NOTA IMPORTANTE

Manual creado y realizado de forma exclusiva por Rafael José Romero

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1992 → 96

TOYOTA

REPAIR MANUAL

- ENGINE
- CHASSIS
- BODY
- ELECTRICAL

CAMRY

INTRODUCTION

HOW TO USE THIS MANUAL

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

TROUBLESHOOTING

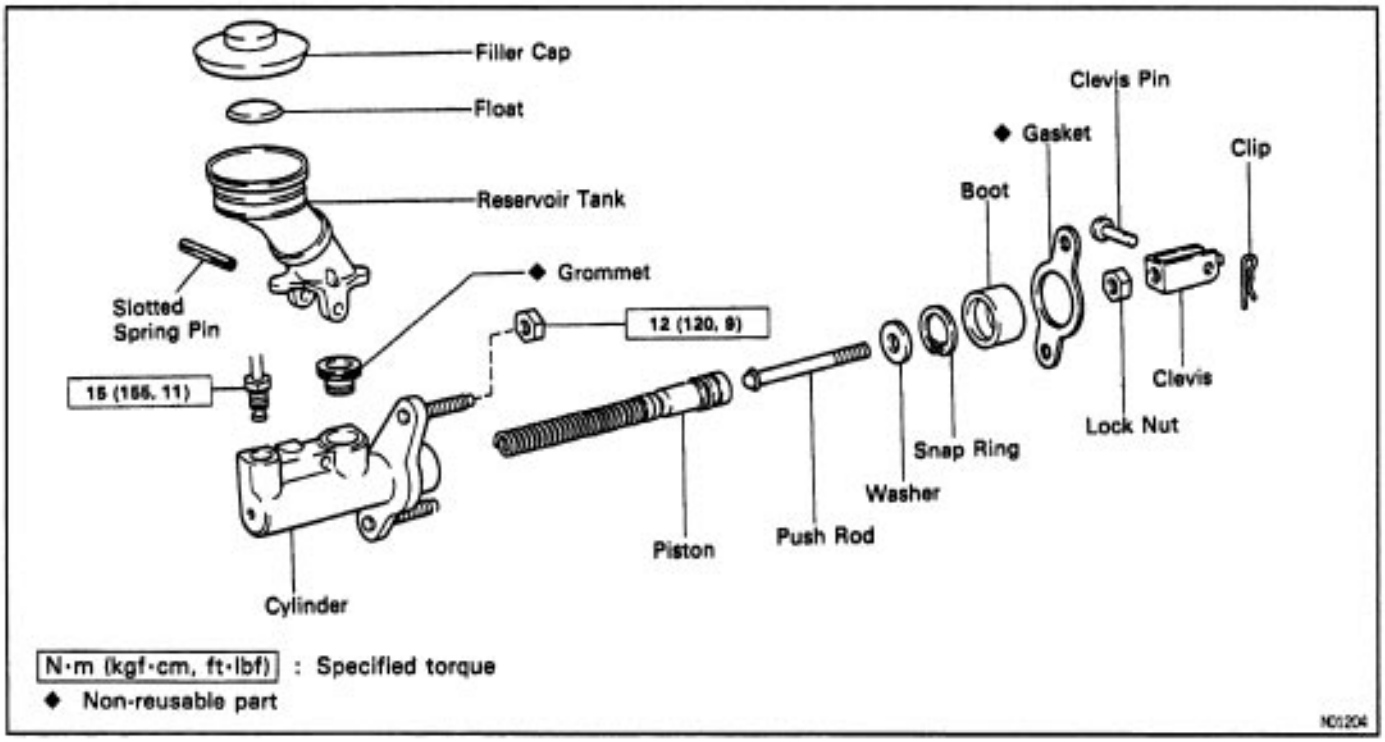
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN –19. Be sure to read this before performing troubleshooting.

PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

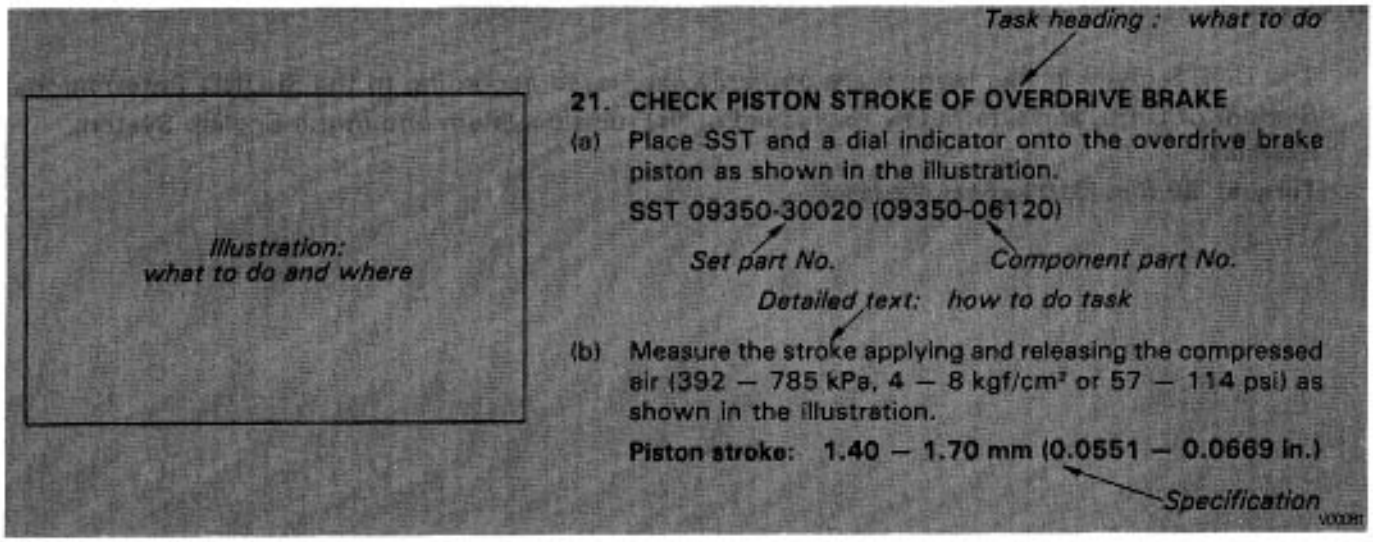
REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



The procedures are presented in a step–by–step format:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.
  Example:



This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the end of each section, for quick reference.

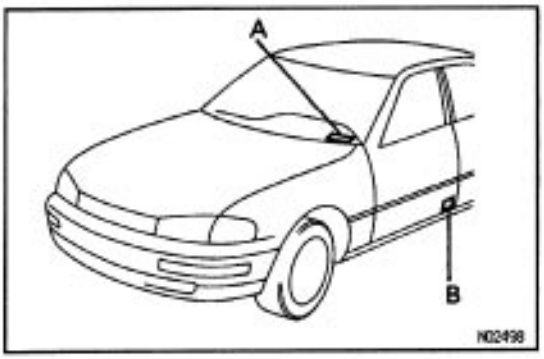
CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

S1 UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.
Example;

Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)



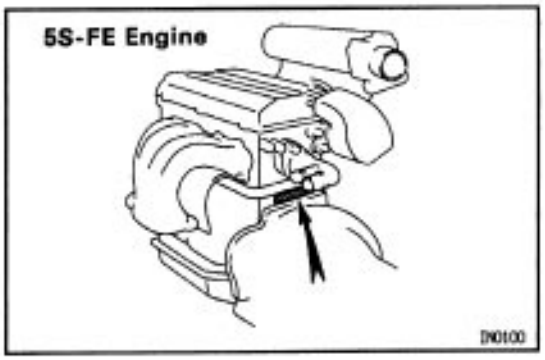
IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and certification label.

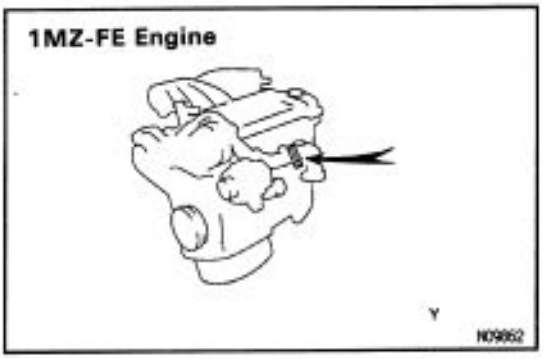
A. Vehicle Identification Number Plate

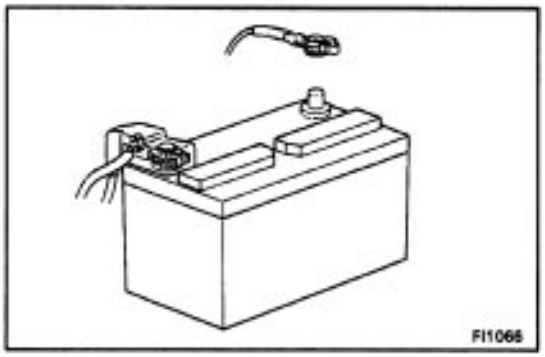
B. Certification Label



ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown.





GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassernbly.
3. Observe the following:

   CAUTION: Work must be started after approx 90 sec–onds from the time the ignition switch is turned to the "LOOK" position and the negative (–) terminal cable is disconnected from the battery (See page RS–2).

   (a) Before performing electrical work, disconnect the negative cable from the battery terminal.

   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (–) terminal which is grounded to the vehicle body.

   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable strai–ght up without twisting or prying it.

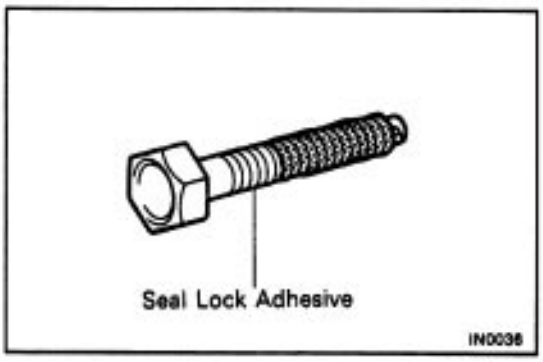
   (d) Clean the battery terminal posts and cable termi–nals with a clean shop rag. Do not scrape them with a file or other abrasive objects.

   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installa–tion. Do not use a hammer to tap the terminal onto the post.

   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non – reusable parts

   (a) Always replace cotter pins, gaskets, 0–rings and oil seals etc. with new ones.

   (b) Non–reusable parts are indicated in the compo–nent illustrations by the "4 " symbol.



6. Precoated parts

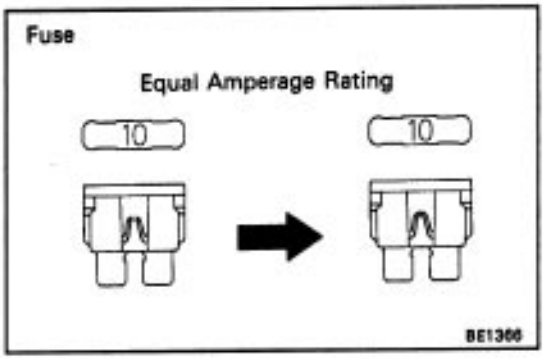
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.

   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

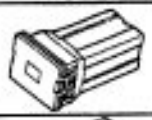
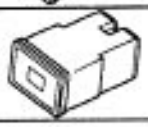
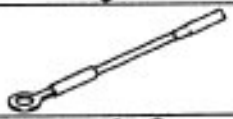
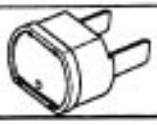
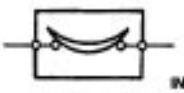
(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

(c) Precoated parts are indicated in the component illustrations by the "®" symbol.

7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work proce–dure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.

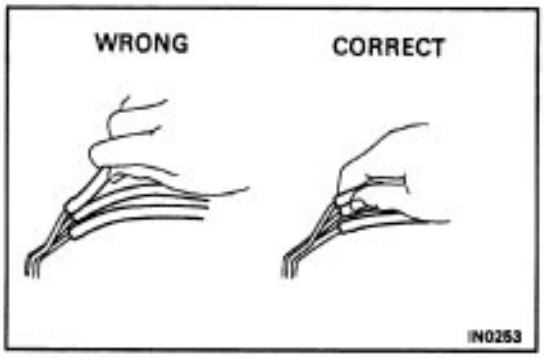


10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

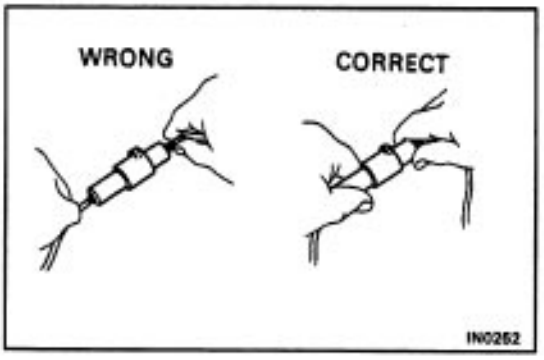
Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

V00075

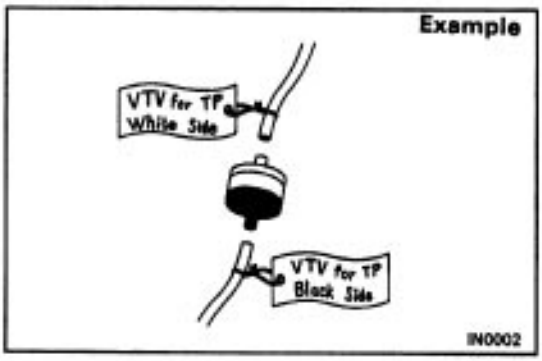
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–37)
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
    (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU, ECM, PCM or TCM unless absolutely necessary. (If the IC terminals are touched, the IC may be destr–oyed by static electricity.)



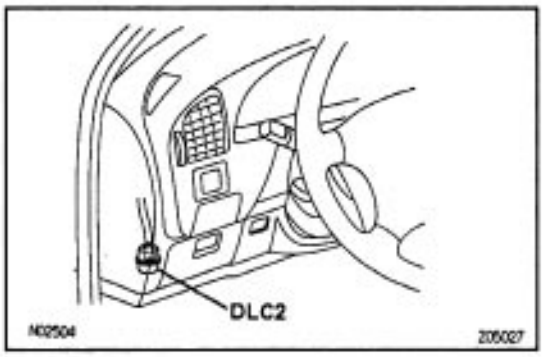
    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the dis–tributor, air filter, and VCV from water.
    (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent termi–nals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.

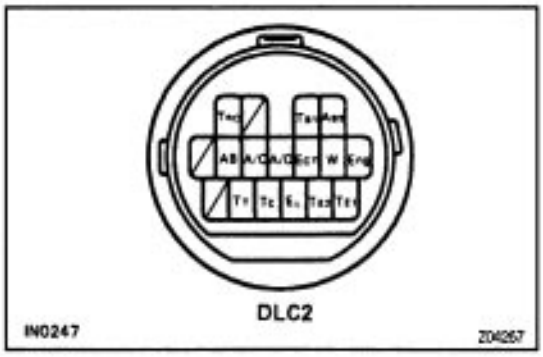


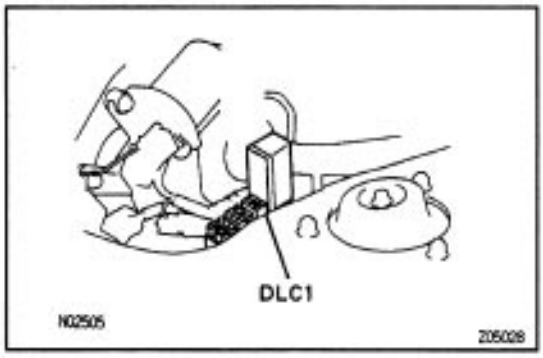
13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.



14. Unless otherwise stated, all resistance is measured at an ambient temperature of 20_3C (68_3F). Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurements should be made when the engine has cooled down.







FOR VEHICLES WITH DATA LINK CONNECTOR 2 (DLC2)

The DLC2 is provided inside the cabin (located under the left side instrument panel) as a connector exclu–sively for diagnosis of data from the engine, automatic transmission, ABS, A/C, Airbag and Cruise Control System to improve serviceability. The DLC1 inside the engine compartment is used for engine adjust–ment.

Connecting the following terminals of the DLC2 to terminal E, selects the diagnosis mode shown.

NOTICE: Never make a mistake with the terminal connec–tion position as this will cause a malfunction.

Terminal	System
T_{E1}	Engine and automatic transmission (Normal mode)
T_{E2} and T_{E1}	Engine and automatic transmission (Test mode)
T_C	ABS, A/C, Airbag and Cruise Control System
T_T	Automatic transmission

Refer to the respective system for the inspection method.

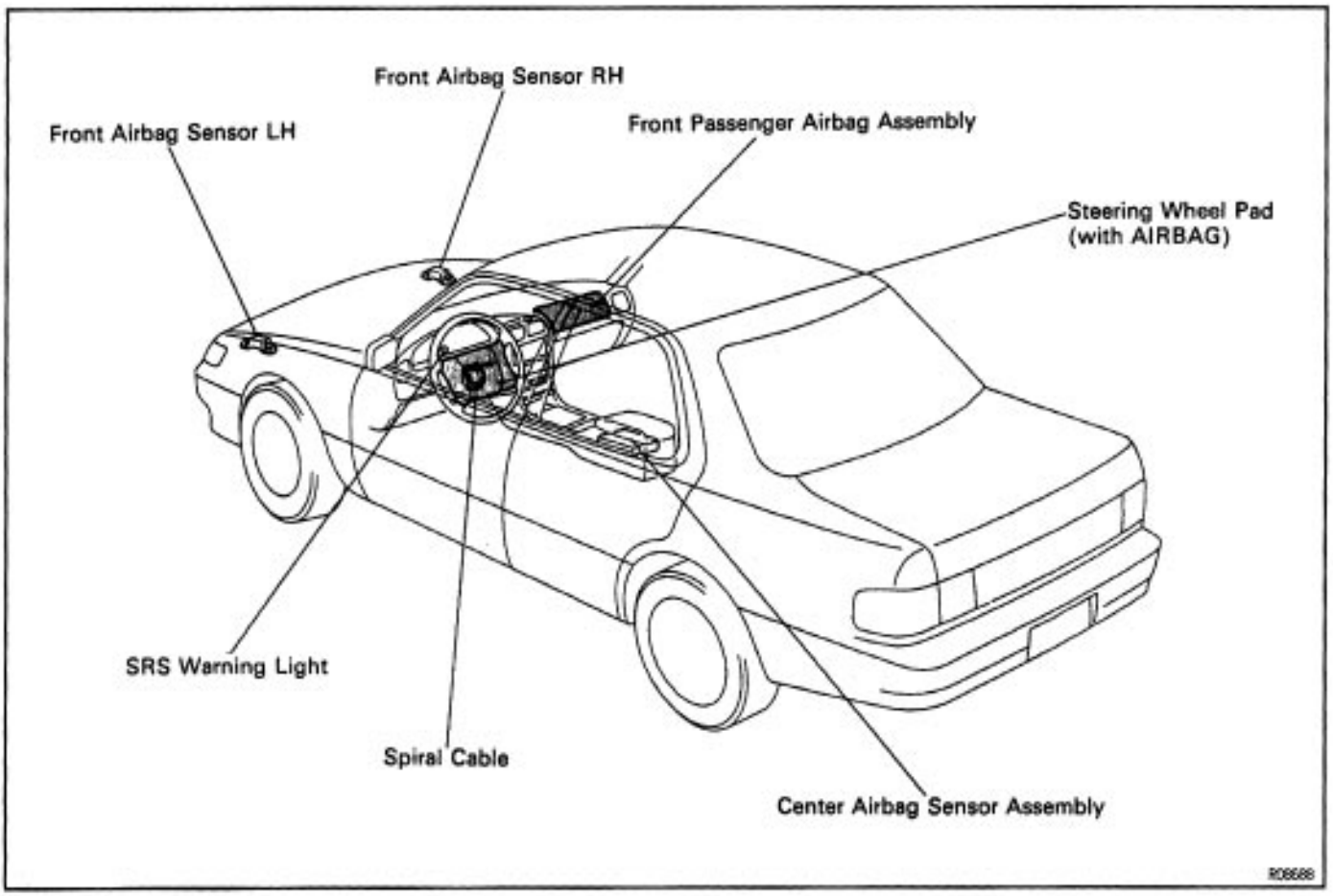
HINT: By connecting the DLC2 up to a monitor specif–ically designed for use with the DLC2, the diagnosis result for each system can be read easily.

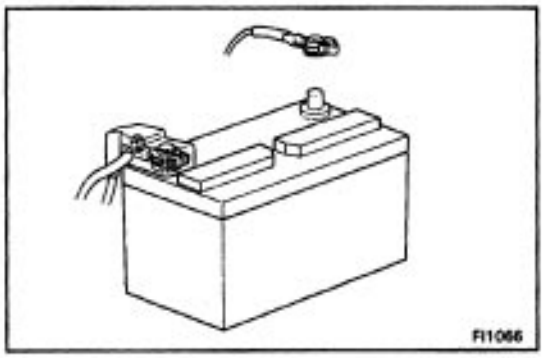
PRECAUTION

FOR VEHICLES EQUIPPED WITH SRS AIRBAG

The 1994 CAMRY specifications is equipped with an SRS (Supplemental Restraint System) airbag.
Failure to carry out service operations in the correct sequence could cause the airbag system to unexpect–edly deploy during servicing, possibly leading to a serious accident.
Further, if a mistake is made in servicing the airbag system, it is possible the airbag may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replace–ment), be sure to read the following items carefully, then follow the correct procedure described in this manual.

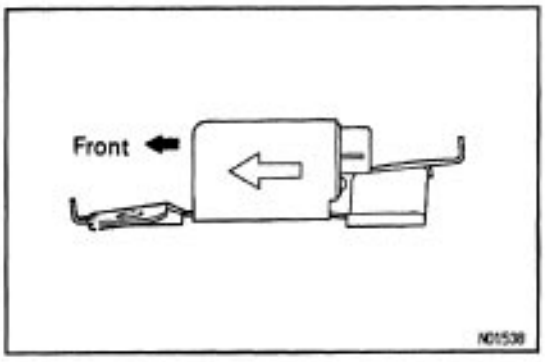
Locations of Airbag Components





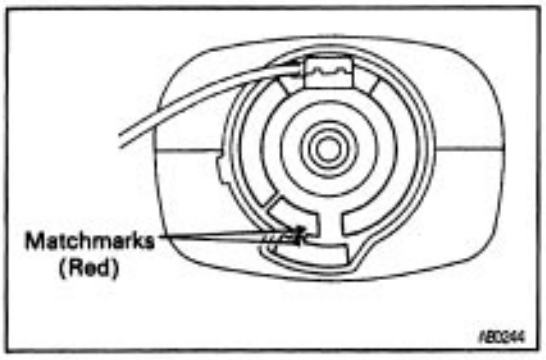
1. Malfunction symptoms of the airbag system are diffi–cult to confirm, so the diagnostic codes become the most important source of information when trouble–shooting. When troubleshooting the airbag system, always inspect the diagnostic codes before dis–connecting the battery (See page RS–55).
2. **Work must be started after approx 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is dis–connected from the battery.**
   (The airbag system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable of the battery, the airbag may be deployed.)
   When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by each memory system. Then when work is finished, reset the clock and audio systems as before.
   To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.
3. Even in cases of a minor collision where the airbag does not deploy, the front airbag sensors , passenger's airbag assembly and the steering wheel pad should be inspected (See page RS–17, 29, 43).
4. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.
5. Before repairs, remove the airbag sensors if shocks are likely to be applied to the sensors during repairs.
6. The center airbag sensor assembly contains mercury. After performing replacement, do not destroy the old part. When scrapping the vehicle or replacing the center airbag sensor assembly itself, remove the center airbag sensor assembly and dispose of it as toxic waste.
7. Never disassemble and repair the front airbag sensors, center airbag sensor assembly or steering wheel pad in order to reuse it.
8. If the front airbag sensors, center airbag sensor as–sembly or steering wheel pad have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
9. Do not expose the front airbag sensors, center airbag sensor assembly or steering wheel pad directly to hot air or flames.
10. Use a volt/ohmmeter with high impedance (10 k) /V minimum) for troubleshooting of the electrical circuit.

11. Information labels are attached to the periphery of the airbag components. Follow the notices.
12. After work on the airbag system is completed, perform the airbag warning light check (See page RS–55).



Front Airbag Sensor

1. Never reuse the front airbag sensors involved in a collision when the airbag has deployed. (Replace both left and right airbag sensors.)
2. Install the front airbag sensor with the arrow on the sensor facing toward the front of the vehicle.
3. The front airbag sensor set bolts have been anti –rust treated. When the sensor is removed, always replace the set bolts with new ones.
4. The front airbag sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If the connector is not securely locked, a malfunction code will be detected by the diagnosis system (See page RS–13).



Spiral Cable (in Combination Switch)

The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position; otherwise cable disconnection and other troubles may result. Refer to page RS–19 concerning correct steering wheel installation.

Steering Wheel Pad (with Airbag)

1. When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
1n this case, the twin –lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. And do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag inflates for some reason.)

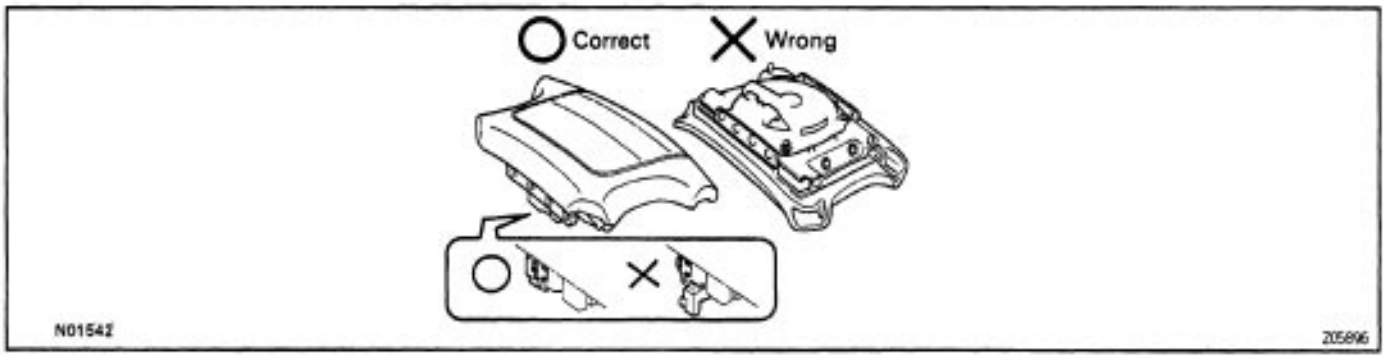
2. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

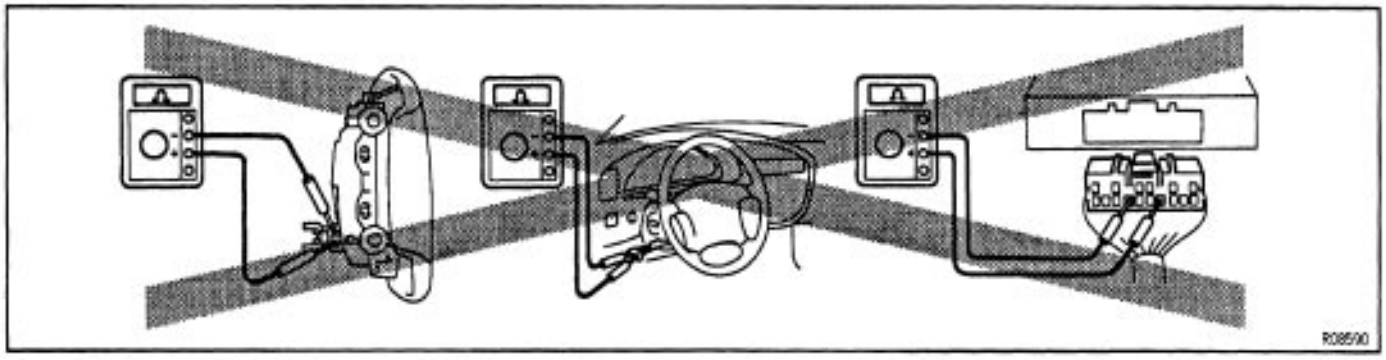
3. Grease should not be applied to the steering wheel pad and the pad should not be cleaned with deter–gents of any kind.

4. Store the steering wheel pad where the ambient tem–perature remains below 93®C (200®F), without high humidity and away from electrical noise.

5. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connec–tor before starting work.

6. When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–22). Perform the operation in a place away from electrical noise.





Front Passenger Airbag Assembly

1. Always store a removed or new front passenger airbag assembly with the airbag door facing up. Storing the airbag assembly with the airbag door facing down could cause a serious accident if the airbag inflates.

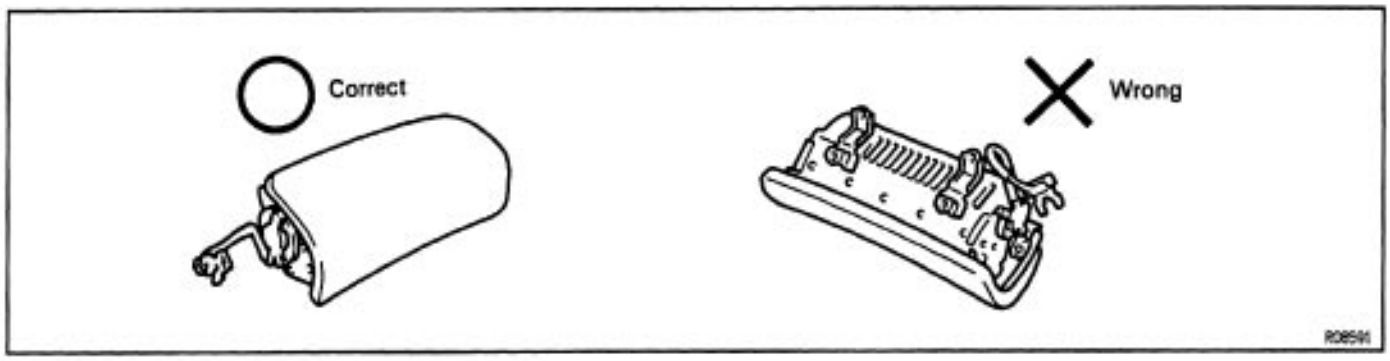
2. Never measure the resistance of the airbag squib. (This may cause the airbag deploy, which is very dangerous.)

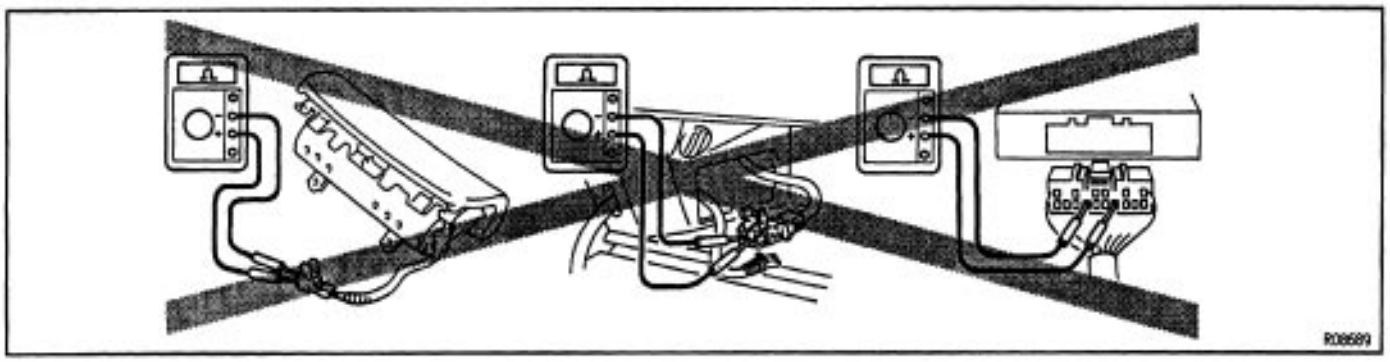
3. Grease should not be applied to the front passenger airbag assembly and the airbag door should not be cleaned with detergents of any kind.

4. Store the airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.

5. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the glove compartment finish plate at the left side of the glove compartment before starting work.

6. When disposing of a vehicle or the airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS–35).
Perform the operation in a safe place away from electrical noise.





Center Airbag Sensor Assembly

The connector to the center airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connector is connected or disconnected while the center airbag sensor as–sembly is not mounted to the floor, it could cause undesired ignition of the airbag system.

Wire Harness and Connector

The airbag system's wire harness is integrated with the cowl wire harness assembly. The wires for the airbag wire harness are encased in a yellow cor–rugated tube. All the connectors for the system are also a standard yellow color. If the airbag system wire harness becomes disconnected or the connector bec–omes broken due to an accident, etc., repair or replace it as shown on page RS–50.

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION: If large amounts of unburned gasoline flow into the converter, It may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.

Avoid running the engine at idle speed for more than 20 minutes.

3. Avoid spark jump test.

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.

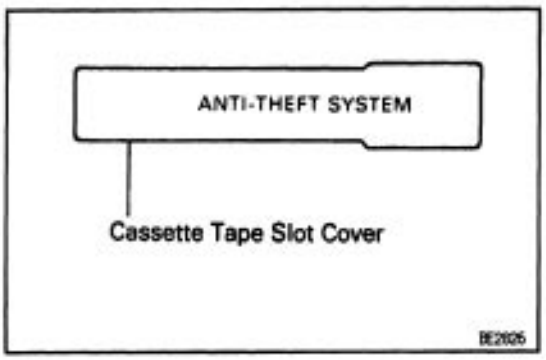
Engine compression tests must be done as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.

This may cause the engine to misfire and create an extra load on the converter.

6. Avoid coasting with ignition turned off and prolonged braking.

7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.



FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM

Audio System displaying the sign ”ANTI –THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery termi–nals or removing the audio system the customer should be asked for the ID number so that the techni–cian can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.

IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two–way radios and cellular telephones, ob–serve the following precautions.

(1) Install the antenna as far as possible away from the ECM, ECU and sensors of the vehicle's electronic system.

(2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECM, ECU and sensors of the vehicle's electronics systems. For details about ECM, ECU and sensors locations, refer to the section on the applica–ble component.

(3) Do not wind the antenna feeder together with the other wiring. As much as possible, also avoid running the antenna feeder parallel with other wire harnesses.

(4) Confirm that the antenna and feeder are correctly adjusted.

(5) Do not install powerful mobile communications system.

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

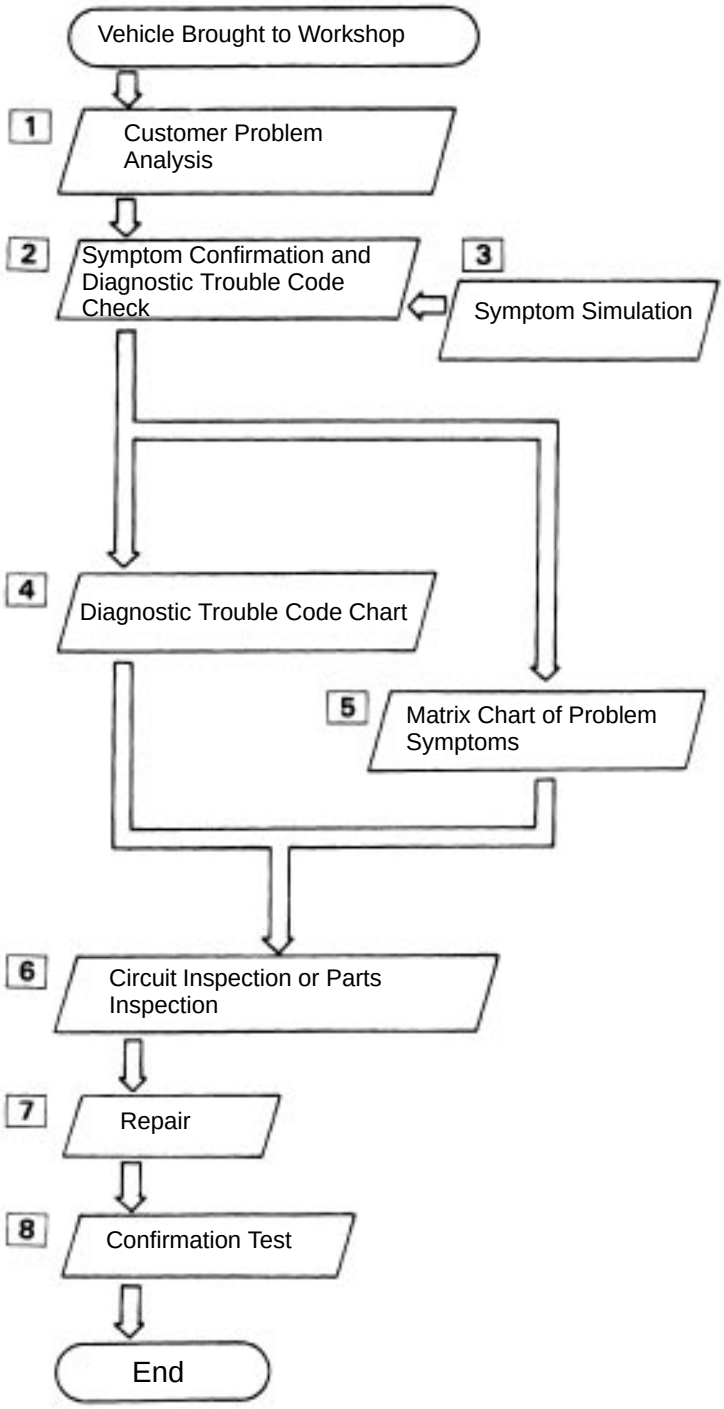
A large number of ECU controlled systems are used in the TOYOTA CAMRY*. In general, the ECU controlled system is considered to be a very intricate system requiring a high level of technical knowledge and expert skill to troubleshoot. However, the fact is that if you proceed to inspect the circuits one by one, troubleshooting of these systems is not complex. If you have adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed to locate and fix the problem. Thismanual is designed through emphasis of the above standpoint to help service technicians perform accurate and effective troubleshooting, and is compiled for the following major ECU controlled systems:

Repair Manual	System		Page
Vol. 1	1.	5S–FE Engine	EG–291
		1MZ–FE Engine	EG–394
Vol. 2	2.	A140E Automatic Transaxle	AX–39
		A541E Automatic Transaxle	AX–49
	3.	Anti–Lock Brake	BR–90
	4.	Supplemental Restraint System	RS–53
	5.	Cruise Control	BE–161

The troubleshooting procedure and how to make use of it are described on the following pages.

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure on the following page. Here, only the basic proce–dure is shown. Details are provided in each section, showing the most effective methods for each circuit. Confirm the troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.



1

Ask the customer about the conditions and the environment when the problem occurred.

2 **3**

Confirm the symptoms and the problem conditions, and check the diagnostic trouble codes.
(When the problem symptoms do not appear dur–ing confirmation, use the symptom simulation method described later on.)

4 **5** **6**

Check the results obtained in Step 2, then confirm the in-spection procedure for the system or the part which should be checked using the diagnostic trouble code chart or the matrix chart of problem symptoms.

7

Check and repair the affected system or part in accordance with the instructions in Step 6.

8

After completing repairs, confirm that the problem has been eliminated.
(If the problem is not reproduced, perform the con–firmation test under the same conditions and in the same environment as when it occurred for the first time.)

1 CUSTOMER PROBLEM ANALYSIS

In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared away in order to give an accurate judgement. To ascertain just what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.

Important Points in the Problem Analysis

The following 5 items are important points in the problem analysis. Past problems which are thought to be unrelated and the repair history, etc. may also help in some cases, so as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for reference in troubleshooting. A customer problem analysis table is provided in the troubleshooting section for each system for your use.

Important Points in the Customer Problem Analysis

- What ——— Vehicle model, system name
- When ——— Date, time, occurrence frequency
- Where ——— Road conditions
- Under what conditions? ——— Running conditions, driving conditions, weather conditions
- How did it happen? ——— Problem symptoms

(Sample) Engine control system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet Inspector's Name

Customer's name		Model and model year	
Driver's name		Frame no.	
Date vehicle brought in		Engine model	
License no.		Odometer reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ———
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other ———
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other ———
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other ———
	☐ Others	

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other ———
Conditions When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other ———
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ___ °F/ ___ °C)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other ———
	Engine Temp.	☐ Cold ☐ Any temp. ☐ Other ———
		☐ Racing

2 SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the TOYOTA CAIVIRY fulfills various functions. The first function is the Diagnostic Trouble Code Check in which a malfunction in the signal circuits to the ECU is stored in code in the ECU memory atthetime of occurrence, to be output bythetechnician during troubleshooting. Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly. By using these check functions, the problem areas can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in the TOYOTA CAMRY

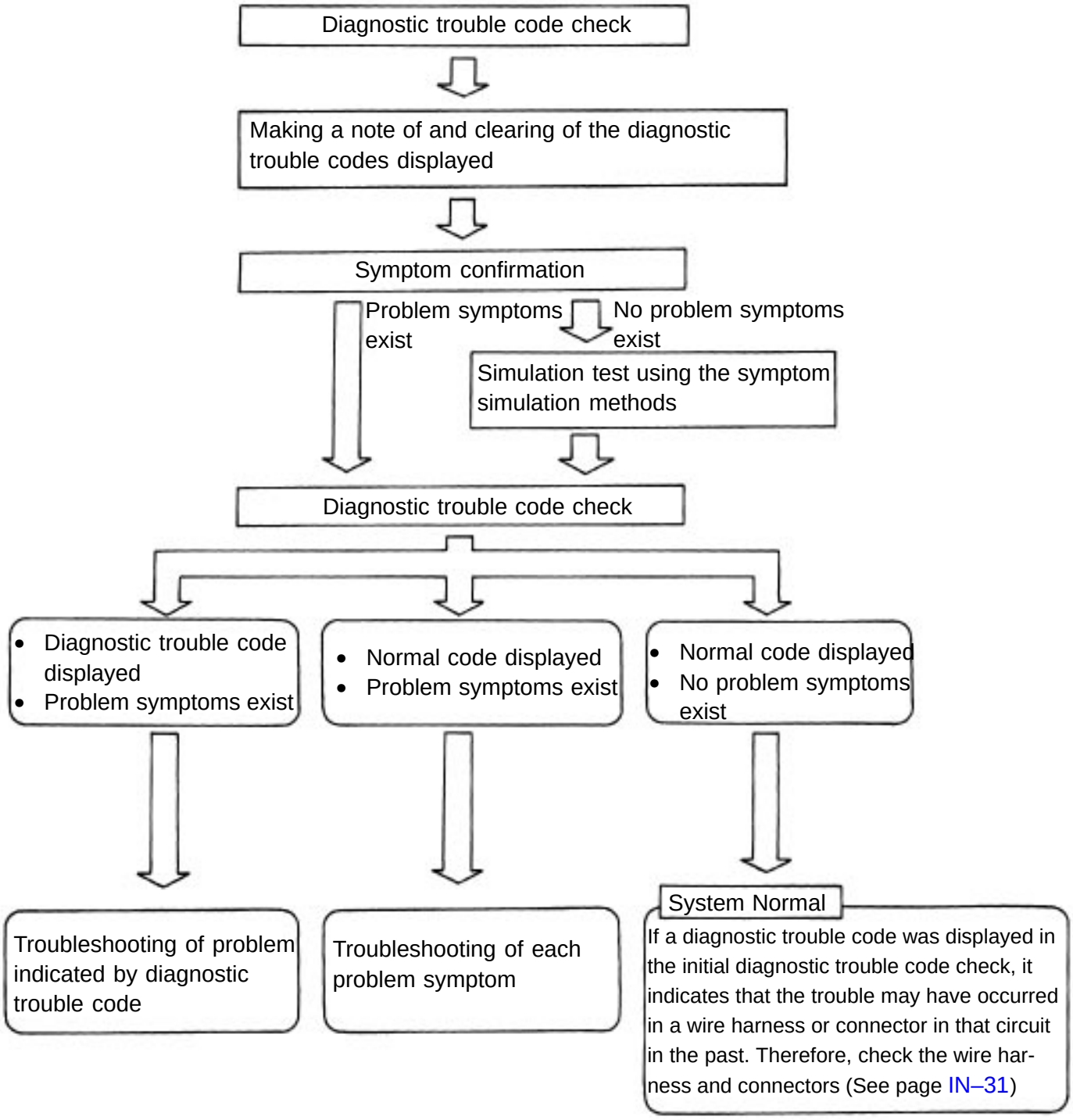
System		Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Other Diagnosis Function
Engine	5S–FE	○ (with Test Mode)	○	
	1MZ–FE	○ (with Check Mode)	○	Diagnostic Test Mode
Automatic Transaxle	A140E	○ (with Test Mode)	○	
	A540E	○ (with Check Mode)	○	Diagnostic Test Mode
Anti–Lock Brake		○	○	
Supplemental Restraint System		○		
Cruise Control		○	○	

In diagnostic trouble code check, it is very important to determine whether the problem indicated by the diagnostic trouble code is still occurring or occurred in the past but returned to normal at present. In addition, it must be checked in the problem symptom check whether the malfunction indicated by the diagnostic trouble code is directly related to the problem symptom or not. For this reason, the diagnostic trouble codes should be checked before and after the symptom confirmation to determine the current conditions, as shown in the table below. If this is not done, it may depending on the case, result in unnecessary troubleshooting for normally operating systems, thus making it more difficult to locate the problem, or in repairs not pertinent to the problem. Therefore, always follow the procedure in correct order and perform the diagnostic trouble code check.

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

Diagnostic Trouble Code Check (Make a note of and then clear)	Confirmation of Symptoms	Diagnostic Trouble Code Check	Problem Condition
Diagnostic Trouble Code Display	Problem symptoms exist	Same diagnostic trouble code is displayed	Problem is still occurring in the diagnostic circuit.
	⇨	Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit. (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem.)
	⇨ No problem symptoms exist		The problem occurred, in the diagnostic circuit in the past.
Normal Code Display	⇨ Problem symptoms exist	Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit.
	⇨ No problem symptoms exist	Normal code is displayed	The problem occurred in a place other than in the diagnostic circuit in the past.

Taking into account the above points, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. This flow chart shows how to utilize the diagnostic trouble code check effectively, then by carefully checking the results, indicates how to proceed either to diagnostic trouble code troubleshooting or to troubleshooting of problem symptoms.



3 SYMPTOM SIMULATION

The most difficult case in troubleshooting is when there are no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out, then¿simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle. No matter now much experience a technician has, or how skilled he may be, if he proceeds to troubleshoot without confirming the problem symptoms he will tend to overlook something important in the repair operation and make a wrong guess somewhere, which will only lead to a standstill. For example, for a problem which only occurs when the engine is cold, or for a problem which occurs due to vibration caused by the road during driving, etc., the problem can never be determined so long as the symptoms are confirmed with the engine hot condition or the vehicle at a standstill. Since vibration, heat or water penetration (moisture) are likely causes for problems which are difficult to reproduce, the symptom simulation tests introduced here are effective measures in that the external causes are applied to the vehicle in a stopped condition.

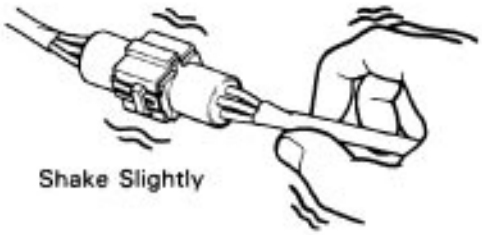
Important Points in the Symptom Simulation Test

In the symptom simulation test, the problem symptoms should of course be confirmed, but the problem area or parts must also be found out. To do this, narrow down the possible problem circuits according to the symptoms before starting this test and connect a tester beforehand. After that, carry out the symptom simulation test, judging whether the circuit being tested is defective or normal and also confirming the problem symptoms at the same time. Refer to the matrix chart of problem symptoms for each system to narrow down the possible causes of the symptom.

1 VIBRATION METHOD: When vibration seems to be the major cause.

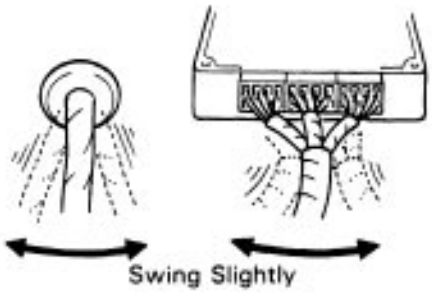
CONNECTORS

Slightly shake the connector vertically and horizontally.



WIRE HARNESS

Slightly shake the wire harness vertically and horizontally. The connector joint, fulcrum of the vibration, and body through portion are the major areas to be checked thoroughly.



FI2331
FI2332

PARTS AND SENSORS

Apply slight vibration with a finger to the part of the sensor considered to be the problem cause and check if the malfunction occurs.

HINT: Applying strong vibration to relays may result in open relays.

FI2330

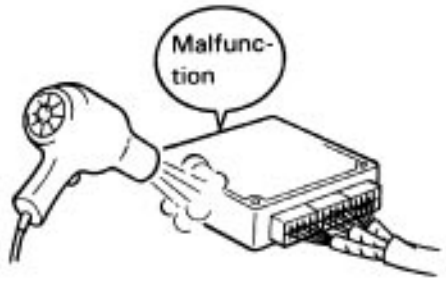
2 HEAT METHOD: When the problem seems to occur when the suspect area is heated.

Heat the component that is the likely cause of the malfunction with a hair dryer or similar object. Check to see if the malfunction occurs.

NOTICE:

(1) Do not heat to more than 60C (140F). (Temperature limit that no damage is done to the component).

(2) Do not apply heat directly to parts in the ECU.



FI2334

3 WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high–humidity condition.

Sprinkle water onto the vehicle and check to see if the malfunction occurs.

NOTICE:

(1) Never sprinkle water directly into the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.

(2) Never apply water directly onto the electronic com–ponents.

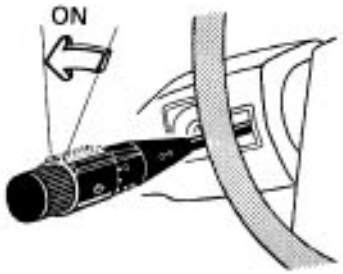
(Service hint)

If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be used.


FI8649

4 OTHER: When a malfunction seems to occur when electrical load is excessive.

Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.



FI2336

4 DIAGNOSTIC TROUBLE CODE CHART

The inspection procedure is shown in the table below. This table permits efficient and accurate troubleshooting using the diagnostic trouble codes displayed in the diagnostic trouble code check. Proceed with troubleshooting in accordance with the inspection procedure given in the diagnostic chart corresponding to the diagnostic trouble codes displayed. The engine diagnostic trouble code chart is shown below as an example.

- DTC No.
  Indicates the diagnostic trouble code.

- Detection Item
  Indicates the system of the problem or contents of the problem.

DIAGNOSTIC TROUBLE CODE CHART (SAE Controlled)

HINT: Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

- Diagnostic Trouble Code Detecting Condition
  Indicates the diagnostic trouble code set parameter.

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0100	Mass Air Flow Circuit Malfunction	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less.
P0101	Mass Air Flow Circuit Range/Performance Problem	Conditions a) and b) continue with engine speed 900 rpm or less. (2 trip detection logic) a) Closed throttle position switch: ON b) Mass air flow meter output > 2.2 V
P0110	Intake Air Temp. Circuit Malfunction	Open or short in intake air temp. sensor circuit.
P0115	Engine Coolant Temp. Circuit Malfunction	Open or short in engine coolant temp. sensor circuit.
		more after starting engine, engine cool... or less

- Trouble Area
  Indicates the suspect area of the problem .

- Page or Instructions
  Indicates the page where the inspection procedure for each circuit is to be found, or gives instructions for checking and repairs.

If a malfunction code is displayed during the diagnostic trouble code check in check mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	MIL	Memory	See Page
• Open or short in mass air flow meter circuit. • Mass air flow meter • ECM	○	○	EG-444
• Mass air flow meter	○	○	EG-450
• Open or short in intake air temp. sensor circuit. • Intake air temp. sensor • ECM	○	○	EG-451
• Open ... sensor circuit.			

5 MATRIX CHART OF PROBLEM SYMPTOMS

The suspect circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshooting the problem when a ”Normal” code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT: When the problem is not detected by the diagnostic system even though the problem symptom is present, it is considered that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a system other than the diagnostic system.

- Page
  Indicates the page where the flow chart for each circuit is located.

- Problem Symptom

- Circuit or Part Name
  Indicates the circuit or part which needs to be checked.

MATRIX CHART OF PROBLEM SYMPTOMS

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Suspect area / See page		Starter signal circuit EG-557	ECM power source circuit EG-565	Fuel pump control circuit EG-575	Fuel pressure control VSV circuit EG-586	A/C signal circuit (Compressor circuit) AC-36	Starter and Starter relay ST-47, 63	Compression EG-36	A/T faulty AX-81	Engine control module (ECM) IN-36
Does not start	Engine does not crank						1			
	No initial combustion		1	2						
	No complete combustion			1						
Difficult to start	Under normal condition	1		2				3		
	Cold engine	1		2						
	Hot engine	1		3	2					
	High engine idle speed					1				

- Circuit Inspection, Inspection Order
  Indicates the circuit which needs to be checked for each problem symptom. Check in the order indicated by the numbers.

6 CIRCUIT INSPECTION

How to read and use each page is shown below.

- Diagnostic Trouble Code No. and Detection Item

- Circuit Description
  The major role and operation, etc. of the circuit and its component parts are explained.

DTC	P0325	Knock Sensor 1 Circuit Malfunction
DTC	P0330	Knock Sensor 2 Circuit Malfunction

- Indicates the diagnostic trouble code, diagnostic trouble code set parameter and suspect area of the problem.

CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 2,000 rpm or more.	• Open or short in knock sensor 1 circuit. • Knock sensor 1 (looseness). • ECM
P0330	No knock sensor 2 signal to ECM with engine speed 2,000 rpm or more.	• Open or short in knock sensor 2 circuit. • Knock sensor 2 (looseness). • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

- Diagnostic Chart
  The troubleshooting procedure for the circuit is shown in a flow chart. Use it to determine if the circuit is normal or abnormal, and, if it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU. For details of each inspection, the page number of the related "Inspection Procedure" is included.

DIAGNOSTIC CHART

HINT: DTC P0325 is for the right bank knock sensor circuit.
DTC P0330 is for the left bank knock sensor circuit.

1 Check knock sensor circuit. — Type II → Go to step 3

Type I

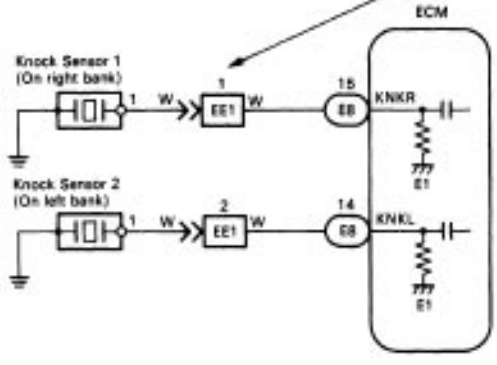
2 Check for open and short in harness and connector between EE1 connector and ECM. — NG → Repair or replace harness or connector.

OK

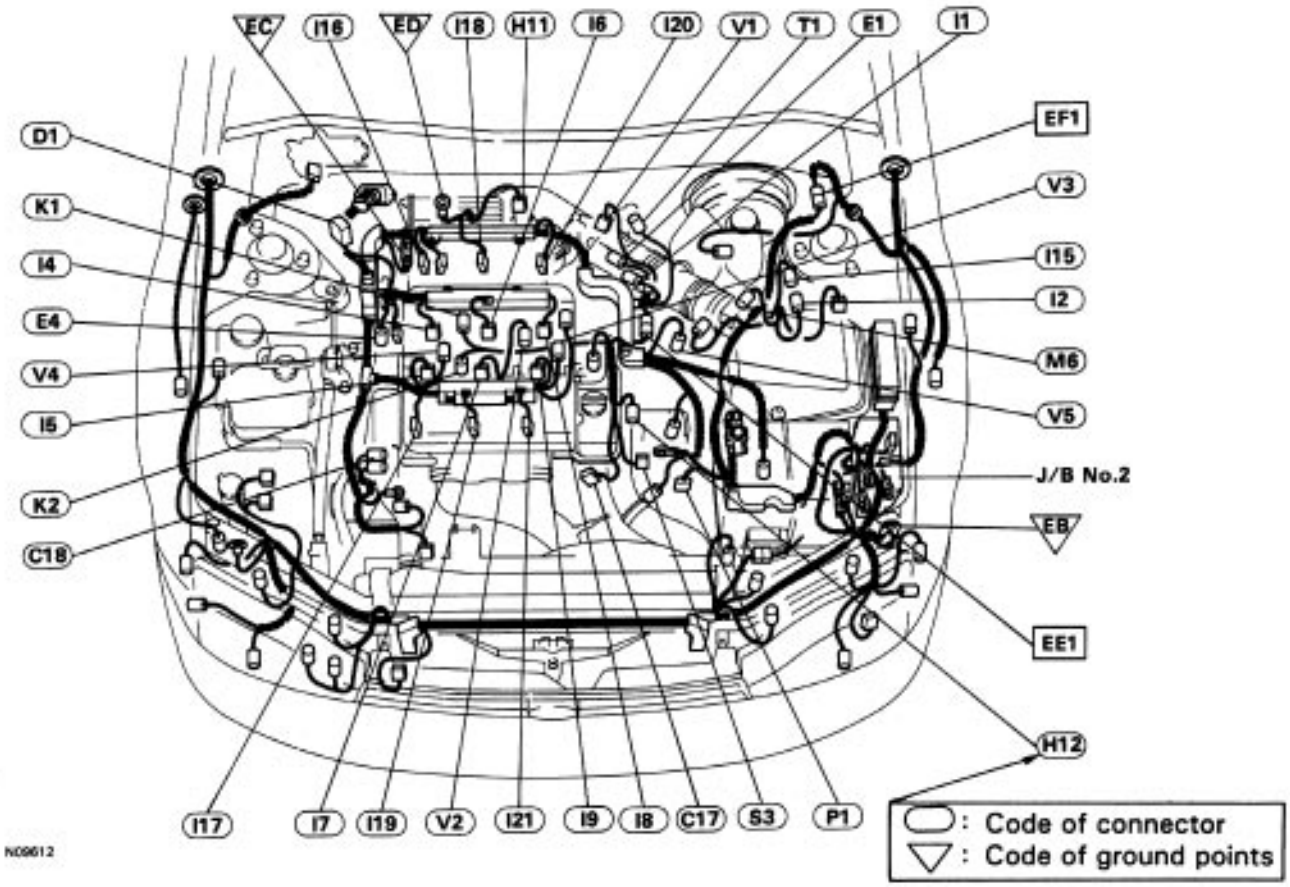
Check and replace ECM.

WIRING DIAGRAM

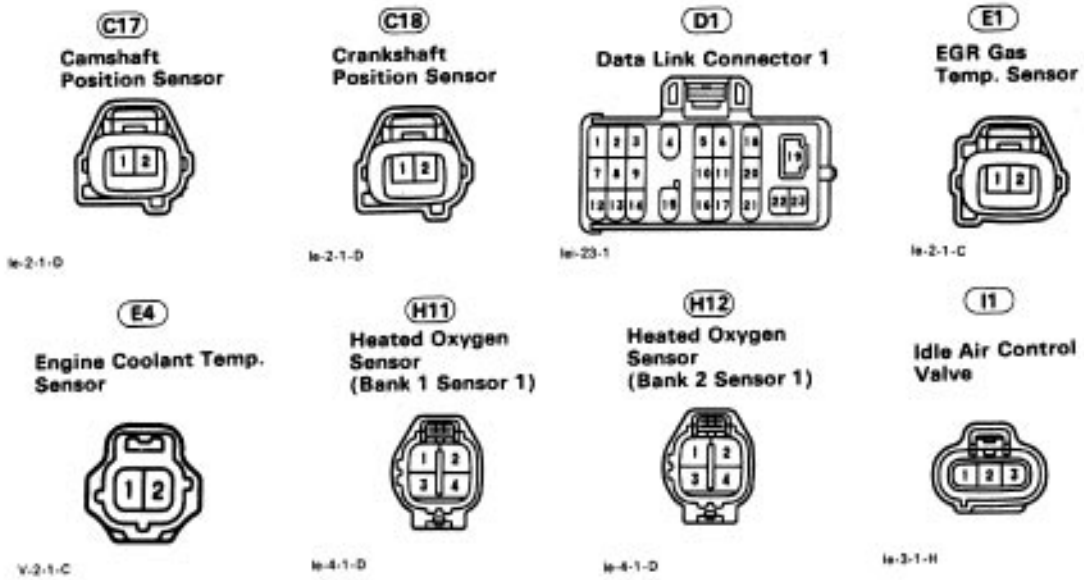
- Wiring Diagram
  This shows a wiring diagram of the circuit. Use thi: diagram together with the location of connector to thoroughly understand the circuit.



Location of Connectors in Engine Compartment



- Location of connectors
  This diagram shows the wire harnesses and connectors used in one system. The connector shows the harness side connector, so when checking the part side connector (sensor, actuator, etc.), be careful not to mistake the terminal positions.



- Indicates the position of the ignition switch during the check.

Ignition Switch OFF
Ignition Switch ON
Ignition Switch STA
Ignition Switch ACC

- Inspection Procedure
This shows the inspection procedure on the diagnostic chart in detail.

Check voltage between terminals VTA and E2 of ECM.

IG ON

(1) Remove glove compartment. (See page EG-309)
(2) Turn ignition switch ON.

Measure voltage between terminals VTA and E2 of ECM.

Throttle Valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	2.7 – 5.2 V

OK

NG

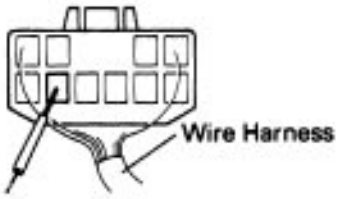
Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN-31).

Check and replace ECM (See page IN–36).

6 Check voltage of ECM

- P Preparation
- C Check

- Indicates the place to check the voltage or resistance.
- Indicates the connector position to be checked, from the front or back side.



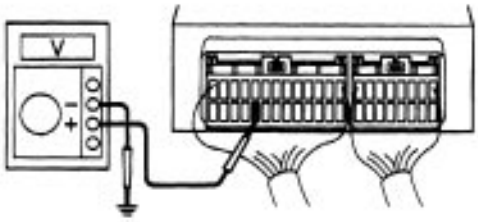
BE4076

Check from the connector back side. (with harness)

BE4077

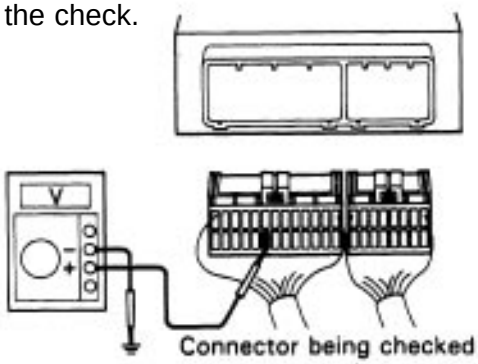
Check from the connector front side (without harness) In this case, care must be taken not to bend the terminals.

- Indicates the condition of the connector of ECU during the check.



Connector being checked is connected.

BR5459



Connector being checked is disconnected.

BR5460

HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

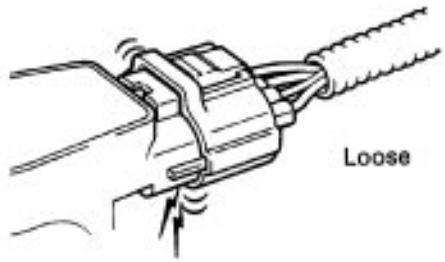
1. For troubleshooting, diagnostic trouble code charts or problem symptom charts are provided for each circuit with detailed inspection procedures on the following page.
2. When all the component parts, wire harnesses and connectors of each circuit except the ECU are found to be normal in troubleshooting, then it is determined that the problem is in the ECU.
   Accordingly, if diagnosis is performed without the problem symptoms occurring, the instruction will be to check and replace the ECU, even if the problem is not in the ECU. So, always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
3. The instructions ”Check wire harness and connector” and ”Check and replace ECU” which appear in the inspection procedure, are common and applicable to all diagnostic trouble codes. Follow the procedure outlined below whenever these instructions appear.

Check Wire Harness and Connector

The problem in the wire harness or connector is an open circuit or a short circuit.

OPEN CIRCUIT:

This could be due to a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc.



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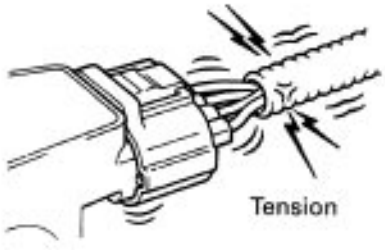


FI7048

HINT:

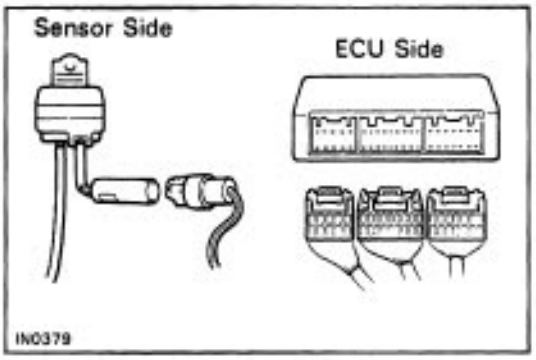
1. It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators.
2. Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a drop in the contact pressure between the male and female terminals of the connector. Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation.
   Therefore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, then the cause is considered to be in the wire harness or connectors.

SHORT CIRCUIT:

This could be due to a short circuit between the wire harness and the body ground or to a short inside the switch, etc.

HINT:

- When there is a short between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.



1. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

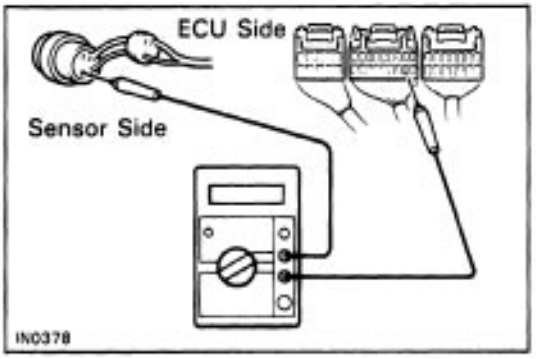
(1) Disconnect the connectors at both ECU and sensor sides.

(2) Measure the resistance between the applicable ter–minals of the connectors.

Resistance: 1II or less

HINT:

- Measure the resistance while lightly shaking the wire harness vertically and horizontally.
- When tester probes are inserted into a connector, insert the probes from the back. For waterproof connectors in which the probes cannot be inserted from the back, be careful not to bend the termianls when inserting the tester probes.



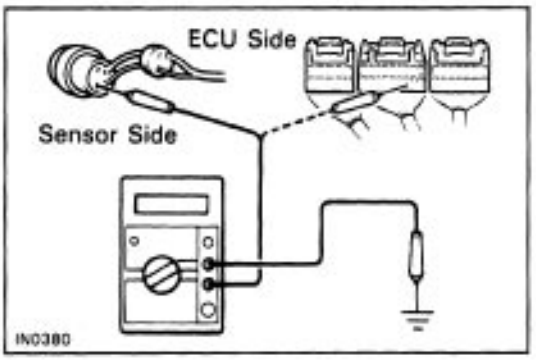
2. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

(1) Disconnect the connectors at both ends.

(2) Measure the resistance between the applicable ter–minals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 1 M) or higher

HINT: Measure the resistance while lightly shaking the wire harness vertically and horizontally.



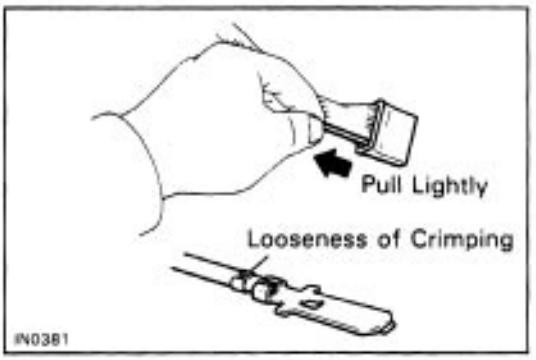
3. VISUAL CHECK AND CONTACT PRESSURE CHECK

(1) Disconnect the connectors at both ends.

(2) Check for rust or foreign material, etc. on the termi–nals of the connectors.

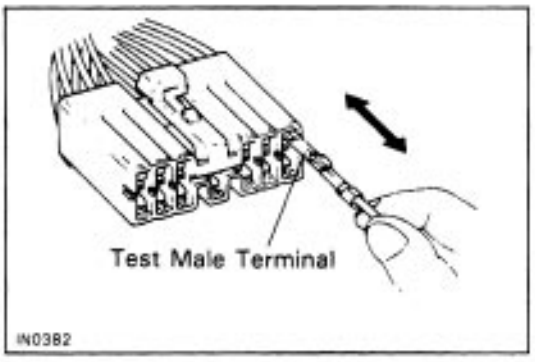
(3) Check crimped portions for looseness or damage and check if the terminals are secured in the lock position.

HINT: The terminals should not come out when pulled lightly.



(4) Prepare a test male terminal and insert it in the female terminal, then pull it out.

HINT: When the test terminal is pulled out more easily than others, there may be poor contact in that section.

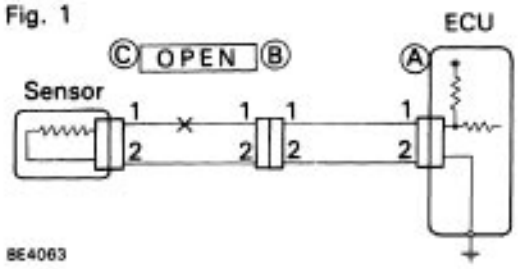


Actual examples of the inspection method for open circuit and short circuit are explained below.

1. OPEN CIRCUIT CHECK

For the open circuit in the wire harness in Fig. 1, perform “(a) Continuity Check” or “(b) Voltage Check” to locate the section.

Fig. 1



(a) Continuity Check

(1) Disconnect connectors (A) and (C) and measure the resistance betwen them.

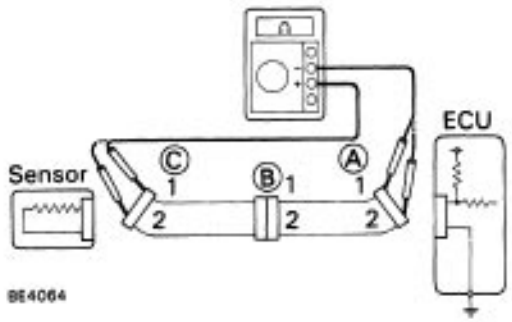
In the case of Fig. 2,

Between terminal 1 of connector (A) and terminal 1 of connector (C)→ No continuity (open)

Between terminal 2 of connector (A) and terminal 2 of connector (C)→ Continuity

Therefore, it is found out that there is an open circuit between terminal 1 of connector (A) and terminal 1 of connector (C).

Fig. 2



(2) Disconnect connector (B) and measure the resistance between connectors (A) and (B), (B) and(C),

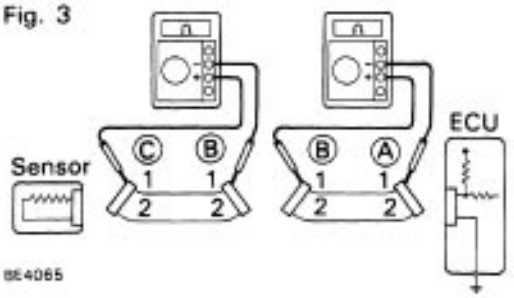
In the case of Fig. 3,

Between terminal 1 of connector (A) and terminal 1 of connector (B)→Continuity

Between terminal 1 of connector (B) and terminal 1 of connector (C)→No Continuity (open)

Therefore, it is found out that there is an open circuit between terminal 1 of connector (B) and terminal 1 of connector (C).

Fig. 3



(b) Voltage Check

In a circuit in which voltage is applied (to the ECU connector terminal), an open circuit can be checked for by conducting a voltage check.

(1) As shown in Fig. 4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector (A) at the ECU 5 V output terminal, terminal 1 of connector (B), and terminal 1 of connector (C), in that order.

If the results are:

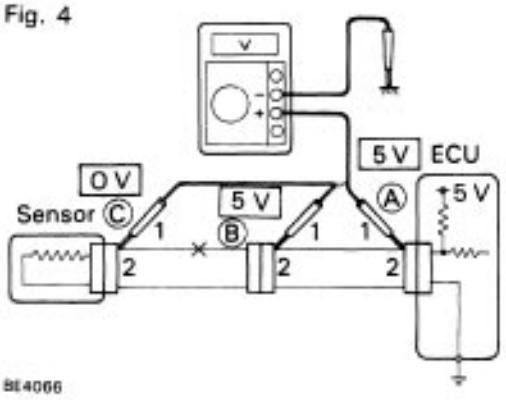
5 V: Between Terminal 1 of connector (A) and Body Ground

5 V: Between Terminal 1 of connector (B) and Body Ground

0 V: Between Terminal 1 of connector (C) and Body Ground

then it is found out that there is an open circuit in the wire harness between terminal 1 of (B) and terminal 1 of (C).

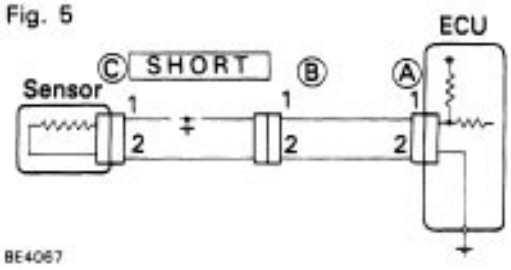
Fig. 4



2. SHORT CIRCUIT CHECK

If the wire harness is ground shorted as in Fig. 5, locate the section by conducting a “continuity check with ground”.

Fig. 5



(a) Continuity Check with Ground

(1) Disconnect connectors (A) and (C) and measure the resistance between terminals 1 and 2 of connector (A) and body ground.

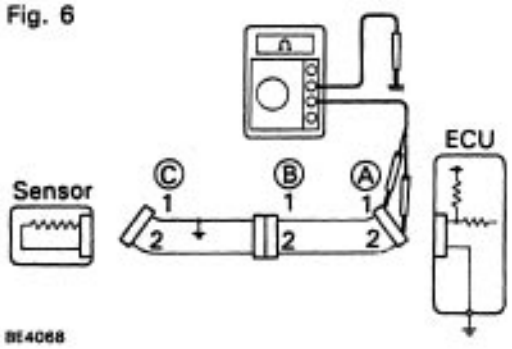
In the case of Fig. 6,

Between terminal 1 of connector (A) and body ground → Continuity

Between terminal 2 of connector (A) and body ground → No continuity (open)

Therefore, it is found out that there is a short circuit between terminal 1 of connector (A) and terminal 1 of connector (C).

Fig. 6



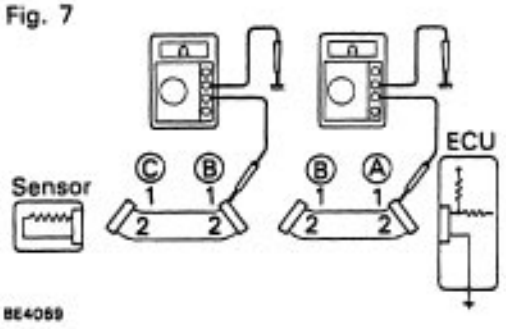
(2) Disconnect connector (B) and measure the resistance between terminal 1 of connector (A) and body ground, and terminal 1 of connector (B) and body ground.

Between terminal 1 of connector (A) and body ground → No continuity (open)

Between terminal 1 of connector (B) and body ground → Continuity

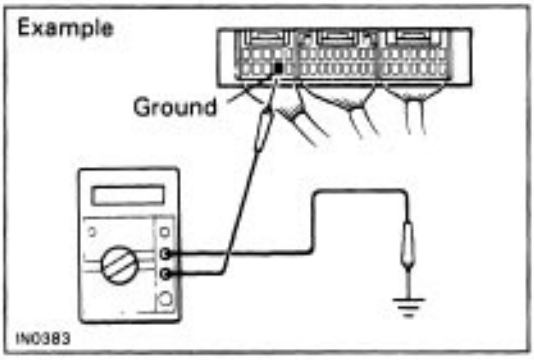
Therefore, it is found out that there is a short circuit between terminal 1 of connector (B) and terminal 1 of connector (C).

Fig. 7

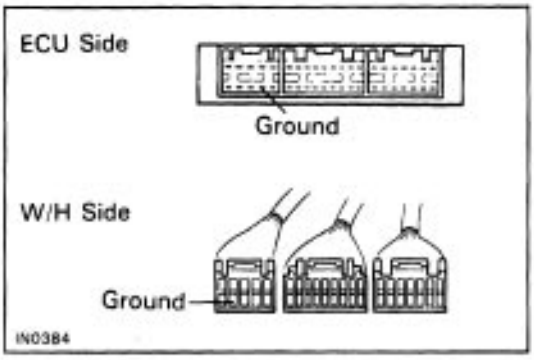


Check and Replace ECU

First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty, so replace the ECU with a known good one and check if the symptoms appear.

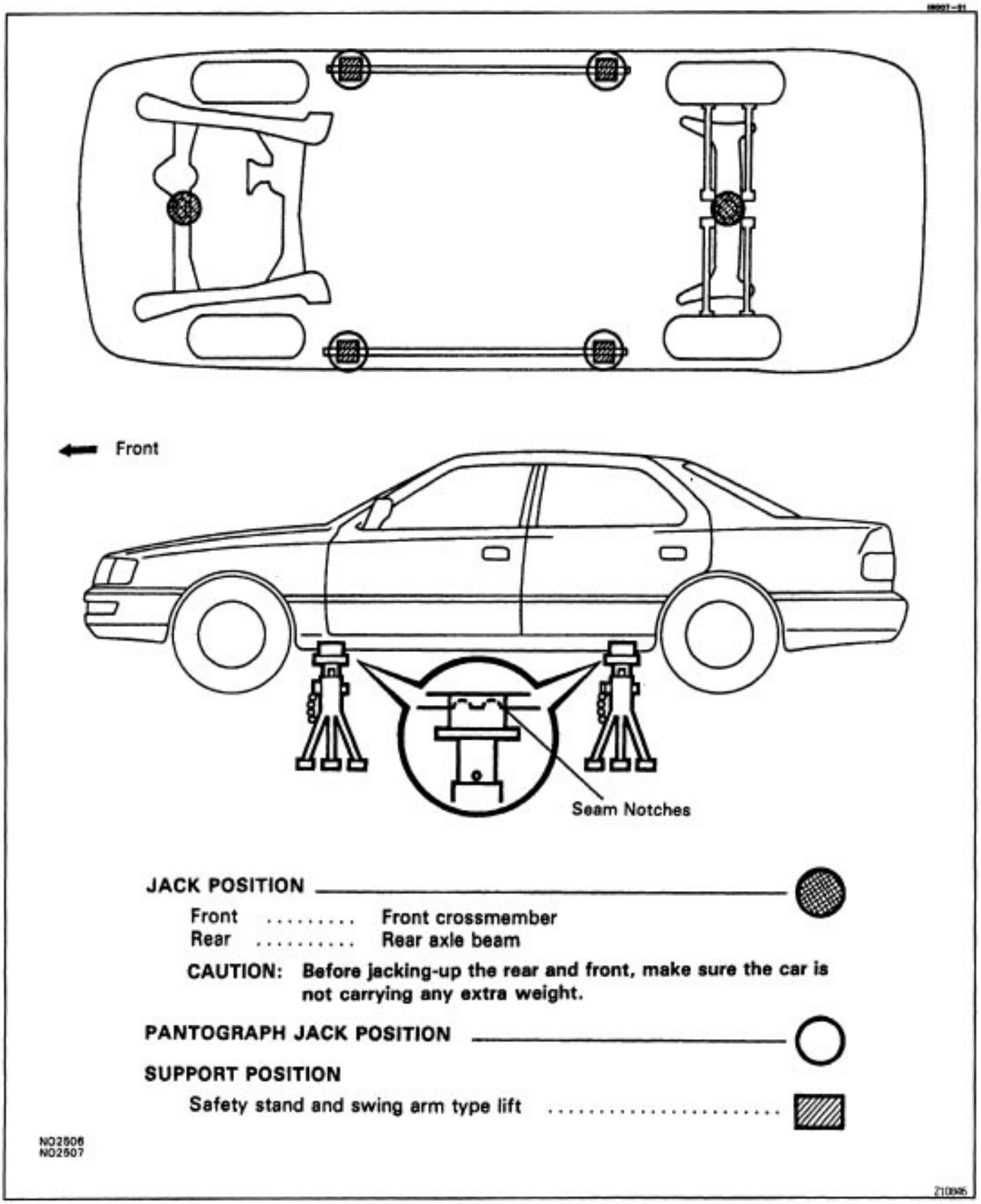


(1) Measure the resistance between the ECU ground terminal and the body ground.
Resistance: 1Ω or less



(2) Disconnect the ECU connector, check the ground terminals on the ECU side and the wire harness side for bend and check the contact pressure.

VEHICLE LIFT AND SUPPORT LOCATIONS



ABBREVIATIONS USED IN THIS MANUAL

ABS	Anti–Lock Brake System
ALR	Automatic Locking Retractor
A/T	Automatic Transaxle
ATF	Automatic Transmission Fluid
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
Calif.	California
CB	Circuit Breaker
CRS	Child Restraint System
DP	Dash Pot
ECU	Electronic Control Unit
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EX	Exhaust (Manifold, Valve)
Ex.	Except
FIPG	Formed in Place Gasket
FL	Fusible Link
Fr	Front
IG	Ignition
IN	Intake (Manifold, Valve)
J/B	Junction Block
LED	Light Emitting Diode
LH	Left – Hand
LSPV	Load Sensing Proportioning Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T	Menusl Trsnsaxls
0/D, OD	Overdrive
0/S	Oversize
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PS	Power Steering
RH	Right–Hand
Rr	Rear
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch

TDC	Top Dead Center
TEMP.	Temperature
T/M	Transmission
TMC	Toyota Motor Corporation
TM M	Toyota Motor Manufacturing U.S.A., Inc.
u/s	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
W/O	Without

GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE–J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their Toyota equivalents.

SAE ABBREVI–ATIONS	SAE TERMS	TOYOTA TERMS ( )–ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+ B, Battery Voltage
BARO	Barometric Pressure	–
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CM P	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CTP	Closed Throttle Position	Idle ON (IDL ON)
D FI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Toyota Diagnosis Comunication Link (TDCL) 3: OBDII Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
EC L	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM). Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EG R	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Toyota Distributorless Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
H02S	Heated Oxygen Sensor	Heated Oxygen Sensor (H02S)

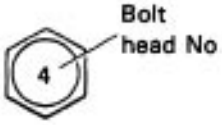
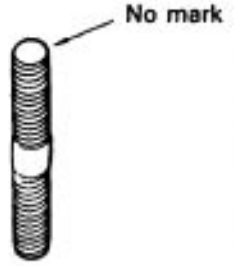
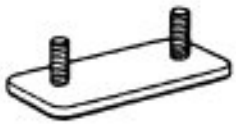
IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection
IFS	Inertia Fuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	–
MFI	M ultiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, Ot Sensor (OtS)
OBD	On –Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
S RT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–

TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three–Way Catalytic Converter	Three–Way Catalytic (TWC) CC_{RO}
TWC+OC	Three–Way + Oxidation Catalytic Converter	CC_R+ CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
WOT	Wide Open Throttle	Full Throttle
WU–OC	Warm Up Oxidation Catalytic Converter	–
WU –TWC	Warm Up Three–Way Catalytic Converter	Manifold Converter
3GR	Third Gear	–
4G R	Fourth Gear	–

STANDARD BOLT TORQUE SPECIFICATIONS

IN00S–01

HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T	Stud bolt		4T
	 No mark	4T			6T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T			
Hexagon head bolt	 2 protruding lines	5T			
Hexagon flange bolt w/ washer hexagon bolt	 2 protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 3 protruding lines	7T			
Hexagon head bolt	 4 protruding lines	8T			

V00078

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
1 OT	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

MAINTENANCE

(5S–FE)

MAINTENANCE SCHEDULE

SCHEDULE A

CONDITIONS:

Towing a trailer, using a camper or car top carrier.
Repeated short trips of less than 8 km (5 miles) with outside temperature remaining below freezing.
Extensive idling and/or low speed driving for long distances, such as police, taxi or door–to –door delivery use.
Operating on dusty, rough, muddy or salt spread roads.
Maintenance operation: A = Check and adjust if necessary.
R = Replace, change or lubricate.
I = Inspect and correct or replace if necessary.

System	Service interval (Use odometer reading or months, whichever comes first) / Maintenance items	Maintenance services beyond 96,000 km (60,000 miles) should continue to be performed at the same intervals shown for each maintenance schedule.																See page (item No.)
	1,000 km	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	Months
	1,000 miles	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60	
ENGINE	Timing belt (1)																R	–	MA–6 (item 1)
	Valve clearance																A	A: Every 72 months	MA–10 (item 12)
	Drive belts	I: First period 96,000 km (60,000 miles) or 72 months. I: After that every 12,000 km (7,500 miles) or 12 months.																	MA–6 (item 2)
	Engine oil and oil filter*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA–8 (item 6)
	Engine coolant	R: First period 72,000 km (46,000 miles) or 36 months. R: After that every 48,000 km (30,000 miles) or 24 months.																	MA–8 (item 7)
	Exhaust pipes and mountings				I				I				I				I	I: Every 24 months	MA–10 (item 11)
FUEL	Air filter (2)*	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	I: Every 6 months A: Every 36 months	MA–7 (item 3, 4)
	Fuel lines end connections (3)								I								I	I: Every 36 months	MA–9 (item 10)
	Fuel tank cap gasket																R	R; Every 72 months	MA–9 (item 9)
IGNITION	Spark plugs (Platinum tipped type)																R	R; Every 72 months	MA–7 (item 5)
EVA P	Charcoal canister (4)																I	I; Every 72 months	MA–9 (item 8)
BRAKES	Brake linings and drums (6)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–1 1 (item 15)
	Brake pads and discs (Front and rear)		I		I		I		I		I		I		I		I	I; Every 12 months	MA–10 (item 14)
	Brake line pipes and hoses				I				I				I				I	I: Every 24 months	MA–10 (item 13)

System	Service interval (Use odometer reading or months, whichever comes first) / Maintenance items	Maintenance services beyond 96,000 km (60,000 miles) should continue to be performed at the same intervals shown for each maintenance schedule. ,																Months	See page (item No.)
	1,000 km	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
	1,000 miles	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60		
CHASSIS	Steering linkage		I		I		I		I		I		I		I		I	I: Every 12 months	MA–12 (item 16)
	SRS airbag	I; First period 10 years. I: After that every 2 years.																	MA–12 (item 17)
	Drive shaft boots		I		I		I		I		I		I		I		I	I; Every 12 months	MA–13 (item 19)
	ball joints and dust covers		I		I		I		I		I		I		I		I	I: Everv 12 month:	MA–1 3 (item 20)
	Manual t anaaxle, automatic tansaxie and differential (6)				R				R				R				R	R; Every 24 months	MA–14 (item 21, 22)
	Steering gear housing oil (7)				I				I				I				I	I: Every 24 months	MA–1 3 (item 18)
	Bolts and nuts on chassis and body (8)		I		I		I		I		I		I		I		I	f: Every 12 months	MA–1 5 (item 23)

*** marks indicates maintenance which is part of the warranty conditions for the Emission Control Systems. The warranty period is in accordance with the owner's guide or the warranty booklet.**

***: California and New York specification vehicles**

(1) Applicable to vehicles operated under conditions of extensive idling and/or low speed driving for long distances such as police, taxi or door–to–door delivery use.

(2) Applicable when operating mainly on dusty roads.

(3) Includes inspection of fuel tank band and vapor vent system.

(4) Non –maintenance item except for California and New York.

(5) Also applicable to drum lining for parking brake. For other usage conditions, refer to SCHEDULE B.

(6) Check for leakage.

(7) Check for oil leaks from steering gear housing.

(8) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.

Front and rear suspension member to cross body.

Strut bar bracket to body bolts.

Bolts for seat installation.

SCHEDULE B

CONDITIONS:

Conditions others than those listed for SCHEDULE A.

Maintenance operation: A = Check and adjust if necessary.
R = Replace, change or lubricate.
I = Inspect and correct or replace if necessary.

system	Service interval (Use odometer reading or months, whichever comes first) / Maintenance items	Maintenance services beyond 96,000 km (60,000 miles) should continue to be performed at the same Intervals shown for each maintenance schedule.									See page (item No.)
		1,000 km	12	24	36	48	60	72	84	96	Months
		1,000 miles	7.6	15	22.5	30	37.5	45	52.5	60	
ENGINE	Volvo clearance									A	A: Every 72 months	MA–10 (item 12)
	Drive belt	I: First period 96,000 km (60,000 miles) or 72 months. I: After that every 12,000 km (7,500 miles) or 12 months.										MA–6 (item 2)
	Engine oil and oil filter*	R	R	R	R	R	R	R	R	R	R: Every 12 months	MA– 8 (item 6)
	Engine coolant	R: First period 72,000 km (45,000 miles) or 36 months. R: After that every 48,000 km (30,000 miles) or 24 months.										MA–8 (item 7)
	Exhaust pipes and mountings				I				I		I: Every 36 months	MA–1 0 (item 11)
FUEL	Air filter*				R				R		R: Every 36 months	MA–7 (item 3, 4)
	Fuel line' and connections (1)				I				I		I: Every 36 month:	MA– 9 (item 10)
	Fuel tank cap gasket								R		R: Every 72 months	MA–9 (item 9)
IGNITION	Spark pluq:(Platinum tipped type)								R		R: Every 72 months	MA–7 (item 5)
EVAP	Charcoal canister (2)								I		I; Every 72 months	MA– 9 (item 8)
BRAKES	Brake linings end drums (3)		I		I		I		I		I: Even 24 months	MA–1 1 (item 15)
	Brake pads and discs		I		I		I		I		I: Every 24 months	MA– 10 (item 14)
	Brake line pipes and hoses (Front and rear)		I		I		I		I		I: Every 24 months	MA–10 (item 13)
CHASSIS	Steering linkage		I		I		I		I		!: Every 24 months	MA–12 (item 16)
	SRS airbag	I: First period 10 years. I: After that every 2 years.										MA–12 (item 17)
	Drive shaft boots		I		I		I		I		I: Every 24 months	MA–1 3 (item 19)
	^aIl joints and dust covers		I		I		I		I		i: Every 24 months	MA– 13 (item 20)
	Man^al transaxle, automatic transaxle and differential (4)		I		I		I		I		I: Every 24 months	MA– 14 (item 21, 22)
	Steering goof housing oil (5)		I		I		I		I		I: Every 24 months	MA–13 (item 18)
	Bolts and nuts on chassis and body (6y		I		I		I		I		I: Every 24 months	MA–1 5 (item 23)

*** marks indicates maintenance which is part of the warranty conditions for the Emission Control Systems. The warranty period is in accordance with the owner's guide or the warranty booklet, *; California and New York specification vehicles**

(1) Includes inspection of fuel tank band and vapor vent system.
(2) Non–maintenance item except for California and New York.
(3) Also applicable to drum lining for parking brake.
(4) Check for leakage.
(5) Check for oil leaks from steering gear housing.
(6) The applicable parts are listed below.

- Front and rear suspension member to cross body.
- Strut bar bracket to body bolt.
  Bolts for seat installation.

PREPARATION

EQUIPMENT

Belt tension gauge	
Dial indicator or dial indicator with magnetic base	
Micrometer	
Mirror	Brake hose
Steel square	
Tachometer	
Torque wrench	
Vernier calipers	

COOLANT

Item	Capacity	Classification
Engine coolant (w/ Heater)	6.3 liters (6.7 US qts, 5.5 Imp. qts)	Ethylene–glycol base

LUBRICANT

Item	Capacity	Classification
Engine oil (M/T) Dry fill Drain and refill w/ Oil filter change w/o Oil filter change Engine oil (A/T) Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	4.2 liters (4.4 US qts, 3.7 Imp. qts) 3.6 liters (3.8 US qts, 3.2 Imp. qts) 3.4 liters (3.6 US qts, 3.0 Imp. qts) 4.3 liters (4.5 US qts, 3.8 Imp. qts) 3.18 liters (3.8 US qts, 3.2 Imp. qts) 3.4 liters (3.6 US qts, 3.0 Imp. qts)	API grade SG or SH, Energy –Conserving II mutigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil
Manual transaxle oil (w/ Differential oil)	2.6 liters (2.7 US qts, 2.3 Imp. qts)	AN GL–3 SAE 75W–90 In case the above is unavailable API GL–4 or GL–5 SAE 75w–90
Automatic transaxle fluid Dry fill Drain and refill	5.18 liters (5.9 US qts, 4.9 Imp. qts) 2.5 liters (2.6 US qts, 2.2 Imp. qts)	ATF DEXRON II
Differential oil	1.6 liters (1.7 US qts, 1.4 Imp. qts)	ATF DEXRON II

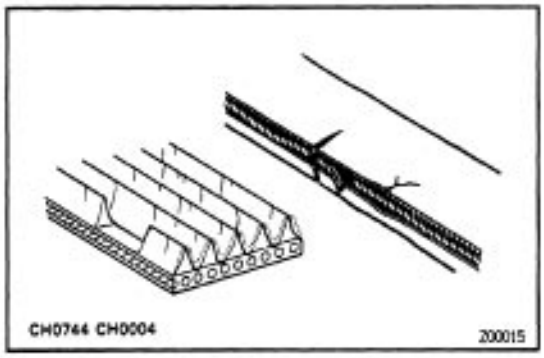
MAINTENANCE OPERATIONS

Cold Engine Operations

1. REPLACE TIMING BELT

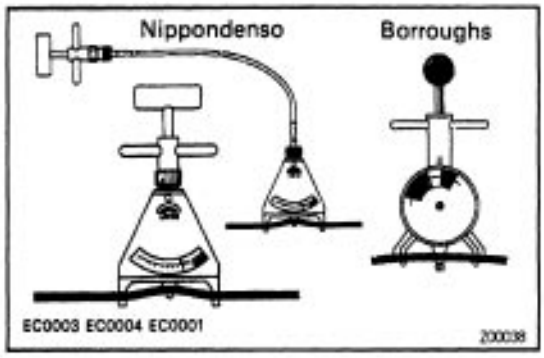
(a) Remove the timing belt.
(See page EG–26)

(b) Install the timing belt.
(See page EG–33)



2. INSPECT DRIVE BELTS

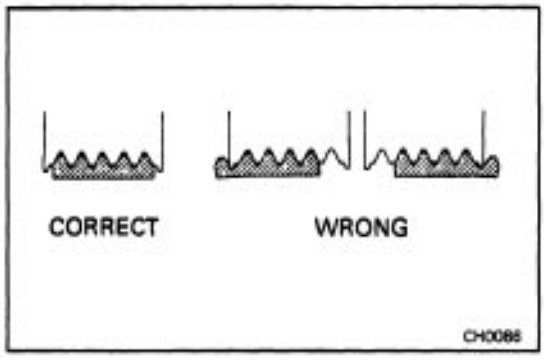
(a) Visually check the belt for excessive wear, frayed cords etc.
If necessary, replace the drive belt.
HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:
Nippondenso BTG–20 (95506–00020)
Borroughs No.BT – 33 – 73F

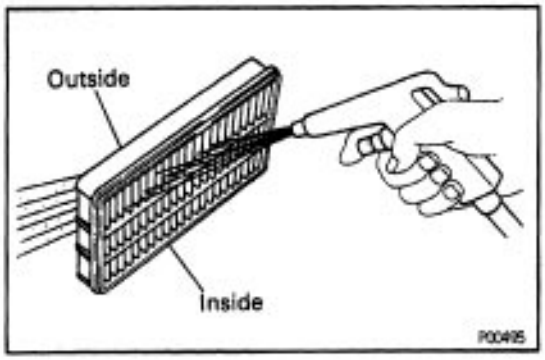
Drive belt tension:
Generator (w/ A/C)
New belt
175 ± 5 lbf
Used belt
130 ± 10 lbf
Generator (w/o A/C)
New belt
125 ± 25 lbf
Used belt
95 ± 20 lbf
PS pump
New belt
125 ± 25 lbf
Used belt
80 ± 20 lbf



If necessary, adjust the drive belt tension.
HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, check that it fits properly in the ribbed grooves.

- Check by hand to confirm that .the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

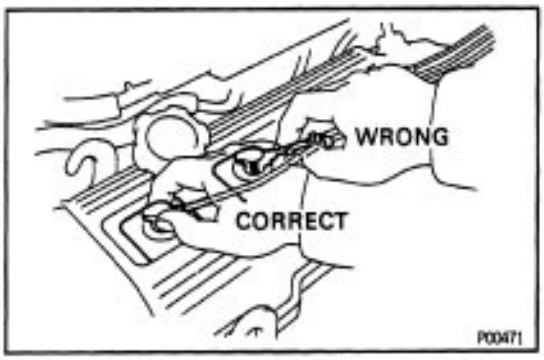


3. INSPECT AIR FILTER

(a) Visually check that the air filter is not damaged or excessively oily.
If necessary, replace the air filter element.
(b) Clean the air filter with compressed air.
First blow from the inside thoroughly, then blow off the outside of the air filter.

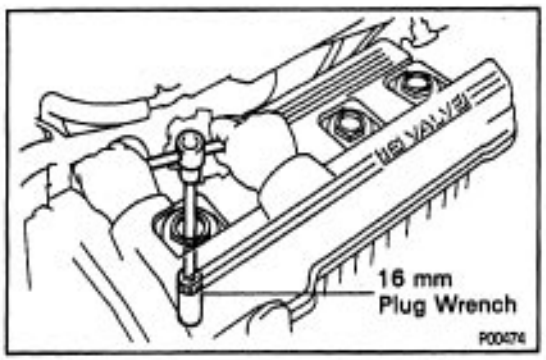
4. REPLACE AIR FILTER

Replace the air filter with a new one.

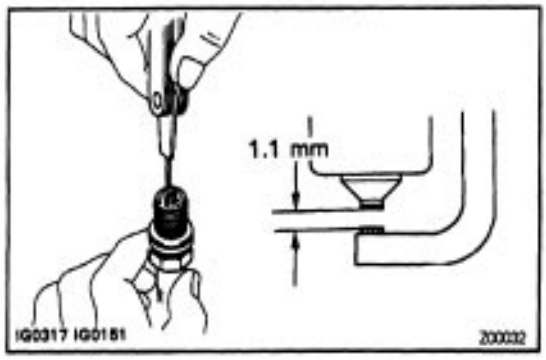


5. REPLACE SPARK PLUGS

(a) Disconnect the spark plug cords at the rubber boot.
DO NOT pull on the cords.



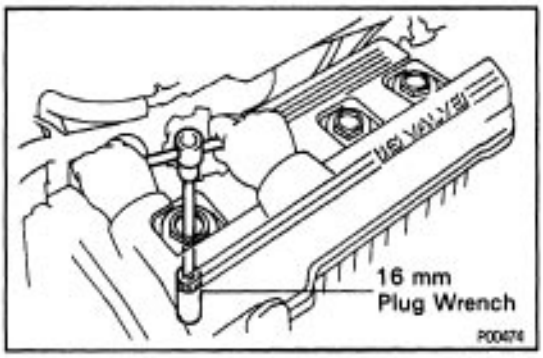
(b) Using a 16 mm plug wrench, remove the spark plugs.



(c) Check the electrode gap of new spark plugs.

Correct electrode gap:
1.1 mm (0.043 In.)
Recommended spark plugs:
PK20R11 for ND
BKR6EP11 for NGK

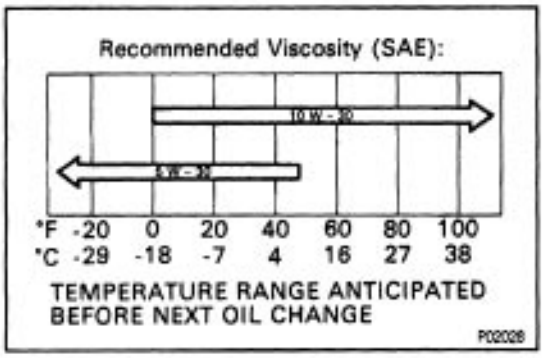
NOTICE: If adjusting the gap of a now plug, bend only the base of the ground electrode. Do NOT touch the tip. Never attempt to adjust the gap on a used plug.



(d) Using a 16 mm plug wrench, reinstall the spark plugs.

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

(e) Reconnect the spark plug cords.



6. REPLACE ENGINE OIL AND OIL FILTER

(See page EG–274)

Oil grade:

API grade SG or SH, Energy–Conserving II multi–grade engine oil or ILSAC multigrade engine oil. Recommended viscosity Is as shown in the illustration.

Drain and refill capacity:

M/T

w/ Oil filter change

3.6 liters (3.8 US qts, 3.2 Imp. qts)

w/o Oil filter change

3.4 liters (3.6 US qts, 3.0 Imp. qts)

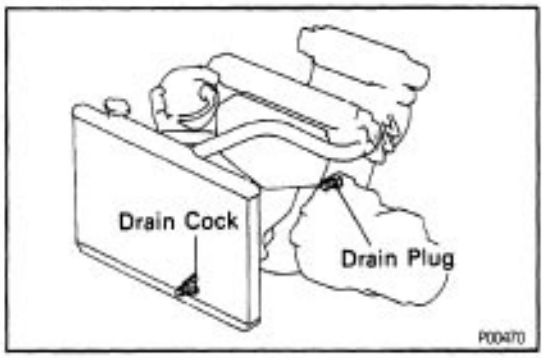
A/T

w/ Oil filter change

3.6 liters (3.8 US qts, 3.2 Imp. qts)

w/o Oil filter change

3.4 liters (3.6 US qts, 3.0 Imp. qts)



7. REPLACE ENGINE COOLANT

(See page EG–241)

HINT:

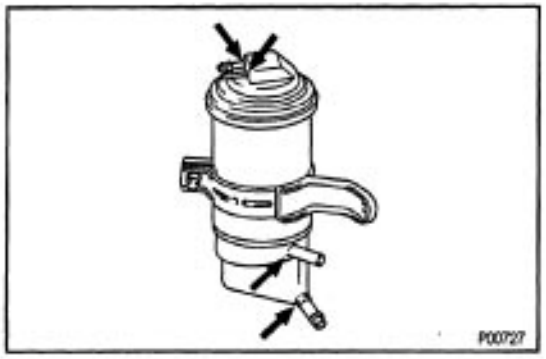
- Use a good brand of ethylene–glycol base engine coolant and mix it according to the manufacturer's instructions.
- Using engine coolant which includes more than 5096 ethylene–glycol (but not more than 70%) is recommended.

NOTICE:

- **Do not use alcohol type coolant.**
- **The engine coolant should be mixed with demineralized water or distilled water.**

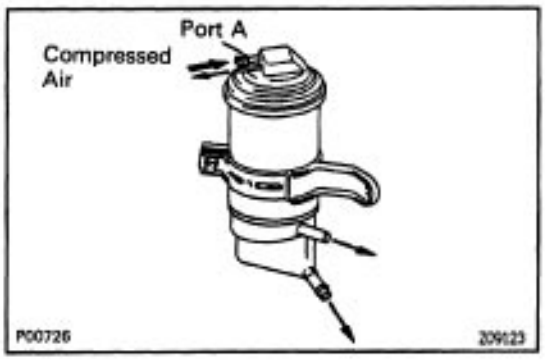
Capacity (w/ Heater):

6.3 liters (6.7 US qts, 5.5 Imp. qts)



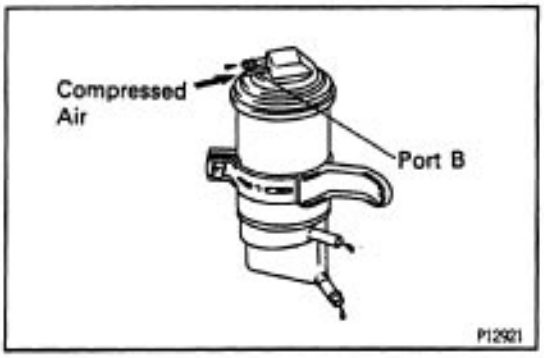
8. INSPECT CHACOAL CANISTER

(a) Visually inspect the canister case.



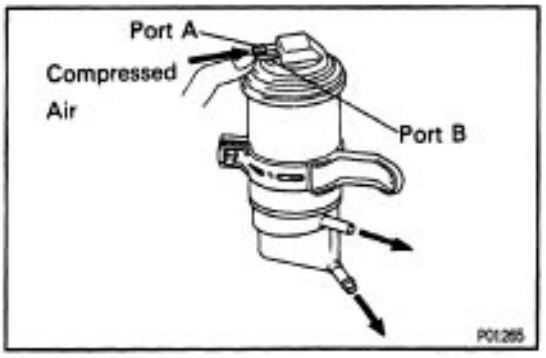
(b) Check for clogged filter and stuck check valve.

- Using low pressure compressed air (4.71 kPa, 48 gf/cmT, 0.68 psi), blow into port A and check that air flows without resistance from the other ports.



- Blow low pressure compressed air (4.71 kPa, 48 gf/cm2, 0.68 psi) into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.

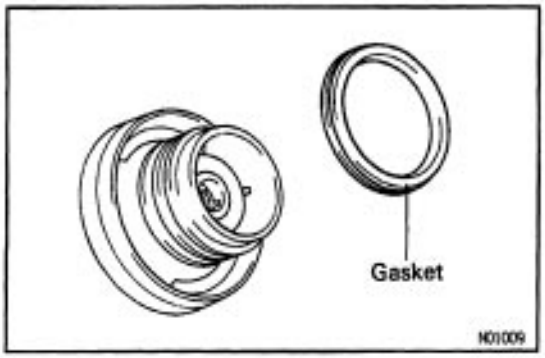


(c) Clean filter in canister.

- Clean the filter by blowing 294 kPa (3 kgf/cm', 43 psi) of compressed air into port A while hold–ing port B closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket from the tank cap.

NOTICE: Do not damage the tank cap.

(b) Install a new gasket by hand.

(c) Check the cap for damage or cracks.

(d) Reinstall the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually check the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually check the pipes, hangers and connections for severe corrosion, leaks or damage.

12. ADJUST VALVE CLEARANCE

(See page EG –12)

Valve clearance (Cold):

Intake

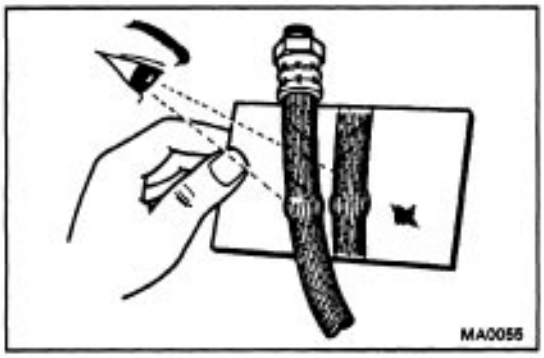
0.19 – 0.29 mm (0.007 – 0.011 In.)

Exhaust

0.28 – 0.38 mm (0.011 – 0.015 In.)

MA006–ST

BRAKES



13. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Check in a well lighted area. Check the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before checking the front brake.

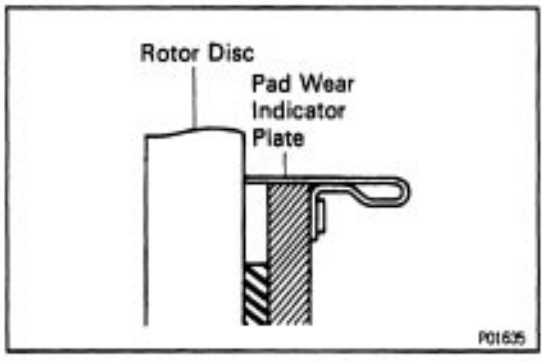
(a) Check all brake lines and hoses for:

- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass thr–ough the center of the grommets.

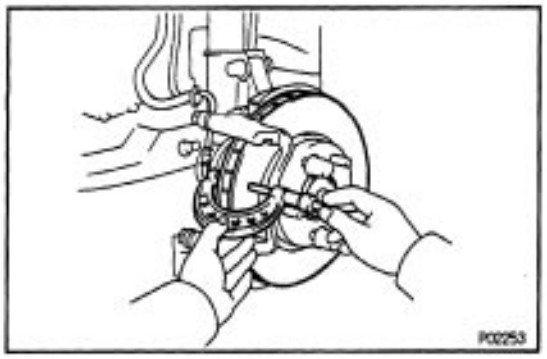


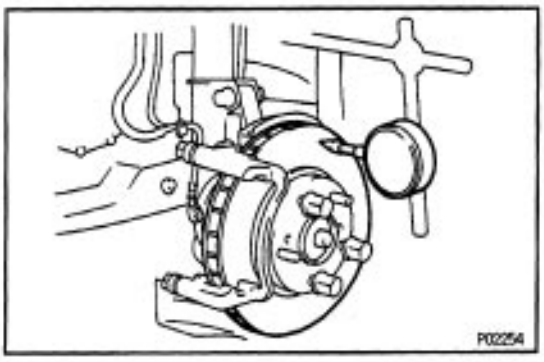
14. INSPECT FRONT AND REAR BRAKE PADS AND DISCS

(a) Check the thickness of the disc brake pads and check for irregular wear.

Minimum pad thickness:

1.0 mm (0.039 in.)





HINT: If a squealing or scraping noise comes from the brake during driving, check the pad wear indicator to see if it is contacting the disc rotor. If so, the disc pad should be replaced.

(b) Check the disc for wear or runout.

Minimum disc thickness:

Front

26.0 mm (1.024 in.)

Rear

9.0 mm (0.354 In.)

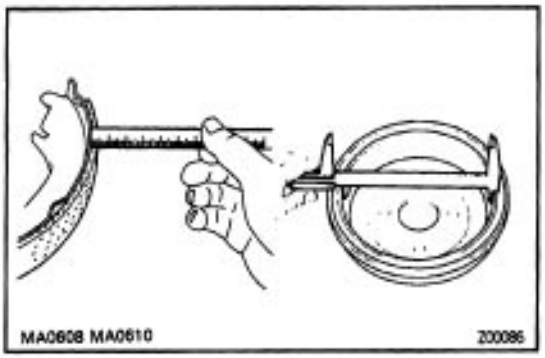
Maximum disc runout:

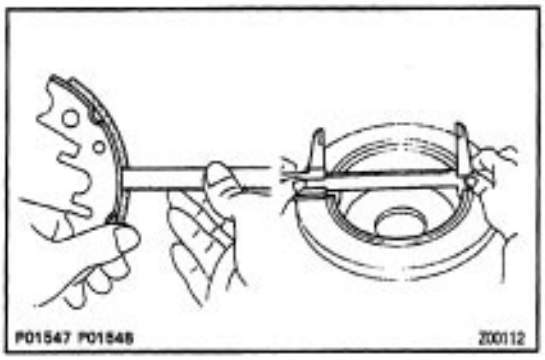
Front

0.05 mm (0.0020 in.)

Rear

0.15 mm (0.0059 in.)





15. INSPECT BRAKE LININGS AND DRUMS

(a) Check the lining – to – drum contact condition and lining wear.

Minimum lining thickness:

1.0 mm (0.0039 in.)

(b) Check the brake drums for scoring or wear.

Maximum drum inside diameter:

Drum brake

230.6 mm (9.079 in.)

Disc brake

171.0 mm (6.732 in.)

(c) Clean the brake parts with a damp cloth.

NOTICE: Do not use compressed air to clean the brake parts.

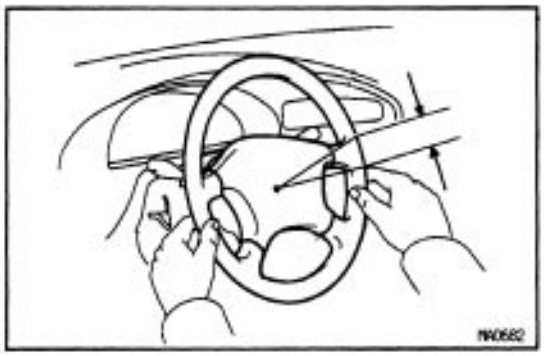
(d) Disc brake:

Settle the parking brake shoes and drum. When per–forming the road test in item 25, do the following:

- Drive the vehicle at approx. 50 km/h (30 mph) on a safe, level and dry road.
- With the parking brake release knob pushed in, pull on the lever with 88 N (9 kgf, 20 lbf) of force.
- Drive the vehicle for approx. 400 m (1 /4 mile) in this condition.
- Repeat this procedure 2 or 3 times.

Check parking lever travel.

If necessary, adjust the parking brake.



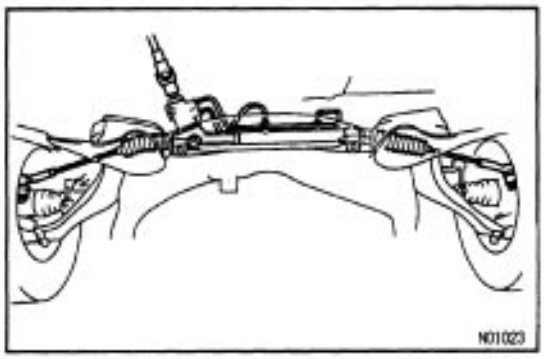
CHASSIS

I6. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay.

Maximum steering wheel freeplay:
30 mm (1.18 In.)

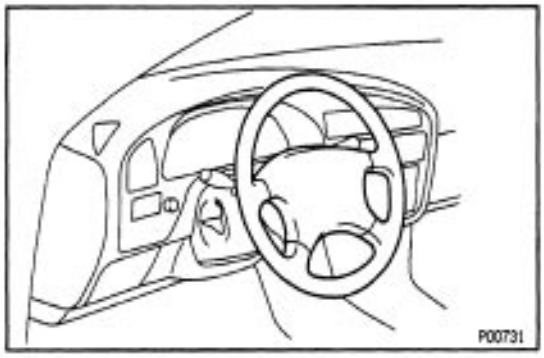
With the vehicle stopped and the front wheels pointing straight ahead, rock the steering wheel gently back and forth with light finger pressure.



(b) Check the steering linkage for looseness or damage.

Check that:

- Tie rod ends do not have excessive play.
- Dust seals and boots are not damaged.
- Boot clamps are not loose.



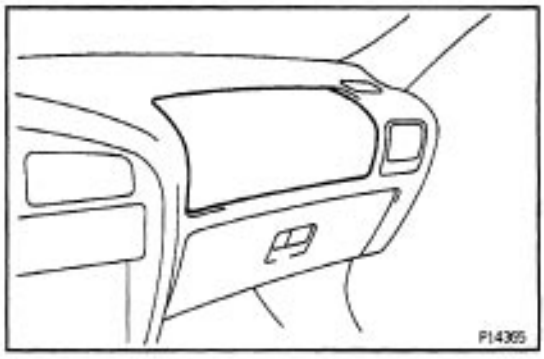
17. INSPECT SRS AIRBAG

Driver Airbag:

Visually inspect the steering wheel pad (airbag and inflater).

- Use the diagnosis check to check if there are abnormalities.
- Check that there are no cuts, cracks or noticeable color changes on the surface of the steering wheel pad or in the center groove of the pad.
- Remove the steering wheel pad from the vehicle and check the wiring and steering wheel for damage and corrosion due to rusting, etc.

If necessary, replace the steering wheel pad.



Front Passenger Airbag:

Visually inspect the front passenger airbag assembly (airbag and inflater).

- Use the diagnosis check to check if there are abnormalities.
- Check that there are no cuts, cracks or noticeable color changes in the front passenger airbag door.

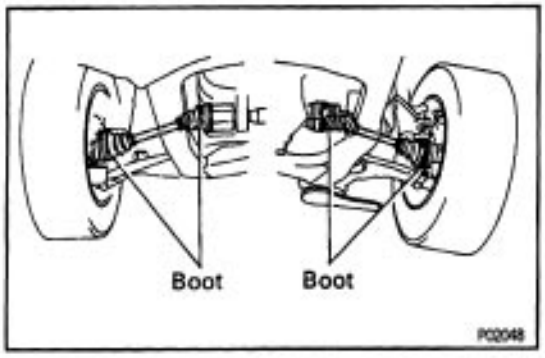
- Remove the front passenger airbag assembly from the vehicle and check the wiring and front passenger airbag door for damage and corrosion due to rusting, etc.
  If necessary, replace the front passenger airbag assembly.

CAUTION:

- **For removal and replacement of the steering wheel pad or front passenger airbag assembly, see page RS–19 or 31 and be sure to perform the operation in the correct order.**
- **Before disposing of the steering wheel pad or front passenger airbag assembly, it must first be deployed by using SST (See page RS–22 or 35).**

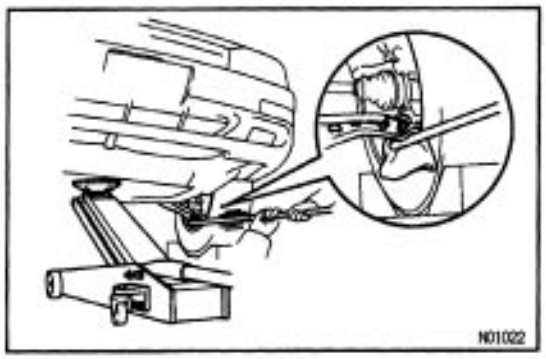
18. INSPECT STEERING GEAR HOUSING OIL

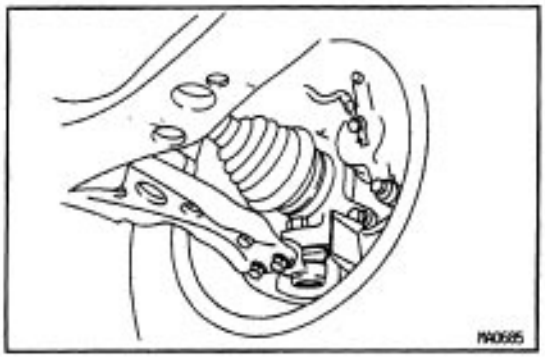
Check the steering gear housing for oil leakage.



19. INSPECT DRIVE SHAFT BOOTS

Check the drive shaft boots for clamp looseness, leakage or damage.





20. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness.

- Jack up the front of the vehicle and place wooden blocks with a height of 180–200 mm (7.09–7.87 in.) under the front tires.
- Lower the jack until there is about half a load on the front coil spring. Place stands under the vehicle for safety.
- Check that the front wheels are in a straight forward position, and block them with chocks.

Using a lever, pry up the end of the lower arm, and check the amount of play.

Maximum ball joint vertical play:

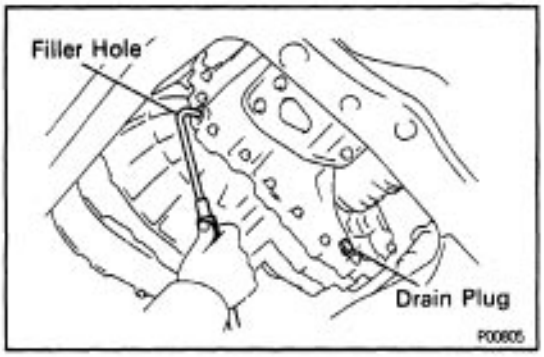
0 mm (0 in.)

If there is play, replace the ball joint.

(b) Check the dust cover for damage.

21. CHECK TRANSAXLE OIL (FLUID)

(a) Visually check the transaxle for oil (fluid) leakage.
If leakage is found, check for the cause and repair.



22. REPLACE TRANSAXLE OIL (FLUID)

A. M/T:

Replace transaxle oil

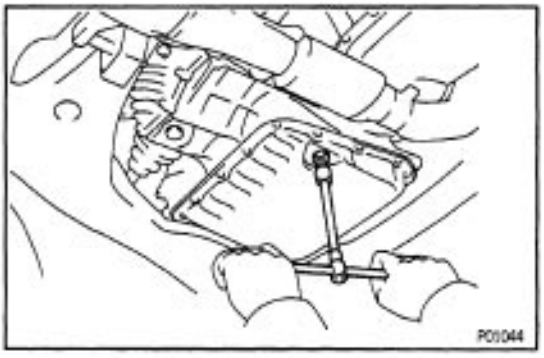
(a) Remove the filler and drain plugs, and drain the oil.
(b) Reinstall the drain plug securely.
(c) Add new oil until it begins to run out of the filler hole.

Recommended transaxle oil:
Oil grade API GL–3
Viscosity SAE 75W–90
Capacity:
2.6 liters (2.7 US qts, 2.3 Imp. qts)

In case the above oil grade is unavailable, use type A or B.

Type A:
Oil grade API GL–4
Viscosity SAE 75W–90
Type B:
Oil grade API GL–5
Viscosity SAE 75W–90

(d) Reinstall the filler plug securely.

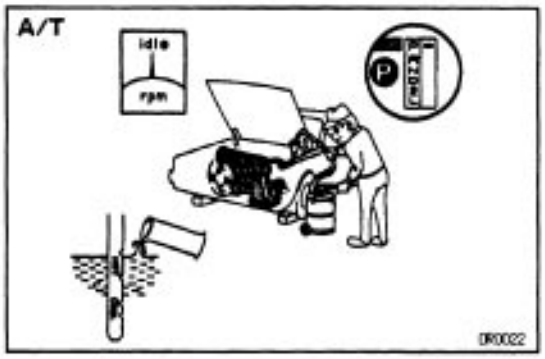


B. A/T:

Replace transaxle fluid

Transmission:

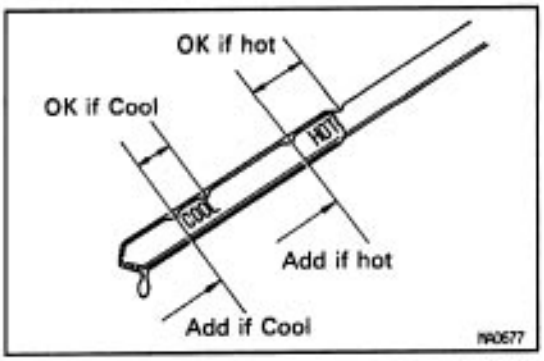
(a) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.
(b) Reinstall the drain plug securely.



(c) With the engine OFF, add new fluid through the dip–stick tube.

Transmission fluid:
ATF DEXRON II
Drain and refill capacity:
2.5 liters (2.6 US qts, 2.2 Imp. qts)

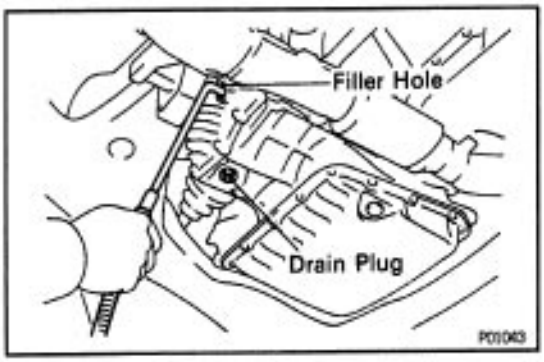
(d) Start the engine and shift the selector into all positions from “P” through “L”, and then shift into “P”.



(e) With the engine idling, check the fluid level. Add fluid up to the “COOL” level on the dipstick.

NOTICE: Do not overfill. The transmission and differen–tial are separate units.

(f) Recheck the fluid level at the normal operating tem–perature (70 – 80®C (158 –176®F)) and add as neces–sary.



Differential:

(a) Remove the filler plug.

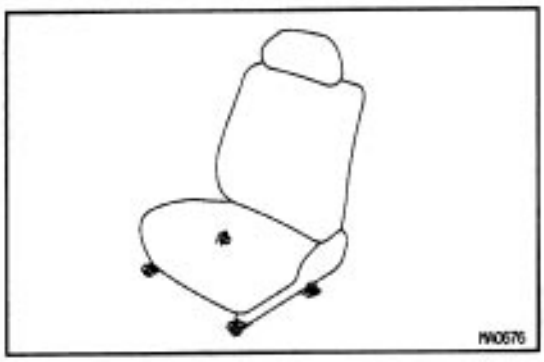
(b) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.

(c) Reinstall the drain plug securely.

(d) Add new fluid until it begins to run out of the filler hole.

Differential fluid:
ATF DEXRON II
Capacity:
1.6 liters (1.7 US qts, 1.4 Imp. qts)

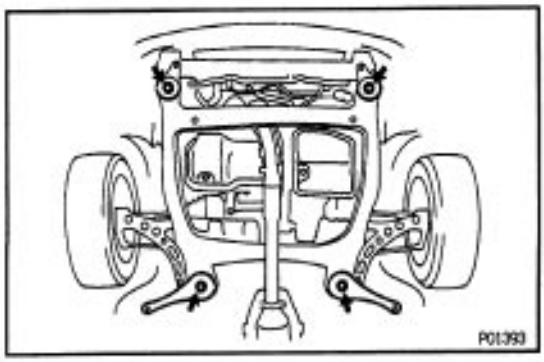
(e) Reinstall the filler plug securely.



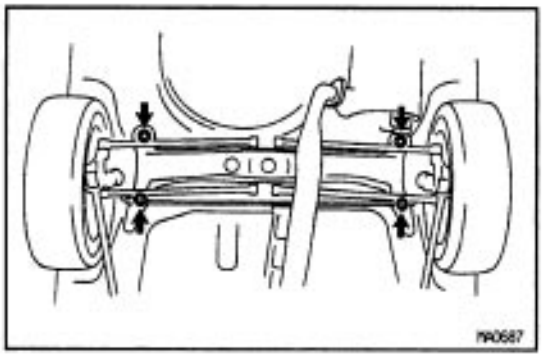
23. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Front seat mount bolts
  Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Front suspension member–to–body mounting bolts
  Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)



- Rear suspension member – to – body mounting nuts
  Torque: 51 N–m (520 kgf–cm, 38 ft–lbf)

24. BODY INSPECTION

(a) Check the body exterior for dents, scratches and rust.
(b) Check the underbody for rust and damage.
If necessary, replace or repair.

25. ROAD TEST

(a) Check the engine and chassis for abnormal noises.
(b) Check that the vehicle does not wander or pull to one side.
(c) Check that the brakes work properly and do not drag.

26. FINAL INSPECTION

(a) Check the operation of the body parts:
Hood:
Auxiliary catch operates properly
Hood locks securely when closed
- Front and rear doors:
  Door lock operates properly
  Doors close properly
- Luggage compartment door and back door:
  Door lock operates properly
  Seats:
  Seat adjusts easily and locks securely in any position
  Front seat back locks securely in any position
  Folding–down rear seat backs lock securely

(b) Be sure to deliver a clean car. Especially check:
- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

GENERAL MAINTENANCE

These are some maintenance and inspec–tion items which are considered to be the owner's responsibility. They can be perfo–rmed by the owner or he can have them done at a service shop. These items in–clude those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform. Items and procedures for general maintenance are as follows:

OUTSIDE VEHICLE

1. TIRES

(a) Check the pressure with a gauge. Adjust if necessary.

(b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If neces–sary, tighten them.

3. TIRE ROTATION

It is recommended that tires be rotated every 12,000 km (7,500 miles).

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. Replace if necessary.

6. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.

(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND ENGINE HOOD

(a) Check that all doors including the trunk lid and back door operate smoothly, and that all latches lock securely.

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.

(b) Check the headlight aim.

6. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.

(b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER

Check that the air comes out from the defroster outlet when operating the heater or air conditioner at defroster mode.

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they more freely and mounted securely.

15. STEERING WHEEL

Check that it has the specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. SEATS

(a) Check that all front seat controls such as seat adjusters, seatback recliner, etc. op–erate smoothly.

(b) Check that all latches lock securely in any position.

(c) Check that the locks hold securely in any latches position.

(d) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.

(e) For folding–down rear seat backs, check that the latches look securely.

17. SEAT BELTS

(a) Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly.

(b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. CLUTCH PEDAL (See page CL–6)

Check the pedal for smooth operation.
Check that the pedal has the proper freeplay.

20. BRAKE PEDAL (See page BR–8)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper re–serve distance and freeplay.

(c) Check the brake booster function.

21. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

22. PARKING BRAKE (See page BR–10)

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that the vehicle is help securely with only the parking brake applied.

23. AUTOMATIC TRANSMISSION PARK MECHANISM

(a) Check that lock release button of the se–lector lever for proper and smooth opera–tion.

(b) On a safe incline, check that the vehicle is held securely with the selector lever in the ”P” position and all brakes released.

UNDER HOOD

24. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

Check that the coolant level is between the ”FULL” and ”LOW” lines on the see–through reservoir.

28. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.

(b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all bat–tery cells is between the upper and lower level lines on the case. If level low, add distilled water only.

28. BRAKE AND CLUTCH FLUID LEVELS

(a) Check that the brake fluid level is near the upper level line on the see –through reser–voir.

(b) Check that the clutch fluid level is within ±5 mm (0.20 in.) of the reservoir filling line.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

30. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

31. POWER STEERING FLUID LEVEL

Check the level.

The level should be in the “HOT” or “COLD” range depending on the fluid temperature.

32. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.

(b) With the engine idling and the’ parking brake applied, shift the selector into all positions from ”P” to ”L” and then shift into ”P”.

(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dipstick and check that the fluid– level is in the HOT ran nge.

(d) Perform this check with the fluid at normal driving temperature (70 – 80®C or 158–176’ F).

NOTE: Wait about 30 minutes before che–cking the fluid level after extended driving at high speeds in hot weather, driving in heavy traffic or with a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.

If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

SERVICE SPECIFICATIONS

SERVICE DATA

Drive belt tension			
Generator (w/ A/C)		New belt	175 ± 5 lbf
Generator (w/ A/C)		Used belt	130 ± 10 lbf
Generator (w/o A/C)		New belt	125 ± 25 lbf
Generator (w/o A/C)		Use belt	95 ± 20 lbf
PS pump		New belt	125 ± 25 lbf
PS pump		Used belt	80 ± 20 lbf
Spark plug	Recommended spark plug	ND	PK20R11
Spark plug	Recommended spark plug	NGK	BKR6EP11
Spark plug	Correct electrode gap		1.1 mm (0.043 in.)
Firing order			1 – 3 – 4 – 2
Valve clearance		Intake	0.19 – 0.29 mm (0.007 – 0.011 in.)
Valve clearance		Exhaust	0.28 – 0.38 mm (0.011 – 0.015 in.)
Front and rear brake			
Pad thickness		Minimum	1.0 mm (0.039 in.)
Disc thickness	Front	Minimum	26.0 mm (1.024 in.)
Disc thickness	Rear	Minimum	9.0 mm (0.354 in.)
Disc runout	Front	Maximum	0.05 mm (0.0020 in.)
Disc runout	Rear	Maximum	0.15 mm (0.0059 in.)
Parking brake			
Lining thickness		Minimum	1.0 mm (0.039 in.)
Drum inside diameter	Drum brake	Maximum	230.6 mm (9.079 in.)
Drum inside diameter	Disc brake	Maximum	171.0 mm (6.732 in.)
Front axle and suspension			
Ball joint vertical play		Maximum	0 mm (0 in.)
Steering wheel freeplay		Maximum	30 mm (1.18 in.) or less

TORQUE SPECIFICATIONS

Part tightended	N·m	kgf·cm	ft·lbf
Front seat mounting bolts	37	375	27
Front suspension member x Body	181	1,850	134
Rear suspension member x Body	51	520	38

(1MZ–FE)

MAINTENANCE SCHEDULE

SCHEDULE A

CONDITIONS:

- Towing a trailer, using a camper or car top carrier.
- Repeated short trips of less than 8 km (5 miles) with outside temperature remaining below freezing.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door–to –door delivery use.
- Operating on dusty, rough, muddy or salt spread roads.

Maintenance operation: A = Check and adjust if necessary.
R = Replace, change or lubricate.
I = Inspect and correct or replace if necessary.

System	Service interval (Use odometer reading or months, whichever comes first.) / Maintenance items	Maintenance services beyond 98,000 km (60.000 miles) should continue to be poformed at the same intervals shown for each maintenance schedule.																	See page (item No.)
	x 1,000 km	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	Month=	
	X 1,000 miles	3.75	7.5	11.25	15	18.75	22.5	26.25	30	33.75	37.5		45	48,7a	52.5	56.25	60		
ENGINE	Timing belt (1)																R	-	MA–24 (item 1)
	valve clearance																A	A: Evan 72 month:	MA–29 (item 12)
	Drive belt	i: First period 96.000 km (80,000 miles) or 72 months. I: After that every 12,000 km (7,500 miles) or 12 month:.																	MA–24 (item 2)
	Engine oil and oil filter*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA–27 (item 6)
	Engine coolant	R: first period 72,040 km (46,000 mile:) or 36 months. R: After that every 48,000 km (30,000 miles) or 24 months.																	MA–27 (item 7)
	Exhavst pipe* and mountings				I				I				I				I	1: Every 24 months	MA–29 (item 11)
FUEL	Air filter ^ty*	I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	1: Every 6 months R: Every 36 month:	MA–25 (item 3, 4)
	Fuel lines and connections (3)								I								I	i: Every 36 months	M^–29 (item 10)
	Fuel tank cap gasket																R	R: Even 72 months	MA–28 (item 9)
IGNITION	Spark plugs (Platinum tipped type)																R	R: Every 72 month:	MA–25 (item 5)
EVAP	Charcoal canister (4)																I	I: Every 72 month:	MA–28 (item 8)
BRAKES	Broke linings and drums (6)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–30 (item 15)
	Broke pads and discs (Front and rev)		I		I		I		I		I		I		I		I	I: Even 12 months	MA–30 (item 14)
	Broke line pipes and hoses				I				I				I				I	I: Every 24 month:	MA–29 (item 13)
CHASSIS	Steering linkage		I		I		I		I		I		I		I		I	I: Every 12 months	MA–31 (item 16)
	SRS ahbap	I: First period 10 years. I: After that every 2 years.																	MA–¿¿ 1 (item 17)
	Ba1I joints and dust covtr:		I		I		I		I		I		I		I		I	I: Every 12 months	MA–33 (item 20)
	Drive shaft boots		I		I		I		I		I		I		I		I	I: Ev..y 12 months	MA–32 (item 19)
	Automatic transmission and differential oil				R				R				R				R	R: Every 24 months	MA–33 (item 22)
	Steering gear housing oil (6)				I				I				I				I	I: Even 24 month:	MA–32 (item 18)
	Bob and nuts on chassis and body (7)		I		I		I		I		I		I		I		I	I: Every 12 months	MA–34 (item 23)

Ⓡ.mark indicates maintenance which is part of the warranty conditions for the Emission Control Systems. The warranty period is in accordance with the owner's guide or the warranty booklet.
(Ⓡ: California and New York specification vehicles)
(1) Applicable to vehicles operated under conditions of extensive idling and/or low speed driving for long distances such as police, taxi or door–to–door delivery use.
(2) Applicable when operating mainly on dusty roads. If not, apply SCHEDULE B.
(3) Includes inspection of fuel tank band and vapor vent system.
(4) Non –maintenance item except for California and New York.
(5) Also applicable to drum lining for parking brake. For other usage conditions, refer to SCHEDULE B.
(6) Check for oil leaks from steering gear housing.
(7) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.

- Front and rear suspension member to cross body.
- Strut bar bracket to body.
- Bolts for seat installation.

SCHEDULE B

CONDITIONS:

Conditions others than those listed for SCHEDULE A.

Maintenance operation: A = Check and adjust if necessary.
R = Replace, change or lubricate.
I = Inspect and correct or replace if necessary.

system	Service interval (Use odometer reading or months, whichever comes first) / Maintenance Items	Maintenance services beyond 98,000 km (84,000 mile:) should continue to be performed at the same Intervals shown for each maintenance schedule,									See page (item No.)
		1,000 km	12	24	36	48	60	72	84	96	Months
		1,000 miles	7.5	15	22.6	30	37.5	45	52.5	60	
ENGINE	Valve clearance									A	A; Every 72 months	MA–29 (item 12)
	Drive belt	I: First period 98,000 km (60,000 miles) or 72 months. I: After that every 12,000 km (7,600 miles) or 12 months.										MA–24 (item 2)
	Engine oil and oil filter*	R	R	R	R	R	R	R	R		R; Every 12 months	MA–27 (item6)
	Engine coolant	R: First period 72,000 km (46,000 miles) or 36 months. R: After that every 48,000 km (30,000 miles) or 24 months.										MA–27 (item 7)
	Exhaust pipes and mountings					I				I	I; Every 36 month:	MA–24 (item 11)
FUEL	nk filter*					R				R	R: Every 36 months	MA–25 (item 4)
	Fuel lines and connections (1)					I				I	I: Every 36 months	MA–29 (item 10)
	Fuel tank cap gasket									R	R: Every 72 months	MA–28 (item 9)
IGNITION	spark plugs (Platinum tipped type)									R	R; Every 72 months	MA–25 (item 5)
EVAP	Charcoal canister (2)									I	I; Every 72 months	MA–28 (item 8)
BRAKES	Broke linings and drums (3)			I		I		I		I	I: Every 24 months	MA–30 (item 15)
	Brake pads and disc (Front and rear)			I		I		I		I	I: Every 24 months	MA–30 (item 14)
	Stake line pipes and hoses			I		I		I		I	I: Every 24 months	MA–29 (item 13)
CHASSIS	Steering linkage			I		I		I		I	I; Every 24 months	MA–31 (item 16)
		I; First period 10 years. I: After that every 2 years.										MA–31 (item 17)
	Ball Jolnta and dust covers			I		I		I		I	I; Every 24 month:	MA–33 (item 20)
	Drive shaft boots			I		I		I		I	I: Every 24 months	MA–32 (item 19)
	Automatic transmission and differential oil (4)			I		I		I		I	I: Every 24 months	MA–33 (item 22)
	Steering gear housing oil (6)			I		I		I		I	i: Every 24 months	MA–32 (item 18)
	Bolts end nuts on chassis end body (6)										I; Every 24 months	MA–34 (item 23)

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* mark indicates maintenance which is part of the warranty conditions for the Emission Control Systems. The warranty period is in accordance with the owner's guide or the warranty booklet.
(*: California and New York specification vehicles)

(1) Includes inspection of fuel tank band and vapor vent system.
(2) Non–maintenance item except for California and New York.
(3) Also applicable to drum lining for parking brake.
(4) Check for leakage.
(5) Check for oil leaks from steering gear housing.
(6) The applicable parts are listed below.
Front and rear suspension member to cross body.
Strut bar bracket to body.
Bolts for seat installation.

PREPARATION

EQUIPMENT

Belt tension gauge	
Dial indicator with magnetic base	
Micrometer	
Mirror	**Brake hose**
Steel square	
Thermometer	
Torque wrench	
Vernier calipers	

COOLANT

Item	Capacity	Classification
Engine coolant	8.7 liters (9.2 US qts. 7.7 Imp. qts)	Ethylene–glycol base

LUBRICANT

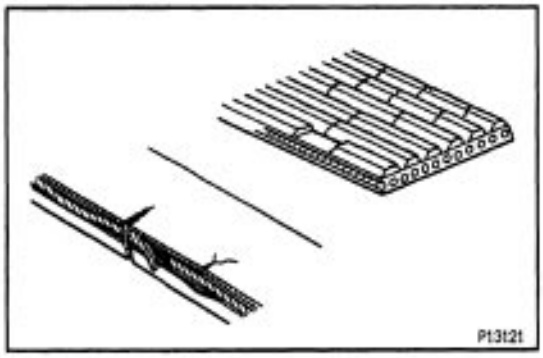
Item	Capacity	Claasifioation
Engine oil Drain and refill w/ Oil filter change w/o Oil filter change	 4.7 liters (5.0 US qts, 4.1 Imp. qts) 4.5 liters (4.8 US qts, 4.0 Imp. qts)	API grade SG or SH, Energy –Conserving II or ILSAC multigrede and recommended viscosity oil with SAE bW–30 being the preferred engine oil
Automatic transaxle fluid Drain end refill	 3.5 liters (3.7 US qts, 3.1 Imp. qts)	ATF DEXRON II
Differential fluid	0.95 liters (1.0 US qts, 0.8 Imp. qts)	ATF DEXRON II

MAINTENANCE OPERATIONS

Cold Engine Operations

1. REPLACE TIMING BELT

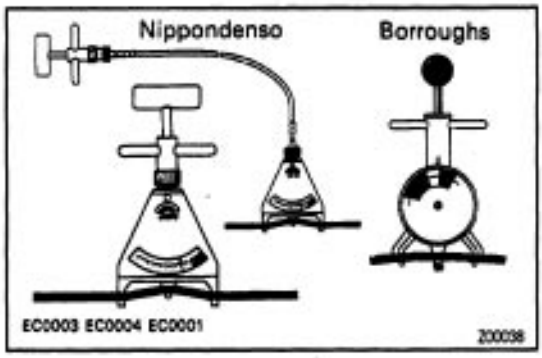
(a) Remove the timing belt.
(See page EG–41)
(b) Install the timing belt.
(See page EG–49)



2. INSPECT DRIVE BELT

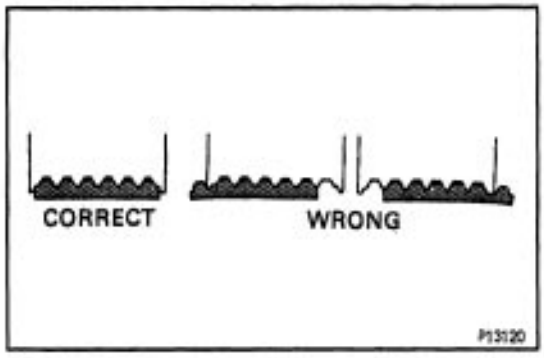
(a) Visually check the belt for excessive wear, frayed cords etc.
If necessary, replace the drive belt.

HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

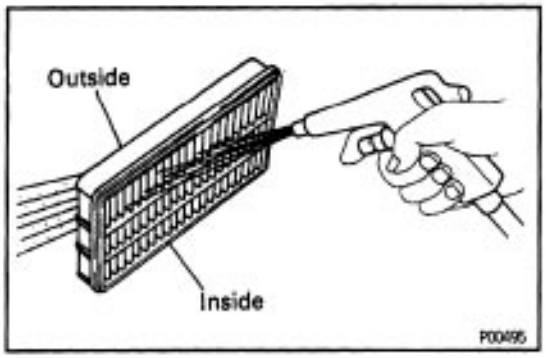


(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:
Nippondenso BTG–20 (95508–00020)
Borroug hs No. BT–33–73F
Drive belt tension:
Generator
New belt
175 ± 5 lbf
Used belt
115 + 20 lbf
PS pump
New belt
150 – 185 lbf
Used belt
115± 20 lbf



If nesessary, adjust the drive belt tension.
HINT:
“New belt” refers to a belt which has been used 5 miniutes or less on a running engine.
“Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
After installing the belt, check that it fits properly in the ribbed grooves.
Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



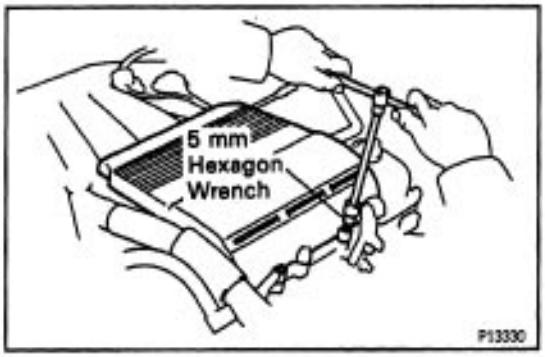
3. INSPECT AIR FILTER

(a) Visually check that the air filter is not excessively damaged or oily.

(b) Clean the element with compressed air.
First blow from the inside thoroughly, then blow off the outside of the air filter.

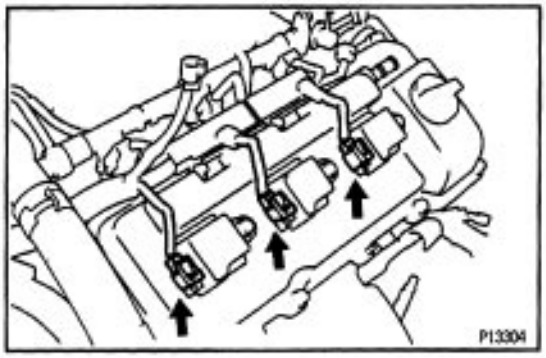
4. REPLACE AIR FILTER

Replace the air filter with a new one.

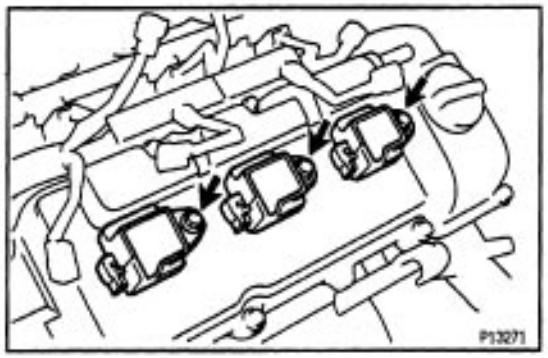


5. REPLACE SPARK PLUGS

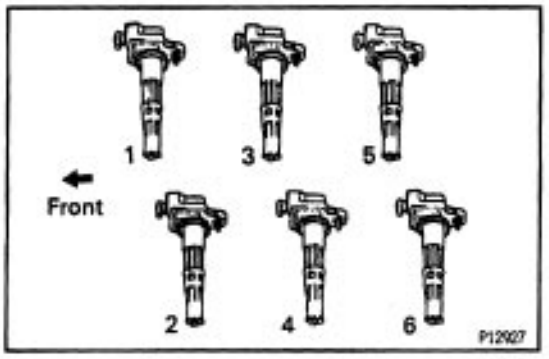
(a) Using a 5 mm hexagon wrench, remove the 2 nuts and V–bank cover.



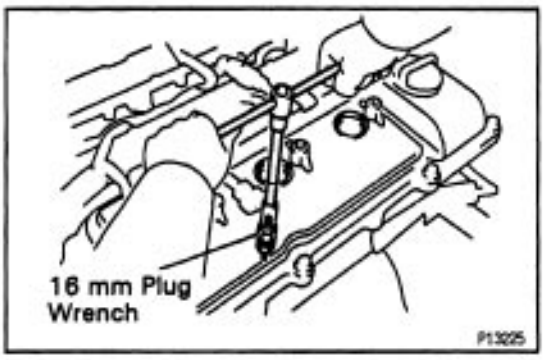
(b) Disconnect the 6 ignition coil connectors from the RH and LH cylinder heads.



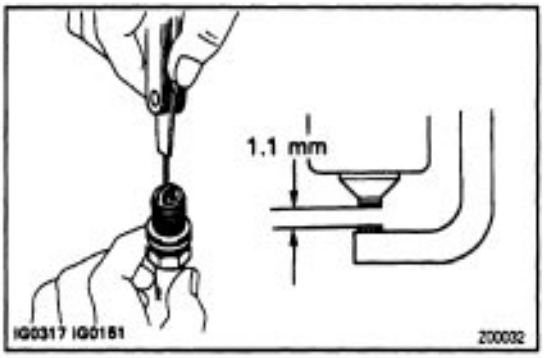
(c) Remove the6 bolts and6 ignition coils from the RH and LH cylinder heads.



HINT: Arrange the ignition coils in the correct order.



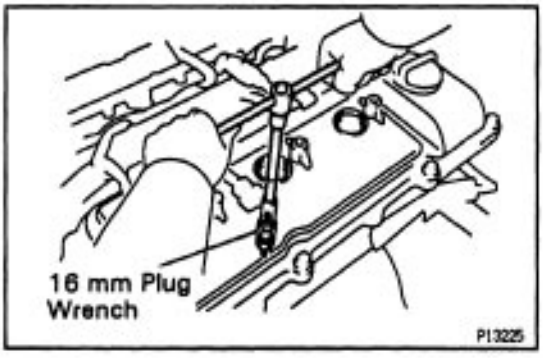
(e) Using a 16 mm plug wrench, remove the 6 spark plugs from the RH and LH cylinder heads.



(f) Check the electrode gap of new spark plugs.

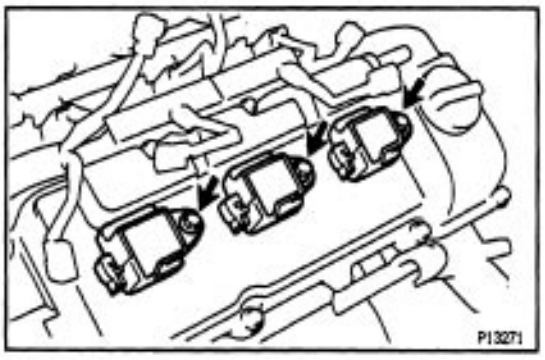
Correct electrode gap:
1.1 mm (0.043 In.)
Recommended spark plugs:
PKZOR11 for ND
BKR6EP–11 for NGK

NOTICE: If adjusting the gap of a new plug, bend only the base of the ground electrode. DO NOT touch the tip. Never attempt to adjust the gap on a used plug.



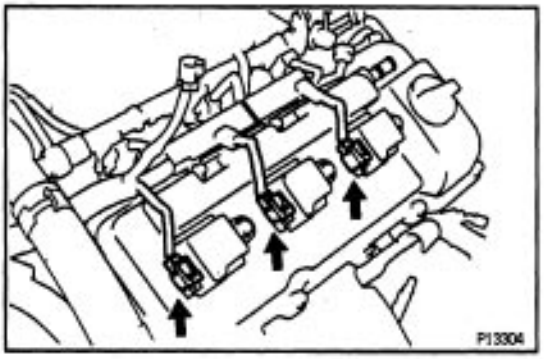
(g) Using a 16 mm plug wrench, reinstall the 6 spark plugs.

Torque: 18 N–m (180 kgf.cm, 13 ft–lbf)

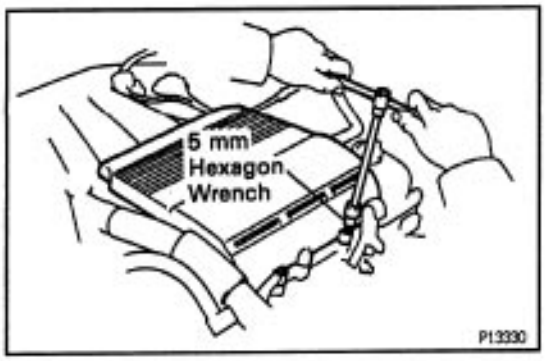


(h) Reinstall the6 ignition coil with the6 bolts.

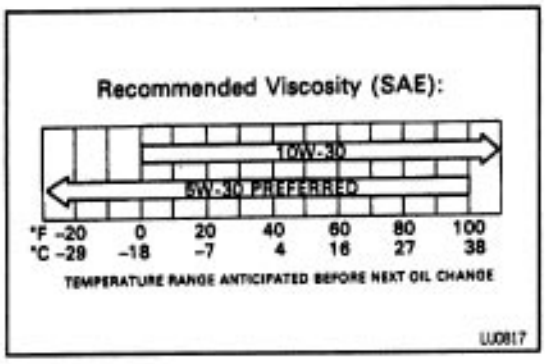
Torque: 8 N–m (80 kgf–cm, 89 in.–lbf)



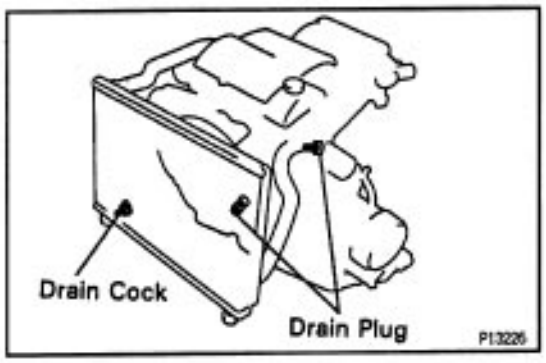
(i) Reconnect the 6 ignition coil connectors.



(j) Using a 5 mm hexagon wrench, reinstall the V–bank cover with the 2 nuts.

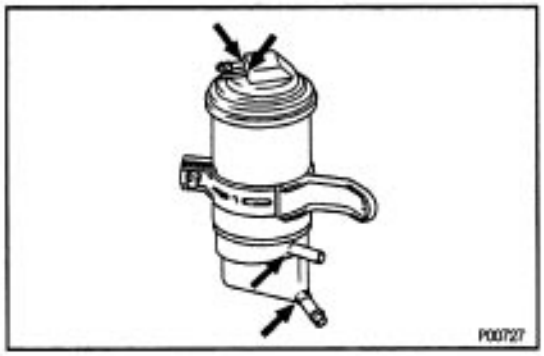


6. REPLACE ENGINE OIL AND OIL FILTER
(See page EG–372)
Oil grade:
API grade SG or SH, Energy–Conserving II or ILSAC multigrade engine oil. Recommended viscosity is as shown in the Illustration with SAE 5W–30 being the preferred engine oil.
Capacity:
Drain and refill
w/ 0il filter change
4.7 liters (5.0 US qts, 4.1 Imp. qts)
w/o Oil filter change
4.5 liters (4.8 US qts, 4.0 Imp. qts)



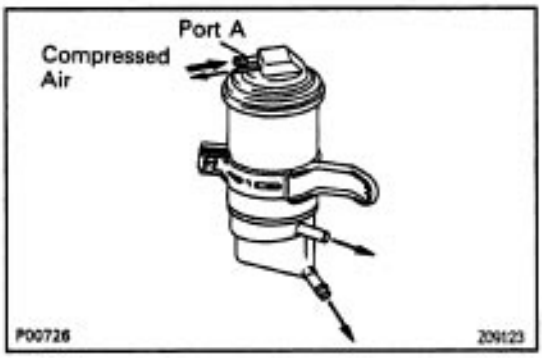
7. REPLACE ENGINE COOLANT
(See page EG–319)
HINT:
- Use a good brand of ethylene–glycol base engine coolant and mix it according to the manufacturer's instructions.
- Using engine coolant which includes more than 5096 ethylene–glycol (but not more than 7096) is recommended.

NOTICE:
Do not use alcohol type coolant.
The engine coolant should be mixed with demineralized water or distilled water.
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp. qts)



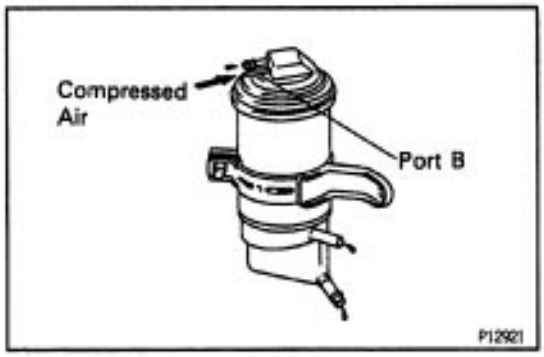
8. INSPECT CHARCOAL CANISTER

(a) Visually inspect the canister case.



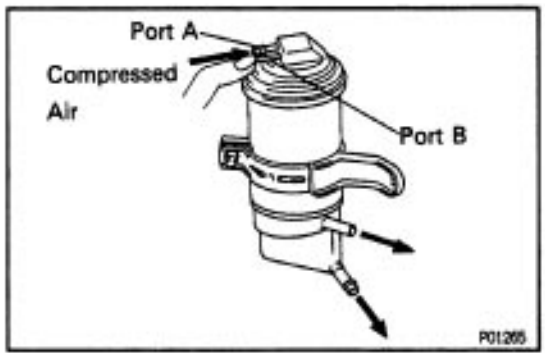
(b) Check for clogged filter and stuck check valve.

Blow low pressure compressed air (4.71 kPa, 48 gf/cm® 0.68 psi) into port A and check that air flows without resistance from the other ports.



- Blow low pressure compressed air (4.71 kPa, 48 gf/cm® 0.68 psi) into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.

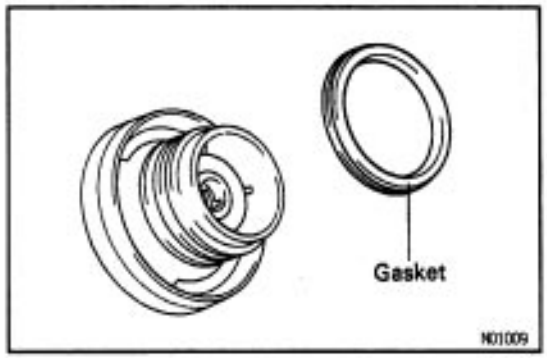


(c) Clean filter in canister.

Clean the filter by blowing 294 kPa (3 kgf/cm® 43 psi) of compressed air into port A while holding port B closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket from the tank cap. Do not damage the cap.

(b) Install a new gasket by hand.

(c) Check the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually check the fuel lines for cracks, leakage, loose connections, deformation or tank band looseness.

11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually check the pipes, hangers and connections for severe corrosion, leaks or damage.

12. ADJUST VALVE CLEARANCE

(See page EG –13)

Valve clearance (Cold):

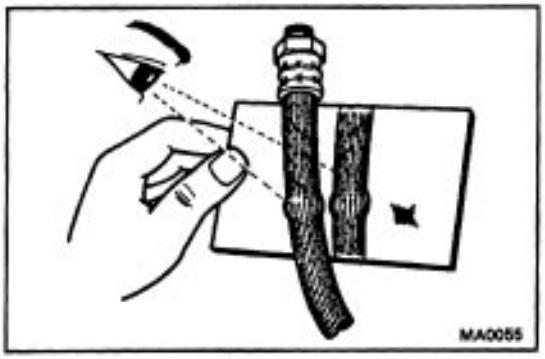
Intake

0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust

0.25 – 0.35 mm (0.010 – 0.014 in.)

BRAKES



13. INSPECT BRAKE LINE PIPES AND HOSES

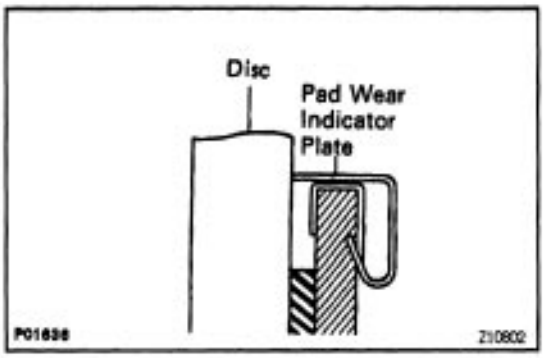
HINT: Check in a well lighted area. Check the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before checking the front brake.

(a) Check all brake lines and hoses for:

- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists
- (b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.

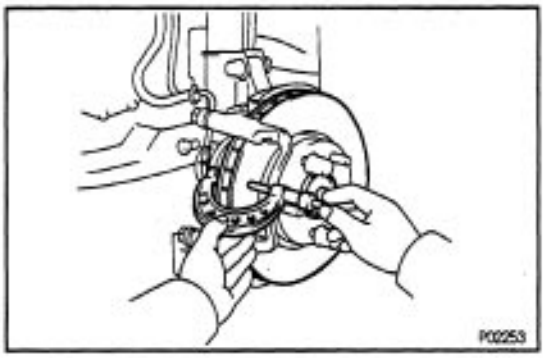


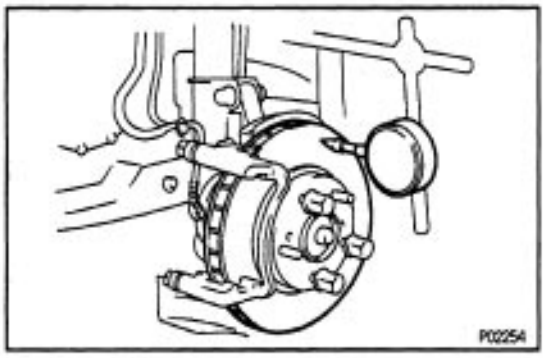
14. INSPECT FRONT AND REAR BRAKE PADS AND DISCS
(See BR section)

(a) Check the thickness of the disc brake pads and check for irregular wear.
Minimum pad thickness:
1.0 mm (0.039 in.)

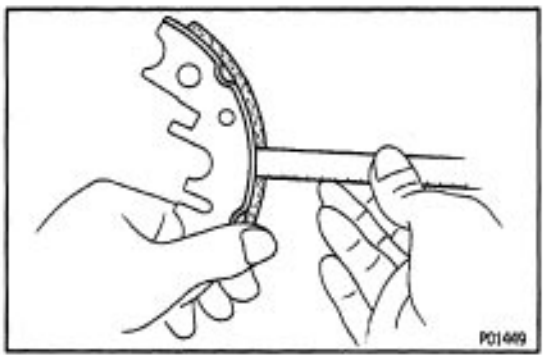
HINT: If a squealing or scraping noise comes from the brake durings driving, check the pad wear indicator to see if it is contacting the disc. If so, the disc pad should be replaced.

(b) Check the disc for wear or runout.
Minimum disc thickness:
Front
26.0 mm (1.024 In.)
Rear
9.0 mm (0.354 in.)



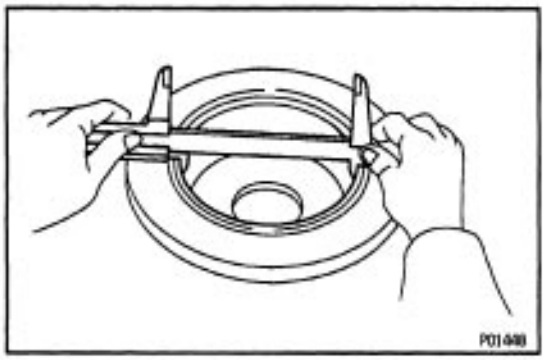


Maximum disc runout:
Front
0.05 mm (0.0020 in.)
Rear
0.15 mm (0.0059 in.)



15. INSPECT PARKING BRAKE LININGS AND DRUMS
(See BR section)

(a) Check the lining – to – drum contact condition and lining wear.
Minimum lining thickness:
1.0 mm (0.0039 in.)



(b) Check the brake drums for scoring or wear.
Maximum drum Inside diameter:
171.0 mm (8.732 in.)

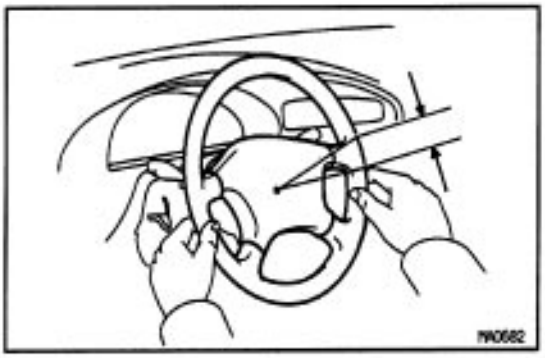
(c) Clean the brake parts with a damp cloth.
NOTICE: Do not use compressed sir to clean the brake parts.

(d) Settle the parking brake shoes and drum. When performing the road test in item 24, do the following:

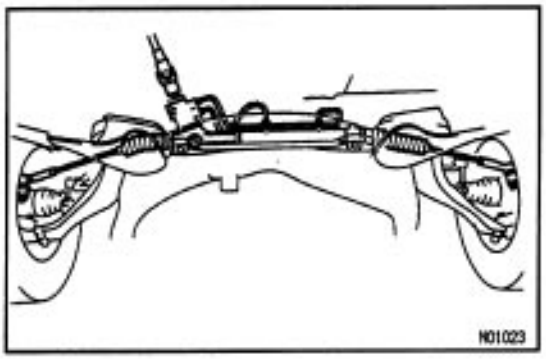
- Drive the vehicle at approx. 50 km/h (30 mph) on a safe, level and dry road.
- Center lever type parking brake:
  With the parking brake release knob pushed in, pull on the lever with 88 N (9 kgf, 20 lbf) of force.
- Pedal type parking brake:
- Depress the pedal with 147 N (15 kgf, 33 lbf) of force.
- Drive the vehicle for approx. 400 m (1 /4 mile) in this condition.
- Repeat this procedure 2 or 3 times.
  Check parking lever travel.

CHASSIS

16. INSPECT STEERING LINKAGE

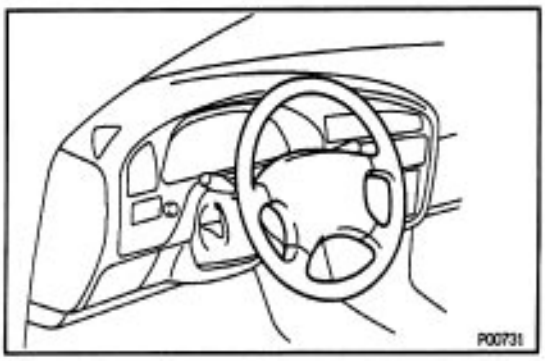


(a) Check the steering wheel freeplay.
Maximum steering wheel freeplay:
30 mm (1.18 In.)
With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.



(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends do not have excessive play.
- Dust seals and boots are not damaged.
- Boot clamps are not loose.



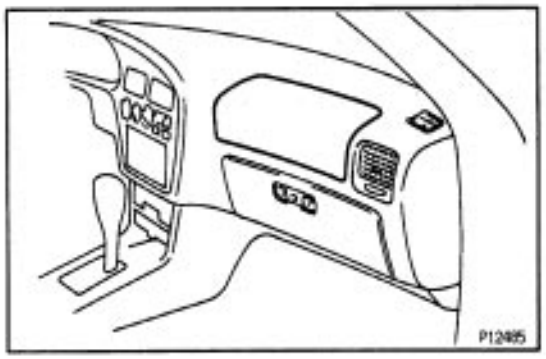
17. INSPECT SRS AIRBAG

Driver Airbag:

Visually inspect the steering wheel pad (airbag and inflater).

- Use the diagnosis check to check if there are abnormalities.
- Check that there are no cuts, cracks or noticeable color changes on the surface of the steering wheel pad or in the center groove of the pad.

Remove the steering wheel pad from the vehicle and check the wiring and steering wheel for damage and corrosion due to rusting, etc.
If necessary, replace the steering wheel pad.



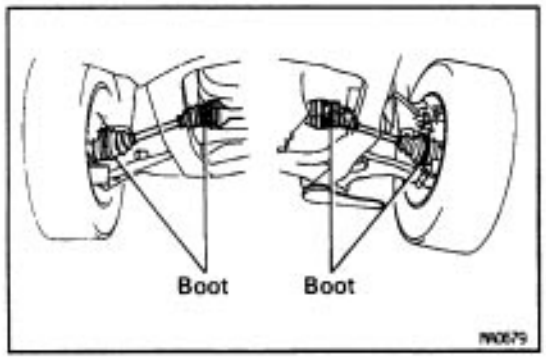
Front Passenger Airbag:
Visually inspect the front passenger airbag assembly (airbag and inflater).

- Use the diagnosis check to check if there are abnormalities.
- Check that there are no cuts, cracks or noticeable color changes in the front passenger airbag door.
- Remove the front passenger airbag assembly from the vehicle and check the wiring and front passenger airbag door for damage and corrosion due to rusting, etc.
  If necessary, replace the front passenger airbag as–sembly.

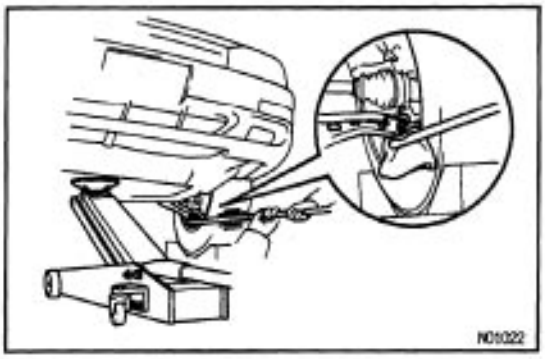
CAUTION:

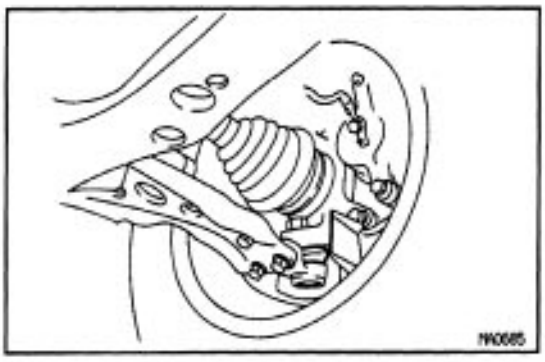
- For removal and replacement of the steering wheel pad or front passenger airbag assembly, see page RS section and be sure to perform the operation in the correct order.
- Before disposing of the steering wheel pad or front passenger airbag assembly the airbag must first be deployed by using SST (See page RS section).

18. INSPECT STEERING GEAR HOUSING OIL
Check the steering gear housing for oil leakage.



19. INSPECT DRIVE SHAFT BOOTS
Check the drive shaft boots for clamp looseness, grease leakage or damage.





20. INSPECT BALL JOINTS AND DUST COVERS

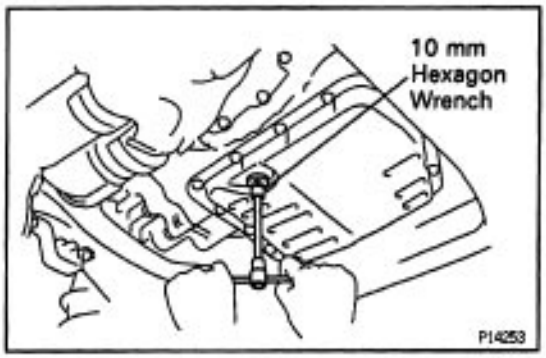
(a) Inspect the ball joints for excessive looseness.

- Jack up the front of the vehicle and place wooden blocks with a height of 180–200 m m (7.09–7.87 in.) under the front tires.
- Lower the jack untiI there is about half a load onthe front coil springs. Place stands under the vehicle for safety.
- Check that the front wheels are in a straight forward position, and block them with chocks.
- Using a lever, pry up the end of the lower arm, and check the amount of play.

  Maximum ball joint vertical play:
  0 mm (0 in.)

If there is play, replace the ball joint.

(b) Check the dust cover for damage.



21. CHECK TRANSAXLE FLUID

Visually check the transaxle for fluid leakage.

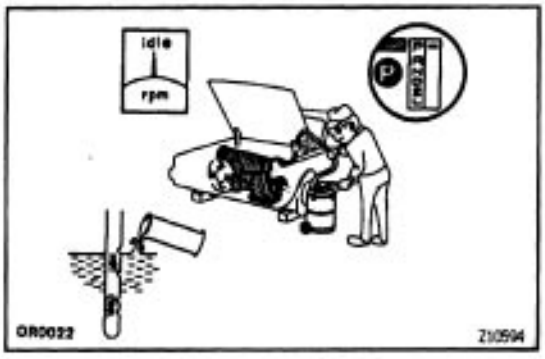
If leakage is found, check for cause and repair.

22. REPLACE TRANSAXLE FLUID

A. Replace transaxle (transmission) fluid

(a) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.



(c) With the engine OFF, add new fluid through the dip–stick tube.

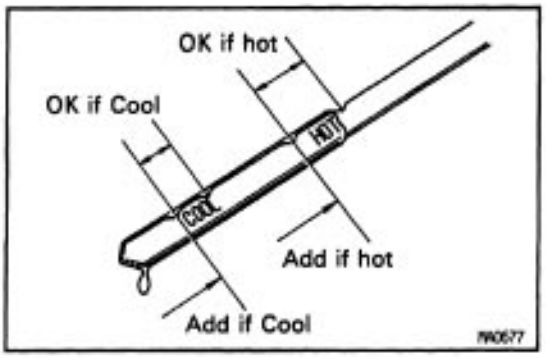
Transaxle fluid:
ATF DEXRON II
Drain and refill capacity:
3.5 liters (3.7 US qts, 3.1 Imp. qts)

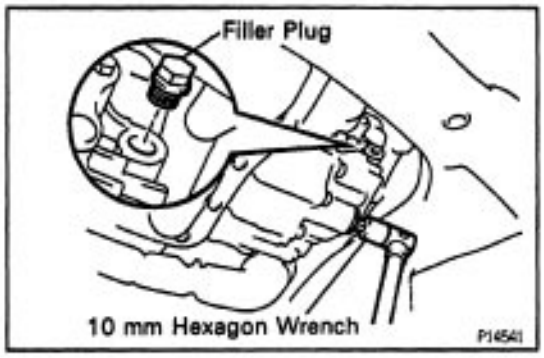
(d) Start the engine and shift the selector into all posi–tions from “P” through “L”, and then shift into “P”.

(e) With the engine idling, check the fluid level. Add fluid up to the ”COOL” level on the dipstick.

NOTICE: Do not overfill. The transmission and differen–tial are separate units.

(f) Recheck the fluid level at the normal operating tem–perature (70 – 80°C (158 – 176°F)) and add as neces-sary.



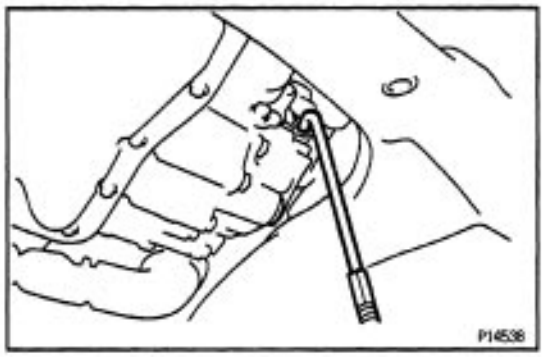


B. Replace differential fluid

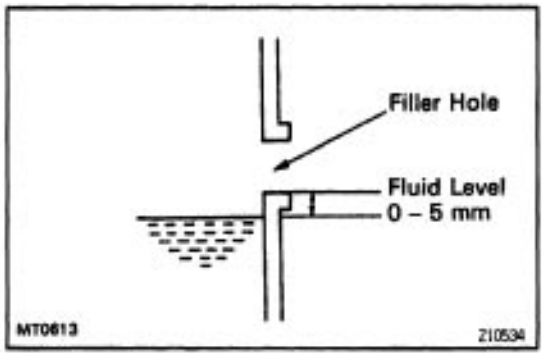
(a) Remove the filler plug.

(b) Using a 10 mm hexagon wrench, remove the drain plug and drain the fluid.

(c) Using a 10 mm hexagon wrench, install the drain plug securely.



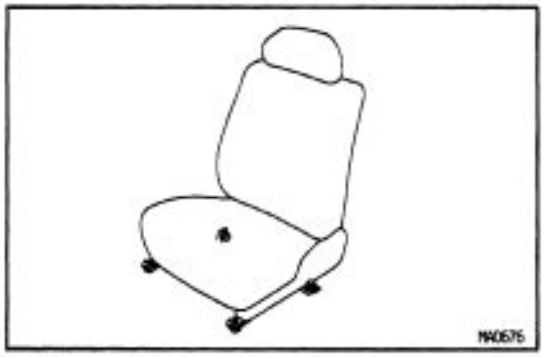
(d) Add new fluid until it begins to run out of the filler hole.



(e) Check that the fluid comes to within 5 mm (0.20 in.) of the bottom edge of the filler hole.

Fluid type:
ATF DEXRON II
Capacity:
0.95 liters (1.0 US qts, 0.8 Imp. qts)

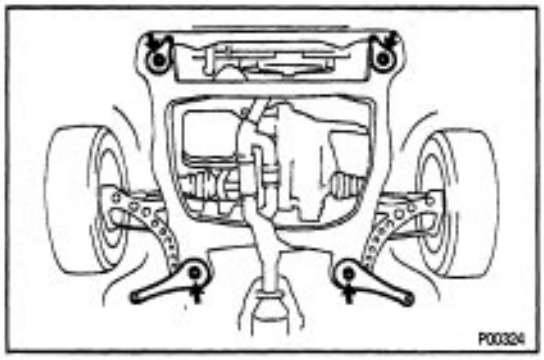
(f) Reinstall the filler plug securely.



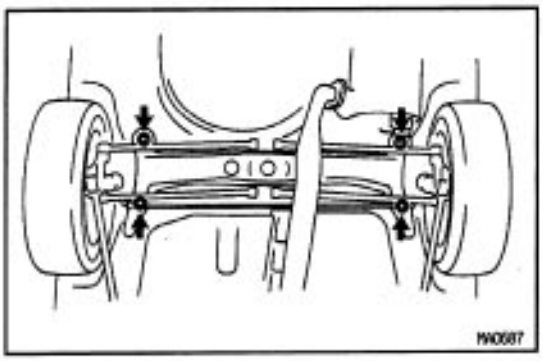
23. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

- Front seat mount bolts
  Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Front suspension member –to body mounting bolts
  Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)



- Rear suspension member–to–body mounting nuts
  Torque: 51 N–m (520 kgf–cm. 38 ft–lbf)

24. FINAL INSPECTION

(a) Check the operation of the body parts:

- Hood

Auxiliary catch operates properly

Hood locks securely when closed

- Front and rear doors
  Door lock operates properly
  Doors close properly
- Luggage compartment door or back door
  Door lock operates properly
- Seats
  Seat adjusts easily and locks securely in any position
  Front seat back locks securely in any position
  Folding–down rear seat backs lock securely

(b) Road test:

- Check the engine and chassis for abnormal noises.
  Check that the vehicle does not wander or pull to one side.
- Check that the brakes work properly and do not drag.
- Perform bedding down of the parking brake shoes and drum. (See page MA–31)

(c) Be sure to deliver a clean car and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

GENERAL MAINTENANCE

These are the maintenance and inspection items which are considered to be the owner's responsibility. They can be perfo–rmed by the owner or they can have them done at a service shop. These items in–clude those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform. Items and procedures for general maintanance are as follows:

OUTSIDE VEHICLE

1. TIRES

(a) Check the pressure with a gauge. Adjust if necessary.

(b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS

Wheel checking the tires, check the nuts for looseness or for missing nuts. If neces–sary, tighten them.

3. TIRE ROTATION

It is recommended that tires be rotated every 12,000 km (7,500 miles).

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. Replace if necessary.

5. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.

(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND ENGINE HOOD

(a) Check that all doors including the trunk lid operate smoothly, and that all latches lock securely.

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.

(b) Check the headlight aiming.

8. WARMING LIGHT AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.

(b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER

Check that air comes out from the defrost–er outlet when operating the heater air conditioner at defroster mode.

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they move freely and are mou nted securely.

15. STEERING WHEEL

Check that it has the specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noises.

16. SEATS

(a) Check that all front seat controls such as seat adjusters, seatback recliner, etc. op–erate smoothly.

(b) Check that all latches lock securely in any position.

(c) Check that the locks hold securely in any latched position.

(d) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.

(e) For folding–down rear seat backs, check that the latches lock securely.

17. SEAT BELTS

(a) Check that the seat belt system such as buckles, retractors and anchors operate properly and smoothly.

(b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. BRAKE PEDAL (See BR section)
(a) Check the pedal for smooth operation.
(b) Check that the pedal has the proper re–serve distance and freeplay.
(c) Check the brake booster function.

20. BRAKES
At a safe place, check that the brakes do not pull to one side when applied.

21. PARKING BRAKE (See BR section)
(a) Check that the lever has the proper travel.
(b) On a safe incline, check that the vehicle is help securely with only the parking brake applied.

22. AUTOMATIC TRANSMISSION ”PARK” MECHANISM
(a) Check the lock release button of the selec–tor lever for proper and smooth operation.
(b) On a safe incline, check that the vehicle is help securely with the selector lever in the “P” position and all brakes released.

MA0XT–08

UNDER HOOD

23. WINDSHIELD WASHER FLUID
Check that there is sufficient fluid in the tank.

24. ENGINE COOLANT LEVEL
Check that the coolant level is between the ”FULL” and ”LOW” lines on the see–through reservoir.

25. RADIATOR AND HOSES
(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
(b) Check the hoses for cracks, kinks, rot or loose connections.

26. BATTERY ELECTROLYTE LEVEL
Check that the electrolyte level of all bat–tery cells is between the upper and lower level lines on the case.

27. BRAKE FLUID LEVEL
Check that the brake fluid level is near the upper level line on the see–through reser–voir.

28. ENGINE DRIVE BELTS
Check all drive belts for fraying, cracks, wear or oiliness.

29. ENGINE OIL LEVEL
Check that level on the dipstick with the engine turned off.

30. POWER STEERING FLUID LEVEL
Check the level.
The level should be in the “HOT” or “COLD” range depending on the fluid temperature.

31. AUTOMATIC TRANSMISSION FLUID LEVEL
(a) Park the vehicle on a level surface.
(b) With the engine idling and the parking brake applied, shift the selector into all positions from “P” to ”L” and then shift into ”P” position.
(c) Pull out the dipstick and wipe off the fluid with a clean rag.
Re–insert the dipstick and check that the fluid level is in the “HOT” range.
(d) Perform this check with the fluid at normal driving temperature (70–80®C, 158 – 176®F).

HINT: Wait about 30 minutes before che–cking the fluid level after extended driving at high speeds in hot weather, driving in heavy traffic or with a trailer.

32. EXHAUST SYSTEM
Visually inspect for cracks, holes or loose supports.
If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

SERVICE SPECIFICATIONS

SERVICE DATA

Drive belt tension			
Generator		New belt	175 ± 5 lbf
Generator		Used belt	115 ± 20 lbf
PS pump		New belt	150 – 185 lbf
PS pump		Used belt	115 ± 20 lbf
Spark plug	Recommended spark plug	ND	PK20R11
Spark plug	Recommended spark plug	NGK	BKR6EP–11
Spark plug	Correct electrode gap		1.1 mm (0.043 in.)
Firing order			1 – 2 – 3 – 4 – 5 – 6
Valve clearance		Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
Valve clearance		Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)
Front and rear brake			
Pad thickness		Minimum	1.0 mm (0.039 in.)
Disc thickness	Front	Minimum	26.0 mm (1.024 in.)
Disc thickness	Rear	Minimum	9.0 mm (0.354 in.)
Disc runout	Front	Maximum	0.05 mm (0.0020 in.)
Disc runout	Rear	Maximum	0.15 mm (0.0059 in.)
Parking brake			
Lining thickness		Minimum	1.0 mm (0.039 in.)
Drum inside diameter		Maximum	171.0 mm (6.732 in.)
Front axle and suspension			
Ball joint vertical play		Maximum	0 mm (0 in.)
Steering wheel freeplay		Maximum	30 mm (1.18 in.) or less

TORQUE SPECIFICATIONS

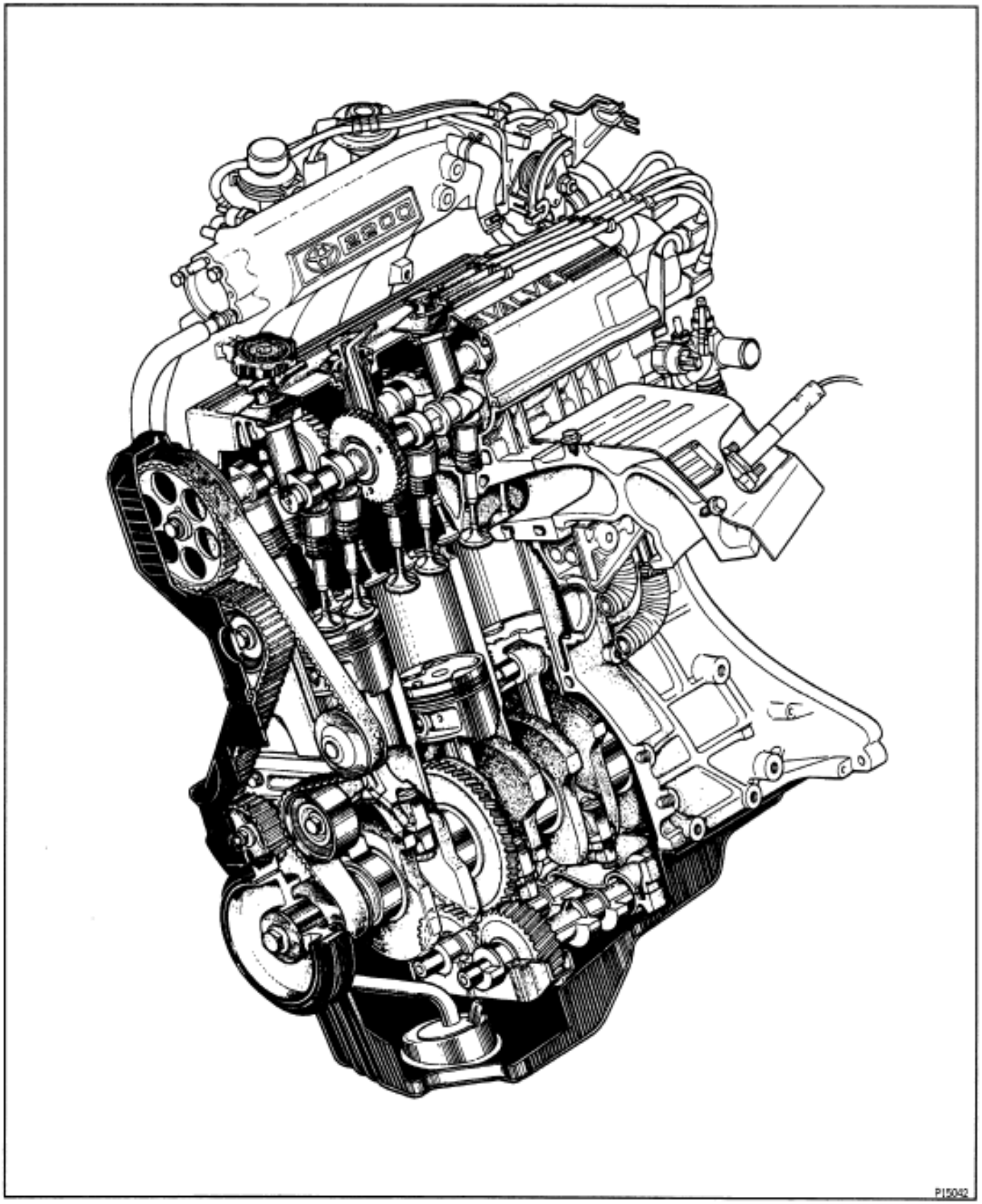
Pert tightened	N·m	kgf·cm	ft·lbf
Front seat mount bolts	37	375	27
Front suspension member x Body	181	1,850	134
Rear suspension member x Body	51	520	38

5S–FE ENGINE

ENGINE MECHANICAL

DESCRIPTION

The 5S–FE engine is an in–line, 4–cylinder, 2.2 liter DOHC 16–valve engine.



The 5S–FE engine is an in–line, 4–cylinder engine with the cylinders numbered 1–2–3–4 from the front. The crankshaft is supported by five bearings inside the crankcase. These bearings are made of aluminum alloy.

The crankshaft is integrated with eight weights for balance. Oil holes are placed in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The firing order is 1–3–4–2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent–roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

The intake manifold has four independent long ports and utilizes the inertial supercharging effect to improve engine torque at low and medium speeds.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.

The intake camshaft is driven by a timing belt, and a gear on the intake camshaft engages with a gear on the exhaust camshaft to drive it. The cam journal is supported at five places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

Pistons are made of high temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the full–floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No.1 and No.2 work to prevent gas leakage from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

The cylinder block is made of cast iron. It has four cylinders which are approximately twice the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed sheet steel. A dividing plate is included ’inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. This dividing plate also prevents the oil from making waves when the vehicle is stopped suddenly and the oil shifts away from the oil pump suction pipe.

The 5S–FE engine uses two balance shafts. The balance shafts are fitted in balance shaft housings that are located at the bottom of the cylinder block. The No. 1 balance shaft is driven by the drive gear of the crankshaft No.3 counterweight at twice the speed of the crankshaft. The No. 2 balance shaft is driven by the No–1 balance shaft at the same speed in the same direction as the crankshaft. The balance shafts are designed to eliminate secondary inertia force from the engine, thereby reducing the engine noise (booming noise).

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09011–38121 12 mm Socket wrench for 12 Pointed Head	Cylinder head bolt and connecting rod bolt
	09201–41020 Valve Stem Oil Seal Replacer	
	09201–70010 Valve Guide Bushing Remover & Replacer	
	09202–70010 Valve Spring Compressor	
	09213–54015 Crankshaft Pulley Holding Tool	
	(91651 –60855) Bolt	
	09213–80017 Crankshaft Pulley & Gear Puller Set	
	(09213–00020) Body With Bolt	
	(09213–00030) Handle	
	(09213–00060) Bolt set	
	09222–30010 Connecting Rod Bushing Remover & Replacer	
	09223–46011 Crankshaft Front Oil Seal Replacer	Camshaft oil seal
	09223–63010 Crankshaft Rear Oil Seal Replacer	

	09224–74010 Engine Balancer Backlash Adjusting Tool	
	09248–55020 Valve Clearance Adjust Tool Set (09248–05011) Valve Lifter Press	
	(09248–05021) Valve Lifter Stopper	
		
	09249–63010 Torque Wrench Adaptor	
	09226–10010 Crankshaft Front & Rear Bearing Replacer	
	09278–54012 Drive Shaft Holding Tool	Camshaft timing pulley
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09616–30011 Steering Worm Bearing Adjusting Screw Wrench	Oil pump pulley
	09816–30010 Oil Pressure Switch Socket	Knock sensor
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

	09090–04010 Engine Sling Device	For suspension engine
	09200–00010 Engine Adjust Kit	

 09256–00030 Hose Plug Set	Plug for vacuum hose, fuel hose etc.
 09904–00010 Expander Set	

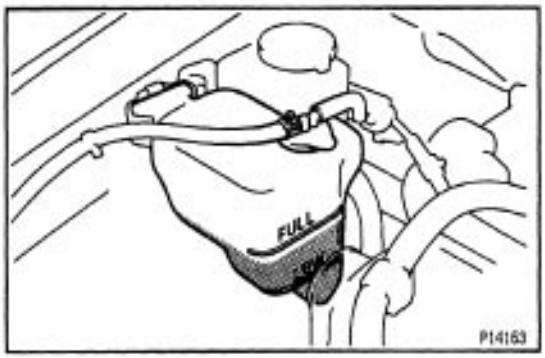
EQUIPMENT

Battery specific gravity gauge	
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	

Valve seat cutter	
Vernier calipers	

SSM (SERVICE SPECIAL MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Cylinder head cover Rear oil sear retainer
08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Flywheel or drive plate bolt

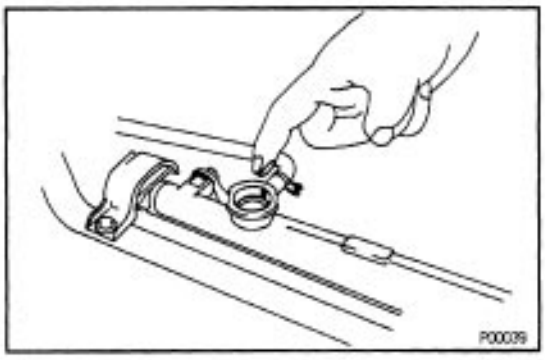


TUNE–UP

ENGINE COOLANT INSPECTION

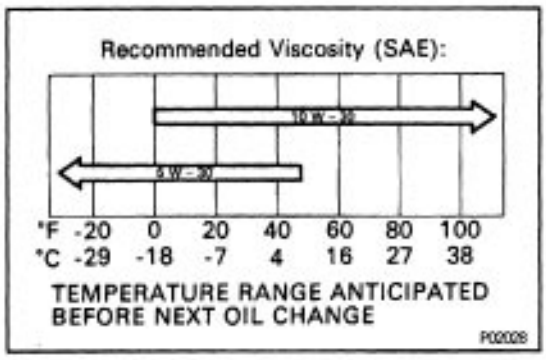
1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the "LOW" and "FULL" lines at low temperature.
If low, check for leaks and add engine coolant up to the "FULL"



2. CHECK ENGINE COOLANT QUALITY

There should be no excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the engine coolant should be free from oil.
If excessively dirty, replace the engine coolant.



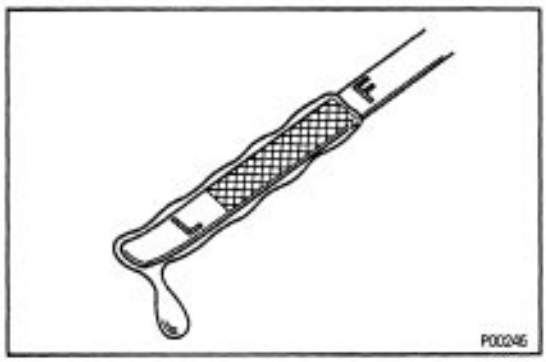
ENGINE OIL INSPECTION

1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, dis–coloring or thinning.
If oil quality is visibly poor, replace it.

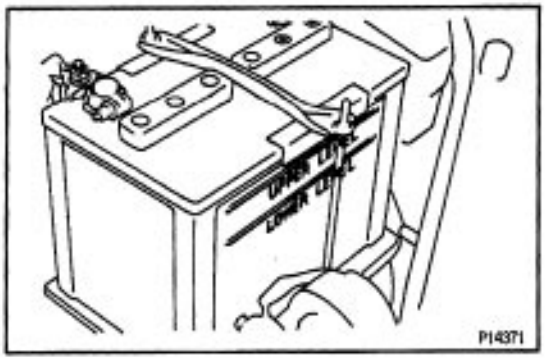
Oil grade:

API grade SG or SH, Energy Conserving II multi–grade engine oil or ILSAC multigrade engine oil. Recommended viscosity is as shown in the illustra–tion.



2. CHECK ENGINE OIL LEVEL

The oil level should be between the "L" and "F" marks on the dipstick.
If low, check for leakage and add oil up to the "F" mark.



BATTERY INSPECTION

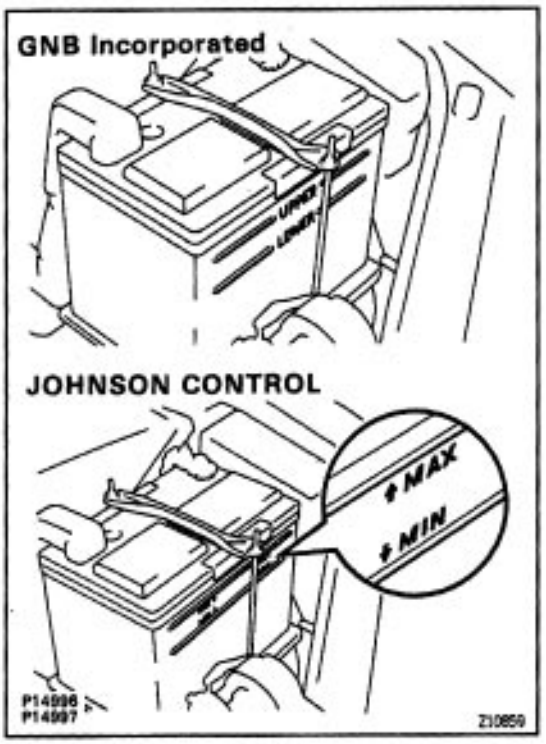
1. Except Delco Battery:

CHECK BATTERY ELECTROLYTE LEVEL

Check the electrolyte quantity of each cell.

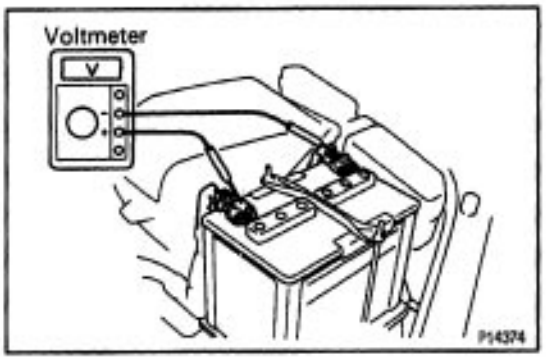
A. Maintenance Free Battery

If under the lower level, replace the battery (or add distilled water if possible). Check the charging system.



B. Except Maintenance Free Battery

If under the “LOWER” or “MIN” line, add distilled water.



2. Except Delco Battery:

CHECK BATTERY VOLTAGE AND SPECIFIC GRAVITY

A. Maintenance Free Battery

Measure the battery voltage between the terminals negative (–) and positive (+) of the battery.

Standard voltage:

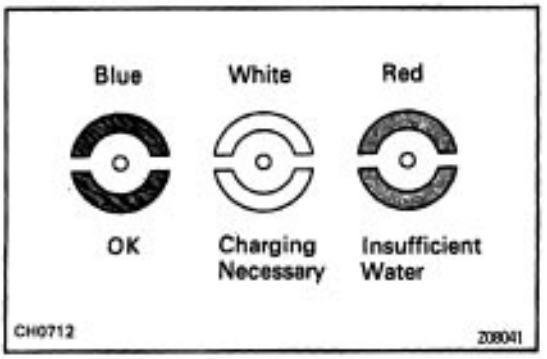
12.7 – 12.9 V at 20°C (68°F)

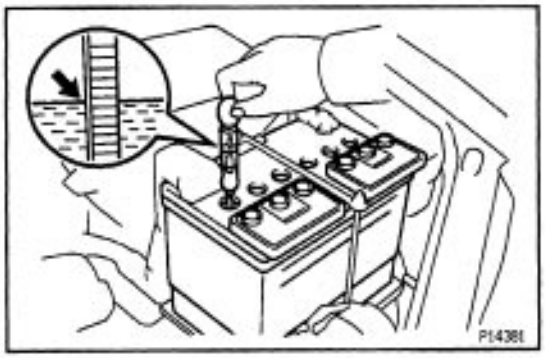
HINT:

- Before measuring the voltage, turn the ignition switch to LOCK and turn off the electrical sys–tems (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- If the vehicle has been running, wait 5 minutes or more after the vehicle stops before measuring the battery voltage.

If the voltage is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





B. Except Maintenance Free Battery

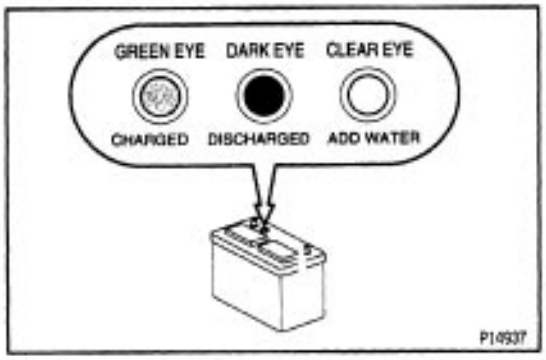
Check the specific gravity of each cell.

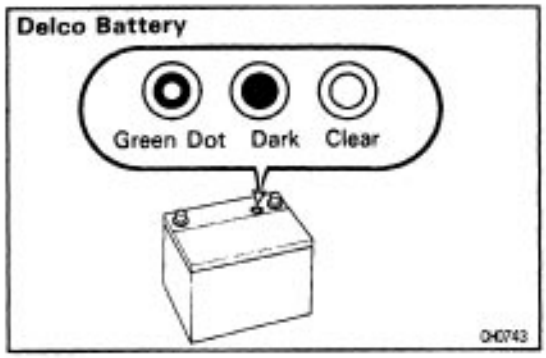
Standard specific gravity:

55D23L battery for GNB Incorporated
1.25 – 1.27 at 20°C (68°F)
55D23L battery for JOHNSON CONTROLS
1.26 – 1.28 at 27°C (81°F)
80D26L battery for GNB Incorporated
1.27 – 1.29 at 20°C (68°F)
80D26L battery for JOHNSON CONTROLS
1.28 – 1.30 at 27°C (81°F)

If the gravity is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.



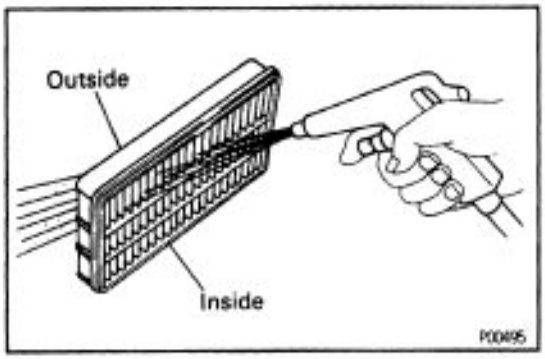


3. Delco Battery:

CHECK HYDROMETER
Green Dot visible:
Battery is adequately charged
Dark (Green Dot not visible):
Battery must be charged
Clear or Light Yellow:
Replace battery

HINT: There is no need to add water during the entire service life of the battery.

AIR FILTER INSPECTION



1. INSPECT AIR FILTER

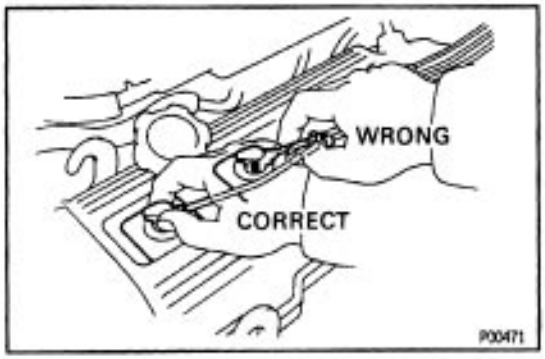
Visually check that the element is not excessively dirty, damaged or oily.

2. CLEAN AIR FILTER

Clean the element with compressed air.

First blow air from the inside thoroughly. Then blow off the outside of the element.

HIGH–TENSION CORDS INSPECTION

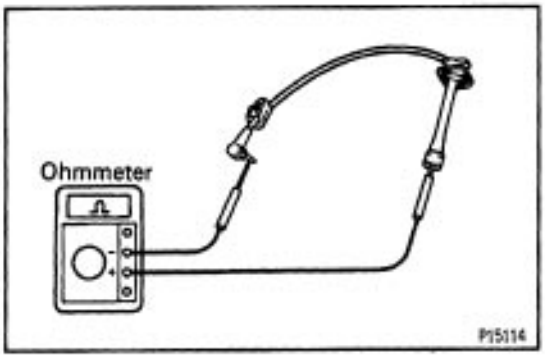


1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

Disconnect the high – tension cords at the rubber boot. Do not pull on the high–tension cords.

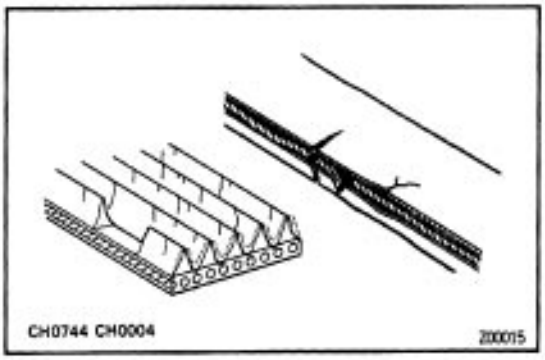
NOTICE: Pulling on or bending the cords may damage the conductor inside.

2. CALIFORNIA ONLY:
DISCONNECT HIGH–TENSION CORD FROM IGNITION COIL
3. DISCONNECT HIGH –TENSION CORDS FROM DISTRIBUTOR CAP



4. INSPECT HIGH–TENSION CORD RESISTANCE
Using an ohmmeter, measure the resistance.
Maximum resistance:
25 kΠ per cord
If the resistance is greater than maximum, check the terminals. If necessary, replace the high – tension cord.

5. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP
6. CALIFORNIA ONLY:
RECONNECT HIGH–TENSION CORD TO IGNITION COIL
7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

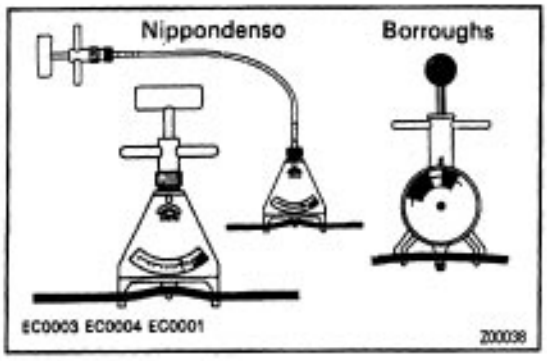


GENERATOR DRIVE BELT INSPECTION

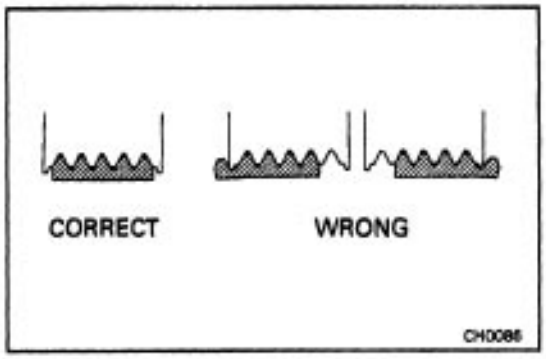
INSPECT DRIVE BELT

(a) Visually check the drive belt for excessive wear, frayed cords etc.
If any defect has been found, replace the drive belt.

HINT: Cracks on the rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.



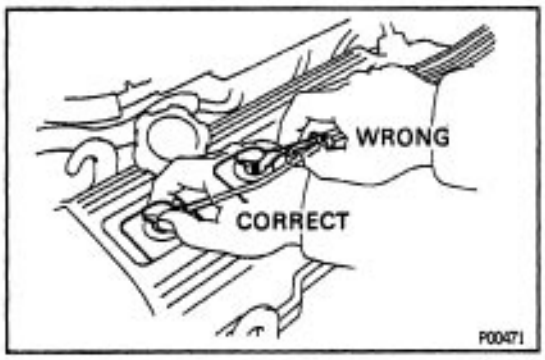
(b) Using a belt tension gauge, measure the belt tension.
Belt tension gauge:
Nippondenso BTG–20 (95506–00020)
Borroughs No. BT–33–73F

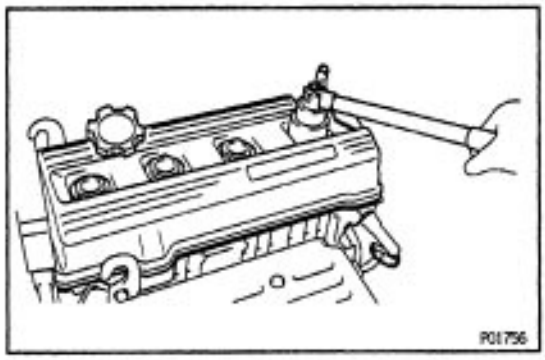


Drive belt tension:
w/ A/C
New belt
175 ± 5 lbf
Used belt
130 ± 10 lbf
w/o A/C
New belt
125 ± 25 lbf
Used belt
95 ± 20 lbf

If the belt tension is not as specified, adjust it.
HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.





VALVE CLEARANCE INSPECTION AND ADJUSTMENT

HINT: Inspect and adjust the valve clearance when the engine is cold.

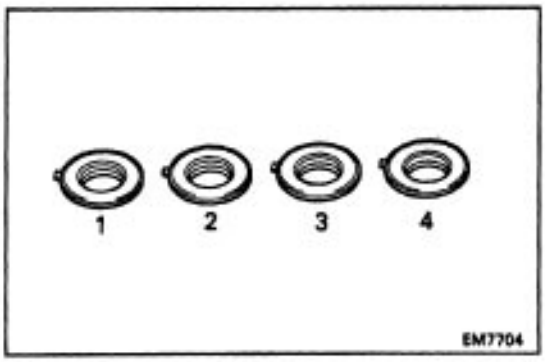
1. DISCONNECT HIGH – TENSION CORDS FROM SPARK PLUGS

Disconnect the high – tension cords at the rubber boot. DO NOT pull on the cords.

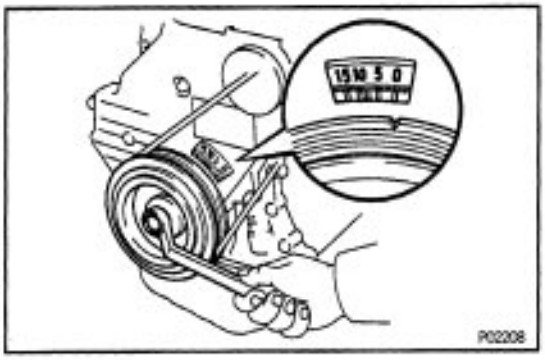
NOTICE: Pulling on or bending the cords may damage the conductor inside.

2. REMOVE CYLINDER HEAD COVER

(a) Disconnect the PCV hoses.
(b) Loosen the 2 wire harness clamp bolts (No.2 timing belt cover) mounting bolts.
(c) Remove the 4 nuts, grommets, head cover and gasket.



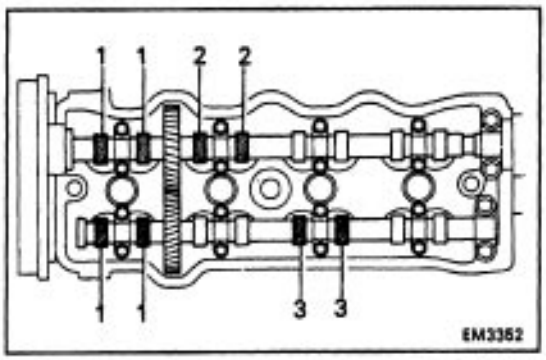
HINT: Arrange the grommets in correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of grommets.



3. SET NO.1 CYLINDER TO TDC/COMPRESSION

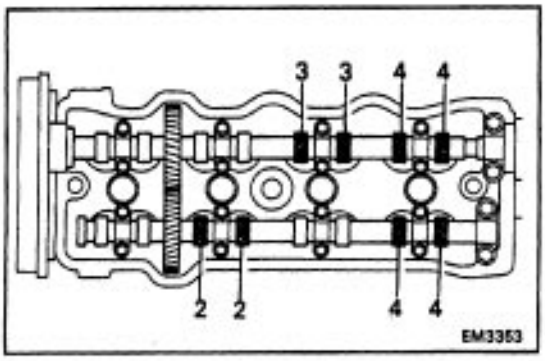
(a) Turn the crankshaft pulley and align its groove with timing mark “0” of the No.1 timing belt cover.

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
If not, turn the crankshaft one revolution (360*) and align the mark as above.



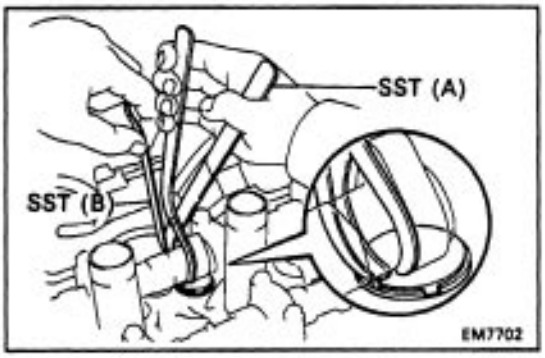
4. INSPECT VALVE CLEARANCE

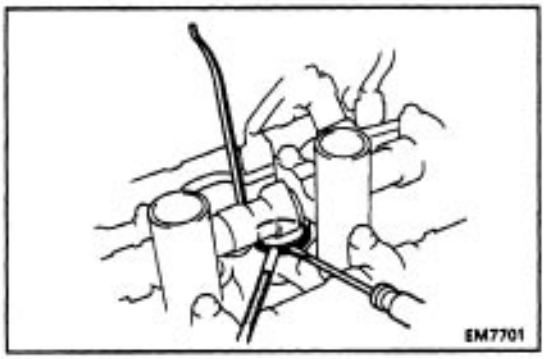
(a) Check only the valves indicated.
Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
Record the out– of –specification valve clear– ance measurements. They will be used later to determine the required replacement adjusting shim.
Valve clearance (Cold):
Intake
0.19 – 0.29 mm (0.007 – 0.011 in.)
Exhaust
0.28 – 0.38 mm (0.011 – 0.015 in.)

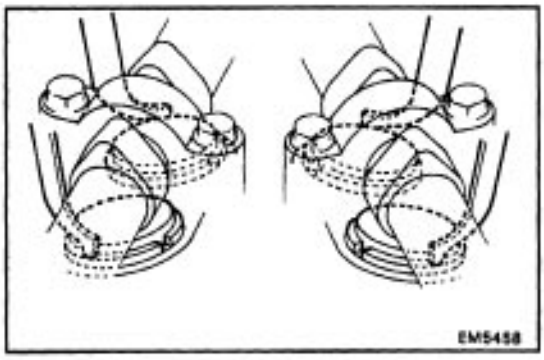


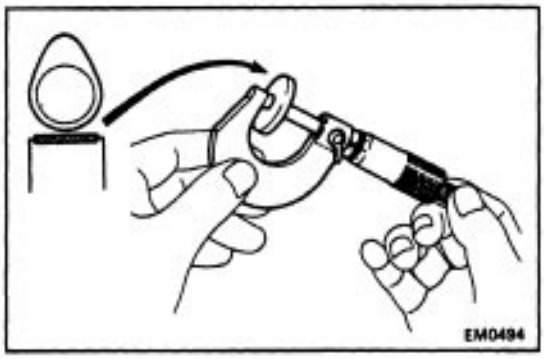
(b) Turn the crankshaft one revolution (360Ⓡ) and align the mark as above. (See procedure in step 3)

(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))









5. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft so that the cam lobe for the valve to be adjusted faces up.
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248 – 55020 (09248 – 05011, 09248–05021)

HINT: Before pressing down the valve lifter, position its notch toward the spark plug side.

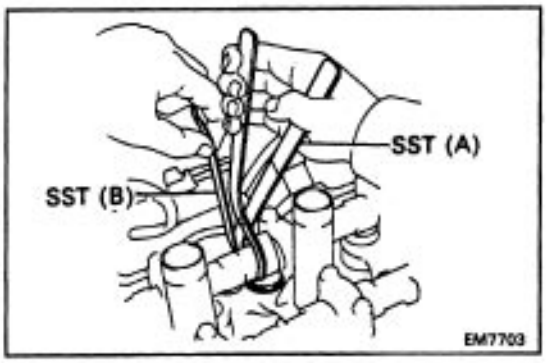
- Remove the adjusting shim with a' small screw–driver and magnetic finger.

HINT: For easy removed of the shim, when positioning SST (B), set it on the lifter so there is space enough to be able to remove the shim.

(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within specified value.
  T ..... Thickness of removed shim
  A ..... Measured valve clearance
  N ..... Thickness of new shim
  Intake:
  N = T + (A – 0.24 mm (0.009 in.))
  Exhaust:
  N = T + (A – 0.33 mm (0.013 In.))
- Select a new shim with a thickness as close as possible to the calculated value.

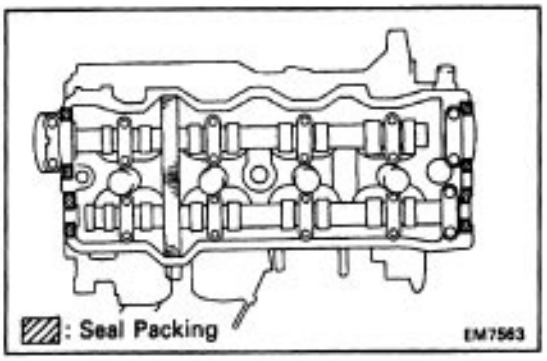
HINT: Shims are available in seventeen sizes in incre–ments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).
  SST 09248–50020 (09248–05011, 09248–05021)

(d) Recheck the valve clearance.



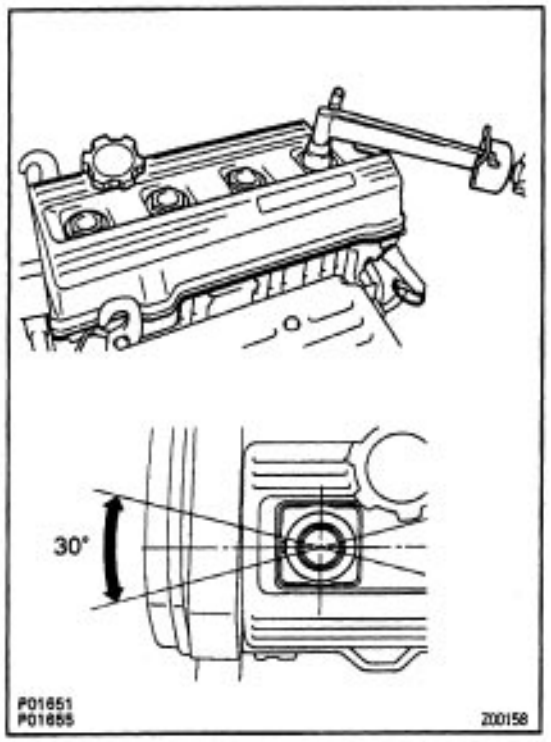
6. REINSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal pecking:

Part No.08826–00080 or equivalent



(c) Install the gasket to the head cover.

(d) Install the head cover with the 4 grommets and nuts. Uniformly tighten the nuts in several passes.

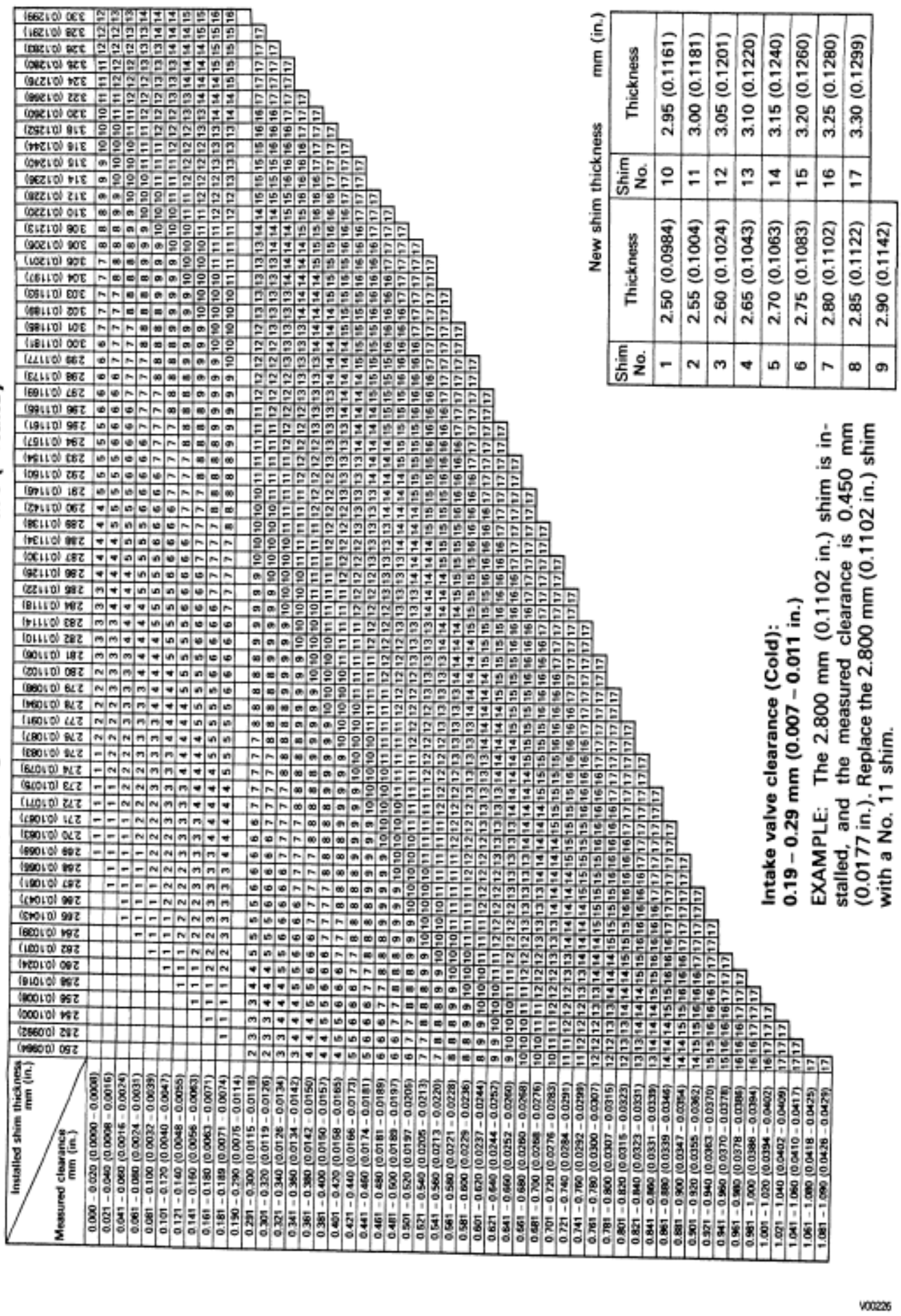
Torque: 23 N–m (230 kgf–cm. 17 ft–lbf)

HINT: Install the grommets so that their markings are as shown in the illustration.

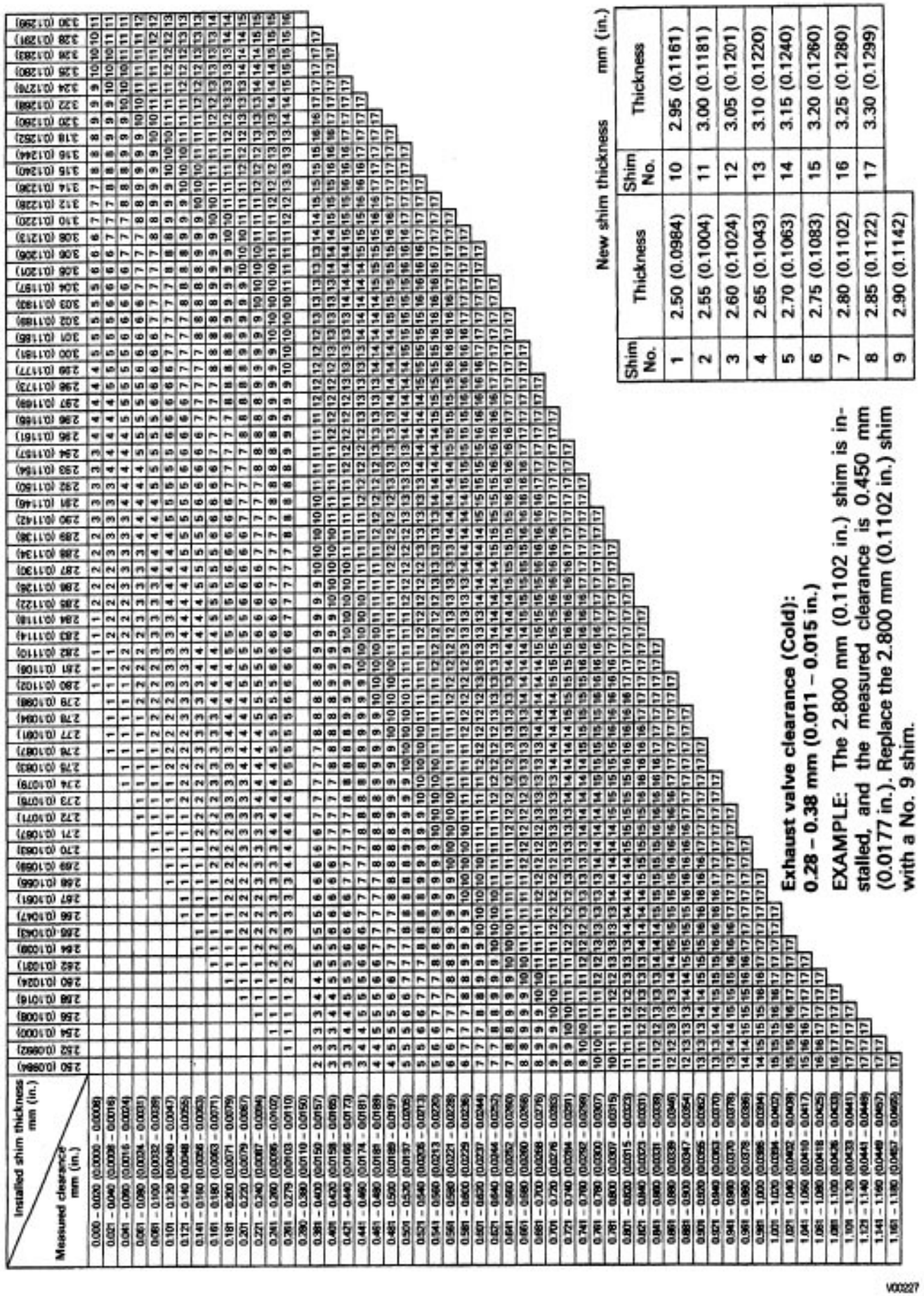
(e) Tighten the 2 wire harness clamp (No.2 timing belt cover) mounting bolts.

(f) Connect the PCV hoses.

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS


Adjusting Shim Selection Chart (Intake)
Installed shim thickness mm (in.)
Measured clearance mm (in.)
New shim thickness mm (in.)
Shim No. | Thickness | Shim No. | Thickness
1 | 2.50 (0.0984) | 10 | 2.95 (0.1161)
2 | 2.55 (0.1004) | 11 | 3.00 (0.1181)
3 | 2.60 (0.1024) | 12 | 3.05 (0.1201)
4 | 2.65 (0.1043) | 13 | 3.10 (0.1220)
5 | 2.70 (0.1063) | 14 | 3.15 (0.1240)
6 | 2.75 (0.1083) | 15 | 3.20 (0.1260)
7 | 2.80 (0.1102) | 16 | 3.25 (0.1280)
8 | 2.85 (0.1122) | 17 | 3.30 (0.1299)
9 | 2.90 (0.1142)
Intake valve clearance (Cold):
0.19 – 0.29 mm (0.007 – 0.011 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 11 shim.
V00226

Adjusting Shim Selection Chart (Exhaust)



New shim thickness mm (in.)			
Shim No.	Thickness	Shim No.	Thickness
1	2.50 (0.0984)	10	2.95 (0.1161)
2	2.55 (0.1004)	11	3.00 (0.1181)
3	2.60 (0.1024)	12	3.05 (0.1201)
4	2.65 (0.1043)	13	3.10 (0.1220)
5	2.70 (0.1063)	14	3.15 (0.1240)
6	2.75 (0.1083)	15	3.20 (0.1260)
7	2.80 (0.1102)	16	3.25 (0.1280)
8	2.85 (0.1122)	17	3.30 (0.1299)
9	2.90 (0.1142)		

Exhaust valve clearance (Cold):
0.28 – 0.38 mm (0.011 – 0.015 in.)

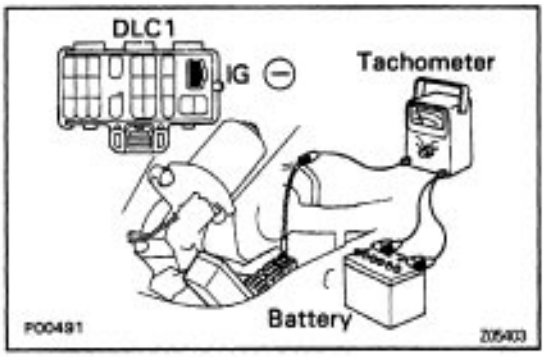
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 9 shim.

V00227

IGNITION TIMING INSPECTION AND ADJUSTMENT

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

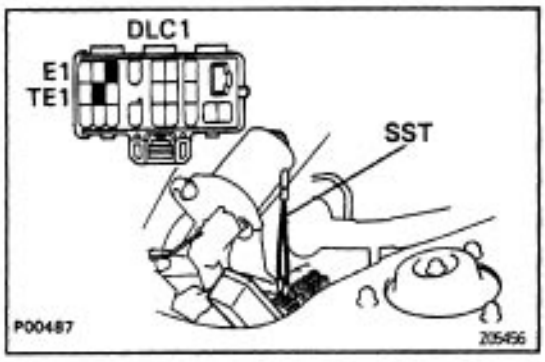


2. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the test probe of a tachometer to terminal IG (–) of the data link connector 1.

NOTICE:

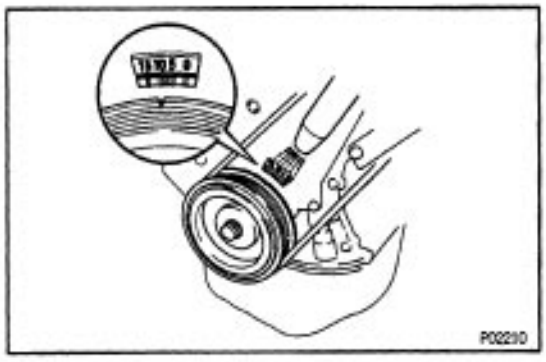
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coif.**
- **As some tachometers are not compatible with this Ignition system, we recommend that you confirm the compatibility of yours before use.**



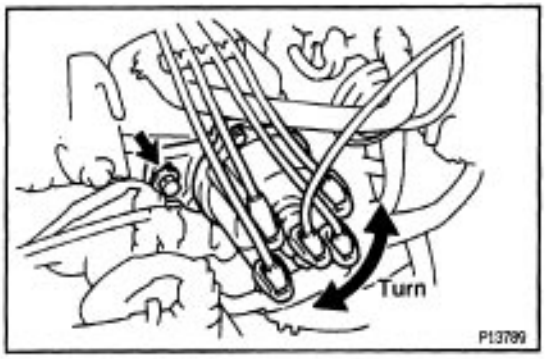
3. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843–18020

HINT: After engine speed is kept at 1,000 – 1,300 rpm for 5 seconds, check that it returns to idle speed.

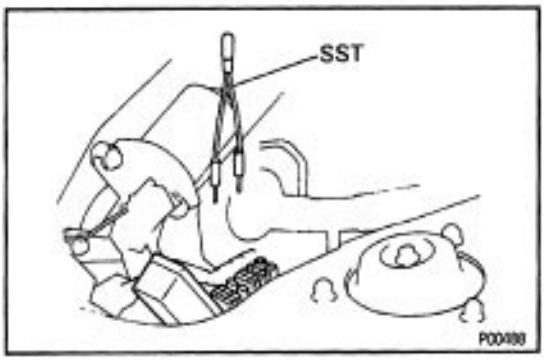


(b) Using a timing light, check the ignition timing.
Ignition timing:
10®BTDC @ idle
(Transmission in neutral position)

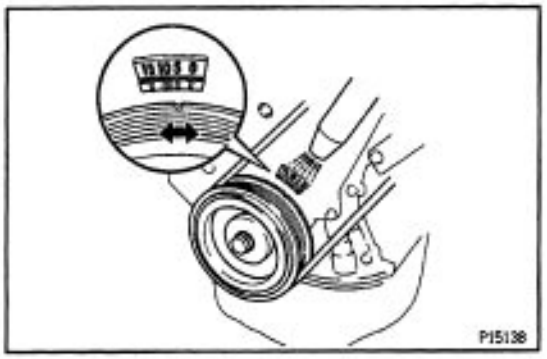


(c) Loosen the bolt (California) or 2 bolts (except Califor–nia), and adjust by turning the distributor.
(d) Tighten the bolt (California) or 2 bolts (except Califor–nia), and recheck the ignition timing.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Remove the SST.
SST 09843–18020



4. FURTHER CHECK IGNITION TIMING

Ignition timing:
0 – 10®BTDC @ idle
(Transmission in neutral position)

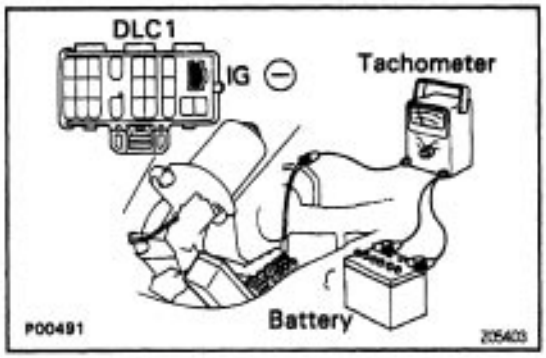
HINT: The timing mark moves in a range between 0® and 10®.

5. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

IDLE SPEED INSPECTION

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All vacuum lines properly connected
(e) MFI/SFI system wiring connectors fully plugged
(f) All operating accessories switched OFF
(g) Ignition timing set correctly
(h) Transmission in neutral position

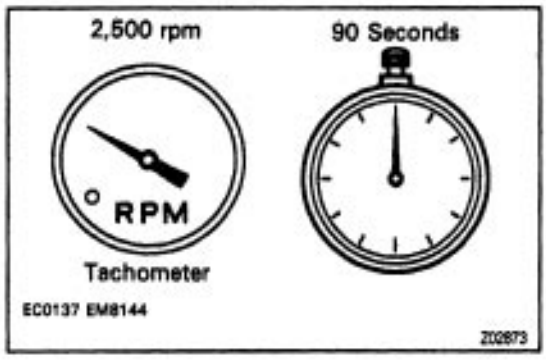


2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the data link connector 1.

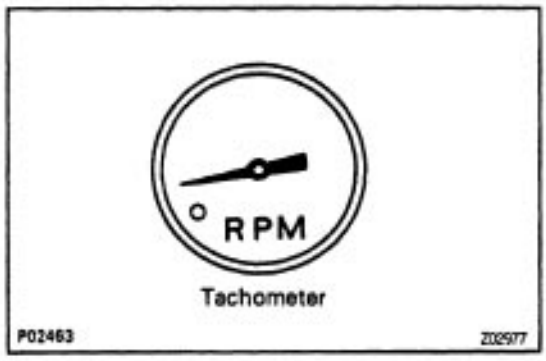
NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result in damage to the Igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.**



3. INSPECT IDLE SPEED

(a) Race the engine at 2,500 rpm for approx. 90 seconds.



(b) Check the idle speed.

Idle speed (w/ Cooling fan OFF):
750±50 rpm

If the idle speed is not as specified, check the IAC system.

4. DISCONNECT TACHOMETER

IDLE AND OR 2,500 RPM CO/HC CHECK

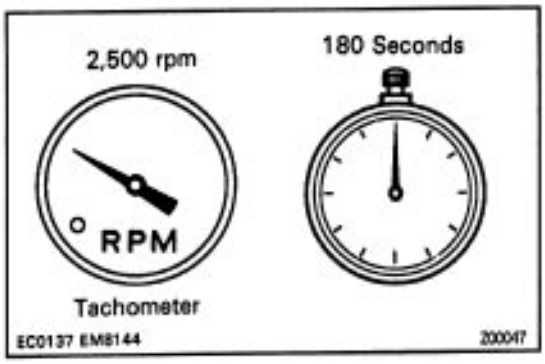
HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

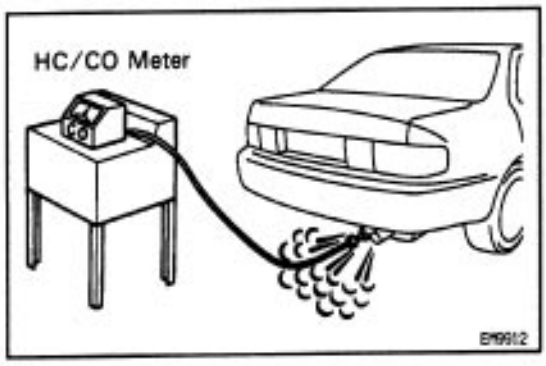
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

(f) MFI/SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand.



2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATTELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

Complete the measuring within 3 minutes.

HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

Troubleshooting

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

(a) Check oxygen sensor operation.
(See page EG1–231)

(b) See the table below for possible causes, then inspect and correct the applicable causes if necessary.

HC	CO	Problems	Causes
High	Normal	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • EGR valve • Intake manifold • Throttle body • !AC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty MFI/SFI systems • Faulty pressure regulator • Clogged fuel return line • Defective engine coolant temp. sensor • Defective intake air temp. sensor • Faulty ECM • Faulty injector • Faulty throttle position sensor • MAP sensor

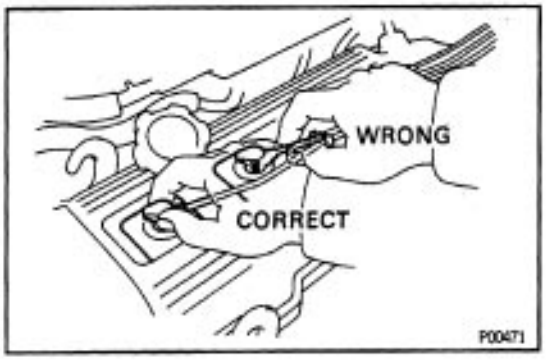
COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consump–tion or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. DISCONNECT DISTRIBUTOR CONNECTOR(S)

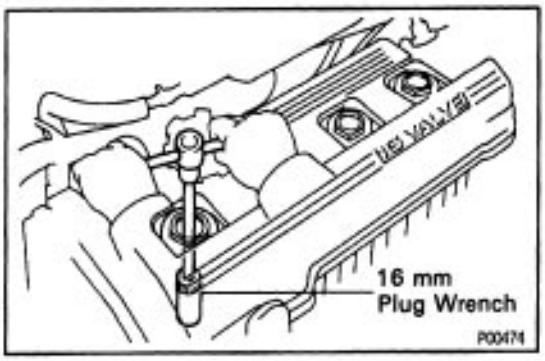


3. DISCONNECT HIGH –TENSION CORDS FROM SPARK PLUGS

Disconnect the high – tension cords at the rubber boot.

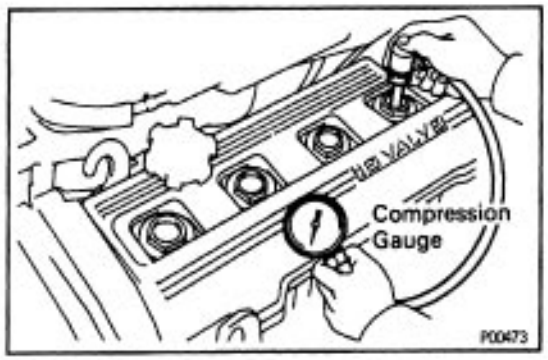
DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



4. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



5. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps
(a) through
(c) for each cylinder.

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:

1,226 kPa (12.5 kgf/cm® 178 psi) or more

Minimum pressure:

981 kPa (10.0 kgf/cm® 142 psi)

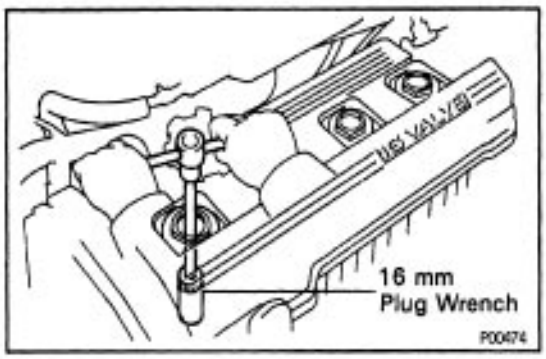
Difference between each cylinder:

98 kPa (1.0 kgf/cm® 14 psi) or less

(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through

(c) for cylinders with low compression.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.



6. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug.

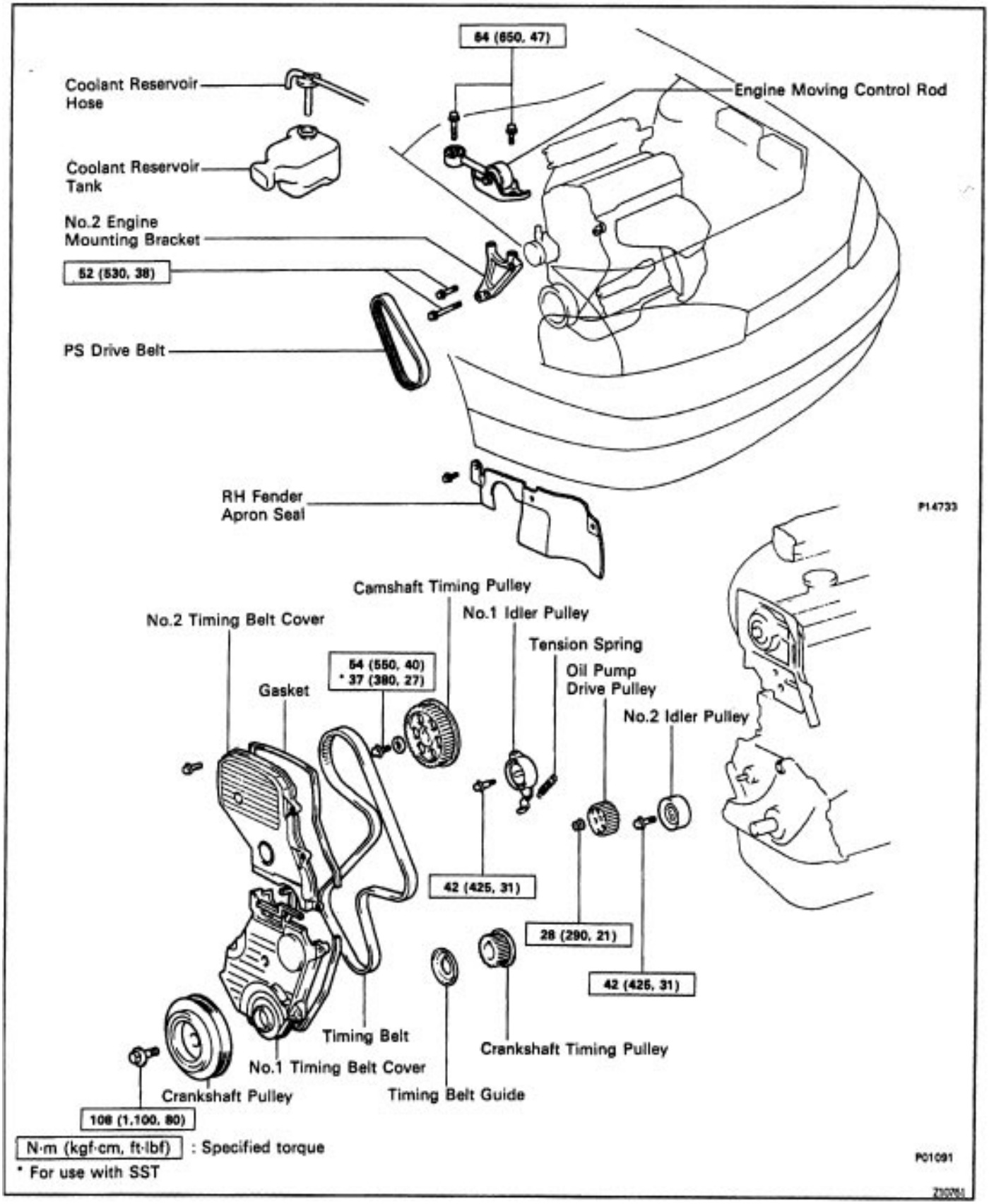
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

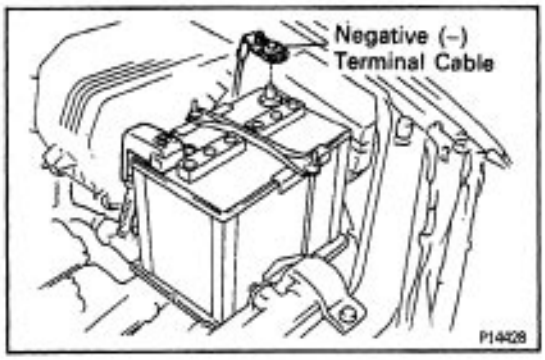
8. RECONNECT DISTRIBUTOR CONNECTOR(S)

TIMING BELT

COMPONENTS FOR REMOVAL AND INSTALLATION



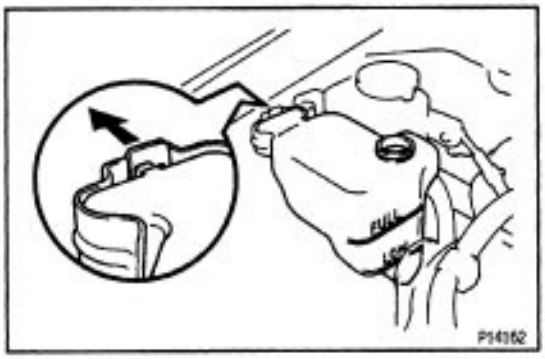
TIMING BELT REMOVAL



(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE ENGINE COOLANT RESERVOIR TANK

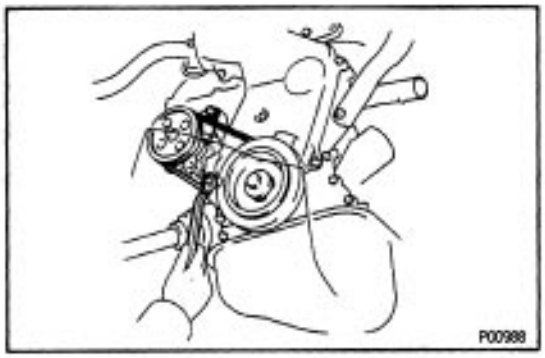
(a) Disconnect the reservoir hose.

(b) While pushing the tab of the bracket, remove the reservoir tank.

3. REMOVE GENERATOR (See page CH–10)

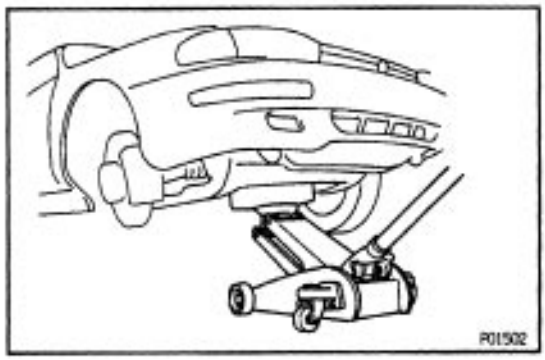
4. REMOVE RH FRONT WHEEL

5. REMOVE RH FENDER APRON SEAL



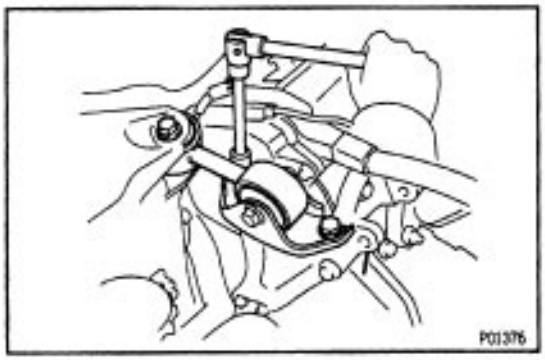
6. REMOVE PS DRIVE BELT

Loosen the 2 bolts, and remove the drive belt.



7. SLIGHTLY JACK UP ENGINE

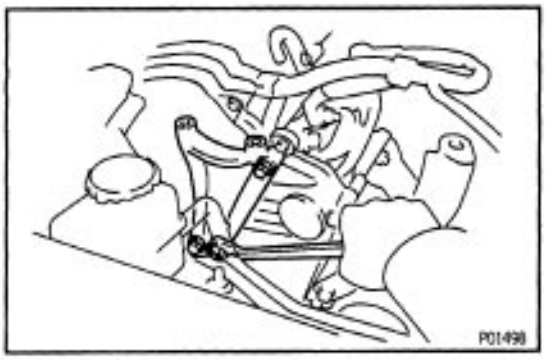
Raise the engine enough to remove the weight from the engine mounting on the right side.



8. REMOVE ENGINE MOVING CONTROL ROD

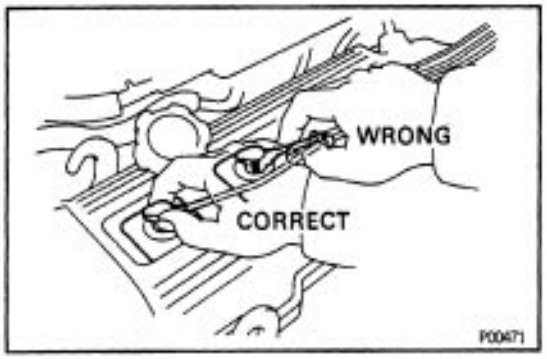
Remove the 3 bolts and control rod.

9. DISCONNECT CONNECTOR FROM GROUND WIRE ON RH FENDER APRON



10. REMOVE No.2 ENGINE MOUNTING BRACKET

Remove the 3 bolts and mounting bracket.

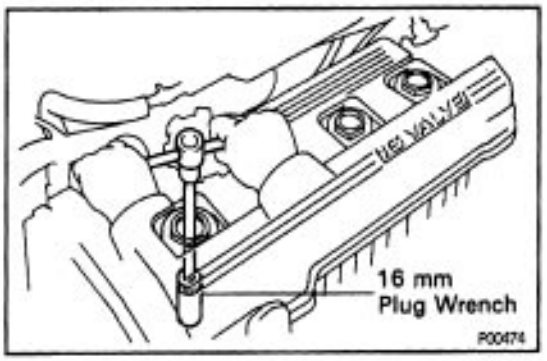


11. REMOVE SPARK PLUGS

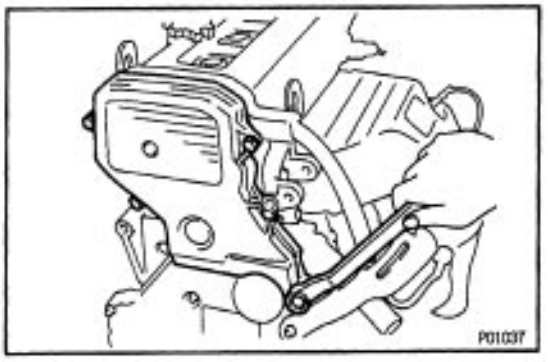
(a) Disconnect the high – tension cords at the rubber boot.

DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

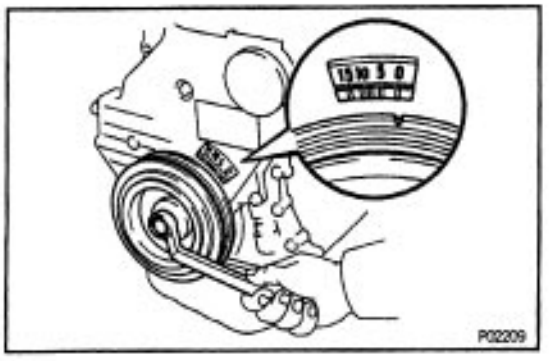


(b) Using a 16 mm plug wrench, remove the spark plug.



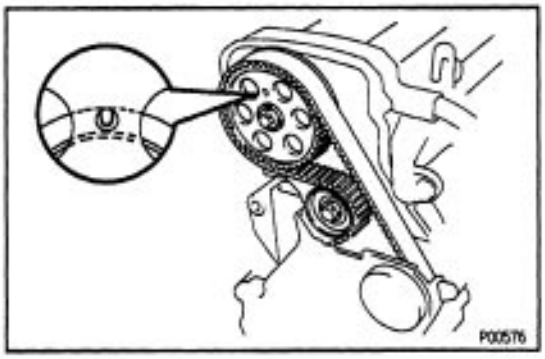
12. REMOVE NO.2 TIMING BELT COVER

Remove the 5 bolts, timing belt cover and 2 gaskets.

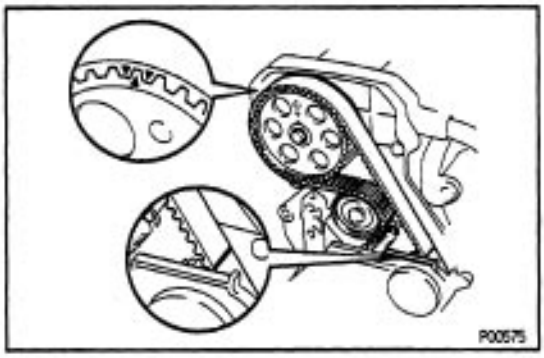


13. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark “0” of the No.1 timing belt cover.

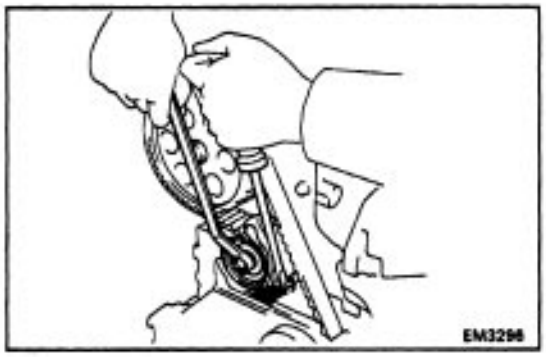


(b) Check that the hole of the camshaft timing pulley is aligned with the timing mark of the bearing cap. If not, turn the crankshaft one revolution (360'*).

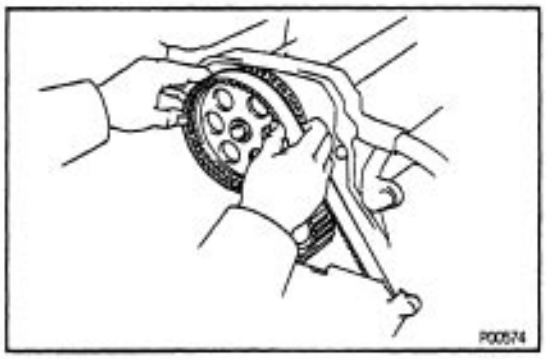


14. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

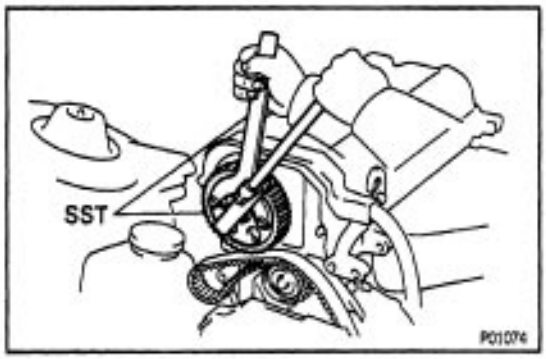
HINT (When re–using timing belt): Place the match–marks on the timing belt and camshaft timing pulley, and place matchmark on timing belt to match the end of the No.1 timing belt cover.



(a) Loosen the mounting bolt of the No.1 idler pulley and shift the pulley toward the left as far as it will go, and temporarily tighten it.



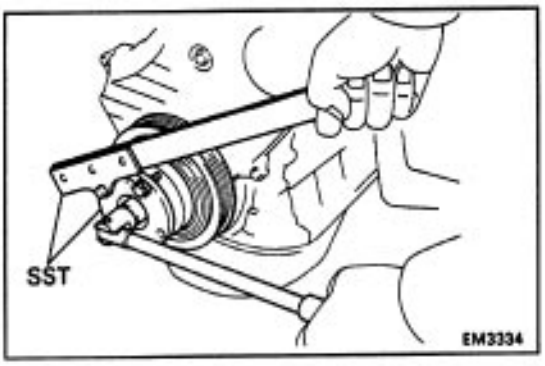
(b) Remove the timing belt from the camshaft timing pulley.



15. REMOVE CAMSHAFT TIMING PULLEY

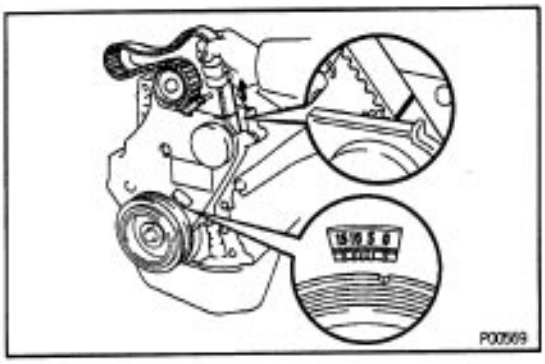
Using SST, remove the bolt, plate washer and timing pulley.

SST 09249–63010 and 09278–54012

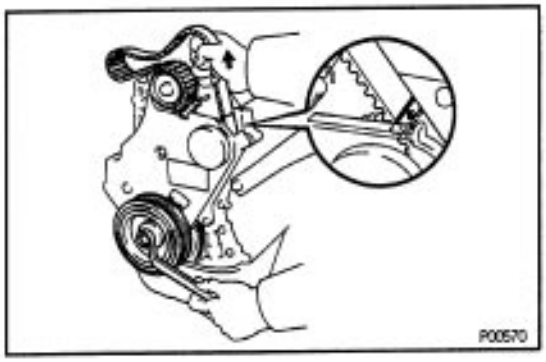


16. REMOVE CRANKSHAFT PULLEY

(a) Using SST, remove the pulley bolt.
SST 09213–54015 (91651– 60855), 09330–00021

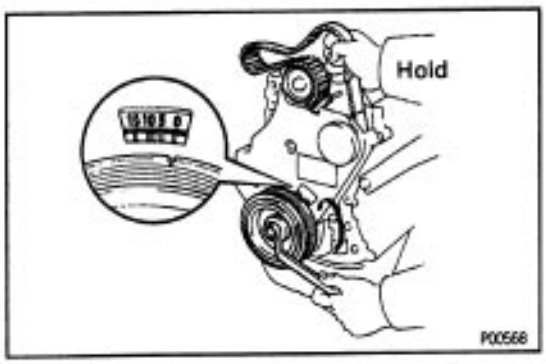


HINT (When re–using timing belt): After loosening the crankshaft pulley bolt, check that the timing belt matchmark aligns with the end of the No. 1 timing belt cover when the crankshaft pulley groove is aligned with the timing mark “0” of the No. 1 timing belt cover. If the matchmark does not align, align as follows**:**

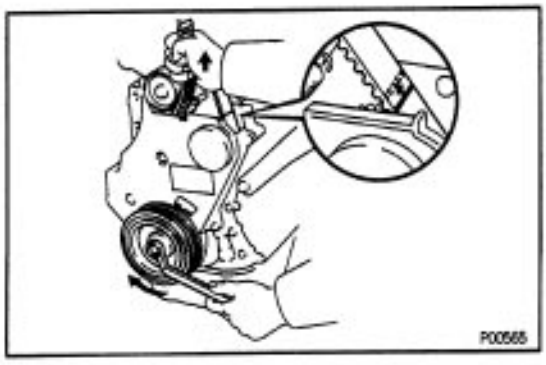


When matchmark is misaligned clockwise:

- Align the matchmark by pulling the timing belt up on the water pump pulley side while turning the crankshaft pulley counterclockwise.

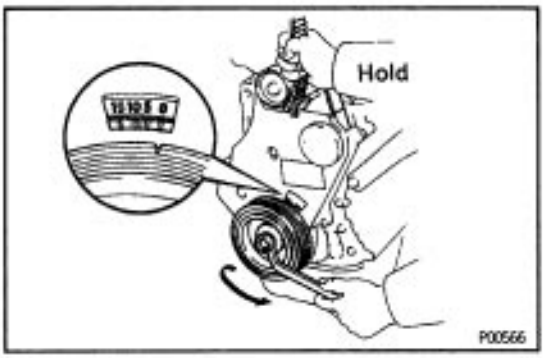


- After aligning the matchmark, hold the timing belt, turn the crankshaft pulley clockwise, and align its groove with timing mark “0” of the No.1 timing belt cover.

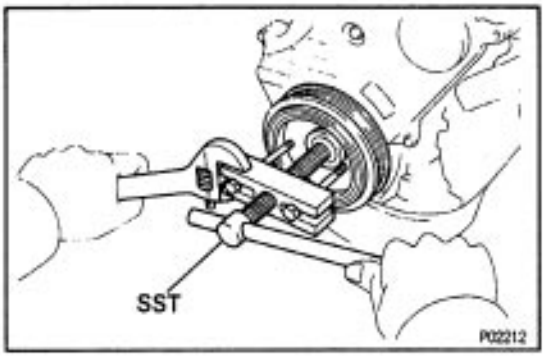


When matchmark is misaligned counterclockwise:

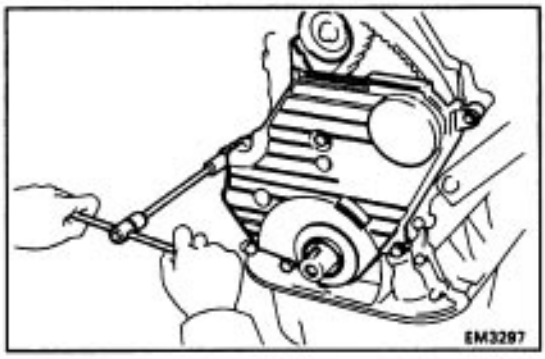
- Align the rnatchmarks by pulling the timing belt up on the No.1 idler pulley side while turning the crankshaft pulley clockwise.



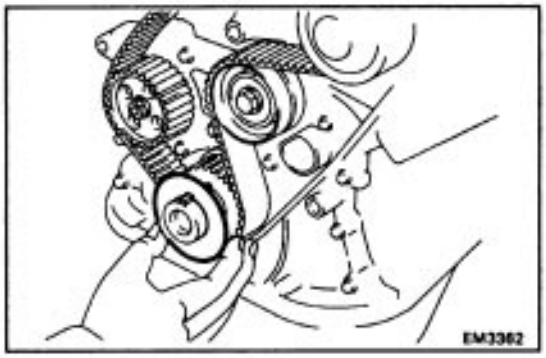
- After aligning the matchmark, hold the timing belt, turn the crankshaft pulley counterclockwise, and align its groove with timing mark “0” of the No.1 timing belt cover.



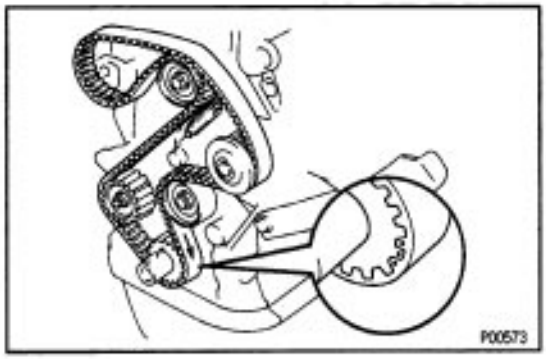
(b) Using SST, remove the pulley.
SST 09213–60017 (09213–00020, 09213–00030, 09213–00060)
HINT (When re–using timing belt): Remove the pulley without turning it.



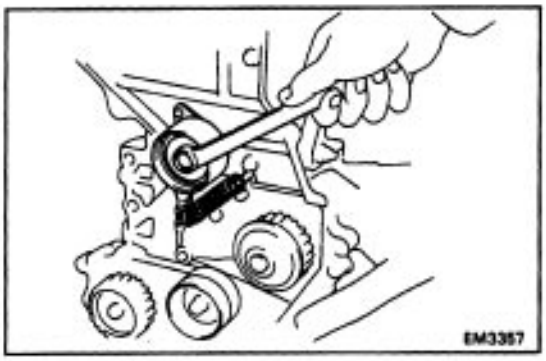
17. REMOVE No.1 TIMING BELT COVER
Remove the 4 bolts, timing belt cover and gasket.



18. REMOVE TIMING BELT GUIDE

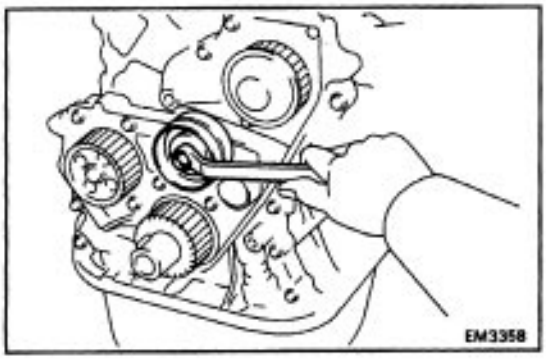


19. REMOVE TIMING BELT
HINT (When re–using timing belt): Draw a direction arrow on the timing belt (in the direction of engine revolution), and place matchmarks on the timing belt and crankshaft timing pulley.



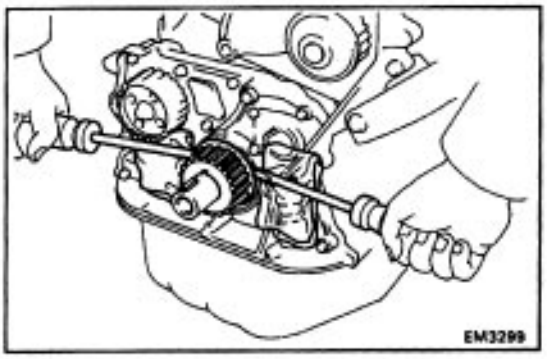
20. REMOVE NO.1 IDLER PULLEY AND TENSION SPRING

Remove the bolt, pulley and tension spring.



21. REMOVE NO.2 IDLER PULLEY

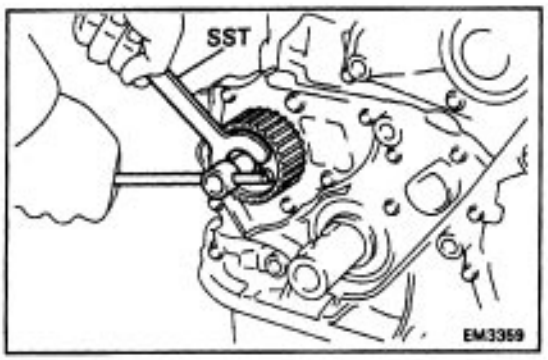
Remove the bolt and pulley.



22. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use 2 screw–drivers.

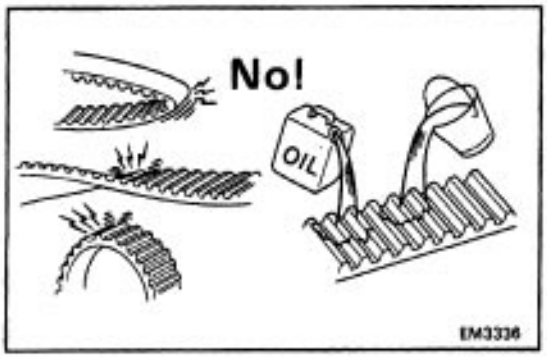
HINT: Position shop rags as shown to prevent damage.



23. REMOVE OIL PUMP PULLEY

Using SST, remove the nut and pulley.

SST 09616–30011

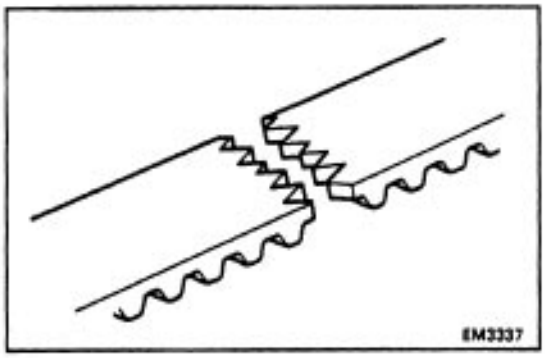


TIMING BELT COMPONENTS INSPECTION

1. INSPECT TIMING BELT

NOTICE:

- **Do not bend, twist or turn the timing belt Inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**



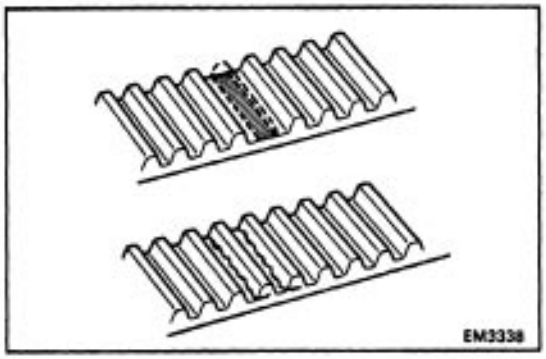
- **Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.**

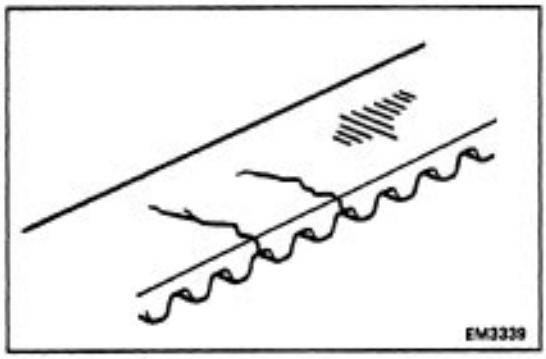
If there are any defects as shown in the illustration, check the following points:

(a) Premature parting

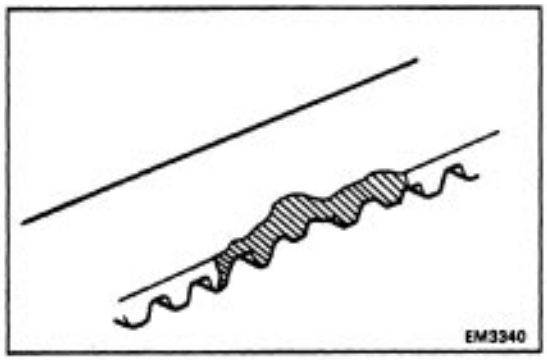
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

(b) If the belt teeth are cracked or damaged, check to see if either camshaft or water pump is locked.

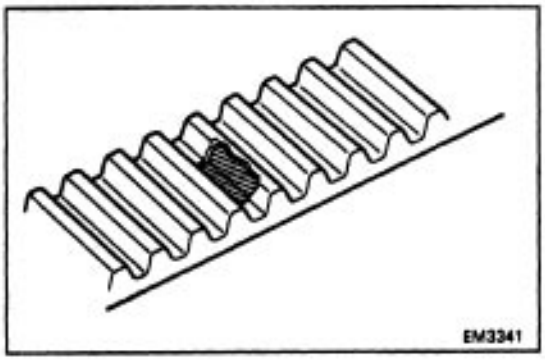




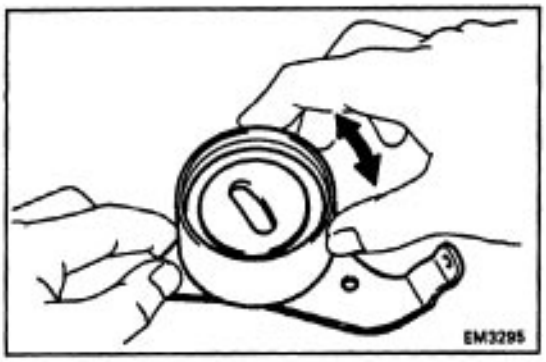
(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock.



(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.



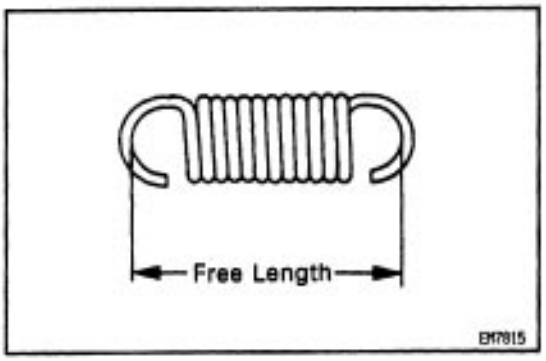
(e) If there is noticeable wear on the belt teeth, check the timing cover for damage, correct gasket installation, and for foreign material on the pulley teeth.
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

Check that the idler pulley turns smoothly.

If necessary, replace the idler pulley.



3. INSPECT TENSION SPRING

(a) Measure the free length of tension spring.

Free length:

46.0 mm (1.811 in.)

If the free length is not as specified, replace the tension spring.

(b) Measure the tension of the tension spring at the specified installed length.

Installed tension (at 50.5 mm (1.988 in.)):

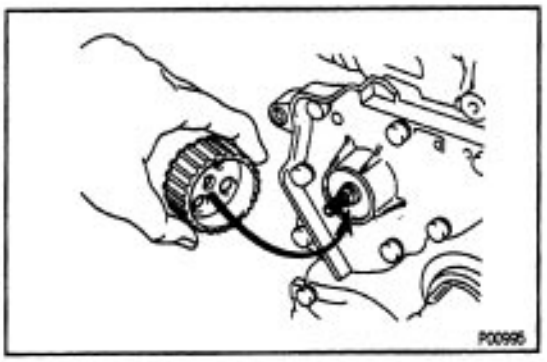
Green color

32 – 37 N (3.25 – 3.75 k9f, 7.2 – 8.3 lbf)

Silver color

47 – 52 N (4.75 – 5.25 kgf, 10.5 – 11.8 lbf)

If the installed tension is not as specified, replace the tension spring.

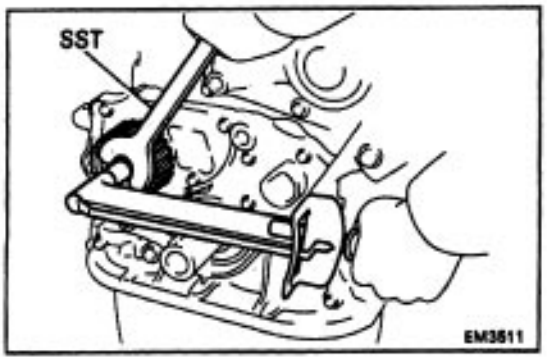


TIMING BELT INSTALLATION

(See Components for Removal and Installation)

1. INSTALL OIL PUMP PULLEY

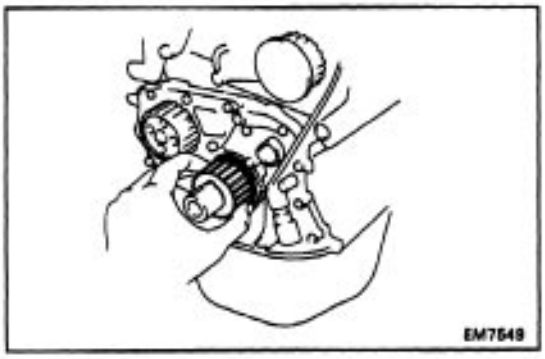
(a) Align the cutouts of the pulley and shaft, and slide on the pulley.



(b) Using SST, install the nut.

SST 09616 – 30011

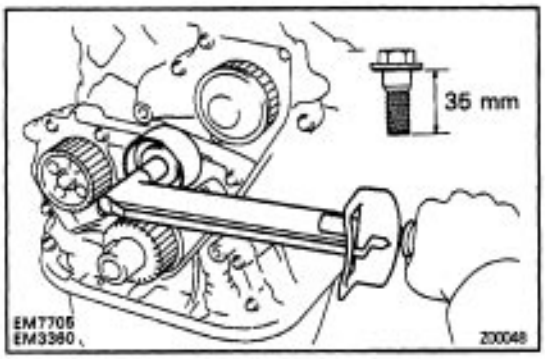
Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)



2. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the timing pulley set key with the key groove of the pulley.

(b) Slide on the timing pulley, facing the flange side inward.



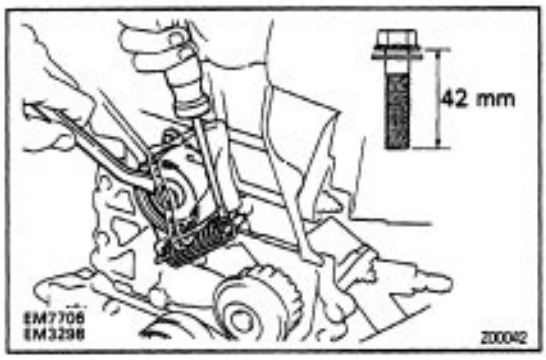
3. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt.

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

HINT: Use a bolt 35 mm (1.38 in.) in length.

(b) Check that the idler pulley moves smoothly.



4. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

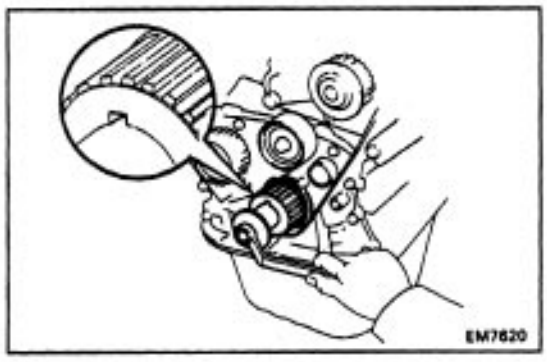
(a) Install the pulley with the bolt. Do not tighten the bolt yet.

HINT: Use a bolt 42 mm (1.65 in.) in length.

(b) Install the tension spring.

(c) Pry the pulley toward the left as far as it will go and tighten the bolt.

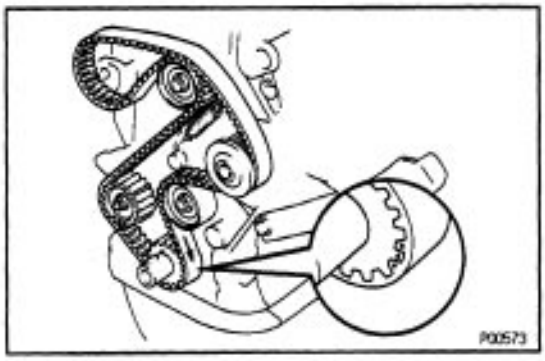
(d) Check that the idler pulley moves smoothly.



5. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

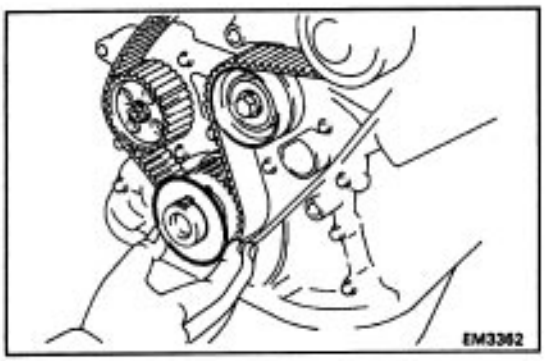
(a) Using the crankshaft pulley bolt, turn the crankshaft and position the key groove of the crankshaft timing pulley upward.



(b) Remove any oil or water on the crankshaft pulley, oil pump pulley, water pump pulley, No. 1 idler pulley, No. 2 idler pulley and keep them clean.

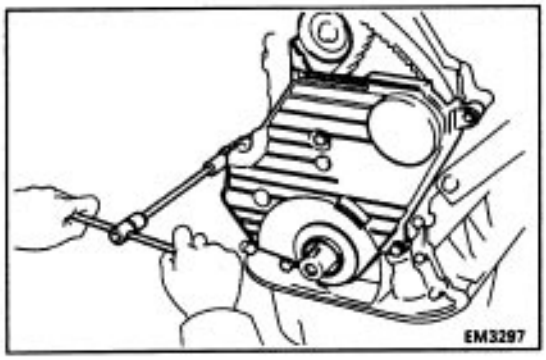
(c) Install the timing belt on the crankshaft timing pulley, oil pump pulley, No.1 idler pulley, water pump pulley and No.2 idler pulley.

HINT (When re–using timing belt): Align the points marked during removal, and install the belt with the arrow pointing in the direction of engine revolution.



6. INSTALL TIMING BELT GUIDE

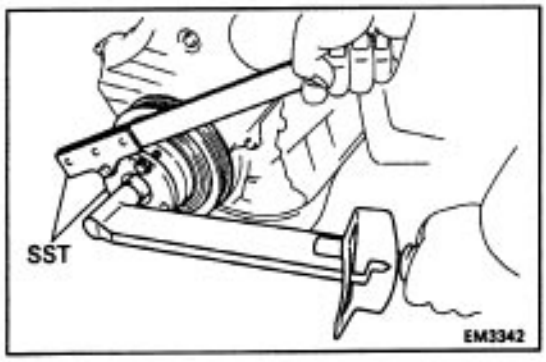
Install the guide, facing the cup side outward.



7. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the timing belt cover.

(b) Install the timing belt cover with the 4 bolts.



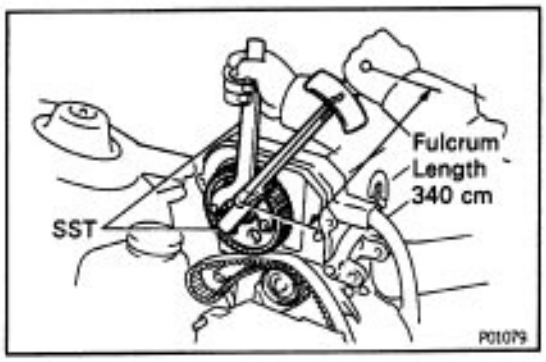
8. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install the pulley bolt.

SST 09213–54015 (91651 –60855)
09330–00021

Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)



9. INSTALL CAMSHAFT TIMING PULLEY

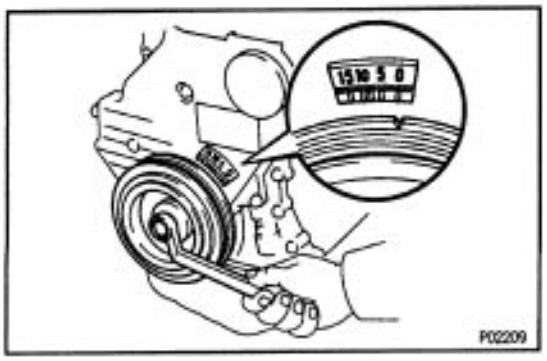
(a) Align the camshaft knock pin with the knock pin groove of the pulley, and slide on the timing pulley.

(b) Using SST, install the plate washer and bolt.

SST 09249 – 63010 and 09278 – 54012

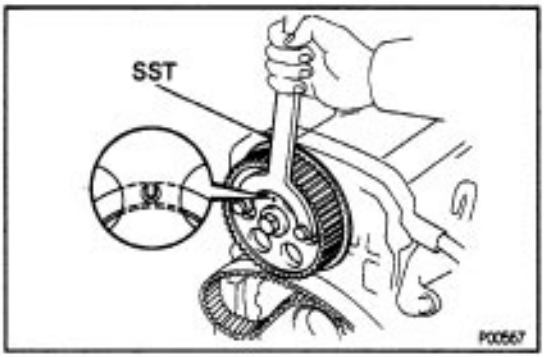
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

HINT: Use a torque wrench with a fulcrum length of 340 cm (13.39 in.)

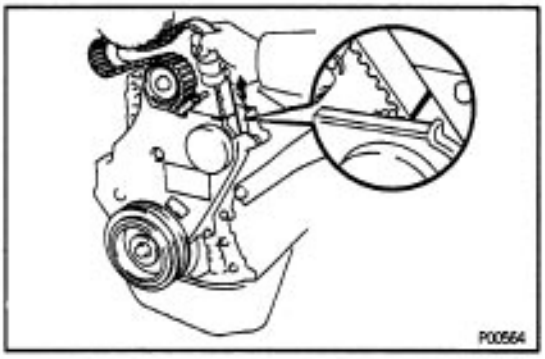


10. SET No.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with timing mark “0” of the No.1 timing belt cover.



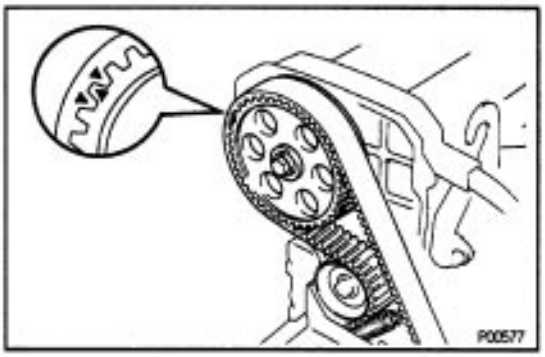
(b) Using SST, turn the camshaft, and align the hole of the camshaft timing pulley with the timing mark of the bearing cap.
SST 09278–54012



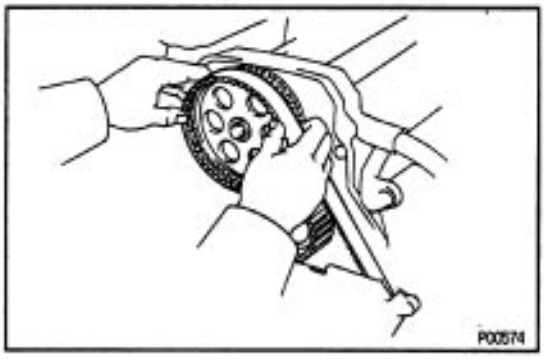
11. INSTALL TIMING BELT

HINT. (When re–using timing belt):

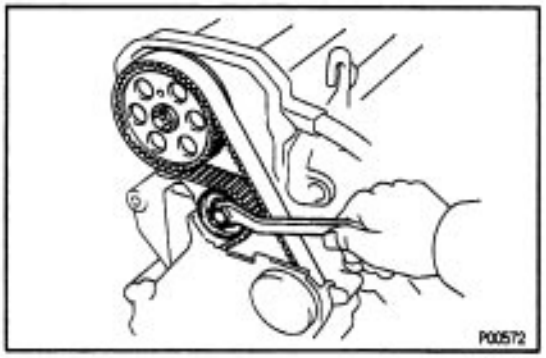
- Check that the matchmark on the timing belt matches the end of the No.1 timing belt cover.
  If the matchmark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align. (See page EG1–29)



- Align the matchmarks of the timing belt and camshaft timing pulley.

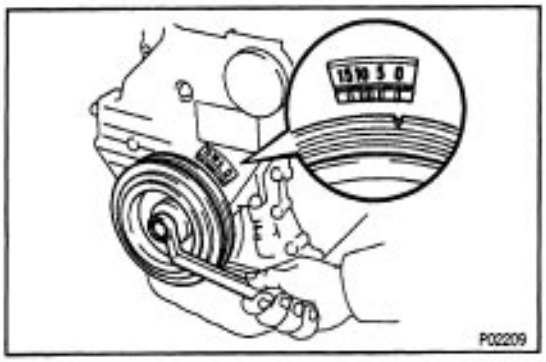


(a) Remove any oil or water on the camshaft timing pulley, and keep it clean.
(b) Install the timing belt, and check the tension between the crankshaft timing pulley and camshaft timing pulley.



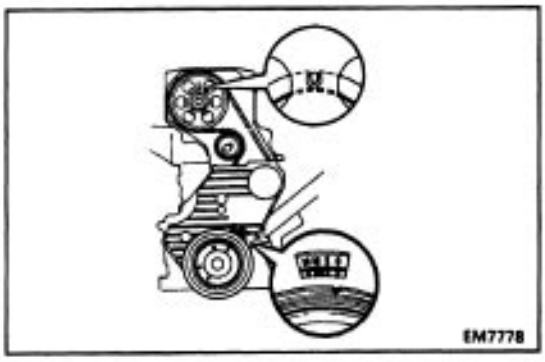
12. CHECK VALVE TIMING

(a) Loosen the No.1 idler pulley bolt 1/2 turn.



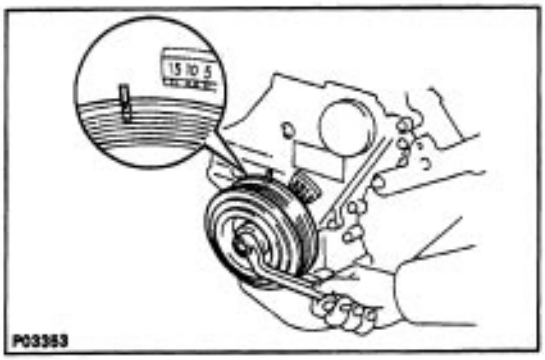
(b) Turn the crankshaft pulley 2 revolutions from TDC to TDC.

NOTICE: Always turn the crankshaft clockwise.



(c) Check that each pulley aligns with the timing marks as shown in the illustration..

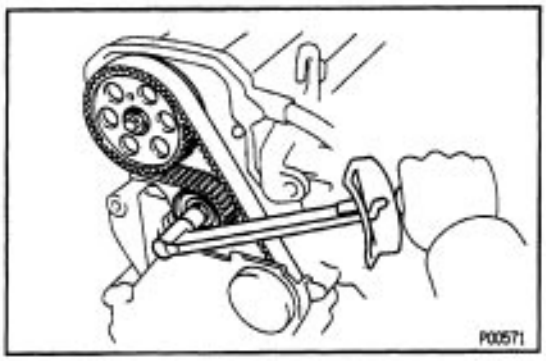
If the timing marks do not align, remove the timing belt and reinstall it.



(d) w/ Green Tension Spring:

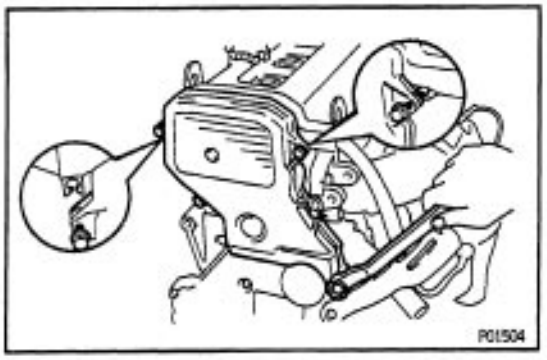
Slowly turn the crankshaft pulley 1 and 7/8 revolu–tions, and align its groove with the mark at 45®BTDC (for No.1 cylinder) of the No.1 timing belt cover.

NOTICE: Always turn the crankshaft clockwise.



(e) Torque the mounting bolt of the No.1 idler pulley.

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

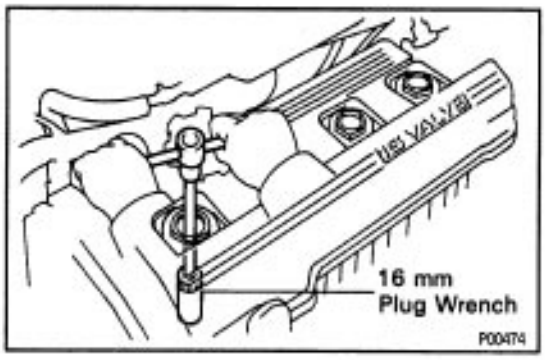


13. INSTALL NO.2 TIMING BELT COVER

(a) Install the 2 gaskets to the No. 1 and No.2 belt covers.

(b) install the belt cover with the 5 bolts.

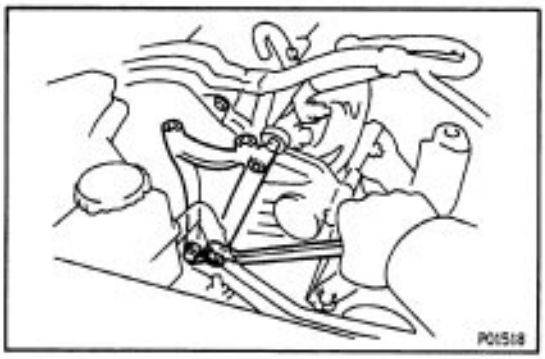
(c) Align the 2 clamps of the engine wire with cover mounting bolts.



14. INSTALL SPARK PLUGS

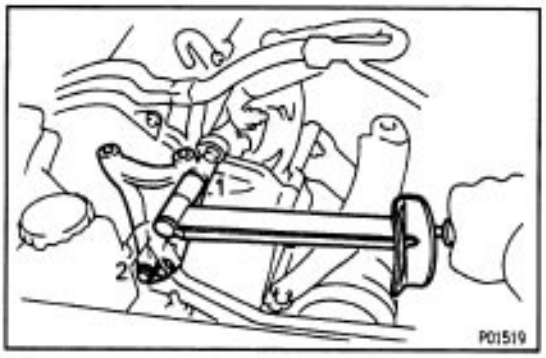
(a) Using a 16 mm plug wrench, install the spark plug.

(b) Connect the high–tension cords.



15. INSTALL NO.2 ENGINE MOUNTING BRACKET

(a) Temporarily install the No.2 engine mounting bracket with the 2 bolts.

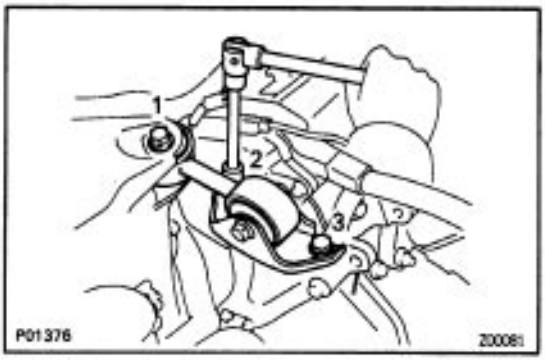


(b) Install the remaining bolt.

(c) Tighten the 3 bolts in the sequence shown.

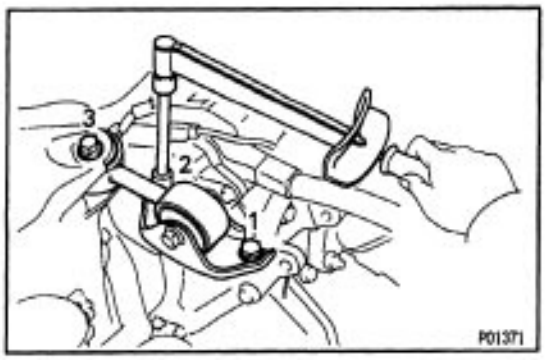
Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)

16. CONNECT CONNECTOR TO GROUND WIRE ON RH FENDER APRON

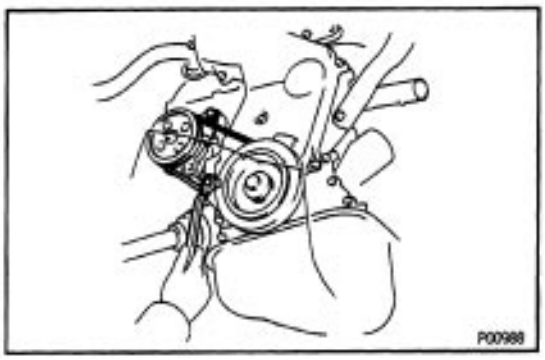


17. INSTALL ENGINE MOVING CONTROL ROD

(a) Temporarily install the engine moving control rod with the 3 bolts in the sequence shown.



(b) Tighten the 3 bolts in the sequence shown.
Torque: 64 N–m (650 kgf–cm. 47 ft–lbf)

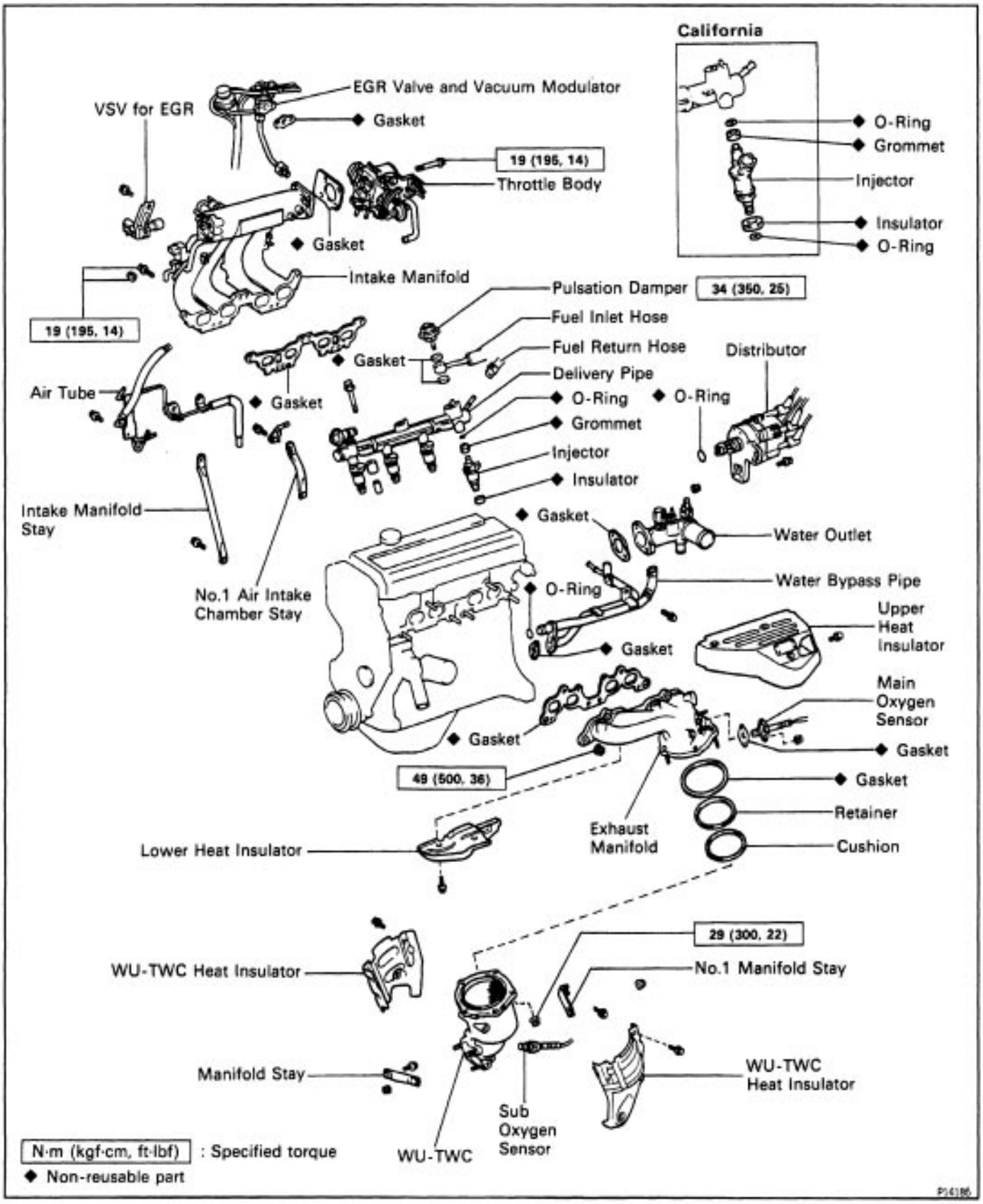


18. INSTALL AND ADJUST PS DRIVE BELT
Install the drive belt with the pivot and adjusting bolts.
Drive belt tension:
New belt
125 ± 25 lbf
Used belt
80 ± 20 I bf

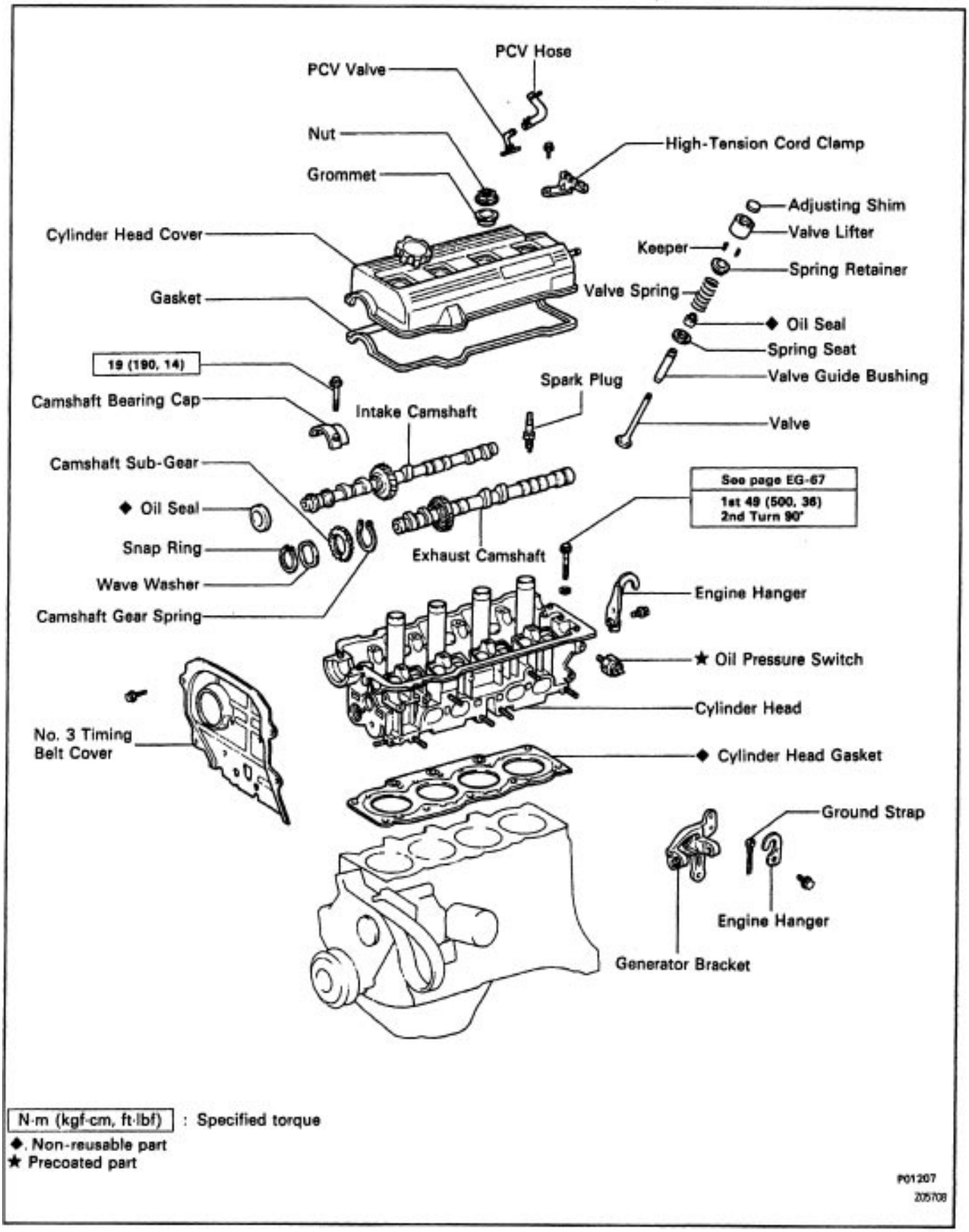
19. INSTALL RH FENDER APRON SEAL
20. INSTALL RH FRONT WHEEL
21. INSTALL GENERATOR (See page CH–24)
Drive belt tension:
w/ A/C
New belt
175 ± 5 lbf
Used belt
130 ± 10 lbf
w/o A/C
New belt
125 ± 25 lbf
Used belt
95 ± 20 lbf
22. INSTALL ENGINE COOLANT RESERVOIR TANK
23. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

CYLINDER HEAD

COMPONENTS FOR REMOVAL AND INSTALLATION

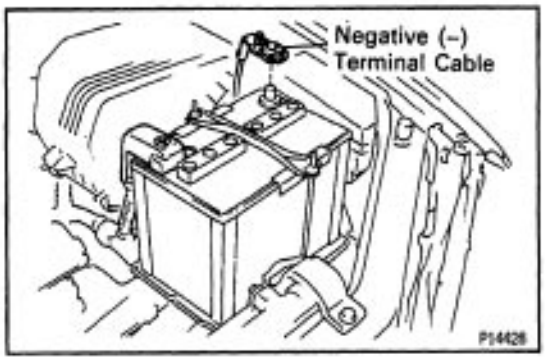


COMPONENTS (Cont'd)



N·m (kgf·cm, ft·lbf) : Specified torque
◆: Non-reusable part
★ Precoated part

P01207
205708



CYLINDER HEAD REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

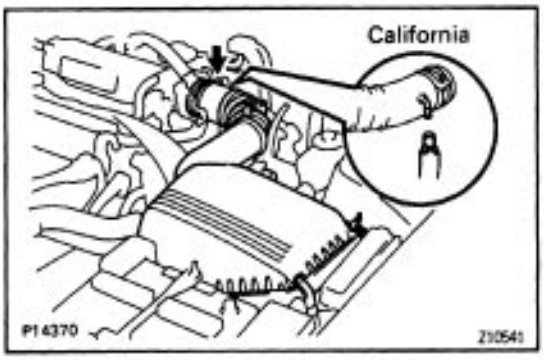
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. A/T:

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY



5. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

(a) Disconnect the intake air temperature sensor connector.

(b) California only:
Disconnect the air hose from the air cleaner hose.

(c) Loosen the air cleaner hose clamp bolt.

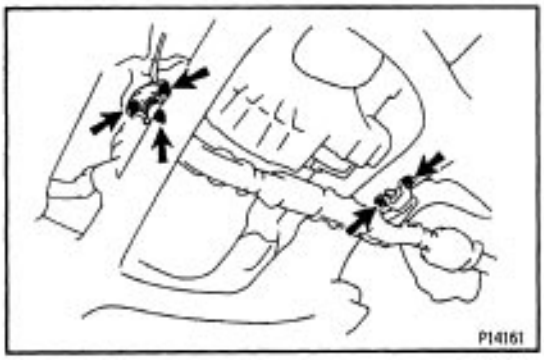
(d) Disconnect the 4 air cleaner cap clips.

(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

6. REMOVE GENERATOR (See page CH–10)

7. REMOVE DISTRIBUTOR

(See page IG–13 end 32)

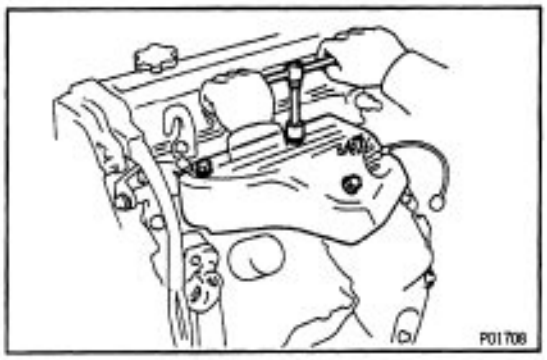


8. DISCONNECT FRONT EXHAUST PIPE

(a) Loosen the 2 bolts, and disconnect the bracket.

(b) Using a 14 mm deep socket wrench, remove the 3 nuts holding the front exhaust pipe to the WU–TWC.

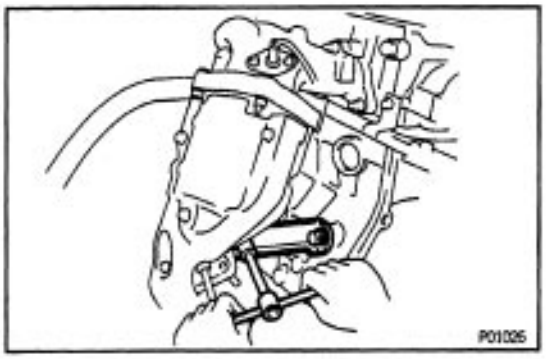
(c) Disconnect the front exhaust pipe and gaskets.



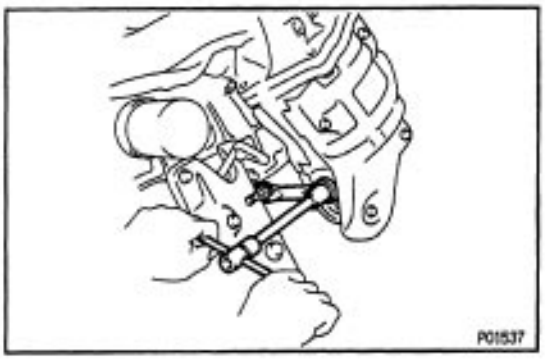
9. REMOVE EXHAUST MANIFOLD AND WARM UP THREE–WAY CATALYTIC CONVERTER ASSEMBLY

(a) Disconnect the main oxygen and sub oxygen sensor connectors.

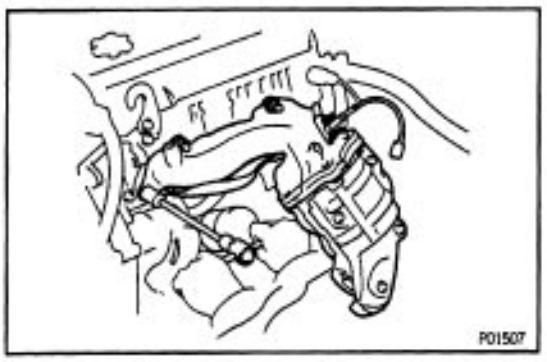
(b) Remove the 4 bolts and upper heat insulator.



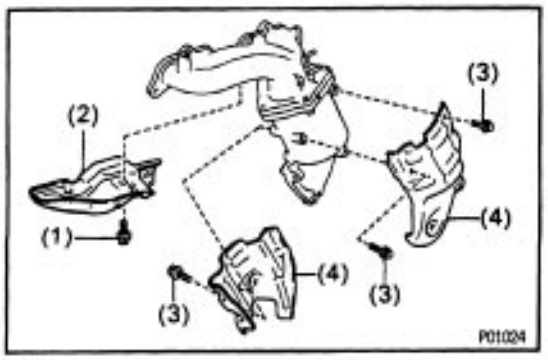
(c) Remove the bolt, nut and No. 1 manifold stay.



(d) Remove the bolt, nut and manifold stay.



(e) Remove the 6 nuts, the exhaust manifold and WU – TWC assembly.



10. SEPARATE EXHAUST MANIFOLD AND WARM UP THREE–WAY CATALYTIC CONVERTER

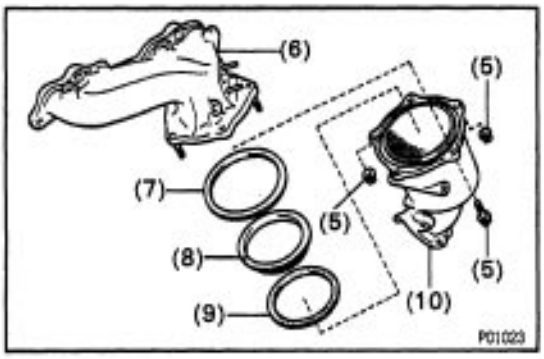
Remove the following parts:

(1) 3 bolts

(2) Manifold lower heat insulator

(3) 8 bolts

(4) 2 WU–TWC heat insulators



(5) 3 bolts and 2 nuts
(6) Exhaust manifold
(7) Gasket
(8) Retainer
(9) Cushion
(10) WU–TWC

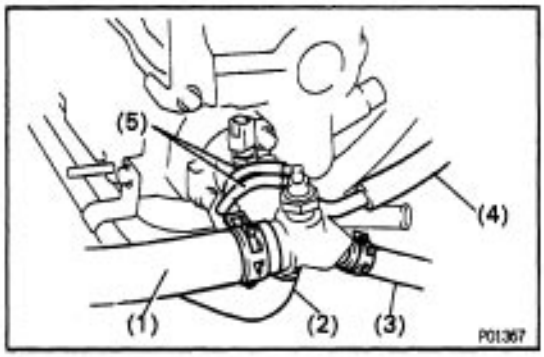
11. DISCONNECT OIL PRESSURE SWITCH CONNECTOR

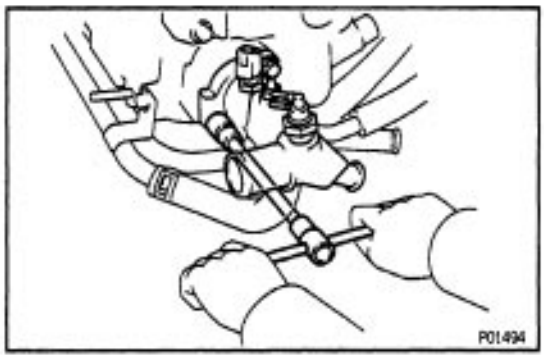
12. DISCONNECT ENGINE WIRE (FOR OXYGEN SENSORS) FROM ENGINE HANGER

13. REMOVE WATER OUTLET

(a) Disconnect the following connectors:
(1) Engine coolant temperature sender gauge con–nector
(2) Engine coolant temperature sensor connector

(b) Disconnect the following hoses:
(1) Upper radiator hose
(2) Water bypass pipe hose
(3) Heater water hose
(4) IAC water bypass hose
(5) 2 TVV (for EVAP) vacuum hoses

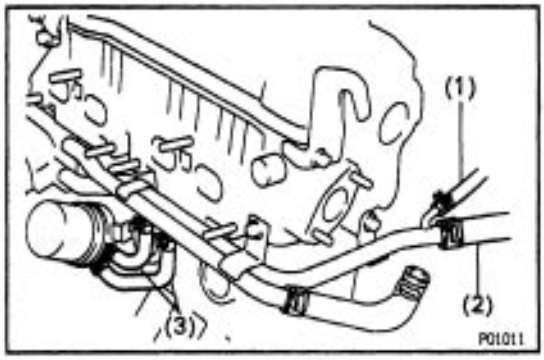


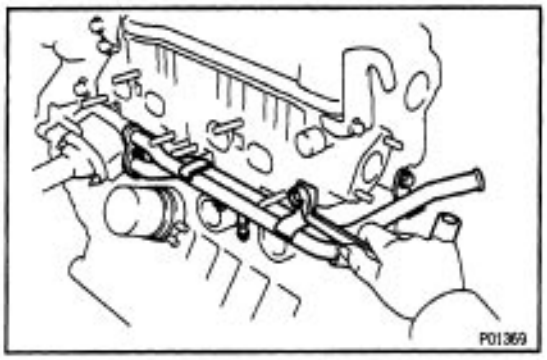


(c) Remove the 2 bolts, water outlet and gasket.

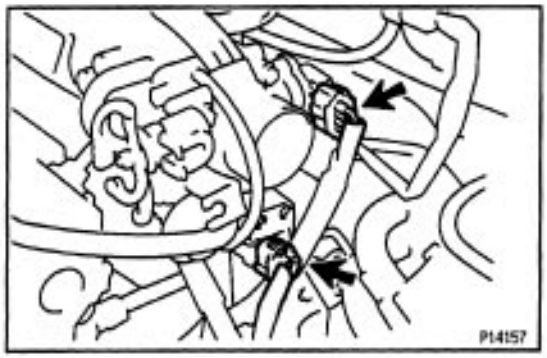
14. REMOVE WATER BYPASS PIPE

(a) Disconnect the following hoses:
(1) IAC water bypass hose
(2) Heater water hose
(3) w/ Oil Cooler:
2 oil cooler water bypass hoses



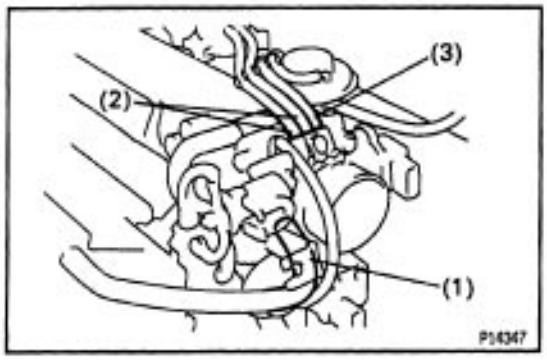


(b) Remove the 2 bolts, 2 nuts, water bypass pipe and gasket.
(c) Remove the O–ring from the water bypass hose.

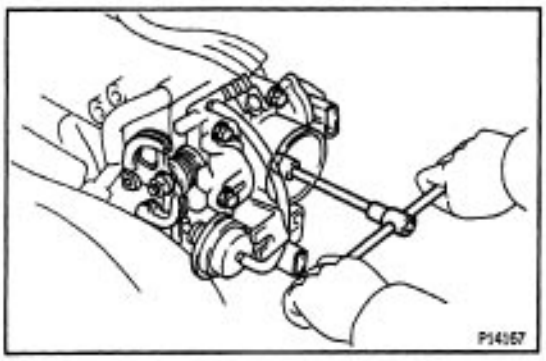


15. REMOVE THROTTLE BODY

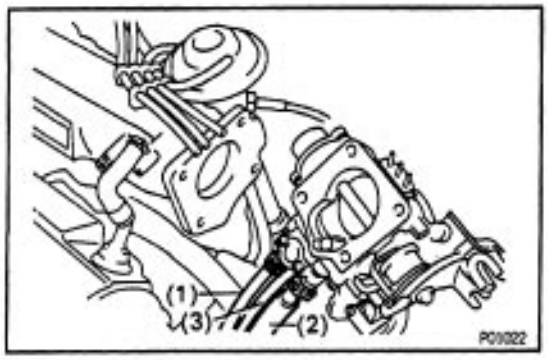
(a) Disconnect the throttle position sensor connector.
(b) Disconnect the IAC valve connector.



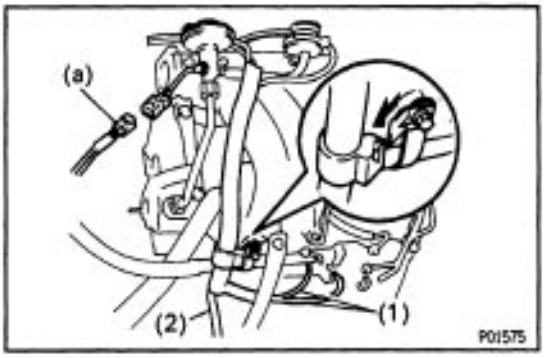
(c) Disconnect the following hoses from the throttle body.
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)



(d) Type A:
Remove the 4 bolts.
(e) Type B:
Remove the 2 bolts and 2 nuts.

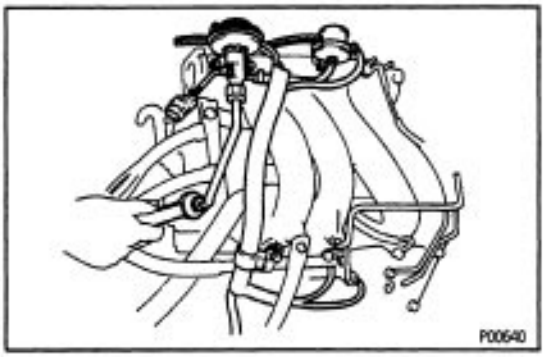


(f) Disconnect the following hoses from the throttle body, and remove the throttle body.
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose from air tube

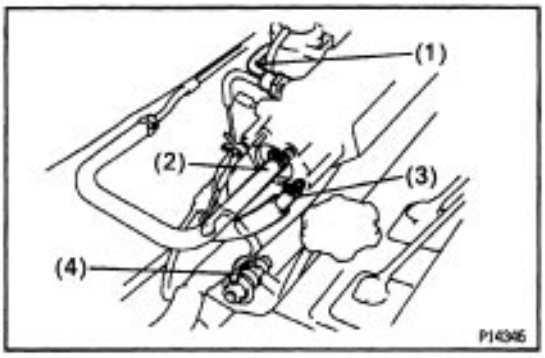


I6. REMOVE EGR VALVE AND VACUUM MODULATOR

(a) Disconnect the EGR gas temperature sensor connector.
(b) Disconnect the following hoses:
(1) 2 vacuum hoses from VSV (for EGR)
(2) Vacuum hose from charcoal canister
(c) Disconnect the vacuum hose clamp.



(d) Loosen the union nut of the EGR pipe, and remove the 2 nuts, EGR valve, vacuum modulator, vacuum hoses assembly and gasket.



17. DISCONNECT VACUUM HOSES

Disconnect the following hoses:
(1) MAP sensor hose from air intake chamber
(2) Brake booster vacuum hose from air intake chamber
(3) PS vacuum hose from air intake chamber
(4) Vacuum sensing hose from fuel pressure regulator 1

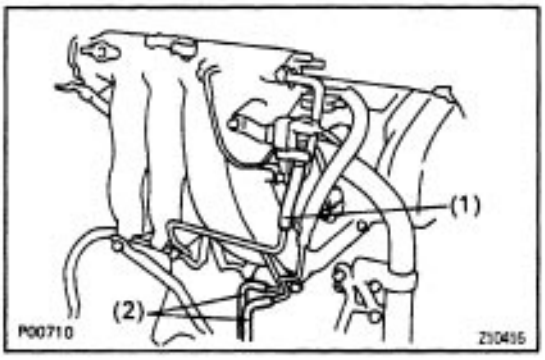
S. W/ A/C:

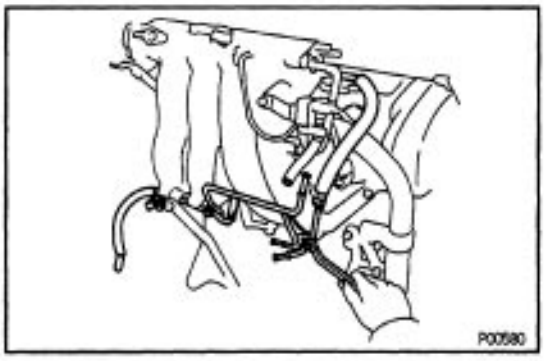
DISCONNECT A/C IDLE–UP VALVE CONNECTOR

19. EXCEPT CALIFORNIA:

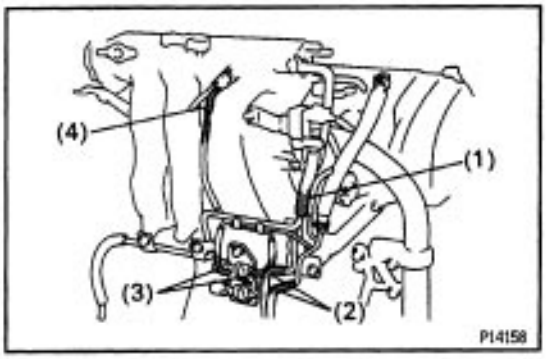
REMOVE AIR TUBE

(a) Disconnect the following hoses from the air tube:
(1) w/ A/C:
Air hose from ASV
(2) 2 air hoses from PS pump



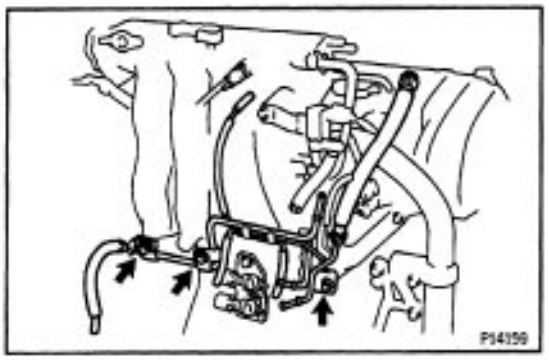


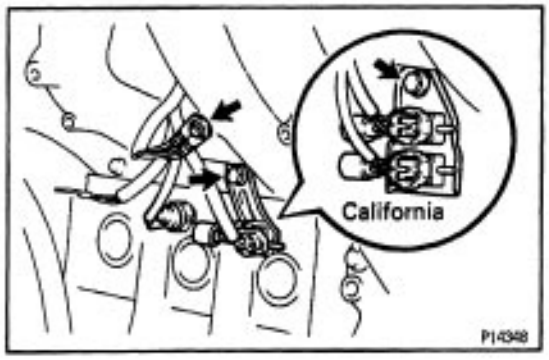
(b) Remove the 3 bolts, wire clamp and air tube.



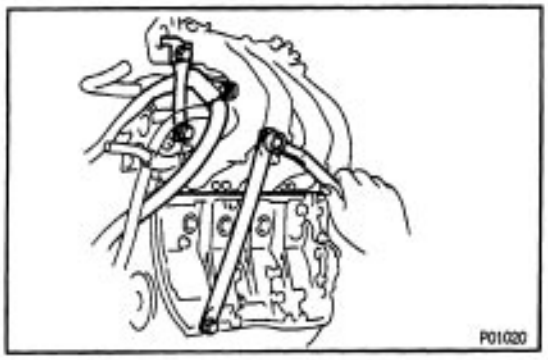
20. CALIFORNIA:
REMOVE AIR TUBE

(a) Disconnect the following hoses:
(1) w/ A/C:
A/C hose (from ASV) from air tube
(2) 2 air hoses (from PS pump) from air tube
(3) California only:
2 vacuum hoses from VSV (for fuel pressure control)
(4) Vacuum hose from air intake chamber
(b) Remove the 3 bolts, wire clamp and air tube.



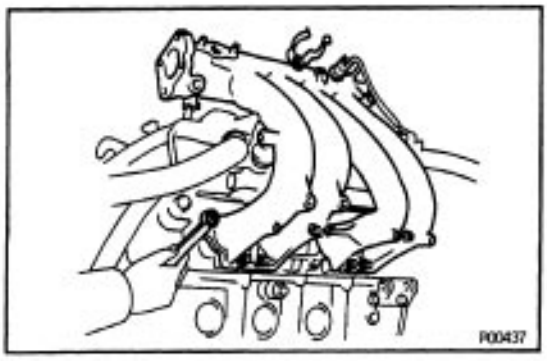


21. DISCONNECT 2 ENGINE WIRE GROUND STRAPS FROM INTAKE MANIFOLD
22. DISCONNECT KNOCK SENSOR AND VSV (FOR EGR) CONNECTORS
23. CALIFORNIA ONLY:
DISCONNECT VSV (FOR FUEL PRESSURE CON–TROL) CONNECTOR
24. REMOVE VSV OR VSV ASSEMBLY

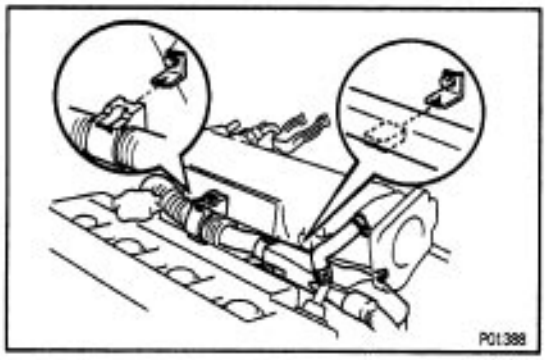


25. REMOVE INTAKE MANIFOLD

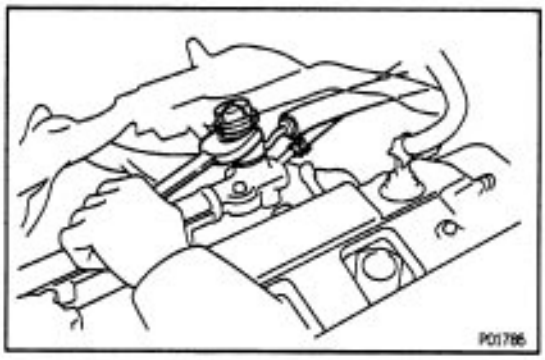
(a) Remove the 4 bolts, wire bracket, No.1 air intake chamber and manifold stays.
(b) Remove the bolt, vacuum hose bracket, and discon–nect the engine wire.



(c) Remove the6 bolts, 2 nuts, intake manifold and gasket.



(d) Disconnect the 2 wire clamps from the wire brackets on the intake manifold.

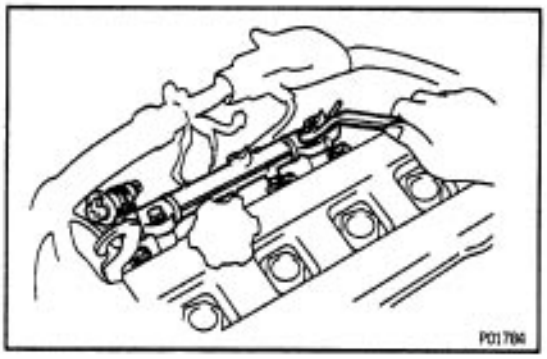


26. REMOVE DELIVERY PIPE AND INJECTORS

(a) Disconnect the injector connectors.

(b) Loosen the pulsation damper, and disconnect the fuel inlet hose.

(c) Disconnect fuel return hose.

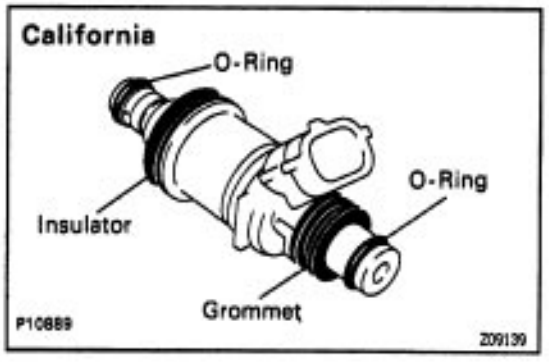


(d) Remove the 2 bolts and delivery pipe together with the 4 injectors.

NOTICE: Be careful not to drop the injectors when removing the delivery pips.

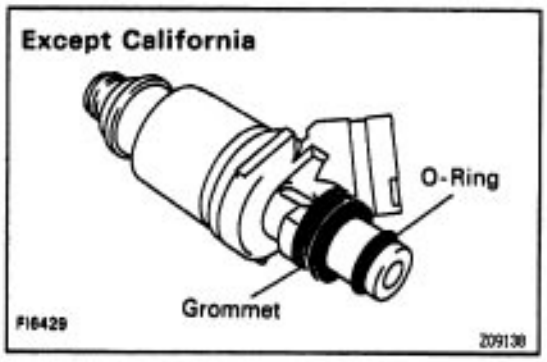
(e) Remove the 4 insulators (except California) and 2 spacers from the cylinder head.

(f) Pull out the 4 injectors from the delivery pipe.



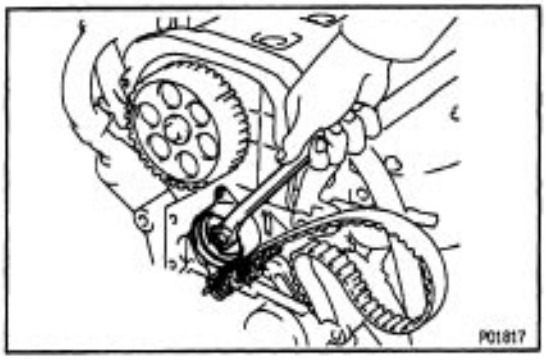
(g) California:

Remove the 2 O–rings, insulator and grommet from each injector.



(h) Except California:

Remove the 0–ring and grommet from each injector.

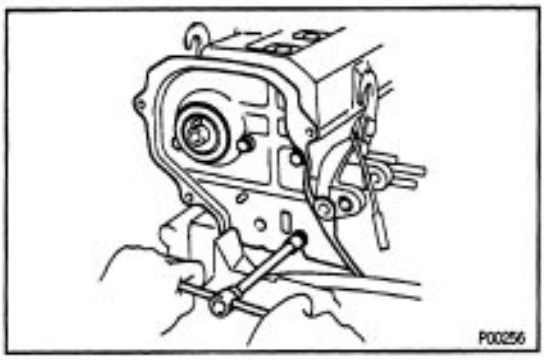


27. REMOVE CAMSHAFT TIMING PULLEY

(See steps 2 to 15 on pages EG1–26 to 28)

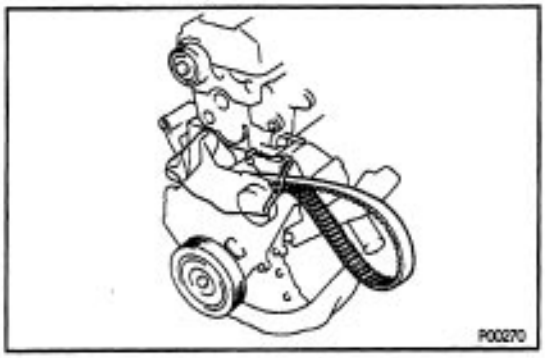
28. REMOVE NO. 1 IDLER PULLEY AND TENSION SPRING

Remove the bolt, pulley and tension spring.



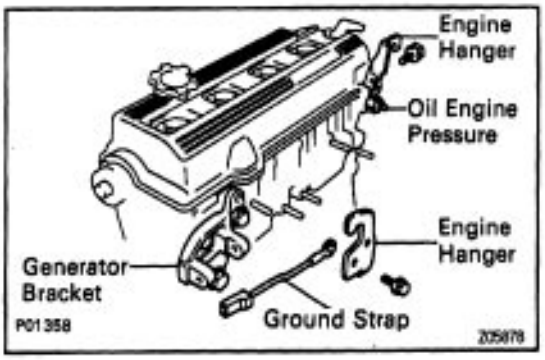
29. REMOVE NO.3 TIMING BELT COVER

Remove the 4 bolts and timing and cover.



NOTICE:

- **Support the timing belt, :o the meshing of crank–shaft timing pulley and timing belt does not shift.**
- **Be careful not to drop anything inside the timing belt cover.**
- **Do not allow the belt to come into correct with oil, water or dust.**



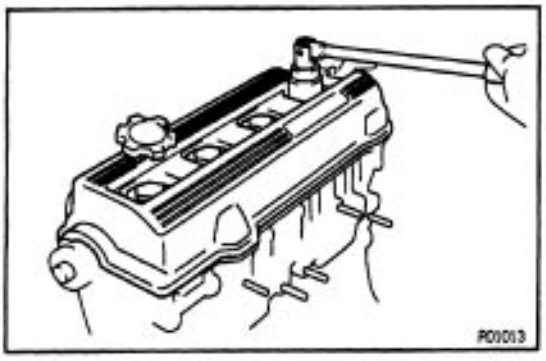
30. REMOVE ENGINE HANGERS

Remove the bolt and engine hanger. Remove the 2 engine hangers. Remove the ground strap.

31. REMOVE GENERATOR BRACKET

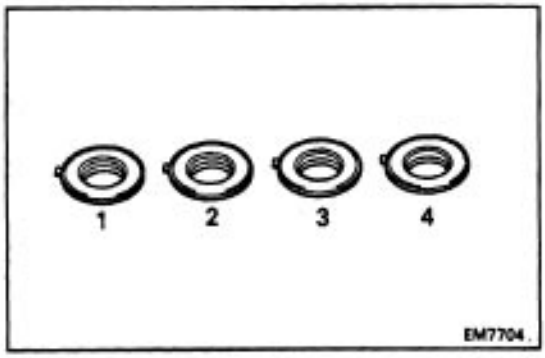
Remove the 3 bolts and generator bracket.

32. REMOVE OIL PRESSURE SWITCH

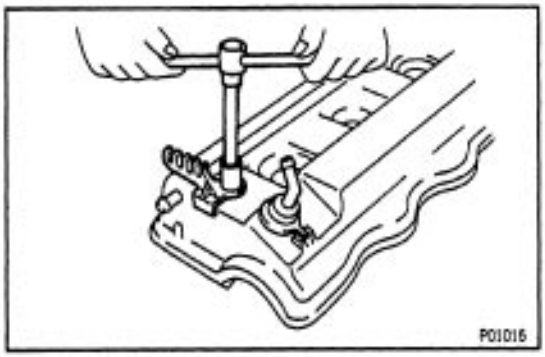


33. REMOVE CYLINDER HEAD COVER

Remove the 4 nuts, grommets, head cover and gasket.



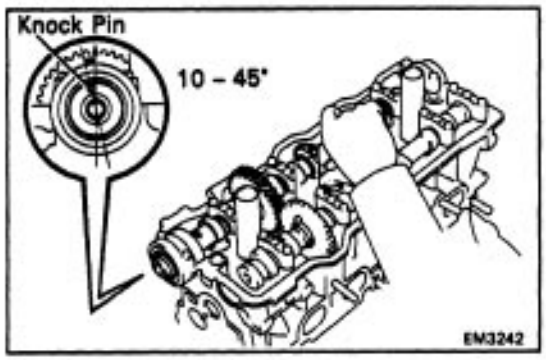
HINT: Arrange the grommets in correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of grommets.



34. REMOVE HIGH – TENSION CORDS CLAMP AND PCV VALVE

35. REMOVE CAMSHAFTS

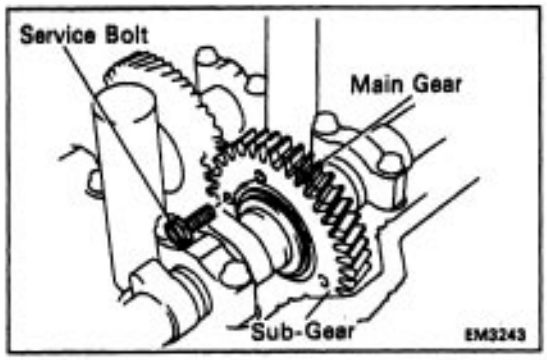
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



A. Remove exhaust camshaft

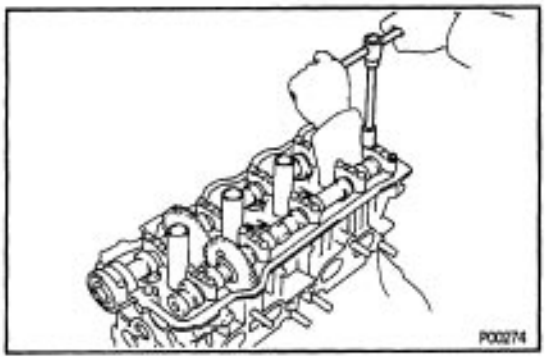
(a) Set the knock pin of the intake camshaft at 10–45° BTDC of camshaft position.

HINT: The above angle allows No.2 and No.4 cylinder cam lobes of the exhaust camshaft to push their valve lifters evenly.

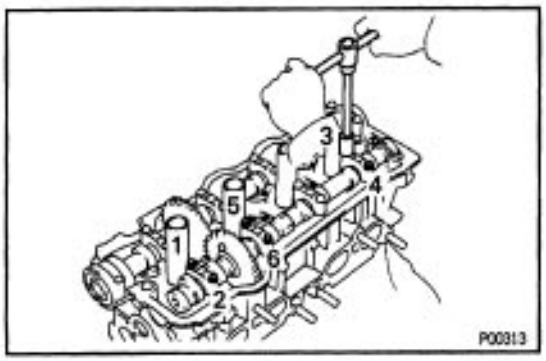


(b) Secure the exhaust camshaft sub gear to drive gear with a service bolt.
Recommended service bolt:
Thread diameter6 mm
Thread pitch 1.0 mm
Bolt length 16–20 m m (0.63–0.79 in.)

HINT: When removing the camshaft, make sure that the torsional spring force of the sub gear has been eliminated by the above operation.



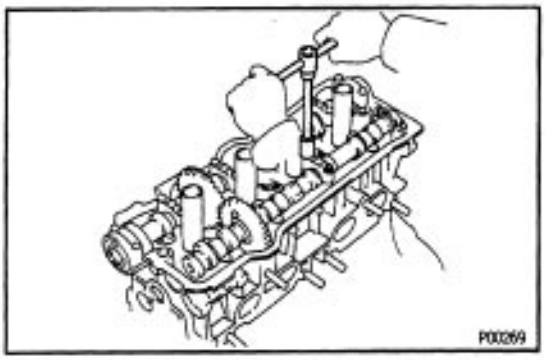
(c) Remove the 2 bolts and rear bearing cap.



(d) Uniformly loosen and remove the6 bolts on the No. 1, No.2 and No.4 bearing caps in several passes in the sequence shown.

NOTICE: Do not remove the No.3 bearing cap bolts at this stage.

(e) Remove the No. 1, No.2 and No.4 bearing caps.



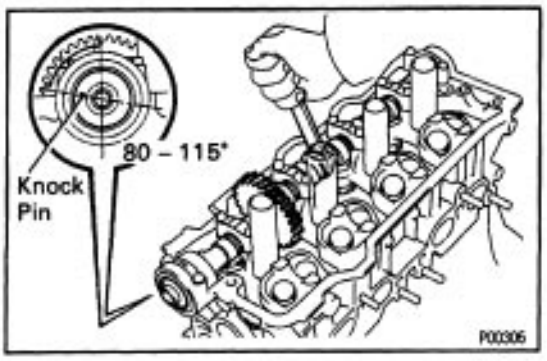
(f) Alternately loosen and remove the 2 bolts on the No. 3 bearing cap.

HINT:

- As the 2 No.3 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level.
- If the camshaft is not being lifted out straight and level, retighten the 2 No.3 bearing cap bolts. Then reverse the order of above steps from (f) to (a) and reset the knock pin of the intake camshaft at 10–45® BTDC, and repeat steps from
  (b) to
  (f) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

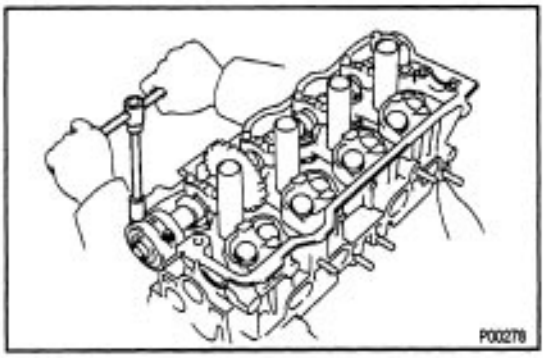
(g) Remove the No.3 bearing cap and exhaust camshaft.



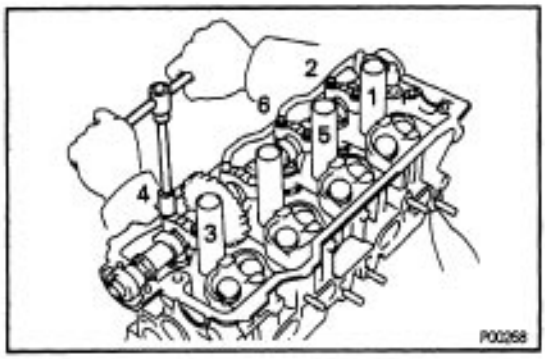
B. Remove intake camshaft

(a) Set the knock pin of the intake camshaft at 80–115® BTDC of camshaft angle.

HINT: The above angle allows the No.1 and No.3 cylinder cam lobes of intake camshaft to push their valve lifters evenly.



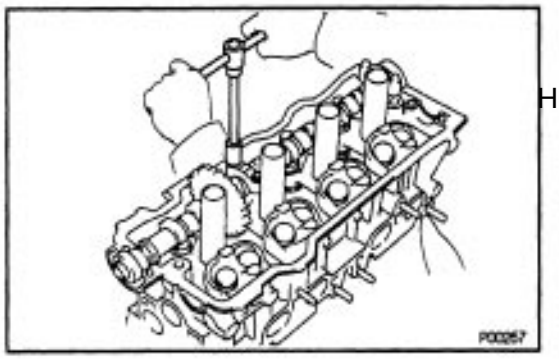
(b) Remove the 2 bolts, front bearing cap and oil seal.



(c) Uniformly loosen and remove the6 bolts on the No.1, No.3 and No.4 bearing caps in several passes in the sequence shown.

NOTICE: Do not remove the No.2 bearing cap bolts at this stage.

(d) Remove the No. 1, No.3 and No.4 bearing caps.



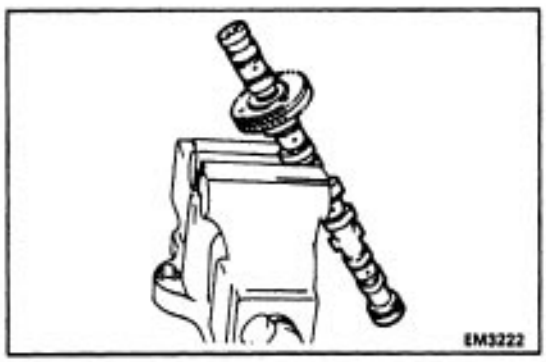
(e) Alternately loosen and remove the 2 bolts on the No. 2 bearing cap.

HINT:

- As the 2 No.2 bearing cap bolts are loosened, make sure that the camshaft is lifted out straight and level, after breaking adhesion on the front bearing cap.
- If the camshaft is not being lifted out straight and level, retighten the 2 No.2 bearing cap bolts. Reverse the order of above steps from (e) to (a) and reset the knock pin of the intake camshaft at 80–115*6TDC, and repeat steps from (b) to (e) once again.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

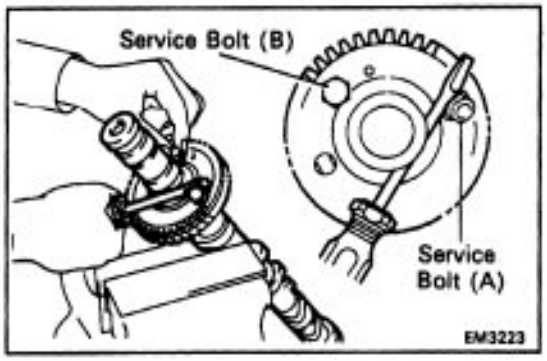
(f) Remove the No.2 bearing cap and camshaft.



36. DISASSEMBLE EXHAUST CAMSHAFT

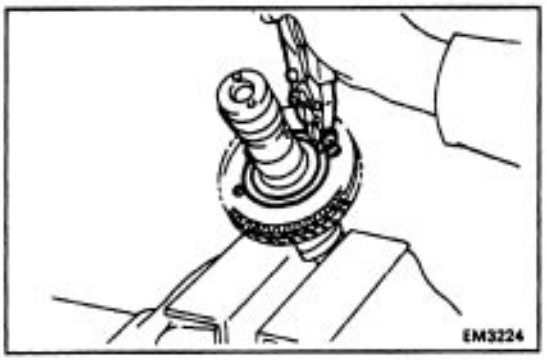
(a) Mount the hexagon wrench head portion of the cam–shaft in a vise.

NOTICE: Be careful not to damage the camshaft.

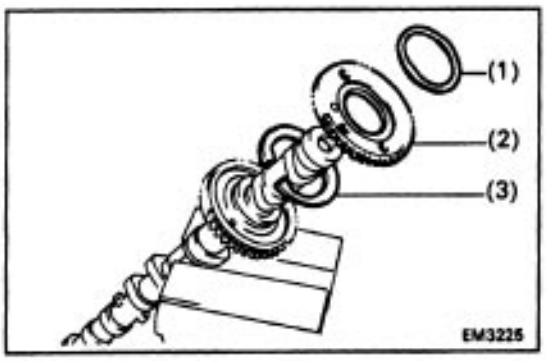


(b) Insert a service bolt (A) into the service hole of the camshaft sub gear.
(c) Using a screwdriver, turn the sub gear clockwise, and remove the service bolt (B).

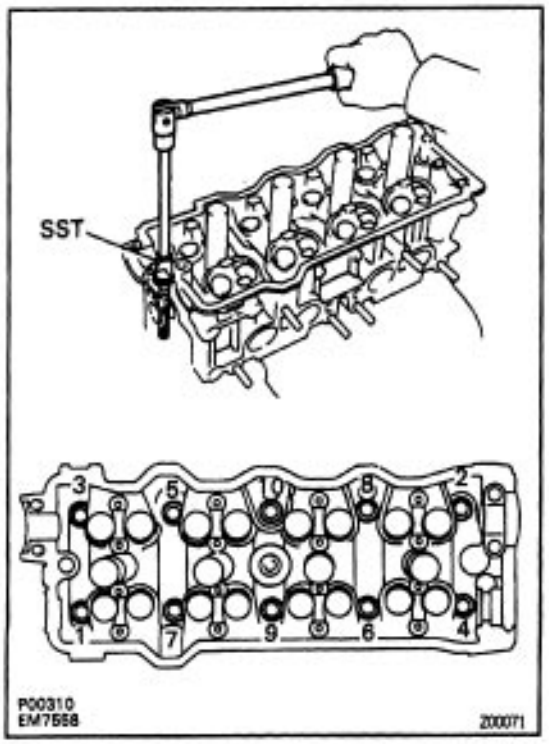
NOTICE: Be careful not to damage the camshaft.



(d) Using snap ring pliers, remove the snap ring.



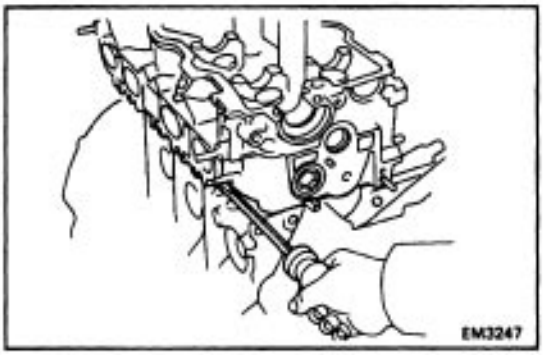
(e) Remove the following parts:
(1) Wave washer
(2) Camshaft sub gear
(3) Camshaft gear spring



37. REMOVE CYLINDER HEAD

(a) Using SST, uniformly loosen and remove the 10 cylin–der head bolts in several passes, in the sequence shown.
SST 09011– 38121

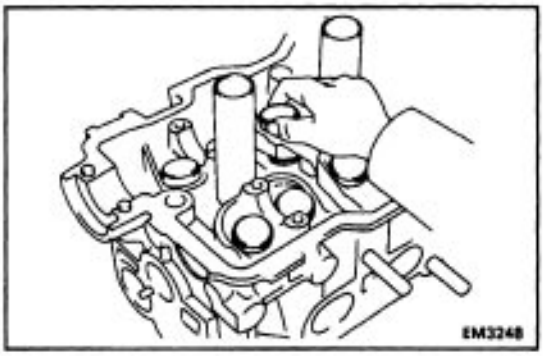
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.



(b) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

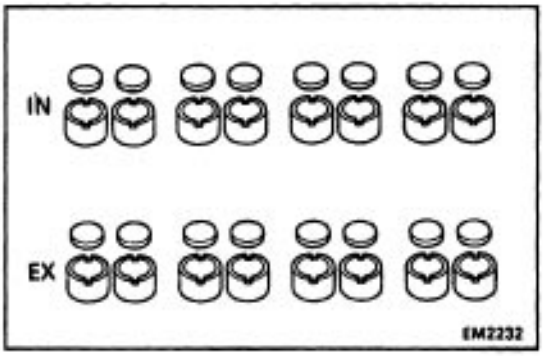
NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



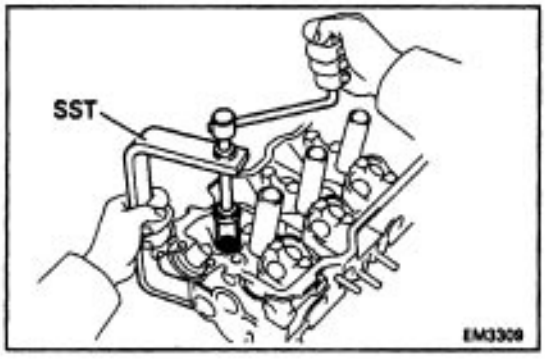
CYLINDER HEAD DISASSEMBLY

(See Components for Removal and Installation)

1. REMOVE VALVE LIFTERS AND SHIMS



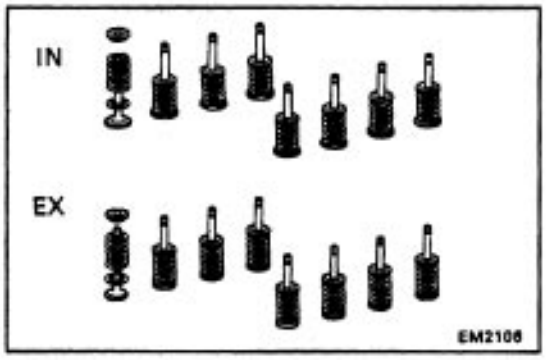
HINT: Arrange the valve lifters and shims in correct order.



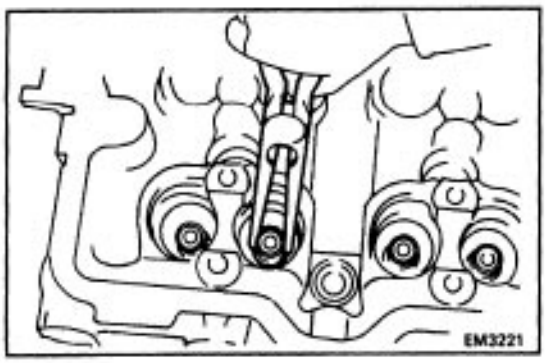
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202 – 70010

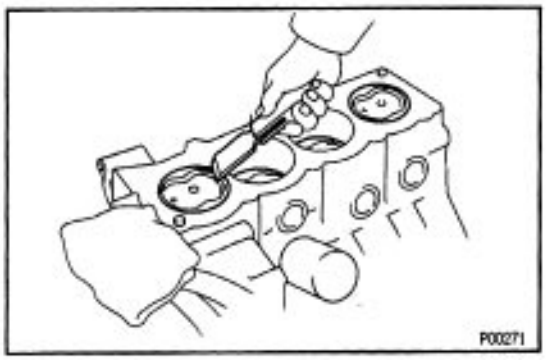
(b) Remove the spring retainer, valve spring, valve and spring seat.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



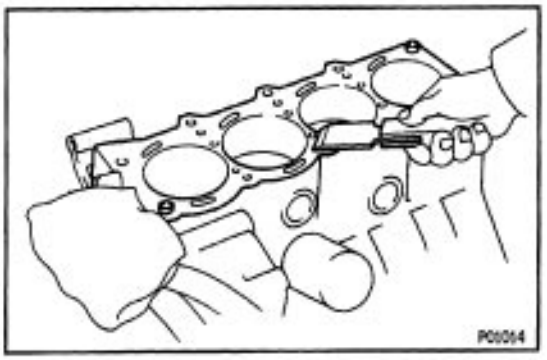
(c) Using needle–nose pliers, remove the oil seal.



CYLINDER HEAD COMPONENTS INSPECTION, CLEANING AND REPAIR

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

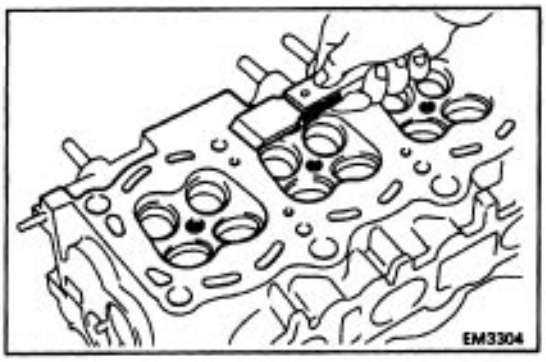
(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high pressure compressed air.



2. CLEAN CYLINDER HEAD

A. Remove gasket material

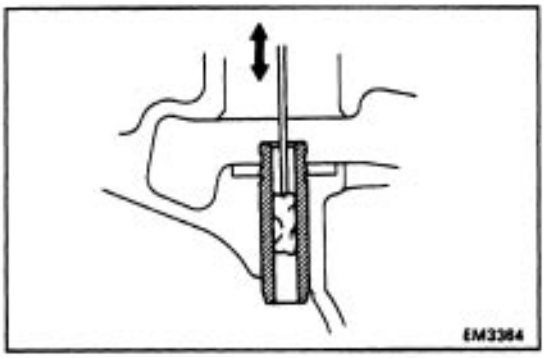
Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE: Be careful not to scratch the cylinder block contact surface.

B. Clean combustion chambers

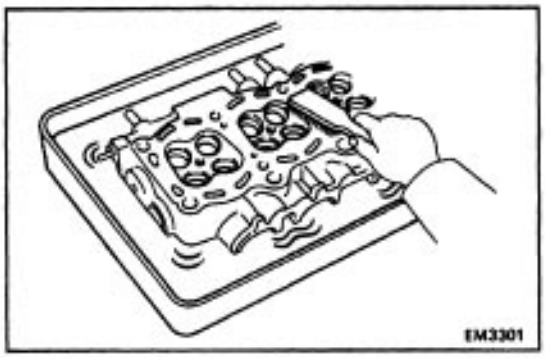
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.



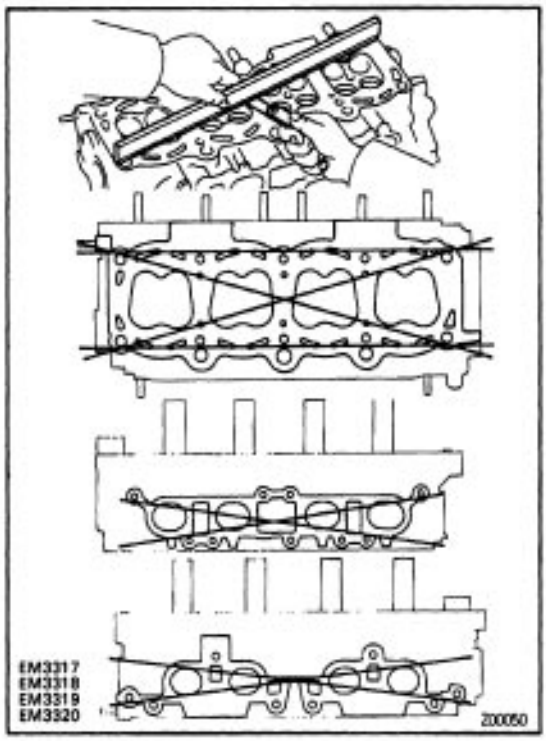
C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.



3. INSPECT CYLINDER HEAD

A. Inspect for flatness

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

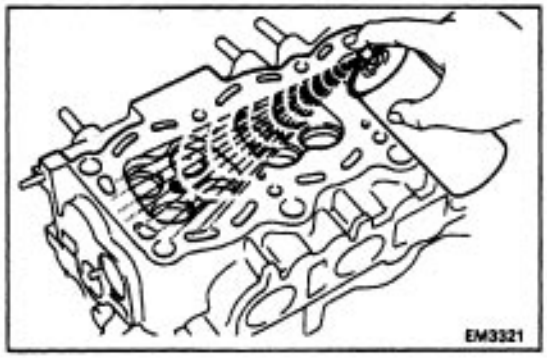
Cylinder block side

0.05 mm (0.0020 in.)

Manifold side

0.08 mm (0.0031 in.)

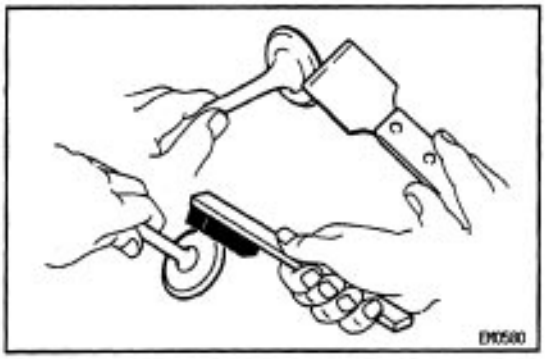
If warpage is greater than maximum, replace the cylin–der head.



B. Inspect for cracks

Using a dye penetrant, check the combustion cham–bers, intake ports, exhaust ports and cylinder block surface for cracks.

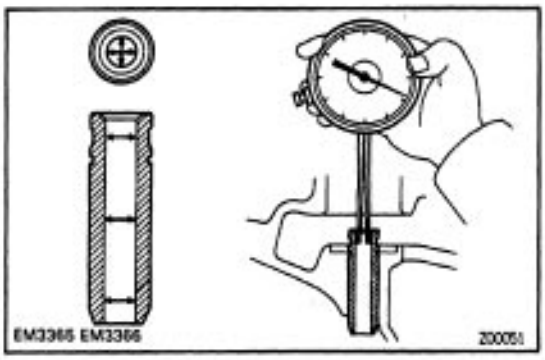
If cracked, replace the cylinder head.



4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

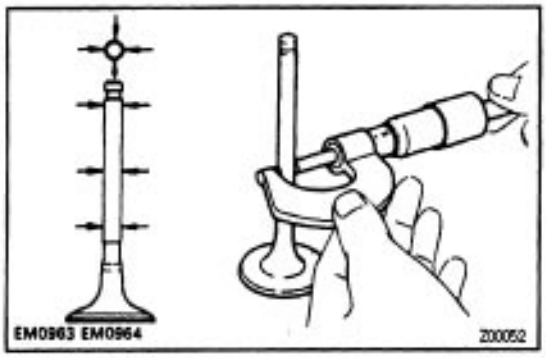


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

6.010 –6.030 mm (0.2366 – 0.2374 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake

5.970 – 5.985 mm (0.2350 – 0.2356 in.)

Exhaust

5.965 – 5.980 mm (0.2348 – 0.2354 In.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

Intake

0.025 – 0.060 mm (0.0010 – 0.0024 in.)

Exhaust

0.030 – 0.065 mm (0.0012 – 0.0028 in.)

Maximum oil clearance:

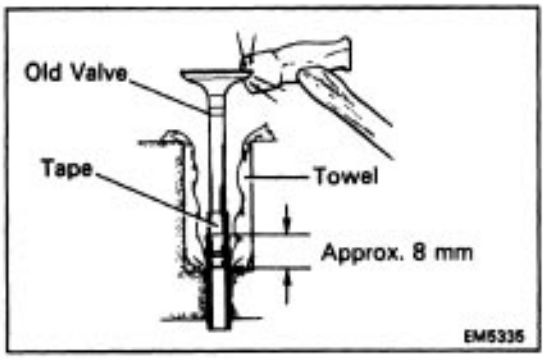
Intake

0.08 mm (0.0031 in.)

Exhaust

0.10 mm (0.0039 In.)

If the clearance is greater than maximum, replace the valve and guide bushing.



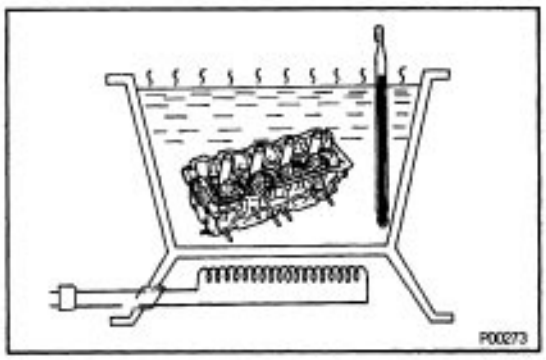
6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) w/ Snap Ring:

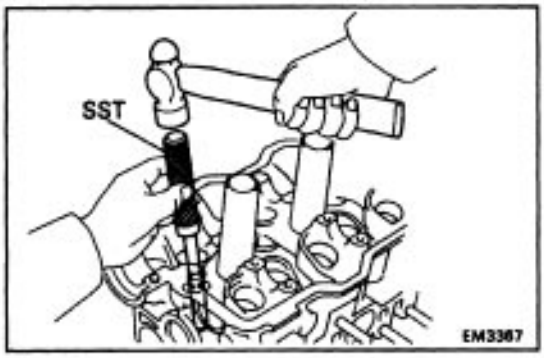
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT: Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.

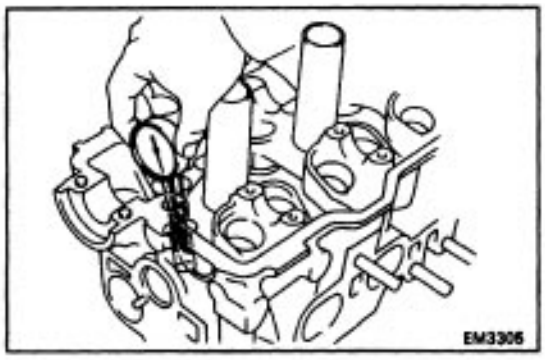
NOTICE: Be careful not to damage the valve lifter hole.



(b) Gradually heat the cylinder head to 80–100°C (176–212°F).



(c) Using SST and a hammer, tap out the guide bushing.
SST 09201–70010



(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

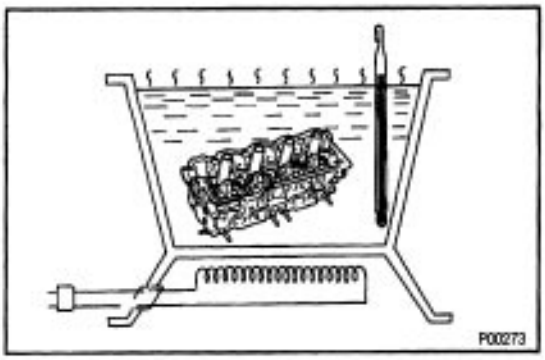
Bushing bore diameter mm (in.)	Bushing size
11.000 – 11.027 10.4331 – 0.4341)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

V00228

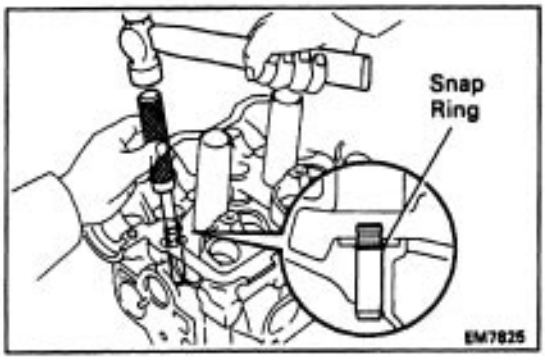
(e) Select a new guide bushing (STD size or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to the following dimension:
11.050 – 11.077 mm (0.4350 – 0.4301 in.)

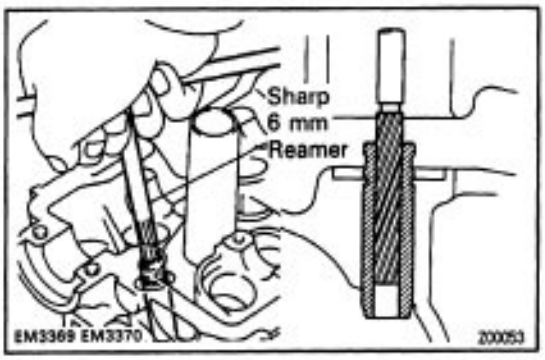
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



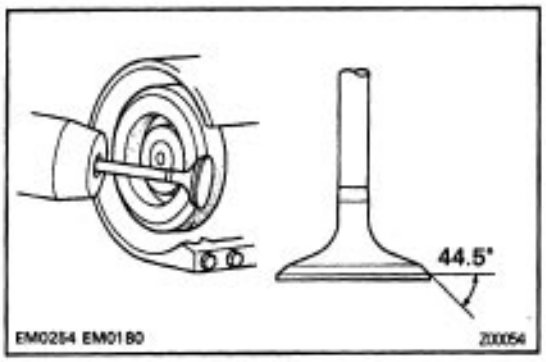
(f) Gradually heat the cylinder head to 80 –100®C (117®–212®F).



(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201– 70010



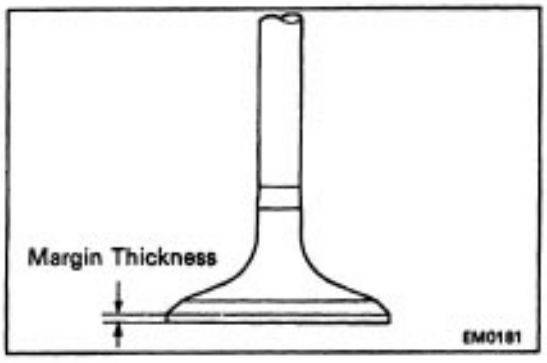
(h) Using a sharp6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EG1–57) between the guide bushing and valve stem.



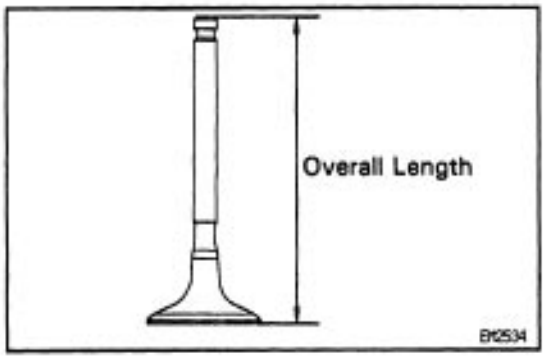
7. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.
Valve face angle:
44.5®



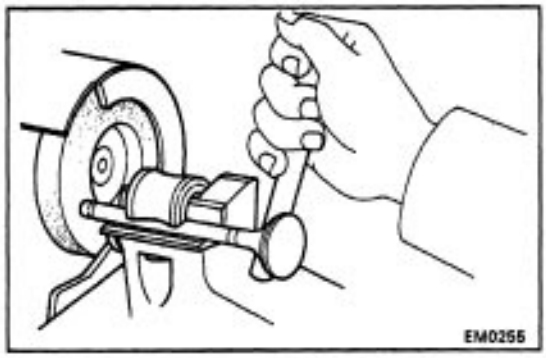
(c) Check the valve head margin thickness.
Standard margin thickness:
0.8 – 1.2 mm (0.031 – 0.047 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)
If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

Standard overall length:
Intake
97.60 mm (3.8425 in.)
Exhaust
98.45 mm (3.8760 in.)
Minimum overall length:
Intake
97.1 mm (3.823 in.)
Exhaust
98.0 mm (3.858 in.)

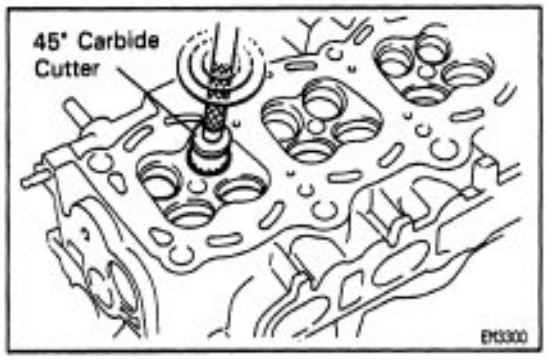
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

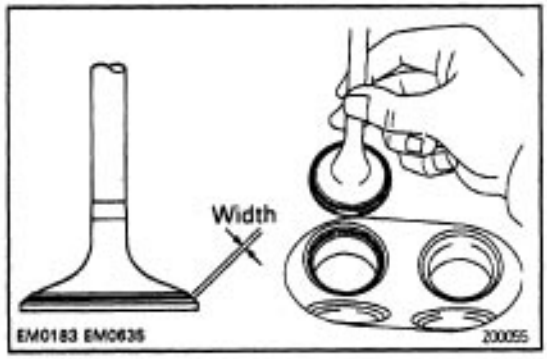
NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45®carbide cutter, resurface the valve seats.

Remove only enough metal to clean the seats.

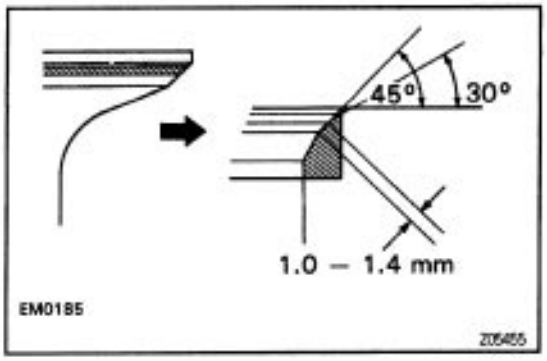


(b) Check the valve seating position.

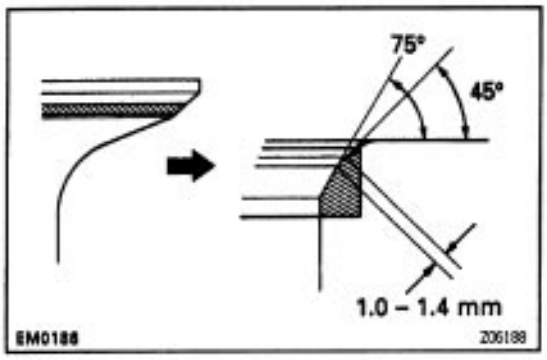
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

(c) Check the valve face and seat for the following:

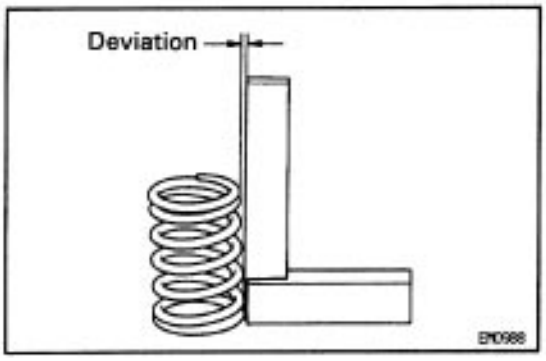
If blue appears 360®around the face, the valve is concentric. If not, replace the valve.



- If blue appears 360®around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:
  1.0 – 1.4 mm (0.039 – 0.055 in.)
  If not, correct the valve seat as follows:
  (1) If the seating is too high on the valve face, use 30®and 45®cutters to correct the seat.
  (2) If the seating is too low on the valve face, use 75®and 45®cutters to correct the seat.

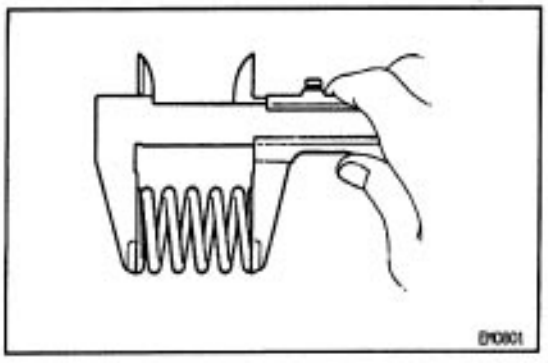


(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.

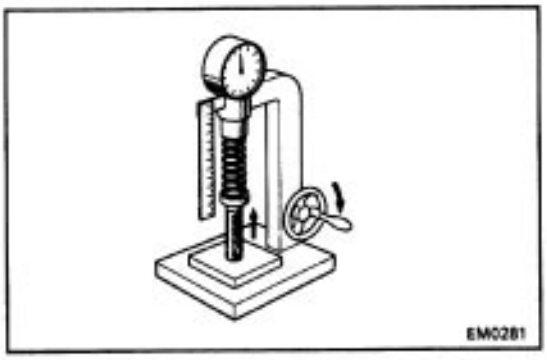


9. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.
Maximum deviation:
2.0 mm (0.079 in.)
If the deviation is greater than maximum, replace the valve spring.



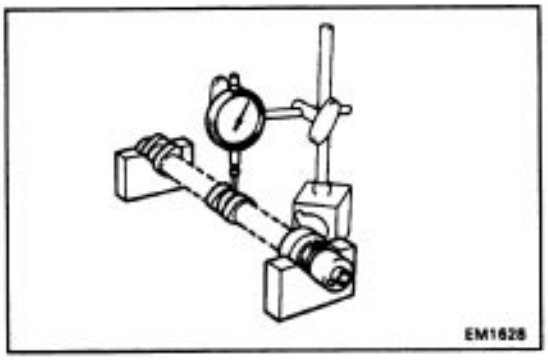
(b) Using a vernier caliper, measure the free length of the valve spring.
Free length:
41.96 – 41.99 mm (1.6520 – 1.6531 in.)
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
164 – 189 N (16.7 – 19.3 kgf, 36.8 – 42.5 lbf)
at 34.7 mm (1.336 in.)

If the installed tension is not as specified, replace the valve spring.



10. INSPECT CAMSHAFTS AND BEARINGS

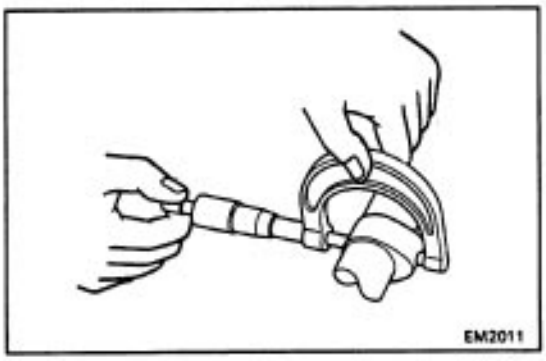
A. Inspect camshaft for runout

(a) Place the camshaft on V – blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.04 mm (0.0016 in.)

If the circle runout is greater than maximum, replace the camshaft.

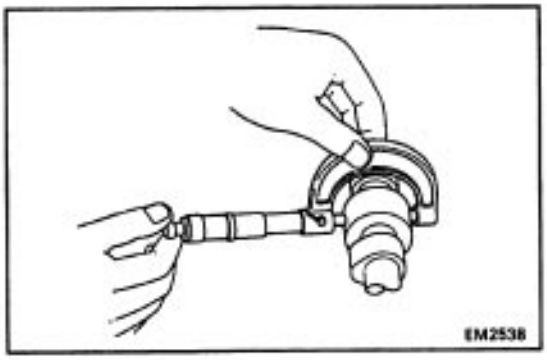


B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
Intake
42.01 – 42.11 mm (1.6539 – 1.6579 in.)
Exhaust
40.06 – 40.18 mm (1.5772 – 1.5811 In.)
Minimum cam lobe height:
Intake
41.90 mm (1.6496 in.)
Exhaust
39.95 mm (1.5728 in.)

If the cam lobe height is less than minimum, replace the camshaft.

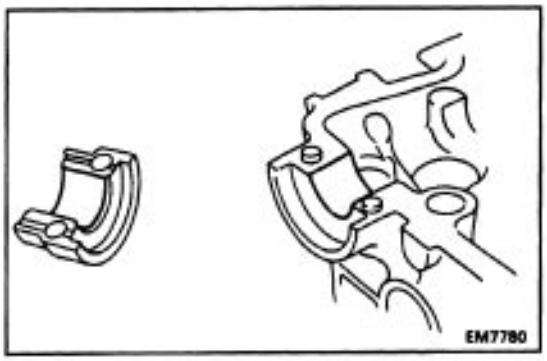


C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:
26.959 – 28.975 mm 11.0814 – 1.0620 in.)

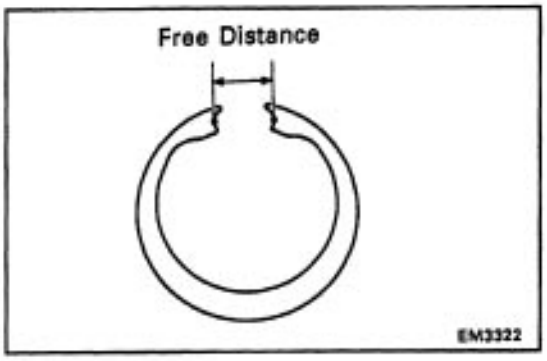
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check that bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.



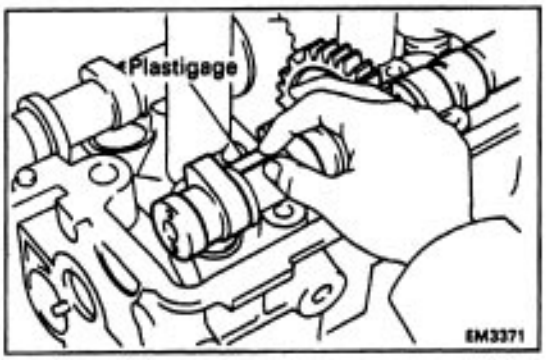
E. Inspect camshaft gear spring

Using a vernier caliper, measure the free distance between the spring ends.

Free distance:

22.5 – 22.9 mm (0.886 – 0.902 in.)

If the free distance is not as specified, replace the gear spring.

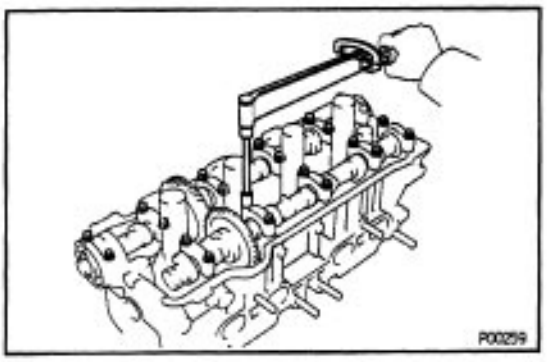


F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

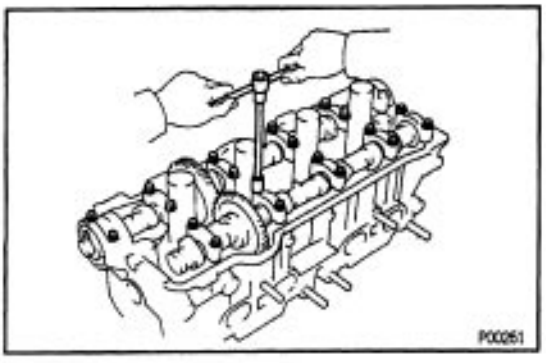


(d) Install the bearing caps.

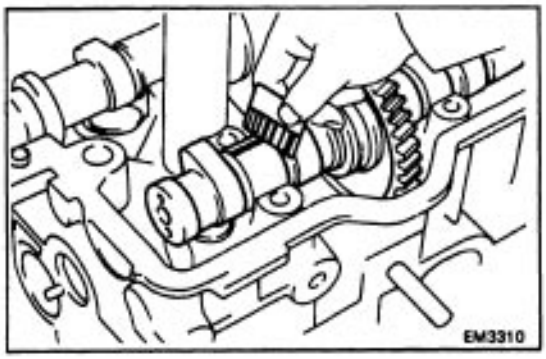
(See step 4 on pages EG1–69 to 71)

Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)

NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.

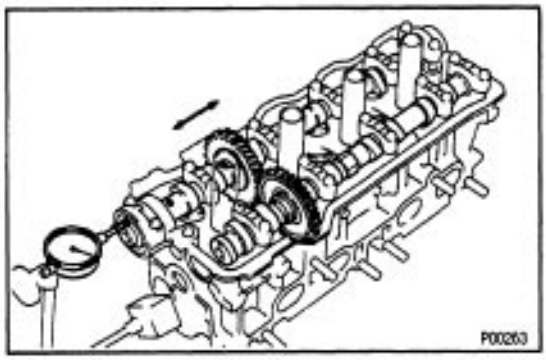


(f) Measure the Plastigage at its widest point.

Standard oil clearance:
0.025 – 0.062 mm (0.0010 – 0.0024 In.)
Maximum oil clearance:
0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.



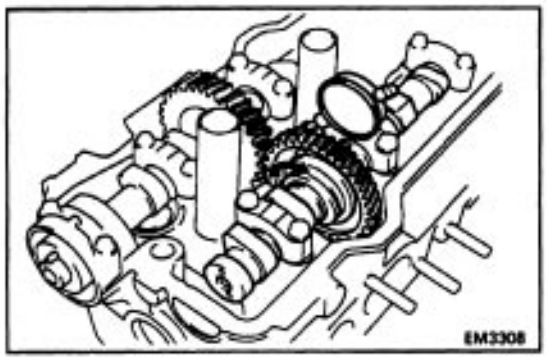
G. Inspect camshaft thrust clearance

(a) Install the camshaft.
(See step 4 on pages EG1–69 to 71)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
Intake
0.045 – 0.100 mm (0.0018 – 0.0039 in.)
Exhaust
0.030 – 0.085 mm (0.0012 – 0.0033 in.)
Maximum thrust clearance:
Intake
0.12 mm (0.0047 in.)
Exhaust
0.10 mm (0.0039 in.)

If the thrust clearance is greater than maximum, re–place the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



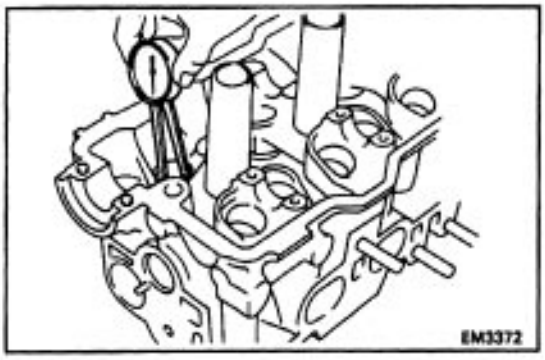
H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust cam sub gear.
(See step 4 on pages EG1–69 to 71)

(b) Using a dial indicator, measure the backlash.

Standard backlash:
0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash:
6.30 mm (0.0188 in.)

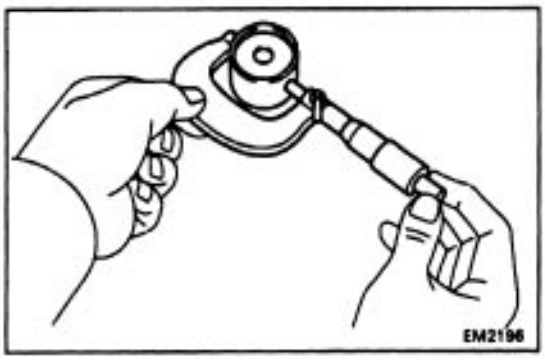
If the backlash is greater then maximum, replace the camshafts.



11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:
31.000 – 31.018 mm (1.2205 – 1.2213 In.)

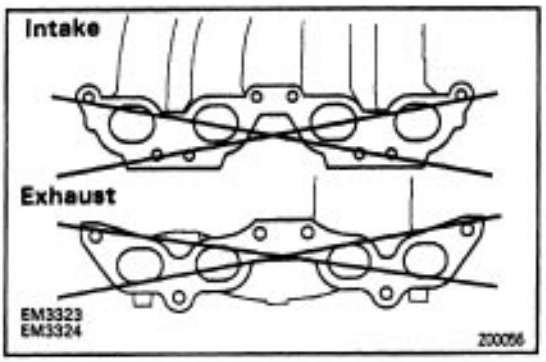


(b) Using a micrometer, measure the lifter diameter.

Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:
0.024 – 0.052 mm (0.0009 – 0.0020 in.)
Maximum oil clearance:
0.07 mm (0.0028 In.)
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



12. INSPECT MANIFOLDS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage:
0.30 mm (0.0 118 In.)

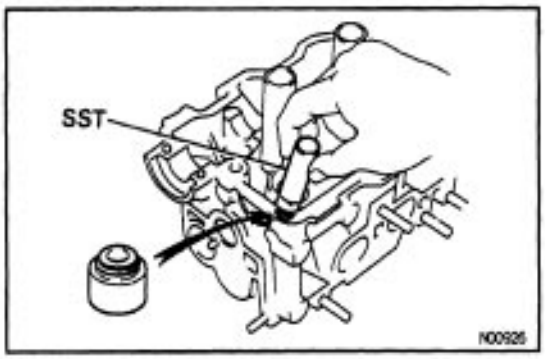
If warpage is greater than maximum, replace the manifold.

CYLINDER HEAD ASSEMBLY

(See Components for Removal and Installation)

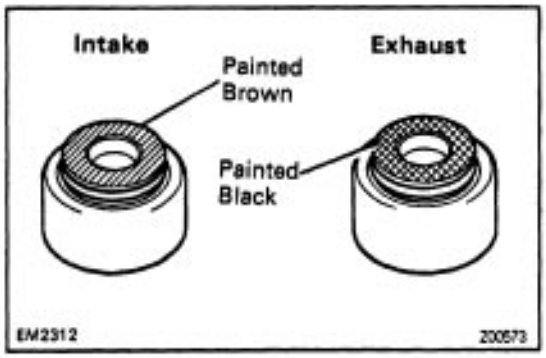
HINT:

- Thoroughly clean all parts to be assembled.
  Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

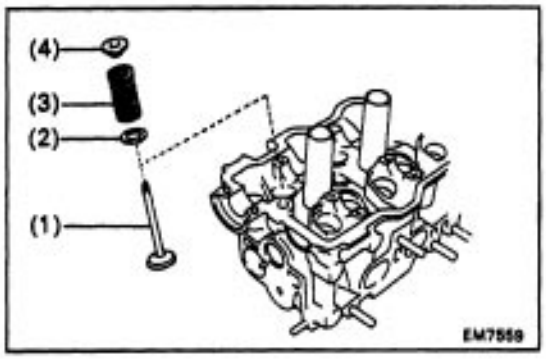


1. INSTALL VALVES

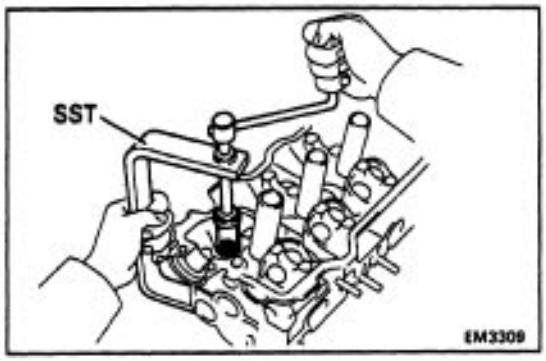
(a) Using SST, push in a new oil seal.
SST 09201 –41020



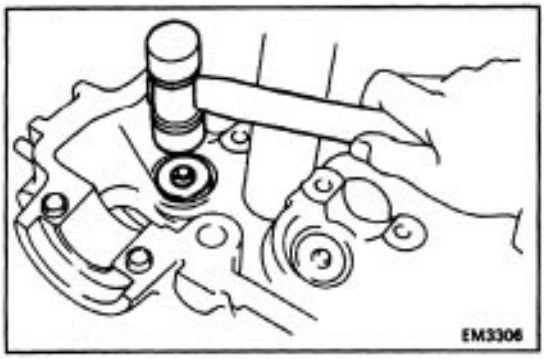
HINT: The intake valve oil seal is brown and the exhaust valve oil seal is black.



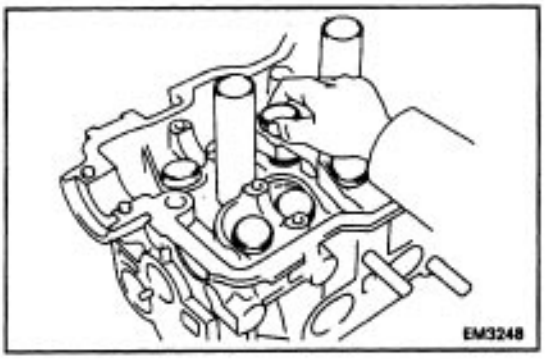
(b) Install the following parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202 – 70010



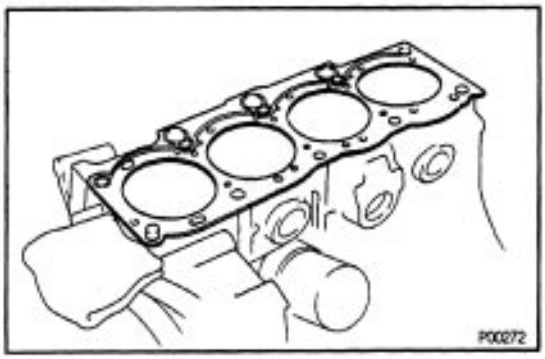
(d) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.

(b) Check that the valve lifter rotates smoothly by hand.



CYLINDER HEAD INSTALLATION

(See Components for Removal and Installation)

1. INSTALL CYLINDER HEAD

A. Place cylinder head on cylinder block

(a) Place a new cylinder head gasket in position on the cylinder block.

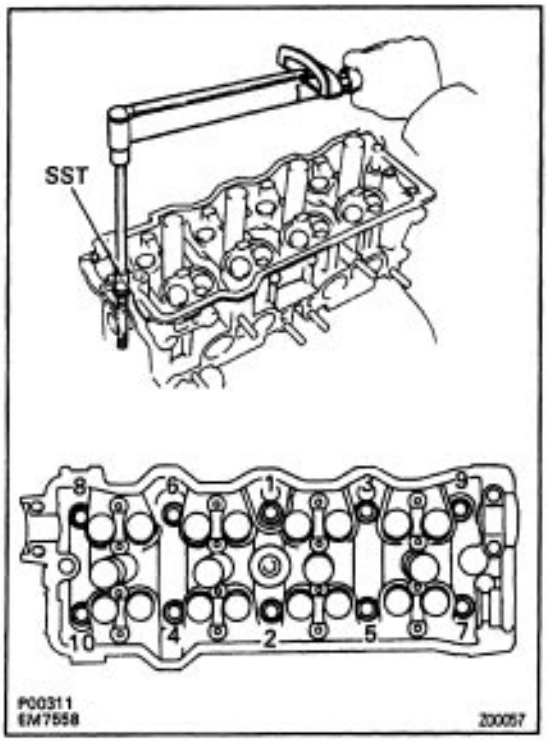
NOTICE: Be careful of the installation direction.

(b) Place the cylinder head in position on the cylinder head gasket.

B. Install cylinder head bolts

HINT:

- The cylinder head bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, re–place it.



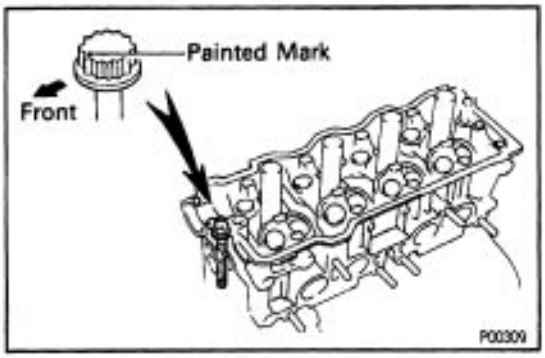
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using SST, install and uniformly tighten the 10 cylin–der head bolts and plate washers in several passes, in the sequence shown.

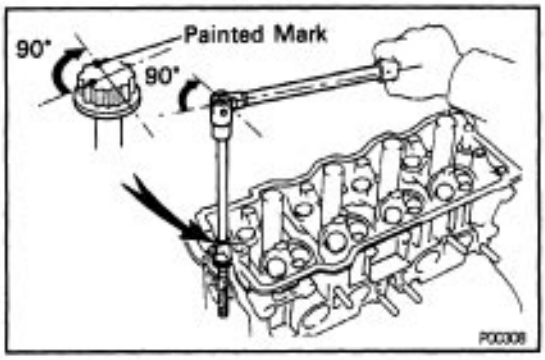
SST 09011– 38121

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)

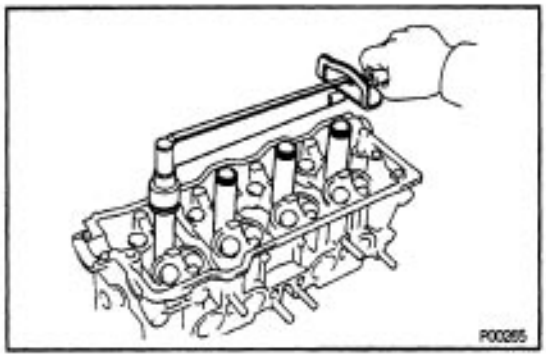
If any one of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



(c) Mark the front of the cylinder head bolt head with paint.



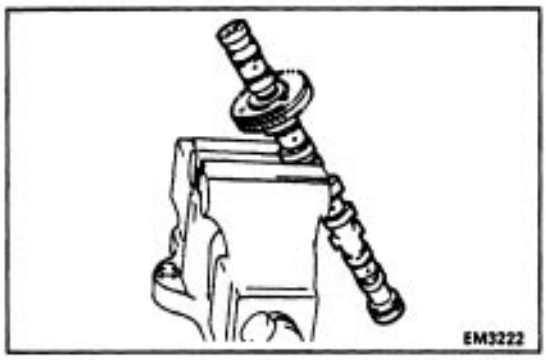
(d) Retighten the cylinder head bolts 90®in the sequence shown on the previous page.
(e) Check that the painted mark is now at a 90®angle to front.



2. INSTALL SPARK PLUG TUBES

(a) Clean the cylinder head tube holes of any residua! adhesive, oil or foreign particles. Remove any oil with kerosene or gasoline.
(b) Screw the threads of the spark plug tube coated with adhesive into the cylinder head.
(c) Using the spark plug tube nut and a 30 mm socket wrench, tighten the spark plug tubes.

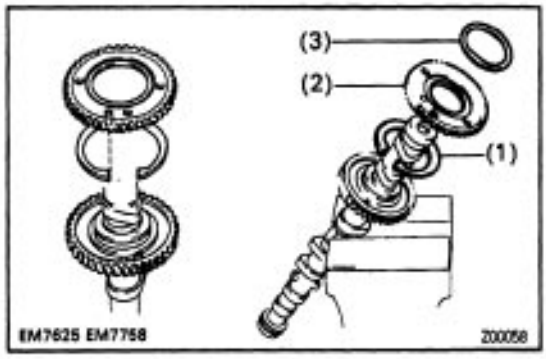
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



3. ASSEMBLY EXHAUST CAMSHAFT

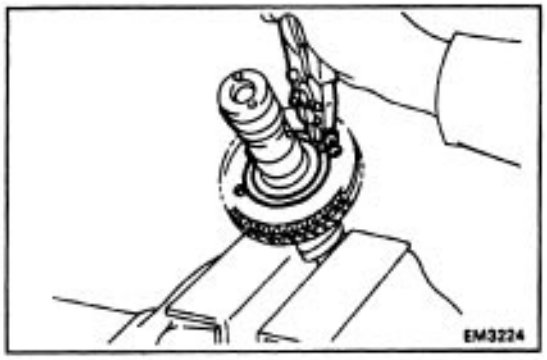
(a) Mount the hexagon wrench head portion of the cam–shaft in a vise.

NOTICE: Be careful not to damage the camshaft.

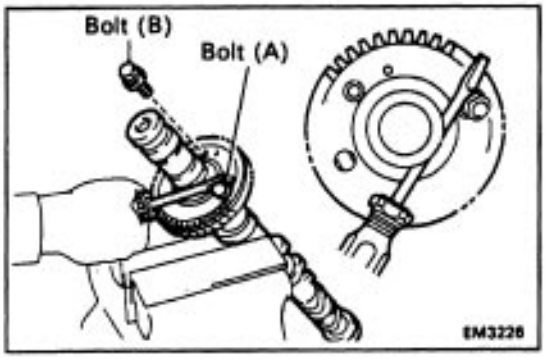


(b) Install the following parts:
(1) Camshaft gear spring
(2) Camshaft sub gear
(3) Wave washer

HINT: Align the pins on the gears with the spring ends.



(c) Using snap ring pliers, install the snap ring.

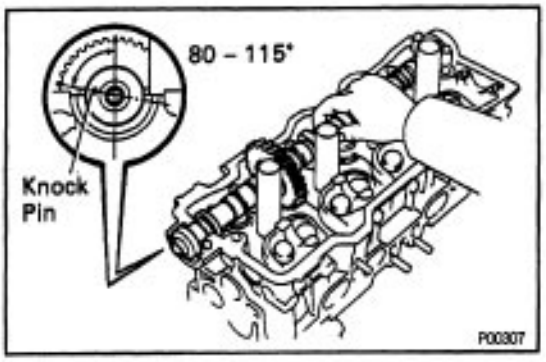


(d) Insert a service bolt (A) into the service hole of the camshaft sub gear.
(e) Using a screwdriver, align the holes of the camshaft main gear and sub gear by turning camshaft sub gear clockwise, and install a service bolt (13).

NOTICE: Be careful not to damage the camshaft.

4. INSTALL CAMSHAFTS

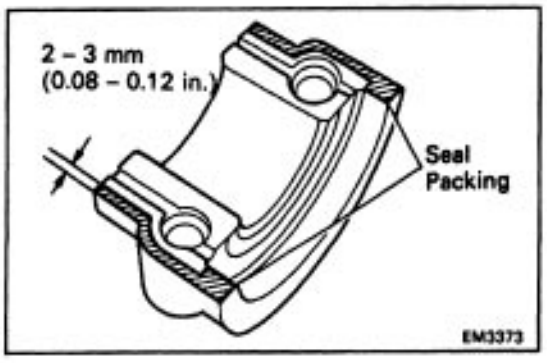
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



A. Install intake camshaft

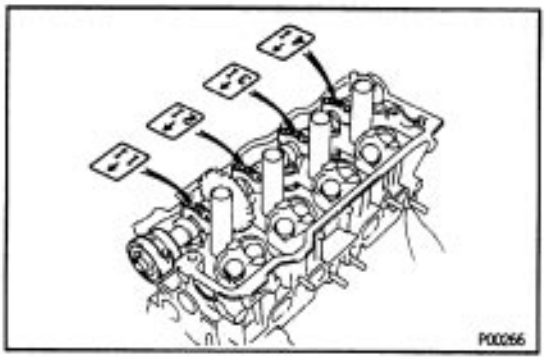
(a) Apply MP grease to the thrust portion of the cam–shaft.
(b) Place the intake camshaft at 80–115° BTDC of cam–shaft angle, on the cylinder head.

HINT: The above angle arrows the No.1 and No.3 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.

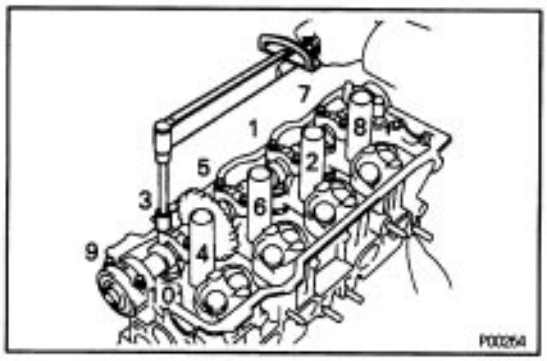


(c) Apply seal packing to the No. 1 bearing cap as shown.

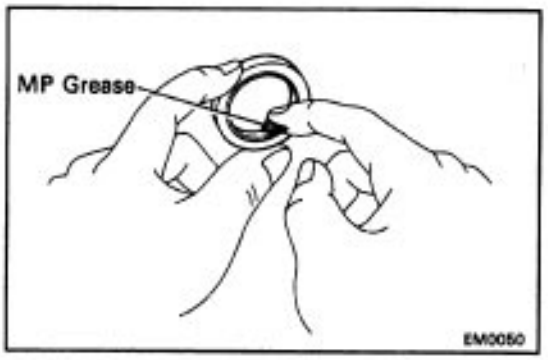
Seal packing:
Part No.08826 –00080 or equivalent



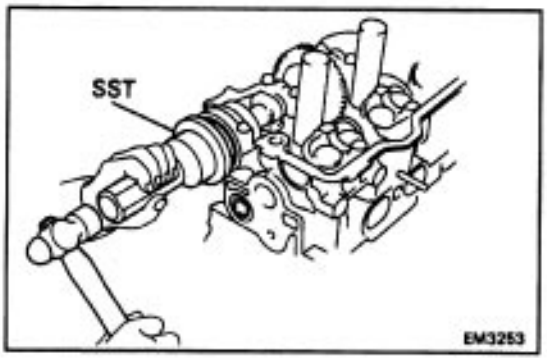
(d) Install the bearing caps in their proper locations.



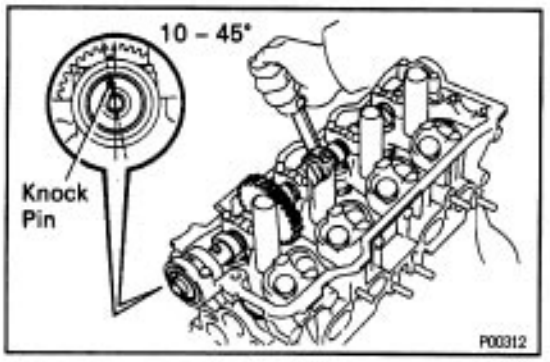
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the 10 bearing cap bolts in several passes, in the sequence shown.
Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)



(g) Apply MP grease to a new oil seal lip.



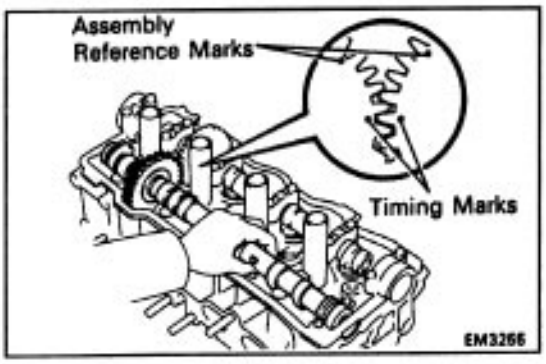
(h) Using SST, tap in the oil seal.
SST 09223–4601 1



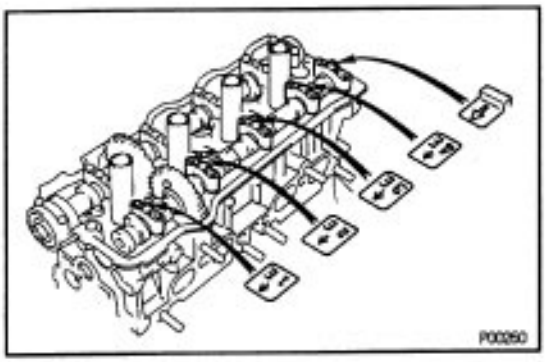
B. Install exhaust camshaft

(a) Set the knock pin of the intake camshaft at 10–45° BTDC of camshaft angle.

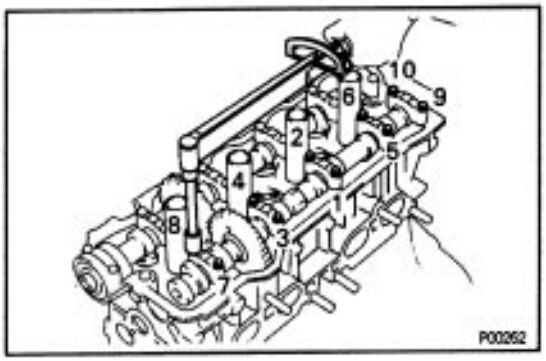
HINT: The above angle allows the No.2 and No.4 cylinder cam lobes of the exhaust camshaft to push their valve lifters evenly.



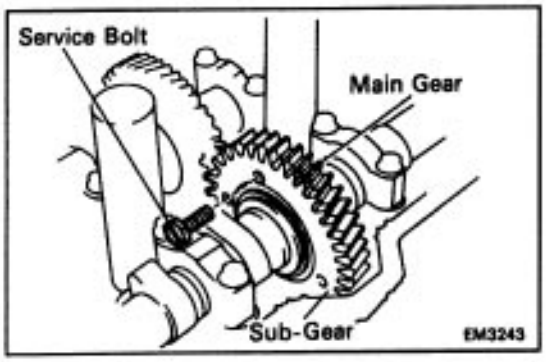
(b) Apply MP grease to the thrust portion of the cam–shaft.
(c) Engage the exhaust camshaft gear to the intake cam–shaft gear by matching the timing marks on each gear.
(d) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.
NOTICE: There are also assembly reference marks on each gear as shown in the Illustration. Do not use these marks.



(e) Turn the intake camshaft clockwise or counterclockwise little by little until the exhaust camshaft sits in the bearing journals evenly without rocking the cam–shaft on the bearing journals.
NOTICE: It is very important to replace the camshaft in the bearing journals evenly while tightening bearing caps in the subsequent steps.
(f) Install the bearing caps in their proper locations.

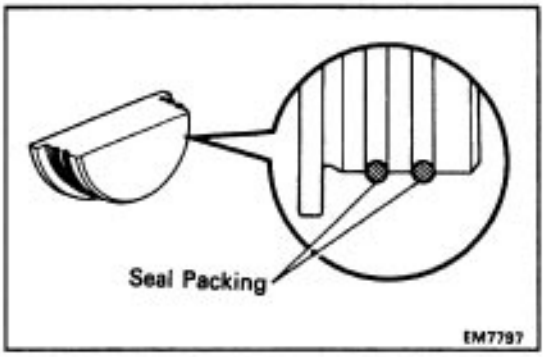


(g) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(h) Install and uniformly tighten the 10 bearing cap bolts in several passes, in the sequence shown.
Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)



(i) Remove the service bolt (B).

5. CHECK AND ADJUST VALVE CLEARANCE
(See page EG1–12**)**
Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.
Valve clearance (Cold):
Intake
0.19 – 0.29 mm (0.007 – 0.011 In.)
Exhaust
0.28 – 0.38 mm (0.011 – 0.015 In.)

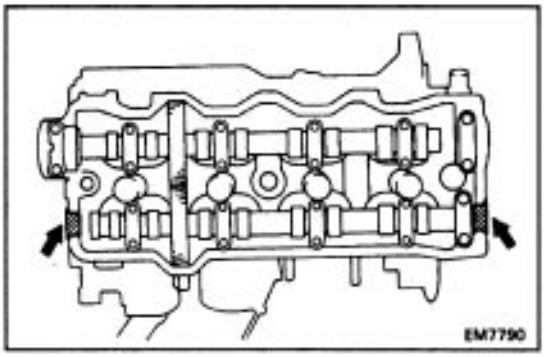


6. INSTALL SEMI–CIRCULAR PLUGS

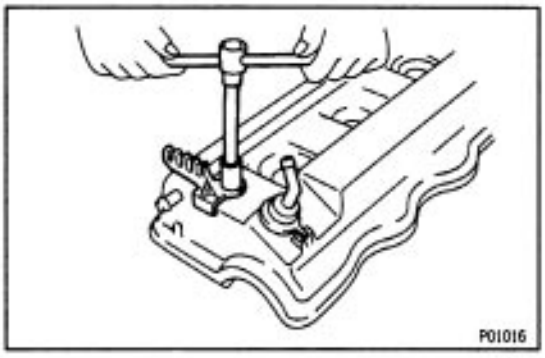
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the semi–circular plug grooves.

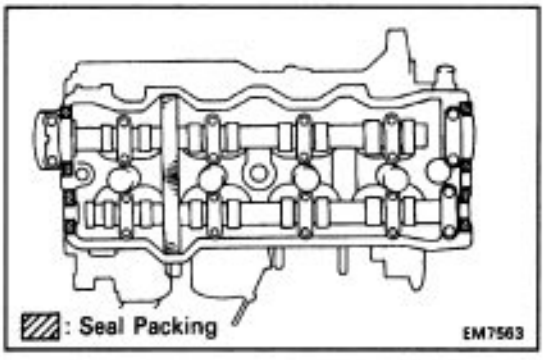
Seal packing:
Part No.08826–00080 or equivalent



(c) Install the 2 semi–circular plugs to the cylinder head.



7. INSTALL PCV VALVE AND HIGH–TENSION CORDS CLAMP

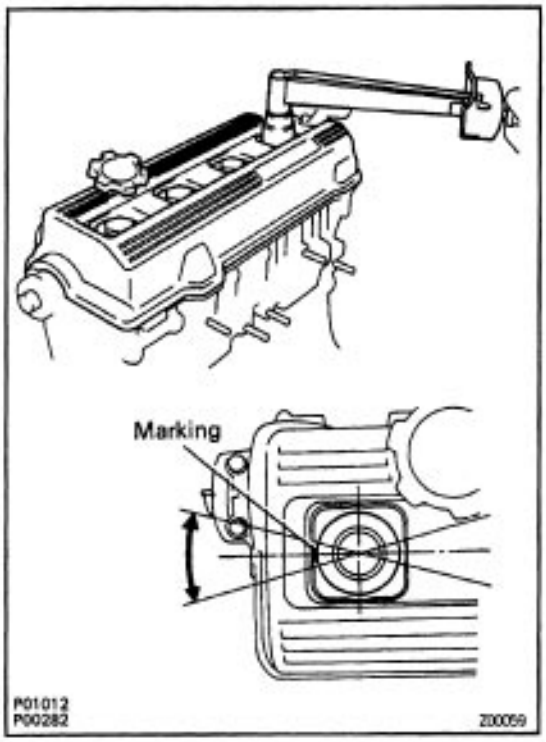


8. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

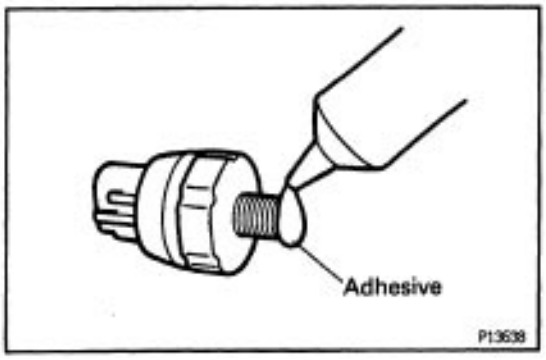
(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:
Part No.08826–00080 or equivalent



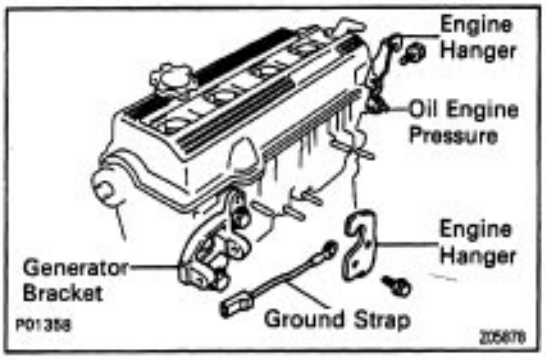
(c) Install the gasket to the head cover.
(d) Install the head cover with the 4 grommets and nuts.
Uniformly tighten the nuts in several passes.
Torque: 23 N–m (230 kgf–cm, 17 ft–lbf)

HINT: Install the grommets so that their markings are as shown in the illustration.



9. INSTALL OIL PRESSURE SWITCH

Apply adhesive to 2 or 3 threads.
Adhesive:
Part No.08833–00080, THREE BOND 1324 or equivalent

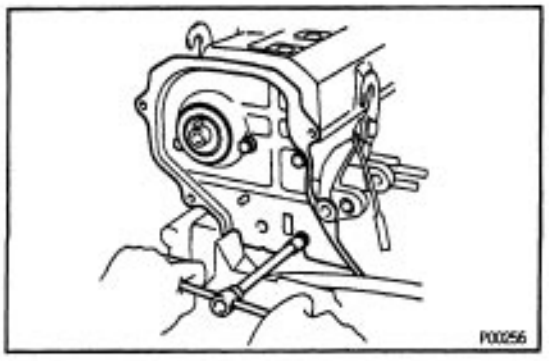


10. INSTALL GENERATOR BRACKET

Install the generator bracket with the 3 bolts.
Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

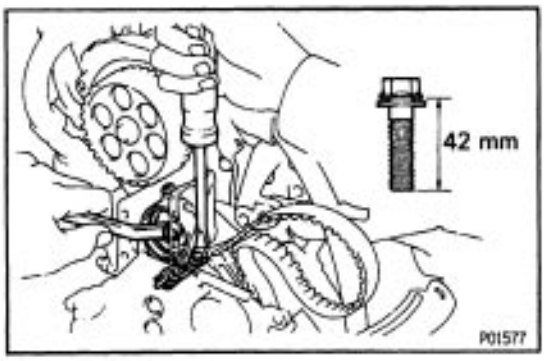
11. INSTALL ENGINE HANGERS

Install the engine hanger with the bolt. Install the 2 engine hangers. Install the ground strap.
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



12. INSTALL NO.3 TIMING BELT COVER

Install the timing belt cover with the 4 bolts.
Torque: 7.8 N–m (80 kgf–cm, 69 in–lbf)



13. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

(a) Install the pulley with the bolt. Do not tighten the bolt yet.

HINT: Use bolt 42 mm (1.65 in.) in length.

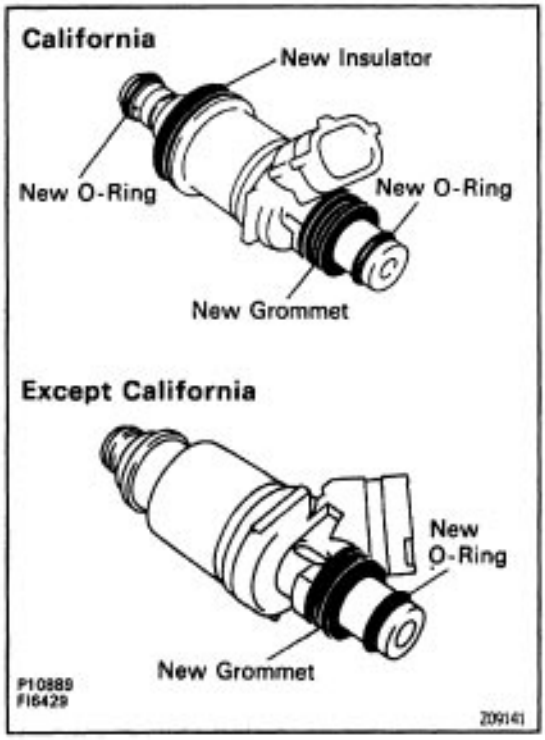
(b) Install the tension spring.

(c) Pry the pulley toward the left as far as it will go and tighten the bolt.

(d) Check that the idler pulley moves smoothly.

14. INSTALL CAMSHAFT TIMING PULLEY AND TIMING BELT

(See page EG1–33**)**



15. INSTALL INJECTORS AND DELIVERY PIPE

(a) California:

Install new insulator and grommet to each injector.

(b) Except California:

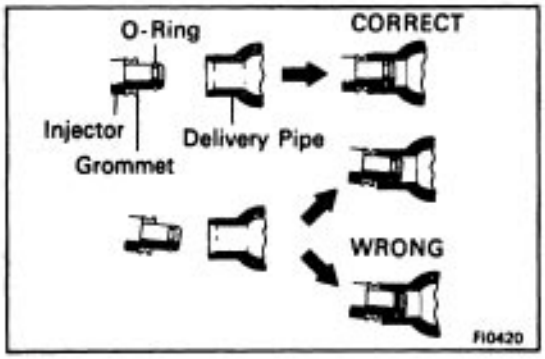
Install a new grommet to each injector.

(c) California:

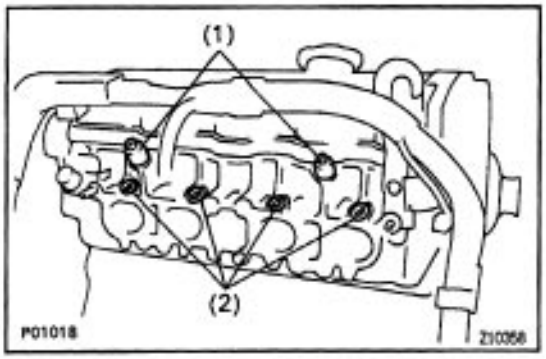
Apply a light coat of gasoline to 2 new 0–rings, and install them to each injector.

(d) Except California:

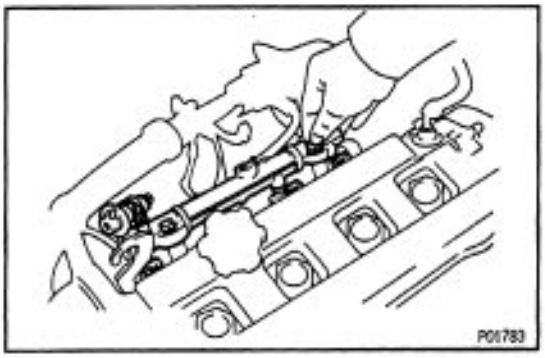
Apply a light coat of gasoline to a new 0–ring, and install it to each injector.



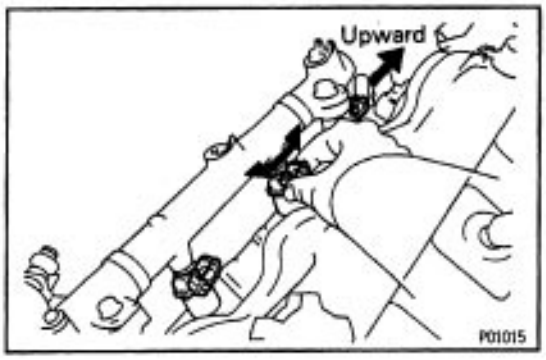
(e) While turning the injector left and right, install it to the delivery pipes. Install the 4 injectors.



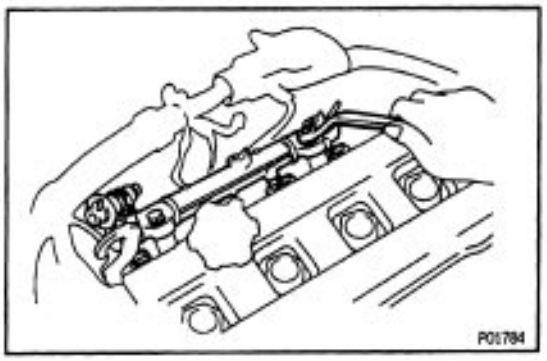
(f) Install the following parts to the intake manifold:
(1) 2 spacers
(2) Except California:
4 new insulators



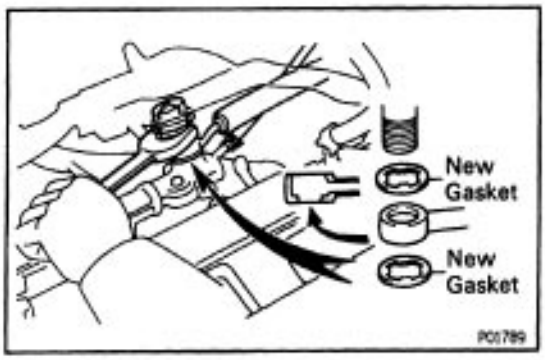
(g) Place the 4 injectors together with the delivery pipe in position on the cylinder head.
(h) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.



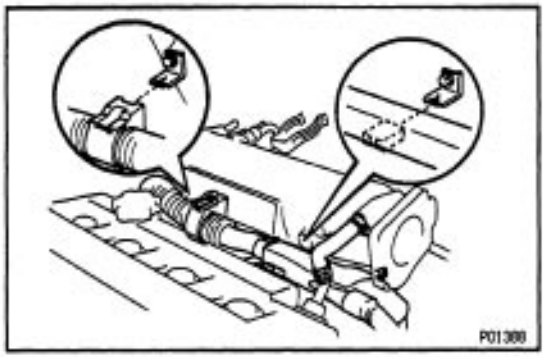
(i) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.
(j) Position the injector connector upward.



(k) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

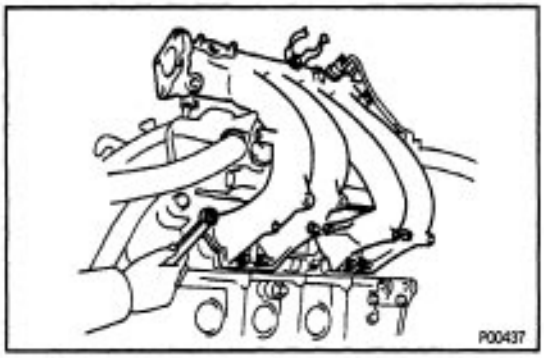


(l) Connect the fuel return hose.
(m) Connect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the pulsation damper.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



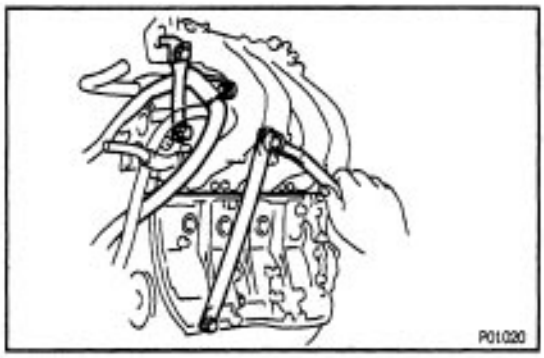
16. INSTALL INTAKE MANIFOLD

(a) Connect the 2 wire clamps to the wire brackets on the intake manifold.



(b) Install a new gasket and the intake manifold with the 6 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(c) Install the vacuum hose bracket and engine wire har–ness with the bolt.

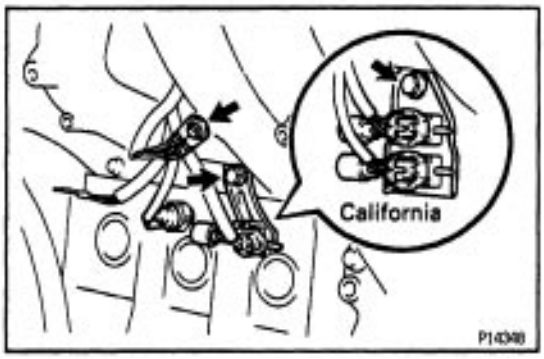
(d) Install the No.1 air intake chamber and manifold stays, wire bracket with the 4 bolts.

14 mm head bolt

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

12 mm head bolt

Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)

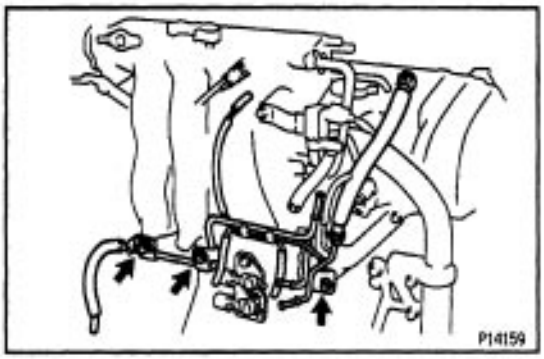


17. INSTALL VSV OR VSV ASSEMBLY

18. CALIFORNIA ONLY:
CONNECT VSV (FOR FUEL PRESSURE CONTROL) CONNECTOR

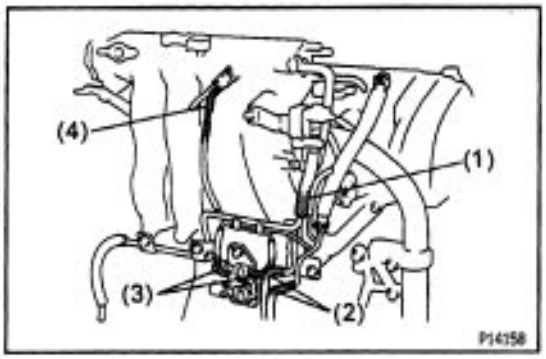
19. CONNECT KNOCK SENSOR AND VSV (FOR EGR) CONNECTORS

20. INSTALL 2 ENGINE WIRE GROUND STRAPS TO INTAKE MANIFOLD

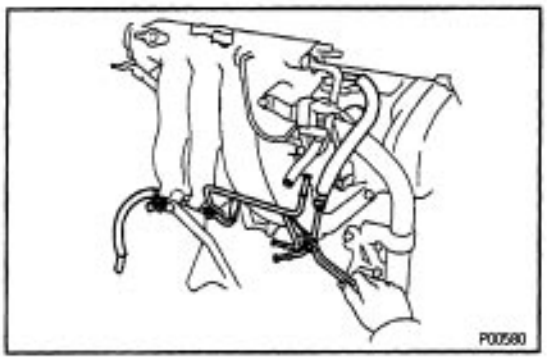


21. CALIFORNIA:
INSTALL AIR TUBE

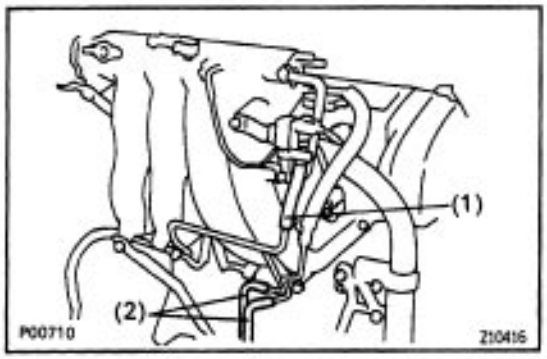
(a) Install the air tube and wire clamp with the 3 bolts.



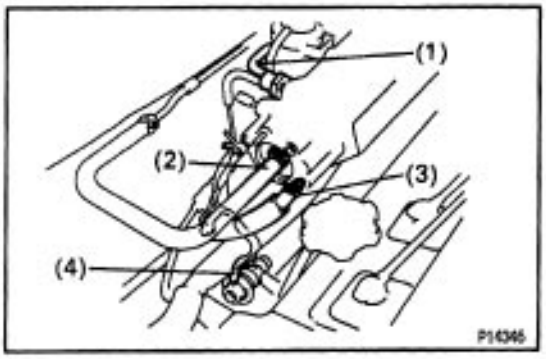
(b) Connect the following hoses:
(1) w/ A/C:
A/C hose (from ASV) to air tube
(2) 2 air hoses (from PS pump) to air tube
(3) 2 vacuum hoses to VSV (for fuel pressure con–trol)
(4) Vacuum hose to air intake chamber



22. EXCEPT CALIFORNIA:
INSTALL AIR TUBE
(a) Install the air tube and wire clamp with the 3 bolts.

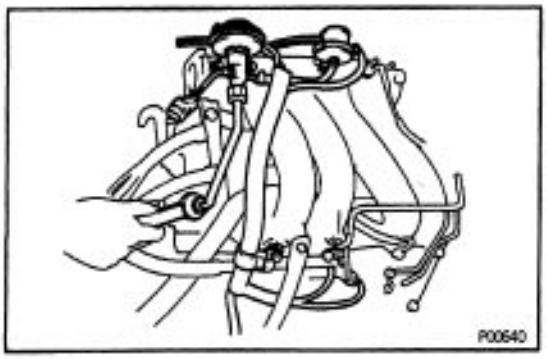


(b) Connect the following hoses to the air tube:
(1) w/ A/C:
Air hose from ASV
(2) 2 air hose from PS pump

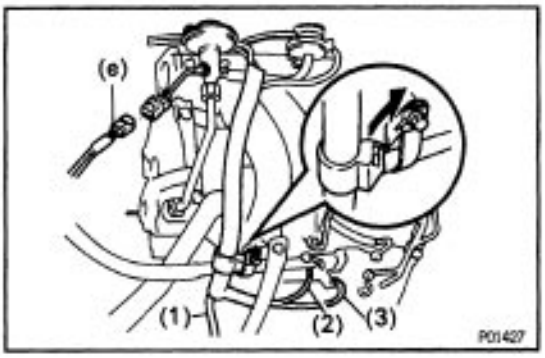


23. CONNECT VACUUM HOSES
Connect the following hoses:
(1) MAP sensor hose to air intake chamber
(2) Brake booster vacuum hose to air intake chamber
(3) PS vacuum hose to air intake chamber
(4) Vacuum sensing hose to fuel pressure regulator.

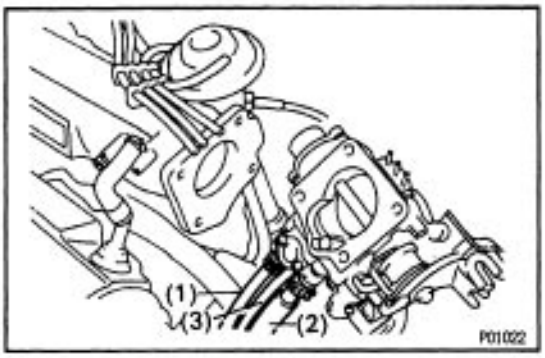
24. w/ A/C:
CONNECT A/C IDLE–UP VALVE CONNECTOR



25. INSTALL EGR VALVE AND VACUUM MODULATOR
(a) Install a new gasket and the EGR valve with the union nut and 2 nuts.
Union nut:
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
Nut:
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(b) Install the EGR modulator to the clamp.

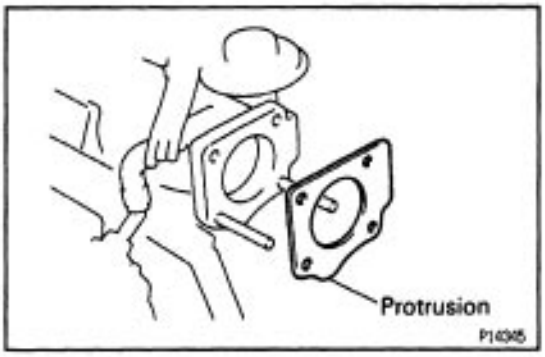


(c) Connect the vacuum hose clamp.
(d) Connect the following hoses:
(1) Vacuum hose to charcoal canister
(2) Vacuum hose (from EGR valve) to E port of VSV (for EGR)
(3) Vacuum hose (from Q port of EGR vacuum modulator) to G port of VSV (for EGR)
(e) Connect the EGR gas temperature sensor connector.

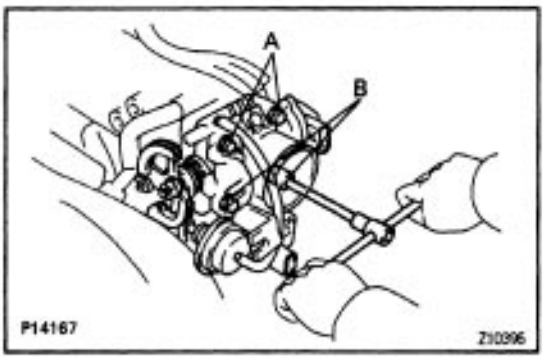


26. INSTALL THROTTLE BODY

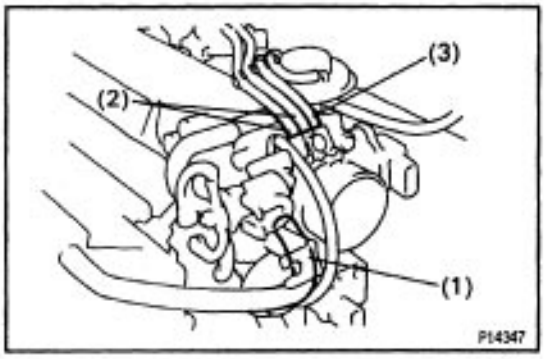
(a) Connect the following hoses to the throttle body:
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose from air tube



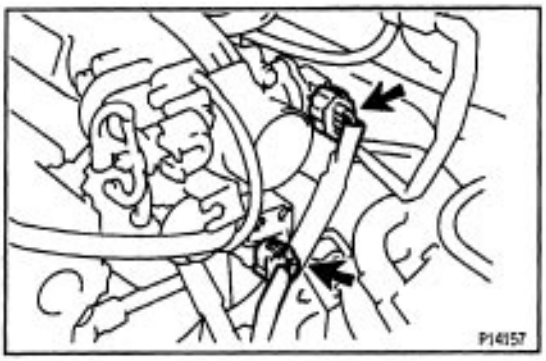
(b) Place a new gasket on the intake chamber, facing the protrusion downward.



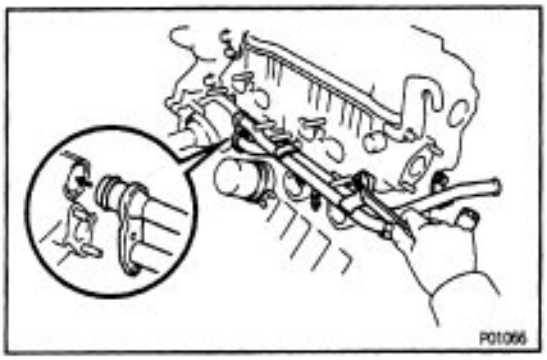
(c) Type A:
Install the throttle body with the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
HINT: Each bolt is indicated in the illustration.
Bolt length:
A 45 mm (1.77 in.)
B 55 mm (2.17 in.)
(d) Type e:
Install the throttle body with the 2 bolts and 2 nuts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Connect the following hoses to the throttle body:
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)

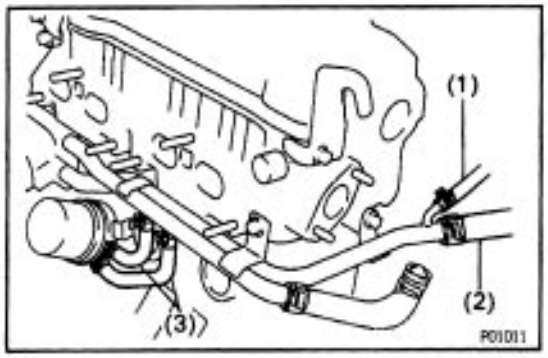


(f) Connect the IAC valve connector.
(g) Connect the throttle position sensor connector.

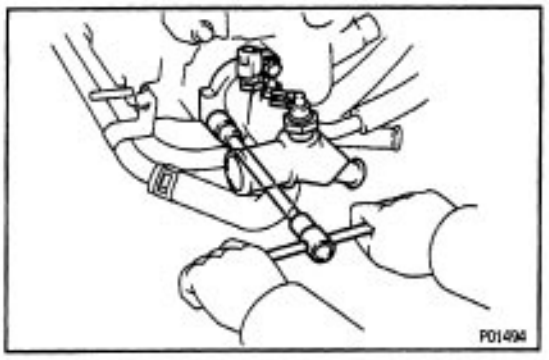


27. INSTALL WATER BYPASS PIPE

(a) Install a new 0–ring to the bypass pipe.
(b) Apply soapy water on the 0– ring.
(c) Install a new gasket and the bypass pipe with the 2 nuts and 2 bolts.
Torque (Nut): 8.8 N–m (90 kgf–cm. 78 in.–lbf)

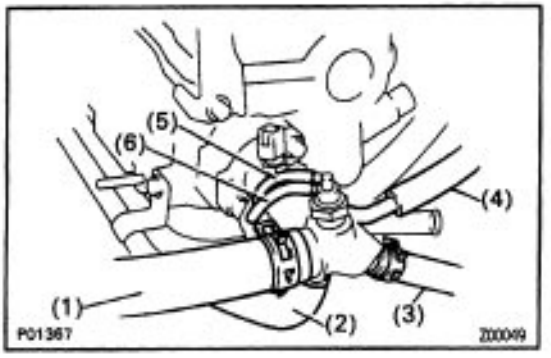


(d) Connect the following hoses:
(1) IAC water bypass hose
(2) Heater water hose
(3) w/ Oil Cooler:
2 oil cooler water bypass hoses



28. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the 2 bolts.
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

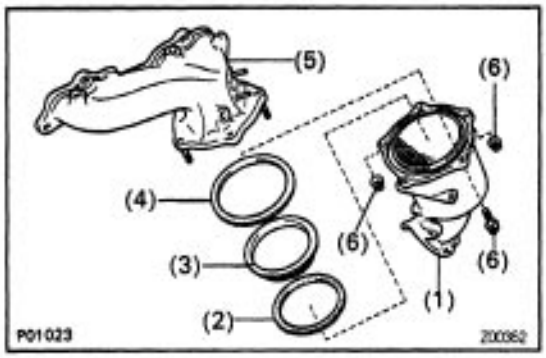


(b) Connect the following hoses:
(1) Upper radiator hose
(2) Water bypass pipe hose
(3) Heater water hose
(4) IAC water bypass hose
(5) TVV (for EVAP) vacuum hose (from P port of throttle body)
(6) TVV (for EVAP) vacuum hose (from charcoal canister)

(c) Connect the following connectors:
(1) Engine coolant temperature sender gauge con–nector
(2) Engine coolant temperature sensor connector

29. CONNECT ENGINE WIRE (FOR OXYGEN SENSORS) TO ENGINE HANGER

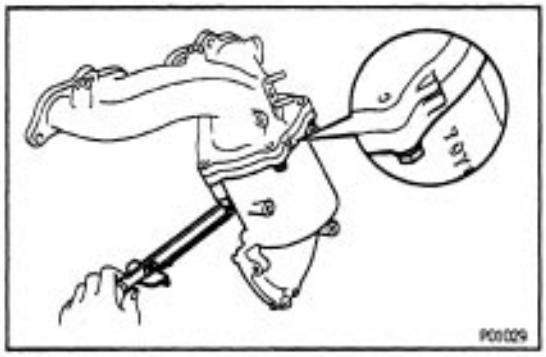
30. CONNECT OIL PRESSURE SWITCH CONNECTOR

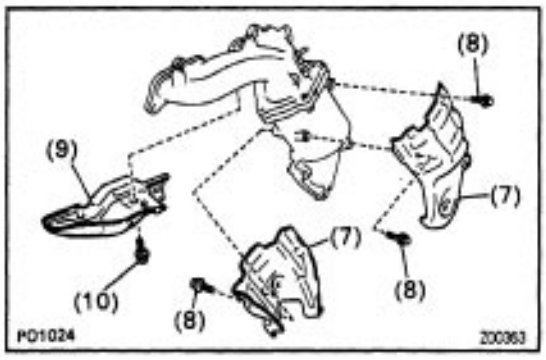


31. ASSEMBLE EXHAUST MANIFOLD AND WARM UP THREE–WAY CATALYTIC CONVERTER

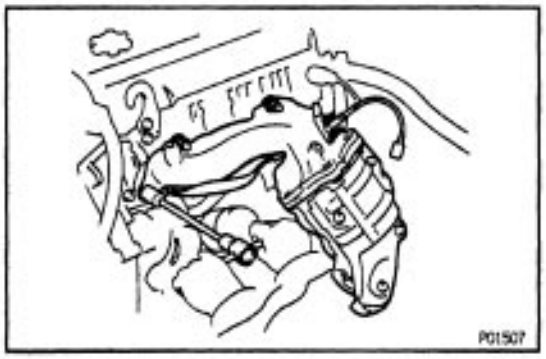
Assemble the following parts:
(1) WU–TWC
(2) Cushion
(3) Retainer
(4) Gasket
(5) Exhaust manifold
(6) 3 bolts and 2 nuts

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)





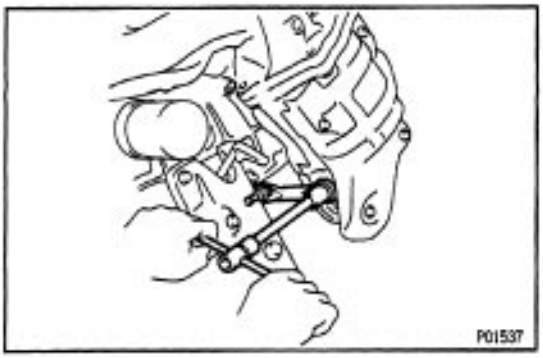
(7) 2 converter heat insulators
(8) 8 bolts
(9) Manifold lower heat insulator
(10) 3 bolts



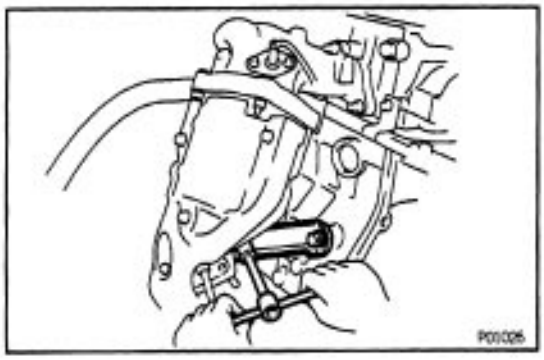
32. INSTALL EXHAUST MANIFOLD AND WARM UP THREE–WAY CATALYTIC CONVERTER ASSEMBLY

(a) Install a new gasket, the exhaust manifold and WU – TWC assembly with the 6 nuts. Uniformly tighten the nuts in several passes.

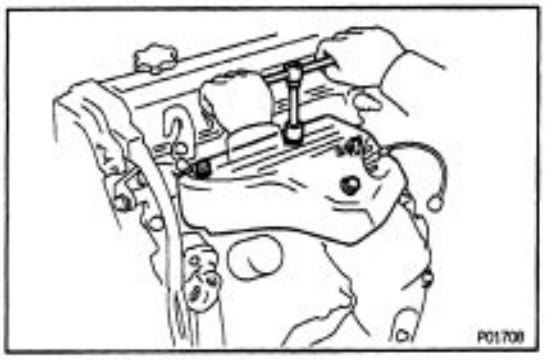
Torque: 49 N–m (540 kgf–cm, 36 ft–lbf)



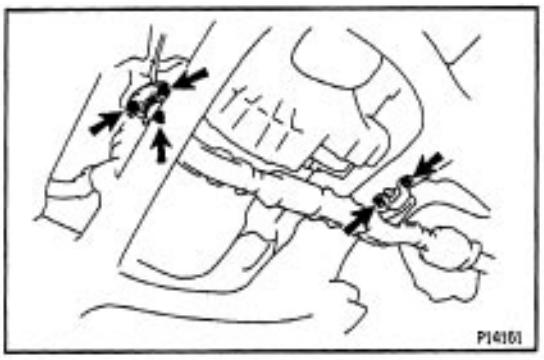
(b) Install the manifold stay with the bolt and nut.
Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)



(c) Install the No. 1 manifold stay with the bolt and nut.
Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)



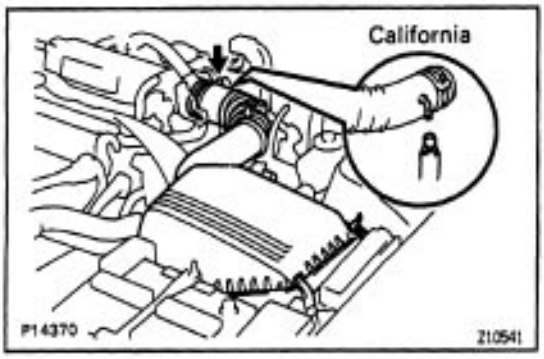
(d) Install the manifold upper heat insulator with the 4 bolts.
(e) Connect the main oxygen and sub oxygen sensor connectors.



33. CONNECT FRONT EXHAUST PIPE
(a) Place a new gasket on the front exhaust pipe.
(b) Using a 14 mm deep socket wrench, install the 3 new nuts holding the front exhaust pipe to the WU –TWC.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(c) Install the bracket with the 2 bolts.

34. INSTALL DISTRIBUTOR
(See page IG–17 and 37)

35. INSTALL GENERATOR (See page CH–24)

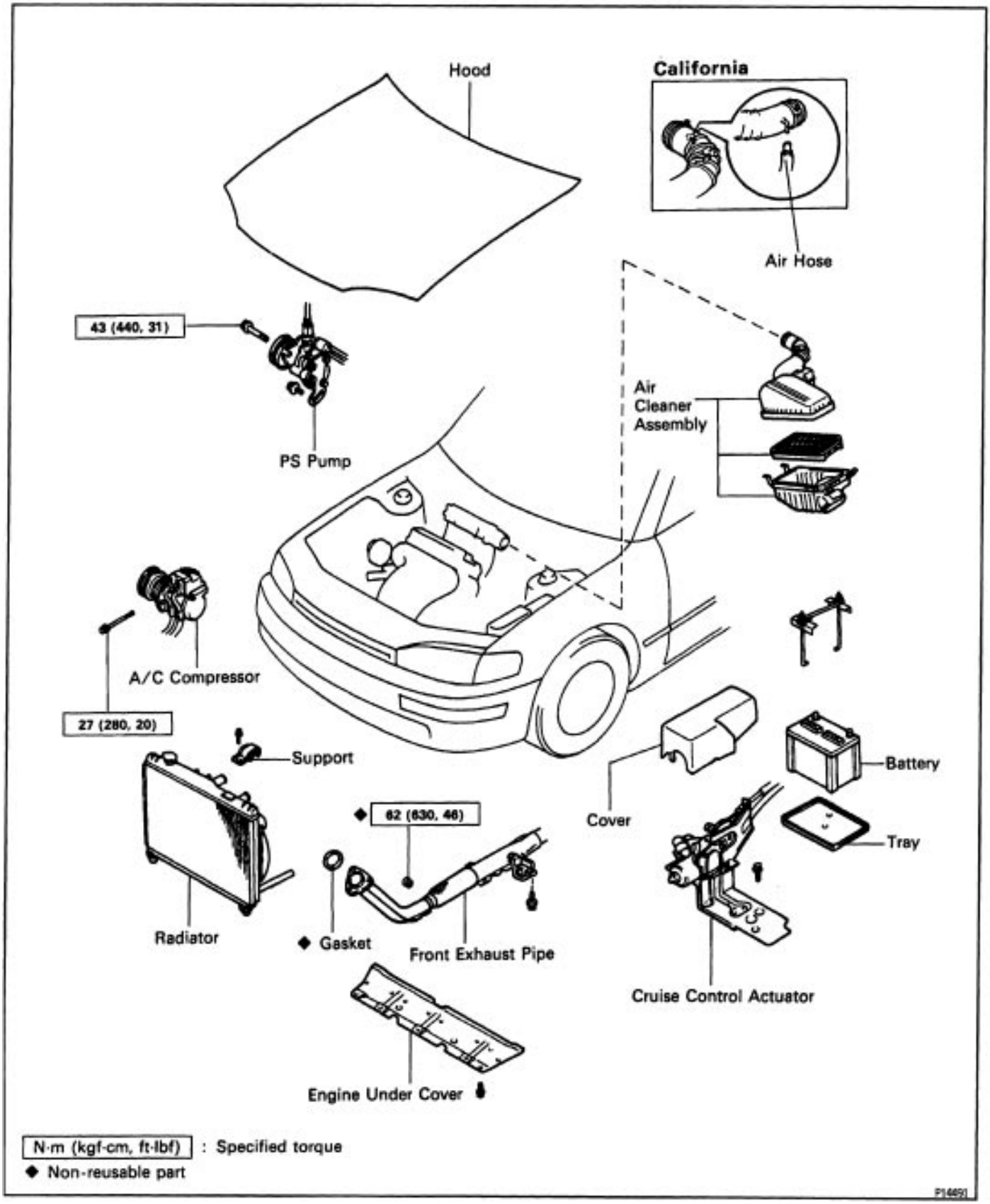


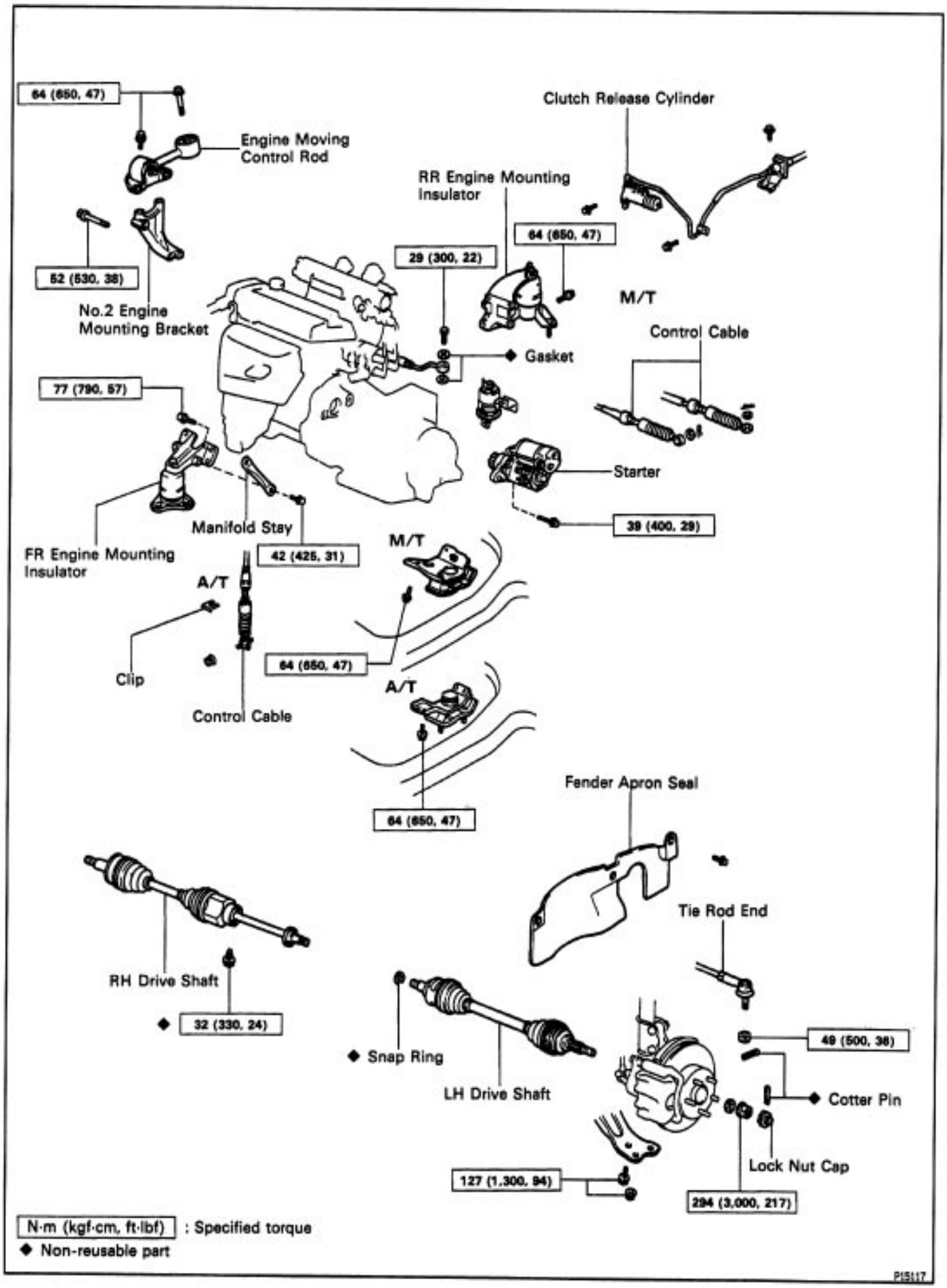
36. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE
(a) Connect the air cleaner hose to the throttle body.
(b) Install the air cleaner cap together with the resonator and air cleaner hose.
(c) California only:
Connect the air hose to the air cleaner hose.
(d) Connect the intake air temperature sensor connector.

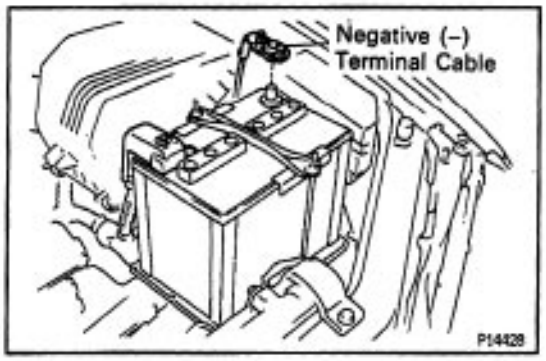
37. A/T:
CONNECT AND ADJUST THROTTLE CABLE
38. CONNECT AND ADJUST ACCELERATOR CABLE
39. FILL WITH ENGINE COOLANT
Capacity:
6.3 liters (6.7 US qts, 5.5 Imp. qts)
40. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
41. START ENGINE AND CHECK FOR LEAKS
42. ADJUST IGNITION TIMING
(See page IG –19 and 38)
Ignition timing:
10®BTDC @ idle
(w/ Terminals TO and E1 connected)
43. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
44. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

CYLINDER BLOCK

COMPONENTS FOR ENGINE REMOVAL AND INSTALLATION




64 (650, 47)
Engine Moving Control Rod
52 (530, 38)
No.2 Engine Mounting Bracket
Clutch Release Cylinder
RR Engine Mounting Insulator
64 (650, 47)
29 (300, 22)
M/T
Gasket
Control Cable
77 (790, 57)
Starter
39 (400, 29)
Manifold Stay
42 (425, 31)
FR Engine Mounting Insulator
A/T
M/T
Clip
64 (650, 47)
Control Cable
A/T
64 (650, 47)
Fender Apron Seal
Tie Rod End
RH Drive Shaft
32 (330, 24)
Snap Ring
LH Drive Shaft
49 (500, 36)
Cotter Pin
Lock Nut Cap
127 (1,300, 94)
294 (3,000, 217)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P15117



ENGINE REMOVAL

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery.

2. REMOVE BATTERY AND TRAY

3. REMOVE HOOD

4. REMOVE ENGINE UNDER COVER

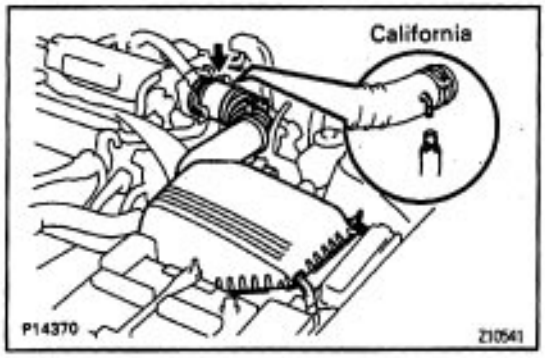
5. DRAIN ENGINE COOLANT

6. DRAIN ENGINE OIL

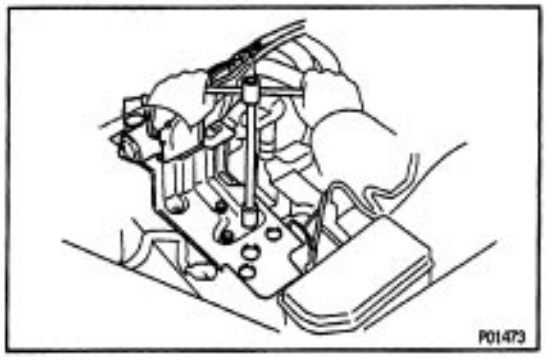
7. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

8. A/T:
DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

9. REMOVE AIR CLEANER ASSEMBLY, RESONATOR AND AIR CLEANER HOSE



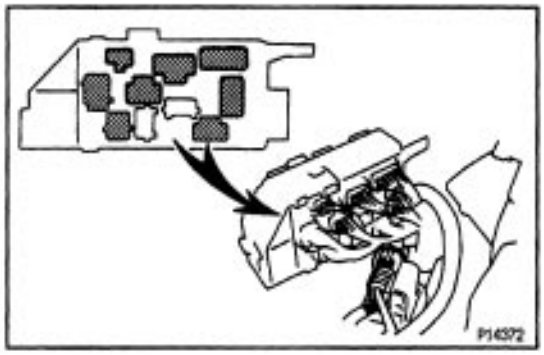
(a) Disconnect the intake air temperature sensor connec–tor.
(b) California only:
Disconnect the air hose from the air cleaner hose.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the 4 air cleaner cap clips.
(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.
(f) Remove the element.
(g) Remove the 3 bolts and air cleaner case.



10. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the actuator cover.
(b) Disconnect the actuator connector.
(c) Remove the 3 bolts, and disconnect the actuator with the bracket.

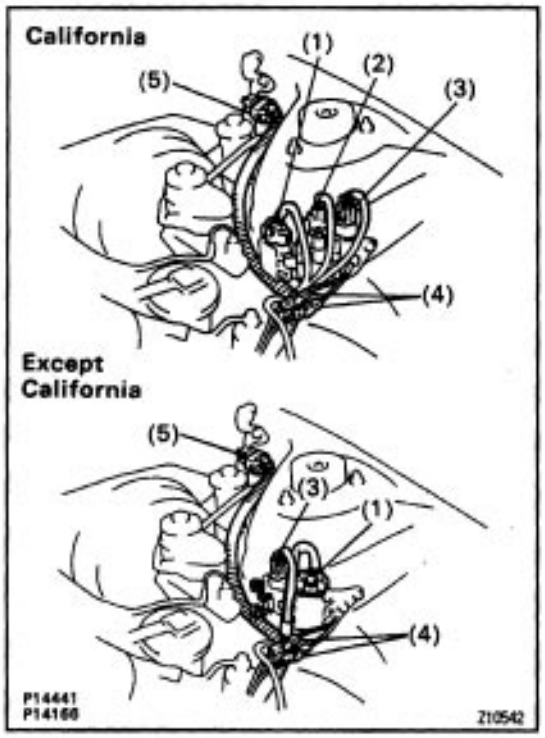
11. REMOVE RADIATOR



12. DISCONNECT WIRES AND CONNECTORS

(a) Remove the engine relay box, and disconnect the 5 connectors.

(b) Connector from LH fender apron



(c) Disconnect the following connectors:

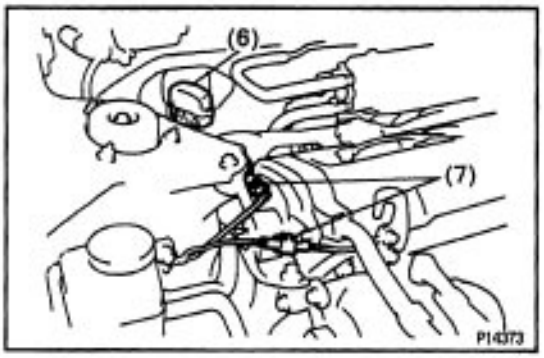
(1) Igniter connector

(2) California only:
Ignition coil connector

(3) Noise filter connector

(4) 2 ground straps from LH fender apron

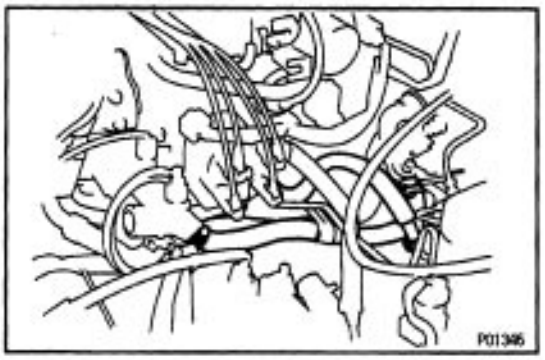
(5) Connector from LH fender apron



(6) Data link connector 1

(7) 2 ground straps from RH fender apron

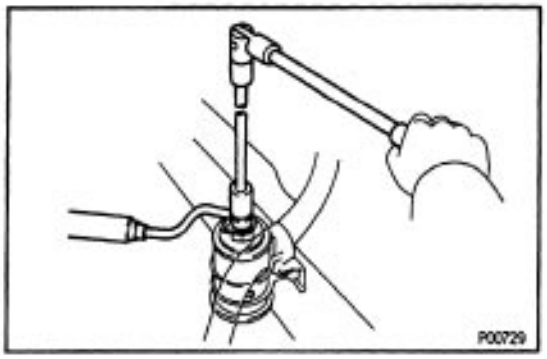
(d) Disconnect the MAP sensor connector.



13. DISCONNECT HEATER HOSES

14. DISCONNECT FUEL RETURN HOSE

CAUTION: Catch leaking fuel in a container.

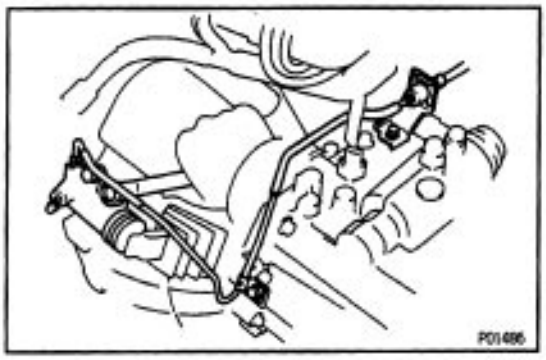


15. DISCONNECT FUEL INLET HOSE

CAUTION: Catch leaking fuel in a container.

16. M/T:

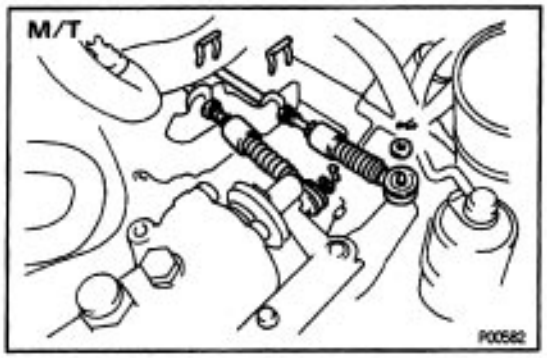
REMOVE STARTER



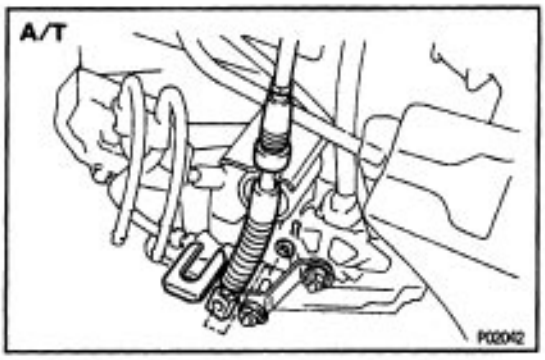
17. M/T:

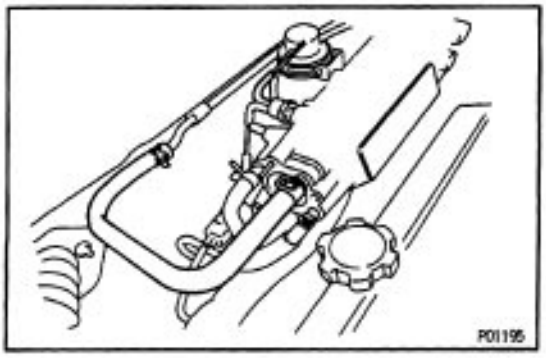
REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE

Remove the 4 bolts, release cylinder and tube from the transaxle.



18. DISCONNECT TRANSAXLE CONTROL CABLE (S) FROM TRANSAXLE





19. DISCONNECT VACUUM HOSES

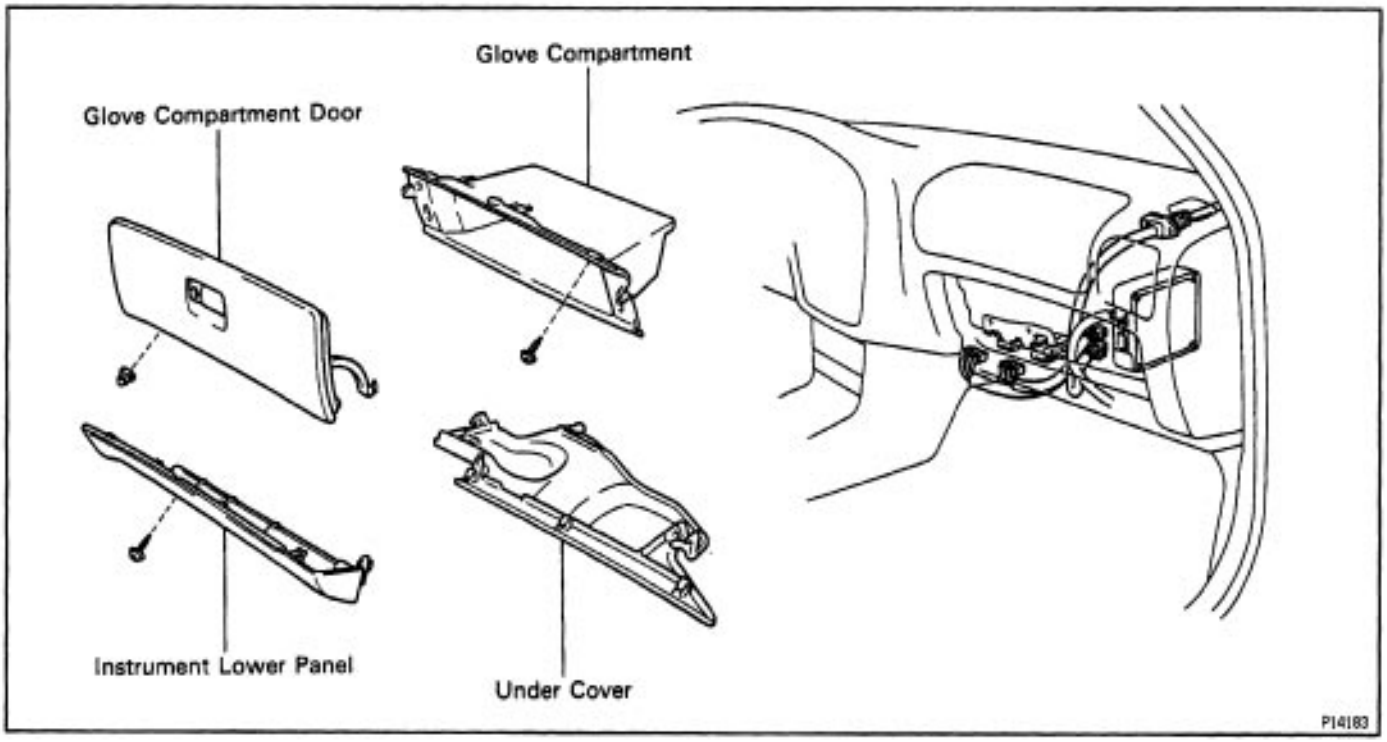
(a) MAP sensor hose from air intake chamber

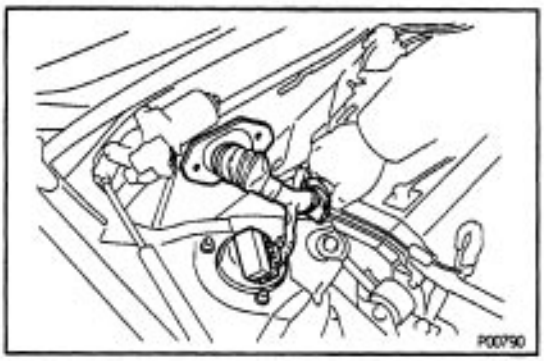
(b) Brake booster vacuum hose from air intake chamber

(c) Charcoal canister vacuum hose

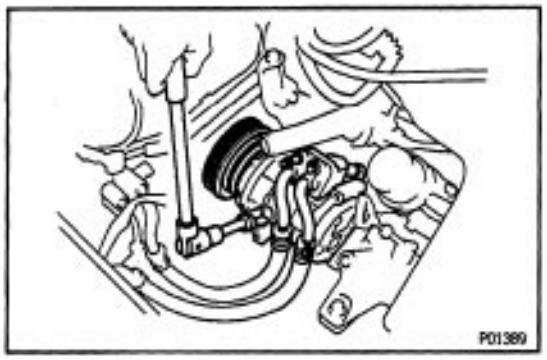
20. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the under cover.
(b) Remove the lower instrument panel.
(c) Remove the glove compartment door.
(d) Remove the glove compartment.
(e) Disconnect the following connectors:
(1) 2 ECM connectors
(2) 2 cowl wire connector





(f) Remove the 2 nuts, and pull out the engine wire from the cowl panel.



21. w/ A/C:

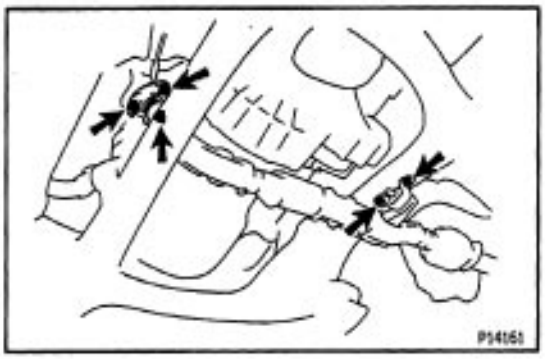
REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the A/C compressor connector.

(b) Remove the drive belt.

(c) Remove the 3 bolts, and disconnect the A/C compres–sor.

HINT: Put aside the compressor, and suspend it to the radiator support with a string.



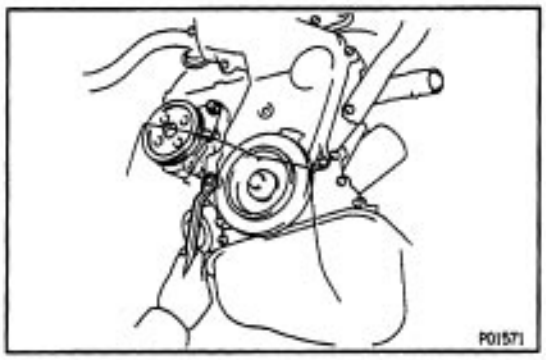
22. DISCONNECT FRONT EXHAUST PIPE

(a) Loosen the 2 bolts, and disconnect the bracket.

(b) Using a 14 mm deep socket wrench, remove the 3 nuts holding the front exhaust pipe to the WU–TWC.

(c) Disconnect the front exhaust pipe and gaskets.

23. REMOVE DRIVE SHAFTS (See page SA–38)



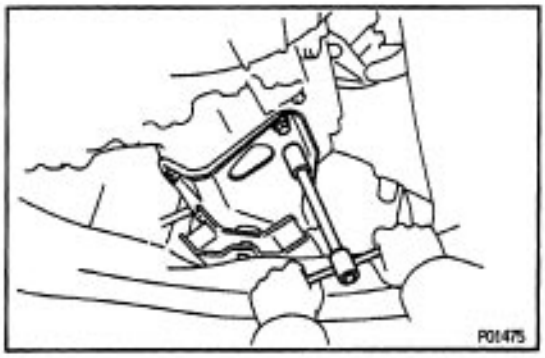
24. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Disconnect the 2 air hoses from the air pipe.

(b) Remove the PS drive belt.

(c) Remove the 2 bolts, and disconnect the PS pump from the engine.

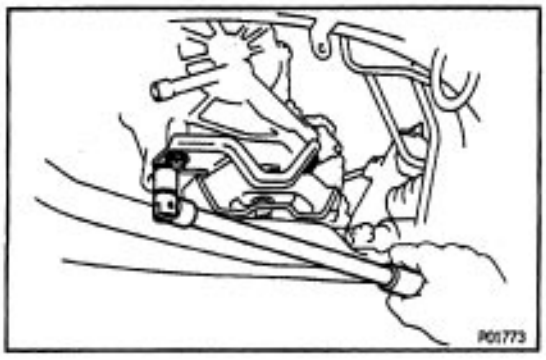
HINT: Put aside the pump and suspend it from the cowl with a string.



25. DISCONNECT LH ENGINE MOUNTING INSULATOR

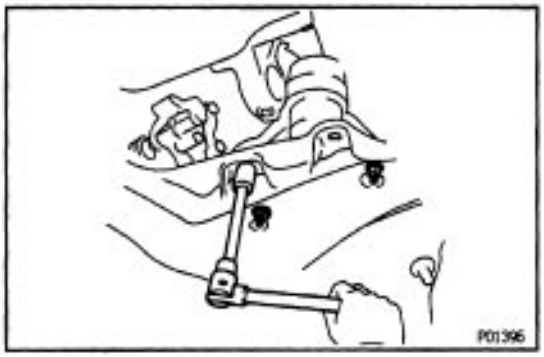
M/T:

Remove the 3 bolts, and disconnect the mounting insulator.



A/T:

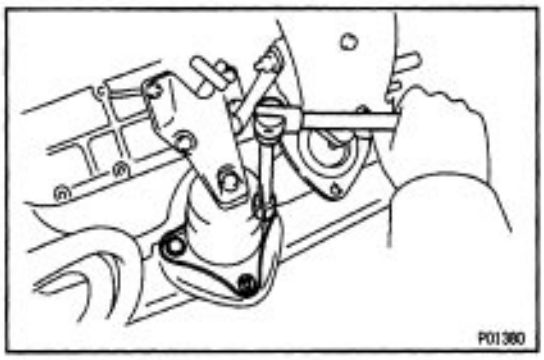
Remove the 4 bolts, and disconnect the mounting insulator.



26. DISCONNECT RR ENGINE MOUNTING INSULATOR

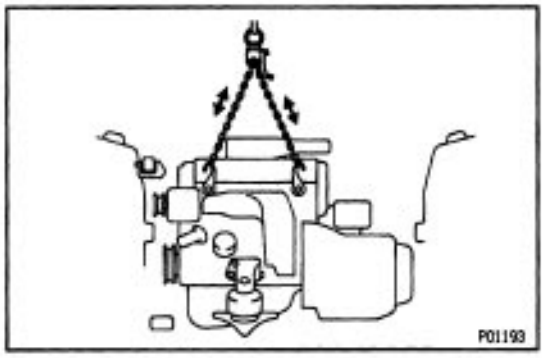
(a) Remove the hole plugs.

(b) Remove the 3 nuts, and disconnect the mounting insulator.

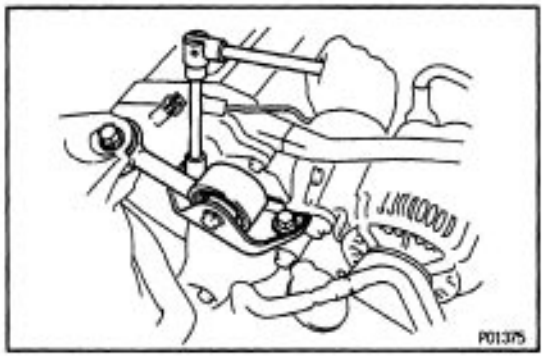


27. DISCONNECT FR ENGINE MOUNTING INSULATOR

Remove the 3 bolts, and disconnect the mounting insulator.

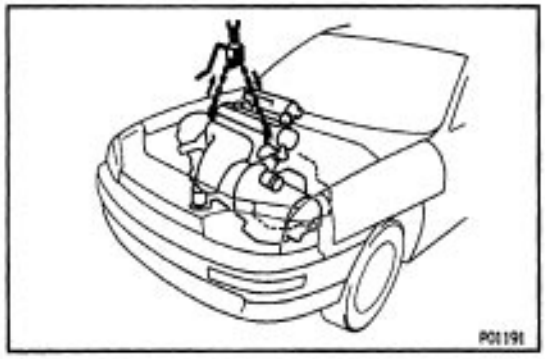


28. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS



29. REMOVE ENGINE MOVING CONTROL ROD

Remove the 3 bolts and control rod.



30. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

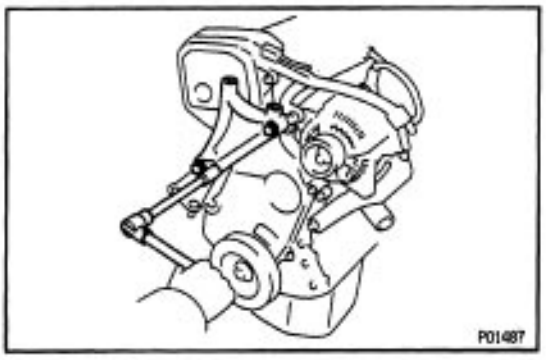
(a) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Be careful not to hit the PS gear housing or perk/neutral position switch (A/T).

(b) Make sure the engine is clear of all wiring, hoses and cables.

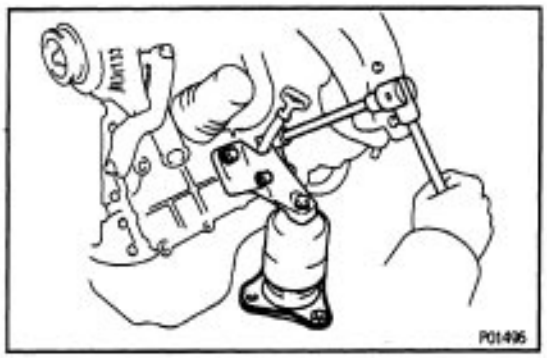
(c) Place the engine and transaxle assembly onto the stand.

31. A/T:
REMOVE STARTER

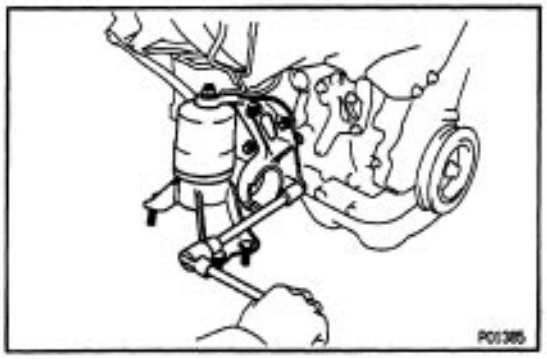
32. SEPARATE ENGINE AND TRANSAXLE
M/T (See page MX–10)
A/T (See page AX1–21)



33. REMOVE N0.2 RH ENGINE MOUNTING BRACKET
Remove the 3 bolts and engine mounting bracket.

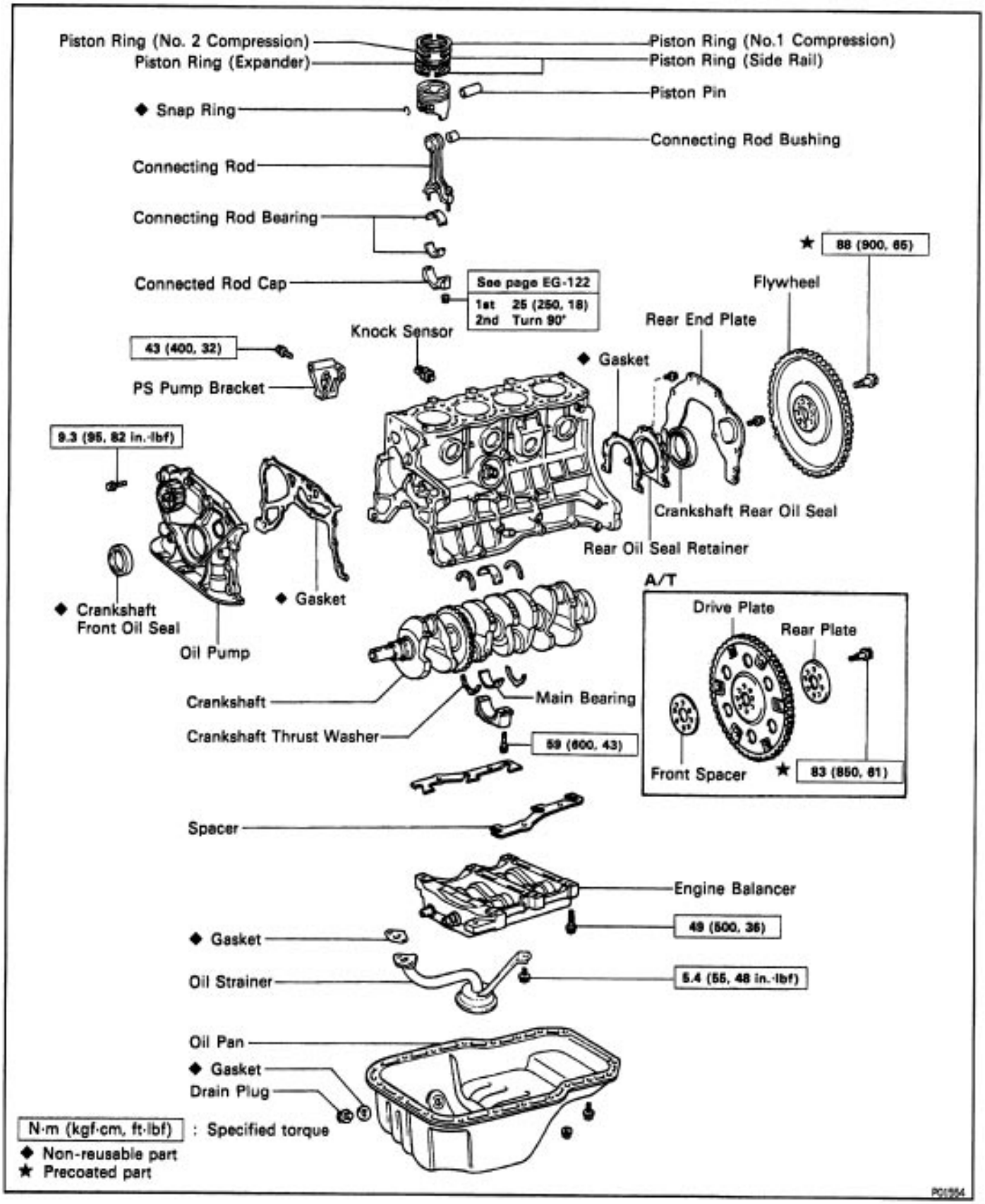


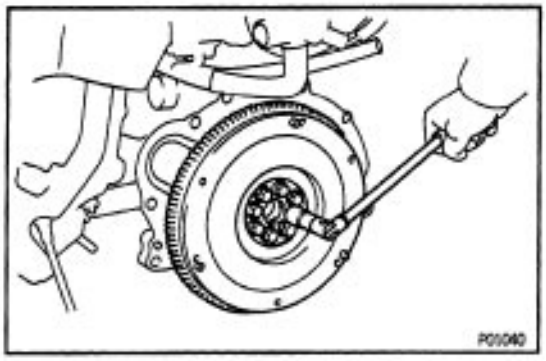
34. REMOVE FR ENGINE MOUNTING INSULATOR
(a) Remove the bolt, nut and manifold stay.
(b) Remove the 4 bolts and mounting insulator.



35. REMOVE RR ENGINE MOUNTING INSULATOR
Remove the 4 bolts and mounting insulator.

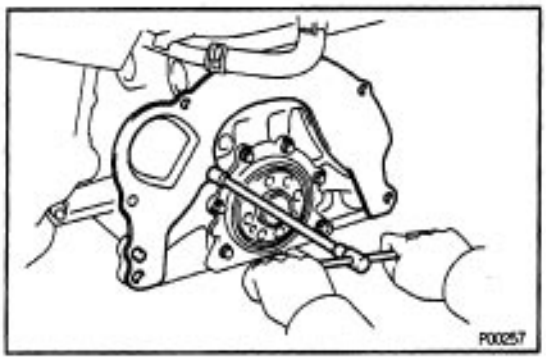
COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY





PREPARATION FOR DISASSEMBLY

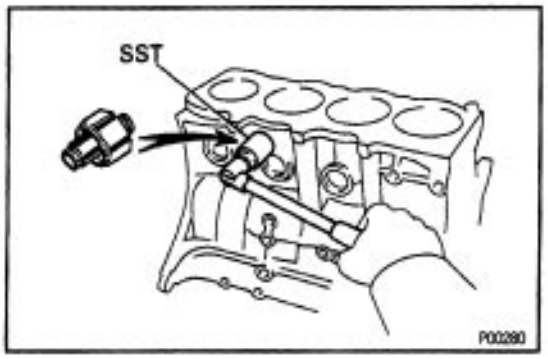
1. M/T:
REMOVE CLUTCH COVER AND DISC
2. M/T:
REMOVE FLYWHEEL
3. A/T:
REMOVE DRIVE PLATE



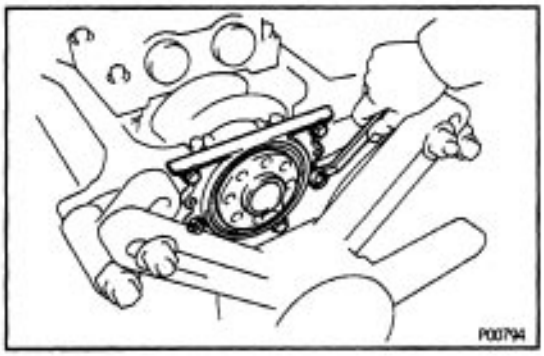
4. REMOVE REAR END PLATE
Remove the bolt and end plate.
5. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY
6. REMOVE GENERATOR
7. REMOVE DISTRIBUTOR

8. REMOVE PS PUMP BRACKET
Remove the 3 bolts and PS pump bracket.

9. REMOVE TIMING BELT AND PULLEYS
10. REMOVE CYLINDER HEAD
11. REMOVE WATER PUMP AND GENERATOR ADJUSTING BAR
12. REMOVE OIL PAN AND OIL PUMP
13. REMOVE OIL FILTER
14. w/ OIL COOLER:
REMOVE OIL COOLER



15. REMOVE KNOCK SENSOR
Using SST, remove the knock sensor.
SST 09816 – 30010

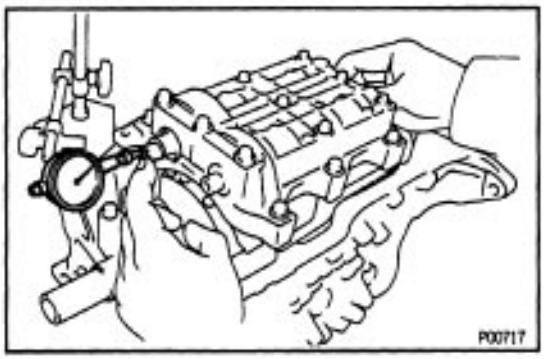


CYLINDER BLOCK DISASSEMBLY

(See Components for Cylinder Block Disassembly and Assembly)

1. REMOVE REAR OIL SEAL RETAINER

Remove the 6 bolts, retainer and gasket.

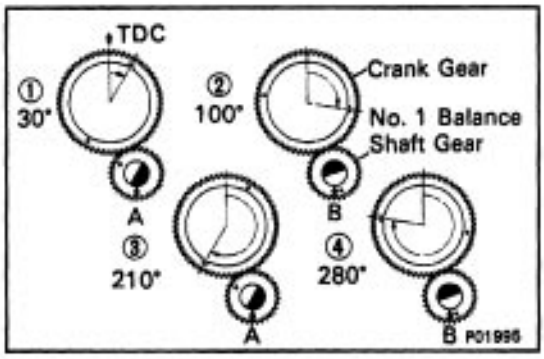


2. CHECK THRUST CLEARANCES OF NO.1 AND NO.2 BALANCE SHAFT OF ENGINE BALANCER

Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:
0.065 – 0.110 mm (0.0026 – 0.0043 in.)
Maximum clearance:
0.11 mm (0.0043 in.)

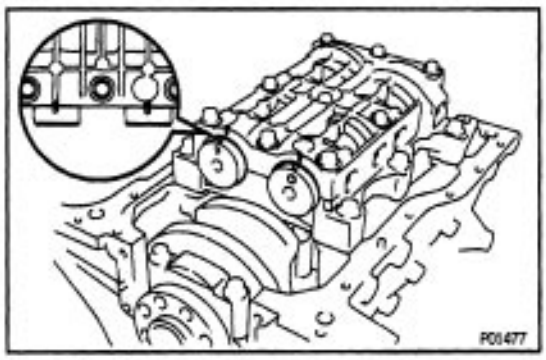
If the clearance is greater than maximum, replace the balance shaft housings and bearings. If necessary, replace the balance shafts.



3. CHECK BACKLASH OF CRANKSHAFT GEAR AND NO.1 BALANCE SHAFT GEAR

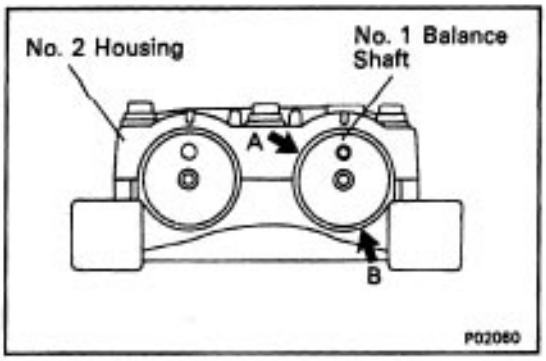
NOTICE:

- **Backlash between the crankshaft gear and No.1 balance shaft gear varies with the rotation of the balance shaft and the deviation of the crankshaft gear.**
- **Accordingly, it is necessary to measure the backlash at the 4 points shown in the illustration on the left. When this inspection is performed on–vehicle, the specifications are increased by approx. 0.025 mm (See specifications below)**

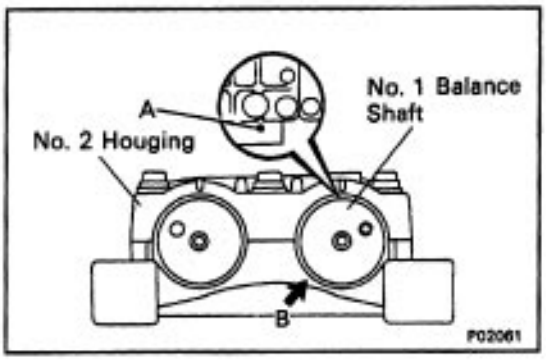


(a) Rotate the crankshaft 2 or 3 times to settle the crank–shaft gear and No.1 balance shaft gear.

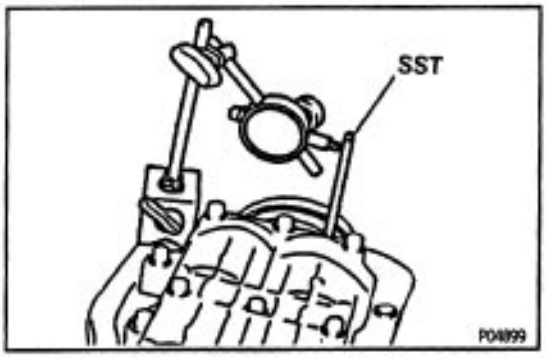
(b) When No.1 piston is at TDC, check that the punch marks shown in the illustration of the balance shafts are aligned with the grooves of the No.2 housing.



(c) Check that the punch marks A and B are at the positions on the No.1 balance shaft indicated in the illustration.

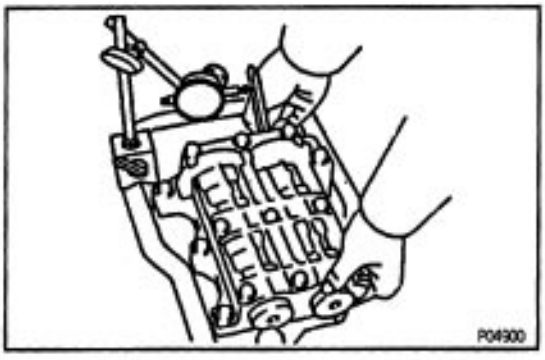


(d) 1 st turn the crankshaft clockwise, and align the groove of the No.2 balance shaft housing with the punch mark A of the No. 1 balance shaft.



(e) Set the SST and the dial indicator as shown in the illustration.
SST 09224– 74010

HINT: Make sure that the–needle of the dial indicator is perpendicular to the SST and that it is placed in the middle of the third indention.



(f) Lightly turn the No. 1 balance shaft by hand and meas–ure the backlash.

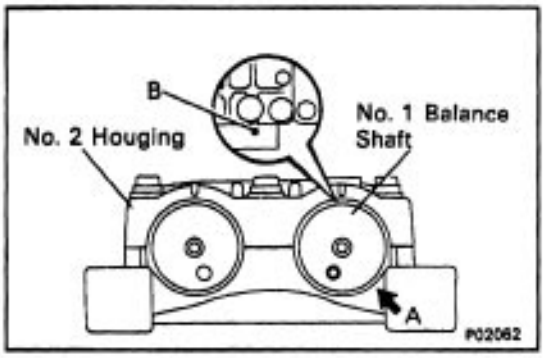
HINT:

- Turn the No.1 balance shaft 4 or 5 times to provide a steady backlash reading.
- To prevent excessive backlash due to thrust cle–arance, measure the backlash while pressing on the rear of the No.1 balance shaft.

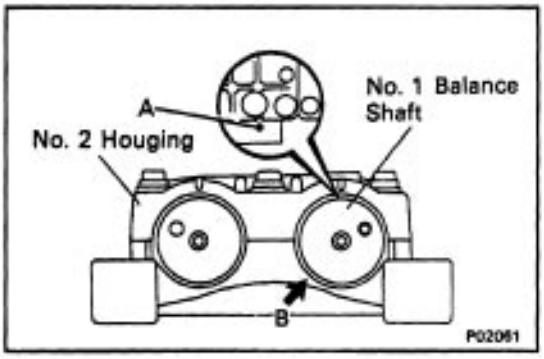
Standard backlash:
Off–vehicle
0–0.06 mm (0–0.0024 In.)
On–vehicle
0.025 – 0.080 mm (0.0010 – 0.0035 in.)

NOTICE: Do not turn the No.1 balance shaft strongly.

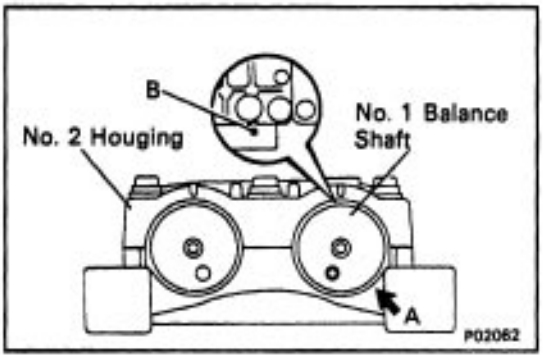
(g) Remove the dial gauge and the SST.



(h) Turn the crankshaft clockwise to align the groove of the No.2 housing with the punch mark B.
(i) Set the dial gauge. (See procedure in step (e))
(j) Measure the backlash. (See procedure in step (f))
Standard backlash:
0 – 0.06 mm (0 – 0.0024 in.)
(k) Remove the dial gauge.



(l) Turn the crankshaft clockwise again to align the groove of the No.2 housing with the punch mark A.
(m) Set the dial gauge. (See procedure in step (e))
(n) Measure the backlash. (See procedure in step (f))
Standard backlash:
0 – 0.06 mm (0 – 0.0024 in.)
(o) Remove the dial gauge.



(p) Turn the crankshaft clockwise again to align the groove of the No.2 housing with the punch mark B.
(q) Set the dial gauge. (See procedure in step (e))
(r) Measure the backlash. (See procedure in step (f))
Standard backlash:
0 – 0.06 mm (0 – 0.0024 In.)
(s) Remove the dial gauge.
If even one of the 4 points measured above exceeds the backlash specification, adjust the backlash with new spacers.

NOTICE: Use the same size spacers for both the left and right sides.

HINT:

- Varying the spacer thickness by 0.02 mm (0.0008 in.) change the backlash by about 0.014 mm (0.0006 in.).
- If the backlash is greater than permitted maxi–mum, select a thinner shim.
- If the backlash is less than the specification, select a thicker shim.

Adjusting Spacer Selection Chart

Measured clearance mm (in.) \ Installed spacer No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
0.000 – 0.060 (0.0000 – 0.0022)																																								
0.061 – 0.067 (0.0023 – 0.0025)		01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35
0.068 – 0.074 (0.0025 – 0.0027)			01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35
0.075 – 0.081 (0.0028 – 0.0030)				01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33
0.082 – 0.088 (0.0030 – 0.0033)					01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	
0.089 – 0.095 (0.0033 – 0.0035)						01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	
0.096 – 0.102 (0.0035 – 0.0038)							01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	
0.103 – 0.109 (0.0038 – 0.0040)								01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.110 – 0.116 (0.0040 – 0.0043)									01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	
0.117 – 0.123 (0.0043 – 0.0045)										01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	
0.124 – 0.130 (0.0046 – 0.0048)											01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	
0.131 – 0.137 (0.0048 – 0.0051)												01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	
0.138 – 0.144 (0.0051 – 0.0053)													01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	
0.145 – 0.151 (0.0054 – 0.0056)														01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	
0.152 – 0.158 (0.0056 – 0.0058)															01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	
0.159 – 0.165 (0.0059 – 0.0061)																01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	
0.166 – 0.172 (0.0061 – 0.0064)																	01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	
0.173 – 0.179 (0.0064 – 0.0066)																		01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	
0.180 – 0.186 (0.0067 – 0.0069)																			01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	
0.187 – 0.193 (0.0069 – 0.0071)																				01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	
0.194 – 0.200 (0.0072 – 0.0074)																					01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	
0.201 – 0.207 (0.0074 – 0.0077)																						01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	
0.208 – 0.214 (0.0077 – 0.0079)																							01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	
0.215 – 0.221 (0.0079 – 0.0082)																								01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	13	
0.222 – 0.228 (0.0082 – 0.0084)																									01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	13	
0.229 – 0.235 (0.0085 – 0.0087)																										01	01	01	01	01	03	03	05	05	07	07	09	09	11	11	
0.234 – 0.242 (0.0087 – 0.0089)																											01	01	01	01	03	03	05	05	07	07	09	09	11	
0.243 – 0.249 (0.0090 – 0.0092)																												01	01	01	01	01	03	03	05	05	07	07	09	09
0.250 – 0.256 (0.0092 – 0.0095)																													01	01	01	01	01	03	03	05	05	07	07	09
0.257 – 0.263 (0.0095 – 0.0097)																														01	01	01	01	01	03	03	05	05	07	07
0.264 – 0.270 (0.0098 – 0.0100)																															01	01	01	01	01	03	03	05	05	07
0.271 – 0.277 (0.0100 – 0.0102)																																01	01	01	01	01	03	03	05	05
0.278 – 0.284 (0.0103 – 0.0105)																																	01	01	01	01	01	03	03	05
0.285 – 0.291 (0.0105 – 0.0108)																																		01	01	01	01	01	03	03
0.292 – 0.298 (0.0108 – 0.0110)																																			01	01	01	01	01	03
0.299 – 0.305 (0.0110 – 0.0113)																																				01	01	01	01	01
0.306 – 0.312 (0.0113 – 0.0115)																																					01	01	01	01
0.313 – 0.319 (0.0116 – 0.0118)																																						01	01	01
0.320 – 0.326 (0.0118 – 0.0120)																																							01	01
0.327 – 0.333 (0.0120 – 0.0123)																																								01

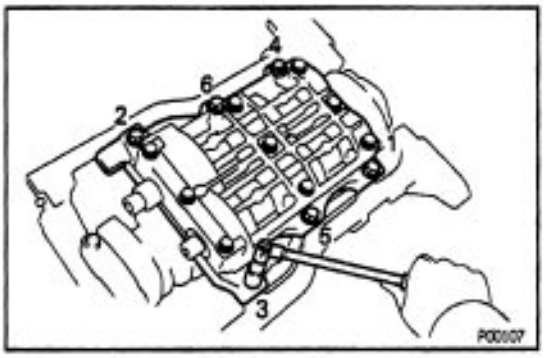
Backlash of crankshaft and No. 1 balance shaft gear:
0 – 0.60 mm (0 – 0.0022 in.)

EXAMPLE: The No. 25 spacers are installed and the measured clearance is 0.140 mm (0.0055 in.). Replace the No. 25 spacers with No. 9 spacers.

New spacer thickness mm (in.)

No.	Thickness	No.	Thickness	No.	Thickness	No.	Thickness
01	1.74 (0.0685)	11	1.84 (0.0724)	21	1.94 (0.0764)	31	2.04 (0.0803)
03	1.76 (0.0693)	13	1.86 (0.0732)	23	1.96 (0.0772)	33	2.06 (0.0811)
05	1.78 (0.0701)	15	1.88 (0.0740)	25	1.98 (0.0780)	35	2.08 (0.0819)
07	1.80 (0.0709)	17	1.90 (0.0748)	27	2.00 (0.0787)	37	2.10 (0.0827)
09	1.82 (0.0717)	19	1.92 (0.0756)	29	2.02 (0.0795)	39	2.12 (0.0835)

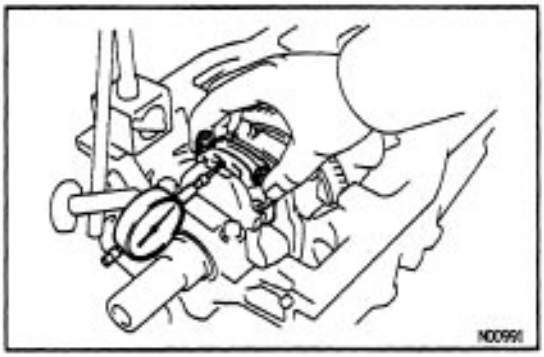
V00096



4. REMOVE ENGINE BALANCER

(a) Uniformly loosen and remove the 6 bolts in several passes, in the sequence shown.

(b) Remove the engine balancer and spacers.

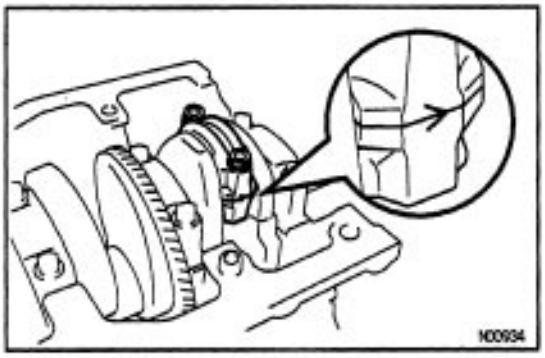


5. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

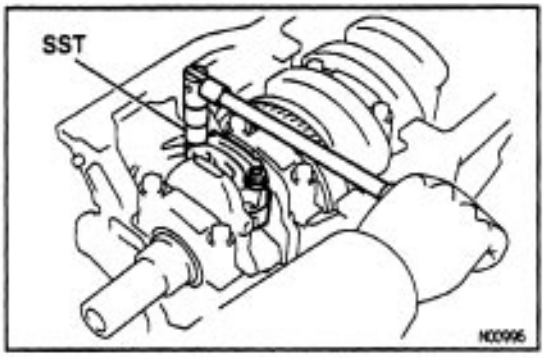
Standard thrust clearance:
0.160 – 0.312 mm (0.0063 – 0.0123 in.)
Maximum thrust clearance:
0.36 mm (0.0138 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

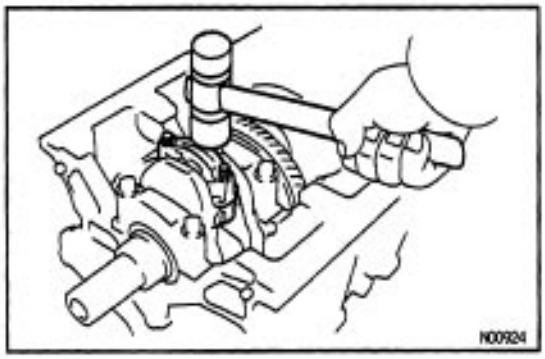


6. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.

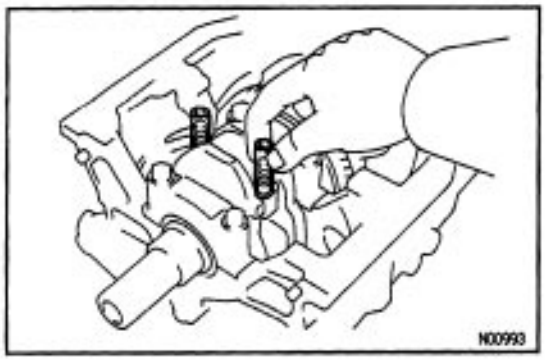


(b) Using SST, remove the connecting rod cap nuts.
SST 09011–38121

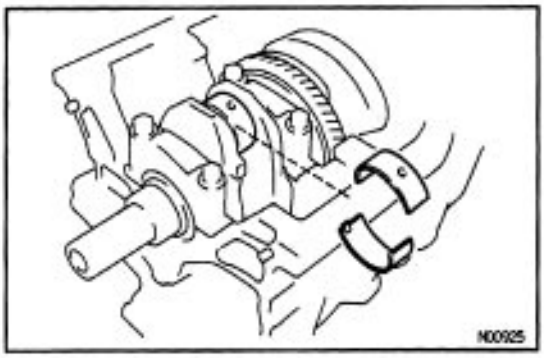


(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT: Keep the lower bearing inserted with the connecting rod cap.



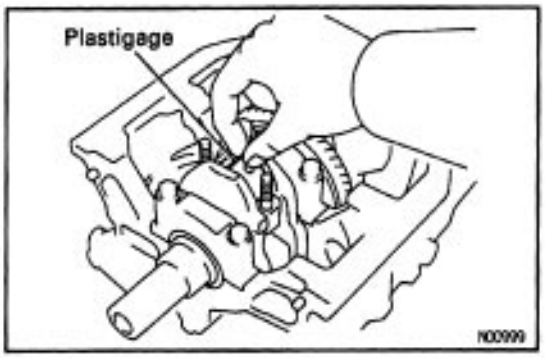
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



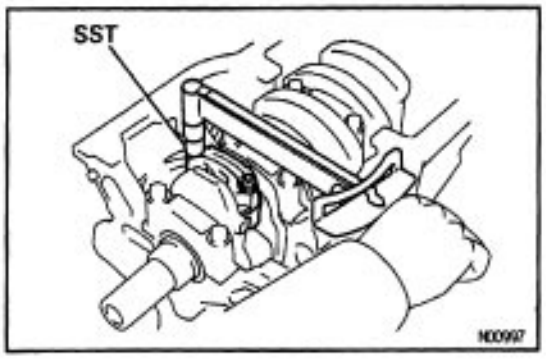
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



(g) Lay a strip of Plastigage across the crank pin.



(h) Install the connecting rod cap.

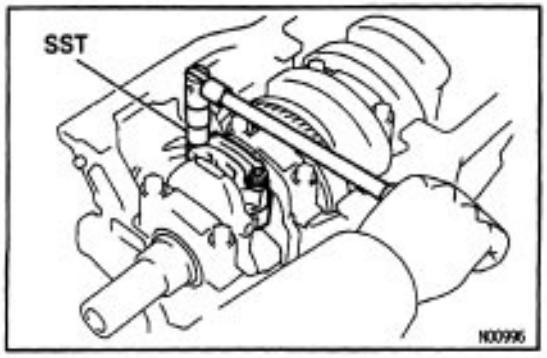
(See step 6 on pages EG1–122)

1st

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

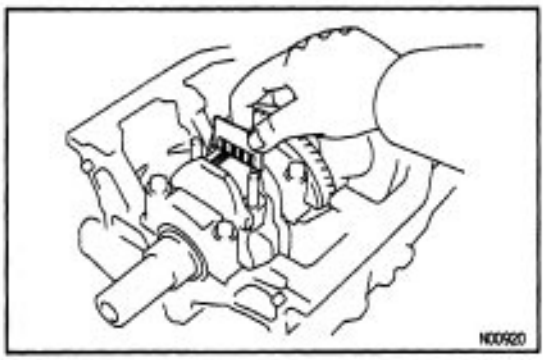
2nd Turn 90°

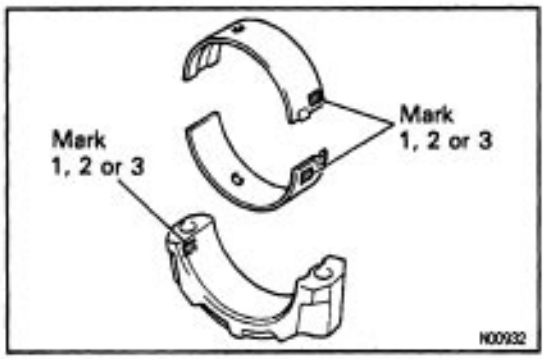
NOTICE: Do not turn the crankshaft.



(i) Remove the connecting rod cap.

(See procedure (b) and (c) on the previous page)





(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.024 – 0.055 mm (0.0009 – 0.0022 in.)

U/S 0.25

0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance:

0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crank–shaft.

HINT: If using a standard bearing, replace it with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked *11', "2" and "3" accordingly.

Standard sized bearing center wall thickness:

Mark "1"

1.484 – 1.488 mm (0.0584 – 0.0586 in.)

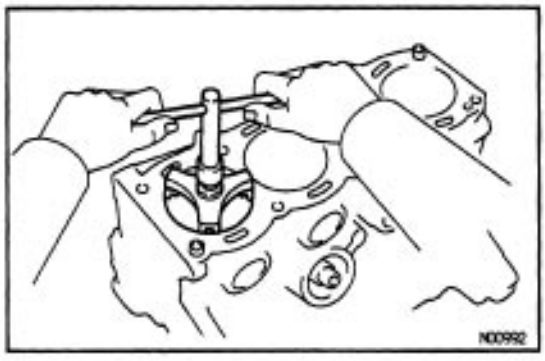
Mark "2"

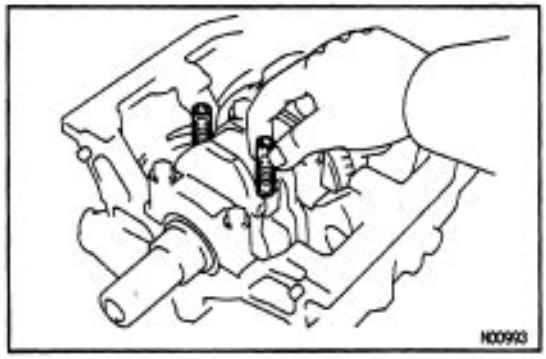
1.488 – 1.492 mm (0.0586 – 0.0587 in.)

Mark "3"

1.492 – 1.498 mm (0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.



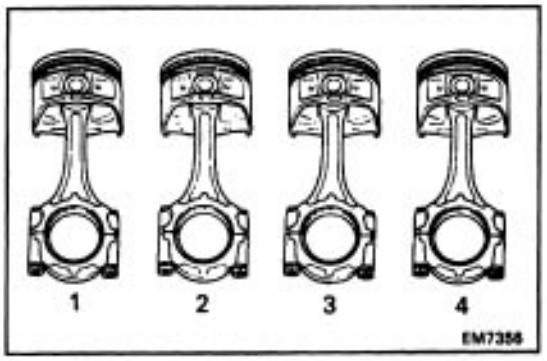


7. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.

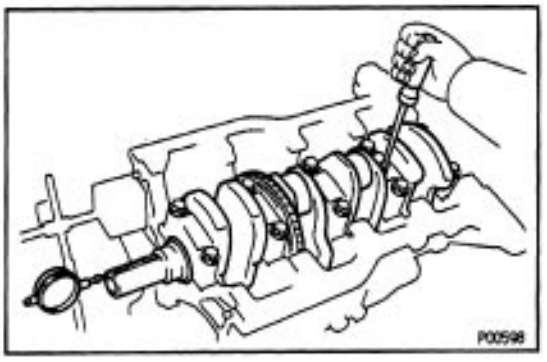
(b) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



8. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.020 – 0.220 mm (0.0008 – 0.0087 in.)

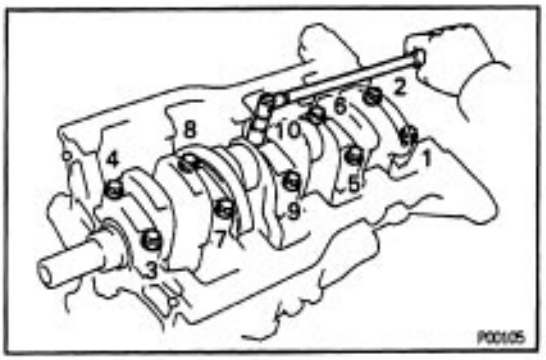
Maximum thrust clearance:

0.30 mm l0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

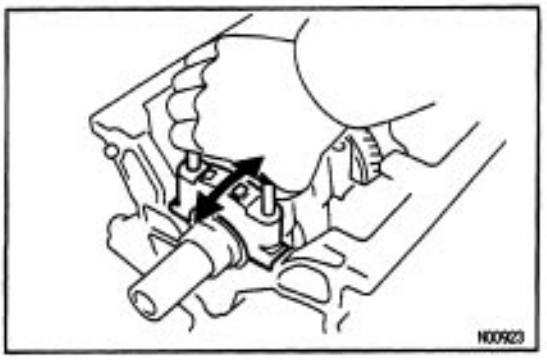
Thrust washer thickness:

2.440 – 2.490 mm 10.0961 – 0.0980 in.)



9. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

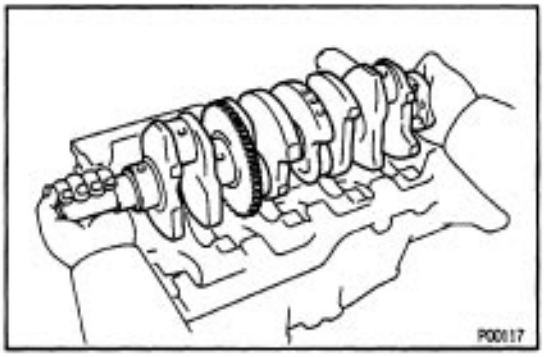
(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.



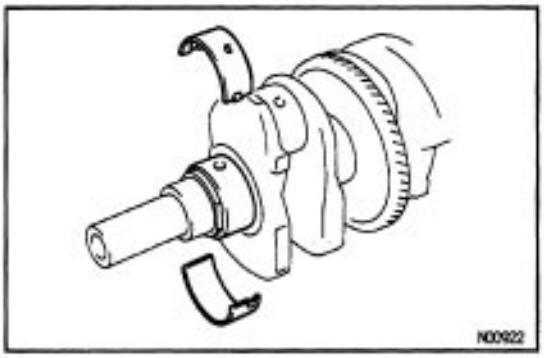
(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and lower thrust washers (No.3 main bearing cap only).

HINT:

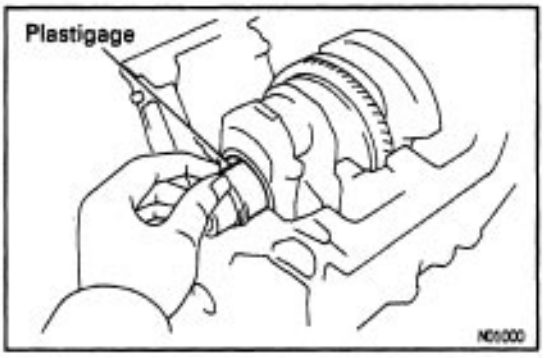
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



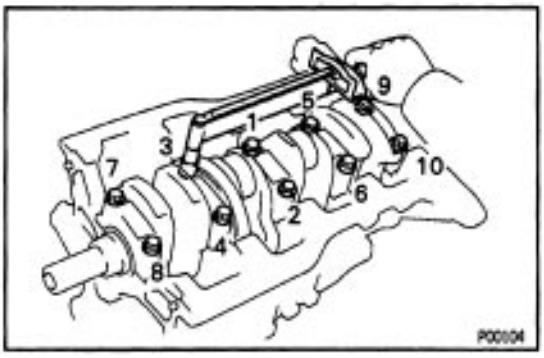
(c) Lift out the crankshaft.
HINT: Keep the upper bearing and upper thrust washers together with the cylinder block.



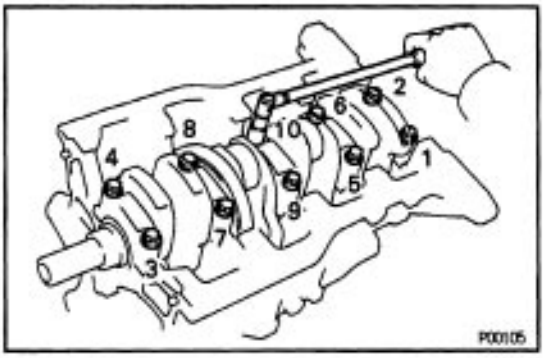
(d) Clean each main journal and bearing.
(e) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



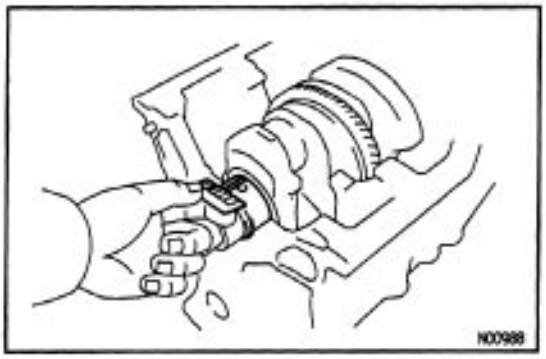
(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.



(h) Install the main bearing caps.
(See step 4 on page EG1–121)
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
NOTICE: Do not turn the crankshaft.



(i) Remove the main bearing caps.
(See procedure (a) and (b) on the previous page)



Measure the Plastigage at its widest point.

Standard clearance:

No.3

STD

0.025 – 0.044 mm (0.0010 – 0.0017 in.)

U/S 0.25

0.027 – 0.067 mm (0.0011 – 0.0026 in.)

Others

STD

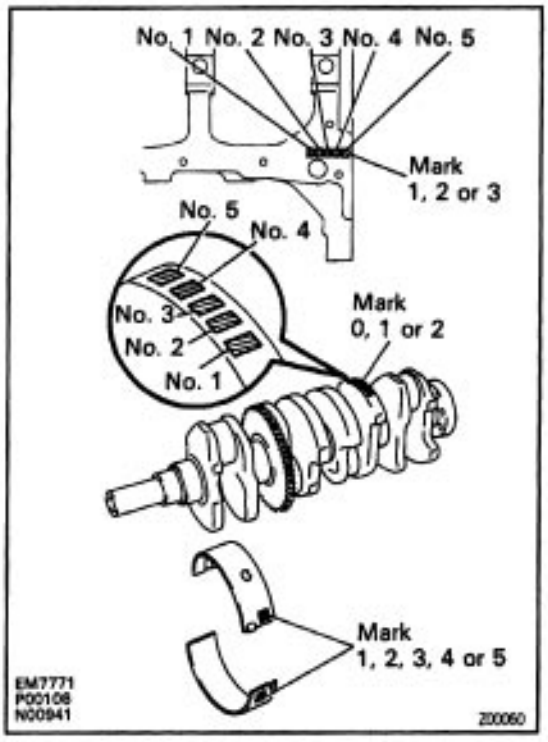
0.015 – 0.034 mm (0.00015 – 0.0013 in.)

U/S 0.25

0.019 – 0.059 mm (0.0007 – 0.0023 in.)

Maximum clearance:

0.08 mm (0.0031 In.)



HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

No.3:

0.027 – 0.054 mm (0.0011 – 0.0021 in.)

Others

0.017 – 0.044 mm (0.0007 – 0.0017 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crank–shaft.

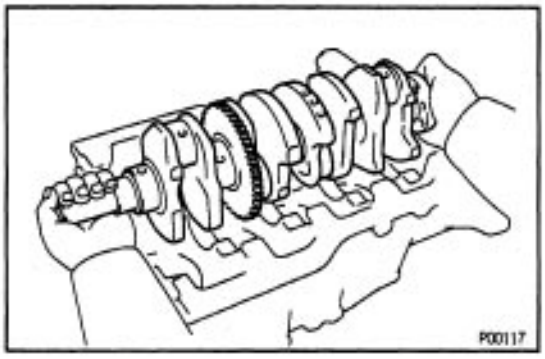
HINT: If using a standard bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylin–der block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked “1”, “2”, “3”, “4” and “5” accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block “2” + Crankshaft “11”
= Total number 3 (Use bearing “3”)

V00240

Reference:
Cylinder block main journal bore diameter:
Mark "1"
59.020 – 59.026 mm (2.32318 – 2.3239 in.)
Mark "2"
59.026 – 59.032 mm (2.3239 – 2.3241 in.)
Mark "3"
59.032 – 59.038 mm (2.3241 – 2.3243 in.)
Crankshaft journal diameter:
Mark "0"
54.998 – 55.003 mm (2.1653 – 2.1655 in.)
Mark "11"
54.993–54.998 mm (2.1651 – 2.1653 in.)
Mark "2"
54.988 – 54.993 mm (2.1649 – 2.1651 in.)
Standard sized bearing center wall thickness:
No–3
Mark "I"
1.992 – 1.995 mm (0.0784 – 0.0785 in.)
Mark '2"
1.995 – 1.998 mm (0.0785 – 0.0787 in.)
Mark "3"
1.998 – 2.001 mm (0.0787 – 0.0788 in.)
Mark '4"
2.001 – 2.004 mm (0.0788 – 0.0789 in.)
Mark '5'
2.004 – 2.007 mm (0.0789 – 0.0790 in.)
Others
Mark "I"
1.997 – 2.000 mm (0.0786 – 0.0787 in.)
Mark '2'
2.000 – 2.003 mm (0.0787 – 0.0789 in.)
Mark "3"
2.003 – 2.006 mm (0.0789 – 0.0790 in.)
Mark '4'
2.006 – 2.009 mm (0.0790 – 0.0791 in.)
Mark '5'
2.009 – 2.012 mm (0.0791 – 0.0792 in.)

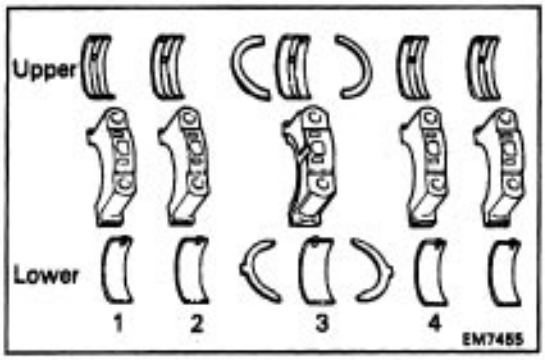


(k) Completely remove the Plastigage.

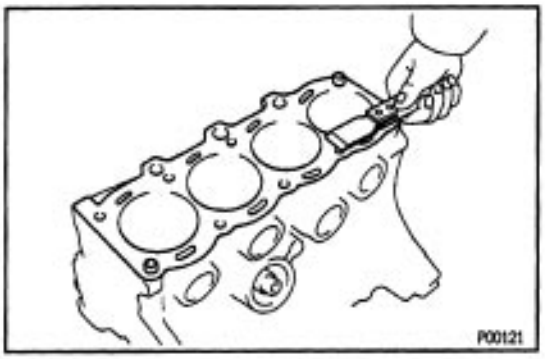
10. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper bearings and upper thrust washers from the cylinder block.



HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.



CYLINDER BLOCK INSPECTION

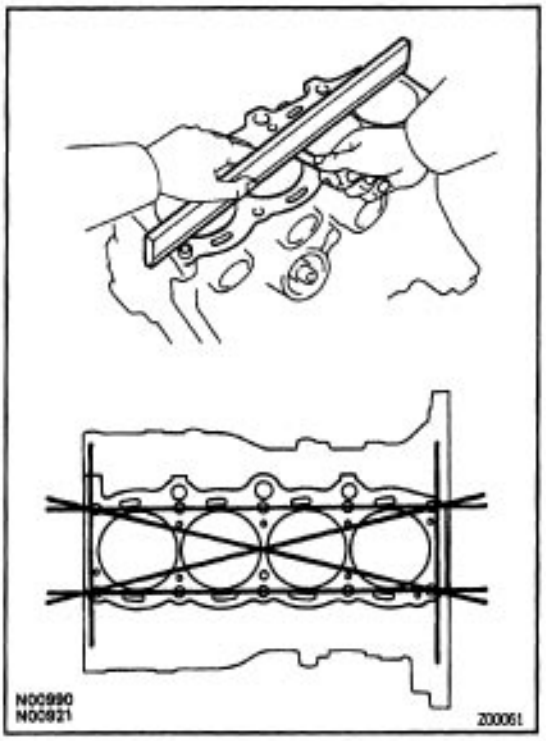
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.

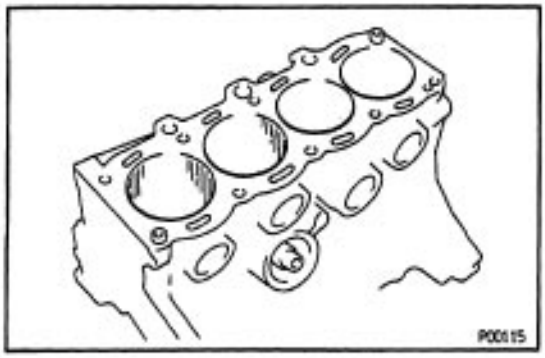


2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:
0.05 mm (0.0020 In.)

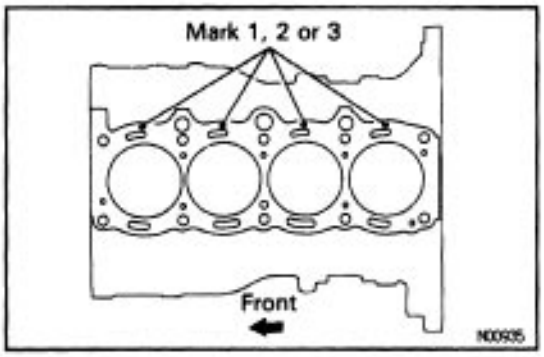
If warpage is greater than maximum, replace the cylin–der block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

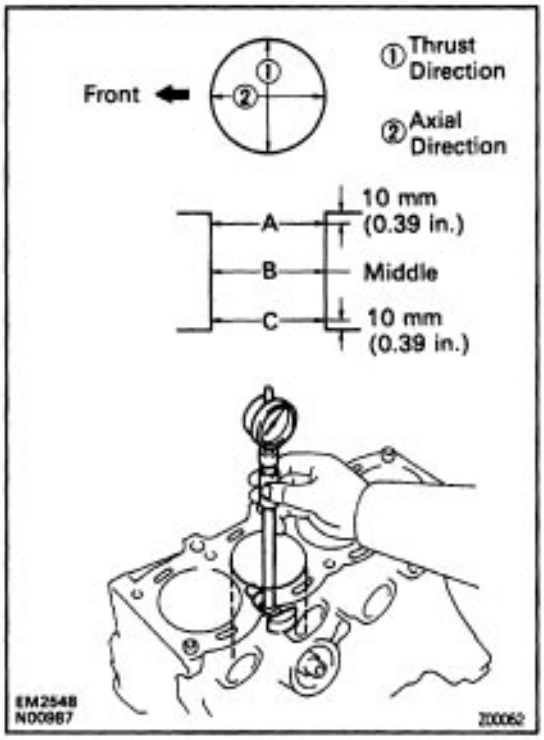
Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 4 cylin–ders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are 3 sizes of the standard cylinder bore diameter, marked “1”, “2” and “3” accordingly. The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

STD

Mark “1”

87.000 – 87.010 mm (3.4252 – 3.4256 in.)

Mark “2”

87.010 – 87.020 mm (3.4256 – 3.4260 in.)

Mark “3”

87.020 – 87.030 mm (3.4260 – 3.4264 In.)

Maximum diameter:

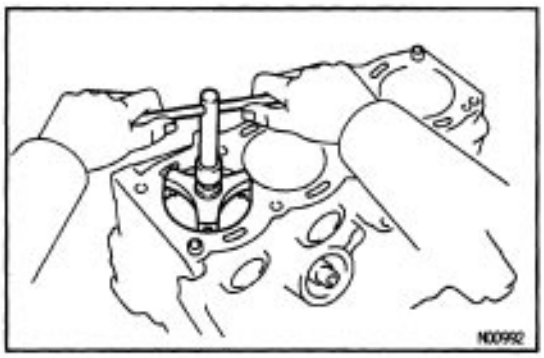
STD

87.23 mm (3.4342 in.)

O/S 0.50

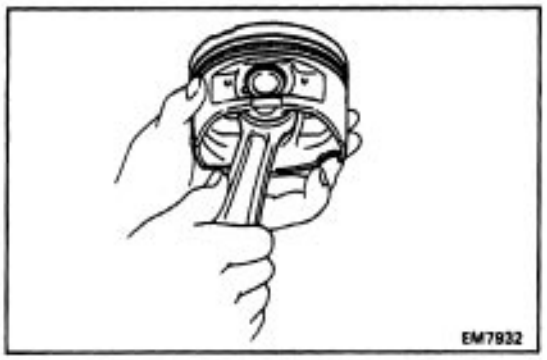
87.73 mm (3.4350 In.)

If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.



5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.

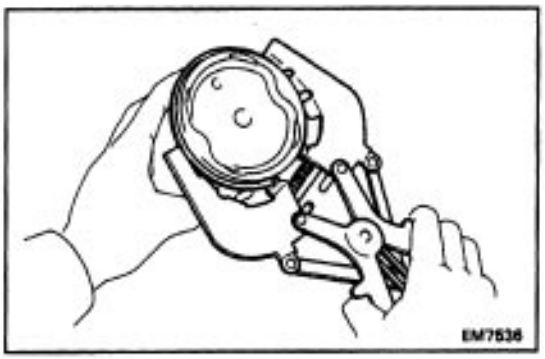


PISTON AND CONNECTING ROD ASSY DISASSEMBLY

1. CHECK FIT BETWEEN PISTON AND PISTON PIN

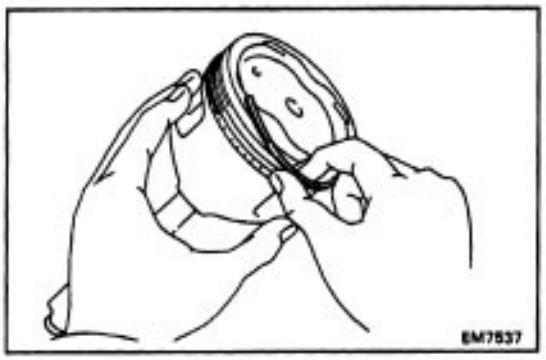
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.



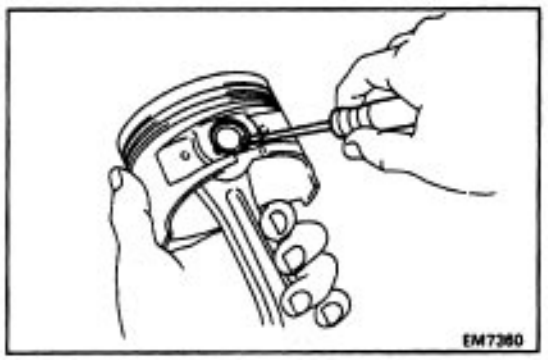
2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.



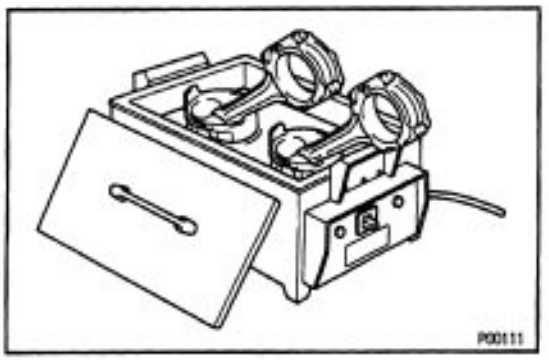
(b) Remove the 2 side rails and oil ring by hand.

HINT: Arrange the rings in correct order only.

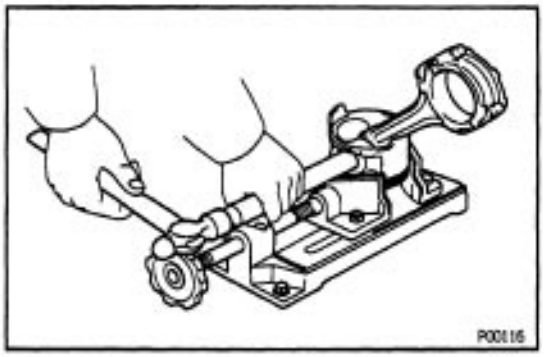


3. DISCONNECT CONNECTING ROD FROM PISTON

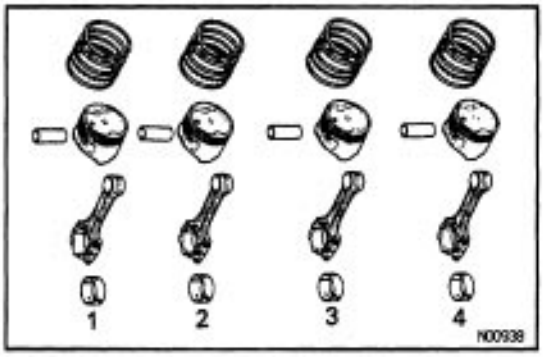
(a) Using a small screwdriver, pry out the 2 snap rings.



(b) Gradually heat the piston to 80–90°C (176–194°F).



(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

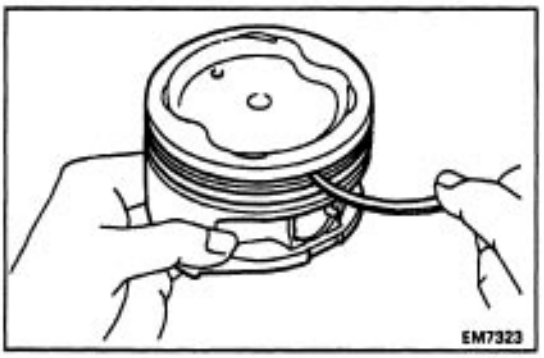


HINT:
The piston and pin are a matched set.
Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

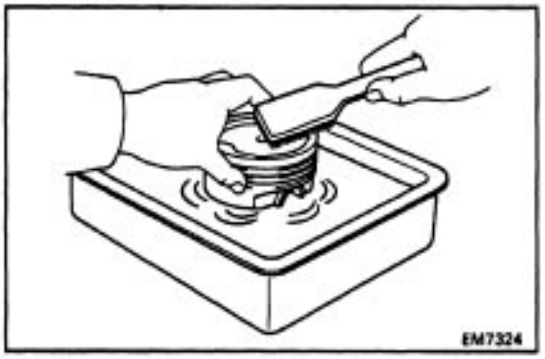
PISTON AND CONNECTING ROD INSPECTION

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

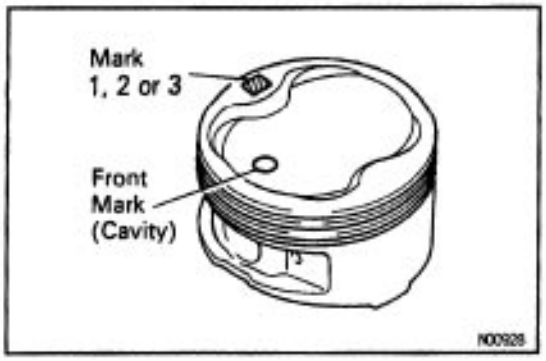


(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

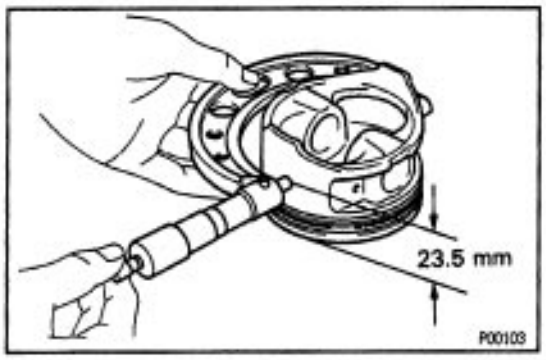
NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are 3 sizes of the standard piston diame–ter, marked “1”, “2” and “3” accordingly. The mark is stamped on the piston top.



(a) Using a micrometer, measure the piston diameter at ring angles to the piston pin center line, 23.5 mm (0.925 in.) from the piston head.

Piston diameter:

STD

Mark “I”

86.85–86.86 mm (3.4193 – 3.4197 in.)

Mark “2”

86.86–86.87 mm (3.4197 – 3.4201 In.)

Mark “3”

86.87 – 86.88 mm (3.4201 – 3.4205 in.)

O/S 0.50

87.35 – 87.38 mm (3.4390 – 3.4402 in.)

(b) Measure the cylinder bore diameter in the thrust di–rections.

(See step 4 on page EG1–106)

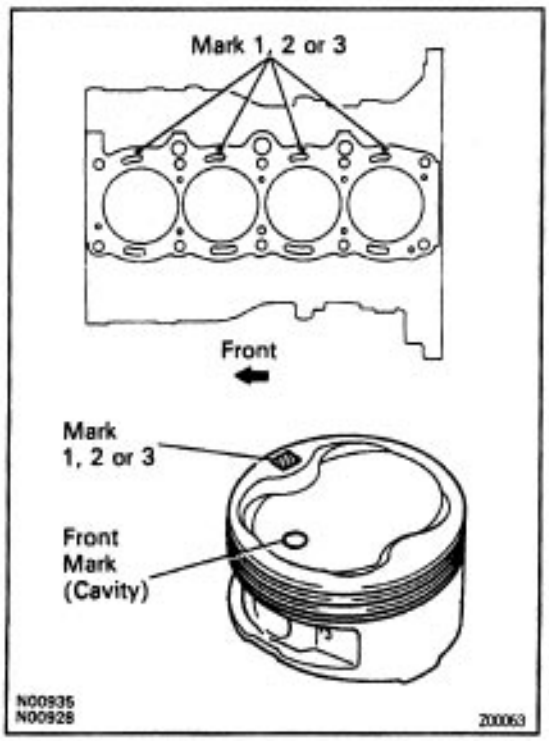
(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.14 – 0.16 mm (0.0055 – 0.0063 in.)

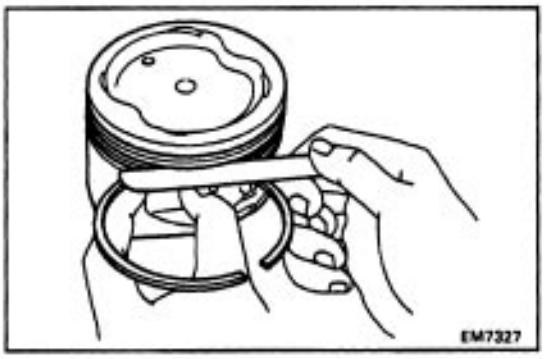
Maximum oil clearance:

0.18 mm (0.0071 in.)



If the oil clearance is greater than maximum, replace all the 4 pistons and rebore all the 4 cylinders. If necessary, replace the cylinder block.

HINT (Use new cylinder block): Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.



B. Inspect piston ring groove clearance

Using a thickness gauge, measure the clearance be–tween new piston ring and the wall of the piston ring groove.

Ring groove clearance:

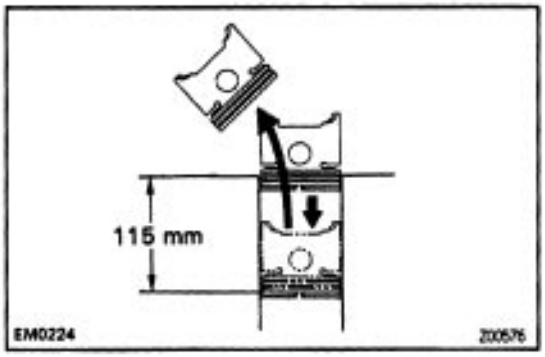
No.1

0.040 – 0.080 mm (0.0016 – 0.0031 In.)

No.2

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

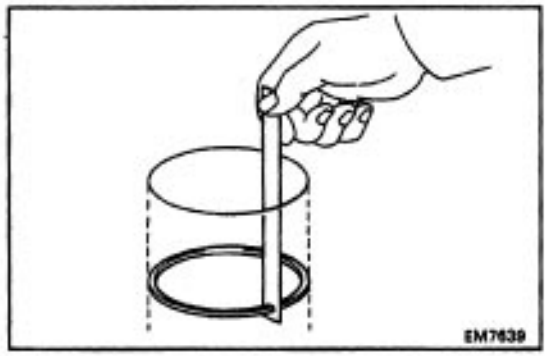
If the clearance is greater than maximum, replace the piston.



C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 115 mm (4.53 in.) from the top of the cylinder block.



(c) Using a thickness gauge, measure the end gap.

Standard and gap:

No.1

0.270 – 0.500 mm (0.0106 – 0.0197 in.)

No.2

0.350 – 0.600 mm (0.0138 – 0.0234 in.)

Oil (Side rail)

0.200 – 0.550 mm (0.0079 – 0.0217 in.)

Maximum end gap:

No.1

1.10 mm (0.0433 in.)

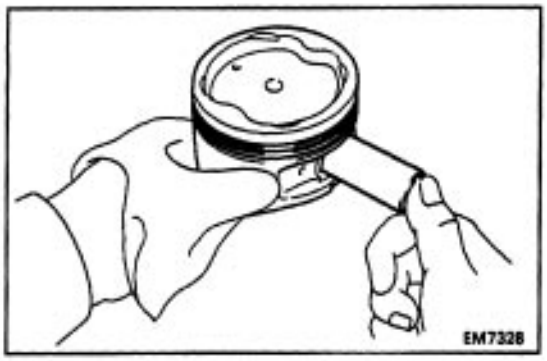
No.2

1.20 mm (0.0472 In.)

Oil (Side rail)

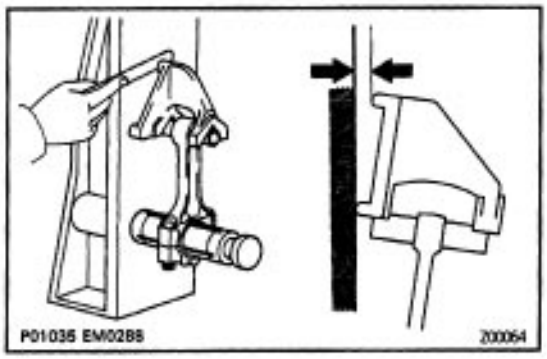
1.15 mm (0.0453 In.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



D. Inspect–piston pin fit

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.

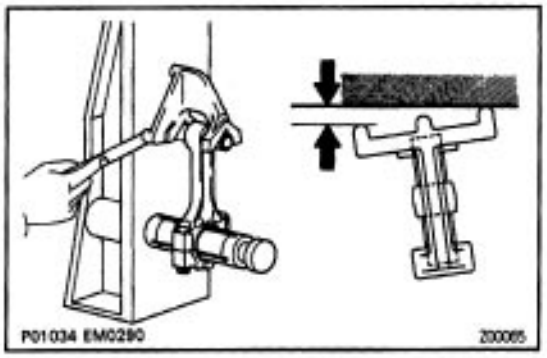


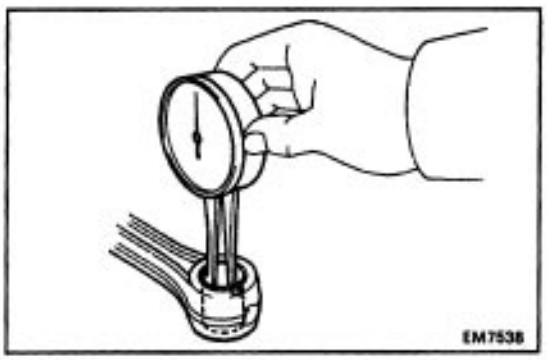
3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

Using a rod aligner and thickness gauge, check the connecting rod alignment.

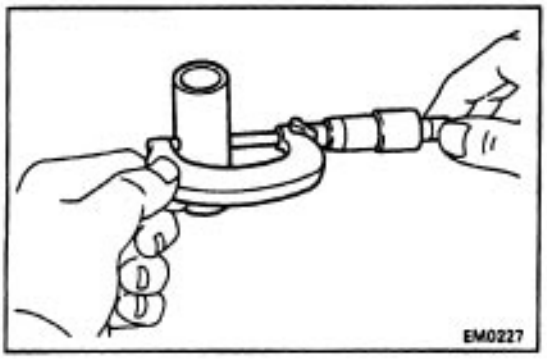
- Check for bend.
  Maximum bend:
  0.05 mm (0.0020 in.) per 100 mm (3.94 In.)
  If bend is greater than maximum, replace the connect–ing rod assembly.
- Check for twist
  Maximum twist:
  0.15 mm (0.0059 in.) per 100 mm (3.94 in.)
  If twist is greater than maximum, replace the connect–ing rod assembly.





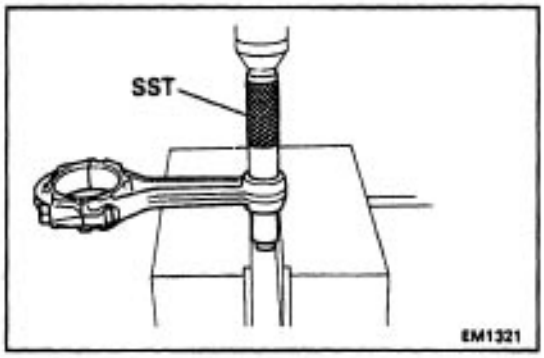
B. Inspect piston pin oil clearance

(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.
Bushing inside diameter:
22.005 – 22.017 mm (0.8663 – 0.8668 in.)



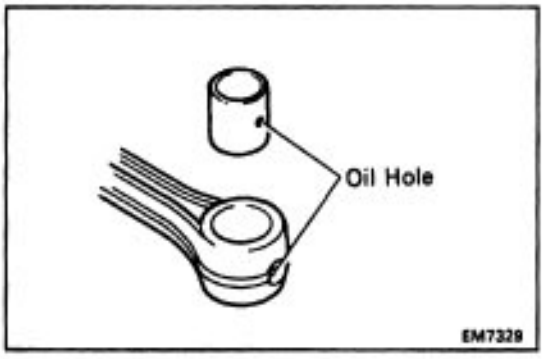
(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 – 22.009 mm (0.8660 – 0.8865 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 – 0.011 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:
0.05 mm (0.0020 In.)
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



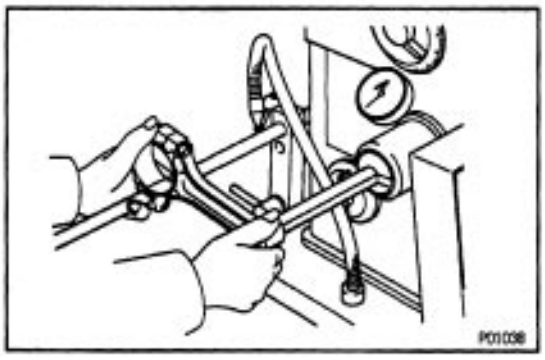
C. If necessary, replace connecting rod bushing

(a) Using SST and a press, press out the bushing.
SST 09222 – 30010

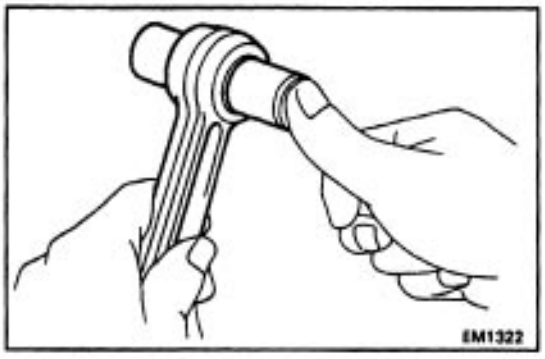


(b) Align the oil holes of a new bushing and the connecting rod.

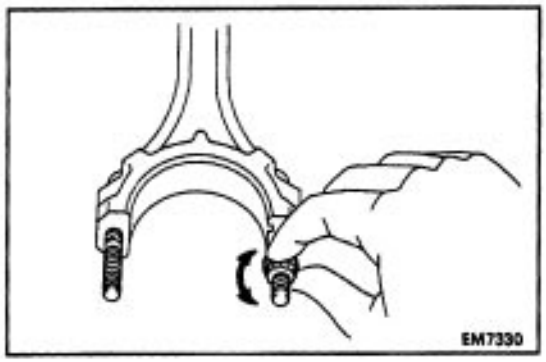
(c) Using SST and a press, press in the bushing.
SST 09222–30010



(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

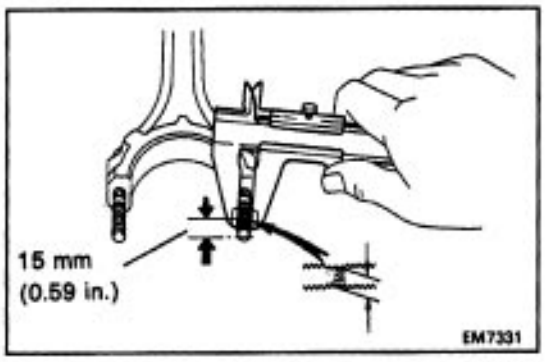


(e) Check the piston pin fit at normal room temperature.
Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



D. Inspect connecting rod bolts

(a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with a vernier caliper.

Standard outside diameter:

7.860–8.000 mm (0.3094–0.3150 in.)

Minimum outside diameter:

7.60 mm (0.2992 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.

If the outside diameter is less than minimum, replace the connecting rod bolt and nut as a set.

CYLINDER BORING

HINT:

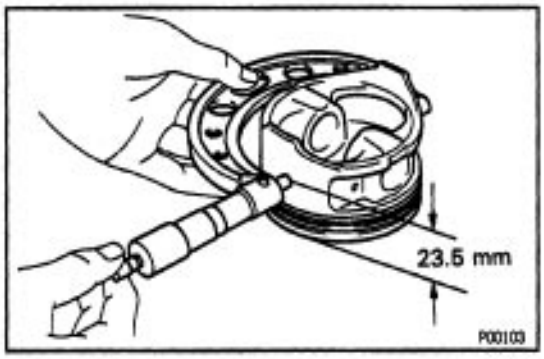
- Bore all the 4 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50

87.35 – 87.38 mm (3.4390–3.4402 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 23.5 mm (0.925 in.) from the piston head.

(b) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C–H

P = Piston diameter

C = Piston clearance

0.14 – 0.18 mm (0.0055 – 0.0063 in.)

H = Allowance for honing

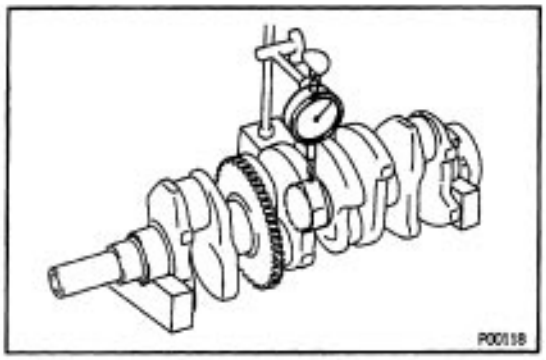
0.20 mm (0.0008 in.) or less

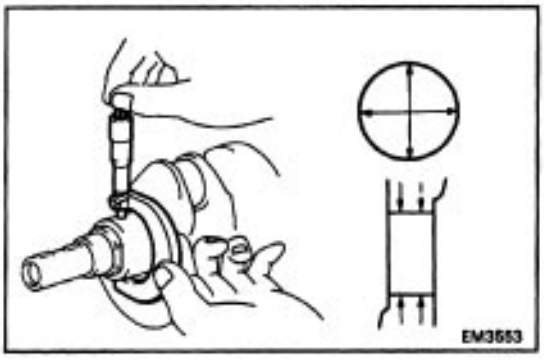
3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished round–ness.





CRANKSHAFT INSPECTION AND REPAIR

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.06 mm (0.0024 In.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:
STD size
54.988 – 55.003 mm (2.1653–2.1655 in.)
U/S 0.25
54.745 – 54.755 mm (2.1553–2.1557 in.)
Crank pin diameter:
STD size
51.985 – 52.000 mm (2.0466–2.0472 in.)
U/S 0.25
51.745 – 51.755 mm (2.0372–2.0376 in.)

If the diameter is not as specified, check the oil clearance (See pages EG1–98 to 104). If necessary, grind or replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.

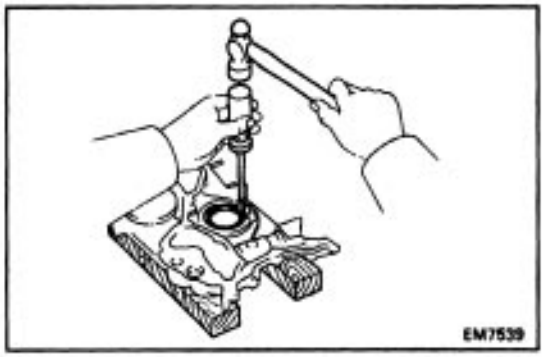
3. IF NECESSARY. GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 2).

Install new main journal and/or crankshaft pin undersized bearings.

CRANKSHAFT OIL SEALS REPLACEMENT

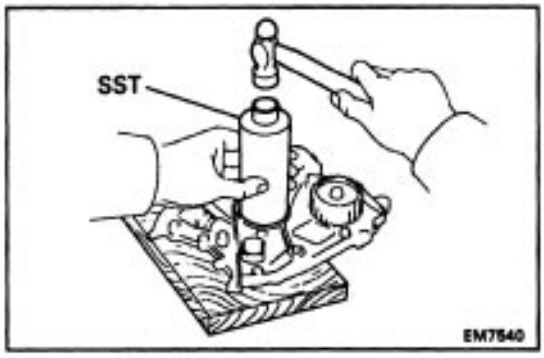
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

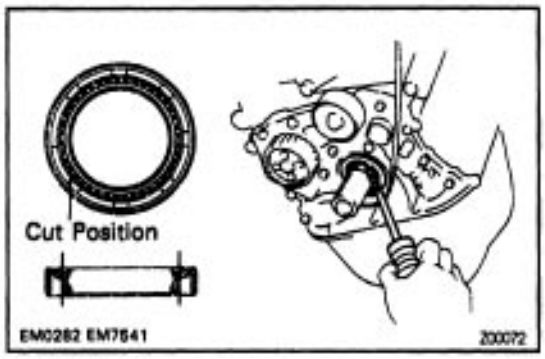
A. If oil pump is removed from cylinder block:

(a) Using a screwdriver and a hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09223 – 63010

(c) Apply MP grease to the oil seal lip.

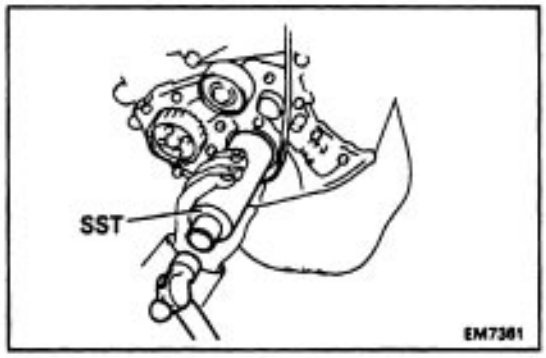


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

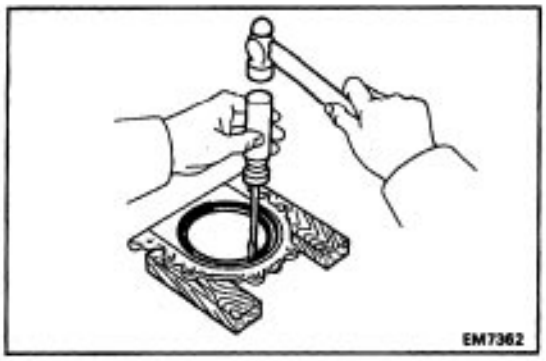
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

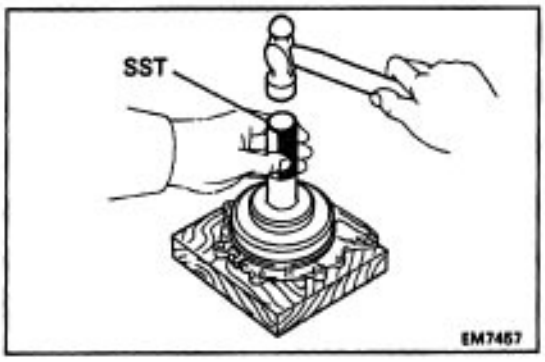
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09226 –10010



2. REPLACE CRANKSHAFT REAR OIL SEAL

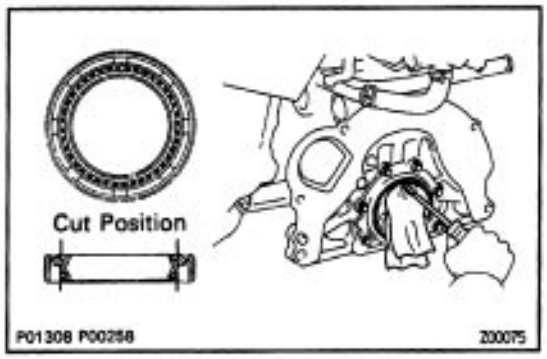
A. If rear oil seal retainer is removed from cylinder block:

(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–63010

(c) Apply MP grease to the oil seal lip.

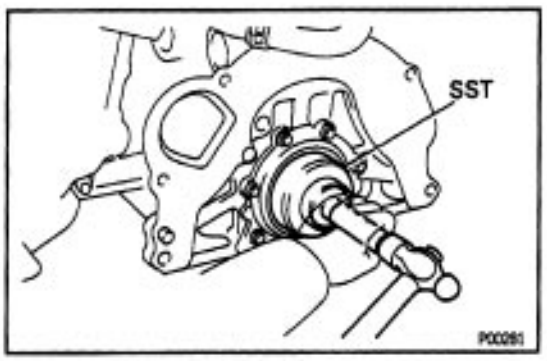


B. If rear oil seal retainer Is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

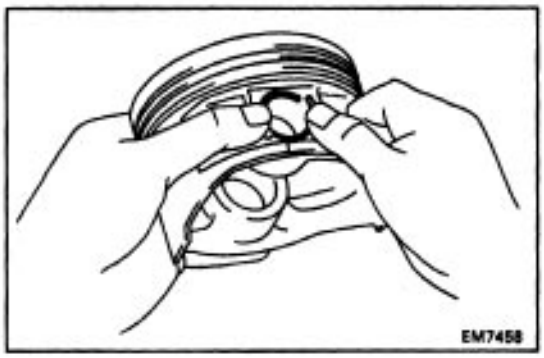
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

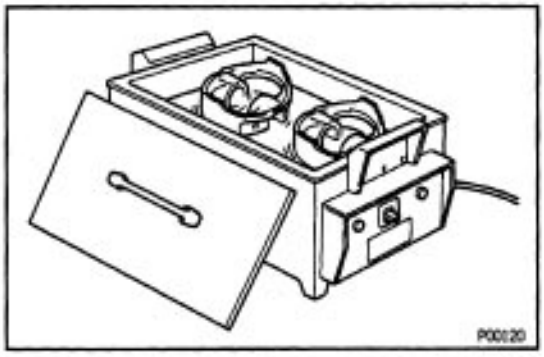
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223 – 63010



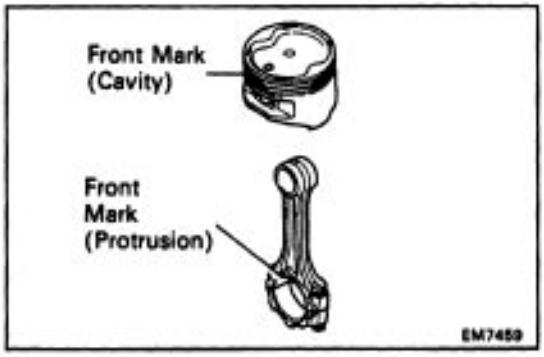
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Install a new snap ring on one side of the piston pin hole.



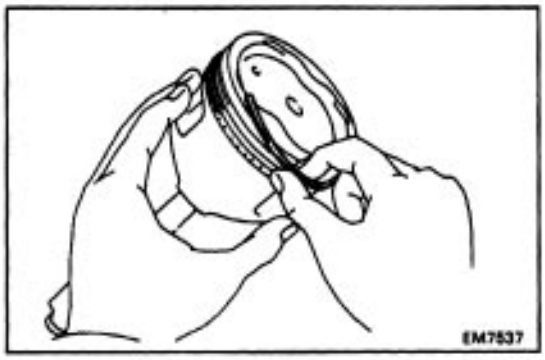
(b) Gradually heat the piston to 80–90°C (176–194°F).



(c) Coat the piston pin with engine oil.

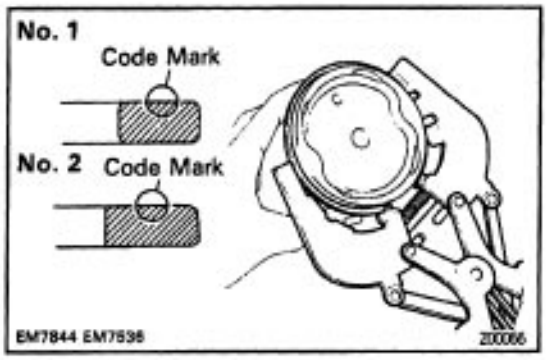
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

(e) Install a new snap ring on the other side of the piston pin hole.



2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.



(b) Using a piston ring expander, install the 2 compres–sion rings with the code mark facing upward.

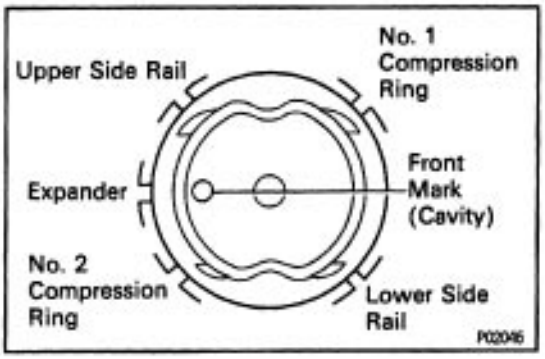
Code mark:

N o.1

1N orT

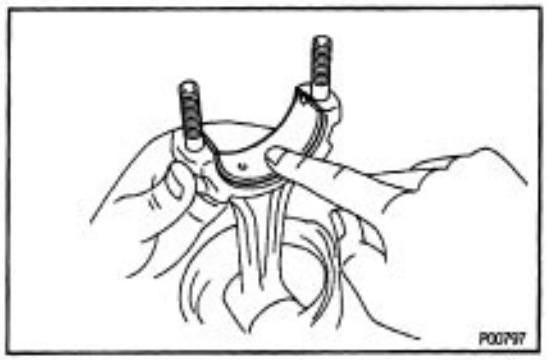
No.2

2N or 2T



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connect–ing rod or connecting cap.

(b) Install the bearings in the connecting rod and con–necting rod cap.

CYLINDER BLOCK ASSEMBLY

(See Components for Cylinder Block Disassembly and Assembly)

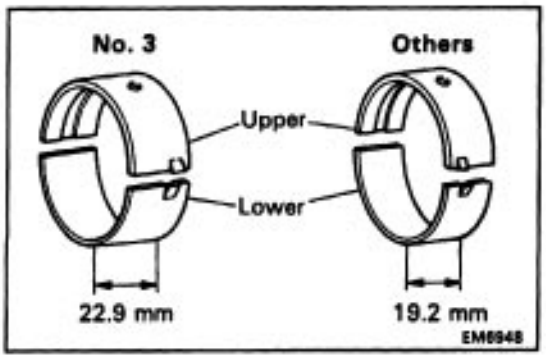
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, 0–rings and oil seals with new parts.

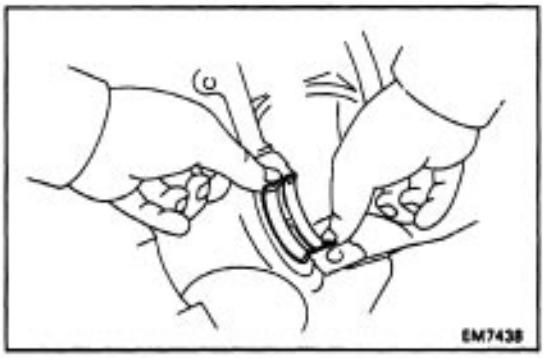
1. INSTALL MAIN BEARINGS

HINT:

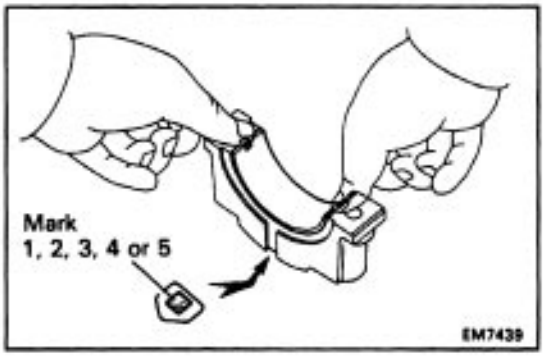
- Main bearings come in widths of 19.2 mm (0.756 in.) and 22.9 mm (0.902 in.). Install the 22.9 mm (0.902 in.) bearings in the No.3 cylinder block journal position with the main bearing cap. Install the 19.2 mm (0.756 in.) bearings in the other positions.



- Upper bearings have an oil groove and oil holes; lower bearings do not.

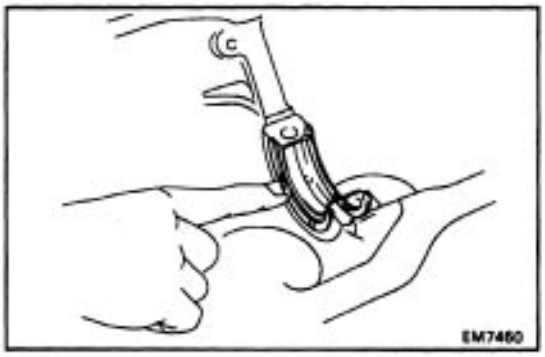


(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



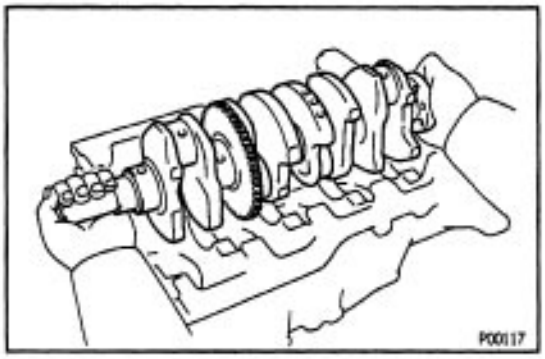
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

HINT: A number is marked on each main bearing cap to indicate the installation position.

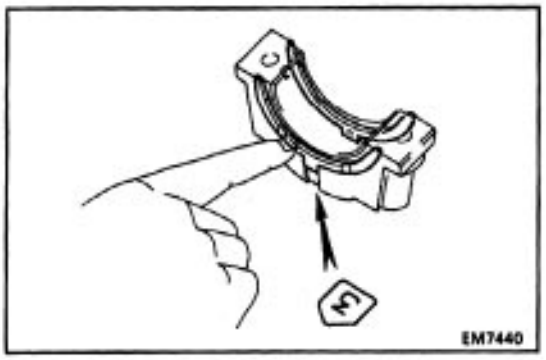


2. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

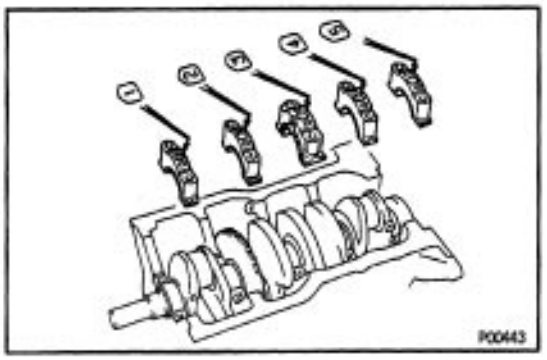


3. PLACE CRANKSHAFT ON CYLINDER BLOCK



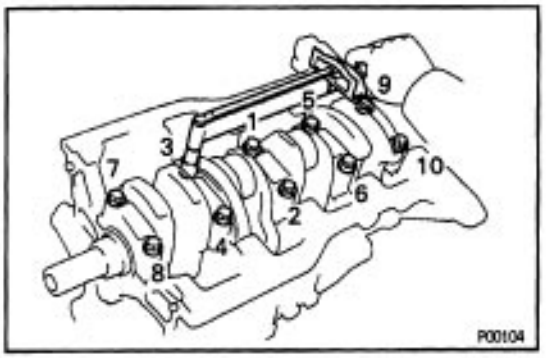
4. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

(a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.



(b) Install the 5 main bearing caps in their proper locations.

HINT: Each bearing cap has a number and front mark.

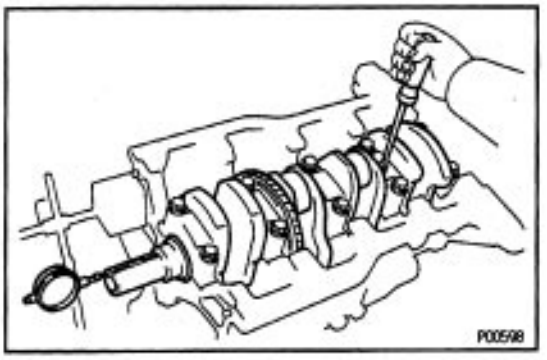


(c) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

(d) Install and uniformly tighten the 10 bolts of the main bearing caps in several passes, in the sequence shown.

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

(e) Check that the crankshaft turns smoothly.

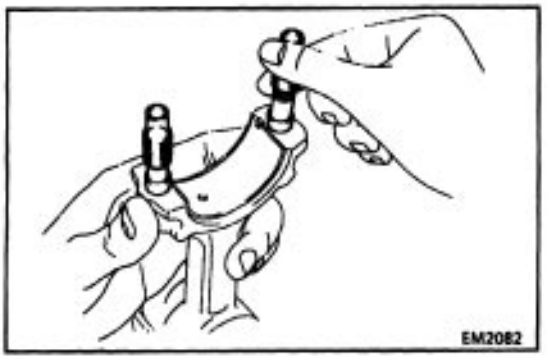


(f) Check the crankshaft thrust clearance.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back an forth with a screwdriver.

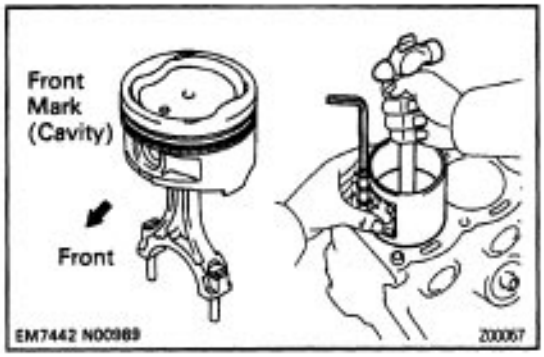
Standard thrust clearance:
0.020 – 0.220 mm (0.0008 – 0.0087 in.)
Maximum thrust clearance:
0.30 mm (0.0118 In.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

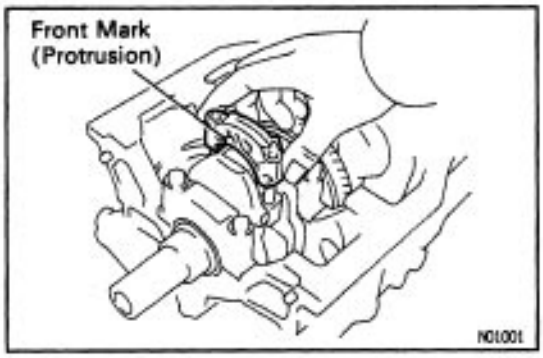


5. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into
each cylinder with the front mark of the piston facing
forward.



6. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

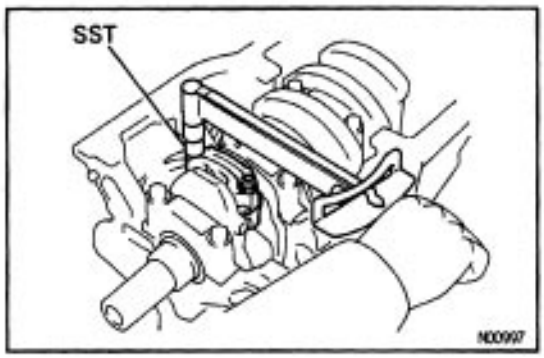
(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.

B. Install connecting rod cap nuts

HINT:

The cap nuts are tightened in 2 progressive steps (steps
(b) and
(d)).
If any one of the connecting rod bolts is broken or deformed, replace it.

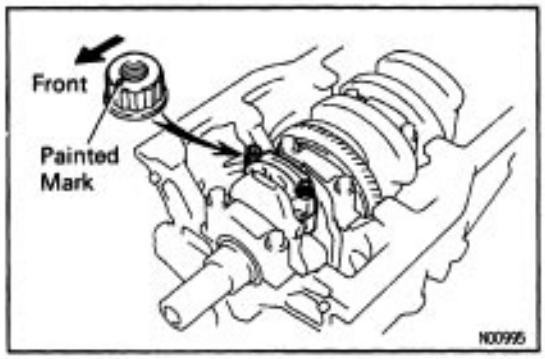


(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

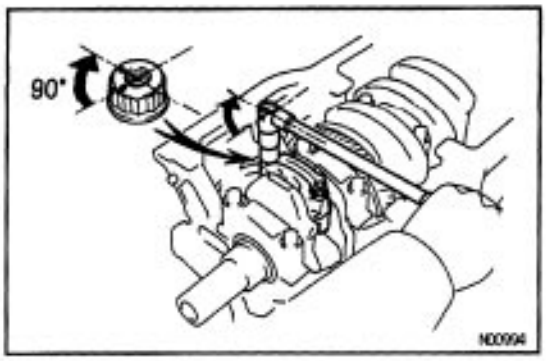
(b) Using SST, install and alternately tighten the cap nuts in several passes.
SST 09011– 38121

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

If any one of the cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.



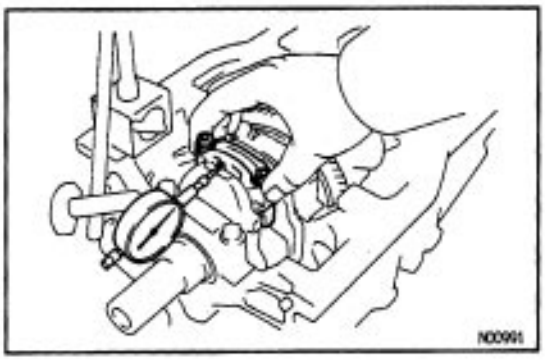
(c) Mark the front of the cap nut with the paint.



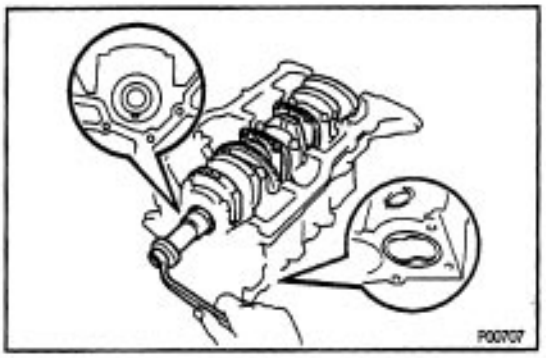
(d) Retighten the cap nuts 90®as shown.

(e) Check that the painted mark is now at a 90®angle to the front.

(f) Check that the crankshaft turns smoothly.

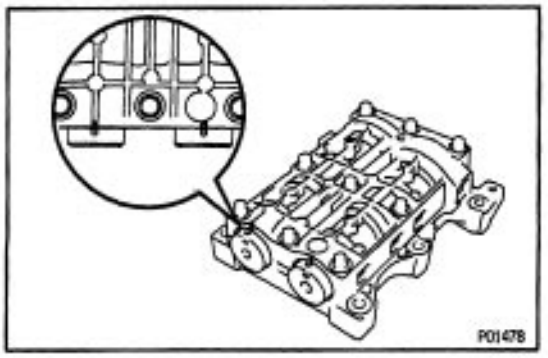


(g) Check the connecting rod thrust clearance.
Using a dial indicator, measure the thrust clear–ance while moving the connecting rod back an forth.
Standard thrust clearance:
0.160 – 0.312 mm (0.0063 – 0.0123 In.)
Maximum thrust clearance:
0.35 mm 10.0138 In.)
If the thrust clearance is greater than maximum, re–place the connecting rod assembly. If necessary, re–place the crankshaft.

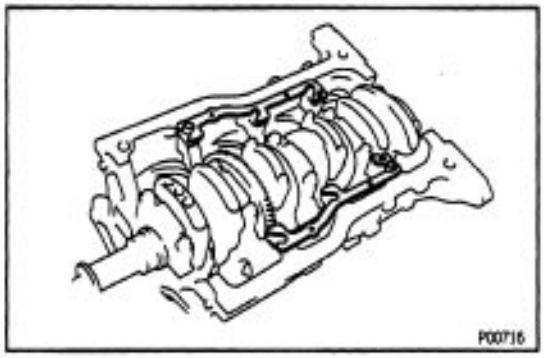


7. INSTALL ENGINE BALANCER

(a) Turn the crankshaft, and set the No. 1 cylinder TDC as shown in the illustration.

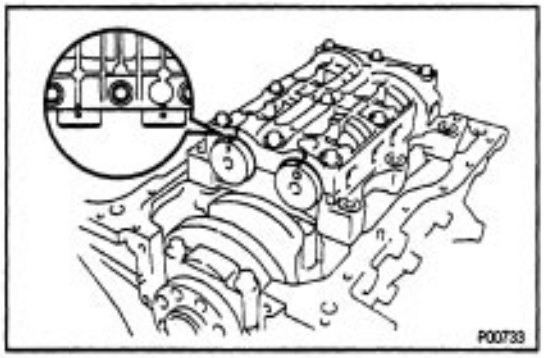


(b) Set the balance shafts so that the punch marks of the balance shafts are aligned with the grooves of the No.
2 housing.

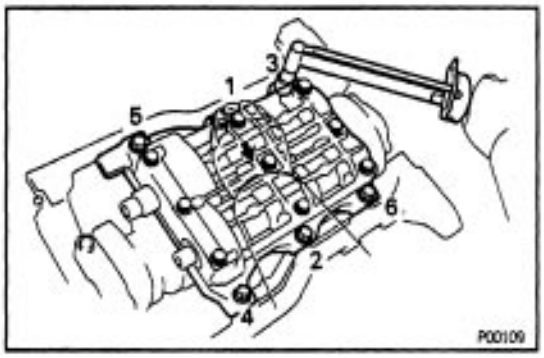


(c) Wipe clean the installation surface of the spacer.
(d) Place the spacers on the cylinder block.

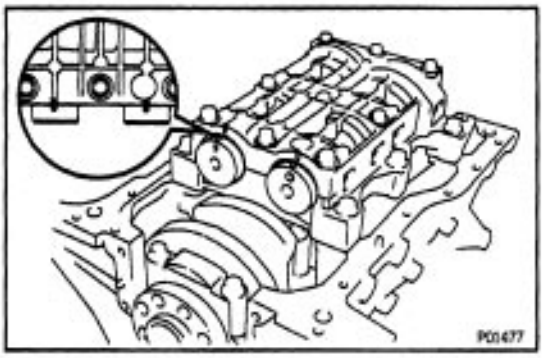
HINT: When replacing the crankshaft and/or balance shaft, use the thickest spacers.



(e) Place the engine balancer on the cylinder block.
(f) Check that punch marks shown in the illustration of the balance shafts are align with the grooves of the No.2 housing.

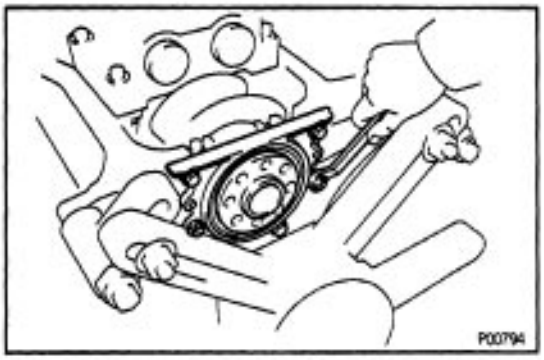


(g) While pulling the center part of the engine balancer in the direction of the arrow, uniformly tighten the 6 bolts in several passes, in the sequence shown.
Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



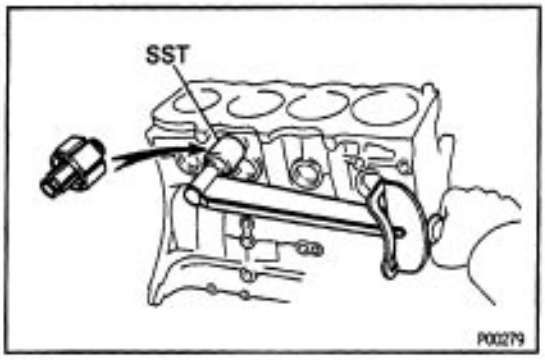
(h) Recheck that the punch marks of the balance shafts are aligned with the grooves of No.2 housing.

8. CHECK AND ADJUST BACKLASH OF CRANKSHAFT GEAR AND NO.1 BALANCE SHAFT GEAR (See page EG1–94)



9. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and the retainer with the 6 bolts.
Torque: 9.3 N–m (95 kgf–cm, 82 in.–lbf)



POST ASSEMBLY

1. INSTALL KNOCK SENSOR

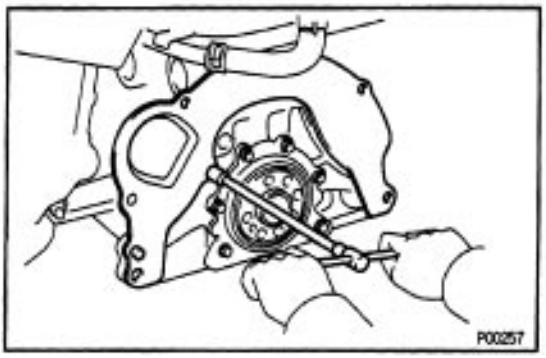
Using SST, install the knock sensor.
SST 09816–30010

Torque: 37 N–m (380 kgf–cm. 27 ft–lbf)

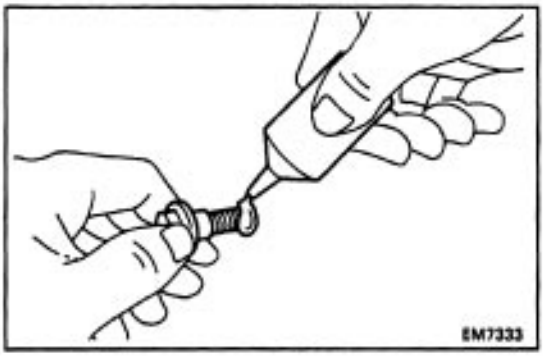
2. w/ OIL COOLER:
INSTALL OIL COOLER
3. INSTALL OIL FILTER
4. INSTALL OIL PUMP AND OIL PAN
5. INSTALL WATER PUMP AND GENERATOR ADJUSTING BAR
6. INSTALL CYLINDER HEAD
7. INSTALL PULLEYS AND TIMING BELT

8. INSTALL PS PUMP BRACKET
Install the PS pump bracket with 3 bolts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

9. INSTALL GENERATOR
10. INSTALL DISTRIBUTOR
11. REMOVE ENGINE STAND



12. INSTALL REAR END PLATE
Torque: 9.3 N–m (95 kgf–cm, 82 in.–lbf)



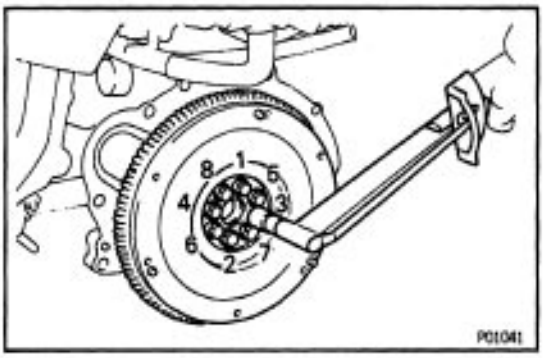
13. M/T:

INSTALL FLYWHEEL

(a) Apply adhesive to 2 or 3 threads of the mounting bolt end.

Adhesive:

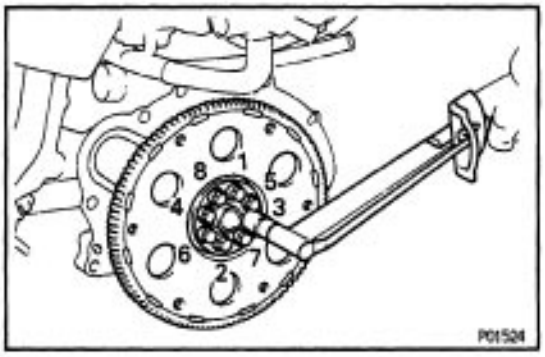
Part No.08833–00070. THREE BOND 1324 or equivalent



(b) Install the flywheel on the crankshaft.

(c) install and uniformly tighten the mounting bolts in several passes, in the sequence shown.

Torque: 88 N–m (900 kgf–cm, 66 ft–lbf)



14. A/T:

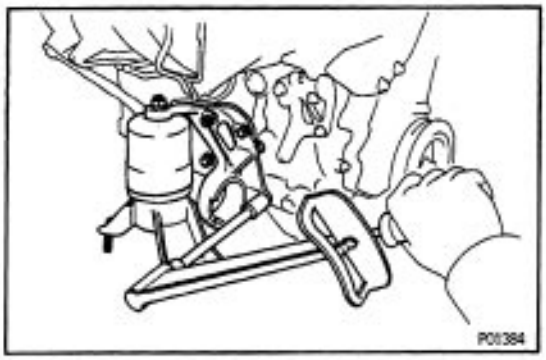
INSTALL DRIVE PLATE (See procedure step 13)

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)

15. M/T:

INSTALL CLUTCH DISC AND COVER

ENGINE INSTALLATION

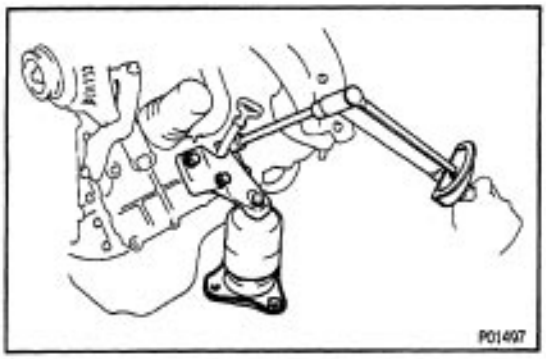


(See Components for Engine Removal and Installation)

1. INSTALL RR ENGINE MOUNTING INSULATOR

Install the mounting insulator with the 4 bolts.

Torque: 64 N–m (650 kgf–cm. 47 ft–lbf)



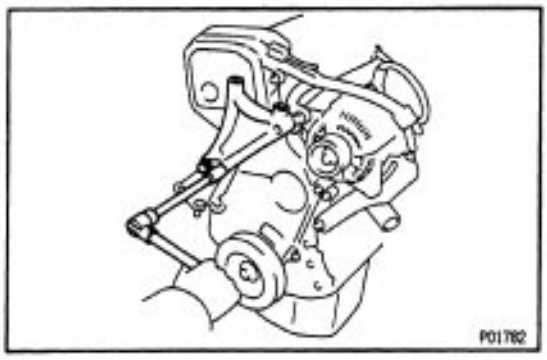
2. INSTALL FR ENGINE MOUNTING INSULATOR

(a) Install the mounting insulator with the 4 bolts.

Torque: 77 N–m (790 kgf–cm. 57 ft–lbf)

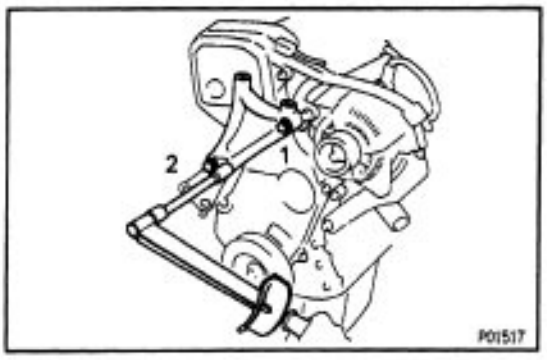
(b) Install the manifold stay with the bolt and nut.

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)



3. INSTALL N0.2 ENGINE MOUNTING BRACKET

(a) Temporarily install the No.2 engine mounting bracket with the 2 bolts.



(b) Install the remain bolt.

(c) Tighten the 3 bolts in the sequence shown.

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)

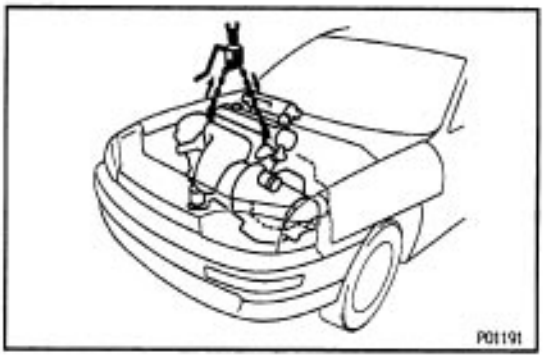
4. ASSEMBLE ENGINE AND TRANSAXLE

M/T (See page MX–15)

A/T (See page AX1–27)

5. A/T:

INSTALL STARTER



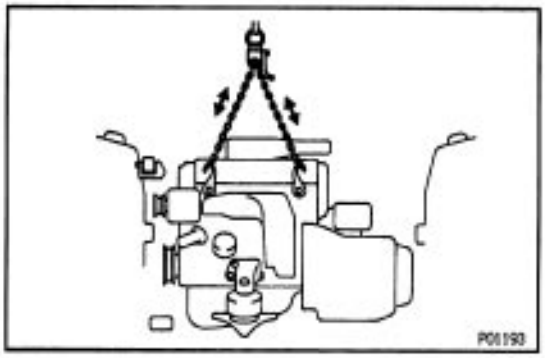
6. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

(a) Attach the engine sling device to the engine hangers.

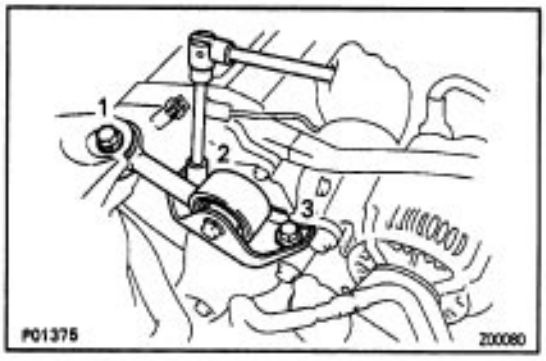
(b) Lower the engine into the engine compartment.

Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be careful not to hit the PS gear housing or park/neutral position switch (A/T).

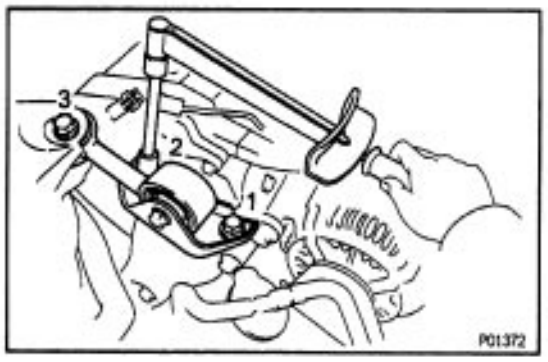


(c) Keep the engine level, and align RH and LH mountings with the body bracket.



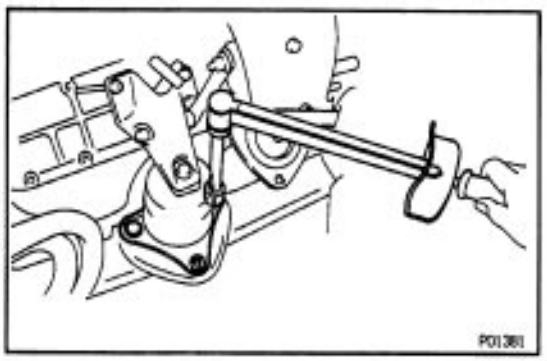
7. INSTALL ENGINE MOVING CONTROL ROD

(a) Temporarily install the engine moving control rod with the 3 bolts in the sequence shown.



(b) Tighten the 3 bolts in the sequence shown.

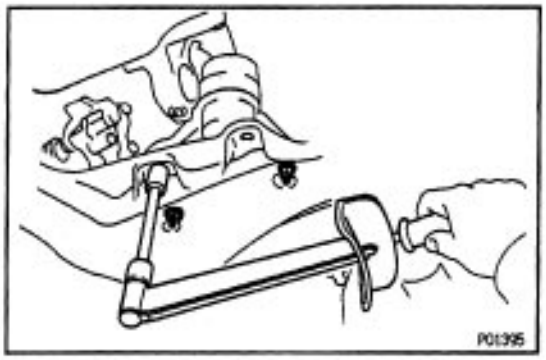
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



8. CONNECT FR ENGINE MOUNTING INSULATOR

Connect the mounting insulator with the 3 bolts.

Torque: 80 N–m (820 kgf–cm. 59 ft–lbf)

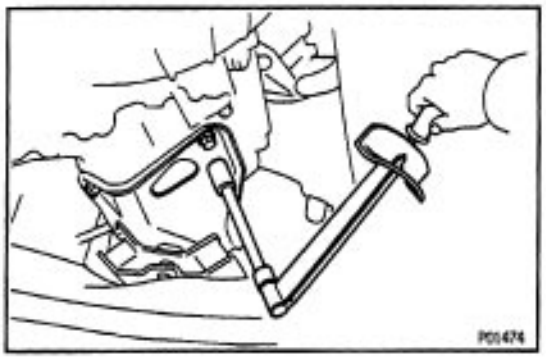


9. CONNECT RR ENGINE MOUNTING INSULATOR

(a) Connect the mounting insulator with the 3 nuts.

Torque: 66 N–m (670 kgf–cm, 48 ft–lbf)

(b) Install the hole plugs:

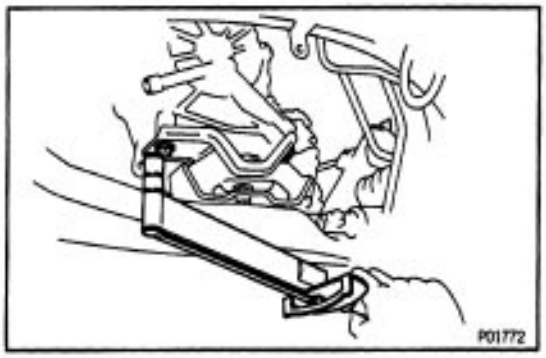


10. CONNECT LH ENGINE MOUNTING INSULATOR

M/T:

Connect the mounting insulator with the 3 bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

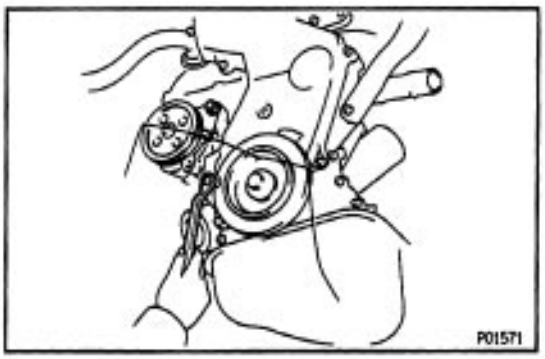


A/T:

Connect the mounting insulator with the 4 bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

11. REMOVE ENGINE SLING DEVICE



12. INSTALL PS PUMP

(a) Install the PS pump with the 2 bolts.

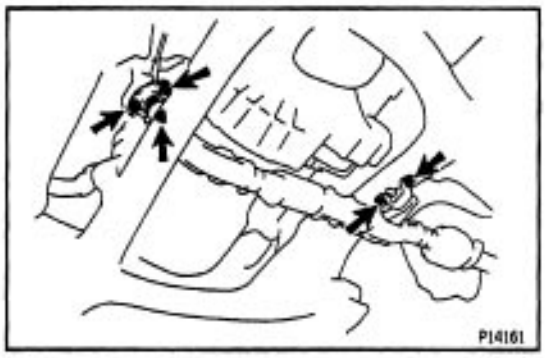
Torque: 43 N–m (440 kgf–cm. 31 ft–lbf)

(b) Install the drive belt.

(c) Connect the 2 air hoses to the air pipe.

13. INSTALL DRIVE SHAFTS

(See page SA–40)



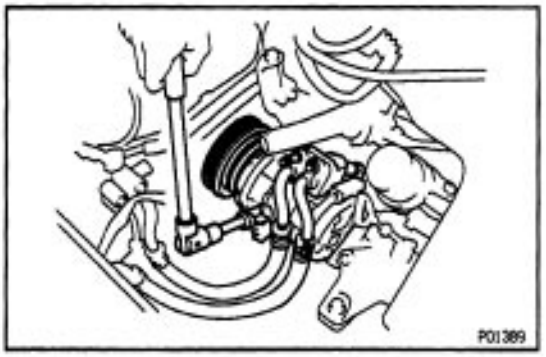
14. CONNECT FRONT EXHAUST PIPE

(a) Place a new gasket on the front exhaust pipe.

(b) Using a 14 mm deep socket wrench, install the 3 new nuts holding the front exhaust pipe to the WU–TWC.

Torque: 82 N–m (630 kgf–cm, 46 ft–lbf)

(c) Install the bracket with the 2 bolts.



15. w/ A/C:

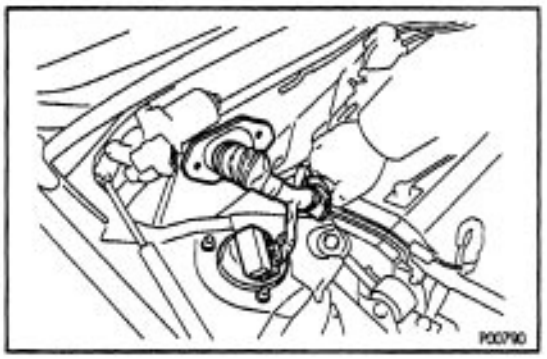
INSTALL A/C COMPRESSOR

(a) Install the compressor with the 3 bolts.

Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

(b) Install the drive belt.

(c) Connect the A/C compressor connector.



16. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel. Install the 2 nuts.

(b) Connect the following connectors:

(1) 2 ECM connectors

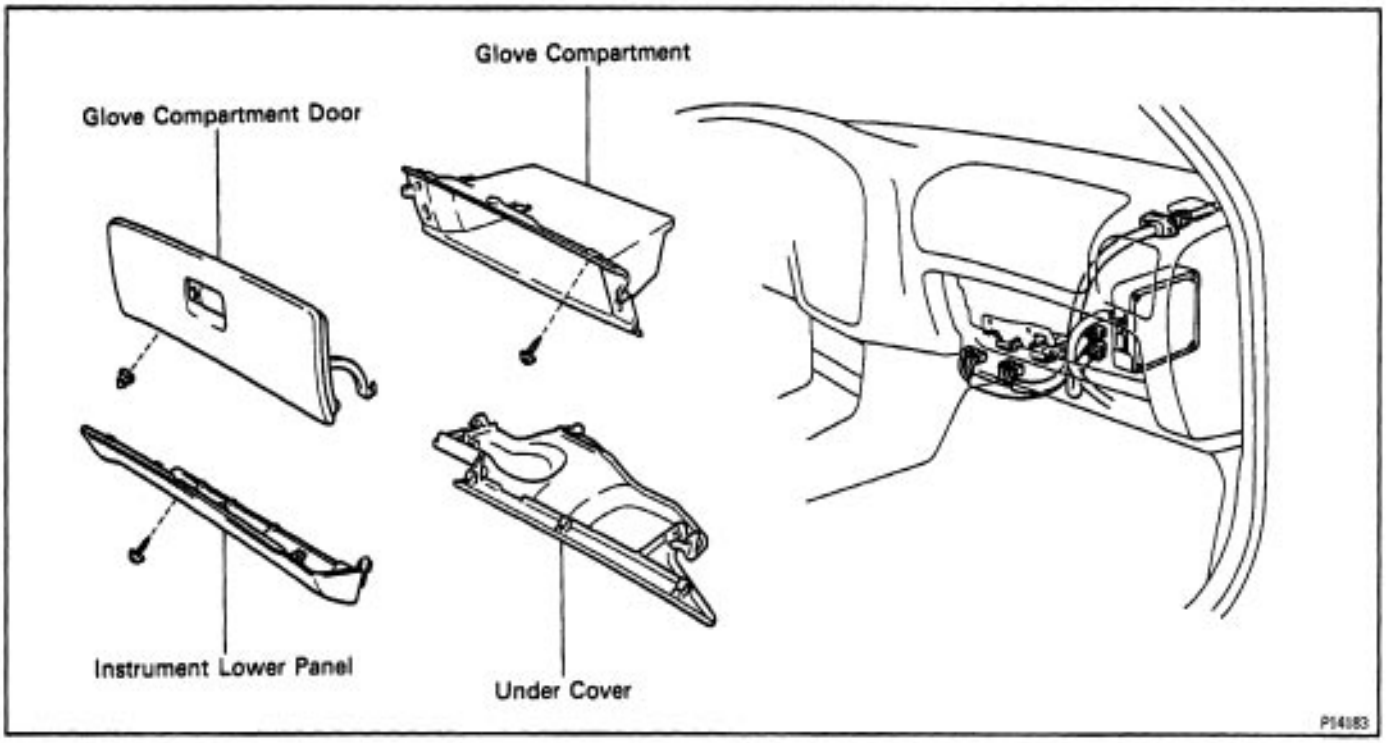
(2) 2 cowl wire connectors

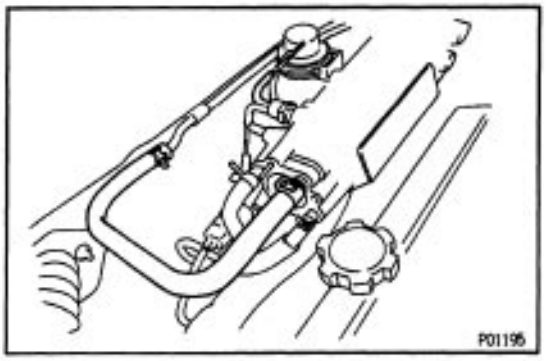
(c) Install the glove compartment.

(d) Install the glove compartment door.

(e) Install the lower instrument panel.

(f) Install the under cover.



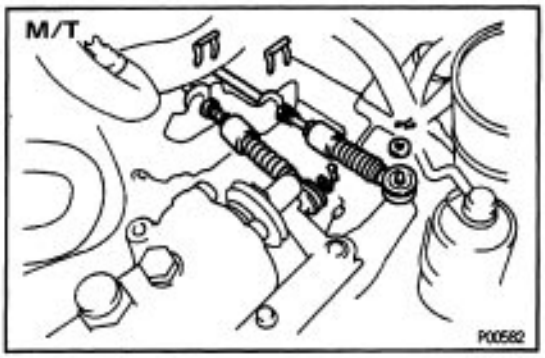


17. CONNECT VACUUM HOSES

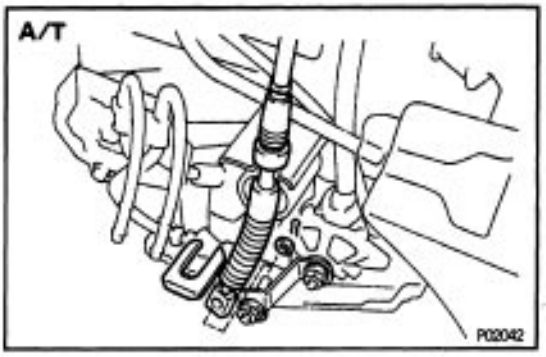
(a) MAP sensor hose to air intake chamber

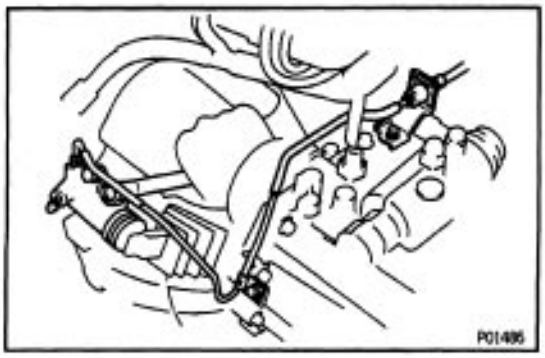
(b) Brake booster vacuum hose to air intake chamber

(c) Charcoal canister vacuum hose



18. CONNECT TRANSAXLE CONTROL CABLE (S) TO TRANSAXLE





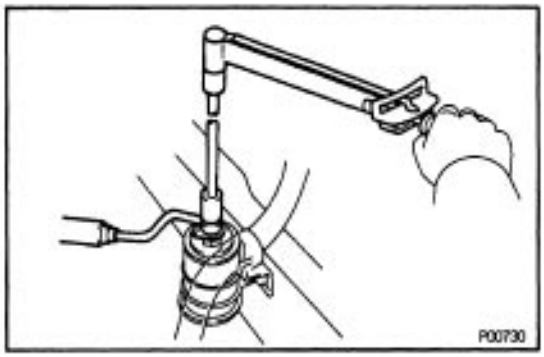
19. M/T:

INSTALL CLUTCH RELEASE CYLINDER

Install the release cylinder and tube with the 4 bolts.

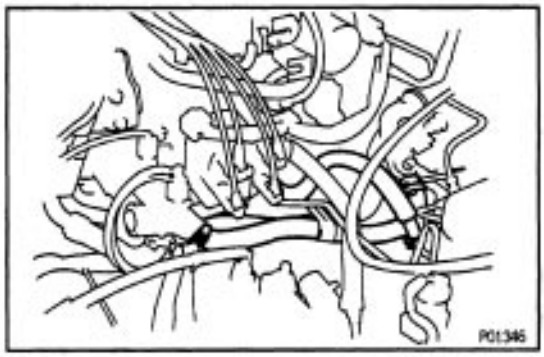
20. M/T:

INSTALL STARTER



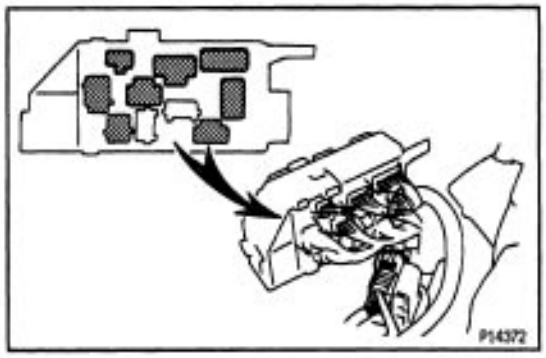
21. CONNECT FUEL INLET HOSE

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



22. CONNECT FUEL RETURN HOSE

23. CONNECT HEATER HOSES

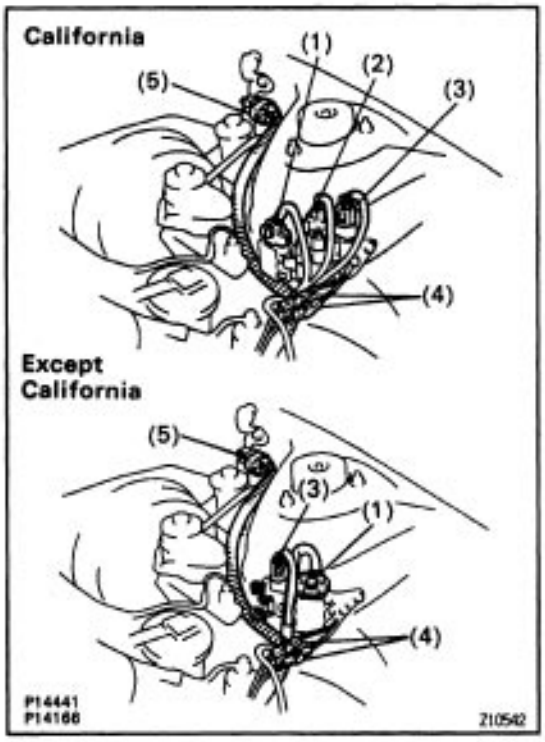


24. CONNECT WIRES AND CONNECTORS

(a) Connect the 5 connectors to the relay box.

(b) Connectors from LH fender apron.

(c) Install the engine relay box.



(d) Connect the following connectors:

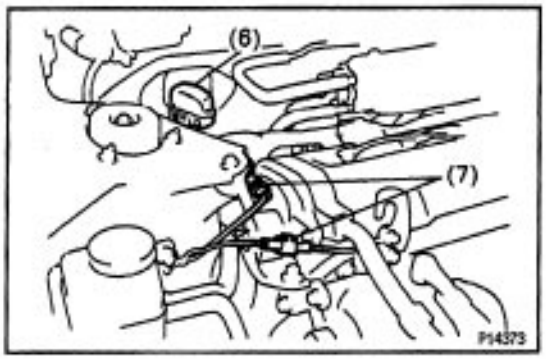
(1) Igniter connector

(2) California only:
Ignition coil connector

(3) Noise filter connector

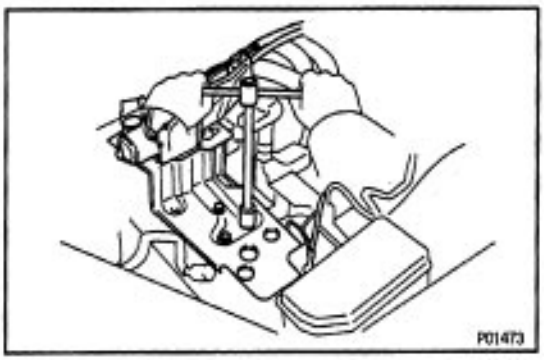
(4) 2 ground straps from LH fender apron

(5) Connector from LH fender apron

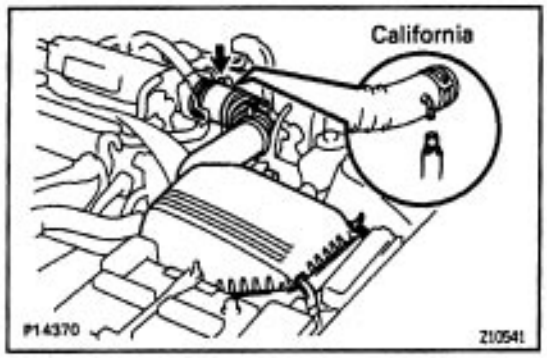


(6) Data link connector 1
(7) 2 ground straps from RH fender apron
(e) Connect the MAP sensor connector.

25. INSTALL RADIATOR



26. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR
(a) Install the actuator and bracket with the 3 bolts.
(b) Connect the actuator connector.
(c) Install the actuator cover.



27. INSTALL AIR CLEANER ASSEMBLY, RESONATOR AND AIR CLEANER HOSE
(a) Install the air cleaner case with 3 bolts.
(b) Install the element.
(c) Connect the air cleaner hose to the throttle body.
(d) Install the air cleaner cap together with the resonator and air cleaner hose.
(e) California only:
Connect the air hose to the air cleaner hose.
(f) Connect the intake air temperature sensor connector.

28. A/T:
CONNECT AND ADJUST THROTTLE CABLE

29. CONNECT AND ADJUST ACCELERATOR CABLE

30. FILL WITH ENGINE COOLANT

31. FILL WITH ENGINE OIL

32. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

33. START ENGINE AND CHECK FOR LEAKS

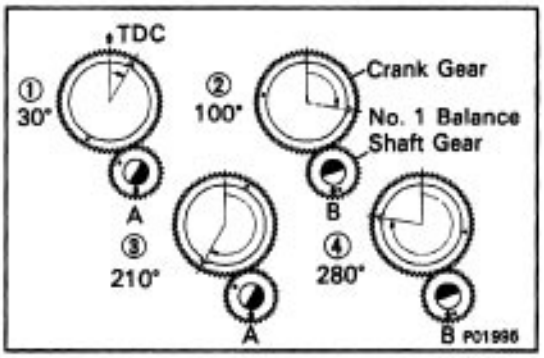
34. PREFORM ENGINE ADJUSTMENT

35. INSTALL ENGINE UNDER COVERS

36. INSTALL HOOD

37. PERFORM ROAD TEST
Check for abnormal noises, shock, slippage, correct shift points and smooth operation.

38. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS



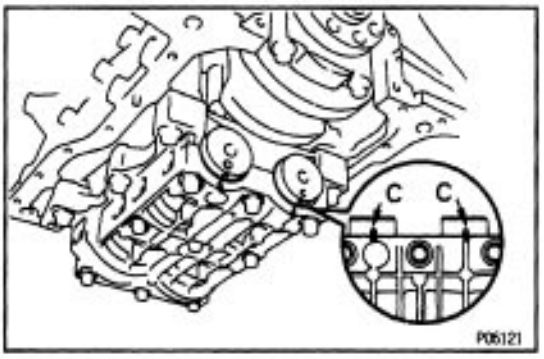
BALANCE SHAFT BACKLASH ADJUSTMENT ON VEHICLE

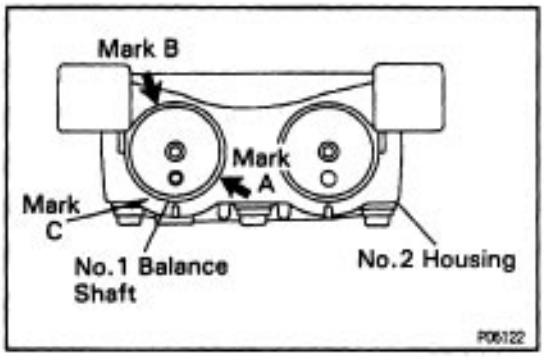
1. CHECK BACKLASH OF CRANKSHAFT GEAR AND NO.1 BALANCE SHAFT GEAR

NOTICE: Backlash between the crankshaft gear and No.1 balance shaft gear varies with the rotation of the balance shaft and the deviation of the crankshaft gear. Accordingly, it is necessary to measure the backlash at the 4 points shown in the illustration on the left.

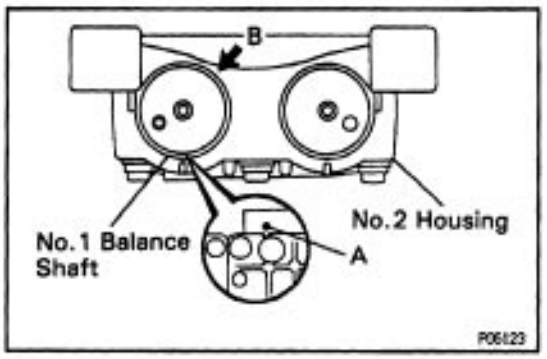
(a) Rotate the crankshaft 2 or 3 times to settle the crank–shaft gear and No. 1 balance shaft gear.

(b) When No.1 piston is at TDC, check that the punch marks C shown in the illustration of the balance shafts are aligned with the grooves of the No. 2 housing.

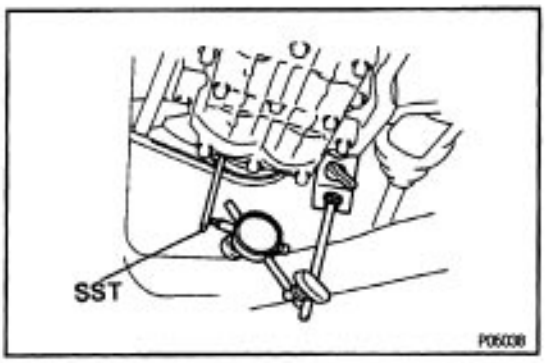




(c) Check that the punch marks A and B are at the positions on the No.1 balance shaft indicated in the illustration.

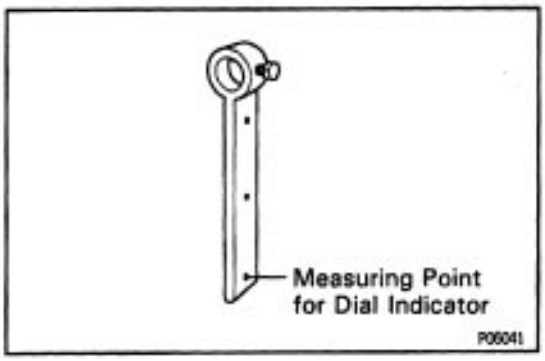


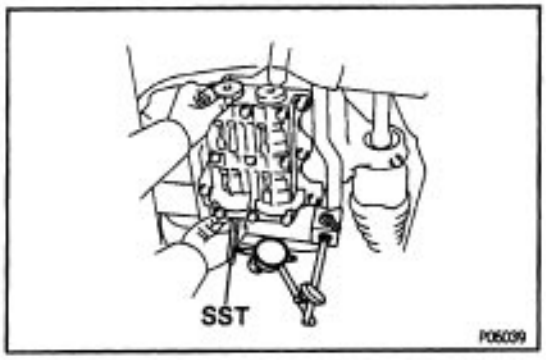
(d) First turn the crankshaft clockwise, and align the groove of the No.2 balance shaft housing with the punch mark A of the No. 1 balance shaft.



(e) Position the SST and dial indicator as shown in the illustration.
SST 09224 – 74010

HINT: Make sure that the stem of the dial indicator is perpendicular to the SST and that it is placed in the middle of the 3rd indentation.





(f) Gently turn the No.1 balance shaft by hand, until resistance is felt, and measure the backlash.

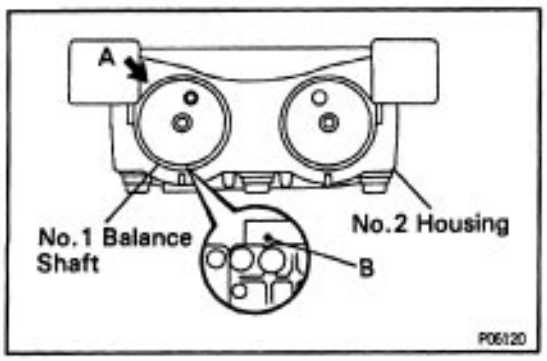
HINT:

- Rotate the No. 1 balance shaft 4 or 5 times to provide a steady backlash reading.
- To prevent excessive backlash due to thrust cle–arance, measure the backlash while pressing on the rear of the No.1 balance shaft.

Standard backlash (use SST):
0.060 – 0.100 mm (0.0024 – 0.0039 In.)

NOTICE: Do not turn the No.1 balance shaft strongly.

(g) Remove the dial gauge and the SST.



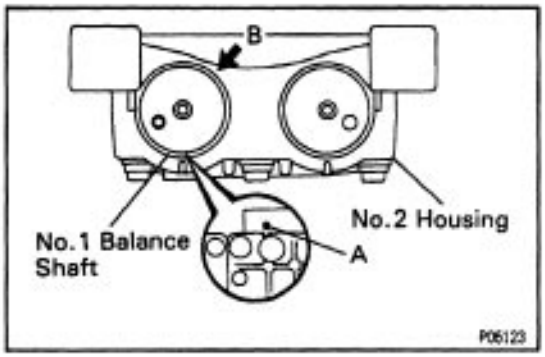
(h) Turn the crankshaft clockwise to align the groove of the No.2 housing with the punch mark B.

(i) Set the dial gauge. (See procedure in step (e))

(j) Measure the backlash. (See procedure in step (f))

Standard backlash (use SST):
0.080 – 0.100 mm (0.0024 – 0.0039 in.)

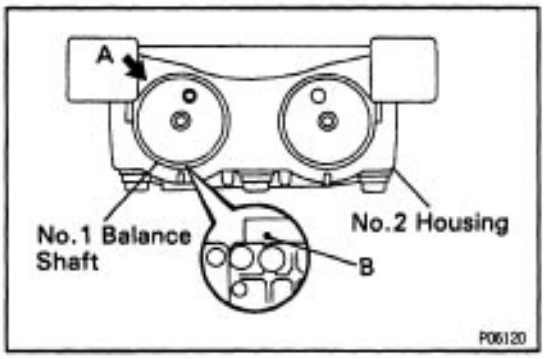
(k) Remove the dial gauge.



(l) Turn the crankshaft clockwise again to align the groove of the No.2 housing with the punch mark A.
(m) Set the dial gauge. (See procedure in step (e))
(n) Measure the backlash. (See procedure in step (f))

Standard backlash (use SST):
0.060 – 0.100 mm (0.0024 – 0.0039 in.)

(o) Remove the dial gauge.



(p) Turn the crankshaft clockwise again to align the groove of the No.2 housing with the punch mark B.
(q) Set the dial gauge. (See procedure in step (e))
(r) Measure the backlash. (See procedure in step (f))

Standard backlash(use SST):
0.06 – 0.100 mm (0.0024 – 0.0039 in.)

(s) Remove the dial gauge.

If even one of the 4 points measured above exceeds the backlash specification, adjust the backlash with new spacers.

NOTICE: Use the same size spacers for both the left and right sides.

HINT:

- Varying the spacer thickness by 0.02 mm (0.0008 in.) changes the backlash by about 0.042 mrn (0.0017 in.).
- If the backlash is greater than permitted maxi– mum, select a thinner shim.
- If the backlash is less than the specification, select a thicker shim.

Adjusting Spacer Selection Chart (On Vehicle)

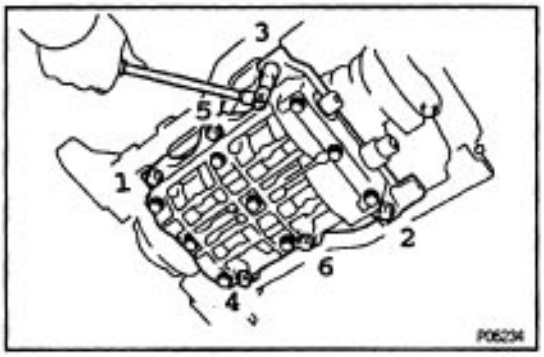
Measured clearance mm (in.) \ Installed spacer No.	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
0.000 – 0.017 (0.0000 – 0.0007)	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39				
0.018 – 0.038 (0.0008 – 0.0015)	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39			
0.039 – 0.059 (0.0016 – 0.0023)	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39	39		
0.060 – 0.100 (0.0024 – 0.0039)																																								
0.101 – 0.121 (0.0040 – 0.0047)		01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	39
0.122 – 0.142 (0.0048 – 0.0056)			01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	37	
0.143 – 0.163 (0.0057 – 0.0064)				01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	37	
0.164 – 0.184 (0.0065 – 0.0072)					01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	35	
0.185 – 0.205 (0.0073 – 0.0081)						01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33	35	
0.206 – 0.226 (0.0082 – 0.0089)							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33	33
0.227 – 0.247 (0.0090 – 0.0097)								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31	33
0.248 – 0.268 (0.0098 – 0.0105)									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31	31
0.269 – 0.289 (0.0106 – 0.0114)										01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	31
0.290 – 0.310 (0.0115 – 0.0122)											01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	29	
0.311 – 0.331 (0.0123 – 0.0130)												01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	29	
0.332 – 0.352 (0.0131 – 0.0138)													01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	27	
0.353 – 0.373 (0.0139 – 0.0147)														01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	27	
0.374 – 0.394 (0.0148 – 0.0155)															01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	25	
0.395 – 0.415 (0.0156 – 0.0163)																01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	25	
0.416 – 0.436 (0.0164 – 0.0172)																	01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	23	
0.437 – 0.457 (0.0173 – 0.0180)																		01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	23	
0.458 – 0.478 (0.0181 – 0.0188)																			01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	21	
0.479 – 0.499 (0.0189 – 0.0196)																				01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	21	
0.500 – 0.520 (0.0197 – 0.0205)																					01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	19	
0.521 – 0.541 (0.0206 – 0.0213)																						01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	19	
0.542 – 0.562 (0.0214 – 0.0221)																							01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	17	
0.563 – 0.583 (0.0222 – 0.0230)																								01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	17	
0.584 – 0.604 (0.0231 – 0.0238)																									01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	15	
0.605 – 0.625 (0.0239 – 0.0246)																										01	01	03	03	05	05	07	07	09	09	11	11	13	13	15	
0.626 – 0.646 (0.0247 – 0.0254)																											01	01	03	03	05	05	07	07	09	09	11	11	13	13	
0.647 – 0.667 (0.0255 – 0.0263)																												01	01	03	03	05	05	07	07	09	09	11	11	13	
0.668 – 0.688 (0.0264 – 0.0271)																													01	01	03	03	05	05	07	07	09	09	11	11	
0.689 – 0.709 (0.0272 – 0.0279)																														01	01	03	03	05	05	07	07	09	09	11	
0.710 – 0.730 (0.0280 – 0.0287)																															01	01	03	03	05	05	07	07	09	09	
0.731 – 0.751 (0.0288 – 0.0296)																																01	01	03	03	05	05	07	07	09	
0.752 – 0.772 (0.0297 – 0.0304)																																	01	01	03	03	05	05	07	07	
0.773 – 0.793 (0.0305 – 0.0312)																																		01	01	03	03	05	05	07	
0.794 – 0.814 (0.0313 – 0.0320)																																			01	01	03	03	05	05	
0.815 – 0.835 (0.0321 – 0.0329)																																				01	01	03	03	05	
0.836 – 0.856 (0.0330 – 0.0337)																																					01	01	03	03	
0.857 – 0.877 (0.0338 – 0.0345)																																						01	01	03
0.878 – 0.898 (0.0346 – 0.0354)																																							01	01
0.899 – 0.919 (0.0355 – 0.0362)																																								01

Backlash of crankshaft and No. 1 balance shaft gear:
0.060 - 0.100 mm (0.0024 - 0.0039 in.)

EXAMPLE: The No. 25 spacers are installed and the measured clearance is 0.342 mm (0.0135 in.). Replace the No. 25 spacers with No. 13 spacers.

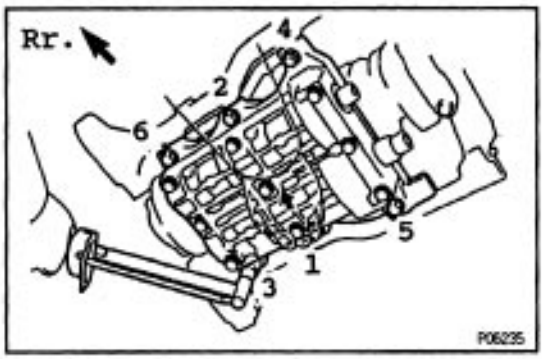
New spacer thickness mm (in.)

No.	Thickness	No.	Thickness	No.	Thickness	No.	Thickness
01	1.74 (0.0685)	11	1.84 (0.0724)	21	1.94 (0.0764)	31	2.04 (0.0803)
03	1.76 (0.0693)	13	1.86 (0.0732)	23	1.96 (0.0772)	33	2.06 (0.0811)
05	1.78 (0.0701)	15	1.88 (0.0740)	25	1.98 (0.0780)	35	2.08 (0.0819)
07	1.80 (0.0709)	17	1.90 (0.0748)	27	2.00 (0.0787)	37	2.10 (0.0827)
09	1.82 (0.0717)	19	1.92 (0.0756)	29	2.02 (0.0795)	39	2.12 (0.0835)



2. REPLACE THE SPACERS

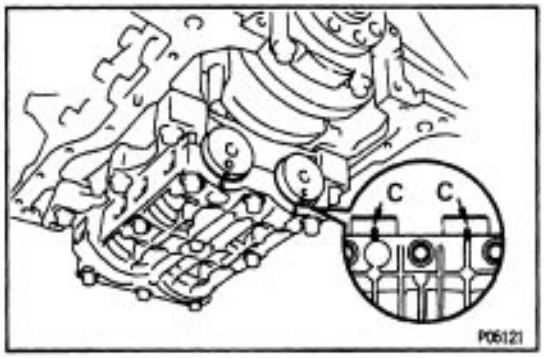
(a) Uniformly loosen the6 bolts in the sequence shown.
(b) Replace the spacers with new ones.



3. TORQUE BALANCESHAFT ASSEMBLY

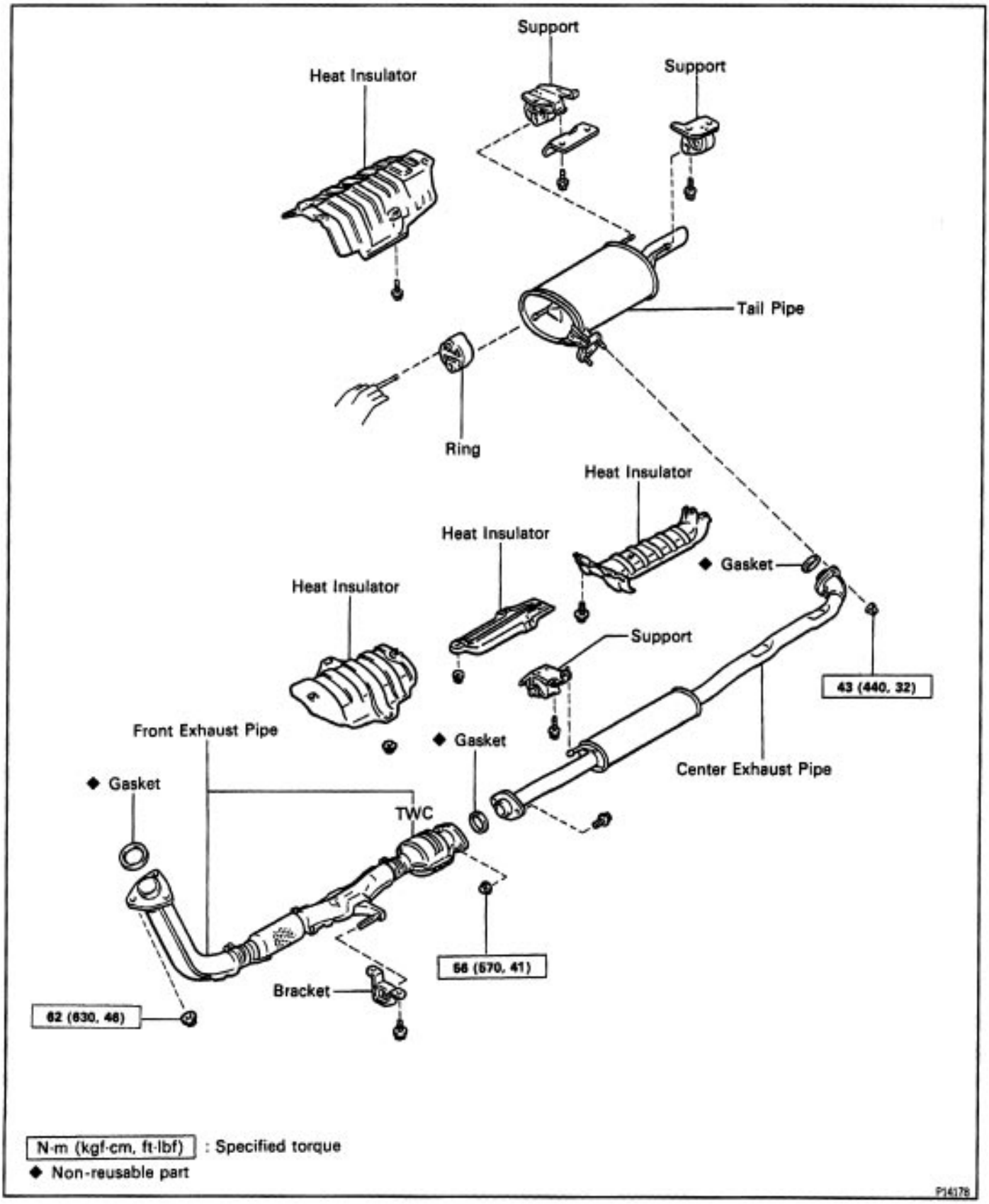
While pulling the center part of the engine balancer in the direction of the arrow, uniformly tighten the6 bolts in several passes, in the sequence shown.

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



4. CHECK AND ADJUST BACKLASH OF CRANK–SHAFT GEAR AND No.1 BALANCE SHAFT GEAR (See procedure in step 1)

EXHAUST SYSTEM COMPONENTS



SERVICE SPECIFICATIONS

SERVICE DATA

Idle speed	–		750 ± 50 rpm
Intake manifold vacuum	at idle speed		60 kPa (450 mmHg, 17.7 in.Hg)
Compression pressure	et 250 rpm	STD	1,226 kPa (12.5 kgf/cm², 178 psi) or more
		Limit	981 kPa (10.0 kgf/cm², 142 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Idler pulley tension spring	Free length		46.0 mm (1.811 in.)
	Installed load at 50.5 mm (1.988 in.)	Green color	32 – 37 N (3.25 – 3.75 kgf, 7.2 – 8.3 lbf)
		Silver color	47 – 52 N (4.75 – 5.25 kgf, 10.5 – 11.6 lbf)
Cylinder head	Warpage		
	Cylinder block side	Limit	0.05 mm (0.020 in.)
	Manifold side	Limit	0.08 mm (0.031 in.)
	Valve seat		
	Refacing angle		30°, 45°, 75°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
Valve guide bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter (for repair part)	STD	11.048 – 11.059 mm (0.4350 – 0.4354 in.)
		O/S 0.05	11.098 – 11.109 mm (0.4369 – 0.4374 in.)
Valve	Valve overall length	STD (Intake)	97.60 mm (3.8425 in.)
		(Exhaust)	98.45 mm (3.8760 in.)
		Limit (Intake)	97.1 mm (3.823 in.)
		(Exhaust)	98.0 mm (3.853 in.)
	Vale face angle		44.5°
	Stem diameter	(Intake)	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
		(Exhaust)	5.965 – 5.980 mm (0.2348 – 0.2354 in.)
	Stem oil clearance	STD (Intake)	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		(Exhaust)	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Limit (Intake)	0.08 mm (0.0031 in.)
		(Exhaust)	0.10 mm (0.0039 in.)
	Margin thickness	STD	0.8 – 1.2 mm (0.031 – 0.047 in.)
		Limit	0.5 mm (0.020 in.)
Valve spring	Deviation	Limit	2.0 mm (0.079 in.)
	Free length		41.96 – 41.99 mm (1.6520 – 1.6531 in.)
	Installed tension et 34.7 mm (1.366 in.)		164 – 189 N (16.7 – 19.3 kgf, 36.8 – 42.5 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.2191 – 1.2195 in.)
	Lifter bore diameter		31.000 – 31.018 mm (1.2205 – 1.2213 in.)
	Oil clearance	STD	0.024 – 0.052 mm (0.0009 – 0.0020 in.)
		Limit	0.07 mm (0.0028 in.)
Manifold	Warpage	Limit	0.30 mm (0.0118 in.)

Camshaft	Thrust clearance	STD (Intake)	0.045 – 0.100 mm (0.0018 – 0.0039 in.)
		(Exhaust)	0.030 – 0.085 mm (0.0012 – 0.0033 in.)
		Limit (Intake)	0.12 mm (0.0047 in.)
		(Exhaust)	0.10 mm (0.0039 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Limit	0.10 mm (0.0039 in.)
	Journal diameter		26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout	Limit	0.04 mm (0.0016 in.)
	Cam lobe height	STD (Intake)	42.01 – 42.11 mm (1.6539 – 1.6579 in.)
		(Exhaust)	40.06 – 40.16 mm (1.5772 – 1.5811 in.)
		Limit (Intake)	41.90 mm (1.6496 in.)
		(Exhaust)	39.95 mm (1.5728 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Limit	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		22.5 – 22.9 mm (0.886 – 0.902 in.)
Cylinder block	Cylinder head surface warpage	Limit	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD (Mark 1)	87.000 – 87.010 mm (3.4252 – 3.4256 in.)
		(Mark 2)	87.010 – 87.020 mm (3.4256 – 3.4260 in.)
		(Mark 3)	87.020 – 87.030 mm (3.4260 – 3.4264 in.)
		Limit (STD)	87.23 mm (3.4342 in.)
		(O/S 0.50)	87.73 mm (3.4350 in.)
Piston and piston ring	Piston diameter	STD (Mark 1)	86.850 – 86.860 mm (3.4193 – 3.4197 in.)
		(Mark 2)	86.860 – 86.870 mm (3.4197 – 3.4201 in.)
		(Mark 3)	86.870 – 86.880 mm (3.4201 – 3.4205 in.)
		O/S 0.50	87.350 – 87.380 mm (3.4390 – 3.4402 in.)
	Piston oil clearance	STD	0.14 – 0.016 mm (0.0055 – 0.0063 in.)
		Limit	0.18 mm (0.0071 in.)
	Piston ring groove clearance	No.1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
		No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD (No.1)	0.270 – 0.500 mm (0.0106 – 0.0197 in.)
		(No.2)	0.350 – 0.600 mm (0.0138 – 0.0234 in.)
		(Oil)	0.200 – 0.550 mm (0.0079 – 0.0217 in.)
		Limit (No.1)	1.10 mm (0.0433 in.)
		(No.2)	1.20 mm (0.0472 in.)
		(Oil)	1.15 mm (0.0453 in.)

Connecting rod	Thrust clearance STD	0.160 – 0.312 mm (0.0063 – 0.0123 inb.)
	Limit	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness (Reference)	
	STD (Mark 1)	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
	(Mark 2)	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
	(Mark 3)	1.492 – 1.496 mm (0.0587 – 0.0589 in.)
	Connecting rod oil clearance STD (STD)	0.024 – 0.055 mm (0.0009 – 0.0022 in.)
	(U/S 0.25)	0.023 – 0.069 mm (0.0009 – 0.0027 in.)
	Limit	0.08 mm (0.0031 in.)
	Rod bend Limit per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist Limit per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter	22.005 – 22.017 mm (0.8663 – 0.8668 in.)
	Piston pin diameter	21.997 – 22.009 mm (0.8660 – 0.8665 in.)
	Piston pin oil clearance	
	Connecting rod bolt outside diameter STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
	Limit	0.05 mm (0.0020 in.)
	STD	7.860 – 8.000 mm (0.3094 – 0.3150 in.)
	Limit	7.60 mm (0.2992 in.)
Crankshaft	Thrust clearance STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
	Limit	0.30 mm (0.0118 in.)
	Thrust washer thickness	2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance STD (No.3 STD)	0.025 – 0.044 mm (0.0010 – 0.0017 in.)
	(No.3 U/S 0.25)	0.027 – 0.067 mm (0.0011 – 0.0026 in.)
	(Others STD)	0.015 – 0.034 mm (0.0006 – 0.0013 in.)
	(Others U/S 0.25)	0.019 – 0.059 mm (0.0007 – 0.0023 in.)
	Limit	0.08 mm (0.0031 in.)
	Main journal diameter STD	54.988 – 55.003 mm (2.1653 – 2.1655 in.)
	U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)
	Main bearing center wall thickness (Reference)	
	STD (No.3 Mark 1)	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
	(No.3 Mark 2)	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
	(No.3 Mark 3)	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
	(No.3 Mark 4)	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	(No.3 Mark 5)	2.004 – 2.007 mm (0.0789 – 0.0790 in.)
	(Others Mark 1)	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
	(Others Mark 2)	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
	(Others Mark 3)	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
	(Others Mark 4)	2.006 – 2.009 mm (0.0790 – 0.0791 in.)
	(Others Mark 5)	2.009 – 2.012 mm (0.0791 – 0.0792 in.)
	Crank pin diameter STD	51.985 – 52.000 mm (2.0466 – 2.0472 in.)
	U/S 0.25	51.745 – 51.755 mm (2.0372 – 2.0376 in.)
	Circle runout Limit	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round Limit	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round Limit	0.02 mm (0.0008 in.)

Engine balancer	Thrust clearance	STD	0.065 – 0.110 mm (0.0026 – 0.0043 in.)
		Limit	0.110 mm (0.0043 in.)
	Backlash		
	Crankshaft x No. 1 balance shaft		
	Off–vehicle	STD	0 – 0.06 mm (0 – 0.0024 in.)
	On–vehicle	STD	0.025 – 0.090 mm (0.0010 – 0.0035 in.)
	No. 1 balance shaft x No.2 balance shaft		
	at D mark	STD	0.020 – 0.075 mm (0.0008 – 0.0030 in.)
	at E mark	STD	0.005 – 0.075 mm (0.0002 – 0.0030 in.)
	at F mark	STD	0.005 – 0.055 mm (0.0002 – 0.0022 in.)
	Spacer thickness	No.01	1.74 mm (0.0685 in.)
		No.03	1.76 mm (0.0693 in.)
		No.05	1.78 mm (0.0701 in.)
		No.07	1.80 mm (0.0709 in.)
		No.09	1.82 mm (0.0717 in.)
		No.11	1.84 mm (0.0724 in.)
		No.13	1.86 mm (0.0732 in.)
		No.15	1.88 mm (0.0740 in.)
		No.17	1.90 mm (0.0748 in.)
		No.19	1.92 mm (0.0756 in.)
		No.21	1.94 mm (0.0764 in.)
		No.23	1.96 mm (0.0772 in.)
		No.25	1.98 mm (0.0780 in.)
		No.27	2.00 mm (0.0787 in.)
		No.29	2.02 mm (0.0795 in.)
		No.31	2.04 mm (0.0803 in.)
		No.33	2.06 mm (0.0811 in.)
		No.35	2.08 mm (0.0819 in.)
		No.37	2.10 mm (0.0827 in.)
		No.39	2.12 mm (0.0835 in.)
	Balance shaft housing bolt outer diameter		
		STD	6.5 – 6.7 mm (0.2559 – 0.2638 in.)
		Limit	6.3 mm (0.2480 in.)

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head cover x Cylinder head	23	230	17
Spark plug x Cylinder head	18	180	13
Oil pump pulley x Oil pump drive 'shaft	28	280	21
No. 2 idler pulley x Cylinder block	42	425	31
Crankshaft pulley x Crankshaft	108	1,100	80
Camshaft timing pulley x Camshaft	54	550	40
Camshaft timing pulley x Camshaft (For use with SST)	37	380	27
No. 1 idler pulley x Cylinder heed	42	425	31
No. 2 engine mounting bracket x Cylinder block	52	530	38
Engine moving control rod X Fender apron	64	650	47
Engine moving control rod x No. 2 engine mounting bracket	64	650	47
Cylinder head x Cylinder block (1 sty	49	500	36

Cylinder head x Cylinder block (2nd)	Turn 90°		
Spark plug tube x Cylinder head	39	400	29
Camshaft bearing cap x Cylinder head	19	190	14
Generator bracket x Cylinder head	42	425	31
Engine hanger x Cylinder head	25	250	18
No. 3 timing belt cover x Cylinder head	7.8	80	69 in.·lbf
Delivery pipe x Cylinder head	13	130	9
Pulsation damper x Delivery pipe	34	350	25
Intake manifold x Cylinder heed	19	195	14
Intake manifold stay x Intake manifold	22	220	16
Intake manifold stay x Cylinder block	42	425	31
No. 1 air intake chamber stay x Intake manifold	42	425	31
No. 1 air intake chamber stay x Cylinder head	42	425	31
EGR valve x intake manifold	13	130	9
EGR pipe x Cylinder head	59	600	43
Throttle body x Intake manifold	19	195	14
Water bypass pipe x Water pump cover	8.8	90	78 in.·lbf
Water outlet x Cylinder head	15	150	11
WU–TWC x Exhaust manifold	29	300	22
Exhaust manifold x Cylinder head	49	500	36
Exhaust manifold stay x WU –TWC	42	425	31
Exhaust manifold stay x FR engine mounting insulator	42	425	31
No. 1 exhaust manifold stay x WU –TWC	42	425	31
No. 1 exhaust manifold stay x Cylinder block	42	425	31
Main bearing cap x Cylinder block	59	600	43
Connecting rod cap x Connecting rod (1 st)	25	250	18
Connecting rod cap x Connecting rod (2nd)	Turn 90°		
No. 1 balance shaft housing x No. 2 balance shaft housing (1st)	22	220	16
No. 1 balance shaft housing x No. 2 balance shaft housing (2nd)	Turn 90°		
Engine balancer x Cylinder block	49	500	36
Rear oil seal retainer x Cylinder block	9.3	95	82 in.·lbf
Knock sensor x Cylinder block	37	380	27
PS pump bracket x Cylinder block	43	440	32
Rear end plate x Cylinder block	9.3	95	82 in.·lbf
Flywheel x Crankshaft (M/T)	88	900	65
Drive plate x Crankshaft (A/T)	83	850	61
RR engine mounting insulator x Cylinder block	64	650	47
FR engine mounting insulator x Cylinder block	77	790	57
FR engine mounting insulator x Front suspension member	80	820	59
RR engine mounting insulator x Front suspension member	66	670	48
LH engine mounting insulator x Transaxle	64	650	47
PS pump x PS pump bracket	43	440	31
Front exhaust pipe x WU –TWC	62	630	46
A/C compressor x Cylinder block	27	280	20
Fuel inlet hose x Fuel filter (Union bolt)	29	300	22

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

system	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EG R	Reduces NOx
Three–way catalytic converter	TWC	Reduces C0, HC and NOx
*Multiport fuel injection/Sequential multiport fuel injection	MFI/SFI	Regulates all engine conditions for reduction of exhaust emissions.

” For inspection and repair of the MFI/SFI system, refer to MFI/SFI Section.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

 09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

 09082–00050 TOYOTA Electrical Tester Set	

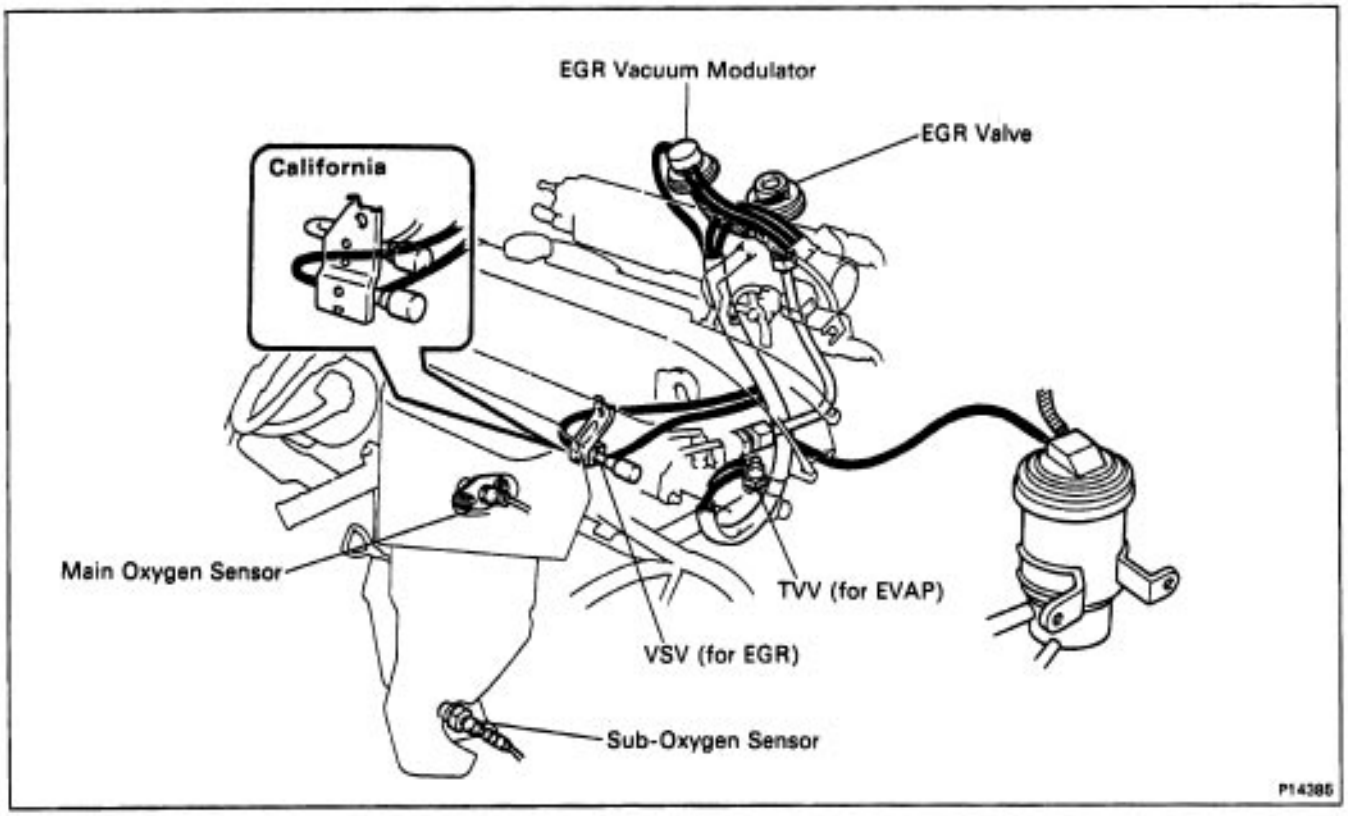
EQUIPMENT

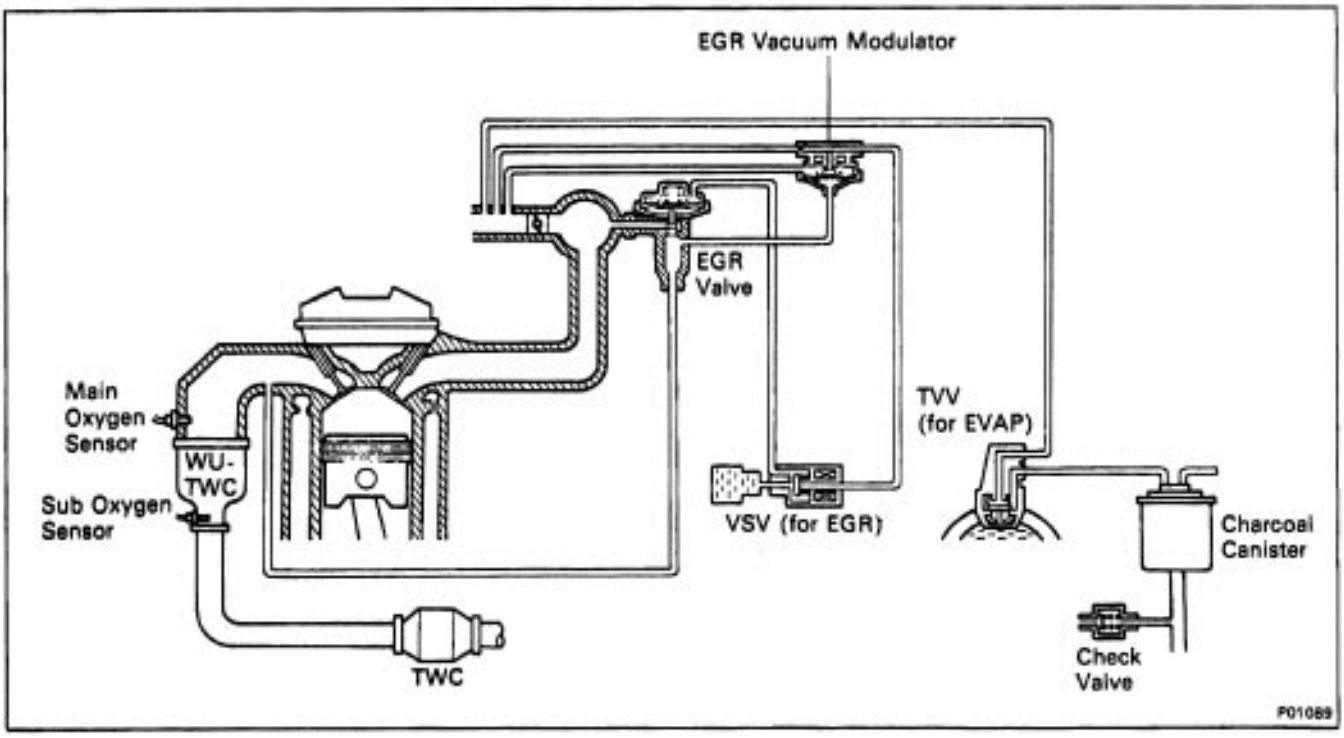
Heater	TVV
Thermometer	TVV
Tachometer	
Torque wrench	
Vacuum gauge	

SSM (SPECIAL SERVICE MATERIALS)

08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	¿¿V

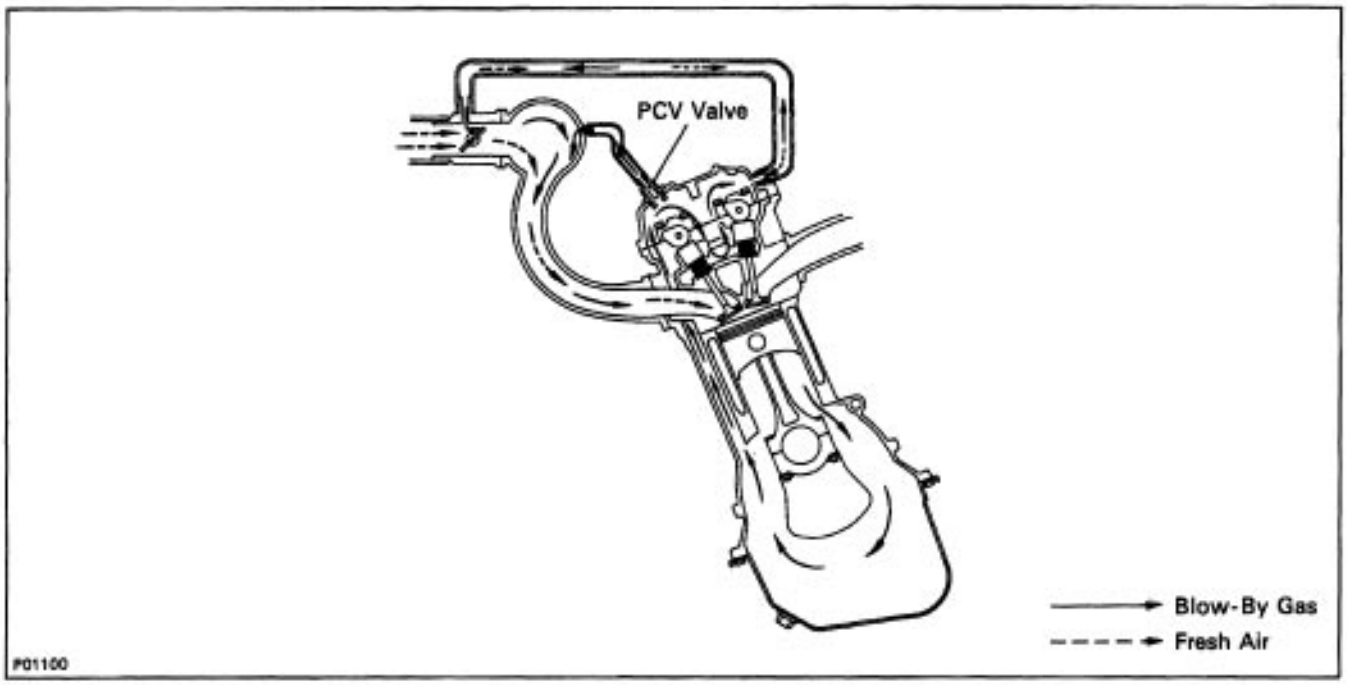
LAYOUT AND SCHEMATIC DRAWING





V04424

POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emission, crankcase blow–by gas is routed through the PCV valve to the air intake chamber for combustion in the cylinders.

Engine not Running

- PCV VALVE IS CLOSED.

Normal Operation

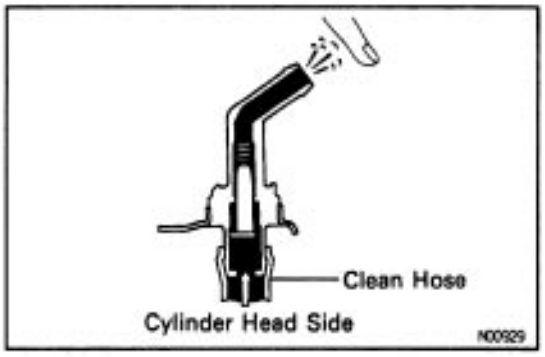
- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

Idling or Deceleration

- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

Acceleration or High Load

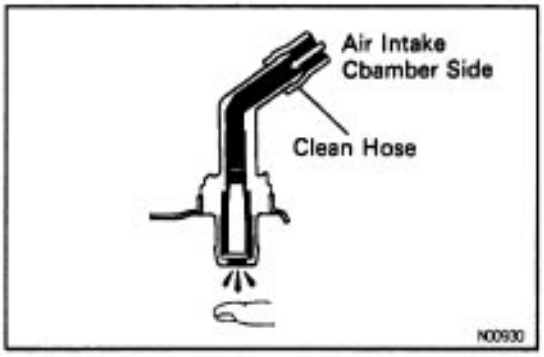
- PCV VALVE IS FULLY OPEN.



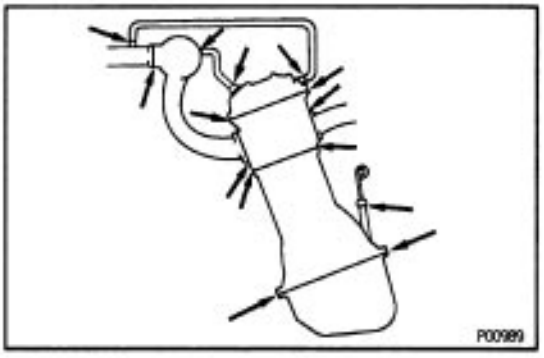
PCV VALVE INSPECTION

1. REMOVE PCV VALVE
2. INSTALL CLEAN HOSE TO PCV VALVE
3. BLOW AIR FROM CYLINDER HEAD SIDE
Check that air passes through easily.

NOTICE: Do not suck air through the valve.
Petroleum substances inside the valve are harmful.

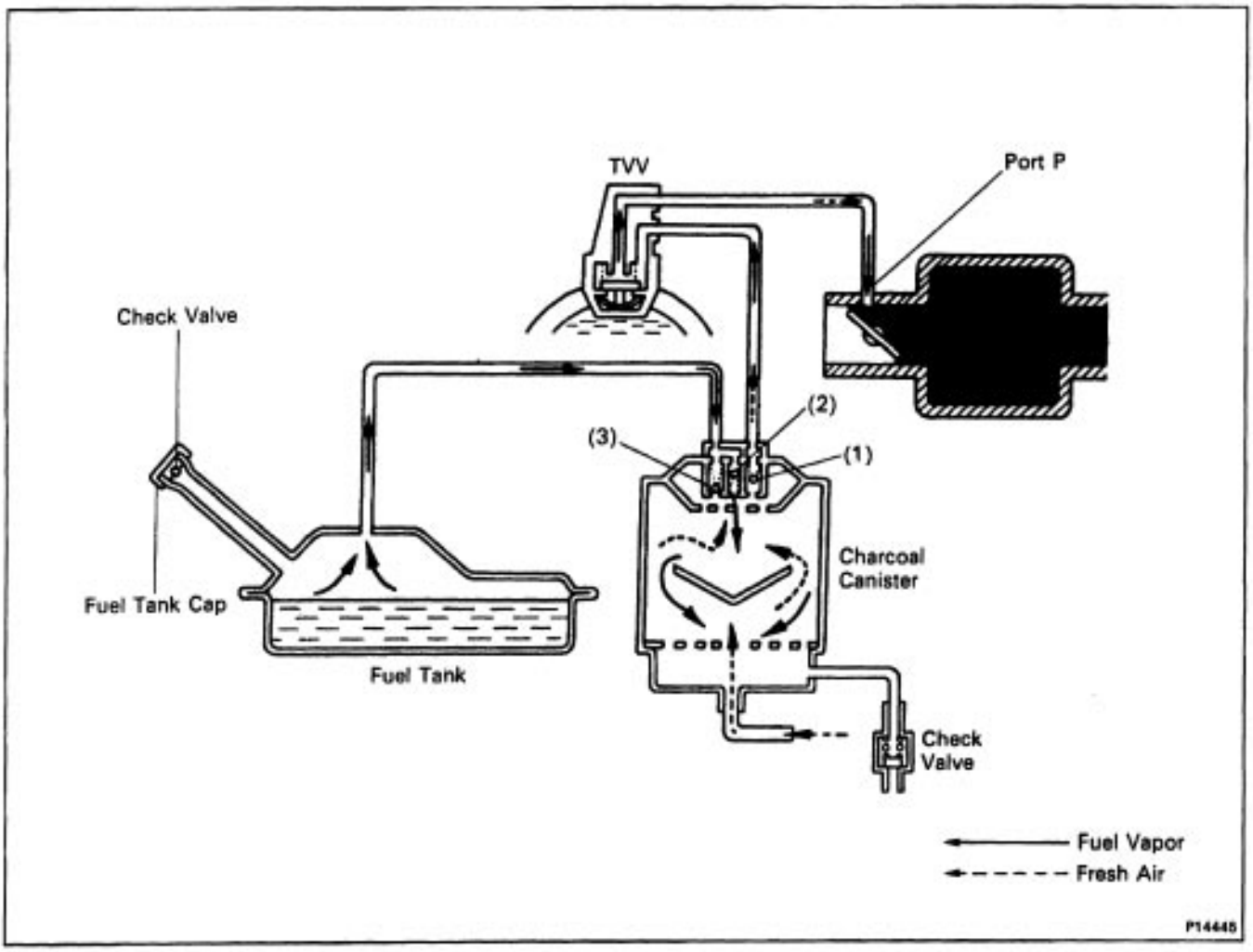


4. BLOW AIR FROM AIR INTAKE CHAMBER SIDE
Check that air passes through with difficulty.
If the PCV valve fails either of the checks, replace it.
5. REMOVE CLEAN HOSE FROM PCV VALVE
6. REINSTALL PCV VALVE



PCV HOSES AND CONNECTIONS
INSPECTION
VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS
Check for cracks, leaks or damage.

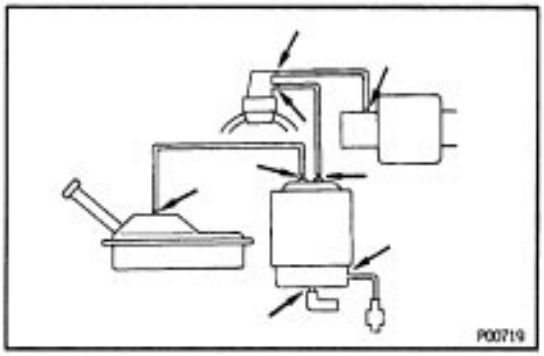
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM



To reduce NC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check Valve In Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	–	–	–	–	–	NC from tank is absorbed into the canister
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	–	–	–	
		Positioned above port P	OPEN	–	–	–	HC from canister is led into air intake chamber.
High pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in tank	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank.

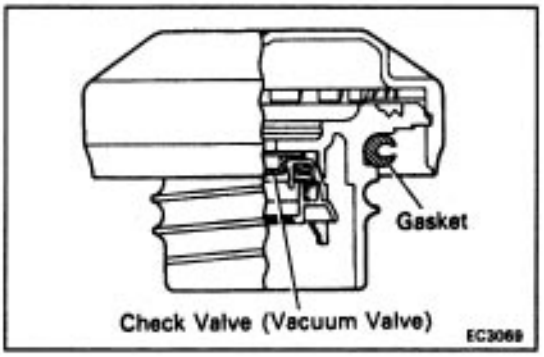
V04477



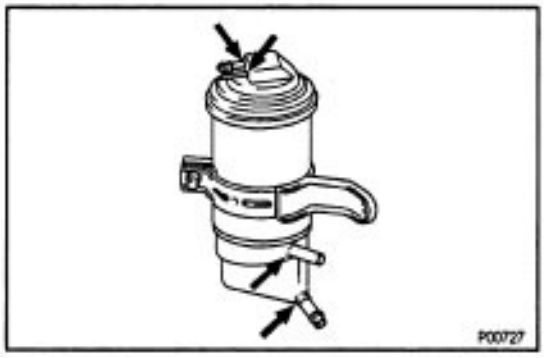
FUEL VAPOR LINES. FUEL TANK AND TANK CAP INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS
Look for loosen connections, sharp bends or damage.
2. VISUALLY INSPECT FUEL TANK

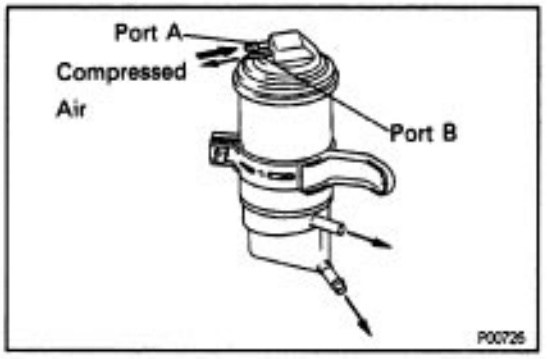
Look for deformation, cracks or fuel leakage.



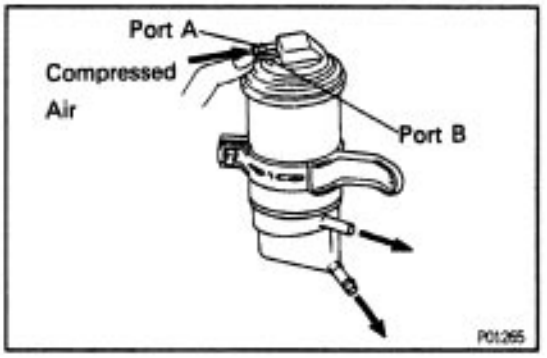
3. VISUALLY INSPECT FUEL TANK CAP
Check if the cap and/or gasket are deformed or dam–aged.
If necessary, repair or replace the cap.



CHARCOAL CANISTER INSPECTION
1. REMOVE CHARCOAL CANISTER
2. VISUALLY INSPECT CHARCOAL CANISTER
Look for cracks or damage.



3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE
(a) Using low pressure compressed air (4.71 kPa, 48 gf/cm^2, 0.68 psi), blow into port A and check that air flows without resistance from the other ports.
(b) Blow air (4.71 kPa, 48 gf/cm® 0.68 psi) into port B and check that air does not flow from the other ports.
If a problem is found, replace the charcoal canister.

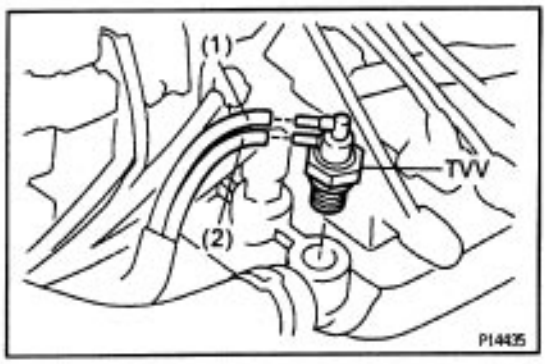


4. CLEAN FILTER IN CANISTER
Clean the filter by blowing 294 kPa (3 kgf/cm® 43 psi) of compressed air into port A while holding port B closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

5. REINSTALL CHARCOAL CANISTER



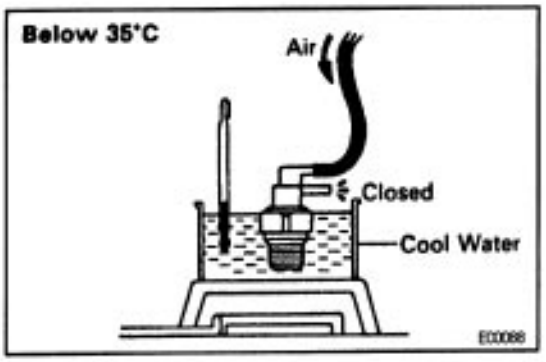
TVV INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE TVV FROM WATER INLET HOUSING

(a) Disconnect the following hoses:
  (1) Vacuum hose (from throttle body)
  (2) Vacuum hose (from charcoal canister)

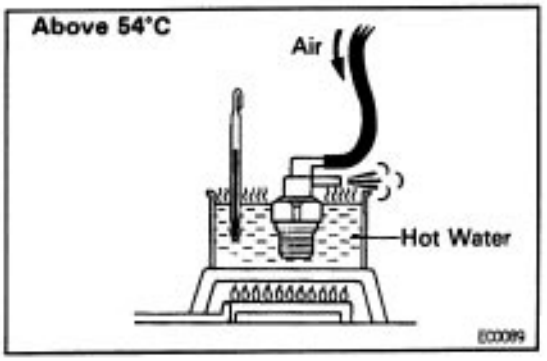
(b) Remove the TVV.



3. INSPECT TVV OPERATION

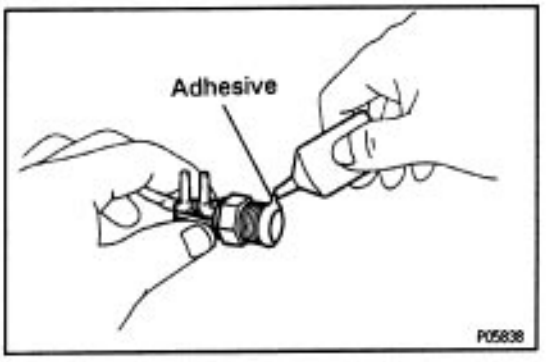
(a) Cool the TVV to below 35_3C (95_3F) with cool water.

(b) Check that air does not flow from the upper port to lower port.



(c) Heat the TVV to above 54_3C (129_3F) with hot water.

(d) Check that air flows from the upper port to lower port.
If operation is not as specified, replace the TVV.

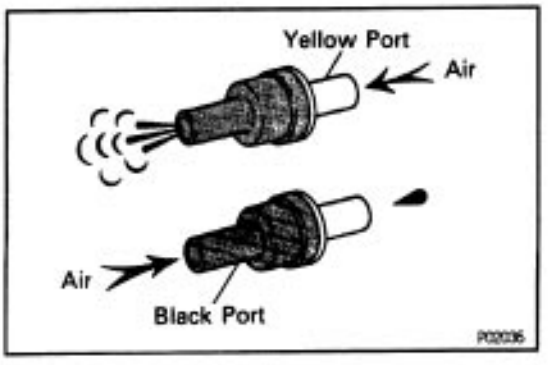


4. REINSTALL TVV

(a) Apply adhesive to 2 or 3 threads of the TVV, and install it.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

(b) Reconnect 2 vacuum hoses.

5. REFILL WITH ENGINE COOLANT



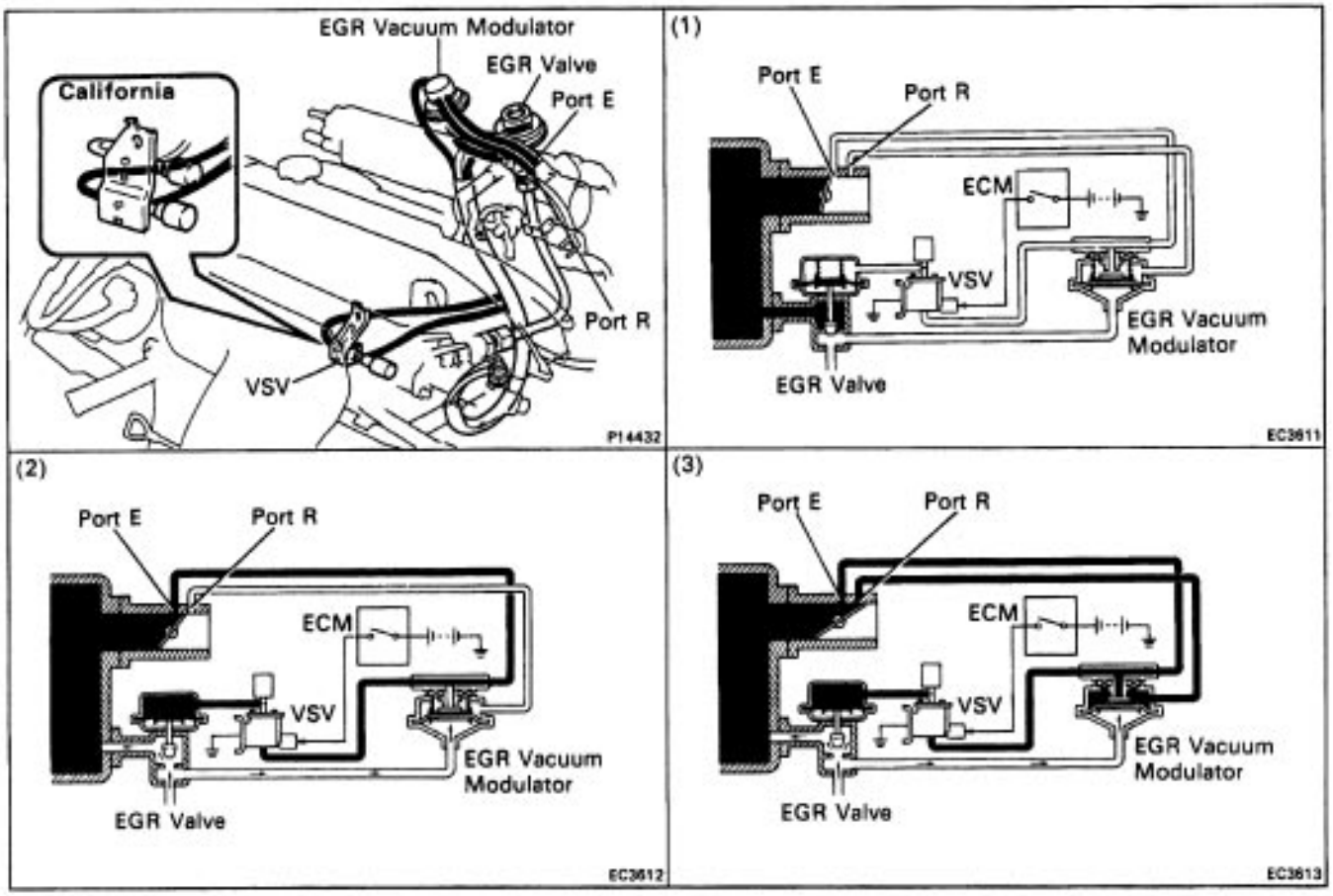
CHECK VALVE INSPECTION

INSPECT CHECK VALVE

(a) Check that air flows from the yellow port to the black port.

(b) Check that air does not flow from the black port to the yellow port.
If operation is not as specified, replace the check valve.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM



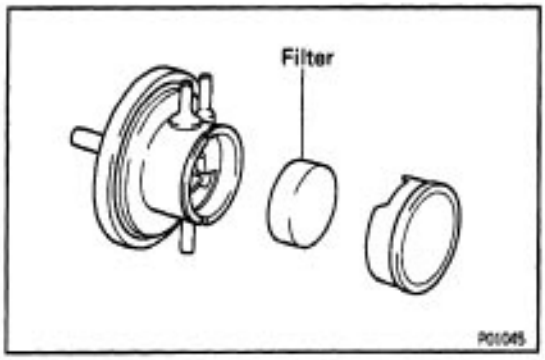
ECT	RPM	PIM (ECM)	VSV	Throttle Valve Opening Aigle	Pressure the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 55°C (131°F)	–	–	CLOSED	–	–		–	CLOSED	Not recirculated
Above 60°C (140°F)	Below 4,000 rpm	OFF	CLOSED	Position below port E	–		–	CLOSED	Not recirculated
			CLOSED	Position below port E	(1)	–	–	CLOSED	Not recirculated
		***ON	OPEN	Positioned between port E and port R	(2) HIGH	*	CLOSES passage to atmosphere	OPEN	Recirculated
				Position above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)
	Above 4,000 rpm	OFF	CLOSED	–	–		–	CLOSED	Not Recirculated

* Pressure increases → Modulator closes → EGR valve opens → Pressure drops
EGR valve closes ← Modulator opens ←

** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the exhaust gas, even if the exhaust pressure is insufficiently low.

*** If terminals TE1 and E1 of data link connector 1 are connected, the VSV switches ON.

EGR SYSTEM INSPECTION

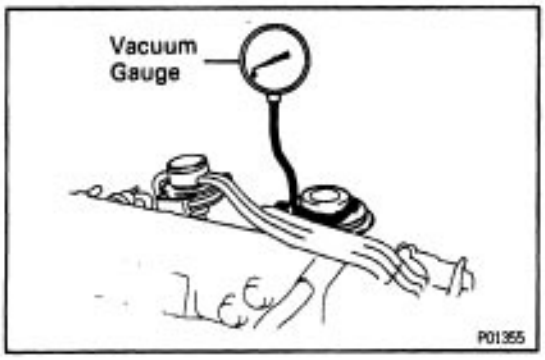


1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

HINT: Install the filter with the coarser surface facing the atmospheric side (outward).

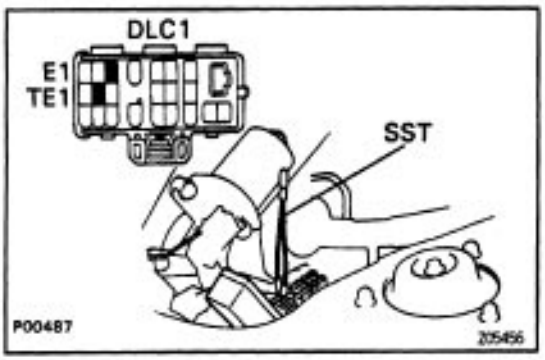


2. PREPARATION

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.

3. CHECK SEATING OF EGR VALVE

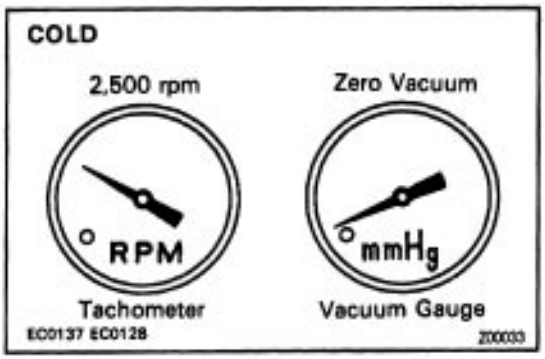
Start the engine and check that the engine starts and runs at idle.



4. CONNECT TERMINALS TE1 AND E1

Using SST, connect terminals TE 1 and E 1 of the data link connector 1.

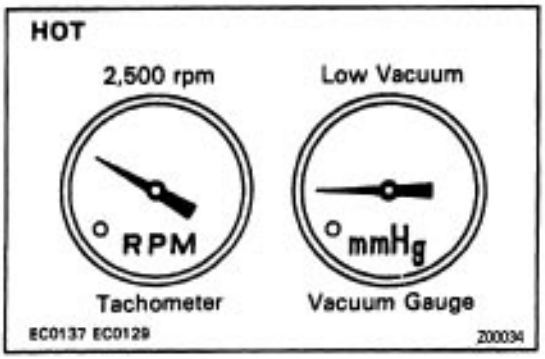
SST 09843–18020



5. CHECK VSV

(a) The engine coolant temperature should be below 60°C (140°F) (A/T) or 55°C (131 °F) (M/T).

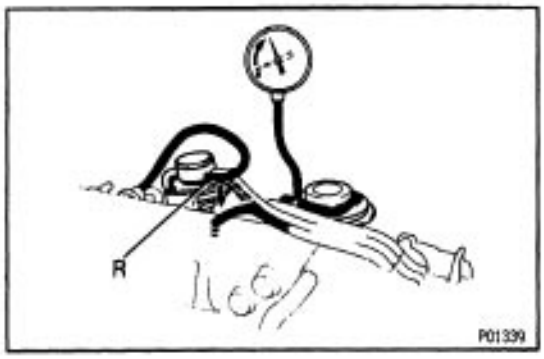
(b) Check that the vacuum gauge indicates zero at 2.500 rpm.



6. CHECK VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

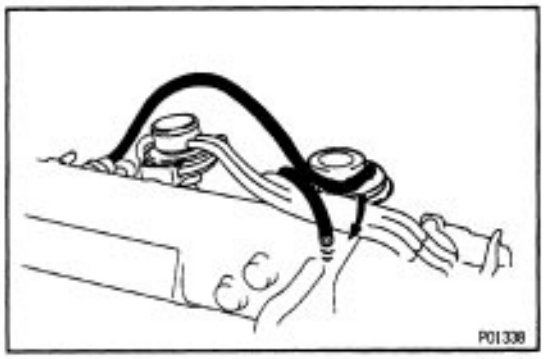
(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.



(c) Disconnect the vacuum hose port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 2,500 rpm.

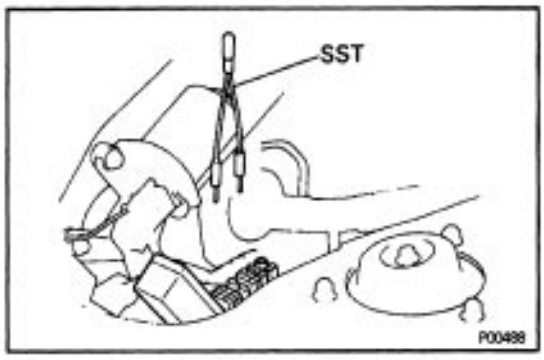
HINT: As a large amount of exhaust gas enters, the engine will misfire slightly.

(e) Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.



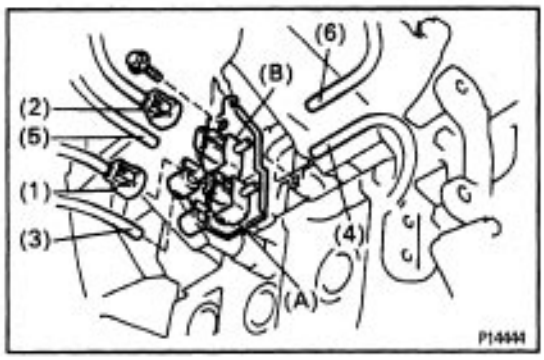
7. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.



8. DISCONNECT TERMINALS TE1 AND E1

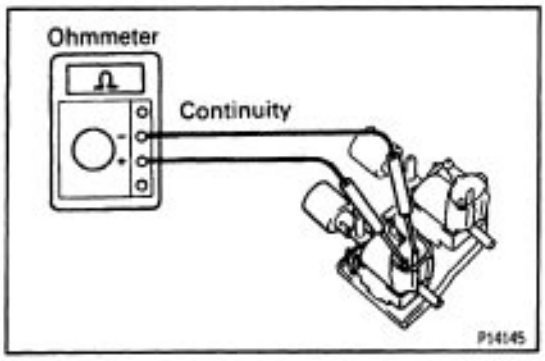
Remove the SST.
SST 09843–18020
IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART



VSV INSPECTION (California)

1. REMOVE VSV

(a) Disconnect the following connectors and hoses:
(1) VSV for EGR
(A) connector
(2) VSV for fuel pressure control
(B) connector
(3) Vacuum hose (from EGR valve) from port E of VSV (A)
(4) Vacuum hose (from port “a” of EGR vacuum modulator) from port G of VSV (A)
(5) Vacuum hose (from fuel pressure regulator) from port E of VSV (B)
(6) Vacuum hose (from air intake chamber) from port G of VSV (B)
(b) Remove the bolt and VSV assembly.



2. INSPECT VSV

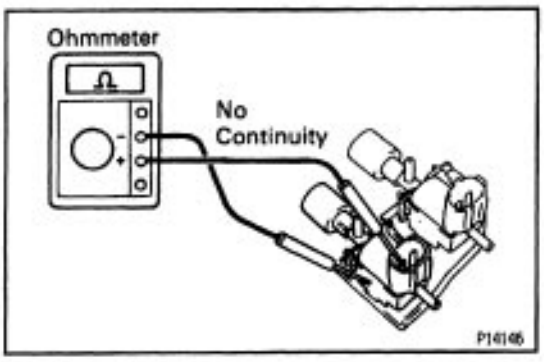
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

33–39)

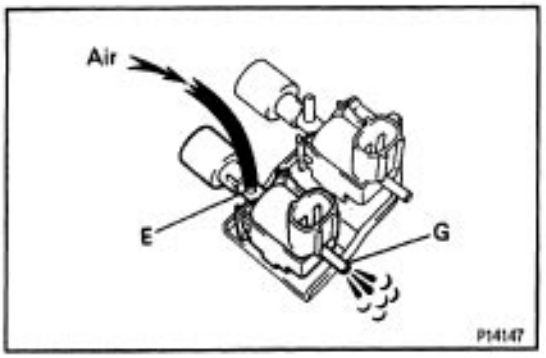
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

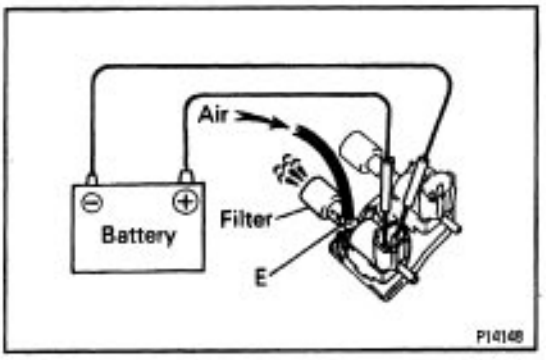
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

(a) Check that air flows from port E to port G.

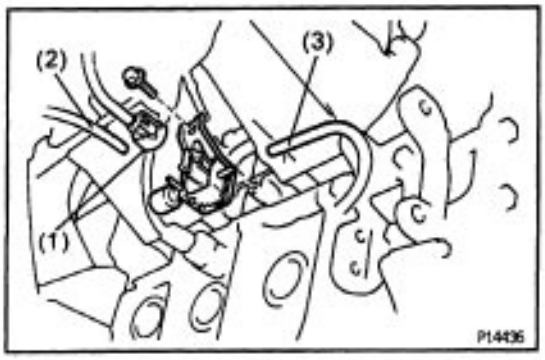


(b) Apply battery voltage across the terminals.

(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

3. REINSTALL VSV



VSV INSPECTION (Except California)

1. REMOVE VSV

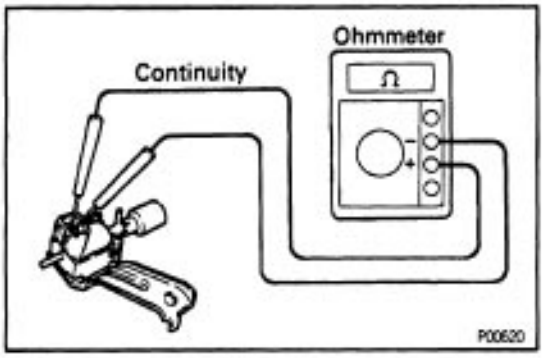
(a) Disconnect the following connector and hoses:

(1) VSV connector

(2) Vacuum hose (from EGR valve) from port E of VSV

(3) Vacuum hose (from port “Q” of EGR vacuum modulator) from port G of VSV

(b) Remove the bolt and VSV.



2. INSPECT VSV

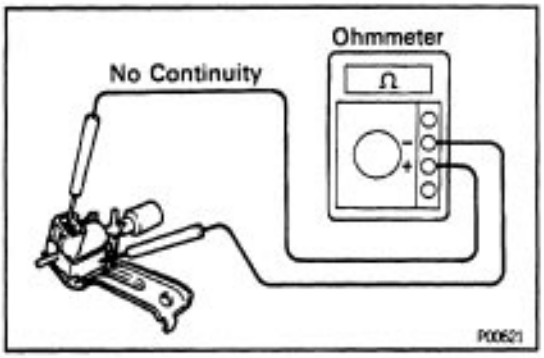
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

33–39)

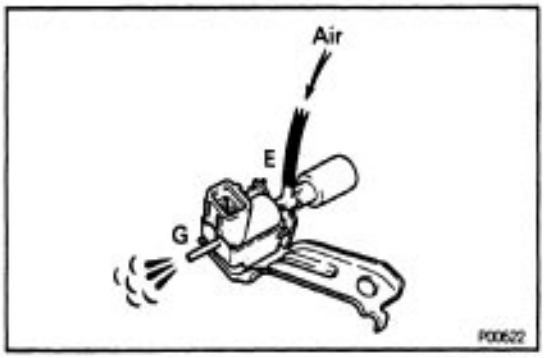
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

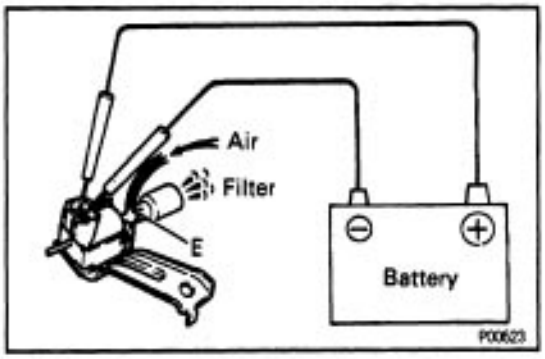
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

(a) Check that air flows from port E to port G.

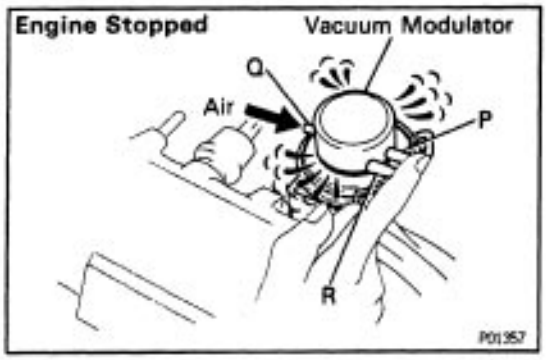


(b) Apply battery voltage across the terminals.

(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

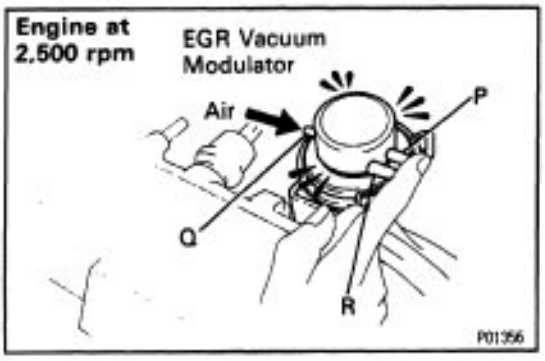
3. REINSTALL VSV



EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Block ports P and R with your finger.
(c) Blow air into port Q, and check that the air passes through to the air filter side freely.



(d) Start the engine, and maintain speed at 2.500 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.

EGR VALVE INSPECTION

1. REMOVE EGR VALVE

Check for sticking and heavy carbon deposits.
If a problem is found, replace the valve.

2. REINSTALL EGR VALVE WITH NEW GASKET

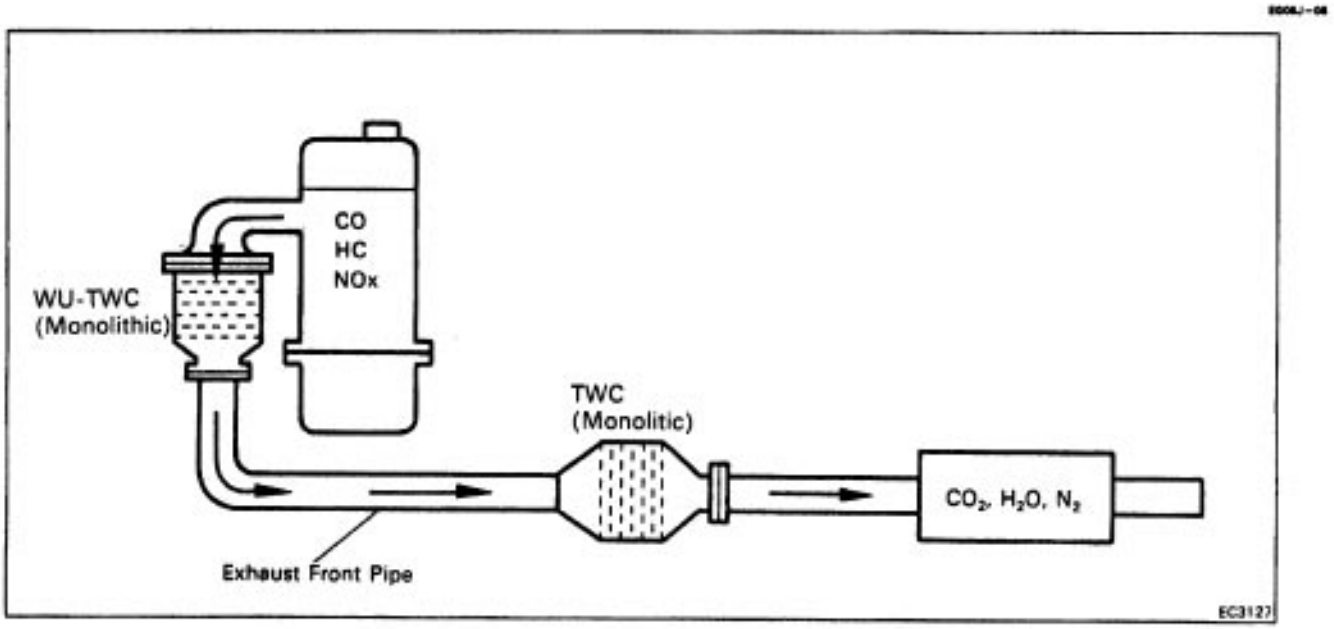
Nut

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

Union nut

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

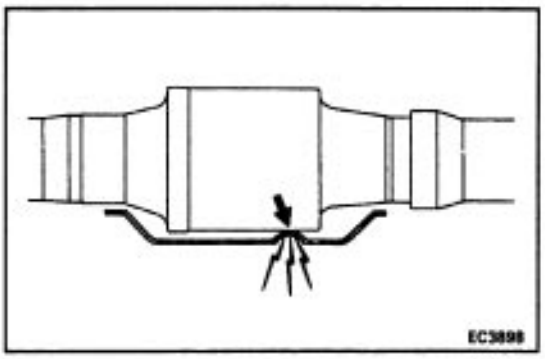


To reduce C0, HC end NOx emissions, they are oxidized, reduced and converted to carbon dioxide (CO_2), water (H_20) and nitrogen (N_2) by the catalyst.

Exhaust Port		WU–TWC		TWC		Exhaust Gas
CO HC NOx	→	OXIDATION AND REDUCTION	→	OXIDATION AND REDUCTION	→	CO_2 H_2O N_2

EXHAUST PIPE ASSEMBLY INSPECTION

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

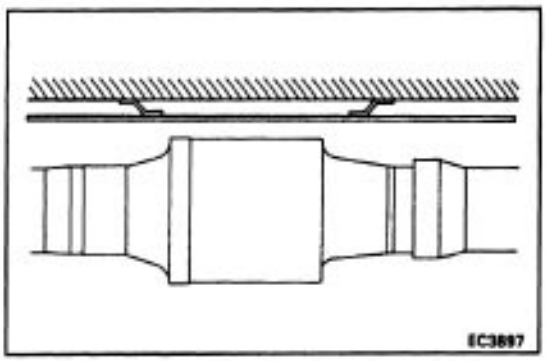


THREE–WAY CATALYTIC CONVERTER INSPECTION

TWC:

CHECK FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that it contacts the TWC, repair or replace it.

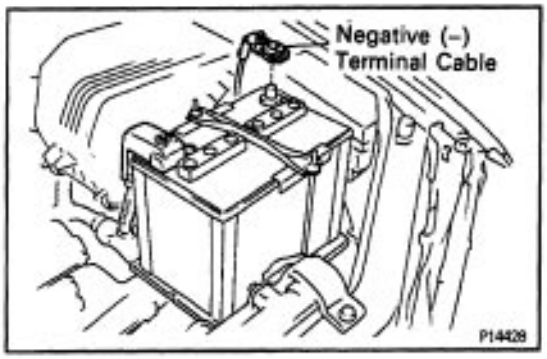


HEAT INSULATOR INSPECTION

TWC:

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN THREE – WAY CATALYTIC CONVERTER AND HEAT INSULATOR

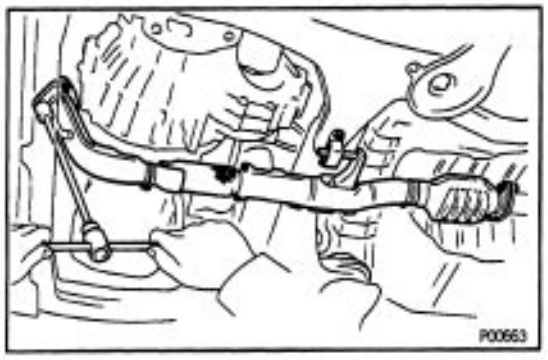


THREE–WAY CATALYTIC CONVERTER REPLACEMENT

WU–TWC:

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE FRONT EXHAUST PIPE

(a) Loosen the 2 bolts, and disconnect the bracket.

(b) Remove the 2 bolts and nuts holding the front exhaust pipe to the center exhaust pipe.

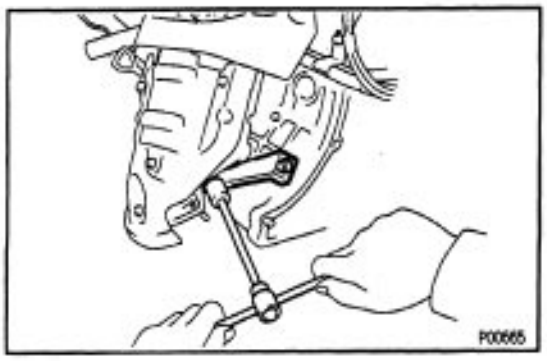
(c) Using a 14 mm deep socket wrench, remove the 3 nuts holding the front exhaust pipe to the WU–TWC.

(d) Remove the front exhaust pipe and gaskets.

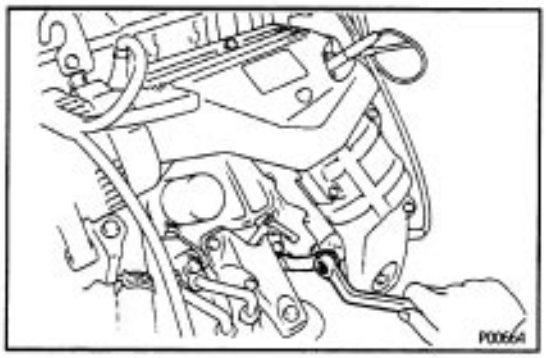
3. REMOVE WARM UP THREE – WAY CATALYTIC CONVERTER

(a) Check that the WU–TWC is cool.

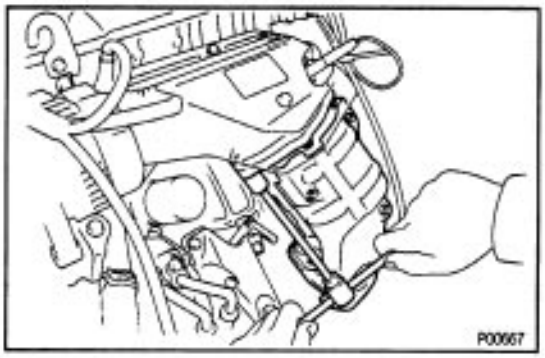
(b) Disconnect the sub oxygen sensor connector.



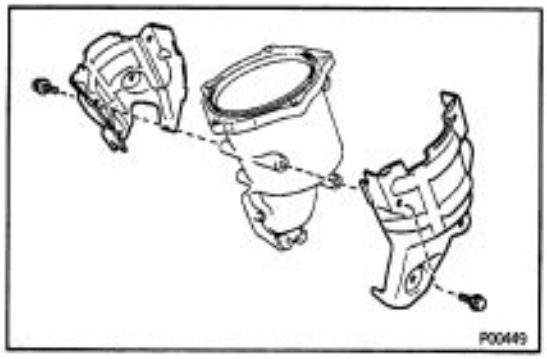
(c) Remove the bolt, nut and No. 1 manifold stay.



(d) Remove the bolt, nut and manifold stay.

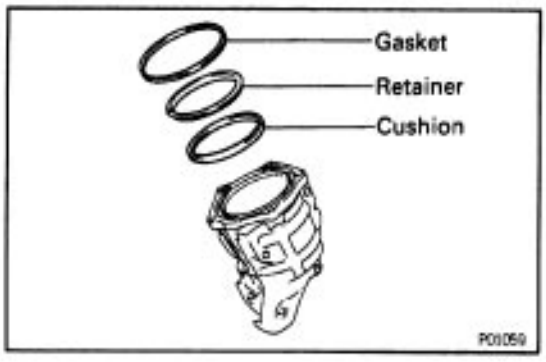


(e) Remove the 3 bolts, 2 nuts, WU –TWC, gasket, retainer and cushion.
(f) Remove the 8 bolts and 2 heat insulators from the WU –TWC.

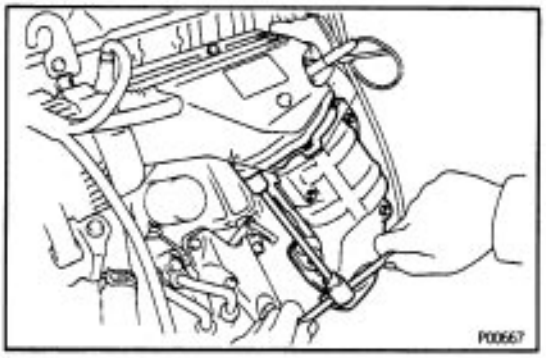


4. REINSTALL WARM–UP THREE–WAY CATALYTIC CONVERTER

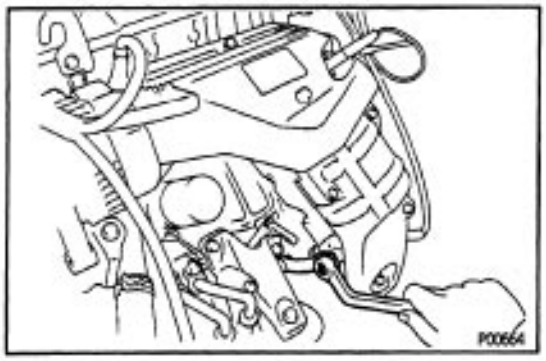
(a) Install the 2 heat insulators to a new WU –TWC with the 8 bolts.



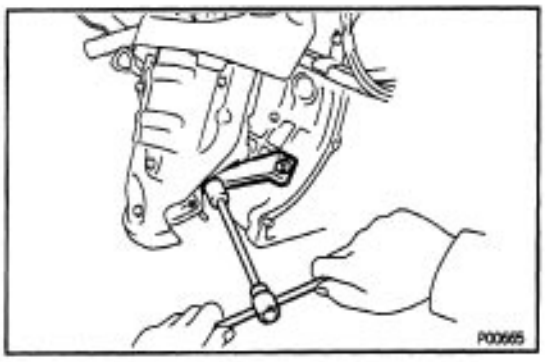
(b) Place new cushion, retainer and gasket on the WU–TWC.



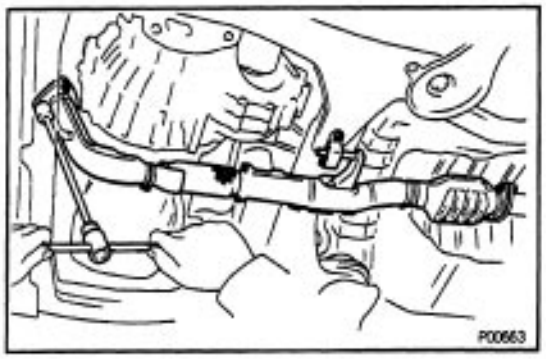
(c) Install the WU–TWC with the 3 bolts and 2 new nuts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



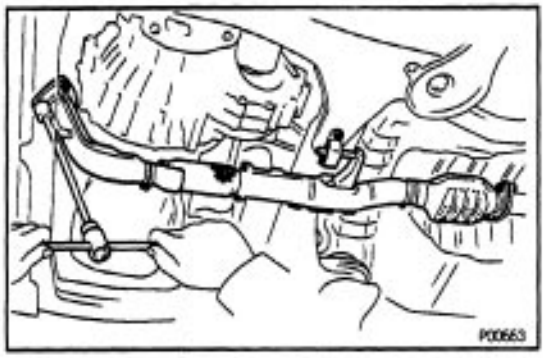
(d) Install the manifold stay with the bolt and nut.
Torque: 42 N–m (425 kgf–cm. 31 ft–lbf)



(e) Install the No. 1 manifold stay with the bolt and nut.
Torque: 42 N–m (425 kgf–cm. 31 ft–lbf)
(f) Connect the sub oxygen sensor connector.



5. REINSTALL FRONT EXHAUST PIPE
(a) Place 2 new gaskets on the front and rear of the front exhaust pipe.
(b) Temporarily install the 2 bolts and 2 new nuts holding the front exhaust pipe to the center exhaust pipe.
(c) Using a 14 mm deep socket wrench, install the 3 new nuts holding the front exhaust pipe to the WU –TWC.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(d) Tighten the 2 bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
Torque: 58 N–m (570 kgf–cm, 41 ft–lbf)
(e) Install the bracket with the 2 bolts.
6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



TWC:

1. REMOVE FRONT EXHAUST PIPE (THREE – WAY CATALYTIC CONVERTER)

(a) Loosen the 2 bolts, and disconnect the bracket.
(b) Remove the 2 bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
(c) Using a 14 mm deep socket wrench, remove the 3 nuts holding the front exhaust pipe to the WU–TWC.
(d) Remove the front exhaust pipe and gasket.

2. REINSTALL FRONT EXHAUST PIPE (THREE–WAY CATALYTIC CONVERTER)

(a) Place 2 new gaskets on the front and rear of the front exhaust pipe.
(b) Temporarily install the 2 bolts and 2 new nuts holding the front exhaust pipe to the center exhaust pipe.
(c) Using a 14 mm deep socket wrench, install the 3 new nuts holding the front exhaust pipe to the WU –TWC.
Torque: 412 N–m (630 kgf–cm, 46 ft–lbf)
(d) Tighten the 2 bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
Torque: 58 N–m (570 kgf–cm, 41 ft–lbf)
(e) Install the bracket with the 2 bolts.

SERVICE SPECIFICATIONS

SERVICE DATA

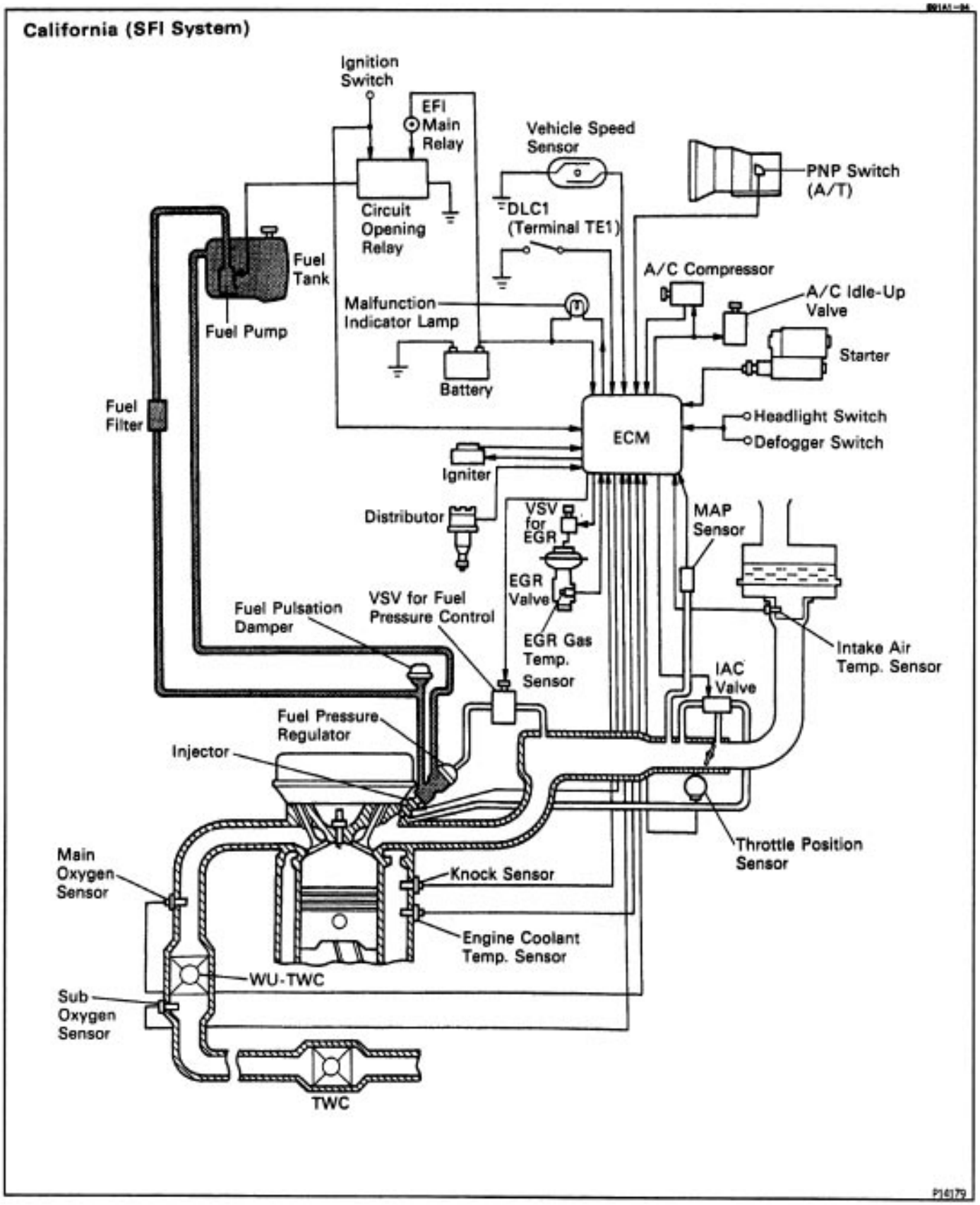
VSV (for EGR)	Resistance at 20°C (68°F)	33 – 39 Ω

TORQUE SPECIFICATIONS

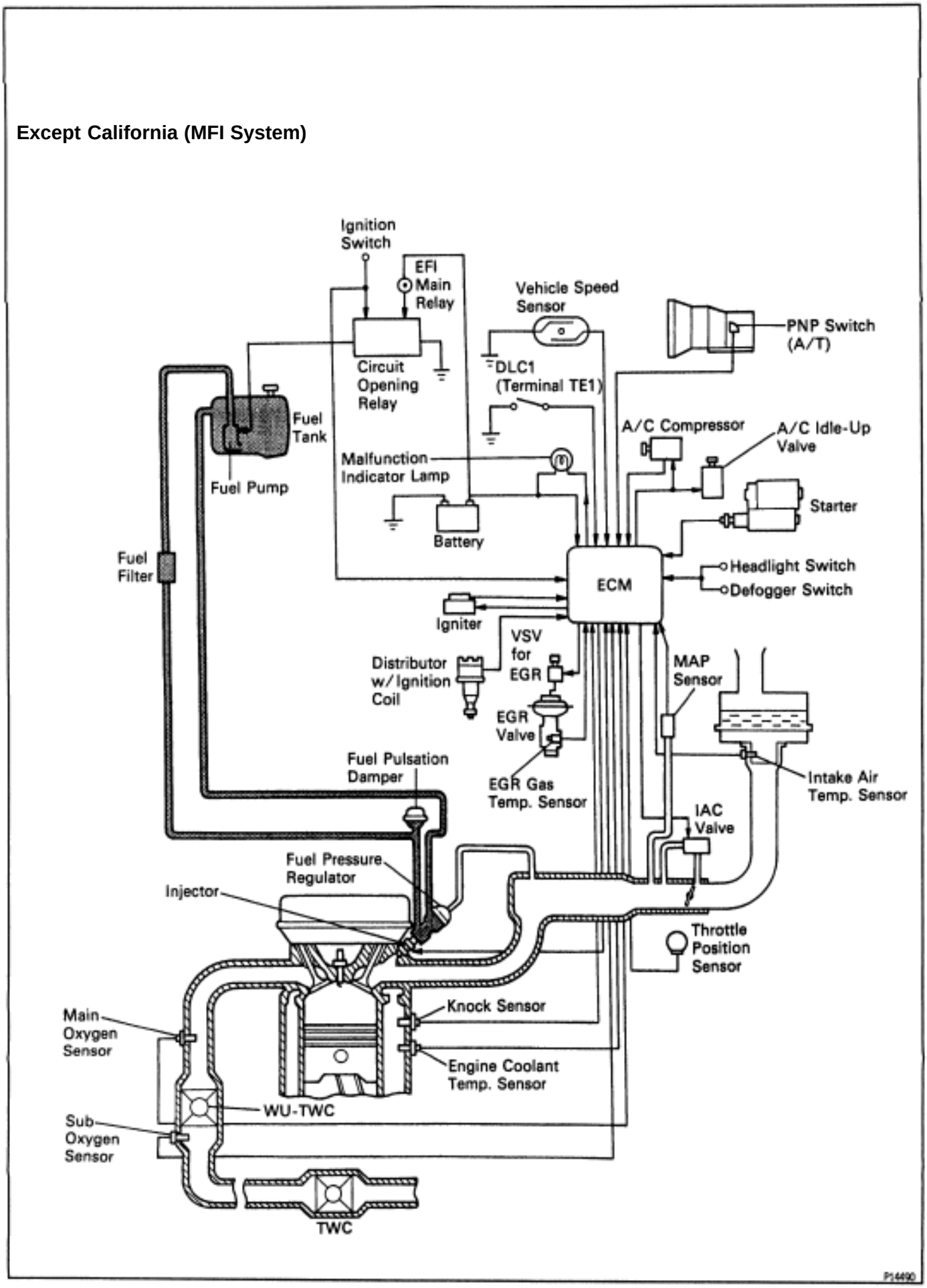
Part tightened	N·m	kgf·cm	ft·lbf
TVV x Water outlet housing	29	300	22
EGR valve x Intake manifold	13	130	9
EG R valve x EGR pipe	59	600	43
WU–TWC x Exhaust manifold	29	300	22
Exhaust manifold stay x WU–TWC	42	425	31
Exhaust manifold stay x FR engine mounting insulator	42	425	31
No.1 exhaust manifold stay x WU–TWC	42	425	31
No.1 exhaust manifold stay x Cylinder block	42	425	31
Front exhaust pipe x WU–TWC	62	630	46
Front exhaust pipe x Center exhaust pipe	56	570	41

MFI/SFI SYSTEM

DESCRIPTION



Except California (MFI System)



The MFI (Multiport Fuel Injection)/SFI (Sequential Multiport Fuel Injection) system is composed of 3 basic sub–systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the MFI/SFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake port in accordance with signals from the ECM (Engine Control Module).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The CAMRY 5S–FE engine is equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the MFI/SFI, ESA, IAC diagnosis systems etc. by means of an Engine Control Module (ECM–formerly MFI/SFI computer) employing a microcomputer.

The ECM controls the following functions:

1. Multiport Fuel Injection (MFI)/Sequential Multiport Fuel Injection (SFI)

   The ECM receives signals from various sensors indicating changing engine operation conditions such as:

   Intake manifold pressure
   Intake air temperature
   Engine coolant temperature
   Engine speed
   Throttle valve opening angle
   Exhaust oxygen content etc.

   The signals are utilized by the ECM to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Spark Advance (ESA)

   The ECM is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (RPM, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.

3. Idle Air Control (IAC)

   The ECM is programmed with target idling speed values to respond to different engine conditions (engine coolant temperature, air conditioning ON/OFF, etc.). Sensors transmit signals to the ECM which controls the flow of air through the bypass of the throttle valve and adjusts idle speed to the target value.

4. Diagnosis

   The ECM detects any malfunctions and abnormalities in the sensor network and lights a malfunction indicator lamp in the combination meter. At the same time, trouble is identified and a diagnostic trouble code is recorded by the EC

5. The diagnostic trouble code can be read by the

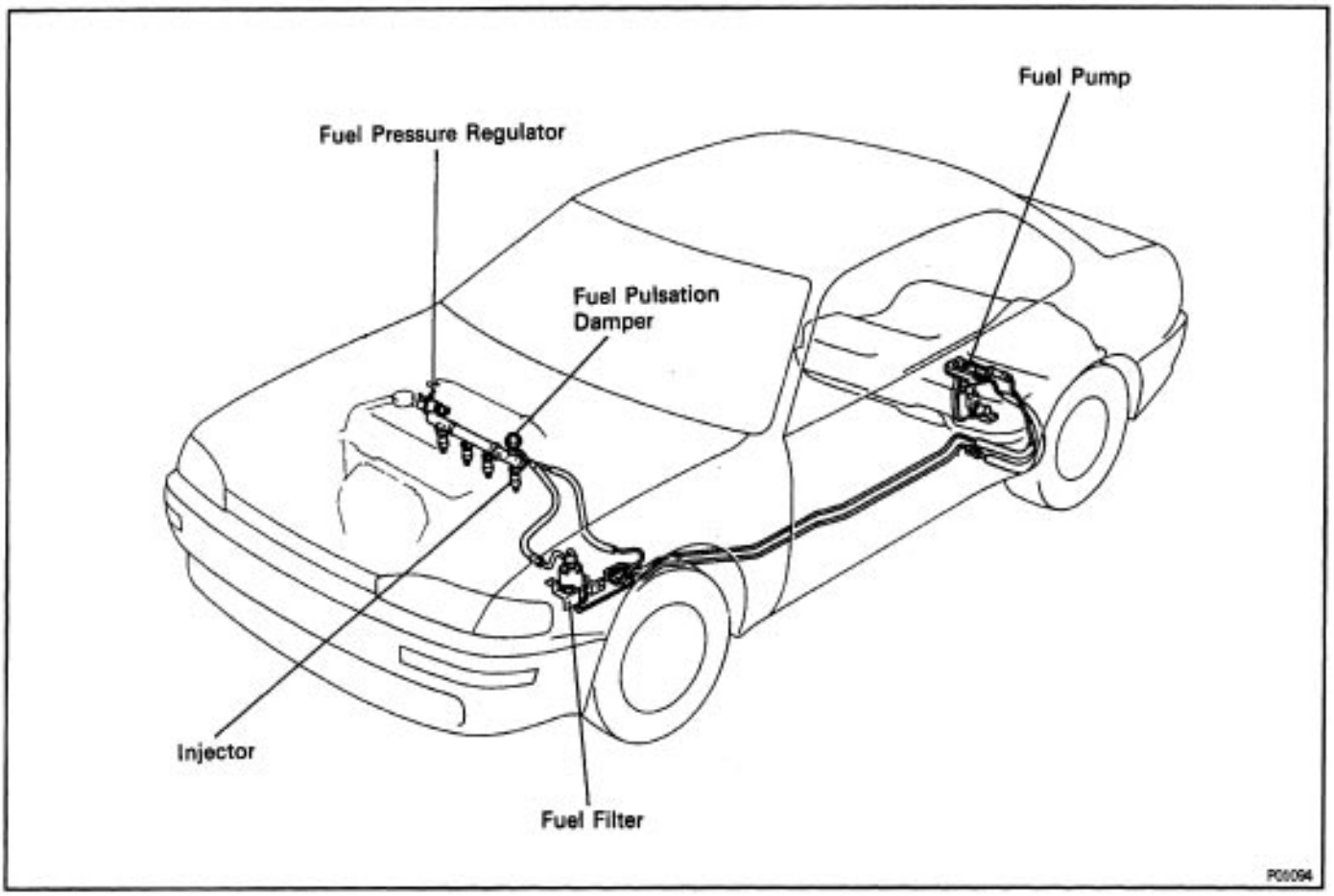
   number of blinks of the malfunction indicator lamp when terminals TE1 and E1 are connected. The diagnostic trouble codes are referred to in later page. (See page EG1–300)

   Fail–Safe Function

   In the event of the sensor malfunction, a back–up circuit will take over to provide minimal driveability, and the malfunction indicator lamp will illuminate.

OPERATION

FUEL SYSTEM



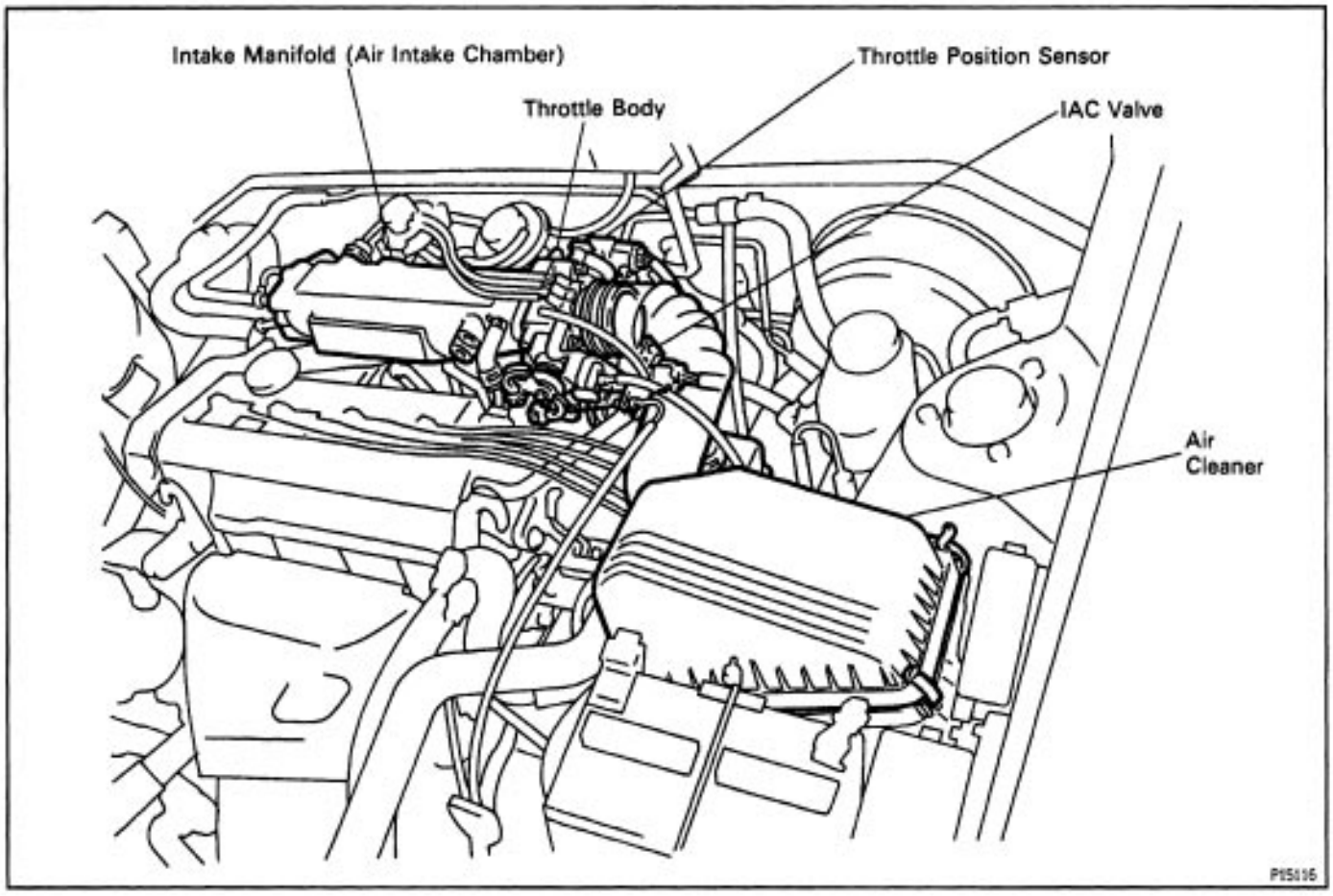
Fuel pumped up by the fuel pump, flows through the fuel filter and is distributed to each injector at a set pressure maintained by the pressure regulator.

The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2.9 kgf/cm® 41 psi) higher than the pressure inside the cylinder head, and excess fuel is returned to the fuel tank through the return pipe.

The pulsation damper absorbs the slight fluctuations in fuel pressure caused by fuel injector from the injector.

The injectors operate on input of injection signals from the ECM and inject fuel into the cylinder head.

AIR INDUCTION SYSTEM

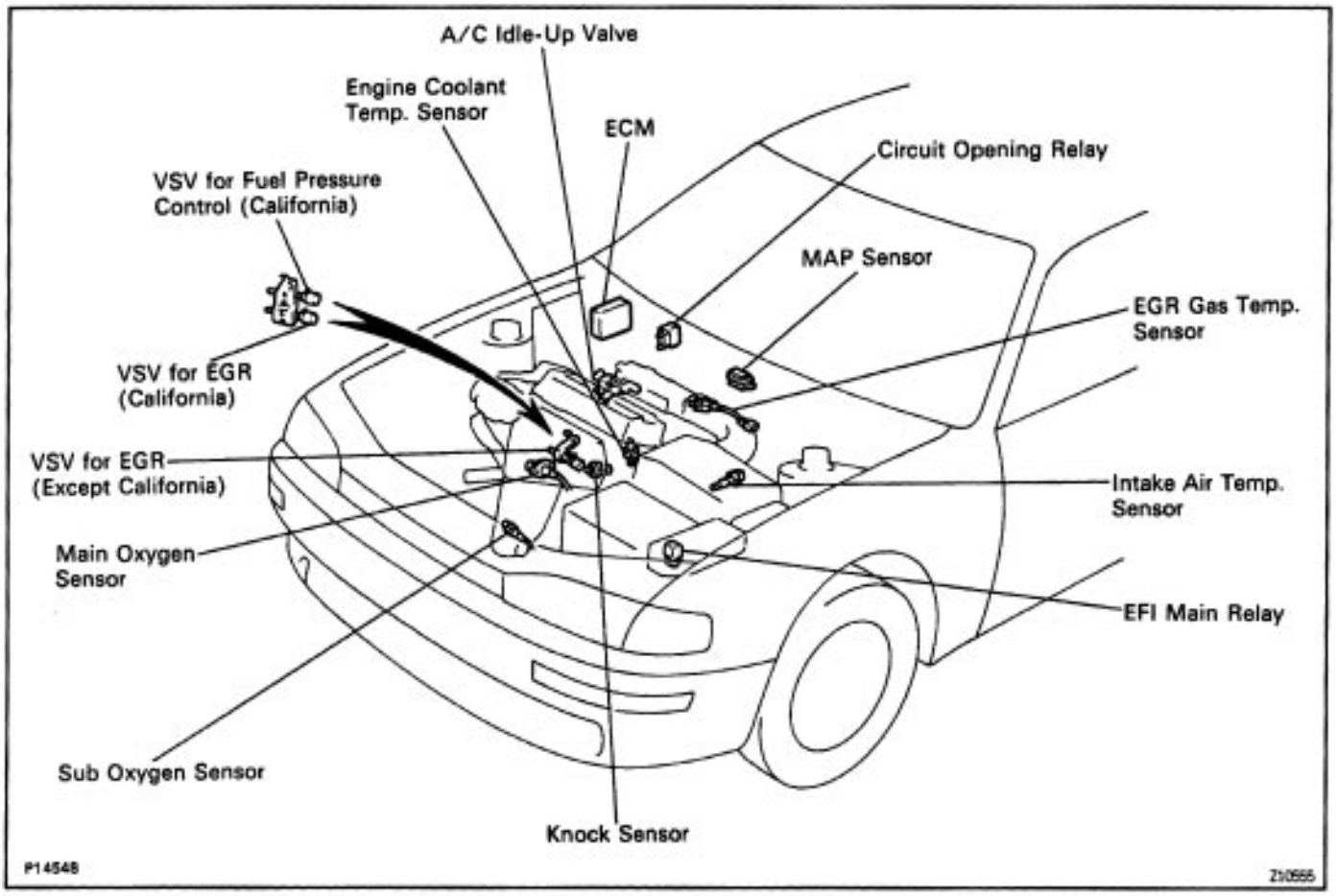


Air is filtered through the air cleaner and the amount flowing to the air intake chamber is determined according to the throttle valve opening in the throttle body and the engine speed. Intake air controlled by the throttle valve opening is distributed from the air intake chamber to the manifold of each cylinder and is drawn into the combustion chamber.

At low temperatures the IAC valve opens and the air flows through the IAC valve and the throttle body, into the air intake chamber. During engine warming up, even if the throttle valve is completely closed, air flows to the air intake chamber, thereby increasing the idle speed (first idle operation).

The air intake chamber prevents pulsation of the intake air. It also prevents intake air interference in each cylinder.

ELECTRONIC CONTROL SYSTEM



The control system consists of sensors which detect various engine conditions, and a ECM which determines the injection volume (timing) based on the signals from the sensors.
The various sensors detect the intake air pressure, engine speed, oxygen density in the exhaust gas, engine coolant temperature, intake air temperature and atmospheric pressure etc. and convert the information into an electrical signal which. is sent to the ECM. Based on these signals, the ECM calculates the optimum ignition timing for the current conditions and operates the injectors.
The ECM not only controls the fuel injection timing, but also the self diagnostic function which records the occurrence of a malfunction, ignition timing control, idle speed control and EGR control.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

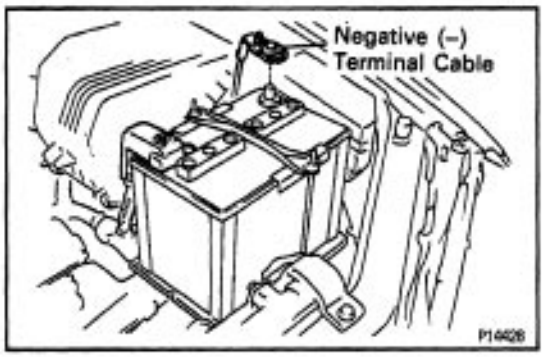
 09268–41045 Injection Measuring Tool Set	
 (09268–41080) No.6 union	
 (09268–41090) No.7 union	
 (90405–09015) No.1 Union	
 09268–45012 EFI Fuel Pressure Gauge	
 09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
 09842–30070 Wiring “F” EFI Inspection	
 09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

 09082–00050 TOYOTA Electrical Tester Set	
 09200–00010 Engine Adjust Kit	
 09258–00030 Hose Plug Set	Plug for vacuum hose, fuel hose etc.

EQUIPMENT

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Soft brush	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	



PRECAUTION

1. Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.

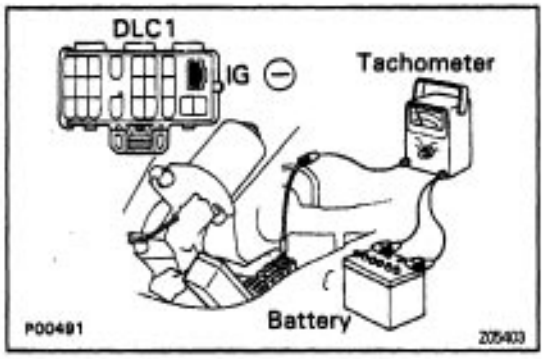
HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed.

Therefore, if necessary, read the diagnosis before removing the terminal.

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. Do not smoke or work near an open flame when working on the fuel system.

3. Keep gasoline away from rubber or leather parts.



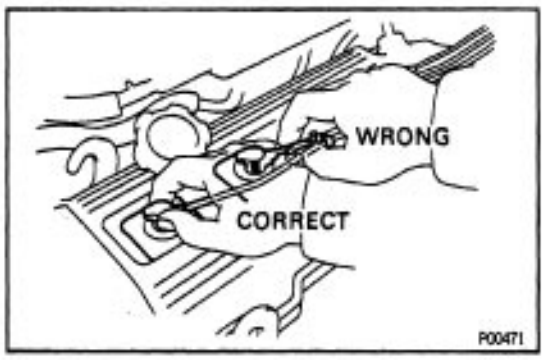
MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP
(See page EG1–8)

2. PRECAUTION WHEN CONNECTING GAUGE

(a) Use battery as the power source for the timing light, tachometer, etc.

(b) Connect the tester probe of a tachometer to the terminal IGE) of the data link connector 1.



3. IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(a) Check proper connection of battery terminals, etc.

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

(a) Do not allow oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.

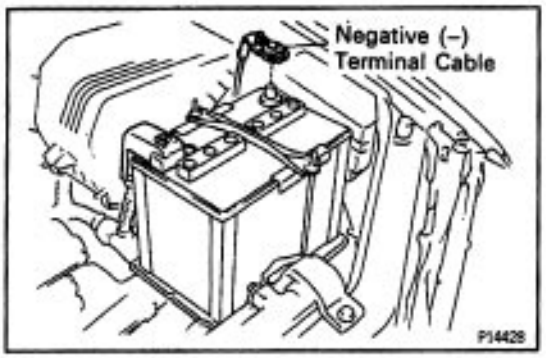
IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

If the vehicle is equipped with a mobile communica–tion system, refer to the precaution in the IN section.

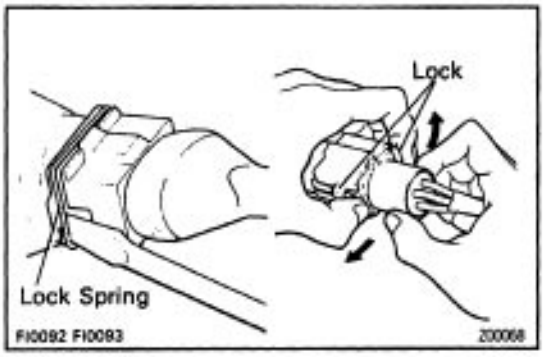
AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

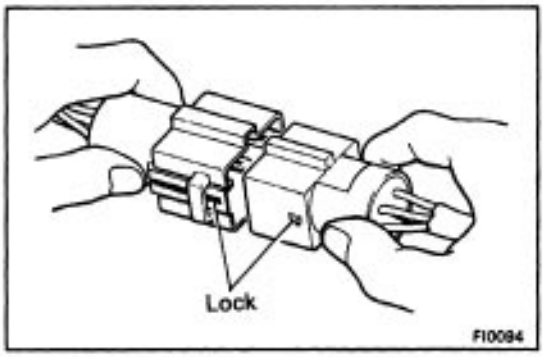
ELECTRONIC CONTROL SYSTEM



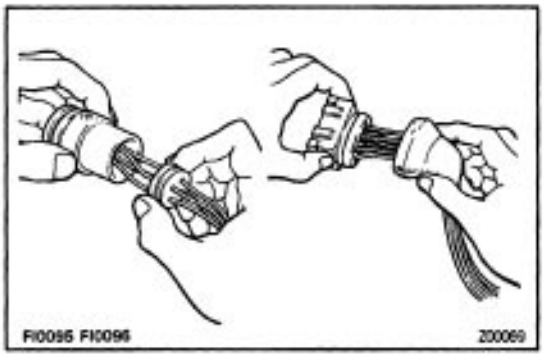
1. Before removing MFI/SFI wiring connectors, termi–nals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery terminals.
HINT: Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI/SFI parts care–fully, especially the ECM.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the MFI/SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



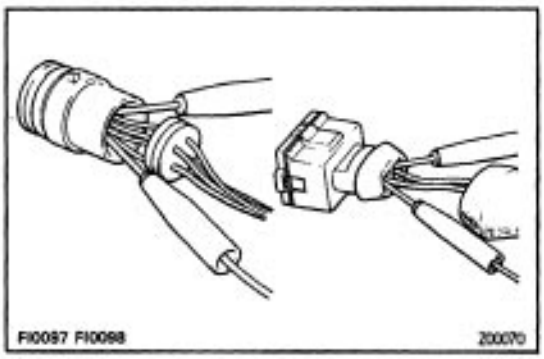
8. Care is required when pulling out and inserting wiring connectors.
(a) Release the lock and pull out the connector, pulling on the connectors.



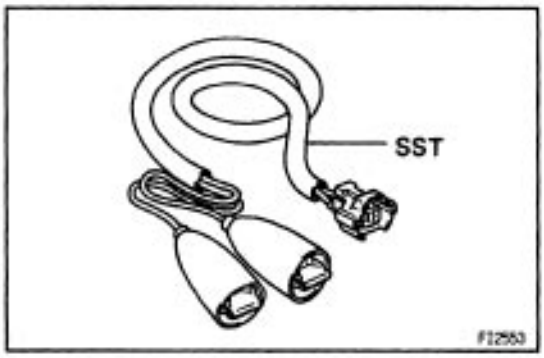
(b) Fully insert the connector and check that it is locked.



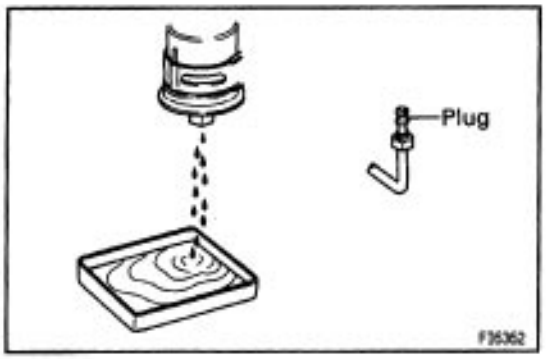
9. When inspecting a connector with a volt/ohmmeter.
(a) Carefully take out the water–proofing rubber if it is a water–proof type connector.



(b) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.
(c) Do not apply unnecessary force to the terminal.
(d) After checking, install the water–proofing rubber on the connector securely.

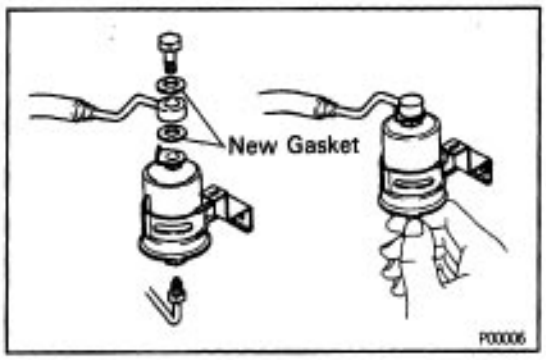


10. Use SST for inspection or test of the injector or its wiring connector.
SST 09842–30070



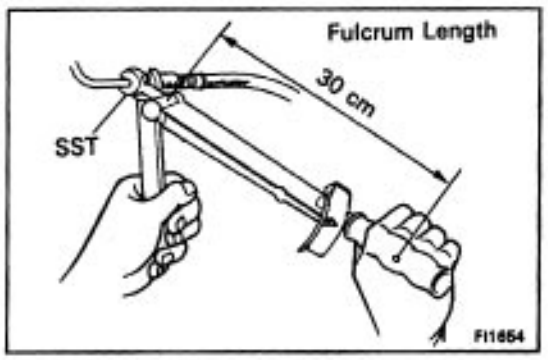
FUEL SYSTEM

1. When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe the following procedures:
   (a) Put a container under the connection.
   (b) Slowly loosen the connection.
   (c) Disconnect the connection.
   (d) Plug the connection with a rubber plug.
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following proce–dures:
   Union Bolt Type:
   (a) Always use a new gasket.
   (b) Tighten the union bolt by hand.
   (c) Tighten the union bolt to the specified torque.
   Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



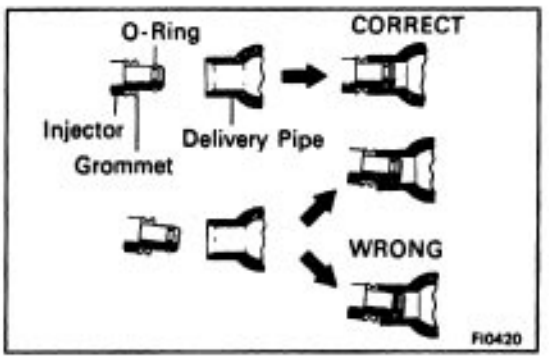
Flare Nut Type:

(s) Apply alight coat of engine oil to the flare and tighten the flare nut by hand.
(b) Using SST, torque the flare nut.
SST 09631–22020
Torque:
28 N–m (285 kgf–cm, 21 ft–lbf) for fuel pump side
30 N–m (310 kgf–cm, 22 ft–lbf) for others

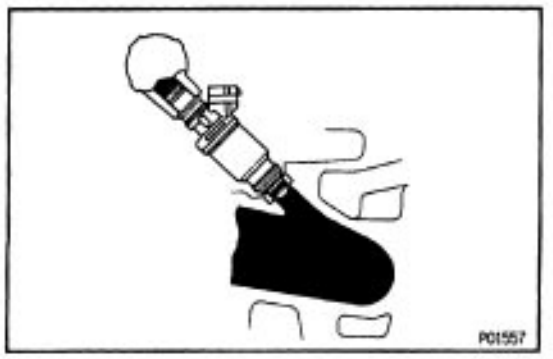


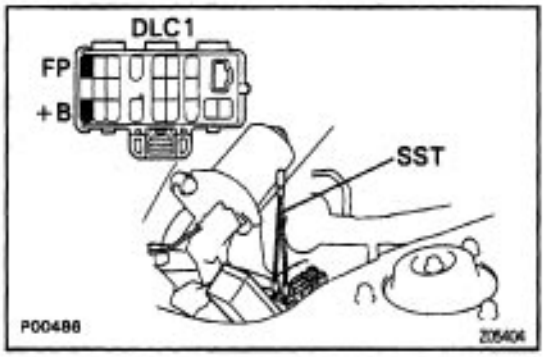
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

3. Observe the following precautions when removing and installing the injectors.
   (a) Never reuse the O–ring.
   (b) When placing a new O–ring on the injector, take care not to damage it in any way.
   (c) Coat a new 0– ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.

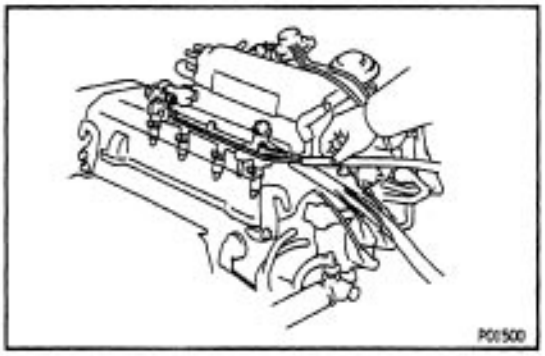


4. Install the injector to delivery pipe and intake manifold as shown in the illustration.



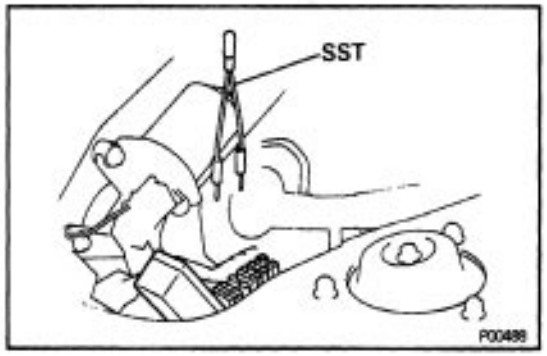


5. Check that there are no fuel leaks after performing maintenance anywhere on the fuel system.
   (a) Using SST, connect terminals + B and FP of the data link connector 1.
   SST 09843–18020
   (b) With engine stopped, turn the ignition switch ON.



   (c) Pinch the fuel return hose. The pressure in high pressure line will rise to approx. 392 kPa (4kgf/cm2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

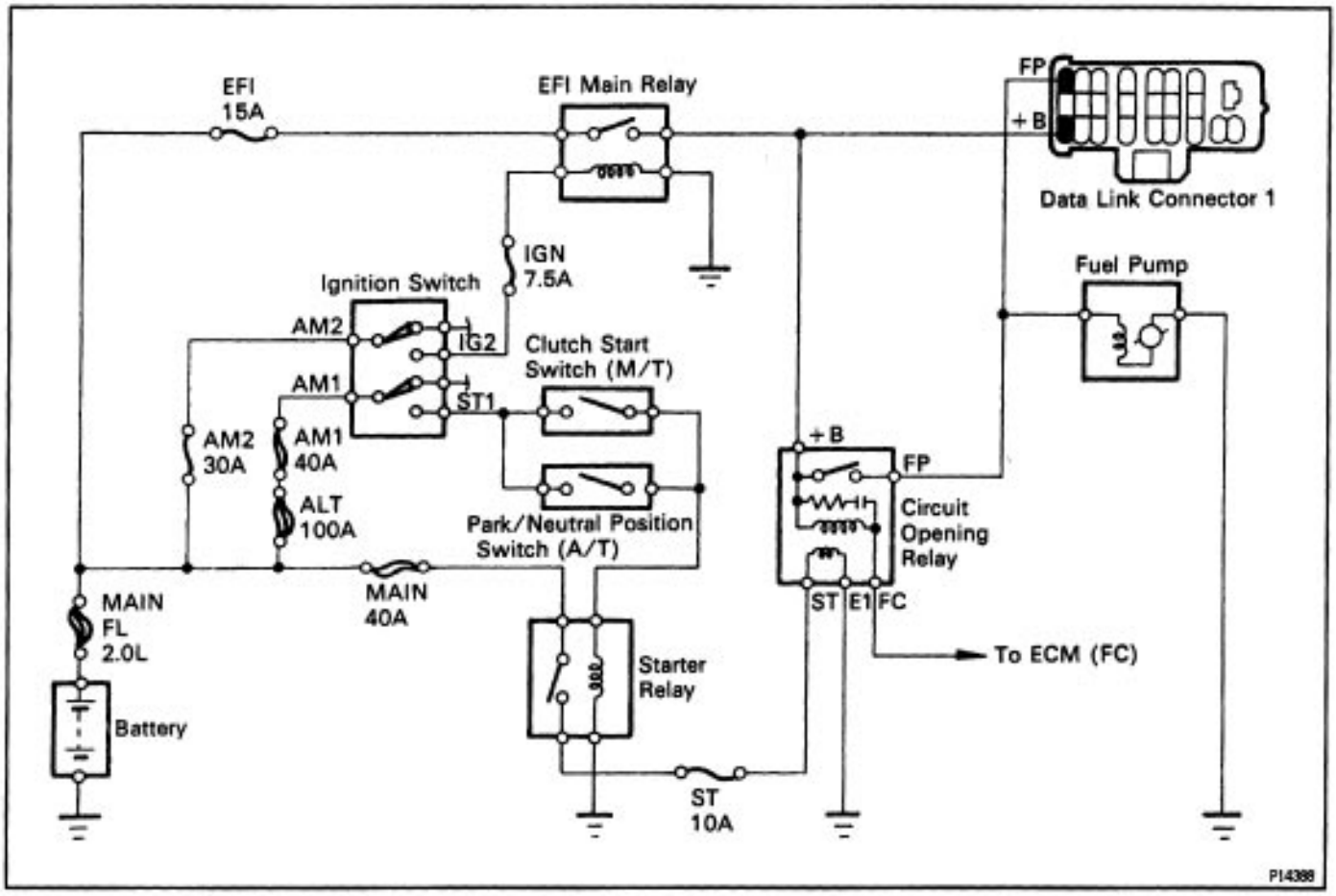
NOTICE: Always pinch the hose. Avoid bending as it may cause the hose to crack.



   (d) Turn the ignition switch OFF.
   (9) Remove the SST.
   SST 09843–18020

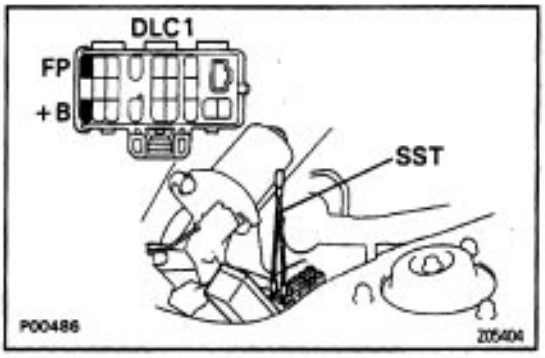
FUEL PUMP

SYSTEM CIRCUIT

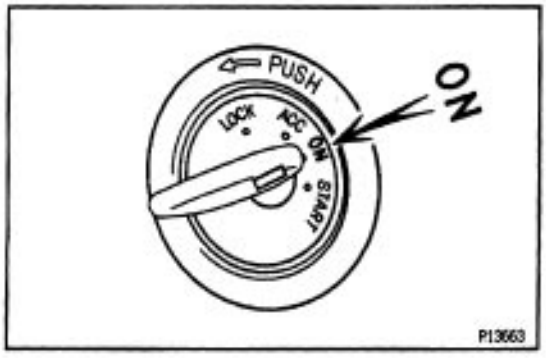


ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

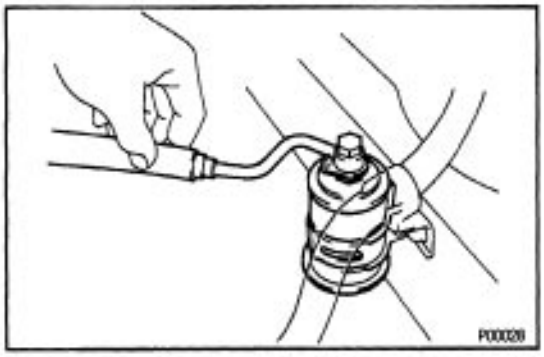


(a) Using SST; connect terminals +B and FP of the data link connector 1.
SST 09843–18020



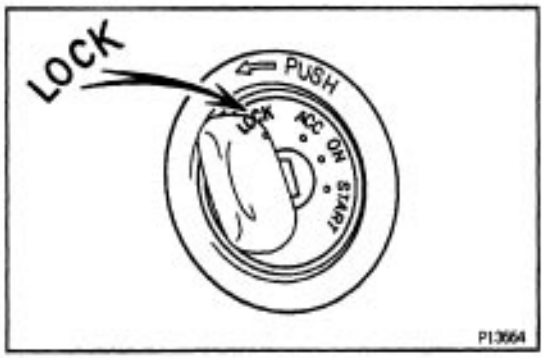
(b) Turn the ignition switch ON.

NOTICE: Do not start the engine.

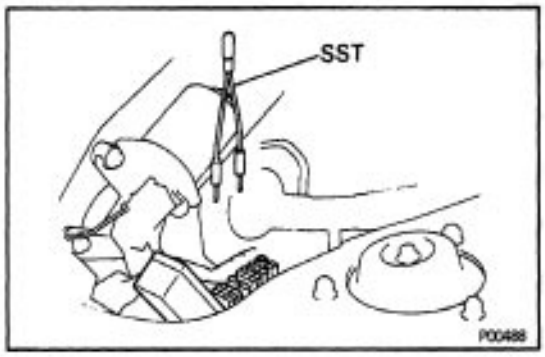


(c) Check that there is pressure in the hose from the fuel filter.

HINT: At this time, you will hear fuel return noise.



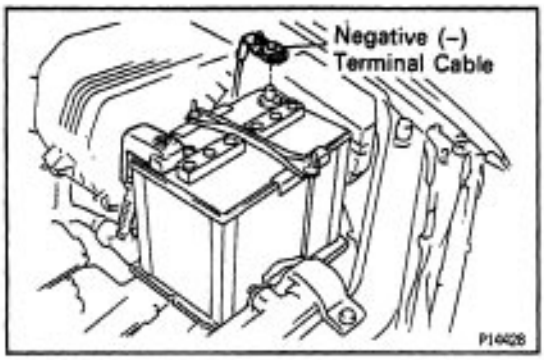
(d) Turn the ignition switch OFF.



(e) Remove the SST.
SST 09843–18020

If there is no pressure, check the following parts:

- Fusible link
- Fuses (AM2 30A, EFI 15A, IGN 7.5A)
- EFI main relay
- Fuel pump
- Wiring connections

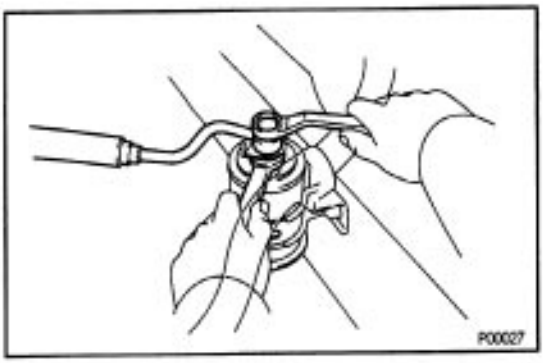


2. CHECK FUEL PRESSURE

(a) Check that the battery voltages is above 12 volts.

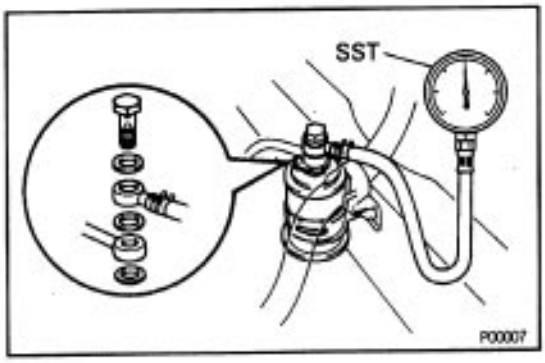
(b) Disconnect the negative (–) terminal cable from the battery.

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is disconnected from the battery.

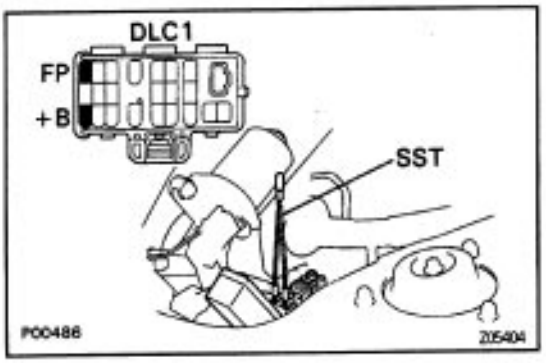


(c) Put a suitable container or shop towel under the fuel filter.
(d) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.

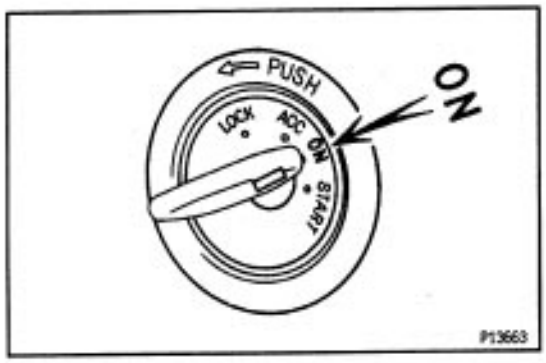
HINT: Slowly loosen the union bolt.



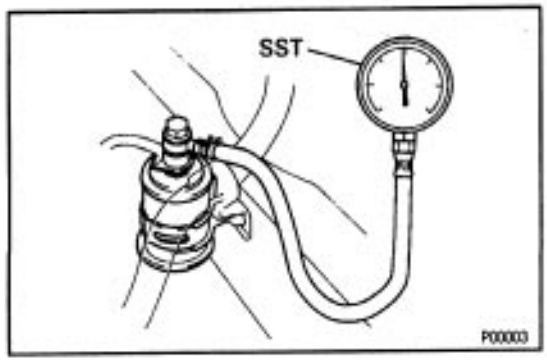
(e) Install the fuel inlet hose and SST (pressure gauge) to the fuel filter outlet with 3 new gaskets and the union bolt.
SST 09268–45012
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)
(f) Wipe off any splattered gasoline.
(g) Reconnect the battery negative (–) cable.



(h) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020

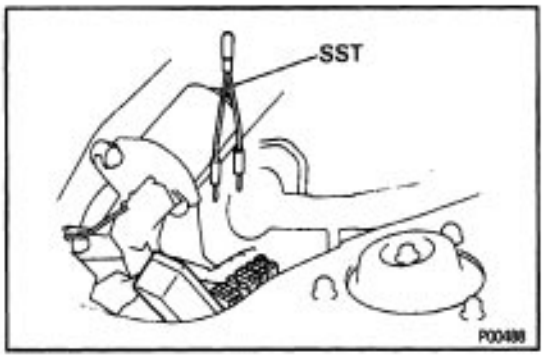


(i) Turn the ignition switch ON.

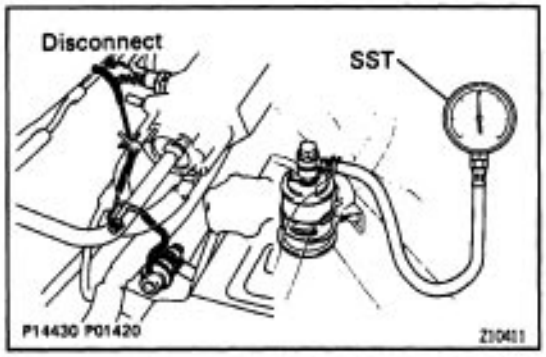


Measure the fuel pressure.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm®, 38 – 44 psi)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:

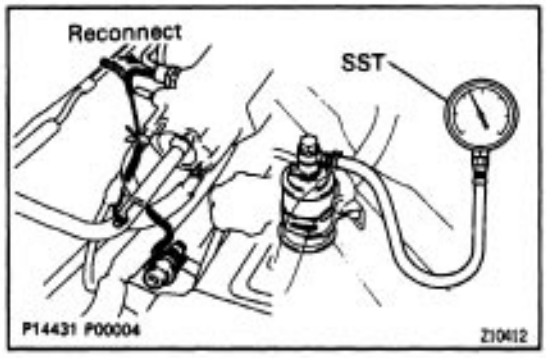
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator



(k) Remove the SST.
SST 09483–18020

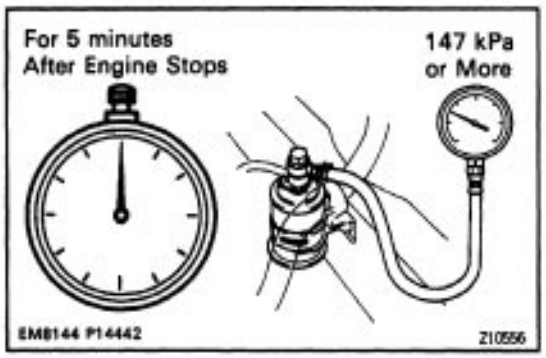


(l) Start the engine.
(m) Disconnect the vacuum sensing hose from the air intake chamber and plug the air intake chamber outlet.
(n) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)

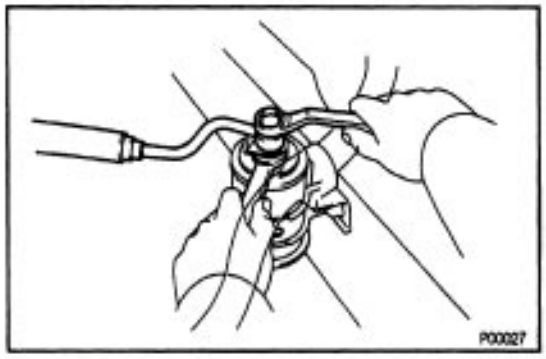


(o) Reconnect the vacuum sensing hose to the air intake chamber.
(p) Measure the fuel pressure at idle.
Fuel pressure:
206 – 255 kPa (2.1 – 2.6 kgf/cm², 31 – 37 psi)

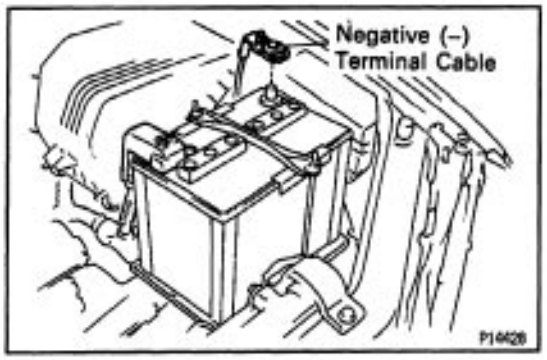
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.



(q) Stop the engine.
(r) Check that the fuel pressure remains 147 kPa (1.5 kgf/cm^2, 21 psi) or more for 5 minutes after the engine is turned off.
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.
(s) After checking fuel pressure, disconnect the battery negative (–) cable and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012



(t) Connect the fuel inlet hose with 2 new gaskets and the union bolt.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)
(u) Reconnect the cable to the negative (–) terminal of the battery.
(v) Check for fuel leakage.



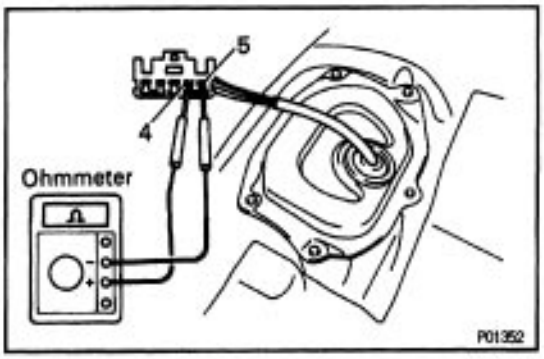
FUEL PUMP INSPECTION

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch Is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

2. REMOVE REAR SEAT CUSHION

3. DISCONNECT FUEL PUMP & SENDER GAUGE CON–NECTOR



4. INSPECT FUEL PUMP

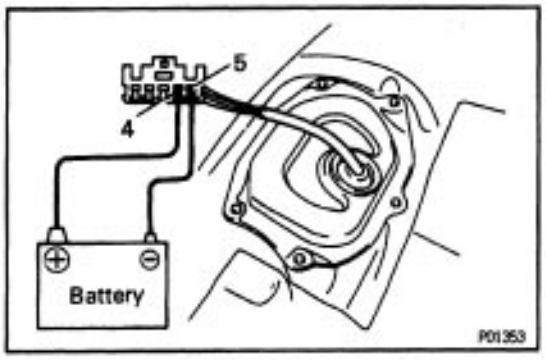
A. Inspect fuel pump resistance

Using an ohmmeter, measure the resistance between terminals 4 and 5.

Resistance (Cold):

0.2–3.0 Ω

If the resistance is not as specified, replace the fuel pump.



B. Inspect fuel pump operation

Connect the positive (+) lead from the battery terminal 4 of the connector, and the negative (–) lead to terminal 5. Check that the fuel pump operates.

NOTICE:

- **These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump a: far away from the battery as possible.**
- **Always perform switching at the battery side.**

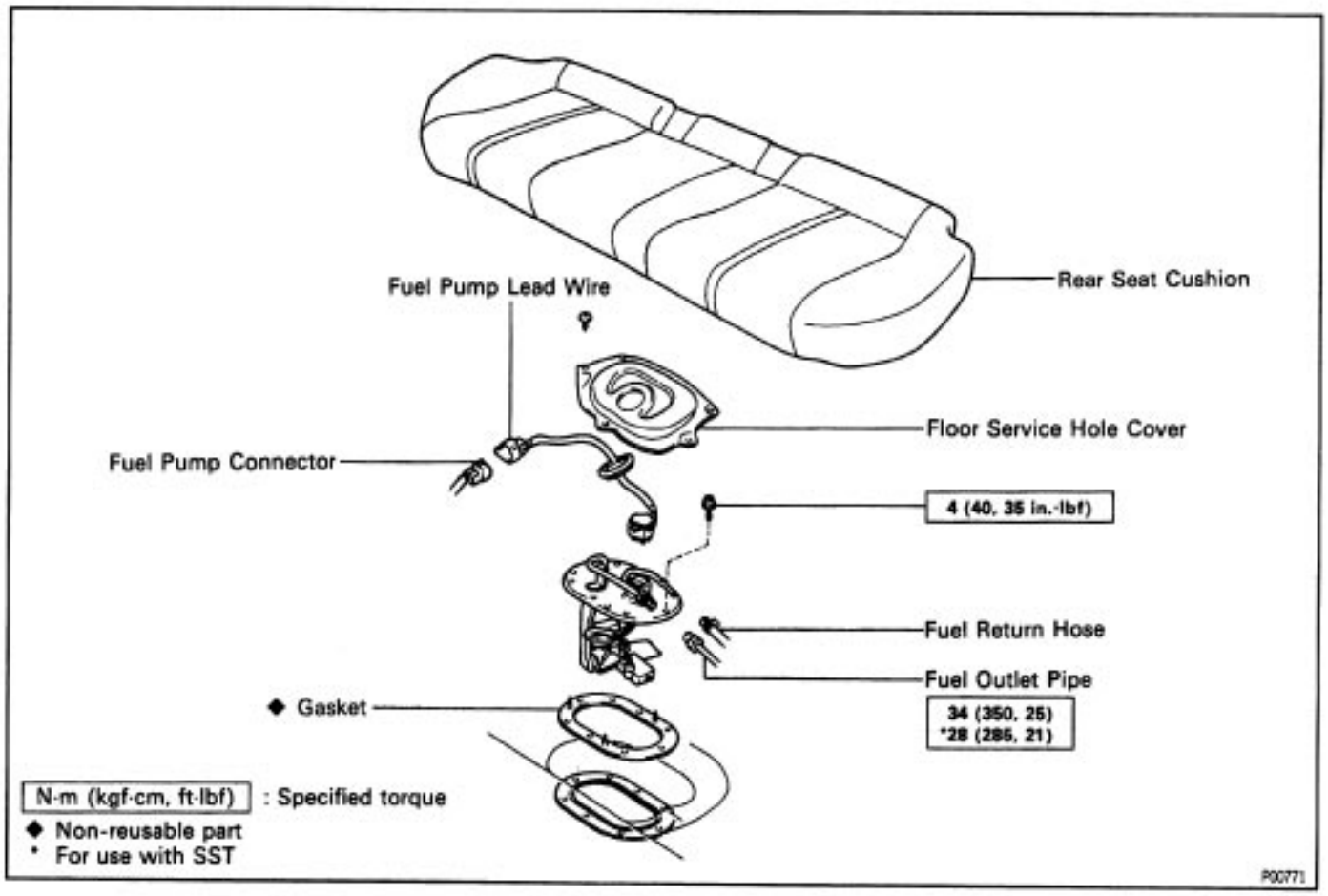
If operation is not as specified, replace the fuel pump.

5. RECONNECT FUEL PUMP & SENDER GAUGE CONNECTOR

6. INSTALL REAR SEAT CUSHION

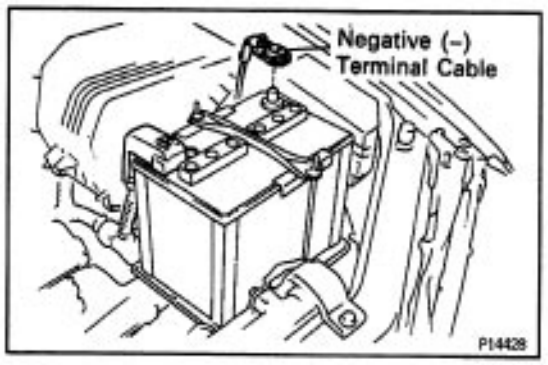
7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PUMP REMOVAL

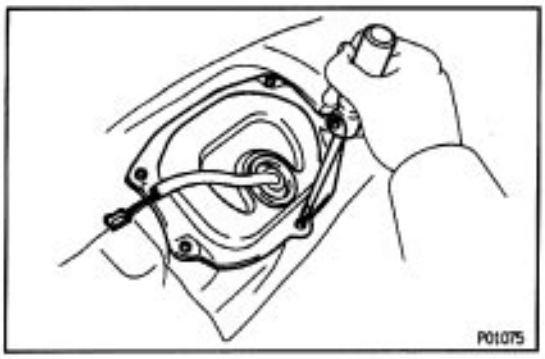
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. REMOVE REAR SEAT CUSHION

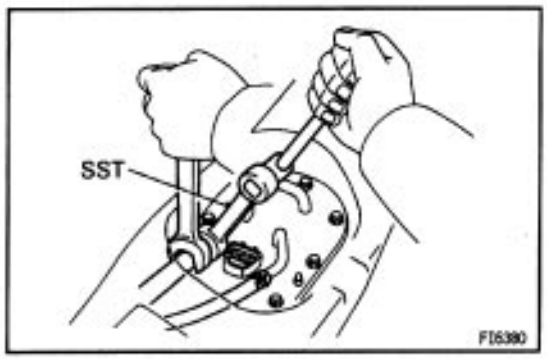


3. REMOVE FLOOR SERVICE HOLE COVER

(a) Disconnect the fuel pump connector.

(b) Remove the 5 screws and service hole cover.

4. REMOVE FUEL PUMP LEAD WIRE

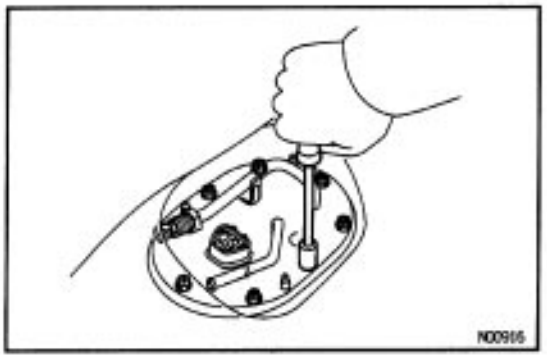


5. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET

CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.

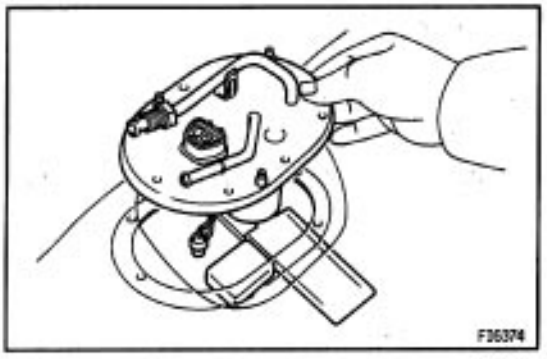
(a) Using SST, disconnect the outlet pipe from the pump bracket.
SST 09631–22020

(b) Disconnect the return hose from the pump bracket.



6. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

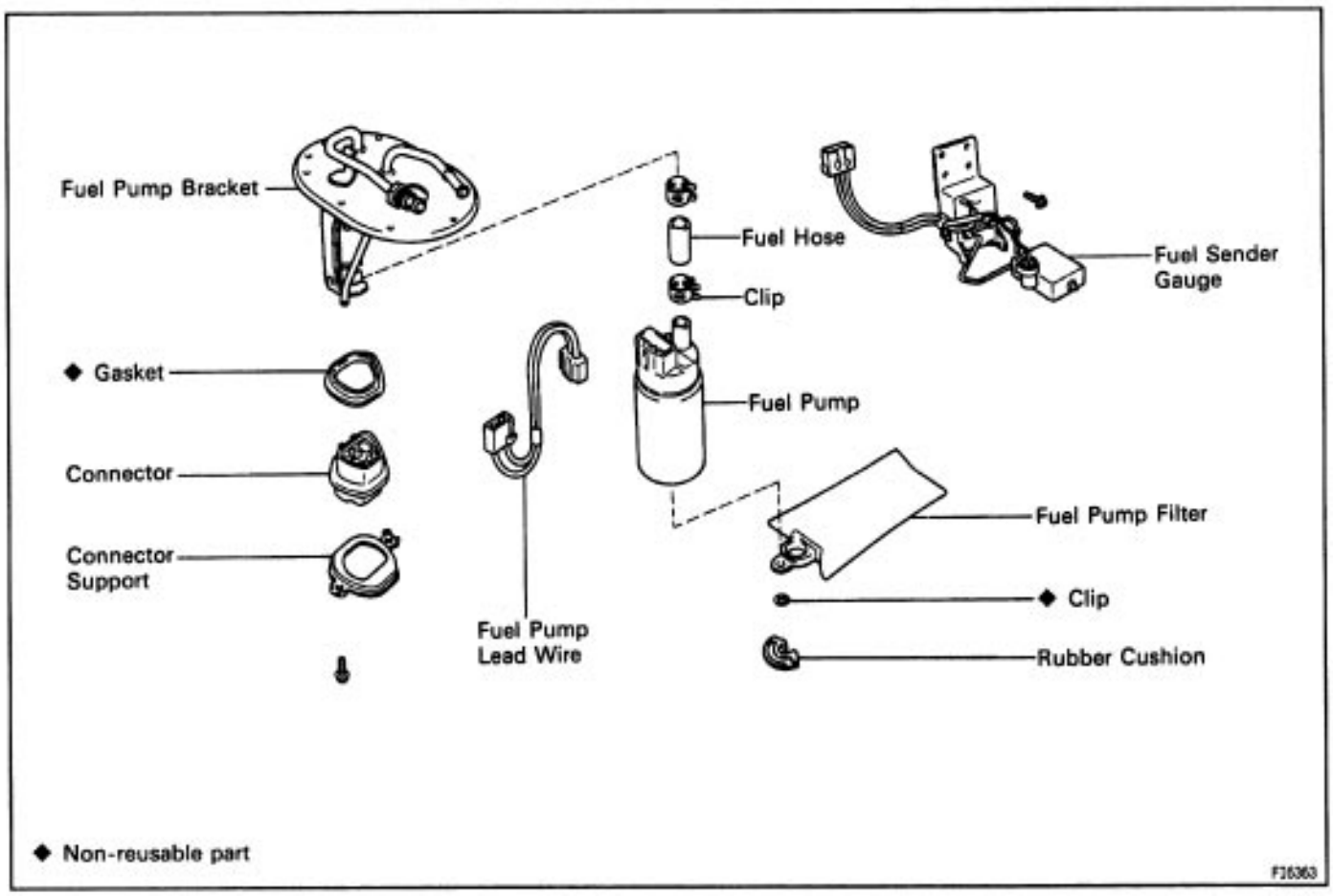
(a) Remove the 8 bolts.

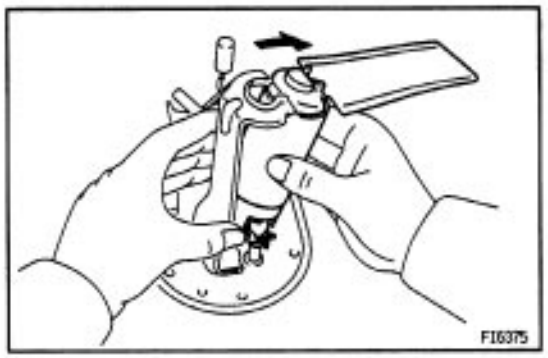


(b) Pull out the pump bracket assembly.

(c) Remove the gasket from the pump bracket.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

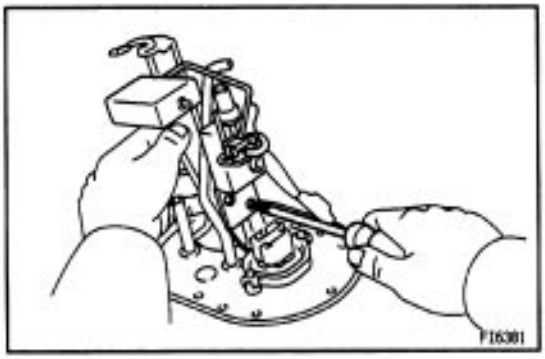




FUEL PUMP DISASSEMBLY

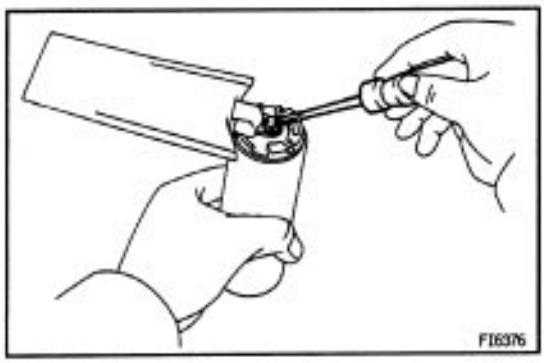
1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Remove the fuel pump lead wire.
(b) Pull off the lower side of the fuel pump from the pump bracket.
(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
(d) Remove the rubber cushion from the fuel pump.



2. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

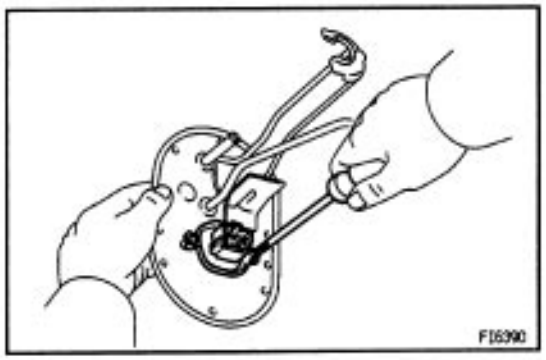
(a) Disconnect the fuel sender gauge connector.
(b) Remove the 2 screws and sender gauge.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

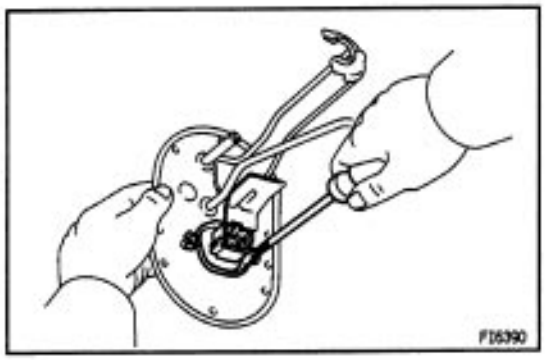
(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.



4. REMOVE CONNECTOR

Remove the 2 screws, connector support, connector and gasket.



FUEL PUMP ASSEMBLY

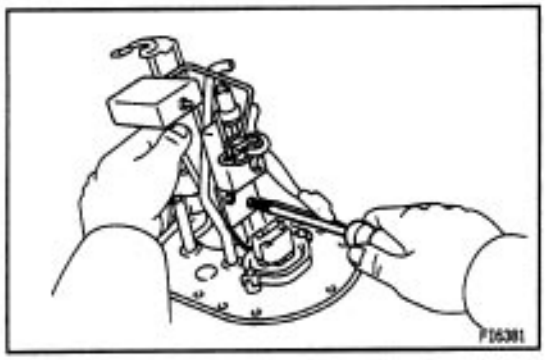
(See Components for Disassembly and Assembly)

1. INSTALL CONNECTOR

Install the gasket, connector and connector support with the 2 screws.

2. INSTALL FUEL PUMP FILTER TO FUEL PUMP

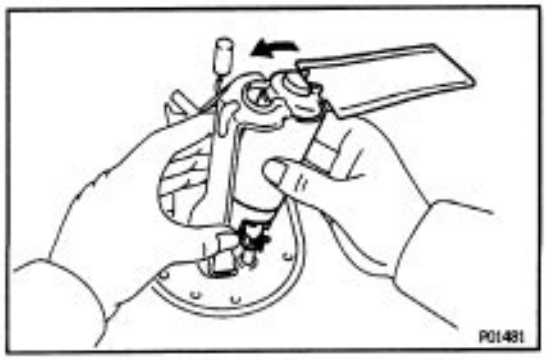
Install the pump filter with a new clip.



3. INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET

(a) Install the sender gauge with the 2 screws.

(b) Connect the fuel sender gauge connector.



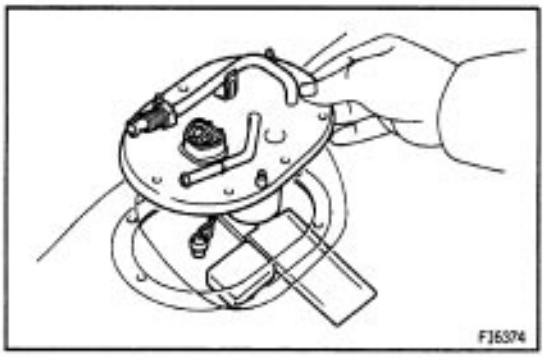
4. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Install the rubber cushion to the fuel pump.

(b) Connect the fuel hose to the outlet port of the fuel pump.

(c) Install the fuel pump by pushing the lower side of the fuel pump.

(d) Install the fuel pump connector.



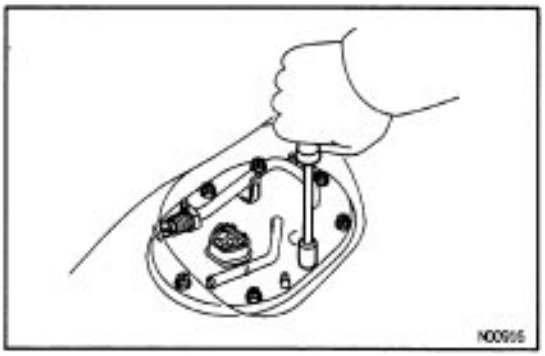
FUEL PUMP INSTALLATION

(See Components for Removal and Installation)

1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

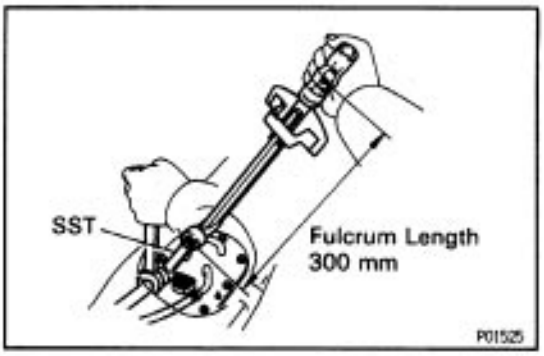
(a) Install a new gasket to the pump bracket.

(b) Insert the pump bracket assembly into the fuel tank.



(c) Install the pump bracket with the 8 screws.

Torque: 3.9 N–m (40 kgf–cm, 35 in.–lbf)



2. CONNECT FUEL PIPE AND HOSE TO FUEL PUMP BRACKET

(a) Using SST, connect the outlet pipe to the pump bracket.

SST 09631–22020

Torque: 28 N–m (285 kgf–cm, 21 ft–lbf)

(b) Connect the return hoses to the pump bracket.

3. CHECK FOR FUEL LEAKAGE

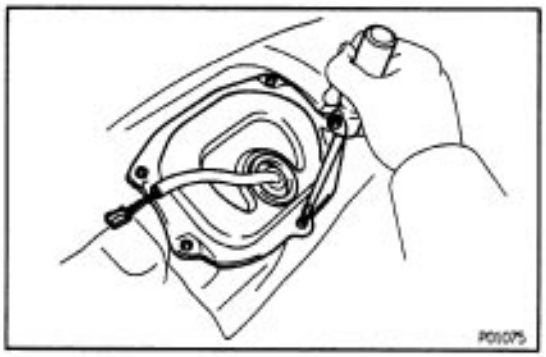
(See page EG1–176**)**

4. CONNECT FUEL PUMP LEAD WIRE

5. INSTALL FLOOR SERVICE HOLE COVER

(a) Install the service hole cover with the 5 screws.

(b) Connect the fuel pump (with fuel sender gauge) connector.



6. INSTALL REAR SEAT CUSHION

7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

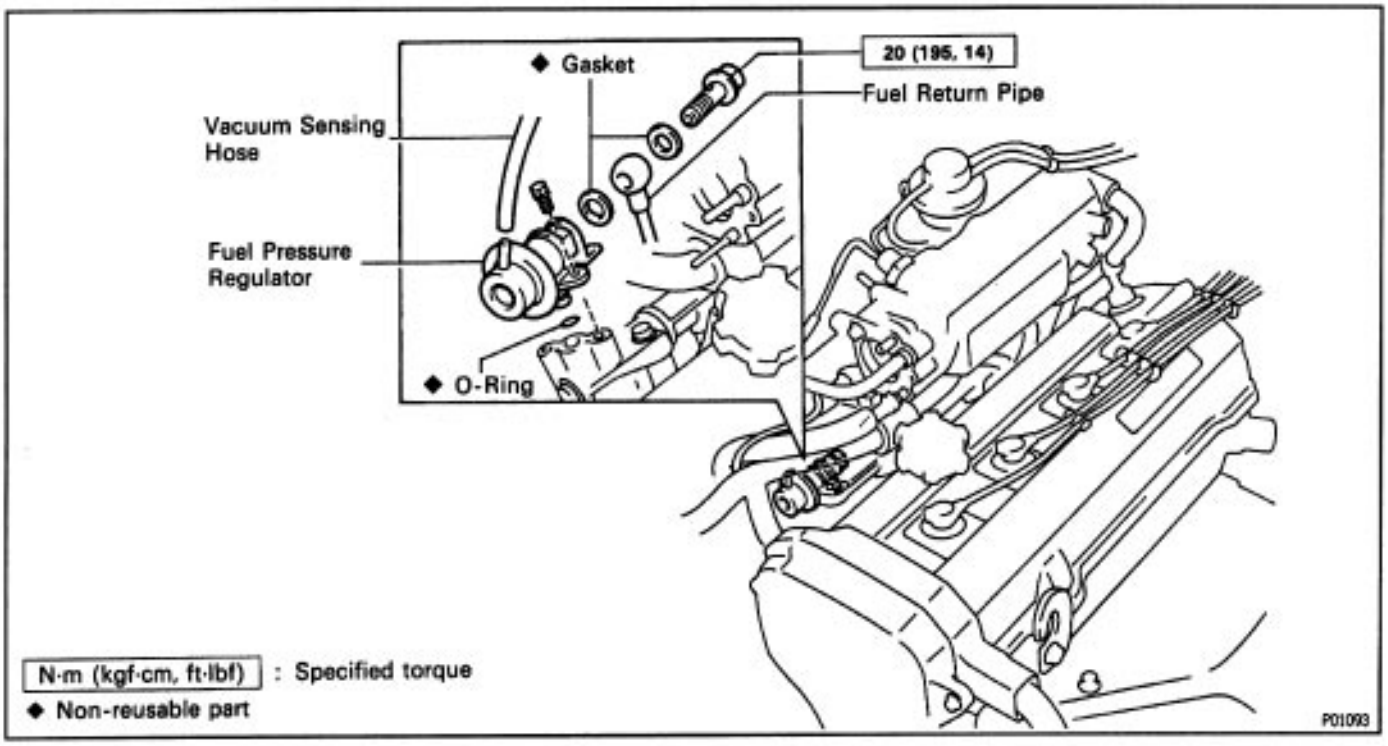
FUEL PRESSURE REGULATOR

ON–VEHICLE INSPECTION

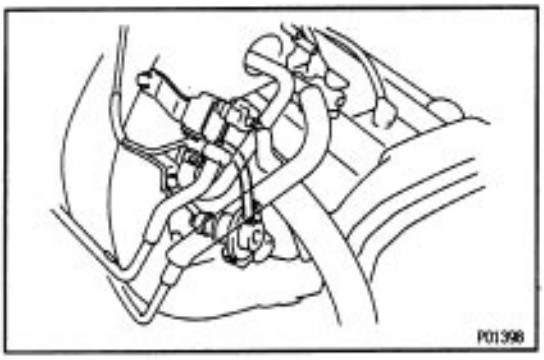
INSPECT FUEL PRESSURE

(See page EG1–178)

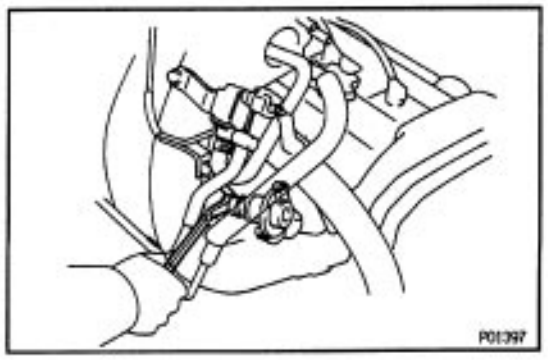
COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PRESSURE REGULATOR REMOVAL



1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

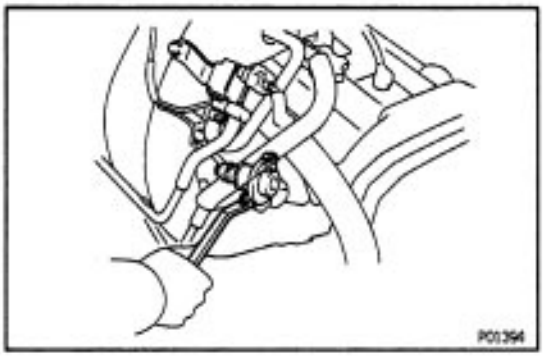


2. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

(a) Put a suitable container or shop rag under the pres–sure regulator.

(b) Remove the union bolt and 2 gaskets, and disconnect the return pipe from the pressure regulator.

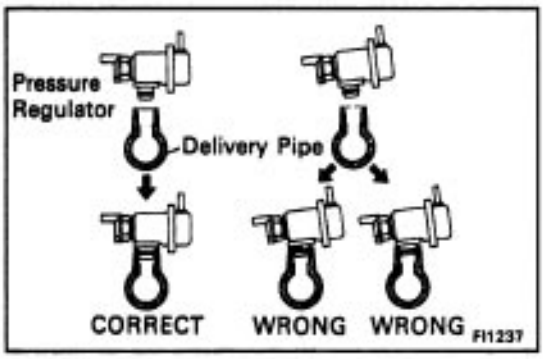
HINT: Slowly loosen the union bolt.



3. REMOVE FUEL PRESSURE REGULATOR

(a) Remove the 2 bolts, and pull out the pressure regula–tor.

(b) Remove the O–ring from the pressure regulator.

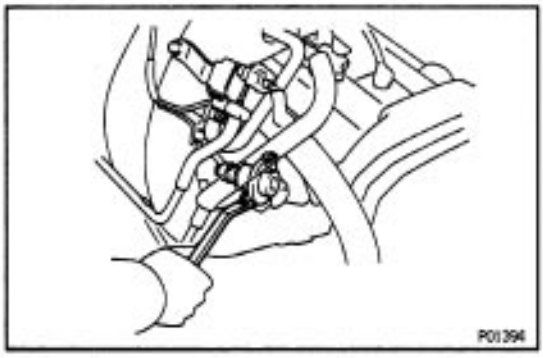


FUEL PRESSURE REGULATOR INSTALLATION

(See Components for Removal and Installation)

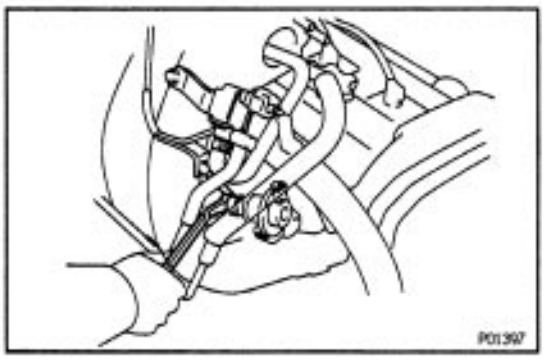
1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.



(b) Install the pressure regulator with the 2 bolts.

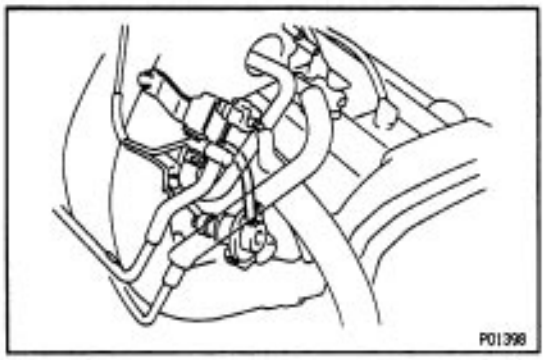
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



2. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

Install the return pipe with 2 new gaskets and the union bolt.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

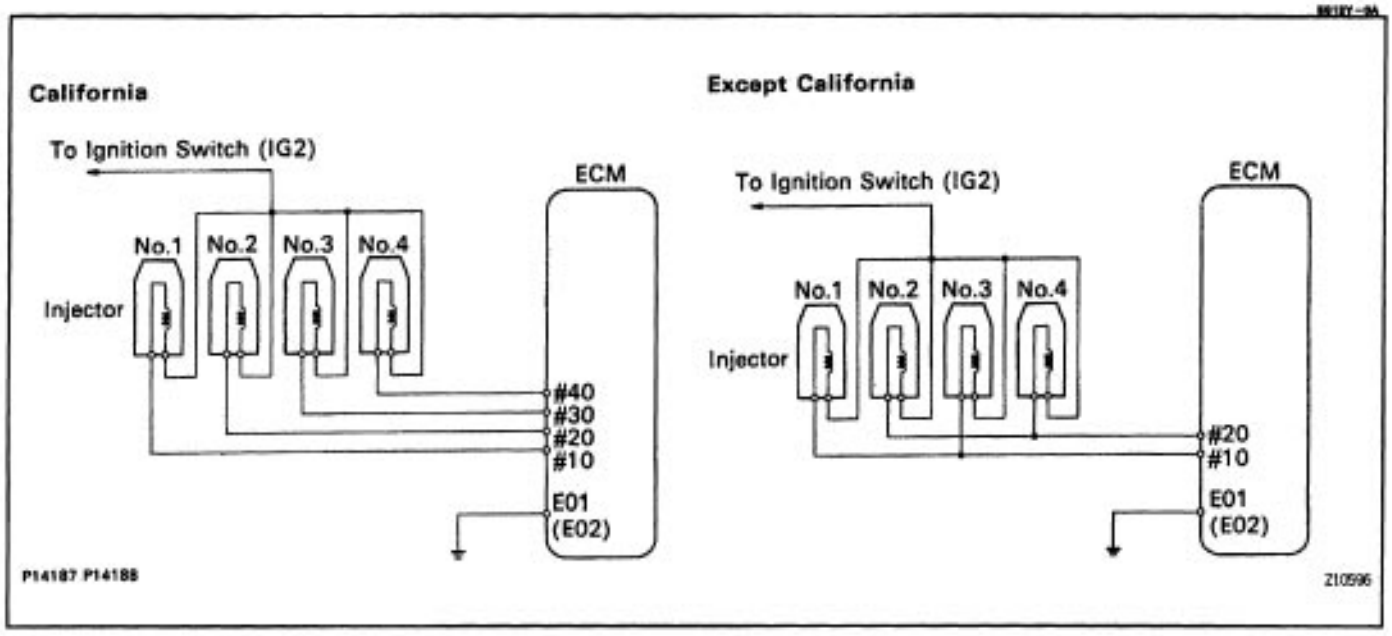


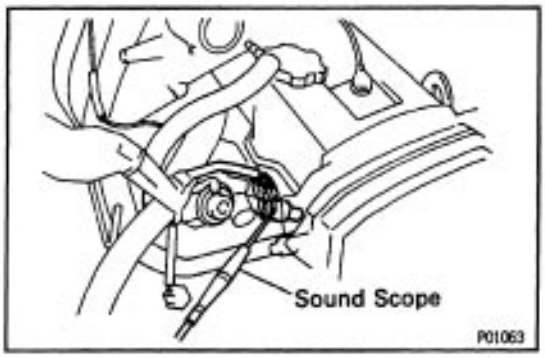
3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR

4. CHECK FOR FUEL LEAKAGE

(See page EG1–176)

INJECTOR



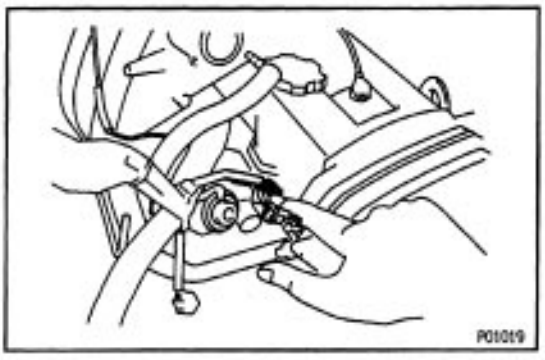


ON–VEHICLE INSPECTION

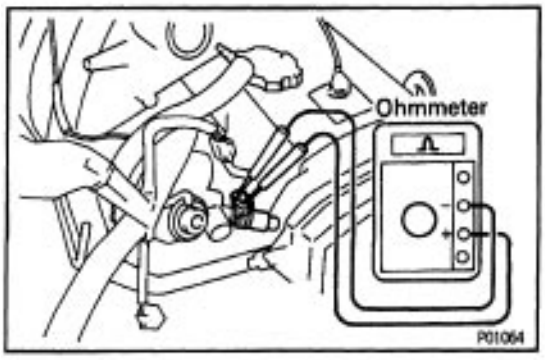
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.



(b) If you have no sound scope, you can check the injector transmission operation with your finger.
If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

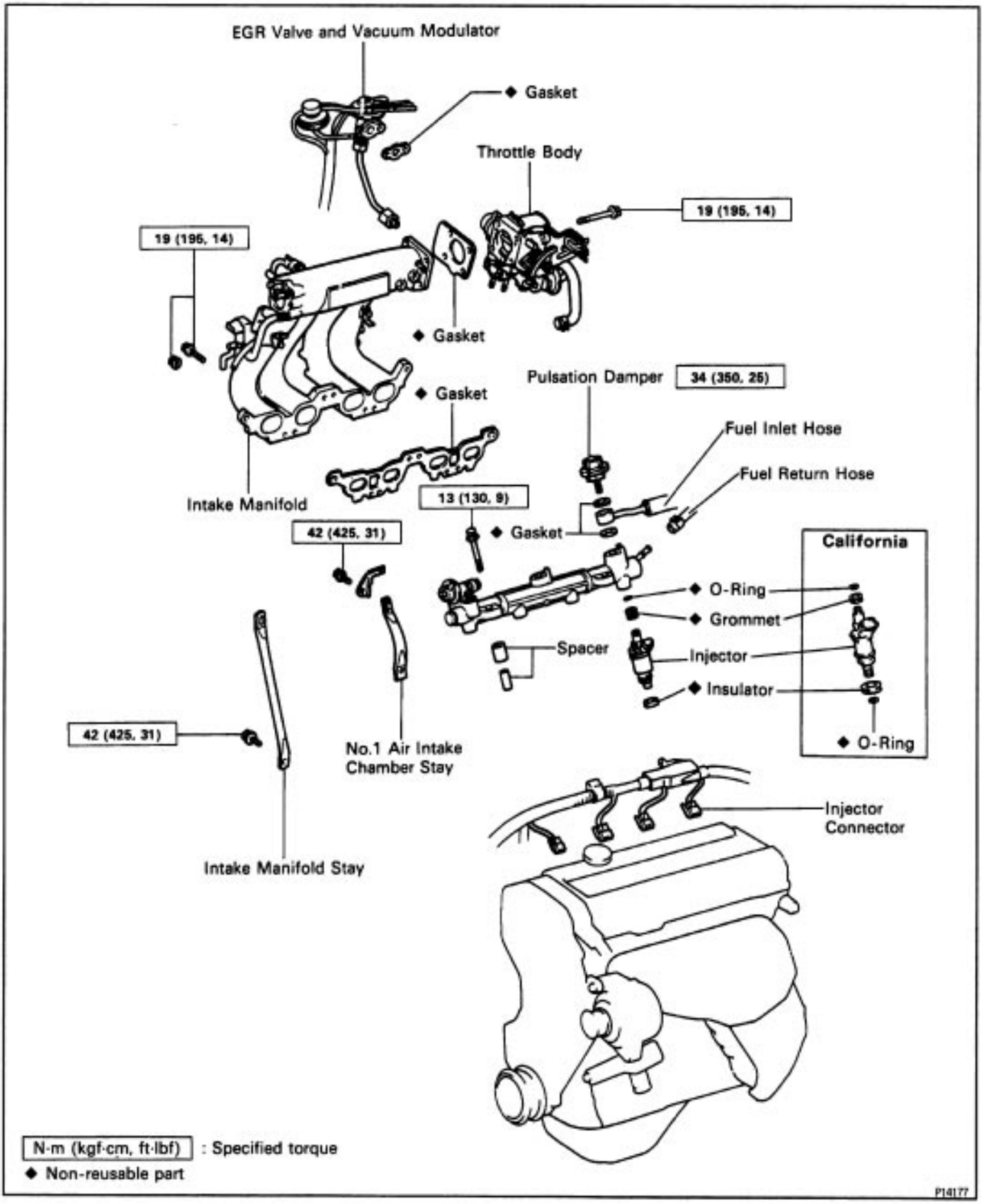
Resistance:

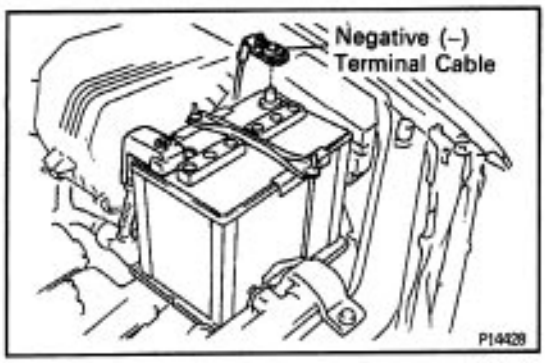
Approx. 13.8Ω

If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

COMPONENTS FOR REMOVAL AND INSTALLATION





INJECTORS REMOVAL

(See Components for Removal and Installation)

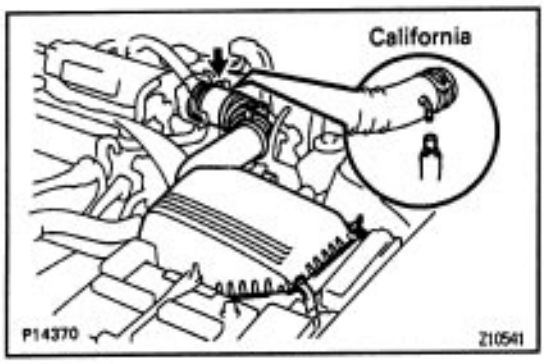
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch i: turned to the "LOCK" position and the negative (–) terminal cable is discon– nected from the battery.

2. DRAIN ENGINE COOLANT

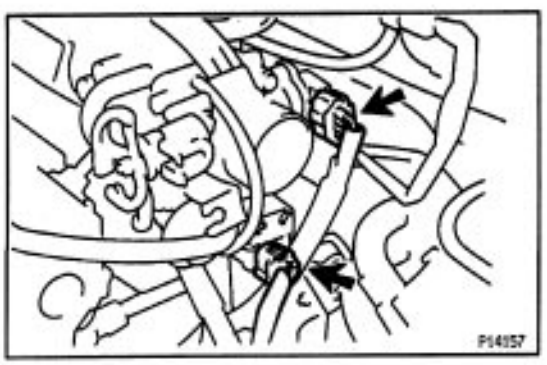
3. A/T:
DISCONNECT THROTTLE CABLE FROM THROTTLE BODY

4. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY



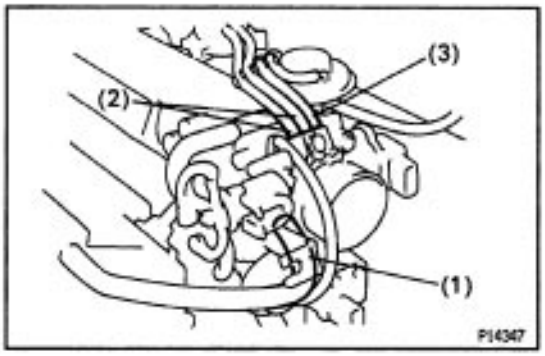
5. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

(a) Disconnect the intake air temperature sensor connector.
(b) California only:
Disconnect the air hose from the air cleaner hose.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the 4 air cleaner cap clips.
(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

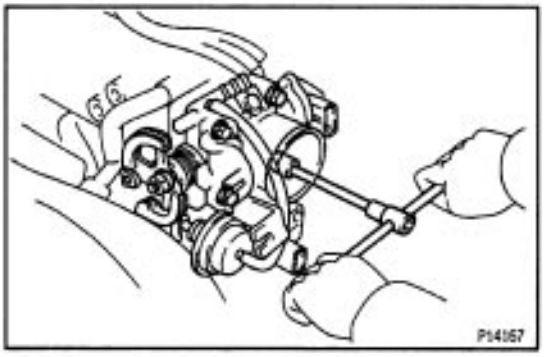


6. REMOVE THROTTLE BODY

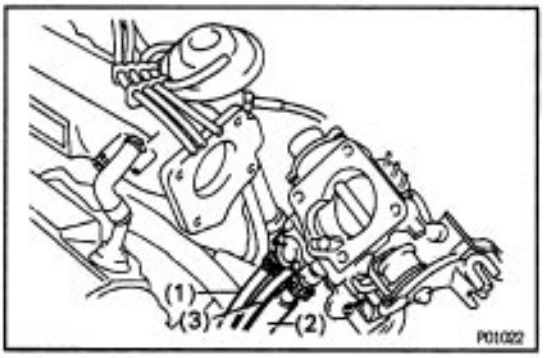
(a) Disconnect throttle position sensor connector.
(b) Disconnect IAC valve connector.



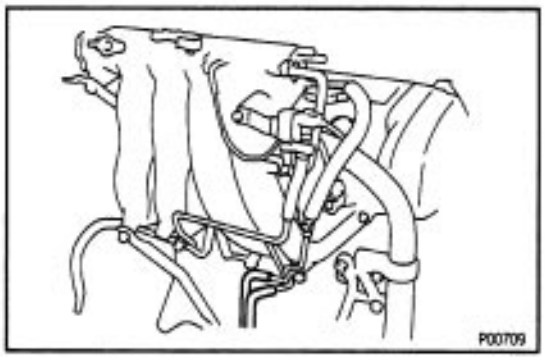
(c) Disconnect the following hoses from the throttle body.
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)



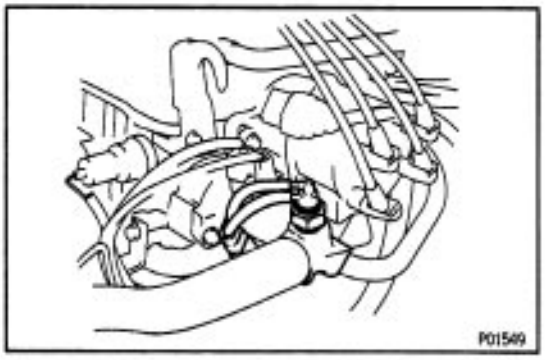
(d) Type A:
Remove the 4 bolts.
(e) Type B:
Remove the 2 bolts and 2 nuts.



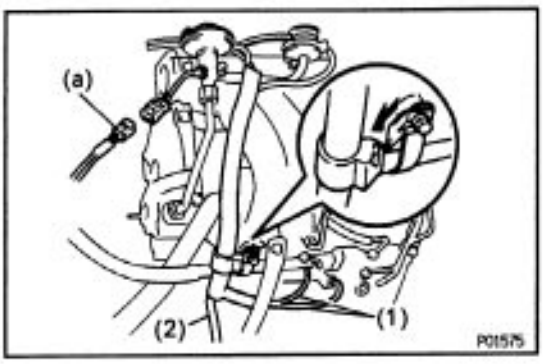
(f) Disconnect the following hoses from the throttle body, and remove the throttle body.
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose from air tube



7. DISCONNECT PS VACUUM HOSES



8. DISCONNECT VACUUM HOSES FROM TVV (FOR EVAP)



9. REMOVE EGR VALVE AND VACUUM MODULATOR

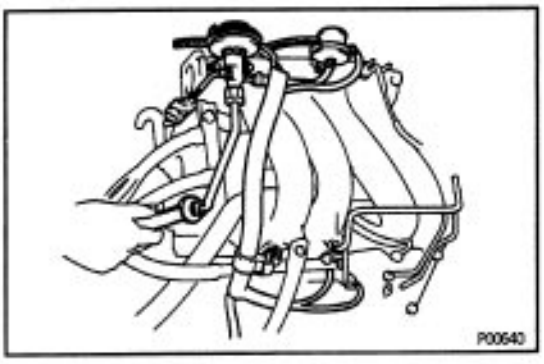
(a) Disconnect the EGR gas temperature sensor connector.

(b) Disconnect the following hoses:

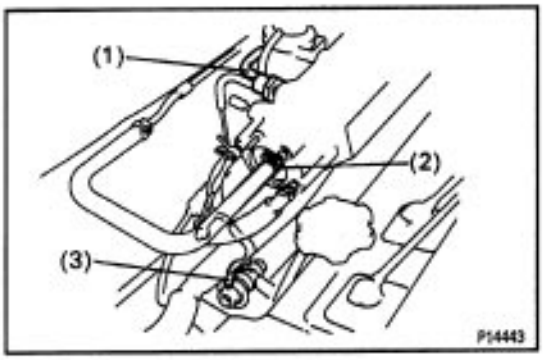
(1) 2 vacuum hoses from VSV (for EGR)

(2) Vacuum hose from charcoal canister

(c) Disconnect the vacuum hose clamp.



(d) Loosen the union nut of the EGR pipe, and remove the 2 nuts, the EGR valve, vacuum modulator, vacuum hoses assembly and gasket.



10. DISCONNECT VACUUM HOSES

Disconnect the following hoses:

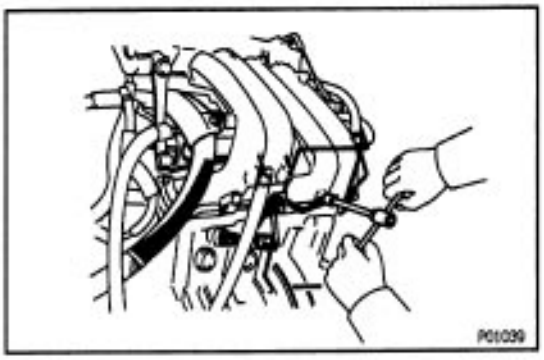
(1) MAP sensor hose from air intake chamber

(2) Brake booster vacuum hose from air intake chamber

(3) Vacuum sensing hose from fuel pressure regulator

11. w/ A/C:

DISCONNECT A/C IDLE–UP VALVE CONNECTOR



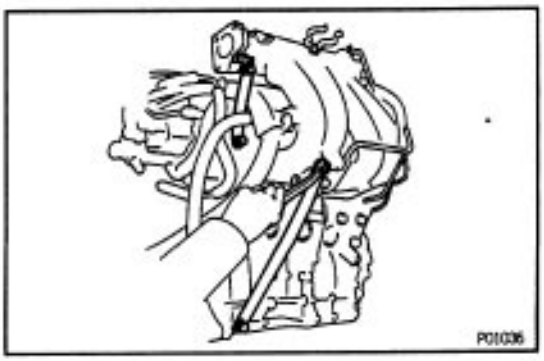
12. DISCONNECT 2 ENGINE WIRE GROUND STRAPS FROM INTAKE MANIFOLD

13. DISCONNECT KNOCK SENSOR AND VSV (FOR EGR) CONNECTORS

14. CALIFORNIA ONLY:

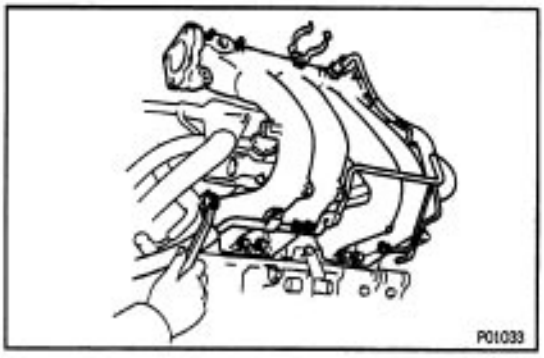
DISCONNECT VSV (FOR FUEL PRESSURE CONTROL) CONNECTOR AND VACUUM HOSES

15. REMOVE BOLT AND WIRE CLAMP, AND DISCONNECT ENGINE WIRE HARNESS

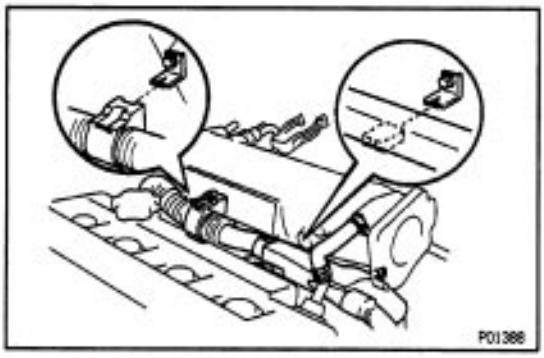


16. REMOVE INTAKE MANIFOLD

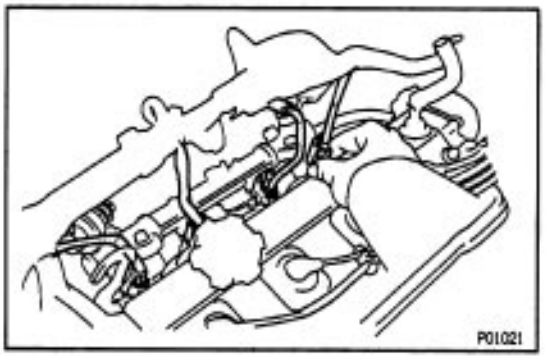
(a) Remove the 4 bolts, wire bracket, No.1 air intake chamber and manifold stays.



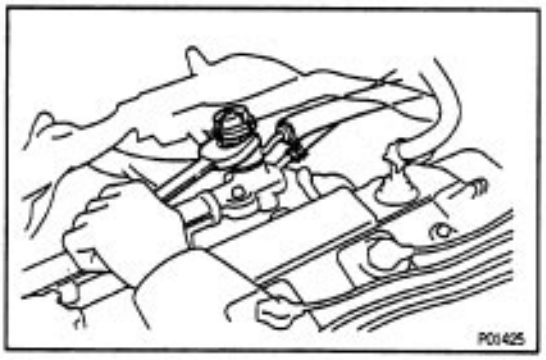
(b) Remove the 6 bolts, 2 nuts, intake manifold and gasket.



(c) Disconnect the 2 wire clamps from the wire brackets on the intake manifold.



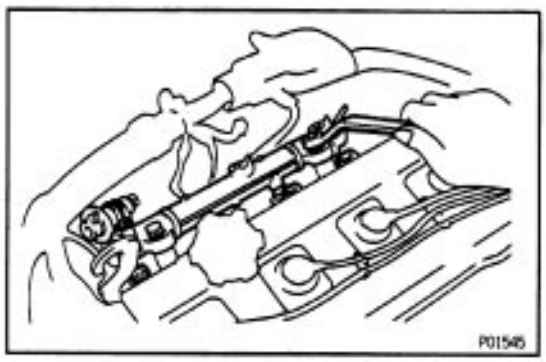
17. DISCONNECT INJECTOR CONNECTORS



18. REMOVE DELIVERY PIPE AND INJECTORS

(a) Loosen the pulsation damper, and disconnect the fuel inlet pipe.

(b) Disconnect the fuel return hose.

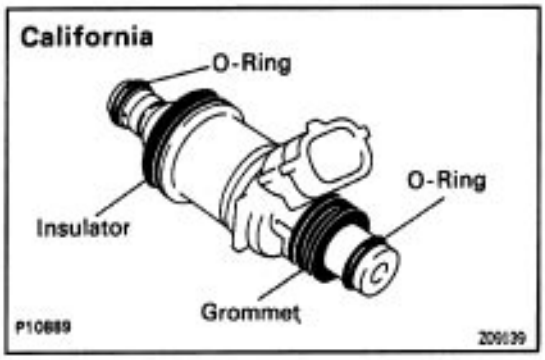


(c) Remove the 2 bolts and delivery pipe together with the 4 injectors.

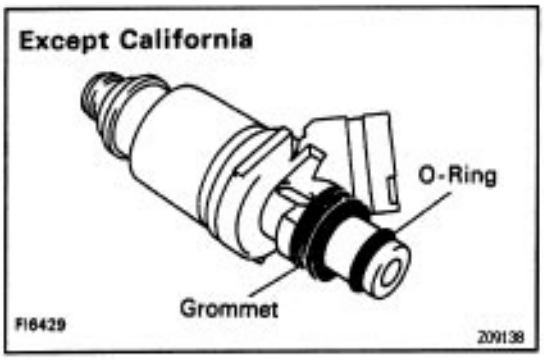
NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

(d) Remove the 4 insulators (except California) and 2 spacers from the cylinder head.

(e) Pull out the 4 injectors from the delivery pipe.



(f) California:
Remove the 2 O–rings, insulator and grommet from each injector.

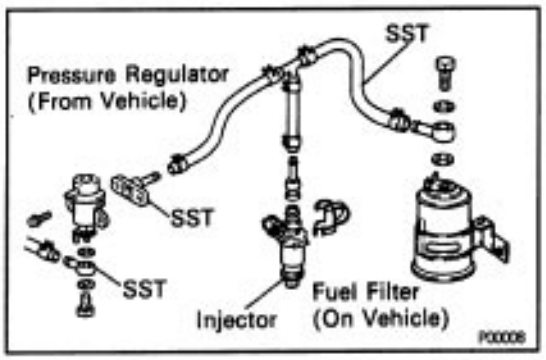


(g) Except California:
Remove the O–ring and grommet from each injector.

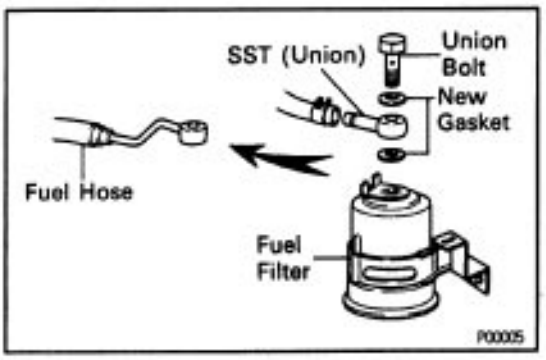
INJECTORS INSPECTION

1. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.

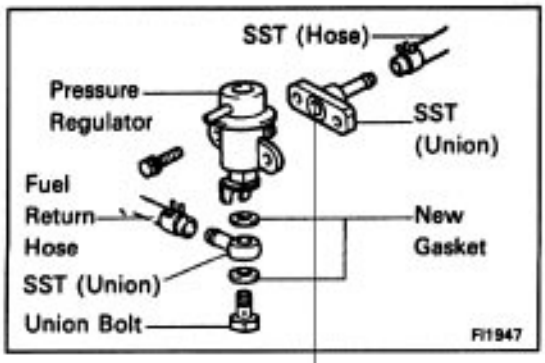


(a) Disconnect the fuel hose from the fuel filter outlet.
(b) Connect SST (union and hose) to the fuel filter outlet with 2 new gaskets and union bolts.
SST 09268–41045 (90405–09015)
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

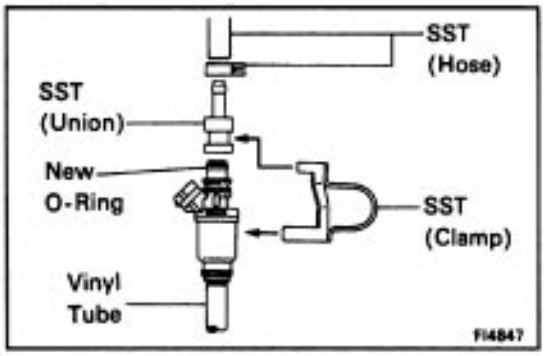


HINT: Use the vehicle's fuel filter.

(c) Install a new O–ring to the fuel inlet of pressure regulator.
(d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268–41045 (09268–41090)
Torque: 5.4 N–m (55 kgf–cm, 48 ft–lbf)



(e) Connect the fuel return hose to the fuel outlet of the pressure regulator with SST (union), 2 new gaskets and union bolts.



SST 09268–41045 (09268–41080)

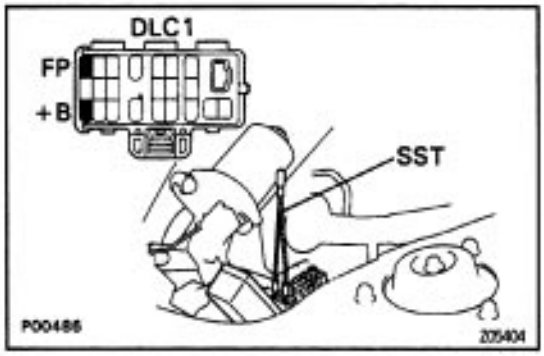
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

(f) Install the grommet and a new O–ring to the injector.

(g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045

(h) Put the injector into a graduated cylinder.

HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

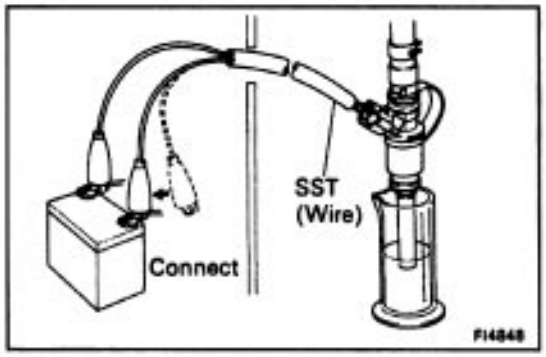


(i) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020

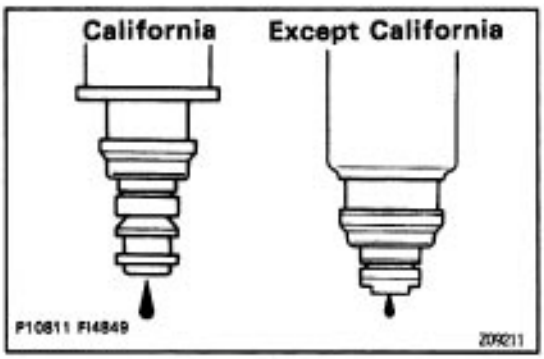
(j) Reconnect the negative (–) terminal cable to the battery.

(k) Turn the ignition switch ON.

NOTICE: Do not start the engine.



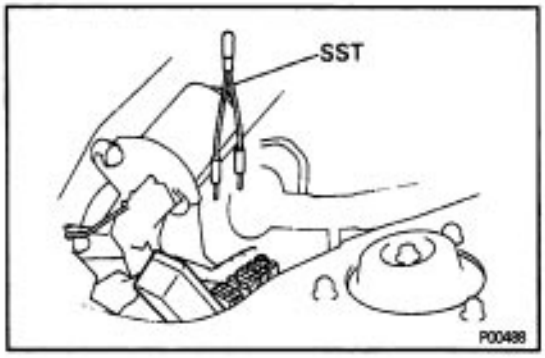
(l) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
49 – 59 cm®(3.0–3.6 cu in.) per 15 sec.
Difference between each Injector:
5 cm®(0.3 cu in.) or less
If the injection volume is not as specified, replace the injector.



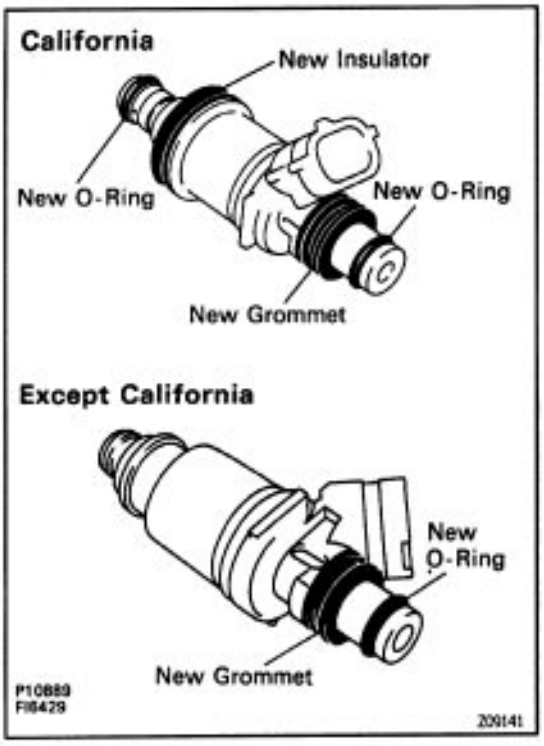
2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
One drop or less per minute

(b) Disconnect the negative (–) terminal cable from the battery.



(c) Remove the SST.
SST 09268–41045 and 09843–18020



INJECTORS INSTALLATION

(See Components for Removal and Installation)

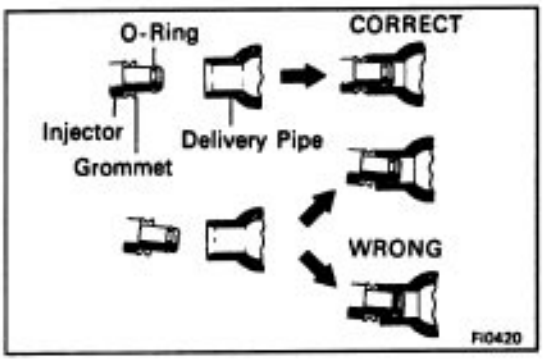
1. INSTALL INJECTORS AND DELIVERY PIPE

(a) California:
Install new insulator and grommet to each injector.

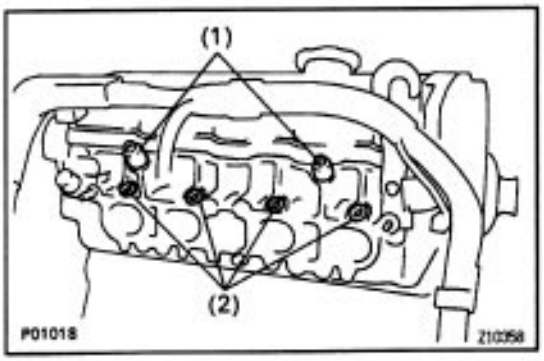
(b) Except California:
Install a new grommet to each injector.

(c) California:
Apply a light coat of gasoline to 2 new O–rings, and install them to each injector.

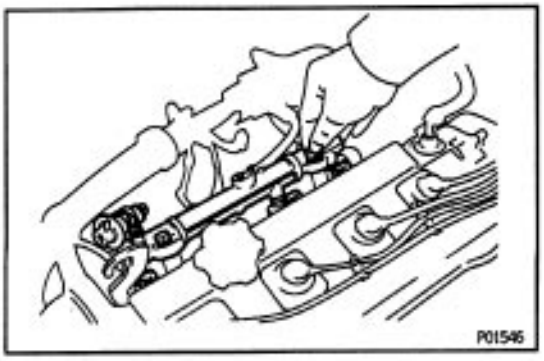
(d) Except California:
Apply a light coat of gasoline to a new O–ring, and install it to each injector.



(e) While turning the injector left and right, install it to the delivery pipes. Install the 4 injectors.

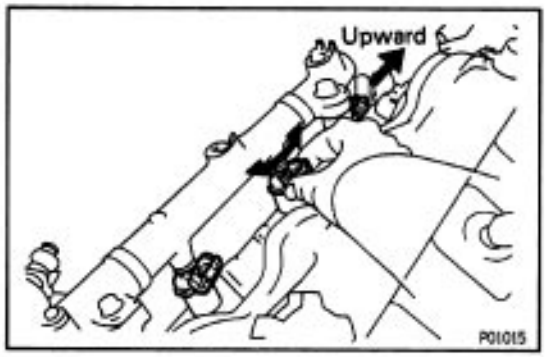


(f) Install the following parts to the cylinder head:
(1) 2 spacers
(2) Except California:
4 new insulators

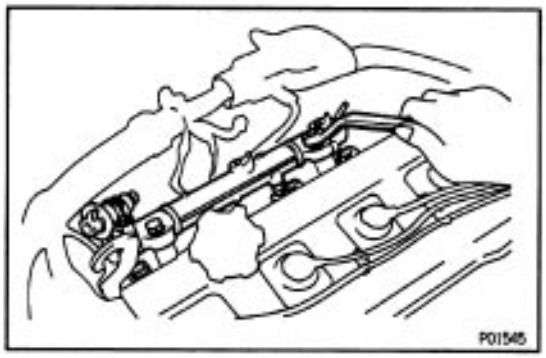


(g) Place the 4 injectors together with the delivery pipe in position on the cylinder head.

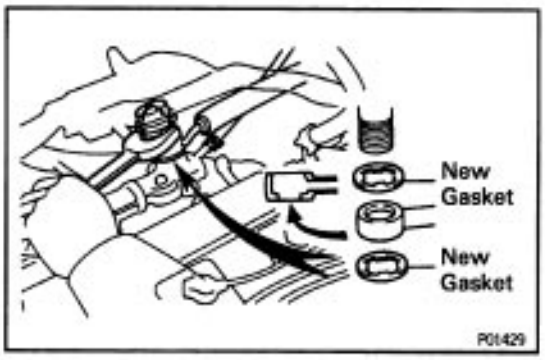
(h) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.



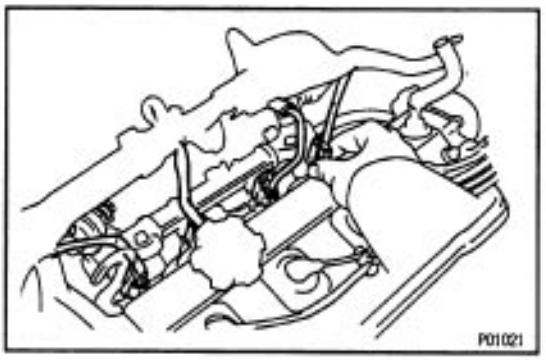
(i) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O – rings. Replace the O–rings.
(j) Position the injector connector upward.



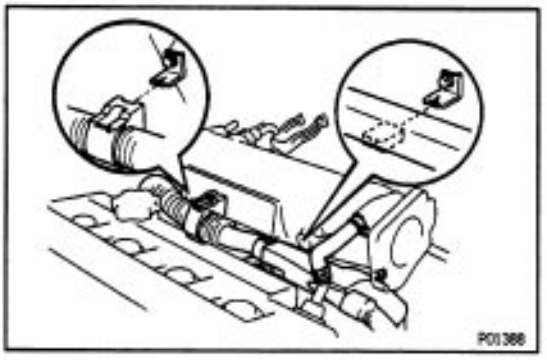
(k) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



(l) Connect the fuel return hose.
(m) Connect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the pulsation damper.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

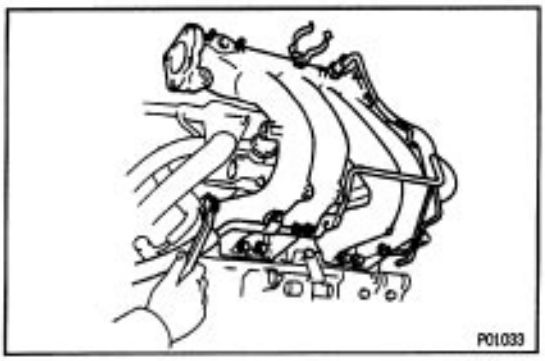


2. CONNECT INJECTOR CONNECTORS



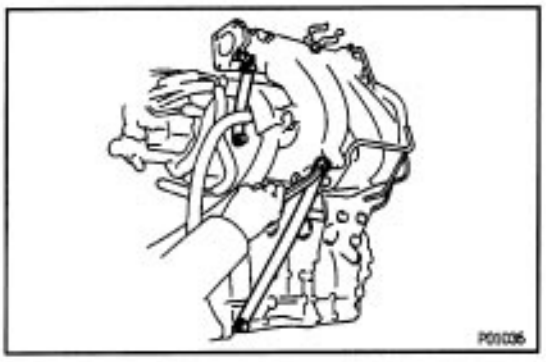
3. INSTALL INTAKE MANIFOLD

(a) Connect the 2 wire clamps to the wire brackets on the intake manifold.



(b) Install a new gasket and the intake manifold with the 6 bolts and 2 nuts. Uniformly tighten the bolts and nuts in several passes.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



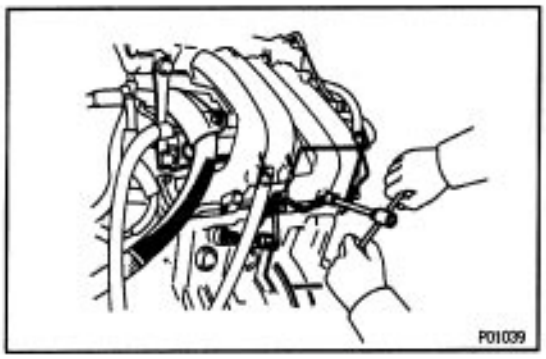
(c) Install the No. 1 air intake chamber and manifold stays, wire bracket with the 4 bolts.

14 mm head bolt

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

12 mm head bolt

Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)

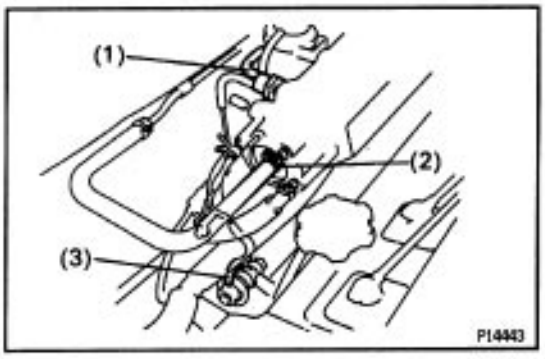


4. CONNECT ENGINE WIRE HARNESS WITH WIRE CLAMP AND BOLT

5. CALIFORNIA ONLY:
CONNECT VSV (FOR FUEL PRESSURE CONTROL) CONNECTOR AND VACUUM HOSES

6. CONNECT KNOCK SENSOR AND VSV (FOR EGR) CONNECTORS

7. CONNECT 2 ENGINE WIRE GROUND STRAPS TO INTAKE MANIFOLD



8. CONNECT VACUUM HOSES

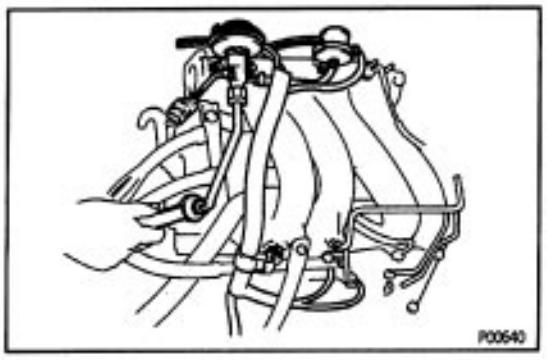
Connect the following hoses:

(1) MAP sensor hose to air intake chamber

(2) Brake booster vacuum hose to air intake chamber

(3) Vacuum sensing hose to fuel pressure regulator.

9. w/ A/C:
CONNECT A/C IDLE–UP VALVE CONNECTOR



10. INSTALL EGR VALVE AND VACUUM MODULATOR

(a) Install a new gasket and the EGR valve with the union nut and 2 nuts.

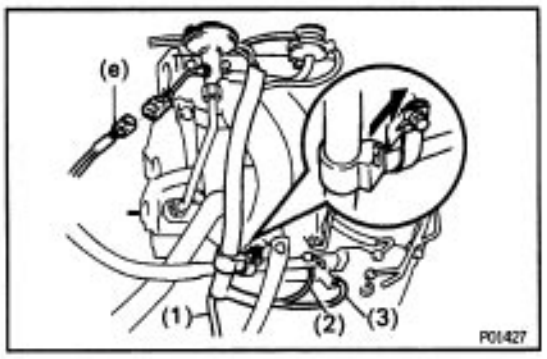
Union nut

Torque: 59 N–m (600 kgf–cm. 43 ft–lbf)

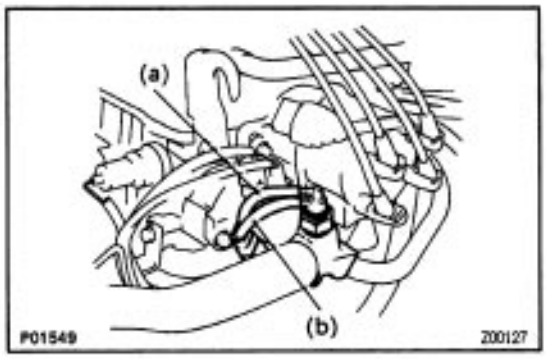
Nut

Torque: 13 N–m (130 kgf–cm. 9 ft–lbf)

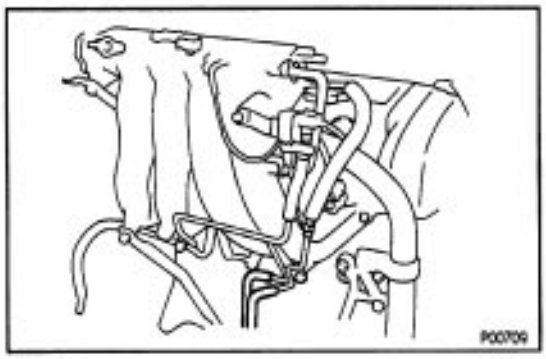
(b) Install the EGR vacuum modulator to the clamp.



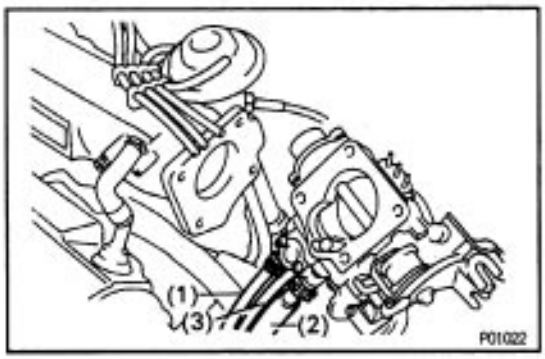
(c) Connect the vacuum hose clamp.
(d) Connect the following hoses:
(1) Vacuum hose to charcoal canister
(2) Vacuum hose (from EGR valves) to E port of VSV (for EGR)
(3) Vacuum hose (from Q port EGR vacuum modulator) to G port of VSV (for EGR)
(e) Connect the EGR gas temperature sensor connector.



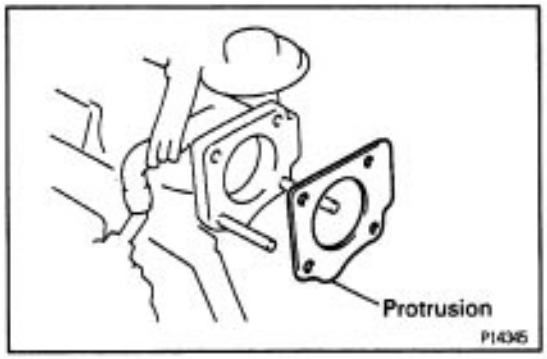
11. CONNECT VACUUM HOSES TO VSV (FOR EVAP)
(a) From P port of throttle body
(b) From charcoal canister



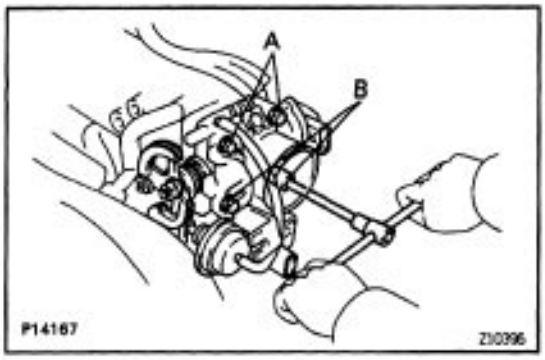
12. CONNECT PS VACUUM HOSES



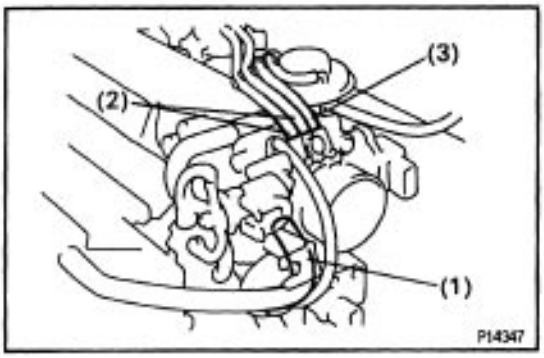
13. INSTALL THROTTLE BODY
(a) Connect the following hoses to the throttle body:
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose to air tube



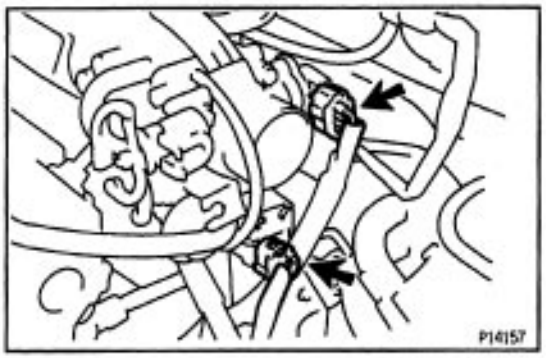
(b) Place a new gasket on the intake chamber, facing the protrusion downward.



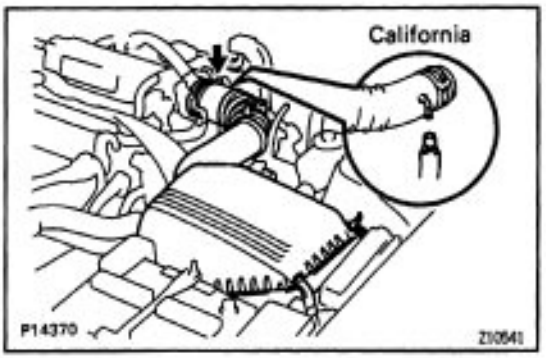
(c) Type A:
Install the throttle body with the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
Bolt length:
A 45 mm (1.77 in.)
B 55 mm (2.17 in.)
(d) Type B:
Install the throttle body with the 2 bolts and 2 nuts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Connect the following hoses to the throttle body:
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)



(f) Connect the IAC valve connector.
(g) Connect the throttle position sensor connector.

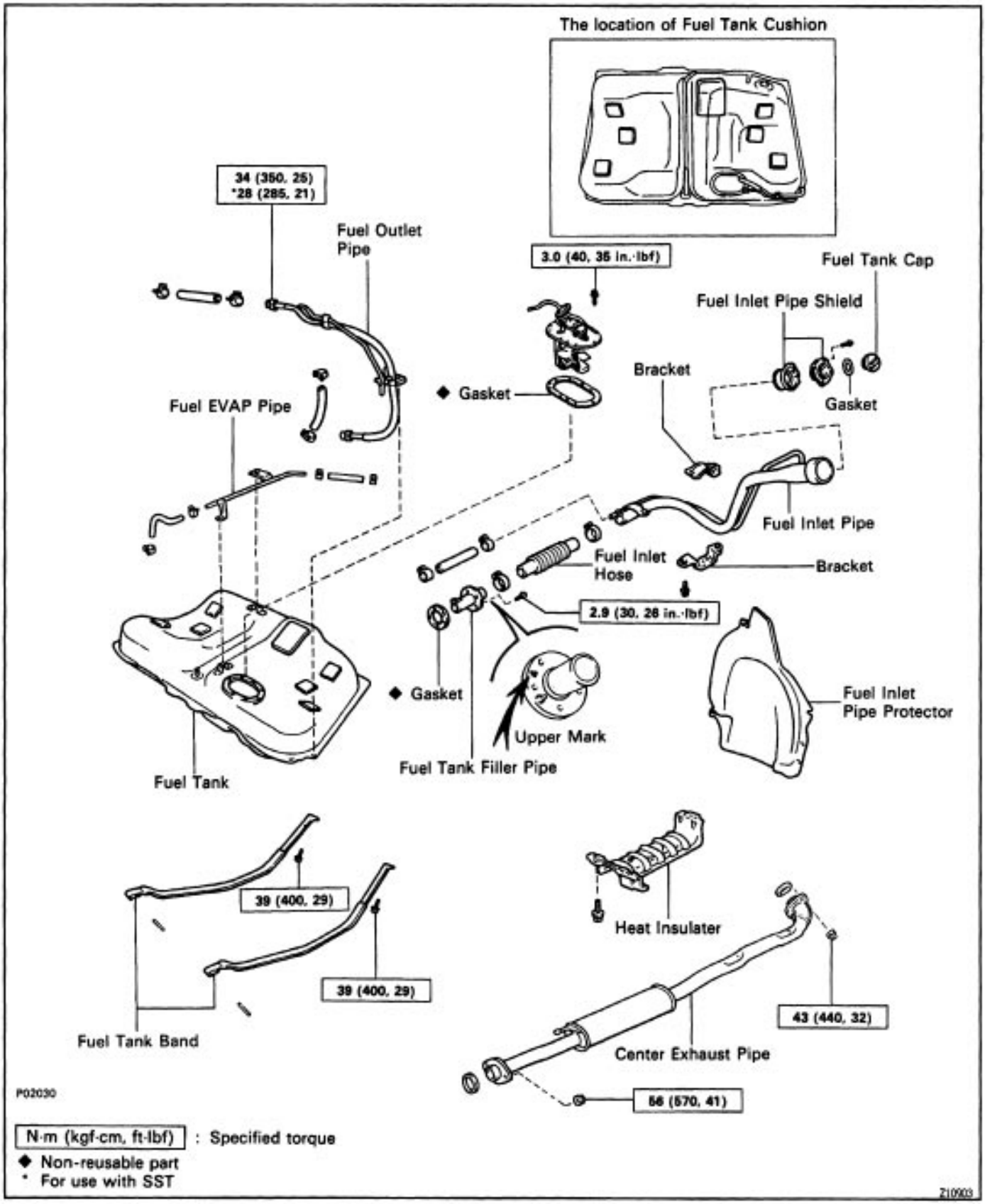


14. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE
(a) Connect the air cleaner hose to the throttle body.
(b) Install the air cleaner cap together with the resonator and air cleaner hose.
(c) California only:
Connect the air hose to the air cleaner hose.
(d) Connect the intake air temperature sensor connector.

15. A/T:
CONNECT AND ADJUST THROTTLE CABLE
16. CONNECT AND ADJUST ACCELERATOR CABLE
17. FILL WITH ENGINE COOLANT
Capacity:
6.3 liters (6.7 US qts. 5.5 Imp. qts)
18. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

FUEL TANK AND LINE

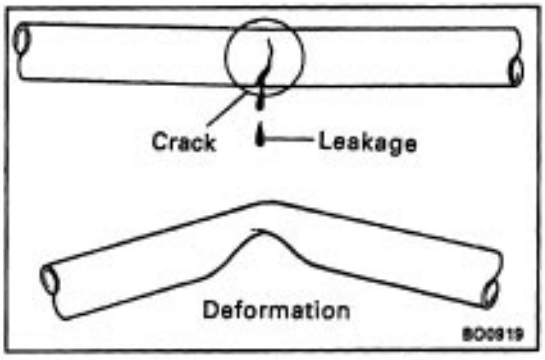
COMPONENTS

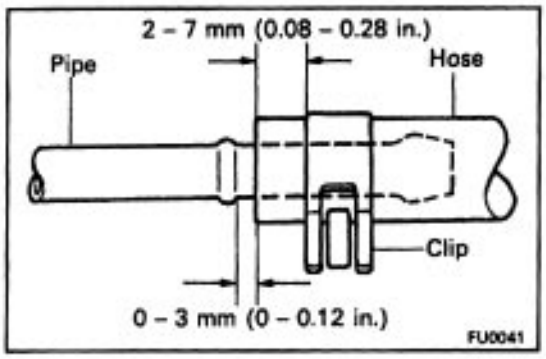


PRECAUTIONS

1. Always use new gaskets when replacing the fuel tank or component parts.

2. Apply the proper torque to all parts tightened.





FUEL LINES AND CONNECTIONS INSPECTION

(a) Check the fuel lines for cracks, leakage and all connections for deformation.

(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

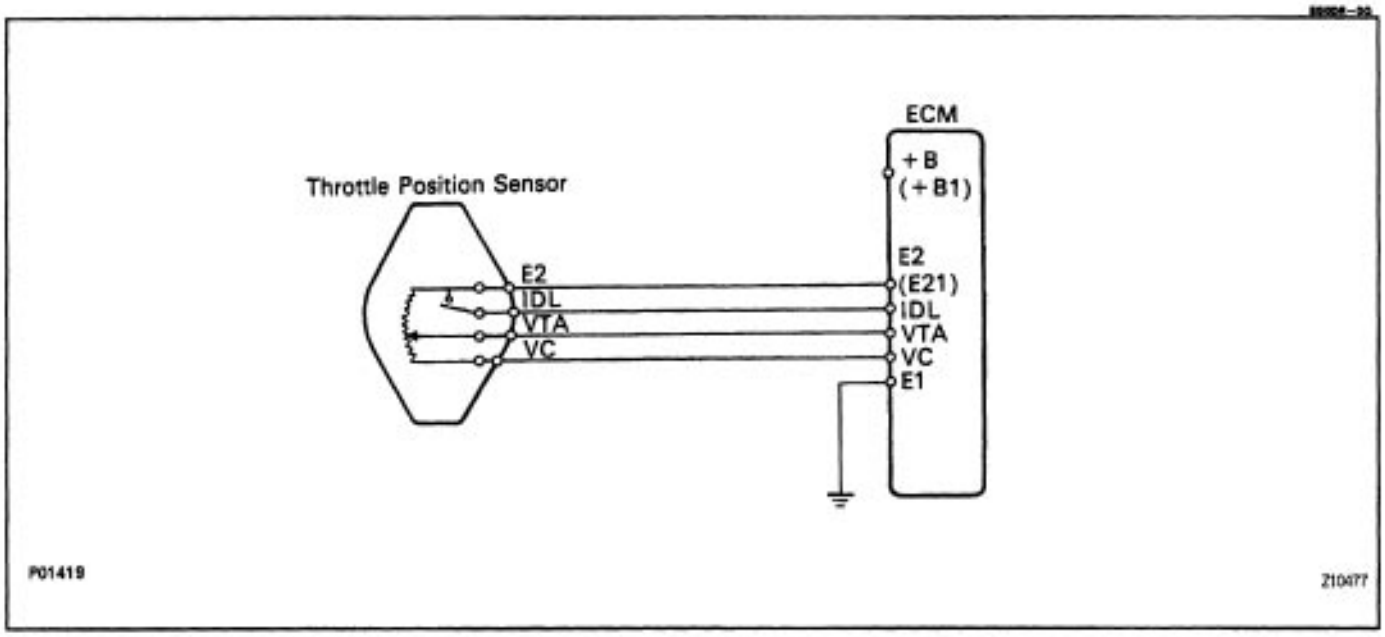
(c) Check the fuel tank for deformation, cracks, fuel leakage and tank band looseness.

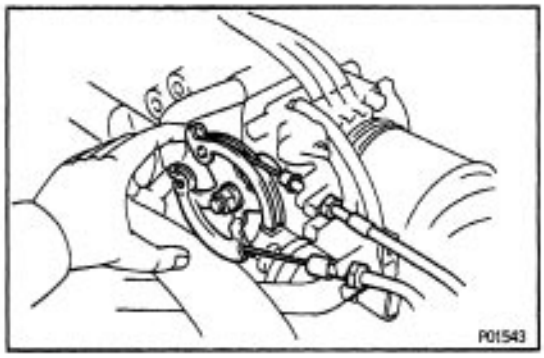
(d) Check the filler neck for damage or fuel leakage.

(e) Hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the part as necessary.

THROTTLE BODY

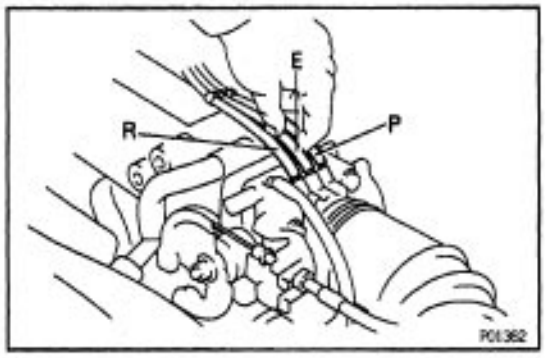




ON–VEHICLE INPSECTION

1. INSPECT THROTTLE BODY

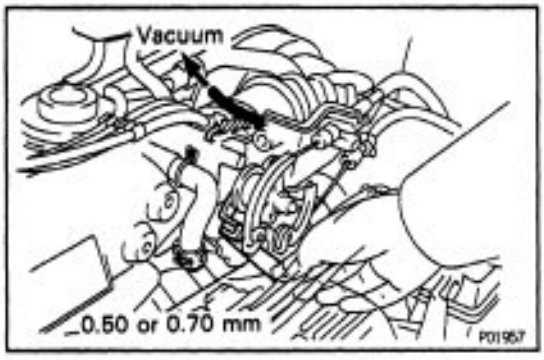
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

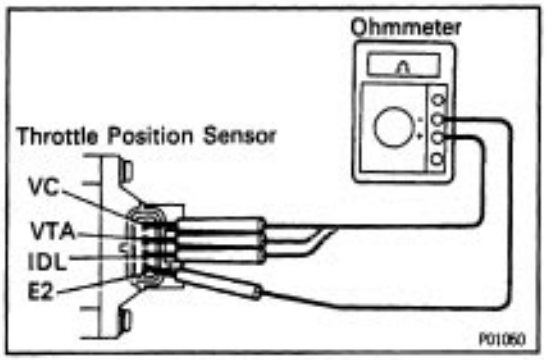
- Start the engine.
- Check the vacuum with your finger.

Port name	At idle	Other than idle
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	No vacuum



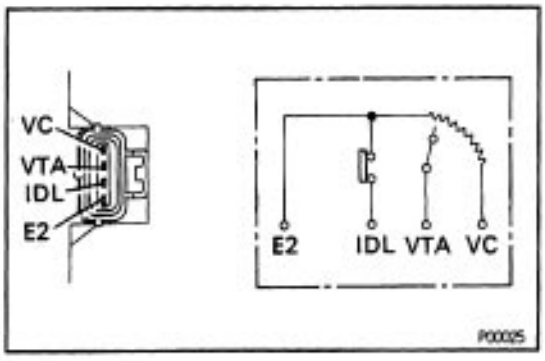
2. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.
(b) Disconnect the sensor connector.
(c) Insert a thickness gauge between the throttle stop screw and stop lever.



(d) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ



(e) Reconnect the sensor connector.

3. INSPECT AND ADJUST THROTTLE OPENER

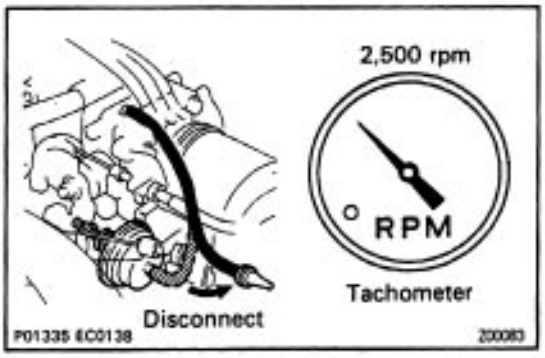
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed:

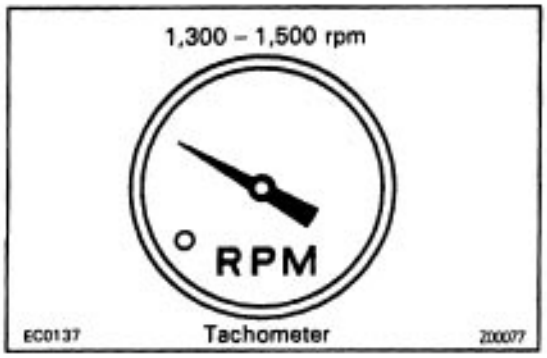
750 ± 50 rpm



C. Check and adjust throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(b) Maintain the engine at 2,500 rpm.

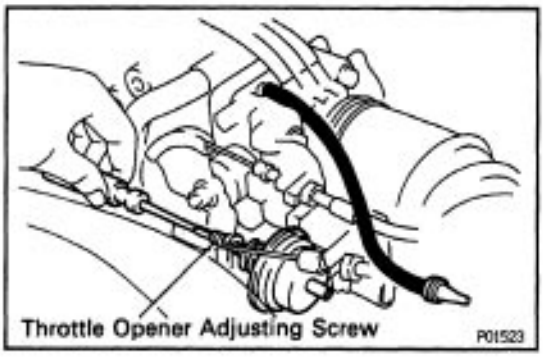


(c) Release the throttle valve.

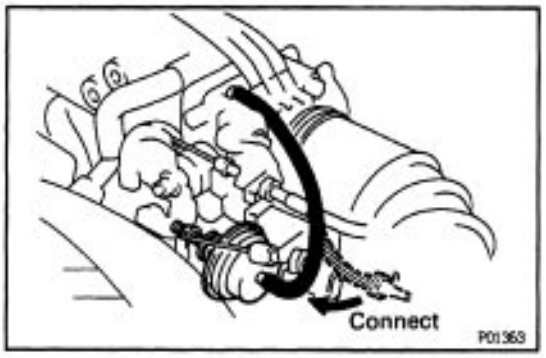
(d) Check that the throttle opener is set.

Throttle opener setting speed:

1,300 – 1,500 rpm (w/ Cooling fan OFF)

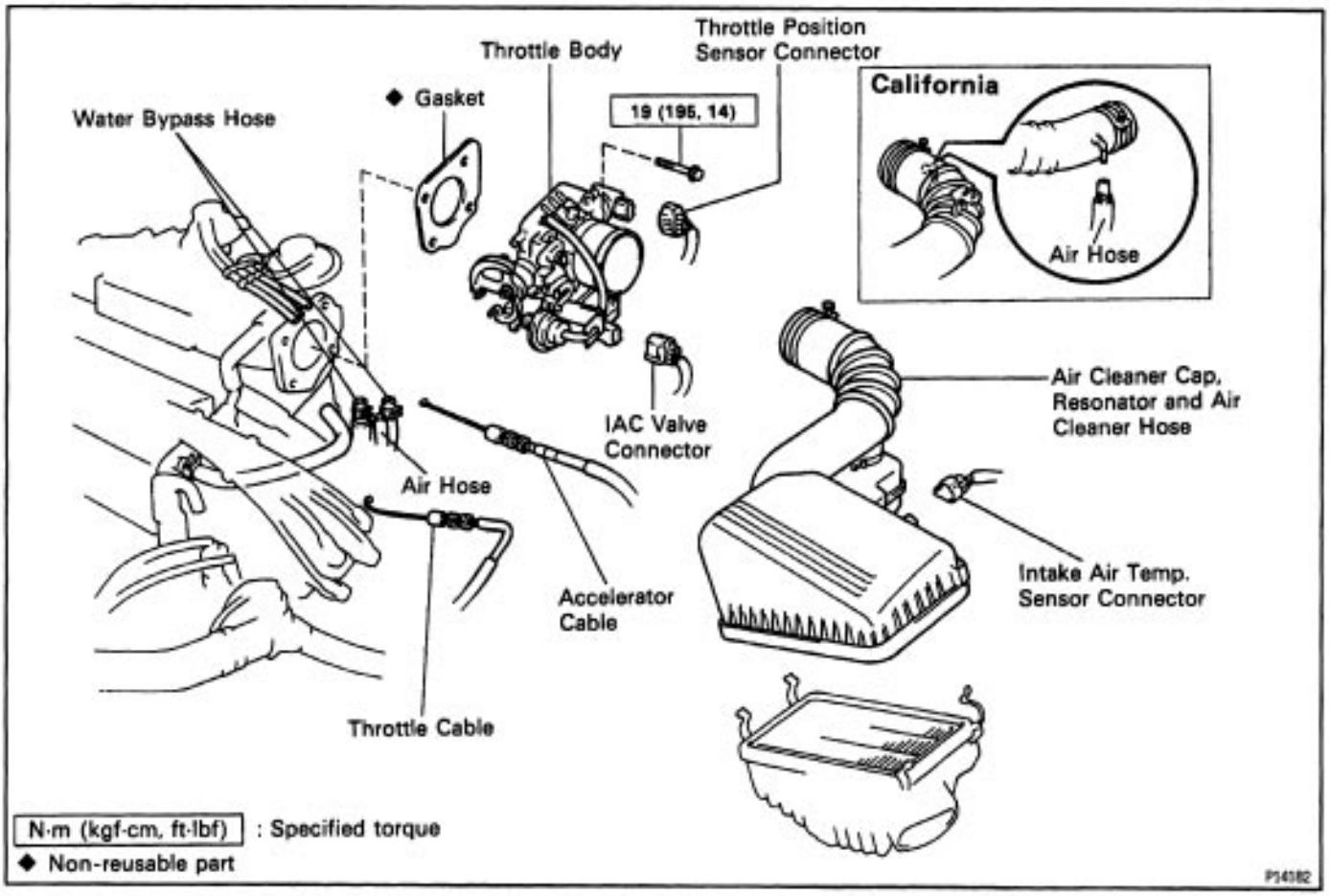


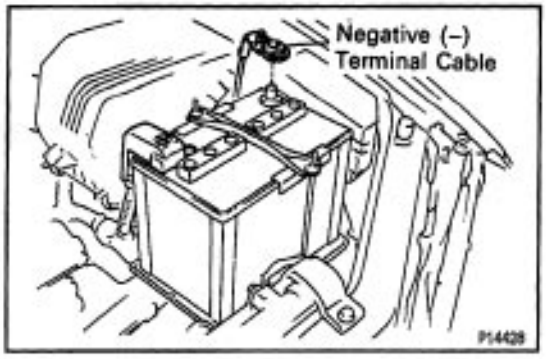
(e) Adjust the throttle opener setting speed by turning the throttle opener adjusting screw.



(f) Reconnect the vacuum hose to the throttle opener.

COMPONENTS FOR REMOVAL AND INSTALLATION





THROTTLE BODY REMOVAL

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

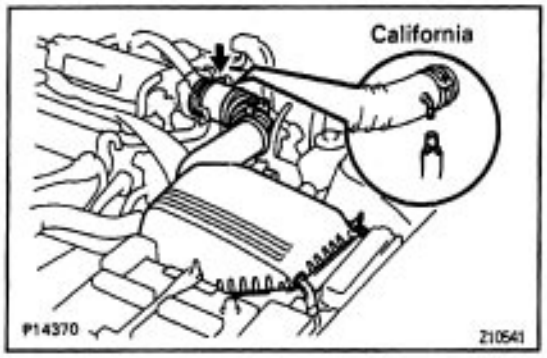
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

4. A/T:

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE



5. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

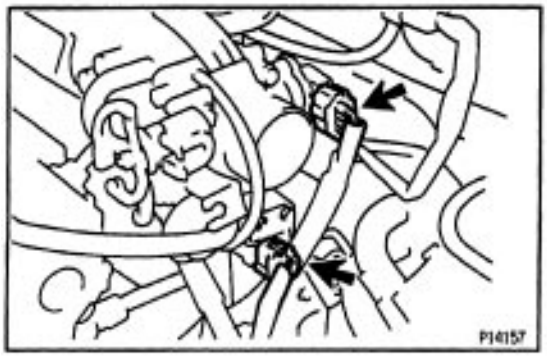
(a) Disconnect the intake air temperature sensor connector.

(b) California only:
Disconnect the air hose from the air cleaner hose.

(c) Loosen the air cleaner hose clamp bolt.

(d) Disconnect the 4 air cleaner cap clips.

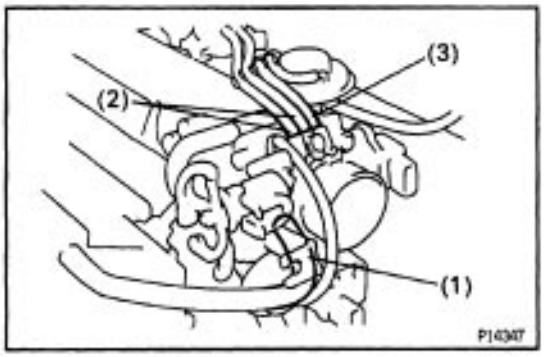
(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.



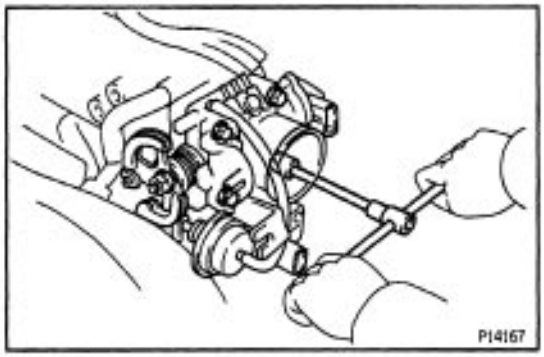
6. REMOVE THROTTLE BODY

(a) Disconnect the throttle position sensor connector.

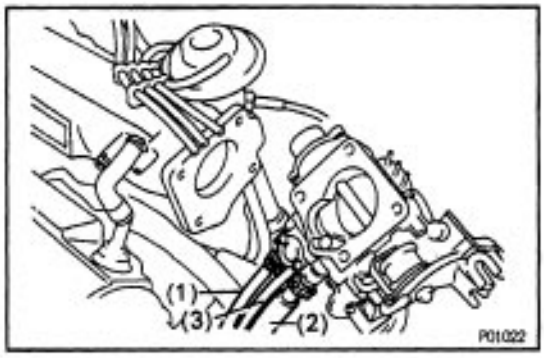
(b) Disconnect the IAC valve connector.



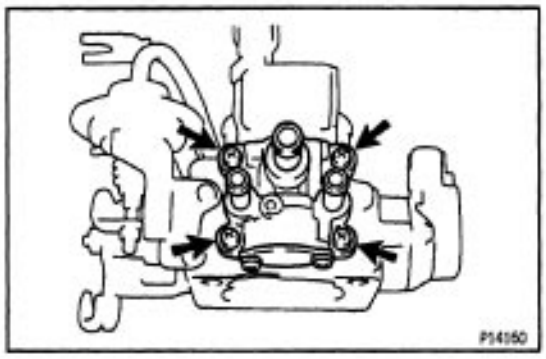
(c) Disconnect the following hoses from the throttle body.
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)



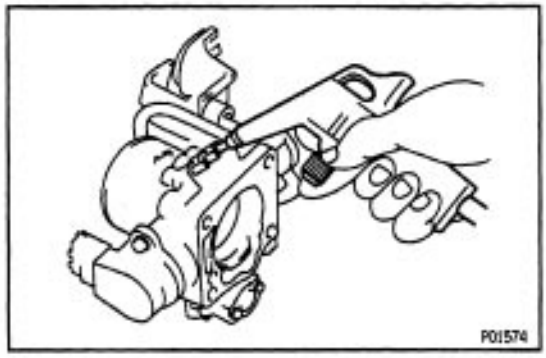
(d) Type A:
Remove the 4 bolts.
(e) Type B:
Remove the 2 bolts and 2 nuts.



(f) Disconnect the following hoses from the throttle body, and remove the throttle body.
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose from air tube

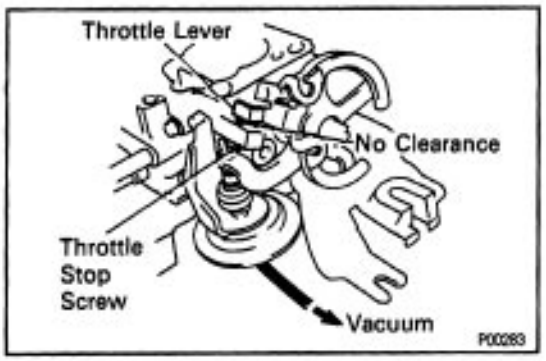


7. IF NECESSARY, REMOVE IAC VALVE FROM THROTTLE BODY
Remove the 4 screws, IAC valve and gasket.



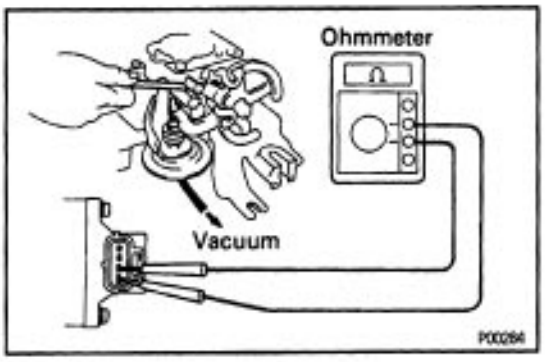
THROTTLE BODY INSPECTION

1. CLEAN THROTTLE BODY
(a) Using a soft brush and carburetor cleaner, clean the cast parts.
(b) Using compressed air, clean all the passengers and apertures.
NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

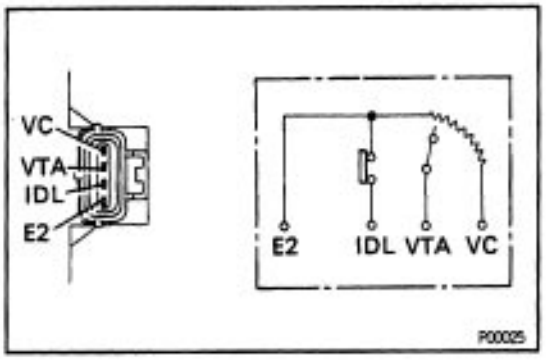
(a) Apply vacuum to the throttle opener.
(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. INSPECT THROTTLE POSITION SENSOR

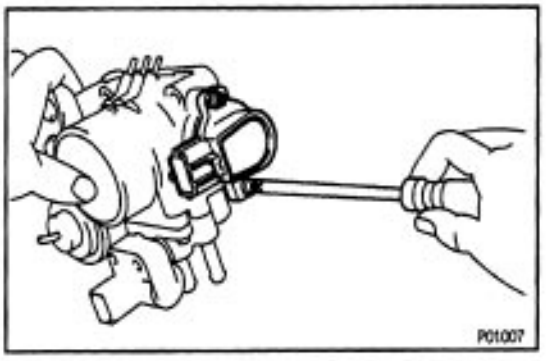
(a) Apply vacuum to the throttle opener.
(b) Insert a thickness gauge between the throttle stop screw and stop lever.
(c) Using an ohmmeter, measure the resistance between each terminal.

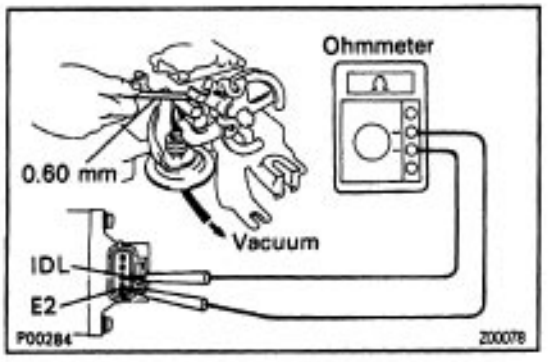
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
0.50 mm (0.020 in.)	IDL–E2	2.3 kΩ or less
0.70 mm (0.028 in.)	IDL–E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ



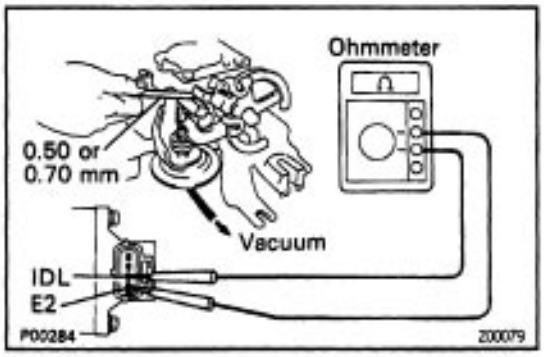
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the 2 set screws of the sensor.



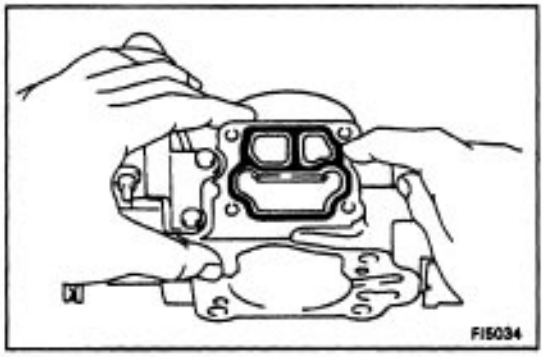


(b) Apply vacuum to the throttle opener.
(c) Insert a 0.60 mm (0.024 in.) thickness gauge between the throttle stop screw and stop lever.
(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.

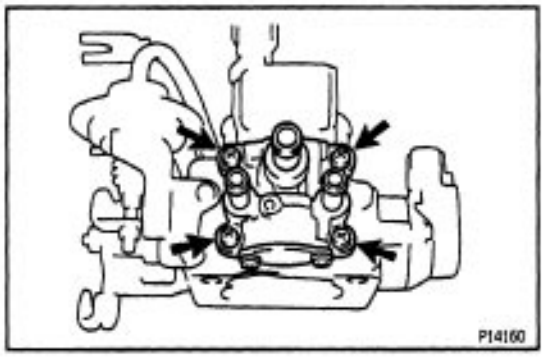


(f) Recheck the continuity between terminals IDL and E2.

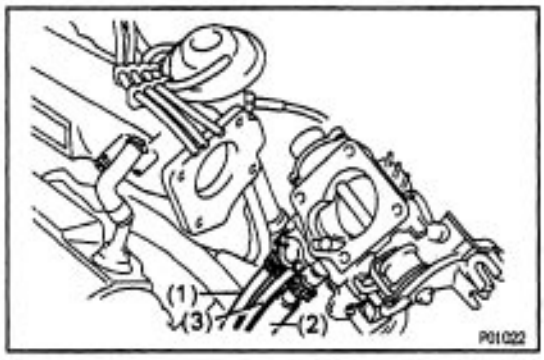
Clearance between lever and stop screw	Continuity (IDL – E2)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



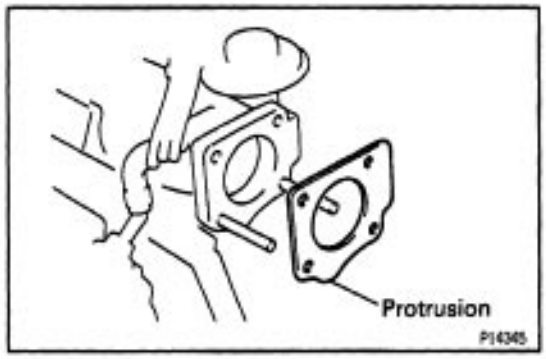
THROTTLE BODY INSTALLATION
(See Components for Removal and Installation)
1. INSTALL IAC VALVE TO THROTTLE BODY
(a) Place a new gasket on the throttle body.



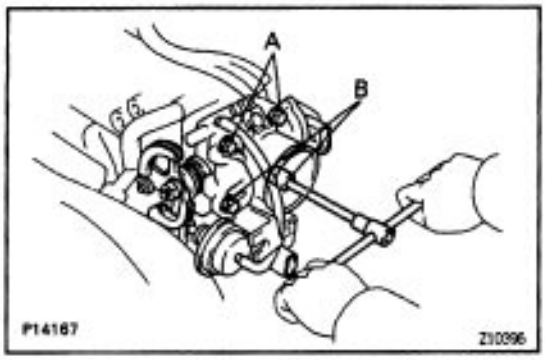
(b) install the IAC valve with the 4 screws.



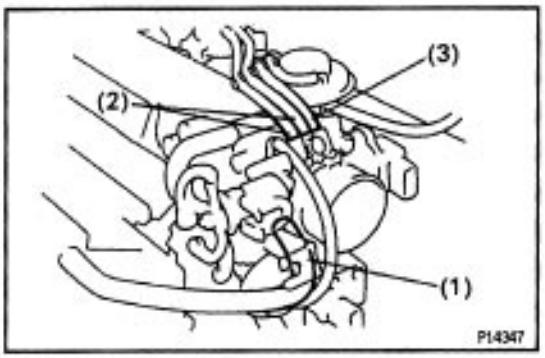
2. INSTALL THROTTLE BODY
(a) Connect the following hoses to the throttle body:
(1) Water bypass hose from water outlet
(2) Water bypass hose from water bypass pipe
(3) California:
Air hose from cylinder head
Except California:
Air hose from air tube



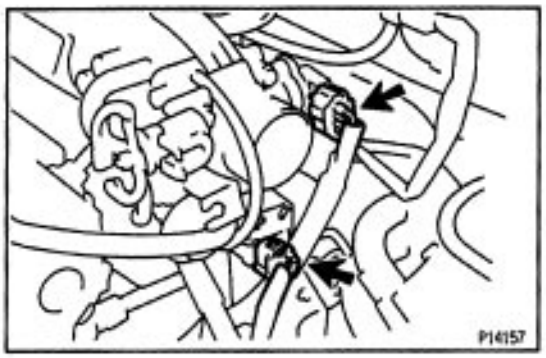
(b) Place a new gasket on the intake chamber, facing the protrusion downward.



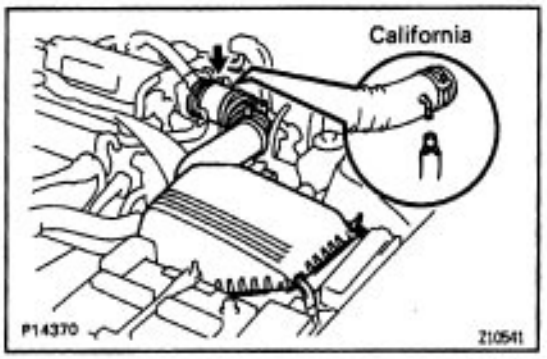
(c) Type A:
Install the throttle body with the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
Bolt length:
A 45 mm (1.77 in.)
B 55 mm (2.17 in.)
(d) Type B:
Install the throttle body with the 2 bolts and 2 nuts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Connect the following hoses to the throttle body:
(1) PCV hose
(2) 2 vacuum hoses from EGR vacuum modulator
(3) Vacuum hose from TVV (for EVAP)



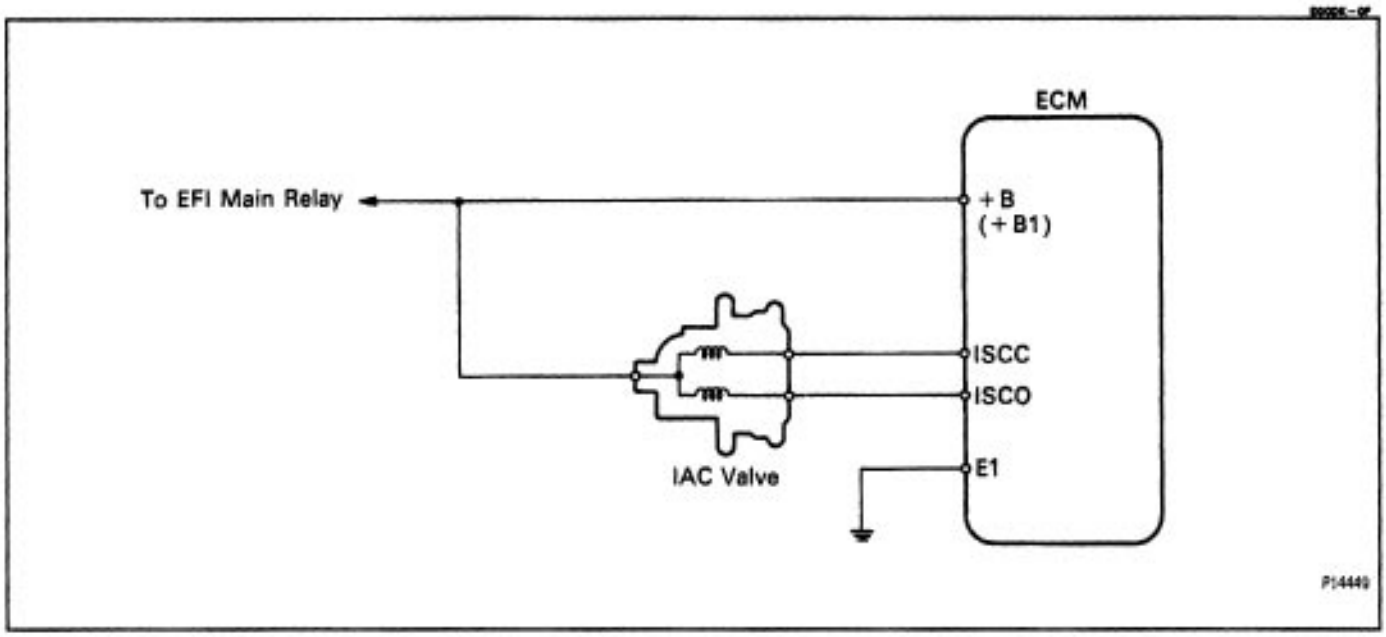
(f) Connect the IAC valve connector.
(g) Connect the throttle position sensor connector.



3. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE
(a) Connect the air cleaner hose to the throttle body.
(b) Install the air cleaner cap together with the resonator and air cleaner hose.
(c) California only:
Connect the air hose to the air cleaner hose.
(d) Connect the intake air temperature sensor connector.

4. A/T:
CONNECT AND ADJUST THROTTLE CABLE
5. CONNECT AND ADJUST ACCELERATOR CABLE
6. FILL WITH ENGINE COOLANT
7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

IDLE AIR CONTROL (IAC) VALVE

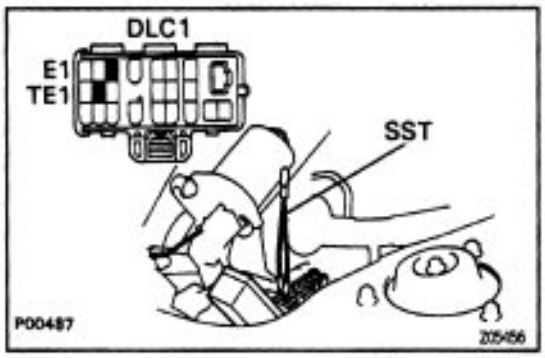


ON–VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

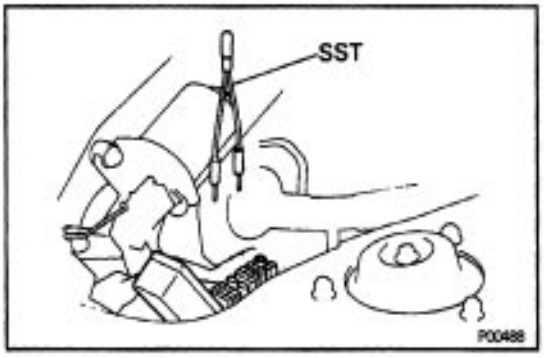
(a) Initial conditions:

- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position

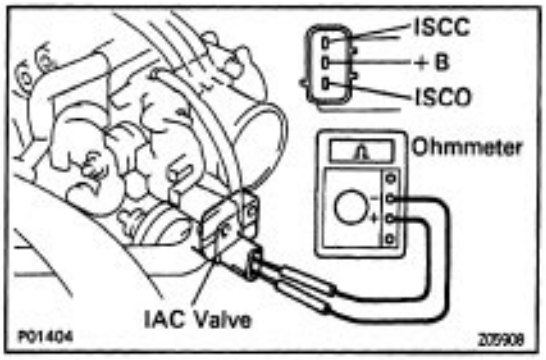


(b) Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843–18020

(c) Maintain engine speed in the range between 900 – 1,300 rpm for 5 seconds. Check that it returns to idle speed.
If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.



(d) Remove the SST.
SST 09843–18020



2. INSPECT IAC VALVE RESISTANCE

(a) Disconnect the IAC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal + B and other terminals (ISCC, ISCO).

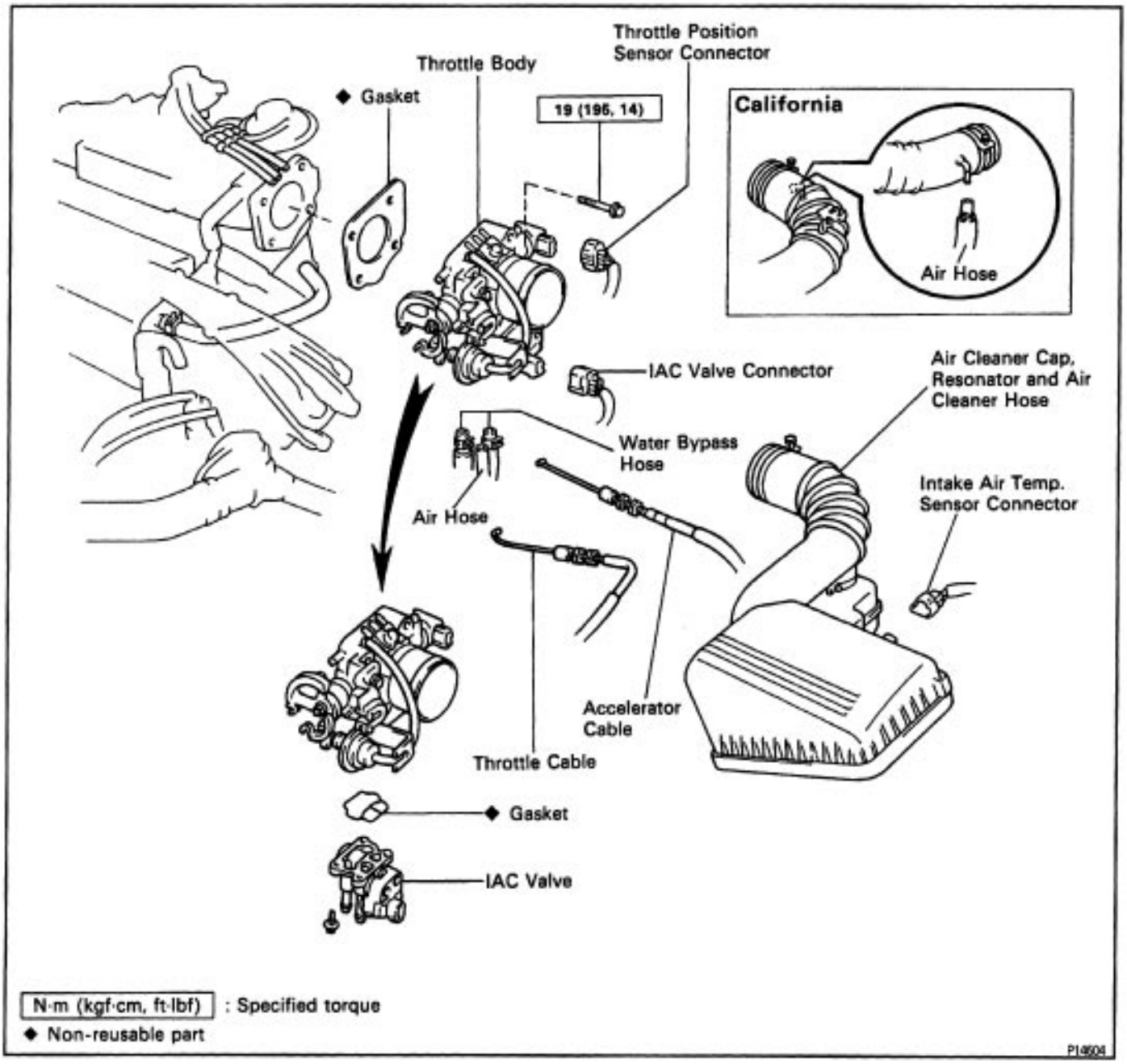
Resistance:

19.3–22–3Ω

If resistance is not as specified, replace the IAC valve.

(c) Reconnect the IAC valve connector.

COMPONENTS FOR REMOVAL AND INSTALLATION

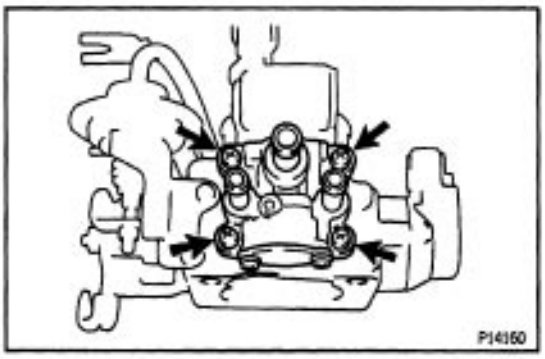


IAC VALVE REMOVAL

(See Components for Removal and Installation)

1. REMOVE THROTTLE BODY

(See steps 1 to 6 on pages EG1–207 and 208)



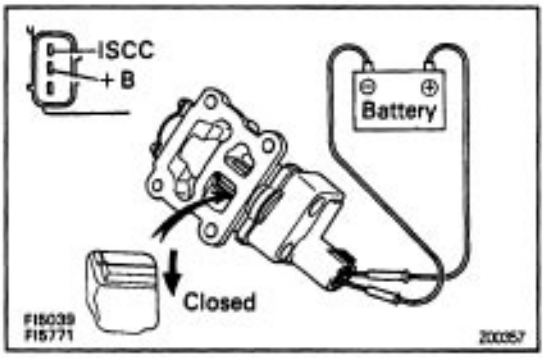
2. REMOVE IAC VALVE

Remove the 4 screws, IAC valve and gasket.

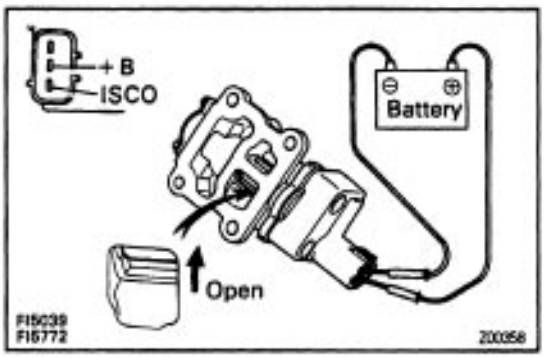
IAC VALVE INSPECTION

INSPECT IAC VALVE OPERATION

(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal ISCC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal ISCO, and check that the valve is open.

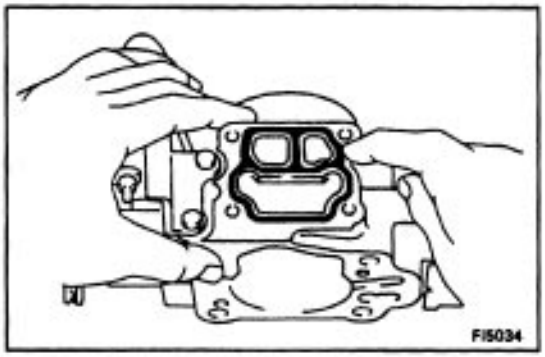


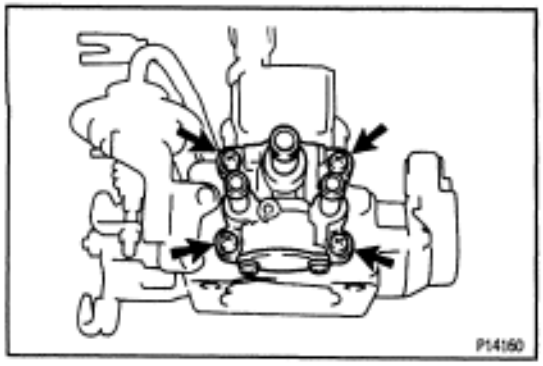
IAC VALVE INSTALLATION

(See Components for Removal and Installation)

1. INSTALL IAC VALVE

(a) Place a new gasket on the throttle body.

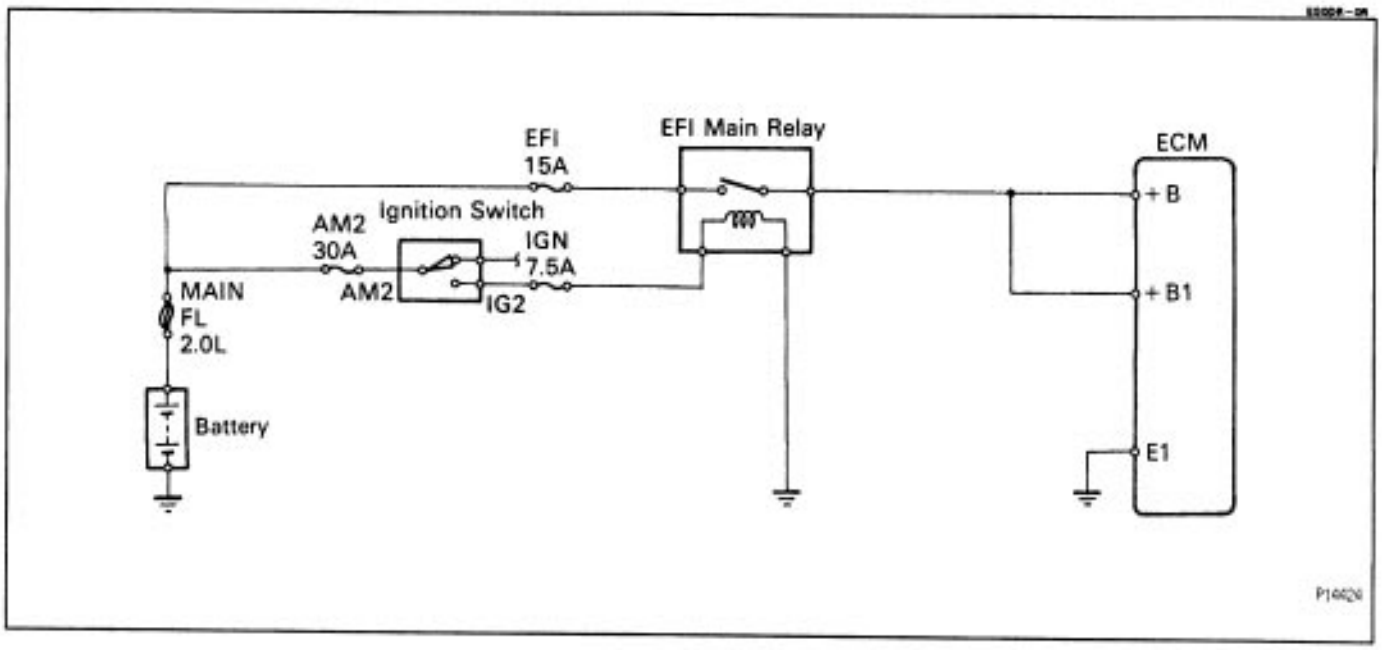


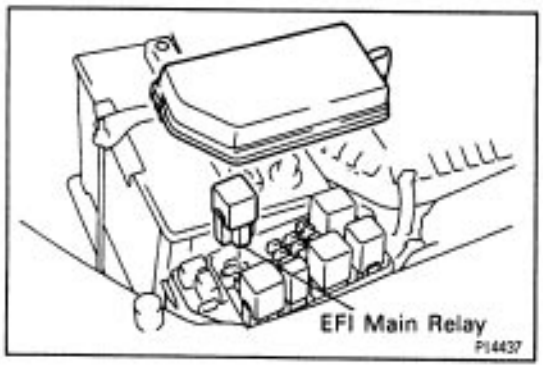


(b) Install the IAC valve with the 4 screws.

2. INSTALL THROTTLE BODY
(See steps 2 to 7 on pages EG1–210 **and 211)**

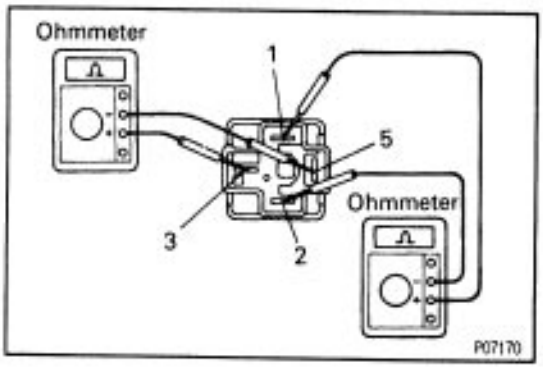
EFI MAIN RELAY





EFI MAIN RELAY INSPECTION

7. REMOVE EFI MAIN RELAY



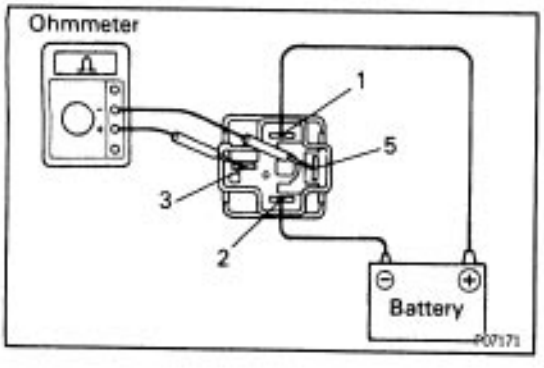
2. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

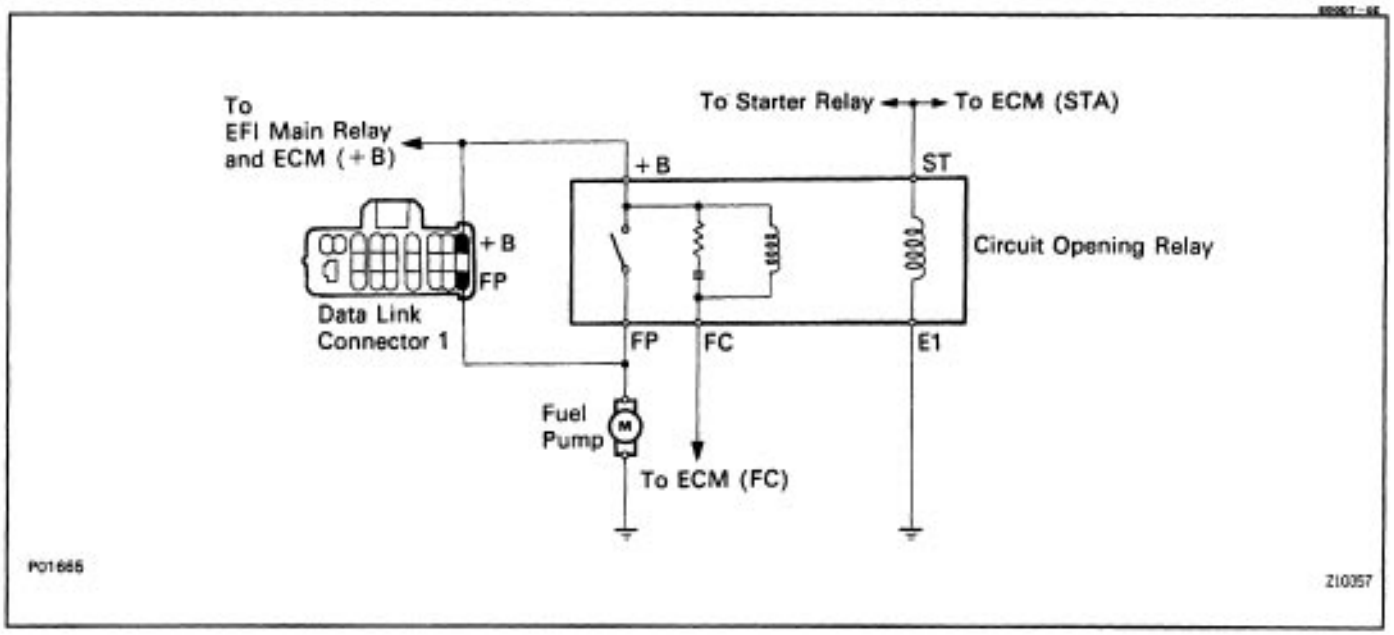
(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

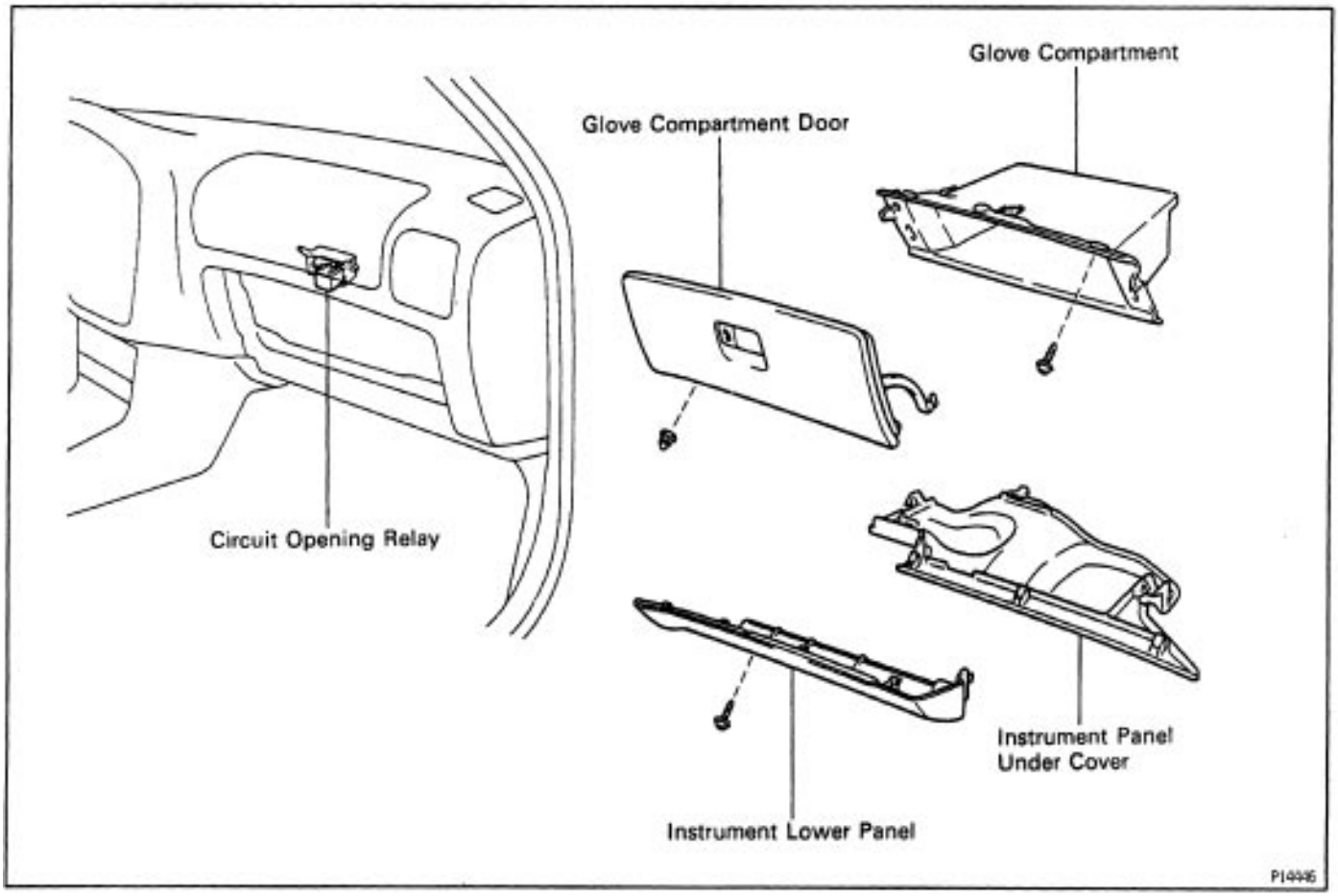
If operation is not as specified, replace the relay.

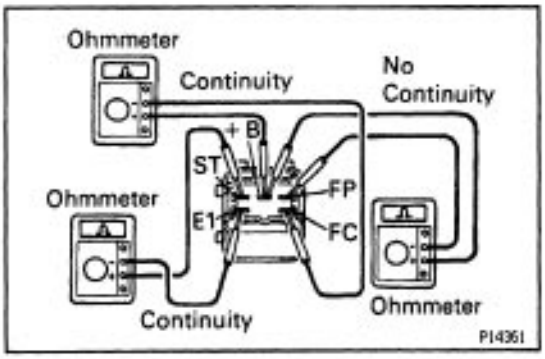
3. REINSTALL EFI MAIN RELAY

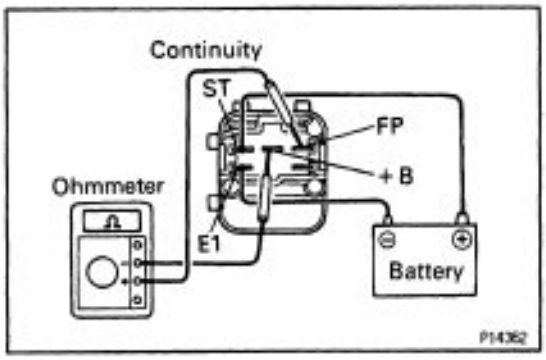
CIRCUIT OPENING RELAY



CIRCUIT OPENING RELAY REMOVAL AND INSTALLATION







CIRCUIT OPENING RELAY INSPECTION

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals ST and E1.

(b) Check that there is continuity between terminals +B and FC.

(c) Check that there is no continuity between terminals + B and FP.

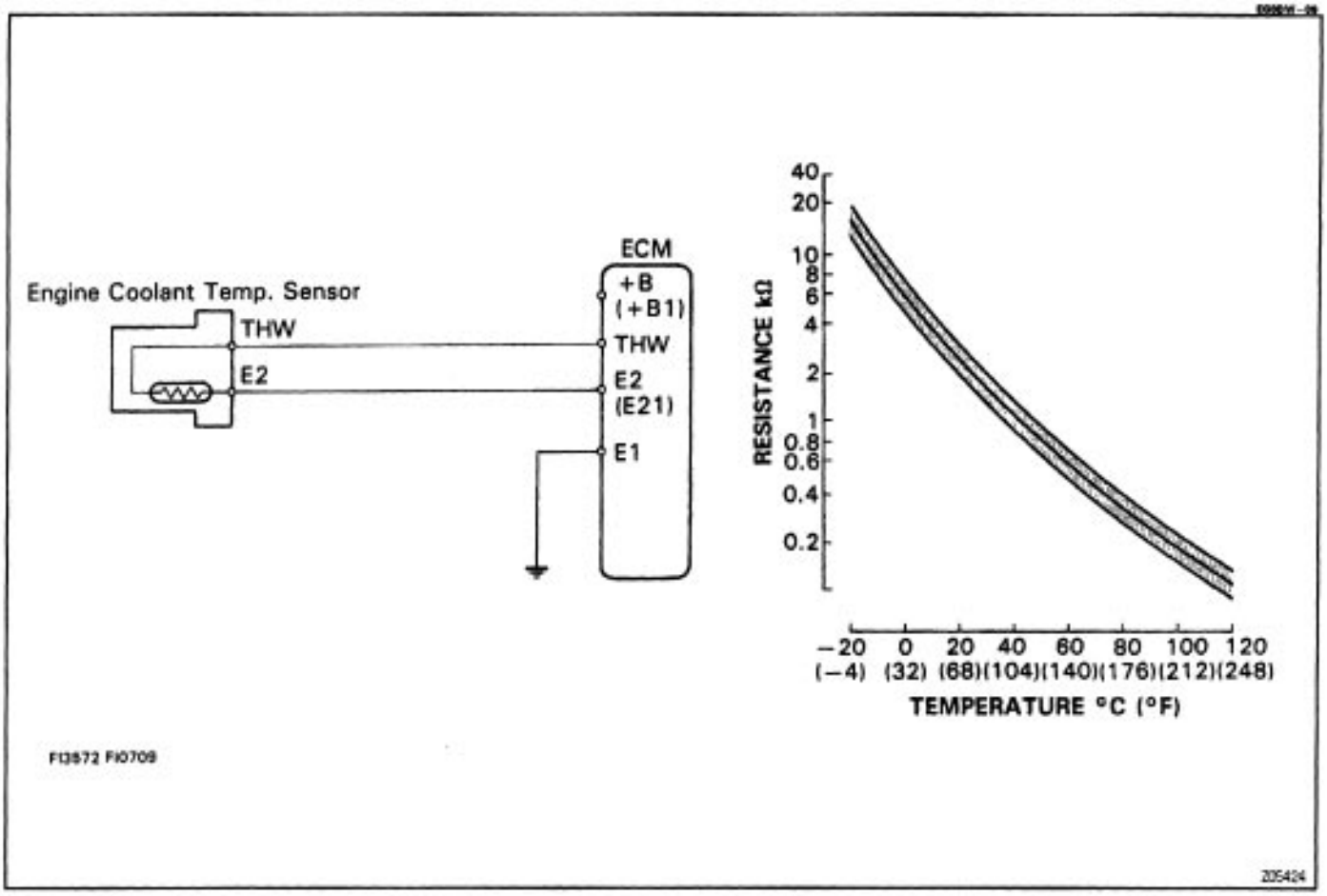
If continuity is not as specified, replace the relay.

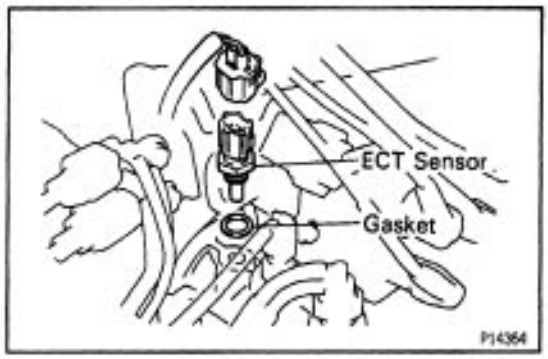
2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals ST and E1.

(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.
If operation is not as specified, replace the relay.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

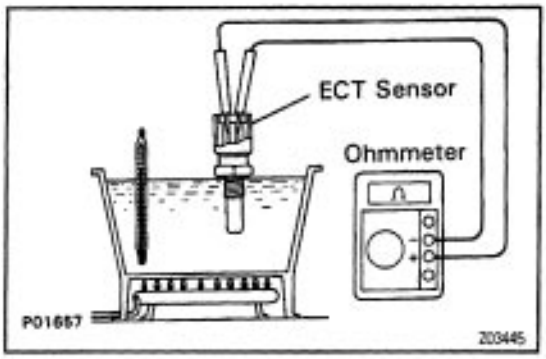




ECT SENSOR INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE ECT SENSOR



3. INSPECT ECT SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

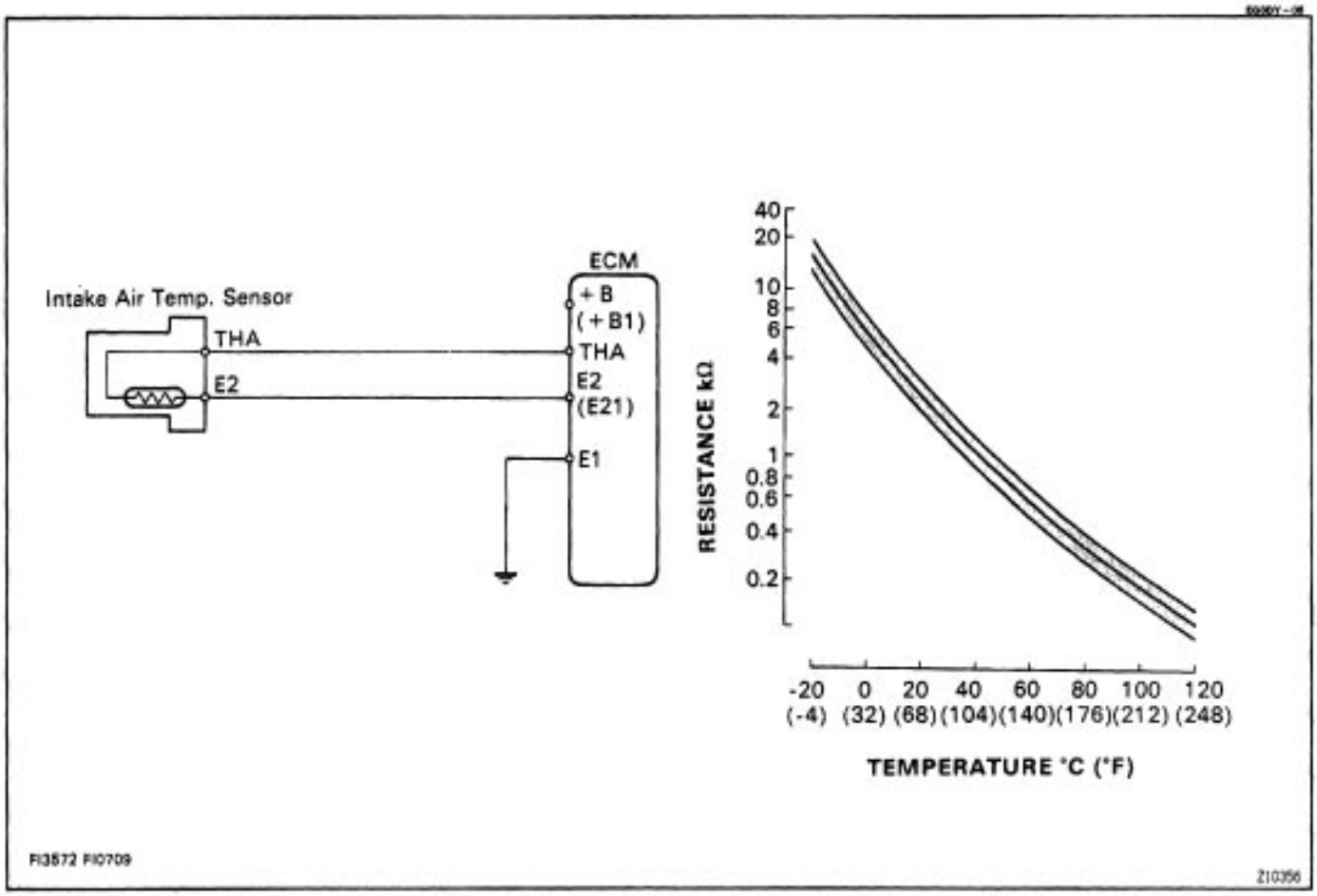
Refer to the graph above

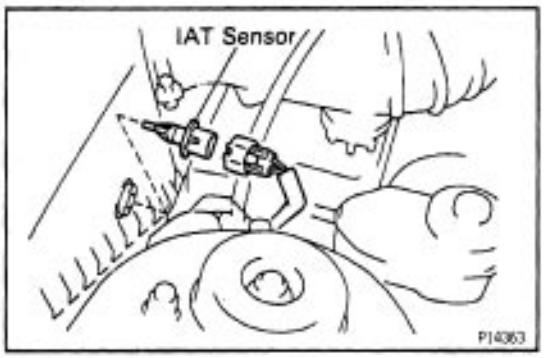
If the resistance is not as specified, replace the sensor.

4. REINSTALL ECT SENSOR

5. FILL WITH ENGINE COOLANT

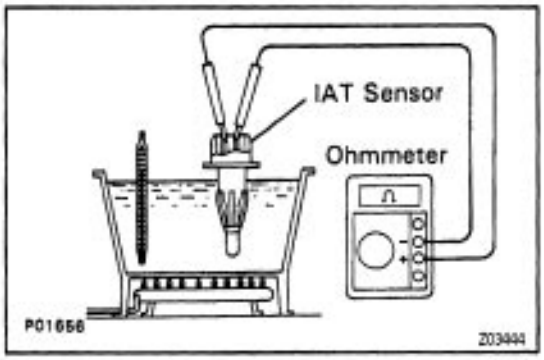
INTAKE AIR TEMPERATURE (IAT) SENSOR





IAT SENSOR INSPECTION

1. REMOVE IAT SENSOR



2. INSPECT IAT SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

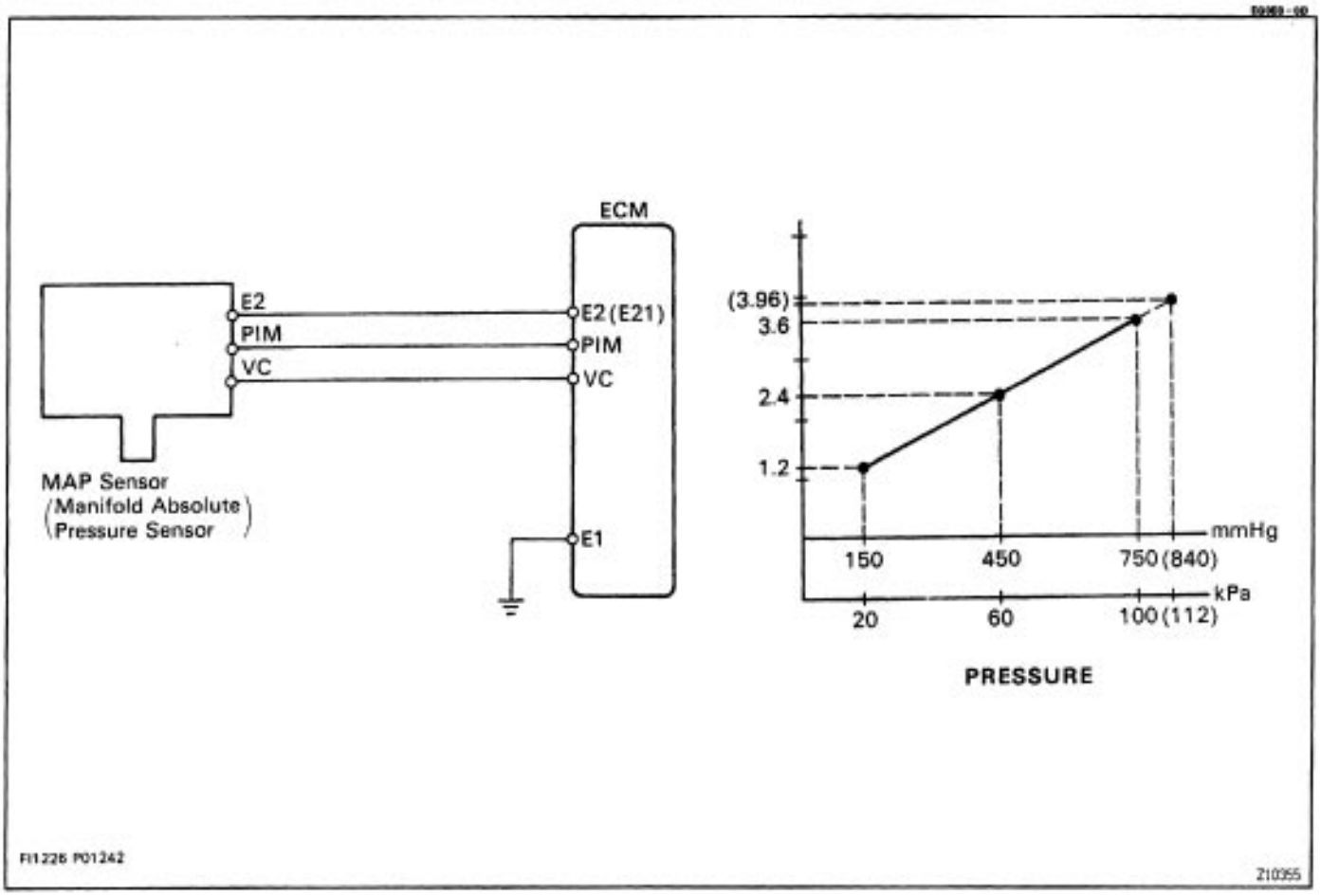
Resistance:

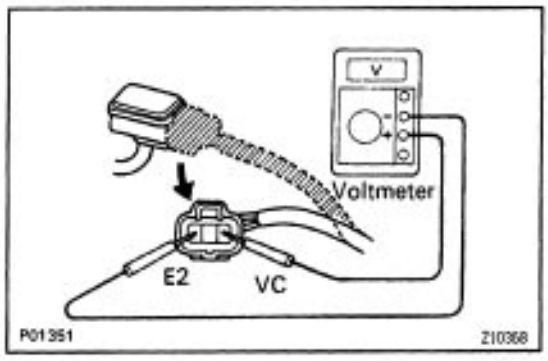
Refer to the graph above

If the resistance is not as specified, replace the sensor.

3. REINSTALL IAT SENSOR

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR





MAP SENSOR INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF MAP SENSOR

(a) Disconnect the MAP sensor connector.

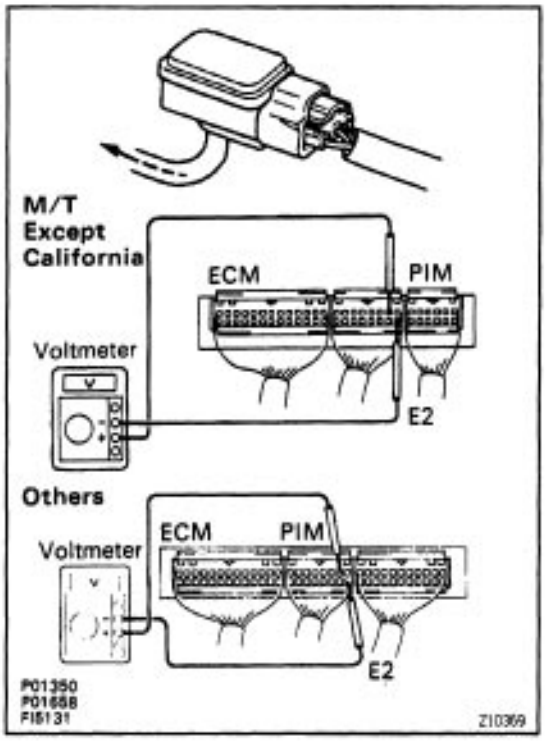
(b) Turn the ignition switch ON.

(c) Using a voltmeter measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage:

4.75 – 5.25 V

(d) Reconnect the MAP sensor connector.



2. INSPECT POWER OUTPUT OF MAP SENSOR

(a) Turn the ignition switch ON.

(b) Disconnect the vacuum hose on the air intake cham–ber side.

(c) Connect a voltmeter to terminals PIM and E2 of the ECM, and measure the output voltage under ambient atmospheric pressure.

(d) Apply vacuum to the MAP sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).

(e) Measure the voltage drop from step

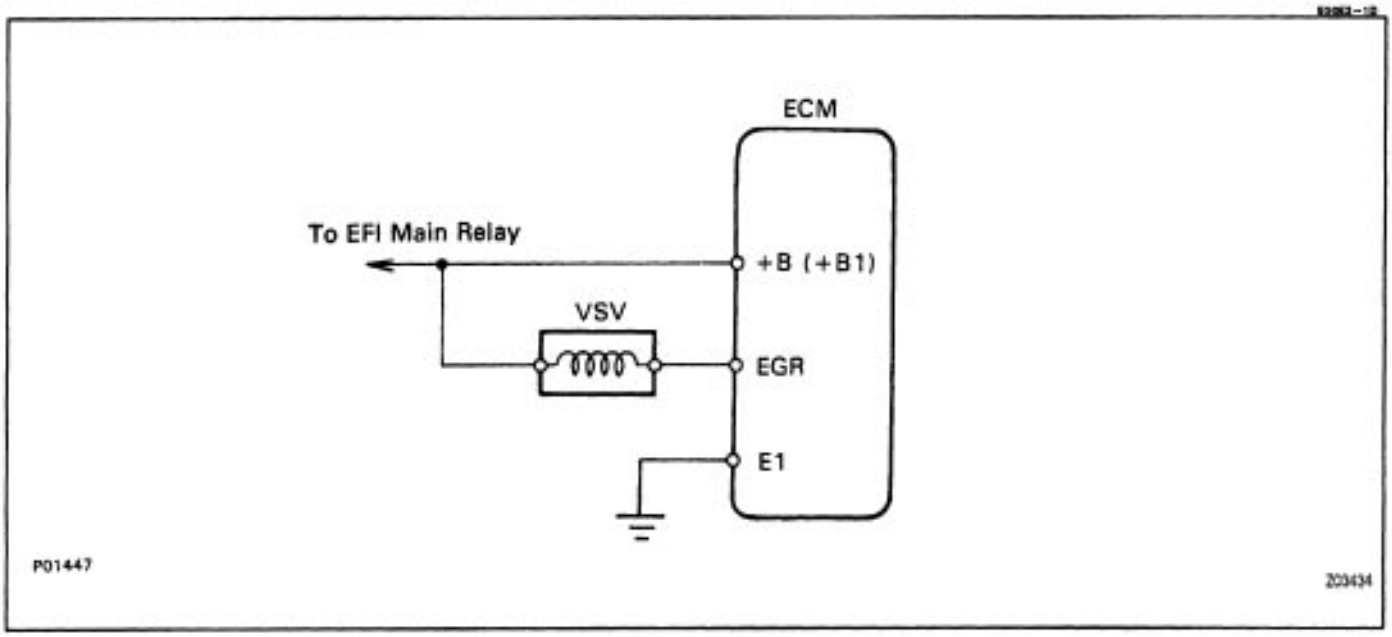
(c) above for each segment.

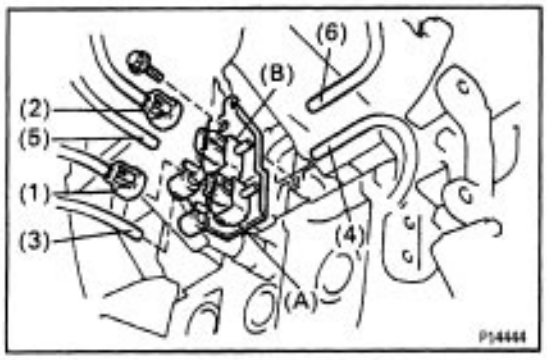
Voltage drop:

Applied Vacuum kPa (mmHg in.Hg)	13.3 (100 3.94)	26.7 (200 7.87)	40.0 (300 111.8)	53.5 (400 15.75)	66.7 (500 19.69)
Voltage drop V	0.3–0.5	0.7–0.9	1.1 –1.3	1.5 – 1.7	1.9 – 2.1

V00494

VSV FOR EGR



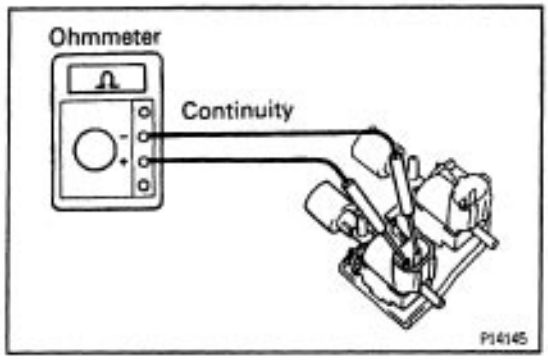


VSV INSPECTION (California)

1. REMOVE VSV

(a) Disconnect the following connectors and hoses:
- (1) VSV for EGR (A) connector
- (2) VSV for fuel pressure control (B) connector
- (3) Vacuum hose (from EGR valve) from port E of VSV (A)
- (4) Vacuum hose (from port “Q” of EGR vacuum modulator) from port G of VSV (A)
- (5) Vacuum hose (from fuel pressure regulator) from port E of VSV (B)
- (6) Vacuum hose (from air intake chamber) from port G of VSV (B)

(b) Remove the bolt and VSV assembly.



2. INSPECT VSV

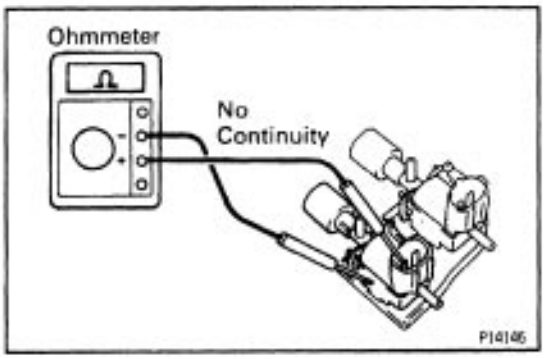
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

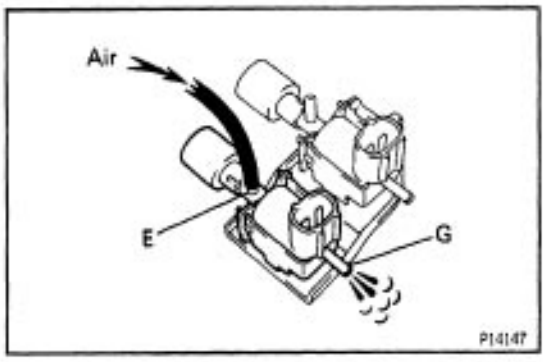
33–39Ω

If there is no continuity, replace the VSV.



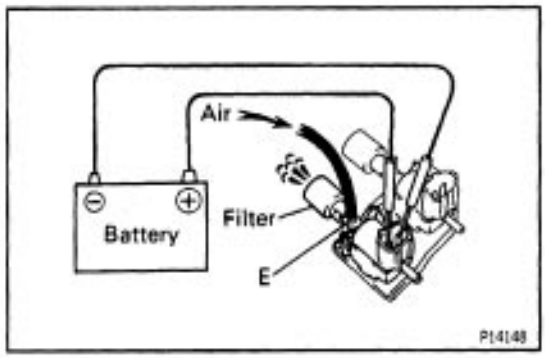
B. Inspect VSV for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the VSV.



C. Inspect VSV operation

(a) Check that air flows from port E to port G.



(b) Apply battery voltage across the terminals.
(c) Check that air flows from port E to the filter.
If operation is not as specified, replace the VSV.

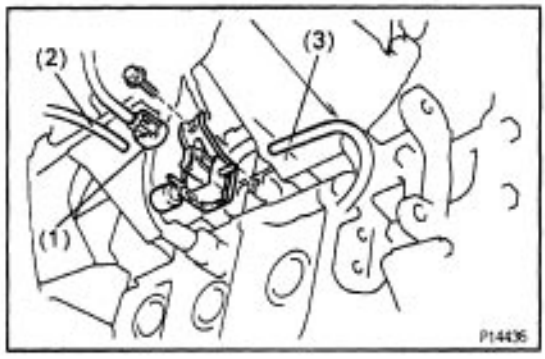
3. REINSTALL VSV

VSV INSPECTION (Except California)

1. REMOVE VSV

(a) Disconnect the following connector and hoses:
(1) VSV connector
(2) Vacuum hose (from EGR valve) from port E of VSV
(3) Vacuum hose (from port “a” of EGR vacuum modulator) from port G of VSV

(b) Remove the bolt and VSV.



2. INSPECT VSV

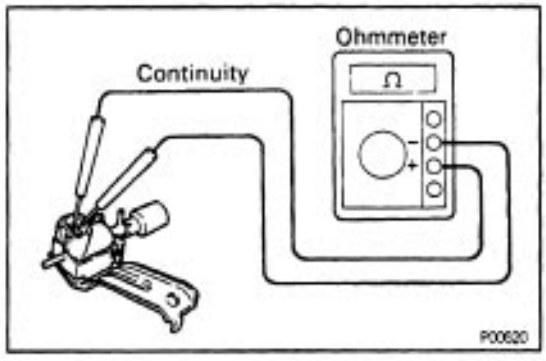
A. Inspect VSV for open circuit

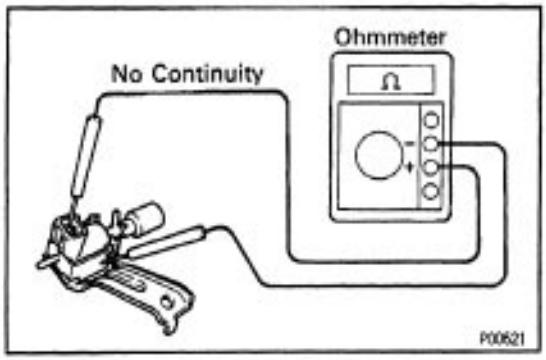
Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

33–39Ω

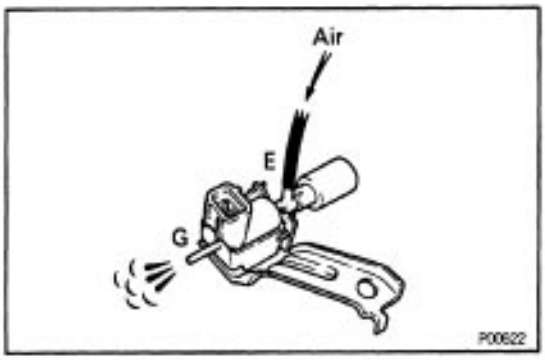
If there is no continuity, replace the VSV.





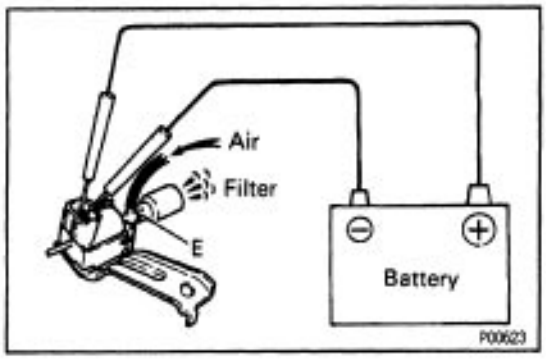
B. Inspect VSV for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity,. replace the VSV.



C. Inspect VSV operation

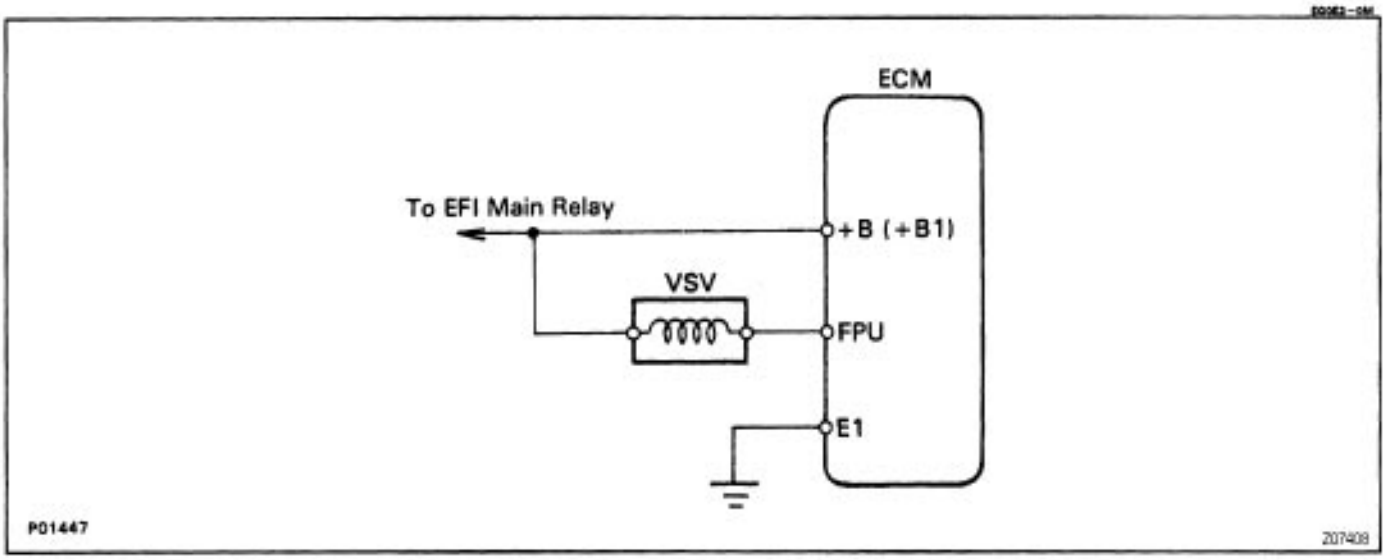
(a) Check that air flows from port E to port G.

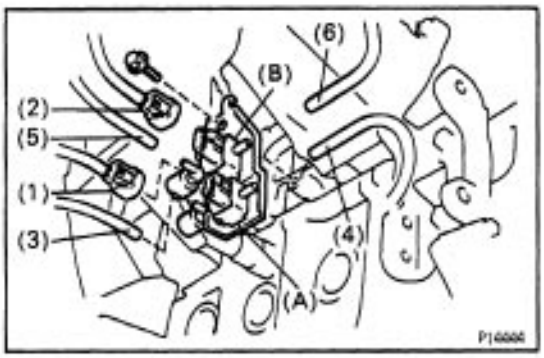


(b) Apply battery voltage across the terminals.
(c) Check that air flows from port E to the filter.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

VSV FOR FUEL PRESSURE CONTROL (California only)



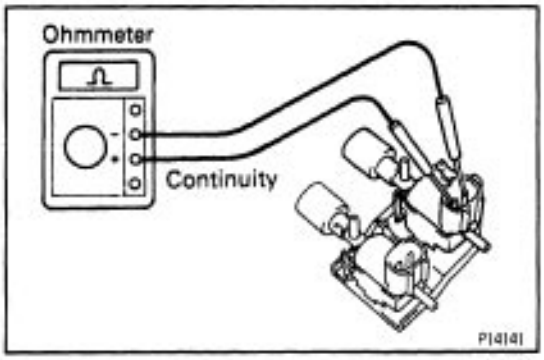


VSV INSPECTION

1. REMOVE VSV

(a) Disconnect the following connectors and hoses:
- (1) VSV for EGR (A) connector
- (2) VSV for fuel pressure control (B) connector
- (3) Vacuum hose (from EGR valve) from port E of VSV (A)
- (4) Vacuum hose (from port “a” of EGR vacuum modulator) from port G of VSV (A)
- (5) Vacuum hose (from fuel pressure regulator) from port E of VSV (B)
- (6) Vacuum hose (from air intake chamber) from port G of VSV (B)

(b) Remove the bolt and VSV assembly.



2. INSPECT VSV

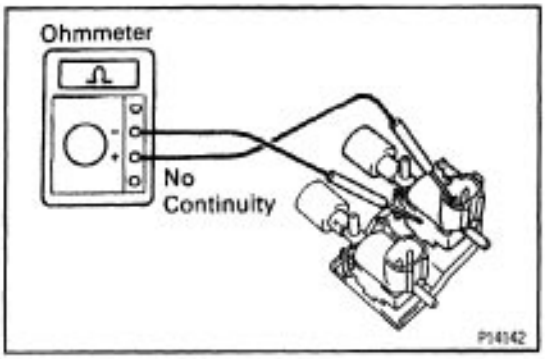
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

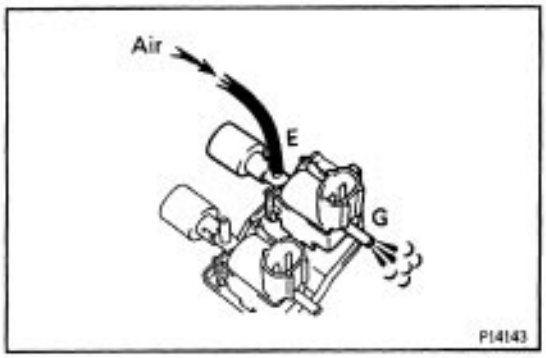
33–39Ω

If there is no continuity, replace the VSV.



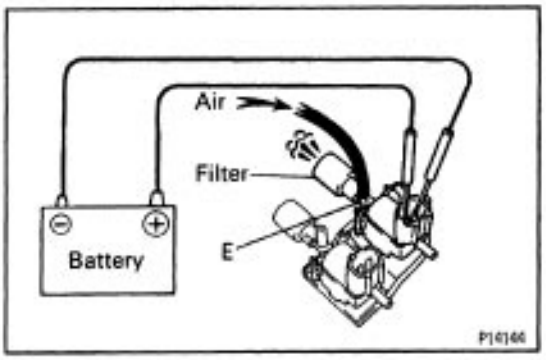
B. Inspect VSV for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the VSV.



C. Inspect VSV operation

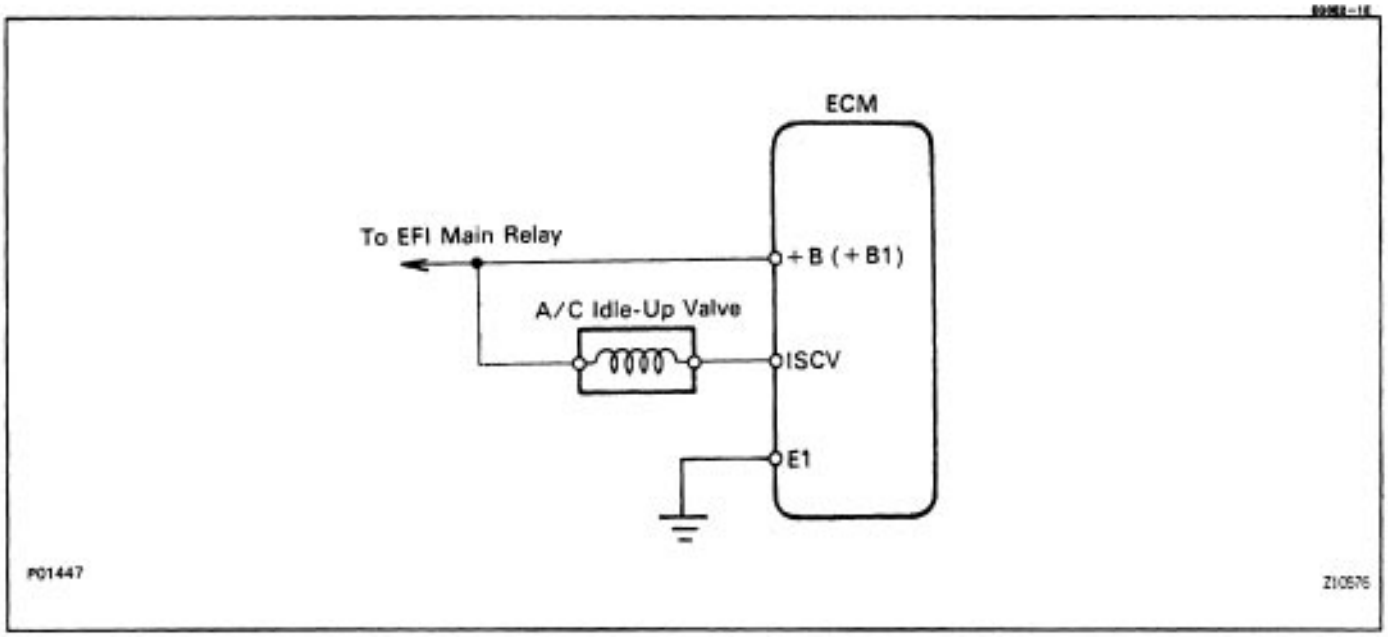
(a) Check that air flows from pipe E to pipe G.

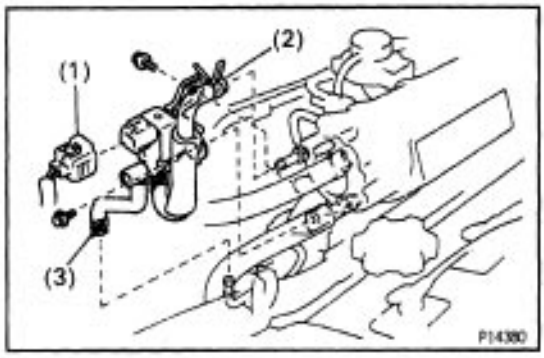


(b) Apply battery voltage across the terminals.
(c) Check that air flows from pipe E to the filter.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

A–C IDLE–UP VALVE





A/C IDLE– UP VALVE INSPECTION

1. REMOVE IDLE–UP VALVE

(a) Disconnect the following connector and hoses:
(1) Idle–up valve connector
(2) Air hose from air intake chamber
(3) Air hose from air tube
(b) Remove the 2 bolts and idle–up valve together with the 2 air hoses.
(c) Disconnect the 2 air hoses from the idle–up valve.

2. INSPECT IDLE–UP VALVE

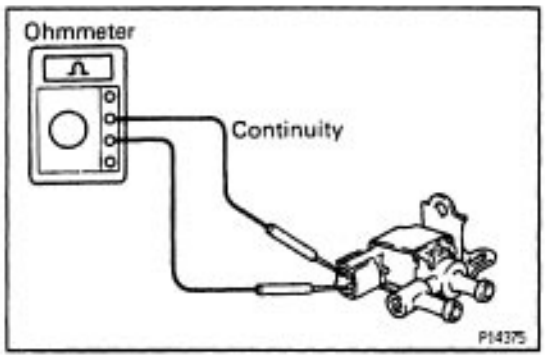
A. Inspect idle–up valve for open circuit

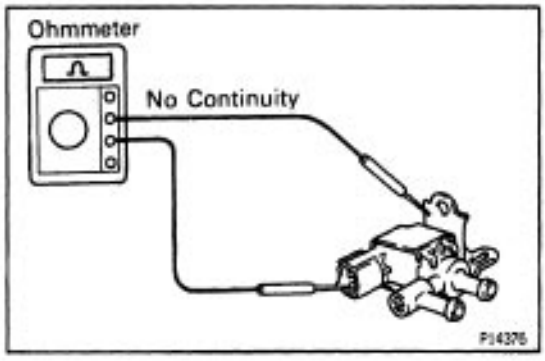
Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

30–34Ω

If there is no continuity, replace the idle–up valve.

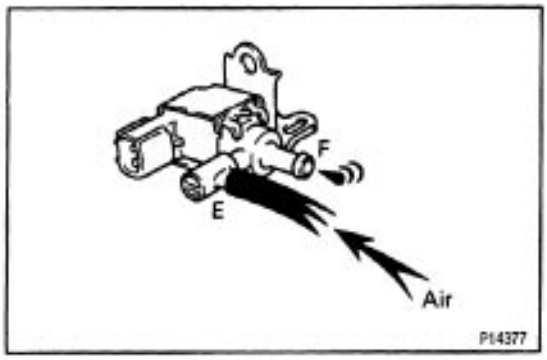




B. Inspect idle–up valve for ground

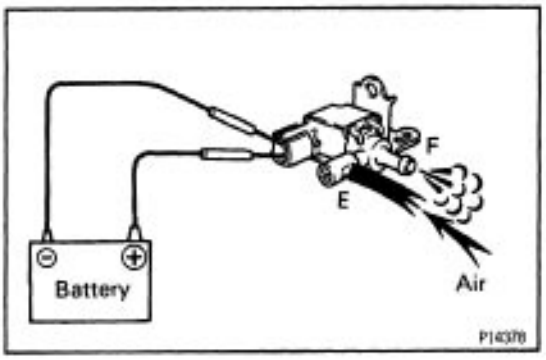
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the idle–up valve.



C. Inspect idle–up valve operation

(a) Check that air does not flow from port E to port F.



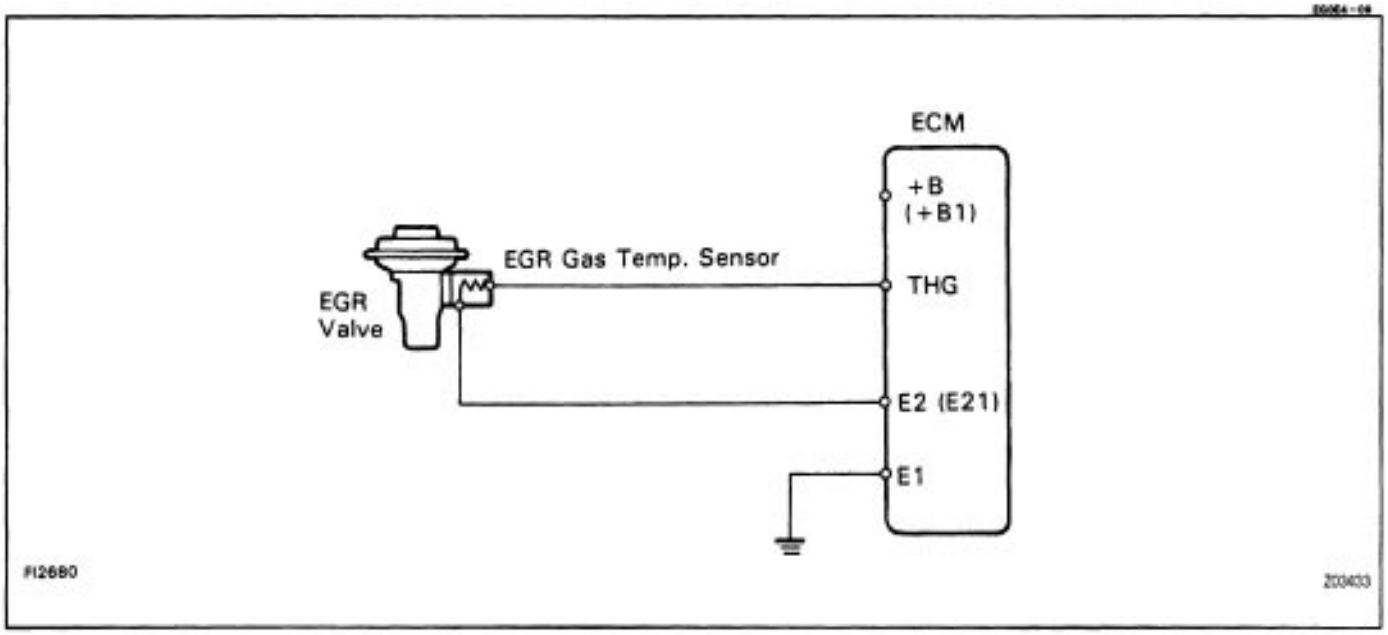
(b) Apply battery voltage across the terminals.

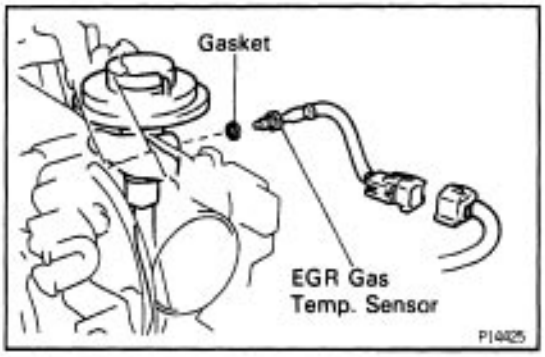
(c) Check that air flows from port E to port F.

If operation is not as specified, replace the idle–up valve.

3. REINSTALL IDLE– UP VALVE

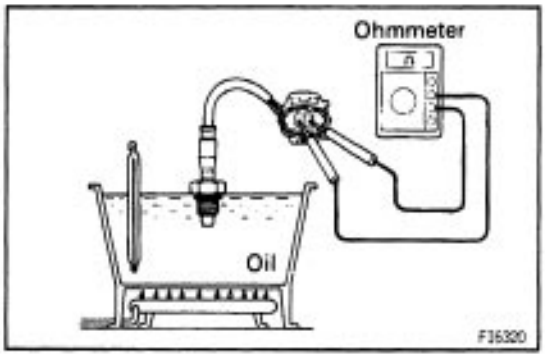
EGR GAS TEMPERATURE SENSOR





EGR GAS TEMPERATURE SENSOR INSPECTION

1. REMOVE EGR GAS TEMPERATURE SENSOR



2. INSPECT EGR GAS TEMPERATURE SENSOR

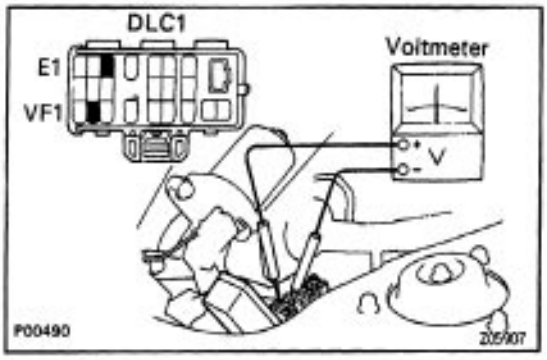
Using an ohmmeter, measure the resistance between the terminals.

Resistance:

64–97 kΩ at 50°C (122°F)
11–16 kΩ at 100°C (212°F)
2–4 kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.

3. REINSTALL EGR GAS TEMPERATURE SENSOR



OXYGEN SENSOR

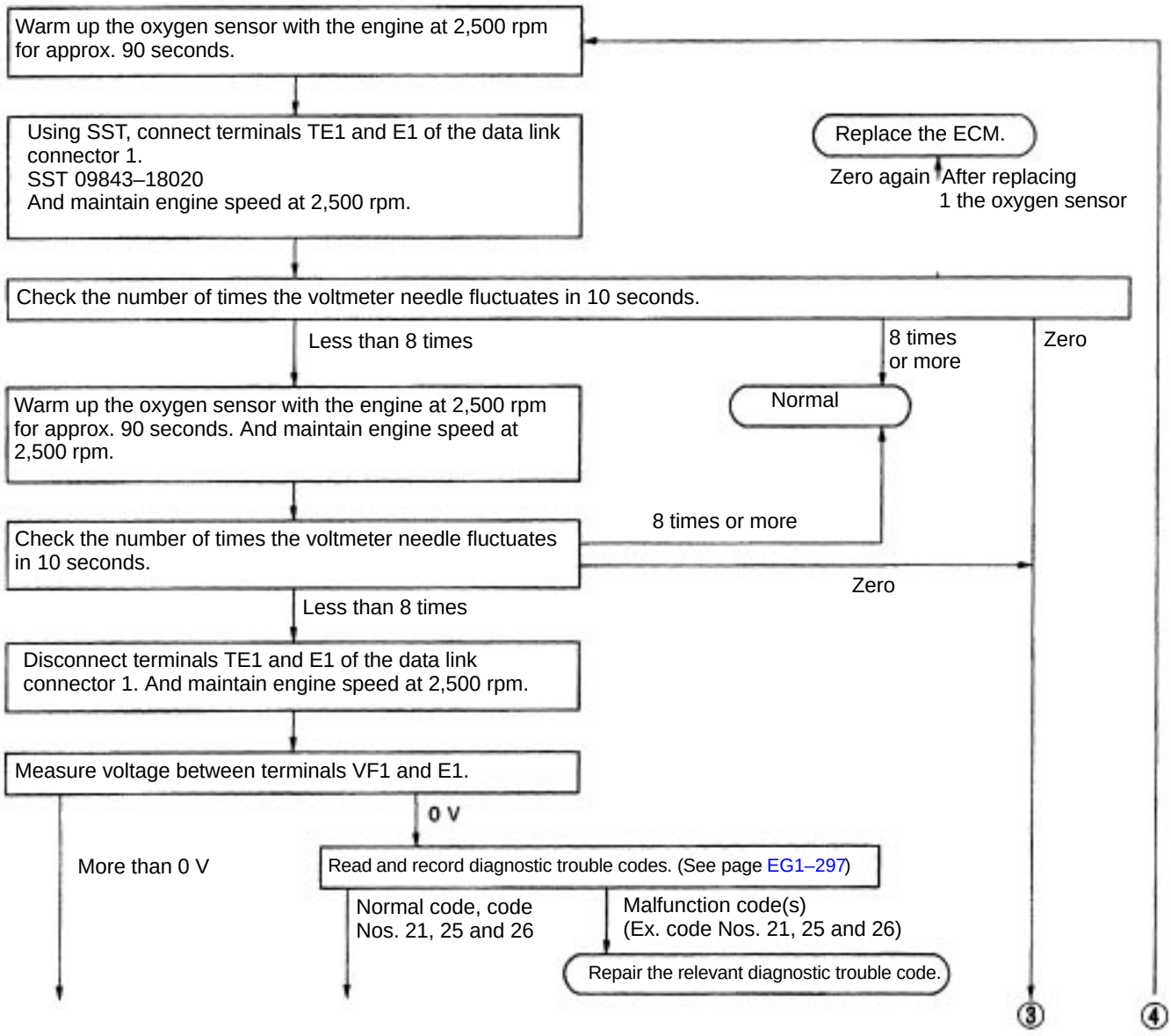
OXYGEN SENSOR INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

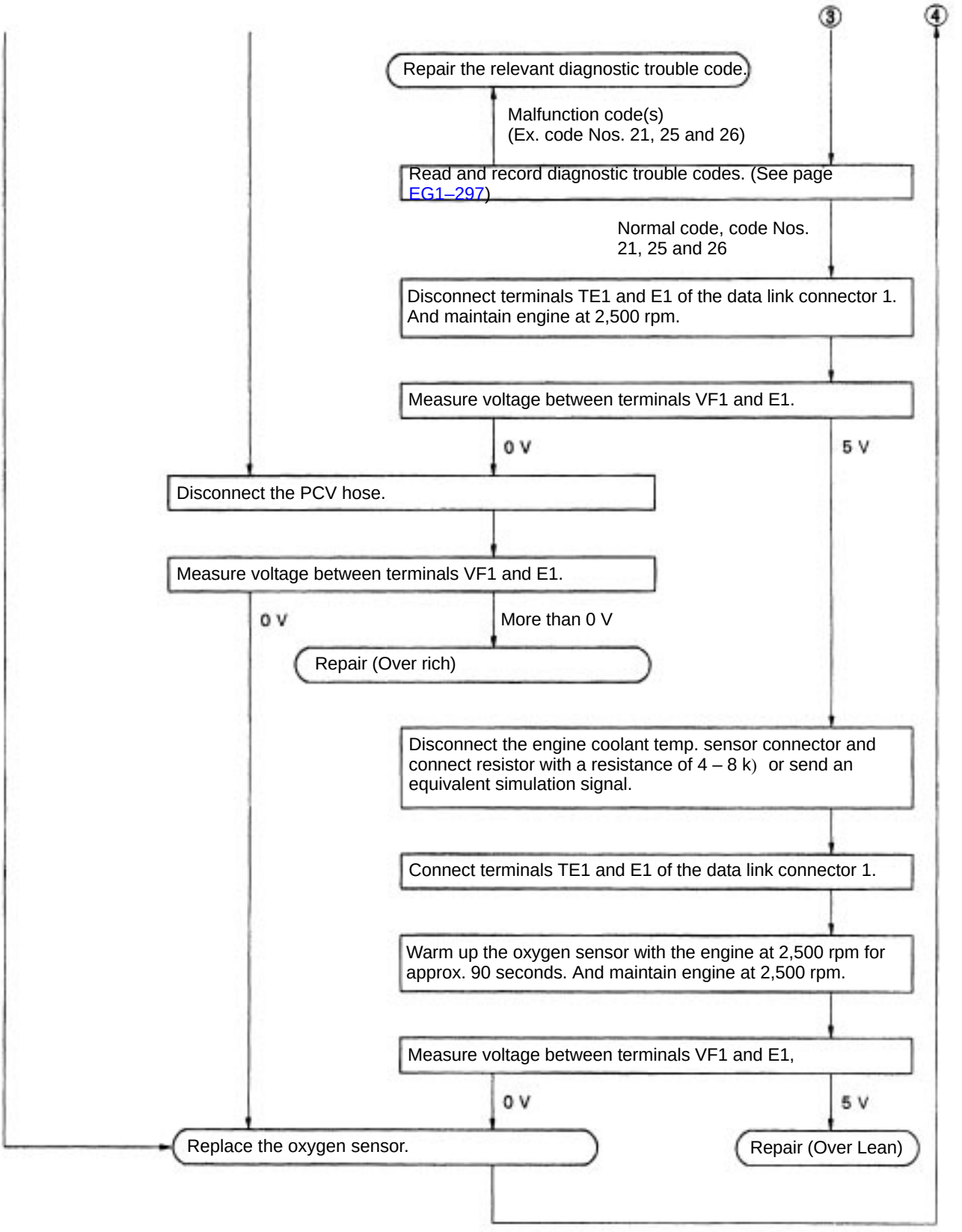
2. INSPECT FEEDBACK VOLTAGE

Connect the positive (+) probe of a voltmeter to terminal VF1 of the data link connector 1 and negative (–) probe to terminal E1. Perform the test as follows:



CONTINUED ON PAGE EG1–232

CONTINUED FROM PAGE EG1–231



V02581

SUB OXYGEN SENSOR

SUB OXYGEN SENSOR INSPECTION

INSPECT SUB OXYGEN SENSOR

HINT: Inspect only when code No. 27 is displayed.

(a) Cancel the diagnostic trouble code. (See page EG1–299)

(b) Warm up the engine until it reaches normal operating temperature.

(c) M/T:

Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in 4th or 5th gear.

A/T:

Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in “D” position.

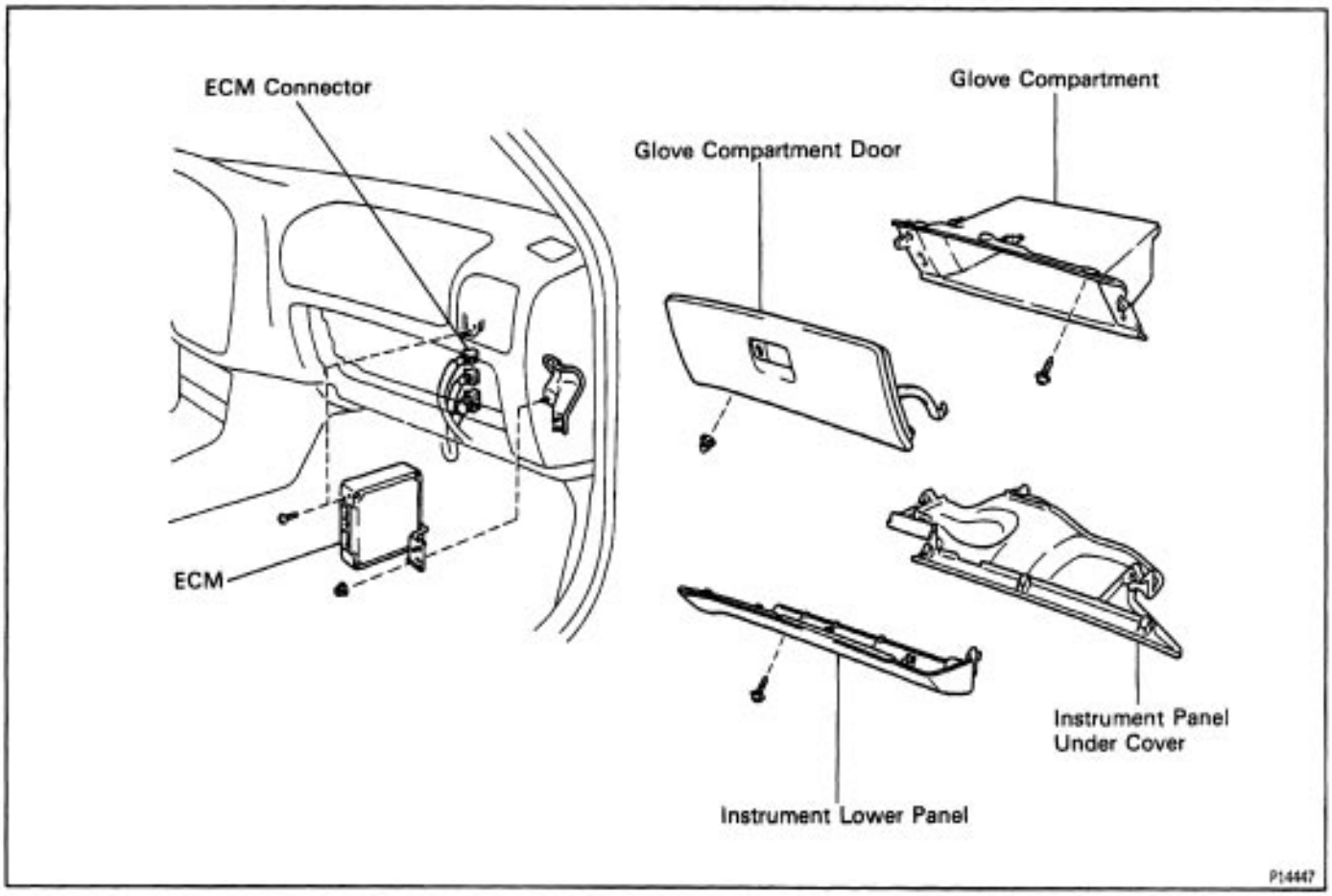
(d) Following the conditions in step (c), fully depress on the accelerator pedal for 2 seconds or more.

(e) Stop the vehicle and turn the ignition switch OFF.

(f) Carry out steps (b), (c) and (d) again to test accelera–tion. If code No.27 appears again, check the sub oxygen sensor circuit. If the circuit is normal, replace the sub oxygen sensor.

ENGINE CONTROL MODULE (ECM)

ECM REMOVAL AND INSTALLATION



ECM INSPECTION

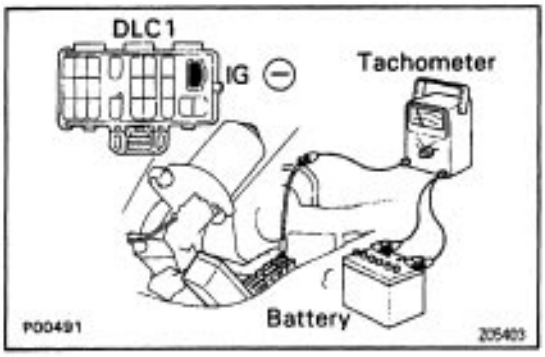
(See page EG1–318)

FUEL CUT RPM

FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

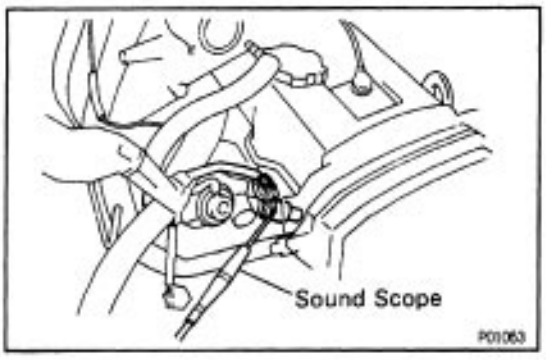


2. CONNECT TACHOMETER TO ENGINE

Connect the test probe of a tachometer to terminal IG (–) of the data link connector 1.

NOTICE:

- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.**



3. INSPECT FUEL CUT RPM

(a) Increase the engine speed to at least 2,500 rpm.

(b) Use a sound scope to check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT: Measure with the A/C OFF.

Fuel return speed:

1,500 rpm

4. DISCONNECT TACHOMETER

SERVICE SPECIFICATIONS

SERVICE DATA

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Fuel pump	Resistance		0.2 – 3.0 Ω
Injector	Resistance		Approx. 13.8 Ω
	Injection volume		49 – 59 cm³ (3.0 – 3.6 cu in.) per 15 sec.
	Difference between each cylinder		5 cm³ (0.3 cu in.) or less
	Fuel leakage		One drop or less per minute
Throttle body	Throttle body fully closed angle		6°
	Throttle opener setting speed		1,300 – 1,500 rpm (w/ Cooling fan OFF)
Throttle position sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
	0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
	0.70 mm (0.028 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
		VC – E2	2.5 – 5.9 kΩ
IAC valve	Resistance (+B – ISCC or ISCO)		19.3 – 22.3 Ω
ECT sensor	Resistance	at −20°C (−4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
IAT sensor	Resistance	at −20°C (−4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
MAP sensor	Power source voltage		4.75 – 5.25 V
VSV for EG R	Resistance		33 – 39 Ω
VSV for Fuel pressure (California only)	Resistance		33 – 39 Ω
A/C idle –up valve	Resistance		30 – 34 Ω
EG R gas temperature sensor	Resistance	at 50°C (122°F)	64 – 97 kΩ
		at 100°C (212°F)	11 – 16 kΩ
		at 150°C (302°F)	2 – 4 kΩ
Fuel cut rpm	Fuel return rpm		1,500 rpm

TORQUE SPECIFICATIONS

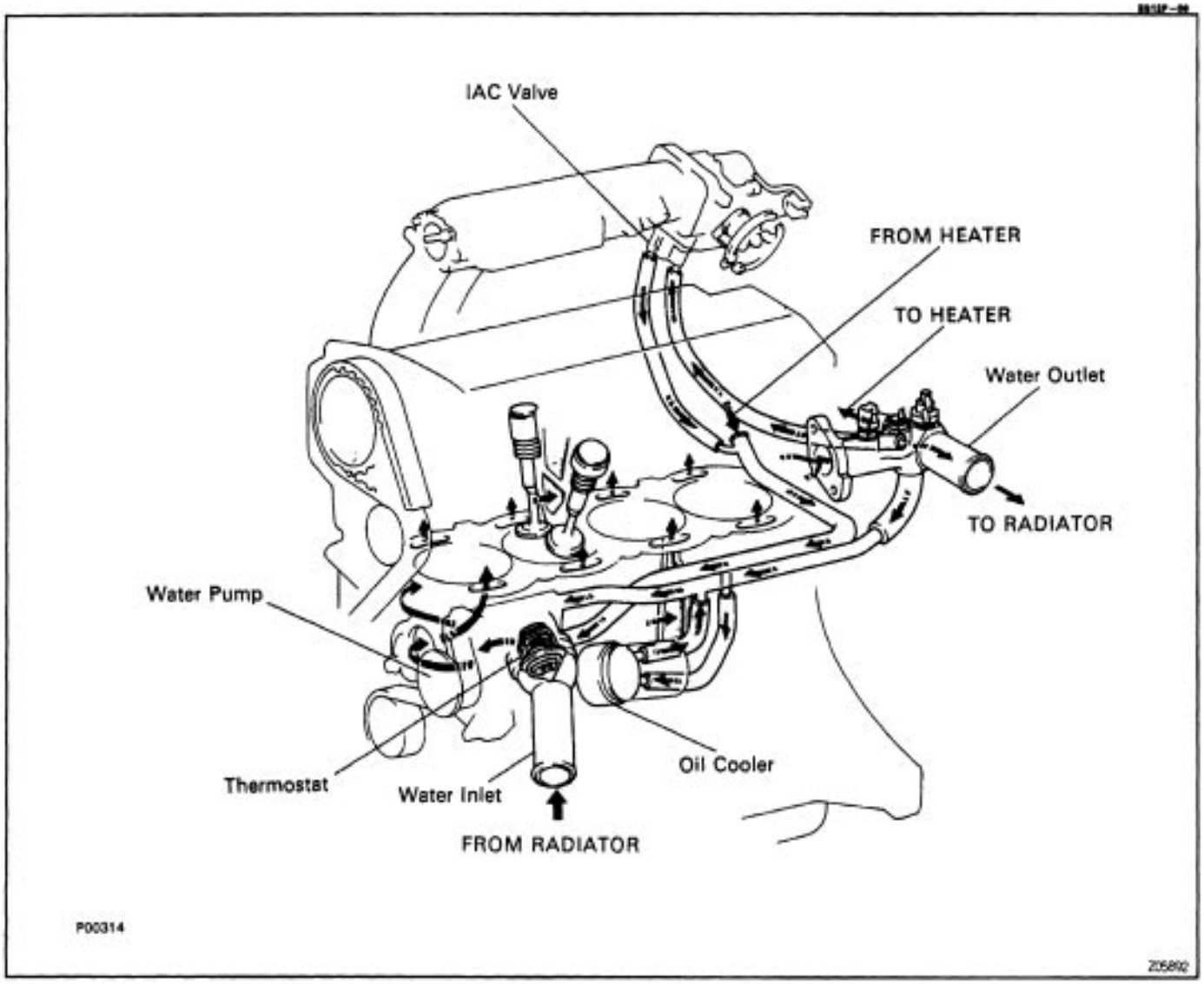
Part tightened		N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type)		29	300	22
Fuel line (Flare nut type – use SST)	Fuel pump side	28	285	21
	Others	30	310	22
Fuel tank band x Body		39	400	29
Fuel pump x Fuel tank		3.9	40	35 in.·lbf
Fuel pressure regulator x Delivery pipe		5.4	55	48 in.·lbf
Fuel return pipe x Fuel pressure regulator		19	195	14
Delivery pipe x Cylinder head		13	130	9
Fuel pulsation damper x Delivery pipe		34	350	25
Intake manifold x Cylinder head		19	195	14
Intake manifold stay x Intake manifold		22	220	16
Intake manifold stay x Cylinder block		42	425	31
No.1 air intake chamber stay x Intake manifold		42	425	31
No.1 air intake chamber stay x Cylinder head		42	425	31
EGR pipe union nut		59	600	43
EGR pipe x Intake manifold		13	130	9
Throttle body x Intake manifold		19	195	14

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a bypass valve mounted on the inlet side.

OPERATION



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electric fan, hoses and other components.

Engine coolant which is heated in the water jacket is pumped to the radiator, through which an electric fan blows air to cool the coolant as it passes through. Engine coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.

The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

RADIATOR

The radiator performs the function of cooling the coolant which has passed through the water jacket and become hot, and it is mounted in the front of the vehicle. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for coolant from the water jacket and the filler inlet. It also has a hose attached through which excess coolant or steam can flow. The lower tank has an outlet and drain cock for the coolant. The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as to cooling fins which radiate heat away from the coolant in the tubes. The air sucked through the radiator by the electric fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the coolant. Models with automatic transmission include an automatic transmission fluid cooler built into the lower tank of the radiator. A fan with an electric motor is mounted behind the radiator to assist the flow of air through the radiator. The fan operates when the engine coolant temperature becomes high in order to prevent it from becoming too high.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the engine coolant temperature exceeds 100˚C (212˚F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110–120˚C (230–248˚F), pressure; 58.8103.0 kpa (0.6–1.05 kgf/cm^2, 8.5–14.9 psi). The vacuum valve opens to alleviate the vacuum which develops in the cooling system after the engine is stopped and the engine coolant temperature drops. The valve's opening allows the coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows from the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir tank returns to the radiator when the coolant temperature drops, thus keeping the radiator full at all times and avoiding needless coolant loss.

Check the reservoir tank level to learn if the coolant needs to be replenished.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a timing belt.

THERMOSTAT

The thermostat has a wax type bypass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the engine coolant temperature. This valve closes when the engine coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the engine coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction allows the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82®C (180®F).

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09228–06500 Oil Filter Wrench	
	09230–01010 Radiator Service Tool Set	

RECOMMENDED TOOLS

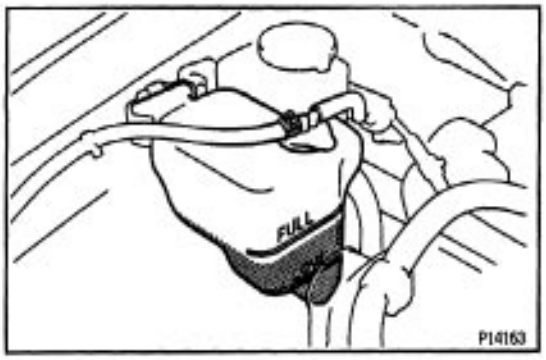
	09082–00050 TOYOTA Electrical Tester Set	

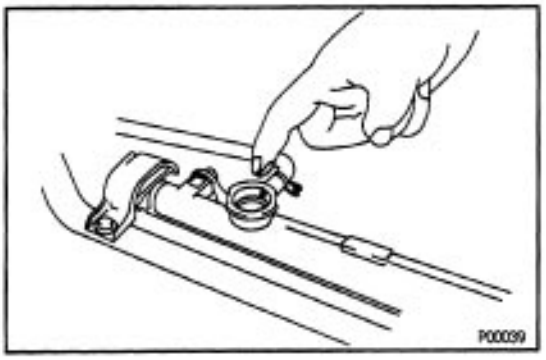
EQUIPMENT

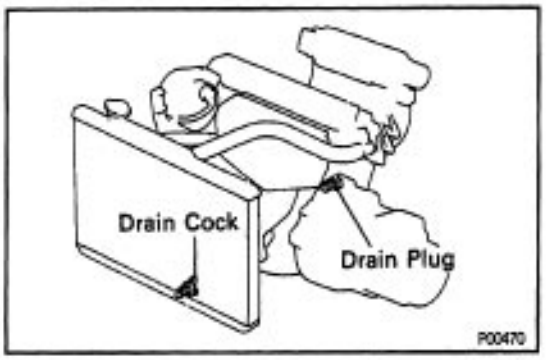
Heater	Engine coolant temperature switch
Radiator cap tester	
Thermometer	Engine coolant temperature switch
Torque wrench	

COOLANT

Item	Capacity	Classification
Engine coolant (w/ Heater)	6.3 liters (6.7 US qts, 5.5 Imp. qts)	Ethylene–glycol base







COOLANT CHECK AND REPLACEMENT

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the ”LOW” and “FULL” lines.
If low, check for leaks and add engine coolant up to the “FULL” line.

2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the engine coolant should be free from oil.
If excessively dirty, replace the engine coolant.

3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove It while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Drain the engine coolant from the radiator drain cock and engine drain plug. (Engine drain plug at the right rear of cylinder block.)

(c) Close the drain cock and plug.

Torque (Engine drain plug):
13 N–m (130 kgf–cm, 9 ft–lbf)

(d) Slowly fill the system with coolant.
Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer’s directions.
Using engine coolant which includes more than 5096 ethylene–glycol (but not more than 7096) is recommended.

NOTICE:

- **Do not use a alcohol type coolant.**
- **The engine coolant should be mixed with demineral–ized water or distilled water.**
  Capacity (w/ Heater):
  8.3 liters (6.7 US qts, 5.5 Imp.qts)

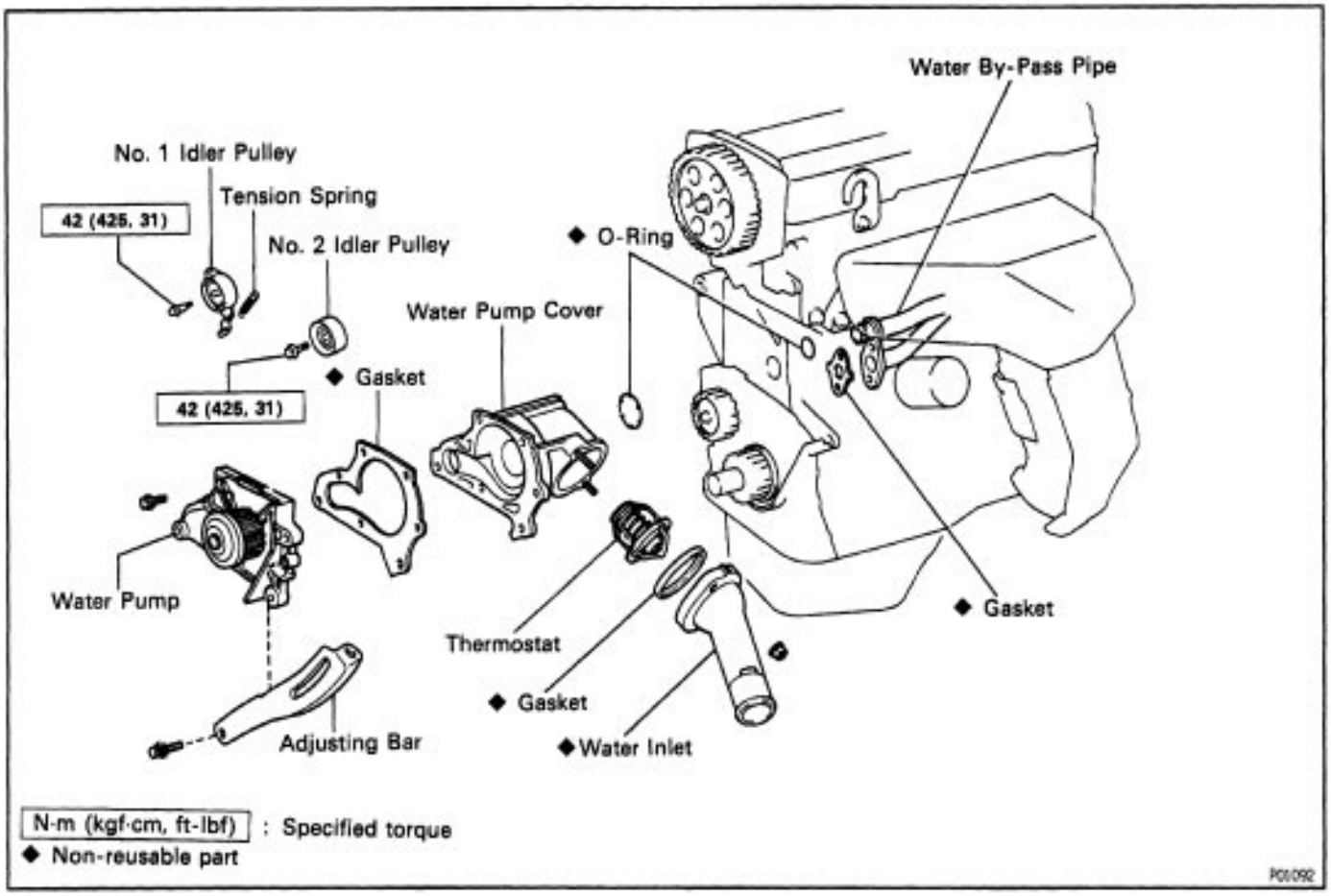
(a) Reinstall the radiator cap.

(f) Warm up the engine and check for leaks.

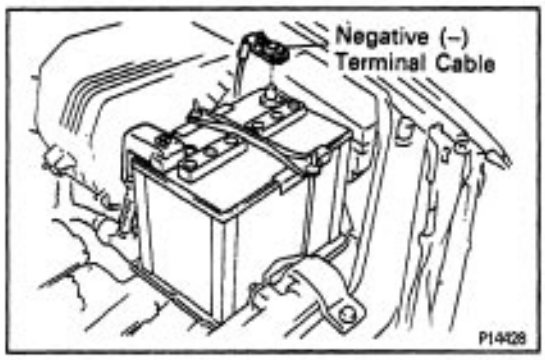
(g) Recheck the engine coolant level and refill as neces–sary.

WATER PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION



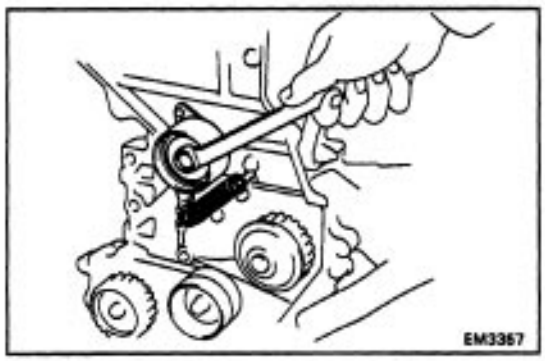
WATER PUMP REMOVAL



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

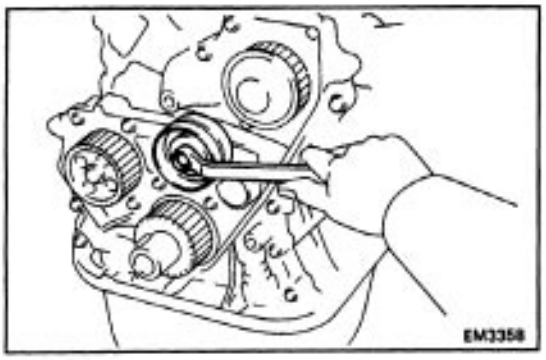
2. DRAIN ENGINE COOLANT (See page EG1–241)



3. REMOVE TIMING BELT (See page EG1–26)

4. REMOVE NO. 1 IDLER PULLEY AND TENSION SPRING

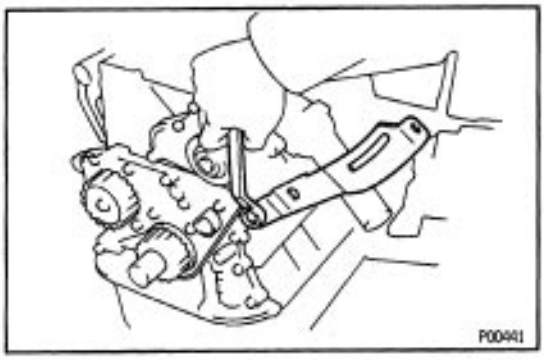
Remove the bolt, pulley and tension spring.



5. REMOVE NO.2 IDLER PULLEY

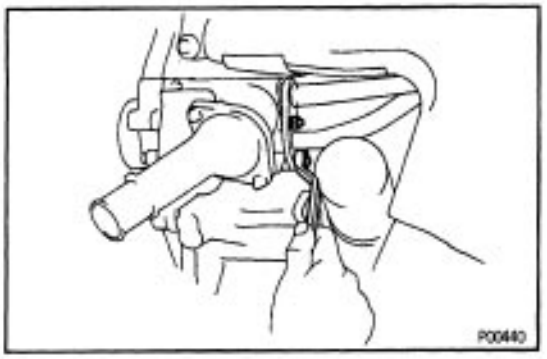
Remove the bolt and pulley.

6. DISCONNECT LOWER RADIATOR HOSE FROM WATER INLET



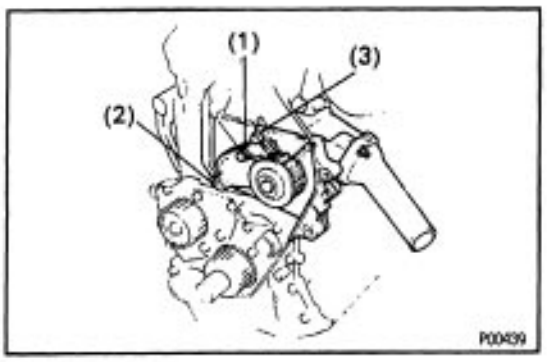
7. REMOVE GENERATOR BELT ADJUSTING BAR

Remove the bolt and adjusting bar.



8. REMOVE WATER PUMP AND WATER PUMP COVER ASSEMBLY

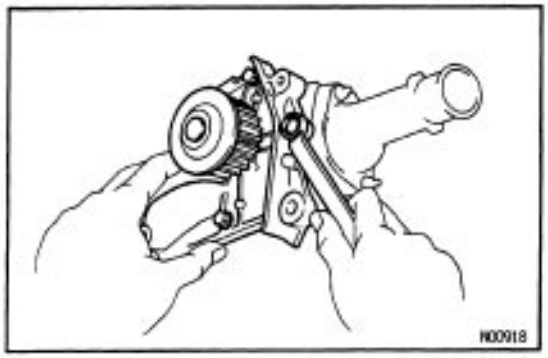
(a) Remove the 2 nuts holding the pump to the water bypass pipe.



(b) Remove the 3 bolts in the sequence shown.

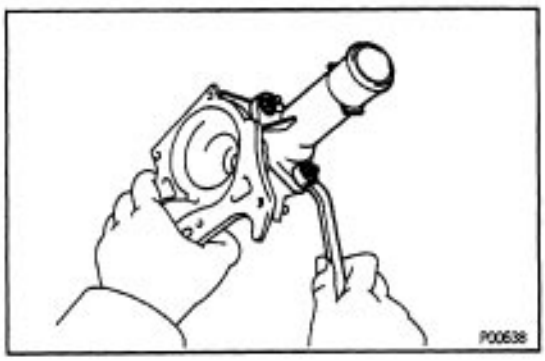
(c) Pull out the water pump together with the water pump cover.

(d) Remove the gasket and 2 O–rings from the water pump and water bypass pipe.



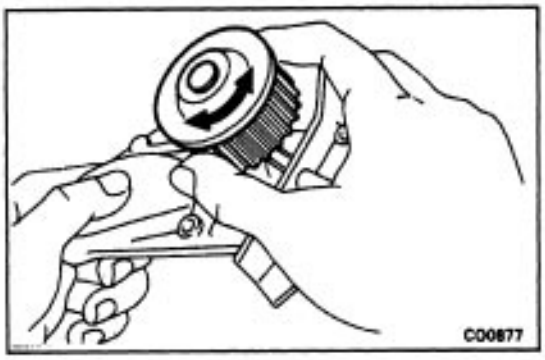
9. SEPARATE WATER PUMP AND WATER PUMP COVER

Remove the 3 bolts, water pump and gasket from the water pump cover.



10. REMOVE WATER INLET AND THERMOSTAT FROM WATER PUMP COVER

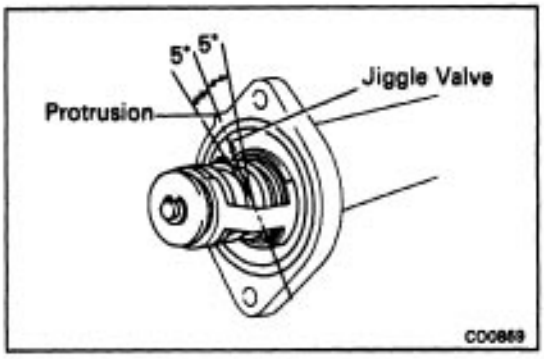
(a) Remove the 2 nuts and water inlet from the water pump.
(b) Remove the thermostat.
(c) Remove the gasket from the thermostat.



WATER PUMP INSPECTION

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.



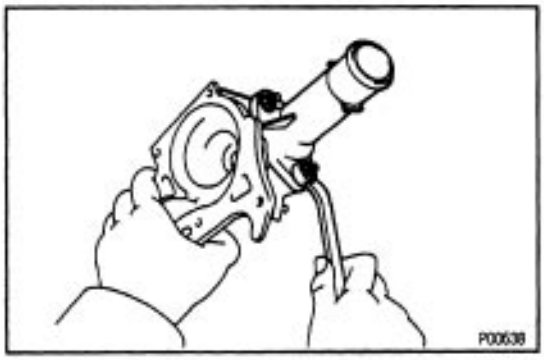
WATER PUMP INSTALLATION

(See Components for Removal and Installation)

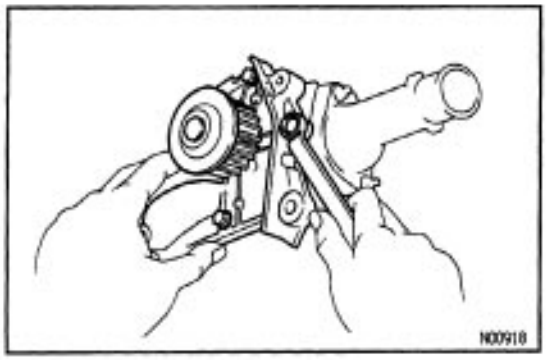
1. INSTALL THERMOSTAT AND WATER INLET TO WATER PUMP COVER

(a) Install a new gasket to the thermostat.
(b) Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water pump.

HINT: The jiggle valve may be set within 5®of either side of the prescribed position.



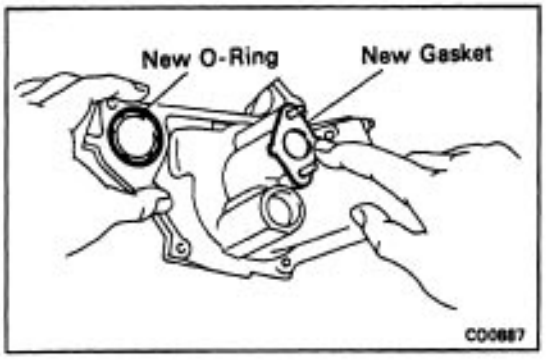
(c) Install the water inlet with the 2 nuts.
Torque: 8.8 N–m (90 kgf–cm. 78 in.–lbf)



2. ASSEMBLE WATER PUMP AND WATER PUMP COVER

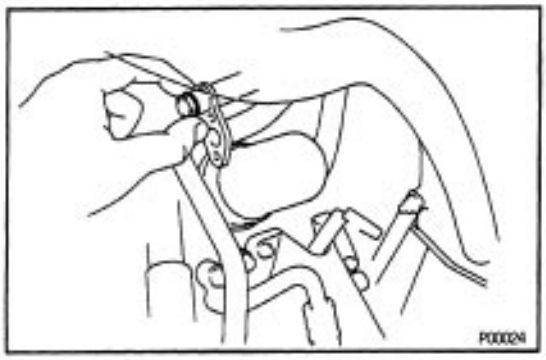
Install a new gasket and the water pump to the pump cover with the 3 bolts.

Torque: 9.3 N–m (95 kgf–cm, 82 In.–lbf)

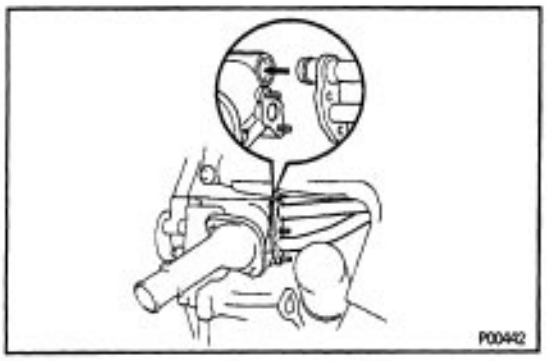


3. INSTALL WATER PUMP AND WATER PUMP COVER ASSEMBLY

(a) Install new O–ring and gasket to water pump cover.

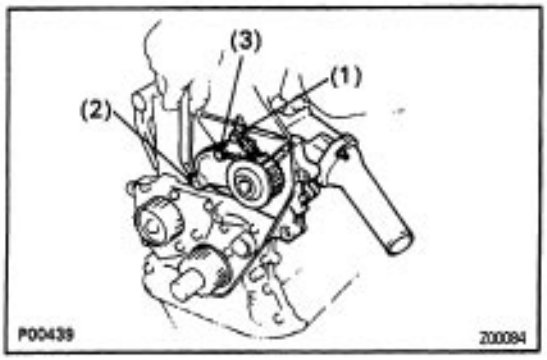


(b) Instal a new O–ring to the water bypass pipe.



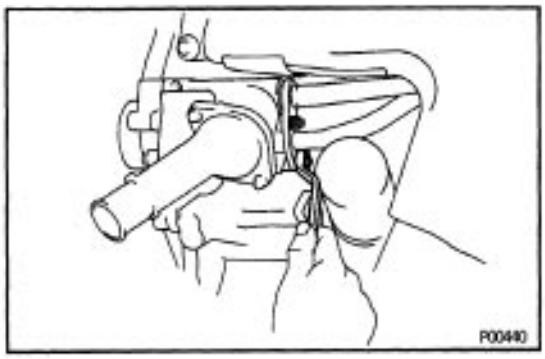
(c) Apply soapy water to the O–ring on the water bypass pipe.

(d) Connect the pump cover to the water bypass pipe. Do not install the nuts yet.



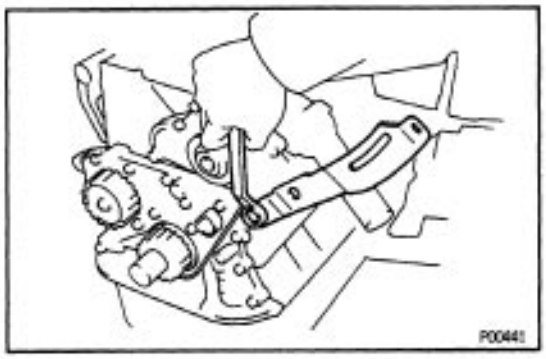
(e) Install the water pump with the 3 bolts. Tighten the bolts in the sequence shown.

Torque: 9.3 N–m (95 kgf–cm, 82 in.–lbf)



(f) Install the 2 nuts holding the water pump cover to the water bypass pipe.

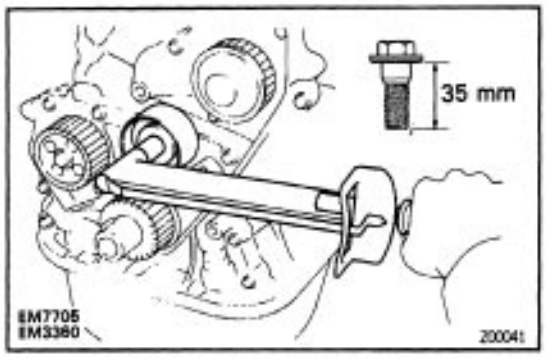
Torque: 8.8 N–m (90 kgf–cm, 78 in.–lbf)



4. INSTALL GENERATOR BELT ADJUSTING BAR

Temporarily install the adjusting bar with the bolt.

5. CONNECT LOWER RADIATOR HOSE TO WATER INLET



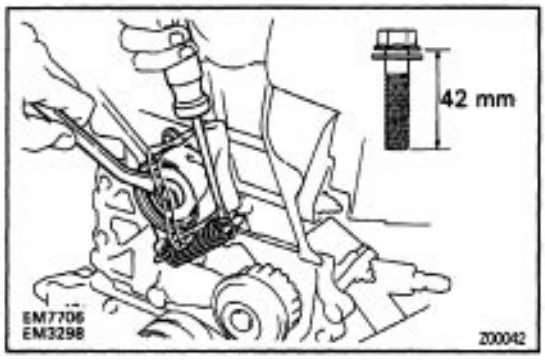
6. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt.

Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

HINT: Use a bolt 35 mm (1.38 in.) in length.

(b) Check that the idler pulley moves smoothly.



7. TEMPORARILY INSTALL NO.1 IDLER PULLEY AND TENSION SPRING

(a) Install the pulley with the bolt. Do not tighten the bolt yet.

HINT: Use bolt 42 mm (1.65 in.) in length.

(b) Install the tension spring.

(c) Pry the pulley toward the left as far as it will go and tighten the bolt.

(d) Check that the idler pulley moves smoothly.

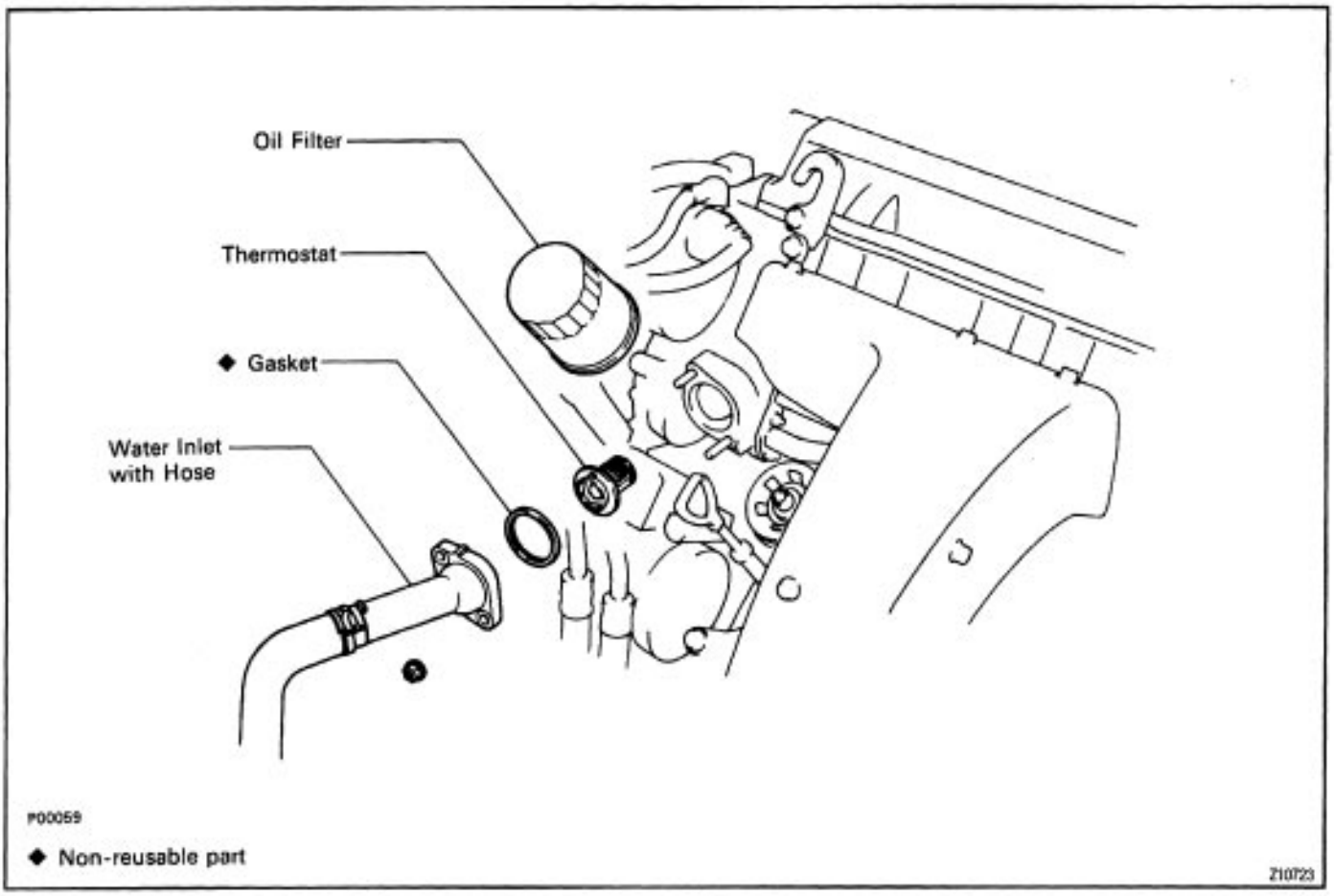
8. INSTALL TIMING BELT (See page EG1–33)

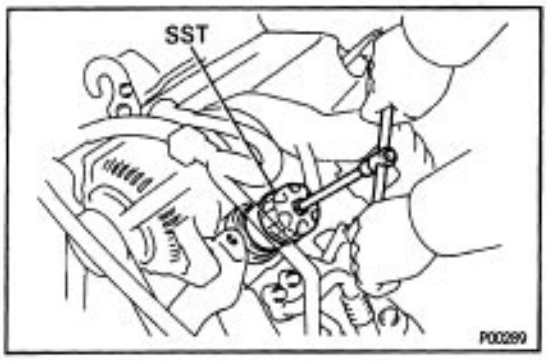
9. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

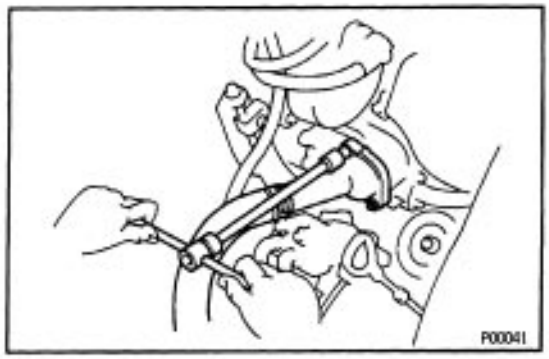
10. FILL WITH ENGINE COOLANT (See page EG1–241)

THERMOSTAT

COMPONENTS FOR REMOVAL AND INSTALLATION







THERMOSTAT REMOVAL

HINT: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. DRAIN ENGINE COOLANT (See page EG1–241)

2. REMOVE OIL FILTER

Using SST, remove the oil filter.

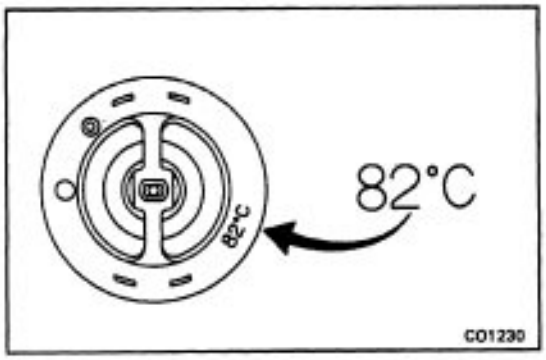
SST 09228–06500

3. REMOVE WATER INLET AND THERMOSTAT

(a) Remove the 2 nuts and water inlet from the water pump.

(b) Remove the thermostat.

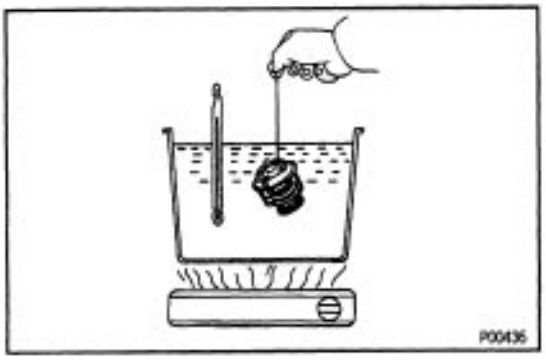
(c) Remove the gasket from the thermostat.



THERMOSTAT INSPECTION

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

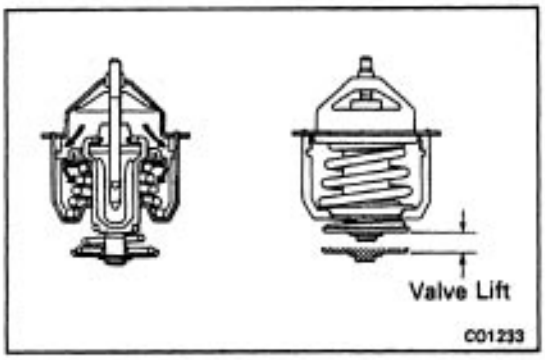


(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:
80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.

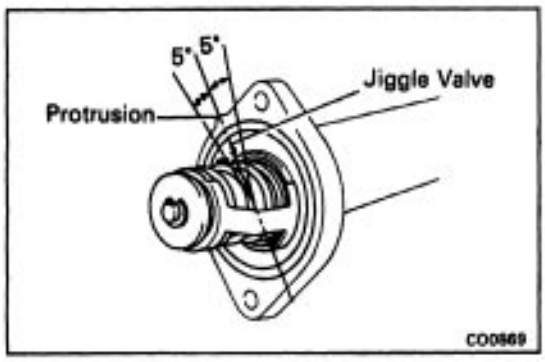


(c) Check the valve lift.

Valve rift:
8 mm (0.31 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermo–stat.

(d) Check that the valve spring is tight when the thermo–stat is fully closed.
If not closed, replace the thermostat.



THERMOSTAT INSTALLATION

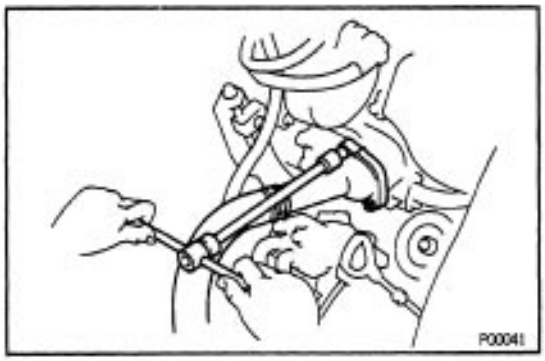
(See Components for Removal and Installation)

1. PLACE THERMOSTAT IN WATER PUMP

(a) Install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with the upper side of the stud bolt, and insert the thermostat in the water pump.

HINT: The jiggle valve may be set within 5°of either side of the prescribed position.



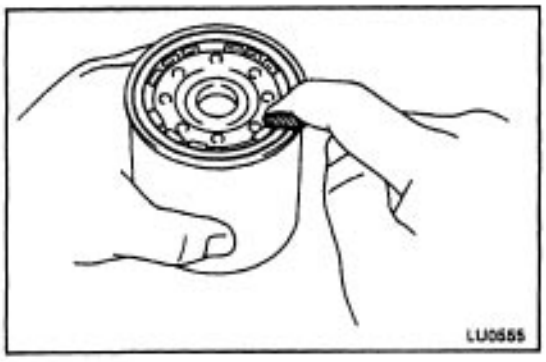
2. INSTALL WATER INLET

Install the water inlet with the 2 nuts.

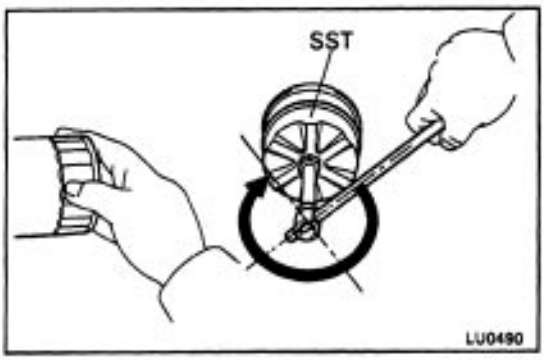
Torque: 8.8 N–m (90 kgf–cm, 78in.–lbf)

3. INSTALL OIL FILTER

(a) Clean the oil filter contact surface on the filter mounting.



(b) Lubricate the filter rubber gasket with engine oil.

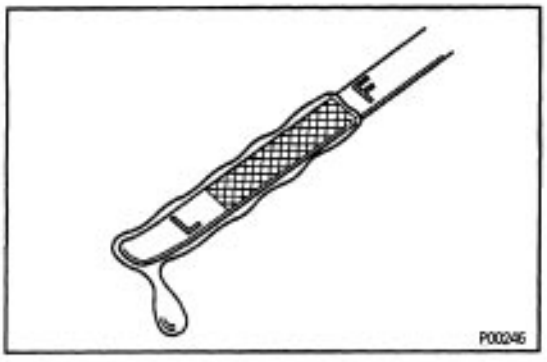


(c) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the oil filter.
SST 09228–06500

4. FILL WITH ENGINE OIL

5. FILL WITH ENGINE COOLANT (SEE PAGE EG1–241)

6. START ENGINE AND CHECK FOR LEAKS



7. CHECK ENGINE OIL LEVEL

The oil level should be between the “L” and “F” marks on the dipstick.

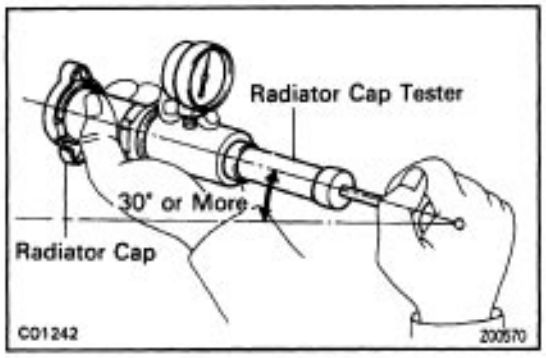
If low, check for leakage and add oil up to “F” mark.

RADIATOR

RADIATOR CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careÐfull not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942 – 3,432 kPa (30 – 35 kgf/cm®, 427 – 498 psi), keep a distance of at least 40 cm (15.75 in.) between the radiator core and cleaner nozzle.



RADIATOR INSPECTION

1. INSPECT RADIATOR CAP

NOTICE: When performing steps (a) and (b) below, keep the radiator pump tester at an angle of over 30° above the horizontal.

(a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the relief valve.

Pump speed:
1 push/ 3 seconds or more

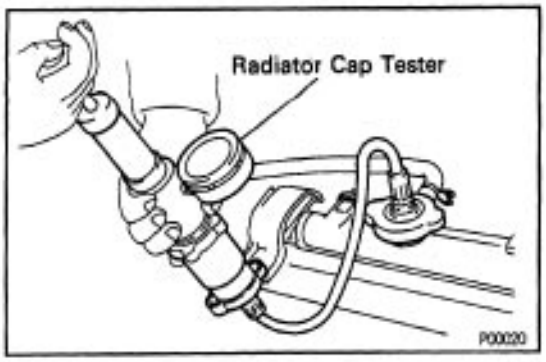
NOTICE: Push the pump at a constant speed.

If air is not coming from the relief valve, replace the radiator cap.

(b) Pump the tester several times and measure the relief valve opening pressure.

Pump speed:
1 at time
1 push/1 second or less
2nd time or more
Any speed
Standard opening pressure:
74–103 kPa
(0.75–1.05 kgf/cm®, 10.7 – 14.9 psi)
Minimum opening pressure:
59 kPa (0.6 kgf/cm®, 8.5 psi)

If the opening pressure is less than minimum, replace the radiator cap.



2. INSPECT COOLING SYSTEM FOR LEAKS

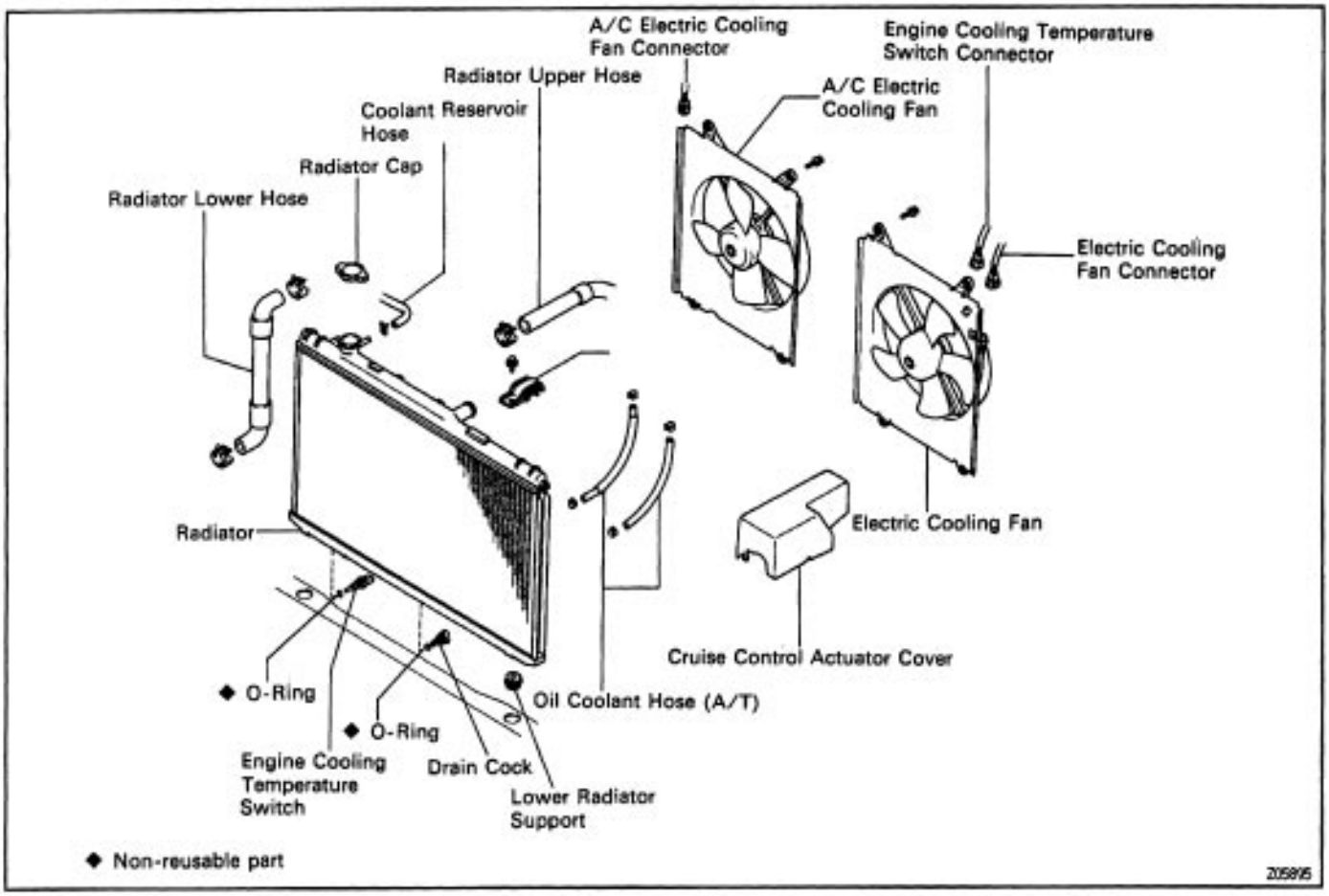
(a) Fill the radiator with coolant and attach a radiator cap tester.

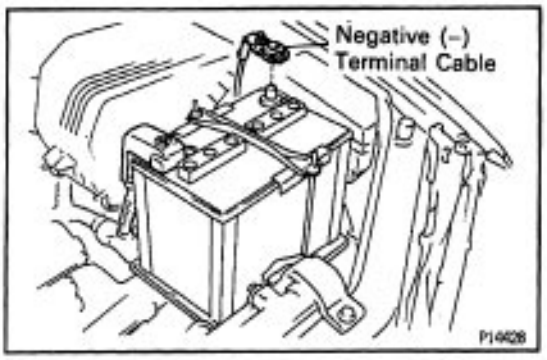
(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm® 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

COMPONENTS FOR REMOVAL AND INSTALLATION



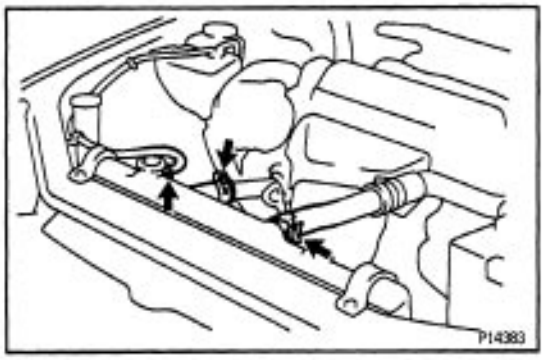


RADIATOR REMOVAL

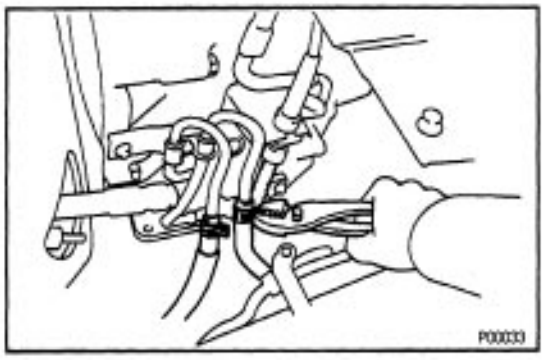
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is disconnected from the battery.

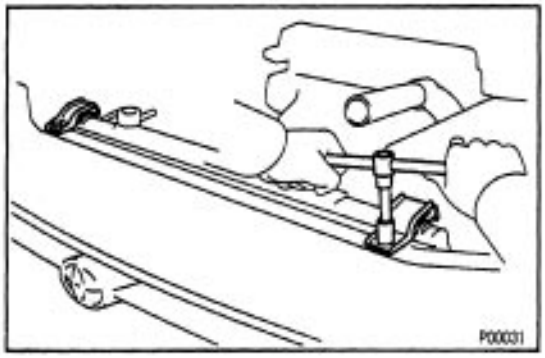
2. DRAIN ENGINE COOLANT (See page EG1–241)
3. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR COVER
4. DISCONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR FROM FAN SHROUD
5. DISCONNECT ELECTRIC COOLING FAN CONNECTORS



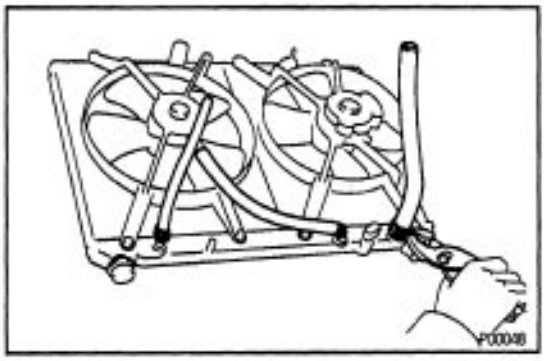
6. DISCONNECT RADIATOR HOSES
(a) Disconnect the upper hose from the radiator side.
(b) Disconnect the lower from the water inlet pipe.
7. DISCONNECT ENGINE COOLANT RESERVOIR HOSE



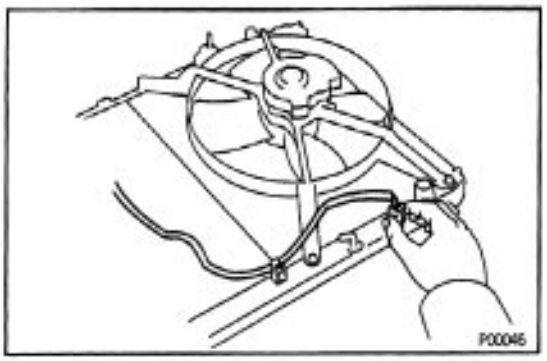
8. A/T:
DISCONNECT OIL COOLER HOSES



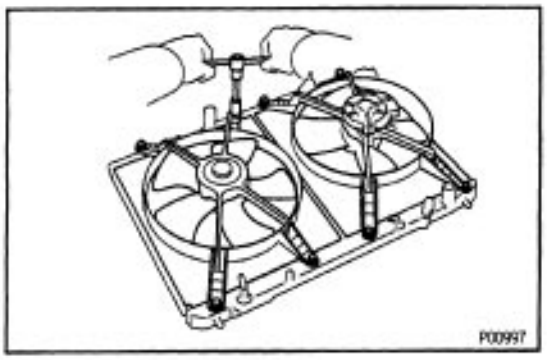
9. REMOVE RADIATOR AND ELECTRIC COOLING FANS
(a) Remove the 2 bolts and 2 upper supports.
(b) Lift out the radiator.
(c) Remove the 2 lower radiator supports.



10. REMOVE RADIATOR LOWER HOSE
11. A/T:
REMOVE A/T OIL COOLER HOSES

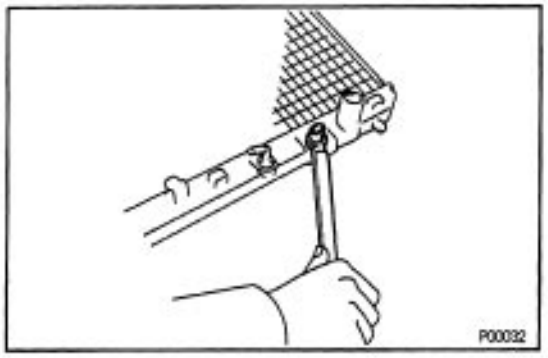


12. REMOVE ENGINE COOLANT TEMPERATURE SWITCH WIRE



13. REMOVE ELECTRIC COOLING FANS FROM RADIATOR

Remove the 8 bolts and cooling fans.

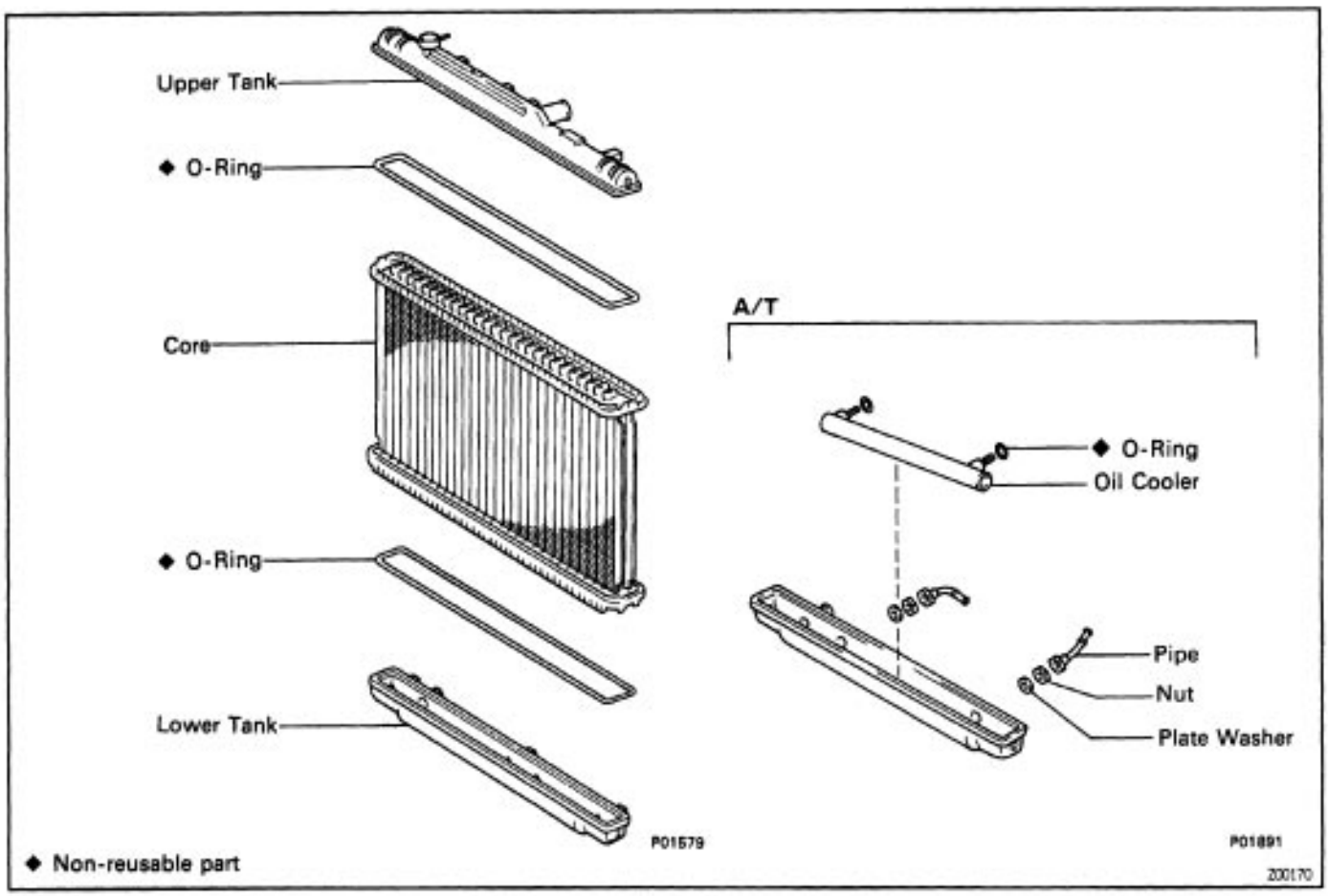


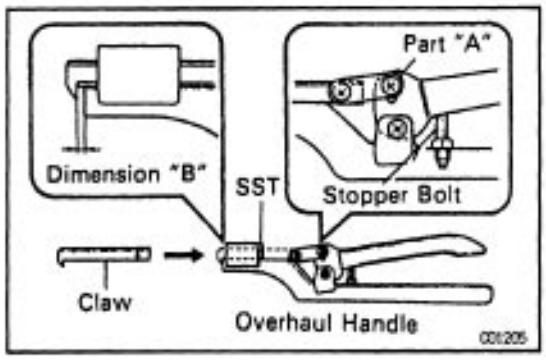
14. REMOVE ENGINE COOLANT TEMPERATURE SWITCH

(a) Remove the engine coolant temperature switch.

(b) Remove the 0–ring.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY





RADIATOR DISASSEMBLY

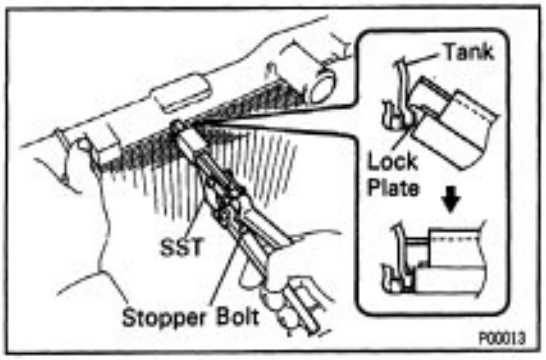
1. ASSEMBLE SST

SST 09230–01010

(a) Install the claw to the overhaul handle, inserting it in the hole in part “A” as shown in the diagram.

(b) While gripping the handle, adjust the stopper bolt so that dimension “B” shown in the diagram is 0.2–0.5 mm (0.008–0.020 in.).

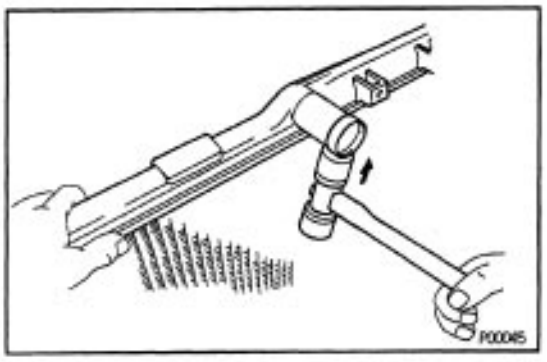
NOTICE: If this adjustment is not performed, the claw may be damaged.



2. UNCAULK LOCK PLATES

Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

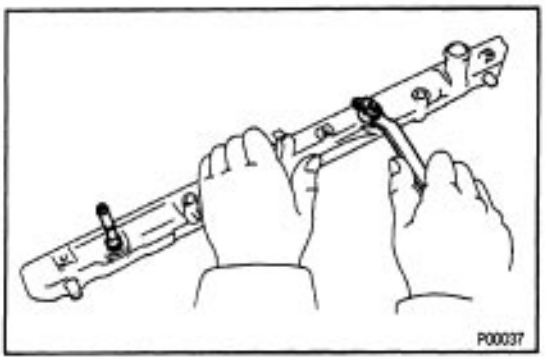
SST 09230–01010



3. REMOVE TANKS AND O–RINGS

(a) Lightly tap the radiator hose inlet (or outlet) with a soft–faced hammer and remove the tank.

(b) Remove the 0–ring.



4. A/T:

REMOVE OIL COOLER FROM LOWER TANK

(a) Remove the pipes.

HINT: Make a note of the direction to face the pipes.

(b) Remove the nuts and plate washers.

(c) Remove the oil cooler and 0–rings.

RADIATOR ASSEMBLY

(See Components for Disassembly and Assembly)

1. A/T:

INSTALL OIL COOLER TO LOWER TANK

(a) Clean the 0–ring contact surface of the lower tank and oil cooler.

(b) Install new 0–rings (1) to the oil cooler (2).

(c) Install the oil cooler with the 0–rings to the lower tank (3).

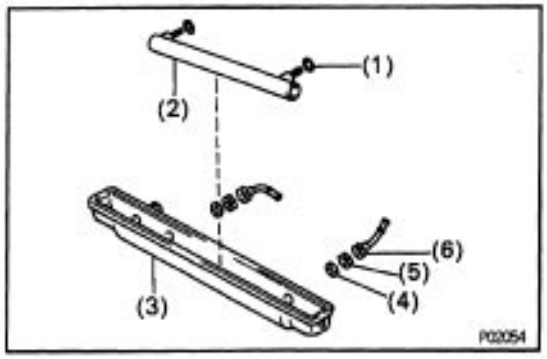
(d) Install the plate washers (4) and nuts (5). Torque the nuts.

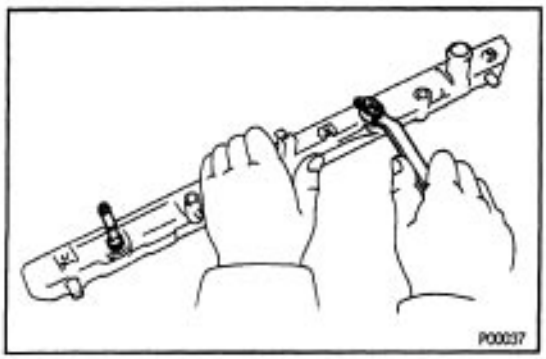
Torque: 8.3 N–m (85 kgf–cm, 74 in.–lbf)

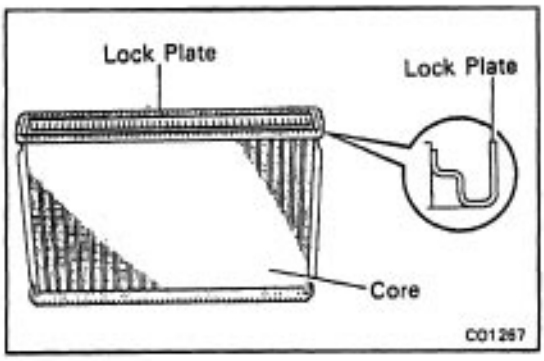
(e) Install the pipes (6).

Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)

HINT: Face the pipes in the same direction as before disassembly.





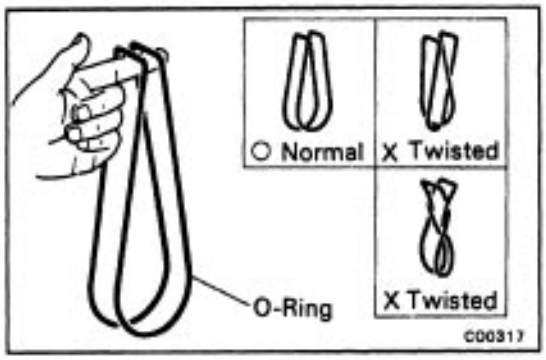


2. INSPECT LOCK PLATE

Inspect the lock plate for damage.

HINT:

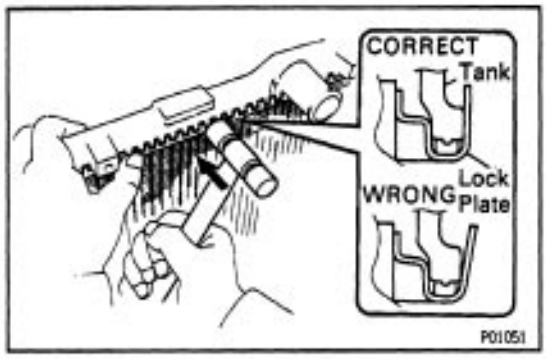
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged or dented. Therefore, repair or replace if necessary.



3. INSTALL NEW O–RINGS AND TANKS

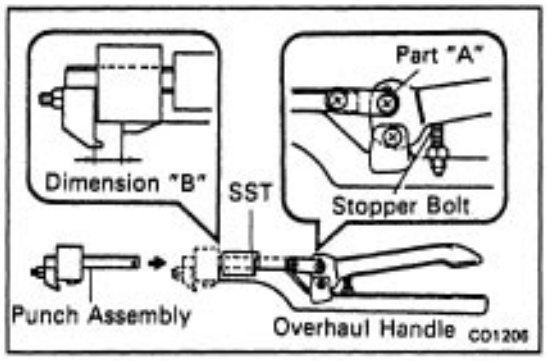
(a) After checking that there are no foreign objects in the lock plate groove, install the new O–ring without twisting it.

HINT: When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.



(b) Install the tank without damaging the 0–ring.

(c) Tap the lock plate with a soft–faced hammer so that there is no gap between it and the tank.

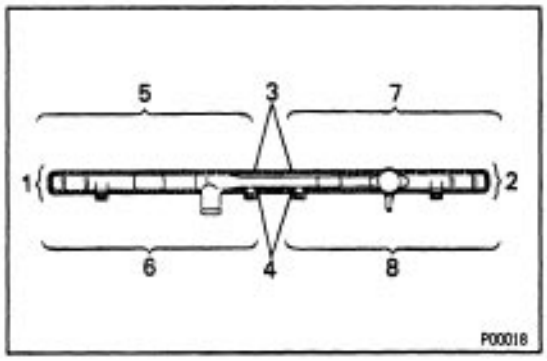


4. ASSEMBLE SST

SST 09230–01010

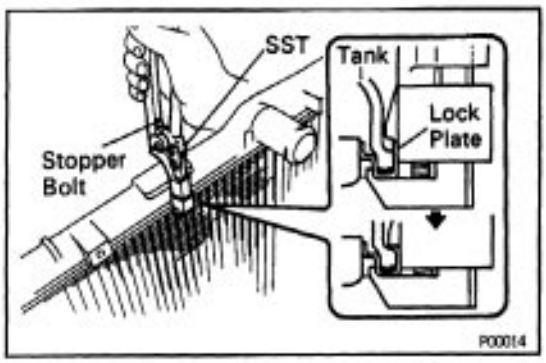
(a) Install the punch assembly to the overhaul handle, inserting it in the hole in part “A” as shown in the illustration.

(b) While gripping the handle, adjust the stopper bolt so that dimension “B” shown in the diagram is 7.7 mm (0.03 in.)

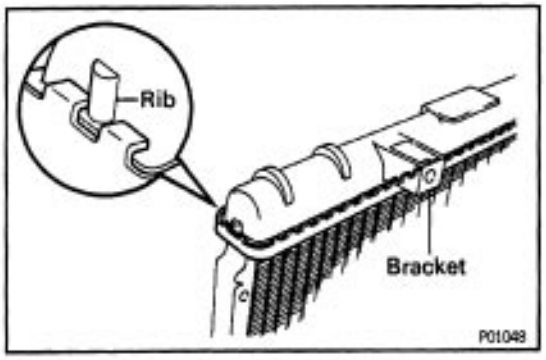


5. CAULK LOCK PLATE

(a) Lightly press SST against the lock plate in the order shown in the illustration.

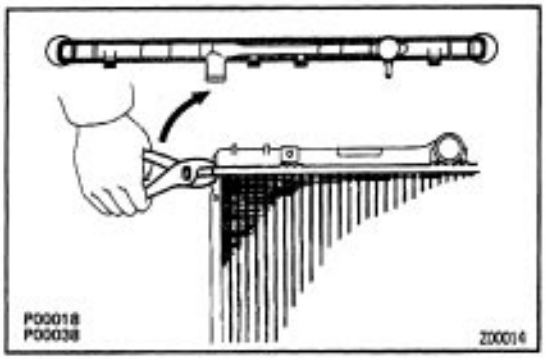


After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.
SST 09230 – 01010

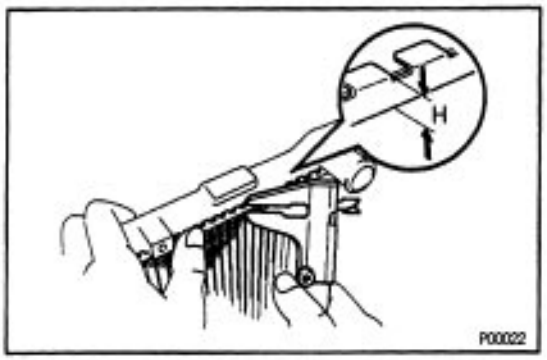


HINT:

- Do not stake the areas protruding around the pipes, brackets or tank ribs.

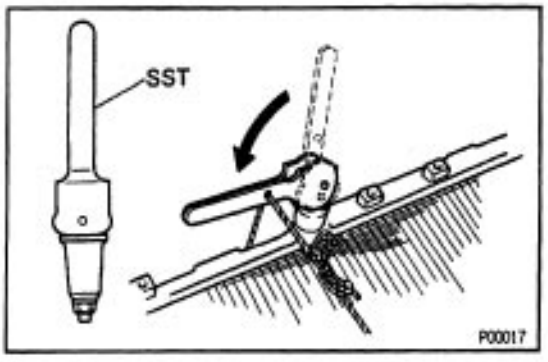


- The points shown in the illustration and oil cooler near here (A/T) cannot be staked with the SST. Use a plier or like object and be careful not to damage the core plates.



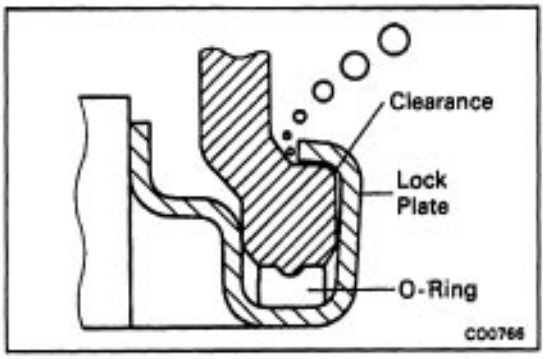
(b) Check the lock plate height (H) after completing the caulking.
Plate height:
7.75–8.25 mm (0–3051–0.3248 in.)

If not within the specified height, adjust the stopper bolt of the handle again and perform the caulking again.



6. INSPECT FOR WATER LEAKS

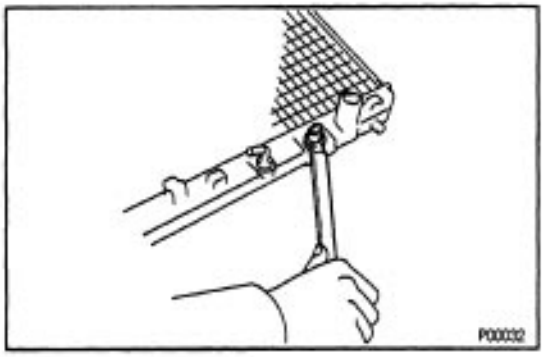
(a) Tighten the drain cock.
(b) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230 – 01010
(c) Using a radiator cap tester, apply pressure to the radiator.
Test pressure:
177 kPa (1.8 kgf/cm® 26 psi)



(d) Inspect for water leaks.
HINT: On radiators with resin tanks, there is a clear–ance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before performing the water leak test, first switch the radiator around in the water until all air bubbles disappear.

7. PAINT LOCK PLATES

HINT: If the water leak test checks out okay, allow the radiator to completely dry and then paint the lock plates.

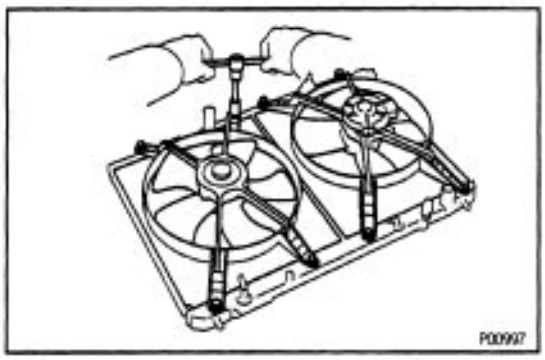


RADIATOR INSTALLATION

(See Components for Removal and installation)

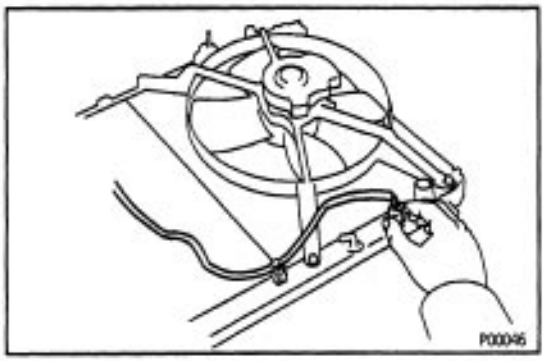
1. INSTALL ENGINE COOLANT TEMPERATURE SWITCH

(a) Install a new O–ring to the engine coolant tempera–ture switch.
(b) Install the engine coolant temperature switch.

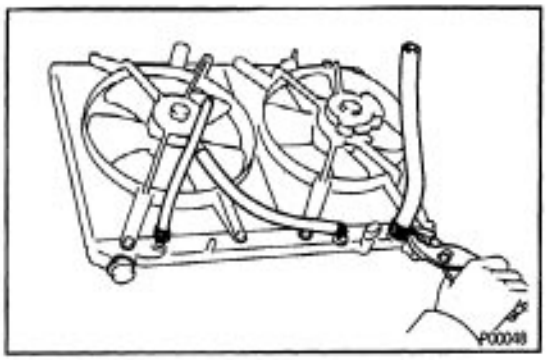


2. INSTALL ELECTRIC COOLING FANS TO RADIATOR

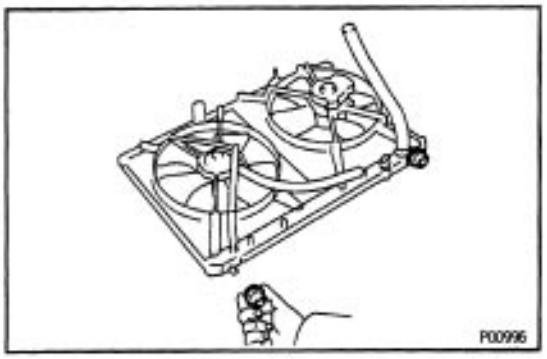
Install the cooling fans with the 8 bolts.



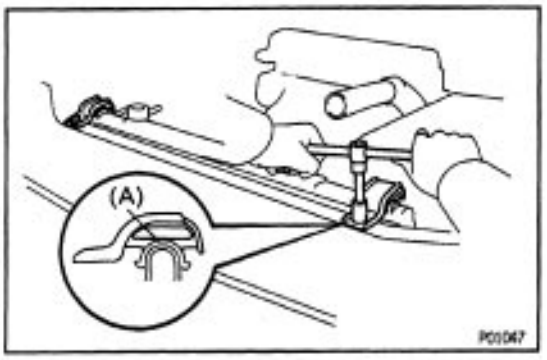
3. INSTALL ENGINE COOLANT TEMPERATURE SWITCH WIRE



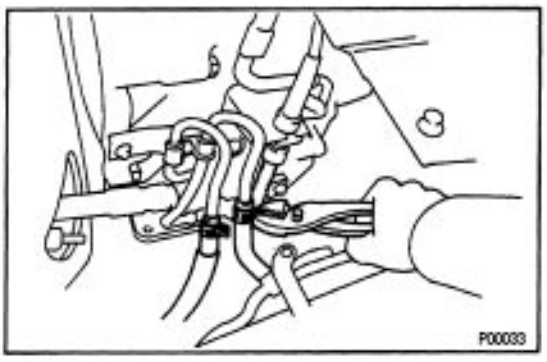
4. A/T:
INSTALL A/T OIL COOLER HOSES
5. INSTALL RADIATOR LOWER HOSE



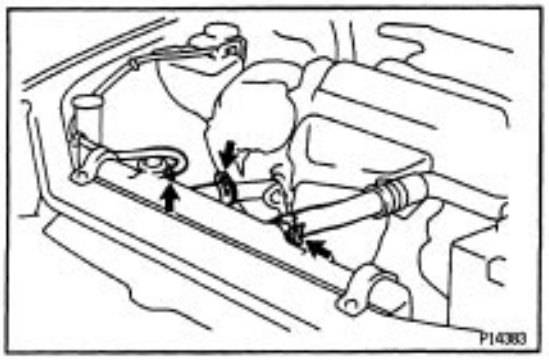
6. INSTALL RADIATOR AND ELECTRIC COOLING FANS
(a) Place the 2 lower radiator supports in position on the body.



(b) Place the radiator in position, and install the 2 upper supports with the 2 bolts.
HINT: After installation, check that the rubber cushion (A) of the support is not depressed.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



7. A/T:
CONNECT OIL COOLER HOSES

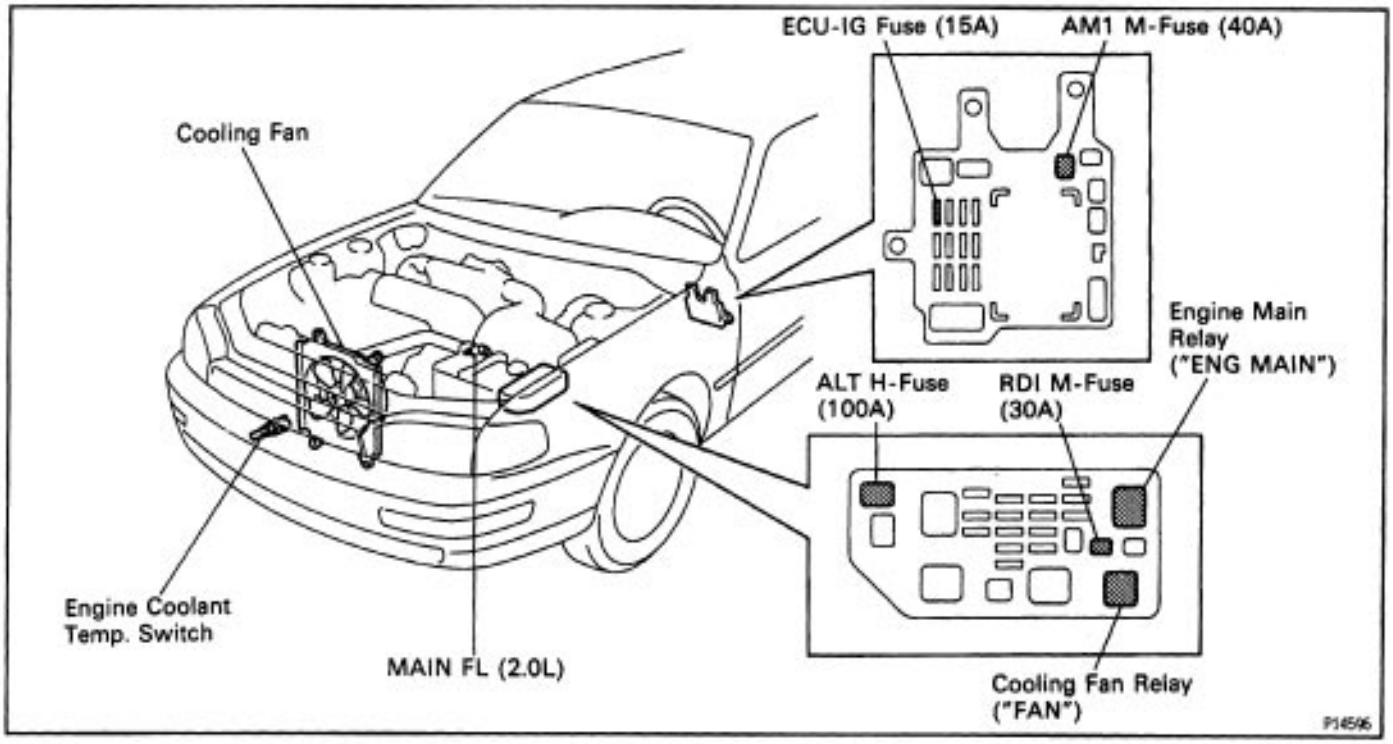


8. CONNECT ENGINE COOLANT RESERVOIR HOSE
9. CONNECT RADIATOR HOSES

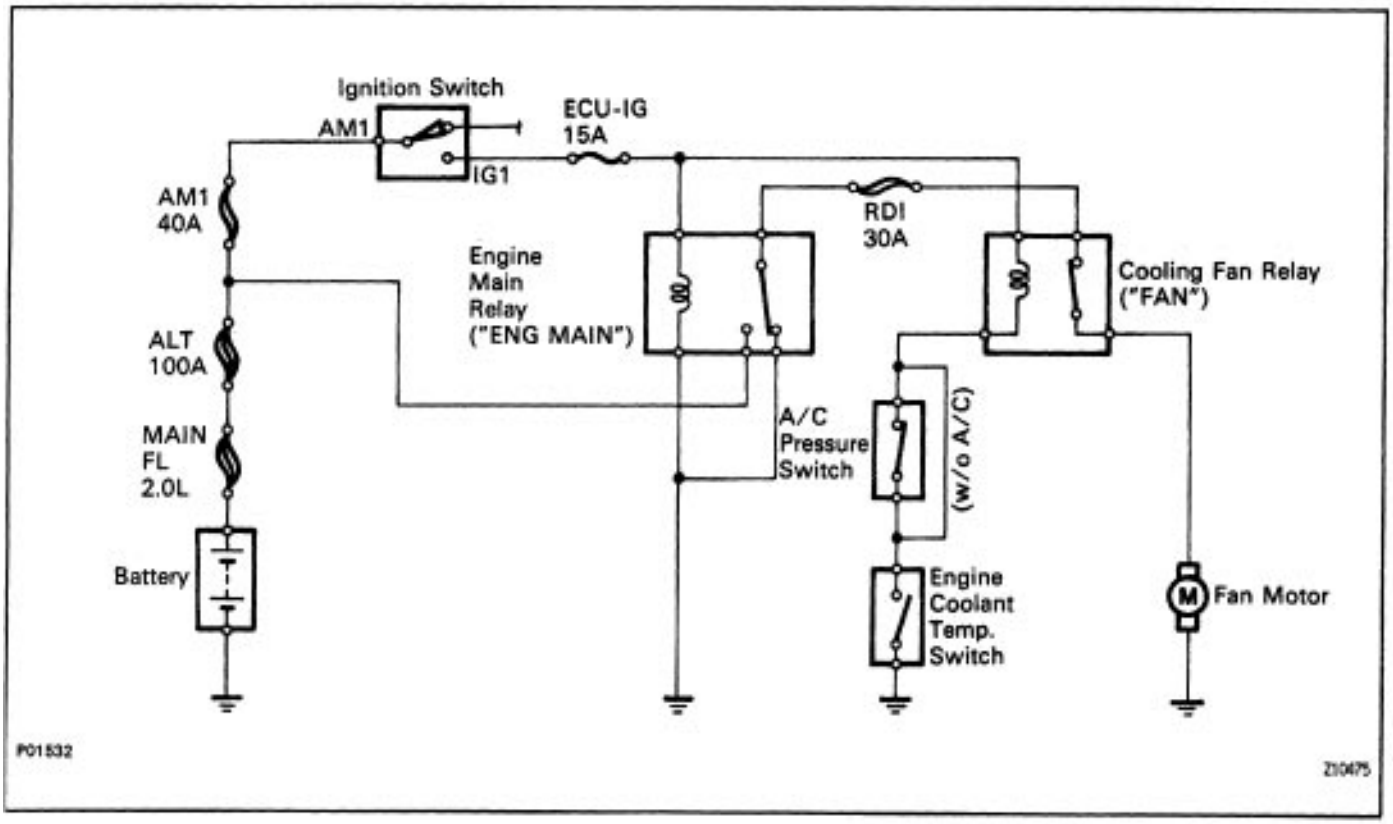
10. CONNECT ELECTRIC COOLING FAN CONNECTORS
11. CONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR TO FAN SHROUD
12. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR COVER
13. FILL WITH ENGINE COOLANT
(See page EG1–241**)**
14. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
15. START ENGINE AND CHECK FOR LEAKS
16. A/T:
CHECK AUTOMATIC TRANSMISSION (A/T) FLUID LEVEL
NOTICE: Do not overfill.

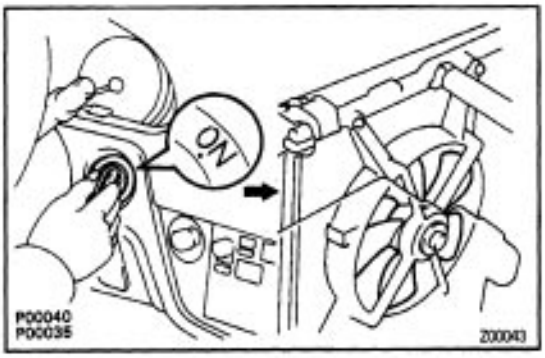
ELECTRIC COOLING FAN

PART LOCATION



SYSTEM CIRCUIT





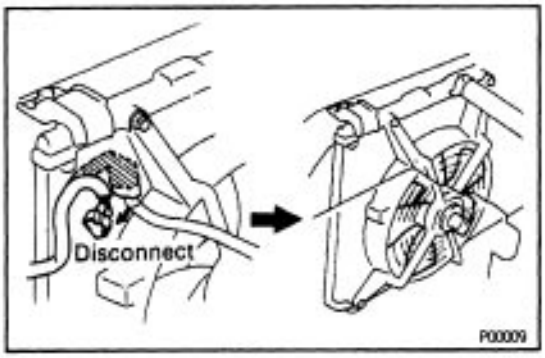
ON–VEHICLE INSPECTION

Low Temperature (Below 83°C (181°F))

1. TURN IGNITION SWITCH “ON”

Check that the cooling fan stops.

If not, check the cooling fan relay and engine coolant temperature switch, and check for a separated con–nector or severed wire between the cooling fan relay and engine coolant temperature switch.

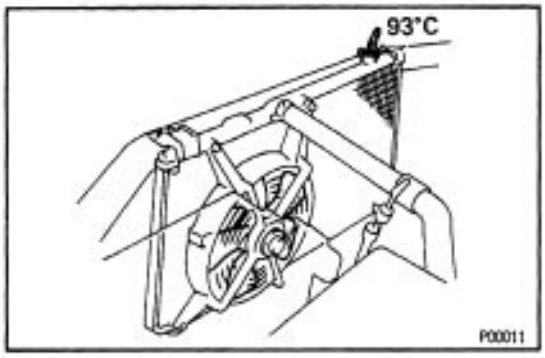


2. DISCONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR

Check that the cooling fan rotates.

If not, check the cooling fan relay, cooling fan, engine main relay and fuse, and check for a short circuit between the cooling fan relay and engine coolant temperature switch.

3. CONNECT ENGINE COOLANT TEMPERATURE SWITCH CONNECTOR



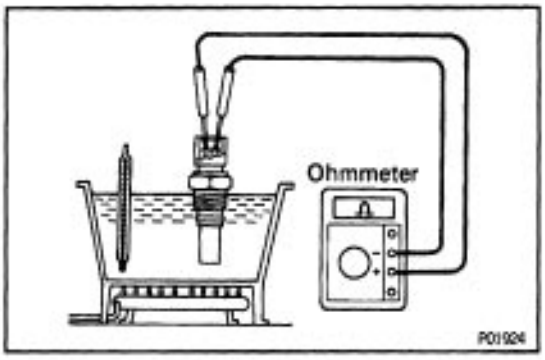
High Temperature (Above 93°C (199°F))

4. START ENGINE

(a) Raise engine coolant temperature to above 93°C (199°F).

(b) Check that the cooling fan rotates.

If not, replace the engine coolant temperature switch.



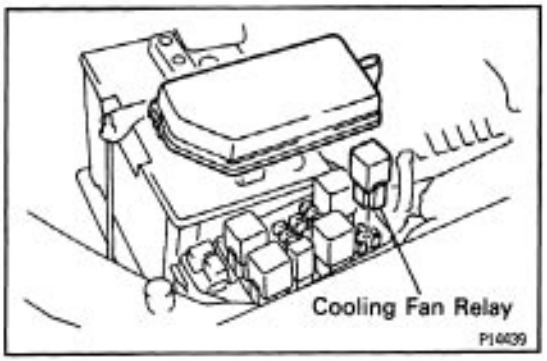
ELECTRIC COOLING FAN COMPONENTS INSPECTION

1. INSPECT ENGINE COOLANT TEMPERATURE SWITCH

(a) Using an ohmmeter, check that there is no continuity between the terminals when the engine coolant tem–perature is above 93°C (199°F).

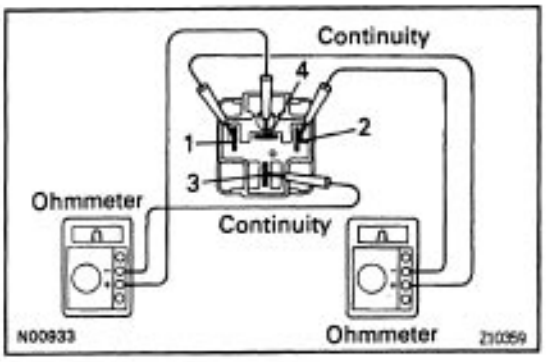
(b) Using an ohmmeter, check that there is continuity between the terminals when the engine coolant tem–perature is below 83°C (181 °F).

If continuity is not as specified, replace the switch.



2. INSPECT COOLING FAN RELAY (”FAN’)

A. Remove cooling fan relay

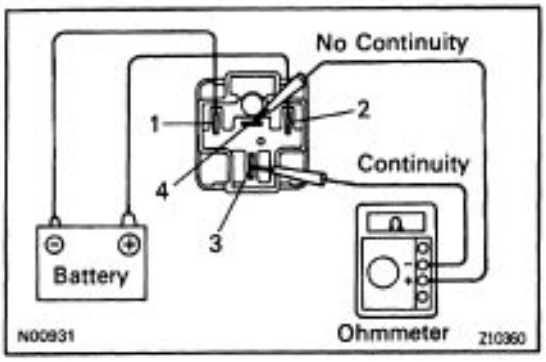


B. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and 4.

If continuity is not as specified, replace the relay.



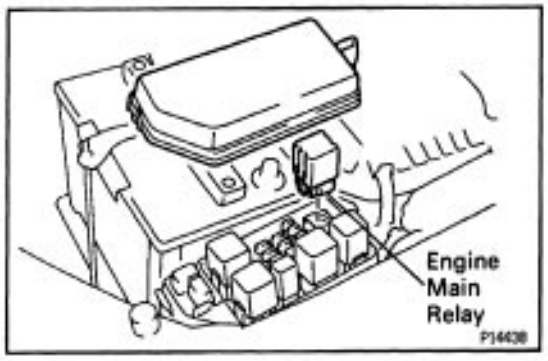
C. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is no continuity between terminals 3 and 4.

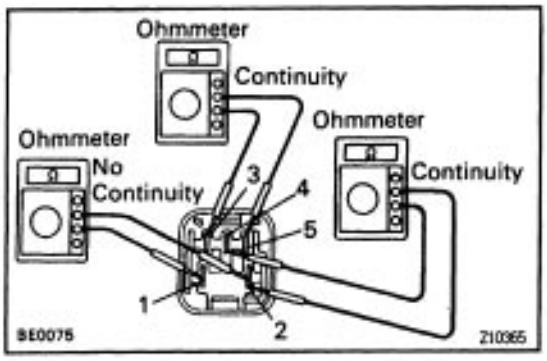
If operation is not as specified, replace the relay.

D. Reinstall cooling fan relay



3. INSPECT ENGINE MAIN RELAY (“ENG MAIN”)

A. Remove engine main relay



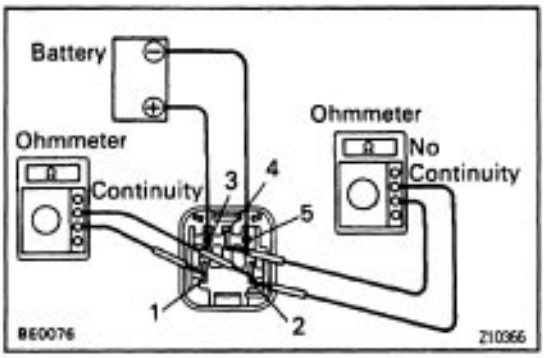
B. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

(b) Check that there is continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 1 and 2.

If continuity is not as specified, replace the relay.



C. Inspect relay operation

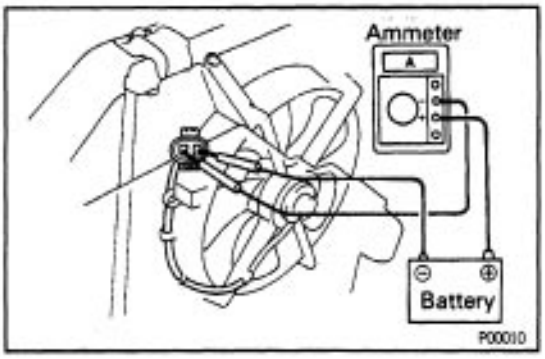
(a) Apply battery voltage across terminals 3 and 5.

(b) Using an ohmmeter, check that there is no continuity between terminals 2 and 4.

(c) Check that there is continuity between terminals 1 and 2.

If operation is not as specified, replace the relay.

D. Reinstall engine main relay



4. INSPECT COOLING FAN

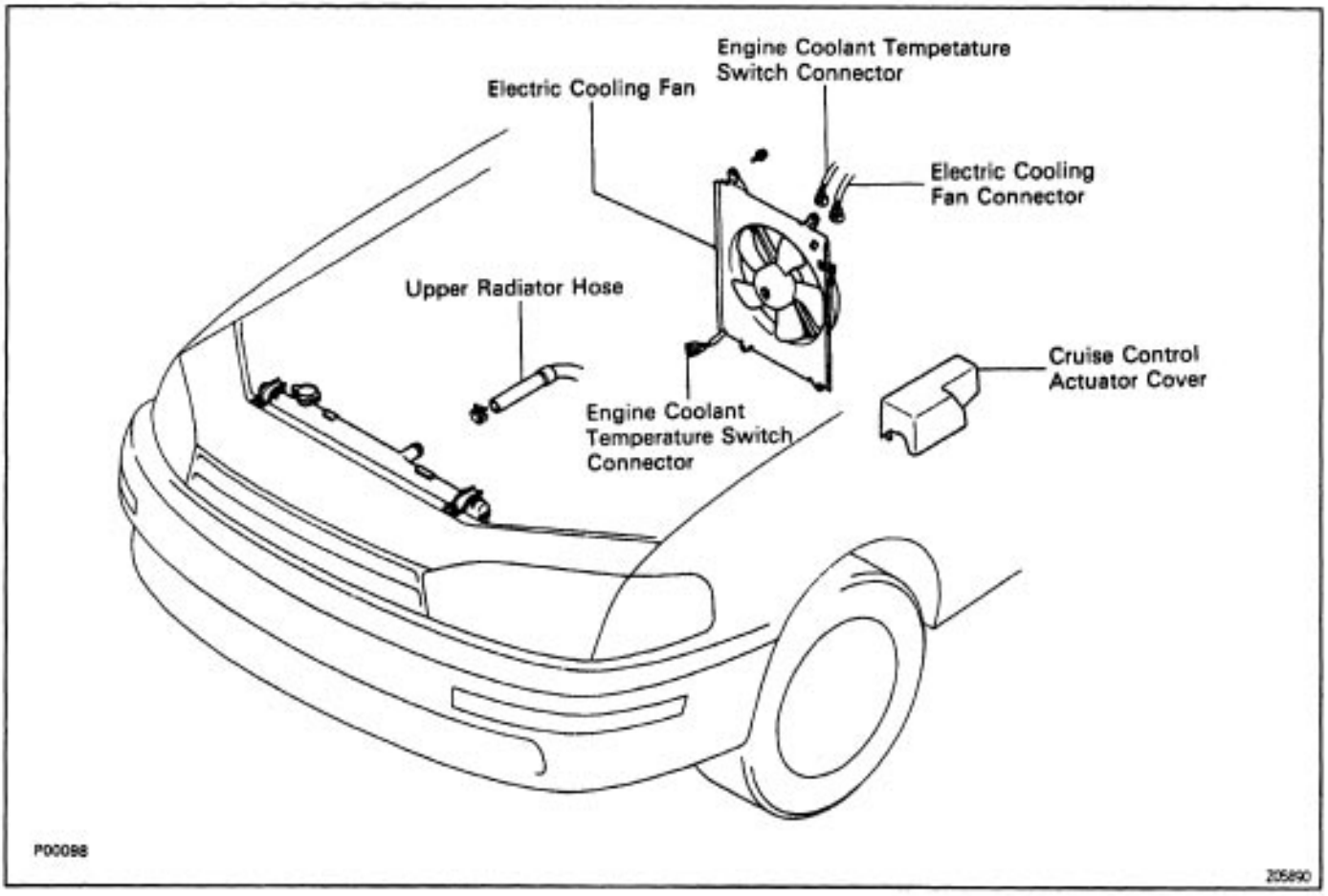
(a) Connect battery and ammeter to the cooling fan connector.

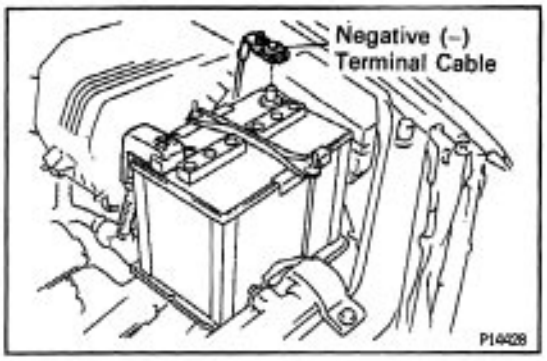
(b) Check that the cooling fan rotates smoothly, and check the reading on the ammeter.

Standard amperage:

5.8 – 7.4 A

COMPONENTS FOR REMOVAL AND INSTALLATION





ELECTRIC COOLING FAN REMOVAL

(See Components for Removal and Installation)

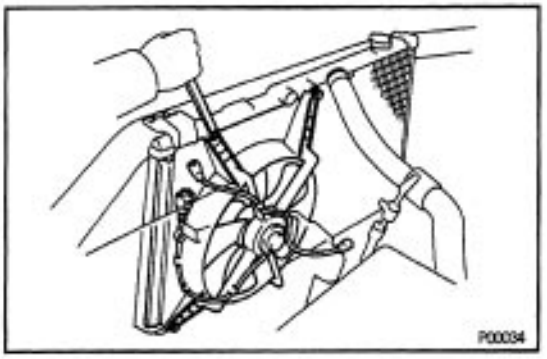
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT (See page EG1–241)

3. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR COVER

4. DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR



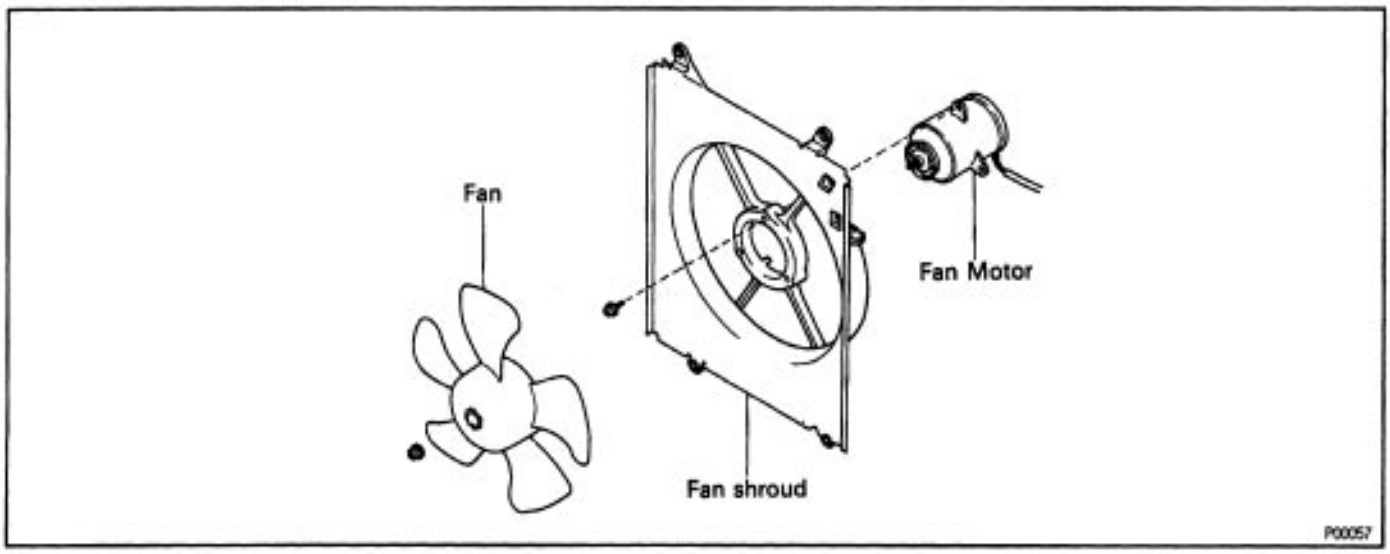
5. REMOVE ELECTRIC COOLING FAN

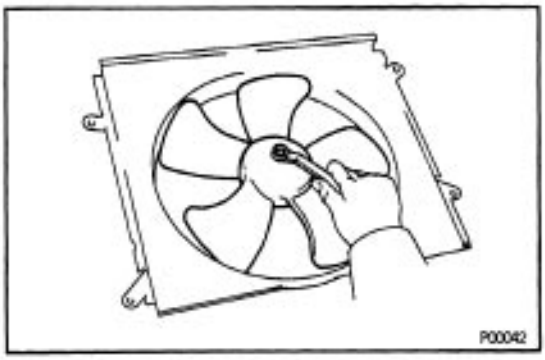
(a) Disconnect the engine coolant temperature switch connector from the radiator.

(b) Disconnect the engine coolant temperature switch and electric cooling fan connectors from the fan shroud.

(c) Remove the 4 bolts and cooling fan.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



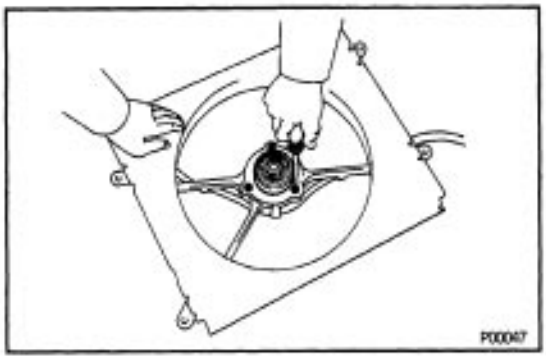


ELECTRIC COOLING FAN DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE FAN

Remove the nut and fan.



2. REMOVE FAN MOTOR

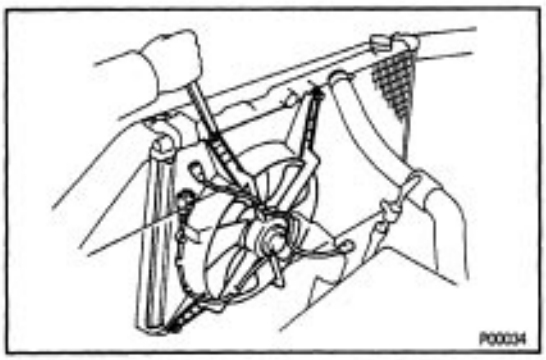
Remove the screws and fan motor.

ELECTRIC COOLING FAN ASSEMBLY

(See Components for Disassembly and Assembly)

1. INSTALL FAN MOTOR

2. INSTALL FAN



ELECTRIC COOLING FAN INSTALLATION

(See Components for Removal and Installation)

1. INSTALL ELECTRIC COOLING FAN

(a) Install the cooling fan with the 4 bolts.

(b) Connect the engine coolant temperature switch and electric cooling fan connectors to the fan shroud.

(c) Connect the engine coolant temperature switch connector to the radiator.

2. CONNECT UPPER RADIATOR HOSE TO RADIATOR

3. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR COVER

4. FILL WITH ENGINE COOLANT

(See page EG1–241)

5. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

6. START ENGINE AND CHECK FOR LEAKS

SERVICE SPECIFICATIONS

SERVICE DATA

Thermostat	Valve opening temperature	80 – 84°C (176 – 183°F)
	Valve lift at 95°C (203°F)	8 mm (0.31 in.) or more
Radiator cap	Relief valve opening pressure STD	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)
	Limit	59 kPa (0.6 kgf/cm², 8.5 psi)
Radiator	Plate height	7.75 – 8.25 mm (0.3051 – 0.3248 in.)
Electric cooling fan	Rotating amperage	5.8 – 7.4 A

TORQUE SPECIFICATIONS

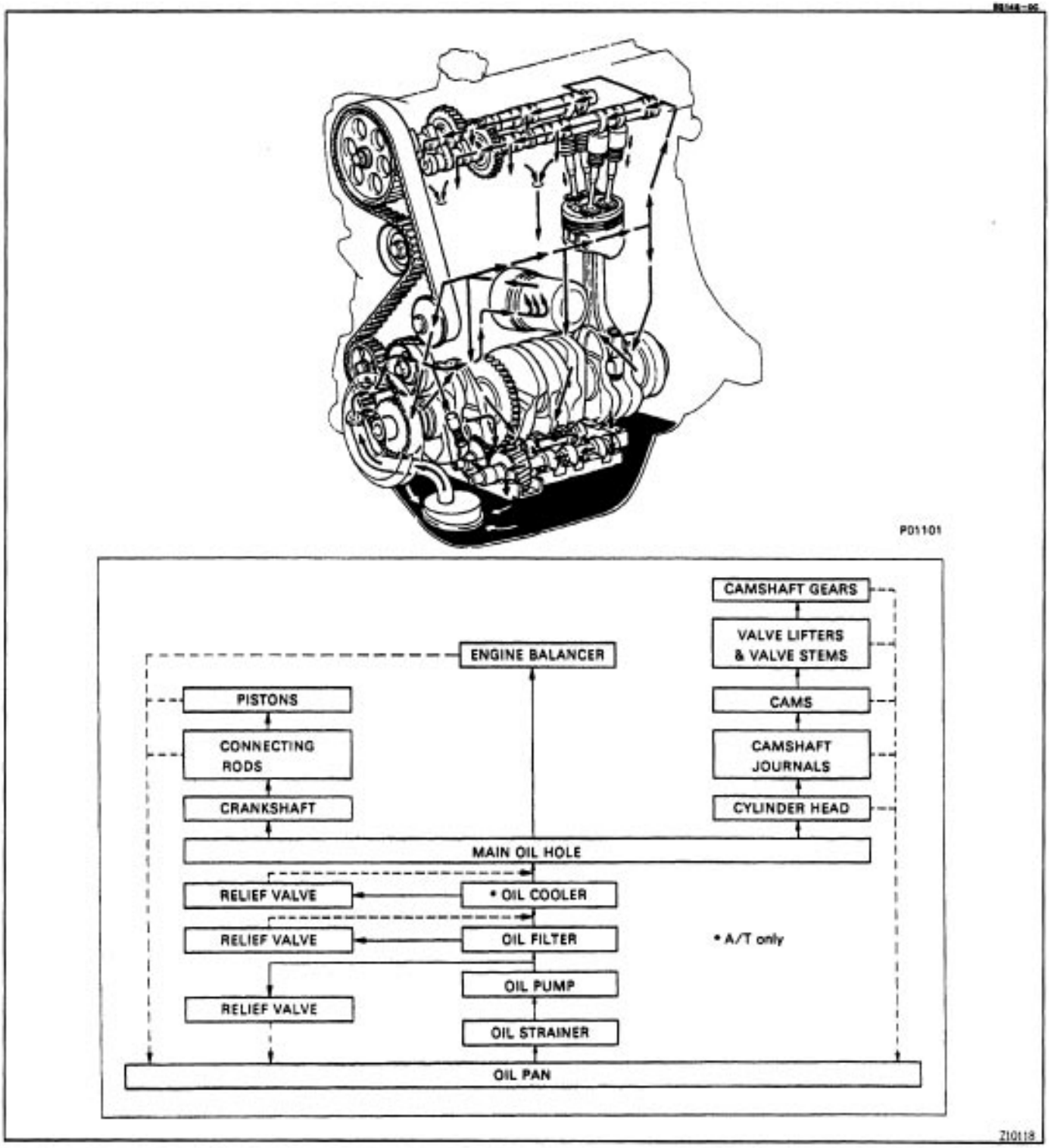
Part tightened	N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug	13	130	9
Water inlet x Water pump cover	8.8	90	78 in.·lbf
Water pump x Water pump cover	9.3	95	82 in.·lbf
Water pump x Cylinder block	9.3	95	82 in.·lbf
Water bypass pipe x Water pump cover	8.8	90	78 in.·lbf
No.2 idler pulley x Cylinder block	42	425	31
Water inlet x Water pump	8.8	90	78 in.·lbf
Radiator oil cooler x Radiator lower tank	8.3	85	74 in.·lbf
Radiator oil cooler pipe	22	220	16
Radiator support bolt	13	130	9

LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.

OPERATION



A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump to remove impurities. The oil pump itself is a trochoid type pump, inside of which is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the two rotors changes as they rotate. Oil is drawn in when the space widens and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the bypass closed, but when too much oil is being fed, the pressure becomes extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a relief valve built into the paper filter element. Particles of metal from wear, airborne dirt, carbon and other impurities can get into the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve bypasses the oil filter and flows directly into the main oil hole in the engine.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seat Cutter	
	09226–10010 Crankshaft Front & Rear Bearing Replacer	Crankshaft front oil seal
	09228–06500 Oil Filter wrench	
	09616–30011 Steering Worm Bearing Adjusting Screw Wrench	Oil pump pulley
	09620–30010 Steering Gear Box Replacer Set	
	(09627–30010) Steering Sector Shaft Bushing Replacer	Oil pump oil seal
	(09631–00020) Handle	Oil pump oil seal

RECOMMENDED TOOLS

	09090–04000 Engine Sling Device	For suspending engine
	09200–00010 Engine Adjust Kit	
	09905–00013 Snap Ring Pliers	

EQUIPMENT

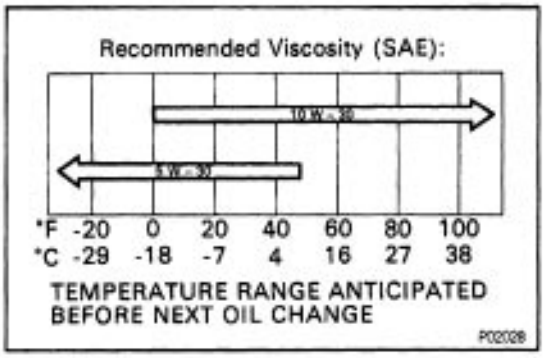
Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Engine oil (M/T)		API grade SG or SH, Energy–Conserving II mutigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil
Dry fill	4.2 liters (4.4 US qts, 3.7 Imp. qts)	
Drain and refill		
w/ Oil filter change	3.6 liters (3.8 US qts, 3.2 Imp. qts)	
w/o Oil filter change	3.4 liters (3.6 US qts, 3.0 Imp. qts)	
Engine oil (A/T)		
Dry fill	4.3 liters (4.5 US qts, 3.8 imp. qts)	
Drain and refill		
w/ Oil filter change	3.6 liters (3.8 US qts, 3.2 Imp. qts)	
w/o Oil filter change	3.4 liters (3.6 US qts, 3.0 Imp. qts)	

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Oil pan
08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch



OIL PRESSURE CHECK

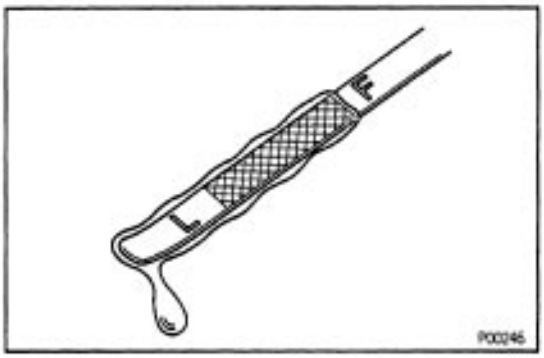
1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, dis–coloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

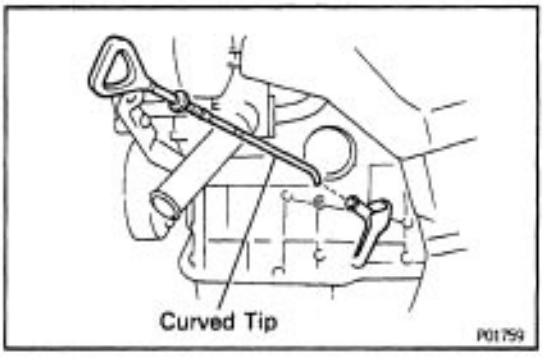
API grade SG or SH, Energy Conserving II multi–grade engine oil or ILSAC multigrade engine oil. Recommended viscosity is as shown in the illustration.



2. CHECK ENGINE OIL LEVEL

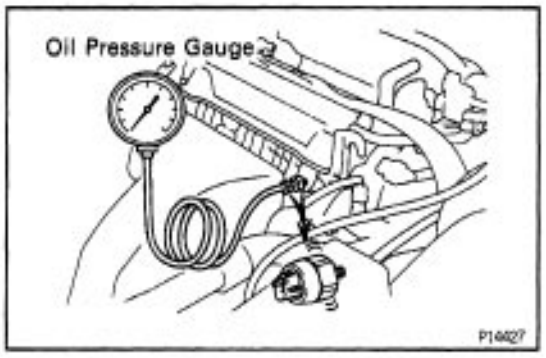
The oil level should be between the “L” and “F” marks on the dipstick.

If low, check for leakage and add oil up to “F” mark.



NOTICE:

- **When inserting the oil dipstick, insert the curved tip of the dipstick facing the same direction as the curve of the guide.**
- **If the dipstick gets caught while inserting it, do not force it in. Reconfirm the direction of the dipstick.**



3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

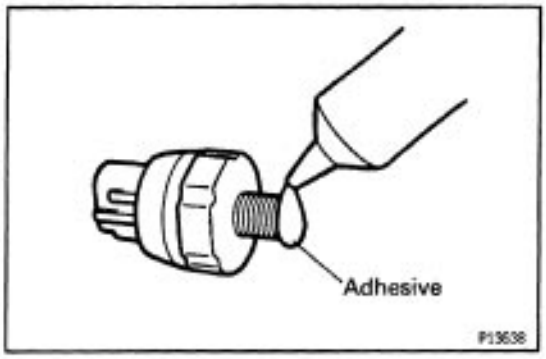
Oil pressure:

At idle

29 kPa (0.3 kgf/cm², 4.3 psi) or more

At 3,000 rpm

245 – 490 kPa (2.5 – 5.0 kg f/cm², 36 – 71 psi)



6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:
Part No.08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

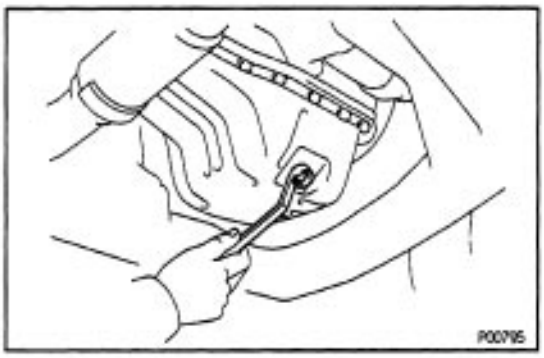
(c) Reinstall the oil pressure switch.

7. START ENGINE AND CHECK FOR LEAKS

OIL AND FILTER REPLACEMENT

CAUTION:

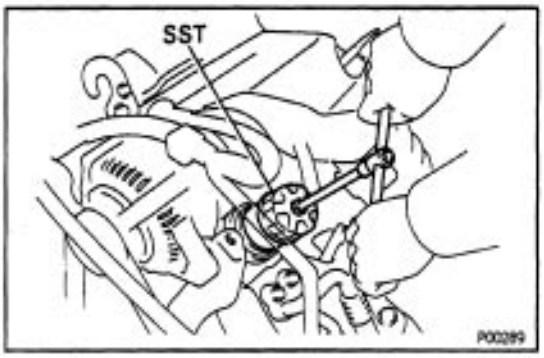
- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Care should be taken, therefore, when changing engine, oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**



1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

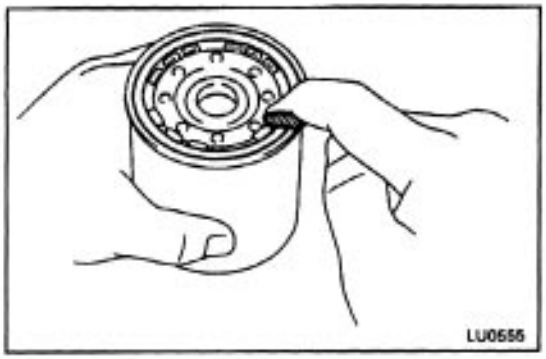
(b) Remove the oil drain plug, and drain the oil into a container.



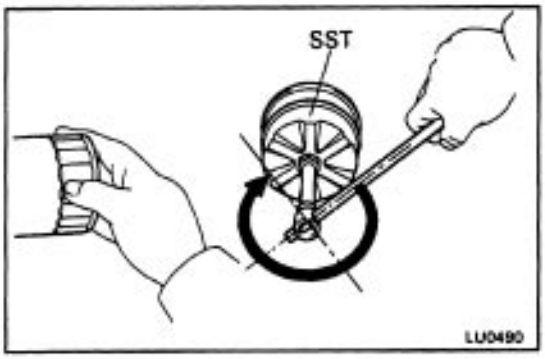
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–06500

(b) Check and clean the oil filter installation surface.



(c) Apply clean engine oil to the gasket of a new oil filter.



(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–06500

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(b) Fill with new engine oil.
Oil grade: (See step 1 on page EG1–272)
Capacity (M/T):
Drain and refill
w/ Oil filter change
3.6 liters (3.8 US qts, 3.2 Imp. qts)
w/o Oil filter change
3.4 liters (3.6 US qts, 3.0 Imp. qts)
Dry fill
4.2 liters (4.4 US qts, 3.7 Imp. qts)
Capacity (A/T):
Drain and refill
w/ Oil filter change
3.6 liters (3.8 US qts, 3.2 Imp. qts)
w/o Oil filter change
3.4 liters (3.6 US qts, 3.0 Imp. qts)
Dry fill
4.3 liters (4.5 US qts, 3.8 Imp. qts)

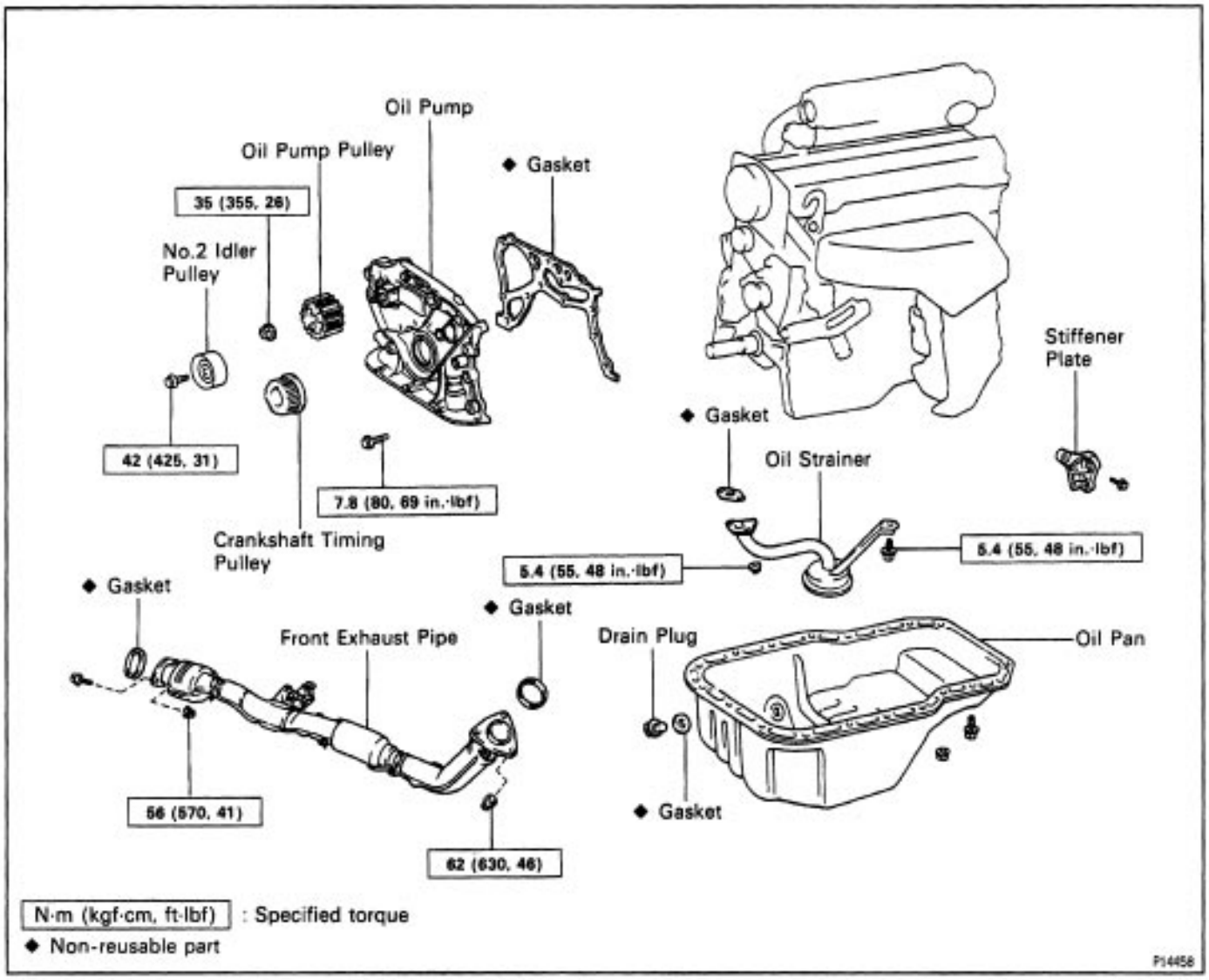
(c) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL
(See page EG1–272)

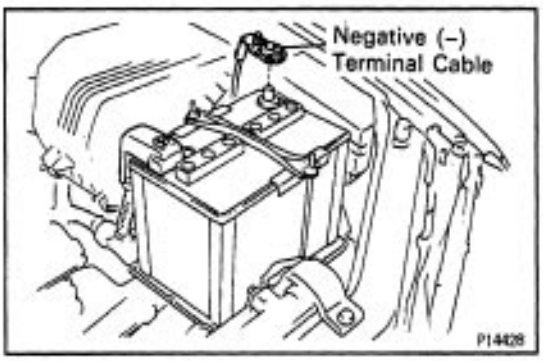
OIL PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION



OIL PUMP REMOVAL

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

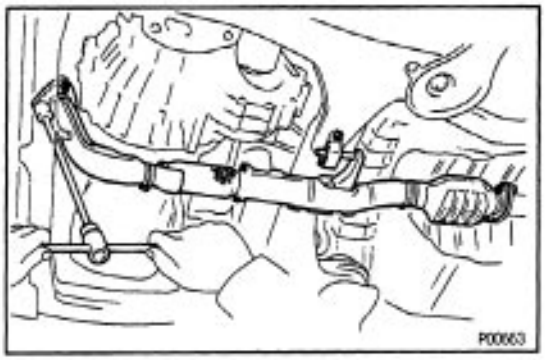


1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

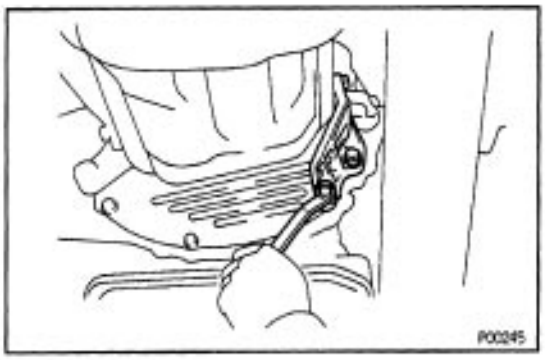
2. REMOVE HOOD

3. DRAIN ENGINE OIL (See page EG1–274)



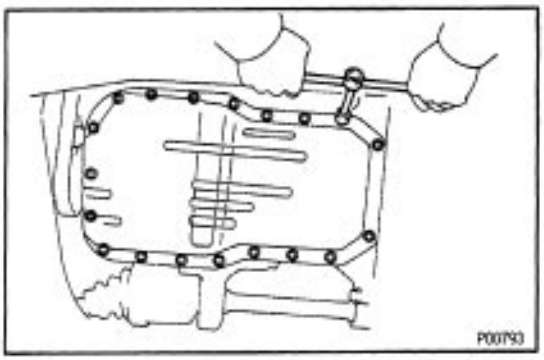
4. REMOVE FRONT EXHAUST PIPE

(a) Loosen the 2 bolts, and disconnect the bracket.
(b) Remove the 2 bolts and nuts holding the front exhaust pipe to the center exhaust pipe.
(c) Using a 14 mm deep socket wrench, remove the 3 nuts holding the front exhaust pipe to the WU–TWC.
(d) Remove the front exhaust pipe and gaskets.



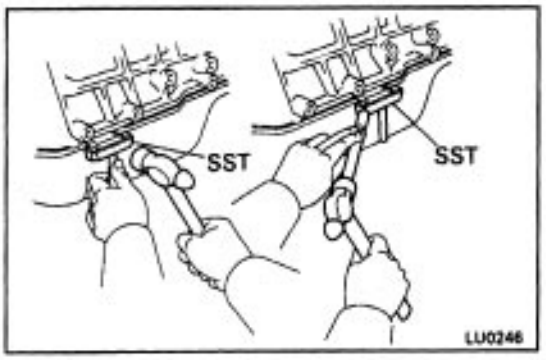
5. REMOVE STIFFENER PLATE

Remove the 3 bolts and stiffener plate.



6. REMOVE OIL PAN

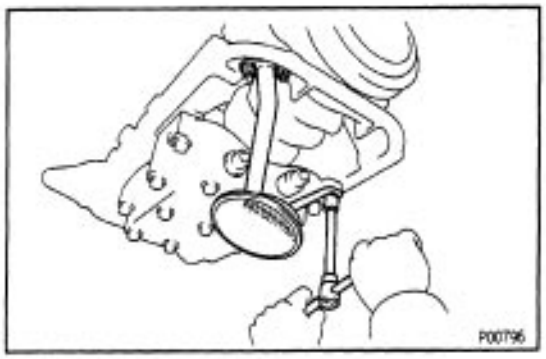
(a) Remove the dipstick.
(b) Remove the 17 bolts and 2 nuts.



(c) Insert the blade of SST between the cylinder block and oil pan, and cut off applied sealer and remove the oil pan.
SST 09032 – 00100

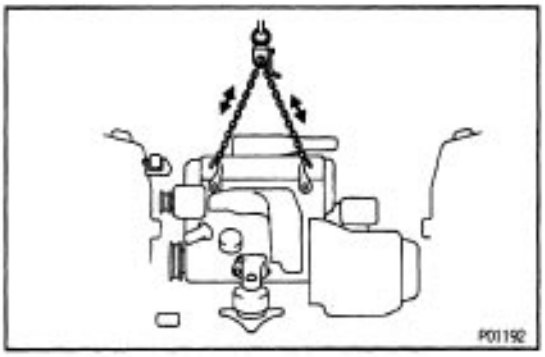
NOTICE:

- **Do not use SST for the oil pump body side and rear oil seal retainer.**
- **Be careful not to damage the oil pan flange.**



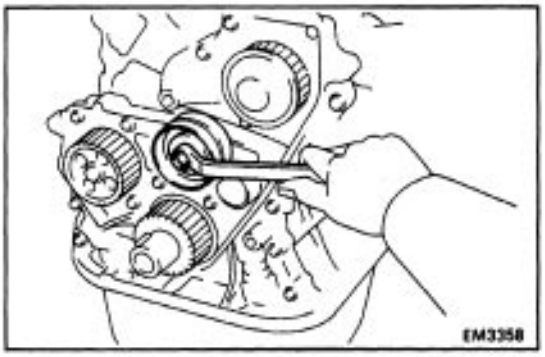
7. REMOVE OIL STRAINER

Remove the bolt, nuts, oil strainer and gasket.



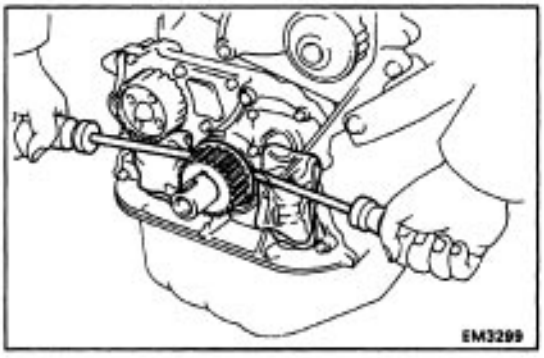
8. SUSPEND ENGINE WITH ENGINE SLING DEVICE

9. REMOVE TIMING BELT (See page EG1–26)



10. REMOVE NO.2 IDLER PULLEY

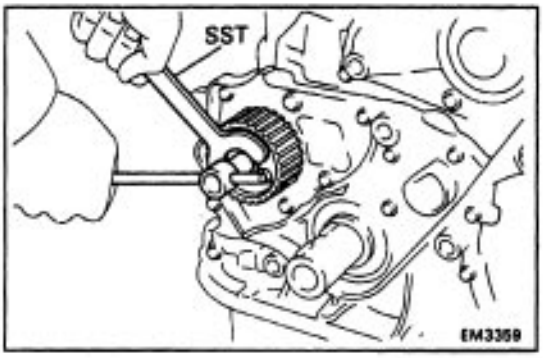
Remove the bolt and pulley.



11. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use 2 screw–drivers.

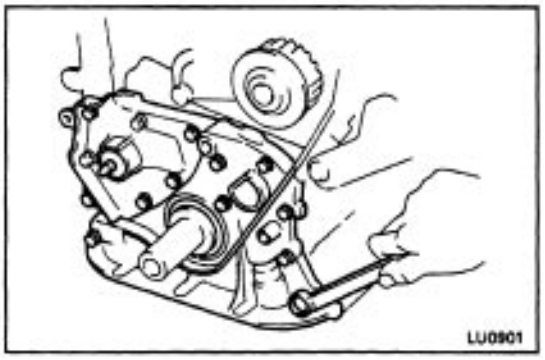
HINT: Position shop rags as shown to prevent damage.



12. REMOVE OIL PUMP PULLEY

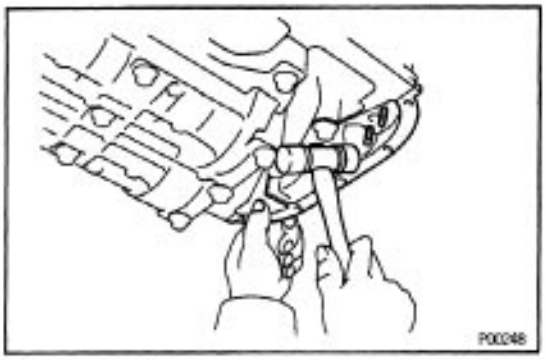
Using SST, remove the nut and pulley.

SST 09616 – 30011



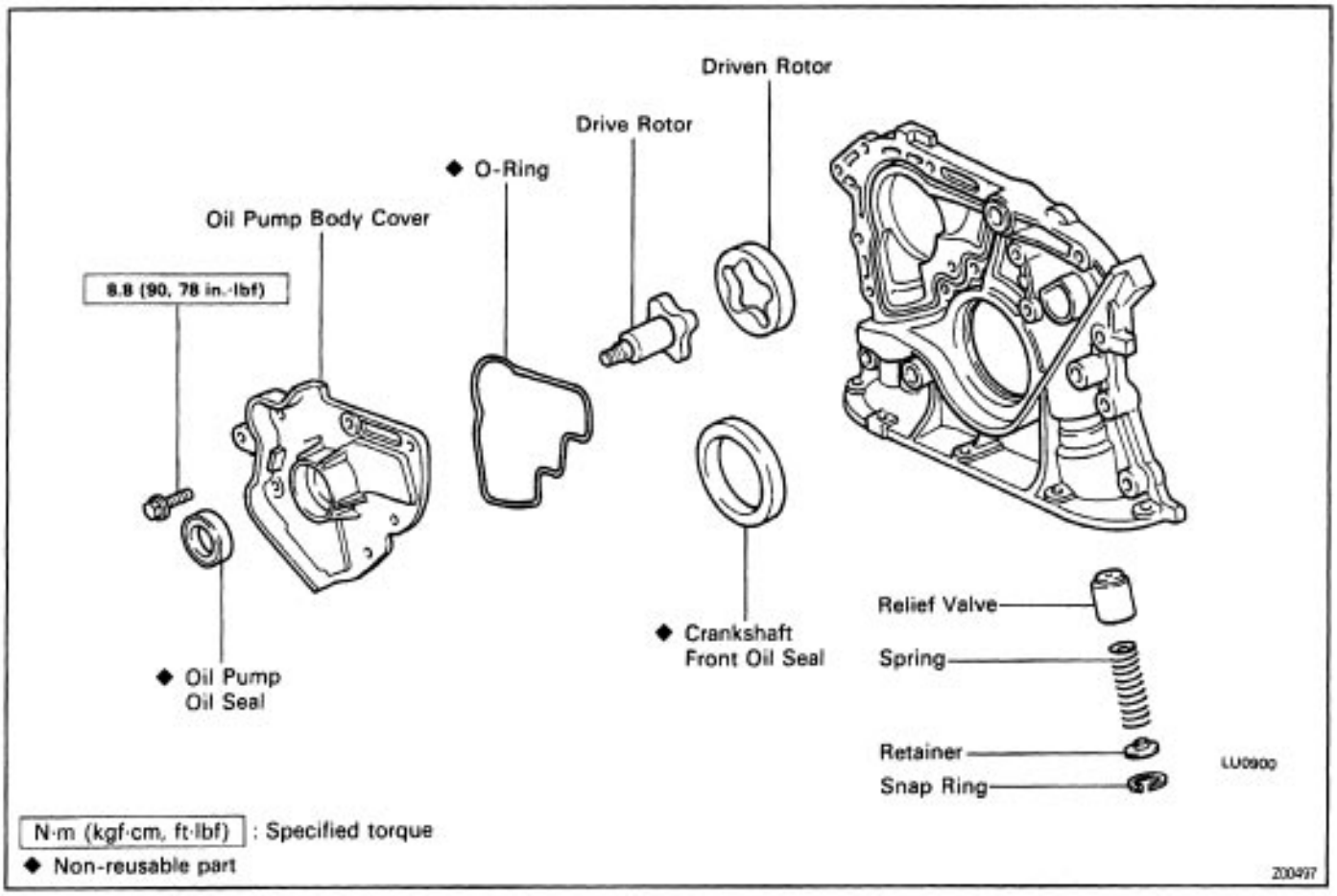
13. REMOVE OIL PUMP

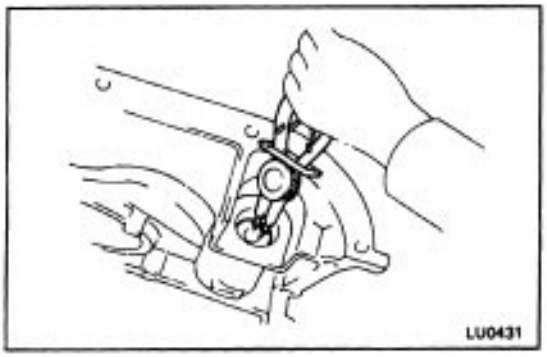
(a) Remove the 12 bolts.



(b) Using a plastic–faced hammer, remove the oil pump by carefully tapping the oil pump body.
(c) Remove the gasket.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

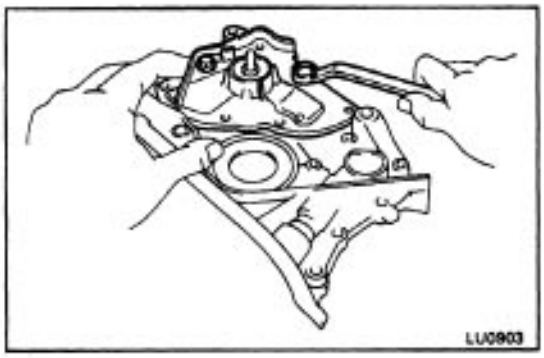




OIL PUMP DISASSEMBLY

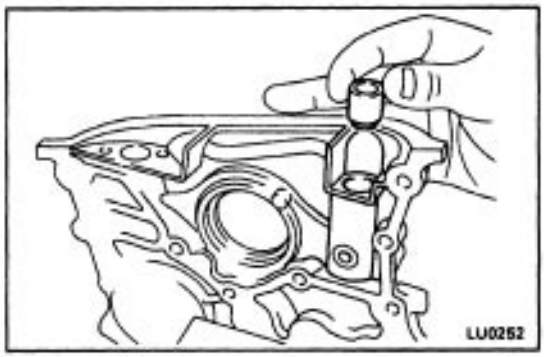
1. REMOVE RELIEF VALVE

(a) Using snap ring pliers, remove the snap ring.
(b) Remove the retainer, spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

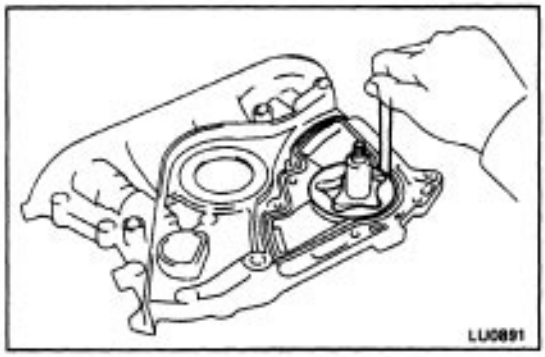
Remove the 2 bolts, pump body cover, O–ring, the drive and driven rotors.

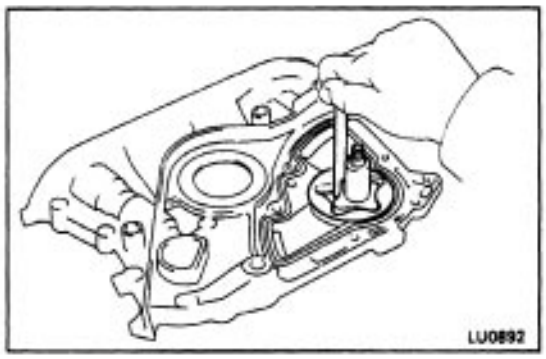


OIL PUMP INSPECTION

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it doesn't, replace the relief valve. If necessary, replace the oil pump assembly.





2. INSPECT DRIVE AND DRIVEN ROTORS

A. Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and body.

Standard body clearance:
0.10 – 0.16 mm (0.0039 – 0.0063 in.)

Maximum body clearance:
0.20 mm (0.0079 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

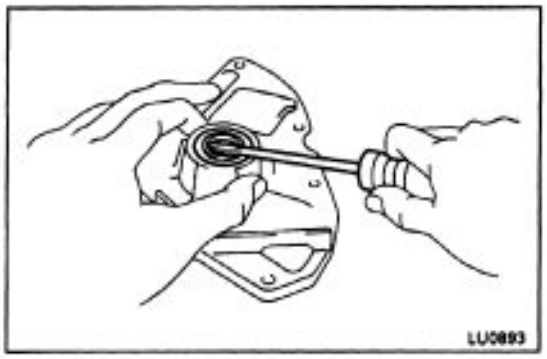
B. Inspect rotor tip clearance

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:
0.04 – 0.16 mm (0.0016 – 0.0063 in.)

Maximum tip clearance:
0.20 mm (0.0079 in.)

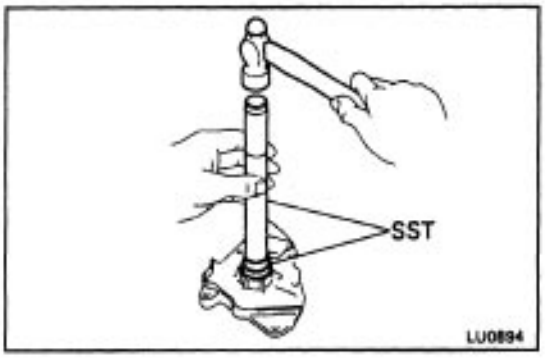
If the tip clearance is greater than maximum, replace the rotors as a set.



OIL PUMP OIL SEAL REPLACEMENT

1. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal.



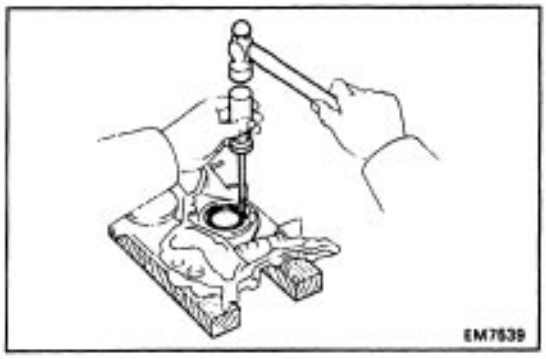
2. INSTALL OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump cover edge.
SST 09620–30010 (09627–30010, 09631–00020)

(b) Apply MP grease to the oil seal lip.

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

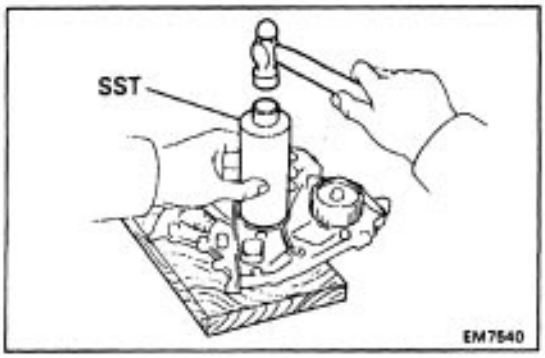
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:



REPLACE CRANKSHAFT FRONT OIL SEAL

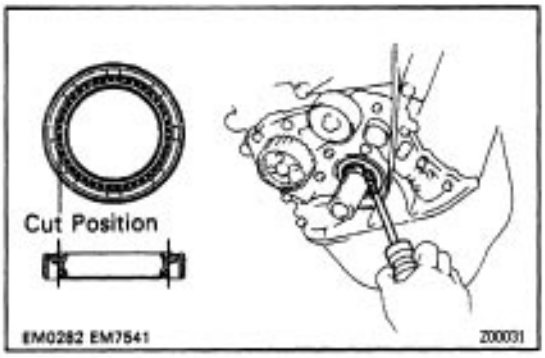
A. If oil pump is removed from cylinder block:

(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09226 –10010

(c) Apply MP grease to the oil seal lip.

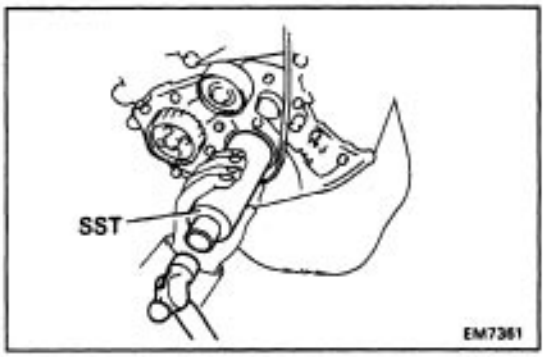


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

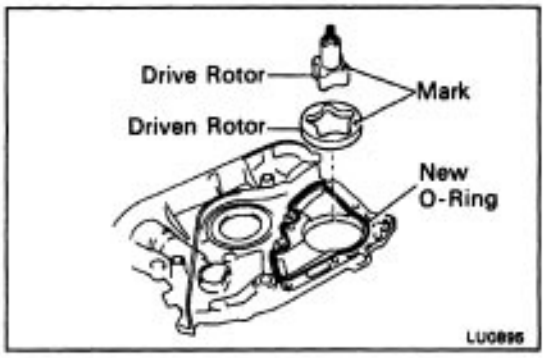
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09226 –10010

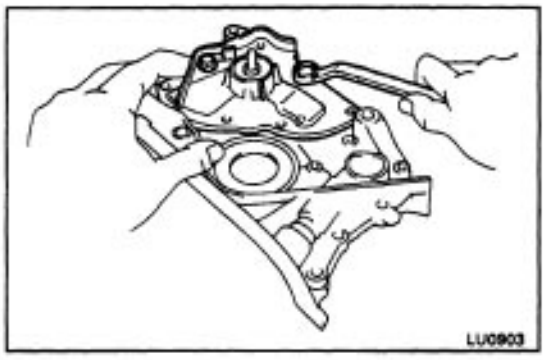
OIL PUMP ASSEMBLY

(See Components for Disassembly and Assembly)

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.



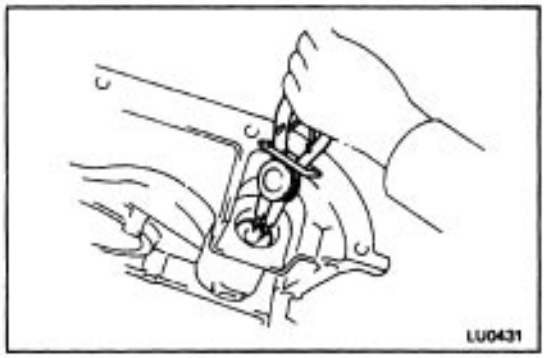


(b) Install the pump body cover with the 2 bolts.
Torque: 8.8 N–m (90 kgf–cm. 78 in.–lbf)

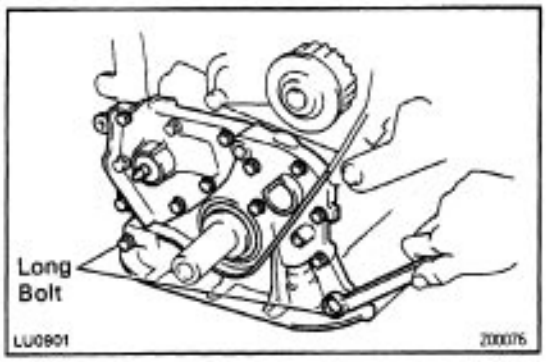
2. INSTALL RELIEF VALVE

(a) Insert the relief valve, spring and retainer into the pump body hole.

(b) Using snap ring pliers, install the snap ring.



OIL PUMP INSTALLATION



(See Components for Removal and Installation)

1. INSTALL OIL PUMP

Install a new gasket and the oil pump with the 12 bolts.

Torque: 9.3 N–m (95 kgf–cm, 82 in.–lbf)

HINT: Long bolts are indicated in the illustration.

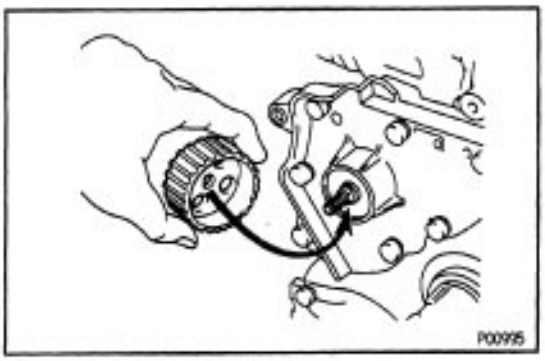
Bolt length:

Long bolt

35 mm (1.38 in.)

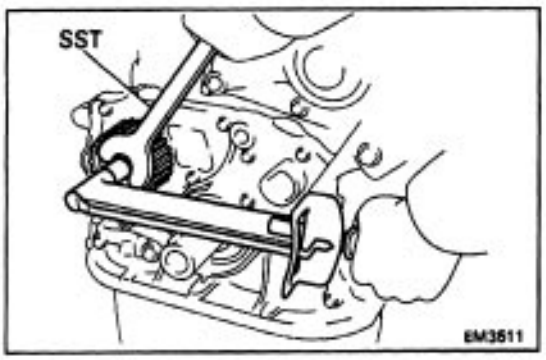
Others

25 mm (0.98 in.)



2. INSTALL OIL PUMP PULLEY

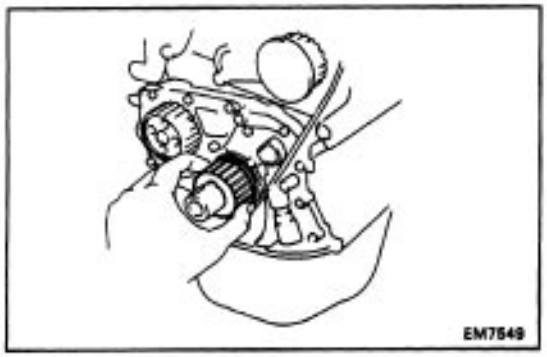
(a) Align the cutouts of the pulley and shaft, and slide on the pulley.



(b) Using SST, install the nut.

SST 09616–30011

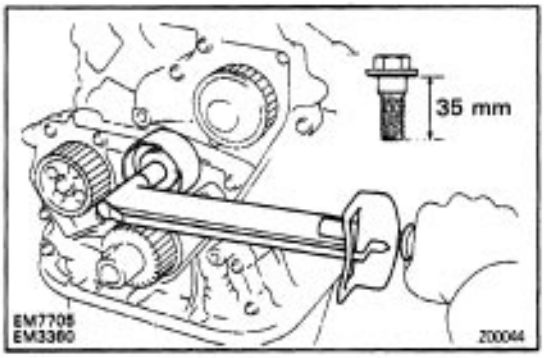
Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)



3. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the timing pulley set key with the key groove of the pulley.

(b) Slide on the timing pulley, facing the flange side inward.



4. INSTALL NO.2 IDLER PULLEY

(a) Install the pulley with the bolt.

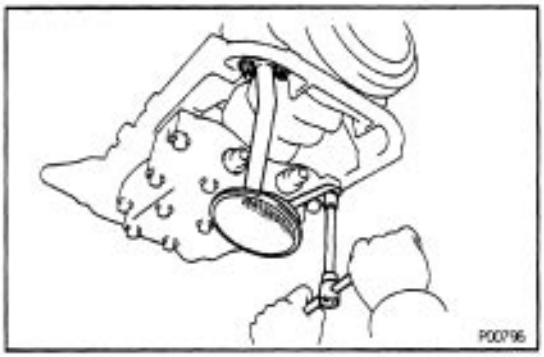
Torque: 42 N–m (425 kgf–cm, 31 ft–lbf)

HINT: Use a bolt 35 mm (1.38 in.) in length.

(b) Check that the idler pulley moves smoothly.

5. INSTALL TIMING BELT (See page EG1–33)

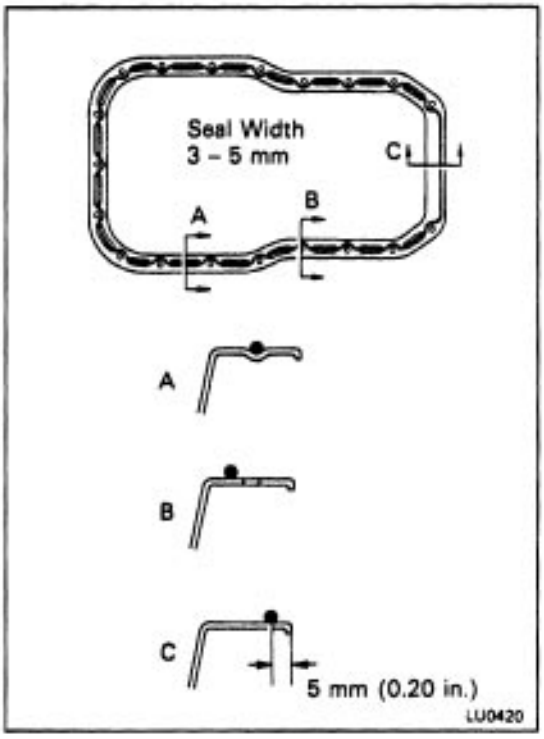
6. REMOVE ENGINE SLING DEVICE



7. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with bolt and nuts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



8. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

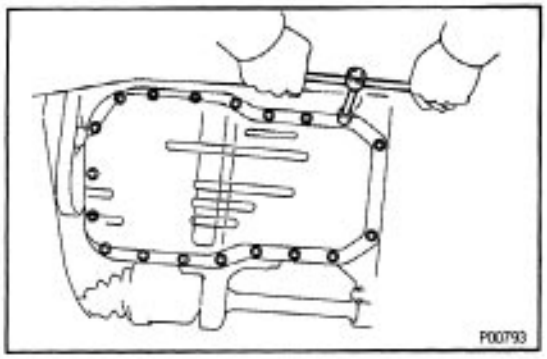
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

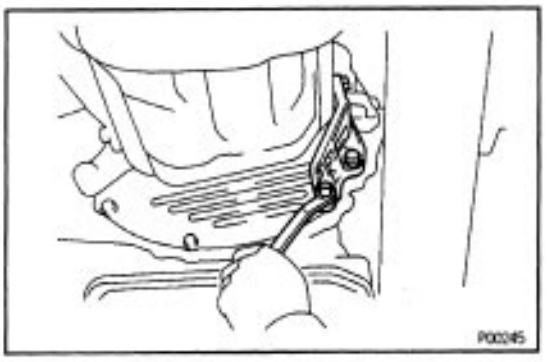
(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing:
Part No.08826 – 00080 or equivalent

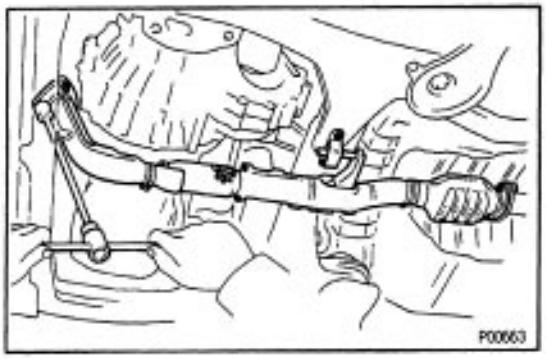
- Install a nozzle that has been cut to a 3–5 mm (0.12–0.20 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the oil pan with 17 bolts and 4 nuts.
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)
(d) Install the dipstick.



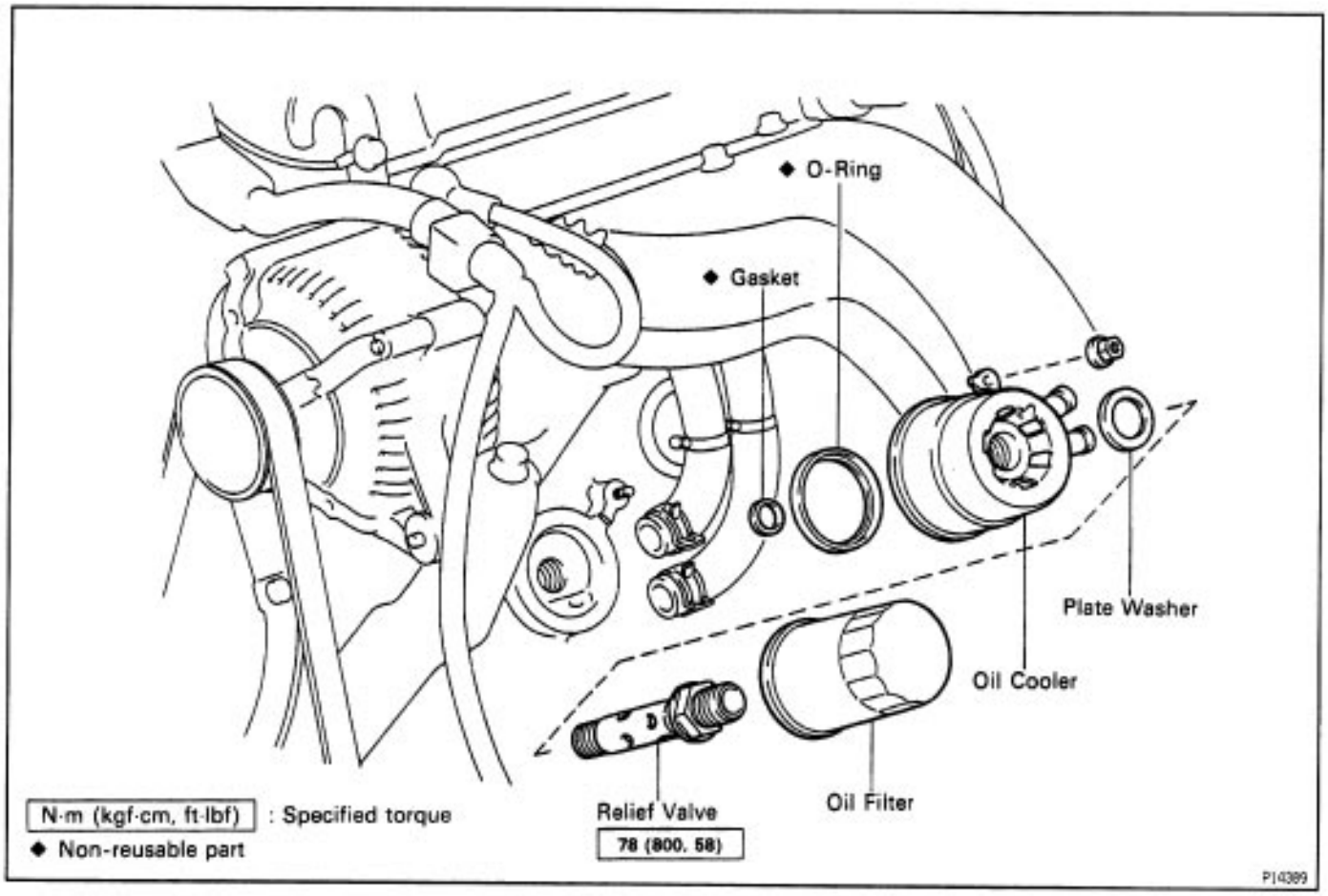
9. INSTALL STIFFENER PLATE
Install the stiffener plate with the 3 bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



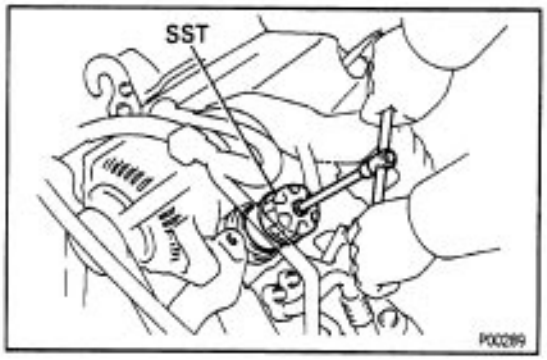
10. INSTALL FRONT EXHAUST PIPE
(a) Place 2 new gaskets on the front and rear of the front exhaust pipe.
(b) Temporarily install the 2 bolts and 2 new nuts holding front exhaust pipe to the center exhaust pipe.
(c) Using a 14 mm deep socket wrench, install the 3 new nuts holding the front exhaust pipe to the WU–TWC.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(d) Tighten the 2 bolts and 2 nuts holding front exhaust pipe to the center exhaust pipe.
Torque: 56 N–m (570 kgf–cm, 41 ft–lbf)
(e) Install the bracket with the 2 bolts.
11. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
12. FILL WITH ENGINE OIL (See page EG1–275)
13. START ENGINE AND CHECK FOR LEAKS
14. RECHECK ENGINE OIL LEVEL
15. INSTALL HOOD

OIL COOLER

COMPONENTS FOR REMOVAL AND INSTALLATION



OIL COOLER REMOVAL

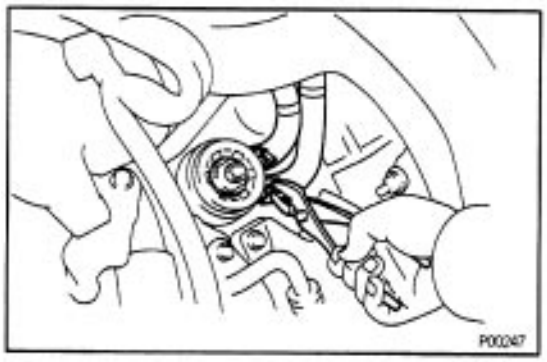


1. DRAIN ENGINE COOLANT

2. REMOVE OIL FILTER

Using SST, remove the oil filter.

SST 09228–06500

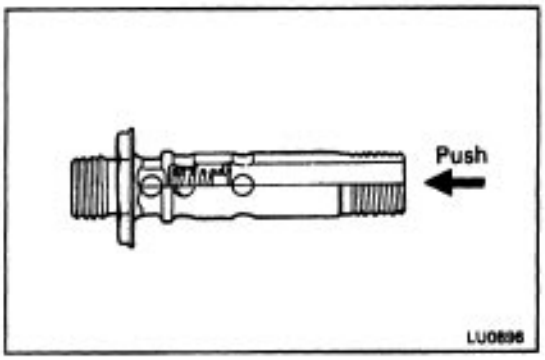


3. DISCONNECT WATER BYPASS HOSES FROM OIL COOLER

Disconnect the 2 water bypass hoses.

4. REMOVE OIL COOLER

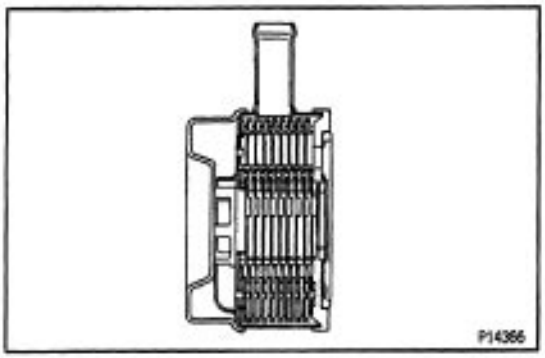
(a) Remove the relief valve and plate washer.
(b) Remove the nut and oil cooler.
(c) Remove the O–ring and gasket from the oil cooler.



OIL COOLER INSPECTION

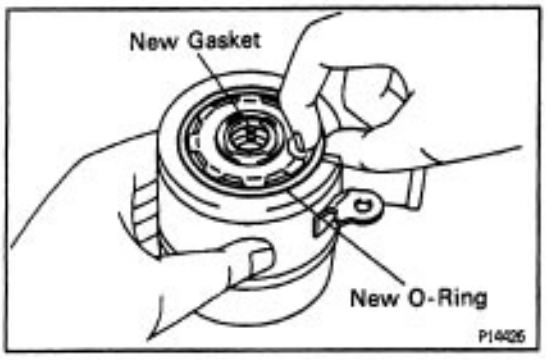
1. INSPECT RELIEF VALVE

Push the valve with a wooden stick to check if it is stuck.
If stuck, replace the relief valve.



2. INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.



OIL COOLER INSTALLATION

(See Components for Removal and Installation)

1. INSTALL OIL COOLER

(a) Install new O–ring and gasket to the oil cooler.

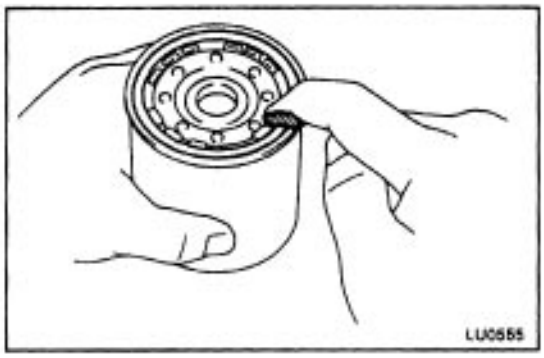
(b) Apply a light coat of engine oil on the threads and under the head of the relief valve.
(c) Temporarily install the oil cooler with the nut.
(d) Install the plate washer and relief valve.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)
(e) Tighten the nut.
Torque: 7.8 N–m (80 kgf–cm, 69 In.–lbf)

2. CONNECT WATER BYPASS HOSES

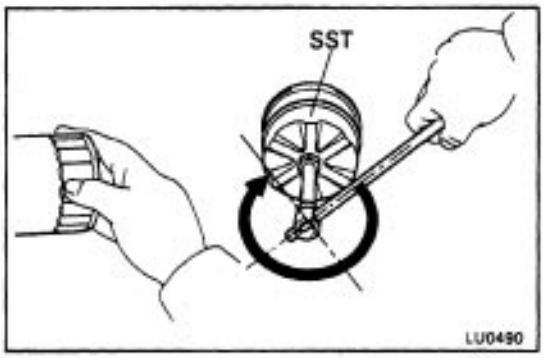
Connect the 2 water bypass hoses.

3. INSTALL OIL FILTER

(a) Clean the oil filter contact surface on the filter mounting.



(b) Lubricate the filter rubber gasket with engine oil.



(c) Tighten the oil filter by hand until the rubber gasket contacts the seat of the filler mounting. Then using SST, give it an additional 3/4 turn to seat the oil filter.
SST 09228–06500

4. FILL WITH ENGINE COOLANT
(See page EG1–241)
5. START ENGINE AND CHECK FOR LEAKS
6. CHECK ENGINE OIL LEVEL

SERVICE SPECIFICATIONS

SERVICE DATA

Oil pressure		at idle speed	29 kPa (0.3 kgf/cm², 43 psi) or more
		at 3,000 rpm	245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)
Oil pump	Body clearance	STD	0.10 – 0.16 mm (0.0039 – 0.0063 in.)
		Limit	0.20 mm (0.0079 in.)
	Tip clearance	STD	0.04 – 0.16 mm (0.0016 – 0.0063in.)
		Limit	0.20 mm (0.0079 in.)

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Oil pan x Drain plug	39	400	29
Oil pump body cover x Oil pump body	8.8	90	78 in.·lbf
Oil pump x Cylinder block	9.3	95	82 in.·lbf
Oil pump pulley x Oil pump drive shaft	28	290	21
No.2 idler pulley x Cylinder block	42	425	31
Oil strainer x Cylinder block	5.4	55	48 in.·lbf
Oil strainer x Oil pump	5.4	55	48 in.·lbf
Oil pan x Cylinder block	5.4	55	48 in.·lbf
Oil pan x Oil pump	5.4	55	48 in.·lbf
Stiffener plate x Cylinder block	37	380	27
Stiffener plate x Transaxle case	37	380	27
Front exhaust pipe x WU–TWC	62	630	46
Front exhaust pipe x Center exhaust pipe	56	570	41
Oil cooler x Cylinder block (Relief valve)	78	800	58
Oil cooler x Cylinder block (Nut)	7.8	80	69 in.·lbf

-Memo

5S–FE ENGINE TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

The Engine Control System broadly consists of the sensors, Engine Control Module (ECM) and actuators. The ECM receives signals from various sensors, judges the operating conditions and determines the optimum injection duration, timing, ignition timing and idle speed.

In general, the Engine Control System is considered to be a very intricate system to troubleshoot. But, the fact is that if you proceed to inspect the circuit one by one following the procedures directed in this manual, troubleshooting of this system is not complex.

This section explains the most ideal method of troubleshooting and tells how to carry out the necessary repairs.

1. CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much details as possible about the problem.

2. CHECK AND CLEAR DIAGNOSTIC TROUBLE CODE (PRECHECK)

Before confirming the problem symptom, first check the diagnostic trouble code and make a note of any malfunction code which is output, then clear the code.

HINT: Output of the malfunction code indicates that there is a malfunction in the circuit indicated. However, it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. In order to determine this, the problem sym toms should be confirmed in step 4 first and the diagnostic trouble code be rechecked in step [6].

Accordingly, if troubleshooting is begun based on the malfunction code only in diagnostic trouble code check in step [2], it could result in a misdiagnosis, leading to troubleshooting of circuits which are normal and making it more difficult to locate the cause of the problem.

3. SETTING THE TEST MODE DIAGNOSIS, [4] PROBLEM SYMPTOM CONFIRMATION, [5] SYMPTOM SIMULATION

In order to find out the trouble more quickly, set the diagnosis check in test mode and with higher sensing ability of the ECM, confirm the problem symptoms. If the trouble does not reappear, use the symptom simulation method to make sure the trouble is reproduced.

6. DIAGNOSTIC TROUBLE CODE CHECK IN TEST MODE

Check the diagnostic trouble code in test mode. If the malfunction code is output, proceed to step. If the normal code is output, proceed to step [7].

7. BASIC INSPECTION

Carry out basic inspection such as the spark check and fuel pressure check, etc.

8. DIAGNOSTIC TROUBLE CODE CHART

If the malfunction code is displayed, proceed to inspect the circuit indicated by the chart for each code.

9. MATRIX CHART OF PROBLEM SYMPTOMS

If the normal code is displayed in the diagnosis in test mode, perform troubleshooting according to the inspection order in the Matrix Chart of Problem Symptoms.

10. PARTS INSPECTION

When the Matrix Chart of Problem Symptoms instructs to check the parts, proceed to parts inspection section included in this manual.

11. CIRCUIT INSPECTION

Determine if the malfunction is the sensor, actuator, wire harness, connector or the ECM.

12 CHECK FOR MOMENTARY INTERRUPTION

By performing the check for momentary interruption, the place where momentary interruptions or momentary shorts are occurring due to poor contacts can be isolated.

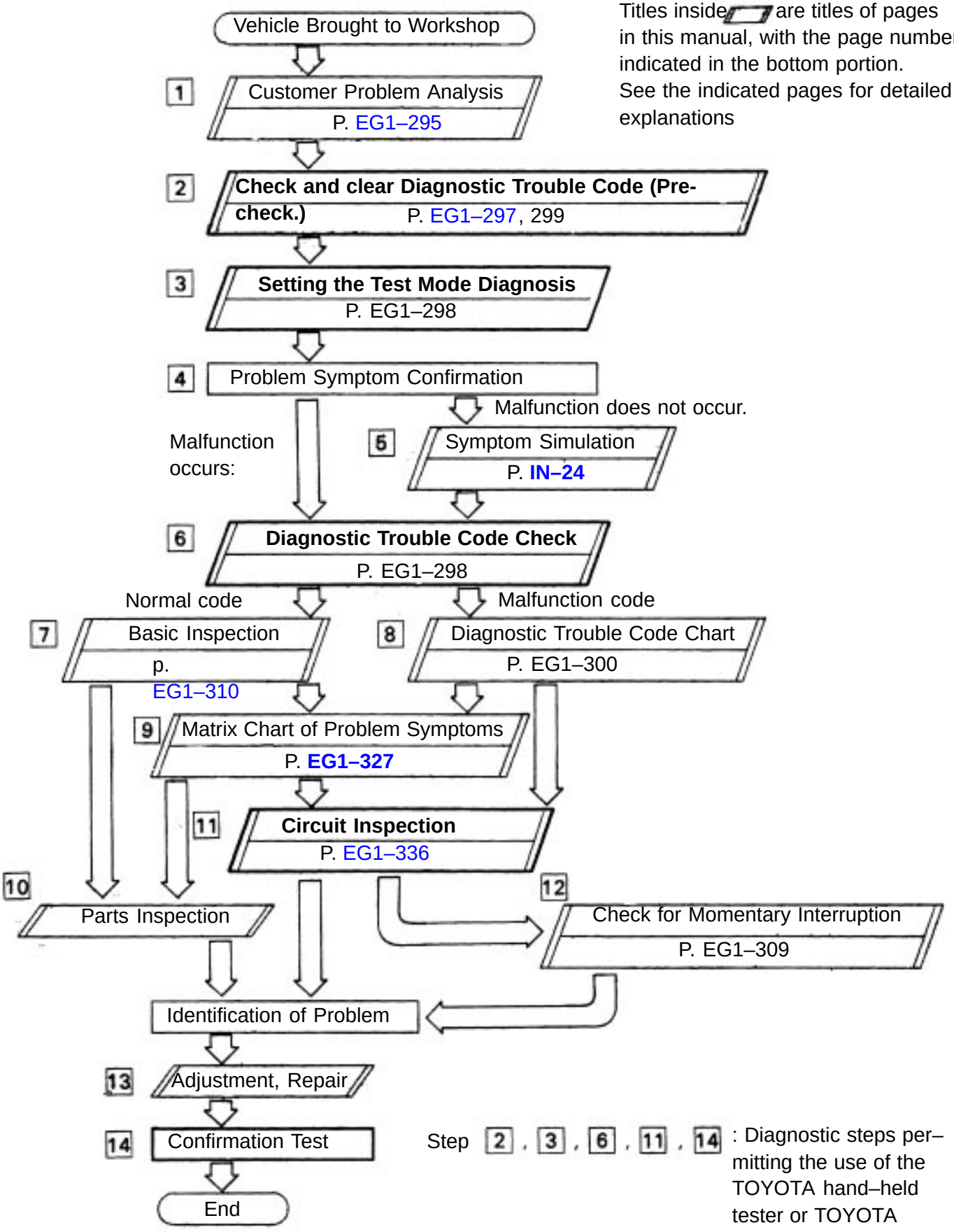
13 ADJUSTMENT, REPAIR

After the cause of the problem is located, perform adjustment or repairs by following the inspection and replacement procedures in this manual.

14 CONFIRMATION TEST

After completing adjustment or repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive, etc., to make sure the entire Engine Control System is operating normally.

Titles inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations



Step 2 , 3 , 6 , 11 , 14 : Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In		Odometer Reading	km Miles

Dates Problem Occured		
Frequency Problem Occurs		☐ Constant ☐ Sometime (times per day/month) ☐ Once only ☐ Other ( )
Conditions When Problem Occurrence	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Hill (☐ Up, ☐ Down) ☐ Rough road ☐ Other ( )
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other
	Engine Operation	☐ Starting ☐ Just after starting ☐ Idling ☐ Racing without load ☐ Driving (☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other ( ))

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ( )
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other ( )
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after fire) ☐ Surging ☐ Knocking ☐ Other ( )
	☐ Engine Stall	☐ Engine stall soon after starting ☐ After acceleration pedal depressed ☐ After acceleration pedal released ☐ During A/C operation ☐ When N to D shift ☐ Other ( )
	☐ Others	

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal Mode (Precheck)	☐ Normal code ☐ Malfunction code [code]
	Test Mode	☐ Normal code ☐ Malfunction code [code]

DIAGNOSIS SYSTEM

DESCRIPTION

The ECM contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and a Malfunction indicator lamp on the instrument panel lights up. By analyzing various signals as shown in the later table (See page EG1–300) the Engine Control Module (ECM) detects system malfunctions relating to the sensors or actuators.

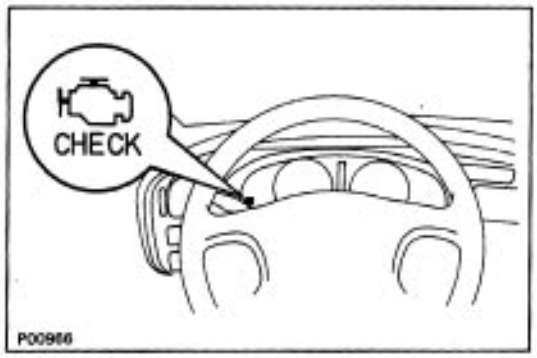
In the normal mode, the self–diagnosis system monitors 14 items, indicated by code No. as shown in EG1–300. A malfunction indicator lamp informs the driver that a malfunction has been detected. The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECM memory (except for code Nos. 16). The ECM stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.

The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the data link connector 1 or 2 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

In the test mode, 9 items, indicated by code No. as shown in EG1–300 are monitored. If a malfunction is detected in any one of the systems indicated by code Nos. 13, 22, 24, 25, 26, 27, 31, 41 and 71 the ECM lights the malfunction indicator lamp to warn the technician that malfunction has been detected. In this case, TE2 and E1 terminals on the data link connector 1 or 2 should be connected as shown later. (See page EG1–298).

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch is off (except code Nos. 43 and 51). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE1, TE2 and E1 terminals on the data link connector 1 or 2, as shown later.

A test mode function has been added to the functions of the self–diagnostic system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self–diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page EG1–298)



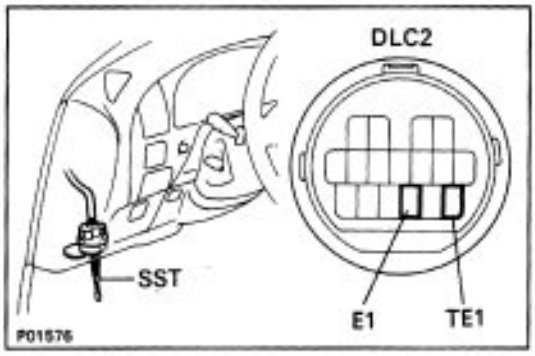
Diagnosis Inspection (Normal Mode)

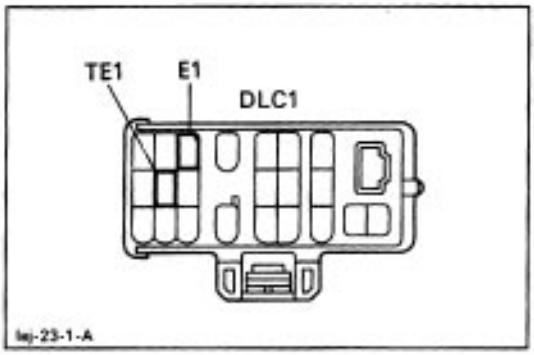
MALFUNCTION INDICATOR LAMP CHECK

1. The Malfunction indicator lamp will come on when the ignition switch is turned ON and the engine is not running.
   HINT: If the malfunction indicator lamp does not light up, proceed to troubleshooting of the combination meter (See page BE–64).
2. When the engine is started, the malfunction indicator lamp should go off.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

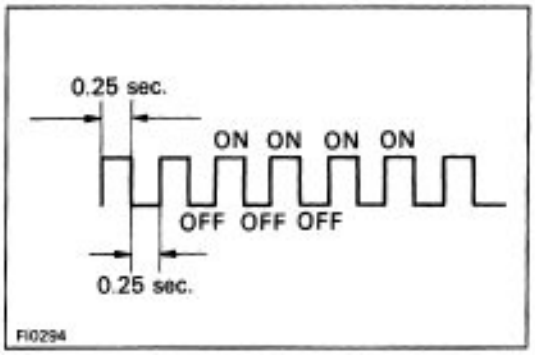
DIAGNOSTIC TROUBLE CODE CHECK

1. Turn ignition switch on.
2. Using SST, connect terminals between TE1 and E1 of data link connector 1 or 2.
   SST 09843–18020





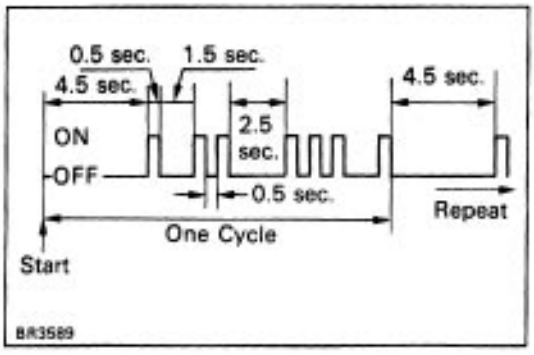
3. Read the diagnostic trouble code from malfunction indicator lamp.
   HINT: If a diagnostic trouble code is not output, check the TE1 terminal circuit (See page EG1–430).

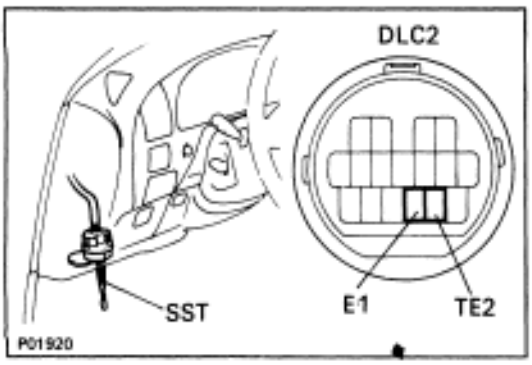


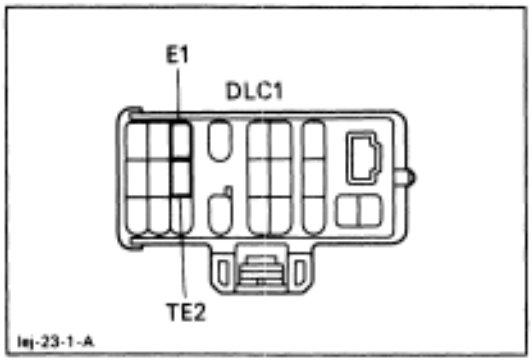
As an example, the blinking patterns for codes;normal, 12 and 31 are as shown on the illustration.

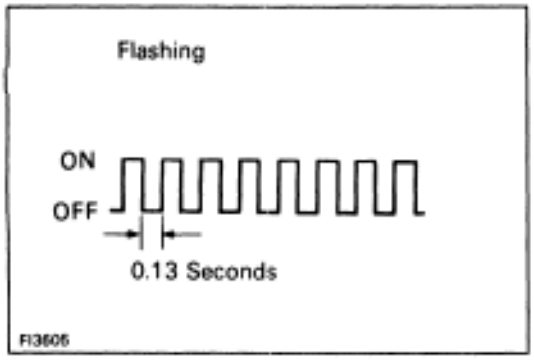
4. Check the details of the malfunction using the diagnostic trouble code table on page EG1–300.
5. After completing the check, disconnect terminals TE1 and E1, and turn off the display.

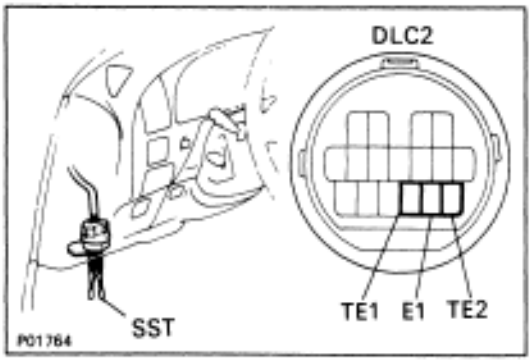
HINT: I n the event of 2 or more malfunction codes, indication will begin from the smaller numbered code and continue in order to the larger.

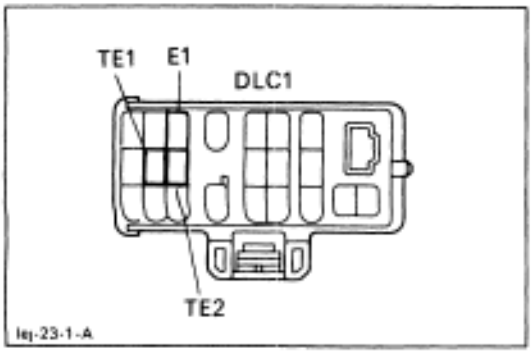












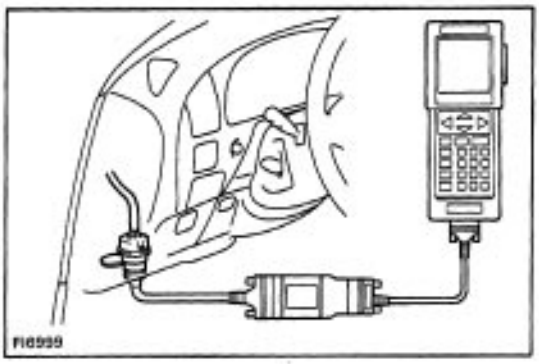
Diagnosis Inspection (Test Mode)

Compared to the normal mode, the test mode has high sens–ing ability to detect malfunctions.
It can also detect malfunctions in the starter signal circuit, the IDL contact signal of the throttle position sensor, air condi–tioning signal and Park/Neutral Position switch signal. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

DIAGNOSTIC TROUBLE CODE CHECK

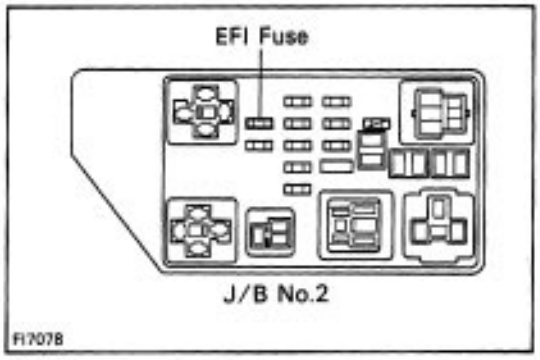
1. Initial conditions.
   (a) Battery voltage 11 V or more.
   (b) Throttle valve fully closed.
   (c) Transmission in neutral position.
   (d) Air conditioning switched off.
2. Turn ignition switch off.
3. Using SST, connect terminals TE2 and E1 of data link connector 1 or 2.
   SST 09843–18020
4. Turn ignition switch on.
   HINT:
   - To confirm that the test mode is operating, check that the malfunction indicator lamp flashes when the igni–tion switch is turned to ON.
   - If the malfunction indicator lamp does not flash, pro–ceed to troubleshooting of the TE2 terminal circuit on page EG1–430.
5. Start the engine.
6. Simulate the conditions of the malfunction described by the customer.
7. After the road test, using SST, connect terminals TE1 and E1 of data link connector 1 or 2.
   SST 09843–18020
8. Read the diagnostic trouble code on malfunction indica–tor lamp on the combination meter (See page EG1–297).
9. After completing the check, disconnect terminals TE1, TE2 and E1, and turn off the display.
   HINT:

- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned on.
- When vehicle speed is 3 mph (5 km/h) or below, diagnostic trouble code “42” (Vehicle speed signal) is output, but this is not abnormal.
- When the engine is not cranked, diagnostic trouble code “43” (Starter signal) output, but this is not ab–normal.
- When the automatic transmission shift lever is in the “D”, “2”, “L” or “R” shift position, or when the air conditioning is on or when the accelerator pedal is depressed, code “51” (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA hand–held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the TOYOTA hand–held tester operator's manual for further details.



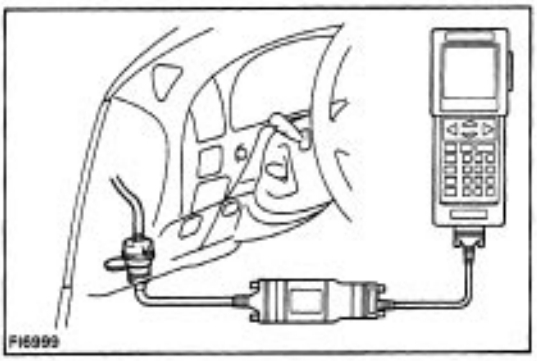
DIAGNOSTIC TROUBLE CODE CLEARANCE

1. After repair of the trouble areas, the diagnostic trouble code retained in the ECM memory must be cleared out by removing the E F I fuse (15A) from J/13 No. 2 for 10 seconds or more, with the ignition switch OFF.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
- If it is necessary to work on engine components requir–ing removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

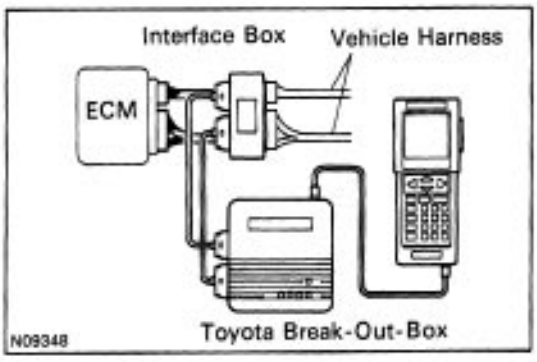
2. After cancellation, road test the vehicle to check that a normal code is now read on the malfunction indicator lamp.
   If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly.



ECM DATA MONITOR USING TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA hand–held tester to the D LC2.
2. Monitor the ECM data by following the prompts on the tester screen.

HINT: TOYOTA hand–held tester has a "Snapshot" function which records the monitored data.
Please refer to the TOYOTA hand–held tester operator's manual for further details.



ECM TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.
2. Read the ECM input/output values by following the prompts on the tester screen.

HINT: TOYOTA hand–held tester has "Snapshot" func–tion. This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the TOYOTA hand–held tester/Toyota break–out–box operator's manual for further details.

DIAGNOSTIC TROUBLE CODE CHART

HINT: Parameters listed in the chart may not be exactly same as your reading due to type of the instruments or other factors.

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
	 BE3931	Normal	No code is recorded.
12	 BE3931	G, NE Signal Circuit (No. 1) (Exc. California spec.)	No NE signal to ECM within 2 sec. or more after cranking.
			No G signal to ECM for 3 sec. or more with engine speed between 600 rpm and 4,000 rpm.
		G, N E Signal Circuit (No. 1) (Only for California spec,)	No N E or G 1 and G2 signal to ECM for 2 sec. or more after cranking.
			Open in G (–) circuit
13	 BE3931	G, NE Signal Circuit (No. 2)	No NE signal to ECM for 0.3 sec. or more at 1,500 rpm or more.
			No G signal to ECM while NE signal is input 4 times to ECM when engine speed is between 500 rpm and 4,000 rpm.
			*3 No N E signal to ECM for 0.1 sec. or more at 1,000 rpm or more.
			*3 NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses.
14	 BE3931	Ignition Signal Circuit	No IGF signal to ECM for 4 consecutive IGT signals.
			*3 No IGF signal to ECM for 8 consecutive IGT signals.
16*4	 BE3931	A/T Control Signal	Fault in communications between the engine CPU and A/T CPU in the ECM

*3,*4 : See page EG1–306

If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	Malfunction Indicator Lamp*®		Memory*	See page
	Normal Mode	Test Mode		
———			—	
• Open or short in NE, G circuit • Distributor • Open or short in STA circuit 9 ECM	ON	N.A.	○	EG1–336 EG1–339
• Open or short in NE circuit • Distributor • ECM	ON	N.A.	○	E G –343
	N.A.	ON		
	ON	N.A.		
	N.A.	ON		
• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	ON	N.A.	○	EG1–344
• ECM	ON	N.A.	X	EG1–351

® : See page EG1–306

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
21	 BE3932	Main Oxygen Sensor Signal	Main oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. under conditions (a) ~ (d). (2 trip detection logic) *5 (a) Engine coolant temp.: 80 C (176 F) or more. (b) Engine speed: 1,500 rpm or more. (c) Load driving (Ex. A/T in overdrive (5th for M/T), A/C ON, Flat road, 50 mph (80 km/h)). (d)Main oxygen sensor signal voltage: Alternating above and below 0.45 V.
22	 BE3932	Engine Coolant Temp. Sensor Signal	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more.
24	 BE3932	Intake Air Temp. Sensor Signal	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.
25	 BE3932	Air–Fuel Ratio Lean Malfunction	(1) Main oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b). (2 trip detection logic)*5 (a) Engine coolant temp.: 60 C (140 F) or more. (b) Engine speed: 1,500 rpm or more.
			(2) Engine speed varies by more than 15 rpm over the preceding crankshaft position period during a period of 50 sec. or more under conditions (a) and (b). (2 trip detection logic)*5 (a) Engine speed: Idling (b) Engine coolant temp.: 60 C (140 F) or more.

*5: See page EG1–307

Trouble Area	Malfunction Indicator Lamp*®		Memory‘	See page
	Normal Mode	Test Mode		
• Main oxygen sensor circuit • Main oxygen sensor	ON	ON	○	EG1–352
• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	ON	ON	○	EG1–356
• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM	ON	ON	○	EG1–360
• Open or short in main oxygen sensor circuit • Main oxygen sensor • ignition system • ECM	ON	ON	○	EG1–363
• Open or short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Air leakage • ECM				

® : See page EG1–306

DTC No.	Number of MIL Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
26	 BE3932	Air–Fuel Ratio Rich Malfunction	Engine speed varies by more than 15 rpm over the preceding crankshaft position period during a period of 50 sec. or more under conditions (a) and (b), (2 trip detection logic)*5 (a) Engine speed: Idling (b) Engine coolant temp.:60 C (140 F) or more.
27	 BE3932	Sub Oxygen Sensor Signal	Main oxygen sensor signal is 0.45 V or more and sub oxygen sensor signal is 0.45 V or less under conditions (a) and (b). (2 trip detection logic)*5 (a) Engine coolant temp.: 80 C (176 F) or more. (b) Accel. pedal: Fully depressed for 2 sec. or more.
31	 BE3933	Manifold Absolute Pressure Sensor Signal	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more.
41	 BE3934	Throttle Position Sensor Signal	Open or short in throttle position sensor circuit for 0.5 sec. or more.
42	 BE3934	No–1 Vehicle Speed Sensor Signal (for A/T)	All conditions below are detected continuously for 8 sec. or more. (a) No.1 vehicle speed sensor signal: 0 mph (km/h) (b) Engine speed: 3,100 rpm or more. (c) Park/Neutral position switch: OFF
		No.1 Vehicle Speed Sensor Signal (for M /T)	All conditions below are detected continuously for 8 sec. or more. (a) No.1 vehicle speed sensor signal: 0 mph (km/h) (b) Engine speed: Between 3,100 rpm and 5,000 rpm. (e) Engine coolant temp.: 80 C (176 F) or more. (d) Load driving.

*5: See page EG1–307

Trouble Area	Malfunction Indicator Lamp*®		Memory*	See page
	Normal Mode	Test Mode		
• Open or short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Air leakage • ECM	ON	ON	○	EG1–363
• Open or short in sub oxygen sensor circuit • Sub oxygen sensor • ECM	ON	ON	○	EG1–369
• Open or short in manifold absolute pressure sensor circuit. • Manifold absolute pressure sensor • ECM	ON	ON	○	EG1–372
• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	ON	ON	○	EG1–376
• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Combination meter • ECM	OFF	OFF	○	EG1–380

® : See page EG1–306

DTC No.	Number of MIL Blinks	Circuit	Diagnostic trouble Code Detecting Condition
43	 BE3934	Starter Signal	No starter signal to ECM.
52	 BE3935	Knock Sensor Signal	Open or short in knock sensor circuit with engine speed between 1,200 rpm and 6,000 rpm.
71	 BE3937	EG R System Malfunction	EGR gas temp. is 70 C (158 F) or below for 50 sec. under conditions (a) and (b). (2 trip detection logic)*5 (a) Engine coolant temp.: 80 C (176 F) or more. (b) EGR operation possible (Ex. A/T in 3rd speed (5th for M/T), 55 – 60 mph (88 – 96 km/h), Flat road).
51	 BE3936	Switch Condition Signal	(1) 3 sec. or more after engine starts with closed throttle position switch OFF (IDL). (2) *4 Park/Neutral switch OFF (PNP). (Shift position in “R”, “D”, “2”, or “L” positions). (3) A/C switch ON.

*1; “ON” displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected. “OFF” indicates that the “CHECK” does not light up during malfunction diagnosis, even if a malfunction is detected. “N.A.” indicates that the item is not included in malfunction diagnosis.

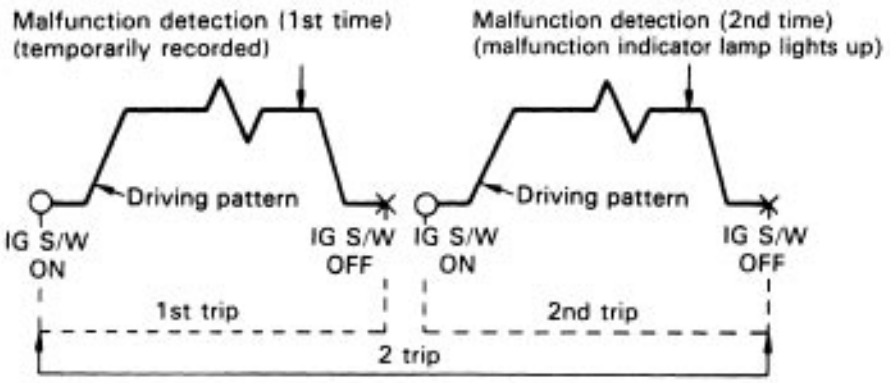
*2; “O” in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. “X” indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the IG switch ON.

*3; Only for California specification vehicles.

*4; Only vehicles with A/T.

Trouble Area	Malfunction Indicator Lamp*®		Memory*	See page
	Normal Mode	Test Mode		
• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit ECM	N.A.	OFF	X	EG1–383
• Open or short in knock sensor circuit • Knock sensor (looseness). • ECM	ON	N.A.	○	EG1–385
• open in EGR gas temp. sensor circuit • Short in VSV circuit for EGR • EGR hose disconnected, valve stuck • Clogged EGR gas passage • ECM	ON	ON	○	EG1–390
• Throttle position sensor IDL circuit • Accelerator pedal and cable • Park/Neutral Position switch circuit • A/C switch circuit • ECM	N.A.	OFF	X	EG1–396

*5: This indicates items for which “2 trip detection logic” is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up.
The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip),
In the Test Mode, the Malfunction Indicator Lamp lights up the 1st trip a malfunction is detected.



FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
14	Fuel cut	1 IGF detected in consecutive 2 (4*) ignitions.
16	Torque control prohibited.	Returned to normal condition.
22	THW is fixed at 80®C (176®F).	Returned to normal condition.
24	THA is fixed at 20®C (68®F).	Returned to normal condition.
31	• Ignition timing fixed at 5®BTDC. • Injection time fixed Starting ..... 12.1 m sec. I D L 0 N ..... 3.3 m sec. IDL OFF .... 6.1 m sec. • Intake manifold vacuum is fixed at 46.7 kPa. (350 mmHg, 13.8 inHg)	Returned to normal condition.
41	VTA1 is fixed at 0®	The following must each be repeated at least 2 time consecutively. • 0.1 V ～VTA ～ 0.95 V • IDL : ON
52	Max. timing retardation.	IG switch OFF.

*: Only for California specification vehicles.

Back–Up Function

If there is trouble with the program in the ECM and the ignition signals (IGT) are not output from microcomputer the ECM controls fuel injection and ignition timing at predetermined levels as a back–up function to make it possible to continue to operate the vehicle.

Furthermore, the injection duration is calculated from the starting signal (STA) and the throttle position signal (IDL). Also, the ignition timing is fixed at the initial ignition timing, 5®BTDC, without relation to the engine speed.

HINT: If the engine is controlled by the back–up function, the malfunction indicator lamp lights up to warn the driver of the malfunction but the diagnostic trouble code is not output.

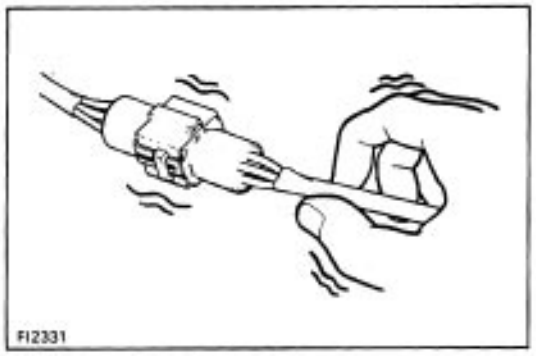
CHECK FOR MOMENTARY INTERRUPTION

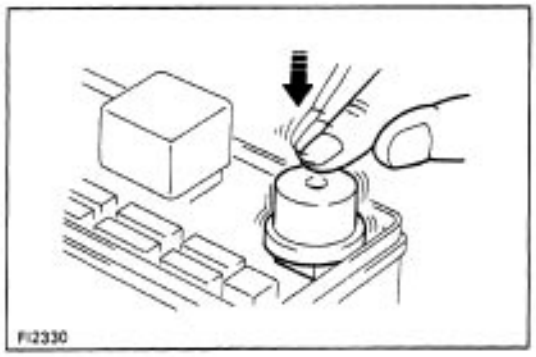
As described in the preceding paragraph, abnormality detec–tion ability in the test mode is increased compared to that in the normal mode, so that when momentary interruptions or momentary shorts occur in the ECM signal circuits (G, NE, THW, THA, PIM, VTA) shown in the table below, the appro–priate diagnostic trouble code is output.

Accordingly, when the diagnostic trouble codes shown in the table below (13, 22, 24, 31, 41) are output during the diag–nostic trouble code check, and inspection of the appropriate circuits reveals no abnormality, perform the check for momen–tary interruption as described below.

By performing the check for momentary interruption, the place where momentary interruptions or momentary shorts are occurring due to poor contacts can be isolated.

DTC	Circuit
13	G, NE signal circuit (No.2)
22	Engine coolant temp. sensor circuit
24	Intake air temp. sensor circuit
31	Manifold absolute pressure sensor circuit
41	Throttle position sensor circuit





CLEAR DIAGNOSTIC TROUBLE CODES

See page EG1–299.

SET TEST MODE

1. With the ignition switch off, using SST, connect the ter–minals TE2 and E1 of the data link connector 1 and 2.
   SST 09843–18020
2. Start the engine and check to see the malfunction indica–tor lamp to go off.

PERFORM A SIMULATION TEST

Using the symptom simulation (See page IN –24), apply vibra–tion to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code.

In this test, if the malfunction indicator lamp light up, it indi–cates that the place where the wire harness, connector or terminals being pulled or vibrated has faulty contact. Check that point for loose connections, dirt on the terminals, poor fit or other problems and repair as necessary.

HINT: After cancelling out the diagnostic trouble code in memory and set the test mode, if the malfunction indicator lamp does not go off after the engine is started, check thor–oughly for faulty contact, etc., then try the check again. If the malfunction indicator lamp still does not go off, check and replace ECM.

BASIC INSPECTION

When the normal code is displayed in the diagnostic trouble code check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems.
In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1 **Is battery positive voltage 11 V or more when engine is stopped?**

YES

NO → **Charge or replace battery.**

2 **Is engine cranked ?**

YES

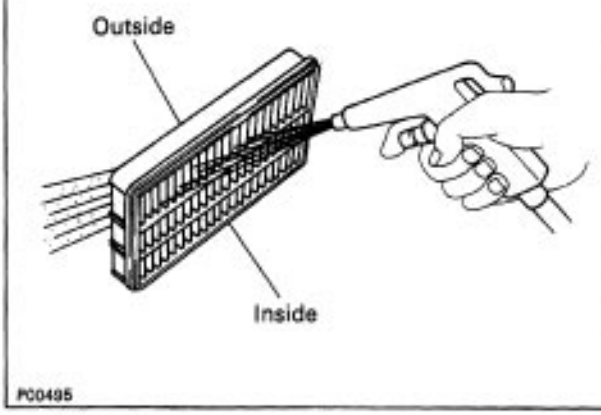
NO → **Proceed to matrix chart of problem symptoms on page EG1–327.**

3 **Does engine start**

YES

NO → **Go to step 7**

4 **Check air filter.**



P Remove air filter.

C Visually check that the air filter is not excessively damaged or oily.

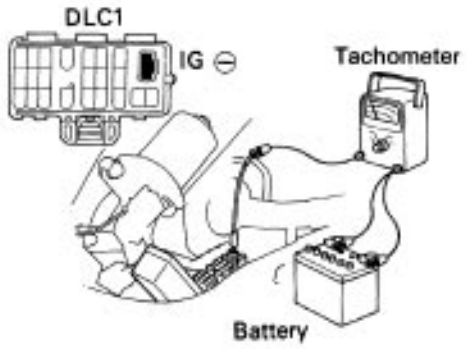
Hint If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow off outside of the air filter.

OK

NG → **Repair or replace.**

Go to step 5

5 Check idle speed.



P (1) Shift transmission into “N” position or neutral.
(2) Warm up engine at normal operating temperature.
(3) Switched off all accessories.
(4) Switched off air conditioning.
(5) Connect tachometer test probe to terminal IG (–) of data link connector 1, and set the tachometer to the 4–cylinder range.

C Check idle speed.

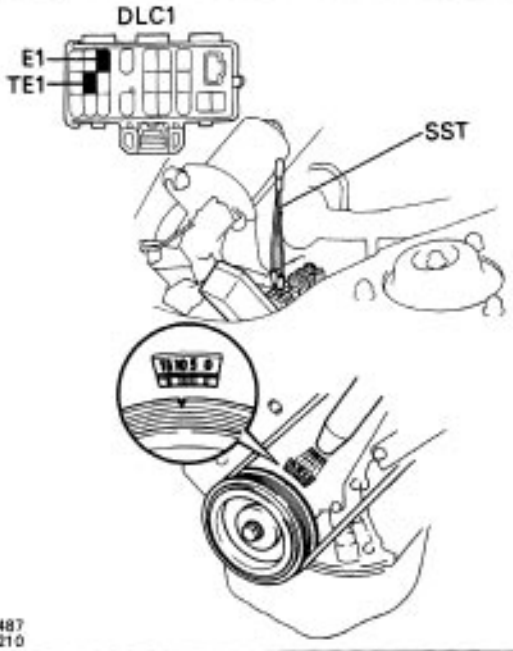
OK **Idle speed: 700 ~ 800 rpm**

Caution
- **NEVER allow tachometer test probe to touch ground as it could result in damage to igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommended that you confirm compatibility of your unit before use.**

OK

NG **Proceed to matrix chart of problem symptoms on page EG1–327.**

6 Check ignition timing.



P (1) Shift transmission into “N” position or neutral.
(2) Warm up engine at normal operating temperature.
(3) Keep the engine speed at idle.
(4) Using SST, connect terminals TE1 and E1 of data link connector 1.
SST 09843–18020
(5) Using a timing light, connect the tester to No. 1 high–tension cord.

C Check ignition timing.

OK **Ignition timing: 10®BTDC at idle**

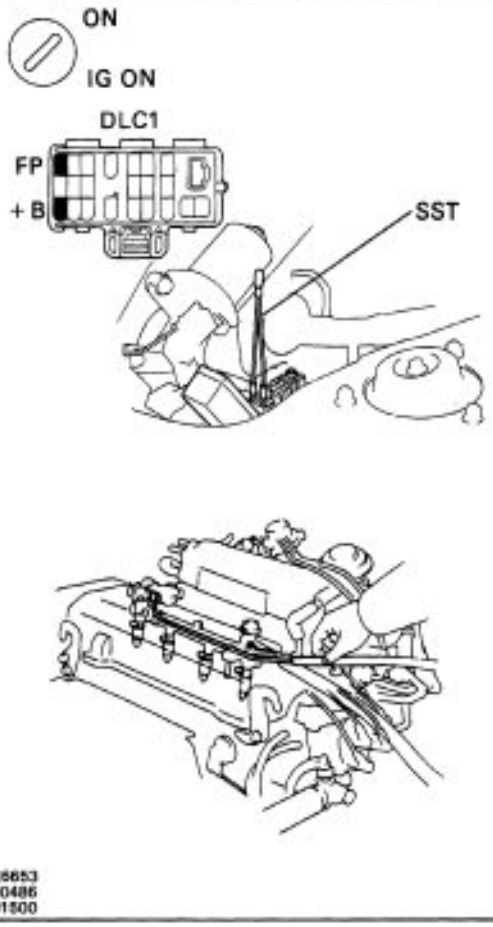
OK

NG **Proceed to page IG–19, 38* and continue to troubleshoot.**

*Except California specification vehicles.

Proceed to matrix chart of problem symptoms on page EG1–327.

7 Check fuel pressure.



P (1) Be sure that fuel is enough in tank.
(2) Turn ignition switch on.
(3) Using SST, connect terminals FP and + B of data link connector 1.
SST 09843–18020

C Check for fuel pressure in the return hose when it is pinched off.

Hint At this time, you will hear fuel return noise.

Caution **Never make a mistake with the terminal connection position as this will cause a malfunction.**

OK

NG → **Proceed to page EG1–178 and continue to troubleshoot.**

8 Check for spark.

C Disconnect the high–tension cord from the distributor and, hold the end about 12.5 mm (1/2”) from the ground, see if spark occurs while the engine is being cranked.

Hint To prevent excessive fuel injected from the injectors during this test, don’t crank the engine for more than 1–2 seconds at a time.

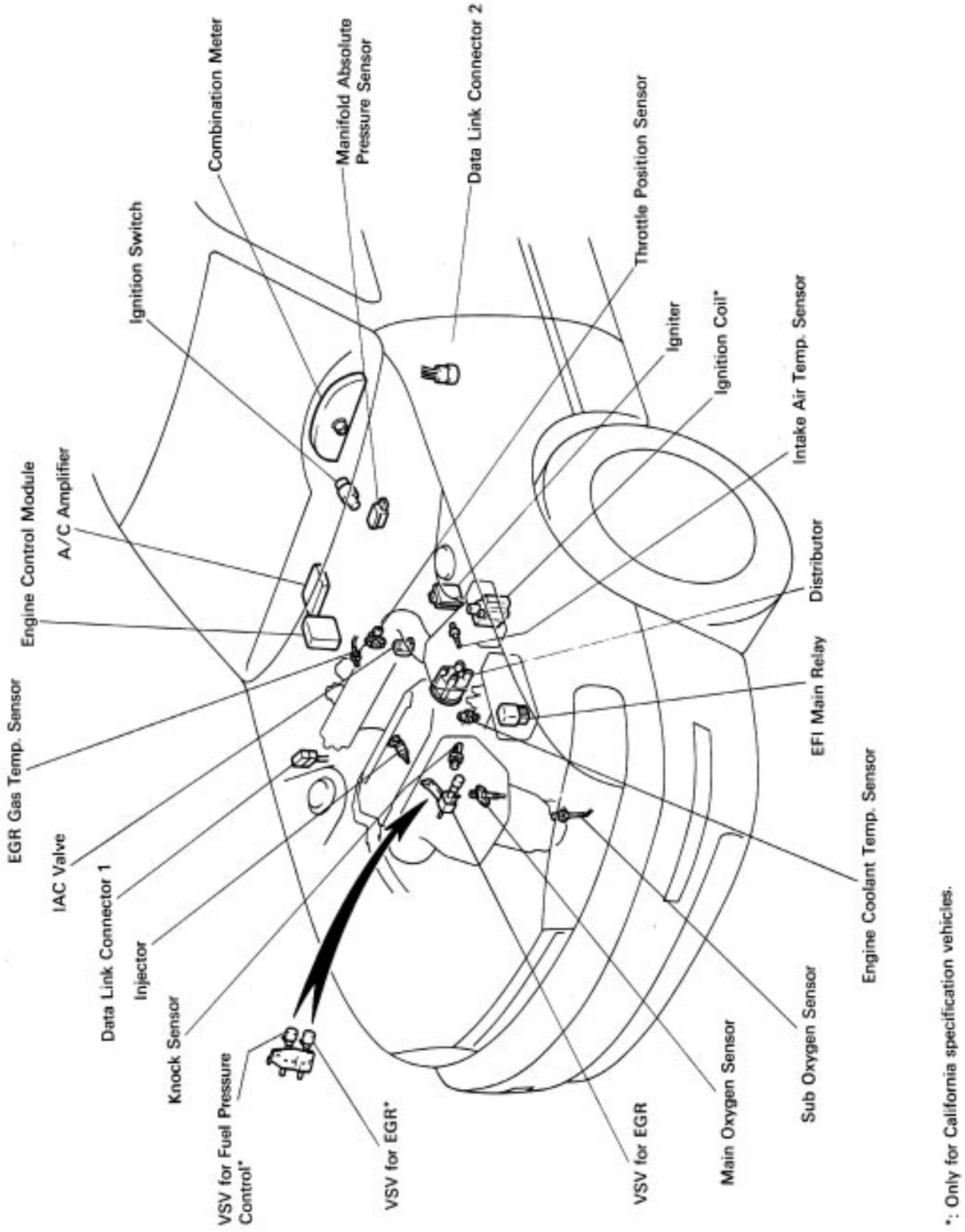
OK

NG → **Proceed to page IG–6, 26* and continue to troubleshoot.**

* : Except California specification vehicles.

Proceed to matrix chart of problem symptoms on page EG1–327.

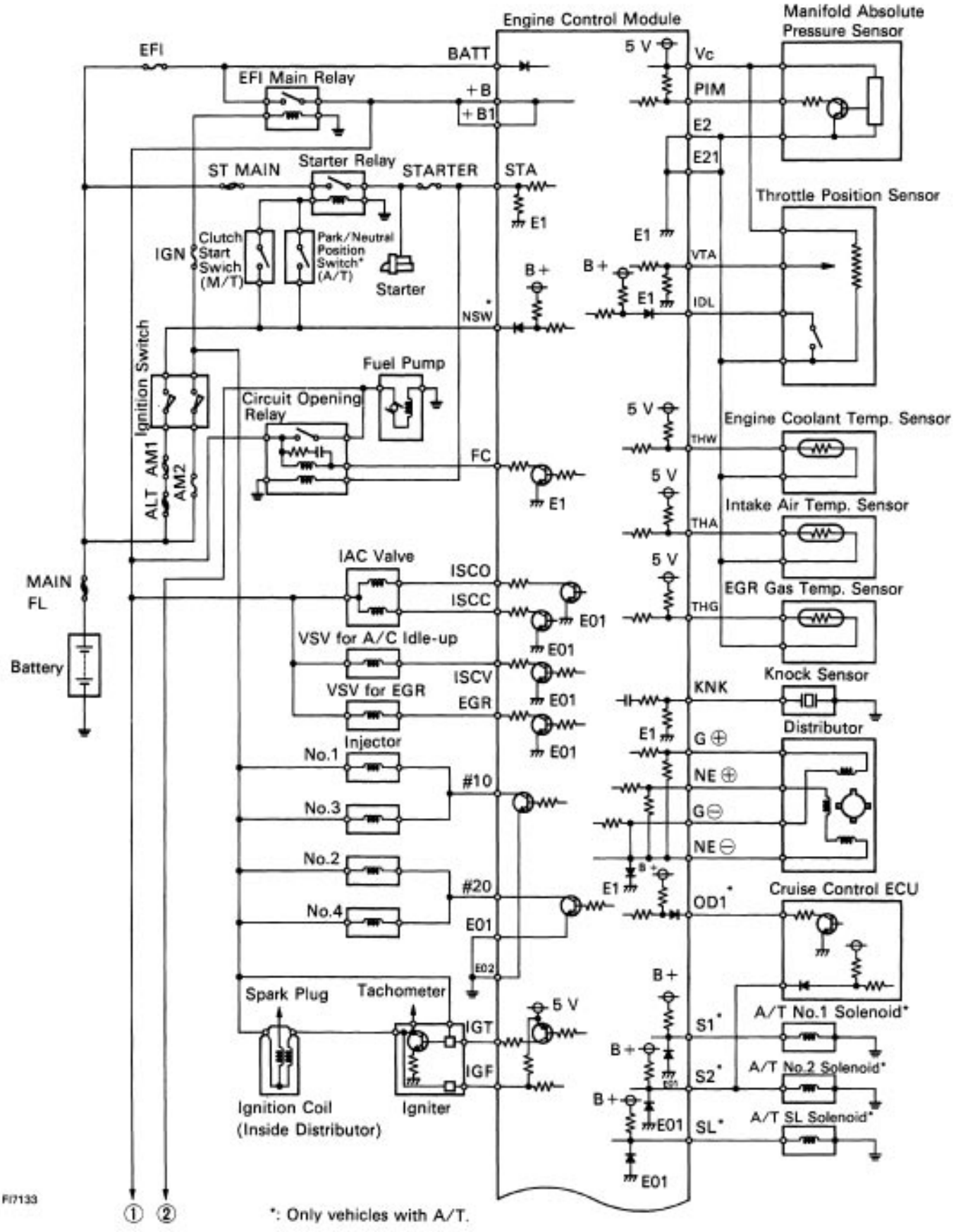
PARTS LOCATION

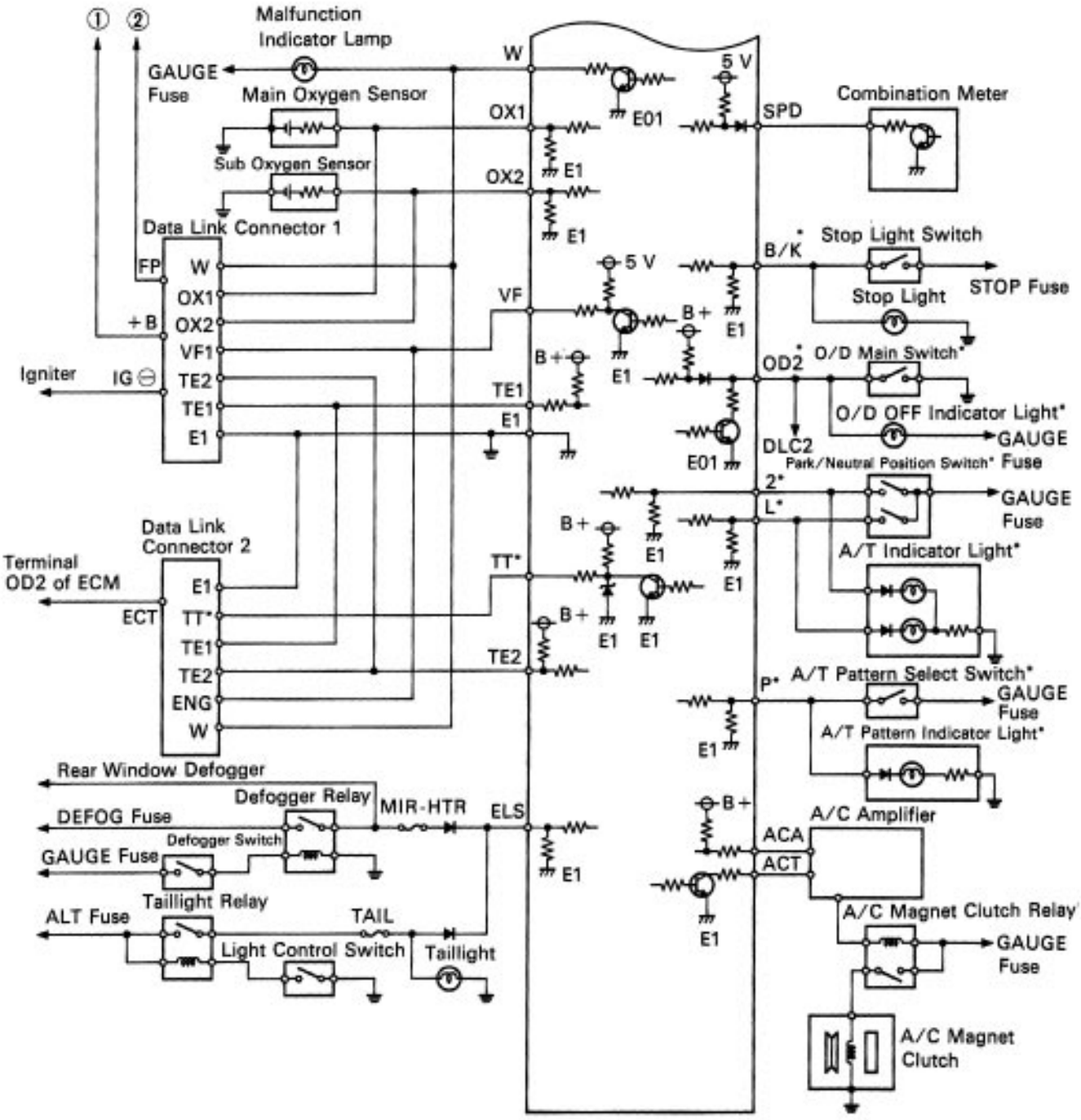


*: Only for California specification vehicles.

WIRING DIAGRAM

Except California specification vehicles.



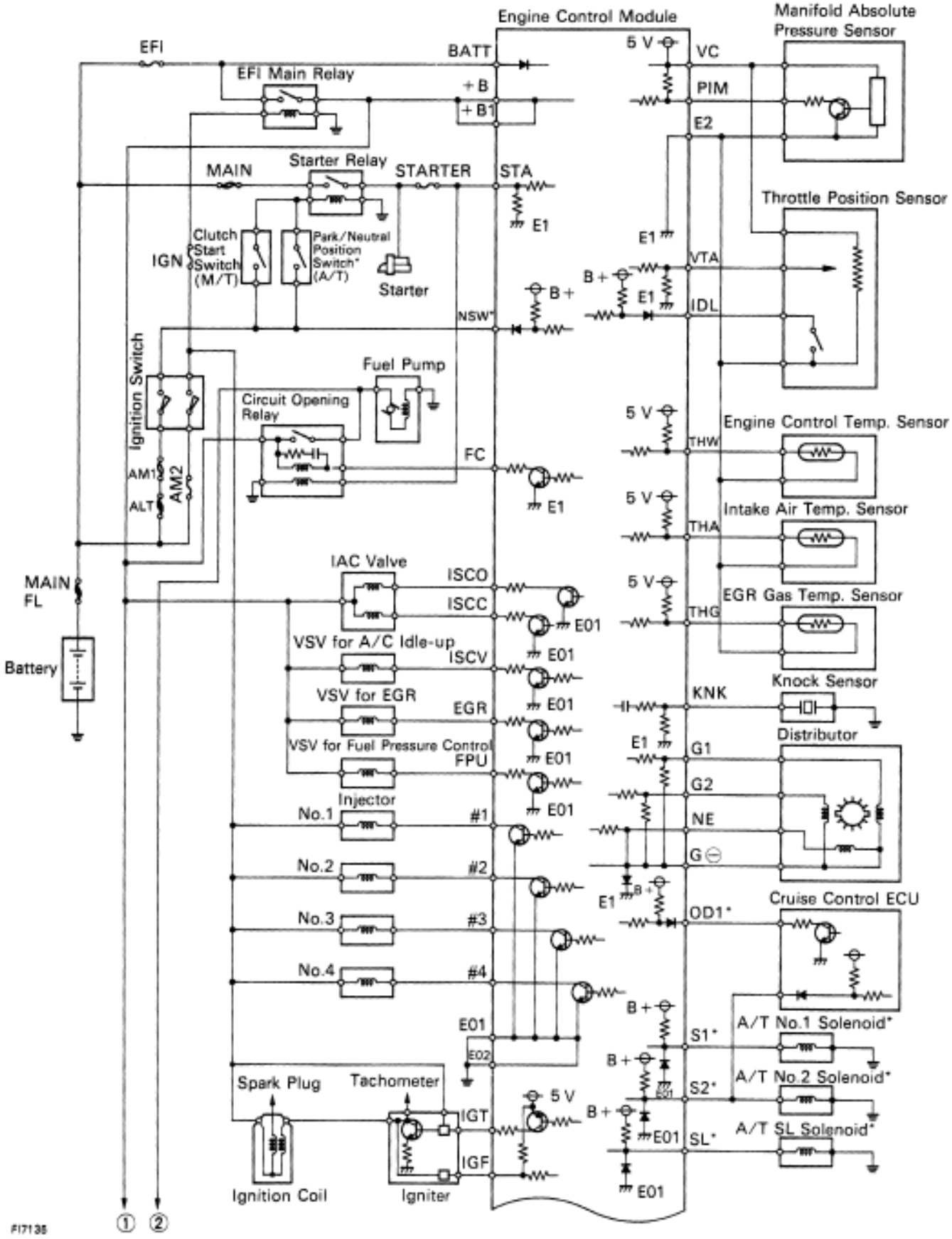


FI7134

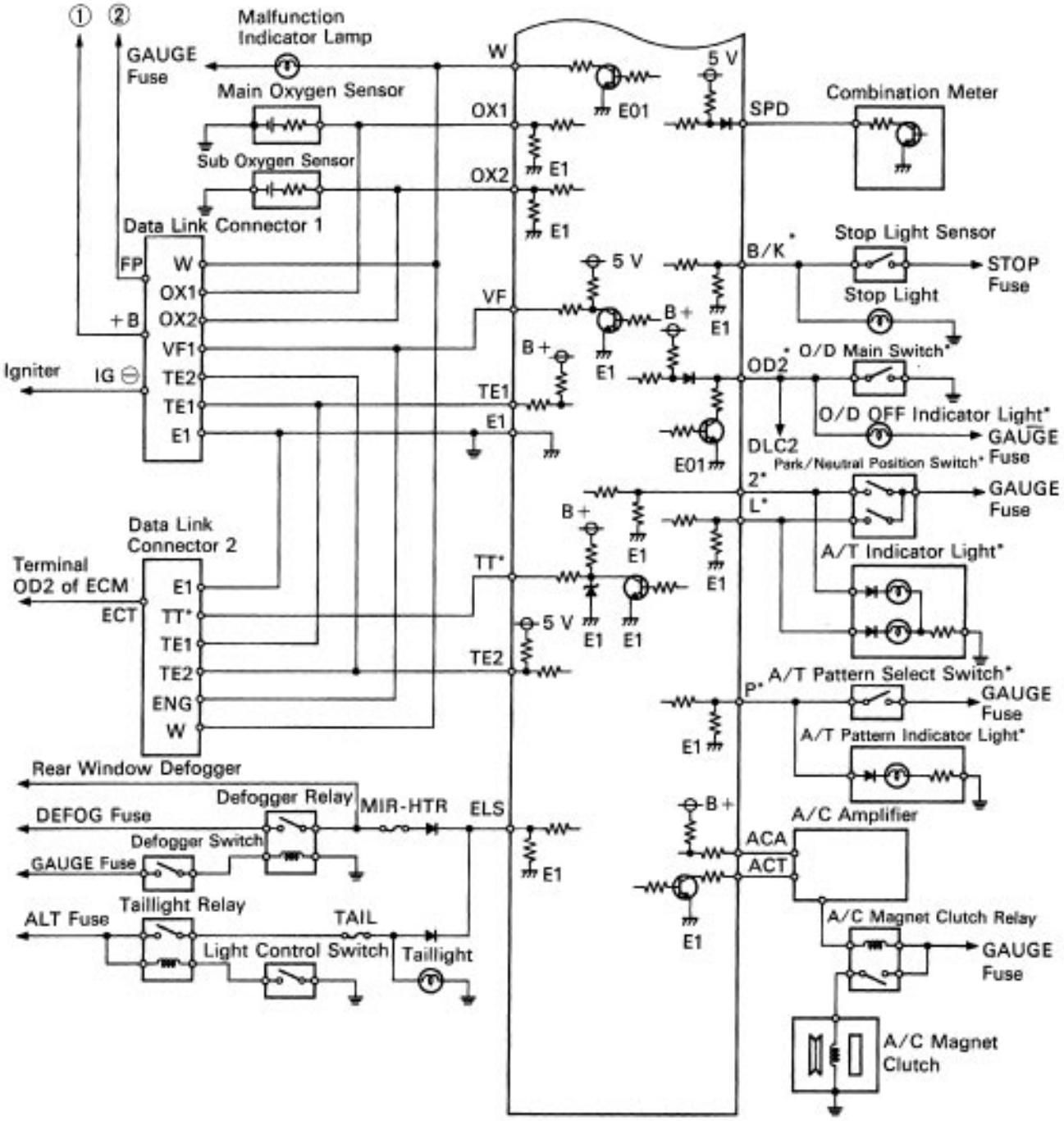
*: Only vehicles with A/T.

WIRING DIAGRAM (Cont'd)

Only for California specification vehicles.



*: Only vehicles with A/T.



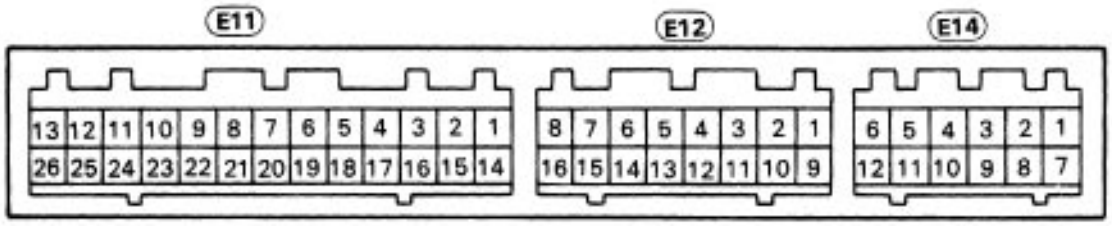
RI7134

*: Only vehicles with A/T.

TERMINALS OF ECM

When measuring the voltage or resistance of the connector part of the ECM, always insert the test probe into the connector from the wire harness side.

ECM (Except California specification vehicles with M/T)



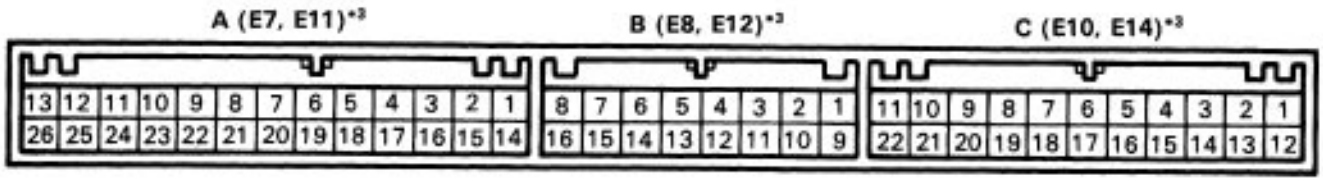
P01821

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E11– 1	ISCV	VSV for A/C Idle up	E11-11	–	———
- 2	STA	Starter relay	-12	#10	Injectors (No.1 and No.3)
- 3	IGF	Igniter	-13	E01	Power ground
- 4	NE⊕	Distributor	-14	–	———
- 5	G⊕	Distributor	-15	–	———
- 6	–	———	-16	–	———
- 7	–	———	-17	NE⊖	Distributor
- 8	–	———	-18	G⊖	Distributor
- 9	ISCC	IAC valve	-19	–	———
-10	ISCO	IAC valve	-20	–	———

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E11-21	–	———	E12-12	IDL	Throttle position sensor
-22	IGT	Igniter	-13	THG	EG R gas temp. sensor
-23	EGR	VSV for EG R	-14	–	———
-24	E1	ECM ground	-15	TE1	Data link connector 1 and 2
-25	#20	Injectors (No.2 and No.4)	-16	E21	Sensor ground
-26	E02	Power ground	E14- 1	+B1	EFI main relay
E12- 1	OX2	Sub oxygen sensor	- 2	BATT	Battery
- 2	PIM	Manifold absolute pressure sensor	- 3	ACA	A/C amplifier
- 3	THA	Intake air temp. sensor	- 4	FC	Circuit opening relay
- 4	THW	Engine coolant temp. sensor	- 5	–	———
- 5	KNK	Knock sensor	- 6	ACT	A/C amplifier
- 6	OX1	Main oxygen sensor	- 7	+B	EFI main relay
- 7	TE2	Data link connector 1 and 2	- 8	W	Malfunction indicator lamp
- 8	VF	Data link connector 1	- 9	–	———
- 9	E2	Sensor ground	-10	–	———
-10	VTA	Throttle position sensor	-11	SPD	No.1 vehicle speed sensor
-11	VC	• Manifold absolute pressure sensor • Throttle position sensor	-12	ELS	• Defogger relay • Taillight relay

TERMINAL OF ECM (Cont'd)

ECM (California specification vehicles and except California specification vehicles with A/T)



FI2796

Terminal No.*3	Symbol	Connection	Terminal No.*3	Symbol	Connection
A- 1	SL	A/T SL solenoid	A-17	G ⊖	Distributor
- 2	S1	A/T No.1 solenoid	-18	G1*1 G ⊕ *2	Distributor
- 3	IGF	Igniter	-19	–	———
- 4	NE*1 NE ⊕ *2	Distributor	-20	IGT	Igniter
- 5	G2*1 NE ⊖ *2	Distributor	-21	–	———
- 6	–	———	-22	–	———
- 7	ISCV	VSV for A/C Idle up	-23	EGR	VSV for EG R
- 8	FPU*1	VSV for fuel pressure control	-24	#4*1	No.4 injector
- 9	ISCC	IAC valve	-25	#3*1	No.3 injector
-10	ISCO	IAC valve	-26	E02	Power ground
-11	#2*1 #20*2	No.2 injector No.2 and No.4 injectors	B- 1	VC	• Manifold absolute pressure sensor • Throttle position sensor
-12	#1*1 #20*2	No.1 injector No.1 and No.3 injectors	- 2	PIM	Manifold absolute pressure sensor
-13	E01	Power ground	- 3	THA	Intake air temp. sensor
-14	E1	ECM ground	- 4	THW	Engine coolant temp. sensor
-15	S2	A/T No,2 solenoid	- 5	OX2	Sub oxygen sensor
-16	–	———	- 6	OX1	Main oxygen sensor

*® Only for California specification vehicles.
*4: Except California specification vehicles with A/T.

*3:

Connector Mark	A	B	C
ECM for A/T	E7	E8	E10
ECM for M/T	E11	E12	E14

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
B- 7	TT	Data link connector 2	C- 7	OD2	O/D main switch
- 8	VF	Data link connector 1	- 8	–	———
- 9	E2	Sensor ground	- 9	SPD	No.1 vehicle speed sensor
-10	THG	EGR gas temp. sensor	-10	ACA	A/C amplifier
-11	VTA	Throttle position sensor	-11	STA	Starter relay
-12	IDL	Throttle position sensor	-12	+B	EFI main relay
-13	KNK	Knock sensor	-13	+B1	EFI main relay
-14	TE2	Data link connector 1 and 2	-14	FC	Circuit opening relay
-15	TE1	Data link connector 1 and 2	-15	–	———
-16	E21*2	Sensor ground	-16	–	———
C- 1	BATT	Battery	-17	–	———
- 2	ELS	• Defogger relay • Taillight relay	-18	2	Park/neutral position switch
- 3	–	———	-19	L	Park/neutral position switch
- 4	B/K	• Stoplight switch • Stoplight	-20	OD1	Cruise control ECU
- 5	W	Malfunction indicator lamp	-21	ACT	A/C amplifier
- 6	P	• Park/neutral position switch	-22	NSW	Park/neutral position switch

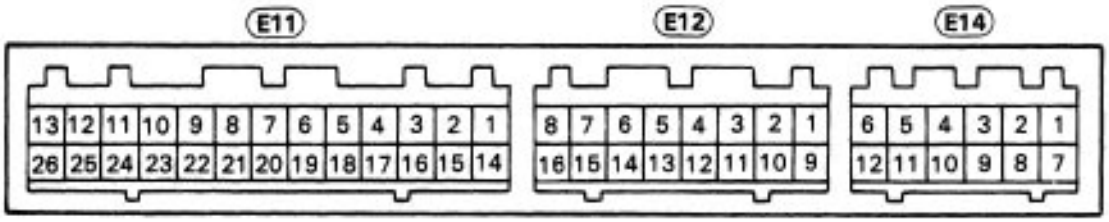
*® Only for California specification vehicles.
*4: Except California specification vehicles with A/T.

*3.

Connector Mark	A	B	C
ECM for A/T	E7	E8	E10
ECM for M/T	E11	E12	E14

STANDARD VALUE OF ECM TERMINALS

ECM (Except California specification vehicles with M/T)



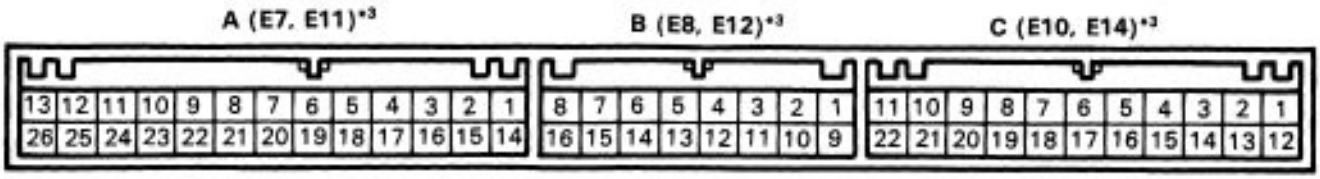
P01821

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E14-2) – E1 (E11-24)	W-L ↔ BR	9 ~ 14	Always
+B (E14-7) +B1 (E14-1) – E1 (E11-24)	B-O B-O ↔ BR	9 ~ 14	IG switch ON
VC (E12-11) – E2 (E12-9)	R ↔ BR	4.5 ~ 5.5	IG switch ON
IDL (E12 – 12) – E2 (E12-9)	L ↔ BR	0 ~ 3.0	IG switch ON and apply vacuum to the throttle opener. Throttle valve fully closed.
		9 ~ 14	IG switch ON Throttle valve fully open
VTA (E12 – 10) – E2 (E12-9)	B ↔ BR	0.3 ~ 0.8	IG switch 0 N Throttle valve fully closed
		3.2 ~ 4.9	IG switch ON Throttle valve fully open
PIN (E12-2) – E2 (E12-9)	B-Y ↔ BR	3.3 ~ 3.9	IG switch ON
		2.5 ~ 3.1	Idling
THA (E12-3) – E2 (E12-9)	L-B ↔ BR	0.5 ~ 3.4	Idling, Intake air temp. 20°C (68°F)
THW (E12-4) – E2 (E12-9)	LG ↔ BR	0.2 ~ 1.0	Idling, Engine coolant temp, 80°C (176°F)
#10 (E11-12) – E01 (E11-13) #20 (E11-25) – E02 (E11-26)	W ↔ W-B Y ↔ W-B	9 ~ 14	IG switch ON
		Pulse generation	Idling
IGT (E11-22) – E1 (E11-24)	W ↔ BR	Pulse generation (See page EG1–347)	Idling
IGF (E11-3) – E1 (E11-24)	W-R ↔ BR	Below 2.0	IG switch ON
		Pulse generation (See page EG1–347)	Idling
G ⊕ (E11-5) – G ⊖ (E11-18)	Y ↔ B	Pulse generation (See page EG1–336)	Idling
NE ⊕ (E11-4) – NE ⊖ (E11-17)	R ↔ L	Pulse generation (See page EG1–336)	Idling

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
ISCC (E11-9) ISCO (E11-10) – E01 (E11-3)	G-R G-Y ↔ W-B	9 ~ 14	IG switch ON
VF (E12-8) – E1 (E11-24)	R-W ↔ BR	1.8 ~ 3.2	Maintain engine speed at 2,500 rpm for 2 minutes after warming up then return to idling
OX1 (E12-6) – E1 (E11-24)	W ↔ BR	Pulse generation (See page EG1–355)	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
EGR (E11-23) – E01 (E11-13)	G ↔ W-B	9 ~ 14	IG switch ON
KNK (E12-5) – E1 (E11-24)	W ↔ BR	Pulse generation (See page EG1–389)	Idling
SPD (E14-11) – E1 (E11-24)	V-Y ↔ BR	Pulse generation (See page EG1–380)	IG switch ON Rotate driving wheel slowly
TE1 (E12-15) – E1 (E11-24)	GR ↔ BR	9 ~ 14	IG switch ON
TE2 (E12-7) – E1 (E11-24)	G-W ↔ BR	9 ~ 14	IG switch ON
W (E14-8) – E1 (E11-24)	G-R ↔ BR	9 ~ 14	Idling
		Below 3.0	IG switch ON
ACA (E14-3) – E1 (E11-24)	B-Y ↔ BR	Below 1.5	A/C switch ON (at idling)
		9 ~ 14	A/C switch OFF
ISCV (E11-1) – E01 (E11-13)	LG ↔ W-B	Below 2.0	Idling, A/C switch ON
		9 ~ 14	Idling, A/C switch OFF

STANDARD VALUE OF ECM TERMINALS (Cont'd)

ECM (California specification vehicles and except California specification vehicles with A/T)



Symbols (Terminals No.)*3	Wiring Color	STD Voltage (V)	Condition
BATT (C-1) – E1 (A-14)	W-L ↔ BR	9 ~ 14	Always
+B (C-12), +B1 (C-13) – E1 (A-14)	B-O, B-O ↔ BR	9 ~ 14	IG switch ON
VC (B-1) – E2 (B-9)	R ↔ BR	4.5 ~ 5.5	IG switch ON
IDL (B-12) – E2 (B-9)	L ↔ BR	0 ~ 3.0	IG switch ON and apply vacuum to the throttle opener. Throttle valve fully closed.
		9 ~ 14	IG switch ON Throttle valve fully open
VTA (B-11) – E2 (B-9)	B ↔ BR	0.3 ~ 0.8	IG switch ON Throttle valve fully closed
		3.2 ~ 4.9	IG switch ON Throttle valve fully open
PIM (B-2) – E2 (B-9)	B-Y ↔ BR	3.3 ~ 3.9	IG switch ON
		2.5 ~ 3.1	Idling
THA (B-3) – E2 (B-9)	L-B ↔ BR	0.5 ~ 3.4	Idling, Intake air temp. 20°C (68°F)
THW (B-4) – E2 (B-9)	LG ↔ BR	0.2 ~ 1.0	Idling, Engine coolant temp. 80°C (176°F)
#10 (#1*1) (A-12) – E01 (A-13) #20 (#2*1) (A-11) – E01 (A-13) #3*1 (A-25) – E01 (A-13) #4*1 (A-24) – E01 (A-13)	W ↔ W-B Y ↔ W-B R-L ↔ W-B R-B ↔ W-B	9 ~ 14	IG switch ON
		Pulse generation (See page EG1–410)	Idling
IGT (A-20) – E1 (A-14)	W ↔ BR	Pulse generation (See page EG1–347)	Idling
IGF (A-3) – E1 (A-14)	W-R ↔ BR	Below 2.0	IG switch ON
		Pulse generation (See page EG1–347)	Idling
G1 (A-18), G2 (A-5) – G⊖ (A-17)*1	Y, L ↔ B	Pulse generation (See page EG1–341)	Idling
NE (A-4) – G⊖ (A-17)*1	R ↔ B	Pulse generation (See page EG1–341)	Idling
G⊕ (A-18) – G⊖ (A-17)*2	Y ↔ B	Pulse generation (See page EG1–336)	Idling
NE⊕ (A-4) – NE⊖ (A-5)*2	R ↔ L	Pulse generation (See page EG1–336)	Idling

*1: Only for California specification vehicles.
*2: Except California specification vehicles with A/T.

*3.

Connector Mark	A	B	C
ECM for A/T	E7	E8	E10
ECM for M/T	E11	E12	E14

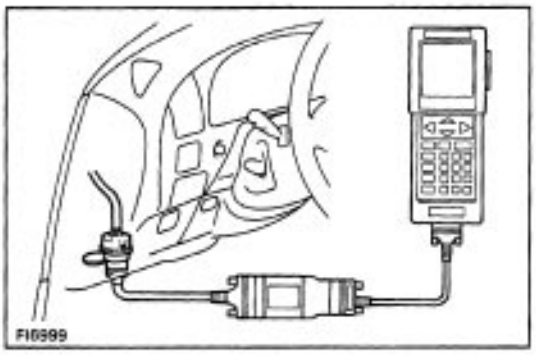
Symbols (Terminals No.)*3	Wiring Color	STD Voltage (V)	Condition
ISCC (A-9) ISCO (A-10) – E01 (A-13)	G-R G-Y ↔ W-B	9 ~ 14	IG switch ON
VF (B-8) – E1 (A-14)	R-W ↔ BR	1.8 ~ 3.2	Maintain engine speed at 2,500 rpm for 2 minutes after warming up then return to idling
OX1 (B-6) – E1 (A-14)	W ↔ BR	Pulse generation (See page EG1–355)	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
EGR (A-23) – E01 (A-13)	G ↔ W-B	9 ~ 14	IG switch ON
KNK (B-13) – E1 (A-14)	W ↔ BR	Pulse generation (See page EG1–389)	Idling
NSW (C-22) – E1 (A-14)	B-W ↔ BR	9 ~ 14	IG switch ON Other shift position in “P”, “N” position
		0 ~ 3.0	IG switch ON Shift position in “P”, “N” position
SPD (C-9) – E1 (A-14)	V-Y ↔ BR	Pulse generation (See page EG1–380)	IG switch ON Rotate driving wheel slowly
TE1 (B-15) – E1 (A-14)	GR ↔ BR	9 ~ 14	IG switch ON
TE2 (B-14) – E1 (A-14)	G-W ↔ BR	9 ~ 14	IG switch O N
W (C-5) – E1 (A-14)	G-R ↔ BR	9 ~ 14	Idling
		Below 3.0	IG switch ON
OD1 (C-20) – E1 (A-14)	Y-B ↔ BR	9 ~ 14	IG switch ON
OD2 (C-7) – E01 (A-13)	G-O ↔ W-B	9 ~ 14	IG switch ON O/D main switch pushed in
		Below 1.0	IG switch ON 0/D main switch pushed out
ACA (C-8) – E1 (A-14)	B-Y ↔ BR	Below 1.5	A/C switch ON (At idling)
		9 ~ 14	A/C switch OFF
ISCV (A-7) – E01 (A-13)	LG ↔ W-B	Below 2.0	Idling, A/C switch ON
		9 ~ 14	Idling, A/C switch OFF
FPU (A-8) – E01 (A-13)*1	B-R ↔ W-B	9 ~ 14	IG switch ON
		Below 2.0	Restarting at high engine coolant temp.

*1: Only for California specification vehicles.

*3:

Connector Mark	A	B	C
ECM for A/T	E7	E8	E10
ECM for M/T	E11	E12	E14

REFERENCE VALUE OF ECM DATA



HINT: ECM data can be monitored by TOYOTA hand–held tester.

1. Hook up the TOYOTA hand–held tester to the DLC2.
2. Monitor ECM data by following the prompts on the tester screen.

Please refer to the TOYOTA hand–held tester operator's manual for further details.

REFERENCE VALUE

Item	Inspection condition	Reference value
INJECTOR	Engine cold to hot Engine idling at normal operating temp.	Gradually decreases Approx. 2 ~ 5 msecs
IGNITION	Increase engine speed	Gradually increases
IAC DUTY	Engine idling at normal operating temp.	30~60%
ENGINE SPEED	RPM kept stable (Comparison with tachometer)	No great changes
MAP	Engine idling at normal operating temp. increase engine load	Approx. 180 ~ 280 mm Hg Gradually increases
ECT	Engine at normal operating temp.	75 – 951C (185 – 2031F) *1
THROTTLE	Closed throttle position Wide open throttle From closed throttle position to wide open throttle	Below 51 Above 701 Gradually increases
VEHICLE SPD	During driving (Comparison with speedometer)	No large differences
TARGET A/F L	Engine idling at normal operating temp.	2.50± 1.25 V *2
A/F FB LEFT	RPM stable at 2,500 rpm with normal operating temp.	ON
STA SIGNAL	During cranking	ON
CTP SIGNAL	Closed throttle position	ON
A/C SIGNAL	A/C switch ON	ON
PNP SIGNAL *3	When shifting from "P" or "N" position into a position other than "P" or "N"	G EAR
OxL	PRM stable at 2,500 rpm with normal operating temp.	RICH LEAN is repeated

*1: If the engine coolant temp, sensor circuit is open or shorted, the ECM assumes an engine coolant temp, value of 801C (1761F).
*2: When feedback control is forbidden, 0 V is displayed,
*3: A/T only.

MATRIX CHART OF PROBLEM SYMPTOMS

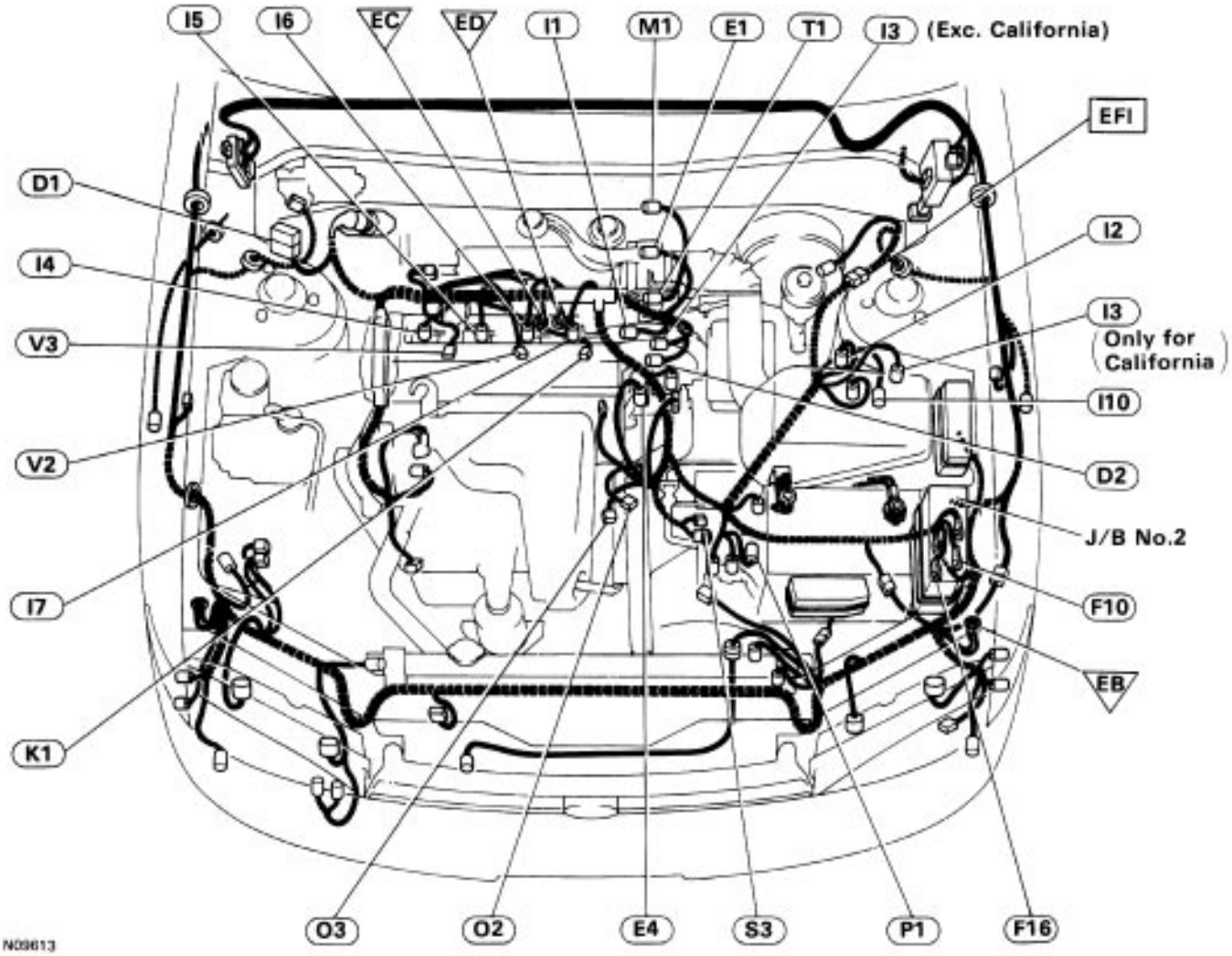
When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Symptom	Suspect area	See page	Manifold absolute pressure sensor circuit	Starter signal circuit	EG R system	Switch condition signal circuit	Park/Neutral position switch circuit	ECM power source circuit	Back up power source circuit	Injector circuit	IAC valve circuit	Fuel system circuit	A/C cut control circuit	VSV circuit for fuel pressure control	Starter and Starter relay	Ignition signal circuit (Spark test)	Spark plug	Ignition coil	Distributor	Compression	A/T faulty	Engine control module
			EG1–372	EG1–383	EG1–390	EG1–396	EG1–400	EG1–403	EG1–408	EG1–410	EG1–415	EG1–419	EG1–428	EG1 –424	ST–19,21	IG–6,26*	IG–8,28*	IG–10,30*	IG–11,30	EG1–23	AX1–68	IN–36
Does not start	Engine does not crank						2								1							
	No initial combustion							1		5		3				2	4					
	No complete combustion									6		1				5	4	2	3			
Difficult to start	Under normal condition			1						8	2	3					6	4	5	7		
	Cold engine			1						4	2	3					7	5	6			
	Hot engine			1						5	2	4		3			8	6	7			
Poor Idling	Incorrect first idle					1					2											
	High engine idle speed					1	4	3	5		2											
	Low engine idle speed		6			2	3		7	5	1	4										
	Rough idling		3		5	1			12	4	2	8				6	11	9	10	7		
	Hunting		3			1		4			2	5										
Poor Driveability	Hesitation/Poor acceleration		2			1				3		4	9			5	8	6	7		10	
	Muffler explosion (after fire)					1				5							4	2	3			
	Surging					1				5		2					4		3			
Engine Stall	Soon after starting		2								3	1										
	After acceleration pedal depressed		2			1																
	After acceleration pedal released									1	2											3
	During A/C operation										1											2
	When N to D shift						1				2											

*: Except California specification vehicles.

LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment



Ioj-23-1-A

Ie-4-1-E

Ie-2-1-C

V-2-1-C

A-A

Ie-3-1-H

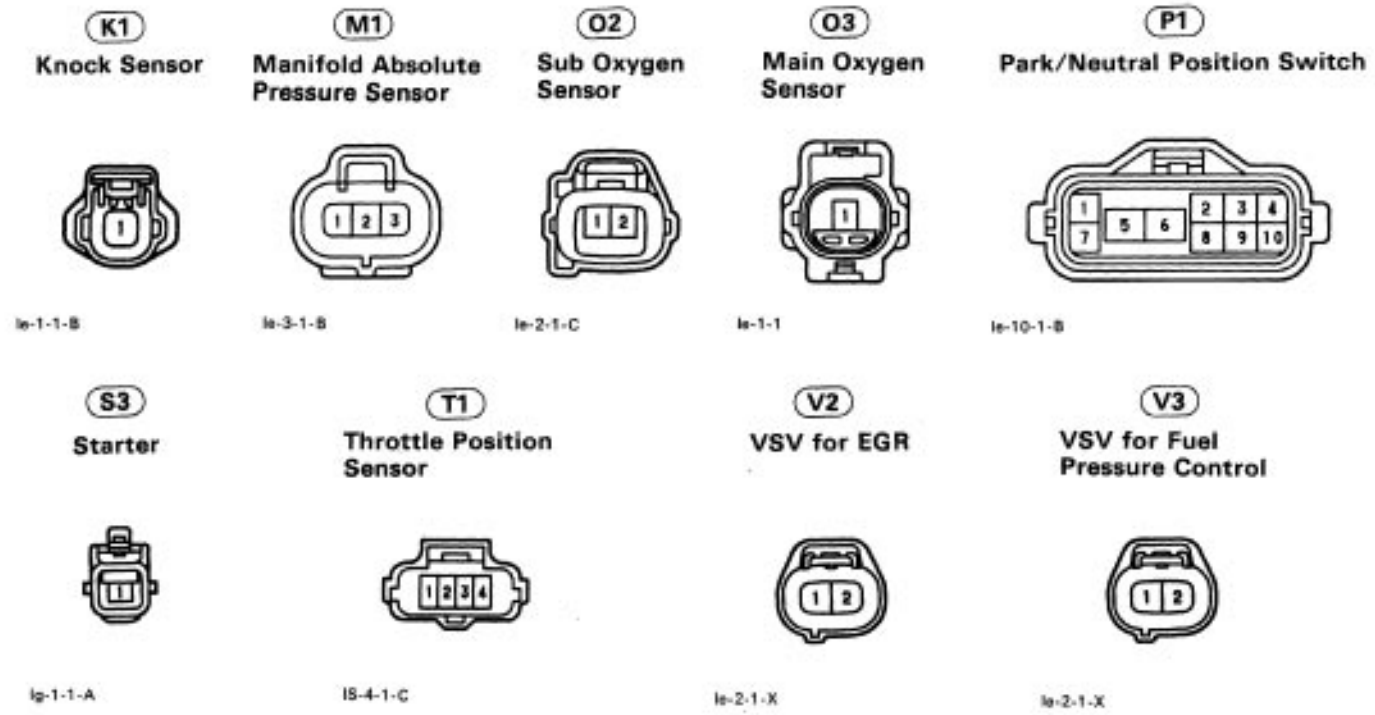
Ie-5-1

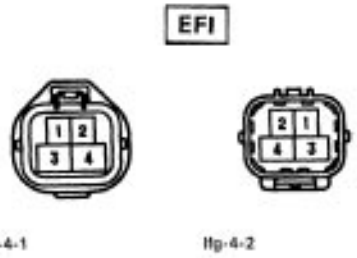
Ie-2-1-X

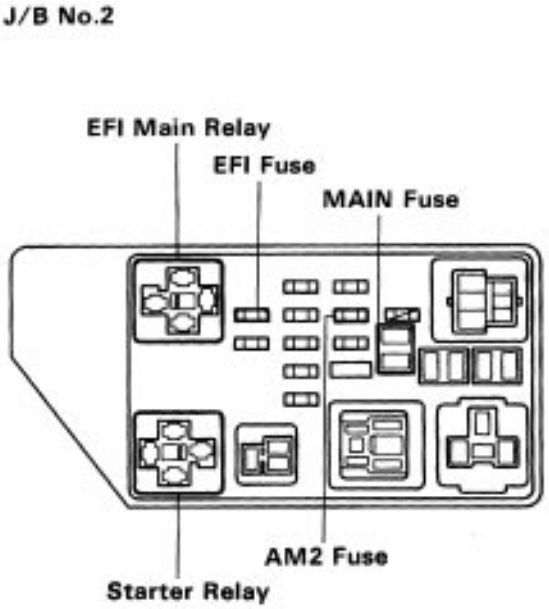
Ie-2-1-n

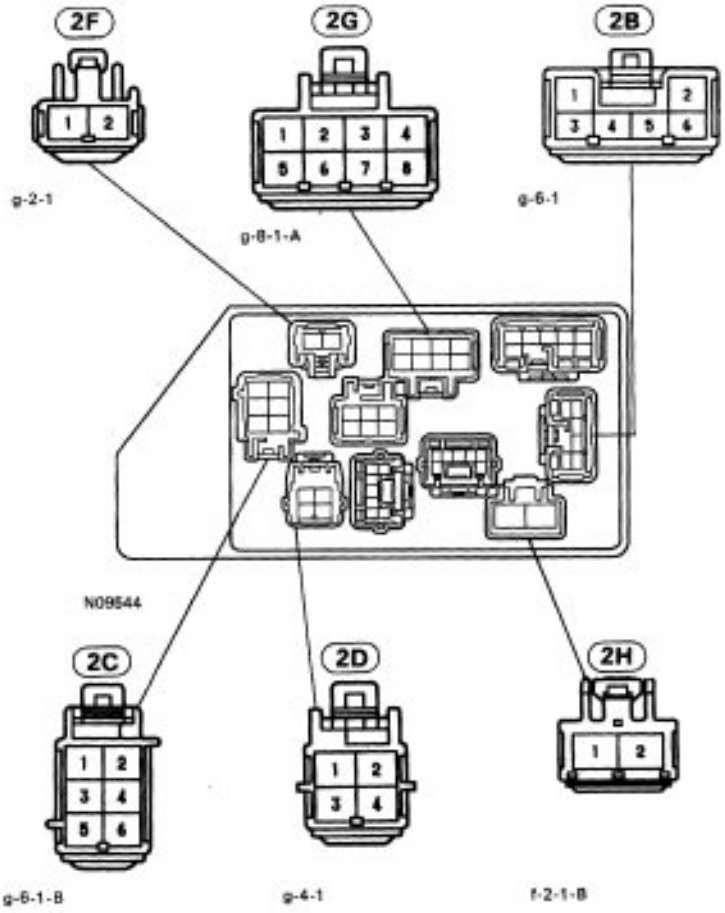
Ie-2-1-a

Ie-2-1-Z

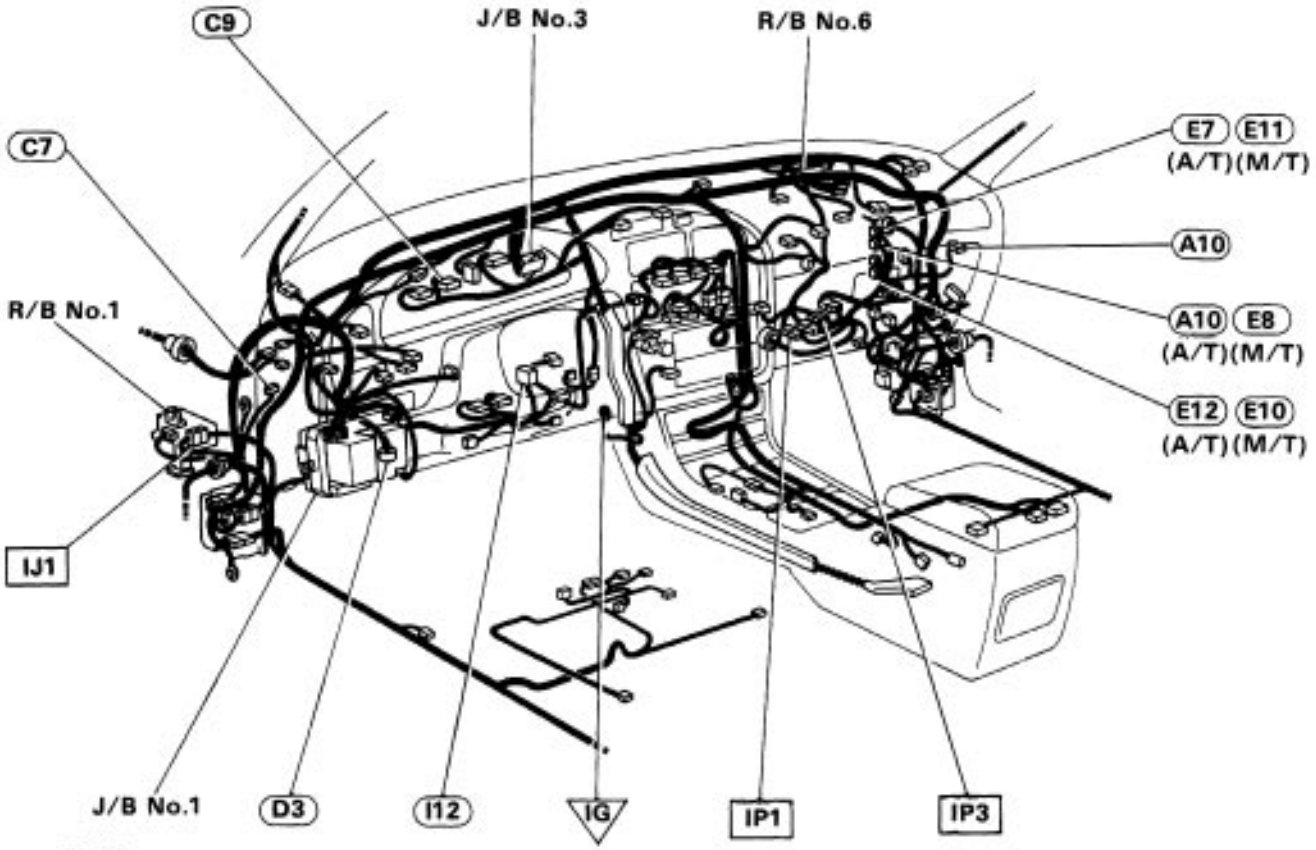

K1
Knock Sensor
M1
Manifold Absolute Pressure Sensor
O2
Sub Oxygen Sensor
O3
Main Oxygen Sensor
P1
Park/Neutral Position Switch
Ie-1-1-B
Ie-3-1-B
Ie-2-1-C
Ie-1-1
Ie-10-1-B
S3
Starter
T1
Throttle Position Sensor
V2
VSV for EGR
V3
VSV for Fuel Pressure Control
Ig-1-1-A
IS-4-1-C
Ie-2-1-X
Ie-2-1-X


EFI
Ifg-4-1
Ifg-4-2


J/B No.2
EFI Main Relay
EFI Fuse
MAIN Fuse
AM2 Fuse
Starter Relay
FI7078


2F
2G
2B
g-2-1
g-8-1-A
g-6-1
N09544
2C
2D
2H
g-6-1-B
g-4-1
f-2-1-B

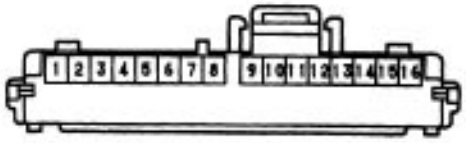
Location of Connectors in Instrument Panel



A10
A/C Amplifier

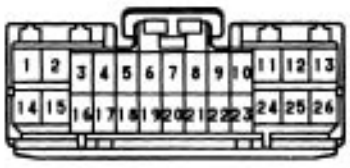
C7
Clutch Start Switch (M/T)

C9
Combination Meter

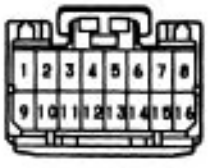


D3
Data Link Connector 2

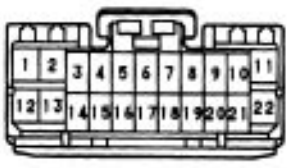
E7 (A/T)
E11 (M/T)
Engine Control Module



E8 (A/T)
E12 (M/T)
Engine Control Module



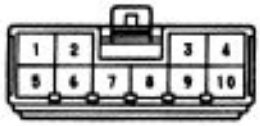
E10 (A/T)
E14 (California spec. with M/T)
Engine Control Module



E14 (Exc. California spec. with M/T)
Engine Control Module

I12

Ignition Switch



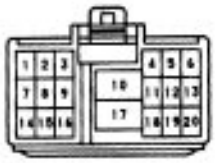
g-10-1-B

IJ1

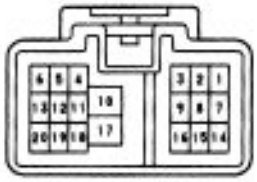
eg-19-1

eg-19-2

IP1



e-20-1-B



e-20-2-B

IP3

ef-19-1

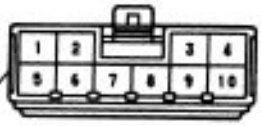
ef-19-2

!/B No.1

1E

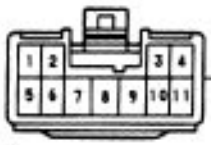
fg-5-1

1G

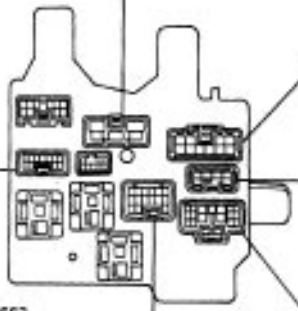


g-10-1-B

1C

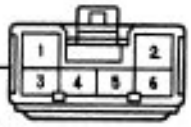


e-11-1



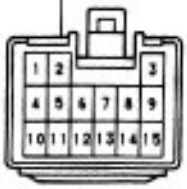
BE6663

1M



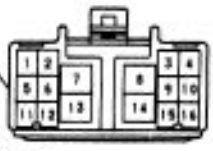
g-8-1

1D



e-15-1

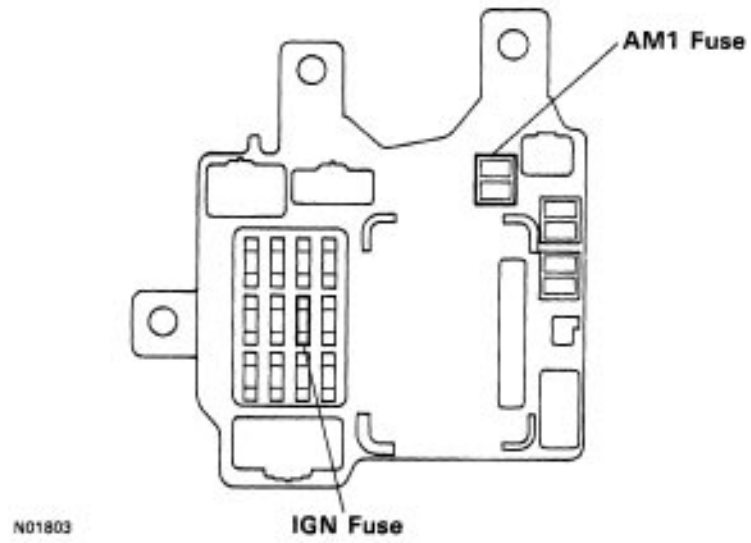
1A



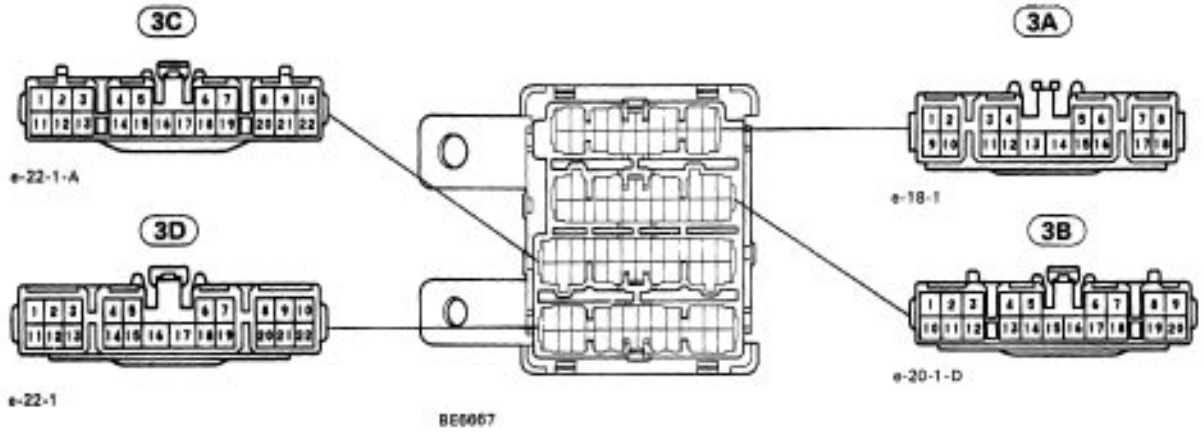
ep-16-1

Location of Connectors in Instrument Panel (Cont'd)

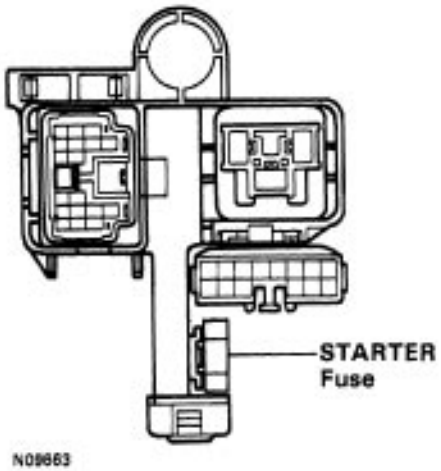
J/B No.1



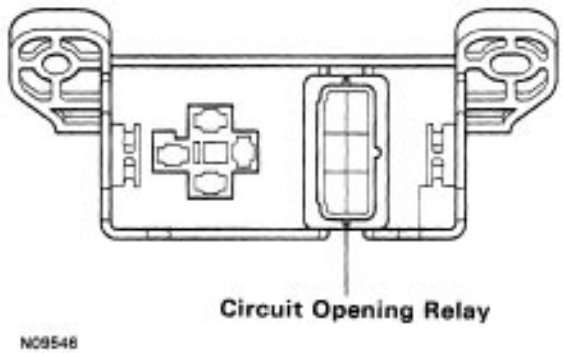
J/B No.3



R/B No.1

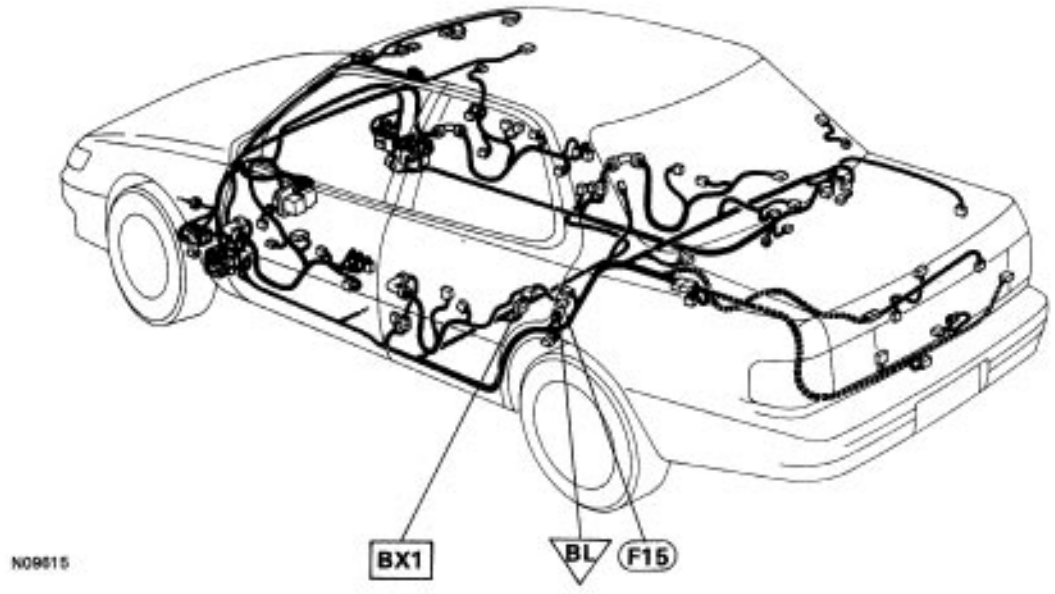


R/B No.6

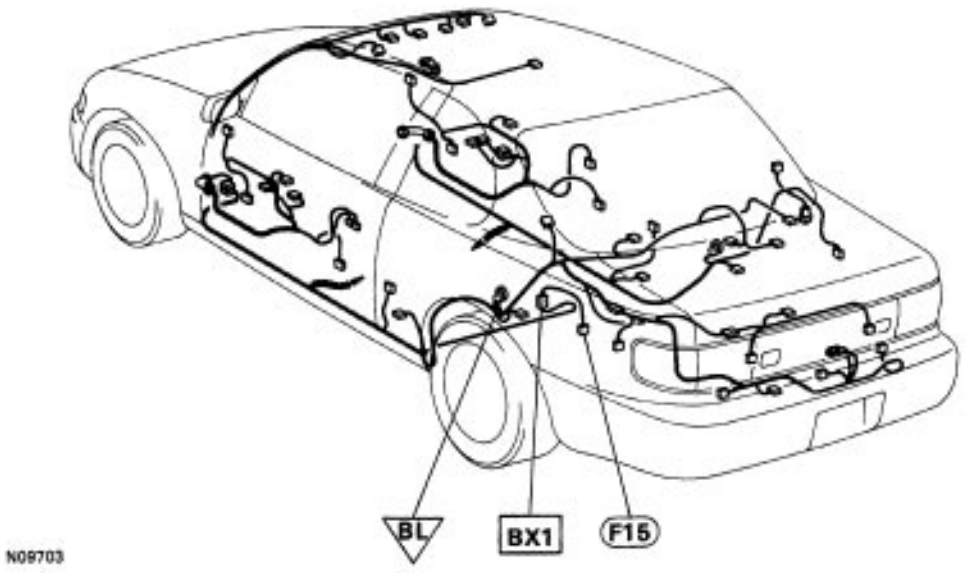


Location of Connectors in Body

Sedan

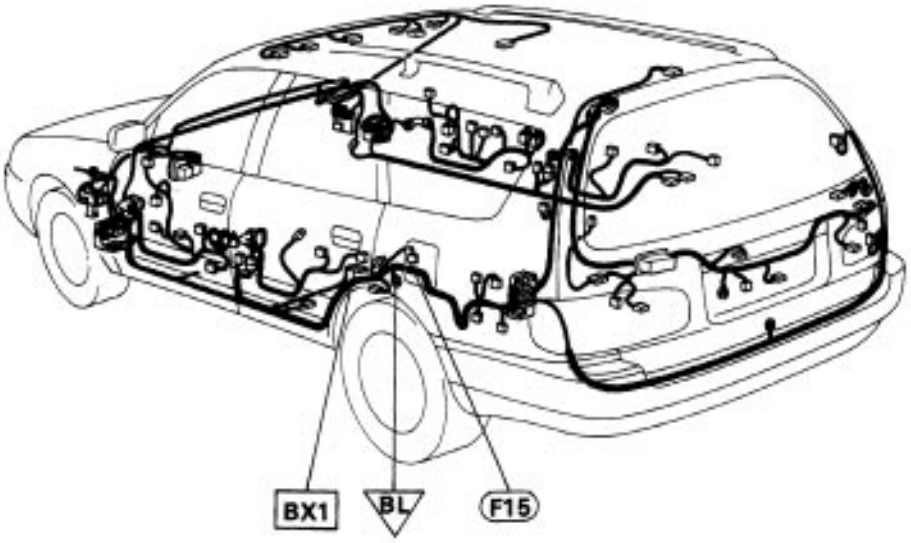


Coupe



Location of Connectors in Body (Cont’d)

Wagon



N09704

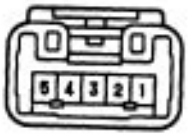
F15

Fuel Pump

Ie-5-1-A

BX1

e-5-1



e-5-2

-Memo

CIRCUIT INSPECTION

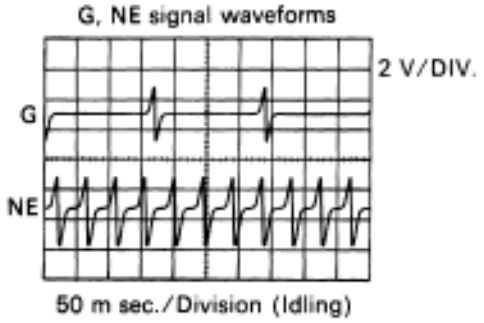
DTC 12 G NE Signal Circuit (No.1) (Exc. California spec.)

CIRCUIT DESCRIPTION

The distributor in the Engine Control System contains 3 pickup coils.
The G signals inform the ECM of the standard crankshaft position.
The NE signals inform the ECM of the crankshaft position and the engine speed.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No N E signal to ECM with 2 sec. or more after cranking.	• Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECM
	No G signal to ECM for 3 sec. or more with engine speed between 600 rpm and 4,000 rpm.	

Reference **INSPECTION USING OSCILLOSCOPE**



FI6674

- During cranking or idling, check waveforms between terminals G (+) and G (–), NE (+) and NE (–) of engine control module.

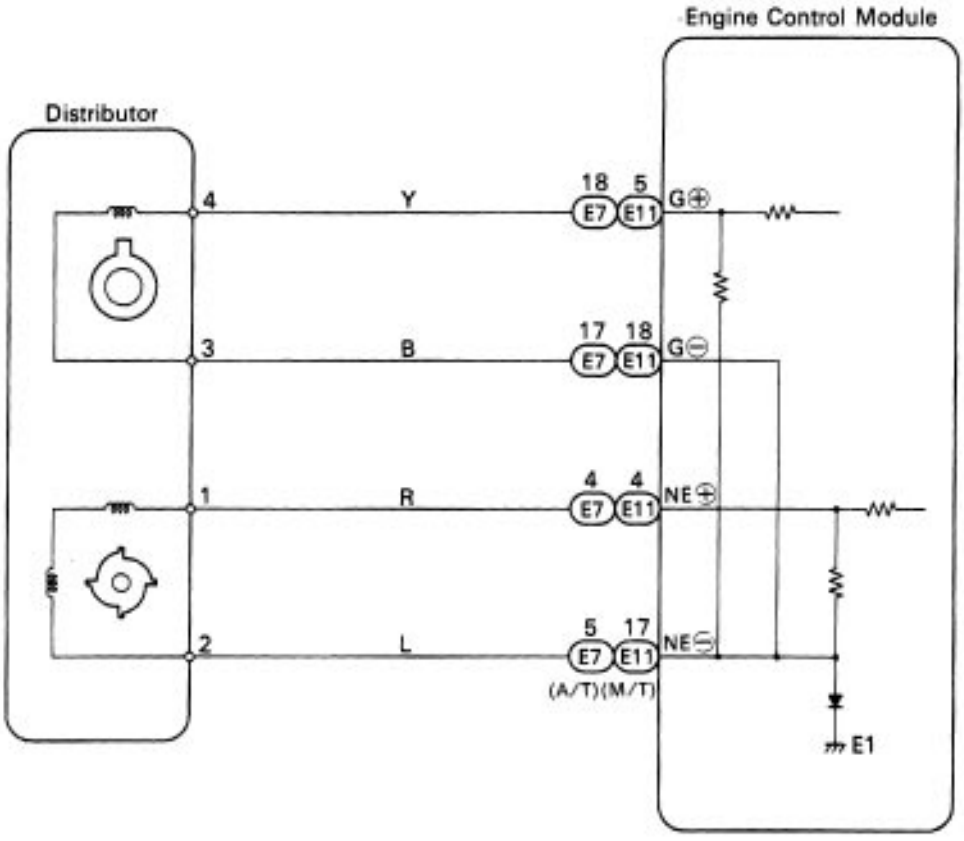
HINT: The correct waveforms appear as shown in the illustration on the left.

DIAGNOSTIC CHART

1. Check resistance of each pickup coils in distributor.
   - NG → Replace distributor housing.
   - OK ↓
2. Check for open and short in harness and connector between ECM and distributor.
   - NG → Repair or replace harness or connector.
   - OK ↓
3. Check air gap.
   - NG → Replace distributor housing.
   - OK ↓

Check and replace ECM.

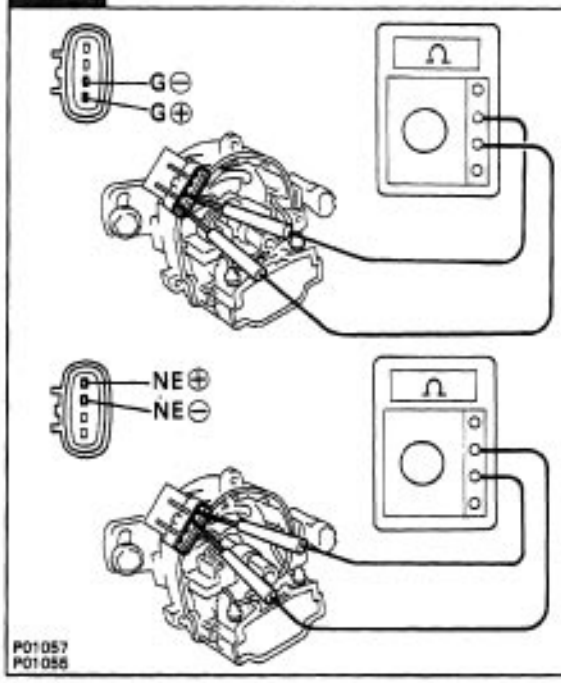
WIRING DIAGRAM



FI6690

INSPECTION PROCEDURE

1 Check resistance of each pickup coils in distributor.



P Disconnect distributor connector.

C Measure resistance between each terminal shown in table below.

OK

		Resistance
G Pickup Coil (G1 –G (–))	Cold	185 ~ 275Ω
	Hot	240 ~ 325 Ω
NE Pickup Coil (NE (+) – NE (–))	Cold	370 ~ 550Ω
	Hot	475 ~ 650Ω

"Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

OK

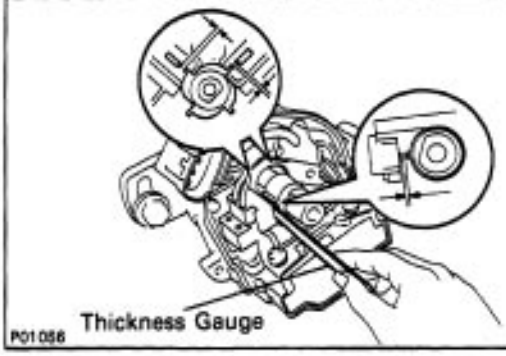
NG → **Replace distributor housing.**

2 Check for open and short in harness and connector between engine control module and distributor (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

3 Check air gap.



P Remove distributor cap and rotor.

C Using a thickness gauge, measure the air gap between the signal rotor and pickup coil projection.

OK **Air gap: 0.2 – 0.4 mm (0.008 – 0.006 in.)**

OK

NG → **Replace distributor housing.**

Check and replace engine control module.

DTC 12 G NE Signal Circuit (No.1) (Only for California spec.)

CIRCUIT DESCRIPTION

The distributor in the Engine Control System contains 3 pick–up coils (G1, G2 and NE).
The G1, G2 signals inform the ECM of the standard crankshaft angle.
The NE signals inform the ECM of the crankshaft angle and the engine speed.

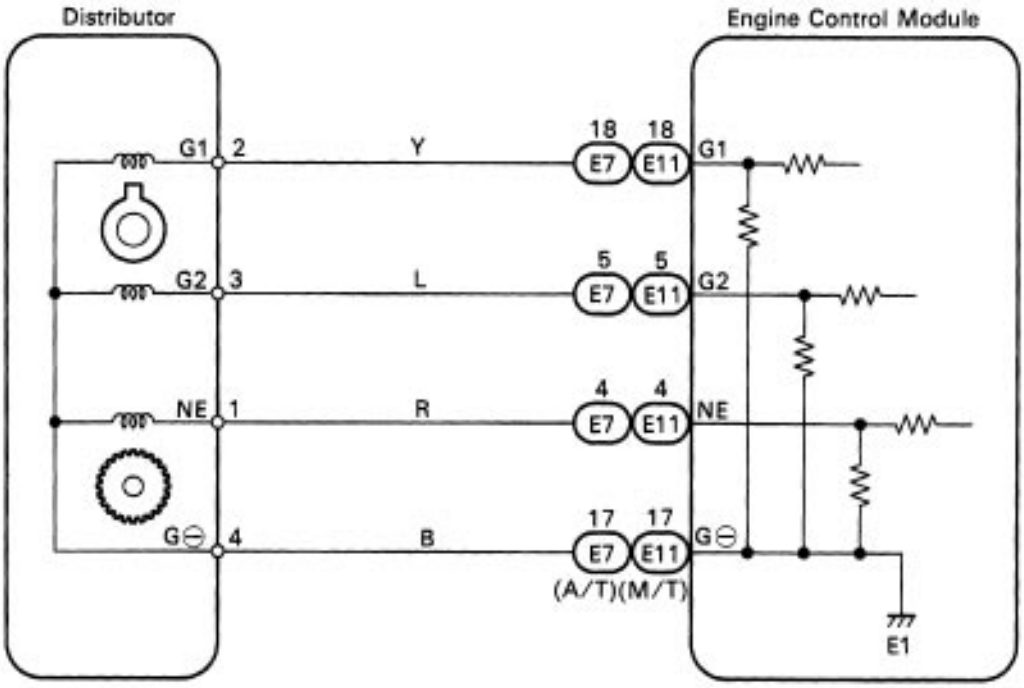
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No NE or G1 and G2 signal to ECM for 2 sec. or more after cranking.	• Open or short in NE, G circuit. • Distributor • Open or short in STA circuit. • ECM
	Open in G (–) circuit.	

DIAGNOSTIC CHART

1. Check resistance of each pickup coils in distributor.
   - NG → Replace distributor.
   - OK ↓
2. Check for open and short in harness and connector between ECM and distributor.
   - NG → Repair or replace harness or connector.
   - OK ↓
3. Check air gap.
   - NG → Replace distributor.
   - OK ↓

Check and replace ECM.

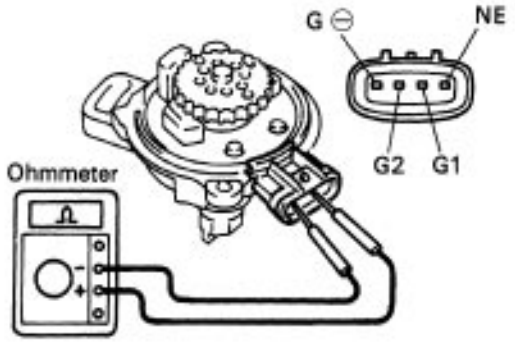
WIRING DIAGRAM



FI7177

INSPECTION PROCEDURE

1 **Check resistance of each pickup coils in distributor.**



P13791

P Disconnect distributor connector.

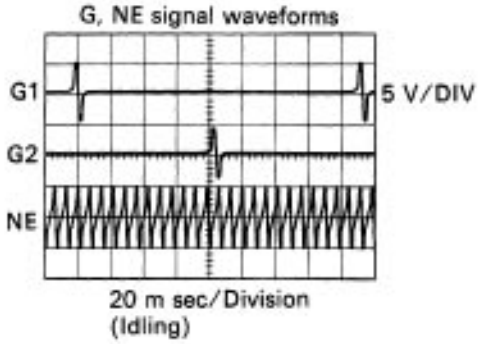
C Measure resistance between each terminal shown in table below.

OK

		Resistance
G1 pickup coil (G1 – G ⊖)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
G2 pickup coil (G2 – G ⊖)	Cold	125 ~ 200 Ω
	Hot	160 ~ 235 Ω
NE pickup coil (NE – G ⊖)	Cold	155 ~ 250 Ω
	Hot	190 ~ 290 Ω

"Cold" is from –10°C (14° F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

Reference **INSPECTION USING OSCILLOSCOPE**



FI6519

- During cranking or idling, check waveforms between terminals G1, G2, NE and G O of engine control module.

HINT: The correct waveforms appear as shown in the illustration on the left.

OK

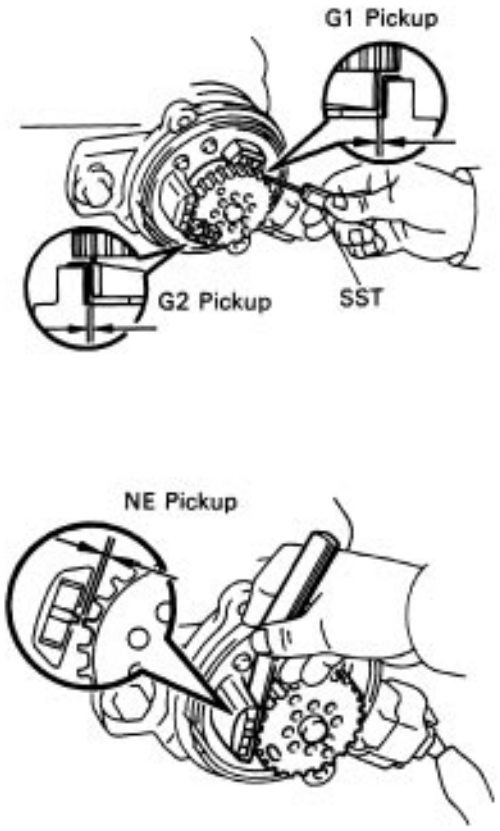
NG → Replace distributor.

2 **Check for open and short in harness and connector between engine control module and distributor (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

3 **Check air gap.**



P Remove distributor cap & rotor.

C Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.
SST 09240–00020 for G1 and G2 pickups

OK **Air gap: 0.2–0.5 mm (0.008–0.020 in.)**

OK

NG > **Replace distributor housing assembly.**

Check and replace engine control module.

DTC 13 G NE Signal Circuit (No.2)

CIRCUIT DESCRIPTION

Refer to G, NE signal circuit (No. 1) on page EG1–336, 339.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
13	No NE signal to ECM for 0.3 sec. or more at 1,500 rpm or more.	• Open or short in NE circuit • Distributor • ECM
	No G signal to ECM while N E signal is input 4 times to ECM when engine speed is between 500 rpm and 4,000 rpm.	
	* No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more.	
	* NE signal does not pulse 12 times to ECM during the interval between G1 and G2 pulses.	

*: Only for California specification vehicles.

DIAGNOSIS

This code indicates that a momentary interruption of the G, N E signal from the distributor to the ECM has occurred, but that it is returned to normal. Note that although this problem may not necessarily appear at the time of inspection, it cannot be ignored because this diagnostic trouble code is output, indicating that there is or was a malfunction in the G, NE signal circuit; this “malfunction” is usually a loose connector.

The distributor connector and the N E terminal of the ECM connector must therefore be checked for the following:

1. Loose connectors
2. Dirty connector terminals
3. Loose connector terminals

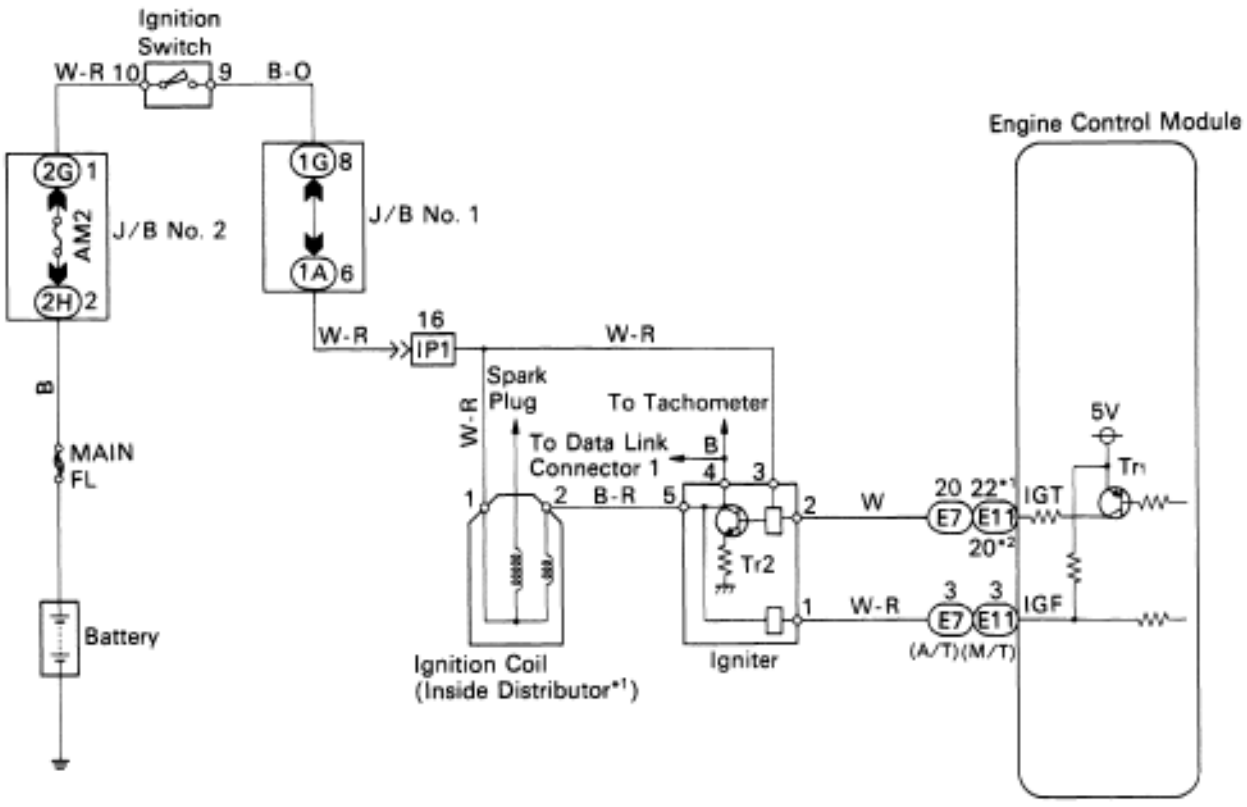
DTC 14 Ignition Signal Circuit

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr, at a predetermined angle ('*CA) before the desired ignition timing and outputs an ignition signal (IGT) “1” to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.
When it reaches the ignition timing, the ECM turns Tr, off and outputs the IGT signal “O”.
This turns Tr2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM.
The ECM stops fuel injection as a fail safe function when the IG F signal is not input to the ECM.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
14	No IGF signal to ECM for 4 (8*2) consecutive IGT signals.	• Open or short in IG F or IGT circuit from igniter to ECM. • Igniter • ECM

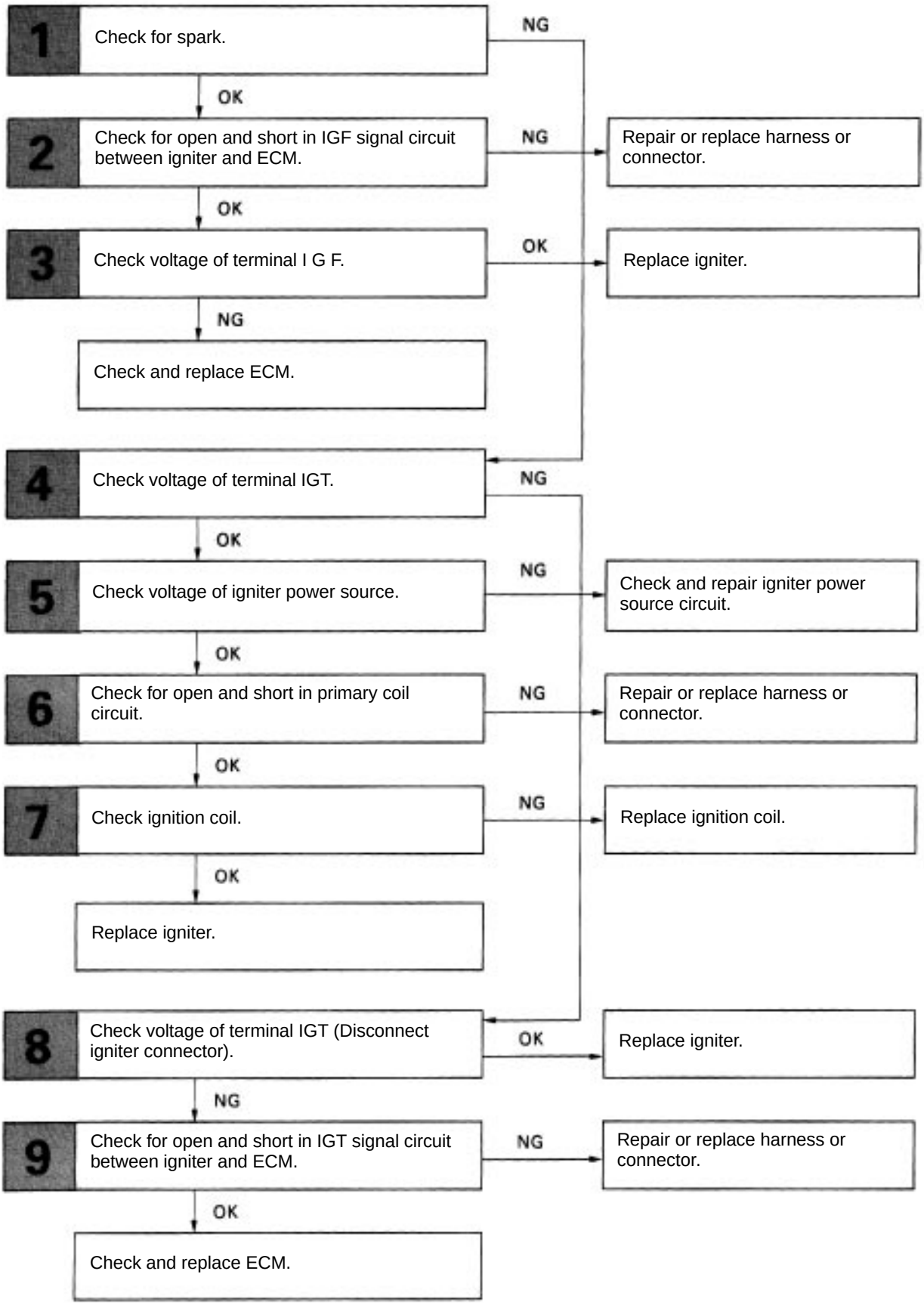
WIRING DIAGRAM



*1: Except California specification vehicles.
*2: Only for California specification vehicles.

FI0591

DIAGNOSTIC CHART



INSPECTION PROCEDURE

1 **Check for spark.**

C Disconnect the high–tension cord from the distributor, hold its end about 12.5 mm (11 /2”) from the ground, see if spark occurs while the engine is being cranked.

OK **Spark should be generated.**

Hint To prevent excessive fuel injected from the injectors during this check, don’t crank the engine for more than 1 – 2 seconds at a time.

OK

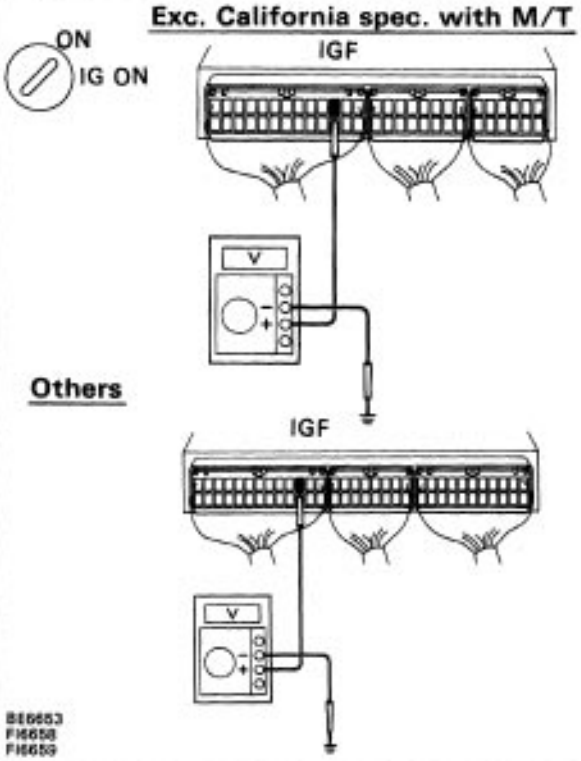
NG → **Go to step 4**

2 **Check for open and short in harness and connector in IGF signal circuit between engine control module and igniter (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

3 **Disconnect igniter connector and check voltage between terminal IGF of engine control module connector and body ground.**



P (1) Disconnect igniter connector.
(2) Remove glove compartment.
(See page EG1–234).
(3) Turn ignition switch on.

C Measure voltage between terminal IGF of engine control module connector and body ground.

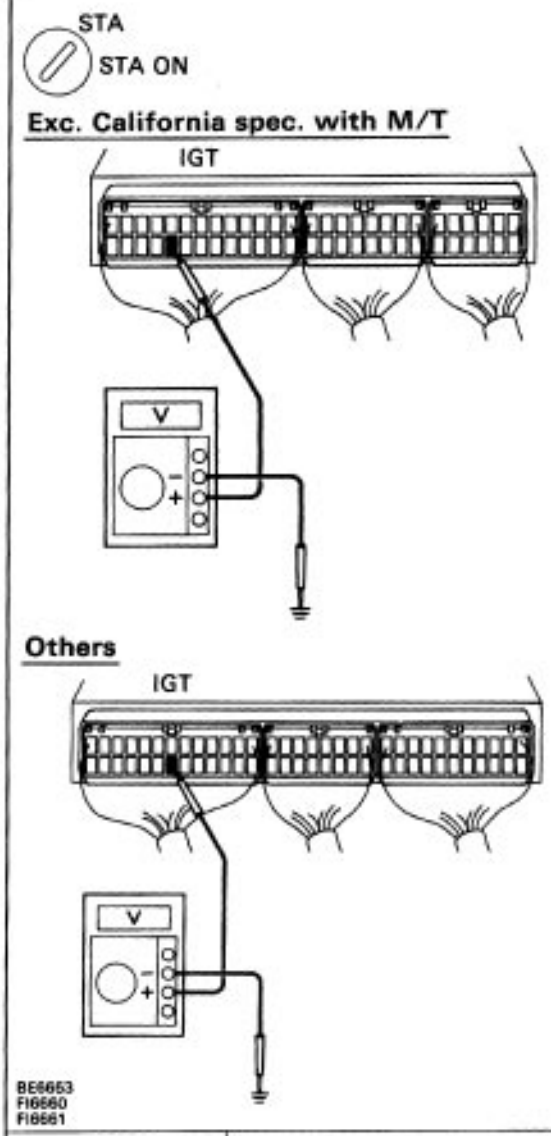
OK **Voltage: 4.5 ~ 5.5 V**

NG

OK → **Replace igniter.**

Check and replace engine control module.

4 **Check voltage between terminal IGT of engine control module connector and body ground.**

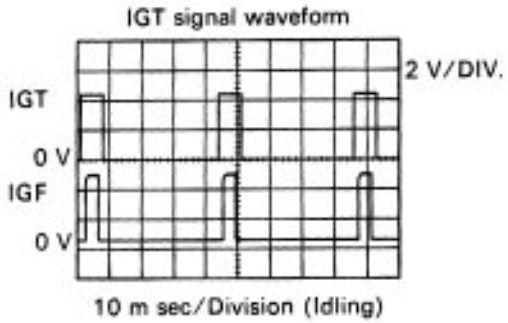


P Remove glove compartment.
(See page EG1–234) .

C Measure voltage between terminal IGT of engine control module connector and body ground when engine is cranked.

OK **Voltage: 0.5 – 1.0 V**
(Neither 0 V nor 5 V)

Reference **INSPECTION USING OSCILLOSCOPE**



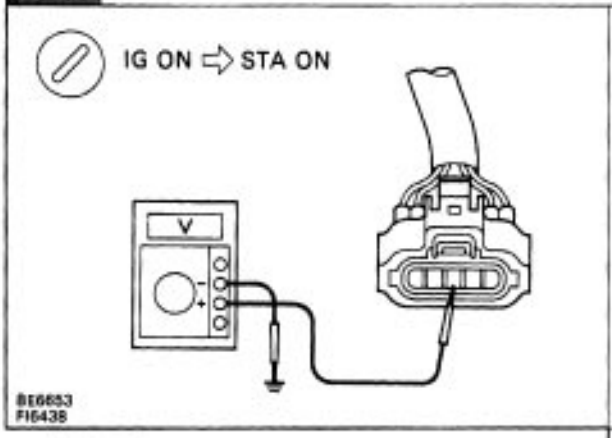
- During cranking or idling, check waveform between terminal IGT and E1 of engine control module.

HINT: The correct waveform appears as shown in the illustration on the left, with rectangle waves.

OK

NG → Go to step 8

5 **Check voltage between terminal 3 of igniter connector and body ground.**



P Disconnect igniter connector.

C Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to “ON” and “STA” position.

OK **Voltage: 9 ~ 14 V**

OK

NG → **Check and repair igniter power source circuit.**

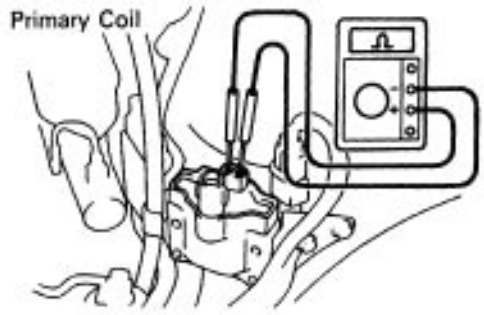
6 **Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–31).**

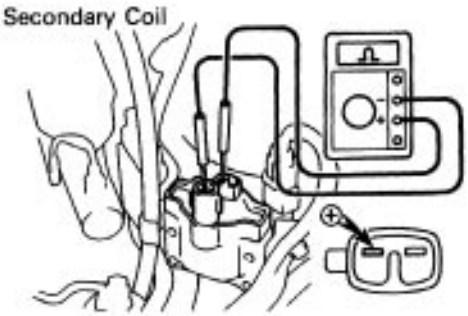
OK

NG → **Repair or replace harness or connector.**

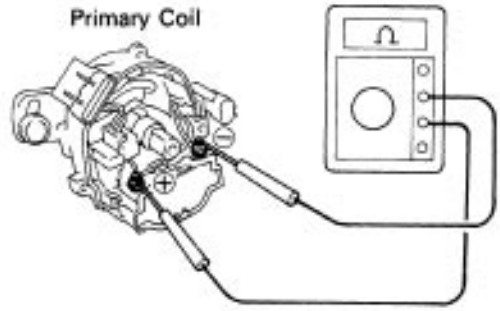
7 Check ignition coil.

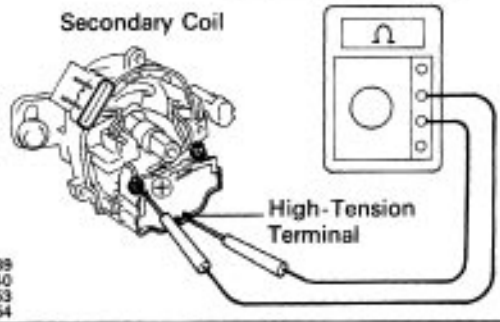
For California spec.





Exc. California spec.





P14139
P14140
P01053
P01054

P For California spec.

(1) Disconnect ignition coil connector.

(2) Disconnect high–tension cord from ignition coil.

Exc. California spec.

(1) Disconnect distributor connectors.

(2) Remove distributor cap and rotor.

(3) Remove ignition coil dust cover.

C (1) Check primary coil.
Measure resistance between the positive (+) and negative (–) terminals.

(2) Check secondary coil.
Measure resistance between the positive (+) and high–tension terminals.

OK

		Resistance
Primary Coil	Cold	0.36 ~ 0.55 Ω
	Hot	0.45 ~ 0.65 Ω
Secondary Coil	Cold	9.0 ~ 15.4 kΩ
	Hot	11.4 ~ 18.1 kΩ

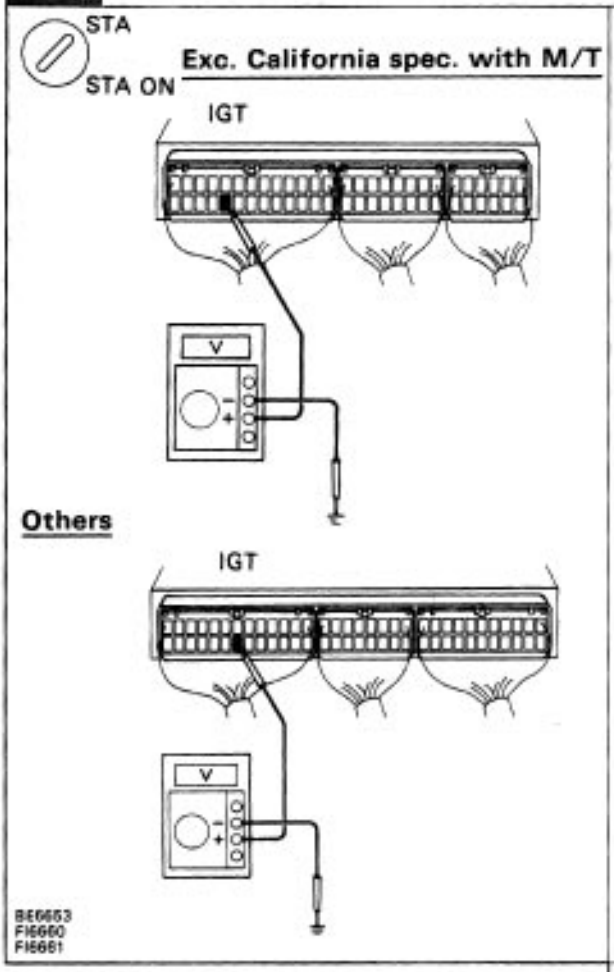
"Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

OK

NG → **Replace ignition coil.**

Replace igniter.

8 **Disconnect igniter connector and check voltage between terminal IGT of engine control module connector and body ground.**



P Disconnect igniter connector.

C Measure voltage between terminal IGT of engine control module connector and body ground when engine is cranked.

OK **Voltage: 0.5–1.0 V**
(Neither 0 V nor 5 V)

NG

OK 〉 **Replace igniter.**

9 **Check for open and short in harness and connector in IGT signal circuit between engine control module and igniter (See page IN–31).**

OK

NG 〉 **Repair or replace harness or connector.**

Check and replace engine control module.

DTC 16 A–T Control Signal Malfunction

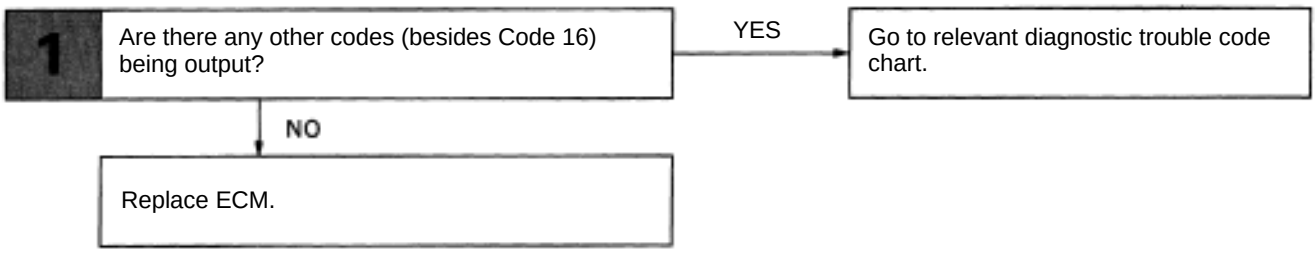
CIRCUIT DESCRIPTION

The signal from the A/T CPU retards the ignition timing of the engine during A/T shifting, thus momentarily reducing torque output of the engine for smooth clutch operation inside the transmission and reduced shift shock.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
16	Fault in communications between the engine CPU and A/T CPU in the ECM	• ECM

If the ECM detects the diagnostic trouble code “16” in memory, it prohibits the torque control of the A/T which performs smooth gear shifting.

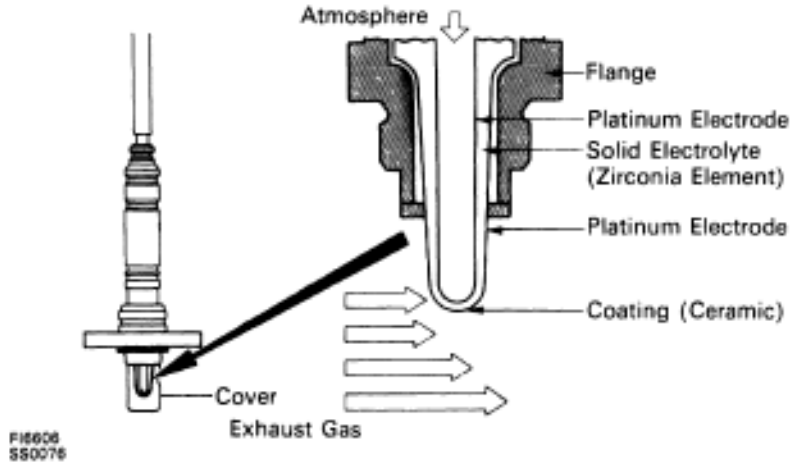
DIAGNOSTIC CHART

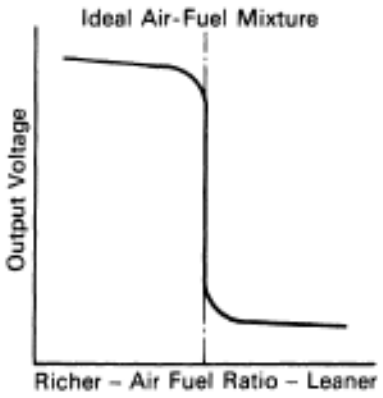


DTC 21 Main Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

To obtain a high purification rate for the C0, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio. The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio. When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force; 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.





DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
21	Main oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. under conditions (a) – (d). (2 trip detection logic) * (a) Engine coolant temp. : 80°C (176°F) or more. (b) Engine speed : 1,500 rpm or more. (c) Load driving (EX. A/T in overdrive (5th for M/T), A/C ON, Flat road, 50 mph (80km/h)). (d) Main oxygen sensor signal voltage : Alternating above and below 0.45 V.	• Main oxygen sensor circuit. • Main oxygen sensor.

*See page EG1–307

CIRCUIT DESCRIPTION (Cont'd)

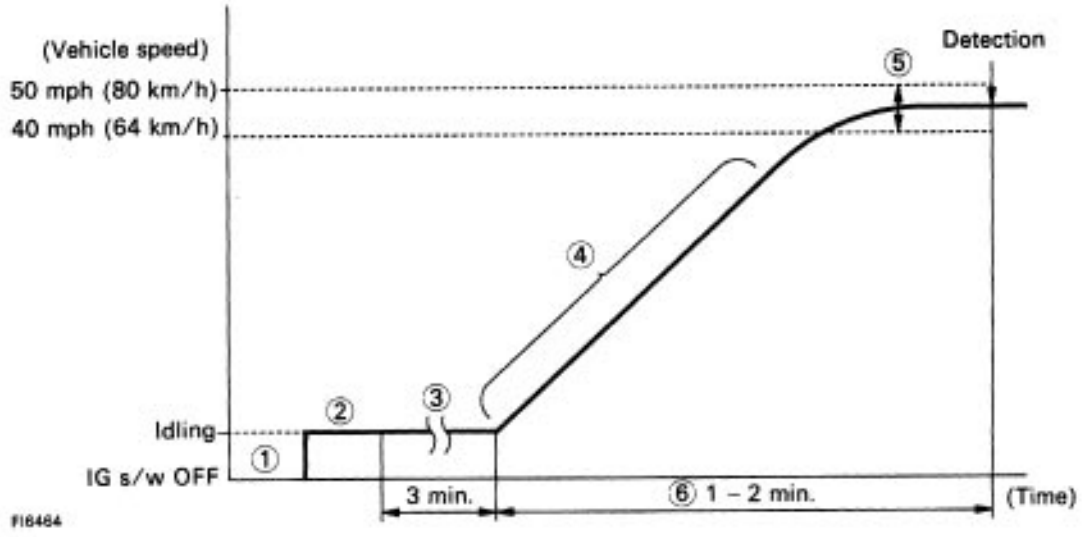
DIAGNOSIS TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

Malfunction: Main Oxygen Sensor Deterioration



① Disconnect the EFI fuse (15A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 or 2 with IG switch OFF).

② Start the engine and warm up with all ACC switch OFF.

③ After the engine is warmed up, let it idle for 3 min.

④ After performing the idling in (3) , perform gradual acceleration with in the range 1,300~1,700 rpm (centered around 1,500 rpm) with the A/C switch ON and D position for A/T (5th for M /T).
(Take care that the engine speed does not fall below 1,200 rpm when shifting. Gradually depress the accelerator pedal and keep it. Steady so that engine braking does not occur).

⑤ Maintain the vehicle speed at 40 – 50 mph (64 – 80 km/h).

⑥ Keep the vehicle running for 1 – 2 min. after starting acceleration.
HINT: If a malfunction exists, the malfunction indicator lamp will light up after approx. 60 sec. from the start of acceleration.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

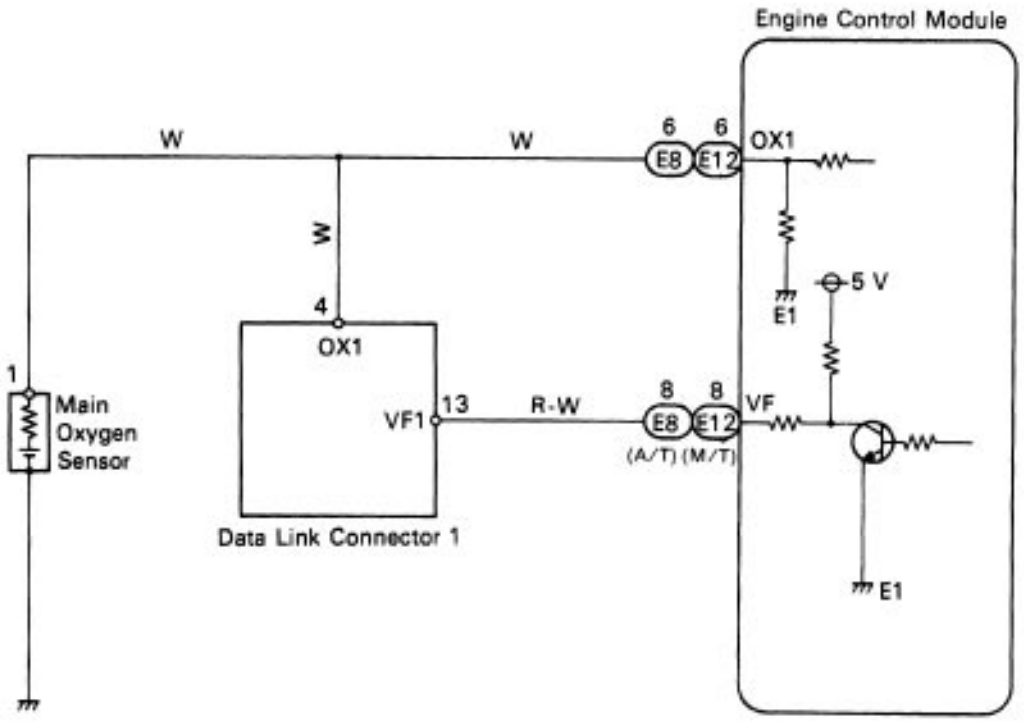
DIAGNOSTIC CHART

1	Are there any other codes (besides code 21) being output ?	YES	Go to relevant diagnostic trouble code chart.

NO

Replace main oxygen sensor.

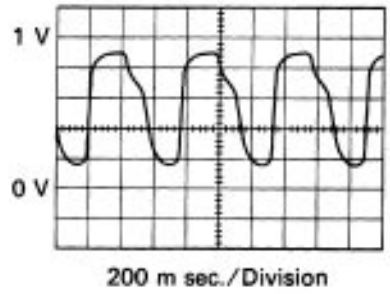
WIRING DIAGRAM

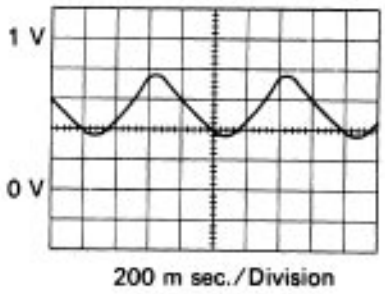


FI6681

Reference INSPECTION USING OSCILLOSCOPE

Ox signal waveform





FI6514
FI6515

- With the engine racing (4,000 rpm) measure wave–form between terminals OX1 and E1 of engine con–trol module.

HINT: The correct waveform appears as shown in the illustration on the left, oscillating between approx. 0.1 V and 0.9 V.

If the oxygen sensor is deteriorated, the amplitude of the voltage is reduced as shown on the left.

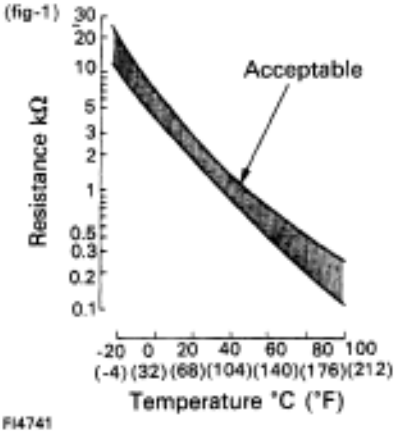
DTC 22 Engine coolant Temp. Sensor Circuit

CIRCUIT DESCRIPTION

The engine coolant temperature sensor senses the engine coolant temperature. A thermistor built in the sensor changes its resistance value according to the engine coolant temperature. The lower the engine coolant temperature, the greater the thermistor resis–tance value, and the higher the engine coolant tem–perature, the lower the thermistor resistance value (See Fig. 1.).

The engine coolant temperature sensor is connected to the ECM (See next page). The 5 V power source voltage in the ECM is applied to the engine coolant temperature sensor from the terminal THW via a resis-tor R. That is, resistor R and the engine coolant tem–perature sensor are connected in series. When the resistance value of the engine coolant temperature sensor changes in accordance with changes in the engine coolant temperature, the potential at the ter–minal THW also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation. If the ECM detects the diagnostic trouble code 22, it operates the fail safe function in which the engine coolant temper–ature is assumed to be 80°C (176°F).

(fig-1)



(Reference)

Engine coolant Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
–20 (–4)	16.0	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.2	1.5
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.2	0.3

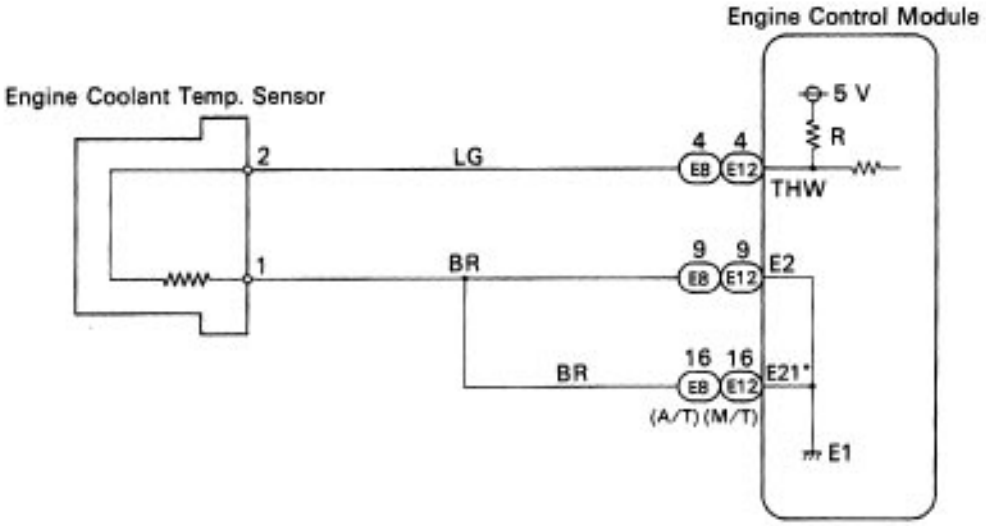
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more.	• Open or short in engine coolant temp, sensor circuit • Engine coolant temp. sensor • ECM

DIAGNOSTIC CHART

HINT If diagnostic trouble codes “22” (engine coolant temperature sensor circuit), “24” (intake air temperature sensor circuit), “31” (manifold absolute pressure sensor circuit) and “41” (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open, OK Check for momentary interruption

1	Check voltage of sensor.		Check for momentary interruption (See page EG1–309).
	NG		
2	Check resistance of sensor.	NG	Replace engine coolant temp. sensor.
	OK		
3	Check for open and short in harness and connector between ECM and engine coolant temp. sensor.	NG	Repair or replace harness or connector.
	OK		
	Check and replace ECM.		

WIRING DIAGRAM



*: Except California specification vehicles.

FI6696

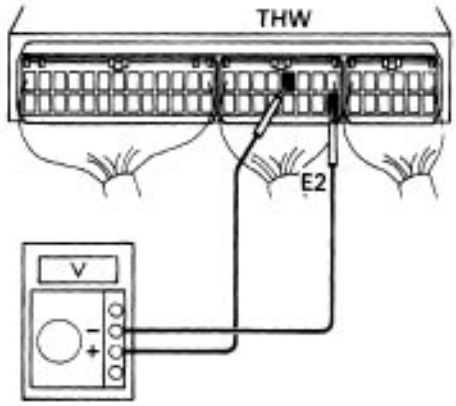
INSPECTION PROCEDURE

HINT: If diagnostic trouble codes “22” (engine coolant temperature sensor circuit), “24” (intake air temperature sensor circuit), “31” (manifold absolute pressure sensor circuit) and “41 “ (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open,

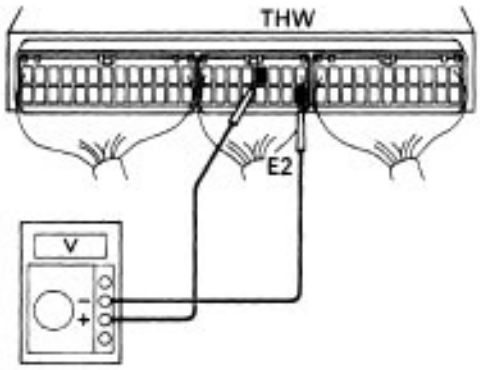
1 Check voltage between terminals THW and E2 of engine control module connector.

ON
IG ON

Exc. California spec. with M/T



Others



BE6653
FI6662
FI6663

P (1) Remove glove compartment
(See page EG1–234)
(2) Turn ignition switch on.
C Measure voltage between terminals THW and E2 of engine control module connector.

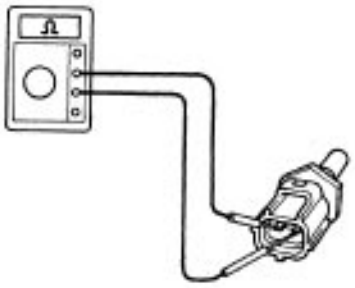
OK

Engine Coolant Temp. ℃ (℉)	Voltage
20 (68) (Engine is cool)	0.5 ~ 3.4 V
80 (176) (Engine is hot)	0.2 ~1.0 v

NG

OK → **Check for momentary interruption (See page EG1–309)**

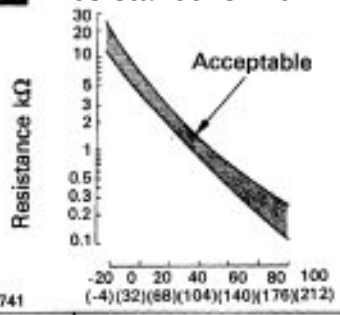
2 **Check engine coolant temp. sensor.**



P Disconnect the engine coolant temp. sensor connector.

C Measure resistance between terminals.

OK **Resistance is within Acceptable Zone on chart.**



Engine coolant Temp. ℃ (℉)	Resistance
20(68)	2 – 3 kΩ
80(176)	0.2 – 0.4 kΩ

OK

NG → **Replace engine coolant temp. sensor.**

3 **Check for open and short in harness and connector between engine control module and engine coolant temp. sensor (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace engine control module.

DTC 24 Intake Air Temp. Sensor Circuit

CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air cleaner cap and senses the intake air temperature. The structure of the sensor and connection to the ECM is the same as in the engine coolant temp. sensor shown on page EG1–356.

If the ECM detects the diagnostic trouble code “24”, it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F)

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

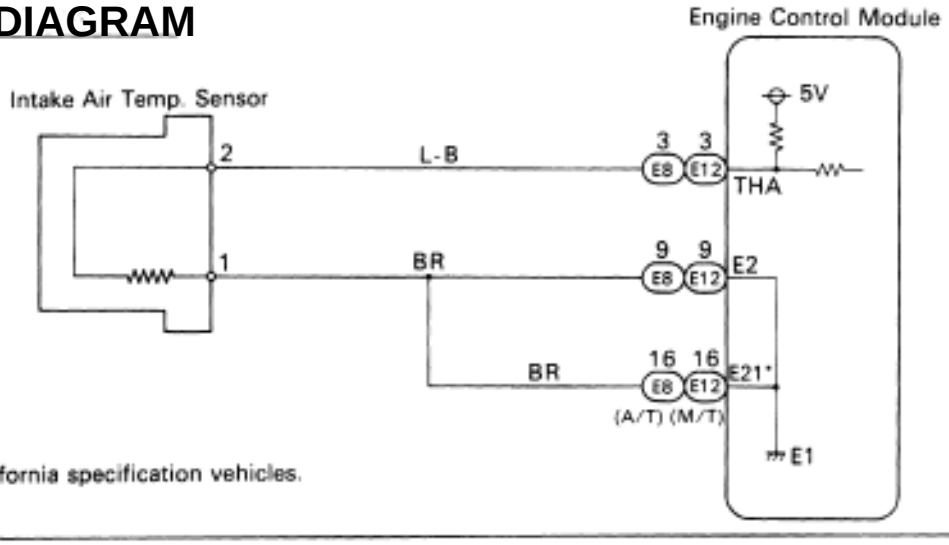
DIAGNOSTIC CHART

HINT: If diagnostic trouble codes “22” (engine coolant temperature sensor circuit), “24” (intake air temperature sensor circuit), “31” (manifold absolute pressure sensor circuit) and “41” (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1. Check voltage of sensor.
   - → Check for momentary interruption (See page EG1–309).
   - NG ↓
2. Check resistance of sensor.
   - NG → Replace intake air temp. sensor.
   - OK ↓
3. Check for open and short in harness and connector between ECM and intake air temp. sensor.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace ECM.

WIRING DIAGRAM



*: Except California specification vehicles.

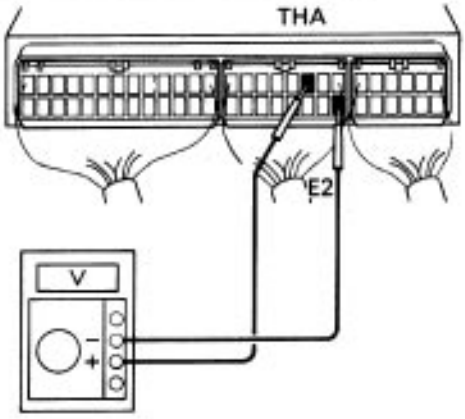
FI6696

INSPECTION PROCEDURE

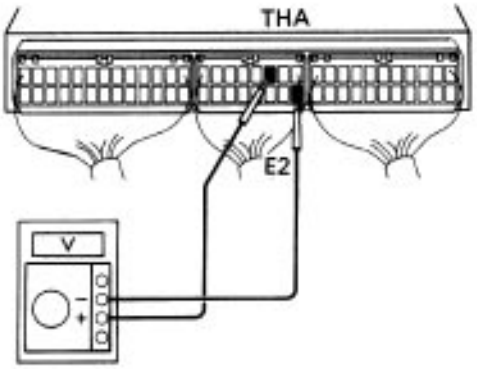
1 **Check voltage between terminals THA and E2 of engine control module connector.**

ON
IG ON

Exc. California spec. with M/T



Others



BE6653
FI6664
FI6665

P (1) Remove glove compartment.
(See page EG1–234)
(2) Turn ignition switch on.

C Measure voltage between terminals THA and E2 of engine control module connector.

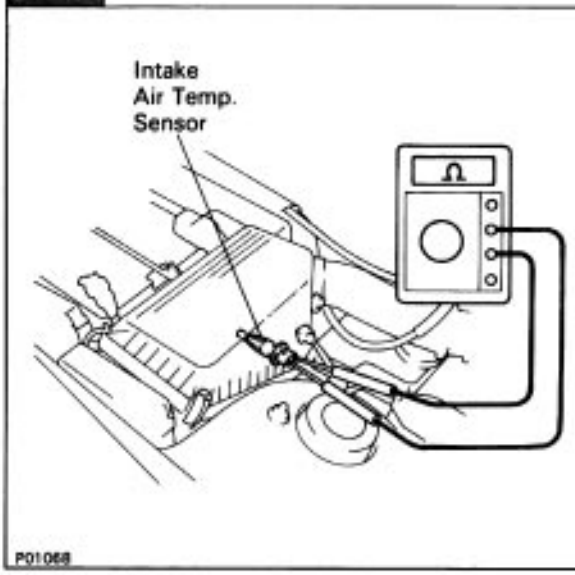
OK

Intake air temp. °C (°F)	Voltage
20 (68)	0.5 ~ 3.4 V
60 (140)	0.2 ~ 1.0 V

NG

OK → **Check for momentary interruption (See page EG1–309).**

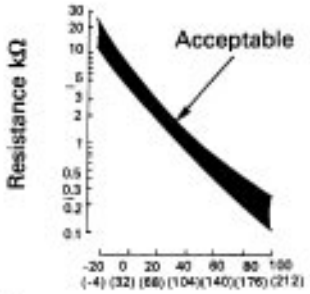
2 Check intake air temp. sensor.



P Disconnect the air temp. sensor connector.

C Measure resistance between terminals.

OK **Resistance is within Acceptable Zone on chart.**



Intake air temp. °C (° F)	Resistance
20(68)	2 –3k)
60 (140)	0.4 – 0.7 k)

OK

NG **Replace intake air temp. sensor.**

3 Check for open and short in harness and connector between engine control module and intake air temp. sensor (See page IN–31).

OK

NG **Repair or replace harness or connector.**

Check and replace engine control module.

DTC 25 26 Air–Fuel Ratio Lean Rich Malfunction

CIRCUIT DESCRIPTION

The main oxygen sensor is located in the exhaust manifold.
It indirectly determines whether the fuel mixture is rich or lean by detecting the concentration of oxygen present in the exhaust gas.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
25	(1) Main oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b). (2 trip detection logic) * (a) Engine coolant temp.: 601C (1401F) or more. (b) Engine speed: 1,500 rpm or more.	• Open or short in main oxygen sensor circuit • Main oxygen sensor • Ignition system • ECM
	(2) Engine speed varies by more than 15 rpm over the preceding crank position period during a period of 50 sec. or more under conditions (a) and (b). (2 trip detection logic) * (a) Engine speed: Idling (b) Engine coolant temp.: 601C (1401F) or more.	• Open or short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Air leakage • ECM
26	Engine speed varies by more than 15 rpm over the preceding crank position period during a period of 50 sec. or more under conditions (a) and (b). (2 trip detection logic) * (a) Engine speed: Idling (b) Engine coolant temp.: 601C (1401F) or more	• Open or short in injector circuit • Fuel line pressure (injector leak, blockage) • Mechanical system malfunction (skipping teeth of timing belt) • Ignition system • Compression pressure (foreign object caught in valve) • Air leakage • ECM

*: See page EG1–307

CIRCUIT DESCRIPTION (Cont'd)

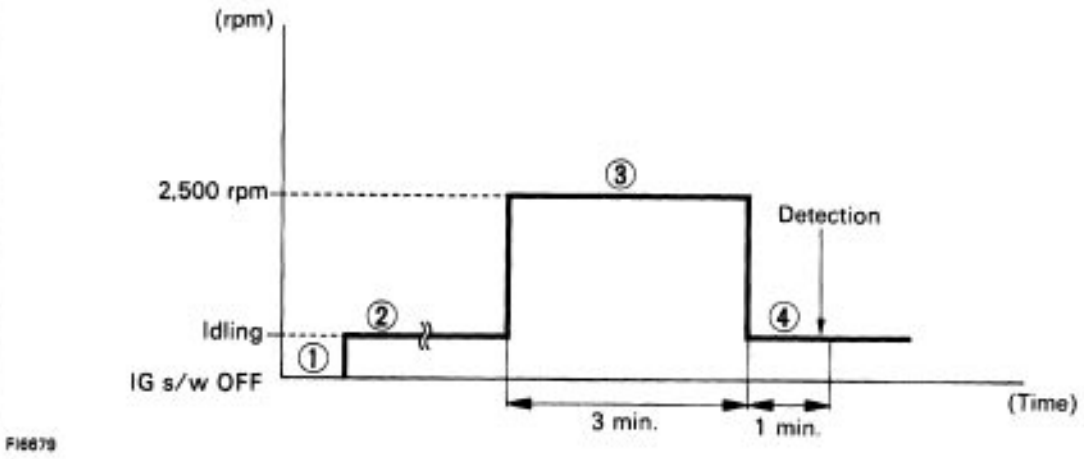
DIAGNOSIS TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

Malfunction: Open or Short in Main Oxygen Sensor.
Open or Short in Injector Circuit, Injector Leak or Blockage.



H I NT: Before this test, check the feedback voltage for oxygen sensor.

①Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 or 2 with IG switch OFF).

②Start engine and warm up.

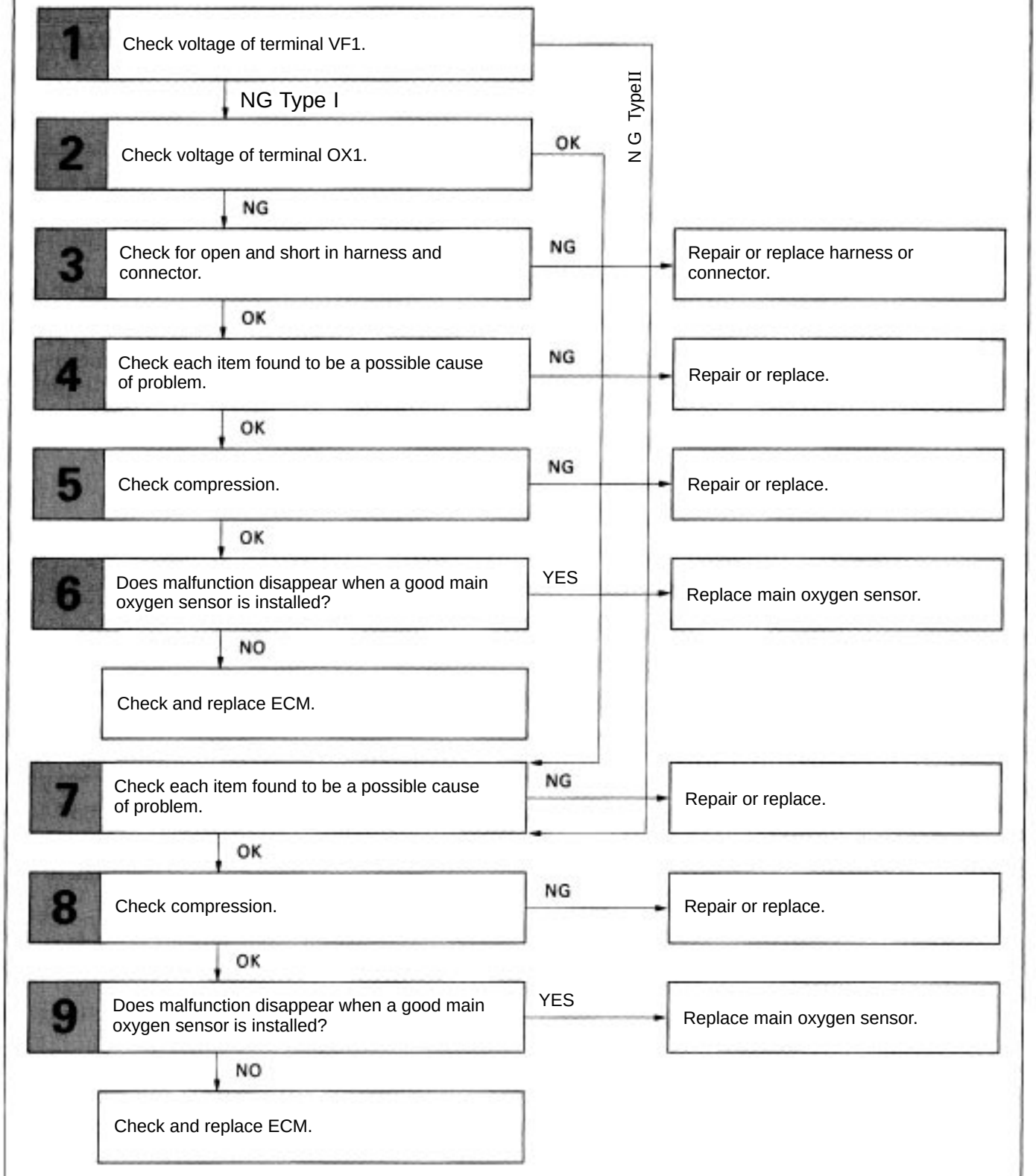
③After the engine is warmed up, let it race at 2,500 rpm for 3 min.

④After performing the racing in (3) , perform idling 1 min.

HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4).

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART

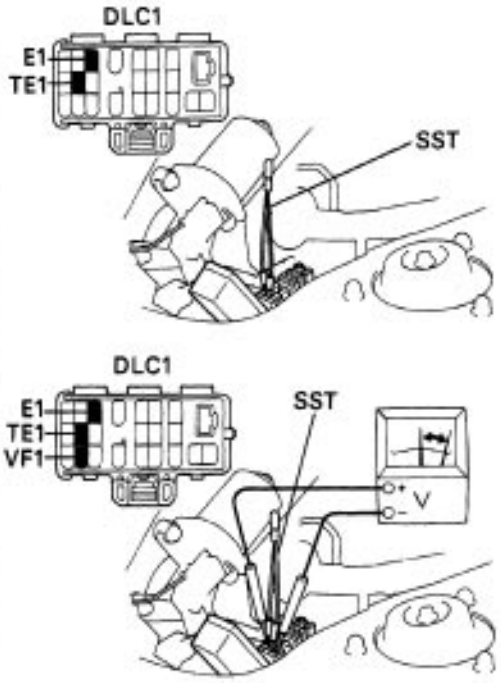


WIRING DIAGRAM

Refer to page EG1–354 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1 Check voltage between terminals VF1 and E1 of data link connector 1.



P (1) Warm up engine at normal operating tem–perature.
(2) Connect terminals TE1 and E1 of data link connector 1.
(3) Connect positive prove to terminal VF1 and negative prove to terminal E1 of data link connector 1.

C (1) Warm up the oxygen sensor by running en–gine at 2,500 rpm for about 2 minutes.
(2) Then, maintaining engine at 2,500 rpm, count how many times needle of voltmeter fluctuates between 0 and 5 V.

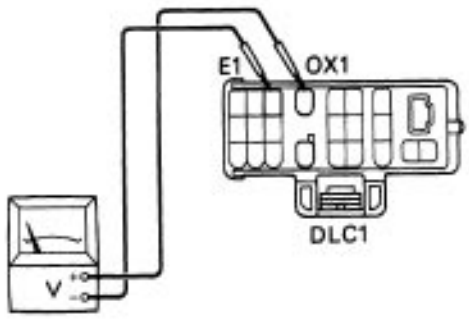
Result

Result	
Needle fluctuates of 8 times or more for every ten seconds	OK
Continue at 0 V	NG Type II
Continue at 5 V	NG Type II

NG Type I

NG Type II → **Go to step 7**

2 **Check voltage between terminals OX1 and E1 of data link connector 1.**



P Warm up engine at normal operating temperature.

C Measure voltage between terminals OX1 and E1 of data link connector 1 when engine is suddenly raced to full throttle.

OK **The voltage should be 0.5 V or higher at least once.**

Hint Perform inspection within 1 second.

NG

OK → **Go to step 7**

3 **Check for open and short in harness and connector between engine control module and main oxygen sensor, engine control module and data link connector 1 (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

4 **Check each item found to be a possible cause of problem.**

Check each circuit found to be a possible cause of trouble according to the results of the check in 1 or 2. The numbers in the table below show the order in which the checks should be performed.

Main oxygen sensor signal continue at OV.	Possible Cause	See page
1	Faulty sensor installation.	–
5	Injector circuit	EG1–410
3	Misfire	IG–6, 26*
9	Valve timing	EG1–36
2	Air leakage	EG1–173
4	Fuel system	EG1–419
8	Characteristics deviation in manifold absolute pressure sensor.	EG1–372
6	Characteristics deviation in engine coolant temp. sensor.	EG1–356
7	Characteristics deviation in intake air temp. sensor.	EG1–360

*: Except California specification vehicles.

OK

NG → **Repair or replace.**

5 **Check compression (See page EG1–23).**

OK

NG → **Repair or replace.**

6 **Does malfunction disappear when a good main oxygen sensor is installed?**

NO

YES → **Replace main oxygen sensor.**

Check and replace engine control module.

7 **Check each item found to be a possible cause of problem.**

Check each circuit found to be a possible cause of trouble according to the results of the check in 1. The numbers in the table below show the order in which the checks should be performed.

Main oxygen sensor signal continue at 5.0 V.	Main oxygen sensor signal is normal.	Possible Cause	See page
2	7	Injector circuit	EG1–410
	3	Misfire	IG–6, 26*
6	4	Valve timing	EG1–36
	1	Air leakage	EG1–173
1	2	Fuel system	EG1–419
5	8	Characteristics deviation in manifold absolute pressure sensor.	EG1–372
3	5	Characteristics deviation in engine coolant temp. sensor.	EG1–356
4	6	Characteristics deviation in intake air temp. sensor.	EG1–360

x: Except California specification vehicles.

OK

NG → **Repair or replace.**

8 **Check compression (See page EG1–23).**

OK

NG → **Repair or replace.**

9 **Does malfunction disappear when a good main oxygen sensor is installed?**

NO

YES → **Replace main oxygen sensor.**

Check and replace engine control module.

DTC 27 Sub Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

The sub oxygen sensor is installed on the exhaust pipe. Its construction and operation is the same as the main oxygen sensor on page EG1–352.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
27	Main oxygen sensor signal is 0.45 V or more and sub oxygen sensor signal is 0.45 V or less under conditions (a) and (b). (2 trip detection logic) * (a) Engine coolant temp. : 80°C (176°F) or more. (b) Accel. pedal : Fully depressed for 2 sec. or more.	• Open or short in sub oxygen sensor circuit. • Sub oxygen sensor • ECM

* : See page EG1–307.

CIRCUIT DESCRIPTION (Cont'd)

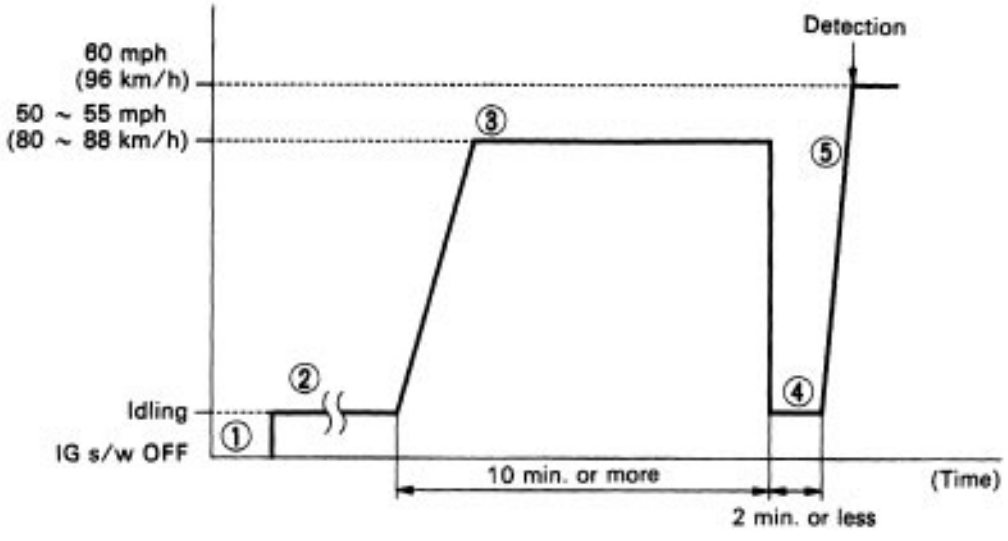
DIAGNOSIS TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

Malfunction: Open or Short in Sub Oxygen Sensor



① Disconnect the E F I fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminals TE2 and E1 of data link connector 1 or 2 with I G switch OFF).

② Start the engine and warm up, with all ACC switch OFF.

③ After the engine is warmed up, let it drive at 50 ~ 55 mph (80 ~ 88 km/h) for 10 min. or more.

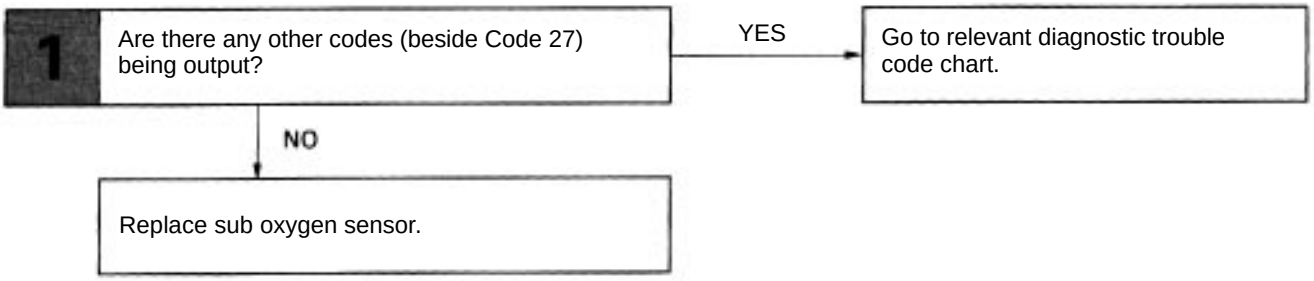
④ After driving, stop at a safe place and perform idling for 2 min. or less.

⑤ After performing the idling in (4) , perform acceleration to 60 mph (96 km/h) with the throttle valve fully open.

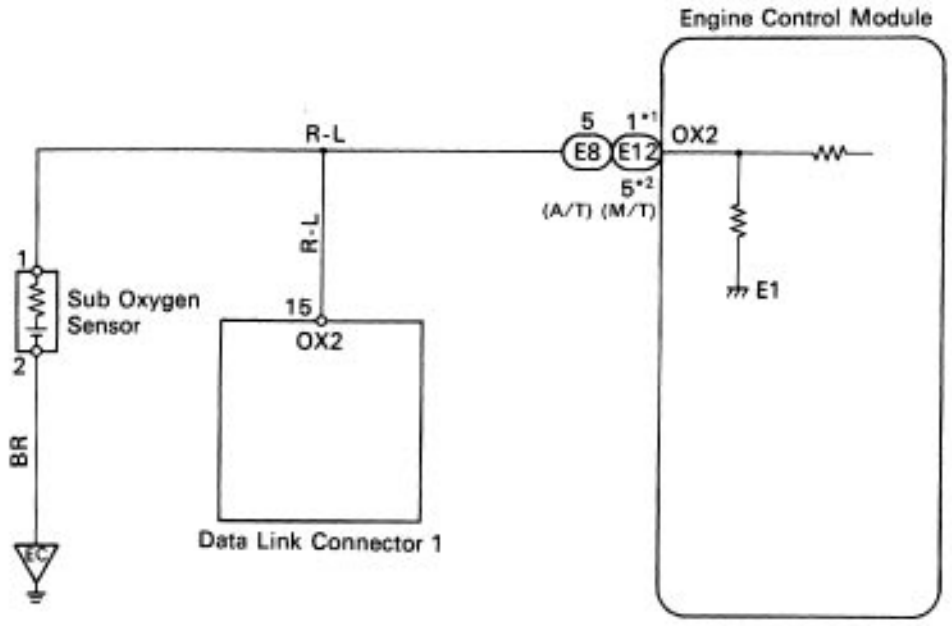
HINT: If a malfunction exists, the malfunction indicator lamp will light up during step.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART



WIRING DIAGRAM



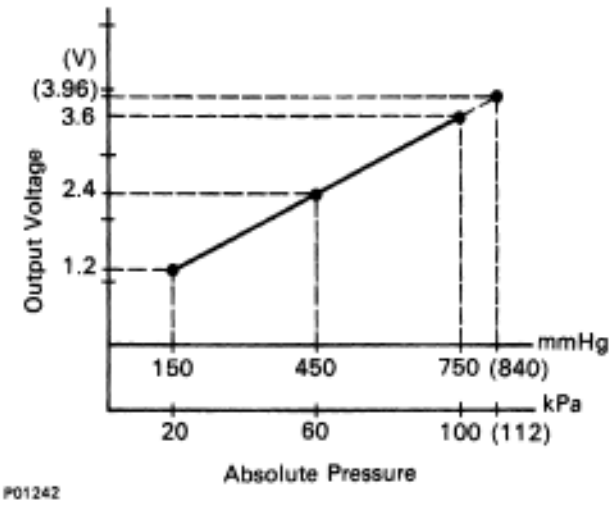
*1: Except California specification vehicles with M/T.
*2: Only for California specification vehicles with M/T.

FI6594

DTC 31 Manifold Absolute Pressure Sensor Circuit

CIRCUIT DESCRIPTION

By a built–in sensor unit, the manifold absolute pressure sensor detects the intake manifold absolute pressure as a voltage.
The ECM then determines the basic injection dura–tion and basic ignition advance angle based on this voltage.
Since the manifold absolute pressure sensor does not use the atmospheric pressure as a criterion, but senses the absolute pressure inside the intake man–ifold (the pressure in proportion to the preset abso–lute vacuum O), it is not influenced by fluctuations in the atmospheric, pressure due to high altitude and other factors. This permits it to control the air–fuel ratio at the proper level under all conditions.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
31	Open or short in manifold absolute pressure sensor circuit for 0.5 sec. or more.	• Open or short in manifold absolute pressure sensor circuit. • Manifold absolute pressure sensor. • ECM

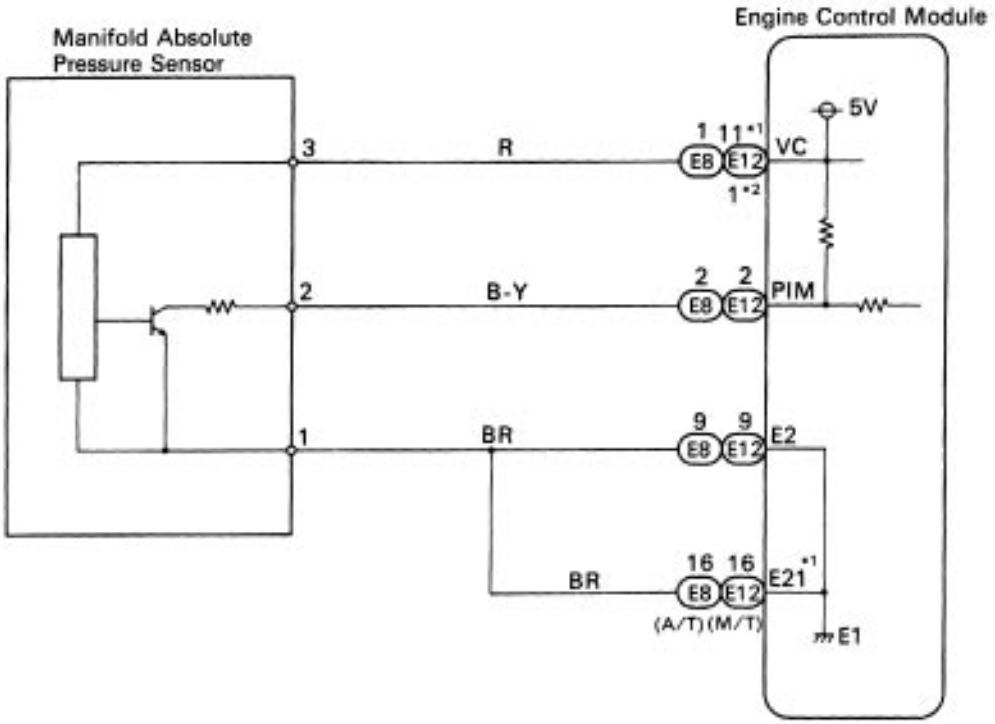
If the ECM detect diagnostic trouble code “31 “, it operates the fail safe function, keeping the ignition timing and fuel injection volume constant and making it possible to drive the vehicle.

DIAGNOSTIC CHART

1. Check voltage of terminal VC.
   - NG → Check and replace ECM.
   - OK ↓
2. Check voltage of terminal PIM.
   - OK → When diagnostic trouble code 31 is displayed, check and replace ECM.
   - NG ↓
3. Check for open and short in harness and connector between manifold absolute pressure sensor and ECM.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace manifold absolute pressure sensor.

WIRING DIAGRAM

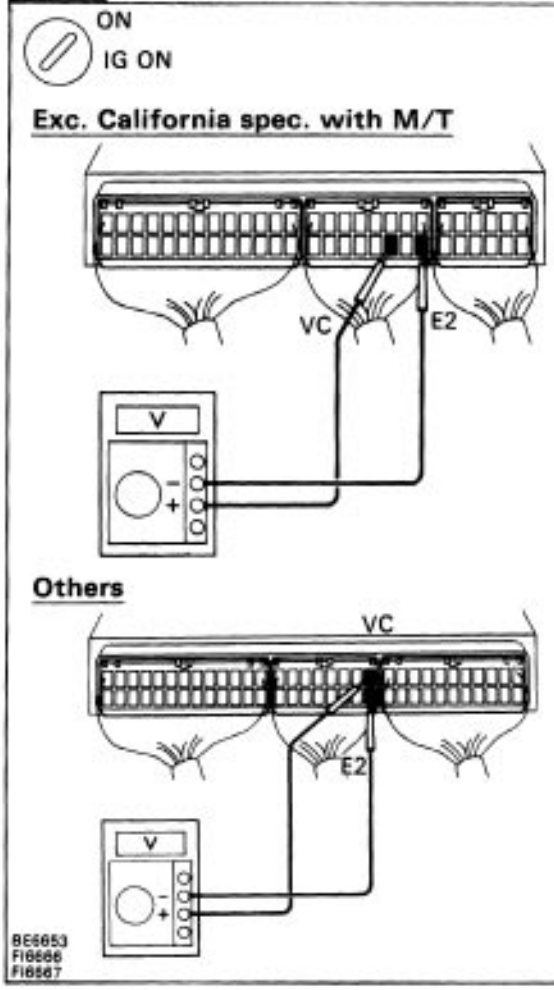


*1: Except California specification vehicles.
*2: Only for California specification vehicles.

FI6697

INSPECTION PROCEDURE

1 **Check voltage between terminals VC and E2 of engine control module connector.**



P (1) Remove glove compartment.
(See page EG1–234).
(2) Turn ignition switch on.

C Measure voltage between terminals VC and E2 of engine control module connector.

OK **Voltage: 4.5 ~ 5.5 V**

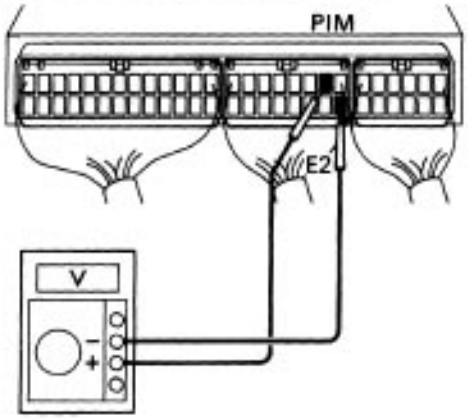
OK

NG **Check and replace engine control module.**

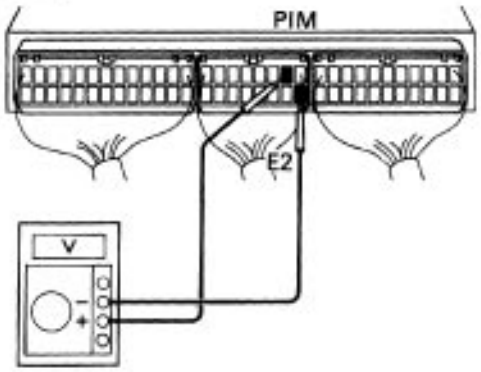
2 **Check voltage between terminals PIM and E2 of engine control module connector.**

ON
IG ON

Exc. California spec. with M/T



Others



BE6853
FI6668
FI6669

P Turn ignition switch on

C Measure voltage between terminals PI M and E2 of engine control module connector.

OK **Voltage: 13 – 3.9 V**

NG

OK → **When diagnostic trouble code 31 is displayed, check and replace engine control module.**

3 **Check for open and short in harness and connector between engine control module and manifold absolute pressure sensor (See page IN–31).**

OK

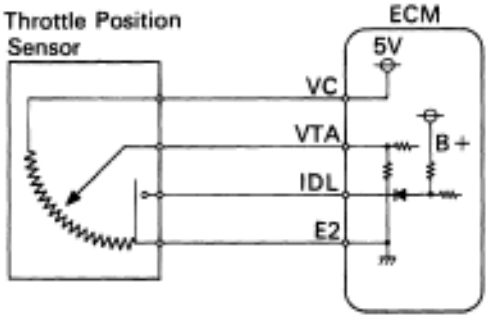
NG → **Repair or replace harness or connector.**

Check and replace manifold absolute pressure sensor.

DTC 41 Throttle Position Sensor Circuit

CIRCUIT DESCRIPTION

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the I D L contacts in the throttle position sensor are on, so the voltage at the ter–minal I D L of the ECM become 0 V. At this time, a voltage of approximately 0.7 V is applied to the terminal VTA of the ECM. When the throttle valve is opened, the I D L contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM. The voltage applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from the terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio cor–rection, power increase correction and fuel–cut control etc.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
41	Open or short in throttle position sensor circuit for 0.5 sec. or more.	• Open or short in throttle position sensor circuit. • Throttle position sensor. • ECM

HINT;

- When the connector for the throttle position sensor is disconnected, diagnostic trouble code 41 is not displayed. Diagnostic trouble code 41 is displayed only when there is an open or short in the VTA signal circuit of the throttle position sensor.

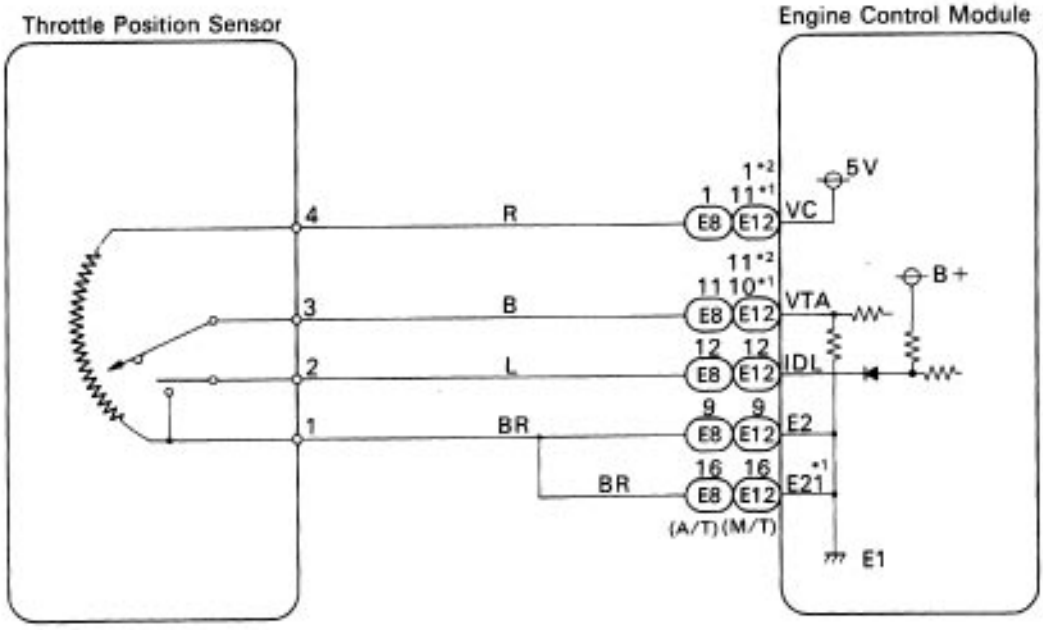
DIAGNOSTIC CHART

HINT: If diagnostic trouble codes “22” (engine coolant temperature sensor circuit), “24” (intake air temperature sensor circuit),“31” (manifold absolute pressure sensor circuit) and “41” (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

1. Check voltage of throttle position sensor.
   - → Check for momentary interruption (See page EG1–309).
   - NG ↓
2. Check operation for throttle position sensor.
   - NG → Adjust or replace throttle position sensor.
   - OK ↓
3. Check for open and short in harness and connector between throttle position sensor and ECM.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace ECM.

WIRING DIAGRAM



*1: Except California specification vehicles.
*2: Only for California specification vehicles.

FI8692

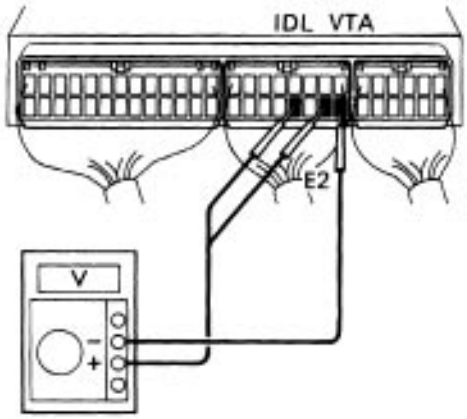
INSPECTION PROCEDURE

HINT: If diagnostic trouble code “22” (engine coolant temperature sensor circuit), “24” (intake air temperature sensor circuit), “31” (manifold absolute pressure sensor circuit) and “41 “ (throttle position sensor circuit) are output simultaneously, E2 (sensor ground) may be open.

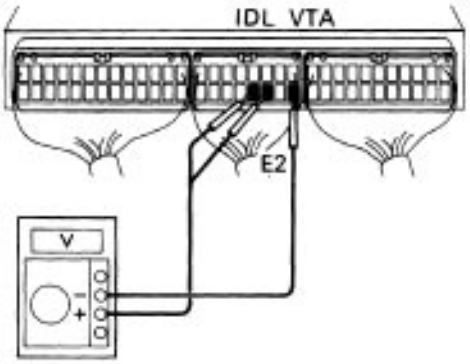
1 Check voltage between terminals VTA, IDL and E2 of engine control module connector.

ON
IG ON

Exc. California spec. with M/T



Others



B66653
FI6670
FI6671

P (1) Remove glove compartment.
(See page EG1–234).
(2) Disconnect the vacuum hose from the throt–tle body, then apply vacuum to the throttle opener (See page EG1–204).
(3) Turn ignition switch ON.

C Measure voltage between terminals VTA, IDL and E2 of engine control module connector when the throttle valve is opened gradually from the closed condition.

OK

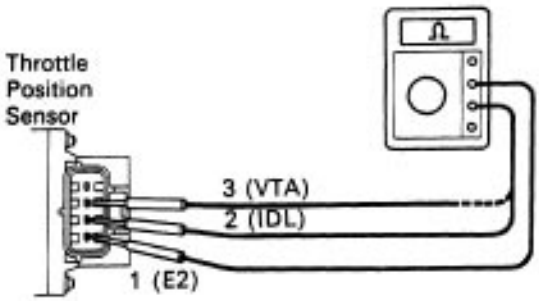
Terminal / Throttle Valve	VTA – E2	IDL – E2
Fully Closed	0.3 – 0.8 V	0 – 3.0 V
Fully Open	3.2 – 4.9 V	9 – 14 V

Hint The voltage should increase steadily in propor–tion to the throttle valve opening angle.

NG

OK → **Check for momentary interruption (See page EG1–309).**

2 Check throttle position sensor.



P (1) Disconnect throttle position sensor connector.
(2) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page EG1–204).

C Measure resistance between terminals 3 (VTA), 2 (IDL) and 1 (E2) of throttle position sensor connector when the throttle valve is opened gradually from the closed condition.

OK

Terminal / Throttle Valve	3 (VTA) – 1 (E2)	2 (IDL) – 1 (E2)
Fully Closed	0.2 – 5.7 kΩ	Less than 2.3 kΩ
Fully Open	2.0 – 10.2 kΩ	1MΩ or higher

Hint Resistance between terminals 3 (VTA) and 1 (E2) should increase gradually in accordance with the throttle valve opening angle.

OK

NG **Adjust or replace throttle position sensor (See page EG1–209).**

3 Check for open and short in harness and connector between engine control module and throttle position sensor (See page IN–31).

OK

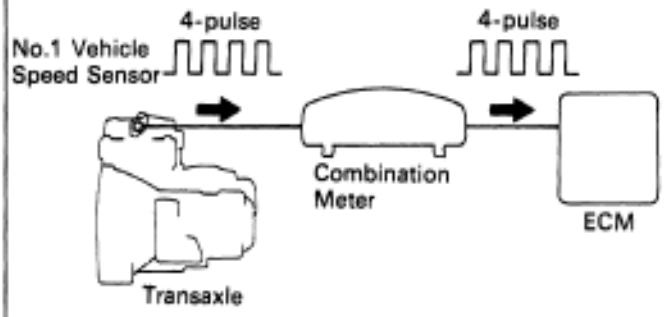
NG **Repair or replace harness or connector.**

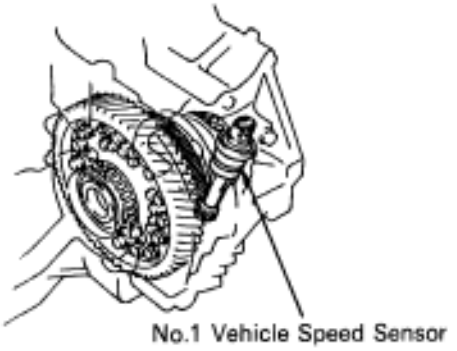
Check and replace engine control module.

DTC 42 No.1 Vehicle Speed Sensor Signal Circuit

CIRCUIT DESCRIPTION

The No.1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.

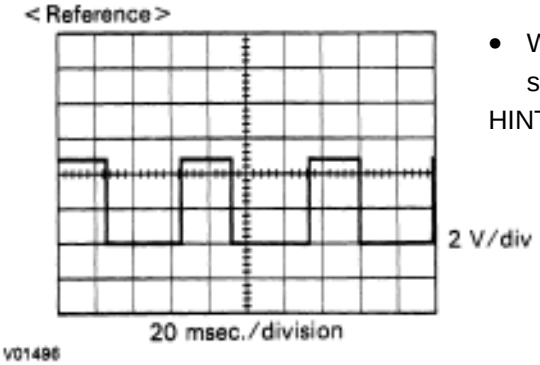




G00515
G00514

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
42	For A/T All conditions below are detected continuously for 8 sec. or more. (a) No.1 Vehicle speed signal: 0 mph (km/h) (b) Engine speed: 3,100 rpm or more (c) Park/Neutral position switch: OFF	• Open or short in No.1 vehicle speed sensor circuit. • No.1 vehicle speed sensor. • Combination meter. • ECM
	For M /T All conditions below are detected continuously for 8 sec. or more. (a) No.1 vehicle speed signal: 0 mph (km/h) (b) Engine speed: Between 3,100 rpm and 5,000 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving	

HINT: In test mode, diagnostic trouble code 42 is output when vehicle speed is 3 mph (5 km/h) or below.

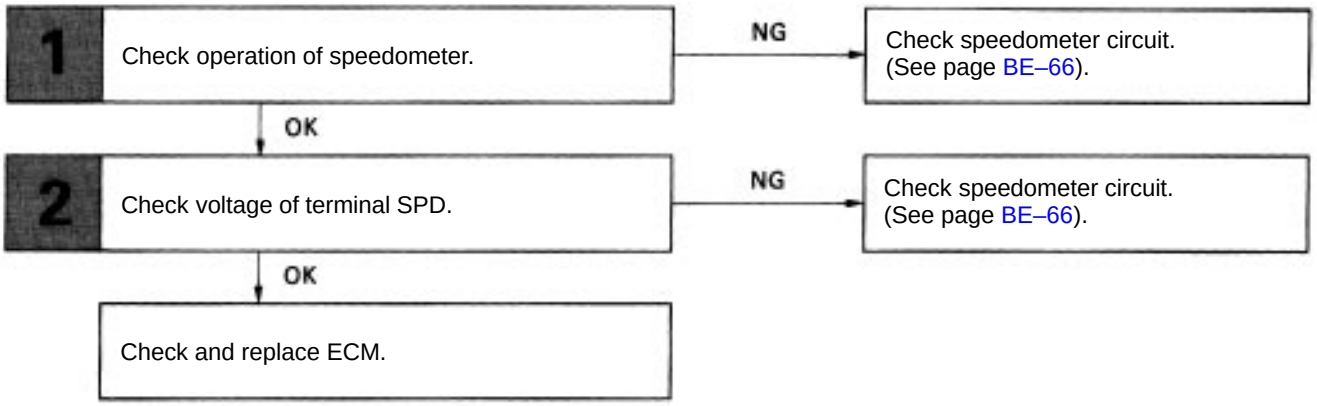


V01496

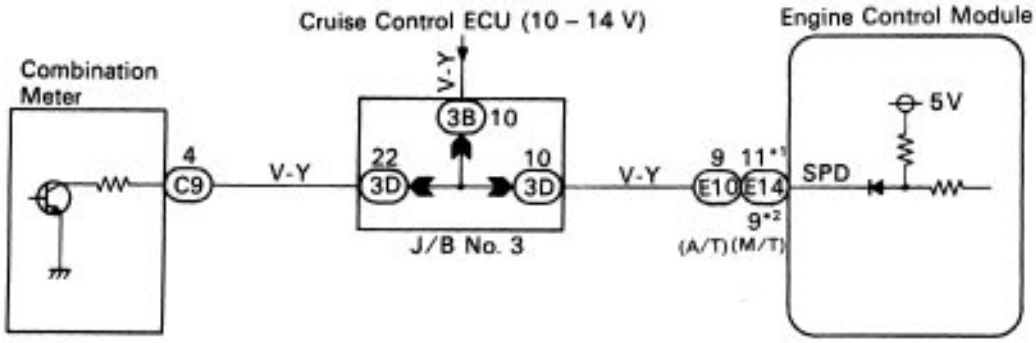
- Waveform between terminals SPD and E1 when vehicle speed is approx. 12 mph (20 km/h).

HINT: The greater the vehicle speed, the greater the number of No.1 vehicle speed sensor signals produced.

DIAGNOSTIC CHART



WIRING DIAGRAM



*1: Except California specification vehicles.
*2: Only for California specification vehicles.

FI8682

INSPECTION PROCEDURE

1 Check operation of speedometer.

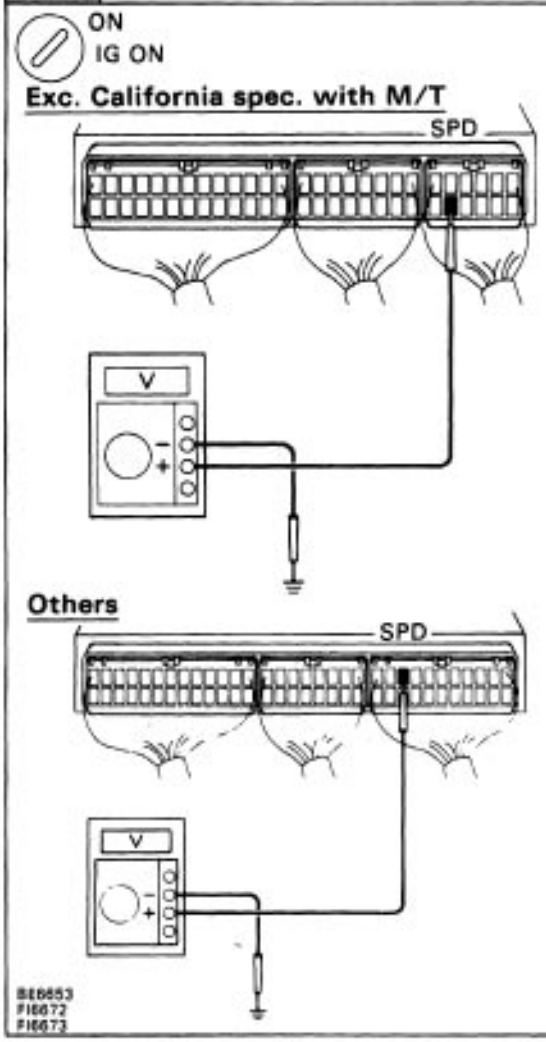
C Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

Hint The No. 1 vehicle speed sensor is operating normally if the speedometer display is normal.

OK

NG → **Check speedometer circuit. See combination meter troubleshooting on page BE–66.**

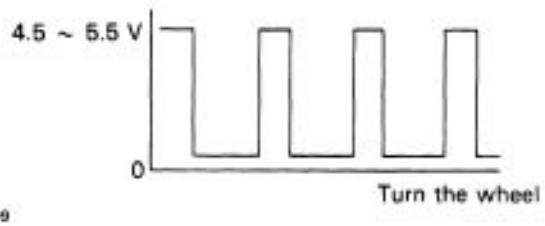
2 Check voltage between terminal SPD of engine control module connector and body ground.



P (1) Remove glove compartment.
(See page EG1–234).
(2) Disconnect cruise control ECU connector.
(3) Shift the shift lever to N position or neutral.
(4) Jack up a front wheel on one side.
(5) Turn ignition switch on.

C Measure voltage between terminal SPD of engine control module connector and body ground when the wheel is turned slowly.

OK **Voltage is generated intermittently.**



OK

NG → **Check speedometer circuit. See combination meter troubleshooting on page BE–66.**

Check and replace engine control module.

DTC 43 Starter Signal Circuit

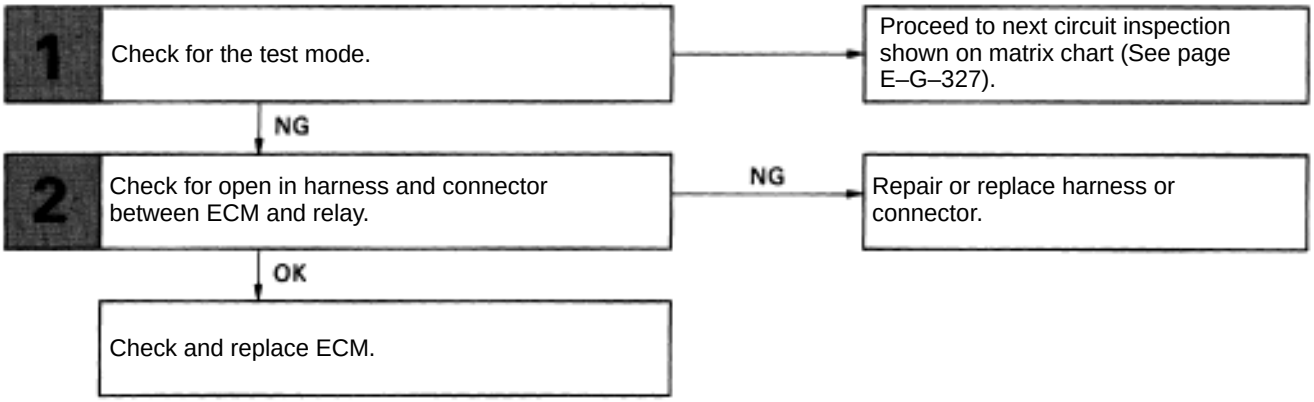
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

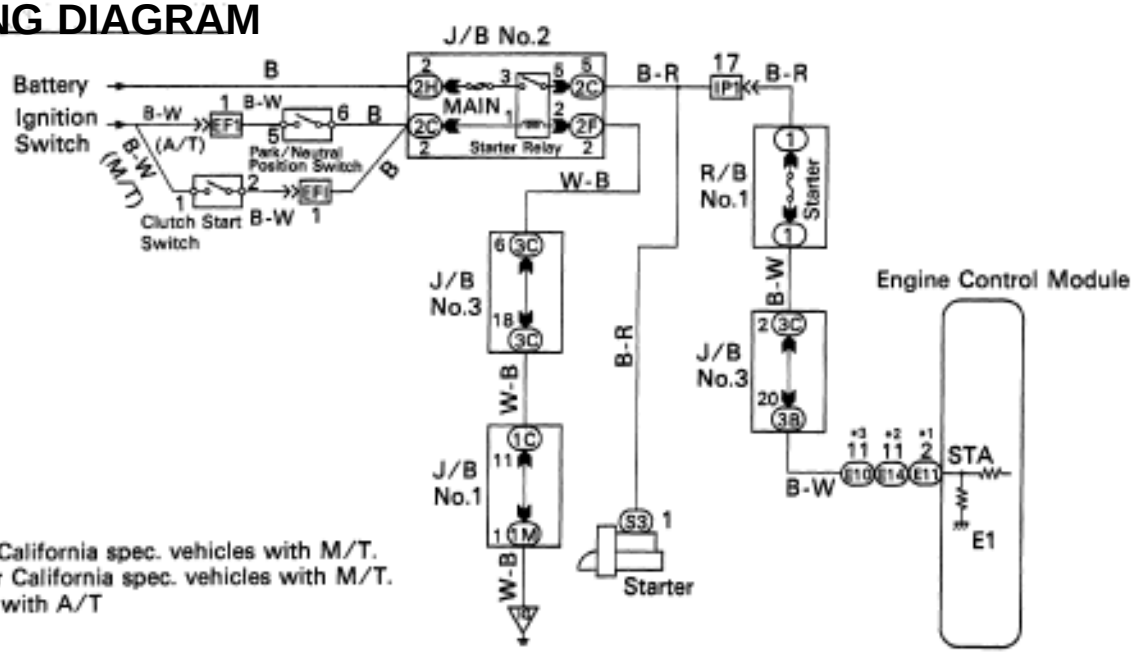
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
43	No starter signal to ECM.	• Open or short in starter signal circuit. • Open or short in ignition switch or starter relay circuit. • ECM

DIAGNOSTIC CHART

HINT: This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG1–327,



WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check output condition of diagnostic trouble code 43.**

P00956

P Setting the test mode.
(1) Turn ignition switch OFF.
(2) Connect terminals TE2 and E1 of DLC2.
(3) Turn ignition switch ON.
(Don't start the engine)
(4) Connect terminals TE1 and E1 of DLC2.

C Check if code "43" is output by the malfunction indicator lamp.

OK **Code "43" is output.**

C Start the engine.
Check if the code "43" disappear.

OK **Code "43" is not output.**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG1–327).**

2 **Check for open in harness and connector between engine control module and starter relay (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace engine control module.

DTC 52 Knock Sensor Circuit

CIRCUIT DESCRIPTION

Knock sensor is fitted the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
52	Open or short in knock sensor circuit with engine speed between 1,200 rpm and 6,000 rpm.	• Open or short in knock sensor circuit. • Knock sensor (looseness) • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

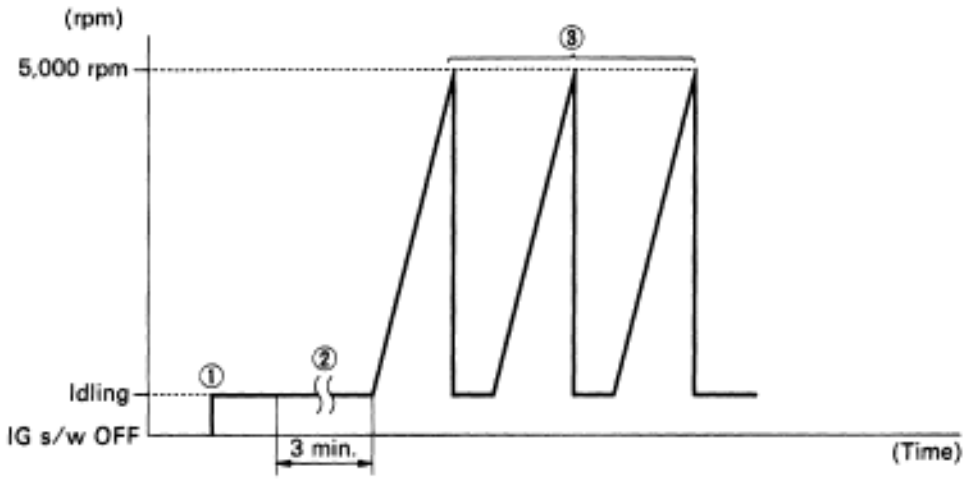
DIAGNOSIS TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

Malfunction: Open or Short in Knock Sensor



FI6461

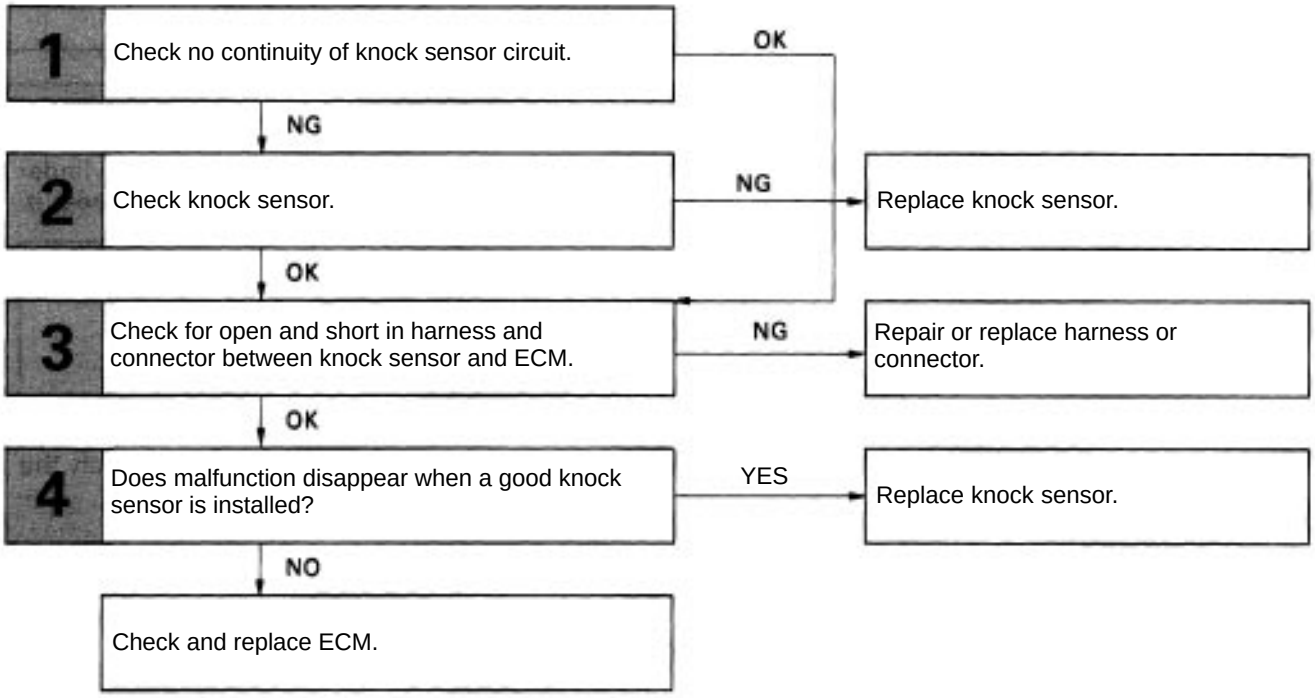
① Start engine and warm up.

② After engine is warmed up, let it idle for 3 min.

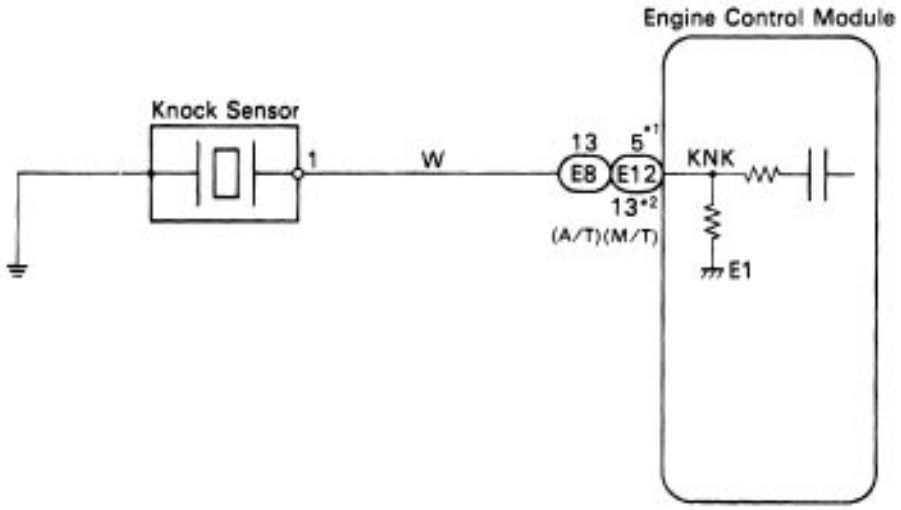
③ With the A/C ON, perform quick racing (5,000 rpm) 3 times.
(Rapidly depress the accelerator pedal and suddenly release it.)
HINT: If a malfunction exists, the malfunction indicator lamp will light up when sudden racing is performed.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART



WIRING DIAGRAM

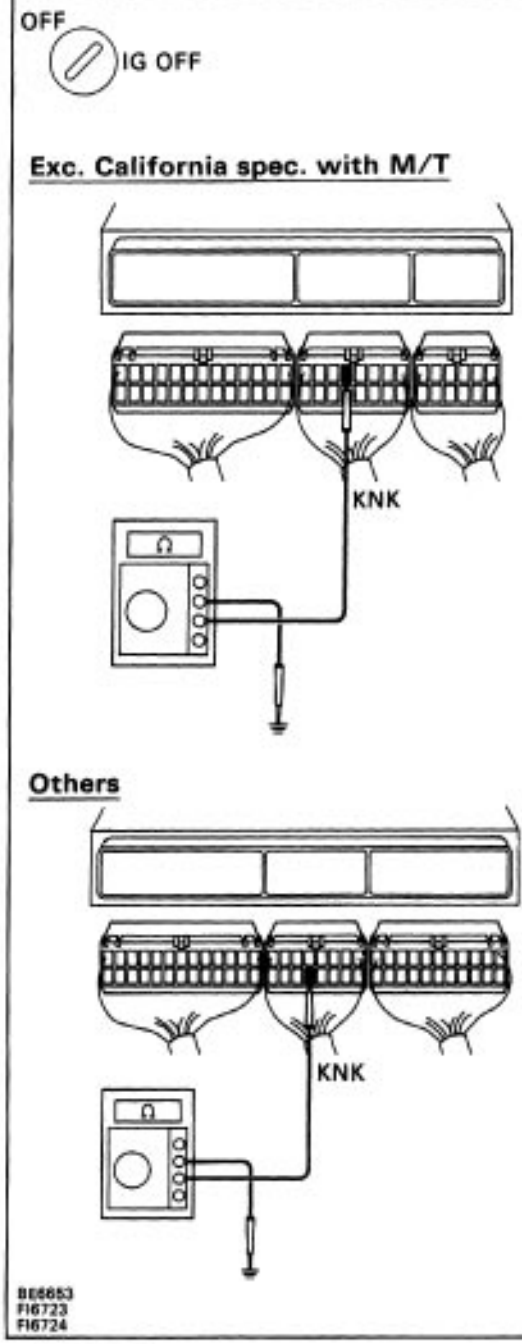


*1: Except California specification vehicles with M/T.
*2: Only for California specification vehicles with M/T.

FI6696

INSPECTION PROCEDURE

1 **Check continuity between terminal KNK of engine control module connector and body ground.**



P (1) Remove glove compartment.
(See page EG1–234)

(2) Disconnect the engine control module connector.

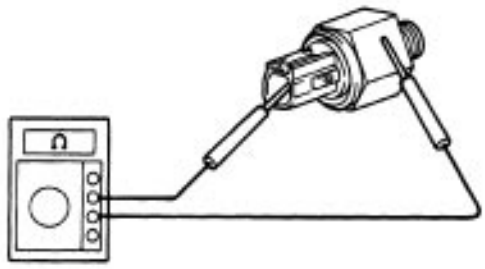
C Measure resistance between terminal KNK of engine control module connector and body ground.

OK **Resistance: 1 MΠ or higher**

NG

OK 〉 Go to step 3

2 **Check knock sensor.**



P Disconnect knock sensor connector.

C Measure resistance between the knock sensor terminal and body.

OK **Resistance: 1 MΩ or higher**

OK

NG → **Replace knock sensor (See page EG1–93).**

3 **Check for open and short in harness and connector between engine control module and knock sensor (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

4 **Does malfunction disappear when a good knock sensor is installed?**

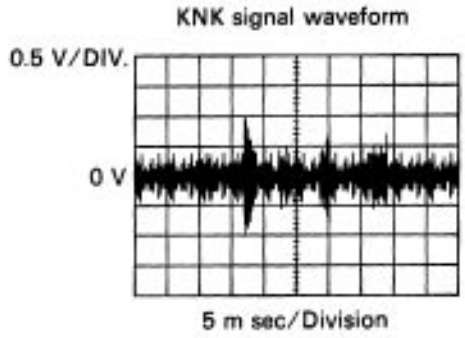
NO

YES → **Replace knock sensor (See page EG1–93).**

Check and replace engine control module.

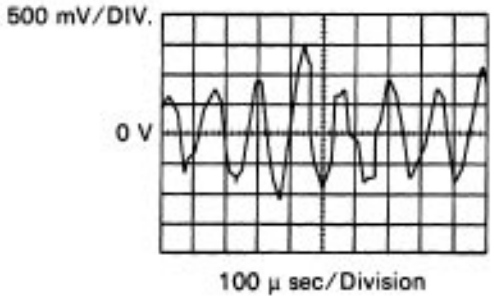
Reference

INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm) measure waveform between terminal KN K of engine control module and body ground.

HINT: The correct waveform appears as shown in the illustration on the left.



- Spread the time on the horizontal axis, and confirm that period of the wave is 132 µ sec. (Normal mode vibration frequency of knock sensor: 7.6 KHz).

HINT: If normal mode vibration frequency is not 7.6 KHz, the sensor is malfunctioning.

FI6510
FI6675

DTC 71 EGR System Malfunction

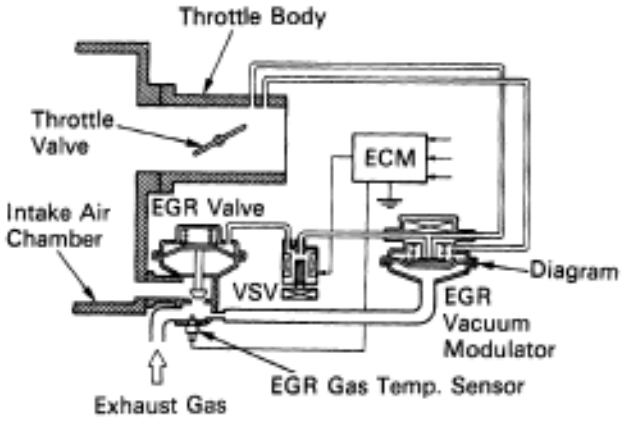
CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temperature and reduces NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–OFF).

Under the following conditions, EGR is cut to maintain driveability.

- Engine coolant temp. below 60°C (140°F).
- During deceleration (throttle valve closed).
- Light engine load (amount of intake air very small).
- Engine speed over 4,400 rpm.
- Engine racing.



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
71	EG R gas temp. is 70°C (158°F) or below for 50 sec. under conditions (a) and (b). (2 trip detection logic) * (a) Engine coolant temp.: 80°C (176°F) or more. (b) EGR operation possible (EX. A/T in 3rd speed (5th for M/T), 55 – 60 mph (88 – 96 km/h), Flat road).	• Open in EGR gas temp. sensor circuit. • Short in VSV circuit for EGR. • EGR hose disconnected, valve stuck. • Clogged EGR gas passage. • ECM

*: See page EG1–307.

CIRCUIT DESCRIPTION (Cont'd)

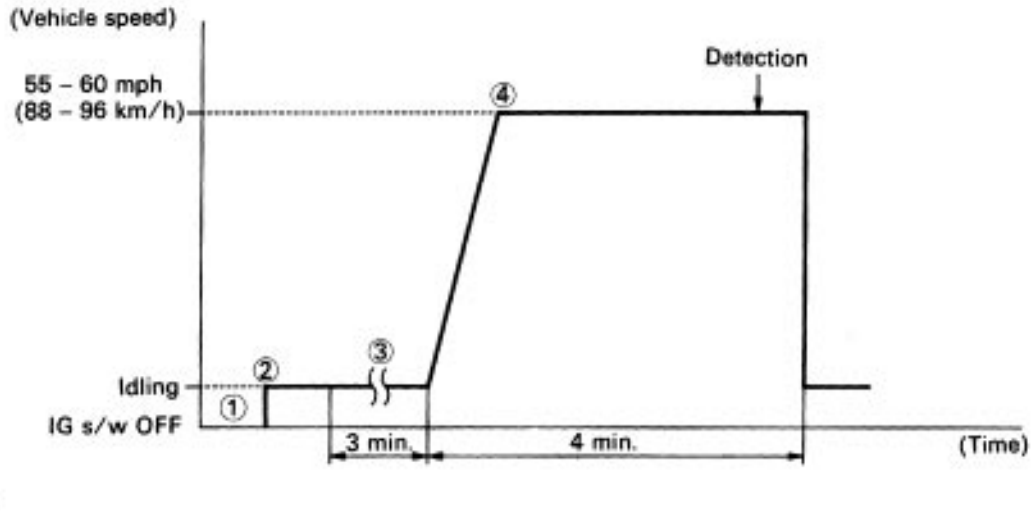
DIAGNOSIS TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

Malfunction: Open in EGR gas temp. sensor circuit



FI6528

① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF. Initiate test mode (Connect terminals TE2 and E1 of data link connector, 1 or 2 with IG switch OFF).

② Start the engine and warm up.

③ After the engine is warmed up, let it idle for 3 min.

④ With the A/C ON and transmission in 5th gear A/T in "D" position), drive at 55 – 60 mph (88 – 96 km/h) for 4 min. or less.

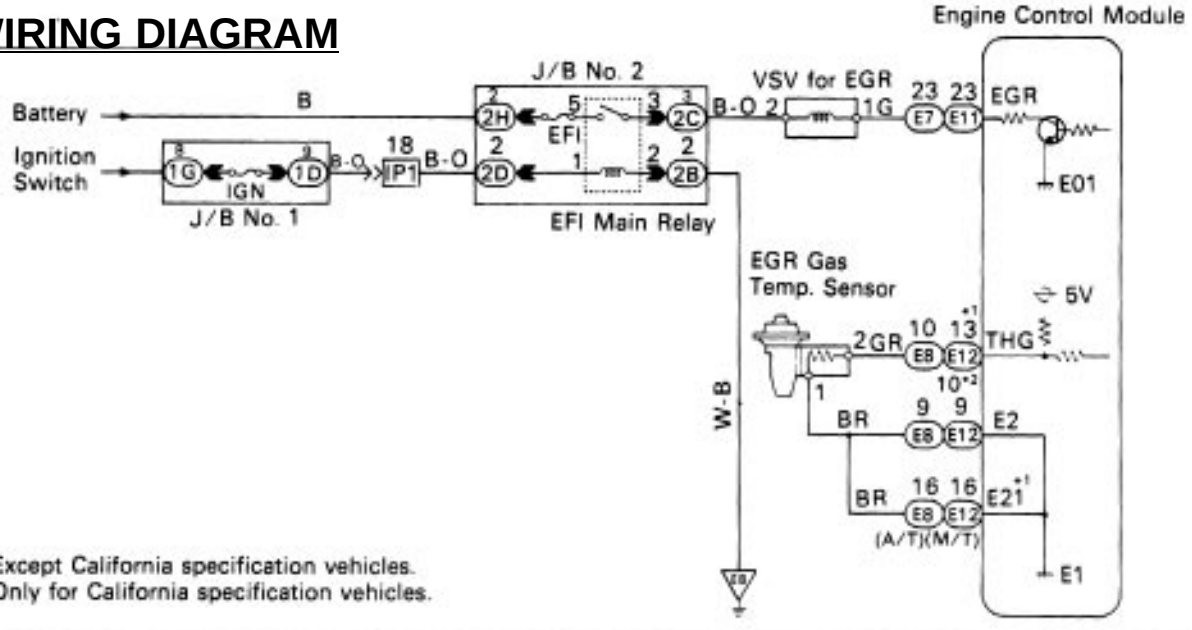
HINT: If a malfunction exists, the malfunction indicator lamp will light up during step (4) .

NOTICE: If the conditions in this test are not strictly observed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART

1. Check voltage of VSV for EGR Power source.
   - OK → 4
   - NG → 2
2. Check resistance of VSV for EG R.
   - NG → Replace VSV for EG R.
   - OK → 3
3. Check for open and short in harness and connector between EFI main relay and ECM.
   - NG → Repair or replace harness or connector.
   - OK → Check and replace ECM.
4. Check EGR system (See page EG1–153) .
   - NG → Repair EGR system.
   - OK → 5
5. Check resistance of EGR gas temp. sensor.
   - NG → Replace EGR gas temp. sensor.
   - OK → 6
6. Check for open in harness and connector between EGR gas temp. sensor and ECM.
   - NG → Repair or replace harness or connector.
   - OK → Check and replace ECM.

WIRING DIAGRAM

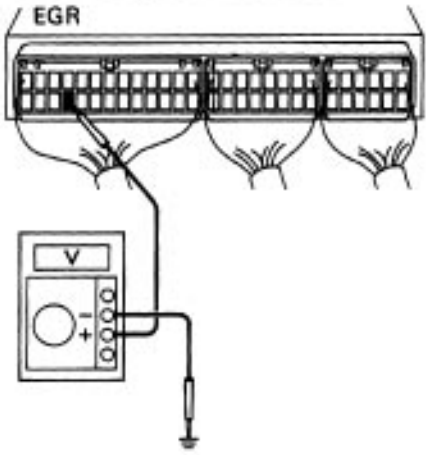


F16689

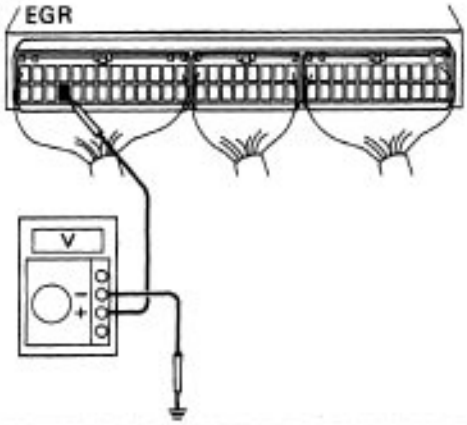
INSPECTION PROCEDURE

1 **Check voltage between terminal EGR of engine control module connector and body ground.**

Exc. California spec. with M/T



Others



FI6726
FI6725

P (1) Remove glove compartment.
(See page EG1–234).
(2) Warm up engine to normal operating temperature.

C Measure voltage between terminal EGR of engine control module connector and body ground.

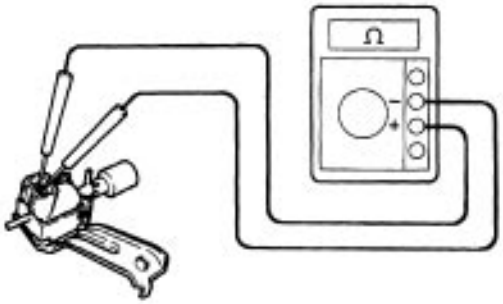
OK **Voltage: 9 –14 V**

NG

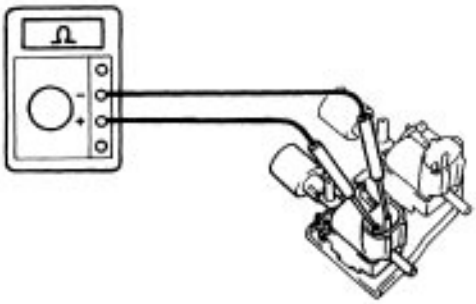
OK 〉 **Go to step** 4

2 **Check resistance between terminals of VSV for EGR.**

Exc. California spec.



Only for California spec.



P00820
P14145

P Remove VSV for EGR. (See page EG1–154, 155*).

C Measure resistance between terminals of VSV for EG R.

OK **Resistance: 33 – 39Ω (Cold)**

*: Except California specification vehicle.

OK

NG → **Replace VSV for EGR.**

3 **Check for open and short in harness and connector between EFI main relay and VSV for EGR, VSV and engine control module. (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

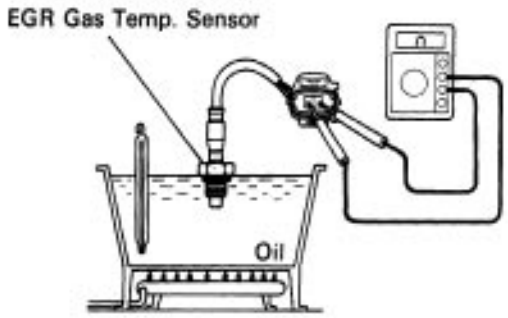
Check and replace engine control module.

4 **Check EGR system (See page EG1–153).**

OK

NG → **Repair EGR system.**

5 **Check resistance of EGR gas temp, sensor.**



P Remove EGR gas temp. sensor.

C Measure resistance between terminals of EG R gas temp. sensor connector.

OK **Resistance: 64 – 97 kΩ at 50°C (122°F)**
11 –16 kΩ at 100°C (212°F)
2 – 4 kΩ at 150°C (302°F)

OK

NG → **Replace EGR gas temp. sensor.**

6 **Check for open in harness and connector between EGR gas temp. sensor and engine control module (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace engine control module.

DTC 51 Switch Condition Signal Circuit

CIRCUIT DESCRIPTION

Park/Neutral Position Switch Signal*

The ECM uses the signals from the park/neutral position switch to determine whether the transmis–sion is in park or neutral, or in some other gear.

Air Conditioning Switch Signal

The ECM uses the output from the air conditioning switch to determine whether or not the air conditioning is operating so that it can increase the idling speed of the engine if necessary.

Throttle Position Sensor IDL Signal

The IDL contacts are mounted in the throttle position sensor, and detects the idle condition.

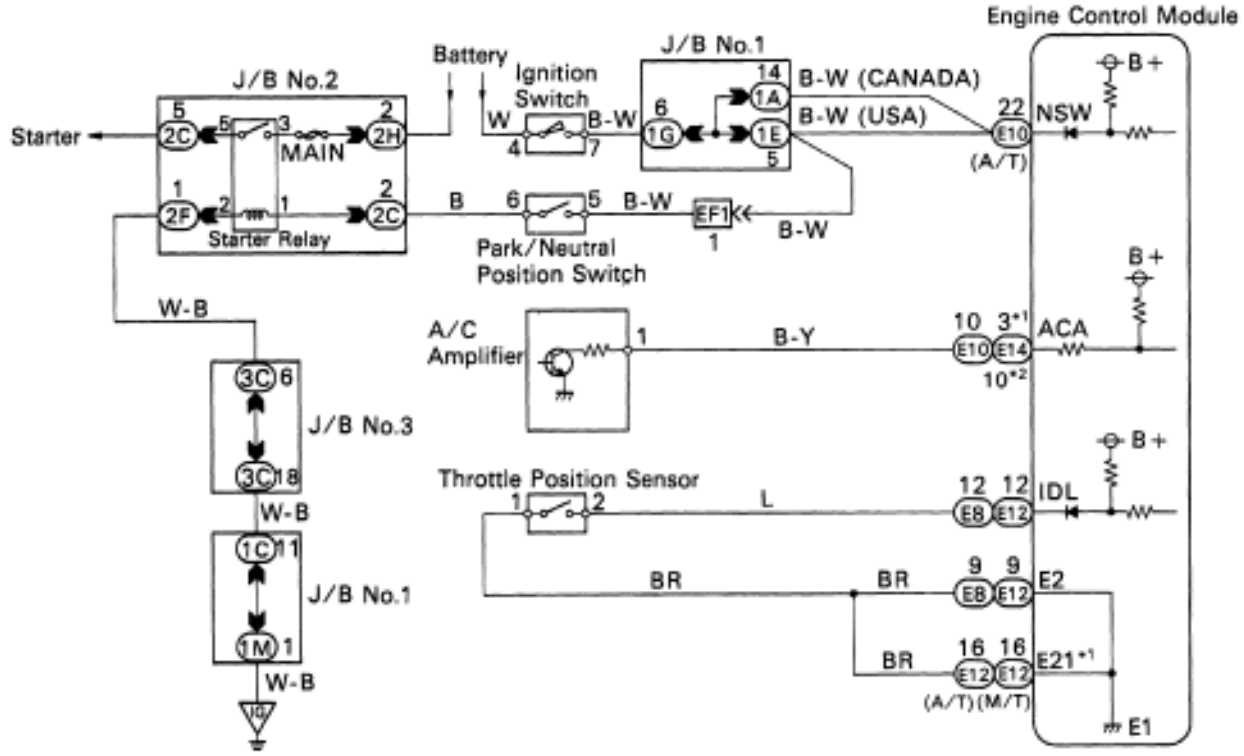
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
51	(1) 3 sec. or more after engine starts with closed throttle position switch OFF (IDL). (2) * Park/ Neutral position switch OFF. (Shift position in “R”, “D”, “2” or “L” positions). (3) A/C switch ON.	• Throttle position sensor IDL circuit • Accelerator pedal and cable • Park/Neutral position switch circuit • A/C switch circuit • ECM

*: Only vehicles with A/T.

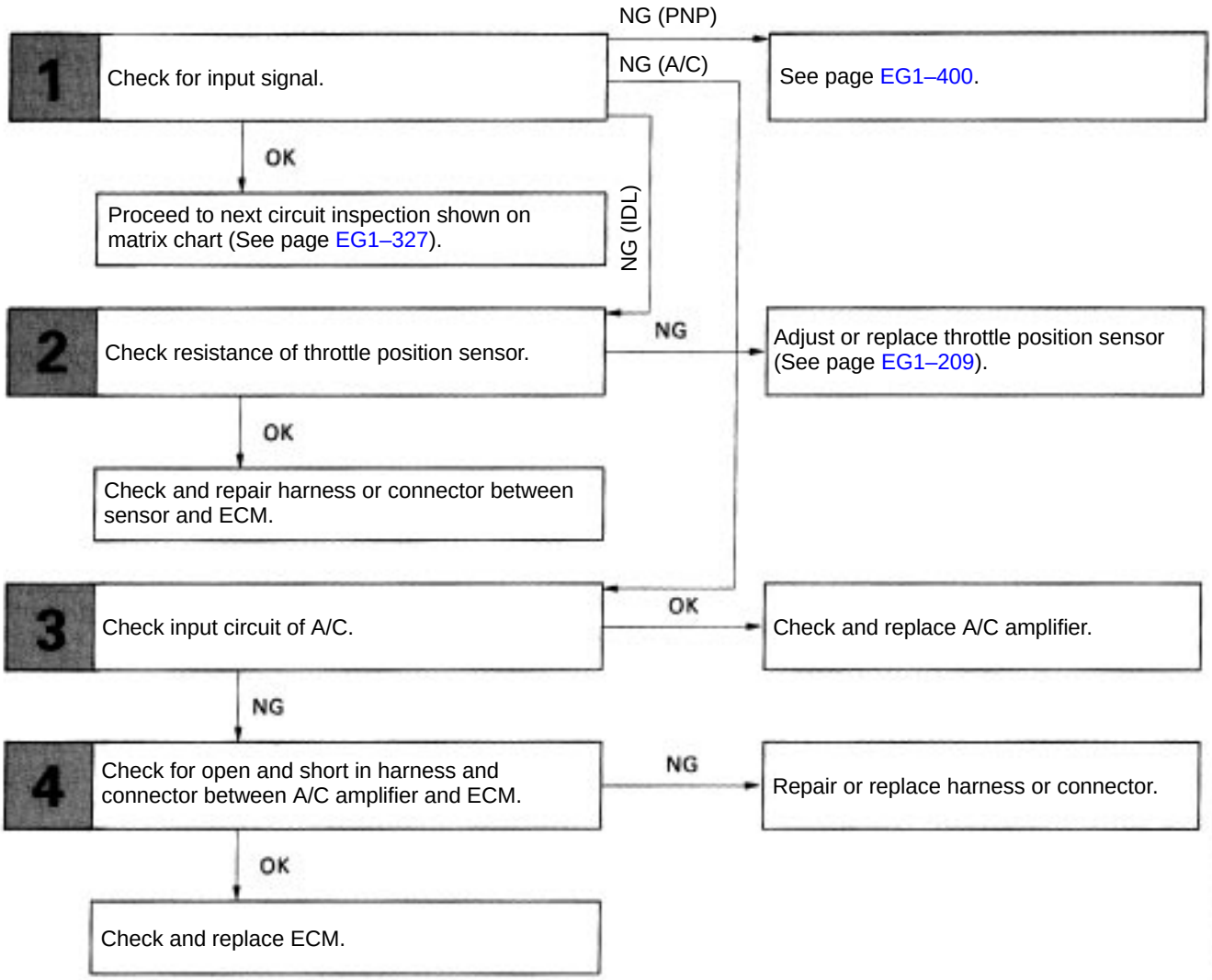
HINT: In this circuit, diagnosis can only be made in the test mode.

DIAGNOSTIC CHART

WIRING DIAGRAM



DIAGNOSTIC CHART



INSPECTION PROCEDURE

1 Check output condition of diagnostic trouble code 51.

P00965

P Setting the test mode.

(1) Turn ignition switch OFF.

(2) Connect terminals TE2 and E1 of DLC2.

(3) Turn ignition switch ON.

(For checking terminal IDL, disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page EG1–204).)

(For checking terminal A/C, start the engine.)

(4) Connect terminals TE1 and E1 of DLC2.

C Check if code "51" is output by the malfunction indicator lamp.

OK

	Condition	Code
Park/Neutral Position Switch (PNP)	P or N position	Normal*
	R, D, 2 or L position	51*
Throttle Position Sensor (IDL)	Accelerator pedal released	Normal*
	Accelerator pedal depressed	51*
A/C Switch (A/C)	A/C SW ON	51
	A/C SW OFF	Normal

*: Before the STA signal is input (ST is not ON), diagnostic trouble code 43 is also output.

Hint Diagnostic trouble code 42 is output with vehicle speed 3 mph (5 km/h) or below.

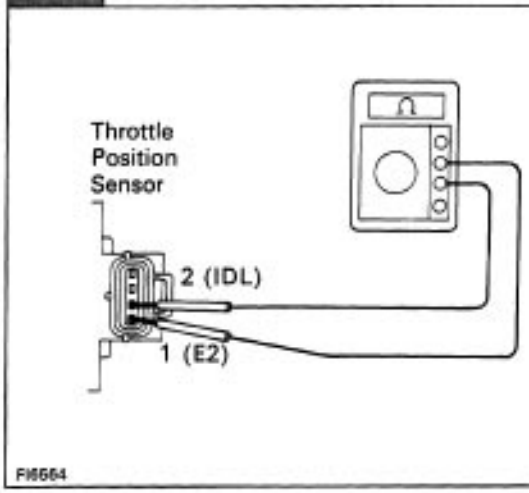
OK

NG **IDL .... Go to step 2**
A/C ... Go to step 3

PN P ... Go to page EG1–400.

Proceed to next circuit inspection shown on matrix chart (See page EG1–327).

2 Check resistance of throttle position sensor.



P (1) Disconnect throttle position sensor connector.
(2) Disconnect the vacuum hose from the throttle body, then apply vacuum to the throttle opener (See page EG1–204).

C Measure resistance between terminals 2 (IDL) and 1(E2) of throttle position sensor connector.

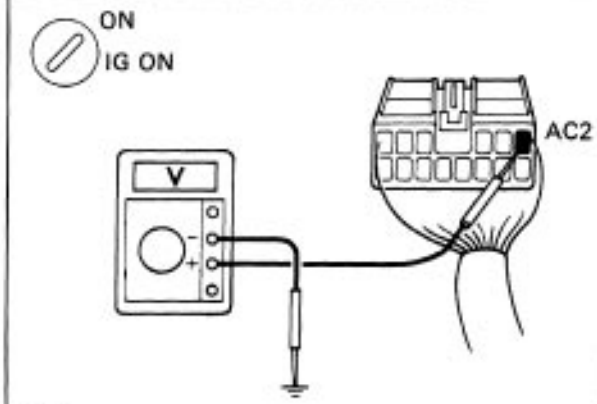
OK

Throttle Valve	Resistance
Fully closed	Less than 2.3 kΩ
Opened	1 MΩ or higher

OK → Check and repair harness or connector between engine control module and throttle position sensor.

NG → **Adjust or replace throttle position sensor (See page EG1–209).**

3 Disconnect A/C amplifier connector, check voltage between terminal AC2 of A/C amplifier connector and body ground.



P (1) Remove glove compartment (See page BO–114).
(2) Disconnect A/C amplifier connector.

C (3) Turn ignition switch on.
Measure voltage between terminal AC2 of A/C amplifier connector and body ground.

OK **Voltage: 9 –14 V**

OK → **Check and replace A/C amplifier.**

4 Check for open and short in harness and connector between engine control module and A/C amplifier (See page IN–31).

OK → **Check and replace engine control module.**

NG → **Repair or replace harness or connector.**

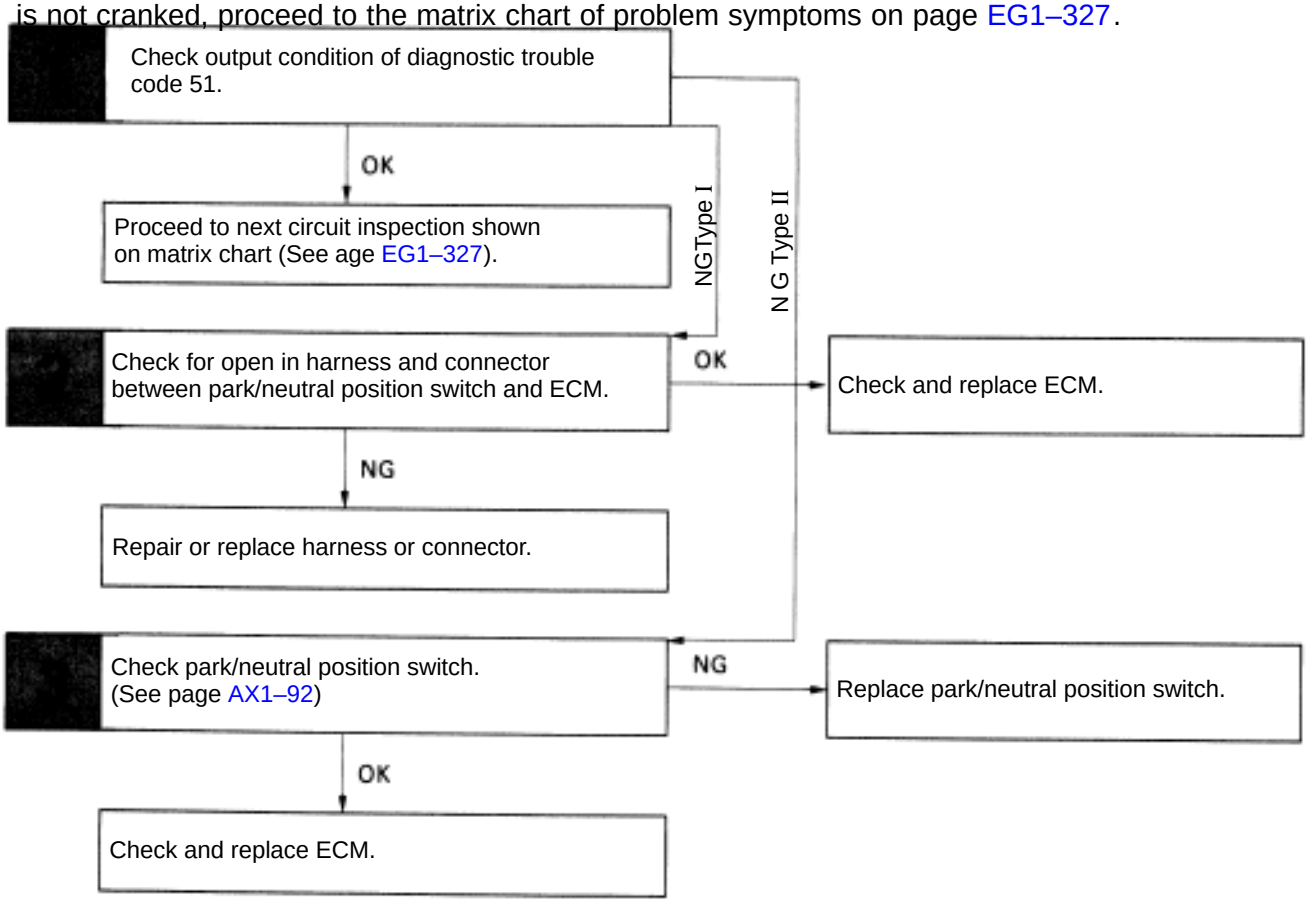
Park Neutral Position Switch Circuit (Only vehicles with A–T)

CIRCUIT DESCRIPTION

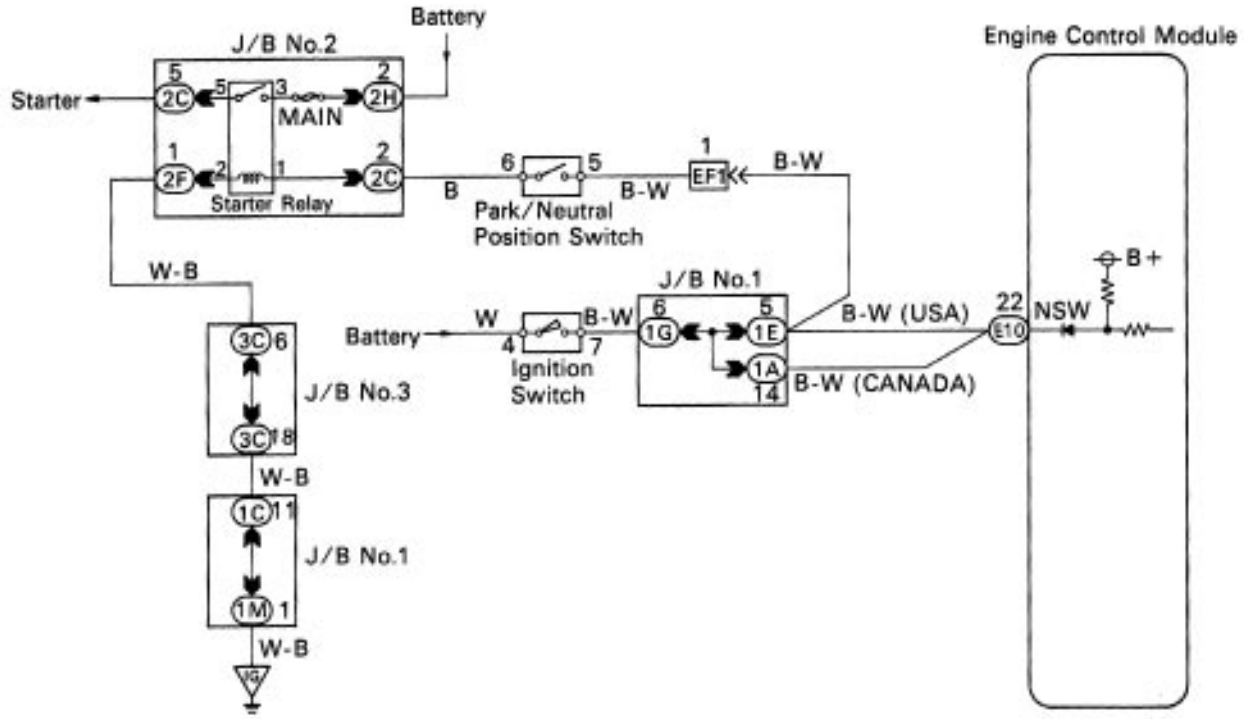
The Park/Neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on the terminal NSW of the ECM is grounded to body ground via the starter relay and theft deterrent ECU, thus the terminal NSW voltage becomes 0V. When the shift lever is in the D, 2, L or R position, the Park/Neutral position switch goes off, so the voltage of ECM terminal NSW becomes battery voltage, the voltage of the ECM internal power source. If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc. When the Park/Neutral position switch is off, code “51” is output in the test mode diagnosis. (This is not abnormal.)

DIAGNOSTIC CHART

HINT: This diagnosis chart is based on premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG1–327.

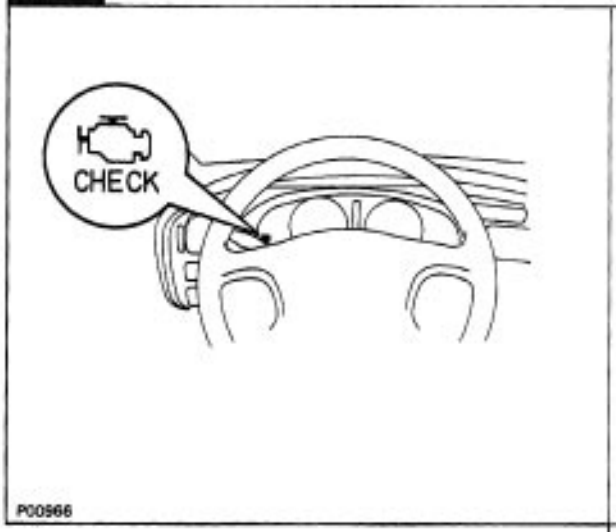


WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check output condition of diagnostic trouble code 51.



P (1) Connect terminals TE2 and E1 of DLC2.
(2) Turn ignition switch on.
(3) Crank the engine.
(4) Connect terminals TE1 and E1 of DLC2.

C Check if diagnostic trouble code "51" is output when the shift lever is in the P and D shift positions.

Result

Shift Position	Result		
	OK	N G Type I	NG Type II
"P"	Normal Code	Code 51	Normal Code
"D"	Code 51	Code 51	Normal Code

OK

NG Type I → **Go to step 2**

NG Type II → **Go to step 3**

Proceed to next circuit inspection shown on matrix chart (See age EG1–327).

2 Check for open in harness and connector between engine control module and park/neutral position switch (See page IN–31).

NG

OK → **Check and replace engine control module.**

Repair or replace harness or connector.

3 Check park/neutral position switch (See page AX1–92).

OK

NG → **Replace park/neutral position switch.**

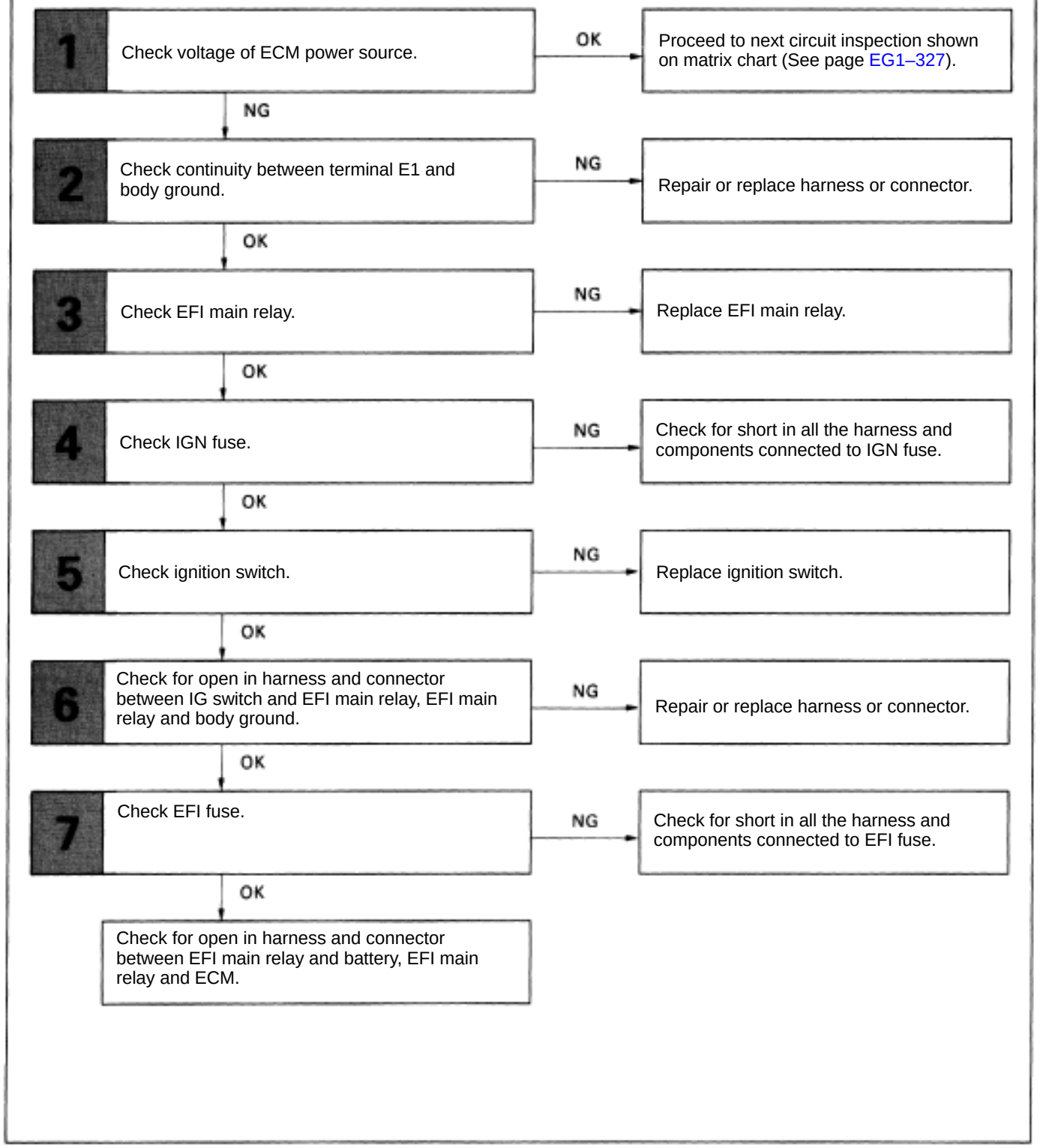
Check and replace engine control module.

ECM Power Source Circuit

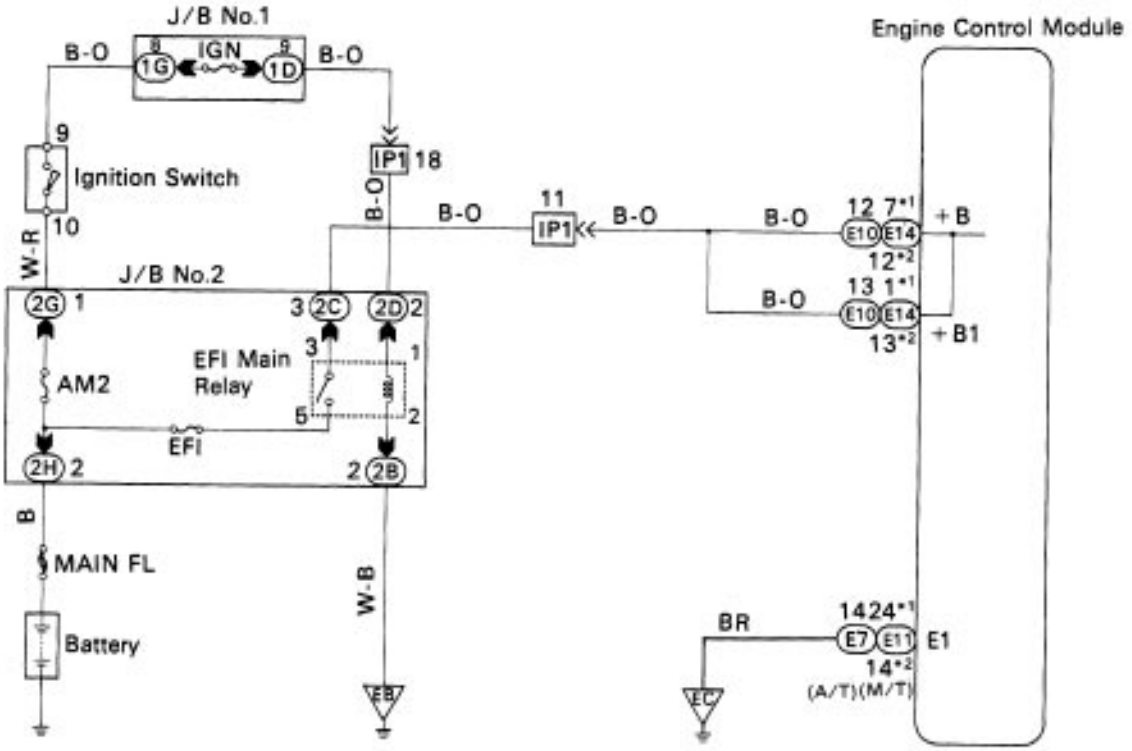
CIRCUIT DESCRIPTION

When the ignition switch is turned on, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminals + B and + 131 of the ECM.

DIAGNOSTIC CHART



WIRING DIAGRAM



*1: Except California specification vehicles with M/T.
*2: Only for California specification vehicles with M/T.

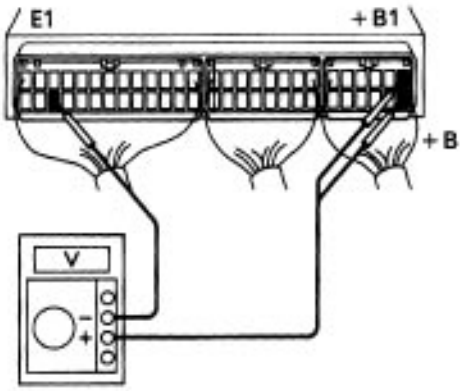
FI0685

INSPECTION PROCEDURE

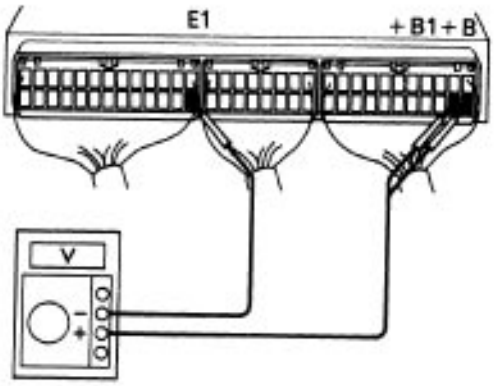
1 **Check voltage between terminals + B, + 131 and E1 of engine control module connector.**

ON
IG ON

Exc.California spec. with M/T



Others



88663
FI6727
FI6728

P (1) Remove glove compartment.
(See page EG1–234)

(2) Turn ignition switch ON.

C Measure voltage between terminals + B, + 131 and E1 of engine control module connector.

OK **Voltage: 9 –14 V**

NG

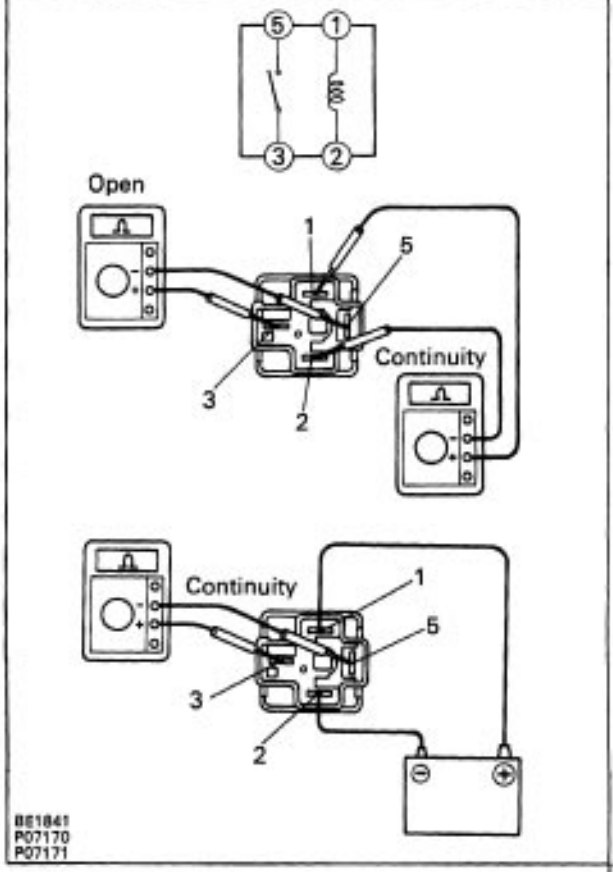
OK → **Proceed to next circuit inspection shown on matrix chart (See page EG1–327).**

2 **Check for open in harness and connector between terminal E1 of engine control module and body ground (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

3 Check EFI main relay.



P Remove EFI main relay from J/B No–2.

C Check continuity between terminals of EFI main relay shown below.

OK

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity (Reference value 72Ω)

C (1) Apply battery voltage between terminals 1 and 2.
(2) Check continuity between terminals 3 and 5.

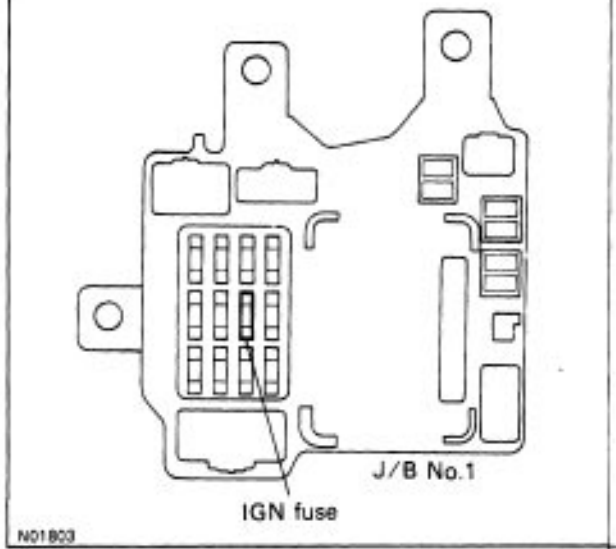
OK

Terminals 3 and 5	Continuity

OK

NG → **Replace EFI main relay.**

4 Check IGN fuse.



P Remove IGN fuse from J/B No.1.

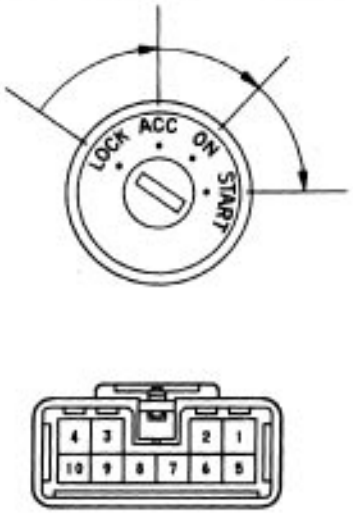
C Check continuity of IGN fuse.

OK **Continuity**

OK

NG → **Check for short in all the harness and components connected to IGN fuse (See attached wiring diagram).**

5 **Check ignition switch.**



P Remove under cover and finish panel.

C Check continuity between terminals.

OK

○—○ continuity

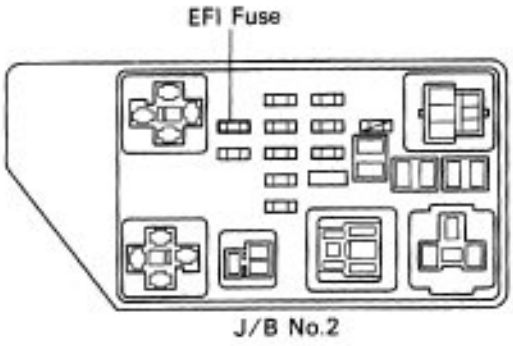
Terminal / Switch position	2 IG1	3 ACC	4 AM1	6 ST2	7 ST1	9 IG2	10 AM2
LOCK							
ACC		○—○	○—○				
ON	○—○	○—○	○—○			○—○	○—○
START	○—○		○—○	○—○	○—○	○—○	○—○

OK → **NG** → Replace ignition switch.

6 **Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–31).**

OK → **NG** → **Repair or replace harness or connector.**

7 **Check EFI fuse.**



P Remove EFI fuse from J/B No.2.

C Check continuity of EFI fuse.
Continuity

OK

OK → **NG** → **Check for short in all the harness and components connected to EFI fuse (See attached wiring diagram).**

Check for open in harness and connector between EFI main relay and battery, EFI main relay and engine control module.

Back Up Power Source Circuit

CIRCUIT DESCRIPTION

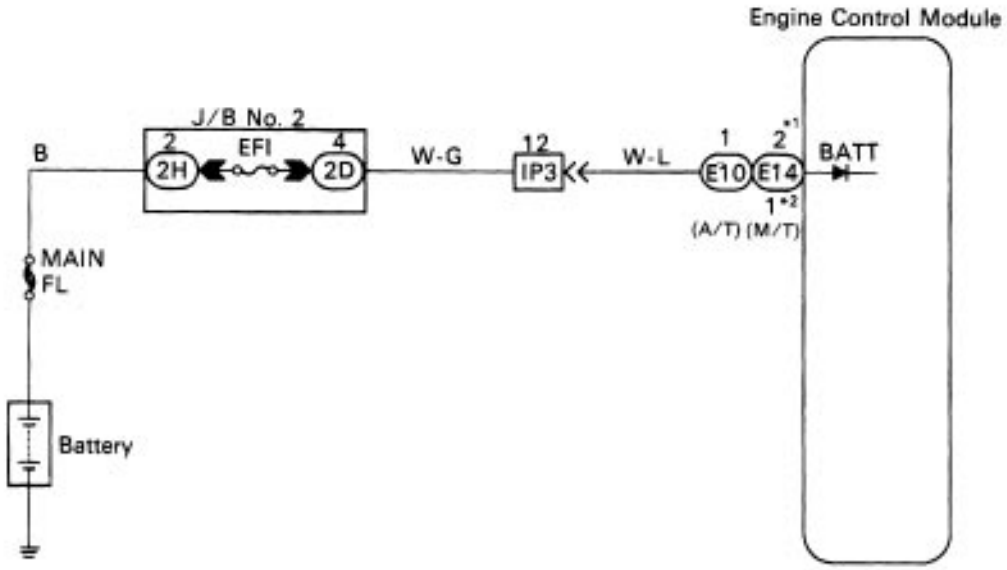
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is off for use by the diagnostic trouble code memory and air–fuel ratio adaptive control value memory, etc.

DIAGNOSTIC CHART

1. Check EFI fuse.
   - NG → Check for short in all the harness and components connected to EFI fuse.
   - OK ↓
2. Check voltage of terminal6ATT.
   - NG → Check and repair harness or connector between battery, EFI fuse and ECU.
   - OK ↓
3. Check operation for the back up.
   - NG → Check and replace ECM.
   - OK ↓

Proceed to next circuit inspection shown on matrix chart (See page EG1–327).

WIRING DIAGRAM

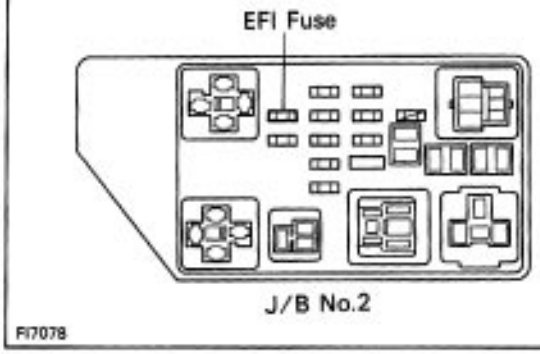


*1: Except California specification vehicles with M/T.
*2: Only for California specification vehicles with M/T.

FI6685

INSPECTION PROCEDURE

1 Check EFI fuse.



P Remove EFI fuse from J/B No.2.
C Check continuity of EFI fuse.
OK Continuity

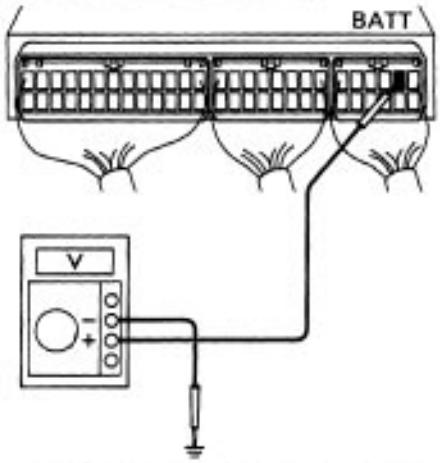
OK

NG → **Check for short in all the harness and components connected to EFI fuse (See attached wiring diagram).**

2 Check voltage between terminal BATT of engine control module connector and body ground.

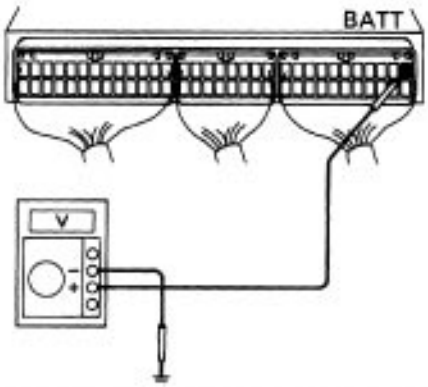
OFF
IG OFF

Exc. California spec. with M/T



P Remove glove compartment.
(See page EG1–234)
C Measure voltage between terminal BATT of engine control module connector and body ground.
OK **Voltage: 9 –14 V**

Others



OK

NG → **Check and repair harness or connector between engine control module and EN fuse, EFI fuse and battery.**

3 Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF?

YES

NO → Check and replace engine control module.

Proceed to next circuit inspection shown on matrix chart (See page EG1–327).

Injector Circuit

CIRCUIT DESCRIPTION

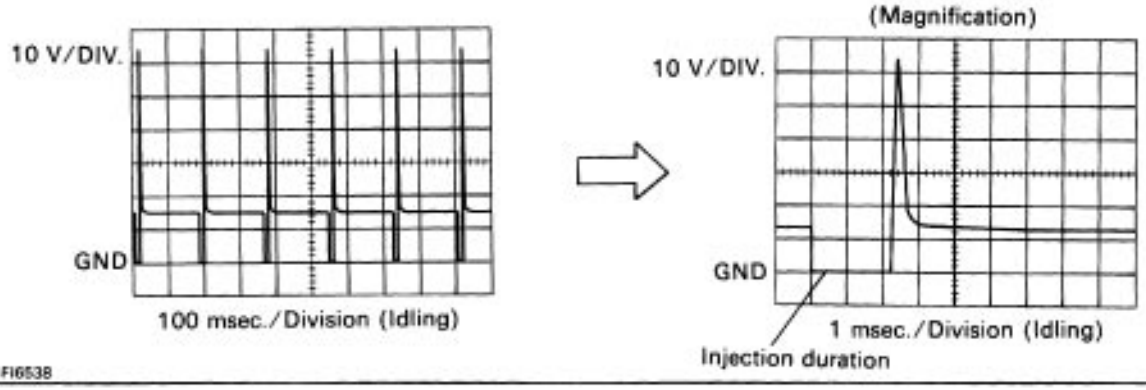
The injectors are provided to the intake manifold. They inject fuel into the cylinders based on the signals from the engine control module.

Reference INSPECTION USING OSCILLOSCOPE

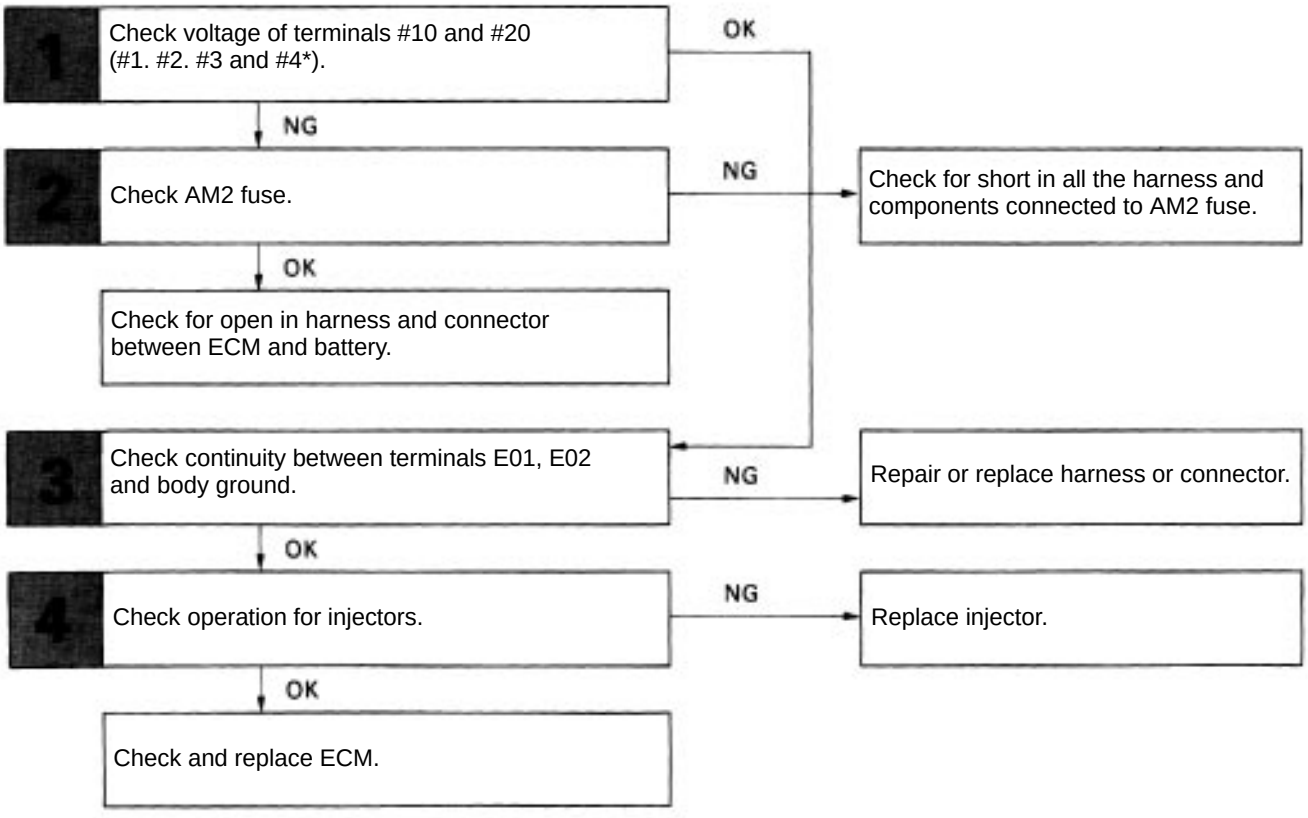
INJECTOR SIGNAL WAVEFORM

- With the engine idling measure waveform between terminals #10, #20 (#1, #2, #3 and #4*) and E01 of engine control module.

HINT: The correct waveform appears as shown in the illustration on the below.



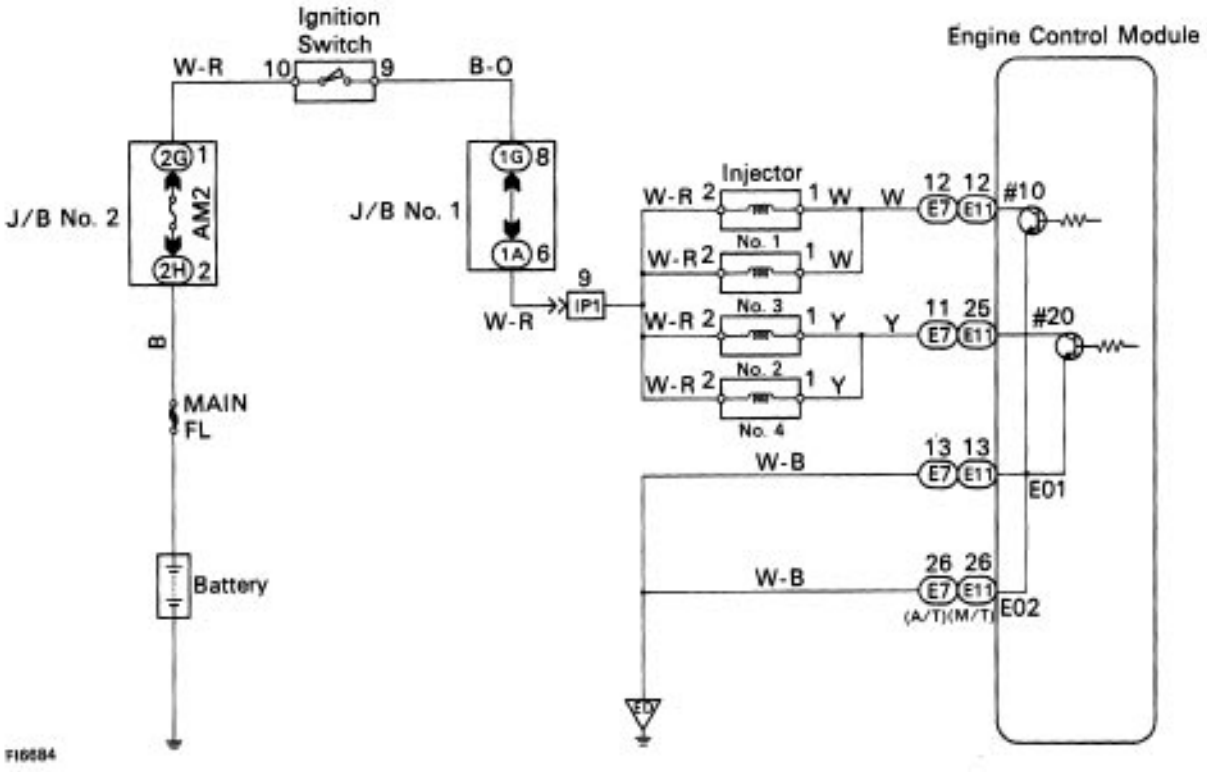
DIAGNOSTIC CHART



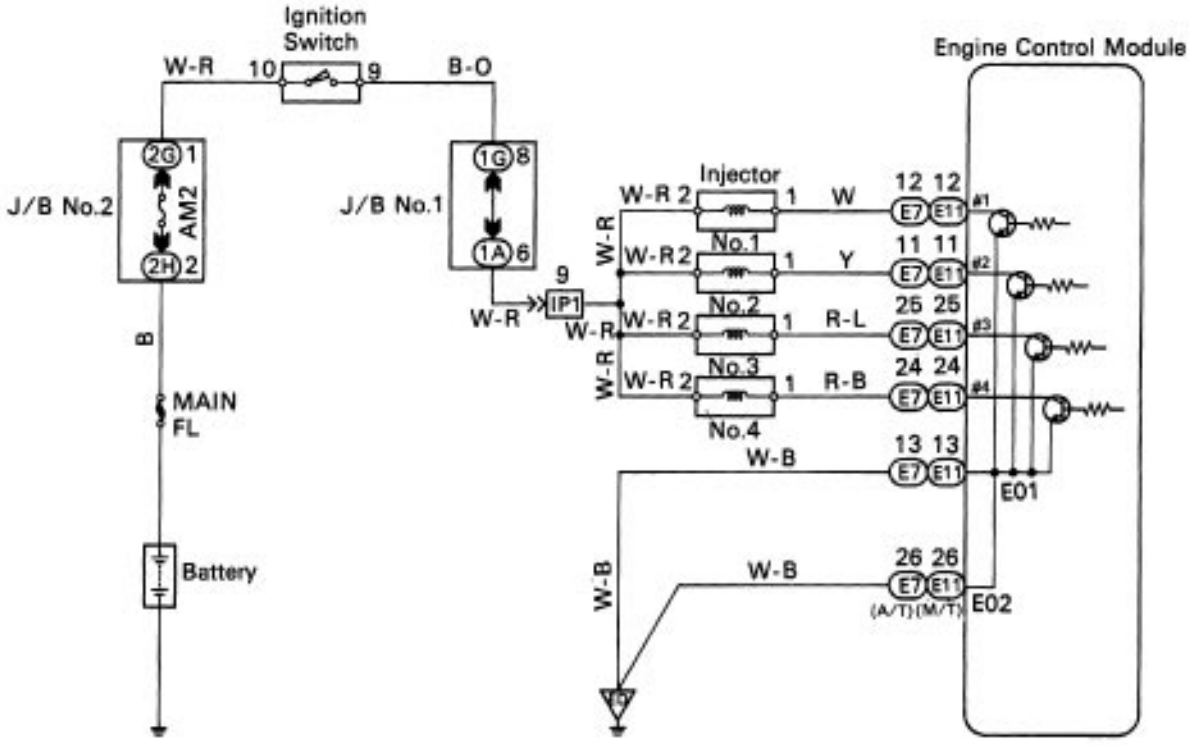
*: Only for California specification vehicles.

WIRING DIAGRAM

Except California specification vehicles.

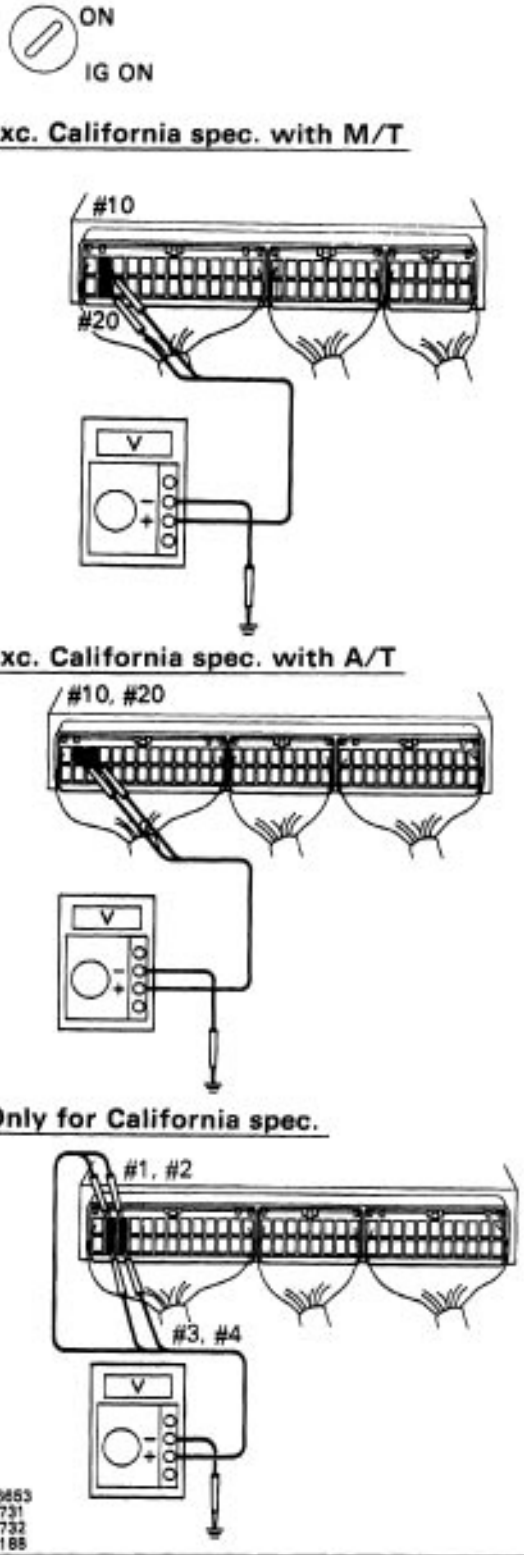


Only for California specification vehicles.



INSPECTION PROCEDURE

1 **Check voltage between terminals #10, #20 (#1, #2, #3 and #4) of engine control module connector and body ground.**



P (1) Remove glove compartment.
(See page EG1–234)
(2) Turn ignition switch ON.

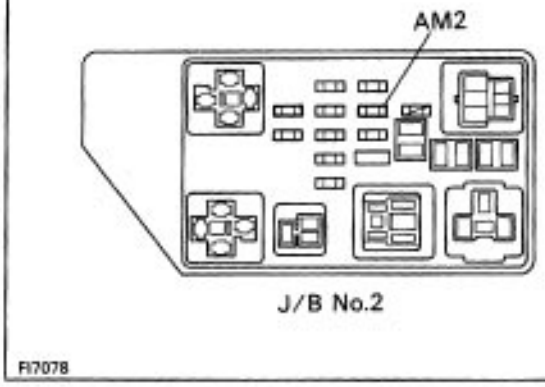
C Exc. California spec.
Measure voltage between terminals #10, #20 of engine control module connector and body ground.
Only for California spec.
Measure voltage between terminals #1, #2, #3 and #4 of engine control module connector and body ground.

OK **Voltage: 9 –14 V**

NG

OK 〉 **Go to step 3**

2 Check AM2 fuse.



P Remove AM2 fuse from J/B No. 2.

C Check continuity of AM2 fuse.
Continuity

OK

OK

NG → Check for short in all the harness and components connected to AM2 fuse.

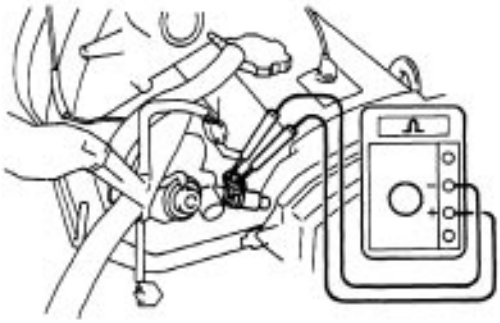
Check for open in harness and connector between engine control module and battery.

3 Check for open in harness and connector between terminals E01, E02 of engine control module connector– and body ground (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

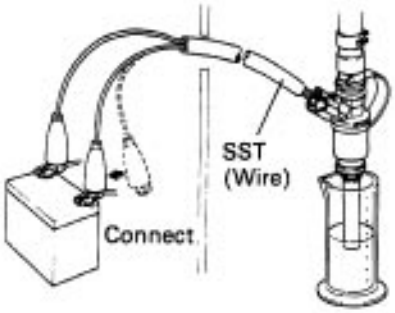
Check injectors.



P Disconnect injector connector
(See page EG1–189) .

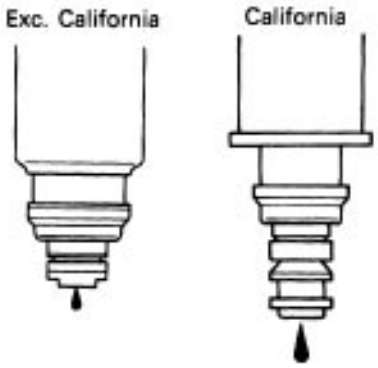
C Measure resistance of injector.

OK **Resistance: Approx. 13.8Ω at 20°C (68°F)**



C Check injection volume of injector
(See page EG1–195).

OK
- **Injection volume**
  49 – 59 cm®(3.0 – 3.6 cu in.)/15 sec.
  Difference between each injector:
  Less than 5 cm3 (0.3 cu in.)
- **Leakage**
  Fuel drop: One drop or less per minute.



P01064
FI4848
FI4849
P10811

OK

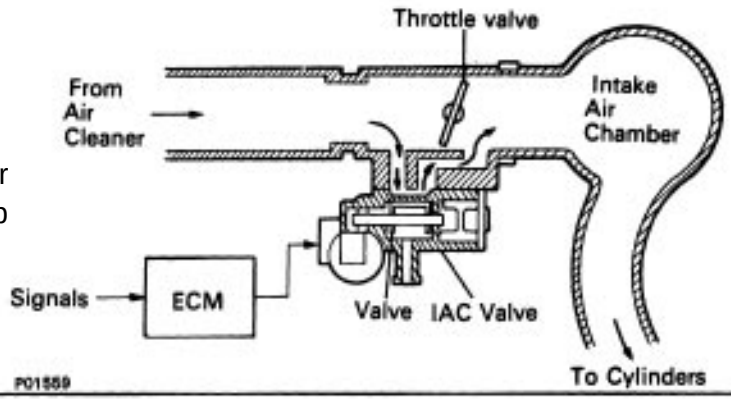
NG → **Replace injector.**

Check and replace engine control module.

IAC Valve Circuit

CIRCUIT DESCRIPTION

The rotary solenoid type IAC valve is provided on the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypas–sing the throttle valve is regulated, con–trolling the engine speed.
The ECM operated only the IAC valve to perform idle–up and provide feedback for the target idling speed, a VSV for idle–up control is also added (for air condition–ing).

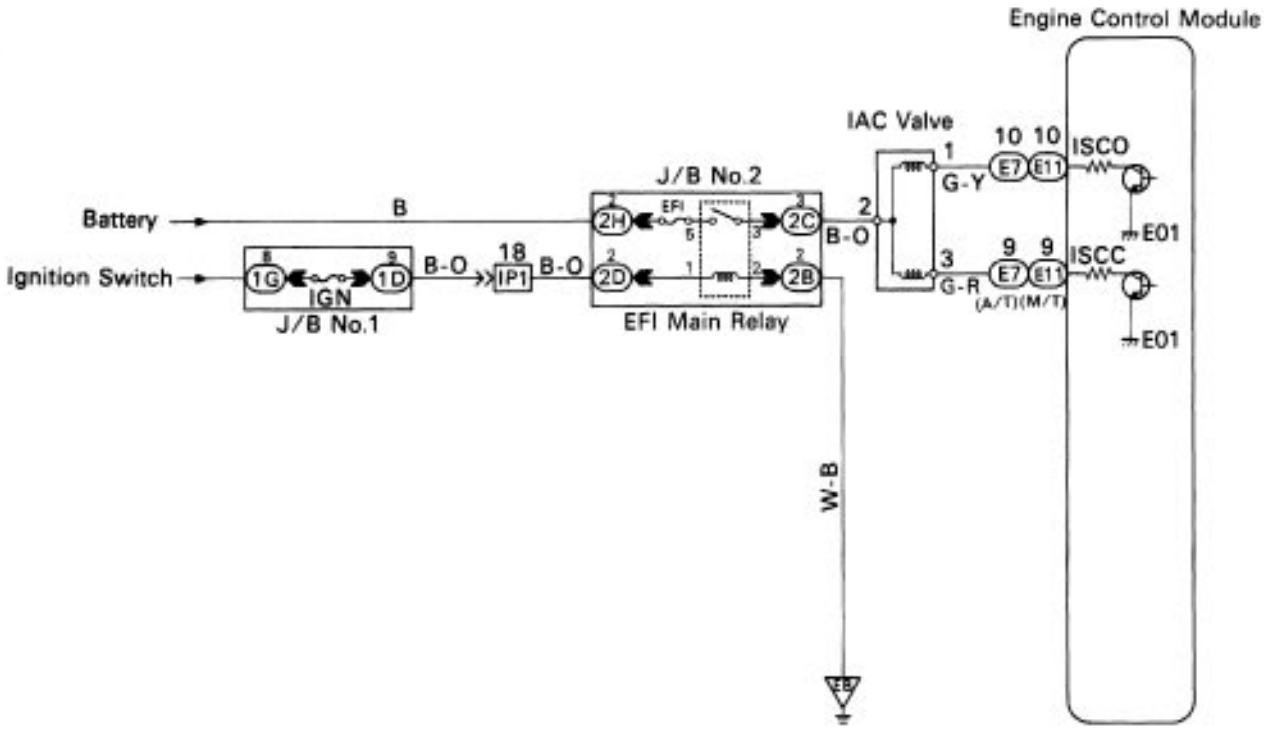


DIAGNOSTIC CHART

1. Check voltage terminals ISCO, ISCC.
   - OK → Check and replace ECM.
   - NG ↓
2. Check operation of the IAC valve.
   - NG → Replace IAC valve.
   - OK ↓
3. Check for open and short in harness and connector between J/B No.2 and IAC valve, IAC valve and ECM.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check for ECM power source circuit.

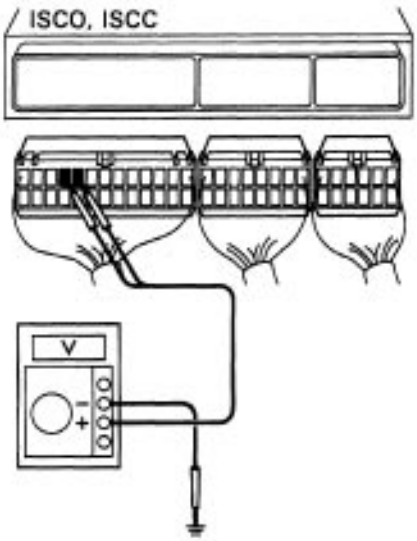
WIRING DIAGRAM



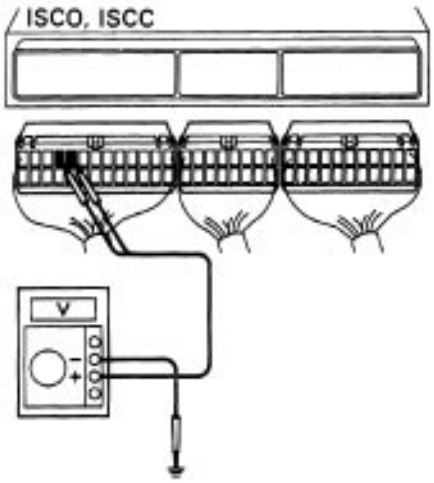
INSPECTION PROCEDURE

1 **Check voltage between terminals ISCO, ISCC of engine control module connector and body ground.**

Exc. California spec. with M/T



Others



BE6653
FI7100
FI7171

P (1) Remove glove compartment (See page EG1–234),

(2) Disconnect the engine control module connectors.

(3) Turn ignition switch ON.

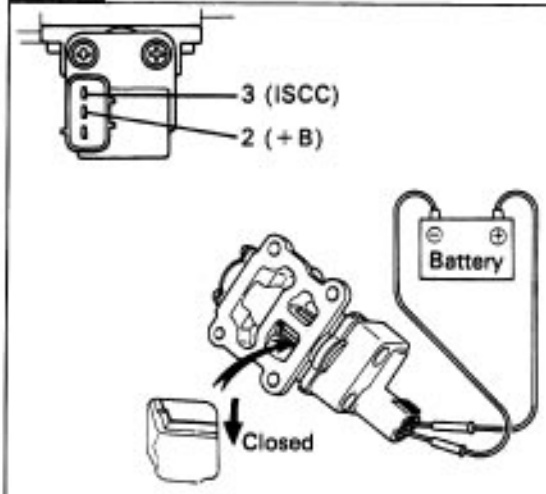
C Measure voltage between terminals ISCO, ISCC of engine control module connector and body ground.

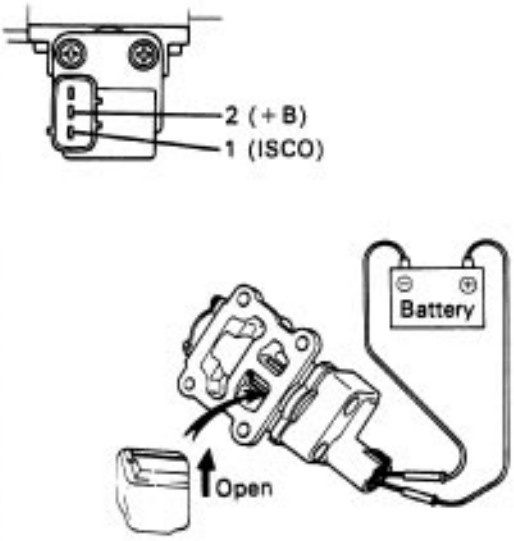
OK **Voltage: 9 –14 V**

NG

OK → **Check and replace engine control module.**

2 Check operation of the IAC valve.





P (1) Disconnect IAC valve connector.

(2) Remove IAC valve (See page EG1–213).

C (1) Connect the positive (+) lead from the battery to terminal 2 (+ B) and negative (–) lead to terminal 3 (ISCC), and check that the valve is closed.

(2) Connect the. positive (+) lead from the battery to terminal 2 (+ B) and negative (–) lead to terminal 1 (ISCO), and check that the valve is open.

OK **(1) The valve is closed.**

(2) The valve is open.

OK

NG → **Replace IAC valve.**

3 Check for open and short in harness and connector between J/B No.2 and IAC valve, IAC valve and engine control module (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

Check for ECM power source circuit (See page EG1–403).

Fuel System Circuit

CIRCUIT DESCRIPTION

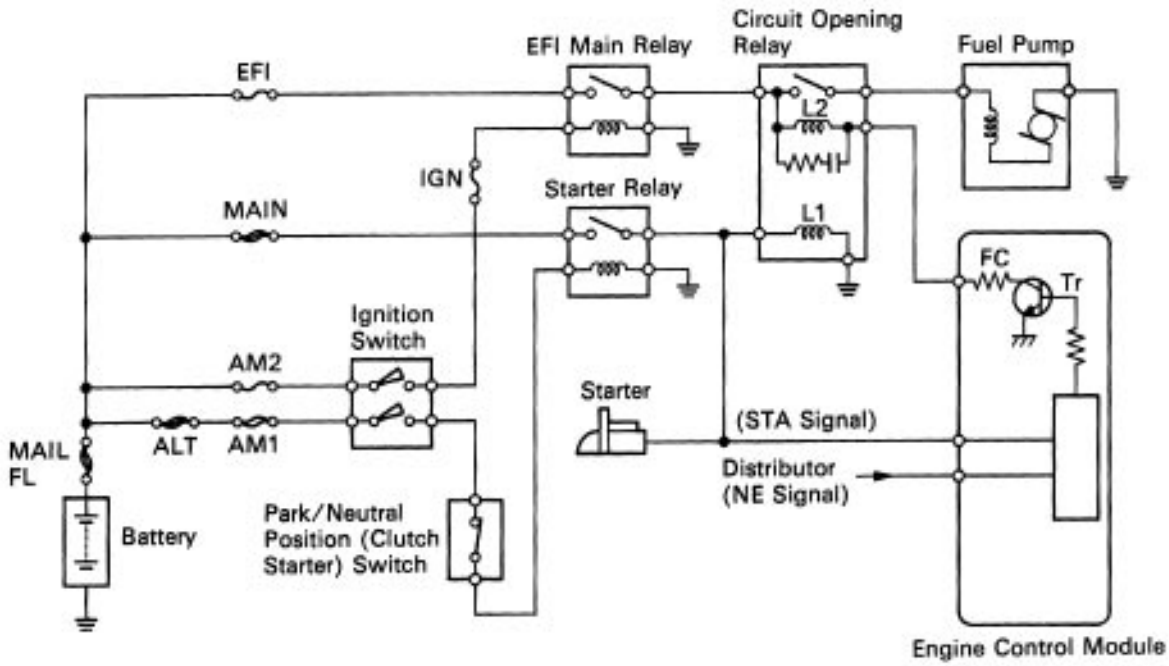
Fuel pump control

The fuel pump is switched on (low voltage at terminal FC) when STA is on or while the NE signal is input to the ECM.

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates.

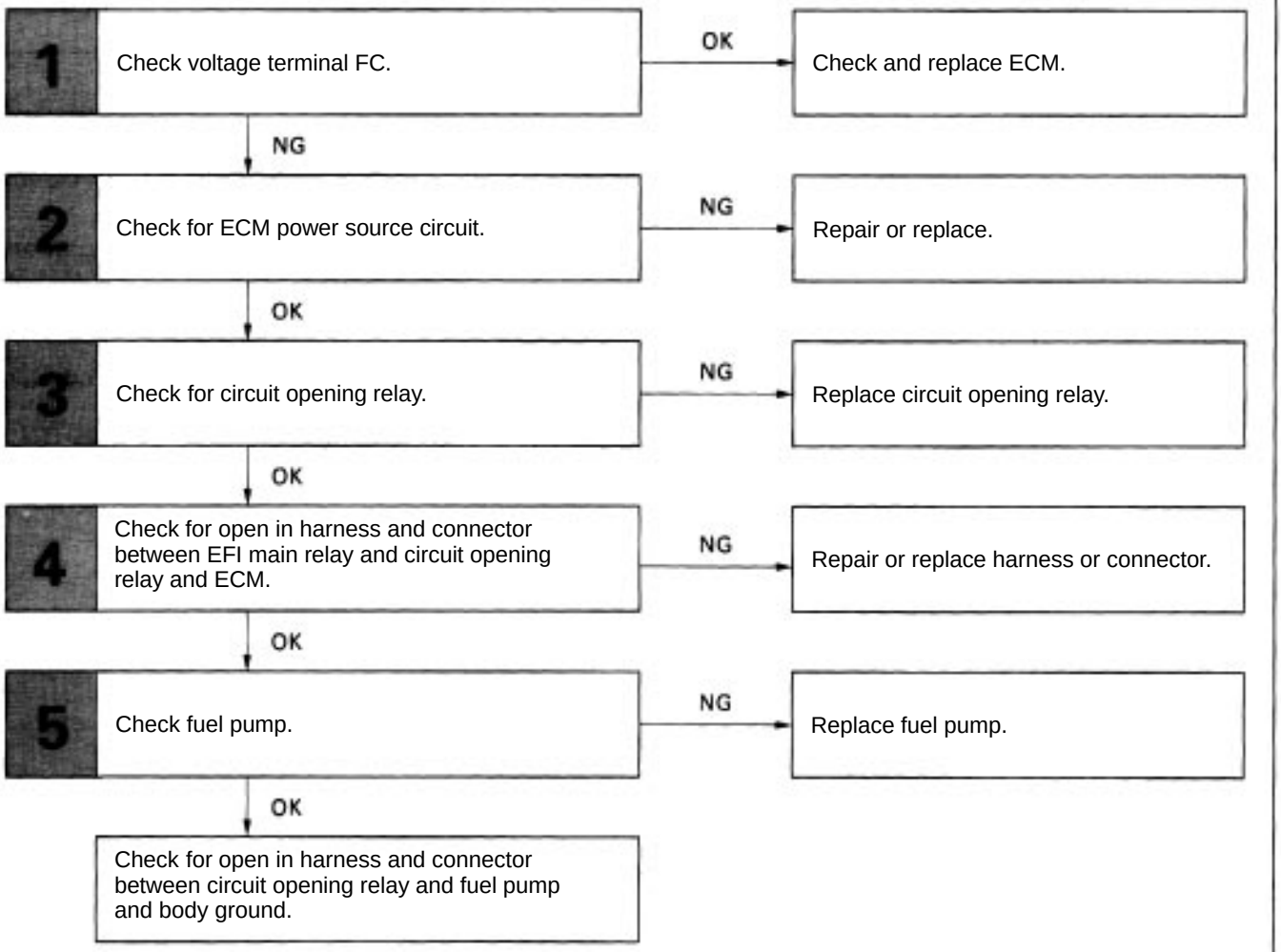
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

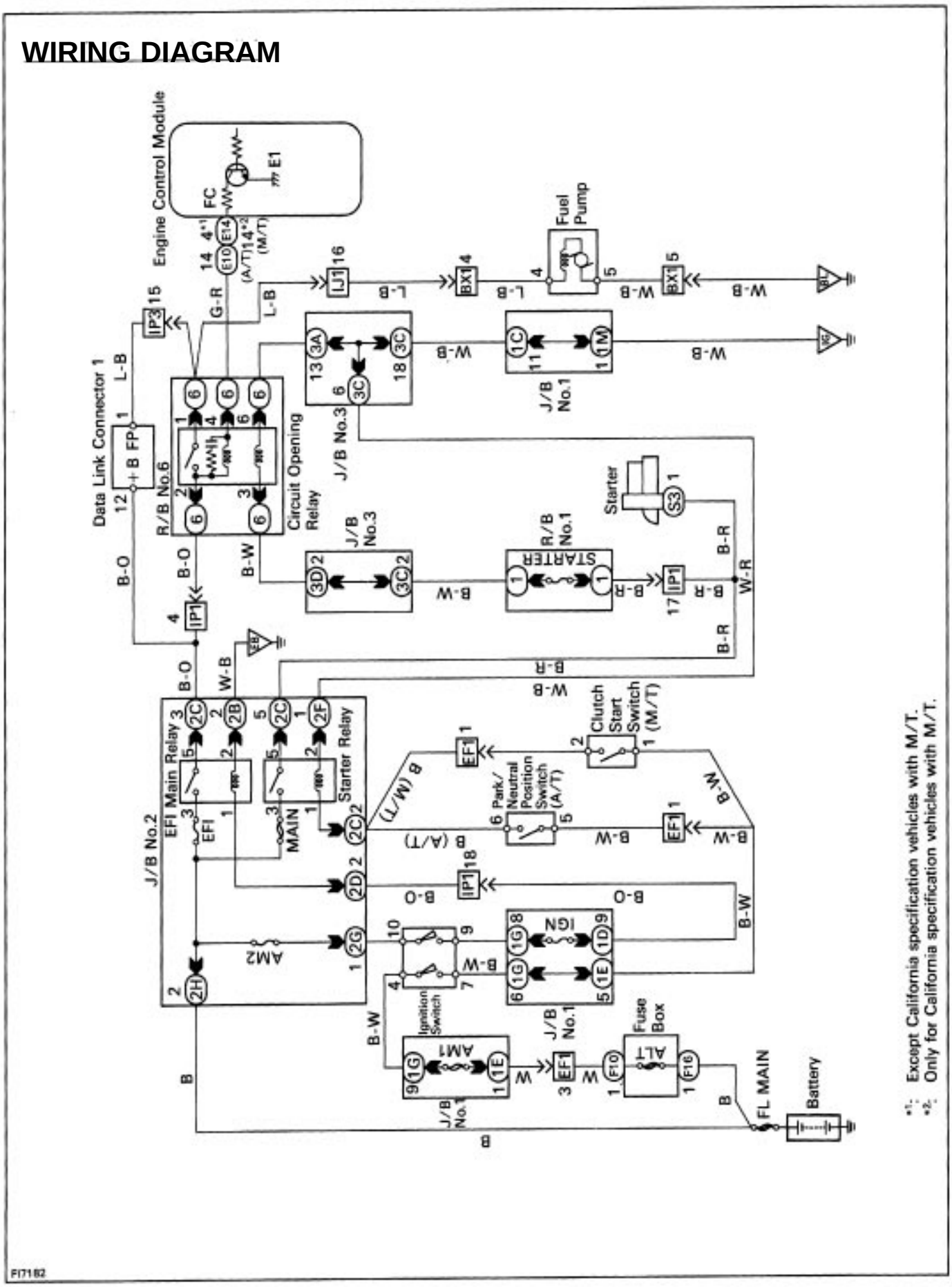


FI7230

DIAGNOSTIC CHART



WIRING DIAGRAM

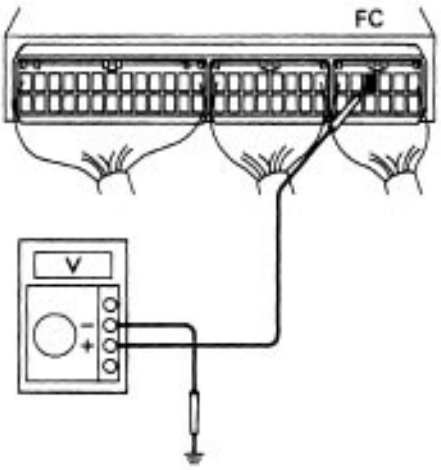


INSPECTION PROCEDURE

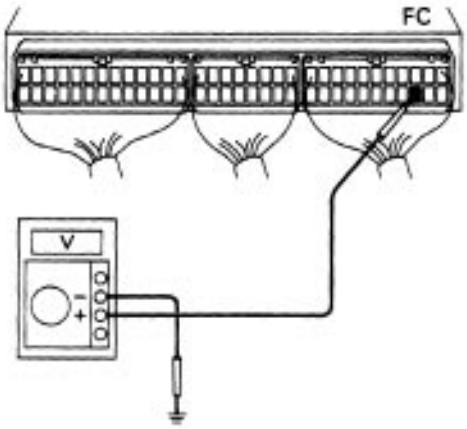
1 **Check voltage between terminals FC of engine control module connector and body ground.**

ON
IG ON

Exc. California spec. with M/T



Others



BE6653
FI6735
FI6736

P (1) Remove glove compartment.
(See page EG1–234).

(2) Turn ignition switch ON.

C Measure voltage between terminal FC of engine control module connector and body ground.

OK **Voltage: 9 –14 V**

NG

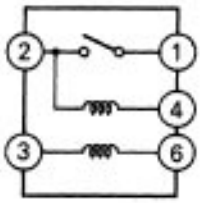
OK → **Check and replace engine control module.**

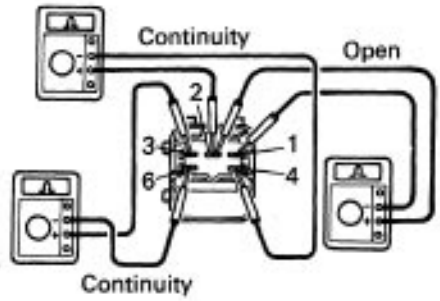
2 **Check for ECM power source circuit (See page EG1–403).**

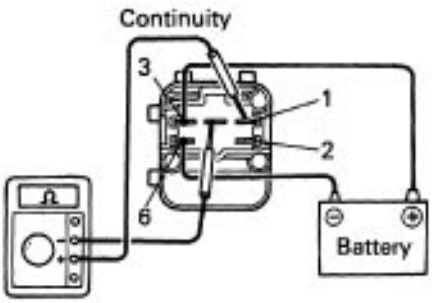
OK

NG → **Repair or replace.**

3 **Check circuit opening relay.**







FI6782
P14361
P14362

P (1) Remove glove compartment (See page EG1–217).

(2) Remove circuit opening relay from R/B No.6.

C Check continuity between terminals of circuit opening relay shown below.

OK

Terminals 1 and 2	Open
Terminals 2 and 4	Continuity
Terminals 3 and 6	Continuity

C (1) Apply battery voltage between terminals 3 and 6.

(2) Check continuity between terminals 1 and 2.

OK

Terminals 1 and 2	Continuity

OK → NG → **Replace circuit opening relay.**

4 **Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and engine control module (See page IN–31).**

OK → NG → **Repair or replace harness or connector.**

5 **Check fuel pump (See page EG1–177).**

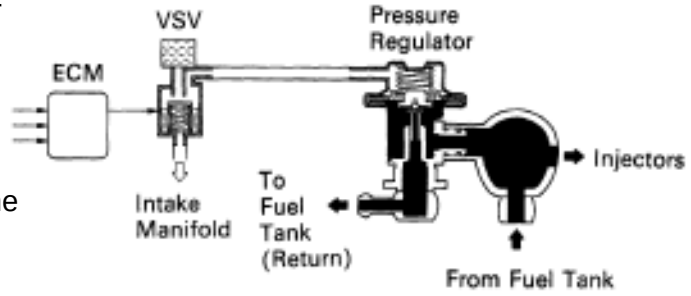
OK → NG → **Replace fuel pump.**

Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground.

VSV Circuit for Fuel Pressure Control (Only for California spec.)

CIRCUIT DESCRIPTION

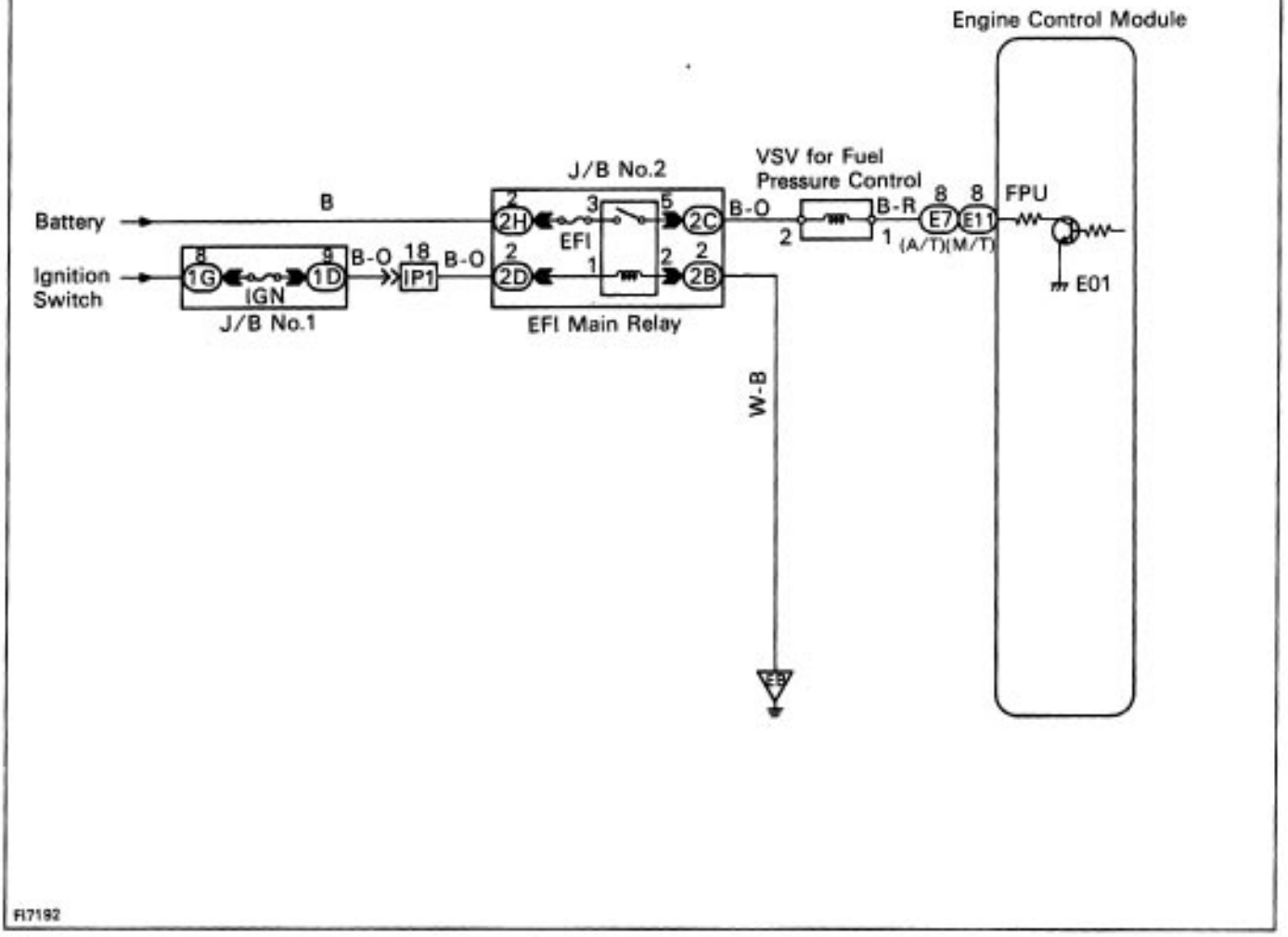
The ECM turns on a VSV (Vacuum Switching Valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine starting. The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.
Fuel pressure control ends approx. 90 secs. after the engine is started.



DIAGNOSTIC CHART

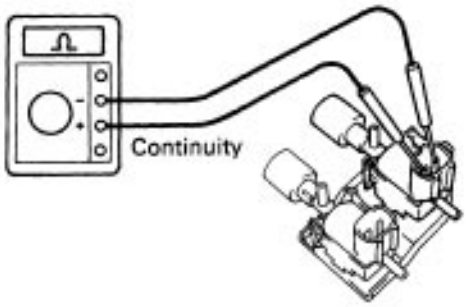
1	Check VSV for fuel pressure control.	NG	Replace VSV.
OK			
2	Check voltage of VSV power source.	OK	Proceed to next circuit inspection shown on matrix chart (See page EG1–327).
NG			
3	Check for open and short in harness and connector between EFI main relay and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			

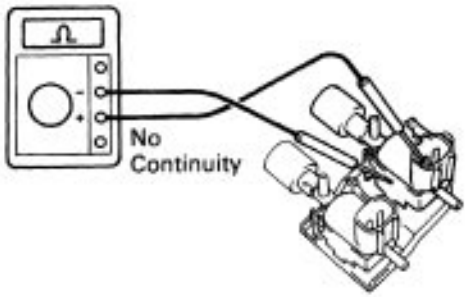
WIRING DIAGRAM

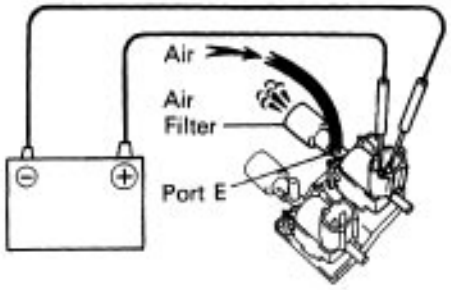


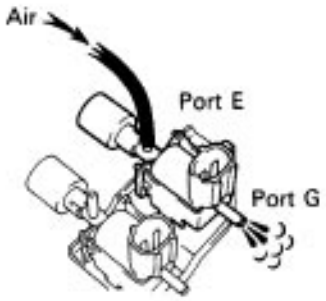
INSPECTION PROCEDURE

1 Check VSV for fuel pressure control.









P14141
P14142
P14144
P14143

P (1) Disconnect VSV connector.
(2) Remove VSV.

C (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

OK **(1) Resistance: 33 – 39Ω at 20°C (68°F)**
(2) Resistance: 1 MΩ or higher.

C Check operation of VSV when battery positive voltage is applied and released to the VSV terminals.

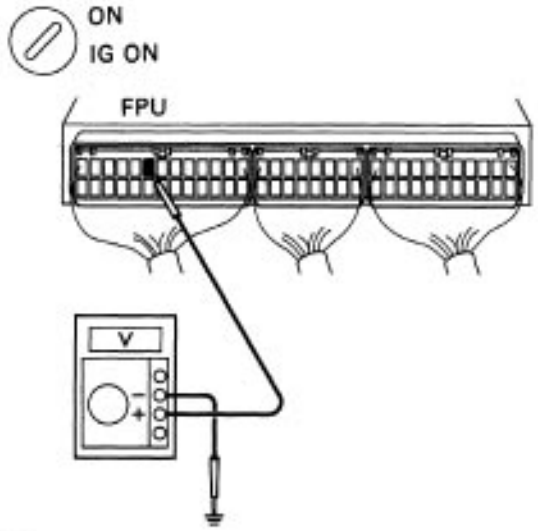
OK **Battery positive voltage is applied:**
The air from port E is flowing out through the air filter.
Battery positive voltage is not applied:
The air from port E is flowing out through port G.

OK

NG → **Replace VSV for fuel pressure control VSV.**

Go to step 2

2 **Check voltage between terminal FPU of engine control module connector and body ground.**



P (1) Remove glove compartment
(See page EG1–234).
(2) Turn ignition switch ON.

C Measure voltage between terminal FPU of engine control module connector and body ground.

OK **Voltage: 9 –14 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG1–327).**

3 **Check for open and short in harness and connector between engine control module and VSV, VSV and EFI main relay (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

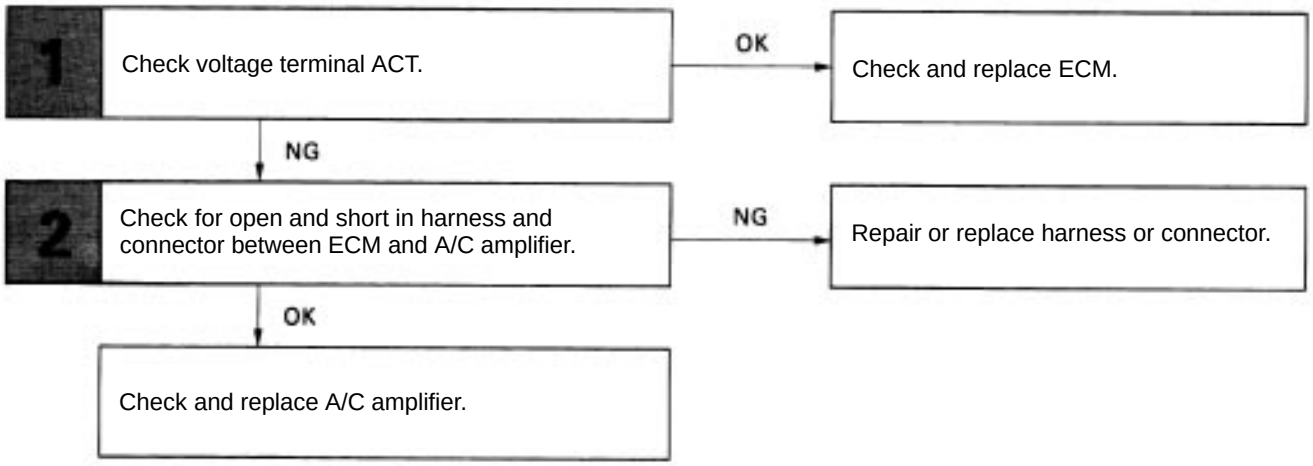
Check and replace engine control module.

Air Conditioning Cut Control Circuit

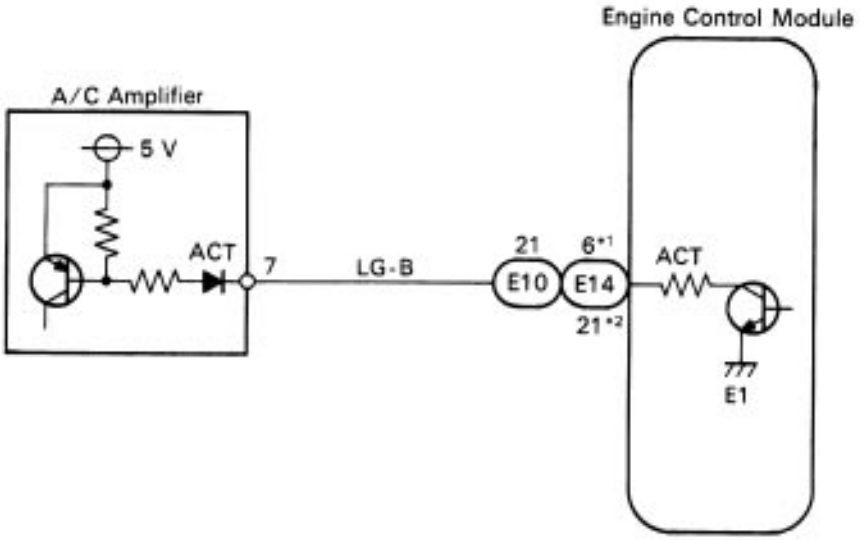
CIRCUIT DESCRIPTION

This circuit cuts air conditioning operation during vehicle acceleration in order to increase accelera–tion performance. During acceleration with the vehicle speed at 16 mph (25 km/h) or less, engine speed at 1,200 rpm or less and throttle valve opening angle at 60_3 or more, the A/C magnet switch is turned OFF for several seconds.

DIAGNOSTIC CHART



WIRING DIAGRAM



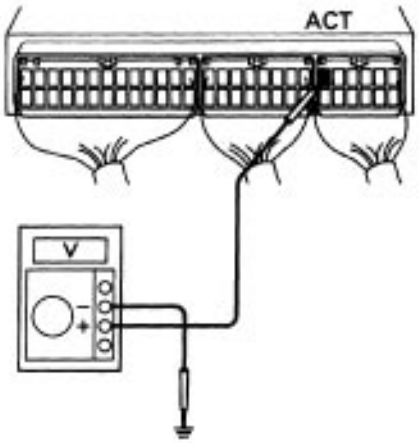
*1: Except California specification vehicles with M/T.
*2: Only for California specification vehicles with M/T.

FI6677

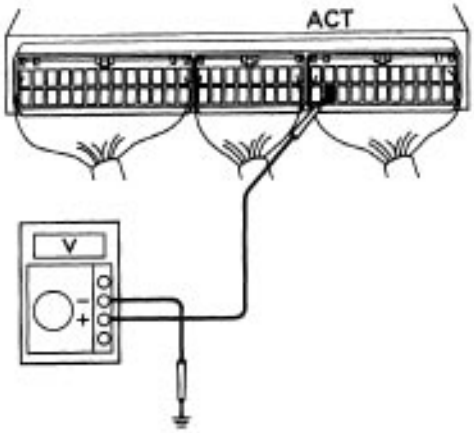
INSPECTION PROCEDURE

1 **Check voltage between terminal ACT of engine control module connector and body ground.**

Exc. California spec. with M/T



Others



BE6653
FI6737
FI6738

P (1) Remove glove compartment.
(See page EG1–234).

(2) Turn ignition switch ON.

C Measure voltage between terminal ACT of engine control module connector and body ground when A/C switch is turned to ON.

OK **Voltage: 9 –14 V**

NG

OK → **Check and replace engine control module.**

2 **Check for open and short in harness and connector between engine control module and A/C amplifier (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace A/C amplifier.

TE1 TE2 Terminal Circuit

CIRCUIT DESCRIPTION

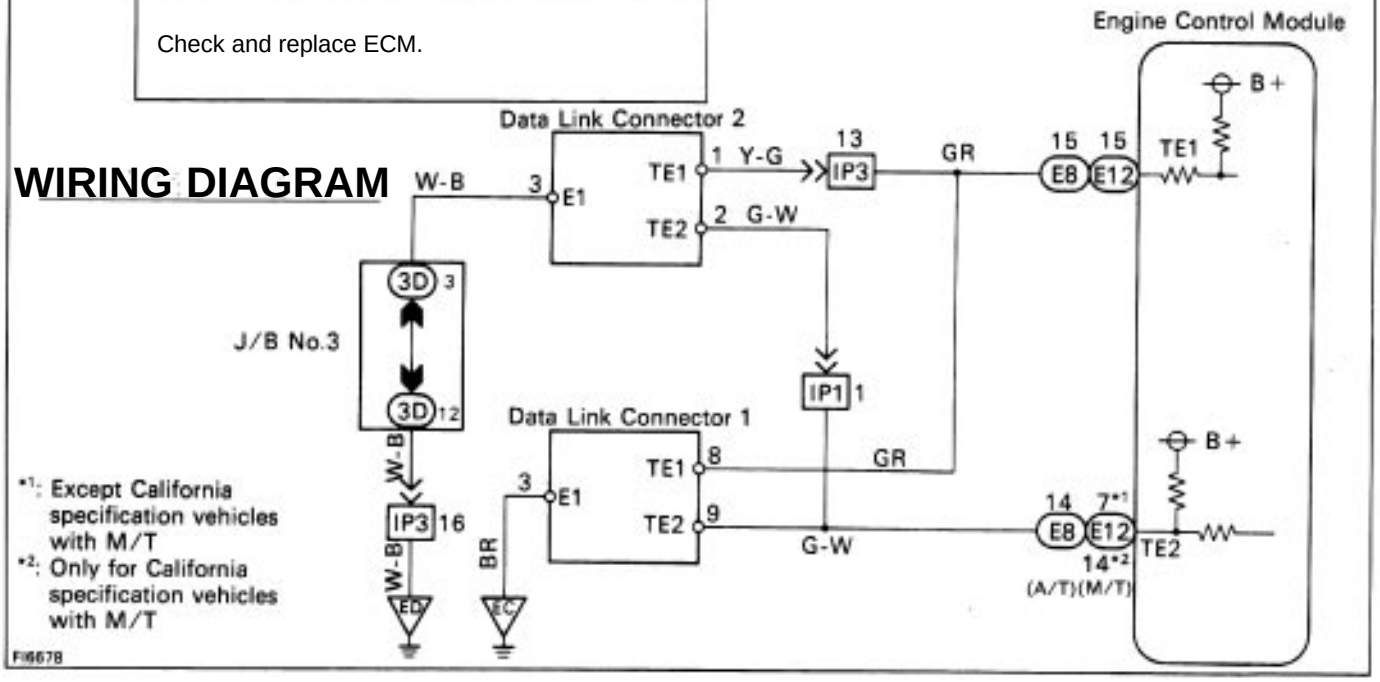
Terminals TE1 and TE2 are located in the data link connector 1 and 2.
The data link connector 1 located in the engine compartment and the data link connector 2 located in the cabin. When these terminals are connected with the E1 terminal, diagnostic trouble codes in normal mode or test mode can be read from the malfunction indicator lamp on the combination meter.

DIAGNOSTIC CHART

HINT: If terminals TE1 and TE2 are connected with terminal E1, diagnostic trouble code is not output or test mode is not activated.
Even though terminal TE1 is not connected with terminal E1, the malfunction indicator lamp blinks.
For the above phenomenon, the likely cause is an open or short in the wire harness, or malfunction inside the ECM.

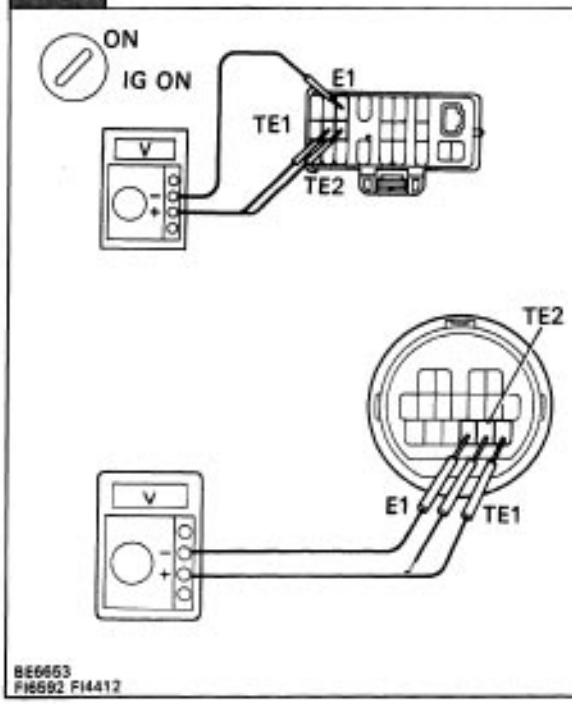
1. Check voltage of terminals TE1, TE2.
   - OK → Check and replace ECM.
   - NG → 2
2. Check continuity between terminal E1 and body ground.
   - NG → Repair or replace harness or connector.
   - OK → 3
3. Check for open and short in harness and connector between data link connector 1, 2 and ECM.
   - NG → Repair or replace harness or connector.
   - OK → Check and replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals TE1, TE2, and E1 of data link connector 1 and 2.**



P Turn ignition switch ON.

C Measure voltage between terminals TE1, TE2 and E1 of data link connector 1 and 2.

OK **Voltage: 9 –14 v**

NG

OK → **Check and replace engine control module.**

2 **Check continuity between terminal E1 of data link connector 1, 2 and body ground.**

OK

NG → **Repair or replace harness or connector.**

3 **Check for open and short in harness and connector between engine control module and data link connector 1, 2 (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace engine control module.

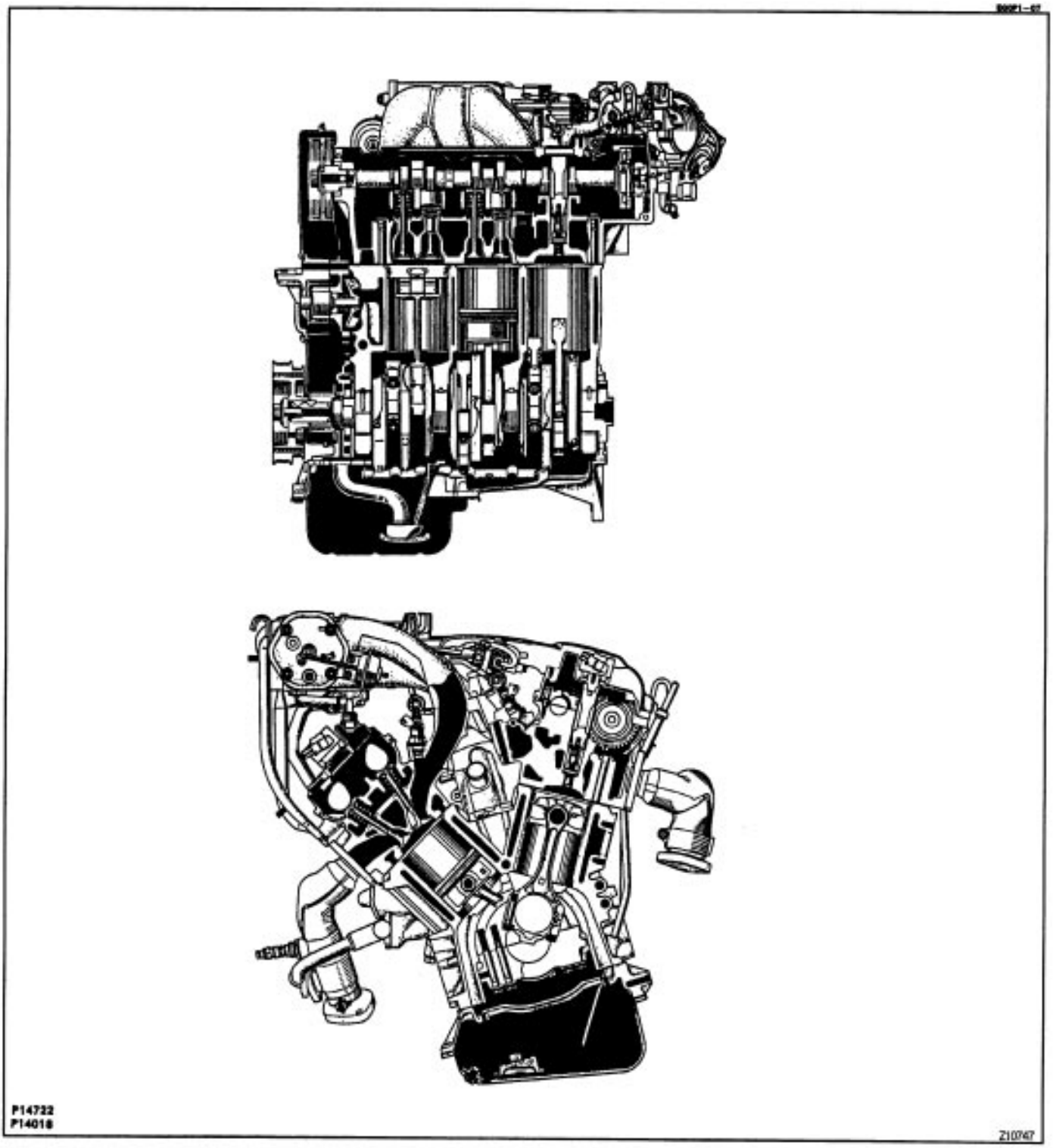
1MZ–FE ENGINE

ENGINE MECHANICAL

DESCRIPTION

The 1 MZ–FE engine is a V–6, 3.0 liter 24 valve DOHC engine.

OPERATION



The 1 MZ–FE engine has 6 cylinders in a V arrangement at a bank angle of 60® From the front of the RH bank cylinders are numbered 1–3–5, and from the front of the LH bank cylinders are numbered 2–4–6. The crankshaft is supported by 4 bearings inside the crankcase. These bearings are made of copper and lead alloy.

The crankshaft is integrated with 9 semi counterweights for balance. Oil holes are placed in the center of the crankshaft for supply oil to the connecting rods, bearings, pistons and other components.

This engine's firing order is 1–2–3–4–5–6. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent–roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

At the front and rear of the intake manifold, a water passage has been provided which connects the RH and LH cylinder heads.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of following the cam profile at all engine speeds.

The RH and LH exhaust camshafts are driven by a single timing belt, and a gear on the exhaust camshaft engages with a gear on the intake camshaft to drive it. The camshaft journal is supported at 5 places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

The timing belt covers consist of the resin type No.2 and No.1 above and below the engine RH mounting bracket.

Pistons are made of high temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the full–floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron. The oil ring also is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. Compression rings No. 1 and No.2 work to prevent gas leakage from the cylinder and the oil ring works to clear oil off the cylinder walls to prevent it from entering the combustion chambers.

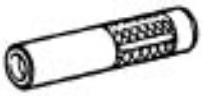
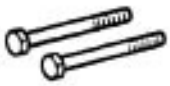
The cylinder block is made of aluminum alloy with a bank angle of 60® It has 6 cylinders which are approximately 1.6 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder heads and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

The No. 1 and No.2 oil pans are bolted onto the bottom of the cylinder block. The No. 1 oil pan is made of aluminum alloy. The No.2 oil pan is an oil reservoir made of pressed sheet steel. An oil pan baffle plate keeps sufficient oil in the bottom of the No.2 oil pan even when the vehicle is tilted. This dividing plate also prevents the oil from sloshing when the vehicle is stopped suddenly and the oil shifts away from the oil pump suction pipe.

Plastic region tightening bolts are used for the cylinder head, main bearing caps and connecting rods.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09201–01055 Valve Guide Bushing Remover & Replacer 5.5	
	09201–41020 Valve Stem Oil Seal Replacer	
	09202–70010 Valve Spring Compressor	
	09213–54015 Crankshaft Pulley Holding Tool	
	09213–60017 Crankshaft Pulley & Gear Puller Set	
	(09213–00020) Body With Bolt	
	(09213–00030) Handle	
	(09213–00050) Bolt set	Crankshaft timing pulley
	(09213–00060) Bolt set	Crankshaft pulley
	08223–00010 Cover & Seal Replacer	Crankshaft front oil seal
	09223–15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09223–46011 Crankshaft Front Oil Seal Replacer	Crankshaft timing pulley
	09248–55040 Valve Clearance Adjust Tool set	

	(09248 –05410) Valve Lifter Press	
	(09248–05420) Valve Lifter Stopper	
	09249–63010 Torque Wrench Adaptor	RH camshaft timing pulley
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09608–20012 Front Hub & Drive Pinion Bearing Tool Set	
	(09608–03020) Handle	Crankshaft rear oil seal Valve guide bushing
	(09608–03070) Replacer	Spark plug tube gasket
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	
	09816–30010 Oil Pressure Switch Socket	Knock sensor Oil pressure switch
	09843–18020 Diagnosis Check Wire	
	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	Camshaft timing pulley

RECOMMENDED TOOLS

	09040–00010 Hexagon Wrench Set	
	09090–04010 Engine Sling Device	For suspending engine
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug set	Plug for the vacuum hose, fuel hose etc.
	09904–00010 Expander Set	

EQUIPMENT

Battery specific gravity gauge	
Caliper gauge	
CO/HC meter	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Magnetic finger	

Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

COOLANT

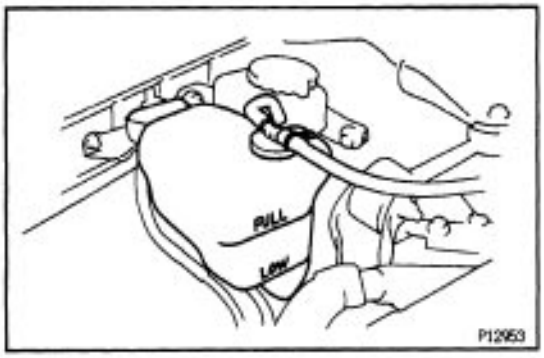
Item	Capacity	Classification
Engine coolant	8.7 liters (9.2 US qts, 7.7 Imp. qts)	Ethylene–glycol base

LUBRICANT

Item	Capacity	Classification
Engine oil Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	 5.5 liters (5.8 US qts, 4.8 Imp. qts) 4.7 liters (5.0 US qts, 4.1 Imp. qts) 4.5 liters (4.8 US qts, 4.0 Imp. qts)	API grade SG or SH, Energy–Conserving II or ILSC multigrade and recommended viscosity oil with SAE 5W–30 being the preferred engine oil

SSM (SERVICE SPECIAL MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Semi–circular plug Spark plug tube Cylinder head cover
08826–00080 Seal packing or equivalent	Intake air control valve Rear oil seal retainer No. 1 oil pan No.2 oil pan
08826–00100 Seal Packing 1282B, THREE BOND 1282B or equivalent	Engine coolant drain cock Water seal plate Water inlet housing
08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Drive plate bolt TVV
08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch

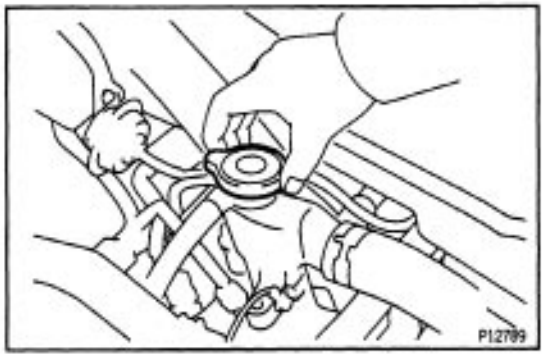


TUNE–UP

ENGINE COOLANT INSPECTION

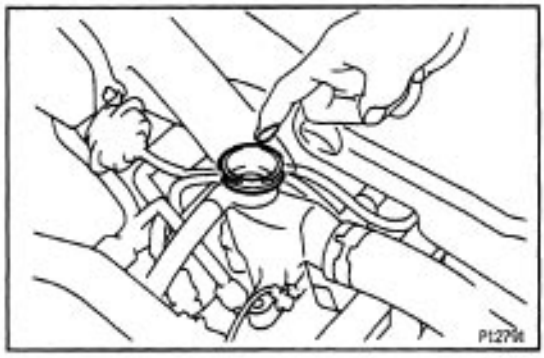
1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the ”LOW” and ”FULL” lines.
If low, check for leaks and add engine coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap from the water outlet.
CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



(b) There should not be any excessive deposits of rust or scale around the radiator cap or water outlet filler hole, and the coolant should be free from oil.
If excessively dirty, clean the coolant passages and replace the coolant.

Capacity:

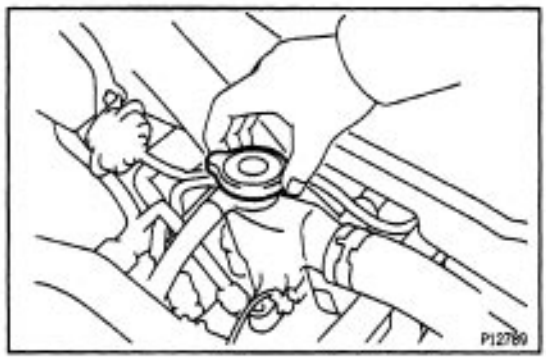
8.7 liters (9.2 US qts, 7.7 Imp. qts)

HINT:

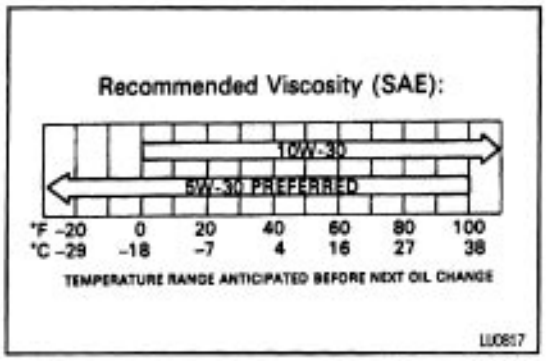
- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer’s directions.
- Using coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

- **Do not use an alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**



(c) Reinstall the radiator cap.



ENGINE OIL INSPECTION

1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, dis–coloring or thinning.

If oil quality is visibly poor, replace the oil.

Oil grade:

API grade SG or SH, Energy – Conserving H or ILSAC multigrade engine oil. Recommended viscosi–ty is as shown in the illustration, with SAE 5W–30 being the preferred engine oil.

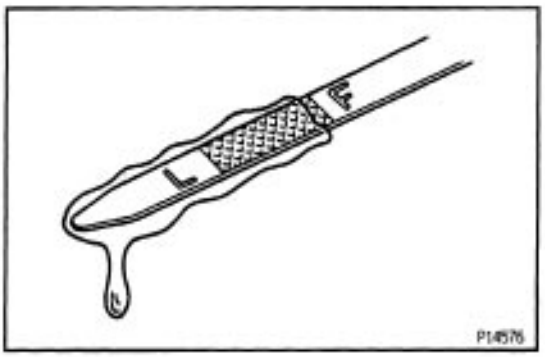
Drain and refill capacity:

w/ Oil filter change

4.7 liters (5.0 US qts, 4.1 Imp, qts)

w/o Oil filter change

4.5 liters (4.8 US qts, 4.0 Imp. qts)



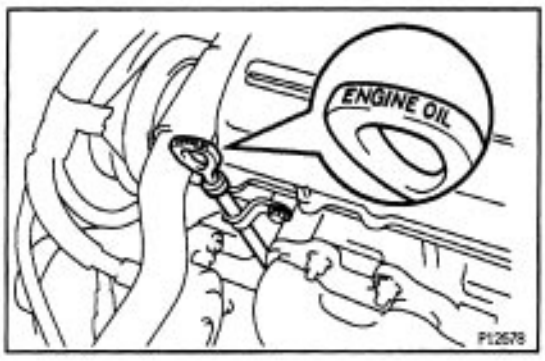
2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

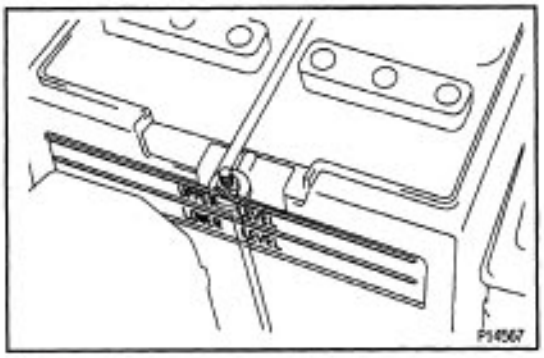
If low, check for leakage and add oil up to the ”F” mark.

NOTICE:

- **Do not fill with engine oil above the ’F’ mark.**



- **Install the oil dipstick facing the direction shown in the illustration.**



BATTERY INSPECTION

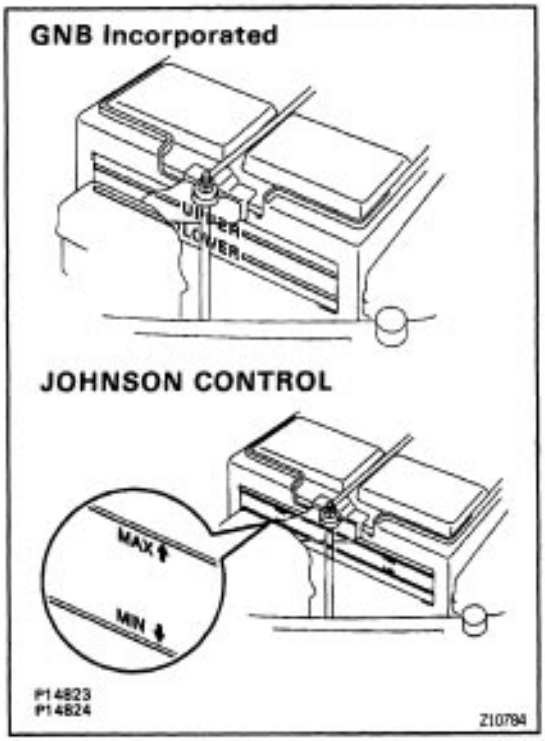
1. Except Delco Battery:

CHECK BATTERY ELECTROLYTE LEVEL

Check the electrolyte quantity of each cell.

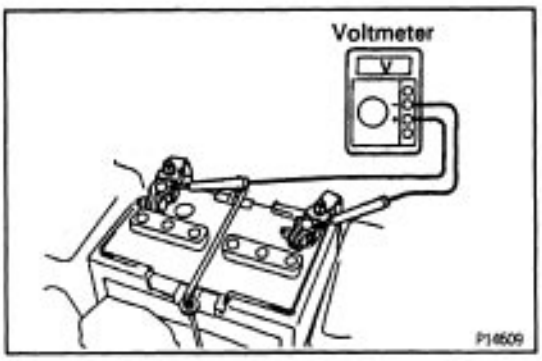
A. Maintenance Free Battery

If under the lower level, replace the battery (or add distilled water if possible). Check the charging system.



B. Except Maintenance Free Battery

If under the ”LOWER” or ”MIN’ line, add distilled water.



2. Except Delco Battery:

CHECK BATTERY VOLTAGE AND SPECIFIC GRAVITY

A. Maintenance Free Battery

Measure the battery voltage between the terminals negative (–) and positive (+) of the battery.

Standard voltage:

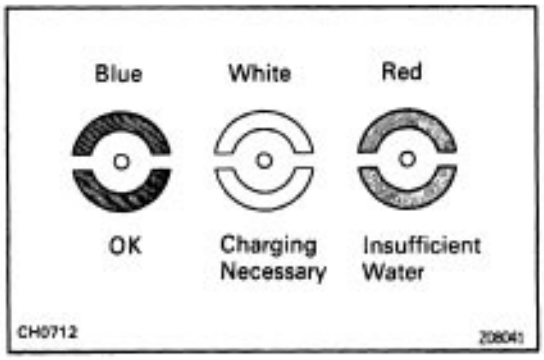
12.7 – 12.9 V at 20˚C (68˚F)

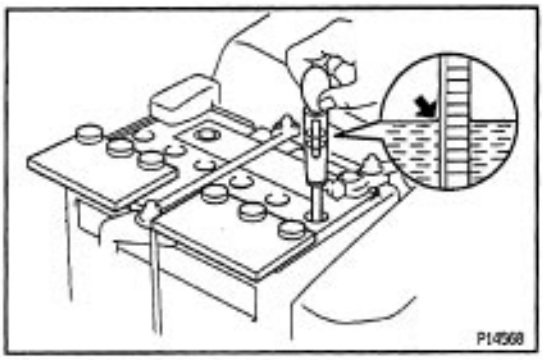
HINT:

- Before measuring the voltage, turn the ignition switch to LOCK and turn off the electrical sys–tems (headlight, blower motor, rear defogger etc.; for 60 seconds to remove the surface charge.
- If the vehicle has been running, wait 5 minutes or more after the vehicle stops before measuring the battery voltage.

If the voltage is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





B. Except Maintenance Free Battery

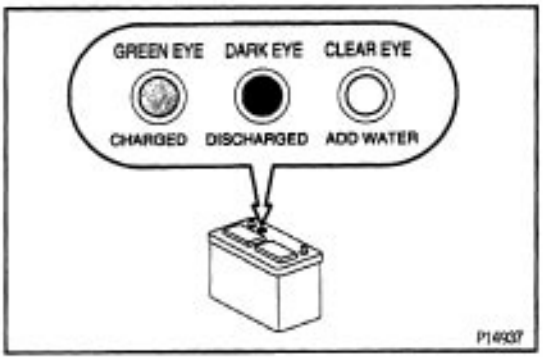
Check the specific gravity of each cell.

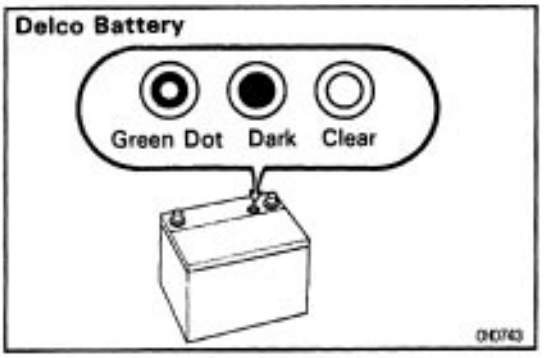
Standard specific gravity:

55D23L battery for GNB Incorporated
1.25 – 1.27 at 20˚C (60˚F)
5513231– battery for JOHNSON CONTROLS
1.26 – 1.28 at 27˚C (81˚F)
80D26L battery for GNB Incorporated
1.27 – 1.29 at 20˚C (68˚F)
80D26L battery for JOHNSON CONTROLS
1.28 – 1.30 at 27˚C (80˚F)

If the gravity is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





3. Delco Battery:

CHECK HYDROMETER

Green Dot visible:

Battery is adequately charged

Dark (Green Dot not visible):

Battery must be charged

Clear or Light Yellow:

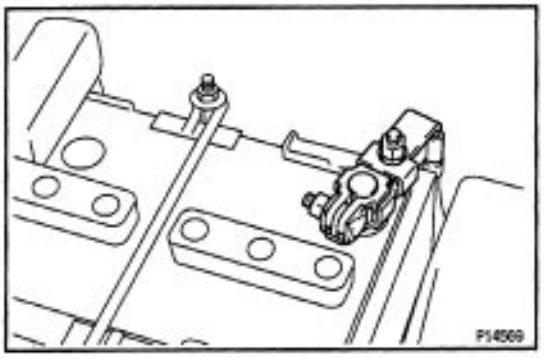
Replace battery

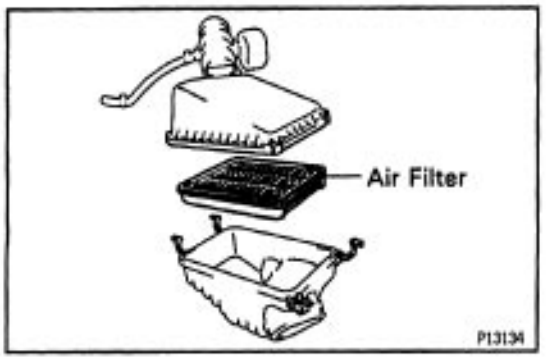
HINT: There is no need to add water during the entire service life of the battery.

4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

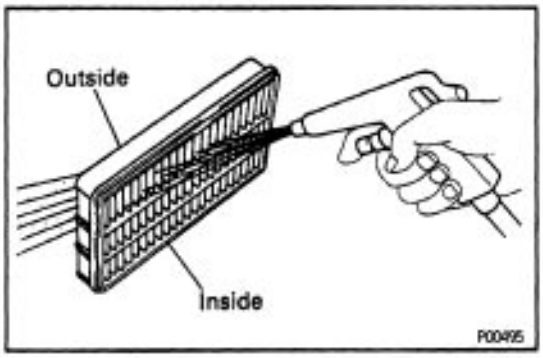
(b) Check the fusible link and fuses for continuity.





AIR FILTER INSPECTION AND CLEANING

1. REMOVE AIR FILTER



2. INSPECT AND CLEAN AIR FILTER

(a) Visually check that the air filter is not excessively dirty, damaged or oily.

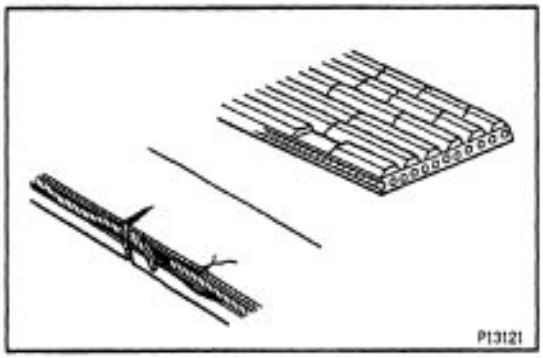
If necessary, replace the air filter.

(b) Clean the air filter with compressed air.

First blow from the inside thoroughly, then blow from the outside of the air filter.

3. REINSTALL AIR FILTER

GENERATOR DRIVE BELT INSPECTION



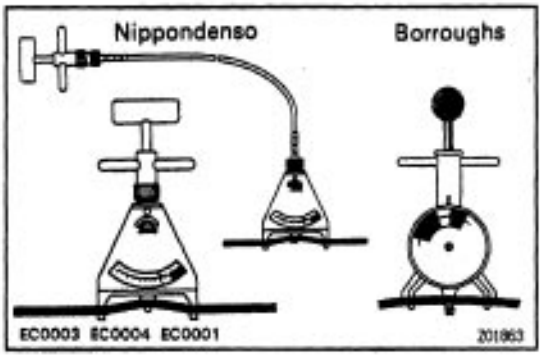
INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

(b) Using a belt tension gauge, measure the drive belt tension.



Belt tension gauge:

Nippondenso BTG – 20 (95506–00020)

Borroughs No. BT–33–73F

Drive belt tension:

New belt

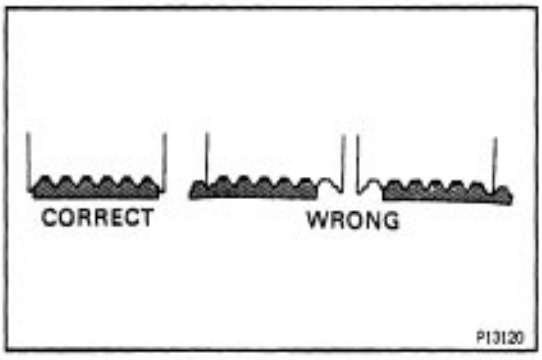
175 ± 5 lbf

Used belt

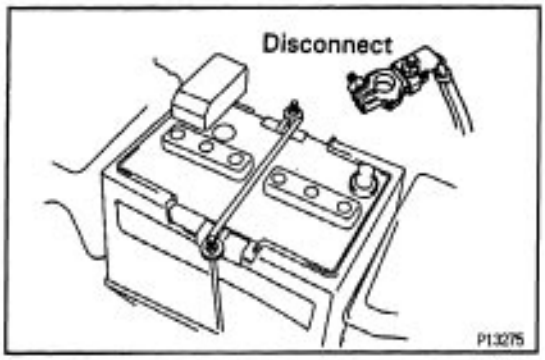
115 ±20 lbf

If the belt tension is not as specified, adjust it.

HINT:



- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



VALVE CLEARANCE INSPECTION AND ADJUSTMENT

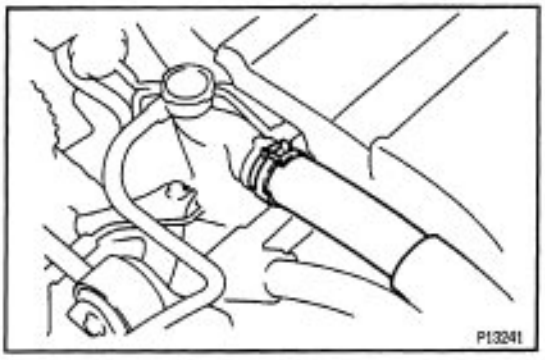
HINT: Inspect and adjust the valve clearance when the engine is cold.

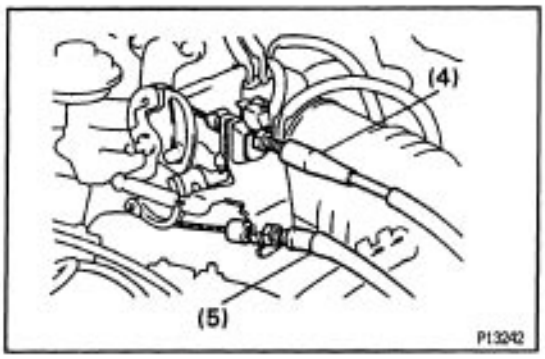
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

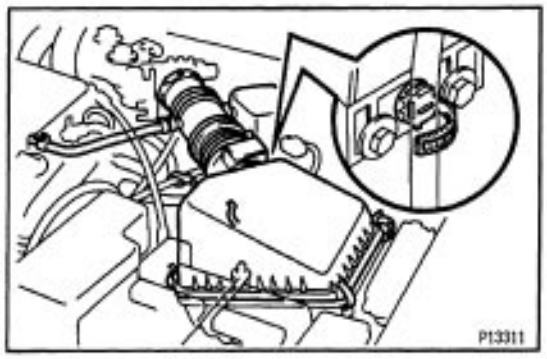
3. DISCONNECT RADIATOR INLET HOSE





4. DISCONNECT ACCELERATOR CABLE

5. DISCONNECT THROTTLE CABLE



6. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector and wire clamp.

(b) Disconnect the accelerator cable clamp.

(c) Disconnect the PCV hose.

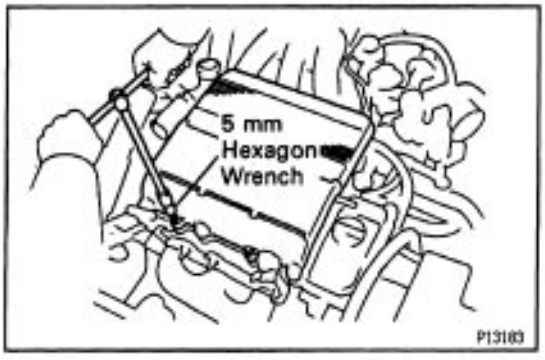
(d) Loosen the air cleaner hose clamp bolt.

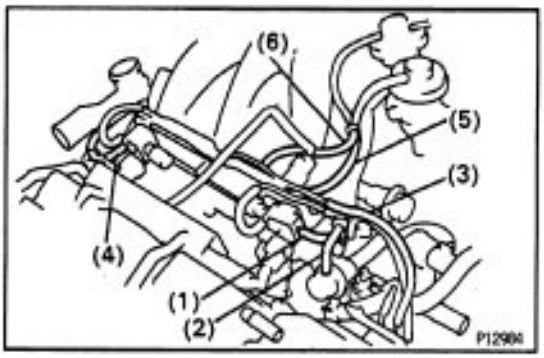
(e) Disconnect the 4 air cleaner cap clips.

(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.

7. REMOVE V–BANK COVER

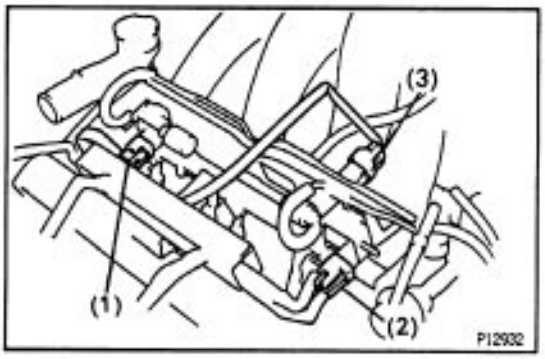
Using a 5 mm hexagon wrench, remove the 2 nuts and V–bank cover.



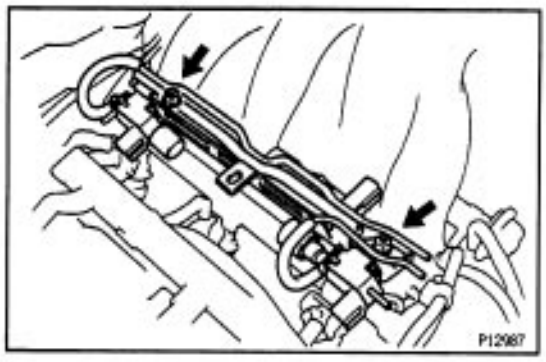


8. REMOVE EMISSION CONTROL VALVE SET

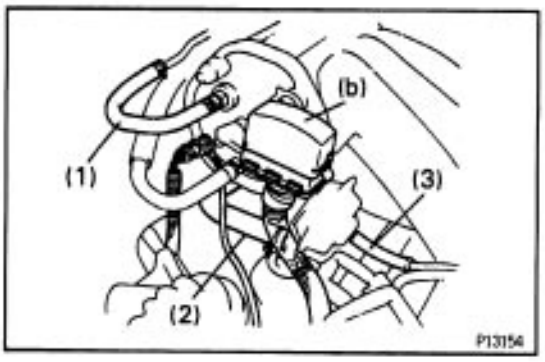
(a) Disconnect the following vacuum hoses:
- (1) Vacuum hose from fuel pressure control VSV
- (2) Vacuum hose from fuel pressure regulator
- (3) Vacuum hose from cylinder head rear plate
- (4) Vacuum hose from intake air control valve VSV
- (5) Vacuum hose from EGR vacuum modulator
- (6) Vacuum hose from EGR valve



(b) Disconnect the following connectors:
- (1) Intake air control valve connector
- (2) Fuel pressure connector
- (3) EGR VSV connector



(c) Remove the 2 nuts and emission control valve set.

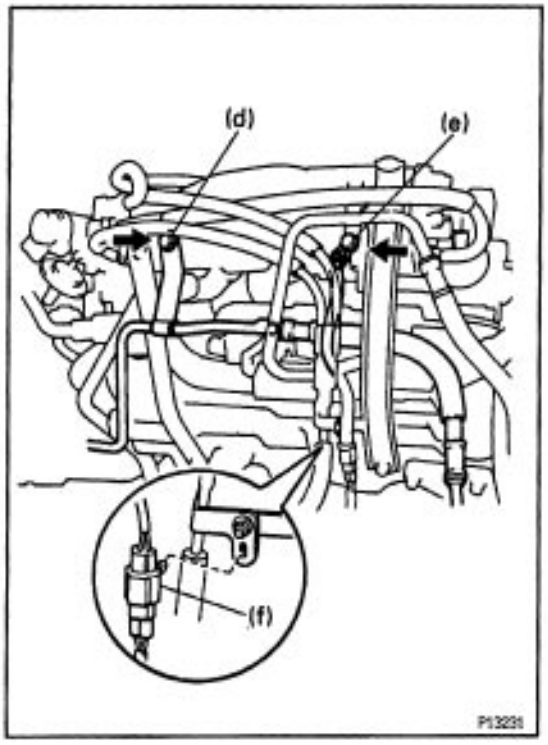


9. REMOVE AIR INTAKE CHAMBER

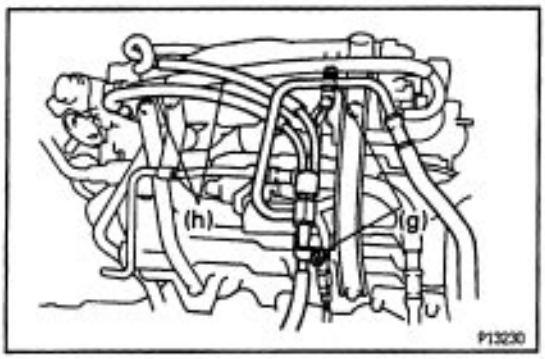
(a) Disconnect the following hoses:
- (1) Brake booster vacuum hose
- (2) PCV hose
- (3) Intake air control valve vacuum hose

(b) Disconnect the data link connector 1.

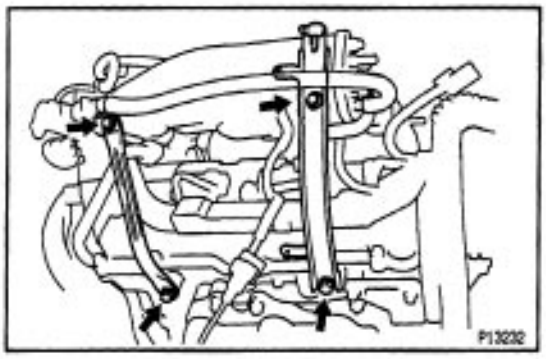
(c) Remove the nut and disconnect the 2 ground straps.



(d) Remove the bolt and disconnect the hydraulic motor pressure hose from the air intake chamber.
(e) Remove the bolt, and disconnect the ground strap.
(f) Disconnect the RH oxygen sensor connector clamp from the PS pressure tube.

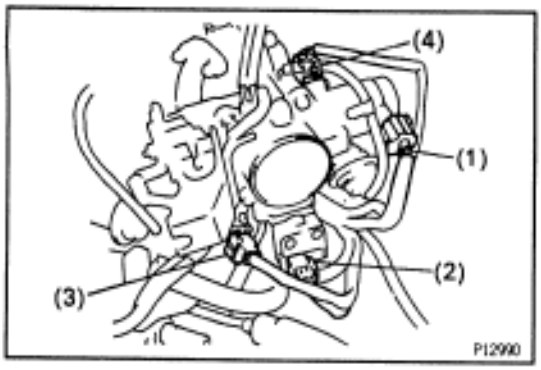


(g) Remove the 2 nuts, and disconnect the PS pressure tube.
(h) Disconnect the 2 PS air hoses.

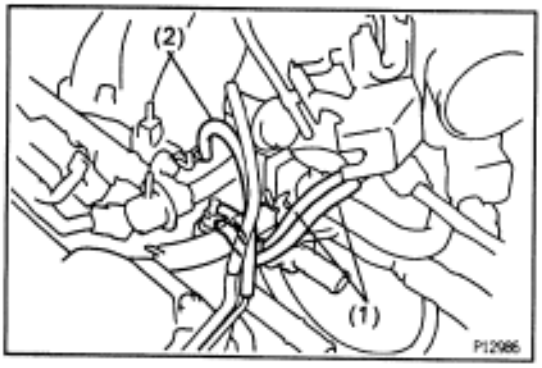


(i) Remove the 2 bolts and No.1 engine hanger.
(j) Remove the 2 bolts and air intake chamber stay.

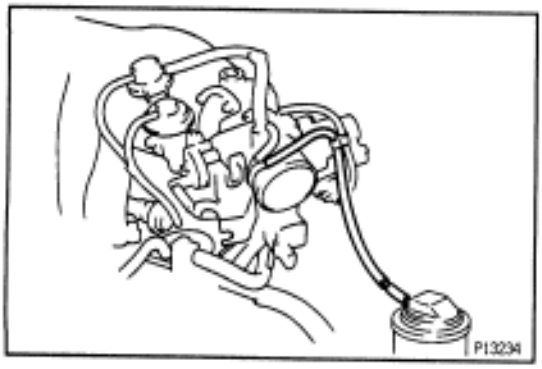
(k) Remove the 4 nuts, EGR pipe and 2 gaskets.



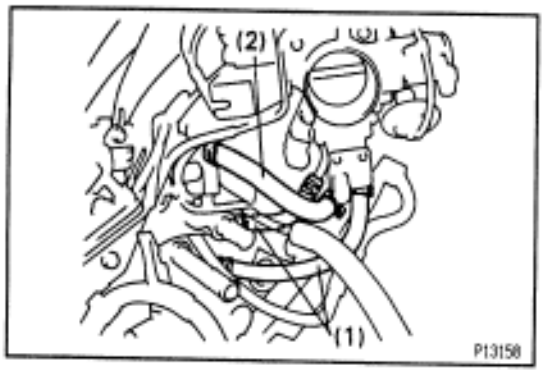
(l) Disconnect the following connectors:
(1) Throttle position sensor connector
(2) IAC valve connector
(3) EGR gas temperature sensor connector
(4) A/C idle–up connector



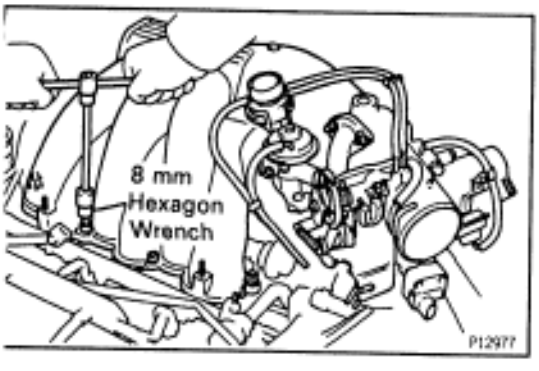
(m) Disconnect the following vacuum hoses:
(1) 2 vacuum hoses from TVV
(2) Vacuum hose from cylinder head rear plate



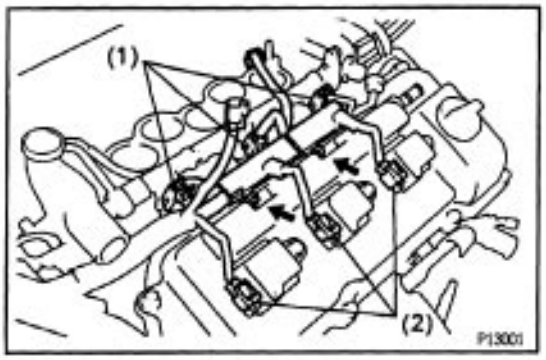
(3) Vacuum hose from charcoal canister



(n) Disconnect the following hoses:
(1) 2 water bypass hoses
(2) Air assist hose

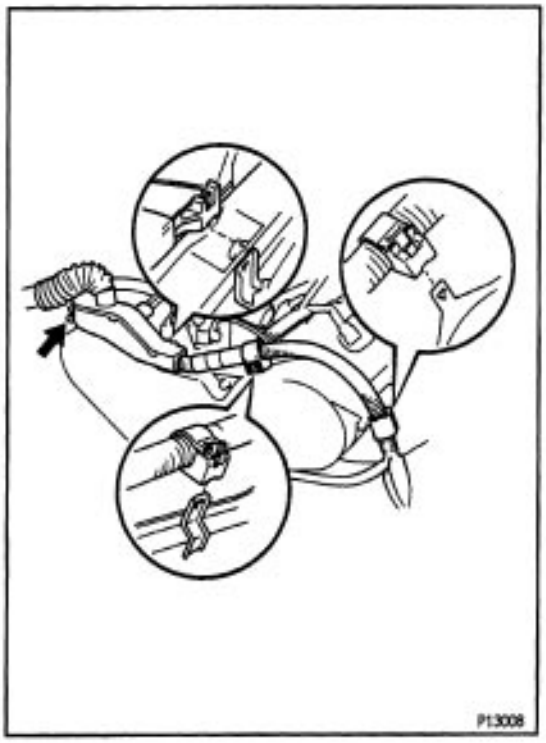


(o) Using an 8 mm hexagon wrench, remove the 2 bolts, 2 nuts, air intake chamber and gasket.



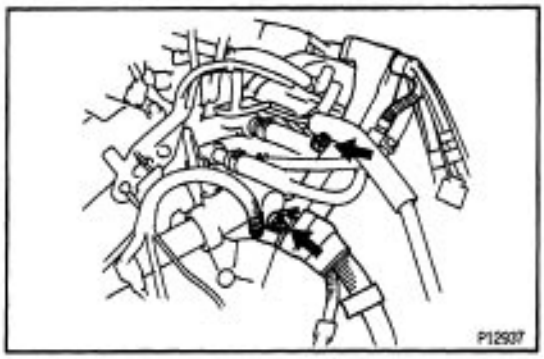
10. DISCONNECT ENGINE WIRE FROM ENGINE LH SIDE

(a) Disconnect the following connectors:
(1) 3 injector connectors
(2) 3 ignition coil connectors
(b) Remove the 2 nuts, and disconnect the engine wire.



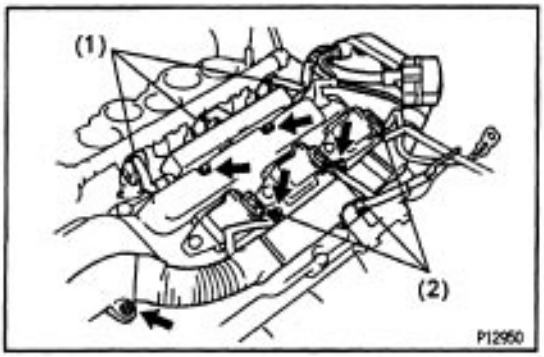
11. DISCONNECT ENGINE WIRE FROM NO.3 TIMING BELT COVER

Remove the bolt and 3 clamps, and disconnect the engine wire.



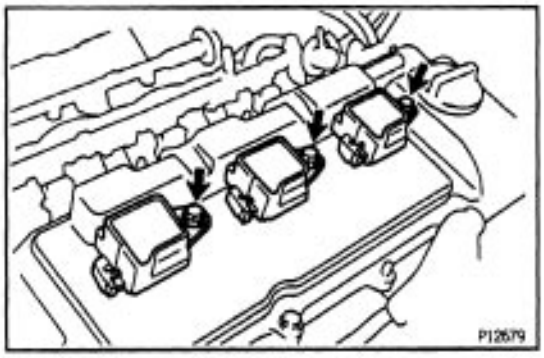
12. DISCONNECT ENGINE WIRE FROM ENGINE REAR SIDE

Remove the 2 nuts, and disconnect the engine wire.



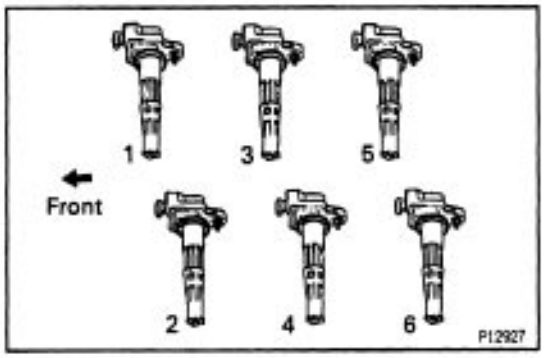
13. DISCONNECT ENGINE WIRE FROM ENGINE RH SIDE

(a) Disconnect the following connectors:
(1) 3 injector connectors
(2) 3 ignition coil connectors
(b) Remove the 5 nuts, and disconnect the engine wire.



14. REMOVE IGNITION COILS

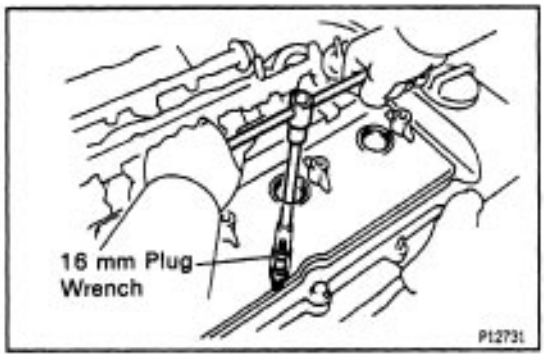
Remove the 6 bolts and 6 ignition coils from the RH and LH cylinder heads.



HINT: Arrange the ignition coils in the correct order.

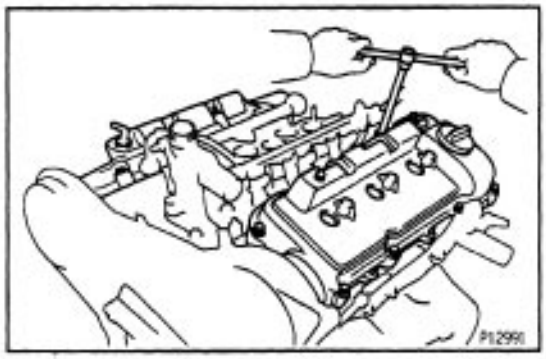
15. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the 6 spark plugs from the RH and LH cylinder heads.



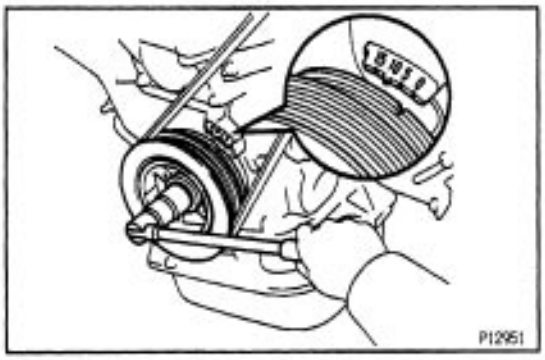
16. REMOVE CYLINDER HEAD COVERS

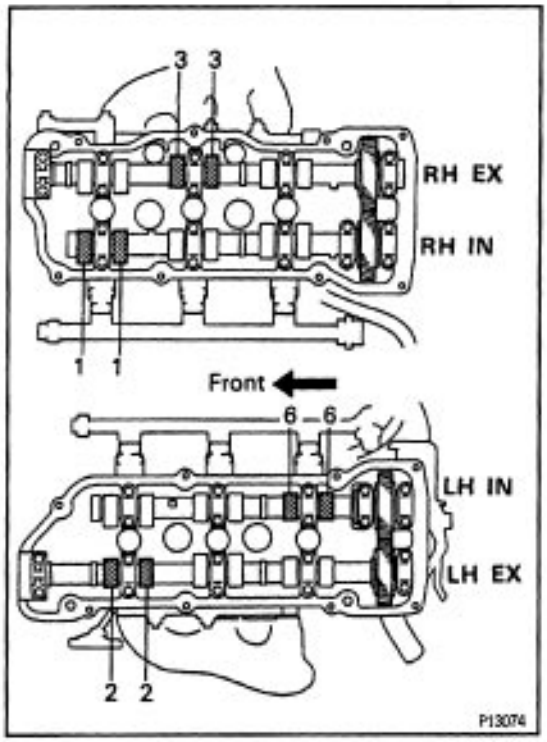
Remove the 8 bolts, cylinder head cover and gasket.
Remove the 2 cylinder head covers.



17. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the No.1 timing belt cover.
(b) Check that the valve lifters on the No.1 (IN) are loose and valve lifters on the No.1 (EX) are tight.
If not, turn the crankshaft 1 revolution (360˚) and align the mark as above.





18. INSPECT VALVE CLEARANCE

(a) Check only those valves indicated in the illustration.

- Using a feeler gauge, measure the clearance be–tween the valve lifter and camshaft.
- Record out of specification valve clearance mea–surements. They will be used later to determine the required replacement adjusting shim.

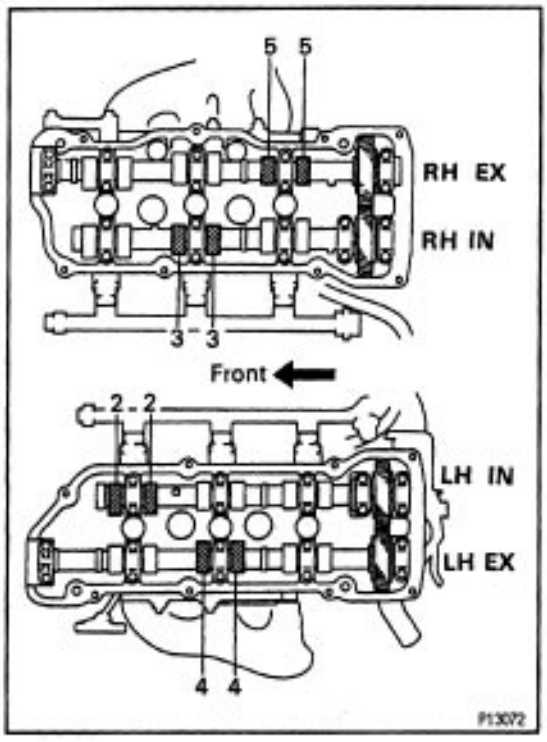
Valve clearance (Cold):

Intake

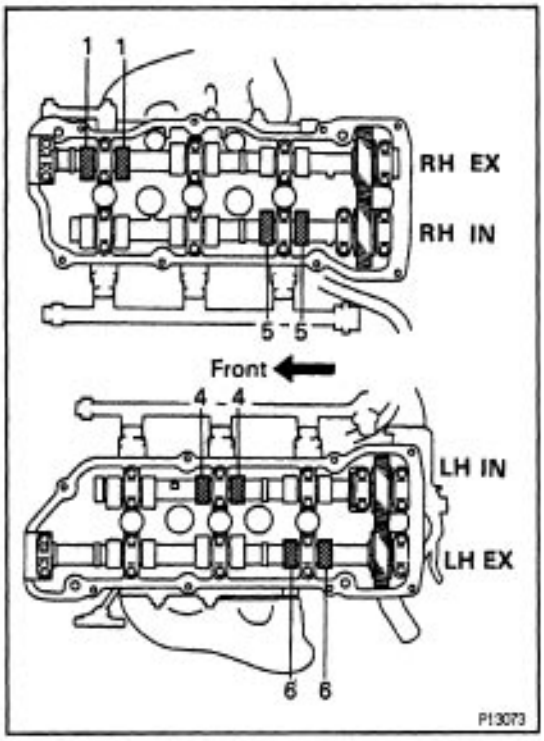
0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust

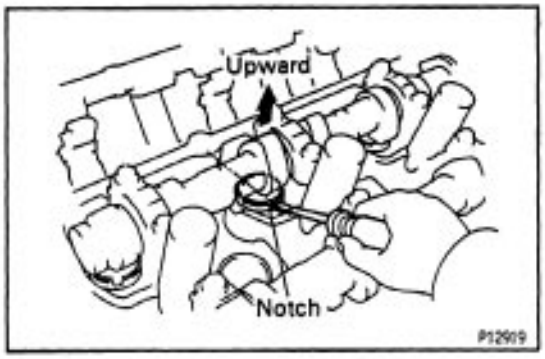
0.25 – 0.35 mm (0.010 – 0.014 in.)



(b) Turn the crankshaft 2/3 of a revolution (240®), and check only. the valves indicated in the illustration. Measure the valve clearance.
(See procedure step (a))



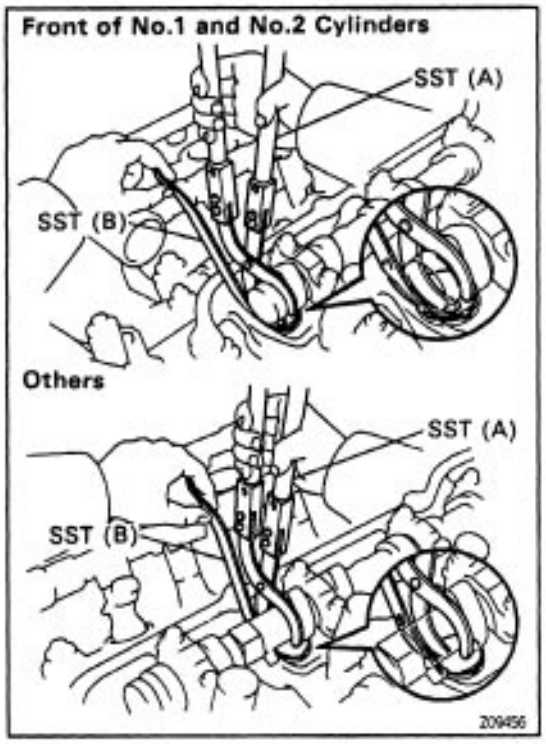
(c) Turn the crankshaft a further 2/3 of a revolution (240°), and check only the valves indicated in the illustration.
Measure the valve clearance.
(See procedure step (a))



19. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

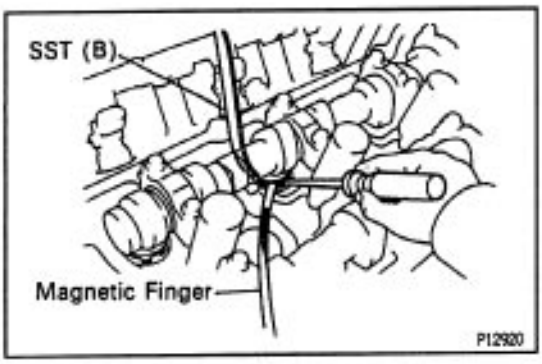
- Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.
- Turn the valve lifter with a screwdriver so that the notches would be perpendicular to the cam–shaft.



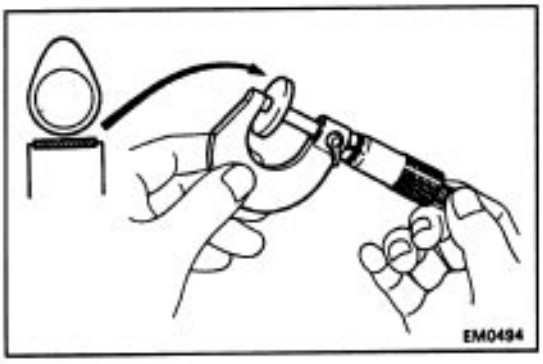
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248–55040 (09248–05410, 09248–05420)
HINT:

- Apply SST (B) at a slight angle on the side marked with ”9” or ”7”, at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side, at a slight angle.



- Using a small screwdriver and a magnetic finger, remove the adjusting shim.



(b) Determine the replacement adjusting shim size according to the following Formula or Charts on the next 2 pages:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so the valve clearance comes within specified value.

T ..... Thickness of used shim
A ..... Measured valve clearance
N ..... Thickness of new shim

Intake

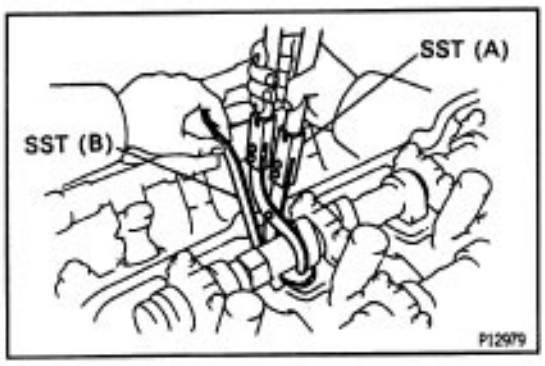
N = T + (A – 0.20 mm (0.008 in.))

Exhaust

N = T + (A – 0.30 mm (0.012 in.))

- Select a new shim with a thickness as close as possible to the calculated values.

HINT: Shims are available in 17 sizes in increments of 0.050 mm (0.0020 in.), from 2.500 mm (0.0984 in.) to 3.300 mm (0.1299 in.).



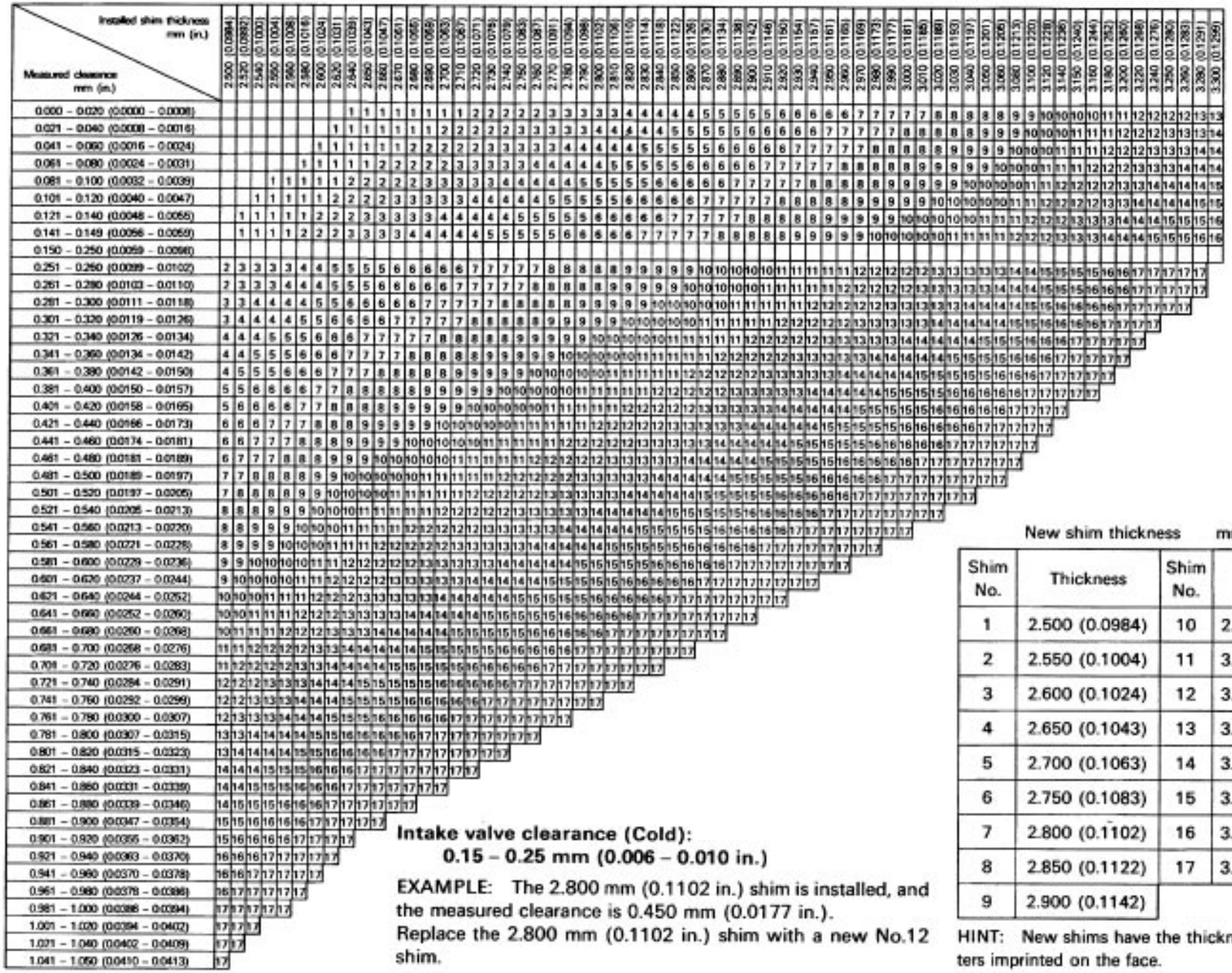
(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter, with imprinted numbers facing down.
- Press down the valve lifter with SST (A), and remove SST (B).

  SST 09248–55040 (09248–05410, 09248–05420)

(d) Recheck the valve clearance.

Adjusting Shim Selection Chart (Intake)



Intake valve clearance (Cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)

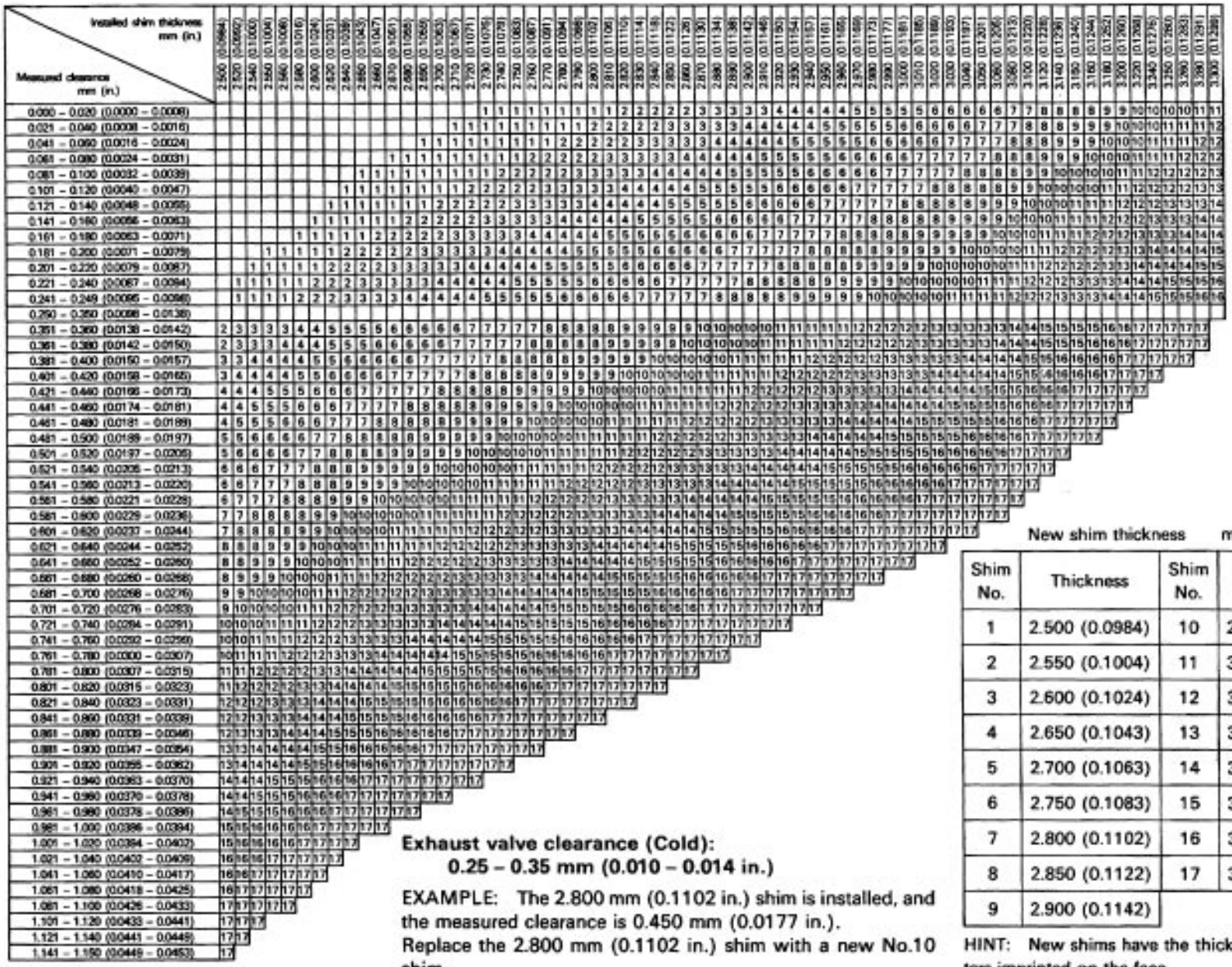
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a new No.12 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

Adjusting Shim Selection Chart (Exhaust)



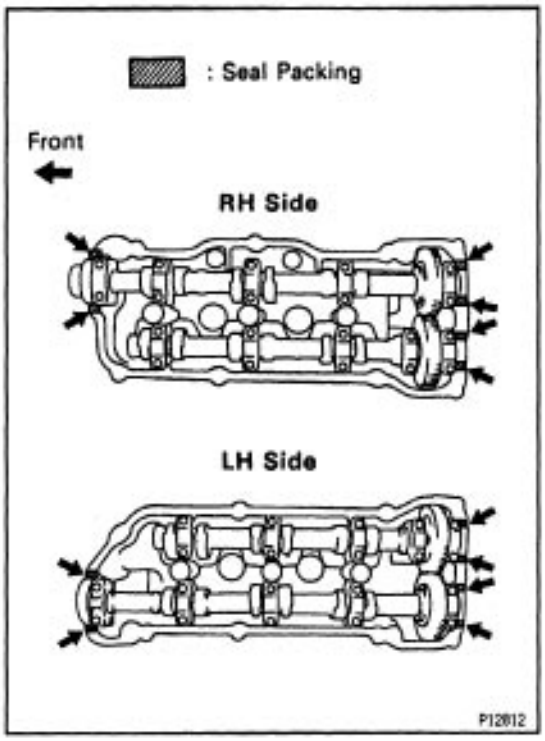
Exhaust valve clearance (Cold):
0.25 – 0.35 mm (0.010 – 0.014 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.).
Replace the 2.800 mm (0.1102 in.) shim with a new No.10 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

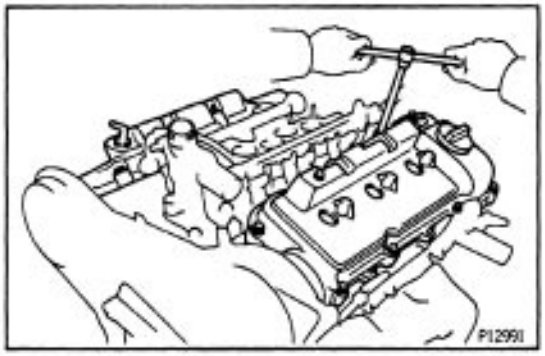


20. REINSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the illustration.

Seal packing:

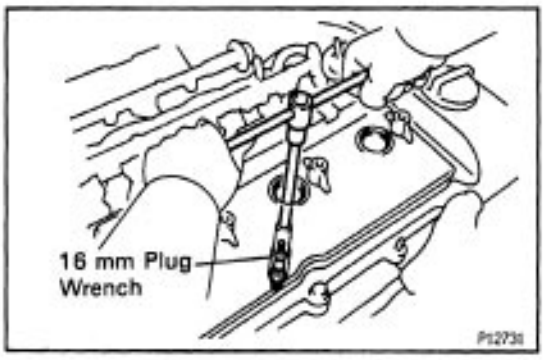
Part No. 08826–00080 or equivalent



(b) Install the gasket to the cylinder head cover.

(c) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.

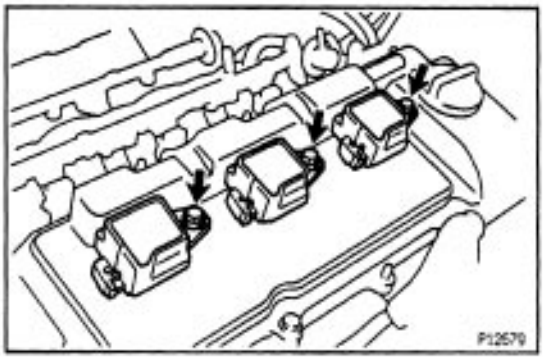
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



21. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the 6 spark plugs to the RH and LH cylinder heads.

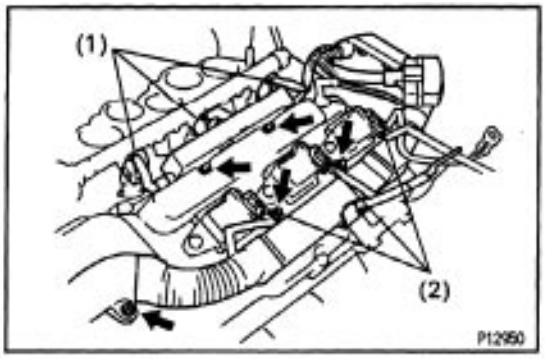
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



22. REINSTALL IGNITION COILS

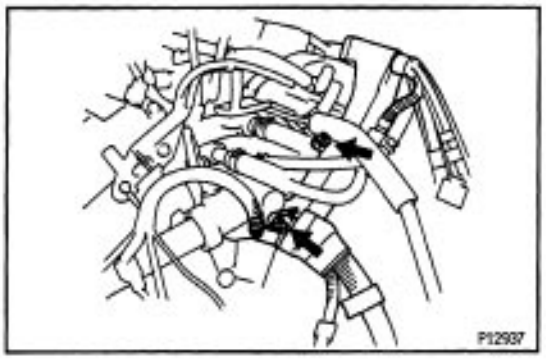
Install the6 ignition coils to the RH and LH cylinder heads.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



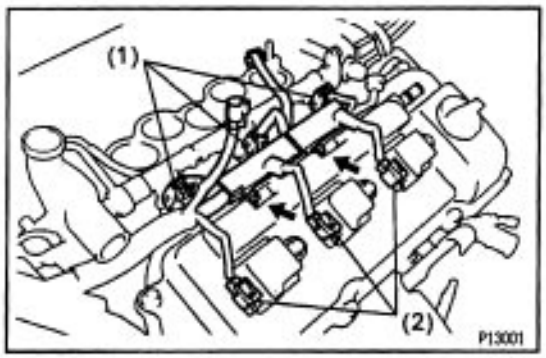
23. RECONNECT ENGINE WIRE TO ENGINE RH SIDE

(a) Connect the engine wire with the 5 nuts.
(b) Connect the following connectors:
    (1) 3 injector connectors
    (2) 3 ignition coil connectors



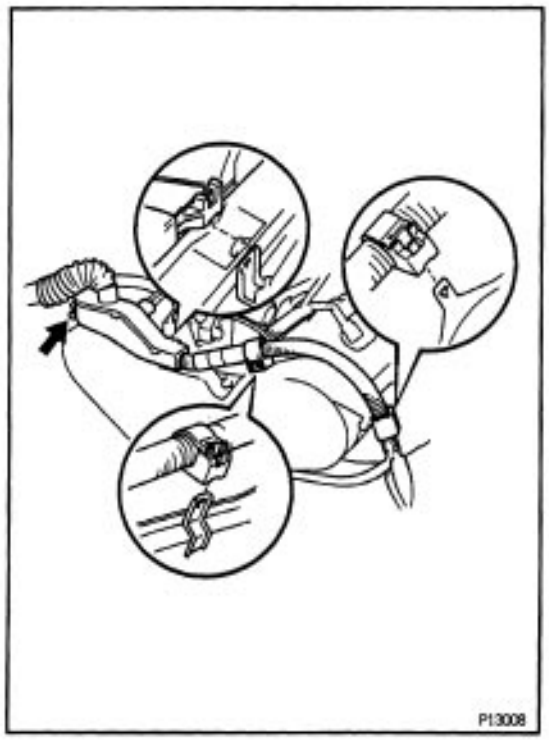
24. RECONNECT ENGINE WIRE TO ENGINE REAR SIDE

Connect the engine wire with the 2 nuts.



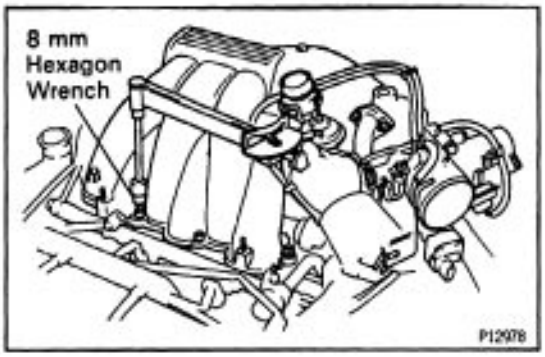
25. RECONNECT ENGINE WIRE TO ENGINE LH SIDE

(a) Connect the engine wire with the 2 nuts.
(b) Connect the following connectors:
    (1) 3 injector connectors
    (2) 3 ignition coil connectors



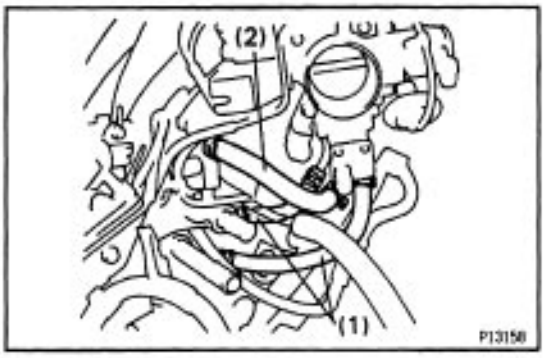
26. RECONNECT ENGINE WIRE TO NO.3 TIMING BELT COVER

(a) Connect the 3 clamps.
(b) Connect the engine wire with the bolt.

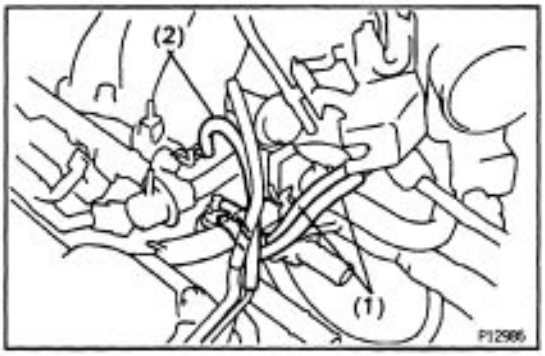


27. REINSTALL AIR INTAKE CHAMBER

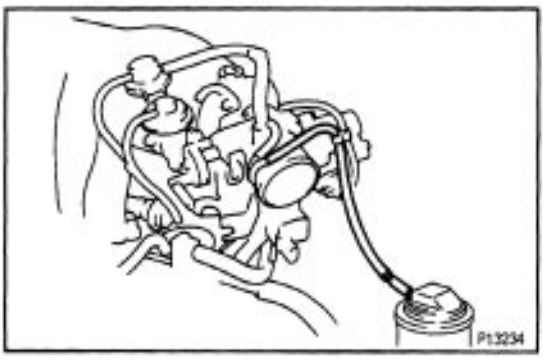
(a) Using an 8 mm hexagon wrench, install a new gasket and the air intake chamber with the 2 bolts and 2 nuts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



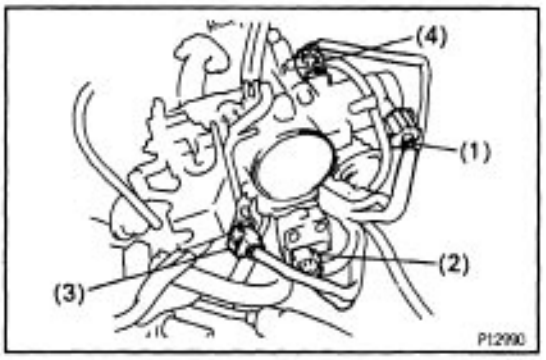
(b) Connect the following hoses:
(1) 2 water bypass hoses
(2) Air assist hose



(c) Connect the following vacuum hoses:
(1) 2 vacuum hoses to TVV
(2) Vacuum hose to cylinder head rear plate

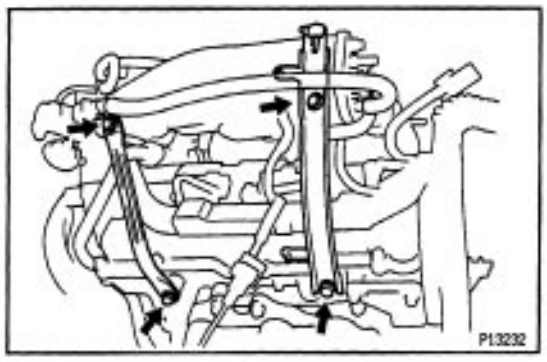


(3) Vacuum hose to charcoal canister

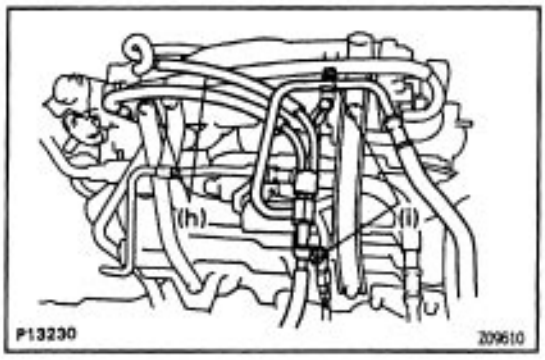


(d) Connect the following connectors:
(1) Throttle position sensor connector
(2) IACV valve connector
(3) EGR gas temperature sensor connector
(4) A/C idle–up connector

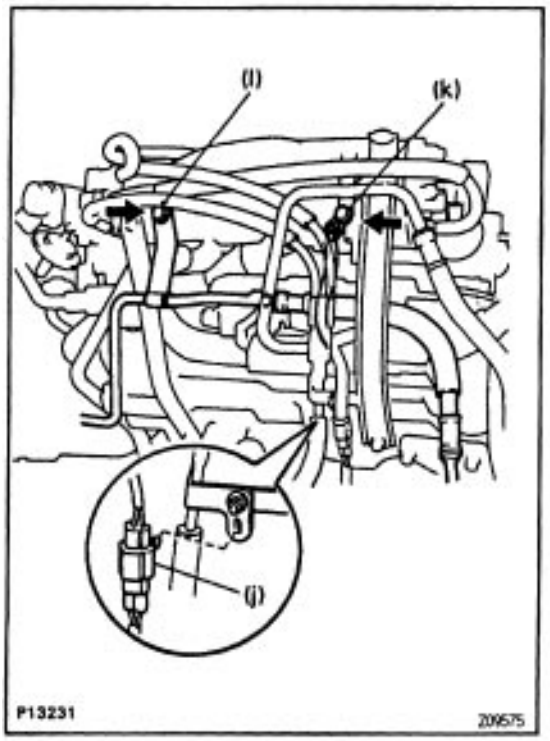
(e) Install 2 new gaskets and EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm. 9 ft–lbf)



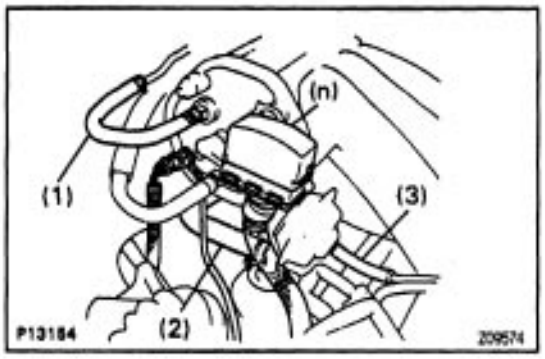
(f) install the No. 1 engine hanger with the 2 bolts.
Torque: 39 N–m (400 kgf–cm, 19 ft–lbf)
(g) Install the air intake chamber stay with the 2 bolts.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



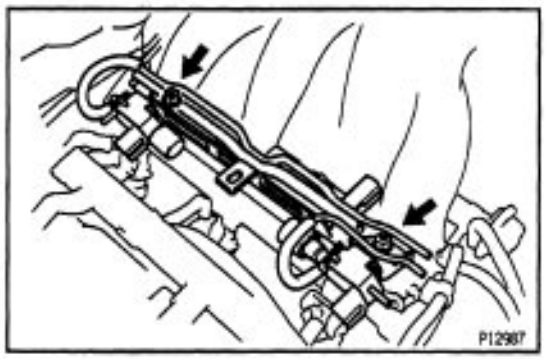
(h) Connect the 2 PS air hoses.
(i) Connect the PS pressure tube with the 2 nuts.



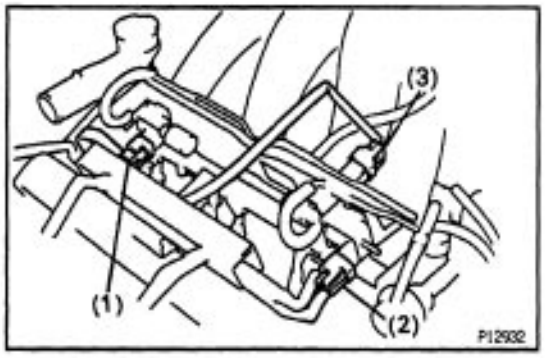
(j) Connect the RH oxygen sensor connector clamp to the PS pressure tube.
(k) Connect the ground strap with the bolt.
(1) Connect the hydraulic pressure pipe to the air intake chamber with the bolt.



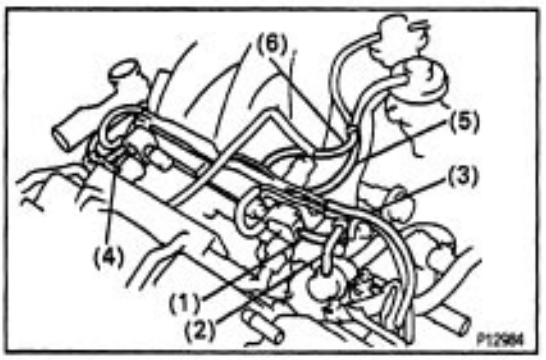
(m) Connect the following hoses:
(1) Brake booster vacuum hose
(2) PCV hose
(3) Intake air control valve vacuum hose
(n) Connect the data link connector 1.
(o) Connect the 2 ground straps with the nut.



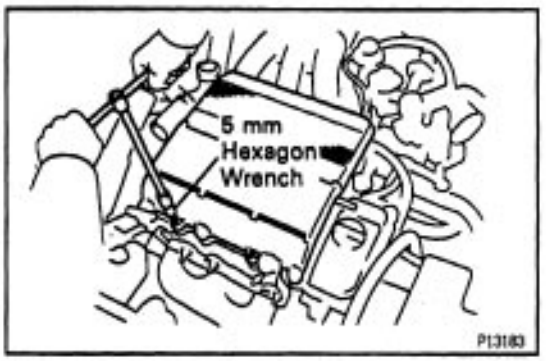
28. REINSTALL EMISSION CONTROL VALVE SET
(a) Install the emission control valve set with the 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



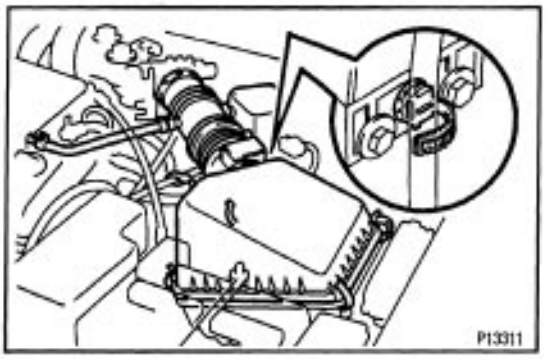
(b) Connect the following connectors:
(1) Intake control valve connector
(2) Fuel pressure connector
(3) EGR VSV connector



(c) Connect the following vacuum hoses:
(1) Vacuum hose to fuel pressure control VSV
(2) Vacuum hose to fuel pressure regulator
(3) Vacuum hose to cylinder head rear plate
(4) Vacuum hose to intake air control valve
(5) Vacuum hose to EGR vacuum modulator
(6) Vacuum hose to EGR valve

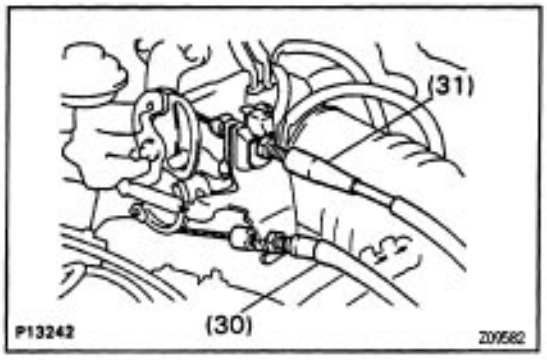


28. REINSTALL V–BANK COVER
Using a 5 mm hexagon wrench, install the V– bank cover with the 2 nuts.

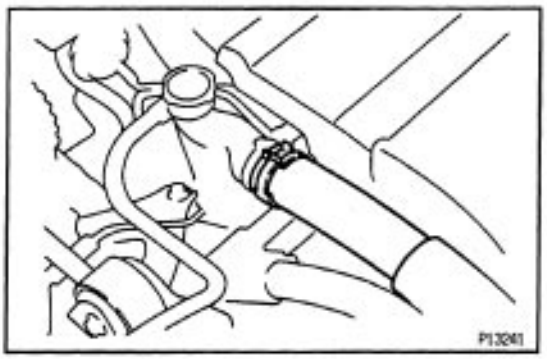


29. REINSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air cleaner cap and volume air flow meter with the 4 clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the PCV hose.
(d) Connect the accelerator cable clamp.
(e) Connect the volume air flow meter connector and wire clamp.



30. RECONNECT THROTTLE CABLE
31. RECONNECT ACCELERATOR CABLE



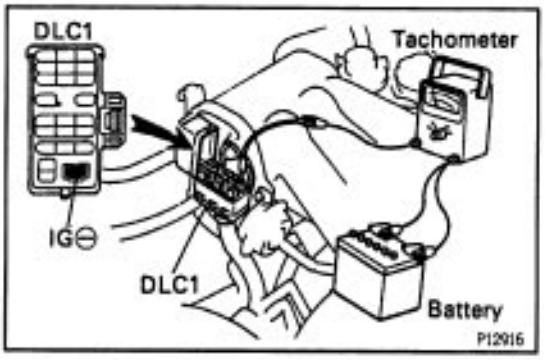
32. RECONNECT RADIATOR INLET HOSE

33. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp. qts)
34. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

IGNITION TIMING INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER TO ENGINE

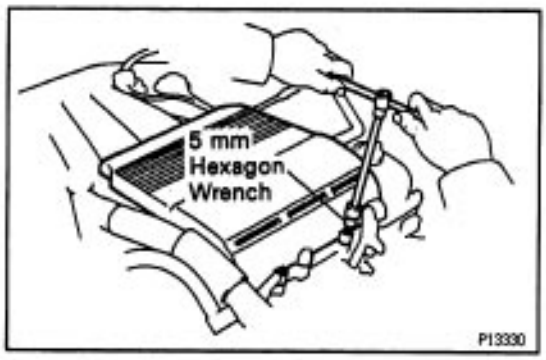
Connect the tester probe of a tachometer to terminal IG(–) of the data link connector 1.

NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result In damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**

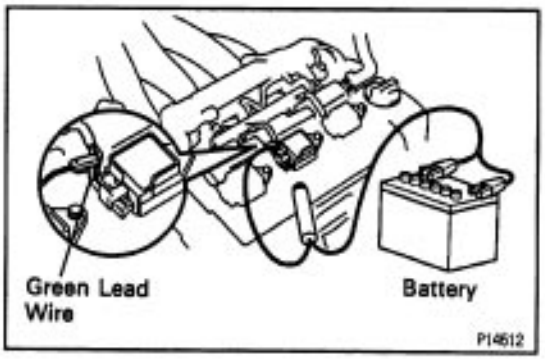
3. CONNECT TIMING LIGHT TO ENGINE

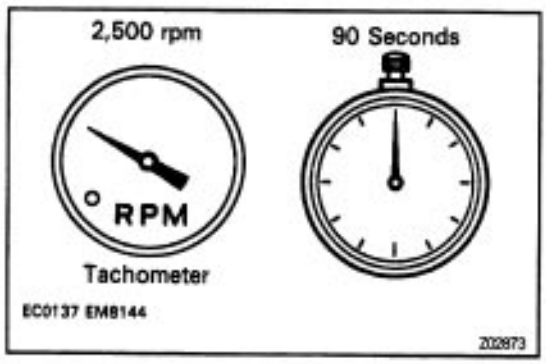
(a) Using a 5 mm hexagon wrench, remove the 2 cap nuts and V– bank cover.



(b) Connect the timing light pickup clip to the the green lead wire for the No.4 ignition coil.

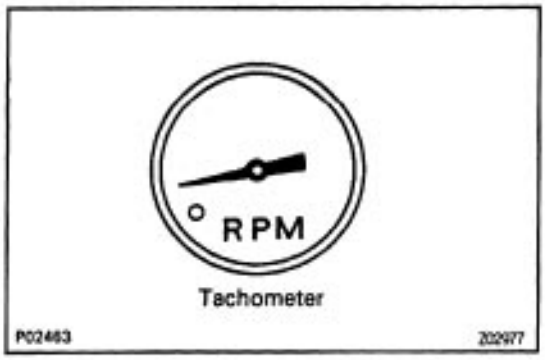
HINT: Use a timing light that can detect the primary signal.



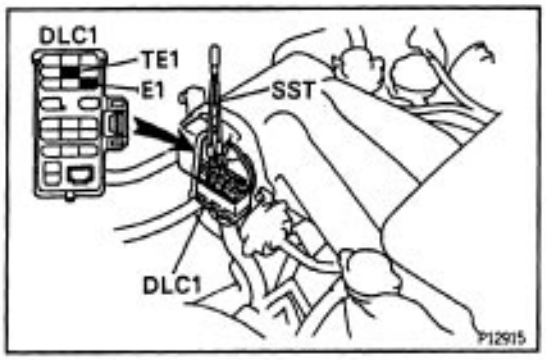


4. CHECK IDLE SPEED

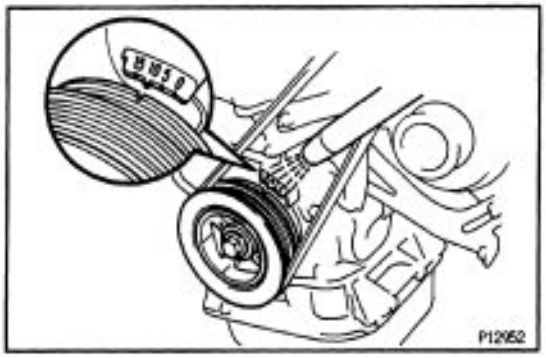
(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.



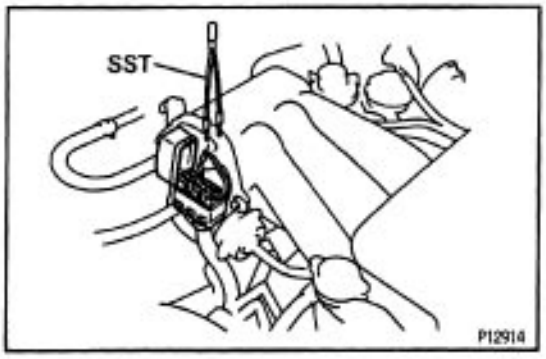
(b) Check the idle speed.
Idle speed:
700 ± 60 rpm



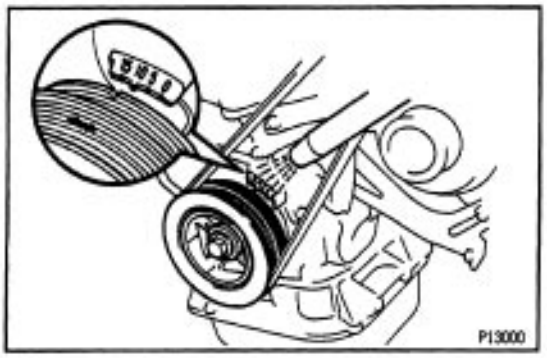
5. INSPECT IGNITION TIMING
(a) Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843–18020



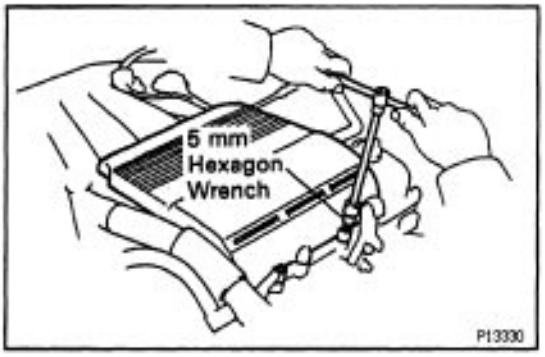
(b) Using a timing light, check the ignition timing.
Ignition timing:
8 – 12®BTDC @ idle
(Transmission in neutral position)
If the ignition timing is not as specified, check that following conditions are normal:
- Throttle valve fully closed
- Continuity between terminals IDL1 and E2 of the throttle position sensor.
- Valve timing



(c) Remove the SST from the data link connector 1.
SST 09843–18020



6. FURTHER CHECK IGNITION TIMING
Ignition timing:
7 – 17®BTDC @ idle
(Transmission in neutral position)
HINT: The timing mark moves in a range between 7® and 17®.



7. DISCONNECT TIMING LIGHT FROM ENGINE

(a) Remove the timing light.

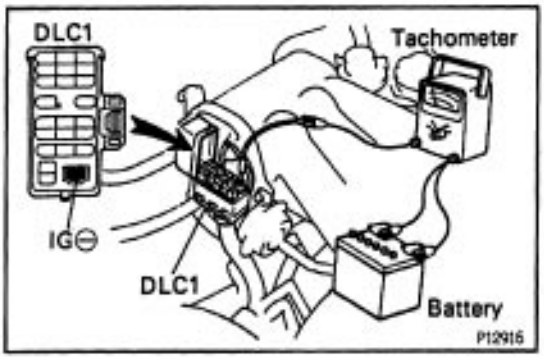
(b) Using a 5 mm hexagon wrench, install the V–bank cover with the 2 cap nuts.

8. DISCONNECT TACHOMETER FROM ENGINE

IDLE SPEED INSPECTION

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR system, etc. should be properly connected.
(f) SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission, in neutral position



2. CONNECT TACHOMETER

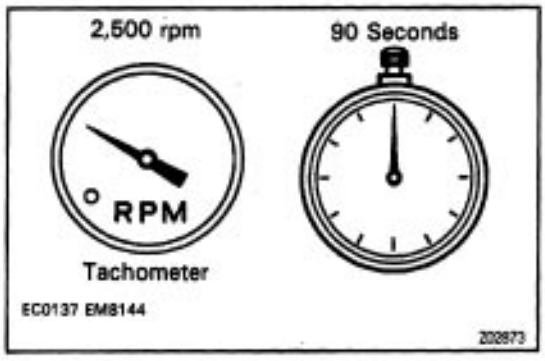
Connect the tester probe of a tachometer to terminal IG(–) of the data link connector 1.

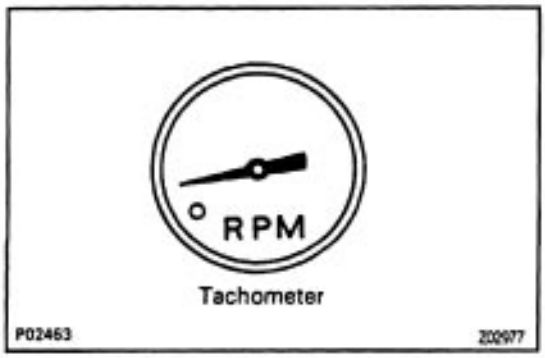
NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**

3. INSPECT IDLE SPEED

(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.





(b) Check the idle speed.

Idle speed:

700 ± 50 rpm

If the idle speed is not as specified, check the IAC valve and air intake system.

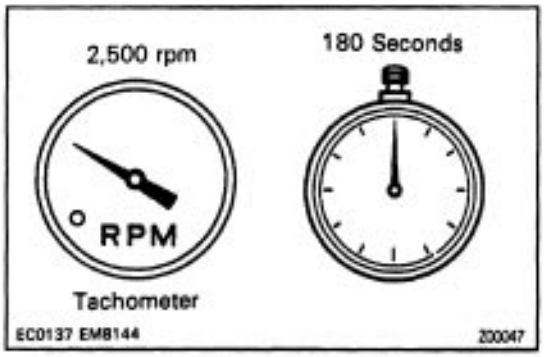
4. DISCONNECT TACHOMETER

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

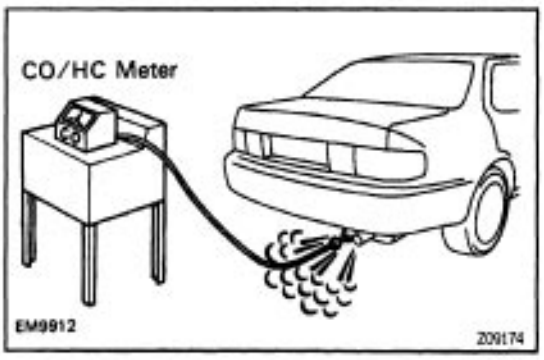
1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.
(f) SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand



2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/NC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

Troubleshooting

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

See the table below for possible causes, and then inspect and correct the applicable causes if neces–sary.

CO	HC	Phenomenon	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Faulty SFI systems: • Faulty fuel pressure regulator • Clogged fuel return line • Defective ECT switch • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty volume air flow meter

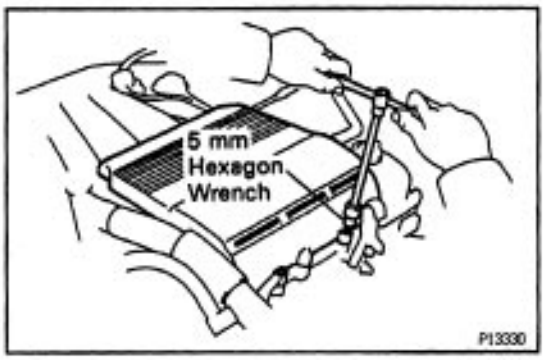
V02907

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consump–tion or poor fuel economy, measure the compression pressure.

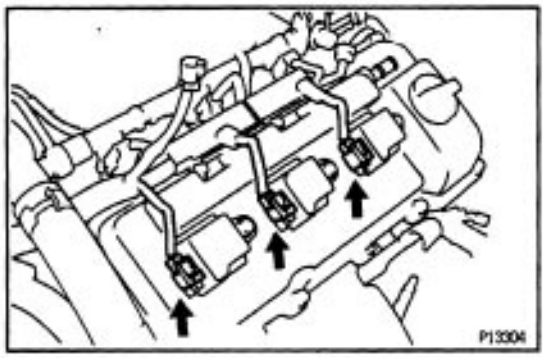
1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.



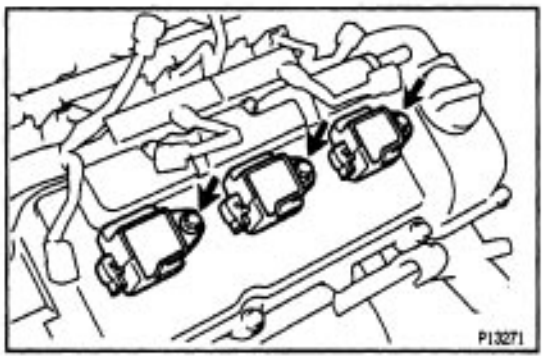
2. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and V– bank cover.

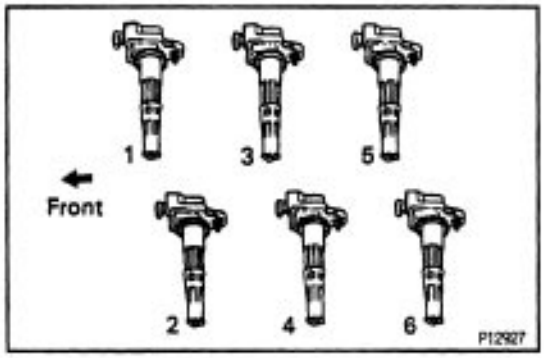


3. REMOVE IGNITION COILS

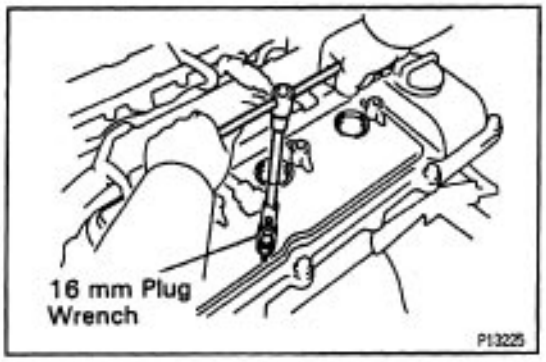
(a) Disconnect the 6 connectors from the RH and LH cylinder heads.



(b) Remove the 6 bolts and 6 ignition coils from the RH and LH cylinder heads.

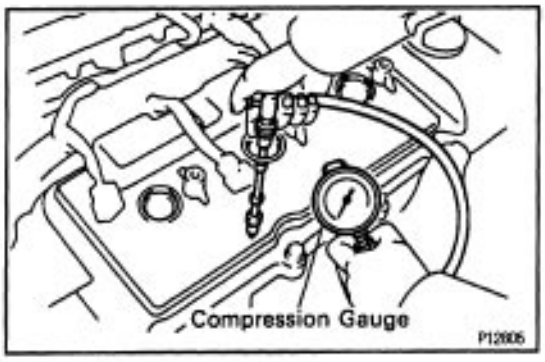


HINT: Arrange the ignition coils in the correct order.



4. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the 6 spark plugs from the RH and LH cylinder heads.



5. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

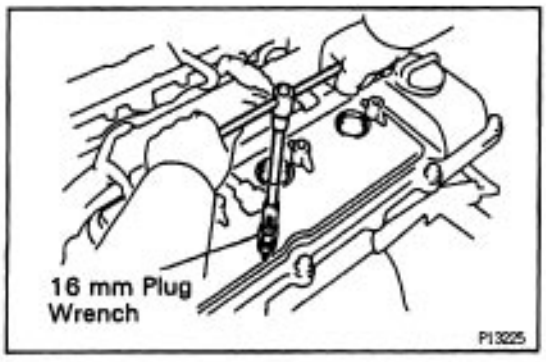
(d) Repeat steps
(a) through
(c) for each cylinder.

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:
1,226 kPa (12.5 kgf/cm^2, 178 psi) or more
Minimum pressure:
981 kPa (10.0 kgf/cm^2, 142 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylin–der through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

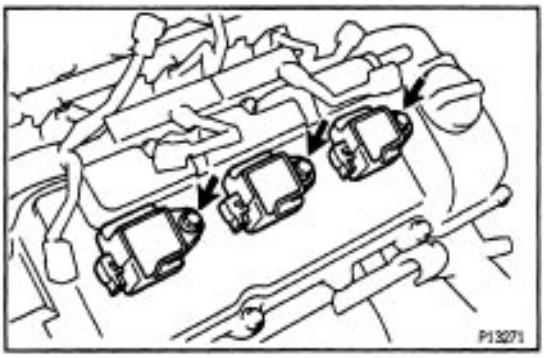
- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.



6. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the 6 spark plugs to the RH and LH cylinder heads.

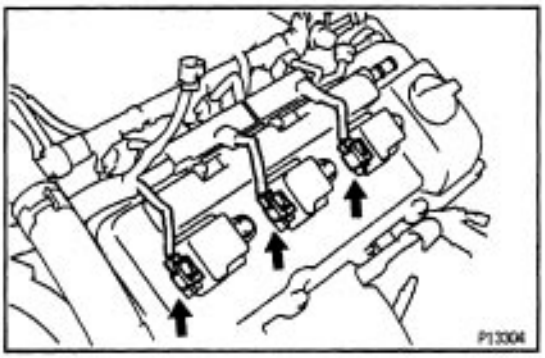
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



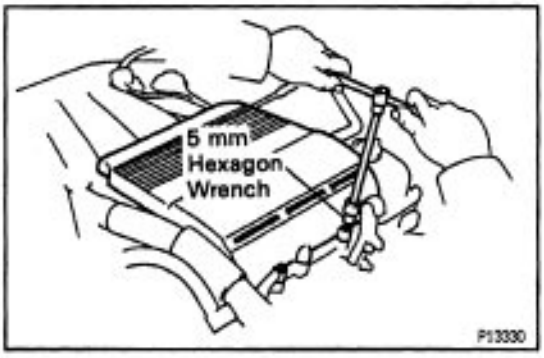
7. INSTALL IGNITION COILS

(a) Install the 6 ignition coil to the RH and LH cylinder heads with the 6 bolts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



(b) Connect the 6 ignition coil connectors.

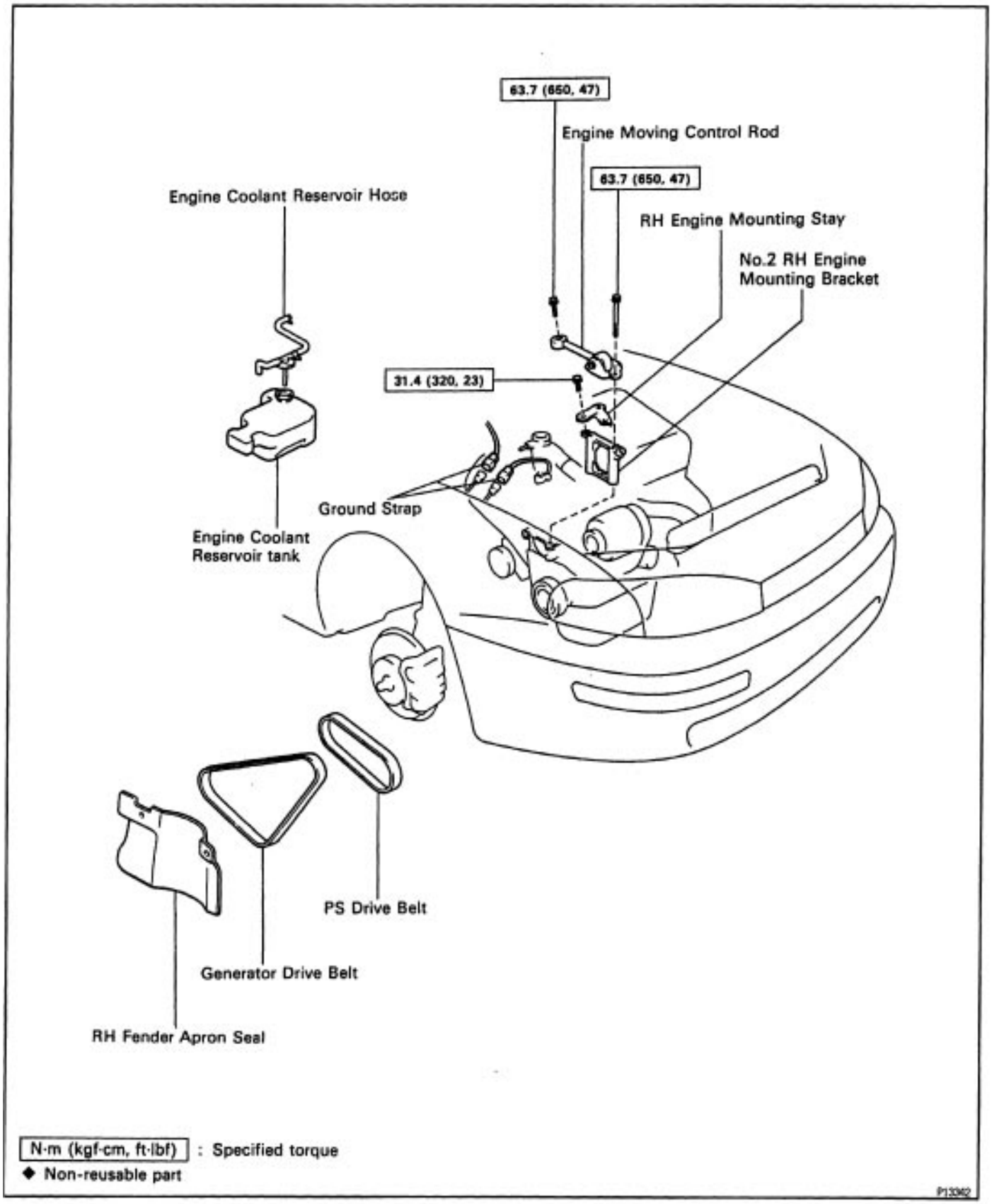


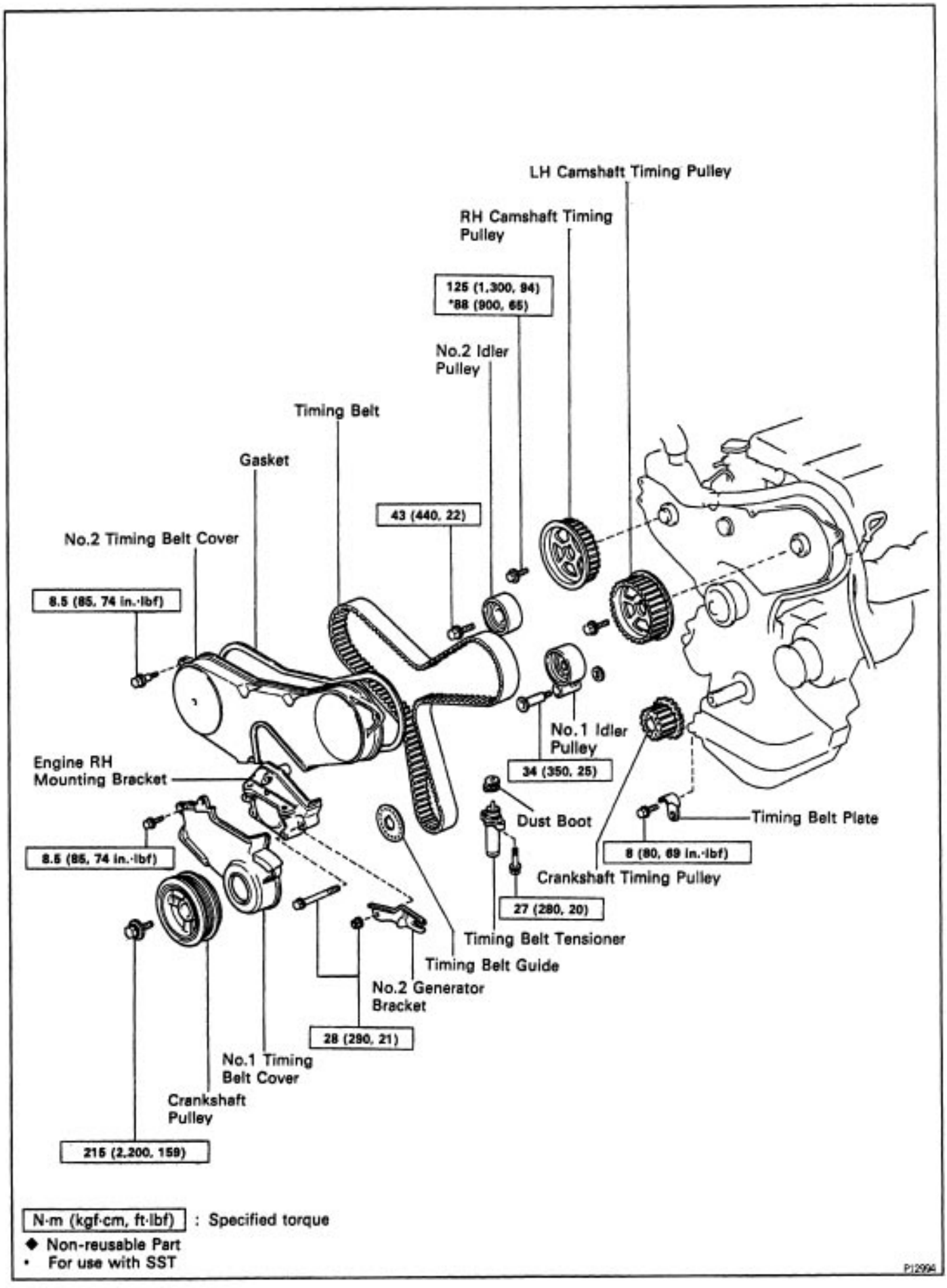
8. REINSTALL V–BANK COVER

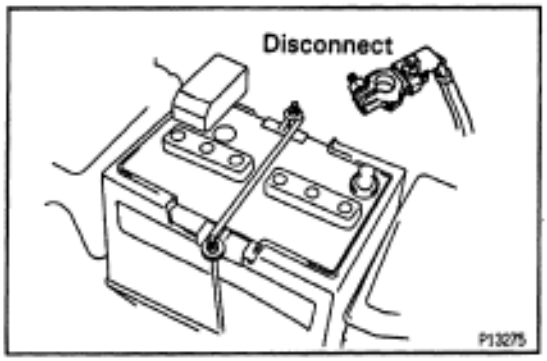
Using a 5 mm hexagon wrench, install the V –bank cover with the 2 cap nuts.

TIMING BELT

COMPONENTS FOR REMOVAL AND INSTALLATION




LH Camshaft Timing Pulley
RH Camshaft Timing Pulley
125 (1,300, 94)
*88 (900, 65)
No.2 Idler Pulley
Timing Belt
Gasket
43 (440, 22)
No.2 Timing Belt Cover
8.5 (85, 74 in.·lbf)
No.1 Idler Pulley
34 (350, 25)
Engine RH Mounting Bracket
Dust Boot
Timing Belt Plate
8.5 (85, 74 in.·lbf)
8 (80, 69 in.·lbf)
Crankshaft Timing Pulley
27 (280, 20)
Timing Belt Tensioner
Timing Belt Guide
No.2 Generator Bracket
28 (290, 21)
No.1 Timing Belt Cover
Crankshaft Pulley
215 (2,200, 159)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable Part
• For use with SST
P12994



TIMING BELT REMOVAL

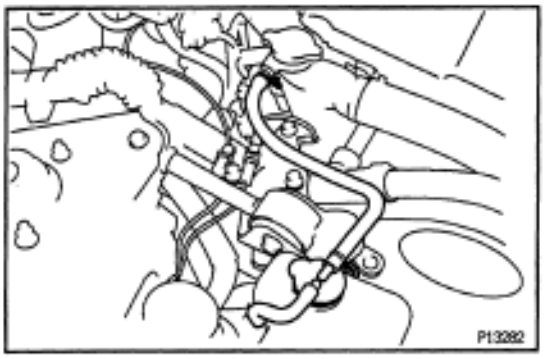
(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

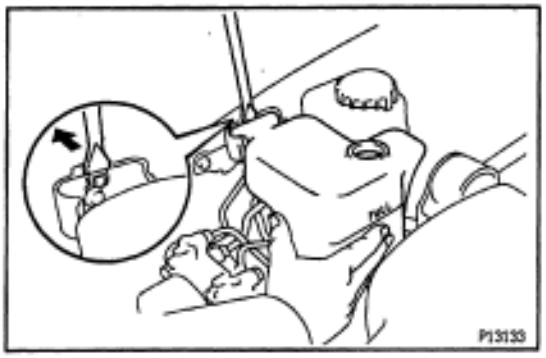
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. REMOVE ENGINE COOLANT RESERVOIR TANK

(a) Disconnect the reservoir hose.

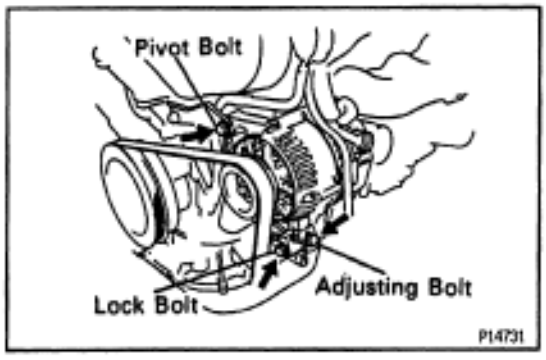


(b) Using a screwdriver, remove the reservoir tank.



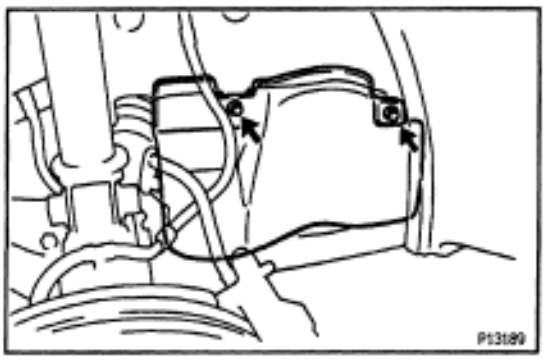
3. REMOVE GENERATOR DRIVE BELT

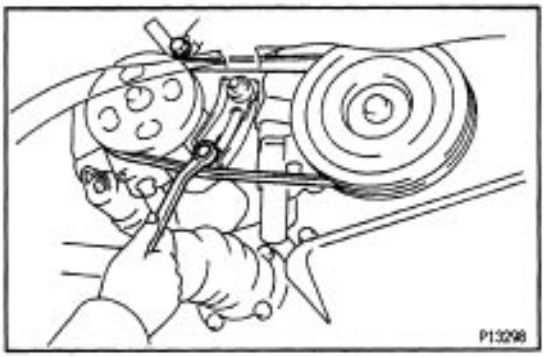
Loosen the pivot bolt and adjusting lock bolt, and remove the drive belt.



4. REMOVE RH FRONT WHEEL

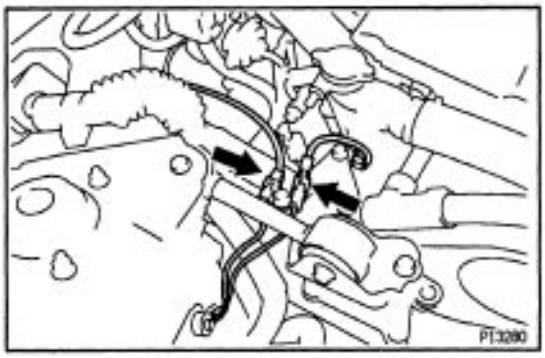
5. REMOVE RH FENDER APRON SEAL





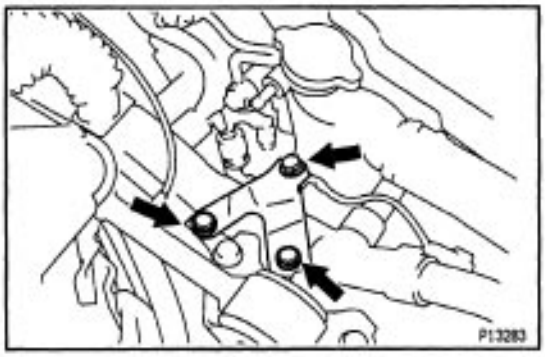
6. REMOVE PS DRIVE BELT

Loosen the 2 bolts, and remove the drive belt.



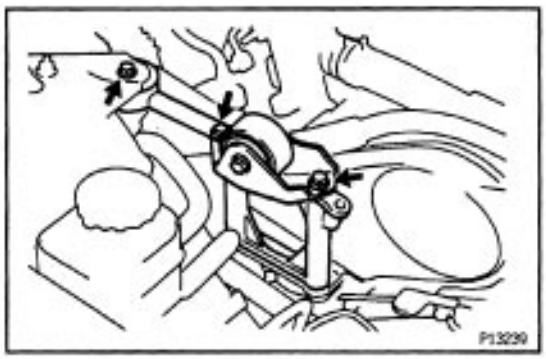
7. DISCONNECT GROUND STRAPS

Disconnect the 2 straps.



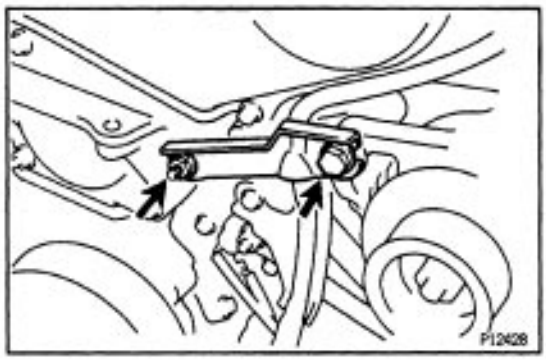
8. REMOVE RH ENGINE MOUNTING STAY

Remove the 3 bolts and RH engine mounting stay.



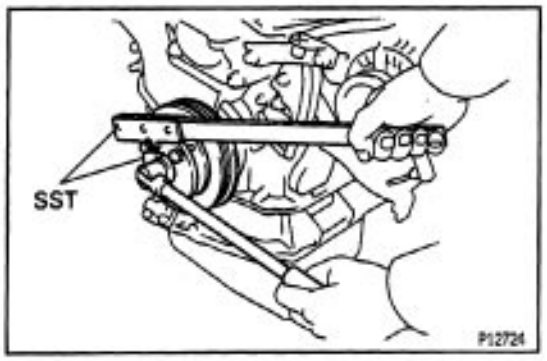
9. REMOVE ENGINE MOVING CONTROL ROD AND NO.2 RH ENGINE MOUNTING BRACKET

Remove the 3 bolts, control rod and mounting brack–et.

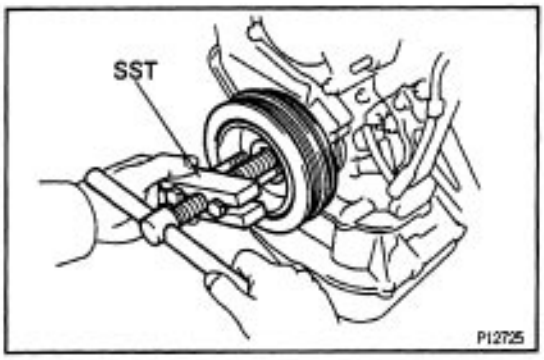


10. REMOVE NO.2 GENERATOR BRACKET

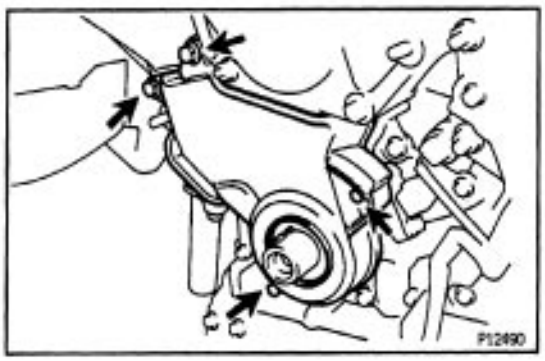
(a) Loosen the generator pivot bolt.
(b) Remove the nut and bracket.



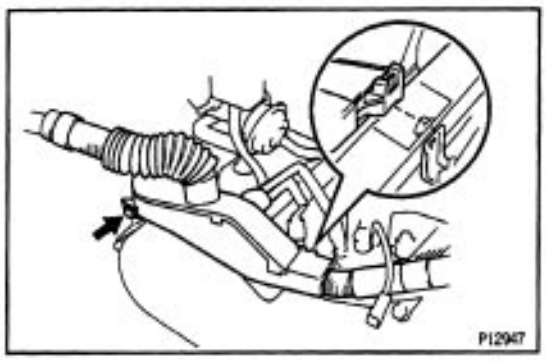
11. REMOVE CRANKSHAFT PULLEY
(a) Using SST, remove the pulley bolt.
SST 09213–54016, 09330–00021



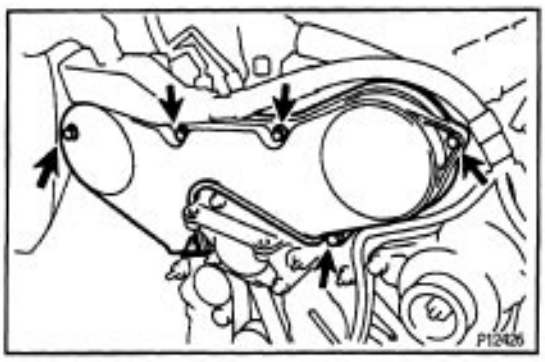
(b) Using SST, remove the pulley.
SST 09213–00060



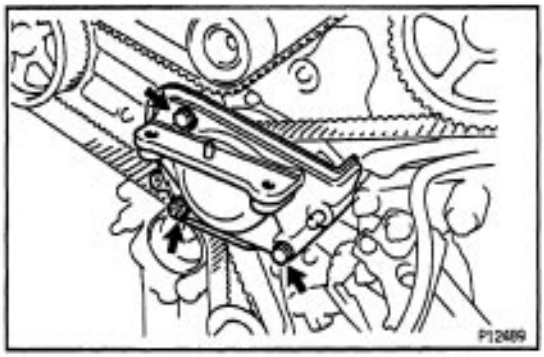
12. REMOVE No.1 TIMING BELT COVER
Remove the 4 bolts and timing belt cover.



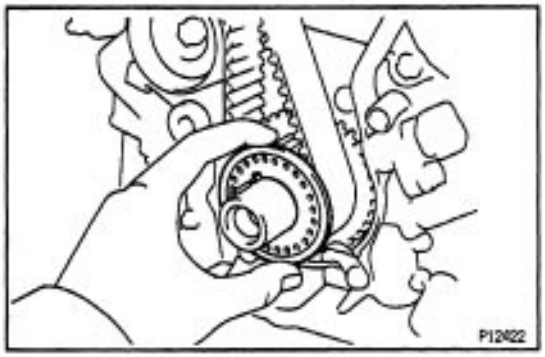
13. DISCONNECT ENGINE WIRE
(a) Remove the bolt holding the engine wire to the No.3 timing belt cover.
(b) Disconnect the engine wire from the clamp.



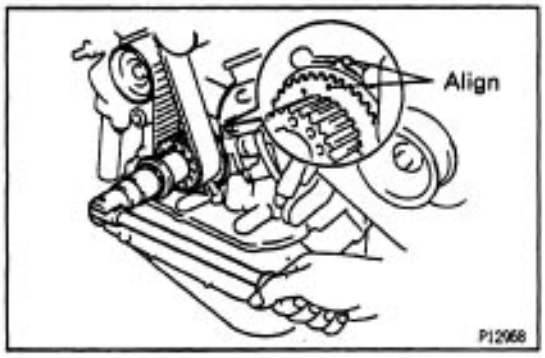
14. REMOVE N0.2 TIMING BELT COVER
Remove the 5 bolts and timing belt cover.



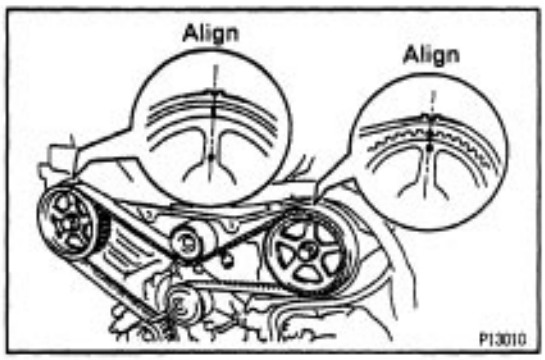
15. REMOVE ENGINE RH MOUNTING BRACKET
Remove the 2 bolts, nut and mounting bracket.



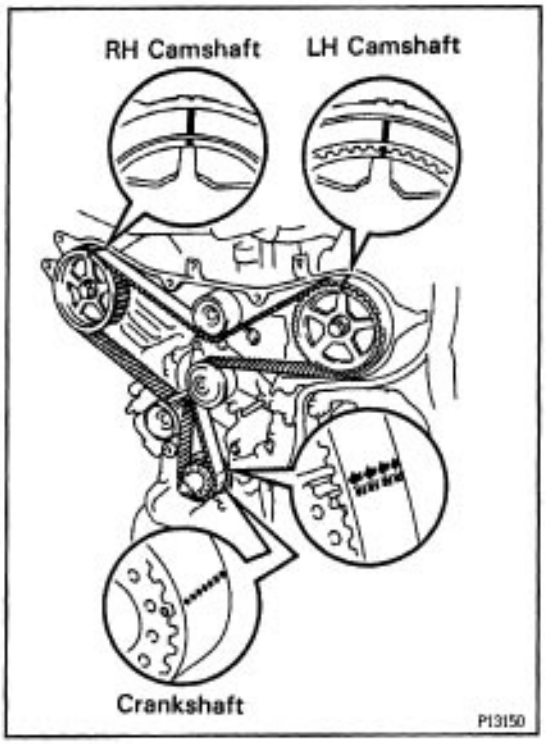
16. REMOVE TIMING BELT GUIDE



17. SET NO.1 CYLINDER TO TDC/COMPRESSION
(a) Temporarily install the crankshaft pulley bolt to the crankshaft.
(b) Turn the crankshaft and align the crankshaft timing pulley groove with the oil pump alignment mark.
NOTICE: Always turn the crankshaft clockwise.



(c) Check that timing marks of the camshaft timing pul–leys and No.3 timing belt cover are aligned.
If not, turn the crankshaft 1 revolution (360˚).
(d) Remove the crankshaft pulley bolt.

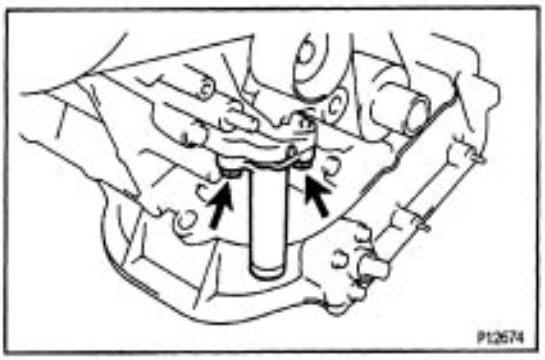


18. IF REUSING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT

Check that there are 3 installation marks and front mark on the timing belt.

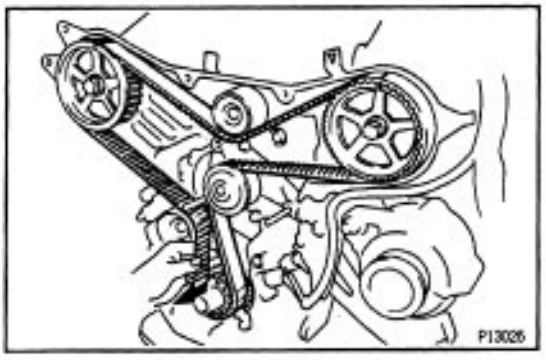
If the installation and front marks have disappeared, before removing the timing belt, place new installation and front marks on the timing belt to the following position:

- Timing mark of RH camshaft timing pulley
- Timing mark of LH camshaft timing pulley
- Dot mark of crankshaft timing pulley

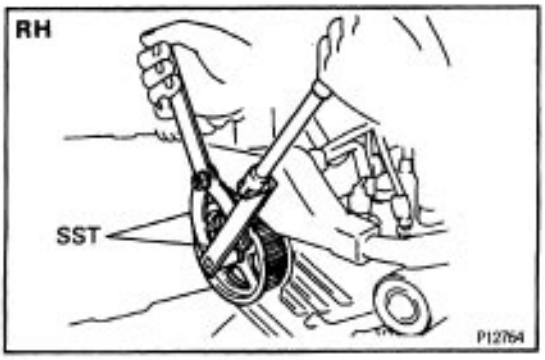


19. REMOVE TIMING BELT TENSIONER

Alternately loosen the 2 bolts, and remove them, the tensioner and dust boot.



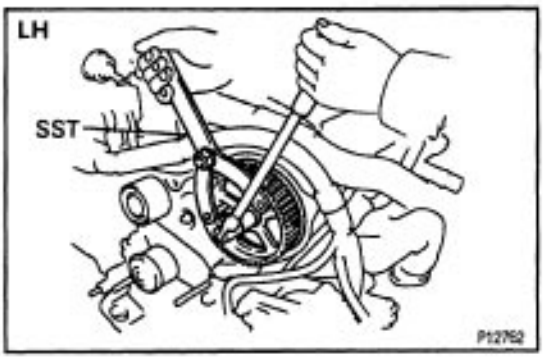
20. REMOVE TIMING BELT



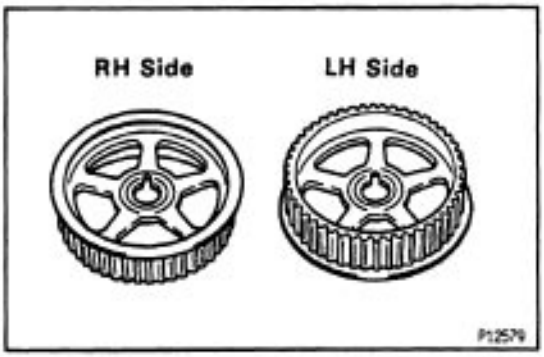
21. REMOVE CAMSHAFT TIMING PULLEYS

(a) Using SST, remove the bolt and RH timing pulley.

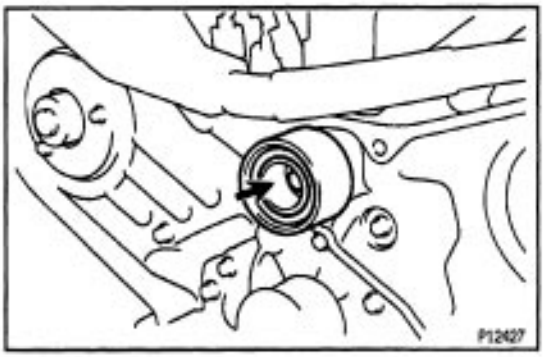
SST 09249 – 63010, 09960 –10010 (09962 – 01000)



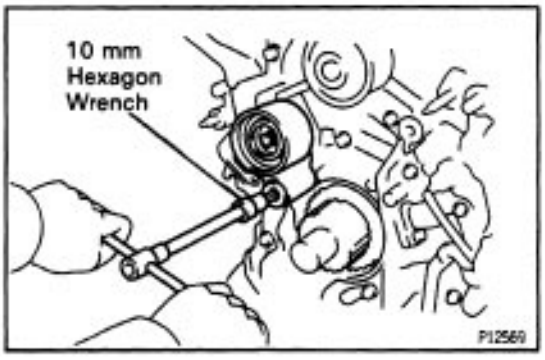
(b) Using SST, remove the LH timing pulley.
SST 09960–10010 (09962–01000)



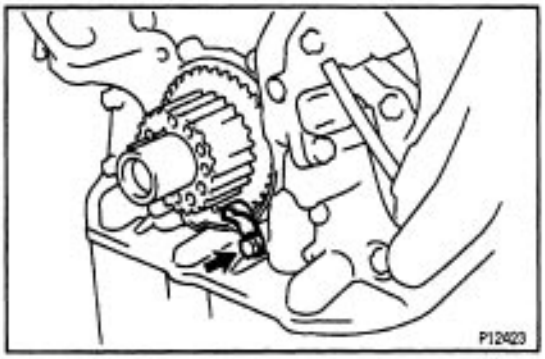
HINT: Arrange the camshaft timing pulleys (RH and LH sides).



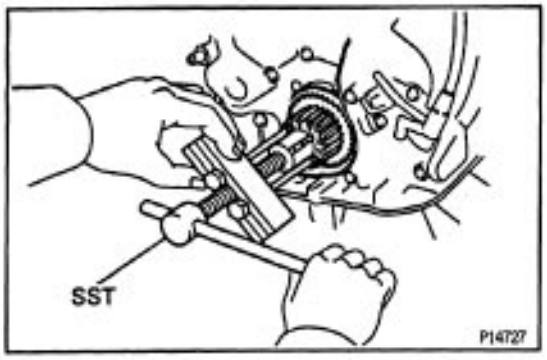
22. REMOVE NO.2 IDLER PULLEY
Remove the bolt and idler pulley.



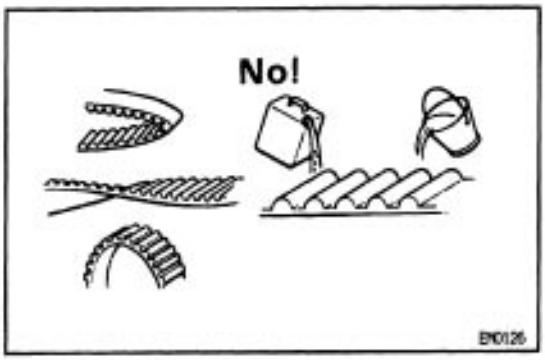
23. REMOVE No.1 IDLER PULLEY
Using a 10 mm hexagon wrench, remove the bolt, idler pulley and plate washer.



24. REMOVE CRANKSHAFT TIMING PULLEY
(a) Remove the bolt and timing belt plate.



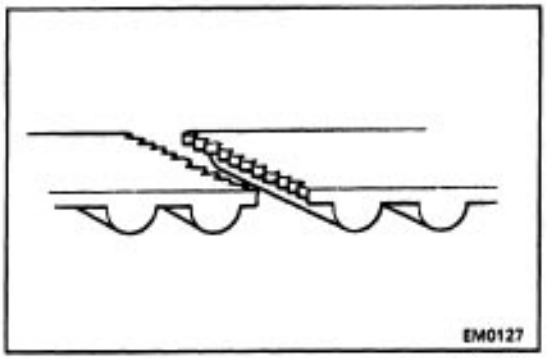
(b) Using SST, remove the crankshaft timing pulley.
SST 09213–60017 (09213–00020, 09213–00030, 09213–00050)
NOTICE: Do not scratch the sensor part of the crankshaft timing pulley.

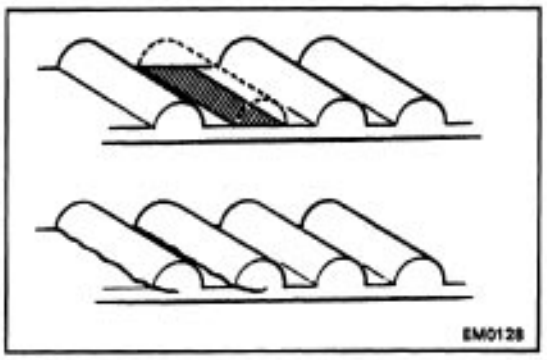


TIMING BELT INSPECTION

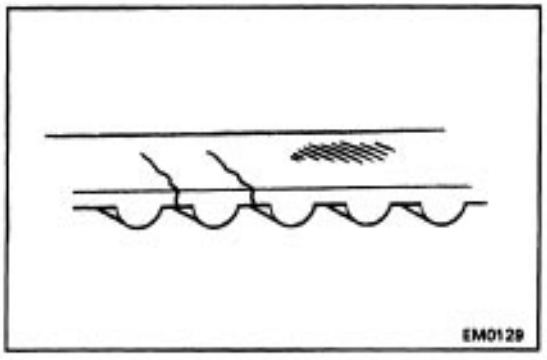
1. INSPECT TIMING BELT
NOTICE:
- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.**

If there are any defects, as shown in the illustrations, check the following points:
(a) Premature parting
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

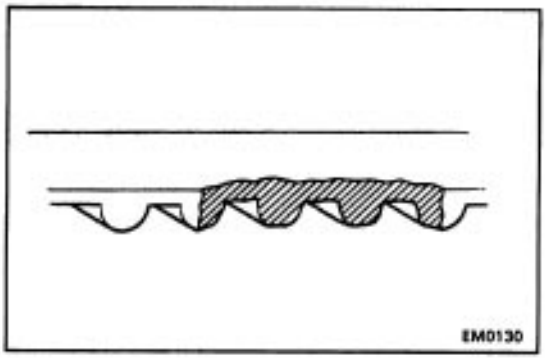




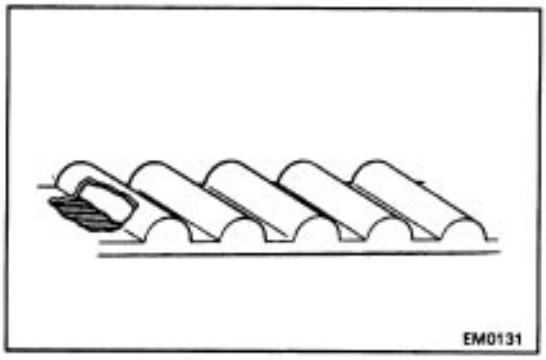
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.



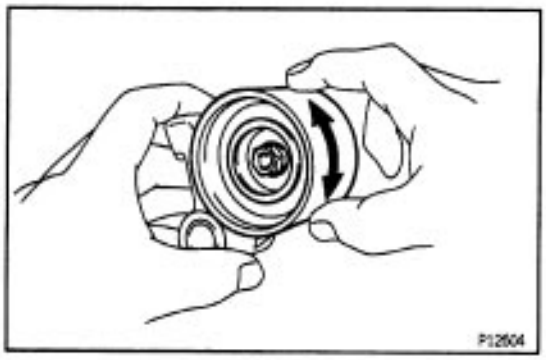
(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.



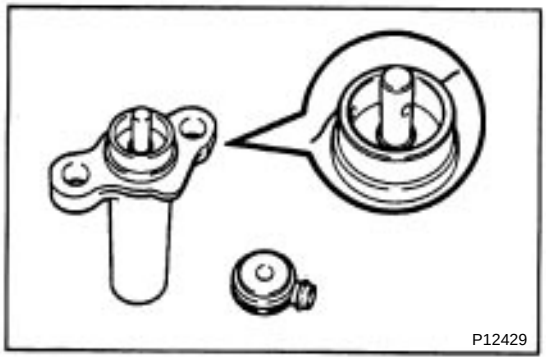
(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.



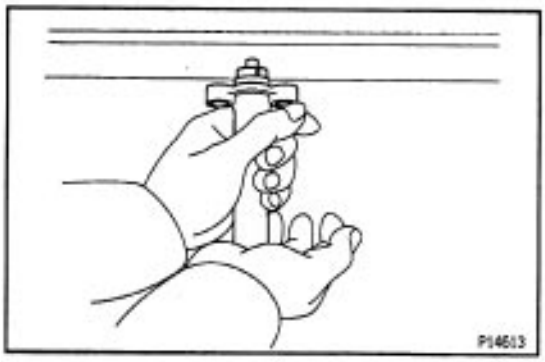
(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.
If necessary, replace the timing belt.



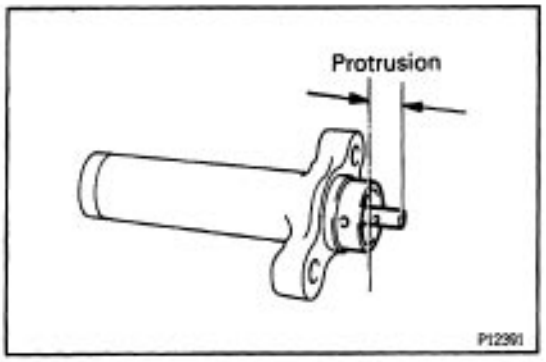
2. INSPECT IDLER PULLEYS
Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.



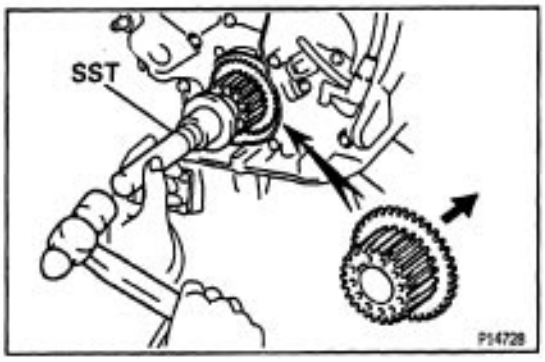
3. INSPECT TIMING BELT TENSIONER
(a) Visually check tensioner for oil leakage.
HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.
If leakage is found, replace the tensioner.



(b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move.
If the push rod moves, replace the tensioner.
NOTICE: Never hold the tensioner push rod facing down–ward.



(c) Measure the protrusion of the push rod from the housing end.
Protrusion:
10.0 – 10.8 mm (0.394 – 0.425 In.)
If the protrusion is not as specified, replace the tensioner.

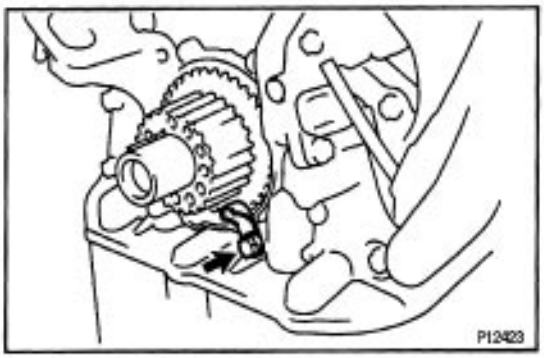


TIMING BELT INSTALLATION

(See Components for Removal and Installation)

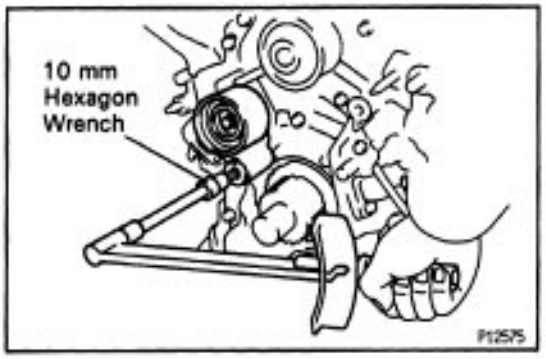
1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the pulley set key with the key groove of the timing pulley and slide on the timing pulley.
(b) Using SST and a hammer, tap in the timing pulley, facing the sensor side rearward.
SST 09223–46011
NOTICE: Do not scratch the sensor part of the crankshaft timing pulley.

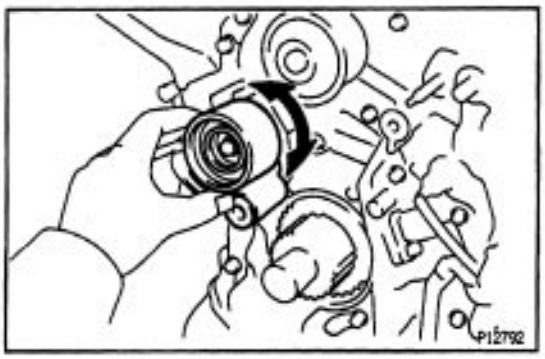


(c) Install the timing belt plate with the bolt.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

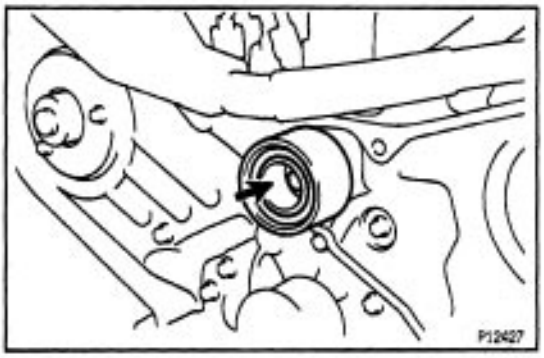
2. INSTALL NO.1 IDLER PULLEY



(a) Using a 10 mm hexagon wrench, install the idler pulley with the plate washer and bolt.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



(b) Check that the pulley bracket moves smoothly.

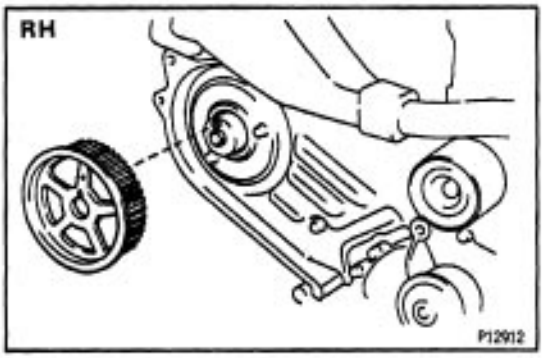


3. INSTALL No.2 IDLER PULLEY

(a) Install the idler pulley with the bolt.

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

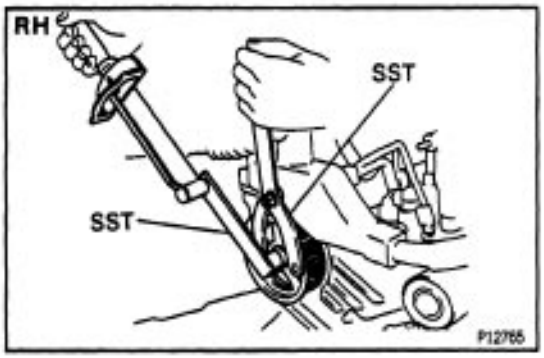
(b) Check that the idler pulley moves smoothly.



4. INSTALL RH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side outward.

(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

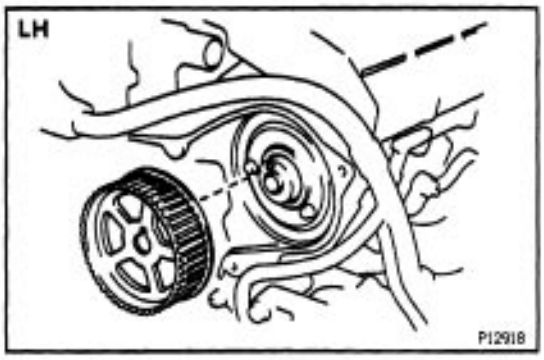


(c) Using SST, install and torque the bolt.

SST 09249–63010, 09960–10010 (09962–01000)

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

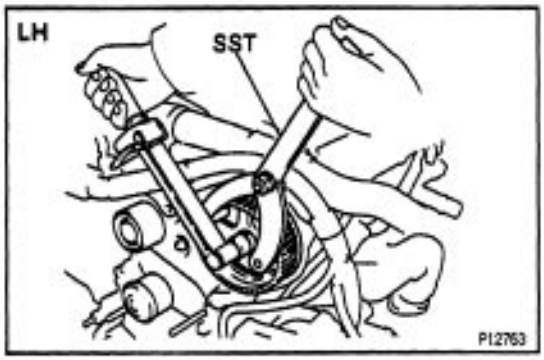
HINT: Use a torque wrench with a fulcrum length of 340 mm (113.39 in.)



5. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side inward.

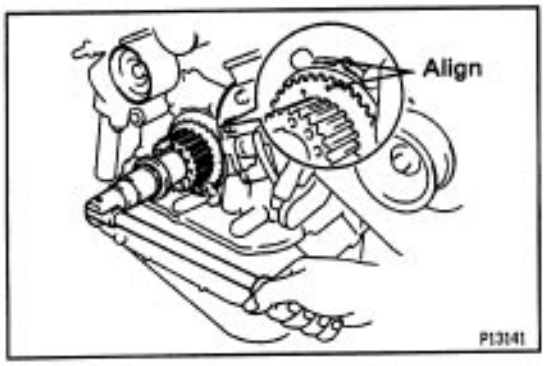
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.



(d) Using SST, install and torque the bolt.

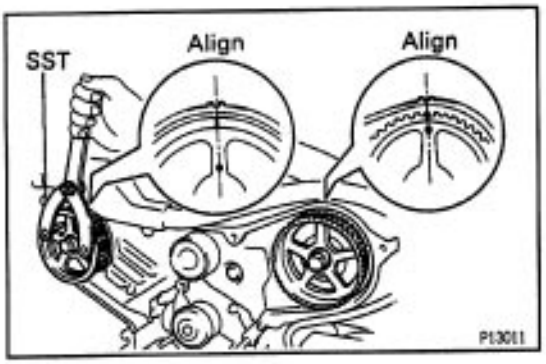
SST 09960–10010 (09962–01000)

Torque: 126 N–m (1,300 kgf–cm, 94 ft–lbf)



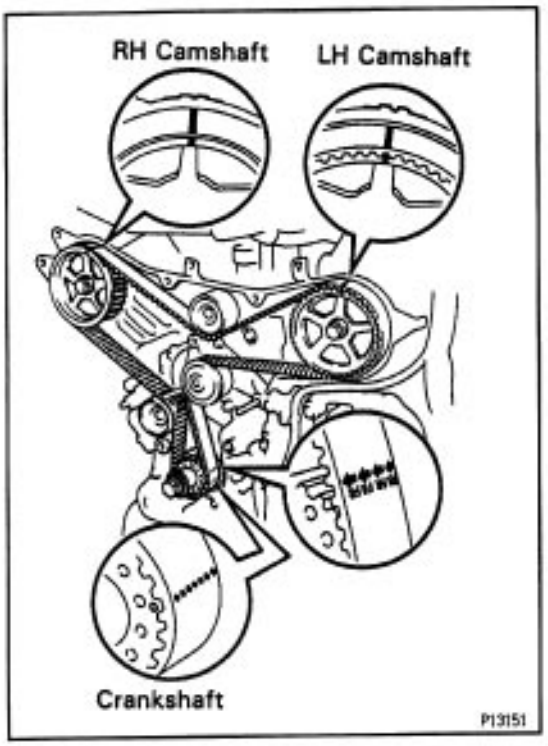
6. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Crankshaft Timing Pulley Position:
Temporarily install the crankshaft pulley bolt to the crankshaft.
Turn the crankshaft and align the crankshaft timing pulley groove with the oil pump alignment mark.



(b) RH Camshaft Timing Pulley Position:
Using SST, turn the camshaft pulley, align the timing marks of the camshaft and the No.3 timing belt cover.
SST 09960–10010 (09962–01000)

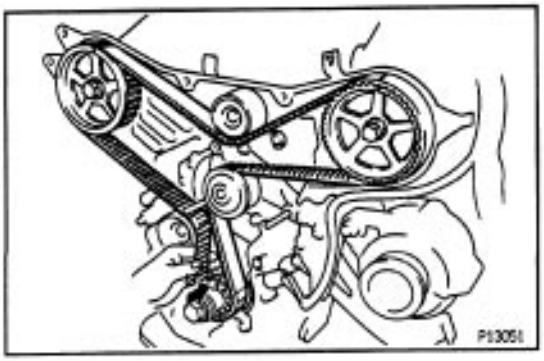
(c) LH Camshaft Timing Pulley Position:
Using SST, turn the camshaft pulley, align the timing marks of the camshaft and the No.3 timing belt cover.
SST 09960 –10010 (09962 – 01000)



7. INSTALL TIMING BELT

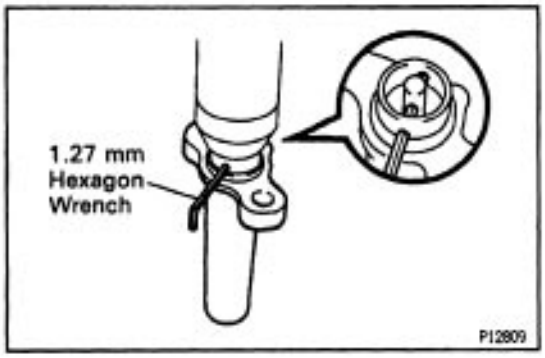
NOTICE: The engine should be cold.

(a) Remove any oil or water on the pulleys, and keep them clean.
(b) Check the timing belt front mark.
(c) Align the installation mark on the timing belt with the dot mark of the crankshaft timing pulley.
(d) Align the installation marks on the timing belt with the timing marks of the camshaft timing pulleys.



(e) Install the timing belt with the following order:

- Crankshaft timing pulley
- Water pump pulley
- LH camshaft timing pulley
- No.2 idler pulley
- RH camshaft timing pulley
- No.1 idler pulley

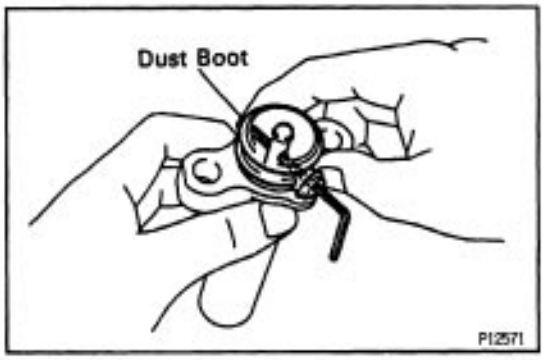


8. SET TIMING BELT TENSIONER

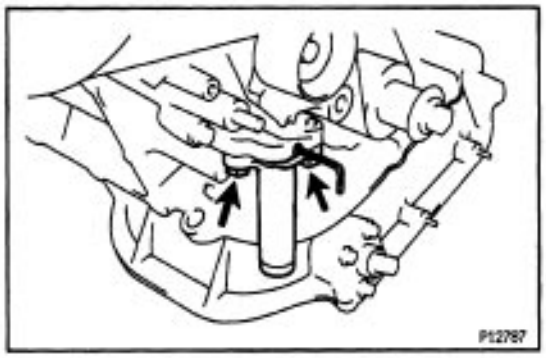
(a) Using a press, slowly press in the push rod using 981 –9,807 N (1100–1,000 kgf, 200–2,205 lbf) of pres– sure.

(b) Align the holes of the push rod and housing, pass a 1.27 mm hexagon wrench through the holes to keep the setting position of the push rod.

(c) Release the press.



(d) Install the dust boot to the tensioner.

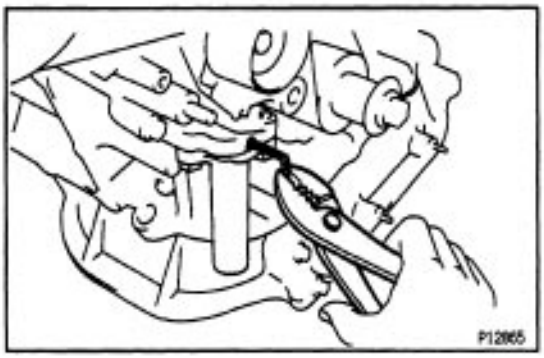


9. INSTALL TIMING BELT TENSIONER

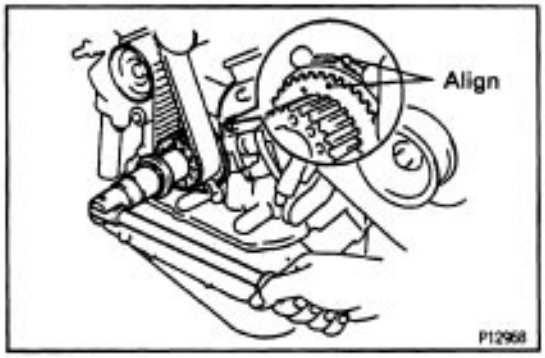
(a) Temporarily install the tensioner with the 2 bolts.

(b) Alternately tighten the 2 bolts.

Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)



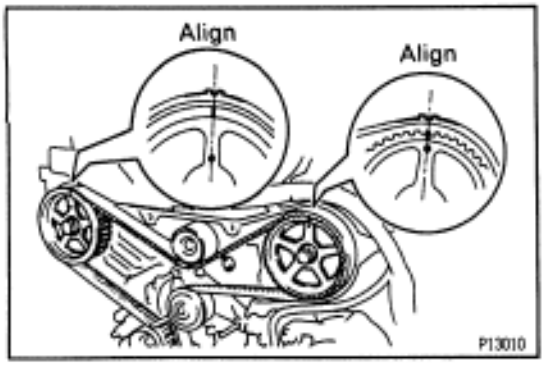
(c) Remove the 1.27 mm hexagon wrench from the tensi– oner.



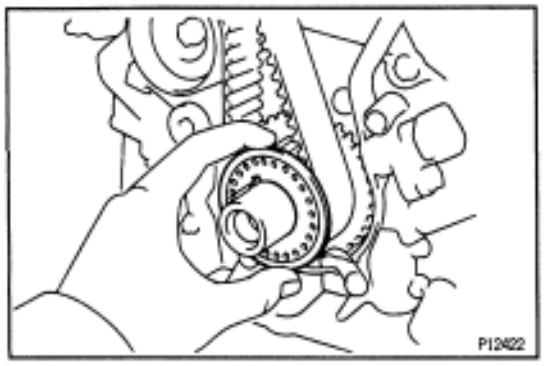
10. CHECK VALVE TIMING

(a) Turn the crankshaft, and align the crankshaft timing pulley groove with the oil pump alignment mark.

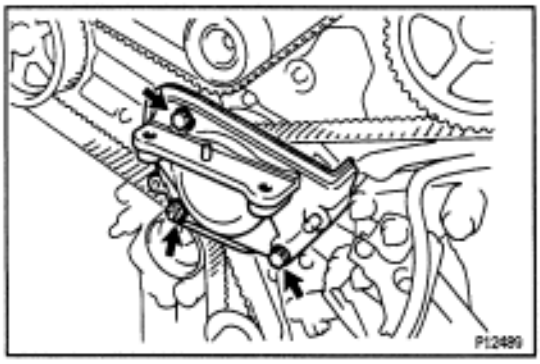
NOTICE: Always turn the crankshaft clockwise.



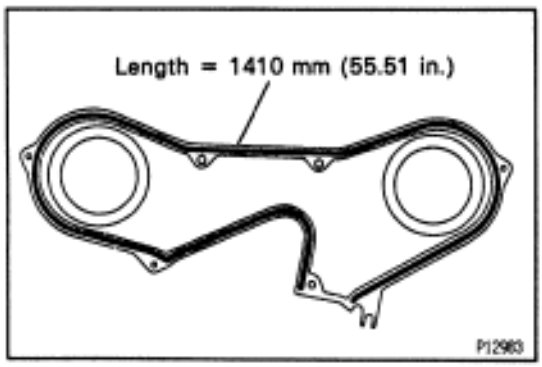
(b) Check that the timing marks of the RH and LH timing pulleys with the timing marks of the No.3 timing belt cover as shown in the illustration.
If the marks do not align, remove the timing belt and reinstall it.
(c) Remove the crankshaft pulley bolt.



11. INSTALL TIMING BELT GUIDE
Install the belt guide, facing the cup side outward.



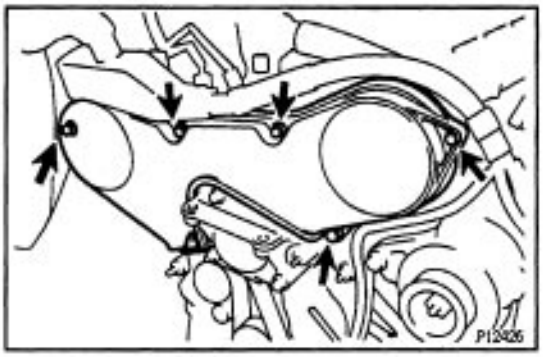
12. INSTALL ENGINE RH MOUNTING BRACKET
Install the mounting bracket with the 2 bolts and nut.
Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)



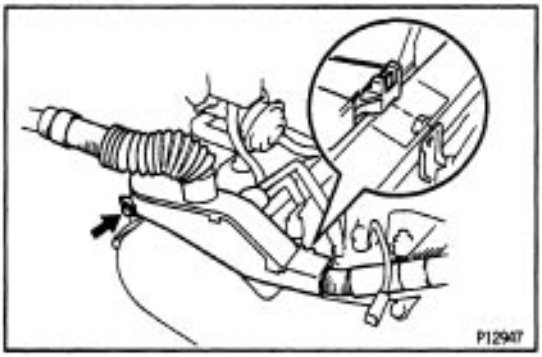
13. INSTALL N0.2 TIMING BELT COVER
(a) Check that the timing belt cover gasket has no cracks or peeling, etc.
If the gasket does have cracks or peeling, etc., replace it using following steps.

(1) Using a screwdriver and gasket scraper, remove all the old gasket material.
(2) Thoroughly clean all components to remove all the loose material.
(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.
(4) After installing the gasket, press down on it sc that the adhesive firmly sticks to the belt cover.

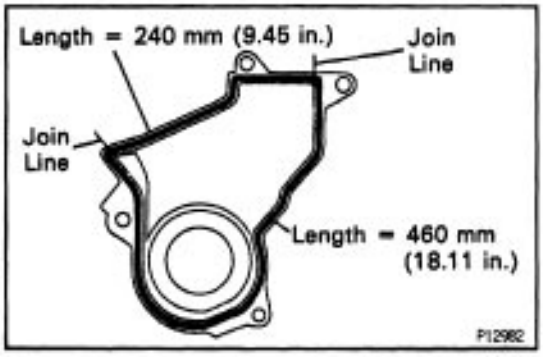
(b) Install new gasket to the No.2 belt cover.



(c) Install the belt cover with the 5 bolts.
Torque: 8.5 N–m (85 kgf–cm. 74 in.–lbf)



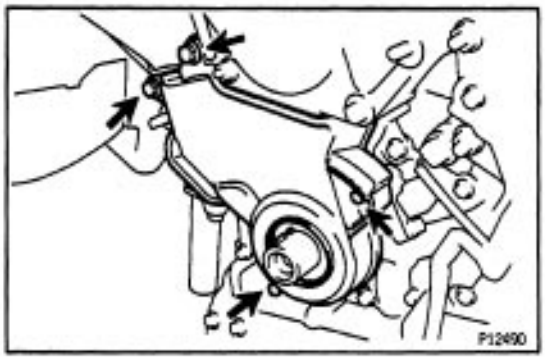
14. CONNECT ENGINE WIRE
(a) Connect the engine wire with the clamp.
(b) Install the bolt holding the engine wire to the No.3 timing belt cover.



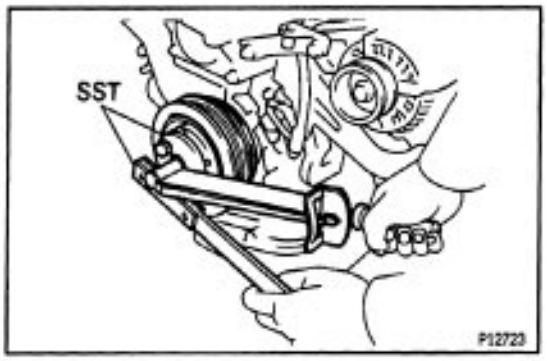
15. INSTALL NO.1 TIMING BELT COVER
(a) Check that the timing belt cover gaskets have cracks or peeling, etc.
If the gasket does have cracks or peeling, etc., replace it using following steps, peeling, etc., replace them using following steps.

(1) Using a screwdriver and gasket scraper, remove all the old gasket material.
(2) Thoroughly clean all components to remove all the loose material.
(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded back in the illustration.

NOTICE: When joining 2 gaskets, do not leave a gap between them. Cut off any excess gasket.
(4) After installing the gasket, press down on it so that the adhesive firmly sticks to the belt cover.
(b) Install new gaskets to the No.1 belt cover.



(c) Install the belt cover with the 4 bolts.
Torque: 8.5 N–m (85 kgf–cm, 74 in.–lbf)



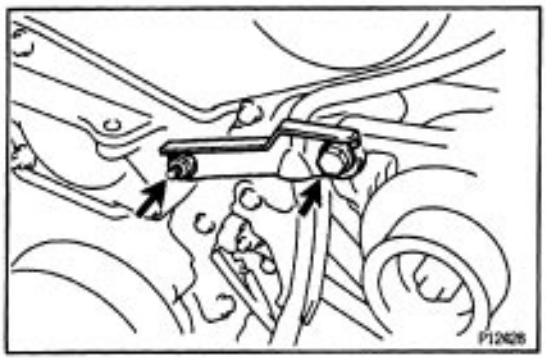
16. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide the pulley.

(b) Using SST, install and torque the bolt.

SST 09213–54015, 09330–00021

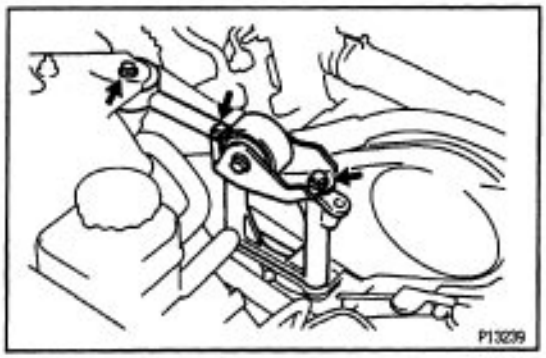
Torque: 216 N–m (2,200 kgf–cm, 159 ft–lbf)



17. INSTALL NO.2 GENERATOR BRACKET

Install the bracket with the pivot bolt and nut. Do not tighten the bolt yet.

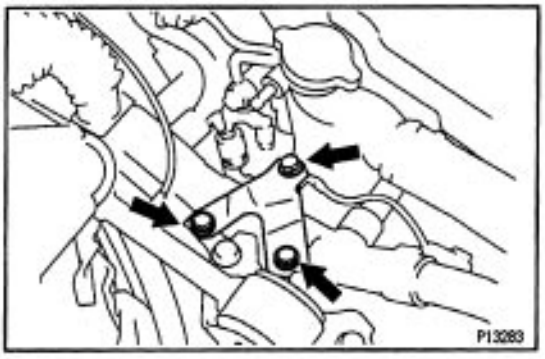
Torque: 28 N–m (290 kgf–cm, 21 ft–lbf) for Nut



18. INSTALL NO.2 RH ENGINE MOUNTING BRACKET AND ENGINE MOVING CONTROL ROD

Install the mounting bracket and control rod with the 3 bolts.

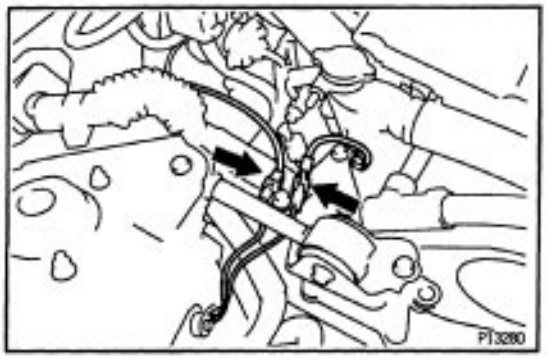
Torque: 63.7 N–m (650 kgf–cm, 47 ft–lbf)



19. INSTALL RH ENGINE MOUNTING STAY

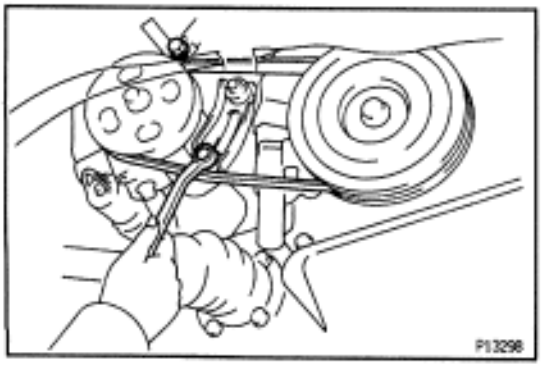
Install the mounting stay with the 3 bolts.

Torque: 31.4 N–m (320 kgf–cm. 23 ft–lbf)



24. CONNECT GROUND STRAPS

Connect the 2 straps.



21. INSTALL AND ADJUST PS DRIVE BELT

Install the drive belt with the pivot and adjusting bolts.

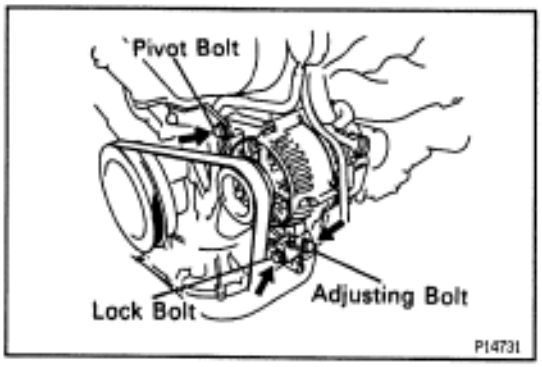
Drive belt tension:

New belt

150 ± 185 l bf

Used belt

115 ± 20 lbf



22. INSTALL GENERATOR DRIVE BELT

Adjust the drive belt. (See CH section)

Drive belt tension:

New belt

175 ± 5 lbf

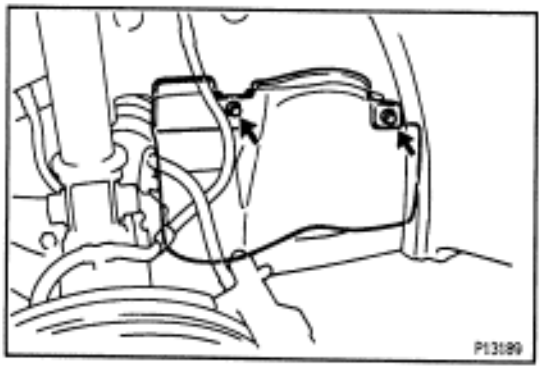
Used belt

115 ± 20 lbf

23. INSTALL COOLANT RESERVOIR TANK

24. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

25. START ENGINE, AND CHECK FOR ABNORMAL NOISE AND SMOOTH OPERATION

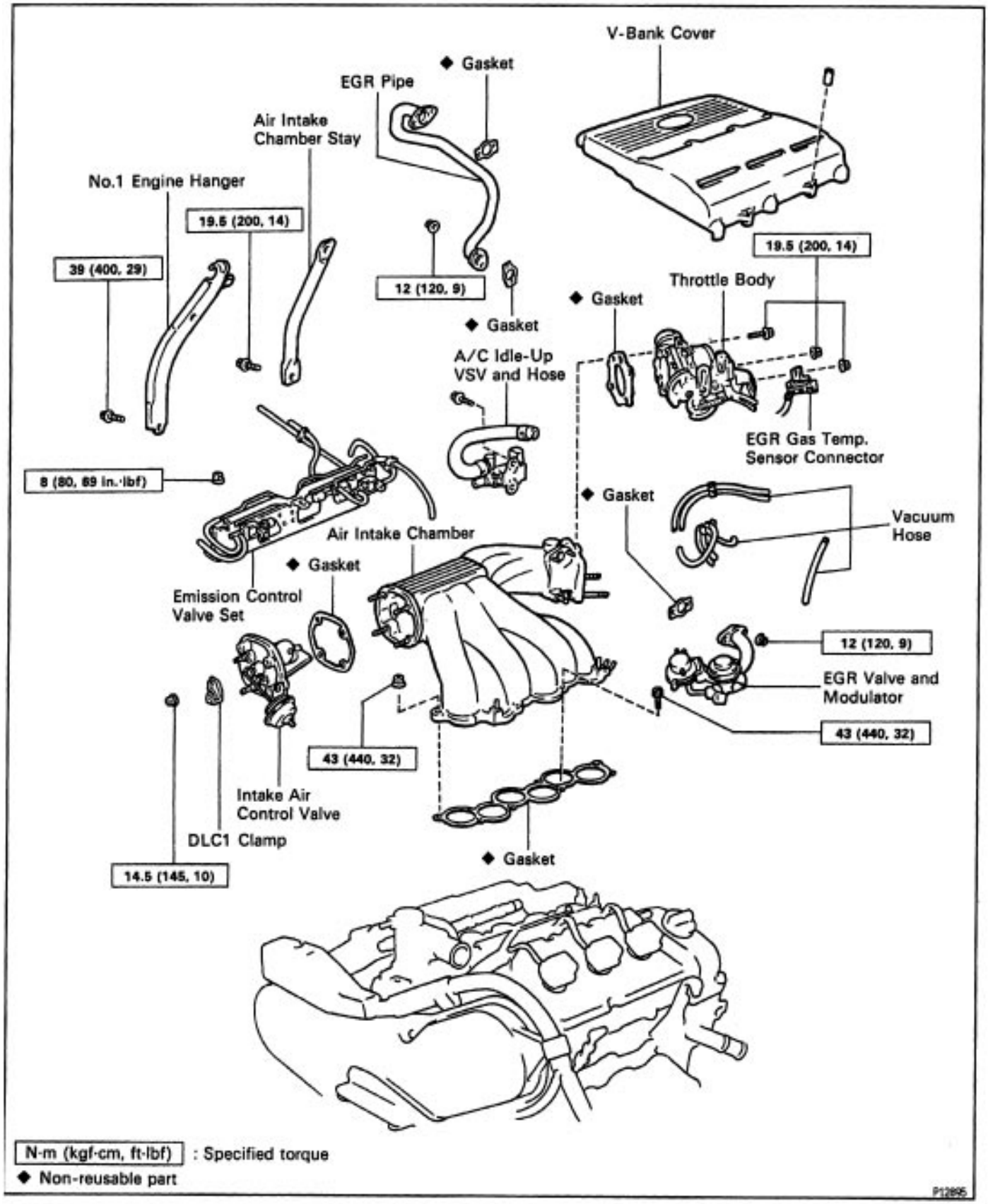


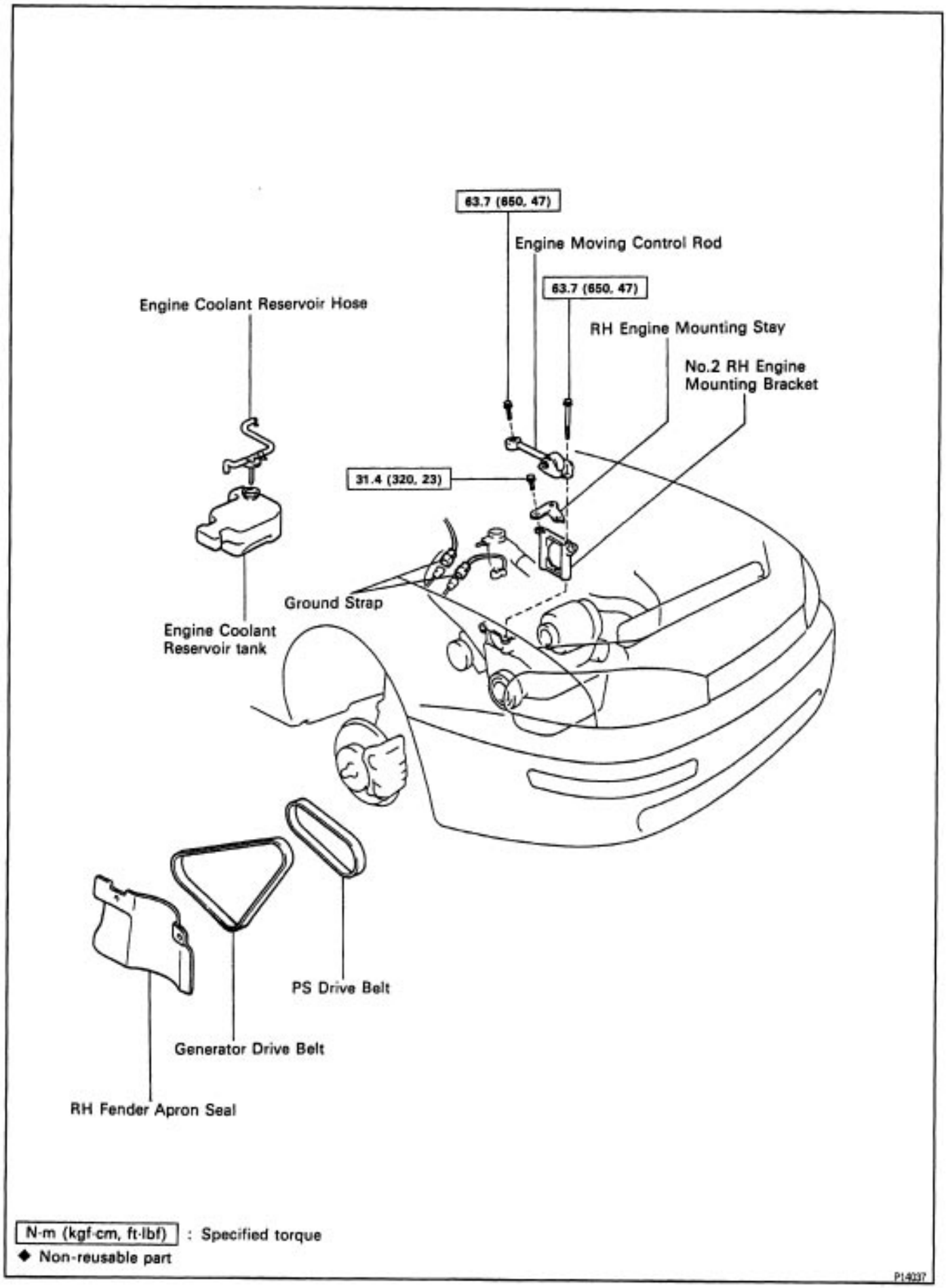
26. INSTALL RH FENDER APRON SEAL

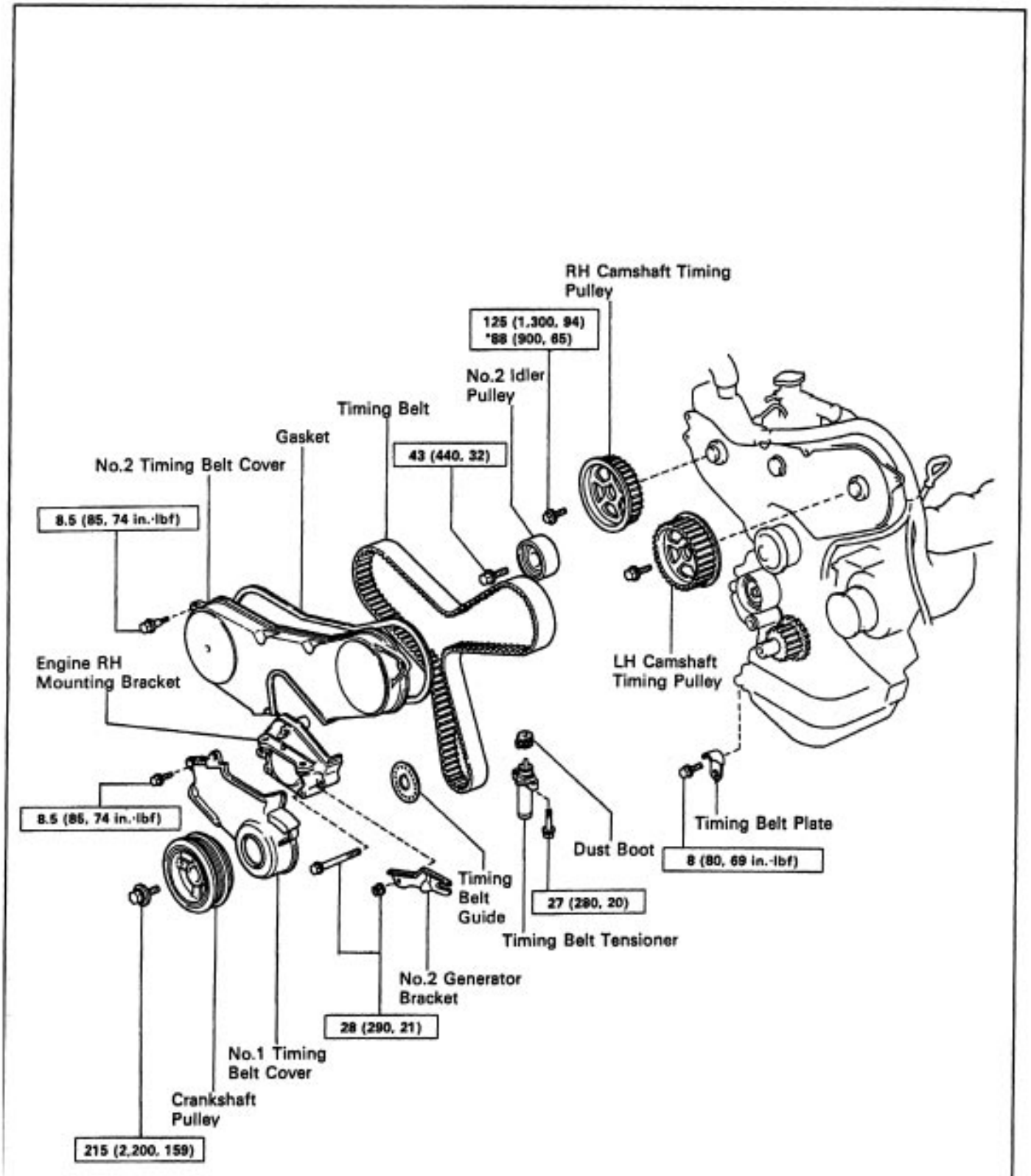
27. INSTALL RH FRONT WHEEL

CYLINDER HEAD

COMPONENTS FOR REMOVAL AND INSTALLATION

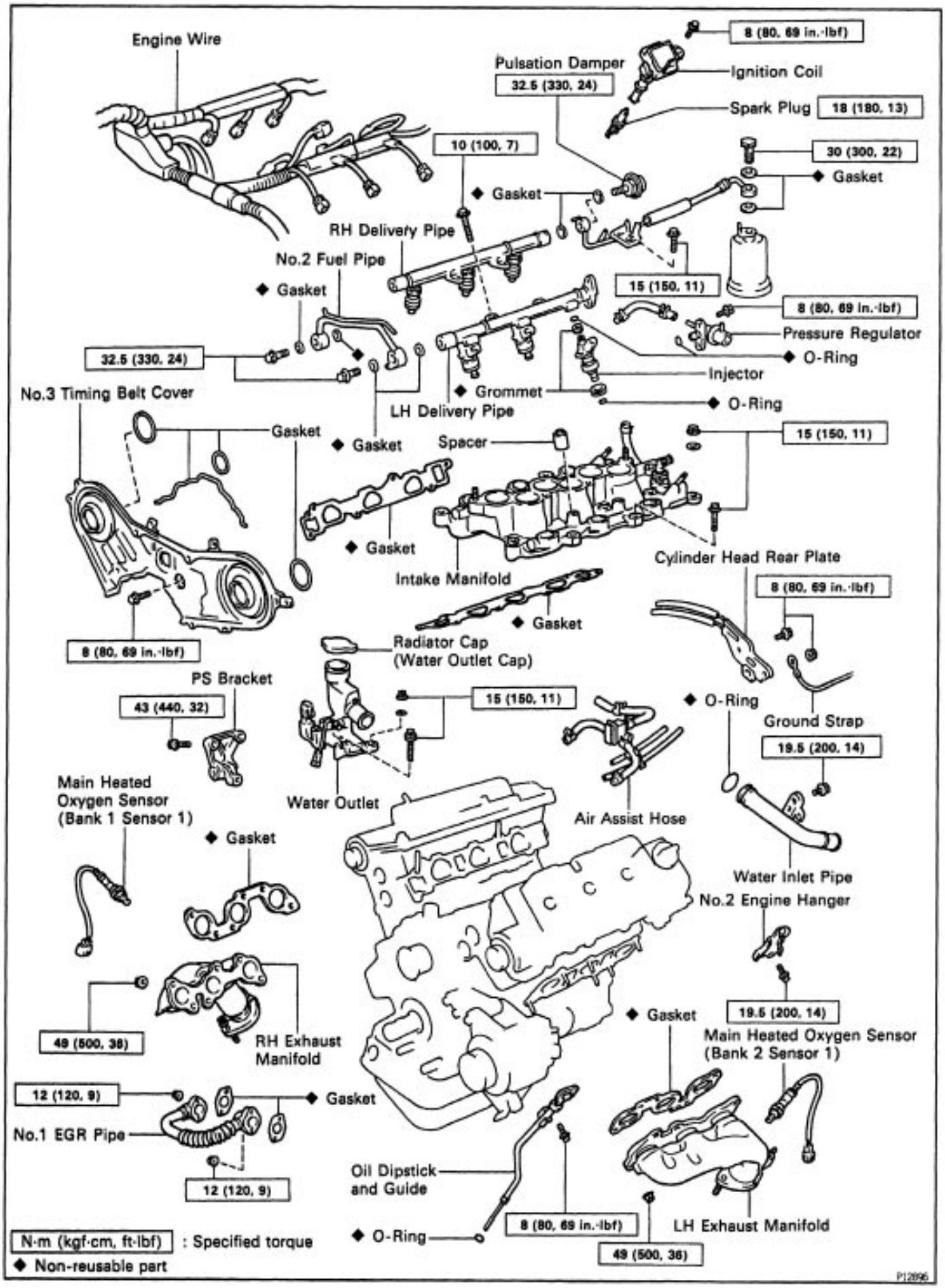


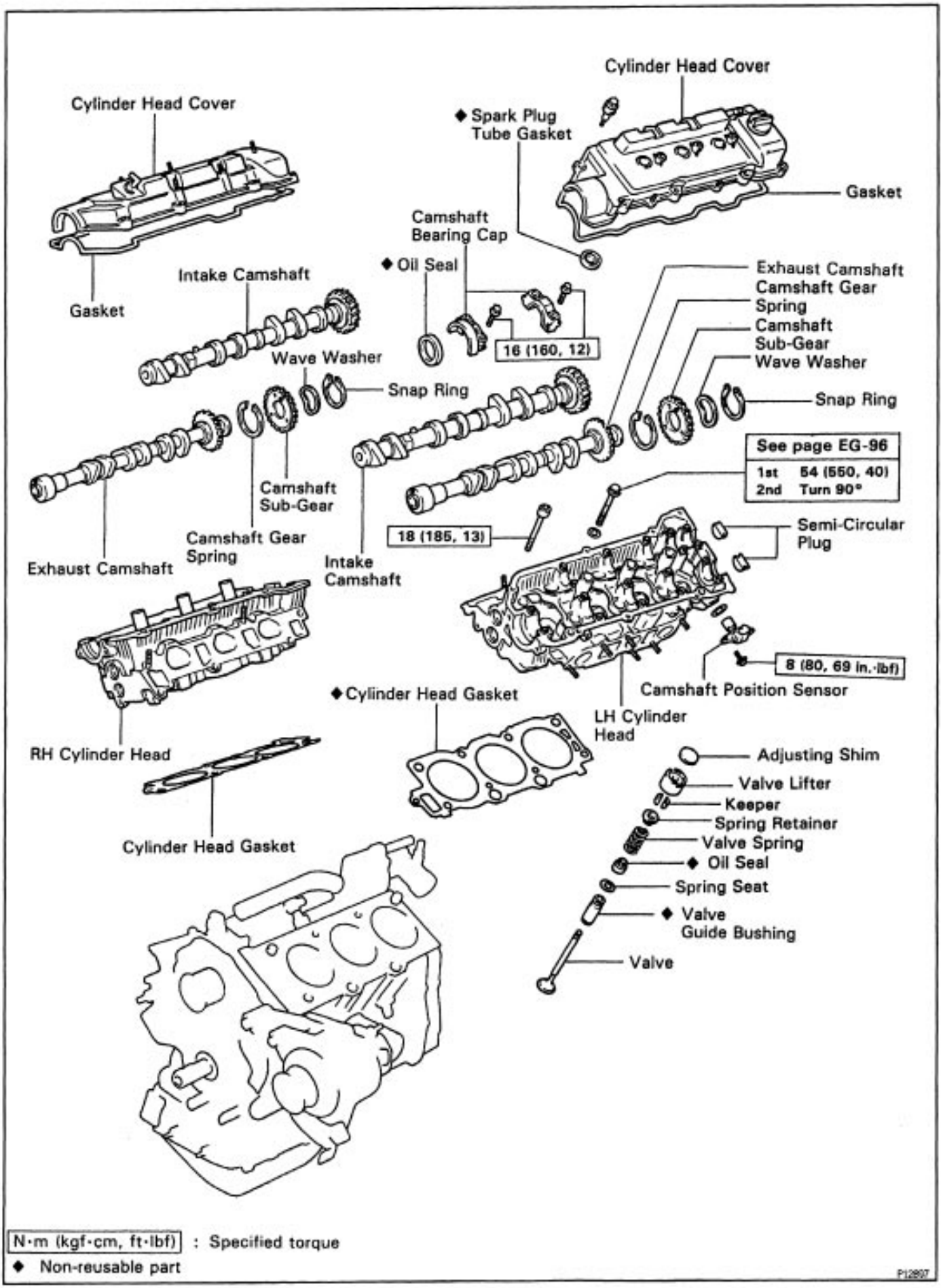

63.7 (650, 47)
Engine Moving Control Rod
63.7 (650, 47)
Engine Coolant Reservoir Hose
RH Engine Mounting Stay
No.2 RH Engine Mounting Bracket
31.4 (320, 23)
Ground Strap
Engine Coolant Reservoir tank
PS Drive Belt
Generator Drive Belt
RH Fender Apron Seal
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P14037

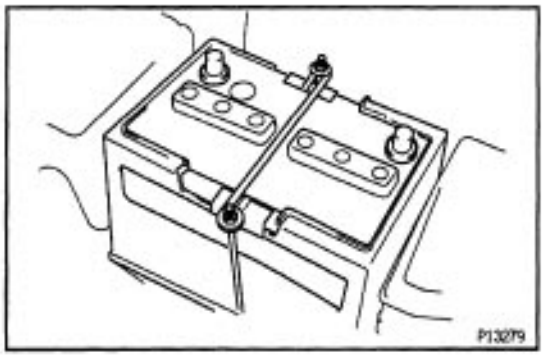


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* For use with SST

P13400


Engine Wire
8 (80, 69 in.·lbf)
Pulsation Damper
32.5 (330, 24)
Ignition Coil
Spark Plug
18 (180, 13)
10 (100, 7)
30 (300, 22)
◆ Gasket
◆ Gasket
RH Delivery Pipe
No.2 Fuel Pipe
◆ Gasket
15 (150, 11)
8 (80, 69 in.·lbf)
Pressure Regulator
32.5 (330, 24)
◆ O-Ring
Injector
No.3 Timing Belt Cover
◆ Grommet
◆ O-Ring
LH Delivery Pipe
Gasket
◆ Gasket
Spacer
15 (150, 11)
◆ Gasket
Cylinder Head Rear Plate
Intake Manifold
8 (80, 69 in.·lbf)
◆ Gasket
8 (80, 69 in.·lbf)
Radiator Cap
(Water Outlet Cap)
PS Bracket
43 (440, 32)
15 (150, 11)
◆ O-Ring
Ground Strap
19.5 (200, 14)
Main Heated
Oxygen Sensor
(Bank 1 Sensor 1)
Water Outlet
Air Assist Hose
◆ Gasket
Water Inlet Pipe
No.2 Engine Hanger
49 (500, 36)
RH Exhaust
Manifold
19.5 (200, 14)
◆ Gasket
Main Heated Oxygen Sensor
(Bank 2 Sensor 1)
12 (120, 9)
◆ Gasket
No.1 EGR Pipe
12 (120, 9)
Oil Dipstick
and Guide
8 (80, 69 in.·lbf)
LH Exhaust Manifold
◆ O-Ring
49 (500, 36)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P12896


Cylinder Head Cover
Cylinder Head Cover
◆ Spark Plug Tube Gasket
Gasket
Camshaft Bearing Cap
◆ Oil Seal
Gasket
Intake Camshaft
16 (160, 12)
Exhaust Camshaft
Camshaft Gear
Spring
Camshaft Sub-Gear
Wave Washer
Wave Washer
Snap Ring
Snap Ring
See page EG-96
1st 54 (550, 40)
2nd Turn 90°
Camshaft Sub-Gear
Camshaft Gear Spring
Exhaust Camshaft
Intake Camshaft
18 (185, 13)
Semi-Circular Plug
8 (80, 69 in.·lbf)
Camshaft Position Sensor
◆ Cylinder Head Gasket
LH Cylinder Head
RH Cylinder Head
Adjusting Shim
Valve Lifter
Keeper
Spring Retainer
Valve Spring
◆ Oil Seal
Spring Seat
◆ Valve Guide Bushing
Valve
Cylinder Head Gasket
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P12897



CYLINDER HEADS REMOVAL

(See Components for Removal and Installation)

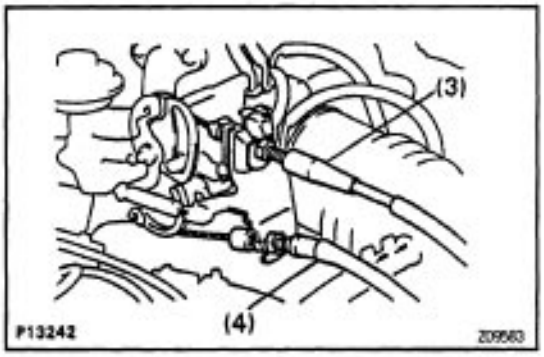
1. REMOVE BATTERY AND TRAY

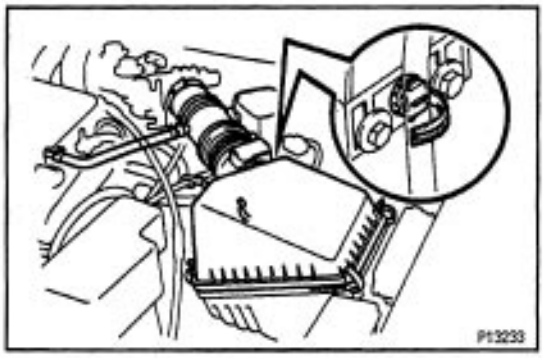
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. DISCONNECT ACCELERATOR CABLE

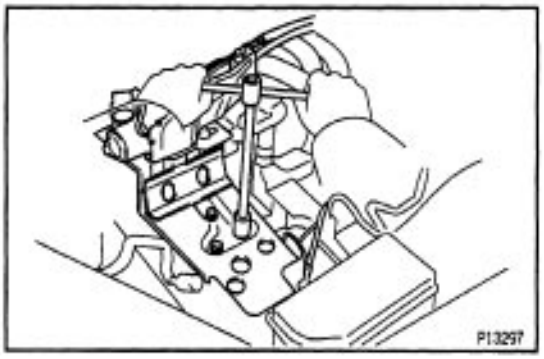
4. DISCONNECT THROTTLE CABLE





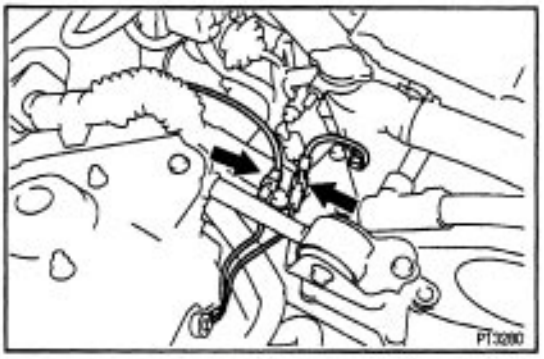
5. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector and wire clamp.
(b) Disconnect the accelerator cable clamp.
(c) Disconnect the PCV hose.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the 4 air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.



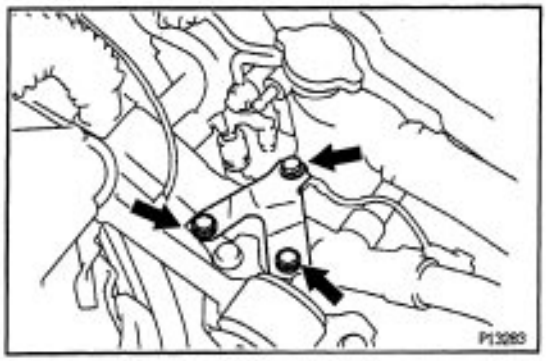
6. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the bolt, clip and actuator cover.
(b) Disconnect the actuator connector and clamp.
(c) Remove the 3 bolts, and disconnect the actuator with the bracket.

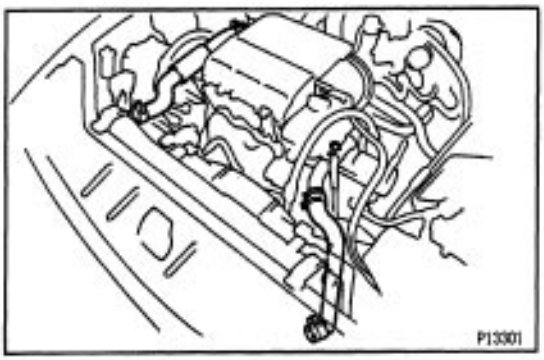


7. DISCONNECT GROUND STRAPS

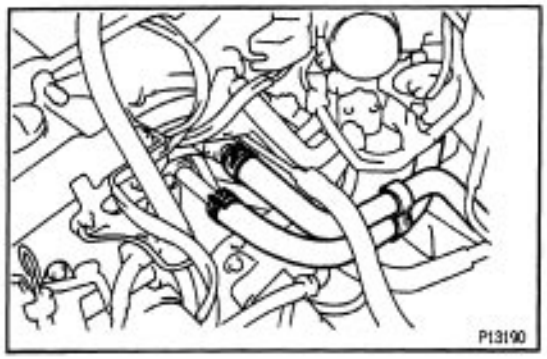
Disconnect the 2 straps.



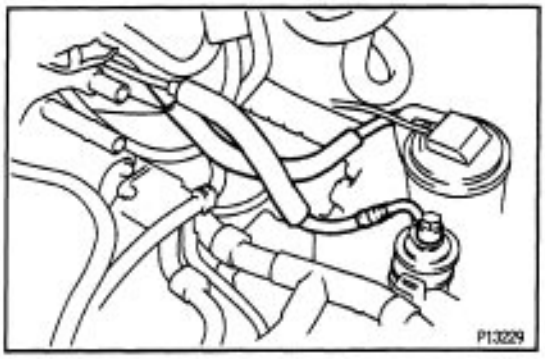
8. REMOVE RH ENGINE MOUNTING STAY
Remove the 3 bolts and RH engine mounting stay.



9. DISCONNECT RADIATOR HOSES

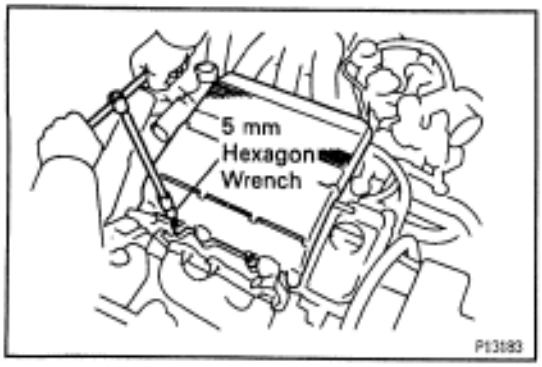


10. DISCONNECT HEATER HOSES
Disconnect the 2 hoses.



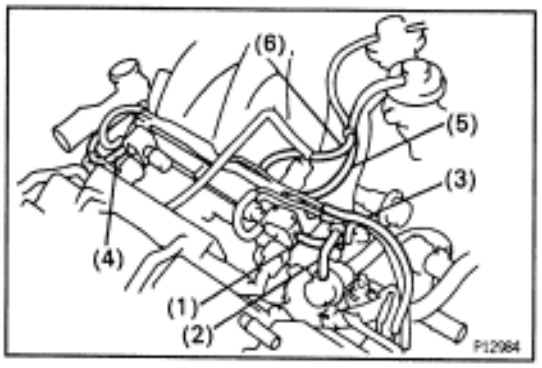
11. DISCONNECT FUEL HOSES
Disconnect the fuel inlet and return hoses.
CAUTION: Catch leaking fuel in a container.

12. DISCONNECT PRESSURE HOSE OF HYDRAULIC MOTOR
Remove the bolt, and disconnect the pressure hose from the water inlet.



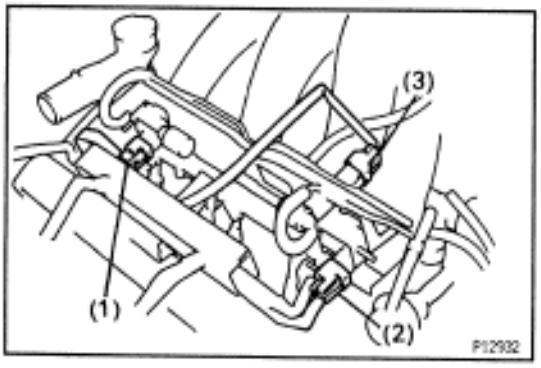
13. REMOVE V – BANK COVER

Using a 5 mm hexagon wrench, remove the 2 nuts and V–bank cover.

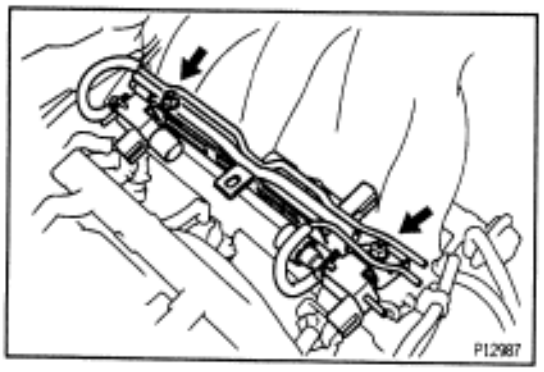


14. REMOVE EMISSION CONTROL VALVE SET

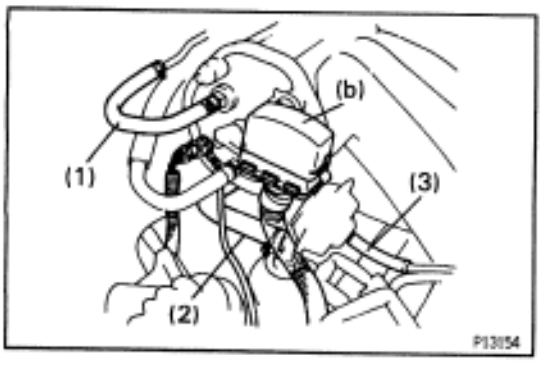
(a) Disconnect the following vacuum hoses:
- (1) Vacuum hose from fuel pressure control VSV
- (2) Vacuum hose from fuel pressure regulator
- (3) Vacuum hose from cylinder head rear plate
- (4) Vacuum hose from intake air control valve VSV
- (5) Vacuum hose from EGR vacuum modulator
- (6) Vacuum hose from EGR valve



(b) Disconnect the following connectors:
- (1) Intake air control valve connector
- (2) Fuel pressure connector
- (3) EGR VSV connector



(c) Remove the 2 nuts and emission control valve set.

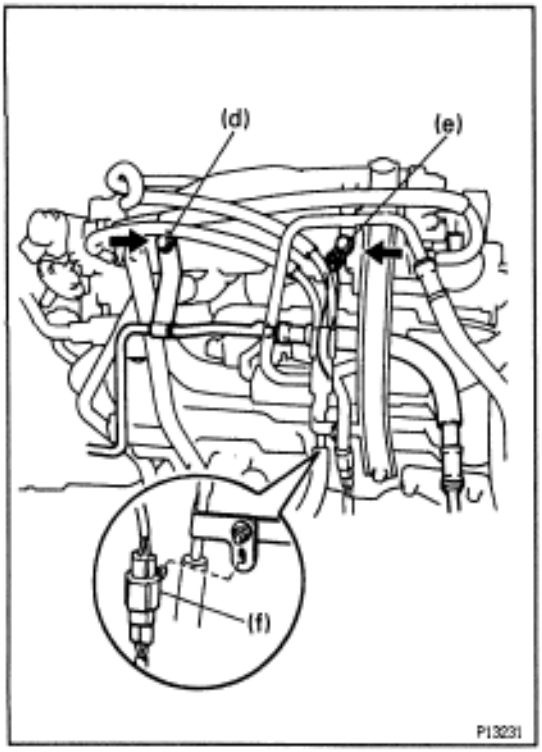


15. REMOVE AIR INTAKE CHAMBER

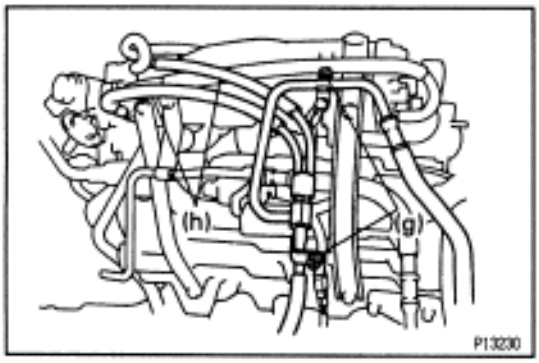
(a) Disconnect the following hoses:
- (1) Brake booster vacuum hose
- (2) PCV hose
- (3) Intake air control valve vacuum hose

(b) Disconnect the data link connector 1.

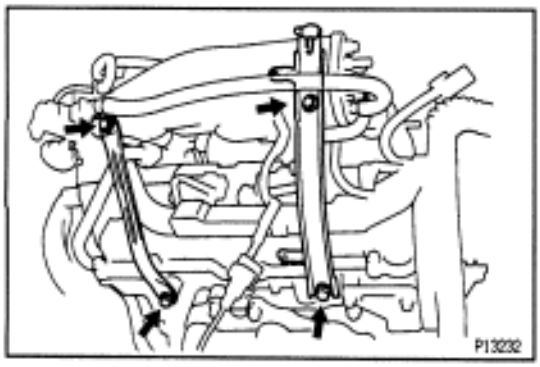
(c) Remove the nut and disconnect the 2 ground straps.



(d) Remove the bolt and disconnect the hydraulic motor pressure hose from the air intake chamber.
(e) Remove the bolt, and disconnect the ground strap.
(f) Disconnect the RH oxygen sensor connector clamp from the PS pressure tube.

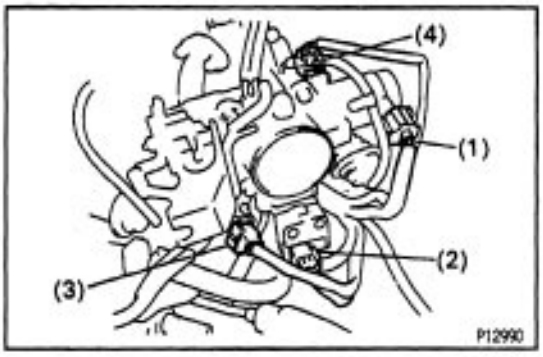


(g) Remove the 2 nuts, and disconnect the PS pressure tube.
(h) Disconnect the 2 PS air hoses.

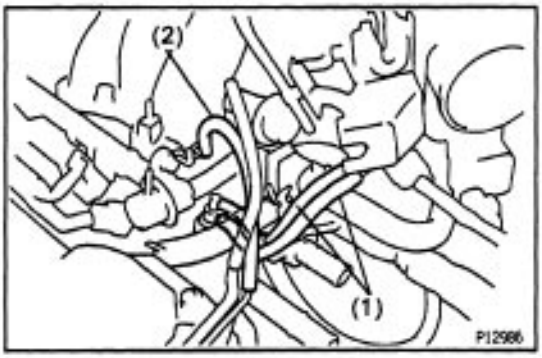


(i) Remove the 2 bolts and No.1 engine hanger.
(j) Remove the 2 bolts and air intake chamber stay.

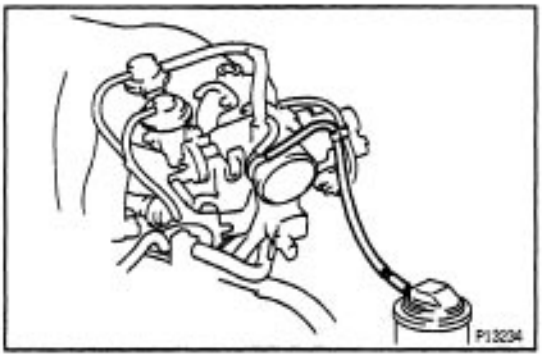
(k) Remove the 4 nuts, EGR pipe and 2 gaskets.



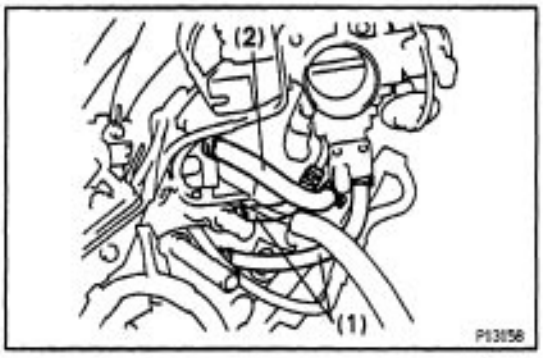
(l) Disconnect the following connectors:
(1) Throttle position sensor connector
(2) IAC valve connector
(3) EGR gas temperature sensor connector
(4) A/C idle–up connector



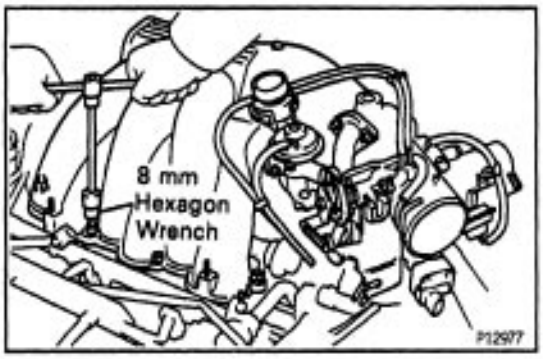
(m) Disconnect the following vacuum hoses:
(1) 2 vacuum hoses from TVV
(2) Vacuum hose from cylinder head rear plate



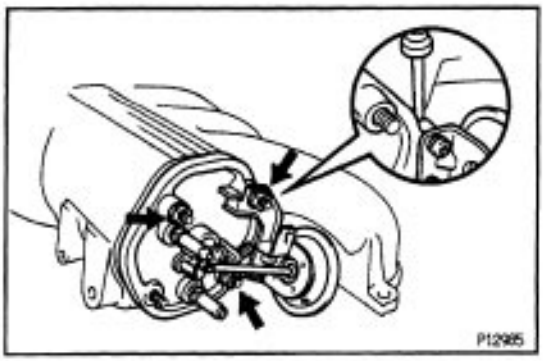
(3) Vacuum hose from charcoal canister



(n) Disconnect the following hoses:
(1) 2 water bypass hoses
(2) Air assist hose

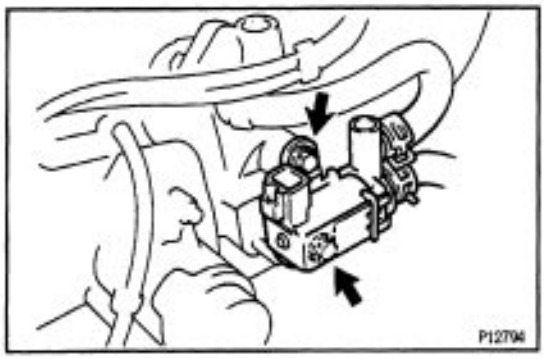


(o) Using an 8 mm hexagon wrench, remove the 2 bolts, 2 nuts, air intake chamber and gasket.



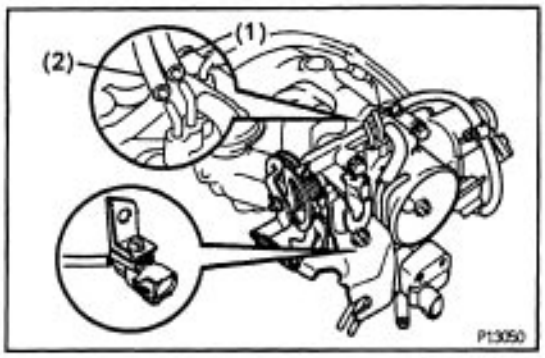
16. REMOVE INTAKE AIR CONTROL VALVE FROM AIR INTAKE CHAMBER

(a) Disconnect the A/C air hose.
(b) Remove the 3 nuts and data link connector 1 clamp.
(c) Remove the intake air control valve by prying a screw–driver between the intake air control valve and air intake chamber.
(d) Remove the gasket.



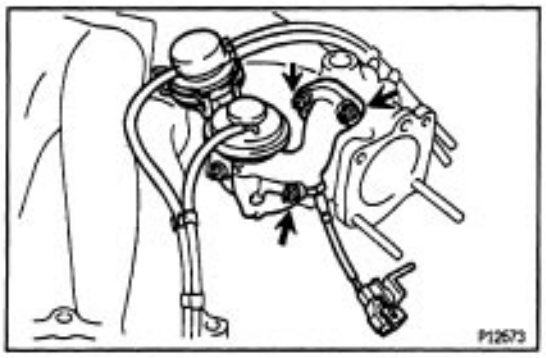
17. REMOVE A/C IDLE–UP VSV FROM AIR INTAKE CHAMBER

(a) Disconnect the air hose.
(b) Remove the 2 bolts and A/C idle–up VSV.



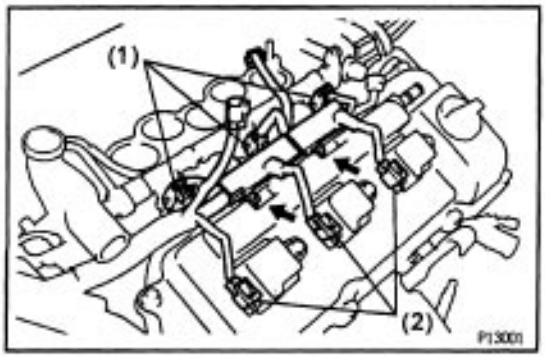
18. REMOVE THROTTLE BODY FROM AIR INTAKE CHAMBER

(a) Disconnect the following vacuum hoes:
(1) Vacuum hose from P port of EGR vacuum modu–lator
(2) Vacuum hose from R port of EGR vacuum modu–lator
(b) Remove the 2 bolts, 2 nuts, throttle body and gasket.



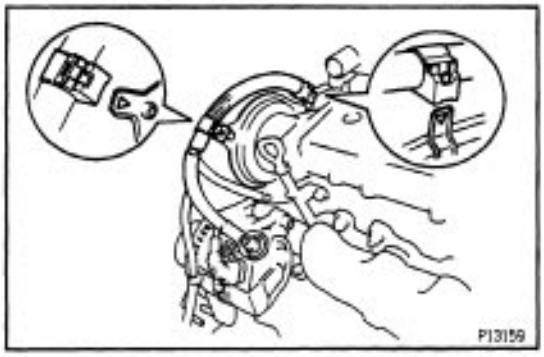
19. REMOVE EGR VALVE AND VACUUM MODULATOR FROM AIR INTAKE CHAMBER

Remove the 3 nuts, EGR valve, vacuum modulator and gasket.



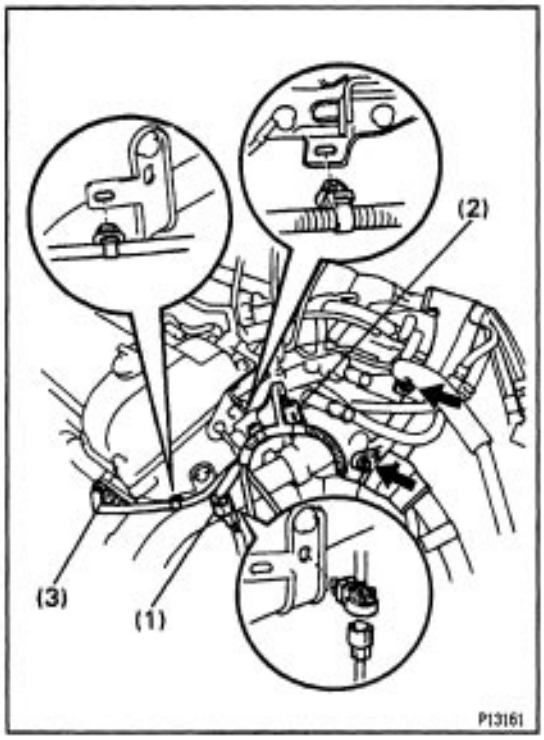
20. DISCONNECT ENGINE WIRE FROM ENGINE LH SIDE

(a) Disconnect the following connectors:
(1) 3 injector connectors
(2) 3 ignition coil connectors
(b) Remove the 2 nuts, and disconnect the engine wire.



21. DISCONNECT ENGINE WIRE FROM NO.3 TIMING BELT COVER

Disconnect the 2 clamps and engine wire.

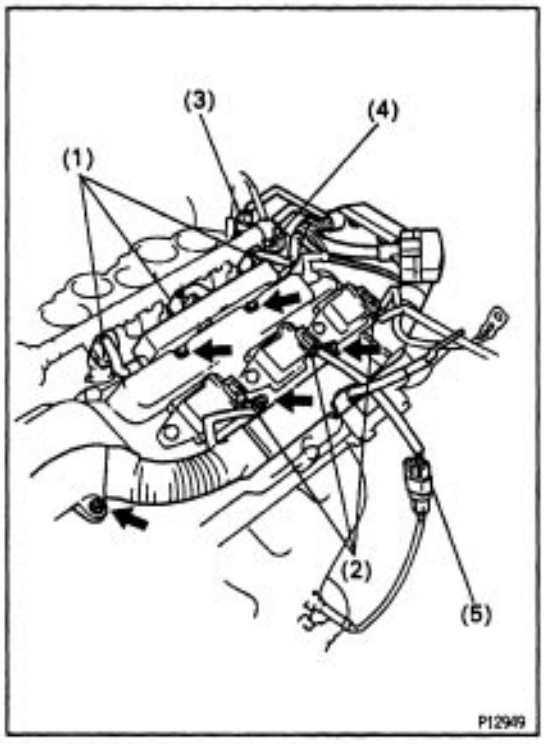


22. DISCONNECT ENGINE WIRE FROM ENGINE REAR SIDE

(a) Disconnect the following connectors:
- (1) LH oxygen sensor
- (2) Engine coolant temperature sensor
- (3) Camshaft position sensor

(b) Disconnect the 3 clamps.

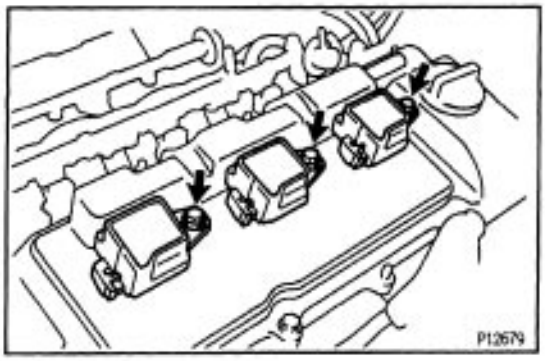
(c) Remove the 2 nuts, and disconnect the engine wire.



23. DISCONNECT ENGINE WIRE FROM ENGINE RH SIDE

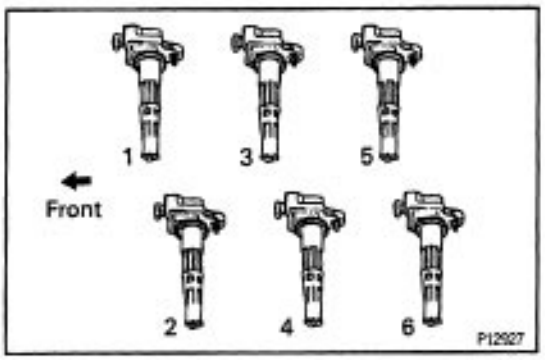
(a) Disconnect the following connectors:
- (1) 3 injector connectors
- (2) 3 ignition coil connectors
- (3) Water temperature sender gauge connector
- (4) Water temperature sensor connector
- (5) RH oxygens sensor connector

(b) Remove the 5 nuts, and disconnect the engine wire.

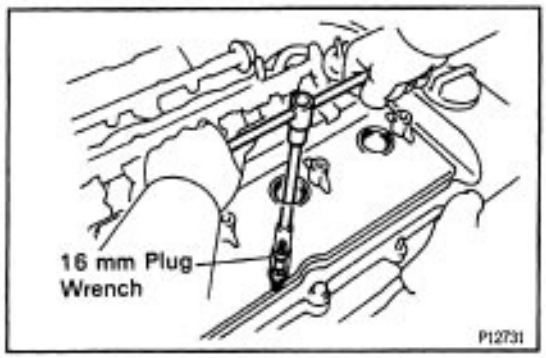


24. REMOVE IGNITION COILS

Remove the6 bolts and6 ignition coils from the RH and LH cylinder heads.

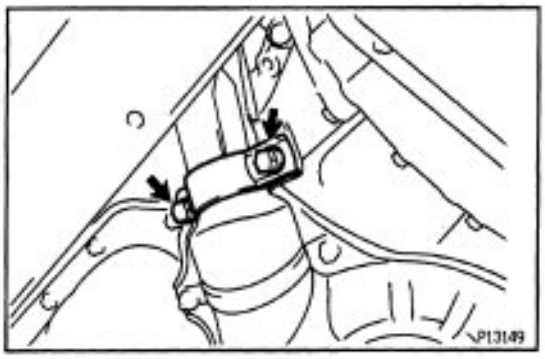


HINT: Arrange the ignition coils in the correct order.



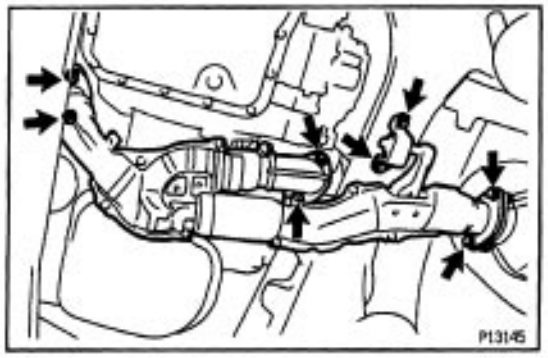
25. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the6 spark plugs from the RH and LH cylinder heads.



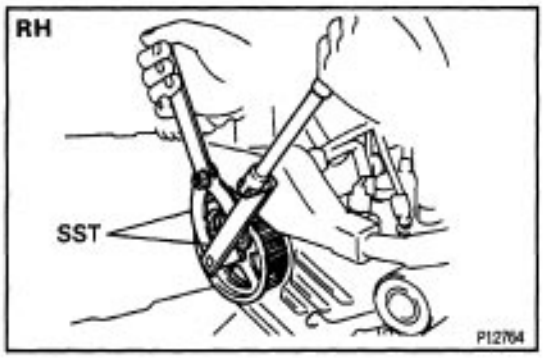
26. REMOVE FRONT EXHAUST PIPE

(a) Remove the 2 bolts and front exhaust pipe clamp.

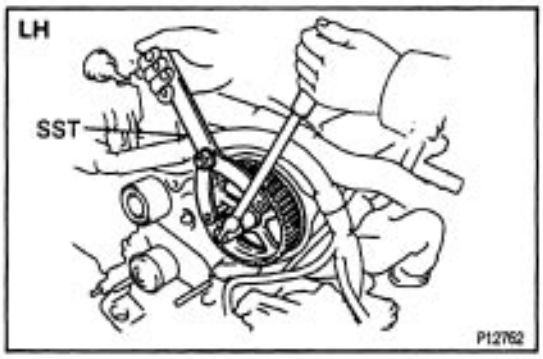


(b) Remove the 2 bolts, and disconnect the bracket.
(c) Remove the 2 bolts and 2 nuts holding the front exhaust pipe to the three–way catalytic converter.
(d) Remove the 4 nuts holding the front exhaust pipe to the exhaust manifolds.
(e) Remove the front exhaust pipe and gaskets.

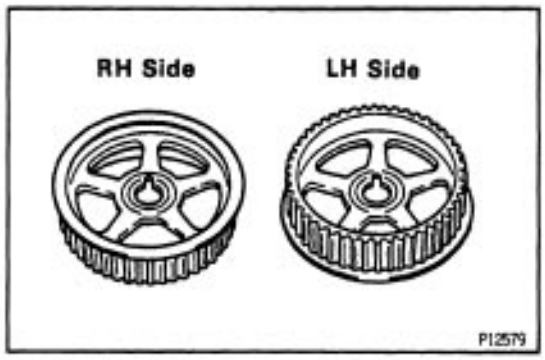
27. REMOVE TIMING BELT
(See steps 2 to 20 on pages EG2–41 to 45)



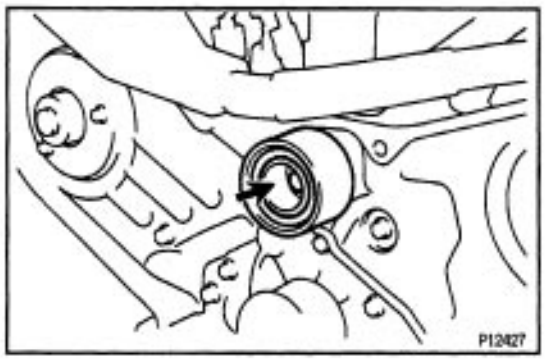
28. REMOVE CAMSHAFT TIMING PULLEYS
(a) Using SST, remove the bolt and RH timing pulley.
SST 09249–63010, 09960–10010 (09862–01000)



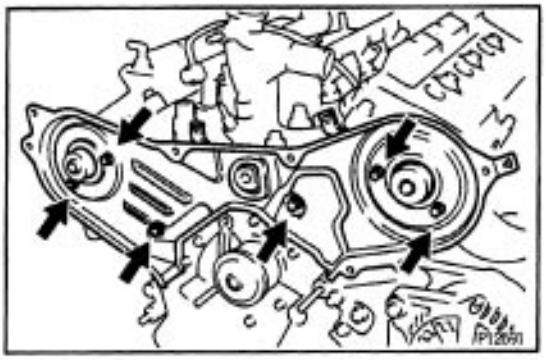
(b) Using SST, remove the LH timing pulley.
SST 09960–10010 (09962–01000)



HINT: Arrange the camshaft timing pulleys (RH and LH sides).

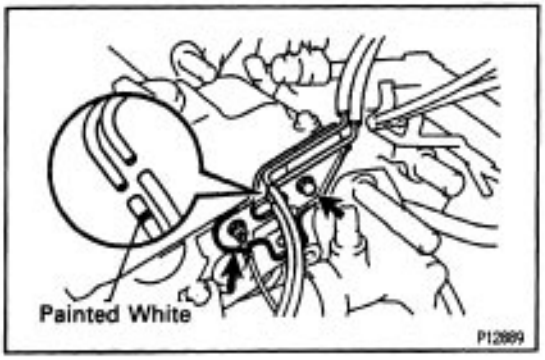


29. REMOVE NO.2 IDLER PULLEY
Remove the bolt and idler pulley.



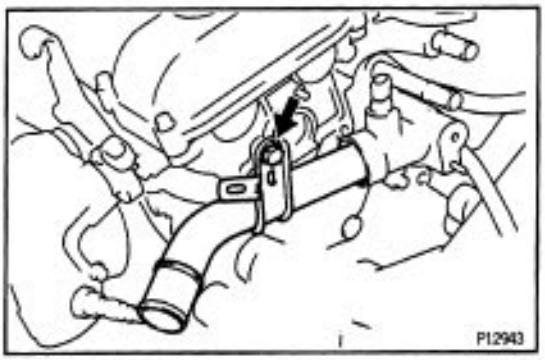
30. REMOVE NO.3 TIMING BELT COVER

Remove the 6 bolts and belt cover.



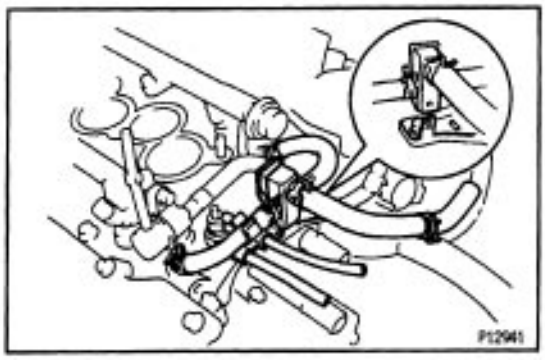
31. REMOVE CYLINDER HEAD REAR PLATE

(a) Disconnect the vacuum hose from the vacuum tank.
(b) Remove the nut, and disconnect the ground strap.
(c) Remove the bolt and rear plate.

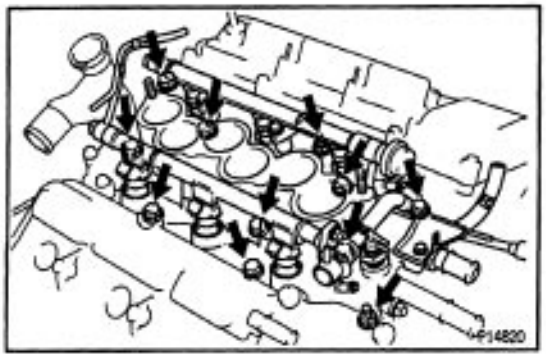


32. REMOVE WATER INLET PIPE

(a) Remove the bolt and inlet pipe.
(b) Remove the O–ring.

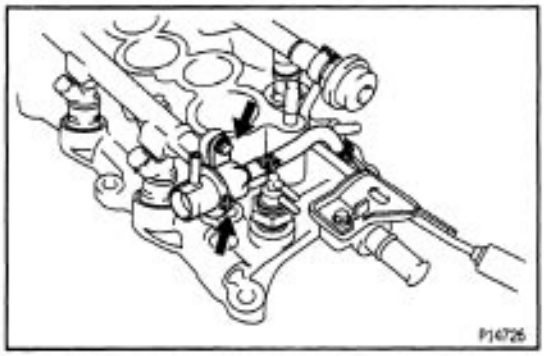


33. REMOVE AIR ASSIST HOSE AND VACUUM HOSE



34. REMOVE INTAKE MANIFOLD, DELIVERY PIPES AND INJECTORS

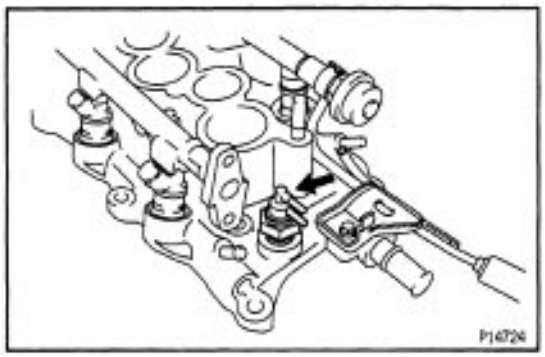
Remove the 9 bolts, 2 nuts, 2 plate washers and intake manifold together with the delivery pipes, and injectors.



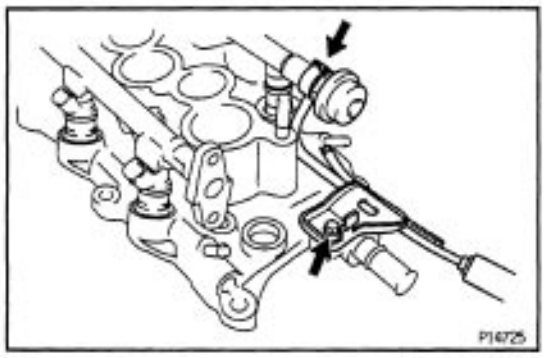
35. REMOVE FUEL PRESSURE REGULATOR FROM LH DELIVERY PIPE

(a) Remove the 2 bolts, and pull out the pressure regula–tor.

(b) Remove the 0–ring from the pressure regulator.

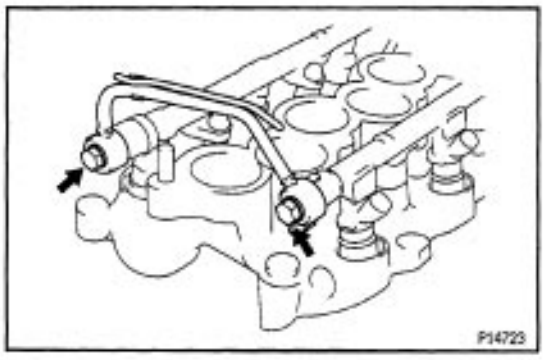


36. REMOVE TVV FROM INTAKE MANIFOLD



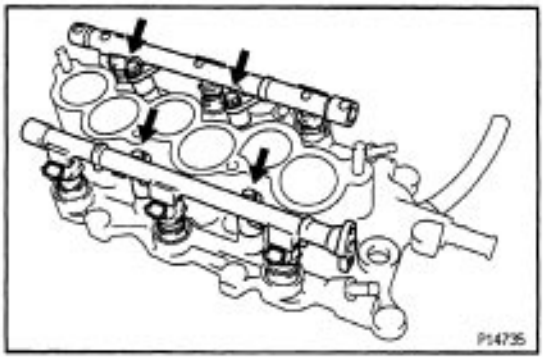
37. REMOVE FUEL PULSATION DAMPER AND No.1 FUEL PIPE

Remove the bolt, pulsation damper, No. 1 fuel pipe and 2 gaskets.



38. REMOVE No.2 FUEL PIPE

Remove the 2 union bolts, No.2 fuel pipe and 4 gas–kets.

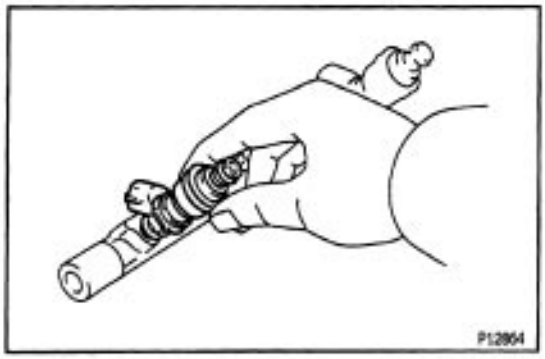


39. REMOVE DELIVERY PIPES AND INJECTORS

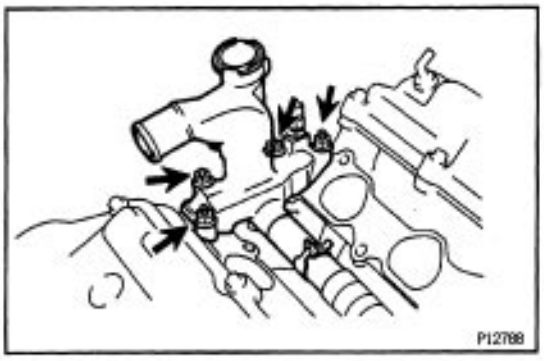
(a) Remove the 4 bolts, delivery pipes together with the 6 injectors.

NOTICE: Be careful not to drop the injectors when rem–oving the delivery pipes.

(b) Remove the 4 spacers from the intake manifold.

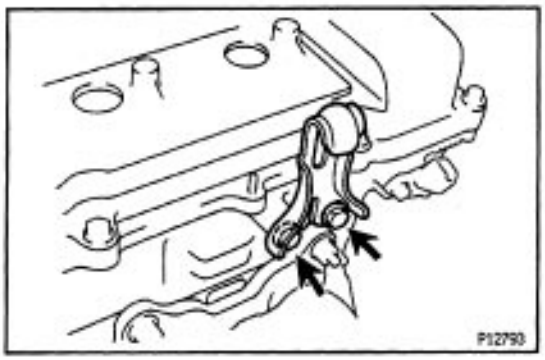


(c) Pull out the 6 injectors from the delivery pipes.
Remove the 0–ring and grommet from each injector.



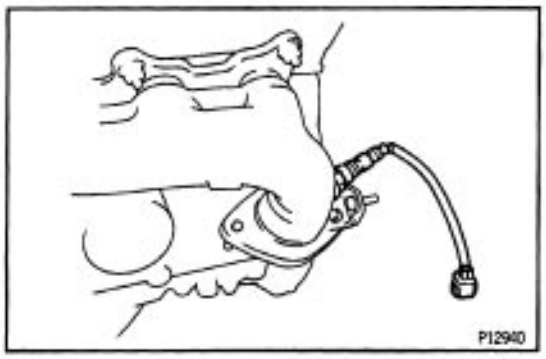
40. REMOVE WATER OUTLET

(a) Remove the 2 bolts, 2 nuts and 2 plate washers.
(b) Disconnect the water bypass hose and remove the water outlet.
(c) Remove the 2 intake manifold gaskets.



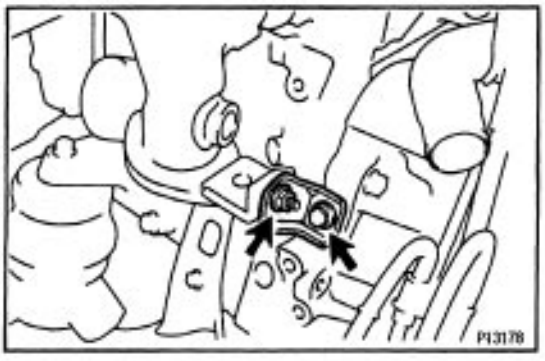
41. REMOVE No.2 ENGINE HANGER

Remove the 2 bolts and engine hanger.

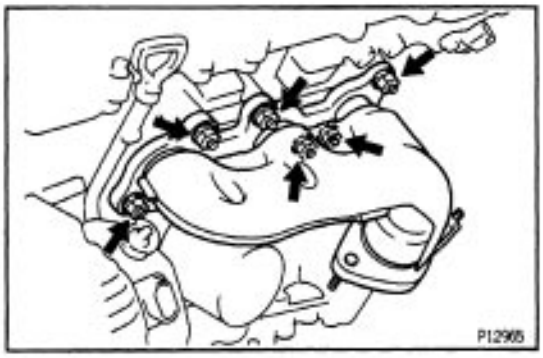


42. REMOVE LH EXHAUST MANIFOLD

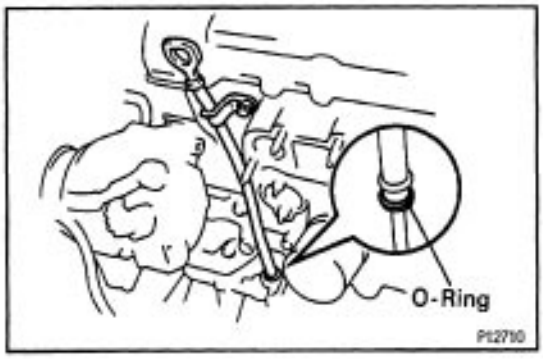
(a) Remove the main heated oxygen sensor (Bank 2 Sensor 1).



(b) Remove the bolt, nut and exhaust manifold stay.

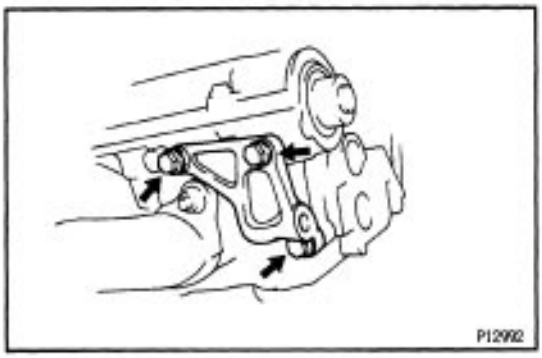


(c) Remove the 6 nuts, exhaust manifold and gasket.



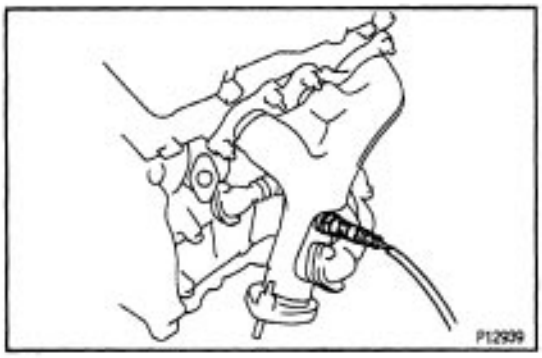
43. REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the bolt holding the dipstick guide to the LH cylinder head.
(b) Pull out the dipstick guide together with the dipstick from the No.1 oil pan.
(c) Remove 0–ring from the dipstick guide.



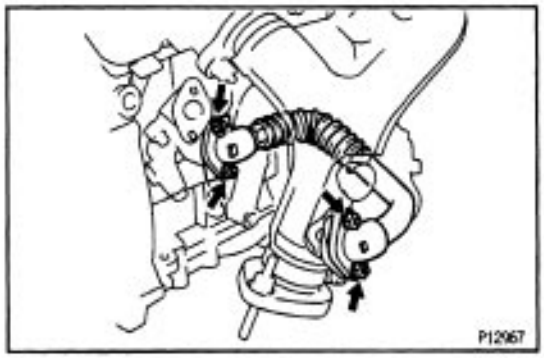
44. REMOVE PS BRACKET

Remove the 3 bolts and PS bracket.

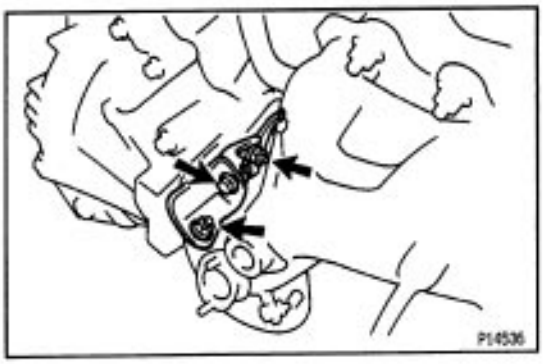


45. REMOVE RH EXHAUST MANIFOLD

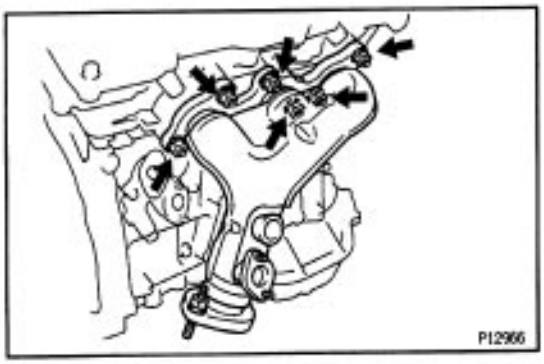
(a) Remove the main heated oxygen sensor (Bank 1 Sensor 1).



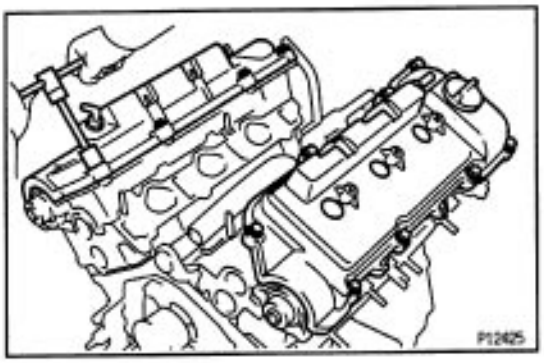
(b) Remove the 4 nuts, EGR pipe and 2 gaskets.



(c) Remove the bolts, 2 nuts, exhaust manifold stay and exhaust manifold plate.

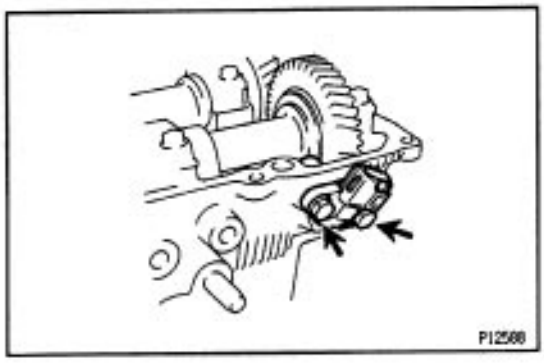


(d) Remove the 6 nuts, exhaust manifold and gasket.



46. REMOVE CYLINDER HEAD COVERS

Remove the 8 bolts, cylinder head cover and gasket.
Remove the 2 cylinder head covers.

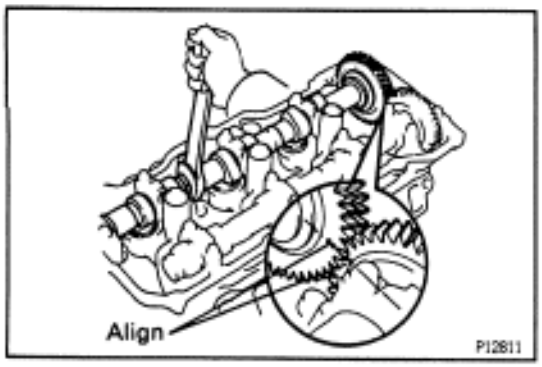


47. REMOVE CAMSHAFT POSITION SENSOR

(a) Remove the bolt and position sensor.
(b) Remove the gasket from the position sensor.

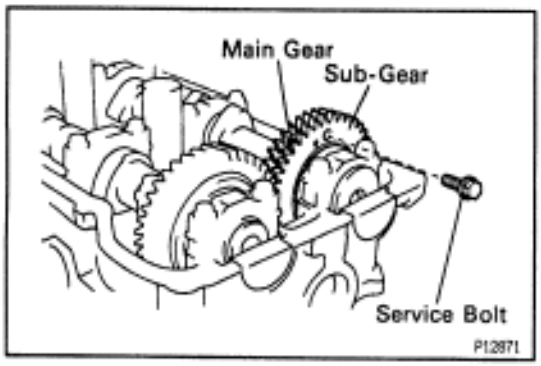
48. REMOVE CAMSHAFTS

NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



A. Remove intake camshaft of RH cylinder head

(a) Align the timing marks (2 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.

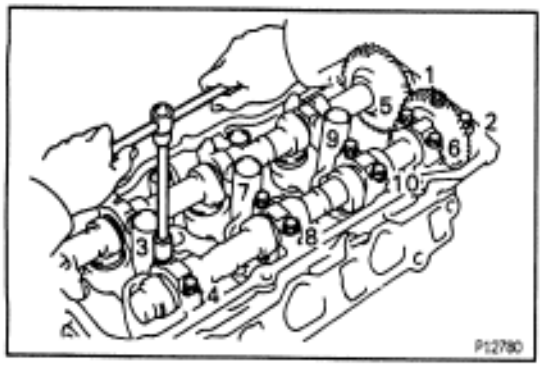


(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

Recommended service bolt:

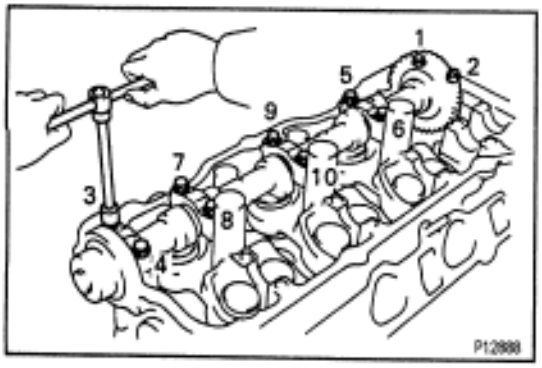
Thread diameter 6 mm
Thread pitch 1.0 mm
Bolt length 16–20 mm

HINT: When removing the camshaft, mark certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

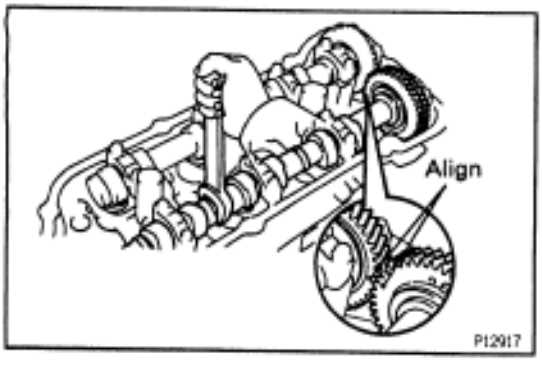
(d) Remove the 5 bearing caps and intake camshaft.



B. Remove exhaust camshaft of RH cylinder head

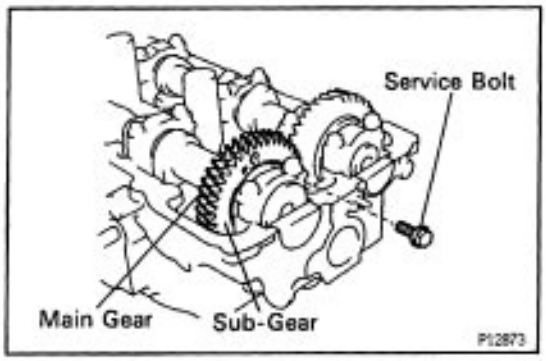
(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

(b) Remove the 5 bearing caps, oil seal and exhaust cam–shaft.



C. Remove intake camshaft of LH cylinder head

(a) Align the timing marks (11 dot mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.

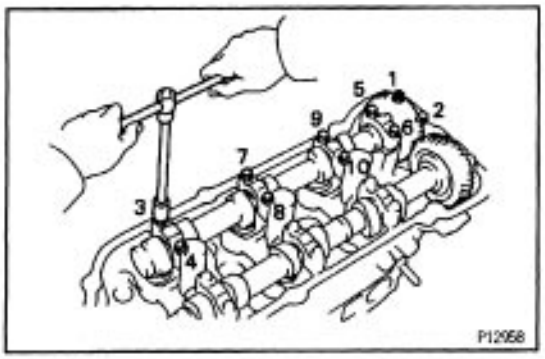


(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

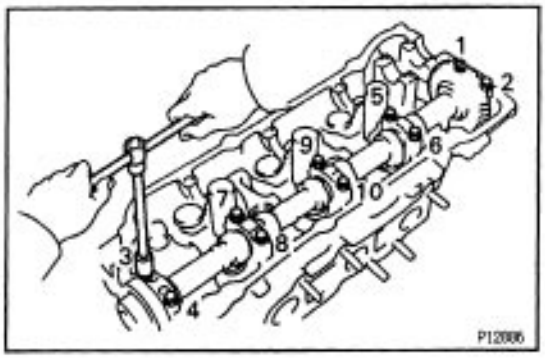
Recommended service bolt:

Thread diameter 6 mm
Thread pitch 1.0 mm
Bolt length 16–20 mm

HINT: When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation.

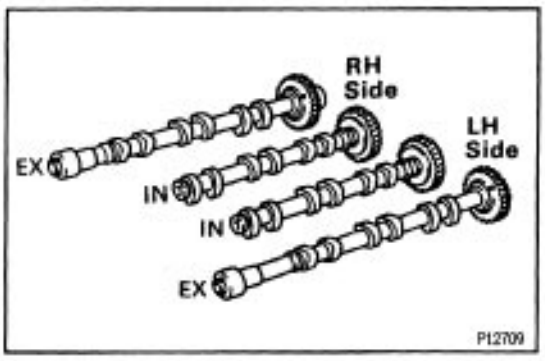


(c) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.
(d) Remove the 5 bearing caps and intake camshaft.



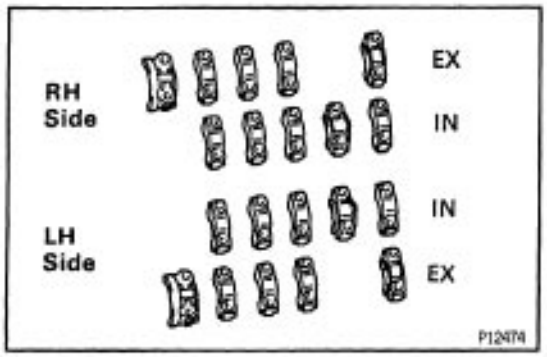
D. Remove exhaust camshaft of LH cylinder head

(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.
(b) Remove the 5 bearing caps, oil seal and exhaust cam–shaft.

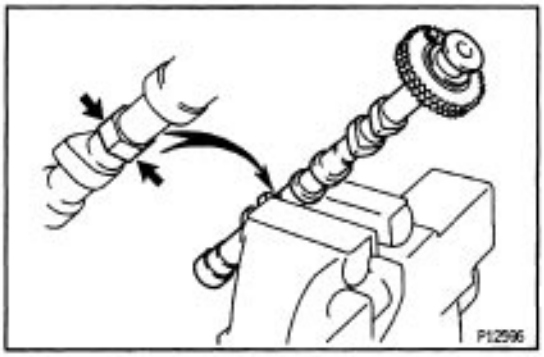


HINT:

- Arrange the camshafts in the correct order.



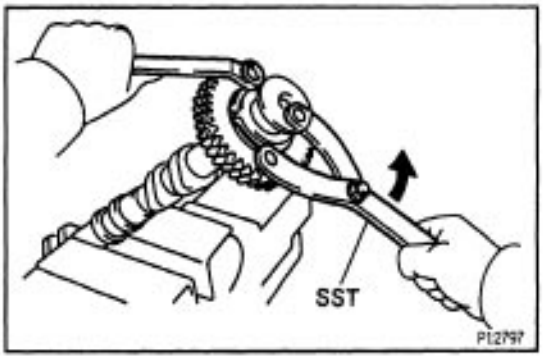
- Arrange the bearing caps in the correct order.



49. DISASSEMBLE EXHAUST CAMSHAFTS

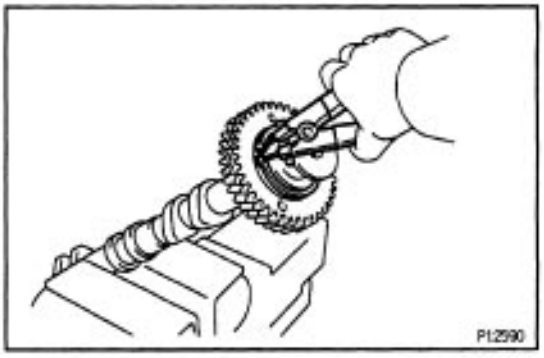
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.

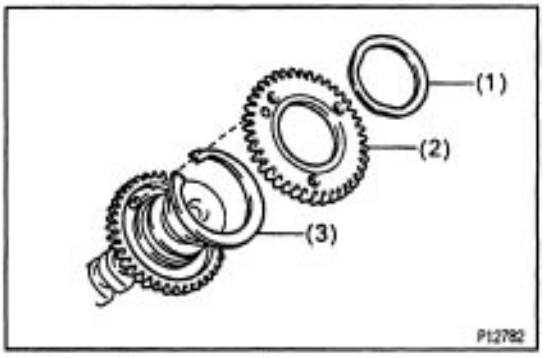


(b) Using SST, turn the sub–gear counterclockwise, and remove the service bolt.

SST 09960–10010 (09962–0100)

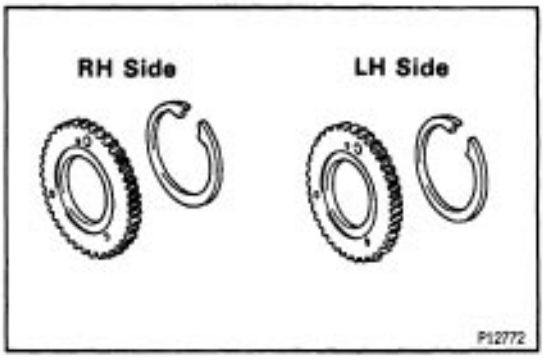


(c) Using snap ring pliers, remove the snap ring.

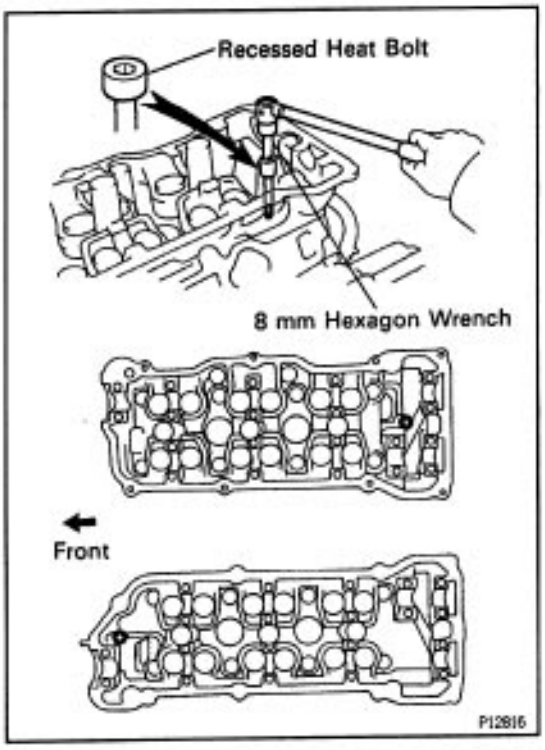


(d) Remove the following parts:

(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring

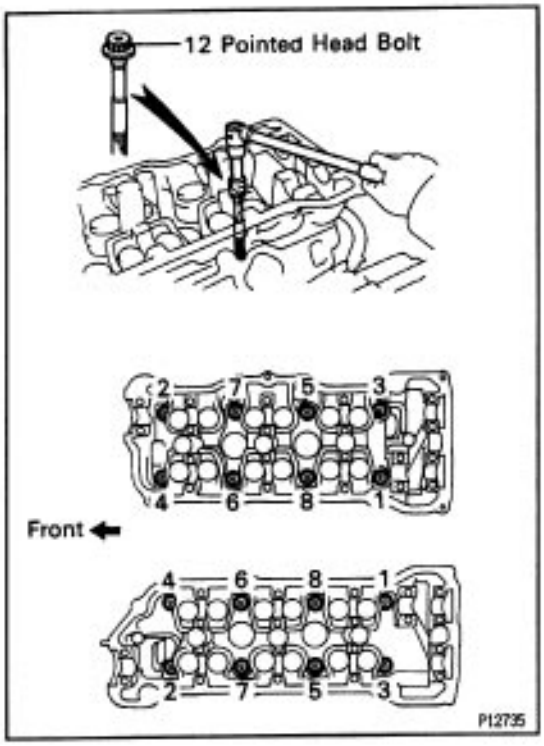


HINT: Arrange the camshaft sub–gears and gear springs (RH and LH sides).



50. REMOVE CYLINDER HEADS

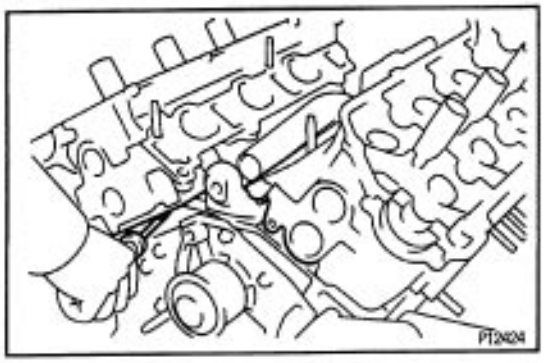
(a) Using a 8 mm hexagon wrench, remove the cylinder head (recessed head) bolt on each cylinder head, then repeat for the other side, as shown.



(b) Uniformly loosen and remove the 8 cylinder head (12 pointed head) bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown.

Remove the 16 cylinder head bolts and plate washers.

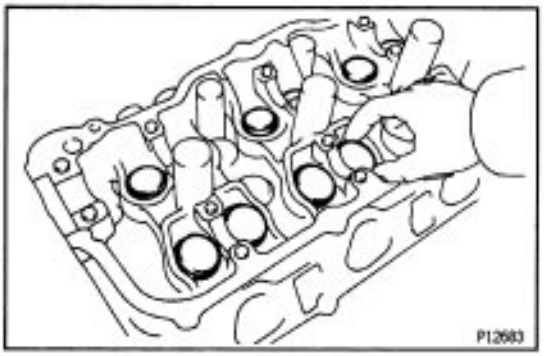
NOTICE: Head warpage or cracking could result from removing bolts in an incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block and place the 2 cylinder heads on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and cylinder block saliences.

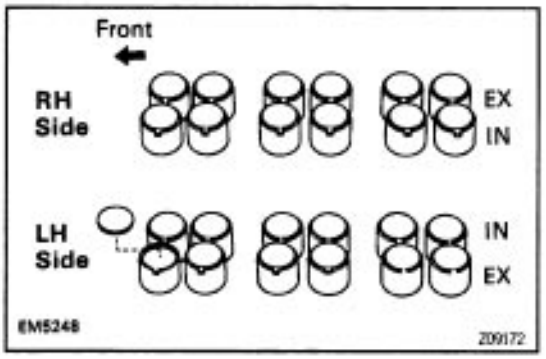
NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



CYLINDER HEAD DISASSEMBLY

(See Components for Removal and Installation)

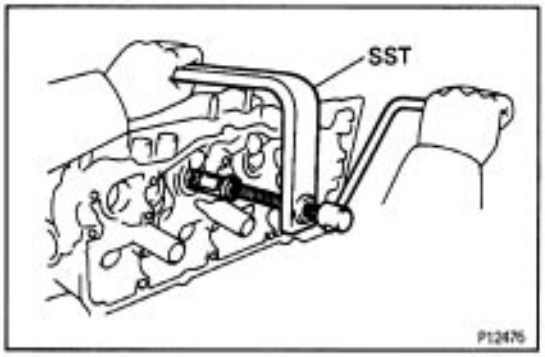
1. REMOVE VALVE LIFTERS AND SHIMS



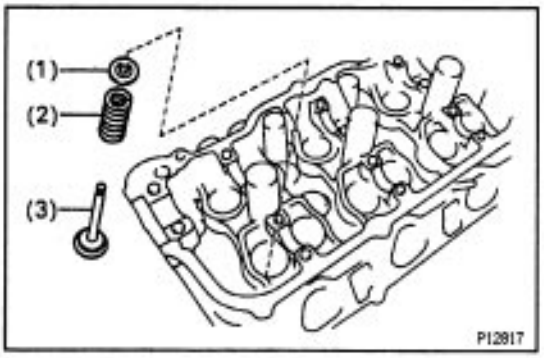
HINT: Arrange the valve lifters and shims in the cor–rect order.

2. REMOVE VALVES

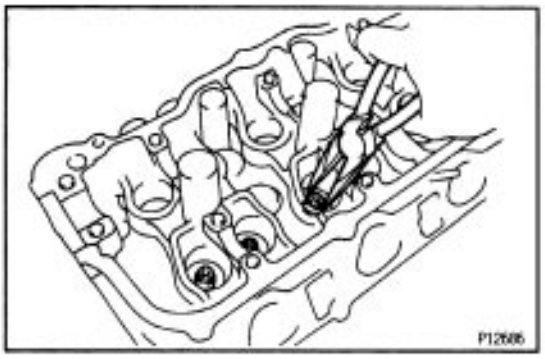
(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202 – 70010

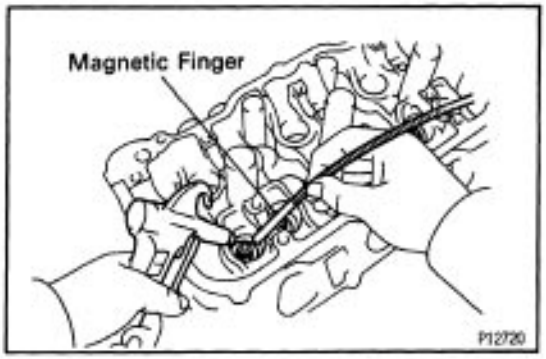


(b) Remove the following parts:
(1) Spring retainer
(2) Valve spring
(3) Valve

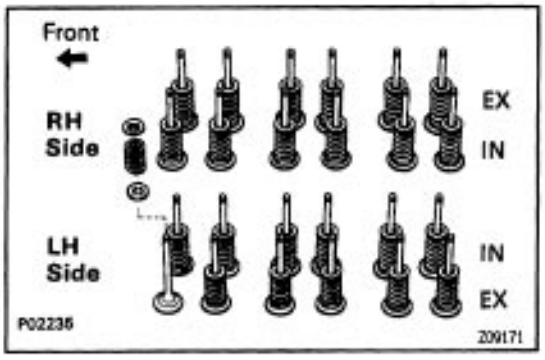


(c) Using needle–nose pliers, remove the oil seal.

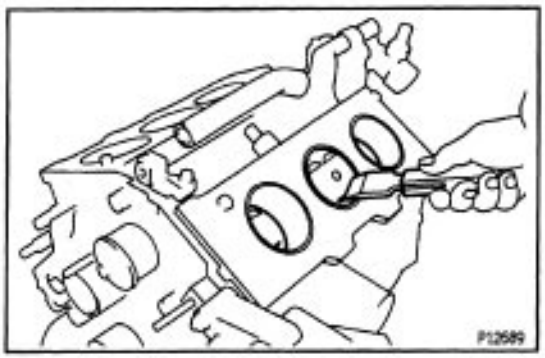




(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.



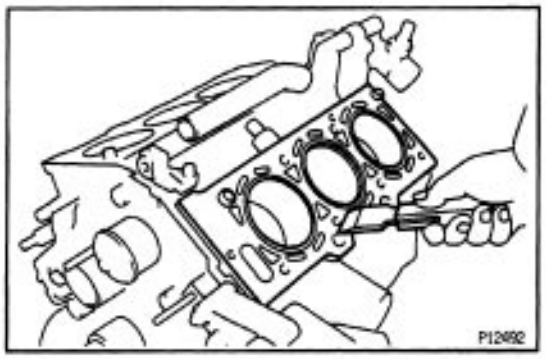
HINT: Arrange the valves, valve springs, spring seats and spring retainers in the correct order.



CYLINDER HEAD COMPONENTS INSPECTION AND REPAIR

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

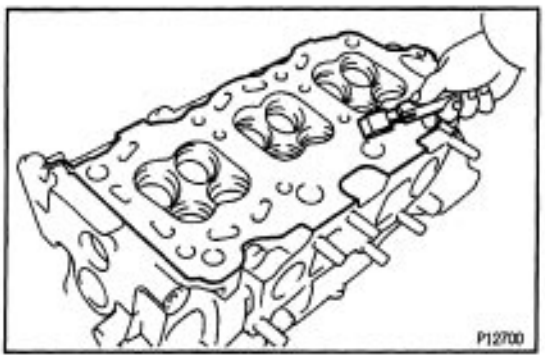
(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high pressure compressed air.

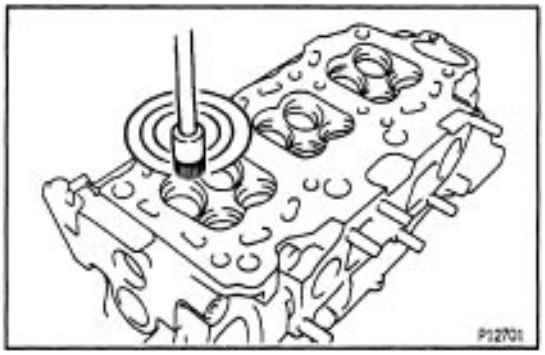


2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

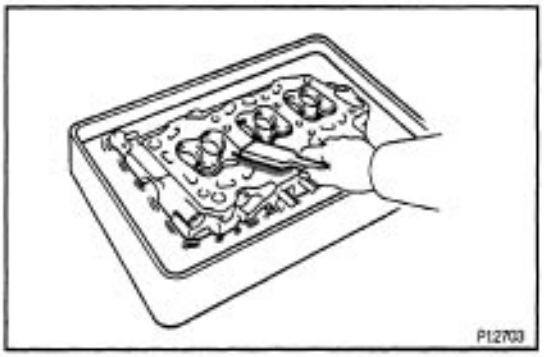
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

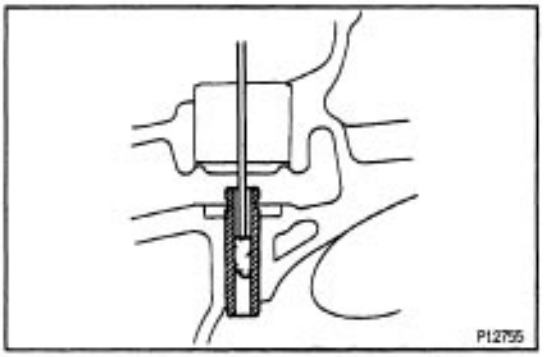
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.



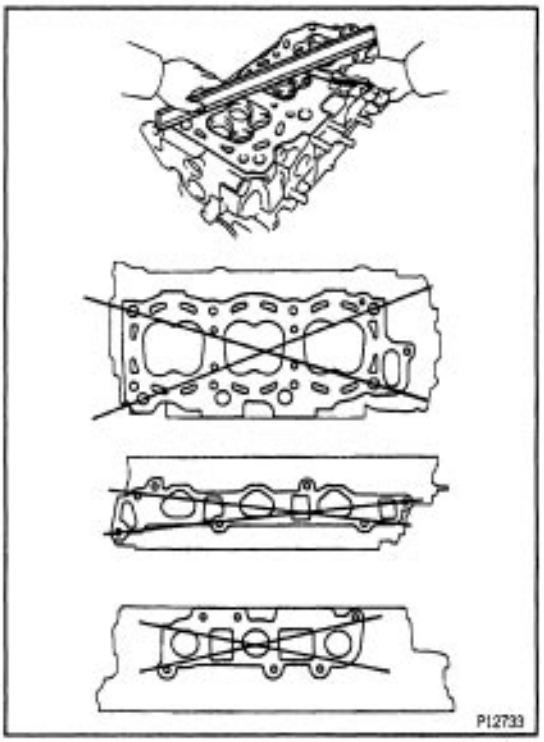
C. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.



D. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



3. INSPECT CYLINDER HEAD

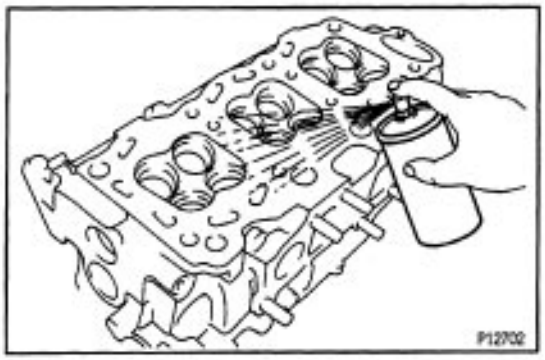
A. Inspect for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

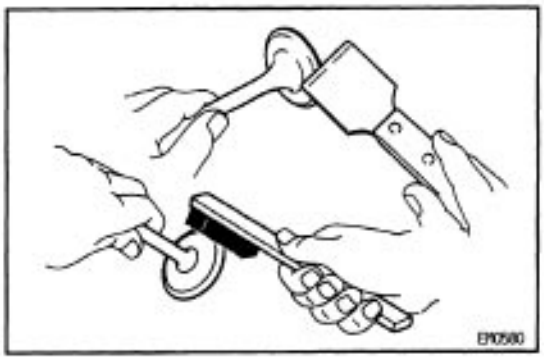
If warpage is greater than maximum, replace the cylinder head.



B. Inspect for cracks

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

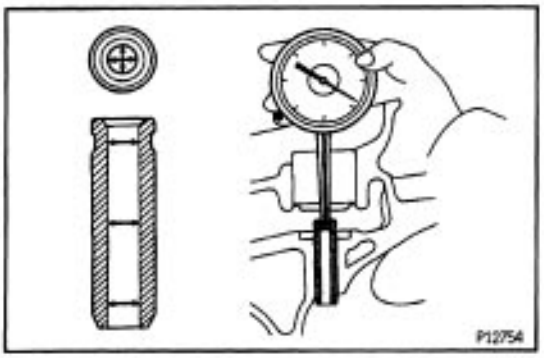
If cracked, replace the cylinder head.



4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

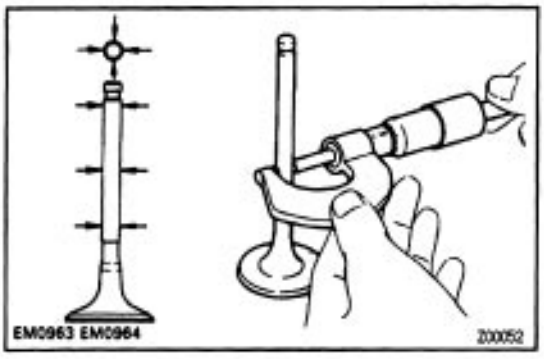


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

5.510 – 5.530 mm (0.2169 – 0.2177 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake

5.470 – 5.485 mm (0.2154 – 0.2159 in.)

Exhaust

5.465 – 5.480 mm (0.2152 – 0.2157 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

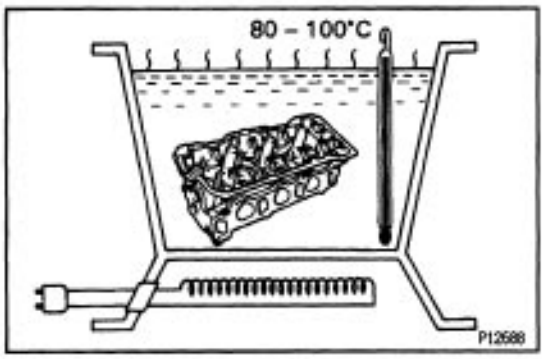
Intake

0.025 – 0.060 mm (0.0010 – 0.0024 in.)

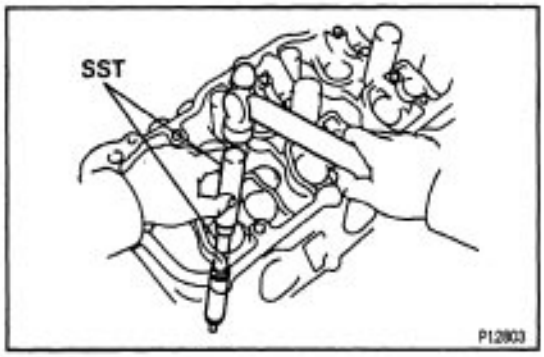
Exhaust

0.030 – 0.065 mm (0.0012 – 0.0026 in.)

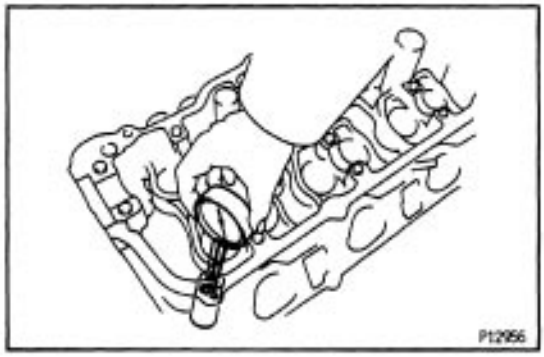
Maximum oil clearance:
Intake
0.08 mm (0.0031 in.)
Exhaust
0.10 mm (0.0039 in.)
If the clearance is greater than maximum, replace the valve and guide bushing.



6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS
(a) Gradually heat the cylinder head to 80 – 100®C (176 – 212®F).



(b) Using SST and a hammer, tap out the guide bushing.
SST 09201– 01055, 09608–20012 (09608–03020)



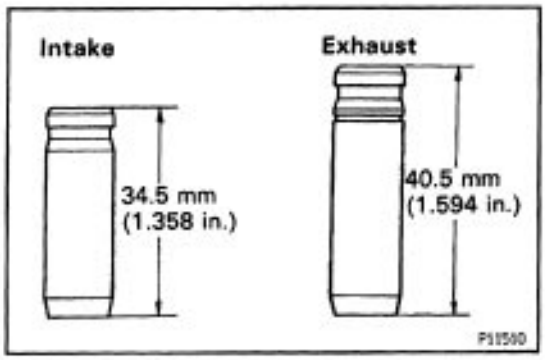
(c) Using a caliper gauge, measure the bushing bore di–ameter of the cylinder head.

Both intake and exhaust

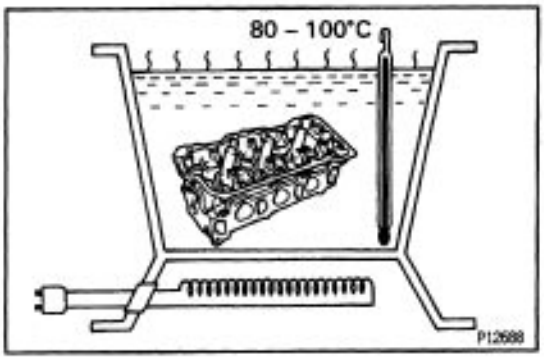
Bushing bore diameter mm (in.)	Bushing size
10.295 –10.313 (0.4053 – 0.4060)	Use STD
10.345 – 10.363 (0.4073 – 0.4080)	Use O/S 0.05

V04650

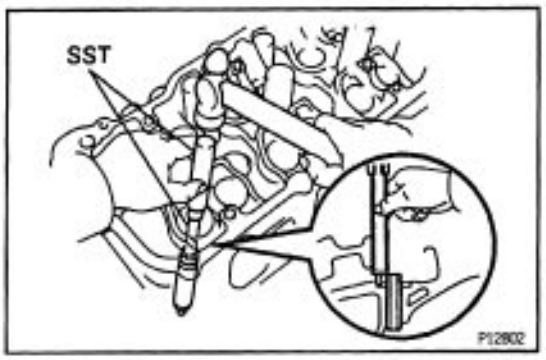
(d) Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 10.313 mm (0.4060 in.), machine the bushing bore to the following dimension:
10.345 – 10.363 mm (0.4073 – 0.4080 in.)
If the bushing bore diameter of the cylinder head is greater than 10.363 mm (0.4080 in.), replace the cylinder head.



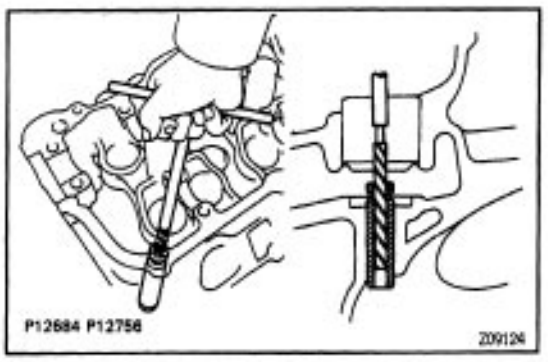
HINT: Different bushings are used for the intake and exhaust.



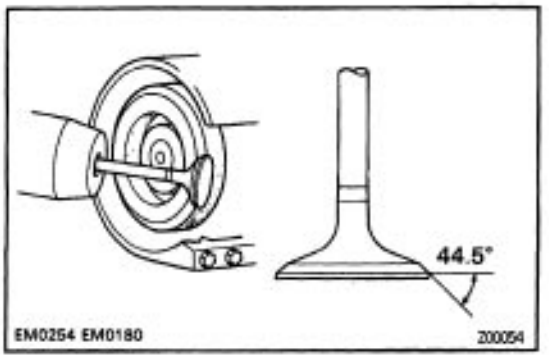
(e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).



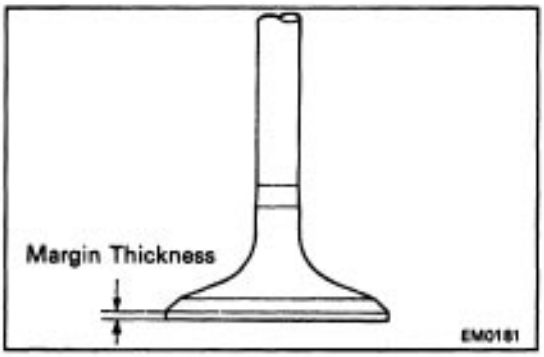
(f) Using SST and a hammer, tap in a new guide bushing to the specified protrusion height.
SST 09201– 01055, 09608–20012 (09608–03020)
Protrusion height:
Intake
11.1 – 11.3 mm (0.437 – 0.445 in.)
Exhaust
8.9 – 9.3 mm (0.350 – 0.366 in.)



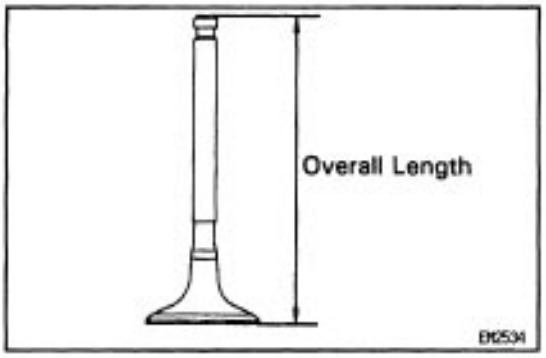
(h) Using a sharp 5.5 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 5 above) between the guide bushing and valve stem.



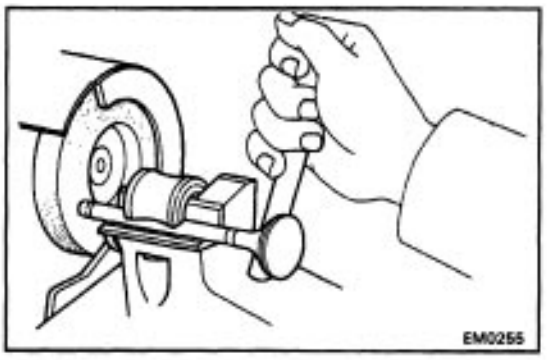
7. INSPECT AND GRIND VALVES
(a) Grind the valve enough to remove pits and carbon.
(b) Check that the valve is ground to the correct valve face angle.
Valve face angle:
44.5°



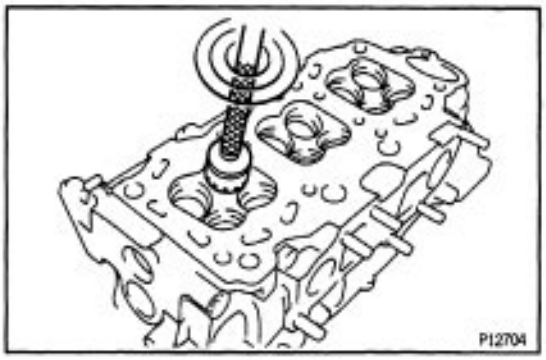
(c) Check the valve head margin thickness.
Standard margin thickness:
1.0 mm (0.039 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)
If the margin thickness is less than minimum, replace the valve.



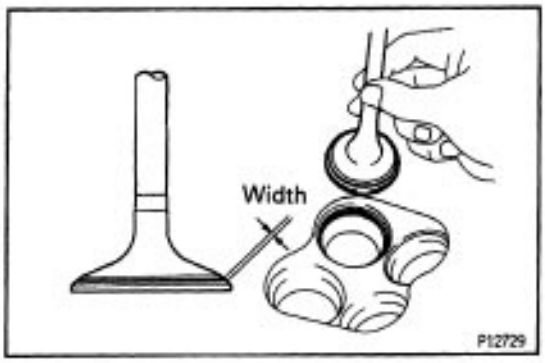
(d) Check the valve overall length.
Standard overall length:
Intake
95.45 mm (3.5779 in.)
Exhaust
95.40 mm (3.7559 in.)
Minimum overall length:
Intake
94.95 mm (3.7382 in.)
Exhaust
94.90 mm (3.7362 in.)
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS
(a) Using a 45®carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

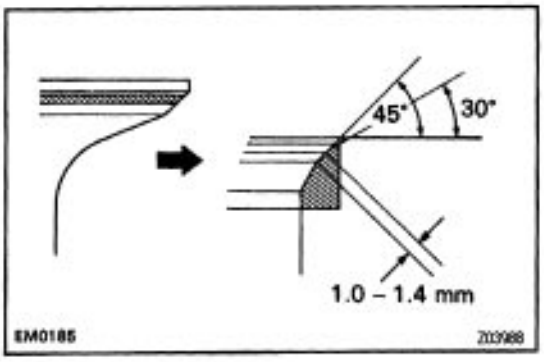


(b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.
(c) Check the valve face and seat for the following:

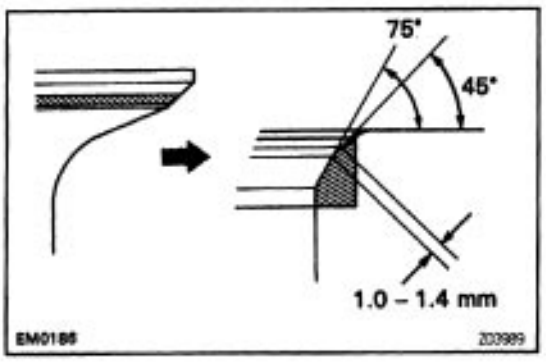
- If blue appears 360® around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360® around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:
  1.0 – 1.4 mm (0.039 – 0.055 In.)

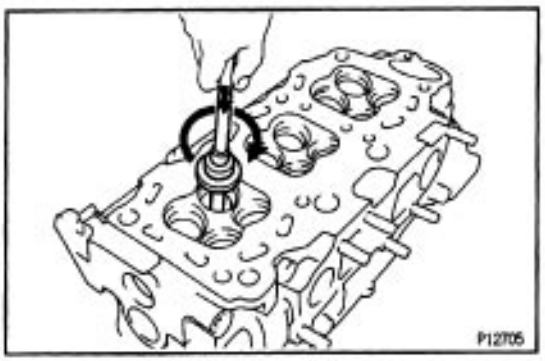
If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 30® and 45® cutters to correct the seat.

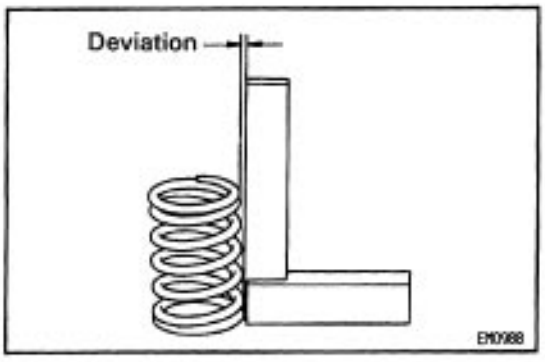


(2) If the seating is too low on the valve face, use 75® and 45® cutters to correct the seat.

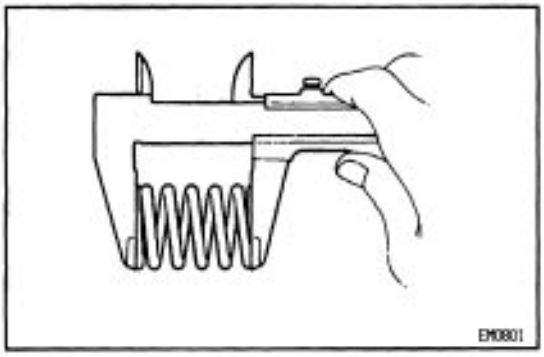




(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.



9. INSPECT VALVE SPRINGS
(a) Using a steel square, measure the deviation of the valve spring.
Maximum deviation:
2.0 mm (0.079 in.)
If the deviation is greater than maximum, replace the valve spring.

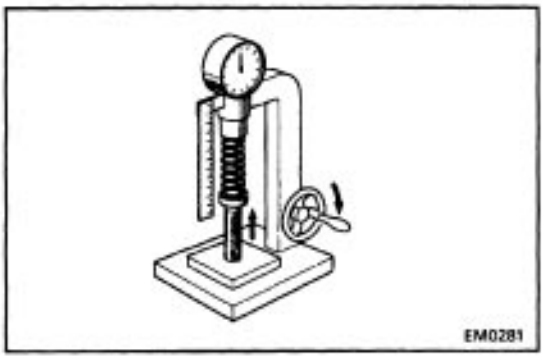


(b) Using a vernier caliper, measure the free length of the valve spring.

Free length:

45.50 mm (1.7913 in.)

If the free length is not as specified, replace the valve spring.

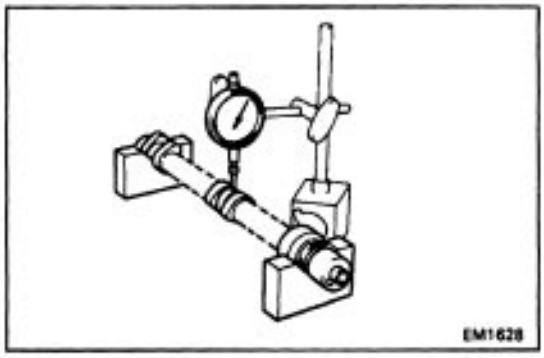


(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
at 33.8 mm (1.331 in.)

If the installed tension is not as specified, replace the valve spring.



10. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

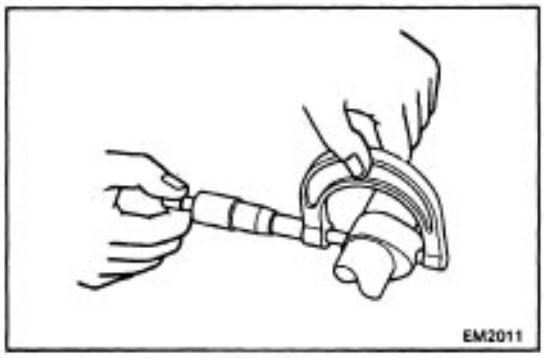
(a) Place the camshaft on V – blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake

42.11 – 42.21 mm (1.6579 – 1.6618 in.)

Exhaust

41.96 – 42.06 mm (1.6520 – 1.6559 in.)

Minimum cam lobe height:

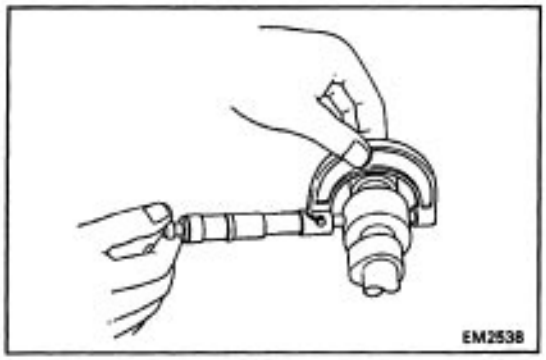
Intake

41.96 mm (1.6520 in.)

Exhaust

41.81 mm (1.6461 in.)

If the cam lobe height is less than minimum, replace the camshaft.



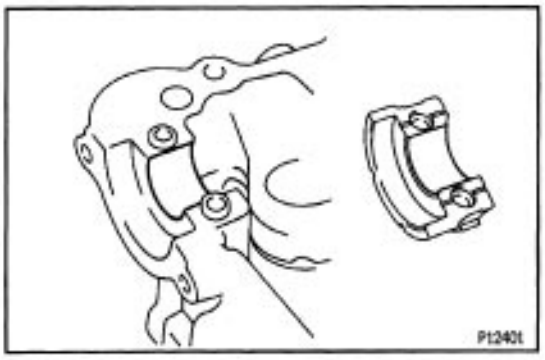
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

26.949 – 26.965 mm (1.0610 – 1.061 6 in.)

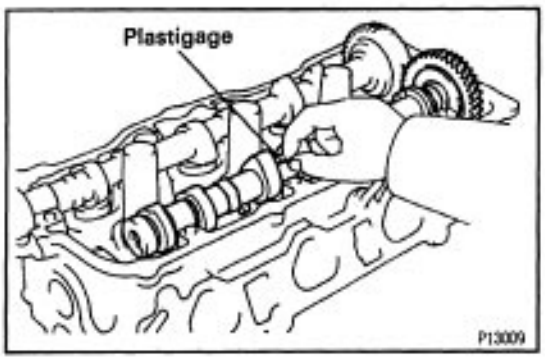
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check that bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

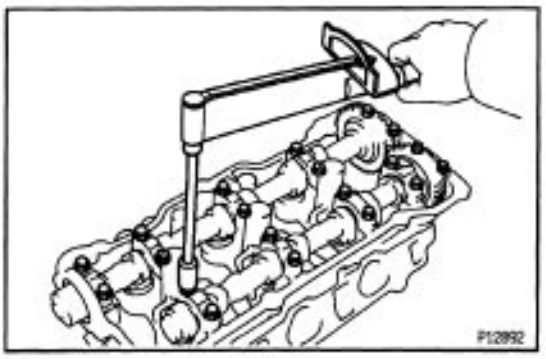


E. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

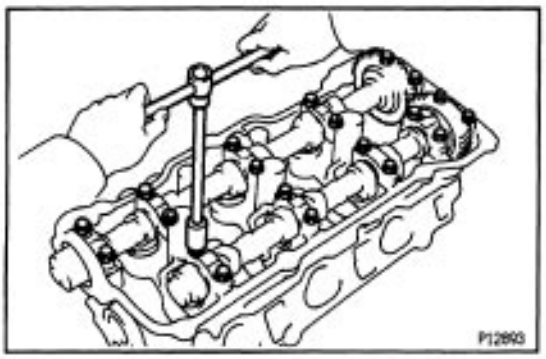


(d) Install the bearing caps.

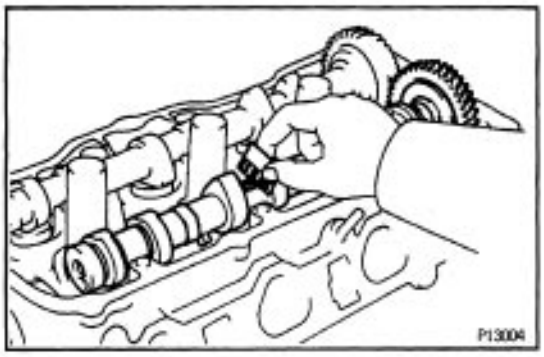
(See step 3 on pages EG2–98 to 102)

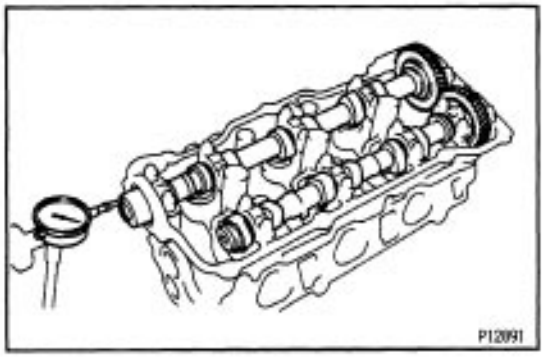
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)

NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.





(f) Measure the Plastigage at its widest point.

Standard oil clearance:

0.035 – 0.072 mm (0.0014 – 0.0028 in.)

Maximum oil clearance:

0.10 mm (0.0039 fn.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.

(h) Remove the camshafts.

F. Inspect camshaft thrust clearance

(a) Install the camshafts.

(See step 3 on pages EG2–98 to 102)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:

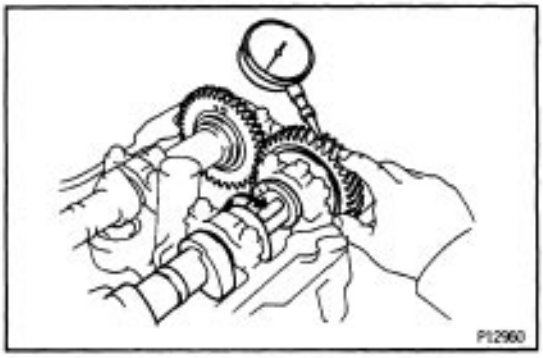
0.040 – 0.090 mm (0.0016 – 0.0035 in.)

Maximum thrust clearance:

0.12 mm (0.0047 in.)

If the thrust clearance is greater than maximum, re–place the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(c) Remove the camshafts.



G. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust cam sub–gear.

(See step 3 on pages EG2–98 to 102)

(b) Using a dial indicator, measure the backlash.

Standard backlash:

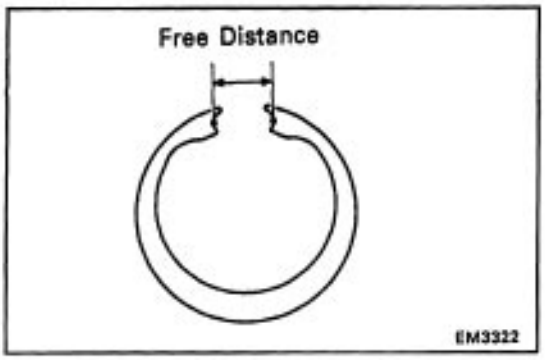
0.020 – 0.200 mm (0.0008 – 0.0079 In.)

Maximum backlash:

0.30 mm (0.0188 in.)

If the backlash is greater then maximum, replace the camshafts.

(c) Remove the camshafts.



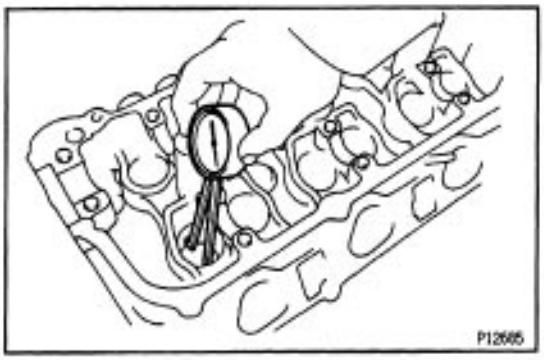
H. Inspect camshaft gear spring

Using a vernier caliper, measure the free distance between the spring ends.

Free distance:

18.2 – 18.8 mm (0.712 – 0.740 in.)

If the free distance is not as specified, replace the gear spring.

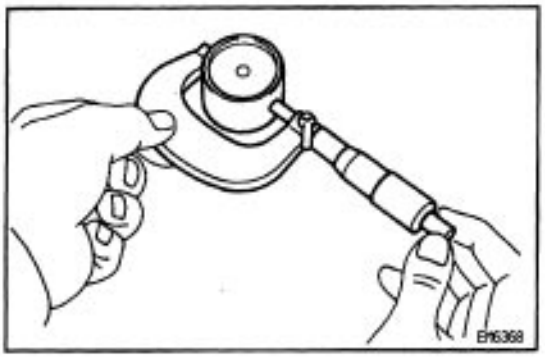


11. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diame–ter of the cylinder head.

Lifter bore diameter:

31.000 – 31.018 mm (1.2205 – 1.2212 in.)



(b) Using a micrometer, measure the lifter diameter.

Lifter diameter:

30.966 – 30.976 mm (1.2191 – 1.2196 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

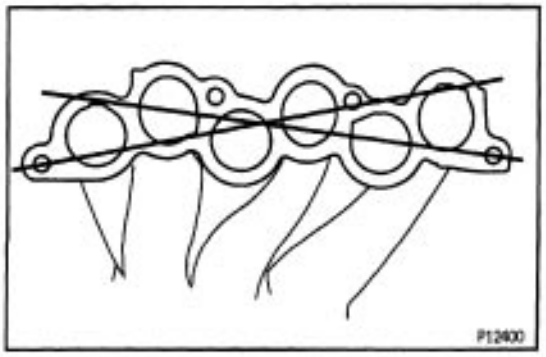
Standard oil clearance:

0.024 – 0.050 mm (0.0009 – 0.0020 in.)

Maximum oil clearance:

0.07 mm (0.0028 In.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



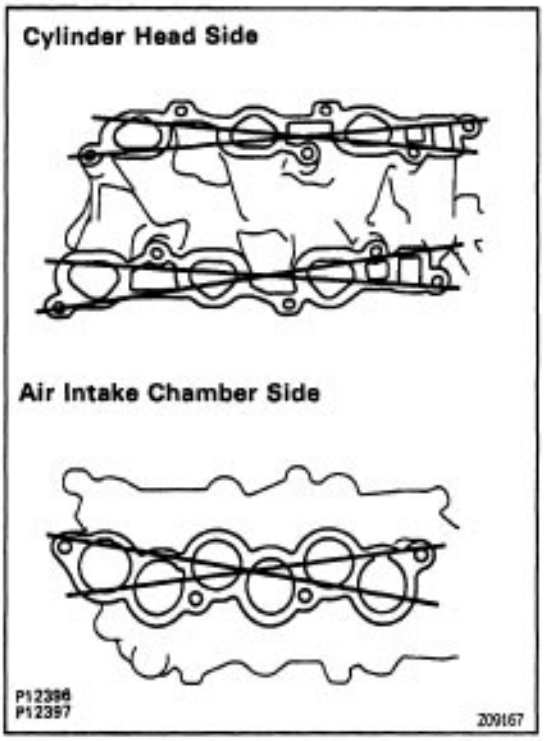
12. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, mea–sure the surface contacting the intake manifold for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the cha–mber.



13. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

Maximum warpage:

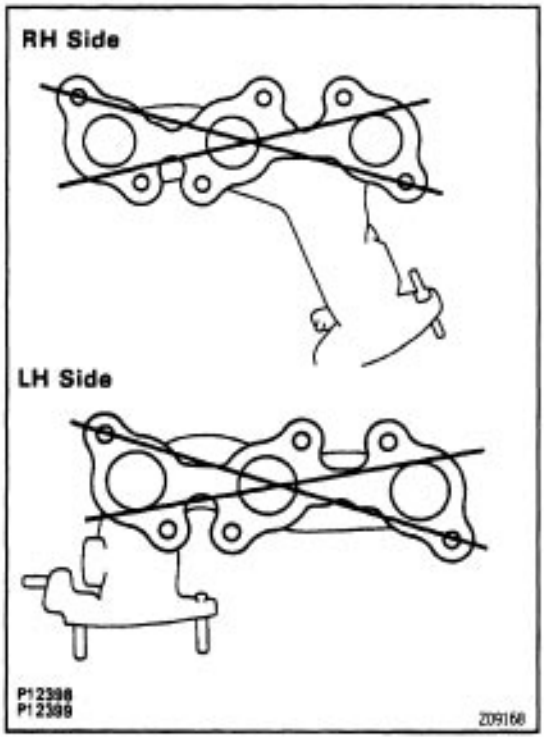
Air Intake Chamber Side

0.15 mm (0.0059 in.)

Cylinder Head Side

0.08 mm (0.0031 in.)

If warpage is greater than maximum, replace the manifold.



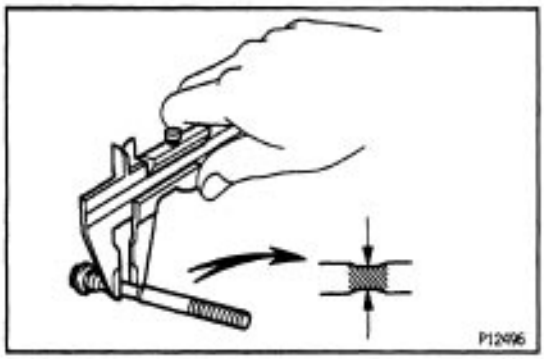
14. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage:

0.50 mm (0.0196 in.)

If warpage is greater than maximum, replace the manifold.



15. INSPECT CYLINDER HEAD BOLTS

(for 12 Pointed Head Bolts)

Using a caliper gauge, measure the thread outside diameter of the bolt.

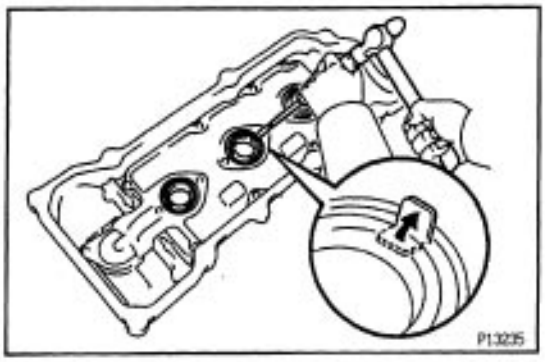
Standard outside diameter:

8.95 – 9.05 mm (0.3524 – 0.3563 in.)

Minimum outside diameter:

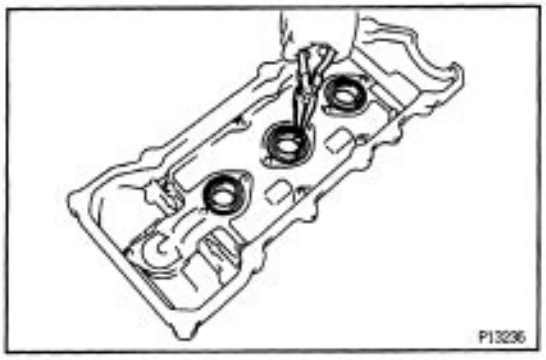
8.75 mm (0.3445 in.)

If the diameter is less than minimum, replace the bolt.

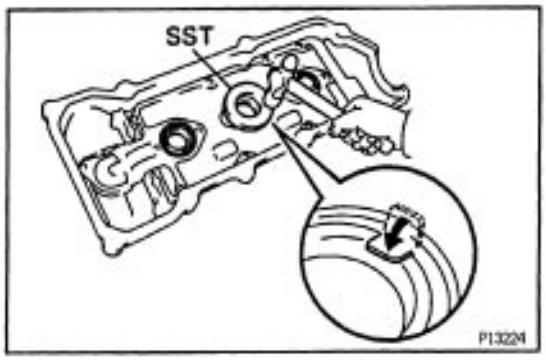


16. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from the slipping out.
(b) Using a screwdriver and hammer, tap out the gasket.



(c) Using needle–nose pliers, ply out the gasket.



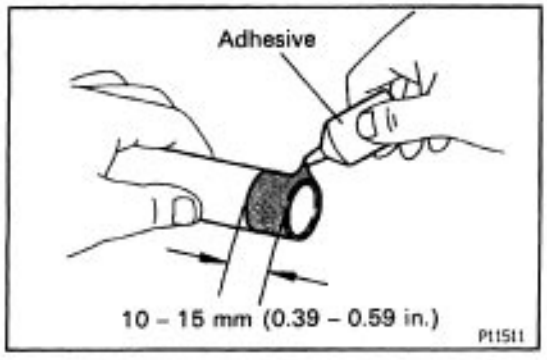
(d) Using SST and a hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.
SST 09608–20012 (09608–03070)
(e) Apply a light coat of MP grease to the gasket lip.
(f) Return the ventilation plate tab to its original position.

CYLINDER HEAD ASSEMBLY

(See Components for Removal and Installation)

HINT:

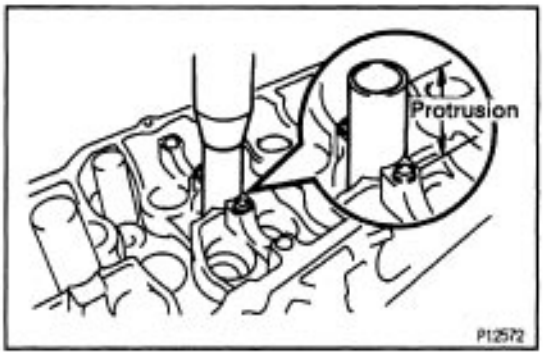
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



1. INSTALL SPARK PLUG TUBES

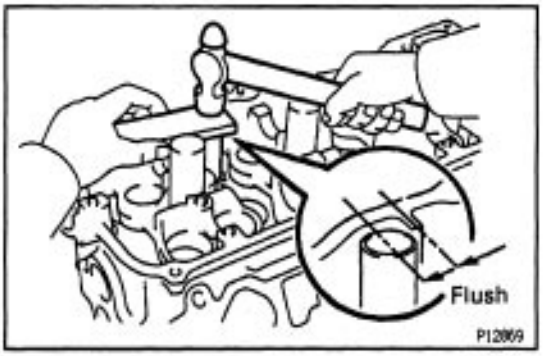
HINT: When using a new cylinder head, spark plug tubes must be installed.
(a) Apply adhesive to the end of the spark plug tube.
Adhesive:

Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Using a press, press in a new spark plug tube until there is 42.4 – 43.4 mm (1.669 – 1.749) protruding from the camshaft bearing cap installation surface of the cylinder head.

NOTICE: Avoid pressing a new spark plug tube In too far by measuring the amount of the protrusion while press–ing.

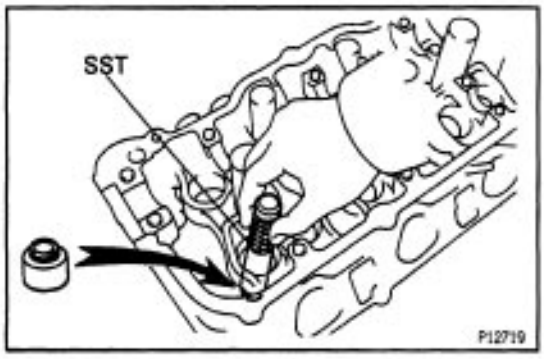


2. INSTALL PCV PIPES

HINT: When using a new cylinder head, PCV pipe must be installed.

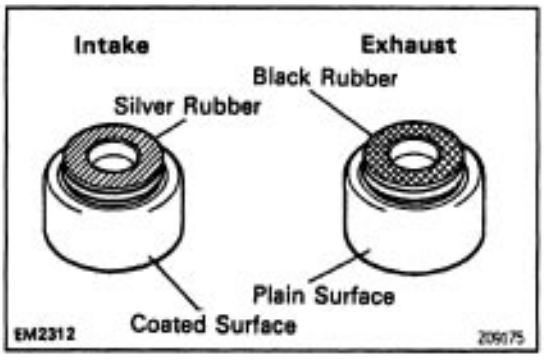
Using a wooden block and hammer, tap in a new spark tube until its top side is flush with the cylinder head edge.

NOTICE: Be careful not to damage the cylinder head edge.

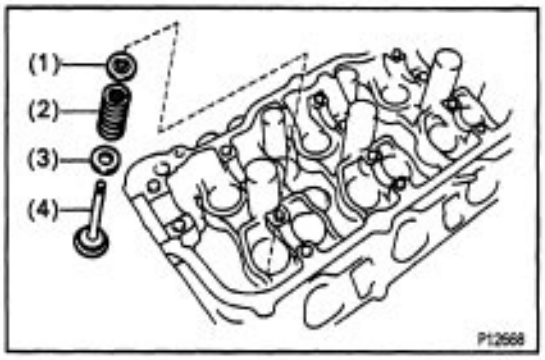


3. INSTALL VALVES

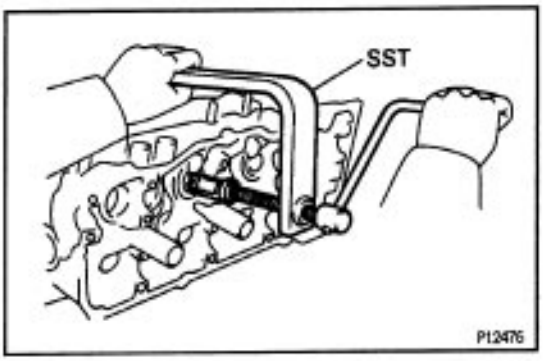
(a) Using SST, push in a new oil seal.
SST 09201 –41020



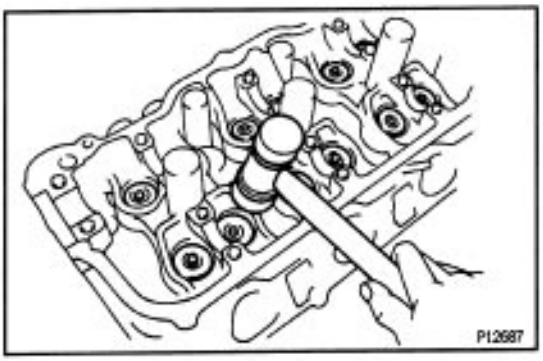
HINT: The intake valve oil seal is silver and the ex–haust valve oil seal is black.



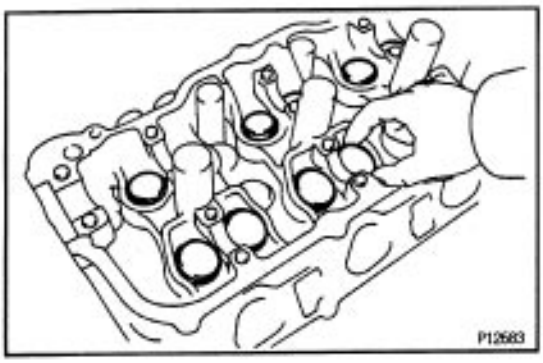
(b) Install the following parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202 – 70010

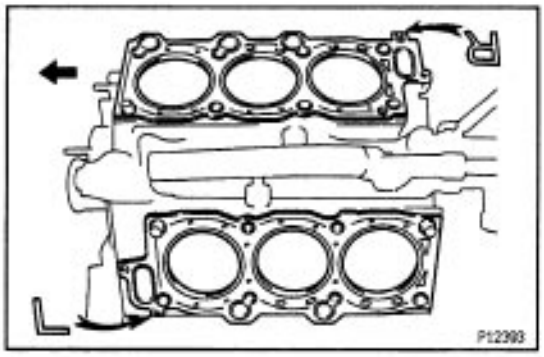


(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit.



4. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.



CYLINDER HEAD INSTALLATION

(See Components for Removal and Installation)

1. INSTALL CYLINDER HEADS

A. Place cylinder head on cylinder block

(a) Place 2 new cylinder head gaskets in position on the cylinder block.

NOTICE: Be careful of the installation direction.

(b) Place the 2 cylinder heads in position on the cylinder head gaskets.

B. Install cylinder head (12 pointed head) bolts

HINT:

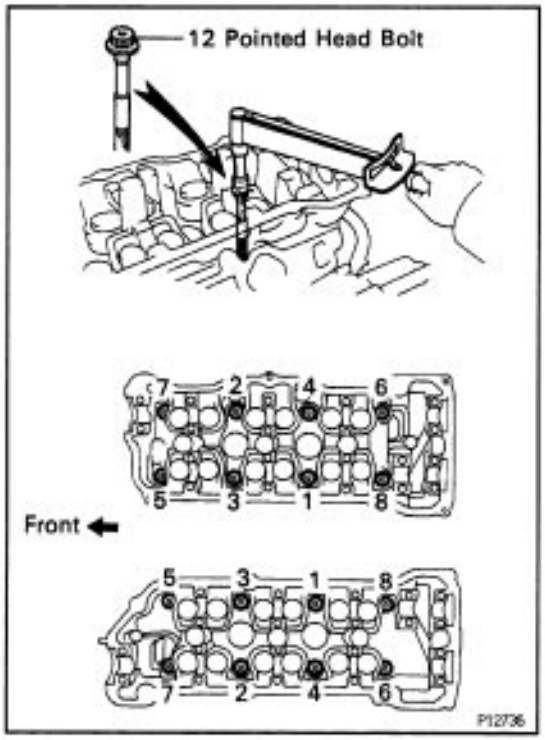
- The cylinder head bolts are tightened in 2 pro–gressive steps (steps (b) and (d)).
- If any bolt is broken or deformed, replace it.

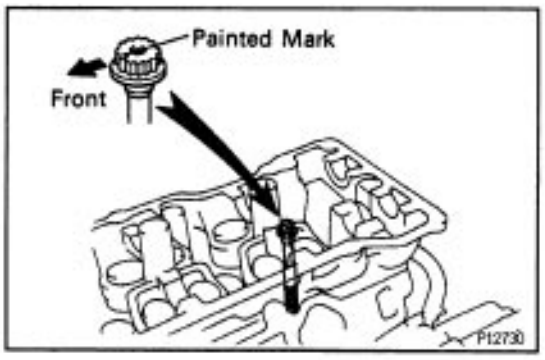
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install and uniformly tighten the . cylinder head bolts on each cylinder head, in several passes, in the se–quence shown, then repeat for the other side, as shown.

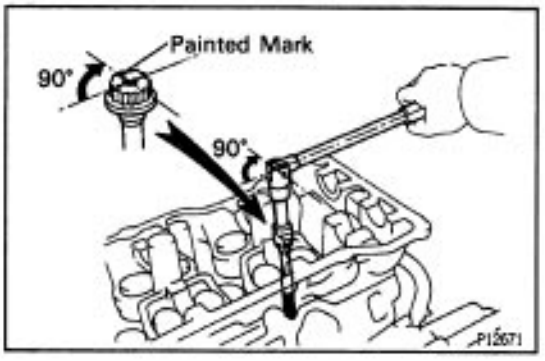
Torque: 64 N–m (550 kgf–cm, 40 ft–lbf)

If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



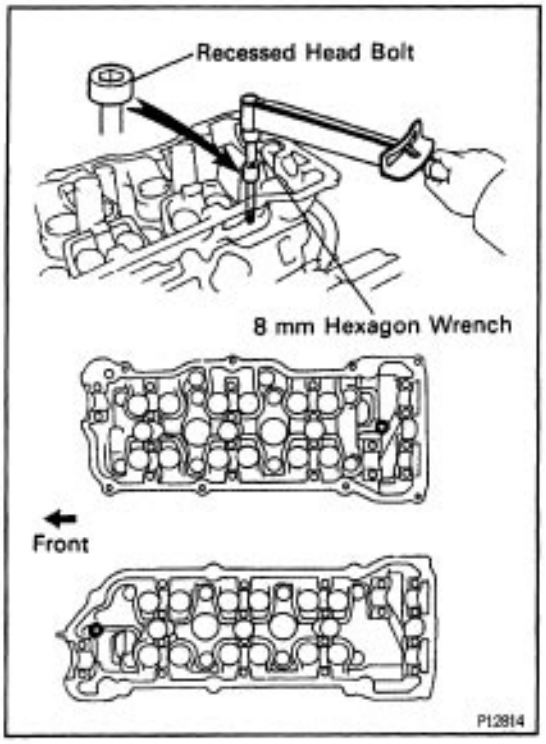


(c) Mark the front of the cylinder head bolt head with paint.



(d) Retighten the cylinder head bolts by 90®in the numer–ical order shown.

(e) Check that the painted mark is now at a 90®angle to the front.

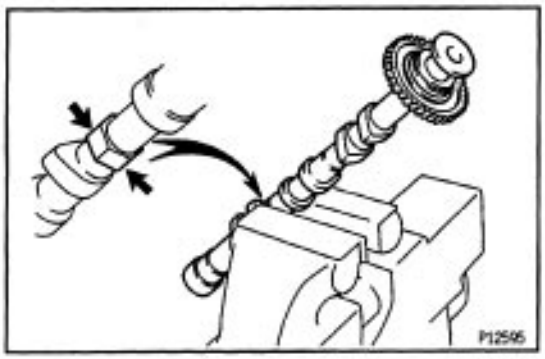


C. Install cylinder head (recessed head) bolts

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using a 8 mm hexagon wrench, install the cylinder head bolt on each cylinder head, then repeat for the other side, as shown.

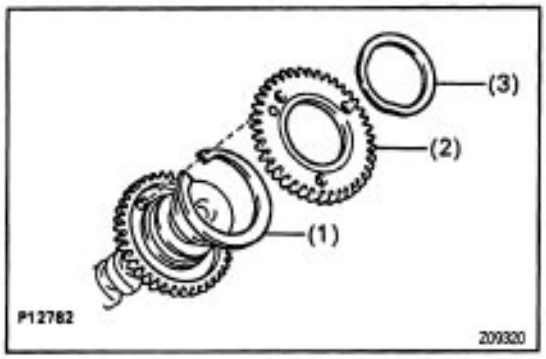
Torque: 18.5 N–m (185 kgf–cm, 13 ft–lbf)



2. ASSEMBLY EXHAUST CAMSHAFTS

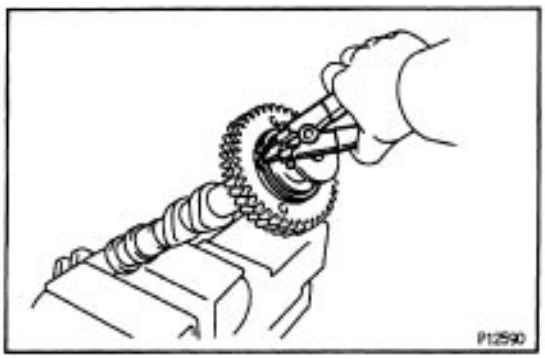
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.

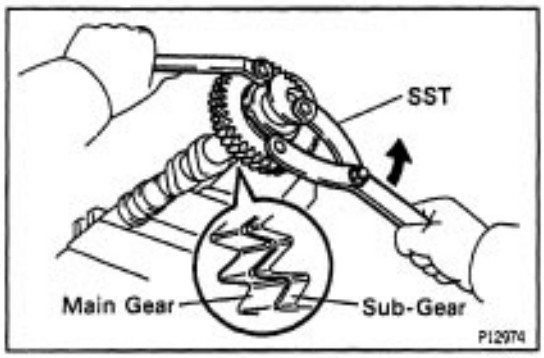


(b) Install the following parts:

(1) Camshaft gear spring
(2) Camshaft sub–gear
(3) Wave washer



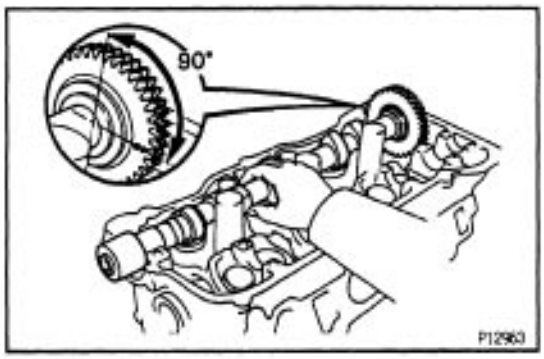
(c) Using snap ring pliers, install the snap ring.



(d) Using SST, align the holes of the camshaft main gear and sub–gear by turning camshaft sub–gear coun–terclockwise, and install a service bolt.
SST 09960–10010 (09962–0100)
HINT: Align the pins on the gears with the gear spring ends.

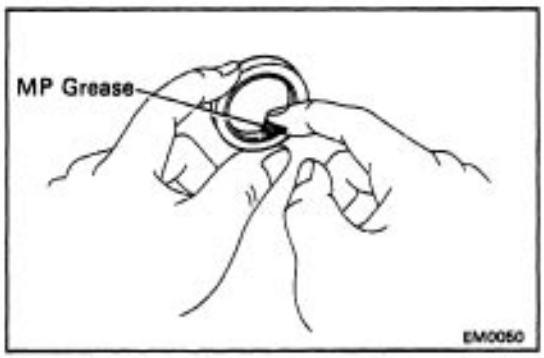
3. INSTALL CAMSHAFTS

NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it Is being installed. If the camshaft Is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

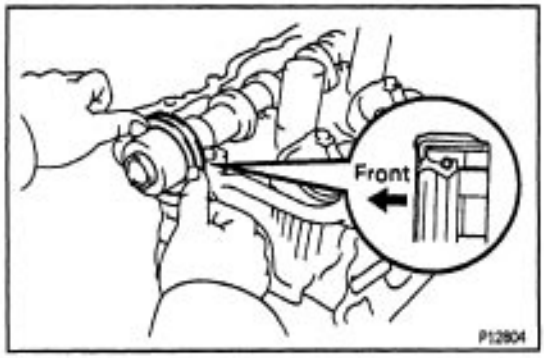


A. Install exhaust camshaft of RH cylinder head

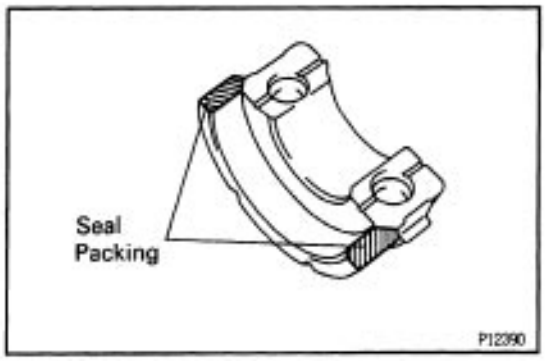
(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Place the exhaust camshaft at 90®angle of timing mark (2 dot marks) on the cylinder head.



(c) Apply MP grease to a new oil seal lip.

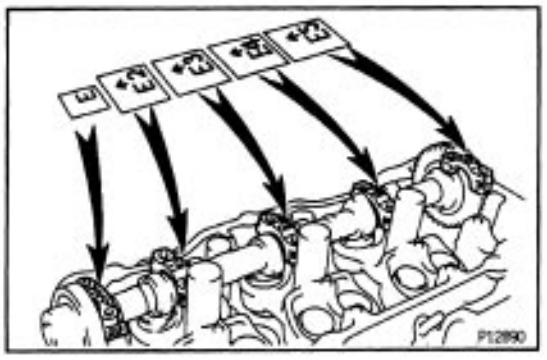


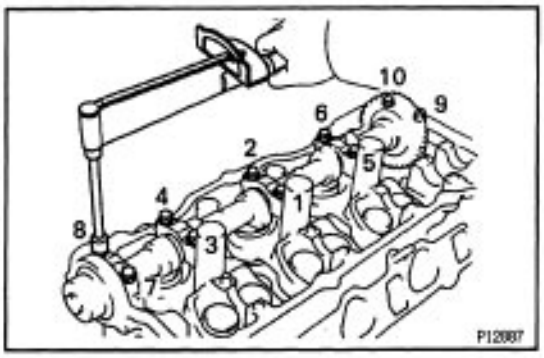
(d) Install the oil seal to the camshaft.



(e) Remove any old packing (FIPG) material.
(f) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent

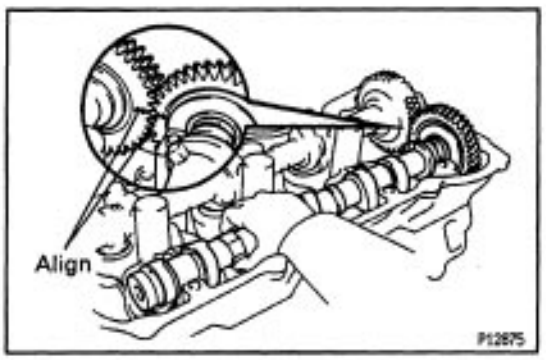
(g) Install the 5 bearing caps in their proper locations.



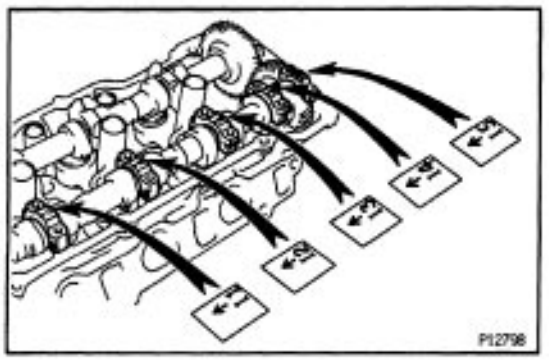


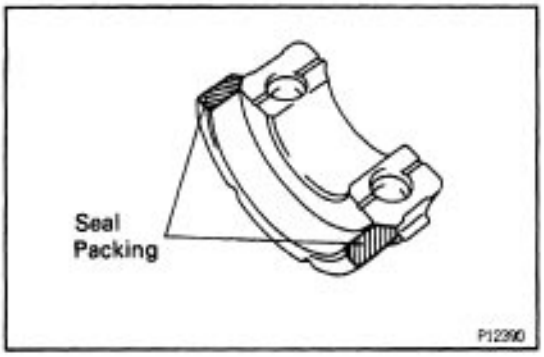
(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)

B. Install intake camshaft of RH cylinder head
(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.
(c) Place the intake camshaft on the cylinder head.

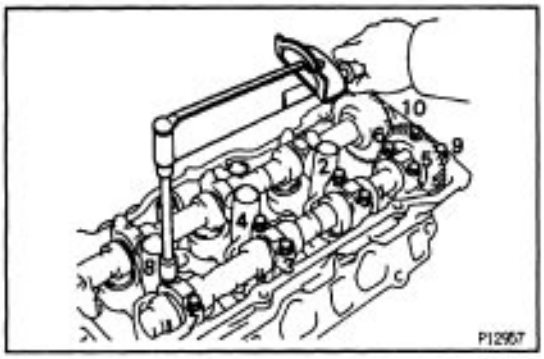


(d) Install the 5 bearing caps in their proper locations.

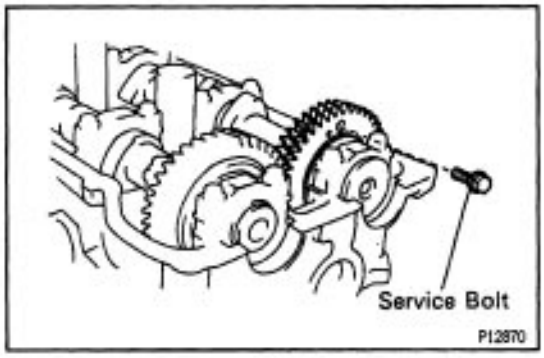




(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

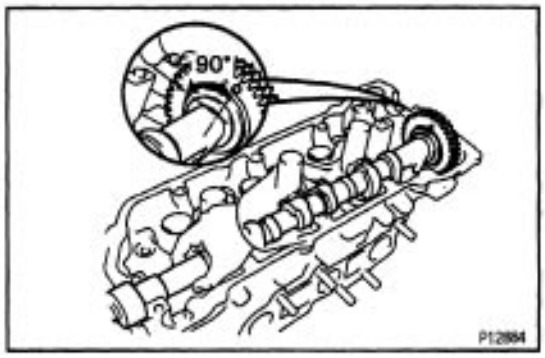


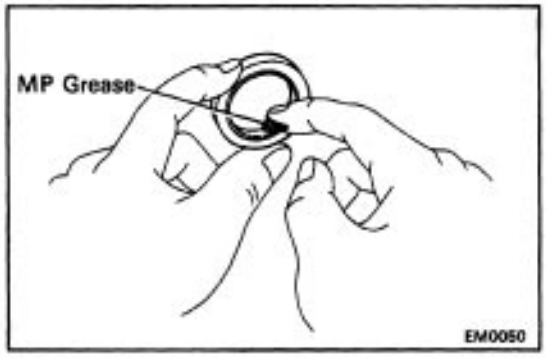
(f) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)



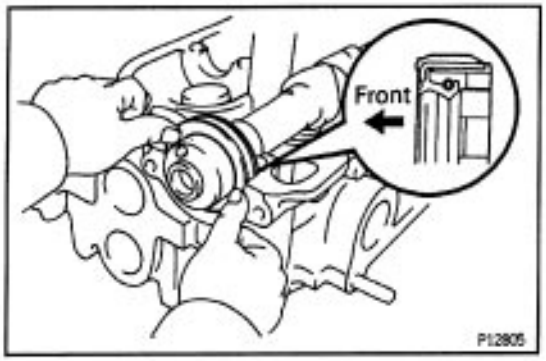
(g) Remove the service bolt

C. Install exhaust camshaft of LH cylinder head
(a) Apply MP grease to the thrust portion of the cam–shaft.
(b) Place the intake camshaft at 90®angle of timing mark (1 dot mark) on the cylinder head.

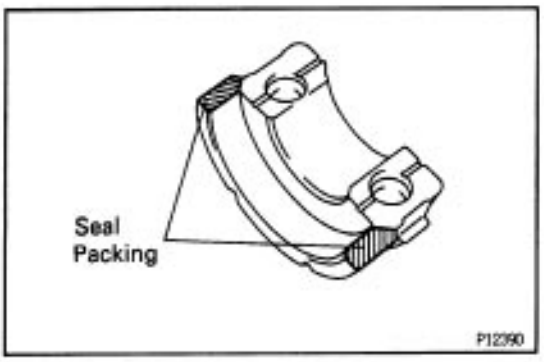




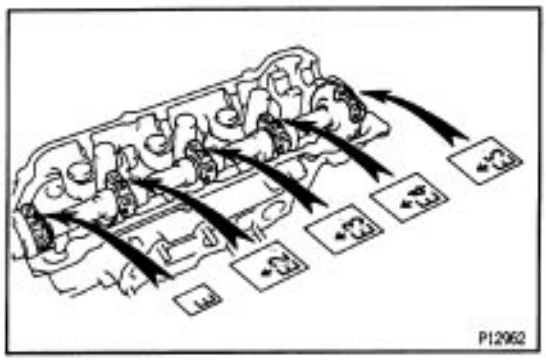
(c) Apply MP grease to a new oil seal lip.



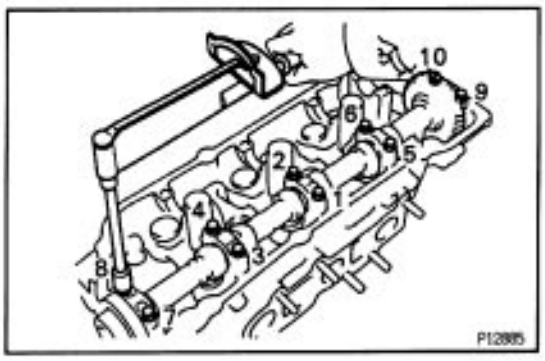
(d) Install the oil seal to the camshaft.



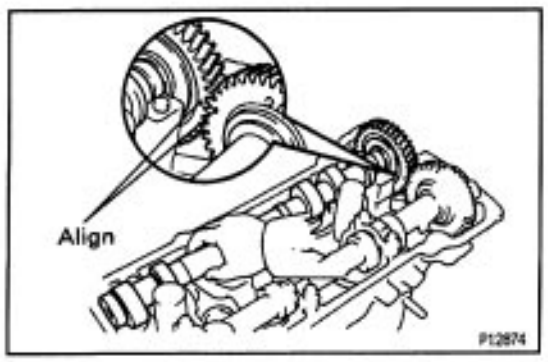
(e) Remove any old packing (FIPG) material.
(f) Apply seal packing to the No. 1 bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent



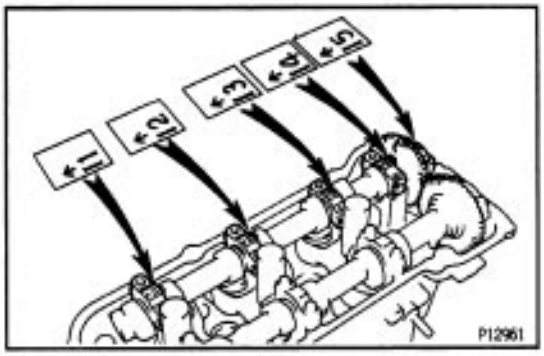
(g) Install the 5 bearing caps in their proper locations.



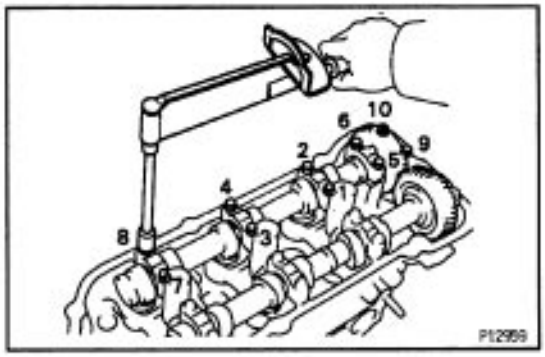
(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)



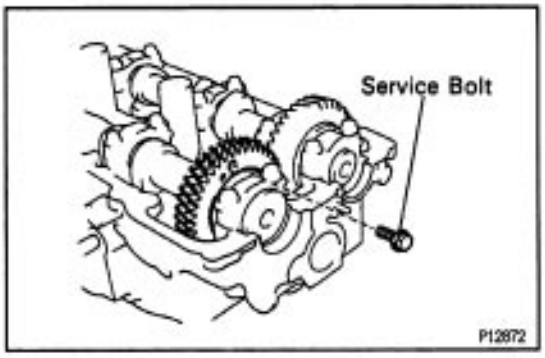
D. Install intake camshaft of LH cylinder head
(a) Apply MP grease to the thrust portion of the cam–shaft.
(b) Align the timing marks (1 dot mark) of the camshaft drive and driven gears.
(c) Place the intake camshaft on the cylinder head.



(d) Install the 5 bearing caps in their proper locations.

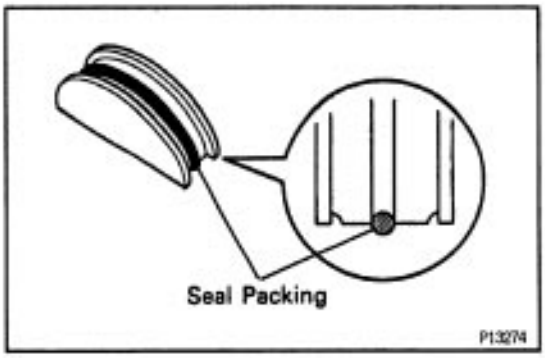


(e) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.
(f) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)

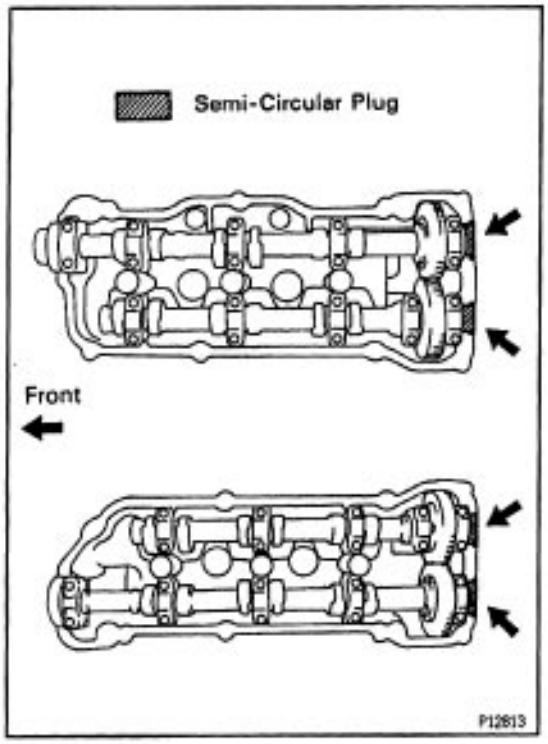


(g) Remove the service bolt.

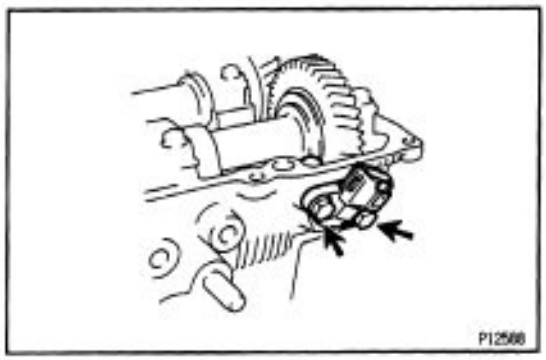
4. CHECK AND ADJUST VALVE CLEARANCE
(See steps 17 to 19 on pages EG2–18 **to 23)**
Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.
Valve clearance (Cold):
Intake
0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust
0.25–0.35mm(0.010–0.014in.)



6. INSTALL SEMI–CIRCULAR PLUGS
(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the semi–circular plug grooves,
Seal packing:
Part No. 08826–00080 or equivalent



(c) Install the 4 semi–circular plugs to the cylinder heads.

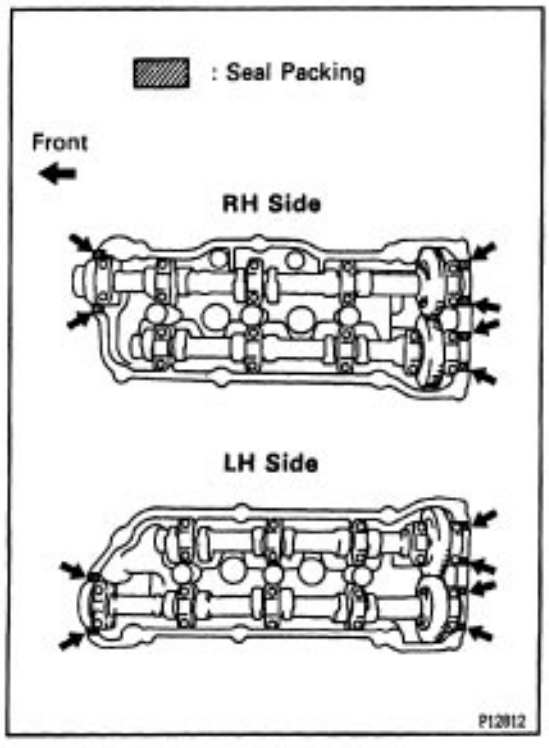


6. INSTALL CAMSHAFT POSITION SENSOR

(a) Install a new gasket to the position sensor.

(b) Install the positron sensor with the bolt.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

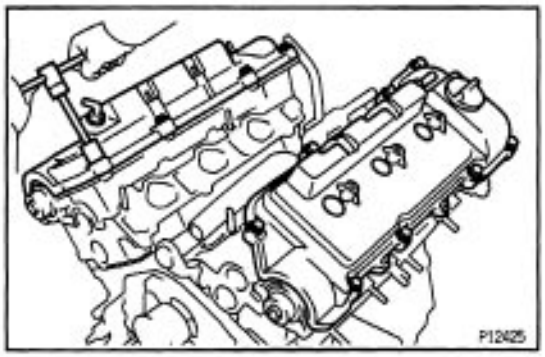


7. INSTALL CYLINDER HEAD COVERS

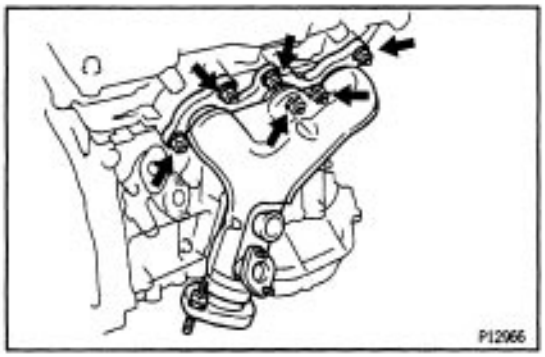
(a) Apply seal packing to the cylinder heads as shown in the illustration.

Seal packing:

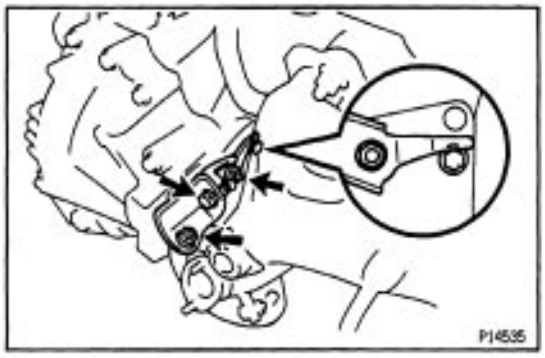
Part No. 08826–00080 or equivalent



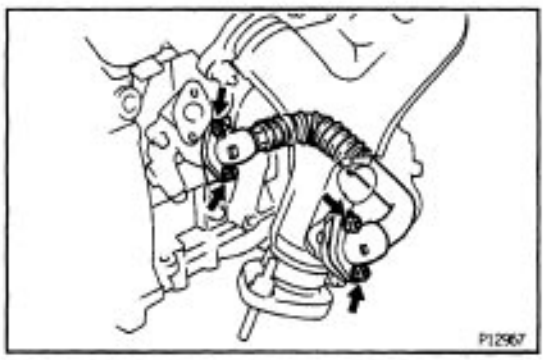
(b) Install the gasket to the cylinder head cover.
(c) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



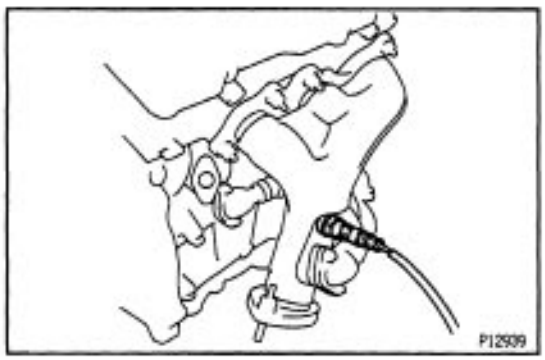
8. INSTALL RH EXHAUST MANIFOLD
(a) Install a new gasket and the exhaust manifold with the 6 nuts.
Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



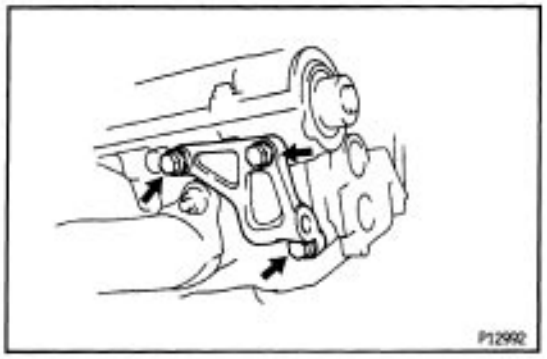
(b) Install the exhaust manifold stay and plate with the bolt and 2 nuts.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)
HINT: Install the manifold stay so that the tip of the stay touches the head of the differential retainer installation bolt as shown in the illustration.



(c) Install 2 new gaskets and the EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



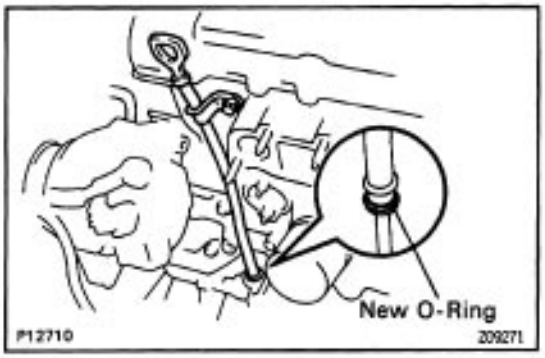
(d) Install the main heated oxygen sensor (Bank 1 Sensor 1).
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)



9. INSTALL PS BRACKET

Install the PS bracket with the 3 bolts.

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



10. INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring to the dipstick guide.

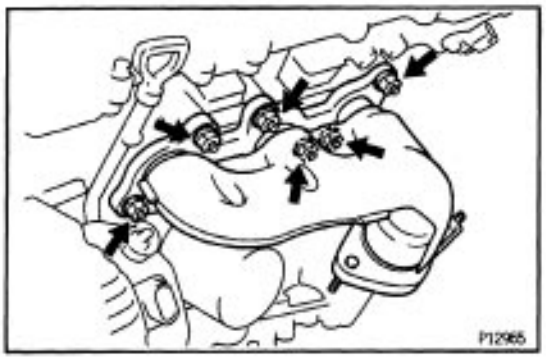
(b) Apply soapy water to the 0– ring.

(c) Push in the dipstick guide end into the guide hole of the No. 1 oil pan.

(d) Install the dipstick guide with the bolt.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

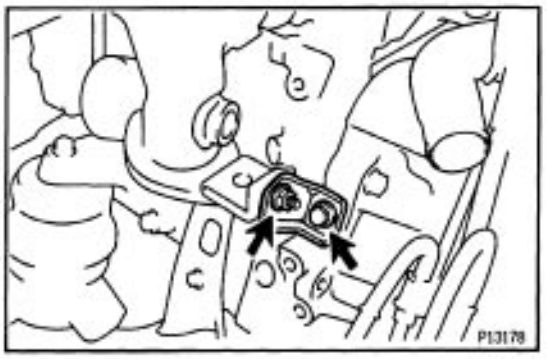
(e) Install the dipstick.



11. INSTALL LH EXHAUST MANIFOLD

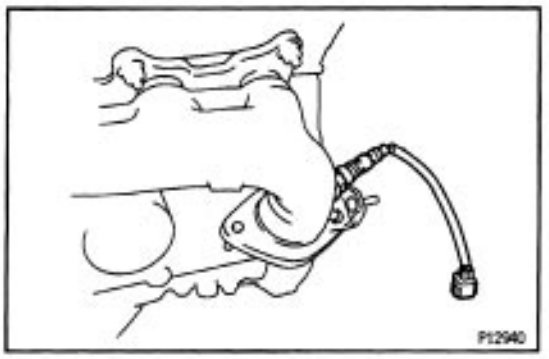
(a) Install a new gasket and the exhaust manifold with the 6 nuts.

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



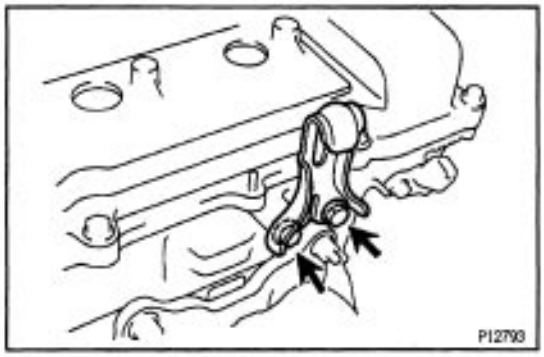
(b) Install the exhaust main manifold stay with the bolt and nut.

Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



(c) Install the main heated oxygen sensor (Bank 2 Sensor 1).

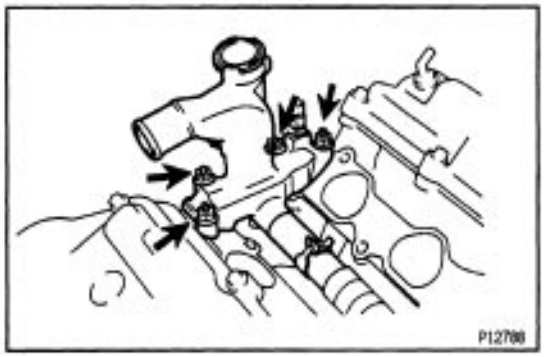
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)



12. INSTALL No.2 ENGINE HANGER

Install the engine hanger with the 2 bolts.

Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



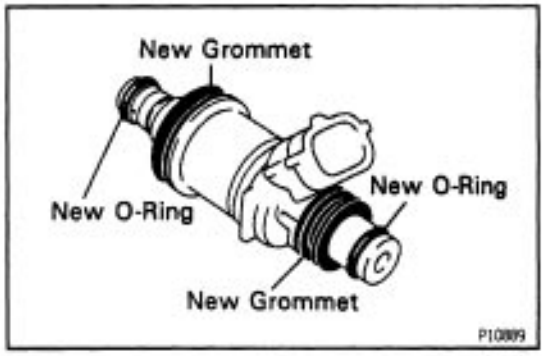
13. INSTALL WATER OUTLET

(a) Connect the water outlet to the bypass hose.

(b) Install 2 new gaskets and the water outlet with the 2 bolts, 2 nuts and 2 plate washers.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

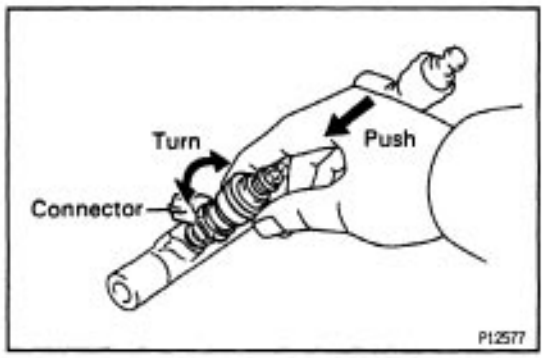
NOTICE: Do not scratch the seal surface of the water outlet with the stud bolt.



14. INSTALL INJECTORS AND DELIVERY PIPES

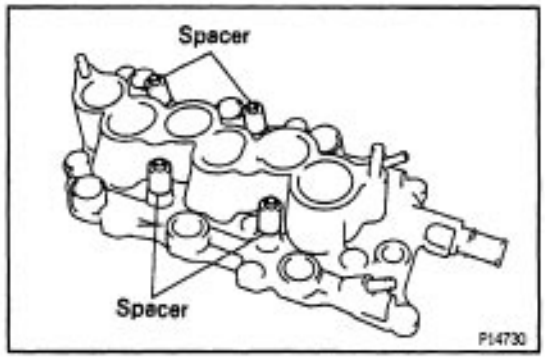
(a) Install 2 new grommets to each injector.

(b) Apply a light coat of gasoline to 2 new 0–rings and install them to each injector.

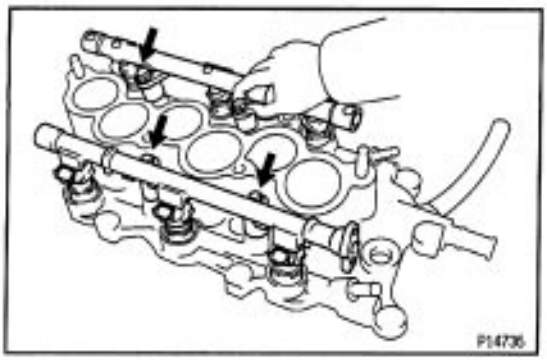


(c) While turning the injector clockwise and counter–clockwise, push it to the delivery pipes. Install the 6 injectors.

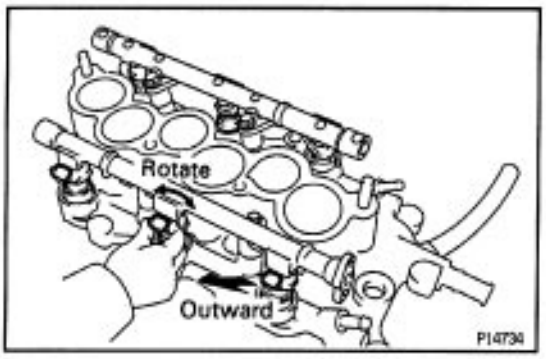
(d) Position the injector connector outward.



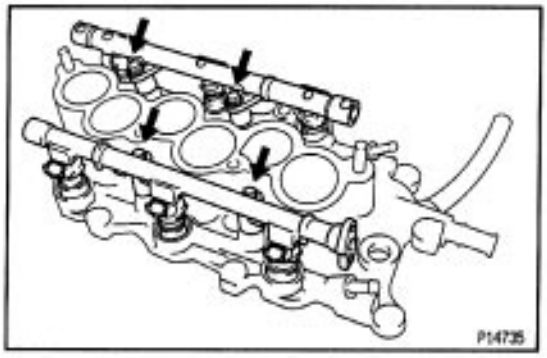
(e) Place the 4 spacers in position on the intake manifold.



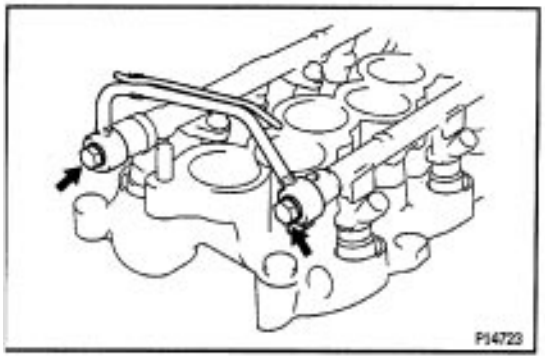
(f) Place the delivery pipes together with the 6 injectors in position on the intake manifold.
(g) Temporarily install the 4 bolts holding the delivery pipes to the intake manifold.



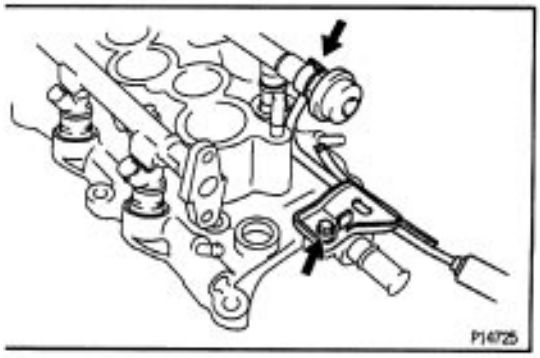
(h) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.
(i) Position the injector connector outward.



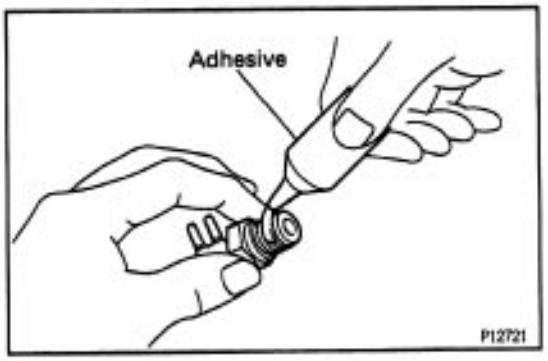
(j) Tighten the 4 bolts holding the delivery pipes to the intake manifold.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



15. INSTALL No.2 FUEL PIPE
Install the No.2 fuel pipe with the 2 union bolts and 4 gaskets.
Torque: 32.5 N–m (330 kgf–cm, 24 ft–lbf)



16. INSTALL NO.1 FUEL PIPE AND PULSATION DAMPER
Install the No.1 fuel pipe with the pulsation damper, 4 new gaskets and bolt.
Torque: 32.5 N–m (330 kgf–cm, 24 ft–lbf) for Pulsation damper
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf) for Bolt

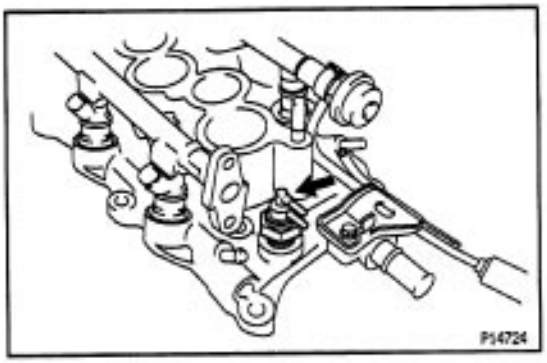


17. INSTALL TVV

(a) Apply adhesive to 2 or 3 threads.

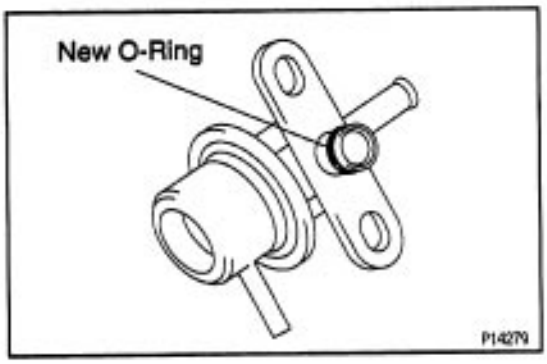
Adhesive:

Part No. 08833–00070, THREE BOND 1324 or equivalent



(b) Install the TVV.

Torque: 30 N–m (305 kgf–cm, 22 ft–lbf)



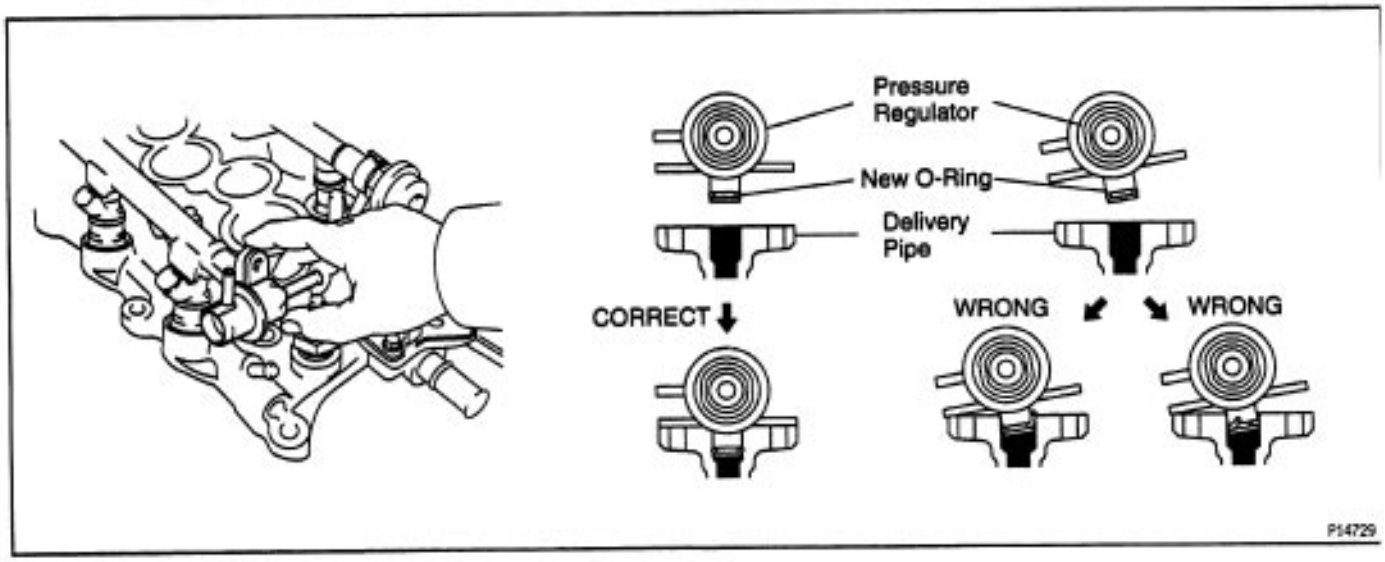
18. INSTALL FUEL PRESSURE REGULATOR

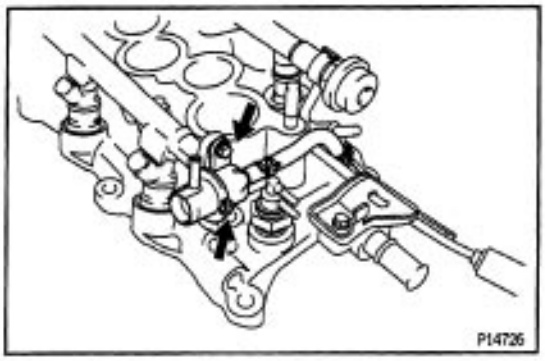
(a) Apply a light coat of gasoline to a new 0–ring, and install it to the pressure regulator.

(b) Attach the pressure regulator to the delivery pipe.

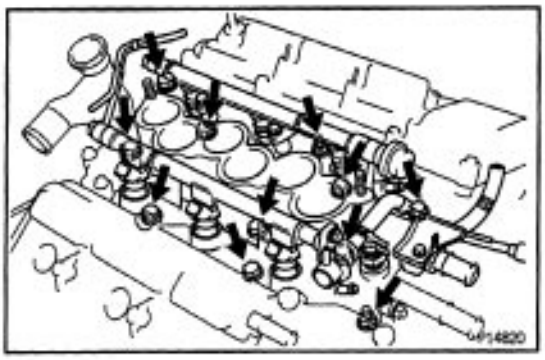
(c) Check that the pressure regulator rotates smoothly.

NOTICE: If it does not rotate smoothly, the O–ring may be pinched, so remove the pressure regulator and repeat steps (b) and (e) above.

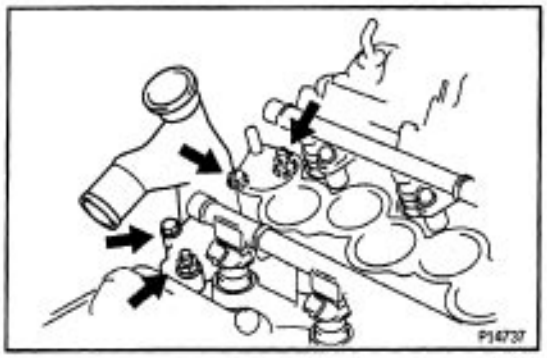




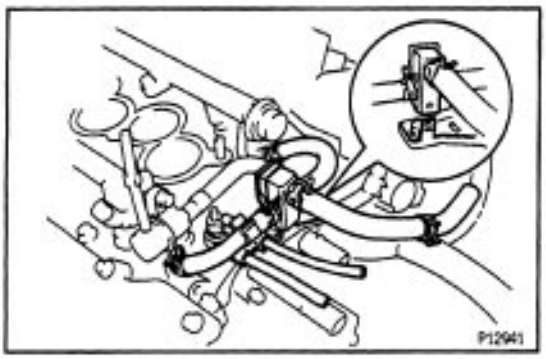
(d) Install the pressure regulator with the 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



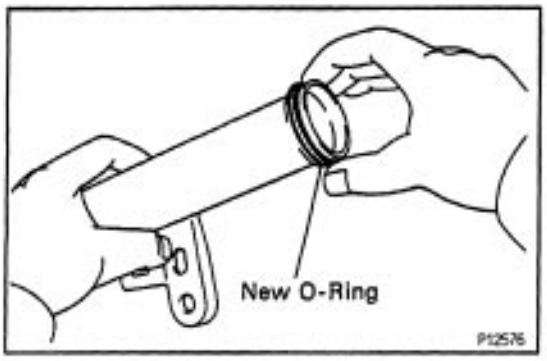
19. INSTALL INTAKE MANIFOLD
Install the intake manifold with the 9 bolts, 2 nuts and 2 plate washers.
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)



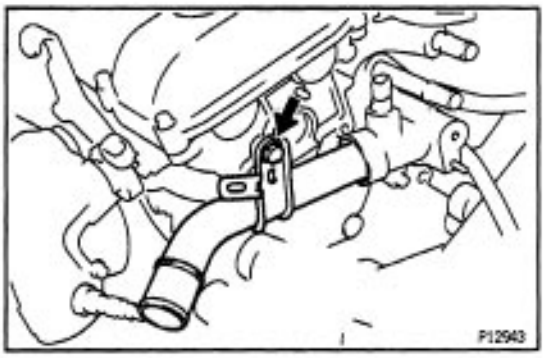
20. RETIGHTEN WATER OUTLET MOUNTING BOLTS AND NUTS
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)



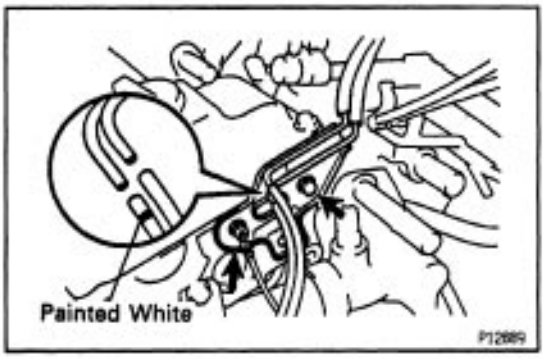
21. INSTALL AIR ASSIST HOSE



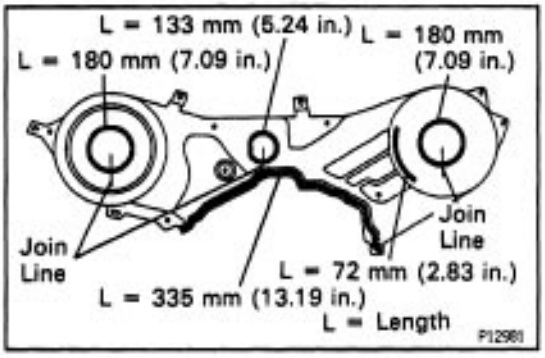
22. INSTALL WATER INLET PIPE
(a) Install a new O–ring to the water inlet pipe.
(b) Apply soapy water to the O–ring.



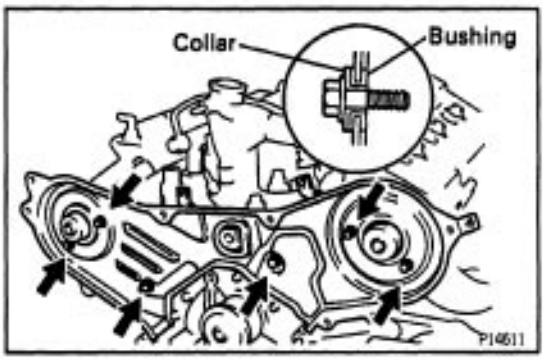
(c) Connect the water inlet pipe to the water inlet.
(d) Install the bolt holding the water inlet pipe to the cylinder head.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



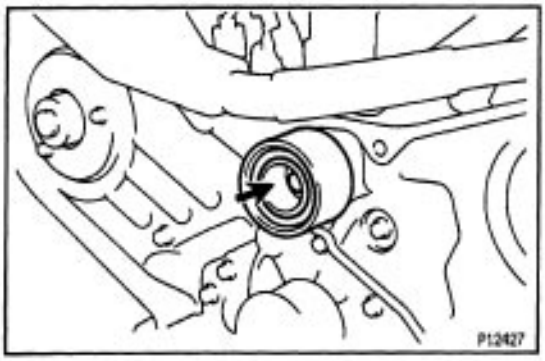
23. INSTALL CYLINDER HEAD REAR PLATE
(a) Install the rear plate and grand strap with the bolt and nut.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)
(b) Connect the vacuum hose to the air intake chamber.
(c) Connect the 2 vacuum hoses to the vacuum tank.



24. INSTALL NO–3 TIMING BELT COVER
(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.
If the gaskets do have cracks or peeling etc., replace them using following steps.
(1) Using a screwdriver and gasket scraper, remove all the old gasket material.
(2) Thoroughly clean all components to remove all the loose material.
(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.
NOTICE: When joining gaskets, do not leave a gap between them. Cut off any excess gasket.
(4) After installing the gasket, press down on it so that the adhesive firmly sticks to the belt cover.
(b) Install new gaskets to the No.3 belt cover.

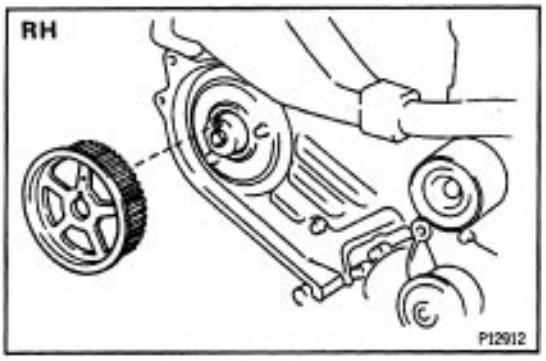


(c) Install the belt cover with the 6 bolts.
Torque: 8.5 N–m (85 kgf–cm, 74 in–lbf)



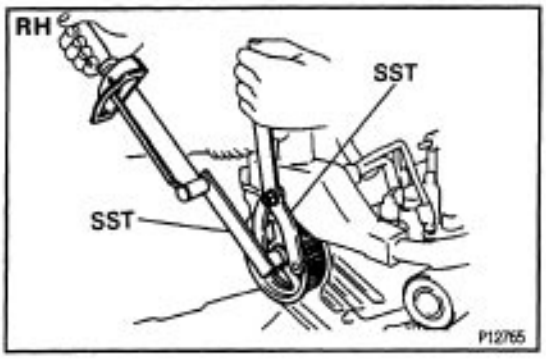
25. INSTALL NO.2 IDLER PULLEY

(a) Install the idler pulley with the bolt.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)
(b) Check that the idler pulley moves smoothly.

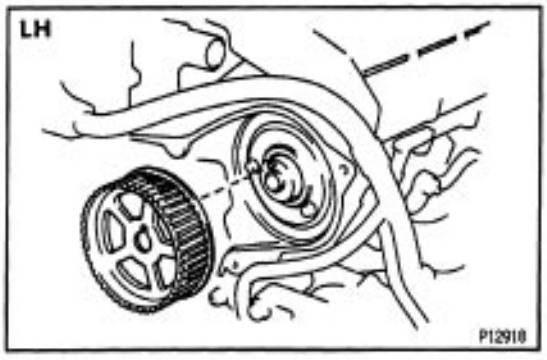


26. INSTALL RH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side outward.
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

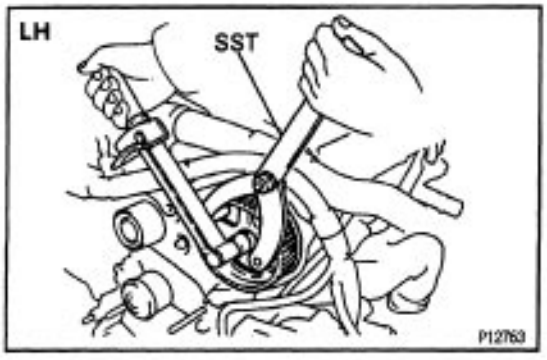


(c) Using SST, install and torque the bolt.
SST 09249–63010, 09960–10010 (09962–01000)
Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.)



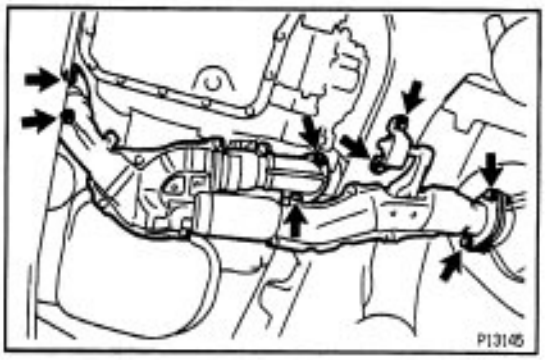
27. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side inward.
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

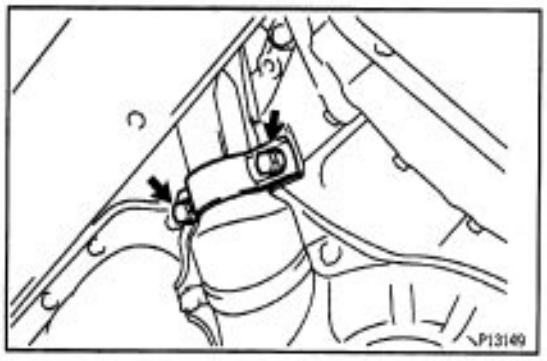


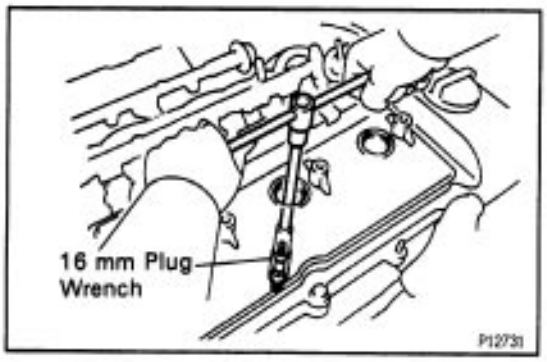
(d) Using SST, install and torque the bolt.
SST 09960–10010 (09962–01000)
Torque: 125 N–m (1,300 kgf–cm, 94 ft–lbf)

28. INSTALL TIMING BELT
(See steps 6 to 27 on pages EG2–51 to 66)

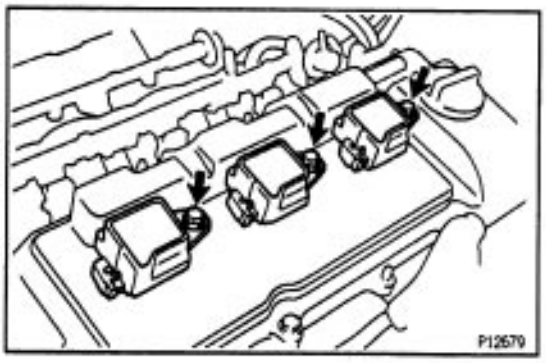


29. INSTALL FRONT EXHAUST PIPE
(a) Temporarily install 3 new gaskets and the front ex–haust pipe with the 2 bolts and 6 nuts.
(b) Tighten the 4 nuts holding the exhaust manifolds to the front exhaust pipe.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(c) Tighten the 2 bolts and 2 nuts holding the three–way catalytic converter to the front exhaust pipe.
Torque: 56 N–m (570 kgf–cm, 41 ft–lbf)
(d) Connect the bracket with the 2 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
(e) Connect the front exhaust pipe clamp with the 2 bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

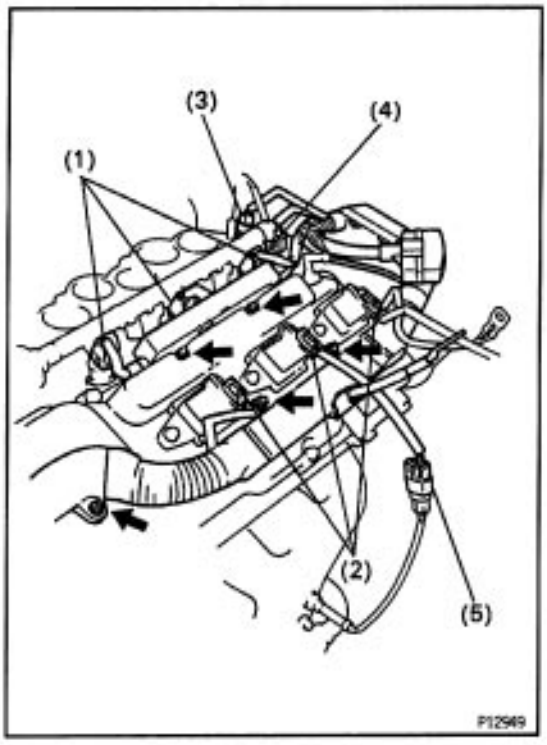




30. INSTALL SPARK PLUGS
Using a 16 mm plug wrench, install the6 spark plugs to the RH and LH cylinder heads.



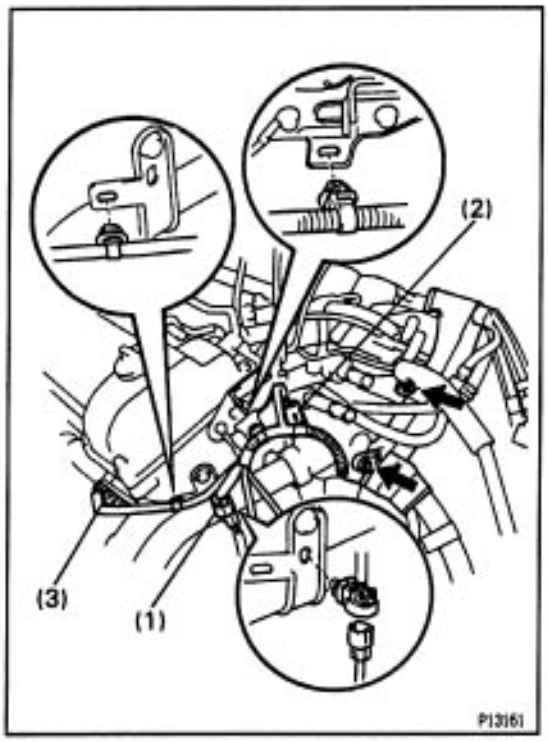
31. INSTALL IGNITION COILS
Install the6 ignition coils to the RH and LH cylinder heads.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



32. CONNECT ENGINE WIRE TO ENGINE RH SIDE

(a) Connect the following connectors:
- (1) 3 injector connectors
- (2) 3 ignition coil connectors
- (3) Water temperature sender gauge connector
- (4) Water temperature sensor connector
- (5) RH oxygens sensor connector

(b) Connect the engine wire with the 5 nuts.

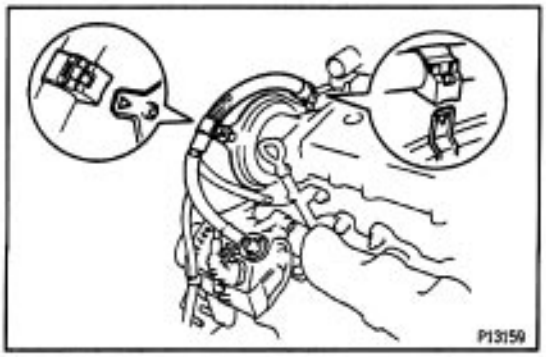


33. CONNECT ENGINE WIRE TO ENGINE REAR SIDE

(a) Connect the following connectors:
- (1) LH oxygen sensor
- (2) Engine coolant temperature sensor
- (3) Camshaft position sensor

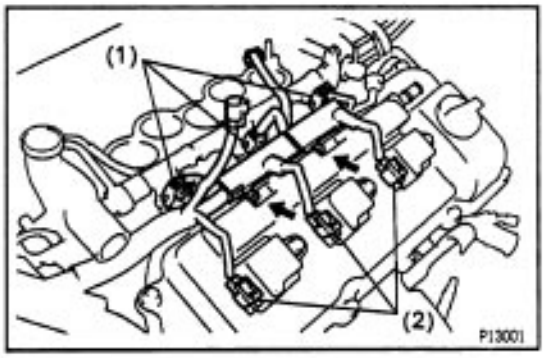
(b) Connect the 3 clamps.

(c) Connect the engine wire with the 2 nuts.



34. CONNECT ENGINE WIRE TO N0.3 TIMING BELT COVER

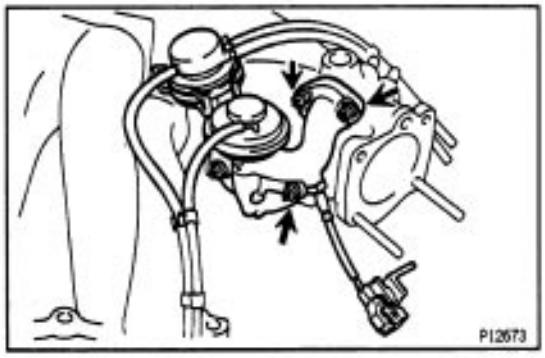
Connect the engine wire with the 2 clamps.



35. CONNECT ENGINE WIRE TO ENGINE LH SIDE

(a) Connect the following connectors:
  (1) 3 injector connectors
  (2) 3 ignition coil connectors

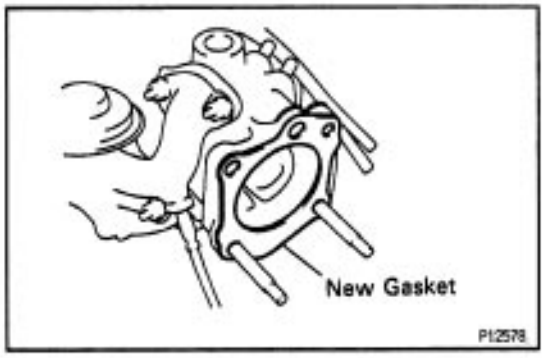
(b) Connect the engine wire with the 2 nuts.



36. INSTALL EGR VALVE AND VACUUM MODULATOR TO AIR INTAKE CHAMBER

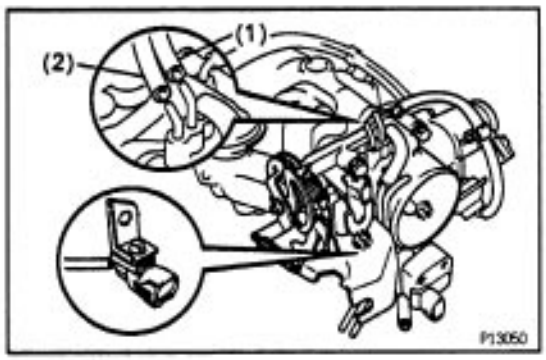
Install a new gasket, the EGR valve and vacuum mod–ulator with the 3 nuts.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



37. INSTALL THROTTLE BODY TO AIR INTAKE CHAMBER

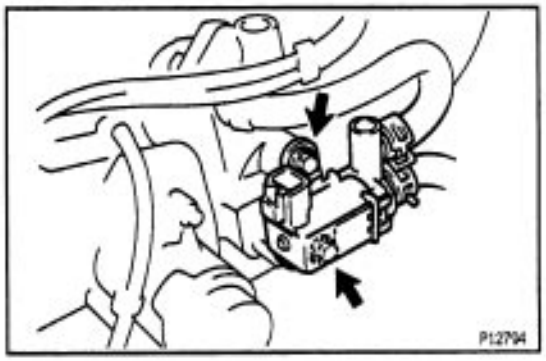
(a) Place a new gasket on the air intake chamber.



(b) Install the throttle body with the 2 bolts and 2 nuts.

Torque: 19.5 N–m (200 kgf–cm. 14 ft–lbf)

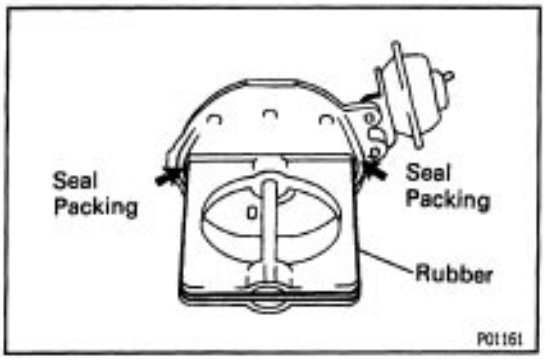
(c) Connect the following vacuum hoses:
  (1) Vacuum hose to P port of EGR vacuum modula–tor
  (2) Vacuum hose to R port of EGR vacuum modula–tor



38. INSTALL A/C IDLE–UP VSV TO AIR INTAKE CHAMBER

(a) Install the A/C idle–up VSV with the 2 bolts.

(b) Connect the air hose.



39. INSTALL INTAKE AIR CONTROL VALVE TO AIR INTAKE CHAMBER

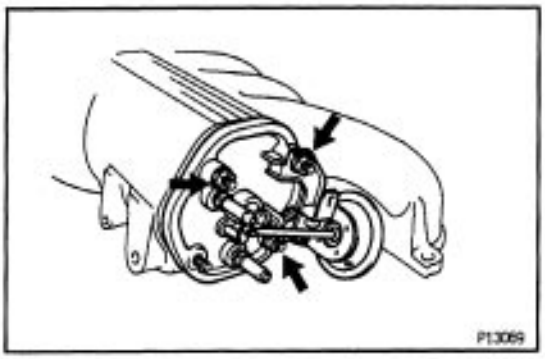
(a) Install a new gasket to the air intake chamber.

(b) Apply a light coat of engine oil to the rubber portions.

(c) Apply seal packing to the positions of the intake air control valve as shown in the illustration.

Seal packing:

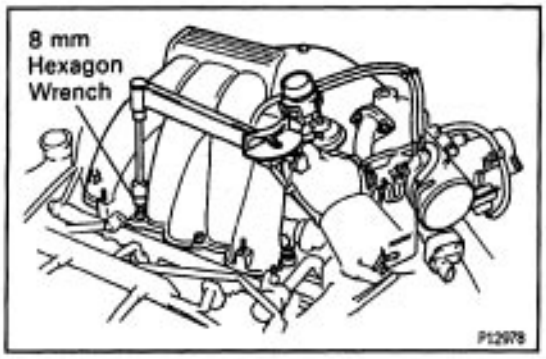
Part No. 08826–00080 or equivalent



(d) Install the intake air control valve and data link connector 1 clamp with the 3 nuts.

Torque: 14.5 N–m (145 kgf–cm, 10 ft–lbf)

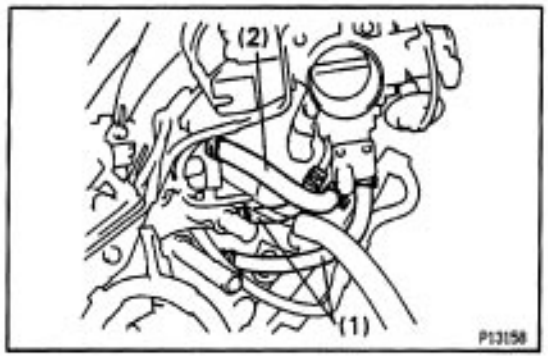
(d) Connect the A/C air hose.



40. INSTALL AIR INTAKE CHAMBER

(a) Using an 8 mm hexagon wrench, install a new gasket and the air intake chamber with the 2 bolts and 2 nuts.

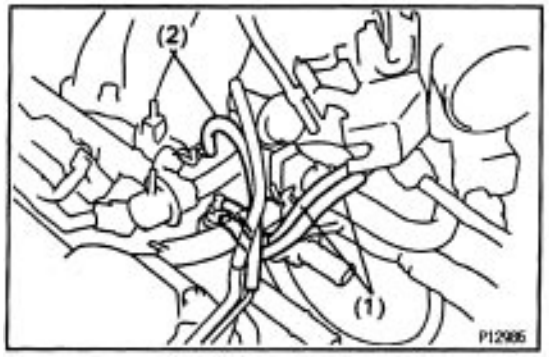
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



(b) Connect the following hoses:

(1) 2 water bypass hoses

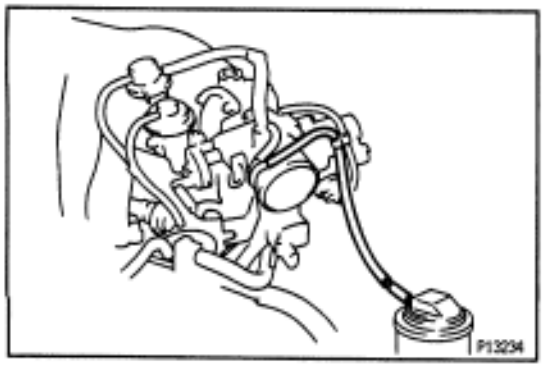
(2) Air assist hose



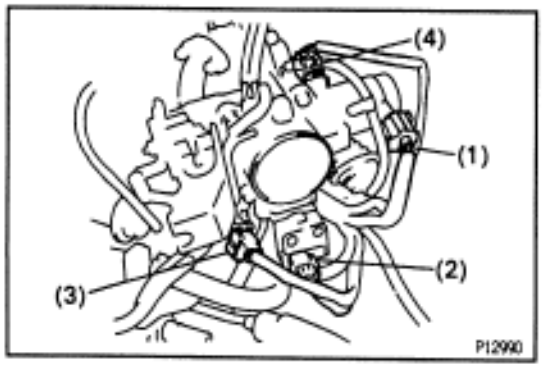
(c) Connect the following vacuum hoses:

(1) 2 vacuum hoses to TVV

(2) Vacuum hose to cylinder head rear plate

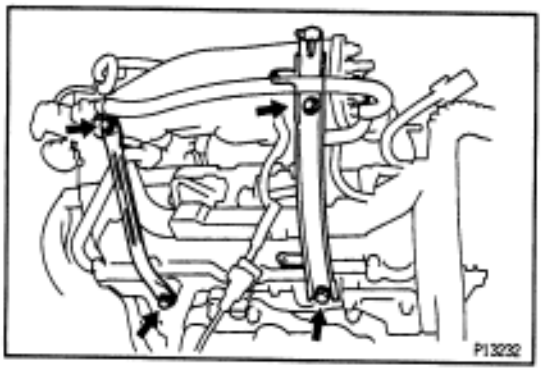


(3) Vacuum hose to charcoal canister

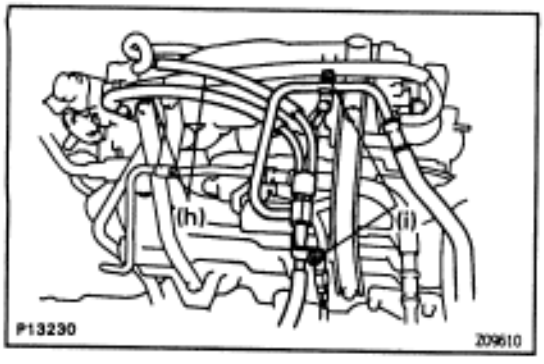


(d) Connect the following connectors:
(1) Throttle position sensor connector
(2) IAC valve connector
(3) EGR gas temperature sensor connector
(4) A/C idle–up connector

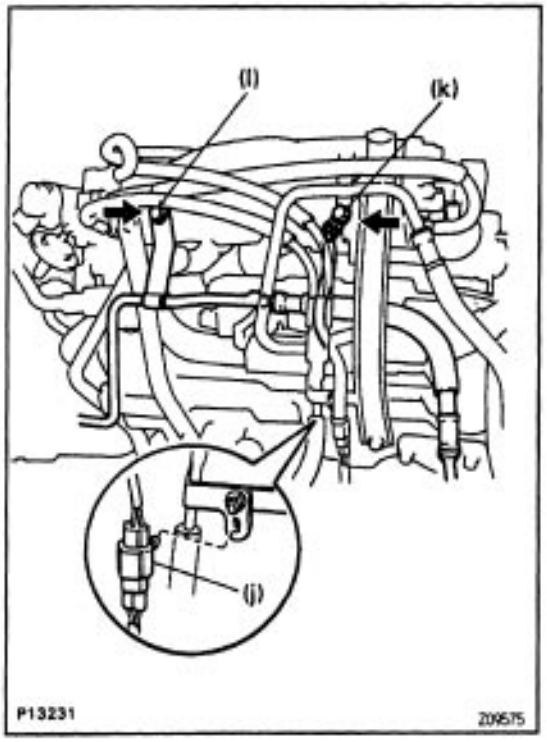
(e) Install 2 new gaskets and EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



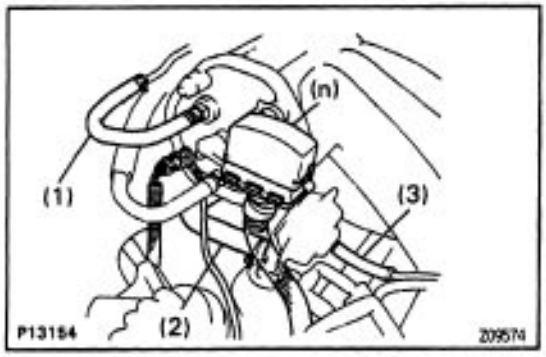
(f) Install the No.1 engine hanger with the 2 bolts.
Torque: 39 N–m (400 kgf–cm, 19 ft–lbf)
(g) Install the air intake chamber stay with the 2 bolts.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



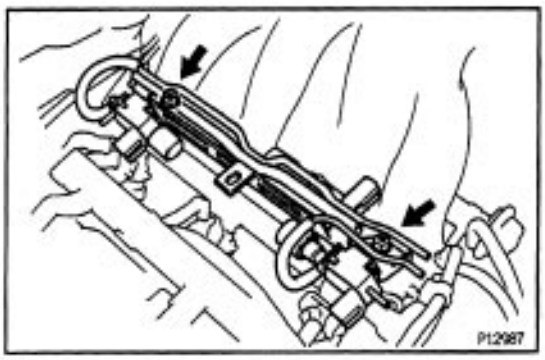
(h) Connect the 2 PS air hoses.
(i) Connect the PS pressure tube with the 2 nuts.



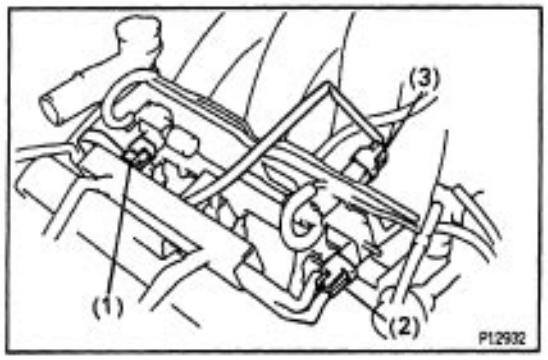
(j) Connect the RH oxygen sensor connector clamp to the PS pressure tube.
(k) Connect the ground strap with the bolt.
(l) Connect the hydraulic pressure pipe to the air intake chamber with the bolt.



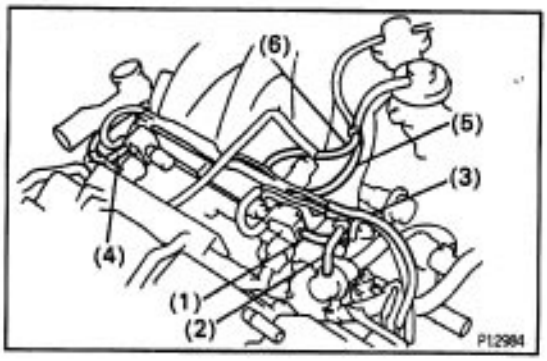
(m) Connect the following hoses:
  (1) Brake booster vacuum hose
  (2) PCV hose
(3) Intake air control valve vacuum hose
(n) Connect the data link connector 1.
(o) Connect the 2 ground straps with the nut.
Torque: 14.5 N–m (145 kgf–cm, 10 ft–lbf)



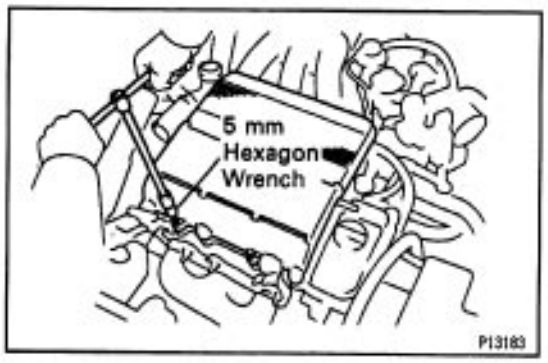
41. INSTALL EMISSION CONTROL VALVE SET
(a) Install the emission control valve set with the 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



(b) Connect the following connectors:
  (1) Intake air control connector
  (2) Fuel pressure connector
  (3) EGR VSV connector

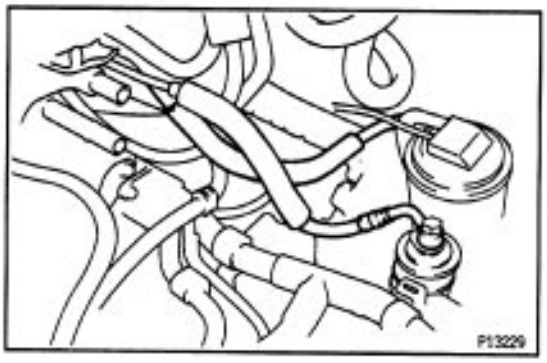


(c) Connect the following vacuum hoses:
(1) Vacuum hose to fuel pressure control VSV
(2) Vacuum hose to fuel pressure regulator
(3) Vacuum hose to cylinder head rear plate
(4) Vacuum hose to intake air control valve VSV
(5) Vacuum hose to EGR vacuum modulator
(6) Vacuum hose to EGR valve

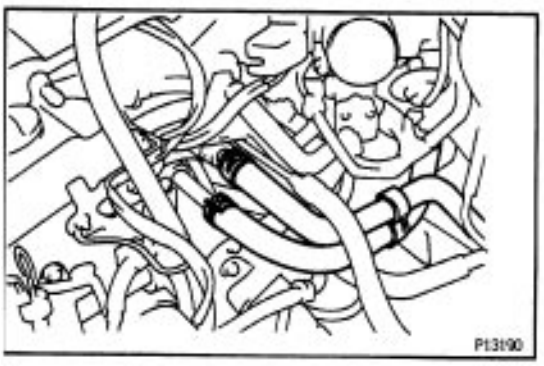


42. INSTALL V–BANK COVER
Using a 5 mm hexagon wrench, install the V–bank cover with the 2 nuts.

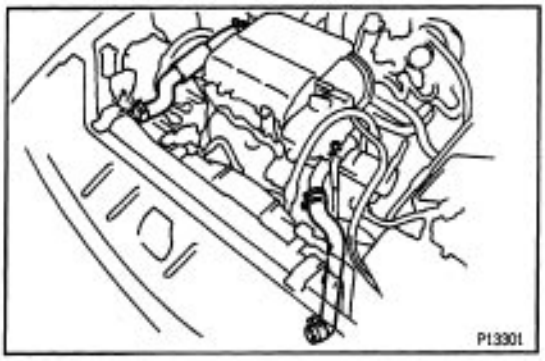
43. CONNECT PRESSURE HOSE TO HYDRAULIC MOTOR
Connect the pressure hose to the water inlet.



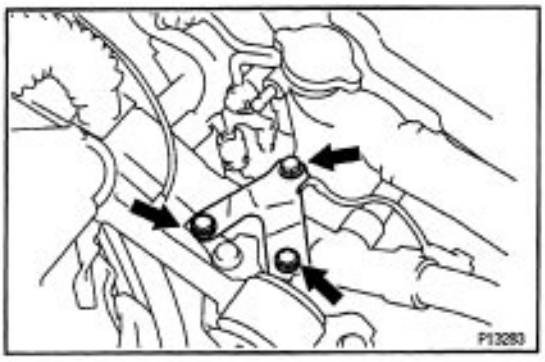
44. CONNECT FUEL HOSES
(a) Connect the fuel return hose to the fuel pipe.
(b) Connect the fuel inlet hose to the fuel filter.
Torque: 30 N–m (300 kgf–cm, 22 ft–lbf)



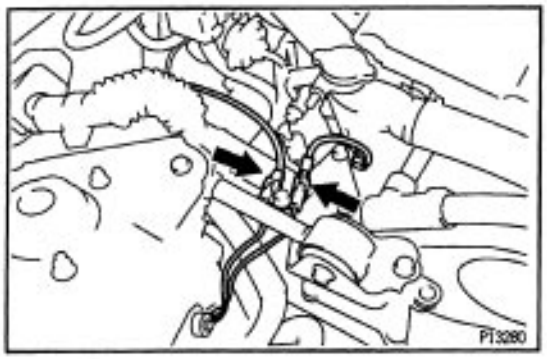
45. CONNECT HEATER HOSES
Connect the 2 hoses.



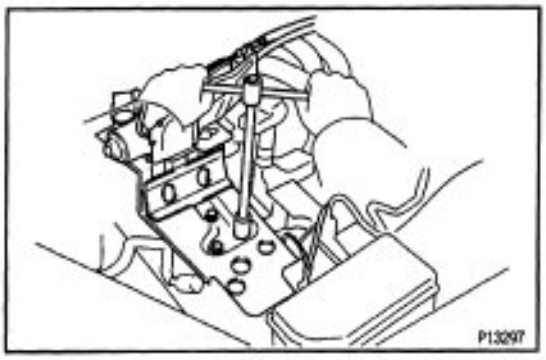
46. CONNECT RADIATOR HOSES
Connect the 2 hoses.



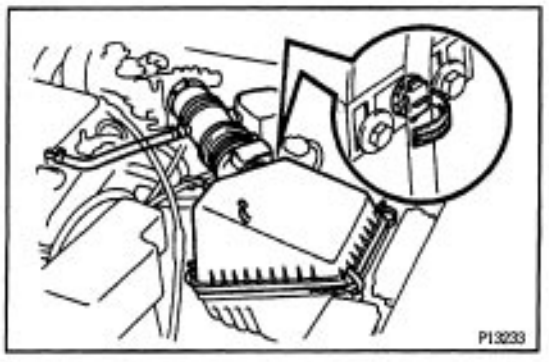
47. INSTALL RH ENGINE MOUNTING STAY
Install the mounting stay with the 3 bolts.
Torque: 31.4 N–m (320 kgf–cm, 23 ft–lbf)



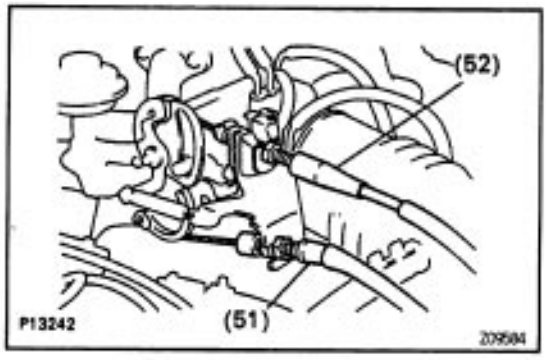
48. CONNECT GROUND STRAPS
Connect the 2 straps.



49. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR
(a) Connect the actuator and bracket with the 3 bolts.
(b) Connect the actuator connector and clamp.
(c) Install the actuator cover with the bolt and clip.

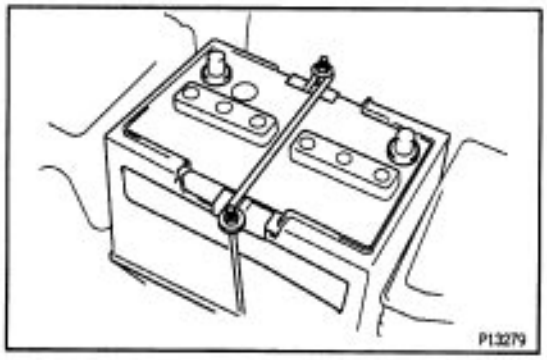


50. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE
(a) Connect the air cleaner hose, and install the air clean–er cap and volume air flow meter with the 4 clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the PCV hose.
(d) Connect the accelerator cable clamp.
(e) Connect the volume air flow meter connector and wire clamp.



51. CONNECT THROTTLE CABLE
52. CONNECT ACCELERATOR CABLE

53. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp. qts)

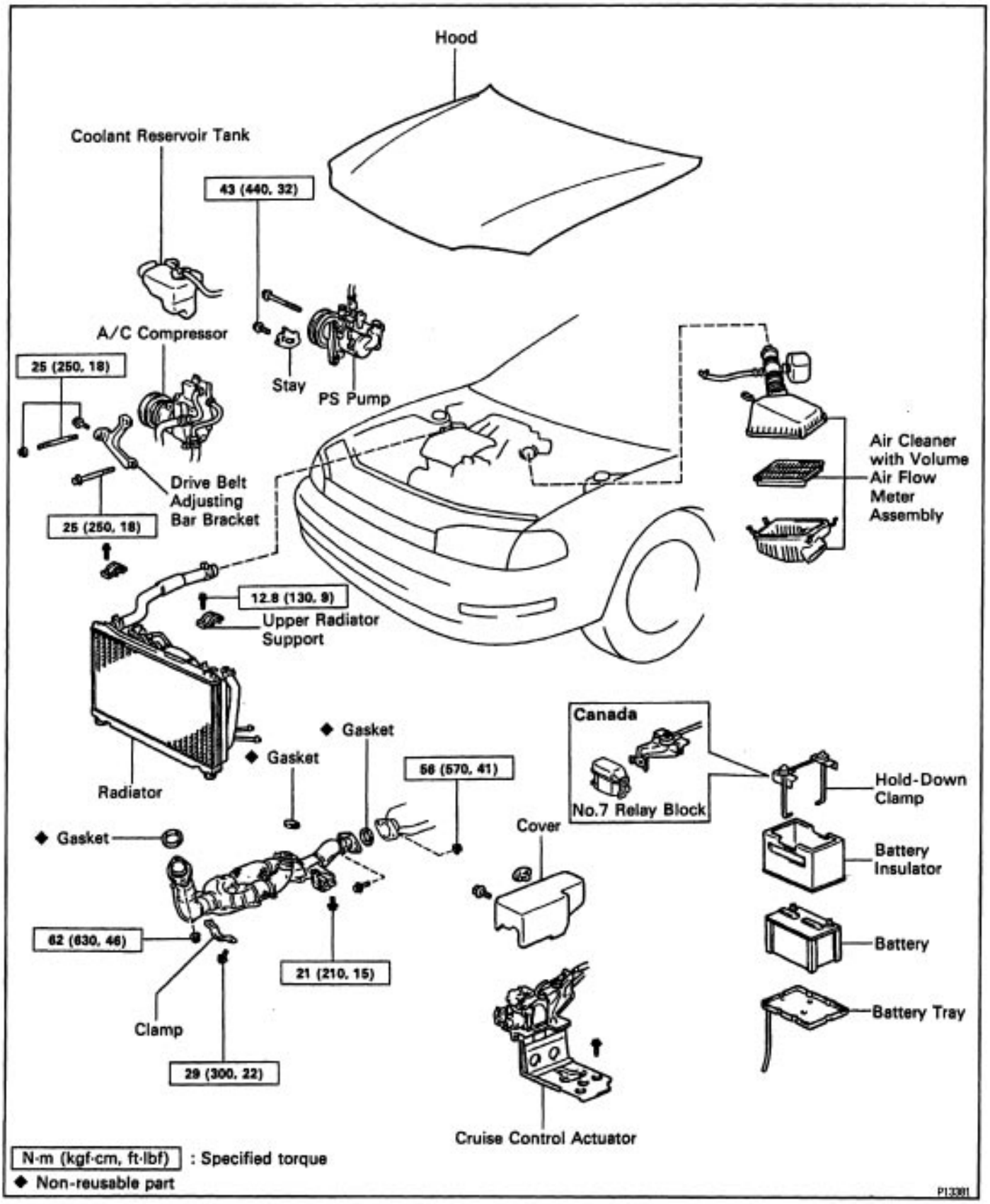


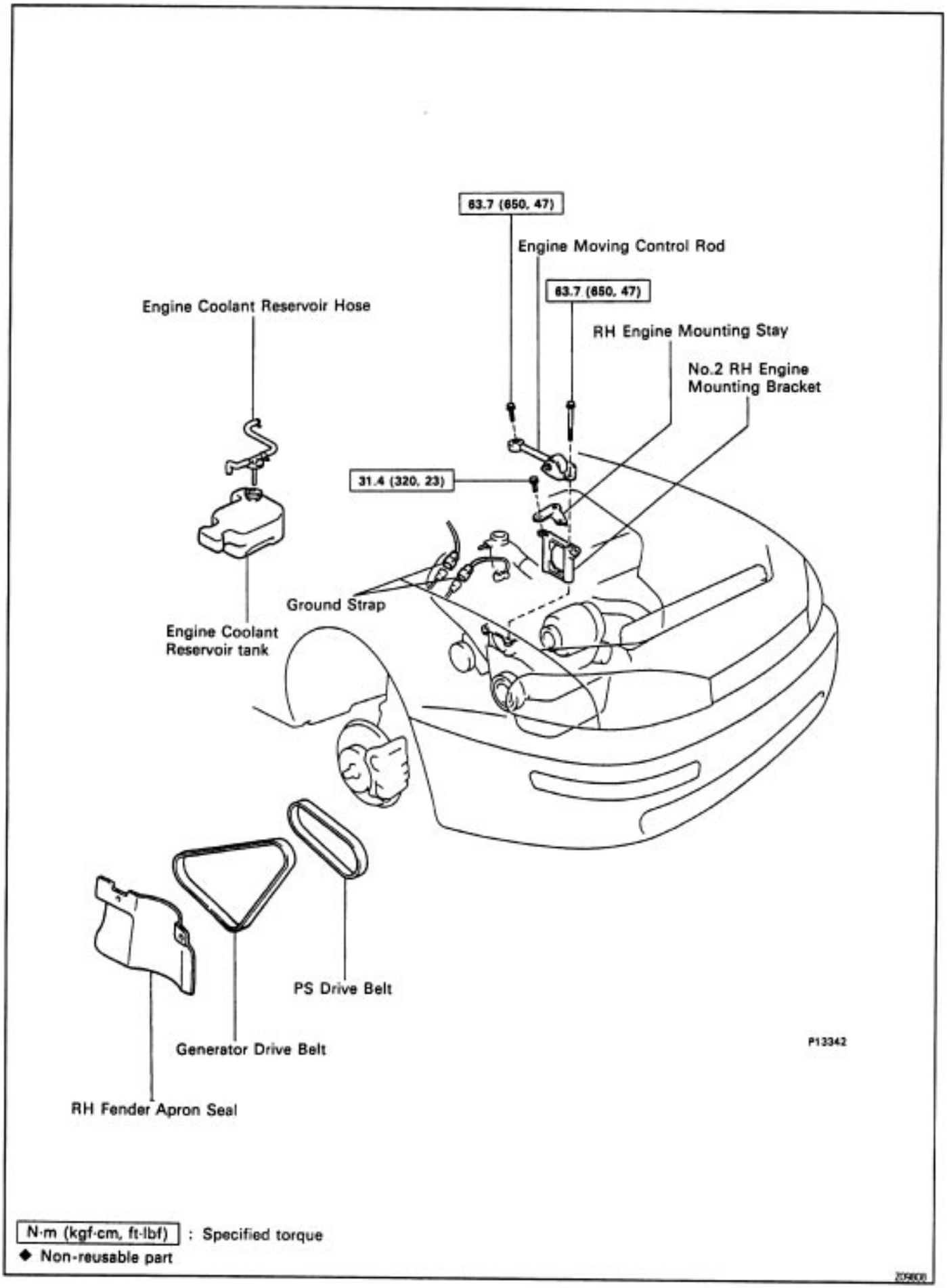
54. INSTALL BATTERY TRAY AND BATTERY

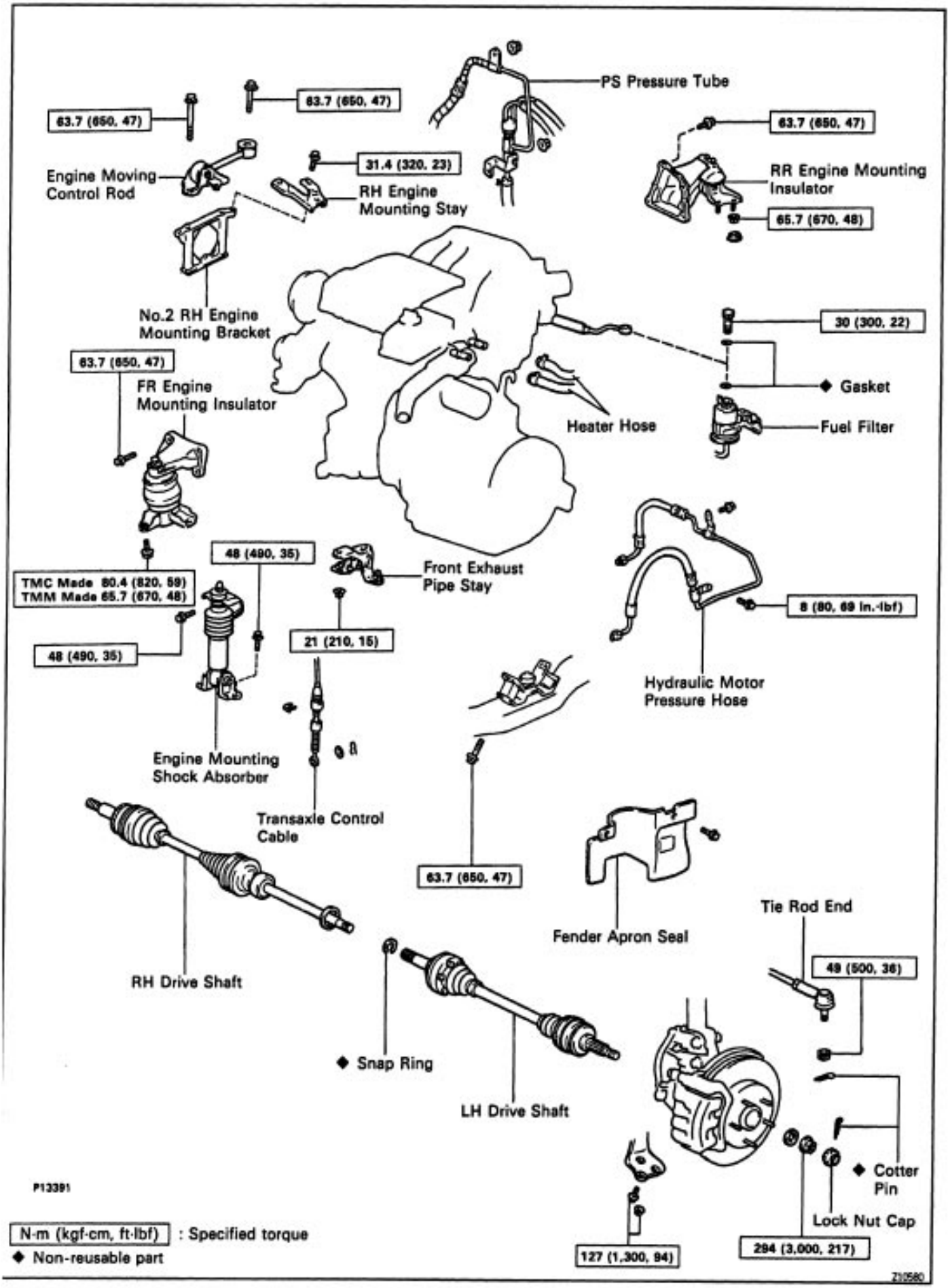
55. START ENGINE AND CHECK FOR LEAKS
56. PERFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
57. RECHECK ENGINE COOLANT LEVEL

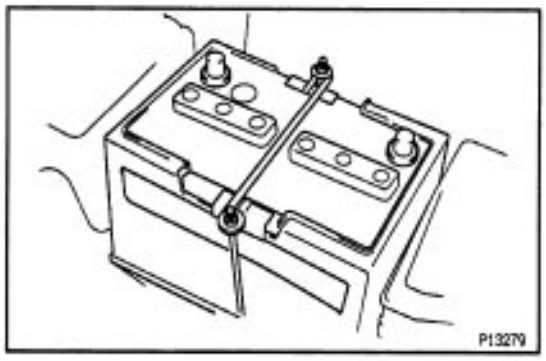
CYLINDER BLOCK

COMPONENTS FOR ENGINE REMOVAL AND INSTALLATION




63.7 (650, 47)
Engine Moving Control Rod
63.7 (650, 47)
Engine Coolant Reservoir Hose
RH Engine Mounting Stay
No.2 RH Engine Mounting Bracket
31.4 (320, 23)
Ground Strap
Engine Coolant Reservoir tank
PS Drive Belt
Generator Drive Belt
RH Fender Apron Seal
P13342
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part


PS Pressure Tube
63.7 (650, 47)
63.7 (650, 47)
63.7 (650, 47)
Engine Moving Control Rod
31.4 (320, 23)
RH Engine Mounting Stay
RR Engine Mounting Insulator
65.7 (670, 48)
No.2 RH Engine Mounting Bracket
30 (300, 22)
63.7 (650, 47)
FR Engine Mounting Insulator
◆ Gasket
Heater Hose
Fuel Filter
48 (490, 35)
Front Exhaust Pipe Stay
TMC Made 80.4 (820, 59)
TMM Made 65.7 (670, 48)
8 (80, 69 in.·lbf)
48 (490, 35)
21 (210, 15)
Hydraulic Motor Pressure Hose
Engine Mounting Shock Absorber
Transaxle Control Cable
63.7 (650, 47)
Fender Apron Seal
Tie Rod End
49 (500, 36)
RH Drive Shaft
◆ Snap Ring
LH Drive Shaft
◆ Cotter Pin
Lock Nut Cap
294 (3,000, 217)
127 (1,300, 94)
P13391
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
Z10580



ENGINE REMOVAL

(See Components for Engine Removal and Installation)

1. REMOVE BATTERY AND TRAY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

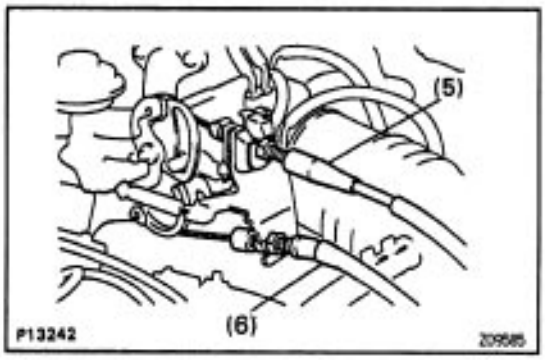
2. REMOVE HOOD

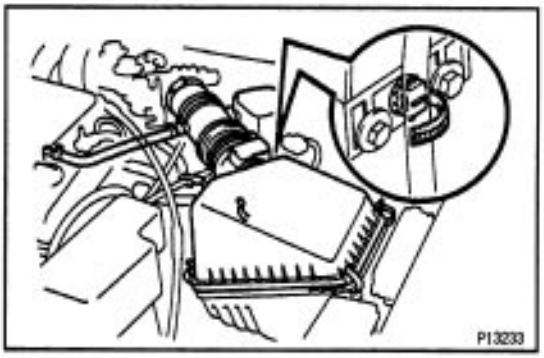
3. DRAIN ENGINE COOLANT

4. DRAIN ENGINE OIL

5. DISCONNECT ACCELERATOR CABLE

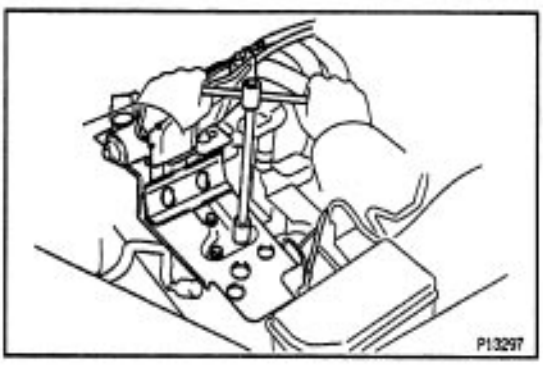
6. DISCONNECT THROTTLE CABLE





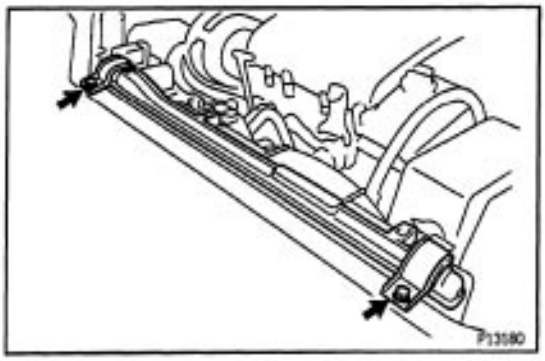
7. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector and wire clamp.
(b) Disconnect the accelerator cable clamp.
(c) Disconnect the PCV hose.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the 4 air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.
(g) Remove the element.
(h) Remove the 3 bolts and air cleaner case.



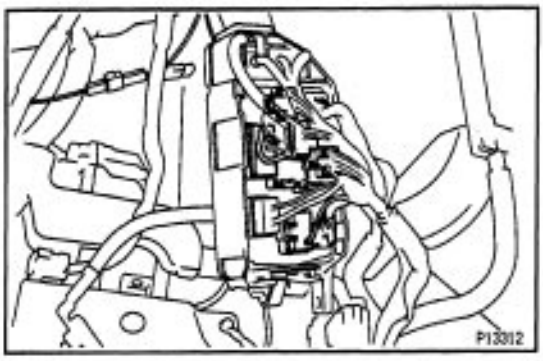
8. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the bolt, clip and actuator cover.
(b) Disconnect the actuator connector and clamp.
(c) Remove the 3 bolts, and disconnect the actuator with the bracket.



9. REMOVE RADIATOR

(See page EG2–336)

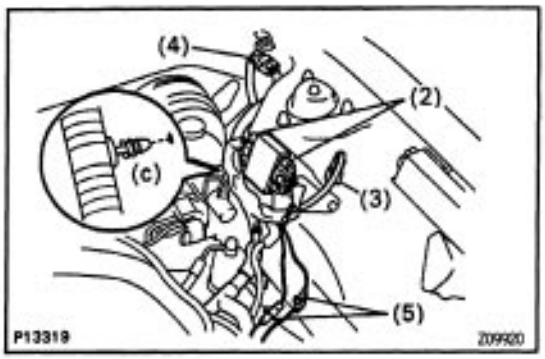


10. DISCONNECT ENGINE WIRE

(a) Remove the 2 bolts and disconnect the engine relay box.

(b) Disconnect the following wires and connectors:

(1) 5 connectors from relay box



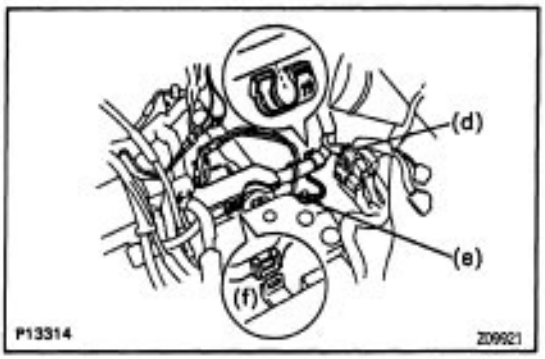
(2) 2 igniter connectors

(3) Noise filter connector

(4) Connector from LH fender apron

(5) 2 ground straps

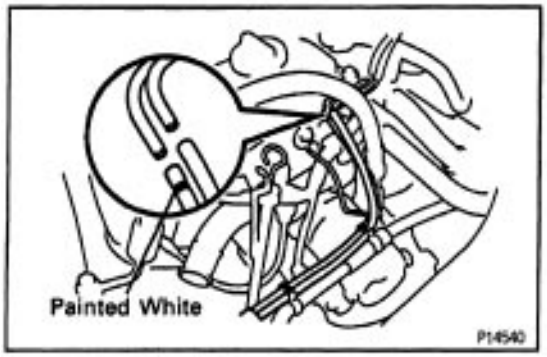
(c) Disconnect the wire clamp.



(d) Disconnect the connector from the LH fender apron.

(e) Remove the bolt and disconnect the ground strap.

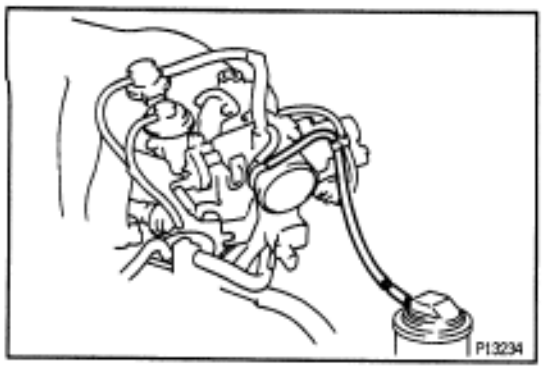
(f) Disconnect the wire clamp.



11. DISCONNECT VACUUM HOSES

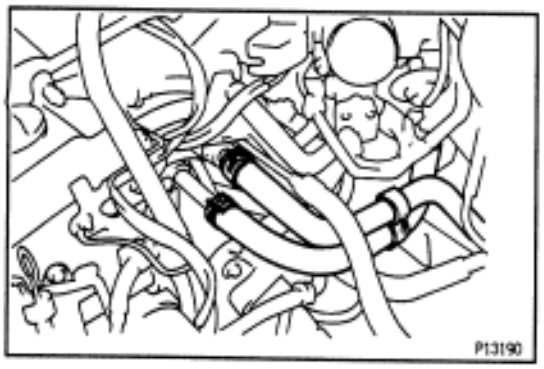
Disconnect the following vacuum hoses:

(1) Vacuum hoses from vacuum tank for intake air control valve

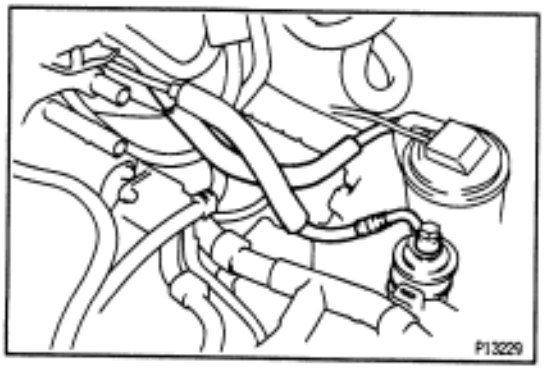


(2) Vacuum hose from charcoal canister

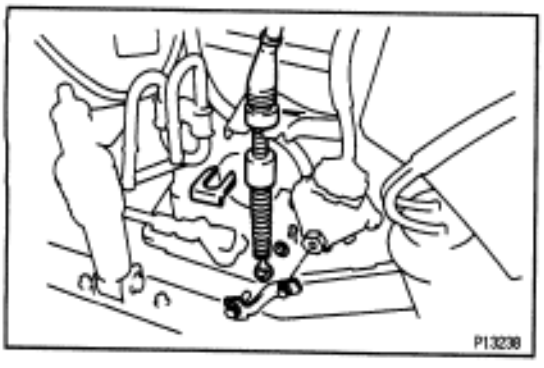
(3) Brake booster vacuum hose from air intake cha–mber



12. DISCONNECT HEATER HOSES
Disconnect the 2 hoses.



13. DISCONNECT FUEL HOSES
Disconnect the fuel inlet and return hoses.
CAUTION: Catch leaking fuel in a container.

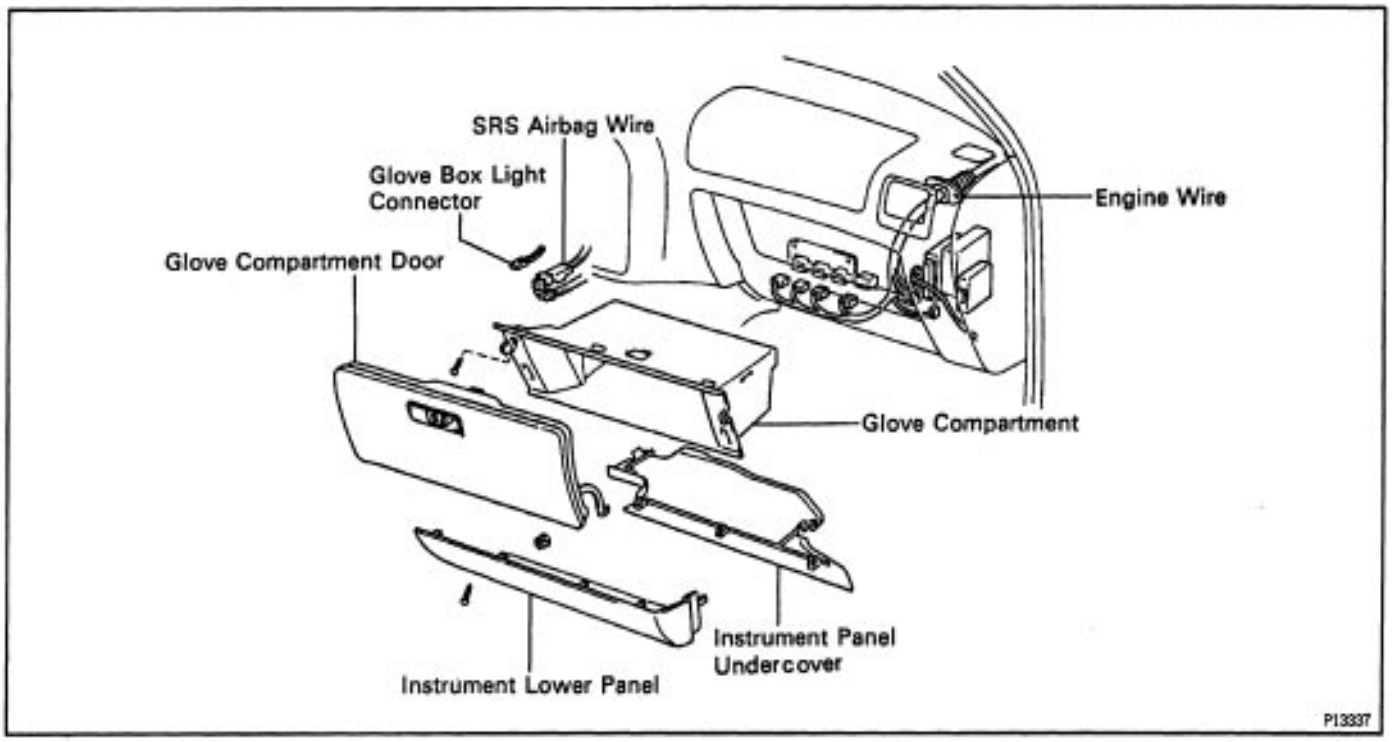


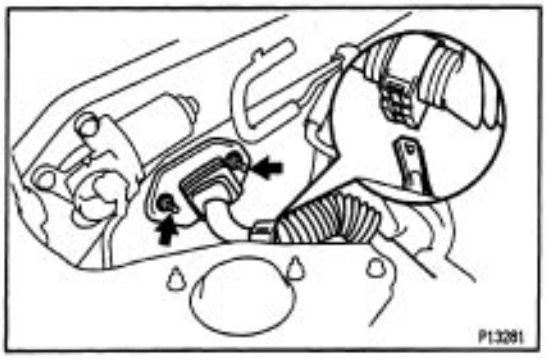
14. DISCONNECT TRANSAXLE CONTROL CABLE FROM TRANSAXLE

15. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove the following parts:
(1) Under cover
(2) Lower instrument panel
(3) Glove compartment door
(4) Glove compartment

(b) Disconnect the following connectors:
(1) 3 ECM connectors
(2) 5 cowl wire connectors
(3) Cooling fan ECU connector

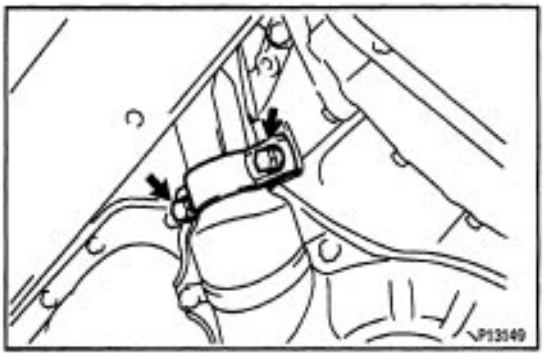




(c) Disconnect the wire clamp.
(d) Remove the 2 nuts, and pull out the engine wire from the cowl panel.

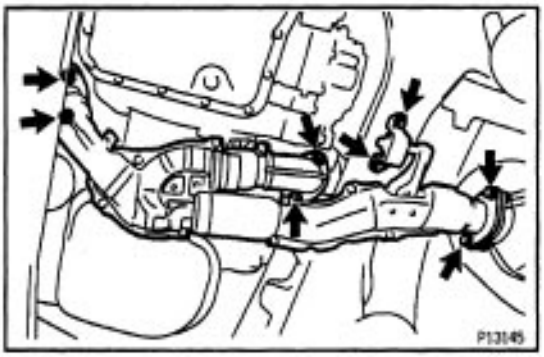
16. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

(a) Disconnect the A/C compressor connector.
(b) Remove the drive belt.
(c) Remove the 5 bolts and drive belt adjusting bar brack–et and, disconnect the A/C compressor.
HINT: Move the compressor aside and suspend it.



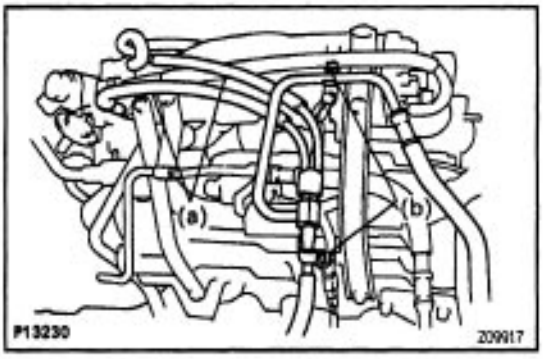
17. REMOVE FRONT EXHAUST PIPE

(a) Remove the 2 bolts and exhaust pipe clamp.



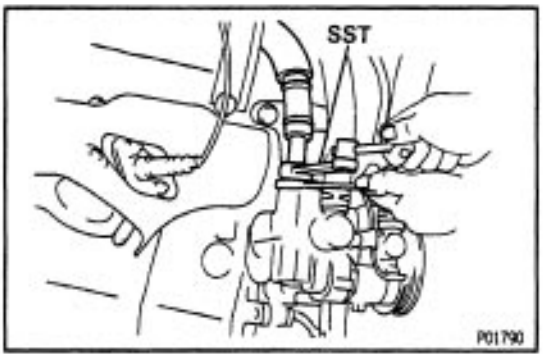
(b) Remove the 2 bolts, and disconnect the bracket.
(c) Remove the 2 bolts and 2 nuts holding the front exhaust pipe to the three–way catalytic converter.
(d) Remove the 4 nuts holding the front exhaust pipe to the exhaust manifolds.
(e) Remove the front exhaust pipe and 3 gaskets.

18. REMOVE DRIVE SHAFTS
(See SA section)



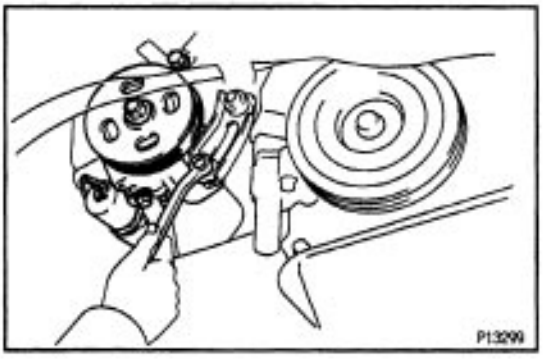
19. DISCONNECT PS PRESSURE TUBE

(a) Disconnect the 2 PS air hoses.
(b) Remove the 2 nuts and disconnect the PS pressure tube.



20. DISCONNECT HYDRAULIC COOLING FAN PRESSURE HOSE

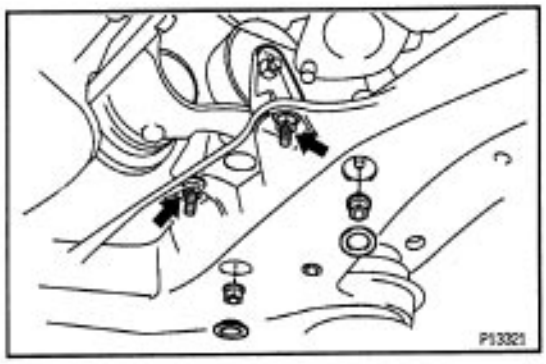
Using SST, disconnect the pressure hose.
SST 09631– 22020



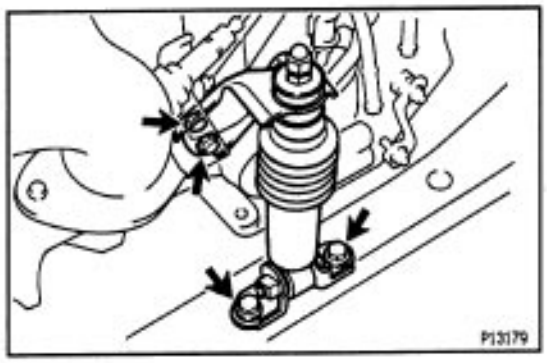
21. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Remove the PS drive belt.
(b) Remove the 2 bolts, and disconnect the PS pump from the engine.
HINT: Move the PS pump aside and suspend it.

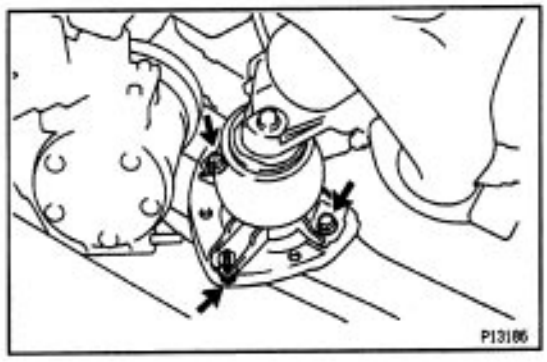
22. DISCONNECT LH ENGINE MOUNTING INSULATOR
Remove the 4 bolts, and disconnect the mounting insulator.



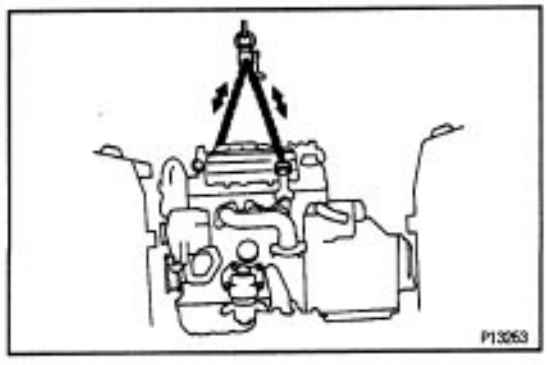
23. DISCONNECT RR ENGINE MOUNTING INSULATOR
(a) Remove the 2 hole plugs.
(b) Remove the 4 nuts, and disconnect the mounting insulator.



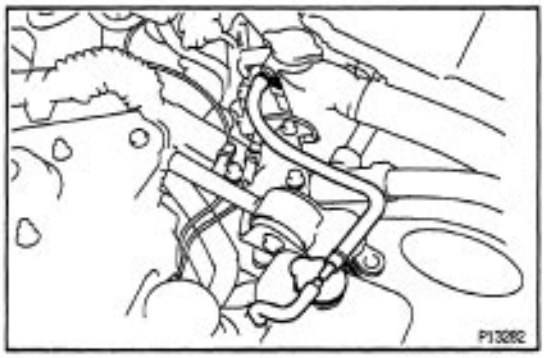
24. REMOVE ENGINE MOUNTING SHOCK ABSORBER
Remove the 4 bolts and engine mounting shock ab–sorber.



25. DISCONNECT FR ENGINE MOUNTING INSULATOR
Remove the 3 bolts, and disconnect the mounting insulator.

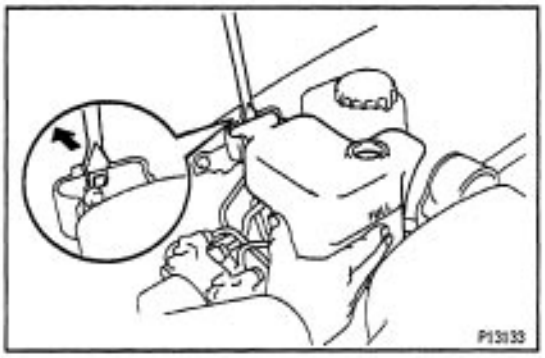


26. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS

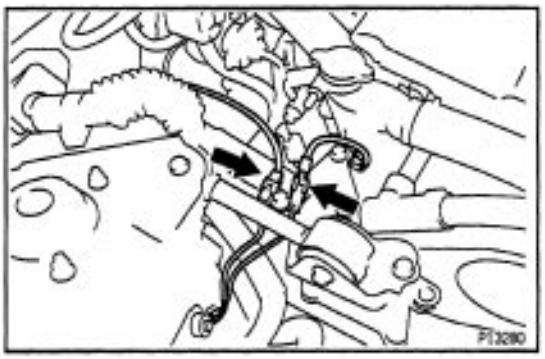


27. REMOVE COOLANT RESERVOIR TANK

(a) Disconnect the reservoir hose.

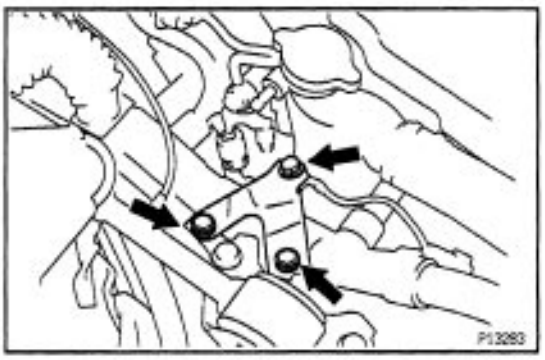


(b) Using a screwdriver, remove the reservoir tank.



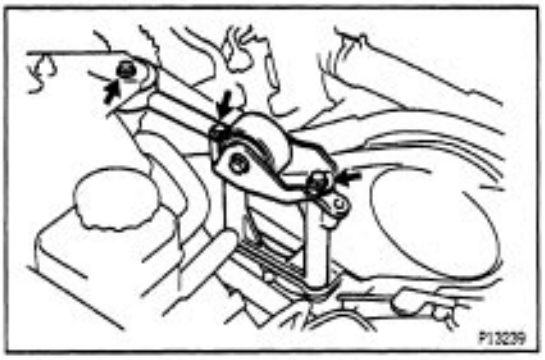
28. DISCONNECT GROUND STRAPS

Disconnect the 2 straps.



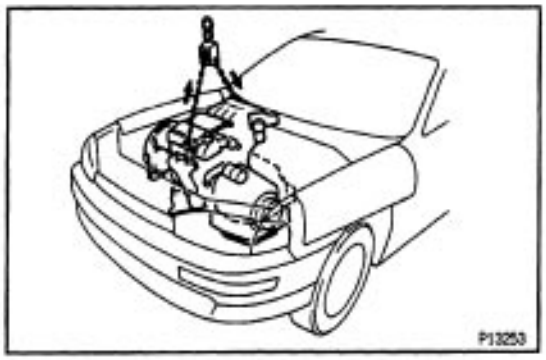
29. REMOVE RH ENGINE MOUNTING STAY

Remove the 3 bolts and RH engine mounting stay.



30. REMOVE ENGINE MOVING CONTROL ROD AND NO.2 RH ENGINE MOUNTING BRACKET

Remove the 3 bolts, control rod and mounting brack–et.



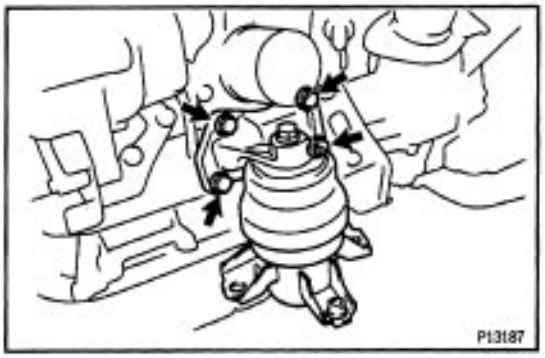
31. REMOVE ENGINE AND TRANSAXLE ASSEMBLY PROM VEHICLE

(a) Lift the engine out of the vehicle slowly and carefully.

NOTICE: Be careful not to hit the PS gear housing or park/neutral position switch.

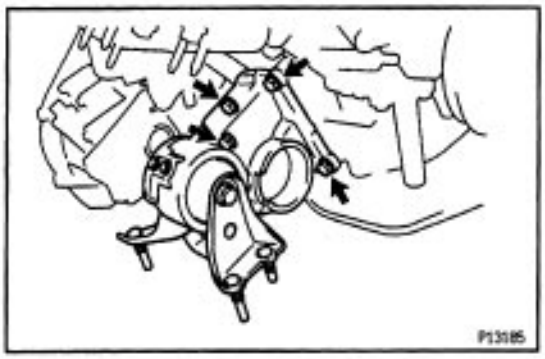
(b) Make sure the engine is clear of all wiring, hoses and cables.

(c) Place the engine and transaxle assembly onto the stand.



32. REMOVE FR ENGINE MOUNTING INSULATOR

Remove the 4 bolts and mounting insulator.



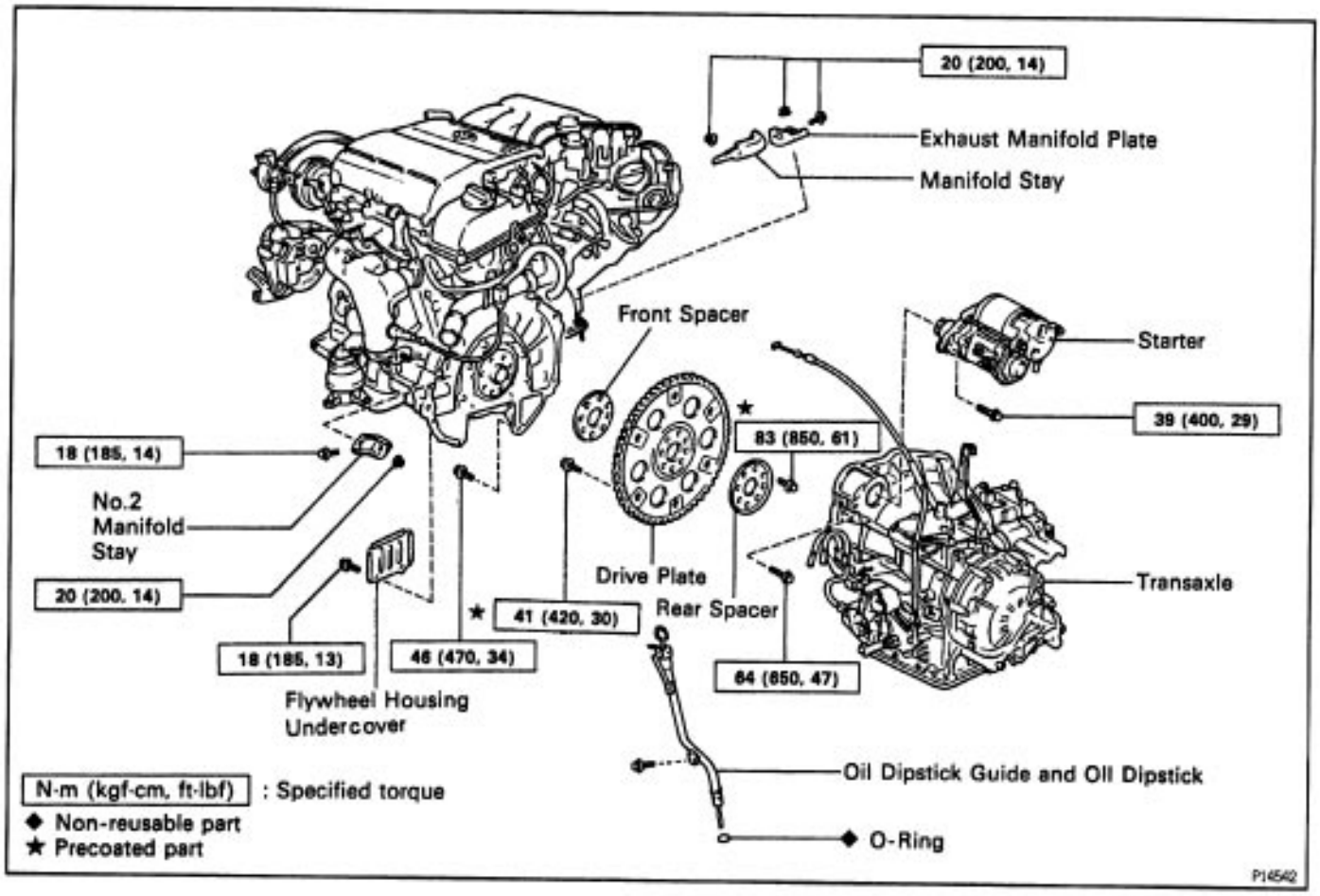
33. REMOVE RR ENGINE MOUNTING INSULATOR

Remove the 4 bolts and mounting insulator.

34. REMOVE FRONT EXHAUST PIPE STAY

Remove the 2 bolts and pipe stay.

COMPONENTS FOR ENGINE & TRANSAXLE SEPARATION AND ASSEMBLY



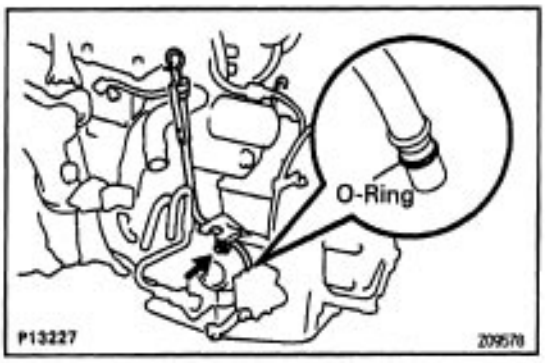
ENGINE & TRANSAXLE SEPARATION

(See Components for Engine & Transaxle Separation and Assembly)

1. DISCONNECT ENGINE WIRE

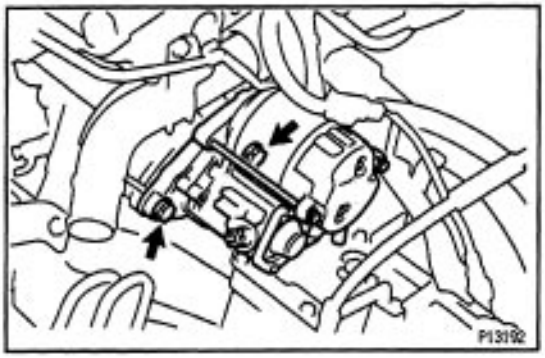
(a) Disconnect the following connector:
- (1) O/D solenoid connector
- (2) PNP switch speedometer
- (3) Starter 50 terminal
- (4) Starter B terminal
- (5) Speed sensor connector

(b) Disconnect the 2 wire clamps from the transaxle.



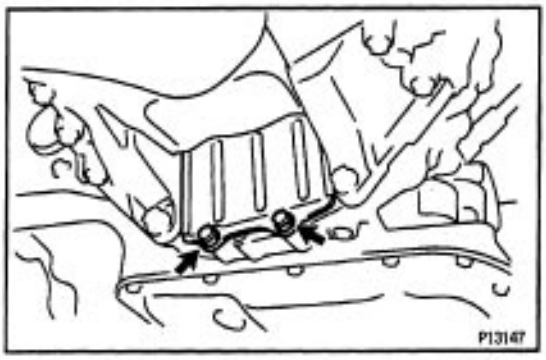
2. REMOVE OIL DIPSTICK GUIDE AND DIPSTICK FOR TRANSAXLE

(a) Remove the mounting bolt.
(b) Pull out the dipstick guide and dipstick from the port of transaxle.
(c) Remove the 0–ring from the dipstick guide.



3. REMOVE STARTER

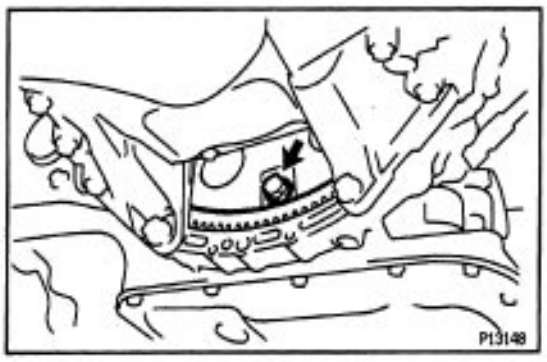
Remove the 2 bolts and starter.



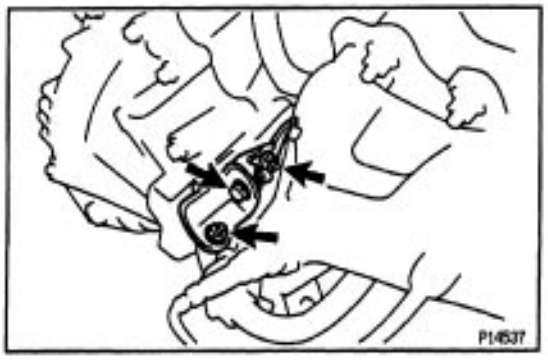
4. REMOVE TRANSAXLE

A. Remove torque converter clutch mounting bolts

(a) Remove the 2 bolts and flywheel housing undercover.

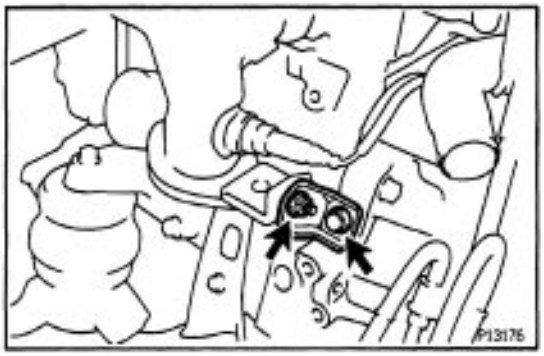


(b) Turn the crankshaft pulley bolt to gain access to each bolt.
(c) Hold the crankshaft pulley bolt with a wrench, and remove the 6 bolts.

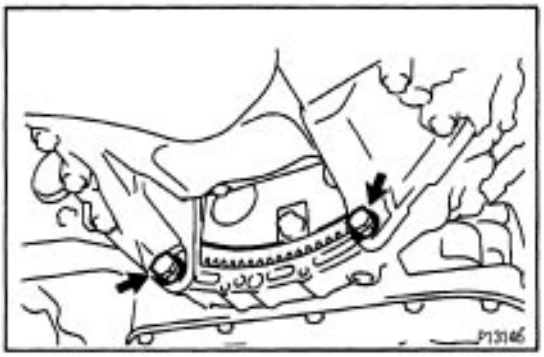


6. Remove transaxle

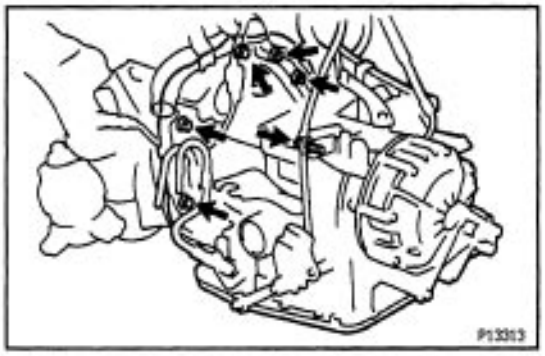
(a) Remove the bolt, 2 nuts, manifold stay and exhaust manifold plate.



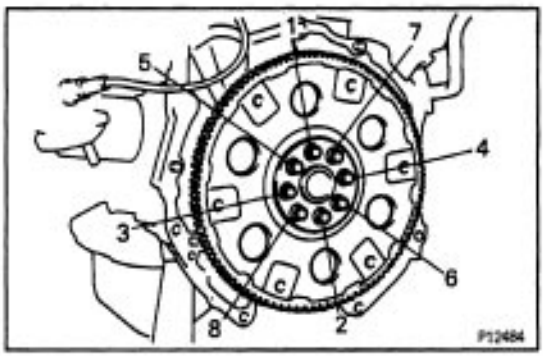
(b) Remove the bolt, nut and No.2 manifold stay.



(c) Remove the 2 bolts holding the No.2 oil pan to the transaxle.



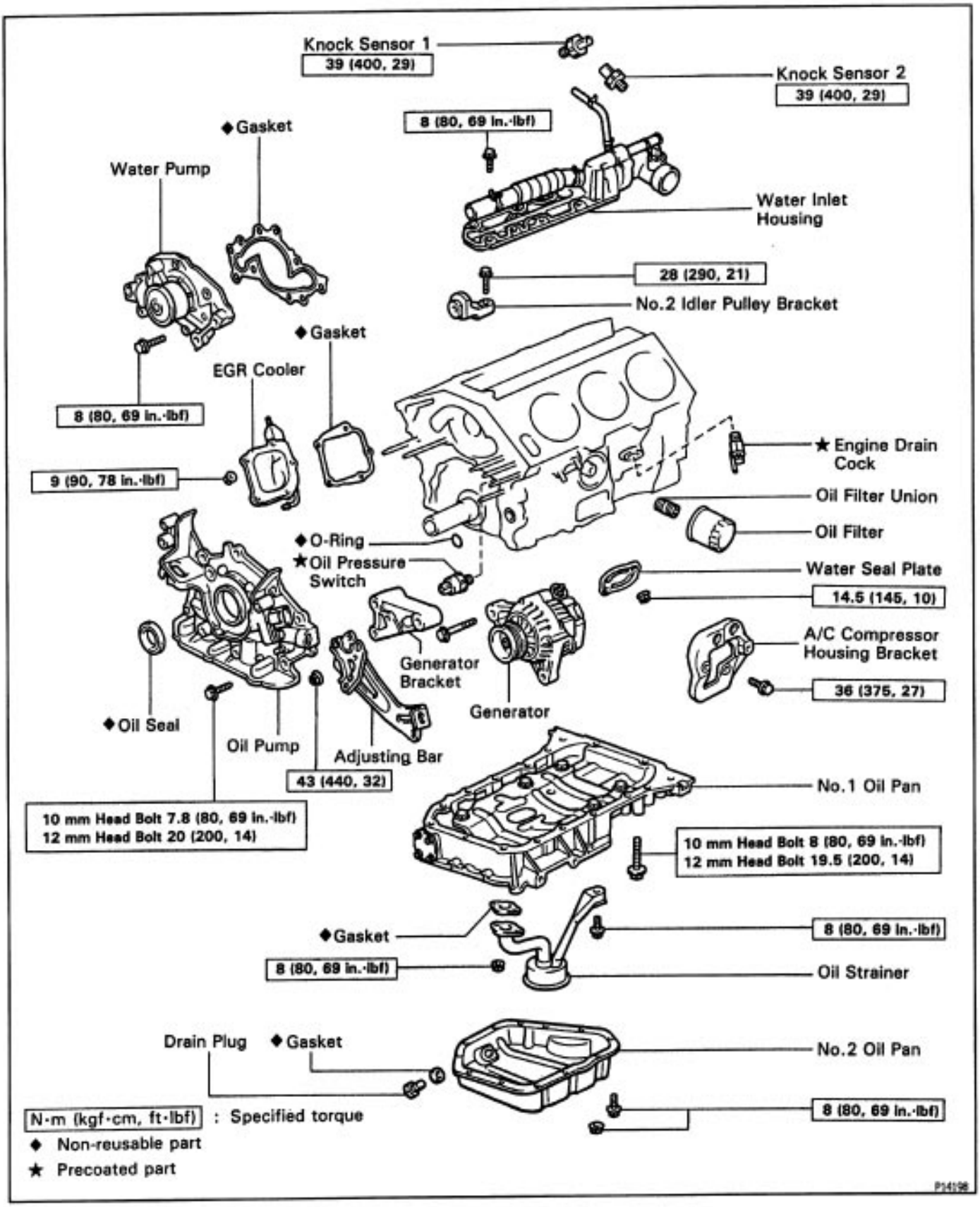
(d) Remove the 6 bolts holding the engine to the trans–axle.
(e) Remove the transaxle together with the torque con–verter clutch from the engine.



5. REMOVE DRIVE PLATE

Uniformly loosen and remove the drive plate bolts, in several passes, in the sequence shown.

COMPONENTS FOR PREPARATION AND AFTER ASSEMBLY



PREPARATION FOR DISASSEMBLY

(See Components for Cylinder Block Preparation of Disassembly and After Assembly)

1. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

2. REMOVE TIMING BELT AND PULLEYS

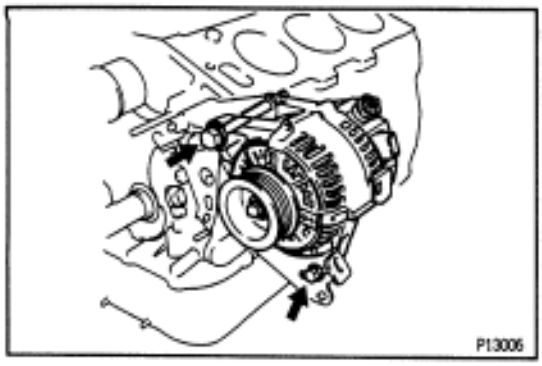
(See pages EG2–42 to 47)

3. REMOVE CYLINDER HEAD

(See pages EG2–64 to 79)

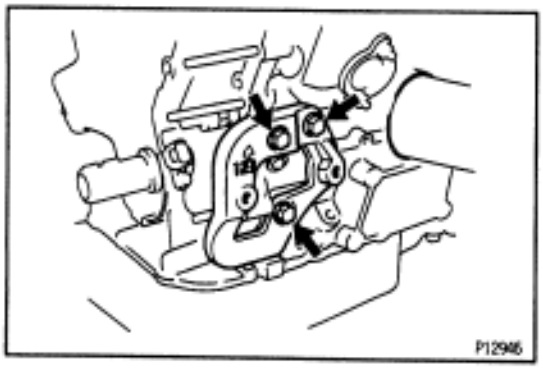
4. REMOVE GENERATOR

Remove the 2 bolts and generator.



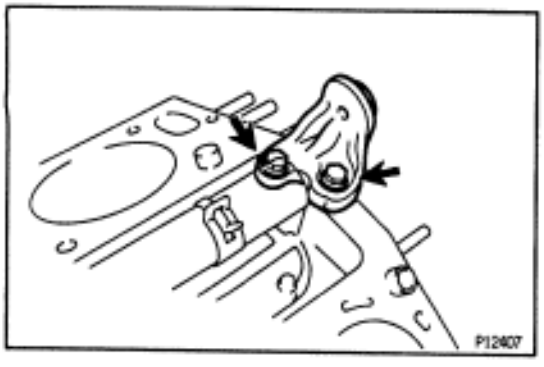
5. REMOVE GENERATOR ADJUSTING BAR AND BRACKET

Remove the 3 nuts, generator adjusting bar and bra–cket.



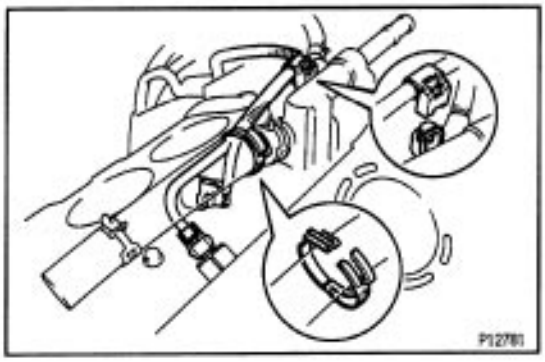
6. REMOVE A/C COMPRESSOR HOUSING BRACKET

Remove the 3 bolts and compressor housing bracket.



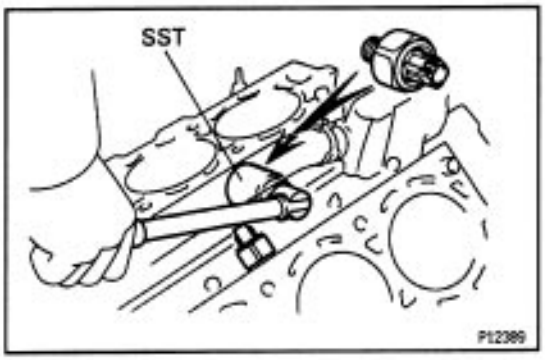
7. REMOVE No.2 IDLER PULLEY BRACKET

Remove the 2 bolts and idler pulley bracket.

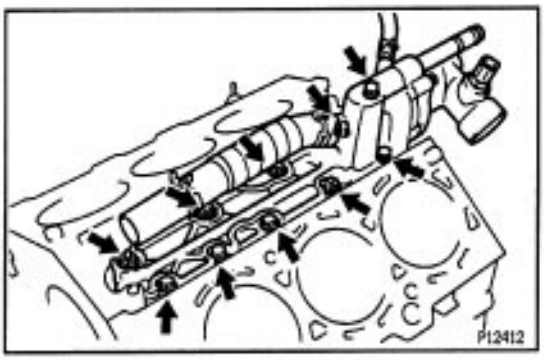


8. REMOVE KNOCK SENSORS

(a) Disconnect the 2 knock sensor connectors.
(b) Remove the wire band.
(c) Disconnect the engine wire clamp.

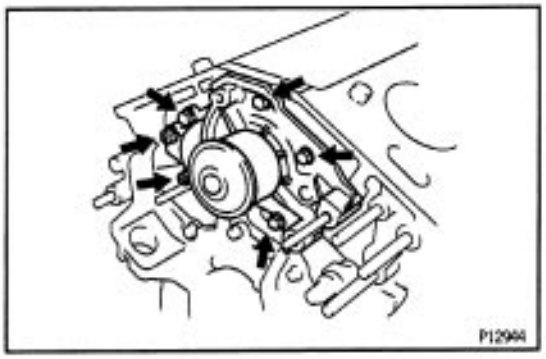


(d) Using SST, remove the 2 knock sensors.
SST 09816 – 30010



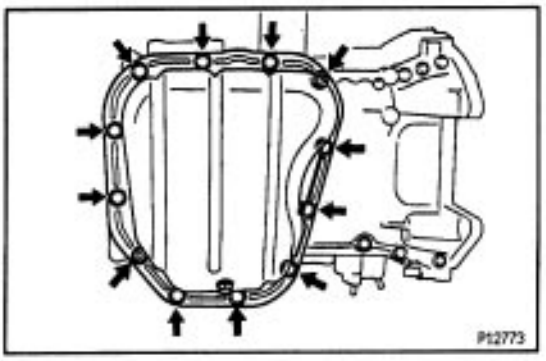
9. REMOVE WATER INLET HOUSING

Remove the 8 bolts, 2 nuts and water inlet housing.



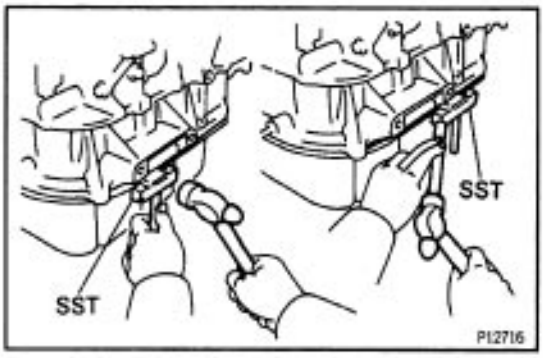
10. REMOVE WATER PUMP

Remove the 4 bolts, 2 nuts, water pump and gasket.

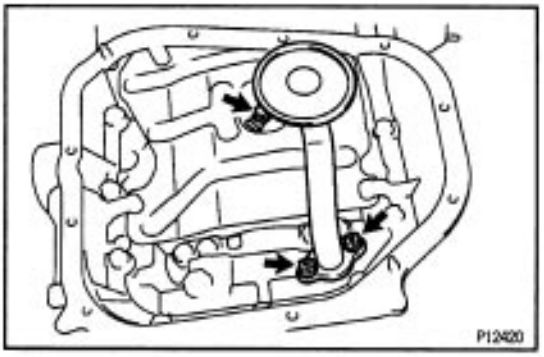


11. REMOVE NO.2 OIL PAN

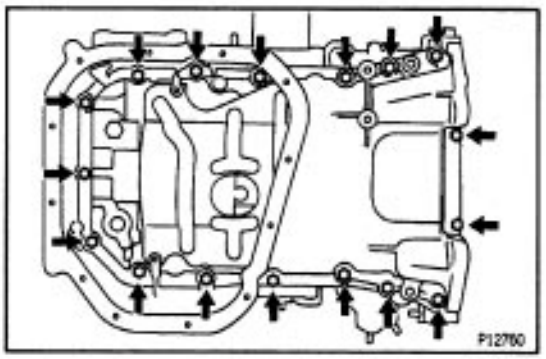
(a) Remove the 10 bolts and 2 nuts.



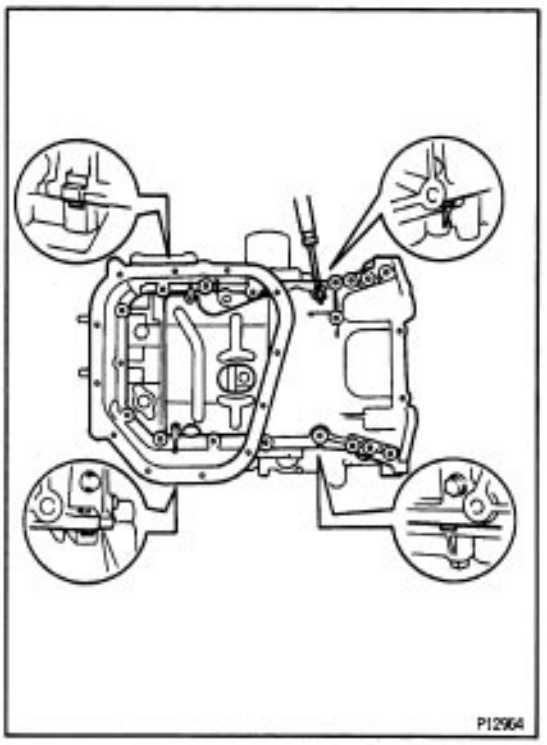
(b) Insert the blade of SST between the No. 1 and No.2 oil pans, and cut off applied sealer and remove the No. 1 oil pan.
SST 09032 – 00100
NOTICE:
- **Be careful not to the damage the No.2 oil pan con–tact surface of the No.1 oil pan.**
- **Be careful not to damage the No.2 oil pan flange.**



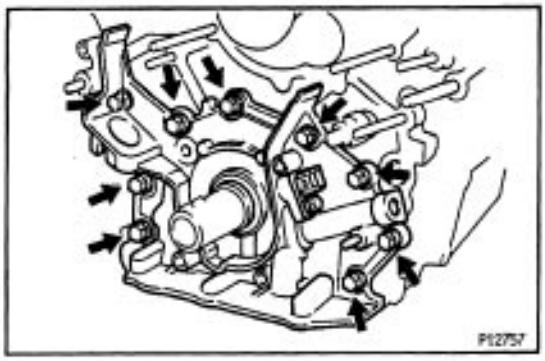
12. REMOVE OIL STRAINER
Remove the bolt, 2 nuts, oil strainer and gasket.



13. REMOVE NO.1 OIL PAN
(a) Remove the 17 bolts.

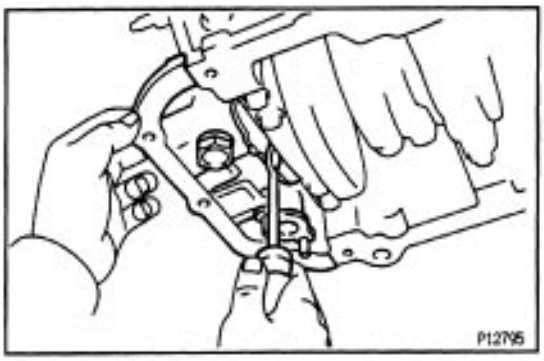


(b) Using a screwdriver, remove the No. 1 oil pan by prying the portions between the cylinder block and No.1 oil pan.
NOTICE: Be careful not to damage the contact surfaces of the cylinder block and No.1 oil pan.

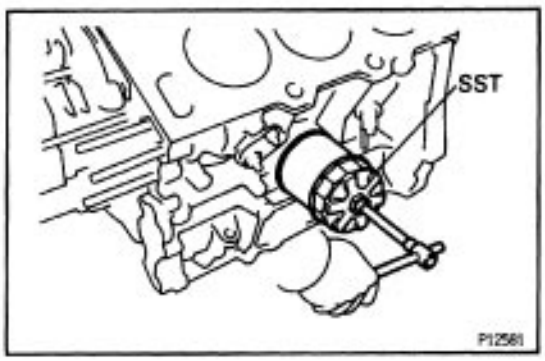


14. REMOVE OIL PUMP

(a) Remove the 9 bolts.

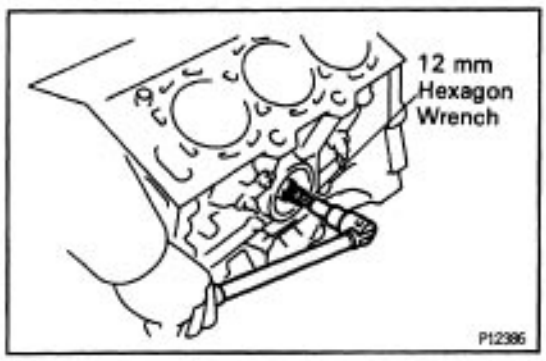


(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.
(c) Remove the 0–ring.



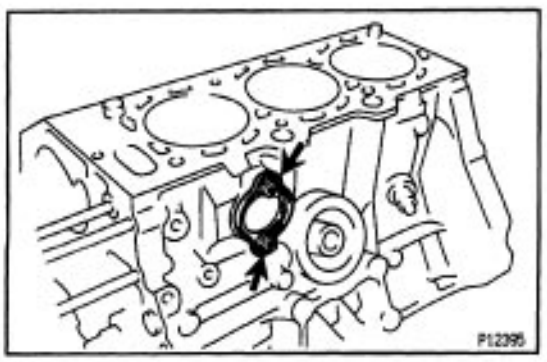
15. REMOVE OIL FILTER

Using SST, remove the oil filter.
SST 09816 – 30010



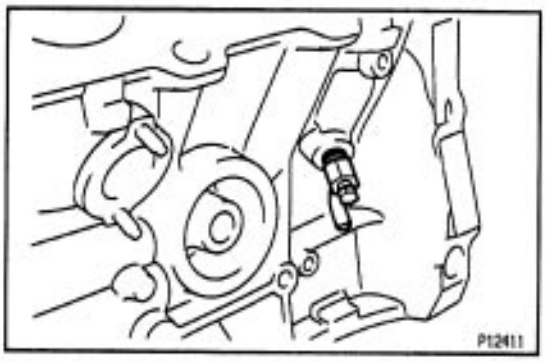
16. REMOVE OIL FILTER UNION

Using a 12 mm hexagon wrench, remove the oil filter union.

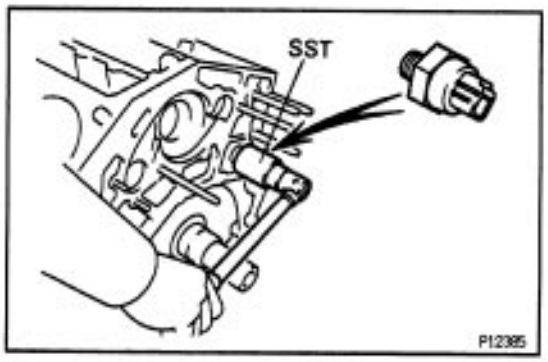


17. REMOVE WATER SEAL PLATE

Remove the 2 nuts and seal plate.

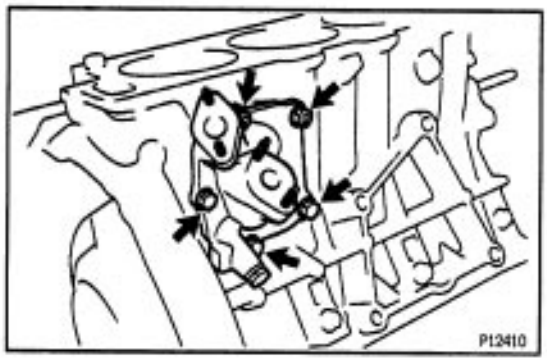


18. REMOVE ENGINE COOLANT DRAIN COCK



19. REMOVE OIL PRESSURE SWITCH

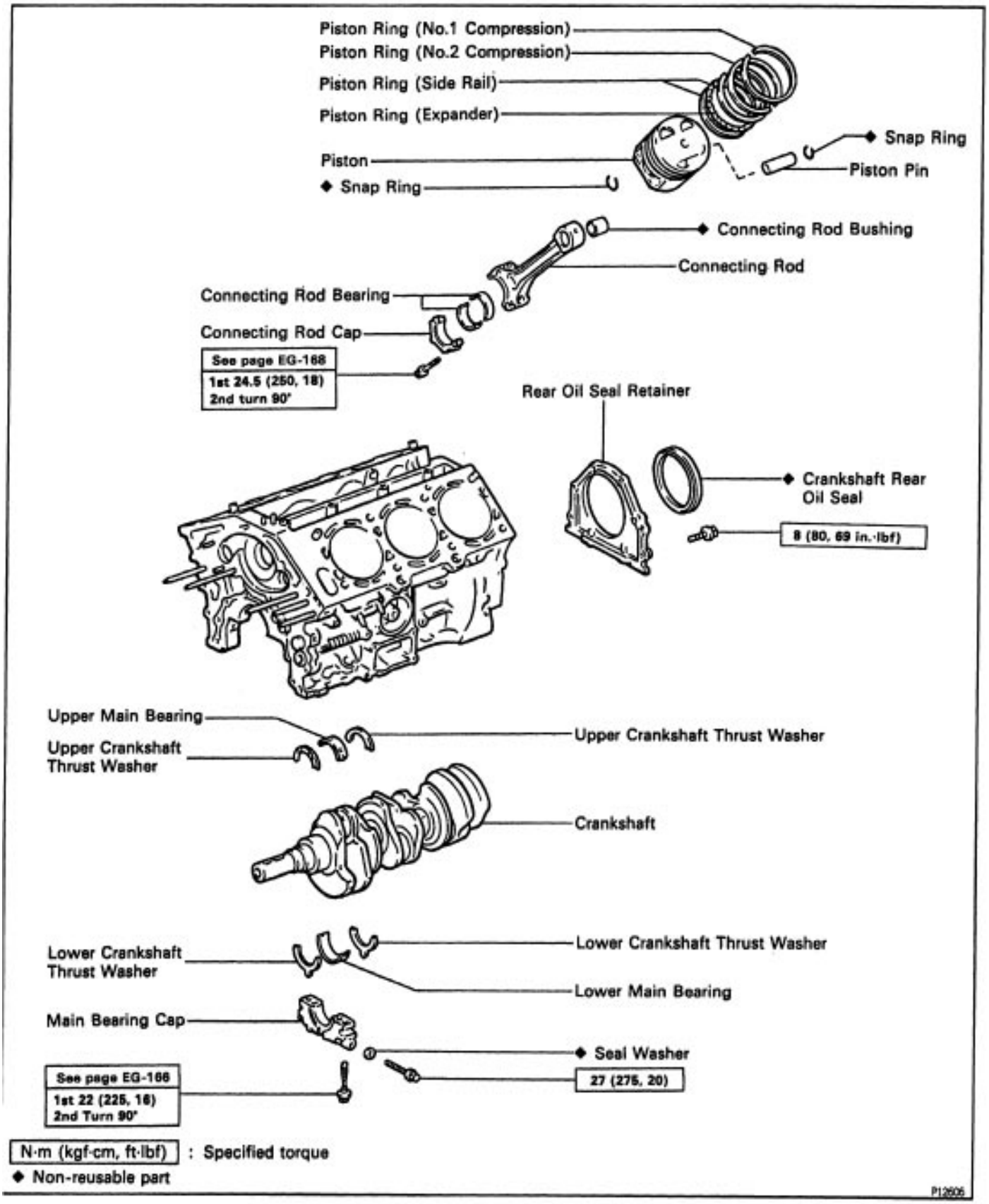
Using SST, remove the oil pressure switch.
SST 09816 – 30010

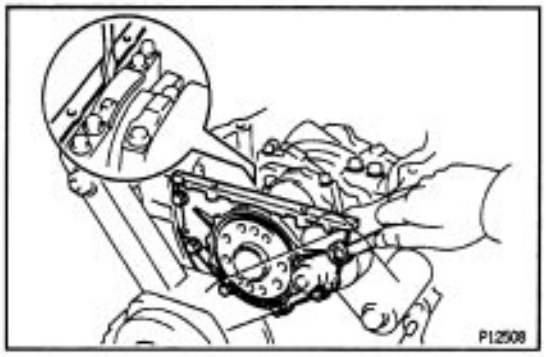


20. REMOVE EGR COOLER

Remove the 3 bolts, 2 nuts, EGR cooler and gasket.

COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY





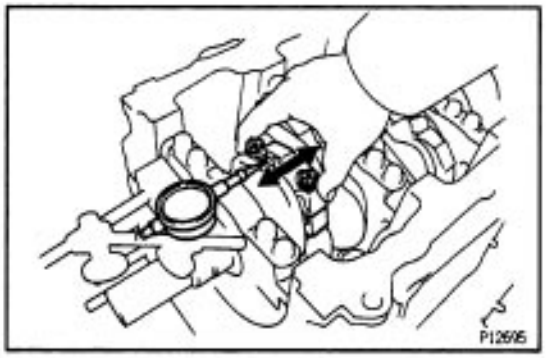
CYLINDER BLOCK DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and main bearing cap.



2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back an forth.

Standard thrust clearance:

0.15 – 0.30 mm (0.0059 – 0.0118 in.)

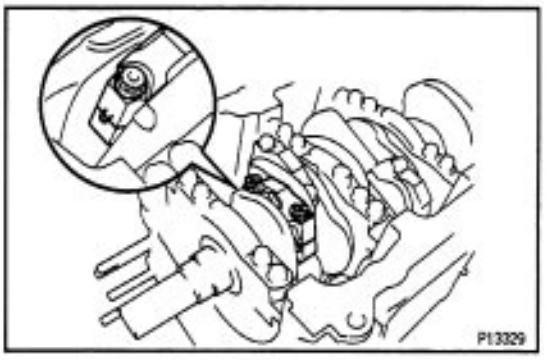
Maximum thrust clearance:

0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, re–place the connecting rod assembly (s). If necessary, replace the crankshaft.

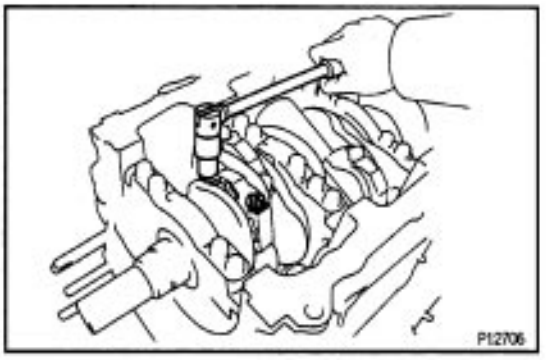
Connecting rod thickness:

20.80 – 20.85 mm (0.8189 – 0.8209 in.)

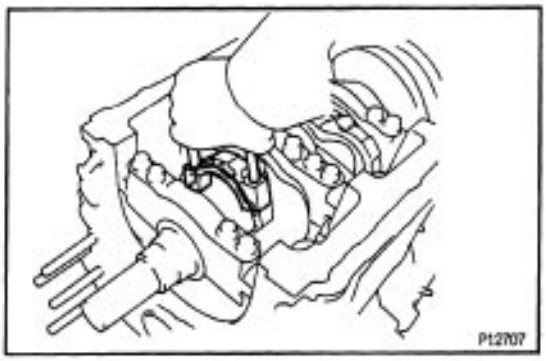


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

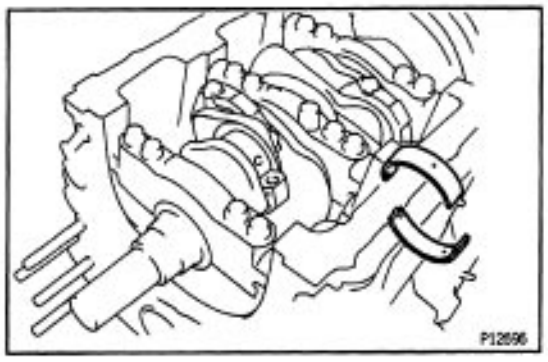
(a) Check the matchmarks on the connecting rod and cap to ensure correct reassembly.



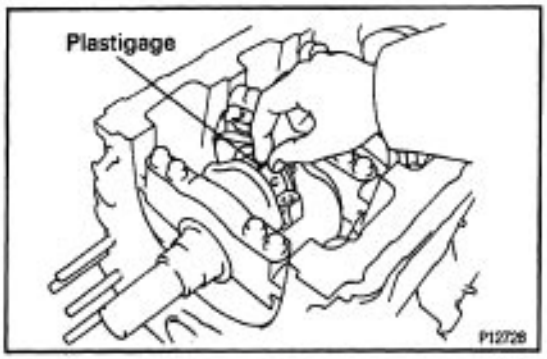
(b) Remove the 2 connecting rod cap bolts.



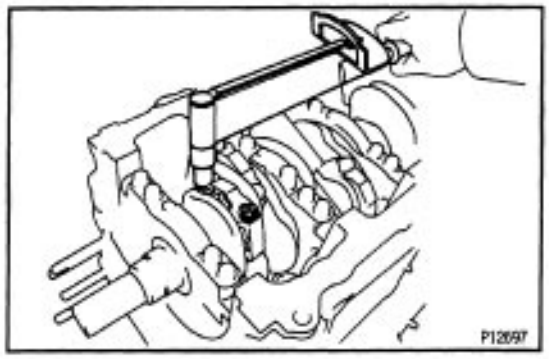
(c) Using the 2 removed connecting rod cap bolts, remove the connecting rod cap and lower bearing by wiggling the connecting rod cap right and left.
HINT: Keep the lower bearing inserted with the con–necting rod cap.



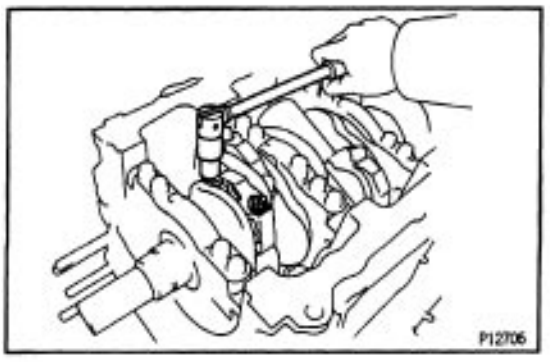
(d) Clean the crank pin and bearing.
(e) Check the crank pin and bearing for pitting and scrat–ches.
If the crank pin or bearing is damaged, replace the bearings. If necessary, replace the crankshaft.



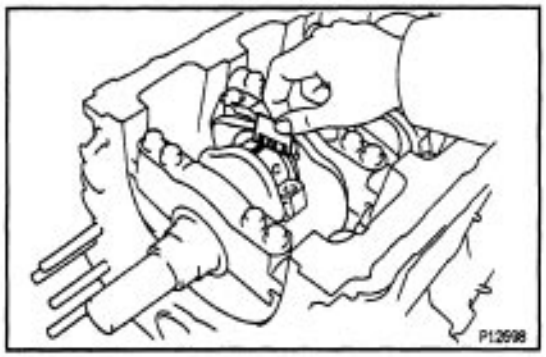
(f) Lay a strip of Plastigage across the crank pin.



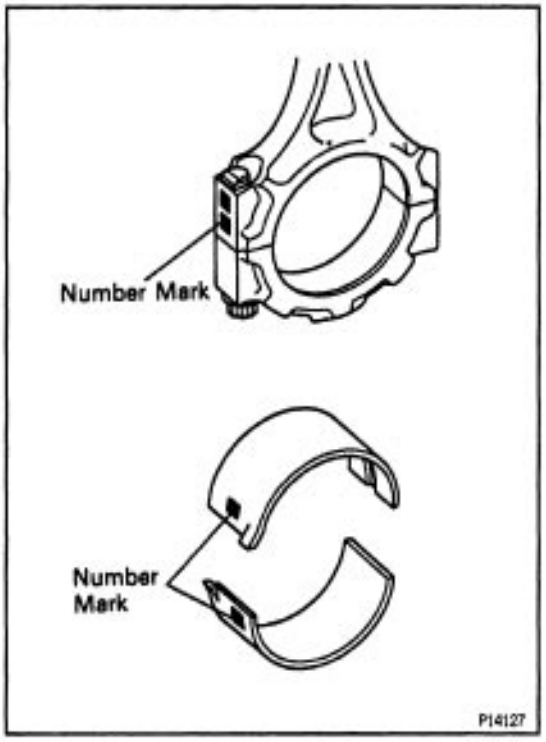
(g) Install the connecting rod cap with the 2 bolts.
(See step 7 on page EG2–167)
Torque:
1st 24.5 N–m (250 kgf–cm. 18 ft–lbf)
2nd Turn extra 90®
NOTICE: Do not turn the crankshaft.



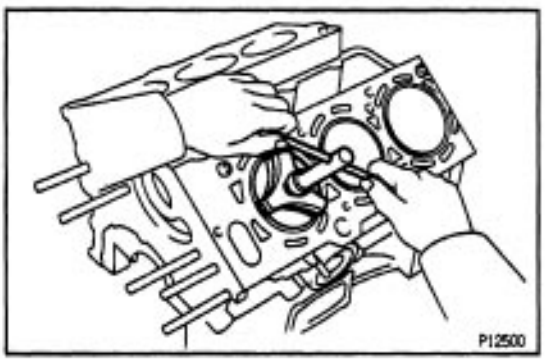
(h) Remove the 2 bolts, connecting rod cap and lower bearing. (See procedure (b) and (c) above)



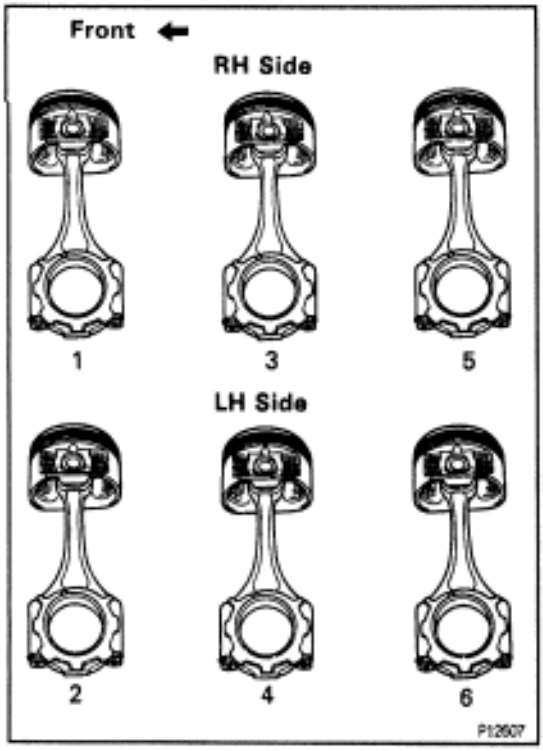
Measure the Plastigage at its widest point.
Standard oil clearance:
0.038 – 0.064 mm (0.0015 – 0.0025 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crank–shaft.



HINT: If replacing a bearing, replace it with 1 having the same number as marked on the connecting rod. There are 4 sizes of standard bearings, marked ”I”, ”2”, ”3” and ”4” accordingly.
Reference:
Connecting rod big end inside diameter:
Mark ’1”
518.000 – 56.006 mm (2.2047 – 2.2050 in.)
Mark ’2’
56.006 – 56.012 mm (2.2050 – 2.2052 in.)
Mark ’3’
56.012 – 56.018 mm (2.2052 – 2.2054 in.)
Mark ”4’
56.018 – 56.024 mm (2.2054 – 2.2057 in.)
Crankshaft crank pin diameter:
52.994 – 53.000 mm (2.0864 – 2.0868 in.)
Standard sized bearing center wall thickness:
Mark ’1’
1.484 – 1.487 mm (0.0584 – 0.0585 in.)
Mark ’2’
1.487 – 1.490 mm (0.0585 – 0.0587 in.)
Mark ’3’
1.490 – 1.493 mm (0.0587 – 0.0588 in.)
Mark W
1.493 – 1.496 mm (0.0588 – 0.0589 in.)
(j) Completely remove the Plastigage.

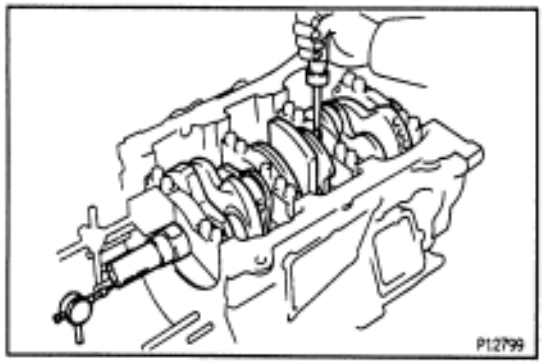


4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES
(a) Using a ridge reamer, remove all the carbon from the top of the cylinder.
(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.04 – 0.24 mm (0.0016 – 0.0095 In.)

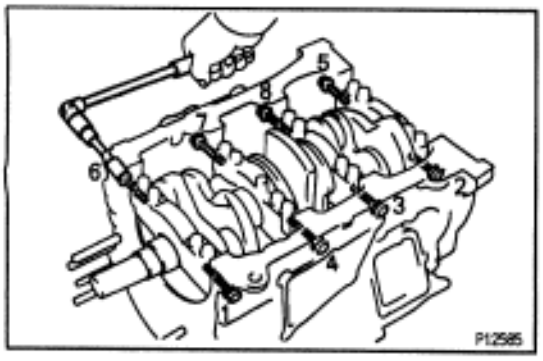
Maximum thrust clearance:

0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

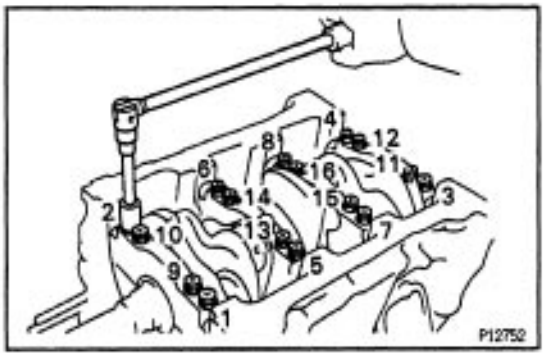
Thrust washer thickness:

1.930 – 1.980 mm (0.0760 – 0.0780 In.)

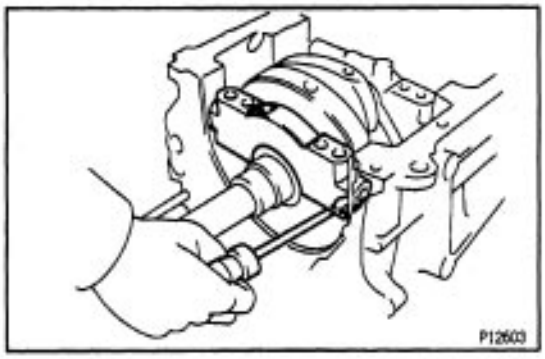


6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the 8 main bearing cap bolts and seal washers, in several passes, in the sequence shown.

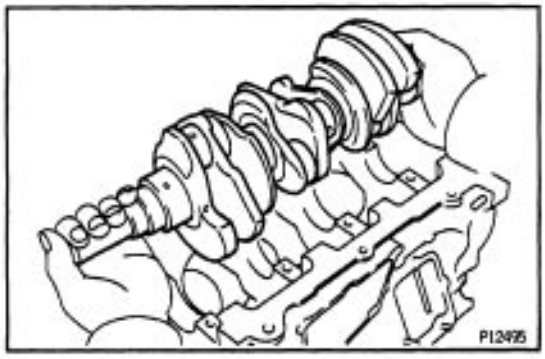


(b) Uniformly loosen and remove the 16 main bearing cap bolts, in several passes, in the sequence shown.

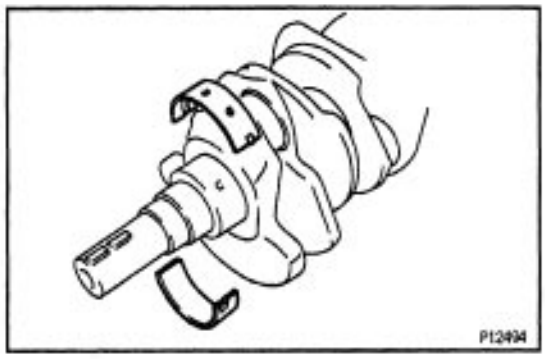


(c) Using a screwdriver, pry out main bearing caps, remove the 4 main bearing caps, lower bearings and (No.2 main bearing cap only) 2 lower thrust washers.
HINT:

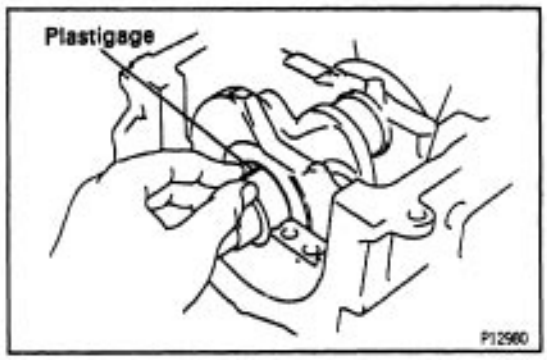
- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.



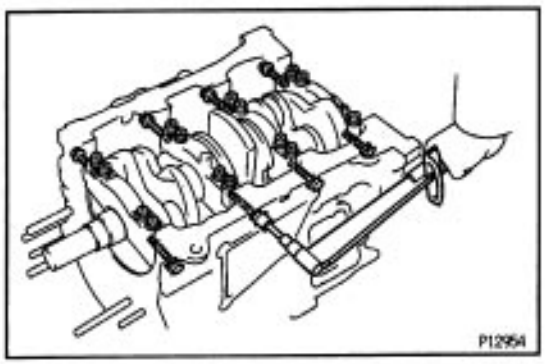
(d) Lift out the crankshaft.
HINT: Keep the upper bearings together with the cyl–inder block.



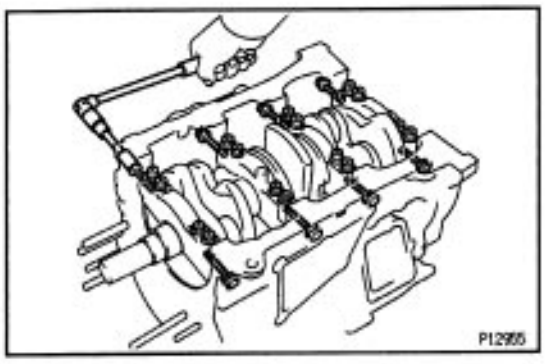
(e) Clean each main journal and bearing.
(f) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bear–ings. If necessary, replace the crankshaft.



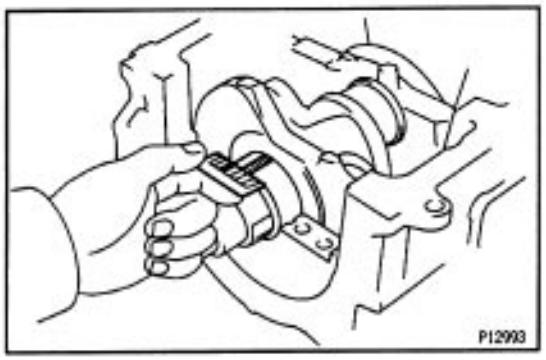
(g) Place the crankshaft on the cylinder block.
(h) Lay a strip of Plastigage across each journal.



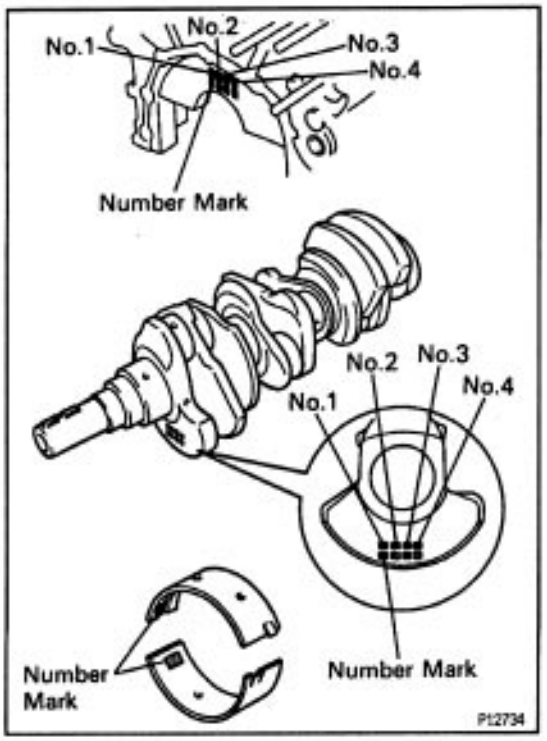
(i) Install the 4 main bearing caps.
(See step 4 on pages EG2–165)
12 Pointed Head Bolts:
Torque:
1 st 22 N–m (225 kgf–cm, 16 ft–lbf)
2nd Turn extra 90®
Hexagon Head Bolts:
Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)
NOTICE: Do not turn the crankshaft.



(j) Remove the main bearing caps.
(See procedures (a) to (c) above)



(k) Measure the Plastigage at its widest point.
Standard oil clearance:
0.026 – 0.046 mm (0.0010 – 0.0018 in.)
Maximum clearance:
0.06 mm (0.0024 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, replace the crankshaft.
HINT: If using a bearing, replace it with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding to–gether the numbers imprinted on the cylinder block and crankshaft, then refer to the table below for the appropriate bearing number. There are 5 standard bearing sizes, marked ’1’, ”2”, ”3”, ”4” and ”5” accord–ingly.



	Total number		” ”: Number mark		
Cylinder block (A) + Crankshaft (B) _	0–5	6–11	12–17	18–23	24–28
Use bearing	“1”	“2”	**”3”**	“4”	”5”

EXAMPLE: Cylinder block ”06” (A)
+ Crankshaft ”08” (B)
= Total number 14 (Use bearing ”3”)

V01565

Reference:
Cylinder block main journal bore diameter (A):
Mark ”00’
66.000 mm (2.5984 in.)
Mark ’01’
66.001 mm (2.5985 in.)
Mark ”02”
66.002 mm (2.5985 in.)
Mark ’03’
66.003 mm (2.5985 in.)
Mark ”04’
66.004 mm (2.5986 in.)
Mark ’05’
66.005 mm (2.5986 In.)
Mark ’06’
66.006 mm (2.5987 in.)
Mark ’07’
66.007 mm (2.5987 in.)
Mark ’08’
66.008 mm (2.5987 in.)
Mark ’09’
66.009 mm (2.5988 in.)
Mark ”10’
66.010 mm (2.5988 in.)
Mark ’11 ”
66.011 mm (2.5989 in.)
Mark ’12’
66.012 mm (2.5989 in.)
Mark ’13’
66.013 mm (2.5989 in.)
Mark ”14’
66.014 mm (2.5990 in.)
Mark ’15’
66.015 mm (2.5990 in.)
Mark ”16’
66.01 6 mm (2.5990 in.)

Crankshaft main journal diameter (B):
Mark ’00”
61.000 mm (2.401 6 in.)
Mark ”01’
60.999 mm (2.4015 in.)
Mark ’02’
60.998 mm (2.4015 in.)
Mark ”03”
60.997 mm (2.4015 in.)
Mark ’04’
60.996 mm (2.4014 in.)
Mark ’05’
60.995 mm (2.4014 in.)
Mark ’06”
60.994 mm (2.4013 in.)
Mark ’07’
60.993 mm (2.4012 in.)
Mark ’08’
60.992 mm (2.4012 In.)
Mark ’09”
60.991 mm (2.4012 In.)
Mark ”10’
60.990 mm (2.4012 in.)
Mark ’11’
60.989 mm (2.4011 in.)
Mark ”12”
60.988 mm (2.4011 in.)
Standard sized bearing center wall thickness:
Mark ”1’
2.488 – 2.489 mm (0.0979 – 0.0980 in.)
Mark ”2
2.489 – 2.492 mm (0.0980 – 0.0981 in.)
Mark ’3”
2.492 – 2.495 mm (0.0981 – 0.0982 in.)
Mark ”4’
2.495 – 2.498 mm (0.0982 – 0.0983 in.)
Mark ”5’
2.498 – 2.501 mm (0.0983 – 0.0985 in.)

Standard sized Bearing Selection Chart

Crankshaft number mark	Cylinder block number mark																
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
00	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3
01	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3
02	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4
03	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4
04	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4
05	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
06	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4
07	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4
08	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5
09	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5
10	2	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5
11	2	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5
12	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5

EXAMPLE: Cylinder block ”06”, Crankshaft ”08”
= Use bearing ”3”

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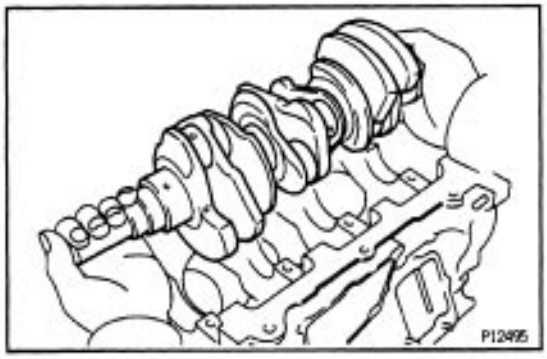
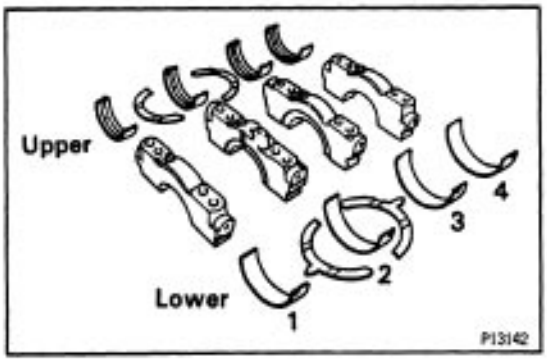
(l) Completely remove the Plastigage.



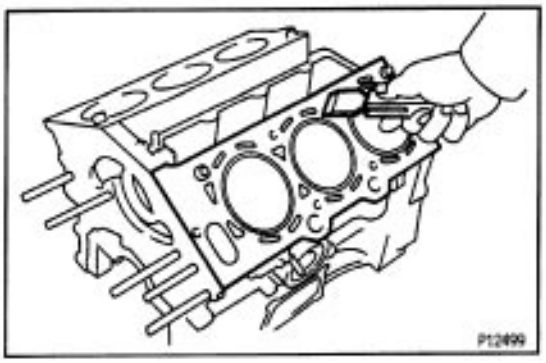
7. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the 4 upper main bearings and 2 upper thrust washers from the cylinder block.



HINT: Arrange the main bearing caps, bearings and thrust washers in correct order.



CYLINDER BLOCK INSPECTION AND REPAIR

1. CLEAN CYLINDER BLOCK

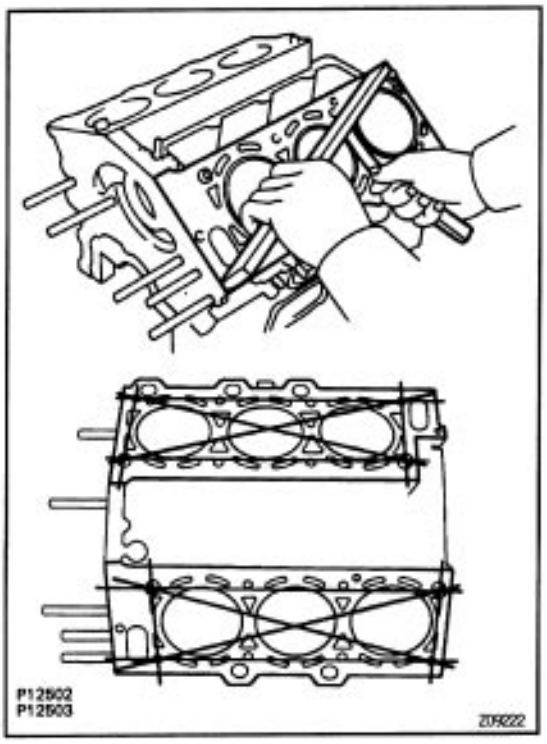
A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.

NOTICE: If the cylinder is washed at high temperatures, the cylinder liner sticks out beyond the cylinder block, so always wash the cylinder block at a temperature of 45°C (113°F) or less.



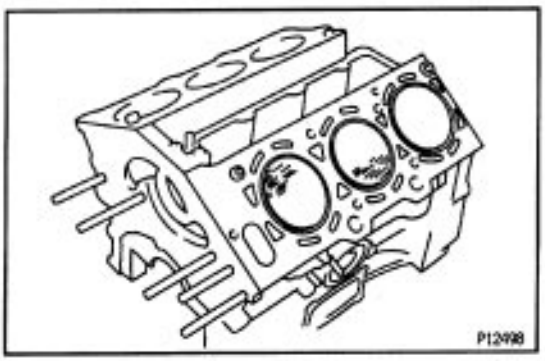
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Maximum warpage:

0.07 mm (0.0028 In.)

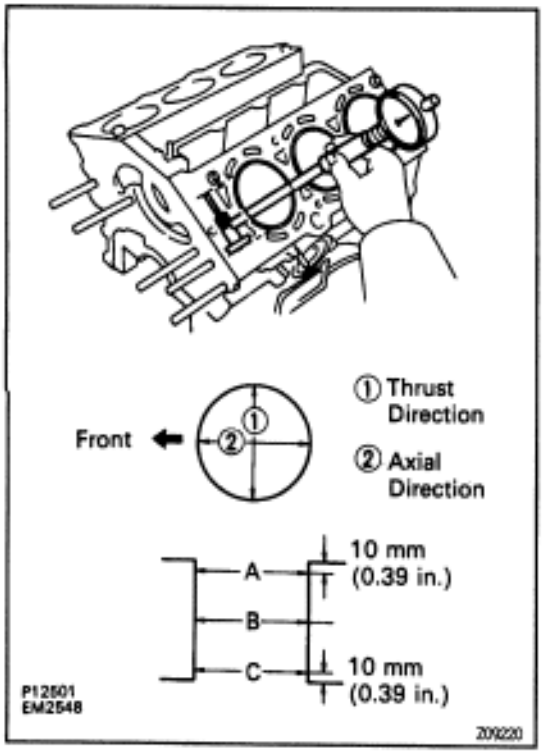
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

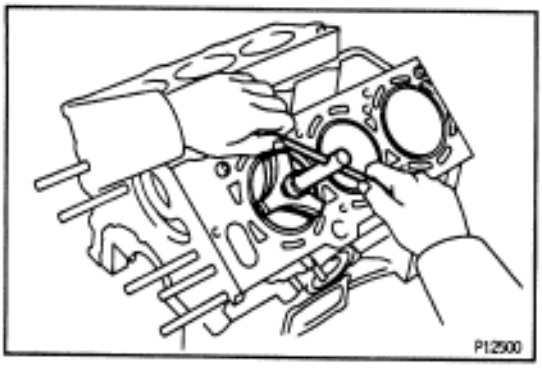
Standard diameter:

87.500 – 87.512 mm (3.4449 – 3.4453 in.)

Maximum diameter:

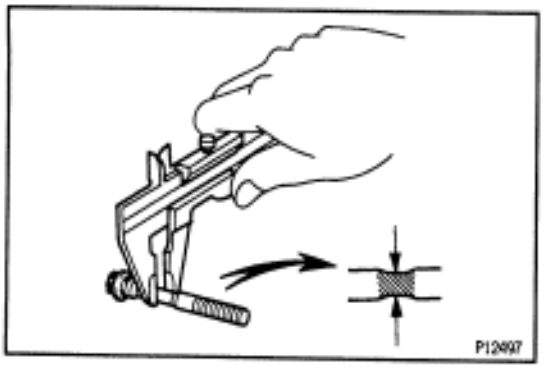
87.52 mm (3.4457 in.)

If the diameter is greater than maximum, replace the cylinder block.



5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



6. INSPECT MAIN BEARING CAP BOLTS

(for 12 Pointed Head Bolts)

Using a vernier caliper, measure the tension portion diameter of the main bearing cap bolt.

Standard diameter:

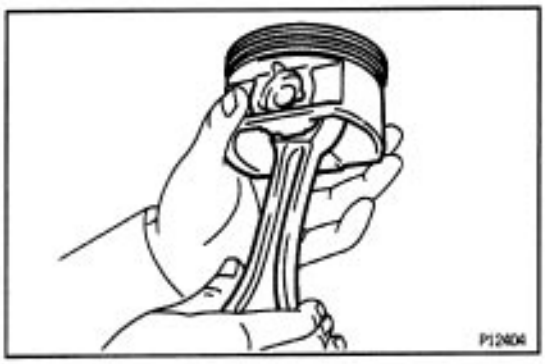
7.500 – 7.600 mm (0.2953 – 0.2992 in.)

Minimum diameter:

7.20 mm (0.2835 In.)

If the diameter is less than minimum, replace the bolt.

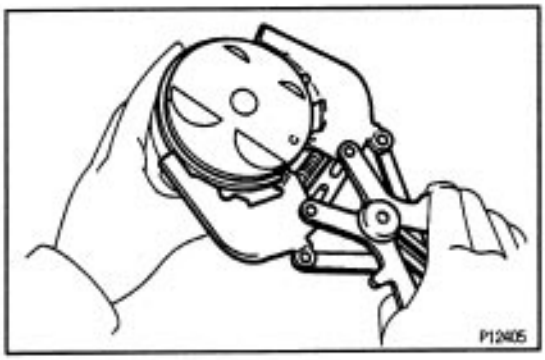
PISTON AND CONNECTING ROD DISASSEMBLY



1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.

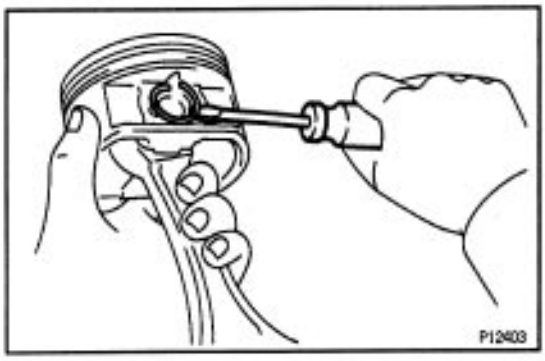


2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.

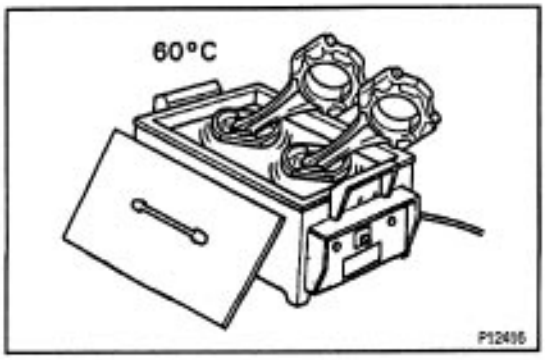
(b) Remove the 2 side rails and oil ring by hand.

HINT: Arrange the piston rings in correct order only.

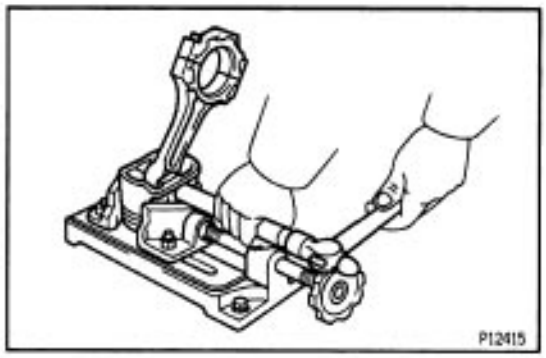


3. DISCONNECT CONNECTING ROD FROM PISTON

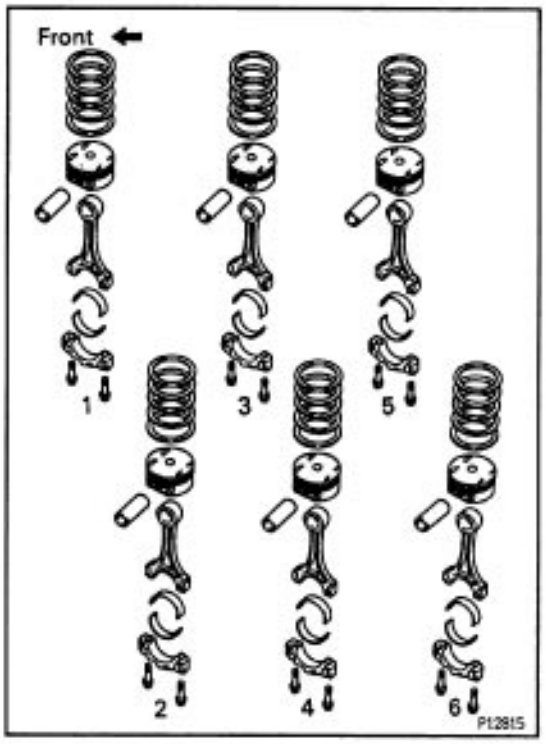
(a) Using a small screwdriver, pry out the 2 snap rings.



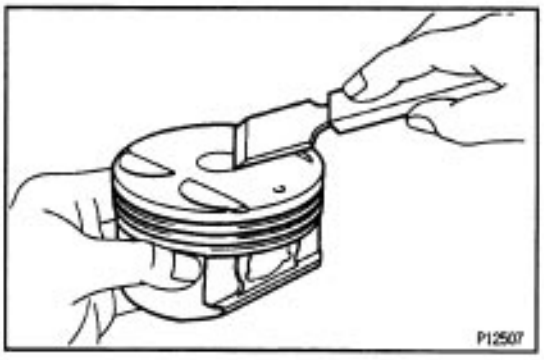
(b) Gradually heat the piston to approx. 60°C (140°F).



(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



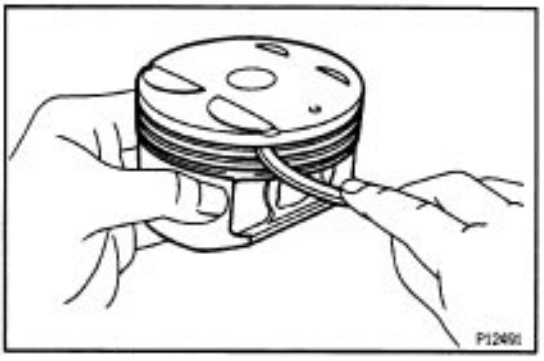
HINT:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



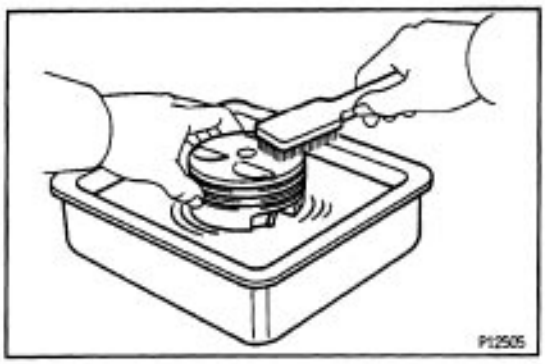
PISTON AND CONNECTING ROD INSPECTION

1. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.

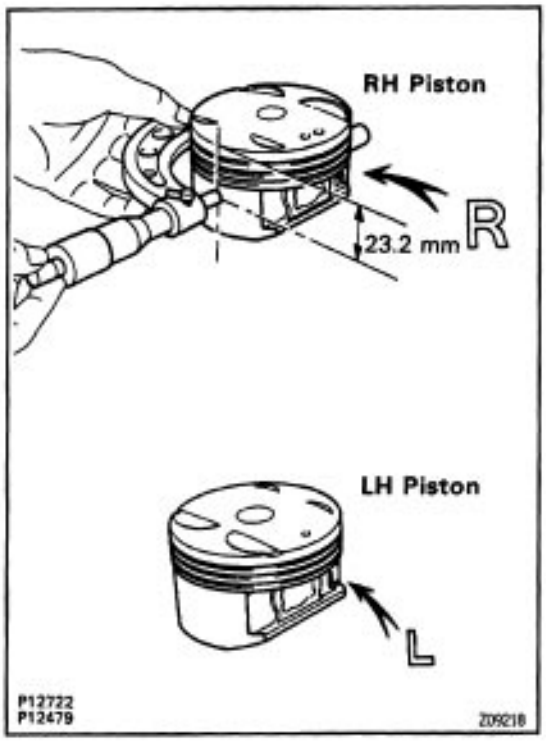


(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

(a) Using a micrometer, measure the piston diameter at ring angles to the piston pin center line, 23.2 mm (0.913 in.) from the piston head.

Piston diameter:

87.406 – 87.416 mm (3.4412 – 3.4416 in.)

(b) Measure the cylinder bore diameter in the thrust di–rections. (See step 4 on page EG2–152)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

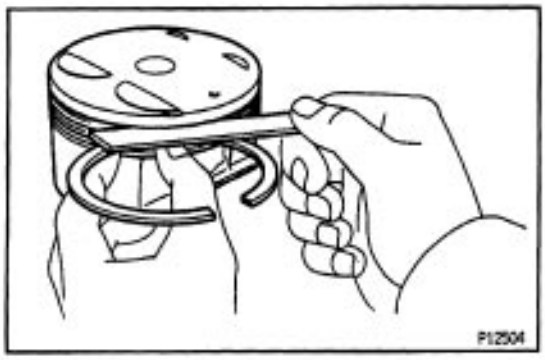
0.084 – 0.106 mm (0.0033 – 0.0042 in.)

Maximum oil clearance:

0.13 mm (0.0051 in.)

If the oil clearance is greater than maximum, replace all the6 pistons. If necessary, replace the cylinder block.

HINT: The shape of the piston varies for the RH and LH banks. The RH piston is marked with ”R”, the LH piston with ”L”.



B. Inspect piston ring groove clearance

Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

Ring groove clearance:

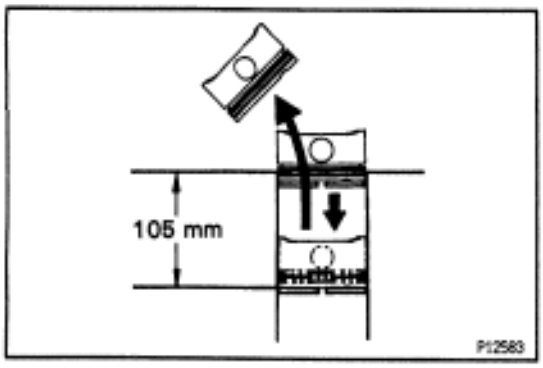
No.1

0.020 – 0.070 mm (0.0008 – 0.0028 in.)

No.2

0.020 – 0.060 mm (0.0008 – 0.0024 In.)

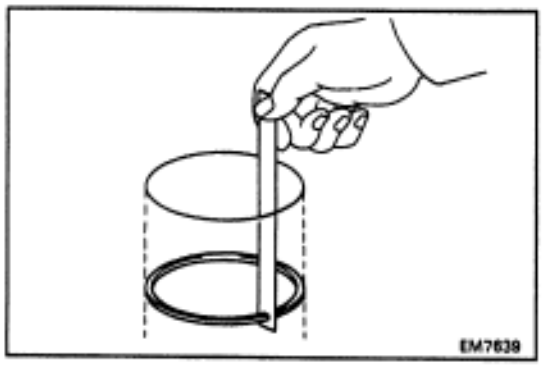
If the clearance is not as specified, replace the piston.



C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 105 mm (4.13 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the end gap.

Standard end gap:

No. 1

0.25 – 0.35 mm (0.0098 – 0.0138 in.)

No.2

0.35 – 0.45 mm (0.0138 – 0.0177 in.)

Oil (Side rail)

0.15 – 0.40 mm (0.0059 – 0.0157 in.)

Maximum end gap:

No.1

0.95 mm (0.0374 in.)

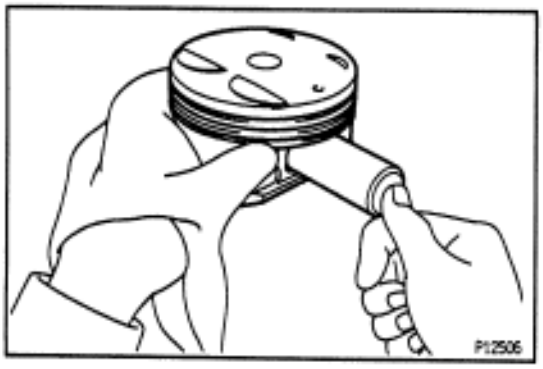
No.2

1.05 mm (0.0413 in.)

Oil (Side rail)

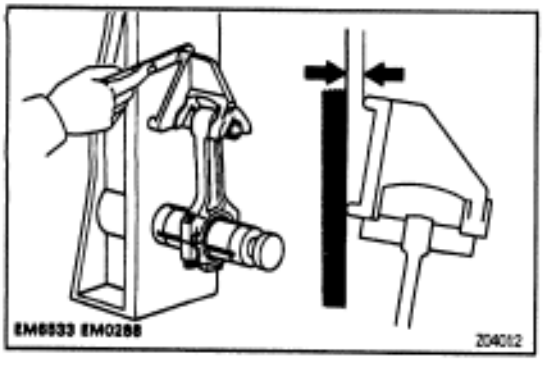
1.00 mm (0.0394 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, replace the cylinder block.



D. Inspect piston pin fit

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

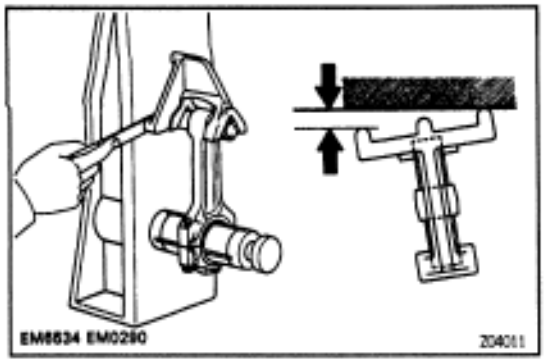
Using a rod aligner and feeler gauge, check the con–necting rod alignment.

- Check for out–of–alignment.

Maximum out–of –alignment:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out–of–alignment is greater than maximum, re–place the connecting rod assembly.

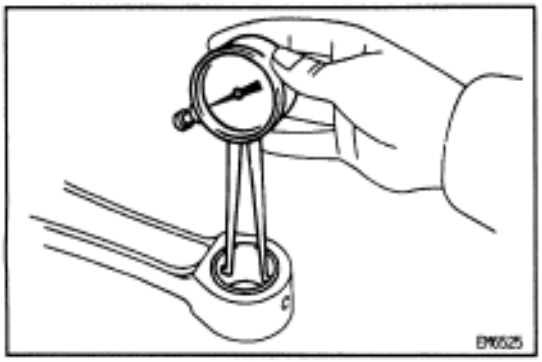


- Check for twist

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connect–ing rod assembly.

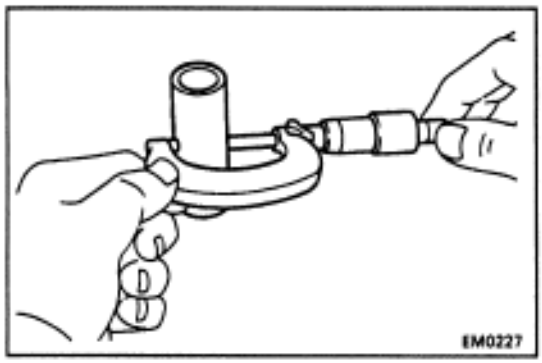


B. Inspect piston pin oil clearance

(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

22.005 – 22.014 mm (0.8663 – 0.8667 in.)



(b) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

21.997 – 22.006 mm (0.8660 – 0.8664 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

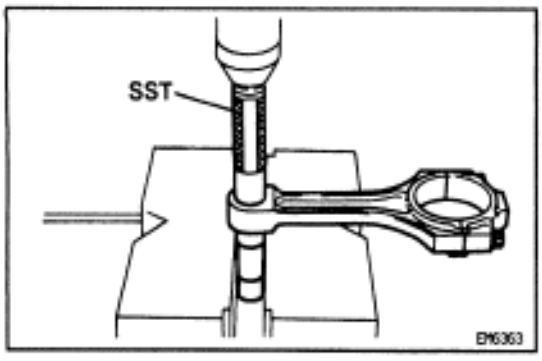
Standard oil clearance:

0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance:

0.05 mm (0.0020 in.)

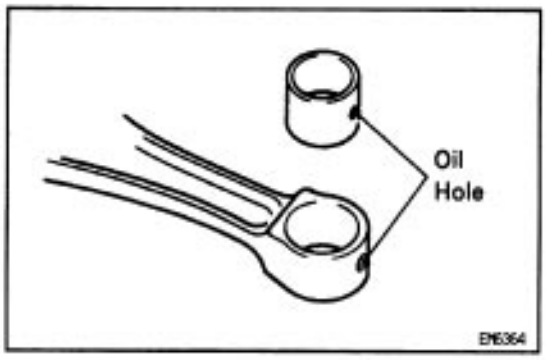
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



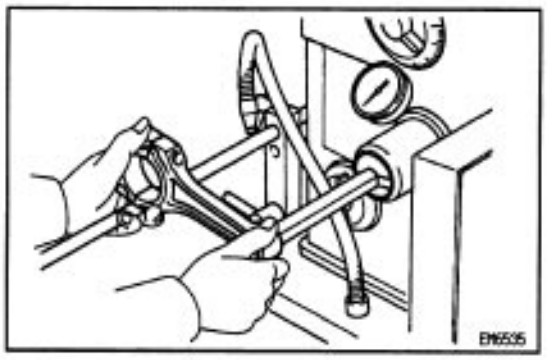
C. If necessary, replace connecting rod bushing

(a) Using SST and a press, press out the bushing.

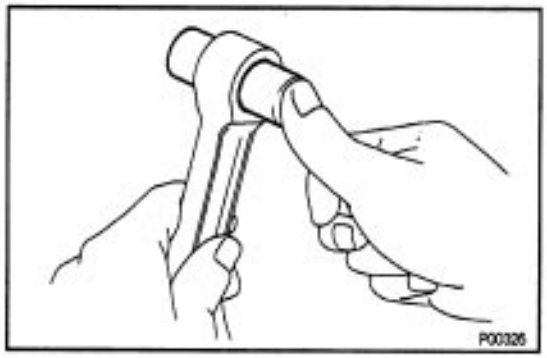
SST 09222 – 30010



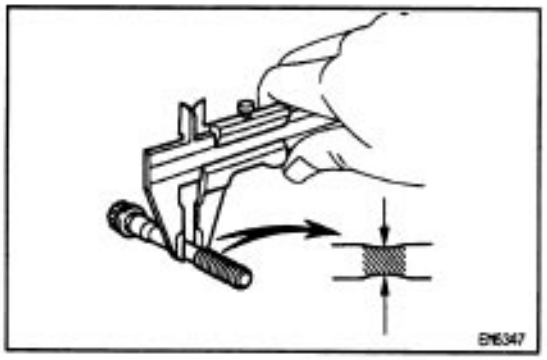
(b) Align the oil holes of a new bushing and the connecting rod.
(c) Using SST and a press, press in the bushing.
SST 09222–30010



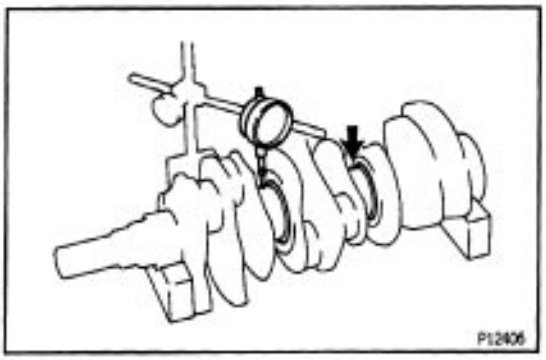
(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

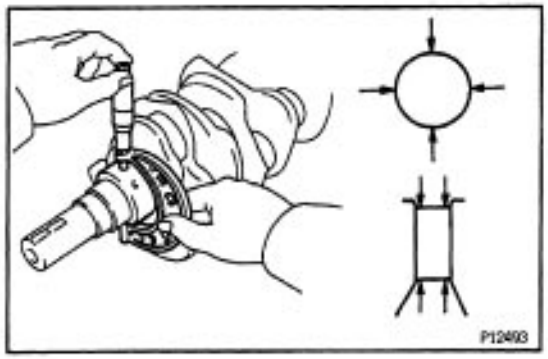


(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



D. Inspect connecting rod bolts
Using a vernier caliper, measure the tension portion of of the connecting rod bolt.
Standard diameter:
7.2 – 7.3 mm (0.284 – 0.287 in.)
Minimum diameter:
7.0 mm (0.276 in.)
HINT: If the tension portion diameter is less than minimum, replace the connecting rod bolt.





CRANKSHAFT INSPECTION

1. INSPECT CRANKSHAFT FOR CIRCLE RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout, as shown in the illustration.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

60.988 –61.000 mm (2.4011 – 2.4016 in.)

Crank pin diameter:

52.994 – 53.000 mm (2.0864 – 2.0866 in.)

If the diameter is not as specified, check the oil clearance (See steps 3 or6 on page EG2–142 or 145). If necessary, replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

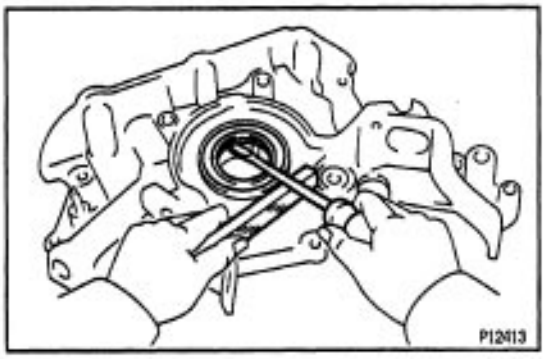
Maximum taper and out–of–round:

0.02 mm (0.0008 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.

CRANKSHAFT OIL SEALS REPLACEMENT

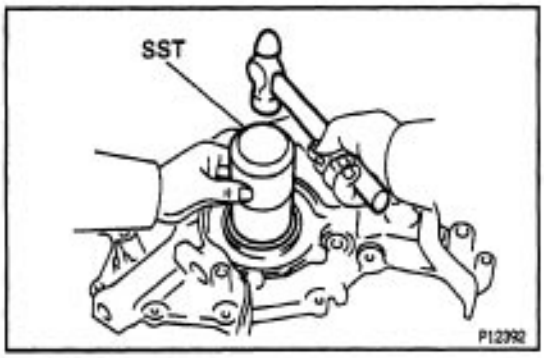
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

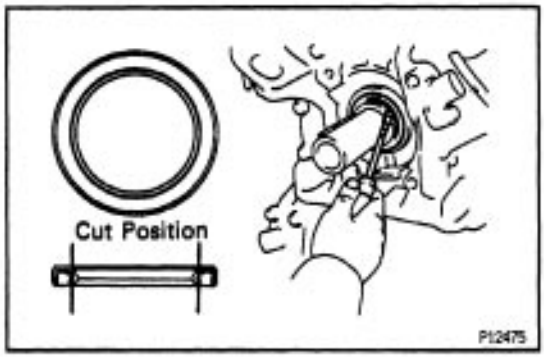
A. If oil pump is removed from cylinder block:

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09223 – 00010

(c) Apply MP grease to the oil seal lip.

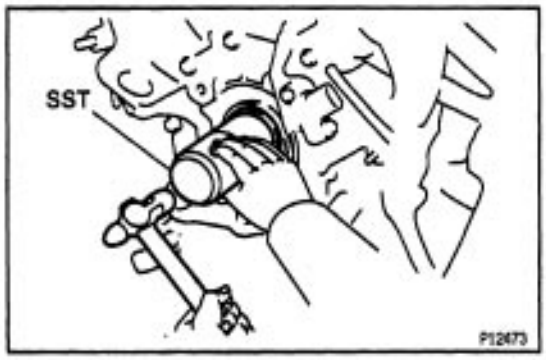


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

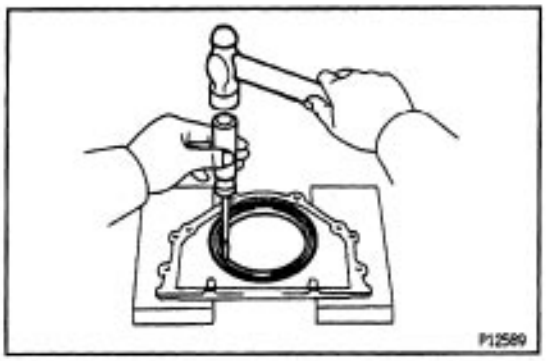
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

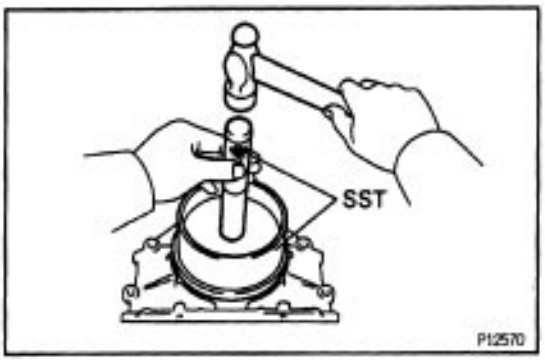
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09223 – 00010



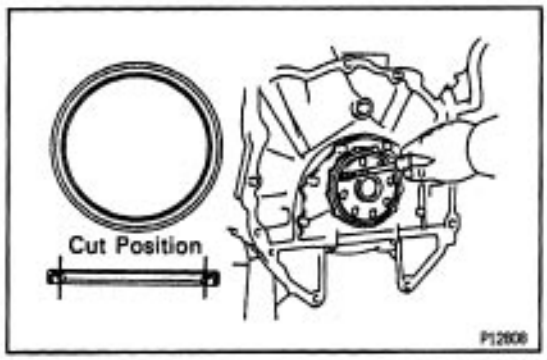
2. REPLACE CRANKSHAFT REAR OIL SEAL

A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



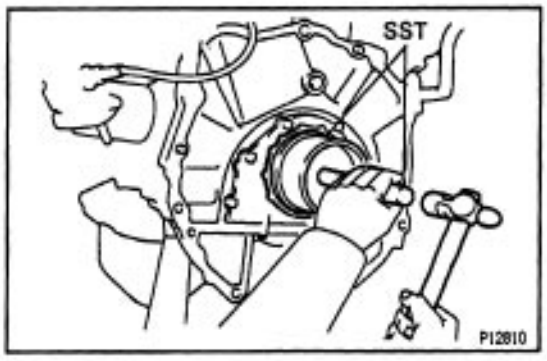
(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223 –15030, 09608 – 30022 (09608 – 05010)
(c) Apply MP grease to the oil seal lip.



B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver, pry out the oil seal.

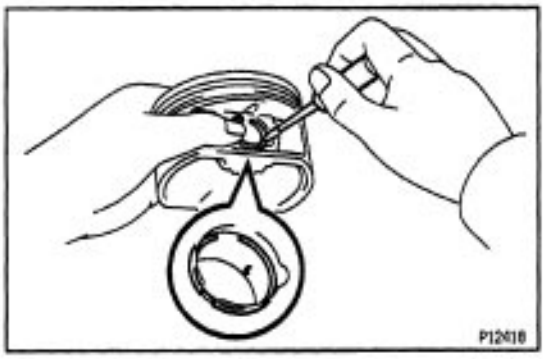
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



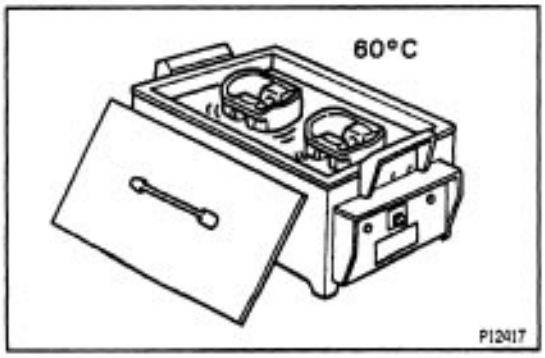
(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil sea! until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09608–30022 (09608–05010)

PISTON AND CONNECTING ROD ASSEMBLY

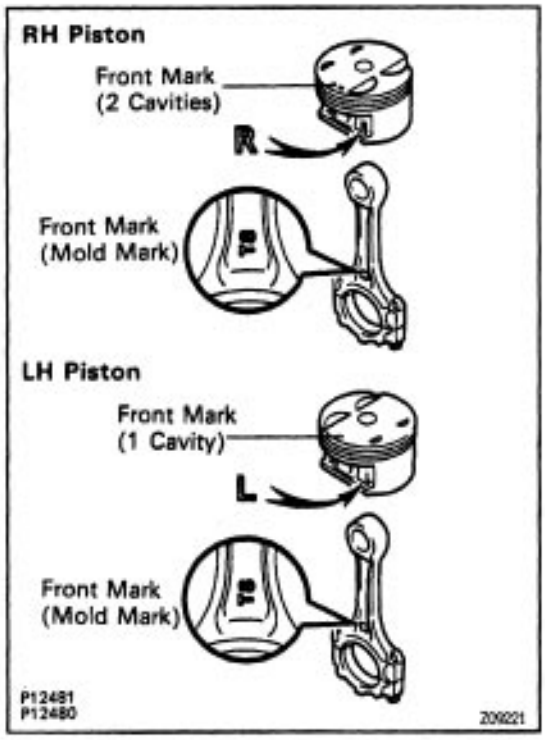
1. ASSEMBLE PISTON AND CONNECTING ROD



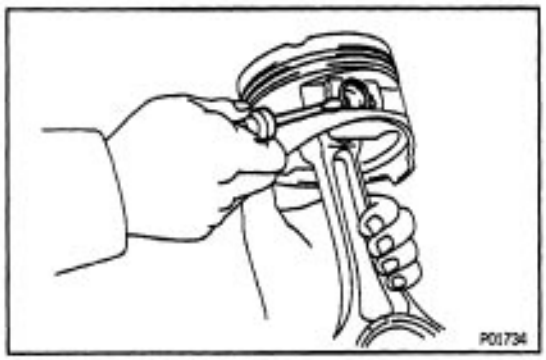
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



(b) Gradually heat the piston to about 60°C (140°F).



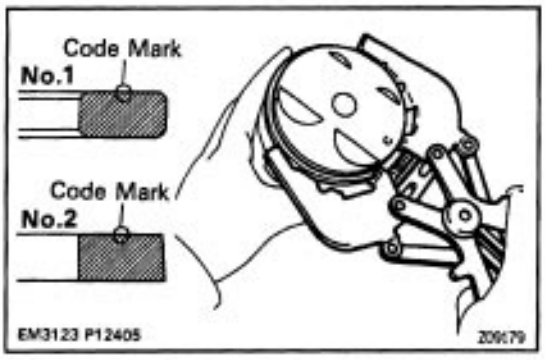
(c) Coat the piston pin with engine oil.
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.



(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.



(b) Using a piston ring expander, install the 2 compres–sion rings with the code mark facing upward.

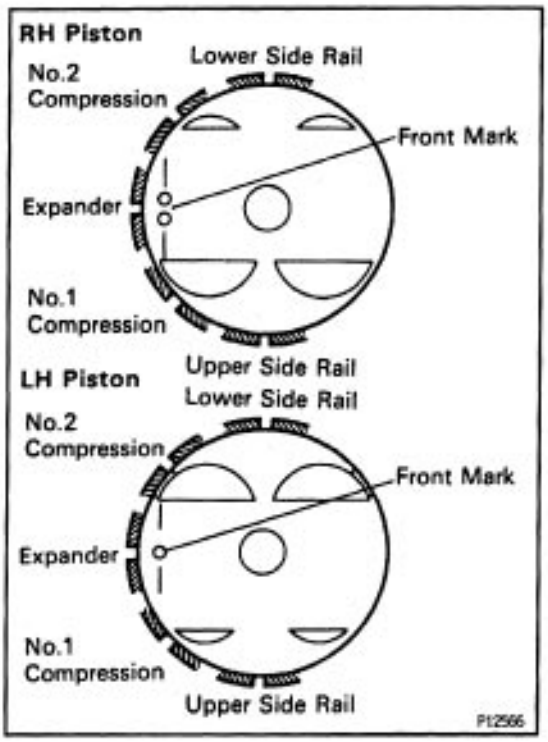
Code mark:

No.1

1RorT

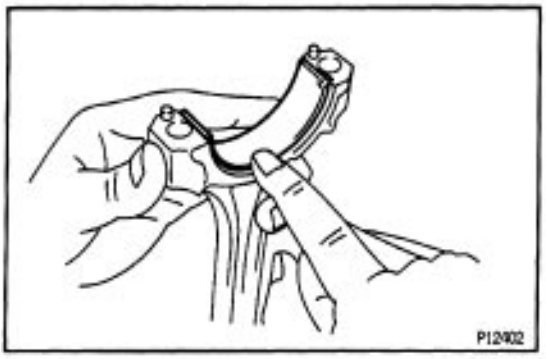
No.2

2R or 2T



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connect–ing rod or connecting cap.

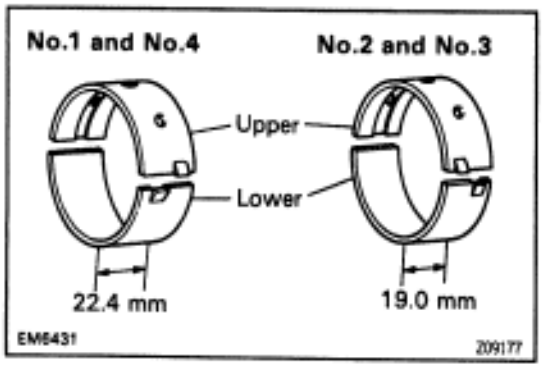
(b) Install the bearings in the connecting rod and con–necting rod cap.

CYLINDER BLOCK ASSEMBLY

(See Components for Disassembly and Assembly)

HINT:

- Thoroughly clean all parts to be assembled. Before installing the parts, apply new engine oil to all sliding and and rotating surfaces.
- Replace all gaskets, 0–rings and oil seals with new parts.



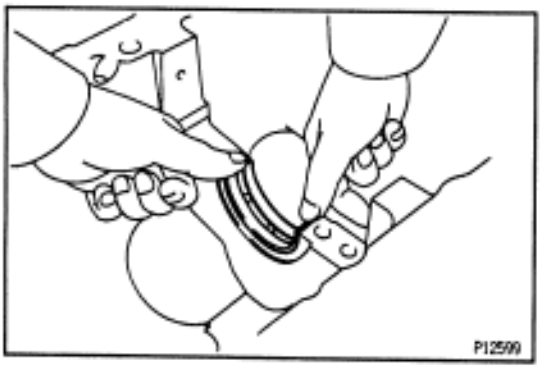
1. INSTALL MAIN BEARINGS

HINT:

- Main bearings come in widths of 19.0 mm (0.748 in.) and 22.4 mm (0.882 in.). Install the 22.4 mm (0.882 in.) bearings in the No. 1 and No.4 cylinder block journal positions with the main bearing cap.
- Install the 19.0 mm (0.748 in.) bearings in the No. 2 and No.3 positions.
- Upper bearings have an oil groove and oil holes; lower bearings do not.

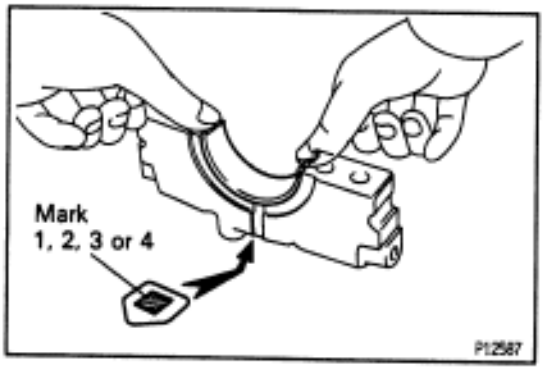
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 4 upper bearings.

NOTICE: Install the bearing with the oil hole in the cylin–der block.



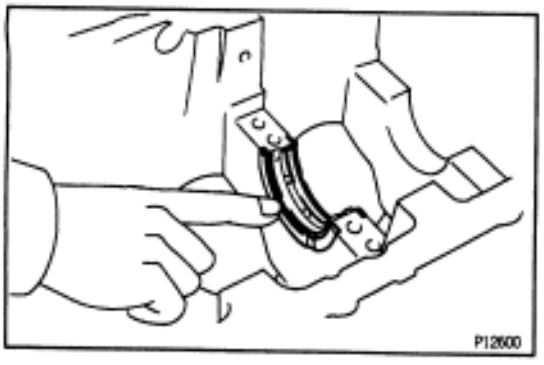
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 4 lower bearings.

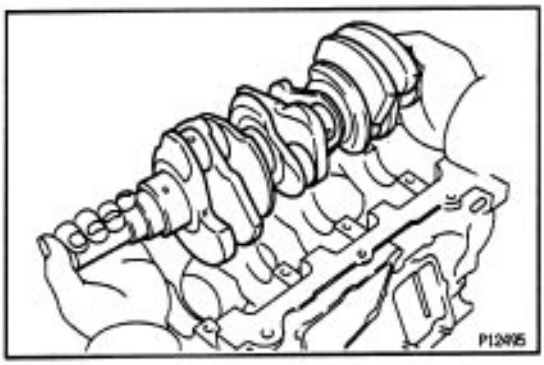
HINT: A number is marked on each main bearing cap to indicate the installation position.



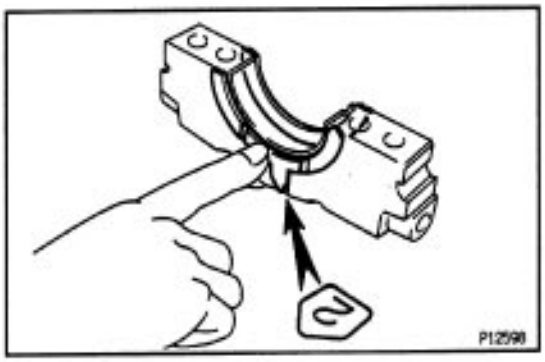
2. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.2 journal position of the cylinder block with the oil grooves facing outward.





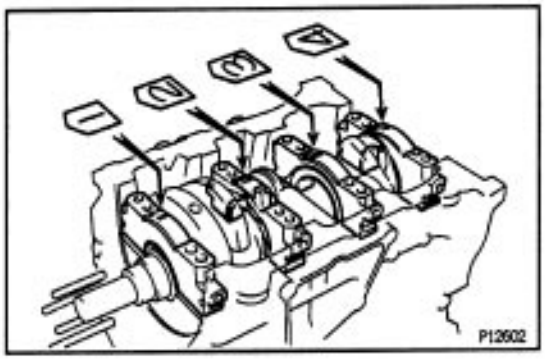
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



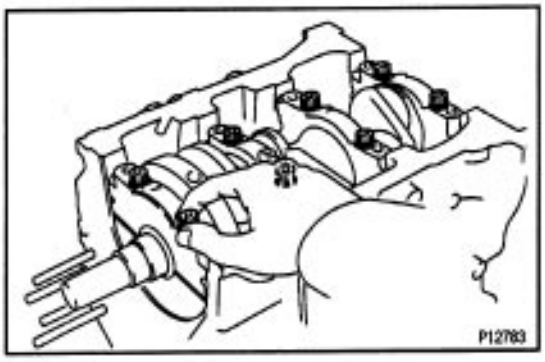
4. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

A. Place main bearing caps and lower thrust washers on cylinder block

(a) Install the 2 thrust washers on the No.2 bearing cap with the grooves facing outward.

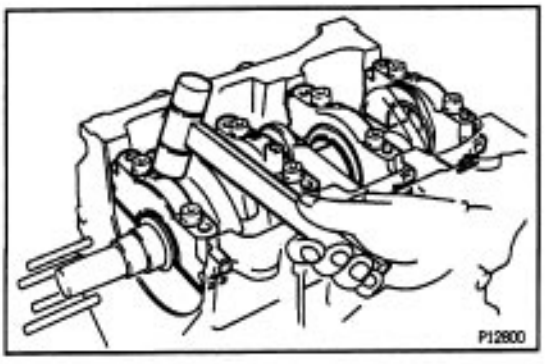


(b) Temporarily place the 4 main bearing caps level and let them in their proper locations.



(c) Apply a light coat of engine oil on the threads and under the main bearing cap bolts (12 Pointed Head Bolts).

(d) Temporarily install the 8 main bearing cap bolts.

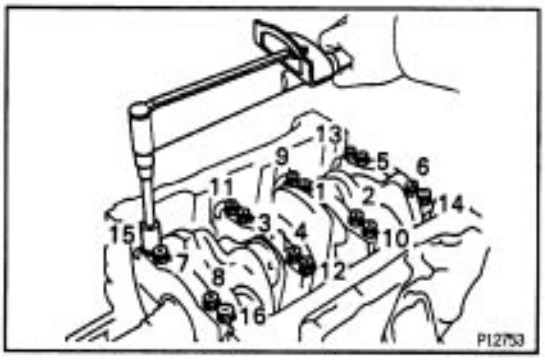


(e) Using a plastic–faced hammer, lightly tap the bearing cap to ensure a proper fit.

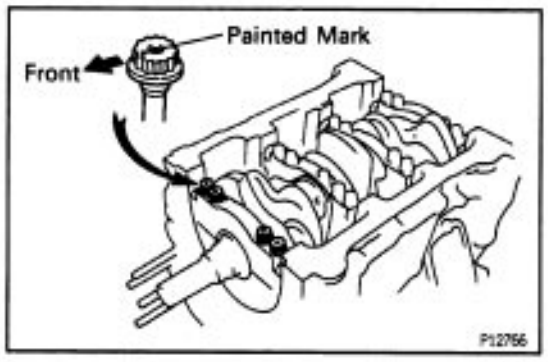
B. Install main bearing cap bolts
(for 12 Pointed Head Bolts)

HINT:

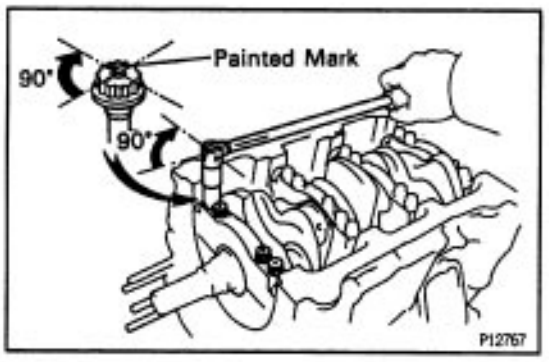
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing cap bolts is broken or deformed, replace it.



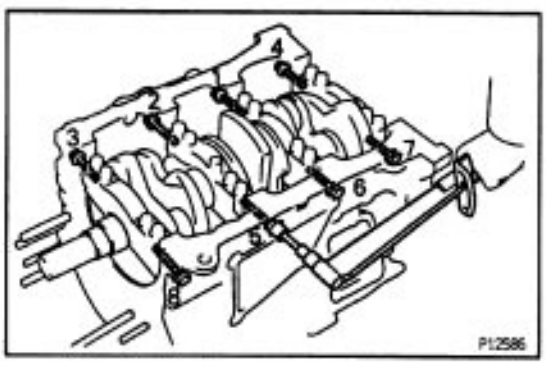
(a) Apply a light coat of engine oil on the threads and under the main bearing cap bolts.
(b) Install and uniformly tighten the 16 main bearing cap bolts, in several passes, in the sequence shown.
Torque: 22 N–m (225 kgf–cm, 16 ft–lbf)
If any of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



(c) Mark the front of the main bearing cap bolts with paint.

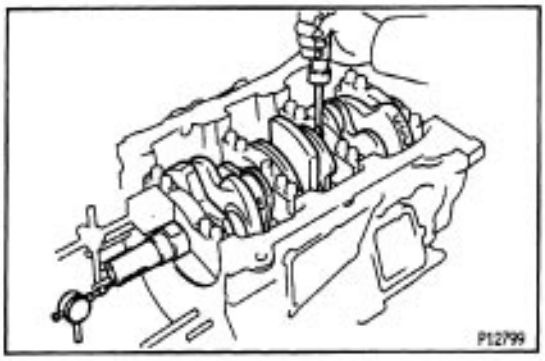


(d) Retighten the main bearing cap bolts by 90®in the numerical order shown.
(e) Check that the painted mark is now at a 90®angle to the front.



C. Install main bearing cap bolts
(for Hexagon Head Bolts)

(a) Install a new seal washer to the main bearing cap bolt.
(b) Install and uniformly tighten the 8 main bearing cap bolts, in several passes, in the sequence shown.
Torque: 27 N–m (275 kgf–cm, 20 ft–lbf)
(c) Check that the crankshaft turns smoothly.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.04 – 0.24 mm (0.0016 – 0.0095 in.)

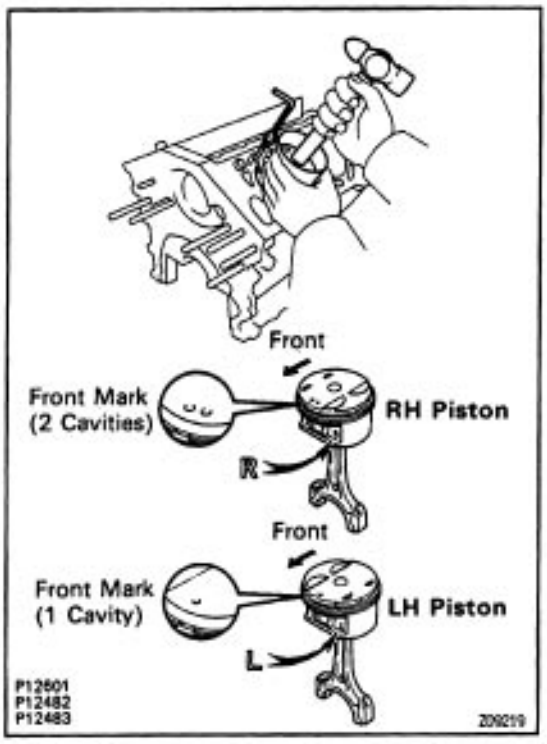
Maximum thrust clearance:

0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, re–place the thrust washers as a set.

Thrust washer thickness:

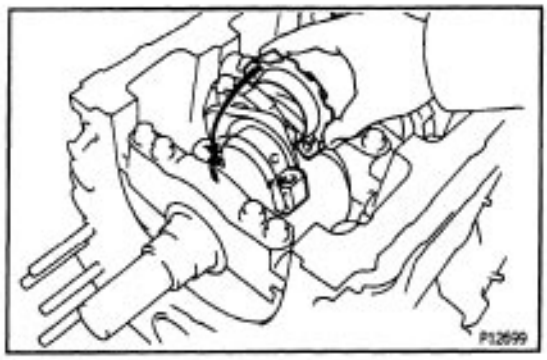
1.930 – 1.980 mm (0.0760 – 0.0780 in.)



6. INSTALL PISTON AND CONNECTING ROD ASSEMBLES

Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

HINT: The shape of the piston varies for the RH and LH banks. The RH piston is marked with ”R”, the LH piston with ”L”.

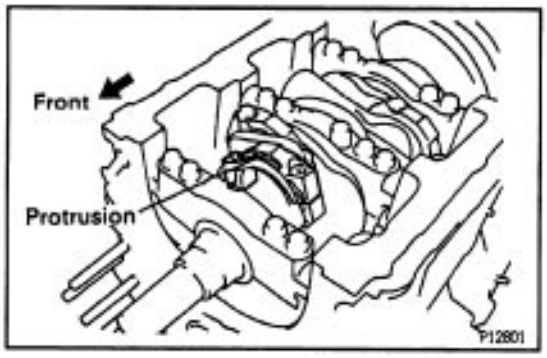


7. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Align the pin dowels of the connecting rod cap with the pins of the connecting rod, and install the con–necting rod.

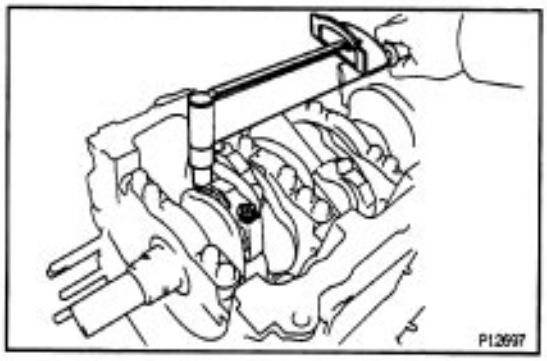


(c) Check that the protrusion of the connecting rod cap is facing in the correct direction.

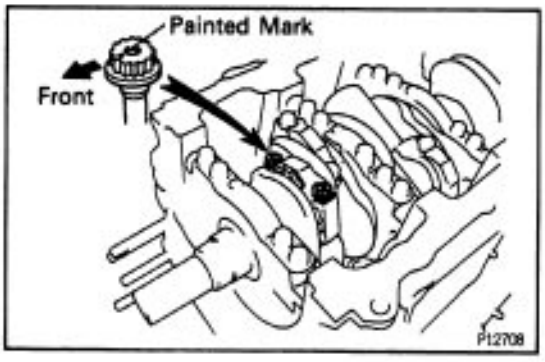
B. Install connecting rod cap bolts

HINT:

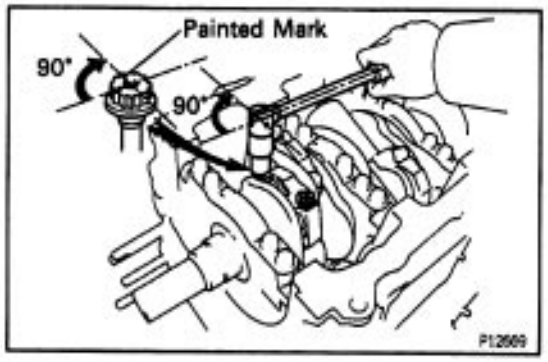
- The connecting rod cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the connecting rod cap bolts is broken or deformed, replace it.



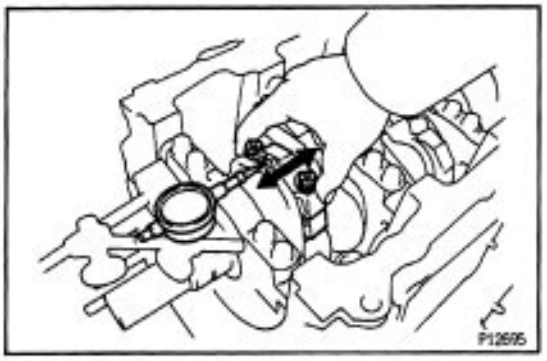
(a) Apply a light coat of engine oil on the threads and under the heads of the connecting rod cap bolts.
(b) Install and alternately tighten the 2 connecting rod cap bolts in several passes.
Torque: 24.5 N–m (250 kgf–cm, 18 ft–lbf)
If any of the connecting rod cap bolts does not meet the torque specification, replace the connecting rod cap bolts.



(c) Mark the front of the connecting cap bolts with paint.



(d) Retighten the cap bolts by 90®as shown.
(e) Check that the painted mark is now at a 90®angle to the front.
(f) Check that the crankshaft turns smoothly.



8. CHECK CONNECTING ROD OIL CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.15 – 0.30 mm (0.0059 – 0.0118 in.)

Maximum thrust clearance:

0.35 mm (0.0138 in.)

If the thrust clearance is greater than maximum, re–place the connecting rod assembly
(s). If necessary,
replace the crankshaft.

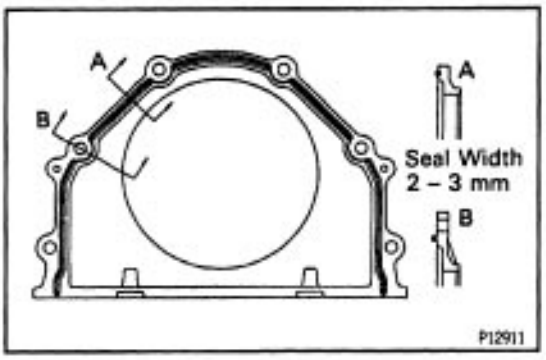
Connecting rod thickness:

20.80 – 20.85 mm (0.8189 – 0.8209 in.)

9. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be care–ful not to drop any oil on the contact surfaces of the oil seal retainer and cylinder block.

- Using a razor blade and gasket scraper, remove all the oil packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

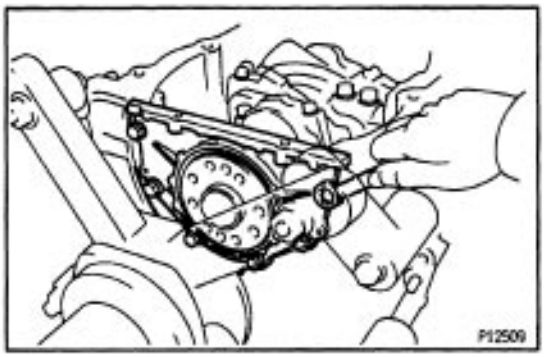


(b) Apply seal packing to the oil seal retainer as shown in the illustration.

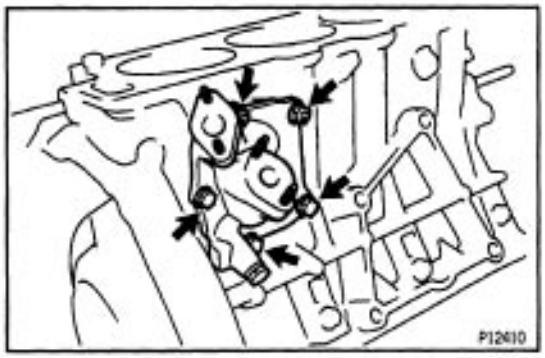
Seal packing:

Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be re–moved and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



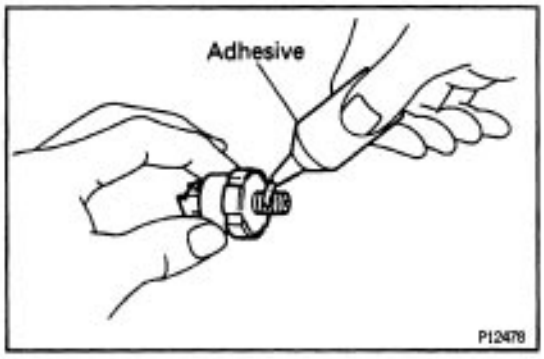
(c) Install the oil seal retainer with the 6 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



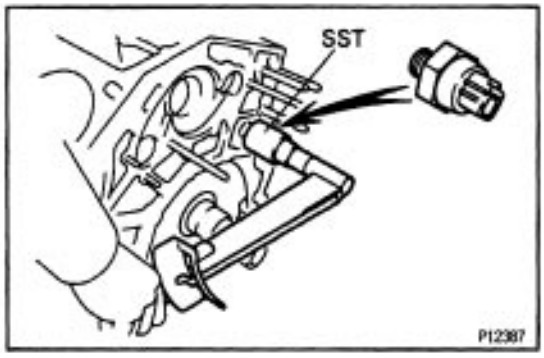
AFTER ASSEMBLY

(See Components for Cylinder Block Preparation of Disassembly and After Assembly)

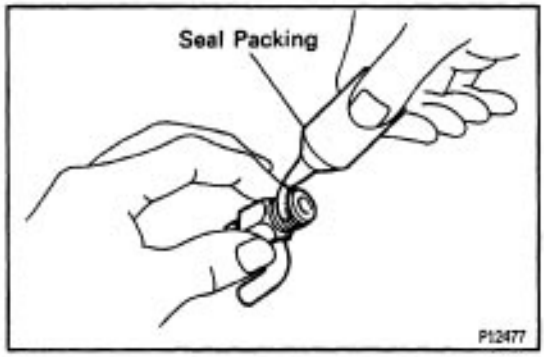
1. INSTALL EGR COOLER
Install a new gasket and the EGR cooler with the 3 bolts and 2 nuts.
Torque: 9 N–m (90 kgf–cm, 78 in.–lbf)



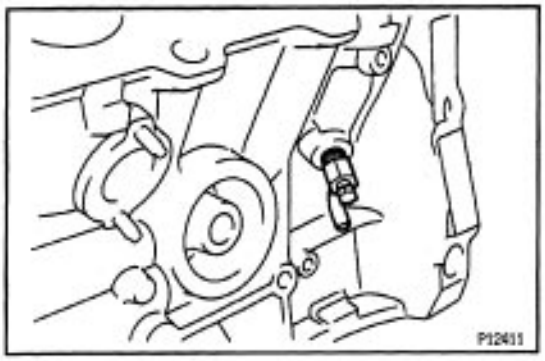
2. INSTALL OIL PRESSURE SWITCH
(a) Apply adhesive to 2 or 3 threads.
Adhesive:
Part No. 08833–00080. THREE BOND 1344, LOCTITE 242 or equivalent



(b) Using SST, install the oil pressure switch.
SST 09816 – 30010
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

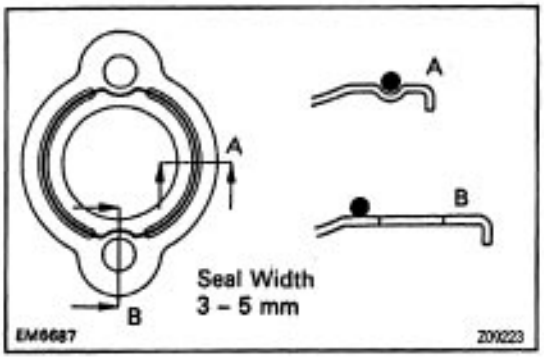


3. INSTALL ENGINE COOLANT DRAIN COCK
(a) Apply seal packing to 2 or 3 threads.
Seal packing:
Part No. 08826–00100 or equivalent

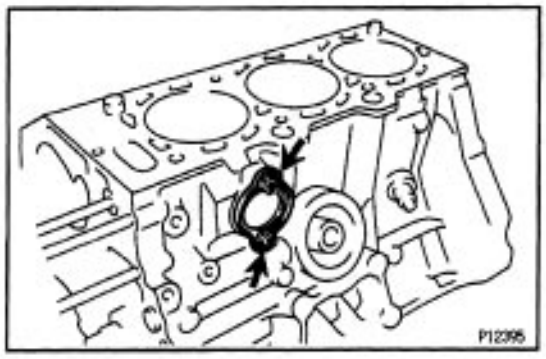


(b) Install the drain cock.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)
HINT: After applying the specified torque, rotate the drain cock clockwise until it is in the position shown.

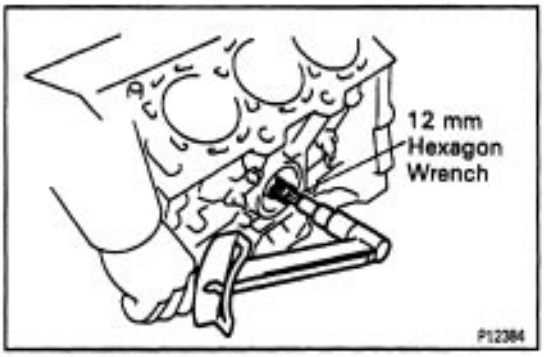
4. INSTALL WATER SEAL PLATE
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the seal plate and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the seal plate as shown in the illustration.
Seal packing:
Part No. 08826–00100 or equivalent
- Install a nozzle that has been cut to a 3–5 mm (0.12 – 0.20 in.) opening.
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



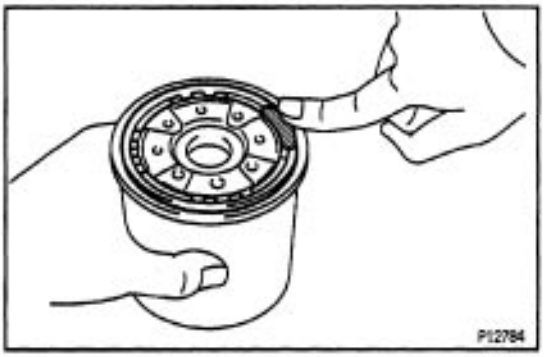
(c) Install the seal plate with the 2 nuts.
Torque: 14.5 N–m (145 kgf–cm. 10 ft–lbf)



5. INSTALL OIL FILTER UNION

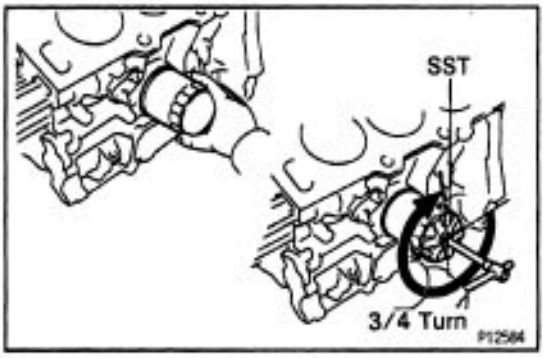
Using a 12 mm hexagon wrench, install the oil filter union.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. INSTALL OIL FILTER

(a) Apply clean engine oil to the gasket of anew oil filter.

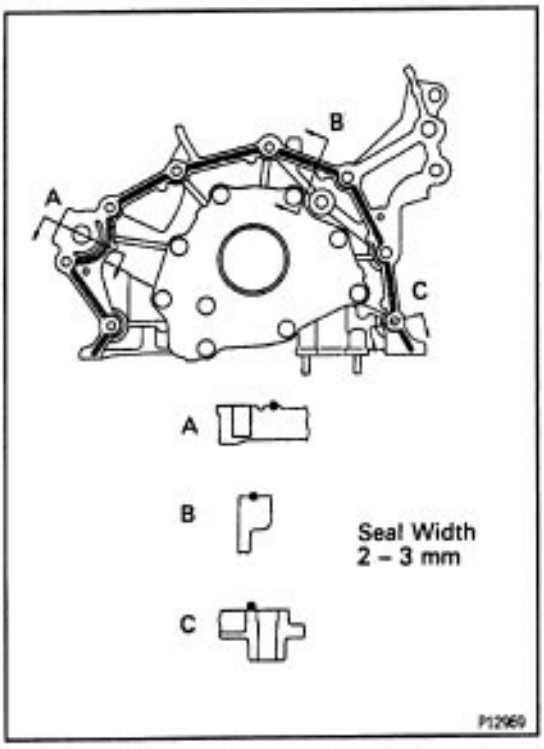


(b) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(c) Using SST, tighten it an additional 3/4 turn.
SST 09228–07500

7. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be care–fuI not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the oil pump as shown in the illustration.

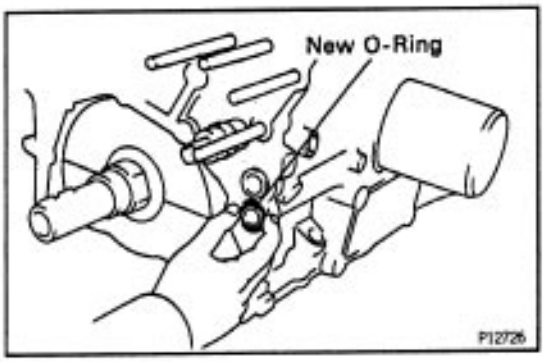
Seal packing:

Part No. 08826–00080 or equivalent

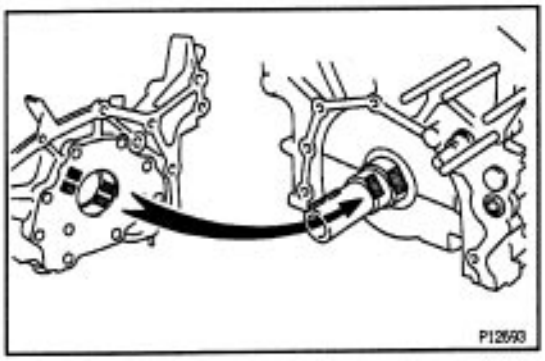
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

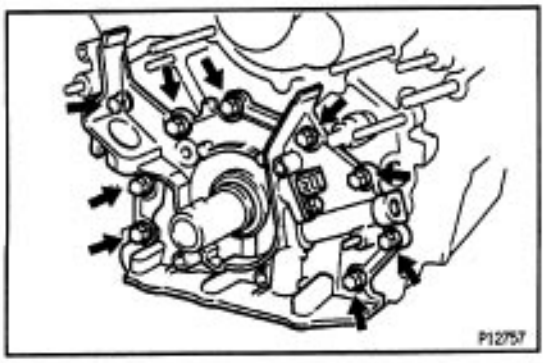
- Parts must be assembled within 3 minutes of application. Otherwise the material must be re–moved and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Place a new O–ring in position on the cylinder block.



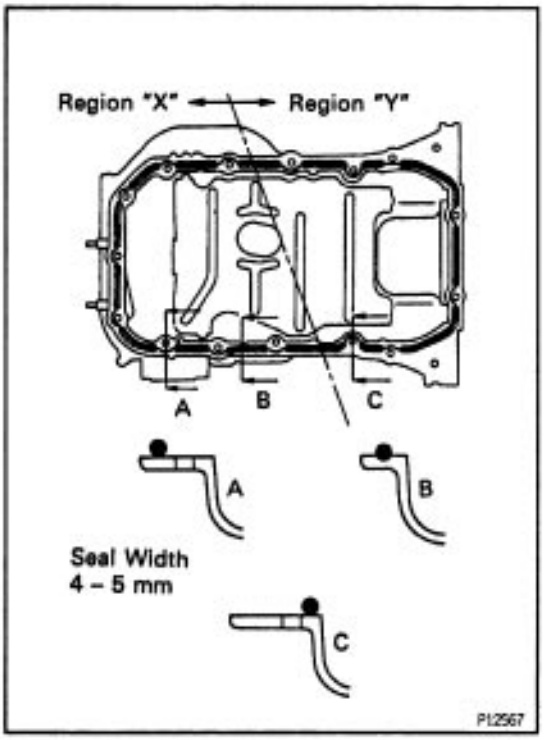
(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide the oil pump on the crankshaft.



(e) Install the oil pump with the 9 bolts.

Torque:

8 N–m (80 kgf–cm, 69 in.–lbf) for 10 mm head bolt
19.5 N–m (200 kgf–cm,14 ft–lbf) for 12 mm head bolt



8. INSTALL N0.1 OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the No.1 oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the No.2 oil pan as shown in the illustration.

Seal packing:

Part No. 08826–00080 or equivalent

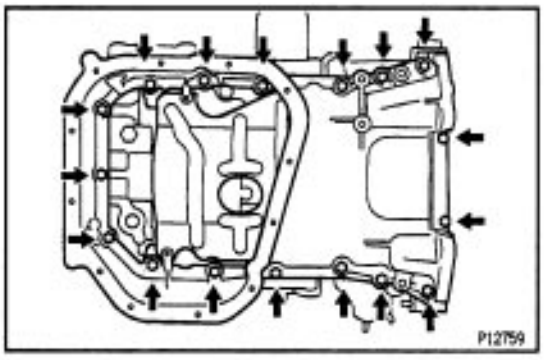
Region ”x” is at the outer side of the bolt hole.

Region ”*” is at the inner side of the bolt hole.

- Install a nozzle that has been cut to a 4–5 m m (0.16 – 0.20 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

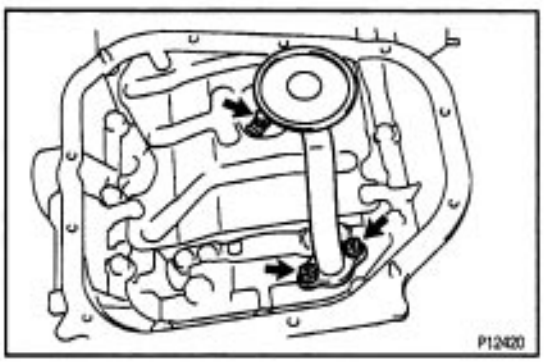


(c) Install the No.1 oil pan with the 17 bolts.

Torque:

8 N–m (80 kgf–cm, 69 in.–lbf) for 10 mm head bolt

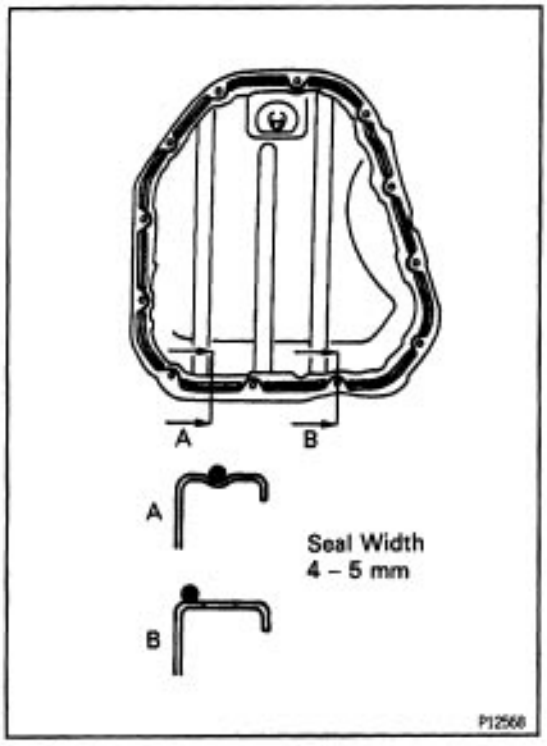
19.5 N–m (200 kgf–cm, 14 ft–lbf) for 12 mm head bolt



9. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.

Torque: 8 N–m (80 kgf–cm, 69 in–lbf)



10. INSTALL NO.2 OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the No.1 and No.2 oil pans.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the No.2 oil pan as shown in the illustration.

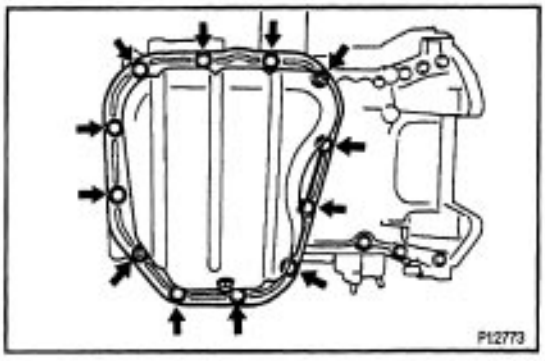
Seal packing:

Part No. 08828–00080 or equivalent

- Install a nozzle that–has been cut to a 4–5 mm (0.16 – 0.20 in.) opening.

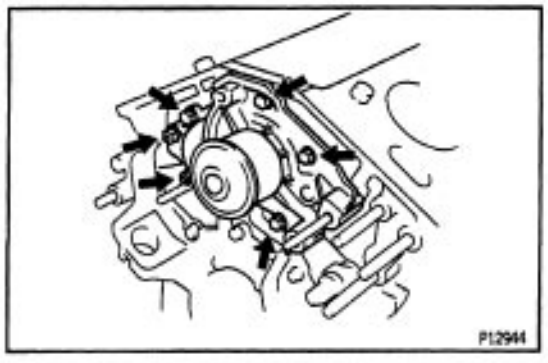
HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the No.2 oil pan with the 10 bolts and 2 nuts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



11. INSTALL WATER PUMP

Install a new gasket and the water pump with the 4 bolts and 2 nuts.

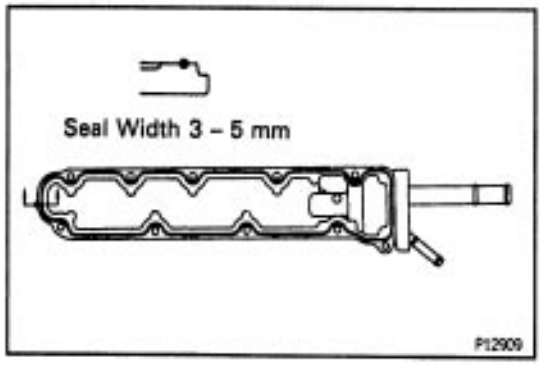
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

NOTICE: Do not got oil on the gasket.

12. INSTALL WATER INLET HOUSING

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water inlet housing and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the water inlet housing as shown in the illustration.

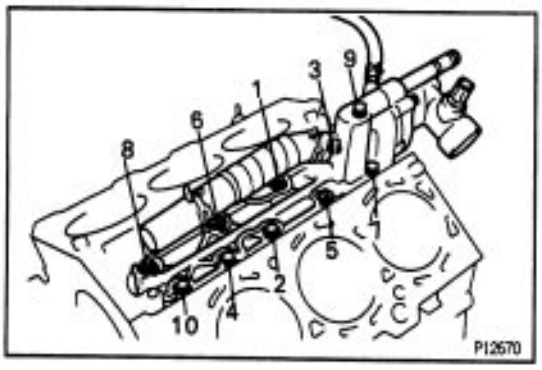
Seal packing:

Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 3–5 mm (0.12–0.20 in.) opening.

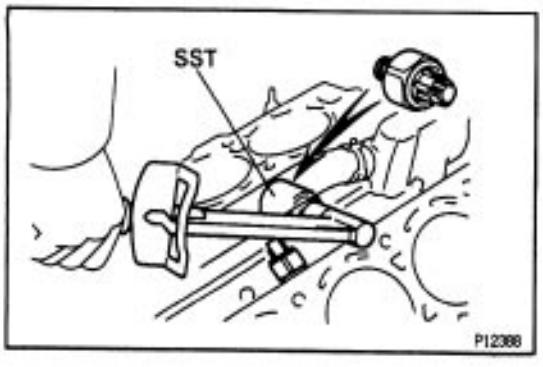
HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the water inlet housing with the 8 bolts and 2 nuts, in the several passes, in the sequence shown.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

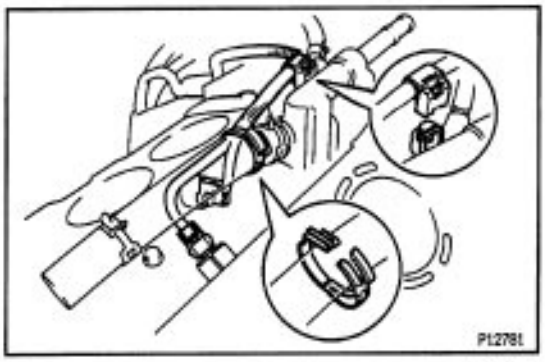


13. INSTALL KNOCK SENSORS

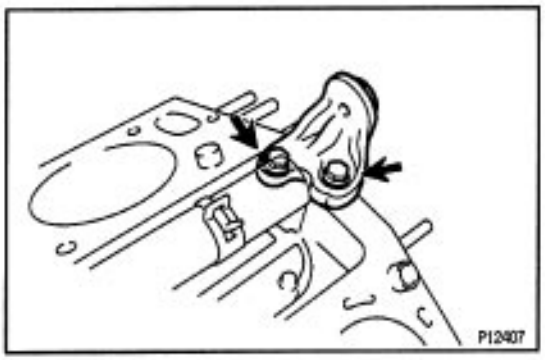
(a) Using SST, install the 2 knock sensors.

SST 09816 – 30010

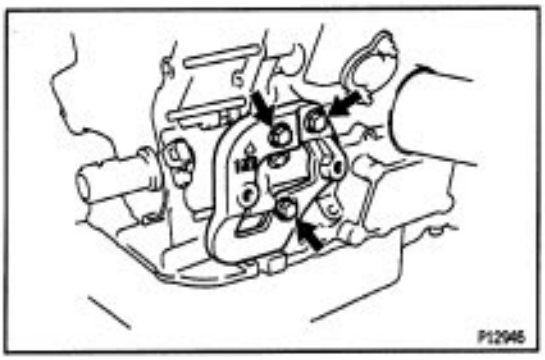
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



(b) Connect the 2 knock sensor connectors.
(c) Install the wire band.
(d) Connect the engine wire clamp.

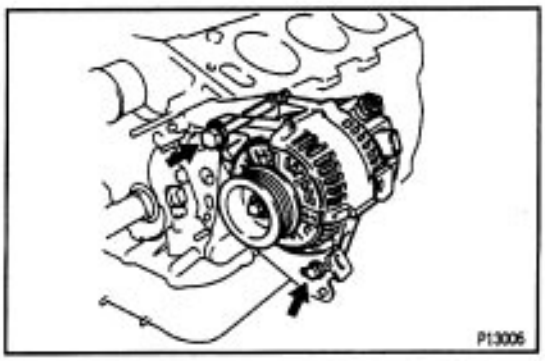


14. INSTALL NO.2 IDLER PULLEY BRACKET
Install the pulley bracket with the 2 bolts.
Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)

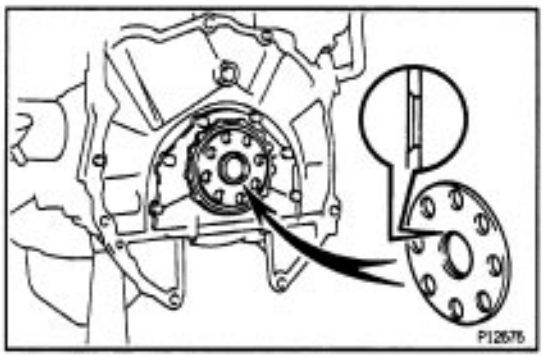


15. INSTALL A/C COMPRESSOR HOUSING BRACKET
Install the compressor housing bracket with the 3 bolts.
Torque: 25 N–m (250 kgf–cm. 18 ft–lbf)

16. INSTALL GENERATOR BRACKET AND ADJUSTING BAR
Install the generator bracket and adjusting bar with the 3 nuts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



17. INSTALL GENERATOR
Install the generator with the 2 bolts. Do not tighten the bolts yet.
18. INSTALL CYLINDER HEAD
(See pages EG2–96 **to 118)**
19. INSTALL TIMING PULLEYS AND BELT
(See pages EG2–49 **to 55)**
20. REMOVE ENGINE STAND

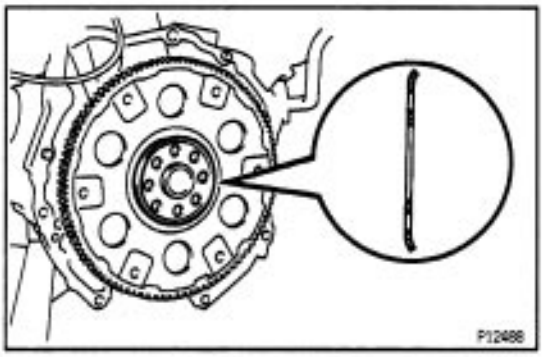


ENGINE & TRANSAXLE ASSEMBLY

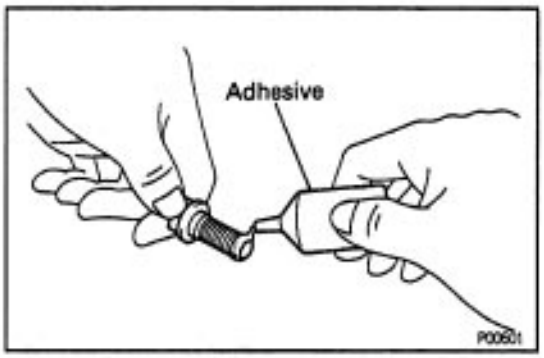
(See Components for Engine & Transaxle Separation and Assembly)

1. INSTALL DRIVE PLATE

(a) Install the front spacer on the crankshaft with the chamfered end facing the shaft.

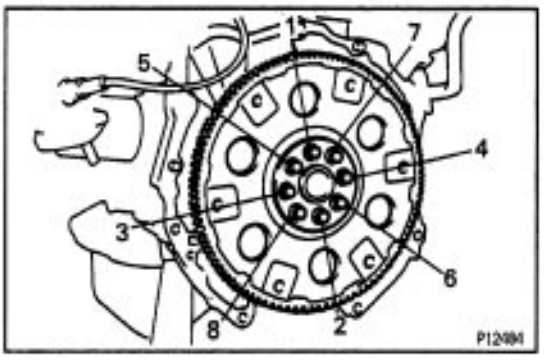


(b) Install the drive pate and rear spacer on the crank–shaft.

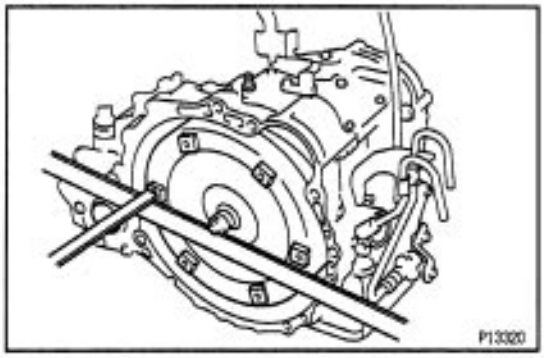


(c) Clean the threads of the bolt with the gasoline.
(d) Apply adhesive to 2 or 3 threads of the mount bolt.
Adhesive:

Part No. 08833–00070. THREE BOND 1324 or equivalent



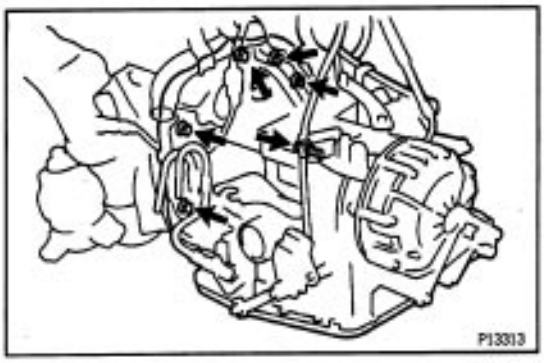
(e) Install and uniformly tighten the mounting bolts, in the several passes, in the sequence shown.
Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using a scale and a straight edge, measure from the installed surface to the front surface of the transaxle housing.
Correct distance:

13.7 mm (0.539 in.) or more



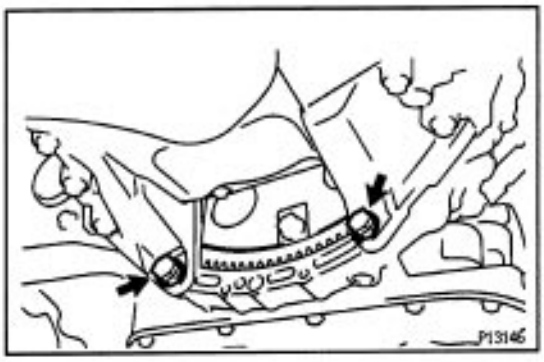
3. INSTALL TRANSAXLE TO ENGINE

A. Install transaxle

(a) Attach the transaxle to the engine.

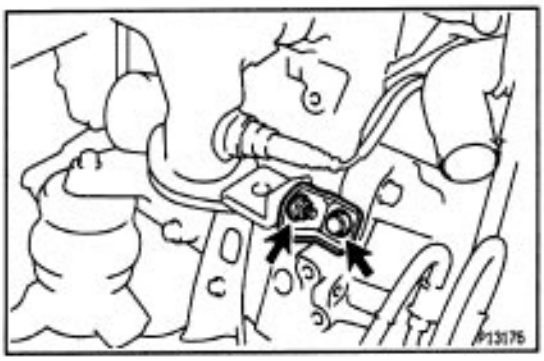
(b) Install the6 bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



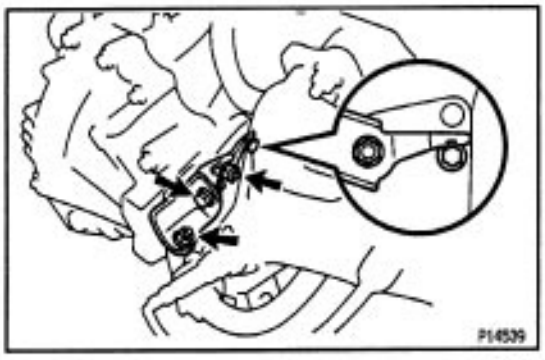
(c) Install the 2 bolts holding the No.2 oil pan to the transaxle.

Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)



(e) Install the No.2 manifold stay with the bolt and nut.

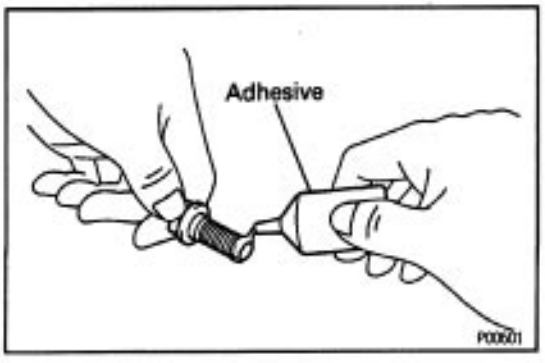
Torque: 20 N–m (200 kgf–cm. 14 ft–lbf)



(f) Install the manifold stay, exhaust manifold plate with the bolt and 2 nuts.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

HINT: Install the manifold so that the tip of the stay touches the head of the differential retainer installa–tion bolt as shown in the illustration.



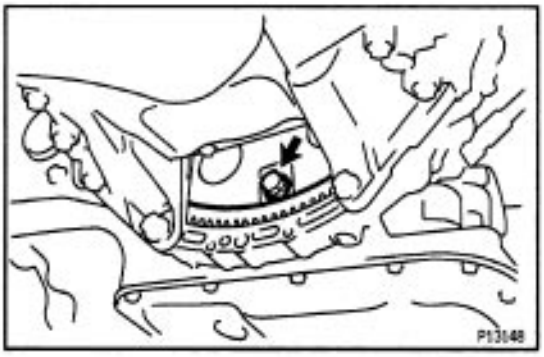
B. Install torque converter clutch mounting bolts

(a) Clean the threads of the bolt with the gasoline.

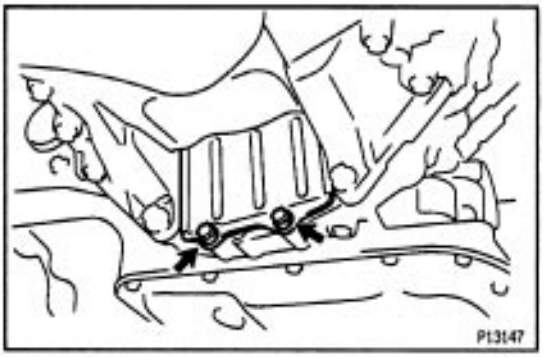
(b) Apply adhesive to 2 or 3 threads of the mount bolt.

Adhesive:

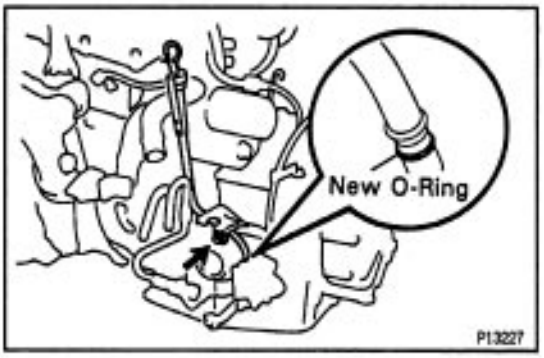
Part No. 08833–00070, THREE BOND 1324 or equivalent



(c) Hold the crankshaft pulley bolt with a wrench, and install the 6 bolts evenly.
Torque: 41 N–m (420 kgf–cm, 30 ft–lbf)
HINT: First install the dark green colored bolt, then install the other bolts.



(d) Install the flywheel housing under cover with the 2 bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



4. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK FOR TRANSMISSION
(a) Install a new 0–ring to the dipstick guide.
(b) Apply soapy water to the 0 – ring.
(c) Connect the dipstick guide end to the dipstick tube of the oil pan.
(d) Install the dipstick guide with the bolt.
(e) Install the dipstick.

5. CONNECT ENGINE WIRE
(a) Connect the following parts:
(1) O/D solenoid connector
(2) PNP switch speedometer
(3) Starter 50 terminal
(4) Starter B terminal
(5) Speed sensor connector
(b) Disconnect the 2 wire clamps from the transaxle.
(c) Install the 2 wire clamps to the transaxle.

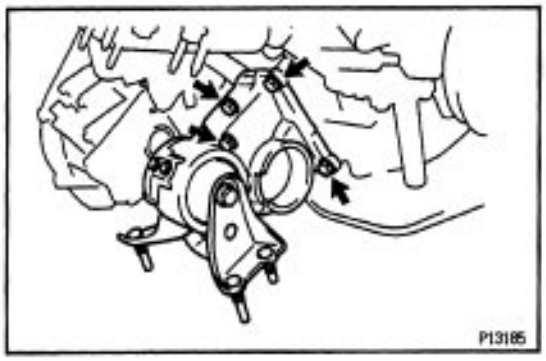
ENGINE INSTALLATION

(See Components for Engine Removal and Installation)

1. INSTALL FRONT EXHAUST PIPE STAY

Install the pipe stay with the 2 bolts.

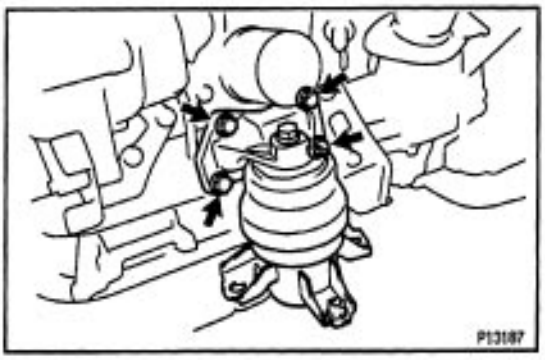
Torque: 21 N–m (210 kgf–cm, 16 ft–lbf)



2. INSTALL RR ENGINE MOUNTING INSULATOR

Install the mounting insulator with the 4 bolts.

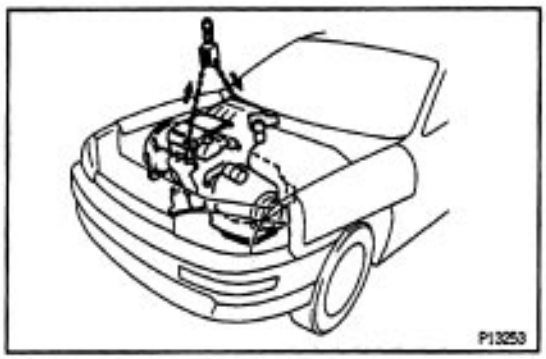
Torque:63.7 N–m (650 kgf–cm, 47 ft–lbf)



3. INSTALL FR ENGINE MOUNTING INSULATOR

Install the mounting insulator with the 4 bolts.

Torque: 6.74 N–m (650 kgf–cm, 47 ft–lbf)

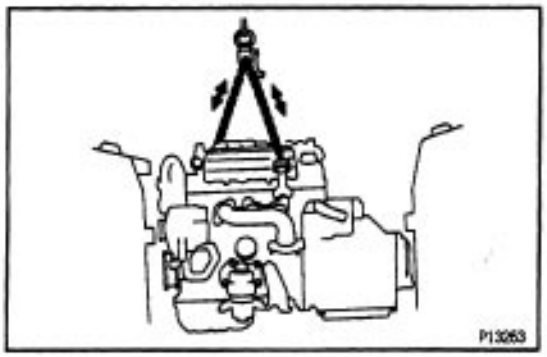


4. INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE

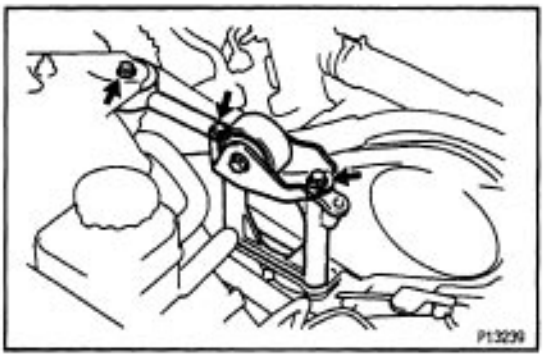
(a) Attach the engine sling device to the engine hangers.

(b) Lower the engine into the engine compartment.
Tilt the transaxle downward, lower the engine and clear the LH mounting.

NOTICE: Be careful not to hit the PS gear housing or neutral start switch.



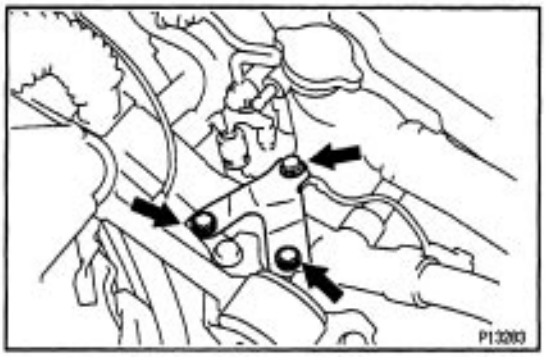
(c) Keep the engine level, and align RH and LH mountings with the body bracket.



5. INSTALL N0.2 ENGINE MOUNTING BRACKET AND ENGINE MOVING CONTROL ROD

Install the engine moving control rod and No.2 engine mounting bracket with the 3 bolts.

Torque: 63.7 N–m (650 kgf–cm, 47 ft–lbf)



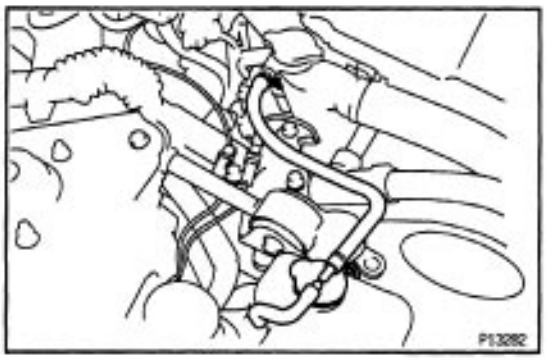
6. INSTALL RH ENGINE MOUNTING STAY

Install the RH mounting stay with the 3 bolts.

Torque: 31.4 N–m (320 kgf–cm, 23 ft–lbf)

7. CONNECT GROUND STRAPS

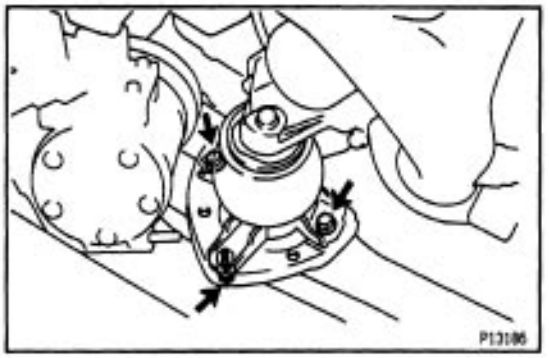
Connect the 2 straps.



8. INSTALL COOLANT RESERVOIR TANK

(a) Install the reservoir tank.

(b) Connect the reservoir hose.

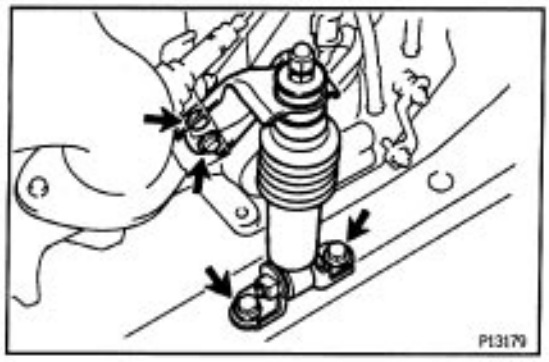


9. CONNECT FR ENGINE MOUNTING INSULATOR

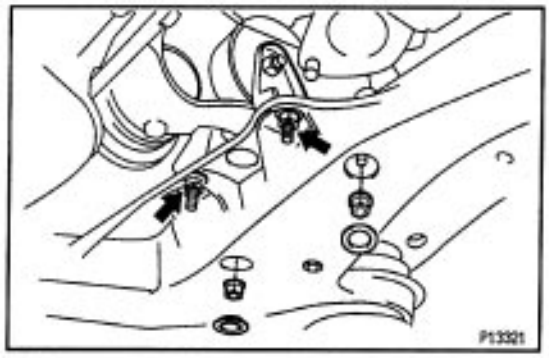
Connect the mounting insulator with the 3 bolts.

Torque: 80.4 N–m (820 kgf–cm, 59 ft–lbf) for TMC made

Torque: 65.7 N–m (670 kgf–cm, 48 ft–lbf) for TMM made

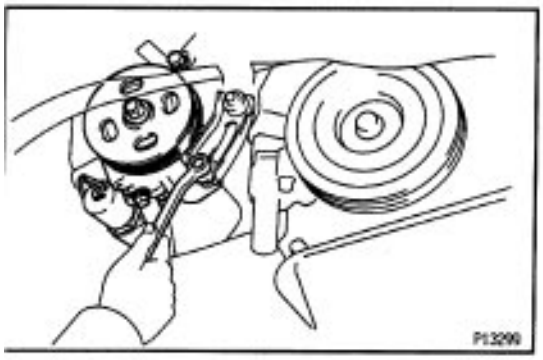


10. INSTALL ENGINE MOUNTING ABSORBER
Install the engine mounting absorber with the 4 bolts.
Torque: 48 N–m (490 kgf–cm, 35 ft–lbf)

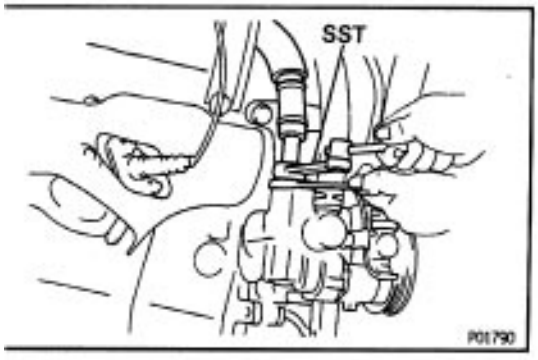


11. CONNECT RR ENGINE MOUNTING INSULATOR
(a) Connect the mounting insulator with the 4 nuts.
Torque: 65.7 N–m (670 kgf–cm, 48 ft–lbf)
(b) Install the 2 hole plugs.

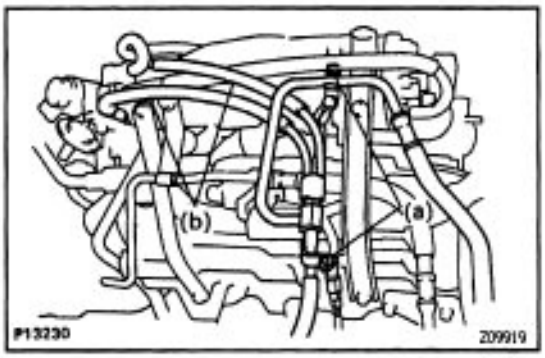
12. CONNECT LH ENGINE MOUNTING INSULATOR
Connect the mounting insulator with the 4 bolts.
Torque: 63.7 N–m (650 kgf–cm, 47 ft–lbf)
13. REMOVE ENGINE SLING DEVICE



14. INSTALL PS PUMP
(a) Install the PS pump with the 2 bolts.
Torque: 43 N–m (440 kgf–cm, 31 ft–lbf)
(b) Install the drive belt.



15. CONNECT HYDRAULIC COOLING FAN PRESSURE HOSE
Using SST, connect the pressure hose.
SST 09631– 22020
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)

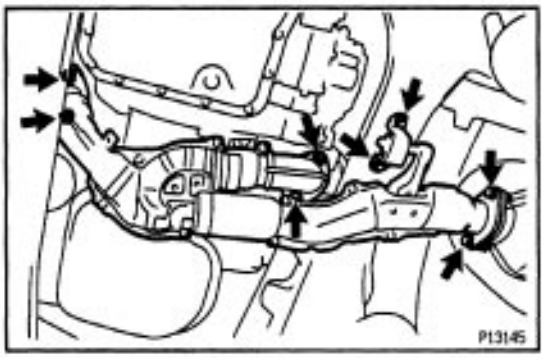


16. CONNECT PS PRESSURE TUBE

(a) Connect the PS pressure tube with the 2 nuts.

(b) Connect the 2 PS air hoses.

17. INSTALL DRIVE SHAFTS (See SA section)



18. INSTALL FRONT EXHAUST PIPE

(a) Temporarily install 3 new gaskets and the front exhaust pipe with the 2 bolts and 6 nuts.

(b) Tighten the 4 nuts holding the exhaust manifolds to the front exhaust pipe.

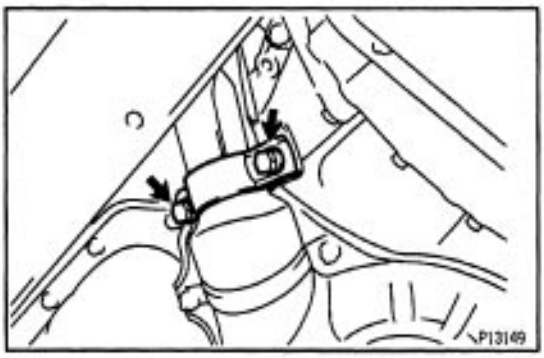
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

(c) Tighten the 2 bolts and 2 nuts holding the three–way catalytic converter to the front exhaust pipe.

Torque: 56 N–m (570 kgf–cm, 41 ft–lbf)

(d) Connect the bracket with the 2 bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



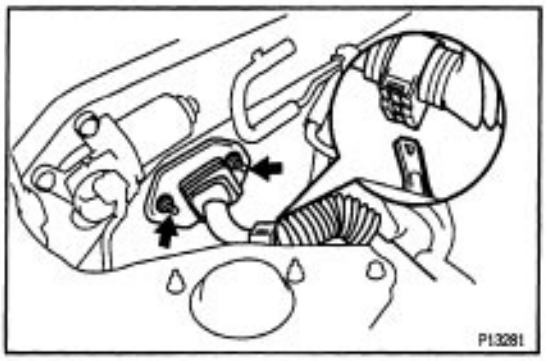
(e) Connect the front exhaust pipe clamp with the 2 bolts.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

19. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor and drive belt adjusting bar bracket with the 5 bolts.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



20. CONNECT ENGINE WIRE TO CABIN

(a) Push in the engine wire through the cowl panel. Install the 2 nuts.

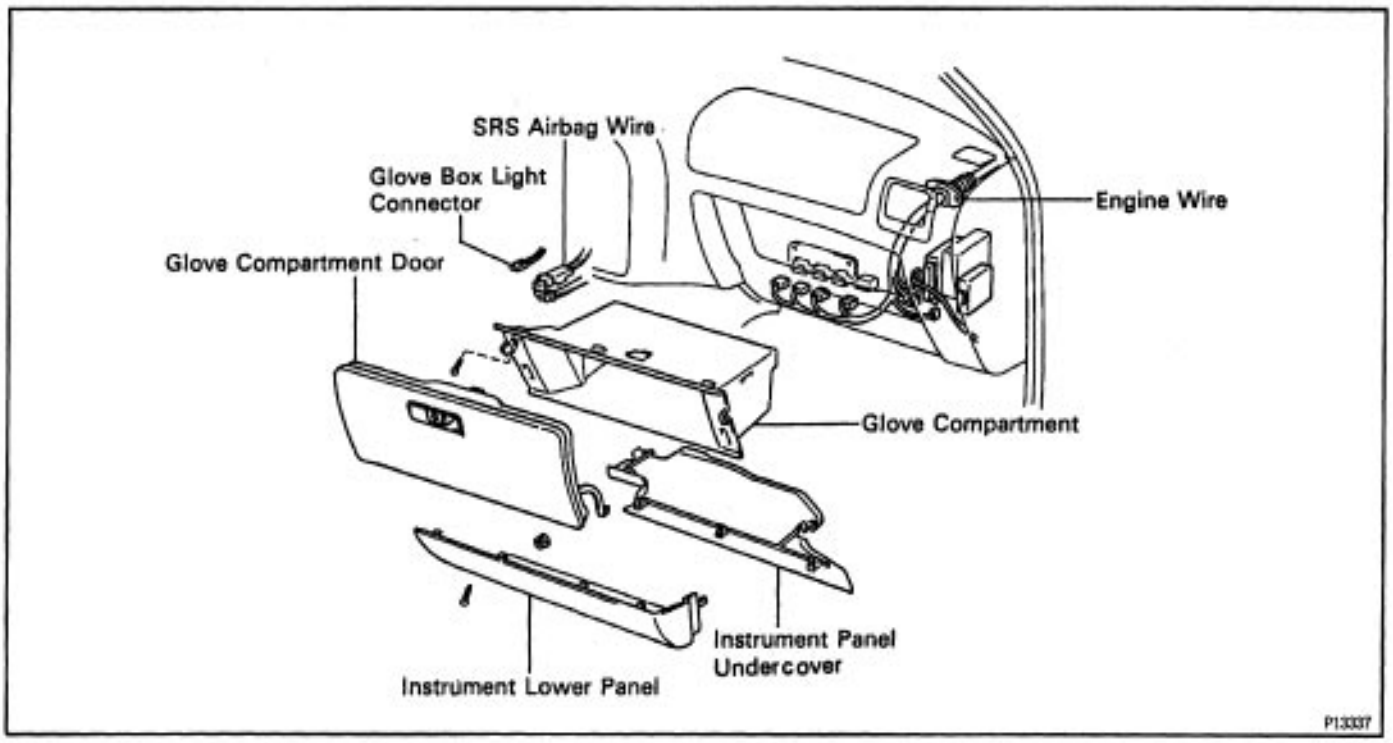
(b) Connect the wire clamp.

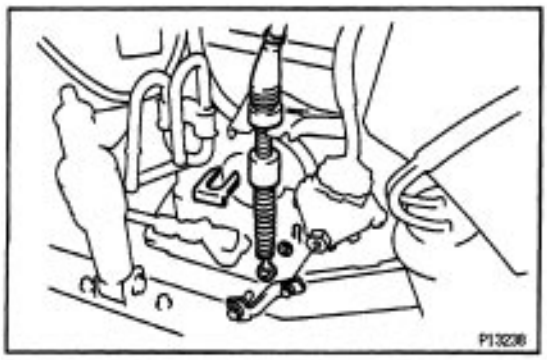
(c) Connect the following connectors:

(1) 3 engine ECM connectors
(2) 5 cowl wire connectors
(3) Cooling fan ECU connector

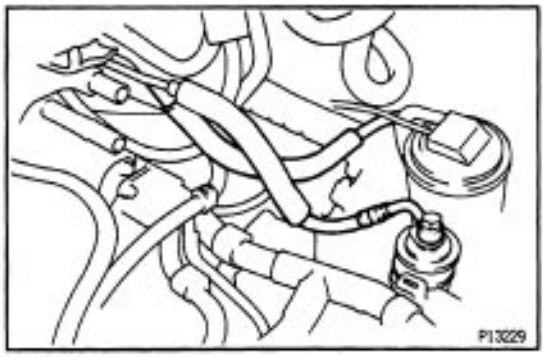
(d) Install the following parts:

(1) Glove compartment
(2) Glove compartment door
(3) Lower instrument panel
(4) Under cover



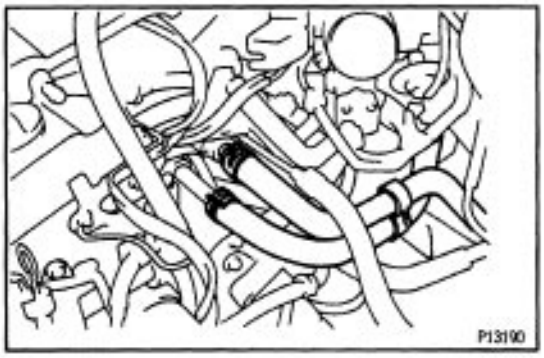


21. CONNECT TRANSAXLE CONTROL CABLE TO TRANSAXLE



22. CONNECT FUEL HOSES

(a) Connect the fuel return hose to the fuel pipe.
(b) Connect the fuel inlet hose to the fuel filter.
Torque: 30 N–m (300 kgf–cm, 22 ft–lbf)



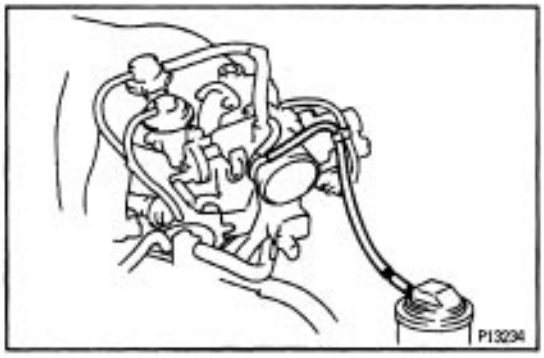
23. CONNECT HEATER HOSES

Connect the 2 hoses.

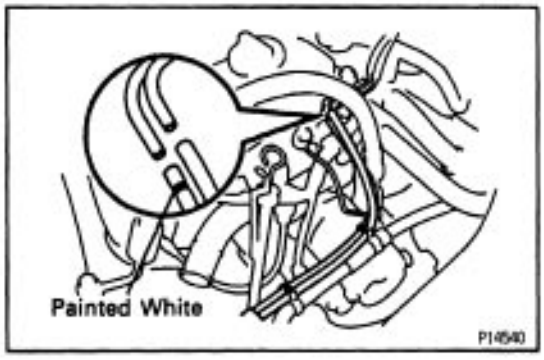
24. CONNECT VACUUM HOSES

Connect the following vacuum hoses:

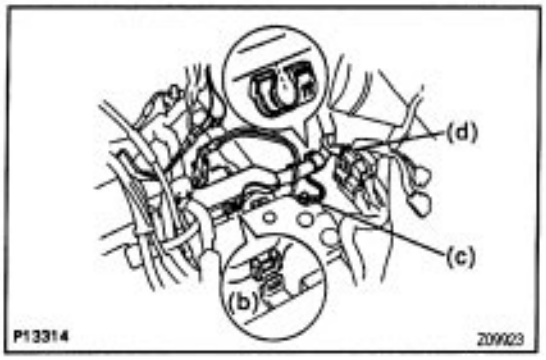
(1) Brake booster vacuum hose to air intake chamber



(2) Vacuum hose to charcoal canister

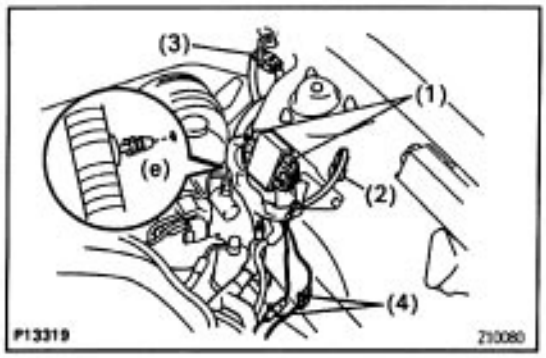


(3) Vacuum hoses to vacuum tank for intake air control valve

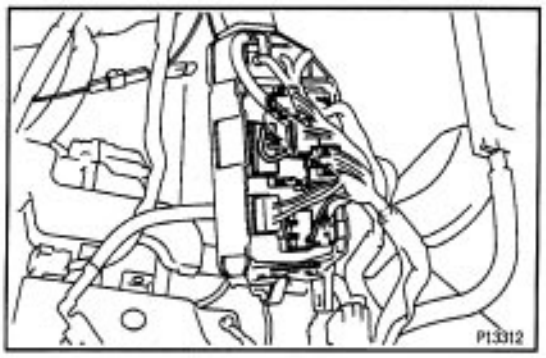


25. CONNECT ENGINE WIRE

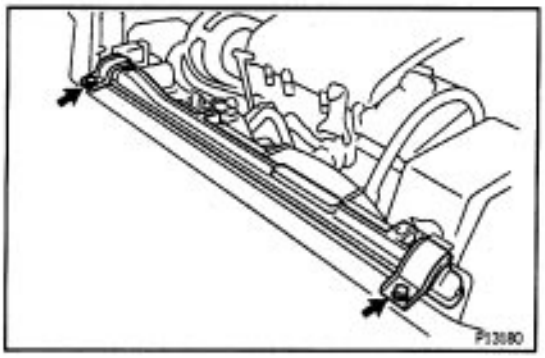
(a) Connect the wire clamps.
(b) Connect the ground strap with the bolt.
(c) Connect the connector to the LH fender apron.



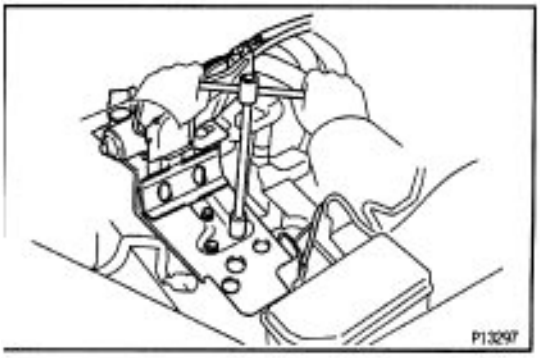
(d) Connect the wire clamps
(e) Connect the following wires and connectors:
(1) 2 igniter connectors
(2) Noise filter connector
(3) Connector to LH fender apron
(4) 2 ground straps



(5) 5 connectors to relay box
(f) Connect the engine relay box with the 2 bolts.

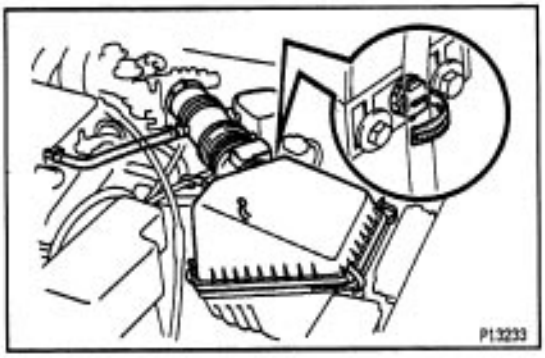


26. INSTALL RADIATOR
(See page EG2–342**)**



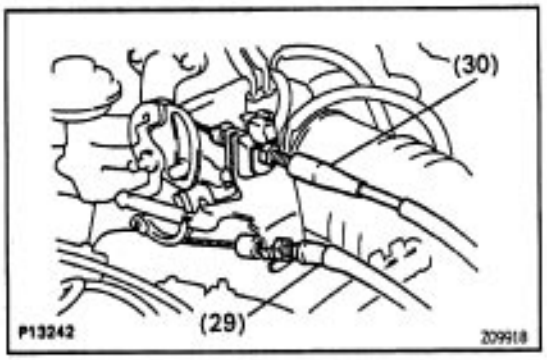
27. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR

(a) Connect the actuator and bracket with the 3 bolts.
(b) Connect the actuator connector and clamp.
(c) Install the actuator cover with the bolt and clip.

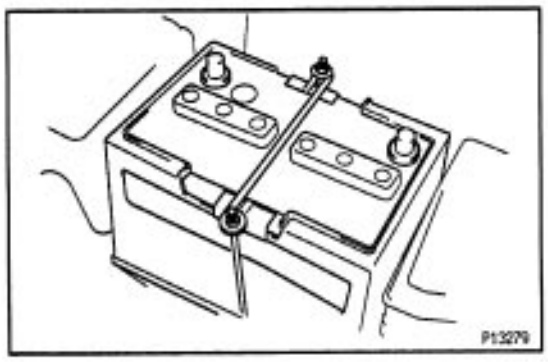


28. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air clean–er cap and volume air flow meter with the 4 clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the PCV hose.
(d) Connect the accelerator cable clamp.
(e) Connect the volume air flow meter connector and wire clamp.



29. CONNECT THROTTLE CABLE
30. CONNECT ACCELERATOR CABLE
31. FILL ENGINE WITH OIL
Capacity:
Drain and refill
w/ Oil filter change
4.7 liters (5.0 US qts, 4.1 Imp. qts)
w/o Oil filter change
4.5 liters (4.8 US qts, 4.0 Imp. qts)
Dry fill
5.5 liters (5.8 US qts, 4.8 Imp. qts)
32. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp. qts)



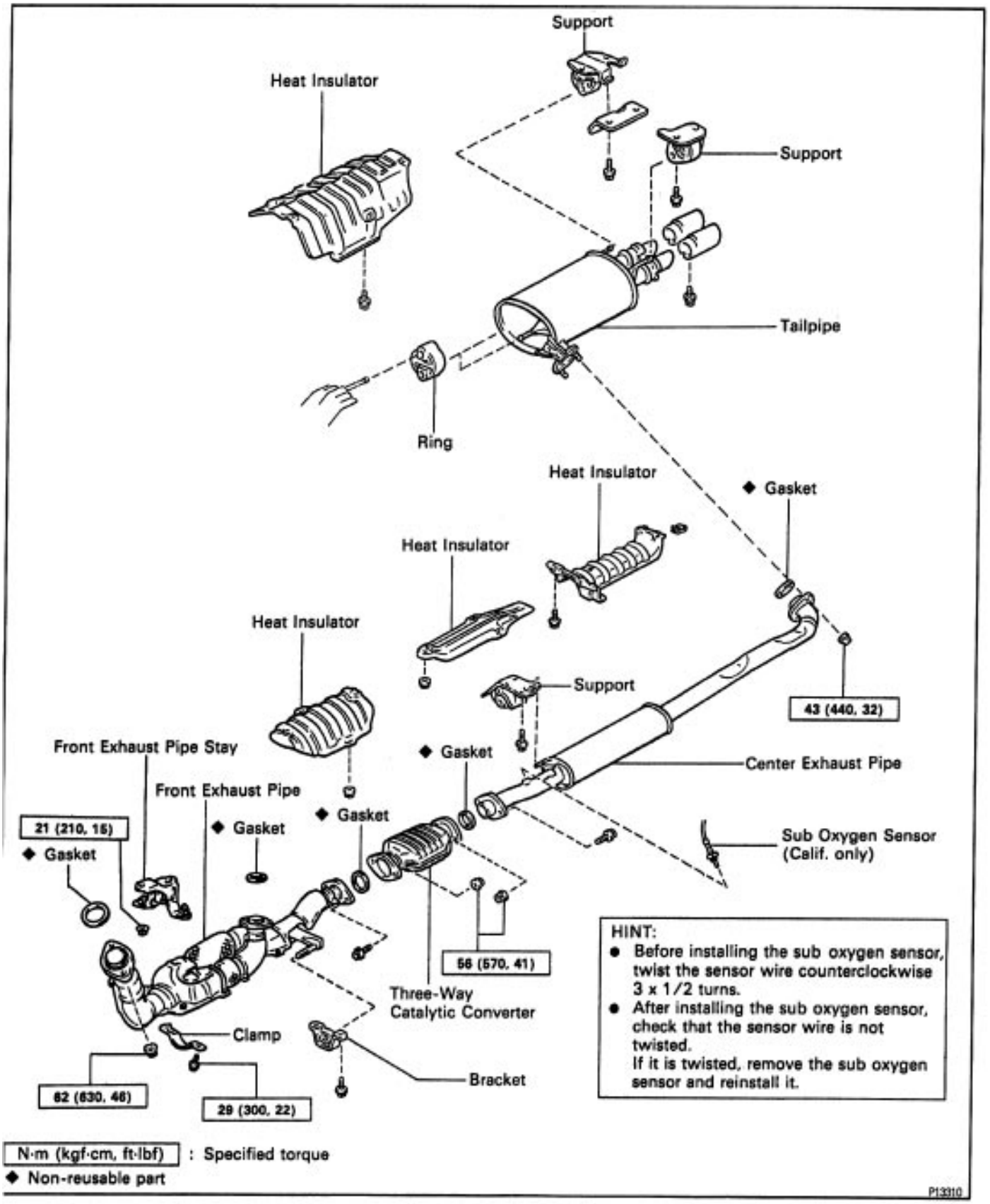
33. INSTALL BATTERY TRAY AND BATTERY
34. START ENGINE AND CHECK FOR LEAKS
35. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

36. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

EXHAUST SYSTEM

COMPONENTS



SERVICE SPECIFICATIONS

SERVICE DATA

Engine tune – up	Battery (Except Delco Battery)		
	Specific gravity (Except maintenance free battery)		
	55D23L Battery		
	GNB Incorporated	at 20°C (68°F)	1.25 – 1.27
	JHONSON CONTROLS	at 27°C (81°F)	1.26 – 1.28
	80D26L Battery		
	GNB Incorporated	at 20°C (68°F)	1.27 – 1.29
	JHONSON CONTROLS	at 27°C (81°F)	1.28 – 1.30
	Voltage (Maintenance free battery)	at 20°C (68°F)	12.7 – 12.9 V
	Drive belt tension	New belt	175 ± 5 lbf
		Used belt	115 ± 20 lbf
	Valve clearance (Cold)	Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
		Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)
	Valve clearance adjusting shim (for repair part)		
		Mark 2.500	2.500 mm (0.0984 in.)
		Mark 2.550	2.550 mm (0.1004 in.)
		Mark 2.600	2.600 mm (0.1024 in.)
		Mark 2.650	2.650 mm (0.1043 in.)
		Mark 2.700	2.700 mm (0.1063 in.)
		Mark 2.750	2.750 mm (0.1083 in.)
		Mark 2.800	2.800 mm (0.1102 in.)
		Mark 2.850	2.850 mm (0.1122 in.)
		Mark 2.900	2.900 mm (0.1142 in.)
		Mark 2.950	2.950 mm (0.1161 in.)
		Mark 3.000	3.000 mm (0.1181 in.)
		Mark 3.050	3.050 mm (0.1201 in.)
		Mark 3.100	3.100 mm (0.1220 in.)
		Mark 3.150	3.150 mm (0.1240 in.)
		Mark 3.200	3.200 mm (0.1260 in.)
		Mark 3.250	3.250 mm (0.1280 in.)
		Mark 3.300	3.300 mm (0.1299 in.)
	Ignition timing		10° BTDC @ idle (w/ Terminals TE1 and E1 connected of DLC1)
	Idle speed		700 ± 50 rpm
Intake manifold vacuum	at idle speed		60 kPa (450 mmHg, 17.7 in.Hg) or more
Compression pressure	at 250 rpm	STD	1,226 kPa (12.5 kgf/cm², 178 psi) or more
		Limit	981 kPa (10.0 kgf/cm², 142 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Tinning belt tensioner	Protrusion (from housing side)		10.0 – 10.8 mm (0.394 – 0.425 in.)

Cylinder head	Warpage	Limit	0.10 mm (0.039 in.)
	Valve seat		
	Refacing angle		30°, 45°, 75°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Cylinder head bolt thread inside diameter	STD	10.70 – 11.00 mm (0.4213 – 0.4724 in.)
		Limit	9.60 mm (0.3780 in.)
Valve guide bushing	Inside diameter		5.510 – 5.530 mm (0.2169 – 0.2177 in.)
	Outside diameter (for repair part)	STD	10.295 – 10.313 mm (0.4053 – 0.4060 in.)
		O/S 0.05	10.345 – 10.363 mm (0.4073 – 0.4080 in.)
	Protrusion height	Intake	11.1 – 11.3 mm (0.437 – 0.445 in.)
		Exhaust	8.9 – 9.3 mm (0.350 – 0.366 in.)
Valve	Valve overall length	STD (Intake)	95.45 mm (3.5779 in.)
		(Exhaust)	95.40 mm (3.7559 in.)
		Limit (Intake)	94.95 mm (3.7382 in.)
		(Exhaust)	94.90 mm (3.7362 in.)
	Vale face angle		44.5°
	Stem diameter	Intake	5.470 – 5.485 mm (0.2154 – 0.2159 in.)
		Exhaust	5.465 – 5.480 mm (0.2152 – 0.2157 in.)
	Stem oil clearance	STD (Intake)	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		(Exhaust)	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Limit (Intake)	0.08 mm (0.0031 in.)
		(Exhaust)	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Limit	0.5 mm (0.020 in.)
Valve spring	Deviation	Limit	2.0 mm (0.079 in.)
	Free length		45.50 mm (1.7913 in.)
	Installed tension at 33.8 mm (1.331 in.)		186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.2191 – 2.2195 in.)
	Lifter bore diameter		31.000 – 31.016 mm (1.2205 – 1.2211 in.)
	Oil clearance	STD	0.024 – 0.050 mm (0.0009 – 0.0020 in.)
		Limit	0.07 mm (0.0028 in.)
Camshaft	Thrust clearance	STD	0.040 – 0.090 mm (0.0016 – 0.0035 in.)
		Limit	0.12 mm (0.0047 in.)
	Journal oil clearance	STD	0.035 – 0.072 mm (0.0014 – 0.0028 in.)
		Limit	0.10 mm (0.0039 in.)
	Journal diameter		26.949 – 26.965 mm (1.0610 – 1.0616 in.)
	Circle runout	Limit	0.06 mm (0.0024 in.)
	Cam lobe height	STD (Intake)	42.11 – 42.21 mm (1.6579 – 1.6618 in.)
		(Exhaust)	41.96 – 42.06 mm (1.6520 – 1.6559 in.)
		Limit (Intake)	41.96 mm (1.6520 in.)
		(Exhaust)	41.81 mm (1.6461 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Limit	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		18.2 – 18.8 mm (0.712 – 0.740 in.)
Air intake chamber	Warpage	Limit	0.10 mm (0.0039 in.)

Intake manifold	Warpage		
	Air intake side	Limit	0.15 mm (0.0059 in.)
	Cylinder head side	Limit	0.08 mm (0.0031 in.)
Exhaust manifold	Warpage	Limit	0.50 mm (0.0196 in.)
Cylinder block	Cylinder head surface warpage	Limit	0.07 mm (0.0028 in.)
	Cylinder bore diameter		87.500 – 87.512 mm (3.4449 – 3.4453 in.)
		Limit	87.52 mm (3.4457 in.)
	Main journal bore diameter		
	(Reference)	Mark 00	66.000 mm (2.5984 in.)
		Mark 01	66.001 mm (2.5985 in.)
		Mark 02	66.002 mm (2.5985 in.)
		Mark 03	66.003 mm (2.5985 in.)
		Mark 04	66.004 mm (2.5986 in.)
		Mark 05	66.005 mm (2.5986 in.)
		Mark 06	66.006 mm (2.5987 in.)
		Mark 07	66.007 mm (2.5987 in.)
		Mark 08	66.008 mm (2.5987 in.)
		Mark 09	66.009 mm (2.5988 in.)
		Mark 10	66.010 mm (2.5988 in.)
		Mark 11	66.011 mm (2.5989 in.)
		Mark 12	66.012 mm (2.5989 in.)
		Mark 13	66.013 mm (2.5989 in.)
		Mark 14	66.014 mm (2.5990 in.)
		Mark 15	66.015 mm (2.5990 in.)
		Mark 16	66.016 mm (2.5990 in.)
	Main bearing cap stud bolt tension portion diameter		
		STD	7.500 – 7.600 mm (0.2953 – 0.2992 in.)
		Limit	7.40 mm (0.2913 in.)
Piston and piston ring	Piston diameter		87.406 – 87.416 mm (3.4412 – 3.4416 in.)
	Piston oil clearance	STD	0.084 – 0.106 mm (0.0033 – 0.0042)
		Limit	0.13 mm (0.0051 in.)
	Piston ring groove clearance	No.1	0.020 – 0.070 mm (0.0008 – 0.0028 in.)
		No.2	0.020 – 0.060 mm (0.0008 – 0.0024 in.)
	Piston ring end gap	STD (No.1)	0.25 – 0.35 mm (0.0098 – 0.0138 in.)
		(No.2)	0.35 – 0.45 mm (0.0138 – 0.0177 in.)
		(Oil)	0.15 – 0.40 mm (0.0059 – 0.0157 in.)
		Limit (No.1)	0.95 mm (0.0374 in.)
		(No.2)	1.05 mm (0.0413 in.)
		(Oil)	1.00 mm (0.0394 in.)
Connecting rod	Thrust clearance	STD	0.15 – 0.30 mm (0.0059 – 0.0118 in.)
		Limit	0.35 mm (0.0138 in.)
	Connecting rod thickness		20.80 – 20.85 mm (0.8189 – 0.8209 in.)
	Connecting rod big end inside diameter		
	(Reference)	Mark 1	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
		Mark 2	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
		Mark 3	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
		Mark 4	56.018 – 56.024 mm (2.2054 – 2.2057 in.)

Connecting rod (Cont'd)	Connecting rod bearing center wall thickness		
	(Reference)	Mark 1	1.484 – 1.487 mm (0.0584 – 0.0585 in.)
		Mark 2	1.487 – 1.490 mm (0.0585 – 0.0587 in.)
		Mark 3	1.490 – 1.493 mm (0.0587 – 0.0588 in.)
		Mark 4	1.493 – 1.496 mm (0.0588 – 0.0589 in.)
	Connecting rod oil clearance	STD	0.038 – 0.064 mm (0.0015 – 0.0025 in.)
		Limit	0.08 mm (0.0031 in.)
	Rod out–of–alignment Limit per 100mm (3.94 in.)		0.05 mm (0.0020 in.)
	Rod twist Limit per 100mm (3.94 in.)		0.15 mm (0.0059 in.)
	Bushing inside diameter		22.005 – 22.014 mm (0.8663 – 0.8667 in.)
	Piston pin diameter		21.997 – 22.006 mm (0.8660 – 0.8664 in.)
	Bushing oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in)
		Limit	0.05 mm (0.0020 in.)
	Connecting rod bolt tension portion diameter	STD	7.2 – 7.3 mm (0.284 – 0.287 in.)
		Limit	7.0 mm (0.276 in.)
Crankshaft	Thrust clearance	STD	0.04 – 0.24 mm (0.0016 – 0.0095 in.)
		Limit	0.30 mm (0.0118 in.)
	Thrust washer thickness		1.930 – 1.980 mm (0.0760 – 0.0780 in.)
	Main journal oil clearance	STD	0.026 – 0.046 mm (0.0010 – 0.0018 in.)
		Limit	0.06 mm (0.0024 in.)
	Main journal diameter		60.988 – 61.000 mm (2.4011 – 2.4016 in.)
	Main bearing center wall thickness		
	(Reference)	Mark 1	2.486 – 2.489 mm (0.0979 – 0.0980 in.)
		Mark 2	2.489 – 2.492 mm (0.0980 – 0.0981 in.)
		Mark 3	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
		Mark 4	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
		Mark 5	2.498 – 2.501 mm (0.0983 – 0.0985 in.)
	Crank pin diameter		52.994 – 53.000 mm (2.0864 – 2.0866 in.)
	Circle runout	Limit	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round	Limit	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round	Limit	0.02 mm (0.0008 in.)

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head cover x Cylinder head	8	80	69 in.·lbf
Spark plug x Cylinder head	18	180	13
Ignition coil x Cylinder head cover	8	80	69 in.·lbf
Air intake chamber x Intake manifold	43	440	32
EGR pipe x Exhaust manifold	12	120	9
EGR pipe x Air intake chamber	12	120	9
No.1 engine hanger x Air intake chamber	39	400	29
No.1 engine hanger x Cylinder heed	39	400	29
Air intake chamber stay x Air intake chamber	19.5	200	14
Air intake chamber stay x Cylinder head	19.5	200	14
Emission control valve set x Air intake chamber	8	80	69 in.·lbf
Timing belt plate x Oil pump	8	80	69 in.·lbf
No.1 idler pulley x Oil pump	34	350	25
No.2 idler pulley x No.2 idler pulley bracket	43	440	32

Camshaft timing pulley x Camshaft (For use with SST)	88	900	65
Camshaft timing pulley x Camshaft	125	1,300	94
Timing belt tensioner x Oil pump	27	280	20
Engine RH mounting bracket x Cylinder block	28	290	21
No.2 timing belt cover x No.3 timing belt cover	8.5	85	74 in.-lbf
No.1 timing belt cover x Oil pump	8.5	85	74 in.-lbf
Crankshaft pulley x Crankshaft	215	2,200	159
No.2 generator bracket x Engine RH mounting bracket	28	290	21
Engine moving control rod x Engine RH mounting bracket	63.7	650	47
Engine moving control rod x RH fender apron	63.7	650	47
RH engine mounting stay x Water outlet	31.4	320	23
RH engine mounting stay x Engine moving control rod	31.4	320	23
RH engine mounting stay x No.2 RH engine mounting bracket	31.4	320	23
Camshaft bearing cap x Cylinder head	16	160	12
Cylinder head x Cylinder block – 12–pointed head bolt (1 st)	54	550	40
Cylinder head x Cylinder block – 12–pointed head bolt (2nd)	Turn 90°	Turn 90°	Turn 90°
Cylinder head x Cylinder block – Recessed head bolt	18.5	185	13
Camshaft position sensor x Cylinder head	8	80	69 in.-lbf
Exhaust manifold x Cylinder head	49	500	36
EGR pipe x RH exhaust manifold	12	120	9
EGR pipe x EGR cooler	12	120	9
Exhaust manifold stay x Exhaust manifold	19.5	200	14
Exhaust manifold stay x Transmission housing	19.5	200	14
Oxygen sensor x Exhaust manifold	44	450	33
PS bracket x RH cylinder head	43	440	32
Oil dipstick guide x LH cylinder head	8	80	69 in.-lbf
No.2 engine hanger x LH cylinder head	19.5	200	14
Water outlet x Intake manifold	15	150	11
No.3 timing belt cover x Cylinder head	8.5	85	74 in.-lbf
Intake manifold x Cylinder head	15	150	11
Delivery pipe x Intake manifold	10	100	7
No. 1 fuel pipe x Intake manifold	19.5	200	14
Cylinder head rear plate x LH cylinder head	8	80	69 in.-lbf
Water inlet pipe x LH cylinder head	19.5	200	14
Front exhaust pipe x Exhaust manifold	62	630	46
Front exhaust pipe x Three–way catalytic converter	56	570	41
Front exhaust pipe bracket x Sub frame	19	195	14
Front exhaust pipe clamp x Front exhaust pipe stay	29	300	22
EGR valve x Air intake chamber	12	120	9
Throttle body x Air intake chamber	19.5	200	14
Intake air control valve x Air intake chamber	14.5	145	10
Fuel inlet hose x Fuel filter	30	300	22
Connecting rod cap x Connecting rod – 1 at	24.5	250	18
Connecting rod cap x Connecting rod – 2nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block – 1 st (12 pointed head bolt)	22	225	16
Main bearing cap x Cylinder block – 2nd (12 pointed head bolt)	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block (Hexagon head bolt)	27	275	20
Rear oil seal retainer x Cylinder block	8	80	69 in.-lbf
EGR cooler x Cylinder block	9	90	78 in.-lbf

Oil pressure switch x Cylinder block	13	130	9
Engine coolant drain cock x Cylinder block	39	400	29
Water seal plate x Cylinder block	14.5	145	10
Oil filter union x Cylinder block	13	130	9
Oil pump x Cylinder block (10 mm head bolt)	8	80	69 in.·lbf
Oil pump x Cylinder block (12 mm head bolt)	19.5	200	14
No.1 oil pan x Cylinder block	19.5	200	14
No.1 oil pan x Oil pump	8	80	69 in.·lbf
No.1 oil pan x Rear oil seal retainer	8	80	69 in.·lbf
Oil strainer x Main bearing cap	8	80	69 in.·lbf
Oil strainer x Oil pump	8	80	69 in.·lbf
No.2 oil pan x No. 1 oil pan	8	80	69 in.·lbf
Water pump x Cylinder block	8	80	69 in.·lbf
Water inlet housing x Cylinder block	8	80	69 in.·lbf
Knock sensor x Cylinder block	39	400	29
No.2 idler pulley bracket x Cylinder block	28	290	21
A/C compressor housing bracket x Cylinder block	25	250	18
Generator bracket x Cylinder block	43	440	32
Drive plate x Crankshaft	83	850	61
Transaxle x Engine	64	650	47
No.2 oil pan x Transaxle	46	470	34
Drive plate x Torque convertor clutch	41	420	30
Front exhaust pipe stay x No.1 oil pan	21	210	15
RR engine mounting insulator x Cylinder block	63.7	650	47
FR engine mounting insulator x Cylinder block	63.7	650	47
FR engine mounting insulator x Front suspension member (TMC made)	80.4	820	59
FR engine mounting insulator x Front suspension member (TM M made)	65.7	670	48
Engine mounting absorber x Front suspension member	48	490	35
Engine mounting absorber x Transaxle	48	490	35
RR engine mounting insulator x Front suspension member	65.7	670	48
LH engine mounting insulator x Transaxle	63.7	650	47
PS pump x PS pump bracket	43	440	31
PS pump x Hydraulic cooling fan pressure hose	44	450	33
A/C compressor x Generator bracket	25	250	18
A/C compressor x Cylinder block	25	250	18

EMISSION CONTROL SYSTEMS

DESCRIPTION

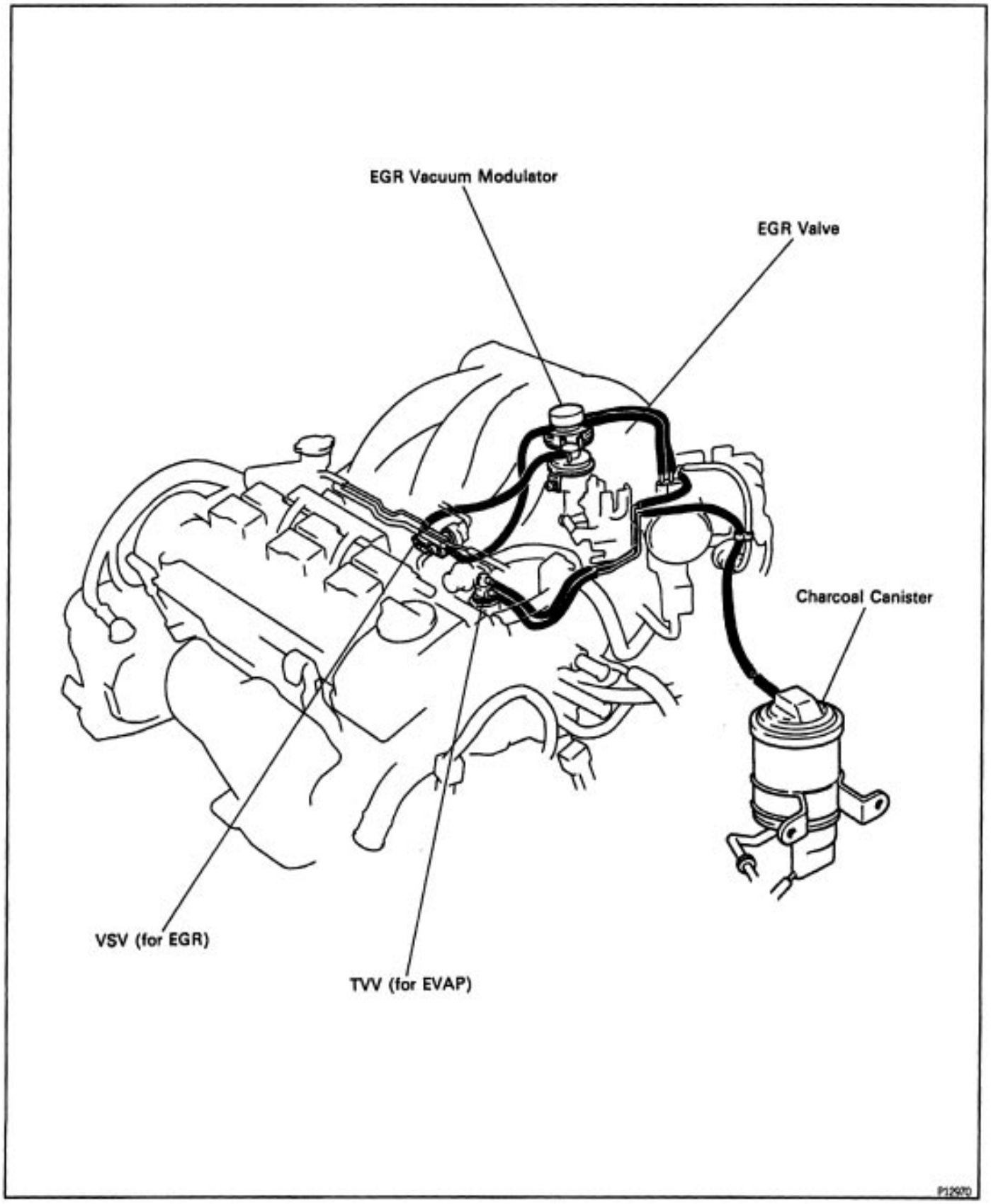
The emission control systems are installed to reduce the amount of HC, CO and NOx emitted from the engine, and to also prevent release of evaporated fuel from the gasoline tank and prevent atmospheric release of blow–by gas.
The system consists of the PCV, EVAP, EGR and TWC.
The function of each system is shown in the following table.

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three–way catalytic converter	TWC	Reduces C0, HC and NOx
Sequential multiport fuel injection’	SFI	Regulates all engine conditions for reduction of exhaust emissions.

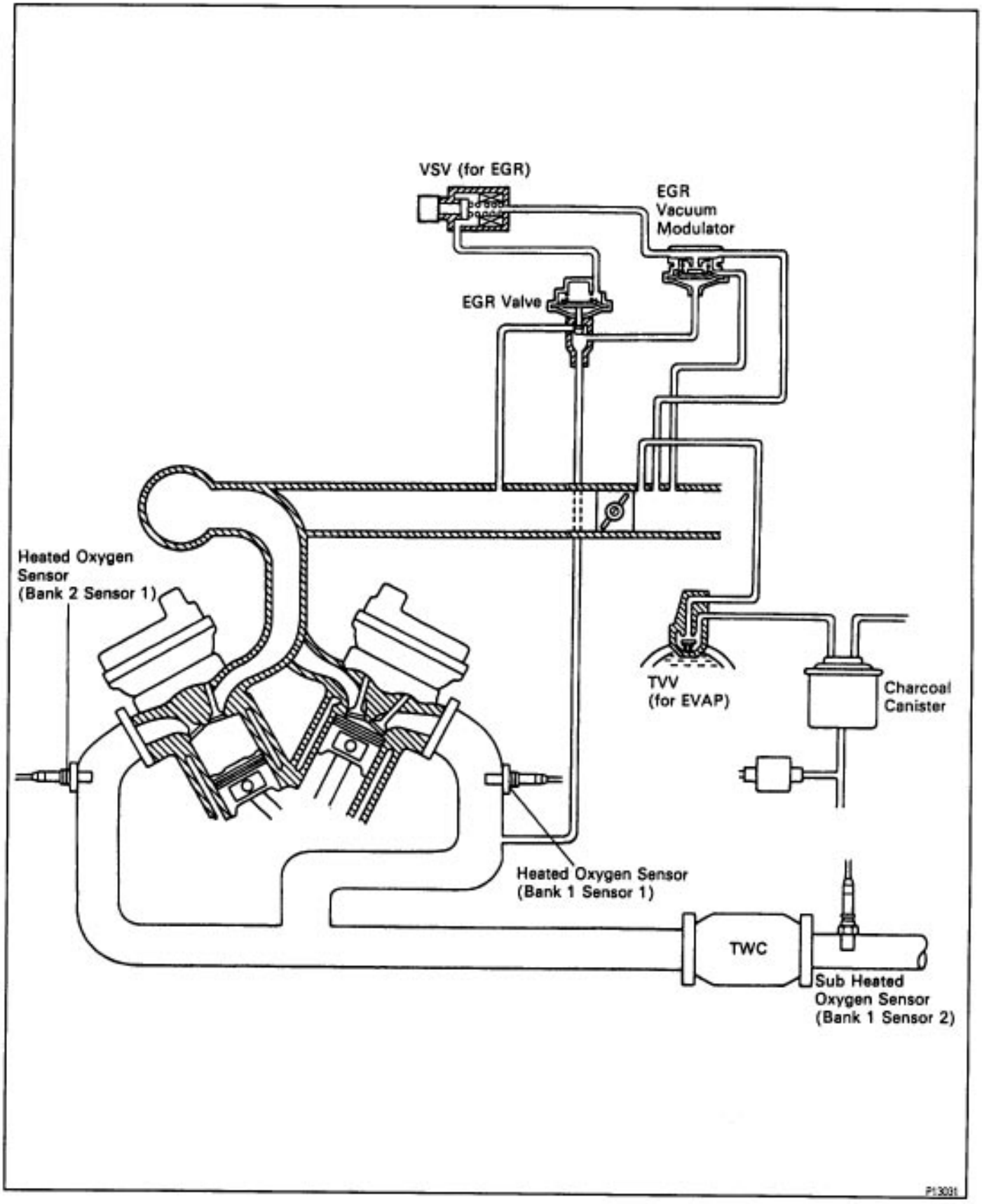
*For inspection and repair of the SFI system, refer to the SFI section.

V02937

COMPONENT LAYOUT



SCHEMATIC DRAWING



PREPARATION

SST (SPECIAL SERVICE TOOL)

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

SSM (SPECIAL SERVICE MATERIALS)

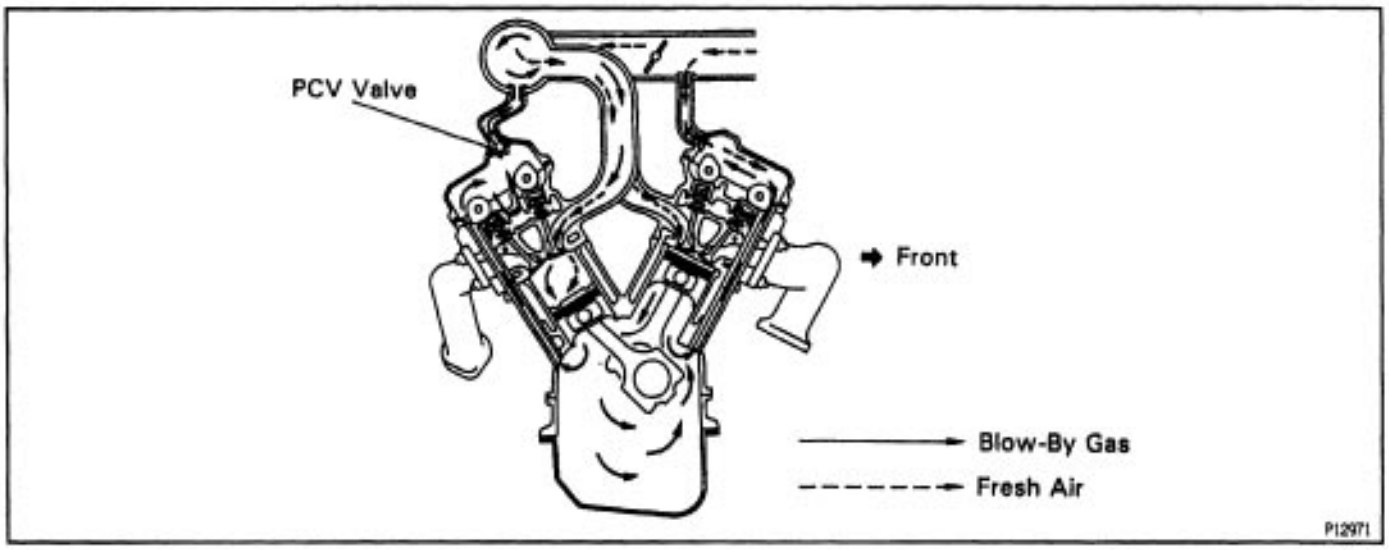
08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	TVV

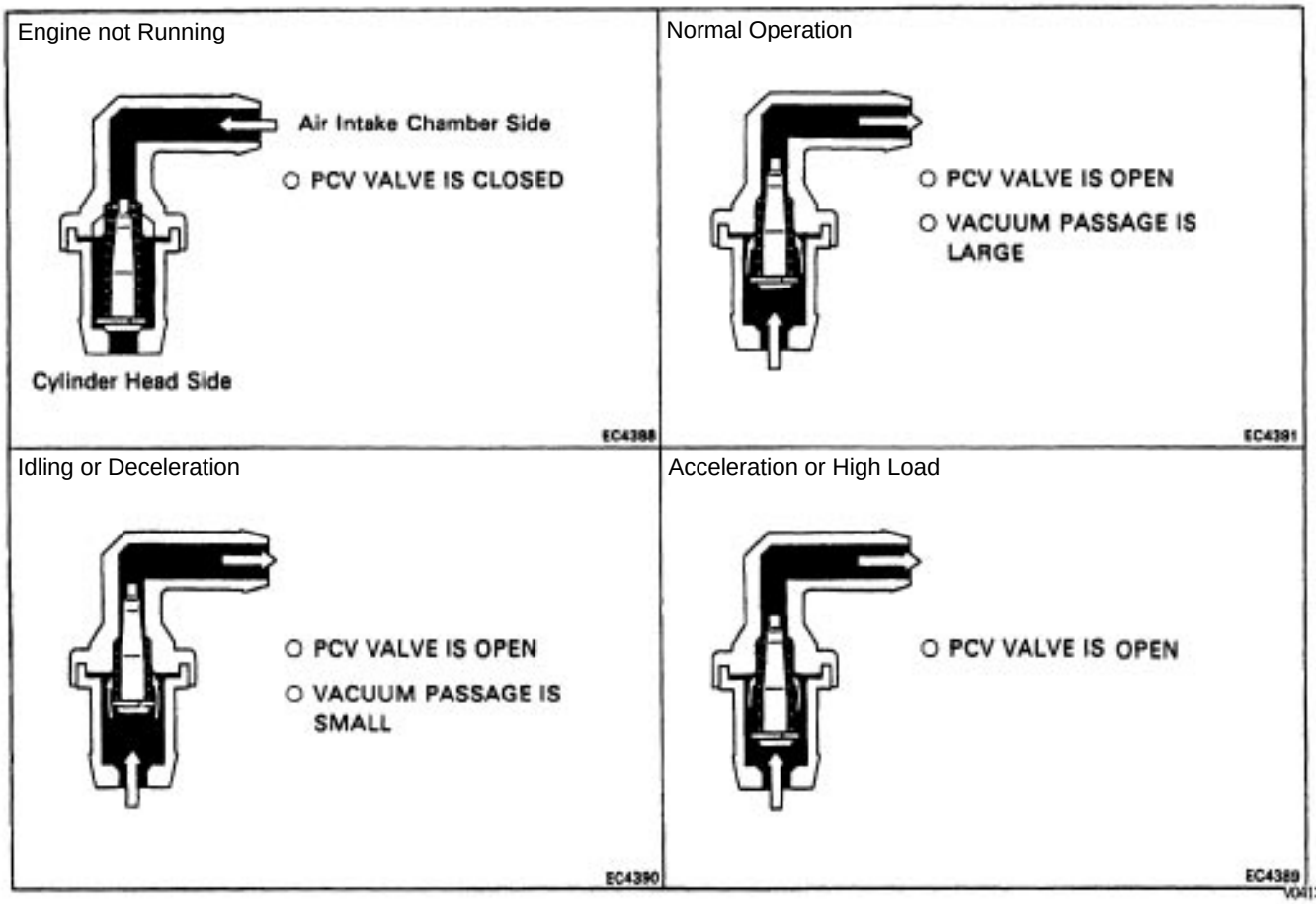
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

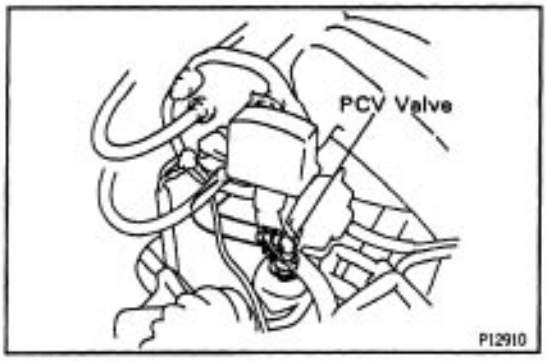
DESCRIPTION

To reduce HC emission, crankcase blow–by gas is routed through the PCV valve to the air intake chamber for combustion in the cylinders.

OPERATION





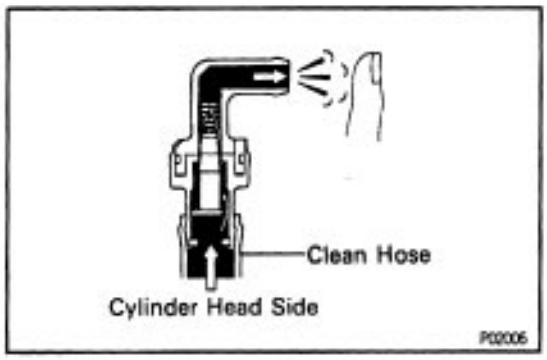


PCV VALVE INSPECTION

1. REMOVE PCV VALVE

(a) Disconnect the PCV hose from the PCV valve.

(b) Remove the PCV valve.

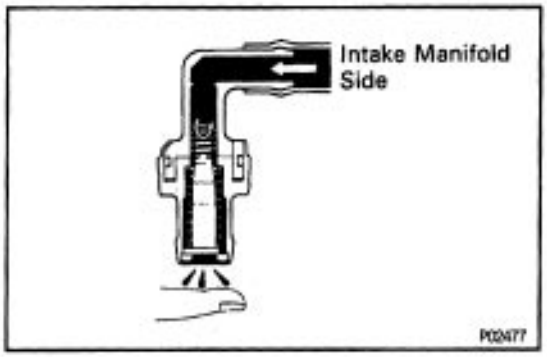


2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

(a) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION: Do not suck sir through the valve. Petroleum substances inside the valve are harmful.

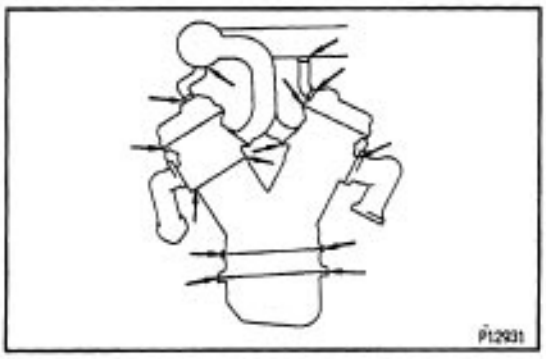


(b) Blow air into the intake manifold side, and check that air passes through with difficulty.

If operation is not as specified, replace the PCV valve.

4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE



PCV HOSES AND CONNECTORS INSPECTION

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

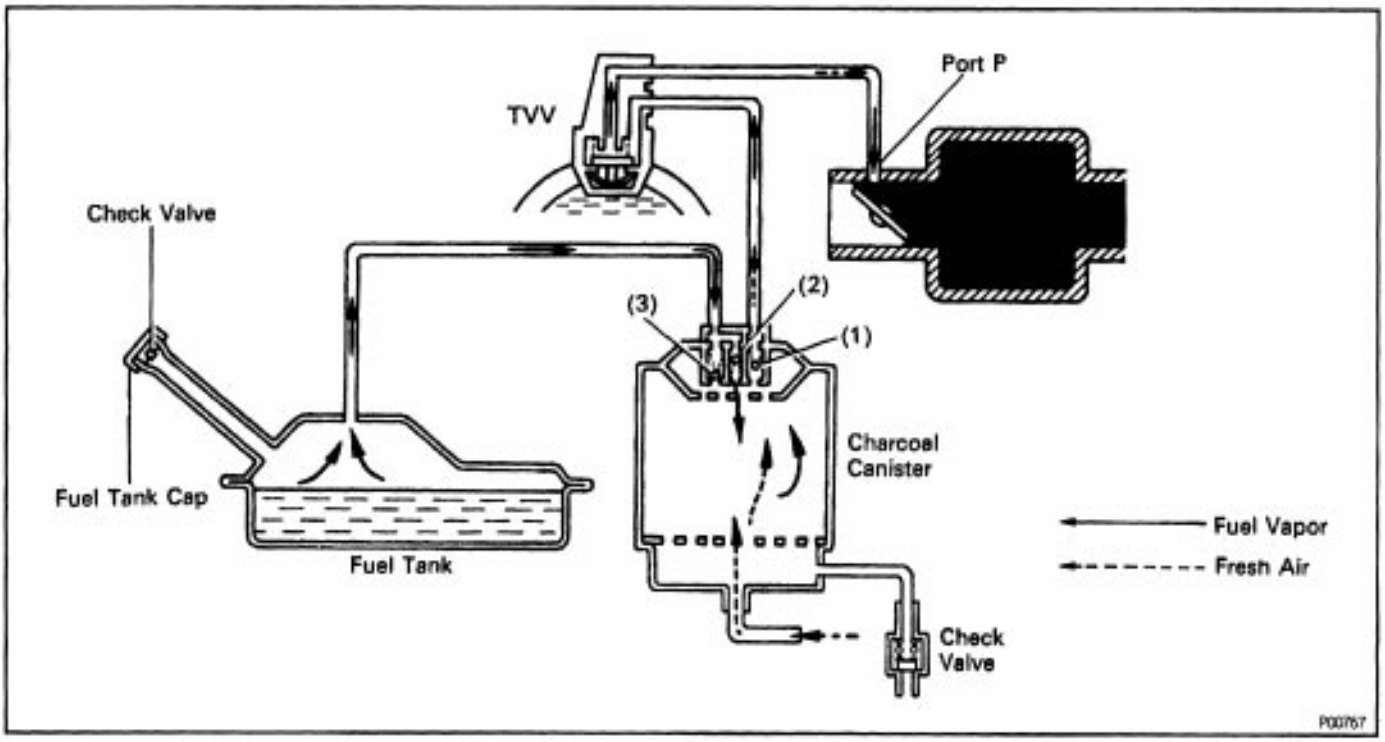
Check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

DESCRIPTION

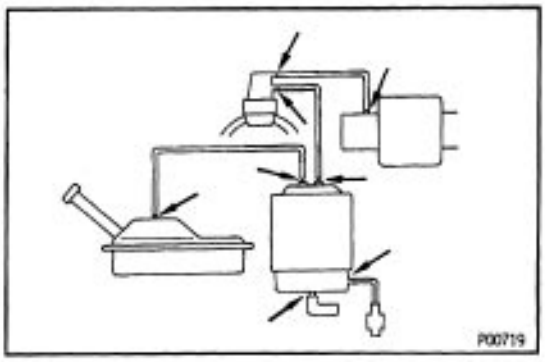
To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

OPERATION



Engine Coolant Temp.	TVV	Throttle Valve Position	Canister Check Valve			Check Valve in Tank Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 40°C (104°F)	CLOSED	–	–	–	–	–	HC from tank is absorbed into the canister.
Above 59°C (138°F)	OPEN	Positioned below port P	CLOSED	–	–	–	
		Positioned above port P	OPEN	–	–	–	HC from canister is led into air intake chamber.
Nigh pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in take	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank

V03593



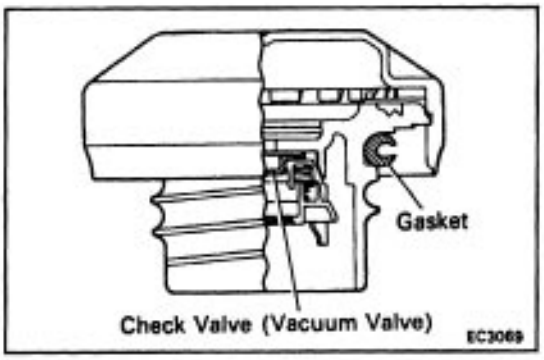
FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

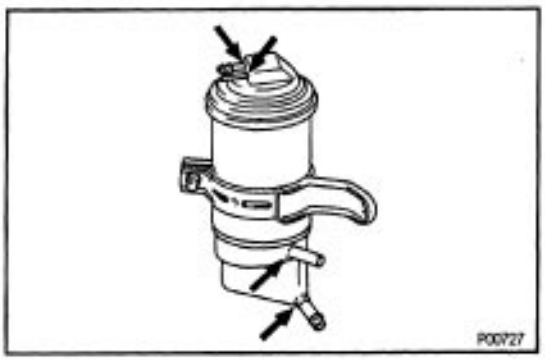
Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged.

If necessary, repair or replace the cap.

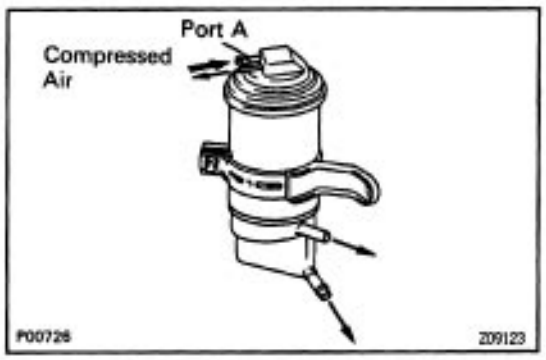


CHARCOAL CANISTER INSPECTION

1. REMOVE CHARCOAL CANISTER

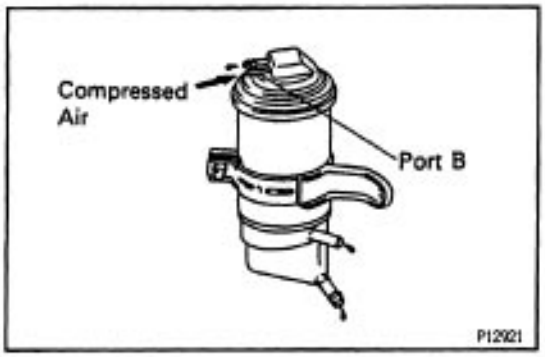
2. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



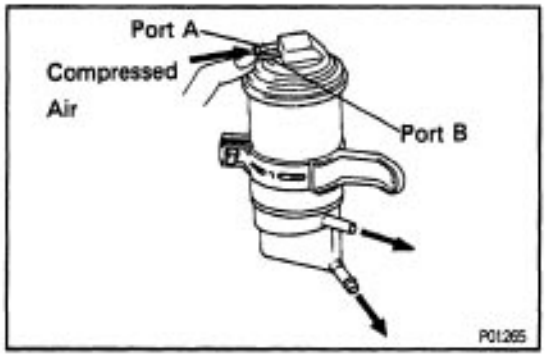
3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Blow low pressure compressed air (4.71 kPa, 48 gf/cm^2. 0.68 psi) into port A and check that air flows without resistance from the other ports.



(b) Blow low pressure compressed air (4.71 kPa, 48 gf/cm^2, 0.68 psi) into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.



4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm^2, 43 psi) of compressed air into port A while holding port B closed.

NOTICE:

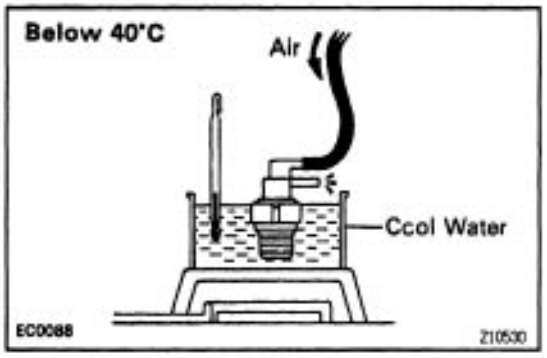
- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

5. REINSTALL CHARCOAL CANISTER

TVV INSPECTION

1. DRAIN ENGINE COOLANT

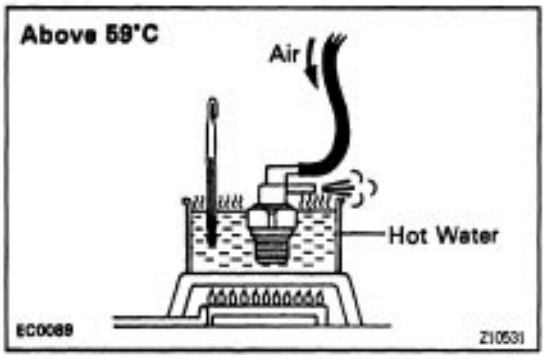
2. REMOVE TVV FROM INTAKE MANIFOLD



3. INSPECT TVV OPERATION

(a) Cool the TVV to below 40°C (104°F) with cool water.

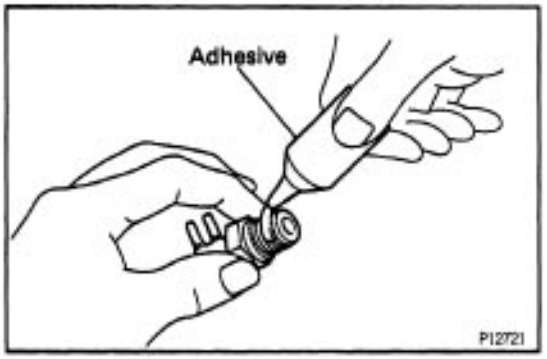
(b) Check that air does not flow from the upper port to lower port.



(c) Heat the TVV to above 59°C (138°F) with hot water.

(d) Check that air flows from the upper port to lower port.

If operation is not as specified, replace the TVV.



4. REINSTALL TVV

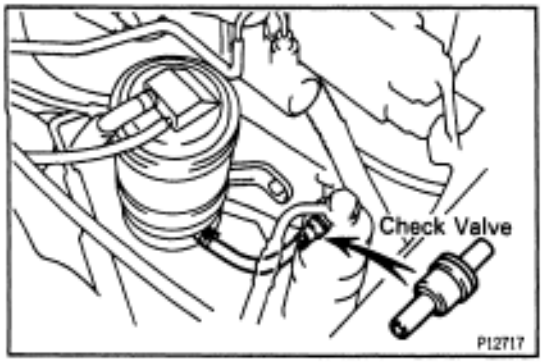
Apply adhesive to 2 or 3 threads of the TVV, and install it.

Adhesive:

Part No. 08833–00070, THREE BOND 1324 or equivalent

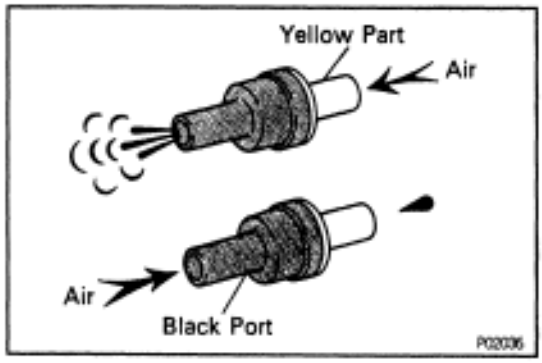
Torque: 30 N–m (305 kgf–cm, 22 ft–lbf)

5. REFILL WITH ENGINE COOLANT



CHECK VALVE INSPECTION

1. REMOVE CHECK VALVE

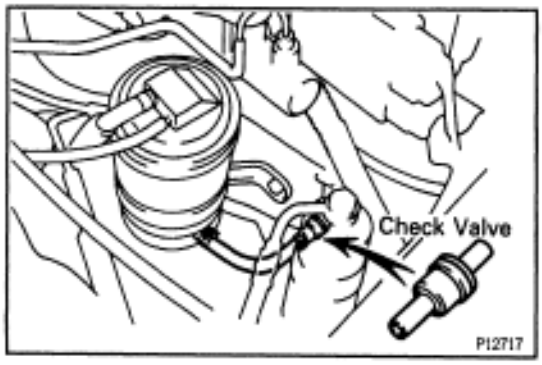


2. INSPECT CHECK VALVE

(a) Check that air flows from the yellow port to the black port.

(b) Check that air does not flow from the black port to the yellow port.

If operation is not as specified, replace check valve.



3. REINSTALL CHECK VALVE

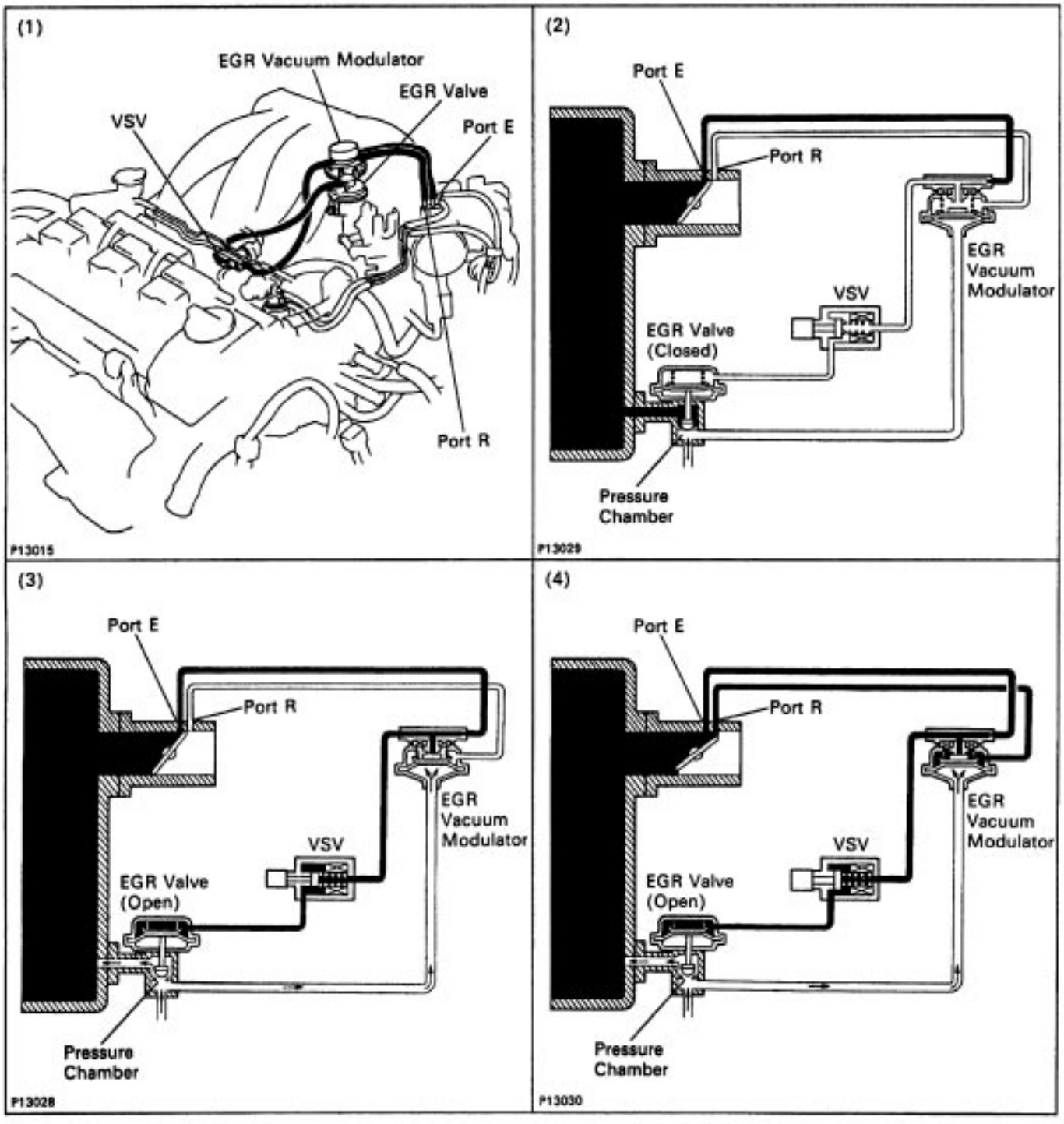
HINT: Reinstall the check valve with the black port facing the purge port side.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

DESCRIPTION

To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

OPERATION

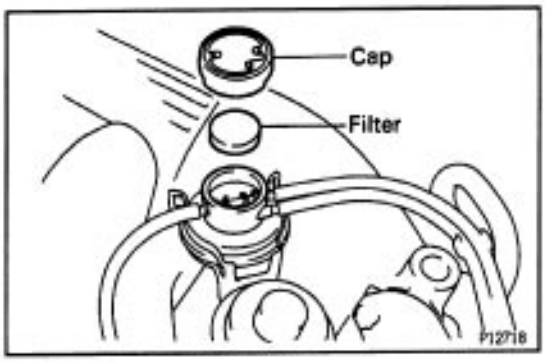


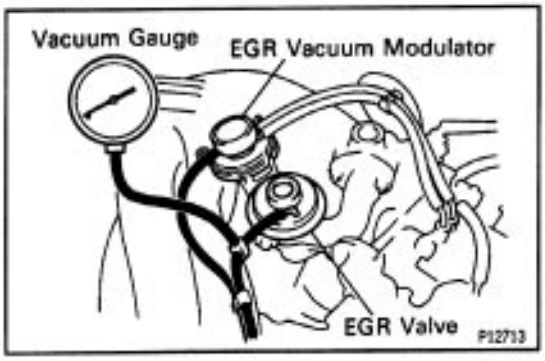
V03802

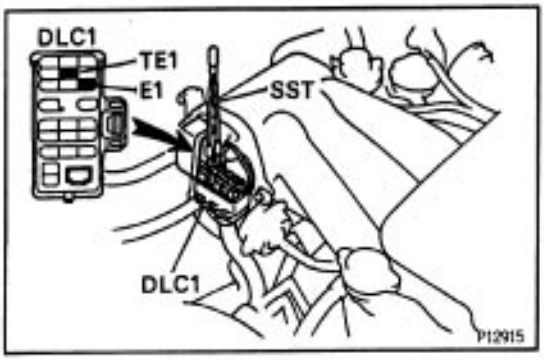
Engine Coolant Temp.	VSV	Throttle Valve Position	Pressure in the EGR Valve Pressure Chamber		EG R Vacuum Modulator	EG R Valve	Exhaust Gas
Below 55˚C (131˚F)	ON OPENS passage to atmosphere	–	–		–	CLOSED	Not recirculated
Above 60˚C (140˚F)	OFF CLOSED passage to atmosphere	Positioned below port E	–		–	CLOSED	Not recirculated
		Positioned between port E and port R	(1) LOW	*Pressure con–stantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere’	OPEN	Recirculated
		Positioned above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

* Pressure increase → Modulator closes → EGR valve opens→ Pressure drops
EGR valve closes← Modulator opens
** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

V03592







EGR SYSTEM INSPECTION

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Remove the cap and filter.
(b) Check the filter for contamination or damage.
(c) Using compressed air, clean the filter.
(d) Reinstall the filter and cap.
HINT: Install the filter with the coarser surface facing out to the atmospheric side.

2. INSTALL VACUUM GAUGE

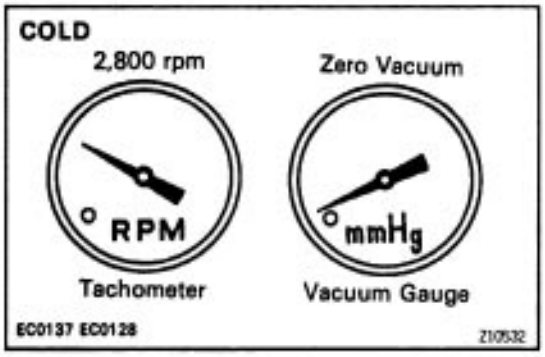
Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and EGR VSV.

3. INSPECT SEATING OF EGR VALVE

Check that the engine starts and runs at idle.

4. CONNECT TERMINALS TE1 AND E1

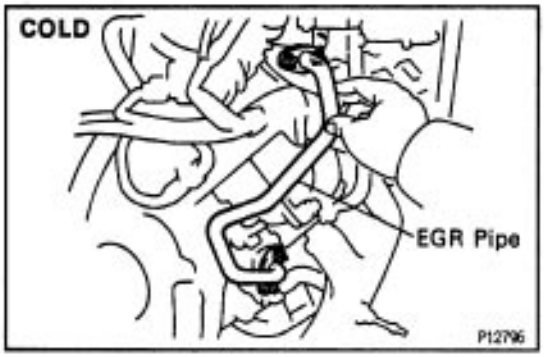
Using SST, connect terminal TE1 and E1 of the data link connector 1.
SST 09843–18020



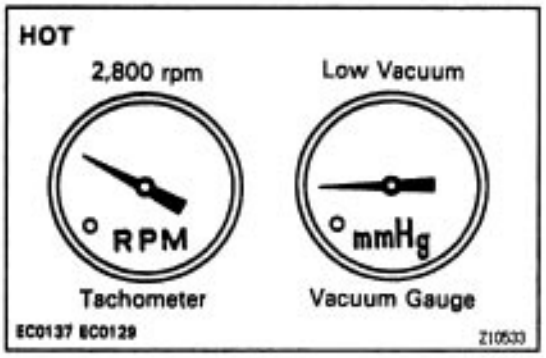
5. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 55°C (131°F).

(b) Check that the vacuum gauge indicates zero at 2,800 rpm.



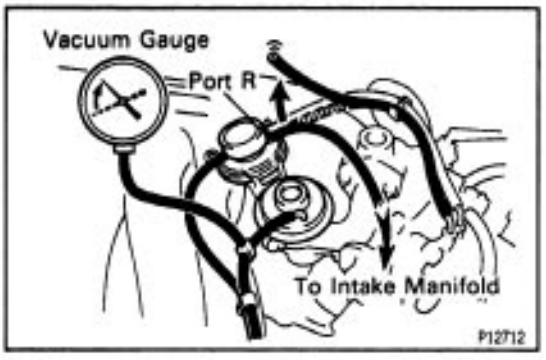
(c) Check that the EGR pipe is not hot.



6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine to above 80°C (176° F).

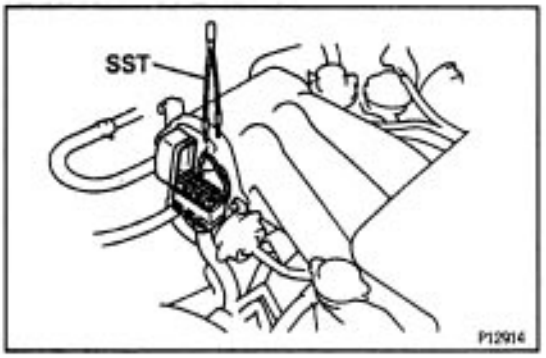
(b) Check that the vacuum gauge indicates low vacuum at 2,800 rpm.



(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

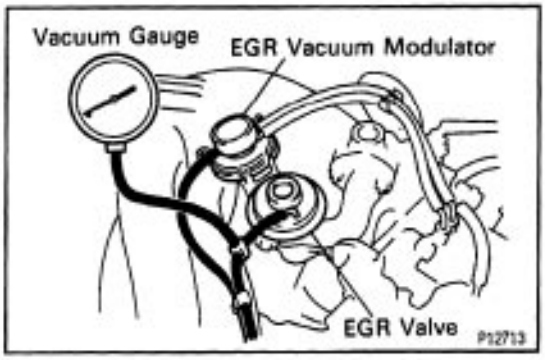
HINT: As exhaust gas is increasingly recirculated, the engine will start to misfire.



7. DISCONNECT TERMINALS TE1 AND E1

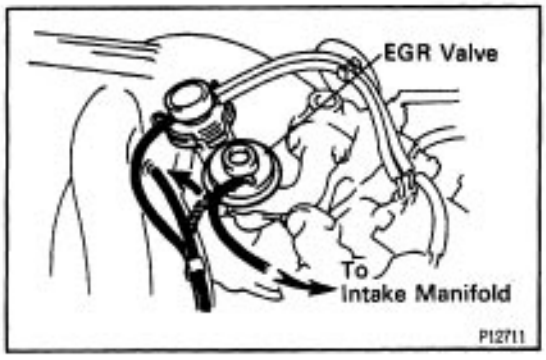
Remove the SST from the data link connector 1.

SST 09843–18020



8. REMOVE VACUUM GAUGE

Remove the vacuum gauge, and reconnect the vacuum hoses to their proper locations.



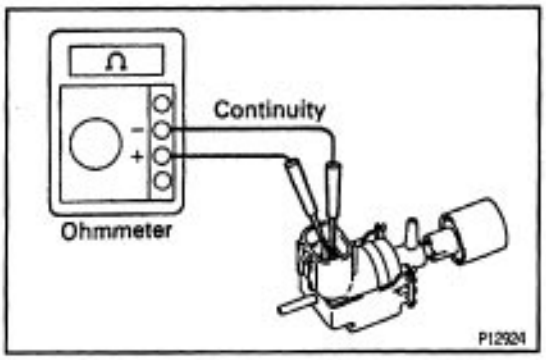
9. INSPECT EGR VALVE

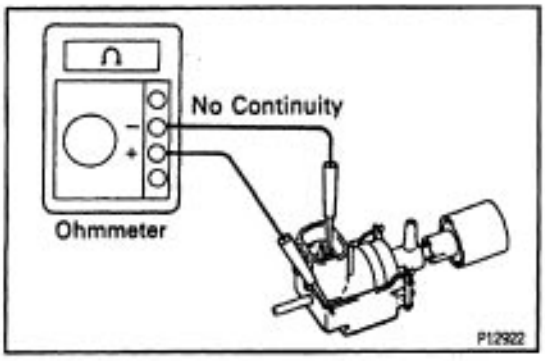
(a) Apply vacuum directly to the EGR valve with the engine idle.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to their proper loca–tions.

IF NO PROBLEM IS FOUND DURING THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART





VSV INSPECTION

1. REMOVE VSV

2. INSPECT VSV

A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

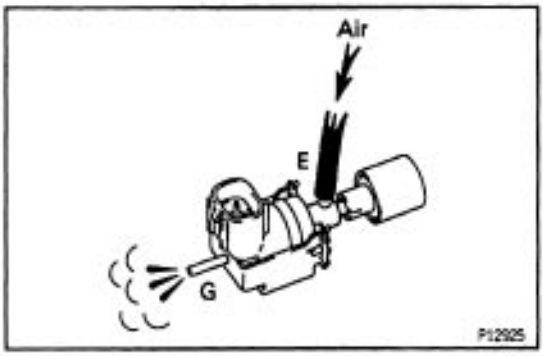
33 – 39 at 20°C (68°F)

If there is no continuity, replace the VSV.

B. Inspect VSV for ground

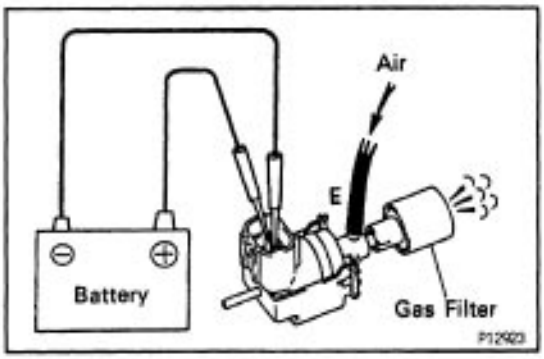
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

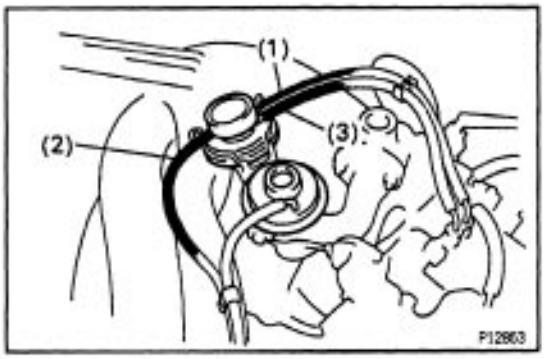
(a) Check that the air flows from ports E to G.



(b) Apply battery voltage across the terminals.
(c) Check that the air flows from port E to the gas filter.
If operation is not as specified, replace the VSV.

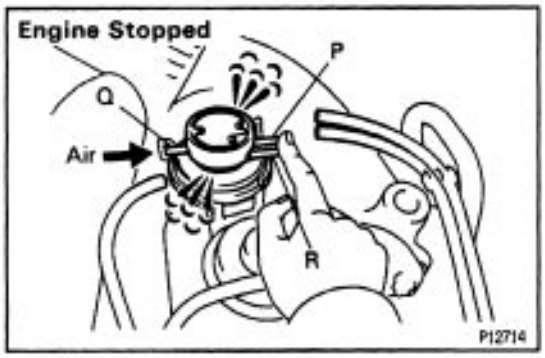
3. REINSTALL VSV

EGR VACUUM MODULATOR INSPECTION



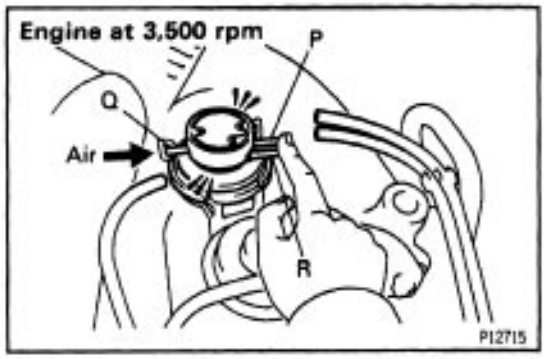
1. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

Disconnect the following vacuum hoses:
(1) Vacuum hose from P port
(2) Vacuum hose from Q port
(3) Vacuum hose from R port

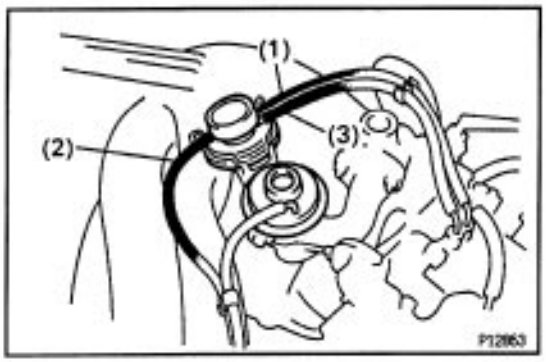


2. INSPECT EGR VACUUM MODULATOR OPERATION

(a) Block ports P and R with your finger.
(b) Blow air into port Q, and check that the air passes through to the air filter side freely.

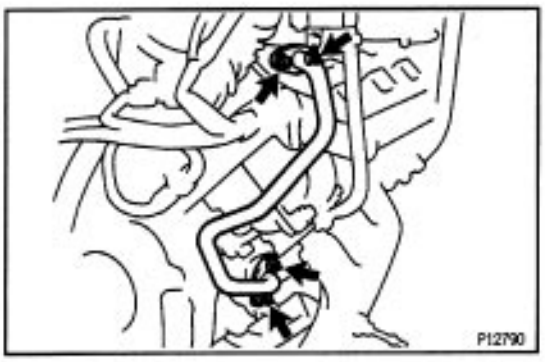


(c) Start the engine, and maintain speed at 3,500 rpm.
(d) Repeat the above test. Check that there is a strong resistance to air flow.



3. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR

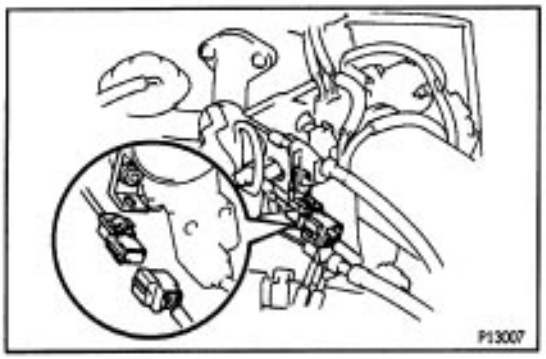
Connect the following vacuum hoses:
(1) Vacuum hose to P port
(2) Vacuum hose to Q port
(3) Vacuum hose to R port



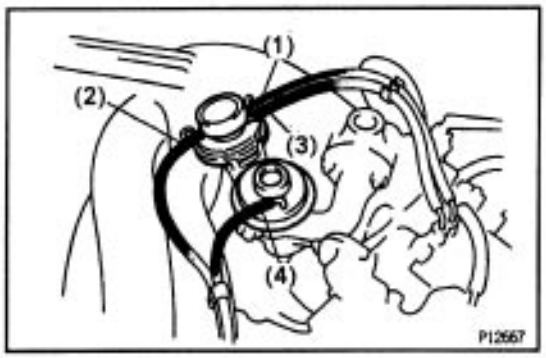
EGR VALVE INSPECTION

1. REMOVE EGR PIPE

Remove the 4 nuts, EGR pipe and 2 gaskets.



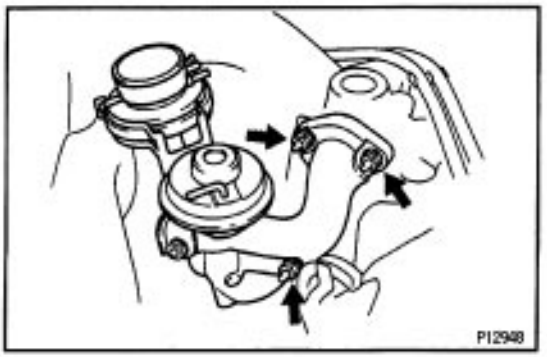
2. DISCONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR AND CLAMP

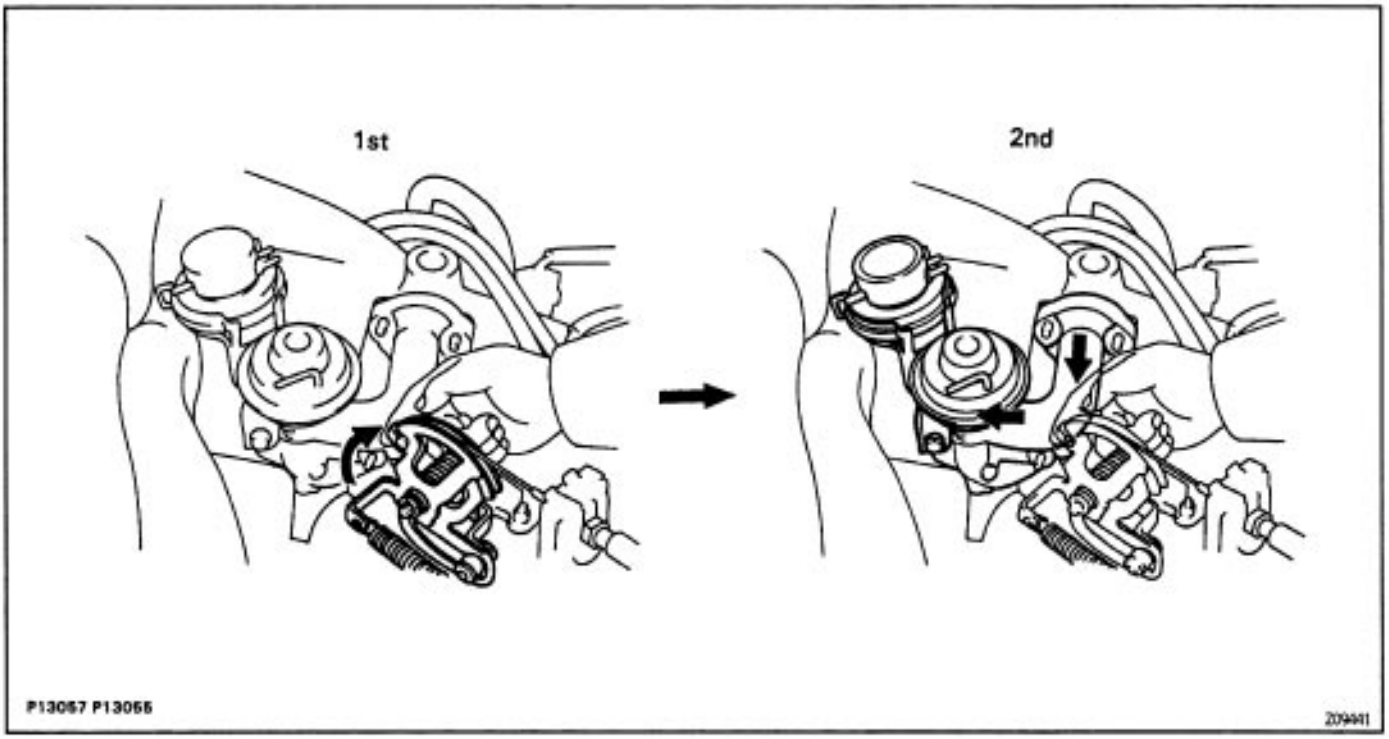


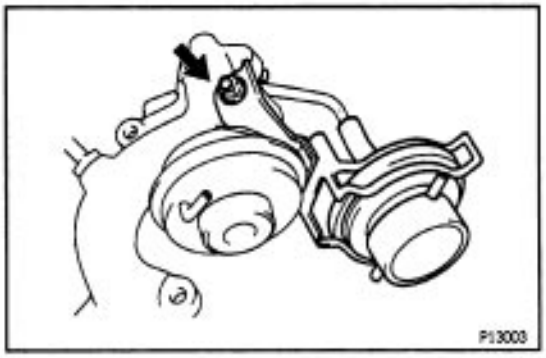
3. REMOVE EGR VALVE AND VACUUM MODULATOR ASSEMBLY

(a) Disconnect the following hoses: .
- (1) Vacuum hose from P port of EGR vacuum modu–lator
- (2) Vacuum hose from Q port of EGR vacuum modu–lator
- (3) Vacuum hose from R port of EGR vacuum modu–lator
- (4) Vacuum hose from EGR valve

(b) Remove the 3 nuts, EGR valve and vacuum modulator assembly and gasket.



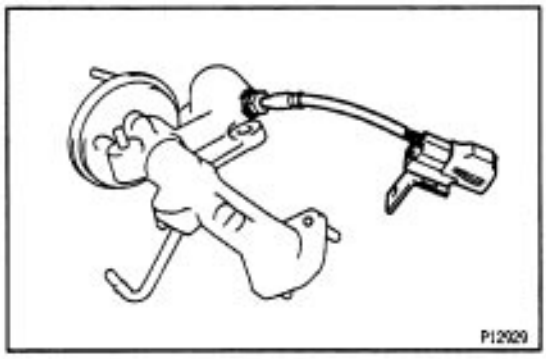




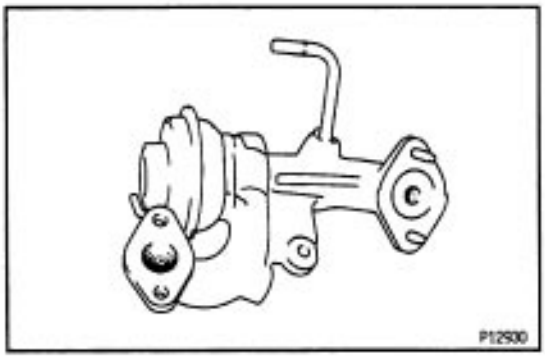
4. SEPARATE EGR VALVE AND VACUUM MODULATOR

(a) Remove the nut and disconnect the EGR vacuum modulator.

(b) Disconnect the pressure hose from the EGR valve and remove the EGR vacuum modulator.



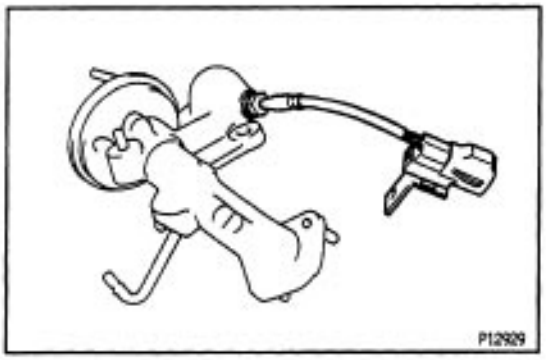
5. REMOVE EGR GAS TEMPERATURE SENSOR



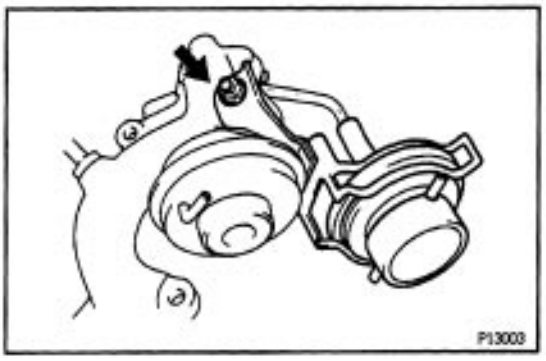
6. INSPECT EGR VALVE

Check for sticking and heavy carbon deposits.

If a problem is found, replace the EGR valve.

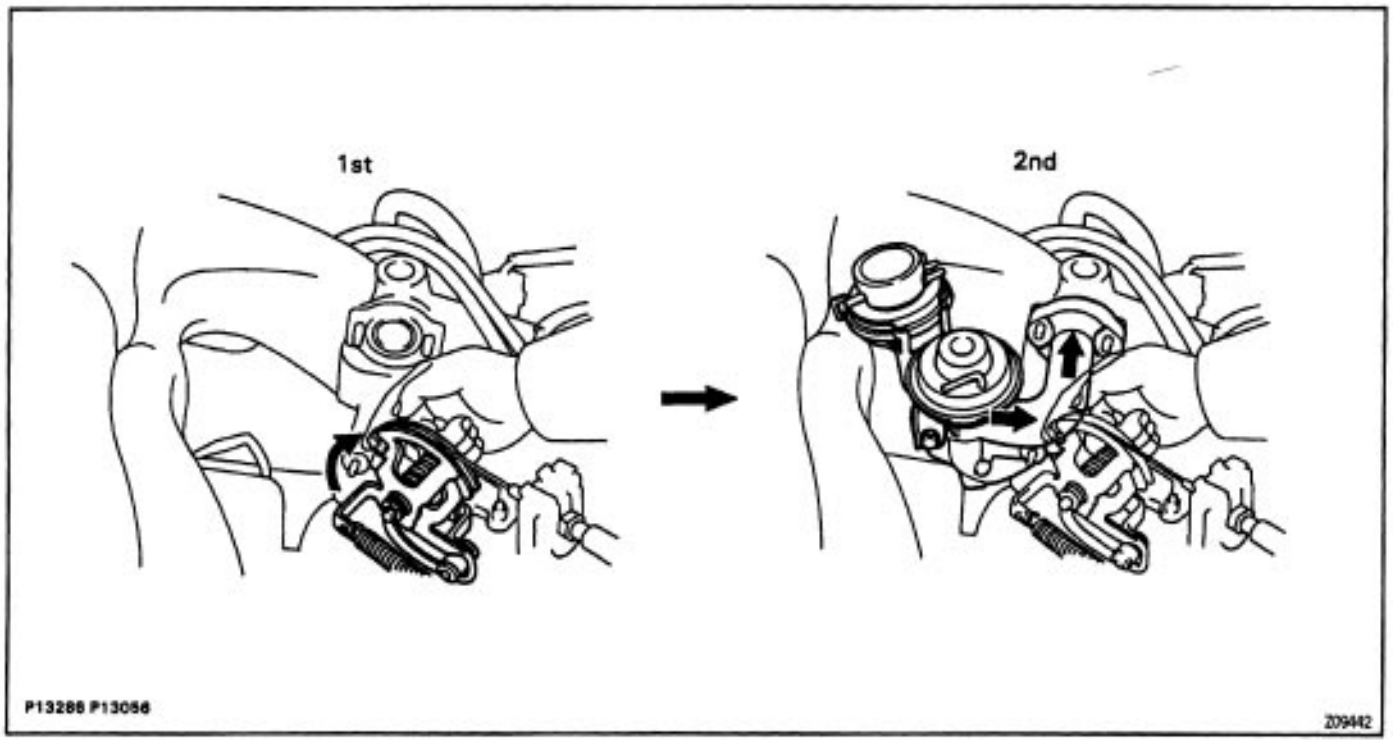


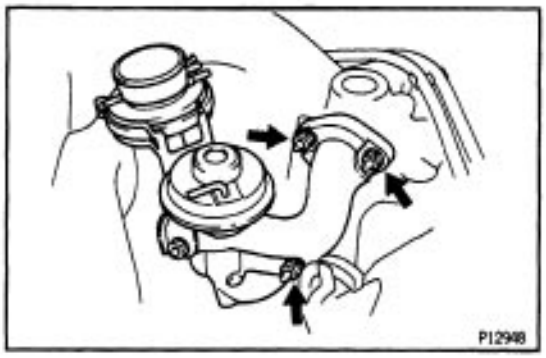
7. REINSTALL EGR GAS TEMPERATURE SENSOR
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)



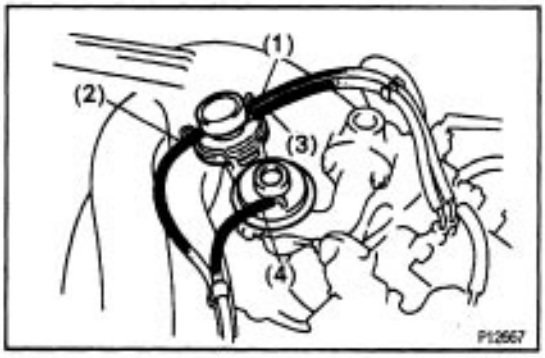
8. REASSEMBLE EGR VALVE AND VACUUM MODULATOR
(a) Connect the pressure hose to the EGR valve.
(b) Install the EGR vacuum modulator with the nut.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

9. REINSTALL EGR VALVE AND VACUUM MODULATOR ASSEMBLY
(a) Install the EGR valve and vacuum modulator assembly to the air intake chamber.

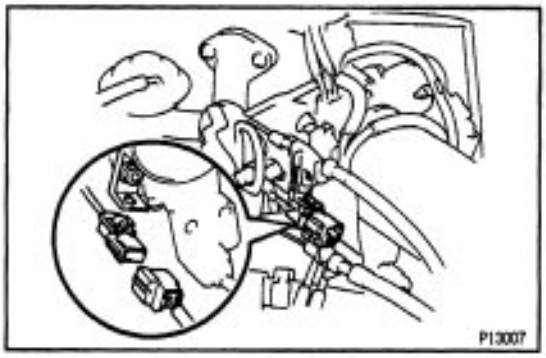




(b) Install and torque the 3 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



(c) Connect the following vacuum hoses:
(1) Vacuum hose to P port of EGR vacuum modula–tor
(2) Vacuum hose to a port of EGR vacuum modula–tor
(3) Vacuum hose to R port of EGR vacuum modula–tor
(4) Vacuum to EGR valve



10. RECONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR AND CLAMP

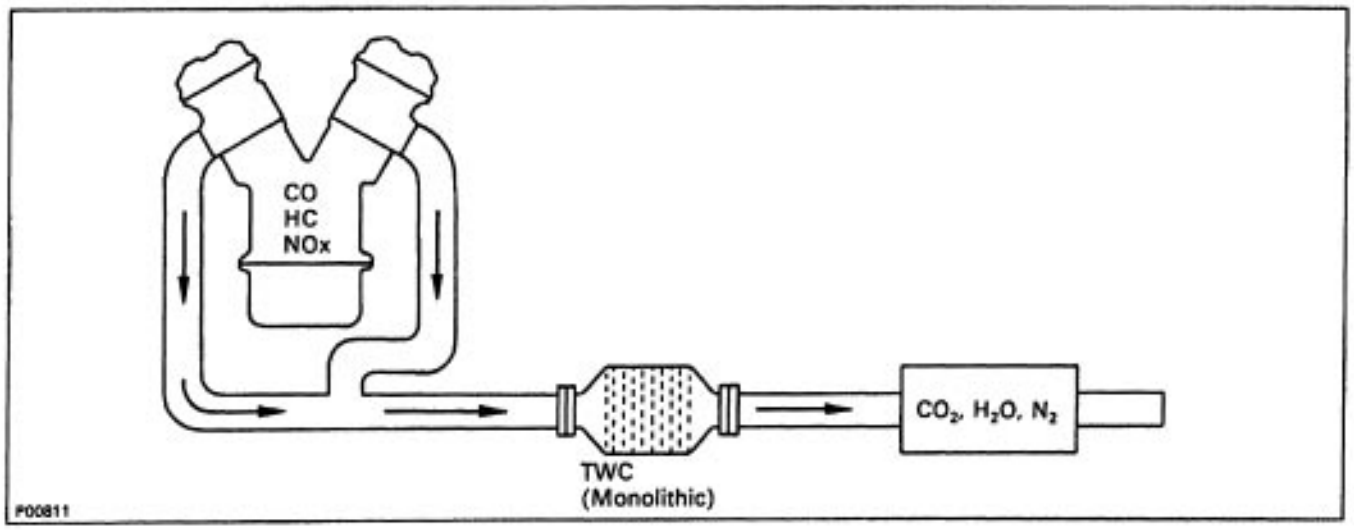
11. REINSTALL EGR PIPE
Install 2 new gaskets and the EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

DESCRIPTION

To reduce HC. CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide ($C0_2$) and water (H_20) by the three–way catalytic converter.

OPERATION

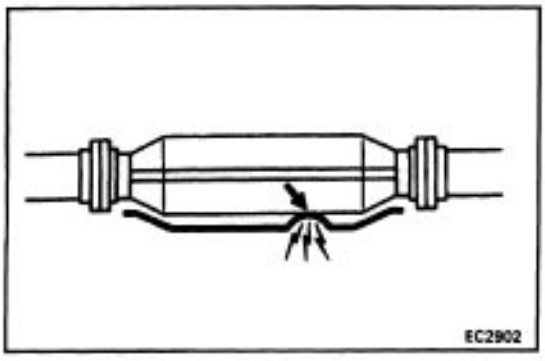


Exhaust port		TWC		Exhaust Gas
HC, CO, AND NOx	→	OXIDATION AND REDUCTION	→	CO_2 H_{2O} N_2

EXHAUST PIPE ASSEMBLY INSPECTION

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

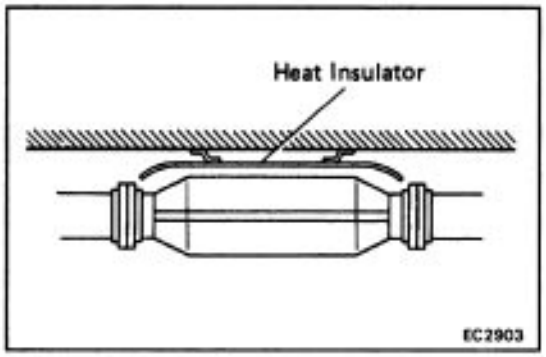
2. CHECK CLAMPS FOR WEAKNESS. CRACKS OR DAMAGE



THREE–WAY CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

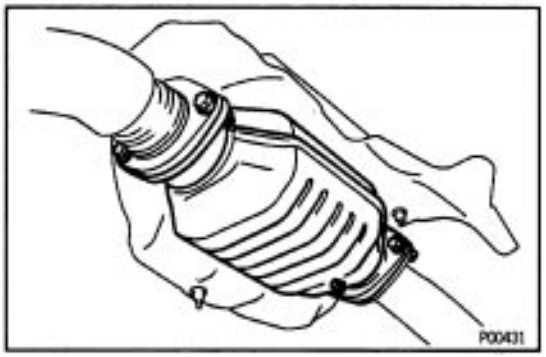
If any part of the protector is damaged or dented to the extent that it contacts the three–way catalytic converter, repair or replace it.



HEAT INSULATOR INSPECTION

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR



THREE–WAY CATALYTIC CONVERTER REPLACEMENT

1. REMOVE CONVERTER

(a) Jack up the vehicle.
(b) Check that the converter is cool.
(c) Remove the 4 bolts and nuts holding the pipes to the converter.
(d) Remove the converter and 2 gaskets.

2. REINSTALL CONVERTER

(a) Place 2 new gaskets on the front and rear pipes.
(b) Install the converter with the bolts and nuts. Torque the bolts and nuts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

SERVICE SPECIFICATIONS

SERVICE DATA

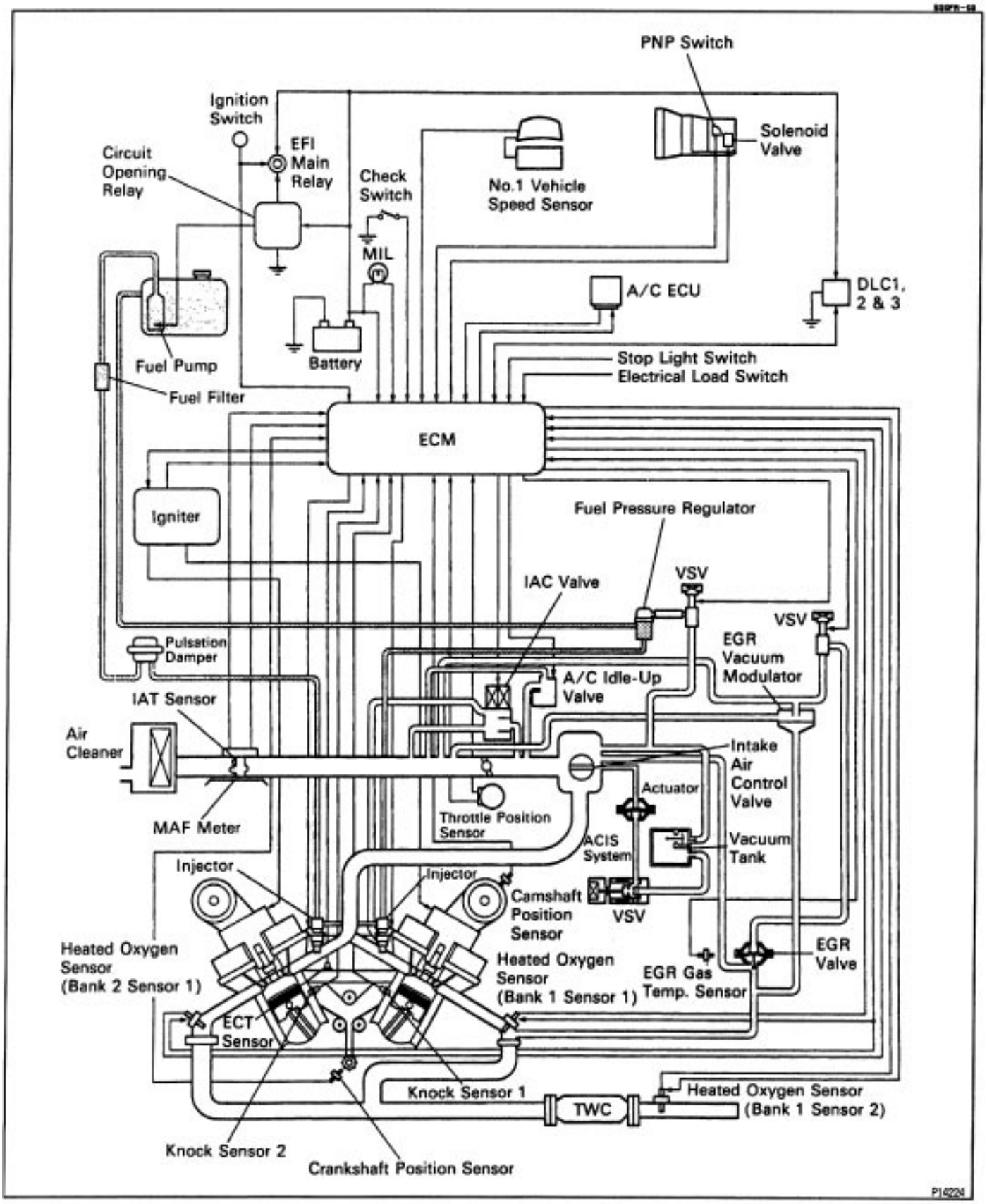
VSV for EGR	Resistance	et 20®C (68®F)	33 –39)

TORQUE SPECIFICATIONS

Part tightened	N-m	kgf-cm	ft·lbf
TVV x Cylinder heed	30	305	22
EGR gas temperature x EGR valve	20	200	14
EGR vacuum modulator x EGR valve	20	200	14
EGR valve x Air intake chamber	12	120	9
EGR pipe x Air intake chamber	12	120	9
EGR pipe x EGR cooler	12	120	9
Three –way catalytic converter x Front exhaust pipe	43	440	32
Three–way catalytic converter x Center exhaust pipe	43	440	32

SFI SYSTEM

DESCRIPTION



The SFI (Sequential Multiport Fuel Injection) system is composed of 3 basic sub–systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the SFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECM (Engine Control Module).

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

The 1 MZ–FE engine is equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the SFI, ESA, IAC, diagnosis systems etc. by means of ECM–formerly SFI computer employing a microcomputer.

The ECM controls the following functions:

1. Sequential Multiport Fuel Injection (SFI)

The ECM receives signals from various sensors indicating changing engine operation conditions such as:

- Intake air volume
- Intake air temperature (IAT)
- Engine coolant temperature (ECT)
- Engine speed (RPM)
- Acceleration/deceleration
- Exhaust oxygen content etc.

The signals are utilized by the ECM to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Spark Advance (ESA)

The ECM is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (RPM, ECT, etc.), the ECM triggers the spark at precisely the right instant.

3. Idle Air Control (IAC)

The ECM is programmed with target idling speed values to respond to different engine conditions (ECT, A/C (air conditioning) ON/OFF, etc.). Sensors transmit signals to the ECM which control the flow of air through the throttle valve bypass and adjust idle speed to the target value.

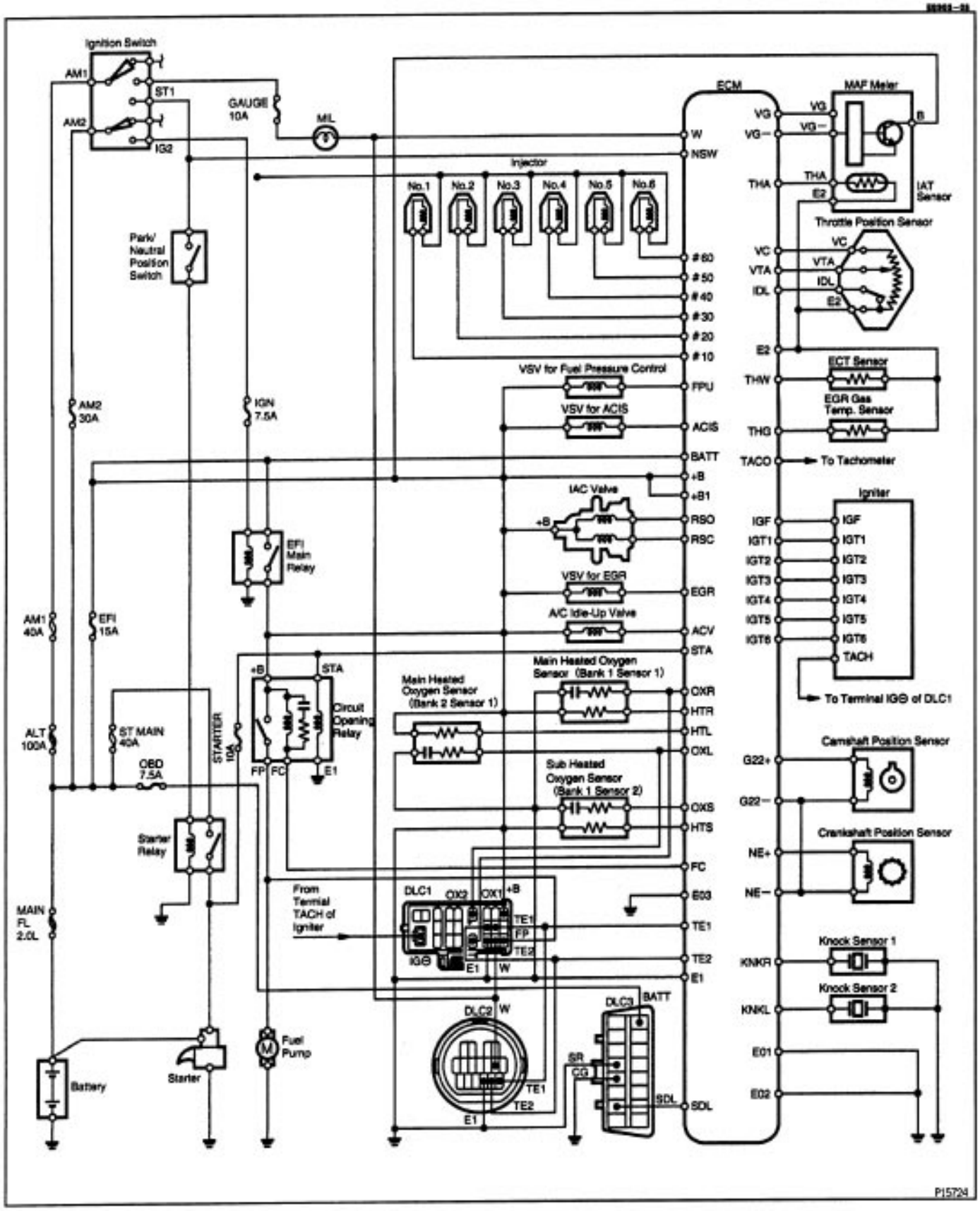
4. Diagnosis

The ECM detects any malfunctions and abnormalities in the sensor network and lights a malfunction indicator lamp (MIL) on the combination meter. At the same time, the trouble is identified and a diagnostic trouble code is recorded by the ECM. The diagnostic trouble codes are referred in the Engine Troubleshooting. (See page EG2–404)

5. Fail–Safe Function

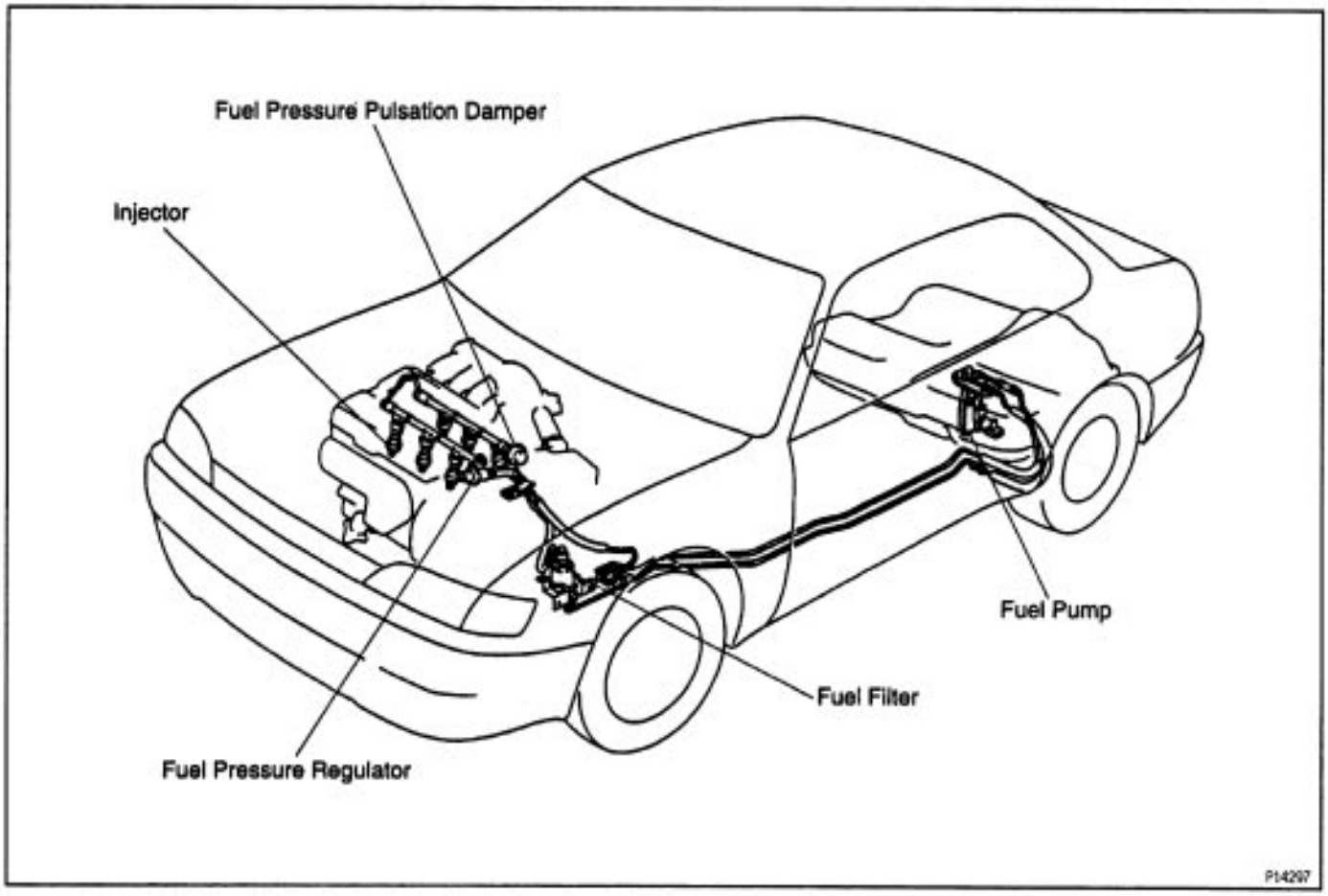
In the event of the sensor malfunctioning, a back–up circuit will take over to provide minimal driveability, and the malfunction indicator lamp will illuminate.

SYSTEM CIRCUIT



OPERATION

FUEL SYSTEM



Fuel is pumped up by the fuel pump, which flows through the fuel filter under pressure through the fuel pipe to the delivery pipe where it is distributed to each injector.

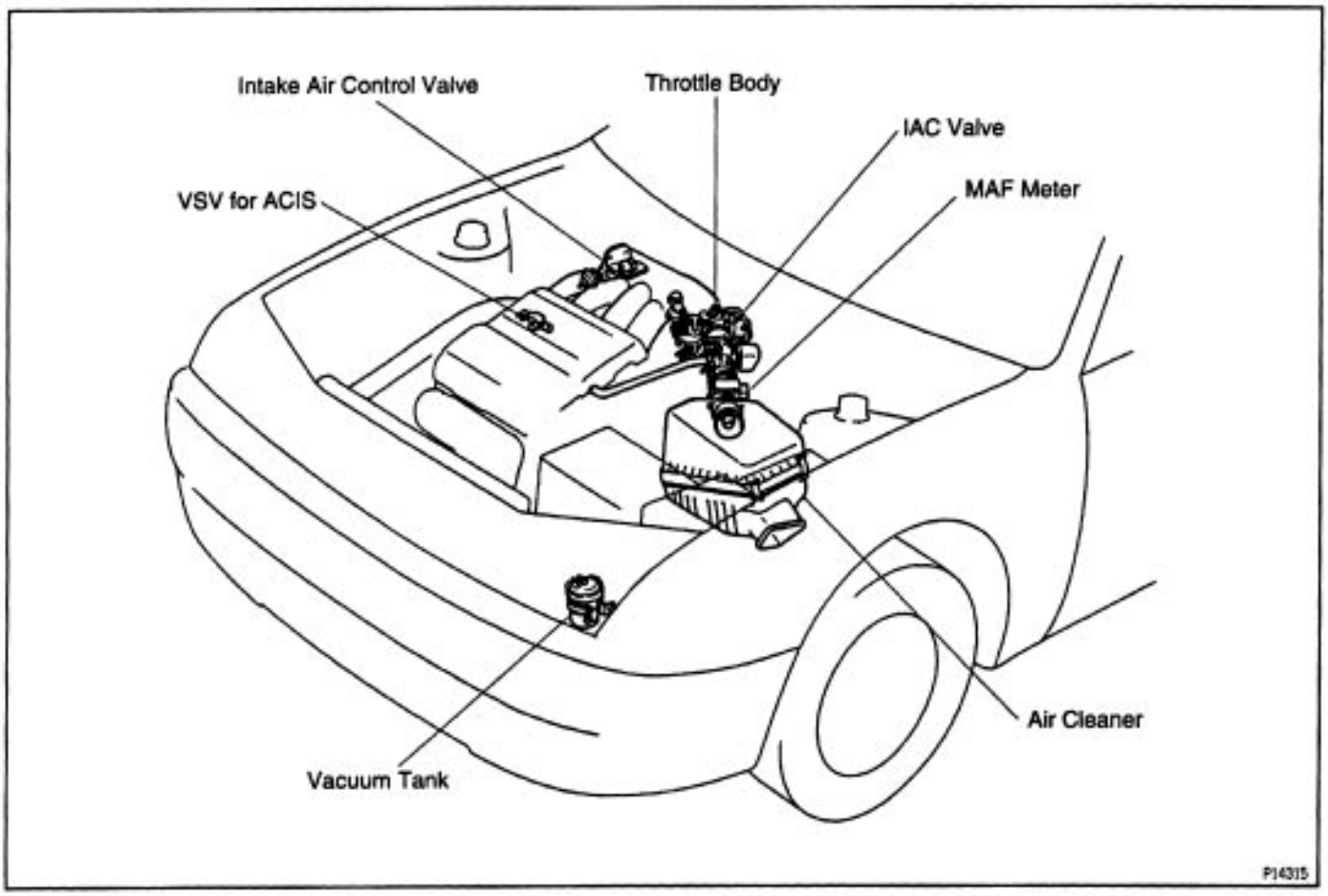
The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2.9 kgf/cm^2, 41 psi) higher than the pressure inside the intake manifold, and excess fuel is returned to the fuel tank through the return tube.

When the engine is hot, the fuel pressure is increased to control percolation in the fuel system and improve restartability and idling stability.

The pulsation damper absorbs the slight fluctuations in fuel pressure caused by the injector.

Fuel is injected into the intake manifold according to signals from the ECM.

AIR INDUCTION SYSTEM



Air filtered through the air cleaner passes through the MAF meter and the amount flowing to the air intake chamber is determined by the throttle valve opening in the throttle body and the engine speed. The MAF meter measures the intake flow to the engine by measuring the air's cooling effect on the thermistor which is heated by the heater.

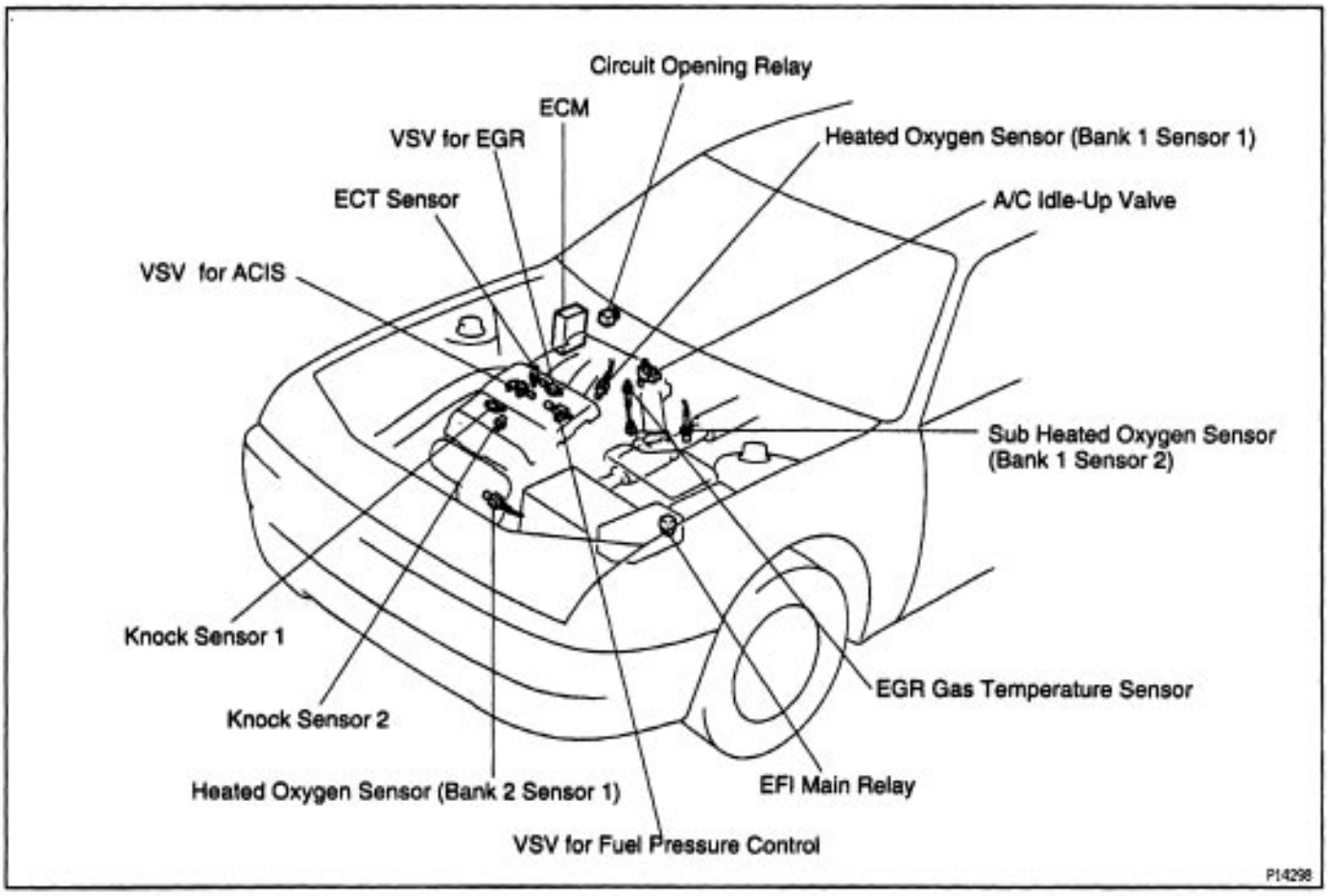
Located in the throttle body is the throttle valve, which regulates the volume of air intake to the engine. Air intake controlled by the throttle valve opening is distributed from the intake chamber to the manifold of each cylinder and is drawn into the combustion chamber.

At low air temperatures the IAC valve opens and the air flows through the IAC valve, as well as the throttle body, into the air intake chamber. During engine warm up, fast idle is accomplished by air flowing into the intake chamber via the IAC valve, even when the throttle valve is completely closed. In this way the IAC valve controls the idle speed to suit the operating conditions.

The air intake chamber prevents pulsation of the intake air, reduces the influence of the MAF meter and increases the air intake volume. It also prevents intake air interference in each cylinder.

There is also the intake air control valve attached to the air intake chamber. Part of the ACIS, the ECM provides signals to the VSV to open or close. This valve opens or closes the vacuum source to the actuator, which in turn opens or closes the intake air control valve. The intake air control valve is designed to modify the effective manifold length in 2 stages for increased power in all driving ranges.

ELECTRONIC CONTROL SYSTEM



The control system consists of sensors which detect various engine conditions, and an ECM which determines the injection volume (timing) based on the signals from the sensors.
The various sensors detect the intake air volume, engine speed, oxygen density in the exhaust gas, engine coolant temperature and intake air temperature etc. and convert the information into an electrical signal which is sent to the ECM; Based on these signals, the ECM calculates the optimum ignition timing for the current conditions and operates the injectors.
The ECM not only controls the fuel injection timing, but also the self diagnostic function which records the occurrence of a malfunction, fuel volume and timing injection control, idle speed control, fuel pressure control, knock sensor control and EGR control.

PREPARATION
SST (SPECIAL SERVICE TOOLS)

	09268–41045 Injection Measuring Tool Set	
	(09268–41080) No.6 union	
	(09268–41090) No.7 Union	
	(90405–09015) No.1 Union	
	09268–45012 EFI Fuel Pressure Gauge	
	09631 –22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09842–30070 Wiring ”F” EFI Inspection	
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.

EQUIPMENT

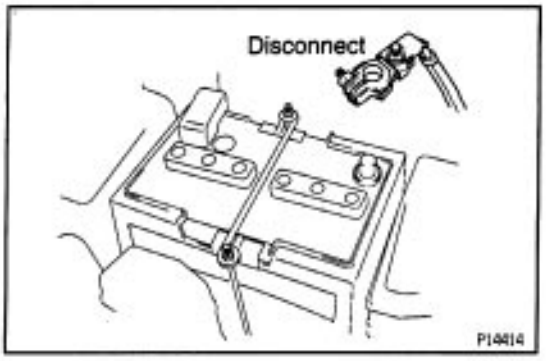
Graduated cylinder	Injector
Carburetor cleaner	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	
Soft brush	Throttle body

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Intake air control valve

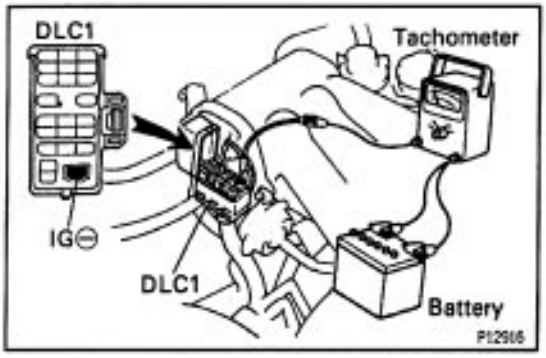
COOLANT

Item	Capacity	Classification
Engine coolant	8.7 liters (9.2 US qts, 7.7 Imp. qts)	Ethylene–glycol base



PRECAUTION

1. Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.
HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed.
Therefore, if necessary, read the diagnosis before removing the battery terminal.
CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.
2. Do not smoke or work near an open flame when working on the fuel system.
3. Keep gasoline away from rubber or leather parts.



MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP
(See page EG2–8**)**
2. PRECAUTIONS WHEN CONNECTING GAUGE
(a) Use the battery as the power source for the timing light, tachometer, etc.
(b) Connect the tester probe of a tachometer to the termi–nal IG(–) of the DLC1.

3. IN EVENT OF ENGINE MISFIRE, FOLLOWING PRE–CAUTIONS SHOULD BE TAKEN
(a) Check proper connection of battery terminals, etc.
(b) After repair work, check that the ignition coil termi–nals and all other ignition system lines are reconne–cted securely.
(c) When cleaning the engine compartment, be especially careful to protect the electrical system from water.
4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR
(a) Do not allow oxygen sensor to drop or hit against an object.
(b) Do not allow the sensor to come into contact with water.

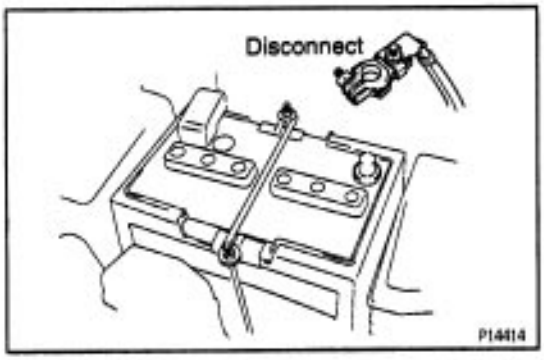
IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

If the vehicle is equipped with a mobile communica–tion system, refer to the precaution in the IN section.

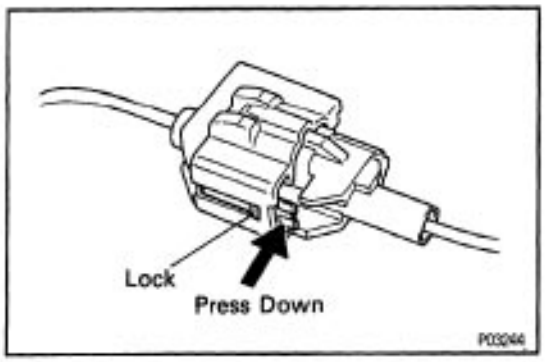
AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

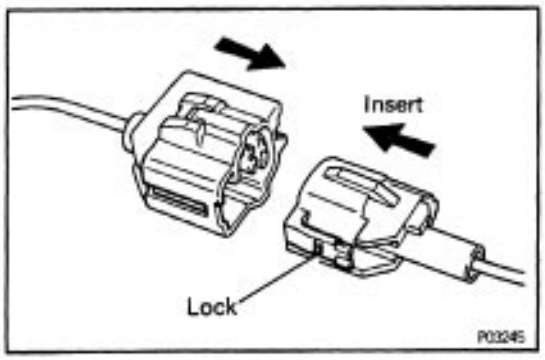
ELECTRONIC CONTROL SYSTEM



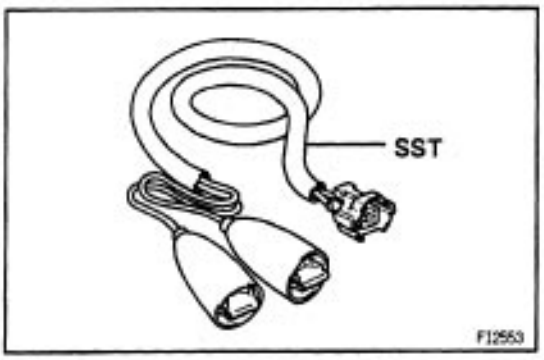
1. Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch to LOCK or disconnecting the negative (–) terminal cable from the battery.
HINT: Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting or the SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



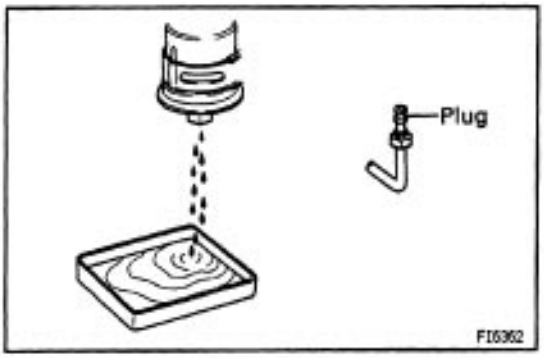
8. Care is required when pulling out and inserting wiring connectors.
(a) Release the lock and pull out the connector, pulling on the connectors.

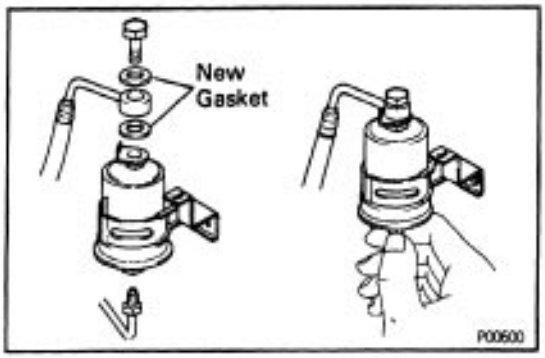


(b) Fully insert the connector and check that it is locked.



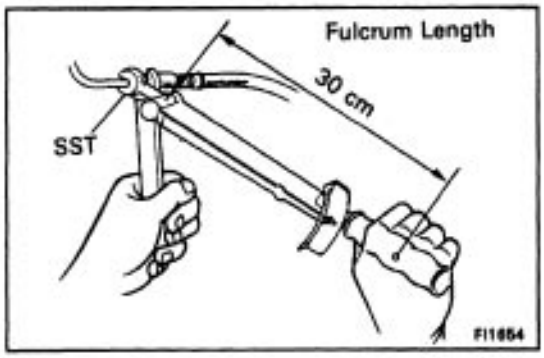
9. Use SST for inspection or test of the injector or its wiring connector.
SST 09842–30070



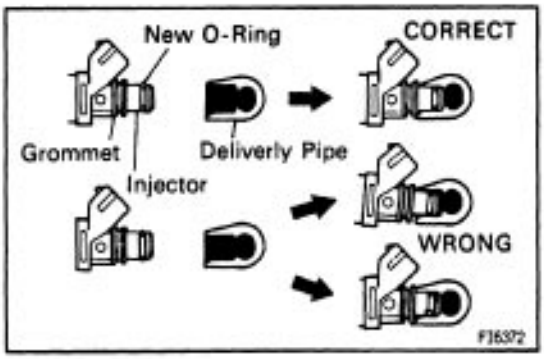


FUEL SYSTEM

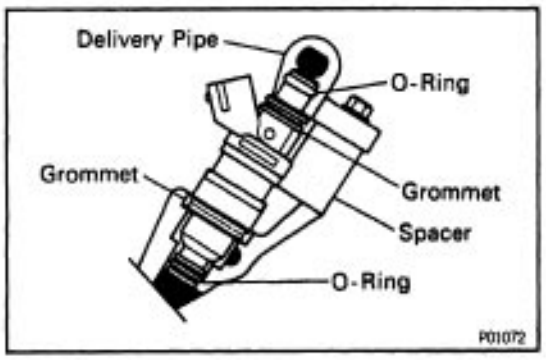
1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedures:
(a) Put a container under the connection.
(b) Slowly loosen the connection.
(c) Disconnect the connection.
(d) Plug the connection with a rubber plug.
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following proce–dures:
Union Bolt Type:
(a) Always use 2 new gaskets.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)



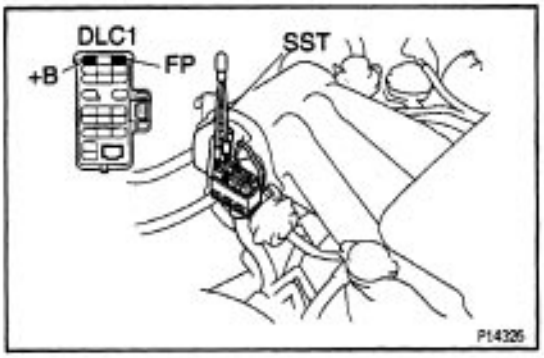
Flare Nut Type:
(a) Apply a light coat of engine oil to the flare nut, and tighten the flare nut by hand.
M Using SST, tighten the flare nut to specified torque.
SST 09631– 22020
NOTICE: Do not rotate the fuel pipe, when tightening the flare nut.
Torque:
28 N–m (285 kgf–cm, 21 ft–lbf) for fuel pump side
30 N–m (310 kgf–cm, 22 ft–lbf) for others
HINT: Use a torque wrench with a fulcrum length of 30 cm (111.81 in.).



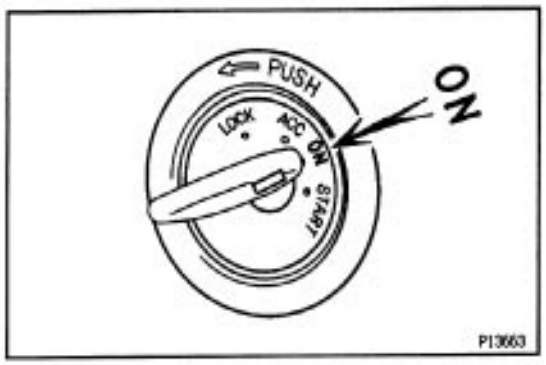
3. Observe the following precautions when removing and installing the injectors.
(a) Never reuse the O–ring.
(b) When placing a new 0 –ring on the injector, take care not to damage it in any way.
(c) Coat a new 0 –ring with spindle oil or gasoline before installing– never use engine, gear or brake oil.



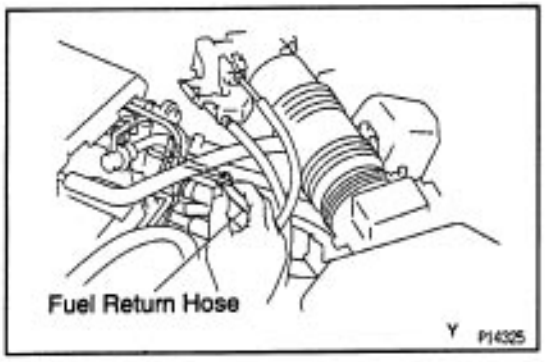
4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.



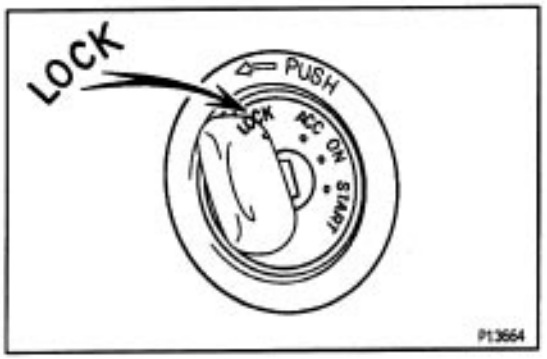
5. Check that there are no fuel leaks after performing any maintenance on the fuel system.
(a) Using SST, connect terminals +B and FP of the DLC 1.
SST 09843–18020



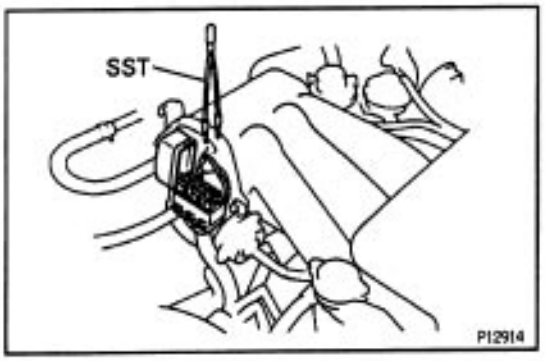
(b) With engine stopped, turn the ignition switch ON.



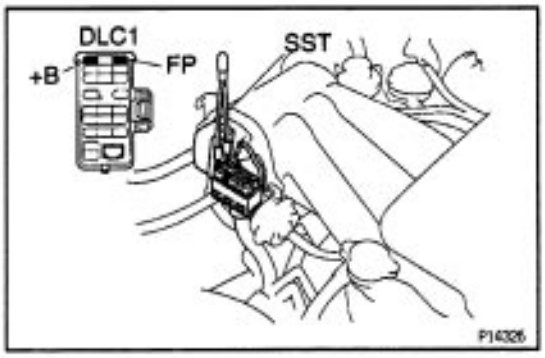
(c) Pinch the fuel return hose.
The pressure in the high pressure line will rise to approx. 392 kPa (4 kgf/cm^2 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bending as it may cause the hose to crack.



(d) Turn the ignition switch to LOCK.



(e) Remove the SST from the DLC1.
SST 09843–18020



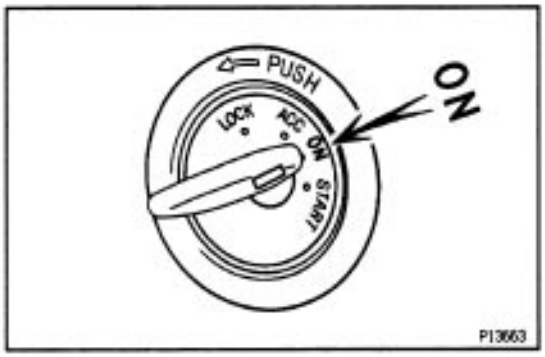
FUEL PUMP

ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

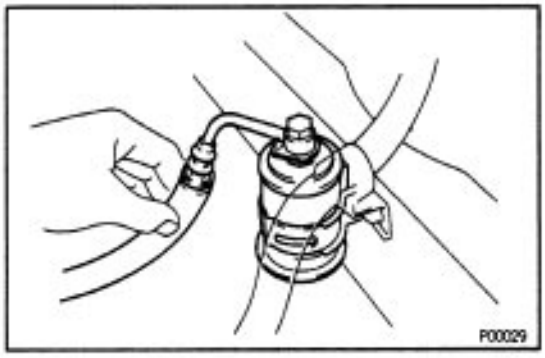
(a) Using SST, connect terminals +B and FP of the DLC 1.

SST 09843–18020



(b) Turn the ignition switch ON.

NOTICE: Do not start the engine.

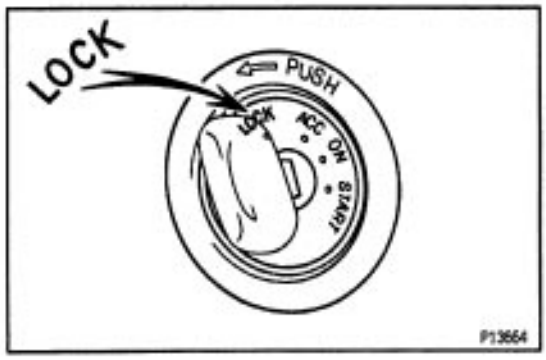


(c) Check that there is pressure in the fuel inlet hose from the fuel filter.

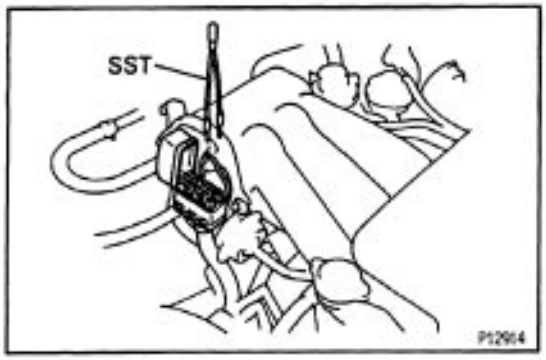
HINT: If there is fuel pressure, you will hear the sound of fuel flowing.

If there is no pressure, check the following parts:

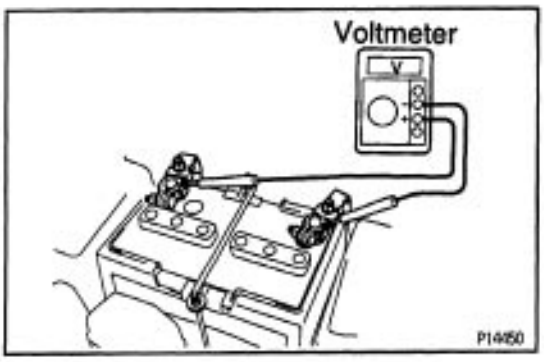
- Fusible link
- Fuses (AM2 30A, IGN 7.5A)
- EFI main relay
- Fuel pump
- ECM
- Wiring connections



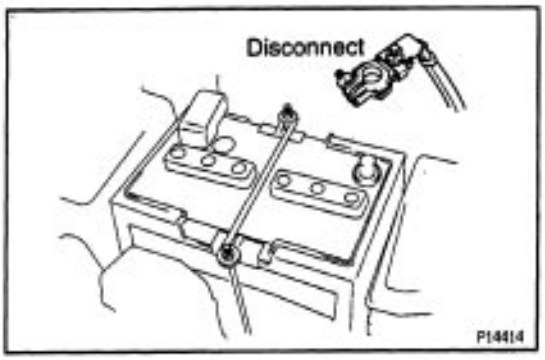
(d) Turn the ignition switch to LOCK.



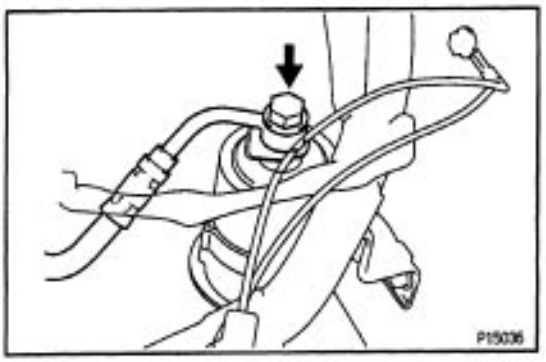
(e) Remove the SST from the DLC1.
SST 09843–18020



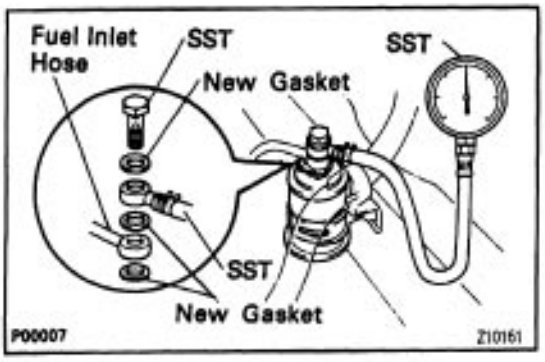
2. CHECK FUEL PRESSURE
(a) Check the battery voltage is above 12 V.



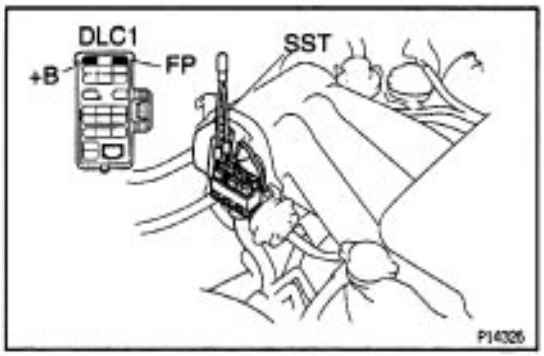
(b) Disconnect the negative (–) terminal cable from the battery.
CAUTION: Work must be started after 90 seconds from the time the ignition switch Is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.



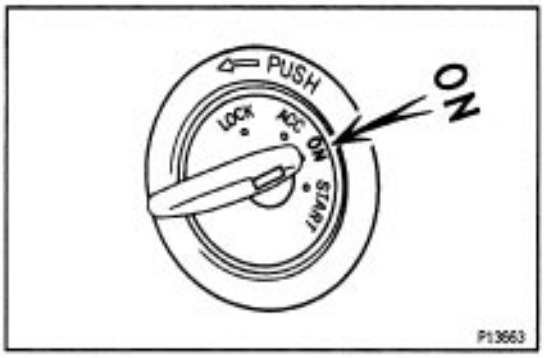
(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.
CAUTION:
- **Put a shop towel under the fuel filter.**
- **Slowly loosen the union bolt.**



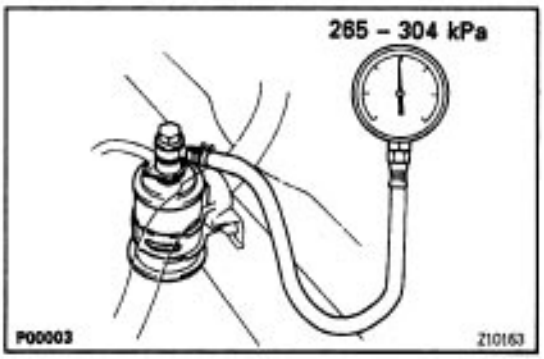
(d) Install the fuel inlet hose and SST (pressure gauge) to the fuel filter outlet with 3 new gaskets and the union bolt.
SST 09268–45012
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)
(e) Wipe off any splattered gasoline.



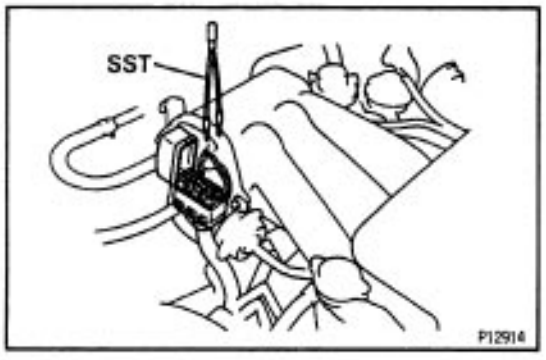
(f) Using SST, connect terminals +B and FP of the DLC 1.
(g) Reconnect the negative (–) terminal cable to the battery.



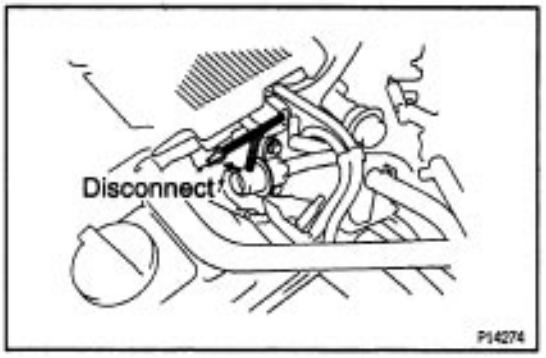
(h) Turn the ignition switch ON.



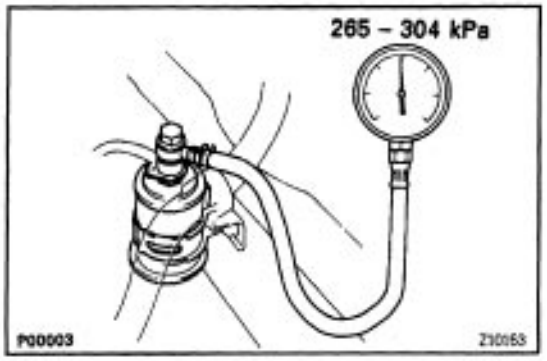
(i) Measure the fuel pressure.
Fuel pressure:
266 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator



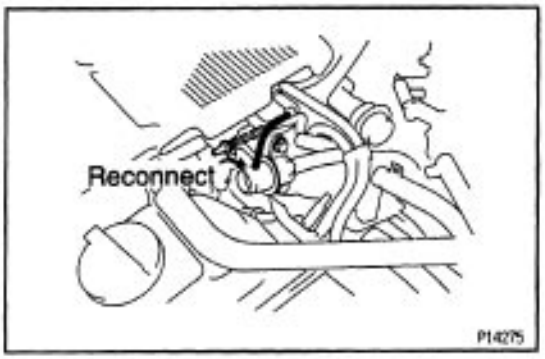
(j) Remove the SST from the DLC1.
SST 09843–18020



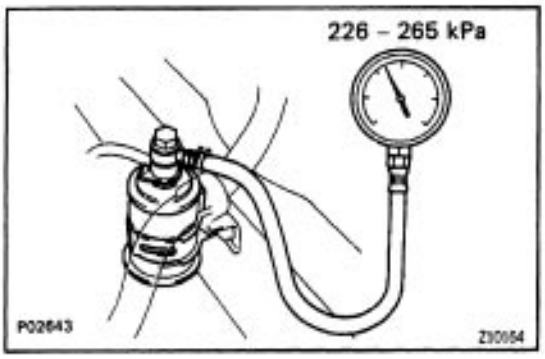
(k) Start the engine.
(l) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.



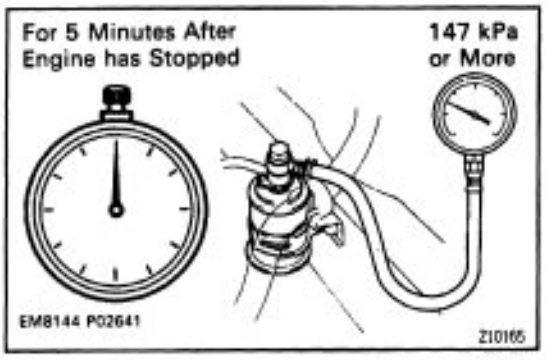
(m) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 39 – 44 psi)



(n) Reconnect the vacuum sensing hose to the fuel pres–sure regulator.

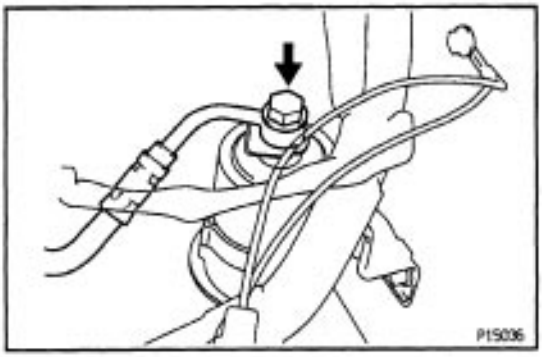


(o) Measure the fuel pressure at idle.
Fuel pressure:
226 – 265 kPa (2.3 – 2.7 kgf/cm^2, 33 – 38 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

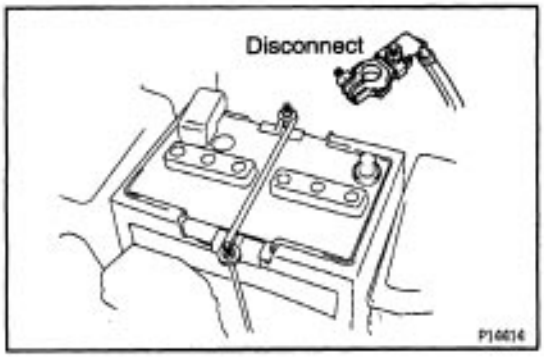


(p) Stop the engine.
(q) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.
Fuel pressure:
147 kPa (1.5 kgf/cm^2, 21 psi) or more
If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.

(r) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012

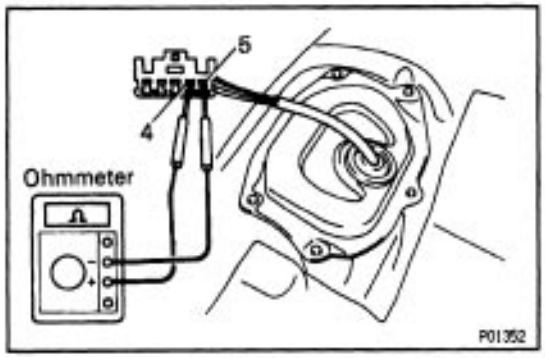


(s) Connect the fuel inlet hose with 2 new gaskets and the union bolt.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)
(t) Reconnect the negative (–) terminal cable to the battery.
(u) Check for fuel leakage.
(See page EG2–228)

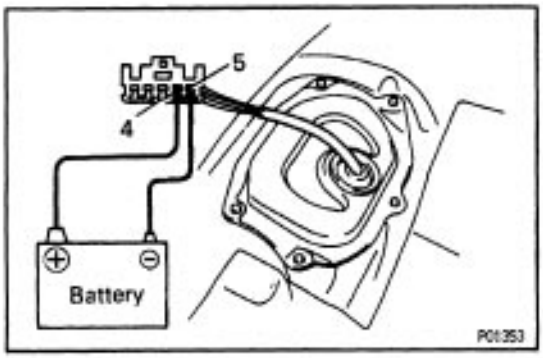


FUEL PUMP INSPECTION

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. REMOVE REAR SEAT CUSHION



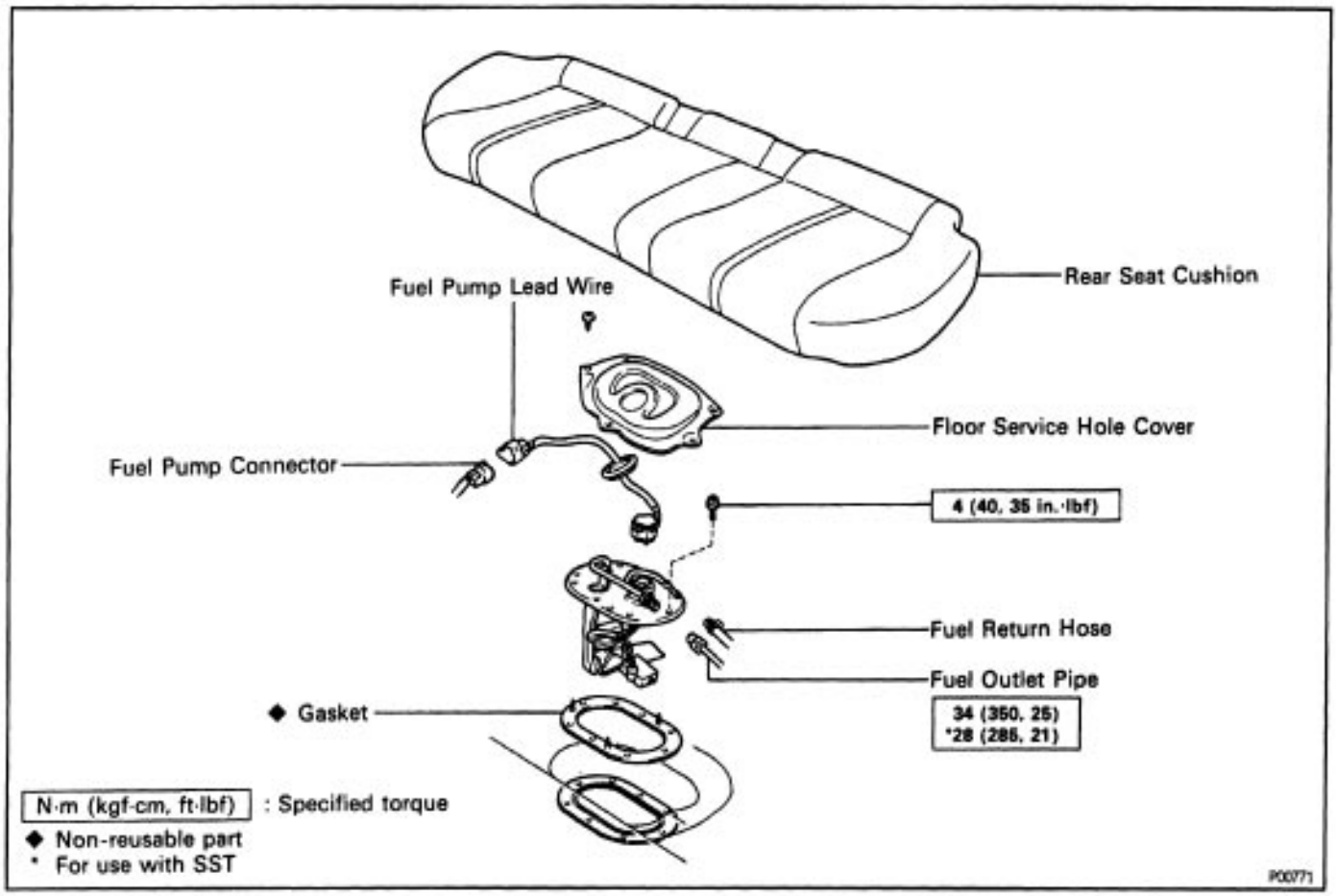
3. INSPECT FUEL PUMP
A. Inspect fuel pump resistance
Using an ohmmeter, measure the resistance between terminals 4 and 5.
Resistance:
0.2–3.0Ω at 20°C (68°F)
If the resistance is not as specified, replace the fuel pump.



B. Inspect fuel pump operation
Connect the positive (+) lead from the battery to terminal 4 of the connector, and the negative (–) lead to terminal
5. Check that the fuel pump operates.
NOTICE:
- **These tests must be performed quickly (within 10 seconds) to prevent the coil burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always perform switching at the battery side.**

If operation is not as specified, replace the fuel pump or lead wire.
4. REINSTALL REAR SEAT CUSHION
5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

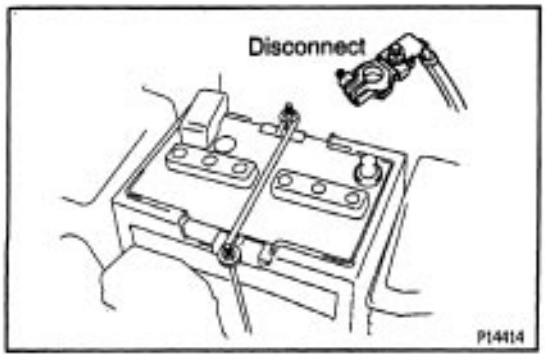
COMPONENTS FOR REMOVAL AND INSTALLATION



FUEL PUMP REMOVAL

(See Components for Removal and Installation)

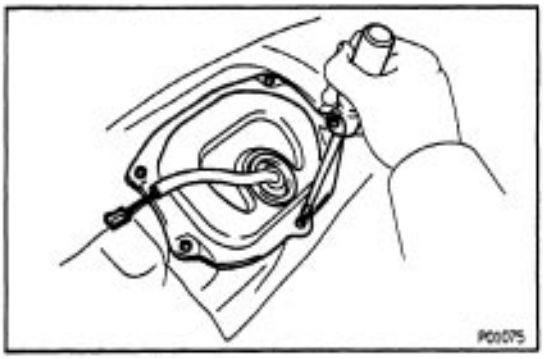
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

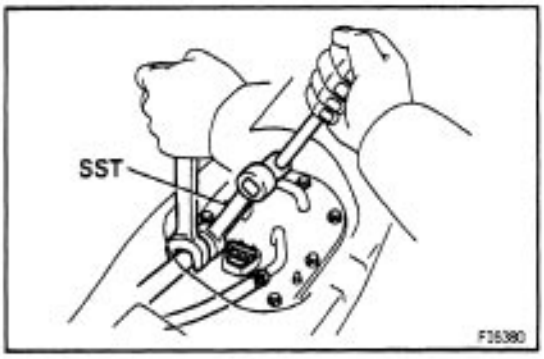
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

2. REMOVE REAR SEAT CUSHION

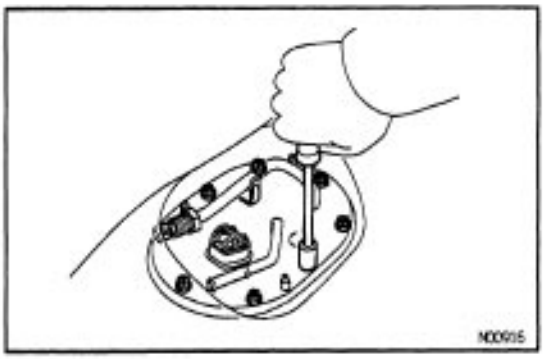


3. REMOVE FLOOR SERVICE HOLE COVER
(a) Disconnect the fuel pump connector.
(b) Remove the 5 screws and service hole cover.

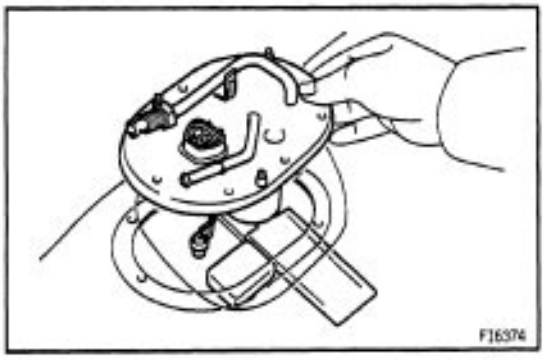
4. REMOVE FUEL PUMP LEAD WIRE
NOTICE: Do not lift the fuel pump up with the wire harness picking.



5. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET
CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.
(a) Using SST, disconnect the outlet pipe from the pump bracket.
SST 09631– 22020
(b) Disconnect the return hose from the pump bracket.

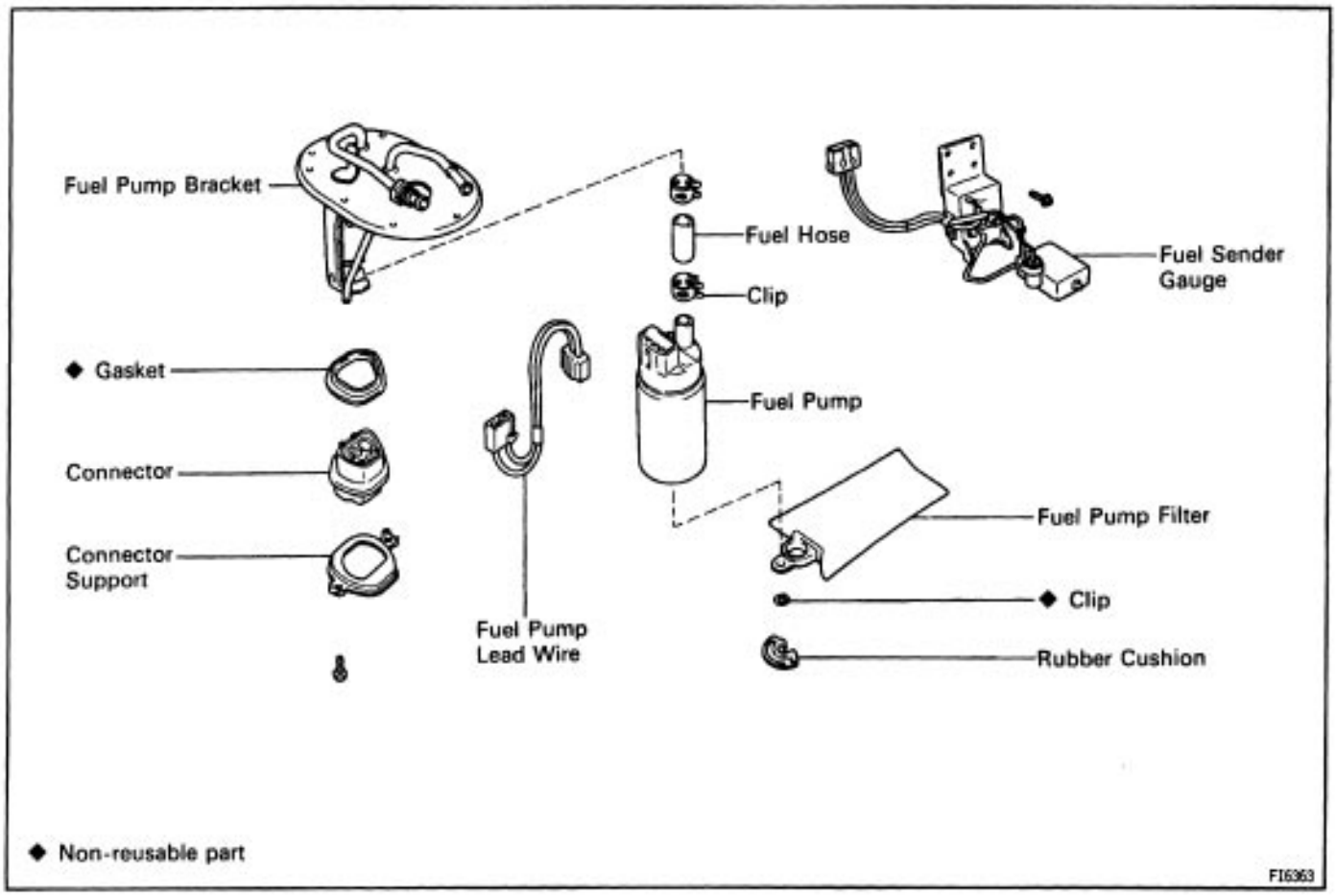


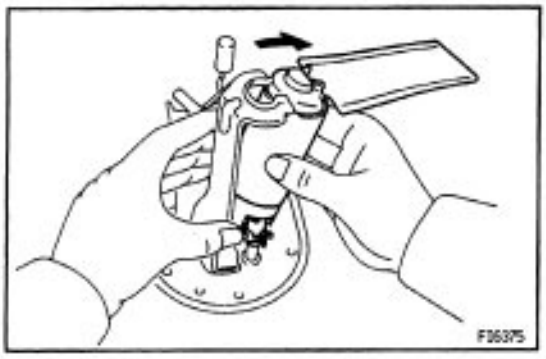
6. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK
(a) Remove the 8 bolts.

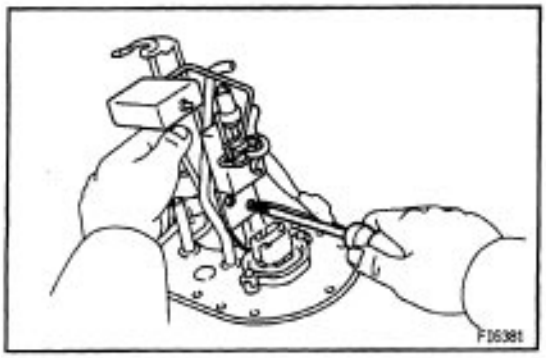


(b) Pull out the pump bracket assembly.
(c) Remove the gasket from the pump bracket.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY







FUEL PUMP DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Remove the fuel pump lead wire.

(b) Pull off the lower side of the fuel pump from the pump bracket.

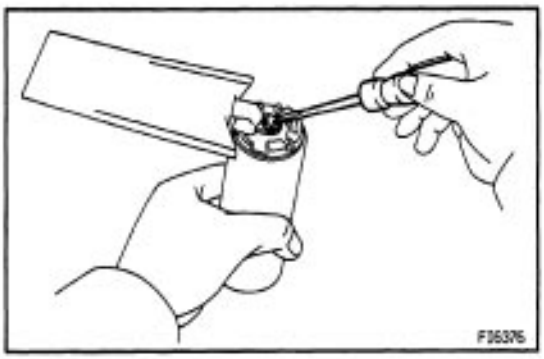
(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

(d) Remove the rubber cushion from the fuel pump.

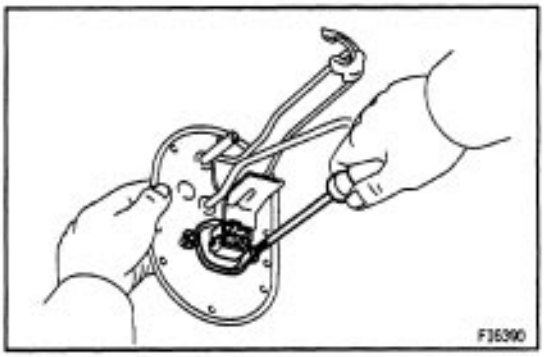
2. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

(a) Disconnect the fuel sender gauge connector.

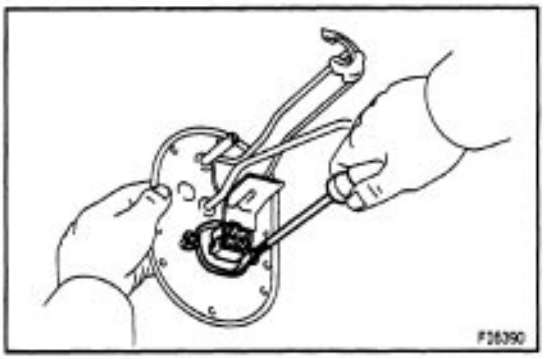
(b) Remove the 2 screws and sender gauge.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP
(a) Using a small screwdriver, remove the clip.
(b) Pull out the pump filter.



4. REMOVE CONNECTOR
Remove the 2 screws, connector support, connector and gasket.

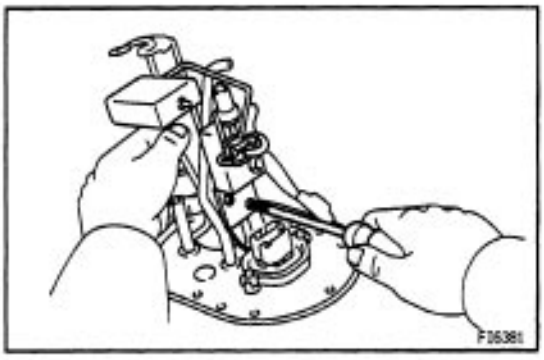


FUEL PUMP ASSEMBLY

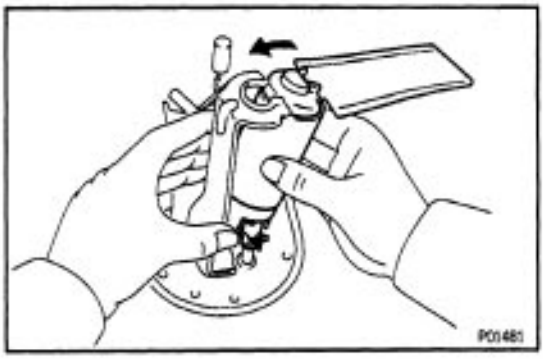
(See Components for Disassembly and Assembly)

1. INSTALL CONNECTOR
Install new gasket, the connector and connector support with the 2 screws.

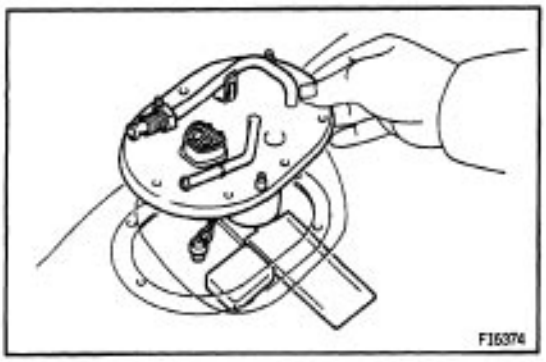
2. INSTALL FUEL PUMP FILTER TO FUEL PUMP
Install the pump filter with a new clip.



3. INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET
(a) Install the sender gauge with the 2 screws.
(b) Connect the fuel sender gauge connector.



4. INSTALL FUEL PUMP TO FUEL PUMP BRACKET
(a) Install the rubber cushion to the fuel pump.
(b) Connect the fuel hose to the outlet port of the fuel pump.
(c) Install the fuel pump by pushing the lower side of the fuel pump.
(d) Install the fuel pump connector.



FUEL PUMP INSTALLATION

(See Components for Removal and Installation)

1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

(a) Install a new gasket to the pump bracket.

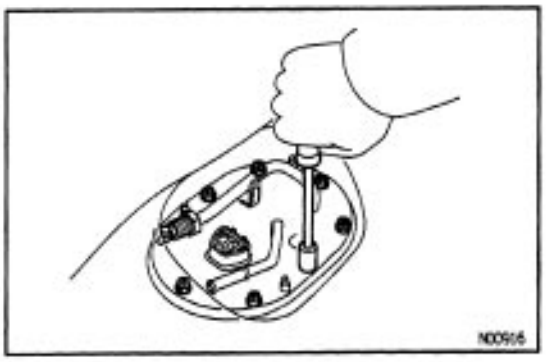
(b) Insert the pump bracket assembly into the fuel tank.

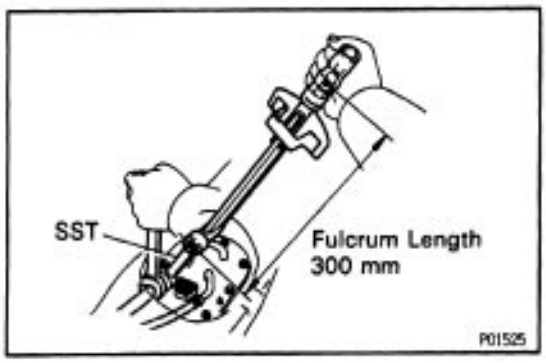
NOTICE:

- **Do not damage the fuel pump filter.**
- **Be careful that the arm of the sender gauge should not bent.**

(c) Install the pump bracket with the 8 screws.

Torque: 4 N–m (40 kgf–cm, 35 in.–lbf)





2. CONNECT FUEL PIPE AND HOSE TO FUEL PUMP BRACKET

(a) Using SST, connect the outlet pipe to the pump bracket.

SST 09631– 22020

Torque: 28 N–m (285 kgf–cm, 21 ft–lbf) for use with SST

(b) Connect the return hoses to the pump bracket.

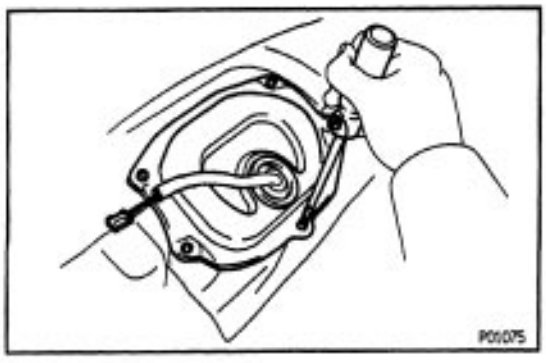
3. CONNECT FUEL PUMP LEAD WIRE

4. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

6. CHECK FOR FUEL LEAKAGE

(See page EG2–228**)**

Connect the fuel pump (with fuel sender gauge) con–nector.

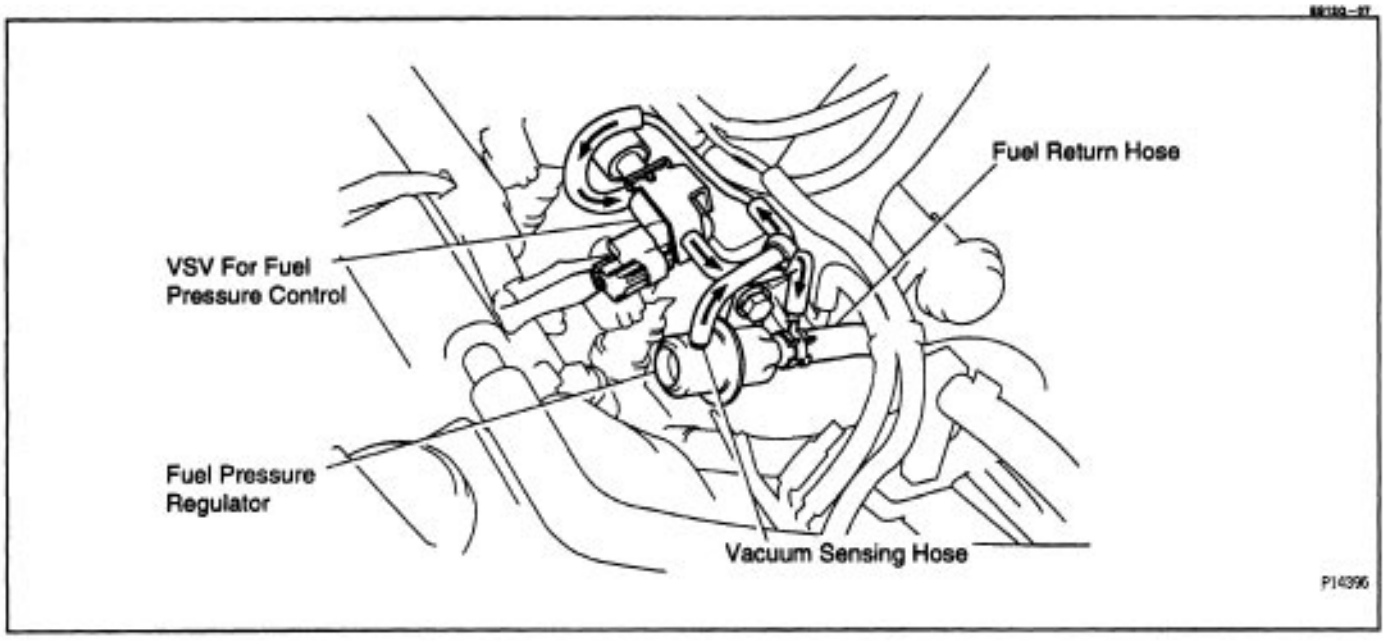


6. INSTALL FLOOR SERVICE HOLE COVER

Install the service hole cover with the 5 screws.

7. INSTALL REAR SEAT CUSHION

FUEL PRESSURE REGULATOR

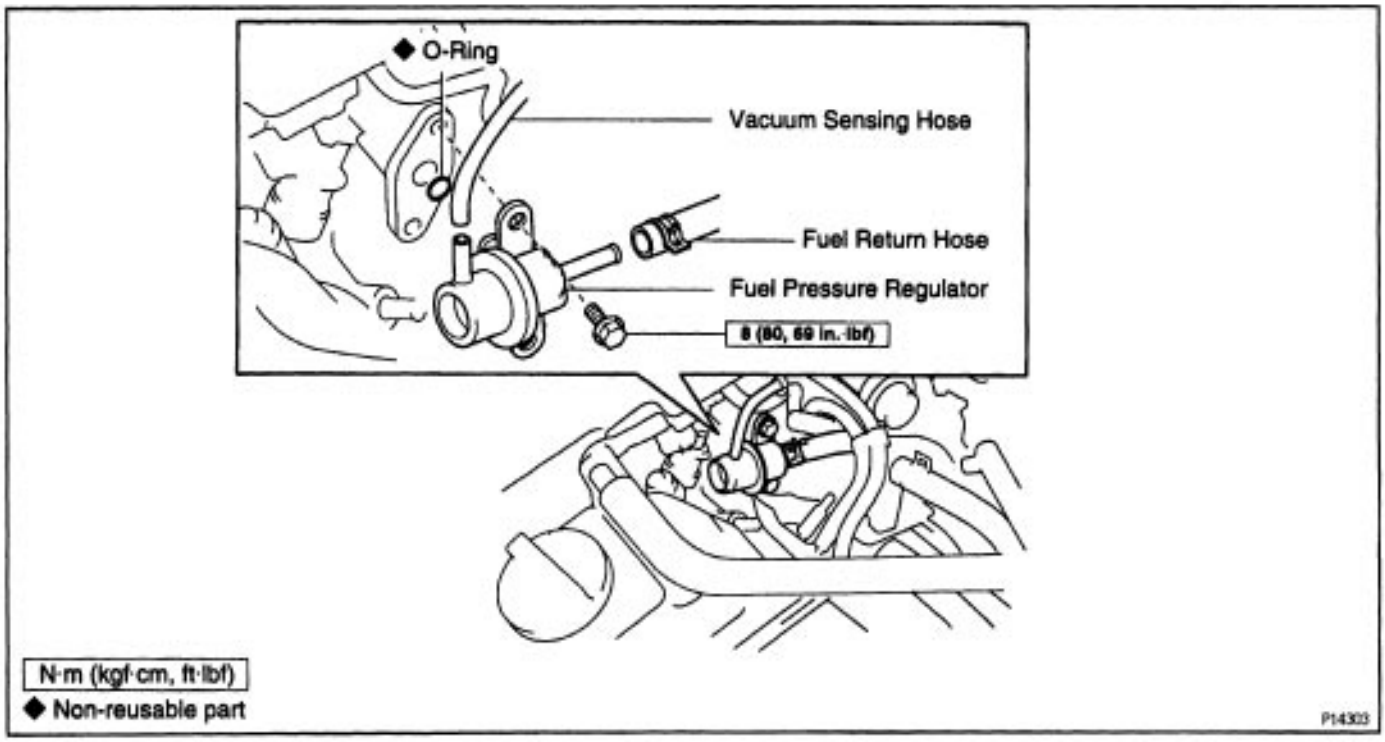


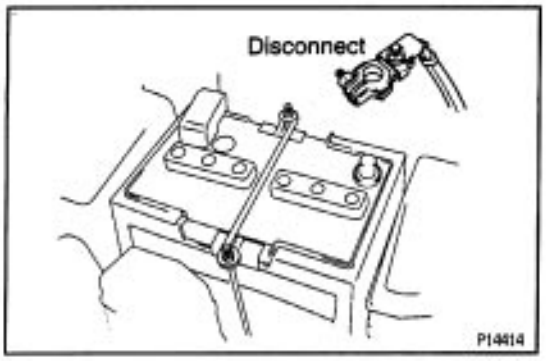
ON–VEHICLE INSPECTION

CHECK FUEL PRESSURE

(See page EG2–231**)**

COMPONENTS FOR REMOVAL AND INSTALLATION



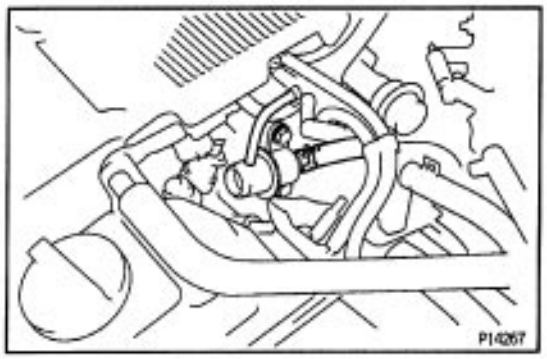


FUEL PRESSURE REGULATOR REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

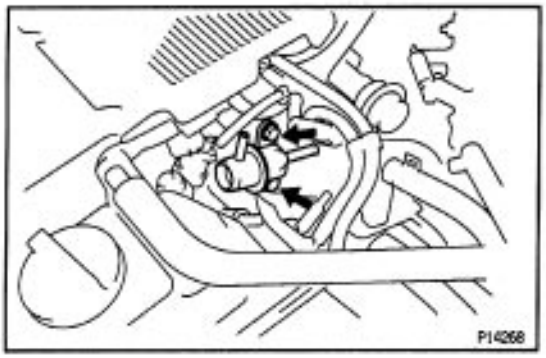
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

3. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

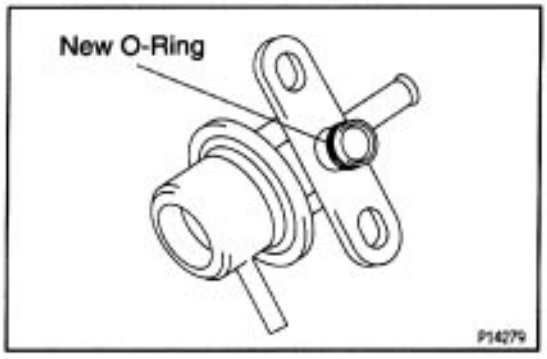
CAUTION: Put a shop rag under the pressure regulator.



4. REMOVE FUEL PRESSURE REGULATOR

(a) Remove the 2 bolts, and pull out the pressure regulator.

(b) Remove the 0–ring from the pressure regulator.



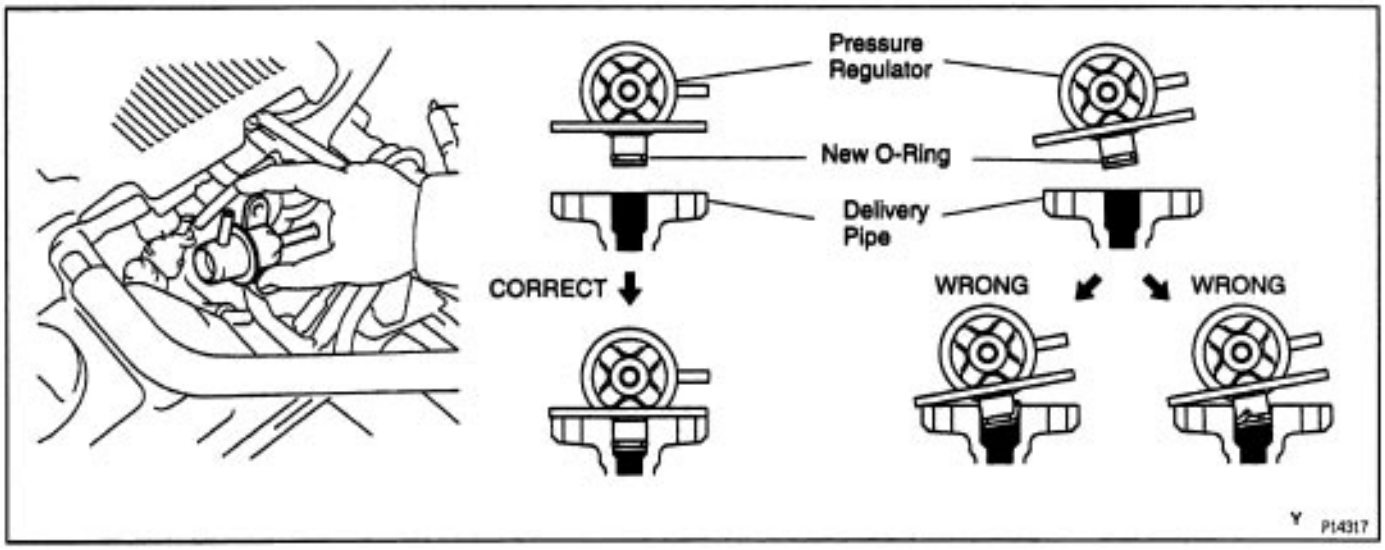
FUEL PRESSURE REGULATOR INSTALLATION

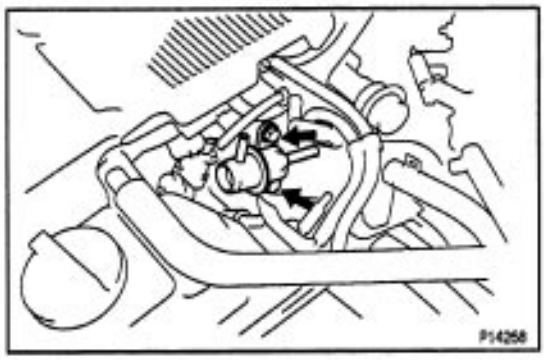
(See Components for Removal and Installation)

1. INSTALL FUEL PRESSURE REGULATOR

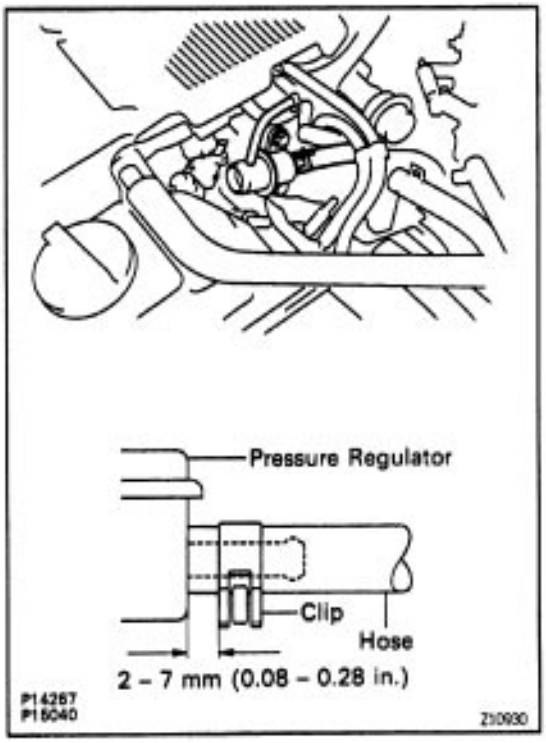
(a) Apply a light coat of gasoline to a new 0–ring, and install it to the pressure regulator.

(b) Attach the pressure regulator to the delivery pipe.
(c) Check that the pressure regulator rotates smoothly.
NOTICE: If it does not rotate smoothly, the O–ring may be pinched, so remove the pressure regulator and repeat steps (a) to (e) above.



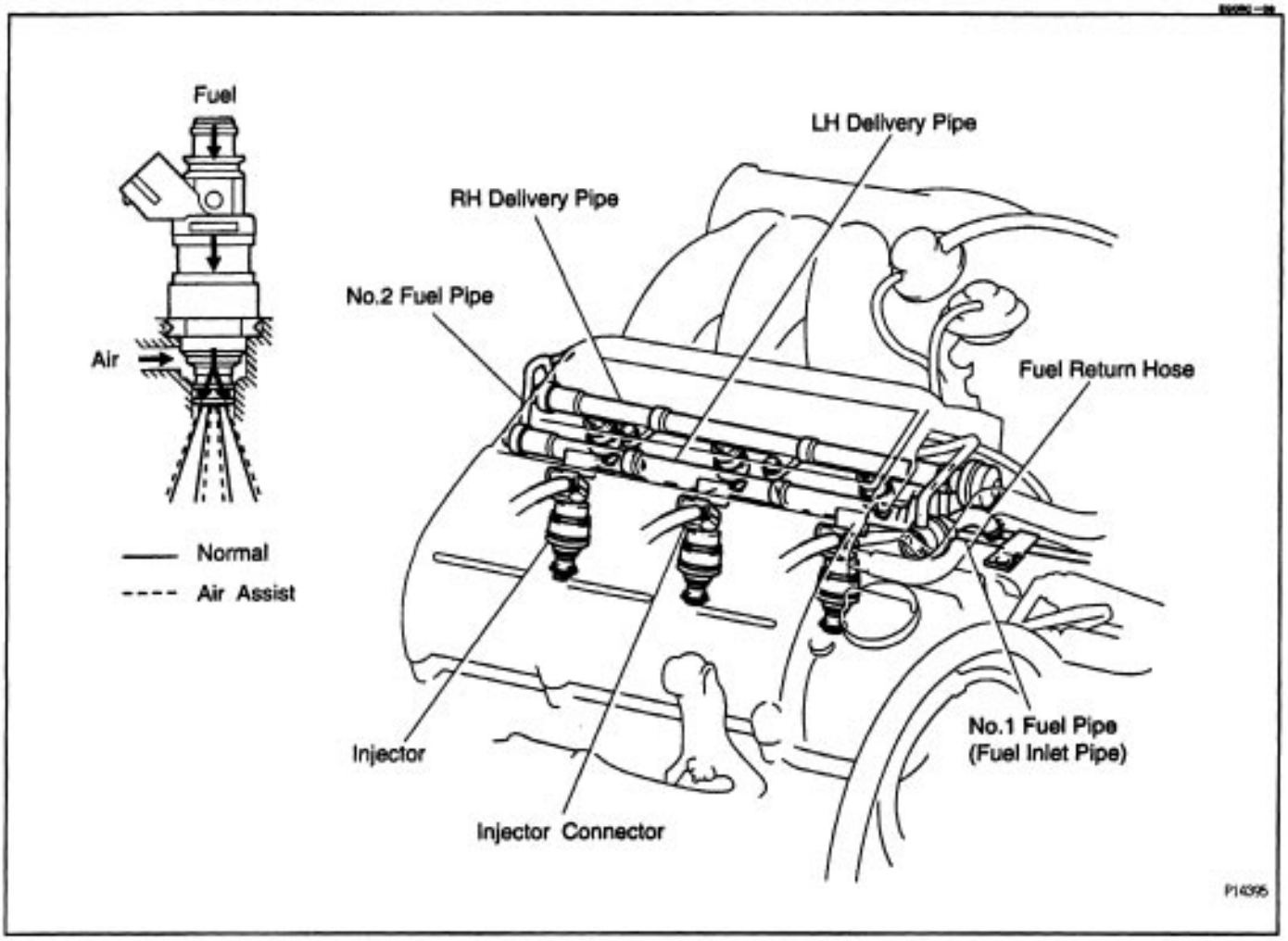


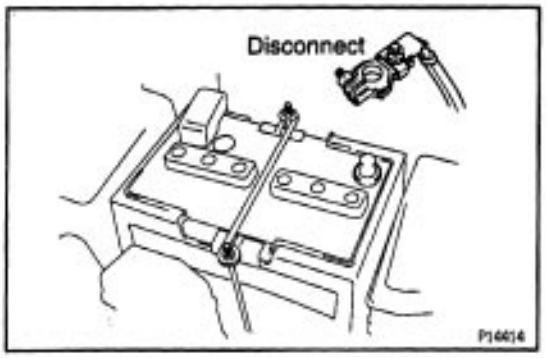
(d) Install the pressure regulator with the 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



2. CONNECT FUEL RETURN HOSE TO FUEL PRES–SURE REGULATOR
NOTICE: Be sure insert the hose up to the stopper and clip It.
3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR
4. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
5. CHECK FOR FUEL LEAKS
(See page EC–228)

INJECTOR

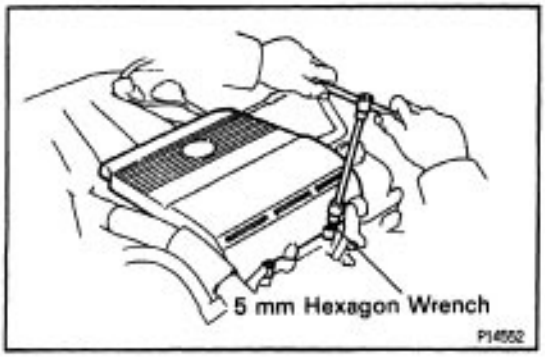




ON–VEHICLE INSPECTION

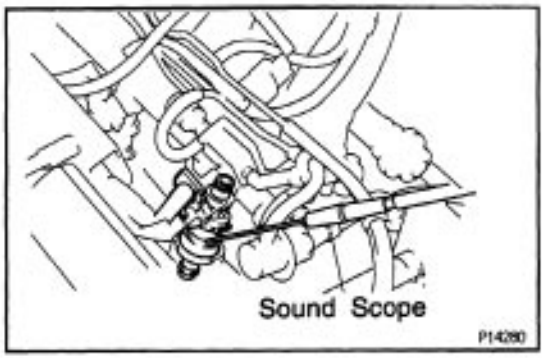
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE V–BANK COVER

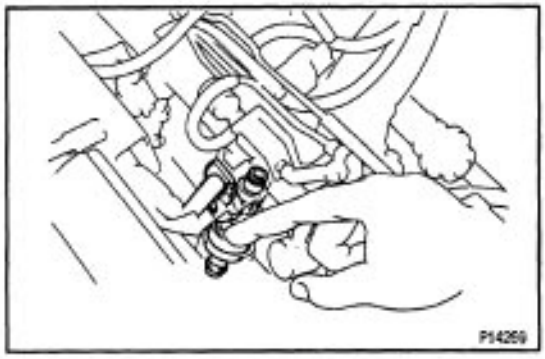
Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.



3. INSPECT INJECTOR OPERATION

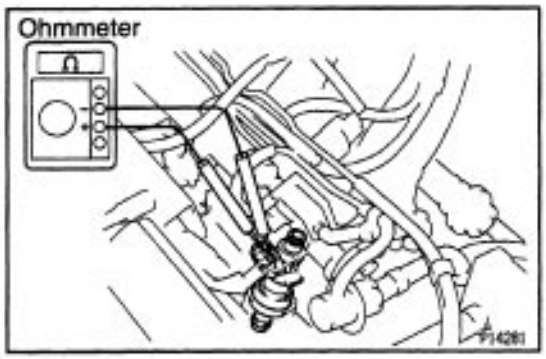
Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.



(b) If you have no sound scope, you can check the injec–tor operating vibration with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



4. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Approx. 13.8Ω at 20°C (68°F)

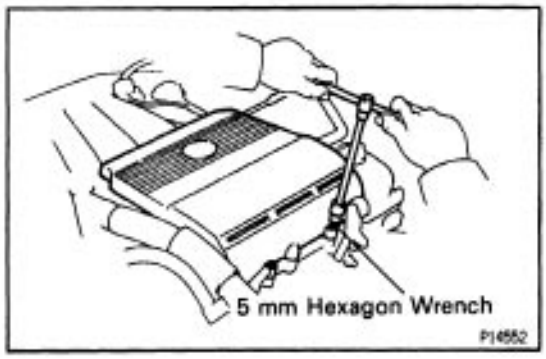
If the resistance is not as specified, replace the injec–tor.

(c) Reconnect the injector connector.

5. REINSTALL V–BANK COVER

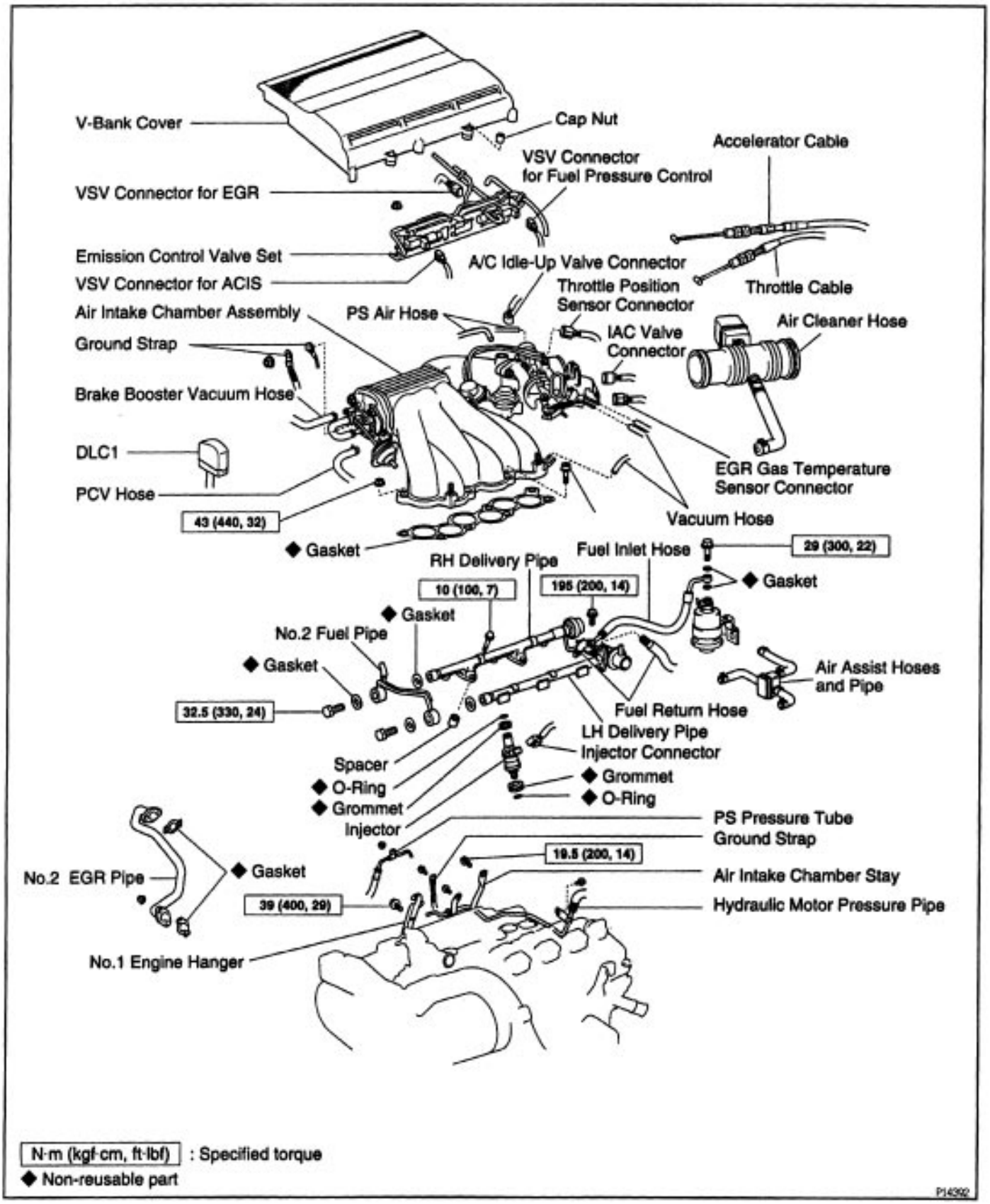
Using a 5 mm hexagon wrench, install the V–bank cover with the 2 cap nuts.

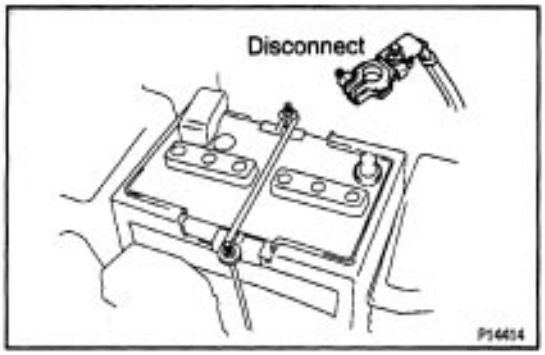
HINT: For fixing the V–bank cover, push on the cover until sense of ”click” is felt.



6. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

COMPONENTS FOR REMOVAL AND INSTALLATION





INJECTORS REMOVAL

(See Components for Removal and Installation)

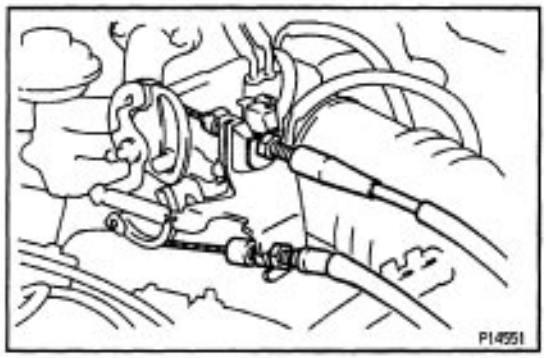
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

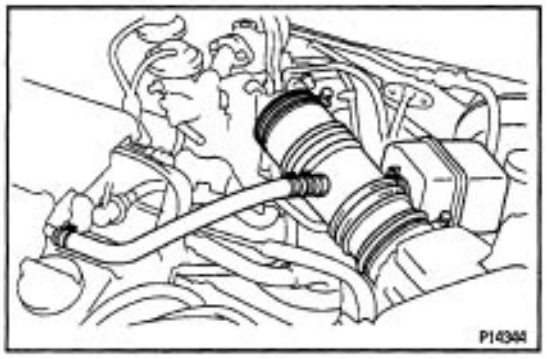
CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. DISCONNECT ACCELERATOR CABLE

4. DISCONNECT THROTTLE CABLE

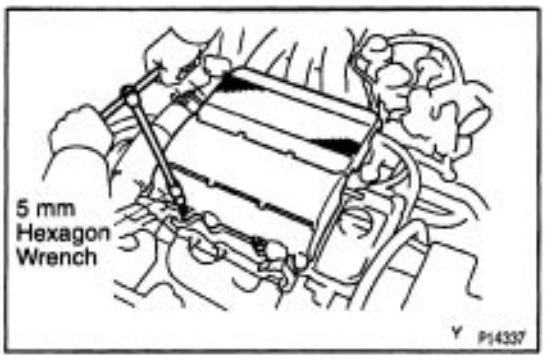




6. REMOVE AIR CLEANER HOSE

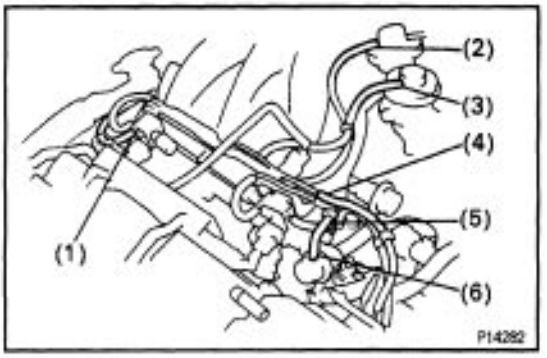
(a) Disconnect the PCV hose.

(b) Loosen the 2 hose clamps, and remove the air cleaner hose.



6. REMOVE V–SANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and v–bank cover.



7. REMOVE EMISSION CONTROL VALVE SET

(a) Disconnect the following vacuum hoses:

(1) Vacuum hose from VSV for ACIS

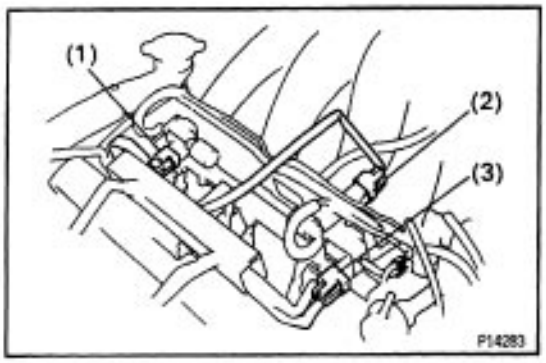
(2) Vacuum hose from EGR vacuum modulator

(3) Vacuum hose from EGR valve

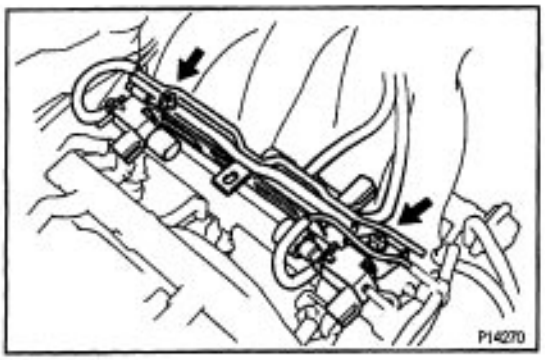
(4) Vacuum hose (from cylinder head rear plate)

(5) Vacuum hose from air intake chamber

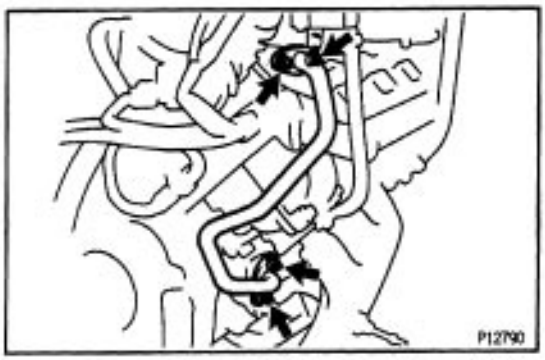
(6) Vacuum hose from fuel pressure regulator



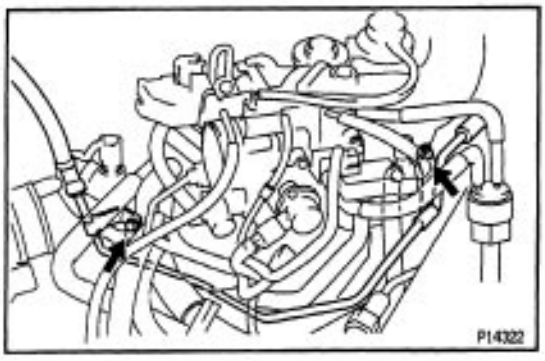
(b) Disconnect the following connectors:
(1) VSV connector for ACIS
(2) VSV connector for EGR
(3) VSV connector for fuel pressure control



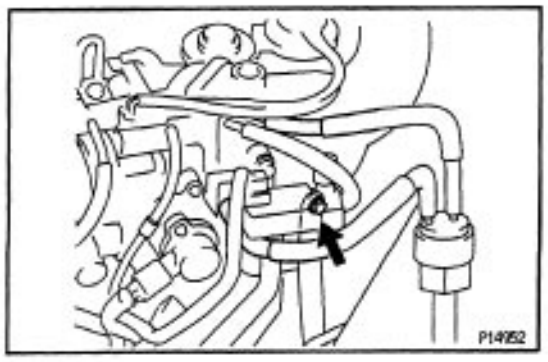
(c) Remove the 2 nuts and emission control valve set.



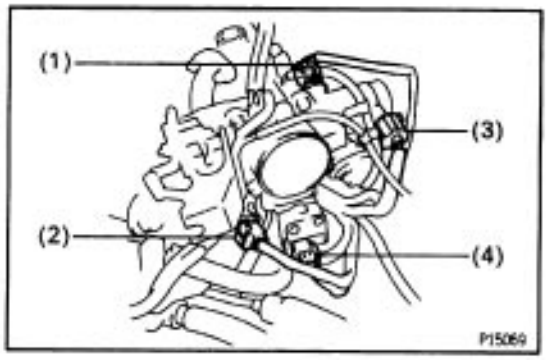
8. REMOVE No.2 EGR PIPE
Remove the 4 nuts, EGR pipe and 2 gaskets.



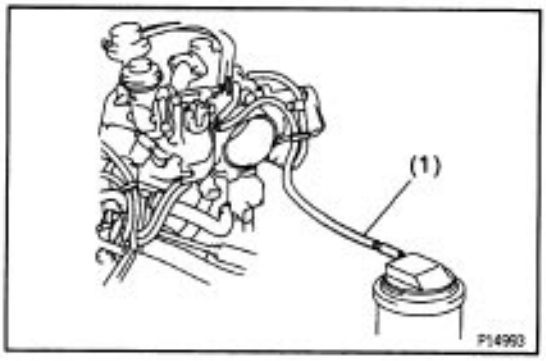
9. DISCONNECT HYDRAULIC MOTOR PRESSURE PIPE
Remove the 2 bolts, and disconnect the pressure pipe from the water inlet and air intake chamber.



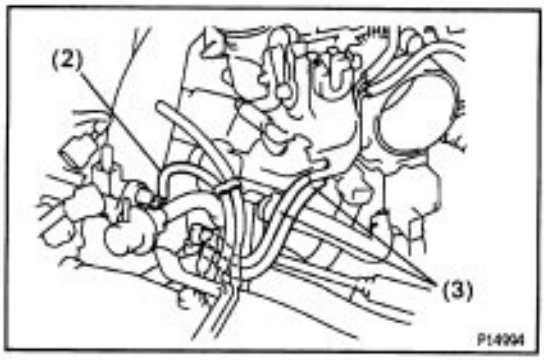
10. REMOVE AIR INTAKE CHAMBER ASSEMBLY
(a) Disconnect the 2 PS air hoses.
(b) Remove the bolt holding the air intake chamber stay to the air intake chamber.



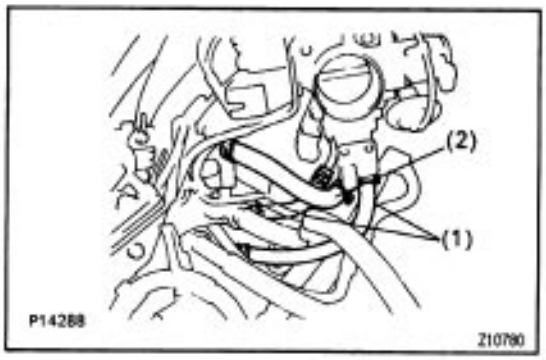
(c) Disconnect the following connectors:
(1) A/C idle–up valve connector
(2) EGR gas temperature sensor connector
(3) Throttle position sensor connector
(4) IAC valve connector



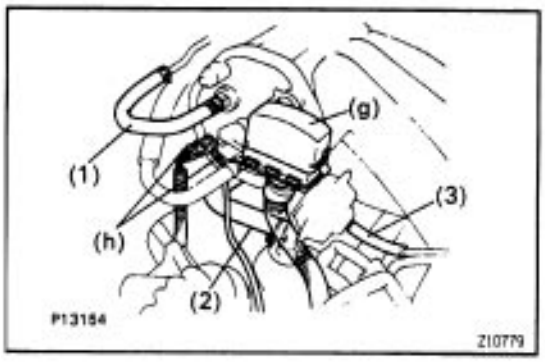
(d) Disconnect the following vacuum hoses:
(1) Vacuum hose from charcoal canister



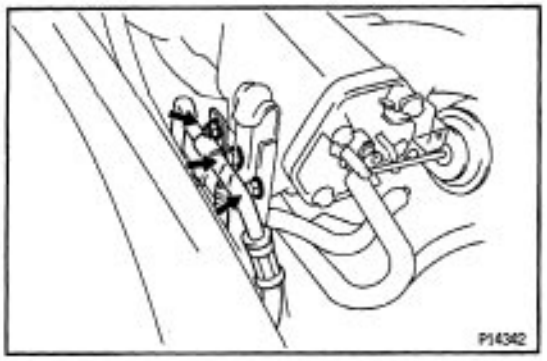
(2) Vacuum hose from air intake chamber
(3) 2 vacuum hoses from throttle body



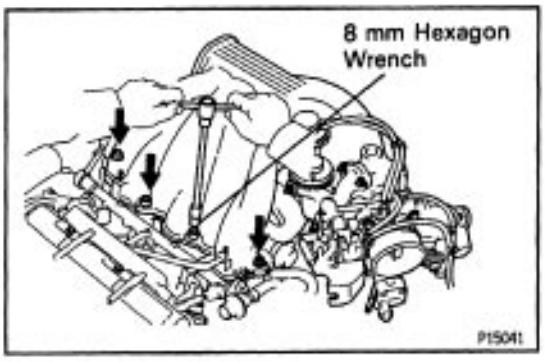
(e) Disconnect the following hoses:
(1) 2 water bypass hoses from throttle body
(2) Air assist hose from throttle body



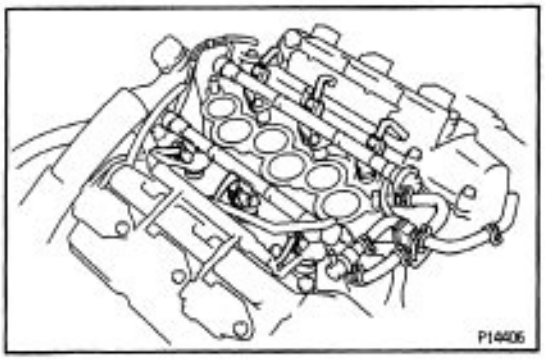
(f) Disconnect the following hoses:
(1) Brake booster vacuum hose
(2) PCV hose
(3) Actuator vacuum hose
(g) Disconnect the DLC1.
(h) Remove the nut and disconnect the 2 ground straps.



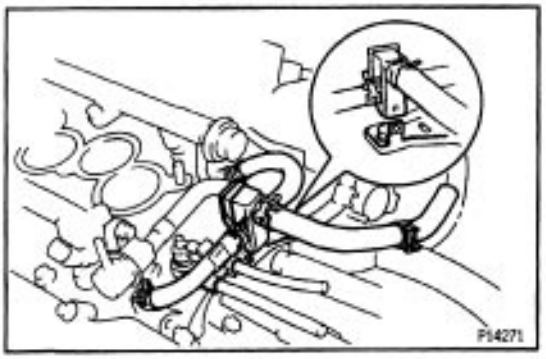
(i) Remove the nut and disconnect the PS pressure tube.
(j) Remove the bolt holding the No.1 engine hanger to the air intake chamber.
(k) Remove the bolt, and disconnect the ground strap.



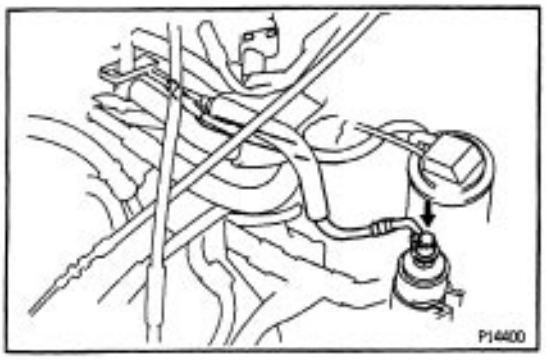
Using a 8 mm hexagon wrench, remove the 2 bolts, 2 nuts, air intake chamber assembly and gasket.



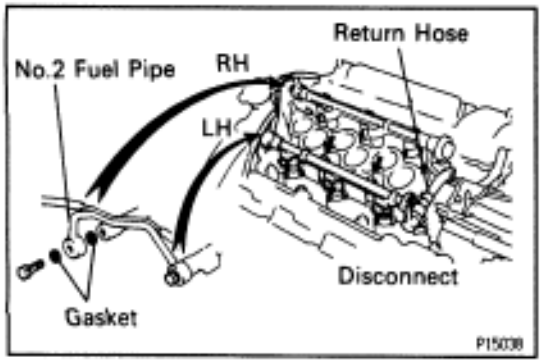
11. DISCONNECT INJECTOR CONNECTORS



12. REMOVE AIR ASSIST HOSES AND PIPE
(a) Disconnect the air assit pipe from the bracket on the No.1 fuel pipe.
(b) Remove the air assist hoses from the intake manifold.



13. DISCONNECT FUEL INLET AND RETURN HOSES
(a) Disconnect the fuel return hose from the No.1 fuel pipe.
(b) Disconnect the fuel inlet hose from the fuel filter.
CAUTION: Catch leaking fuel in a container.



14. REMOVE DELIVERY PIPES AND INJECTORS

NOTICE: Be careful not to drop the injectors when removing the delivery pipes.

(a) Loosen the 2 union bolts holding the No.2 fuel pipe to the delivery pipes.

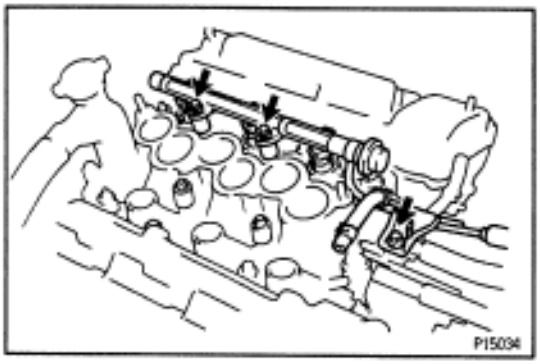
(b) Disconnect the fuel return hose from the fuel pressure regulator.

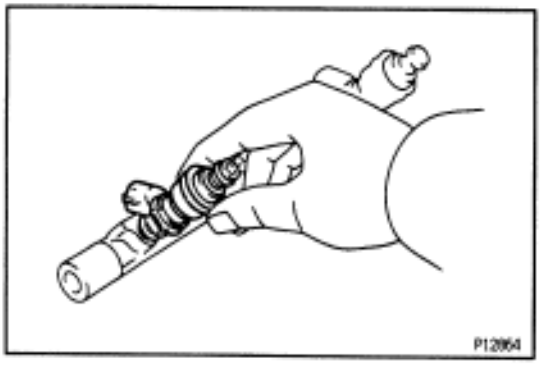
(c) Remove the union bolt for the RH delivery pipe, 2 gaskets, 2 bolts, LH delivery pipe together with the 3 injectors and No.2 fuel pipe.

(d) Remove the union bolt for the LH delivery pipe and 2 gaskets from the No.2 fuel pipe.

(e) Remove the 3 bolts, RH delivery pipe together with the 3 injectors and No.1 fuel pipe.

(f) Remove the 4 spacers from the intake manifold.





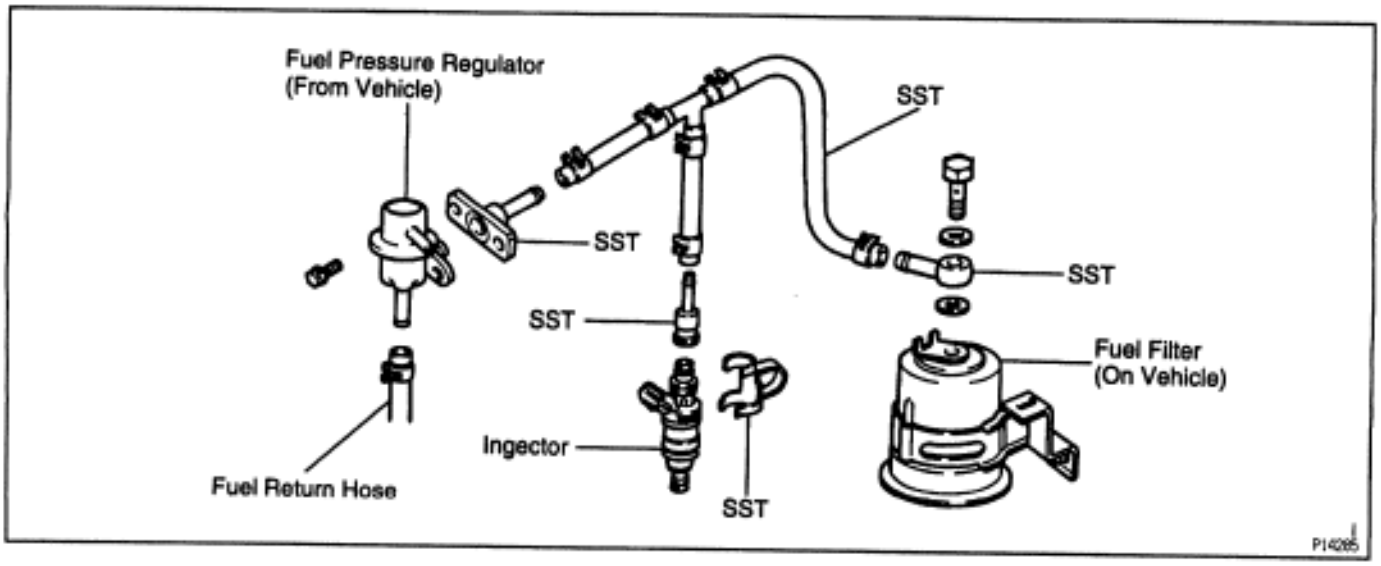
(g) Pull out the 6 injectors from the delivery pipes.

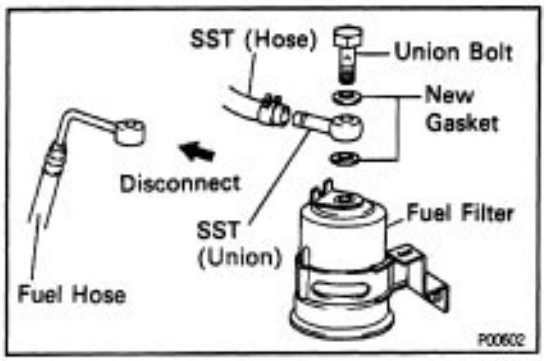
(h) Remove the 2 0 – rings and 2 grommets from each injector.

INJECTORS INSPECTION

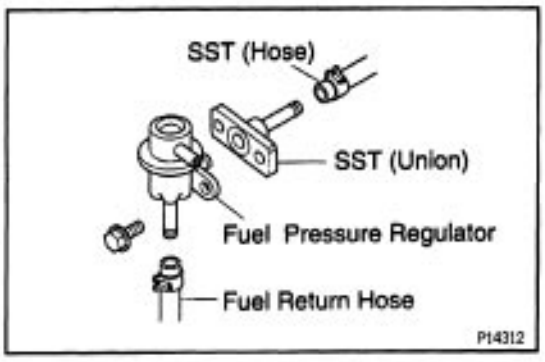
1. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.

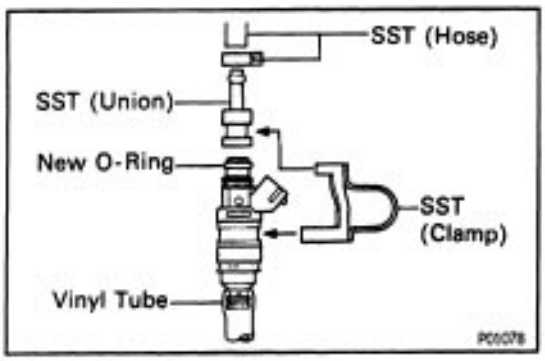




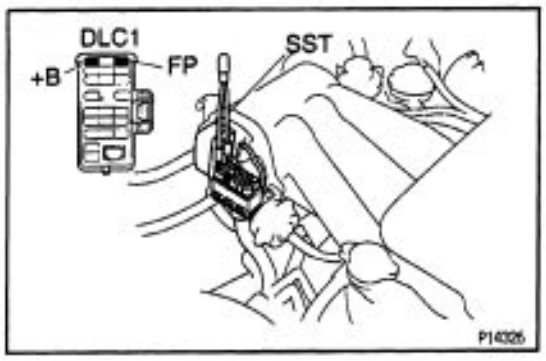
(a) Disconnect the fuel hose from the fuel filter outlet.
(b) Connect SST (union an hose) to the fuel filter outlet with 2 new gaskets and the union bolt.
SST 09268–41045 (90405–09015)
HINT: Use the vehicle's fuel filter.



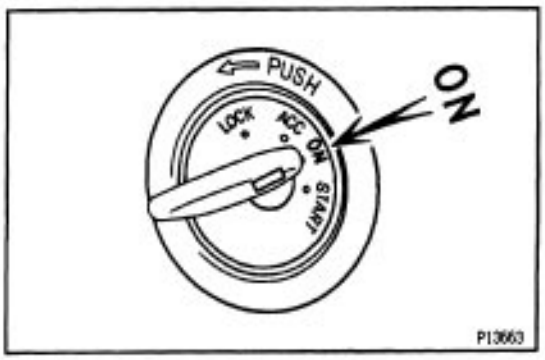
(c) Remove the fuel pressure regulator.
(d) Connect the fuel return hose, SST (hose) and SST (union) to the fuel pressure regulator.
SST 09268–41045 (09268–41090)



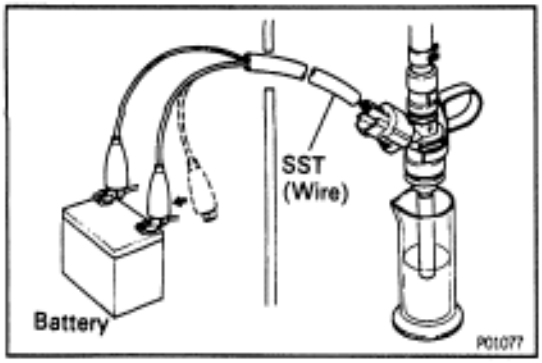
(e) Install a new O–ring to the injector.
(f) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045
(g) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



(h) Using SST, connect terminals +B and FP of the DLC1.
SST 00843–18020
(i) Reconnect the negative (–) terminal cable to the battery.

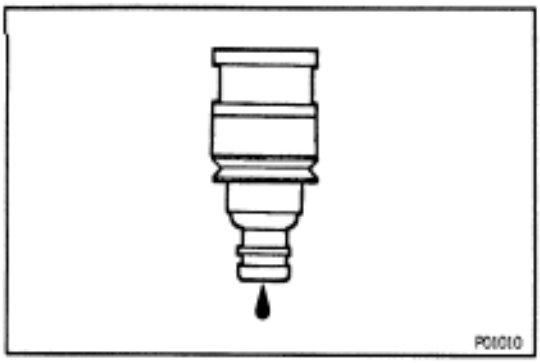


(j) Turn the ignition switch ON.
NOTICE: Do not start the engine.



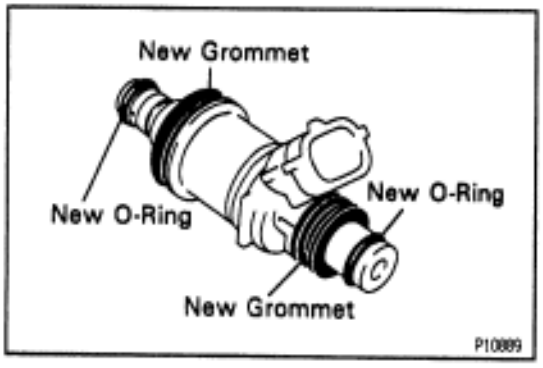
(k) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
54 – 64 cm^3 (3.3 – 3.9 cu in.) per 15 sec.
Difference between each injector:
5 cm^3 (0.3 cu in.) or less
If the ignition volume is not as specified, replace the injector.

2. INSPECT LEAKAGE



(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
1 drop or less per minute

(b) Disconnect the negative (–) terminal cable to the battery.
(c) Remove SST.
SST 09268–41045 and 09843–18020
(d) Reinstall the fuel pressure regulator to the delivery pipe. (See step 1 on pages EG2–241 and 242)
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

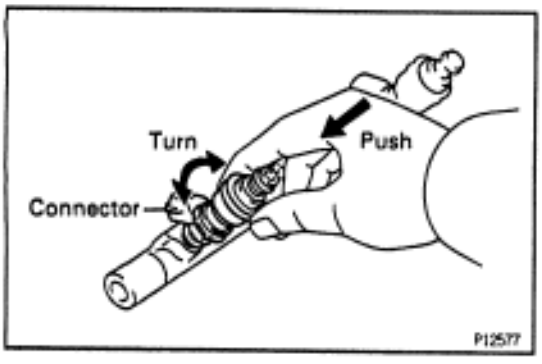


INJECTORS INSTALLATION

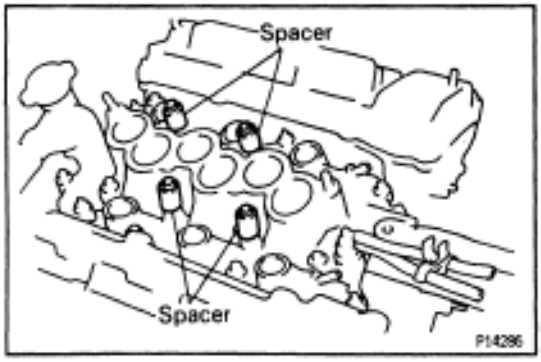
(See Components for Removal and Installation)

1. INSTALL INJECTORS AND DELIVERY PIPES

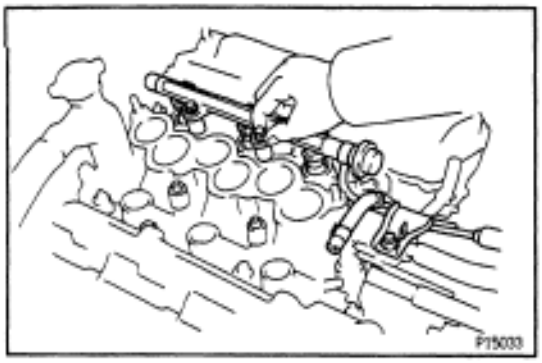
(a) Install 2 new grommets to each injector.
(b) Apply a light coat of spindle oil or gasoline to 2 new 0 –rings and install them to each injector.



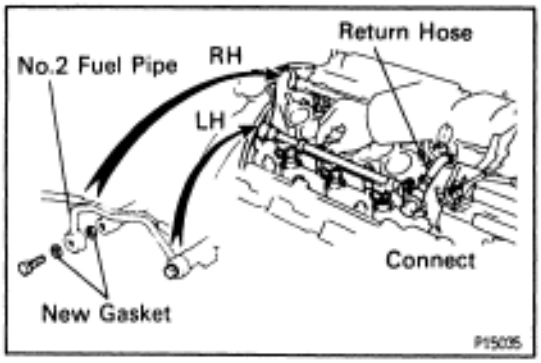
(c) While turning the injector clockwise and counter–clockwise, push it to the delivery pipes. Install the 6 injectors.
(d) Position the injector connector outward.



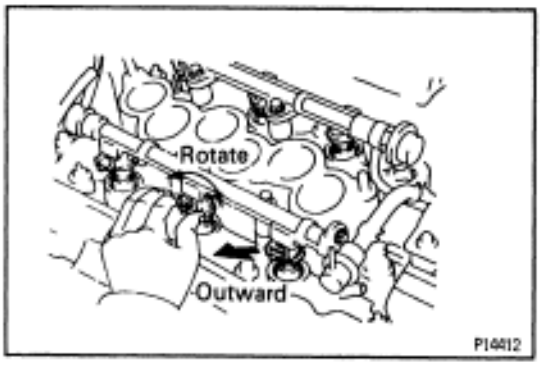
(e) Place the 4 spacers in position on the intake manifold.



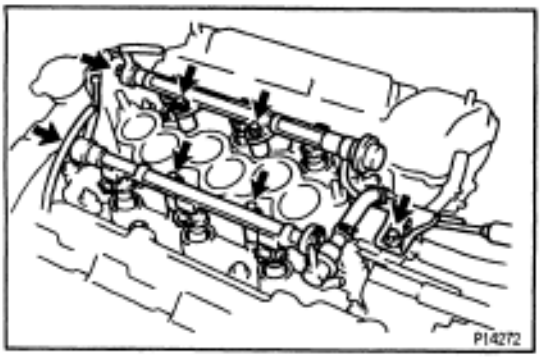
(f) Place the RH delivery pipe and No.1 fuel pipe together with the 3 injectors in position on the intake manifold.
(g) Temporarily install the 2 bolts holding the RH delivery pipe to the intake manifold.
(h) Temporarily install the bolt holding the No.1 fuel pipe to the intake manifold.



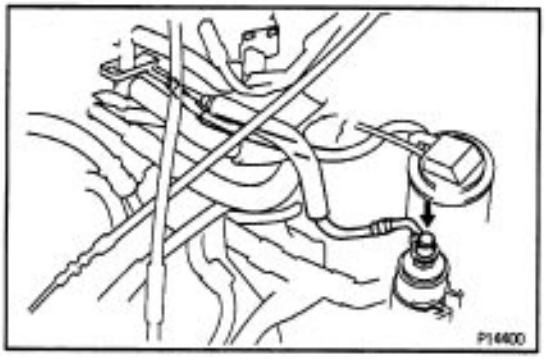
(i) Place the LH delivery pipe and No.2 fuel pipe together with the 3 injectors in position on the intake manifold.
(j) Connect the fuel return hose to the fuel pressure regulator.
(k) Temporarily install the 2 bolts holding the LH delivery pipe to the intake manifold.
(l) Temporarily install the No.2 fuel pipe to the LH deliv–ery pipe with the union bolt and 2 new gaskets.



(m) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of 0–rings. Replace the O – rings.
(n) Position the injector connector outward.



(o) Tighten the 4 bolts holding the delivery pipes to the intake manifold.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)
(p) Tighten the bolt holding the No.1 fuel pipe to the intake manifold.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)
(q) Tighten the 2 union bolts holding the No.2 fuel pipe to the delivery pipes.
Torque: 32.5 N–m (330 kgf–cm, 24 ft–lbf)



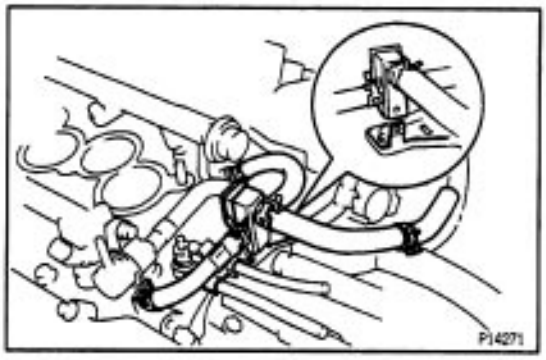
2. CONNECT FUEL INLET AND RETURN HOSES

(a) Connect the fuel inlet hose to the fuel filter with the 2 new gaskets and union bolt.

Torque: 30 N–m (300 kgf–cm, 22 ft–lbf)

(b) Connect the fuel return hose to the No.1 fuel pipe.

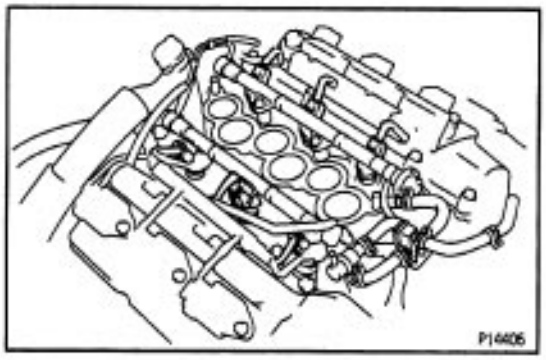
HINT: Pass the fuel return hose under the heater hoses.



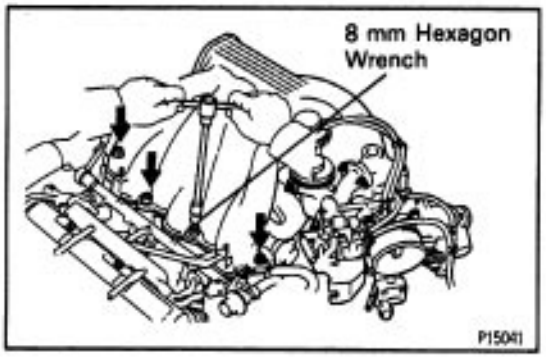
3. INSTALL AIR ASSIST HOSES AND PIPE

(a) Connect the air assist hoses to the intake manifold.

(b) Install the air assist pipe to the bracket on the No.1 fuel pipe.



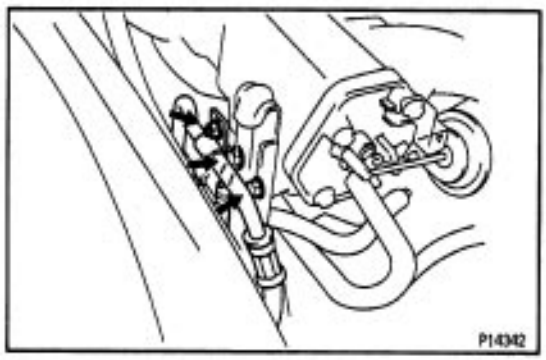
4. CONNECT INJECTOR CONNECTORS



5. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(a) Using a 8 mm hexagon wrench, install a new gasket and the air intake chamber assembly with the 2 bolts and 2 nuts.

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

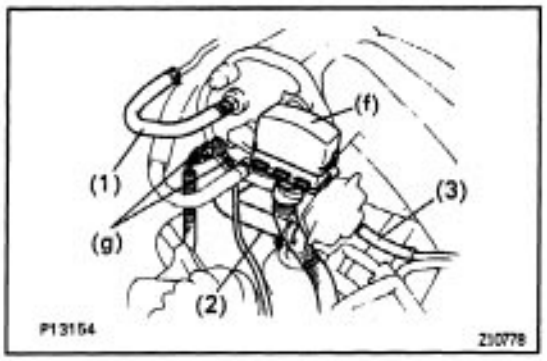


(b) Connect the ground strap with the bolt.

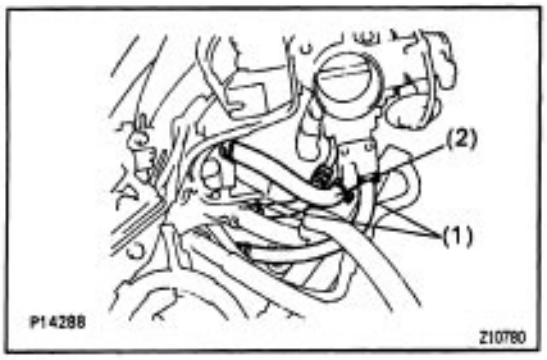
(c) Install the bolt holding the No.1 engine hanger to the air intake chamber.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

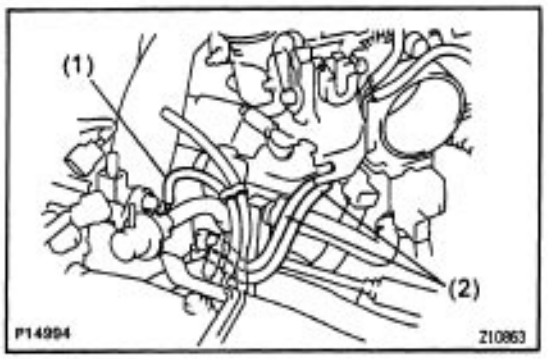
(d) Connect the PS pressure tube with the nut.



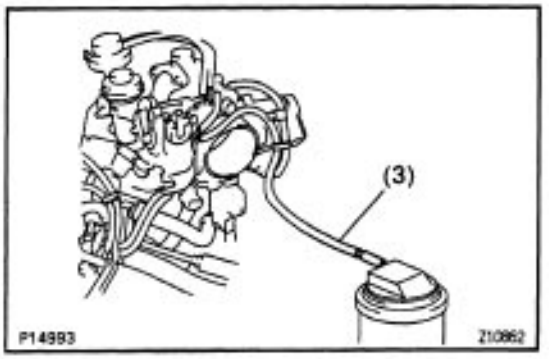
(e) Connect the following hoses:
(1) Brake booster vacuum hose
(2) PCV hose
(3) Actuator vacuum hose
(f) Connect the DLC1.
(g) Connect the 2 ground straps with the nut.
Torque: 14.5 N–m (145 kgf–cm. 10 ft–lbf)



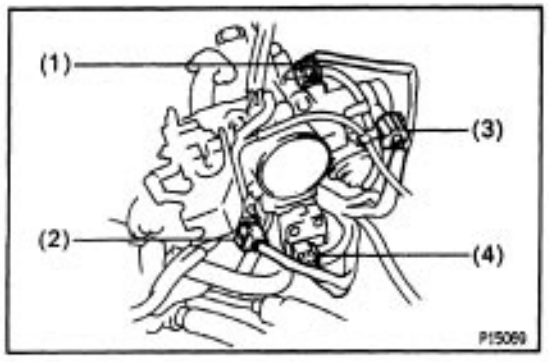
(h) Connect the following hoses:
(1) 2 water bypass hoses to throttle body
(2) Air assist hose to throttle body



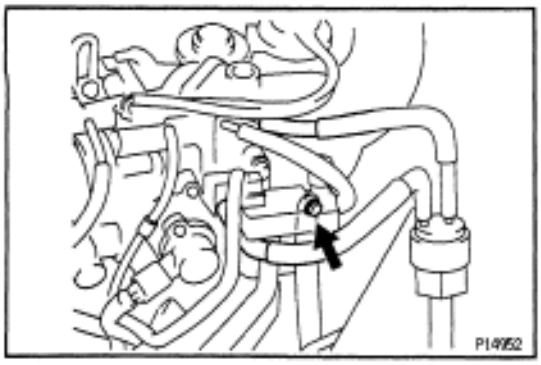
(i) Connect the following vacuum hoses:
(1) Vacuum hose to air intake chamber
(2) 2 vacuum hoses to throttle body



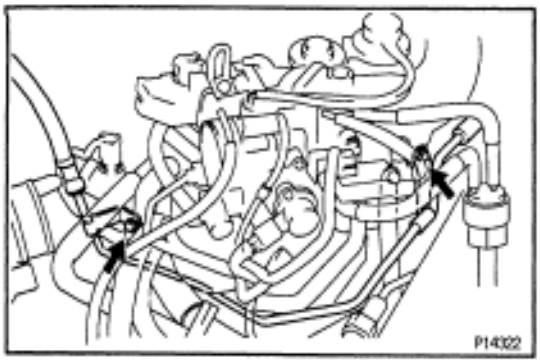
(3) Vacuum hose to charcoal canister



(j) Connect the following connectors:
(1) A/C idle–up valve connector
(2) EGR gas temperature sensor connector
(3) Throttle position sensor connector
(4) IAC valve connector

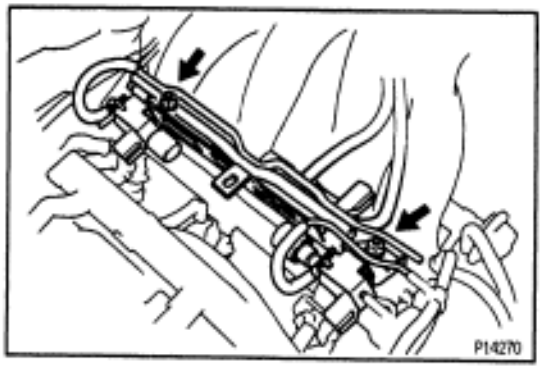


(k) Install the bolt holding the air intake chamber stay to the air intake chamber.
Torque: 19.5 N–m (200 kgf–cm. 14 ft–lbf)
(1) Connect the 2 PS air hoses.

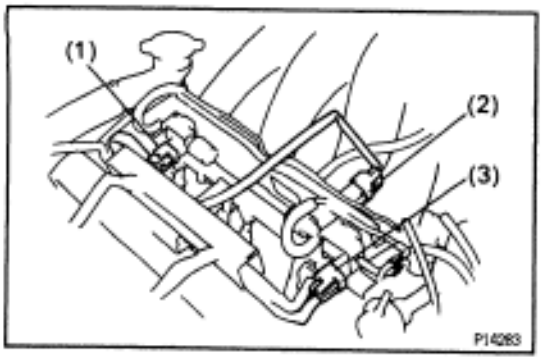


6. CONNECT HYDRAULIC MOTOR PRESSURE PIPE
Connect the pressure pipe to the air intake chamber and water inlet with the 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

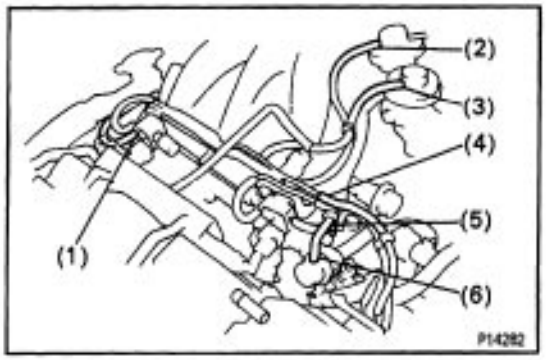
7. INSTALL NO.2 EGR PIPE
Install 2 new gaskets and the EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



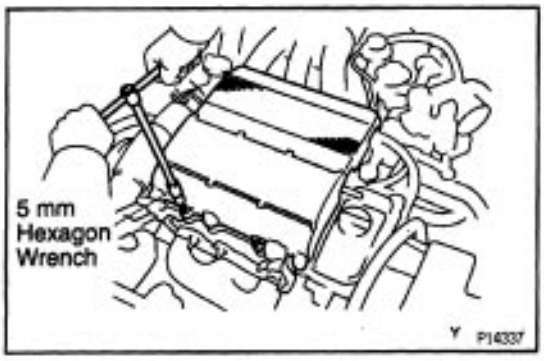
8. INSTALL EMISSION CONTROL VALVE SET
(a) Install the emission control valve set with 2 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



(b) Connect the following connectors:
(1) VSV connector for ACIS
(2) VSV connector for EGR
(3) VSV connector for fuel pressure control



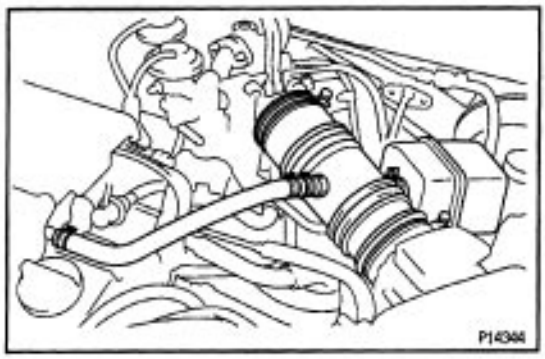
(c) Connect the following vacuum hoses:
(1) Vacuum hose to VSV for ACIS
(2) Vacuum hose to EGR vacuum modulator
(3) Vacuum hose to EGR valve
(4) Vacuum hose (from cylinder head rear plate)
(5) Vacuum hose from air intake chamber
(6) Vacuum hose to fuel pressure regulator



9. INSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V– bank cover with the 2 cap nuts.

HINT: For fixing the V – bank cover, push on the cover until sense of ”click” is felt.



10. INSTALL AIR CLEANER HOSE

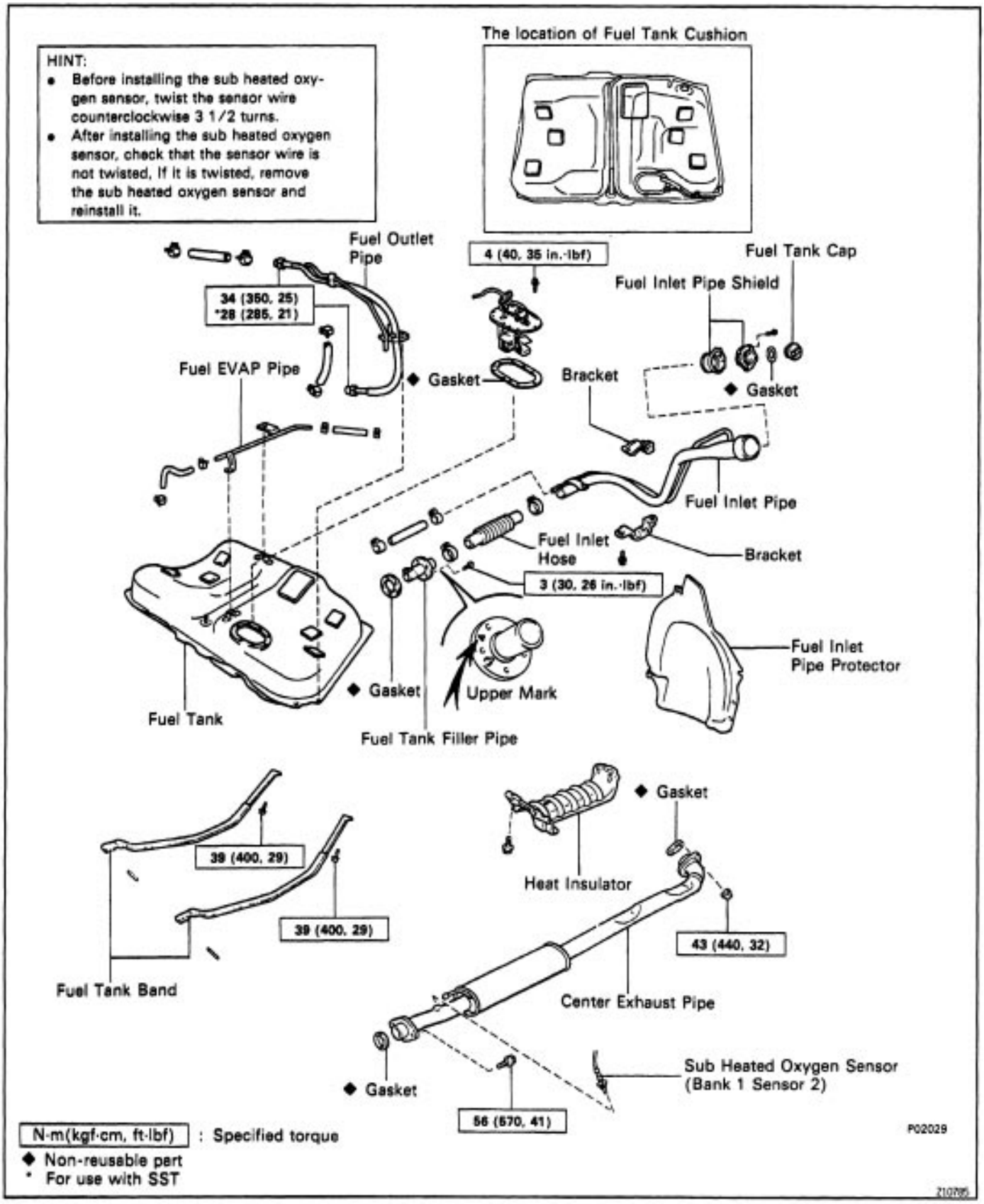
(a) Connect the air cleaner hose with the 2 hose clamps.
(b) Connect the PCV hose.

11. CONNECT THROTTLE CABLE
12. CONNECT ACCELERATOR CABLE

13. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts. 7.7 Imp. qts)
14. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

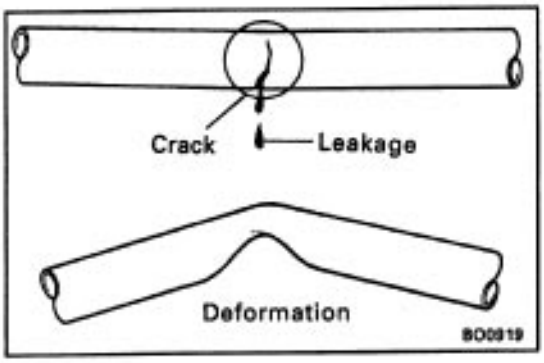
FUEL TANK AND LINE

COMPONENTS



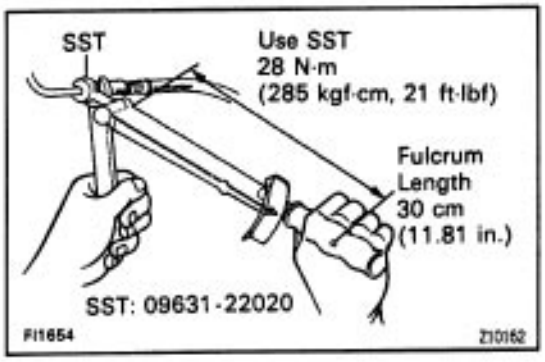
PRECAUTIONS

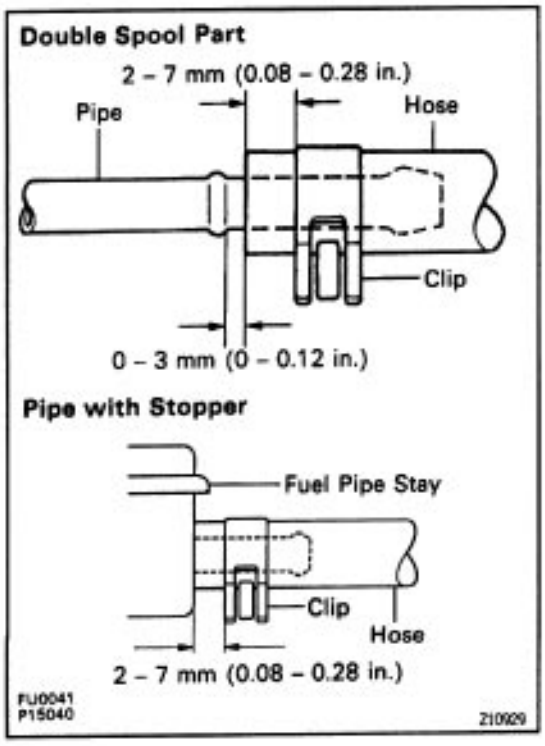
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.



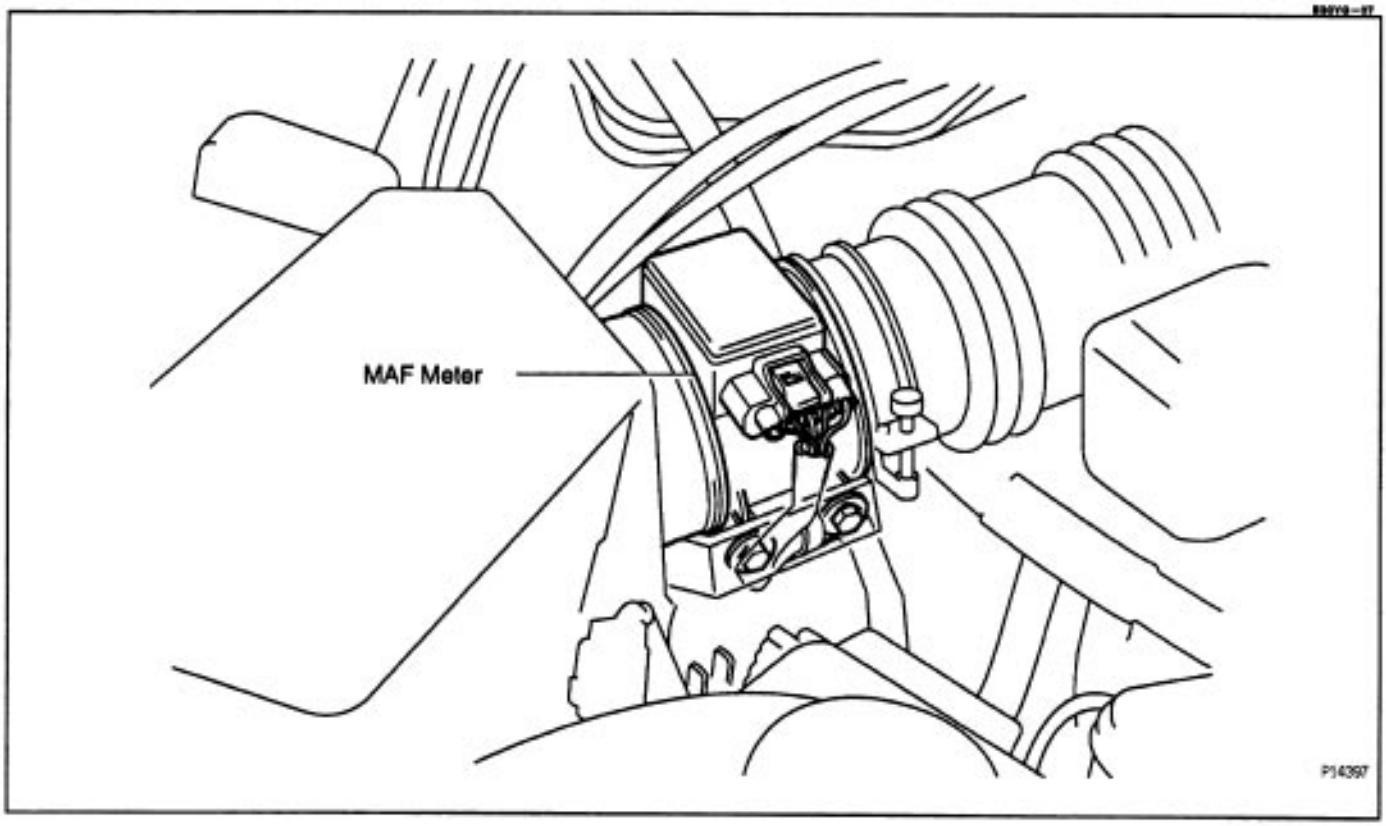
FUEL LINES AND CONNECTIONS INSPECTION

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
(c) Check the fuel tank for deformation, cracks, fuel leak–age or tank band looseness.
(d) Check the filler neck for damage or fuel leakage.
(e) Hose and pipe connections are as shown in the illus–tration.
If a problem is found, repair or replace the parts as necessary.

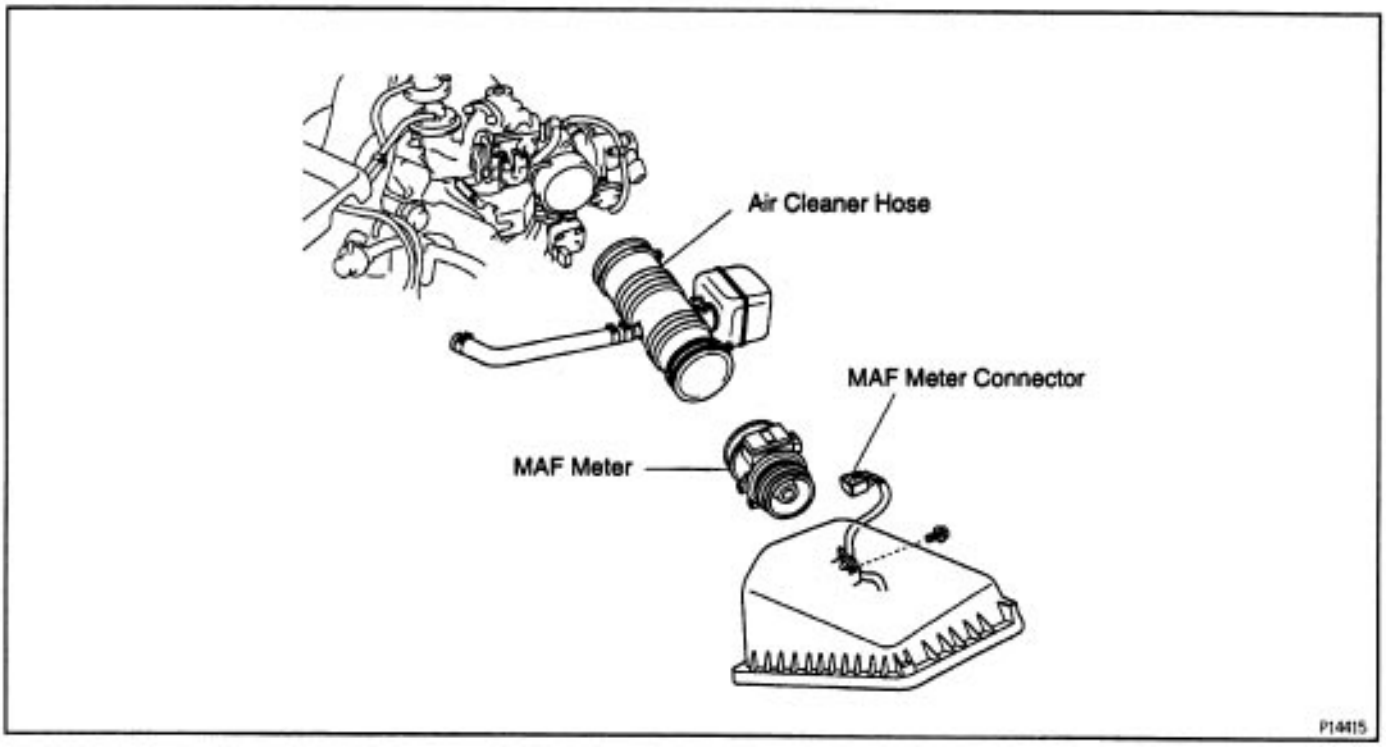


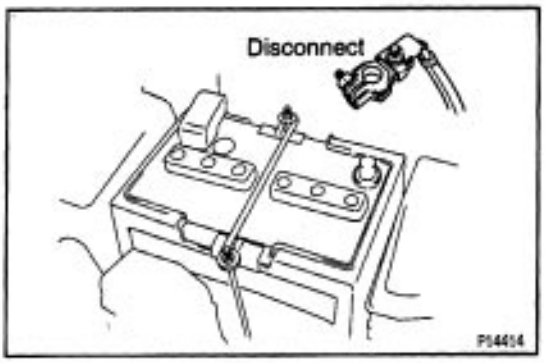


MASS AIR FLOW (MAF) METER



COMPONENTS FOR REMOVAL AND INSTALLATION



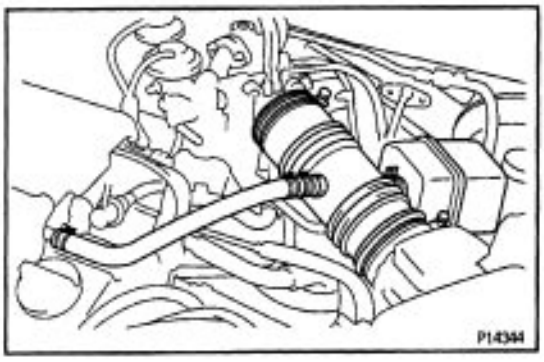


MAF METER REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

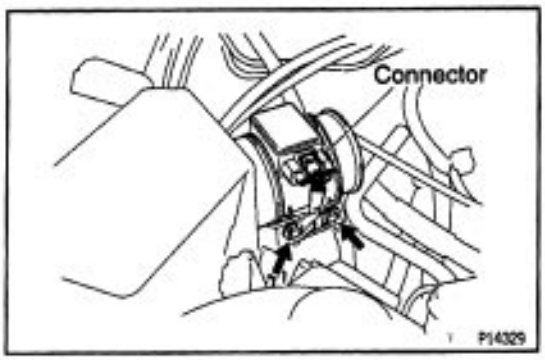
CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery.



2. REMOVE AIR CLEANER NOSE

(a) Disconnect the PCV hose.

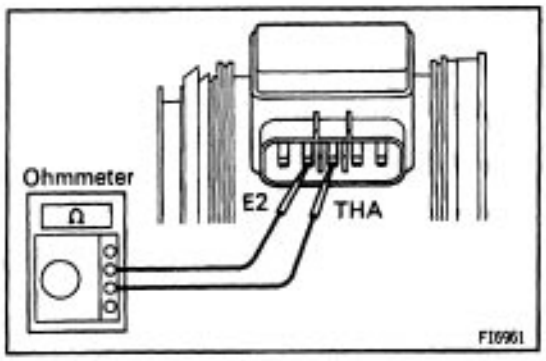
(b) Loosen the 2 hose clamps, and remove the air cleaner hose.



3. REMOVE MAP METER

(a) Disconnect the MAF meter connector.

(b) Remove the 2 bolts and MAF meter.



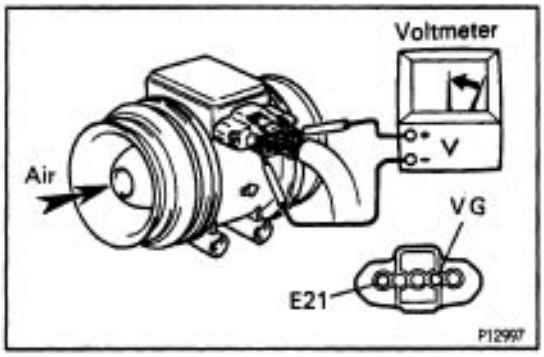
MAF METER INSPECTION

1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Between terminals	Resistance	Temperature
THA – E2	10–20kΩ	– 20° C (–4° F)
THA – E2	4 –7kΩ	0°C (32° F)
THA – E2	2 –3kΩ	20°C (68°F)
THA – E2	0.9 – 1.3 kΩ	40° C (104° F)
THA = E2	0.4 – 0.7 kΩ	60° C (140° F)

If the resistance is not as specified, replace the MAF meter.



2. INSPECT MAF METER OPERATION

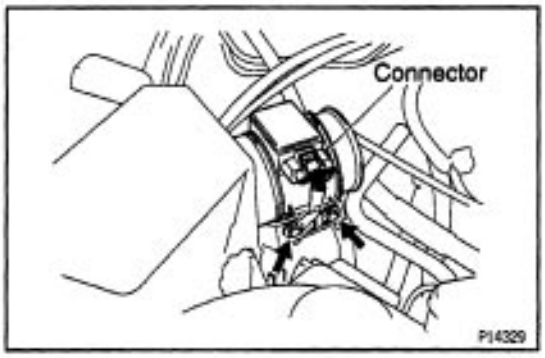
(a) Connect the MAF meter connector.

(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E21.

(c) Blow air into the MAF meter, and check that the voltage fluctuates.

If operation is not as specified, replace the MAF meter.

(d) Disconnect the MAF meter connector.



MAF METER INSTALLATION

(See Components for Removal and Installation)

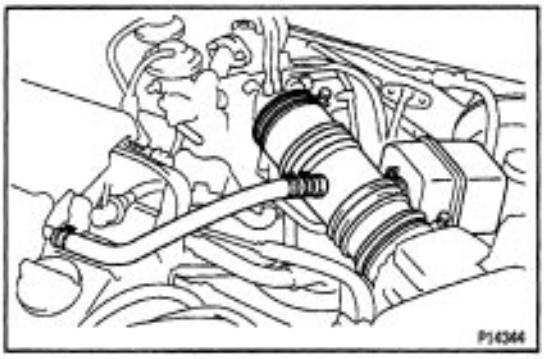
1. INSTALL MAF METER

(a) Insert the MAF meter end into the air cleaner case.

(b) Install the MAF meter with the 2 bolts.

Torque: 6.9 N–m (70 kgf–cm, 61 in.–lbf)

(c) Connect the MAF meter connector.



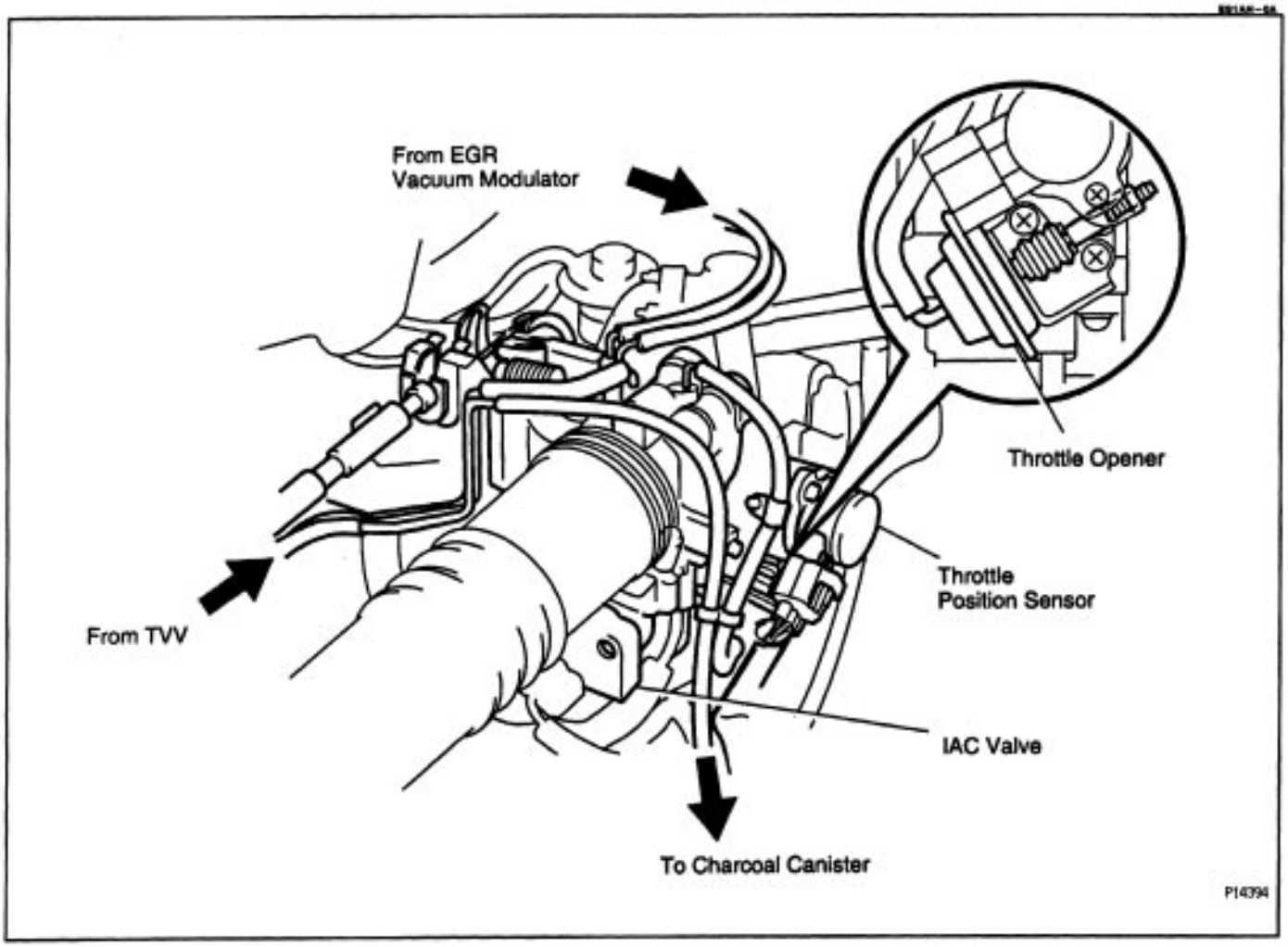
2. INSTALL AIR CLEANER HOSE

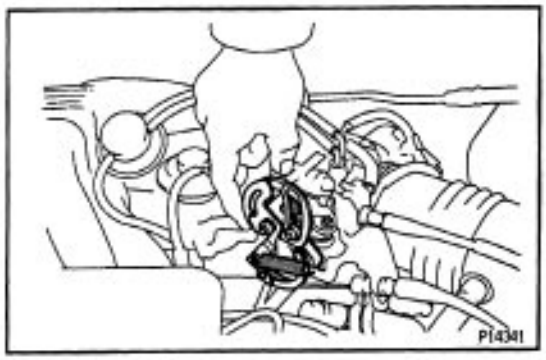
(a) Install the air cleaner hose with the 2 hose clamps.

(b) Connect the PCV hose.

3. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

THROTTLE BODY

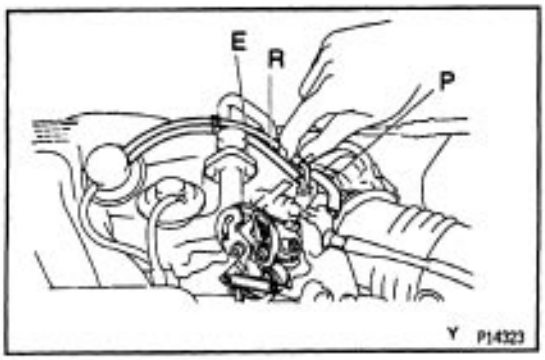




ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

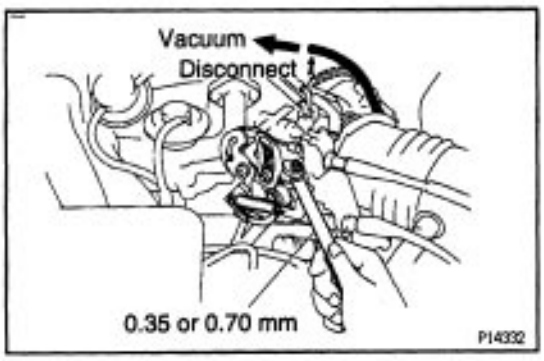
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port name	At idle	3,000 rpm or more
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum

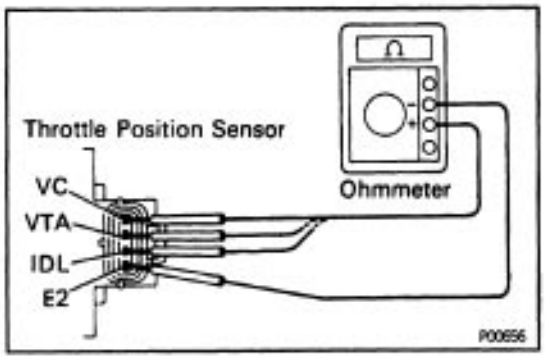


2. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

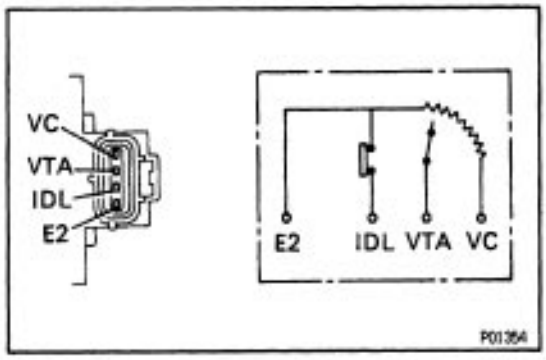
(b) Disconnect the sensor connector.

(c) Insert a thickness gauge between the throttle stop screw and stop lever.

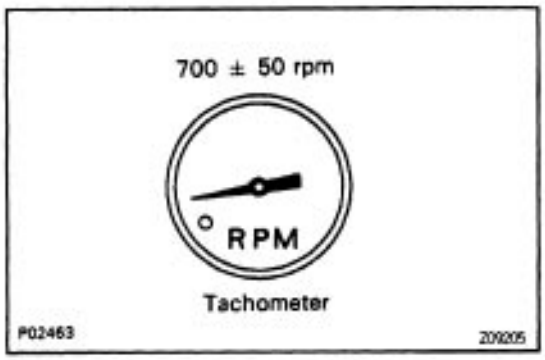


(d) Using an ohmmeter, measure the resistance between each terminal.

Clearance between fever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.28 – 6.4 kΩ
0.35 mm (0.014 in.)	IDL – E2	0.5 kΩ or less
0.70 mm (0.028 in.)	IDL– E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 11.6 kΩ
–	VC –E2	2.7 – 7.7 kΩ



(e) Reconnect the sensor connector.



3. INSPECT THROTTLE OPENER

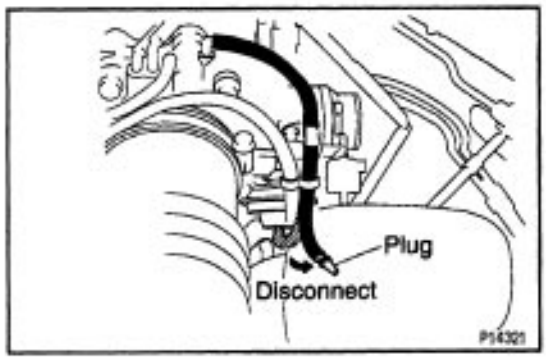
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

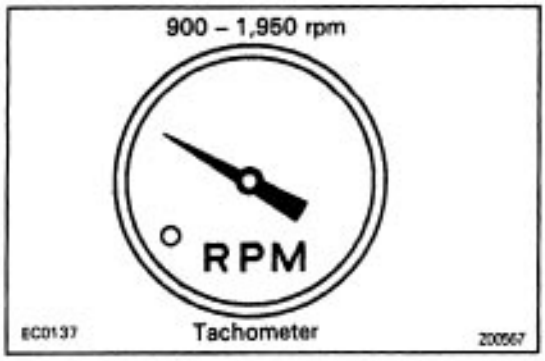
Idle speed:

700 ± 50 rpm



C. Check throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.



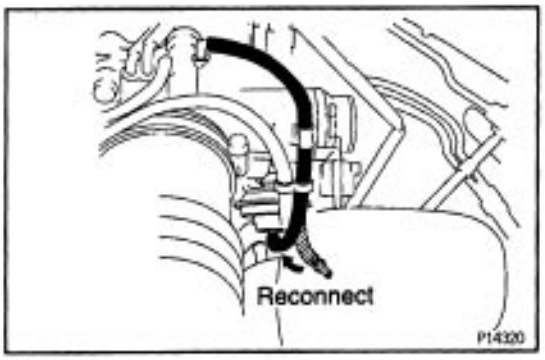
(b) Check the throttle opener setting speed.

Throttle opener setting speed:

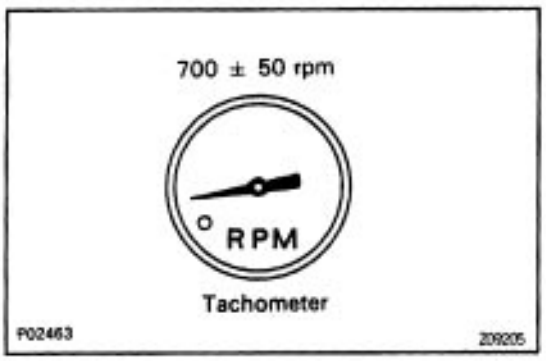
900–1,950 rpm

If the throttle opener setting is not as specified, replace the throttle body.

(c) Stop the engine.

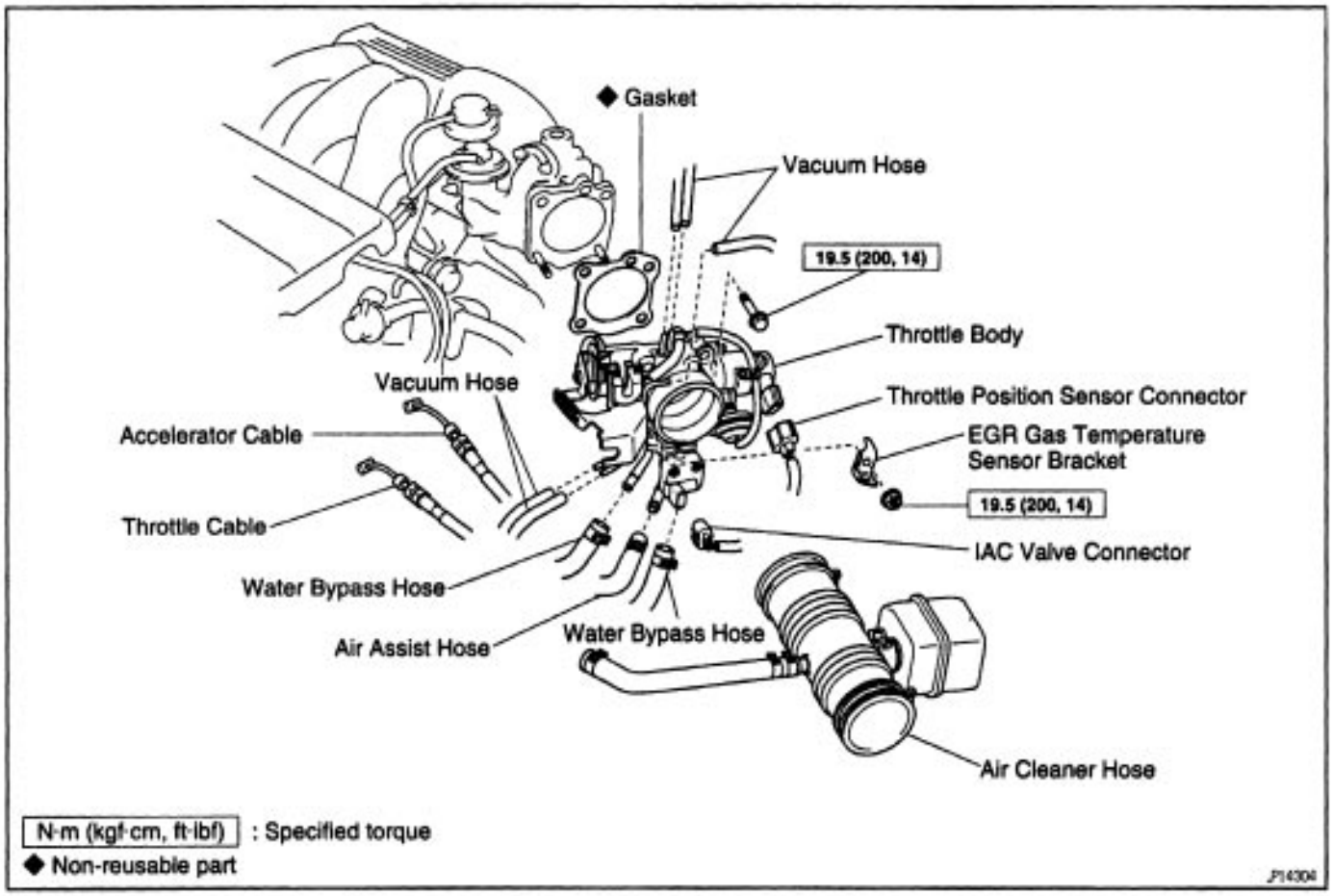


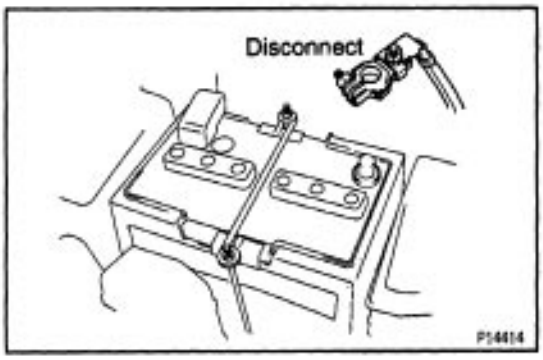
(d) Reconnect the vacuum hose to the throttle opener.



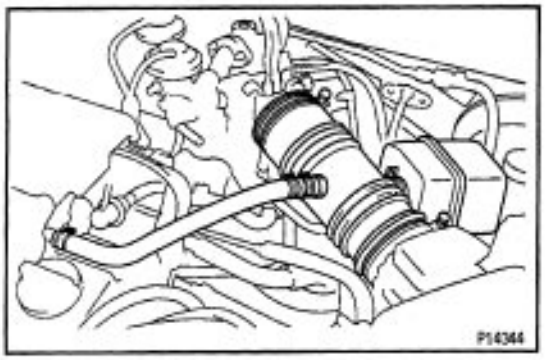
(e) Start the engine and check that the idle speed returns to the correct speed.

COMPONENTS FOR REMOVAL AND INSTALLATION





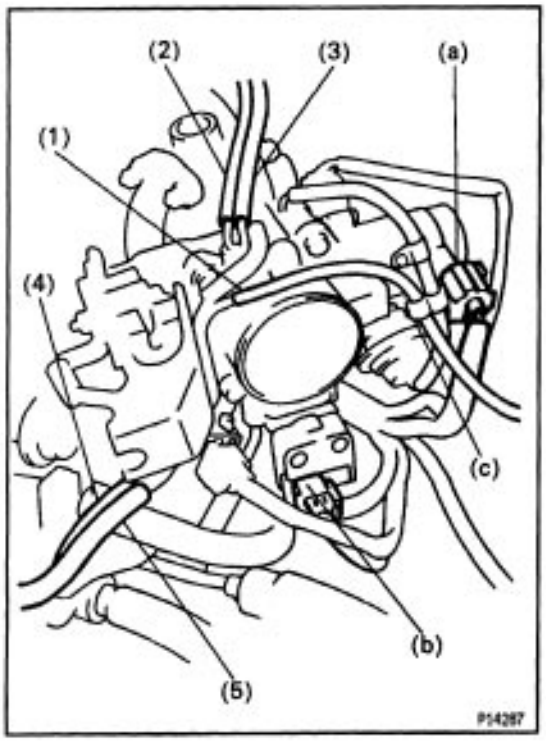
THROTTLE BODY REMOVAL
(See Components for Removal and Installation)
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.
2. DRAIN ENGINE COOLANT
3. DISCONNECT ACCELERATOR CABLE
4. DISCONNECT THROTTLE CABLE



5. REMOVE AIR CLEANER HOSE

(a) Disconnect the PCV hose.

(b) Loosen the 2 hose clamps, and remove the air cleaner hose.



6. REMOVE THROTTLE BODY

(a) Disconnect the throttle position sensor connector.

(b) Disconnect the IAC valve connector.

(c) Remove the hose clamp.

(d) Disconnect the following vacuum hoses:

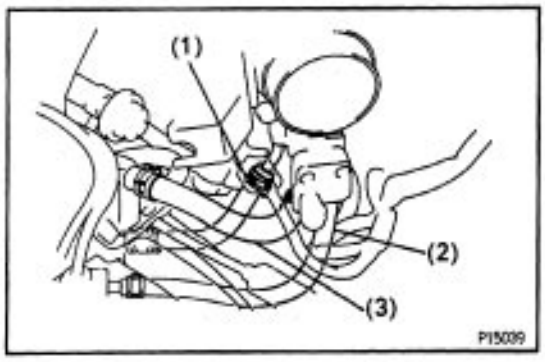
(1) Vacuum hose (from charcoal canister)

(2) Vacuum hose (from port R of EGR vacuum modulator)

(3) Vacuum hose (from port E of EGR vacuum modulator)

(4) Vacuum hose (from upper port of TVV)

(5) Vacuum hose (from lower port of TVV)

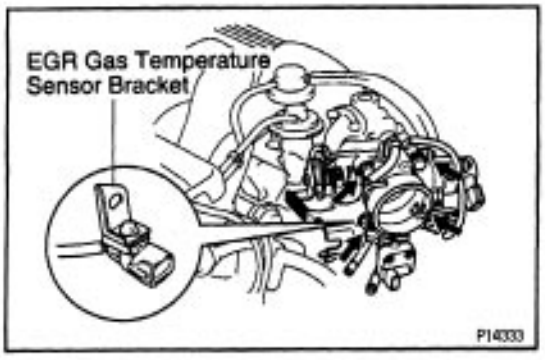


(e) Disconnect the following hoses:

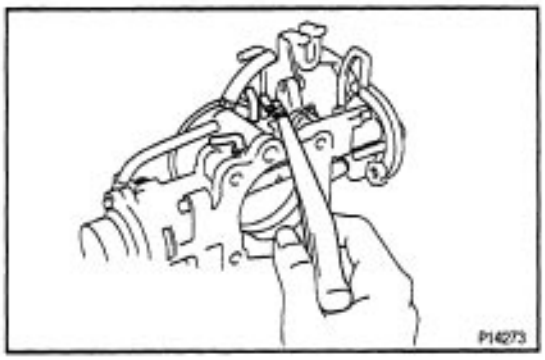
(1) Water bypass hose (from intake manifold)

(2) Water bypass hose (from water inlet housing)

(3) Air assist hose



(f) Remove the 2 bolts, 2 nuts, EGR gas temperature sensor bracket, throttle body and gasket.



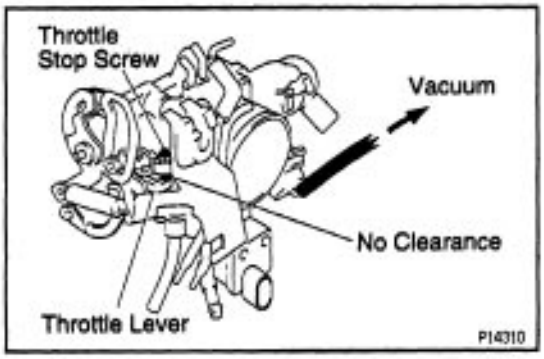
THROTTLE BODY INSPECTION

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

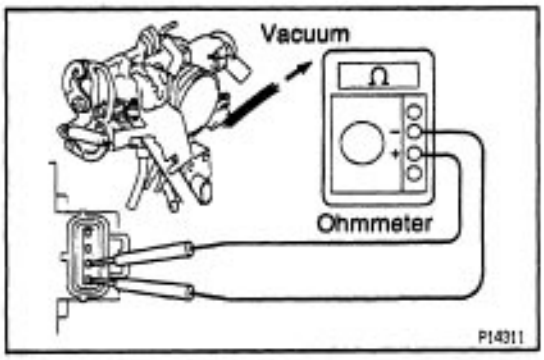
NOTICE: To prevent deterioration, do not clean the throt–tle position sensor.



2. INSPECT THROTTLE VALVE

(a) Apply vacuum to the throttle opener.

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



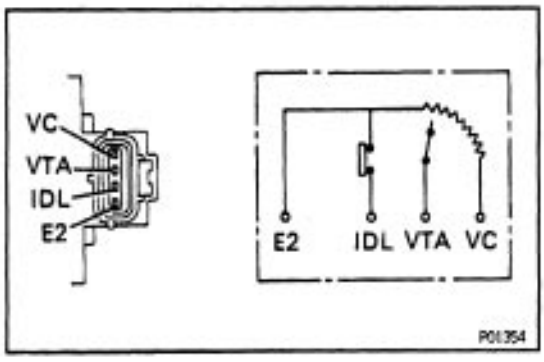
3. INSPECT THROTTLE POSITION SENSOR

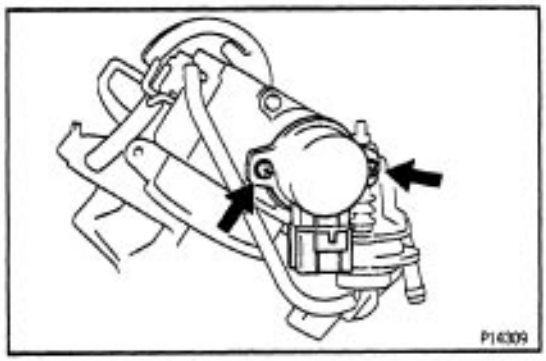
(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.

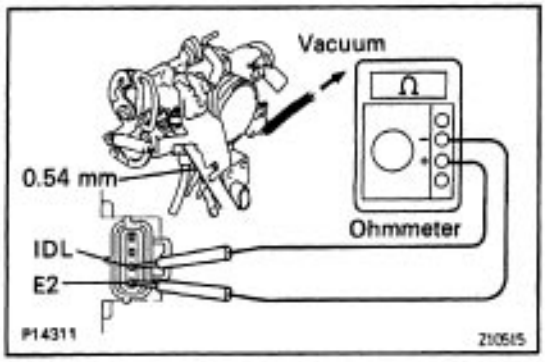
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA –.E2	0.28 – 6.4 kΩ
0.35 mm (0.014 in.)	IDL – E2	0.5 k(Ω or less
0.70 mm (0.028 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 11.6 k Ω
–	VC – E2	2.7 – 7.7 kΩ



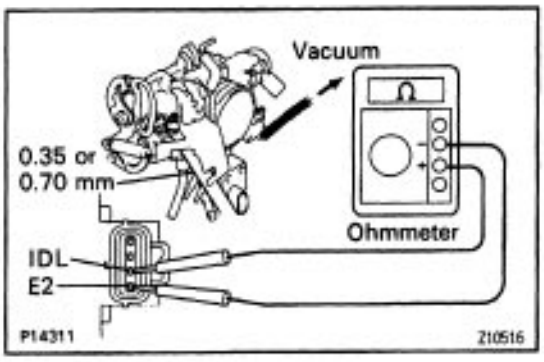


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the 2 set screws of the sensor.

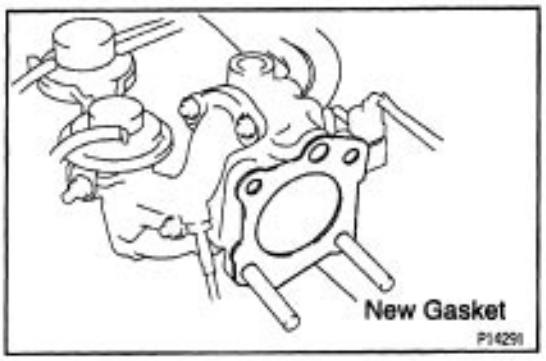


(b) Apply vacuum to the throttle opener.
(c) Insert a 0.54 mm (0.021 in.) thickness gauge, between the throttle stop screw and stop lever.
(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.

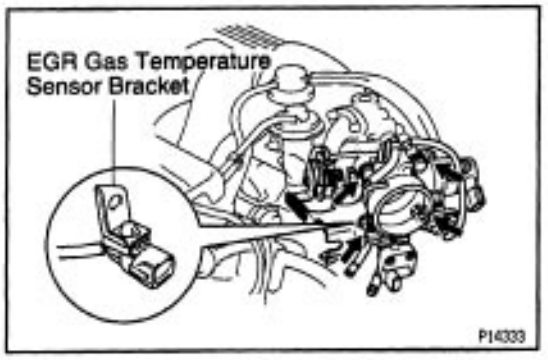


(f) Recheck the continuity between terminals IDL and E2.

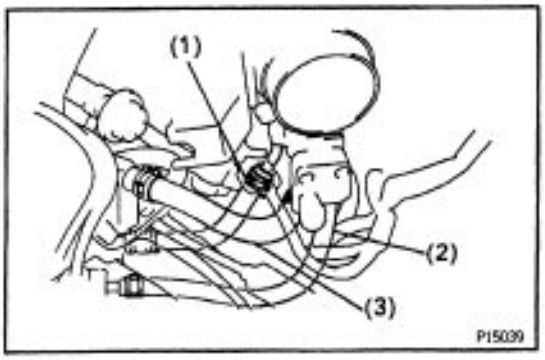
Clearance between lever and stop screw	Continuity (IDL – E2)
0.35 mm (0.014 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



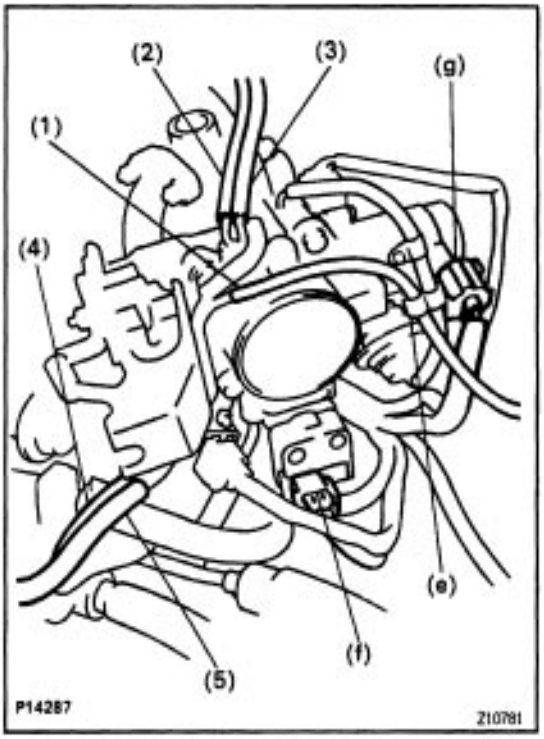
THROTTLE BODY INSTALLATION
(See Components for Removal and Installation)
1. INSTALL THROTTLE BODY
(a) Place a new gasket on the air intake chamber.



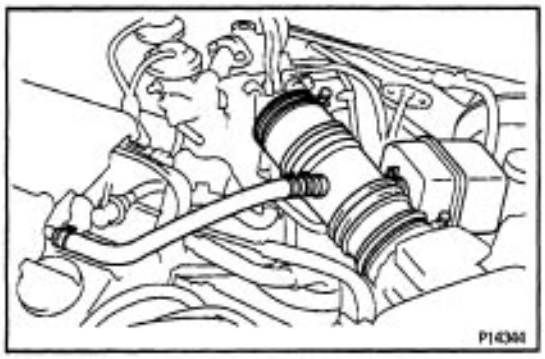
(b) Install the throttle body, EGR gas temperature sensor bracket with the 2 bolts and 2 nuts.
Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



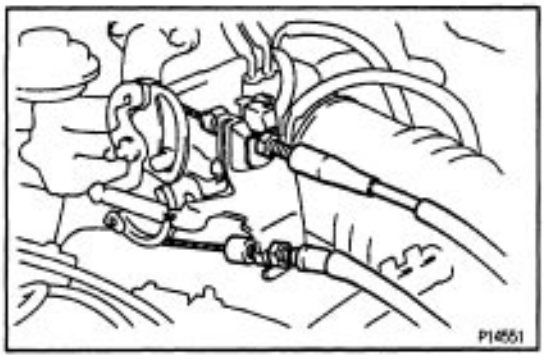
(c) Connect the following hoses:
(1) Water bypass hose (from intake manifold)
(2) Water bypass hose (from water inlet housing)
(3) Air assist hose



(d) Connect the following vacuum hoses:
(1) Vacuum hose (from charcoal canister)
(2) Vacuum hose (from port R of EGR vacuum modulator)
(3) Vacuum hose (from port R of EGR vacuum modulator)
(4) Vacuum hose (from upper port of TVV)
(5) Vacuum hose (from lower port of TVV)
(e) Install the hose clamp.
(f) Connect the IAC valve connector.
(g) Connect the throttle position sensor connector.



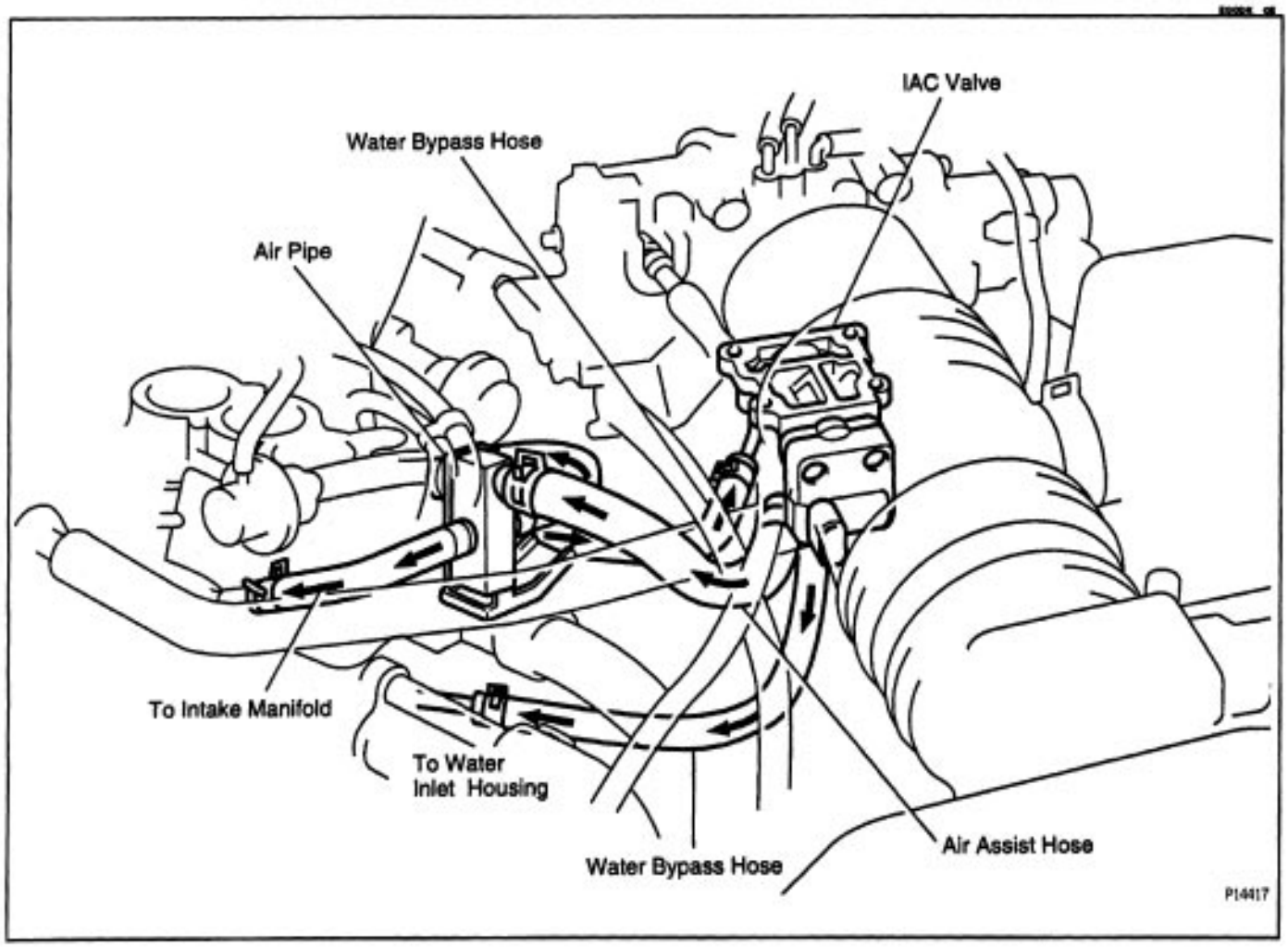
2. INSTALL AIR CLEANER HOSE
(a) install the air cleaner hose with the 2 hose clamps.
(b) Connect the PCV hose.



3. CONNECT THROTTLE CABLE
4. CONNECT ACCELERATOR CABLE

5. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp.qts)
6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

IDLE AIR CONTROL (IAC) VALVE

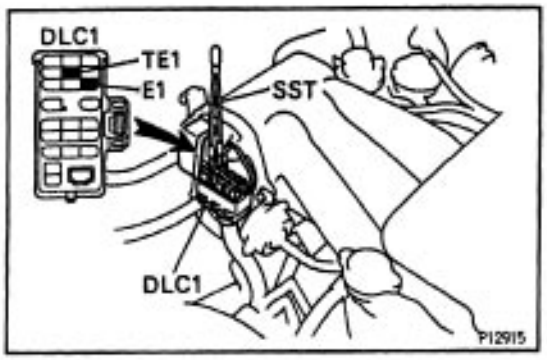


ON–VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:

- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position
- A/C switch OFF

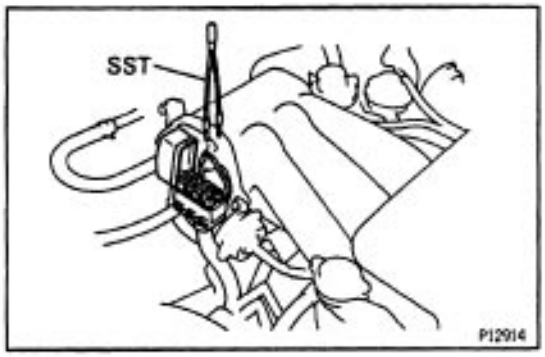


(b) Using SST, connect terminals TE1 and E1 of the DLC 1.

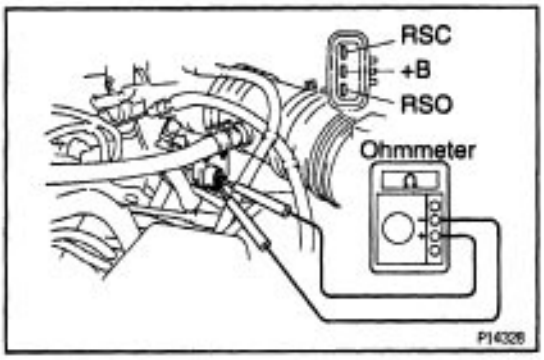
SST 09843–18020

(c) After engine speed are kept at approx. 1,000 rpm for 5 seconds, check that they return to idle speed.

If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.

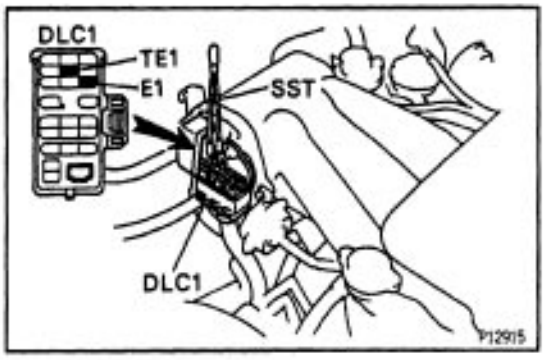


(d) Remove the SST from the DLC1.
SST 09843–18020

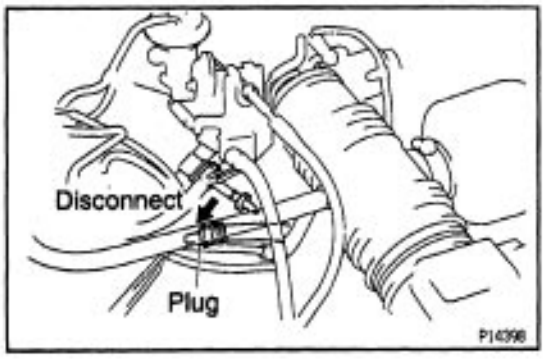


2. INSPECT IAC VALVE RESISTANCE
(a) Disconnect the IAC valve connector.
(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).
Resistance:
19.3 – 22.3Ω at 20˚C (68˚F)
If resistance is not as specified, replace the IAC valve.
(c) Reconnect the IAC valve connector.

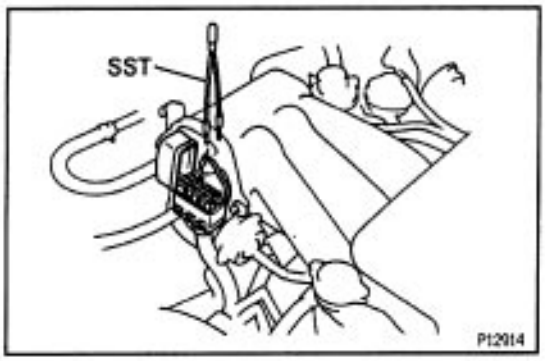
3. INSPECT AIR ASSIST SYSTEM
(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position
- A/C switch OFF



(b) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843–18020
(c) After engine speed are kept at 900 – 1,300 rpm for 10 seconds, check that they return to idle speed.

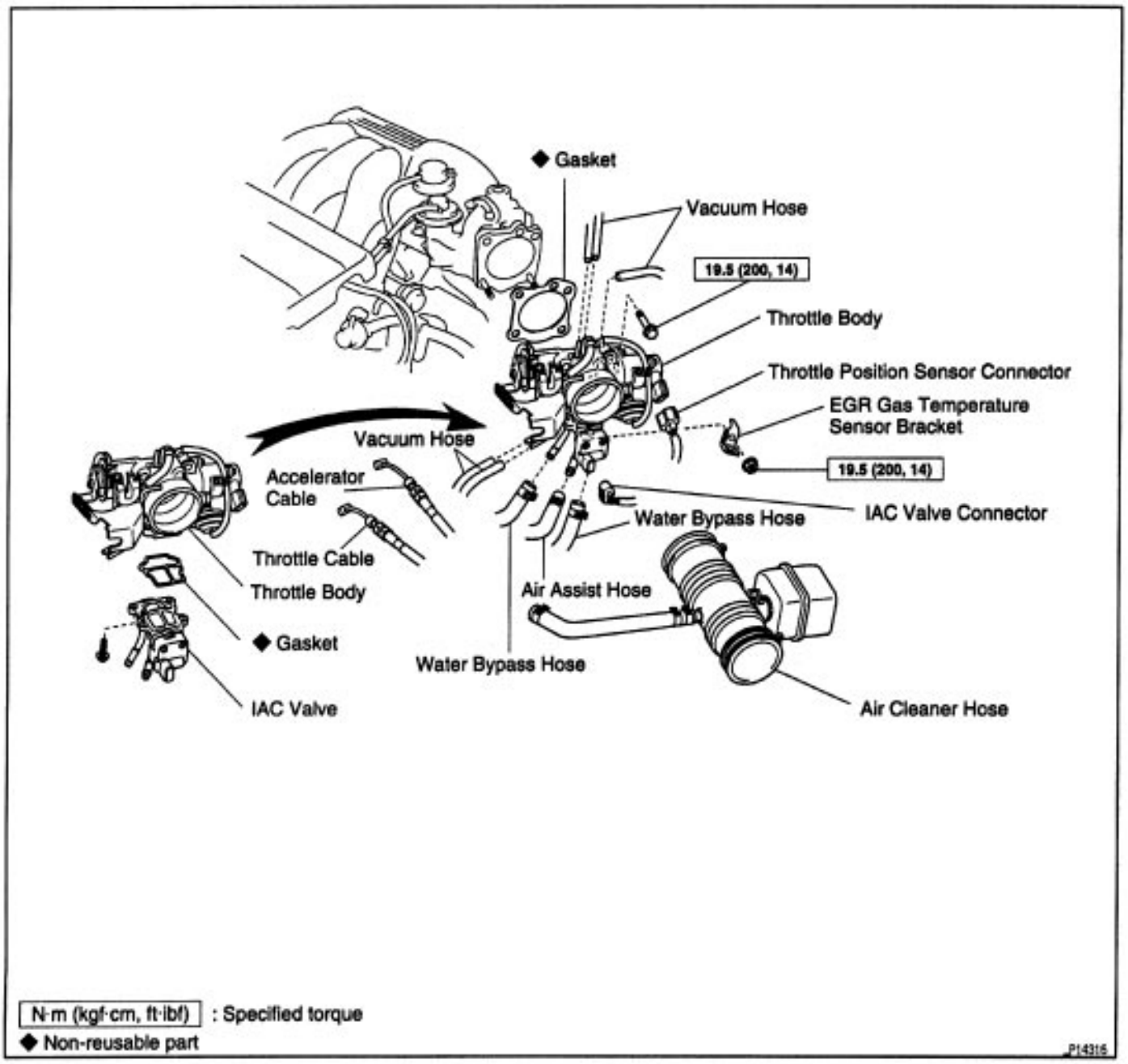


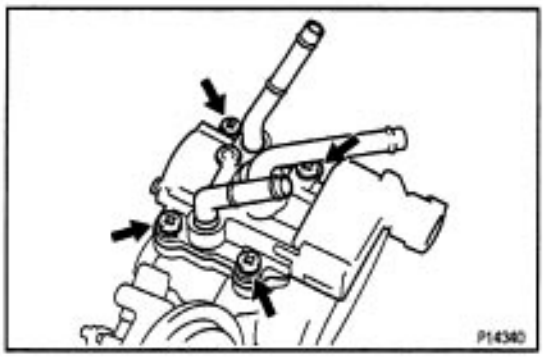
(d) Stop the engine.
(e) Disconnect the air assist hose from the air pipe, and block off the IAC valve exit and the entry to the pipe.
(f) Start the engine and check that the idle speed reaches 500 rpm or below (the engine may stall).
If the idle does not reach 500 rpm or below, check for a leak between the air pipe and injector.



(g) Remove the SST from the DLC 1.
SST 09843–18020
(h) Reconnect the air assist hose to the air pipe.

COMPONENTS FOR REMOVAL AND INSTALLATION





IAC VALVE REMOVAL

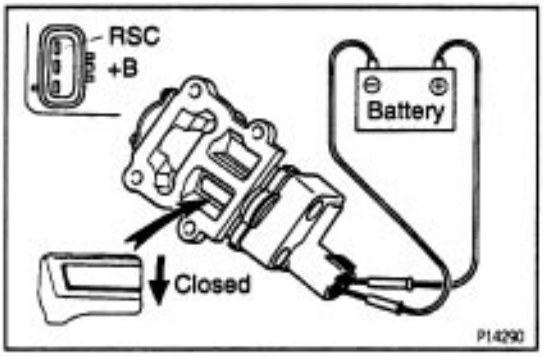
(See Components for Removal and Installation)

1. REMOVE THROTTLE BODY

(See page EG2–266**)**

2. REMOVE IAC VALVE

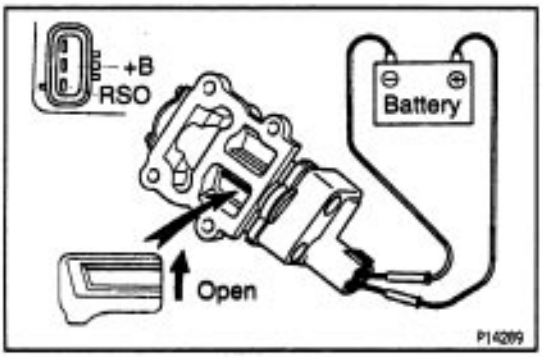
Remove the 4 screws, IAC valve and gasket.



IAC VALVE INSPECTION

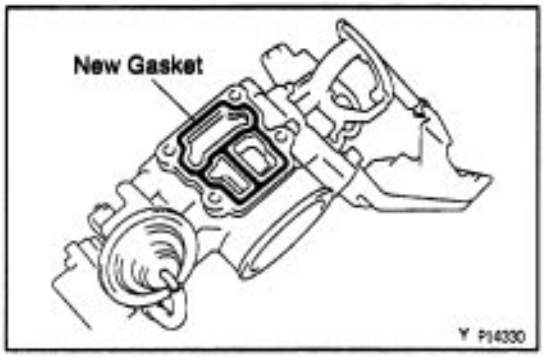
INSPECT IAC VALVE OPERATION

(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSO, and check that the valve is open.

If operation is not as specified, replace the IAC valve.

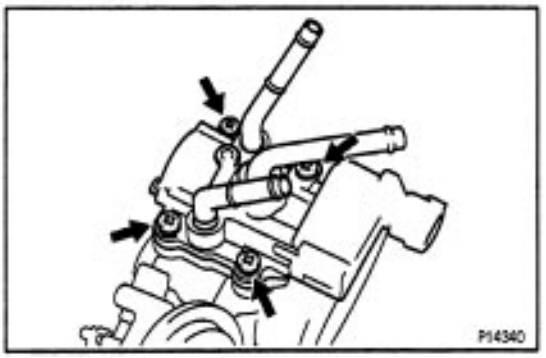


IAC VALVE INSTALLATION

(See Components for Removal and Installation)

1. INSTALL IAC VALVE

(a) Place a new gasket on the throttle body.

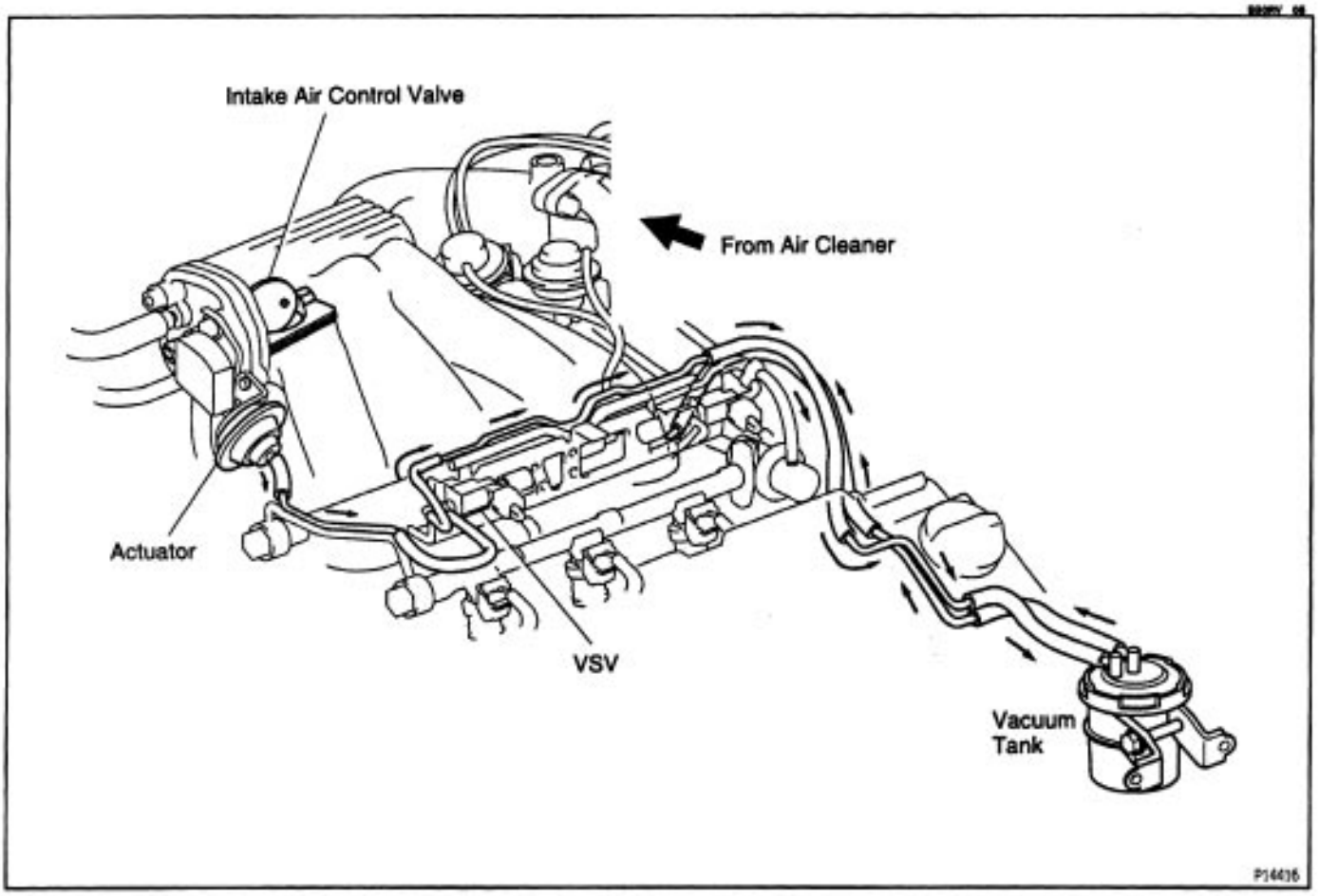


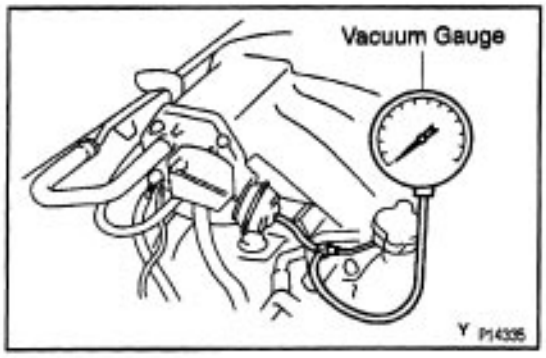
(b) Install the IAC valve with the 4 screws.

2. INSTALL THROTTLE BODY

(See page EG2–269**)**

ACOUSTIC CONTROL INDUCTION SYSTEM (ACIS)

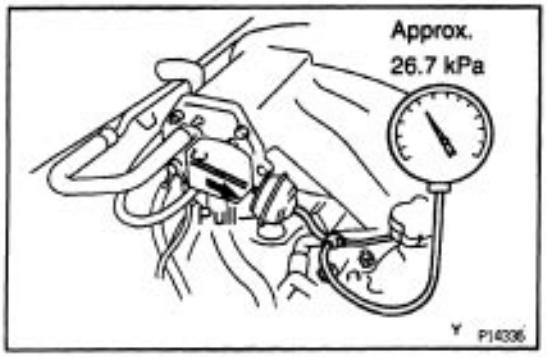




ON–VEHICLE INSPECTION

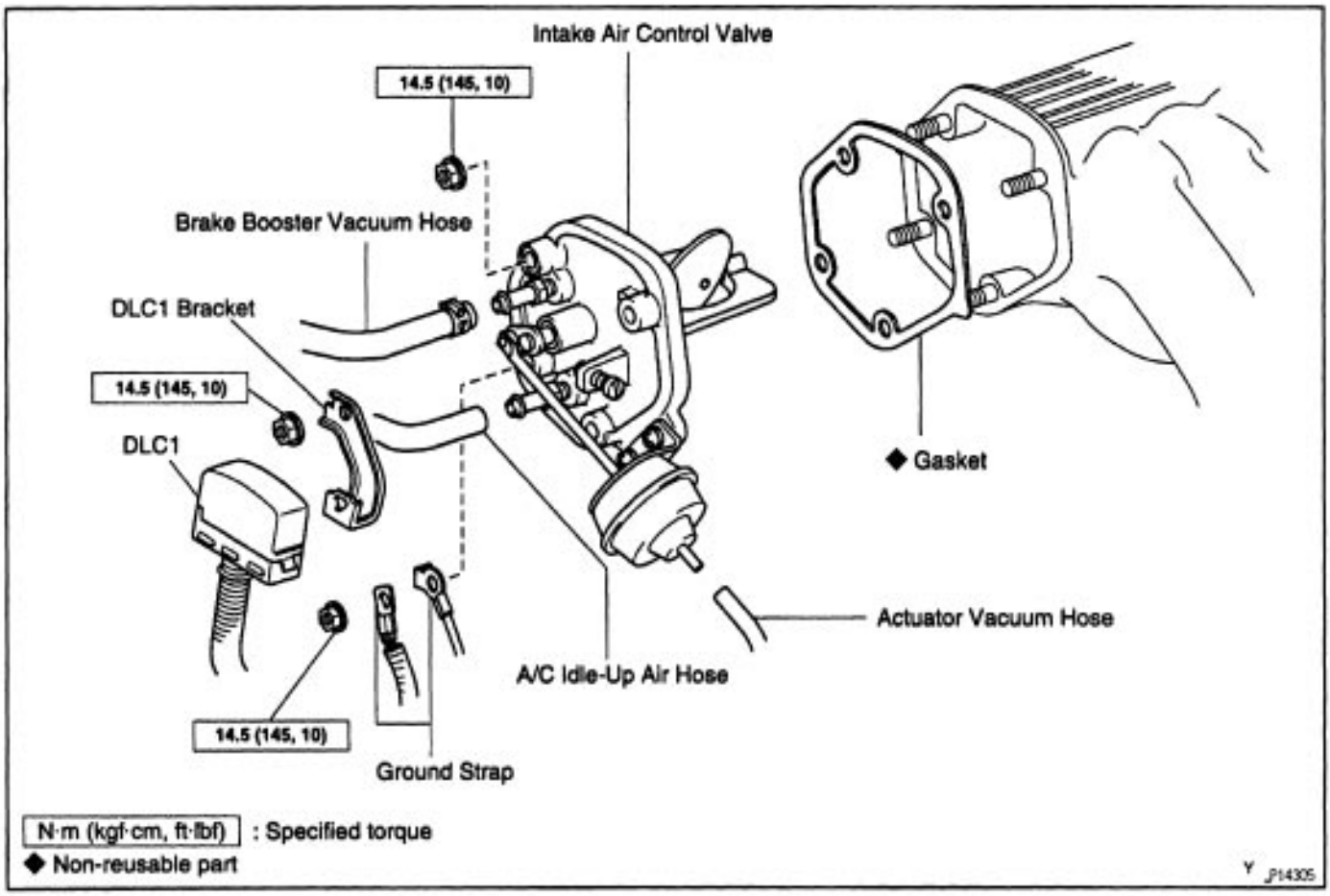
INSPECT INTAKE AIR CONTROL VALVE

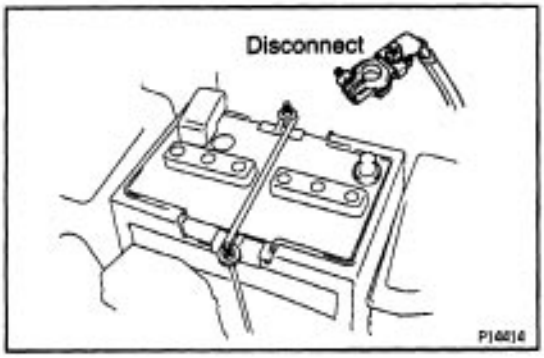
(a) Using a 3–way connector, connect vacuum gauge to the actuator hose.
(b) Start the engine.
(c) While the engine is idling, check that the vacuum gauge needle does not move.



(d) Rapidly depress the accelerator pedal to fully open position and check that the vacuum gauge needle momentarily fluctuates up to approx. 26.7 kPa (200 mmHg, 7.9 in.Hg). (The actuator rod is pulled out.)

COMPONENTS FOR INTAKE AIR CONTROL VALVE REMOVAL AND INSTALLATION



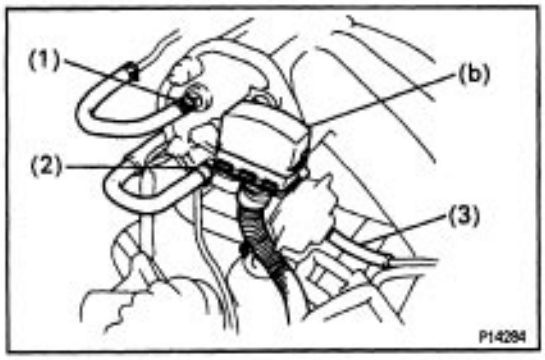


INTAKE AIR CONTROL VALVE REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

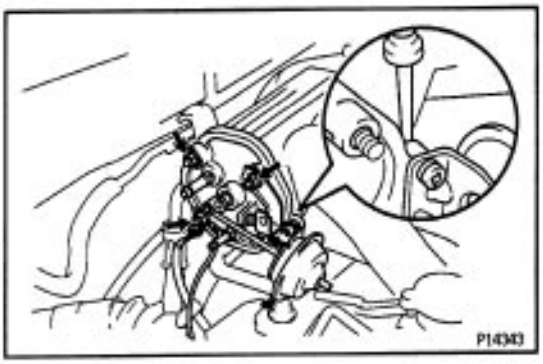
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



2. DISCONNECT HOSES FROM INTAKE AIR CONTROL VALVE

(a) Disconnect the following hoses:
(1) Brake booster vacuum hose
(2) A/C idle–up air hose
(3) Actuator vacuum hose

(b) Disconnect the DLC1.



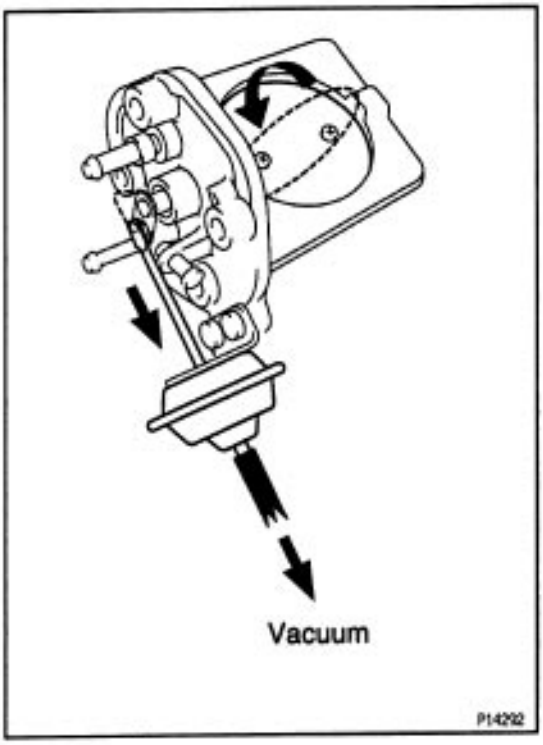
3. REMOVE INTAKE AIR CONTROL VALVE

(a) Remove the 4 nuts and DLC1 bracket, and disconnect the 2 ground straps.

(b) Remove the intake air control valve by prying a screw–driver between the intake air control valve and air intake chamber.

(c) Remove the gasket.

INTAKE AIR CONTROL VALVE AND COMPONENTS INSPECTION

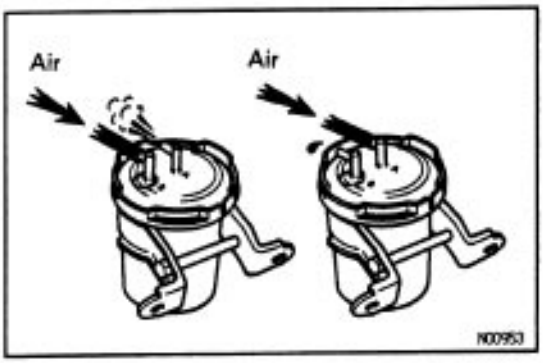


1. INSPECT INTAKE AIR CONTROL VALVE

(a) With 26.7 kPa (200 mmHg, 7.9 in.Hg) of vacuum applied to the actuator, check that the actuator rod moves.

(b) One minute after applying the vacuum in (a), check that the actuator rod does not return.

If the operation is not as specified, replace the intake air control valve.

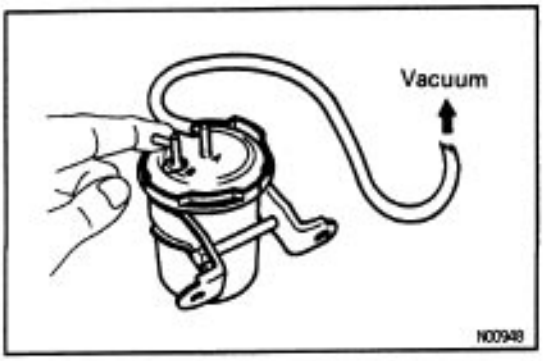


2. INSPECT VACUUM TANK

LOCATION: The LH side member under the battery tray.

(a) Check that air flows from port B to port A.

(b) Check that air does not flow from port A to port B.



(c) Plug port B with your finger, and apply 26.7 kPa (200 mrnHg, 7.9 in.Hg) of vacuum to port A, and check that there is no change in vacuum after one minute.

If the operation is not as specified, replace the vacuum tank.

3. INSPECT VSV

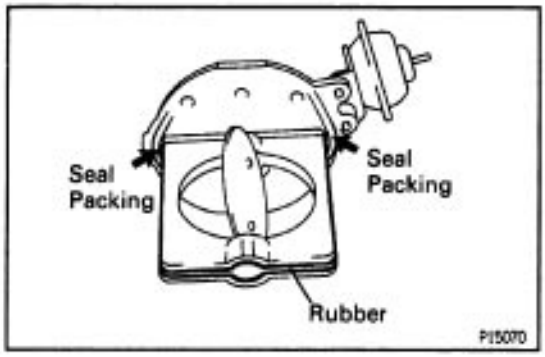
(See page EG2–293**)**

INTAKE AIR CONTROL VALVE INSTALLATION

(See Components for Removal and Installation)

1. INSTALL INTAKE AIR CONTROL VALVE

(a) Install a new gasket to the air intake chamber.

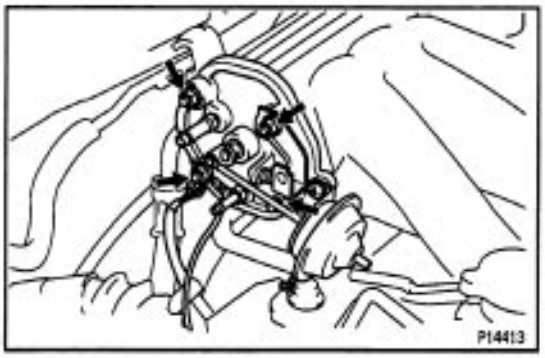


(b) Apply a light coat of engine oil to the rubber portions.

(c) Apply seal packing to the positions of the intake air control valve shown in the

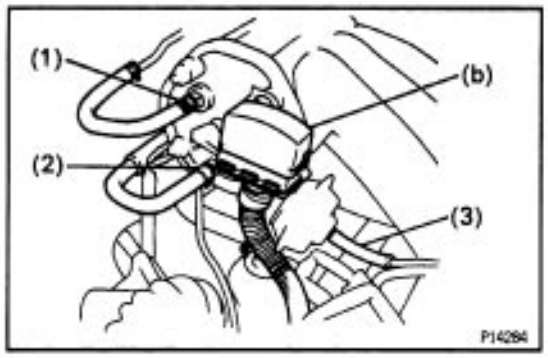
Seal packing:

Part No.08826–00080 or equivalent illustration.



(d) Install the intake air control valve, DLC 1 bracket and 2 ground straps with the 4 nuts.

Torque: 14.5 N–m (145 kgf–cm, 10 ft–lbf)



2. CONNECT HOSES TO INTAKE AIR CONTROL VALVE

(a) Connect the following hoses:

(1) Brake booster vacuum hose

(2) A/C idle–up air hose

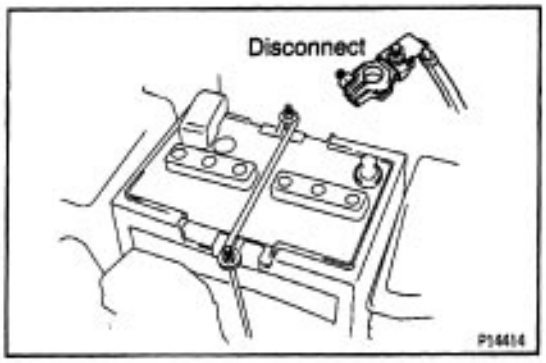
(3) Actuator vacuum hose

(b) Install the DLC1.

3. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

4. CHECK FOR FUEL LEAKAGE

(See page EG2–228**)**

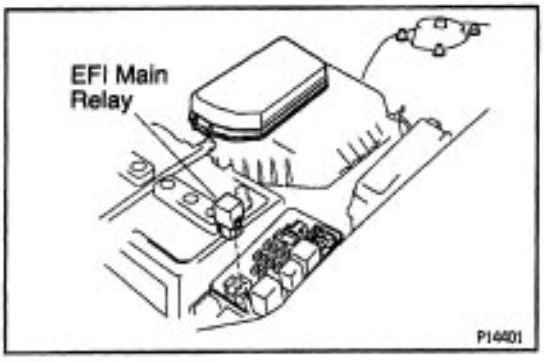


EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

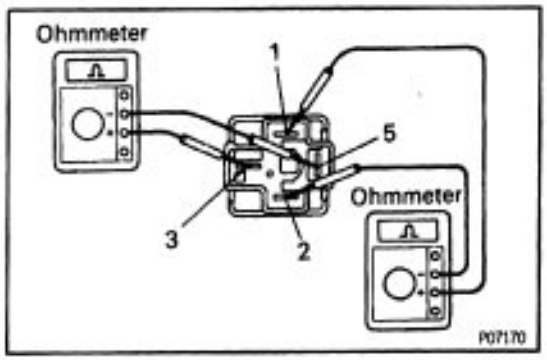
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch Is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.



2. REMOVE EFI MAIN RELAY

LOCATION: In the engine compartment relay box.



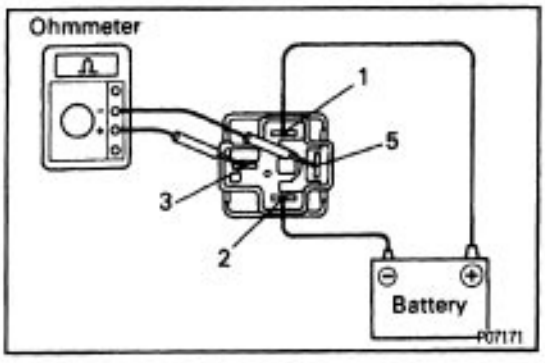
3. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

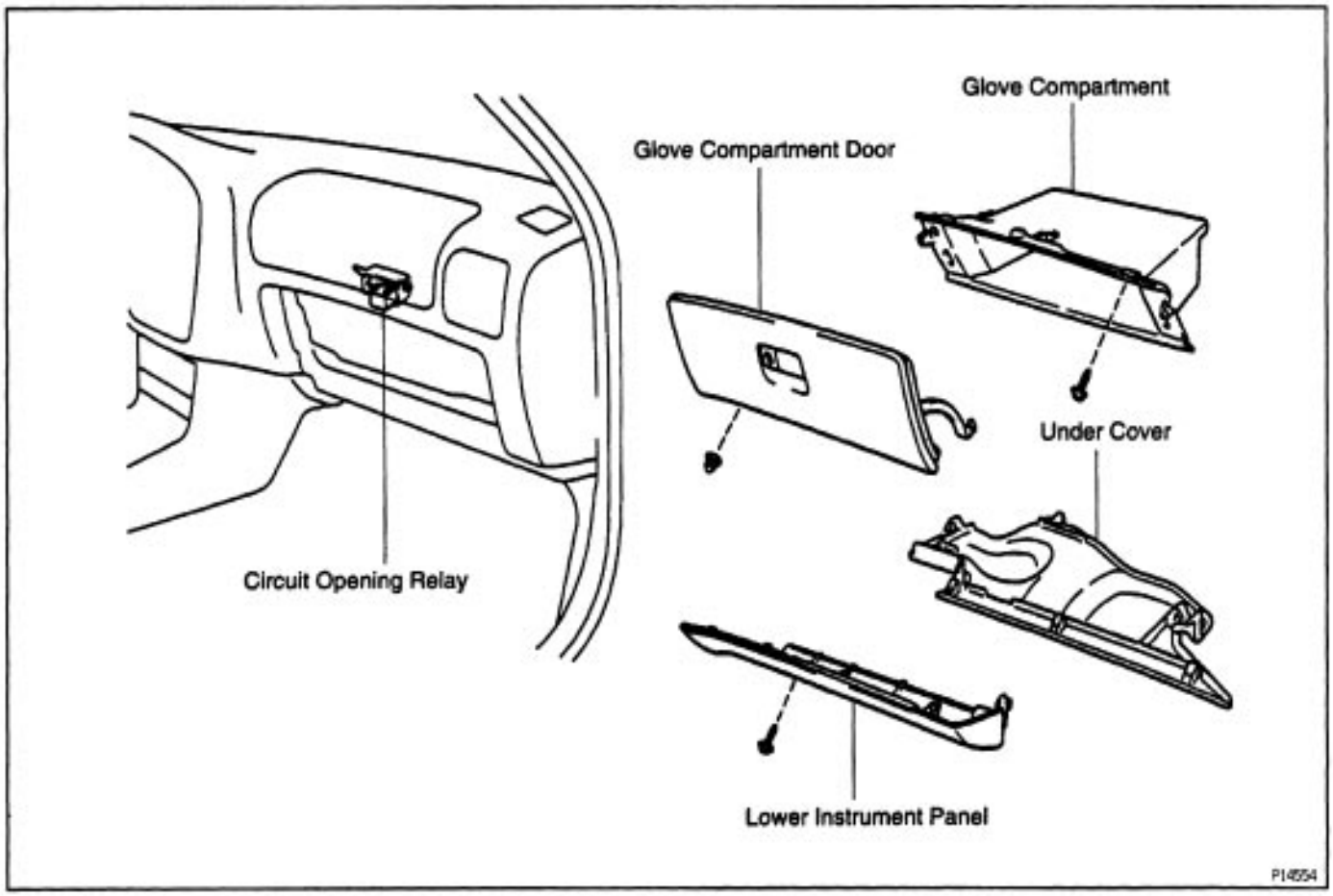
If operation is not as specified, replace the relay.

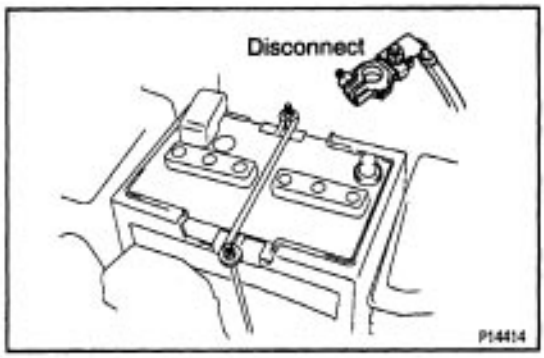
4. REINSTALL EFI MAIN RELAY

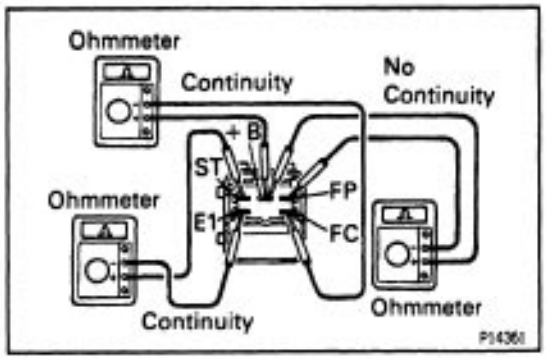
5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

CIRCUIT OPENING RELAY

COMPONENTS FOR REMOVAL AND NOW INSTALLATION







CIRCUIT OPENING RELAY INSPECTION

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch 1s turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery.

2. REMOVE CIRCUIT OPENING RELAY

3. INSPECT CIRCUIT OPENING RELAY

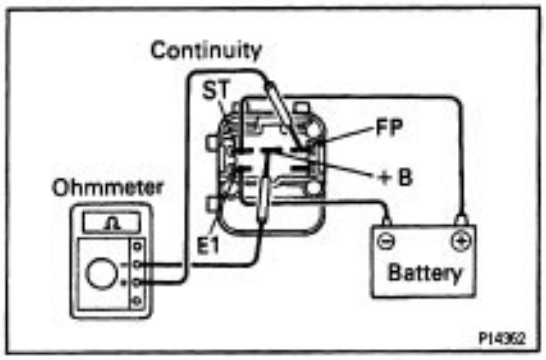
A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals ST and E1.

(b) Check that there is continuity between terminals +B and FC.

(c) Check that there is no continuity between terminals + B and FP.

If continuity is not as specified, replace the relay.

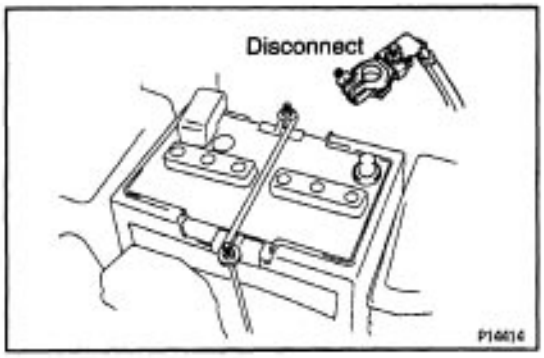


B. Inspect relay operation

(a) Apply battery voltage across terminals ST and El.
M Using an ohmmeter, check that there is continuity between terminals +B and FP.
If operation is not as specified, replace the relay.

4. REINSTALL CIRCUIT OPENING RELAY

5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



ENGINE COOLANT TEMPERATURE (ECT) SENSOR

ECT SENSOR INSPECTION

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

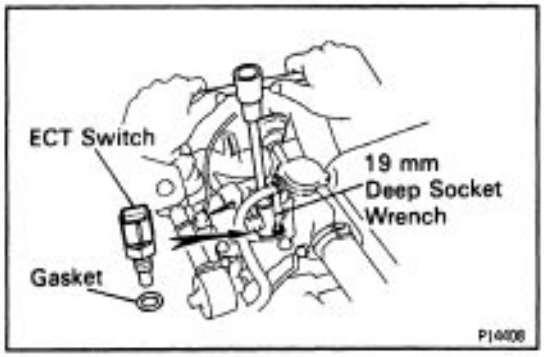
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. REMOVE ECT SENSOR

(a) Disconnect the ECT sensor connector.

(b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.



4. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Refer to the graph

If the resistance is not as specified, replace the ECT sensor.

5. REINSTALL ECT SENSOR

(a) Install a new gasket to the ECT sensor.

(b) Using a 19 mm deep socket, install the ECT sensor.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

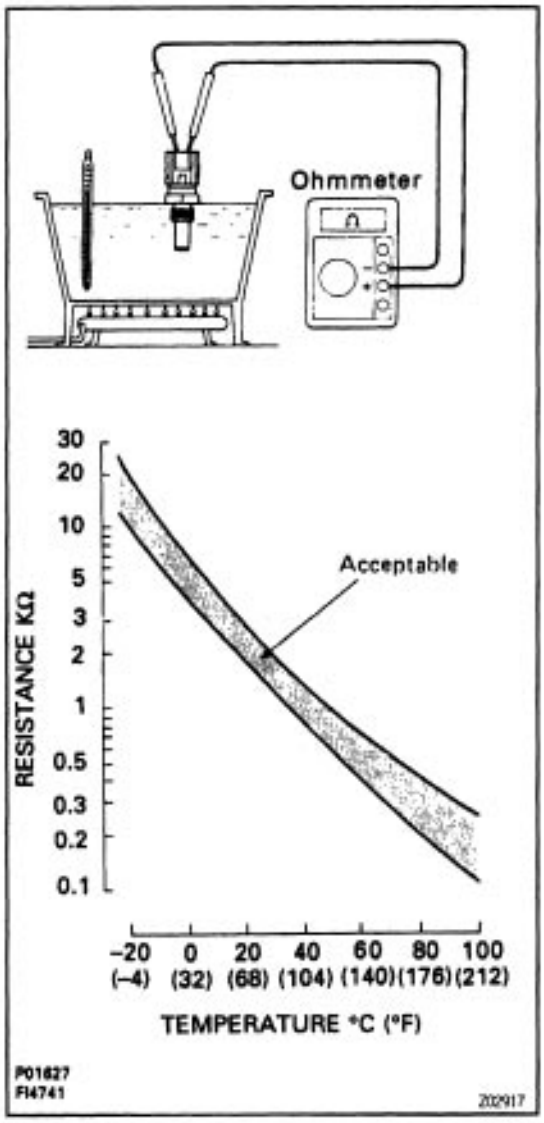
(c) Connect the ECT sensor connector.

6. REFILL WITH ENGINE COOLANT

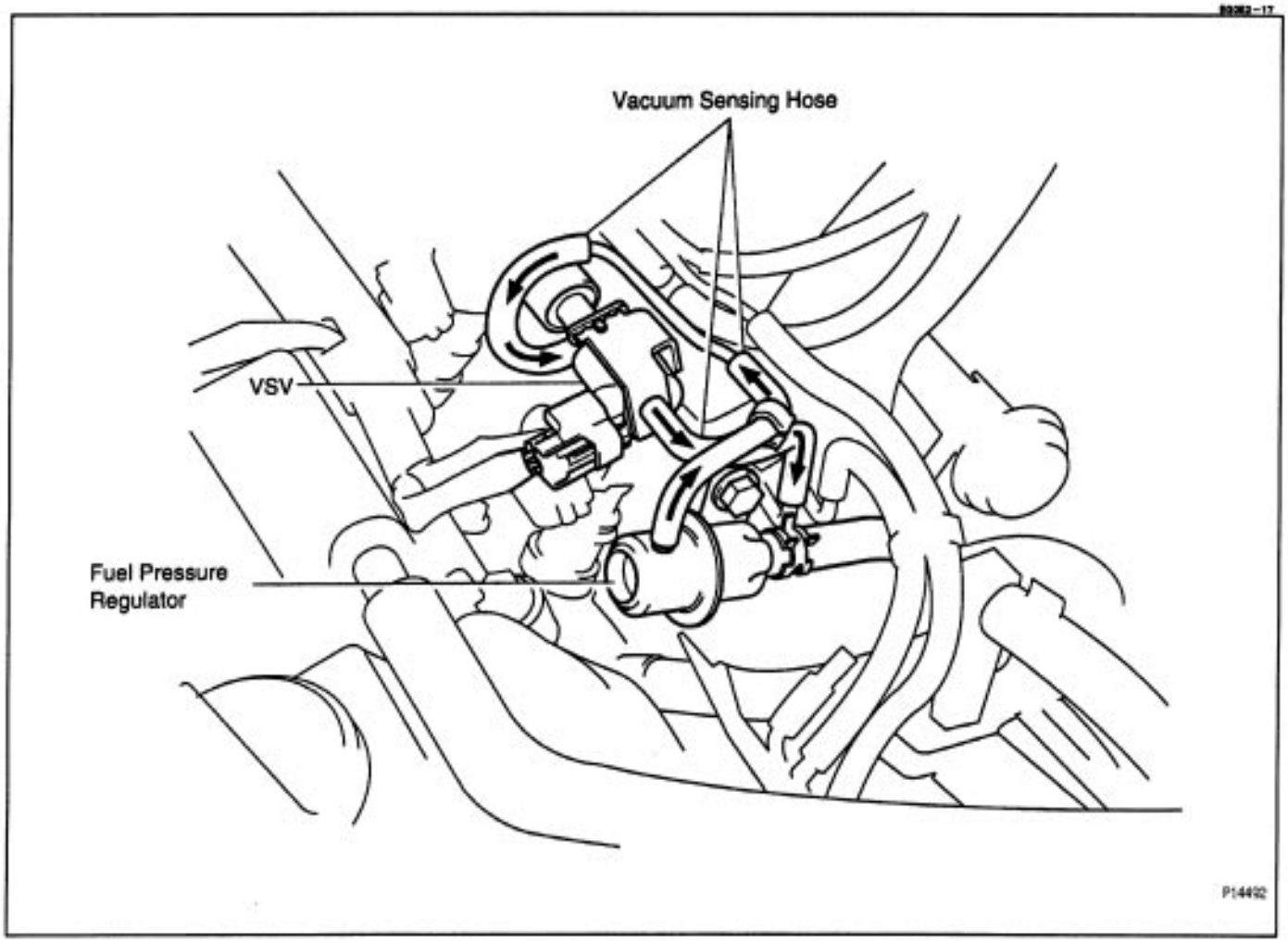
Capacity:

8.7 liters (9.2 US qts, 7.7 Imp. qts)

7. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



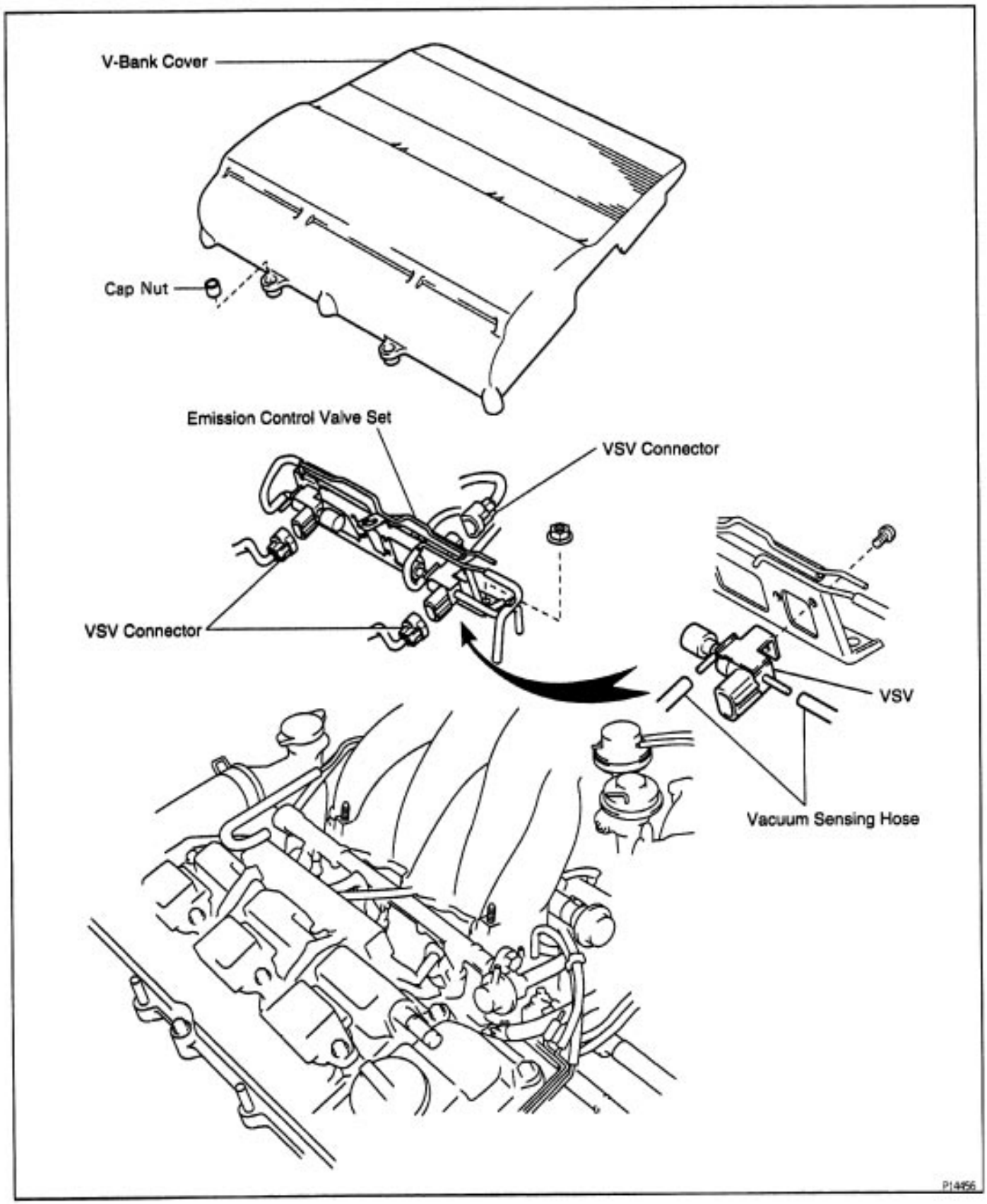
VSV FOR FUEL PRESSURE CONTROL

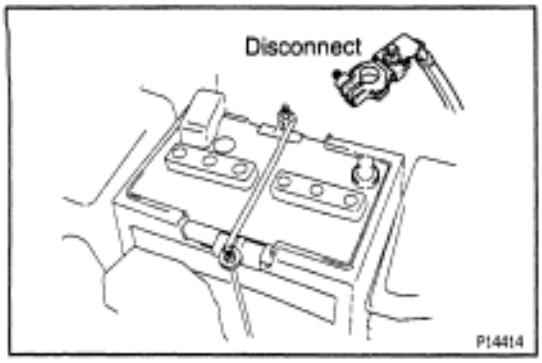


ON–VEHICLE INSPECTION

CHECK FUEL PRESSURE
(See step 2 on page EG2–231)

COMPONENTS FOR REMOVAL AND INSTALLATION



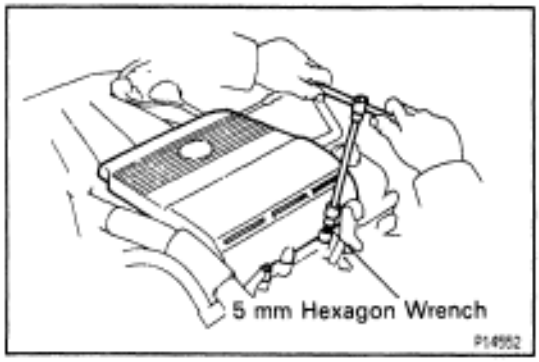


VSV INSPECTION

(See Components for Removal and Installation)

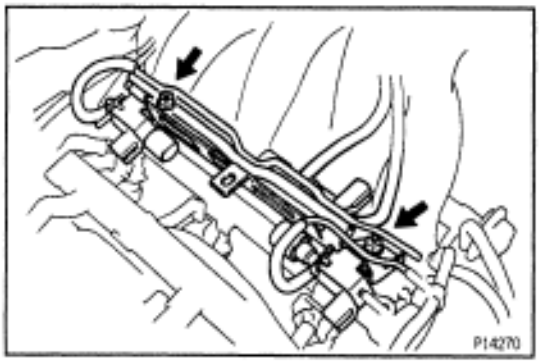
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.



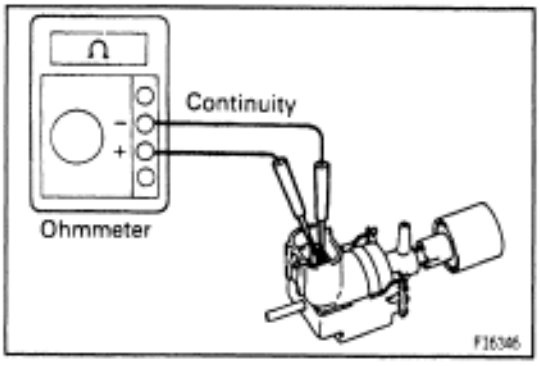
3. REMOVE EMISSION CONTROL VALVE SET

(See step 7 on page EG2–246**)**

4. REMOVE VSV

(a) Disconnect the 2 vacuum sensing hoses from the VSV.

(b) Remove the screw and VSV.



5. INSPECT VSV

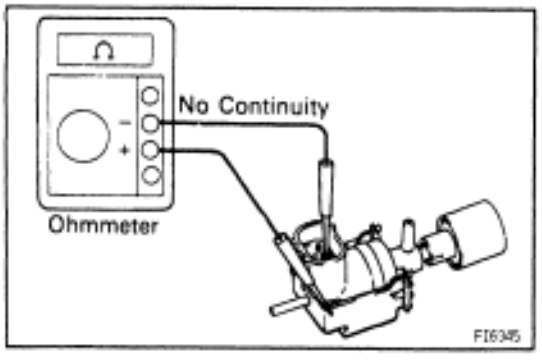
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

33 – 39 Ω at 20℃ (68℉)

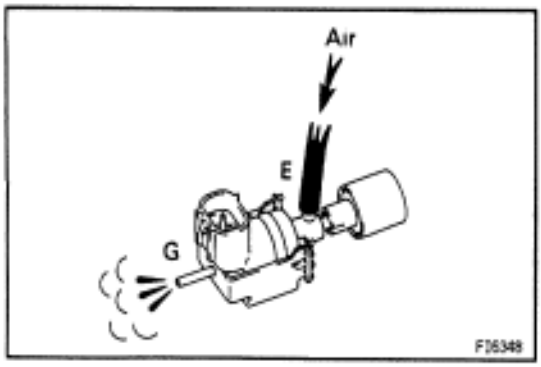
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

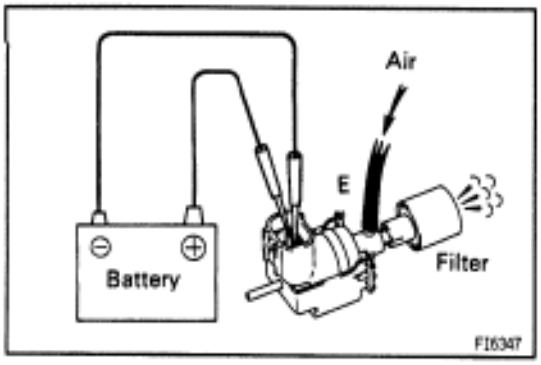
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.

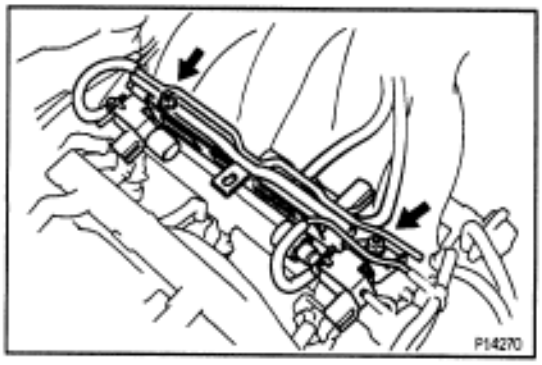


C. Inspect VSV operation

(a) Check that the air flows from ports E to G.



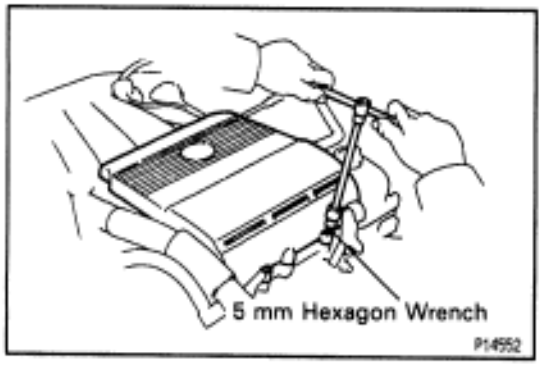
(b) Apply battery voltage across the terminals.
(c) Check that the air flows from port E to the filter.
If operation is not as specified, replace the VSV.



6. REINSTALL EMISSION CONTROL VALVE SET
(See step 8 on page EG2–256**)**

7. REINSTALL VSV

(a) Install the VSV with the screw.
(b) Connect the 2 vacuum sensing hoses to the VSV.

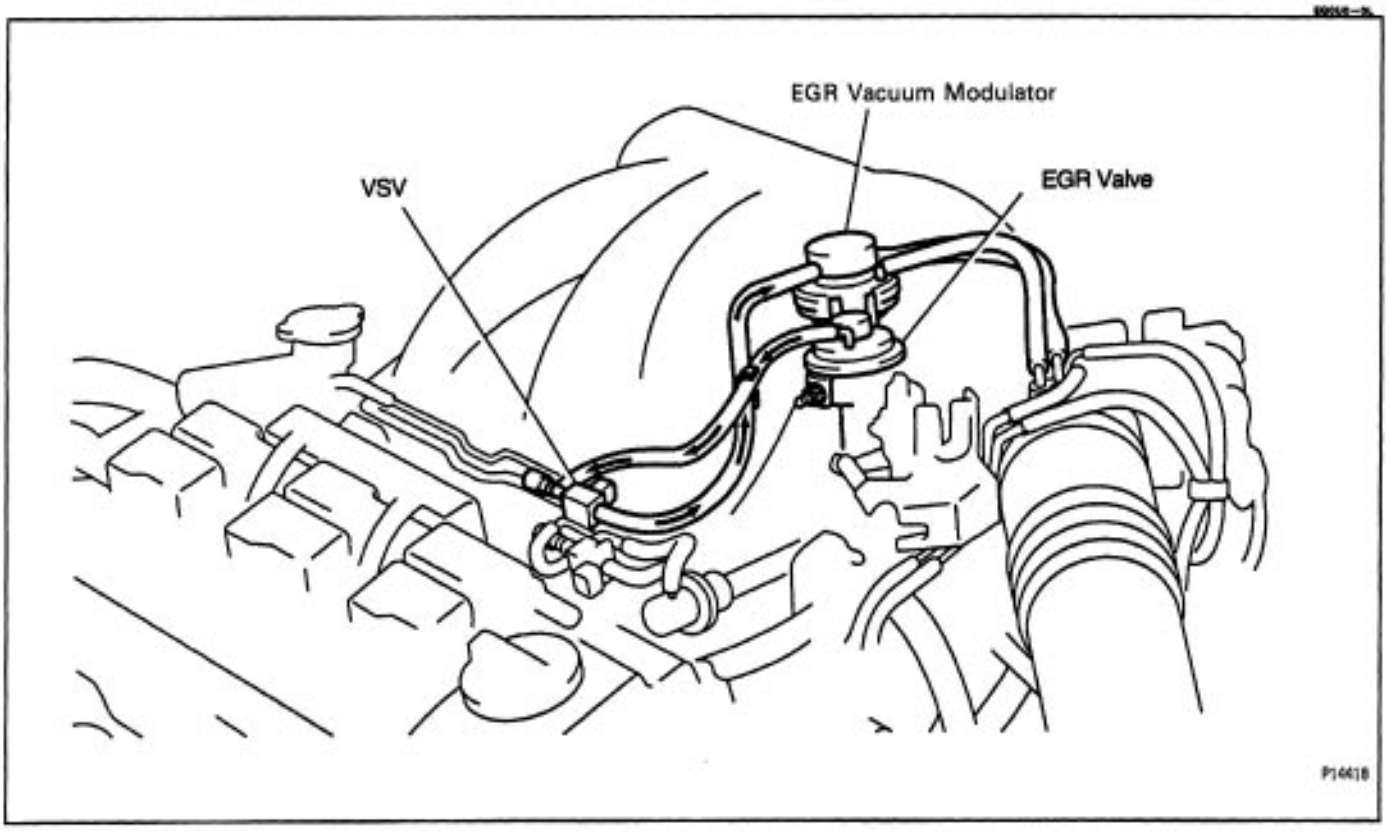


8. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the 2 cap nuts.
HINT: For fixing the V–bank cover, push on the cover until sense of ”click” is felt.

9. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

VSV FOR EGR

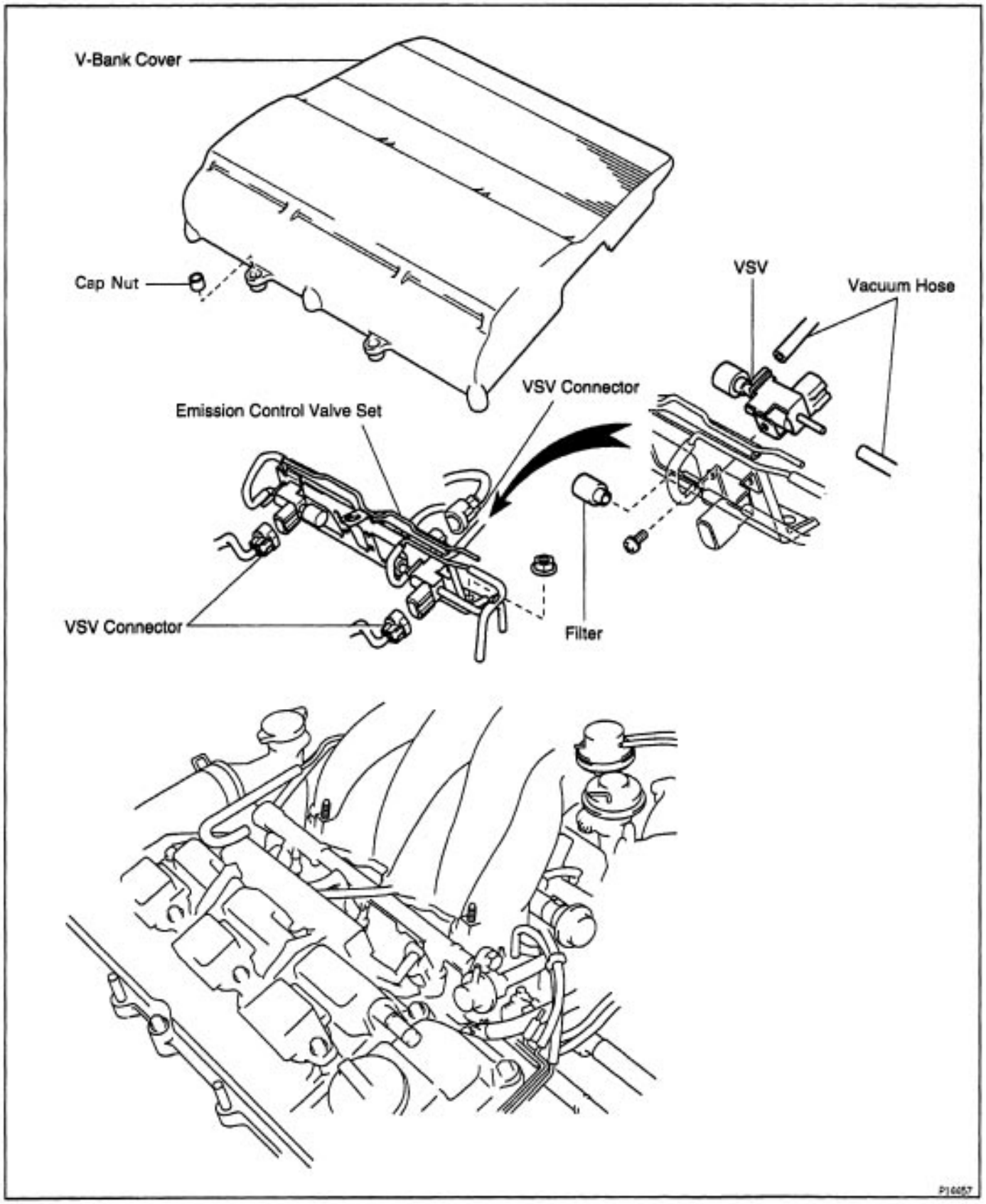


ON–VEHICLE INSPECTION

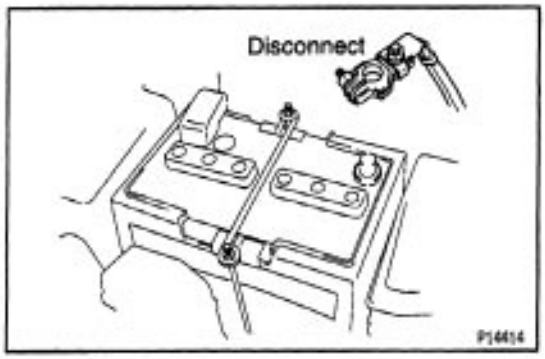
EGR SYSTEM INSPECTION

(See steps 2 to 6 on pages EG2–207 and 208)

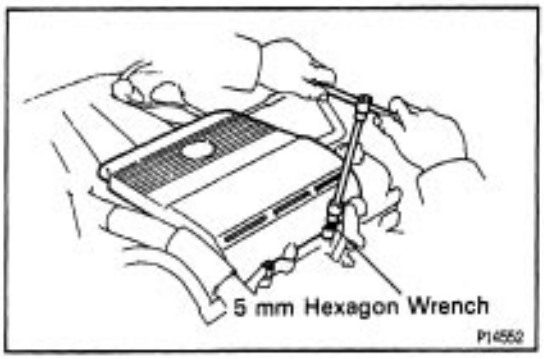
COMPONENTS FOR REMOVAL AND INSTALLATION



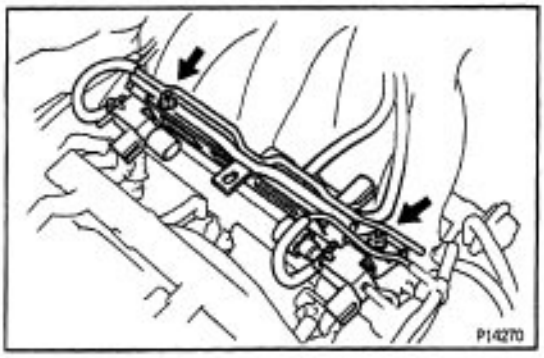
VSV INSPECTION



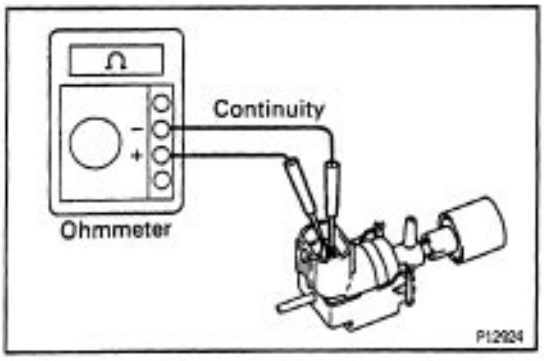
(See Components for Removal and Installation)
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY
CAUTION: Work must be started after 90 seconds from the time the Ignition switch Is turned to the "LOCK" position and the negative (–) terminal cable is discon–nected from the battery.



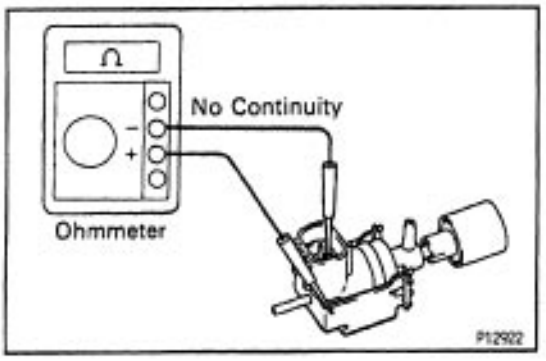
2. REMOVE V–BANK COVER
Using a 5 mm hexagon wrench, remove the 2 cap nuts and V – bank cover.



3. REMOVE EMISSION CONTROL VALVE SET
(See step 7 on page EG2–246**)**
4. REMOVE VSV
(a) Remove the filter.
(b) Disconnect the 2 vacuum hoses from the VSV.
(c) Remove the screw and VSV.



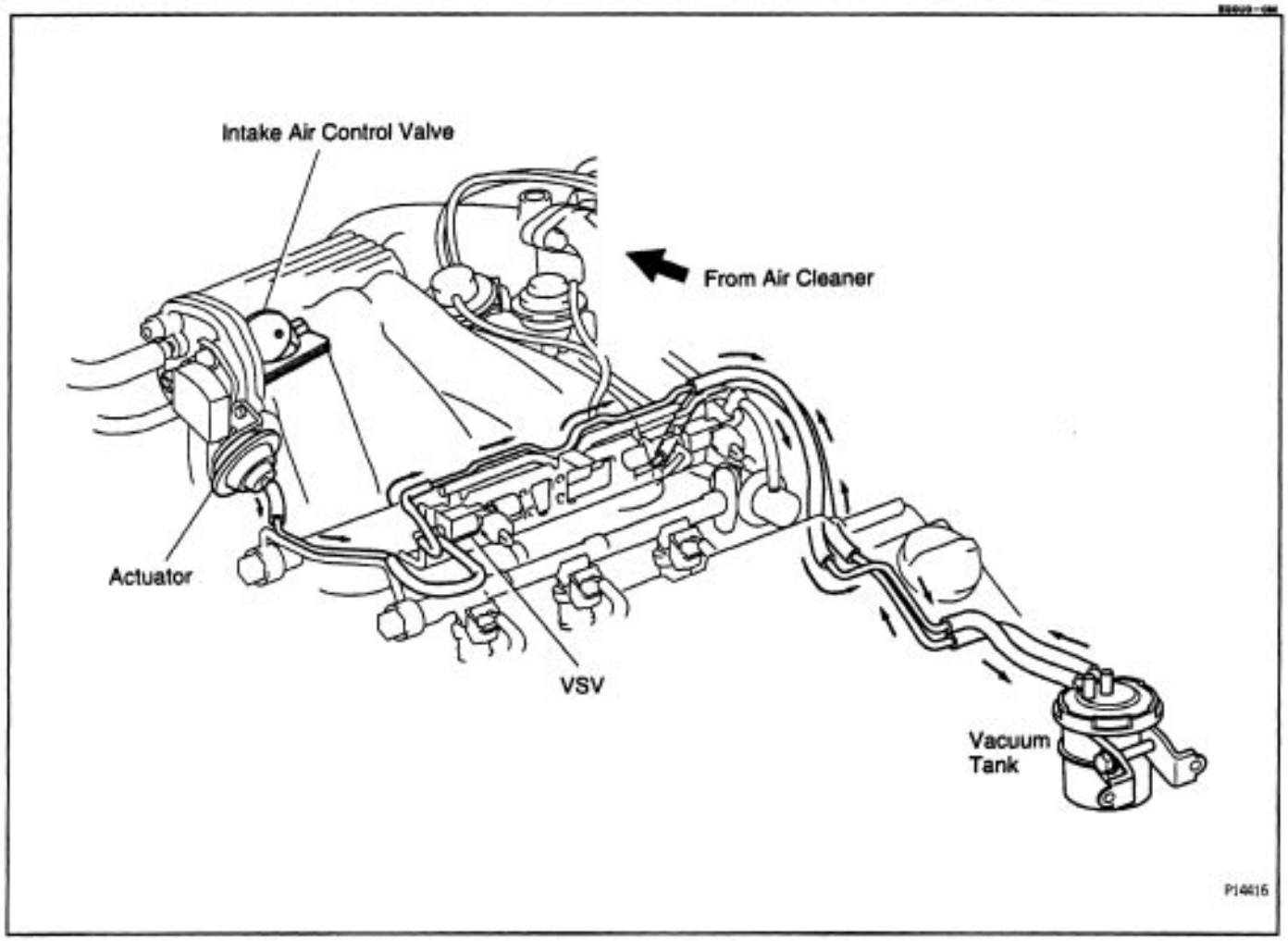
5. INSPECT VSV
A. Inspect VSV for open circuit
Using an ohmmeter, check that there is continuity between the terminals.
Resistance:
33 – 39 Ω at 20° C (68° F)
If there is no continuity, replace the VSV.



B. Inspect VSV for ground
Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the VSV.

-Memo

VSV FOR ACIS

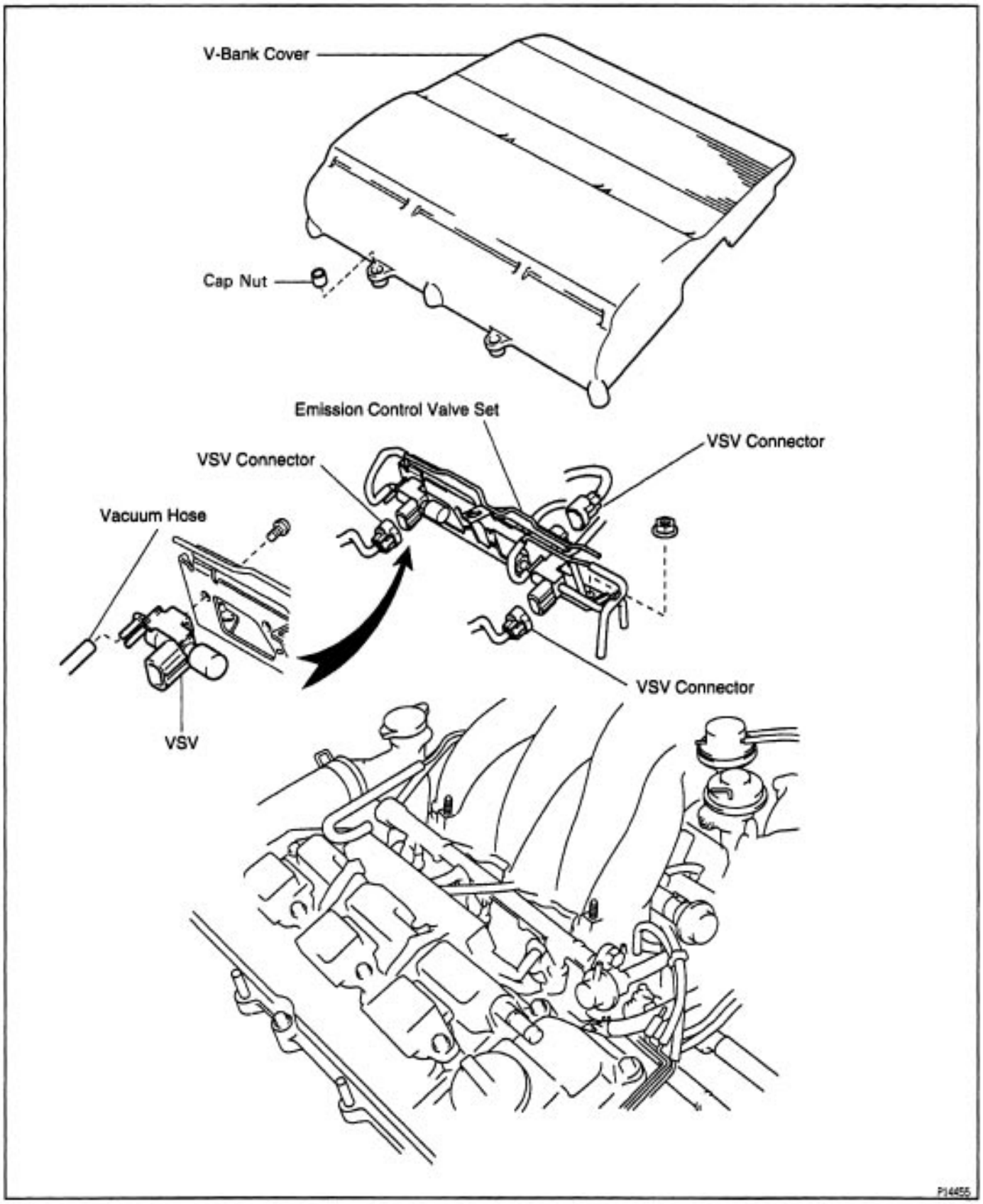


ON–VEHICLE INSPECTION

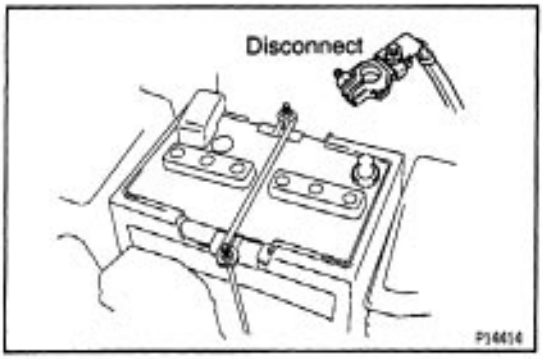
INSPECT INTAKE AIR CONTROL VALVE

(See page EG2–275)

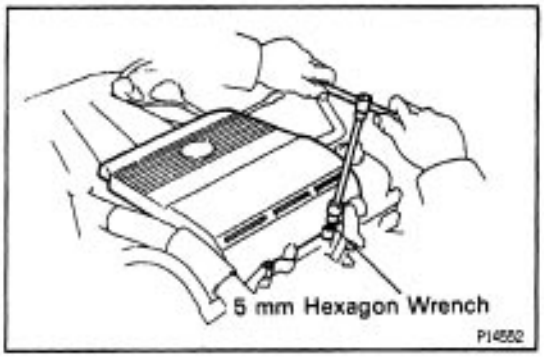
COMPONENTS FOR REMOVAL AND INSTALLATION



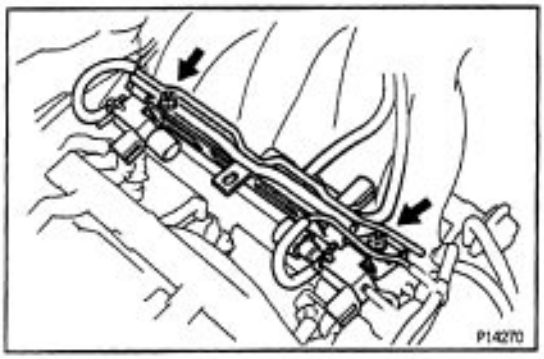
VSV INSPECTION



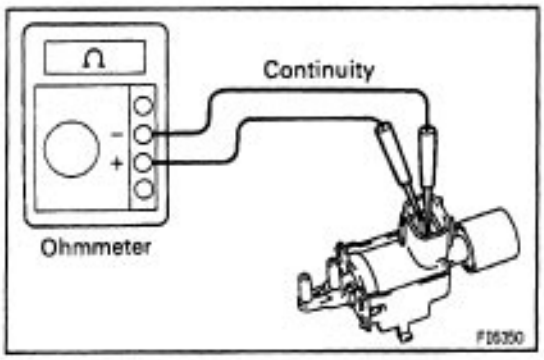
(See Components for Removal and Installation)
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



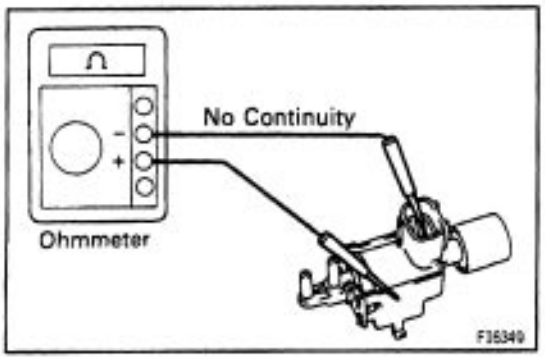
2. REMOVE V – BANK COVER
Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.



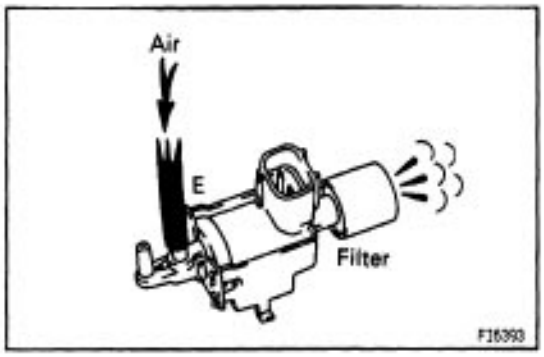
3. REMOVE EMISSION CONTROL VALVE SET
(See step 7 on page EG2–246**)**
4. REMOVE VSV
(a) Disconnect the 2 vacuum hoses from the VSV.
(b) Remove the screw and VSV.



5. INSPECT VSV
A. Inspect VSV for open circuit
Using an ohmmeter, check that there is continuity between each terminals.
Resistance:
33 – 39 Ω at 20˚C (68˚F)
If there is no continuity, replace the VSV.

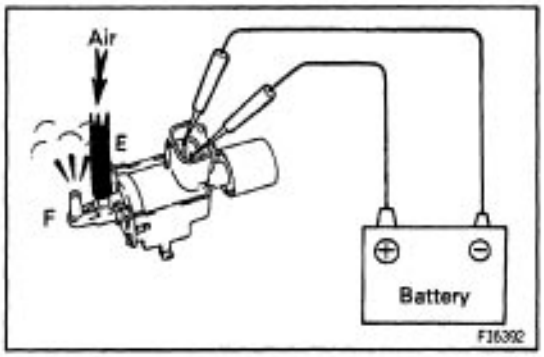


B. Inspect VSV for ground
Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the VSV.

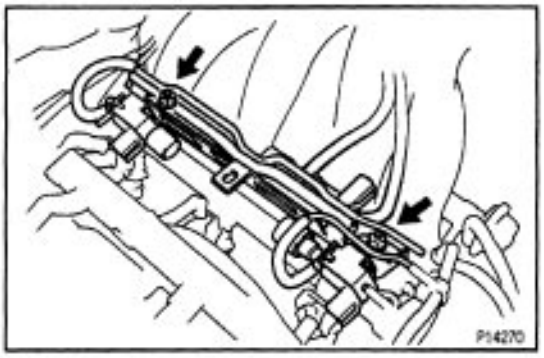


C. Inspect VSV operation

(a) Check that air flows from pipe E to the filter.



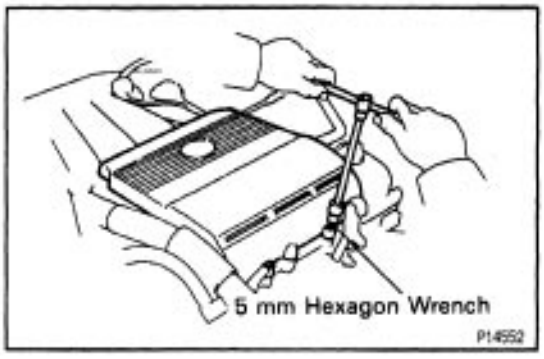
(b) Apply battery voltage across the terminals.
(c) Check that air flows from pipe E to pipe F.
If operation is not as specified, replace the VSV.



6. REINSTALL EMISSION CONTROL VALVE SET
(See step 8 on page EG2–256**)**

7. REINSTALL VSV

(a) Install the VSV with the screw.
(b) Connect the 2 vacuum to the VSV.

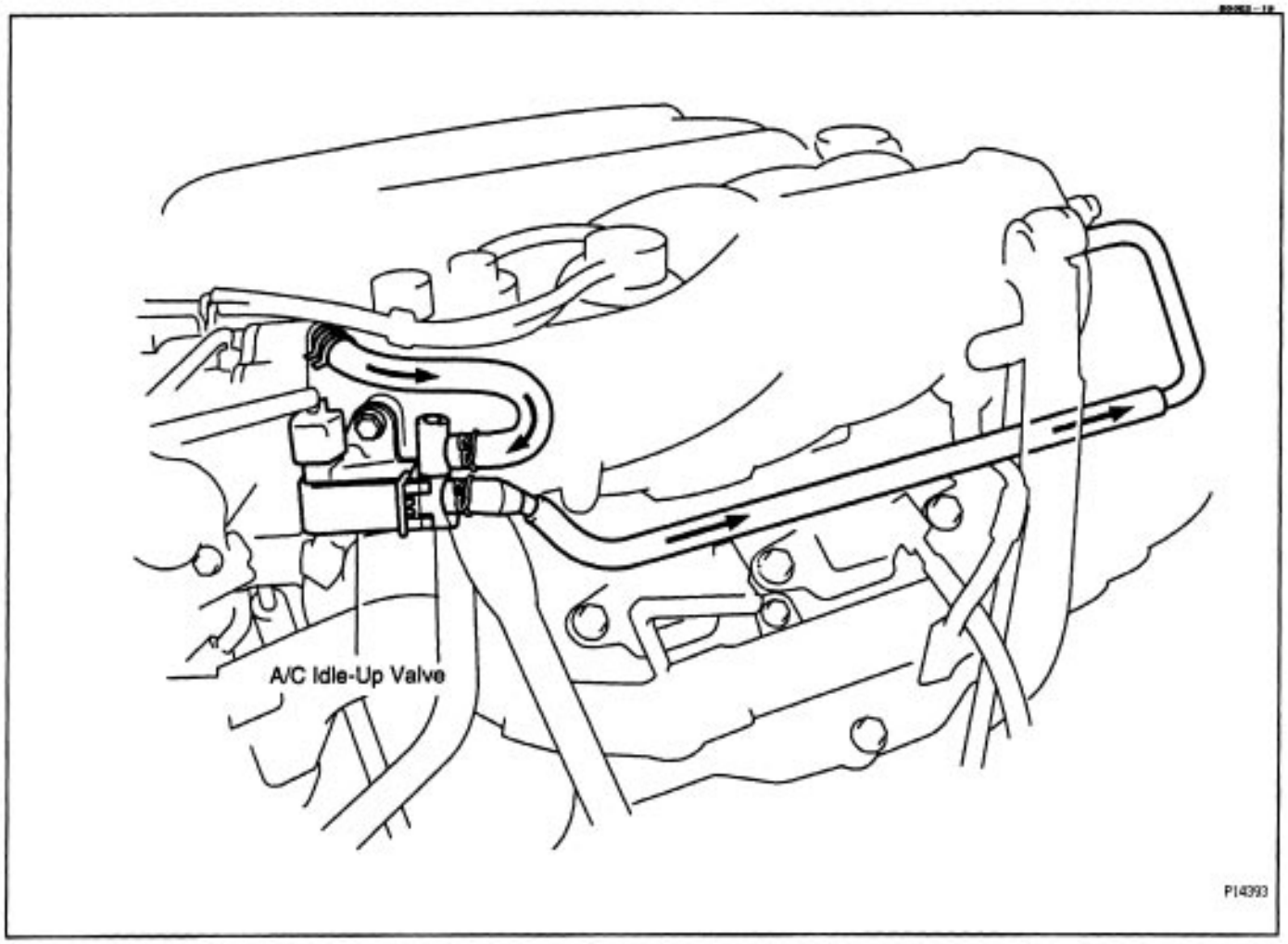


8. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V – bank cover with the 2 cap nuts.
HINT: For fixing the V–bank cover, push on the cover until sense of ”click” is felt.

9. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

AC IDLE–UP VALVE

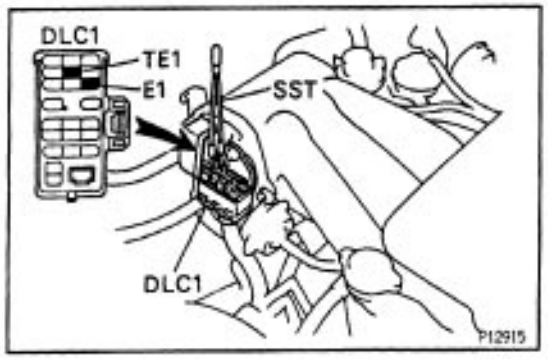


ON–VEHICLE INSPECTION

INSPECT A/C IDLE–UP VALVE OPERATION

(a) Initial conditions:

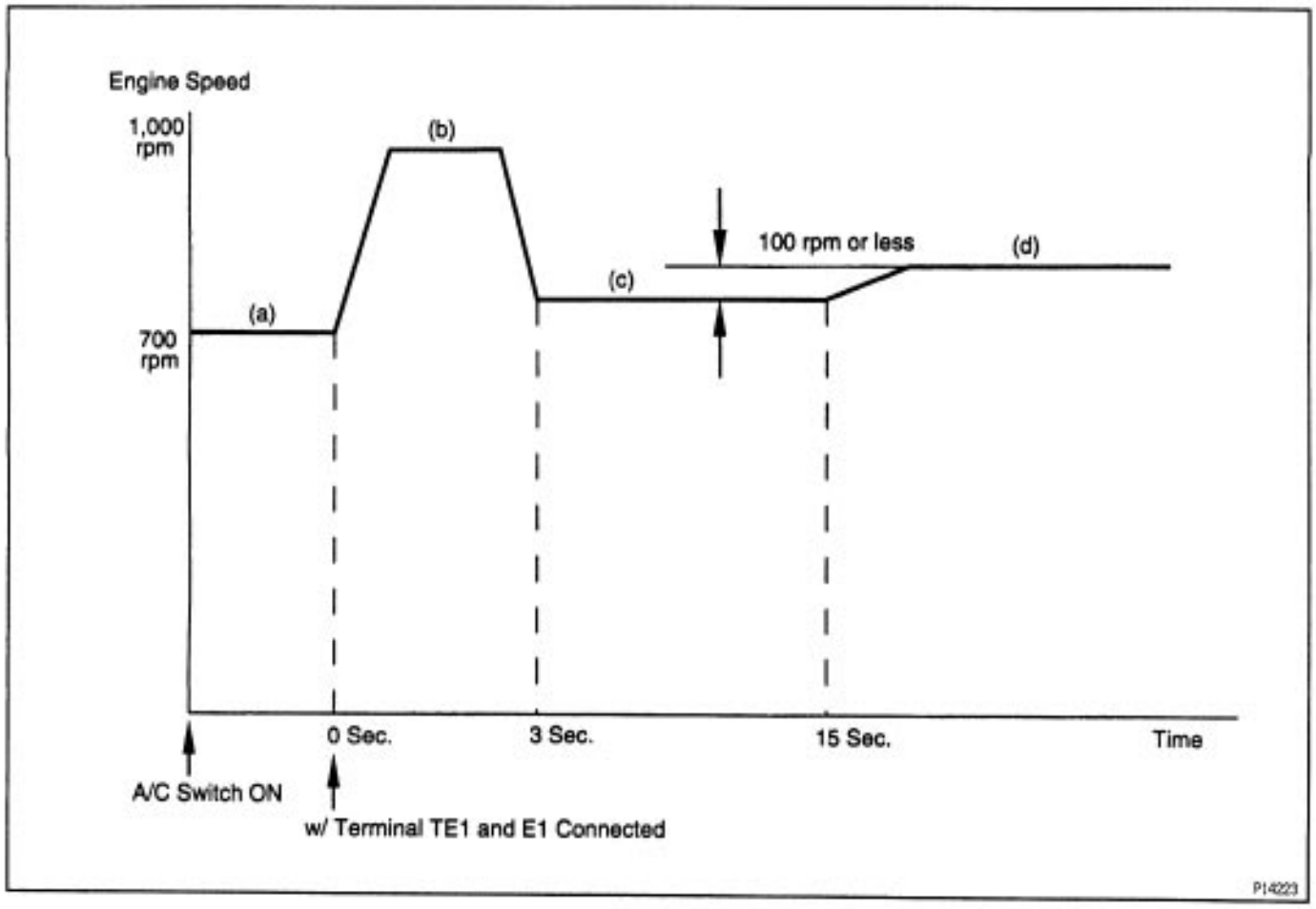
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position
- A/C switch ON

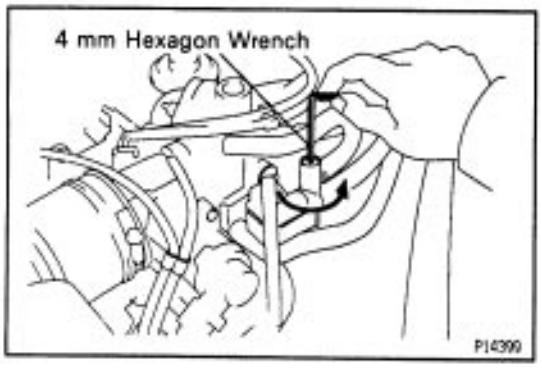


(b) Using SST, connect terminals TE1 and E1 of the DLC 1, check that idle–up occurs for approx. 3 seconds.
SST 09843–18020
Valve operation is faulty if during the idle–up period the engine speed drops by 100 rpm or more, rough idle occurs, or the engine stalls.

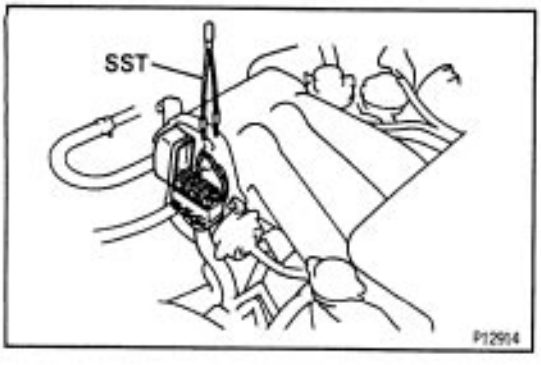
(c) Observe the idle speed for approx. 3 to 15 seconds. During this time the idle –up valve should go off, the IAC valve half –open and idle –up should occur.

(d) Check that the idle speed after approx. 15 seconds, does not vary greatly from the idle speed observed in step
(c). The idle–up valve should now be in ON position.



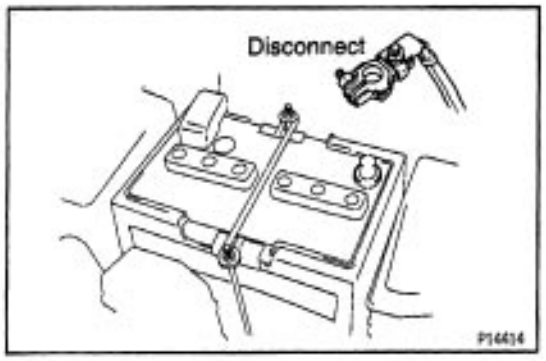


If the idle speed is increases by more 100 rpm, using a 4 mm hexagon wrench, turn the idle–up valve adjustment screw to correct the idle–up valve.



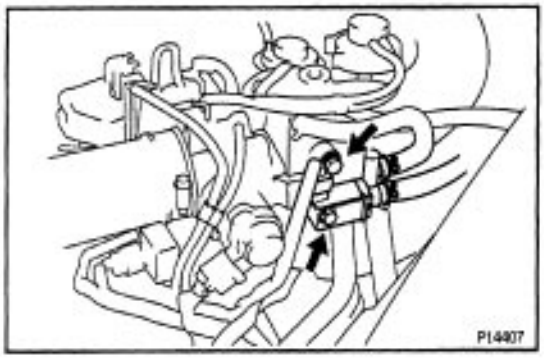
(e) Remove the SST from the DLC1.
SST 09843–18020
(f) A/C switch OFF.

A/C IDLE–UP VALVE INSPECTION



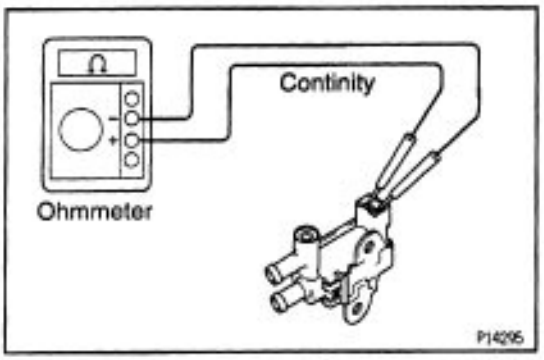
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch Is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.



2. REMOVE A/C IDLE–UP VALVE

(a) Disconnect the idle–up valve connecter.
(b) Disconnect the 2 air hoses.
(c) Remove the 2 bolts and idle–up valve.



3. INSPECT A/C IDLE– UP VALVE

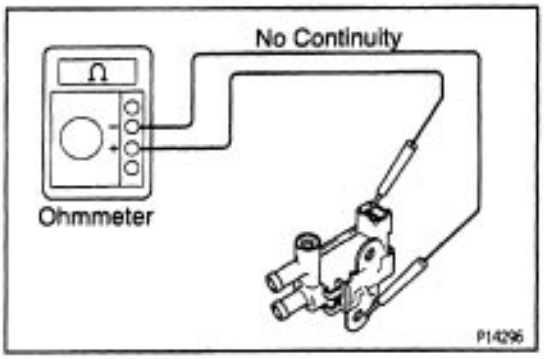
A. Inspect idle–up valve for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

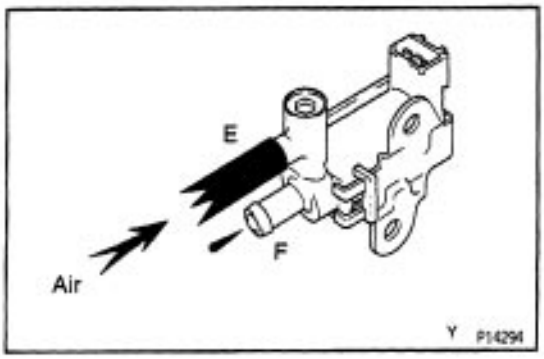
30 – 33 Ω at 20˚C (68˚F)

If there is no continuity, replace the idle–up valve.



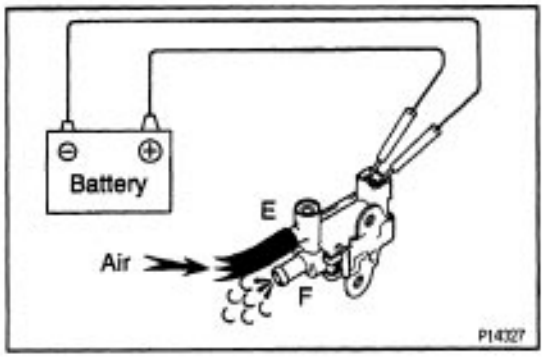
B. Inspect A/C idle–up valve for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the idle–up valve.

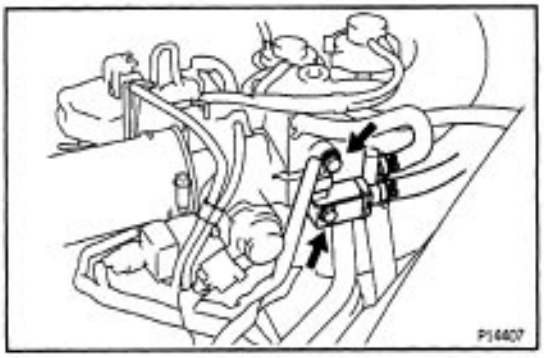


C. Inspect A/C idle–up valve operation

(a) Check that the air does not flow from port E to port F.



(b) Apply battery voltage across the terminals.
(c) Check that the air flows from port E to port F.
If operation is not as specified, replace the idle–up valve.



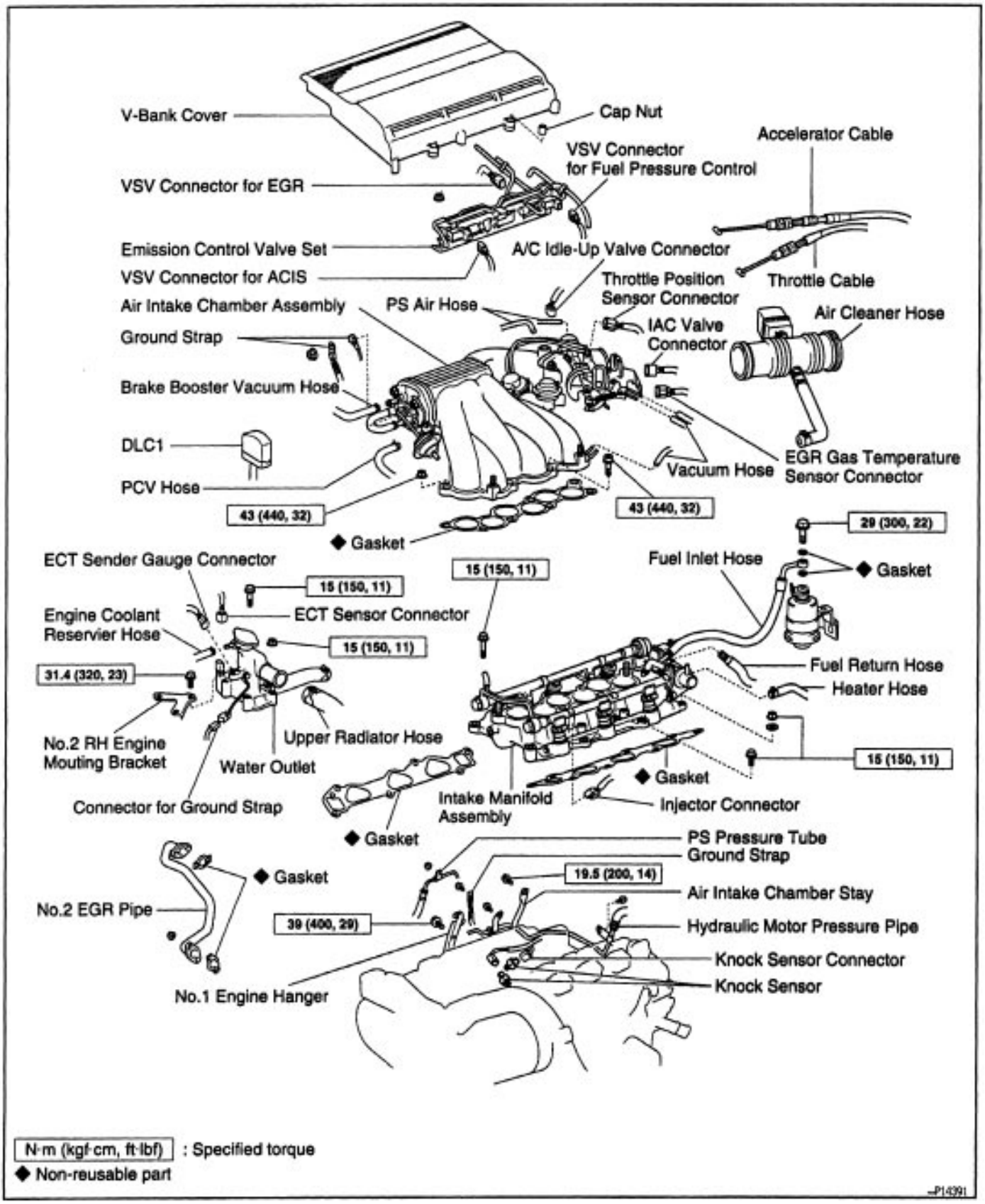
4. REINSTALL A/C IDLE– UP VALVE

(a) Install the idle–up valve with the 2 bolts.
(b) Connect the air hose.
(c) Connect the idle–valve connector.

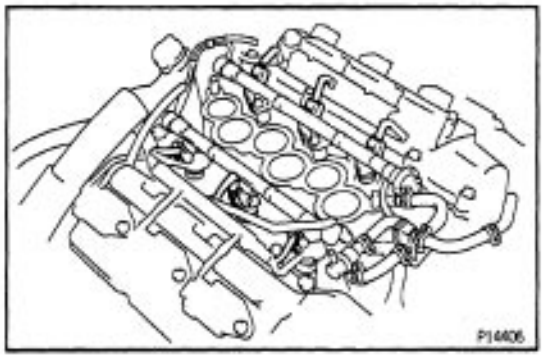
5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

KNOCK SENSOR

COMPONENTS FOR REMOVAL AND INSTALLATION



KNOCK SENSORS INSPECTION

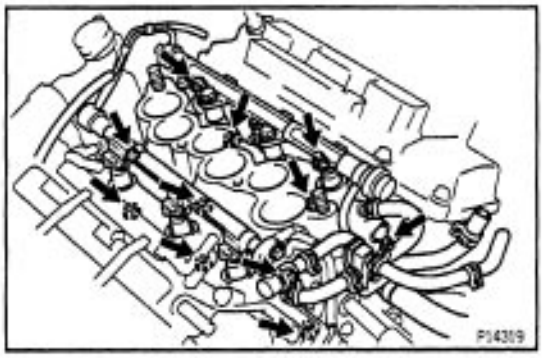


(See Components for Removal and Installation)

1. REMOVE AIR INTAKE CHAMBER ASSEMBLY

(See steps 1 to 10 on pages EG2–246 to 249)

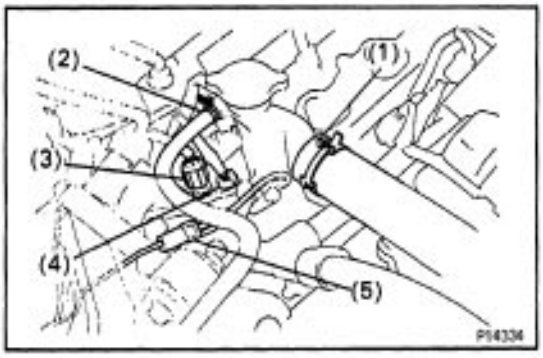
2. DISCONNECT INJECTOR CONNECTORS



3. REMOVE INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the heater hose from the intake manifold.

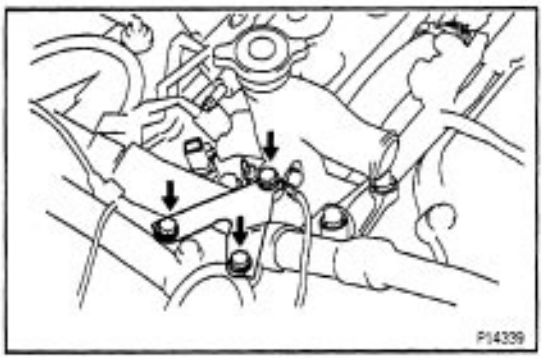
(b) Remove the 9 bolts, 2 nuts, 2 plates washers and intake manifold assembly.



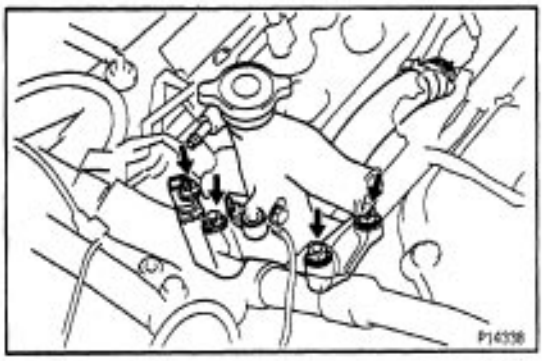
4. REMOVE RH ENGINE MOUNTING STAY AND WATER OUTLET

(a) Disconnect the following hoses and connectors:

(1) Radiator inlet hose
(2) Engine coolant reservoir hose
(3) ECT sensor connector
(4) ECT switch connector
(5) Ground strap connector



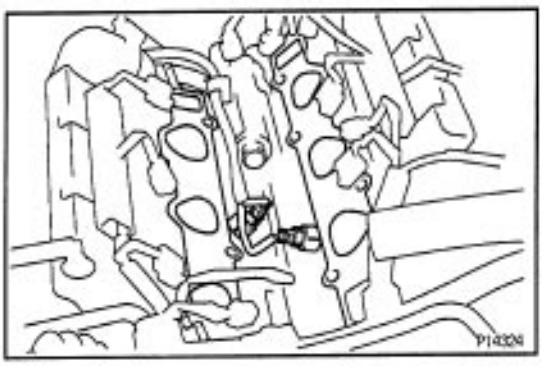
(b) Remove the 3 bolts and RH mounting stay.



(c) Remove the wire band.

(d) Disconnect the water bypass hose from the inlet housing.

(e) Remove the 2 bolts, 2 nuts, 2 plate washers and water outlet.

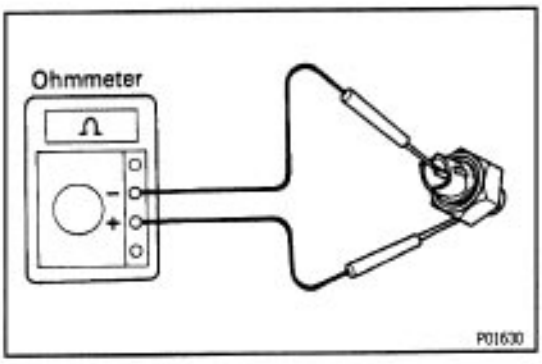


(f) Remove the 2 gaskets.

5. REMOVE KNOCK SENSORS

(a) Disconnect the knock sensor connector.

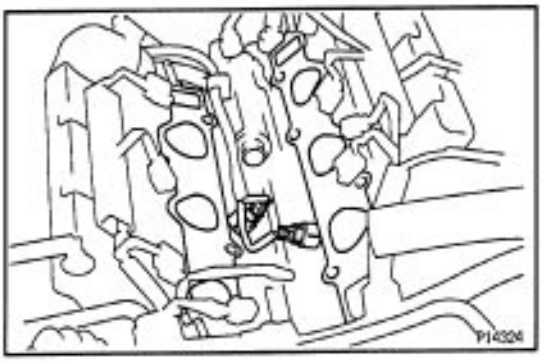
(b) Remove the knock sensor.



6. INSPECT KNOCK SENSORS

Using an ohmmeter, check that there is no continuity between the terminal and body.

If there is continuity, replace the sensor.



7. REINSTALL KNOCK SENSORS

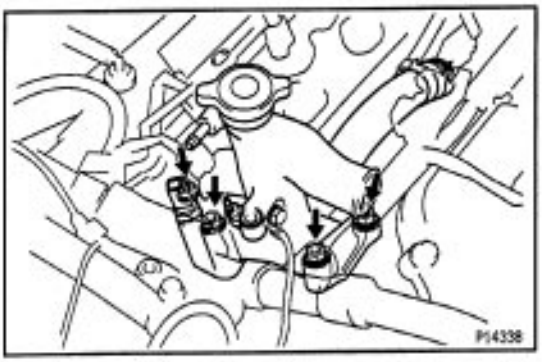
(a) Install the knock sensor.

Torque: 39 N–m (400 kgf–cm. 29 ft–lbf)

(b) Connect the knock sensor connector.

8. REINSTALL WATER OUTLET AND RH ENGINE MOUNTING STAY

(a) Install 2 new gaskets on the cylinder head.



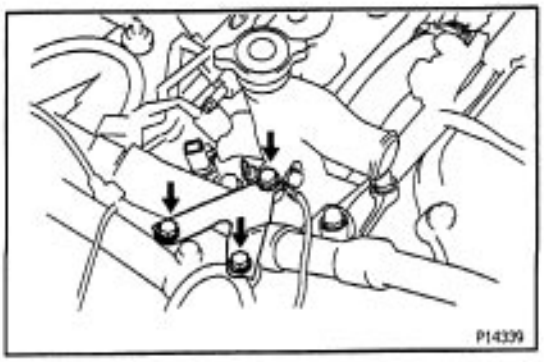
(b) Install the water outlet with the the 2 bolts, 2 plate washers and 2 nuts.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

NOTICE: Do not scratch the seal surface of the water outlet with the stud bolt.

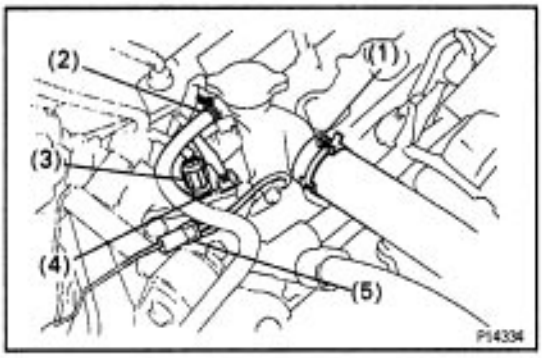
(c) Connect the water bypass hose to the inlet housing.

(d) Install the wire band.

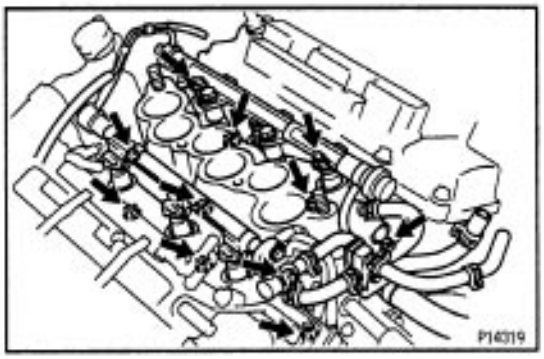


(e) Install the RH mounting stay with the 3 bolts.

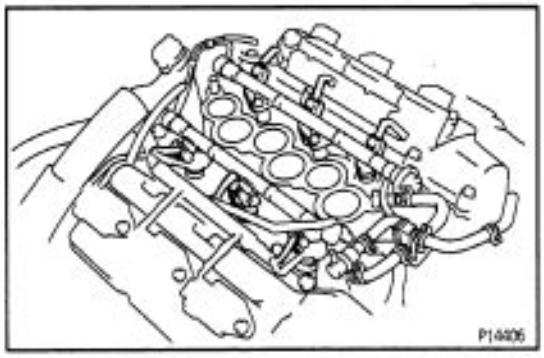
Torque: 31.4 N–m (320 kgf–cm, 23 ft–lbf)



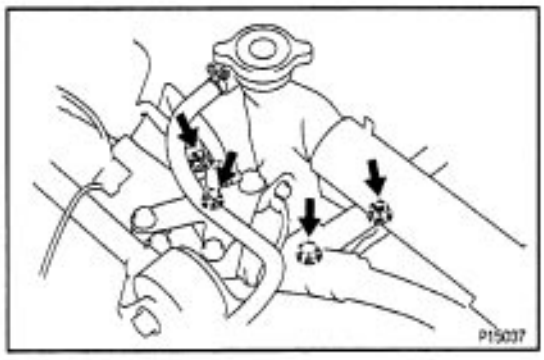
(f) Connect the following hoses and connectors:
(1) Radiator inlet hose
(2) Engine coolant reservoir hose
(3) ECT sensor connector
(4) ECT switch connector
(5) Ground strap connector



9. REINSTALL INTAKE MANIFOLD ASSEMBLY
(a) Install the intake manifold assembly with the 9 bolts, 2 plate washers and 2 nuts.
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)
(b) Connect the heater hose to the intake manifold.

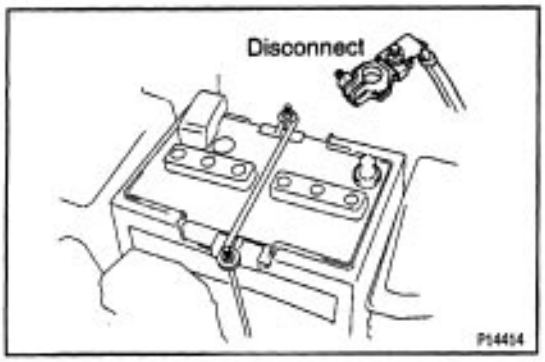


10. RECONNECT INJECTOR CONNECTORS



11. RETIGHTENING WATER OUTLET MOUNTING BOLTS AND NUTS
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

12. REINSTALL AIR INTAKE CHAMBER ASSEMBLY
(See steps 5 to 14 on pages EG2–254 to 257)



EGR GAS TEMPERATURE SENSOR

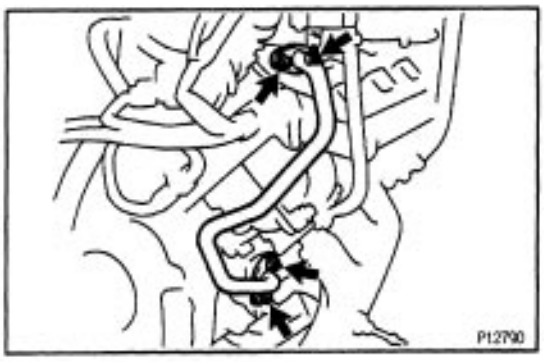
EGR GAS TEMPERATURE SENSOR INSPECTION

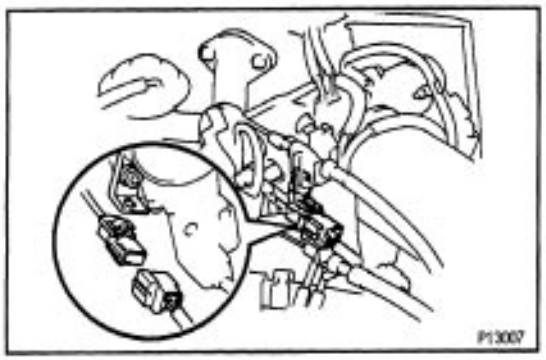
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch Is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

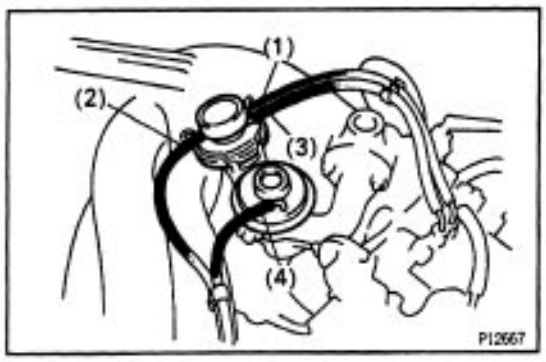
2. REMOVE NO.2 EGR PIPE

Remove the 4 nuts, EGR pipe and 2 gaskets.





3. DISCONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR AND CLAMP



4. REMOVE EGR VALVE AND VACUUM MODULATOR ASSEMBLY

(a) Disconnect the following hoses:

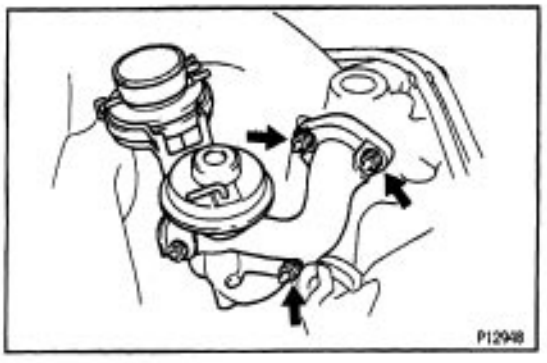
(1) Vacuum hose from port P of EGR vacuum modulator

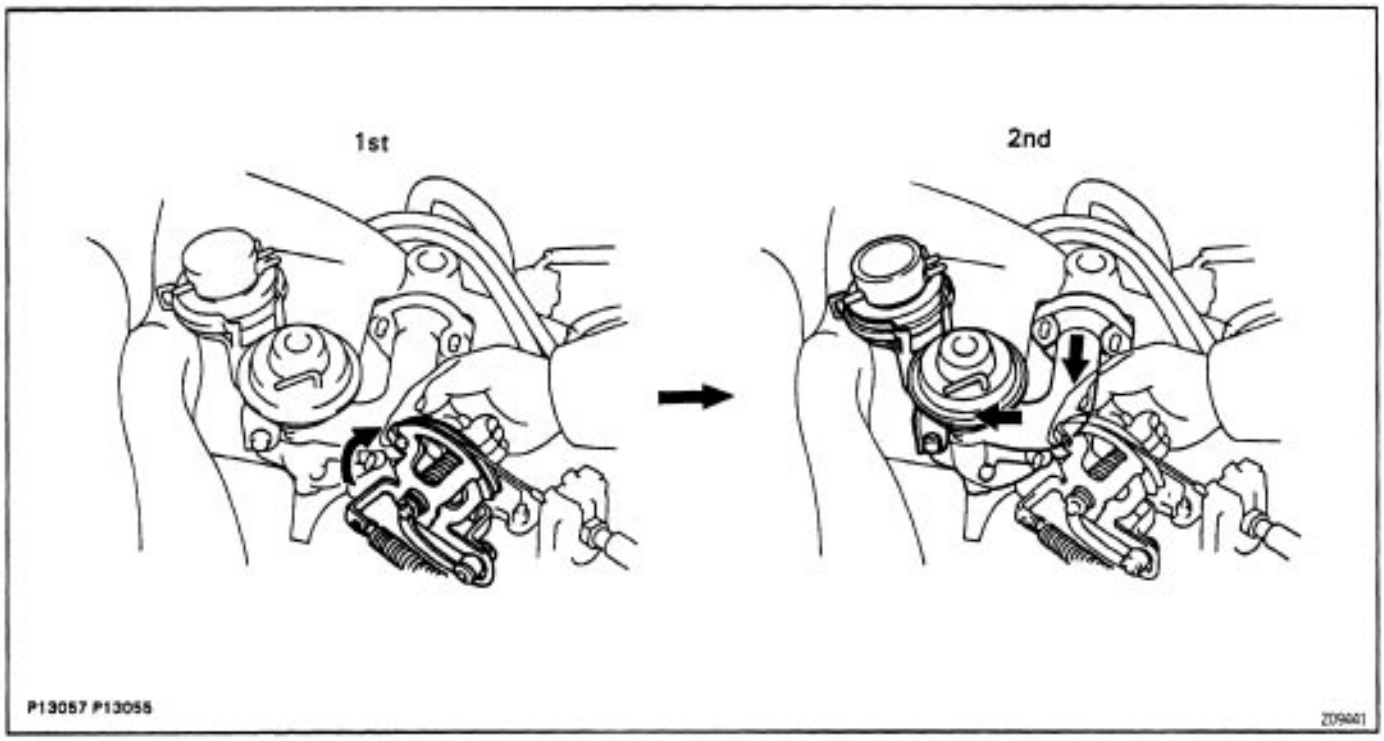
(2) Vacuum hose from port Q of EGR vacuum modulator

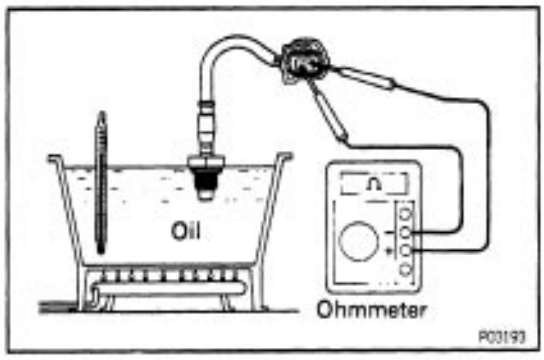
(3) Vacuum hose from port R of EGR vacuum modulator

(4) Vacuum hose from EGR valve

(b) Remove the 3 nuts, EGR valve and vacuum modulator assembly and gasket.







5. REMOVE EGR GAS TEMPERATURE SENSOR

6. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

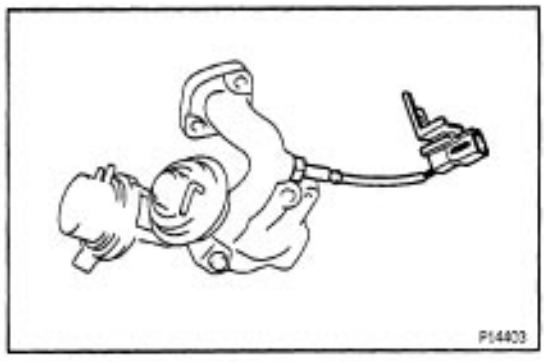
Resistance:

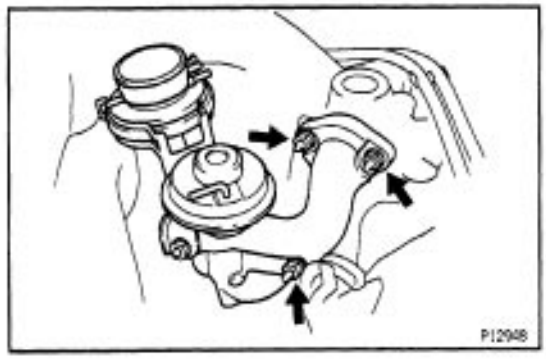
64 – 97 kΩ at 50°C (112°F)
11 – 16 kΩ et 100°C (212°F)
2 – 4 kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.

7. REINSTALL EGR GAS TEMPERATURE SENSOR

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

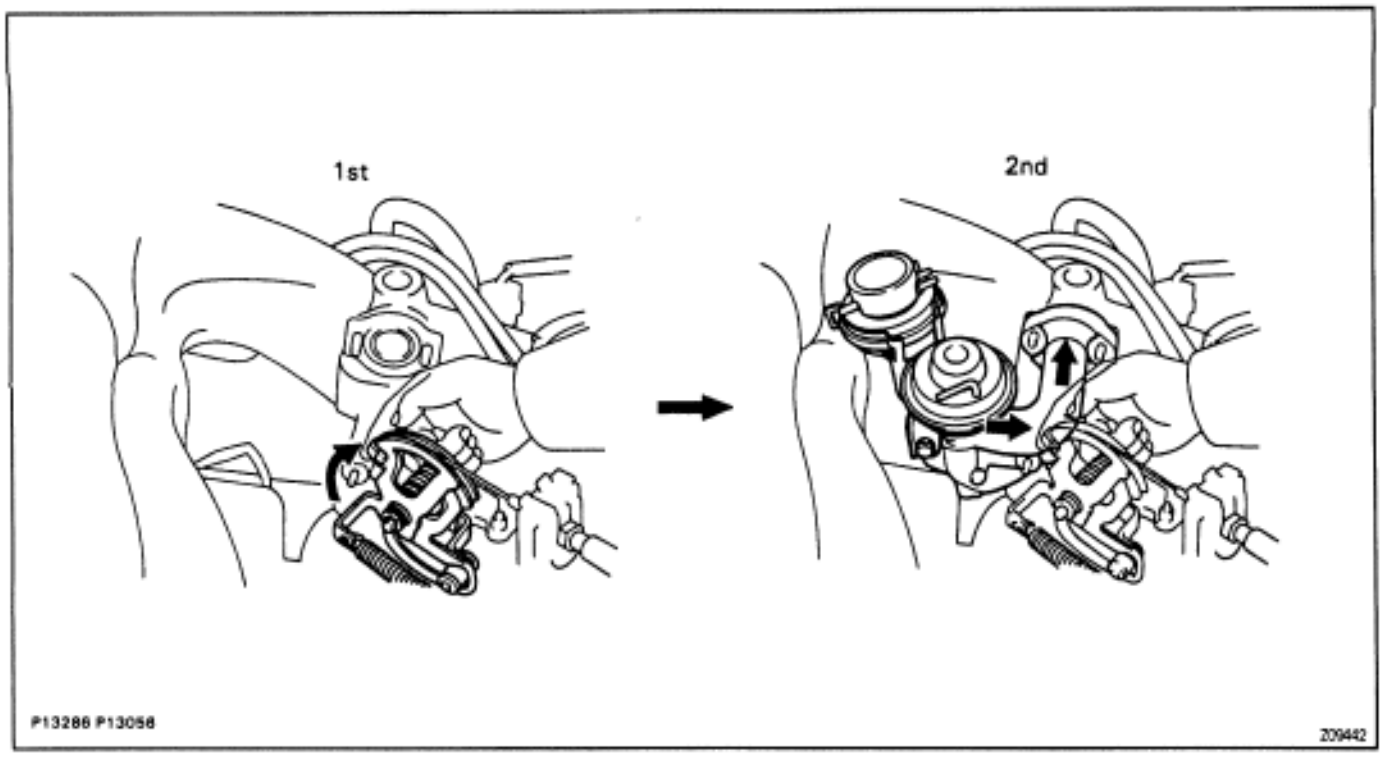


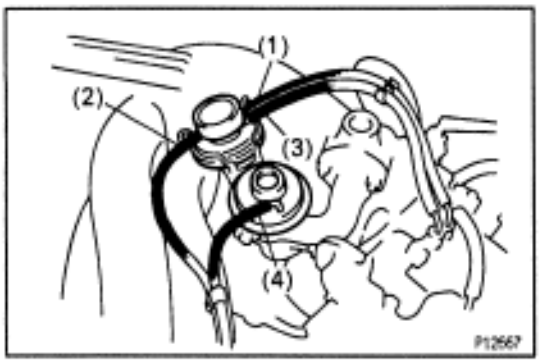


8. REINSTALL EGR VALVE AND VACUUM MODULATOR ASSEMBLY

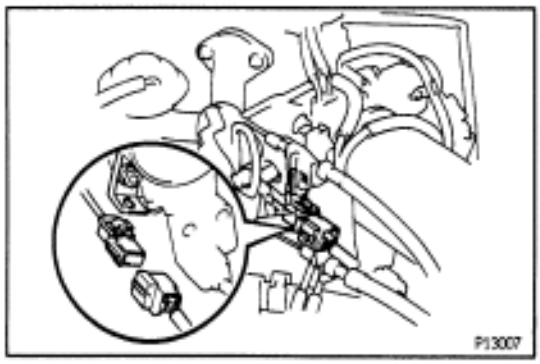
(a) Install the EGR valve and vacuum modulator assembly with the 3 nuts.

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)



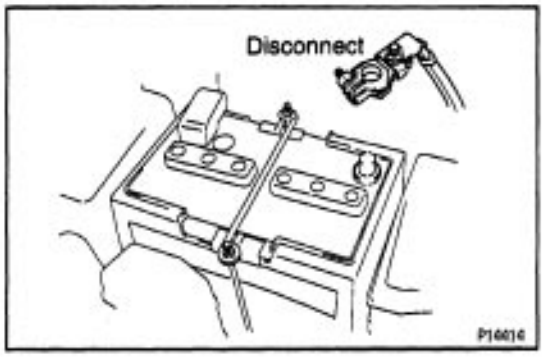


(b) Connect the following vacuum hoses:
(1) Vacuum hose to port P of EGR vacuum modulator
(2) Vacuum hose to port Q of EGR vacuum modulator
(3) Vacuum hose to port R of EGR vacuum modulator
(4) Vacuum to EGR valve



9. RECONNECT EGR GAS TEMPERATURE SENSOR CONNECTOR AND CLAMP

10. REINSTALL N0.2 EGR PIPE
Install 2 new gaskets and the EGR pipe with the 4 nuts.
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)
11. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

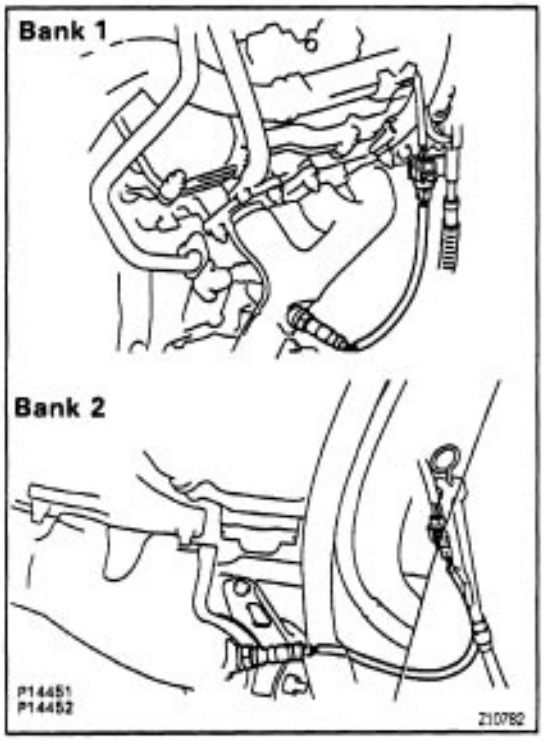


OXYGEN SENSOR

OXYGEN SENSORS INSPECTION

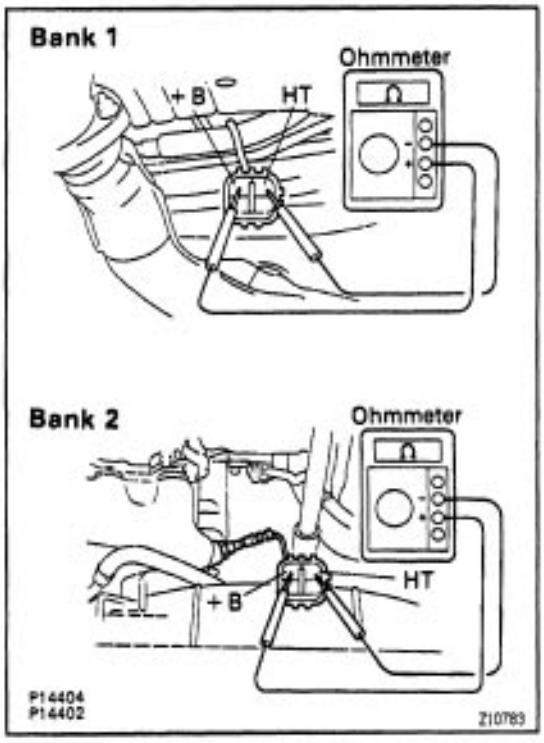
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. INSPECT HEATER RESISTANCE OF MAIN HEATED OXYGEN SENSORS

(a) Disconnect the oxygen sensor connectors.



(b) Using an ohmmeter, measure the resistance between the terminals + B and HT.

Resistance:

11 – 16Ω at 20℃ (68℉)

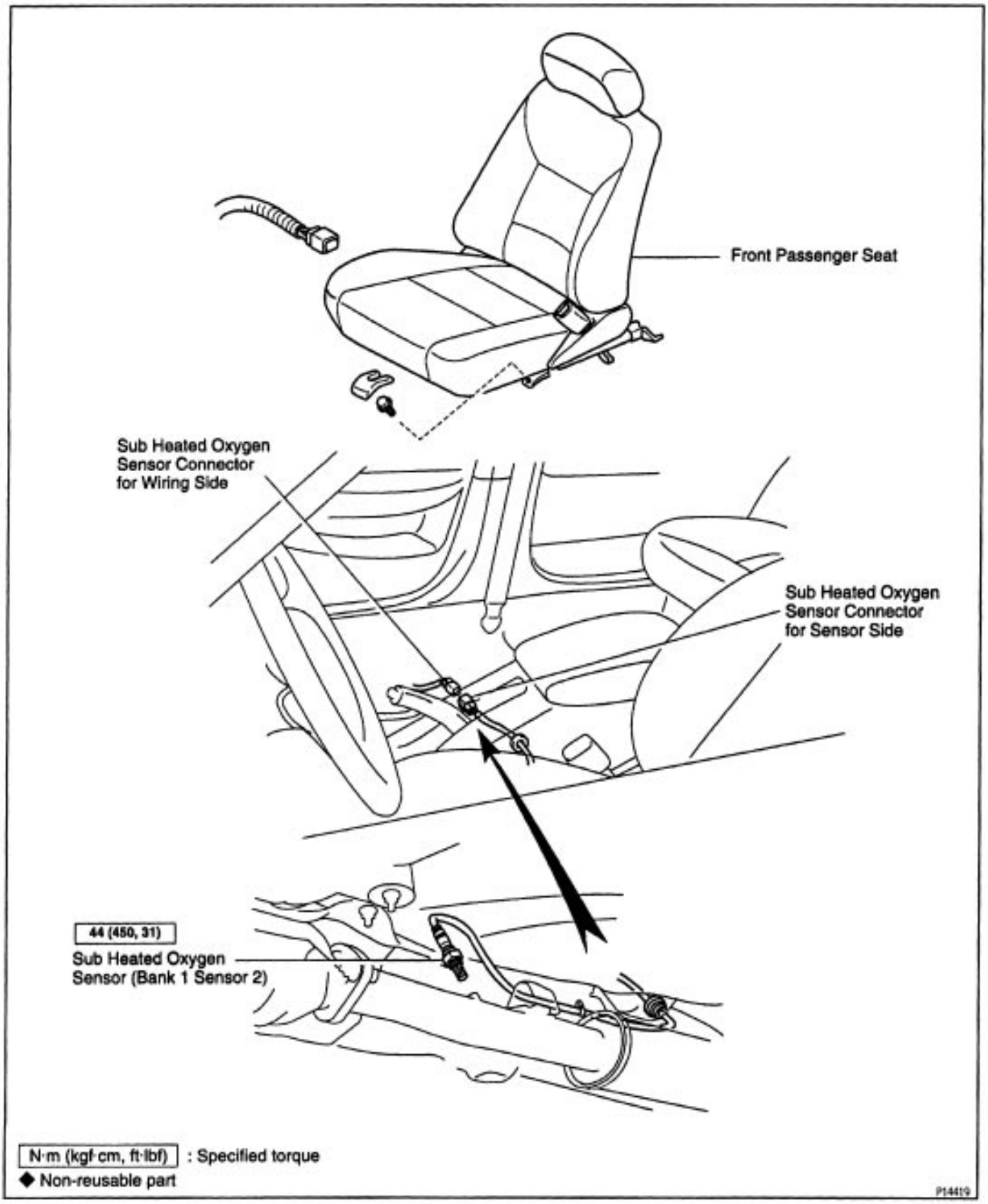
If the resistance is not as specified, replace the sensor.

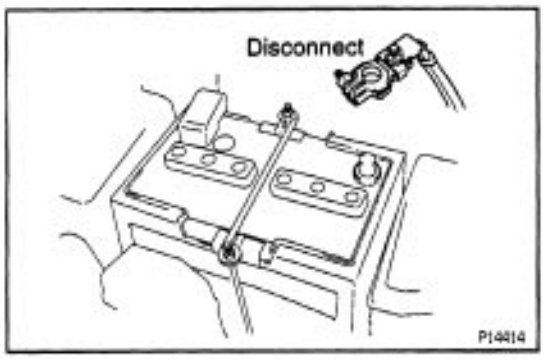
Torque: 44 N–m (450 kgf–cm, 31 ft–lbf)

(c) Reconnect the oxygen sensor connectors.

3. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

Sub Heated Oxygen Sensor COMPONENTS FOR REMOVAL AND INSTALLATION



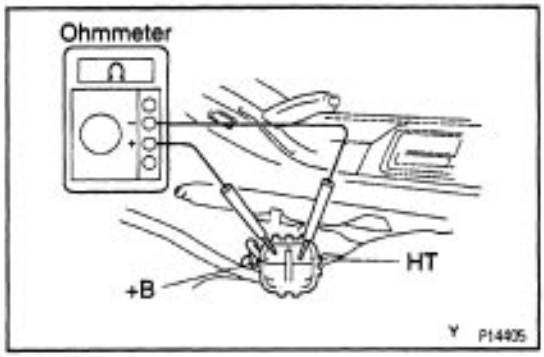


OXYGEN SENSOR INSPECTION

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. INSPECT HEATER RESISTANCE OF SUB HEATED OXYGEN SENSOR

(a) Remove the passenger's seat.
(b) Take out the consol box side of the floor carpet.
(c) Disconnect the oxygen sensor connector.
(d) Using an ohmmeter, measure the resistance between the terminals + B and HT.

Resistance:

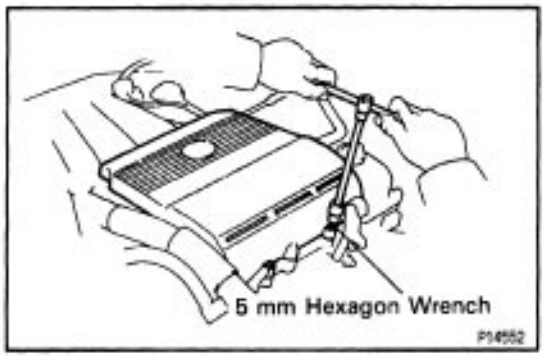
11 – 16Ω at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

(e) Reconnect the oxygen sensor connector.
(f) Reinstall the floor carpet.
(g) Reinstall the passenger's seat.

3. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

-Memo



FUEL CUT RPM

FUEL CUT OFF INSPECTION

1. REMOVE V– BANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.

2. WARM UP ENGINE

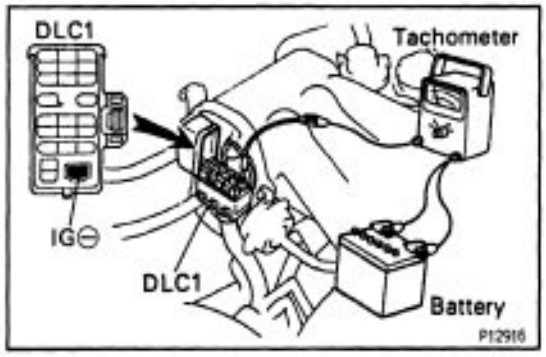
Allow the engine to warm up to normal operating temperature.

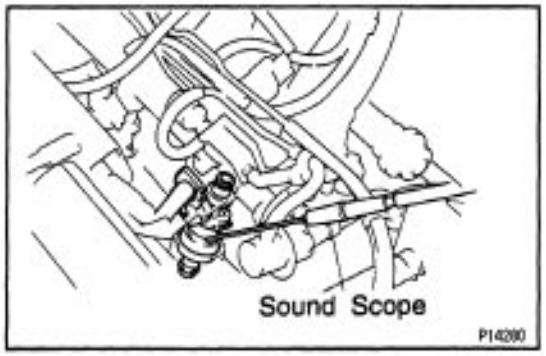
3. CONNECT TACHOMETER TO ENGINE

Connect the test probe of a tachometer to terminal IG (1) of the DLC1.

NOTICE:

- **NEVER allow the tachometer terminal to touch ground as It could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your until before use.**





4. INSPECT FUEL CUT OFF PRM

(a) Increase the engine speed to at least 3,500 rpm.

(b) Use a sound scope to check for injector operating noise.

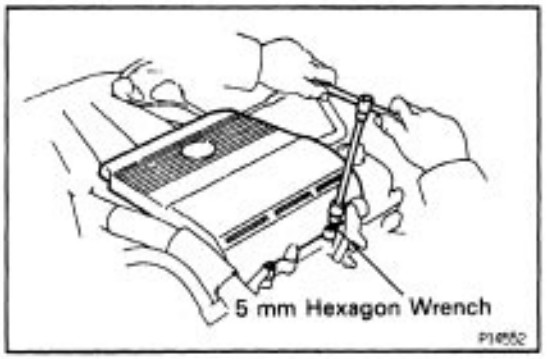
(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT: Measure with the A/C OFF.

Fuel return rpm:

1,200 rpm

5. DISCONNECT TACHOMETER



6. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V– bank cover with the 2 cap nuts.

HINT: For fixing the V– bank cover, push on the cover until sense of ”click” is felt.

SERVICE SPECIFICATIONS

SERVICE DATA

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance		Approx. 13.8 Ω
	Injection volume		54 – 64 cm³ (3.5 – 3.9 cu in.) per 15 sec.
	Difference between each cylinder		5 cm³ (0.31 cu in.) or less
	Fuel leakage		1 drop or less per minute
MAF meter	Resistance (THA – E2)	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
Throttle body	Throttle body fully closed angle		10°
	Throttle opener setting speed		900 –1,950 rpm
Throttle position sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA – E2	0.28 – 6.4 kΩ
	0.35 mm (0.014 in.)	IDL – E2	0.5 kΩ or less
	0.70 mm (0.028 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	2.0 – 11.6 kΩ
	–	VC – E2	2.7 – 7.7 kΩ
IAC valve	Resistance	+B – RSO (or RSC)	19.3 – 22.3 Ω
VSV for Fuel pressure control	Resistance	at 20°C (68°F)	33 – 39 Ω
VSV for ACIS	Resistance	at 20°C (68°F)	33 – 39 Ω
VSV for EGR	Resistance	at 20°C (68°F)	33 – 39 Ω
A/C idle–up valve	Resistance	at 20°C (68°F)	30 – 33 Ω
ECT sensor	Resistance	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
EGR gas temperature sensor	Resistance	at 50°C (122°F)	64 – 97 kΩ
		at 100°C (212°F)	11 – 16 kΩ
		at 150°C (302°F)	2 – 4 kΩ
Main heated oxygen sensor	Heater coil resistance	at 20°C (68°F)	11 – 16 Ω
Sub heated oxygen sensor	Heater coil resistance	at 20°C (68°F)	11 – 16 Ω
Fuel cut rpm	Fuel return rpm		1,200 rpm

TORQUE SPECIFICATIONS

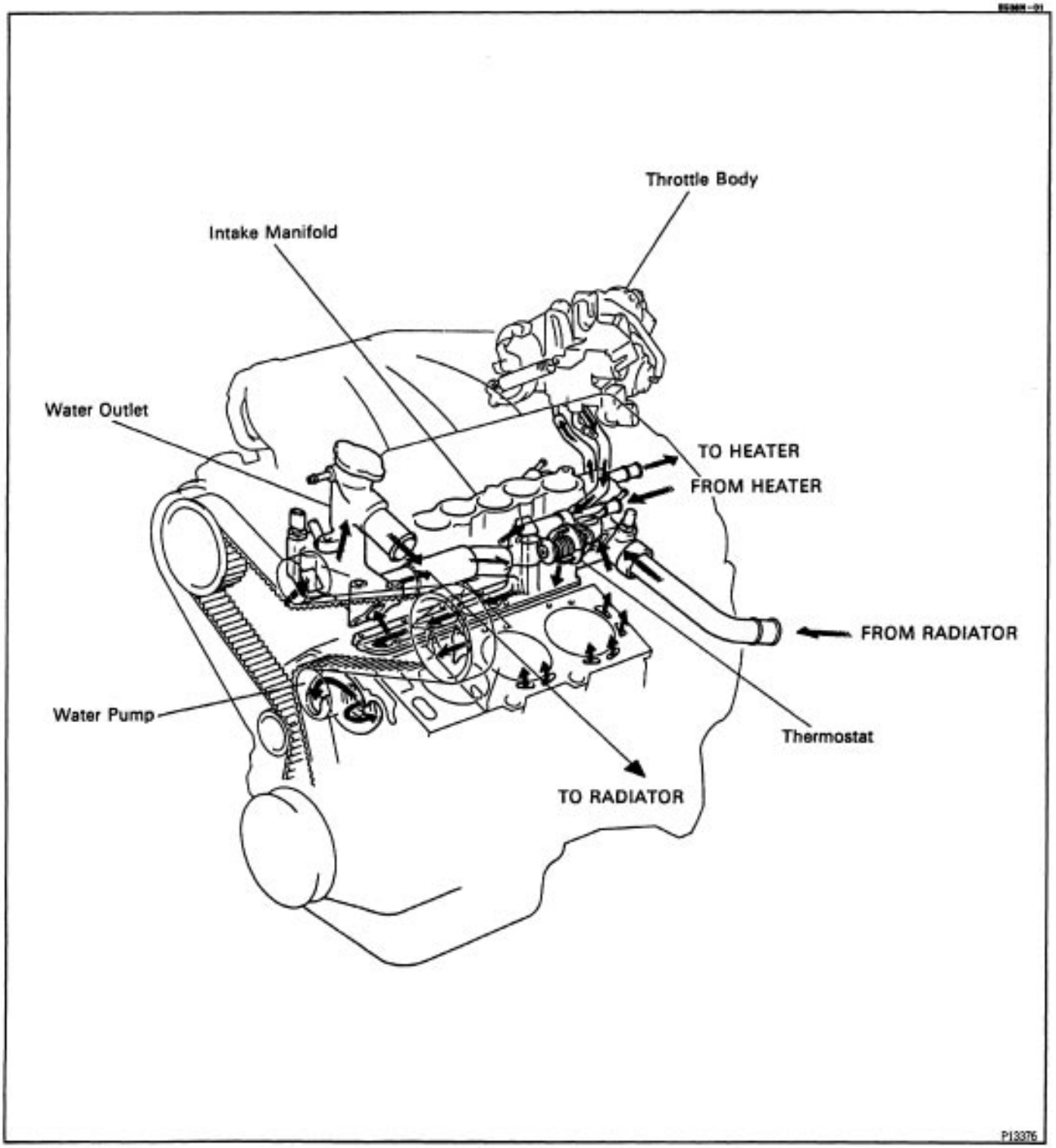
Part tightened	N·m	kgf-cm	ft·lbf
Fuel line (Union bolt type)	29	300	22
Fuel line (Flare nut type for fuel pump side)	28	285	21
Fuel line (Flare nut type for others)	30	310	22
Fuel tank band x Body	39	400	29
Fuel pump x Fuel tank	4	40	35 in.·lbf
Fuel pressure regulator x Delivery pipe	8	80	69 in.·lbf
Delivery pipe x Cylinder head	10	100	7
No.1 fuel pipe x Intake manifold	19.5	200	14
No.2 fuel pipe x Delivery pipe	19.5	200	14
Air intake chamber x Intake manifold	43	440	32
EGR pipe x EGR vacuum modulator	12	120	9
EGR pipe x RH exhaust manifold	12	120	9
No. 1 engine hanger x Air intake chamber	39	400	29
Air intake chamber stay x Air intake chamber	19.5	200	14
Ground stop x Intake air control valve	14.5	145	10
Emission control valve set x Air intake chamber	8	80	69
MAF meter x Air cleaner	6.9	70	61
Throttle body x air intake chamber	19.5	200	14
Intake air control valve x Air intake chamber	14.5	145	10
ECT switch x Water outlet	20	200	14
Knock sensor x Cylinder head	39	400	29
Water outlet x Cylinder head	15	150	11
RH engine mounting stay x Water outlet	31.4	320	23
RH engine mounting stay x No.2 RH engine mounting bracket	31.4	320	23
Intake manifold x Cylinder head	15	150	11
EGR gas temperature sensor x EGR valve	20	200	14
EGR valve x Air intake chamber	12	120	9
Main heated oxygen sensor x Exhaust manifold	44	450	31
Sub heated oxygen sensor x Exhaust pipe	44	450	31

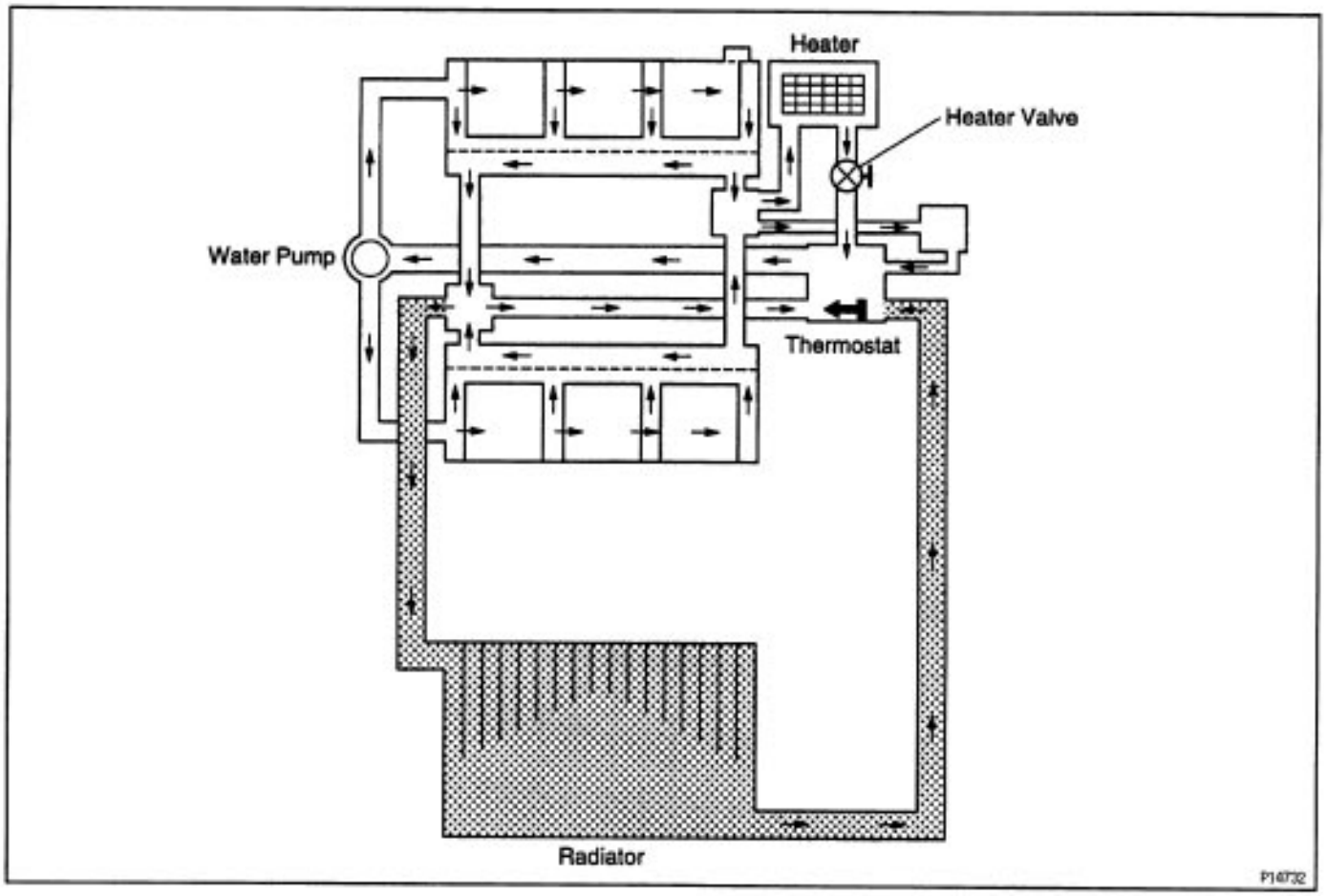
COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a bypass valve mounted on the inlet side.

OPERATION





The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electronically controlled hydraulic cooling fan, hoses and other components.

Coolant which is heated in the water jacket is pumped to the radiator, through which a cooling fan blows air to cool the coolant as it passes through. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.

The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

RADIATOR

The radiator, mounted in the front of the vehicle, performs the function of cooling the coolant which has passed through the water jacket and become hot. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for coolant from the water jacket. The lower tank has an outlet and drain plug for the coolant. The core contains many tubes through which coolant flows from the upper tank to the lower tank as well as cooling fins which radiate heat away from the coolant in the tubes.

The air sucked through the radiator by the cooling fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the coolant. Models with an automatic transmission include an automatic transmission fluid cooler built into the lower tank of the radiator. A cooling fan is mounted behind the radiator to assist the flow of air through the radiator. When the coolant temperature is low, the fan operates slowly to help the engine warm up, and when the coolant temperature becomes high, the fan speed is increased to provide the air flow required for cooling.

RADIATOR CAP (on water outlet)

The radiator cap is a pressure–type cap which seals the engine coolant circuit and the resulting pressurization of the engine as the coolant expands. The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100°C (212°F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110 – 120°C (230 – 248°F), pressure: 83 – 113 kPa (0.85 – 1.15 kgf/cm^2,12.1 – 16.4 psi). The vacuum valve opens to alleviate the vacuum which develops in the coolant system after the engine is stopped and the coolant temperature drops. The valve's opening allows the coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. The coolant in the reservoir tank returns to the water outlet when the coolant temperature drops thus keeping the radiator full at all times and avoiding needless coolant loss. Check the reservoir tank level to learn if the coolant needs to be replenished.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a timing belt.

THERMOSTAT

The thermostat has a wax type bypass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the coolant tempera–ture. This valve closes when the coolant temperature drops, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the coolant temperature has risen, allowing the circulation of coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction allows the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82°C (180°F).

ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN (See page EG2–346)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09230–01010 Radiator Service Tool Set	
	09249–63010 Torque Wrench Adaptor	RH camshaft timing pulley
	09620–30010 Steering Gear Box Replacer Set	
	(09627–30010) Steering Sector Shaft Bushing Replacer	Hydraulic motor oil seal
	(09631 –00020) Handle	Hydraulic motor oil seal
	09843–18020 Diagnosis Check Wire	
	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	

RECOMMENDED TOOLS

	09025–00010 Smell Torque Wrench	For measuring preload
	09082–00050 TOYOTA Electrical Tester Set	
	09905–00013 Snap Ring Pliers	

EQUIPMENT

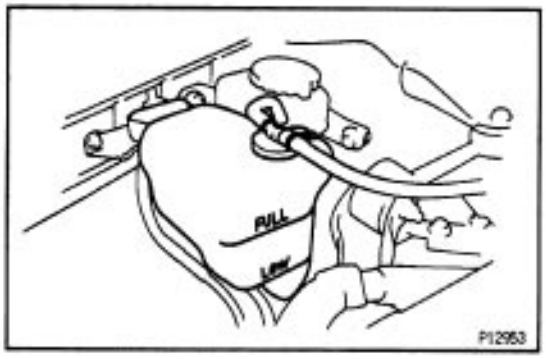
Caliper gauge	
Heater	ECT sensor
Precision straight edge	
Radiator cap tester	
Micrometer	
Thermometer	ECT sensor
Torque wrench	
Vernier calipers	

LUBRICANT

Item	Capacity	Classification
Power steering fluid (Total) (Hydraulic cooling fan fluid)	2.2 liters (2.3 US qts, 1.9 Imp. qts)	ATF DEXRON® II

COOLANT

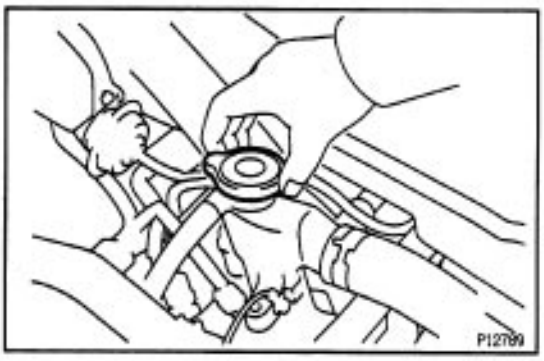
Item	Capacity	Classification
Engine coolant	8.7 liters (9.2 US qts, 7.7 Imp. qts)	Ethylene–glycol base



COOLANT CHECK

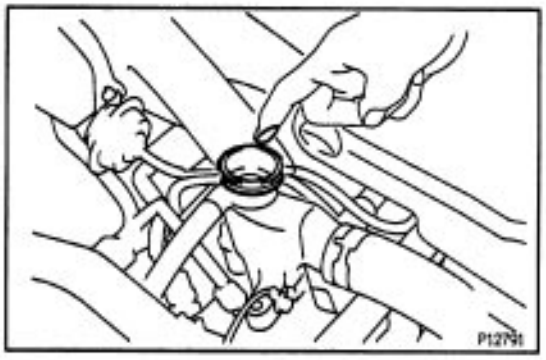
1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the ”LOW” and ”FULL” lines.
If low, check for leaks and add engine coolant up to the ”FULL’ line.

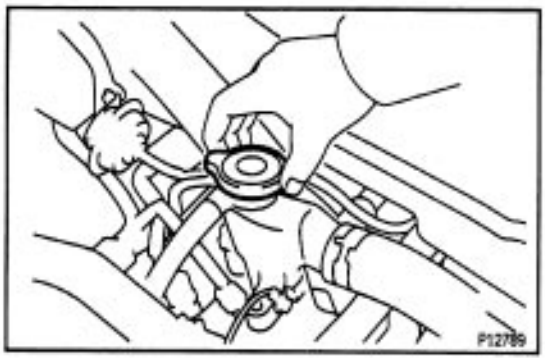


2. CHECK ENGINE COOLANT QUALITY

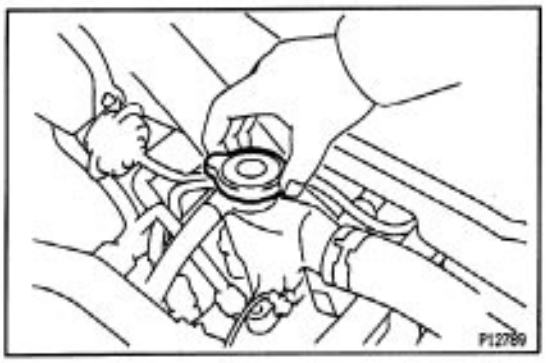
(a) Remove the radiator cap from the water outlet.
CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



(b) There should not be any excessive deposits of rust or scale around the radiator cap or water outlet filler hole, and the coolant should be free from oil.
If excessively dirty, clean the coolant passages and replace the coolant.



(c) Reinstall the radiator cap.

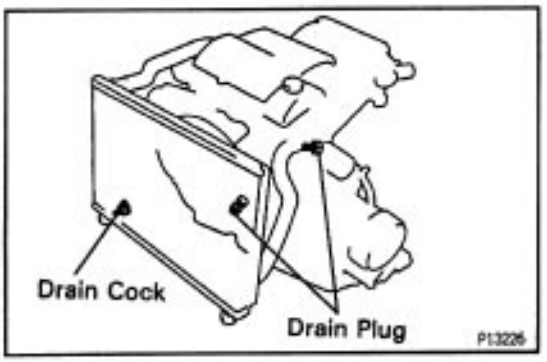


COOLANT REPLACEMENT

1. DRAIN ENGINE COOLANT

(a) Remove the radiator cap from the water outlet.

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

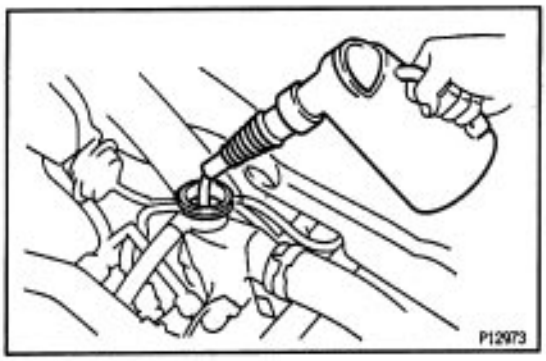


(b) Loosen the drain cock (for the radiator) and drain plugs (for the engine), and drain the coolant.

(c) Close the drain plugs and cock.

Torque:

7 N–m (70 kgf–cm, 61 in.–lbf) for RH drain plug
13 N–m (130 kgf–cm, 9 ft–lbf) for LH drain plug



2. FILL ENGINE COOLANT

(a) Slowly fill the system with coolant.

- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer's directions.
- Using coolant which includes more than 50% ethylene–glycol (but not more than 70 96) is recommended.

NOTICE:

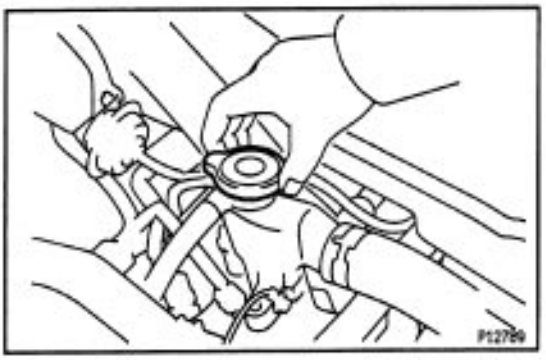
- **Do not use an alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

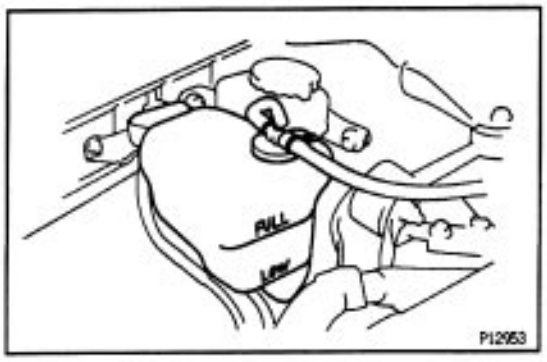
Capacity:

8.7 liters (9.2 US qts. 7.7 Imp. qts)

(b) Install the radiator cap.

(c) Start the engine, and bleed the cooling system.



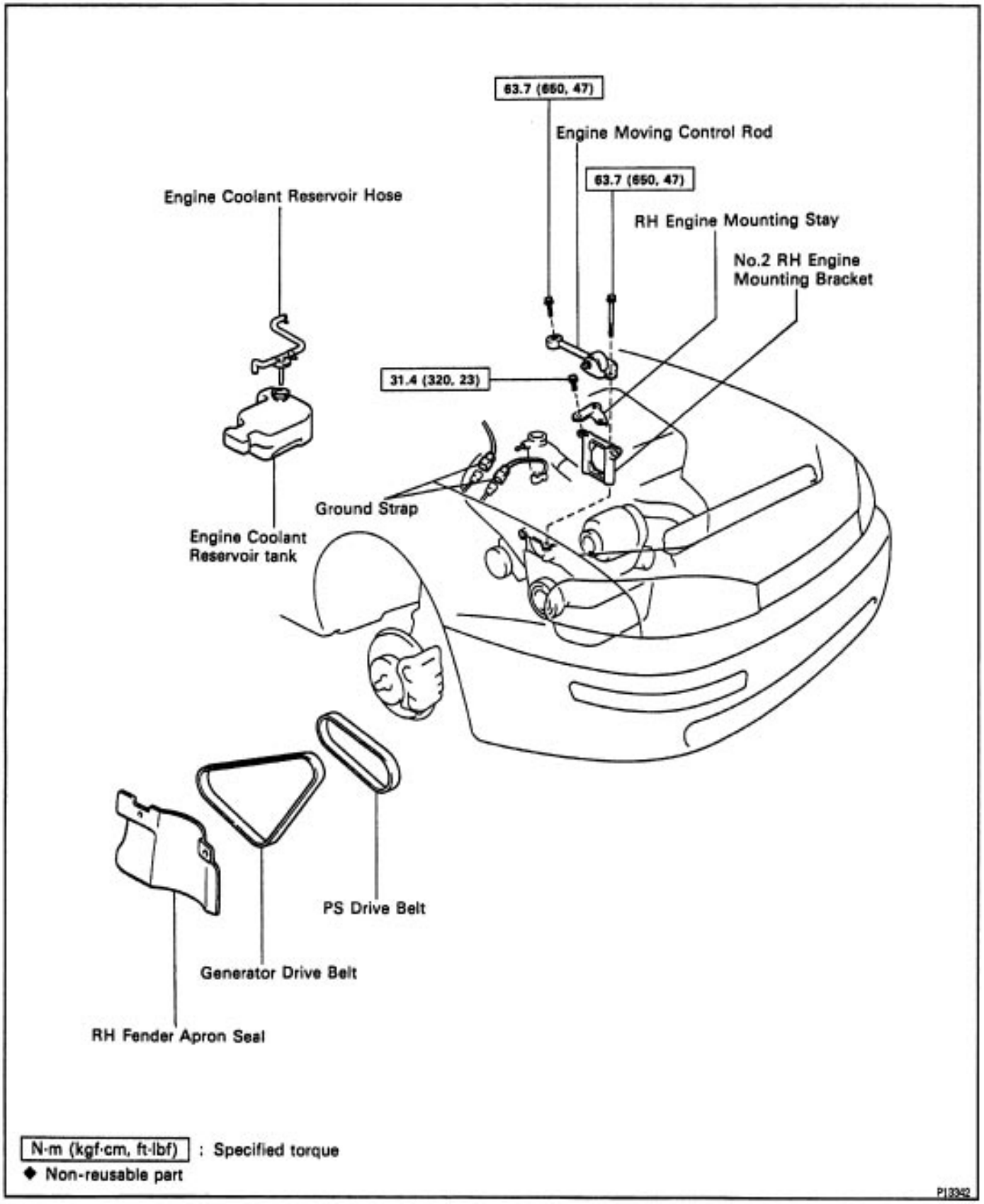


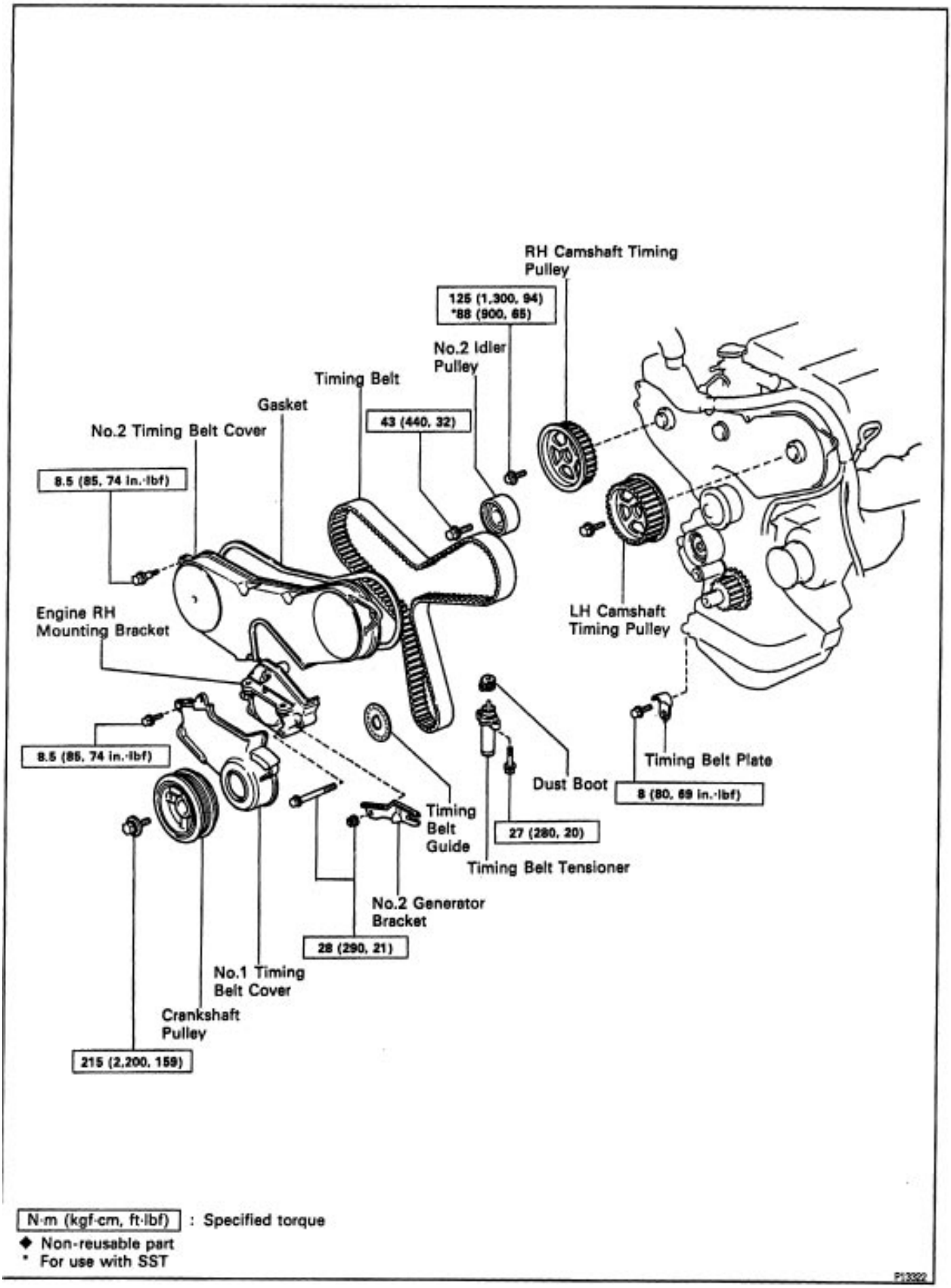
(d) If necessary, refill coolant into the reservoir tank up to the "FULL" line.

3. CHECK ENGINE COOLANT FOR LEAKS

WATER PUMP

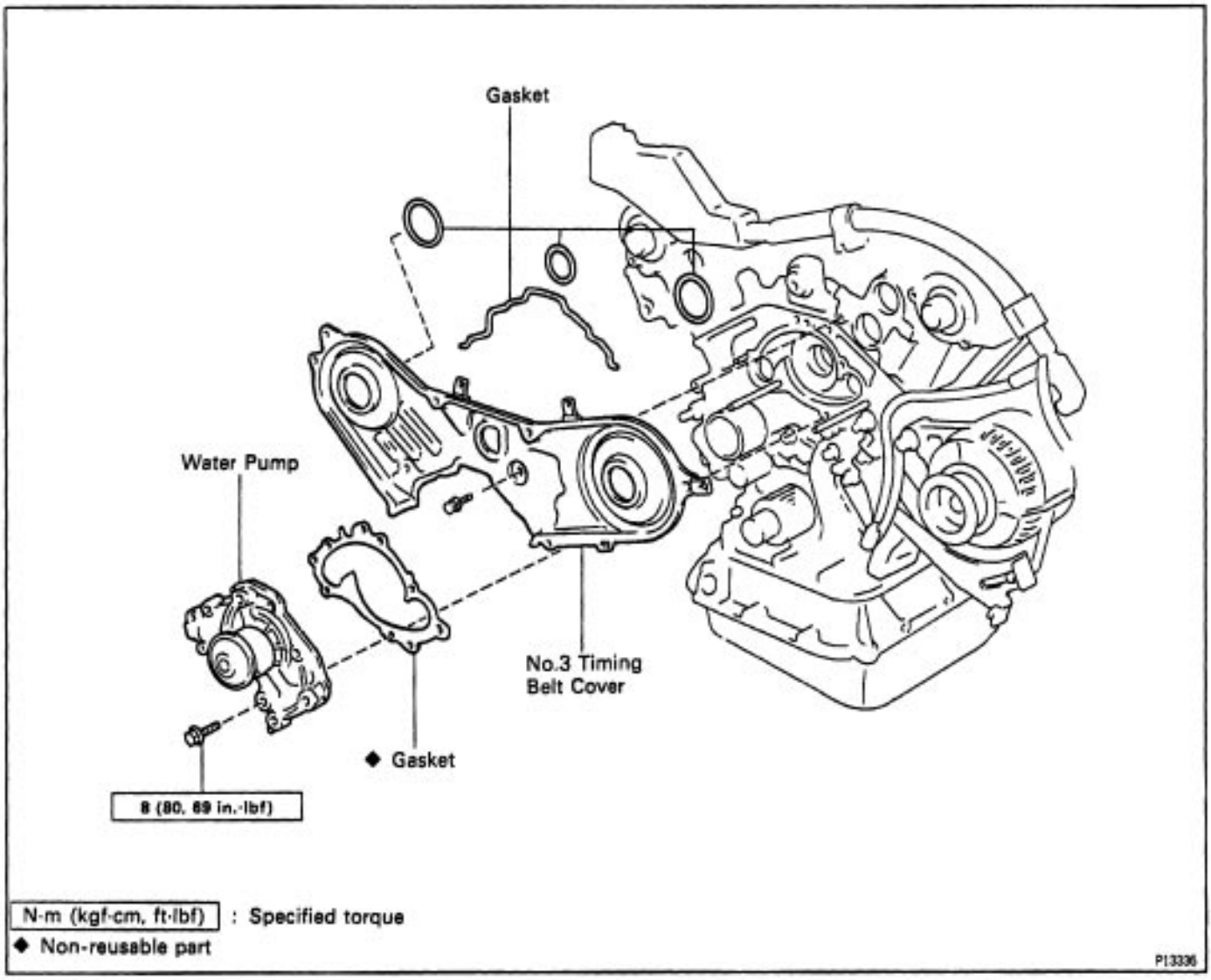
COMPONENTS FOR REMOVAL AND INSTALLATION

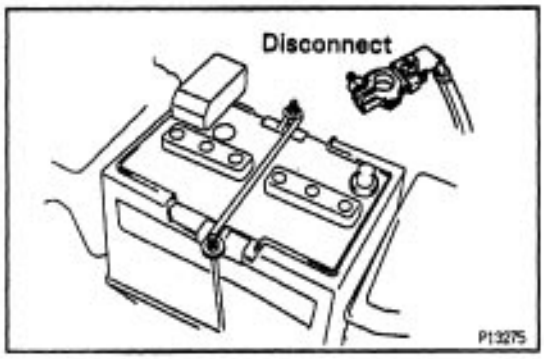




N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* For use with SST

P13922





WATER PUMP REMOVAL

(See Components for Removal and Installation)

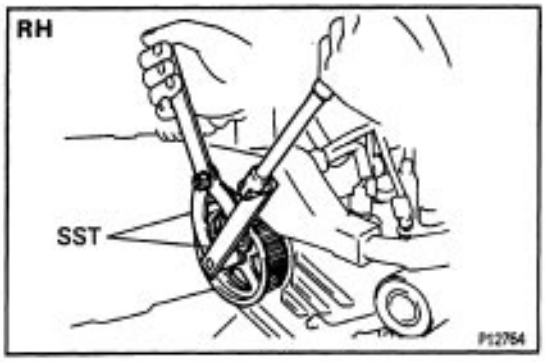
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

2. DRAIN ENGINE COOLANT

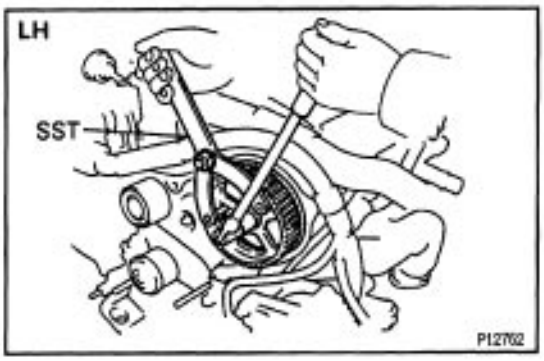
3. REMOVE TIMING BELT

(See steps 2 to 20 on pages EG2–41 to 45)

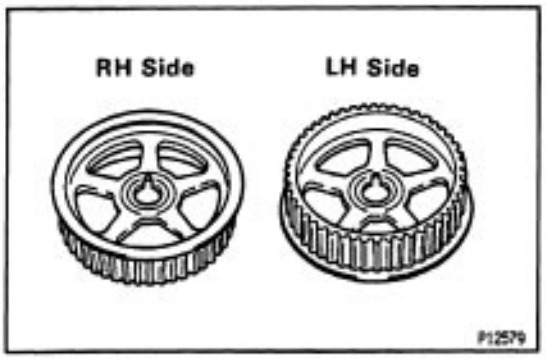


4. REMOVE CAMSHAFT TIMING PULLEYS

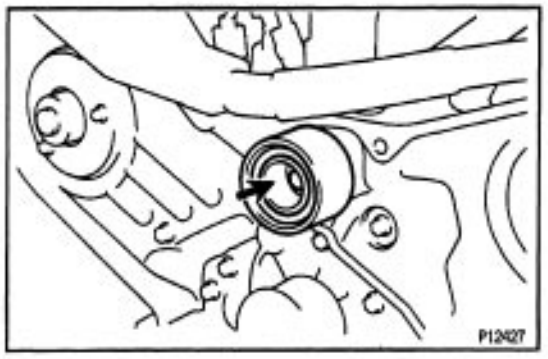
(a) Using SST, remove the bolt and RH timing pulley.
SST 09249–63010, 09960–10010 (09962–01000)



(b) Using SST, remove the bolt and LH timing pulley.
SST 09960–01000 (09962–01000)

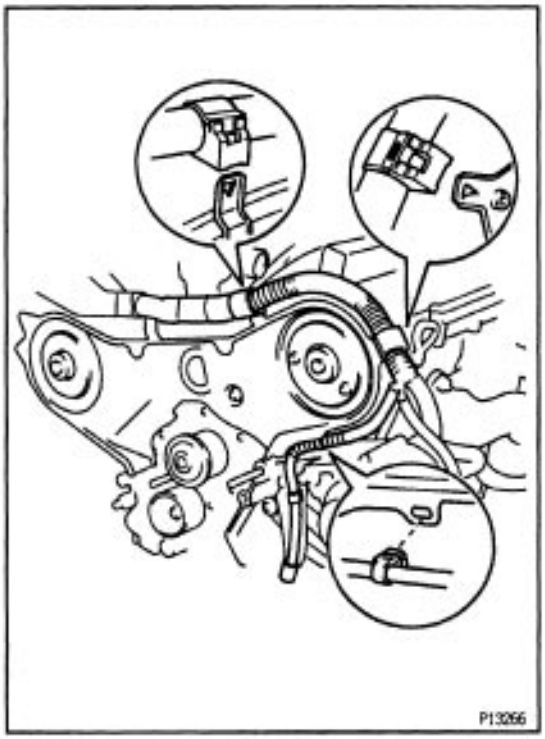


HINT: Arrange the camshaft timing pulleys (RH and LH sides).



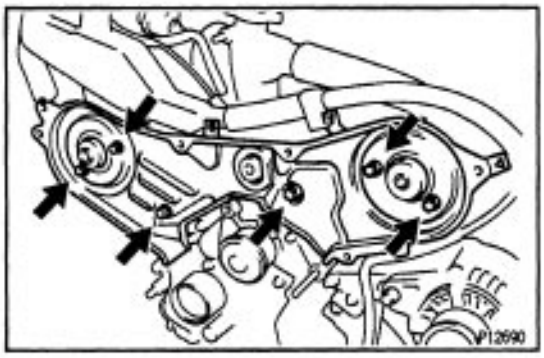
5. REMOVE NO.2 IDLER PULLEY

Remove the bolt and idler pulley.



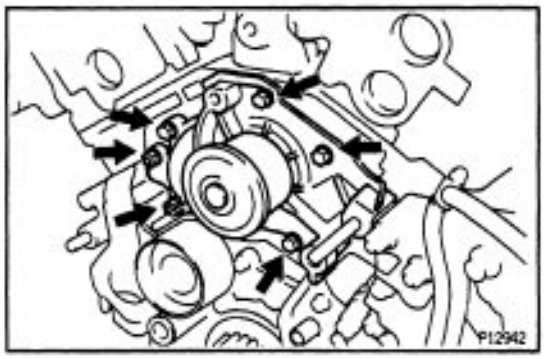
6. DISCONNECT ENGINE WIRE

Disconnect the 3 clamps and engine wire from the No. 3 timing belt cover.



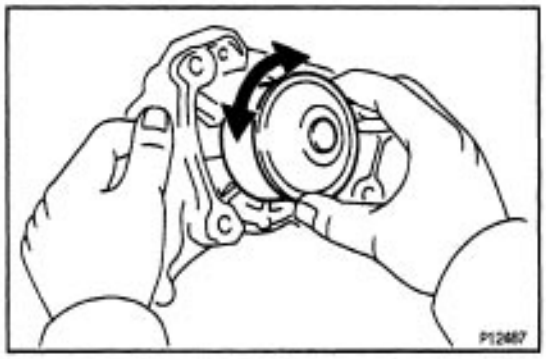
7. REMOVE NO.3 TIMING BELT COVER

Remove the 6 bolts and belt cover.



8. REMOVE WATER PUMP

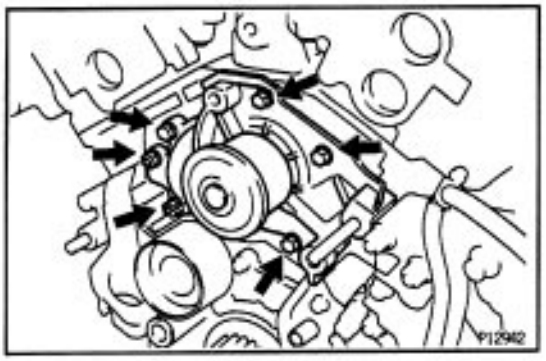
Remove the 4 bolts, 2 nuts, water pump and gasket.



WATER PUMP INSPECTION

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.



WATER PUMP INSTALLATION

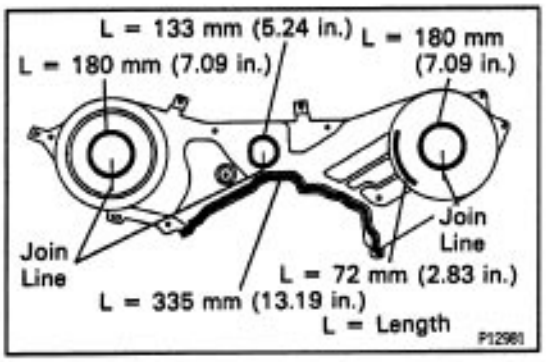
(See Components for Removal and Installation)

1. INSTALL WATER PUMP

Install a new gasket and the water pump with the 4 bolts and 2 nuts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

NOTICE: Do not get oil on the gasket.



2. INSTALL N0.3 TIMING BELT COVER .

(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.

If the gaskets do have cracks or peeling, etc., replace them using the following steps.

(1) Using a screwdriver and gasket scraper, remove all the old gasket material.

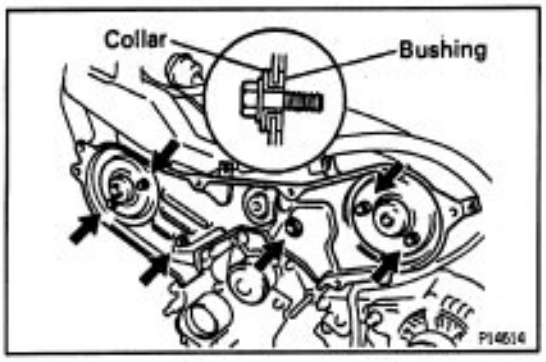
(2) Thoroughly clean all components to remove all the loose material.

(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.

NOTICE: When joining gaskets, do not leave a gap between them. Cut off any excess gasket.

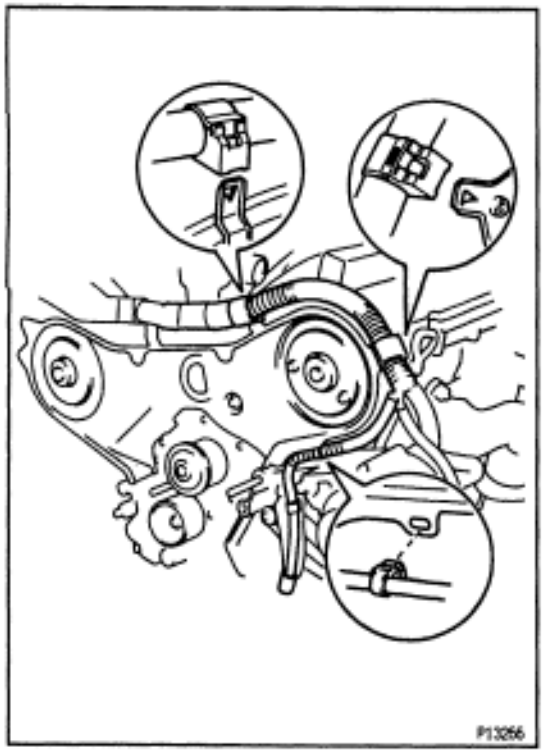
(4) After installing the gasket, press down on it so that the adhesive firmly sticks to the belt cover.

(b) Install new gaskets to the No.3 belt cover.



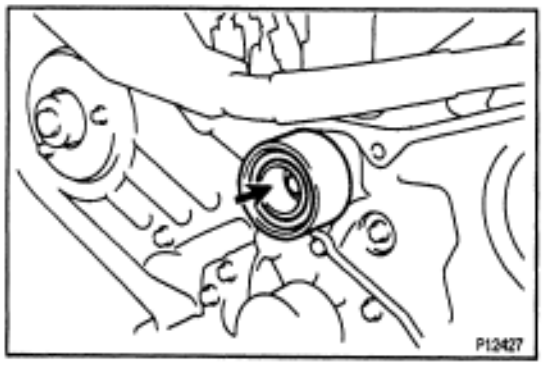
(c) Install the belt cover with the6 bolts.

Torque: 8.5 N–m (85 kgf–cm, 74in.–lbf)



3. CONNECT ENGINE WIRE

Connect the engine wire with the 3 clamps.

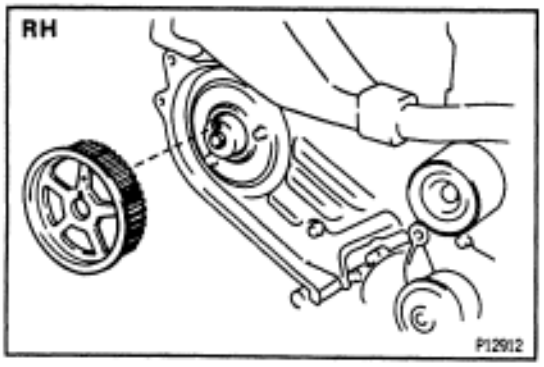


4. INSTALL N0.2 IDLER PULLEY

(a) Install the idler pulley with the bolt.

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

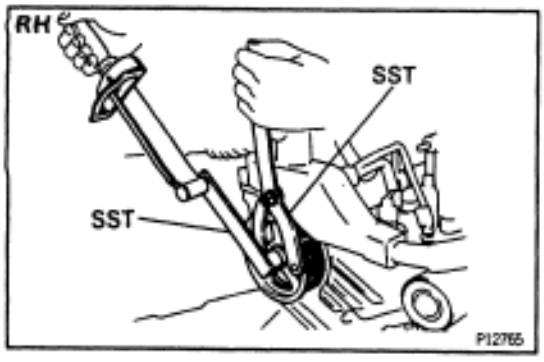
(b) Check that the idler pulley moves smoothly.



5. INSTALL RH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side outward.

(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

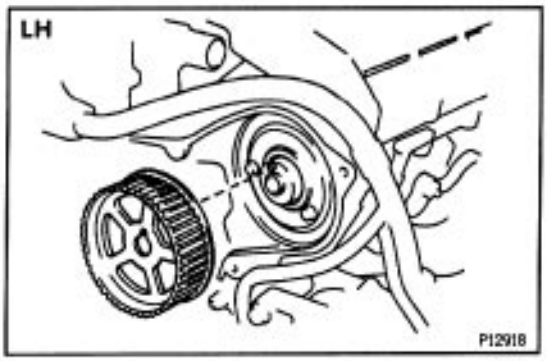


(c) Using SST, install and torque the bolt.

SST 09249–63010, 09960–10010 (09962–01000)

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

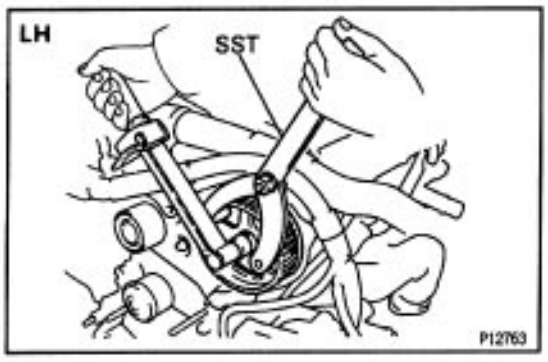
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.)



6. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Install the timing pulley, facing the flange side inward.

(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.



(c) Using SST, install and torque the bolt.

SST 09960–10010 (09962–01000)

Torque: 125 N–m (1,300 kgf–cm, 94 ft–lbf)

7. INSTALL TIMING BELT

(See steps6 to 27 on pages EG2–51 **to 56)**

8. FILL WITH ENGINE COOLANT

Capacity:

8.7 liters (9.2 US qts, 7.7 Imp. qts)

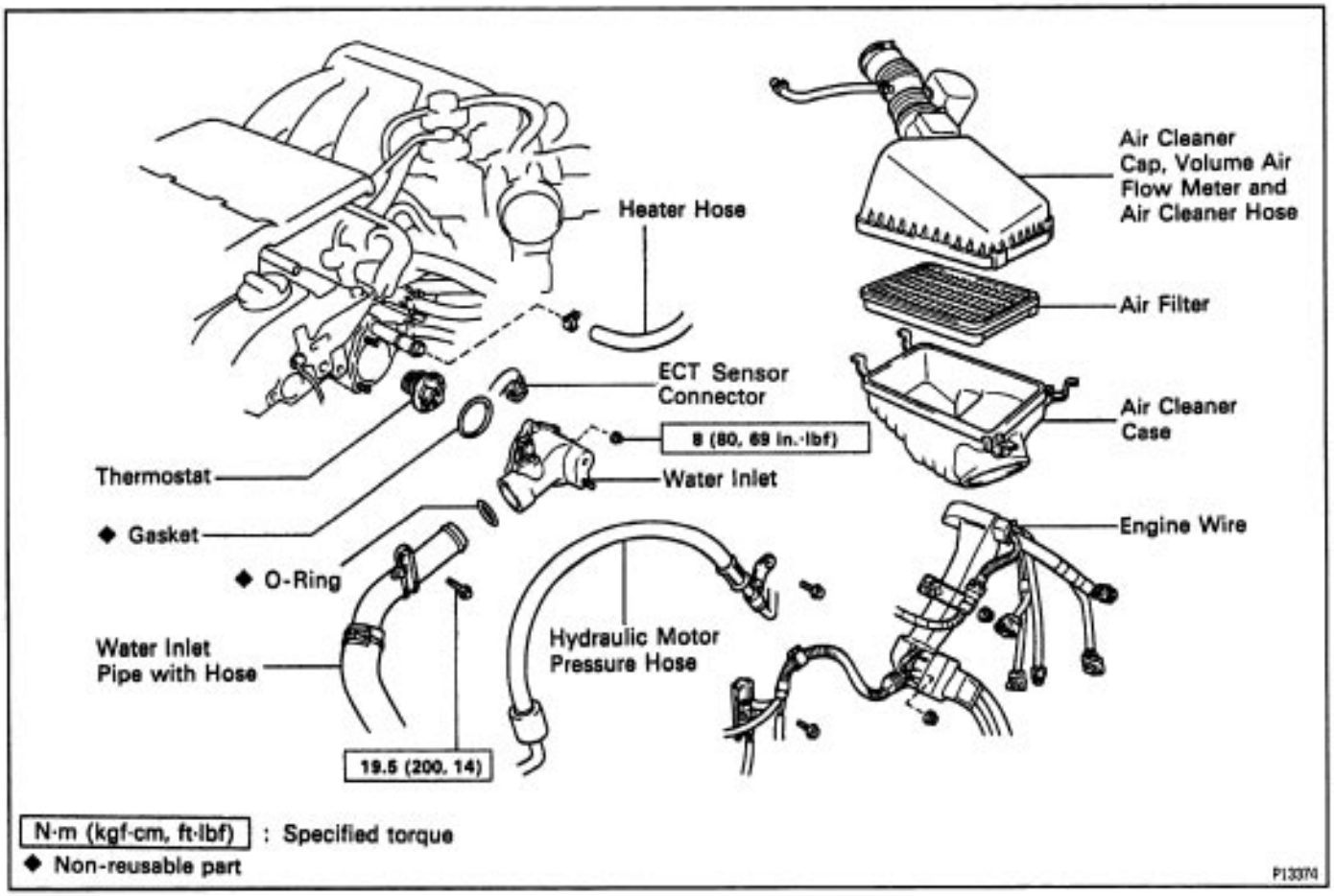
9. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

10. START ENGINE AND CHECK FOR LEAKS

11. RECHECK ENGINE COOLANT LEVEL

THERMOSTAT

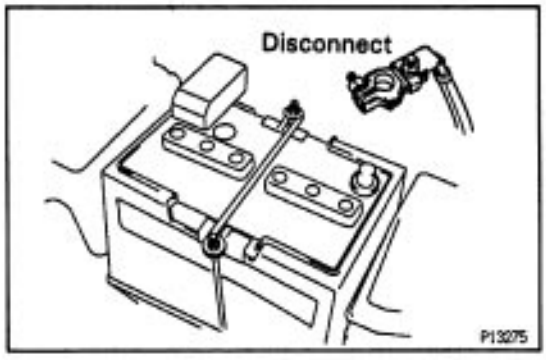
COMPONENTS FOR REMOVAL AND INSTALLATION



THERMOSTAT REMOVAL

(See Components for Removal and Installation)

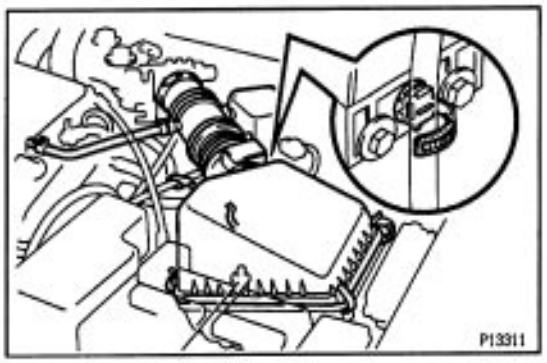
HINT: Removal of the thermostat would have an ad–verse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.

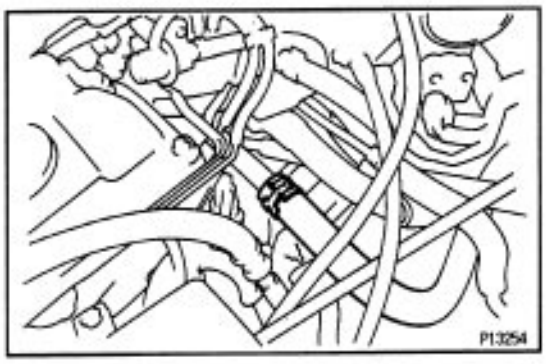
2. DRAIN ENGINE COOLANT



3. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector and wire clamp.
(b) Disconnect the accelerator cable clamp.
(c) Disconnect the PCV hose.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the 4 air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.

4. DISCONNECT HEATER HOSE



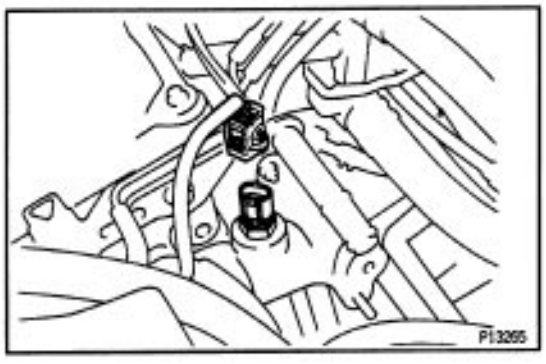
5. DISCONNECT PRESSURE HOSE OF HYDRAULIC MOTOR

Remove the bolt and disconnect the pressure hose from the water inlet.

6. DISCONNECT ENGINE WIRE

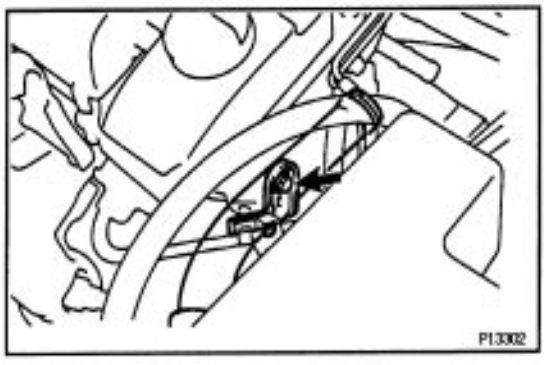
Remove the 2 nuts and disconnect the engine wire from the water inlet and cylinder head.

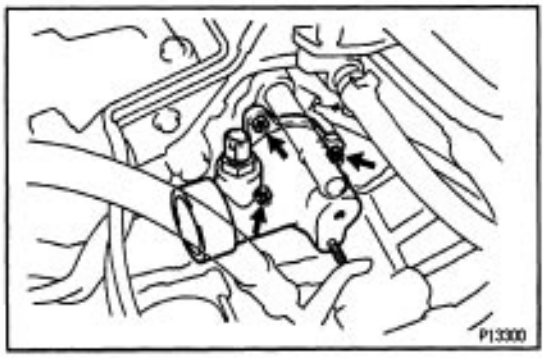
7. DISCONNECT ENGINE COOLANT TEMPERATURE (ECT) SENSOR CONNECTOR



8. DISCONNECT WATER INLET PIPE

(a) Remove the bolt holding the water inlet pipe to the cylinder head.
(b) Disconnect the water inlet pipe and remove the 0–ring.

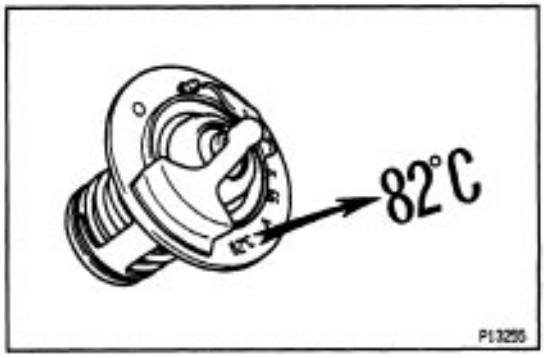




8. REMOVE WATER INLET

Remove the 3 nuts and water inlet from the water inlet housing.

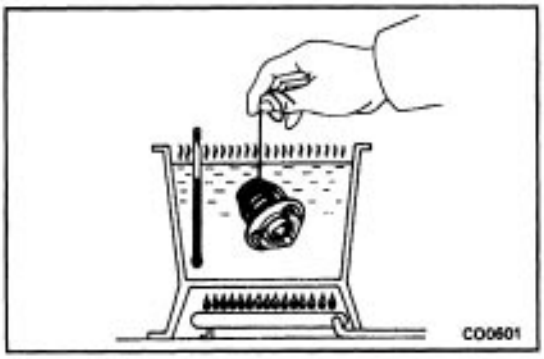
10. REMOVE THERMOSTAT AND GASKET



THERMOSTAT INSPECTION

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.



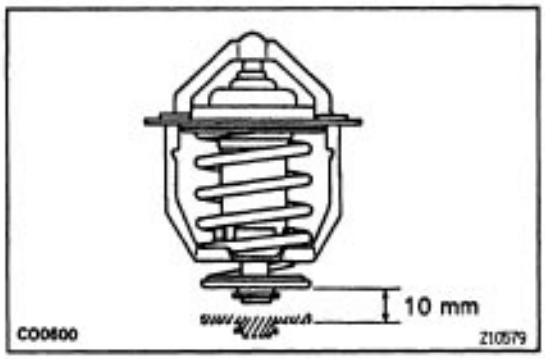
(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:

80 – 84˚C (176 – 183˚F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.

Volvo lift:

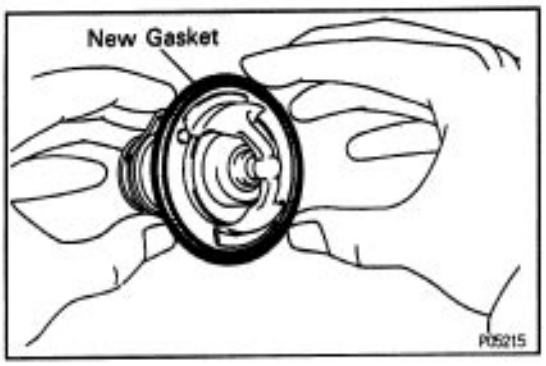
10.0 mm (0.394 In.) or more at 95˚ C (203®F)

If the valve lift is not as specified, replace the thermo–stat.

(d) Check that the valve spring is tight when the thermo–stat is fully closed.

If not closed, replace the thermostat.

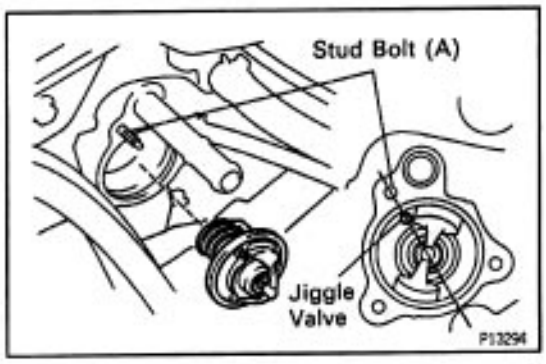
THERMOSTAT INSTALLATION



(See Components for Removal and Installation)

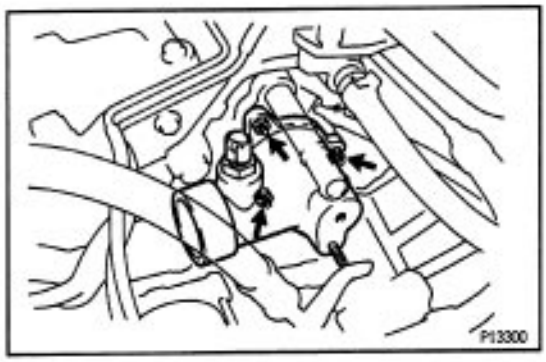
1. PLACE THERMOSTAT IN WATER PUMP

(a) Install a new gasket to the thermostat.



(b) Align the jiggle valve of the thermostat with stud bolt (A), and insert the thermostat in the water inlet housing.

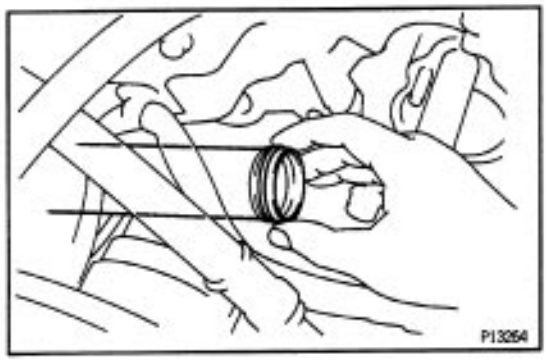
HINT: The jiggle valve may be set within 30®of either side of the prescribed position.



2. INSTALL WATER INLET

Install the water inlet with the 3 nuts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



3. INSTALL WATER INLET PIPE

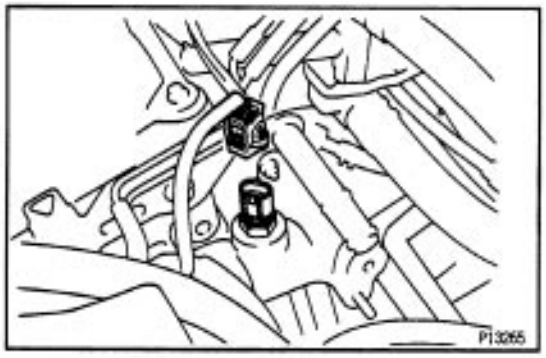
(a) Install a new 0 – ring to the water inlet pipe.

(b) Apply soapy water to the 0 – ring.

(c) Connect the water inlet pipe to the water inlet.

(d) Install the bolt holding the water inlet pipe to the cylinder head.

Torque: 19.5 N–m (200 kgf–cm, 14 ft–lbf)



4. CONNECT ENGINE COOLANT TEMPERATURE SENSOR (ECT) CONNECTOR

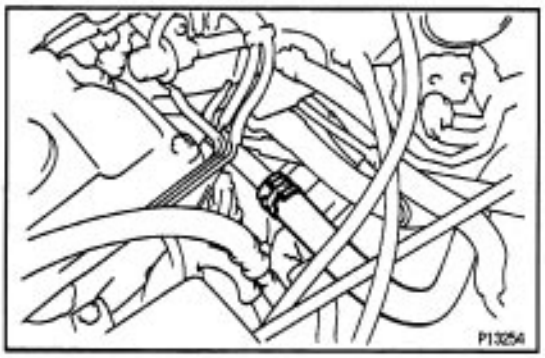
5. CONNECT ENGINE WIRE

Connect the engine wire to the water inlet and cylin–der head with the 2 nuts.

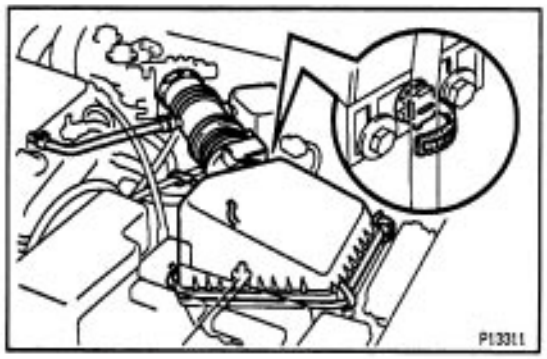
6. CONNECT HYDRAULIC MOTOR PRESSURE HOSE

Connect the pressure hose with the bolt.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



7. CONNECT HEATER HOSE



8. REINSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air clean–er cap and volume air flow meter with the 4 clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the PCV hose.
(d) Connect the accelerator cable clamp.
(e) Connect the volume air flow meter connector and wire clamp.

9. FILL WITH ENGINE COOLANT

Capacity:

8.7 liters (9.2 US qts, 7.7 Imp. qts)

10. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

11. START ENGINE AND CHECK FOR LEAKS

12. RECHECK ENGINE COOLANT LEVEL

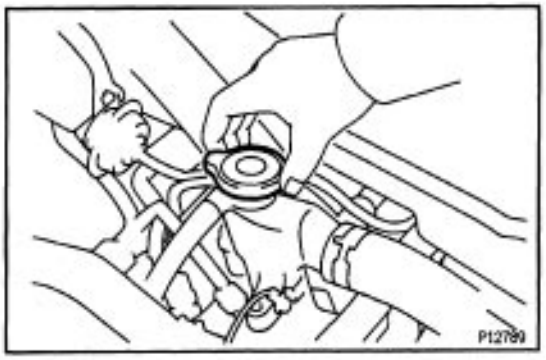
RADIATOR

RADIATOR CLEANING

Using water or a steam cleaner, remove any mud and dirt from the radiator core.

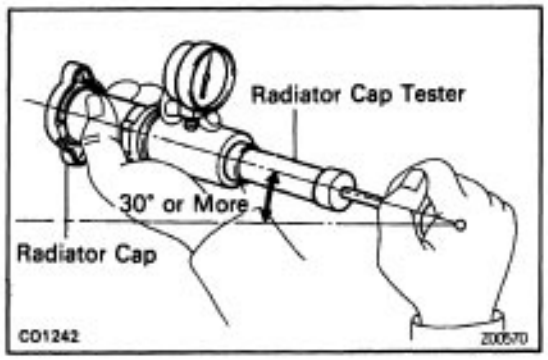
NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942 – 3,432 kPa (30 – 35 kgf/cm^2, 427 – 498 psi), keep a distance of at least 40 cm (15.75 in.) between the radiator core and cleaner nozzle.

RADIATOR INSPECTION



1. REMOVE RADIATOR CAP FROM WATER OUTLET

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



2. INSPECT RADIATOR CAP

NOTICE: When performing steps (a) and (b) below, keep the radiator pump tester at an angle of over 30® above the horizontal.

(a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the relief valve.

Pump speed:

1 push/3 seconds or more

NOTICE: Push the pump at a constant speed.

If air is not coming from the relief valve, replace the radiator cap.

(b) Pump the tester several times and measure the relief valve opening pressure.

Pump speed:

1 at time

1 push/1 second or less

2nd time or more

Any speed

Standard opening pressure:

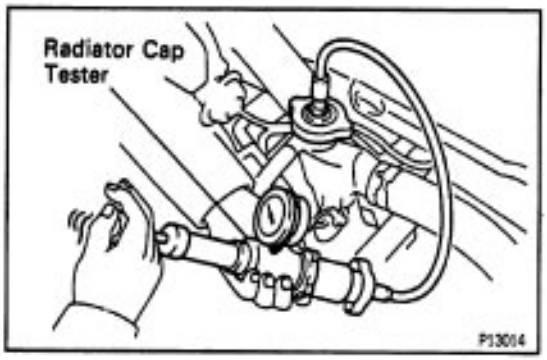
83 – 113 kPa

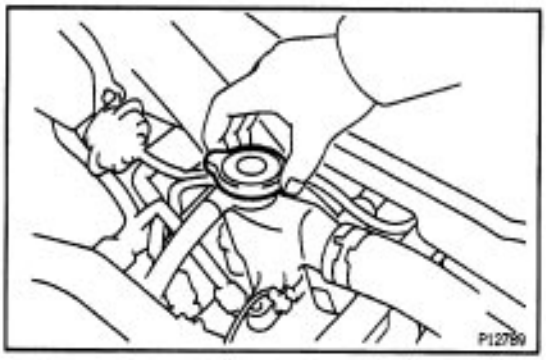
(0.85 – 1.15 kgf/cm^2, 12.1 – 16.4 psi)

Minimum opening pressure:

69 kPa (0.7 kgf/cm^2, 10.0 psi)

If the opening pressure is less than minimum, replace the radiator cap.





3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator and engine with coolant and attach a radiator cap tester.

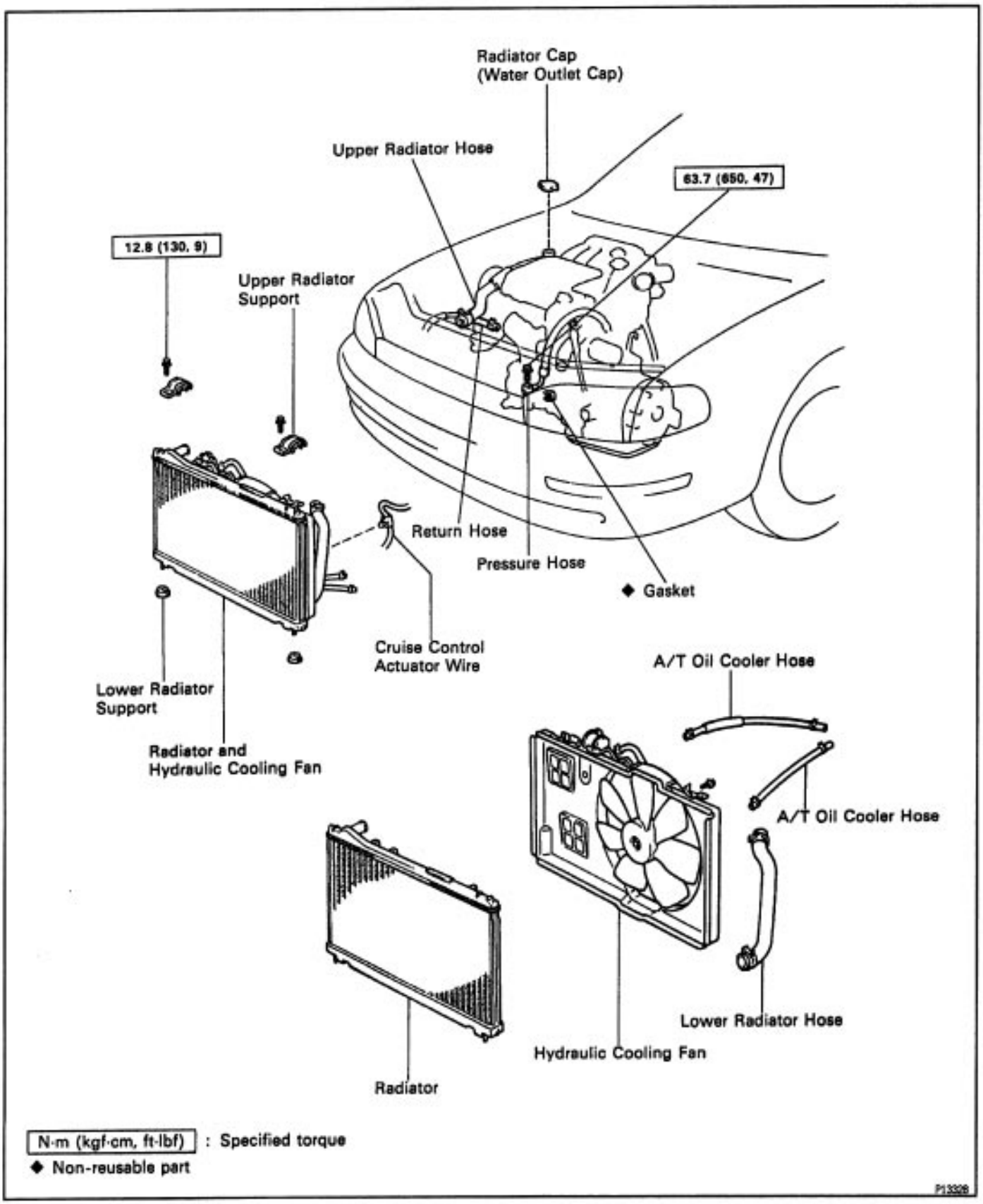
(b) Warm up the engine.

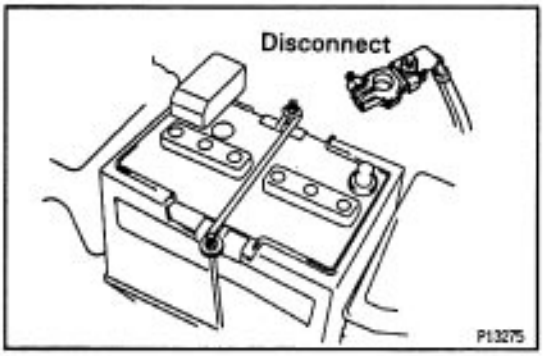
(c) Pump it to 127 kPa (1.3 kgf/cm^2, 18.5 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and cylinder head.

4. REINSTALL RADIATOR CAP

COMPONENTS FOR REMOVAL AND INSTALLATION





RADIATOR REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

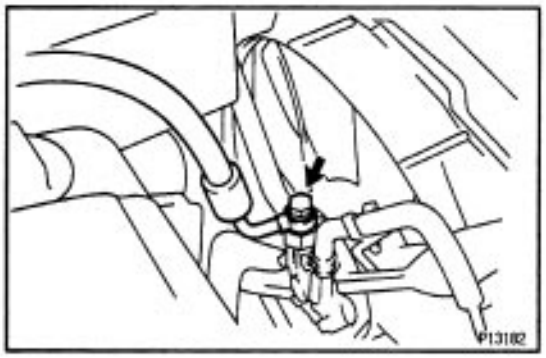
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

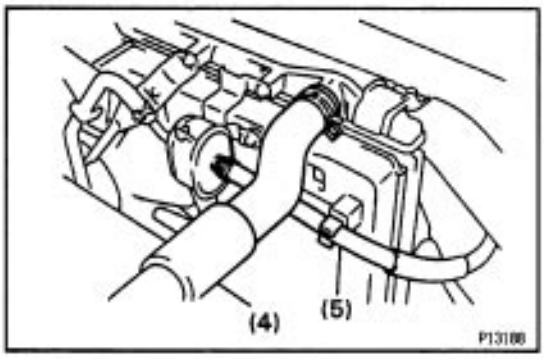
2. DRAIN ENGINE COOLANT

3. DISCONNECT PRESSURE HOSE

Remove the union bolt and gasket, and disconnect the pressure hose from the hydraulic motor.

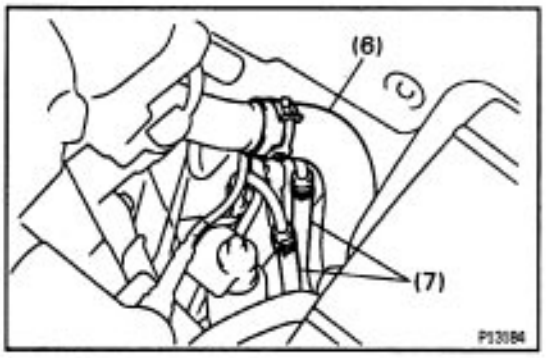
NOTICE: Catch leaking oil in a container.





4. DISCONNECT UPPER RADIATOR HOSE

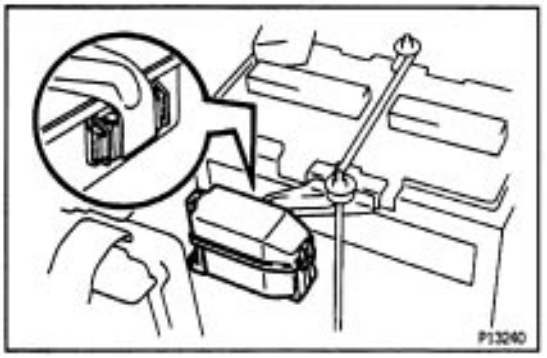
5. DISCONNECT HYDRAULIC MOTOR RETURN HOSE



6. DISCONNECT LOWER RADIATOR HOSE FROM WATER INLET PIPE

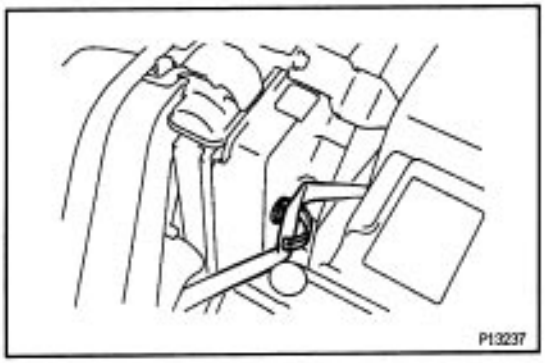
7. DISCONNECT OIL COOLER HOSES FROM OIL COOLER PIPES

Disconnect the 2 hoses.

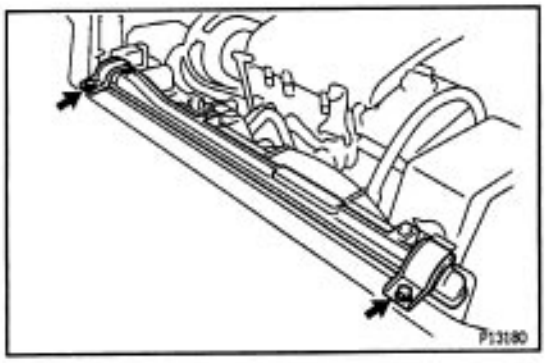


8. Canada only:

REMOVE NO.7 RELAY BLOCK

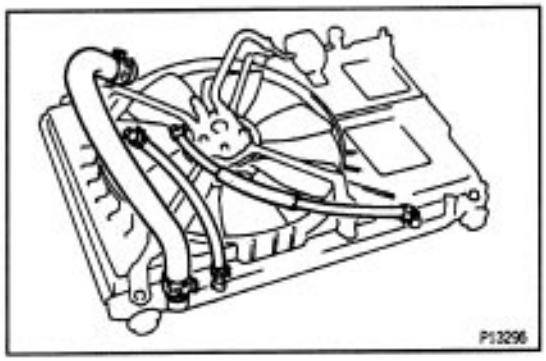


9. DISCONNECT CRUISE CONTROL ACTUATOR WIRE CLAMP



10. REMOVE RADIATOR AND HYDRAULIC COOLING FAN

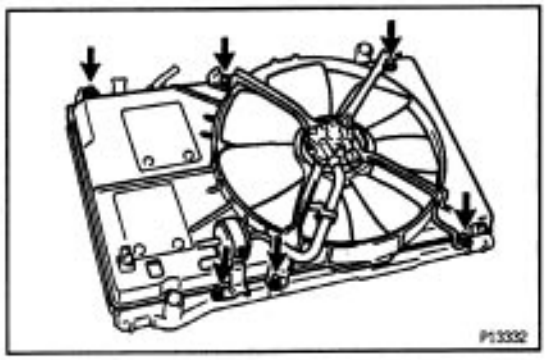
(a) Remove the 2 bolts and 2 upper supports.
(b) Lift out the radiator.



11. REMOVE A/T OIL COOLER HOSES

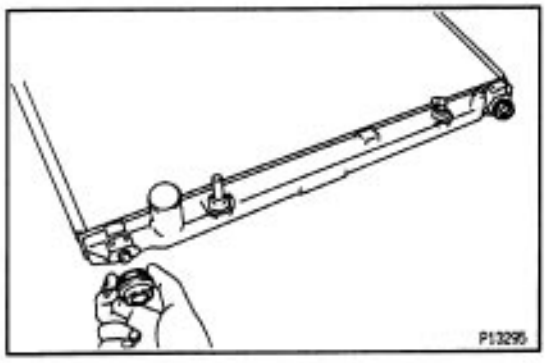
Remove the 2 hoses.

12. REMOVE RADIATOR LOWER HOSE



13. REMOVE HYDRAULIC COOLING FAN FROM RADIATOR

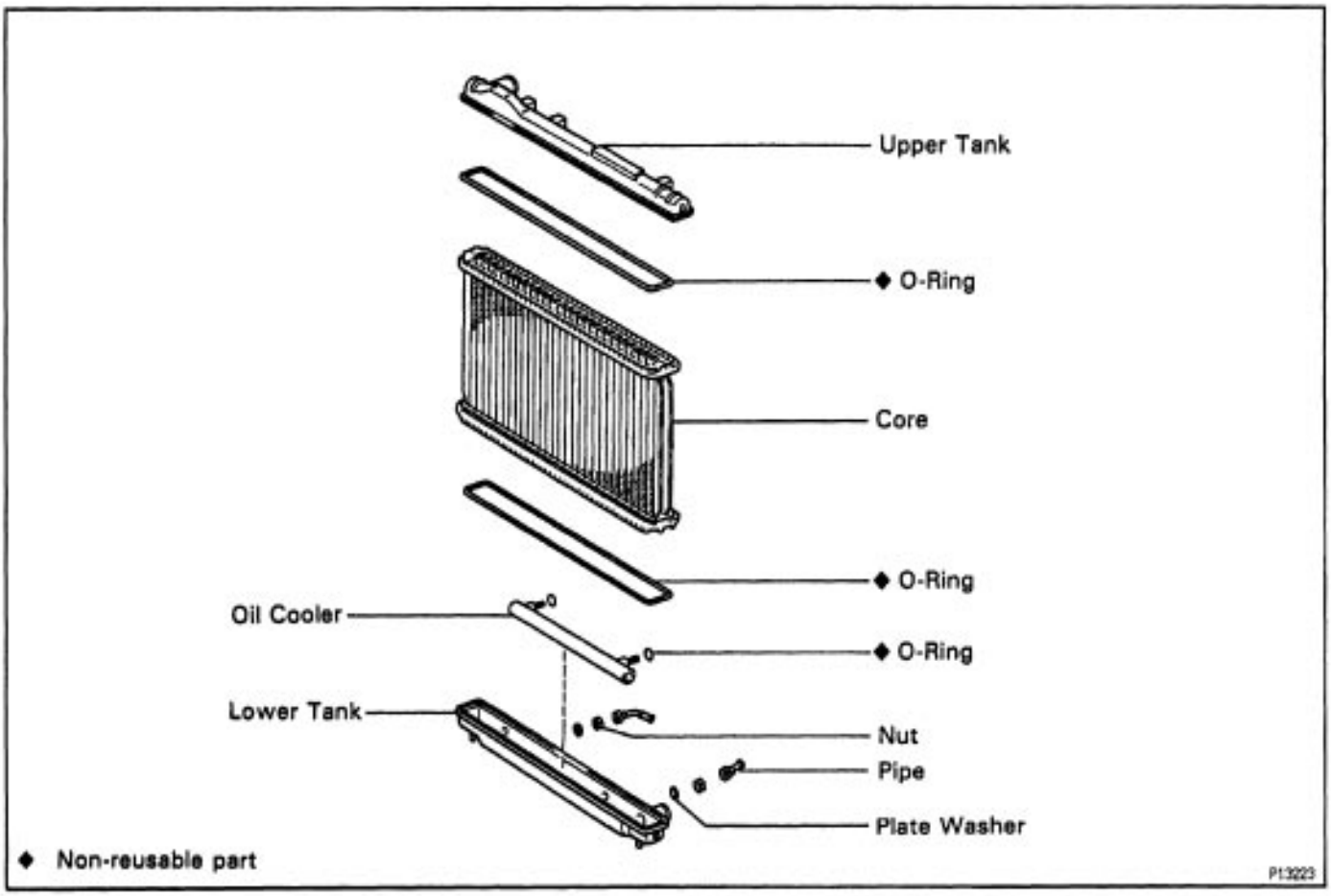
Remove the 6 bolts and cooling fan.

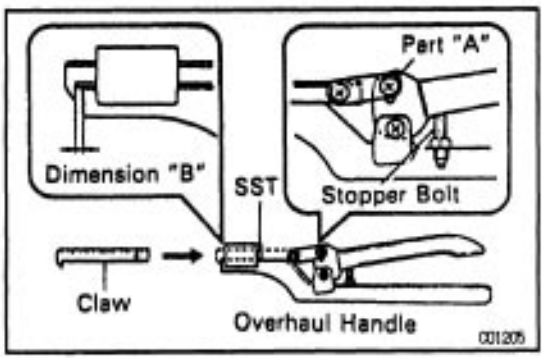


14. REMOVE LOWER RADIATOR SUPPORTS

Remove the 2 lower radiator supports.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY





RADIATOR DISASSEMBLY

(See Components for Disassembly and Assembly)

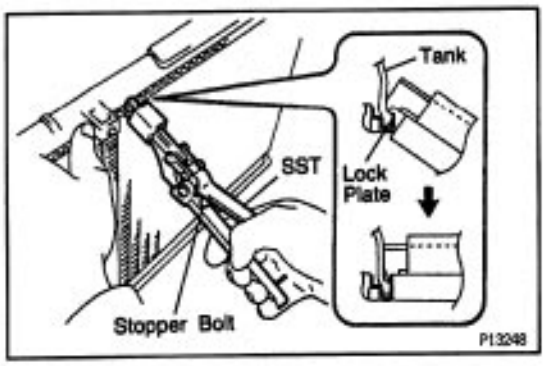
ASSEMBLY OF SST

09230 – 01010

(a) Install the claw to the overhaul handle, inserting it in the hole in part ”A” as shown in the diagram.

(b) While gripping the handle, adjust the stopper bolt so that dimension ”B” shown in the diagram is 0.2–0.5 mm (0.008–0.020 in.).

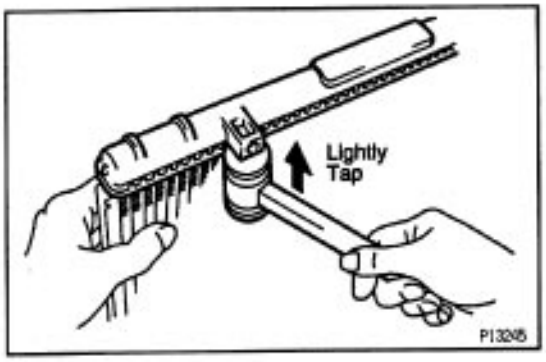
NOTICE: If this adjustment is not performed, the claw may be damaged.



2. UNCAULK LOCK PLATES

Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

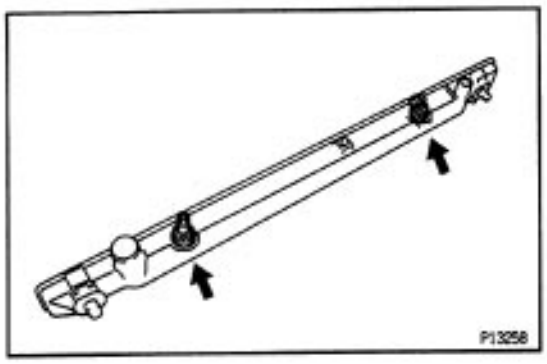
SST 09230 – 01010



3. REMOVE TANKS AND O–RINGS

(a) Lightly tap the bracket of the radiator (or radiator hose inlet or outlet) with a soft–faced hammer and remove the tank.

(b) Remove the O–ring.



4. REMOVE OIL COOLER FROM LOWER TANK

(a) Remove the pipes.

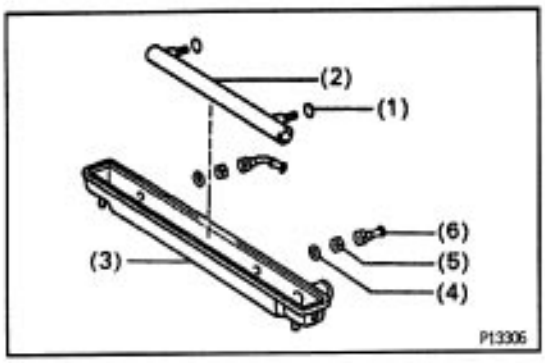
HINT: Make a note of the direction to face the pipes.

(b) Remove the nuts, and plate washers.

(c) Remove the oil cooler and 0–rings.

RADIATOR ASSEMBLY

(See Components for Disassembly and Assembly)



1. INSTALL OIL COOLER TO LOWER TANK

(a) Clean the O–ring contact surface of the lower tank and oil cooler.

(b) Install new 0–rings (1) to the oil cooler (2).

(c) Install the oil cooler with the 0–rings to the lower tank (3).

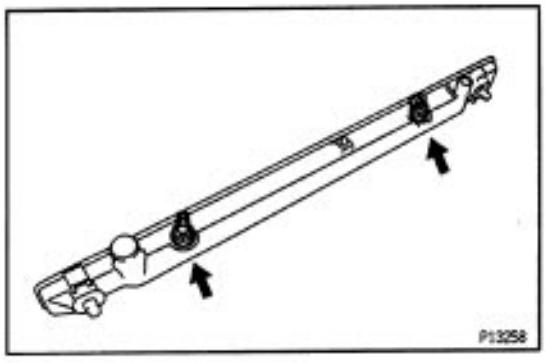
(d) Install the plate washers (4), and nuts (5). Torque the nuts.

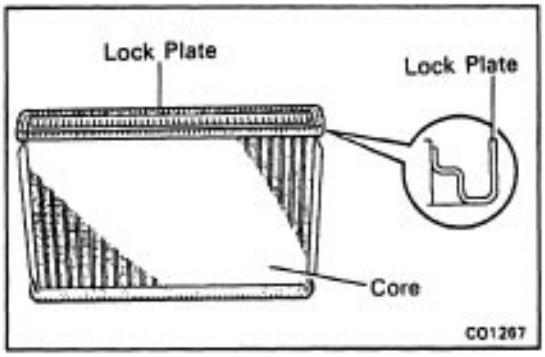
Torque: 8.3 N–m (85 kgf–cm, 74 ft–lbf)

(e) Install the pipes (6).

Torque: 14.7 N–m (150 kgf–cm, 11 ft–lbf)

HINT: Face the pipes in the same direction as before disassembly.





2. INSPECT LOCK PLATE

Inspect the lock plate for damage.

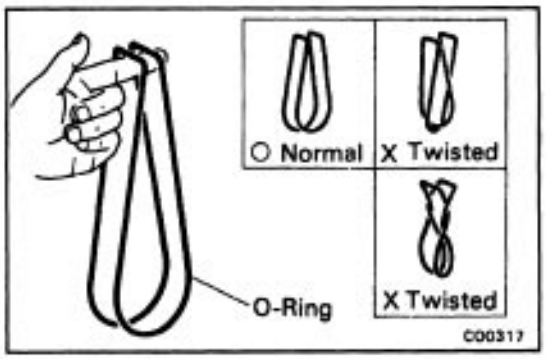
HINT:

- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.
- Therefore, first correct any deformation with pliers or similar object. Water leakage will result if the bottom of the lock plate groove is damaged or dented, Therefore, repair or replace if neces– sary.

3. INSTALL NEW O–RINGS AND TANKS

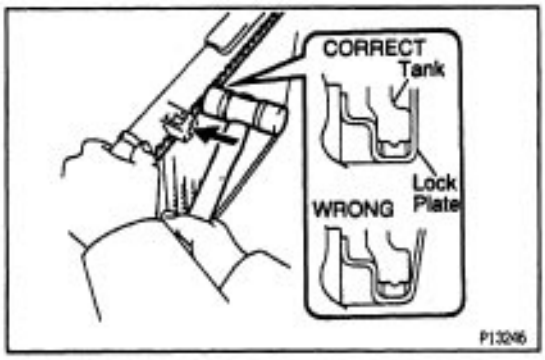
(a) After checking that there are no foreign objects in the lock plate groove, install the new 0–ring without twisting it.

HINT: When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.



(b) Install the tank without damaging the 0 – ring.

(c) Tap the lock plate with a soft–faced hammer so that there is no gap between it and the tank.

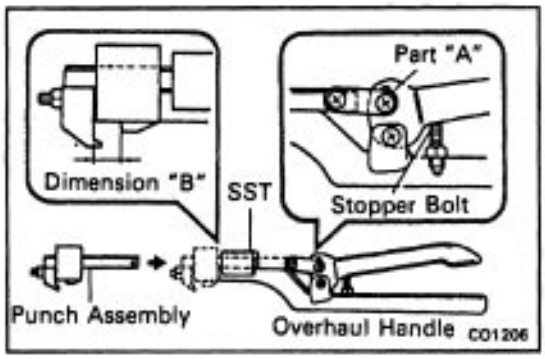


4. ASSEMBLY OF SST

SST 09230 – 01010

(a) Install the punch assembly to the overhaul handle, inserting it in the hole in part ”A” as shown in the illustration.

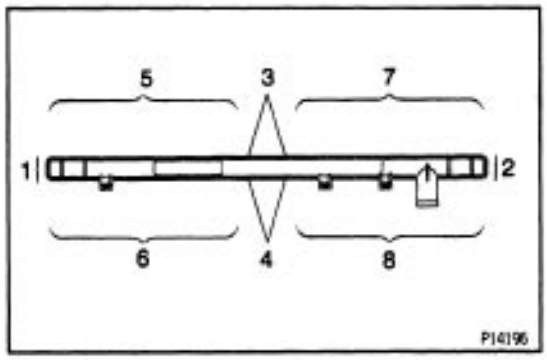
(b) While gripping the handle, adjust the stopper bolt so that dimension ”B” shown in the diagram is 7.7 mm (0.30 in.).

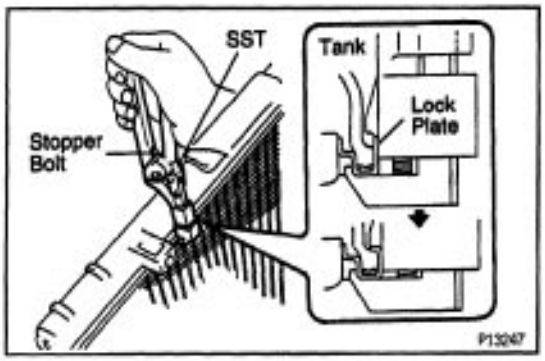


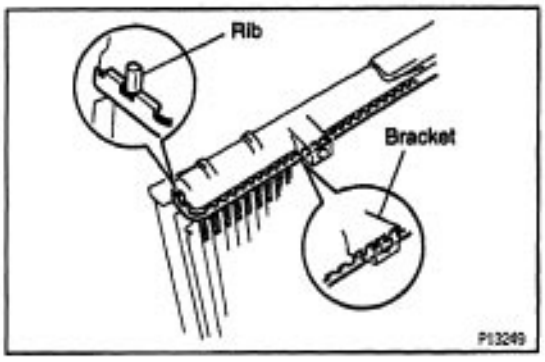
5. CAULK LOCK PLATE

(a) Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.

SST 09230 – 01010

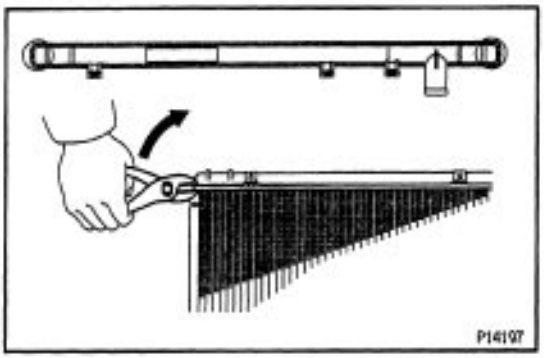




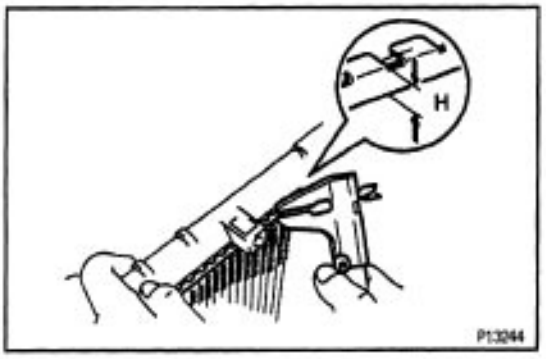


HINT:

- Do not stake the areas protruding around the pipes, brackets or tank ribs.



- The points shown in the illustration and oil cooler near here cannot be staked with the SST. Use a plier or similar object and be careful not to damage the core plates.



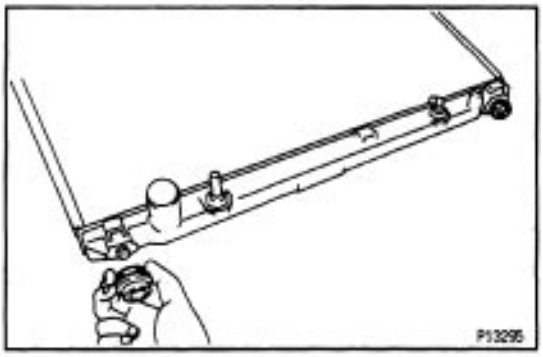
(b) Check the lock plate height (H) after completing the caulking.

Plate height:

7.75 – 8.25 mm (0.305 – 0.325 in.)

If not within the specified height, adjust the stopper bolt of the handle again and perform the caulking again.

6. PAINT LOCK PLATES

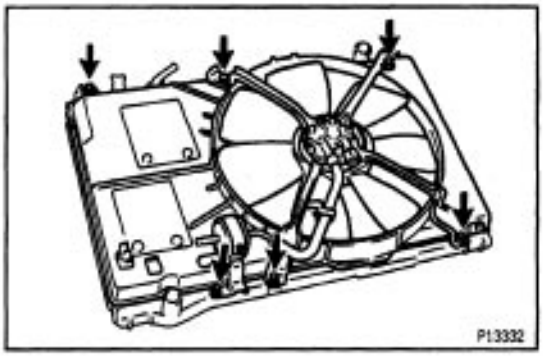


RADIATOR INSTALLATION

(See Components for Removal and Installation)

1. INSTALL RADIATOR SUPPORTS

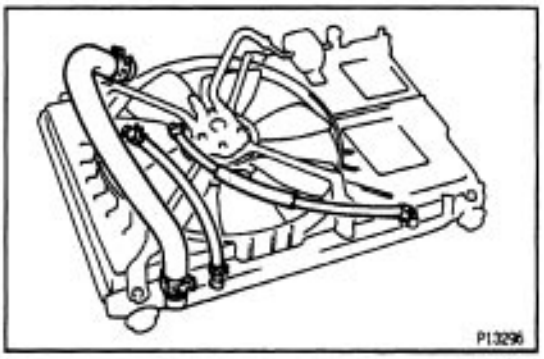
Install the 2 supports.



2. INSTALL HYDRAULIC COOLING FAN TO RADIATOR

Install the cooling fan with the6 bolts.

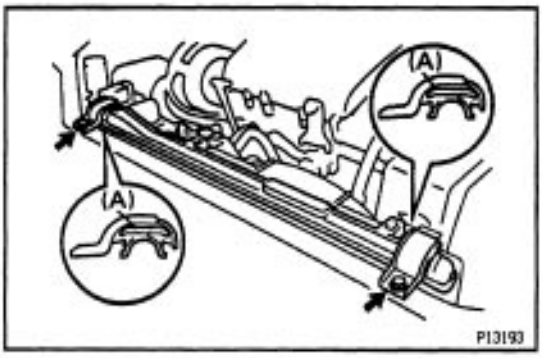
Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)



3. INSTALL RADIATOR LOWER HOSE

4. INSTALL A/T OIL COOLER HOSES

Install the 2 hoses.

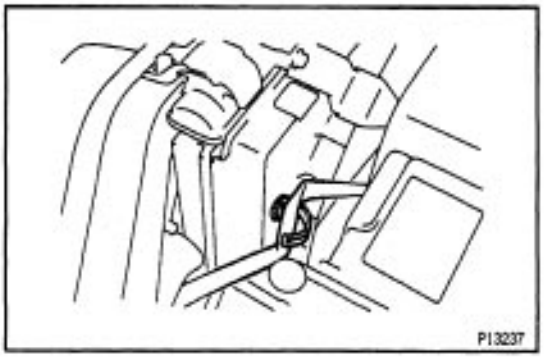


6. INSTALL RADIATOR AND HYDRAULIC COOLING FAN

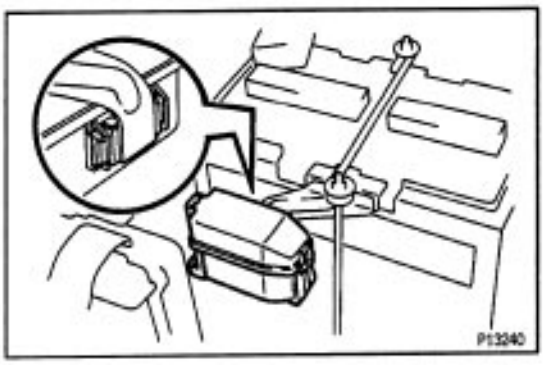
Place the radiator in position, and install the 2 upper supports with the 2 bolts.

Torque: 12.8 N–m (130 kgf–cm, 9 ft–lbf)

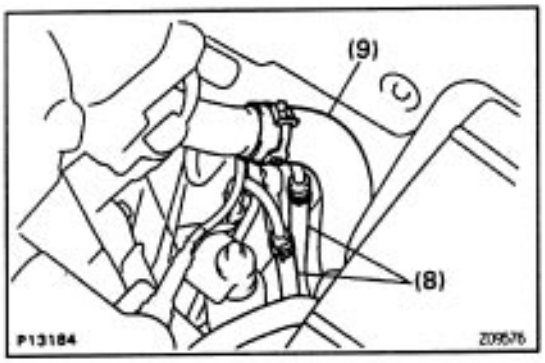
HINT: After installation, check that the rubber cushion (A) of the support is not depressed.



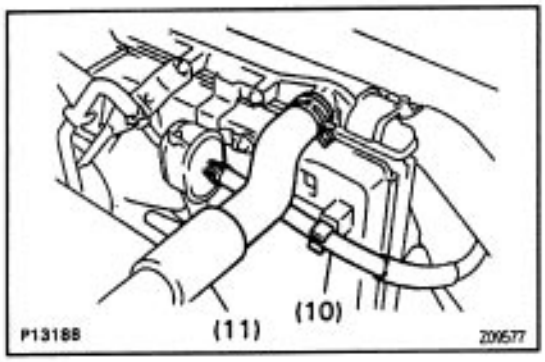
6. CONNECT CRUISE CONTROL ACTUATOR WIRE CLAMP



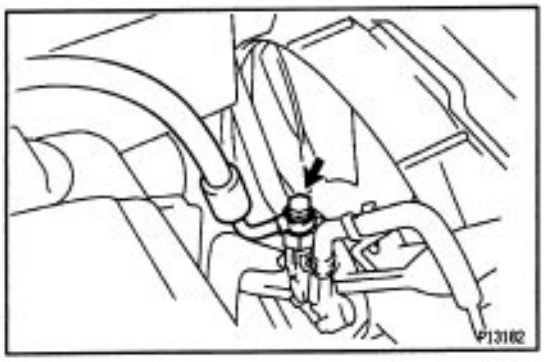
7. Canada only:
INSTALL NO.7 RELAY BLOCK



8. CONNECT OIL COOLER HOSES
9. CONNECT LOWER RADIATOR HOSE



10. CONNECT HYDRAULIC MOTOR RETURN HOSE
11. CONNECT UPPER RADIATOR HOSE



12. CONNECT PRESSURE HOSE TO HYDRAULIC MOTOR
Connect the pressure hose with a new gasket and the union bolt.
Torque: 63.7 N–m (650 kgf–cm, 47 ft–lbf)

13. FILL WITH ENGINE COOLANT
Capacity:
8.7 liters (9.2 US qts, 7.7 Imp. qts)
14. FILL COOLING FAN (PS) RESERVOIR TANK WITH FLUID
15. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
16. START ENGINE AND CHECK FOR LEAKS

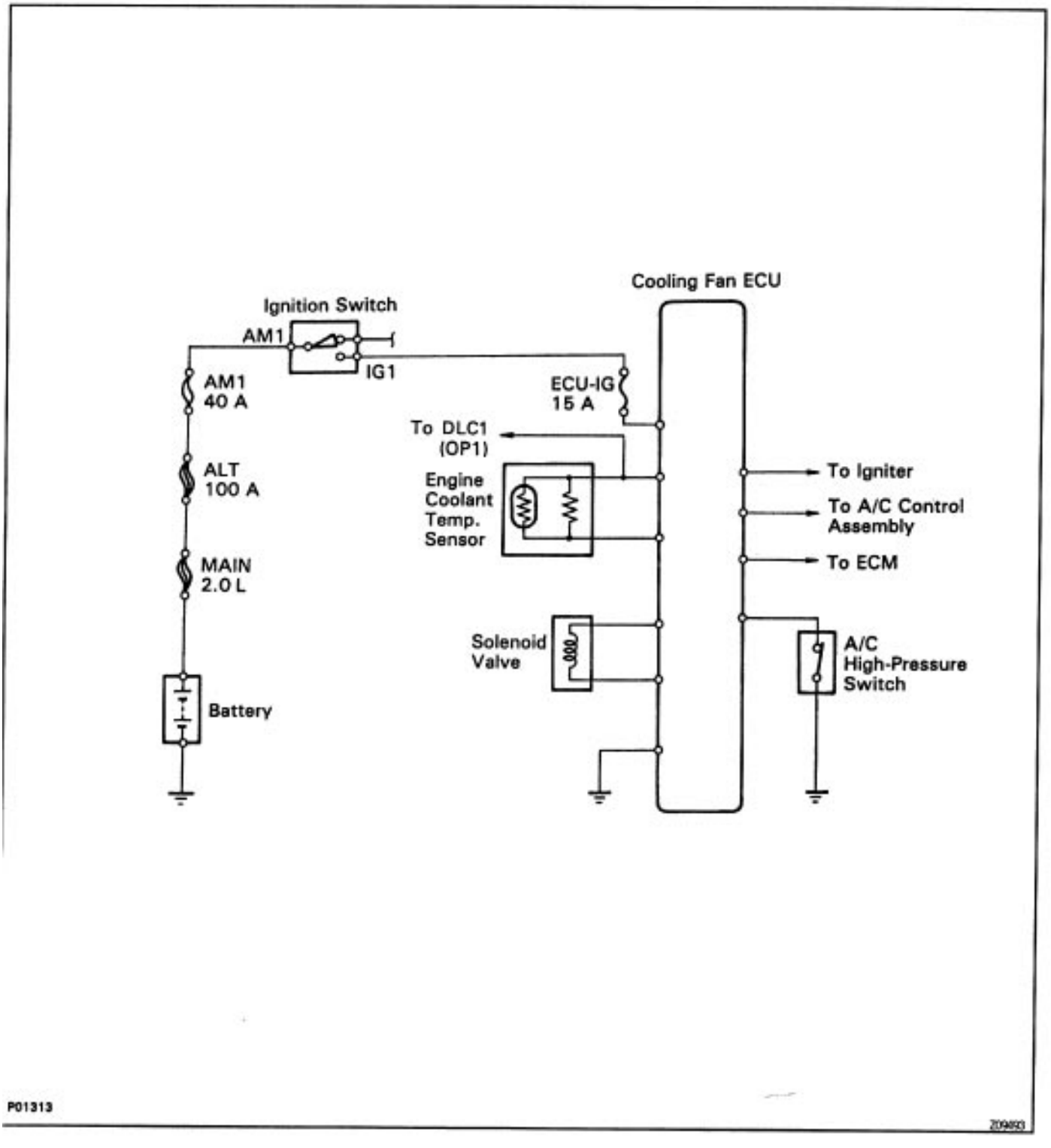
17. BLEED ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM
(See page EG2–348)
18. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL
NOTICE: Do not overfill.
19. RECHECK ENGINE COOLANT LEVEL

ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM

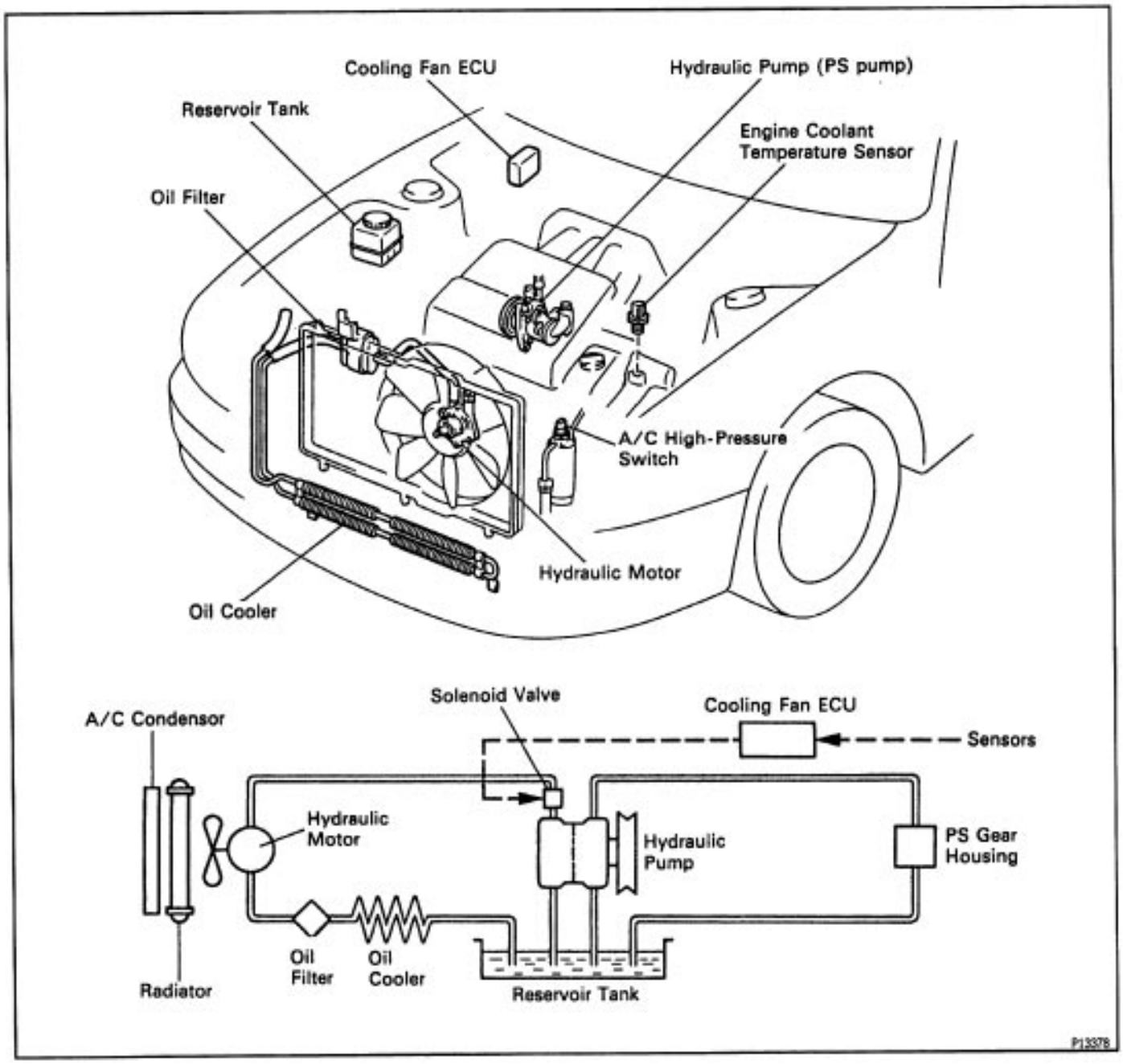
Description

In this system, the cooling fan ECU controls the hydraulic pressure acting on the hydraulic motor, thus controlling the speed of the cooling fan steplessly in response to the condition of the engine and air conditioning.

System Circuit



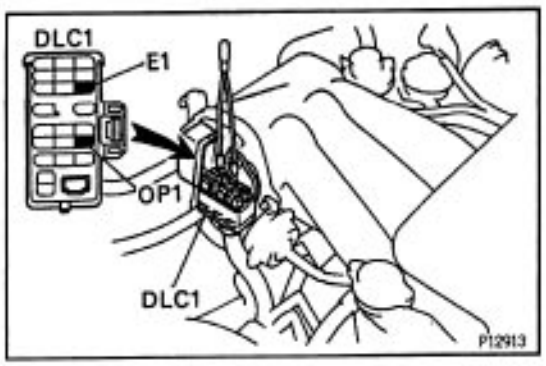
Operation



The hydraulic pump is integrated with the PS pump and is driven by a drive belt. The solenoid valve adjusts the volume of oil sent from the hydraulic pump to the hydraulic motor which drive; the fan directly, thereby controlling the fan speed.

Oil which has passed through the hydraulic motor is cooled by the oil cooler before returning to the PS pump reservoir tank.

The solenoid valve is controlled by the cooling fan ECU in accordance with the engine rpm, engine coolant temperature and A/C signals.



On–Vehicle Inspection
FLUID LEVEL INSPECTION

1. KEEP VEHICLE LEVEL

2. INSPECT FLUID LEVEL

(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.

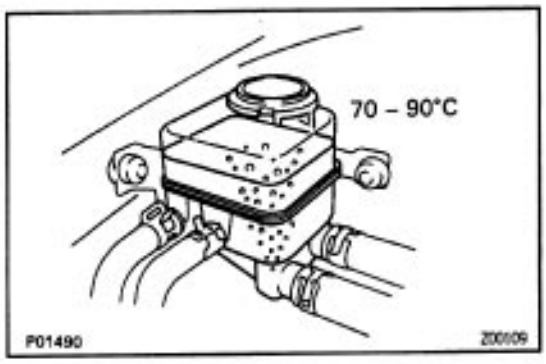
SST 09843–18020

HINT: When terminals OP1 and E1 are connected, the circuit of the ECT sensor is grounded, fixing the cooling fan speed at approx. 1,100 rpm. (Fail–safe operation occurs.)

(b) Keep the engine speed at 2,000 rpm until the fluid temperature reaches the specified temperature.

Fluid temperature:

70 – 90˚C (158 – 195˚F)



(c) Check that there is no foaming and emulsification of the fluid in the reservoir tank.

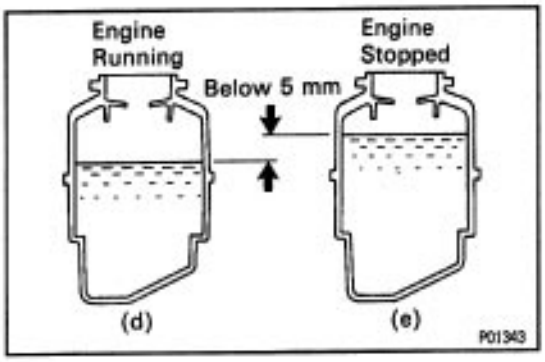
(d) Measure the fluid level with the engine running.

(e) Stop the engine, and measure the fluid level.

(f) Subtract level (d) from (e).

Maximum level difference:

5 mm (0.20 in.)



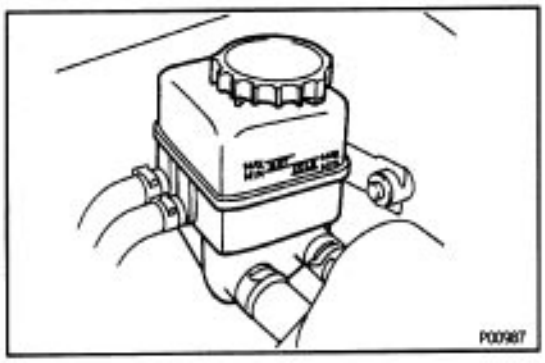
(g) Check the fluid level.

If low, add fluid.

Fluid:

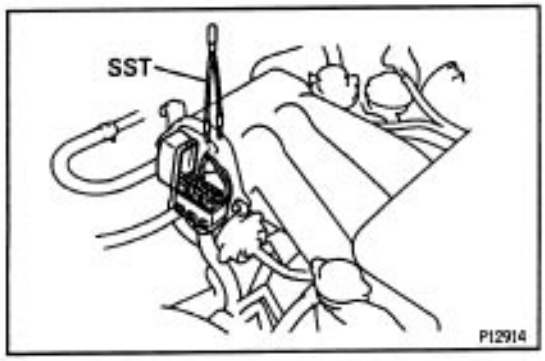
ATF DEXRON © II

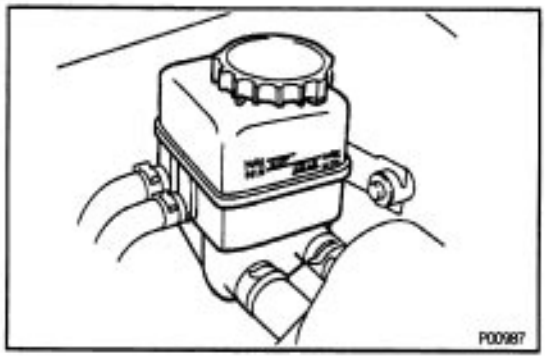
HINT: Check that fluid level is within the ”HOT” level on reservoir tank. If the fluid is cold, check that it is within the ”COLD” level on the reservoir tank.



(h) Remove the SST from the data link connector 1.

SST 09843–18020





HYDRAULIC COOLING FAN SYSTEM BLEEDING

1. CHECK FLUID LEVEL IN RESERVOIR TANK

If low, add fluid.

Fluid:

ATF DEXRON©II

HINT: Check that fluid level is within the ”HOT” level on reservoir tank. If the fluid is cold, check that it is within the ”COLD” level on the reservoir tank.

2. BLEED COOLING SYSTEM

(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.

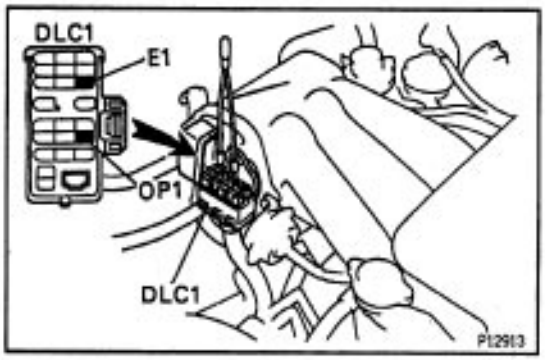
SST 09843–18020

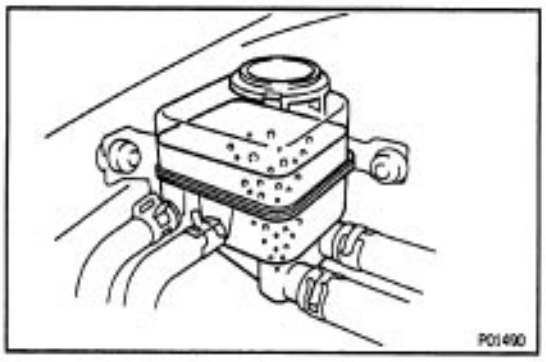
HINT: When terminals OP1 and E1 are connected, the circuit of the ECT sensor is grounded, fixing the cooling fan speed at approx. 1,100 rpm. (Fail–safe operation occurs.)

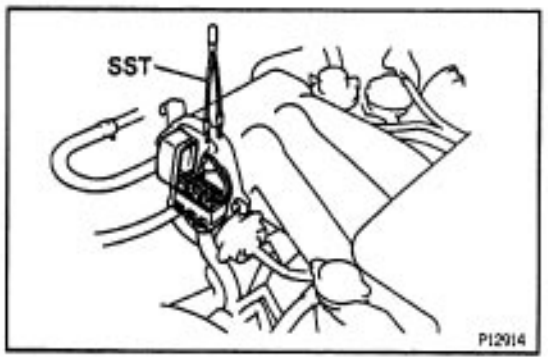
(b) Start the engine without depressing the accelerator pedal.

(c) Leave the engine running for several seconds.

(d) Check that there is no foaming and emulsification of the fluid in the reservoir tank.

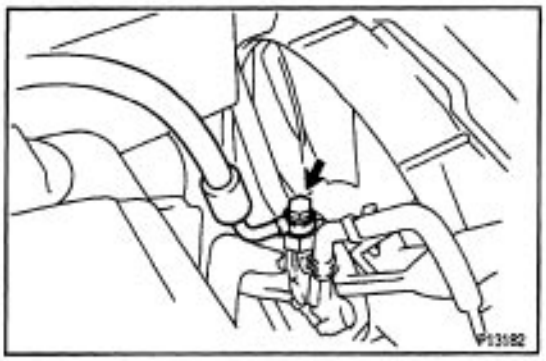






(e) Remove the SST from the data link connector 1.

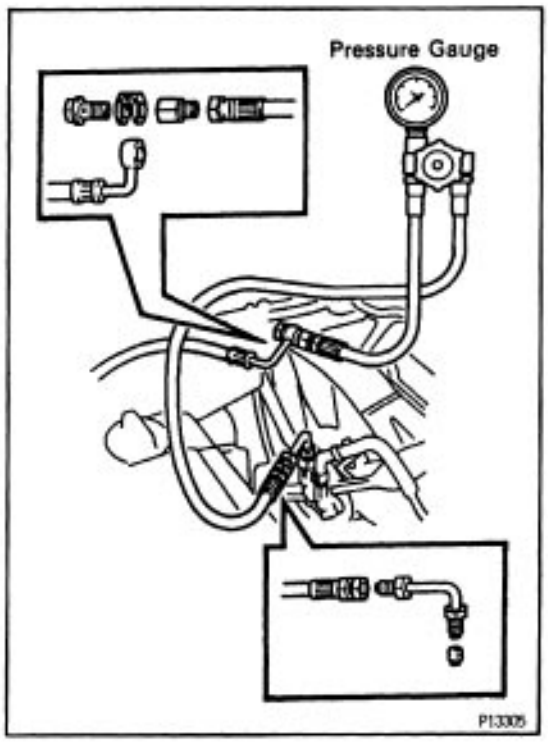
SST 09843–18020



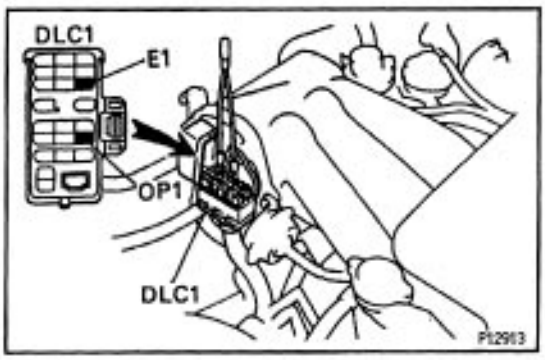
OIL PRESSURE INSPECTION

1. DISCONNECT PRESSURE HOSE FROM HYDRAULIC MOTOR, AND INSTALL OIL PRESSURE GAUGE

(a) Remove the union bolt and gasket, and disconnect the pressure hose from the hydraulic motor.



(b) Connect the gauge side of a pressure gauge to pressure hose, and the valve side to the hydraulic motor.



2. INSPECT OIL PRESSURE

HINT: Before inspecting the oil pressure, first check that the A/C is off.

(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.

SST 09843–18020

HINT: When terminals OP1 and E1 are connected, the circuit of the ECT sensor is grounded, fixing the cooling fan speed at approx. 1,100 rpm. (Fail–safe operation occurs.)

(b) Bleed the hydraulic cooling system.

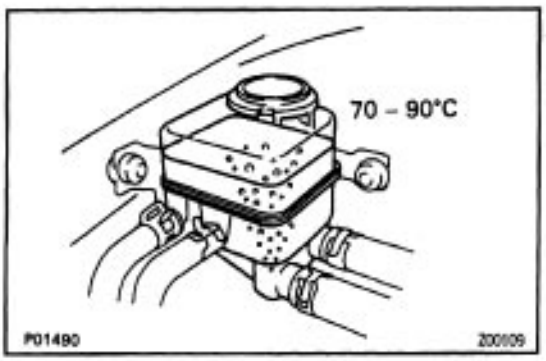
(See page EG2–348)

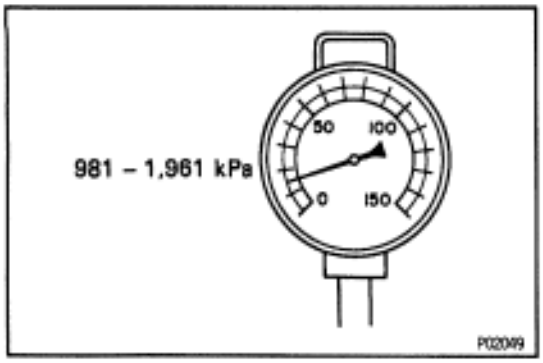
(c) Keep the engine speed at 2,000 rpm until the fluid temperature reaches the specified temperature.

Fluid temperature:

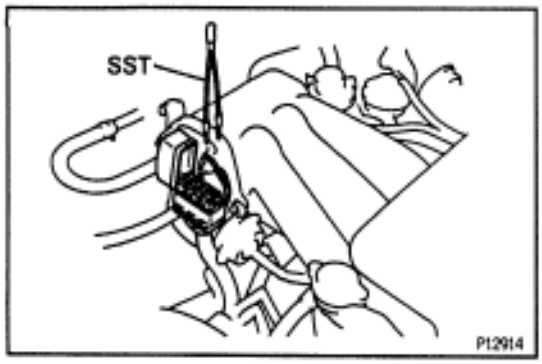
70 – 90° C (158 – 195° F)

(d) Check the fluid level is correct.

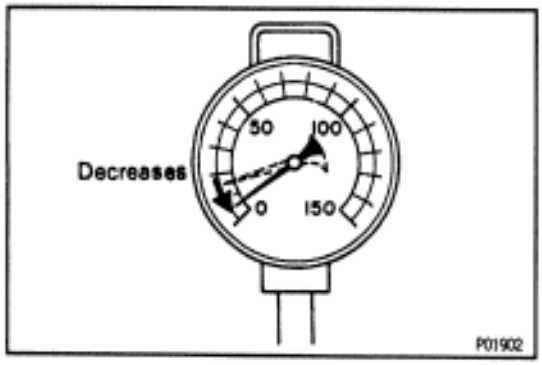




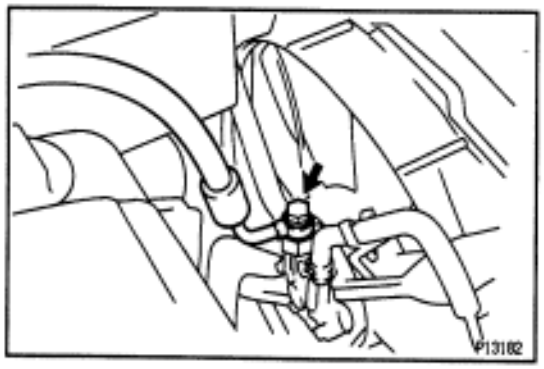
(e) Measure the oil pressure at idling.
Oil pressure:
981 – 1,961 kPa
(10 – 20 kgf/cm^2, 142 – 284 pal)



(f) Remove the SST from the data link connector 1.
SST 09843–18020



(g) Check that the oil pressure decreases.

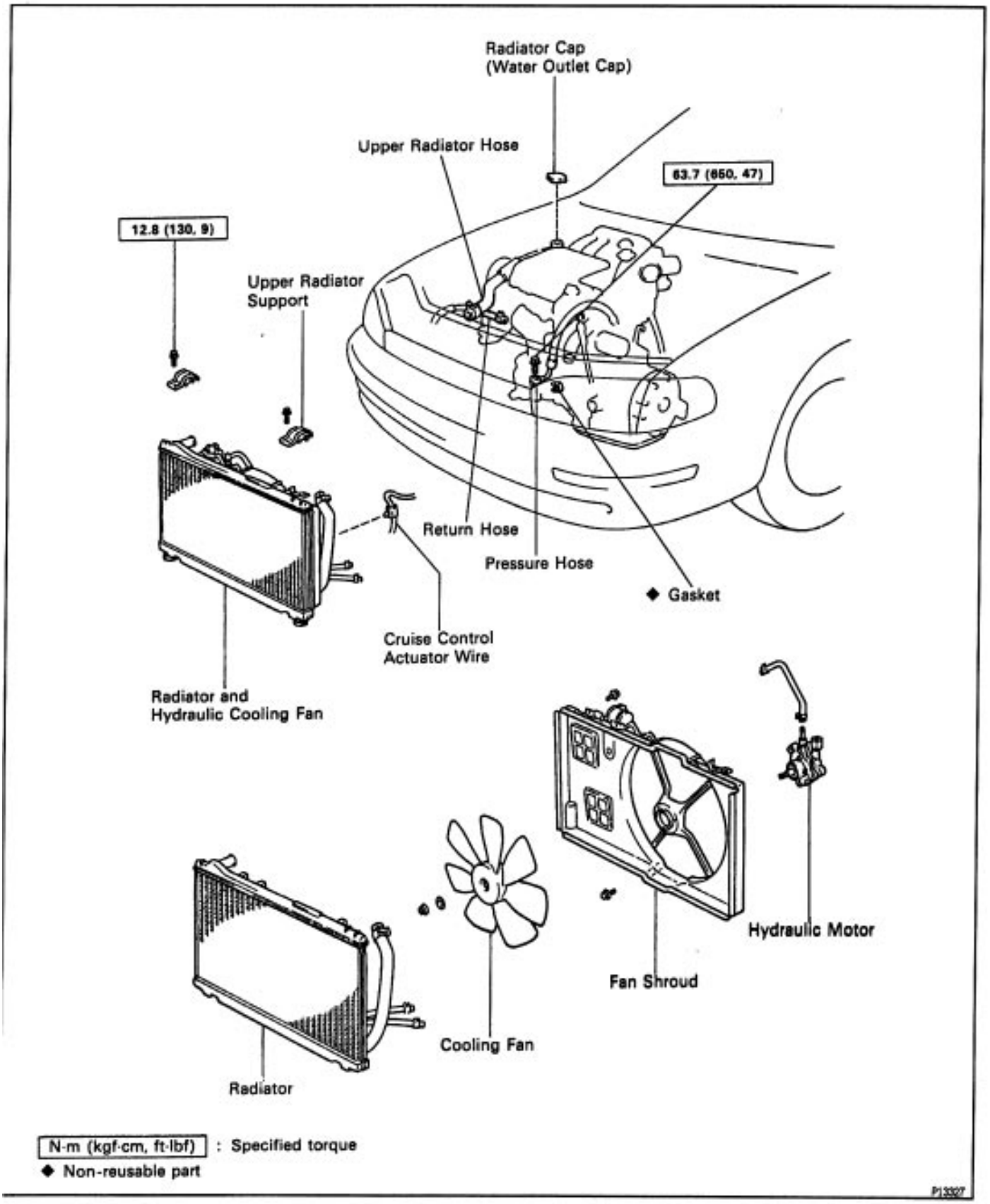


3. REMOVE OIL PRESSURE GAUGE, AND RECONNECT PRESSURE HOSE TO HYDRAULIC MOTOR
(a) Remove the pressure gauge.
(b) Connect the pressure hose to the hydraulic motor with a new gasket and the union bolt.
Torque: 63.7 N–m (650 kgf–cm, 47 ft–lbf)

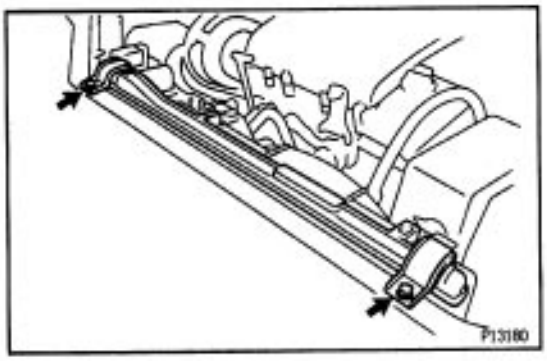
Hydraulic Pump (PS pump)

(See SR section)

Hydraulic Motor
COMPONENTS FOR REMOVAL AND INSTALLATION



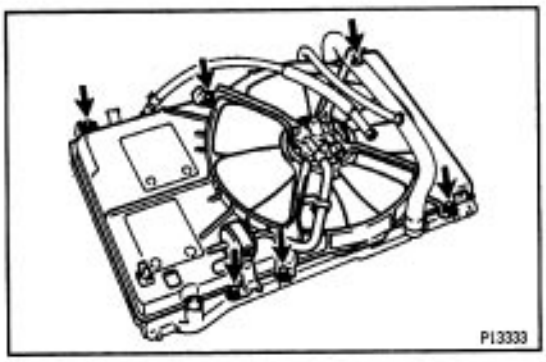
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part



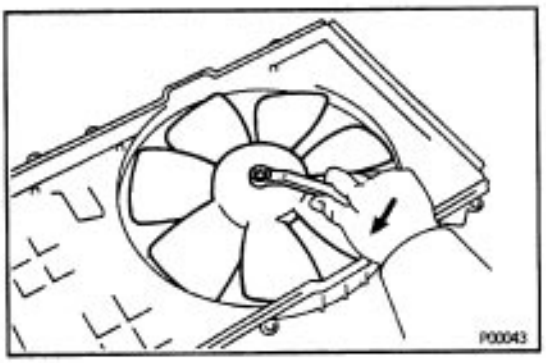
HYDRAULIC MOTOR REMOVAL

(See Components for Removal and Installation)

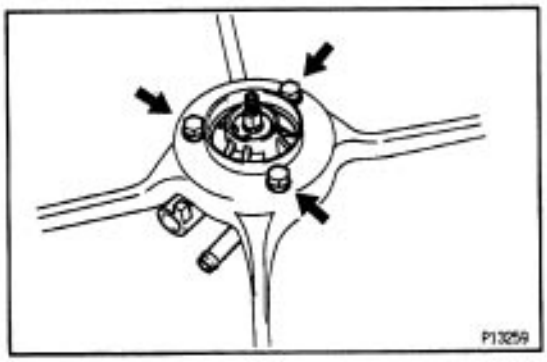
1. REMOVE RADIATOR
(See page EG2–336**)**



2. REMOVE HYDRAULIC COOLING FAN
Remove the 6 bolts and hydraulic cooling fan.

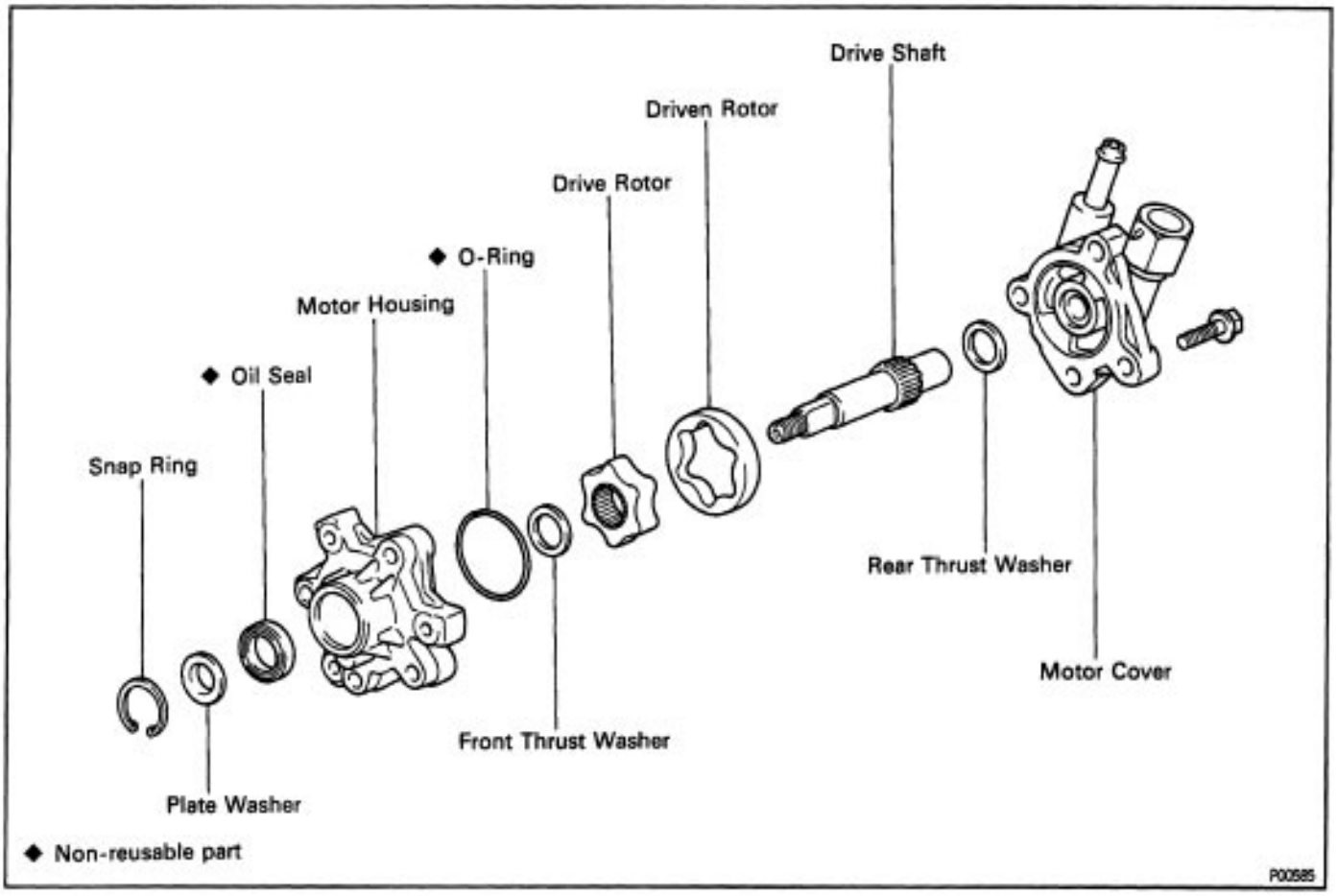


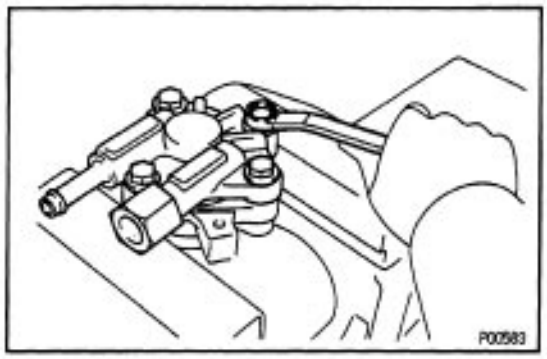
3. REMOVE COOLING FAN FROM HYDRAULIC MOTOR
Loosen the fan mounting nut clockwise, and remove the nut, plate washer and fan.

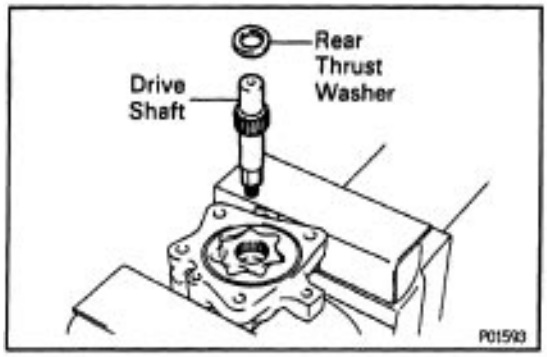


4. REMOVE HYDRAULIC MOTOR FROM FAN SHROUD
Remove the 3 bolts and hydraulic motor.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY







HYDRAULIC MOTOR DISASSEMBLY

(See Components for Disassembly and Assembly)

1. MOUNT MOTOR HOUSING

Carefully mount the motor housing in a vise.

NOTICE: Be careful not to damage the motor housing.

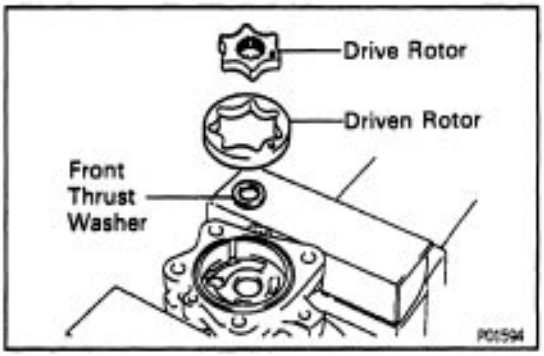
2. REMOVE MOTOR COVER

(a) Remove the 4 bolts and motor cover.

(b) Remove the 0–ring from the motor housing.

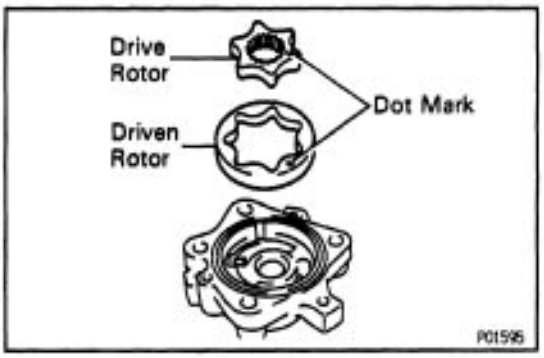
3. REMOVE REAR THRUST WASHER

4. REMOVE DRIVE SHAFT



5. REMOVE DRIVE AND DRIVEN ROTORS

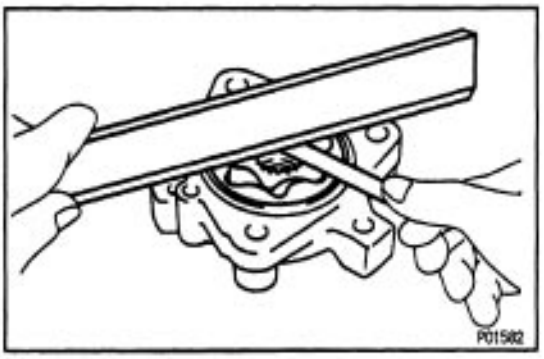
6. REMOVE FRONT THRUST WASHER



HYDRAULIC MOTOR INSPECTION

1. INSPECT DRIVE AND DRIVEN ROTORS

(a) Install the drive and driven rotors to the motor housing with the dot mark facing upward.



(b) Using a feeler gauge and precision straight edge, measure the side clearance between the rotor and precision straight edge.

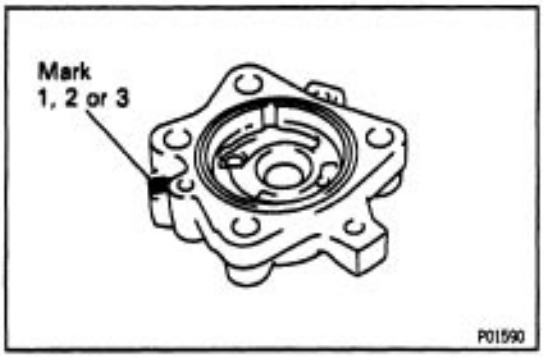
Standard side clearance:

0.01 – 0.04 mm (0.0004 – 0.0016 in.)

Maximum side clearance:

0.05 mm (0.0020 in.)

If the clearance is greater than maximum, replace the rotors as a set. If necessary, replace the motor assembly.



HINT: When replacing the rotors, select a new rotor set according to the imprinted mark on the motor housing.

Imprinted mark on housing	Rotor set
1	16906–50010
2	16906–50020
3	16906–50030

2. INSPECT CLEARANCE OF DRIVE SHAFT

(a) Using a caliper gauge, measure the, shaft hole inside diameter of the housing and cover.

Shaft hole inside diameter:

14.000 – 14.011 mm (0.5512 – 0.5516 in.)

(b) Using a micrometer, measure the drive shaft diameter.

Shaft diameter:

13.973 – 13.984 mm (0.5501 – 0.5506 in.)

(c) Subtract the drive shaft diameter measurement from the shaft hole diameter measurement.

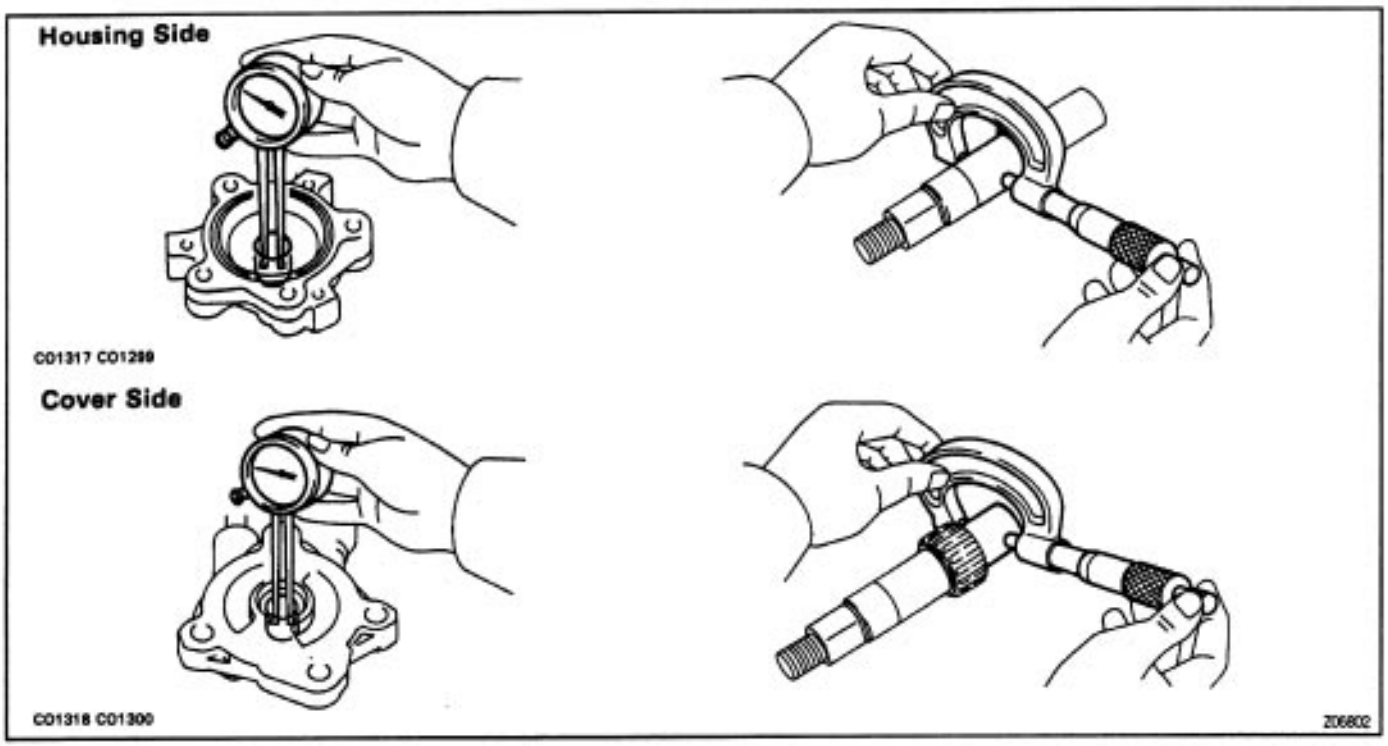
Standard clearance:

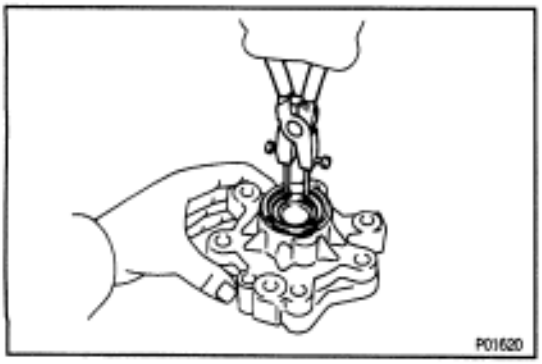
0.016 – 0.038 mm (0.0006 – 0.0015 in.)

Maximum clearance:

0.04 mm (0.0016 In.)

If the clearance is greater than maximum, replace the shaft. If necessary, replace the motor assembly.

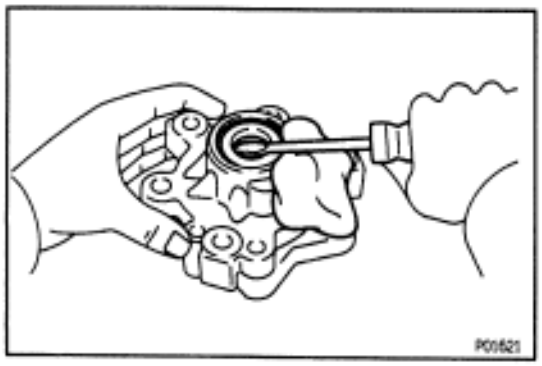




OIL SEAL REPLACEMENT

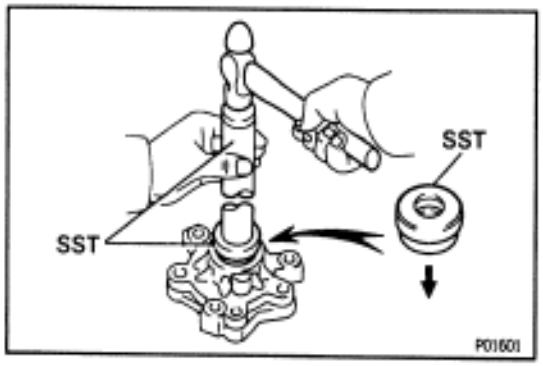
1. REMOVE OIL SEAL

(a) Using snap ring pliers, remove the snap ring and plate washer.



(b) Using a screwdriver, pry out the oil seal.

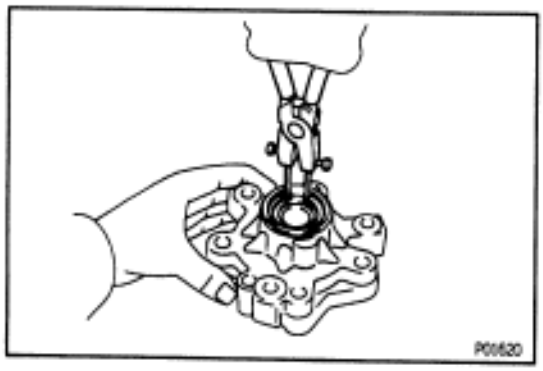
NOTICE: Be careful not to damage the housing.



2. INSTALL OIL SEAL

(a) Using SST and a hammer, tap in a new oil seal to a depth of 4.5 – 5.5 mm (0.177 – 0.217 in.) from the housing edge.

SST 09620–30010 (09627–30010, 09631– 00020)



(b) Using snap ring pliers, install the plate washer and snap ring.

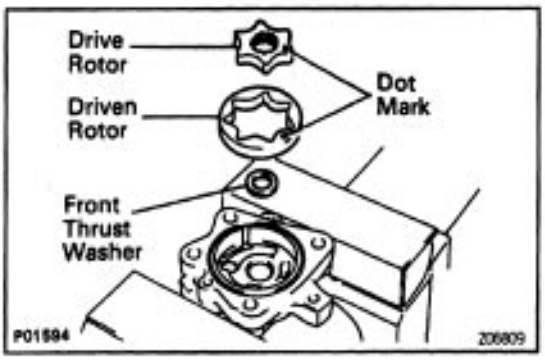
(c) Apply fluid to the oil seal lip.

HYDRAULIC MOTOR ASSEMBLY

(See Components for Disassembly and Assembly)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new fluid to all sliding and rotating surfaces.



1. MOUNT MOTOR HOUSING

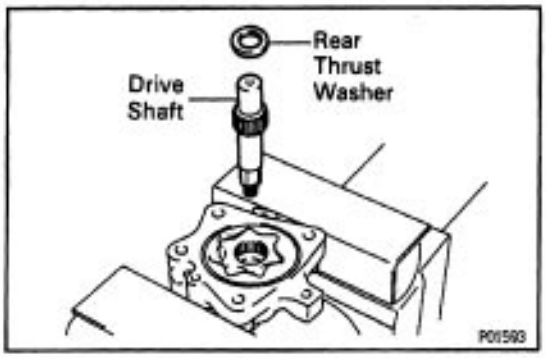
Slightly mount the motor housing in a vise.

NOTICE: Be careful not to damage the motor housing.

2. INSTALL FRONT THRUST WASHER

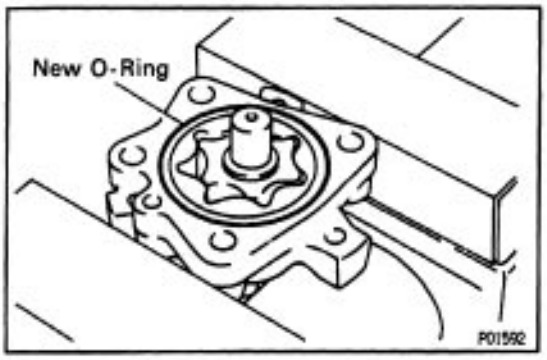
3. INSTALL DRIVEN AND DRIVE ROTORS

Install the drive and driven rotors with the dot mark facing upward.



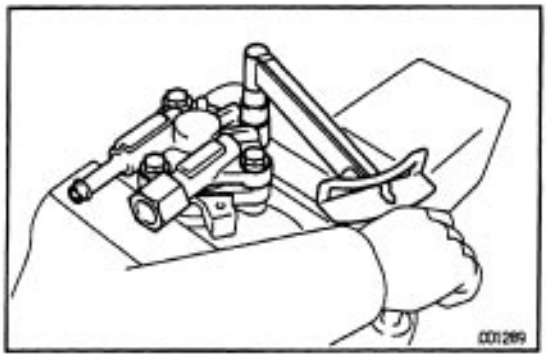
4. INSTALL DRIVE SHAFT

5. INSTALL REAR THRUST WASHER



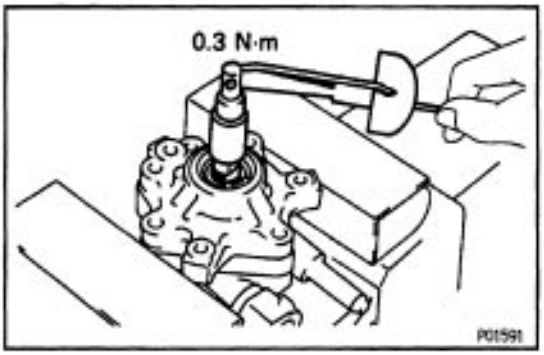
6. INSTALL MOTOR COVER

(a) Install a new 0–ring to the motor housing groove.



(b) Install the motor cover with the 4 bolts.

Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)



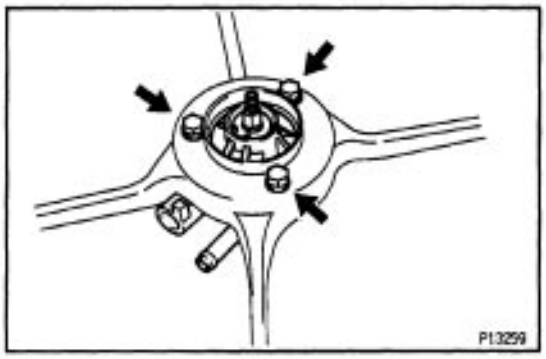
7. INSPECT DRIVE SHAFT PRELOAD

(a) Check that the drive shaft rotates smoothly without abnormal noise.

(b) Temporarily install the pulley nut, and check the rotating torque.

Rotating torque:

0.3 N–m (3.0 kgf–cm, 2.6 in.–lbf)



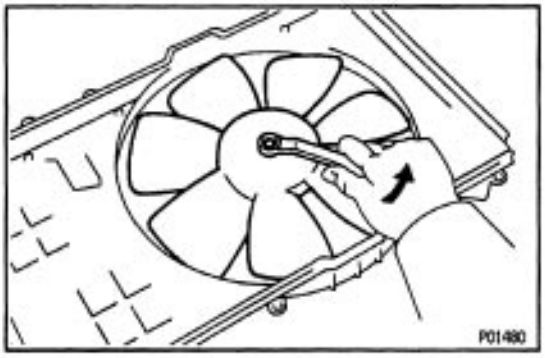
HYDRAULIC MOTOR INSTALLATION

(See Components for Removal and Installation)

1. INSTALL HYDRAULIC MOTOR TO FAN SHROUD

Install the hydraulic motor with the 3 bolts.

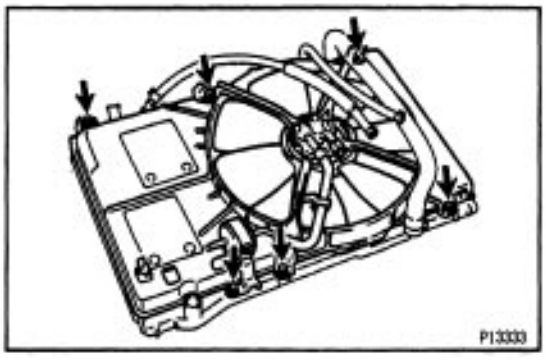
Torque: 4.9 N–m (50 kgf–cm. 43 in.–lbf)



2. INSTALL COOLING FAN TO HYDRAULIC MOTOR

Install the fan with the plate washer and nut. Tighten the nut by turning it counterclockwise.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)



3. INSTALL HYDRAULIC COOLING FAN

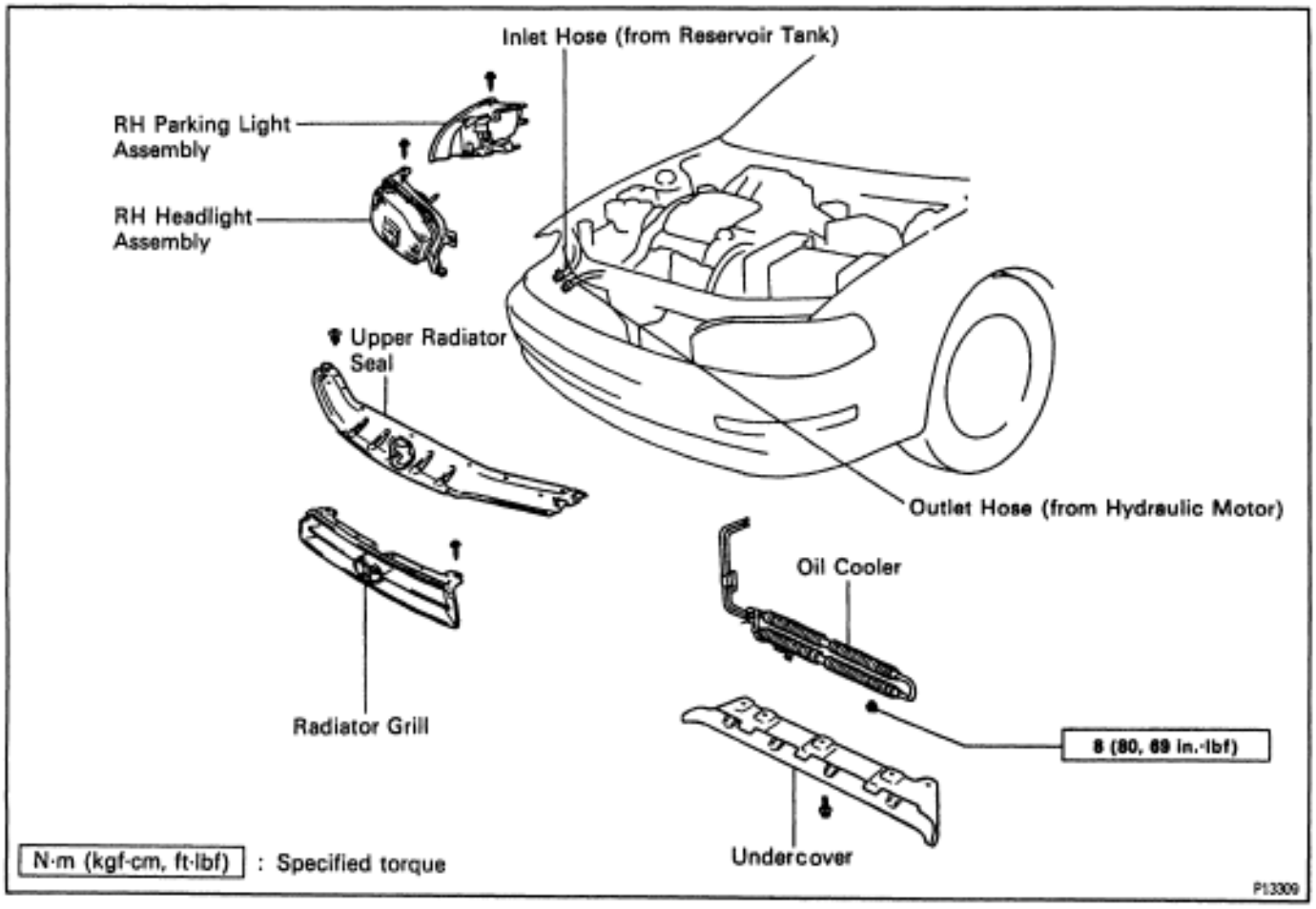
Install the hydraulic cooling fan with the6 bolts.

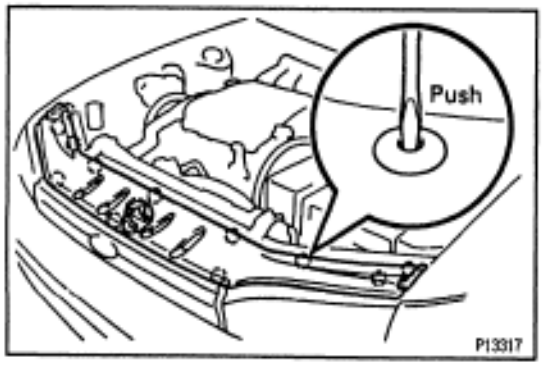
Torque: 4.9 N–m (50 kgf–cm, 43 In.–lbf)

4. INSTALL RADIATOR

(See page EG2–342)

Oil Cooler
COMPONENTS FOR REMOVAL AND INSTALLATION



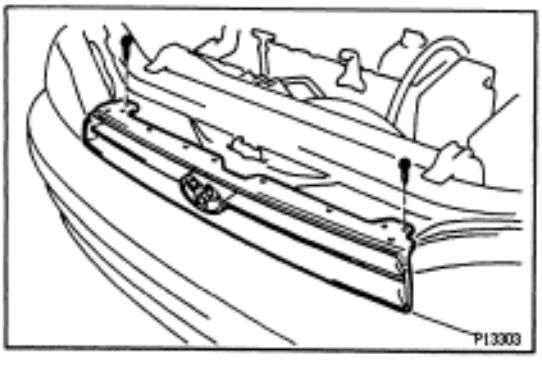


OIL COOLER REMOVAL

(See Components for Removal and Installation)

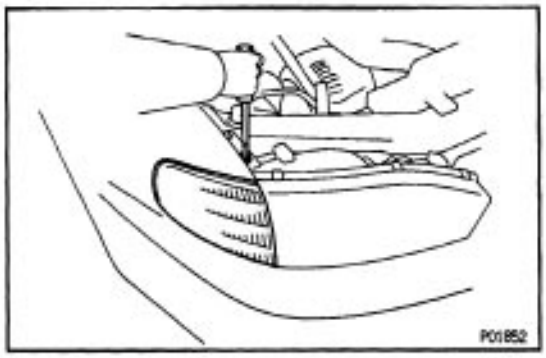
1. REMOVE UPPER RADIATOR SEAL

Remove the 12 clips and radiator seal.



2. REMOVE RADIATOR GRILLE

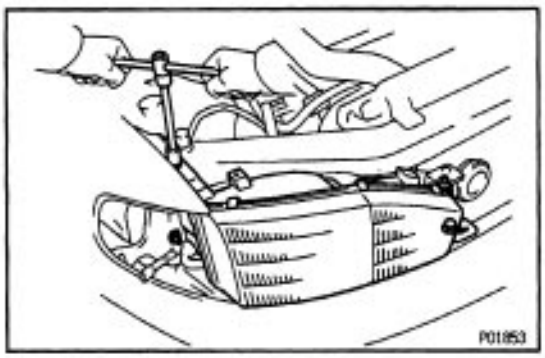
Remove the 2 mounting screws and radiator grille.



3. REMOVE RH PARKING LIGHT ASSEMBLY

(a) Remove the screw.

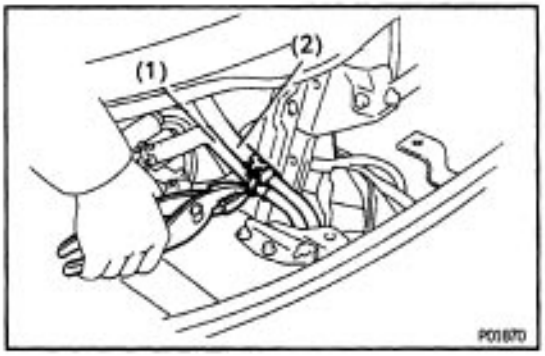
(b) Disconnect the connector and remove the parking light assembly.



4. REMOVE RH HEADLIGHT ASSEMBLY

(a) Remove the 3 bolts and nut.

(b) Disconnect the 2 connectors and remove the head–light assembly.



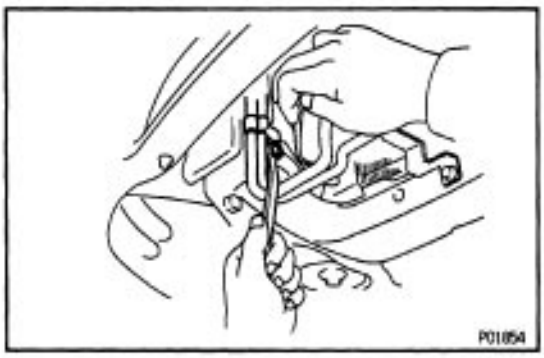
5. DISCONNECT HOSES FROM OIL COOLER

Disconnect the following hoses:

(1) Outlet hose (to reservoir tank)

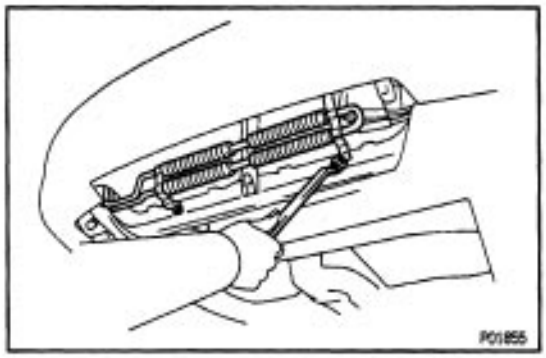
(2) Inlet hose (from hydraulic motor)

6. REMOVE UNDERCOVER

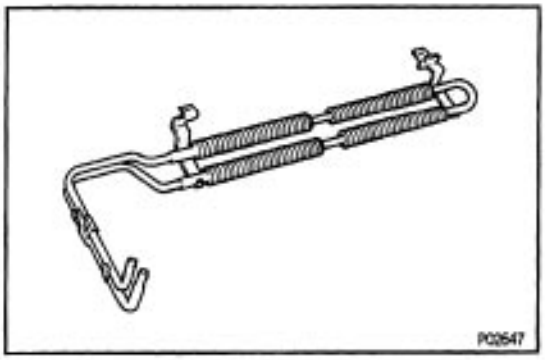


7. REMOVE OIL COOLER

(a) Pull aside the shroud to expose the bolt in the stay. Remove the bolt.



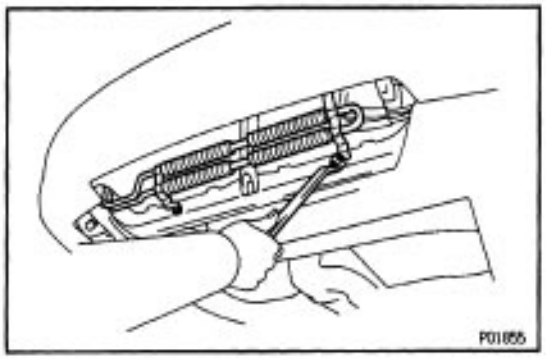
(b) Remove the 2 nuts and remove the oil cooler.



OIL COOLER INSPECTION

INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.

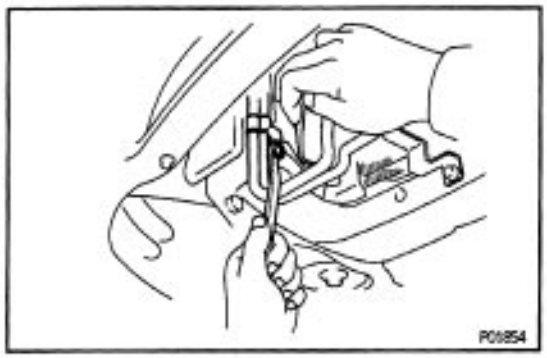


OIL COOLER INSTALLATION

(See Components for Removal and Installation)

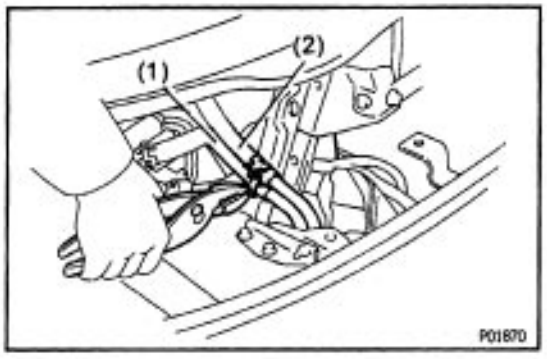
1. INSTALL OIL COOLER

(a) Install the oil cooler with the 2 nuts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



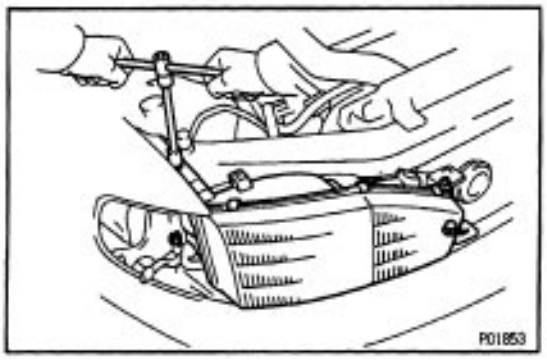
(b) Install the bolt while pulling aside the shroud.

2. INSTALL UNDERCOVER



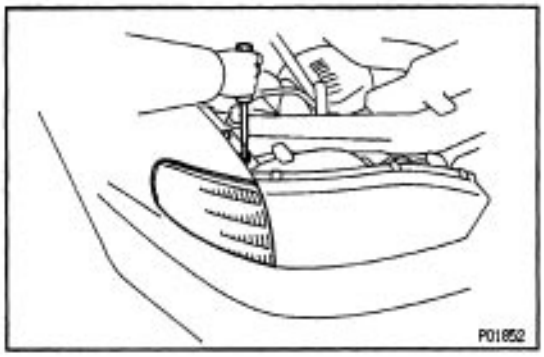
3. CONNECT HOSES TO OIL COOLER

Connect the following hoses:
(1) Outlet hose (to reservoir)
(2) Inlet hose (from hydraulic motor)



4. INSTALL RH HEADLIGHT ASSEMBLY

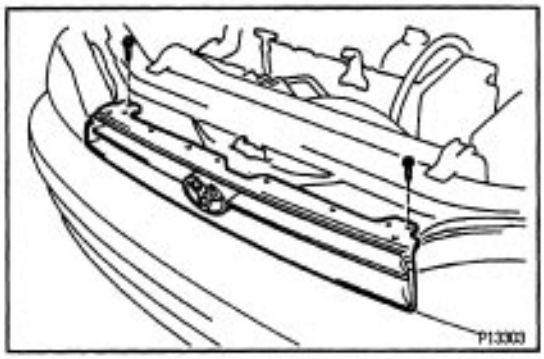
(a) Connect the 2 connectors.
(b) Install the headlight assembly with the 3 bolts and nut.



5. INSTALL RH PARKING LIGHT ASSEMBLY

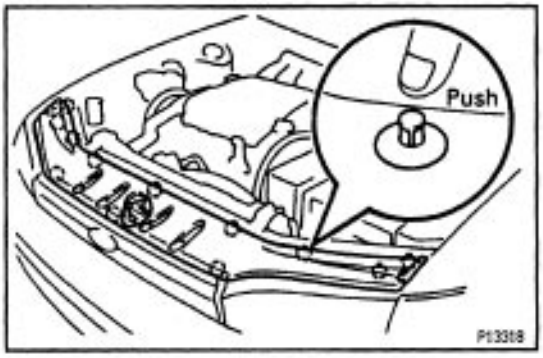
(a) Connect the connector.

(b) Install the parking light assembly with the screw.



6. INSTALL RADIATOR GRILLE

Install the radiator grille with the 2 mounting screws.



7. INSTALL UPPER RADIATOR SUPPORT SEAL

Install the support seal with the 12 clips.

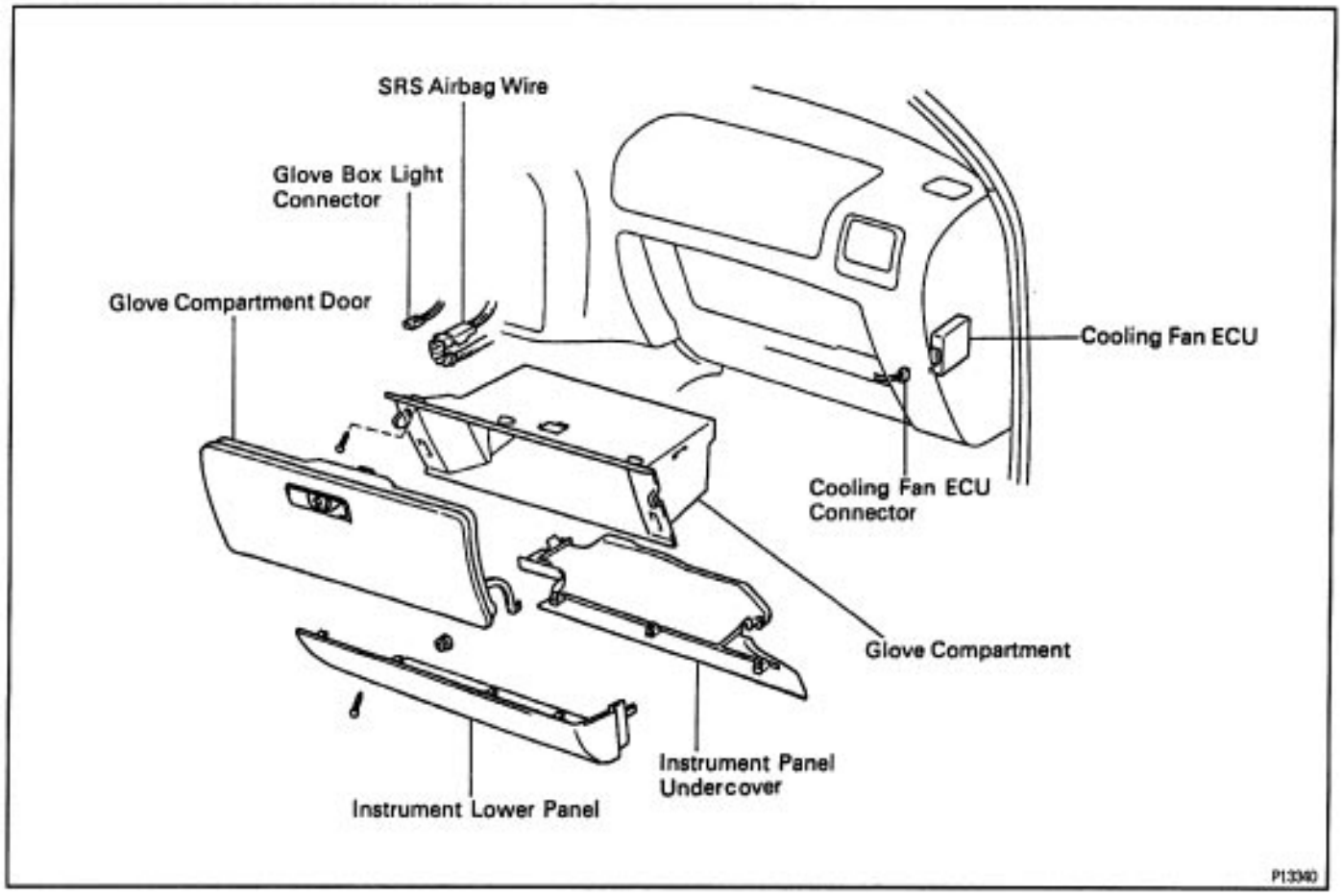
8. FILL PS RESERVOIR TANK WITH FLUID

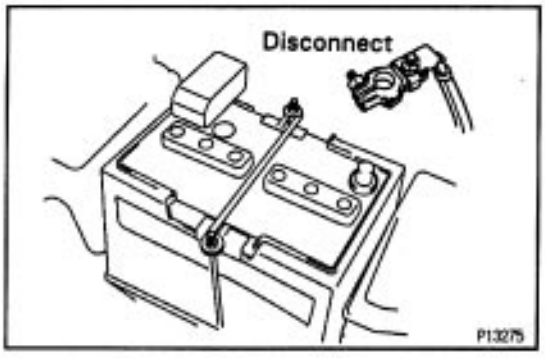
(See page EG2–347**)**

9. BLEED ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM

(See page EG2–348**)**

Cooling Fan ECU
COMPONENTS FOR REMOVAL AND INSTALLATION





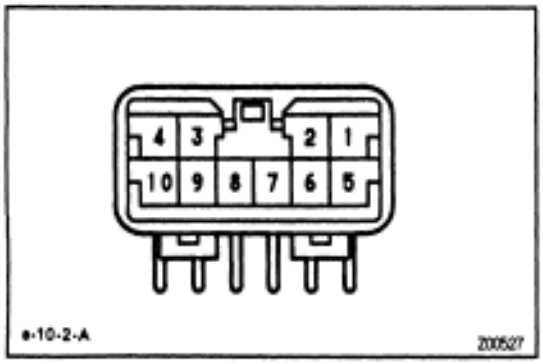
COOLING FAN ECU INSPECTION

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. DISCONNECT COOLING FAN ECU CONNECTOR (See Components)

(a) Remove the instrument panel undercover.
(b) Remove the instrument lower panel.
(c) Remove the glove compartment door.
(d) Remove the glove compartment.
(e) Disconnect the cooling fan ECU connector.



3. INSPECT COOLING FAN ECU

(a) Connect the cable to the negative (–) terminal of the battery.

(b) Check the connector on the wiring harness side as shown in the chart.

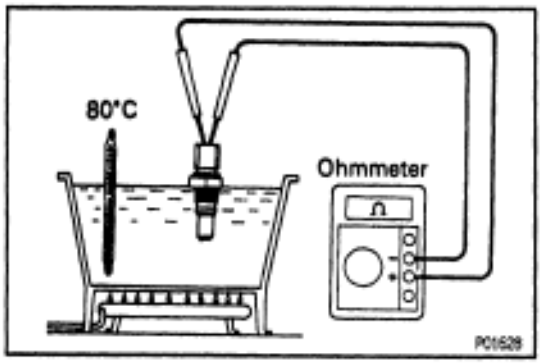
Check for	Tester connection	Condition	Specified value
Voltage	1 – Ground	Ignition switch ON	Battery voltage
Resistance	2–3	Solenoid valve at cold (25˚C (77˚F))	7.6 – 8.0Ω
Continuity	4 – Ground	–	Continuity
Continuity	5 – Ground	Throttle valve open	No continuity
		Throttle valve closed	Continuity
Continuity	8 – Ground	A/C pressure SW connector disconnected	No continuity
		A/C pressure SW connector connected	Continuity
Resistance	9–10	Coolant temperature at 80˚C (176˚F)	1.48 – 1.58 kΩ

V00331

(c) Disconnect the cable from the negative (–) terminal of the battery.

4. RECONNECT COOLING FAN ECU CONNECTOR

5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



ECT SENSOR INSPECTION

INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

1.48 – 1.58 Ω at 80˚ C (176˚ F)

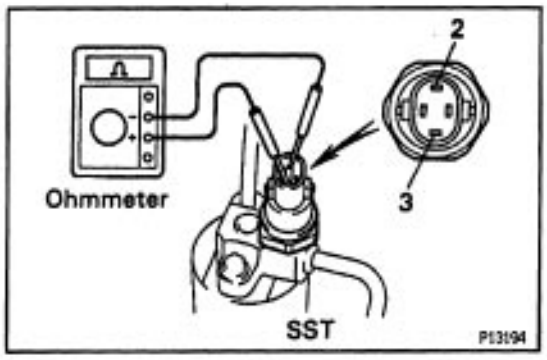
If the resistance is not as specified, replace the sensor.

A/C High –Pressure Switch
A/C HIGH–PRESSURE SWITCH INSPECTION

1. DISCONNECT A/C HIGH–PRESSURE SWITCH CONNECTOR

2. INSTALL MANIFOLD GAUGE SET

(See page AC–23)



3. INSPECT A/C HIGH–PRESSURE SWITCH

(a) When the A/C switch is OFF, check that there is continuity between terminals 2 and 3. (When the pressure is 1,226 kPa (12.5 kgf/cm^2, 178 psi) or lower.)

(b) When the A/C and blower switches are ON, check that there is no continuity between terminals 2 and 3. (When the pressure is 1,520 kPa (15.5 kgf/cm^2, 220 psi) or higher.)

If continuity is not as specified, replace the switch.

4. REMOVE MANIFOLD GAUGE SET

5. RECONNECT A/C HIGH–PRESSURE SWITCH CONNECTOR

Solenoid Valve
SOLENOID VALVE INSPECTION

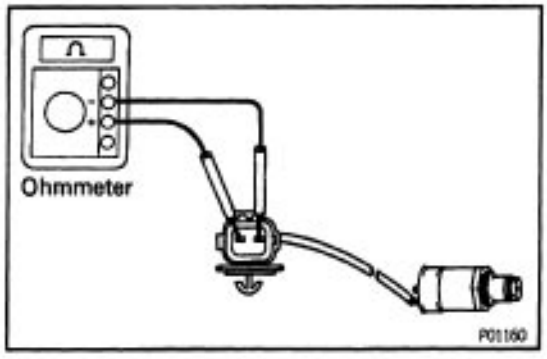
INSPECT SOLENOID VALVE

Using an ohmmeter, measure the resistance between the terminals

Resistance:

7.6 – 8.0Ω at 25°C (77°F)

If the resistance is not as specified, replace the sole–noid valve.



SERVICE SPECIFICATIONS

SERVICE DATA

Thermostat	Valve opening pressure	80 – 84°C (176 – 183°F)
	Valve lift at 95°C (203°F)	10.0 mm (0.394 in.) or more
Radiator cap	Relief valve opening pressure (STD)	83 – 113 kPa (0.85 – 1.15 kgf/cm², 12.1 – 16.4 psi)
	Relief valve opening pressure (Limit)	69 kPa (0.7 kgf/cm², 10.0 psi)
Radiator	Plate height	7.75 – 8.25 mm (0.3051 – 0.3248 in.)
On–vehicle inspection for hydraulic–driven cooling motor	Oil pressure	981 – 1,961 kPa (10 – 20 kgf/cm², 142 – 284 psi)
Hydraulic motor	Rotor side clearance (STD)	0.01 – 0.04 mm (0.0004–0.0016 in.)
	Rotor side clearance (Limit)	0.05 mm (0.0020 in.)
	Drive shaft hole inside diameter	14.000 – 14.011 mm (0.5512 – 0.5516 in.)
	Drive shaft diameter	13.973–13.984 mm (0.5501 – 0.5506 in.)
	Drive shaft oil clearance (STD)	0.016 – 0.038 mm (0.0006 – 0.0015 in.)
	Drive shaft oil clearance (Limit)	0.04 mm (0.0031 in.)
	Drive shaft preload (rotating torque)	0.03 N·m (3.0 kgf·cm, 2.6 in.·lbf)
ECT sensor	Resistance at 80°C (176°F)	1.48 – 1.58 kΩ

TORQUE SPECIFICATIONS

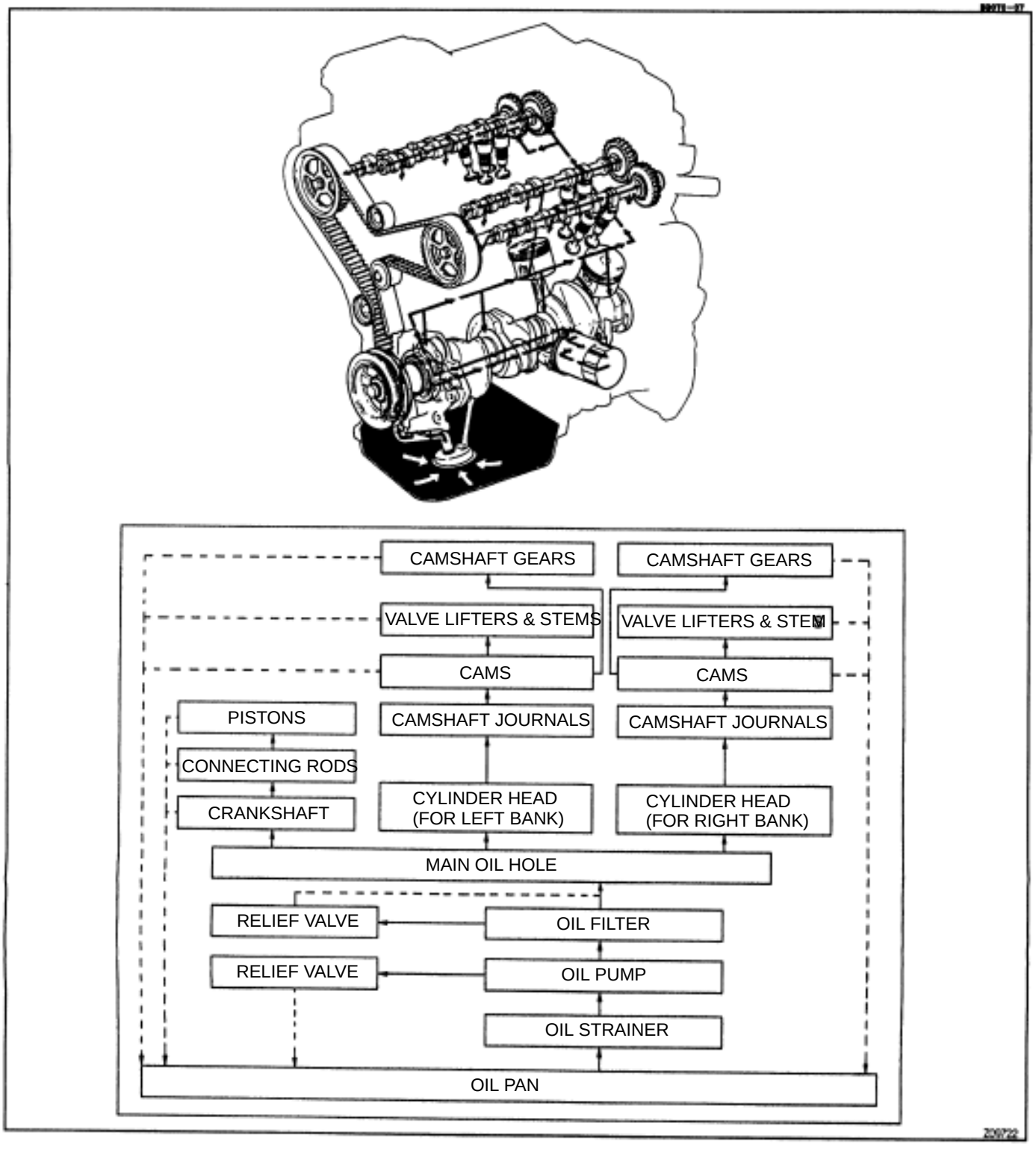
Part tightened	N·m	kgf·cm	ft·lbf
RH Drain plug x Cylinder block	7	70	61 in.·lbf
LH Drain plug x Cylinder block	13	130	9
Water pump x Cylinder block	8	80	69 in.·lbf
No.3 timing belt cover x Cylinder head	8.5	85	74 in.·lbf
No.2 idler pulley x Cylinder heads	43	440	32
Camshaft pulley x Camshaft	125	1,300	94
Camshaft pulley x Camshaft (For use with SST)	88	900	65
Water inlet x Water inlet housing	8	80	69 in.·lbf
Water inlet pipe x LH cylinder head	19.5	200	14
Hydraulic motor pressure hose x Water inlet	8	80	69 in.·lbf
Radiator oil cooler x Radiator lower tank	8.3	85	7.4 in.·lbf
Radiator pipe x Radiator lower tank	14.7	150	11
Pressure hose x Hydraulic motor	63.7	650	47
Radiator support bolt	12.8	130	9
Hydraulic motor housing x Motor cover	28	290	21
Hydraulic motor x Fan shroud	4.9	50	43 in.·lbf
Cooling fen x Hydraulic motor	15	150	11
Hydraulic cooling fan x Radiator	4.9	50	43 in.·lbf
Oil cooler (for hydraulic cooling fan) x RadiAtor lower support	8	80	69 in.·lbf

LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system has been adopted for this engine.

OPERATION



A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump to remove impurities. The oil pump itself is a trochoid type pump, inside of which there is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the two rotors changes as they rotate. Oil is drawn in when the space is wide and is discharged when the space in narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil.
–During normal oil supply, a coil spring and valve keep the bypass closed, but when too much oil is being fed, the pressure become extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the relief valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a built–in paper filter element. Particles of metal from wear, airborne dirt, carbon and other impurities can get into the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve bypasses the oil filter and flows directly into the main oil hole in the engine.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seal Cutter	No.2 oil pan
	09223–00010 Cover & Seal Replacer	Crankshaft front oil seal
	09226–07500 Oil Filter Wrench	
	09816–30010 Oil Pressure Switch Socket	

RECOMMENDED TOOLS

	09200–00010 Engine Adjust Kit	

EQUIPMENT

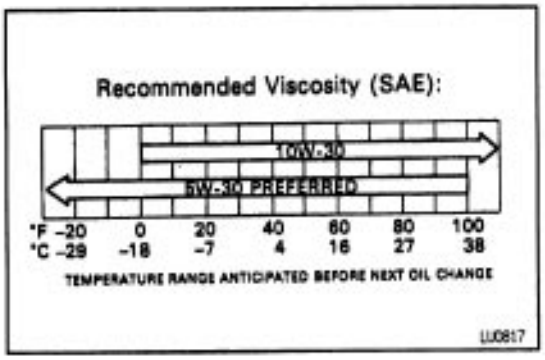
Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Engine oil Dry fill Drain and refill w/ Oil filter change w/o Oil filter change	5.5 liters (5.8 US qts, 4.8 Imp. qts) 4.7 liters (5.0 US qts, 4.1 Imp. qts) 4.5 liters (4.8 US qts, 4.0 Imp. qts)	API grade SG or SH, Energy–Conserving II or ILSAC multigrade and recommended viscosity oil with SAE 5W–30 being the preferred engine oil

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Oil pump No.1 oil pan No.2 oil pan
08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch



OIL PRESSURE CHECK

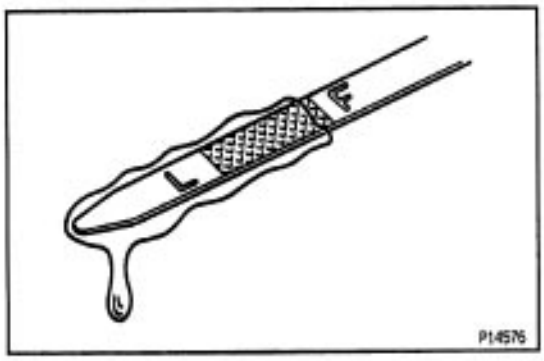
1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, dis–coloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade SG or SH, Energy – Conserving II or ILSAC multigrade engine oil. Recommended viscosi–ty is as shown in the illustration with SAE 5W–30 being the preferred engine oil.



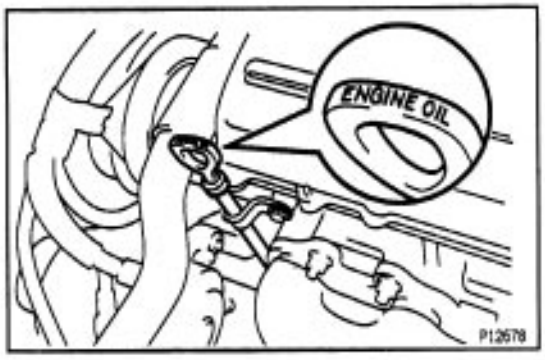
2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

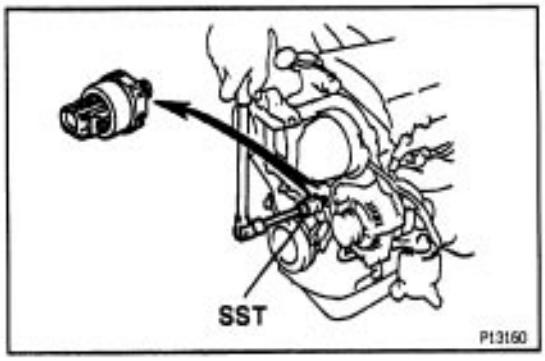
If low, check for leakage and add oil up to the ”F” mark.

NOTICE:

- **Do not fill with engine oil above the ”F” mark.**



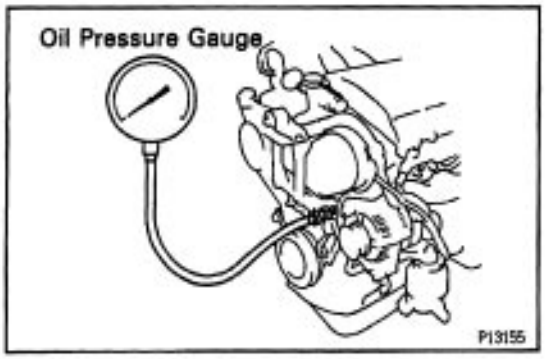
- **Install the oil dipstick facing the direction shown in the illustration.**



3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

(a) Using SST, remove the oil pressure switch.

SST 09816 – 30010



(b) Install the oil pressure gauge.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

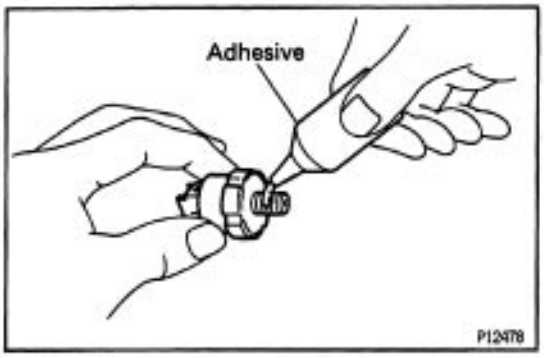
Oil pressure:

At idle speed

29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

294 – 539 kPa (3.0 – 5.5 kgf/cm^2, 43 – 78 psi)



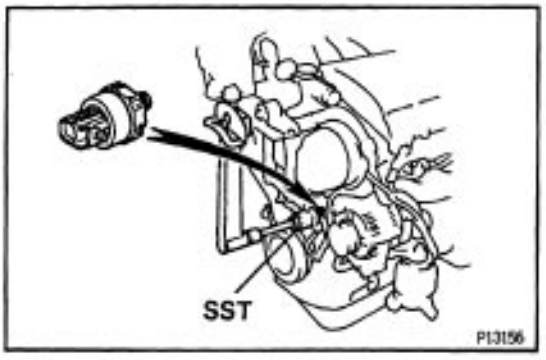
6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(c) Using SST, reinstall the oil pressure switch.

SST 09816–30010

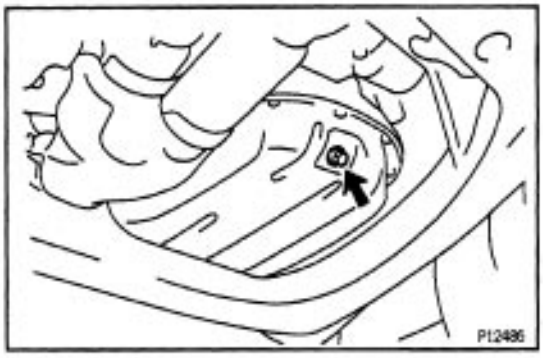
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

7. START ENGINE AND CHECK FOR LEAKS

OIL AND FILTER REPLACEMENT

CAUTION:

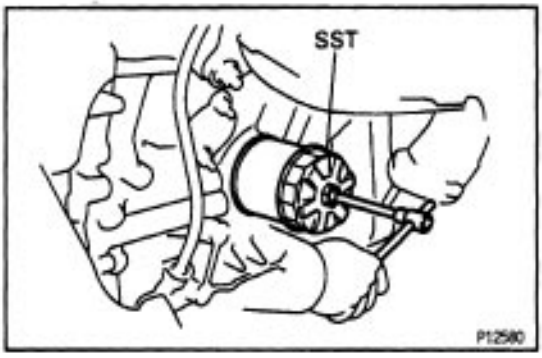
- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing end gloves. Wash your skin thoroughly with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**



1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

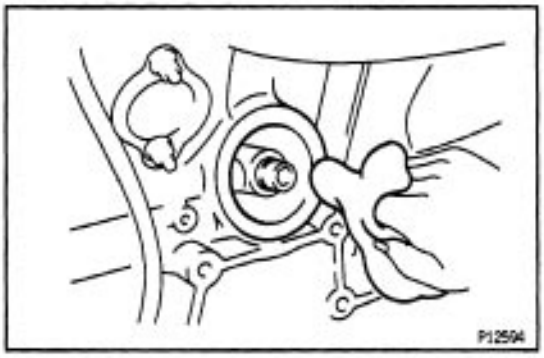
(b) Remove the oil drain plug, and drain the oil into a container.



2. REPLACE OIL FILTER

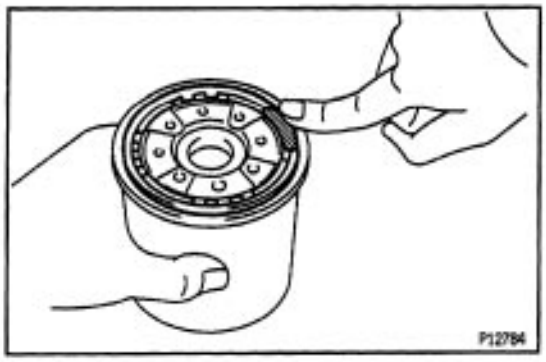
(a) Using SST, remove the oil filter.

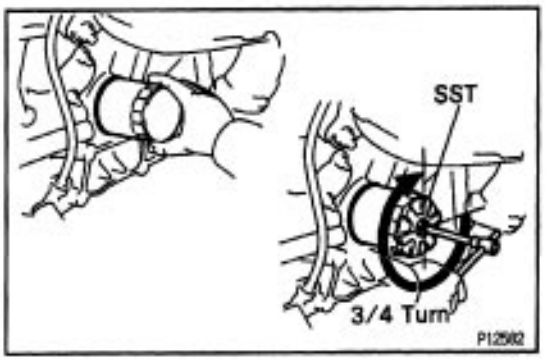
SST 09228–07500



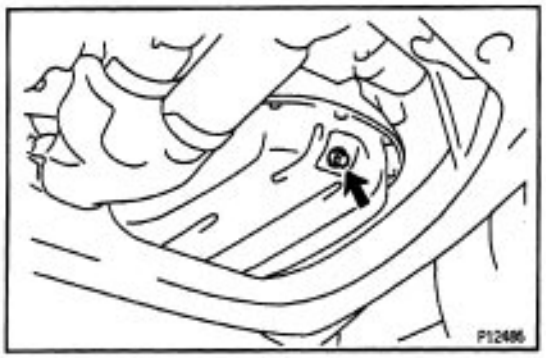
(b) Check and clean the oil filter installation surface.

(c) Apply clean engine oil to the gasket of a new oil filter.





(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07500



3. REFILL WITH ENGINE OIL

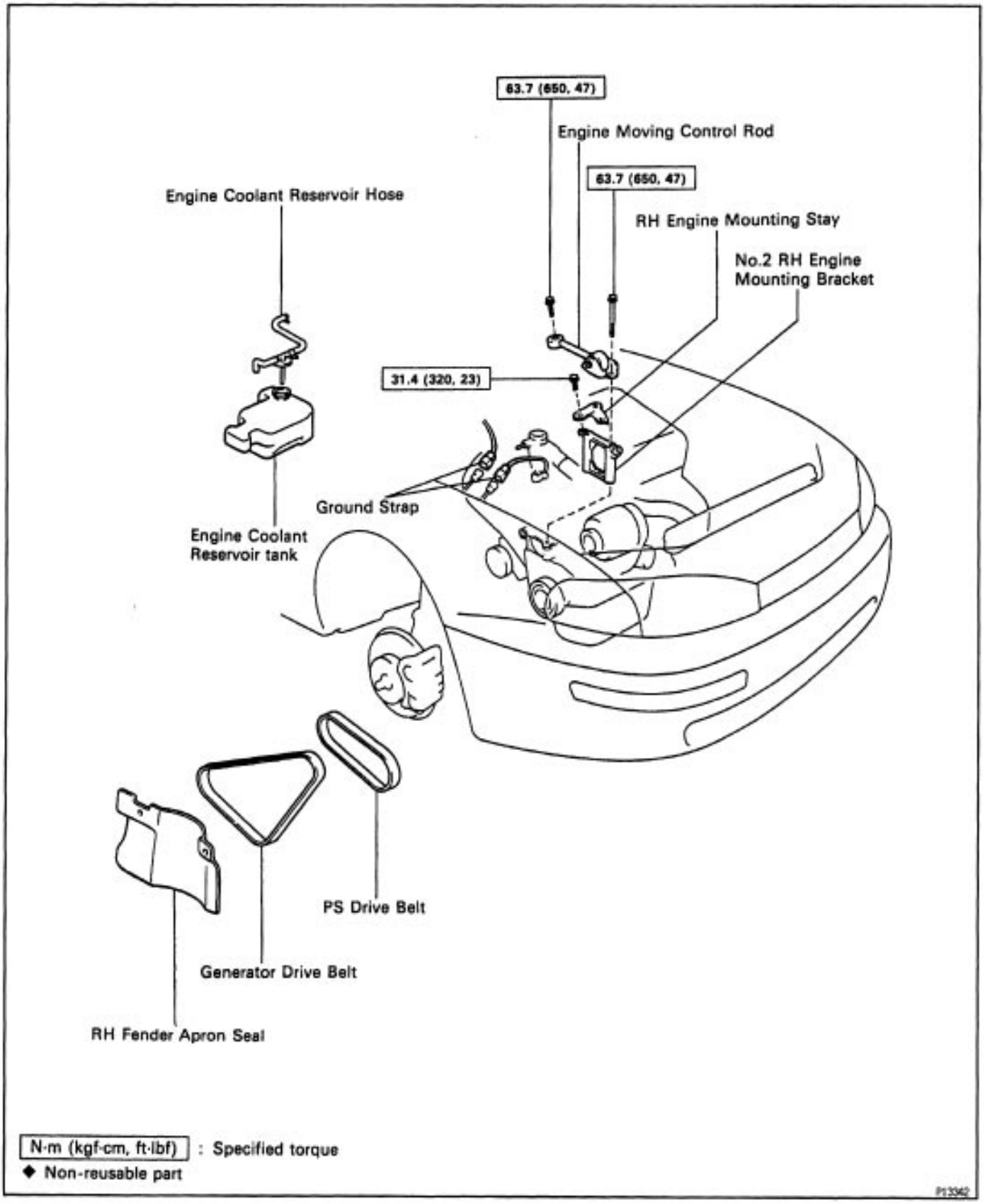
(a) Clean and install the oil drain plug with a new gasket.
Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)
(b) Fill with fresh engine oil.
Oil grade:
API grade SG or SH, Energy – Conserving II or ILSAC multigrade and recommended viscosity oil, with SAE 5W–30 being the preferred engine oil.
Capacity:
Drain and refill
w/ Oil filter change
4.7 liters (5.0 US qts, 4.1 Imp. qts)
w/o Oil filter change
4.5 liters (4.8 US qts, 4.0 Imp. qts)
Dry fill
5.5 liters (5.8 US qts, 4.8 Imp. qts)
(c) Reinstall the oil filler cap.

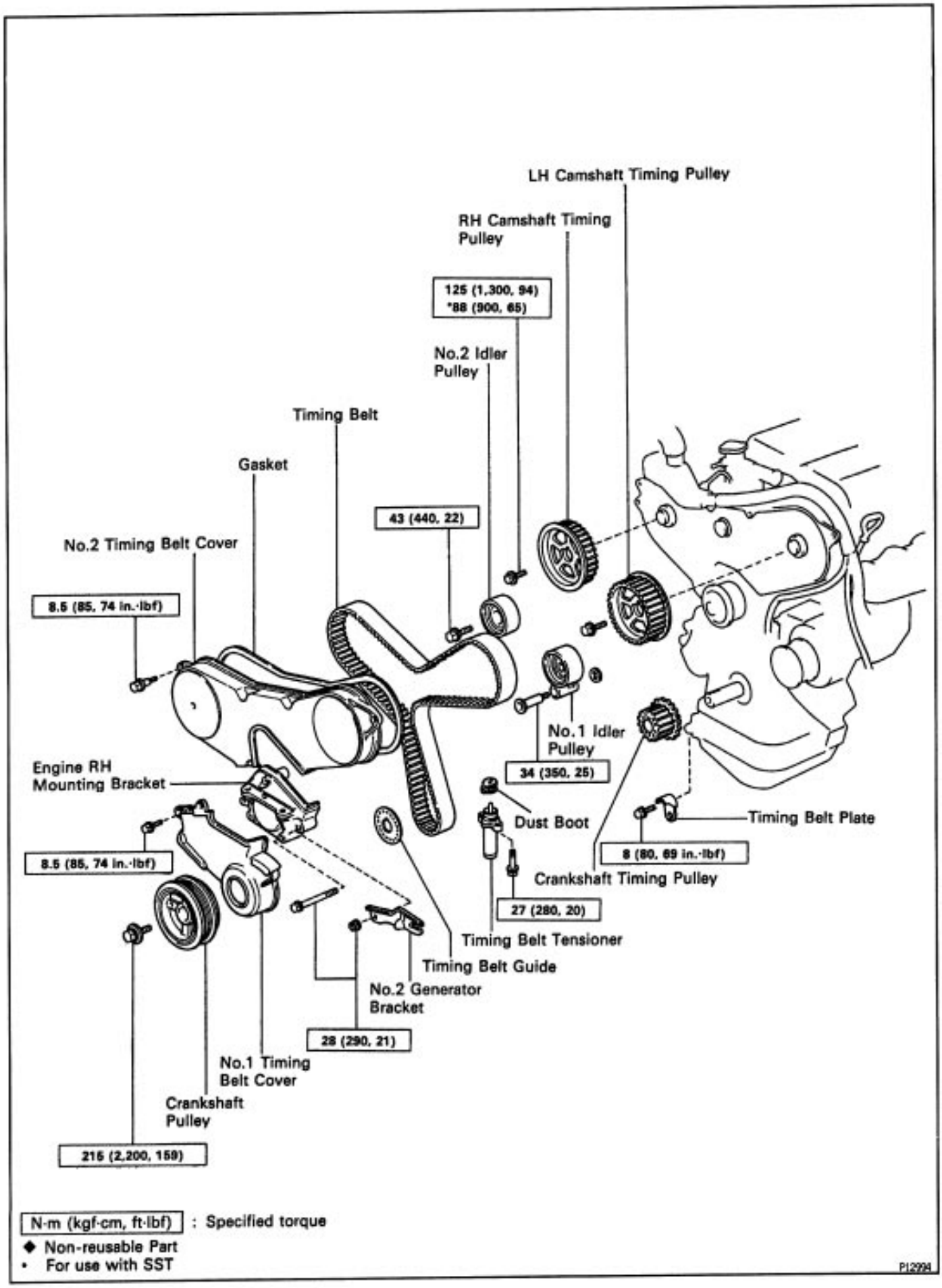
4. START ENGINE AND CHECK FOR OIL LEAKS

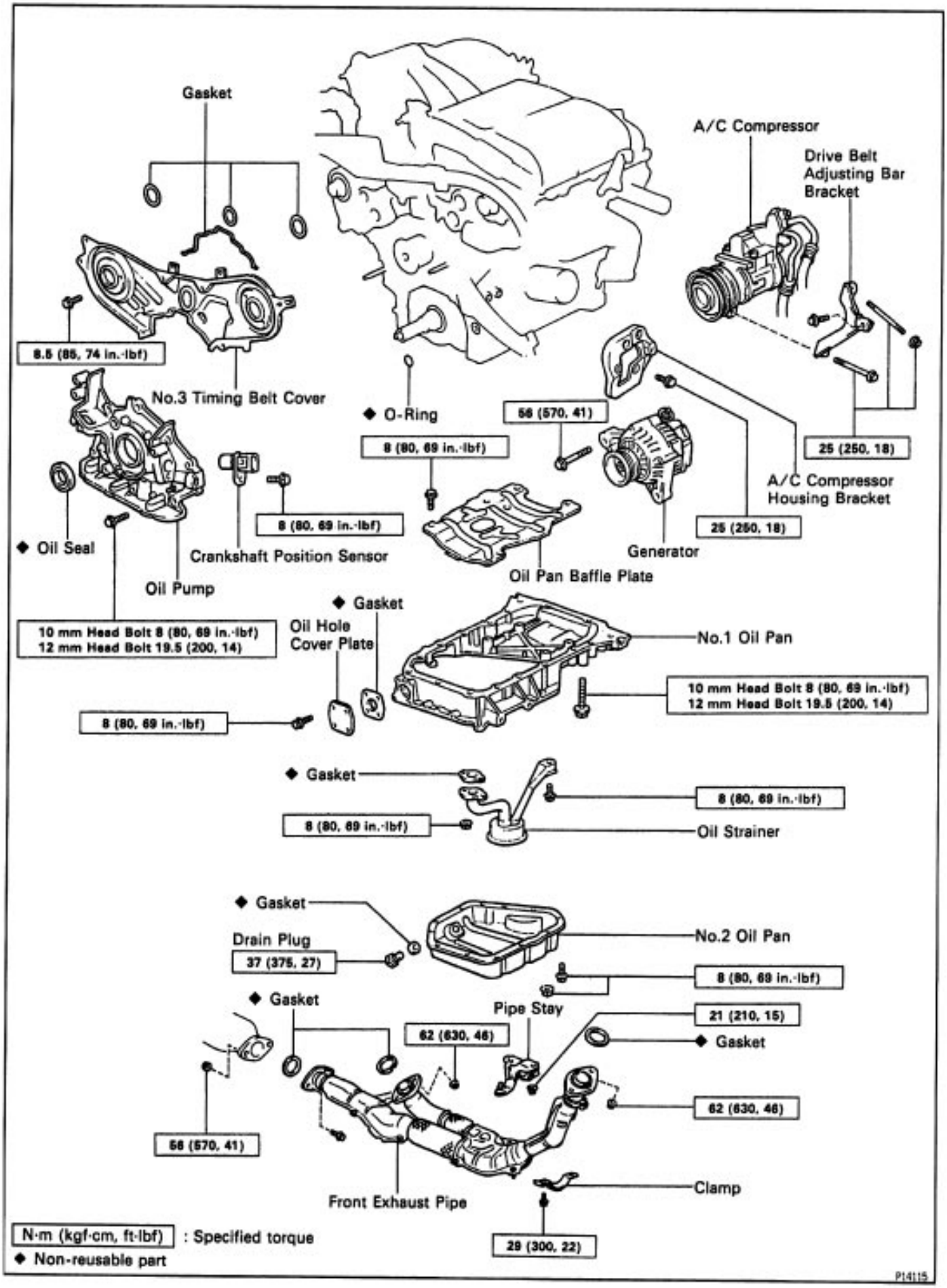
5. RECHECK ENGINE OIL LEVEL

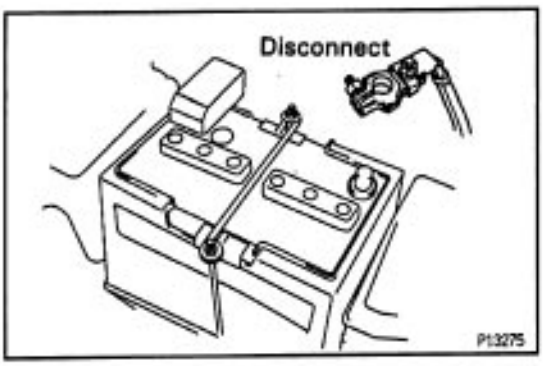
OIL PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION




LH Camshaft Timing Pulley
RH Camshaft Timing Pulley
125 (1,300, 94)
*88 (900, 65)
No.2 Idler Pulley
Timing Belt
Gasket
43 (440, 22)
No.2 Timing Belt Cover
8.5 (85, 74 in.·lbf)
No.1 Idler Pulley
34 (350, 25)
Engine RH Mounting Bracket
Dust Boot
Timing Belt Plate
8 (80, 69 in.·lbf)
8.5 (85, 74 in.·lbf)
Crankshaft Timing Pulley
27 (280, 20)
Timing Belt Tensioner
Timing Belt Guide
No.2 Generator Bracket
28 (290, 21)
No.1 Timing Belt Cover
Crankshaft Pulley
215 (2,200, 159)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable Part
• For use with SST
P12998


Gasket
A/C Compressor
Drive Belt Adjusting Bar Bracket
8.5 (85, 74 in.·lbf)
No.3 Timing Belt Cover
◆ O-Ring
56 (570, 41)
8 (80, 69 in.·lbf)
25 (250, 18)
A/C Compressor Housing Bracket
◆ Oil Seal
8 (80, 69 in.·lbf)
Crankshaft Position Sensor
Generator
Oil Pump
Oil Pan Baffle Plate
◆ Gasket
10 mm Head Bolt 8 (80, 69 in.·lbf)
12 mm Head Bolt 19.5 (200, 14)
Oil Hole Cover Plate
No.1 Oil Pan
8 (80, 69 in.·lbf)
◆ Gasket
8 (80, 69 in.·lbf)
Oil Strainer
◆ Gasket
Drain Plug
37 (375, 27)
No.2 Oil Pan
◆ Gasket
Pipe Stay
21 (210, 15)
◆ Gasket
62 (630, 46)
56 (570, 41)
62 (630, 46)
Front Exhaust Pipe
Clamp
29 (300, 22)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P14115



OIL PUMP REMOVAL

(See Components for Removal and Installation)

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery.

2. DRAIN ENGINE OIL

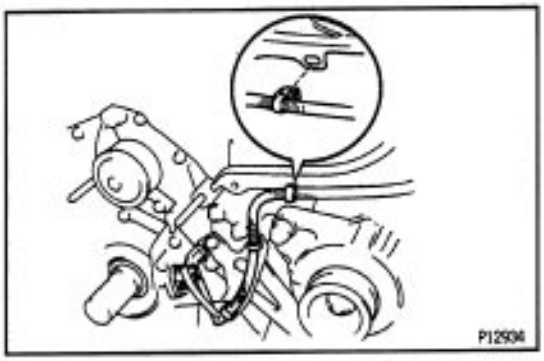
3. REMOVE OIL DIPSTICK

4. REMOVE TIMING BELT

(See step 2 to 20 on pages EG2–41 to 45)

5. REMOVE TIMING PULLEYS

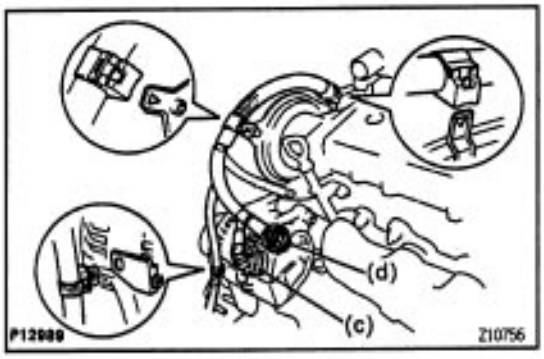
(See step 21 to 24 on pages EG2–45 to 47)



6. DISCONNECT ENGINE WIRE

(a) Disconnect the crankshaft position sensor connector.

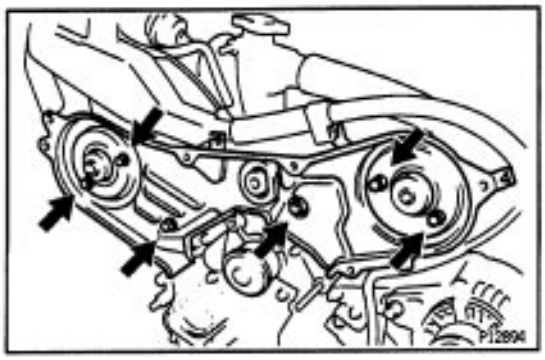
(b) Disconnect the engine wire from the wire clamp.



(c) Disconnect the generator connector.

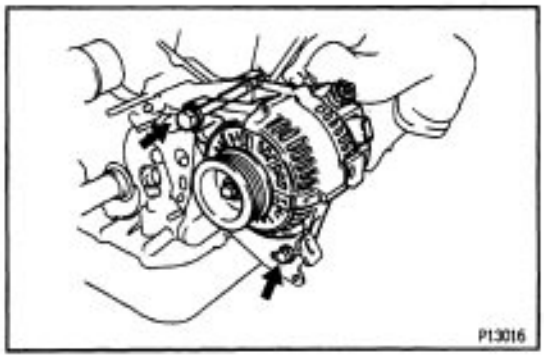
(d) Remove the nut and disconnect the generator wire.

(e) Disconnect the engine wire from the 3 clamps.

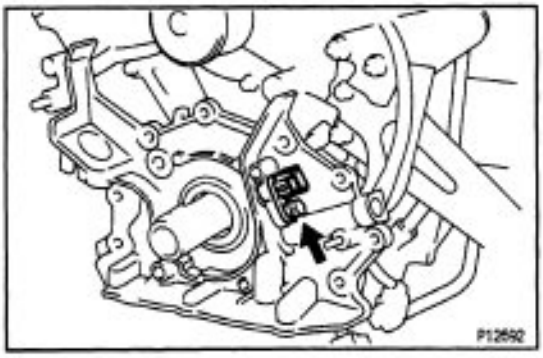


7. REMOVE No.3 TIMING BELT COVER

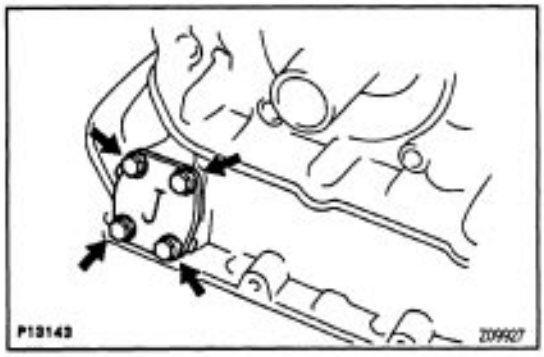
Remove the 6 bolts and belt cover.



8. REMOVE GENERATOR
Remove the 2 bolts and generator.

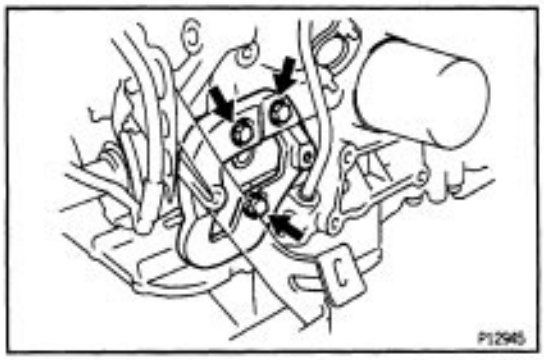


9. REMOVE CRANKSHAFT POSITION SENSOR
Remove the bolt and position sensor.

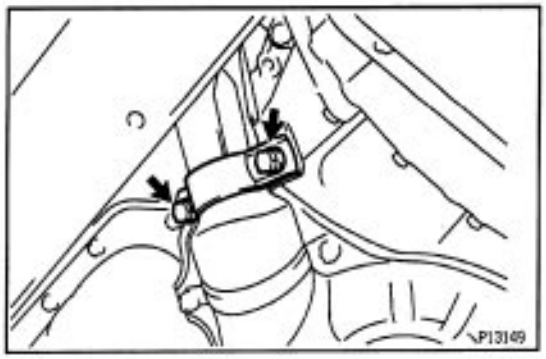


10. REMOVE OIL HOLE COVER PLATE
Remove the 4 bolts and cover plate.

11. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES
(a) Disconnect the A/C compressor connector.
(b) Remove the drive belt.
(c) Remove the 5 bolts, 2 nuts and drive belt adjusting bar bracket, and disconnect the A/C compressor.
(d) Move the compressor aside and suspend it.

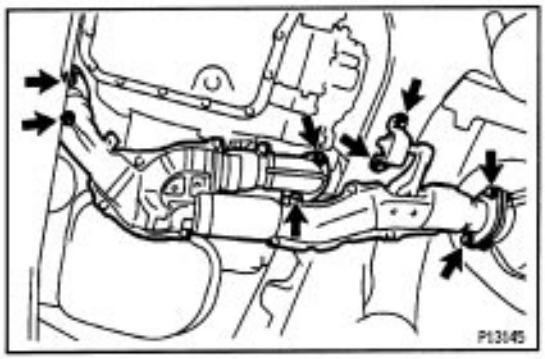


12. REMOVE A/C COMPRESSOR HOUSING BRACKET
Remove the 3 bolts and A/C compressor housing bracket.



13. REMOVE FRONT EXHAUST PIPE

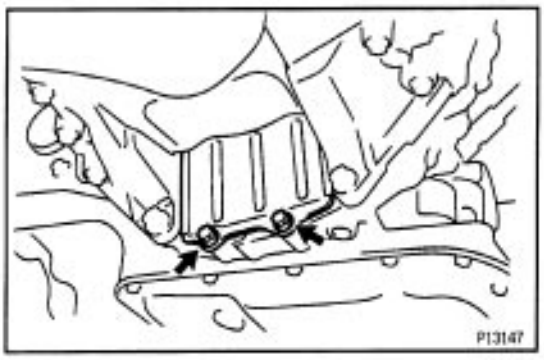
(a) Remove the 2 bolts and exhaust pipe clamp.



(b) Remove the 2 bolts, and disconnect the bracket.
(c) Remove the 2 bolts and 2 nuts holding the front exhaust pipe to the three–way catalytic converter.
(d) Remove the 4 nuts holding the front exhaust pipe to the exhaust manifolds.
(e) Remove the front exhaust pipe and 3 gaskets.

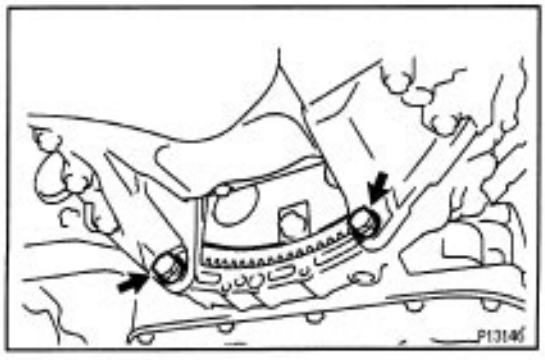
14. REMOVE FRONT EXHAUST PIPE STAY

Remove the 2 bolts and pipe stay.



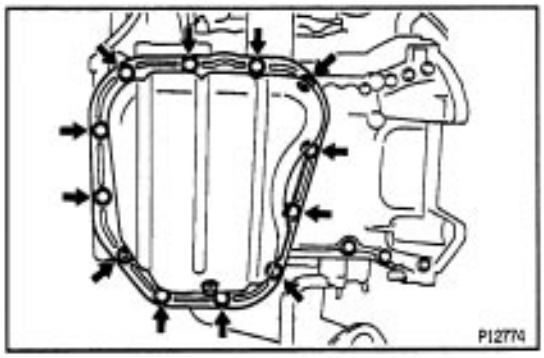
15. REMOVE FLYWHEEL HOUSING UNDERCOVER

Remove the 2 bolts and undercover.



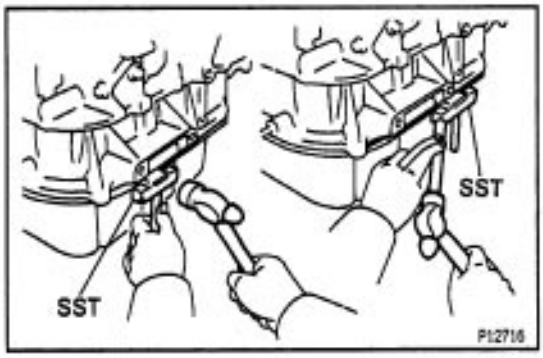
16. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSAXLE

Remove the 2 bolts.



17. REMOVE NO.2 OIL PAN

(a) Remove the 10 bolts and 2 nuts.



(b) Insert the blade of SST between the No. 1 and No.2 oil pans, and cut off applied sealer and remove the No. 1 oil pan.

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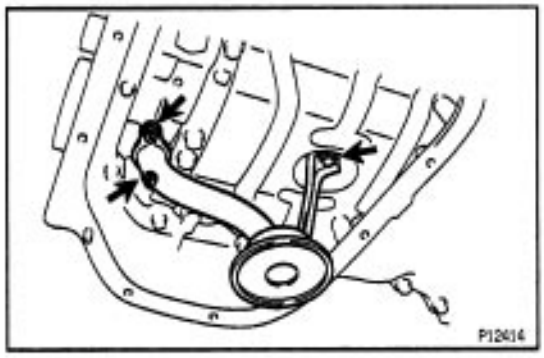
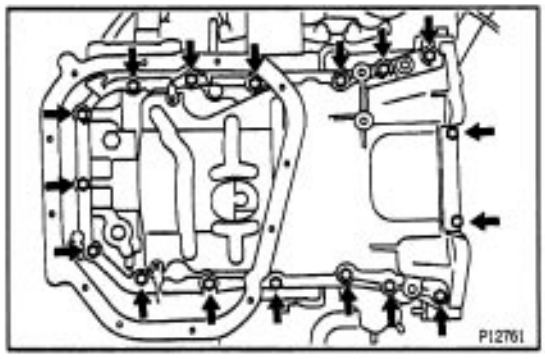
NOTICE:

- **Be careful not to the damage the No.2 oil pan con–tact surface of the No.1 oil pan.**
- **Be careful not to damage the No..2 oil pan flange.**



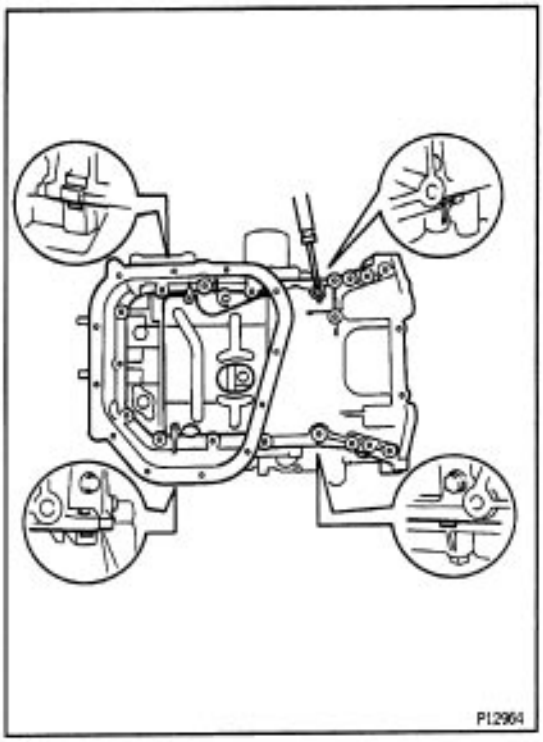
18. REMOVE OIL STRAINER

Remove the bolt, 2 nuts, oil strainer and gasket.



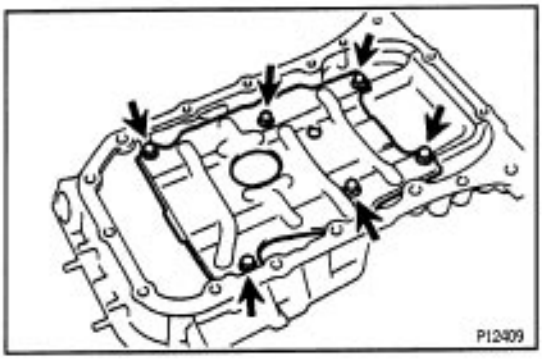
19. REMOVE NO.1 OIL PAN

(a) Remove the 17 bolts.



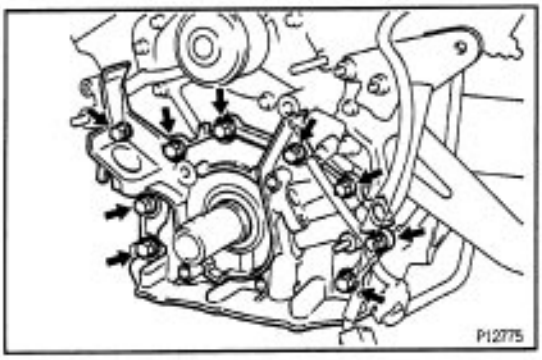
(b) Using a screwdriver, remove the No. 1 oil pan by prying the portions between the cylinder block and No.1 oil pan.

NOTICE: Be careful not to damage the contact surfaces of the cylinder block and No.1 oil pan.



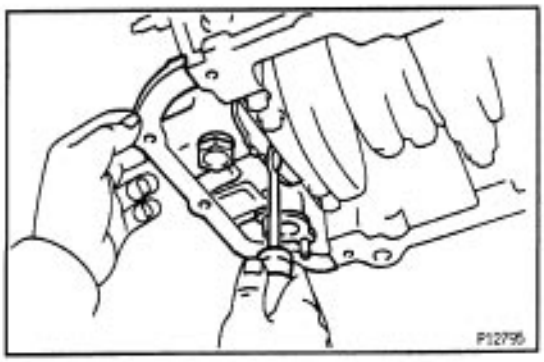
20. REMOVE OIL PAN BAFFLE PLATE

Remove the 6 bolts and baffle plate.



21. REMOVE OIL PUMP

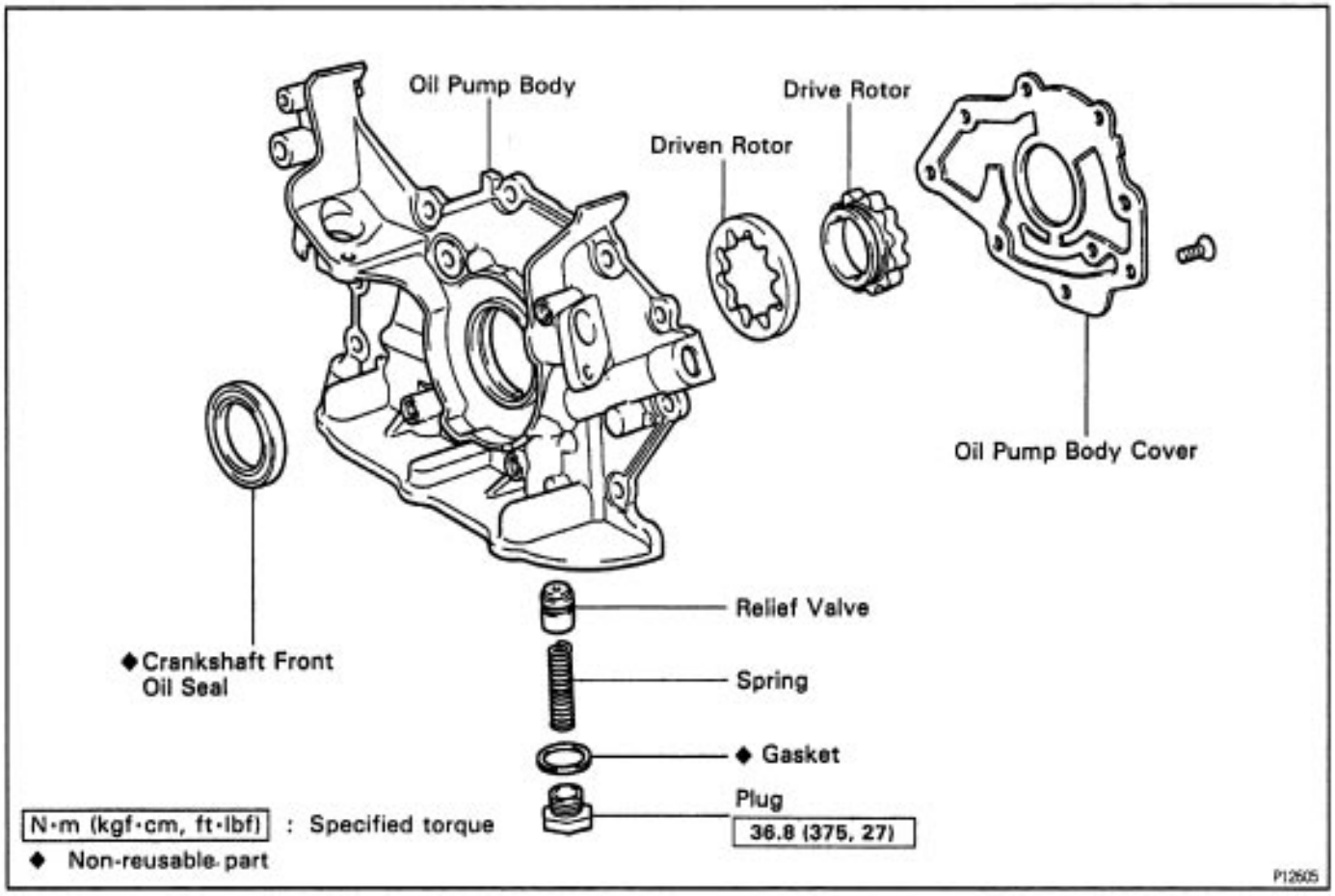
(a) Remove the 9 bolts.

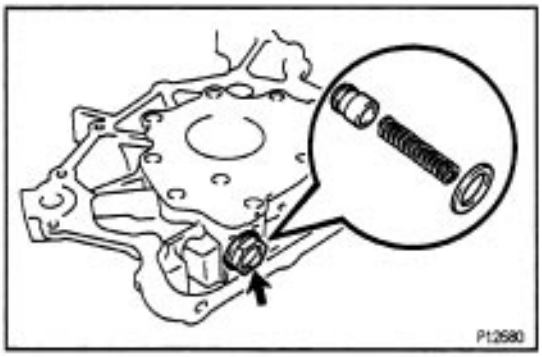


(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.

(c) Remove the 0–ring.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

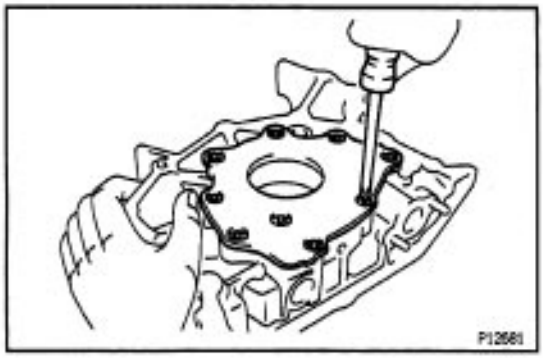




OIL PUMP DISASSEMBLY

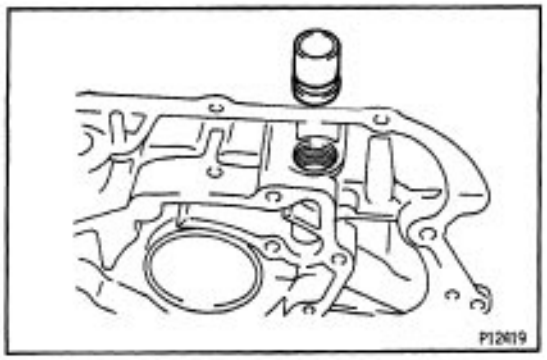
1. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve.



2. REMOVE DRIVE AND DRIVEN ROTORS

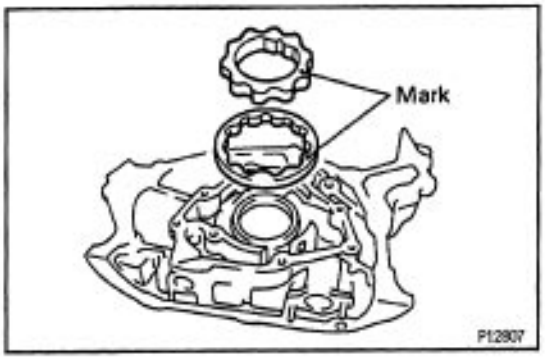
Remove the 9 screws, pump body cover, drive and driven rotors.



OIL PUMP INSPECTION

1. INSPECT RELIEF VALVE

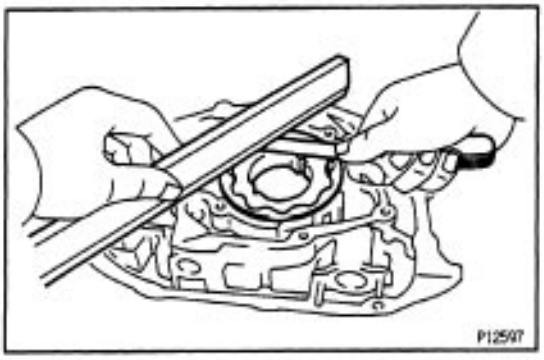
Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN ROTORS

A. Place drive and driven rotors into oil pump body

Place the drive and driven rotors into the oil pump body with the mark facing upward.



B. Inspect rotor side clearance

Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

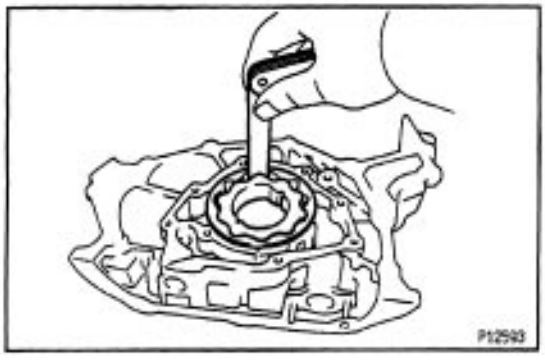
Standard side clearance:

0.030 – 0.090 mm (0.0012 – 0.0035 in.)

Maximum side clearance:

0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



C. Inspect rotor tip clearance

Using a feeler gauge, measure the clearance between the drive and driven rotor tips.

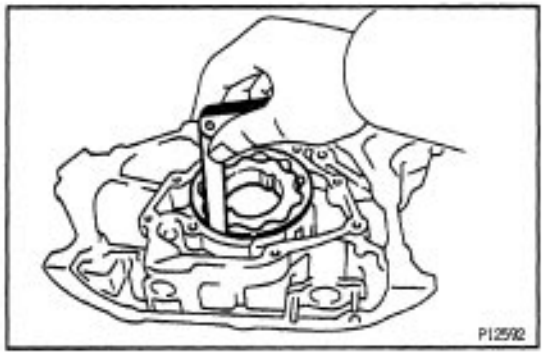
Standard tip clearance:

0.110 – 0.240 mm (0.0043 – 0.0094 In.)

Maximum tip clearance:

0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



D. Inspect rotor body clearance

Using a feeler gauge, measure the clearance between the driven rotor and body.

Standard body clearance:

0.100 – 0.175 mm (0.0039 – 0.0069 In.)

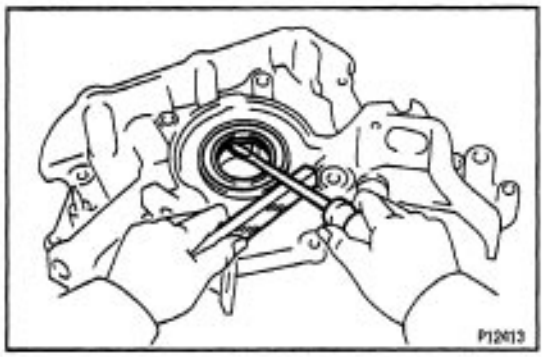
Maximum body clearance:

0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, re–place the rotors as a set. If necessary, replace the oil pump assembly.

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

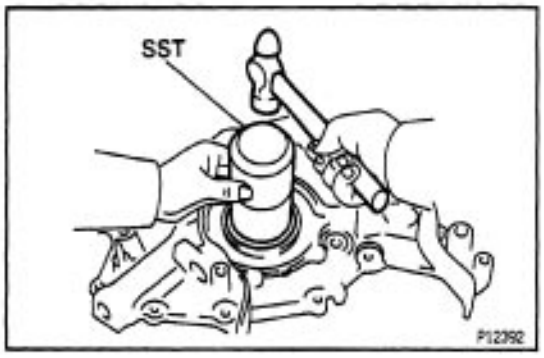
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:



REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

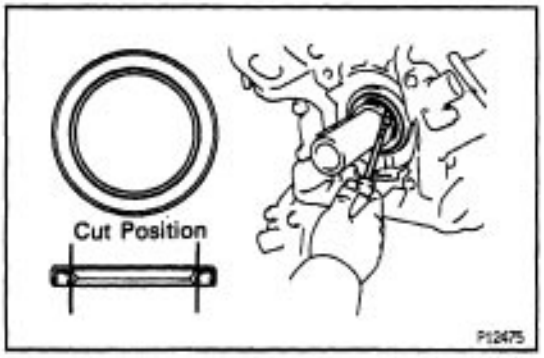
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.

SST 09223 – 00010

(c) Apply MP grease to the oil seal lip.

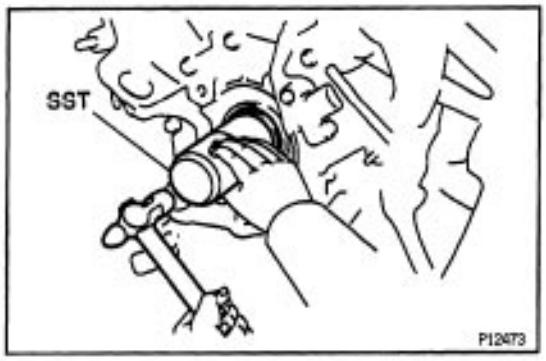


B. If oil pump is installed to the cylinder block:

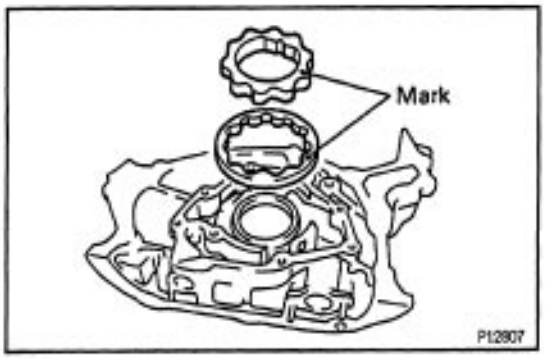
(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09223 – 00010

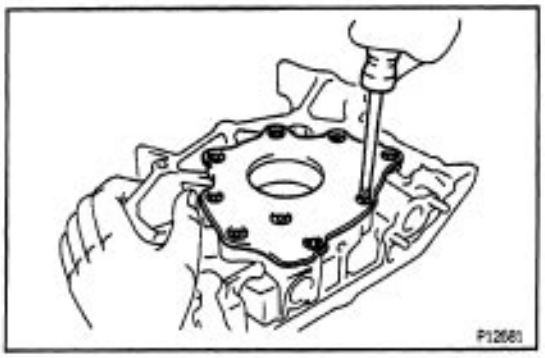


OIL PUMP ASSEMBLY

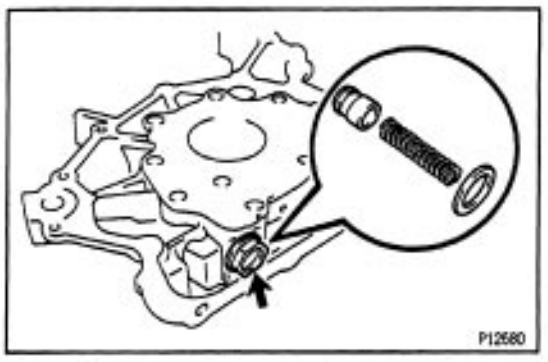
(See Components for Disassembly and Assembly)

1. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

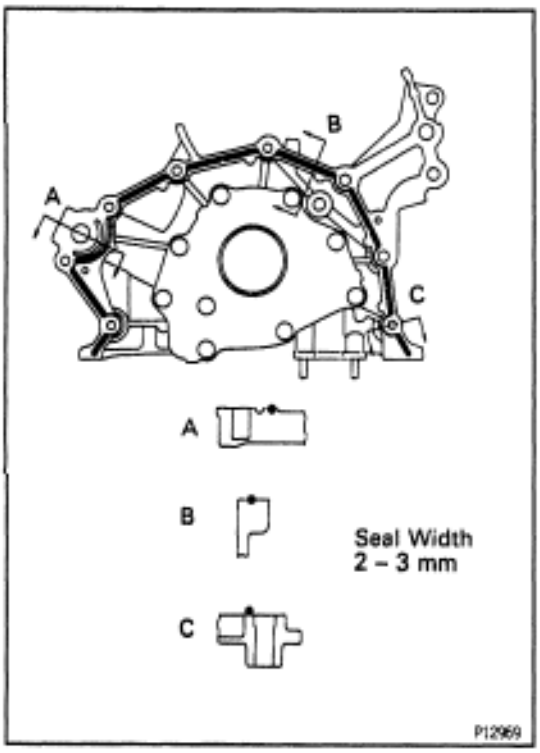


(b) Install the pump body cover with the 9 screws.



2. INSTALL RELIEF VALVE

(a) Insert the relief valve and spring into the pump body hole.
(b) Install the plug with a new gasket.
Torque: 36.8 N–m (375 kgf–cm, 37 ft–lbf)



OIL PUMP INSTALLATION

(See Components for Removal and Installation)

1. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil pump as shown in the illustration.

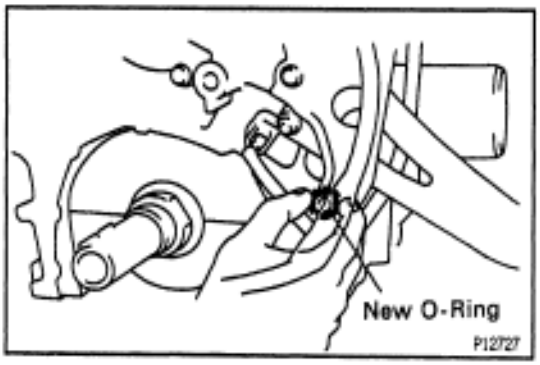
Seal packing:

Part No. 08826–00080 or equivalent

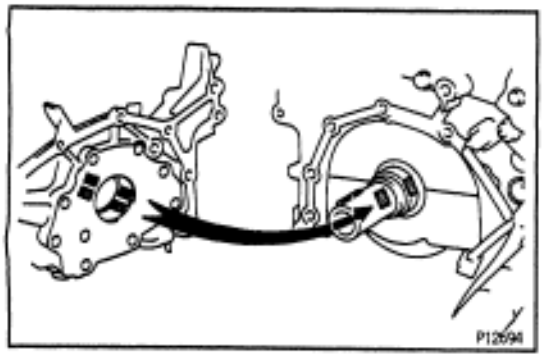
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

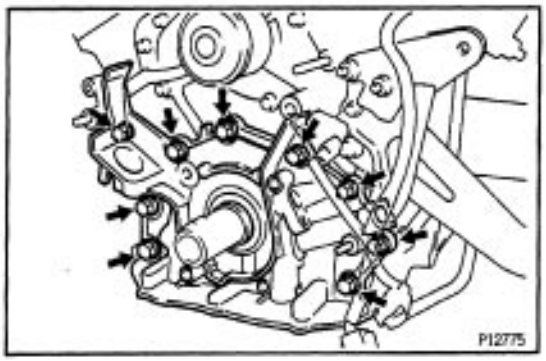
- Parts must be assembled within 3 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Place a new 0 – ring in position on the cylinder block.



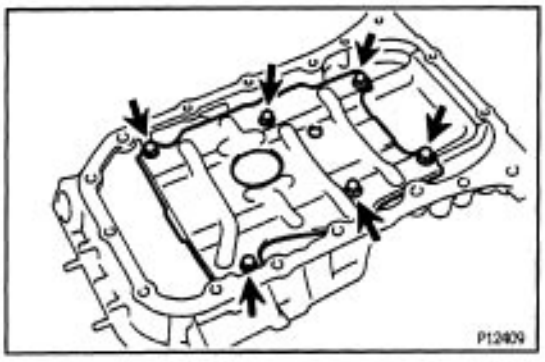
(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide the oil pump on the crankshaft.



(e) Install the oil pump with the 9 bolts.

Torque:

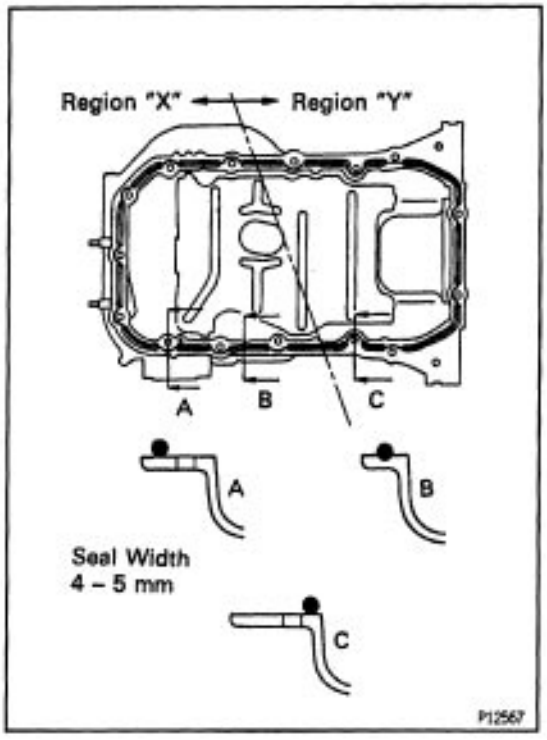
8 N–m (80 kgf–cm, 69 in.–lbf) for 10 mm head bolt
19.5 N–m (200 kgf–cm, 14 ft–lbf) for 12 mm head bolt



2. INSTALL OIL PAN BAFFLE PLATE

Install the baffle plate with the 6 bolts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



3. INSTALL NO.1 OIL PAN

(a) Remove any old packing (FIPG) material and be care–f ul not to drop any oil on the contact surfaces of the oil pan, oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing:

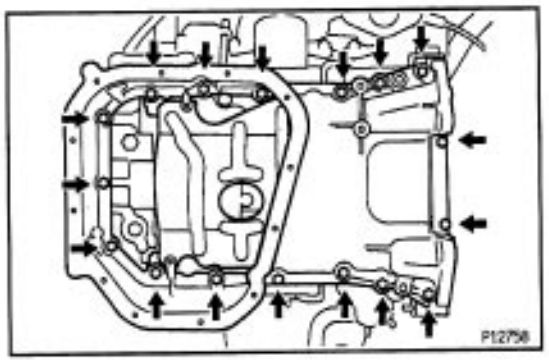
Part No. 08826–00080 or equivalent

Region “X” is at the outer side of the bolt hole.
Region “Y” Is at the inner side of the bolt hole.

- Install a nozzle that has been cut to a 4–5 mm (0.16–0.20 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

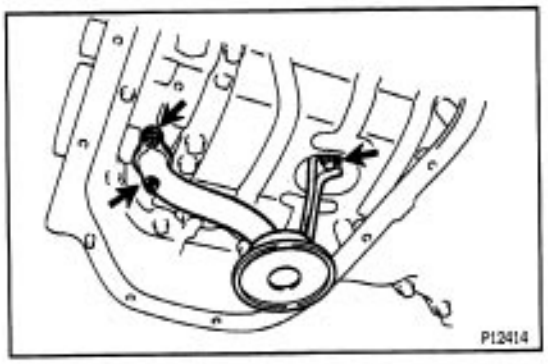
- Parts must be assembled within 3 minutes of application. Otherwise the material must be re–moved and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the oil pan with the 17 bolts.

Torque:

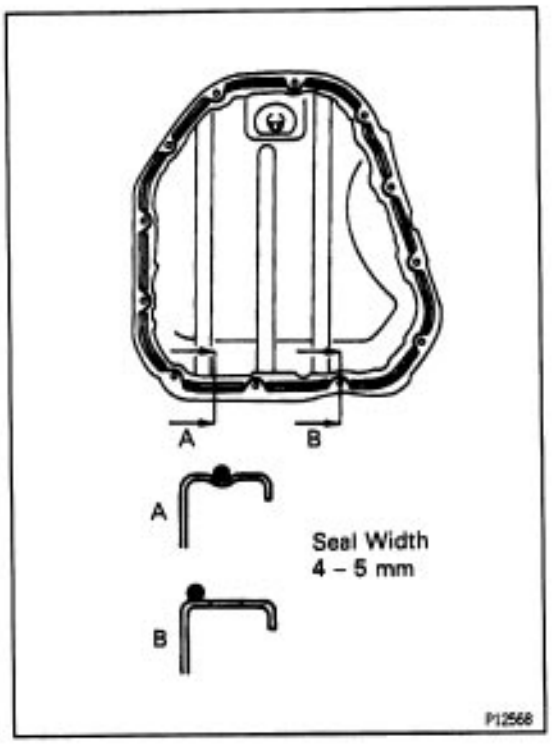
8 N–m (80 kgf–cm, 69 in.–lbf) for 10 mm head bolt
19.5 N–m (200 kgf–cm. 14 ft–lbf) for 12 mm head bolt



4. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.

Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)



5. INSTALL NO.2 OIL PAN

(a) Remove any old packing (FIPG) material and be care. ful not to drop any oil on the contact surface of the No. 1 and No.2 oil pans.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove al the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the paint ed surfaces.

(b) Apply seal packing to the No.2 oil pan as shown in the illustration.

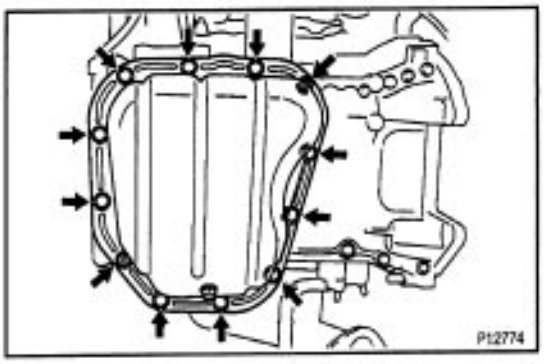
Seal packing:

Part No. 088218–00080 or equivalent

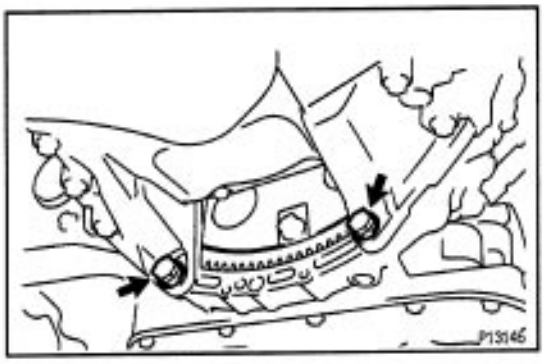
- Install a nozzle that has been cut to a 4–5 mm (0.16 – 0.20 in.) opening.

HINT: Avoid –applying an excessive amount to the surface.

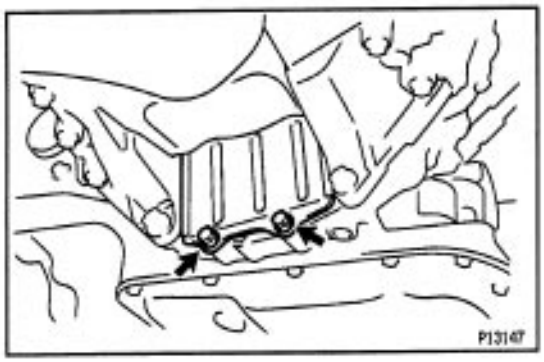
- Parts must be assembled within 3 minutes an application. Otherwise the material must be re–moved and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the No.2 oil pan with the 10 bolts and 2 nuts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

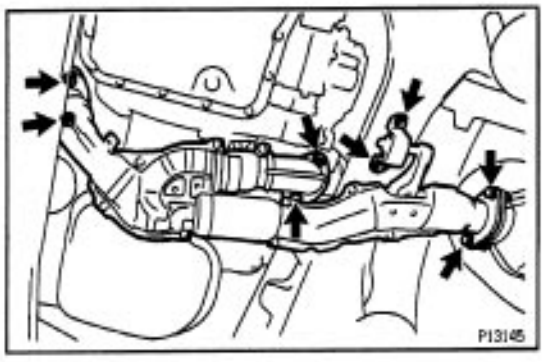


6. INSTALL BOLTS HOLDING NO.1 OIL PAN TO TRANSAXLE
Install the 2 bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

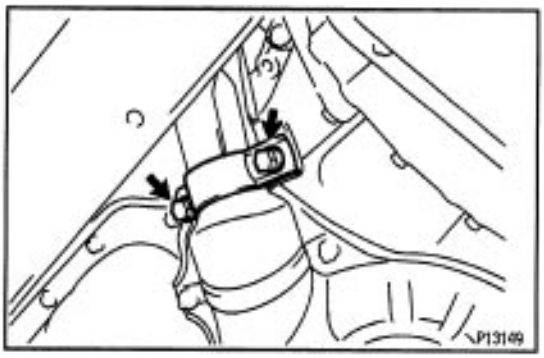


7. INSTALL FLYWHEEL HOUSING UNDERCOVER
Install the undercover with the 2 bolts.
Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

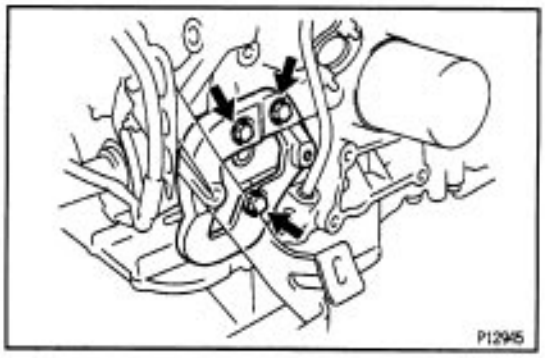
8. INSTALL FRONT EXHAUST PIPE STAY
Install the pipe stay with the 2 bolts.
Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)



9. INSTALL FRONT EXHAUST PIPE
(a) Temporarily install 3 new gaskets and the front ex–haust pipe with the 2 bolts and6 nuts.
(b) Tighten the 4 nuts holding the exhaust manifolds to the front exhaust pipe.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(c) Tighten the 2 bolts and 2 nuts holding the three–way catalytic converter to the front exhaust pipe.
Torque: 56 N–m (570 kgf–cm, 41 ft–lbf)
(d) Connect the bracket with the 2 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

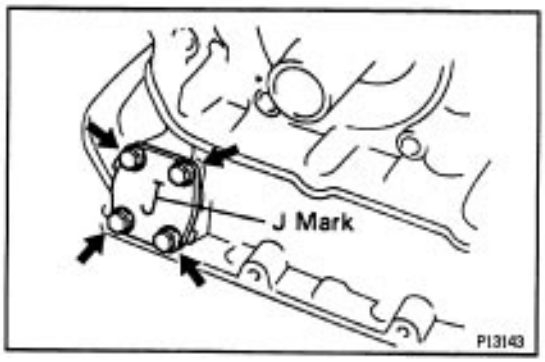


(e) Connect the front exhaust pipe clamp with the 2 bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

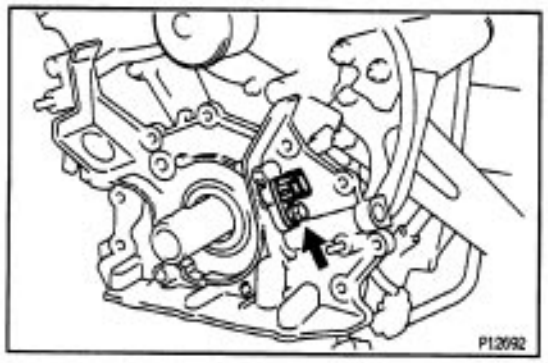


10. INSTALL A/C COMPRESSOR HOUSING BRACKET
Install the housing bracket with the 3 bolts.
Torque: 26 N–m (250 kgf–cm, 18 ft–lbf)

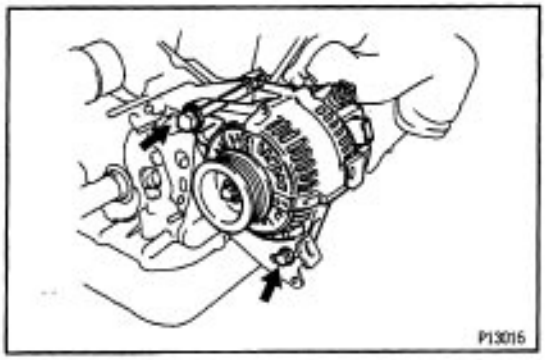
11. INSTALL A/C COMPRESSOR
(a) Install the A/C compressor and drive belt adjusting bar bracket with the 5 bolts.
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



12. INSTALL OIL HOLE COVER PLATE
Install a new gasket and the hole cover plate (J mark facing outward) with the 4 bolts.
Torque: 8 N–m (80 kgf–cm, 69 in.–lbf)

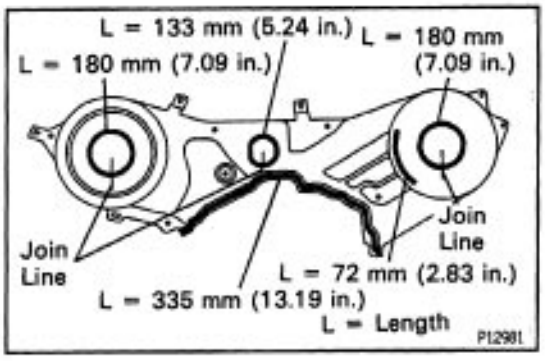


13. INSTALL CRANKSHAFT POSITION SENSOR
Install the position sensor with the bolt.
Torque: 8 N–m (80 kgf–cm, 89 in.–lbf)



14. INSTALL GENERATOR

Install the generator with the 2 bolts. Do not tighten the bolts yet.



15. INSTALL NO.3 TIMING BELT COVER

(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.

If the gaskets do have cracks or peeling etc., replace them using the following steps.

(1) Using a screwdriver and gasket scraper, remove all the old gasket material.

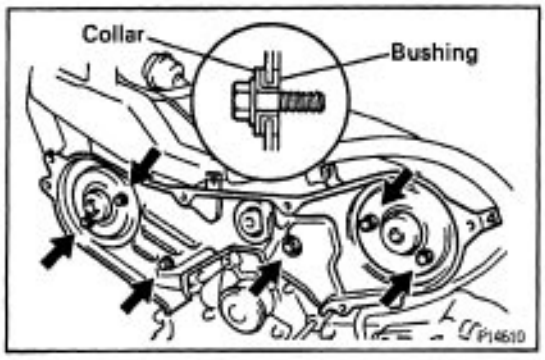
(2) Thoroughly clean all components to remove all the loose material.

(3) Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.

NOTICE: When joining gaskets, do not leave a gap between them. Cut off any excess gasket.

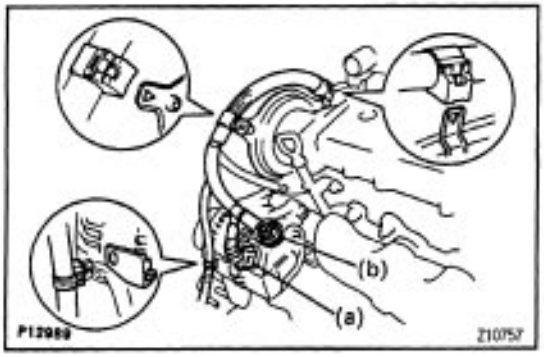
(4) After installing the gasket, press down on it so that the adhesive firmly sticks to the belt cover.

(b) Install new gaskets to the No.3 belt cover.



(c) Install the belt cover with the 6 bolts.

Torque: 8.5 N–m (85 kgf–cm. 74 in.–lbf)

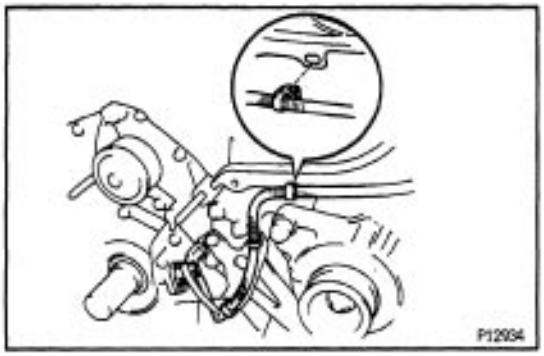


16. CONNECT ENGINE WIRE

(a) Connect the generator connector.

(b) Connect the generator wire with the nut.

(c) Connect the engine wire with the 3 clamps.



(d) Connect the crankshaft position sensor connector.
(e) Connect the engine wire with the wire clamp.

17. INSTALL TIMING PULLEYS
(See steps 1 to 5 on pages EG2–49, 50)
18. INSTALL TIMING BELT
(See steps6 to 27 on pages EG2–51 to 66)
19. FILL ENGINE WITH OIL
Capacity:
Drain and refill
w/ Oil filter change
4.7 liters (5.0 US qts, 4.1 Imp. qts)
w/o Oil filter change
4.5 liters (4.8 US qts, 4.0 Imp. qts)
20. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
21. START ENGINE AND CHECK FOR LEAKS
22. RECHECK ENGINE ENGINE OIL LEVEL

SERVICE SPECIFICATIONS

SERVICE DATA

Oil pressure	At idle speed (normal operating temperature) At 3,000 rpm (normal operating temperature)		29 kPa (0.3 kgf/cm², 43 psi) or more 294 – 539 kPa (3.0 – 5.5 kgf/cm², 43 – 78 psi)
Oil pump	Side clearance	STD	0.030 – 0.090 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)
	Body clearance	STD	0.100 – 0.175 mm (0.0039 – 0.0069 in.)
		Maximum	0.30 mm (0.0118 in.)
	Tip clearance	STD	0.110 – 0.240 mm (0.0043 – 0.0094 in.)
		Maximum	0.35 mm (0.0138 in.)

TORQUE SPECIFICATIONS

Pert tightened	N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block	13	130	9
No.2 oil pan x Drain plug	37	375	27
Oil pump x Plug (for relief valve)	36.8	375	37
Oil pump x Cylinder block (10 mm head bolt)	8	80	69 in.·lbf
Oil pump x Cylinder block (12 mm head bolt)	19.5	200	14
Oil pan baffle plate x No.1 oil pan	8	80	69 in.·lbf
No.1 idler pulley x Oil pump	34	350	25
No. 1 oil pan x Cylinder block	19.5	200	14
No. 1 oil pan x Oil pump	8	80	69 in.·lbf
No.1 oil pan x Rear oil seal retainer	8	80	69 in.·lbf
Oil strainer x Main bearing cap	8	80	69 in.·lbf
Oil strainer x Oil pump	8	80	69 in.·lbf
No.2 oil pan x No. 1 oil pan	8	80	69 in.·lbf
Flywheel housing under cover x Transaxle	8	80	69 in.·lbf
Exhaust pipe stay x No.1 oil pan	21	210	15
Exhaust pipe clamp x Exhaust pipe stay	29	300	22
A/C compressor housing bracket x Cylinder block	25	250	18
A/C compressor x A/C compressor housing bracket	25	255	18
Oil hole cover plate x No.2 oil pan	8	80	69 in.·lbf
No.1 oil pan x Transaxle case	37	380	27
Front exhaust pipe x Exhaust manifold	62	630	46
Front exhaust pipe x Converter	56	570	41
Crankshaft position sensor x Oil pump	8	80	69 in.·lbf
No.3 timing belt cover x Cylinder head	8.5	85	74 in.·lbf

1MZ–FE ENGINE TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

The Engine Control System broadly consists of the sensors, ECM and actuators. The ECM receives signals from various sensors, judges the operating conditions and determines the optimum injection duration, timing, ignition timing and idle speed.
In general, the Engine Control System is considered to be a very intricate system to troubleshoot. But, the fact is that if you inspect each circuit in order following the procedures in this manual, troubleshooting of this system is not complex.
When troubleshooting OBDll vehicles, use an OBDII scan tool complying with SAE J1978 or TOYOTA hand–held –tester to confirm the diagnostic trouble codes, freezed frame data and engine data.
This will enable you to determine the system causing the problem.
This section explains the best method of troubleshooting and how to carry out the necessary repairs.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in detail about the problem.

(2) CONNECT OBDII SCAN TOOL OR TOYOTA HAND–HELD TESTER TO DLC 3

Connect the OBDII scan tool complying with SAE J1978 or TOYOTA hand–held tester to the vehicle's data link connector 3.

NOTICE: For OBDII scan tool or TOYOTA hand–held tester operating instructions, see the in–struction booklet accompanying the scan tool or tester.

If your display shows "UNABLE" TO CONNECT TO VEHICLE" when you have connected the scan tool/TOYOTA hand–held tester cable to DLC 3, turn the ignition switch ON and operate the scan tool/TOYOTA hand–held tester, inspect DLC (See page **EG2–401**)

(3) CHECK DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA (PRECHECK)

First check the diagnostic trouble codes. If a code is output, make a note of it.
Also check and note the freezed frame data.
HINT: Output of the malfunction code indicates a circuit malfunction. However, it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. To determine this, first confirm the problem symptoms in (7) and then recheck the diagnostic trouble code in (9).
If troubleshooting started based only on the malfunction code in the diagnostic trouble code check in (3) , it could result in a misdiagnosis and troubleshooting of circuits which are normal, making it more difficult to locate the cause of the problem.

(4) CLEAR DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA

Use the OBDII scan tool or TOYOTA hand–held tester to erase the diagnostic trouble codes and freezed frame data.

NOTICE: For OBDII scan tool or TOYOTA hand–held tester operating instructions, see the in–struction booklet accompanying the scan tool.

(5) VISUAL INSPECTION

(6) SETTING CHECK MODE DIAGNOSIS

(7) PROBLEM SYMPTOM CONFIRMATION

If the engine does not start, first carry out steps (10) and (12) while referring to the diagnostic trouble codes confirmed in step (4) .

(8) SYMPTOM SIMULATION

To find the trouble more quickly, set the diagnosis check to check mode and confirm the problem symptoms with the higher sensing ability of the ECM. If the trouble does not reappear, use the symptom simulation method to make sure the trouble can be reproduced.

(9) DIAGNOSTIC TROUBLE CODE CHECK IN CHECK MODE

Check the diagnostic trouble code in check mode. If a malfunction code is output, proceed to step (11) of the Diagnostic Trouble Code Chart. If a malfunction code is not output, proceed to step (10) Basic Inspection.

(10) BASIC INSPECTION

Carry out basic inspection such as the spark check and fuel pressure check, etc.

(11) DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed, inspect the circuit indicated by the chart for each code.

(12) MATRIX CHART OF PROBLEM SYMPTOMS

If a diagnostic trouble code is not displayed in the diagnosis in check mode, troubleshoot according to the inspection order in the Matrix Chart of Problem Symptoms.

(13) CIRCUIT INSPECTION

Determine if the malfunction is in the sensor, actuator, wire harness, connector or the ECM.

(14) PARTS INSPECTION

When the Matrix Chart of Problem Symptoms instructs you to check the parts, refer to the parts inspection section in this manual.

(15) CHECK FOR INTERMITTENT PROBLEMS

By checking for intermittent problems, you can isolate the place where momentary interruptions or momentary shorts are occurring due to poor contacts.

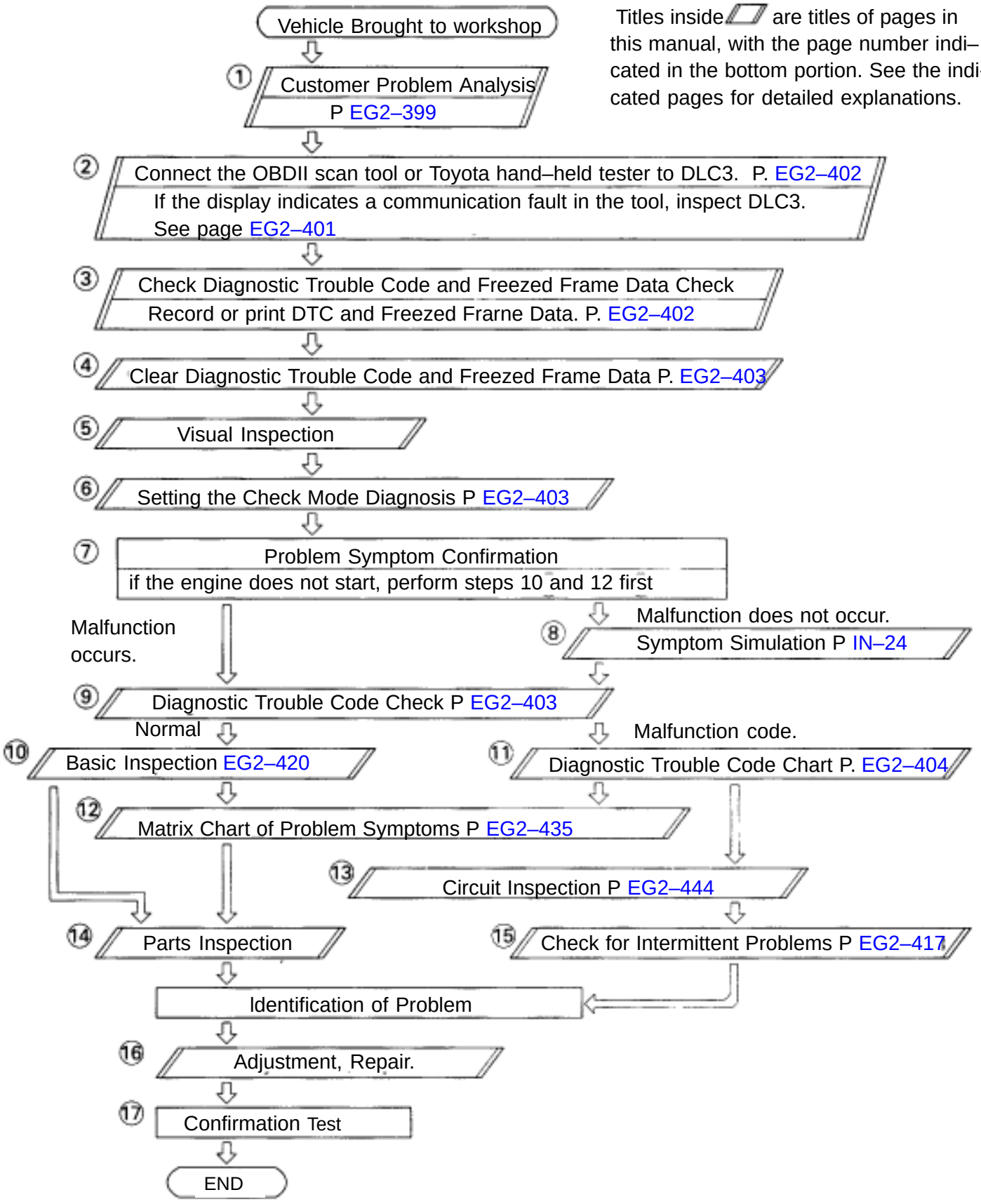
(16) ADJUSTMENT, REPAIR

After you locate the cause of the problem, follow the inspection and replacement procedures in this manual and adjust or repair as necessary.

(17) CONFIRMATION TEST

After completing adjustment or repairs, confirm not only that the malfunction is eliminated, but also test drive the vehicle, to make sure the entire Engine Control System is operating normally.

Titles inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's Name _____

Customer's name		Model and model year	
Driver's name		Frame no.	
Date vehicle brought in		Engine model	
License no.		Odometer reading	km / miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Conditions When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ___ °F/ ___ °C)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting [min.] ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal Mode (Precheck)	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]
	Check Mode	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]

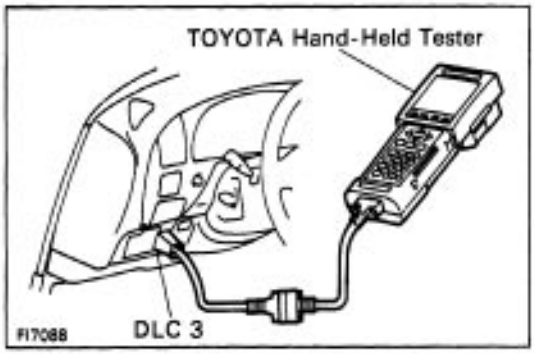
DIAGNOSIS SYSTEM

DESCRIPTION

When troubleshooting OBDII vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBDll scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.

OBDll regulations require that the vehicle's on–board com–puter lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which af–fect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable diagnostic trouble codes prescribed by SAE J2012 are recorded in the ECM memory. (See page EG2–404)

If the malfunction does not reoccur in 3 trips, the MIL goes off but the diagnostic trouble codes remain recorded in the ECM memory.



To check the diagnostic trouble codes, connect the OBDII scan tool or TOYOTA hand–held tester to Data Link Connec–tor 3 on the vehicle. The OBDII scan tool or TOYOTA hand–held tester also enables you to erase the diagnostic trouble codes and check freezed frame data and various forms of engine data. (For operating instructions, see the OBDII scan tool's instruction book.)

Diagnostic trouble codes include SAE controlled codes and Manufacturer controlled codes.

SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.

(See diagnostic trouble code chart on page EG2–404)

The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simu–late malfunction symptoms and troubleshoot. Most diagnos–tic trouble codes use 2 trip detection logic*to prevent erro–neous detection and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (TOYOTA hand–held tester only)

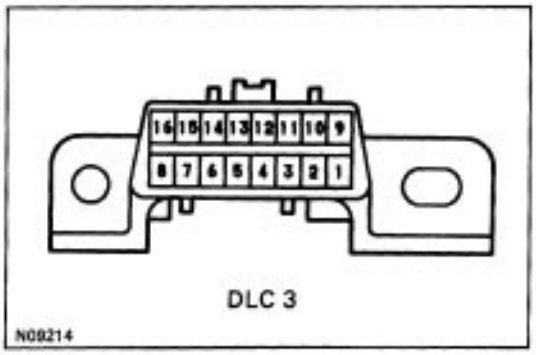
(See page EG2–403)

*2 trip detection logic

When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunc–tion is detected again during the second drive test, this sec–ond detection causes the MIL to light up.

The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1 st trip and 2nd trip).

Freeze frame data:
Freeze frame data records the engine condition when a misfire (DTC P0300 – P0306) or fuel trim malfunction (DTC P0171, P0172), or other malfunction (first malfunc–tion only), is detected.
Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the mal–function is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.
Priorities for Troubleshooting:
If troubleshooting priorities for multiple diagnostic codes are given in the applicable diagnostic chart, these should be followed.
If no instructions are given, troubleshoot diagnostic trouble codes according to the following priorities.
(1) Diagnostic trouble codes other than fuel trim malfunc–tion (DTC P0171, P0172) and EGR (DTC P0401, P0402) and misfire (DTC P0300 – P0306).
(2) Fuel trim malfunction (DTC P0171, P0172) and EGR (DTC P0401, P0402)
(3) Misfire (DTC P0300 – P0306).

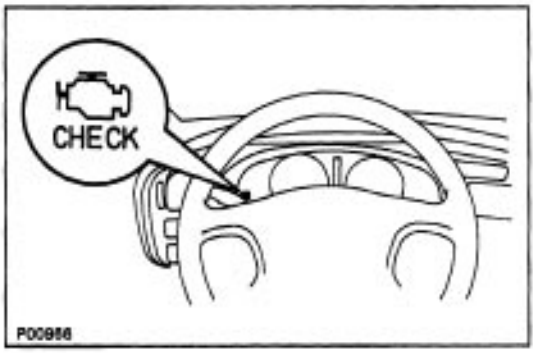


DATA LINK CONNECTOR 3 INSPECTION

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal ar–rangement of DLC 3 complies with SAE J1962 and matches the V. P.W. format.

Terminal No.	Connection	Voltage or Resistance	Condition
2	Bus (+) Line	Pulse generation	During transmission
4	Chassis Ground	↔ Body Ground 1 0 or less	Always
5	Signal Ground	↔ Body Ground 1 0 or less	Always
16	Battery Positive	↔ Body Ground 9 – 14 V	Always

HINT: If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBDII scan tool or TOYOTA hand–held tester to DLC 3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.
1) If communication is normal when the tool is connected to another vehicle, inspect DLC 3 on the original vehicle.
2) If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



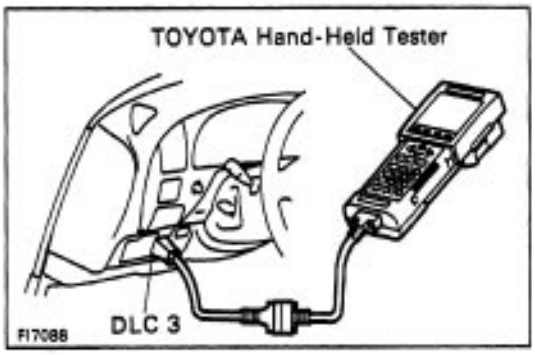
Diagnosis Inspection (Normal Mode)

MALFUNCTION INDICATOR LAMP CHECK

1. The malfunction indicator lamp comes on when the igni–tion switch is turned ON and the engine is not running.
HINT: If the malfunction indicator lamp does not light up, troubleshoot the combination meter.
(See page BE–64).
2. When the engine is started, the malfunction indicator lamp should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE CHECK

NOTICE (TOYOTA hand–held tester only): When the diag–nosis system is switched from normal mode to check mode, it erases all diagnostic trouble codes and freezed frame data recorded in normal mode. So before switching modes, always check the diagnostic trouble codes and freezed frame data, and note them down.

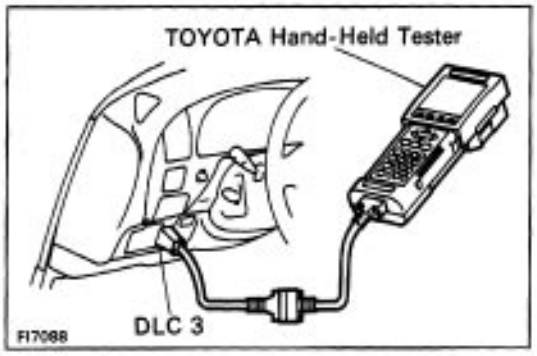


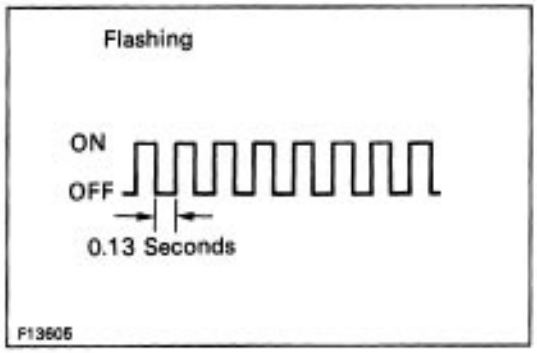
1. Prepare the OBDII scan tool (complying with SAE J1978) or TOYOTA hand–held tester.
2. Connect the OBDll scan tool or TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.
3. Turn the ignition switch ON and turn the OBDII scan tool or TOYOTA hand–held tester switch ON.
4. Use the OBDII scan tool or TOYOTA hand–held tester to check the diagnostic trouble codes and freezed frame data, note them down. (For operating instructions, see the OBDll scan tool's instruction book.)
5. See page EG2–404 to confirm the details of the diagnostic trouble codes.

NOTICE: When simulating symptoms with an OBDll scan tool (excluding TOYOTA hand–held tester) to check the di–agnostic trouble codes, use normal mode. For codes on the diagnostic trouble code chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the diagnostic trouble codes are recorded in the ECM .

Diagnosis Inspection (Check Mode)

TOYOTA HAND–HELD TESTER only
Compared to the normal mode, the check mode has an in–creased sensitivity to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.



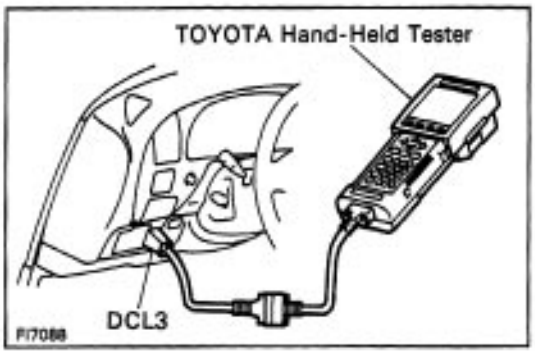


DIAGNOSTIC TROUBLE CODE CHECK

1. Initial conditions.
(a) Battery positive voltage 11 V or more.
(b) Throttle valve fully closed.
(c) Transmission in park or neutral position.
(d) Air conditioning switched OFF.
2. Turn ignition switch OFF.
3. Prepare the TOYOTA hand–held tester.
4. Connect the TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.
5. Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.
6. Switch the TOYOTA hand–held tester normal mode to check mode. (Check that the MIL flashes.)
7. Start the engine. (The MIL goes out after the engine start.)
8. Simulate the conditions of the malfunction described by the customer.

NOTICE: Leave the ignition switch ON until you have checked the diagnostic trouble codes, etc.

9. After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the diagnostic trouble codes and freezed frame data, etc.
HINT: Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, so all diagnostic codes, etc. are erased.
10. After checking the diagnostic trouble code, inspect the applicable circuit.



DIAGNOSTIC TROUBLE CODE CLEARANCE

The following actions will erase the diagnostic trouble codes and freezed frame data.
1. Operating the OBDII scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes. (See the OBDII scan tool's instruction book for operating instructions.)
2. Disconnecting the battery terminals or EFI fuse.

NOTICE: If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the diagnostic trouble codes and freezed frame data will be erased.

DIAGNOSTIC TROUBLE CODE CHART (SAE Controlled)

HINT: Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0100	Mass Air Flow Circuit Malfunction	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less.
P0101	Mass Air Flow Circuit Range/ Performance Problem	Conditions a) and b) continue with engine speed 900 rpm or less. (2 trip detection logic) a) Closed throttle position switch: ON b) Mass air flow meter output) ≧2.2 V
P0110	Intake Air Temp. Circuit Malfunction	Open or short in intake air temp. sensor circuit.
P0115	Engine Coolant Temp. Circuit Malfunction	Open or short in engine coolant temp. sensor circuit.
P0116	Engine Coolant Temp. Circuit Range/ Performance Problem	20 min. or more after starting engine, engine coolant temp. sensor value is 30°C (86°F) or less. (2 trip detection logic)
P0120	Throttle Position Circuit Malfunction	Condition a) or b) continues. a) VTA ～ (0.1 V, and closed throttle position switch is OFF. b) VTA) ≧ 4.9 V
P0121	Throttle Position Circuit Range/ Performance Problem	When closed throttle position switch is ON, condition a) continues. (2 trip detection logic) a) VTA) ≧ 2.0 V
P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control	After the engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions a) and b) continue for at least 2 minutes. a) Engine speed: 1,500 rpm or more b) Vehicle speed: 40 km/h (25 mph) or more
P01 30	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	Voltage output of heated oxygen sensor remains at 0.4 V or more, or 0.55 V or less, during idling after the engine is warmed up. (2 trip detection logic)
P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	Response time for the heated oxygen sensor's voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after the engine is warmed up. (2 trip detection logic)

If a malfunction code is displayed during the diagnostic trouble code check in check mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	MIL	Memory	See Page
• Open or short in mass air flow meter circuit. • Mass air flow meter • ECM	○	○	EG2–444
• Mass air flow meter	○	○	EG2–450
• Open or short in intake air temp. sensor circuit. • Intake air temp. sensor • ECM	○	○	EG2–451
• Open or short in engine coolant temp. sensor circuit. • Engine coolant temp. sensor • ECM	○	○	EG2–457
• Engine coolant temp. sensor • Coolant system	○	○	EG2–462
• Open or short in throttle position sensor circuit. • Throttle position sensor. • ECM	○	○	EG2–463
• Throttle position sensor	○	○	EG2–472
• Open or short in heated oxygen sensor circuit. • Heated oxygen sensor.	○	○	EG2–473
• Heated oxygen sensor • Fuel trim malfunction	○	○	EG2–476
• Heated oxygen sensor	○	○	EG2–480

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0135	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	When the heater operates, heater current exceeds 2 A or voltage drop for the heater circuit exceeds 5 V. (2 trip detection logic)
		Heater current of 0.25 A or less when the heater operates. (2 trip detection logic)
P0136	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	Voltage output of the heated oxygen sensor (bank1 sensor 2) remains at 0.4 V or more or 0.5 V or less when the vehicle is driven at 50 km/h (31 mph) or more after the engine is warmed up. (2 trip detection logic)
P0141	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	Same as DTC No. P01 35.
P0150	Heated Oxygen Sensor Circuit Malfunction (Bank 2 Sensor 1)	Same as DTC No. P01 30.
P0153	Heated Oxygen Sensor Circuit Slow Response (Bank 2 Sensor 1)	Same as DTC No. P01 33.
P0155	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 2 Sensor 1)	Same as DTC No. P01 35.
P0171	System too Lean (Fuel Trim)	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the RICH side. (2 trip detection logic)
P0172	System too Rich (Fuel Trim)	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the LEAN side. (2 trip detection logic)
P0201 P0202 P0203 P0204 P0205 P0206	Injector Circuit Malfunction – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4 – Cylinder 5 – Cylinder 6	A specified cylinder misfire continuously. (2 trip detection logic)

Trouble Area	MIL	Memory	See Page
• Open or short in heater circuit of heated oxygen sensor. • Heated oxygen sensor heater • ECM	○	○	EG2–481
• Heated oxygen sensor	○	○	EG2–484
• Same as DTC No. P01 35.	○	○	EG2–481
• Same as DTC No. P01 30.	○	○	EG2–476
• Same as DTC No. P01 33.	○	○	EG2–480
• Same as DTC No. P01 35.	○	○	EG2–481
• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○	EG2–486
• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○	EG2–486
• Open or short in injector circuit • Injector blockage, seized • Ignition system • Valve clearance not to specification • Compression pressure	○	○	EG2–491

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0300	Random Misfire Detected	Misfiring of multiple cylinders is detected during the same 200 or 1,000 revolutions.
P0301 **P0302** **P0303** **P0304** **P0305** **P0306**	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4 – Cylinder 5 – Cylinder 6	For each 200 revolutions of the engine, misfiring is detected which can cause catalyst overheating. (This causes MIL to blink.)
		For each 1,000 revolutions of the engine, misfiring is detected which causes emissions deterioration. (2 trip detection logic)
P0325	Knock Sensor 1 Circuit Malfunction	No knock sensor 1 signal to ECM with engine speed 2,000 rpm or more.
P0330	Knock Sensor 2 Circuit Malfunction	No knock sensor 2 signal to ECM with engine speed 2,000 rpm or more.
P0335	Crankshaft Position Sensor Circuit Malfunction	No crankshaft position sensor signal to ECM during cranking. (2 trip detection logic)
		No crankshaft position sensor signal to ECM during engine running.
P0336	Crankshaft Position Sensor Circuit Range/ Performance	Deviation in crankshaft position sensor signal and camshaft position sensor signal. (2 trip detection logic)
P0340	Camshaft Position Sensor Circuit Malfunction	No camshaft position sensor signal to ECM during cranking. (2 trip detection logic)
		No camshaft position sensor signal to ECM during engine running.
P0401	Exhaust Gas Recirculation Flow Insufficient Detected	After the engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 minutes, the EGR gas temperature sensor value does not exceed 40°C (104°F) above the ambient air temperature, (2 trip detection logic)

Trouble Area	MIL	Memory	See Page
• Ignition system • Injector • Fuel line pressure • EG R • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor	○	○	EG2–493
• Open or short in knock sensor 1 circuit. • Knock sensor 1 (looseness) • ECM	○	○	EG2–499
• Open or short in knock sensor 2 circuit. • Knock sensor 2 (looseness) • ECM	○	○	EG2–499
• Open or short in crankshaft position sensor circuit. • Crankshaft position sensor • Starter • ECM	○	○	EG2–503
• Mechanical system malfunction (skipping teeth of timing belt, belt stretched) • ECM	○	○	EG2–507
• Open or short in camshaft position sensor circuit. • Camshaft position sensor • Starter • ECM	○	○	EG2–508
• EGR valve stuck closed • Short in EGR VSV circuit • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM	○	○	EG2–512

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0402	Exhaust Gas Recirculation Flow Excessive Detected	EG R gas temp. sensor value is high during EGR cut–off when engine is cold (Race engine at about 4,000 rpm without load so that vacuum is applied to port E). (2 trip detection logic)
		EG R valve is always open. (2 trip detection logic)
P0420	Catalyst System Efficiency Below Threshold	After the engine is warmed up and the vehicle driven for 5 min. at 32 – 80 km/h (20 – 50 mph), the waveforms of the heated oxygen sensors, bank 1, 2 sensor 1 and bank 1 sensor 2 have the same amplitude.
P0500	Vehicle Speed Sensor Malfunction	No vehicle speed sensor signal to ECM under conditions a) and b). a) Park/neutral position switch is OFF. b) Vehicle is being driven.
P0505	Idle Control System Malfunction	Idle speed continues to vary greatly from the target speed. (2 trip detection logic)
P0510	Closed Throttle Position Switch Malfunction	The closed throttle position switch does not turn ON even once when the vehicle is driven. (2 trip detection logic)

Trouble Area	MIL*1	Memory	See Page
• EGR valve stuck open • EGR VSV open malfunction • Open in EGR VSV circuit • Short in EGR gas temp. senor circuit • ECM	O	O	EG2–527
• Three–way catalytic converter • Open or short in heated oxygen sensor circuit • Heated oxygen sensor	O*2	O	EG2–534
• Open or short in vehicle speed sensor circuit. • Vehicle speed sensor • Combination meter • ECM	O	O	EG2–537
• IAC valve is stuck or closed • Open or short in IAC valve circuit • Air conditioner idle up VSV • Air intake (hose loose)	O	O	EG2–541
• Open in closed throttle position switch circuit. • Closed throttle position switch • ECM	O	O	EG2–546

*1.... MIL does not light up
O .... MIL lights up
O .... MIL lights up, 0/D OFF indicator light blinks
*2.... MIL lights up only on USA specification vehicles.

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0720	Output Speed Sensor Circuit Malfunction (for Electronically Controlled Transaxle)	DTC No. P0500 is detected.
P0750	Shift Solenoid A Malfunction (Shift Solenoid Valve No.1)	During normal driving the gear required by the ECM does not match the actual gear, (2 trip detection logic)
P0753	Shift Solenoid A Electrical (Shift Solenoid Valve No,1)	Open or short in shift solenoid valve No.1 circuit.
P0755	Shift Solenoid6 Malfunction (Shift Solenoid Valve No.2)	Same as for DTC No. P0750.
P0758	Shift Solenoid B Electrical (Shift Solenoid Valve No.2)	Open or short in shift solenoid valve No.2 circuit.
P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range. (2 trip detection logic)
P0773	Shift Solenoid E Electrical (Shift Solenoid Valve SL)	Open or short in shift solenoid valve SL circuit. (2 trip detection logic)

Trouble Area	MIL*	Memory	See Page
• Same as for DTC No. P0500.	◎	○	AX2–92
• Shift solenoid valve No.1 is stuck open or closed. • Valve body is blocked up or stuck.	◎	○	AX2–96
• Open or short in shift solenoid valve No.1 circuit. • Shift solenoid valve No.1 • ECM	◎	○	AX2–98
• Shift solenoid valve No.2 is stuck open or closed.	◎	○	AX2–96
• Open or short in shift solenoid valve No.2 circuit. • Shift solenoid valve No.2 • ECM	◎	○	AX2–98
• Shift solenoid valve SL is stuck open or closed. • Lock–up clutch 9 Valve body is blocked up or stuck.	◎	○	AX2–102
• Open or short in shift solenoid valve SL circuit. • Shift solenoid valve SL • ECM	◎	○	AX2–104

***** – . . . . . MIL does not light up
O . . . . .MIL lights up
◎ . . . . MIL lights up, 0/D OFF indicator light blinks

DIAGNOSTIC TROUBLE CODE CHART (Manufacturer Controlled)

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P1300	Igniter Circuit Malfunction	No IGF signal to ECM for 6 consecutive IGT signals during engine running.
P1500	Starter Signal Circuit Malfunction	No starter signal to ECM.
P1600	ECM BATT Malfunction	Open in back up power source circuit.
P1605	Knock Control CPU Malfunction	Engine control computer malfunction (for knock control).
P1705	”NC2” Revolution Sensor Circuit Malfunction (Direct Clutch Speed Sensor)	Output of direct clutch speed sensor (NC2) is 300 rpm or less under conditions a) and b). (2 trip detection logic) a) Vehicle speed: 32 km/h (20 mph) or more b) Park/neutral position switch: OFF
P1765	Linear Solenoid for Accumulator Pressure Control Circuit Malfunction (Shift Solenoid Valve SLN)	After the engine is warmed up, the current flow to the shift solenoid valve SLN is 0.2 A or less for at least 1 sec. under condition a) or b). (2 trip detection logic) a) Engine speed: 500 rpm or more b) Park/neutral position switch: ON (P or N position)
P1780	Park/Neutral Position Switch Malfunction	Two or more switches are ON simultaneously for ”N”, ”2” and ”L” position. (2 trip detection logic)
		When driving under conditions a) and b)for 30 sec. or more, the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed: 70 km/h (44 mph) or more b) Engine speed: 1,500 – 2,500 rpm

Trouble Area	MIL*	Memory	See Page
• Open or short in IGF or IGT circuit from igniter to ECM. • Igniter • ECM	O	O	EG2–550
• Open or short in starter signal circuit. • Open or short in ignition switch or starter relay circuit, • ECM	–	O	EG2–557
• Open in back up power source circuit. • ECM	O	O	EG2–559
• ECM	O	O	EG2–561
• Open or short in direct clutch speed sensor circuit. • Direct clutch speed sensor • ECM	◎	O	AX2–108
• Open or short in shift solenoid valve SLN circuit. • Shift solenoid valve SLN • ECM	–	O	AX2–112
• Short in park/neutral position switch circuit. • Park/neutral position switch • ECM	O	O	EG2–562

*: – . . . . . MIL does not light up
O . . . . MIL lights up
◎ . . . . MIL lights up, 0/D OFF indicator light blinks

FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–safe Deactivation Conditions
P0100	• Ignition timing fixed at 5°BTDC. • Injection time fixed Starting ..... 11.0 m sec. CTP Switch ON ..... 3.5 m sec. CTP Switch OFF ..... 6.3 m sec.	Returned to normal condition
P0110	Intake air temp. is fixed at 68°F (20°C).	Returned to normal condition
P0115	Engine coolant temp. is fixed at 176°F (80°C).	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively. When closed throttle position switch is ON: 0.1 V ∼VTA≧ 0.95 V
P0135 P0141 P0155	The heater circuit in which an abnormality is detected is turned off.	Ignition switch OFF
P0325 P0330	Max. timing retardation.	Ignition switch OFF
P0720	Gears are shifted according to the engine rpm and throttle angle.	Returned to normal condition
P0753	Power to the solenoid valve and lock–up solenoid valve is cut off.	Returned to normal condition
P0758	Power to the solenoid valve and lock–up solenoid valve is cut off.	Returned to normal condition
P0773	Power to the solenoid valve is cut off.	Returned to normal condition
P1300	Fuel cut	IGF signal is detected for 6 consecutive ignitions.
P1605	Max. timing retardation.	Returned to normal condition
P1766	Power to the solenoid valve is cut off.	Returned to normal condition

Back–up Function

If there is trouble with the program in the ECM and ignition signals (IGT) are not output from the microcomputer, the ECM controls fuel injection and ignition timing at predetermined levels as a back–up function to make it possible to continue to operate the vehicle.

Furthermore, the injection duration is calculated from the starting signal (STA) and the closed throttle position switch signal (IDL). Also, the ignition timing is fixed at 5°BTDC, without relation to the engine speed,

HINT: If the engine is controlled by the back–up function, the malfunction indicator lamp lights up to warn the driver of the malfunction but the diagnostic trouble code is not output.

CHECK FOR INTERMITTENT PROBLEMS

TOYOTA HAND–HELD TESTER only

By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

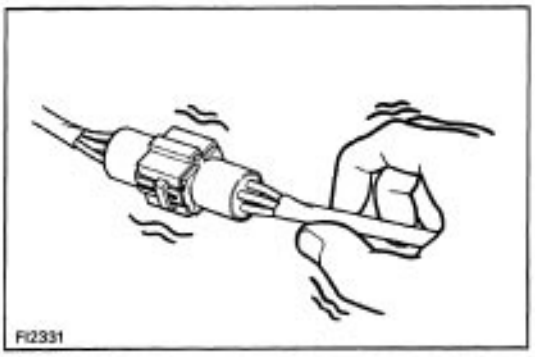
CLEAR DIAGNOSTIC TROUBLE CODES

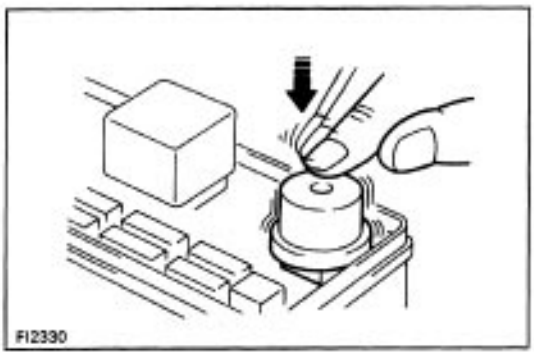
See page EG2–403

SET CHECK MODE

See page EG2–403

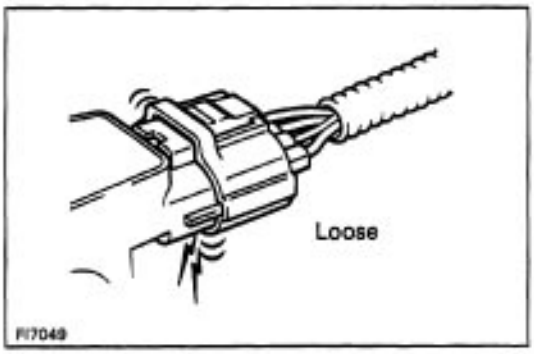
PERFORM A SIMULATION TEST

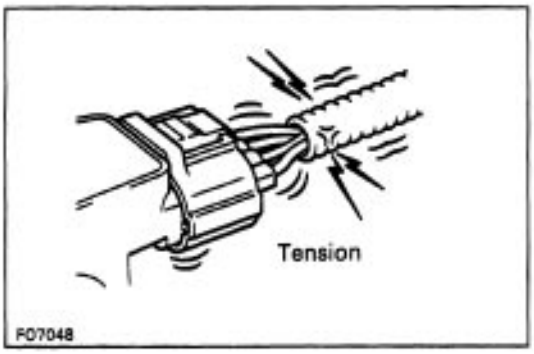




Using the symptom simulation (see page IN–24), shake and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code. In this test, if the malfunction indicator lamp lights up, it indicates that the place where the wire harness, connector or terminals being pulled or shake has faulty contact. Check that point for loose connec–tions, dirt on the terminals, poor fit or other problems and repair as necessary.

HINT: After cancelling out the diagnostic trouble code in memory and setting the check mode, if the malfunction indi–cator lamp does not go off after the engine is started, check thoroughly for faulty contacts, etc., then try the check again. If the malfunction indicator lamp still does not go off, check and replace the ECM.





CONNECTOR CONNECTION AND TERMINAL INSPECTION

When checking for an open circuit or short circuit, it is impor–tant to check the connector connection and the condition of the terminals.

OPEN CIRCUIT:

This could be due to a disconnected wire harness, faulty con–tact in the connector, a connector terminal pulled out, etc.

HINT:

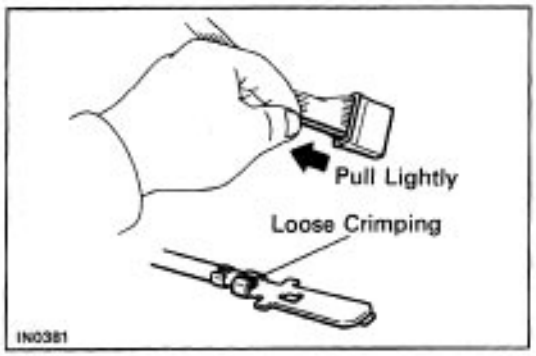
1. A wire rarely breaks in the middle of it's length. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators.
2. Faulty contact could be due to rusting of the connector terminals, to foreign materials entering the terminals or a drop in the contact pressure between the male and fe–male terminals of the connector. Simply disconnecting and reconnecting the connectors once changes the con–dition of the connection and may result in a return to normal operation. Therefore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, them the cause is considered to be in the wire harness or con–nectors.

SHORT CIRCUIT:

This could be due to a short circuit between the wire harness and the body ground or to a short inside the switch, etc.

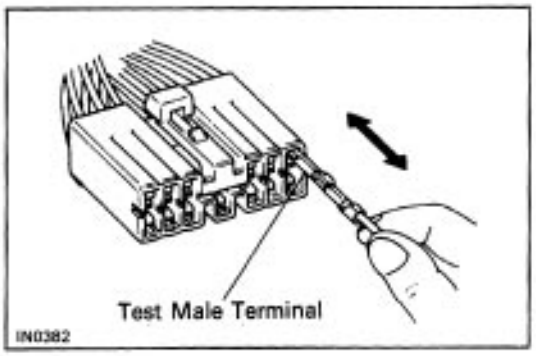
HINT:

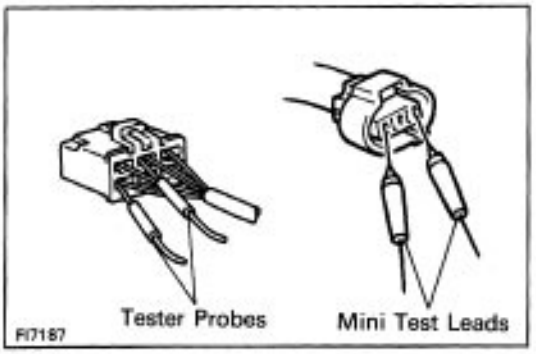
When there is a short between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.



VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.
(b) Check for rust or foreign material, etc. on the terminals of the connectors.
(c) Check crimped portions for looseness or damage and check if the terminals are secured in the lock position.
HINT: The terminals should not come out when pulled lightly.
(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.
NOTICE: When testing a gold–plated female terminal, always use a gold–plated male terminal.
HINT: When the test terminal is pulled out more easily than others, there may be poor contact in that section.





CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.

BASIC INSPECTION

When the normal code is displayed in the diagnostic trouble code check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems.
In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1 **Is battery positive voltage 11 V or more when engine is stopped?**

YES

NO → **Charge or replace battery.**

2 **Is engine cranked?**

YES

NO → **Proceed to page ST–47, 63 and continue to troubleshoot.**

3 **Does engine start?**

YES

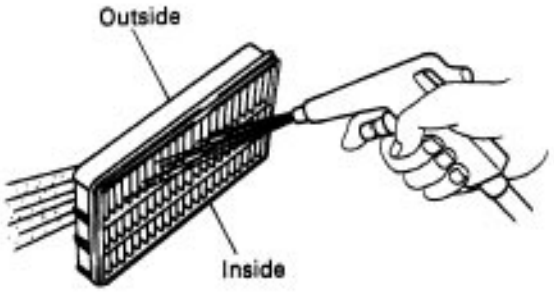
NO → **Go to step 7**

4 **Check air filter.**

P Remove air filter.

C Visually check that the air cleaner element is not damaged or excessively oily.

Hint If necessary, clean element with compressed air. First blow from inside thoroughly, then blow from outside of element.



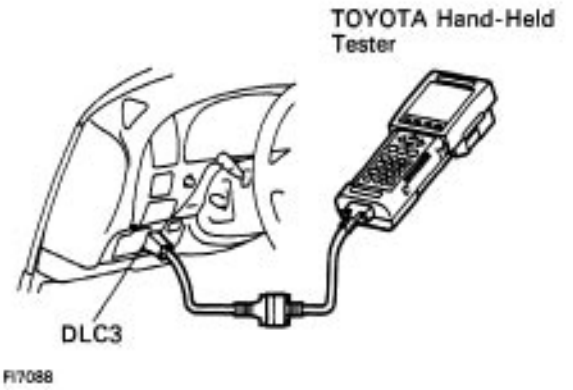
P00495

OK

NG → **Repair or replace.**

Go to step 5

5 Check idle speed.



P (1) Warm up engine to normal operating temperature.
(2) Switch off all accessories.
(3) Switch off air conditioning.
(4) Shift transmission into ”N” position.
(5) Connect the OBDII scan tool or TOYOTA hand–held tester to data link connector 3 on the vehicle.

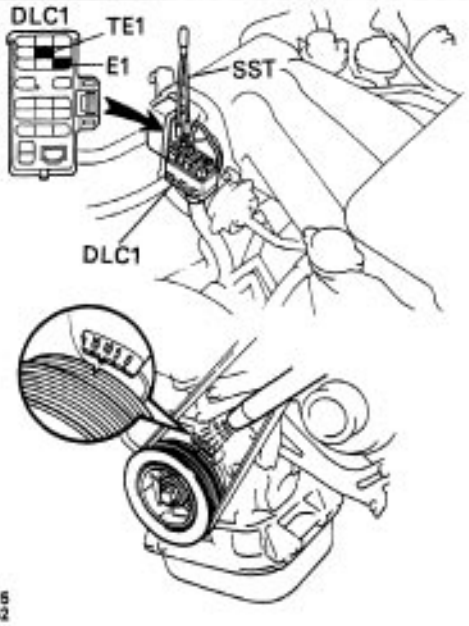
C Use CURRENT DATA to check the engine idle speed.

OK **Idle speed: 650 – 750 rpm**

OK

NG **Proceed to matrix chart of problem symptoms on page EG2–435.**

6 Check ignition timing.



P (1) Warm up engine to normal operating temperature.
(2) Shift transmission into ”N” position.
(3) Keep the engine speed at idle.
(4) Using SST, connect terminals TE1 and E1 of data link connector 1.
SST 09843–18020
(5) Using a timing light, connect the tester to check wire. (See page IG–81)

C Check ignition timing.

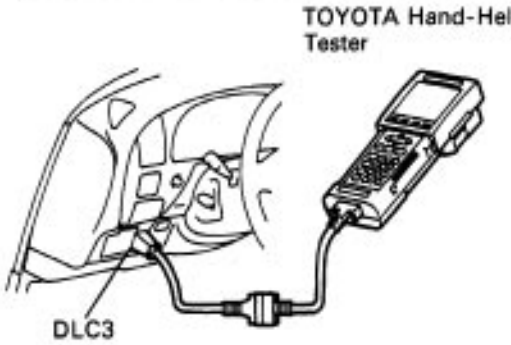
OK **Ignition timing: 10°BTDC at idle**

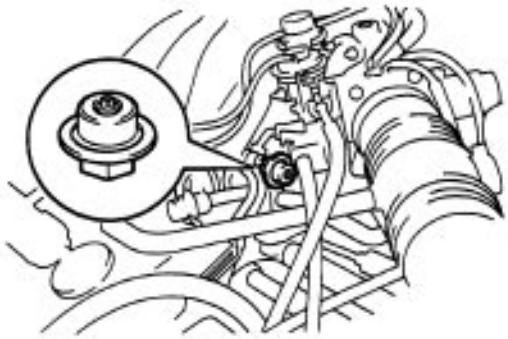
OK

NG **Proceed to page IG–80 and continue to troubleshoot.**

Proceed to matrix chart of problem symptoms on page EG2–435.

7 **Check fuel pressure.**





FI7088
FI7093

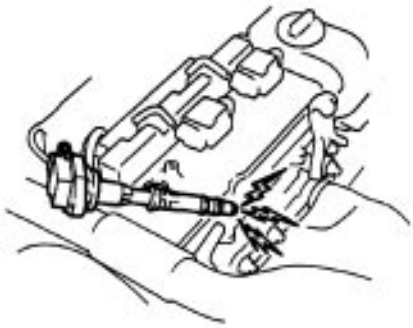
P (1) Be sure that enough fuel is in the tank.
(2) Turn ignition switch ON.
(3) Connect the TOYOTA hand–held tester to data link connector 3 on the vehicle.
(4) Use ACTIVE TEST mode to operate the fuel pump.

C Check that the pulsation damper screw rises up when the fuel pump operates.

OK

NG **Proceed to page EG2–230 and continue to troubleshoot.**

8 **Check for spark.**



FI7084

P (1) Remove ignition coil (See page IG–89). .
(2) Remove spark plug.
(3) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(4) Ground the spark plug.
(5) Disconnect injector connector.

C Check if spark occurs while engine is being cranked.

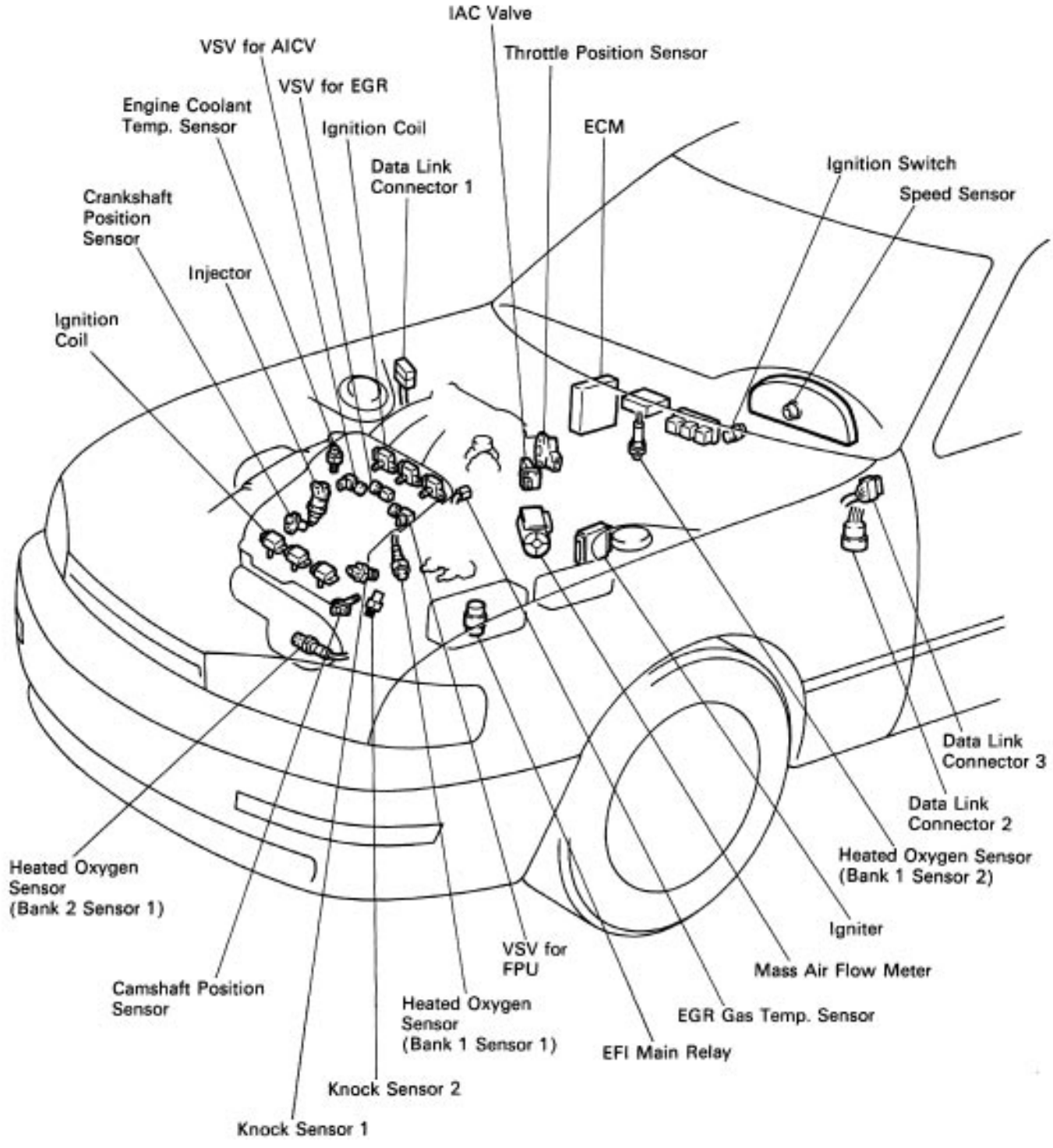
NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 –10 seconds at a time.

OK

NG **Proceed to page IG–87 and continue to troubleshoot.**

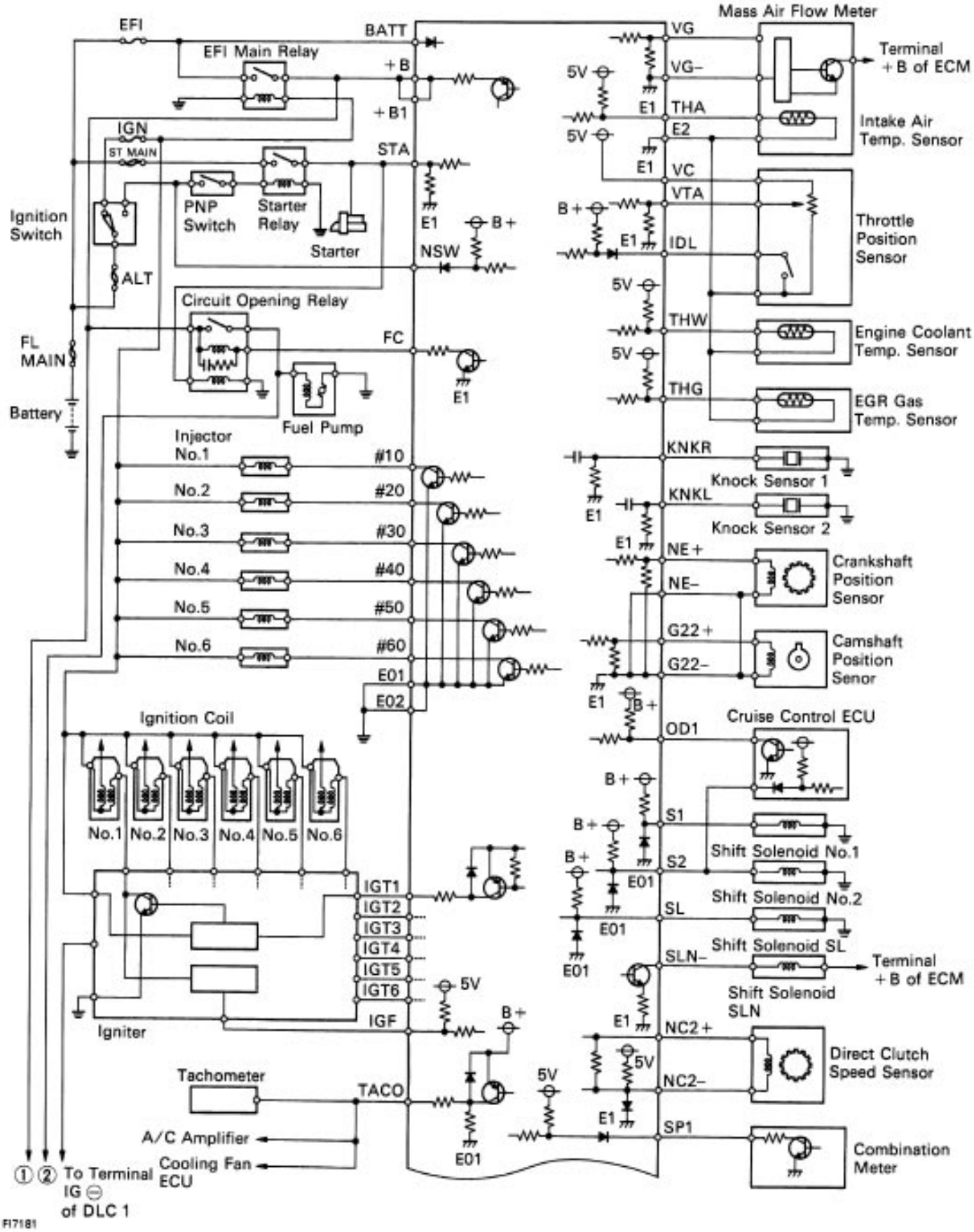
Proceed to matrix chart of problem systems on page EG2–435.

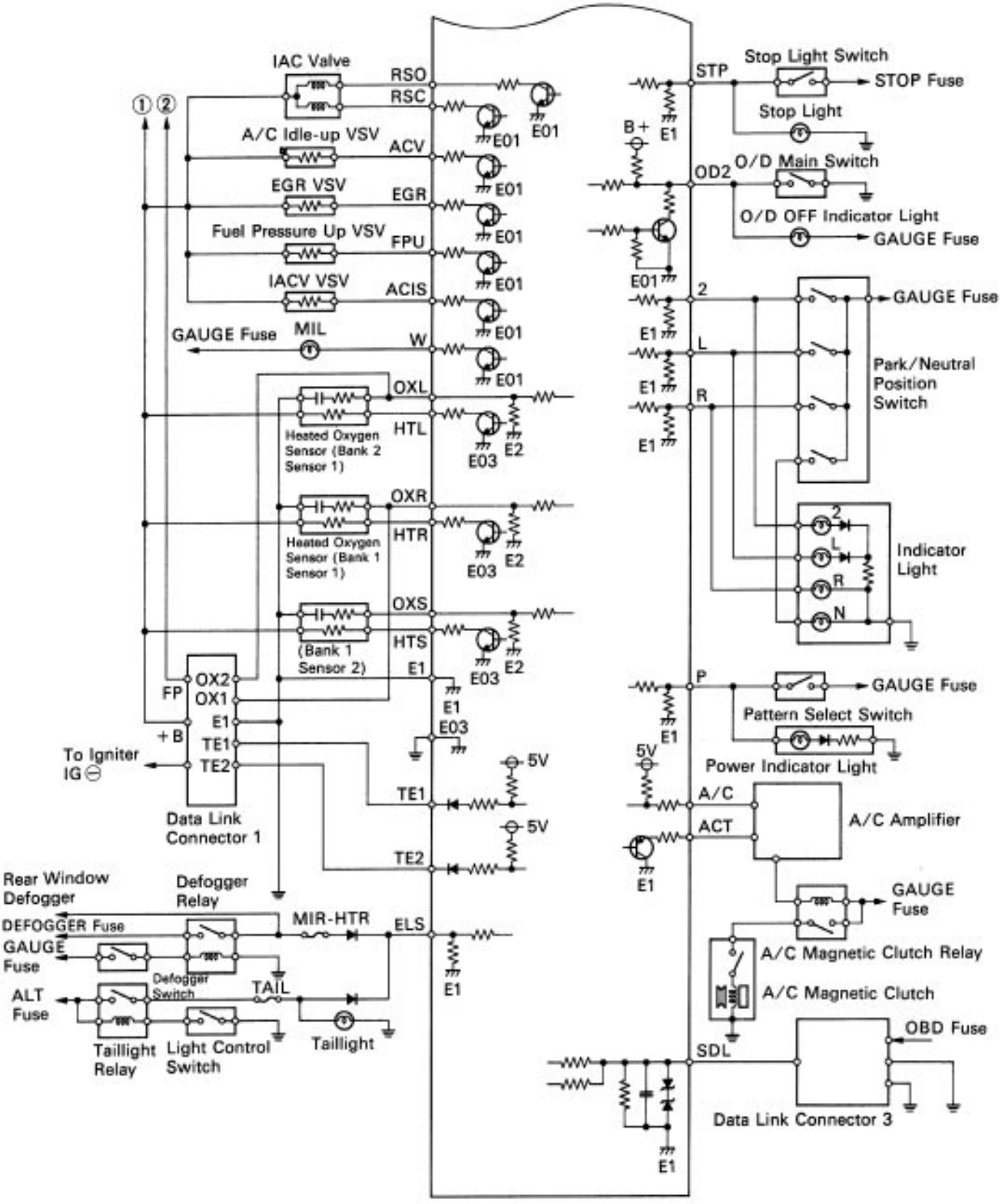
PARTS LOCATION



FI7089

WIRING DIAGRAM



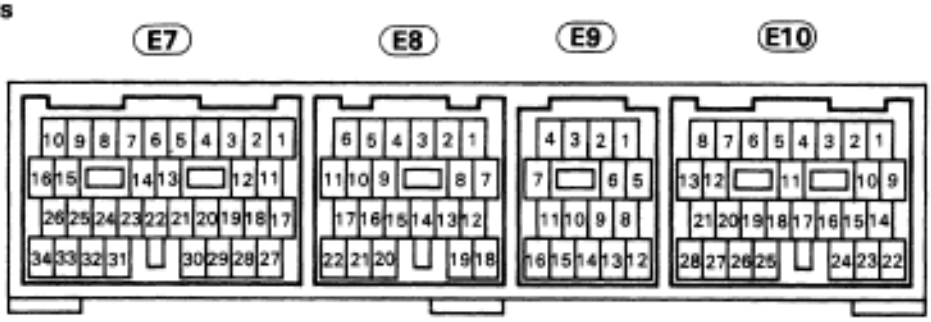

IAC Valve
RSO
RSC
E01
A/C Idle-up VSV
ACV
EGR VSV
EGR
Fuel Pressure Up VSV
FPU
IACV VSV
ACIS
GAUGE Fuse
MIL
W
OXL
HTL
E03
E2
Heated Oxygen Sensor (Bank 2 Sensor 1)
OXR
HTR
Heated Oxygen Sensor (Bank 1 Sensor 1)
OXS
HTS
(Bank 1 Sensor 2)
E1
FP
OX2
OX1
+B
To Igniter
IG
TE1
TE2
5V
Data Link Connector 1
Rear Window Defogger
Defogger Relay
DEFOGGER Fuse
GAUGE Fuse
MIR-HTR
ELS
Defogger Switch
ALT Fuse
TAIL
Taillight Relay
Light Control Switch
Taillight
Stop Light Switch
STP
STOP Fuse
Stop Light
B+
O/D Main Switch
OD2
O/D OFF Indicator Light
2
L
R
Park/Neutral Position Switch
Indicator Light
N
P
Pattern Select Switch
Power Indicator Light
A/C
ACT
A/C Amplifier
A/C Magnetic Clutch Relay
A/C Magnetic Clutch
SDL
OBD Fuse
Data Link Connector 3

FI7145

TERMINALS OF ECM

When measuring the voltage or resistance of the connector part of the ECM, always insert the test probe into the connector from the wire harness side.

ECM Terminals



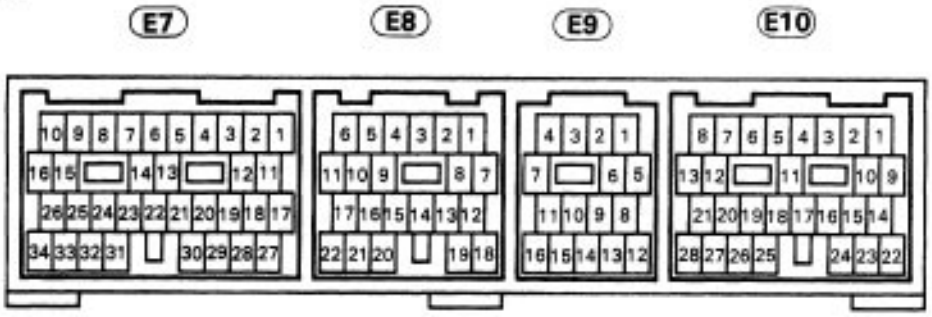
FI6810

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E7- 1	–	———	E7–15	IG T3	Igniter
2	–	———	16	IG T2	Igniter
3	SLN ⊖	Shift solenoid SLN	17	S2	Shift Solenoid No.2
4	–		18	–	
5	#60	Injector (No.6)	19	–	———
6	#50	Injector (No.5)	20	–	———
7	#40	Injector (No.4)	21	–	———
8	#30	Injector (No.3)	22	RSC	IAC valve
9	#20	Injector (No.2)	23	RSO	IAC valve
10	#10	Injector (No.1)	24	IGT1	Igniter
11	S1	Shift solenoid No.1	25	FPU	Fuel pressure up VSV
12	IGF	Igniter	26	IGT4	Igniter
13	STA	Starter relay	27	SL	Shift solenoid SL
14	NSW	Park/Neutral position switch	28	E03	Oxygen sensor heater ground

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E7-29	IGT6	Igniter	E8-19	OXL	Heated oxygen sensor (Bank 2 Sensor 1)
30	IGT5	Igniter	20	THW	Engine coolant temp. sensor
31	–	———	21	THA	Intake air temp. sensor
32	IDL	Throttle position sensor	22	E2	Sensor ground
33	E02	Power ground	E9- 1	ACV	A/C idle–up VSV
34	E01	Power ground	2	–	———
E8- 1	VC	Throttle position sensor	3	W	Malfunction indicator lamp
2	–		4	–	———
3	–		5	TE1	Data link connector 1
4	NC2 ⊖	Direct clutch speed sensor	6	ACIS	Intake air control valve VSV
5	NE ⊕	Crankshaft position sensor	7	VG ⊖	Mass air flow meter
6	NE ⊖	Crankshaft position sensor	8	–	———
7	VTA	Throttle position sensor	9	–	———
8	VG	Mass air flow meter	10	HTL	Heated oxygen sensor heater (Bank 2 Sensor 1)
9	NC2 ⊕	Direct clutch speed sensor	11	HTR	Heated oxygen sensor heater (Bank 1 Sensor 1)
10	–	———	12	EGR	EGR VSV
11	–		13	–	———
12	–	———	14	THG	EG R gas temp. sensor
13	OXR	Heated oxygen sensor (Bank 1 Sensor 1)	15	–	———
14	KNKL	Knock sensor 2	16	E1	ECM ground
15	KNKR	Knock sensor 1	E10- 1	–	———
16	G22 ⊕	Camshaft position sensor	2	L	Park/Neutral position switch
17	G22 ⊖	Camshaft position sensor	3	P	Electronically controlled transmission select switch
18	FC	Circuit opening relay	4	–	———

TERMINALS OF ECM (Cont'd)

ECM Terminals



FI6810

Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E10- 5	ACT	A/C control assembly	E10-17	–	———
6	OD2	0/D main switch	18	–	———
7	OD1	Cruise control ECU	19	–	———
8	–	———	20	A/C	A/C control assembly
9	–	———	21	ELS	Defogger relay Taillight relay
10	2	Park/Neutral position switch	22	+B	EFI Main relay
11	–	———	23	+B1	EFI Main relay
12	SP1	Vehicle speed sensor	24	STP	Stop light switch Stop light
13	TACO	Tachometer	25	HTS	Heated oxygen sensor heater (Bank 1 Sensor 2)
14	BATT	Battery	26	OXS	Heated oxygen sensor (Bank 1 Sensor 2)
15	R	Park/Neutral position switch	27	–	———
16	–	———	28	SDL	Data link connector 3

– MEMO –

STANDARD VALUE OF ECM TERMINALS

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E10-14) – E1 (E9-16)	W-L ↔ BR	9 ~ 14	Always
+B (E10-22) +B1 (E10-23) – E1 (E9-16)	B-O B-O ↔ BR	9 ~ 14	IG switch ON
VC (E8-1) – E2 (E8-22)	L-R ↔ BR	4.5 ~ 5.5	IG switch ON
IDL (E7-32) – E2 (E8-22)	L ↔ BR	0 ~ 3	IG switch 0 N Throttle valve fully closed.
		9 ~ 14	IG switch ON Throttle valve fully open.
VTA (E10-7) – E2 (E8-22)	B-Y ↔ BR	0.3 ~ 0.8	IG switch ON Throttle valve fully closed.
		3.2 ~ 4.9	IG switch O N Throttle valve fully open.
VG (E8-8) – VG – (E9-7)	R ↔ R-B	1.1 – 1.5	Idling, P or N Position, A/C switch off.
THA (E8-21) – E2 (E8-22)	L-B ↔ BR	0.5 ~ 3.4	Idling, Intake air temp. 20°C (68°F)
THW (E8-20) – E2 (E8-22)	G-B ↔ BR	0.2 ~ 1.0	Idling, Engine coolant temp. 80°C (176°F)
STA (E7-13) – E1 (E9-16)	B-W ↔ BR	6.0 or more	Cranking
#10 (E7-10) #20 (E7-9) #30 (E7-8) #40 (E7-7) #50 (E7-6) #60 (E7-5) – E01 (E7-34)	W Y GR L R G ↔ W-B	9 ~ 14	IG switch 0 N
		Pulse generation (See page EG2–492)	Idling
IGT1 (E7-24) IGT2 (E7-16) IGT3 (E7-15) IGT4 (E7-26) IGT5 (E7-30) IGT6 (E7-29) – E1 (E9-16)	W-G Y-R GR-B L-B R-B G-R ↔ BR	Pulse generation (See page EG2–556)	Idling
IGF (E7-12) – E1 (E9-16)	W-R ↔ BR	4.5 ~ 5.5	IG switch ON
		Pulse generation (See page EG2–556)	Idling
G22 ⊕ (E8-16) – G22 ⊖ (E8-17)	B-W ↔ L	Pulse generation (See page EG2–505)	Idling
NE ⊕ (E8-5) – NE ⊖ (E8-6)	R ↔ G	Pulse generation (See page EG2–505)	Idling
FPU (E7-25) – E1 (E9-16)	B-R ↔ BR	9 ~ 14	IG switch ON
		0 ~ 3	Restarting at high engine coolant temp.
ELS (E10-21) – E1 (E9-16)	B-R ↔ BR	7.5 ~ 14	Defogger switch and taillight switch ON.
		0 ~ 1.5	Defogger switch and taillight switch OFF.
EGR (E9-12) – E1 (E9-16)	B-L ↔ BR	9 ~ 14	IG switch ON
ACIS (E9-6) – E1 (E9-16)	R-Y ↔ BR	9 ~ 14	IG switch ON

STANDARD VALUE OF ECM TERMINALS (Cont'd)

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
RSC (E7-22) RSO (E7-23) – E1 (E9-16)	Y-B G-B ↔ BR	9 ~ 14	IG switch ON Disconnect (E7)of ECM connector
ACV (E9-1) – E1 (E9-16)	W-L ↔ BR	0 ~ 3	Idling, A/C switch ON
		9 ~ 14	Idling, A/C switch OFF
OXR (E8-13) OXL (E8-19) – E1 (E9-16)	R-L R-L ↔ BR	Pulse generation	Maintain engine speed at 2,500 rpm for 2 mins. after warming up.
HTL (E9-10) HTR (E9-11) – E03 (E7-28) HTS (E10-25)	V-R L-B ↔ W-B P-B	Below 3.0	Idling
		9 ~ 14	IG switch 0 N
KNKR (E8-15) KNKL (E8-14) – E1 (E9-16)	W W ↔ BR	Pulse generation (See page EG-502)	Idling
NSW (E7-14) – E1 (E9-16)	B-W ↔ BR	9 ~ 14	IG switch ON Other shift position in "P", "N" position
		0 ~ 3.0	IG switch ON Shift position in "P", "N" position
SP1 (E10-12) – E1 (E9-16)	V-Y ↔ BR	Pulse generation	IG switch 0 N Rotate driving wheel slowly.
TE1 (E9-5) – E1 (E9-16)	GR-B ↔ BR	4.5 ~ 5.5	IG switch ON
OD1 (E10-7) – E1 (E9-16)	Y-B ↔ BR	4.5 ~ 5.5	IG switch ON
ACT (E10-5) – E1 (E9-16)	LG-B ↔ BR	4.5 ~ 5.5	Idling, A/C switch ON
		Below 2.0	Idling, A/C switch OFF
A/C (E10-20) – E1 (E9-16)	B-Y ↔ BR	Below 2.0	Idling, A/C switch ON
		4.5 ~ 5.5	Idling, A/C switch OFF

ENGINE OPERATING CONDITION

NOTICE: The values given below for ”Normal Condition” are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the ”Normal Condition” here.

CARB Mandated Signals

TOYOTA hand–held tester display	Measurement Item	Normal Condition
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warning up: CLOSED
FUEL SYS #2	Fuel System Bank 2 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warning up, CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 12.9 – 25.2% Racing without load (2,500 rpm): 11.7 – 23.9%
COOLANT TEMP	Engine Coolant Temperature Sensor Value	After warning up: 80 – 951C (176 – 2031F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20%
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20%
SHORT FT #2	Short–term Fuel Trim Bank 2	0 ± 20%
LONG FT #2	Long–term Fuel Trim Bank 2	0 ± 20%
ENGINE SPD	Engine Speed	Idling: 700 ± 50 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: p km/h mph
IGN ADVANCE	Ignition Advance Ignition Timing of Cylinder No.1	Idling: BTDC 12 ±51
INTAKE AIR	Intake Air Temperature Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 2.4 – 4.8 gm/sec Racing without load (2,500 rpm): 7.9 –.– 16.2 gm/sec
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a Percentage 0 V→ 0%, 5 V → 100%	Throttle Fully Closed: 7 – 11% Fully Open: 65 – 75%
02S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V

If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

TOYOTA hand–held tester display	Measurement Item	Normal Condition
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20%
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving (50 km/h, 31 mph): 0.1 – 0.9 V
O2S B2, S1	Voltage Output of Oxygen Sensor Bank 2, Sensor 1	Idling: 0.1 – 0.9 V
O2FT B2, S1	Oxygen Sensor Fuel Trim Bank 2, Sensor 1 (Same as SHORT FT #2)	0 ± 20%

TOYOTA Enhanced Signals

TOYOTA hand–held tester display	Measurement Item	Normal Condition
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 RPM
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 2.2 – 5.1 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 30 – 40%
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Switch Signal	Throttle Fully Closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
PNP SW	Park/Neutral Position Switch Signal	P or N position: ON
ELCTRCL LOAD SIG	Electrical Load Signal	Defogger S/W ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL #1 | CY L #6	Ratio of revolution variation for each cylinder when variation is large	0 %
IGNITION	Ignition rate for all cylinders every 1,000 revolutions	0 – 3,000
EGRT GAS	EGR Gas Temperature Sensor Value	EG R not operating: Temperature between intake air temp. and engine coolant temp.
INTAKE CTRL VSV	Intake Air Control Valve VSV Signal	VSV operating: ON
EGR SYSTEM	EG R system operating condition	Idling: OFF
FUEL PRES UP VSV	Fuel Pressure Up VSV Signal	High temp. restarting: ON
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
A/C IDLE U P VSV	A/C Idle Up Signal	A/C S/W ON & D position & headlight ON: ON

TOYOTA hand–held tester display	Measurement Item	Normal Condition *
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2
TOTAL FT B2	Total Fuel Trim Bank 2: Average value for fuel trim system of bank 2	Idling: 0.8 – 1.2
02 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich.	Idling after warned up: 0 – 1,000 m sec.
02 LR B2, S1	Oxygen Sensor Lean Rich Bank 2, Sensor 1 Response time for oxygen sensor output to switch from lean to rich.	Idling after warned up: 0 – 1,000 msec.
02 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean.	Idling after warned up: 0 – 1,000 msec.
02 RL B2, S1	Oxygen Sensor Rich Lean Bank 2, Sensor 1 Response time for oxygen sensor output to switch from rich to lean.	Idling after warned up: 0 – 1,000 msec.

*; If no conditions are specifically stated for ”Idling”, it means the shift lever is at Nor P position, the A/C switch is OFF and all accessory switches are OFF.

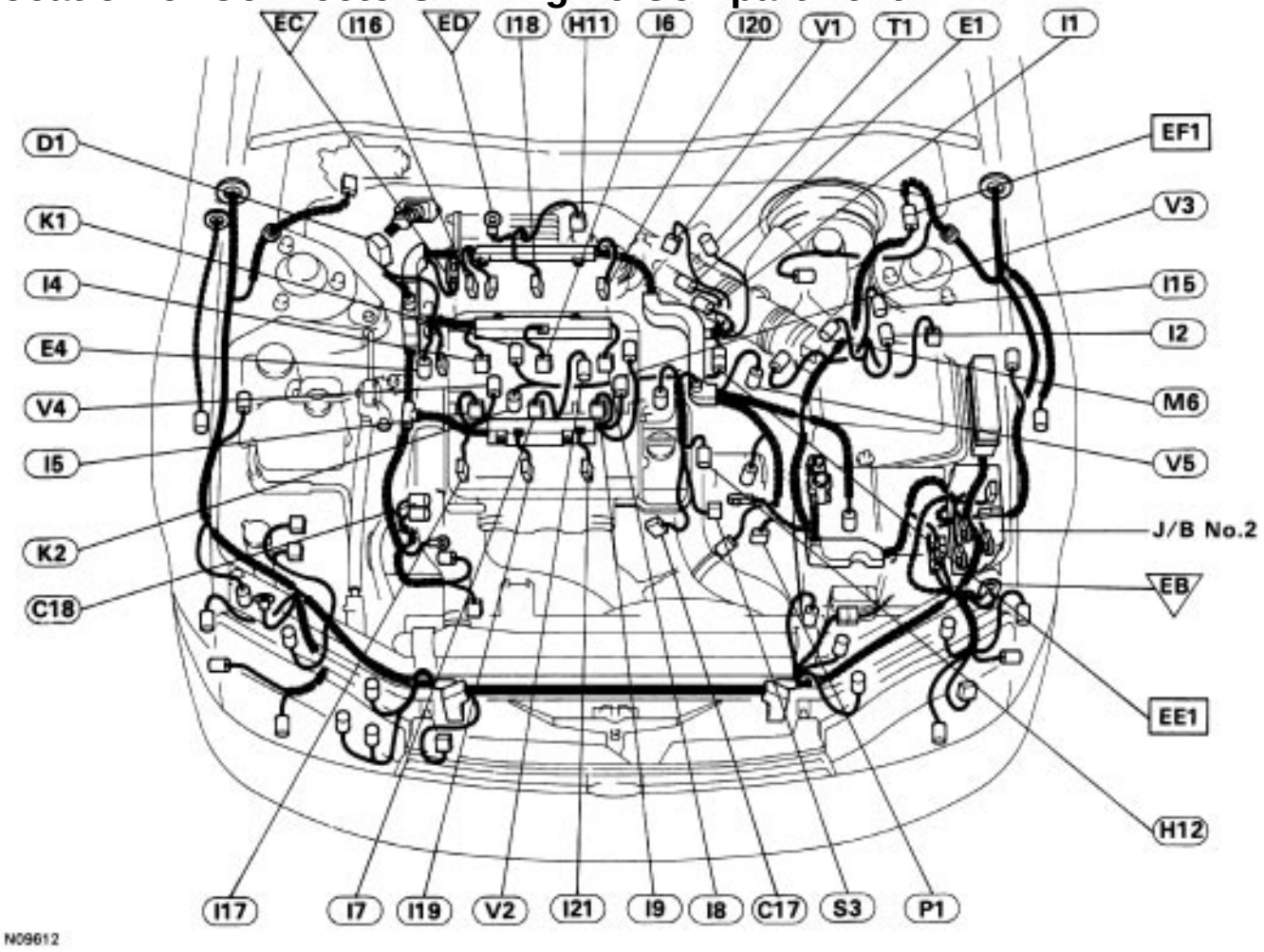
MATRIX CHART OF PROBLEM SYMPTOMS

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

Symptom	Suspect area	Starter signal circuit	ECM power source circuit	Fuel pump control circuit	Fuel pressure control VSV circuit	A/C signal circuit (Compressor circuit)	Starter and Starter relay	Compression	A/T faulty	Engine control module (ECM)
	See page	EG2–557	EG2–565	EG2–575	EG2–586	AC–36	ST–47, 63	EG2–36	AX2–81	IN–36
Does not start	Engine does not crank						1			
	No initial combustion		1	2						
	No complete combustion			1						
Difficult to start	Under normal condition	1		2				3		
	Cold engine	1		2						
	Hot engine	1		3	2					
Poor Idling	High engine idle speed		2			1				
	Low engine idle speed			2		1				
	Rough idling			2				1		
	Hunting		1	2						
Poor Drive–ability	Hesitation/Poor acceleration			1					2	
	Surging			1						
Engine stall	Soon after starting			1						
	During A/C operation					1				2

LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment



C17

Camshaft Position Sensor

Ie-2-1-D

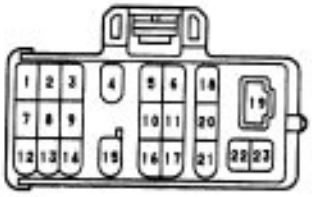
C18

Crankshaft Position Sensor

Ie-2-1-D

D1

Data Link Connector 1



Ie-23-1

E1

EGR Gas Temp. Sensor

Ie-2-1-C

E4

Engine Coolant Temp. Sensor

V-2-1-C

H11

Heated Oxygen Sensor (Bank 1 Sensor 1)

Ie-4-1-D

H12

Heated Oxygen Sensor (Bank 2 Sensor 1)

Ie-4-1-D

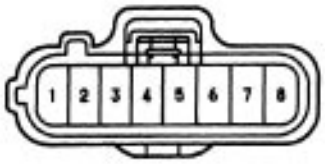
I1

Idle Air Control Valve

Ie-3-1-H

I2

ign¿ter



e-8-1-G

I4

Injector No.1

Ie-2-1-a

I5

Injector No.2¿

Ie-2-1-a

I6

Injector No.3

Ie-2-1-a

I7

Injector No.4

Ie-2-1-a

I8

Injector No.5

Ie-2-1-a

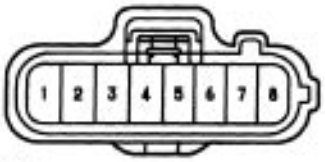
I9

Injector No.6

Ie-2-1-a

I15

Igniter



e-8-1-F

I16

Ignition Coil No.1

Ie-2-1-n

I17

Ignition Coil No.2

Ie-2-1-n

I18

Ignition Coil No.3

Ie-2-1-n

I19

Ignition Coil No.4

Ie-2-1-n

I20

Ignition Coil No.3

Ie-2-1-n

I21

Ignition Coil No.6

Ie-2-1-n

K1

Knock Sensor 1

Ie-1-1-F

K2

Knock Sensor 2

Ie-1-1-F

M6

Mass Air Flow Meter

Ie-5-1-D

P1

Park/Neutral Position Switch

Ie-10-1-B

S3

Starter

H-1-1

T1

Throttle Position Sensor

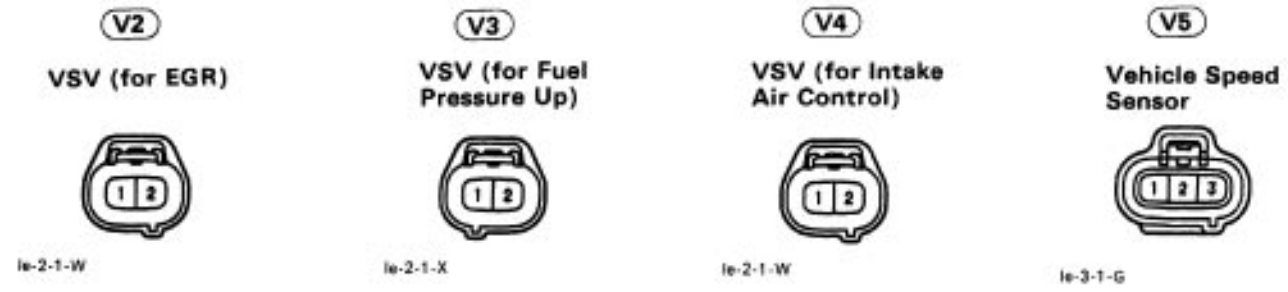
IV-4-1-A

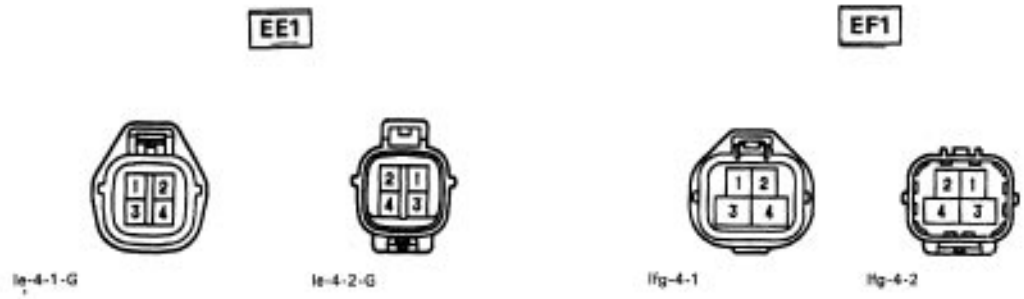
V1

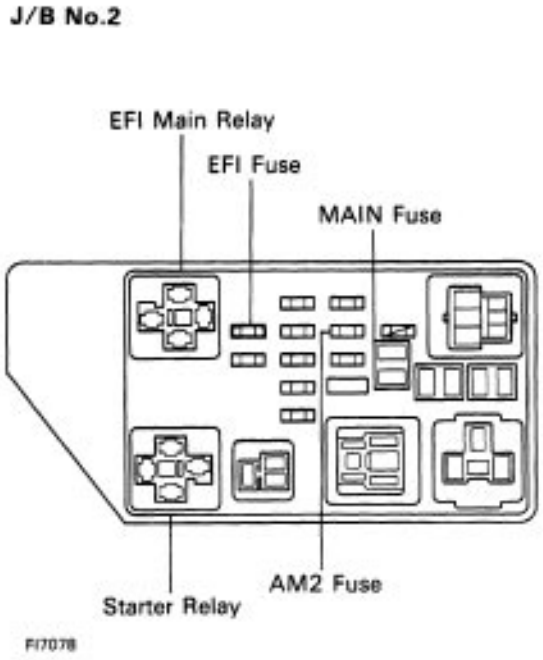
VSV (for A/C Idle Up)

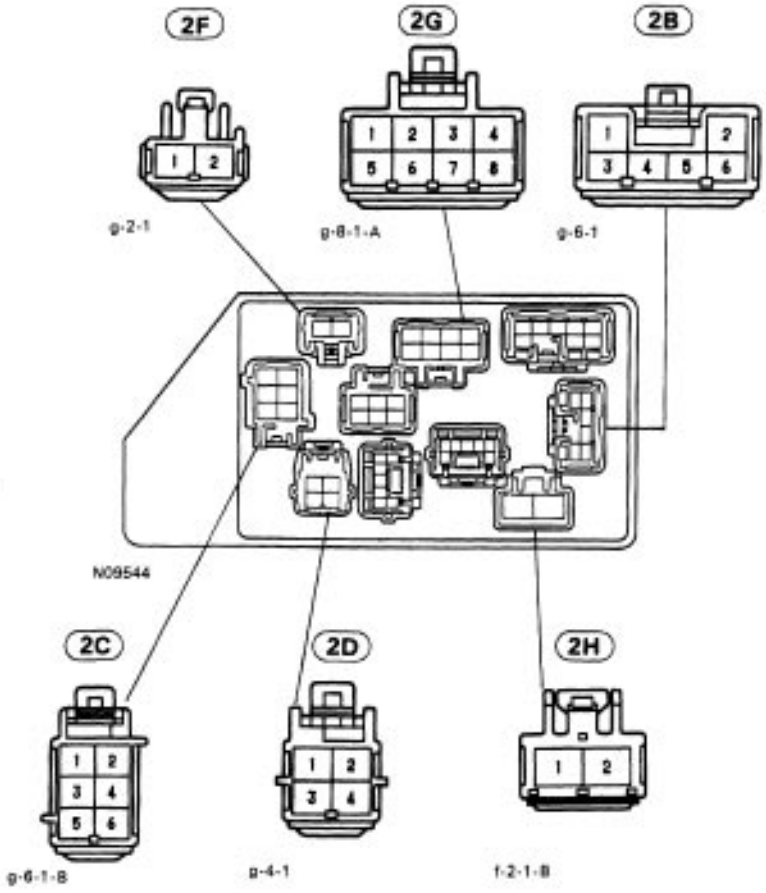
Ie-2-1-N

Location of Connectors in Engine Compartment (Cont'd)

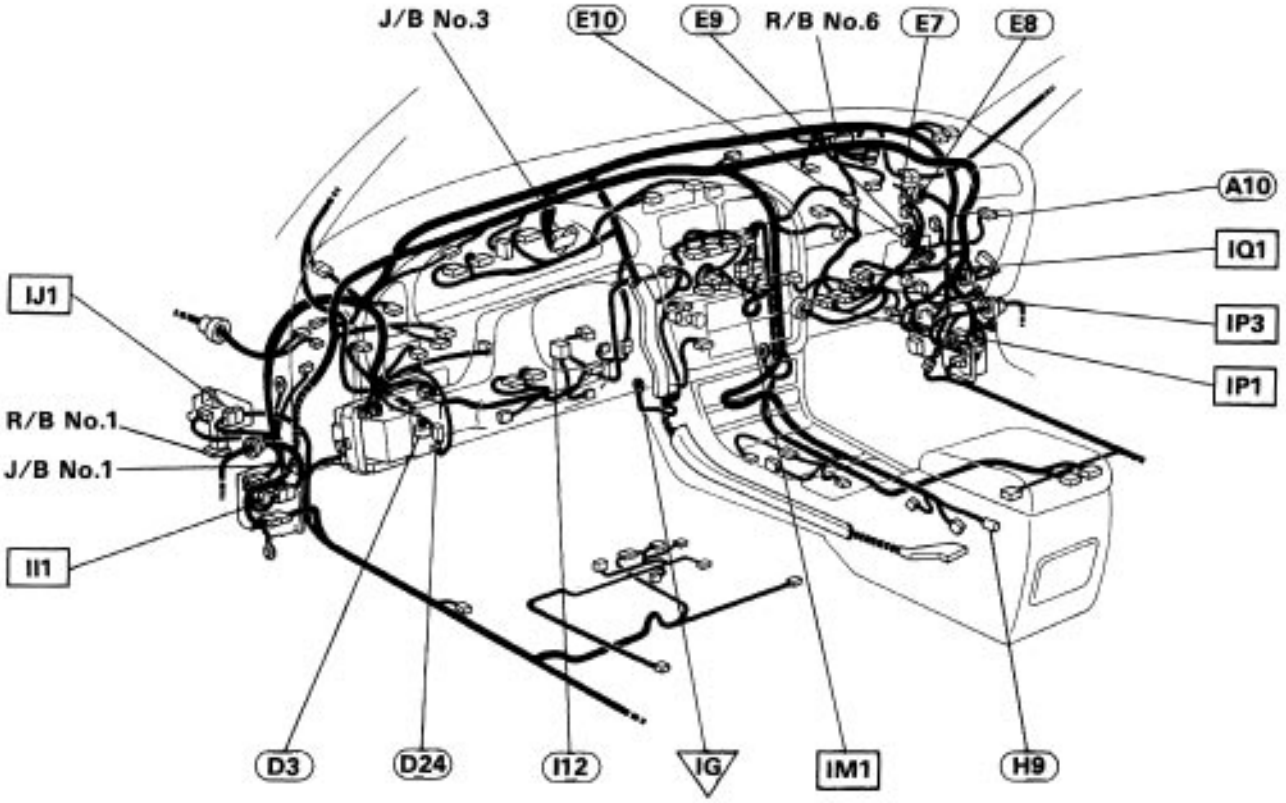








Location of Connectors in Instrument Panel



N09614

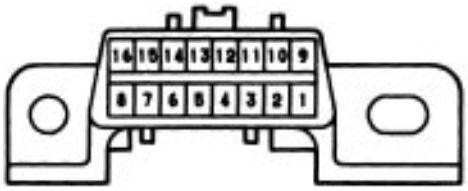
A10
A/C Amplifier

e-14-1-A

D3
Data Link Connector 2

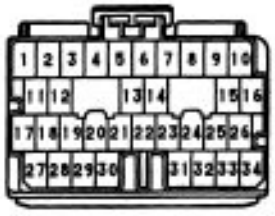
S-17-1

D24
Data Link Connector 3



N09214

E7
Engine Control Module



n-34-1

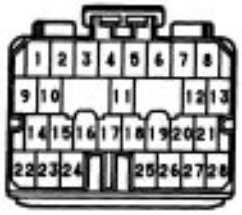
E8
Engine Control Module

n-22-1

E9
Engine Control Module

n-16-1

E10
Engine Control Module

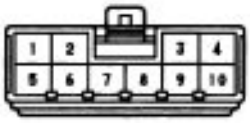


n-28-1

H9
Heated Oxygen Sensor (Bank 1 Sensor 2)

Ie-4-1-D

I12
Ignition Switch

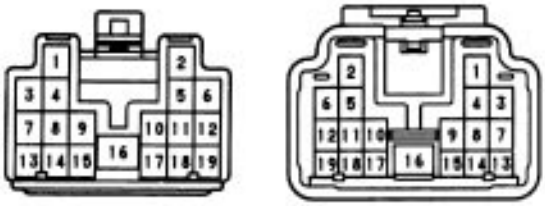


g-10-1-B

II1

e-10-1 e-10-2

IJ1

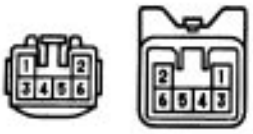


eg-18-1 eg-18-2

IM1

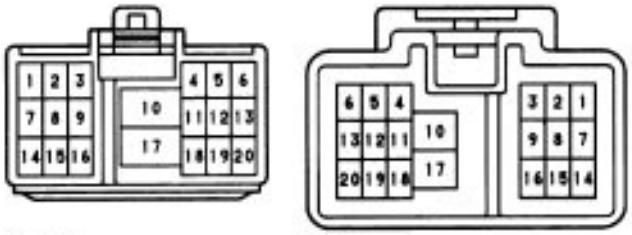
Ie-6-1-A Ie-6-2-A

IQ1



e-6-1 e-6-2

IP1



e-20-1-B e-20-2-B

IP3

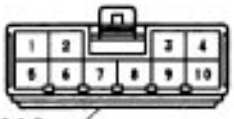
ef-19-1 ef-19-2

J/B No.1

1E

fg-5-1

1G



g-10-1-B

1C

e-11-1

1M

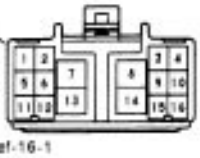
g-6-1

1D

e-15-1

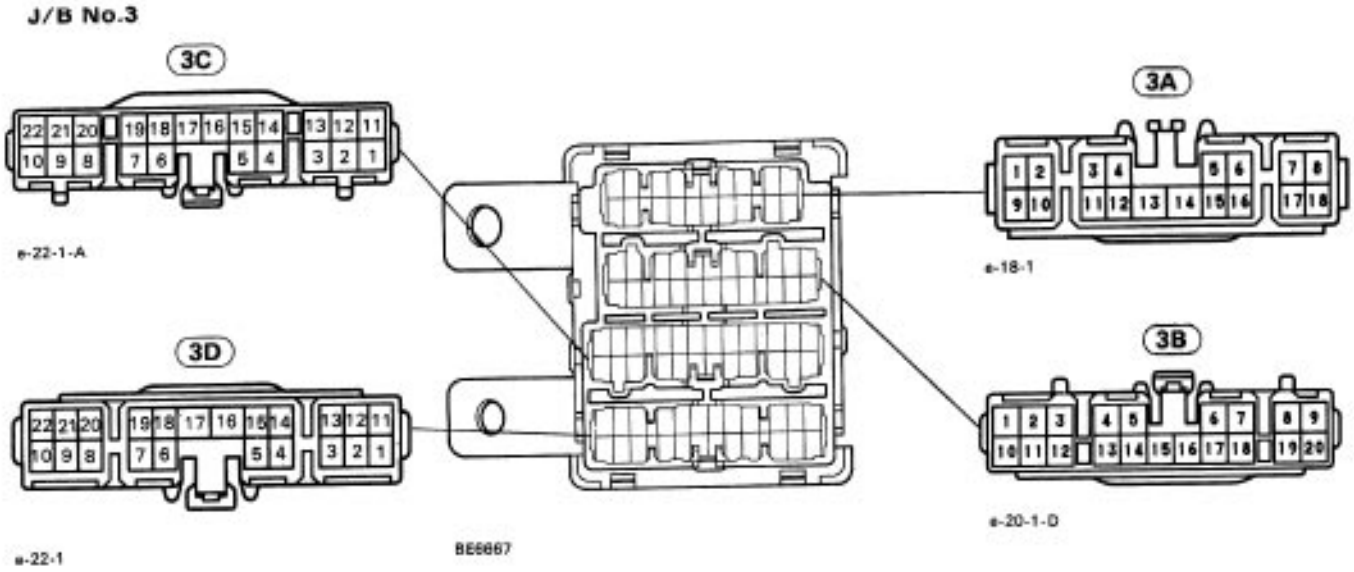
BE6663

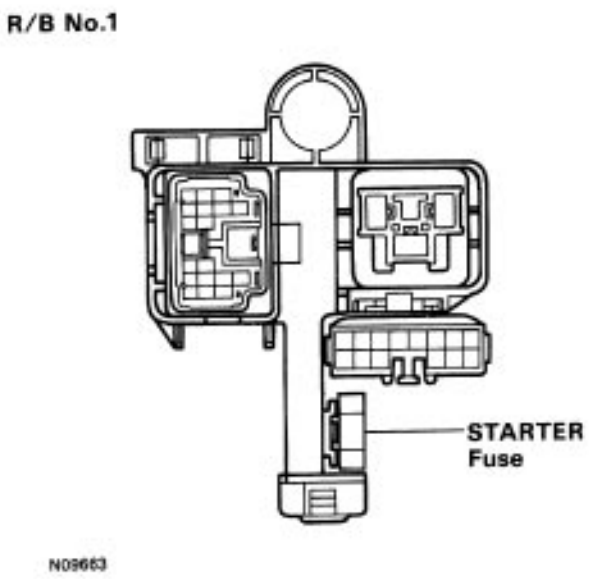
1A

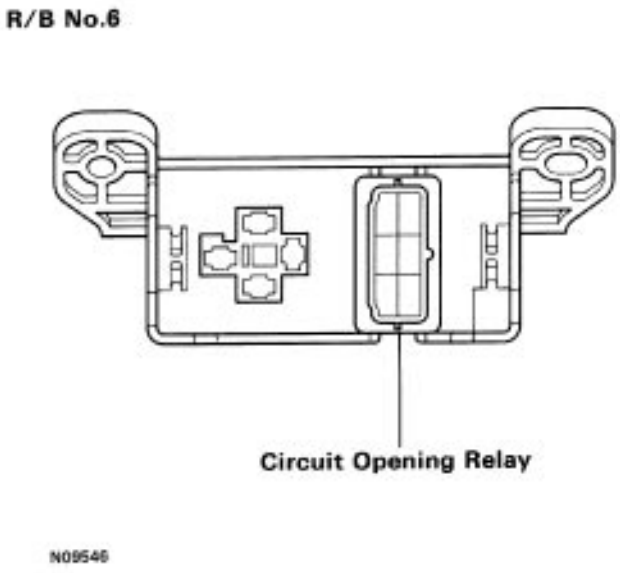


ef-16-1

Location of Connectors in Instrument Panel (Cont'd)

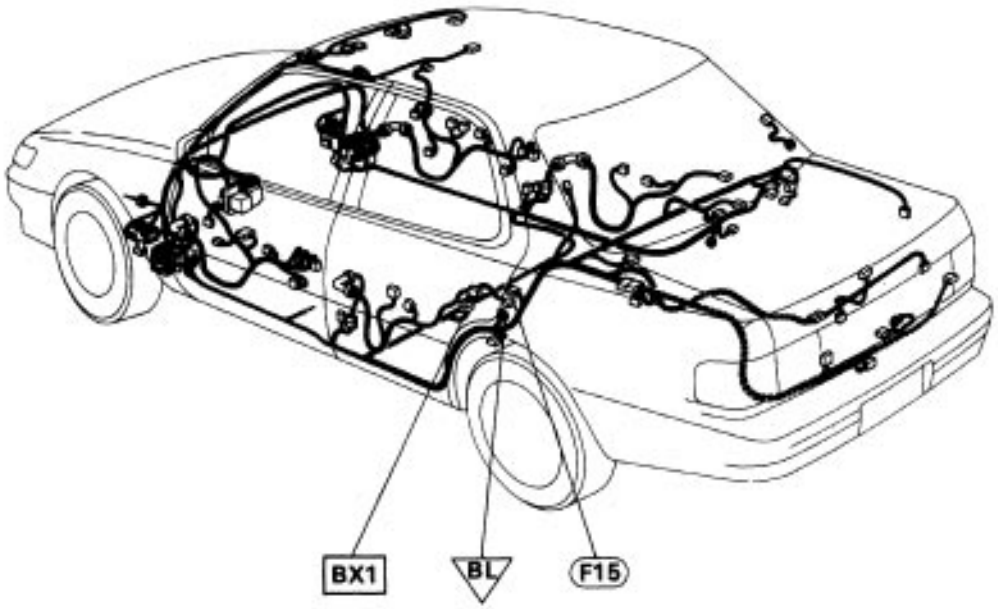






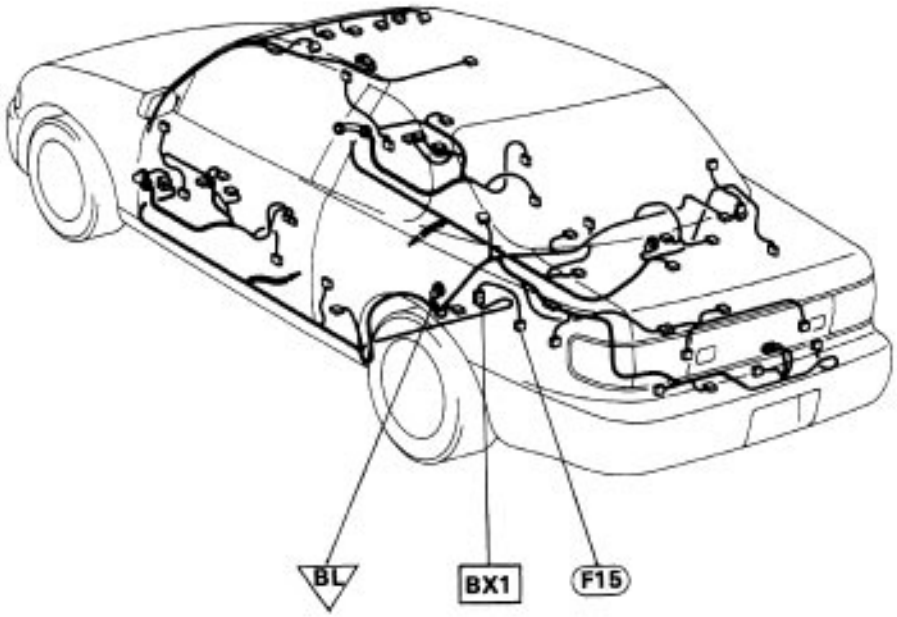
Location of Connectors in Body

Sedan



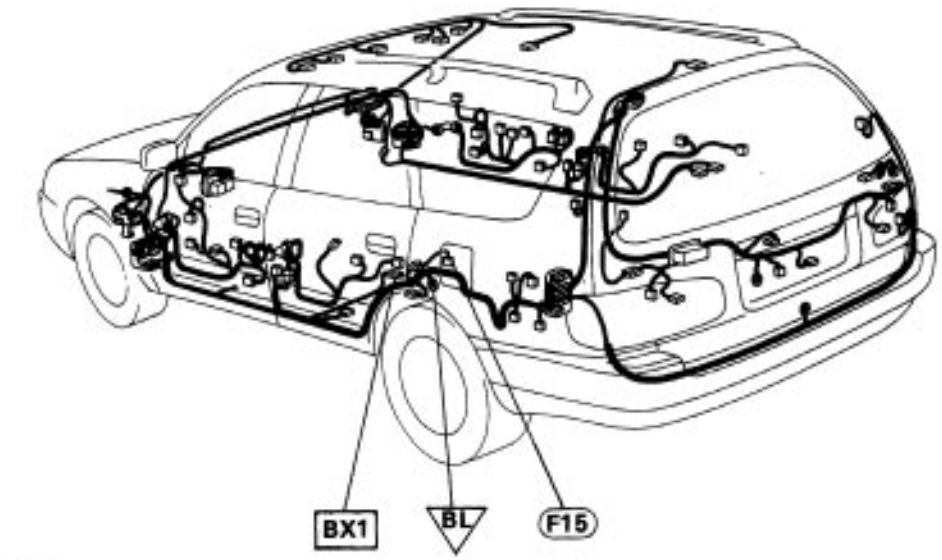
N09615

Coupe



N09703

Wagon



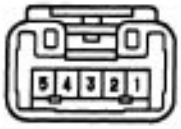
F15

Fuel Pump

Ie-5-1-A

BX1

e-5-1



e-5-2

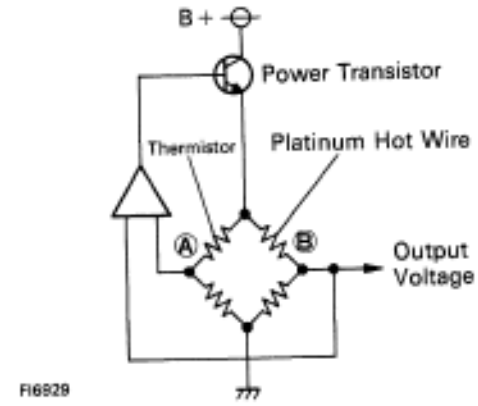
DTC P0100 Mass Air Flow Circuit Malfunction

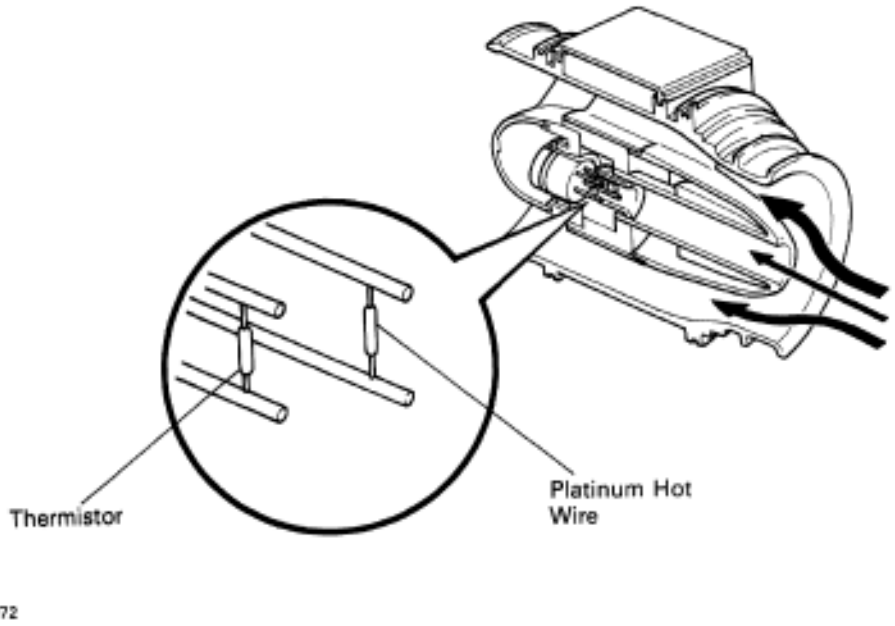
CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temperature.

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the air flow meter.

The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of (A) and (B) remains equal to maintain the set tem–perature.





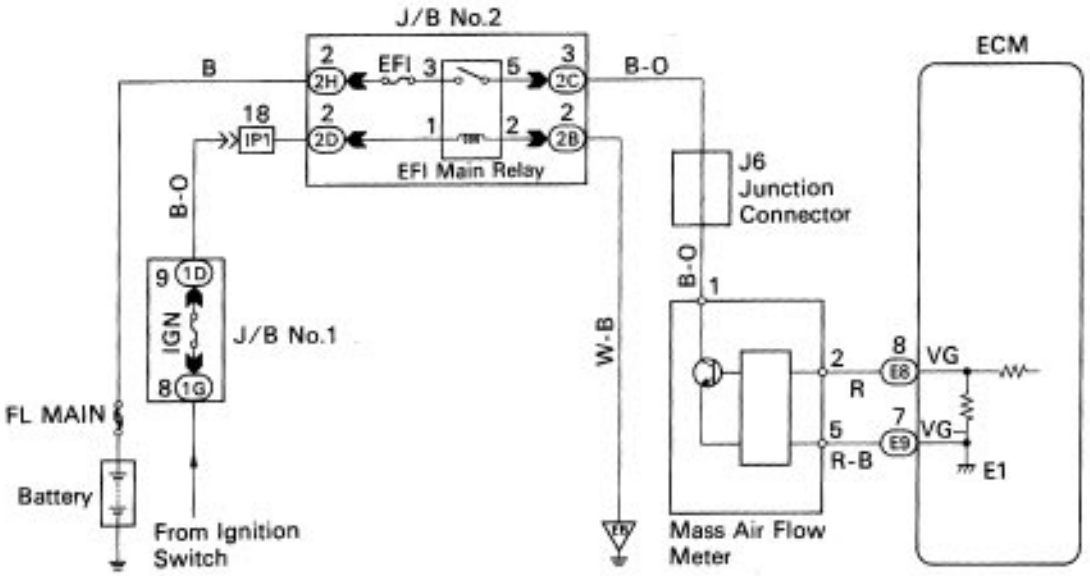
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0I00	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less.	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

If the ECM detects diagnostic trouble code ”P01 00” it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

HINT: After confirming DTC P01 00 use the OBDll scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from ”CURRENT DATA”.

Mass Air Flow Value (gm/sec.)	Malfunction
0.0	• + B circuit open • VG circuit open or short
271.0 or more	• VG– circuit open

WIRING DIAGRAM



FI7047

DIAGNOSTIC CHART

1	Connect the OBDII scan tool or TOYOTA hand–held tester, and read value of mass air flow rate.	Type II	Go to step 5

Type I

2	Check voltage of mass air flow meter power source.	NG	Check for open in harness and connector between EFI main relay and mass air flow meter.

OK

3	Check voltage between terminal VG and body ground.	OK	Check and replace ECM.

NG

4	Check for open and short in harness and connector between mass air flow meter and ECM.	NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

5	Check continuity between terminal VG– and body ground.	NG	Check and replace ECM.

OK

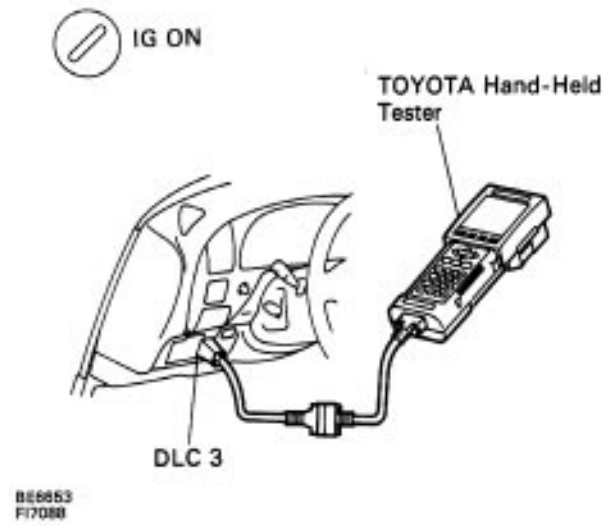
6	Check for open in harness and connector between mass air flow meter and ECM.	NG	Repair or replace harness or connector.

OK

Replace mass air flow meter.

INSPECTION PROCEDURE

1 **Connect the OBDII scan tool or TOYOTA hand–held tester, and read value of mass air flow rate.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.
(4) Start the engine.

C Read mass air flow rate on the OBDII scan tool or TOYOTA hand–held tester.

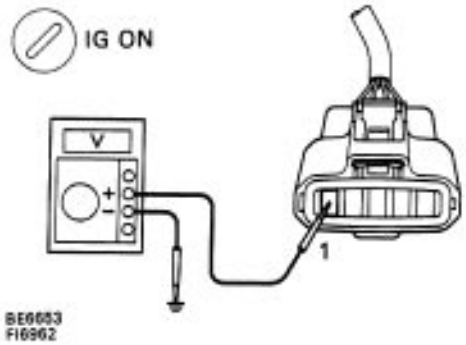
Result

	Mass air flow rate
Type I	0.0 gm/sec.
TypeII	271.0 gm/sec. or more

Type I

Type II → **Go to step 5.**

2 **Check voltage of mass air flow meter power source.**



P (1) Disconnect the mass air flow meter connector.
(2) Turn ignition switch ON.

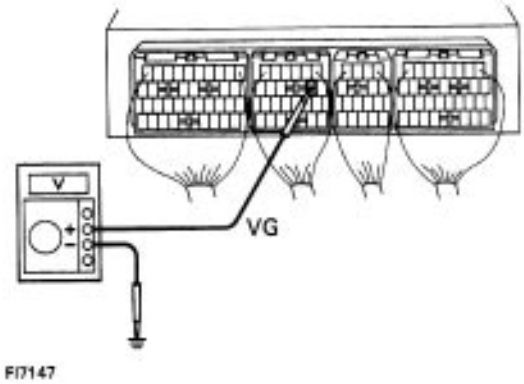
C Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK **Voltage: 9 –14 V**

OK

NG → **Check for open in harness and connector between EFI main relay and mass air flow meter (See page IN–31).**

3 **Check voltage between terminal VG of ECM and body ground.**



P (1) Remove glove compartment.
(See page EG2–309)
(2) Start the engine.

C Measure voltage between terminal VG of ECM and body ground while engine is idling.

OK **Voltage: 1.1 – 1.5 V**
(P position and A/C switch OFF)

NG

OK → **Check and replace ECM (See page IN–36).**

4 **Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

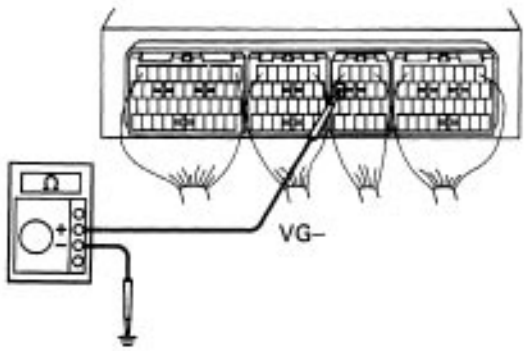
Replace mass air flow meter.

5 **Check continuity between terminal VG of ECM and body ground.**

P Remove glove compartment (See page EG2–309).

C Check continuity between terminal VG– of ECM and body ground.

OK **Continuity (1Ω or less)**



FI7148

OK

NG → **Check and replace ECM (See page IN–36).**

6 **Check for– open in harness and connector between mass air flow meter– and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Replace mass air flow meter.

DTC P0101 Mass Air Flow Circuit Range Performance Problem

CIRCUIT DESCRIPTION

Refer to mass air flow circuit malfunction on page EG2–444.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0101	Conditions a) and b) continue with engine speed 900 rpm or less. (2 trip detection logic) a) Closed throttle position switch: ON b) Mass air flow meter output) 2.2 V	• Mass air flow meter

WIRING DIAGRAM

Refer to mass air flow circuit malfunction on page EG2–445.

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P0101) being output?	YES	Go to relevant diagnostic trouble code chart.

NO

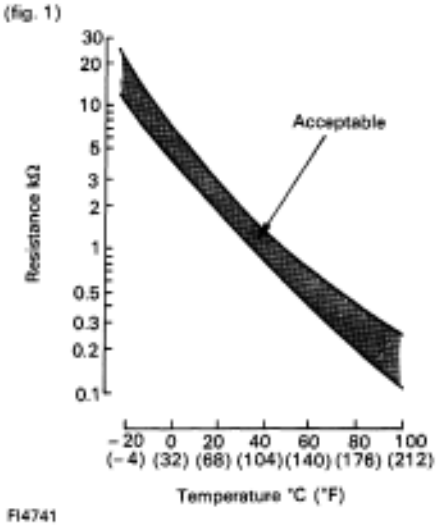
Replace mass air flow meter.

DTC P0110 Intake Air Temp Circuit Malfunction

CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air flow meter and senses the intake air temperature.
A thermistor built in the sensor changes the resistance value according to the intake air temperature.
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See Fig. 1.).
The intake air temperature sensor is connected to the ECM (See next page). The 5V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a resistor R.
That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this–signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.
If the ECM records the diagnostic trouble code ”P0110”, it operates the fail safe function in which the intake temperature is assumed to be 20°C (68°F). Intake Air Ter

(fig. 1)



(Reference)

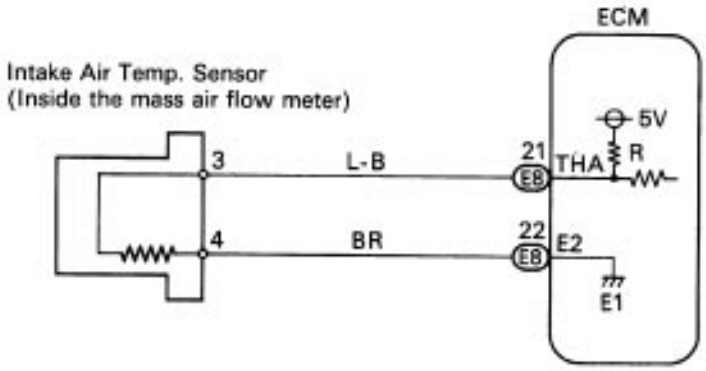
Intake Air Temp. °C (° F)	Resistance (kΩ)	Voltage M
– 20 (– 4)	16.2	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.1	1.4
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.1	0.2

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit.	• Open or short in intake air temp. sensor circuit. • Intake air temp. sensor • ECM

Hint; After confirming DTC P01 10 use the OBDII scan tool or TOYOTA hand–held tester to confirm the intake air temperature from ”CURRENT DATA”.

Temperature Displayed	Malfunction
– 40°C (–40°F)	Open circuit
120°C (248°F) or more	Short circuit

WIRING DIAGRAM



FI5448

DIAGNOSTIC CHART

HINT; If diagnostic trouble codes ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction), ”P0120” (throttle position circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	Connect the OBDII scan tool or TOYOTA hand–held tester and read value of intake air temp.	NG	– 40°C (– 40°F) ..... Go to step 2 120°C (248°F) or more .. Go to step 4

OK

Check for intermittent problems.

2	Check for open in harness or ECM.	OK	Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3	Check for open in harness or ECM.	OK	Open in harness between ECM and intake air temp. sensor.

NG

Confirm good connection at ECM. If OK, replace ECM.

4	Check for short in harness and ECM.	OK	Replace mass air flow meter.

NG

5	Check for short in harness or ECM.	OK	Repair or replace harness or connector.

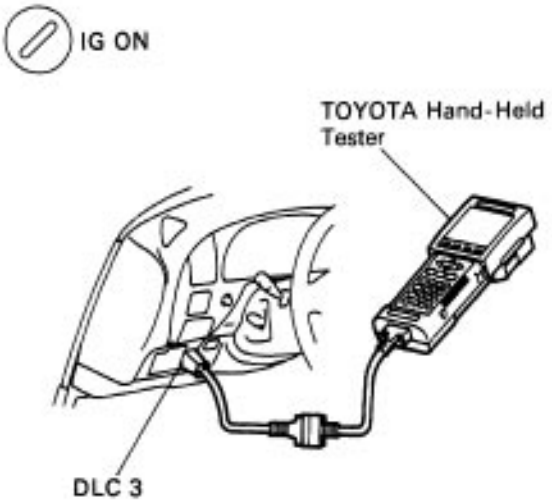
NG

Check and replace ECM.

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction), ”P0120” (throttle position circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1 **Connect the OBDII scan tool or TOYOTA hand–held tester, and read value of intake air temperature.**



P (1) Remove the fuse cover on the instrument panel.

(2) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(3) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK Same as actual intake air temperature.

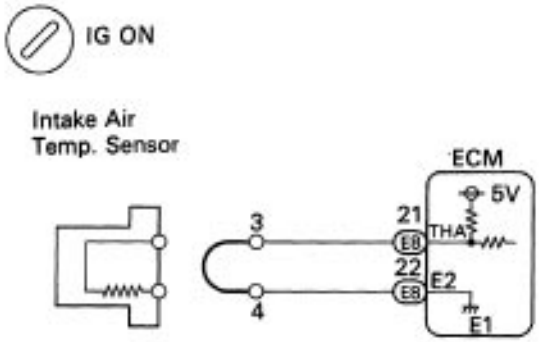
Hint If there is open circuit, OBDII scan tool or TOYOTA hand–held tester indicates – 40°C (– 40° F).
If there is short circuit, OBDII scan tool or TOYOTA hand–held tester indicates 120°C (248°F) or more.

OK

NG – 40°C (– 40° F) ..... Go to step Ⓡ
120°C (248°F) or more ... Go to step 3

Check for intermittent problems.
(See page EG2–417)

2 **Check for open in harness or ECM.**



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FI7065

P (1) Disconnect the mass air flow meter connector.
(2) Connect sensor wire harness terminals together.
(3) Turn ignition switch ON.

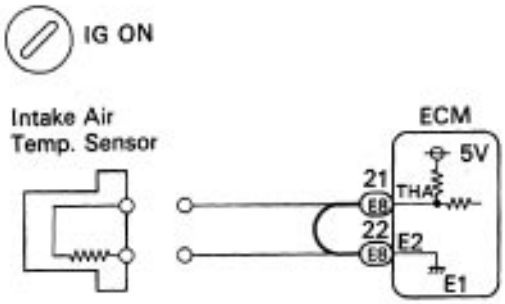
C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

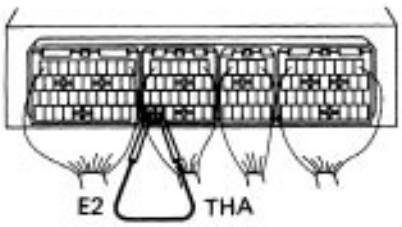
OK **Temperature value: 120°C (248°F) or more**

NG

OK → **Confirm good connection at sensor. If OK, replace mass air flow meter.**

3 **Check for open in harness or ECM.**





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P (1) Remove glove compartment.
(See page EG2–309)
(2) Connect between terminals THA and E2 of ECM E8 connector.
HINT: Mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector. (See page EG2–418)

C (3) Turn ignition switch ON.
Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

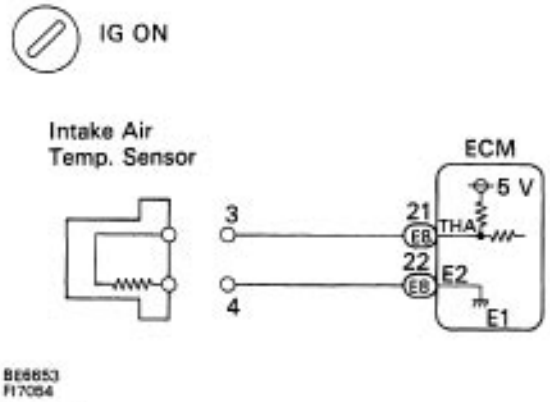
OK **Temperature value: 120°C (248°F) or more**

NG

OK → **Open in harness between terminals E2 or THA, repair or replace harness.**

Confirm good connection at ECM. If OK, replace ECM..

4 **Check for short in harness and ECM.**



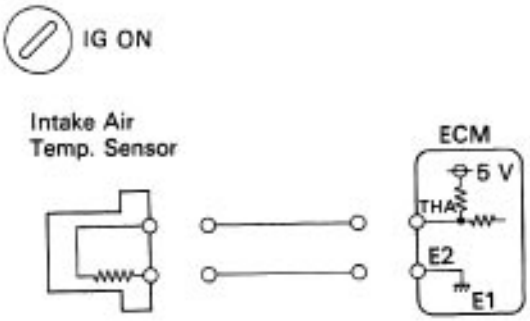
P (1) Disconnect the mass air flow meter connector.
(2) Turn ignition switch ON.

C Read temperature value on the 0BDII scan tool or TOYOTA hand–held tester.

OK **Temperature value: – 40°C (– 40°F).**

NG → OK → **Replace mass air flow meter.**

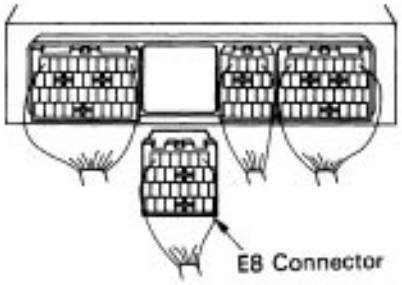
5 **Check for short in harness or ECM.**



P (1) Remove glove compartment.
(See page EG2–309)
(2) Disconnect the E8 connector of ECM.
HINT: Mass air flow meter connector is disconnected.
(3) Turn ignition switch ON.

C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK **Temperature value: –40°C (–40°F)**



NG → OK → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

DTC P0115 Engine Coolant Temp Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temperature sensor changes the resistance value according to the coolant temperature.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page EG2–451.

If the ECM records the diagnostic trouble code P01 15, it operates the fail safe function, keeping the engine coolant temp. at a constant 80°C (176°F).

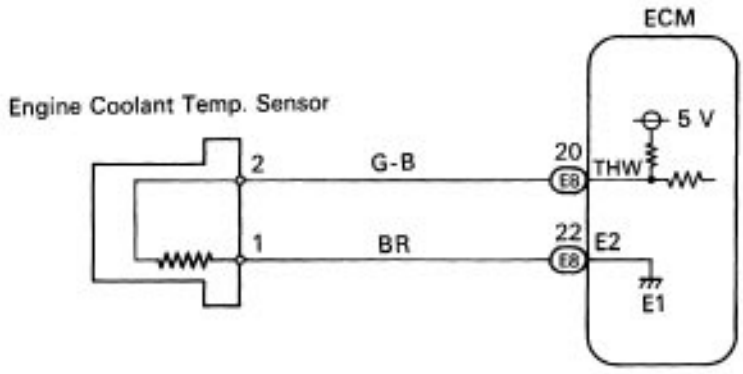
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit.	• Open or short in engine coolant temp. sensor circuit. • Engine coolant temp. sensor. • ECM

HINT: After confirming DTC P01 15 use the OBDll scan tool or TOYOTA hand–held tester to confirm the engine coolant temperature from ”CURRENT DATA”.

Temperature Displayed Malfunction

– 40°C (– 40°F)	Open circuit
120°C (248°F) or more	Short circuit

WIRING DIAGRAM



FI6448

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction) and ”P0120” (throttle position circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1	Connect the OBDII scan tool or TOYOTA hand–held tester and read value of engine coolant temp.	NG	– 40°C (– 40°F) ..... Go to step 2 120°C (248°F) or more .. Go to step 4

OK

Check for intermittent problems.

2	Check for open in harness or ECM.	OK	Confirm good connection at sensor. If OK, replace engine coolant temp. sensor.

NG

3	Check for open in harness or ECM.	OK	Open in harness between ECM and engine coolant temp. sensor.

NG

Confirm connection at ECM. If OK, replace ECM.

4	Check for short in harness and ECM.	OK	Replace engine coolant temp. sensor.

NG

5	Check for short in harness or ECM.	OK	Repair or replace harness or connector.

NG

Check and replace ECM.

INSPECTION PROCEDURE

HINT; If diagnostic trouble codes ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction), ”P0120” (throttle position circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1 **Connect the OBD II scan tool or TOYOTA hand–held tester, and read value of engine coolant temperature.**

P (1) Remove the fuse cover on the instrument panel.
(2) Connect the 0BDII scan tool or TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK Same as actual engine coolant temperature.

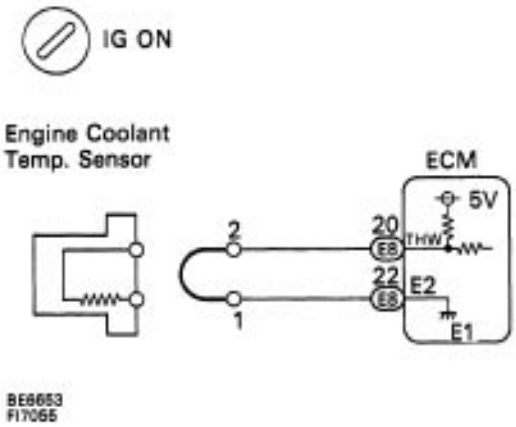
Hint If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 120°C (248°F) or more.

OK

NG **– 40°C (– 40°F) ..... Go to step 2.**
120°C (248°F) or more . . Go to step 3.

Check for intermittent problems.
(See page EG2–417)

2 **Check for open in harness or ECM.**



P (1) Disconnect the engine coolant temp. sensor connector.
(2) Connect sensor wire harness terminals together.
(3) Turn ignition switch ON.

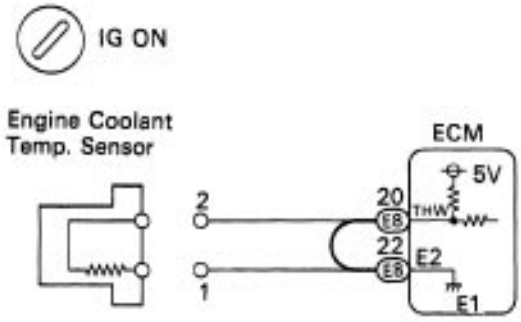
C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

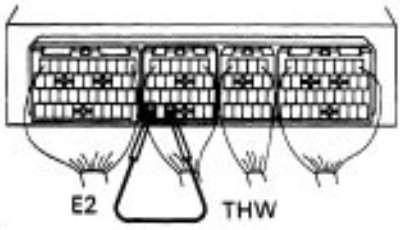
OK **Temperature value: 120°C (248°F) or more**

NG

OK → **Confirm good connection at sensor. If OK, replace engine coolant temp. sensor.**

3 **Check for open in harness or ECM.**





P (1) Remove glove compartment.
(See page EG2–309)
(2) Connect between terminals THW and E2 of ECM E8 connector.
HINT: Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector.
(See page EG2–418)

C (3) Turn ignition switch ON.
Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

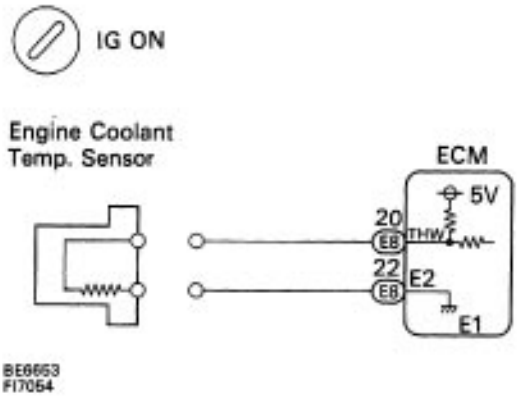
OK **Temperature value: 120°C (248°F) or more**

NG

OK → **Open in harness between terminals E2 or THW, repair or replace harness.**

Confirm good connection at ECM.
If OK, replace ECM .

4 **Check for short in harness and ECM.**



P (1) Disconnect the engine coolant temp. sensor connector.
(2) Turn ignition switch ON.

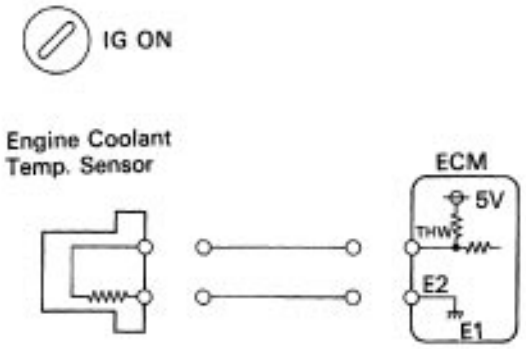
C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK **Temperature value: – 40°C (– 40°F)**

NG

OK **Replace engine coolant temp. sensor.**

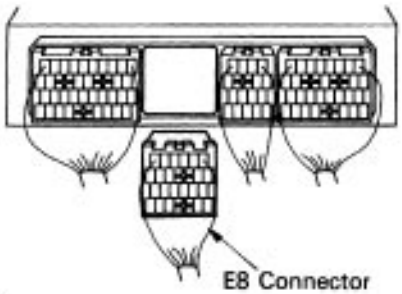
5 **Check for short in harness or ECM.**



P (1) Remove glove compartment.
(See page EG2–309)
(2) Disconnect the E8 connector of ECM.
HINT: Engine coolant temp. sensor connector is dis–connected.
(3) Turn ignition switch ON.

C Read temperature value on the OBDII scan tool or TOYOTA hand–held tester.

OK **Temperature value: –40°C (–40°F)**



NG

OK **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

DTC P0116 Engine Coolant Temp Circuit Range Performance Problem

CIRCUIT DESCRIPTION

Refer to engine coolant temp. circuit malfunction on page EG2–457.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0116	20 min. or more after starting engine, engine coolant temp. sensor value is 30°C (86°F) or less. (2 trip detection logic)	• Engine coolant temp. sensor. • Cooling system.

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes ”P0115” (engine coolant temp. circuit malfunction) and ”P0116” (engine coolant temp. circuit range/ performance) are output simultaneously, engine coolant temp. sensor circuit may be open.
Perform troubleshooting of diagnostic trouble code P0115 first.

1	Are there any other codes (besides DTC P0116) being output?	YES	Go to relevant diagnostic trouble code chart.

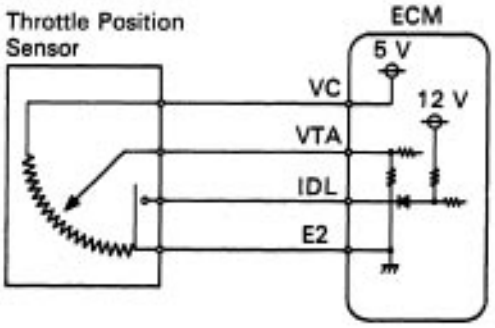
NO

Replace engine coolant temp. sensor. (See page EG2–282)

DTC P0120 Throttle Position Circuit Malfunction

CIRCUIT DESCRIPTION

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM becomes 0V. At this time, a voltage of approximately 0.7 V is applied to terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM. The voltage applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 – 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increases correction and fuel–cut control etc.



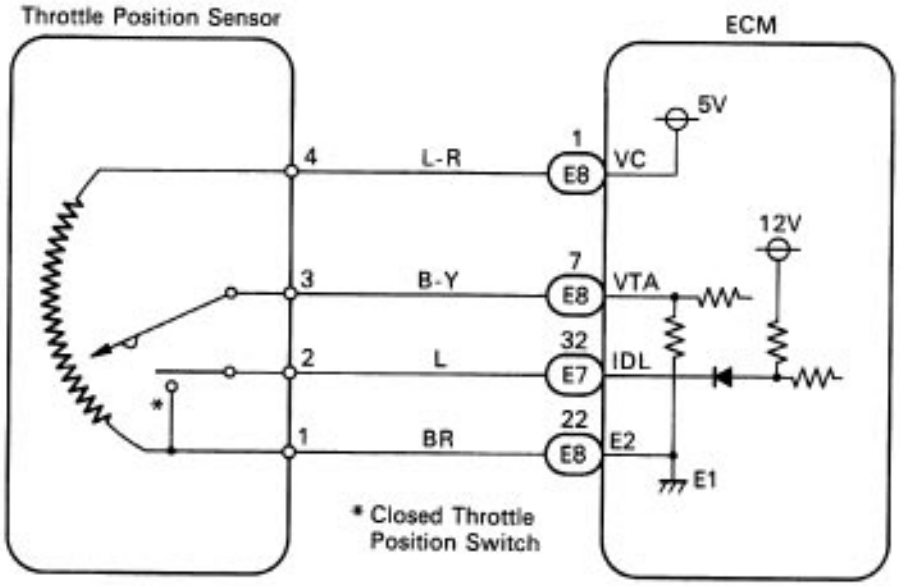
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0120	Condition a) or b) continues. a) VTA (0.1 V, and closed throttle position switch is OFF. b) VTA) 4.9 V	• Open or short in throttle position sensor circuit. • Throttle position sensor. • ECM

HINT:

- If there is open circuit in IDL line, diagnostic trouble code P0120 does not indicate,
- After confirming DTC P0120 use the OBDII scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0%	0 %	VC line open VTA line open or short
Approx. 99%	Approx. 100%	E2 line open

WIRING DIAGRAM



FI6573

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes P0110, P01 15 and P0120 are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand–held tester

1	Connect the TOYOTA hand–held tester and read the throttle valve opening percentage.	OK	Check for intermittent problems.

NG

2	Read closed throttle position switch condition.	OK	G o to step 5

NG

3	Check voltage of terminal VC.	NG	Go to step 6

OK

4	Check throttle position sensor.	NG	Replace throttle position sensor.

OK

5	Check voltage of terminal VTA and E2 of ECM.	NG	Check for open and short in harness and connector between ECM and throttle position sensor (VTA line).

OK

Check and replace ECM.

6	Check voltage of terminal VC and E2 of ECM.	NG	Check and replace ECM.

OK

Check for open in harness and connector between ECM and sensor (VC line).

OBDII scan tool (excluding TOYOTA hand–held tester)

1	Connect the OBDII scan tool and read the throttle valve opening percentage.	OK	Check for intermittent problems.

NG

2	Check voltage of terminal IDL and E2 of ECM.	OK	Go to step 5

NG

3	Check voltage of terminal VC on wire harness side connector.	NG	G o to step 6

OK

4	Check throttle position sensor.	NG	Replace throttle position sensor.

OK

5	Check voltage of terminal VTA and E2 of ECM.	NG	Check for open and short in harness and connector between ECM and throttle position sensor (VTA line).

OK

Check and replace ECM.

6	Check voltage of terminal VC and E2 of ECM.	NG	Check and replace ECM.

OK

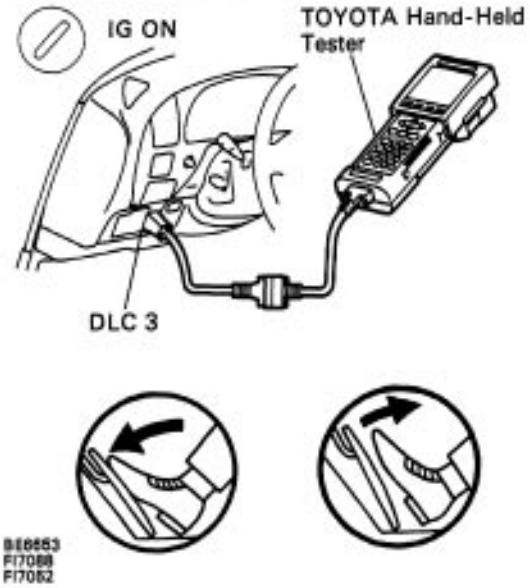
Check for open in harness and connector between ECM and sensor (VC line).

INSPECTION PROCEDURE

TOYOTA hand–held tester

HINT: If diagnostic trouble codes P01 10, P01 15 and P0120 are output simultaneously, E2 (sensor ground) may be open.

1 **Connect the TOYOTA hand–held tester and read the throttle valve opening percentage.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read the throttle valve opening percentage.

OK

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 70%
Fully closed	Approx. 10%

NG

OK → **Check for intermittent problems (See page EG2–417).**

2 **Read closed throttle position switch condition.**

P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read closed throttle position switch condition.

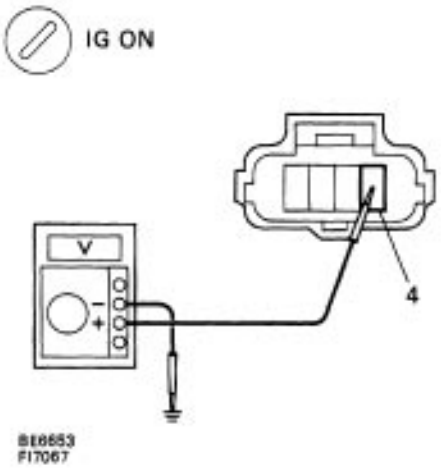
OK

Throttle valve	Closed throttle position switch condition
Fully open	OFF
Fully closed	ON

NG

OK → **Go to step 5**

3 **Check voltage between terminal VC of wire harness side connector and body ground.**



P (1) Disconnect the throttle position sensor connector.
(2) Turn ignition switch ON.

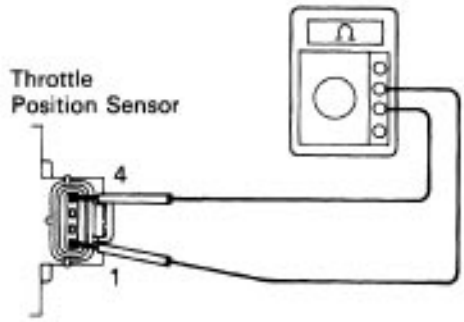
C Measure voltage between terminal VC of wire harness side connector and body ground.

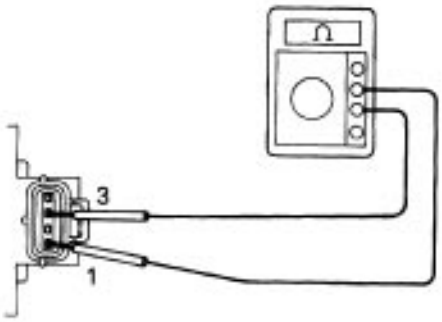
OK **Voltage: 4.5 – 5.5 V**

OK

NG → **Go to step 6**

4 **Check throttle position sensor.**





P Disconnect the throttle position sensor connector.

C Measure resistance between terminals 4, 3 and 1 of throttle position sensor.

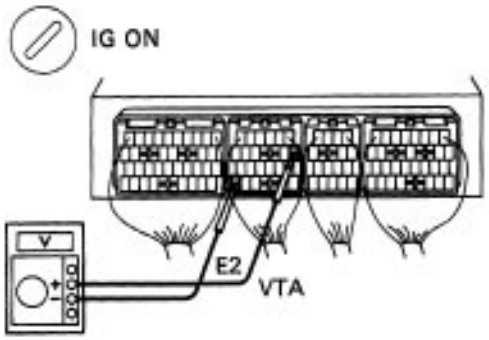
OK

Terminals	Throttle valve	Resistance
1 –4	–	4.25 – 8.25 kΩ
1 –3	Fully closed	0.3 – 6.3 kΩ
	Fully open	3.5 – 10.3 kΩ

OK

NG → **Replace throttle position sensor.**

5 **Check voltage between terminals VTA and E2 of ECM.**



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FI7044

P (1) Remove glove compartment.
(See page EG2–309)
(2) Turn ignition switch ON.

C Measure voltage between terminals VTA and E2 of ECM.

OK

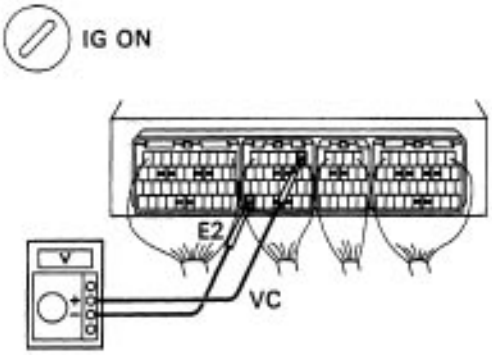
Throttle Valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	2.7 – 5.2 V

OK

NG **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–31).**

Check and replace ECM (See page IN–36).

6 **Check voltage between terminals VC and E2 of ECM.**



BE6653
FI7229

P (1) Remove glove compartment.
(See page EG2–309)
(2) Turn ignition switch ON.

C Measure voltage between terminals VC and E2 of engine control module connector.

OK **Voltage: 4.5 – 5.5 V**

OK

NG **Check and replace ECM (See page IN–36).**

Check for open in harness and connector between ECM and sensor (VC line) (See page IN–31).

INSPECTION PROCEDURE

OBD II scan tool (excluding TOYOTA hand–held tester)

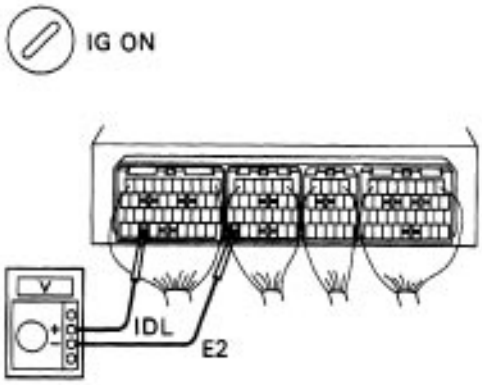
HINT: If diagnostic trouble codes P0110, P0115, and P0120 are output simultaneously, E2 (sensor ground) may be open.

1 **Connect the OBD II scan tool and read the throttle valve opening percentage (See page EG2–467, step 1).**

NG

OK → **Check for intermittent problems. (See page EG2–417)**

2 **Check voltage of terminal IDL and E2 of ECM.**



BE6653
FI7040

P (1) Remove glove compartment.
(See page EG2–309)
(2) Turn ignition Switch ON.

C Measure voltage between terminals IDL and E2 of ECM.

OK

Throttle Valve	Voltage
Fully closed	0 – 3.0 V
Fully open	9–14V

NG

OK → **Go to step**

3 **Check voltage between terminal VC of wire harness side connector and body ground (See page EG2–468, step 3).**

OK

NG → **Go to step 6**

4 **Check throttle position sensor (See page EG2–468, step 4).**

OK

NG → **Replace throttle position sensor.**

5	Check voltage between terminals VTA and E2 of ECM (See page EG2–469, step 5).

OK → Check and replace ECM (See page IN–36).

NG → Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–31).

6	Check voltage terminals VC and E2 of ECM (Seepage EG2–469, step 6).

OK → Check for open in harness and connector between ECM and sensor (VC line) (See page IN–31).

NG → Check and replace ECM (See page IN–36).

DTC P0121 Throttle Position Circuit Range Performance Problem

CIRCUIT DESCRIPTION

Refer to throttle position circuit malfunction on page EG2–463.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0121	When closed throttle position switch is ON, condition a) continues. (2 trip detection logic) a) VTA) 2.0 V	• Throttle position sensor.

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P0121) being output?	YES	Go to relevant diagnostic trouble code chart.

NO

Replace throttle position sensor.

DTC P0125 Insufficient Coolant Temp for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

To obtain a high purification rate for the C0, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.

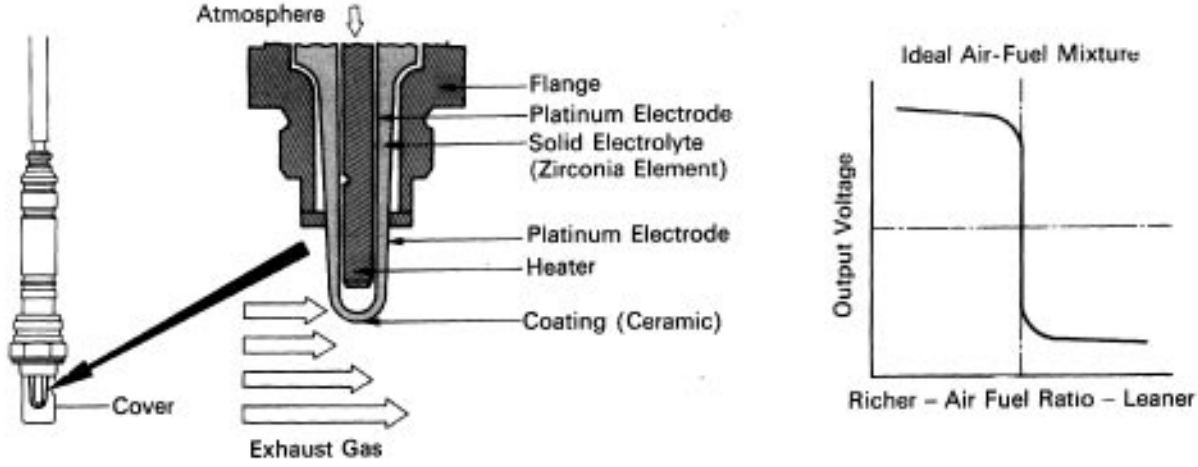
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.

When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).

When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force:1V)

The EMC judges by the electromotive force from the oxygen sensor whether the air–fuel ration is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the EMC is unable to perform accurate air–fuel ration control.

The main heated oxygen sensors include a heater which heats the Zirconia element. The heater is controlled by the EMC. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.



FI4835 FI7210

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0125	After the engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions a) and b) continue for at least 2 minutes. a) Engine speed: 1,500 rpm or more b) Vehicle speed: 40 km/h (25 mph) or more	• Open or short in heated oxygen sensor circuit. • Heated oxygen sensor.

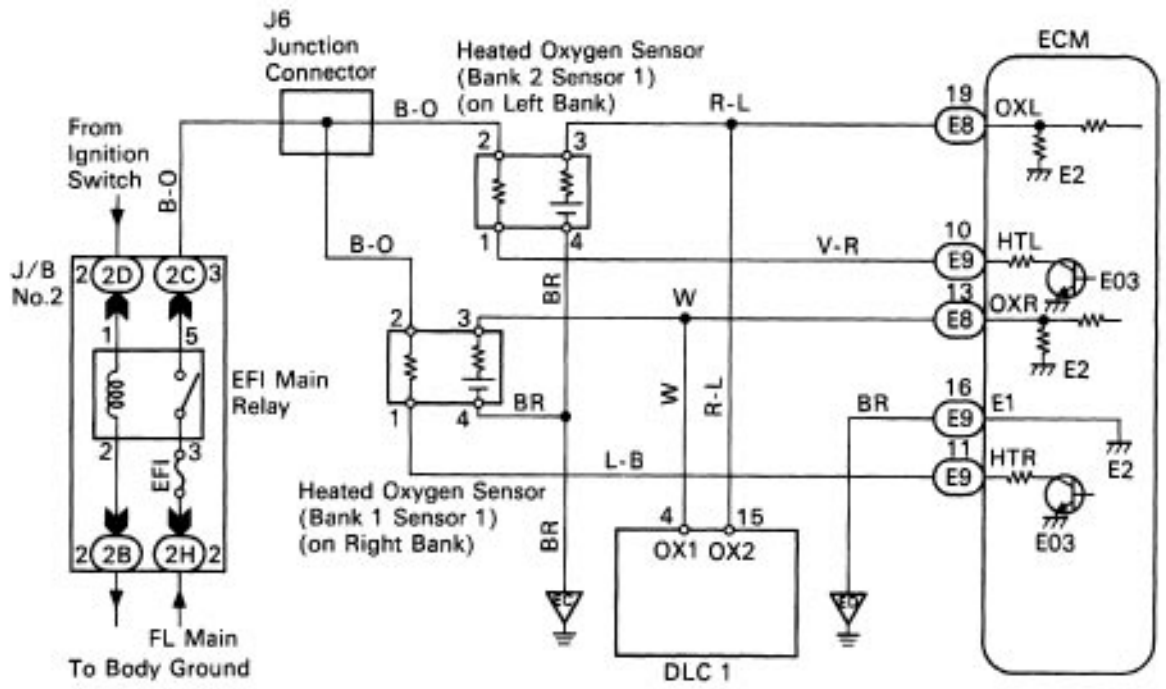
HINT: After confirming DTC P0125 use the 0BDll scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor from current data.

If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

DIAGNOSTIC CHART

1	Connect the OBDII scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor.	OK	Check and replace ECM.
NG			
2	Check for open and short in harness and connector between ECM and heated oxygen sensor.	NG	Repair or replace harness or connector.
OK			
Replace heated oxygen sensor.			

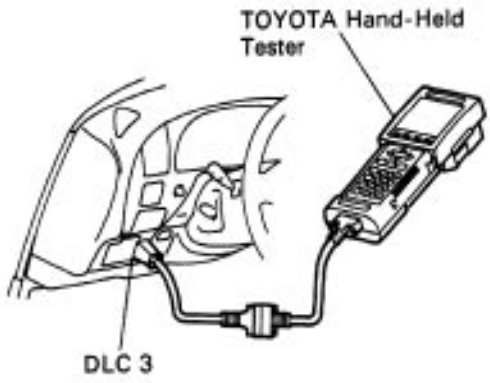
WIRING DIAGRAM



FI7013

INSPECTION PROCEDURE

1 **Connect the OBDII scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the OBDll scan tool or TOYOTA hand–held tester to the DLC 3.
(3) Warm up engine to normal operating temper–ature.

C Read voltage output of heated oxygen sensor (bank 1,2 sensor 1) when engine is suddenly raced.

Hint Perform quick racing to 4,000 rpm three times us–ing accelerator pedal.

OK **Both heated oxygen sensors [(bank 1 sensor 1) (bank 2 sensor 1)] output a RICH signal (0.45 V or more) at least once.**

NG

OK → **Check and replace ECM (See page IN–36).**

2 **Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Replace heated oxygen sensor.

DTC P0130 P0150 Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1 Bank 2 Sensor 1)

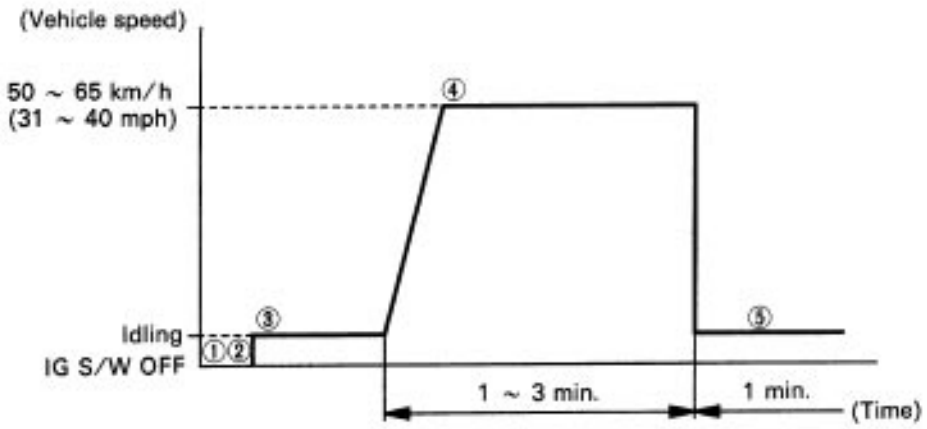
CIRCUIT DESCRIPTION

Refer to ”Insufficient coolant temp. for closed loop fuel control” on page EG2–473.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0130 **P0150**	Voltage output of heated oxygen sensor remains at 0,4 V or more, or 0,55 V or less, during idling after the engine is warmed up. (2trip detection logic)	• Heated oxygen sensor • Fuel trim malfunction

H I NT: Bank 1 refers to the bank that includes cylinder No.1.
Bank 2 refers to the bank that does not include cylinder No,1.
Sensor 1 refers to the sensor closer to the engine body.
The heated oxygen sensor’s output voltage and the short–term fuel trim value can be read using the OBDll scan tool or TOYOTA hand–held tester.

CONFIRMATION DRIVING PATTERN



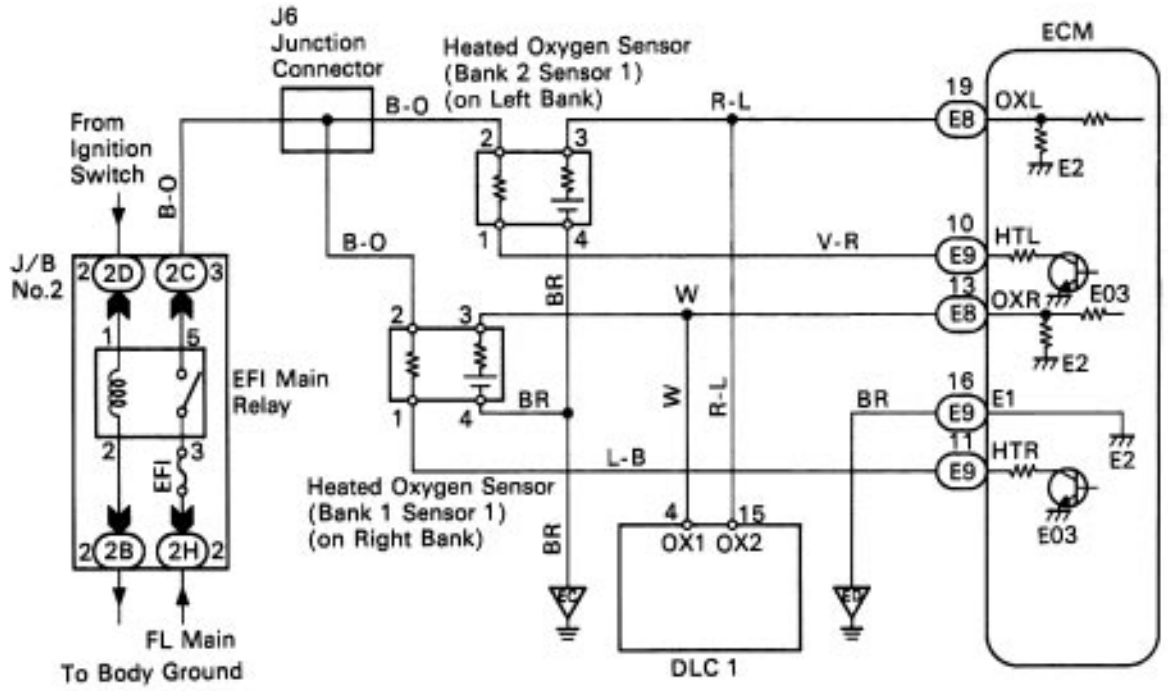
FI7130

(1)Connect the TOYOTA hand–held tester to the DLC 3.
(2)Switch the TOYOTA hand–held tester from normal mode to check mode (See page EG2–403).
(3) Start the engine and warm it up with all accessory switches OFF.
(4) After the engine is warmed up, drive at 50 – 65 km/h (31 – 40 mph) for 1 – 3 minutes to warm up the heated oxygen sensor.
(5) After driving let the engine idle for 1 minute.
HINT: If a malfunction exists, the MIL will light up during step (5) .
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.
If you do not hove a TOYOTA hand–held tester, turn the ignition switch OFF after perform–ing steps (3) to (5), then perform steps (3) to (5) again.

DIAGNOSTIC CHART

1	Check for open and short in harness and connector between ECM and heated oxygen sensor.	NG	Repair or replace harness or connector.
OK			
2	Check heated oxygen sensor data.	OK	Check fuel trim system.
NG			
3	Check output voltage of heated oxygen sensor.	OK	Perform confirmation driving pattern.
NG			
Replace heated oxygen sensor.			

WIRING DIAGRAM



FI7013

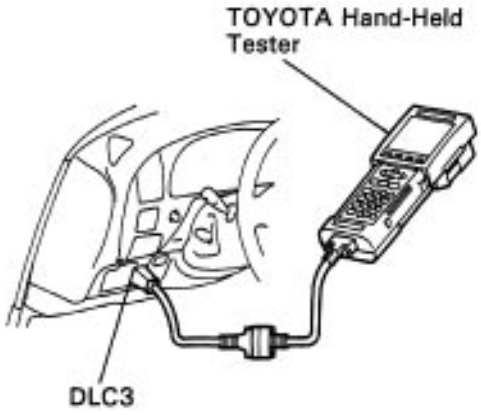
INSPECTION PROCEDURE

1 **Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

2 **Check for heated oxygen sensor data.**



FI7088

P (1) Remove the fuse cover on the instrument panel.
(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC 3.
(3) Warm up engine to normal operating temperature.

C Read the heated oxygen sensor output voltage and short–term fuel trim.

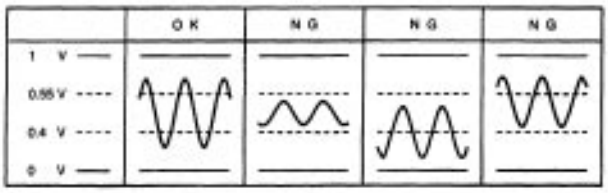
Hint Read the values for the same bank.

Result

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
①	Lean condition (Changes at 0.55 V or less)	Changes at about +20%
②	Rich condition (Changes at 0.4 V or more)	Changes at about –20%
③	Except (1) and (2)	

③ → (1),(2) → **Check fuel trim system. (See page EG2–486).**

3 **Check the output voltage of heated oxygen sensor during idling.**



P18349

P Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

C Use the OBD II scan tool or TOYOTA hand–held tester read the output voltage of the heated ox–ygen sensor during idling.

OK **Heated oxygen sensor output voltage: Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the adjacent table).**

NG

OK → **Perform confirmation driving pattern. (See page EG2–477).**

Replace heated oxygen sensor.

DTC P0133 P0153 Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1 Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to ”Insufficient coolant temp. for closed loop fuel control” on page EG2–473.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0133 P0153	Response time for the heated oxygen sensor’s voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after the engine is warmed up. (2 trip detection logic)	• Heated oxygen sensor

HINT: Bank 1 refers to the bank that includes cylinder No.1.
Bank 2 refers to the bank that does not include cylinder No.1.
Sensor 1 refers to the sensor closer to the engine body.

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P0133, P0153) being output?	YES	Go to relevant diagnostic trouble code chart.

NO

Replace heated oxygen sensor.

DTC P0135 P0141 P0155 Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1 – Bank 1 Sensor 2 – Bank 2 Sensor 1)

CIRCUIT DESCRIPTION

Refer to ”Insufficient coolant temp. for closed loop fuel control” on page EG2–473.

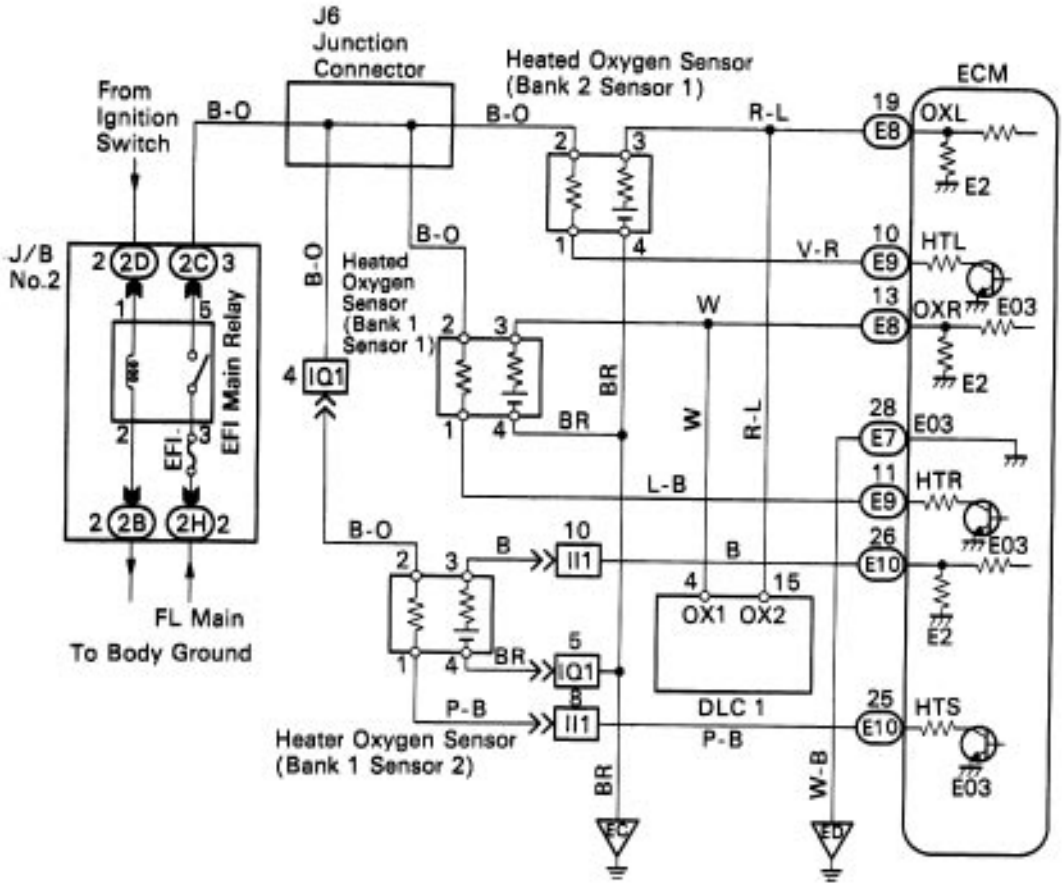
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0135 P0141 P0155	When the heater operates, heater current exceeds 2 A or voltage drop for the heater circuit exceeds 5 V. (2 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor. • Heated oxygen sensor heater • ECM
	Heater current of 0.25 A or less when the heater operates. (2 trip detection logic)	

H I NT: Bank 1 refers to the bank that includes cylinder No.1.
Bank 2 refers to the bank that does not include cylinder No.1.
Sensor 1 refers to the sensor closer to the engine body.
Sensor 2 refers to the sensor farther away from the engine body.

DIAGNOSTIC CHART

1	Check voltage of terminals HTR, HTS, HTL.	OK	Check and replace ECM.
NG			
2	Check resistance of heated oxygen sensor heater.	NG	Replace heated oxygen sensor.
OK			
Check and repair harness or connector between main relay and heated oxygen sensor and ECM.			

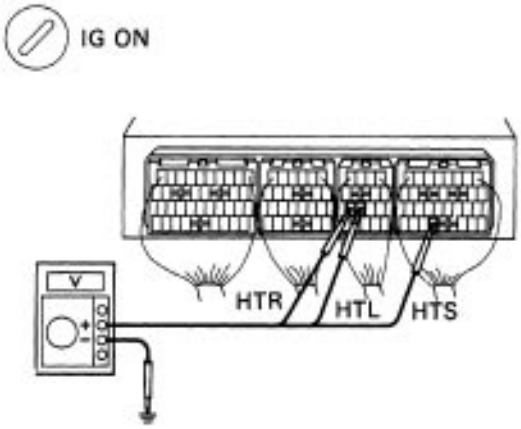
WIRING DIAGRAM



FI7077

INSPECTION PROCEDURE

1 **Check voltage between terminals HTR, HTS, HTL of ECM connector and body ground.**



BE6653
FI7033

P (1) Remove glove compartment
(See page EG2–309).
(2) Turn ignition switch ON.

C Measure voltage between terminals HTR, HTS, HTL of ECM connector and body ground.

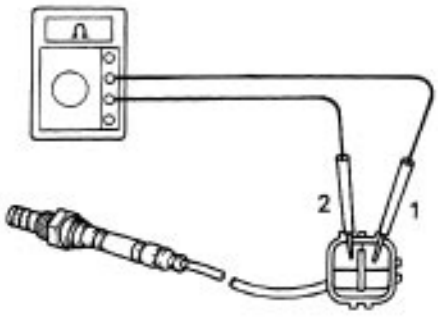
Hint Connect terminal HTR to bank 1 sensor 1.
Connect terminal HTS to bank 1 sensor 2.
Connect terminal HTL to. bank 2 sensor 1.

OK **Voltage: 9 –14 V**

NG

OK → **Check and replace ECM (See page IN–36).**

2 **Check resistance of heated oxygen sensor heater.**



FI6613

P Disconnect heated oxygen sensor connector.

C Measure resistance between terminals 1 and 2 of heated oxygen sensor connector.

OK **Resistance: 11 –16Ω at 20°C (68°F)**

OK

NG → **Replace heated oxygen sensor.**

Check and repair harness or connector between main relay and heated oxygen sensor and ECM.

DTC P0136 Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to ”Insufficient coolant temp. for closed loop fuel control” on page EG2–473.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P01 36	Voltage output of the heated oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when the vehicle is driven at 50 km/h (31 mph) or more after the engine is warmed up. (2 trip detection logic)	• Heated oxygen sensor

HINT: Bank 1 refers to the bank that includes cylinder No.1.
Sensor 2 refers to the sensor farther away from the engine body.

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P01 36) being output?	YES	Go to relevant diagnostic trouble code chart.
NO			
2	Check for open and short in harness and connector between ECM and heated oxygen sensor.	NG	Repair or replace harness or connector.
OK			
3	Check the output voltage of the heated oxygen sensor.	OK	Check that each connector is properly connected.
NG			
Replace heated oxygen sensor.			

WIRING DIAGRAM

Refer to page EG2–482 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1 Are there any other codes (besides DTC P0136) being output?

NO

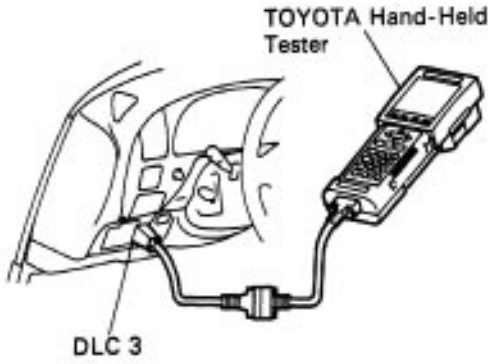
YES → **Go to relevant diagnostic trouble code chart.**

2 Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

3 Check the output voltage of heated oxygen sensor (bank 1 sensor 2).



FI7088

P (1) Remove the fuse cover on the instrument panel.

(2) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(3) After warming up the engine, race the engine at 2,500 rpm for 3 mins.

C Read the output voltage of heated oxygen sensor (bank 1 sensor 2) when racing the engine after 3 mins. have elapsed.

OK **Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0,5 V or more.**

NG

OK → **Check that each connector is properly connected.**

Replace heated oxygen sensor.

DTC P0171 System too Lean (Fuel Trim)
DTC P0172 System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

”Fuel trim” refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.
”Short–term fuel trim” is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggening a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.
”Long–term fuel trim” is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.
If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0171	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the RICH side. (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor
P0172	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the LEAN side. (2 trip detection logic)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor

HINT;

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side,
- Fuel trim applies separately to bank 1 and bank 2, so the ECM lights up the MIL if a problem occurs with either bank.
- You can tell which bank is malfunctioning by looking at the short–term fuel trim and long–term fuel trim, thus allowing you to focus your inspection.
- If the total of the short–term fuel trim value and long–term fuel trim value for each bank is within ± 25%, the system is functioning normally.

DIAGNOSTIC CHART

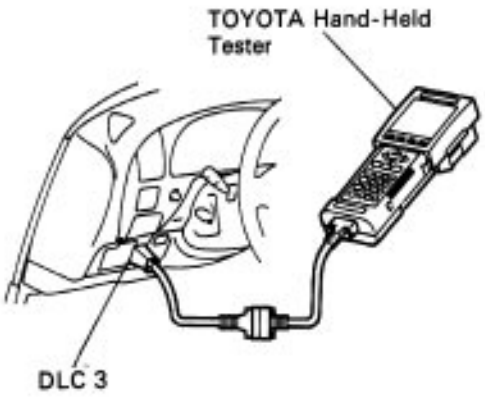
1	Check air induction system.	NG	Repair or replace.
OK			
2	Check heated oxygen sensor data.	NG	Check heated oxygen sensor.
OK			
3	Check fuel pressure.	NG	Check and repair fuel pump, pressure regulator, fuel pipe line and filter.
OK			
4	Check injector injection.	NG	Replace injector.
OK			
5	Check mass air flow meter and engine coolant temp. sensor	NG	Repair or replace.
OK			
6	Check for spark and ignition.	NG	Repair or replace.
OK			
Check and replace ECM.			

INSPECTION PROCEDURE

1 **Check air induction system (See page EG2–221).**

OK → **NG** → **Repair or replace.**

2 **Check for– heated oxygen sensor data.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.
(3) Warm up engine to normal operating temper–ature.

C Read the heated oxygen sensor output voltage and short–term fuel trim.

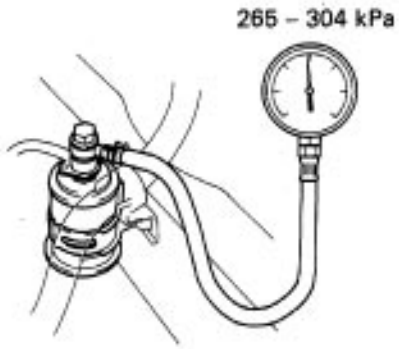
Hint Read the values for the same bank.

OK

Pattern	Heated oxygen sensor out put voltage	Short–term fuel trim
①	Lean condition Changes at 0.55 V or less	Changes at about + 20%
②	Rich condition Changes at 0.4 V or more	Changes at about – 20%

OK → **NG** → **Check for heated oxygen sensor (See page EG2–476).**

3 Check fuel pressure.



B86653
P00003

P (1) Install the SST (pressure gauge) to the fuel filter output (See page EG2–231).
SST 09268–45012

(2) Turn ignition switch ON.

(3) Connect the TOYOTA hand–held tester to data link connector 3 on the vehicle.

(4) Use ACTIVE TEST mode to operate the fuel pump.

Hint Connecting terminals B and FP of data link connector 1 allows the fuel pump to be operated.

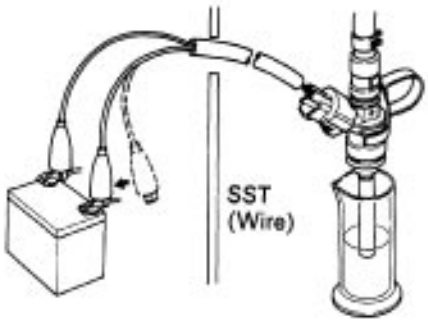
C Measure the fuel pressure

OK **Fuel pressure: 265 – 304 kPa (2.7 – 3.1 kg f/cm^2, 38 – 44 psi)**

OK → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter. (See page EG2–230).**

NG

4 Check injector injection.



P01077
P01010

P Remove the delivery pipe and injectors from the bank that has the malfunction (See page EG2–246).

C Check injection volume of injector (See page EG2–250) .

OK **Injection volume:**
56 – 69 cm^3/15 sec. (3.4 – 4.2 cu in.)
Difference between each injector:
Less than 6 cm^3 (0.4 cu in.)
Fuel drop (leakage):
One drop or less per minute.

OK

NG → **Replace injector.**

5	Check mass air flow meter– and engine coolant temp. sensor (See page EG2–444, 457).

OK

NG → Repair or replace.

6	Check for spark and ignition (See page IG–84).

OK

NG → Repair or replace.

Check and replace ECM (See page IN–36).

DTC P0201 P0202 P0203 P0204 P0205 P0206 Injector Circuit Malfunction (Cylinder 1–6)

CIRCUIT DESCRIPTION

The injectors are located in the intake manifold. They inject fuel into the cylinders based on signals from the ECM.

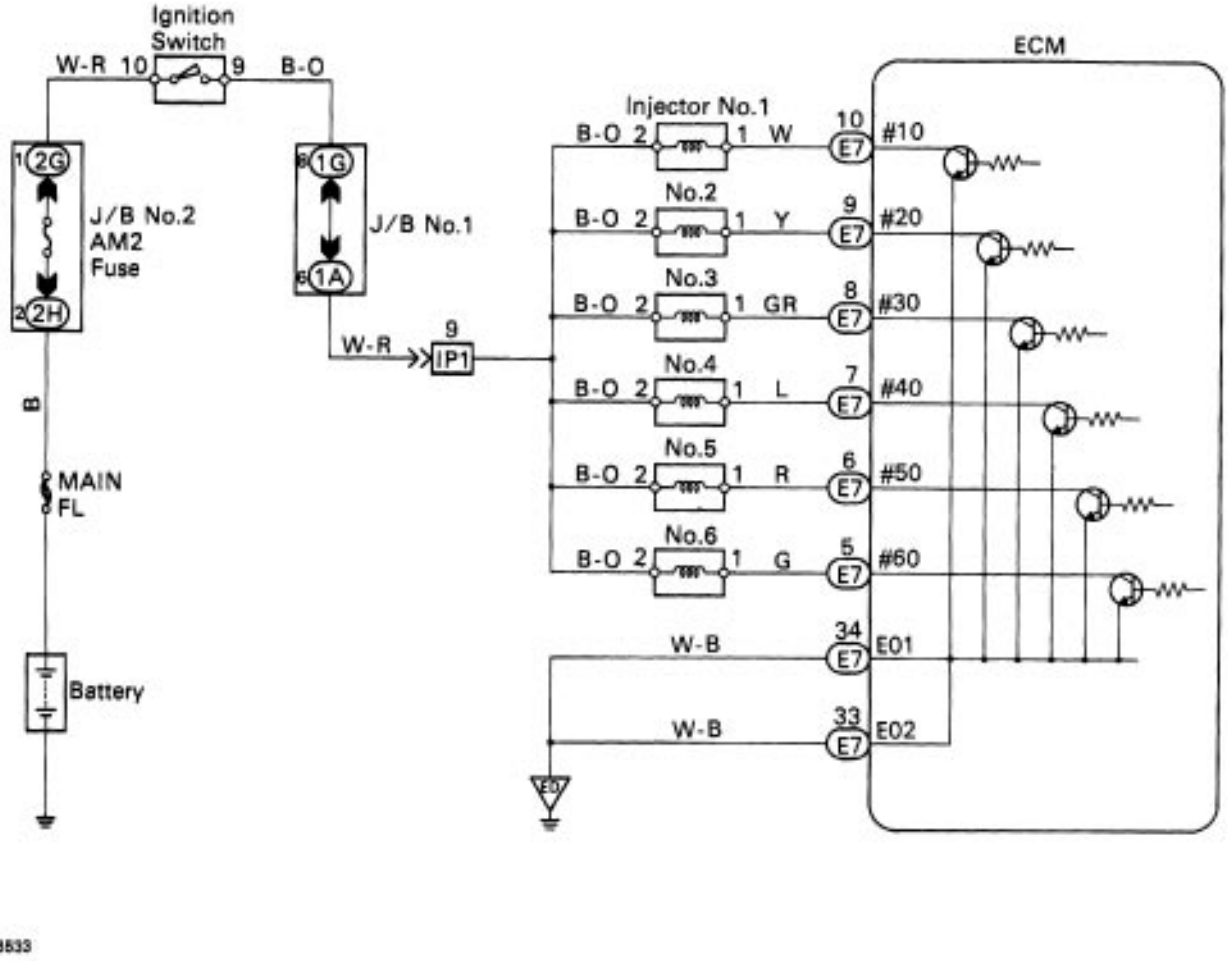
The ECM detects a malfunction of the injector circuit by counting the number of misfires of a specific cylinder.

For an explanation of misfire detection requirements, see page DTC P0301.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0201 **P0202** **P0203** **P0204** **P0205** **P0206**	A specified cylinder misfire continuously. (2 trip detection logic)	• Open or short in injector circuit • Injector blockage, seized • Ignition system • Valve clearance not to specification • Compression pressure

See the Diagnostic Chart and Inspection Procedure under ”Misfiring”.

WIRING DIAGRAM



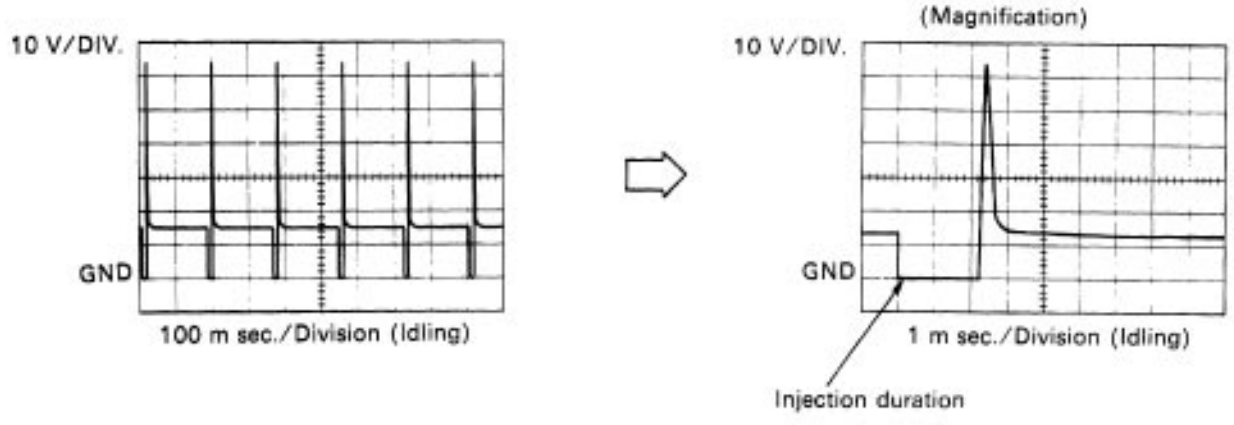
FI6533

Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

- With the engine idling, measure between terminals #10 – #60 and E01 of ECM.

HINT: The correct waveform appears as shown in the illustration below.



FI6688 FI6539

DTC P0300 Random Misfire Detected

DTC P0301 P0302 P0303 P0304 P0305 P0306 Misfire Detected (Cylinder 1–6)

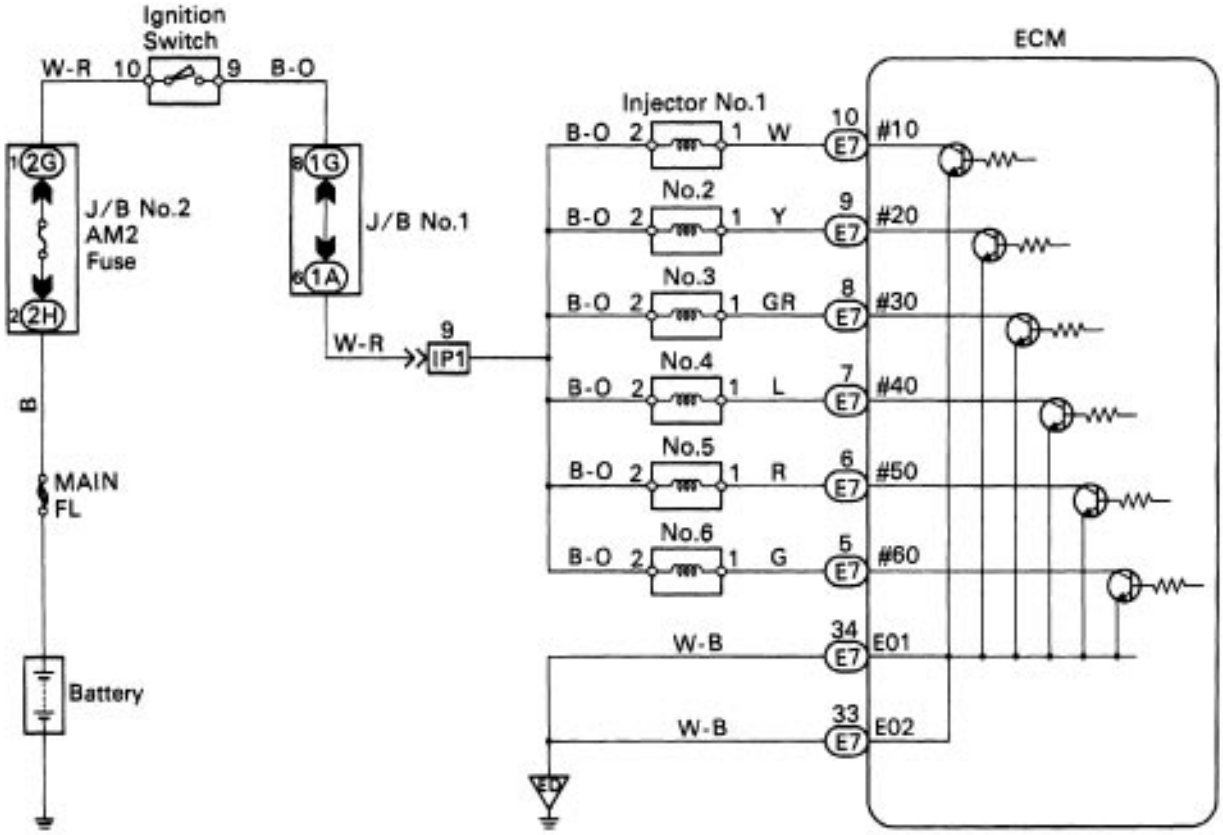
CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.
The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.
If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0300	Misfiring of multiple cylinders is detected during the same 200 or 1,000 revolutions.	• Ignition system • Injector • Fuel line pressure • EG R • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor
P0301 **P0302** **P0303**	For each 200 revolutions of the engine, misfiring is detected which can cause catalyst overheating. (This causes MIL to blink)	
P0304 **P0305** **P0306**	For each 1,000 revolutions of the engine, misfiring is detected which causes emissions deterioration. (2 trip detection logic)	

HINT; When the code for a misfiring cylinder is recorded repeatedly but no Random Misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM



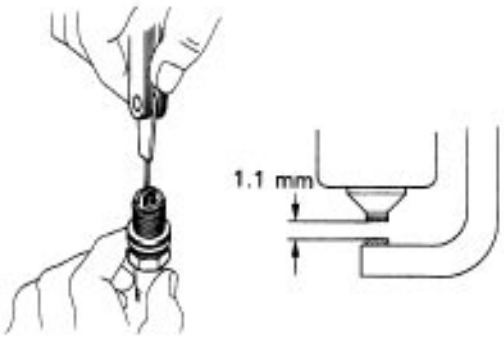
FI6533

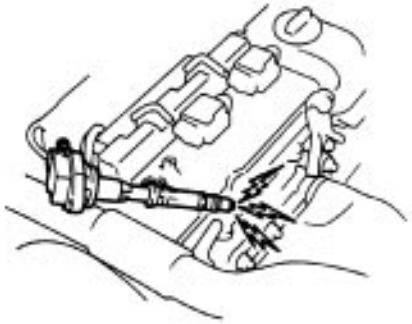
DIAGNOSTIC CHART

1	Check spark plug and spark of misfiring cylinder.	NG	Replace or check ignition system.
OK			
2	Check voltage of ECM terminal for injector of failed cylinder.	OK	Go to step 4
NG			
3	Check injector of misfiring cylinder.	NG	Replace injector.
OK			
Check for open and short in harness and connector between injector and ECM.			
4	Check fuel pressure.	NG	Repair or replace fuel pump.
OK			
5	Check injector injection.	NG	Replace injector.
OK			
6	Check EGR system.	NG	Repair EGR system.
OK			
7	Check mass air flow meter and engine coolant temp. sensor.	NG	Repair or replace.
OK			
Check engine mechanical systems.			

INSPECTION PROCEDURE

1 **Check spark plug and spark of misfiring cylinder.**





IG0317 IG0151
FI7084

P (1) Remove ignition coil (See page IG–87).
(2) Remove spark plug.

C (1) Check the carbon deposits on electrode.
(2) Check electrode gap.

OK **(1) No large carbon deposit present.**
Not wet with gasoline or oil.
(2) Electrode gap: 1.1 – 1.3 mm
(0.043 – 0.051 in.)

P (1) Install the spark plug to the ignition coil, and connect the ignition coil connector.
(2) Ground the spark plug.
(3) Disconnect injector connector.

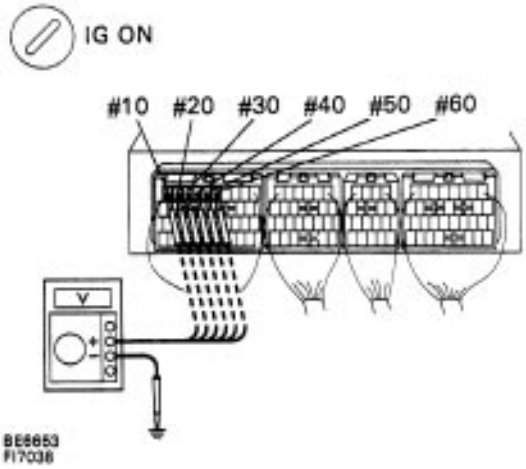
C Check if spark occurs while engine is being cranked.
NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5–10 seconds at a time.

OK **Spark jumps across electrode gap.**

OK

NG **Replace or check ignition system (See page IG–84).**

2 **Check voltage of ECM terminal for injector of failed cylinder.**



BE6653
FI7038

P (1) Remove glove compartment (See page EG2–309) .
(2) Turn ignition switch ON.

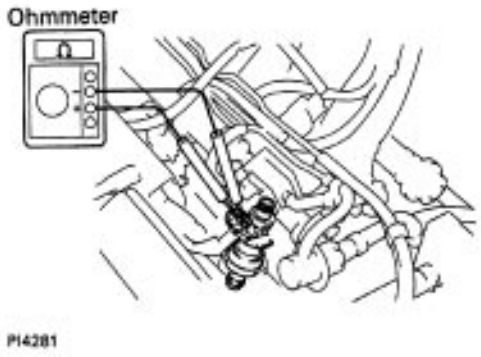
C Measure voltage between applicable terminal of ECM and body ground.

OK **Voltage: 9 – 14 V**

NG

OK **Go to step 4**

3 **Check injector of misfiring cylinder.**



P Disconnect injector connector (See page EG2–243) .

C Measure resistance of injector.

OK **Resistance: 5 – 23 Ω at 20°C (68°F)**

OK

NG **Replace injector.**

Check for open and short in harness and connector between injector and ECM (See page IN–31).

4 **Check fuel pressure.**

P (1) Install the SST (pressure gauge) to the fuel filter outlet. (See page EG2–231) .
SST 09268–45012
(2) Turn ignition switch ON.
(3) Connect the TOYOTA hand–held tester to the DLC3.
(4) Use ACTIVE TEST mode to operate the fuel pump.
HINT: The fuel pump can be operated by connecting terminals B and FP of data link connector 1.

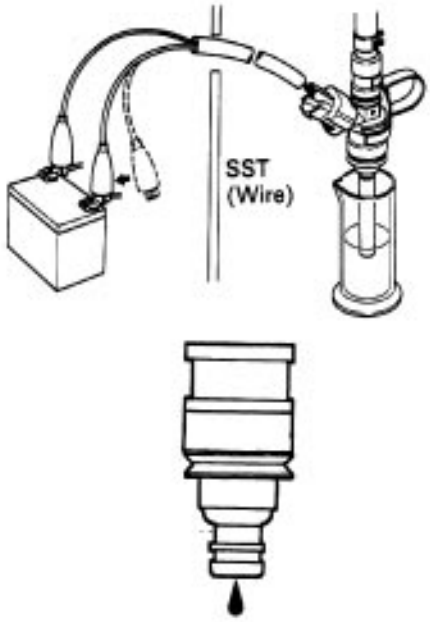
C Measure the fuel pressure.

OK **Fuel pressure: 265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)**

OK

NG **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page EG2–230).**

5 **Check injector injection.**



P Remove delivery pipe and injectors (See page EG2–246) .

C Check injection volume of injector (See page EG2–250) .

OK **Injection volume:**
56 – 69 cm^3/15 sec. (3.4 – 4.2 cu in.)
Difference between each injector:
Less than 6 cm^3 (0.4 cu in.)
Fuel drop (leakage):
One drop or less per minute.

OK → **6** **Check EGR system (See page EG2–207).**

NG → **Replace injector.**

OK → **7** **Check mass air flow meter and engine coolant temp. sensor (See page EG2–444, 457).**

NG → **Repair or replace.**

OK → **Check engine mechanical systems.**
- **Compression pressure (See page EG2–36).**
- **Valve clearance (See page EG2–13).**
- **Valve timing (See page EG2–52).**

DTC P0325 P0330 Knock Sensor Circuit Malfunction (Knock Sensor 1 Knock Sensor 2)

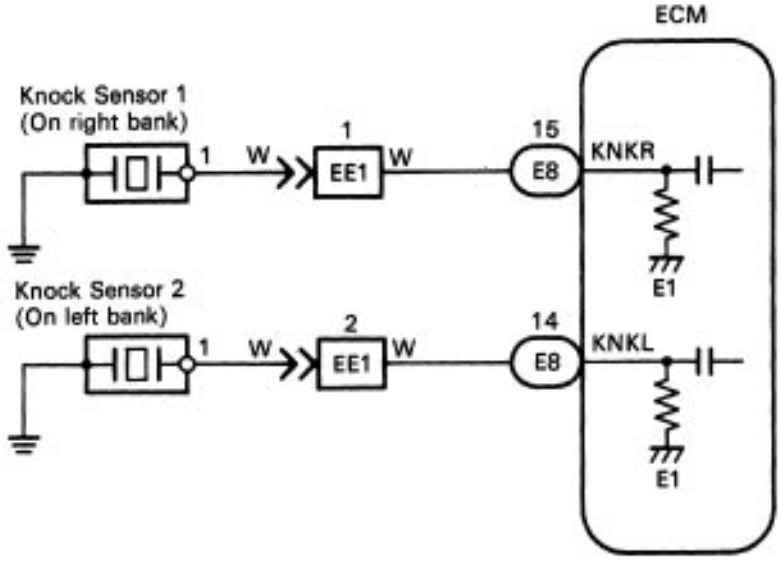
CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 2,000 rpm or more.	• Open or short in knock sensor 1 circuit. • Knock sensor 1 (looseness). • ECM
P0330	No knock sensor 2 signal to ECM with engine speed 2,000 rpm or more.	• Open or short in knock sensor 2 circuit. • Knock sensor 2 (looseness). • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

WIRING DIAGRAM



FI6610

DIAGNOSTIC CHART

HINT: DTC P0325 is for the right bank knock sensor circuit.
DTC P0330 is for the left bank knock sensor circuit.

1	Check knock sensor circuit.	Type II	G o to step 3

Type I

2	Check for open and short in harness and connector between EE1 connector and ECM.	NG	Repair or replace harness or connector.

OK

Check and replace ECM.

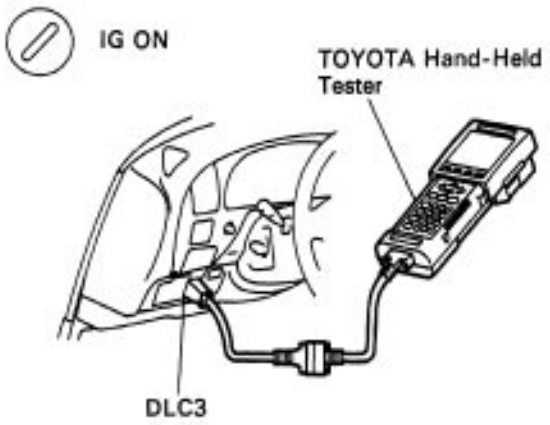
3	Check for open and short in harness and connector between EE1 connector and knock sensor.	NG	Repair or replace harness or connector.

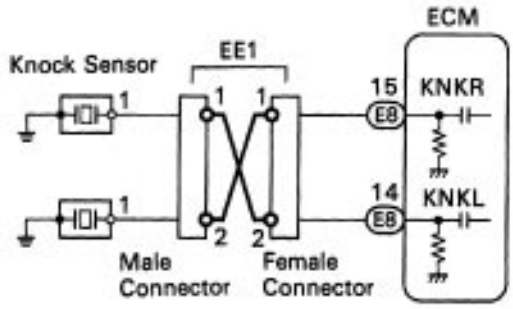
OK

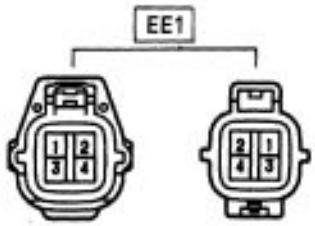
Replace knock sensor.

INSPECTION PROCEDURE

1 **Connect the OBDII scan tool or TOYOTA hand–held tester and check the knock sensor circuit.**







BE6653
FI7088
FI7060
Ie-4-1
Ie-4-2

P (1) Remove the fuse cover on the instrument panel.

(2) Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

(3) Disconnect the wire to wire connector EE1.

(4) Connect the terminals of the disconnected EE1 male connector and EE1 female as follows.

Male connector ↔ Female connector
Terminal 1↔ Terminal 2
Terminal 2↔ Terminal 1

(5) Turn ignition switch ON and OBDII scan tool or TOYOTA hand–held tester main switch ON.

(6) After the engine is warmed up, perform quick racing (4,000 rpm) three times.

C Check the diagnostic trouble code.

Result

Type I	DTC same as when vehicle brought in. P0325→ P0325 or P0330→ P0330
Type II	DTC different to when vehicle brought in. P0325→ P0330 or P0330→ P0325

Type I

Type II → **Go to step 3.**

2 **Check for open and short in harness and connector between EE1 connector and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

3	Check for open and short in harness and connector between EE1 connector and knock sensor (See page IN–31).

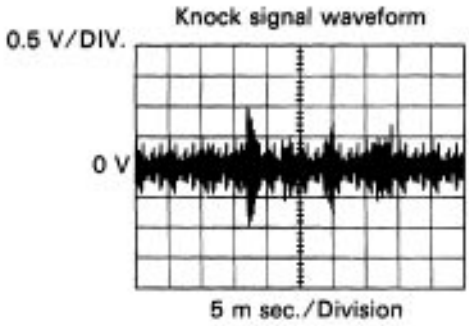
HINT: If DTC P0325 has changed to P0330, check the knock sensor circuit on the right bank side.
If DTC P0330 has changed to P0325, check the knock sensor circuit on the left bank side.

OK

NG → **Repair or replace harness or connector.**

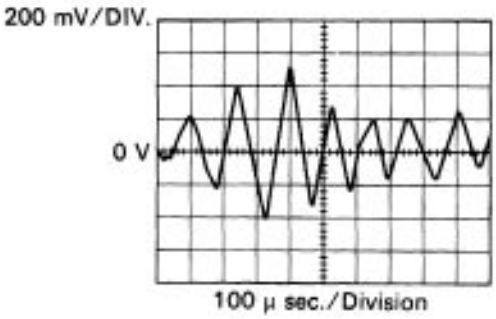
Replace knock sensor.

Reference **INSPECTION USING OSCILLOSCOPE**



- With the engine racing (4,000 rpm) measure between terminals KNKR, KNKL of ECM and body ground.

HINT: The correct waveform appears as shown i n the illustration on the left.



- Spread the time on the horizontal axis, and confirm that period of the wave is 141 µ sec.
  (Normal mode vibration frequency of knock sensor: 7.1 KHz).

HINT: If normal mode vibration frequency is not 7.1 KHz, the sensor is malfunctioning.

FI6510
FI6607

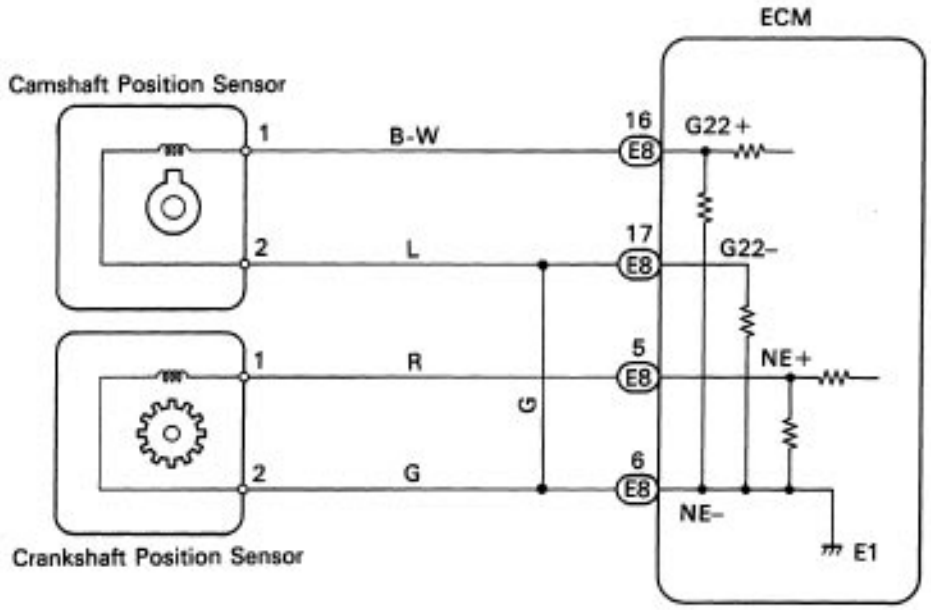
DTC P0335 Crankshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pick up coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G22 signals, and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P4335	No crankshaft position sensor signal to ECM during cranking. (2 trip detection logic)	• Open or short in crankshaft position sensor circuit. • Crankshaft position sensor. • Starter • ECM
	No crankshaft position sensor signal to ECM during engine running.	

WIRING DIAGRAM



FI7016

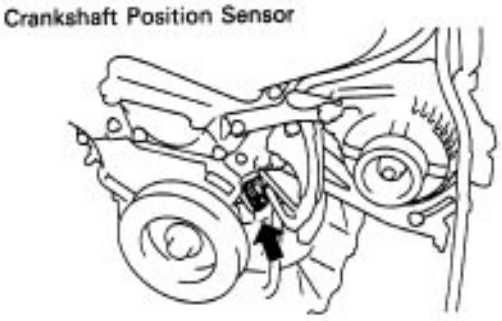
DIAGNOSTIC CHART

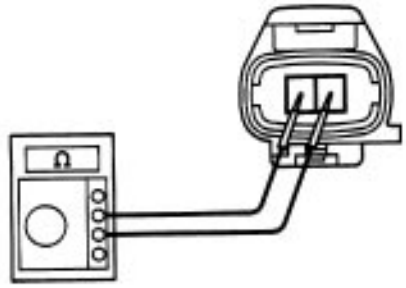
HINT: Perform troubleshooting of diagnostic trouble code P0335 first, If no trouble is found, trou–bleshoot the following mechanical systems.

1	Check resistance of crankshaft position sensor.	NG	Replace sensor.
OK			
2	Check for open and short in harness and connector between ECM and crankshaft position sensor.	NG	Repair or replace harness or connector.
OK			
3	Inspect sensor installation and teeth of signal plate.	NG	Tighten the sensor. Replace signal plate.
OK			
Check and replace ECM.			

INSPECTION PROCEDURE

1 **Check resistance of crankshaft position sensor.**





FI7087
FI7066

P Disconnect crankshaft position sensor connector.

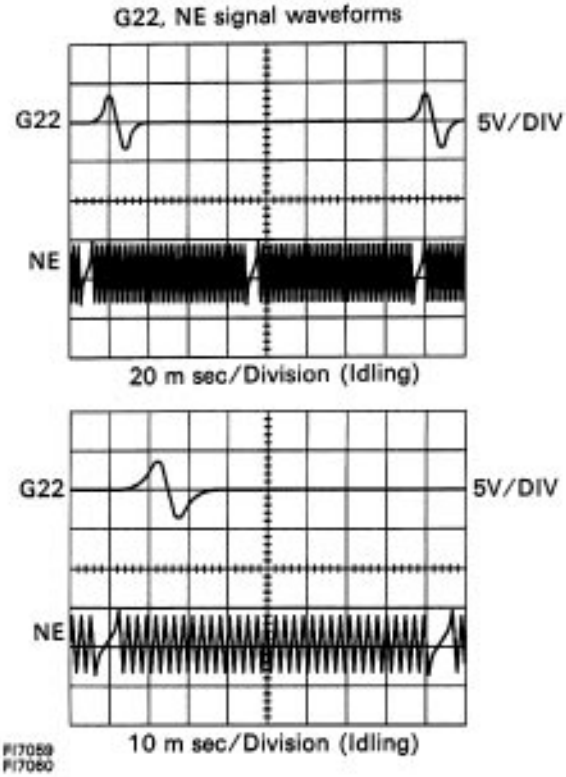
C Measure resistance of crankshaft position sensor.

OK

	Resistance
Cold	1,630 – 2,740 Ω
Hot	2,065 – 3,225 Ω

"Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 1 00°C (212°F).

Reference INSPECTION USING OSCILLOSCOPE



FI7059
FI7060

- During cranking or idling, check between terminals G22(+) and G22 (–) , NE(+) and NE (–) of engine control module.

HINT: The correct waveforms appear as shown in the illustration on the left.

OK

NG **Replace crankshaft position sensor.**

2	Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–31).

OK → Go to step 3

NG → Repair or replace harness or connector.

3	Inspect sensor installation and teeth of signal plate.

OK → Check and replace ECM (See page IN–36).

NG → Tighten the sensor.
Replace signal plate.

DTC P0336 Crankshaft Position Sensor Circuit Range Performance

CIRCUIT DESCRIPTION

Refer to crankshaft position sensor circuit malfunction on page EG2–503.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0336	Deviation in crankshaft position sensor signal and camshaft position sensor signal. (2 trip detection logic)	• Mechanical system malfunction. (Skipping teeth of timing belt, belt stretched.) • ECM

DIAGNOSTIC CHART

1	Check valve timing (Check for loose and jumping teeth of timing belt) (See page EG2–52).	NG	Adjust valve timing. (Repair or replace timing belt.)

OK

Check and replace ECM (See page IN–36).

DTC P0340 Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

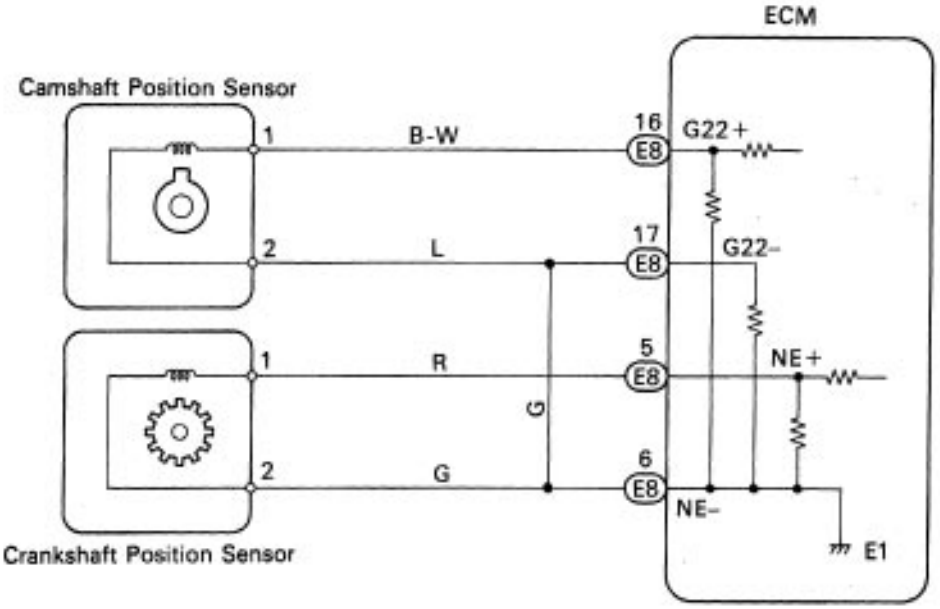
Camshaft position sensor (G22 signal) consist of a signal plate and pick up coil.
The G22 signal plate has one tooth, on its outer circumference and is mounted on the left bank camshafts. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G22 signal and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking. (2 trip detection logic)	• Open or short in camshaft position sensor circuit. • Camshaft position sensor. • Starter. • ECM
	No camshaft position sensor signal to ECM during engine running.	

DIAGNOSTIC CHART

1	Check resistance of camshaft position sensor.	NG	Replace sensor.
OK			
2	Check for open and short in harness and connector between ECM and camshaft position sensor.	NG	Repair or replace harness or connector.
OK			
3	Inspect sensor installation.	NG	Tighten the sensor.
OK			
Check and replace ECM.			

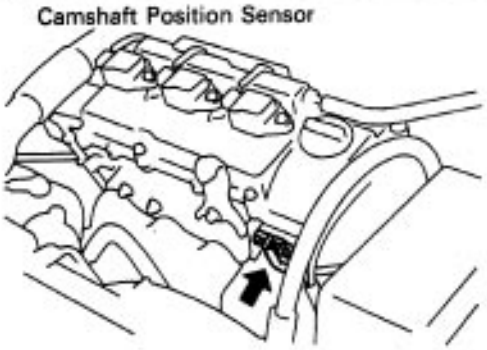
WIRING DIAGRAM

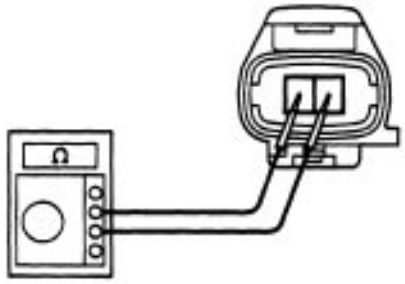


FI7016

INSPECTION PROCEDURE

1	Check resistance of camshaft position sensor.





P Disconnect camshaft position sensor connector.

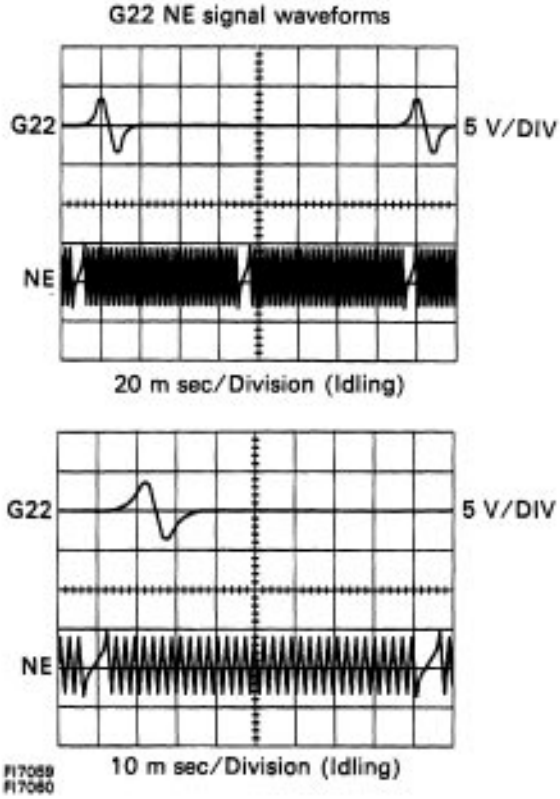
C Measure resistance of camshaft position sensor.

OK

	Resistance
Cold	835 – 1,400Ω
Hot	1,060 – 1,645Ω

”Cold is form –10ⓇC (140ⓇF) to 50ⓇC (122ⓇF) and ”Hot” is form 50ⓇC (122ⓇF) to 100ⓇC (212ⓇF).

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check between terminals G 22(+) and G22(–), NE(+) and NE (–) of engine control module.

HINT: The correct waveforms appear as shown in the illustration on the left.

OK

NG **Replace camshaft position sensor.**

2	Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–31).

OK → NG: Repair or replace harness or connector.

3	Inspect sensor installation.

OK → NG: Tighten the sensor.

Check and replace ECM (See page IN–36).

DTC P0401 Exhaust Gas Recirculation Flow Insufficient Detected

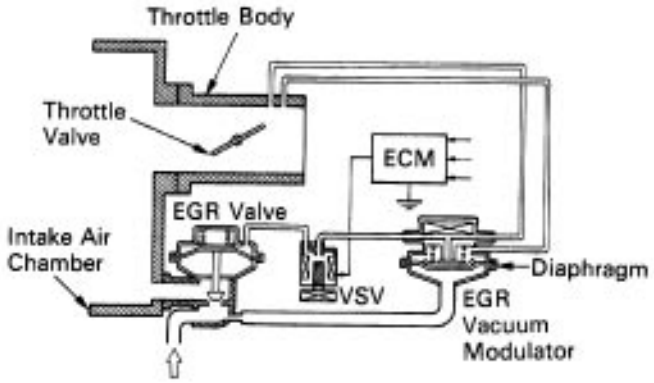
CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temperature and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).

Under the following conditions, EGR is cut to maintain driveability.

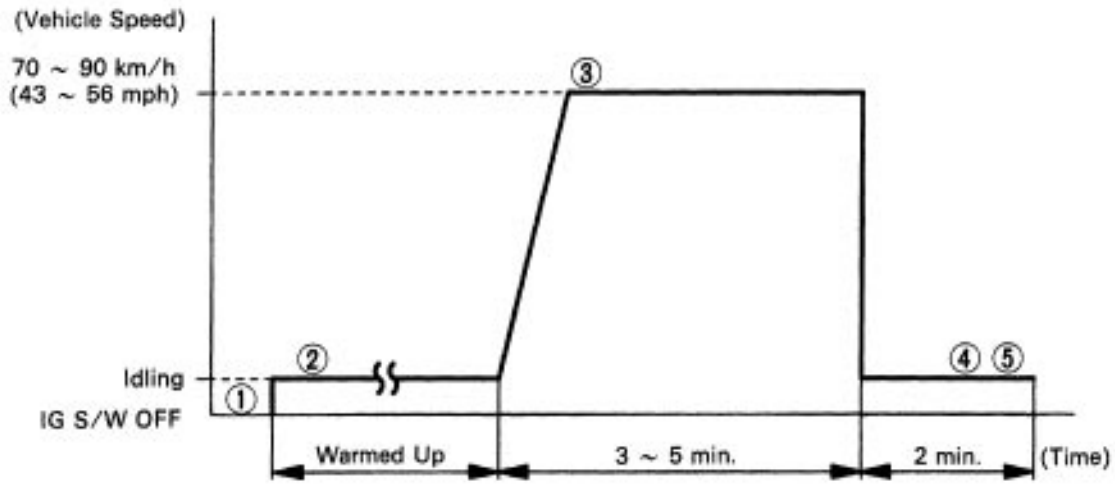
- Coolant temp. below 60°C (140°F).
- During deceleration (throttle valve closed).
- Light engine load (amount of intake air very small).
- Engine racing.



FI4825

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0401	After the engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 minutes, the EGR gas temperature sensor value does not exceed 40°C (104°F) above the ambient air temperature. (2 trip detection logic)	• EGR valve stuck closed. • Short in EGR VSV circuit. • Open in EGR gas temp. sensor circuit. • EGR hose disconnected. • ECM

SYSTEM CHECK DRIVING PATTERN



FI7131

① Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC 3.

② Start and warm up the engine with all accessories switched OFF.

③ After the engine is warmed up, run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min, or more.

④ After driving, idle the engine for about 2 mins.

⑤ After idling, check the ”READINESS TESTS”. If ”COMPL” (test completed) is displayed and the MIL does not light up, the system is normal. If ”INCPL” is displayed, run the vehicle again and check it.
HINT: If a malfunction exists, the MIL will light up during step (4).

DIAGNOSTIC CHART
TOYOTA hand–held tester

1 Connect the TOYOTA hand–held tester and read value of EGR gas temperature.

- OK → Go to step 4
- NG →

2 Check for open in harness or ECM.

- OK → Confirm good connection at sensor. If OK, replace EGR gas temp. sensor.
- NG →

3 Check for open in harness or ECM.

- OK → Open in harness between terminals E2 or THG. Repair or replace harness.
- NG →

Confirm connection at ECM, If OK, replace ECM.

4 Check connection of vacuum hose, EGR hose.

- NG → Repair or replace.
- OK →

5 Check the VSV for EG R,

- OK → Go to step 7
- NG →

6 Check operation of the VSV for EG R.

- NG → Replace VSV for EG R.
- OK →

Check for short in harness and connector between VSV and ECM.

7	Check EGR Vacuum modulator.	NG	Repair or replace.
OK			
8	Check EGR Valve.	NG	Repair or replace.
OK			
9	Check value of EGR gas temp. sensor.	NG	Replace EGR gas temp. sensor.
OK			
Check and replace ECM.			

OBD II scan tool (excluding TOYOTA hand–held tester)

1 Check resistance of EGR gas temp. sensor.

NG → Check and replace EGR gas temp. sensor.

OK

2 Check for open in harness or ECM.

OK → Go to step 4

NG

3 Check for open in harness or ECM.

OK → Open in harness between terminals E2 or THG. Repair or replace harness.

NG

Confirm connection at ECM. If OK, replace ECM.

4 Check connection of vacuum hose, EGR hose.

NG → Repair or replace.

OK

5 Check the VSV for EG R.

OK → Go to step 7

NG

6 Check operation of the VSV for EG R.

NG → Replace VSV for EG R.

OK

Check for open in harness and connector between J/B No,2 and ECM.

7	Check EGR vacuum modulator.	NG	Repair or replace.

OK

8	Check EGR valve.	NG	Repair or replace.

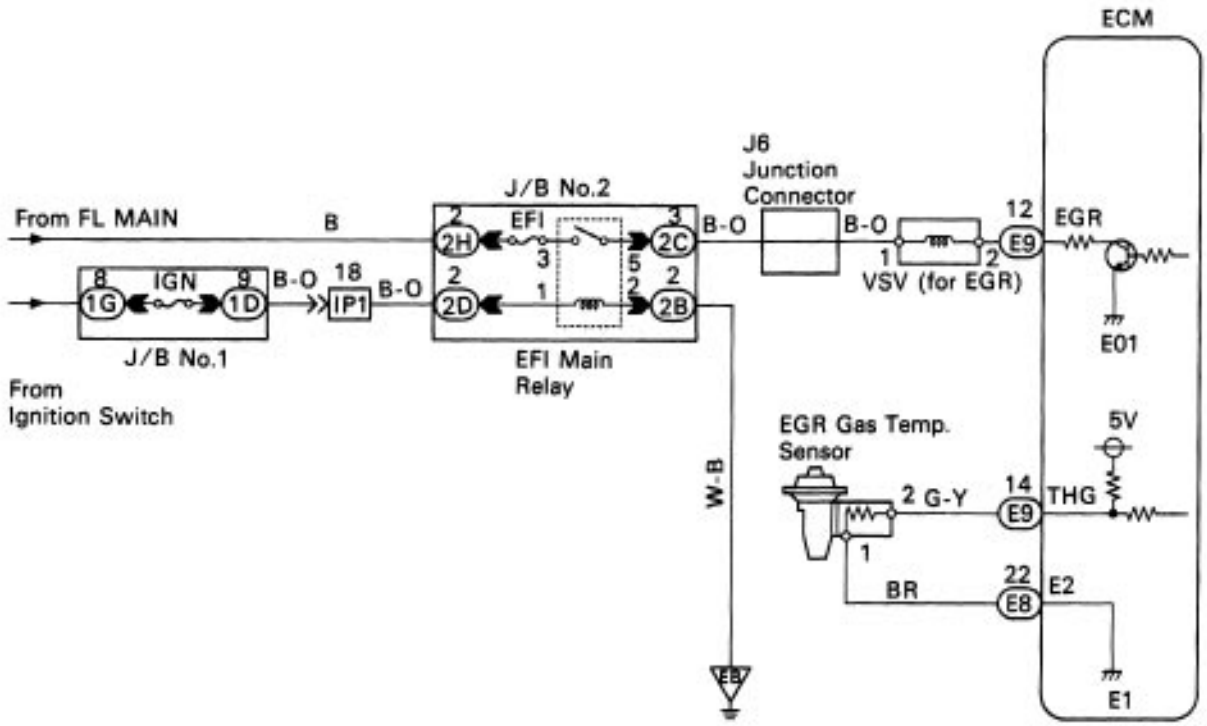
OK

9	Check resistance of EGR gas temp. sensor.	NG	Replace EGR gas temp. sensor.

OK

Check and replace ECM.

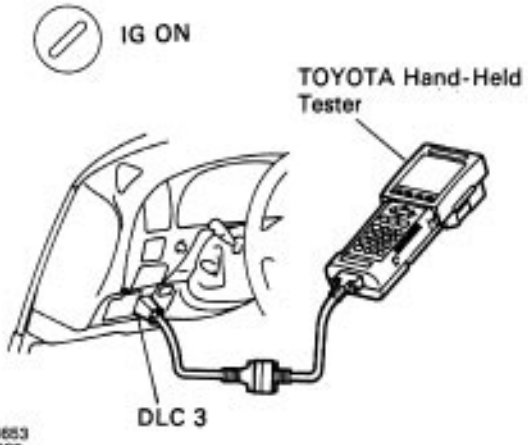
WIRING DIAGRAM



FI7020

INSPECTION PROCEDURE
TOYOTA hand–held tester

1 **Connect the TOYOTA hand–held tester and read value of EGR gas temperature value.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the D LC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read EGR gas temperature on the TOYOTA hand–held tester.

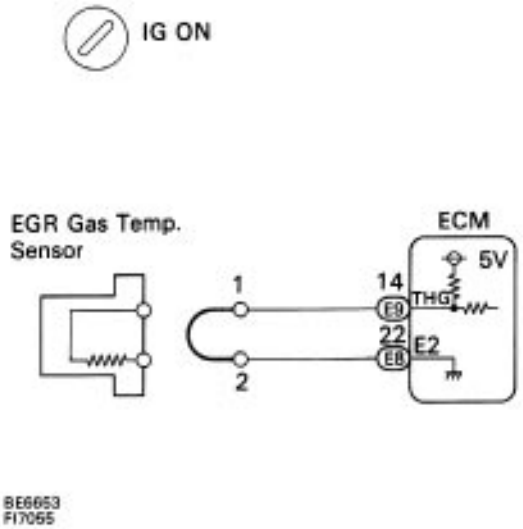
OK **EGR gas temp.: 10°C (50°F) or more.**

Hint If there is an open circuit, the TOYOTA hand–held tester indicates 3.1 °C (37.6°F).

NG

OK → **Go to step 4**

2 **Check for open in harness or ECM.**



P (1) Disconnect the EGR gas temp. sensor connector.
(2) Connect sensor wire harness terminals together.
(3) Turn ignition switch ON.

C Read EGR gas temperature on the TOYOTA hand–held tester.

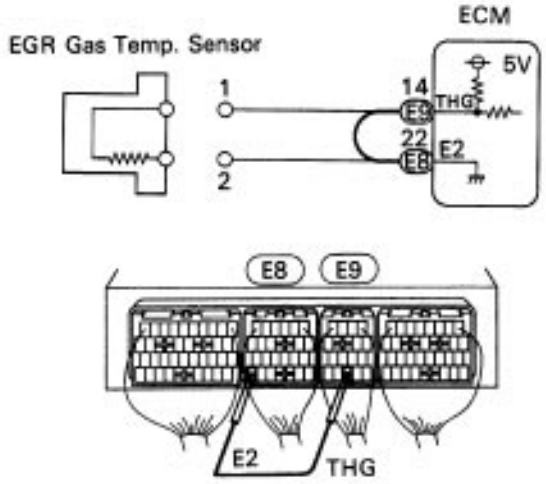
OK **EGR gas temp.: 159.3°C (318.7°F)**

NG

OK → **Confirm good connection at sensor.**
If OK, replace EGR gas temp. sensor.

3 **Check for open in harness or ECM.**

IG ON



B66663
FI7057
FI7104

P (1) Remove glove compartment
(See page EG2–309).
(2) Connect between terminals THG and E2 of ECM E8 and E9 connectors.
HINT: EGR gas temp. sensor connector is disconnected.
Before checking, do a visual check and contact pressure check for the ECM connector (See page EG2–418).

C Read EGR temperature on the TOYOTA hand–held tester.

OK **EGR gas temp.: 159.3°C (318.7°F)**

NG → **Open in harness between terminals E2 or THG. Repair or replace harness.**

OK → **Confirm connection at ECM.**
If OK, replace ECM.

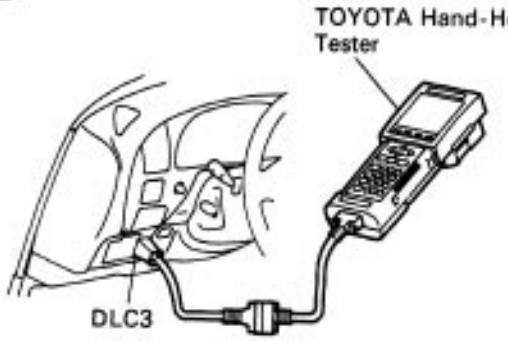
4 **Check the connection of the vacuum hose, EGR hose (See page EG2–287).**

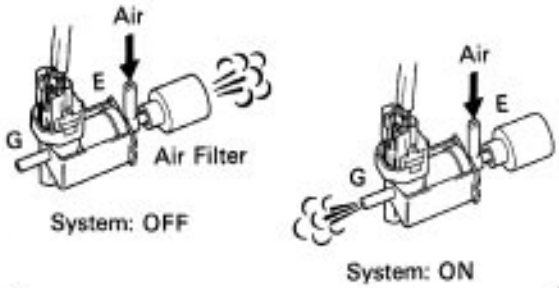
OK →

NG → **Repair or replace.**

5	Check the VSV for EGR.

IG ON





8E6653
FI7088
FI7076
FI7075

P Select the active test mode on the TOYOTA hand–held tester.

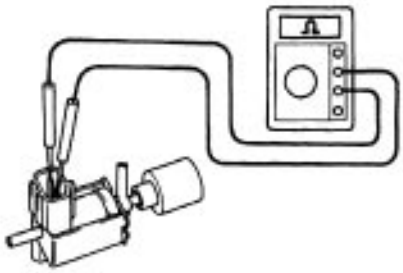
C Check operation of EGR VSV, when it is operated by the TOYOTA hand–held tester.

OK **EGR system is OFF:**
The air from pipe E is flowing out through the air fitter.
EGR system is ON:
The air from pipe E is flowing out pipe G.

NG

OK → **Go to step 7**

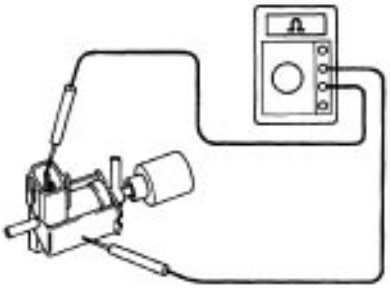
6 **Check operation of the VSV for EGR.**

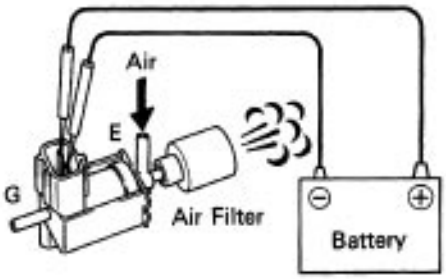


P (1) Remove EGR VSV.
(2) Disconnect EGR VSV connector.

C (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

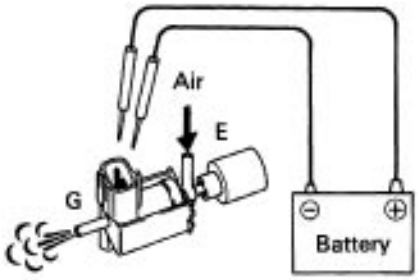
OK **(1) Resistance: 26 – 46Ω at 20°C (68°F)**
(2) Resistance: 1 MΩ or higher.





C Check operation of EGR VSV when battery voltage is applied, and is not applied to the terminals of EGR VSV connector.

OK **Battery voltage is applied:**
The air from pipe E flows out through the air filter.
Battery voltage is not applied:
The air from pipe E flows out through pipe G.



EC2939
EC2940
EC2941
EC2942

OK

NG **Replace VSV for EGR.**

Check for short in harness and connector between VSV and ECM (See page IN–31).

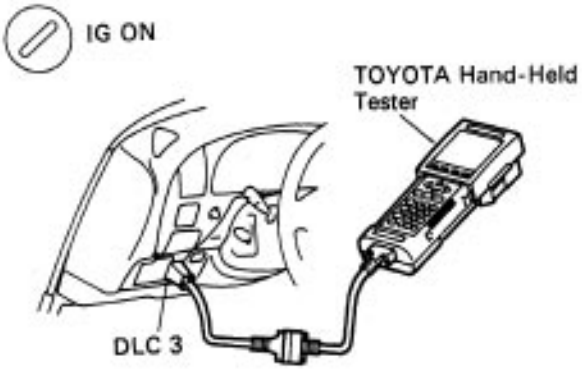
7 Check EGR vacuum modulator (See page EG2–210).

OK → NG: Repair or replace.

8 Check EGR valve (See page EG2–211).

OK → NG: Repair or replace.

9 Check value of EGR gas temp. sensor.



BE6653
FI7088

P (1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Turn ignition switch ON and TOYOTA hand–held tester main switch ON'
(3) Select the active test mode on the TOYOTA hand–held tester.
(EGR system ON)
(4) Race the engine at 4,000 rpm for 3 mins.

C Measure the EGR gas temp. while racing engine at 4,000 rpm.

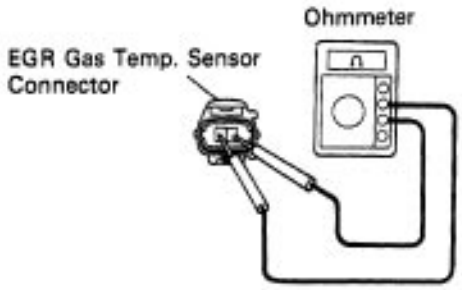
OK **EGR gas temp. after 3 mins.: 140°C (284°F) or more**

OK → NG: Replace EGR gas temp. sensor.

Check and replace ECM (See page IN–36).

OBDII scan tool (excluding TOYOTA hand–held tester)

1 **Check resistance of EGR gas temp. sensor.**



FI7097

P Disconnect EGR gas temp. sensor connector.

C Measure resistance between terminals of EGR gas temp. sensor connector.

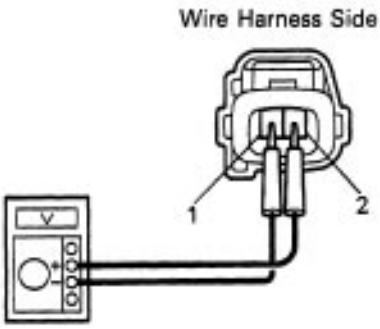
OK **Resistance: 600 kΩ or less.**

Hint If there is open circuit, ohmmeter indicates 720 kΩ or more.

OK

NG → **Check and replace EGR gas temp. sensor (See page EG2–303).**

2 **Check for open in harness or ECM.**



FI7098

P Disconnect EGR gas temp. sensor connector.

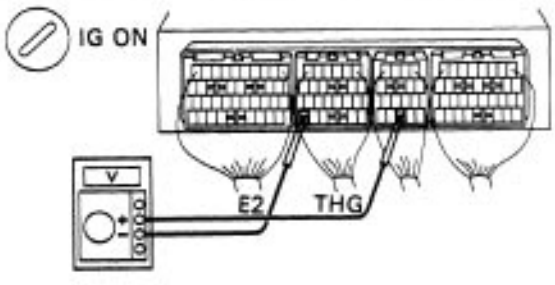
C Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.

OK **Voltage: 4.5 – 5.5 V**

NG

OK → **Go to step 4**

3 **Check for open in harness or ECM.**



B66663
FI7036

P (1) Remove glove compartment (See page EG2–309) .
(2) Turn ignition switch ON.

C Measure voltage between terminals THG and E2 of ECM.
HINT: EG R gas temp. sensor connector is dis–connected.

OK **Voltage: 4.5 – 5.5 V**

NG

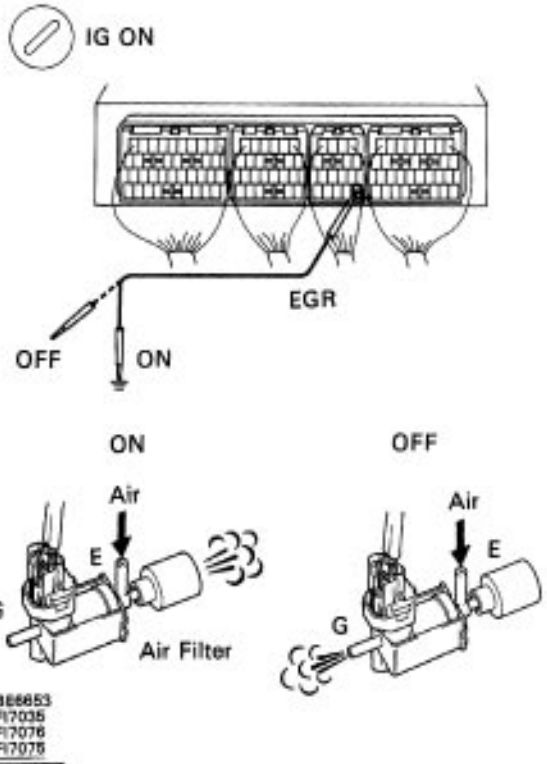
OK → **Open in harness between terminals E2 or THG. repair or replace harness.**

**Confirm connection at ECM.
If OK, replace ECM.**

4 **Check connection of vacuum hose, EGR hose (See page EG2–287).**

OK → **NG** → **Repair or replace.**

5 **Check the VSV for EGR.**



P (1) Remove glove compartment (See page EG2–309).
(2) Turn ignition switch ON.

C Check EGR VSV function
(1) Connect between terminal EGR of ECM and body ground. (ON)
(2) Disconnect between terminal EGR of ECM and body ground (OFF).

OK **(1) VSV is ON:**
The air from pipe E flows out through the air filter.
(2) VSV is OFF:
The air from pipe E flows out through pipe G.

NG → **OK** → **Go to step 7**

6 **Check operation of the VSV for– EGR (See page EG2–522, step 6).**

OK → **NG** → **Replace VSV for EGR.**

Check for open in harness and connector between J/B No.2 and ECM (See page IN–31).

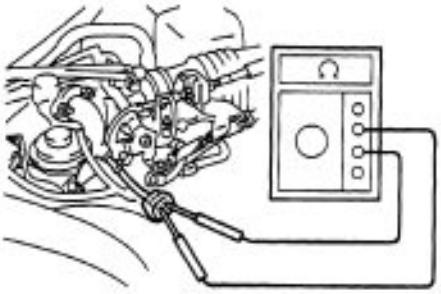
7 Check EGR vacuum modulator (See page EG2–210).

OK → NG: **Repair or replace.**

8 Check EGR valve (See page EG2–211).

OK → NG: **Repair or replace.**

9 Check resistance of EGR gas temp. sensor.



FI7176

P (1) Disconnect EGR gas temp. sensor connector.
(2) Start the engine and warm it up.
(3) Disconnect EGR VSV connector.
(4) Race the engine at 4,000 rpm for 3 mins.

C Measure the resistance of the EGR gas temp. sen–sor while racing the engine at 4,000 rpm.

OK **Resistance of EGR gas temp. sensor after 3 mins: 4.3 kΠ or less**

Hint Resistance: 188.6 – 439.0 kΩ at 20°C (68°F)

OK → NG: **Replace EGR gas temp. sensor.**

Check and replace ECM (See page IN–36).

DTC P0402 Exhaust Gas Recirculation Flow Excessive Detected

CIRCUIT DESCRIPTION

Refer to Exhaust gas recirculation flow insufficient detected on page EG2–512.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0402	EG R gas temp. sensor value is high during EG R cut–off when engine is cold (Race engine at about 4,000 rpm without load so that vacuum is applied to port E). (2 trip detection logic)	• EGR valve stuck open • EGR VSV open malfunction • Open in EGR VSV circuit • Short in EGR gas temp. sensor circuit • ECM
	EG R valve is always open (2 trip detection logic)	

See DTC P0401 for System Check Driving Pattern and Wiring Diagram.

DIAGNOSTIC CHART
TOYOTA hand–held tester

1	Connect the TOYOTA hand–held tester and read value of EGR gas temperature.	OK	G o to step 4

NG

2	Check for short in harness and ECM.	OK	Replace EGR gas temp. sensor.

NG

3	Check for short in harness or ECM.	OK	Repair or replace harness or connector.

NG

Check and replace ECM.

4	Check the VSV for EG R.	OK	Check EGR valve.

NG

5	Check operation of the VSV for EG R.	NG	Replace VSV for EG R.

OK

Check for open in harness and connector between J/B No.2 and ECM.

OBD II scan tool (excluding TOYOTA hand–held tester)

1 Check resistance of EGR gas temp. sensor.

NG → Replace EGR gas temp. sensor.

OK ↓

2 Check for short in harness and connector between EGR gas temp. sensor and ECM.

NG → Repair or replace harness or connector.

OK ↓

3 Check the VSV for EG R.

OK → Check EGR valve.

NG ↓

4 Check operation of the VSV for EG R.

NG → Replace VSV for EG R.

OK ↓

5 Check for open in harness and connector between J/B No.2 and ECM.

NG → Repair or replace harness or connector.

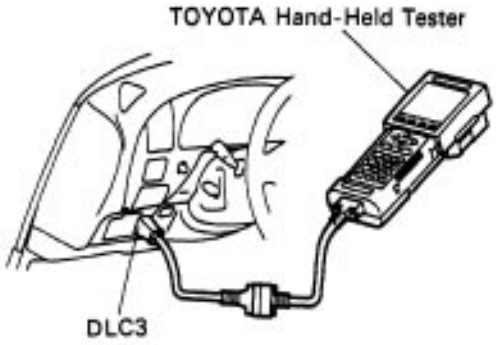
OK ↓

Check and replace ECM.

INSPECTION PROCEDURE
TOYOTA hand–held tester

1 **Connect the TOYOTA hand–held tester and read EGR gas temperature value.**

IG ON



BE6653
FI7088

P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the D LC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read EGR gas temperature on the TOYOTA hand–held tester.

OK **EGR gas temp.: 150°C (302°F) or less. (Not immediately after driving)**

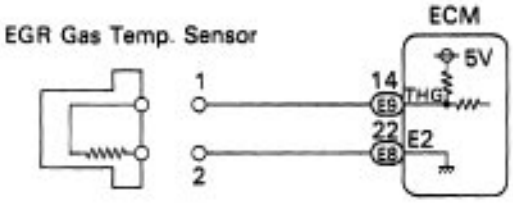
Hint If there is a short circuit, the TOYOTA hand–held tester indicates 159.3°C (318.7°F) .

NG

OK → **G o to step 4**

2 **Check for short in harness and ECM.**

IG ON



BE6653
FI7054

P Disconnect the EGR gas temperature sensor connector.

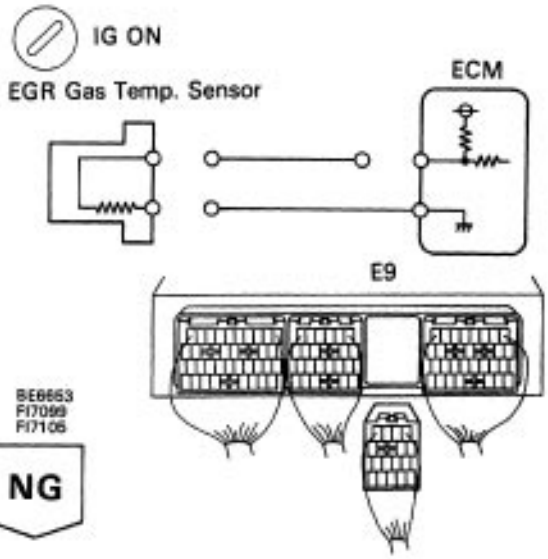
C Rear EGR gas temperature on the TOYOTA hand–held tester.

OK **EGR gas temp.: 3.1°C (37.6°F)**

NG

OK → **Replace EGR gas temp. sensor.**

3 Check for short in harness or ECM.



P (1) Remove glove compartment (See page EG2–309) .
(2) Disconnect the E9 connector of ECM.
HINT: EGR gas temp. sensor is disconnected.

C Read EGR gas temp. on the TOYOTA hand–held tester.

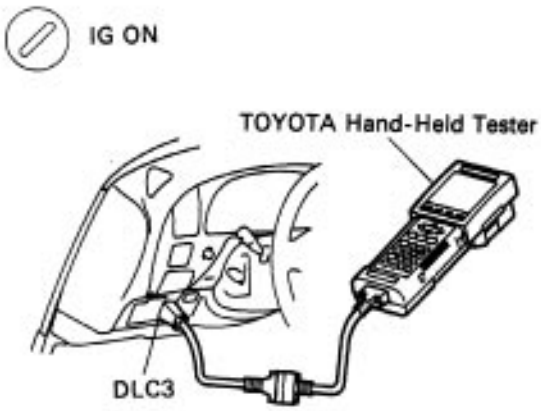
OK **EGR gas temp.: 3.1 ℃ (37.6 ℉)**

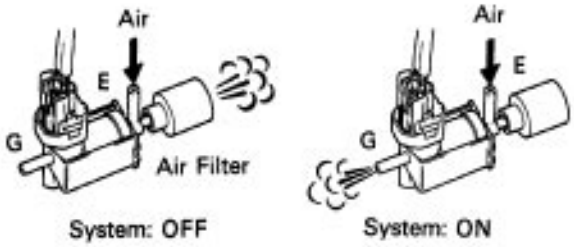
NG

OK → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

4 Check the VSV for EGR.





P Select the active test mode on the TOYOTA hand–held tester.

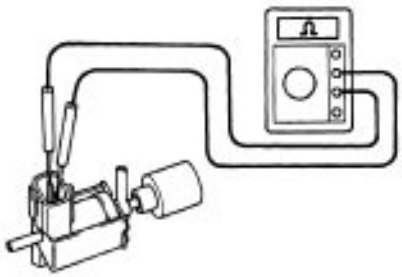
C Check operation of EGR VSV, when it is operated by the TOYOTA hand–held tester.

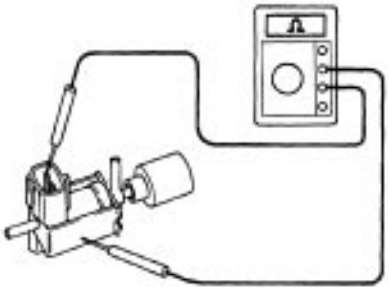
OK **EGR system is OFF:**
The air from pipe E flows out through the air filter.
EG R system is ON:
The air from pipe E flows out through pipe G.

NG

OK → **Check EGR valve (See page EG2–211).**

5 **Check operation of the VSV for EGR.**

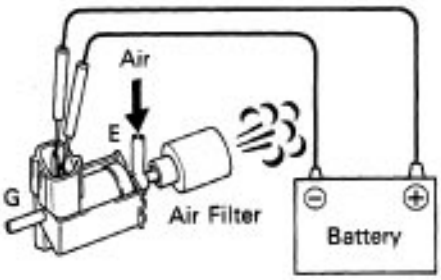




P (1) Remove EGR VSV.
(2) Disconnect EGR VSV connector.

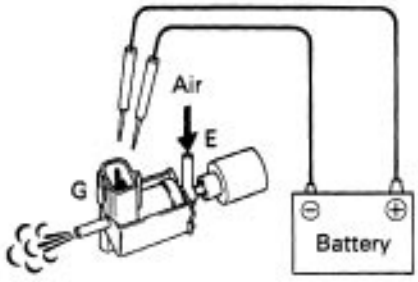
C (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

OK **(1) Resistance: 26 – 46Ω at 20°C (68°F)**
(2) Resistance: 1 MΩ or higher.



C Check operation of EGR VSV when battery voltage is applied, and not applied to the terminals of EGR VSV connector or not.

OK **Battery voltage is applied:**
The air from pipe E flows out through the air filter.
Battery voltage is not applied:
The air from pipe E flows out through pipe G.



EC2939
EC2940
EC2941
EC2942

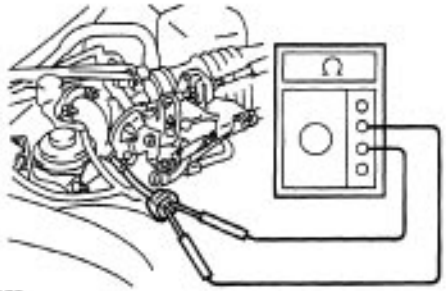
OK

NG **Replace VSV for EG R.**

Check for open in harness and connector between J/B No.2 and ECM (See page IN–31).

OBDII scan tool (excluding TOYOTA hand–held tester)

1 **Check resistance of EGR gas temp. sensor.**



FI7176

P Disconnect EGR gas temp. sensor connector (See page EG2–303) .

C Measure resistance between terminals of EGR gas temp. sensor connector.

OK **Resistance: 2.5 kII or more.**
(Not immediately after driving)

Hint If there is short circuit, ohmmeter indicates 200) or less.

OK

NG → **Replace EG R gas temp. sensor.**

2 **Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–31)..**

OK

NG → **Repair or replace harness or connector.**

3 **Check the VSV for EGR (See page EG2–525, step 5).**

NG

OK → **Check EGR valve (See page EG2–211).**

4 **Check operation of the VSV for EGR (See page EG2–532, step 5).**

OK

NG → **Replace VSV for EG R.**

5 **Check for open in harness and connector between J/B No.2 and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

DTC P0420 Catalyst System Efficiency Below Threshold

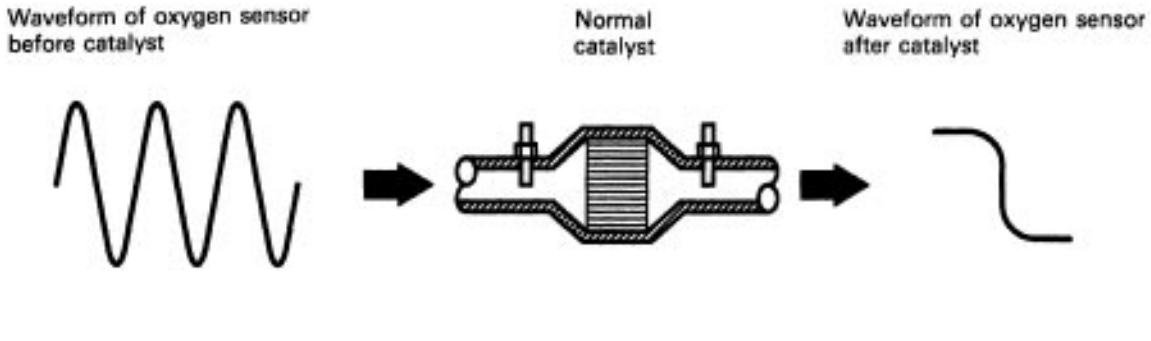
CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteri–orated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst re-peatedly changing back and forth from rich to lean.

If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.

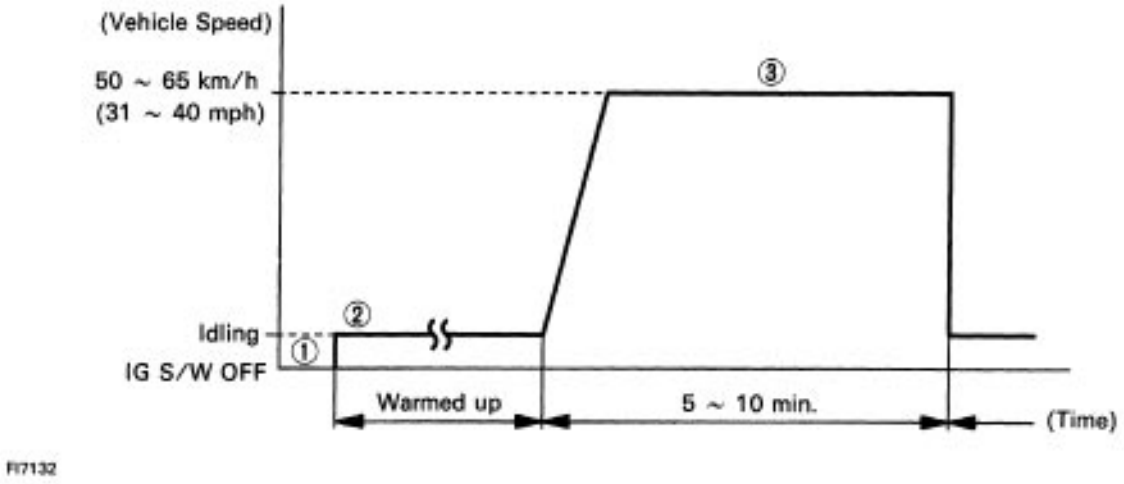


FI7081

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0420	After the engine is warmed up and the vehicle driven for 5 min. at 32 – 80 km/h (20 – 50 mph), the waveforms of the heated oxygen sensors, bank 1, 2 sensor 1 and bank 1 sensor 2 have the same amplitude.	• Three–way catalytic converter • Open or short in heated oxygen sensor circuit • Heated oxygen sensor

HINT: Only on U.S. vehicles does the MIL light up when a malfunction is detected.

SYSTEM CHECK DRIVING PATTERN



① Connect the OBDII scan tool or TOYOTA hand–held tester to the DLC3.
② Start and warm up the engine with all accessories switched OFF.
③ After the engine is warmed up, run the vehicle at 50 – 65 km/h (31 – 40 mph) for 5 – 10 min.
HINT: If a malfunction exists, the MIL will light up during step (3) .

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P0420) being output?	YES	Go to relevant diagnostic trouble code chart.

NO

2	Check heated oxygen sensor. (See page EG2–476).	NG	Repair or replace.

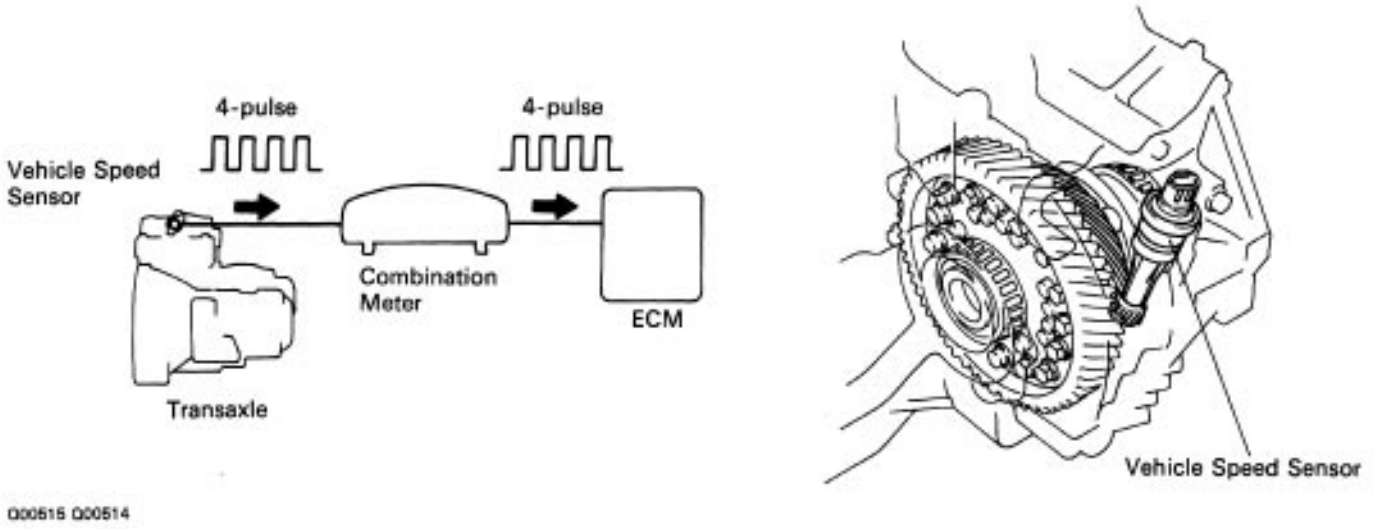
OK

Replace three–way catalytic converter.

DTC P0500 Vehicle Speed Sensor Malfunction

CIRCUIT DESCRIPTION

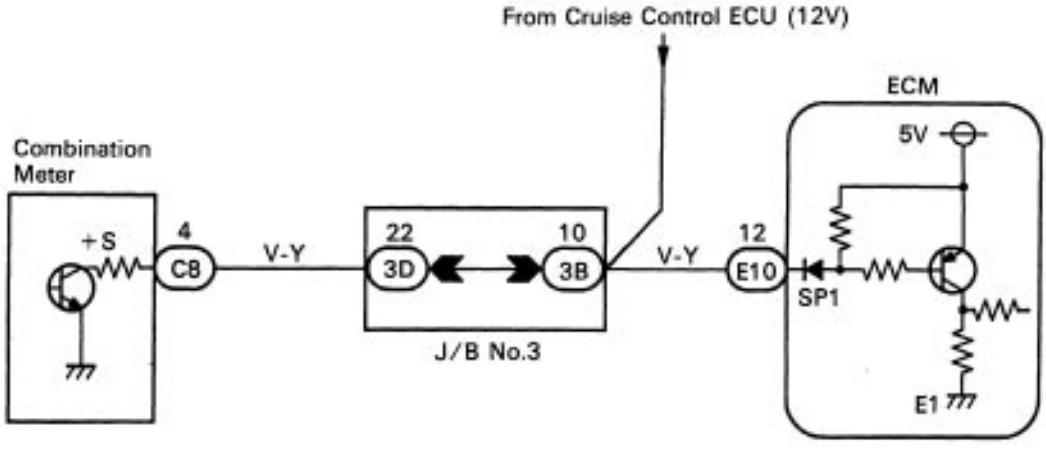
The vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



Q00515 Q00514

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under conditions (a) and (b). (a) Park/neutral position switch is OFF. (b) Vehicle is being driven.	• Open or short in vehicle speed sensor circuit. • Vehicle speed sensor • Combination meter • ECM

WIRING DIAGRAM



F17138

DIAGNOSTIC CHART

1	Check operation of speedometer.	NG	Check speedometer circuit

OK

2	Check for short in harness and connector between terminal SP1 and body ground.	NG	Repair or replace harness or connector.

OK

3	Check voltage of terminal SP1.	NG	Check for open in harness and connector between J/B No.3 and ECM.

OK

4	Check for open in harness and connector between J/6 No.3 and combination meter.	NG	Repair or replace harness or connector.

OK

Check and replace ECM.

INSPECTION PROCEDURE

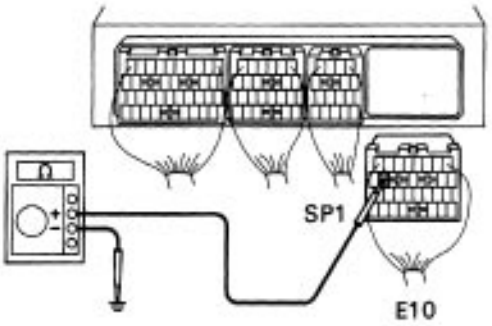
1 **Check operation of speedometer.**

C Drive the vehicle and check if the operation of the speedometer in the combination meter is normal,
HINT: The vehicle speed sensor is operating normally if the speedometer display is normal.

OK

NG **Check speedometer circuit. See combination meter troubleshooting on page BE–66.**

2 **Check for short in harness and connector between terminal SP1 of ECM and body ground.**



FI7024

P (1) Remove glove compartment
(See page EG2–309).
(2) Disconnect the E10 ECM connector.

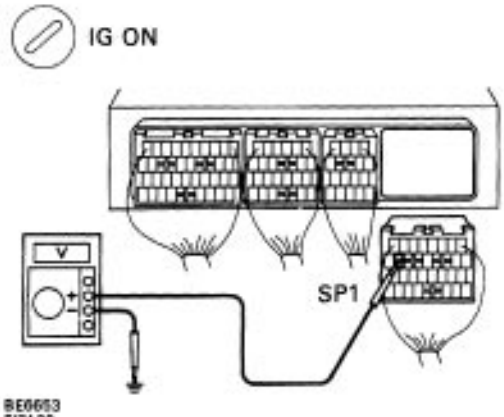
C Check continuity between terminal SP1 of ECM and body ground.

OK **No continuity (1 MΠ or higher)**

OK

NG **Repair or replace harness or connector.**

3 **Check voltage between terminal SP1 of ECM and body ground.**



BE0653
FI7129

P Turn ignition switch ON.

C Measure voltage between terminal SP1 of ECM and body ground.

OK **Voltage: 9 –14 V**

OK

NG **Check for open in harness and connector between J/B No.3 and ECM (See page IN–31).**

4	**Check for open in harness and connector between J/B No.3 and combination meter (See page IN–31).**

OK

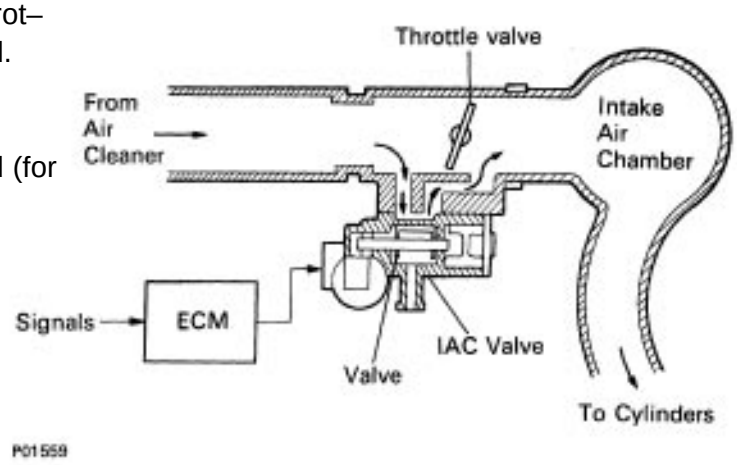
NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

DTC P0505 Idle Control System Malfunction

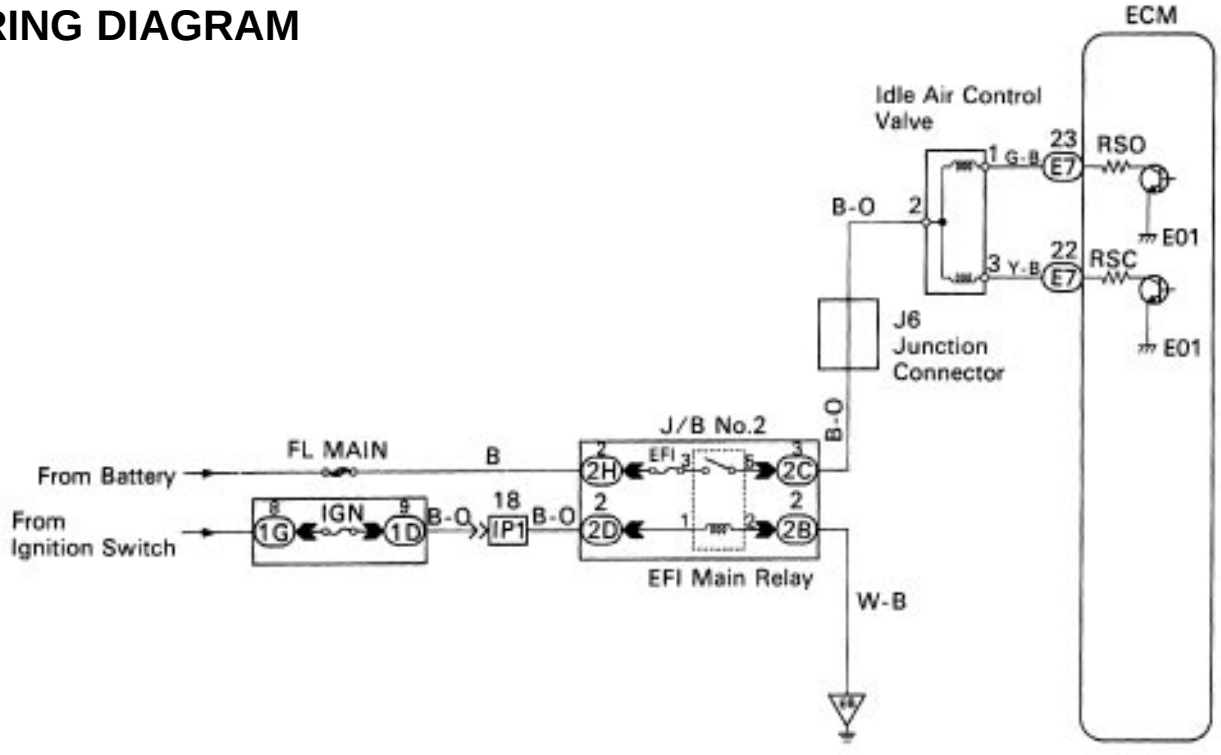
CIRCUIT DESCRIPTION

The rotary solenoid type IAC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throt–tle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed and a VSV for idle–up control is also added (for air conditioning).



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from the target speed. (2 trip detection logic)	• IAC valve is stuck or closed • open or short in IAC valve circuit • Air conditioner idle up VSV • Air intake (hose loose)

WIRING DIAGRAM



DIAGNOSTIC CHART

1	Check air induction system.	NG	Repair or replace.
OK			
2	Check A/C idle up VSV.	NG	Repair or replace.
OK			
3	Check voltage terminals RSO, RSC.	OK	G o to step 5
NG			
4	Check IAC valve.	NG	Replace IAC valve.
OK			
Check for open and short in harness and connector between J/B No.2 and IAC valve, IAC valve and ECM.			
5	Check operation of the IAC valve.	NG	Repair or replace IAC valve.
OK			
Check and replace ECM.			

INSPECTION PROCEDURE

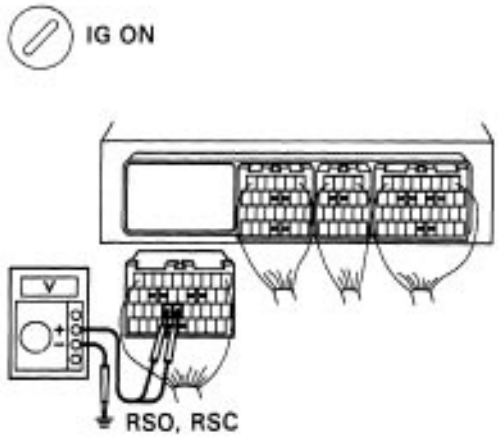
1 Check air induction system (See page EG2–221).

OK → NG: Repair or replace.

2 Check A/C idle up VSV (See page EG2–570).

OK → NG: Repair or replace.

3 Check voltage terminals RSO, RSC.



P (1) Remove glove compartment (See page EG2–309).
(2) Disconnect the ECM connector (P).
(3) Turn ignition switch ON.

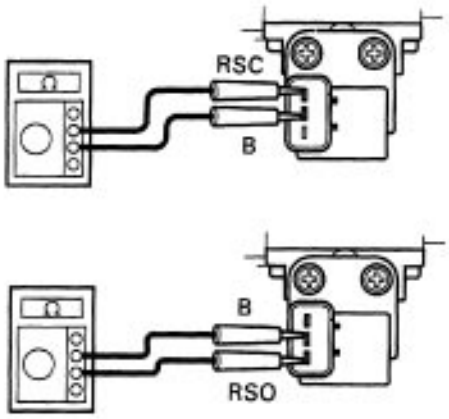
C Measure voltage between terminals RSO, RSC of ECM connector and body ground.

OK **Voltage: 9 –14 V**

NG

OK → Go to step 5.

4 **Check IAC valve.**



F17063
F17062

P Disconnect the IAC valve connector.

C Check continuity between terminals RSO, RSC and B of IAC valve connector.

OK

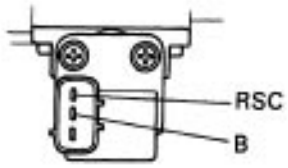
Terminals RSO and B	Continuity (Reference value 10 – 30Ω)
Terminals RSC and B	Continuity (Reference value 10 – 30Ω)

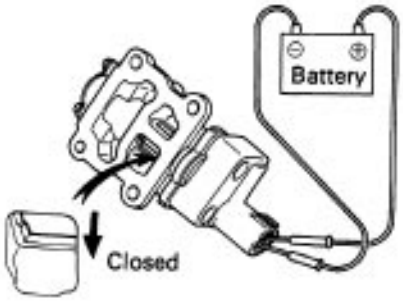
OK

NG **Replace IAC valve.**

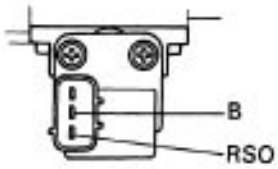
Check for open and short in harness and connector between J/B No.2 and IAC valve, IAC valve and ECM (See page IN–31).

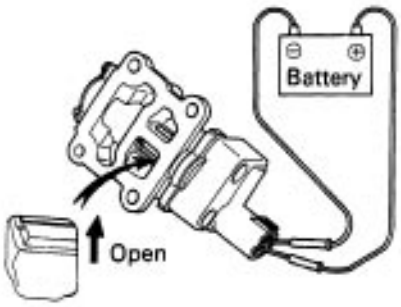
5 Check operation of the IAC valve





FI5039
FIS771





FI5039
FIS772

P Remove IAC valve (See page EG2–274).

C (1) Connect the positive (+) lead from the battery to terminal B and negative (–) lead to terminal RSC, and check that the valve is closed.
(2) Connect the positive (+) lead from the battery to terminal B and negative (–) lead to terminal RSO, and check that the valve is open.

OK **(1) The valve moves to close direction.**
(2) The valve moves to open direction.

Hint The ACTIVE TEST mode of the TOYOTA hand–held tester can be used to change the duty of the IAC valve as desired.

OK

NG **Repair or replace IAC valve.**

Check and replace ECM (See page IN–36).

DTC P0510 Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

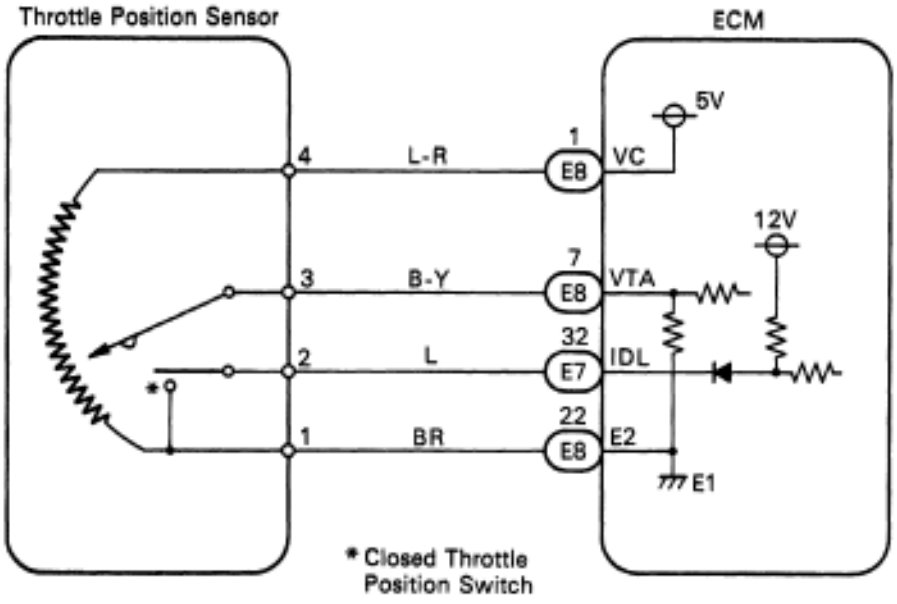
Refer to throttle Position Circuit on page EG2–463.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0510	The closed throttle position switch does not turn ON even once when the vehicle is driven, (2 trip detection logic)	• Open in closed throttle position switch circuit. • Closed throttle position switch. • ECM

HINT: After confirming DTC P0510 use the TOYOTA hand–held tester to confirm the closed throttle position switch signal from ”CURRENT DATA”.

Throttle Valve	Closed throttle position switch signal	Malfunction
Fully Closed	OFF	Open Circuit
Fully Open	ON	Short Circuit

WIRING DIAGRAM



FI6873

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction) and ”P0120” (throttle position circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.
TOYOTA hand–held tester

1	Check for open in harness or ECM.	OK	Confirm good connection at sensor. If OK, replace throttle position sensor.
NG			
2	Check for open in harness or ECM.	OK	Open in harness between ECM and throttle position sensor.
NG			
Confirm connection at ECM. If OK, replace ECM.			

OBDII scan tool (excluding TOYOTA hand–held tester)

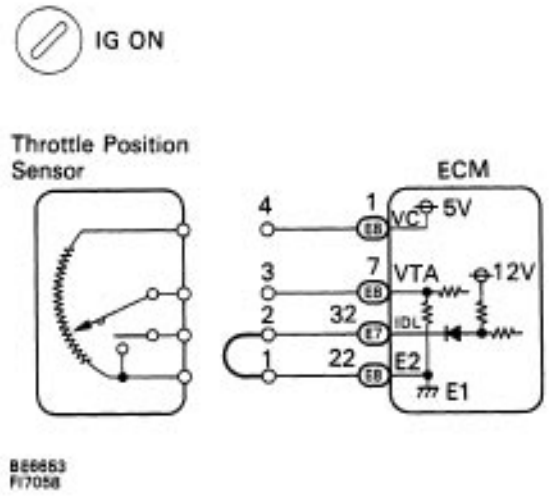
1	Check for open in harness or ECM.	OK	Confirm good connection at sensor. If OK, replace throttle position sensor.
NG			
2	Check for open in harness and connector between throttle position sensor and ECM.	NG	Open in harness between ECM and throttle position sensor.
OK			
Confirm connection at ECM. If OK, replace ECM.			

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand–held tester

1 **Check for open in harness or ECM.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Disconnect the throttle position sensor connector.
(4) Connect sensor wire harness terminals between terminals 1 and 2.
(5) Turn ignition switch ON.

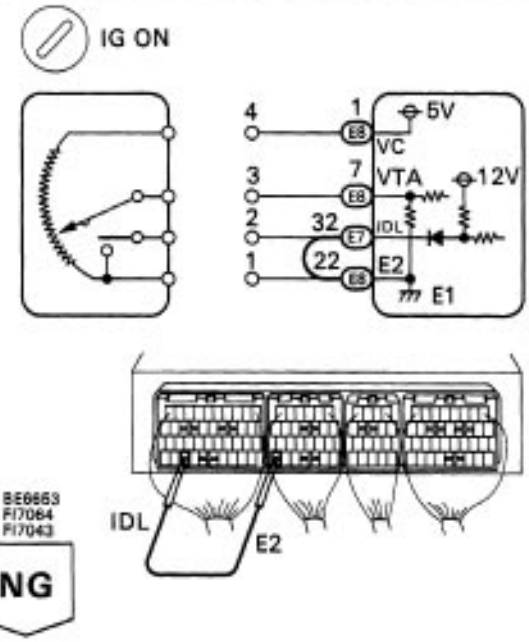
C Read CTP switch signal on the TOYOTA hand–held tester.

OK **CTP switch signal: ON**

NG

OK → **Confirm good connection at sensor. If OK, replace throttle position sensor.**

2 **Check for open in harness or ECM.**



P (1) Remove glove compartment.
(See page BO–309)
(2) Connect between terminals IDL and E2 of ECM connectors.
H I NT: Throttle position sensor connector is disconnected.
Before checking, do a visual check and contact pressure –check for the connector.
(See page EG2–418)
(3) Turn ignition switch ON.

C Read CTP switch signal on the TOYOTA hand–held tester.

OK **CTP switch signal: ON**

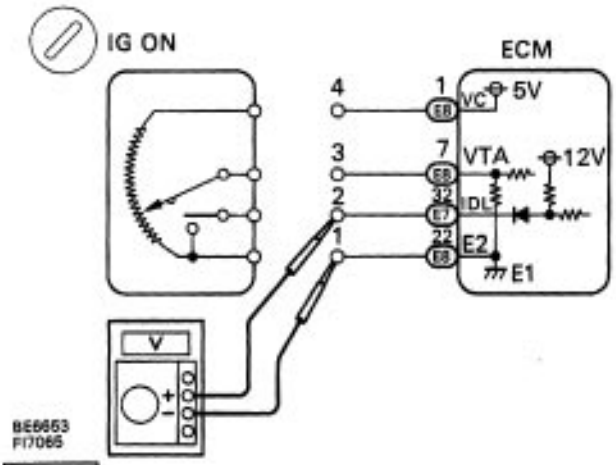
NG

OK → **Open in harness between ECM and throttle position sensor, repair or replace harness.**

Confirm connection at ECM. If OK, replace ECM.

OBDII scan tool (excluding TOYOTA hand–held tester)

1 **Check for open in harness or ECM.**



P (1) Disconnect the throttle position sensor connector.
(2) Turn ignition switch ON.

C Measure voltage between terminals 1 and 2 of throttle position sensor connector.

OK **Voltage: 9 –14 V**

NG

OK → **Confirm good connection at sensor. If OK, replace throttle position sensor.**

2 **Check for open in harness and connector between throttle position sensor and ECM (See page IN–31).**

OK

NG → **Open in harness between ECM and throttle position sensor.**

Confirm connection at ECM. If OK, replace ECM.

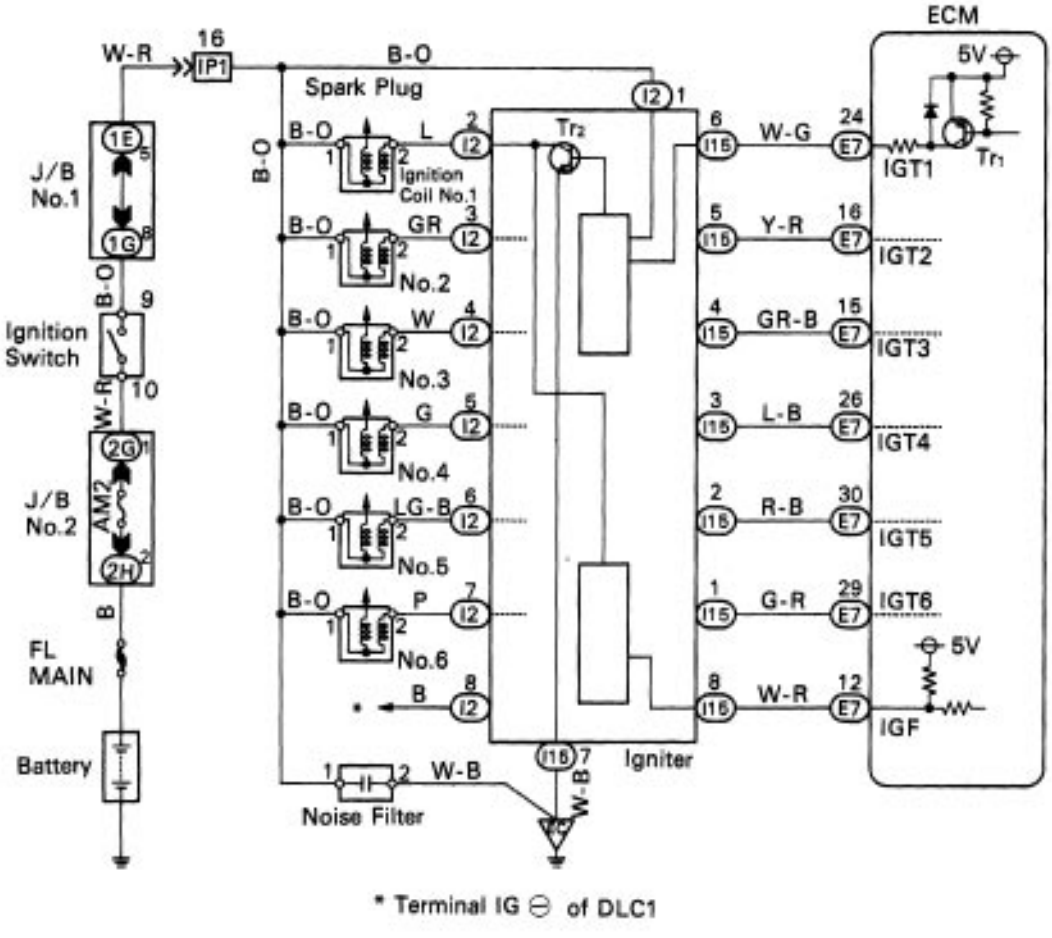
DTC P1300 Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr1 at a predetermined angle (”CA) before the desired ignition timing and outputs an ignition signal (IGT) ”1” to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr2 turns on.
When it reaches the ignition timing, the ECM turns Tr1 off and outputs the IGT signal ”0”.
This turns Tr2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM.
The ECM stops. fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 6 consecutive IGT signals during engine running.	• Open or short in IGF or IGT circuit from igniter to ECM. • Igniter • ECM

WIRING DIAGRAM



* Terminal IG ⊖ of DLC1

DIAGNOSTIC CHART

1	Check voltage igniter power source.	NG	Check and repair igniter power source circuit.

OK

2	Check voltage between terminals 2 – 7 of igniter connector (12) and body ground.	OK	G o to step 4

NG

3	Check ignition coil.	NG	Replace ignition coil.

OK

Check for open and short in harness and connector between J/B No.1 and ignition coil, ignition coil and igniter.

4	Check continuity between terminal 7 of igniter and body ground.	NG	Repair or replace harness or connector.

OK

5	Check voltage between terminal 8 of igniter connector (115) and body ground.	OK	Go to step 7

NG

6	Check for open and short in IGF circuit.	NG	Repair or replace harness or connector.

OK

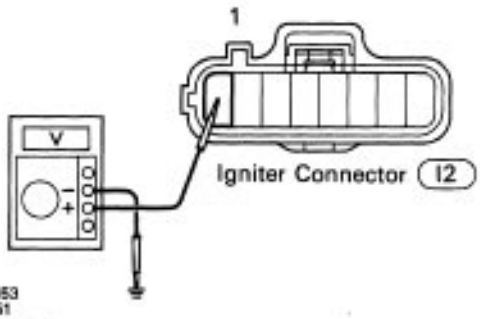
Check and replace ECM.

7	Check for open and short in IGT circuit.	NG	Repair or replace harness or connector.
OK			
8	Check voltage between terminals IGT 1 – 6 of ECM and body ground.	OK	Replace igniter.
NG			
Check and replace ECM.			

INSPECTION PROCEDURE

1 **Check voltage between terminal 1 of igniter connector (12) and body ground.**

IG ON



P (1) Disconnect igniter connector (12)
(2) Turn ignition switch ON.

Hint Connector 12 color is dark gray

C Measure voltage between terminal 1 of igniter connector 12 and body ground.

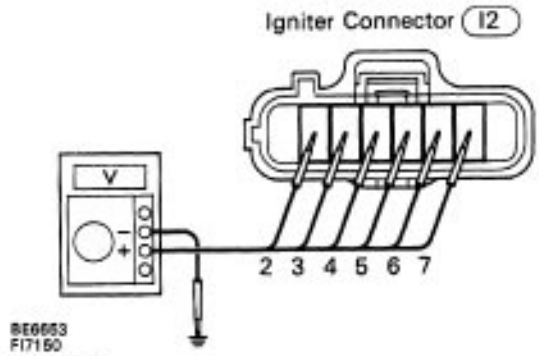
OK **Voltage: 9 –14 V**

OK

NG → **Check and repair igniter power source circuit.**

2 **Check voltage between terminals 2 – 7 of igniter connector and body ground.**

IG ON



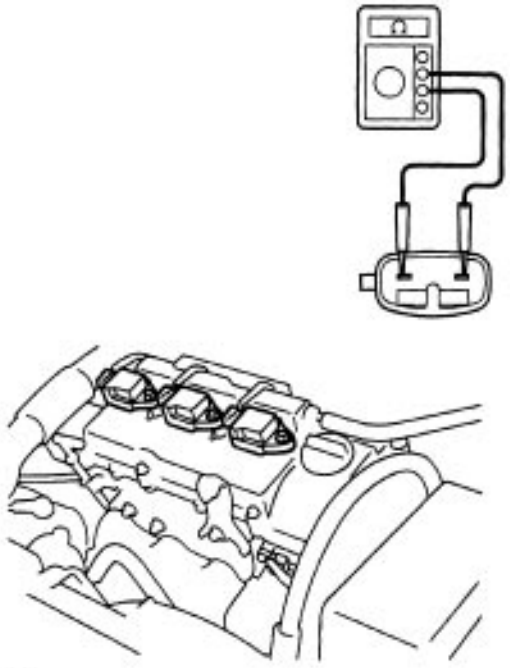
C Measure voltage between terminals 2 – 7 of igniter connector (12) and body ground.

OK **Voltage: 9 – 14 V**

NG

OK → **Go to step 4**

3 **Check ignition coil.**



FI7079
FI7086

P Disconnect ignition coil connector.
(See page IG–87).

Hint Refer to the wiring diagram and inspect the ignition coil connected to the terminal which was without voltage in step (2) .

C Measure resistance between terminals of ignition coil connector.

OK

	Resistance
Cold	0.54 – 0.84Ω
Hot	0.68 – 0.98Ω

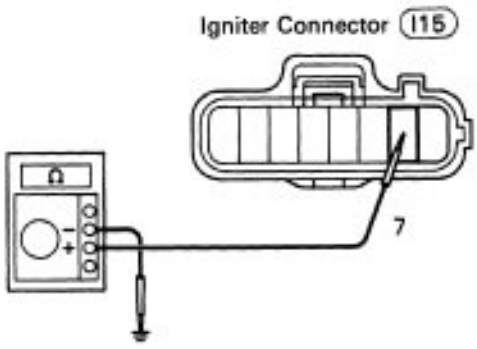
"Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

OK

NG **Replace ignition coil.**

Check for open and short in harness and connector between J/B No.1 and ignition coil, ignition coil and igniter (See page IN–31).

4 **Check continuity between terminal 7 of igniter connector (I15) and body ground.**



FI7149

P Disconnect igniter connector(I15)

Hint Connector (I15) is black.

C Check continuity between terminal 7 of igniter connector (I15) and body ground.

OK **Continuity (1Ω or less)**

OK

NG **Repair or replace harness or connector.**

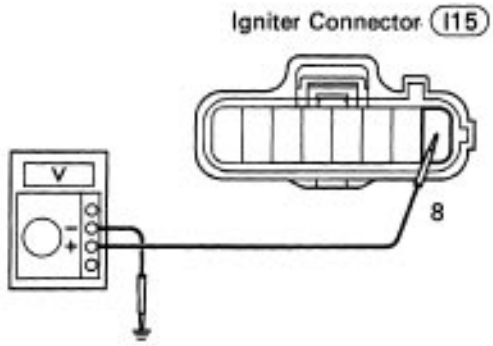
5	Check voltage between terminal 8 of igniter connector (I15) and body ground.

IG ON

P Turn ignition switch ON.

C Measure voltage between terminal 8 of igniter connector (I15) and body ground.

OK **Voltage: 4.5 – 5.5 V**



B66663
FI7151

NG

OK → **Go to step (7)**

6	Check for open and short in harness and connector between terminal IGF of ECM and igniter (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

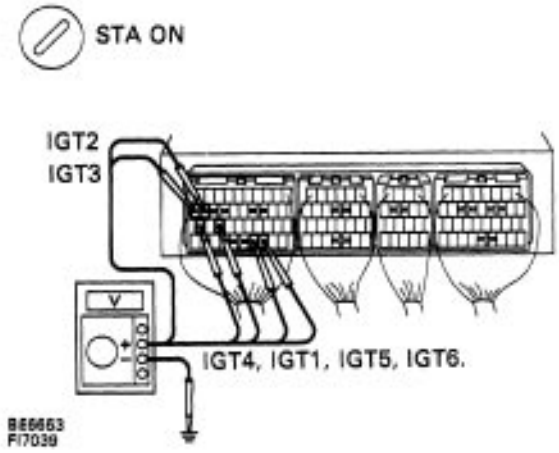
Check and replace ECM (See page IN–36).

7	Check for open and short in harness and connector between terminals IGT1 – of ECM and igniter (See page IN–31).

OK

NG → Repair or replace harness or connector.

8	Check voltage between terminals IGT1 – 6 of ECM and body ground.



P Remove glove compartment (See page EG2–309).

Hint Leave igniter connector 115 disconnected.

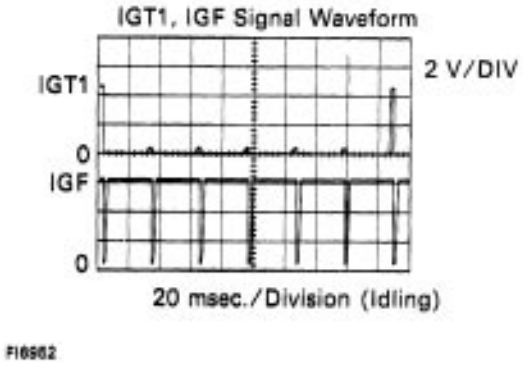
C Measure voltage between terminals IGT1 – 6 of ECM and body ground when engine is cranked.

OK **Voltage: 0.5 – 1.0 v (Neither 0 v nor 5 v)**

NG → **Check and replace ECM (See page IN–36).**

OK → **Replace igniter.**

Reference INSPECTION USING OSCILLOSCOPE



- During idling, check waveform between terminal IGT1, IGF and E1 of ECM.

HINT: The correct waveform appears as shown in the illustration on the left, with rectangular waves.
IGT2, IGT3, IGT4, IGT5 and IGT6 signal wave–forms are the same as the IGT1 signal waveform.

DTC P1500 Starter Signal Circuit Malfunction

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1500	No starter signal to ECM.	• Open or short in starter signal circuit. • Open or short in ignition switch or starter relay circuit. • ECM

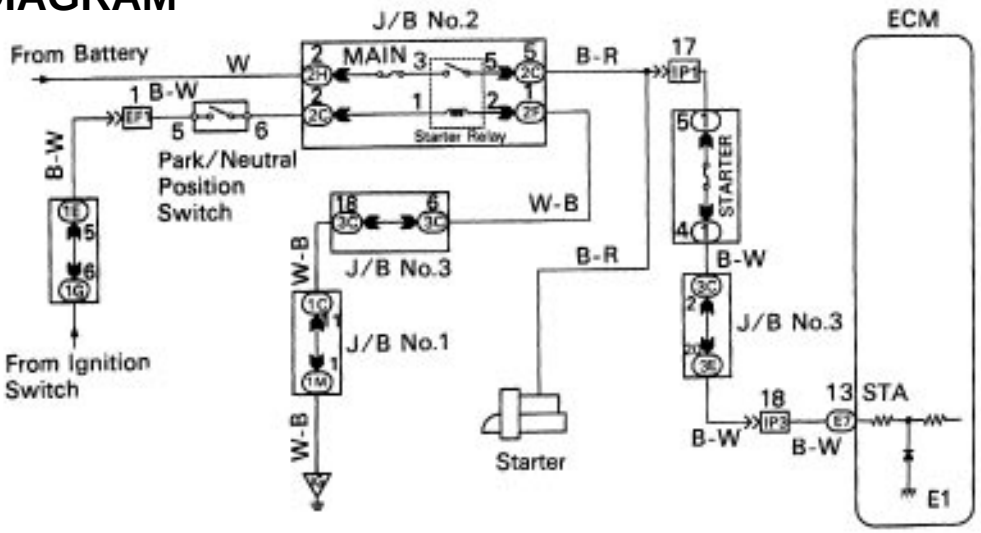
HINT: In this circuit, diagnosis can only be made in the check mode.

DIAGNOSTIC CHART

HINT: This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG2–435.

1	Connect the TOYOTA hand–held tester and check STA signal.	OK	Proceed to next circuit inspection shown on matrix chart.
NG			
2	Check for open in harness and connector between ECM and starter relay.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			

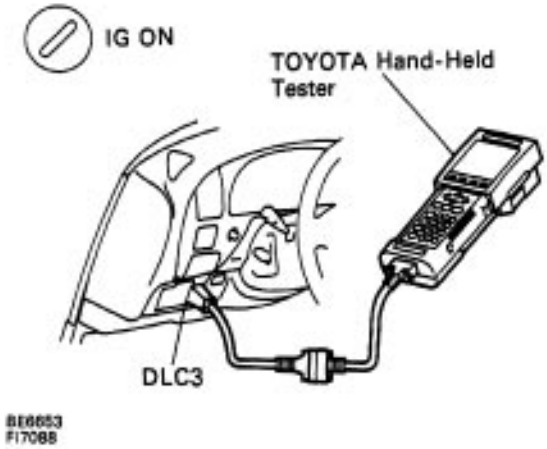
WIRING DIAGRAM



FI7140

INSPECTION PROCEDURE

1 **Connect the TOYOTA hand–held tester and check STA signal.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read STA signal on the TOYOTA hand–held tester while starter operates.

OK

Ignition Switch Position	STA Signal
ON	OFF
START	ON

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG2–435).**

2 **Check for open in harness and connector between ECM and starter relay (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

DTC P1600 EMC BATT Malfunction

CIRCUIT DESCRIPTION

Battery voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the diagnostic trouble code memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1600	Open in back up power source circuit.	• Open in back up power source circuit. • ECM

HINT: If DTC P1600 appear, the ECM does not store another diagnostic trouble code.

DIAGNOSTIC CHART

1 Check voltage of terminal BATT.

OK → Check and replace ECM.

NG

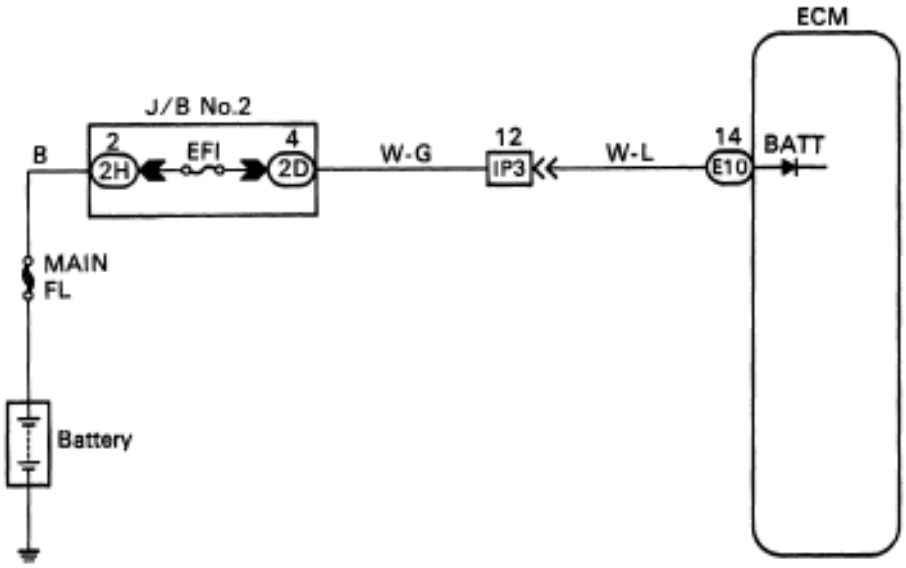
2 Check EFI fuse.

NG → Check for short in all the harness and components connected to EFI fuse.

OK

Check and repair harness or connector between battery, EFI fuse and ECM.

WIRING DIAGRAM

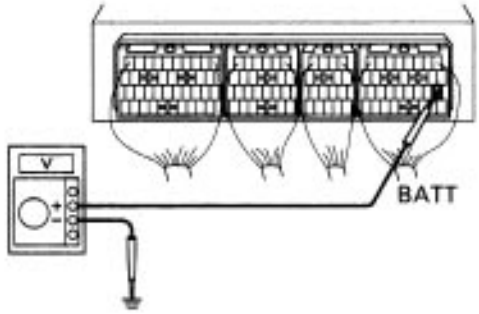


FI6681

INSPECTION PROCEDURE

1 **Check voltage between terminal BATT of ECM connector and body ground.**

IG OFF



B66653
FI6807

P Remove glove compartment.
(See page EG2–309)

C Measure voltage between terminal BATT of ECM connector and body ground.

OK **Voltage: 9 –14 V**

NG

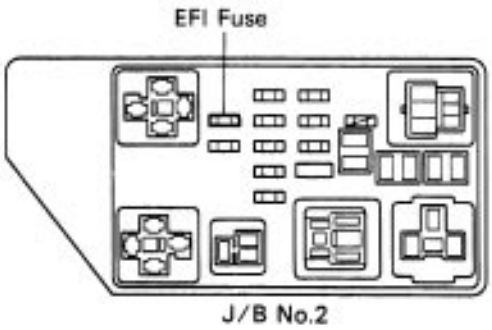
OK → **Check and replace ECM (See page IN–36).**

2 **Check EFI fuse.**

P Remove EFI fuse from J/B No.2.

C Check continuity of EFI fuse.

OK **Continuity**



FI7078

OK

NG → **Check for short in all the harness and components connected to EFI fuse.**

Check and repair harness or connector between battery, EFI fuse and ECM.

DTC P1605 Knock Control CPU Malfunction

CIRCUIT DESCRIPTION

Refer to knock sensor 1 circuit malfunction on page EG2–499.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1605	Engine control computer malfunction. (for knock control)	• ECM

WIRING DIAGRAM

Refer to knock sensor 1 circuit malfunction on page EG2–499.

DIAGNOSTIC CHART

1	Are there any other codes (besides DTC P1605) being output?	YES	Go to relevant diagnostic trouble code chart.

NO

Check and replace ECM (See page IN–36).

DTC P1780 Park Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0 V, When the shift lever is in the D, 2, L or R position, the park/neutral position switch goes off, so the voltage of ECM terminal NSW becomes battery voltage, the voltage of the ECM internal power source.

If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

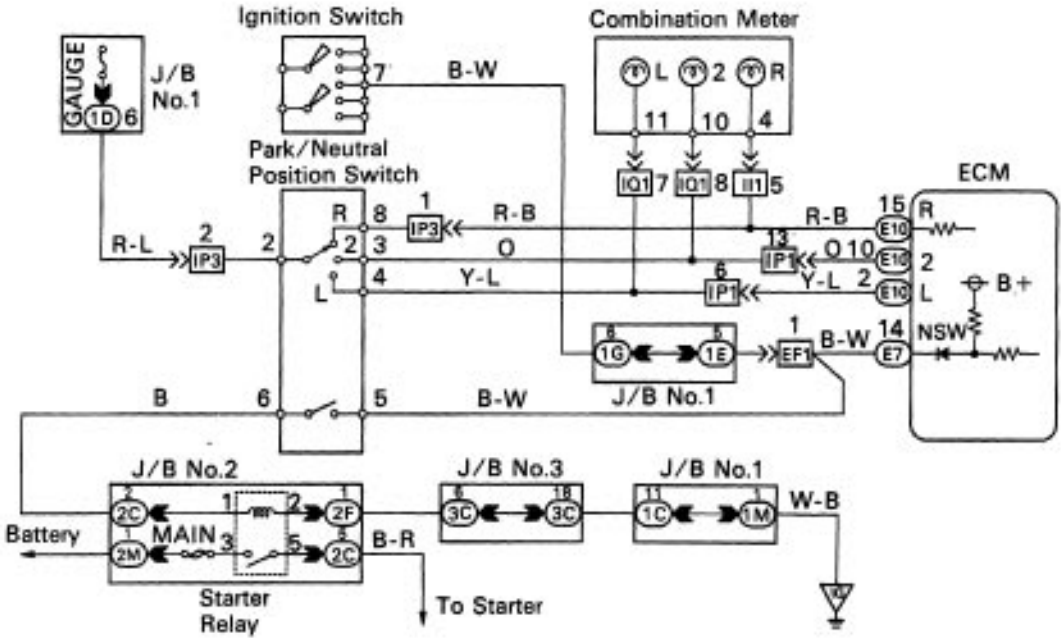
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1780	Two or more switches are ON simultaneously for ”N”, ”2” and ”L” position. (2 trip detection logic)	• Short in park/neutral position switch circuit. • Park/neutral position switch. • ECM
	When driving under conditions a) and b) for 30 sec. or more the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed; 70 km/h (44 mph) or more b) Engine speed; 1,500 – 2,500 rpm	

HINT: After confirming DTC P1780 use the TOYOTA hand–held tester to confirm the PNP switch signal from ”CURRENT DATA”.

DIAGNOSTIC CHART

1	Check park/neutral position switch.	NG	Replace park/neutral position switch.
OK			
2	Check voltage between terminal NSW of ECM connector and body ground.	OK	Check and replace ECM.
NG			
Check for open and short in harness and connector between ECM and park/neutral position switch.			

WIRING DIAGRAM



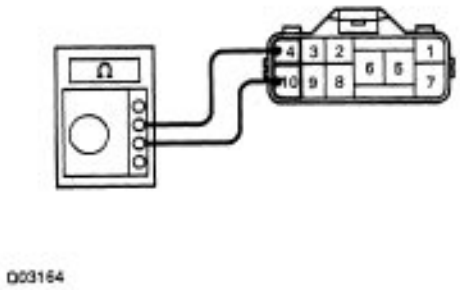
FI7141

INSPECTION PROCEDURE

1 Check park/neutral position switch.

P Disconnect park/neutral position switch connector.

C Check continuity between each terminal shown below when the shift lever is positioned to each range.



D03164

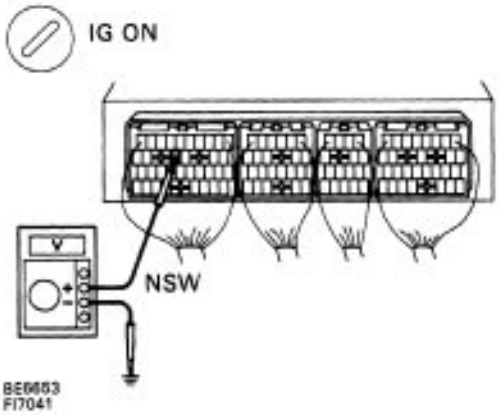
OK

Continuity

Shift Position \ Terminal	5	6	2	7	8	9	10	3	4
P	○—○		○—○						
R			○	○	○—○				
N	○—○		○	○	○	○—○			
D			○	○	○	○	○—○		
2			○	○	○	○	○	○—○	
L			○	○	○	○	○	○	○—○

OK → NG → **Replace park/neutral position switch.**

2 **Check voltage between terminal NSW of ECM connector and body ground.**



BE6653
FI7041

P Remove glove compartment.
(See page EG2–309)

C (1) Turn ignition switch ON.
(2) Measure voltage between terminal NSW of ECM connector and body ground when the shift lever is positioned to the following positions.

OK

Shift lever position	P or N	L,2,D or R
Voltage	0 V	9–14V

NG → **Check for open and short in harness and connector between ECM and park/neutral position switch (See page IN–31).**

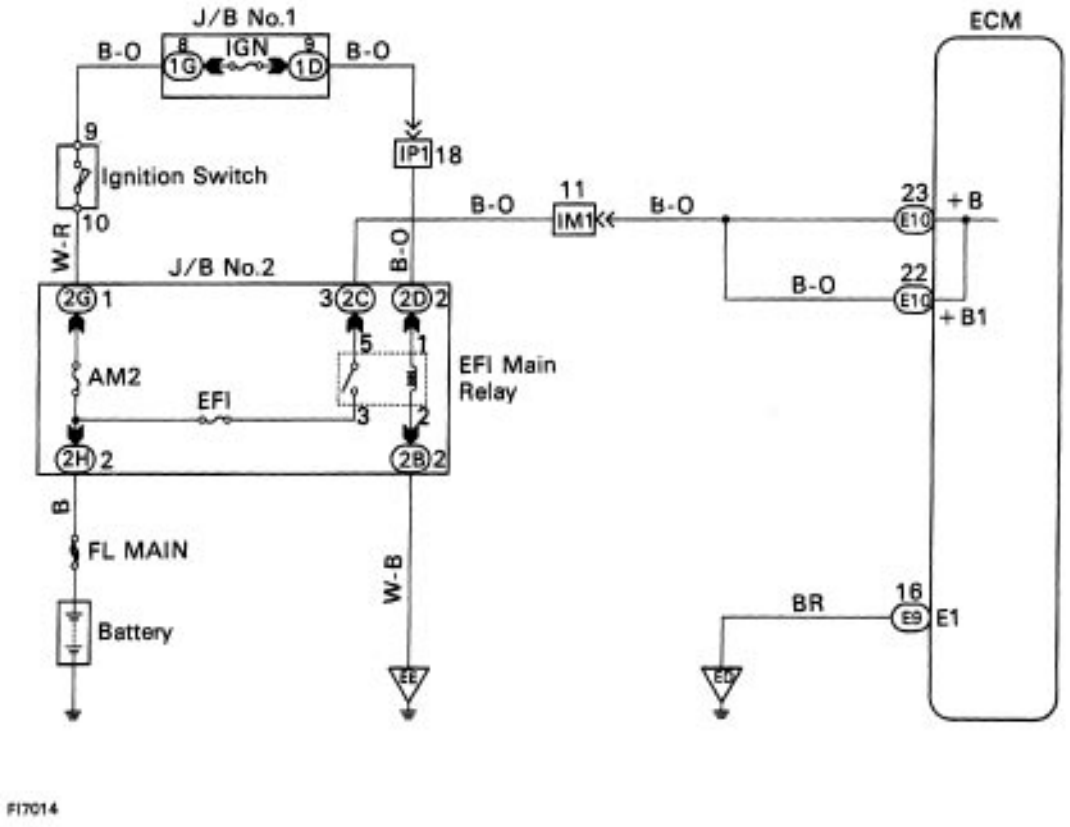
OK → **Check and replace ECM (See page IN–36).**

ECM Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery voltage is applied to the coil, closing the contacts of the EFI main relay and supplying power to the terminals + B and + B1 of the ECM.

WIRING DIAGRAM



FI7014

DIAGNOSTIC CHART

1	Check voltage of ECM power source.	OK	Proceed to next circuit inspection shown on matrix chart .

NG

2	Check continuity between terminal E1 and body ground.	NG	Repair or replace harness or connector.

OK

3	Check EFI main relay.	NG	Replace EFI main relay.

OK

4	Check EFI fuse.	NG	Check for short in all the harness and components connected to EFI fuse.

OK

5	Check for open in harness and connector between main relay and battery, main relay and ECM.	NG	Repair or replace harness or connector.

OK

6	Check I G N fuse.	NG	Check for short in all the harness and components connected to IGN fuse.

OK

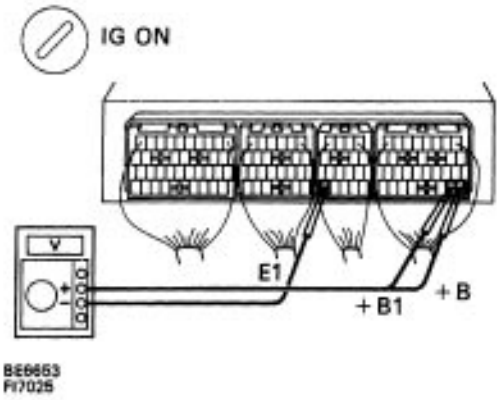
7	Check ignition switch.	NG	Replace ignition switch.

OK

Check for open in harness and connector between IG switch and main relay, main relay and body ground.

INSPECTION PROCEDURE

1 **Check voltage between terminals + B, + B1 and E1 of ECM connector.**



P (1) Remove glove compartment.
(See page EG2–309)
(2) Turn ignition switch ON.

C Measure voltage between terminals + B, + 1B and E1 of ECM connector.

OK **Voltage: 9 –14 V**

NG

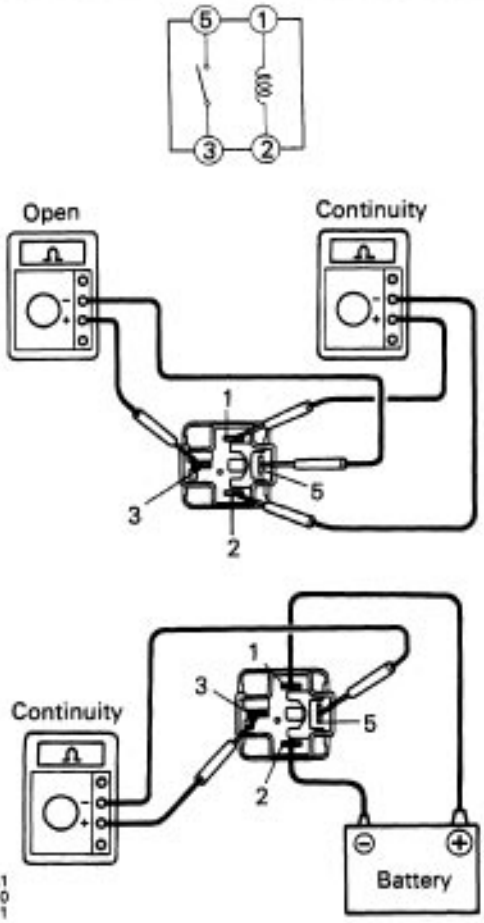
OK **Proceed to next circuit inspection shown on matrix chart (See page EG2–435).**

2 **Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–31).**

OK

NG **Repair or replace harness or connector.**

3 Check EFI main relay.



P Remove EFI main relay from J/B No–2.

C Check continuity between terminals of EFI main relay shown below.

OK

Terminals 3 and 5	Open
Terminals 1 and 2	Continuity (Reference value 72Ω)

C (1) Apply battery voltage between terminals 1 and 2.
(2) Check continuity between terminals 3 and 5.

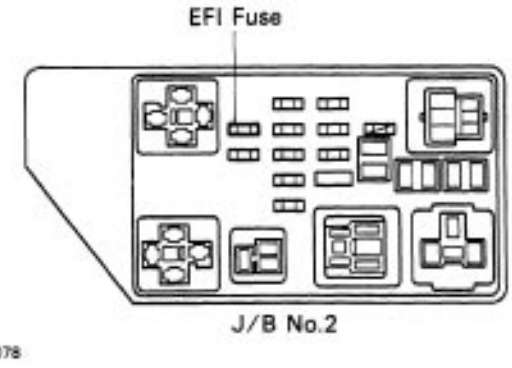
OK

Terminals 3 and 5	Continuity

OK

NG **Replace EFI main relay.**

4 Check EFI fuse.



P Remove EFI fuse from J/B No.2.

C Check continuity of EFI fuse.

OK **Continuity**

OK

NG **Check for short in all the harness and components connected to EFI fuse.**

5	**Check for open in harness and connector between main relay and battery, main relay and ECM (See page IN–31).**

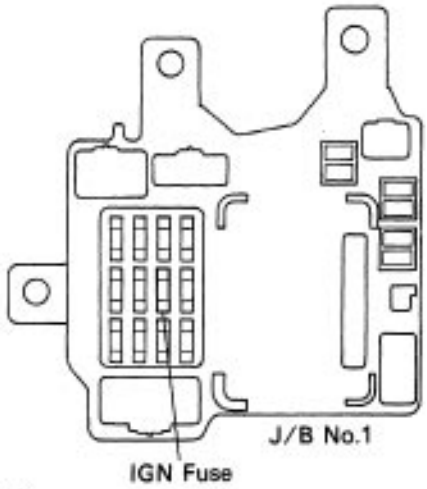
OK → **NG** → **Repair or replace harness or connector.**

6	**Check IGN fuse.**

P Remove IGN fuse from J/B No–1

C Check continuity of IGN fuse.

OK **Continuity**



OK → **NG** → **Check for short in all the harness and components connected to IGN fuse.**

7	**Check ignition switch (See page BE–14).**

OK → **NG** → **Replace ignition switch.**

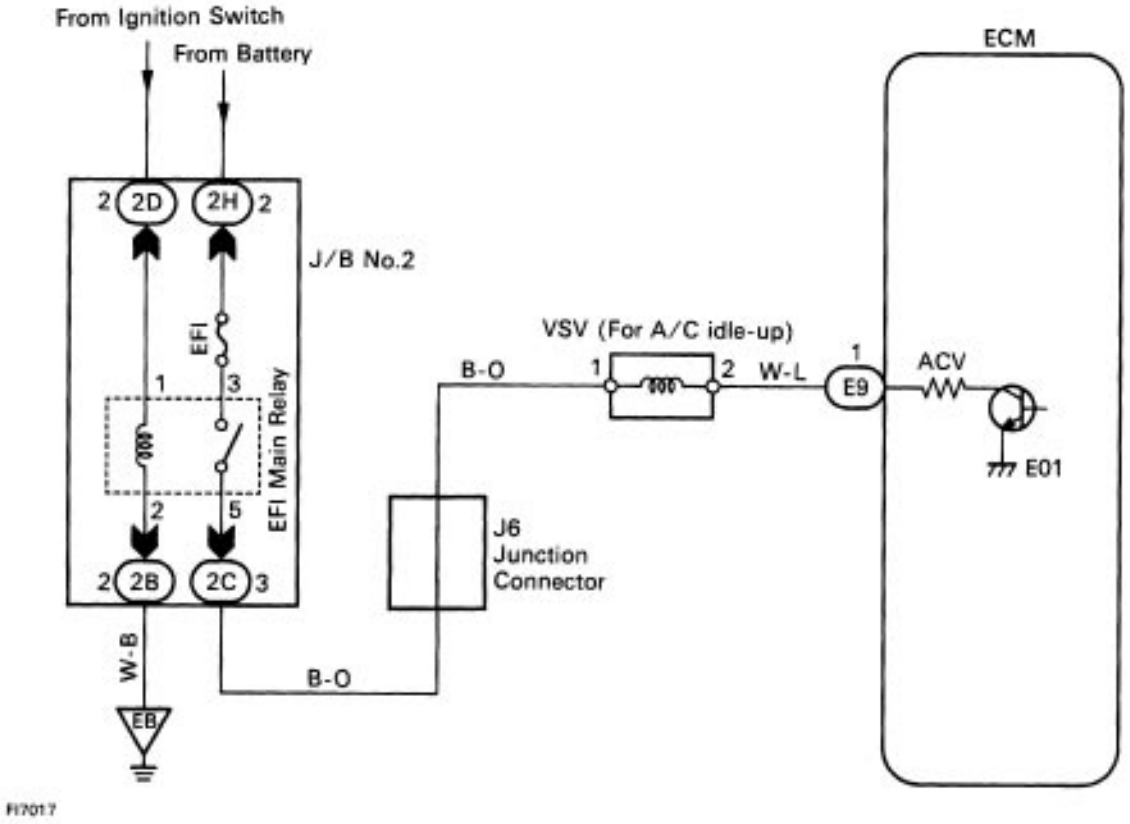
Check for open in harness and connector between IG switch and main relay, main relay and body ground (See page IN–31).

AC Idle Up Circuit

CIRCUIT DESCRIPTION

When the air conditioning operates (increased engine load), this circuit switch is on the VSV and increases the amount of bypass air to increase the idle speed, thus maintaining driveability.

WIRING DIAGRAM



DIAGNOSTIC CHART
TOYOTA hand–held tester

1	Connect the TOYOTA hand–held tester and check operation of A/C idle–up VSV.	OK	Check and repair air hose and air pipe.

NG

2	Check A/C idle–up VSV.	NG	Replace A/C idle–up VSV.

OK

3	Check for open and short in harness and connector between EFI main relay and ECM.	NG	Repair or replace harness or connector.

OK

Check and replace ECM.

OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check A/C idle–up VSV.	NG	Replace A/C idle–up VSV.

OK

2	Check voltage between terminal ACV and body ground.	NG	Check and repair harness or connector.

OK

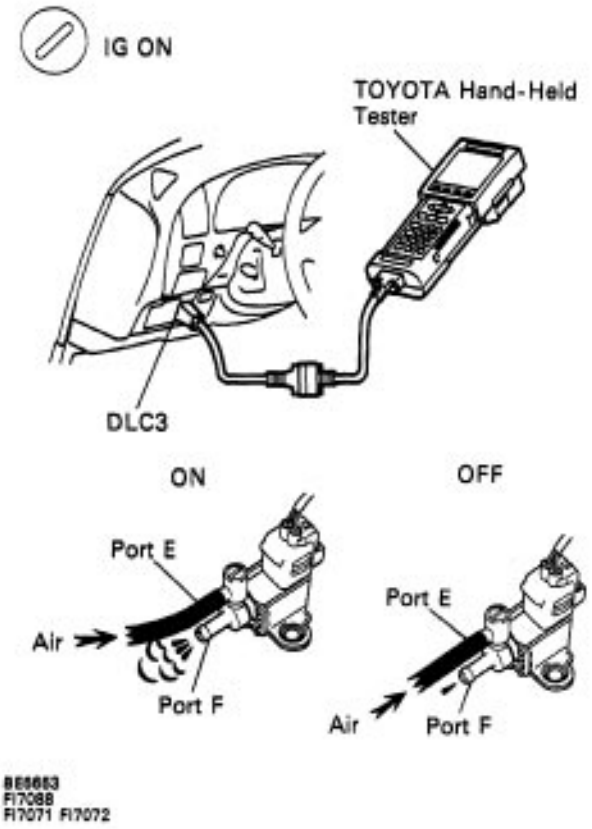
3	Check air hose and air pipe.	NG	Repair or replace.

OK

Check and replace ECM.

INSPECTION PROCEDURE
TOYOTA hand–held tester

1 **Connect the TOYOTA hand–held tester and check operation of A/C idle–up VSV.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(4) Select the active test mode on the TOYOTA hand–held tester.

C Check operation of A/C idle–up VSV when A/C idle–up VSV is operated by the TOYOTA hand–held tester.

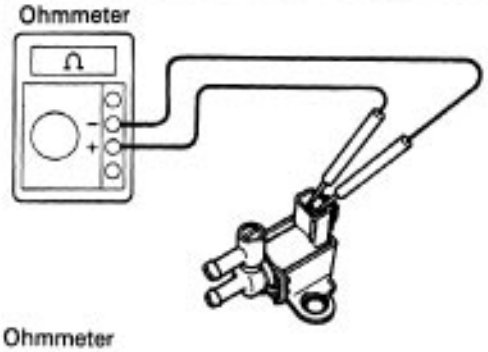
OK **A/C idle–up VSV is ON:**
The air from port E is flowing out through port F.
A/C idle–up VSV is OFF:
The air does not flow from port E to port F.

NG

OK → **Check and repair air hose and air pipe.**

(See page EG2–295)

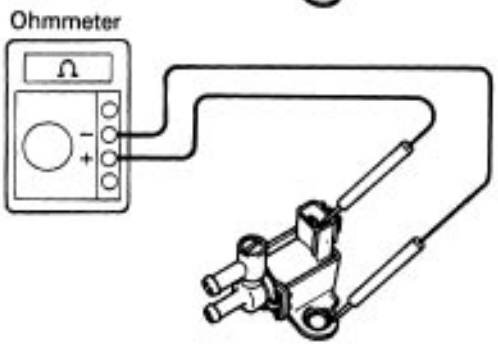
2 **Check A/C idle–up VSV.**

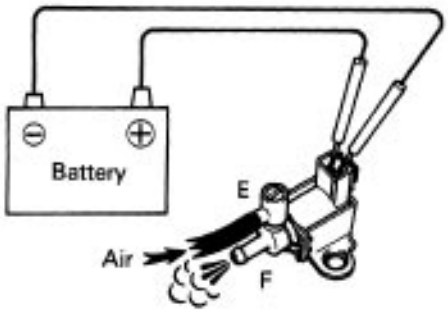


P (1) Remove A/C idle–up VSV.
(2) Disconnect A/C idle–up VSV connector.

C (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

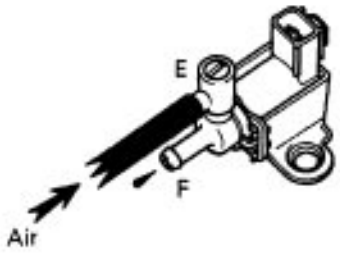
OK **(1) Resistance: 22 – 42Ω at 20°C (68°F)**
(2) Resistance: 1 MΩ or higher





C Check operation of A/C idle–up VSV when battery positive voltage is applied to the terminals of A/C idle–up VSV connector or not.

OK **Battery positive voltage is applied:**
The air from pipe E is flowing out through pipe F.
Battery positive voltage is not applied:
The air from pipe E is not flowing out through pipe F.



P04118
P04117
P04276
P04275

OK

NG → **Replace A/C idle–up VSV.**

3 **Check for open and short in harness and connector between EFI main relay and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

INSPECTION PROCEDURE
OBDII scan tool (excluding TOYOTA hand–held tester)

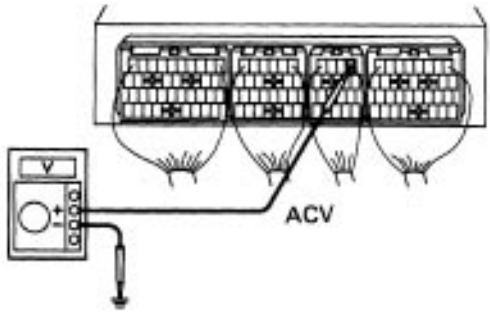
1 **Check A/C idle–up VSV (See page EG2–573, step 2)**

OK

NG **Replace A/C idle–up VSV.**

2 **Check voltage between terminal ACV of ECM connector and body ground.**

IG ON



B85653
FI7029

P (1) Remove glove compartment.
(See page EG2–309)
(2) Turn ignition switch ON.

C Measure voltage between terminal ACV of ECM connector and body ground.

OK **Voltage: 9 –14 V**

OK

NG **Check for open and short in harness and connector between EFI main relay and ECM (See page IN–31).**

3 **Check air hose and air pipe (See page EG2–295).**

OK

NG **Repair or replace.**

Check and replace ECM (See page IN–36).

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

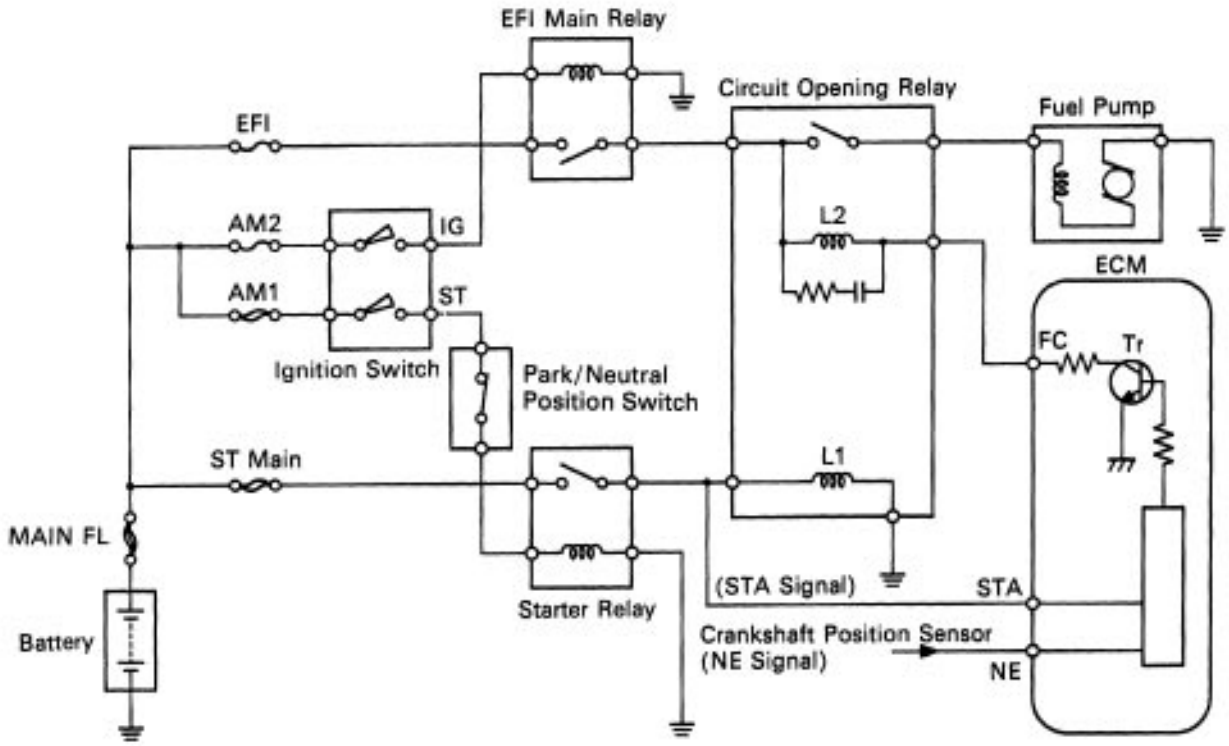
Fuel pump control

The fuel pump is switched on (low voltage at terminal FC) when STA is on or while the NE signal is input to the ECM.

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates.

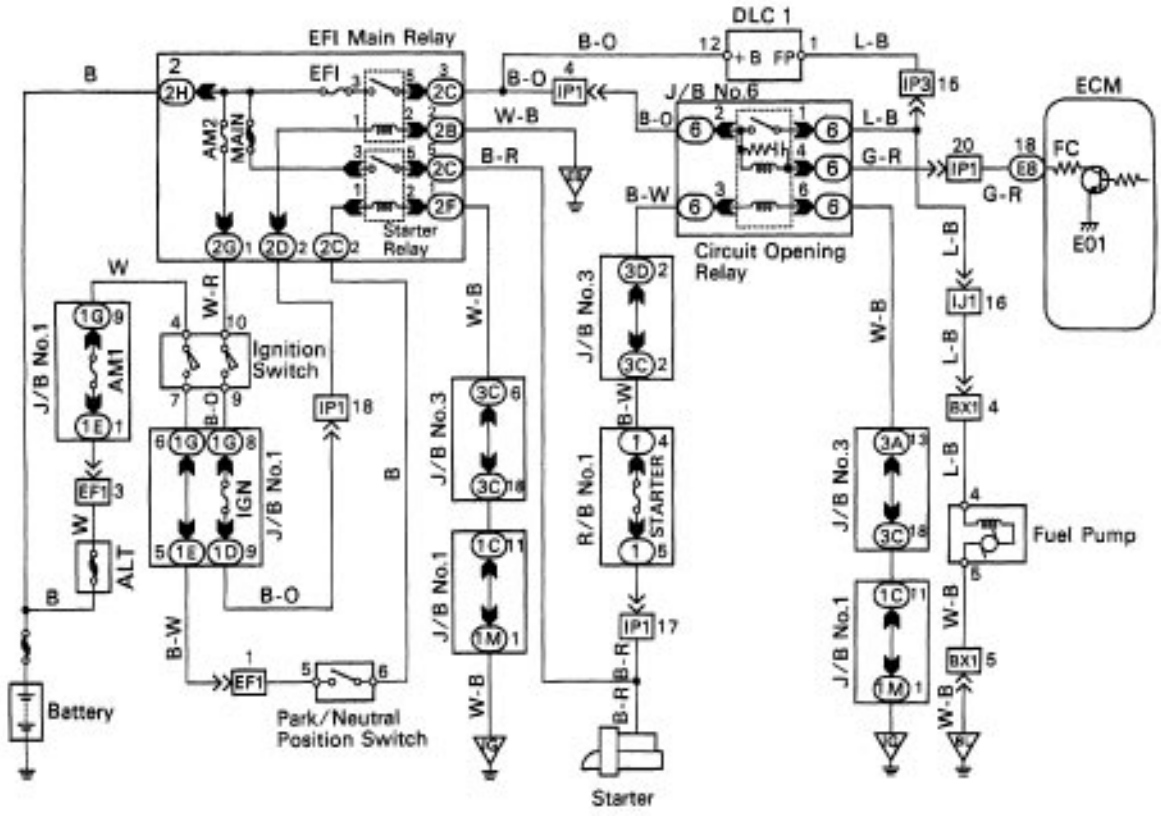
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



FI6722

WIRING DIAGRAM



FI7143

DIAGNOSTIC CHART
TOYOTA hand – held tester

1	Check fuel pump operation.	OK	Go to step 4
NG			
2	Check for ECM power source circuit.	NG	Repair or replace.
OK			
3	Check fuel pump.	NG	Repair or replace fuel pump.
OK			
Check for open in harness and connector between terminal FP of DLC1 and fuel pump. fuel pump and body ground.			
4	Connect the TOYOTA hand – held tester and check operation of fuel pump.	OK	Go to step 7
NG			
5	Check circuit opening relay.	NG	Replace circuit opening relay.
OK			
6	Check voltage terminal FC.	OK	Check and replace ECM.
NG			
Check for open in harness and connector between ER main relay and circuit opening relay, circuit opening relay and ECM.			

7	Check circuit opening relay.	NG	Replace circuit opening relay.

OK

8	Check voltage terminal 3 of circuit opening relay.	NG	Check for starter signal circuit.

OK

Check for open in harness and connector between terminal 6 of circuit opening relay and body ground,

OBD II scan tool (excluding TOYOTA hand – held tester)

1	Check fuel pump operation.	OK	Go to step 4

NG

2	Check for ECM power source circuit.	NG	Repair or replace.

OK

3	Check fuel pump.	NG	Repair or replace fuel pump.

OK

Check for open in harness and connector between terminal FP of DLC1 and fuel pump, fuel pump and body ground.

4	Check circuit opening relay.	NG	Replace circuit opening relay.

OK

5	Check voltage terminal FC.	OK	Check and replace ECM.

NG

6	Check for open in harness and connector between EFI main relay and ECM.	NG	Repair or replace harness or connector.

OK

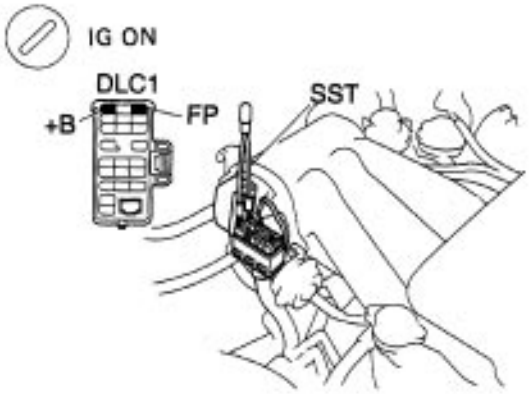
7	Check voltage terminal 3 of circuit opening relay.	NG	Check for starter signal circuit.

OK

Check for open in harness and connector between terminal 6 of circuit opening relay and body ground.

INSPECTION PROCEDURE
TOYOTA hand–held tester

1 **Check fuel pump operation.**

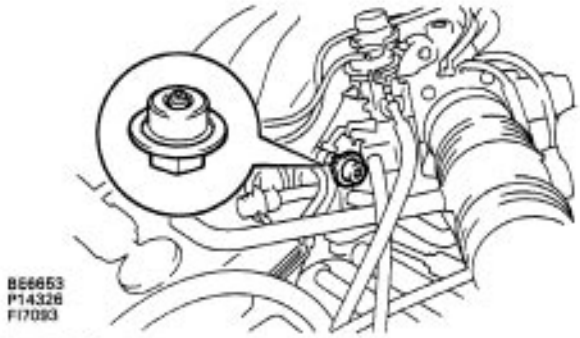


P (1) Be sure that enough fuel is in the tank.
(2) Turn ignition switch ON.
(3) Using SST, connect terminals FP and + B of DLC 1,
SST 09843–18020

C Check that pulsation damper screw rises up when terminals are connected.

Caution
Never make a mistake with the terminal connection position as this will cause a malfunction.

OK **The pulsation damper screw rises up.**



NG

OK → **Go to step 4**

2 **Check for ECM power source circuit (See page EG2–565).**

OK

NG → **Repair or replace.**

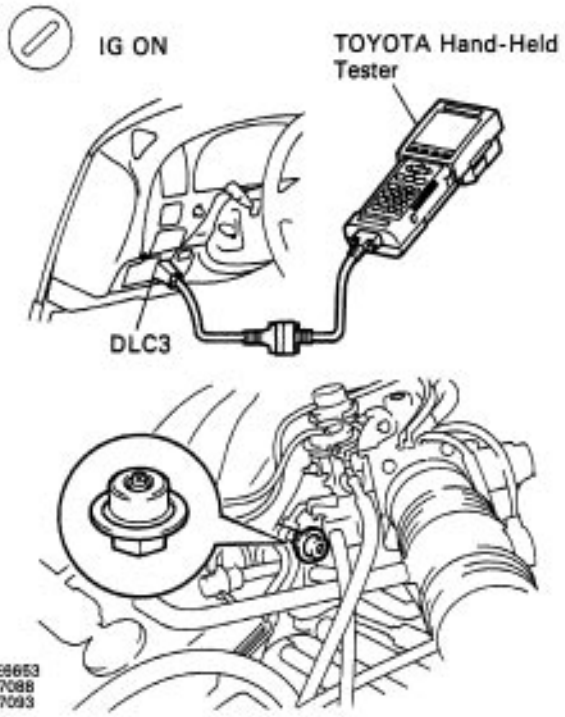
3 **Check fuel pump (See page EG2–234).**

OK

NG → **Repair or replace fuel pump.**

Check for open in harness and connector between terminal FP of DLC 1 and fuel pump, fuel pump and body ground (See page IN–31).

4 **Connect the TOYOTA hand–held tester and check operation of fuel pump.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(4) Select the active test mode on the TOYOTA hand–held tester.

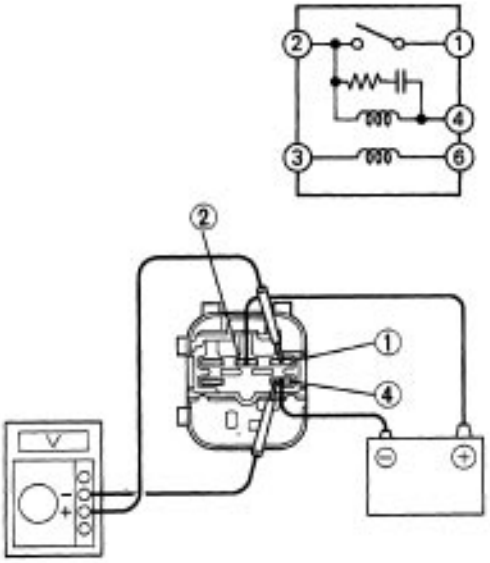
C Check that pulsation damper screw rises up when fuel pump is on by TOYOTA hand–held tester.

OK **The pulsation damper screw rises up.**

NG

OK → **Go to step 7**

5 **Check circuit opening relay.**



FI7063
FI7068

P Remove circuit opening relay from R/B No.6.

C (1) Apply battery voltage between terminals 2 and 4.
(2) Measure voltage between terminals 1 and 4.

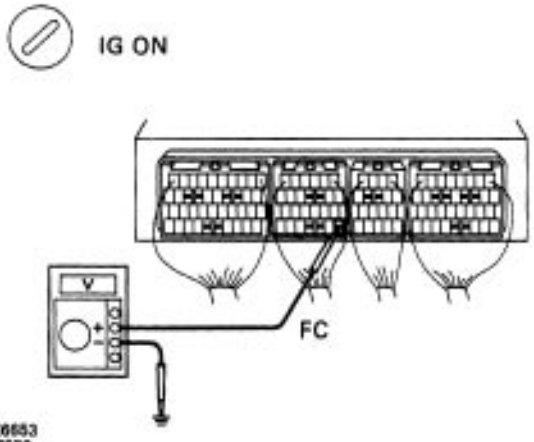
OK

Terminals 1 and 4	Same as battery

OK

NG **Replace circuit opening relay.**

6 **Check voltage between terminal FC of ECM and body ground.**



BE6653
FI7030

P (1) Remove glove compartment (see page EG2–309).
(2) Turn ignition switch ON.

C Measure voltage between terminal FC of ECM and body ground.

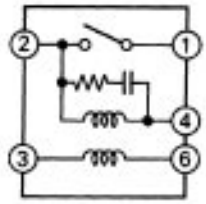
OK **Voltage: 9 –14 V**

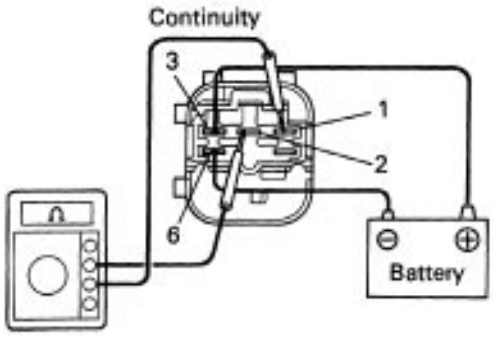
NG

OK **Check and replace ECM (See page IN–36).**

Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and ECM (See page IN–31).

7 **Check circuit opening relay.**





FI7053
FI1909

P (1) Remove glove compartment (See page EG2–309).
(2) Remove circuit opening relay from R/B No.6.

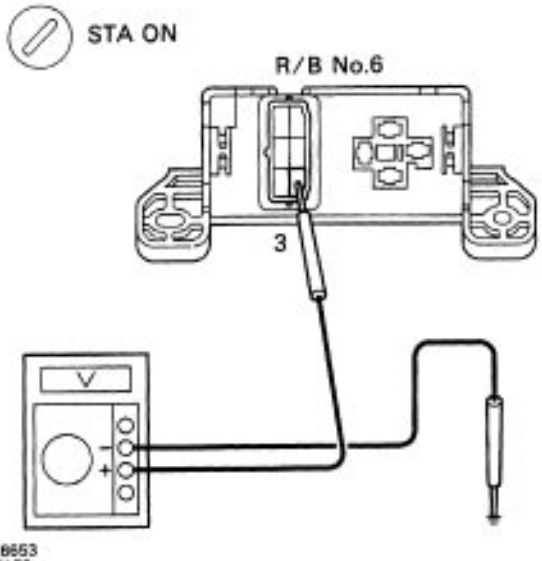
C (1) Apply battery voltage between terminals 3 and 6.
(2) Check continuity between terminals 1 and 2.

OK

Terminals 1 and 2	Continuity

OK → NG → **Replace circuit opening relay.**

8 **Check voltage between terminal 3 of R/B No.6 (for circuit opening relay) and body ground.**



BE6653
FI7152

C Measure voltage between terminal 3 of R/B No.6 (for circuit opening relay) and body ground when engine is cranked.

OK **Voltage: 9 –14 V**

OK → NG → **Check for starter signal circuit (See page EG2–557).**

Check for open in harness and connector between terminal 6 of R/6 No.6 (for circuit opening relay) and body ground (See page IN–31).

OBDII scan tool (excluding TOYOTA hand–held tester)

1 Check fuel pump operation (See page EG2–580, step

NG

OK → Go to step 4

2 Check for ECM power source circuit (See page EG2–565).

OK

NG → Repair or replace.

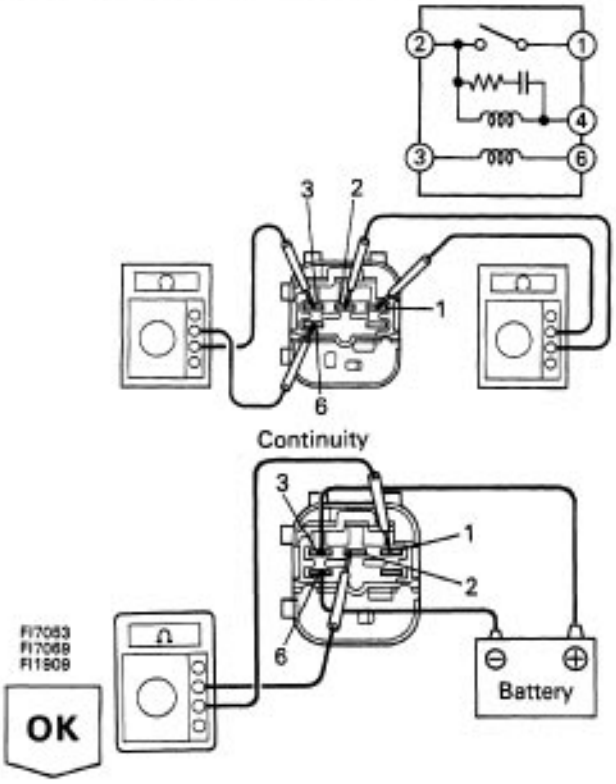
3 Check fuel pump (See page EG2–234).

OK

NG → Repair or replace fuel pump.

Check for open in harness and connector between terminal FP of DLC1 and fuel pump, fuel pump and body ground (See page IN–31).

4 Check circuit opening relay.



P (1) Remove glove compartment (See page EG2–309).
(2) Remove circuit opening relay from R/B No.6.

C Check continuity between terminals of circuit opening relay shown below.

OK

Terminals 1 and 2	Open
Terminals 3 and 6	Continuity (Reference value 30Ω)

C (1) Apply battery voltage between terminals 3 and 6.
(2) Check continuity between terminals 1 and 2.

OK

Terminals 1 and 2	Continuity

NG → Replace circuit opening relay.

5	Check voltage between terminal FC of ECM and body ground (Seepage EG2–582, step 6).

NG

OK → Check and replace ECM (See page IN–36).

6	Check for open in harness and connector between ER main relay and circuit opening relay, circuit opening relay and ECM (See page IN–31).

OK

NG → Repair or replace harness or connector.

7	Check voltage between terminal 3 of R/B No–6 (for circuit opening relay) and body ground (See page EG2–583, step 8).

OK

NG → Check for starter signal circuit (See page EG2–557).

Check for open in harness and connector between terminal 6 of circuit opening relay and body ground (See page IN–31).

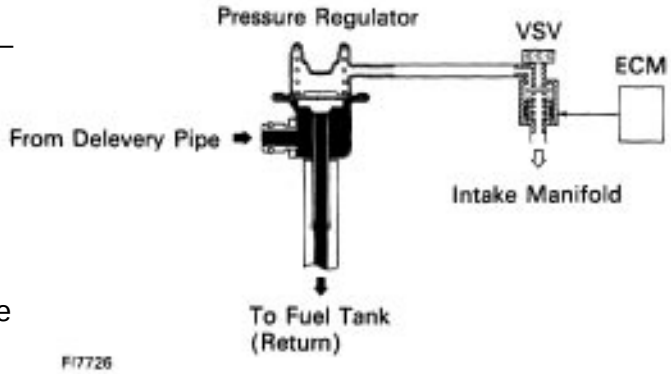
Fuel Pressure Control VSV Circuit

CIRCUIT DESCRIPTION

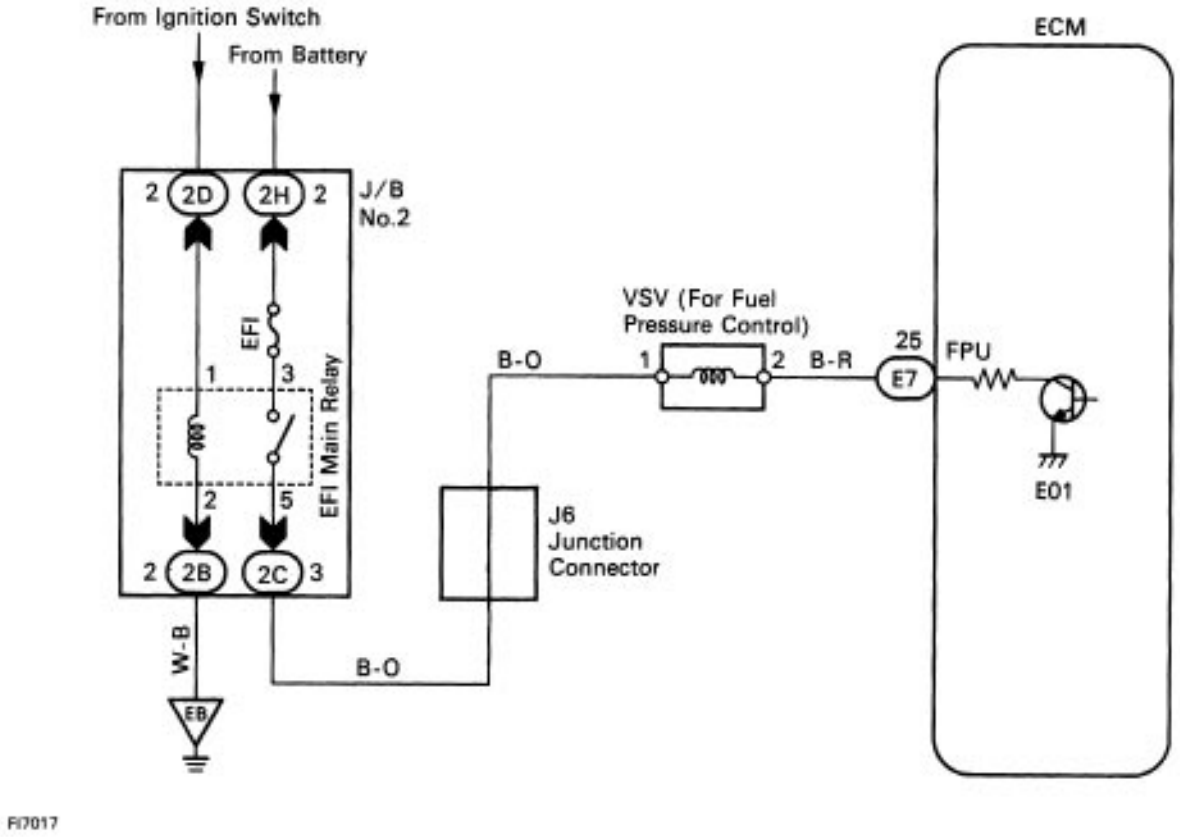
The ECM turns on a VSV (Vacuum Switching Valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temper–ature of the engine coolant is too high during engine starting.

The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.

Fuel pressure control ends approx. 120 sec. after the engine is started.



WIRING DIAGRAM



DIAGNOSTIC CHART
TOYOTA hand–held tester

1 Connect the TOYOTA hand–held tester and check operation of fuel pressure control VSV.

OK → Check and repair fuel pressure regulator.

NG

2 Check fuel pressure control VSV.

NG → Replace fuel pressure control VSV.

OK

3 Check for open and short in harness and connector between EFI main relay and ECM.

NG → Repair or replace harness or connector.

OK

Check and replace ECM.

OBDII scan tool (excluding TOYOTA hand–held tester)

1 Check fuel pressure control VSV.

NG → Replace fuel pressure control VSV.

OK

2 Check voltage between terminal FPU and body ground.

NG → Check and repair harness or connector.

OK

3 Check fuel pressure regulator.

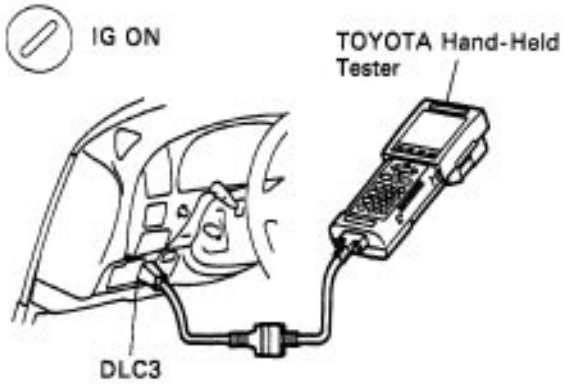
NG → Repair or replace.

OK

Check and replace ECM.

INSPECTION PROCEDURE
TOYOTA hand–held tester

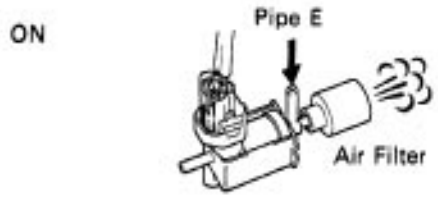
1	Connect the TOYOTA hand–held tester and check operation of fuel pressure control VSV.

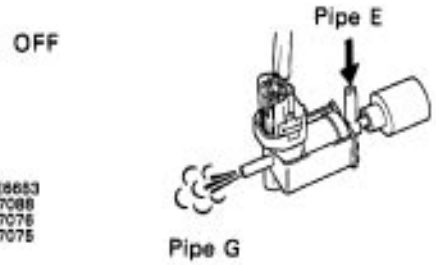


P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC 3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(4) Select the active test mode on the TOYOTA hand–held tester.

C Check operation of fuel pressure control VSV when fuel pressure control VSV is operated by the TOYOTA hand–held tester.

OK **Fuel pressure control VSV is ON:**
The air from pipe E is flowing out through the air filter.
Fuel pressure control VSV is OFF:
The air from pipe E is flowing out through pipe G.



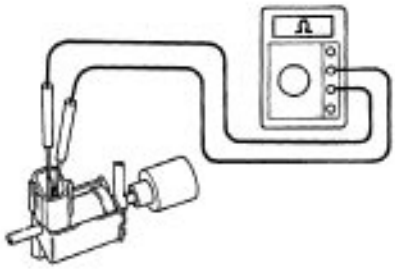


B16653
F17068
F17076
F17075

NG

OK → **Check and repair fuel pressure regulator (See page EG2–240).**

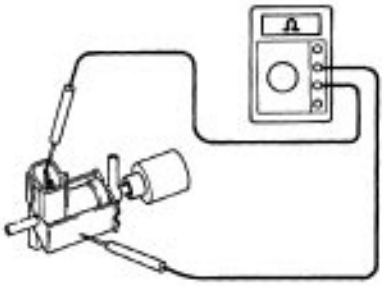
2 **Check fuel pressure control VSV.**

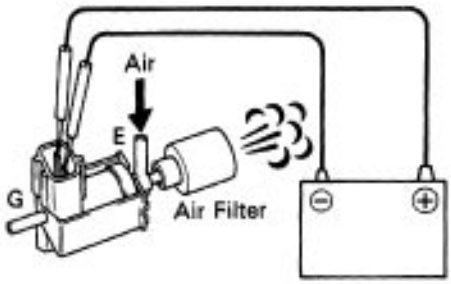


P (1) Remove fuel pressure control VSV.
(2) Disconnect fuel pressure control VSV connector.

C (1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

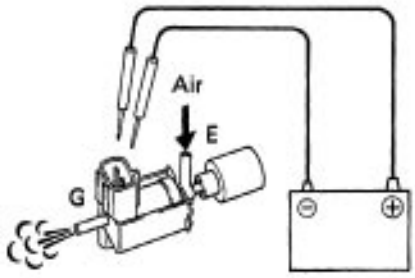
OK **(1) Resistance: 26 – 46Ω at 20°C (68°F)**
(2) Resistance: 1 MΩ or higher





C Check operation of fuel pressure control VSV when battery positive voltage is applied to the terminals of fuel pressure control VSV connector or not.

OK **Battery positive voltage is applied:**
The air from pipe E is flowing out through the air filter.
Battery positive voltage is not applied:
The air from pipe E is flowing out through pipe G.



EC2939
EC2940
EC2941
EC2942

OK

NG **Replace fuel pressure control VSV.**

3 **Check for open and short in harness and connector between EFI main relay and ECM (See page IN–31).**

OK

NG **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

INSPECTION PROCEDURE
OBDII scan tool (excluding TOYOTA hand–held tester)

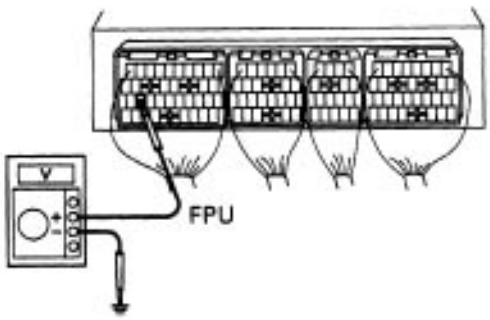
1 **Check fuel pressure control VSV (See page EG2–589, step**

OK

NG **Replace fuel pressure control VSV.**

2 **Check voltage between terminal FPU of ECM connector and body ground.**

IG ON



BE6653
FI702B

P (1) Remove glove compartment (See page EG2–309).
(2) Turn ignition switch ON.

C Measure voltage between terminal FPU of ECM connector and body ground.

OK **Voltage: 9 –14 V**

OK

NG **Check for open and short in harness and connector between EFI main relay and ECM (See page IN–31).**

3 **Check fuel pressure regulator (See page EG2–240).**

OK

NG **Repair or replace.**

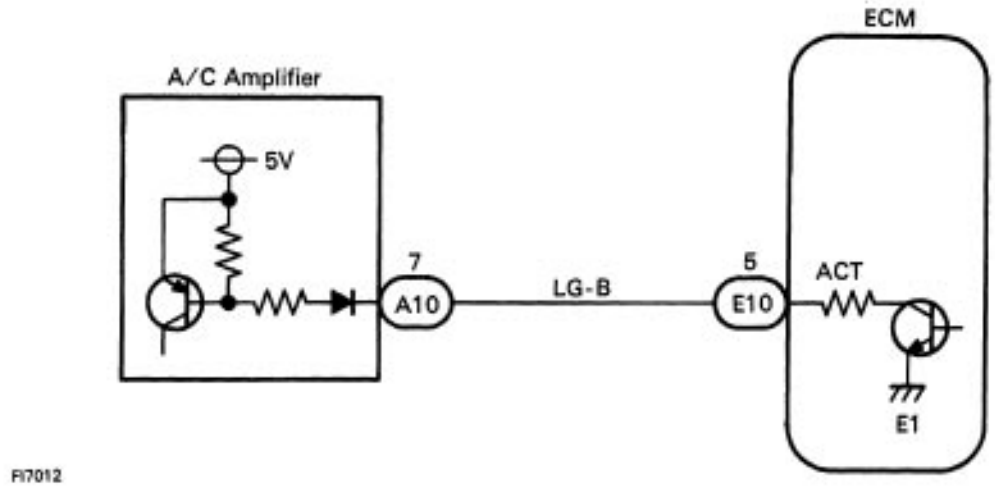
Check and replace ECM (See page IN–36).

AC Cut Control Circuit

CIRCUIT DESCRIPTION

This circuit cuts air conditioning operation during vehicle acceleration in order to increase acceleration performance. During acceleration with the vehicle speed at 25 km/h (16 mph) or less, engine speed at 1,600 rpm or less and throttle valve opening angle at 60®or more, the A/C magnet switch is turned OFF for several seconds.

WIRING DIAGRAM



DIAGNOSTIC CHART
TOYOTA hand–held tester

1	Connect the TOYOTA hand–held tester and check operation of air conditioning cut control.	OK	Proceed to next circuit inspection shown on matrix chart.

NG

2	Check for open and short in harness and connector between ECM and A/C amplifier.	NG	Repair or replace harness or connector.

OK

3	Check voltage terminal ACT.	NG	Check and replace A/C amplifier.

OK

Check and replace ECM.

OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check voltage terminal ACT.	OK	Check and replace ECM.

NG

2	Check for open and short in harness and connector between ECM and A/C amplifier.	NG	Repair or replace harness or connector.

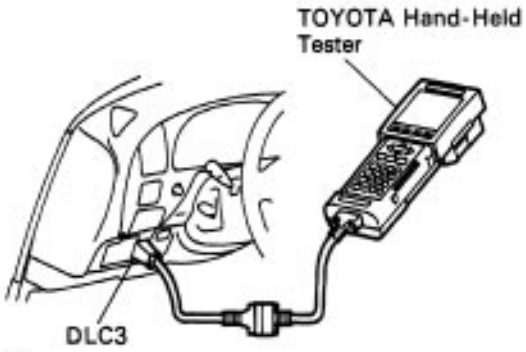
OK

Check and replace A/C amplifier.

INSPECTION PROCEDURE
TOYOTA hand–held tester

1 **Connect the TOYOTA hand–held tester and check operation of air conditioning cut control.**

IG ON



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the DLC3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(4) Start the engine and air conditioning switch ON.
HINT: A/C magnet clutch is turned ON.
(5) Select the active test mode on the TOYOTA hand–held tester.

C Check operation of A/C magnet clutch cut when air conditioning cut control is operated by the TOYOTA hand–held tester.

OK **A/C magnet clutch is turned OFF.**

NG

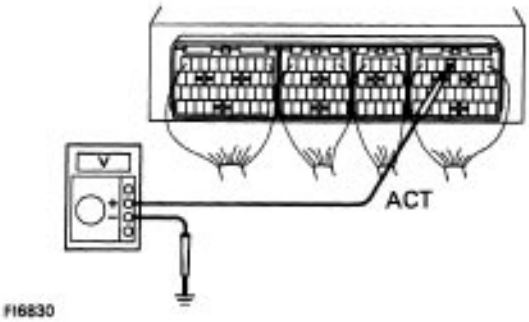
OK → **Proceed to next circuit inspection shown on matrix chart (See page EG2–435).**

2 **Check for open and short in harness and connector between ECM and A/C amplifier (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

3 **Check voltage between terminal ACT of ECM and body ground.**



P (1) Remove glove compartment (See page EG2–309).
(2) Start the engine.

C Measure voltage between terminal ACT of ECM connector and body ground when A/C switch is turned to ON and OFF.

OK

A/C switch condition	Voltage
ON	4.5 – 5.5 V
OFF	0 –2 V

OK

NG → **Check and replace A/C amplifier.**

Check and replace ECM (See page IN–36).

INSPECTION PROCEDURE
OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check voltage between terminal ACT of ECM and body ground (See page EG2–593, step 3).

NG → OK: Check and replace ECM (See page IN–36).

2	Check for open and short in harness and connector between ECM and A/C amplifier (See page IN–31).

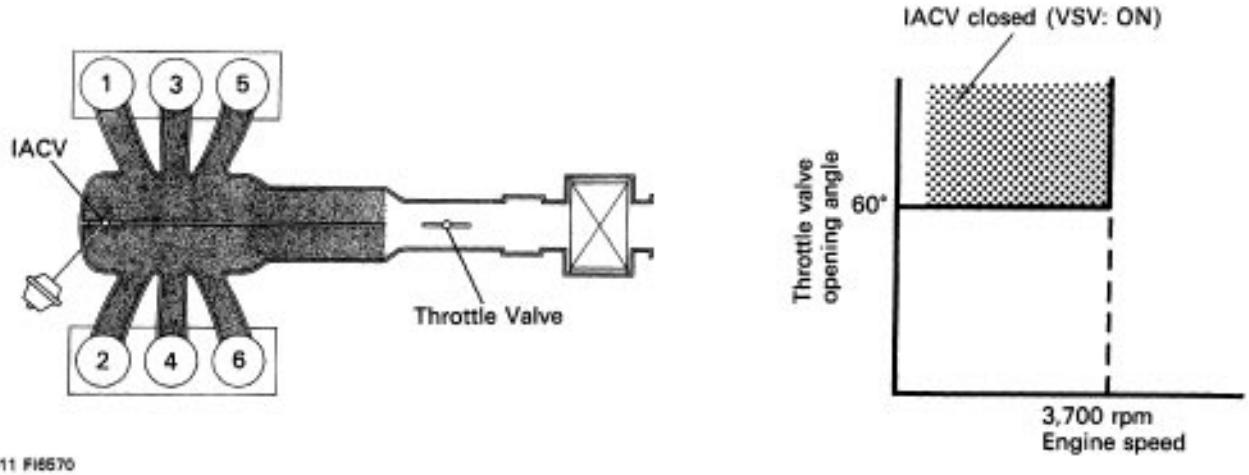
OK → NG: Repair or replace harness or connector.

OK: Check and replace A/C amplifier.

IACV Control VSV Circuit

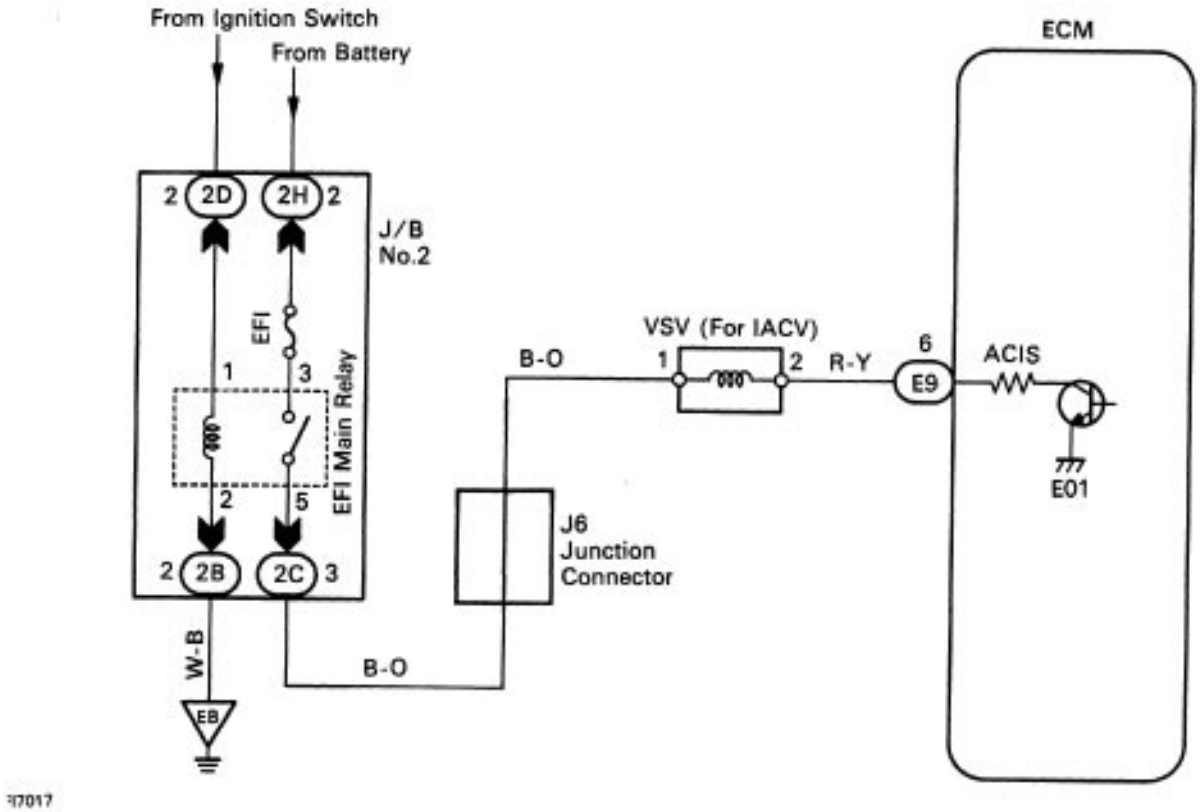
CIRCUIT DESCRIPTION

This circuit opens and closes the IACV (Intake Air Control Valve) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).
When the engine speed is 3,700 rpm or less and the throttle valve opening angle is 60®or more, the ECM turns the VSV ON and closes the IACV. At all other times, the VSV is OFF, so the IACV is open.



FI7011 FI6570

WIRING DIAGRAM



FI7017

DIAGNOSTIC CHART
TOYOTA hand–held tester

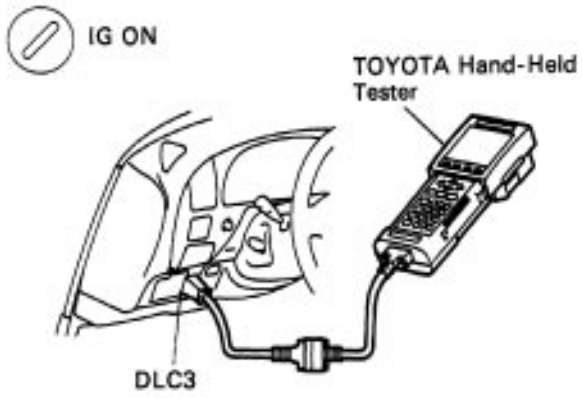
1	Connect the TOYOTA hand–held tester and check operation of IACV control VSV.	OK	Check for vacuum tank.
NG			
2	Check IACV control VSV.	NG	Replace IACV control VSV.
OK			
3	Check for open and short in harness and connector between EFI main relay and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			

OBDII scan tool (excluding TOYOTA hand–held tester)

1	Check IACV control VSV.	NG	Replace IACV control VSV.
OK			
2	Check voltage between terminal ACIS and body ground.	NG	Check and repair harness or connector.
OK			
3	Check vacuum tank.	NG	Repair or replace.
OK			
Check and replace ECM.			

INSPECTION PROCEDURE
TOYOTA hand–held tester

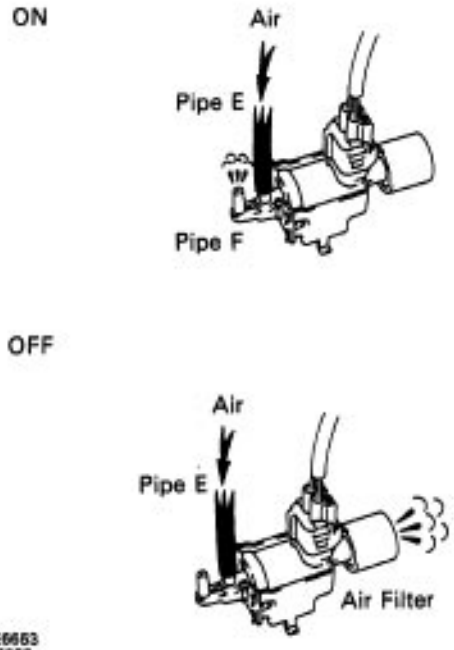
1 **Connect the TOYOTA hand–held tester and check operation of IACV control VSV.**



P (1) Remove the fuse cover on the instrument panel.
(2) Connect the TOYOTA hand–held tester to the D LC3.
(3) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(4) Select the active test mode on the TOYOTA hand–held tester.

C Check operation of IACV control VSV when IACV control VSV is operated by TOYOTA hand–held tester.

OK **IACV control VSV is ON:**
The air from port E is flowing out through port F.
IACV control VSV is OFF:
The air from port E is flowing through the air filter.

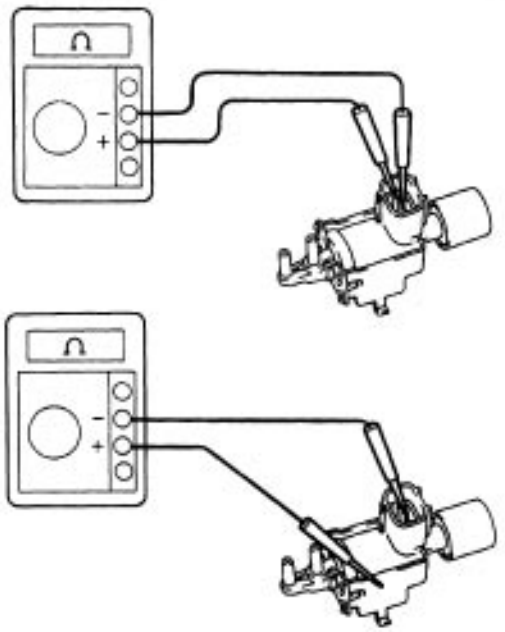


BE6663
FI7088
FI7073
FI7074

NG

OK **Check for vacuum tank (See page EG2–277).**

2 **Check IACV control VSV.**



P
(1) Remove IACV control VSV.
(2) Disconnect IACV control VSV connector.

C
(1) Measure resistance between terminals.
(2) Measure resistance between each terminal and the body.

OK
(1) Resistance: 26 – 46Ω at 20°C (68°F)
(2) Resistance: 1 MΩ or higher.

C
Check operation of IACV control VSV when battery positive voltage is applied to the terminals of IACV control VSV connector or not.

OK
Battery positive voltage is applied:
The air from pipe E is following out through pipe F.
Battery positive voltage is not applied:
The air from pipe E is flowing out through the air filter.

OK

NG → **Replace IACV control VSV.**

3 **Check for open and short in harness and connector between EFI main relay and ECM (See page IN–31).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM (See page IN–36).

INSPECTION PROCEDURE
OBDII scan tool (excluding TOYOTA hand–held tester)

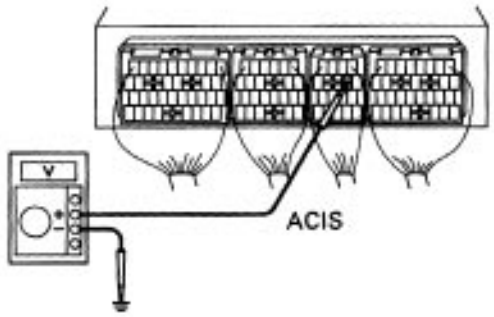
1 **Check IACV control VSV (See page EG2–598, step 2)**

OK

NG → **Replace IACV control VSV.**

2 **Check voltage between terminal ACIS of ECM connector and body ground.**

IG ON



BE6653
FI7026

P (1) Remove glove compartment
(See page EG2–309).
(2) Turn ignition switch ON.

C Measure voltage between terminal ACIS of ECM connector and body ground.

OK **Voltage: 9 –14 V**

OK

NG → **Check for open and short in harness and connector between EFI main relay and ECM (Seepage IN–31).**

3 **Check for vacuum tank (See page EG2–277).**

OK

NG → **Repair or replace.**

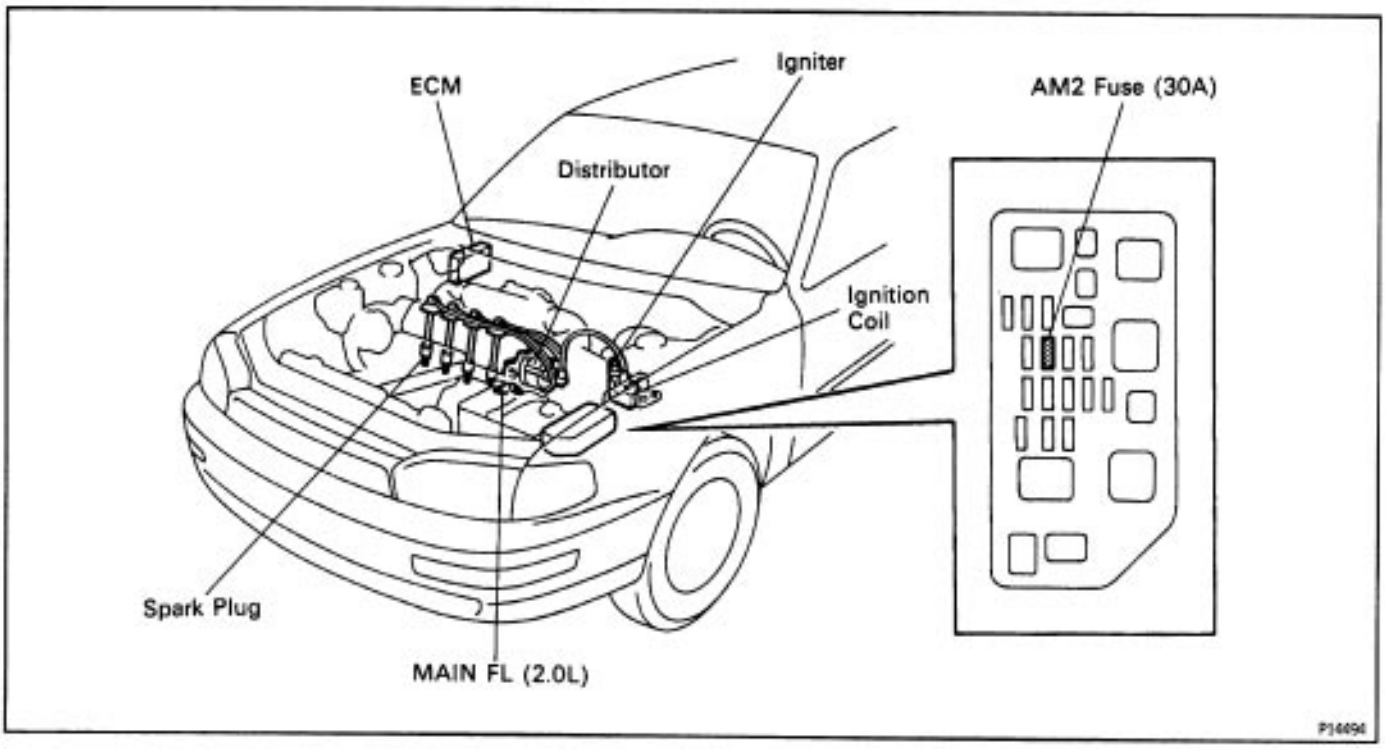
Check and replace ECM (See page IN–36).

IGNITION SYSTEM

(5S–FE California)

DESCRIPTION

The engine control module (ECM) is programmed with data for optimum ignition timing unndr all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine temperature, etc.), the ECM triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

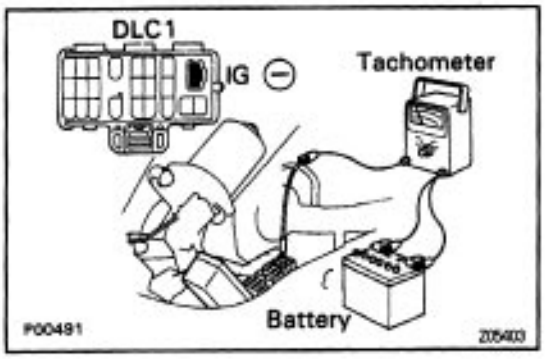
This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

PICKUP COILS

The NE coil detects the crankshaft angle, and the G 1 and G2 coils detect the camshaft position.

PRECAUTION

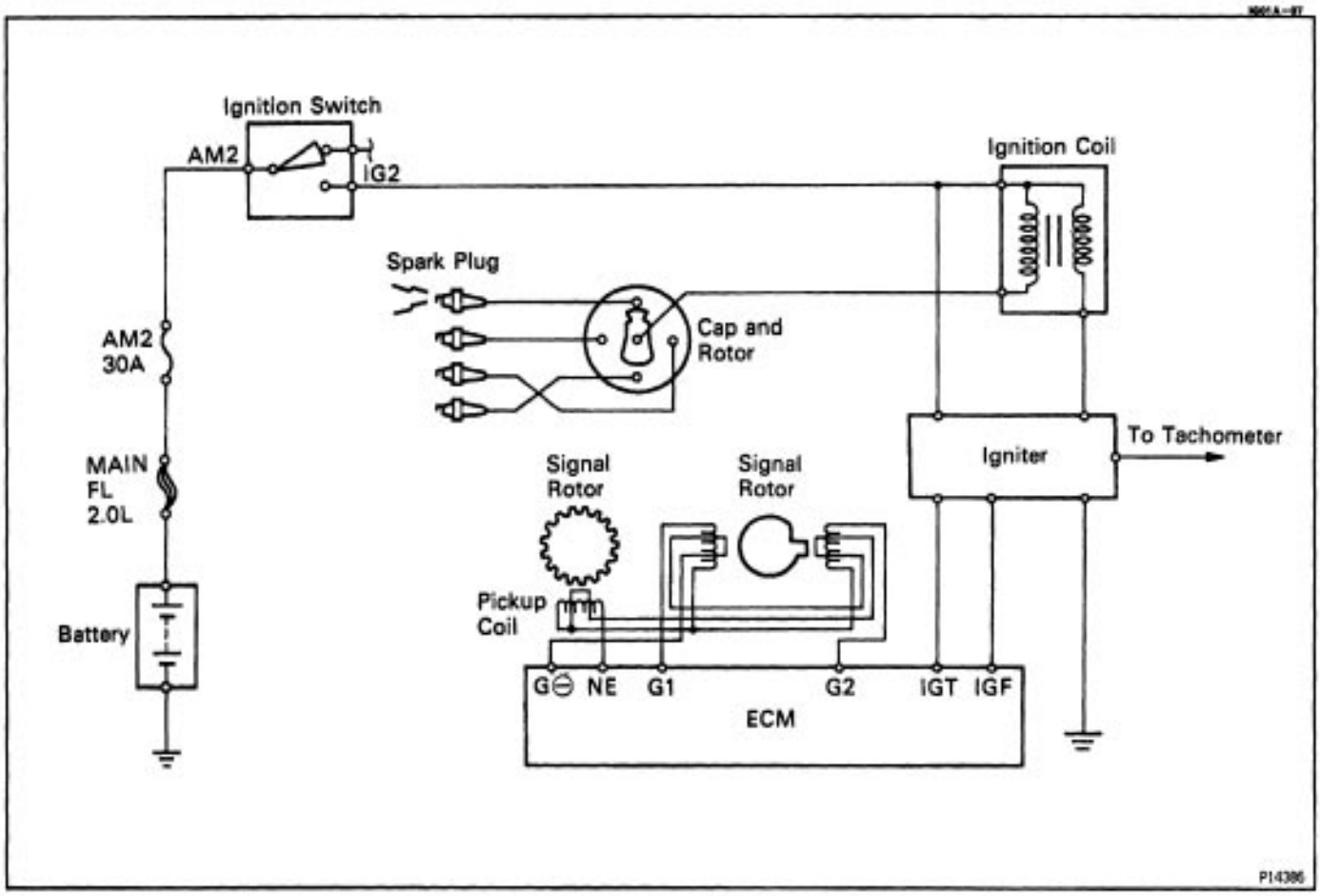
1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



2. With a tachometer connected to the system, connect the tester probe of the tachometer to terminal IG(–) of the data link connector 1.

3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.
4. Never allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
   Do not disconnect the battery while the engine is running.
6. Check that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09240–00020 Wire Gauge Set	Air gap
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

ON–VEHICLE INSPECTION

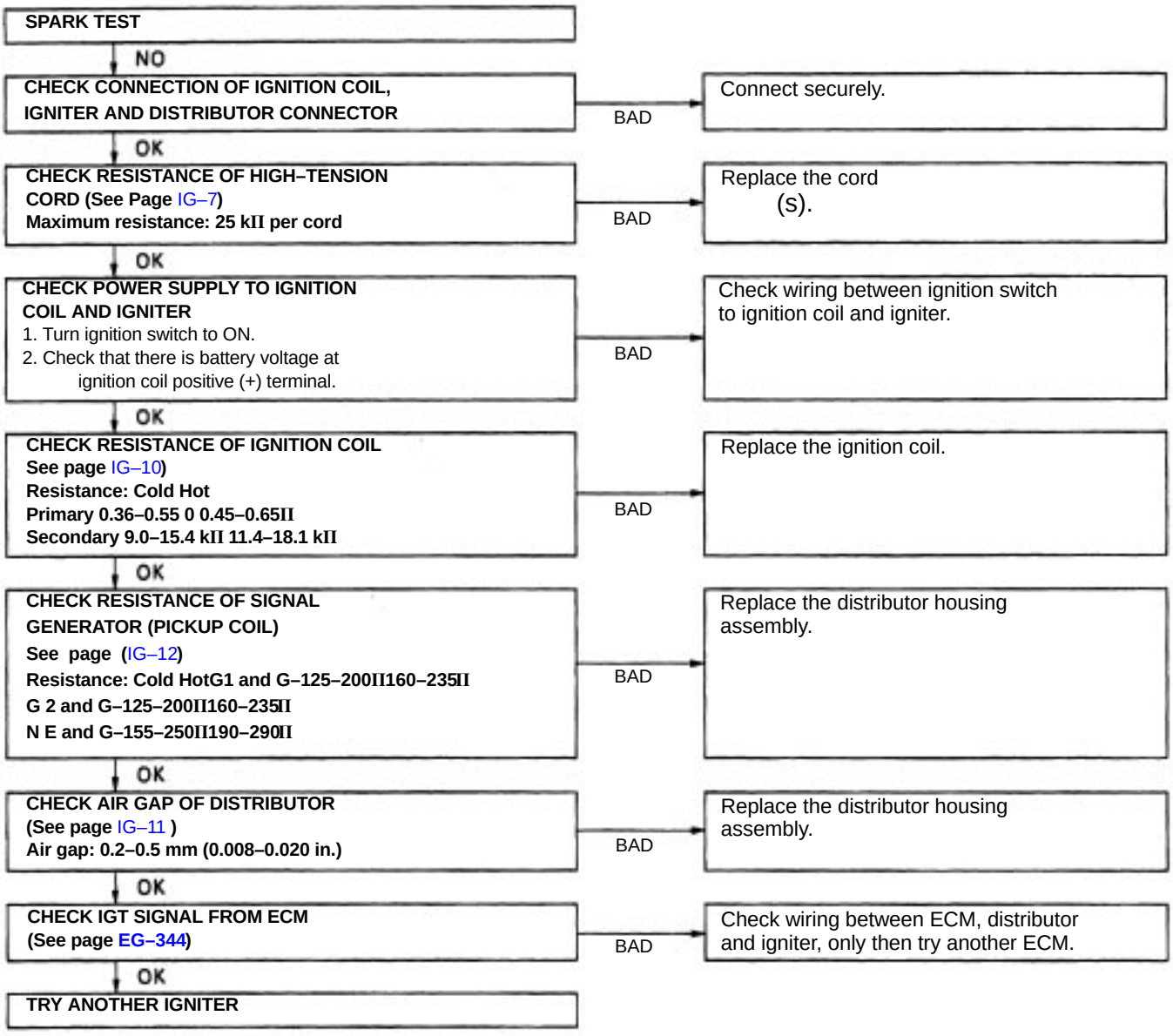
SPARK TEST

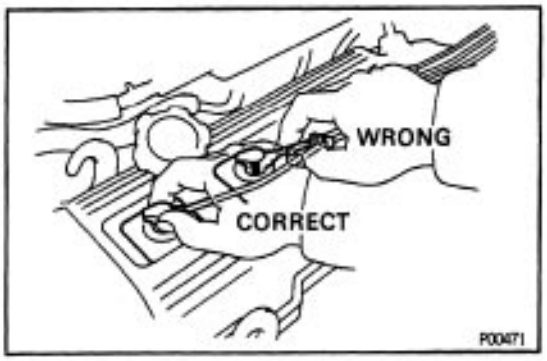
CHECK THAT SPARK OCCURS

(a) Disconnect the high–tension cord (from the ignition coil) from the distributor cap.
(b) Hold the end approx. 12.5 mm (0.50 in.) from the body ground.
(c) See if spark occurs while engine is being cranked.

HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1–2 seconds at time.

If the spark does not occur, perform the test as fol–lows:





HIGH–TENSION CORDS INSPECTION

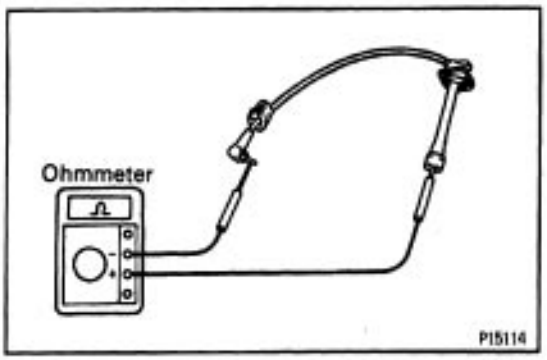
1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

Disconnect the high–tension cords at the rubber boot. Do not pull on the high–tension cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

2. DISCONNECT HIGH–TENSION CORD FROM IGNITION COIL

3. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP



4. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

25 kΩ per cord .

If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord.

6. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

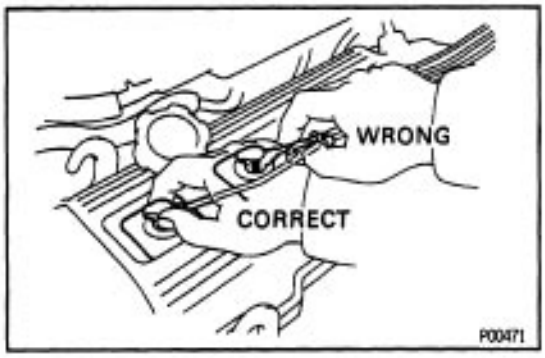
6. RECONNECT HIGH–TENSION CORD TO IGNITION COIL

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

SPARK PLUGS INSPECTION

NOTICE:

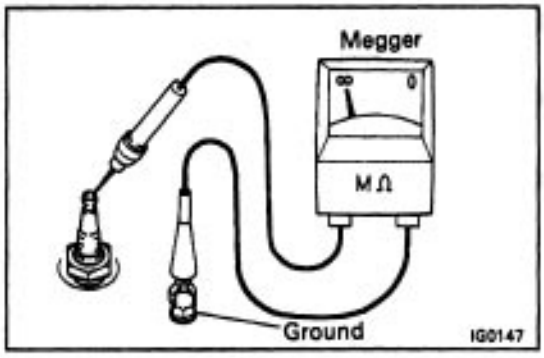
- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on a used spark plug.**
- **Spark plugs should be replaced every 100.000 km (60.000 miles).**



1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

Disconnect the high–tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



2. INSPECT ELECTRODE

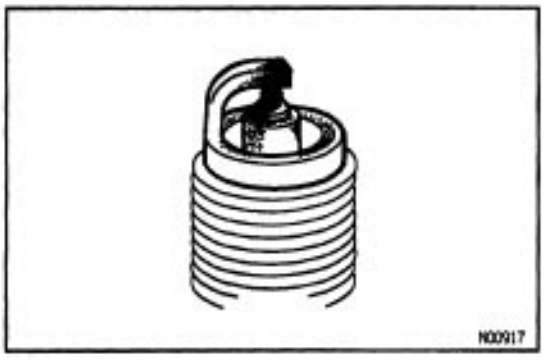
Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:

10 MII or more

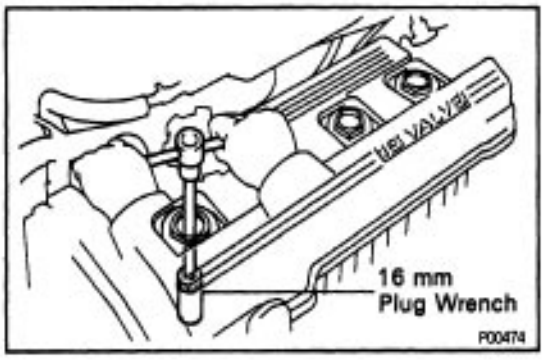
If the resistance is less than specified, proceed to step 4.

HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.



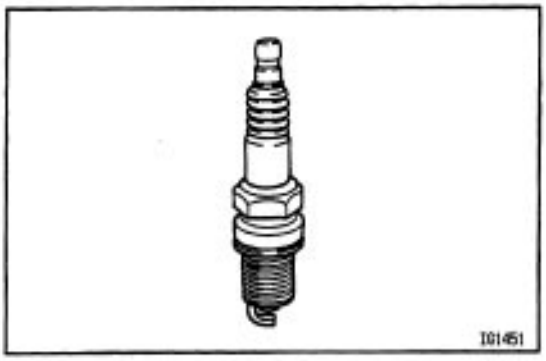
Simple Method:

(a) Quickly race the engine to 4,000 rpm 5 times.
(b) Remove the spark plug. (See step 4)
(c) Visually check the spark plug.
If the electrode is dry ... OK
If the electrode is wet ... Proceed to step 5
(d) Reinstall the spark plug. (See step 8)



3. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the 4 spark plugs.



4. VISUALLY INSPECT SPARK PLUGS

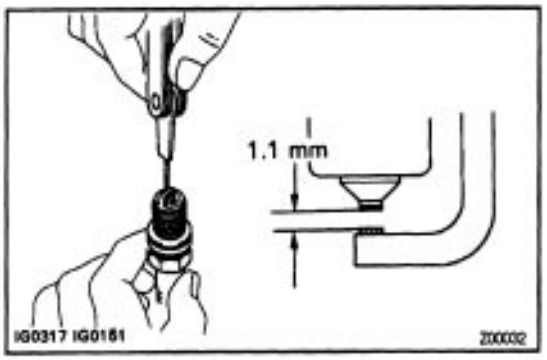
Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

PK20R11 for ND

BKR6EP11 for NGK



5. INSPECT ELECTRODE GAP

Maximum electrode gap for used spark plug:

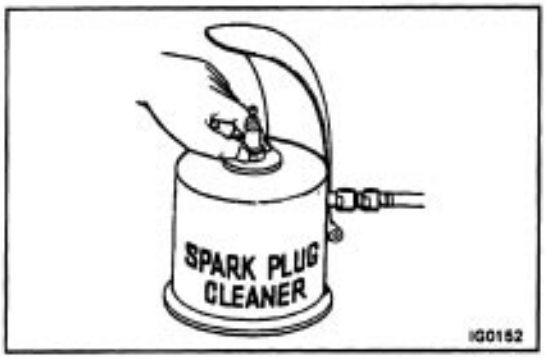
1.3 mm (0.051 In.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for new spark plug:

1.1 m m (0.043 in.)

NOTICE: if adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



6. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

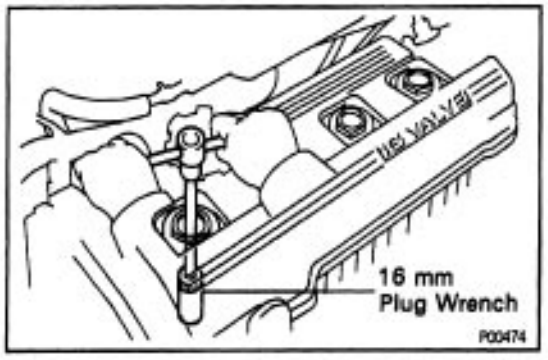
Air pressure:

Below 588 kPa (6 kgf/cm2, 85 psi)

Duration:

20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



7. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the 4 spark plugs.

Torque: 18 N–m (180 k9f–cm. 13 ft–lbf)

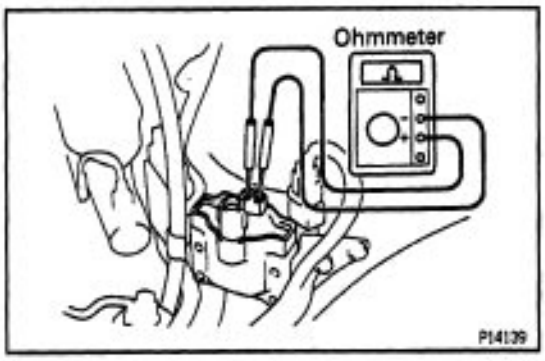
8. RECONNECT HIGH–TENSION CORDS T4 SPARK PLUGS

IGNITION COIL INSPECTION

NOTICE: 'Cold' and 'Hot' in the following sentences express the temperature of the coils themselves. 'Cold' is from–10°C (14°F) to 50°C (122°F) and 'Hot' is from 60°C (122" F) to 100°C (212°F).

1. DISCONNECT IGNITION COIL CONNECTOR

2. DISCONNECT HIGH–TENSION CORD FROM IGNITION COIL



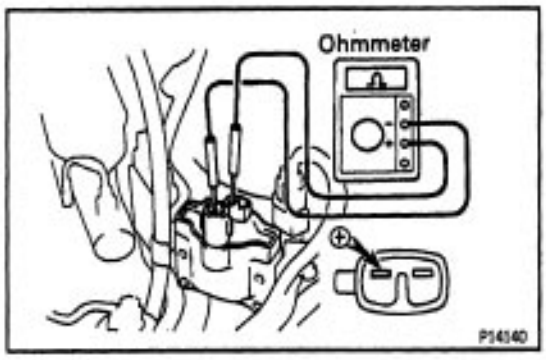
3. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

Primary coil resistance (Cold):
0.36–0.55Ω

Primary coil resistance (Hot):
0.45–O.65Ω

If the resistance is not as specified, replace the ignition coil.



4. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and high–tension terminals.

Secondary coil resistance (Cold):
9.0–15.4 kΩ

Secondary coil resistance (Hot):
11.4–18.1 kΩ

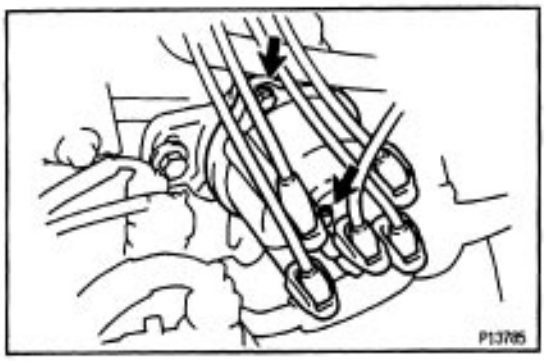
If the resistance is not as specified, replace the ignition coil.

6. RECONNECT HIGH–TENSION CORD TO IGNITION COIL

6. RECONNECT IGNITION COIL CONNECTOR

DISTRIBUTOR INSPECTION

NOTICE: 'Cold' and "Hot' in the following sentences express the temperature of the coils themselves. 'Cold' is from–10°C (14°F) to 50°C (122°F) and 'Hot' is from 50°C (122°F) to 100°C (212°F).

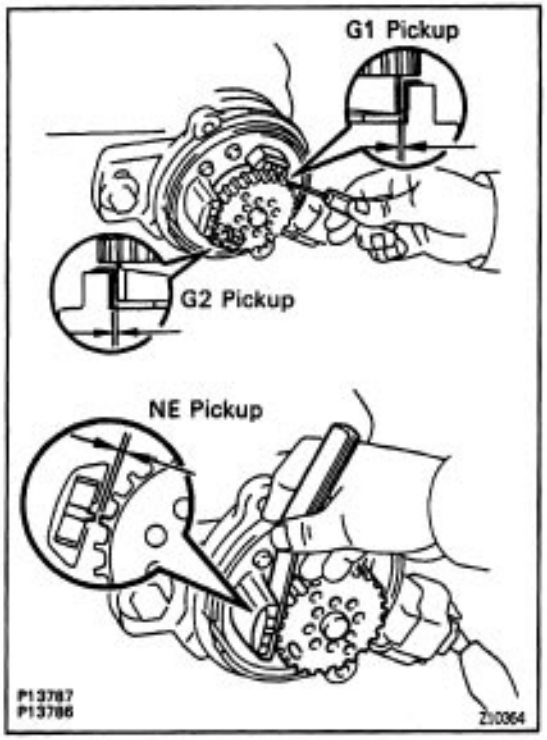


1. REMOVE DISTRIBUTOR CAP

Remove the 2 bolts, and disconnect the distributor cap from the distributor housing.

2. REMOVE ROTOR

3. REMOVE DUSTPROOF COVER



4. INSPECT AIR GAP

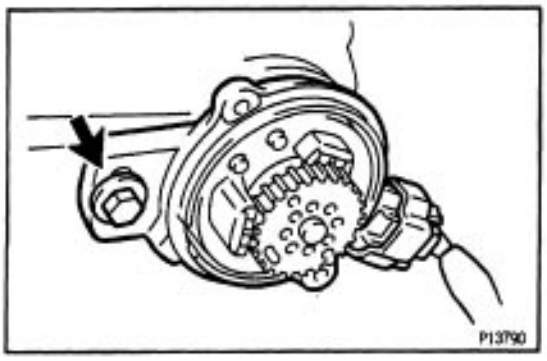
Using SST (G1 and G2 pickups) and a feeler gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.

SST 09240–00020 for G 1 and G2 pickups

Air gap:

0.2–0.5 mm (0.008–0.020 in.)

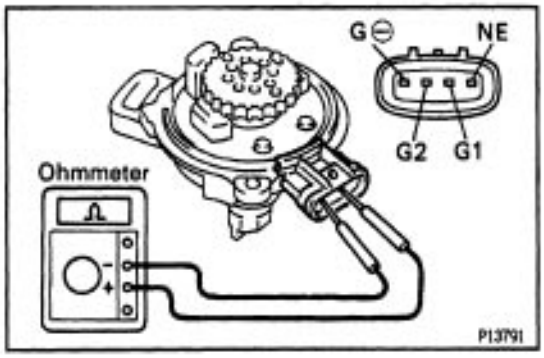
If the air gap is not as specified, replace the distributor housing assembly.



6. DISCONNECT DISTRIBUTOR CONNECTOR

6. REMOVE DISTRIBUTOR HOUSING ASSEMBLY

Remove the bolt, pull out the distributor housing.



7. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

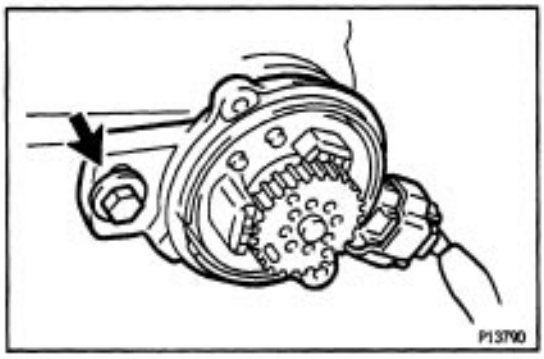
Pickup coil resistance (Cold):

G1 and GE)
125–200Ω
G2 and G(–)
125–200Ω
NE and G(–)
155–2500

Pickup coil resistance (Hot):

G 1 and G(–)
160–235Ω
G2 and G(–)
160–235Ω
NE and G(–)
190–290Ω

If the resistance is not as specified, replace the distributor housing assembly.

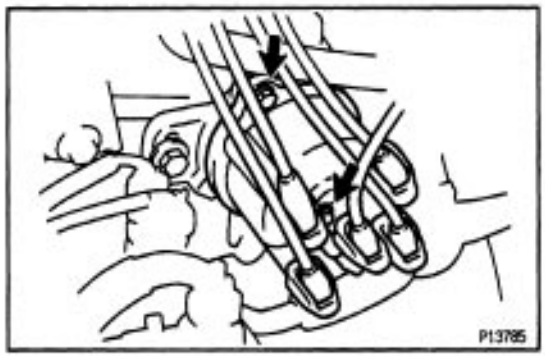


8. REINSTALL DISTRIBUTOR HOUSING ASSEMBLY
(See steps 1 and 2 on pages IG–17 and 18)

9. RECONNECT DISTRIBUTOR CONNECTOR

10. REINSTALL DUSTPROOF COVER

11. REINSTALL ROTOR



12. REINSTALL DISTRIBUTOR CAP

Install a new packing and distributor cap with the 2 bolts.

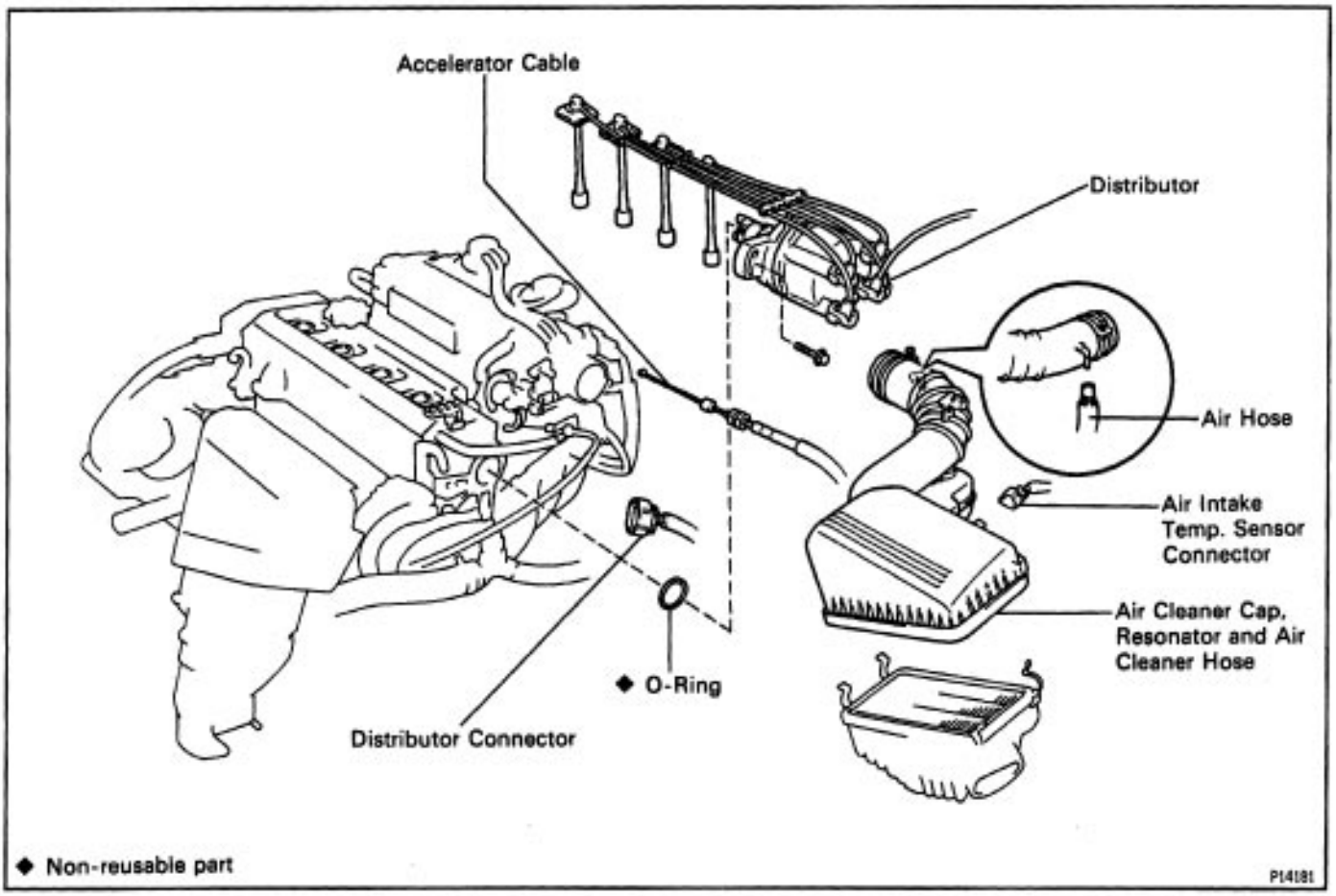
13. ADJUST IGNITION TIMING
(See page IG–19)

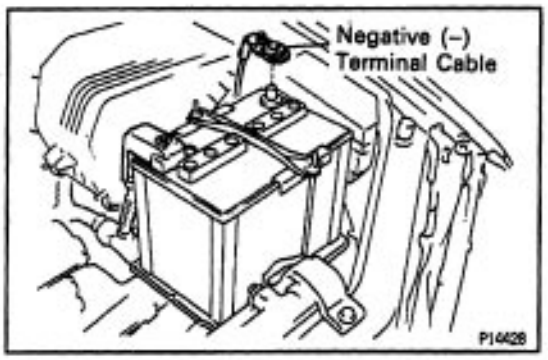
IGNITER INSPECTION

(See Spark Test procedure on page IG–6)

DISTRIBUTOR

COMPONENTS FOR REMOVAL AND INSTALLATION





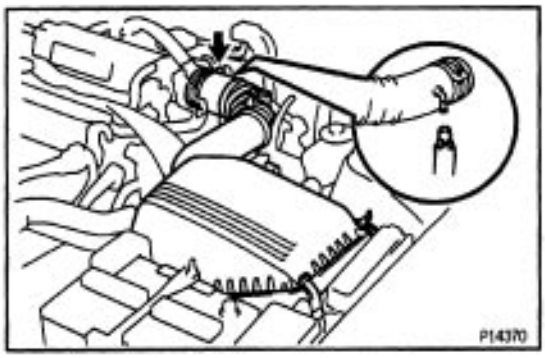
DISTRIBUTOR REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch Is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nacted from the battery.

2. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

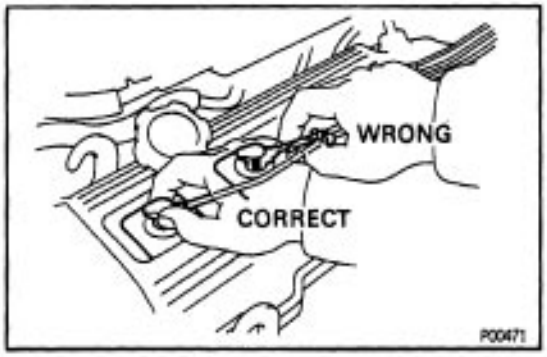


3. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

(a) Disconnect the intake air temperature sensor connector.
(b) Disconnect the air hose from the air cleaner hose.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the 4 air cleaner cap clips.
(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

4. DISCONNECT DISTRIBUTOR CONNECTOR

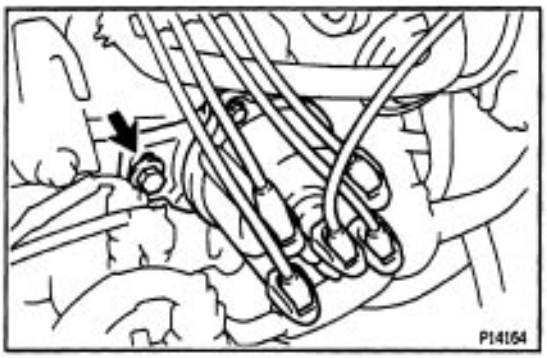
5. DISCONNECT NIGH–TENSION CORD FROM IGNITION COIL



6. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

(a) Disconnect the high–tension cords from the cord clamps.
(b) Disconnect the 4 high–tension cords from the spark plugs.
Disconnect the high–tension cords at the rubber boot. Do not pull on the high–tension cords.

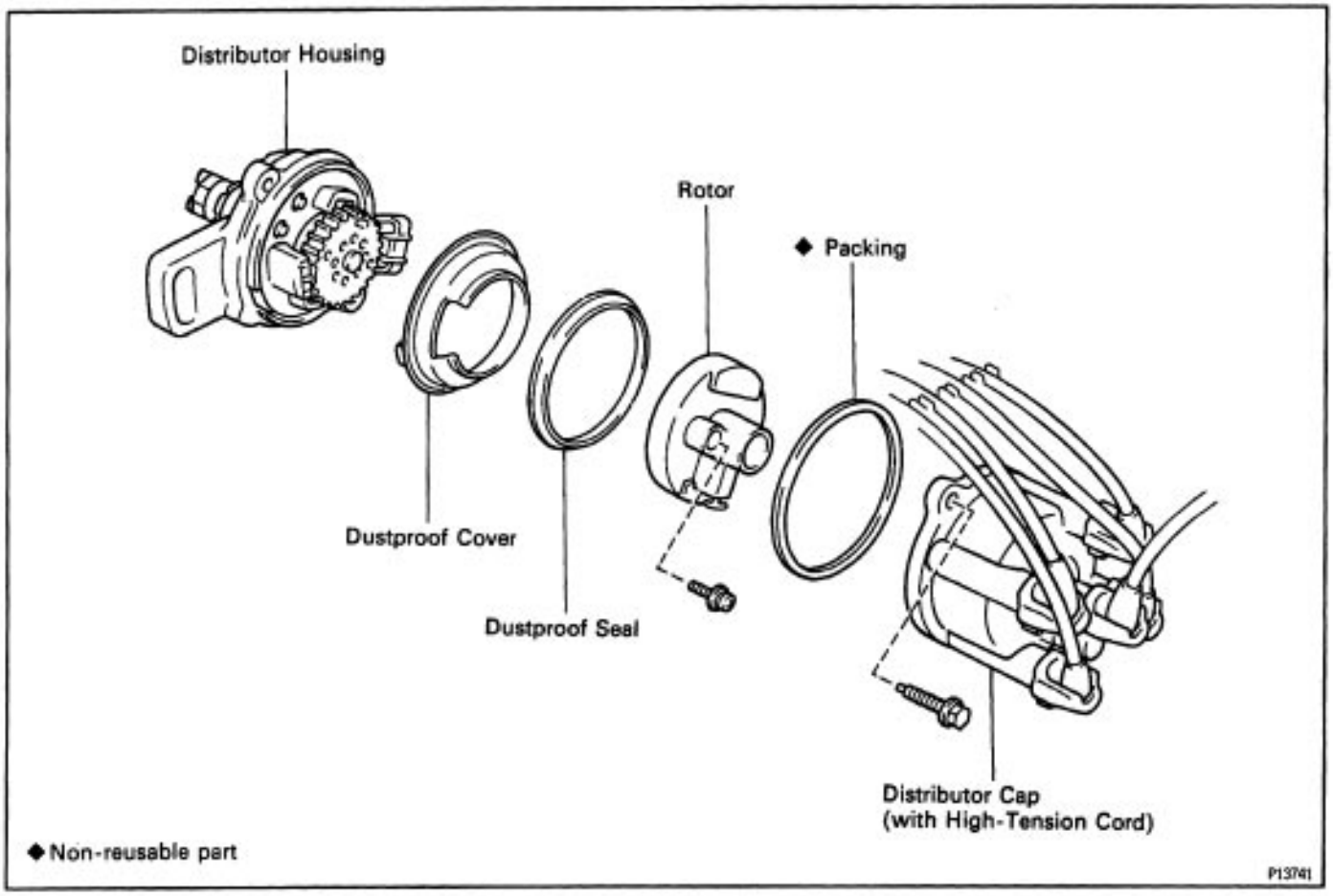
NOTICE: Pulling on or bending the cords may damage the conductor Inside.

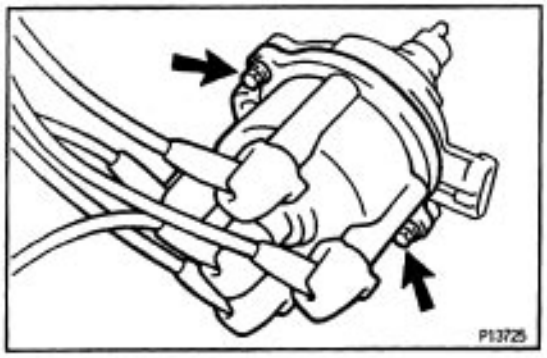


7. REMOVE DISTRIBUTOR

(a) Remove the hold–down bolt, and pull out the distributor.
(b) Remove the 0–ring from the distributor housing.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



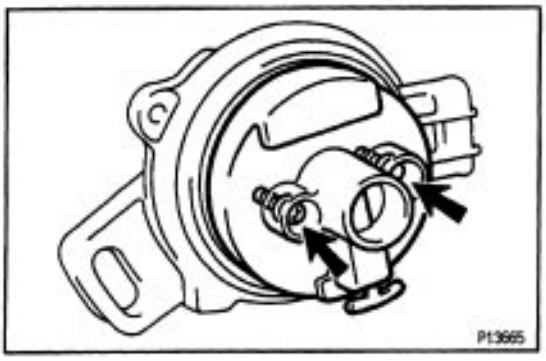


DISTRIBUTOR DISASSEMBLY

(See Components for Disassembly and Assembly)

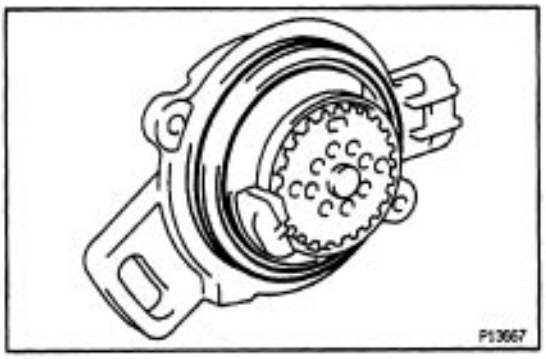
1. REMOVE DISTRIBUTOR CAP

Remove the 2 bolts, distributor cap and packing.



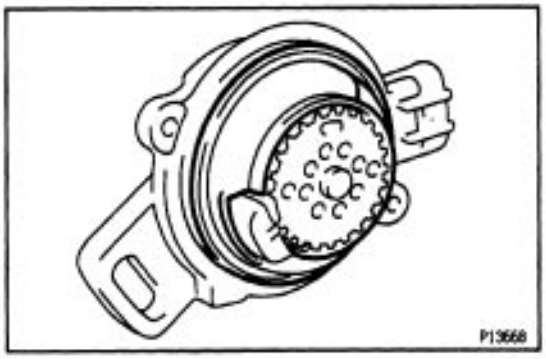
2.REMOVE ROTOR

Remove the 2 screws and rotor.

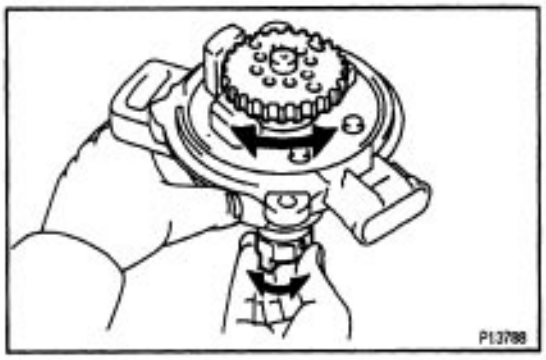


3. REMOVE DUST PROOF COVER

(a) Remove the dust proof seal.



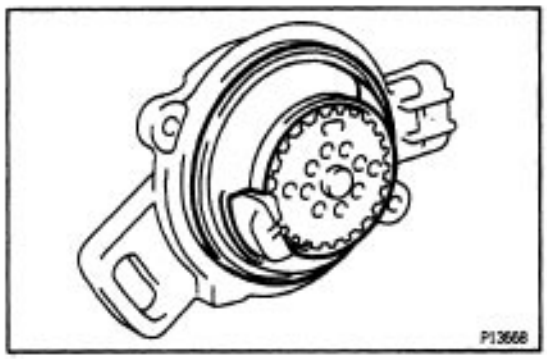
(b) Remove the dust proof cover.



DISTRIBUTOR INSPECTION

INSPECT SHAFT

Turn the shaft and check that it is not rough or worn. If it feels rough or worn, replace the distributor housing assembly.

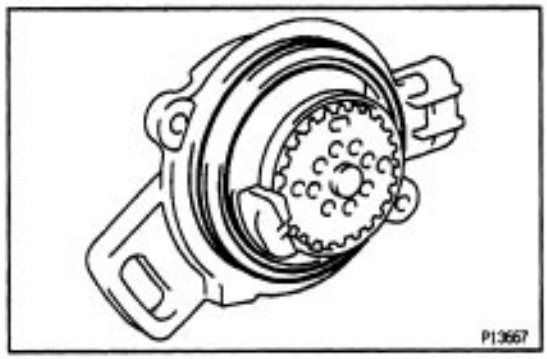


DISTRIBUTOR ASSEMBLY

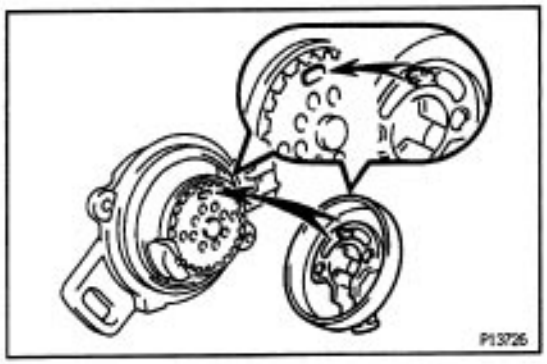
(See Components for Disassembly and Assembly)

1. INSTALL DUST PROOF COVER

(a) Install the dust proof cover.

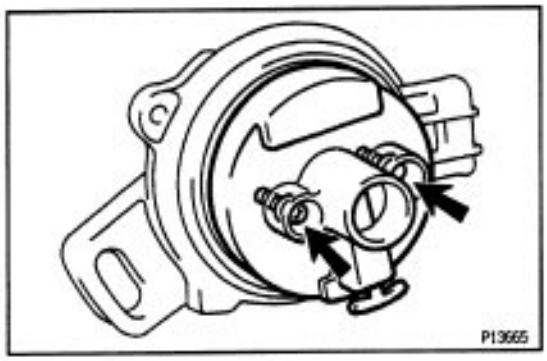


(b) Install the dust proof.seal.

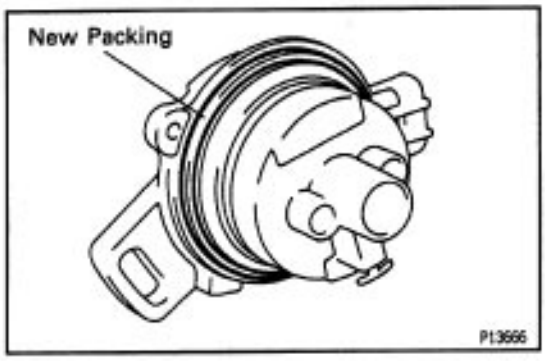


2. INSTALL ROTOR

(a) Align the hollow of the signal rotor with the protrusion of the rotor.

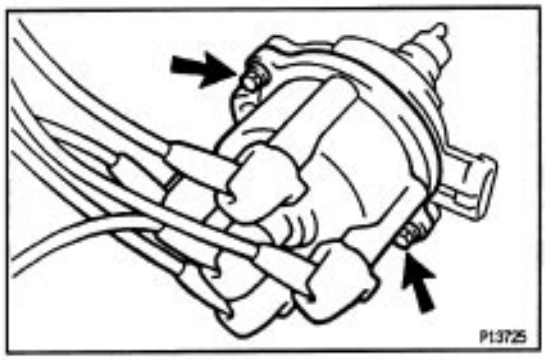


(b) Install the rotor with the 2 screws.



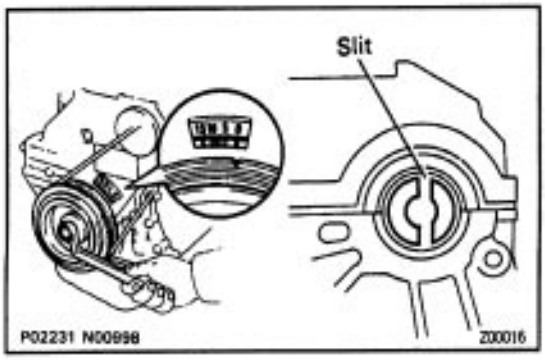
3. INSTALL DISTRIBUTOR CAP

(a) Install a new packing to the distributor housing.



(b) Install the distributor cap with the 2 bolts.

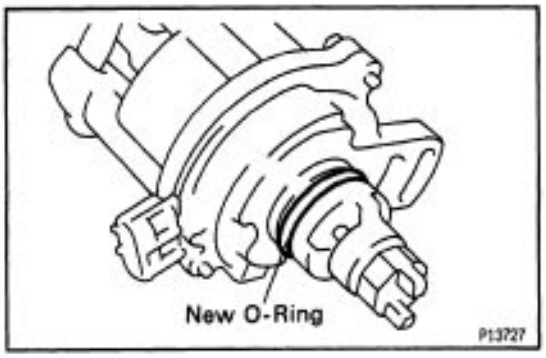
DISTRIBUTOR INSTALLATION



(See Components for Removal and Installation)

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

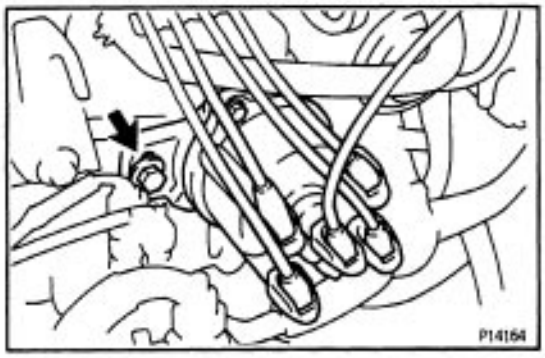
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown in the illustration.



2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the housing.
(b) Apply a light coat of engine oil on the 0–ring.

(c) Align the cutout of the coupling with the line of the housing.
(d) Insert the distributor, aligning the center of the flange with that of bolt hole on the cylinder head.



(e) Lightly tighten the hold–down bolt.
(f) Connect the high–tension cords to the clamp on the cylinder head cover.

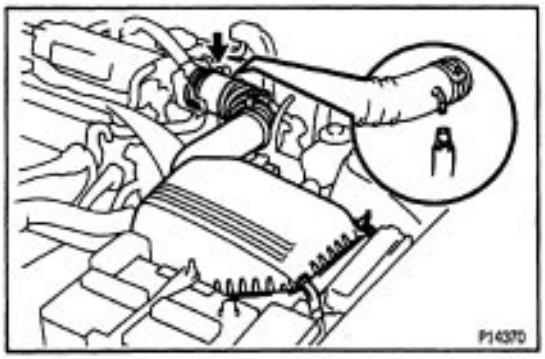
3. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS

Firing order:

1–3–4–2

4. CONNECT HIGH–TENSION CORD TO IGNITION COIL

5. CONNECT DISTRIBUTOR CONNECTOR



6. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

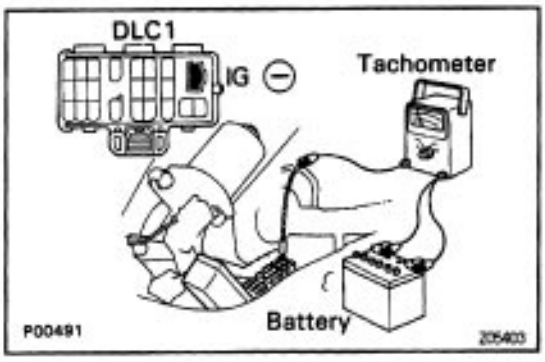
(a) Connect the air cleaner hose to the throttle body.
(b) Install the air cleaner cap together with the resonator and air cleaner hose.
(c) Connect the air hose to the air cleaner hose.
(d) Connect the intake air temperature sensor connector.

7. CONNECT AND ADJUST ACCELERATOR CABLE

8. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

9. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

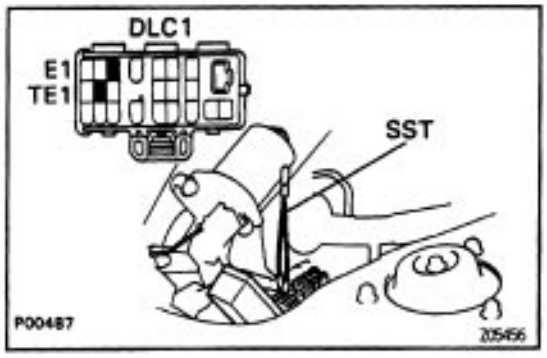


10. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the test probe of a tachometer to terminal IGE) of the data link connector 1.

NOTICE:

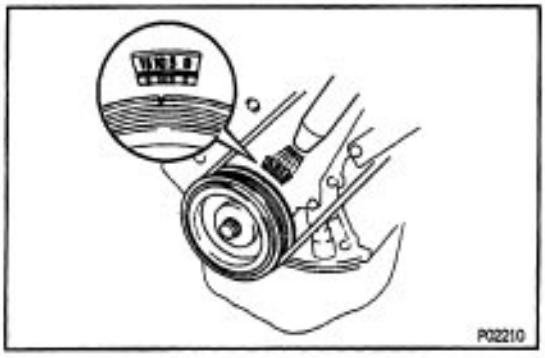
- **NEVER allow the tachometer terminal to touch ground as It could result In damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use. .**



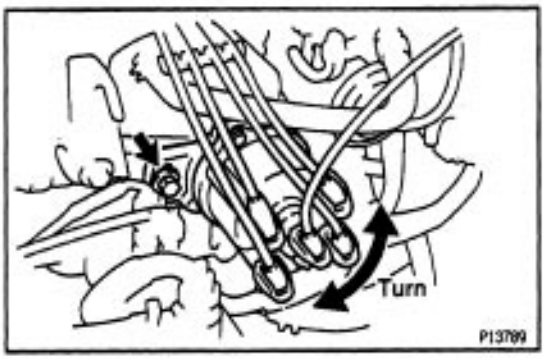
11. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the data link connector 1.
SST 09843–18020

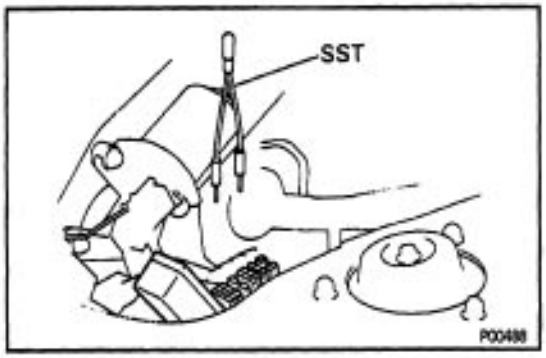
HINT: After engine speed is kept at 1,000–1,300 rpm for 5 seconds, check that it returns to idle speed.



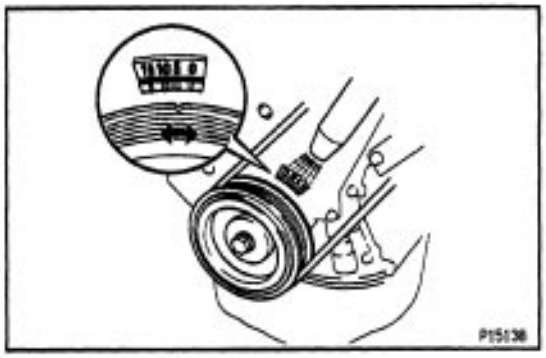
(b) Using a timing light, check the ignition timing.
Ignition timing:
10®BTDC 0 idle
(Transmission in neutral position)



(c) Loosen the hold–down bolt, and adjust by turning the distributor.
(d) Tighten the hold–down bolt, and recheck the ignition timing.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Remove the SST.
SST 09843–18020



12. FURTHER CHECK IGNITION TIMING
Ignition timing:
0–10®BTDC 0 idle
(Transmission in neutral position)
HINT: The timing mark moves in a range between 0® and 10®.

13. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

SERVICE DATA

Ignition timing	w/ Terminals TE1 and E1 connected of DLC1		10° BTDC @ idle
Firing order	–		1 – 3 – 4 – 2
High–tension cord	Resistance	Limit	25 kΩ per cord
Spark plug	Recommended spark plug	ND	PK20R11
		NGK	BKR6EP11
	Correct electrode gap		1.1 mm (0.043 in.)
Ignition coil	Primary coil resistance	at cold	0.36 – 0.55 Ω
		at hot	0.45 – 0.65 Ω
	Secondary coil resistance	at cold	9.0 – 15.4 kΩ
		at hot	11.4 – 18.1 kΩ
Distributor	Air gap		0.2 – 0.5 mm (0.008 – 0.020 in.)
	Pickup coil resistance	at cold G1 – G⊖	125 – 200 Ω
		G2 – G⊖	125 – 200 Ω
		NE – G⊖	155 – 250 Ω
		at hot G1 – G⊖	160 – 235 Ω
		G2 – G⊖	160 – 235 Ω
		NE – G⊖	190 – 290 Ω

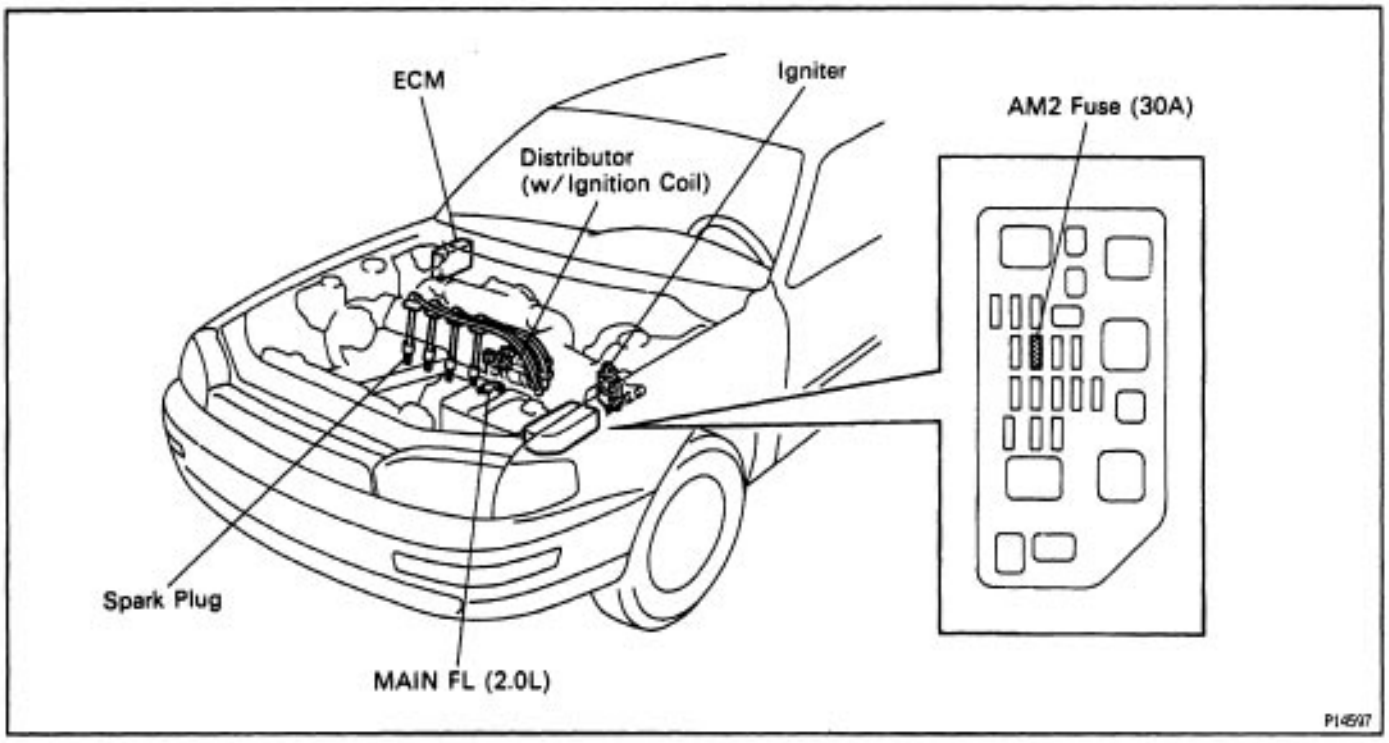
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	19	195	14

(5S–FE Except California)

DESCRIPTION

The engine control module (ECM) is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine temperature, etc.), the ECM triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

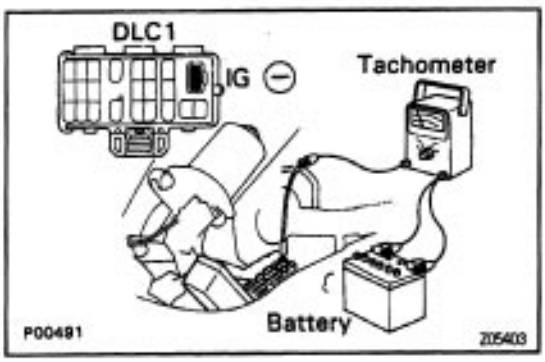
This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

The NE coil detects the crankshaft position, and the G coil detects the camshaft position.

The NE coil detects the crankshaft position, and the G coil detects the camshaft position.

PRECAUTION

1. Do not leave the ignition switch on for more then 10 minutes if the engine does not start.



2. With a tachometer connected to the system, connect the test probe of the tachometer to terminal IG ~ of the data link connector 1.

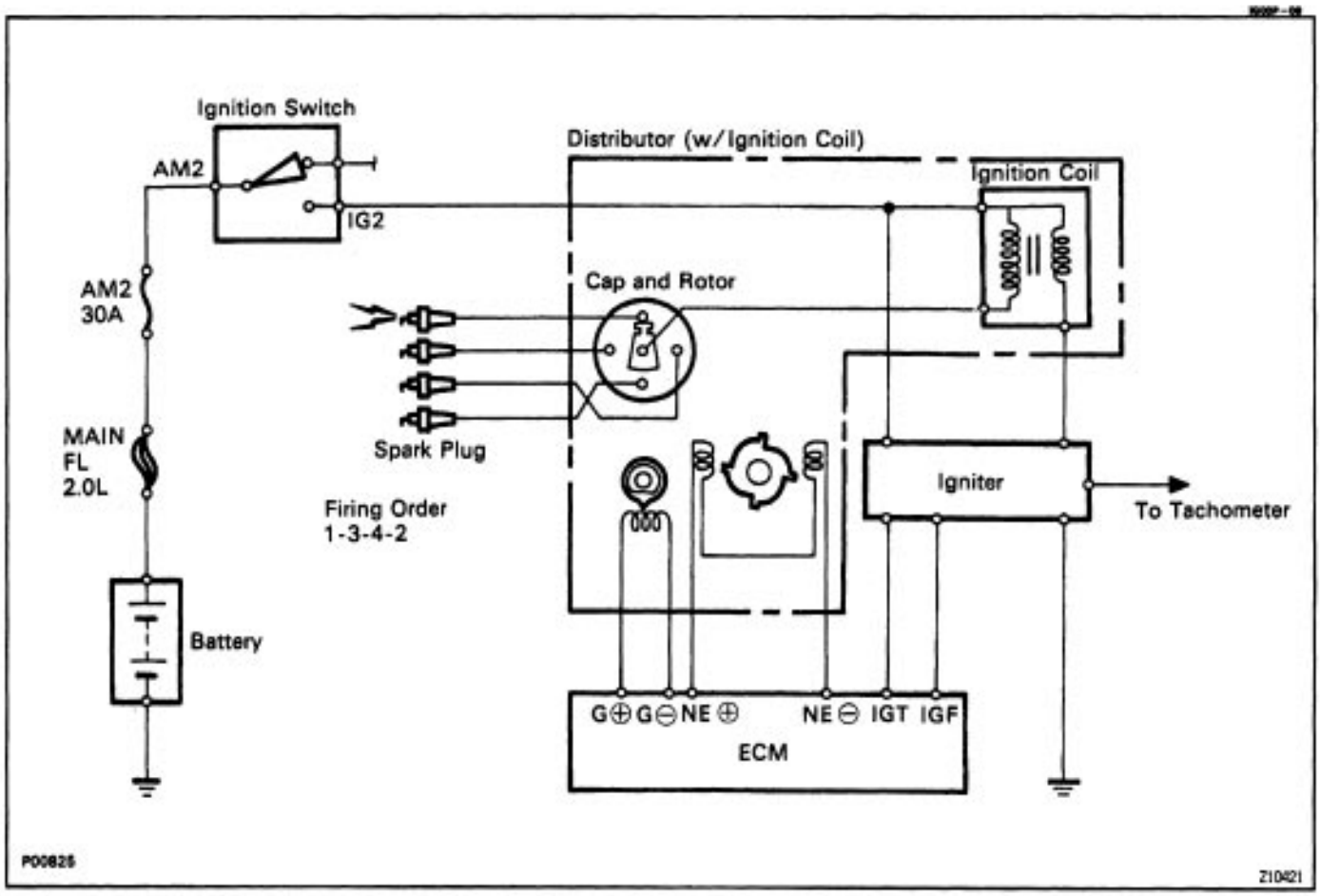
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.

4. NEVER allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.

6. Do not disconnect the battery while the engine is running.

6. Check that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

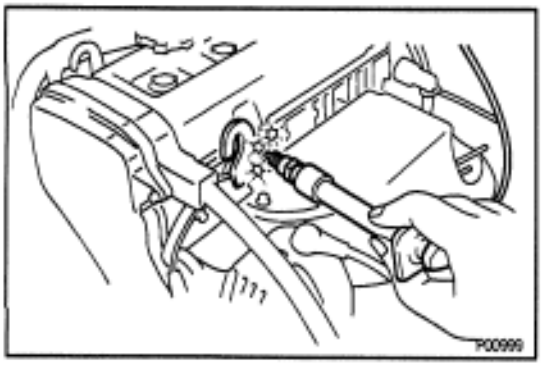
	09082–00050 TOYOTA Electrical Tester Set	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

Megger insulation resistance meter	Insulation resistance meter
Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Ignition coil



ON–VEHICLE INSPECTION

SPARK TEST

CHECK THAT SPARK OCCURS

(a) Disconnect the high–tension cords from the spark plugs. (See page IG–28)
(b) Remove the spark plugs. (See page IG–28)
(c) Install the spark plugs to the each high–tension cord.
(d) Ground the spark plug.
(e) Check if spark occurs while engine is being cranked.

HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1–2 seconds at a time. If the spark does not occur, perform the test as follows:

SPARK TEST

NO

CHECK CONNECTION OF DISTRIBUTOR CONNECTORS → BAD → Connect securely.

OK

CHECK RESISTANCE OF HIGH–TENSION CORD (See page IG–27)
Maximum resistance: 25 kΩ per cord → BAD → Replace the cord (s) .

OK

CHECK POWER SUPPLY TO IGNITION COIL
1. Turn ignition switch ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal. → BAD → Check wiring between ignition switch and ignition coil.

OK

CHECK RESISTANCE OF IGNITION COIL (See page IG–30)

Resistance:	Cold	Hot
Primary	0.36–0.55 Ω	0.45–0.65 Ω
Secondary	9.0–15.4 kΩ	11.4–18.1 kΩ

→ BAD → Replace the ignition coil.

OK

CHECK RESISTANCE OF SIGNAL GENERATOR (PICKUP COIL) (See page IG–31)

Resistance:	Cold	Hot
G (+) and IG (–)	185–275 Ω	240–325Ω
N E (+) and NE (–)	370–550Ω	475–650 Ω

→ BAD → Replace distributor housing assembly.

OK

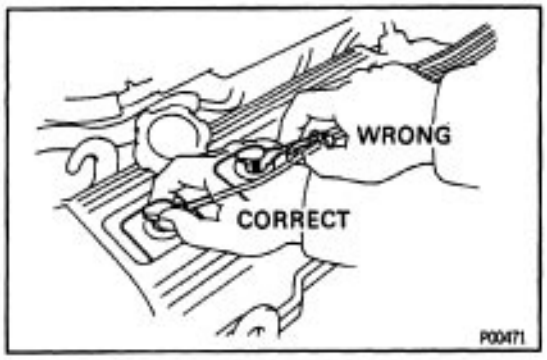
CHECK AIR GAP OF DISTRIBUTOR (See page IG–30)
Air gap: 0.2–0.4 mm (0.008–0.016 in.) → BAD → Replace the distributor housing assembly.

OK

CHECK IGT SIGNAL FROM ECM (See page EG–344) → BAD → Check wiring between ECM, distributor and igniter, and then try another ECM.

OK

TRY ANOTHER IGNITER



HIGH–TENSION CORDS INSPECTION

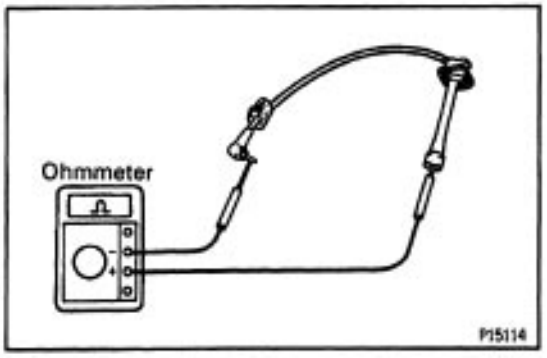
1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

Disconnect the high–tension cords at the rubber boot.

DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

2. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP



3. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

25 kΠ per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord.

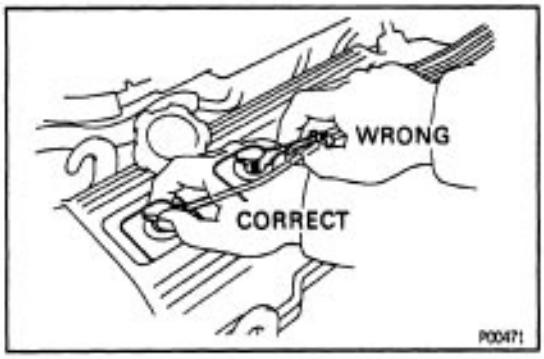
4. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

5. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS .

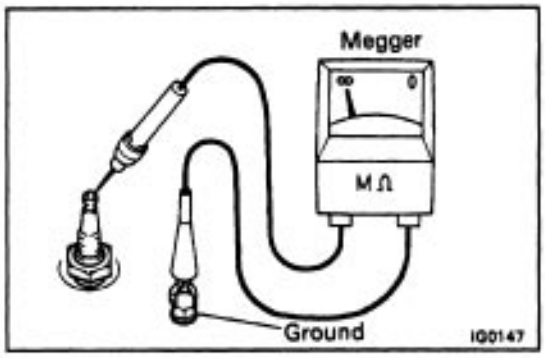
SPARK PLUGS INSPECTION

NOTICE:

- **Never use e wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on a used spark plug.**
- **Spark plugs should be replaced every 100.000 km (60.000 miles).**



1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



2. INSPECT ELECTRODE

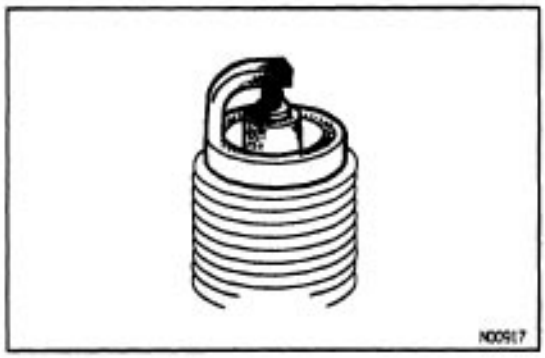
Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:

10 MII or more

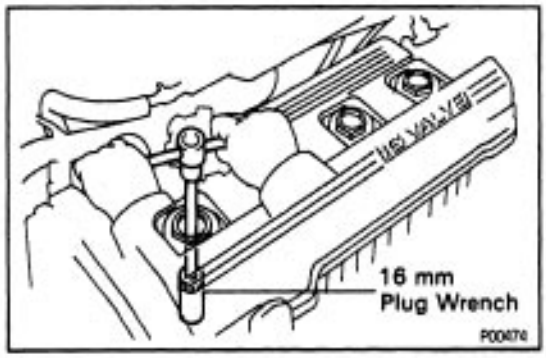
If the resistance is less than specified, proceed to step 3.

HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.



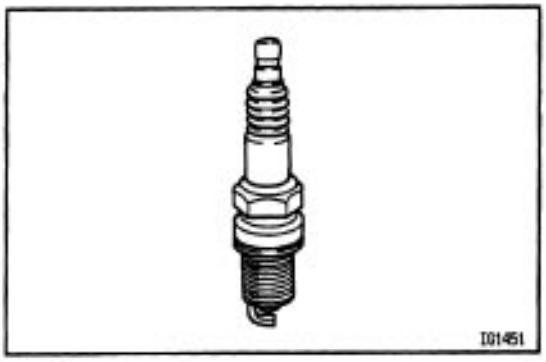
Simple Method:

(a) Quickly race the engine to 4,000 rpm 5 times.
(b) Remove the spark plug. (See step 3)
(c) Visually check the spark plug.
If the electrode is dry ... OK
If the electrode is wet ... Proceed to step 4
(d) Reinstall the spark plug.
(See step 7 on page IG–29)



3. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



4. VISUALLY INSPECT SPARK PLUGS

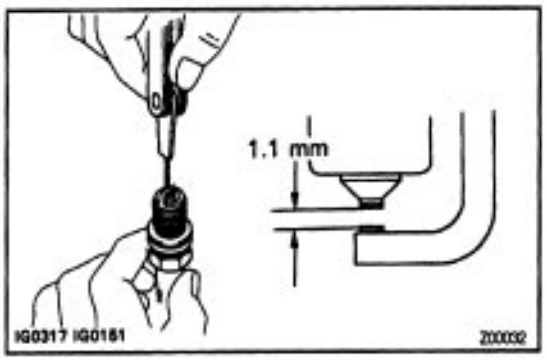
Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

PK20R 11 for N D

BKR6EP11 for NGK



5. INSPECT ELECTRODE GAP

Maximum electrode gap:

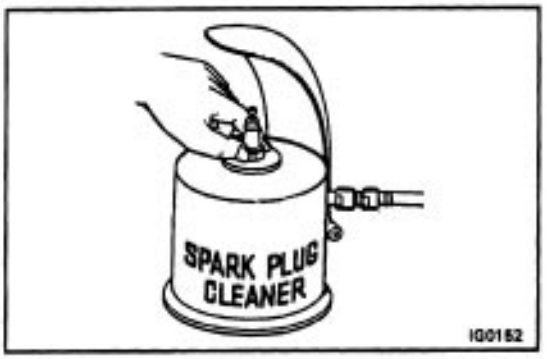
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap of new spark plug:

1.1 mm (0.043 in.)

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



6. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

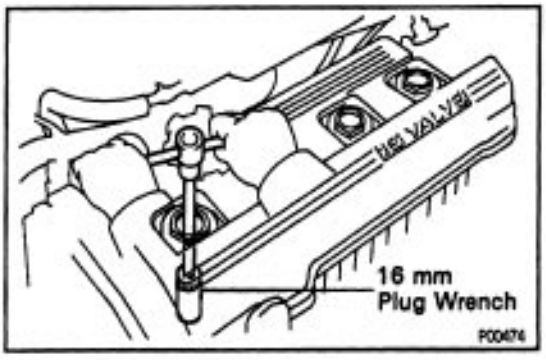
Air pressure:

Below 588 kPa (6 kgf/cm2, 85 psi)

Duration:

20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



7. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug.

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

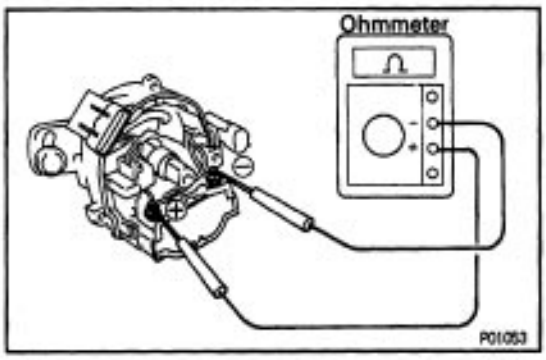
8. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

DISTRIBUTOR INSPECTION

NOTICE: 'Cold' and 'Hot' in the following sentences express the temperature of the coils themselves. 'Cold' is from–10°C (14°F) to 50°C (122°F) and 'Hot' is from 50°C (122°F) to 100°C (212°F).

1. DISCONNECT DISTRIBUTOR CONNECTORS
2. REMOVE DISTRIBUTOR CAP
3. REMOVE ROTOR
4. REMOVE IGNITION COIL DUST COVER

Ignition Coil

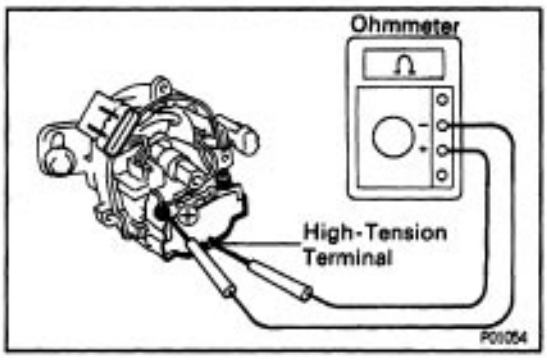


5. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between–the positive (+) and negative (–) terminals.

Primary coil resistance (Cold):
0.38–0.550
Primary coil resistance (Hot):
0.45–0.650

If the resistance is not as specified, replace the ignition coil.



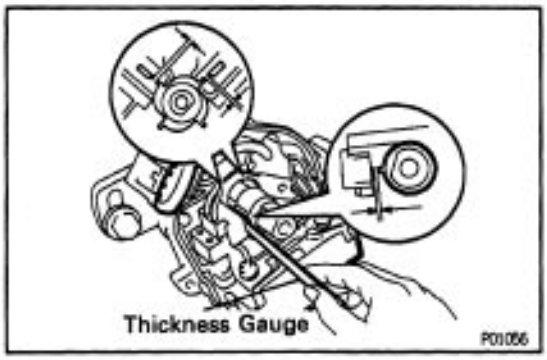
6. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between positive (+) and high–tension terminals.

Secondary coil resistance (Cold):
9.0–15.4 kΩ
Secondary coil resistance (Hot):
11.4–18.1 kΩ

If the resistance is not as specified, replace the ignition coil.

Distributor

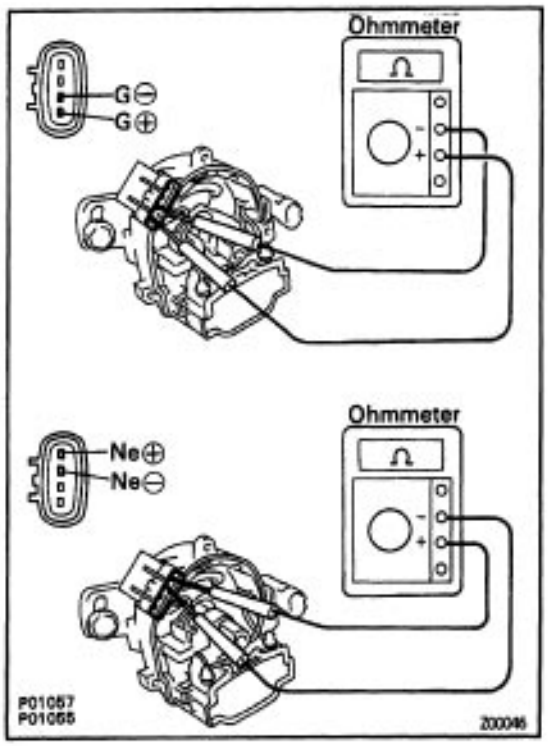


7. INSPECT AIR GAP

Using a thickness gauge, measure the air gap between the signal rotor and pickup coil projection.

Air gap:
0.2–0.4 mm (0.008–0.018 in.)

If the air gap is not as specified, replace the distributor housing assembly.



8. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals (G～ and G≧, NE～ and NE≧).

Pickup coil resistance (Cold):

G～ and G≧
185–2750
NE～ and NE≧
370–5500

Pickup coil resistance (Hot):

G～ and G≧
240–3250
NE～ and NE≧
475–6500

If the resestance is not as specified, replace the dis–tributor housing assmebly.

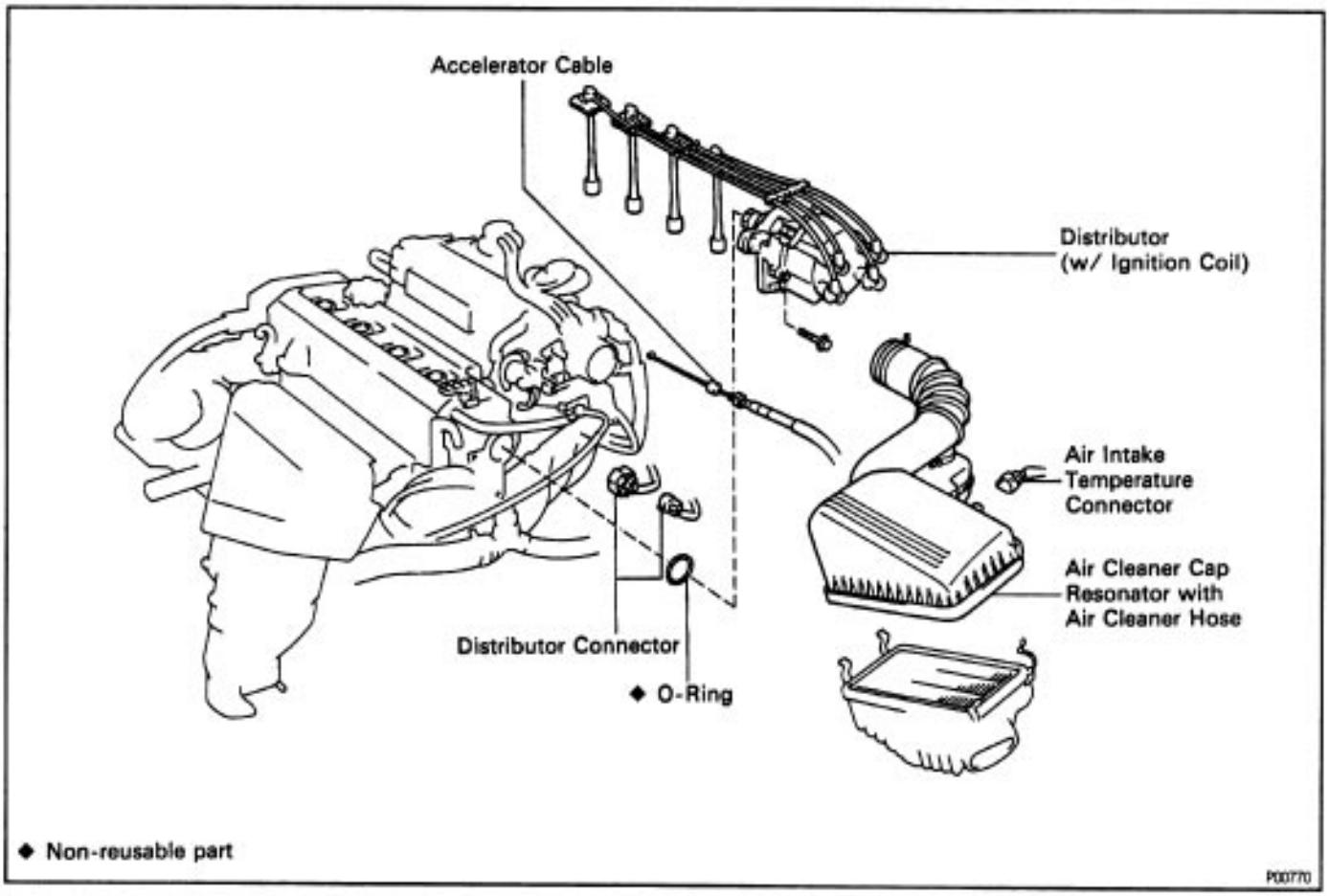
9. REINSTALL IGNITION COIL DUST COVER
10. REINSTALL ROTOR
11. REINSTALL DISTRIBUTOR CAP
12. RECONNECT DISTRIBUTOR CONNECTORS

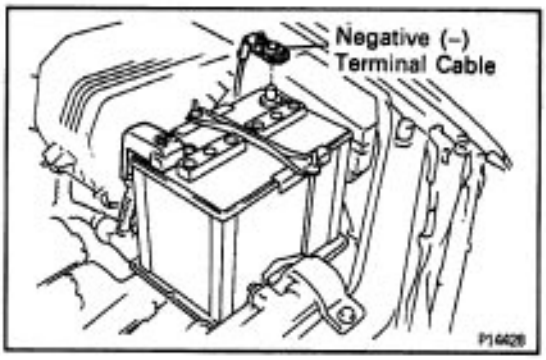
IGNITER INSPECTION

(See Spark Test procedure on page IG–26)

DISTRIBUTOR

COMPONENTS FOR REMOVAL AND INSTALLATION



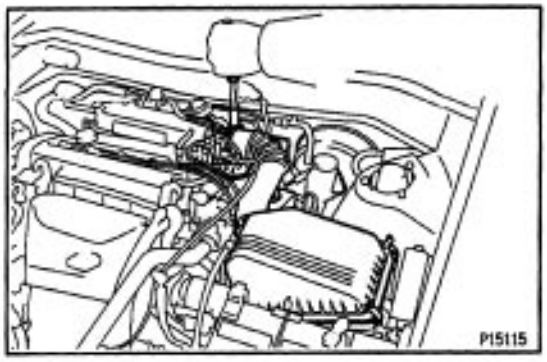


DISTRIBUTOR REMOVAL

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch (: turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

2. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE



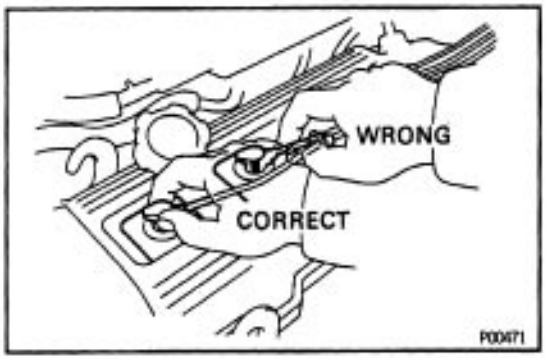
3. REMOVE AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE

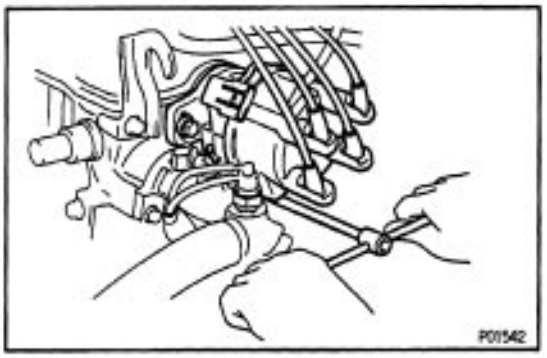
(a) Disconnect the intake air temperature sensor connector.
(b) Loosen the air cleaner hose clamp bolt.
(c) Disconnect the 4 air cleaner cap clips.
(d) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the resonator and air cleaner hose.

4. DISCONNECT DISTRIBUTOR CONNECTORS

5. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

(a) Disconnect the 4 high–tension cords from the spark plugs.
(b) Disconnect the high–tension cords from the clamp on the cylinder head cover.

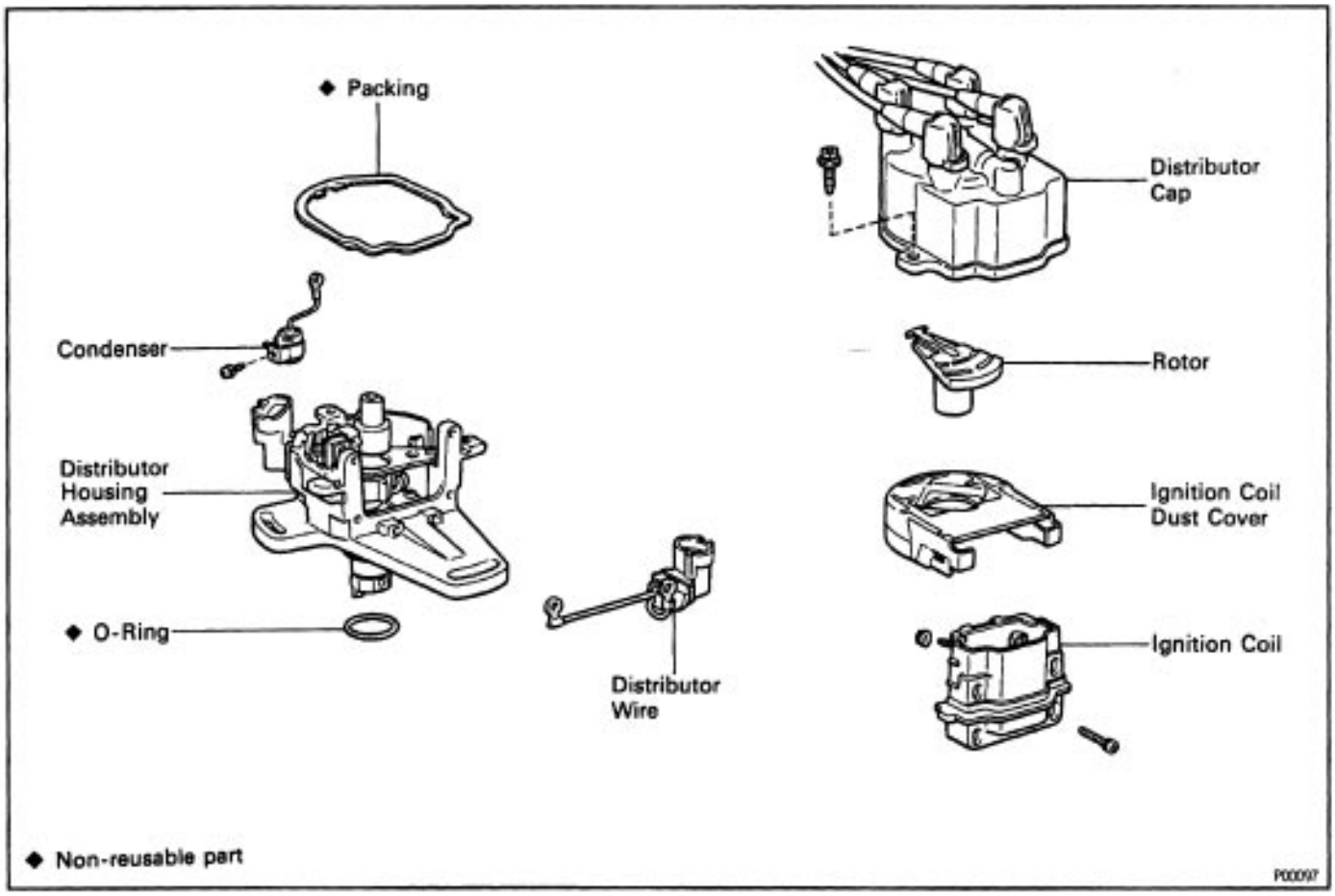




6. REMOVE DISTRIBUTOR

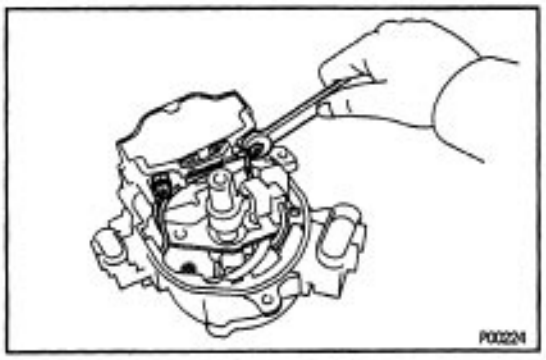
(a) Remove the 2 hold–down bolts, and pull out the distributor.
(b) Remove the 0–ring from the distributor housing.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



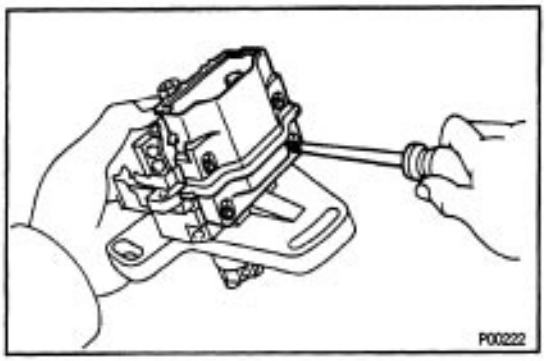
DISTRIBUTOR DISASSEMBLY

1. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS
2. REMOVE ROTOR
3. REMOVE IGNITION COIL DUST COVER

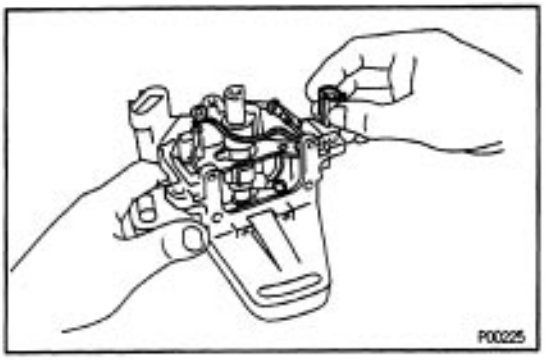


4. REMOVE IGNITION COIL

(a) Remove the 2 nuts, and disconnect the 3 wires from the ignition coil terminals.

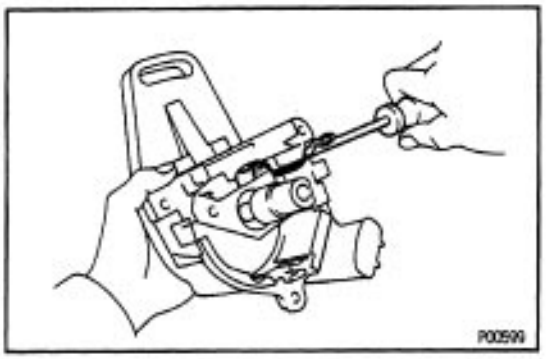


(b) Remove the 4 screws and ignition coil.



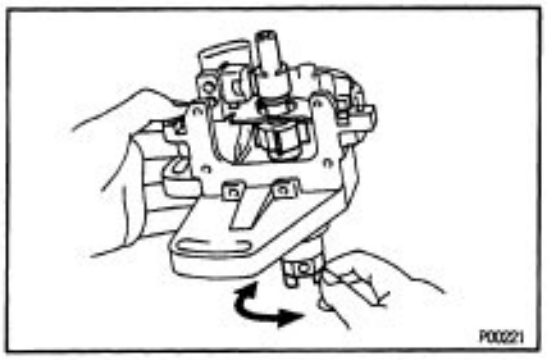
B. REMOVE DISTRIBUTOR WIRE

Remove the distributor wire from the distributor housing.



6. REMOVE CONDENSER

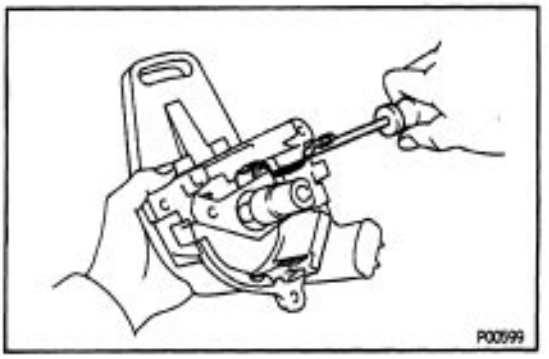
Remove the screw and condenser.



DISTRIBUTOR INSPECTION

INSPECT SHAFT

Turn the shaft and check that it is not rough or worn. If it feels rough or worn, replace the distributor housing assembly.

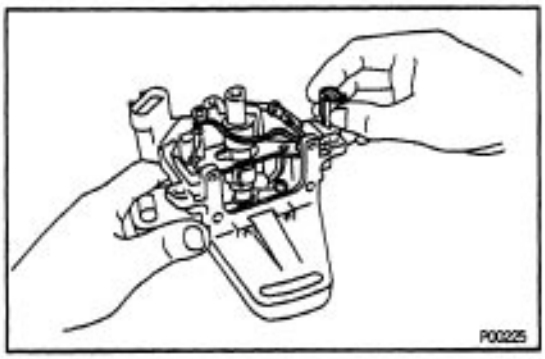


DISTRIBUTOR ASSEMBLY

(See Components for Disassembly and Assembly)

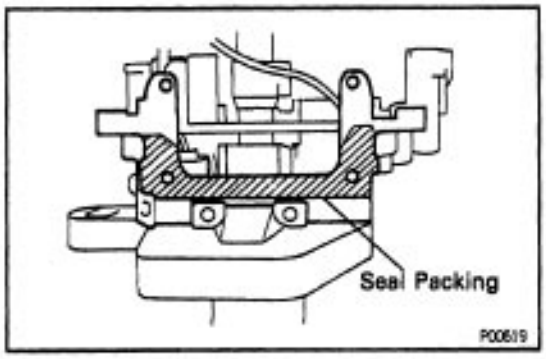
1. INSTALL CONDENSER

Install the condenser with the screw.



2. INSTALL DISTRIBUTOR WIRE

Install the grommet of the wire to the distributor housing.

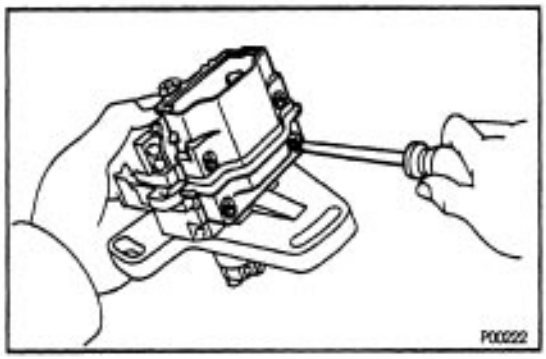


3. INSTALL IGNITION COIL

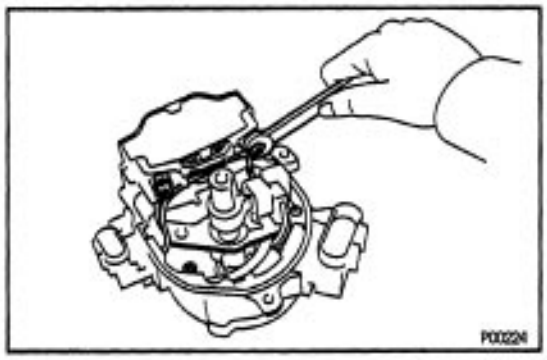
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the ignition coil installing surface of the housing as shown in the illustration.

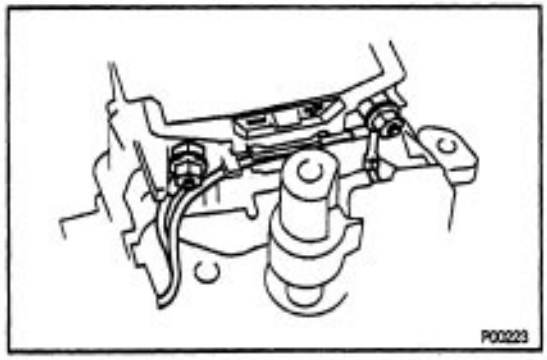
Seal packing:
Part No. 08826–00080 or equivalent



(c) Install the ignition coil with the 4 screws.



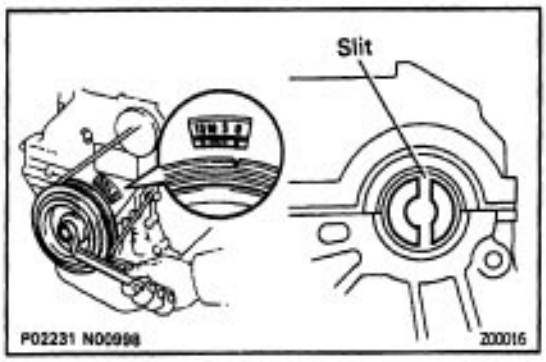
(d) Connect the 3 wires to the ignition coil terminals with the 2 nuts.



NOTICE:

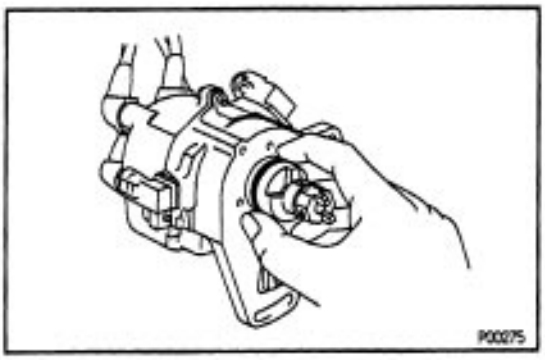
- **When connecting the wires to the ignition coil. insert both properly into their grooves found on the side of the Ignition coil.**
- **Be sure the wires do not contact with signal rotor or distributor housing.**

4. INSTALL IGNITION COIL DUST COVER
5. INSTALL ROTOR
6. INSTALL DISTRIBUTOR CAP AND HIGH–TENSION CORDS

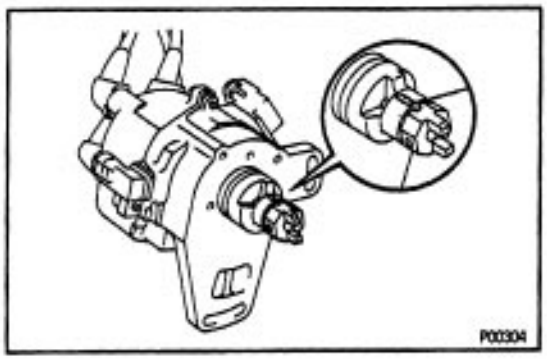


DISTRIBUTOR INSTALLATION

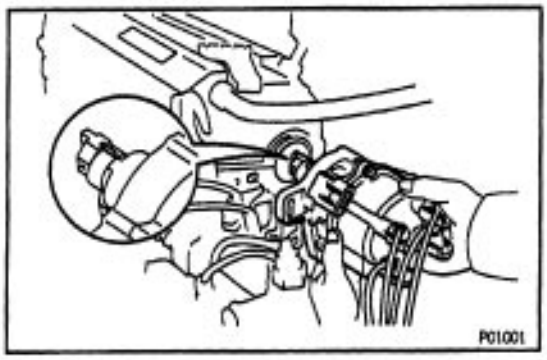
(See Components for Disassembly and Assembly)
1. SET NO. 1 CYLINDER TO TDC/COMPRESSION
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown in the illustration.



2. INSTALL DISTRIBUTOR
(a) Install a new O–ring to the housing.
(b) Apply a light coat of engine oil on the 0–ring.

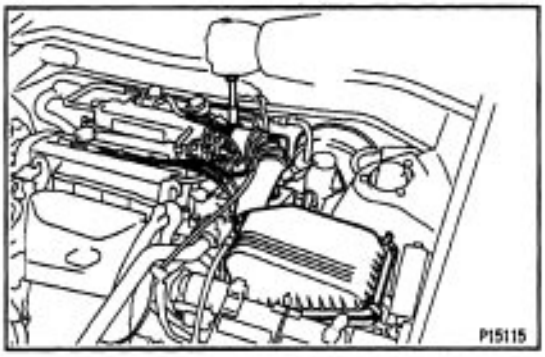


(c) Align the cutout of the coupling with the line of the housing.



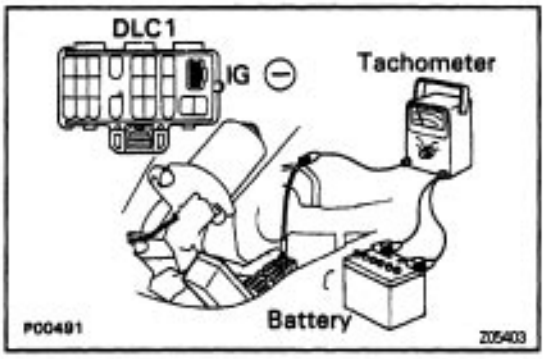
(d) Insert the distributor, aligning the center of the flange with that of bolt hole on the cylinder head.
(e) Lightly tighten the 2 hold–down bolts.
(f) Connect the high–tension cords to the clamp on the cylinder head cover. .

3. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS
Firing order:
1–3–4–2
4. CONNECT DISTRIBUTOR CONNECTORS

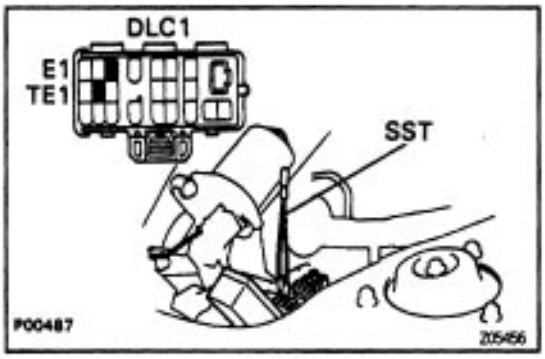


5. INSTALL AIR CLEANER CAP, RESONATOR AND AIR CLEANER HOSE
(a) Connect the air cleaner hose to the throttle body.
(b) Install the air cleaner cap together with the resonator and air cleaner hose.
(c) Connect the intake air temperature sensor connector.

6. CONNECT AND ADJUST ACCELERATOR CABLE
7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY
8. WARM UP ENGINE
Allow the engine to warm up to normal operating temperature.

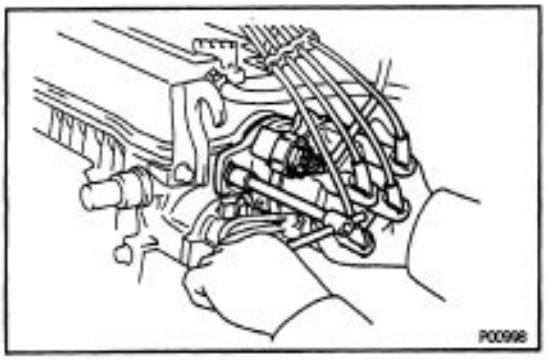


9. CONNECT TACHOMETER
Connect the test probe of a tachometer to terminal IG
E) of the data link connector 1.
NOTICE:
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.**

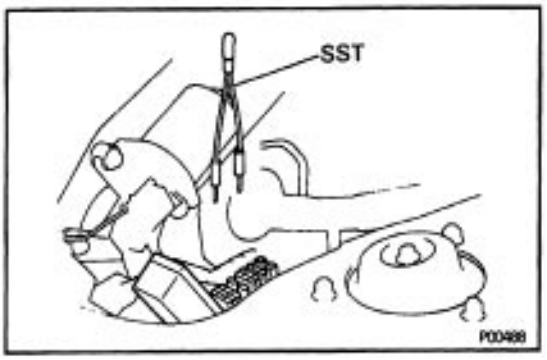


10. ADJUST IGNITION TIMING
(a) Using SST, connect terminals TE 1 and E 1 of the data link connector 1.
SST 09843–18020
HINT: After engine speed is kept at 1,000–1,300 rpm for 5 seconds, check that it returns to idle speed.

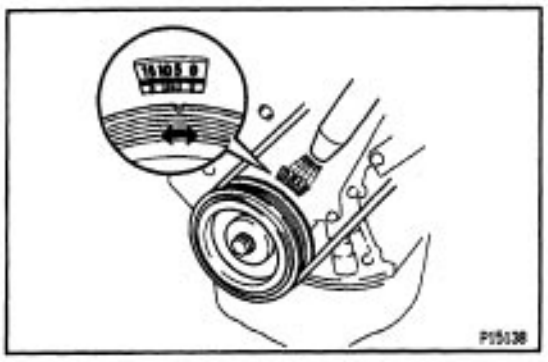
(b) Using a timing light, check the ignition timing.
Ignition timing:
10®BTDC 0 Idle
(Transmission In neutral position)



(c) Loosen the 2 hold–down bolts, and adjust by turning the distributor.
(d) Tighten the hold–down bolts, and recheck the ignition timing.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



(e) Remove the SST.
SST 09843–18020



11. FURTHER CHECK IGNITION TIMING
Ignition timing:
0–10®BTDC 0 idle
(Transmission In neutral position)
HINT: The timing mark moves in a range between 0® and 10®.

12. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

SERVICE DATA

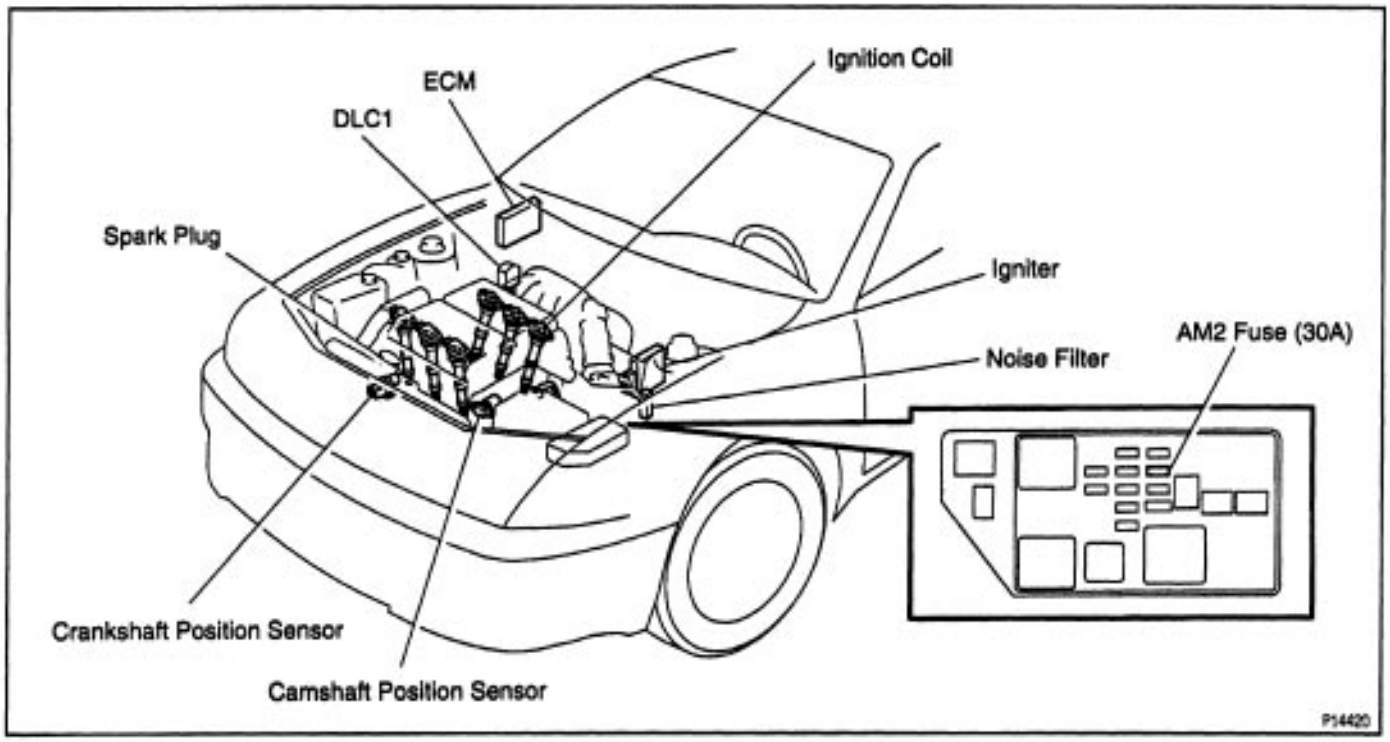
Ignition timing	w/ Terminals TE1 end E1 connected of DLC1		10°BTDC @ idle
Firing order	–		1 – 3 – 4 – 2
High–tension cord	Resistance	Limit	25 kΩ per cord
Spark plug	Recommended spark plug	ND	PK20R11
		NGK	BKR6EP11
	Correct electrode gap		1.1 mm (0.043 in.)
Ignition coil	Primary coil resistance	at cold	0.36 – 0.55 Ω
		at hot	0.45 – 0.65 Ω
	Secondary coil resistance	at cold	9.0 – 15.4 kΩ
		at hot	11.4 – 18.1 kΩ
Distributor	Air gap		0.2 – 0.4 mm (0.008 – 0.016 in.)
	Pickup coil resistance	at cold G⊕ – G⊖	185 – 275 Ω
		NE⊕ – NE⊖	370 – 550 Ω
		at hot G⊕ – G⊖	240 – 325 Ω
		NE⊕ – NE⊖	475 – 650 Ω

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder heed	18	180	13
Distributor x Cylinder head	19	195	14

(1 MZ–FE)
DESCRIPTION

The engine control module (ECM) is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (RPM, intake air volume, engine temperature, etc.), the ECM triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COILS

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

CAMSHAFT POSITION SENSOR

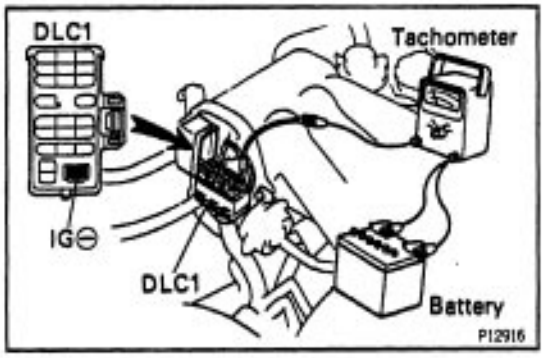
The camshaft position sensor detect the camshaft position.

CRANKSHAFT POSITION SENSOR

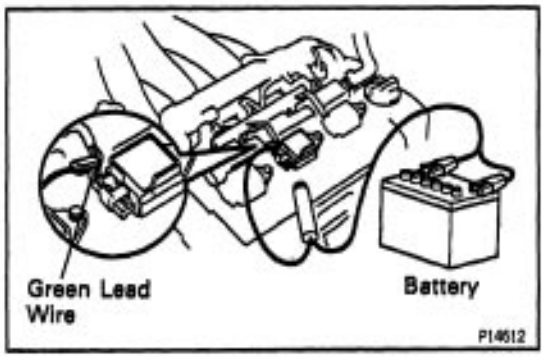
The crankshaft position sensor detect the crankshaft position.

PRECAUTION

1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



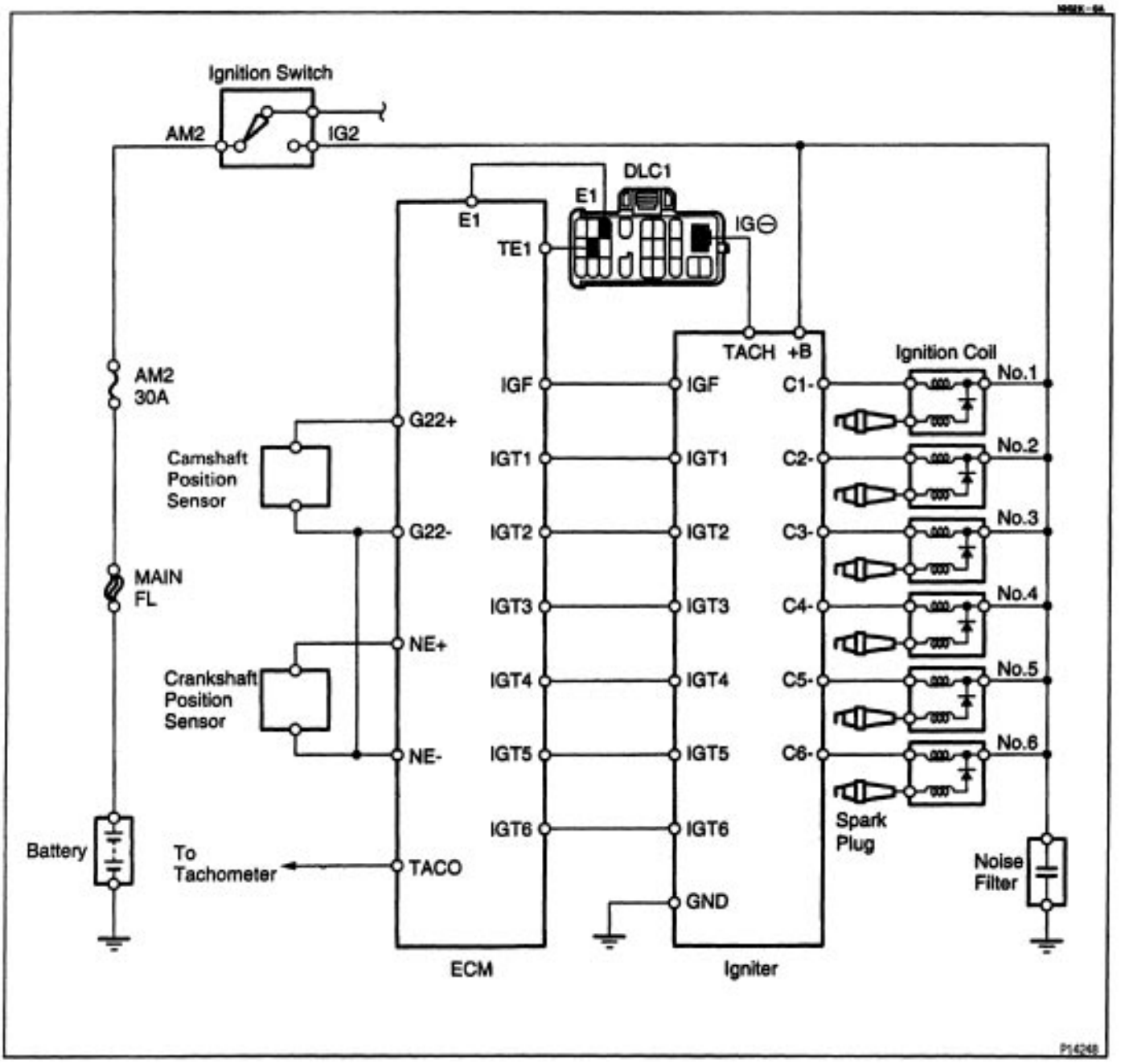
2. With a tachometer connected to the system, connect the tester probe of the tachometer to terminal IG～ of the DLC 1.



3. With a timing tight connected to the system, connect the timing light pickup clip to the green lead wire for the No.4 ignition coil.

4. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
5. Never allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
6. Do not disconnect the battery while the engine is running.
7. Check that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter is pass the current to the ignition coils and the spark plugs produce a spark.

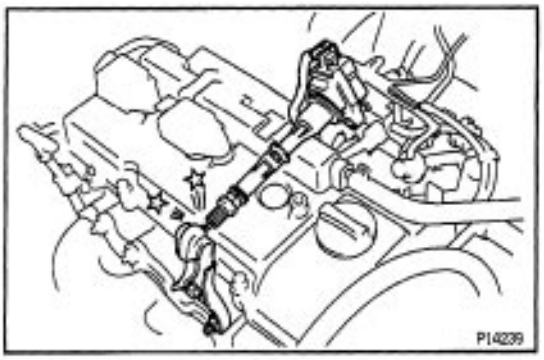
PREPARATION

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

Megger insulation resistance meter	Spark plug
Spark plug cleaner	
Thermometer	
Timing light	



ON–VEHICLE INSPECTION

SPARK TEST

CHECK THAT SPARK OCCURS

(a) Remove the ignition coil.
(See steps 1 to 3 on page IG–50)
(b) Remove the spark plug.
(See step 3 on page IG–47)
(c) Install the spark plug to the ignition coil, and connect the ignition coil connecter.
(d) Ground the spark plug.
(e) Check if spark occurs while engine is being cranked.
HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1–2 seconds at time.
If the spark does not occur, perform the test as fol–lows:

SPARK TEST

NO

CHECK CONNECTION OF IGNITION COIL AND IGNITER — BAD → Connect securely.

OK

CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER
1. Turn ignitioin switch ON.
2. Check that there is battery voltage at Ignition coil positive (+) terminal.

BAD → Check wiring between ignition switch to ignition coil and igniter.

OK

CHECK RESISTANCE OF IGNITION COIL
(See page IG–48)
Resistance:
Primary Cold : 0.54–0.84Il, Hot : 0.68–0.98 n

BAD → Replace the ignition coil.

OK

CHECK RESISTANCE OF CAMSHAFT POSITION SENSOR
(See page IG–49)
Resistance:
Cold : 835–1,4000, Hot : 1,060–1,6450

BAD → Replace the camshaft position sen-sor.

OK

CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR
(See page IG–54)
Resistance:
Cold : 1,630–2,7400, Hot : 2,065–3,2250

BAD → Replace the crankshaft position sen-sor.

OK

CHECK IGT SIGNAL FROM ECM
(See page EG–550)

BAD → Check wiring between ECM, and igni-ter, and then try another ECM.

OK

TRY ANOTHER IGNITER

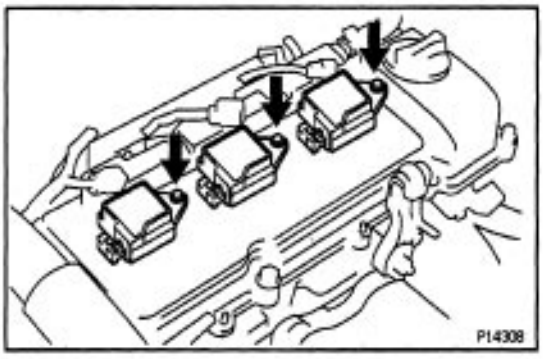
V04169

(f) Reinstall the spark plug.
(See step 7 on page IG–47)
(g) Reinstall the ignition coil.
(See steps 1 to 3 on page IG–51)

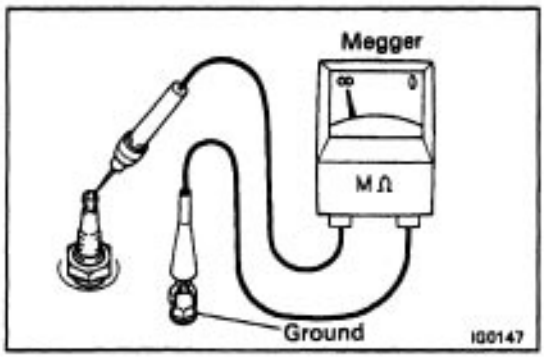
SPARK PLUGS INSPECTION

NOTICE:

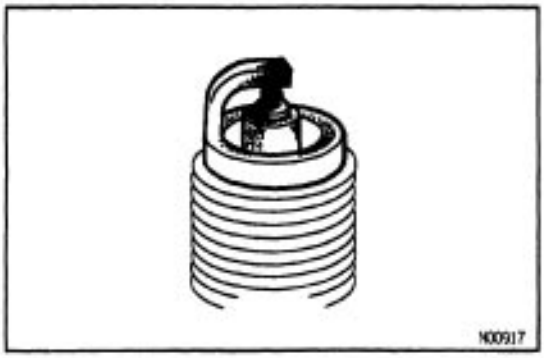
- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on a used spark plug.**
- **Spark plugs should be replaced every 100,000 km (60,000 miles).**



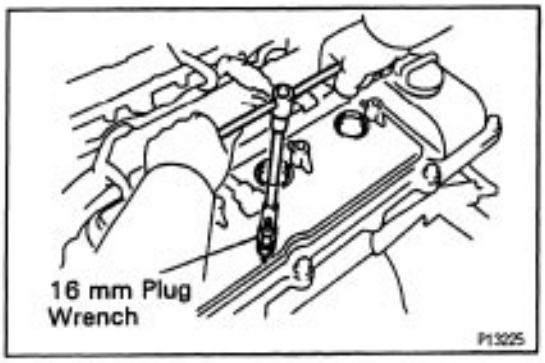
1. REMOVE IGNITION COILS
(See steps 1 to 3 on page IG–b0)



2. INSPECT ELECTRODE
Using a megger (insulation resistance meter), measure the insulation resistance.
Standard correct Insulation resistance:
10 MΠ or more
If the resistance is less than specified, proceed to step 4.
HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.

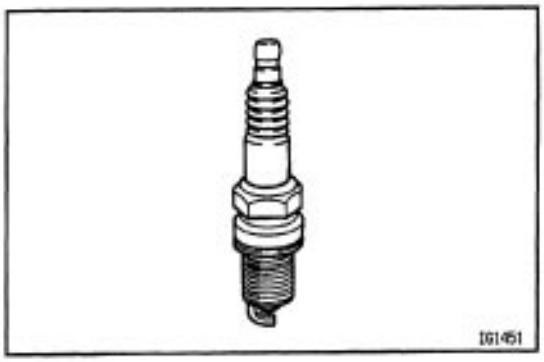


Simple Method:
(a) Quickly race the engine to 4,000 rpm 5 times.
(b) Remove the spark plug. (See step 3)
(c) Visually check the spark plug.
If the electrode is dry ... OK
If the electrode is wet ... Proceed to step 4
(d) Reinstall the spark plug. (See step 7)



3. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the ^ spark plugs from the RH and LH cylinder heads.



4. VISUALLY INSPECT SPARK PLUGS

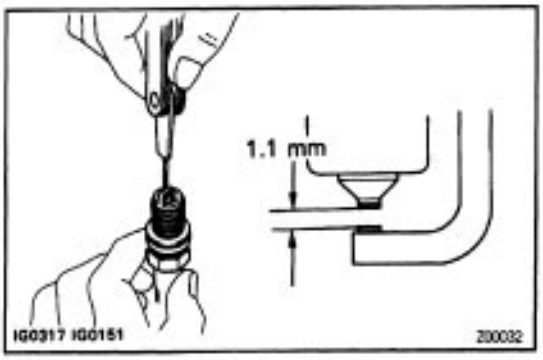
Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

PK20R11 for ND

BKR6EP–11 for NGK



5. INSPECT ELECTRODE GAP

Maximum electrode gap for used spark plug:

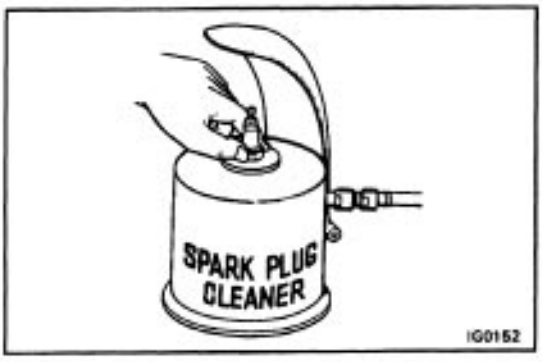
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for now spark plug:

1.1 mm (0.043 in.)

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



6. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

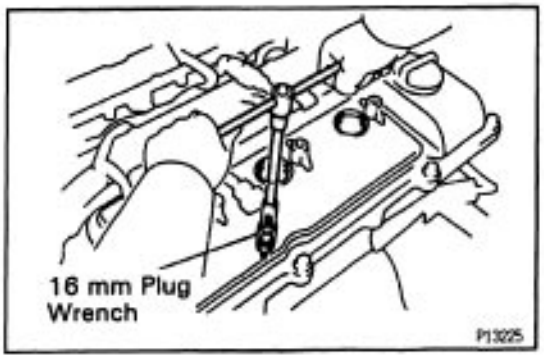
Air pressure:

Below 588 kPa (6 kgf/cm2, 85 psi)

Duration:

20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



7. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the6 spark plugs to the RH and LH cylinder heads**.**

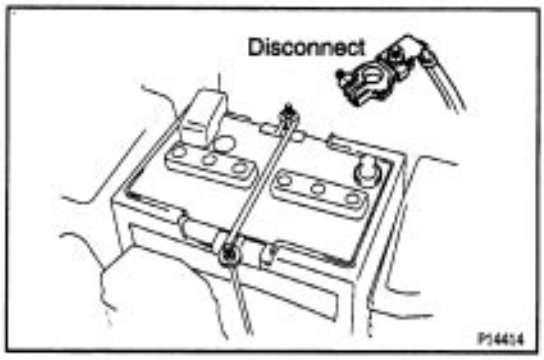
Torque: 18 N–m (180 kgf–cm. 13 ft–lbf)

8. REINSTALL IGNITION COILS

(See steps 1 to 3 on page IG–51**)**

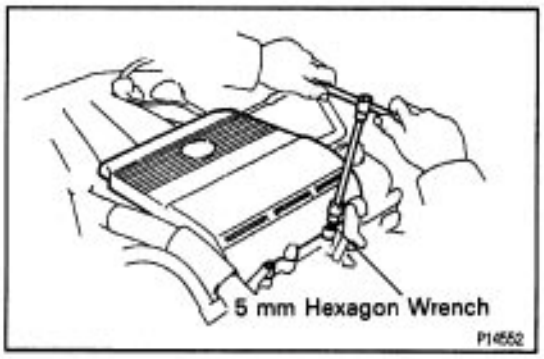
IGNITION COIL INSPECTION

NOTICE: 'Cold' and 'Hot' in the following sentences express the temperature of the coils themselves. "Cold" is from–10®C (14®F) to 50®C (1122* F) and 'Hot' is from 60® C (122®F) to 100®C (212®F).



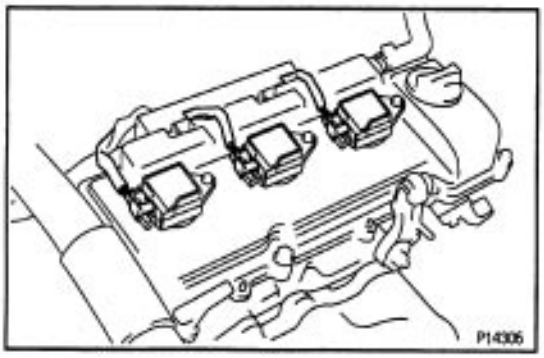
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

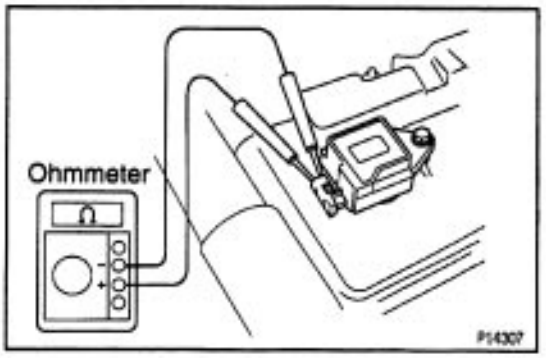


2. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.



3. DISCONNECT IGNITION COIL CONNECTORS



4. INSPECT PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

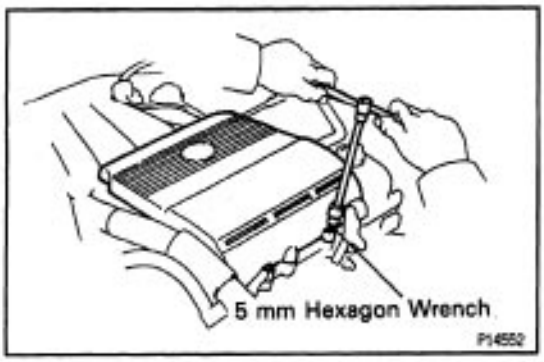
Primary coil resistance (Cold):

0.54–0.84Ω

Primary coil resistance (Hot):

0.68–0.98Ω

If the resistance is not as specified, replace the ignition coil. (See page I G–50)



5. RECONNECT IGNITION COIL CONNECTORS

6. REINSTALL V–BANK COVER

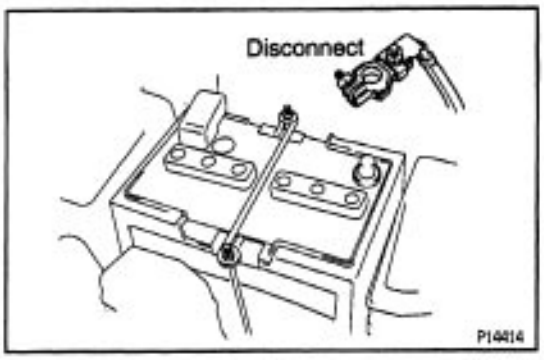
Using a 5 mm hexagon wrench, install the V–bank cover with the 2 cap nuts.

HINT: For fixing the V–bank cover, push on the cover until sense of “click” is felt.

7. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

CAMSHAFT POSITION SENSOR INSPECTION

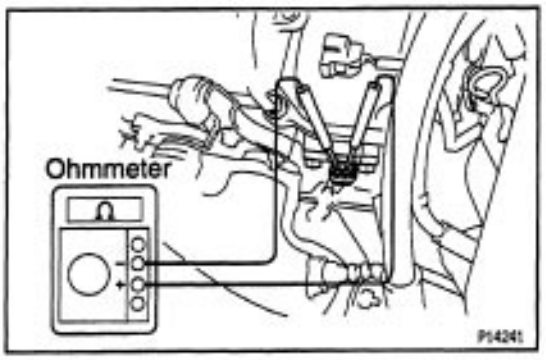
NOTICE: ’Cold’ and ’Hot’ in the following sentences express the temperature of the sensors themselves. ’Cold’ Is from–10®C (14®F) to 50®C (122®F) and “Hot’ is from 50®C 0 22®F) to 100®C (212®P).



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch Is turned to the ’LOCK’ position and the negative (–) terminal cable is disconnected from the battery.

2. DISCONNECT CAMSHAFT POSITION SENSOR CONNECTOR



3. INSPECT CAMSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance (Cold):

835–1,4000

Resistance (Hot):

1,060–1,645 0

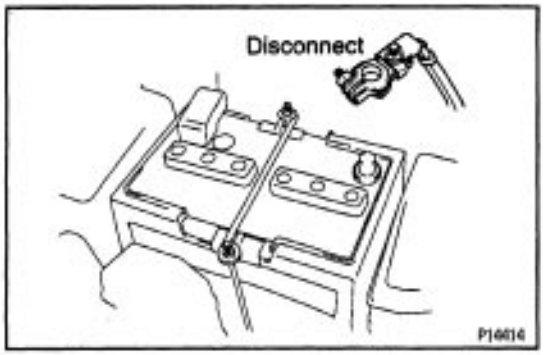
If the resistance is not as specified, replace the camshaft position sensor. (See page IG–52)

4. RECONNECT CAMSHAFT POSITION SENSOR CONNECTOR

5. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

IGNITER INSPECTION

(See procedure Spark Test on page IG–46)

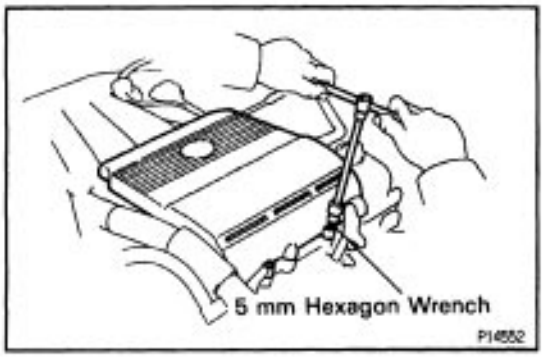


IGNITION COIL

IGNITION COILS REMOVAL

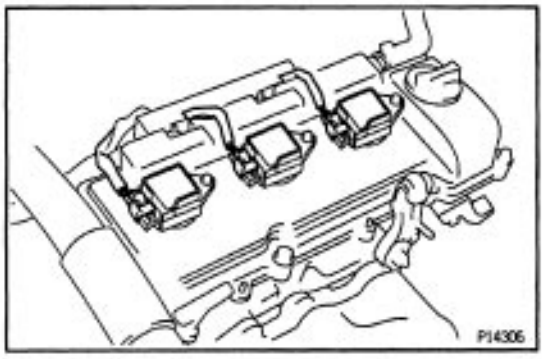
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



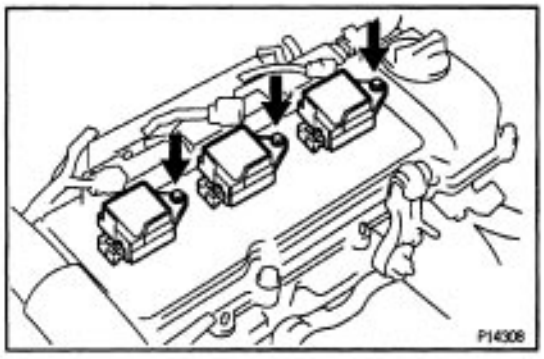
2. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the 2 cap nuts and V–bank cover.

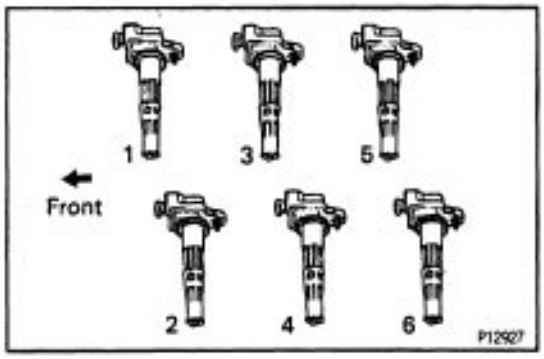


3. REMOVE IGNITION COILS

(a) Disconnect the 6 connectors from the RH and LH cylinder heads.

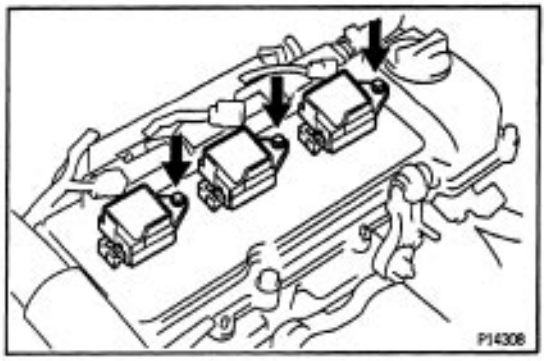


(b) Remove the 8 bolts and6 ignition coils from the RH and LH cylinder heads.



HINT: Arrange the ignition coils in correct order.

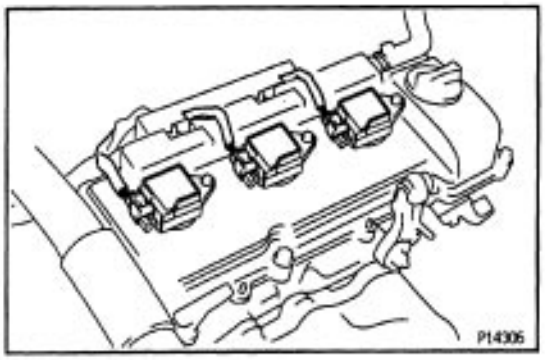
IGNITION COIL INSTALLATION



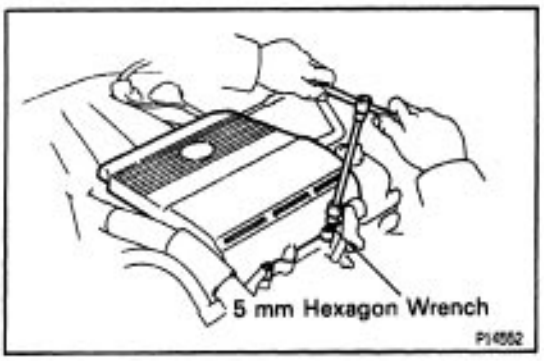
1. INSTALL IGNITION COILS

(a) Install the6 ignition coils to the RH and LH cylinder heads with the ^ bolts.

Torque: 8 N–m (80 kgf–cm. 89 in.lbf)



(b) Connect the 6 ignition coil connectors.

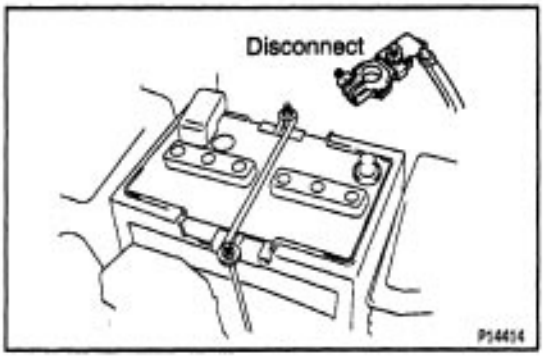


2. INSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the 2 cap nuts.

HINT: For fixing the V–bank cover, push on the cover until sense of “click” is felt.

3. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

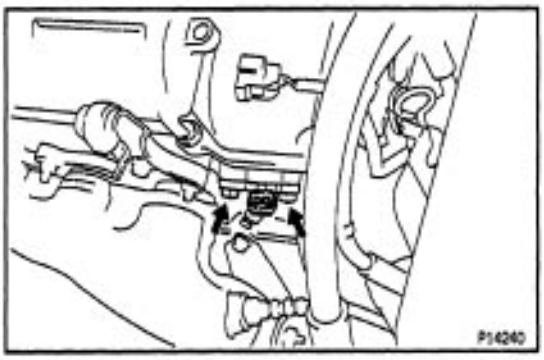


CAMSHAFT POSITION SENSOR

CAMSHAFT POSITION SENSOR REMOVAL

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.
(b) Remove the 2 bolts and camshaft position sensor.

CAMSHAFT POSITION SENSOR INSTALLATION

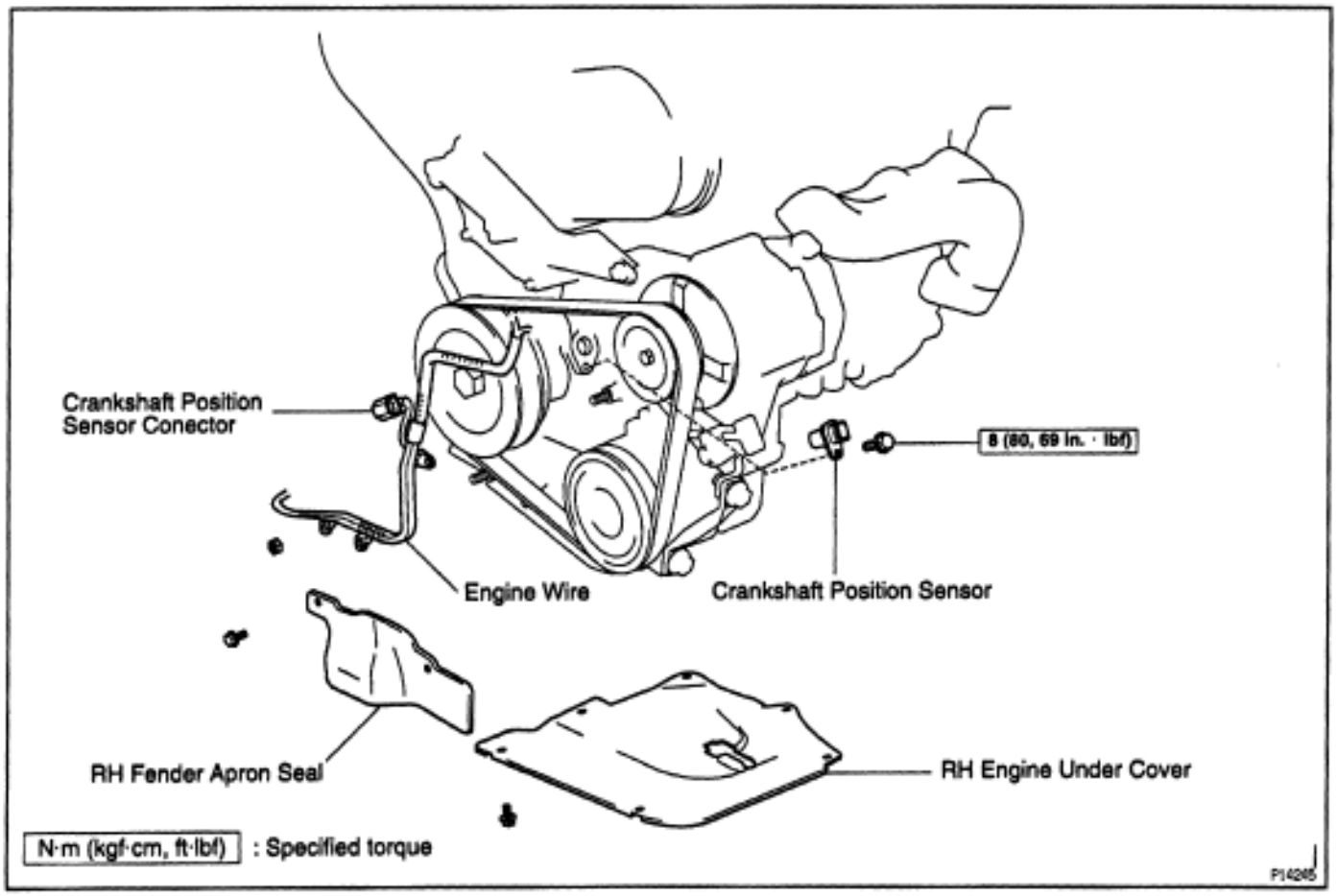
1. INSTALL CRANKSHAFT POSITION SENSOR

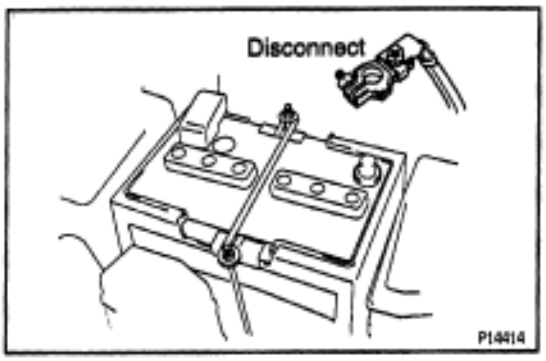
Torque: 8 N–m (80 kgf–cm, 69 in.ibf)

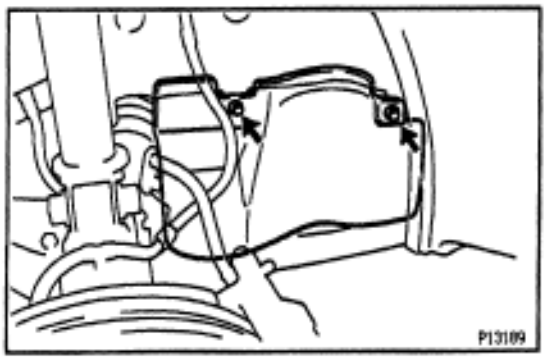
2. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

CRANKSHAFT POSITION SENSOR

COMPONENTS FOR REMOVAL AND INSTALLATION







CRANKSHAFT POSITION SENSOR REMOVAL

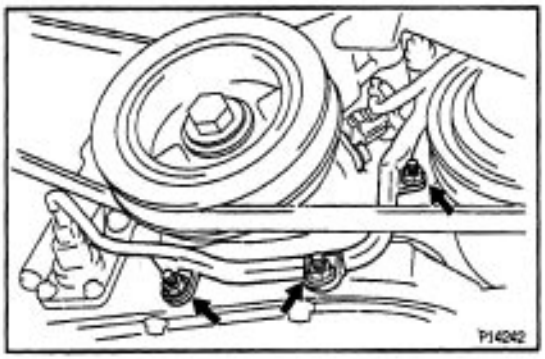
(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

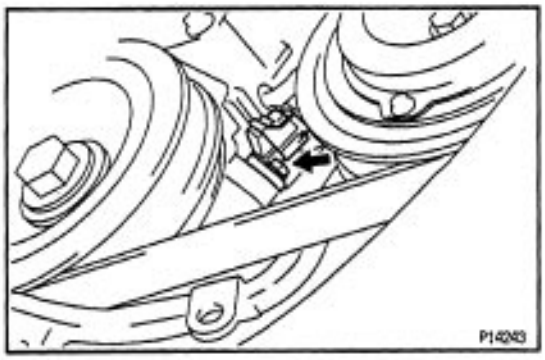
2. REMOVE RH ENGINE UNDER COVER

3. REMOVE RH FENDER APRON SEAL



4. DISCONNECT ENGINE WIRE

Remove the 3 nuts and disconnect the engine wire.



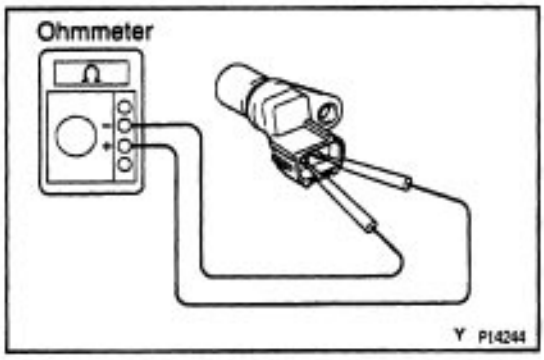
5. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the bolt and disconnect the crankshaft posi–tion sensor.

(b) Disconnect the crankshaft position sensor conecter.

CRANKSHAFT POSITION SENSOR INSPECTION

NOTICE: 'Cold' and 'Hot' in the following sentences ex–press the temperature of the sensors themselves. 'Cold' is from–10ºC (14ºF) to 50ºC (122ºF) and 'Hot' is from 50ºC (122ºF) to 100ºC (212ºF).



INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance (Cold):

1,630–2,740 0

Resistance (Hot):

2,060–3,225 0

If the resistance is not as specified, replace the crank shaft position sensor.

CRANKSHAFT POSITION SENSOR INSTALLATION

(See Components for Removal and Installation)

1. INSTALL CRANKSHAFT POSITION SENSOR
Torque: 8 N–m (80 kgf–cm, 69 in.lbf)

2. CONNECT ENGINE WIRE

3. INSTALL RH FENDER APRON SEAL

4. INSTALL RH ENGINE UNDER COVER

6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

SERVICE SPECIFICATIONS

SERVICE DATA

Ignition timing	w/ Terminals TE1 and E1 connected of DLC1		10 ± 2° BTDC @ idle
Firing order	–		1 – 2 – 3 – 4 – 5 – 6
Spark plug	Recommended spark plug	ND	PK20R11
		NGK	BKR6EP–11
	Correct electrode gap for new plug		1.1 mm (0.043 in.)
	Maximum electrode gap for used plug		1.3 mm (0.051 in.)
Ignition coil	Primary coil resistance	at cold	0.54 – 0.84 Ω
		at hot	0.68 – 0.98 Ω
Camshaft position sensor	Resistance	at cold	835 – 1,400 Ω
		at hot	1,060 – 1,645 Ω
Crankshaft position sensor	Resistance	at cold	1,630 – 2,740 Ω
		at hot	2,060 – 3,225 Ω

TORQUE SPECIFICATIONS

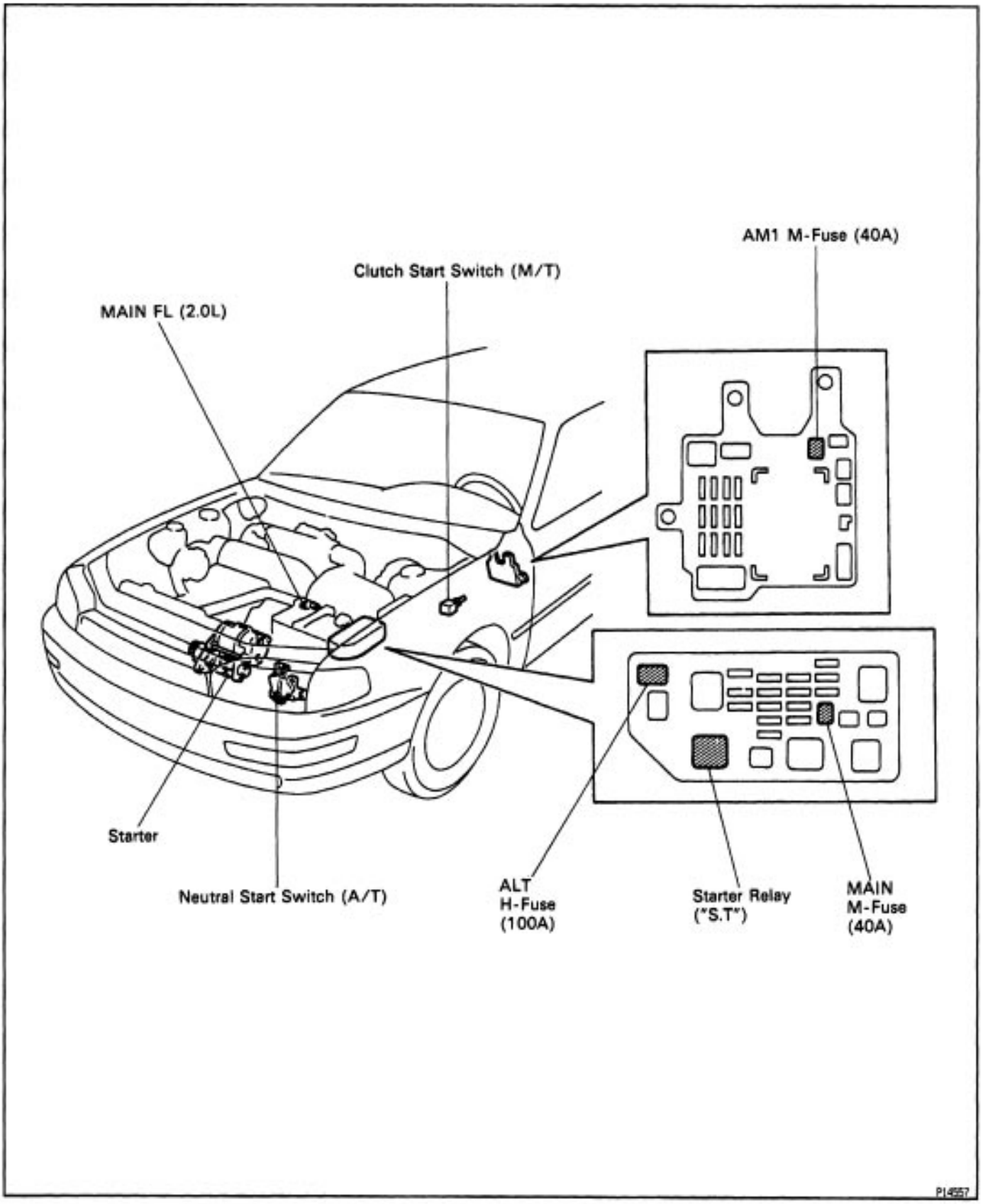
Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder heed	18	180	13
Ignition coil x Cylinder head	8	80	69 in.·lbf
Camshaft position sensor x Cylinder head	8	80	69 in.·lbf
Crankshaft position sensor x Oil pump	8	80	69 in.·lbf

STARTING SYSTEM

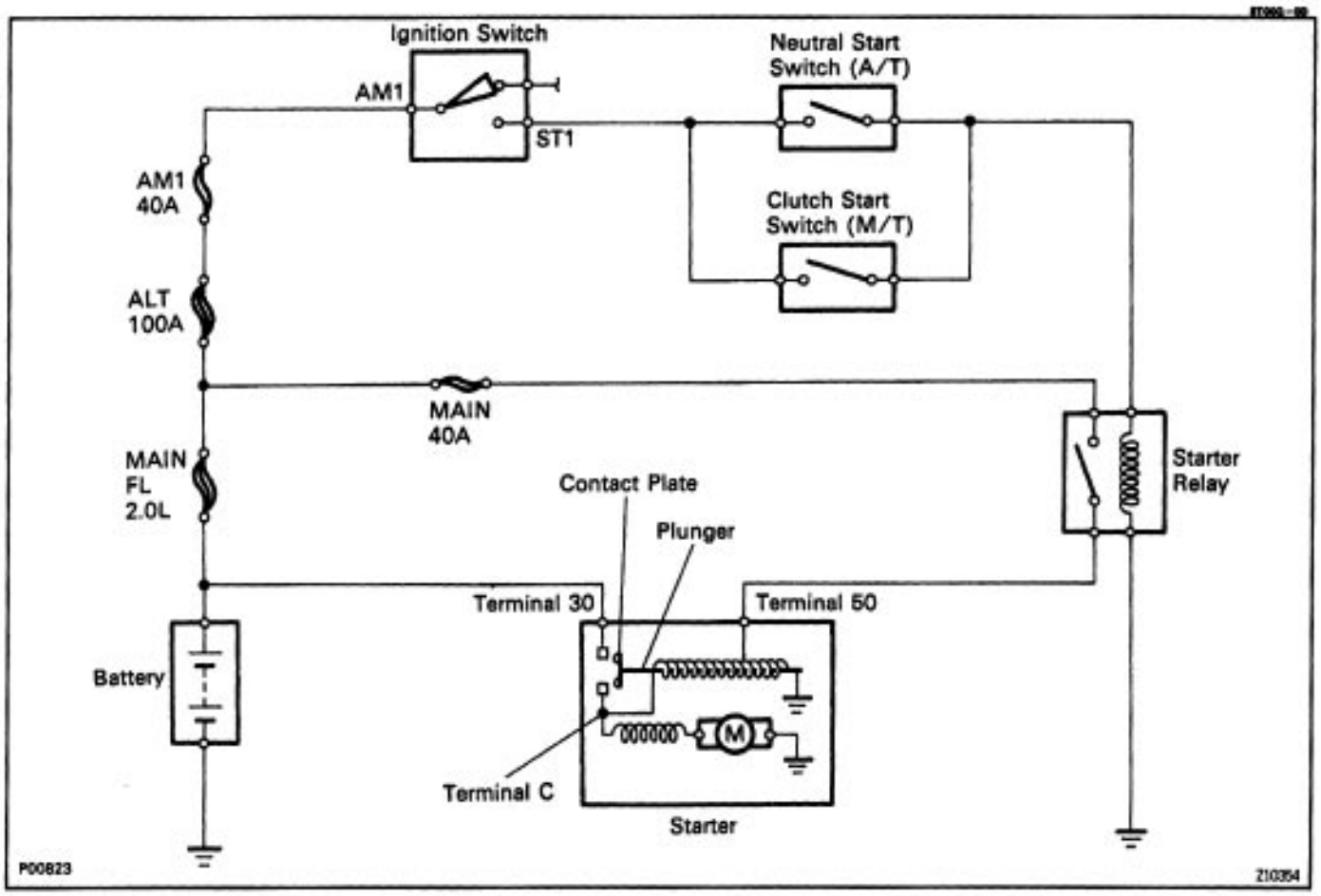
(5S–FE)

DESCRIPTION

The starter is a reduction type with a small, high–speed motor used to drive the pinion gear.



SYSTEM CIRCUIT



OPERATION

When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil. When the plunger is pulled to the left, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates.

When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring. Battery voltage no longer flows from terminal 30, so the motor stops.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09286–46011 Injection Pump Spline Shaft Puller	Armature bearing
	09820–00030 Alternator Rear Bearing Replacer	Armature front bearing

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester set	

EQUIPMENT

Dial indicator	Commutator
Magnetic finger	
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V – block	
Vernier calipers	Commutator, Brush

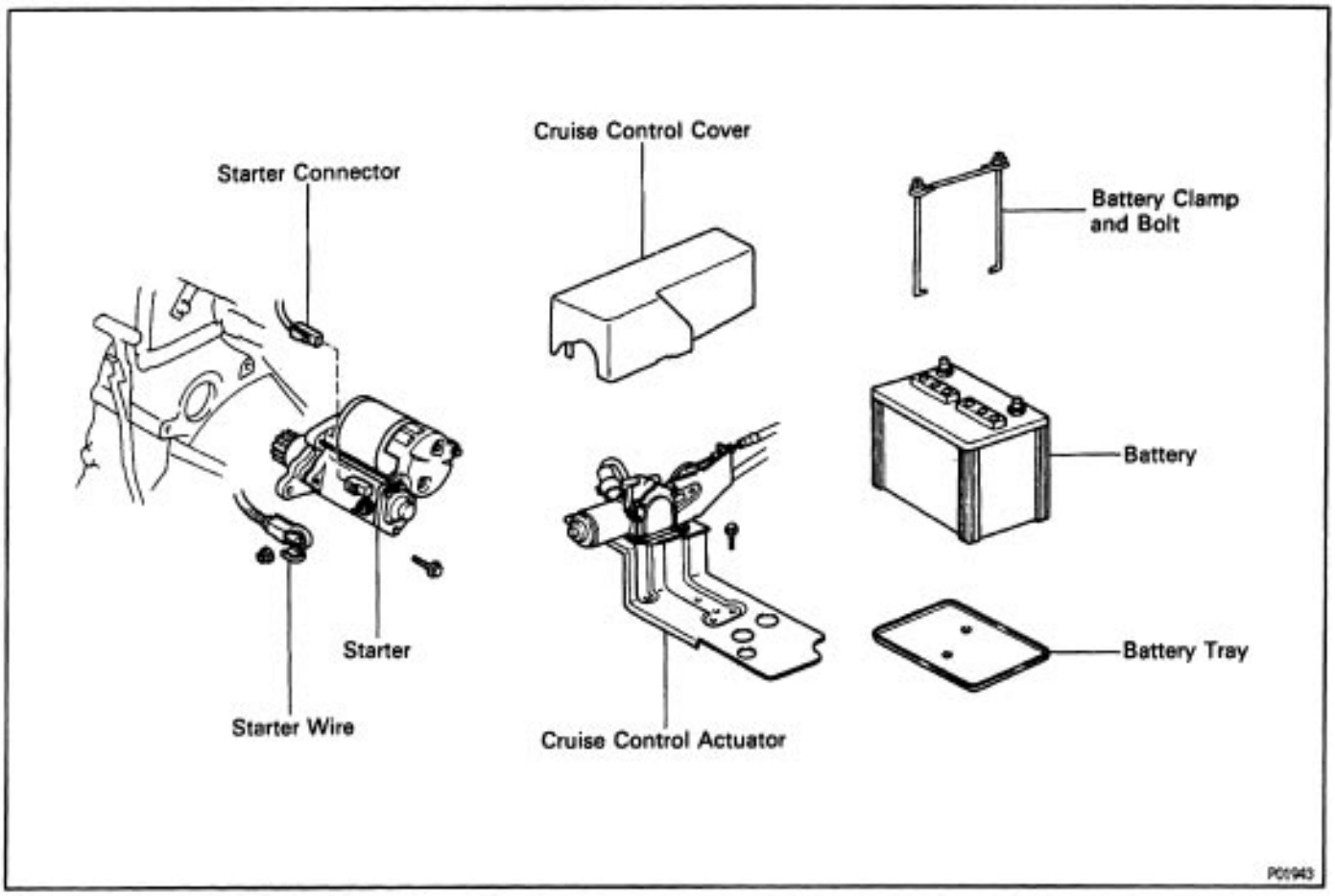
ON–VEHICLE INSPECTION

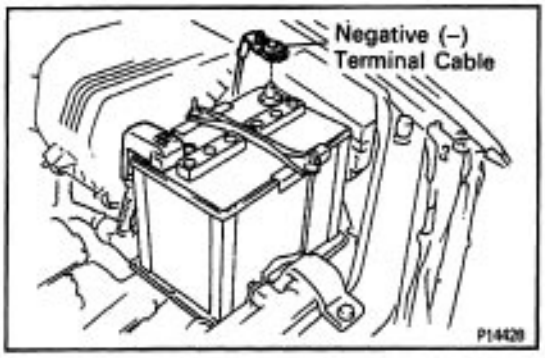
NOTICE: Before changing the starter, check the following Items again:

- **Connector connection**
- **Accessory Installation, e.g.: theft deterrent system**

STARTER

COMPONENTS FOR REMOVAL AND INSTALLATION



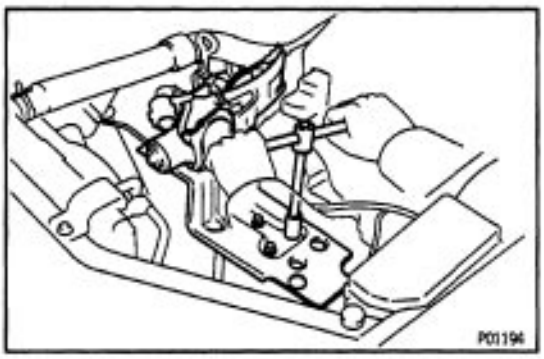


STARTER REMOVAL

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

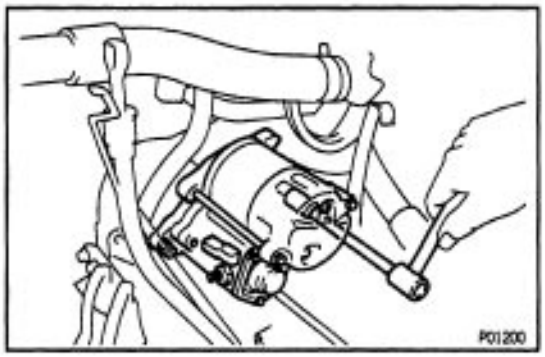
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery.

2. w/ CRUISE CONTROL SYSTEM:
REMOVE BATTERY



3. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR

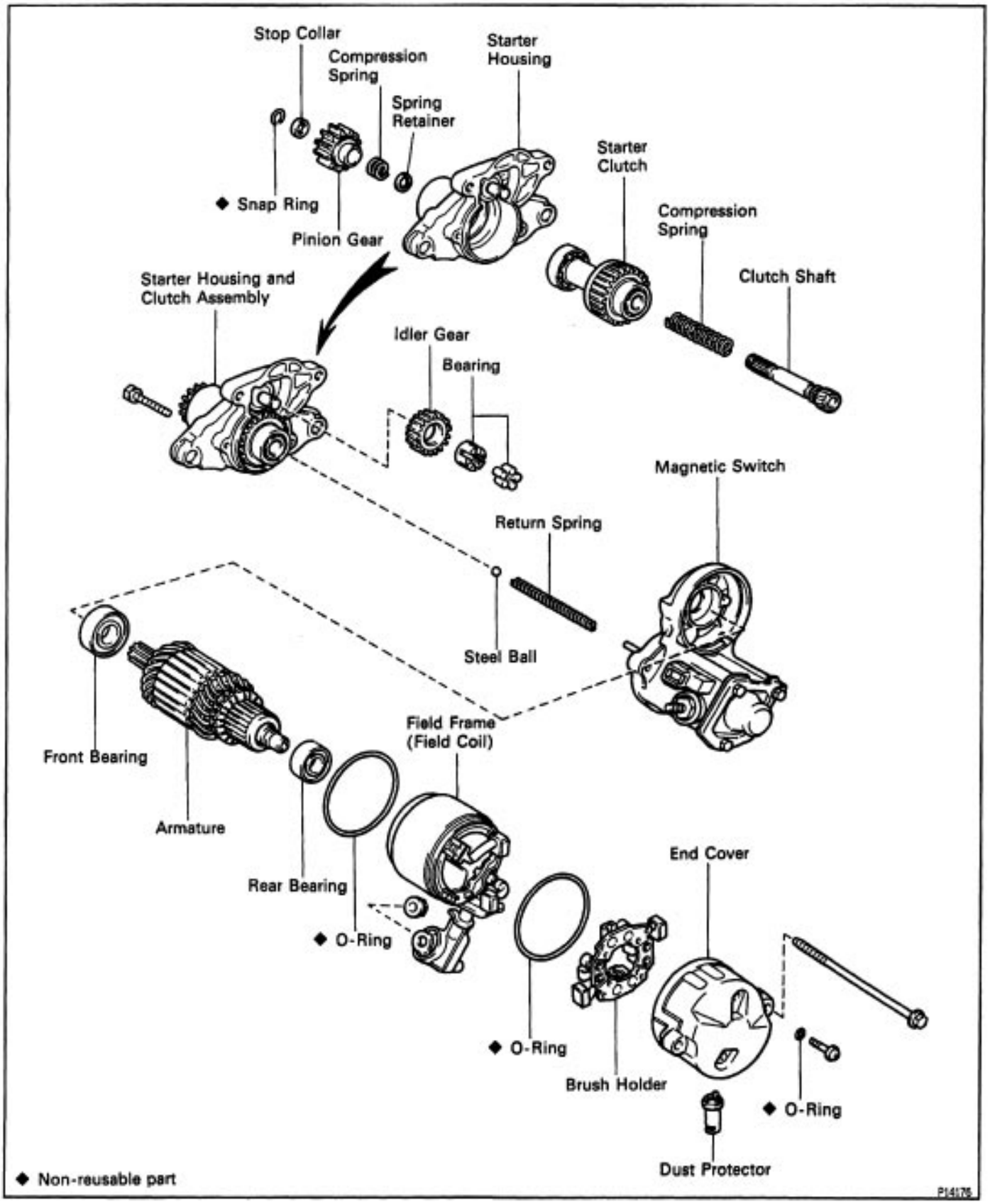
(a) Remove the actuator cover.
(b) Disconnect the actuator connector.
(c) Remove the 3 bolts and cruise control actuator.



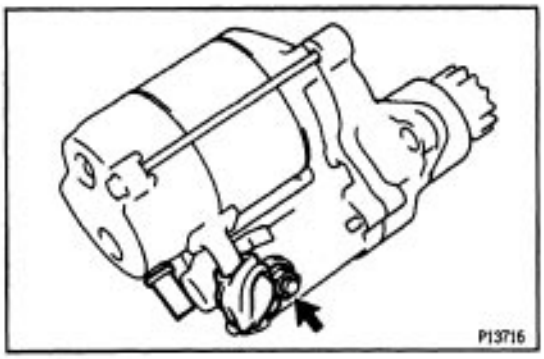
4. REMOVE STARTER

(a) Disconnect the starter connector.
(b) Remove the nut, and disconnect the starter wire.
(c) Remove the 2 bolts and starter.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



STARTER DISASSEMBLY

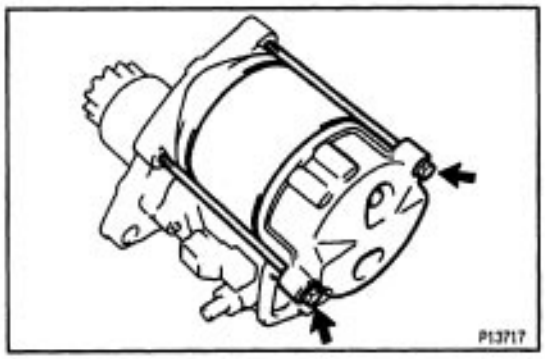


(See Components for Disassembly and Assembly)

1. REMOVE DUST PROTECTOR

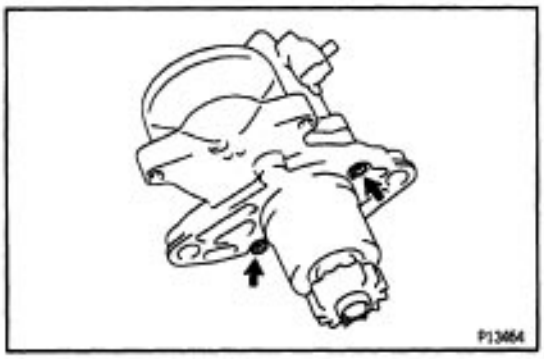
2. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.



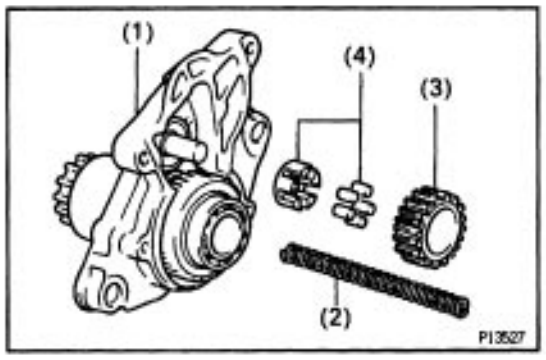
(b) Remove the 2 through bolts, and pull out the field frame together with the armature.

(c) Remove the O–ring from the field frame.



3. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.



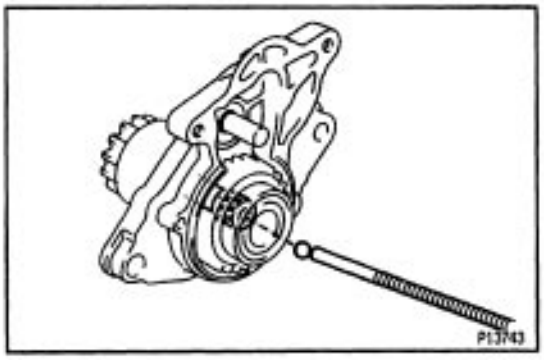
(b) Remove the following parts from the magnetic switch:

(1) Starter housing and clutch assembly

(2) Return spring

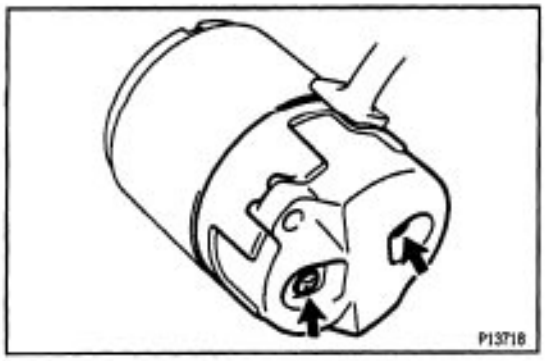
(3) Idler gear

(4) Bearing



4. REMOVE STEEL BALL

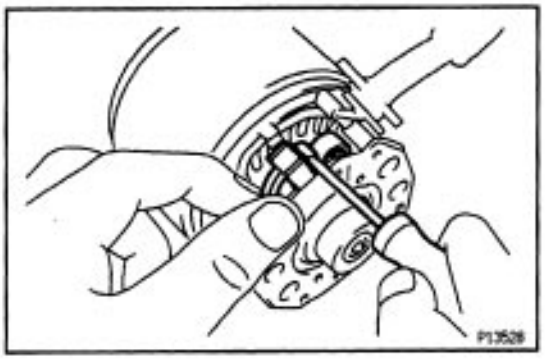
Using a magnetic finger, remove the steel ball from the clutch shaft hole.



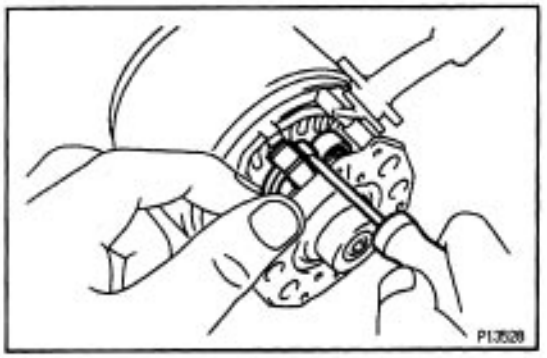
REMOVE BRUSH HOLDER

(a) Remove the 2 screws, 2 O–rings and end cover from the field frame.

(b) Remove the O–ring from the field frame.

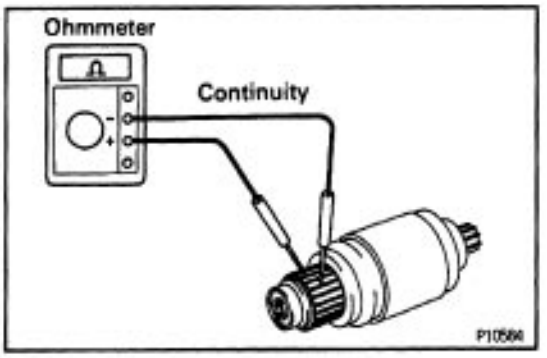


(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.
Disconnect the 4 brushes, and remove the brush holder.



6. REMOVE ARMATURE FROM FIELD FRAME

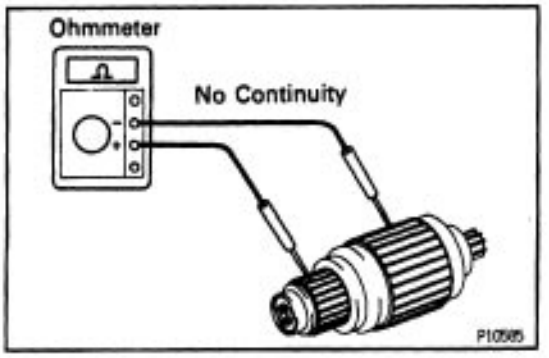
STARTER INSPECTION AND REPAIR



Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.



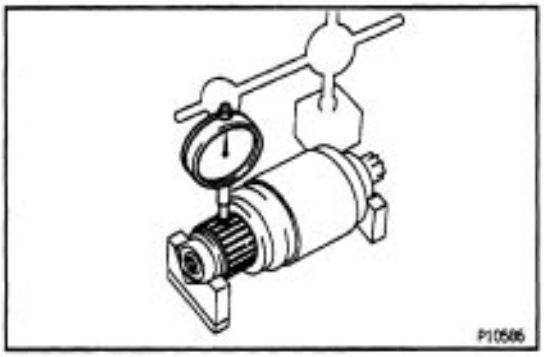
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpa–per (No.400) or on a lathe.



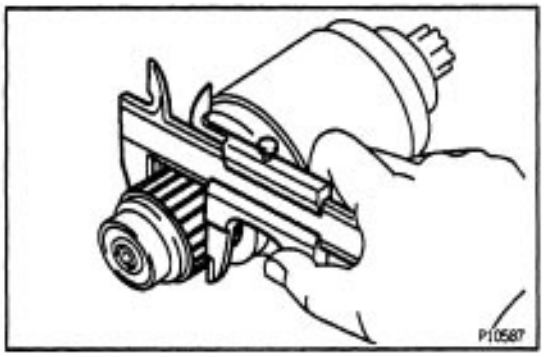
2. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V – blocks.

(b) Using a dial gauge, measure the circle runout.

Maximum circle runout:
0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.

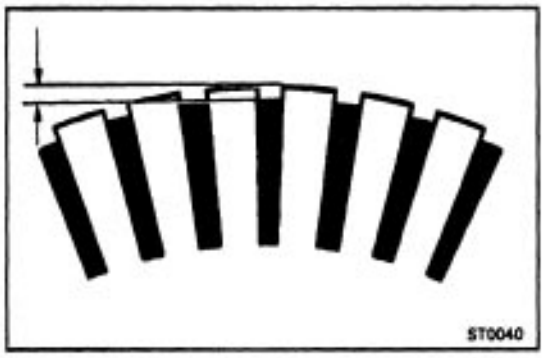


3. INSPECT COMMUTATOR4R DIAMETER

Using a vernier caliper, measure the commutator di–ameter.

Standard diameter:
30 mm (1.18 In.)
Minimum diameter:
29 mm (1.14 in.)

If the diameter is less than minimum, replace the armature.



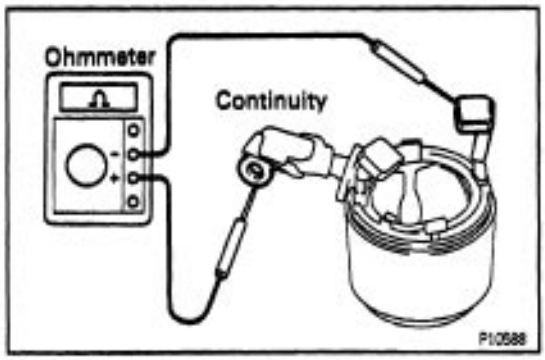
4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth:
0.6 mm (0.024 in.)
Minimum undercut depth:
0.2 mm 10.008 In.)

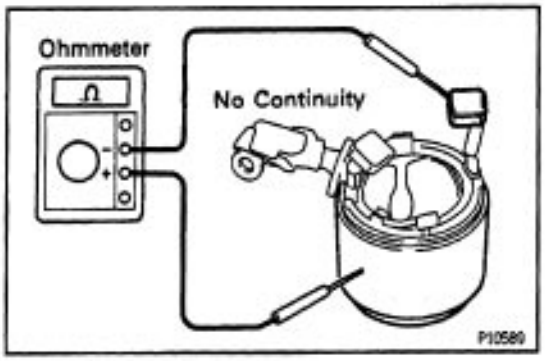
If the undercut depth is less than minimum, correct it with a hacksaw blade.

Field Frame (Field Coil)



1. INSPECT FIELD COIL FOR OPEN CIRCUIT

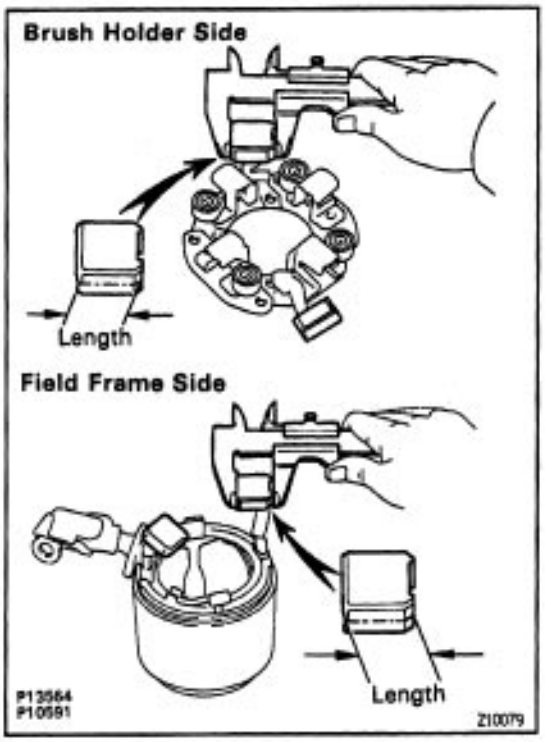
Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

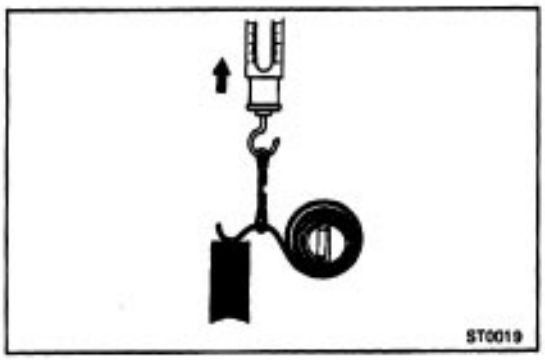
Standard length:

15.5 mm (O.610 In.)

Minimum length:

8.5 mm (0.335 in.)

If the length is less than minimum, replace the brush holder and field frame.



Brush Springs

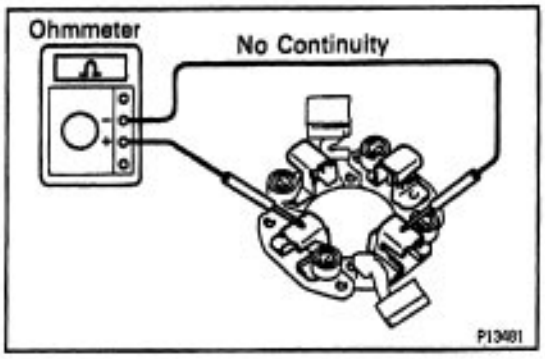
INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:

18–24N(1.79–2.41kgf,3.9–5.31bf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

INSPECT BRUSH HOLDER INSULATION

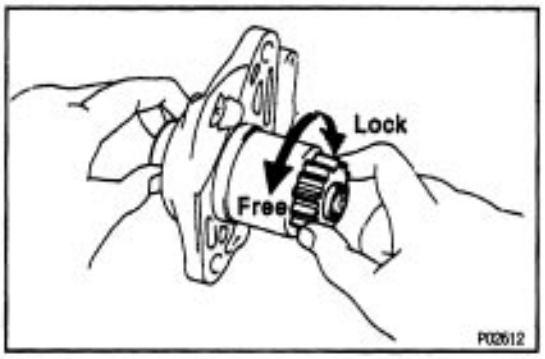
Using an ohmmeter, check that there is no continuity between the positive (+).and negative (–) brush hol–ders.

If there is continuity, repair or replace the brush holder.

Clutch and Gears

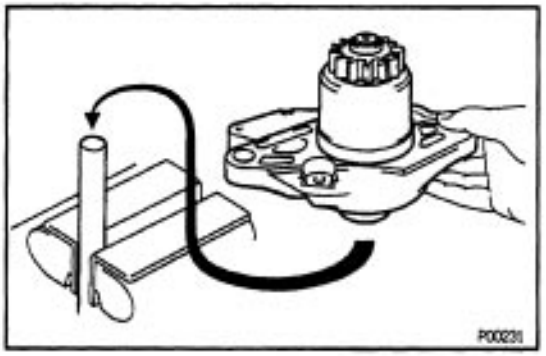
1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idle gear and clutch assembly for wear or damage.
If damaged, replace the gear or clutch assembly.
If damaged, also check the drive plate ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

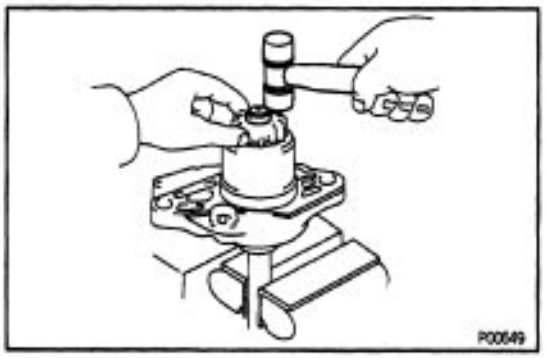
Hold the starter clutch and rotate the pinion gear counterclockwise, and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.
If necessary, replace the clutch assembly.



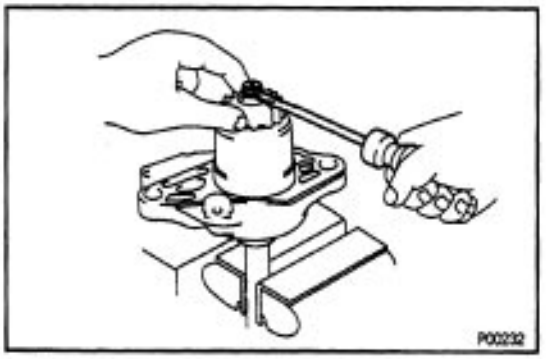
3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY

A. Disassemble starter housing and clutch assembly

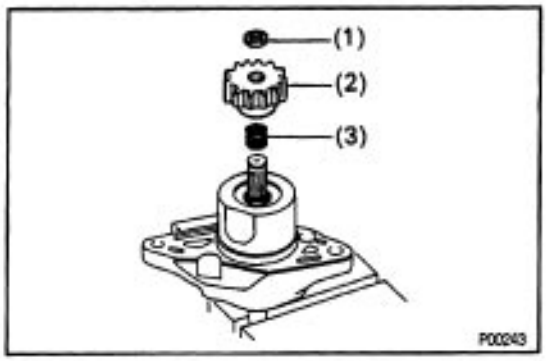
(a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.



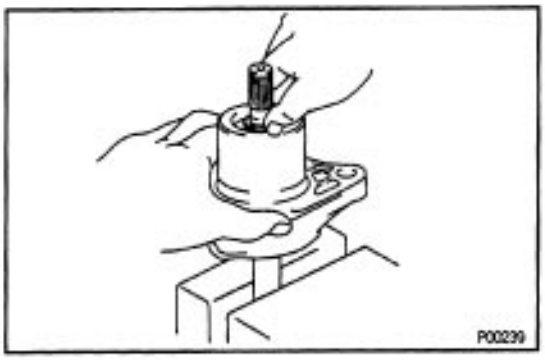
(b) Push down the pinion gear.
(c) Using a plastic–faced hammer, tap down the stop collar.



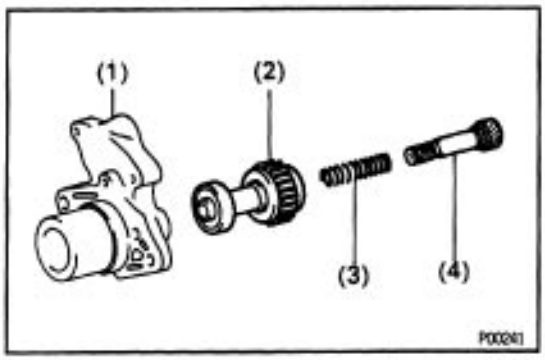
(d) Using a screwdriver, pry out the snap ring.



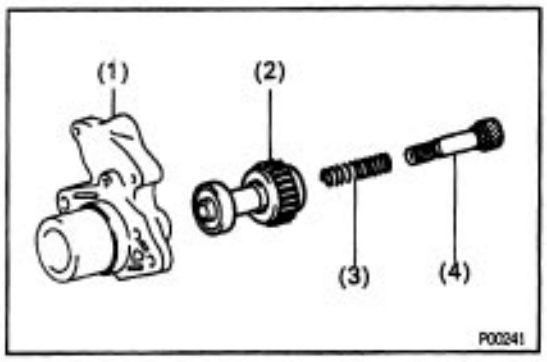
(e) Remove the following parts:
(1) Stop collar
(2) Pinion gear
(3) Compression spring



(f) Push down the starter housing, and remove the spring retainer.

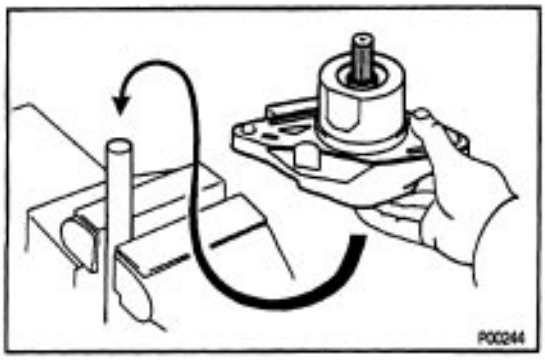


(g) Disassemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft

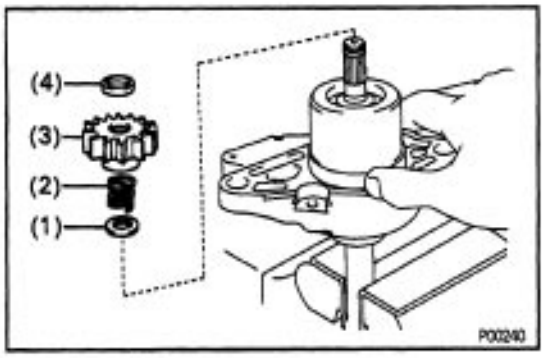


B. Assemble starter housing and clutch assembly

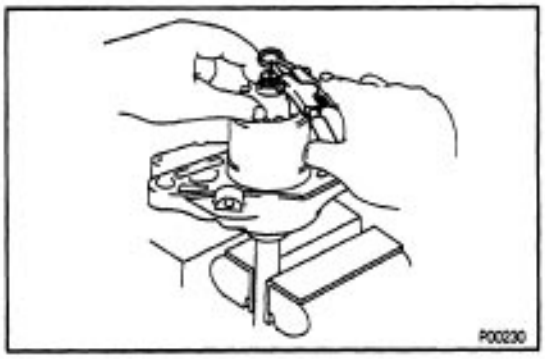
(a) Assemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft



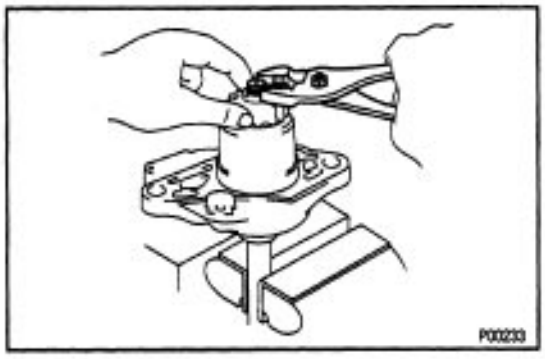
(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.



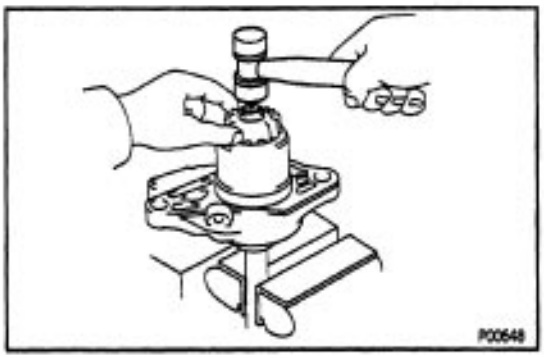
(c) Push down the starter housing, and install the following parts:
(1) Spring retainer
(2) Compression spring
(3) Pinion gear
(4) Stop collar



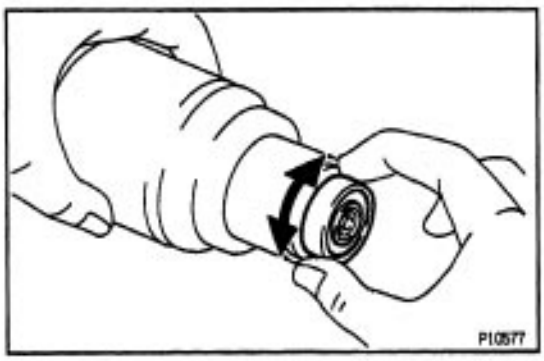
(d) Push down the pinion gear.
(e) Using snap ring pliers, install a new snap ring.



(f) Using pliers, compress the snap ring.
(g) Check that the snap ring fits correctly.



(h) Remove the starter housing and clutch assembly from the brass bar.
(i) Using a plastic–faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.

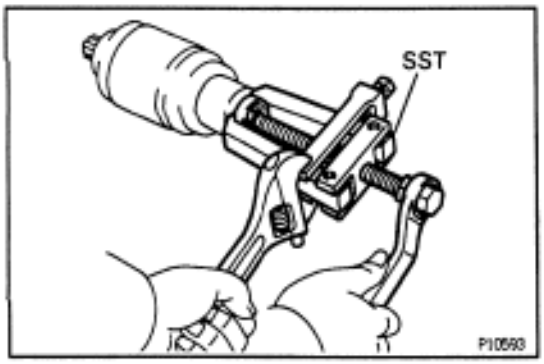


Bearings

1. INSPECT REAR BEARINGS

Turn each bearing by hand while applying inward force.

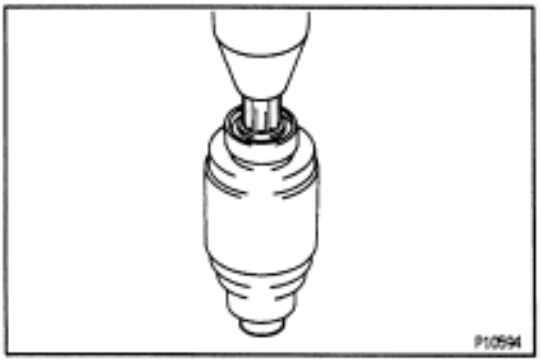
If resistance is felt or the bearing sticks, replace the bearing.



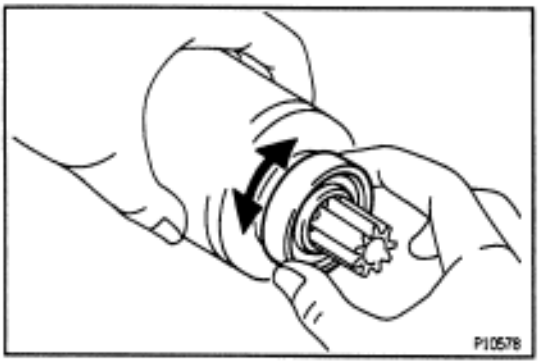
2. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.

SST 09286–46011



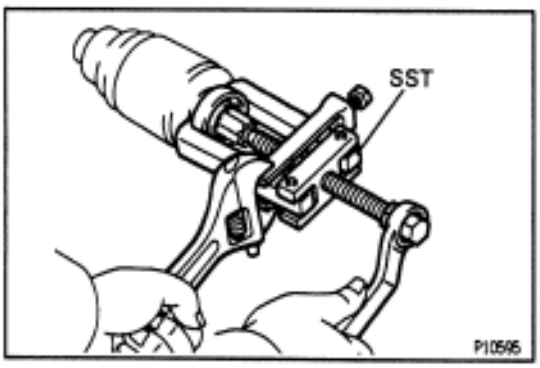
(b) Using a press, press in a new front bearing.



3. INSPECT FRONT BEARING

Turn each bearing by hand while applying inward force.

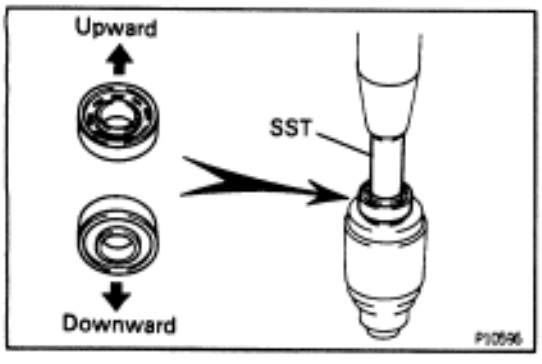
If resistance is felt or the bearing sticks, replace the bearing.



4. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing.

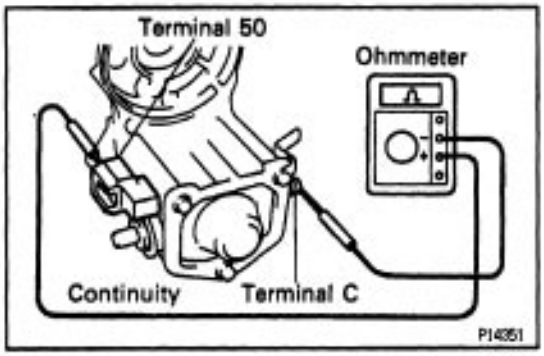
SST 09286 – 46011



(b) Using SST and a press, press in a new bearing.

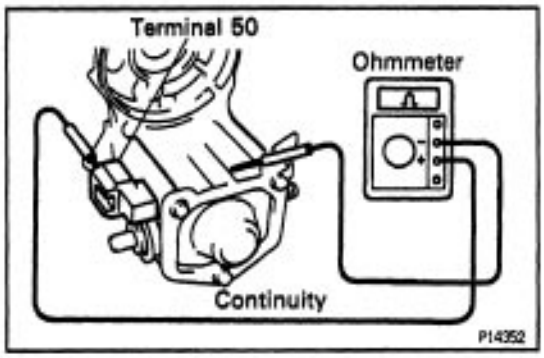
NOTICE: Be careful of the bearing Installation direction.

SST 09820–00030

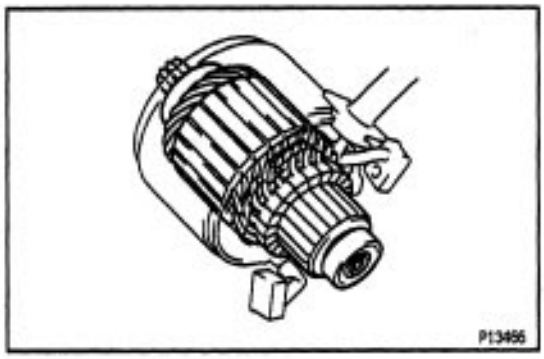


Magnetic Switch

1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch.



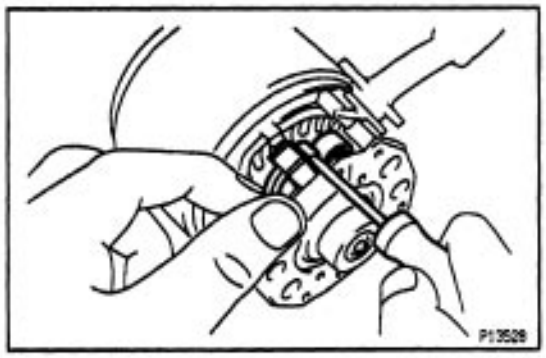
2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.



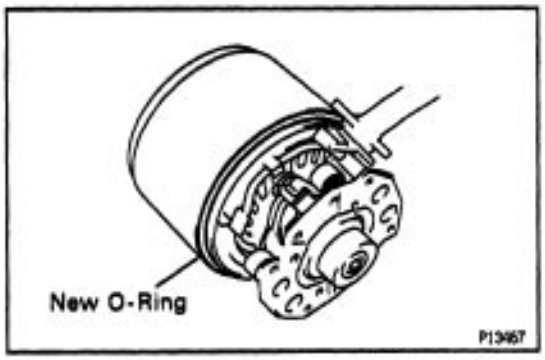
STARTER ASSEMBLY

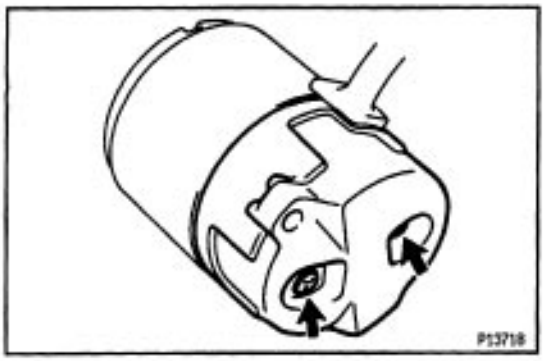
(See Components for Disassembly and Assembly)
HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.
1. PLACE ARMATURE INTO FIELD FRAME
Apply grease to the armature bearings, and insert the armature into the field frame.

2. INSTALL BRUSH HOLDER
(a) Place the brush holder in position on the armature.
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the 4 brushes.
NOTICE: Check that the positive (+) lead wires are not grounded.

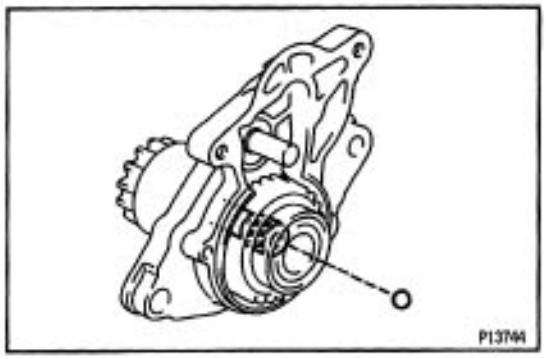


(c) Place a new O–ring in position on the field frame.

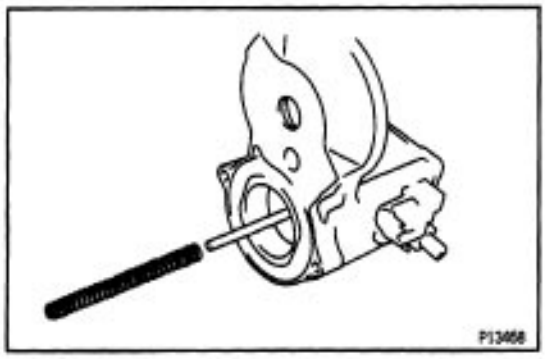




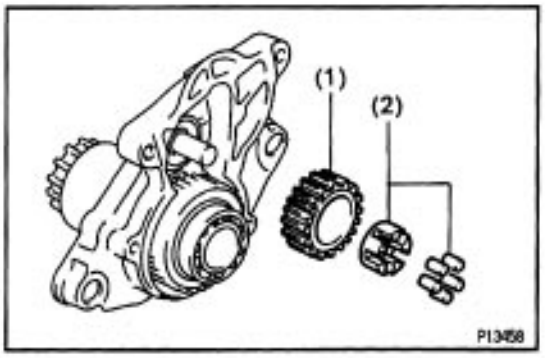
(d) Install a new O–ring to the screw.
(e) Install the end cover to the field frame with the 2 screws.
Torque: 1.5 N·m (15 kgf·cm, 13 in.·lbf)



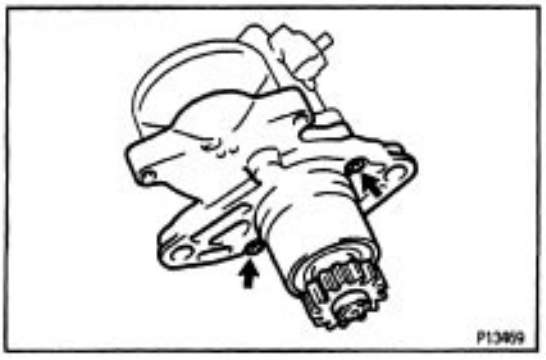
3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE
(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.



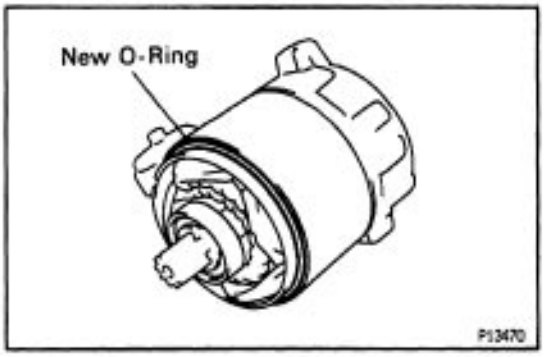
4. INSTALL STARTER HOUSING, CLUTCH ASSEM–
BLY AND GEAR
(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic switch hole.



(c) Place the following parts in position on the starter housing:
(1) Idler gear
(2) Retainer

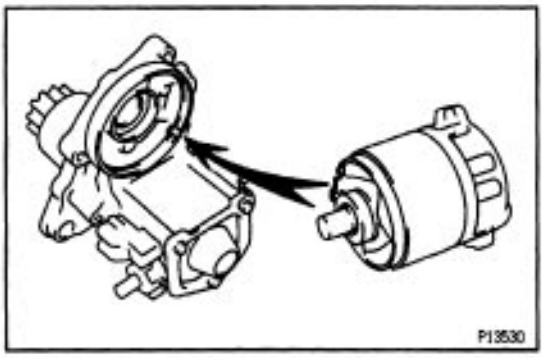


(d) Install the starter housing to the magnetic switch with the 2 screws.
Torque: 5.9 N·m (60 kgf·cm. 62 in.·lbf)

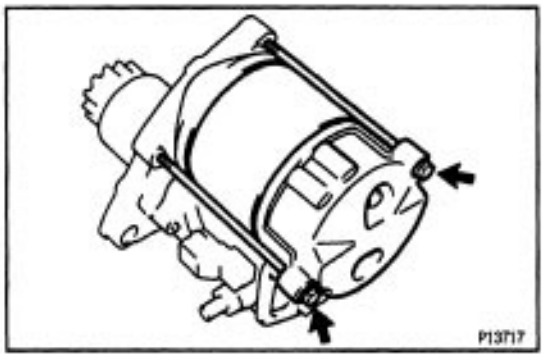


5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

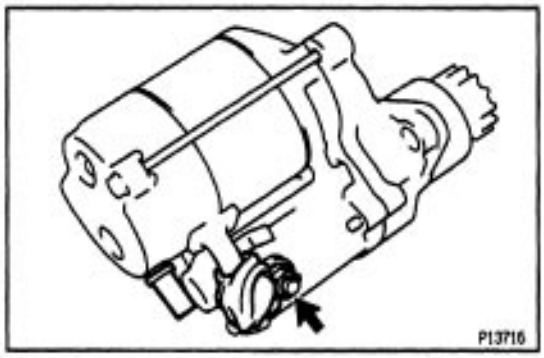
(a) Place a new O–ring in position on the field frame.



(b) Align the protrusion of the field frame with the cutout of the magnetic switch.

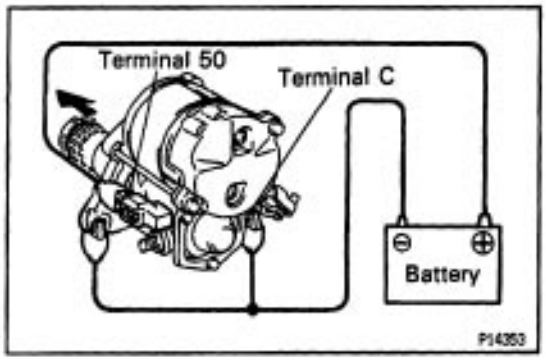


(c) Install the field frame and armature assembly with the 2 through bolts.
Torque: 6.9 N·m (60 kgf·cm, 52 in.·lbf)



(d) Connect the lead wire to terminal C, and install the nut.
Torque: 7.9 N·m (81 kgf·cm, 70 In.·lbf)

6. INSTALL DUST PROTECTOR



STARTER PERFORMANCE TEST

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

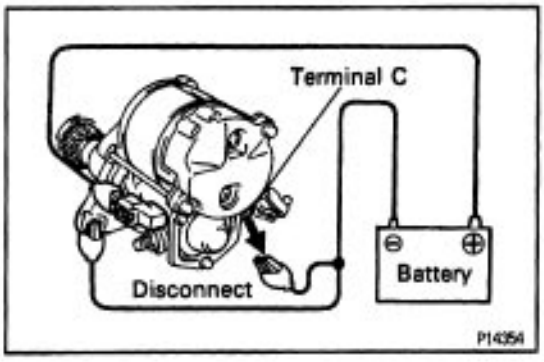
1. PERFORM PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown.

Check that the clutch pinion gear moves outward.

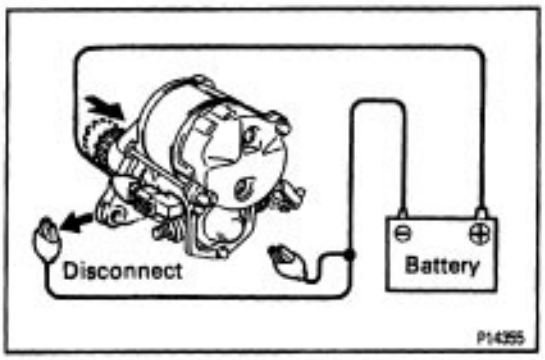
If the clutch pinion gear does not move, replace the magnetic switch assembly.



2. PERFORM HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.

If the clutch pinion gear returns inward, replace the magnetic switch assembly.

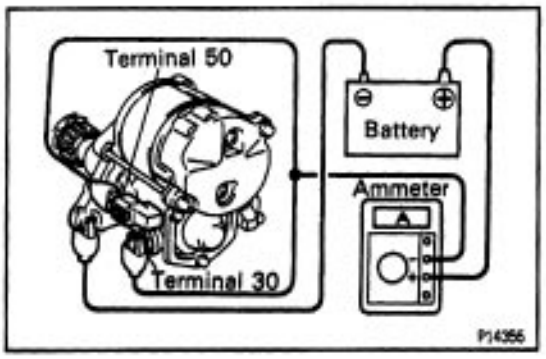


3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body.

Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch assembly.



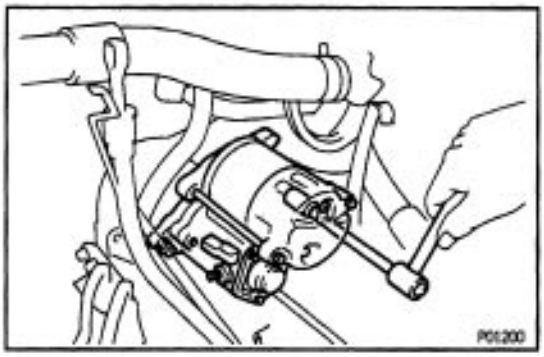
4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the am–meter shows the specified current.

Specified current:

90 A or less at11.6V



STARTER INSTALLATION

(See Components for Removal and Installation)

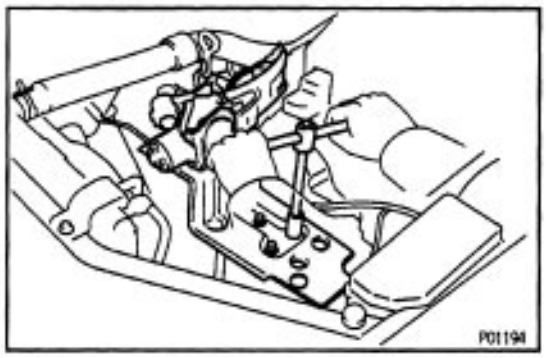
1. INSTALL STARTER

(a) Install the starter with the 2 bolts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Connect the starter wire with the nut.

(c) Connect the starter connector.



2. w/ CRUISE CONTROL SYSTEM:
INSTALL CRUISE CONTROL ACTUATOR

(a) Install the cruise control actuator with the 3 bolts.

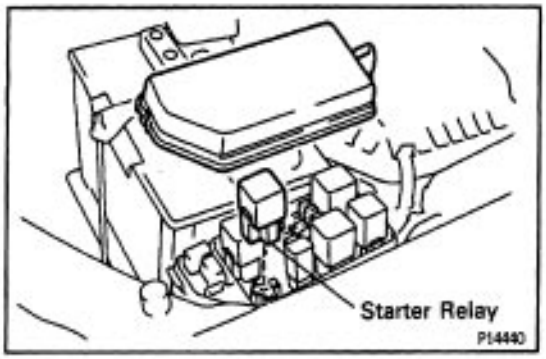
(b) Connect the actuator connector.

(c) Install the actuator cover.

3. w/ CRUISE CONTROL SYSTEM:
INSTALL BATTERY

4. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

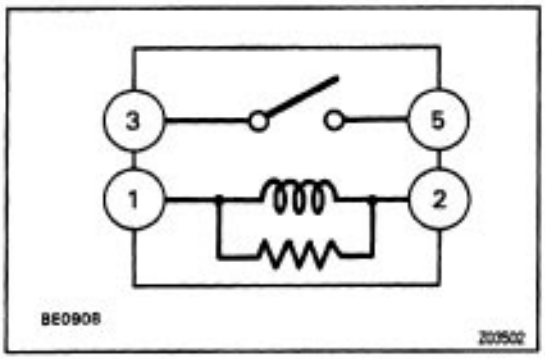
6. CHECK THAT ENGINE STARTS



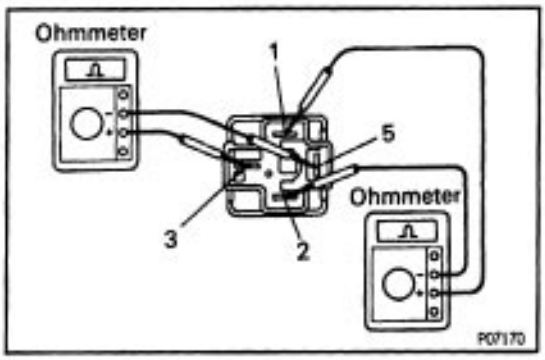
STARTER RELAY

STARTER RELAY INSPECTION

1. REMOVE STARTER RELAY



2. INSPECT STARTER RELAY

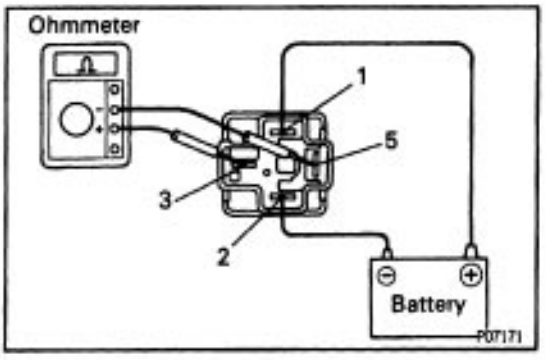


A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If operation is not as specified, replace the relay.

3. REINSTALL STARTERT RELAY

CLUTCH START SWITCH (M/T)

(See page CL–7)

PARK/NEUTRAL POSITION (PNP) SWITCH (A/T)

(See page AX–92)

SERVICE SPECIFICATIONS

SERVICE DATA

Starter	Rated voltage and output power		12 V 1.4 kW
	No–load characteristics	Current	90 A or less at 11. 5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Limit	8.5 mm (0.335 in.)
	Spring installed load		18 – 24 N (1.79 – 2.41 kgf, 3.9 – 5.3 lbf)
	Commutator Diameter		
		STD	30 mm (1.18 in.)
		Limit	29 mm (1.14 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Limit	0.2 mm (0.008 in.)
	Circle runout	Limit	0.05 mm (0.0020 in.)

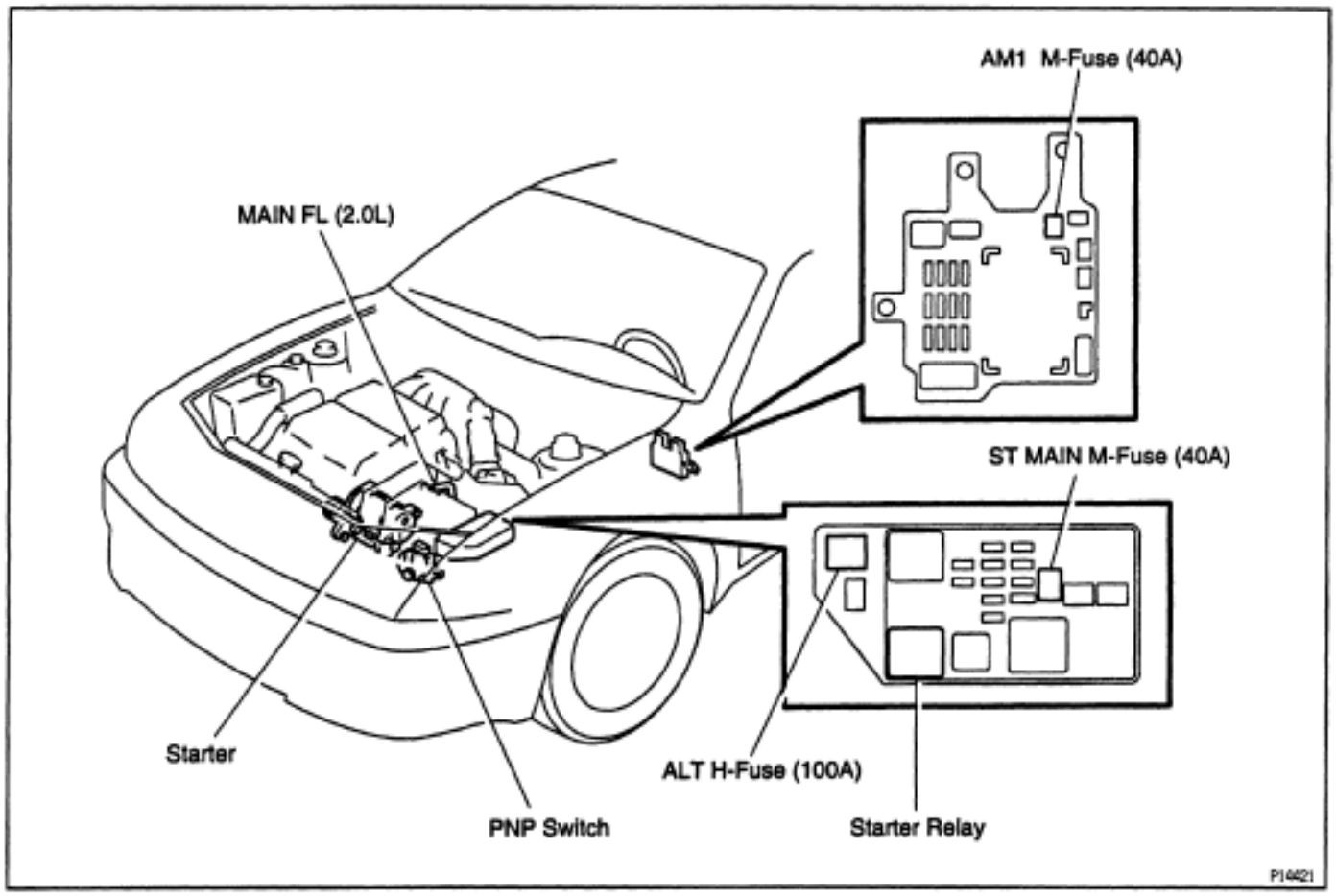
TORQUE SPECIFICATIONS

Pert tightened	N·m	kgf-cm	ft-lbf
End cover x Brush holder	1.5	15	13 in.-lbf
Starter housing x Magnetic switch	5.9	60	52 in.-lbf
End cover x Starter housing (Through bolt)	5.9	60	52 in.-lbf
Lead wire x Terminal C of starter	7.9	81	70 in.-lbf
Starter x Transaxle	39	400	29

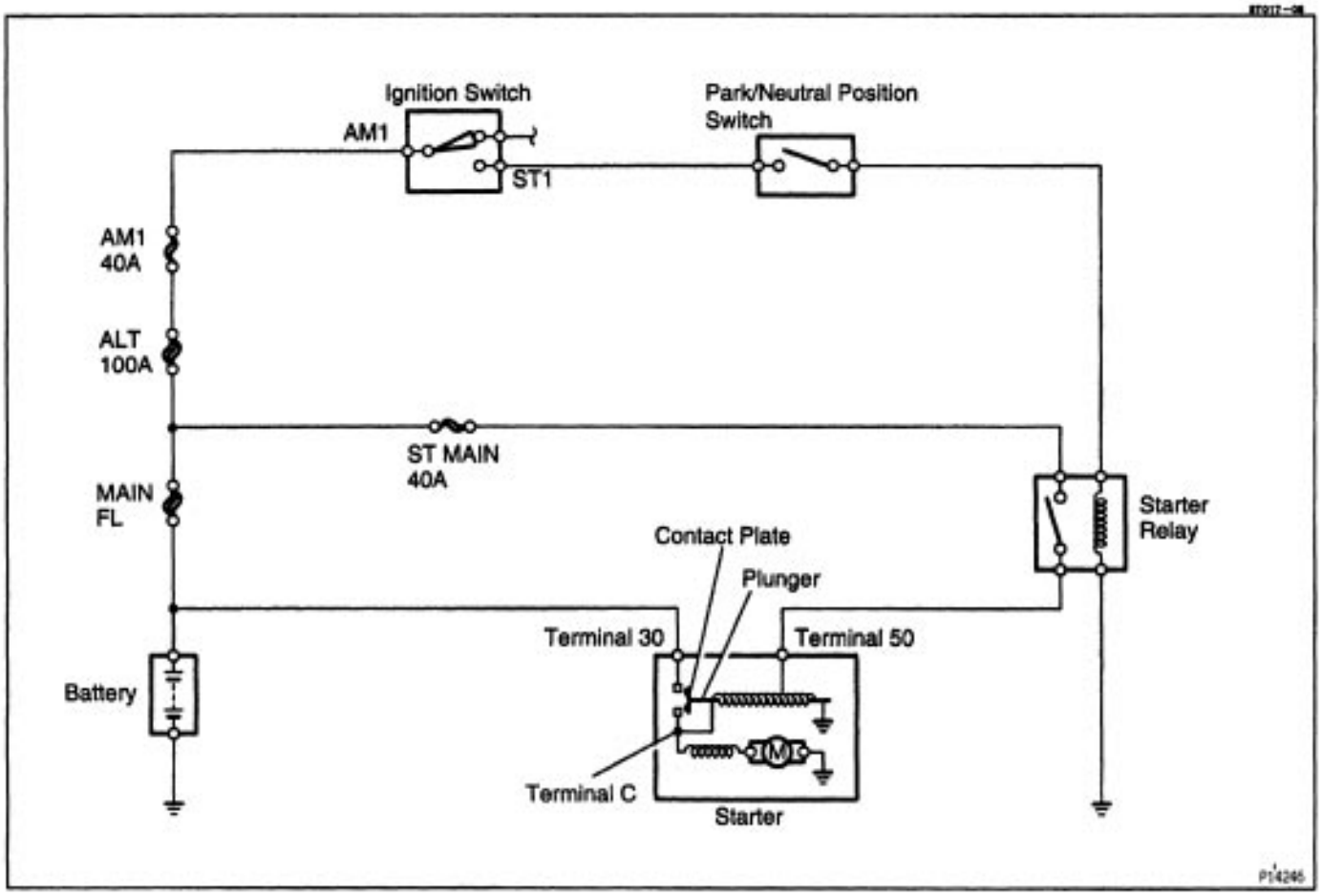
(1 MZ–FE)

DESCRIPTION

The starter is a reduction type with a small, high–speed motor used to drive the pinion gear.



SYSTEM CIRCUIT



OPERATION

When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil. When the plunger is pulled to the left, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates.

When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring. Battery voltage no longer flows from terminal 30, so the motor stops.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09286–46011 Injection Pump Spline Shaft Puller	Armature bearing
	09820–00030 Alternator Rear Bearing Replacer	Armature front bearing

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester set	

EQUIPMENT

Dial indicator	Commutator
Magnetic finger	Steel bell
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

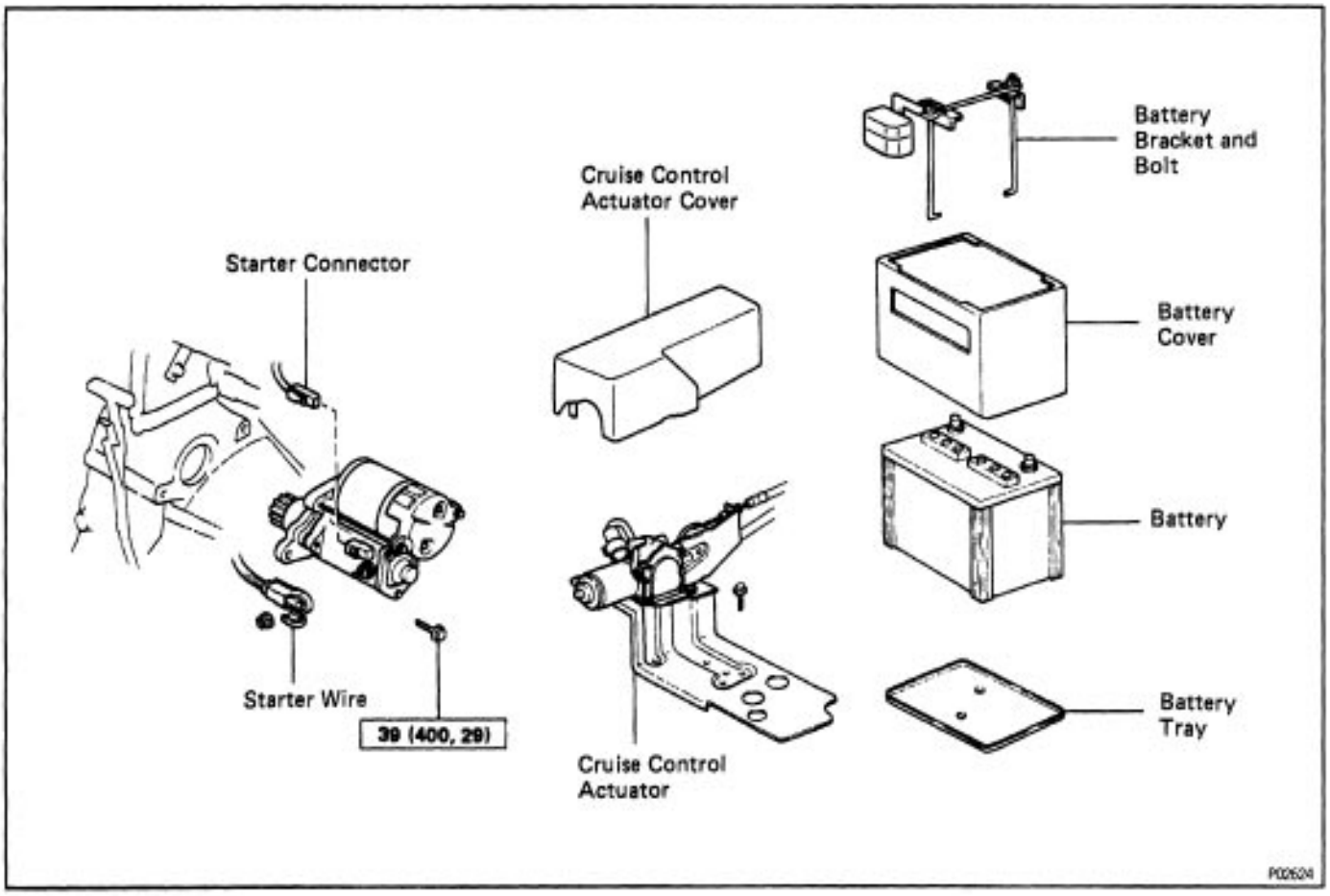
ON –VEHICLE INSPECTION

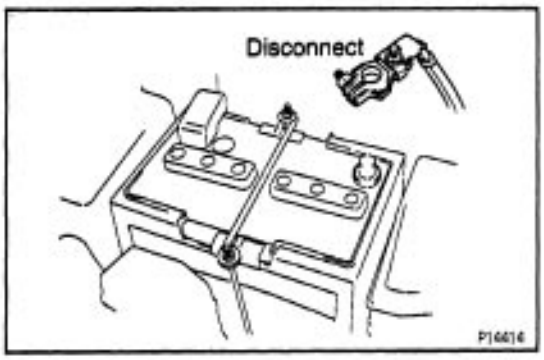
NOTICE: Before changing the starter, check the following items again:

- **Connector connection**
- **Accessory installation, e.g.: theft deterrent system**

STARTER

COMPONENTS FOR REMOVAL AND INSTALLATION





STATER REMOVAL

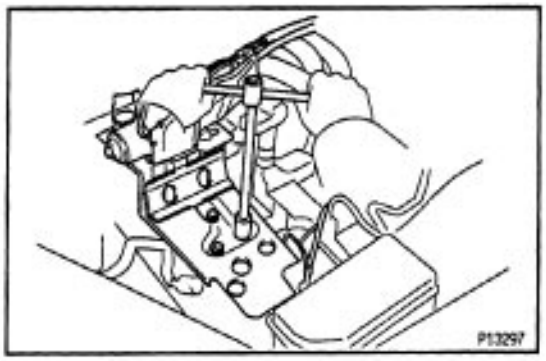
(See Components for Removal and installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is dis–connected from the battery.

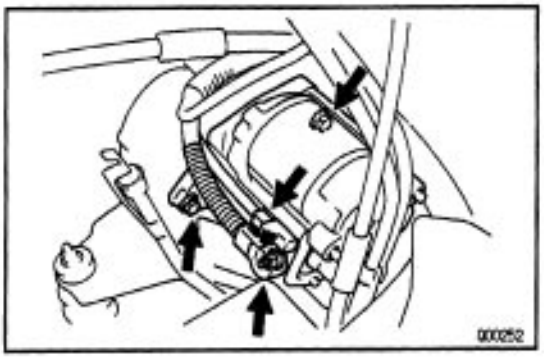
2. w/ CRUISE CONTROL SYSTEM:

REMOVE BATTERY AND TRAY



3. w/ CRUISE CONTROL SYSTEM:
REMOVE CRUISE CONTROL ACTUATOR

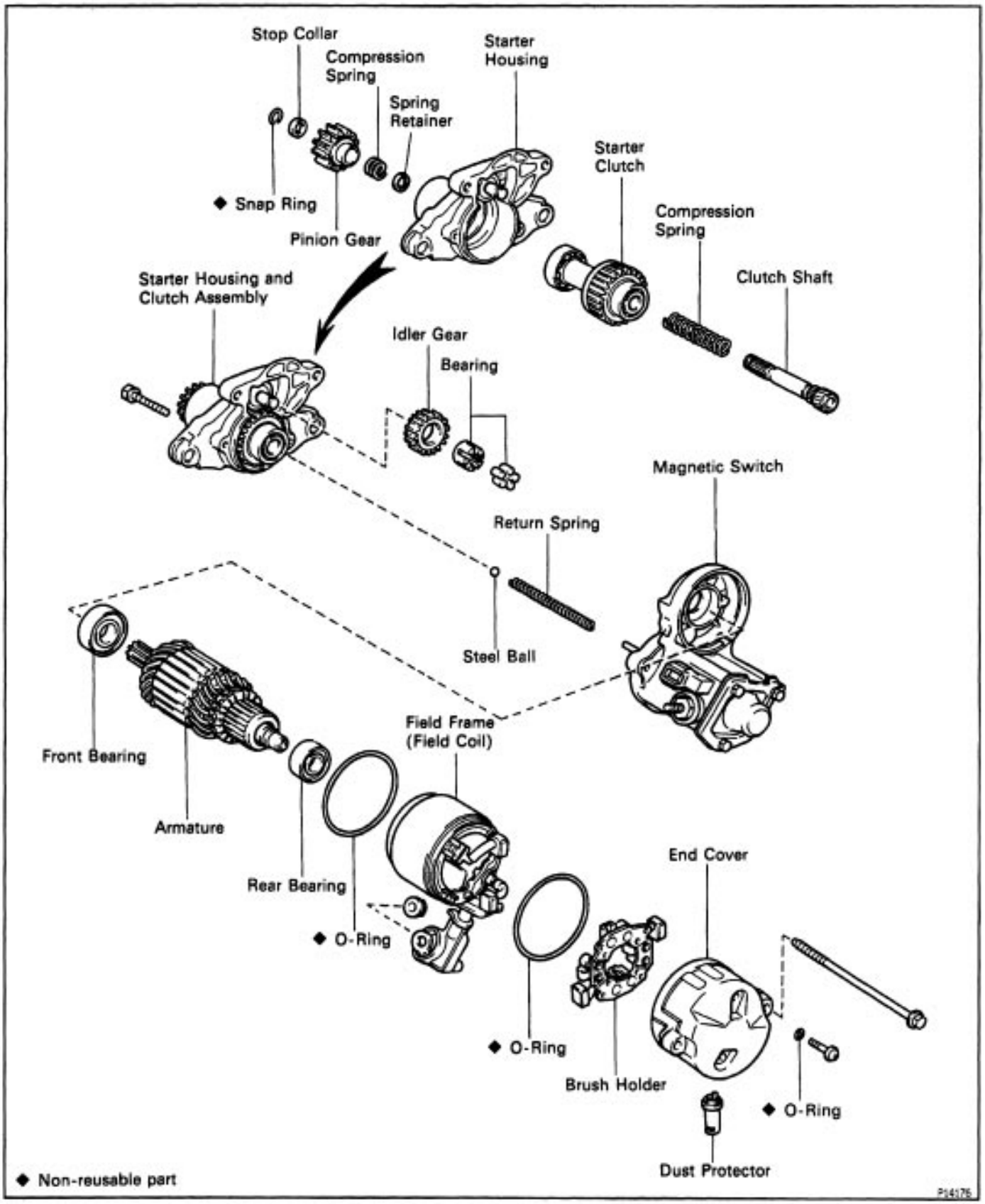
(a) Remove the bolt, clip and actuator cover.
(b) Disconnect the actuator connector and clamp.
(c) Remove the 3 bolts, and disconnect the actuator with the bracket.



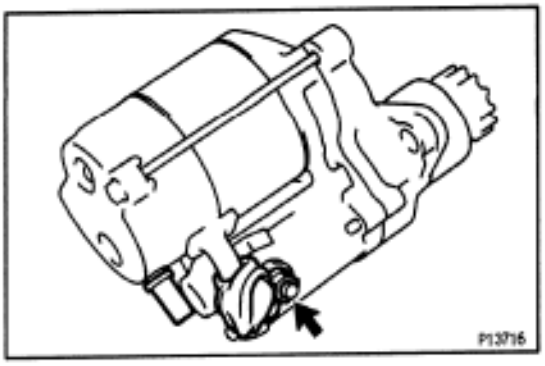
4. REMOVE STARTER

(a) Disconnect the starter connector.
(b) Remove the nut, and disconnect the starter wire.
(c) Remove the 2 bolts and starter.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



STARTER DISASSEMBLY

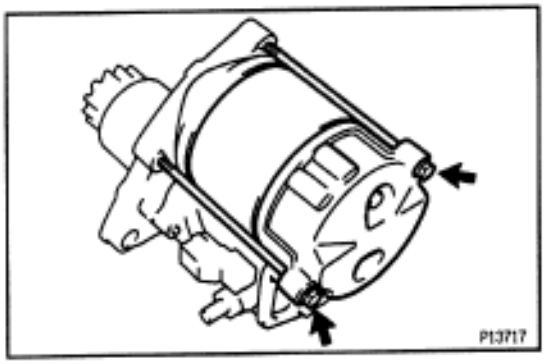


(See Components for Disassembly and Assembly)

1. REMOVE DUST PROTECTOR

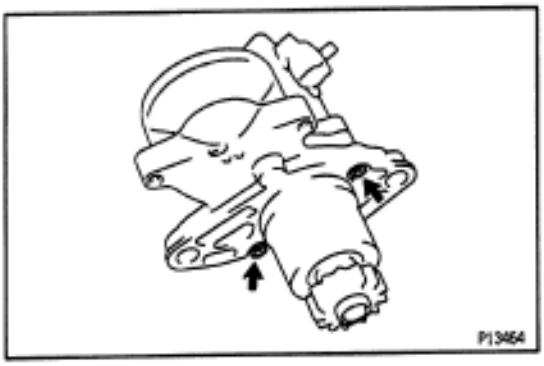
2. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.



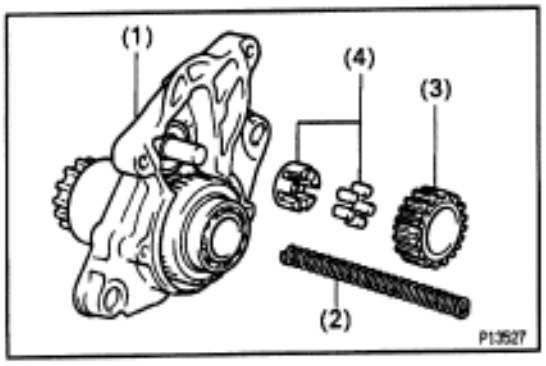
(b) Remove the 2 through bolts, and pull out the field frame together with the armature.

(c) Remove the O–ring from the field frame.



3. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.



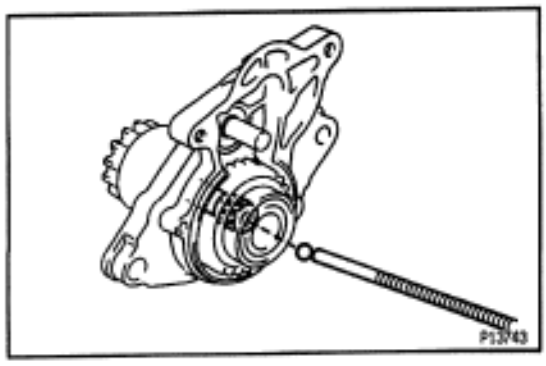
(b) Remove the following parts from the magnetic switch:

(1) Starter housing and clutch assembly

(2) Return spring

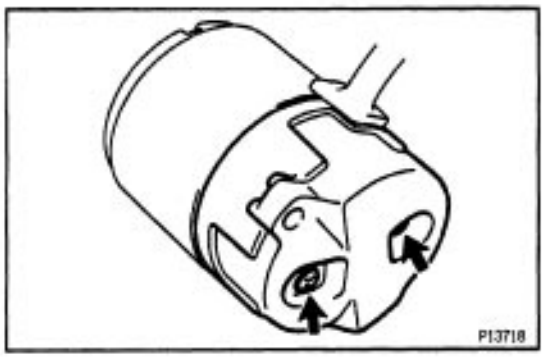
(3) Idler gear

(4) Bearing



4. REMOVE STEEL BALL

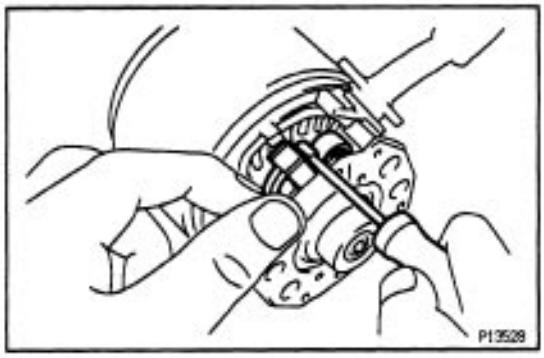
Using a magnetic finger, remove the steel ball from the clutch shaft hole.



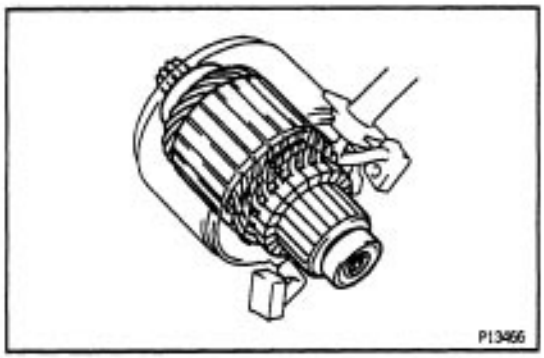
5. REMOVE BRUSH HOLDER

(a) Remove the 2 screws, 2 O–rings and end cover from the field frame.

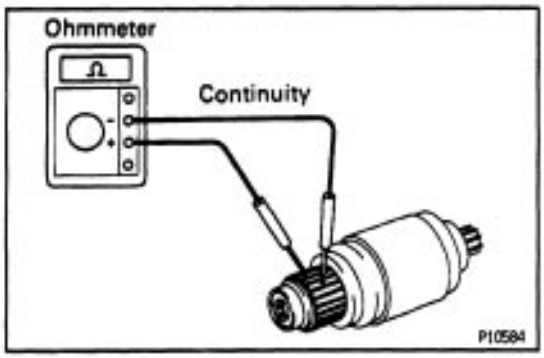
(b) Remove the O–ring from the field frame.



(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder.
Disconnect the 4 brushes, and remove the brush holder.



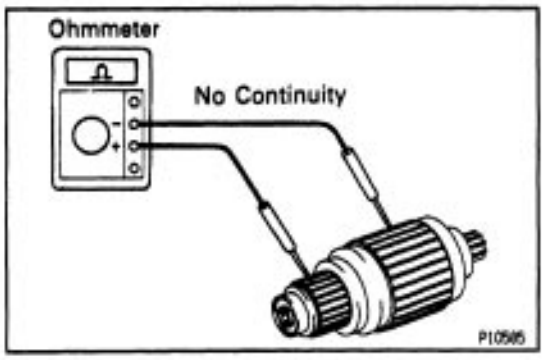
6. REMOVE ARMATURE FROM FIELD FRAME



STARTER INSPECTION AND REPAIR
Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.
If there is no continuity between any segment, replace the armature.



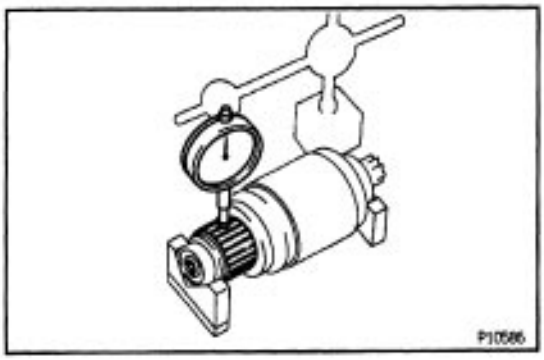
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



2. INSPECT COMMUTATOR CIRCLE RUNOUT

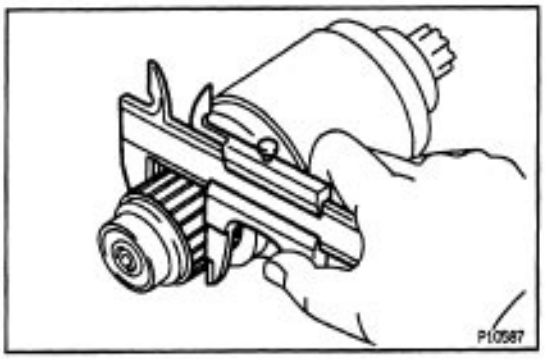
(a) Place the commutator on V – blocks.

(b) Using a dial gauge, measure the circle runout.

Maximum circle runout:

0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the commutator diameter.

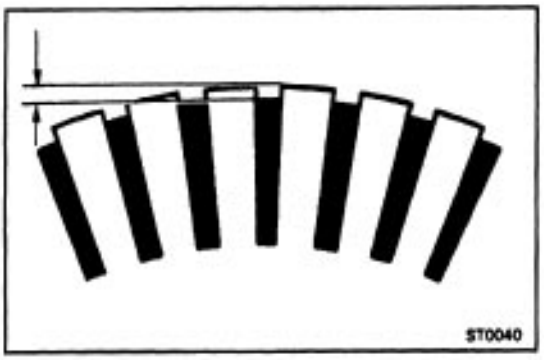
Standard diameter:

30.0 mm 0.181 In.)

Minimum diameter:

29.0 mm (1.142 In.)

If the diameter is less than minimum, replace the armature.



4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

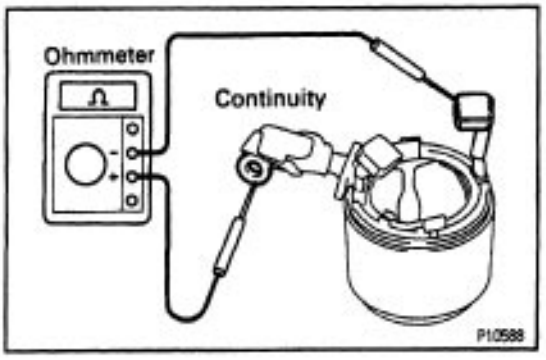
Standard undercut depth:

0.6 mm (0.024 In.)

Minimum undercut depth:

0.2 mm (0.008 In.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

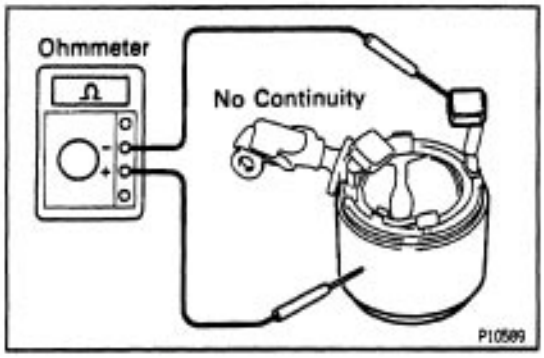


Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

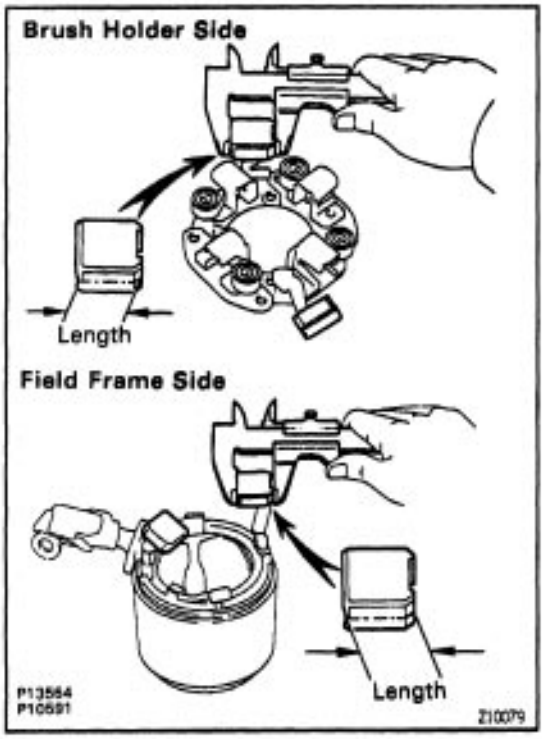
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

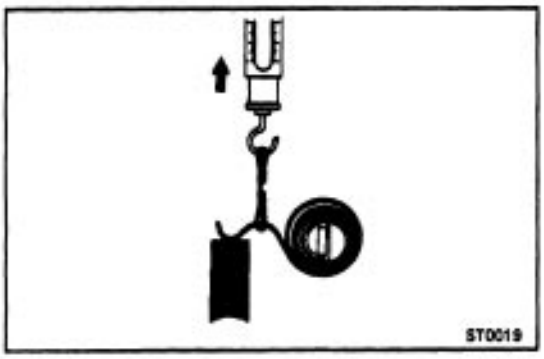
Standard length:

15.5 mm (O.610 In.)

Minimum length:

8.5 mm (0.335 In.)

If the length is less than minimum, replace the brush holder and field frame.



Brush Springs

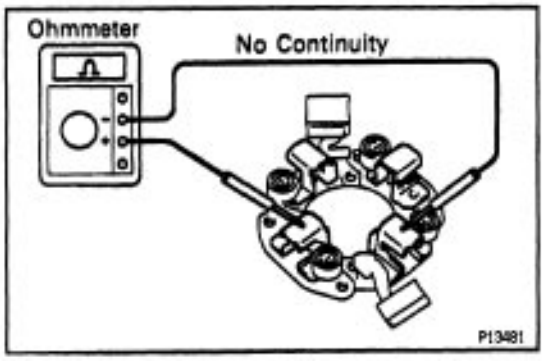
INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:

18 – 24 N (1.79 – 2.41 kgf. 3.9 – 5.3 lbf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

INSPECT BRUSH HOLDER INSULATION

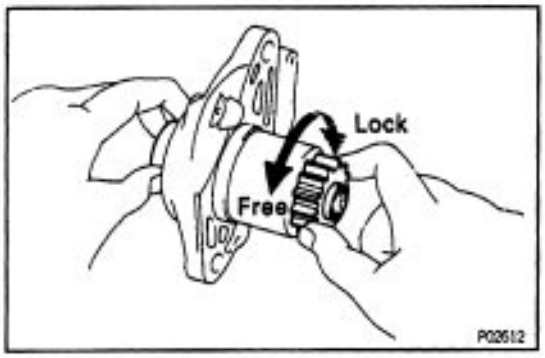
Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush hol–ders.

If there is continuity, repair or replace the brush holder.

Clutch and Gears

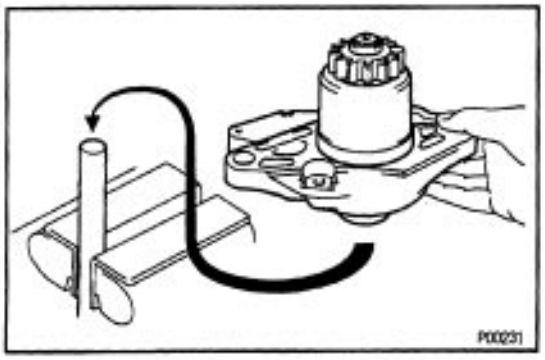
1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.
If damaged, replace the gear or clutch assembly.
If damaged, also check the drive plate ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

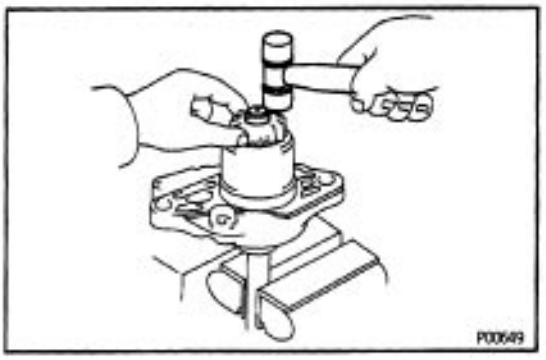
Hold the starter clutch and rotate the pinion gear counterclockwise, and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.
If necessary, replace the clutch assembly.



3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY

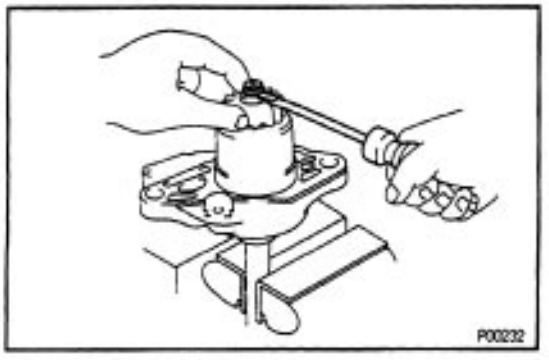
A. Disassembly of starter housing and clutch assembly

(a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.

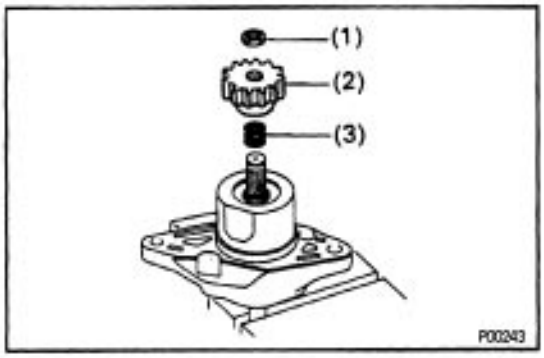


(b) Push down the pinion gear.

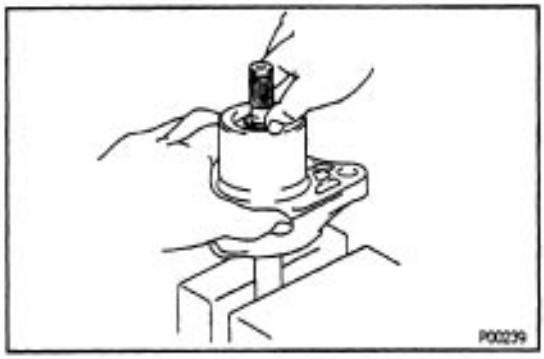
(c) Using a plastic–faced hammer, tap down the stop collar.



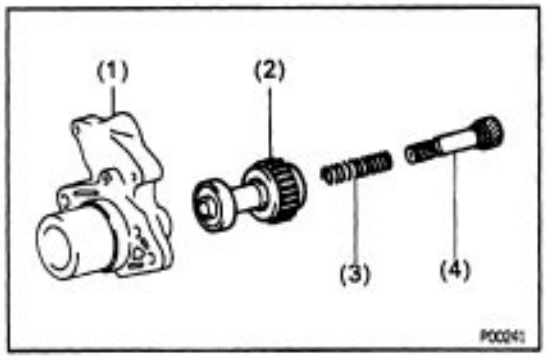
(d) Using a screwdriver, pry out the snap ring.



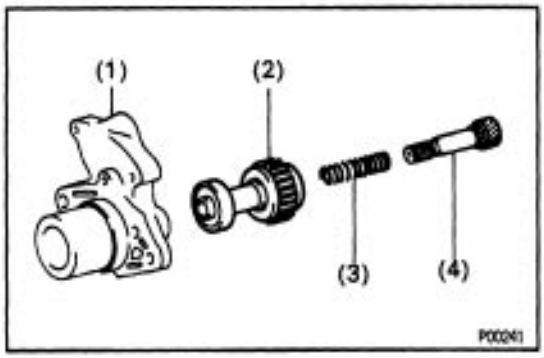
(e) Remove the following parts:
(1) Stop collar
(2) Pinion gear
(3) Compression spring



(f) Push down the starter housing, and remove the spring retainer.

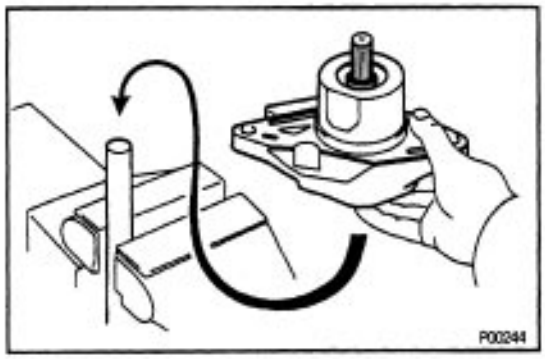


(g) Disassemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft

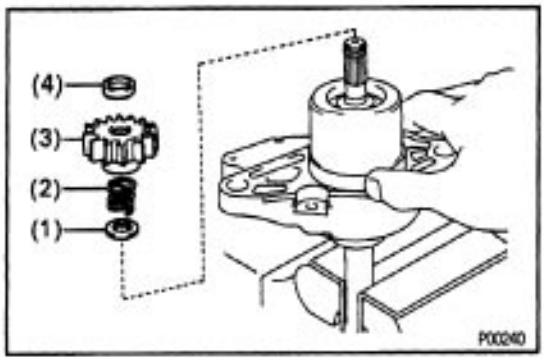


B. Assemble starter housing and clutch assembly

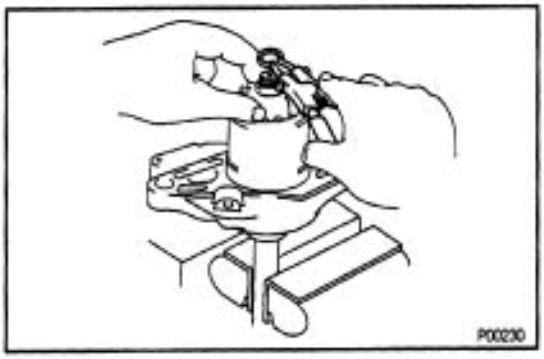
(a) Assemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft



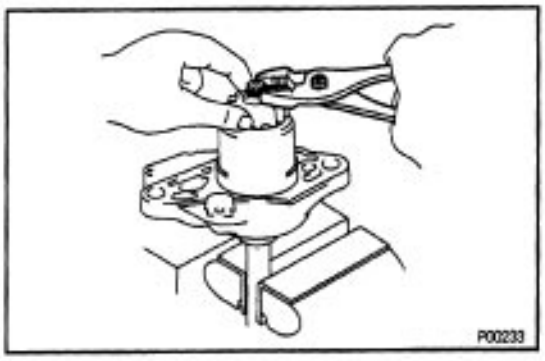
(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.



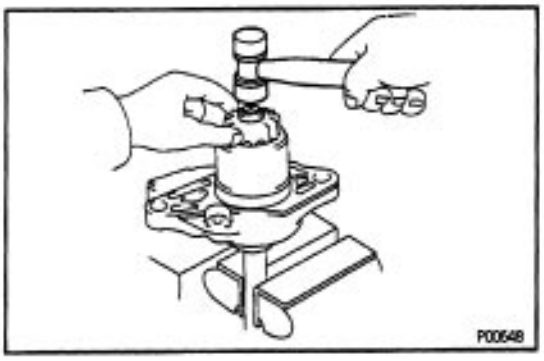
(c) Push down the starter housing, and install the following parts:
(1) Spring retainer
(2) Compression spring
(3) Pinion gear
(4) Stop collar



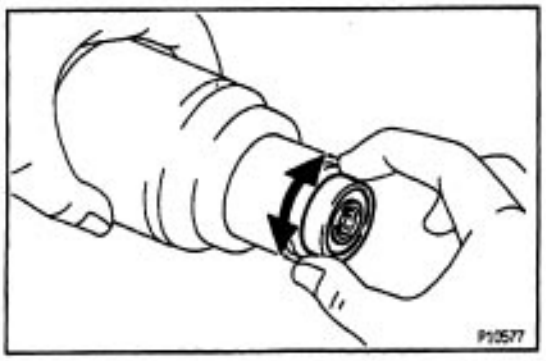
(d) Push down the pinion gear.
(e) Using snap ring pliers, install a new snap ring.



(f) Using pliers, compress the snap ring.
(g) Check that the snap ring fits correctly.



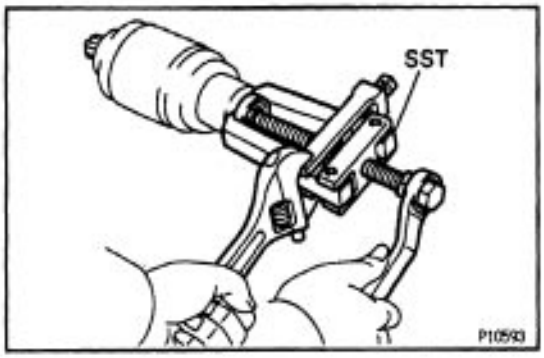
(h) Remove the starter housing and clutch assembly from the brass bar.
(i) Using a plastic–faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.



Bearings

1. INSPECT REAR BEARINGS

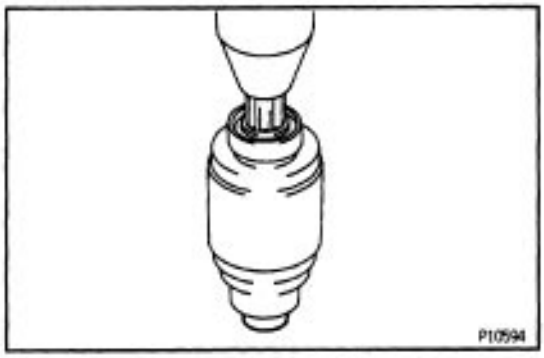
Turn each bearing by hand while applying inward force.
If resistance is felt or the bearing sticks, replace the bearing.



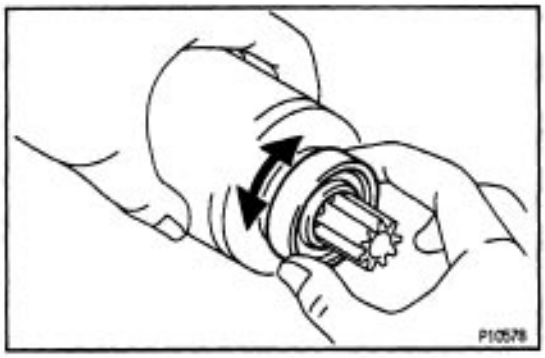
2. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.

SST 09286–46011



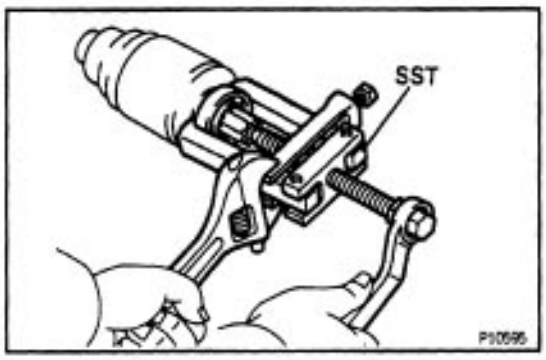
(b) Using a press, press in a new front bearing.



3. INSPECT FRONT BEARING

Turn each bearing by hand while applying inward force.

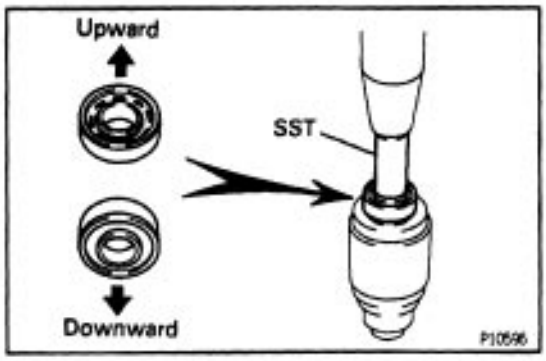
If resistance is felt or the bearing sticks, replace the bearing.



4. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing.

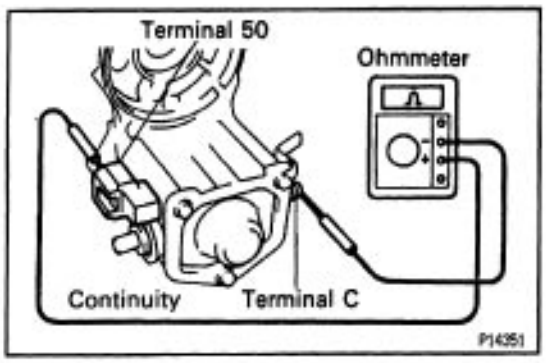
SST 09286–46011



(b) Using SST and a press, press in a new bearing.

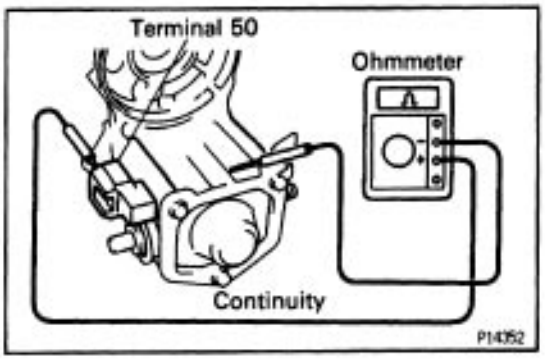
NOTICE: Be careful of the bearing Installation direction.

SST 09820–00030

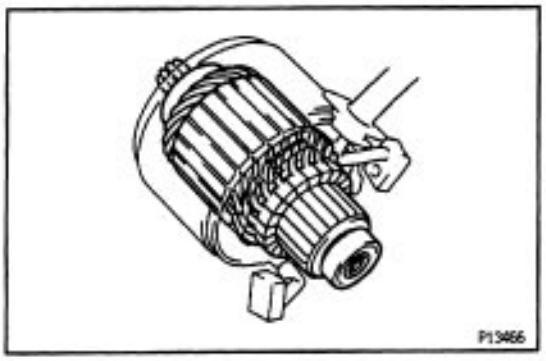


Magnetic Switch

1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, replace the magnetic switch.

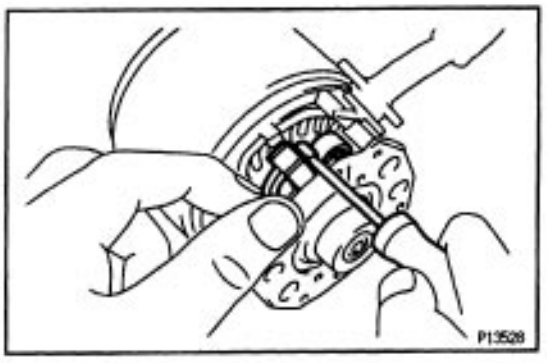


2. PERFORM HOLD –IN COIL OPEN CIRCUIT TEST
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch.

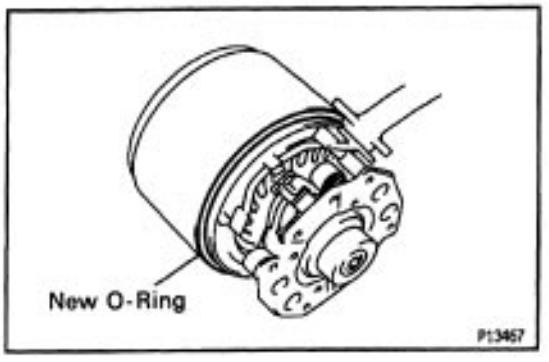


STARTER ASSEMBLY

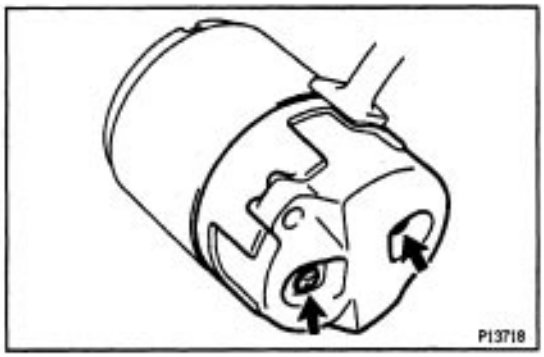
(See Components for Disassembly and Assembly)
HINT: Use high –temperature grease to lubricate the bearings and gears when assembling the starter.
1. PLACE ARMATURE INTO FIELD FRAME
Apply grease to the armature bearings, and insert the armature into the field frame.



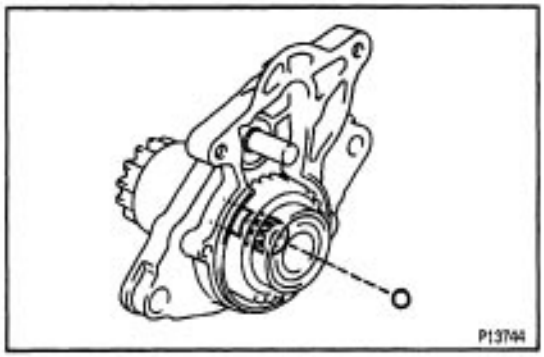
2. INSTALL BRUSH HOLDER
(a) Place the brush holder in position on the armature.
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the 4 brushes..
NOTICE: Check that the positive (+) load wires are not grounded.



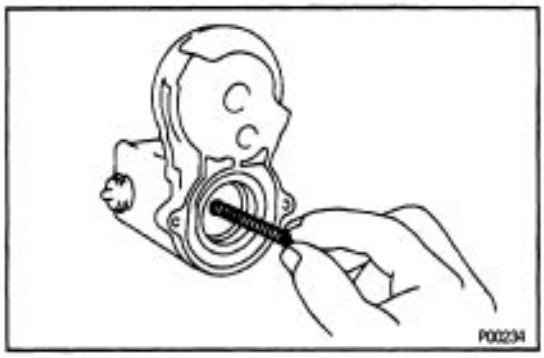
(c) Place a new O–ring in position on the field frame.



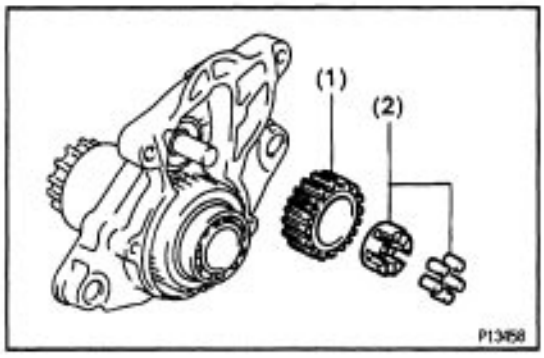
(d) Install a new 0 – ring to the screw.
(e) Install the end cover to the field frame with the 2 screws.
Torque: 1.5 N·m (15 kgf·cm, 13 in.·lbf)



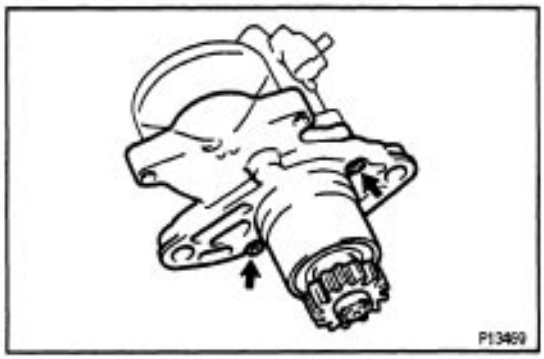
3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE
(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.



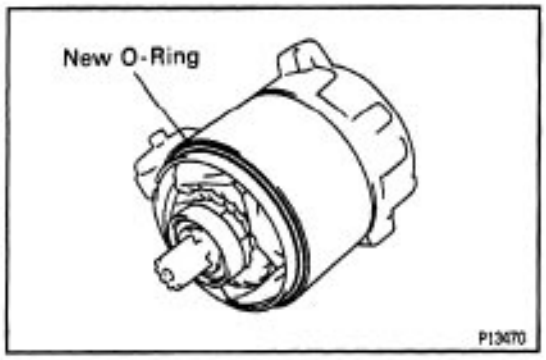
4. INSTALL STARTER HOUSING, CLUTCH ASSEM–BLY AND GEAR
(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic switch hole.



(c) Place the following parts in position on the starter housing:
(1) Idler gear
(2) Retainer



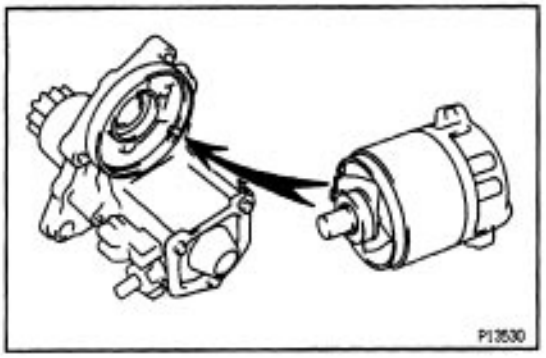
(d) Install the starter housing to the magnetic switch with the 2 screws.
Torque: 5.9 N·m (60 kgf·cm, 52 In.·lbf)



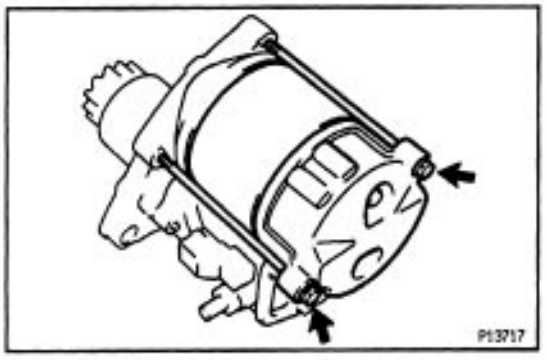
5. INSTALL FIELD FRAME AND ARMATURE

ASSEMBLY

(a) Place a new 0 – ring in position on the field frame.

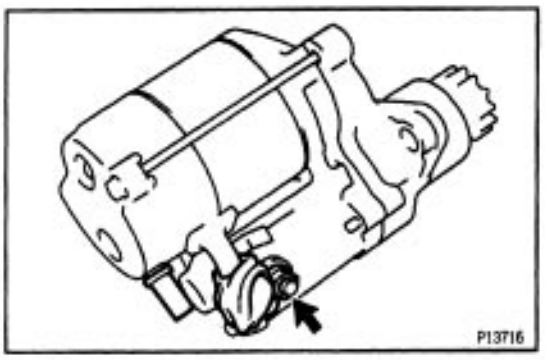


(b) Align the protrusion of the field frame with the cutout of the magnetic switch.



(c) Install the field frame and armature assembly with the 2 through bolts.

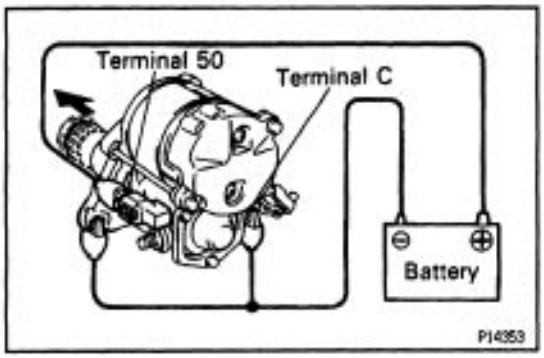
Torque: 5.9 N·m (60 kgf·cm. 52 in.·lbf)



(d) Connect the lead wire to terminal C, and install the nut.

Torque: 7.9 N·m (87 kgf·cm, 70 in.·lbf)

STARTER PERFORMANCE TEST

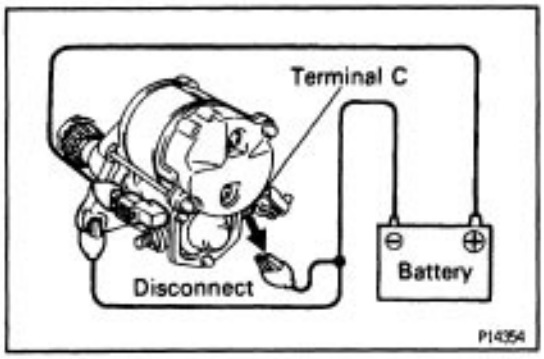


NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

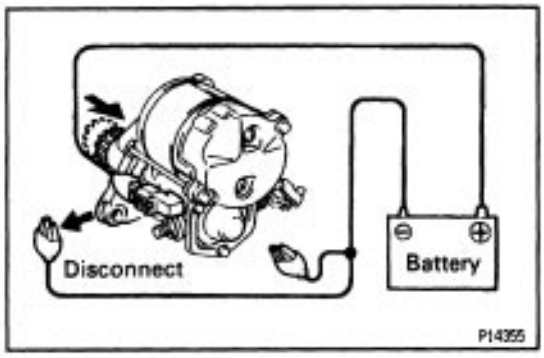
(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown.
Check that the clutch pinion gear moves outward.
If the clutch pinion gear does not move, replace the magnetic switch assembly.



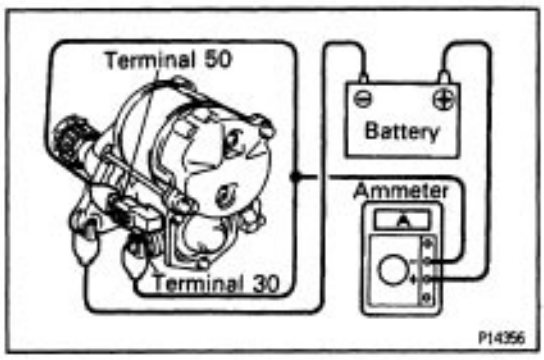
2. PERFORM HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body.
Check that the clutch pinion gear returns inward.
If the clutch pinion gear does not return, replace the magnetic switch assembly.



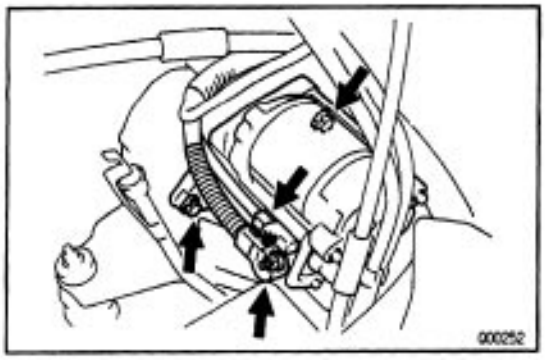
4. PERFORM NO –LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the am–meter shows the specified current.

Specified current:

90 A or less at 11.5 V



STARTER INSTALLATION

(See Components for Remove and Installation)

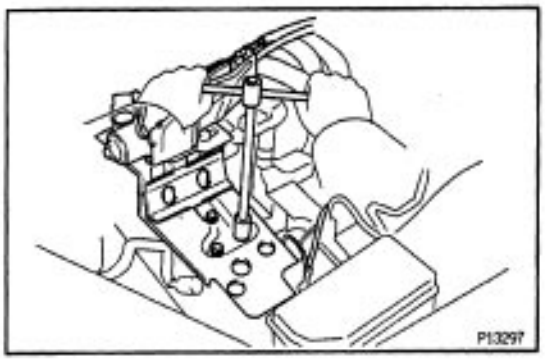
1. INSTALL STARTER

(a) Install the starter with the 2 bolts.

Torque: 39 N·m (400 kgf·cm. 29 ft·lbf)

(b) Connect the starter wire with the nut.

(c) Connect the starter connector.



2. w/ CRUISE CONTROL SYSTEM:

INSTALL CRUISE CONTROL ACTUATOR

(a) Connect the actuator and bracket with the 3 bolts.

(b) Connect the actuator connector and clamp.

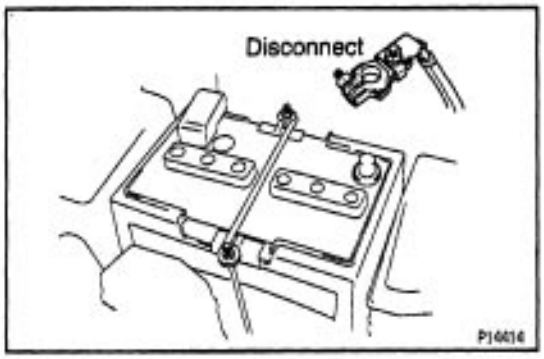
(c) Install the actuator cover with the bolt and clip.

3. w/ CRUISE CONTROL SYSTEM:

INSTALL BATTERY TRAY AND BATTERY

4. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

5. CHECK THAT ENGINE STARTS

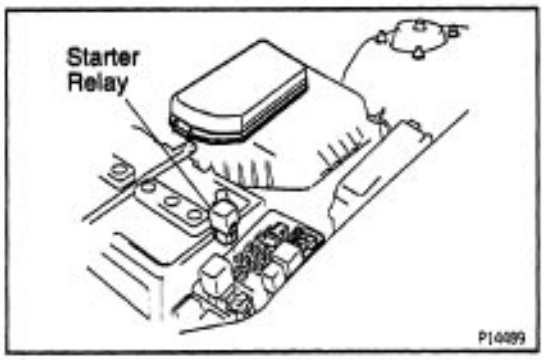


STARTER RELAY

STARTER RELAY INSPECTION

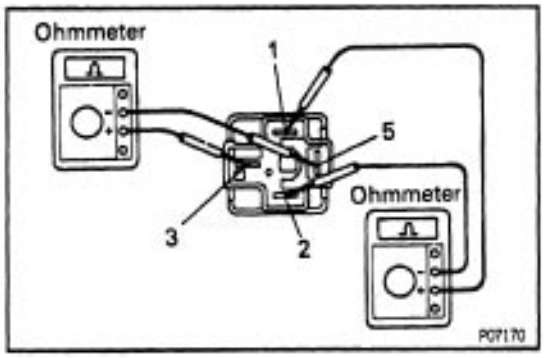
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch Is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE STARTER RELAY

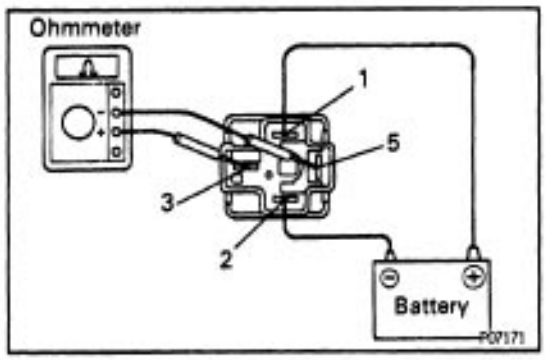
LOCATION: In the engine compartment relay box.
Remove the relay box cover and starter relay.



3. INSPECT STARTER RELAY

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
(b) Check that there is no continuity between terminals 3 and 5.
If continuity is not as specified, replace the relay.



B. Inspect relay operation

(a) Apply battery voltage across terminals 1 and 2.
(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.
If operation is not as specified, replace the relay.

4. REINSTALL STARTER RELAY

6. RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

PARK NEUTRAL POSITION (PNP) SWITCH

(See page AX–116)

SERVICE SPECIFICATIONS

SERVICE DATA

Starter	Rated voltage and output power		12 V 1.4 kW
	No–load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Limit	8.5 mm (0.335 in.)
	Spring installed load		18 – 24 N (1.79 – 2.41 kgf, 3.9 – 5.3 lbf)
	Commutator Diameter		
		STD	30.0 mm (1.181 in.)
		Limit	29.0 mm (1.142 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Limit	0.2 mm (0.008 in.)
	Circle runout	Limit	0.05 mm (0.0020 in.)

TORQUE SPECIFICATIONS

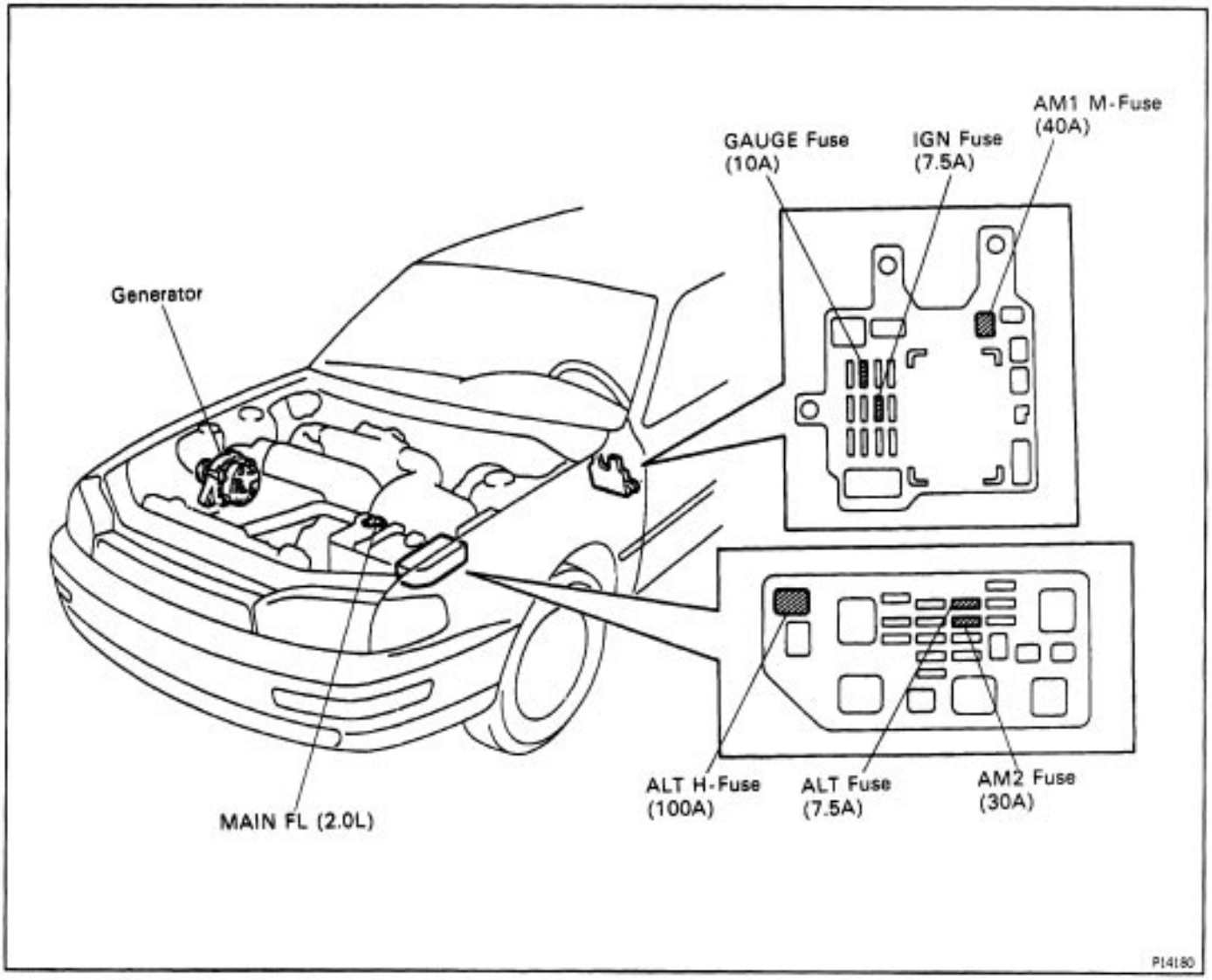
Part tightened	N·m	kgf·cm	ft·lbf
End cover x Field frame	1.5	15	13 in.·lbf
Starter housing x Magnetic switch	5.9	60	52 in.·lbf
Field frame x Armature assembly	5.9	60	52 in.·lbf
Lead wire x Terminal C of starter	7.9	81	70 in.·lbf
Starter mounting bolt	39	400	29

CHARGING SYSTEM

(5S–FE)

DESCRIPTION

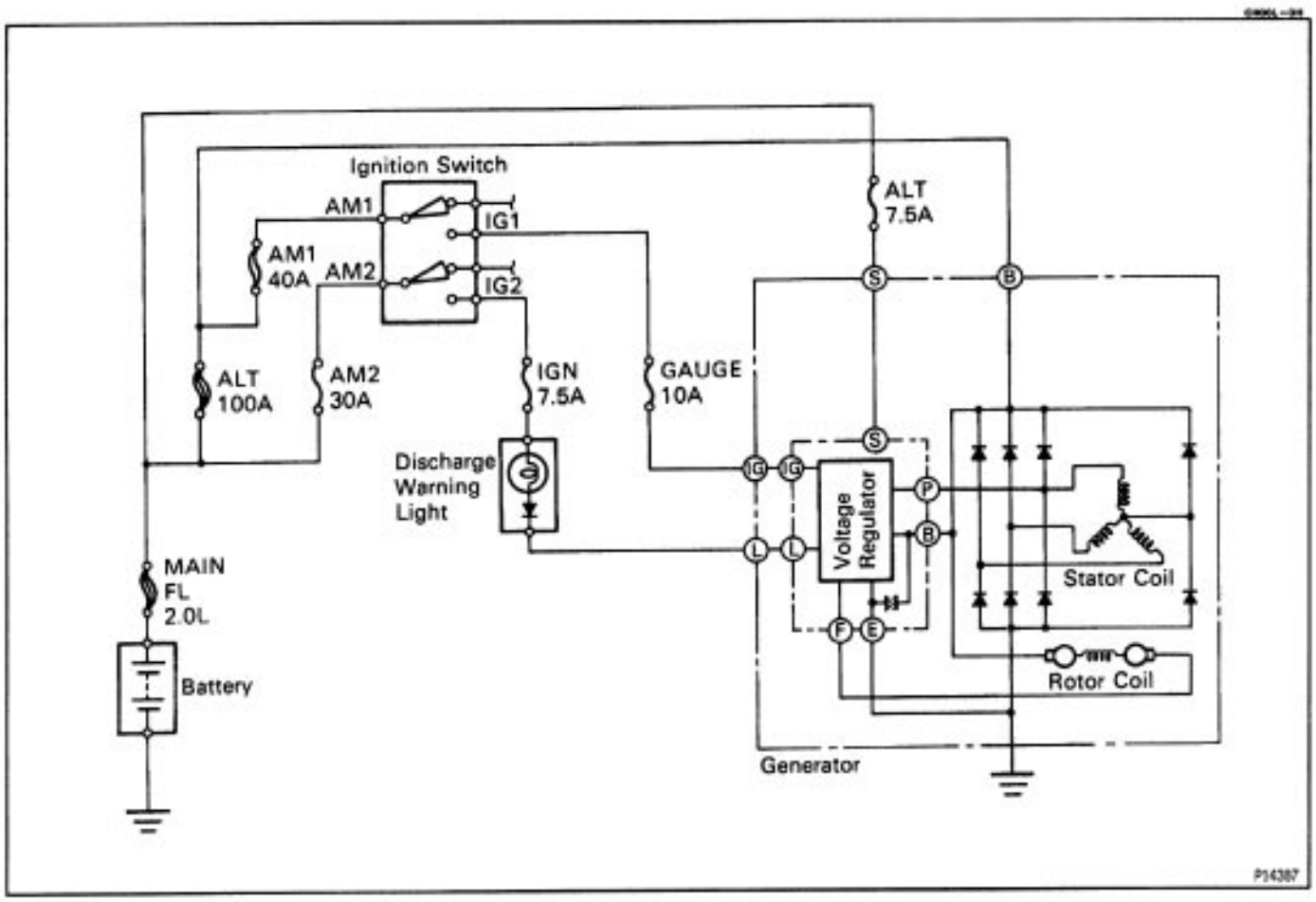
The generator is a small, high speed, high performance type with an voltage regulator incorporated. The voltage regulator uses integrated circuits and controls the voltage produced by the generator.



PRECAUTION

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

SYSTEM CIRCUIT



OPERATION

EH00N–0a

When the ignition switch is turned ON, current from the battery flows from terminal L of the generator through the voltage regulator to terminal E, causing the discharge warning light to light up.

Then when the engine is started, the voltage output increases as the generator rpm increases. When the voltage output becomes greater than the battery voltage, current for recharging flows from terminal B. Simultaneously, voltage at terminal L increases and the potential difference between battery and terminal L disappears, causing the discharge warning light to go off. When the voltage output exceeds the regulator adjustment voltage, the transistor inside the voltage regulator regulates the voltage so that the voltage from the generator remains constant.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

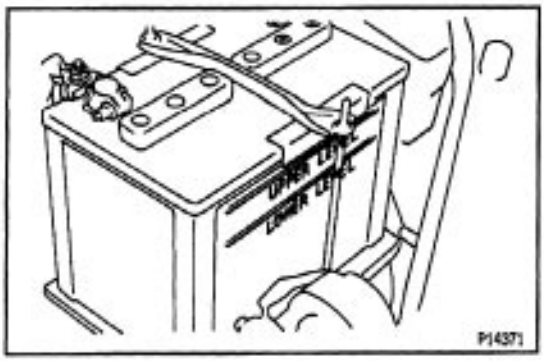
	09285–76010 Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011 Injection Pump Spline Shaft Puller	Rectifier end frame
	09608–20012 Front Hub & Drive Pinion Bearing Tool Set	Rotor front bearing
	(09608–00030) Replacer	
	09820–00021 Alternator Rear Bearing Puller	
	09$20–00030 Alternator Rear Bearing Replacer	Rotor rear bearing
	09820–63010 Alternator Pulley Set Nut Wrench Set	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Ammeter(A)	
Battery specific gravity gauge	
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush



ON–VEHICLE INSPECTION

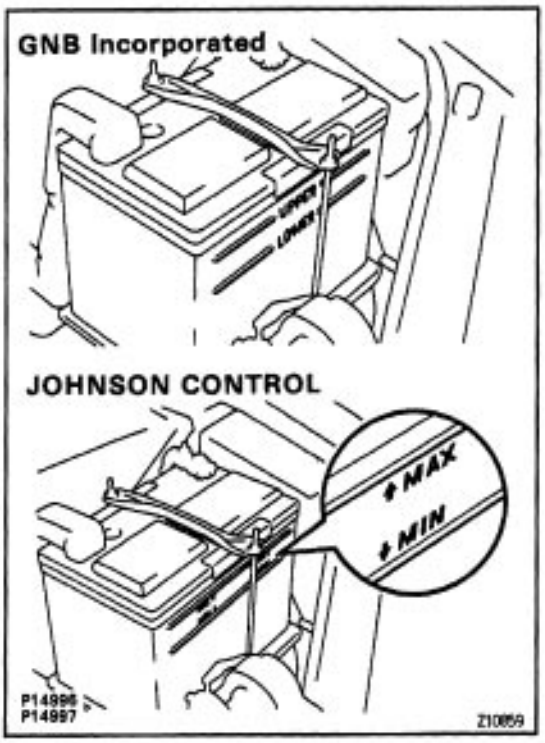
1. Except Delco Battery:

CHECK BATTERY ELECTROLYTE LEVEL

Check the electrolyte quantity of each cell.

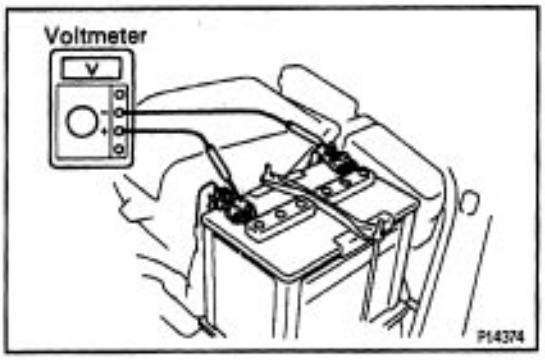
A. Maintenance Free Battery

If under the lower level, replace the battery (or add distilled water if possible). Check the charging system.



6. Except Maintenance Free Battery

If under the “LOWER” or “MIN” line, add distilled water.



2. Except Delco Battery:

CHECK BATTERY VOLTAGE AND SPECIFIC GRAVITY

A. Maintenance Free Battery

Measure the battery voltage between the terminals negative (–) and positive (+) of the battery.

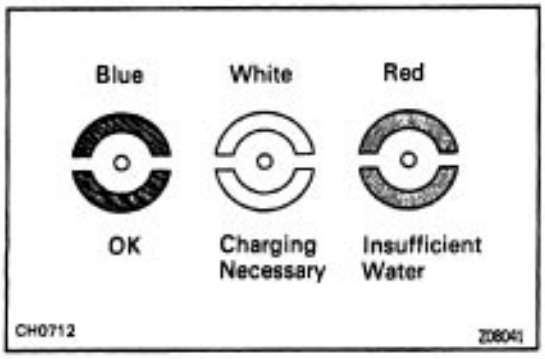
Standard voltage:

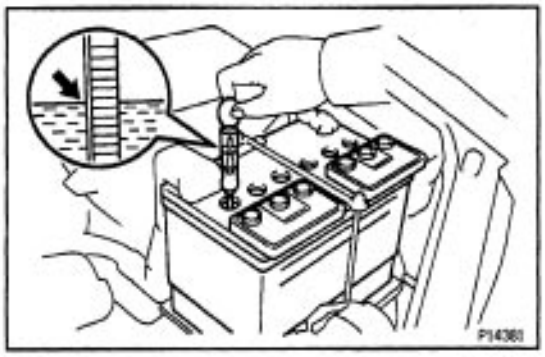
12.7 – 12.9 V at 200C (680F)

HINT:

- Before measuring the voltage, turn the ignition switch to LOCK and turn off the electrical sys–tems (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- If the vehicle has been running, wait 5 minutes or more after the vehicle stops before measuring the battery voltage.
  If the voltage is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





B. Except Maintenance Free Battery

Check the specific gravity of each cell.

Standard specific gravity:

55D23L battery for GNB Incorporated

1.25 – 1.27 at 20°C (68° F)

55D23L battery for JOHNSON CONTROLS

1.26 – 1.28 at 27°C (81°F)

80D26L battery for GNB Incorporated

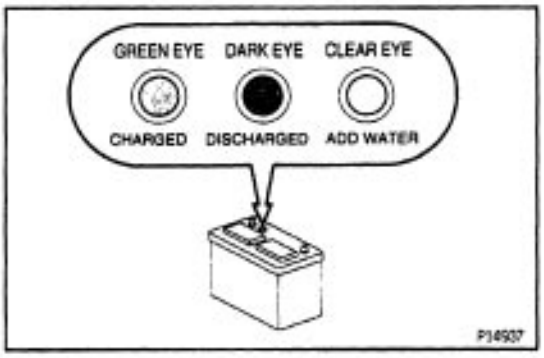
1.27 – 1.29 at 20°C (68°F)

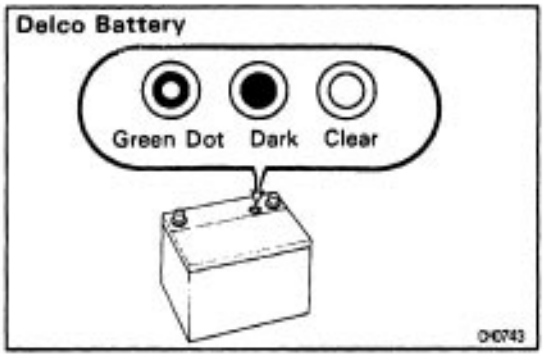
80D26L battery for JOHNSON CONTROLS

1.28 – 1.30 at 27°C (81°F)

If the gravity is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





3. Delco Battery:

CHECK HYDROMETER

Green Dot visible:

Battery is adequately charged

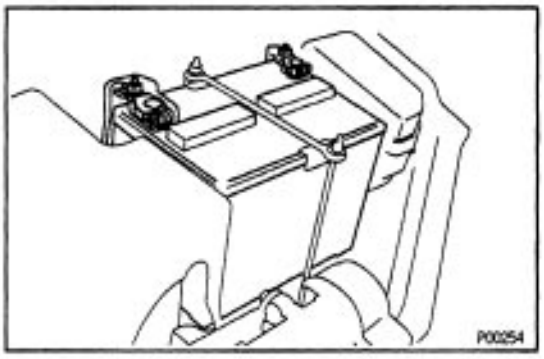
Dark (Green Dot not visible):

Battery must be charged

Clear or Light Yellow:

Replace battery

HINT: There is no need to add water during the entire service life of the battery.



4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.

Fusible link:

MAIN 2.0L

H – Fuse:

ALT 100A

M – Fuse:

AM 1 40A

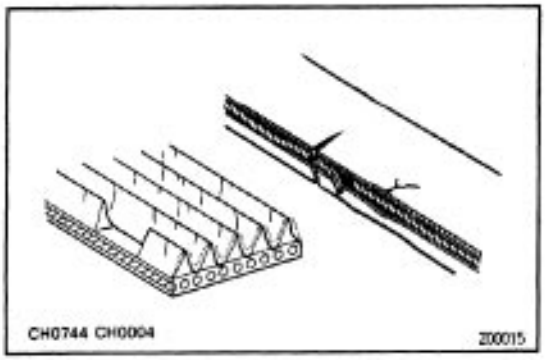
Fuse:

AM2 30A

IG2 7.5A

GAUGE 10A

ALT 7.5A

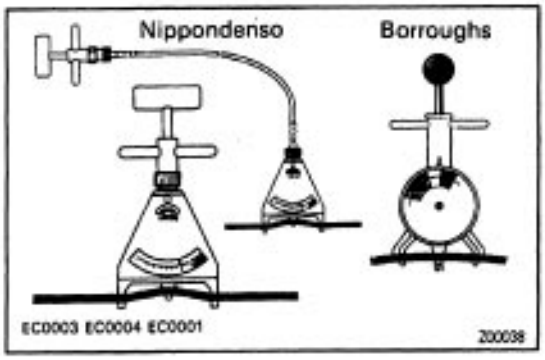


5. INSPECT DRIVE BELT

(a) Visually check the drive belt for excessive wear, frayed cords etc.

If any defect has been found, replace the drive belt.

HINT: Cracks on the rib side of a drive belt are considered acceptable. If the drive belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020)

Borroughs No. BT–33–73F

Drive belt tension:

w/ A/C

Now belt

175 ± 5 lbf

Used belt

130 ± 10 lbf

w/o A/C

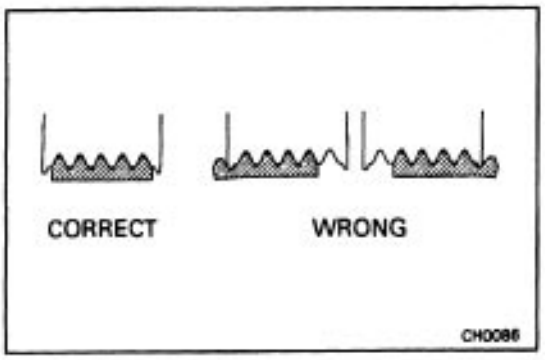
New belt

125 ± 25 lbf

Used belt

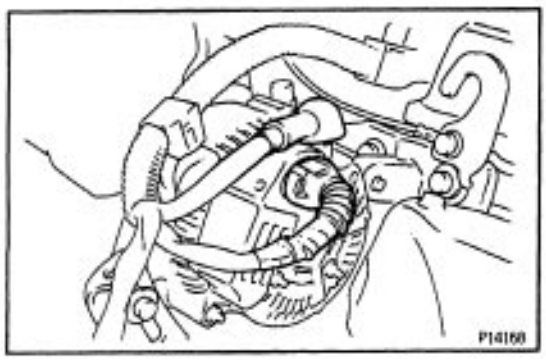
95 ± 20 lbf

If the belt tension is not as specified, adjust it.



HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



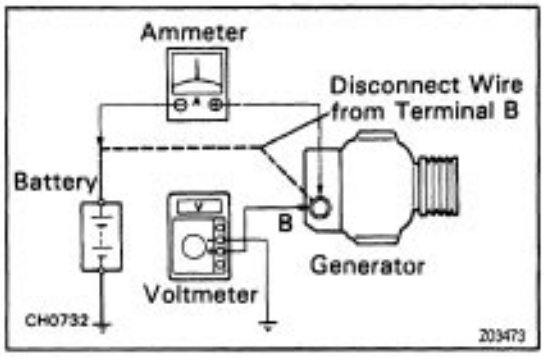
6. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the generator while the engine is running.

7. CHECK DISCHARGE WARNING LIGHT CIRCUIT

(a) Warm up the engine and then turn it off.
(b) Turn off all accessories.
(c) Turn the ignition switch '"ON'. Check that the dis–charge warning light is lit.
(d) Start the engine. Check that the light goes off.
If the light does not go off as specified, troubleshoot the discharge light circuit.

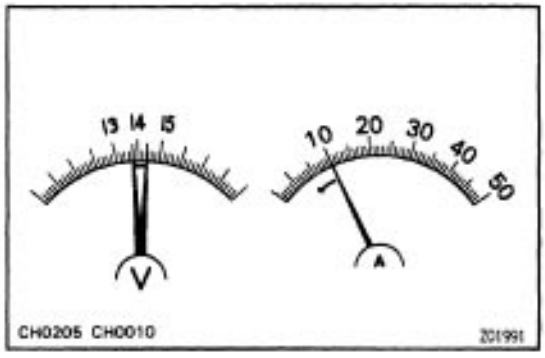


8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, con–nect the tester to the charging circuit as per manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

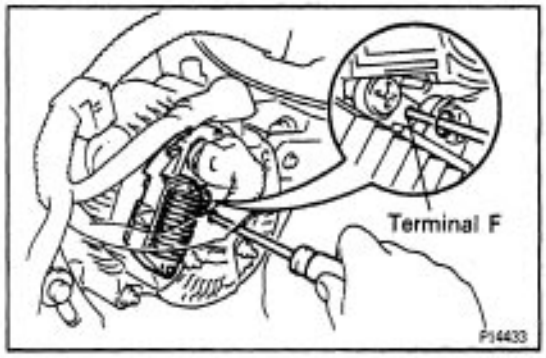
- Disconnect the wire from terminal B of the gener–ator, and connect it to the negative (–) tester probe of the ammeter.
- Connect the positive (+) tester probe of the am–meter to terminal B of the generator.
- Connect the positive (+) tester probe of the volt–meter to terminal B of the generator.
- Ground the negative (–) tester probe of the volt–meter.

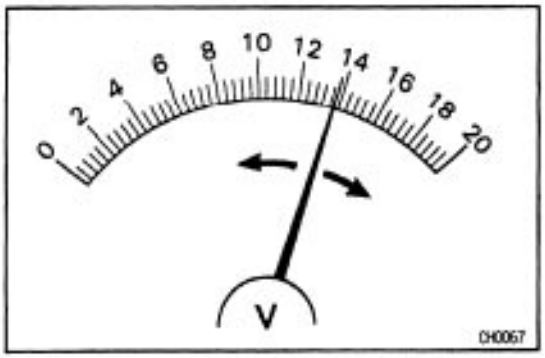


(b) Check the charging circuit as follows:
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.
Standard amperage:
10 A or less
Standard voltage:
13.9 – 15.1 V at 25°C (77°F)
13.5 – 14.3 V at 115®C (239®F)

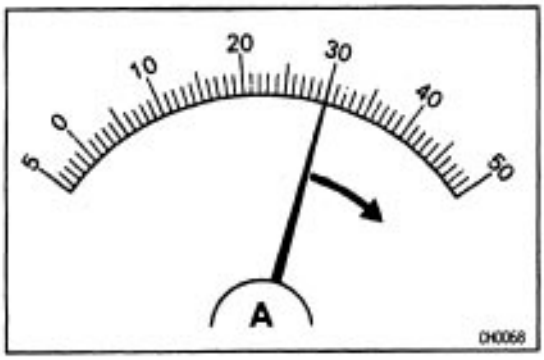
If the voltmeter reading is more than standard voltage, replace the voltage regulator.
If the voltmeter reading is less than standard voltage, check the voltage regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.





- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than standard voltage, check the generator.



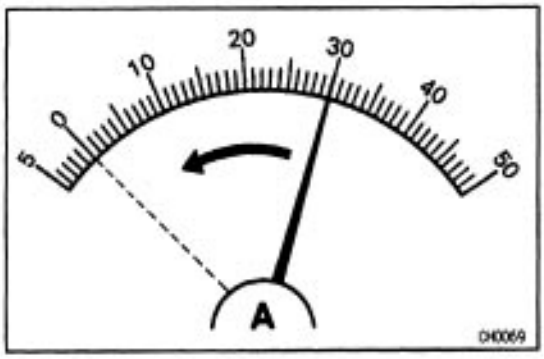
9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at 'Hl".

(b) Check the reading on the ammeter.

Standard amperage:

30 A or more

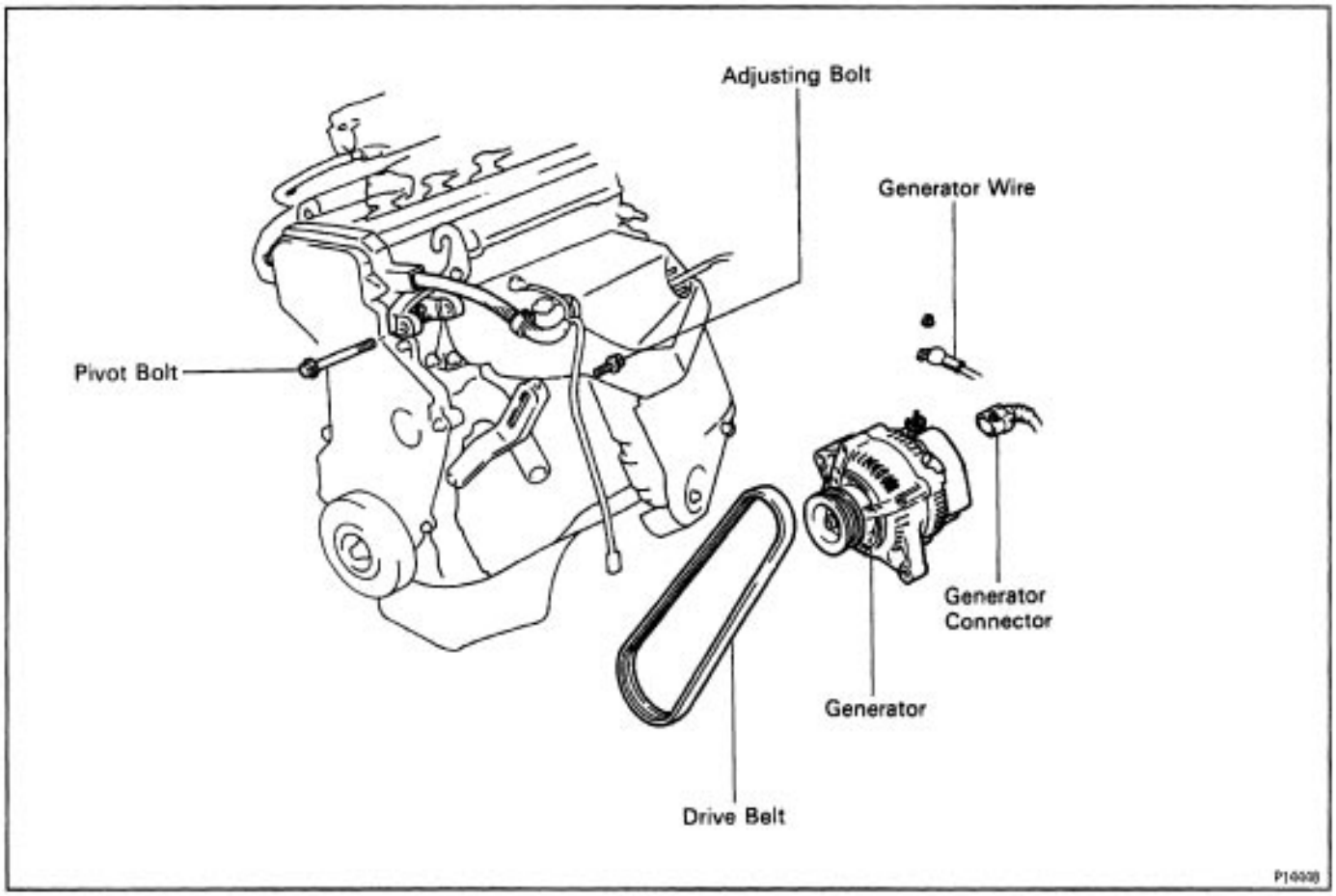


If the ammeter reading is less than the standard am–perage, repair the generator.

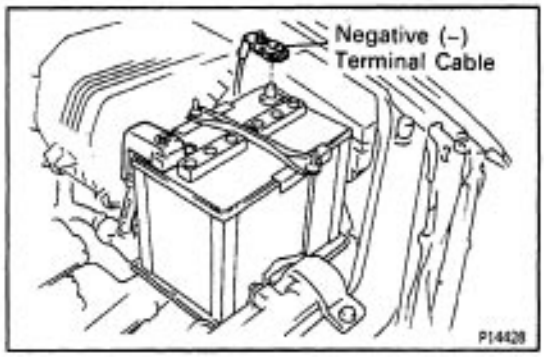
HINT: If the battery is fully charged, the indication will sometimes be less than standard amperage.

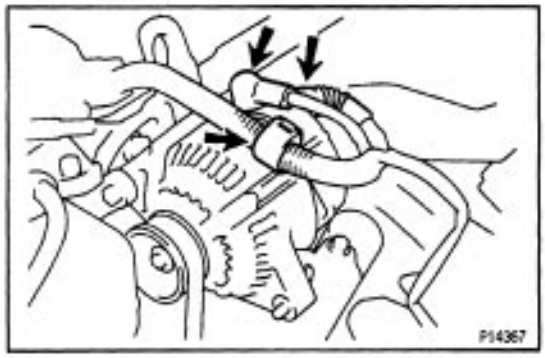
GENERATOR

COMPONENTS FOR REMOVAL AND INSTALLATION



GENERATOR REMOVAL





(See Components for Removal and installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

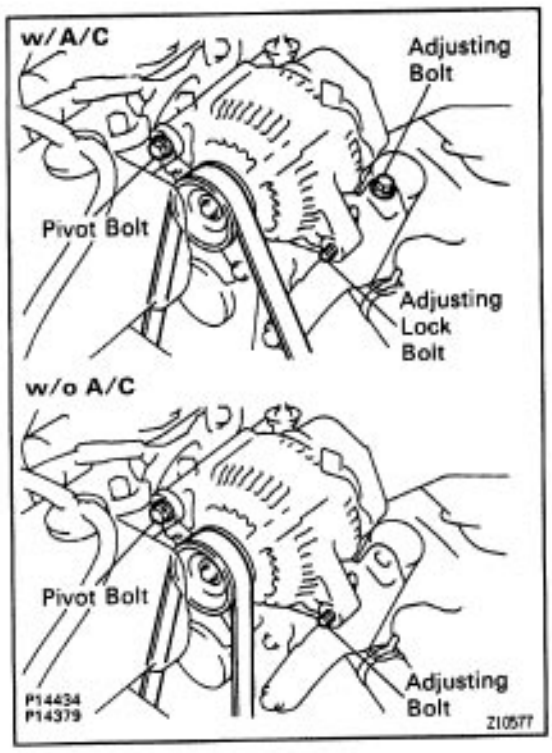
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. REMOVE GENERATOR

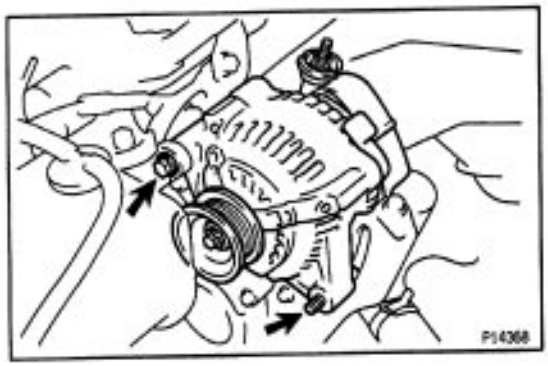
(a) Disconnect the wire clamp from the wire clip on the rectifier end frame.

(b) Disconnect the generator connector.

(c) Remove the rubber cap and nut, and disconnect the generator wire.

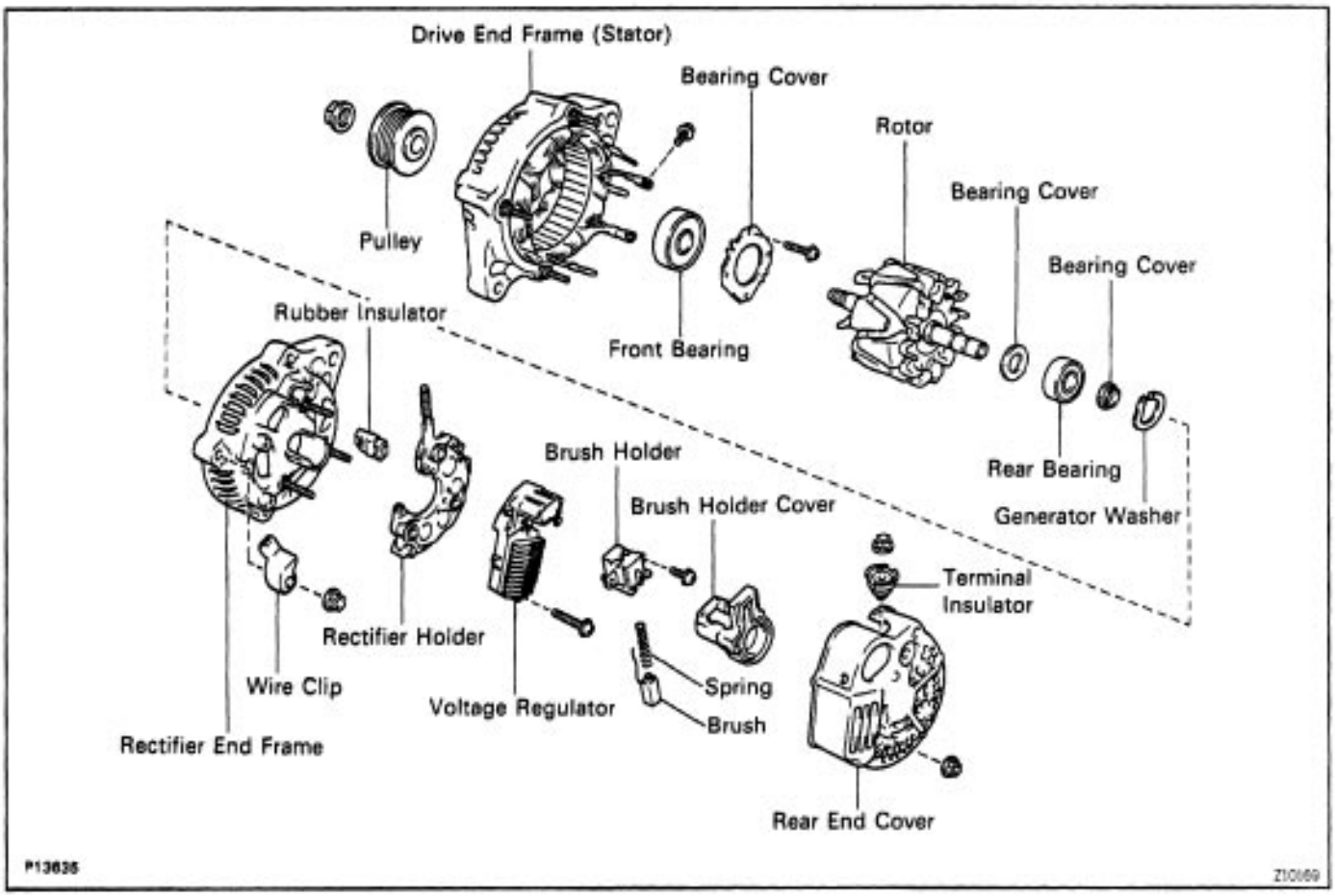


(d) Loosen the adjusting lock bolt (w/ A/C), adjusting bolt and pivot bolt.
(e) Remove the drive belt.

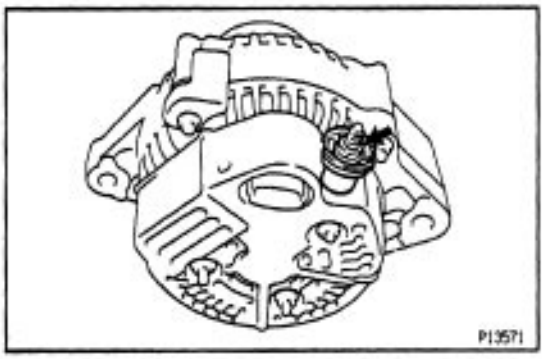


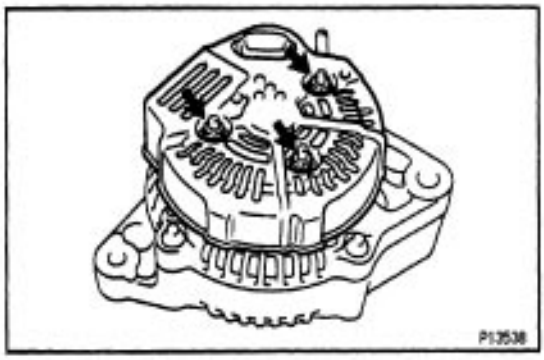
(f) Remove the adjusting lock bolt (w/ A/C) or adjusting bolt (w/o A/C) and pivot bolt.
(g) Remove the generator.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



CH08C–01





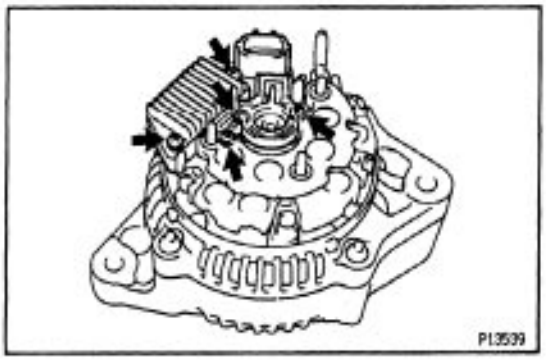
GENERATOR DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE REAR END COVER

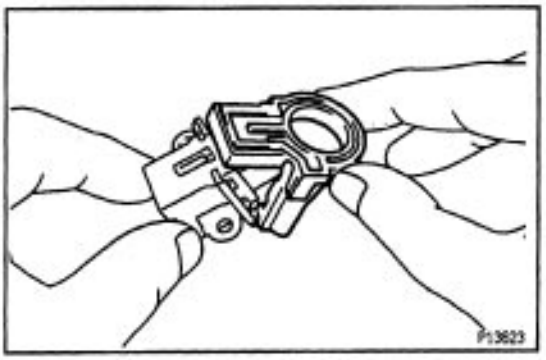
(a) Remove the nut and terminal insulator.

(b) Remove the 3 nuts and end cover.

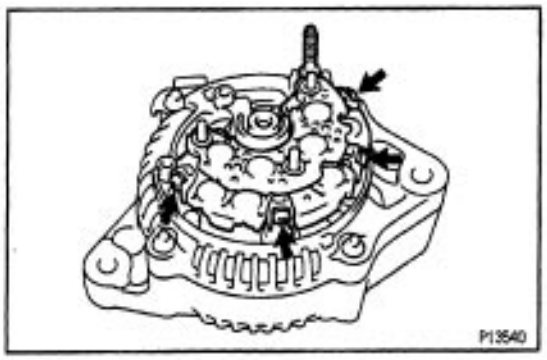


2. REMOVE BRUSH HOLDER AND VOLTAGE REGULATOR

(a) Remove the 5 screws, brush holder and voltage regu–lator.

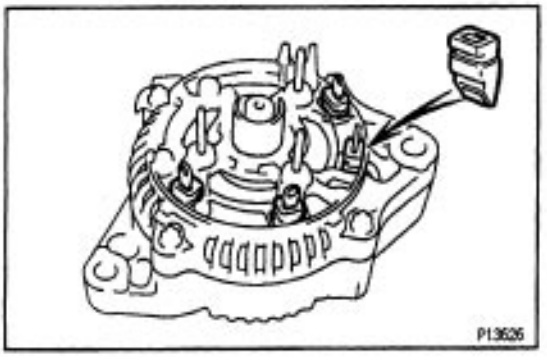


(b) Remove the brush holder cover from the brush holder.

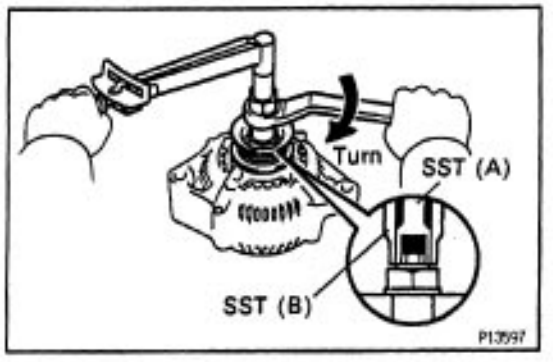


3. REMOVE RECTIFIER HOLDER

(a) Remove the 4 screws and rectifier holder.

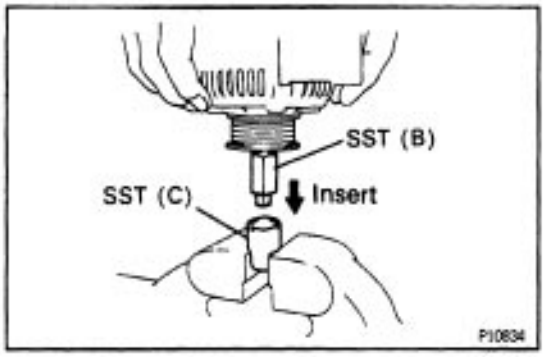


(b) Remove the 4 rubber insulators.

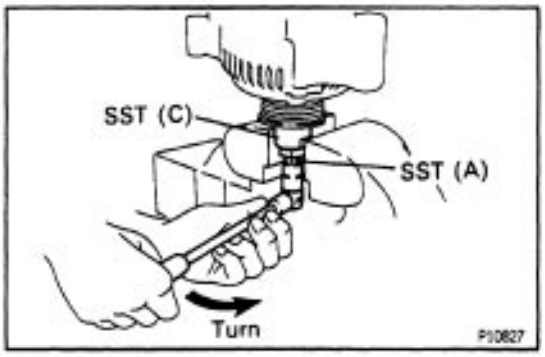


4. REMOVE PULLEY

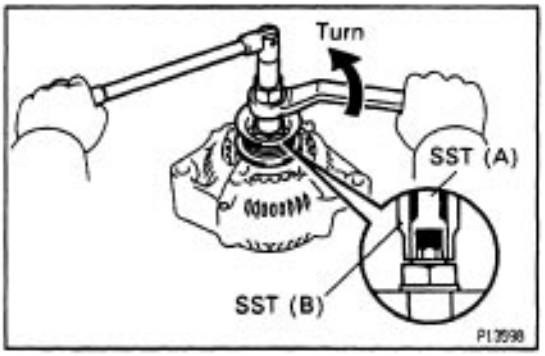
(a) Hold SST
(A) with a torque wrench, and tighten SST
(B) clockwise to the specified torque.
SST 09820–63010
Torque: 39 N·m (400 kgf·cm. 29 ft·lbf)
(b) Check that SST
(A) is secured to the rotor shaft.



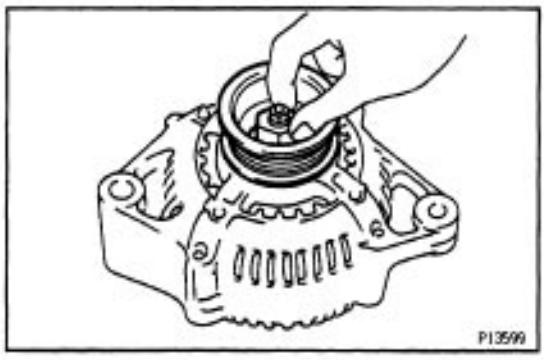
(c) Mount SST
(C) in a vise.
(d) Insert SST
(B) into SST
(C), and attach the pulley nut to
SST
(C).



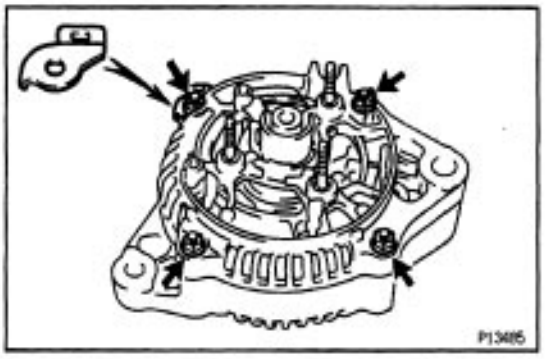
(e) To loosen the pulley nut, turn SST
(A) in the direction
shown in the illustration.
NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.
(f) Remove the generator from SST (C).



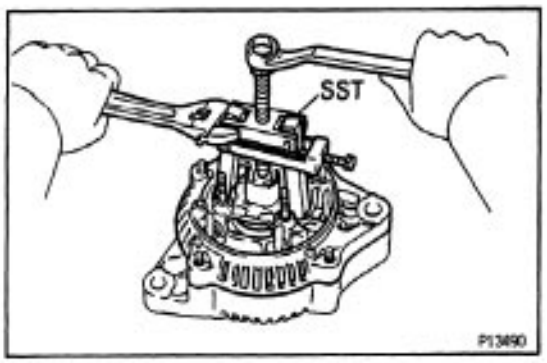
(g) Turn SST (B), and remove SST (A and B).



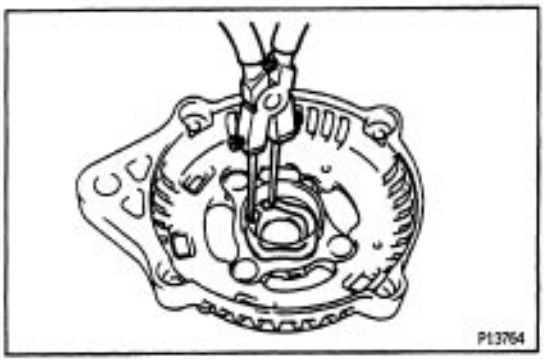
(h) Remove the pulley nut and pulley.



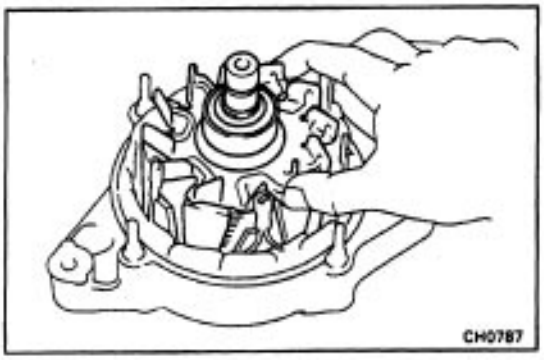
5. REMOVE RECTIFIER END FRAME
(a) Remove the 4 nuts and wire clip.



(b) Using SST, remove the rectifier end frame.
SST 09286 – 46011



(c) Using snap ring pliers, remove the generator washer from the rectifier end frame.



6. REMOVE ROTOR FROM DRIVE END FRAME

GENERATOR INSPECTION AND REPAIR

Rotor

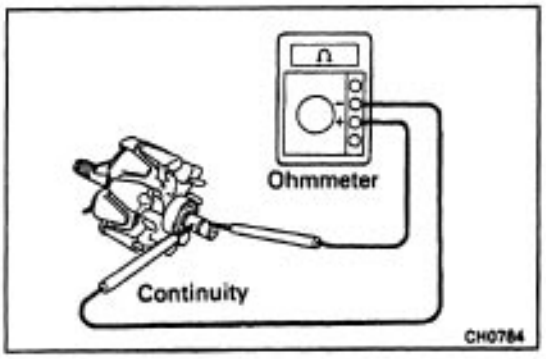
1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:

2.8 – 3.0 Ω at 20°C (68°F)

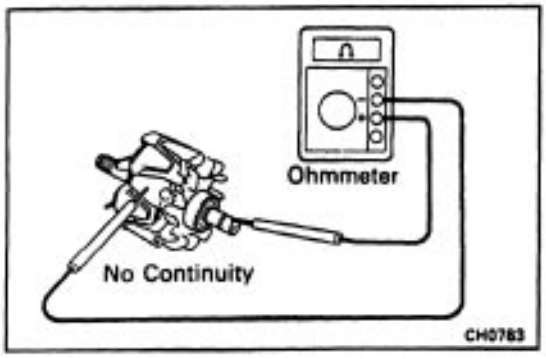
If there is no continuity, replace the rotor.

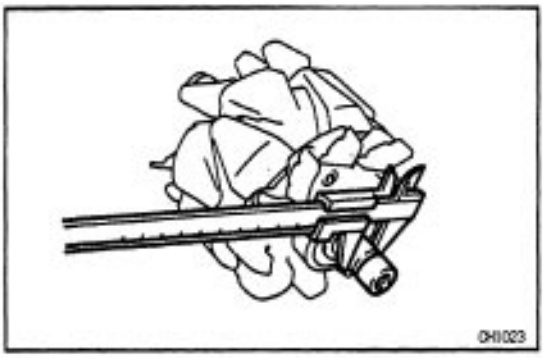


2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.





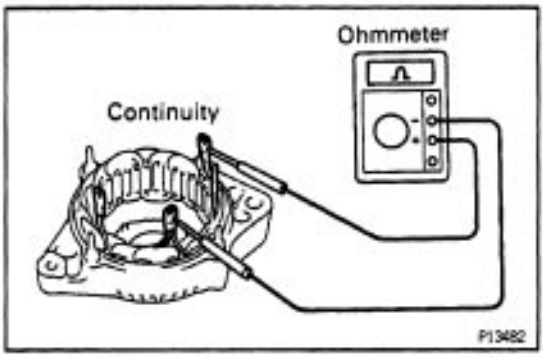
3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.
If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter:
14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter:
12.8 mm (0.504 in.)

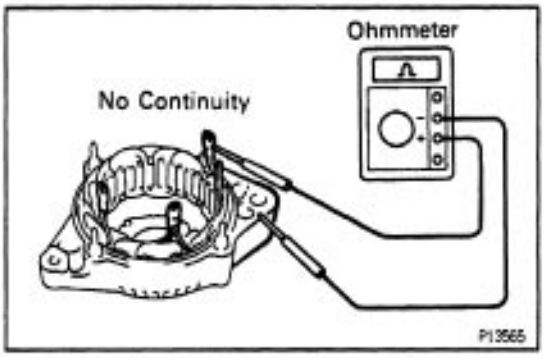
If the diameter is less than minimum, replace the rotor.



Stator (Drive End Frame)

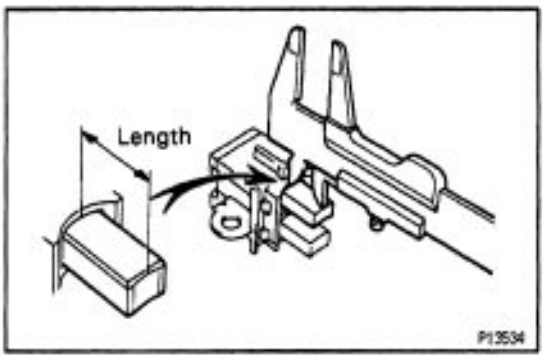
1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.
If there is no continuity, replace the drive end frame assembly.



2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.
If there is continuity, replace the drive end frame assembly.



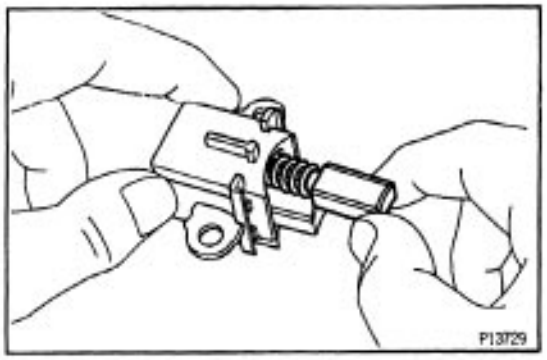
Brushes

1. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

Standard exposed length:
10.5 mm (0.413 In.)
Minimum exposed length:
1.5 mm (0.059 in.)

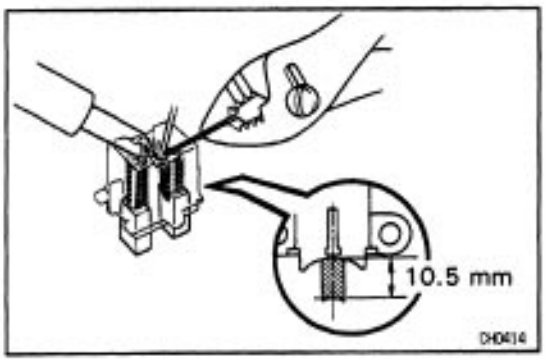
If the exposed length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.

(b) Run the wire of a new brush through the spring and the hole in the brush –holder, and insert the spring and brush into the brush holder.



(c) Solder the brush wire to the brush holder at specified exposed length.

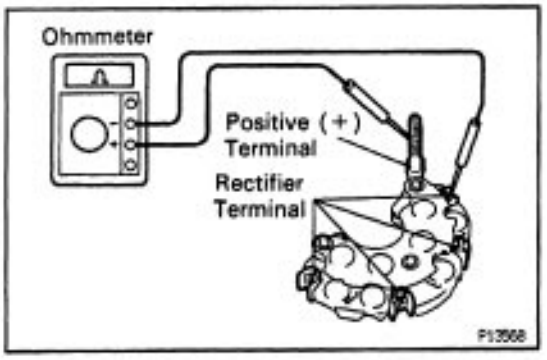
Exposed length:

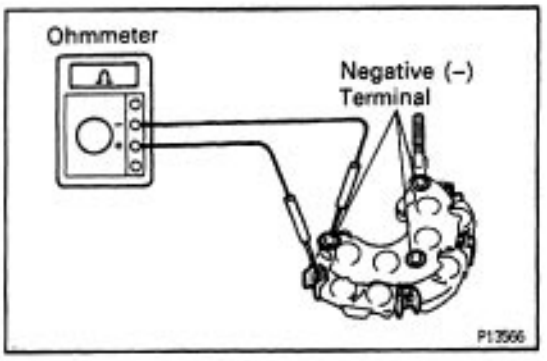
10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

(f) Apply insulation paint to *the soldered area.





Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

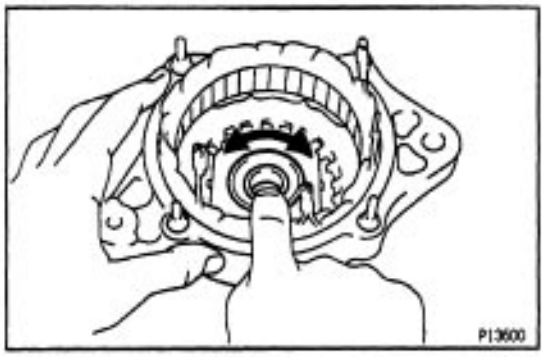
2. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

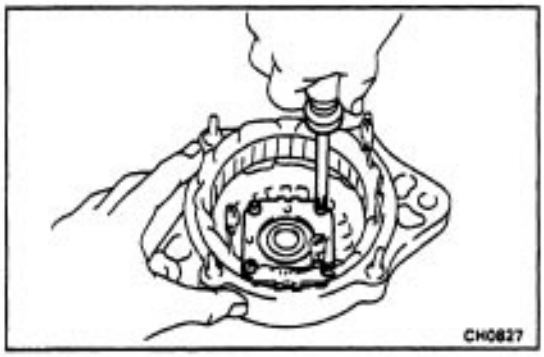
If continuity is not as specified, replace the rectifier holder.



Bearings

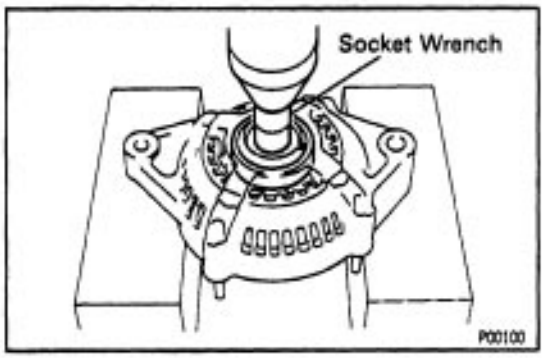
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

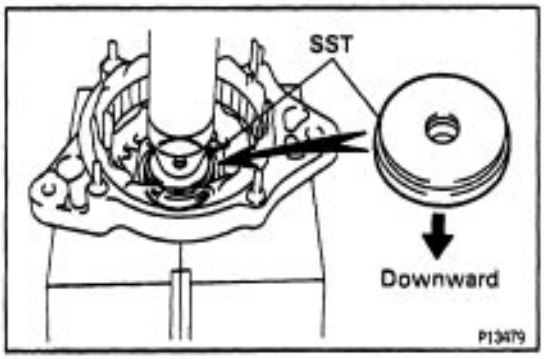


2. IF NECESSARY, REPLACE FRONT BEARING

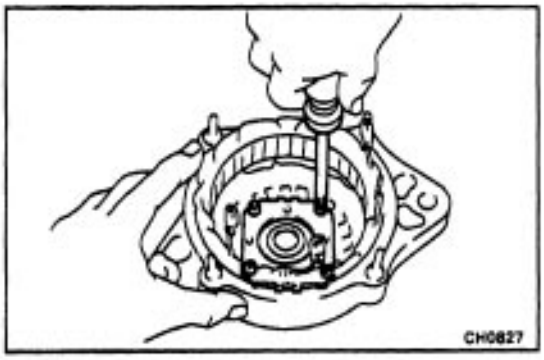
(a) Remove the 4 screws, bearing retainer and bearing.



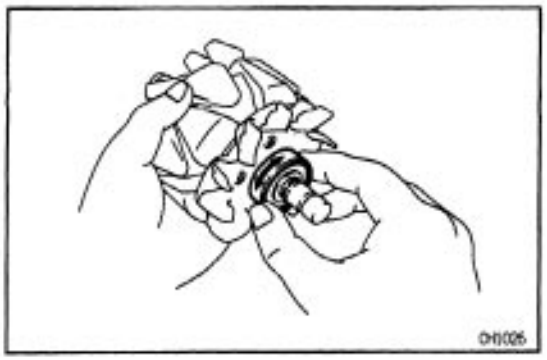
(b) Using a socket wrench and press, press out the bear–ing.



(c) Using SST and a press, press in a new bearing.
SST 09608–20012 (09608–00030)

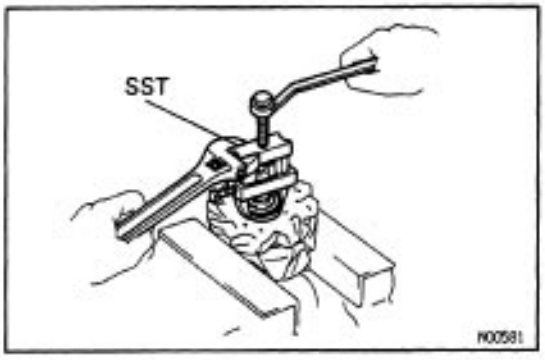


(d) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.·lbf)



3. INSPECT REAR BEARING

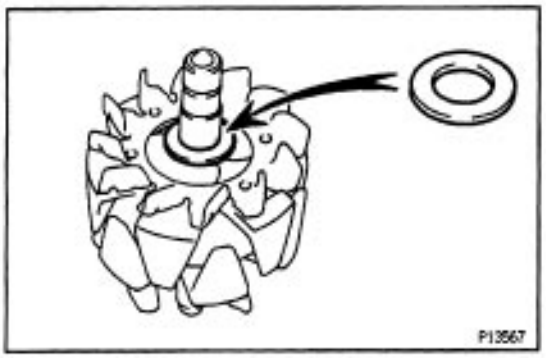
Check that the bearing is not rough or worn.



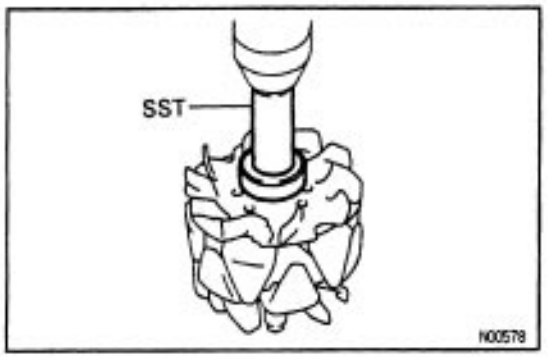
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover (outside) and bearing.
SST 09820–00021
NOTICE: Be careful not to damage the fan.

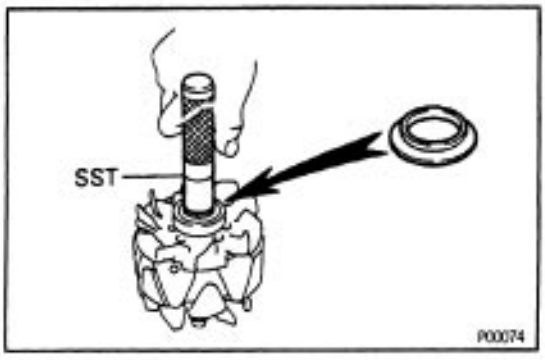
(b) Remove the bearing cover (inside).



(c) Place the bearing cover (inside) on the rotor.

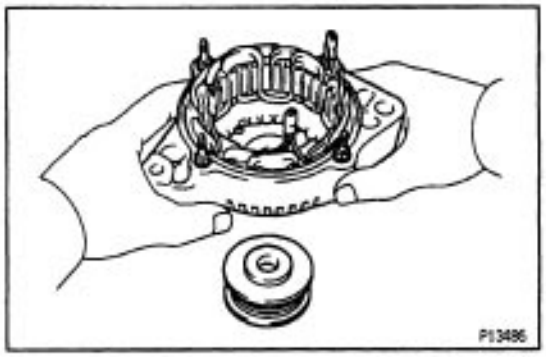


(d) Using SST and a press, press in a new bearing.
SST 09820–00030



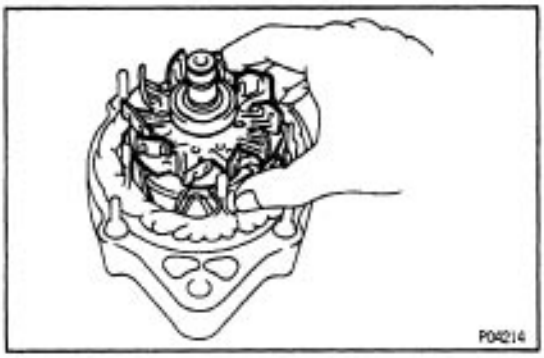
(e) Using SST, push in the bearing cover (outside).
SST 09285 – 76010

GENERATOR ASSEMBLY

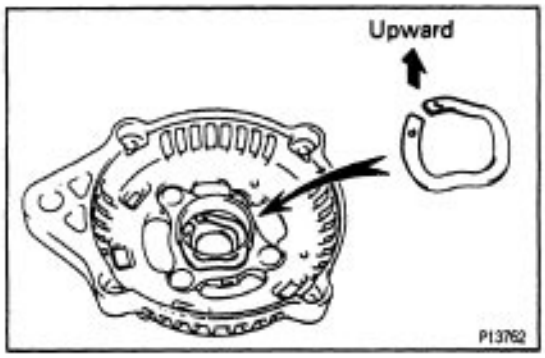


(See Components for Disassembly and Assembly)

1. PLACE RECTIFIER END FRAME ON PULLEY



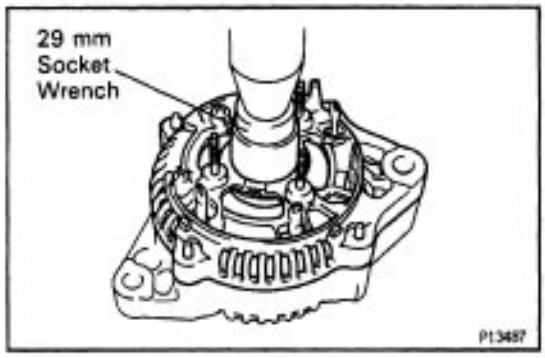
2. INSTALL ROTOR TO DRIVE END FRAME



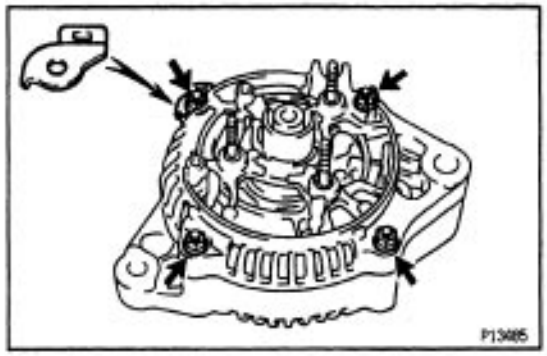
3. INSTALL RECTIFIER END FRAME

(a) Insert the generator washer into the rectifier end frame.

NOTICE: Be careful of the generator washer installation direction.

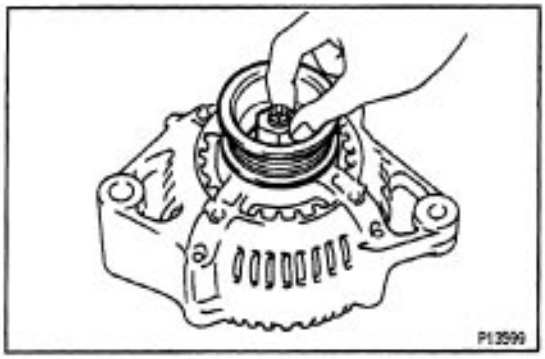


(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



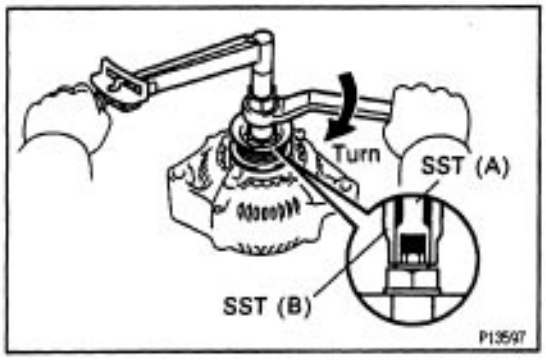
(c) Install the wire clip and 4 nuts.

Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)



4. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

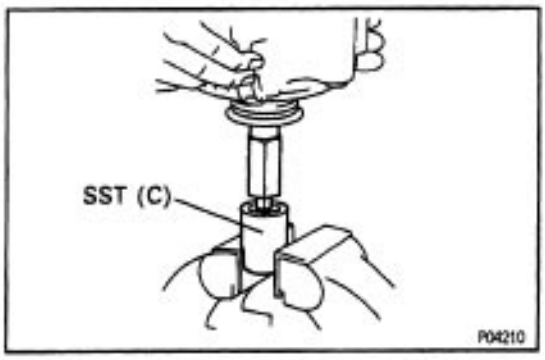


(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820 – 63010

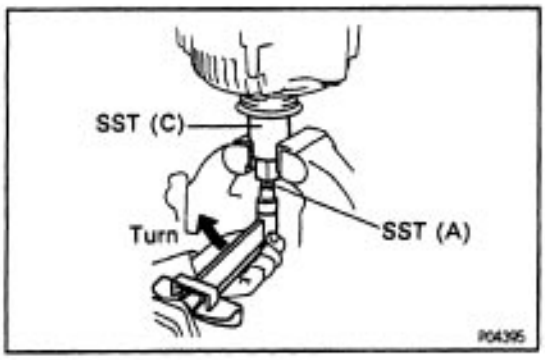
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(c) Check that SST (A) is secured to the pulley shaft.



(d) Mount SST (C) in a vise.

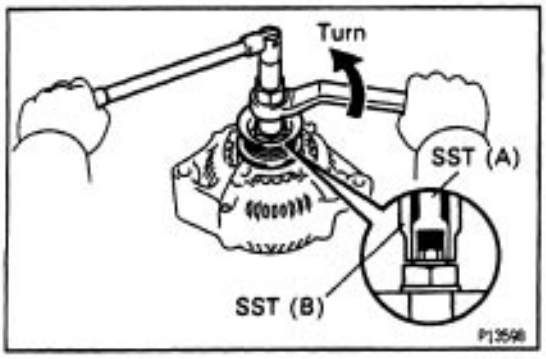
(e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



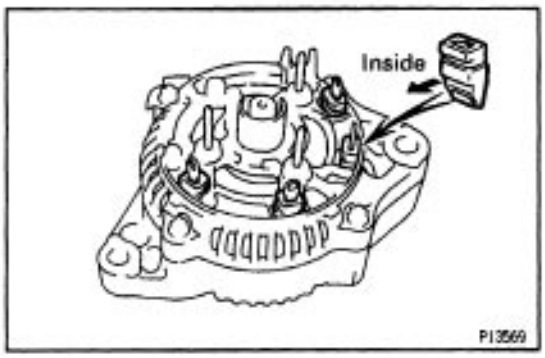
(f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.

Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)

(g) Remove the generator from SST (C).



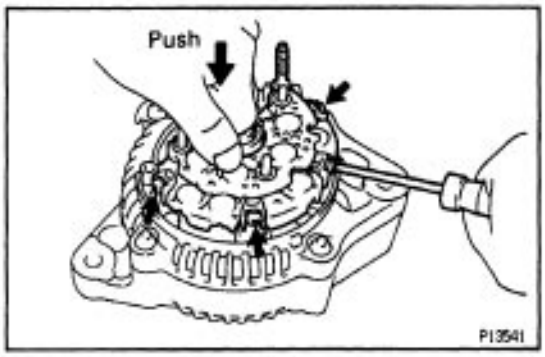
(h) Turn SST (B), and remove SST (A and B).



5. INSTALL RECTIFIER HOLDER

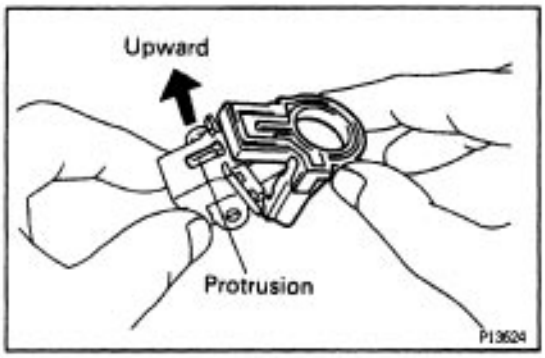
(a) Install the 4 rubber insulators on the lead wires.

NOTICE: Be careful of the rubber insulators installation direction.



(b) Install the rectifier holder while pushing it with the 4 screws.

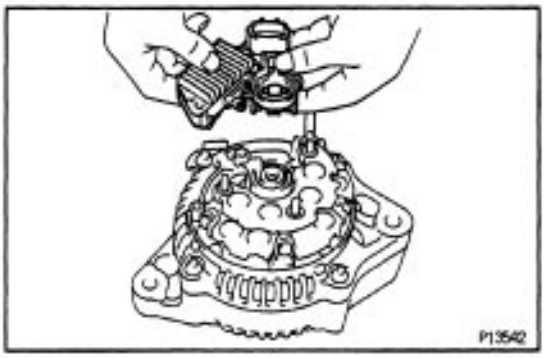
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)



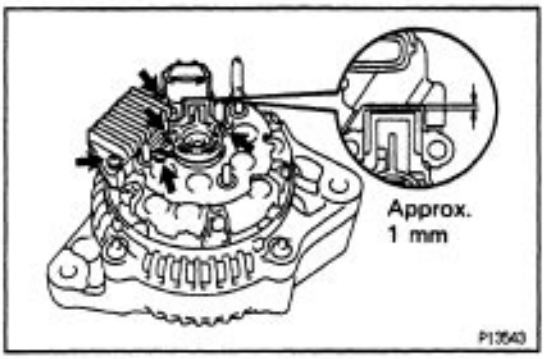
6. INSTALL VOLTAGE REGULATOR AND BRUSH HOLDER

(a) Install the brush holder cover to the brush holder.

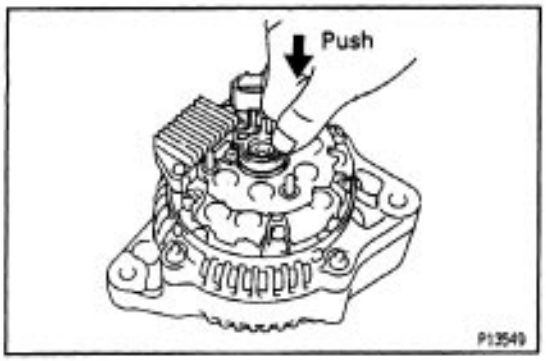
NOTICE: Be careful of the holder installation direction.



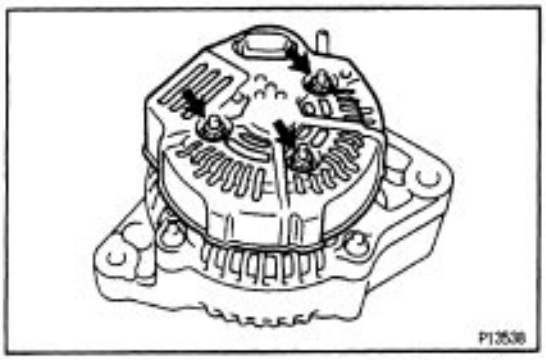
(b) Place the voltage regulator together with the brush holder horizontally on the rectifier end frame.



(c) Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and voltage regulator.



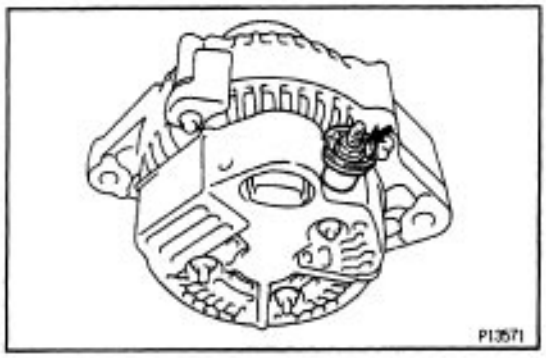
(d) Fit the brush holder cover.



7. INSTALL REAR END COVER

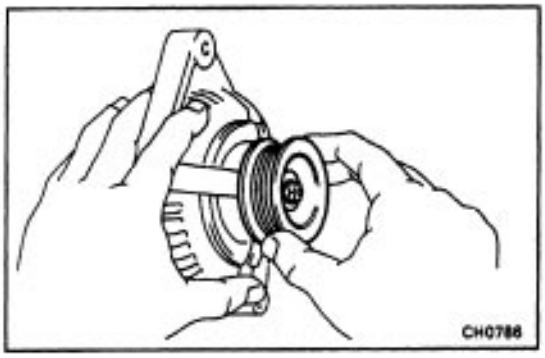
(a) Install the end cover with the 3 nuts.

Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)



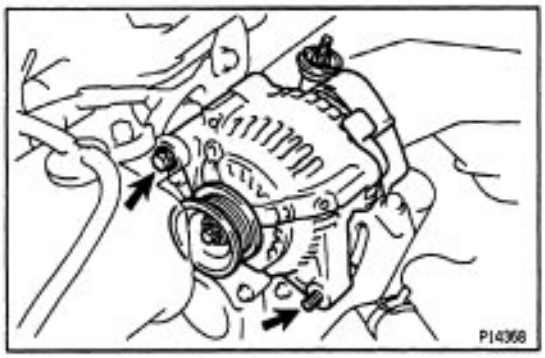
(b) Install the terminal insulator with the nut.

Torque: 4.1 N·m (42 kgf·cm, 36 in.·lbf)



8. CHECK THAT ROTOR ROTATES SMOOTHLY

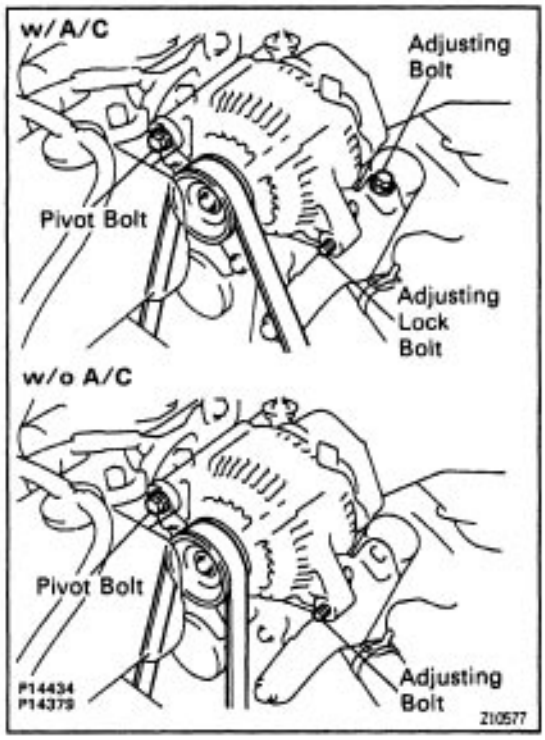
GENERATOR INSTALLATION



(See Components for Removal and Installation)

1. INSTALL GENERATOR

(a) Temporarily install the generator with the pivot bolt and adjusting lock bolt (w/ A/C) or adjusting bolt (w/o A/C).



(b) Install the drive belt with the adjusting bolt.

(c) Adjust the drive belt with the adjusting bolt.
(See step 5 on page CH–7)

(d) Tighten the pivot bolt, adjusting lock bolt (w/ A/C) and adjusting bolt (w/o A/C).

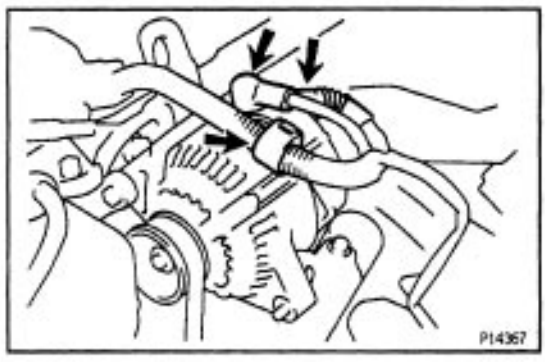
Torque:

Pivot bolt

52 N·m (530 kgf·cm, 38 ft·lbf)

Adjusting lock bolt (w/ A/C) or adjusting bolt (w/o A/C)

18 N·m (185 kgf·cm, 13 ft·lbf)



(f) Connect the generator connector.

(g) Connect the generator wire with the nut and rubber cap.

(h) Install the wire clamp to the wire clip on the rectifier end frame.

2. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

3. PERFORM ON–VEHICLE INSPECTION

(See page CH–5)

SERVICE SPECIFICATIONS

CH01A–0A

SERVICE DATA

Battery (Except Delco Battery)	Voltage (Maintenance free battery)	at 20°C (68°F)	12.7 – 12.9 V
	Specific gravity (Except maintenance free battery)		
	55D23L Battery		
	GNB Incorporated		
	JHONSON CONTROLS	at 20°C (68°F)	1.25 – 1.27
	80D26L Battery		
	GNB Incorporated	at 27°C (81°F)	1.26 – 1.28
	JHONSON CONTROLS		
		at 20°C (68°F)	1.27 – 1.29
		at 27°C (81°F)	1.28 – 1.30
Drive belt	Tension	w/ A/C New belt	175 ± 5 lbf
		Used belt	130 ± 10 lbf
		w/o A/C New belt	125 ± 25 lbf
		Used belt	95 ± 20 lbf
Generator	Rated output		12 V 70 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter	STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Limit	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Limit	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage	at 25 °C (77°F)	13.9 – 15.1 V
		at 115°C (239°F)	13.5 – 14.3 V

CH01C–0A

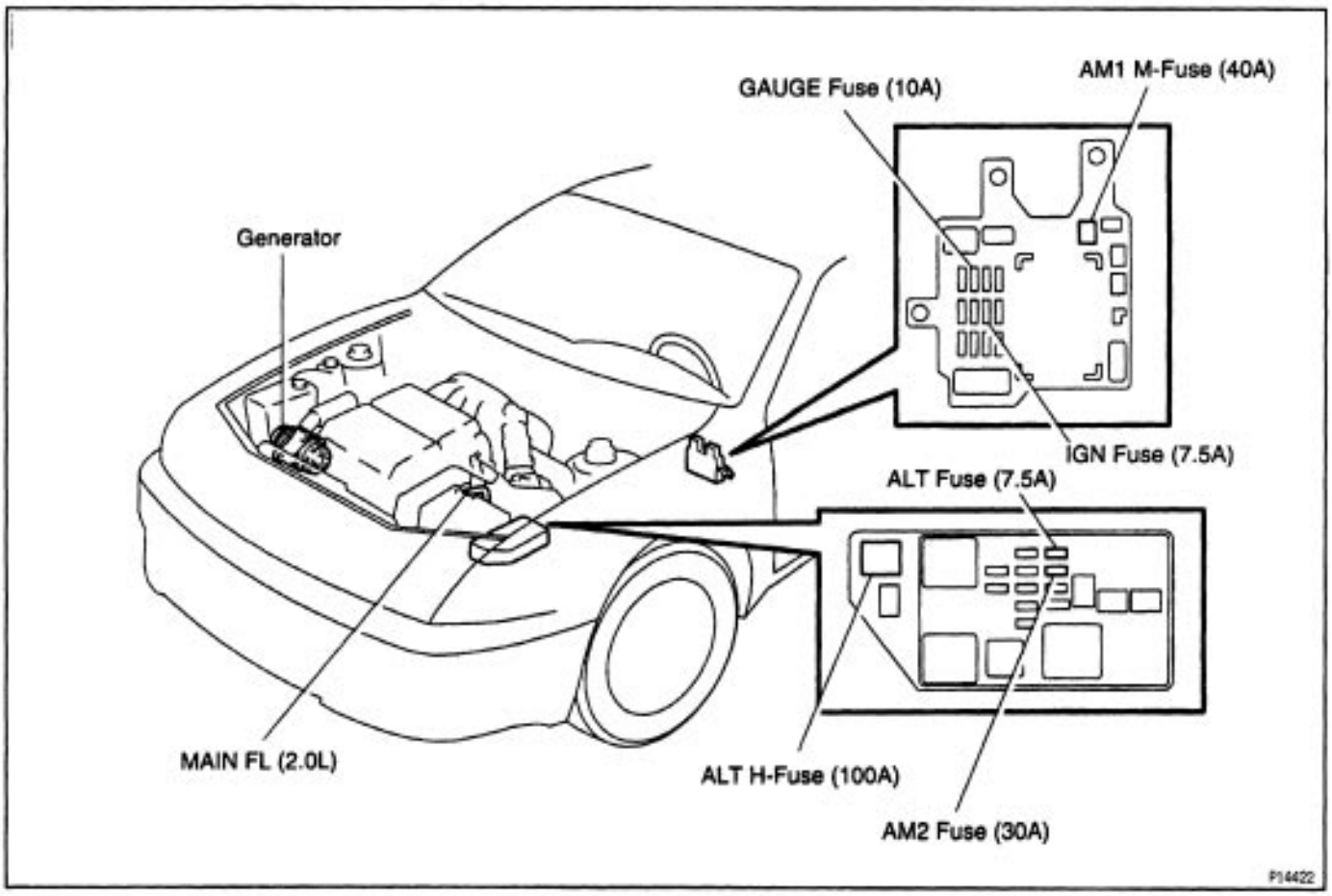
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Bearing cover x Drive end frame	2.6	27	23 in.·lbf
Rectifier end frame x Drive end frame	4.5	46	40 in.·lbf
Generator pulley x Rotor	110	1,125	81
Rectifier holder x Coil lead on rectifier end frame	2.0	20	17 in.·lbf
Rear end cover x Rectifier holder	4.5	46	40 in.·lbf
Terminal insulator x Rectifier holder	4.1	42	36 in.·lbf
Generator x Generator bracket	52	530	38
Generator x Adjusting bar	18	185	13

(1MZ–FE)

DESCRIPTION

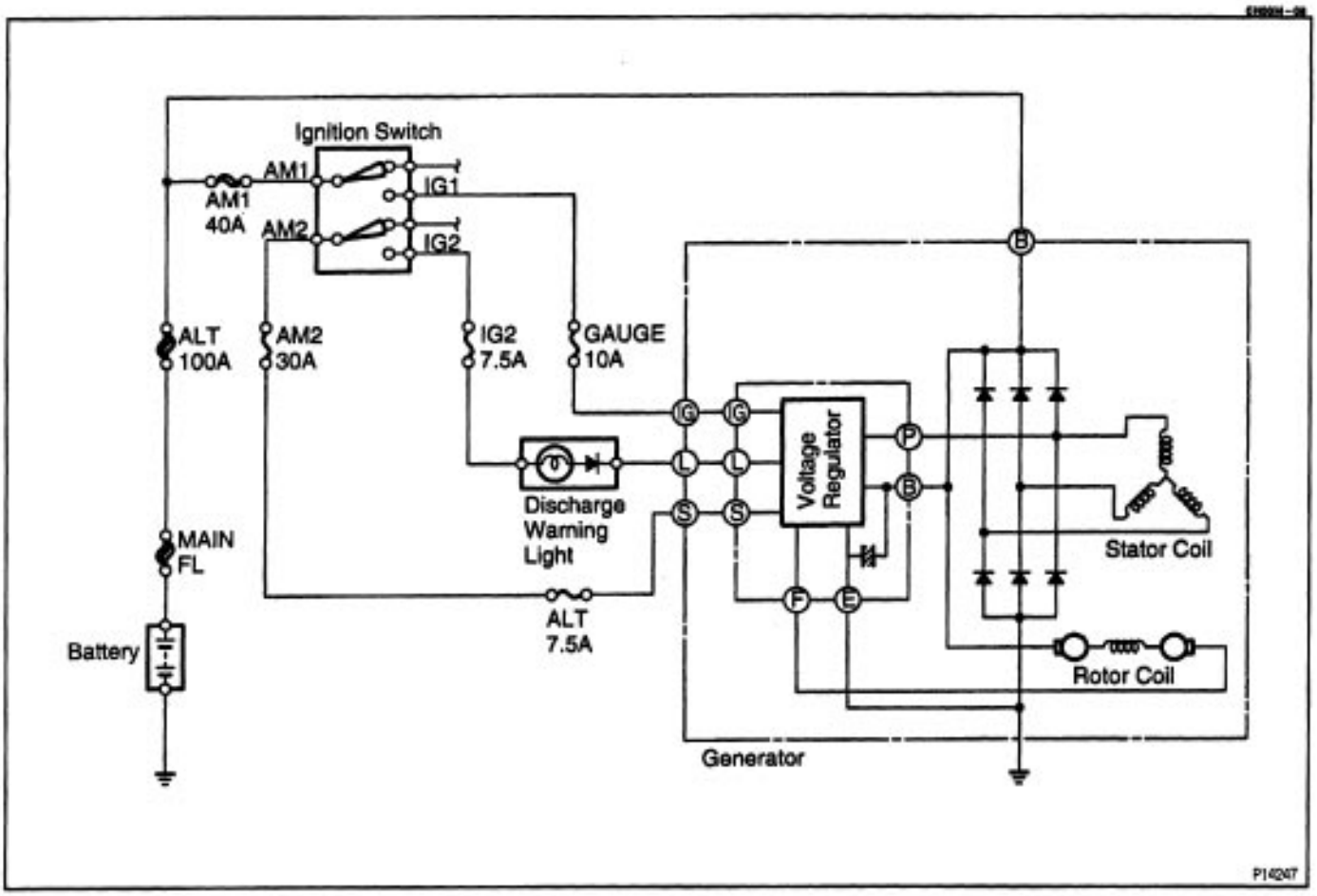
The generator is a small, high–speed, high–performance type with a voltage regulator incorporated. The voltage regulator uses integrated circuits and controls the voltage produced by the generator.



PRECAUTION

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

SYSTEM CIRCUIT



OPERATION

When the ignition switch is turned ON, current from the battery flows from terminal L of the generator through the voltage regulator to terminal E, causing the discharge warning light to light up. Then when the engine is started, the voltage output increases as the generator speed increases. When the voltage output becomes greater than the battery voltage, current for recharging flows from terminal B. Simultaneously, voltage at terminal L increases and the potential difference between battery and terminal L disappears, causing the discharge warning light to go off. When the voltage output exceeds the regulator adjustment voltage, the transistor inside the voltage regulator regulates the voltage so that the voltage from the generator remains constant.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

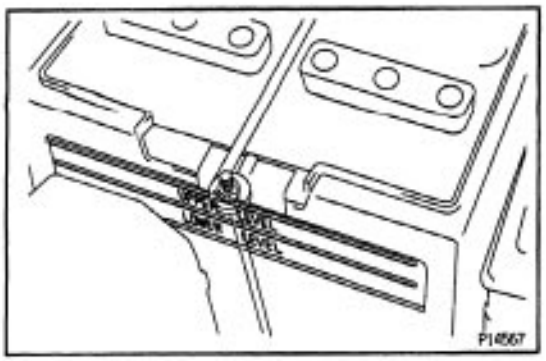
	09285–76010 Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011 Injection Pump Spline Shaft Puller	Rectifier end frame
	09808–20012 Front Hub & Drive Pinion Bearing Tool Set	
	(09608–00030) Replacer	Rotor front bearing
	09820–00021 Alternator Rear Bearing Puller	
	09820–00030 Alternator Rear Bearing Replacer	Rotor rear bearing
	09620–63010 Alternator Pulley Set Nut Wrench Set	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Ammeter(A)	
Battery specific gravity gauge	Except maintenance free battery
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring)



ON–VEHICLE INSPECTION

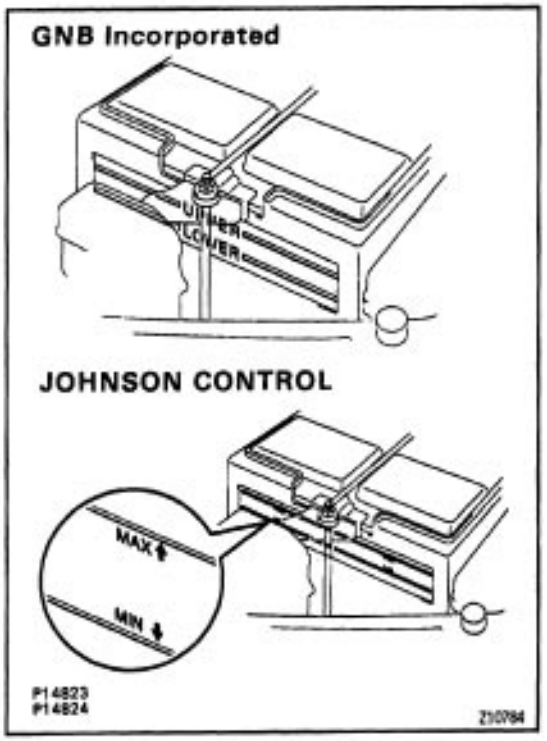
1. Except Delco Battery:

CHECK BATTERY ELECTROLYTE LEVEL

Check the electrolyte quantity of each cell.

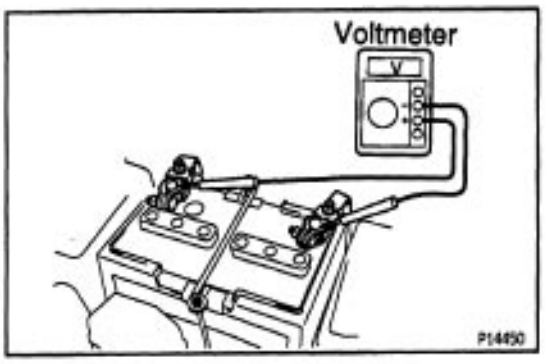
A. Maintenance Free Battery

If under the lower level, replace the battery (or add distilled water if possible). Check the charging system.



B. Except Maintenance Free Battery

If under the “LOWER” or ’MIN” line, add distilled water.



2. Except Delco Battery:

CHECK BATTERY VOLTAGE AND SPECIFIC GRAVITY

A. Maintenance Free Battery

Measure the battery voltage between the terminals negative (–) and positive (+) of the battery.

Standard voltage:

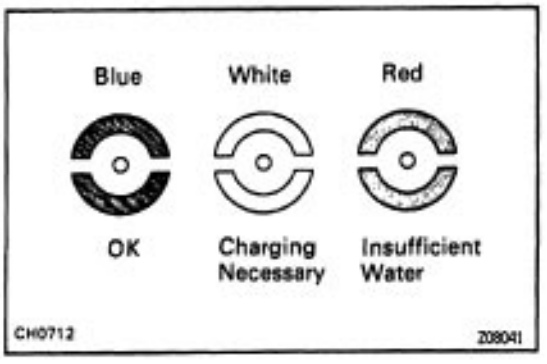
12.7 – 12.9 V at 20°C (68°F)

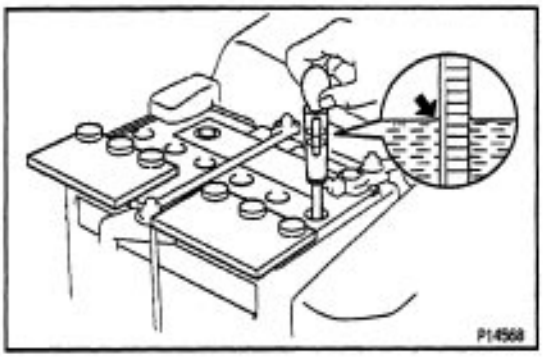
HINT:

- Before measuring the voltage, turn the ignition switch to LOCK and turn off the electrical sys–tems (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- If the vehicle has been running, wait 5 minutes or more after the vehicle stops before measuring the battery voltage.

If the voltage is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





B. Except Maintenance Free Battery

Check the specific gravity of each cell.

Standard specific gravity:

SSD23L battery for GNB Incorporated

1.25 – 1.27 at 20°C (68°F)

55D23L battery for JOHNSON CONTROLS

1.28 – 1.28 at 27°C (81°F)

80D26L battery for GNB Incorporated

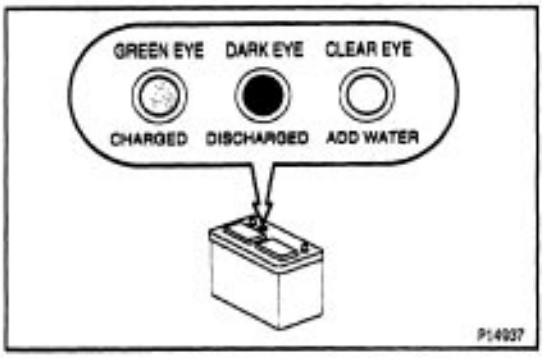
1.27 – 1.29 at 20°C (68°F)

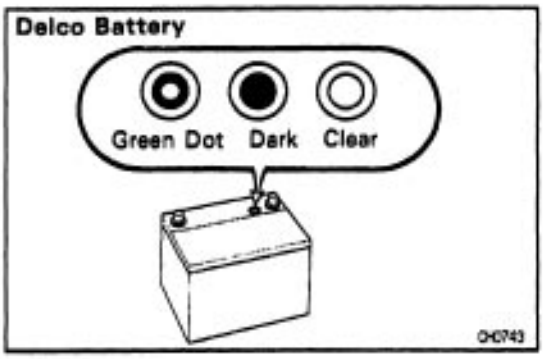
80D28L battery for JOHNSON CONTROLS

1.28 – 1.30 at 27°C (81°F)

If the gravity is less than specification, charge the battery.

HINT: Check the indicator as shown in the illustration.





3. Delco Battery:

CHECK HYDROMETER

Green Dot visible:

Battery I: adequately charged

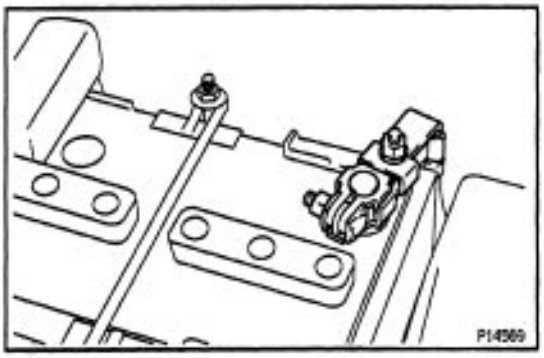
Dark (Green Dot not visible):

Battery must be charged

Clear or Light Yellow:

Replace battery

HINT: There is no need to add water during the entire service life of the battery.



4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.

Fusible link:

MAIN 2.0L

H–fuse:

ALT 100A

M – fuse:

AM 1 40A

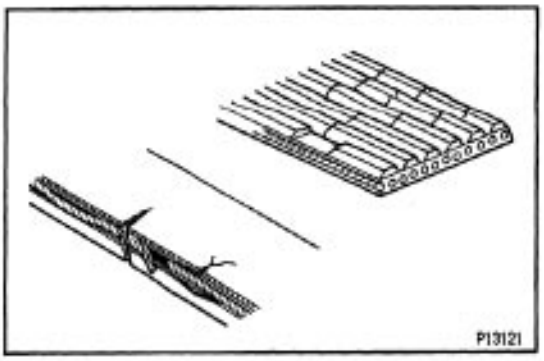
Fuse:

AM2 30 A

IG2 7.5A

GAUGE 10A

ALT 7.5A

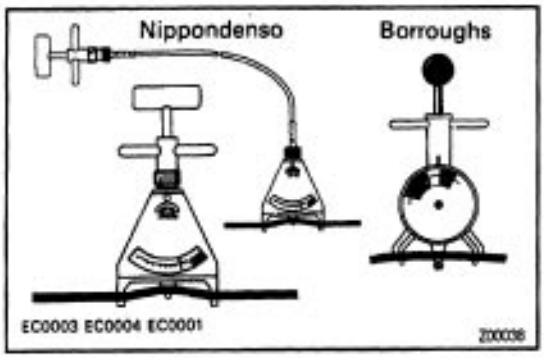


5. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

If any defect has been found, replace the drive belt.

HINT: Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020)

Borroughs No.BT–33 – 73F

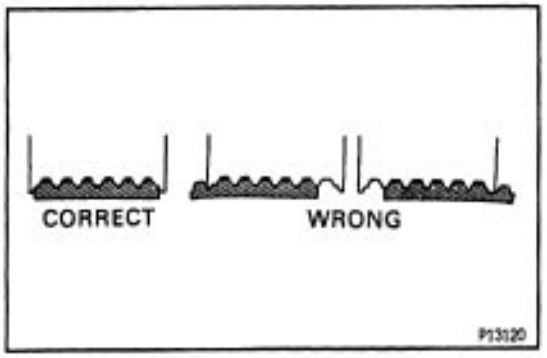
Drive belt tension:

New belt

175 ± 5 lbf

Used belt

115 ± 20 lbf



If the belt tension is not as specified, adjust it.

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slip out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

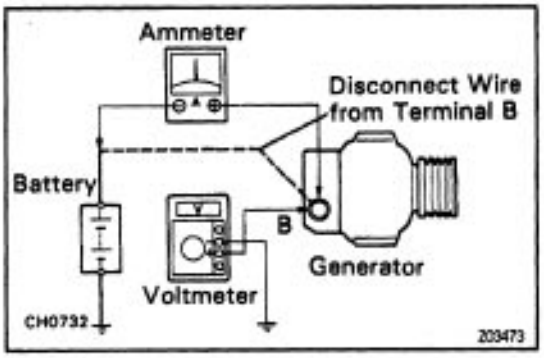
6. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the gener–ator while the engine is running.

7. CHECK DISCHARGE WARNING LIGHT CIRCUIT

(a) Warm up the engine and then turn it off.
(b) Turn off all accessories.
(c) Turn the ignition switch 'ON". Check that the dis–charge warning light is lit.
(d) Start the engine. Check that the light goes off.
If the light does not go off as specified, troubleshoot the discharge light circuit.

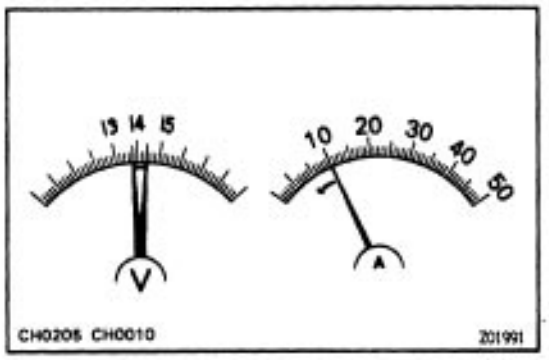


8. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, con–nect the tester to the charging circuit as per the manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the gener–ator, and connect it to the negative (–) probe of the ammeter.
- Connect the positive (+) probe of the ammeter to terminal B of the generator.
- Connect the positive (+) probe of the voltmeter to terminal B of the generator.
- Ground the negative (–) probe of the voltmeter.



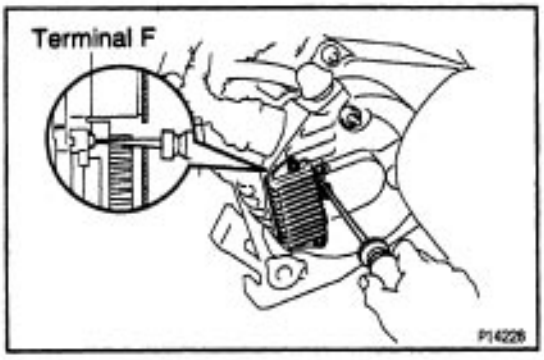
(b) Check the charging circuit as follows:
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

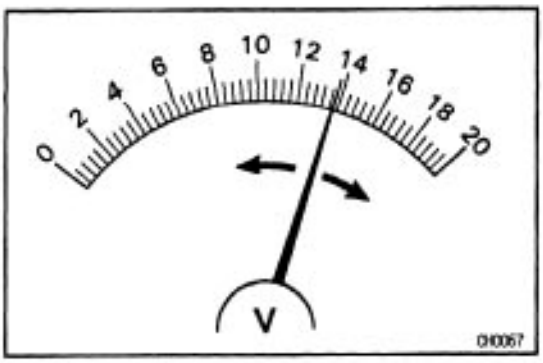
Standard amperage:
10 A or less

Standard voltage:
14.0 – 15.0 V at 25°C (77°F)
13.5 – 14.3 V at 115°C (239°F)

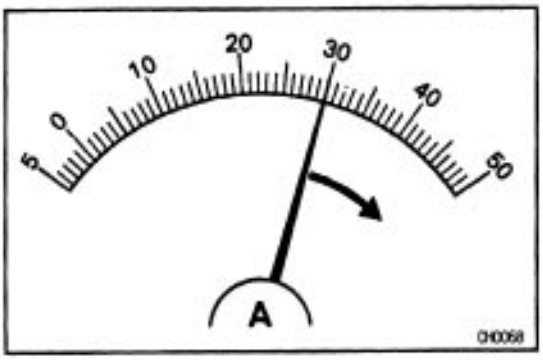
If the voltmeter reading is more than standard voltage, replace the voltage regulator.
If the voltmeter reading is less than standard voltage, check the voltage regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal6.





- If the voltmeter reading is more than standard voltage, replace the voltage regulator.
- If the voltmeter reading is less than standard voltage, check the generator.



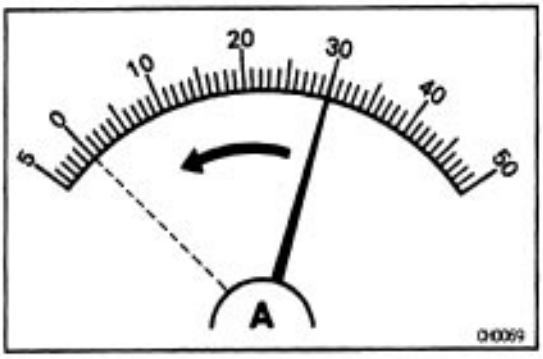
9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch –at “HI”.

(b) Check the reading on ’the ammeter.

Standard amperage:

30 A or more

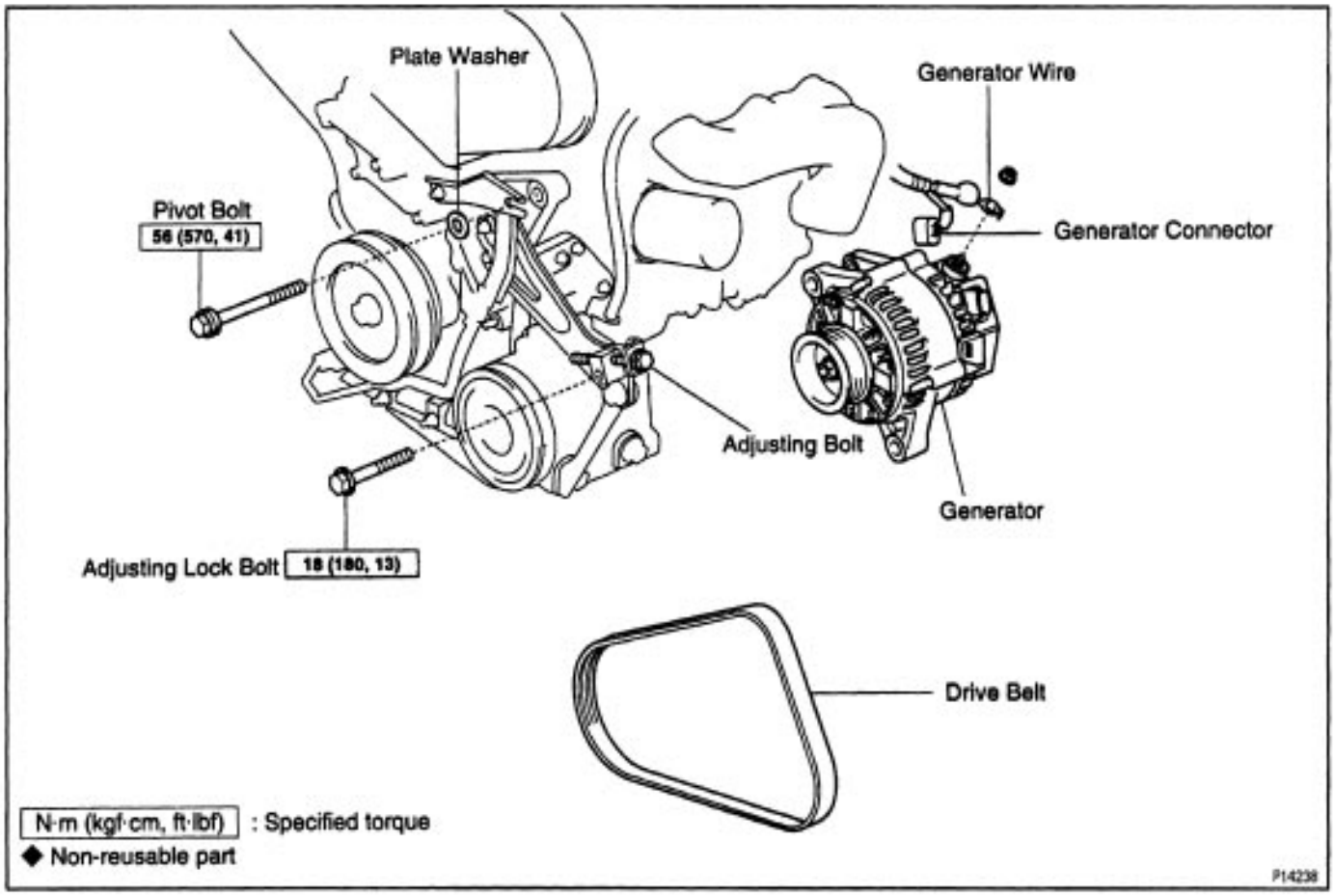


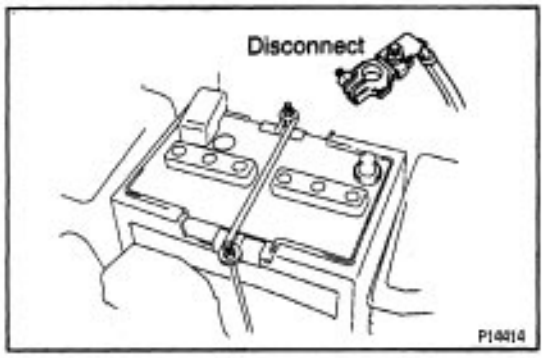
If the ammeter reading is less than the standard am–perage, repair the generator.

HINT: If the battery is fully charged, the indication will sometimes be less than standard amperage.

GENERATOR

COMPONENTS FOR REMOVAL AND INSTALLATION



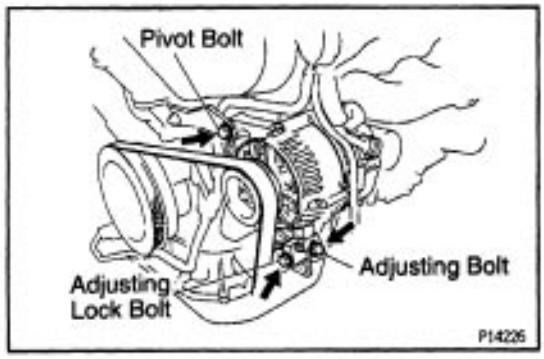


GENERATOR REMOVAL

(See Components for Removal and Installation)

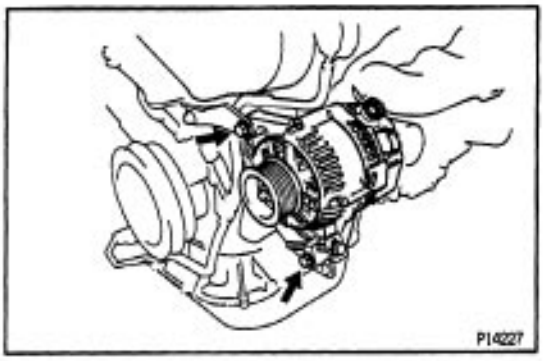
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE DRIVE BELT

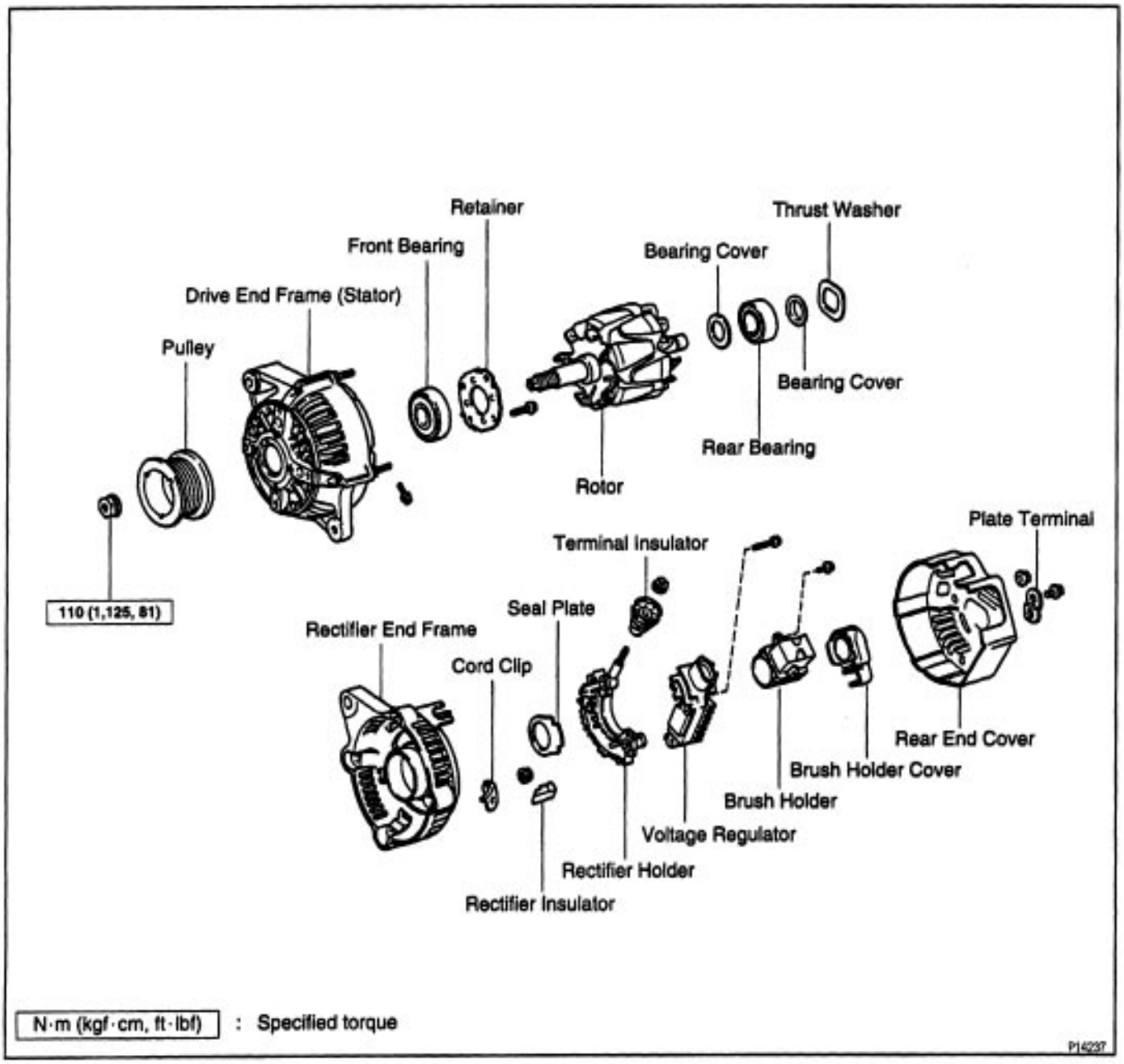
Loosen the pivot bolt, adjusting lock bolt, and adjusting bolt, and remove the drive belt.



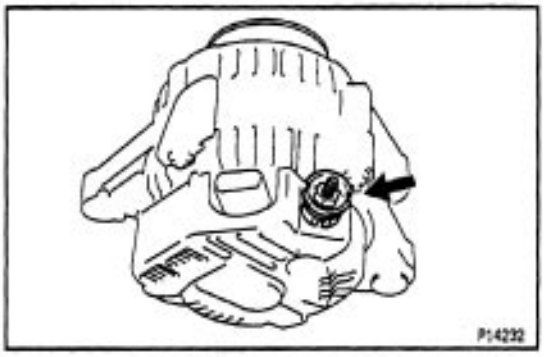
3. REMOVE GENERATOR

(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire.
(c) Disconnect the wire harness from the clip.
(d) Remove the pivot bolt, plate washer, adjusting lock bolt and generator.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



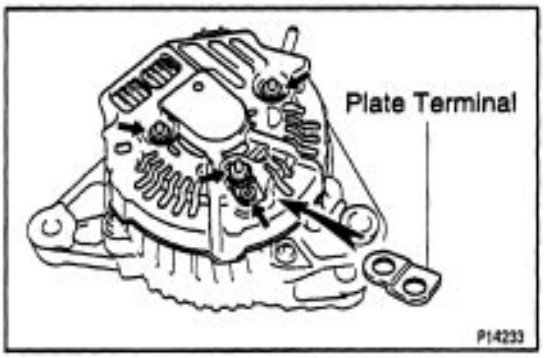
GENERATOR DISASSEMBLY



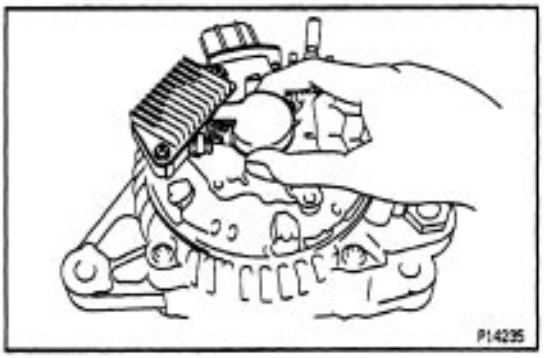
(See Components for Disassembly and Assembly)

1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

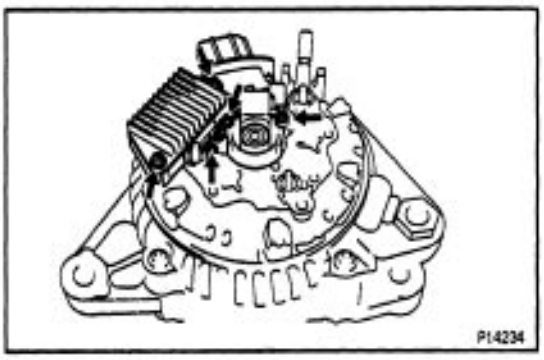


(b) Remove the screw, 3 nuts, plate terminal and end cover.

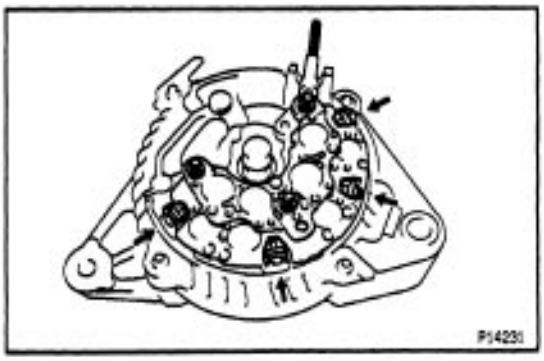


2. REMOVE BRUSH HOLDER AND VOLTAGE REGULA–TOR

(a) Remove the brush holder cover from the brush holder.

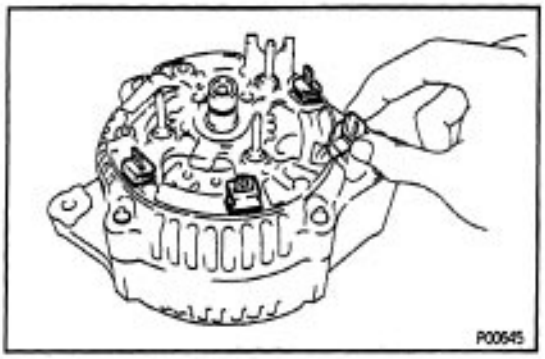


(b) Remove the 5 screws, brush holder and voltage regu–lator.

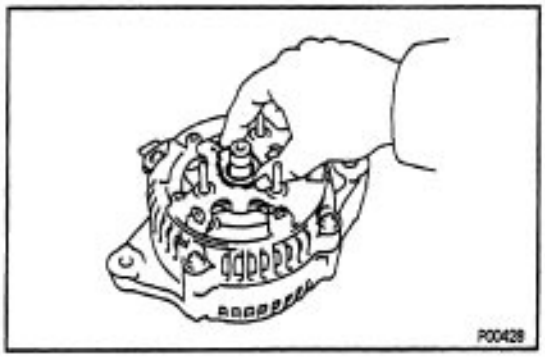


3. REMOVE RECTIFIER HOLDER

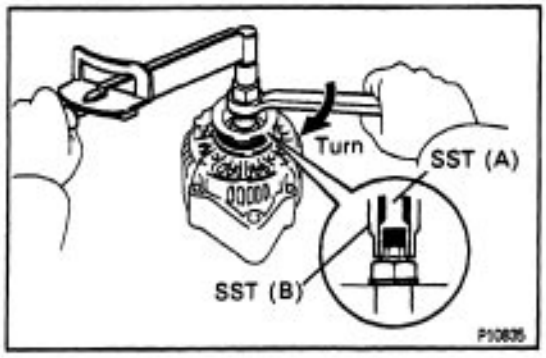
(a) Remove the 4 screws and rectifier holder.



(b) Remove the 4 rubber insulators.



(c) Remove the seal plate.



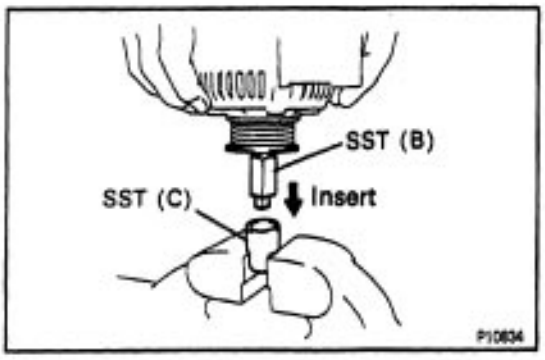
4. REMOVE PULLEY

(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63010

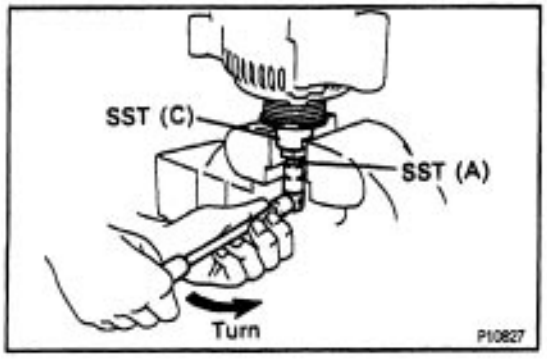
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.



(c) Mount SST (C) in a vise.

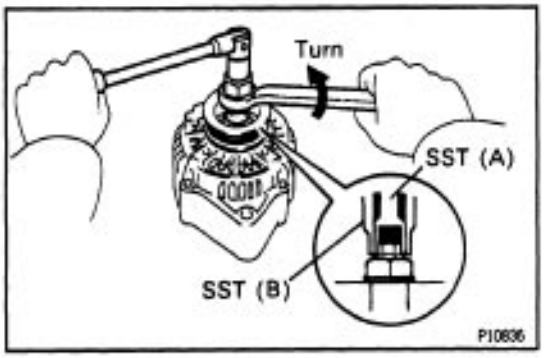
(d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



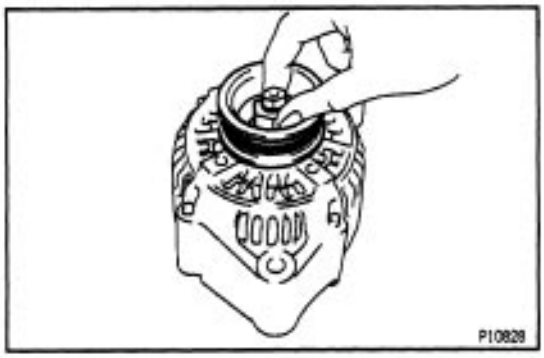
(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

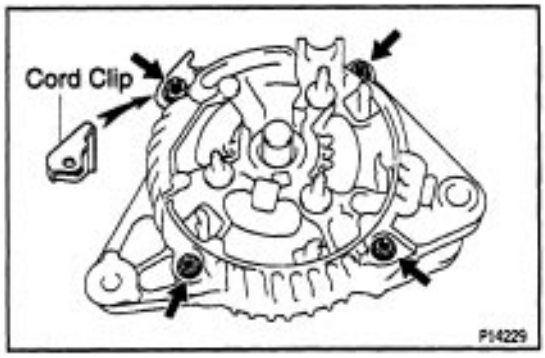
(f) Remove the generator from SST (C).



(g) Turn SST (B), and remove SST (A and B).

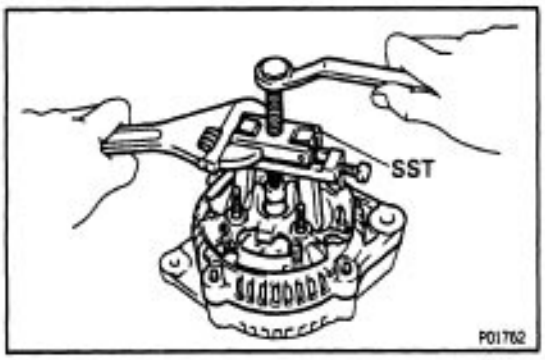


(h) Remove the pulley nut and pulley.

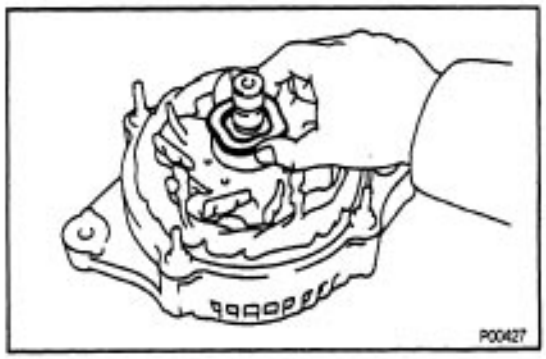


6. REMOVE RECTIFIER END FRAME

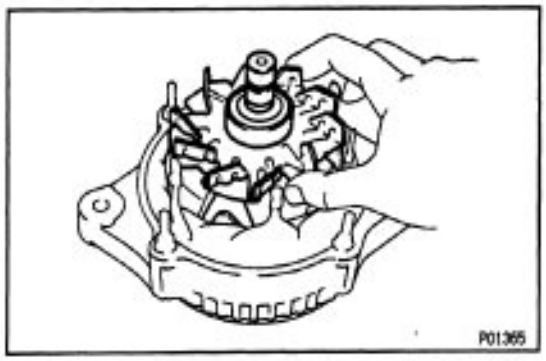
(a) Remove the 4 nuts and cord clip.



(b) Using SST, remove the rectifier end frame.
SST 09286–46011



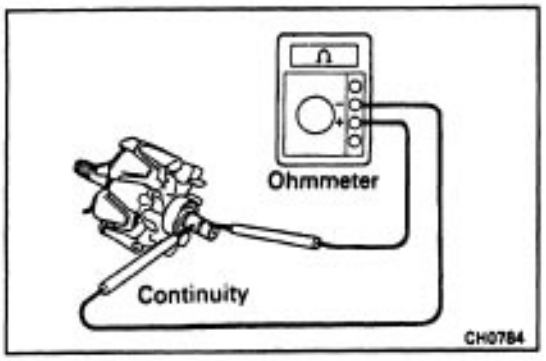
(c) Remove the thrust washer.



6. REMOVE ROTOR FROM DRIVE END FRAME

GENERATOR INSPECTION AND REPAIR

Rotor



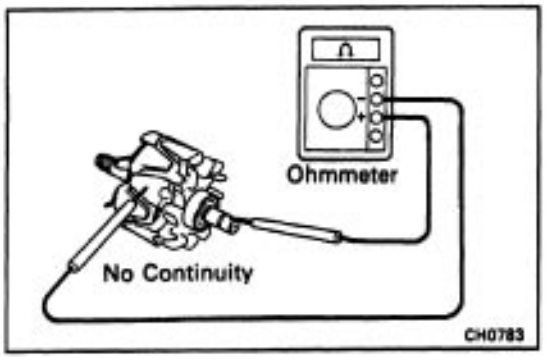
1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:

2.8–3.0 Ω at 20°C (68°F)

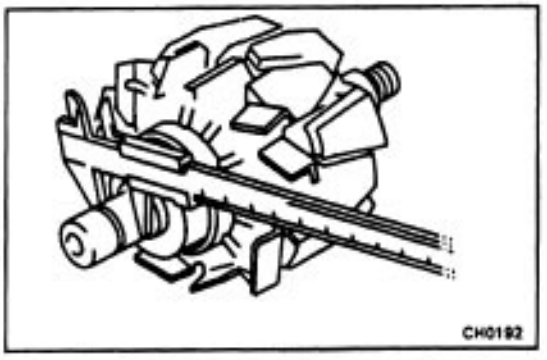
If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter:

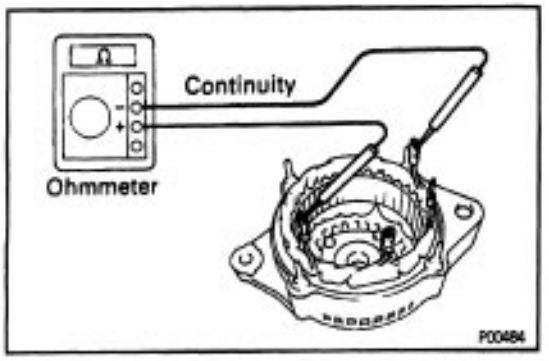
14.2–14.4 mm (0.559–0.587 In.)

Minimum diameter:

12.8 mm (0.504 In.)

If the diameter is less than minimum, replace the rotor.

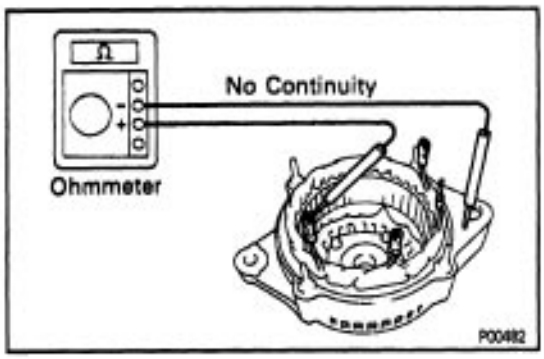
Stator (Drive End Frame)



1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

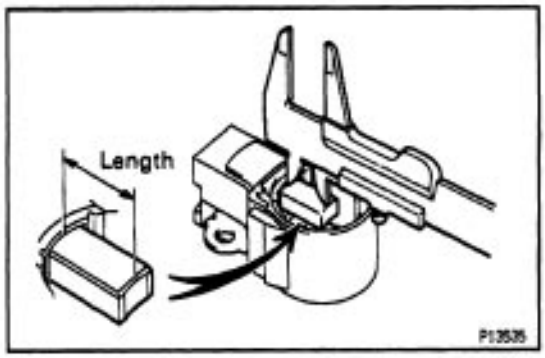
If there is no continuity, replace the drive end frame assembly.



2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.



Brushes

1. INSPECT EXPOSED BRUSH LENGTH

Using a vernier caliper, measure the exposed brush length.

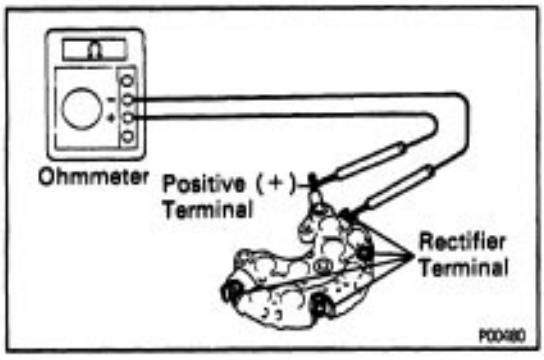
Standard exposed length:

10.5 mm (0.413 In.)

Minimum exposed length:

1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brushes and brush holder assembly.



Rectifiers (Rectifier Holder)

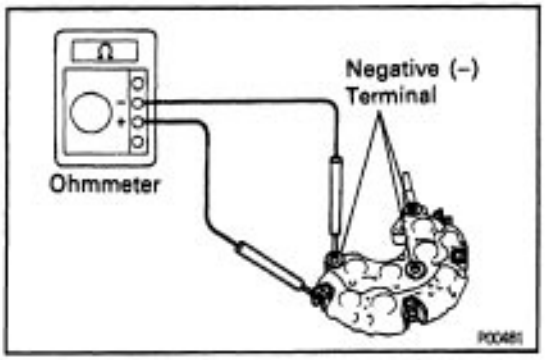
1. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



2. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

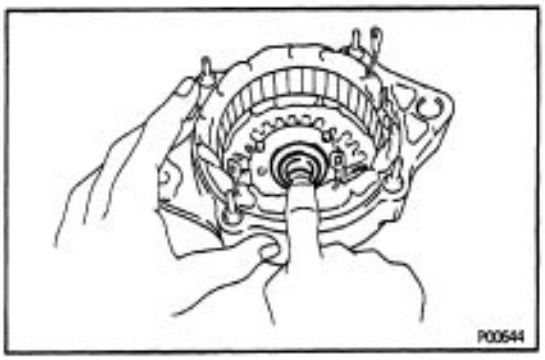
(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

Bearings

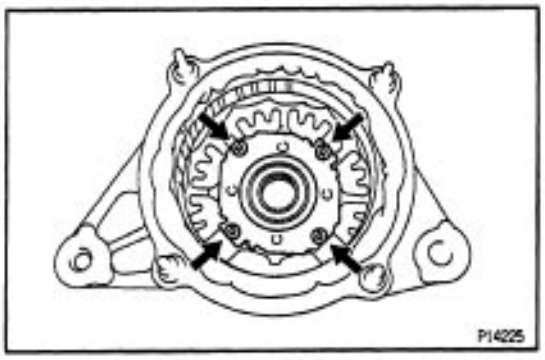
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

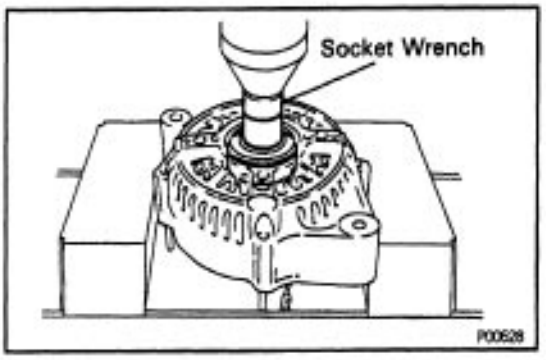


2. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the 4 screws, bearing retainer and bearing.

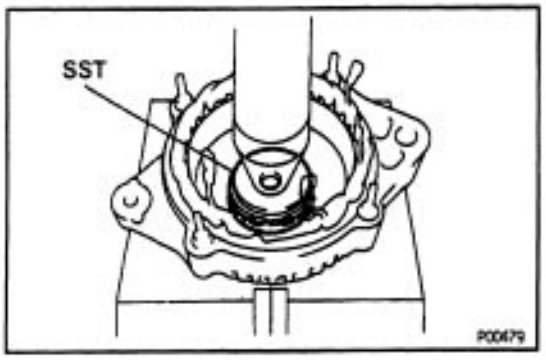


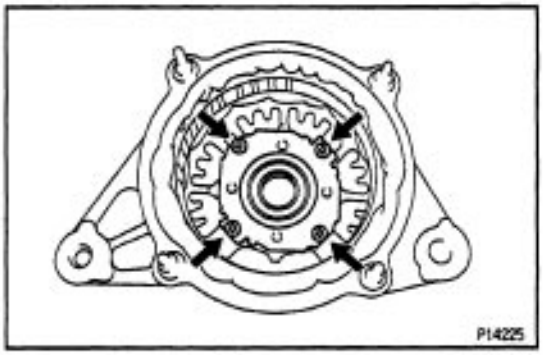
(b) Using a socket wrench and press, press out the bear–ing.



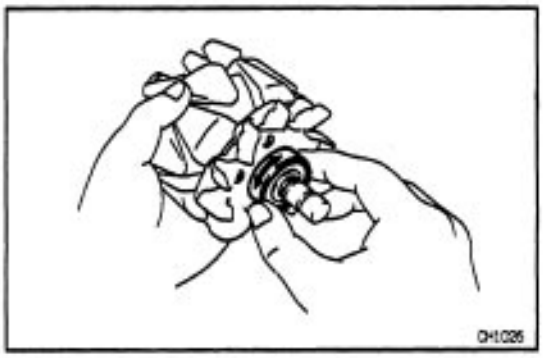
(c) Using SST and a press, press in a new bearing.

SST 09608 – 20012 (09608 – 00030)



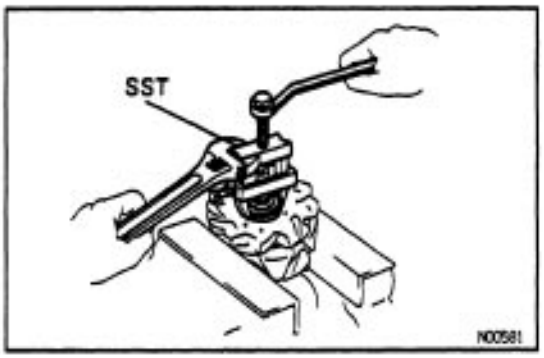


(d) Install the bearing retainer with the 4 screws.



3. INSPECT REAR BEARING

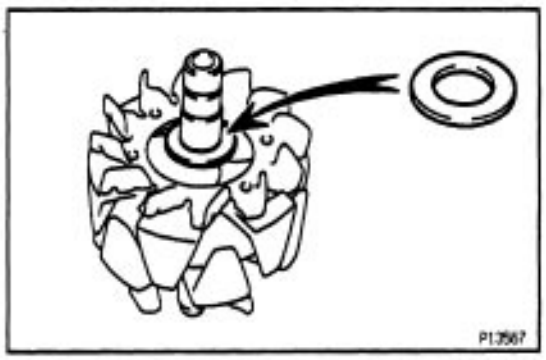
Check that the bearing is not rough or worn.



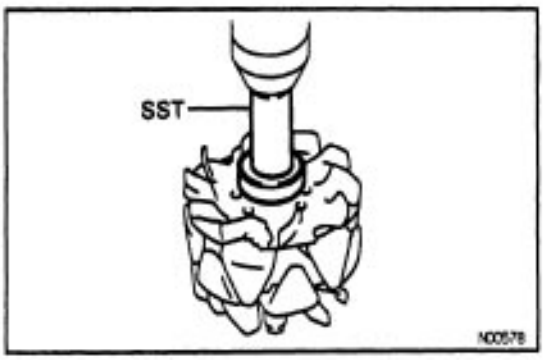
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover (outside) and bearing.
SST 09820–00021
NOTICE: Be careful not to damage the fan.

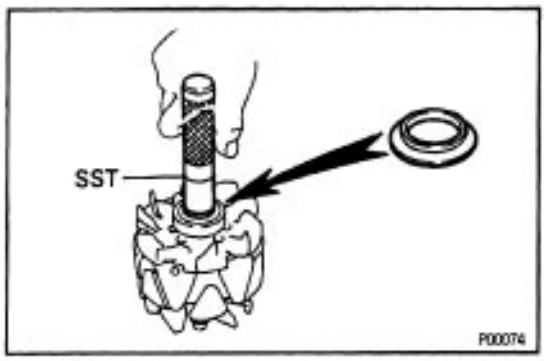
(b) Remove the bearing cover (inside).



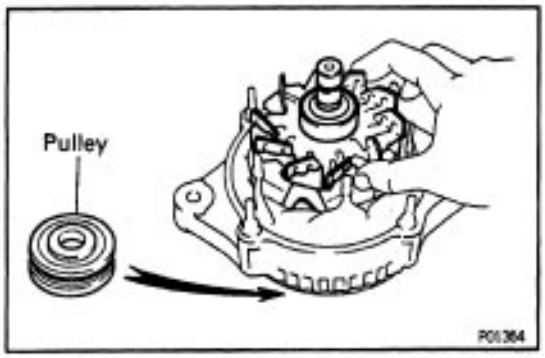
(c) Place the bearing cover (inside) on the rotor.



(d) Using SST and a press, press in a new bearing.
SST 09820–00030



(e) Using SST, push in the bearing cover (outside).
SST 09285 – 76010



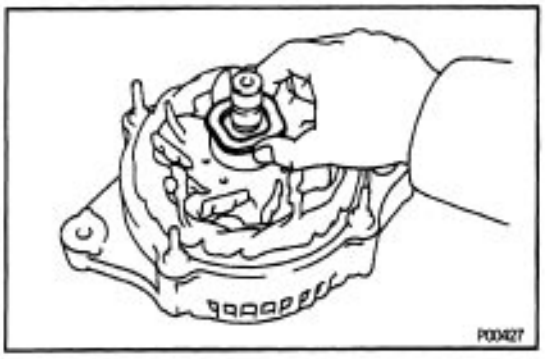
GENERATOR ASSEMBLY

(See Components for Disassembly and Assembly)

1. INSTALL ROTOR TO DRIVE END FRAME

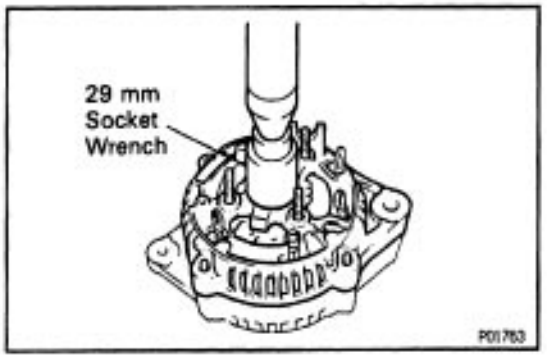
(a) Place the rectifier end frame on the pulley.

(b) Install the rotor to the rectifier end frame.

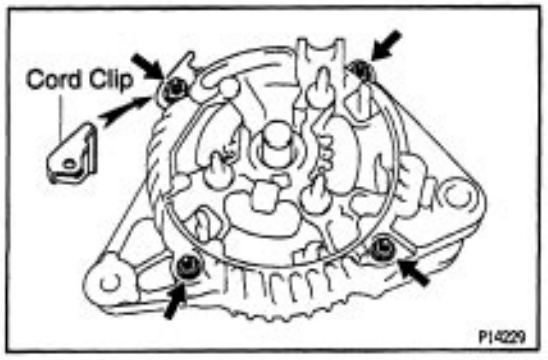


2. INSTALL RECTIFIER END FRAME

(a) Place the thrust washer on the rotor.

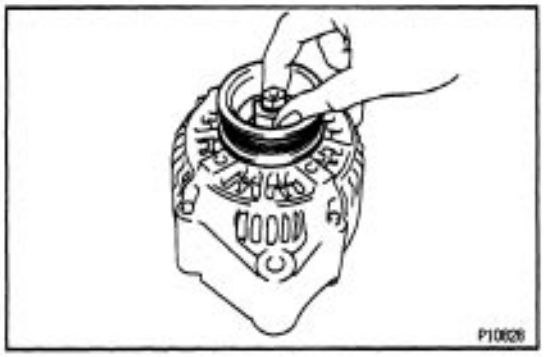


(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



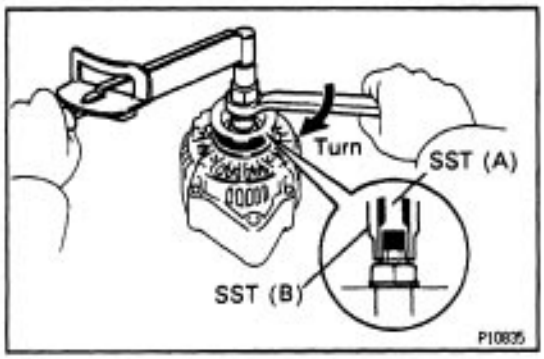
(c) Install the 3 nuts.
Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)

(d) Install the cord clip with the nut.
Torque: 5.4 N·m (55 kgf·cm. 48 in.·lbf)



3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

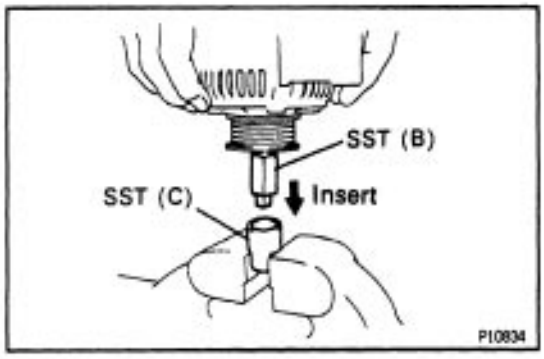


(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820 – 63010

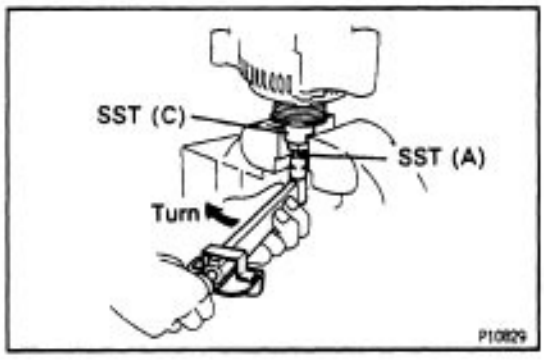
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(c) Check that SST (A) is secured to the pulley shaft.



(d) Mount SST (C) in a vise.

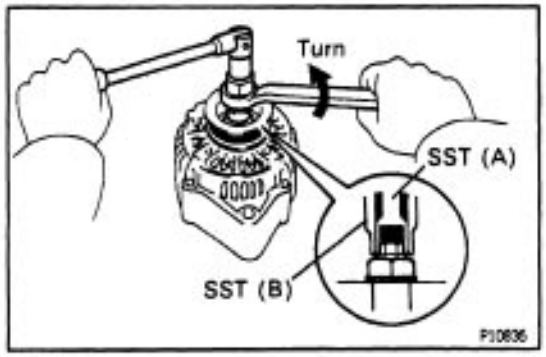
(e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



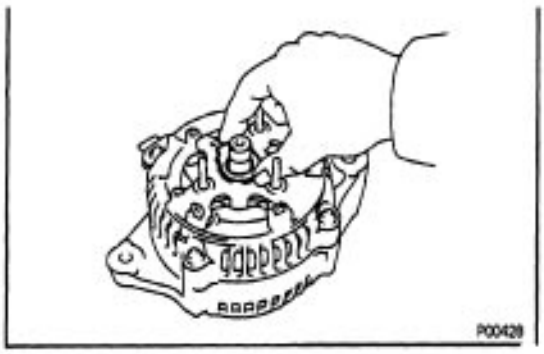
(f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.

Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)

(g) Remove the generator from SST (C).

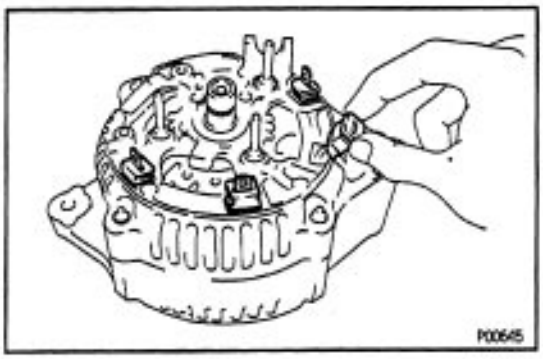


(h) Turn SST (B), and remove SST (A and B).

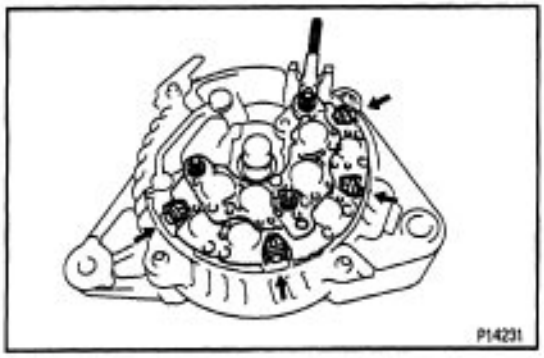


4. INSTALL RECTIFIER HOLDER

(a) Place the seal plate on the rectifier end frame.

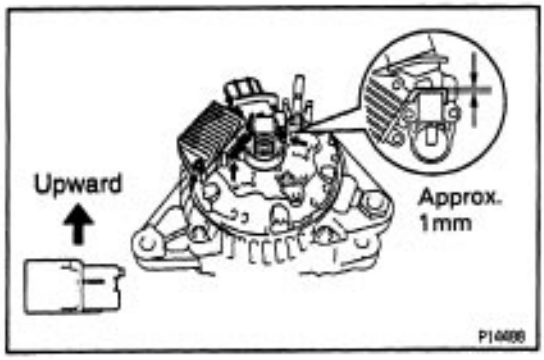


(b) Install the 4 rubber insulators on the lead wires.



(c) Install the rectifier holder with the 4 screws.

Torque: 2.94 N·m (30 kgf·cm, 26 In.·lbf)

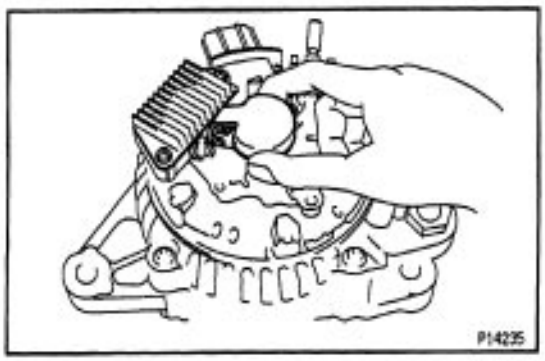


5. INSTALL VOLTAGE REGULATOR AND BRUSH HOLDER

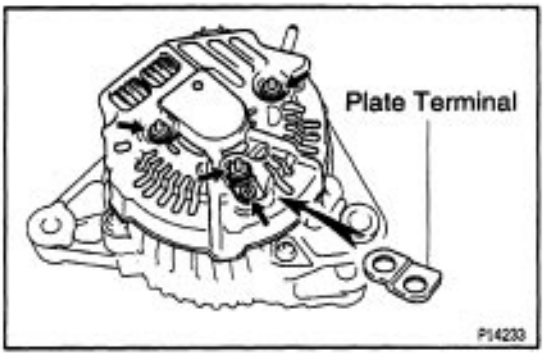
(a) Place the voltage regulator and brush holder on the rectifier end frame.

NOTICE: Be careful of the holder installation direction.

(b) Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.



(c) Place the brush holder cover on the brush holder.



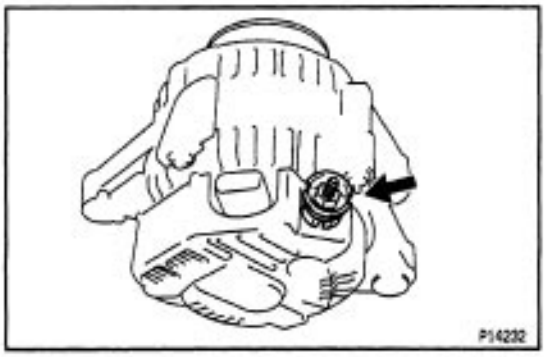
6. INSTALL REAR END COVER

(a) Install the end cover and plate terminal with the 3 nuts and screw.

Torque:

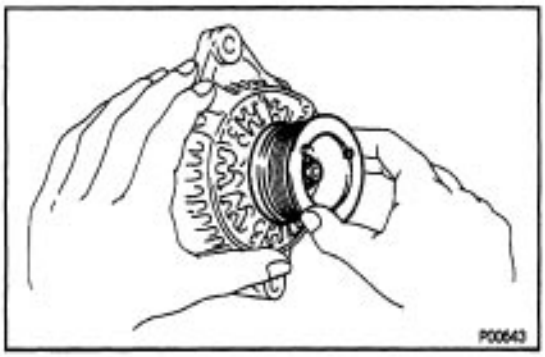
3.85 N·m (39 kgf·cm, 34 in.·lbf) for screw

4.4 N·m (45 kgf·cm, 39 in.·lbf) for nut

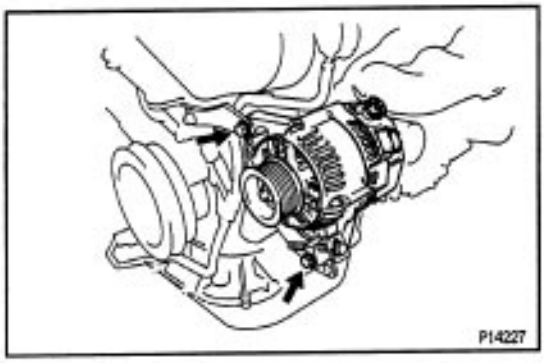


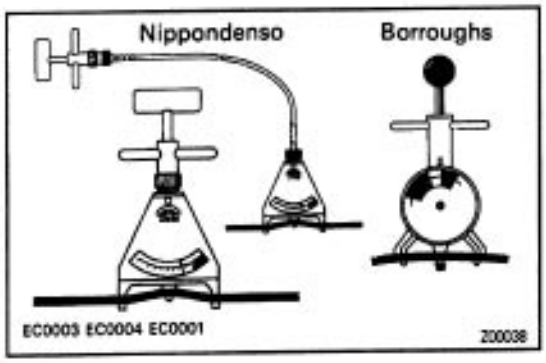
(b) Install the terminal insulator with the nut.

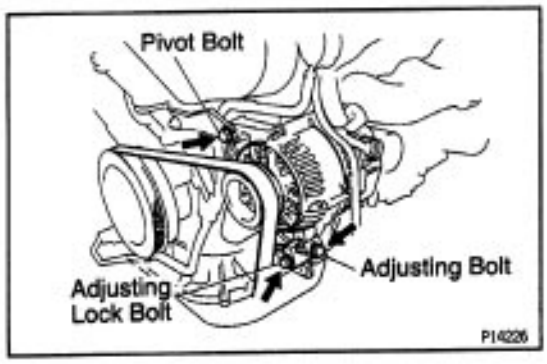
Torque: 4.1 N·m (41.5 kgf·cm. 36 in.·lbf)

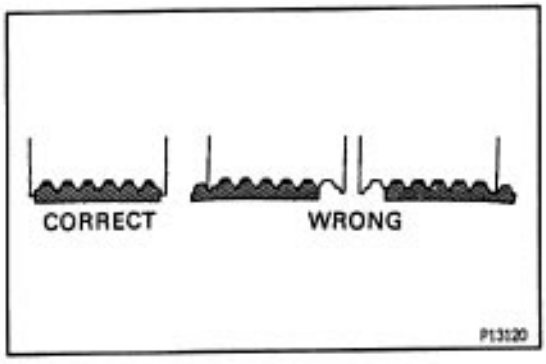


7. CHECK THAT ROTOR ROTATES SMOOTHLY









GENERATOR INSTALLATION

(See Components for Removal and Installation)

1. INSTALL GENERATOR

(a) Mount generator on the generator bracket with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.

(b) Connect the generator connector.

(c) Connect the generator wire with the nut.

2. INSTALL DRIVE BELT

(a) Install the drive belt with the adjusting bolt.

(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020)

Borroughs No. BT–33–73F

Drive belt tension:

New belt

175 ± 5 lbf

Used belt

115 ± 20 lbf

(c) Tighten the pivot bolt and adjusting lock bolt.

Torque:

56 N·m (570 kgf·cm. 41 ft·lbf) for pivot bolt

18 N·m (180 kgf·cm. 13 ft·lbf) for lock bolt

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slip out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

3. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

4. PERFORM ON–VEHICLE INSPECTION

(See steps 7 to 9 on pages CH–32 and 33)

SERVICE SPECIFICATIONS

SERVICE DATA

Battery (Except Delco Battery)	Voltage (Maintenance free battery)	at 20°C (68°F)	12.7 – 12.9 V
	Specific gravity (Except maintenance free battery)		
	55D23L Battery		
	GNB Incorporated		
	JHONSON CONTROLS	at 20°C (68°F)	1.25 – 1.27
	8OD26L Battery	at 27°C (81°F)	1.26 – 1.28
	GNB Incorporated		
	JHONSON CONTROLS		
		at 20°C (68°F)	1.27 – 1.29
		at 27°C (81°F)	1.28 – 1.30
Drive belt	Tension		
	New belt		175 ± 5 lbf
	Used belt		115 ± 20 lbf
Generator	Rated output		12 V 80 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter		
		STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Limit	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Limit	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage	at 25°C (77°F)	14.0 – 15.0 V
		at 115°C (239°F)	13.5 – 14.3 V

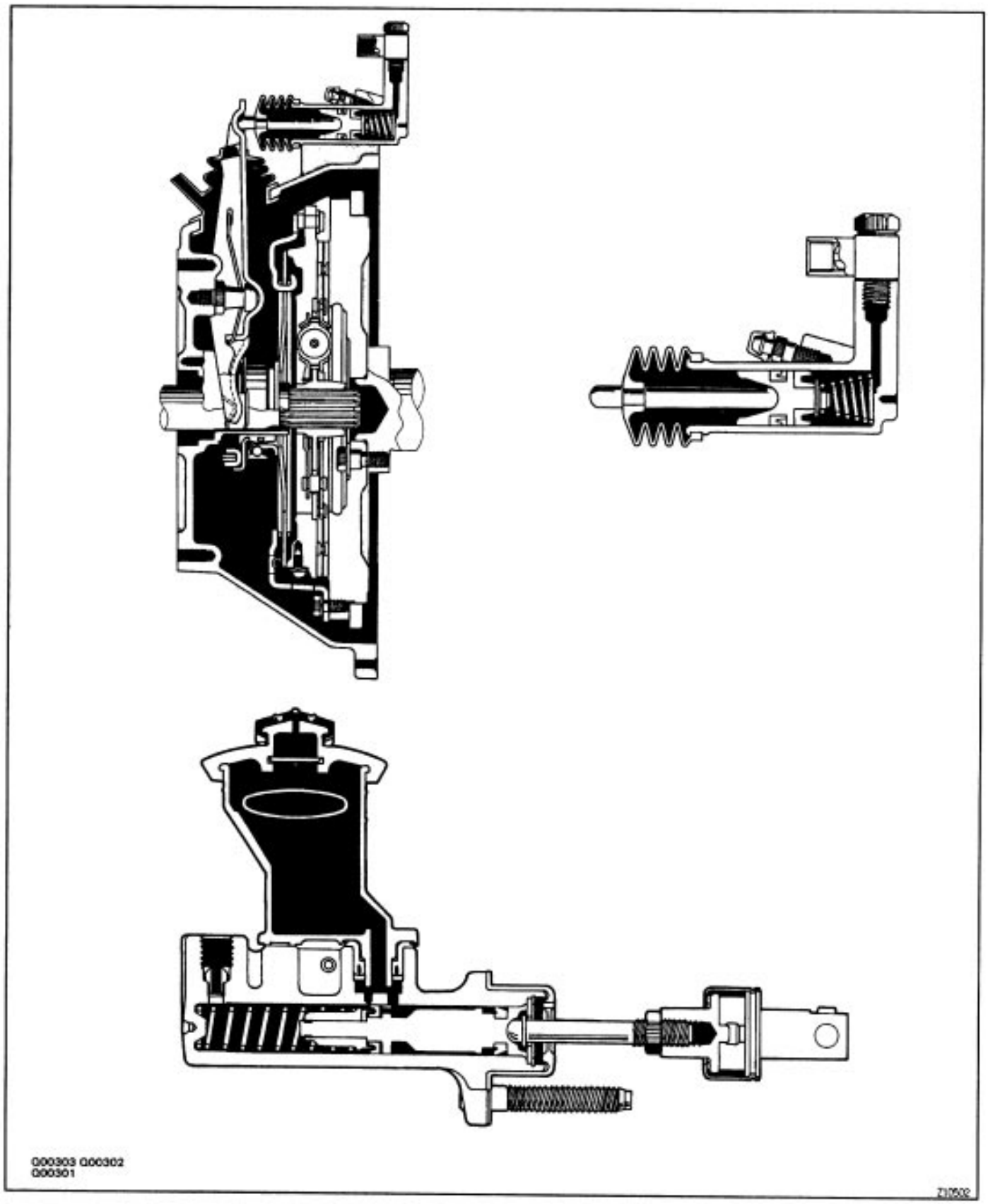
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Rectifier end frame x Drive end frame	4.5	46	40 in.·lbf
Cord clamp x Rectifier end frame	5.4	55	48 in.·lbf
Generator pulley x Rotor	110	1,125	81
Rectifier holder x Coil lead on rectifier end frame	2.94	30	26 in.·lbf
Rear end cover x Rectifier holder	4.4	45	39 in.·lbf
Plate terminal x Rectifier holder	3.85	39	34 in.·lbf
Terminal insulator x Rectifier holder	4.1	41.5	36 in.·lbf
Generator x Generator bracket	56	570	41
Generator x Adjusting bar	18	180	13

CLUTCH

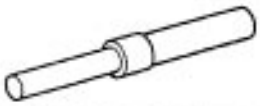
DESCRIPTION

The diaphragm spring turnover type clutch providing lighter release performance.



PREPARATION

SST(SPECIAL SERVICE TOOLS)

	09023–00100 Union Nut Wrench 10 mm	Clutch line tube
	09301–00210 Clutch Guide Tool	
	09333–00013 Clutch Diaphragm Spring Aligner	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	
	09905–00013 Snap Ring Pliers	

EQUIPMENT

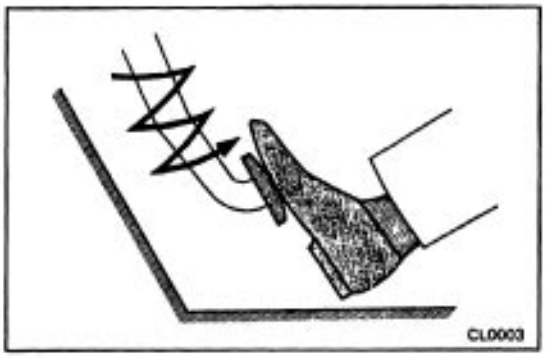
Calipers	
Dial indicator	
Torque wrench	

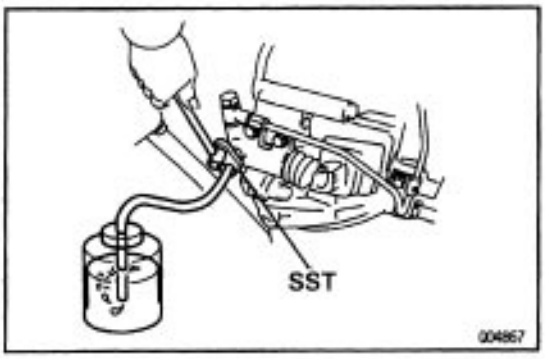
TROUBLESHOOTING

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Trouble \ Parts Name / See Page	Clutch pedal (Freeplay out of adjustment) CL–6	Clutch line (Air in line) CL–5	Master cylinder cup (Damaged) CL–8	Release cylinder cup (Damaged) CL–11	Engine mounting (Loosen) -	Release bearing (Worn, dirty or damaged) CL–14	Input shaft bearing (Worn or damaged) MX–33	Clutch disc (Out of true) CL–14	Clutch disc (Runout is excessive) CL–14	Clutch disc (Lining broken) CL–14	Clutch disc (Dirty or burred) CL–14	Clutch disc (Oily) CL–14	Clutch disc (Worn out) CL–14	Clutch disc torsion rubber (Damaged) CL–14	Clutch disc (Harden) CL–14	Clutch disc (Lack of spline grease) CL–16	Diaphragm spring (Damaged) CL–14	Diaphragm spring (Out of tip alignment) CL–16	Pressure plate (Distortion) CL–14	Flywheel (Distortion) -
Clutch grabs/chatters					1				2			2	2	2	2			2		
Clutch pedal spongy		1	2	2																
Clutch noisy						1	2							3						
Clutch slips	1											2	2				3		4	5
Clutch does not disengage	1	2	3	4			5	6	6	6	6	6				6	7	7	8	

V00004





CLUTCH SYSTEM BLEEDING

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

2. CONNECT VINYL TUBE TO BLEEDER PLUG

Insert the other end of the tube in a half–full container of brake fluid.

HINT: Check the reservoir frequently. Add fluid if necessary.

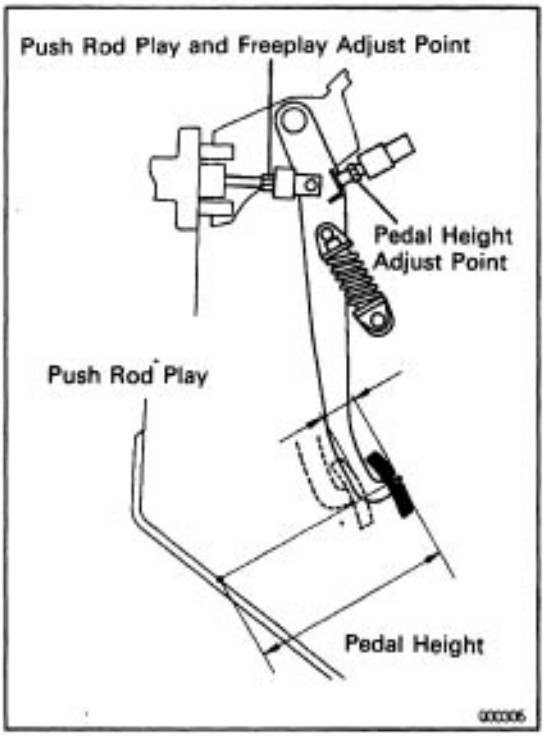
3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

SST 09023–00100

(c) Repeat this procedure until there are no more air bubbles in the fluid.



CLUTCH PEDAL

CLUTCH PEDAL CHECK AND ADJUSTMENT

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from asphalt sheet:

160.8–170.8 mm (6.33–6.72 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.

3. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

Pedal freeplay:

Push in on the pedal until the beginning of clutch resistance is felt.

Pedal fresplay:

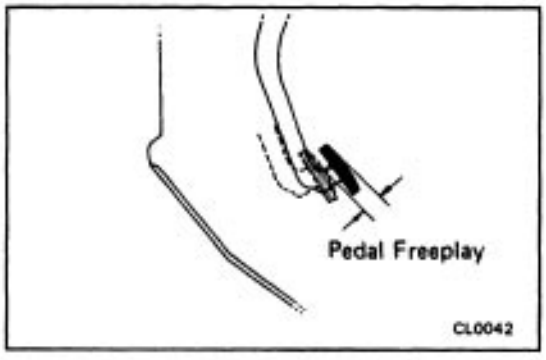
5.0–15.0 mm (0.197–0.591 in.)

Push rod play:

Push in on the pedal with a finger softly until the resistance begins to increase a little.

Push rod play at pedal top:

1.0–5.0 mm (0.039–0.197 in.)



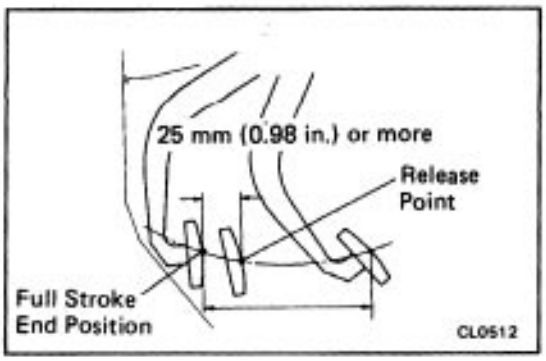
4. IF NECESSARY, ADJUST PEDAL FREEPLAY AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the push rod until the freeplay and push rod play are correct.

(b) Tighten the lock nut.

(c) After adjusting the pedal freeplay, check the pedal height.

(d) Connect the air duct and install the lower finish panel.



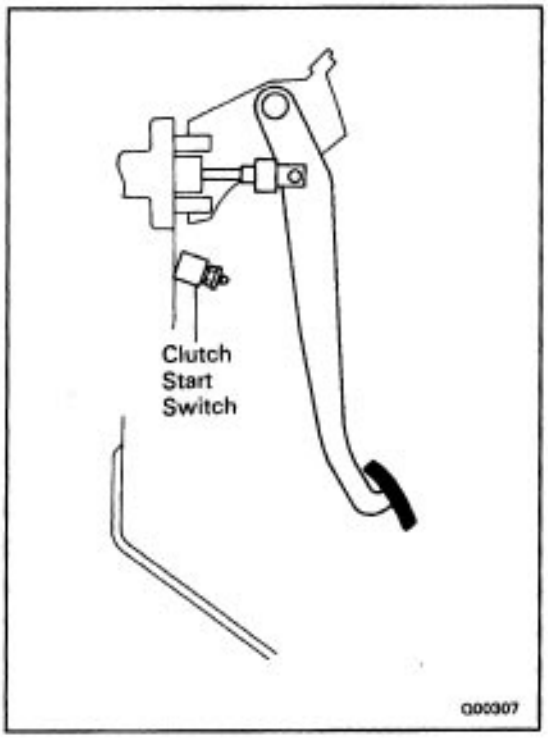
5. INSPECT CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stopper.
(b) Start the engine and idle the engine.
(c) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.
(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) up to the full stroke end position.

Standard distance:
25 mm (0.98 in.) or more
(From pedal stroke end position to release point)

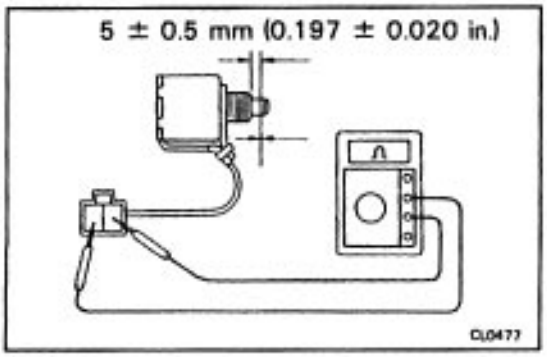
If the distance not as specified, perform the following operation.

- Inspect pedal height.
- Inspect push rod play and pedal freeplay.
- Bleed the clutch line.
- Inspect the clutch cover and disc.



6. CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.
(b) Check that the engine starts when the clutch pedal is fully depressed.
If necessary, adjust or replace the clutch start switch.

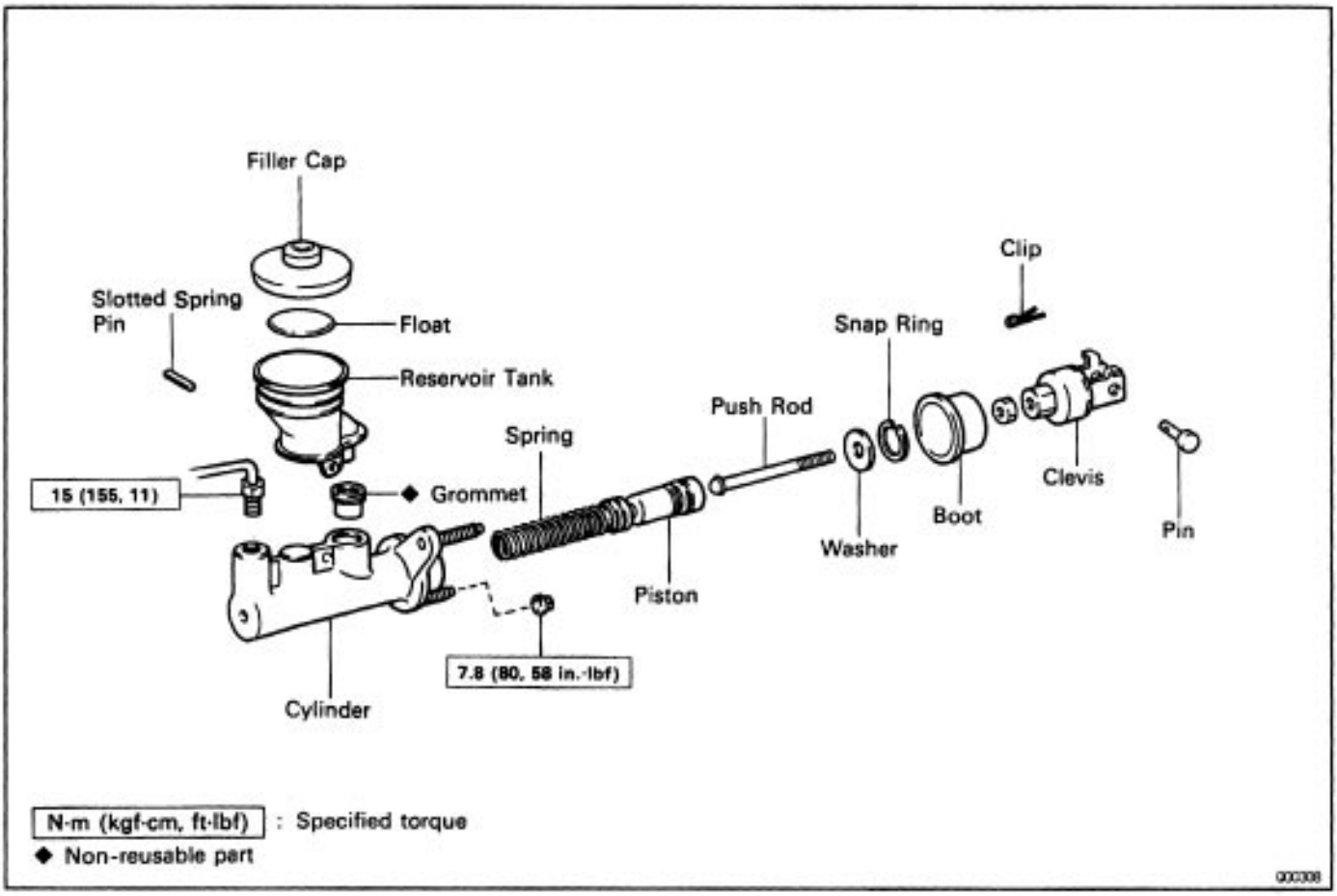


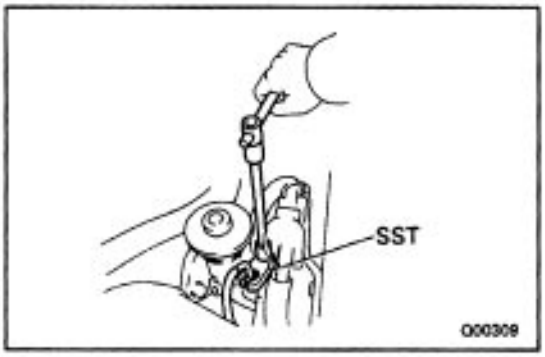
7. CHECK CONTINUITY OF CLUTCH START SWITCH

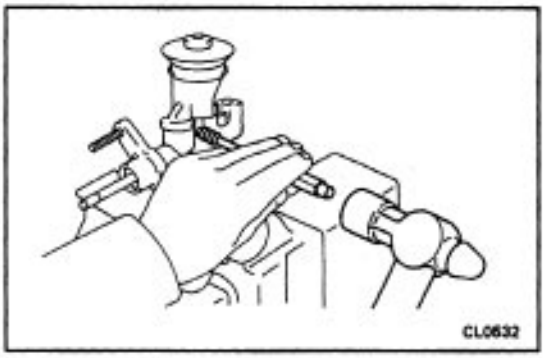
(a) Check that there is continuity between terminals when the switch is ON (pushed).
(b) Check that there is no continuity between terminals when the switch is OFF (free).
If continuity is not as specified, replace the switch.

CLUTCH MASTER CYLINDER

COMPONENTS







MASTER CYLINDER REMOVAL

1. DRAW OUT FLUID WITH SYRINGE

2. DISCONNECT CLUTCH LINE TUBE

Using SST, disconnect the clutch line tube. Use a container to catch the brake fluid.

SST 09023–00100

3. REMOVE CLIP AND CLEVIS PIN

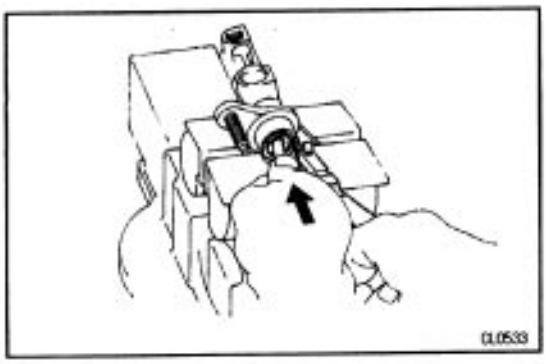
4. REMOVE 2 MOUNTING NUTS AND PULL OUT MASTER CYLINDER

MASTER CYLINDER DISASSEMBLY

1. REMOVE RESERVOIR TANK

(a) Using a pin punch and a hammer, drive out the slotted spring pin.

(b) Remove the reservoir tank and grommet.



2. REMOVE PUSH ROD

Pull back the boot, and using snap ring pliers, remove the snap ring.

3. REMOVE PISTON

MASTER CYLINDER INSPECTION

HINT: Clean the disassembled parts with compressed air.

1. INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION

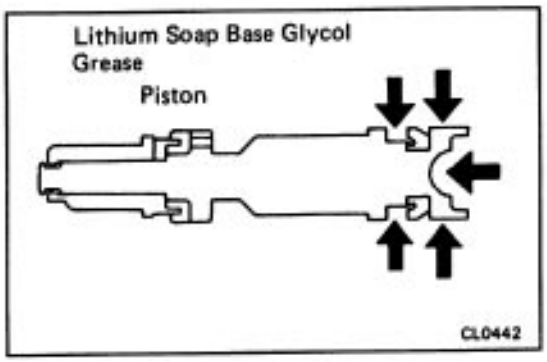
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.

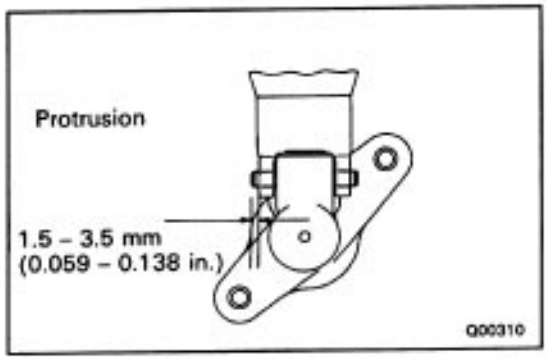


MASTER CYLINDER ASSEMBLY

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE. AS SHOWN

2. INSERT PISTON INTO CYLINDER

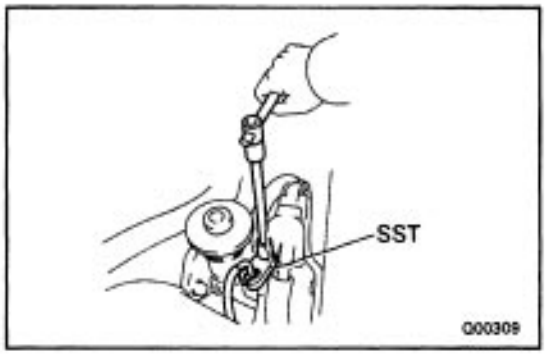
3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING



4. INSTALL RESERVOIR TANK

(a) Install the reservoir tank and new grommet.

(b) Using a pin punch and a hammer, drive in the slotted spring pin.



MASTER CYLINDER INSTALLATION

1. INSTALL MASTER CYLINDER

Install the 2 mounting nuts, and torque them.

Torque: 7.8 N–m (80 kgf–cm, 58 in,.lbf)

2. CONNECT CLUTCH LINE TUBE

Using SST, connect the clutch line tube.

SST 09023–00100

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

3. CONNECT PUSH ROD AND INSTALL PIN

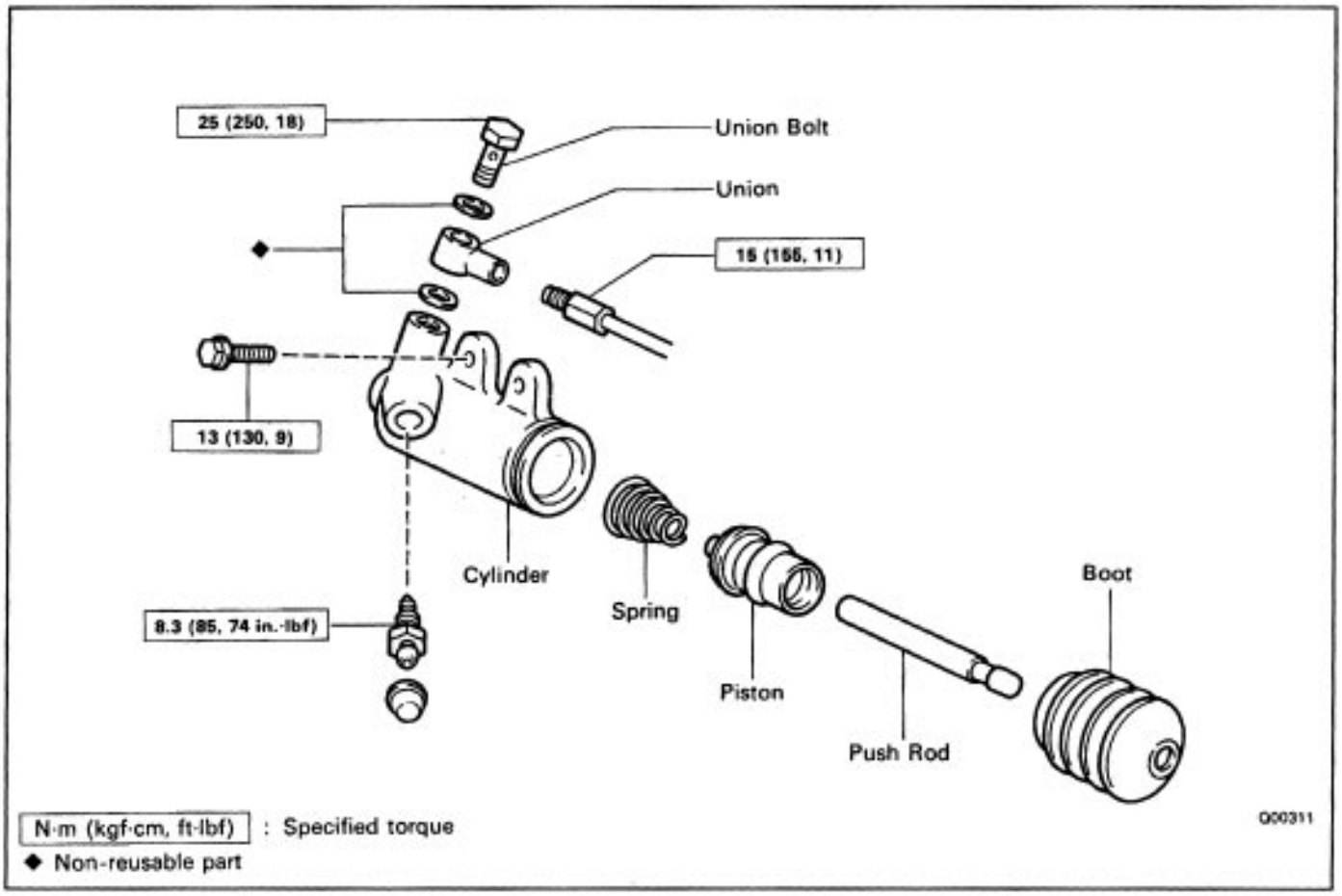
Install the clip in the push rod pin.

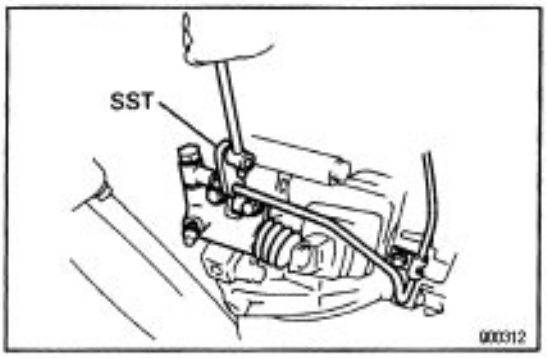
4. BLEED SYSTEM AND ADJUST CLUTCH PEDAL

(See page CL–5,6)

CLUTCH RELEASE CYLINDER

COMPONENTS





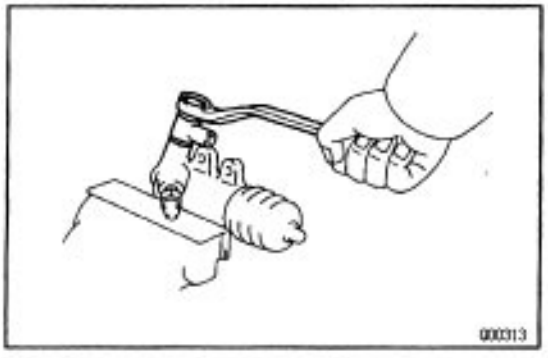
RELEASE CYLINDER REMOVAL

1. DISCONNECT CLUTCH LINE TUBE

Using SST, disconnect the tube. Use a container to catch the brake fluid.

SST 09023–00100

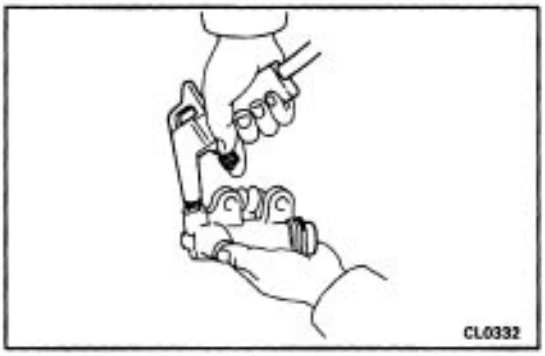
2. REMOVE 2 BOLTS AND PULL OUT RELEASE CYLINDER



RELEASE CYLINDER DISASSEMBLY

1. REMOVE UNION FROM RELEASE CYLINDER

Remove the union bolt, 2 gaskets and union from the release cylinder.



2. PULL OUT BOOT WITH PUSH ROD
3. REMOVE PISTON

Using compressed air, remove the piston with the spring from the cylinder.

RELEASE CYLINDER INSPECTION

HINT: Clean the disassembled parts with compressed air.

1. INSPECT RELEASE CYLINDER BORE FOR SCORING OR CORROSION

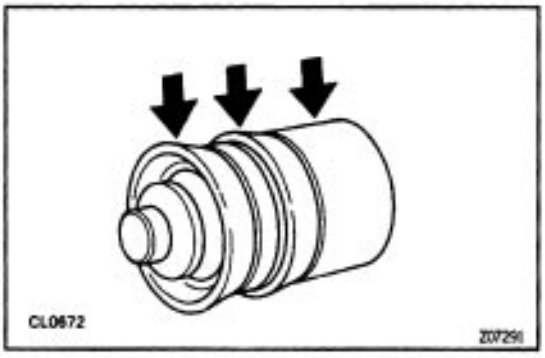
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

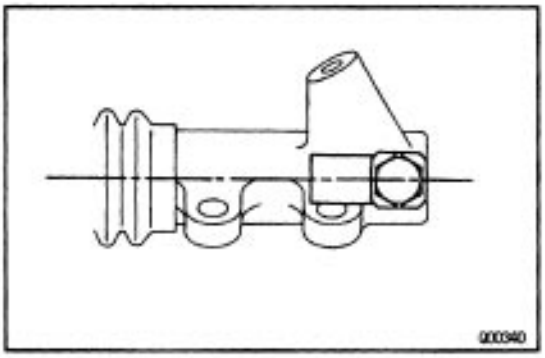
3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.



RELEASE CYLINDER ASSEMBLY

1. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN
2. INSTALL PISTON WITH SPRING INTO CYLINDER
3. INSTALL BOOT WITH PUSH ROD TO CYLINDER

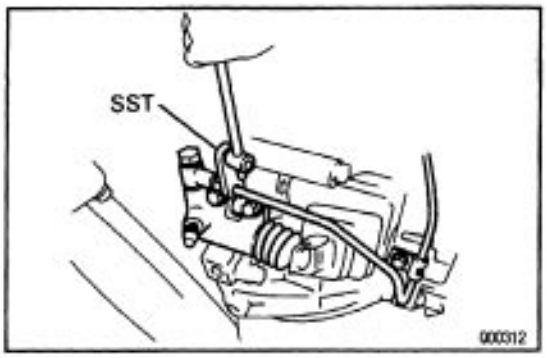


4. INSTALL UNION TO RELEASE CYLINDER

(a) Adjust the center line of the union is in parallel with the release cylinder.

(b) Install the union bolt.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



RELEASE CYLINDER INSTALLATION

1. INSTALL RELEASE CYLINDER WITH 2 BOLTS

Torque: 13 N–m (130 kgf–cm. 9 ft–lbf)

2. CONNECT CLUTCH LINE TUBE

Using SST, connect the tube.

SST 09023–00100

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

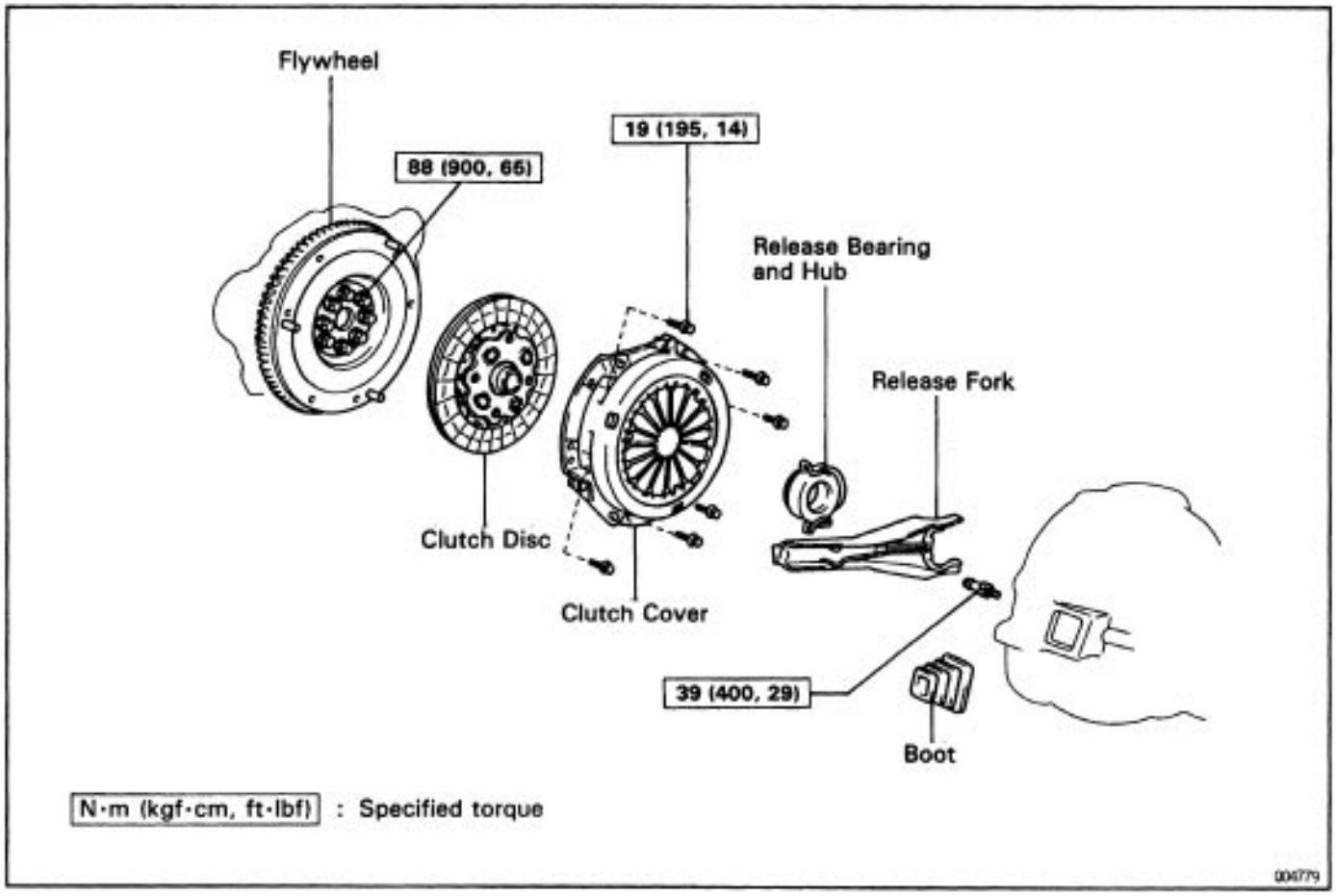
3. FILL CLUTCH RESERVOIR WITH BRAKE FLUID AND BLEED CLUTCH SYSTEM

(See page CL–5)

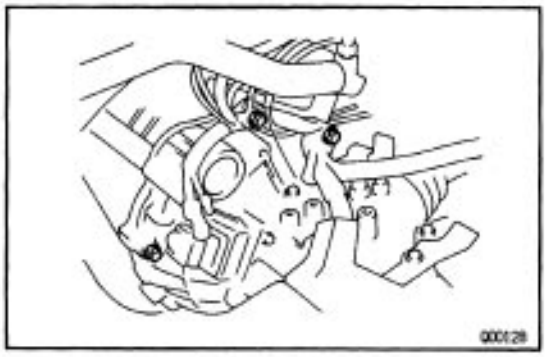
4. CHECK FOR LEAKS

CLUTCH UNIT

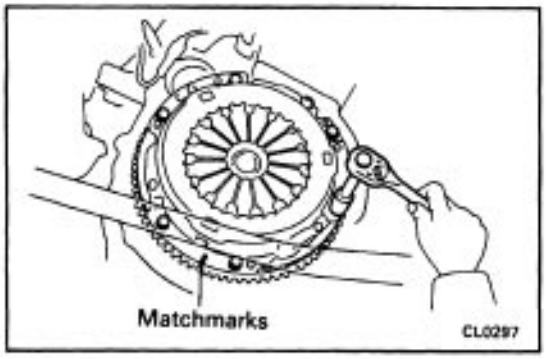
COMPONENTS



CLUTCH UNIT REMOVAL



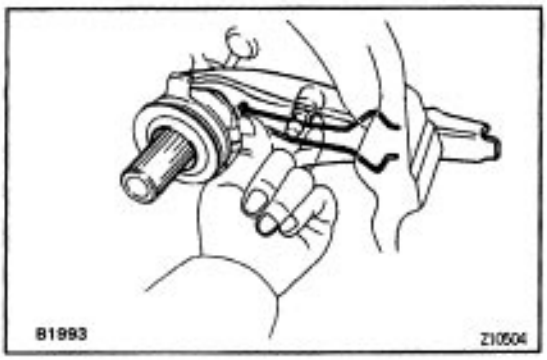
1. REMOVE TRANSAXLE FROM ENGINE
(See page MX–10**)**



2. REMOVE CLUTCH COVER AND DISC

(a) Place matchmarks on the flywheel and clutch cover.
(b) Loosen each set bolt one turn at a time until spring tension is released.
(c) Remove the set bolts, and pull off the clutch cover with the clutch disc.

NOTICE: Do not drop the clutch disc.

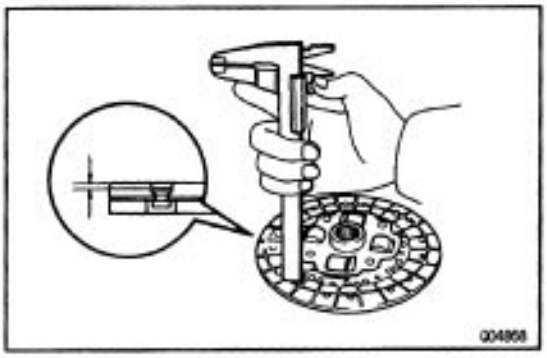


3. REMOVE RELEASE BEARING AND FORK FROM TRANSAXLE

(a) Remove the release bearing together with the fork and then separate them.

(b) Remove the boot.

CLUTCH PARTS INSPECTION



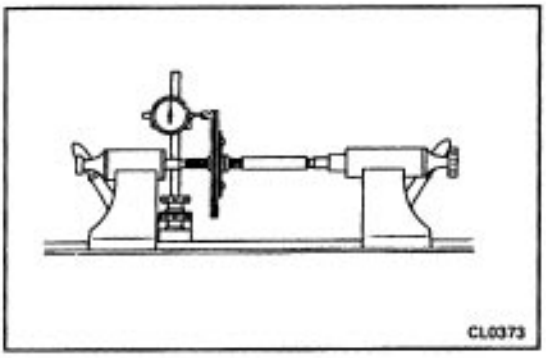
1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.

Minimum rivet depth:

0.3 mm (0.0121n.)

If a problem is found, replace the clutch disc.



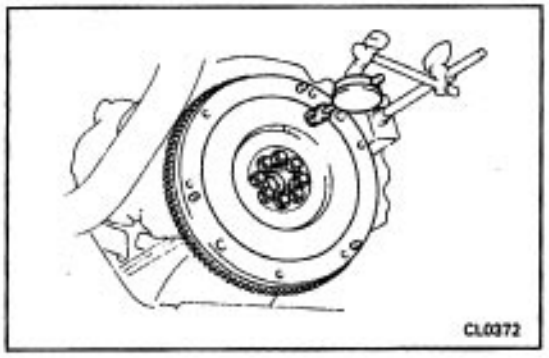
2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout:

0.8 mm (0.031 in.)

If runout is excessive, replace the clutch disc.



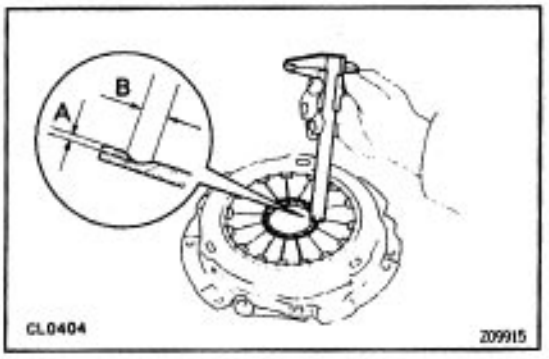
3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.

Maximum runout:

0.1 mm (0.004 in.)

If runout is excessive, replace the flywheel.



4. INSPECT DIAPHRAGM SPRING FOR WEAR

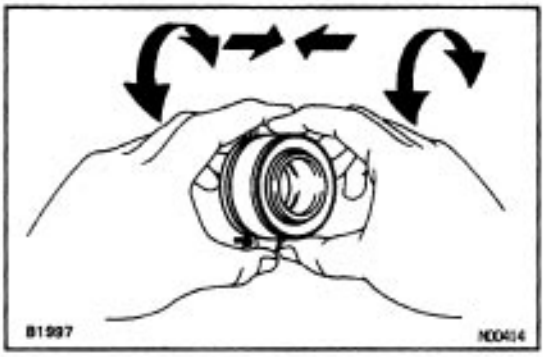
Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum:

A: Depth 0.6 mm (0.024 in.)

B: Width 5.0 mm 10.197 In.)

If necessary, replace the clutch cover.

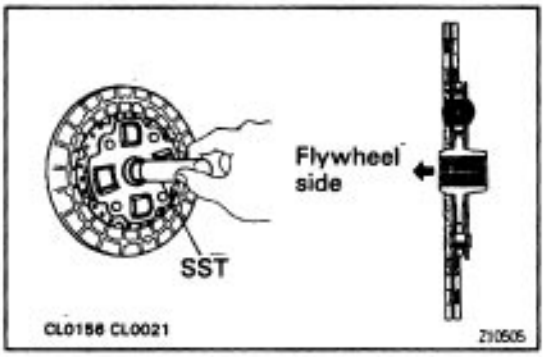


5. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the axial direction.

HINT: The bearing is permanently lubricated and re–quires no cleaning or lubrication.

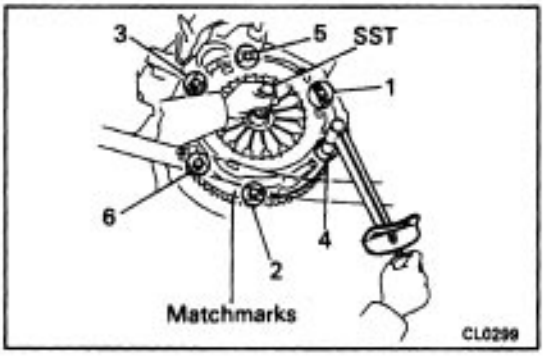
If a problem is found, replace the bearing.



CLUTCH UNIT INSTALLATION

1. INSTALL CLUTCH DISC AND CLUTCH COVER ON FLYWHEEL

(a) Insert the SST in the clutch disc, and then set them and the clutch cover in position.
SST 09301–00210



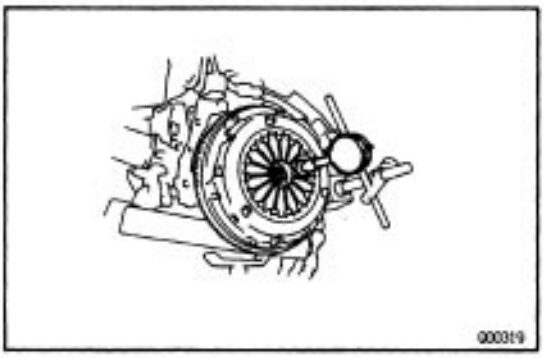
(b) Align the matchmarks on the clutch cover and fly–wheel.

(c) Temporarily tighten the topmost bolt from the 3 near the knock pins.

HINT: Temporarily tighten the No.3 bolt.

(d) Torque the bolts on the clutch cover in the order shown.

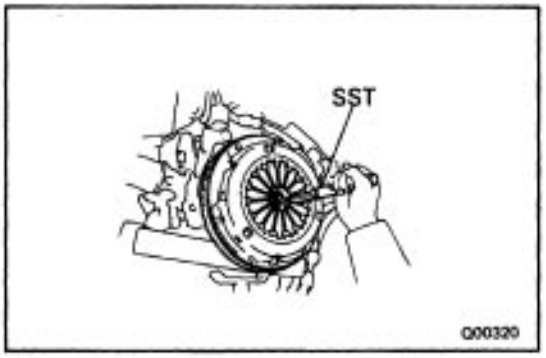
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



2. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

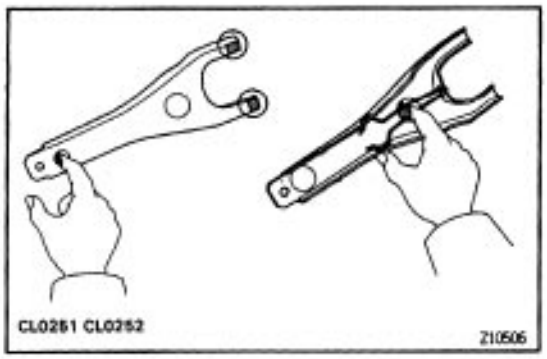
Using a dial indicator with roller instrument, check the diaphragm spring tip alignment.

Maximum non–alignment:
0.5 mm (0.020 in.)



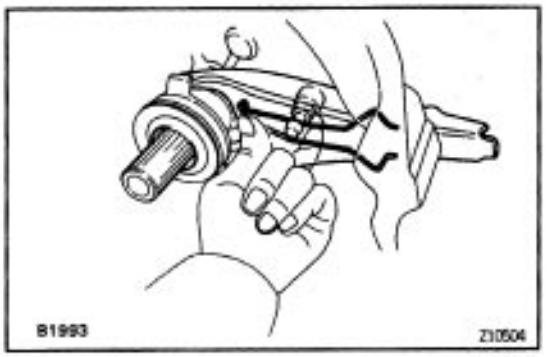
If alignment is not as specified, using SST, adjust the diaphragm spring tip alignment.

SST 09333–00013



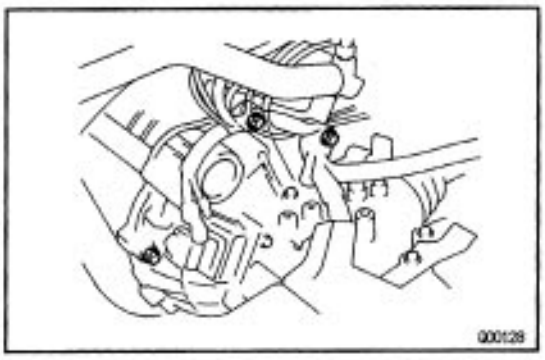
3. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) TO FOLLOWING PARTS

- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point
- Clutch disc spline



4. INSTALL RELEASE BEARING AND FORK TO TRANSAXLE

Install the bearing to the release fork, and then install them to the transaxle.



5. INSTALL TRANSAXLE TO ENGINE

(See page MX–15**)**

SERVICE SPECIFICATIONS

SERVICE DATA

Pedal height from asphalt sheet	160.8–170.8mm (6.33–6.72in.)
Push rod play at pedal top	1.0–5.0mm (0.039–0.197in.)
Pedal freeplay	5.0–15.0mm (0.197–0.591in.)
Clutch release point from pedal full stroke end position	25 mm (0.98in.) or more
Disc rivet head depth (Minimum)	0.3mm (0.012in.)
Disc runout (Maximum)	0.8mm (0.031in.)
Diaphragm spring tip non–alignment (Maximum)	0.5mm (0.020in.)
Diaphragm spring finger wear (Maximum depth)	0.6mm (0.024in.)
Diaphragm spring finger wear (Maximum width)	5.0mm (0.197in.)
Flywheel runout (Maximum)	0.1mm (0.004in.)

TORQUE SPECIFICATIONS

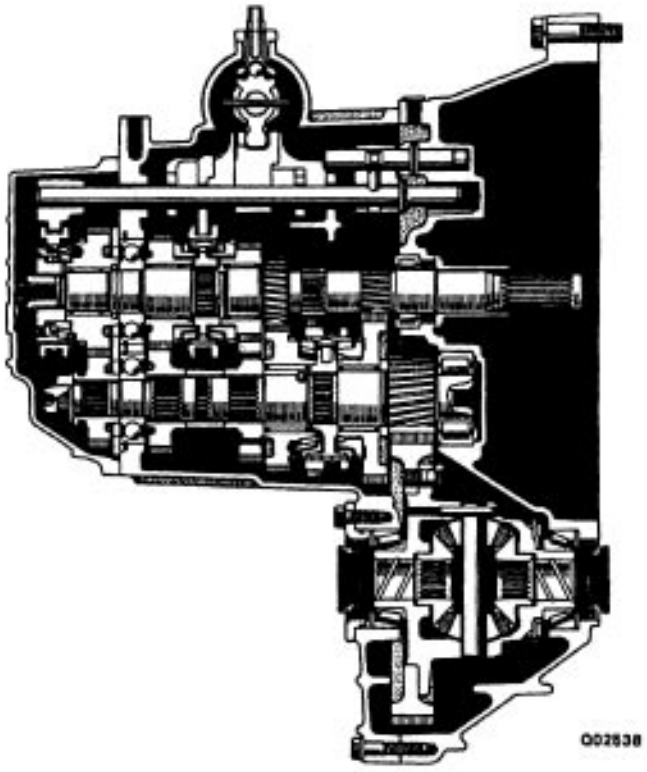
Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder installation nut	7.8	80	58 in.·lbf
Release cylinder installation nut	13	130	9
Union bolt	25	250	18
Clutch line union	15	155	11
Bleeder plug	8.3	85	74 in.·lbf
Release fork support	39	400	29
Clutch cover x Flywheel	19	195	14
Flywheel set bolt	88	900	65

MANUAL TRANSAXLE

DESCRIPTION

GENERAL

- A triple–cone type synchromesh mechanism is used in the 2nd gear to improve the shift feeling characteristics. This helps to reduce the shifting effort.
- A reverse synchromesh mechanism is used to suppress gear engagement noise in reverse gear shifting.

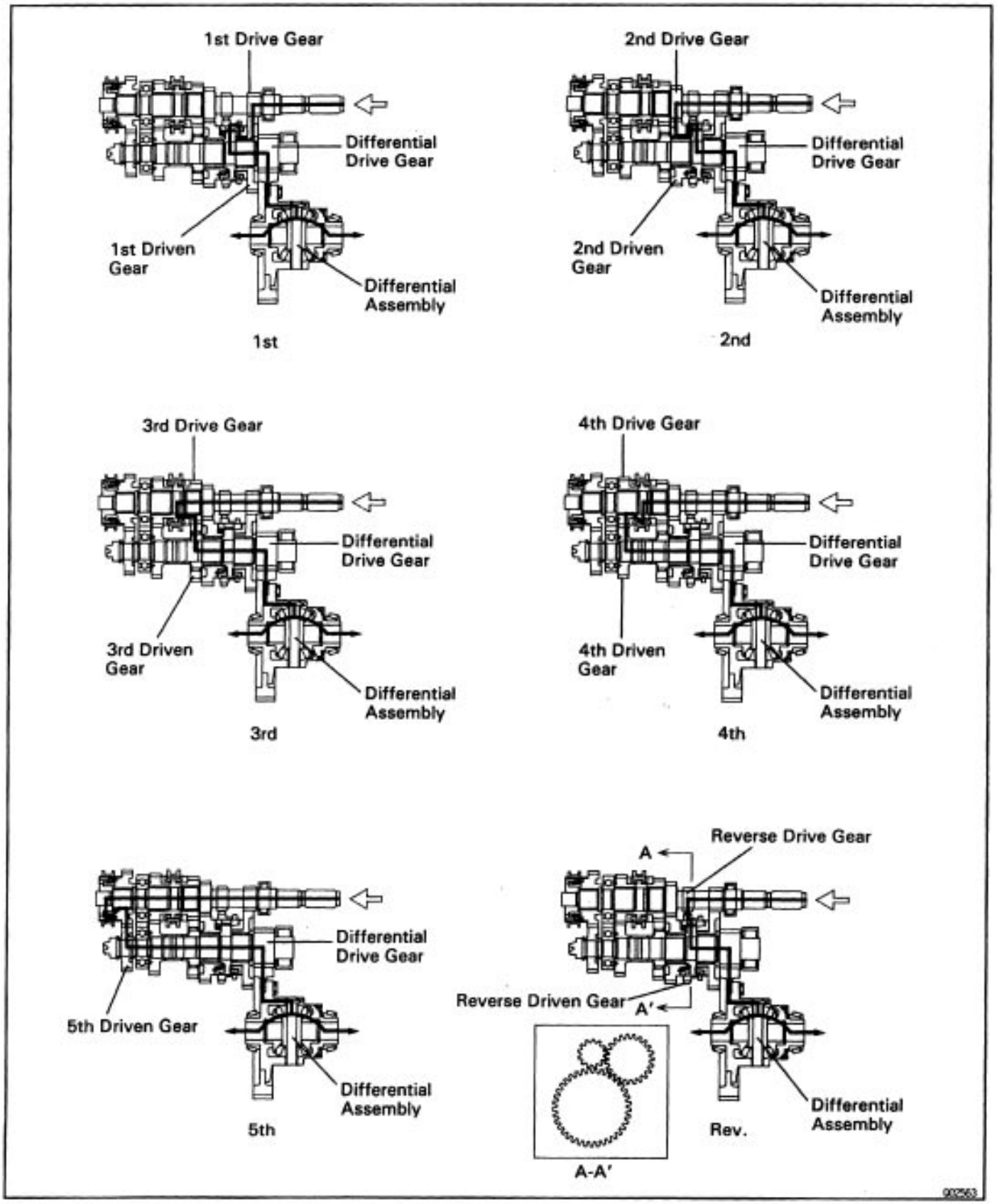


V04838

Type of Transaxle		S51
Type of Engine		5S–FE
Gear Ratio	1st gear	3.538
	2nd gear	1.960
	3rd gear	1.250
	4th gear	0.945
	5th gear	0.731
	Reverse gear	3.153
Differential Gear Ratio		3.944
Oil Capacity		2.6 liters (2.7 US qts, 2.3 Imp. qts)
Oil Viscosity		SAE 75W–90
Oil Grade		API GL–3, GL–4 or GL–5

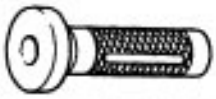
OPERATION

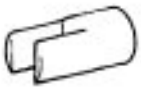
The illustration below show the engagements of transaxle gears.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09308–00010 Oil Seal Puller	Input shaft front bearing Output shaft front bearing
	09309–12020 5th Driven Gear Replacer	
	09310–17010 Transaxle Gear Remover & Replacer	
	(09310–07010) Plate	
	(09310–07020) Center Bolt	
	(09310–07030) Set Bolt	
	09310–35010 Countershaft Bearing Replacer	Input shaft front bearing Output shaft front bearing
	09316–60010 Transmission & Transfer Bearing Replacer	
	(09316–00010) Replacer Pipe	
	(09316–00040) Replacer 'C'	
	09350–32014 TOYOTA Automatic Transmission Tool Set	Differential side bearing
	(09351–32120) Overdrive Bearing Replacer	
	(09351–32130) Handle	

	(09351–32150) Oil Seal Replacer	Differential side bearing Oil seal (Transaxle case side)
	09502–10012 Differential Side Bearing Puller	
	09564–32011 Differential Preload Adaptor	
	09608–12010 Front Hub & Drive Pinion Bearing Replacer Set	
	(09608–00070) Drive Pinion Rear Bearing Cone Replacer	Input shaft rear bearing 4th drive gear and rear bearing
	09608–20012 Front Nub & Drive Pinion Bearing Tool Set	
	(09608–00080) Replacer	Input shaft front oil seal Control shaft cover oil seal
	(09608–03020) Handle	
	(09608–03060) Replacer	Differential taper roller bearing outer race
	09612–22011 Tilt Handle Bearing Replacer	Output shaft rear bearing No.3 clutch hub
	09950–00020 Bearing Remover	
	09950–00030 Bearing Remover Attachment	
	09950–20017 Universal Puller	

RECOMMENDED TOOLS

	09025–00010 Small Torque Wrench	Differential preload
	09031–00030 Pin Punch	
	09905–00012 Snap Ring No. 1 Expander	

EQUIPMENT

Dial indicator	
Torque wrench	
Feeler gauge	

LUBRICANT

Item	Capacity	Classification
Manual transaxle oil	2.6 liters (2.7 US qts, 2.3 Imp.qts)	API GL–3, GL–4 or GL–5 SAE 75W–90

SSM (SPECIAL SERVICE MATERIALS)

08826–00090 Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Transmission case x Transaxle case Transmission case x Case cover
08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Straight screw plug Control shaft cover bolt

TROUBLESHOOTING

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

See Page / Parts Nacre / Trouble	Oil (Level low)	Oil (Wrong)	Oil (Level too high)	Gasket (Damaged)	Oil seal (Worn or damaged)	O–Ring (Worn or damaged)	Control cable (Faulty)	Locking ball spring (Damaged)	Shift fork (Worn)	Gear (Worn or damaged)	Bearing (Worn or damaged)	Synchronizer ring (Worn or damaged)	Shifting key spring (Damaged)			
	MX–2		MX–20	MX–20	MX–20	MX–20	MX–70	MX–20	MX–20	MX–20	MX–20	MX–33, 40	MX–33,40			
Noise	1	2								3	3					
Oil leakage			1	2	2	3										
Hard to shift or will not shift							1					2	3			
Jumps out of gear								1	2	3	3					

V00310

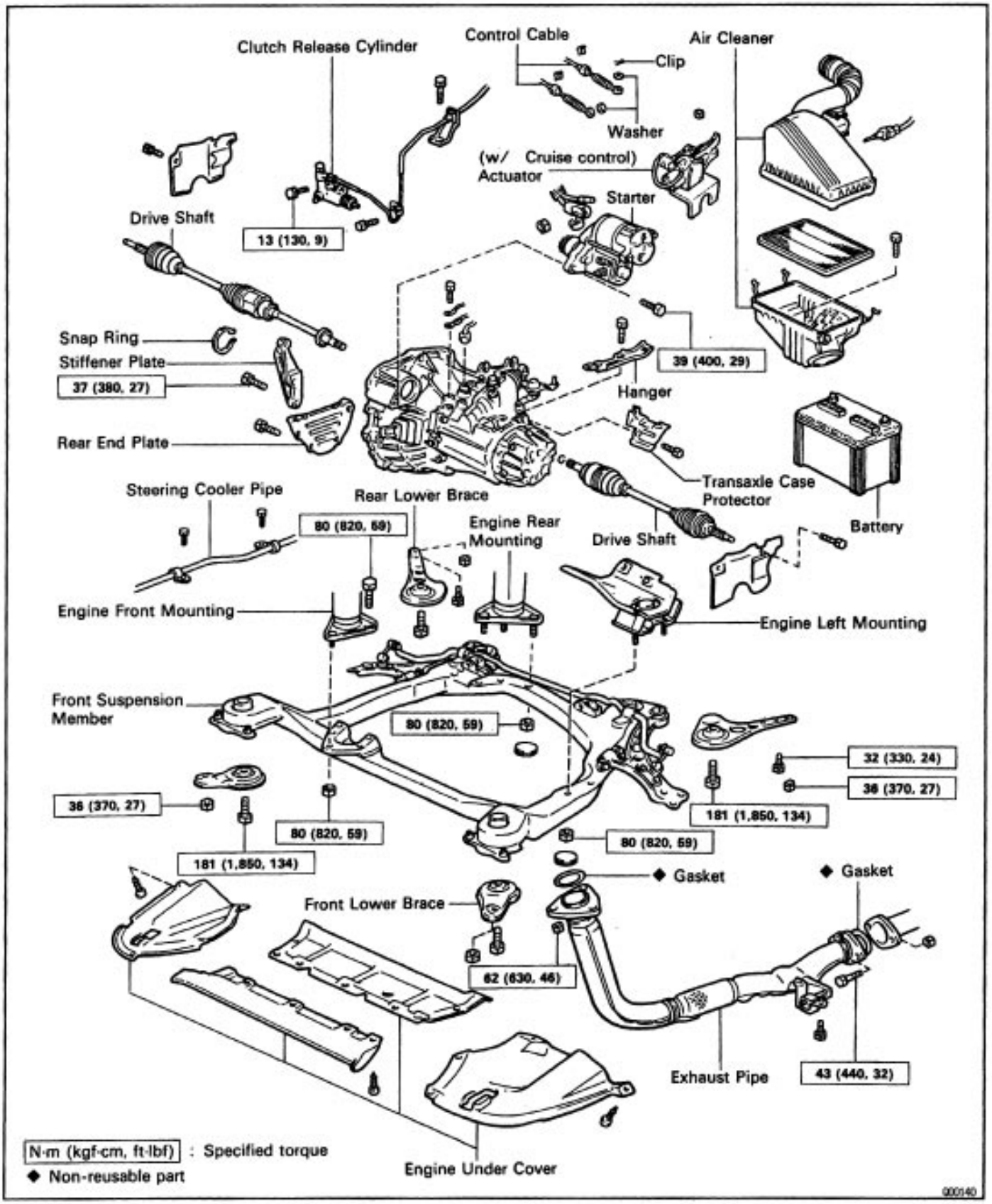
PRECAUTION

When working with FIPG material, you must observe the following.

- Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.

ASSEMBLY REMOVAL AND INSTALLATION

Remove and install the parts as shown below.



TRANSAXLE REMOVAL

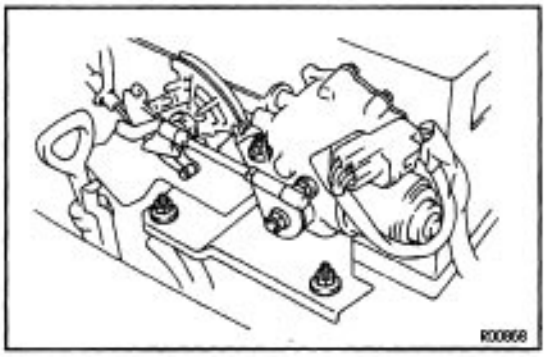
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

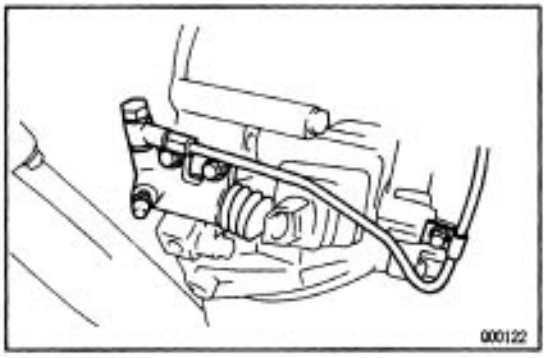
CAUTION: Work must be started after 90 seconds from the time the ignition switch 1: turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery.

2. REMOVE AIR CLEANER CASE ASSEMBLY WITH AIR HOSE

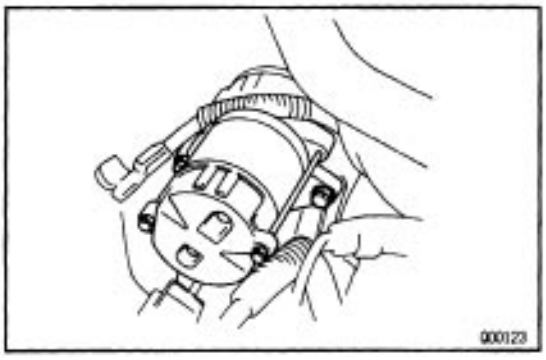
3. REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the cruise control actuator cover.
(b) Disconnect the connector.
(c) Remove the 3 nuts and cruise control actuator with bracket.



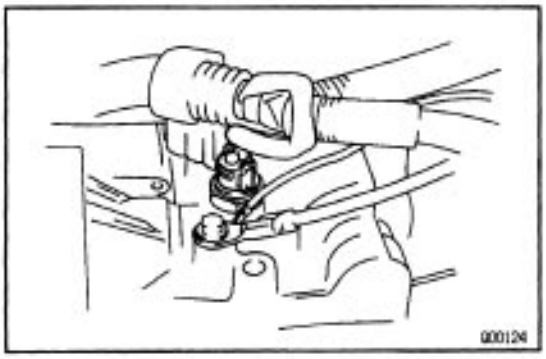


4. REMOVE CLUTCH RELEASE CYLINDER AND TUBE CLAMP

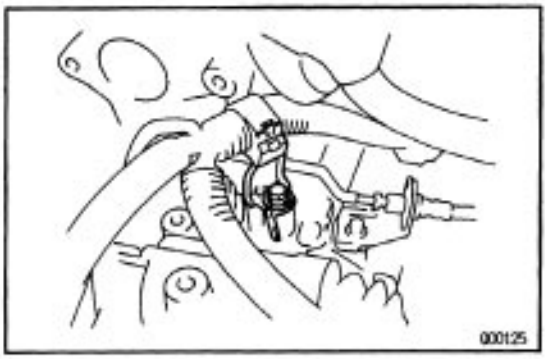


5. REMOVE STARTER

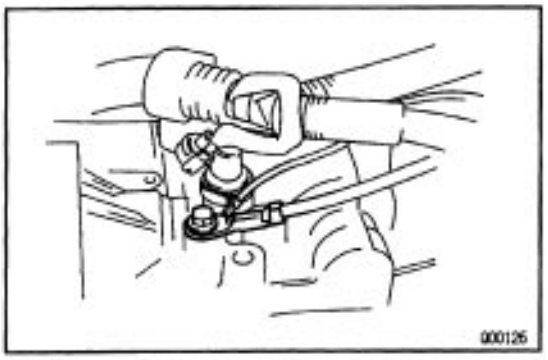
(a) Disconnect the connector and wire from the starter.
(b) Remove the 2 bolts and starter.



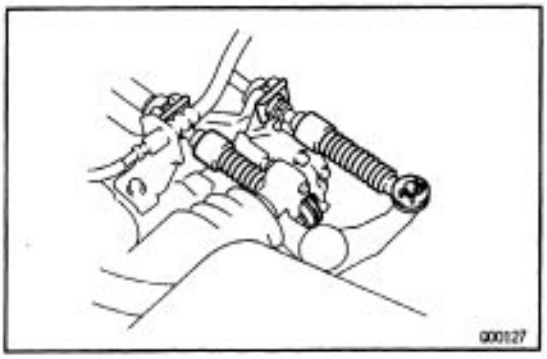
6. DISCONNECT BACK–UP LIGHT SWITCH CONNECTOR



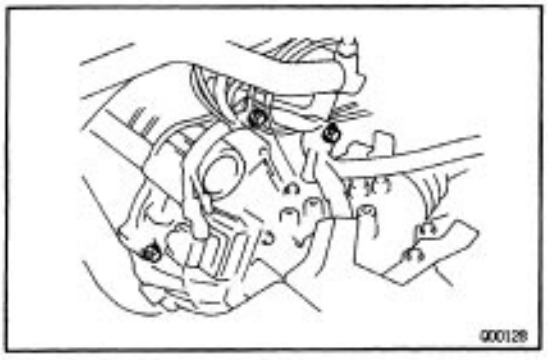
7. DISCONNECT WIRES CLAMP



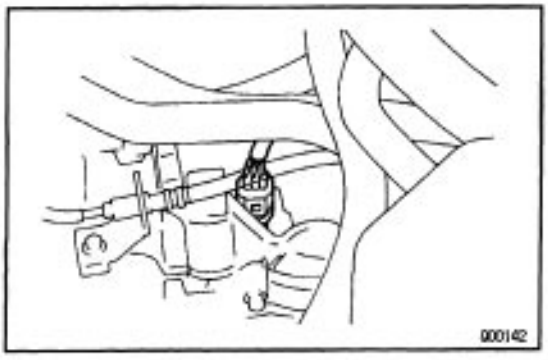
8. REMOVE EARTH CABLES



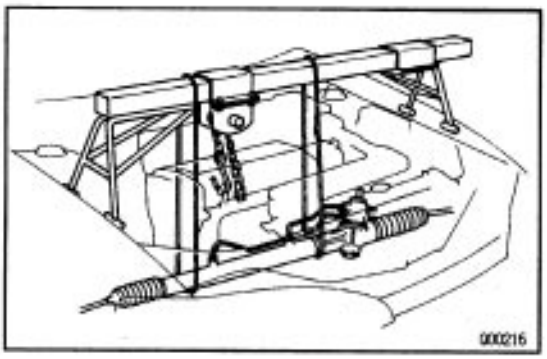
9. DISCONNECT CONTROL CABLES
(a) Remove the clips and washers.
(b) Remove the clips from the cables.



10. REMOVE TRANSAXLE MOUNTING THREE BOLTS OF TRANSAXLE CASE UPPER SIDE

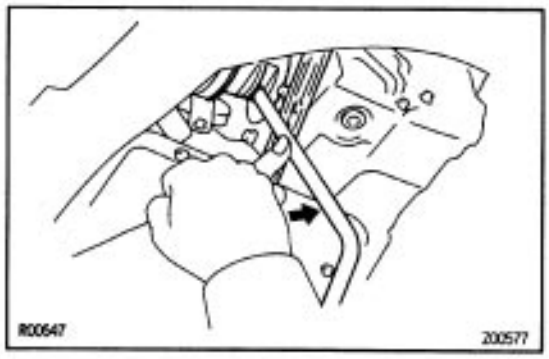


11. DISCONNECT VEHICLE SPEED SENSOR CONNECTOR



12. INSTALL ENGINE SUPPORT FIXTURE

13. TIE STEERING GEAR HOUSING TO ENGINE SUPPORT FIXTURE BY CORD OR EQUIVALENT



14. REMOVE FRONT WHEEL

15. RAISE VEHICLE

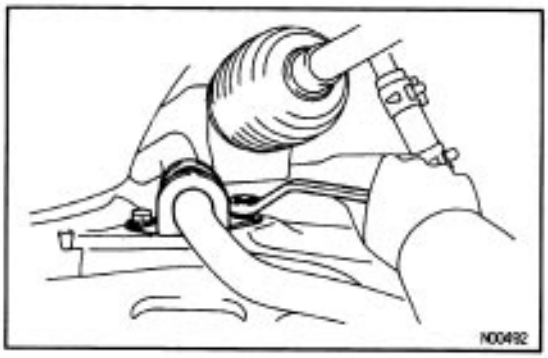
NOTICE: Be sure the vehicle is securely supported.

16. REMOVE UNDER COVERS AND SIDE COVERS

17. DRAIN TRANSAXLE OIL

18. REMOVE DRIVE SHAFT

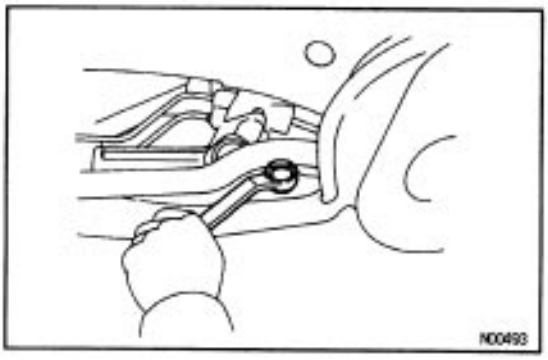
(See page SA–38)



19. DISCONNECT STEERING GEAR HOUSING FROM FRONT SUSPENSION MEMBER

(a) Remove the 4 bolts.

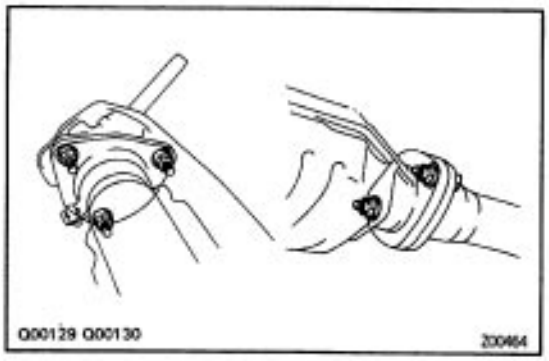
(b) Remove the stabilizer bar bush bracket.



(c) Remove the 2 set bolts and nuts.

(d) Disconnect the steering gearbox from the suspension member.

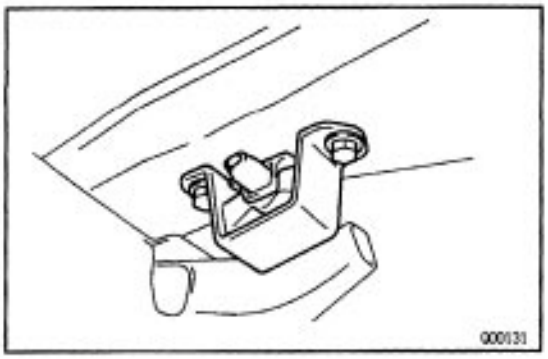
HINT: Suspend the steering gear box with cord.



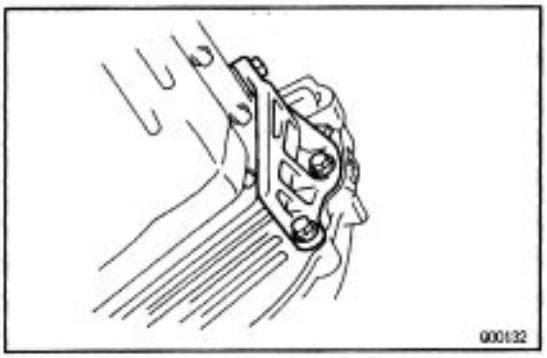
20. REMOVE EXHAUST PIPE

(a) Remove the 3 nuts.

(b) Remove the 2 bolts and nuts.

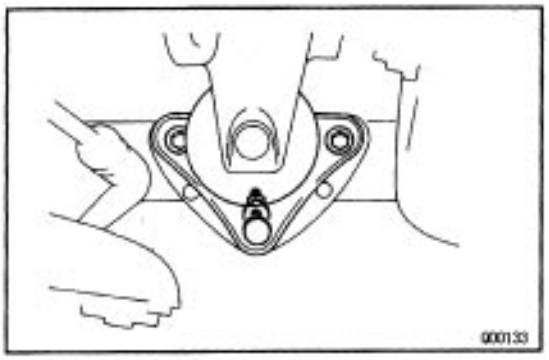


(c) Remove 2 bolts and exhaust pipe.



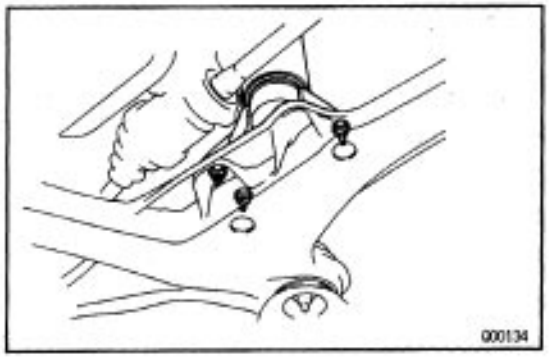
21. REMOVE STIFFENER PLATE

Remove the 3 bolts and the stiffener plate.



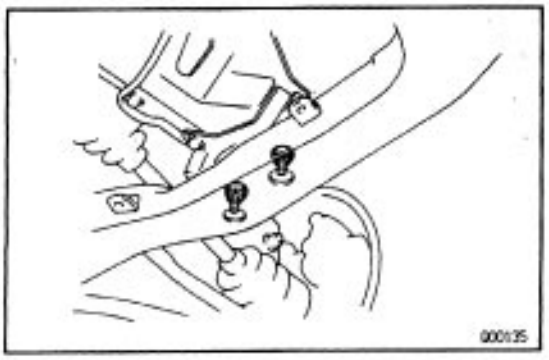
22. DISCONNECT ENGINE FRONT MOUNTING FROM SUSPENSION MEMBER

Remove the 2 bolts and a nut.



23. DISCONNECT ENGINE REAR MOUNTING FROM FRONT SUSPENSION MEMBER

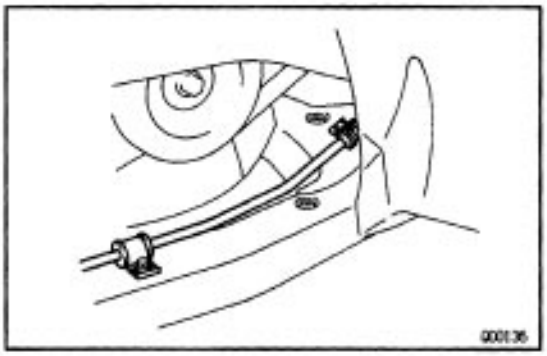
(a) Remove the 2 hole plugs.
(b) Remove the 3 nut.



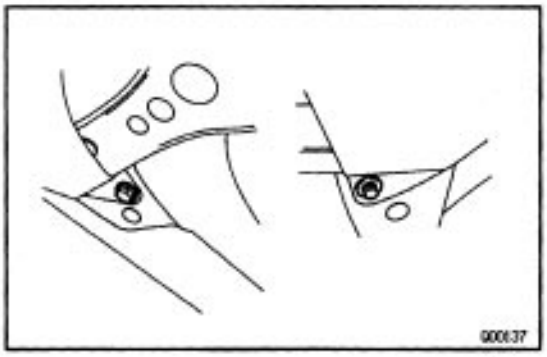
24. REMOVE ENGINE LEFT MOUNTING

(a) Raise the transaxle and engine slightly with a jack and wooden block in between.
(b) Remove the 2 hole plugs and nuts.

(c) Remove the 3 bolts and engine left mounting.

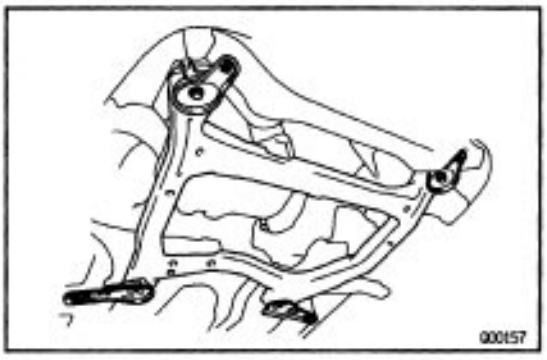


25. DISCONNECT STEERING COOLER PIPE FROM SUSPENSION MEMBER

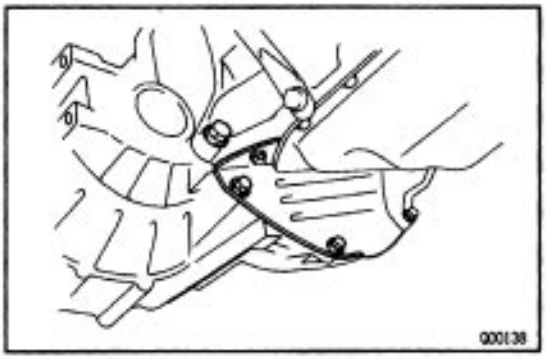


26. REMOVE FRONT SUSPENSION MEMBER

(a) Remove the 2 fender liner set screws.

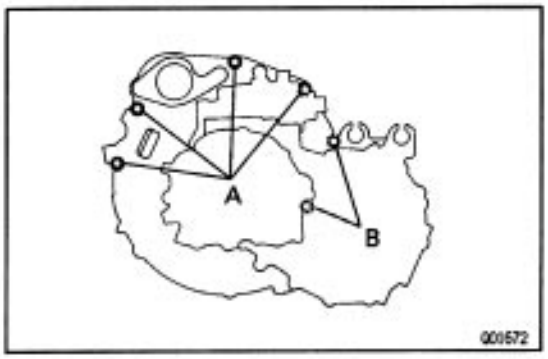


(b) Remove the 2 bolts and 4 nuts.
(c) Remove the 4 bolts.
(d) Remove the 2 front lower brace, rear lower brace and front suspension member.



27. REMOVE TRANSAXLE

(a) Remove the transaxle mounting bolts from the engine.
(b) Lower the engine left side and remove the transaxle from the engine.



TRANSAXLE INSTALLATION (See page MX–9)

1. INSTALL TRANSAXLE TO ENGINE

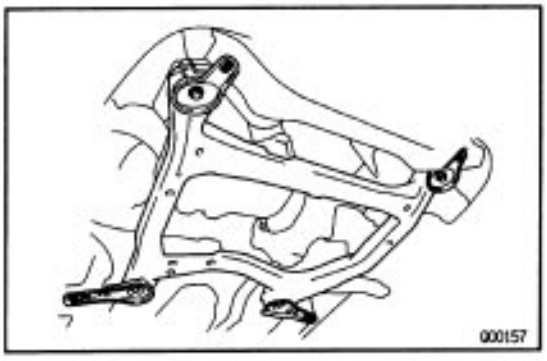
Align the input shaft spline with the clutch disc and install the transaxle to the engine.

Bolt A

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

Bolt B

Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)



2. INSTALL FRONT SUSPENSION MEMBER

(a) Install the front suspension member, rear lower brace, front lower brace and 4 bolts.

(b) Torque the 4 bolts.

Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)

(c) Install and torque the 2 bolts and 4 nuts.

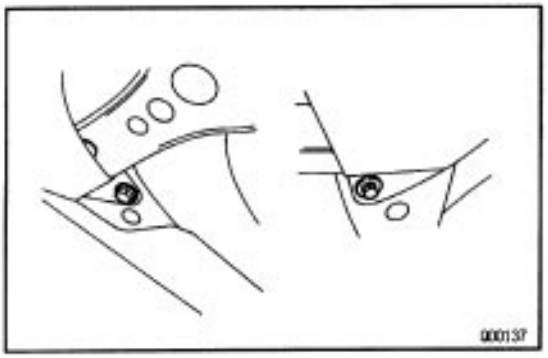
Bolt

Torque: 32 N–m (330 kgf–cm, 24 ft–lbf)

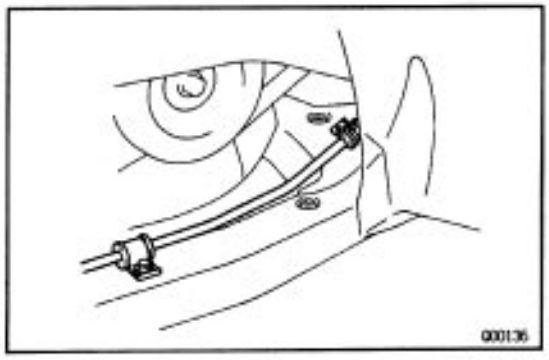
Nut

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

(d) Install the 2 fender liner set screws.



3. CONNECT STEERING COOLER PIPE TO FRONT SUSPENSION MEMBER

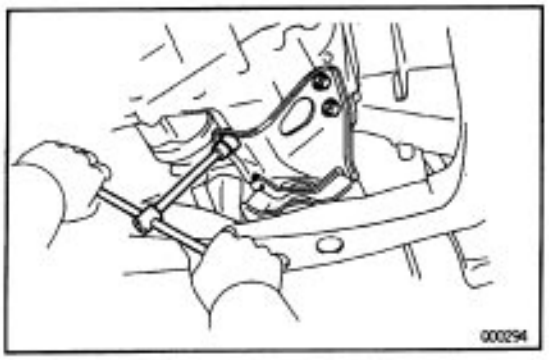


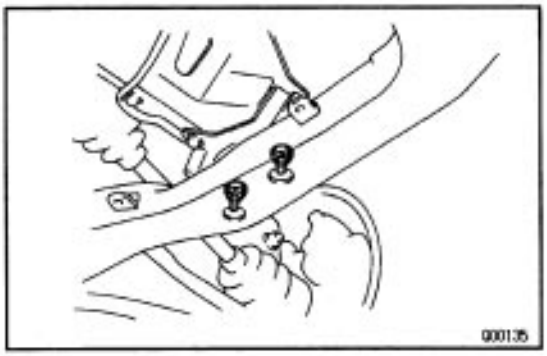
4. INSTALL ENGINE LEFT MOUNTING

(a) Install the engine left mounting.

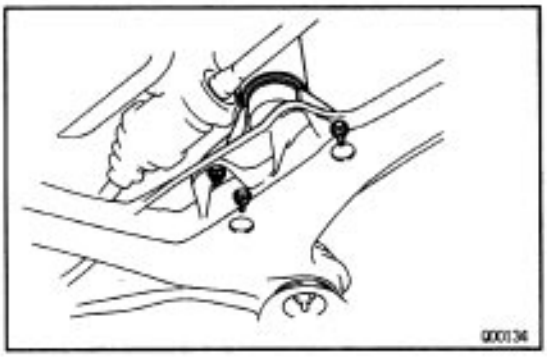
(b) Install and torque the 3 bolts.

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)

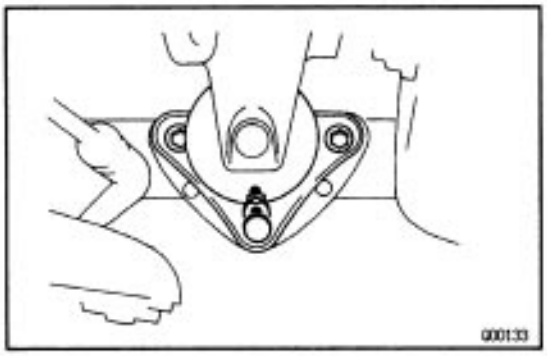




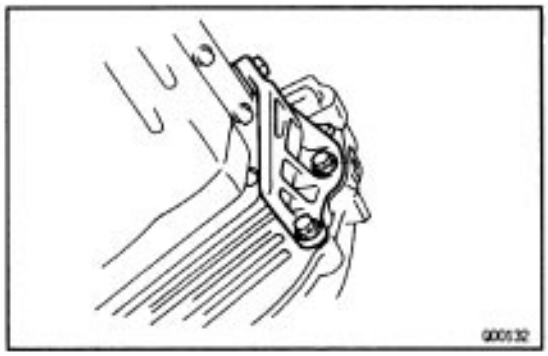
(c) Install and torque the 2 nuts.
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)
(d) Install the 2 hole plugs.



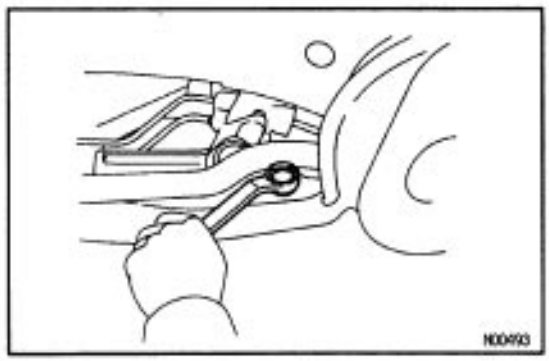
5. CONNECT ENGINE REAR MOUNTING TO FRONT SUSPENSION MEMBER
(a) Install and torque the 3 nuts.
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)
(b) Install the 2 hole plugs.



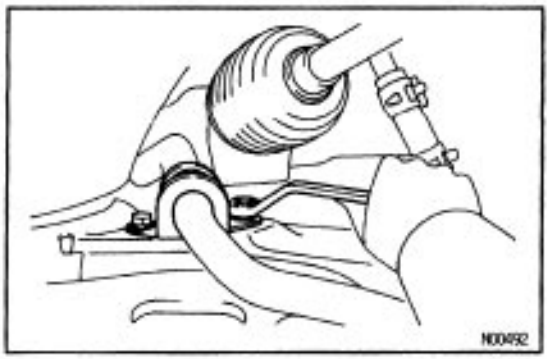
6. CONNECT ENGINE FRONT MOUNTING TO FRONT SUSPENSION MEMBER
Install and torque the 2 bolts and a nut.
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)



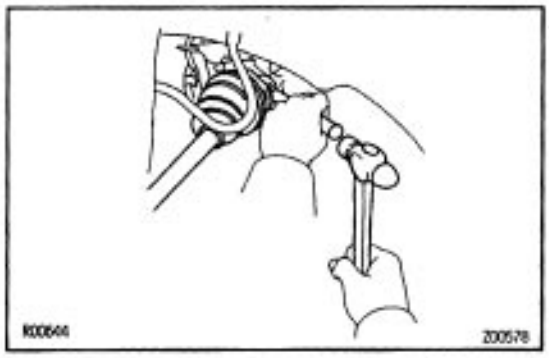
7. INSTALL STIFFENER PLATE
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



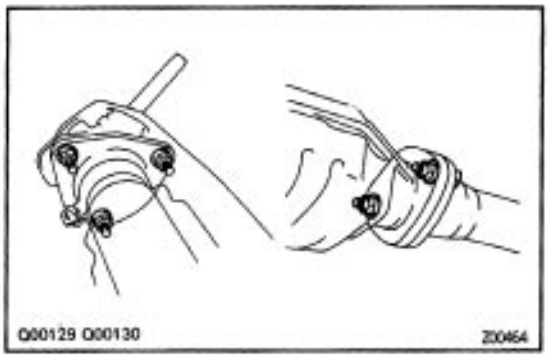
8. CONNECT STEERING GEAR HOUSING TO FRONT SUSPENSION MEMBER
(a) Connect the steering gear housing to the front sus–pension member.
(b) Install and torque the 2 set bolts and nuts.
Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)



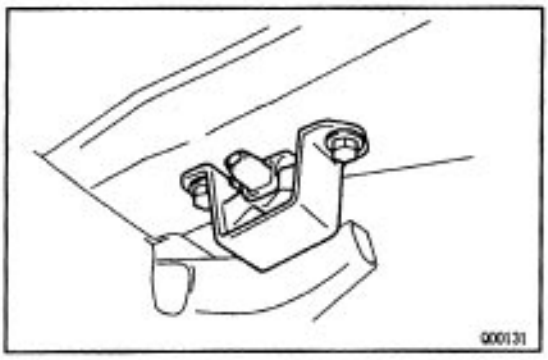
(c) Install the stabilizer bar bush bracket.
(d) Install and torque the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



9. INSTALL DRIVE SHAFT
(See page SA–40)



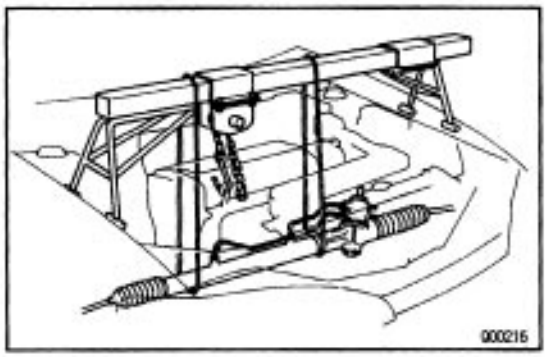
10. INSTALL EXHAUST FRONT PIPE
(a) Install the exhaust front pipe.
(b) Install and torque the 2 bolts and nuts.
Front side
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
Rear side
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



(c) Connect the exhaust front pipe to the front suspen–sion member.
(d) Torque the 2 bolts.

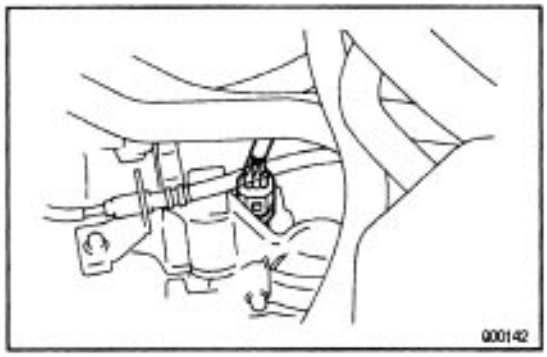
11. FILL TRANSAXLE WITH GEAR OIL
Oil:
Gear oil super (08885–02106) or equivalent
Recommended oil
oil grade:
API GL–3, GL–4 or GL–5
Viscosity:
SAE 75 W–90
Above –18℃ (0℉) SAE 90
Below –18℃ (0℉) SAE 75 W
Capacity:
2.6 liters (2.7 US qts, 2.3 Imp.qts)

12. INSTALL UNDER COVERS AND SIDE COVERS
13. INSTALL FRONT WHEEL AND LOWER VEHICLE
Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

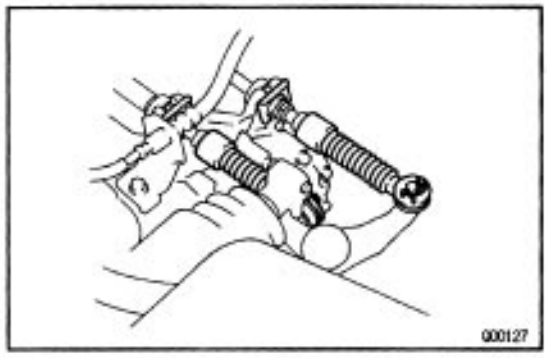


14. UNTIE STEERING GEAR HOUSING FROM ENGINE SUPPORT FIXTURE

15. REMOVE ENGINE SUPPORT FIXTURE



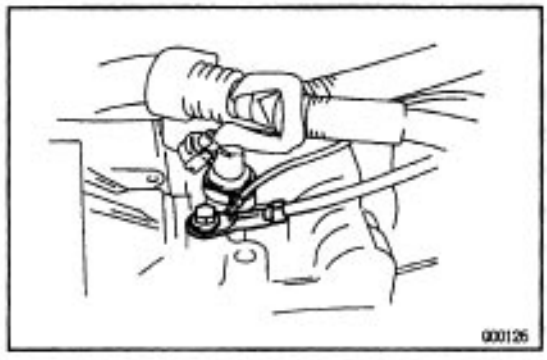
16. CONNECT VEHICLE SPEED SENSOR CONNECTOR



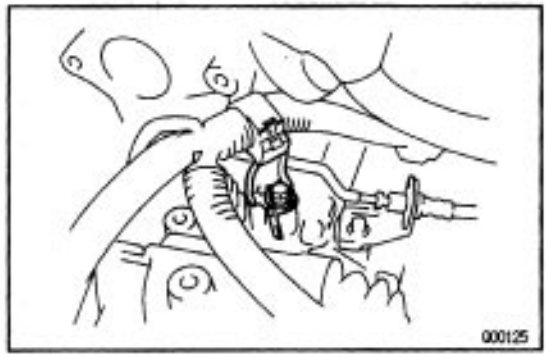
17. CONNECT CONTROL CABLES

(a) Install the clips to the cables

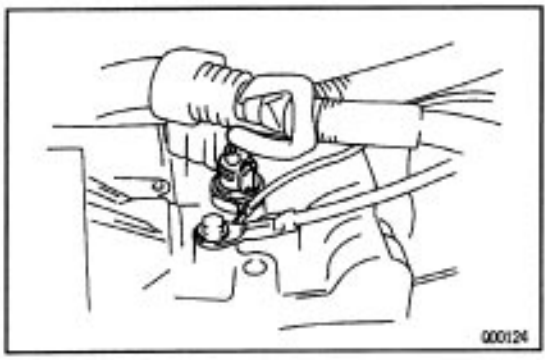
(b) Connect the cables to the linkage with washers and clips.



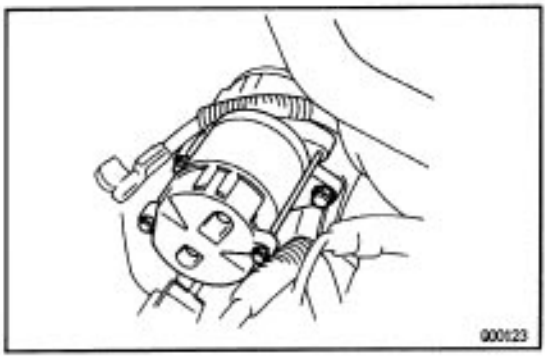
18. INSTALL EARTH CABLES



19. CONNECT WIRE HARNESS CLAMP



20. CONNECT BACK – UP LIGHT SWITCH CONNECTOR



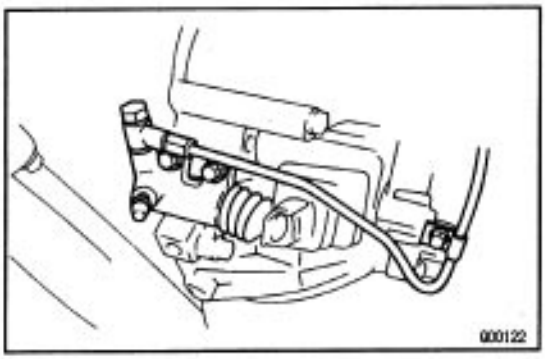
21. INSTALL STARTER

(a) Install the starter.

(b) Install and torque the 2 bolts.

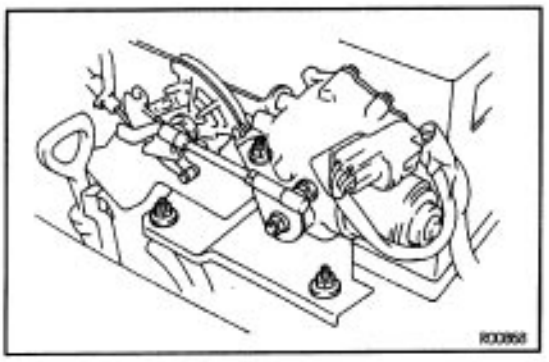
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(c) Connect the connector and wire to the starter.



22. INSTALL CLUTCH RELEASE CYLINDER AND TUBE CLAMP

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



23. INSTALL CRUISE CONTROL ACTUATOR

(a) Install the cruise control actuator bracket with the 3 nuts.

(b) Connect the connector.

(c) Install the cruise control actuator cover.

24. INSTALL AIR CLEANER CASE ASSEMBLY WITH AIR HOSE

25. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

26. INSPECT FRONT WHEEL ALIGNMENT

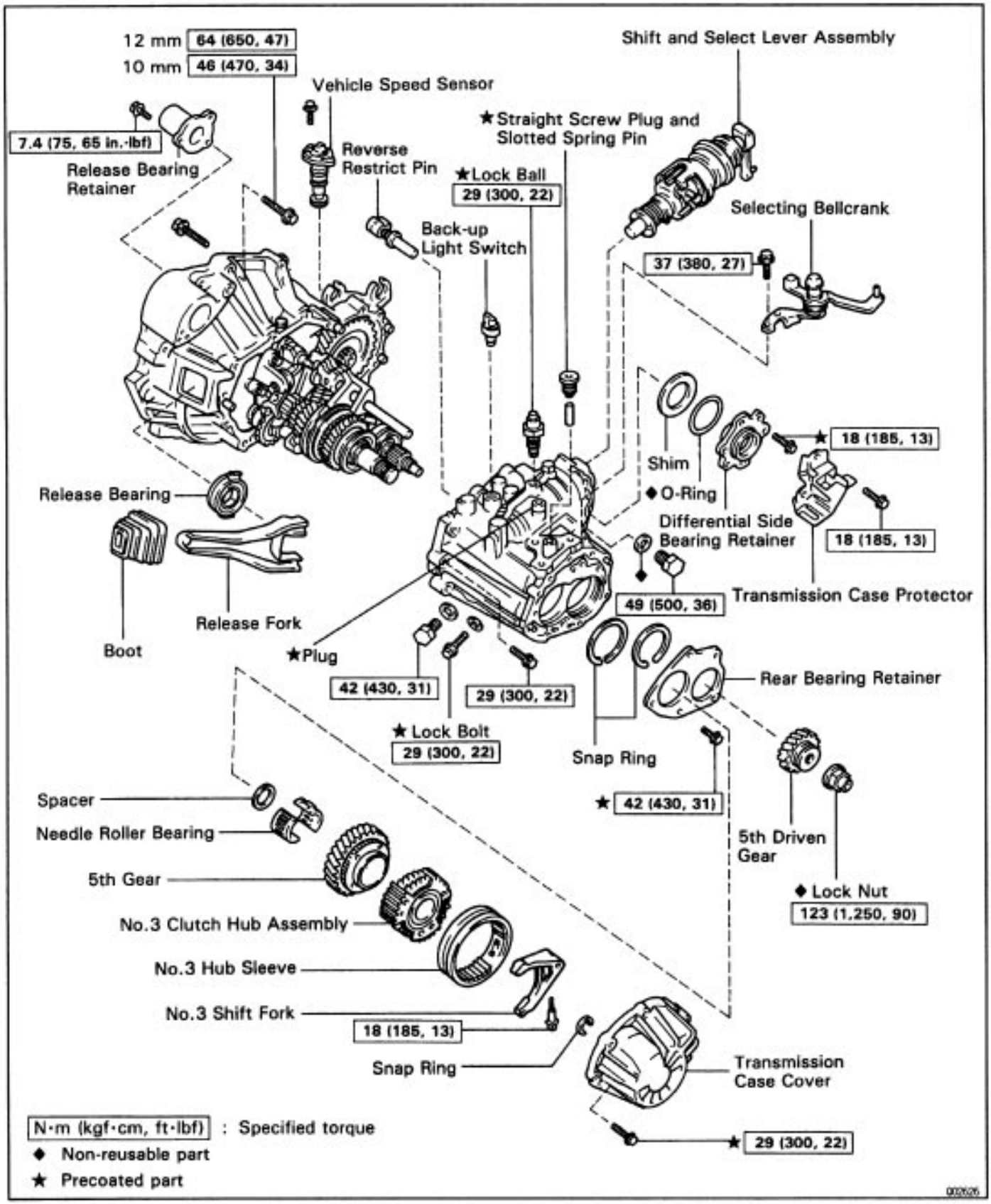
(See page SA–4)

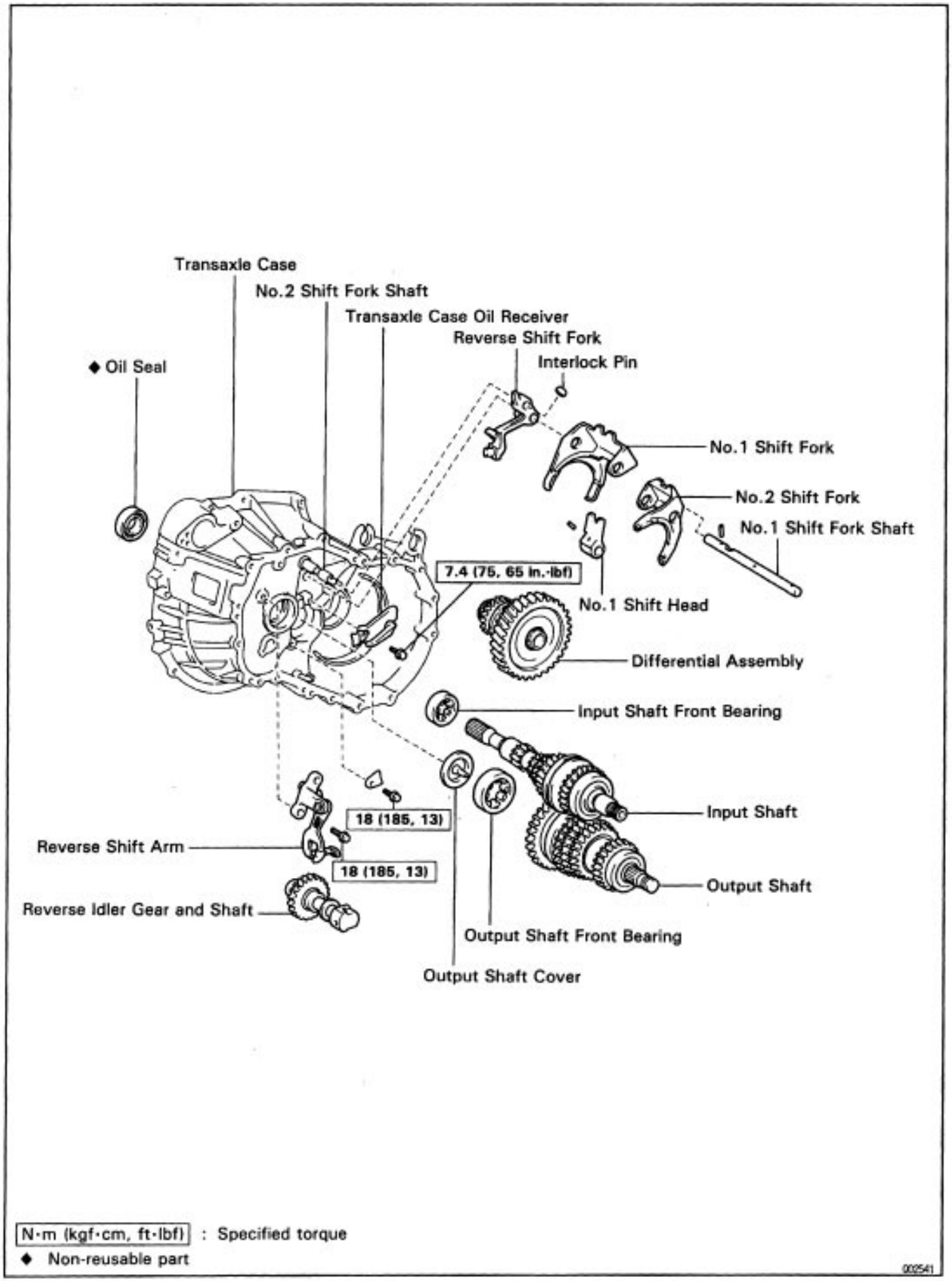
27. PERFORM ROAD TEST

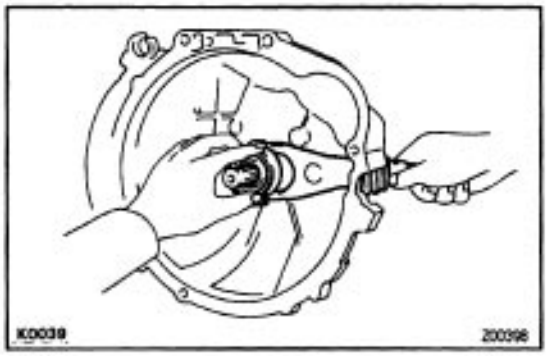
Check for abnormal noise and smooth shifting.

COMPONENT PARTS REMOVAL

COMPONENTS

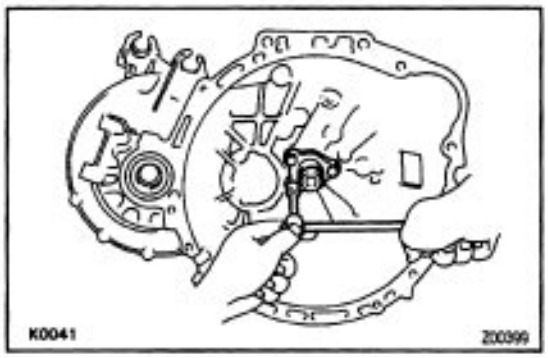



Transaxle Case
No.2 Shift Fork Shaft
Transaxle Case Oil Receiver
Reverse Shift Fork
Interlock Pin
◆ Oil Seal
No.1 Shift Fork
No.2 Shift Fork
No.1 Shift Fork Shaft
7.4 (75, 65 in.-lbf)
No.1 Shift Head
Differential Assembly
Input Shaft Front Bearing
Input Shaft
18 (185, 13)
Reverse Shift Arm
18 (185, 13)
Output Shaft
Reverse Idler Gear and Shaft
Output Shaft Front Bearing
Output Shaft Cover
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
002541

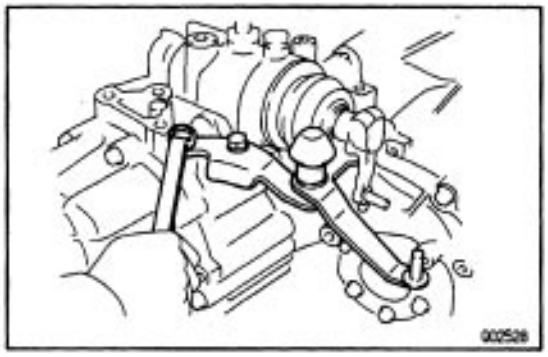


BASIC SUBASSEMBLY SEPARATION
(See page MX–20 and MX–21)

1. REMOVE RELEASE FORK, BEARING BACK – UP LIGHT SWITCH AND VEHICLE SPEED SENSOR

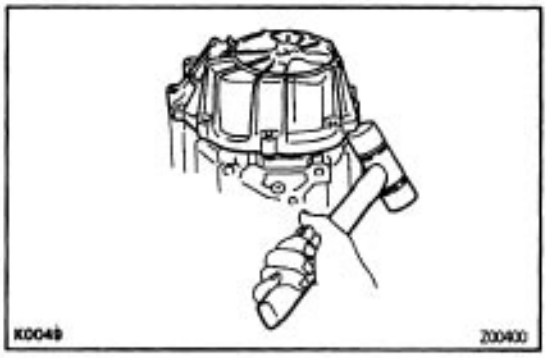


2. REMOVE RELEASE BEARING RETAINER



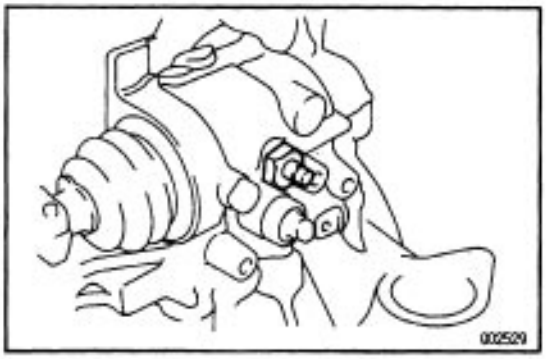
3. REMOVE ENGINE MOUNT BRACKET AND SELECTING BELLCRANK

(a) Remove the 3 bolts and engine mount bracket.
(b) Remove the 2 bolts and selecting bellcrank.



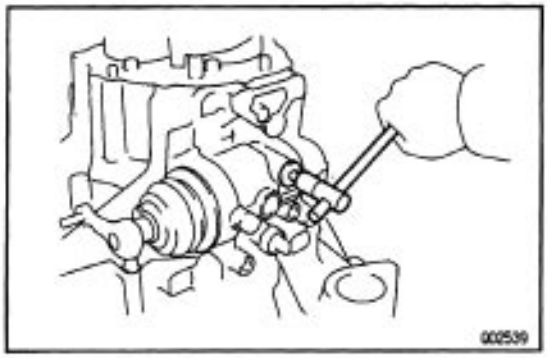
4. REMOVE TRANSMISSION CASE COVER

(a) Remove the 8 bolts.
(b) Using a plastic hammer, tap off the transmission case cover.

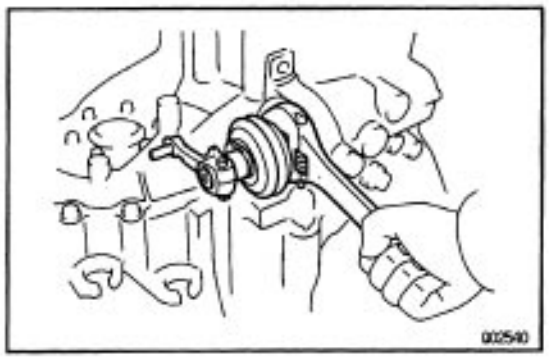


5. REMOVE LOCK BALL ASSEMBLY AND PLUG

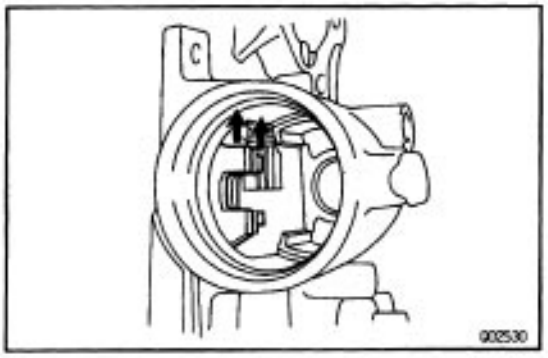
(a) Remove the lock ball.



(b) Using a hexagon wrench, remove the plug.



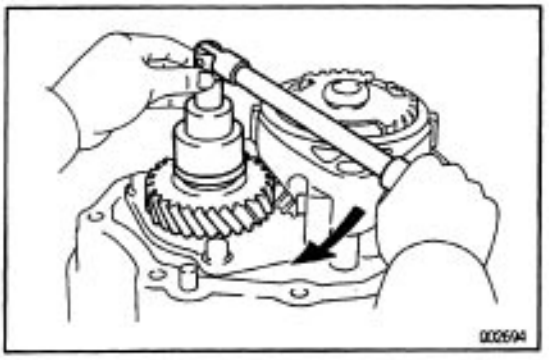
6. REMOVE SHIFT AND SELECT LEVER ASSEMBLY



7. REMOVE OUTPUT SHAFT LOCK NUT

(a) Unstake the nut.

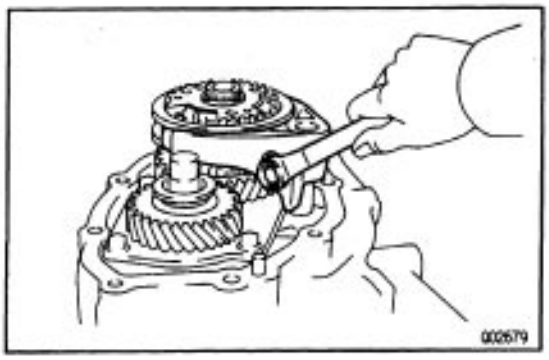
(b) Engage the gear double meshing.



(c) Remove the lock nut clockwise and remove it.

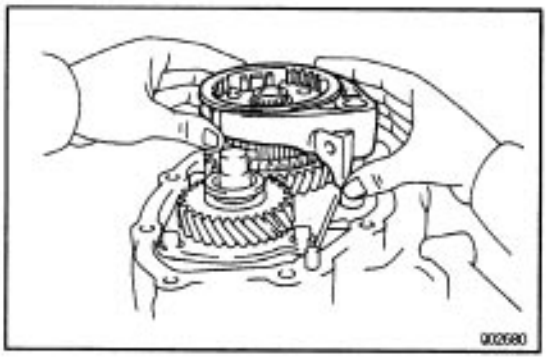
HINT: The lock nut has LH threads.

(d) Disengage the gear double meshing.

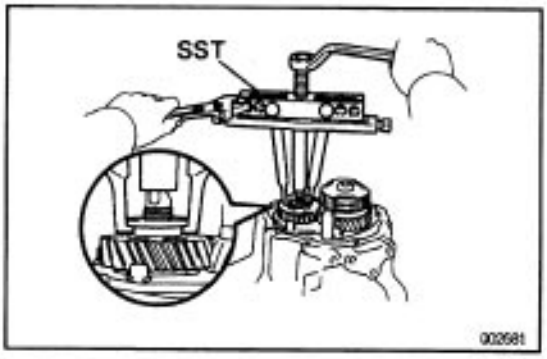


8. REMOVE NO.3 HUB SLEEVE AND NO.3 SHIFT FORK

(a) Remove the No.3 shift fork set bolt.

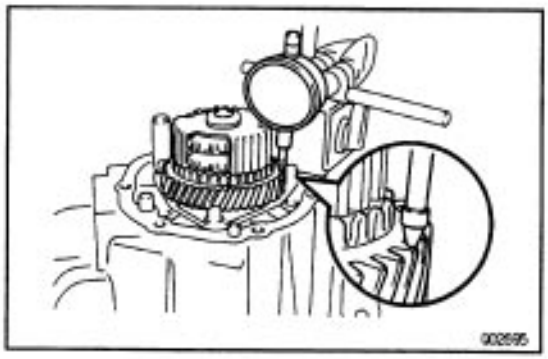


(b) Remove the No.3 hub sleeve and No.3 shift fork.



9. REMOVE 5TH DRIVEN GEAR

Using SST, remove the 5th driven gear.
SST 09950–20017



10. MEASURE 5TH GEAR THRUST CLEARANCE

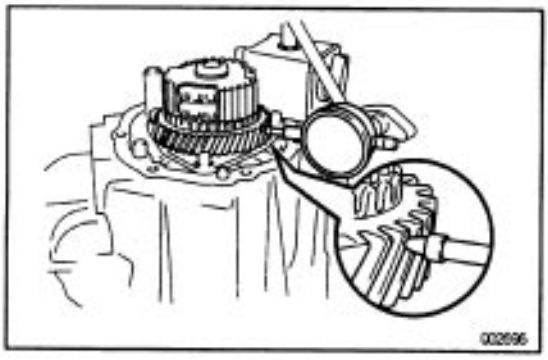
Using a dial indicator, measure the thrust clearance.

Standard clearance:

0.20–0.40 mm (0.0079–0.0157 In.)

Maximum clearance:

0.45 mm (0.0177 in.)



11. MEASURE 5TH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance.

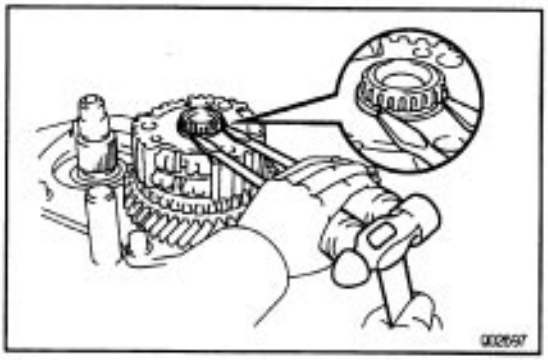
Standard clearance:

0.009–0.050 m m (0.0004–0.0020 in.)

Maximum clearance:

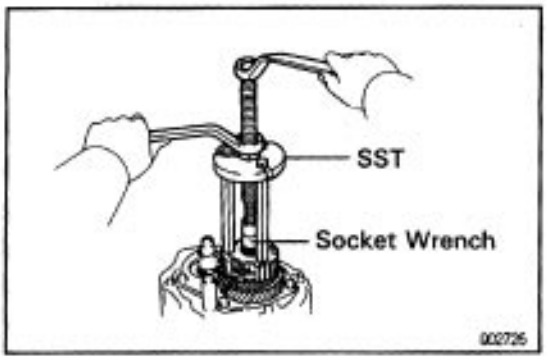
0.07 mm (0.0028 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or input shaft.



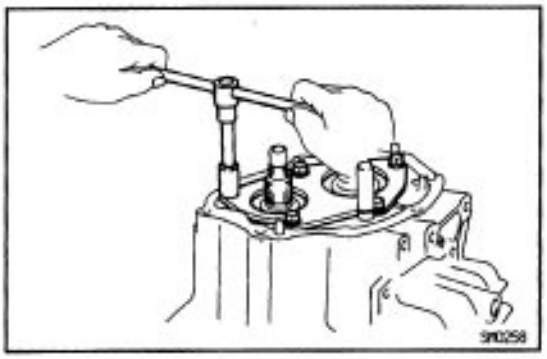
12. REMOVE NO.3 CLUTCH HUB AND 5TH GEAR

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

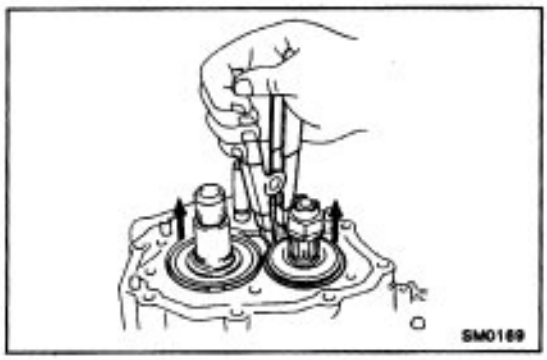


(b) Using SST, remove the No–3 clutch hub with synchronizer ring.
SST 09310–17010 (09310–07010, 09310–07020. 09310–07030)
(c) Remove the 5th gear.

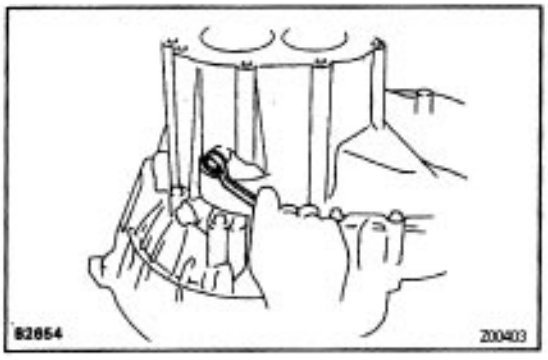
13. REMOVE NEEDLE ROLLER BEARING



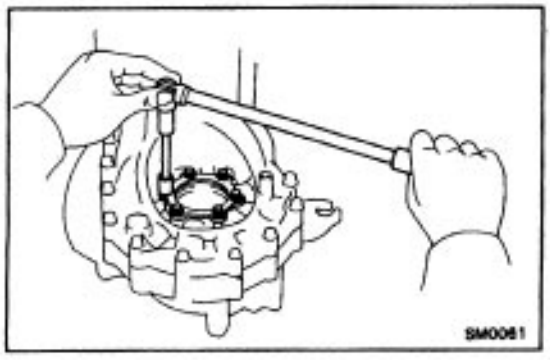
14. REMOVE REAR BEARING RETAINER



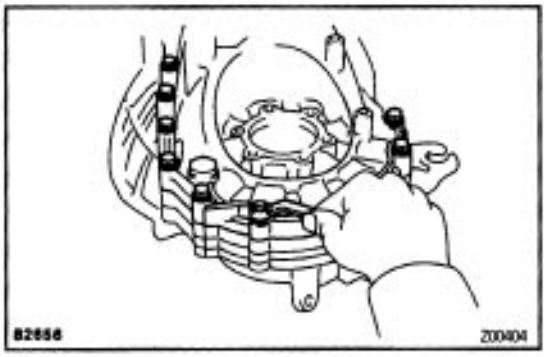
15. REMOVE BEARING SNAP RINGS
Using a snap ring expander, remove the 2 snap rings.
HINT: If it is difficult to remove the snap rings, pull up the shafts.



16. REMOVE REVERSE IDLER GEAR SHAFT LOCK BOLT



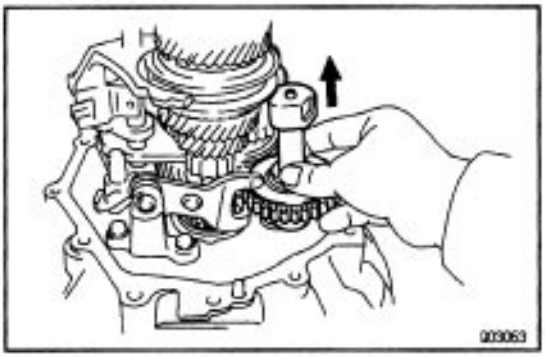
17. REMOVE DIFFERENTIAL SIDE BEARING RETAINER AND SHIM



18. REMOVE TRANSMISSION CASE

(a) Remove the 17 bolts.

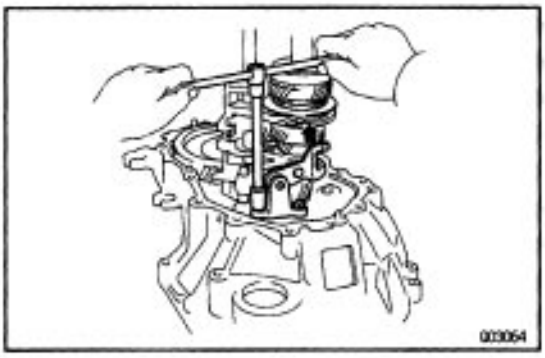
(b) Using a plastic hammer, tap off the transmission case.



19. REMOVE REVERSE IDLER GEAR AND SHAFT

(a) Pull out the shaft.

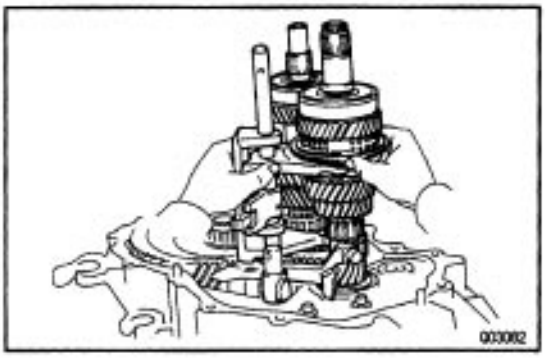
(b) Remove the idler gear and thrust washer.



20. REMOVE REVERSE SHIFT ARM

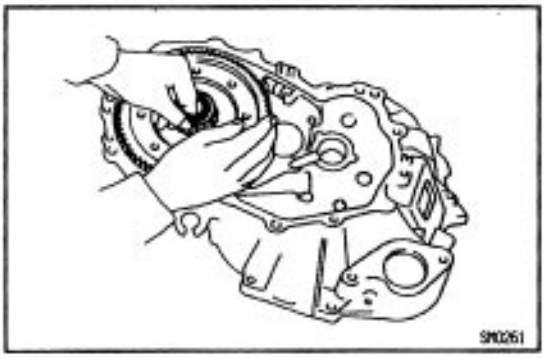
(a) Shift the fork shaft into reverse.

(b) Remove the 2 bolts and pull off the reverse shift arm.

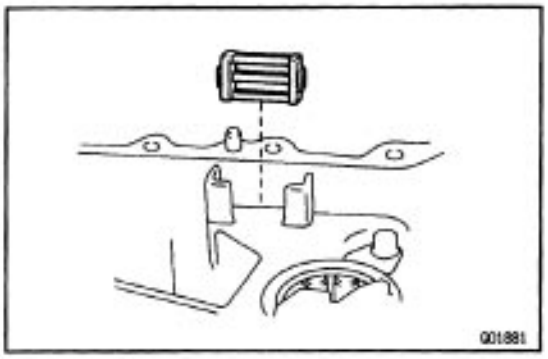


21. REMOVE NO.1 SHIFT FORK SHAFT, NO.1 SHIFT HEAD, NO.1 AND NO.2 SHIFT FORKS, REVERSE SHIFT FORK WITH INTERLOCK PIN, INPUT AND OUTPUT SHAFTS ASSEMBLY

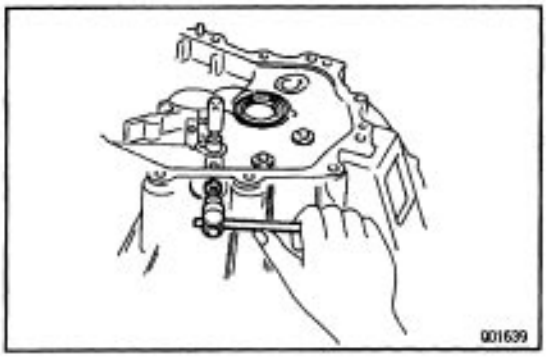
Remove the input shaft assembly and output shaft assembly together with the No. 1 fork shaft, shift head and shift forks with the interlock pin from the trans–axle case.



22. REMOVE DIFFERENTIAL CASE ASSEMBLY

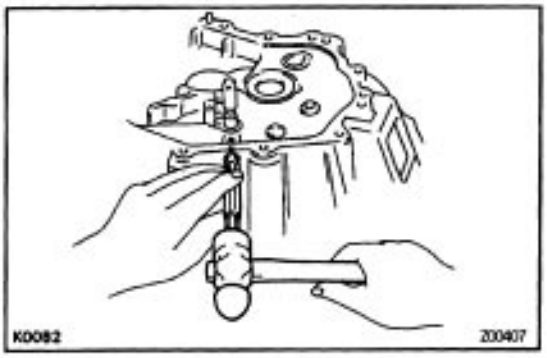


23. REMOVE MAGNET FROM TRANSAXLE CASE



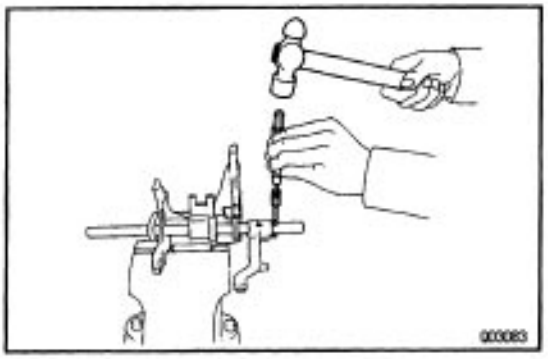
24. REMOVE NO.2 FORK SHAFT

(a) Using a hexagon wrench, remove the straight screw plug.



(b) Using a pin punch and hammer, drive out the slotted spring pin.

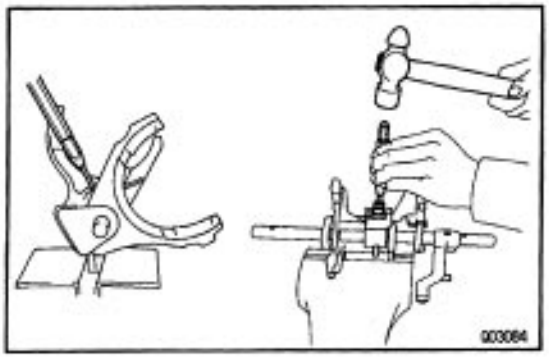
(c) Pull out the shaft.



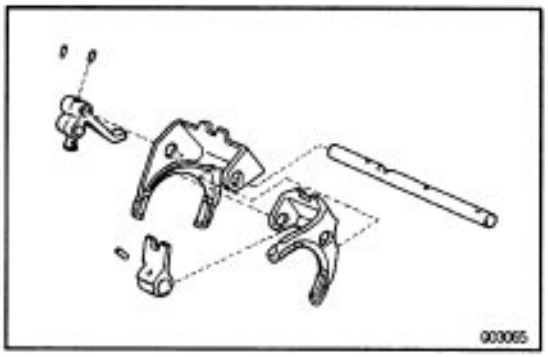
25. SEPARATE NO.1 FORK SHAFT, NO.1 SHIFT HEAD, NO.1, NO.2 SHIFT FORKS AND REVERSE SHIFT FORK

(a) Mount the shift forks to the vise.

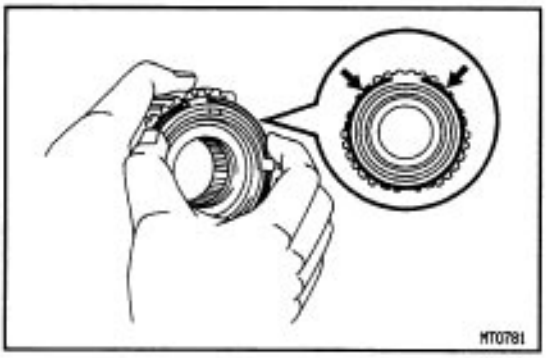
(b) Using a pin punch and hammer, drive out the slotted spring pin from the No.1 fork shaft.



(c) Using a pin punch and hammer, drive out the slotted spring pin from the No. 1 fork shaft as shown in the illustration.

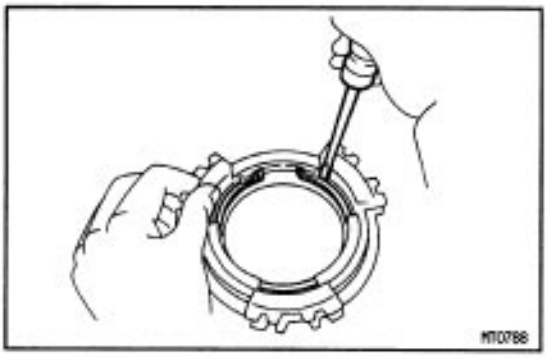


(d) Separate the No.1 shift fork shaft, No.1 shift head, No.1, No.2 shift forks and reverse shift fork.

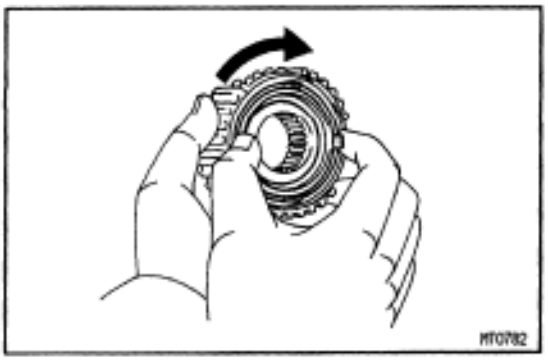


26. REMOVE NO.5 SYNCHRONIZER RING WITH KEY SPRING FROM NO.3 CLUTCH HUB

(a) Remove the No.5 synchronizer ring with key spring from No.3 clutch hub.



(b) Using a screwdriver, remove the snap ring.
HINT: Wrap vinyl tape on the screwdriver to prevent damaging the synchronizer ring.
(c) Remove the synchronizer rings.



COMPONENT PARTS INSPECTION

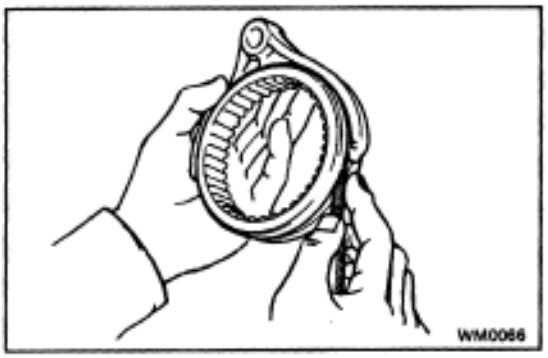
1. INSPECT N0.5 SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.

Turn the middle No.5 synchronizer ring in one direc–tion while pushing it to the outer No.5 synchronizer ring. Check that the ring locks.

If the braking effect is insufficient, replace the syn–chronizer ring.



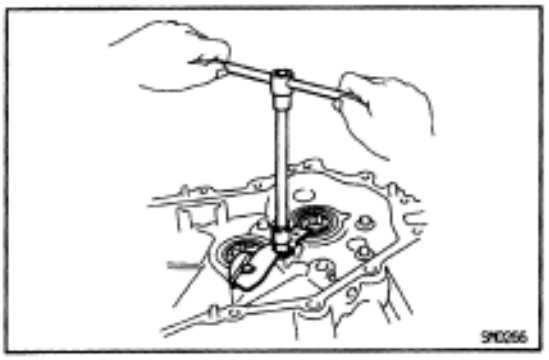
2. INSPECT CLEARANCE OF NO.3 SHIFT FORK AND NO.3 HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

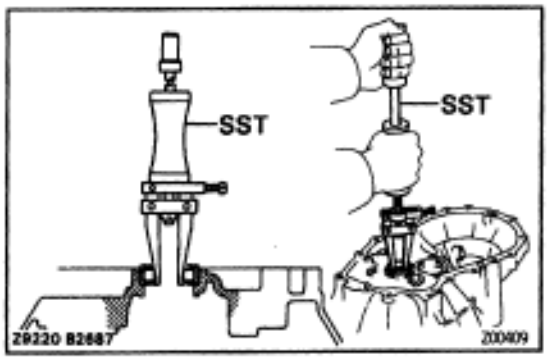
1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



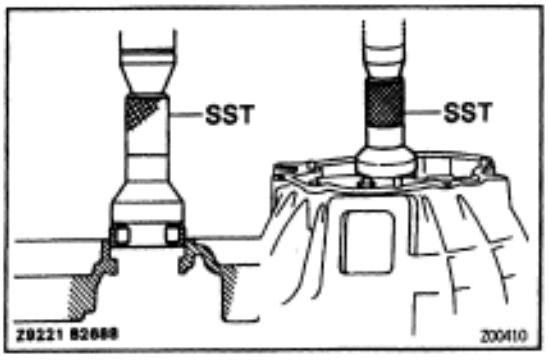
3. IF NECESSARY, REPLACE INPUT SHAFT FRONT BEARING

(a) Remove the bolt and transaxle case receiver.



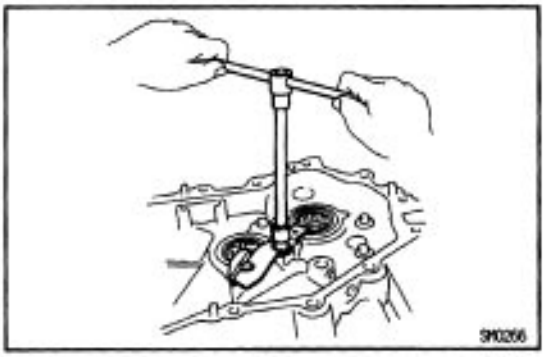
(b) Using SST, pull out the bearing.

SST 09308–00010

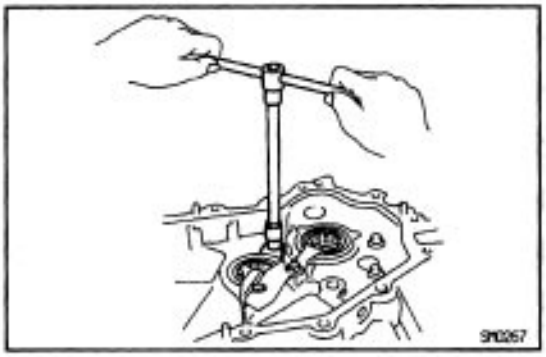


(c) Using SST, press in a new bearing.

SST 09310–35010

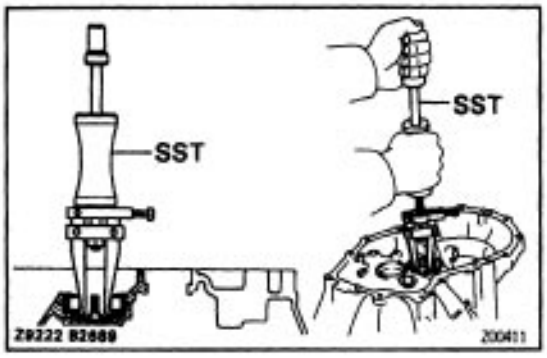


(d) Install the transaxle case receiver and torque the bolt.
Torque: 7.4 N–m (75 kgf–cm, 65 in–lbf)

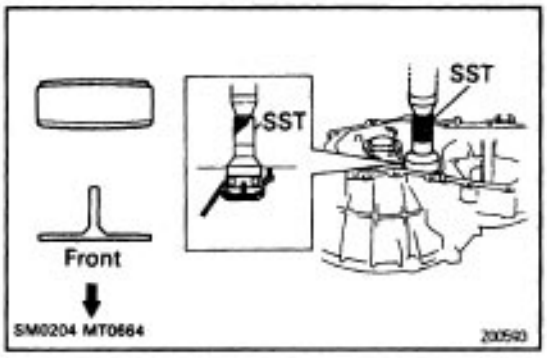


4. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

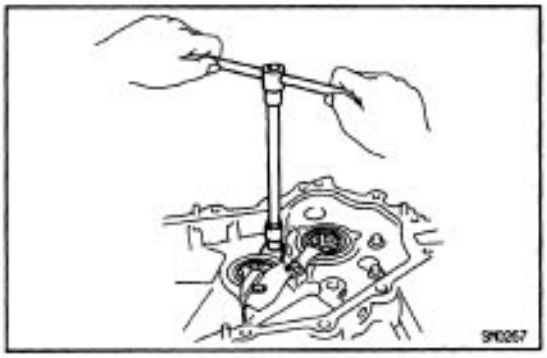
(a) Remove the bolt and bearing lock plate.



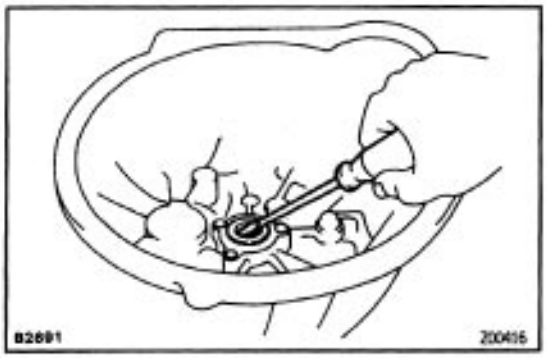
(b) Using SST, pull out the bearing.
SST 09308–00010



(c) Using SST, press in a new bearing.
SST 09310–35010

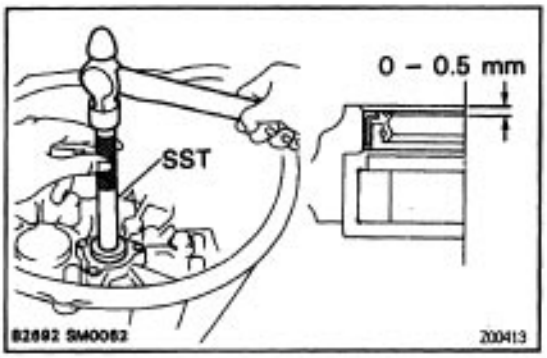


(d) Install the bearing lock plate and torque the bolt.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



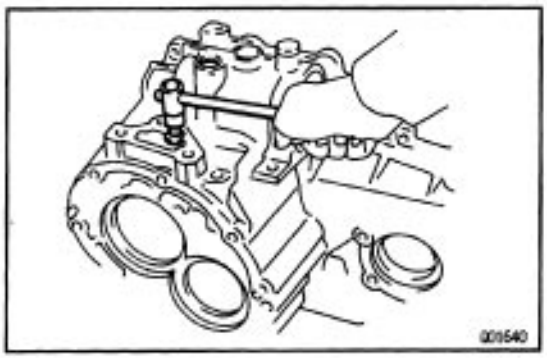
5. IF NECESSARY, REPLACE INPUT SHAFT FRONT OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



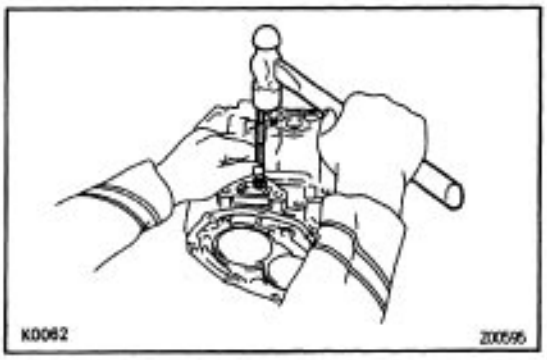
(b) Using SST, drive in a new oil seal.
SST 09608–20012 (09608–00080, 09608–03020)
Drive in depth:
0–0.5 mm (0–0.012 in.)

(c) Coat the lip of the oil seal with MP grease.

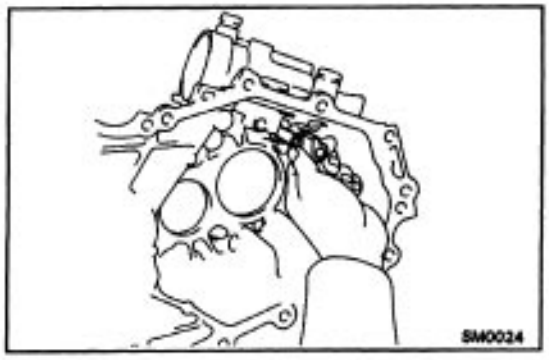


6. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

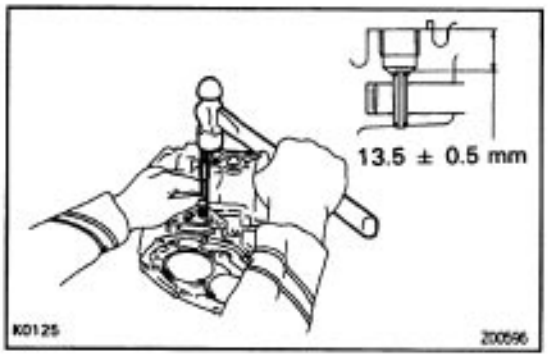
(a) Using a hexagon wrench, remove the straight screw plug.



(b) Using a pin punch and hammer, drive out the slotted spring pin.



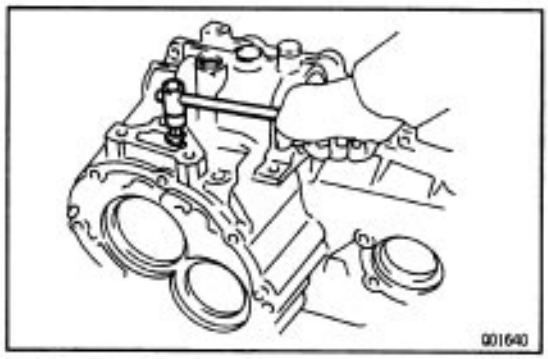
(c) Replace the reverse restrict pin.



(d) Using a pin punch and hammer, drive in the slotted spring pin.

Drive In depth:

13.5 ± 0.5 mm (0.531 t 0.020 in.)



(e) Apply sealant to the plug threads.

Sealant:

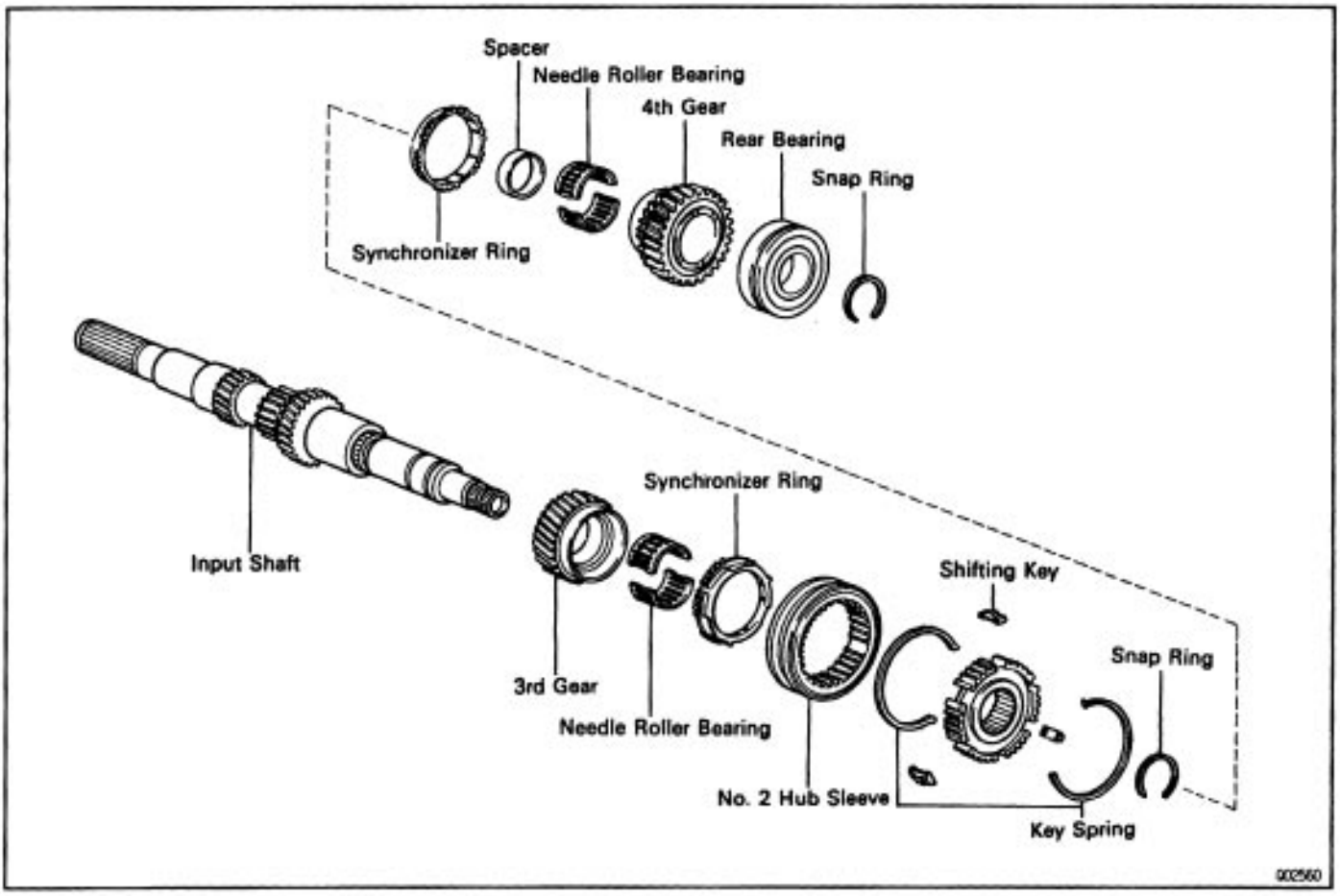
Part No.08833 – 00080, THREE BOND 1344, LOC–TITE 242 or equivalent

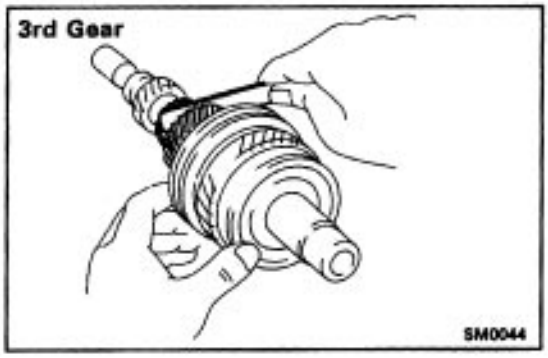
(f) Using a hexagon wrench, install and torque the straight screw plug.

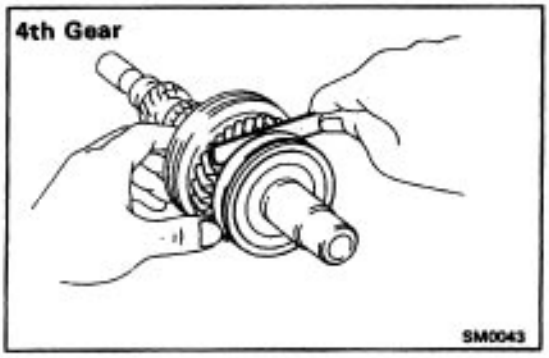
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

INPUT SHAFT

COMPONENTS







INPUT SHAFT DISASSEMBLY

1. INSPECT 3RD AND 4TH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the clearance.

Standard clearance:

3rd gear

0.10–0.25 mm (0.0039–0.0098 in.)

4th gear

0.20–0.45 mm (0.0079–0.0177 in.)

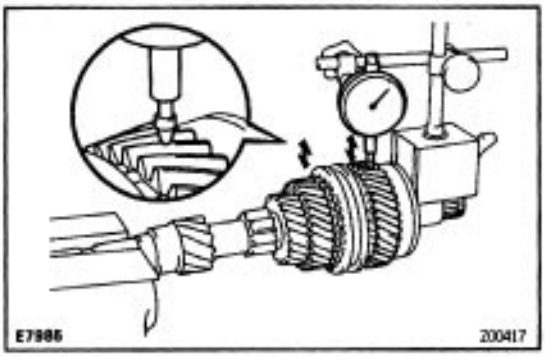
Maximum clearance:

3rd gear

0.30 mm (0.0118 in.)

4th gear

0.50 mm (0.0197 in.)



2. INSPECT 3 RD AND 4 TH GEAR RADIAL CLEARANCE

Using dial indicator, measure the radial clearance between the gear and shaft.

Standard clearance:

0.009–0.053 mm (0.0004–0.0021 in.)

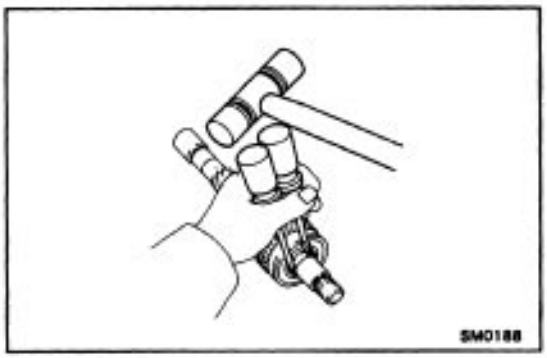
Maximum clearance:

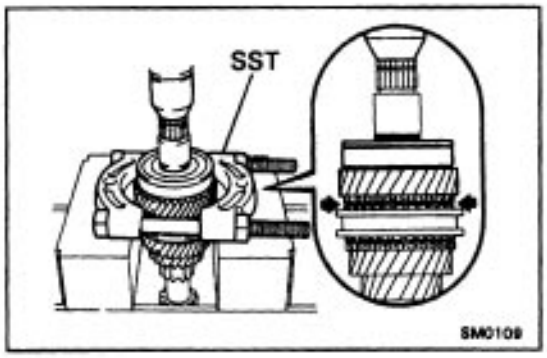
0.070 mm (0.0028 in.)

If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.

3. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the snap ring.

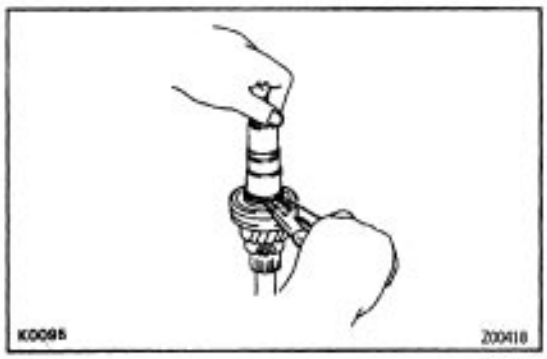




4. REMOVE REAR BEARING, 4 TH GEAR, NEEDLE ROLLER BEARINGS, SPACER AND SYNCHRONIZER RING FROM INPUT SHAFT

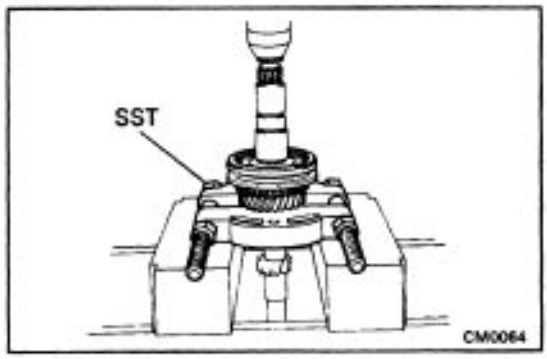
(a) Using SST and a press, remove the 4th gear and rear bearing.
SST 09950–00020

(b) Remove the needle roller bearings, spacer and synchronizer ring.



5. REMOVE SNAP RING

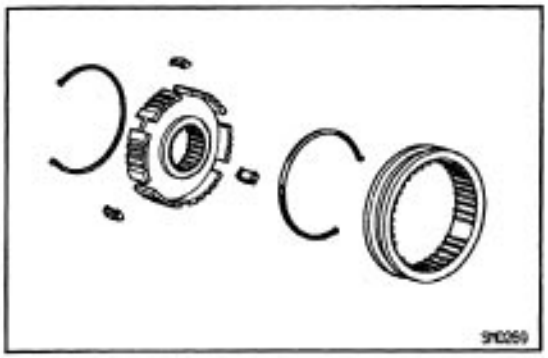
Using a snap ring expander, remove the snap ring.



6. REMOVE NO. 2 HUB SLEEVE ASSEMBLY, 3 RD GEAR SYNCHRONIZER RING AND NEEDLE ROLLER-BEARINGS

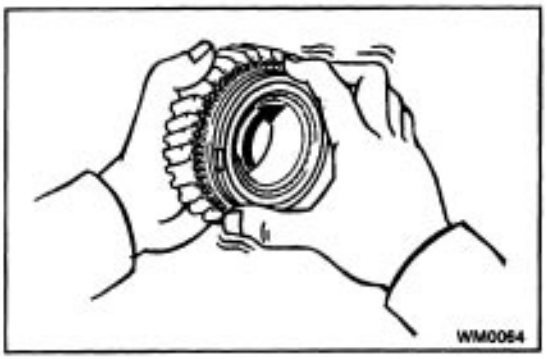
Using SST and a press, remove the No.2 hub sleeve, 3rd gear, synchronizer ring and needle roller bearings.
SST 09950–00020

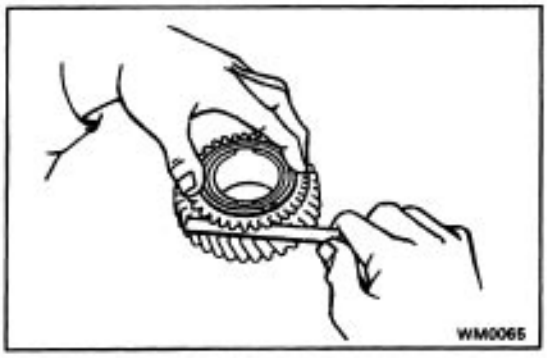
NOTICE: Be careful not to confuse the synchronizer ring for 3rd gear and synchronizer ring for 4th gear.



7. REMOVE N0.2 HUB SLEEVE, SHIFTING KEYS AND SPRINGS FROM NO.2 CLUTCH HUB

Using a screwdriver, remove the 3 shifting keys and 2 springs from the No.2 clutch hub.





INPUT SHAFT COMPONENTS INSPECTION

1. INSPECT SYNCHRONIZER RINGS

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.

Turn the synchronizer ring in one direction while push–ing it to the gear cone. Check that the ring locks.

If the braking effect is¿insufficient, apply a small amount of fine lapping compound between the syn–chronizer ring and gear cone.

Lightly rub the synchronizer ring and gear cone to–gether.

NOTICE: Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance:

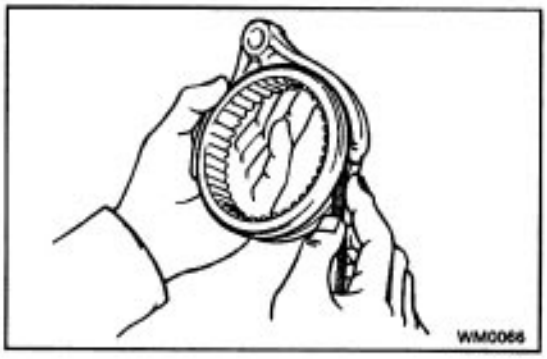
0.6 mm (0.024 fn.)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping com–pound between the synchronizer ring and gear cone.

  Lightly rub the synchronizer ring and gear cone together.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them to-gether.

  NOTICE: Ensure the fine lapping compound is completely washed off after rubbing.



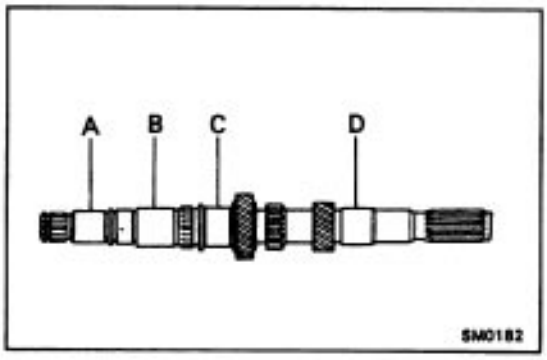
2. INSPECT CLEARANCE OF N0.2 SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace shift fork or hub sleeve.



3. INSPECT INPUT SHAFT

(a) Check the input shaft for wear or damage.

(b) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum outer diameter:

Part A

26.970 mm (1.0618 in.)

Part B

32.470 mm (1.2783 in.)

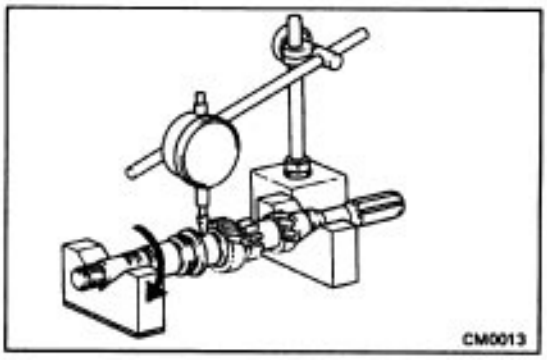
Part C

33.090 mm (1.3028 in.)

Part D

29.970 mm (1.1799 in.)

If the outer diameter is less than the minimum, replace the input shaft.

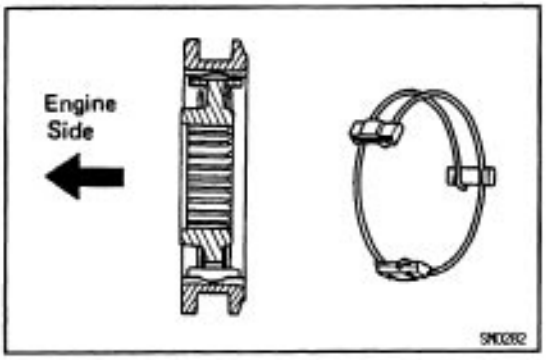


(c) Using a dial indicator, check the shaft runout.

Maximum runout:

0.05 mm (0.0020 in.)

If the outer diameter exceeds the maximum, replace the input shaft.



INPUT SHAFT ASSEMBLY
(See page MX–33)

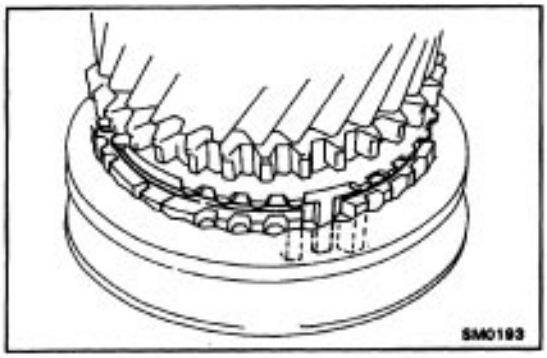
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSTALL NO.2 CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and shifting keys to the hub sleeve.

(b) Install the shifting key springs under the shifting keys.

NOTICE: Install the key springs positioned so that their and gaps are not line.

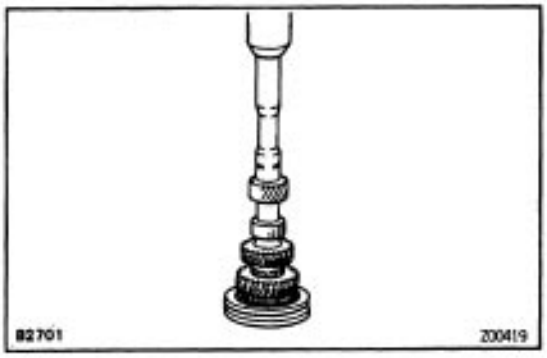


2. INSTALL 3RD GEAR, NEEDLE ROLLER BEARINGS. SYNCHRONIZER RING AND NO.2 HUB SLEEVE ASSEMBLY TO INPUT SHAFT

(a) Apply gear oil to the needle roller bearings.

(b) Place the synchronizer ring (for 3rd gear) on the gear and align the ring slots with the shifting keys.

NOTICE: Do not install the synchronizer ring for 4th gear.

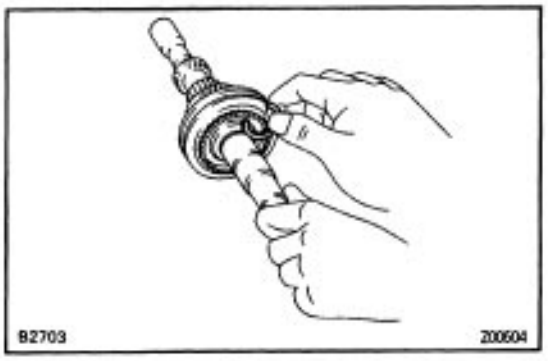


(c) Using a press, install the 3rd gear and No.2 hub sleeve.

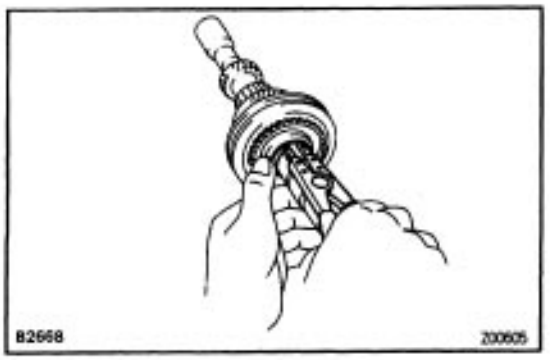
3. INSTALL SNAP RING

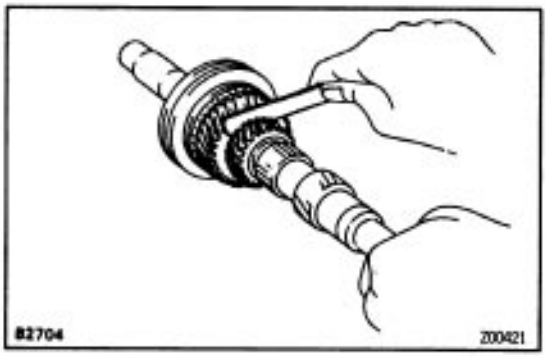
(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.95 – 2.00 (0.0768 – 0.0787)
2	2.00 – 2.05 (0.0787 – 0.0807)
3	2.05 – 2.10 (0.0807 – 0.0827)
4	2.10 – 2.15 (0.0827 – 0.0846)
5	2.15 – 2.20 (0.0846 – 0.0866)
6	2.20 – 2.25 (0.0866 – 0.0886)



(b) Using a snap ring expander, install the snap ring.



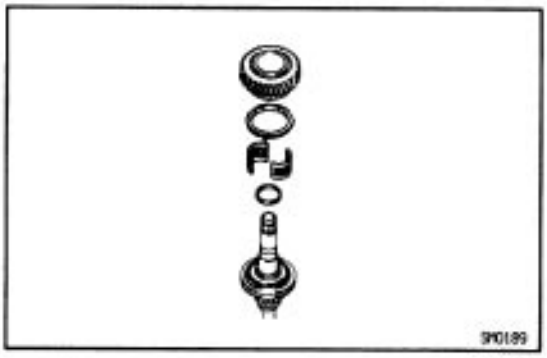


4. INSPECT 3RD GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard clearance:

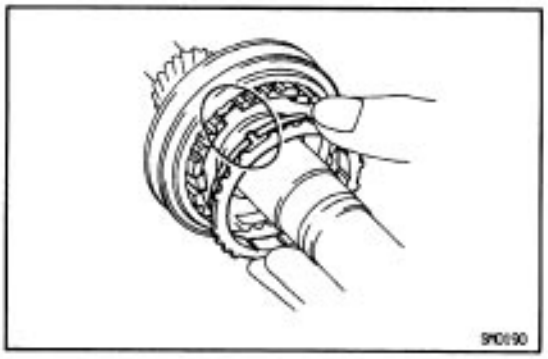
0.10–0.25 mm (0.0039–0.0098 in.)



5. INSTALL SYNCHRONIZER RING, NEEDLE ROLLER BEARINGS, SPACER, 4TH GEAR AND REAR BALL BEARING

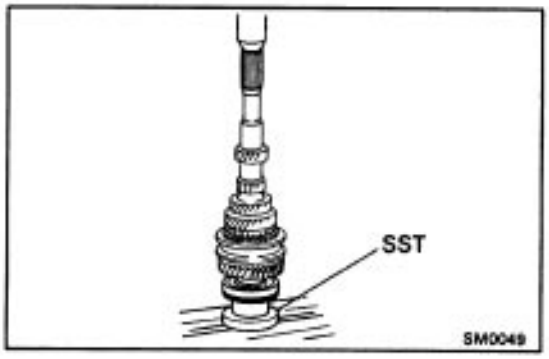
(a) Apply gear oil to the needle roller bearings.

(b) Install the spacer and needle roller bearings.



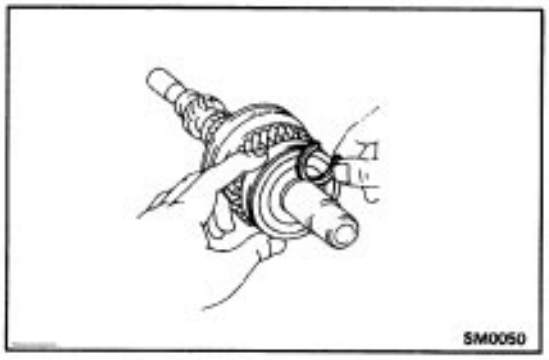
(c) Place the synchronizer ring on the gear.

HINT: Align the ring slots with the shifting keys, and the ring projections with the hub slots.



(d) Using SST and a press, install the rear ball bearing.

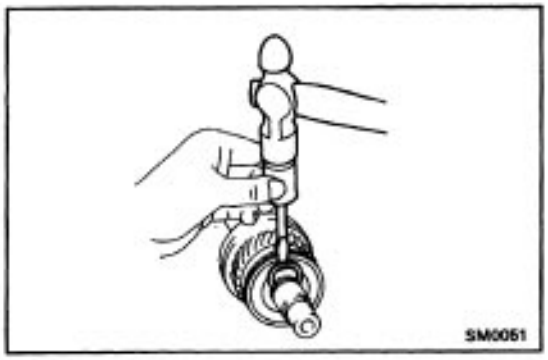
SST 09608–12010 (09608–00070)



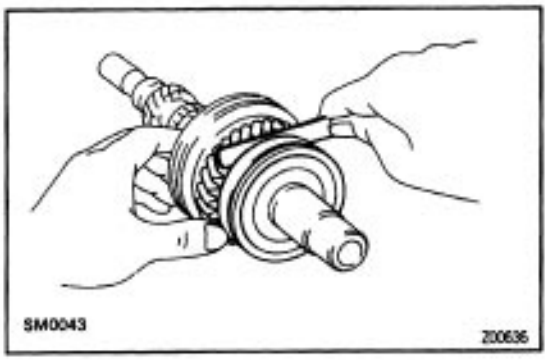
6. INSTALL SNAP RING

(a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	2.15 – 2.20 (0.0846 – 0.0866)
B	2.20 – 2.25 (0.0866 – 0.0886)
C	2.25 – 2.30 (0.0886 – 0.0906)
D	2.30 – 2.35 (0.0906 – 0.0925)
E	2.35 – 2.40 (0.0925 – 0.0945)



(b) Using a screwdriver and hammer, tap in the snap ring.



7. INSPECT 4TH GEAR THRUST CLEARANCE

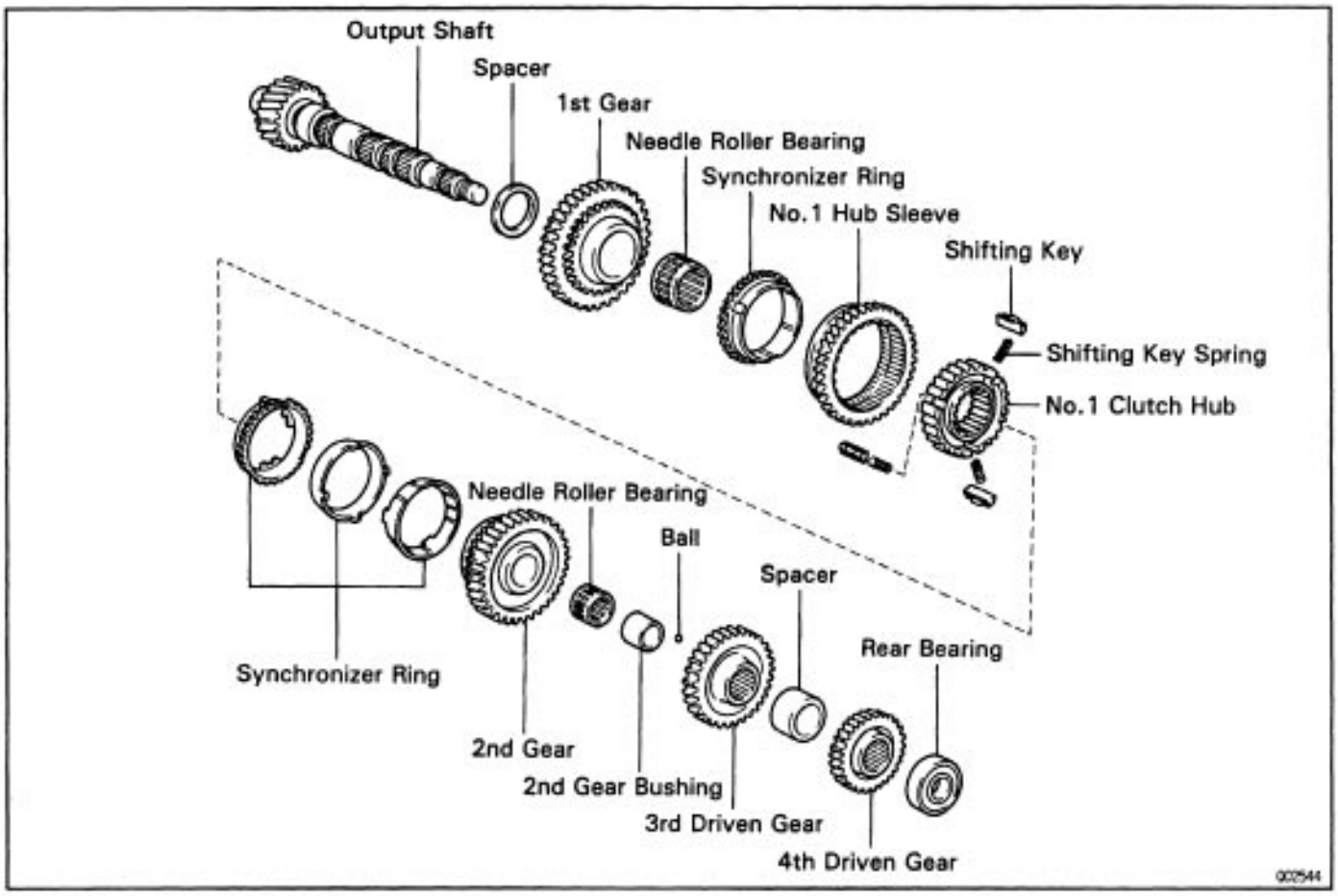
Using a feeler gauge, measure 4th gear thrust clear–ance.

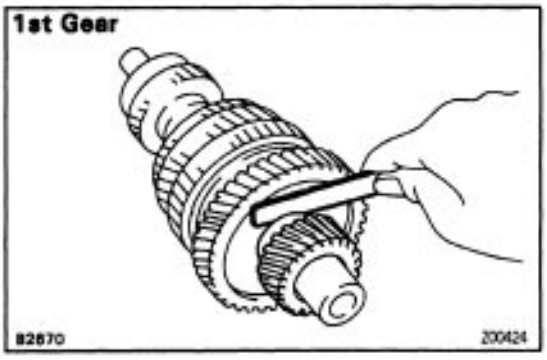
Standard clearance:

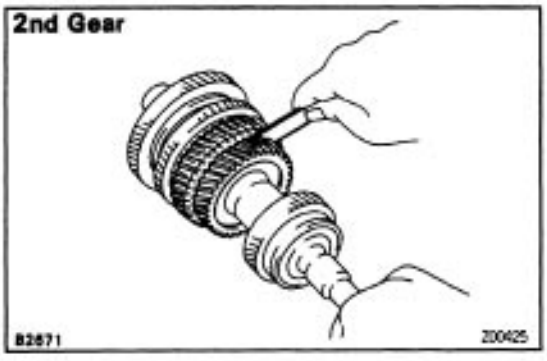
0.20–0.45 mm (0.0079–0.0177 in.)

OUTPUT SHAFT

COMPONENTS







OUTPUT SHAFT DISASSEMBLY

1. INSPECT 1ST AND 2ND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance.

Standard clearance:

1st gear

0.10–0.29 mm (0.0039–0.0114 in.)

2nd gear

0.20–0.44 mm (0.0079–0.0173 in.)

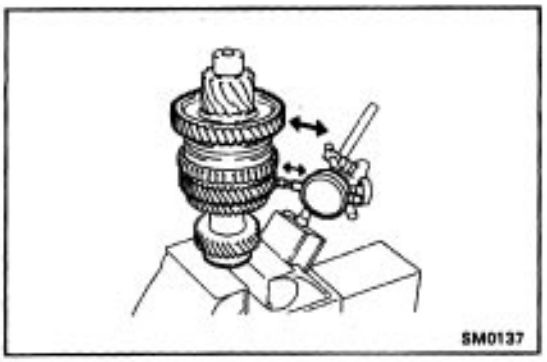
Maximum clearance:

1st gear

0.35 mm (0.0138 in.)

2nd gear

0.50 mm (0.0197 in.)



2. INSPECT 1 ST AND 2 ND GEAR RADIAL CLEARANCE

Using dial indicator, measure the radial clearance be–tween the gear and shaft.

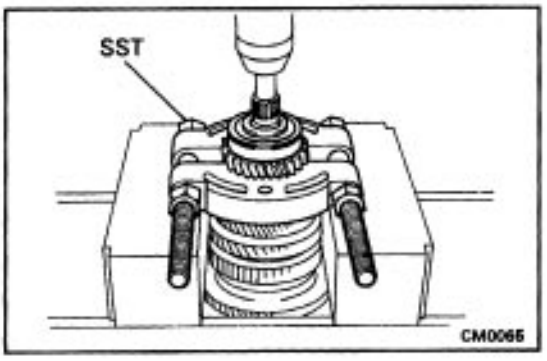
Standard clearance:

0.009–0–053 m m (0.0004–0.0021 In.)

Maximum clearance:

0.070 mm (0.0028 In.)

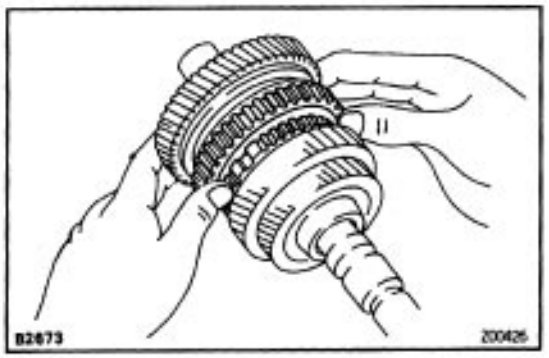
If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.



3. REMOVE REAR BALL BEARING, 4TH DRIVEN GEAR AND OUTPUT GEAR SPACER

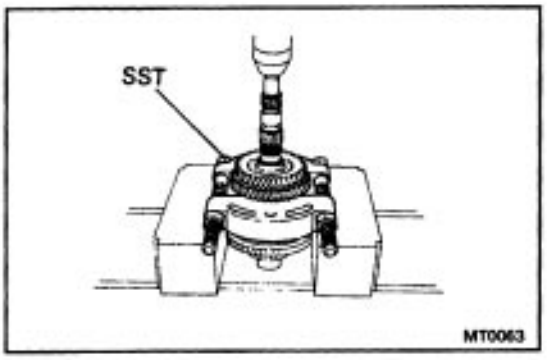
(a) Using SST and a press, remove the rear ball bearing and 4th driven gear.
SST 09950–00020

(b) Remove the output gear spacer and bait.



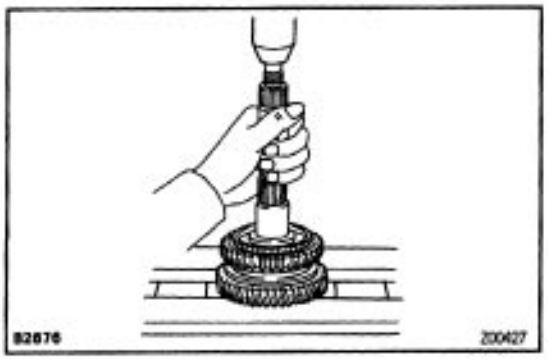
4. REMOVE 3RD DRIVEN GEAR, 2ND GEAR, NEEDLE ROLL-ER BEARING AND SYNCHRONIZER RING

(a) Shift the No. 1 hub sleeve into the 1 st gear.



(b) Using SST and a press, remove the 3rd driven gear and 2nd gear.
SST 09950–00020

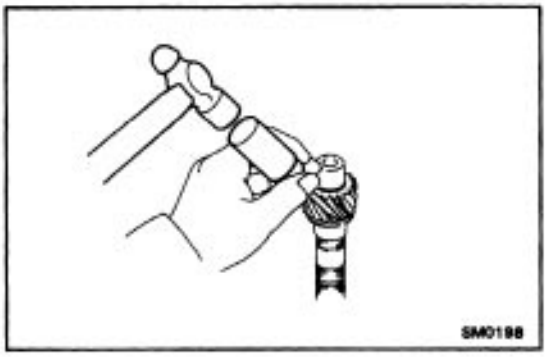
(c) Remove the needle roller bearing and synchronizer rings.



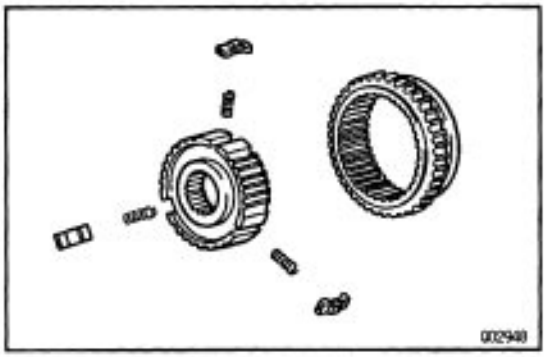
5. REMOVE NO.1 HUB SLEEVE ASSEMBLY, 1ST GEAR, SYN-CHRONIZER RING, NEEDLE ROLLER BEARING, THRUST WASHER AND LOCKING BALL

(a) Using a press, remove the No.1 hub sleeve, 1st gear and synochronizer ring.

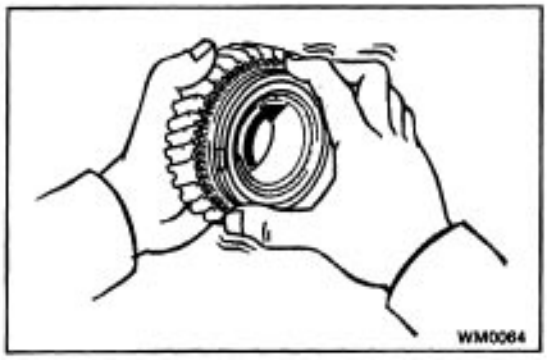
(b) Remove the needle roller bearing and locking ball.

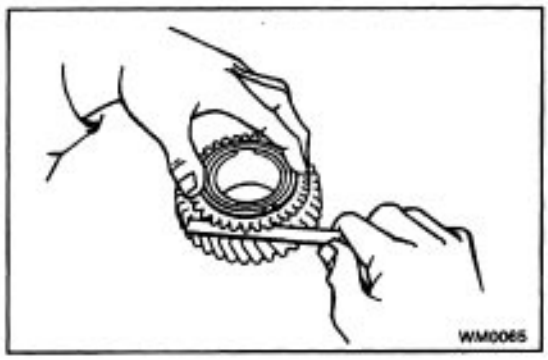


(c) Using a screwdriver and hammer, drive out the thrust washer.



6. REMOVE NO.1 HUB SLEEVE, SHIFTING KEYS AND SPRINGS FROM NO.1 CLUTCH HUB





OUTPUT SHAFT COMPONENT PARTS INSPECTION

MX071–04

1. INSPECT 1ST GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.

Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE: Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.

Minimum clearance:

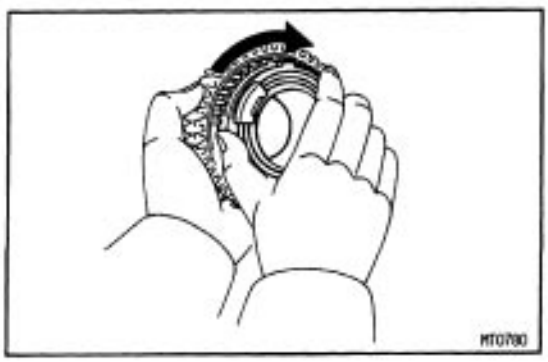
0.6 mm (0.024 in.)

HINT:

- When replacing either a synchronizer ring or gear, apply a small amount of fine lapping compound between the synchronizer ring and gear cone.

  Lightly rub the synchronizer ring and gear cone together.
- When replacing both the synchronizer ring and gear, there is no need to apply any compound or to rub them together.

  NOTICE: Ensure the fine lapping compound is completely washed off after rubbing.

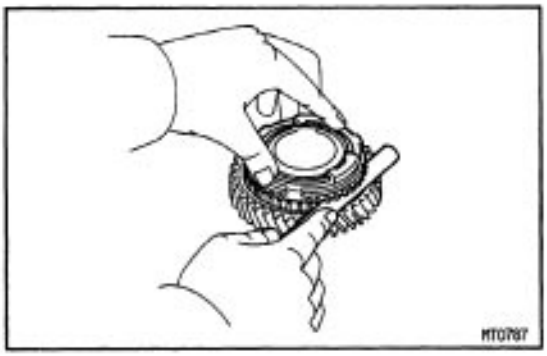


2. INSPECT 2ND GEAR SYNCHRONIZER RING

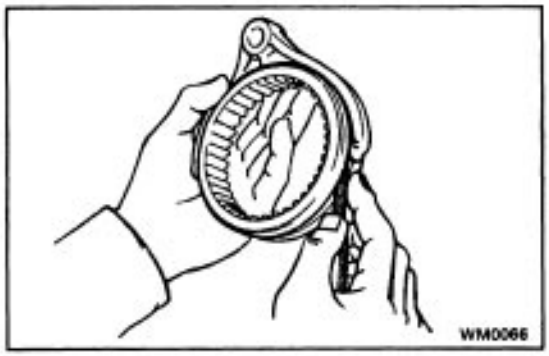
(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, replace the synchronizer ring.



(c) Measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance:
0.7 mm (0.028 in.)
If the clearance is less than the limit, replace the synchronizer ring.



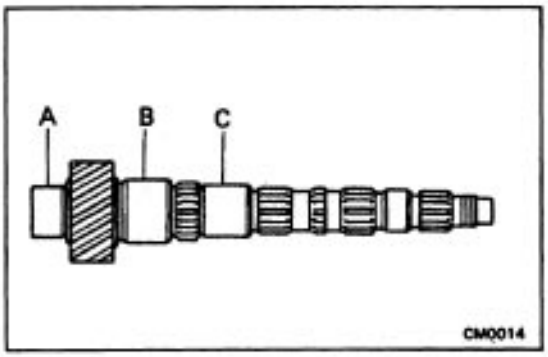
3. INSPECT SHIFT FORKS AND HUB SLEEVES CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance:

1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



4. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the outer diameter of the output shaft journal surface.

Minimum outer diameter:

Part A

31.970 mm 11.2587 In.)

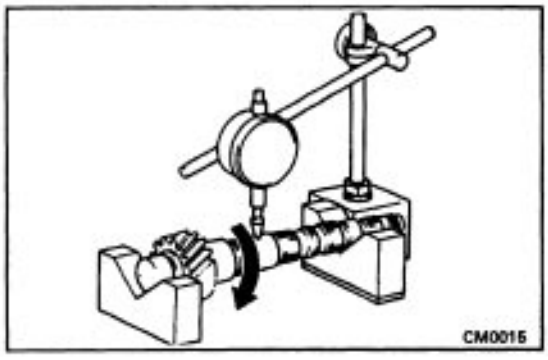
Part B

37.970 mm (1.4949 In.)

Part C

31.990 mm 11.2594 In.)

If the outer diameter is less than the minimum, replace the output shaft.

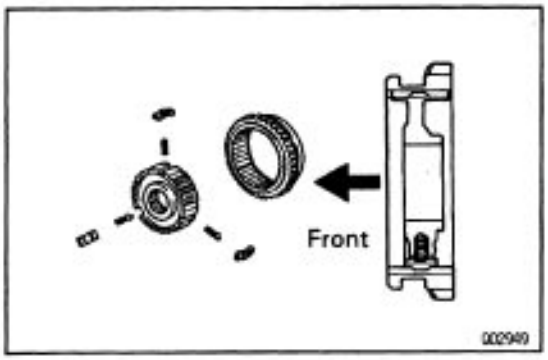


(b) Using a dial indicator, check the shaft runout.

Maximum runout:

0.05 mm (0.0020 in.)

If the runout exceeds the maximum, replace the output shaft.



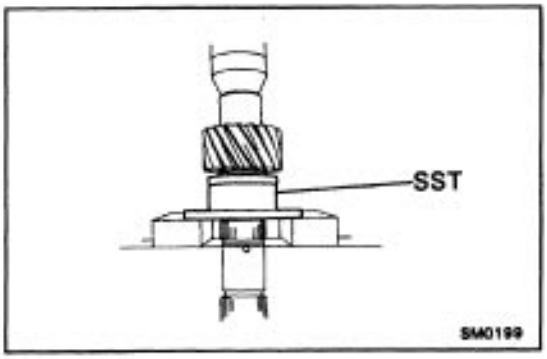
OUTPUT SHAFT ASSEMBLY
(See page MX–40)

HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSTALL NO.1 CLUTCH HUB INTO HUB SLEEVE

(a) Install the 3 springs and shifting keys to the clutch hub.

(b) Install the hub sleeve to the clutch hub.

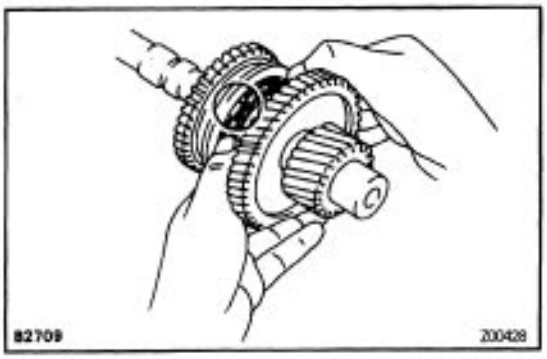


HINT: Direct identification groove of the hub sleeve to front of the transmission.

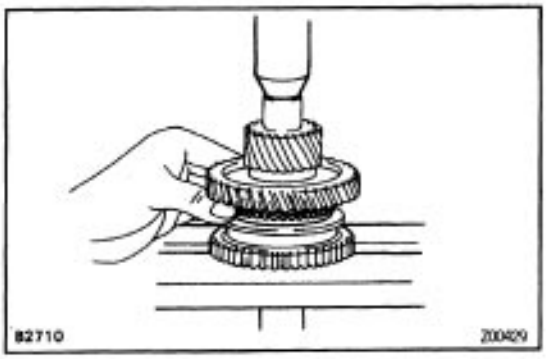
2. INSTALL THRUST WASHER, 1 ST GEAR, NEEDLE ROLLER BEARING, SYNCHRONIZER RING AND NO.1 HUB SLEEVE TO OUTPUT SHAFT

(a) Using SST and a press, install the thrust washer.
SST 09316–60010 (09316–00040)

(b) Apply gear oil to the needle roller bearing.



(c) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.



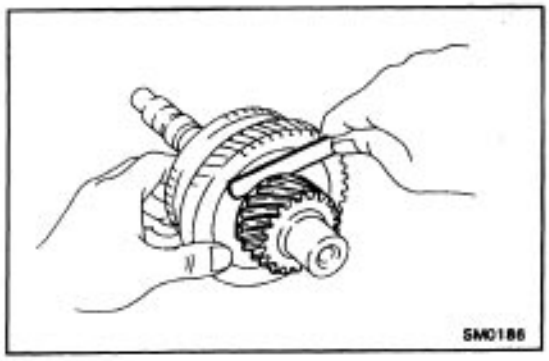
(d) Using a press, install the 1 st gear and No. 1 hub sleeve.

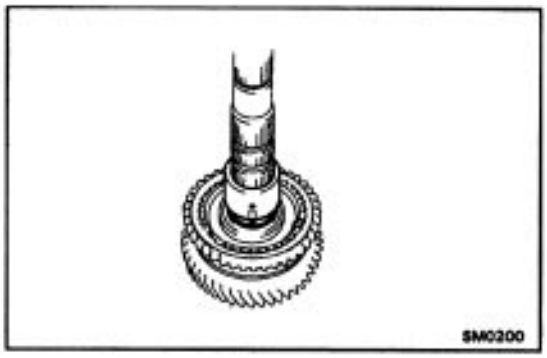
3. INSPECT 1ST GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 1st gear thrust clearance.

Standard clearance:

0.10–0.29 mm (0.0039–0.0114 in.)

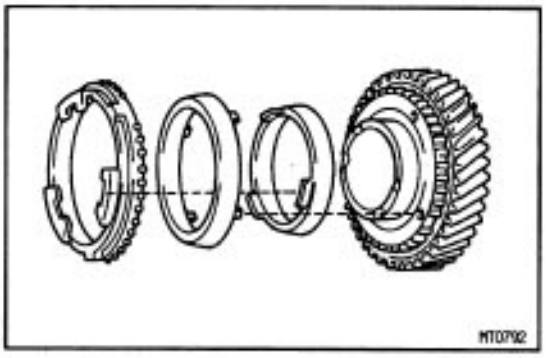




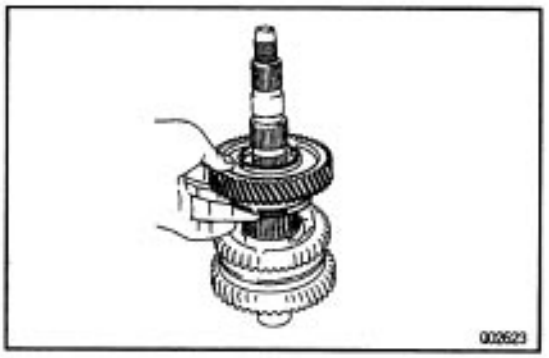
4. INSTALL SYNCHRONIZER RINGS, 2 ND GEAR, NEEDLE ROLLER BEARING AND 3RD DRIVEN GEAR

(a) Install the ball.

(b) Fit the 2nd gear bushing groove securely over the ball when installing the 2nd gear bushing on the shaft.



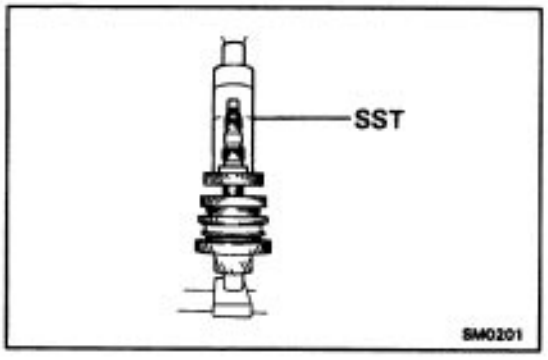
(c) Place the synchronizer rings on the 2nd gear.



(d) Apply gear oil to the needle roller bearing and install it.

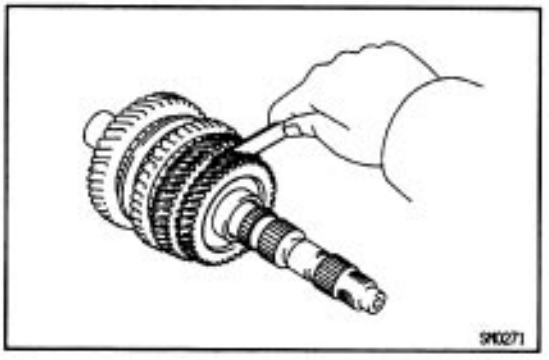
(e) Install the 2nd gear.

NOTICE: Align the clutch hub grooves with the projections on the synchronizer ring.



(f) Using SST and a press, install the 3rd driven gear.

SST 09316–60010 (09316–00010)

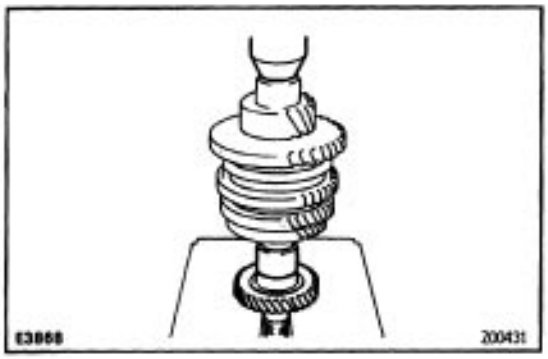


5. INSPECT 2ND GEAR THRUST CLEARANCE

Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard clearance:

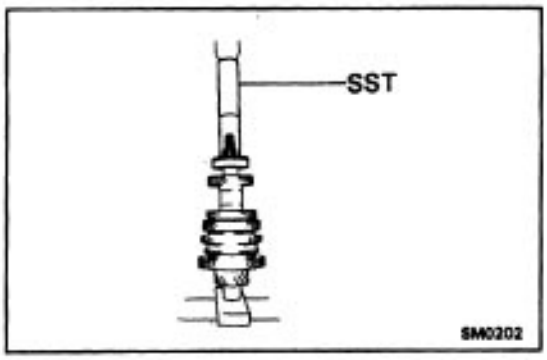
0.20–0.44 mm (0.0079–0.0173 in.)



6. INSTALL OUTPUT GEAR SPACER, 4TH DRIVEN GEAR AND RADIAL BALL BEARING

(a) Install the outer gear spacer.

(b) Using a press, install the 4th driven gear and bearing.



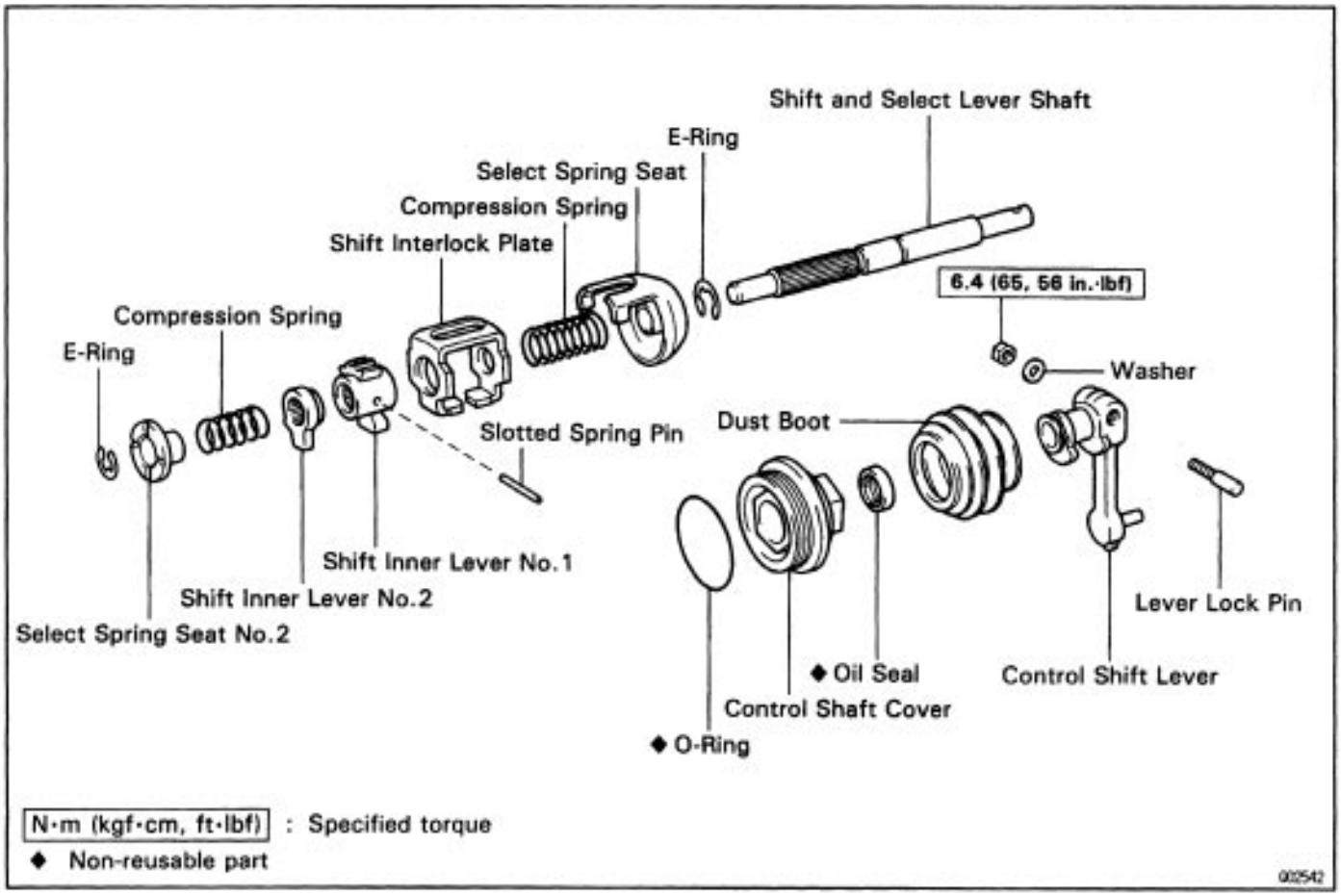
7. INSTALL REAR BEARING

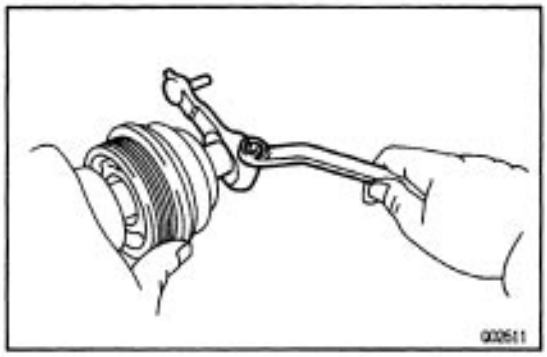
Using SST and a press, install the rear bearing.

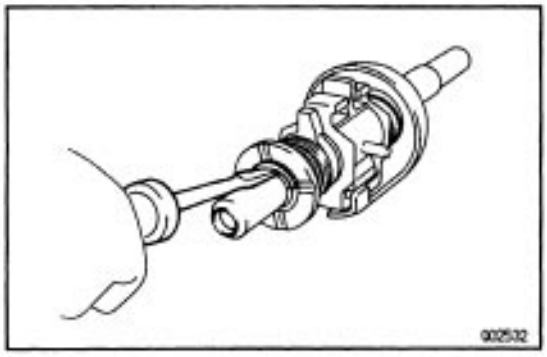
SST 09612–22011

SHIFT AND SELECT LEVER SHAFT

COMPONENTS







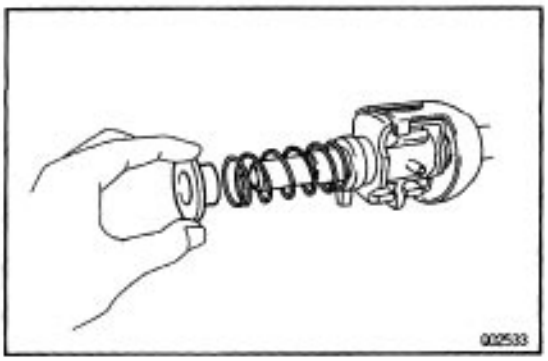
SHIFT AND SELECT LEVER SHAFT DISASSEMBLY

1. REMOVE CONTROL SHIFT LEVER, DUST BOOT AND CONTROL SHAFT COVER

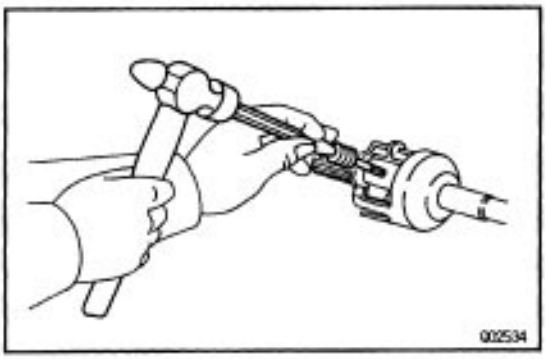
(a) Remove the nut and washer.
(b) Remove the lever lock pin.
(c) Remove the control shift lever.
(d) Remove the dust boot.
(e) Remove the control shaft cover.

2. REMOVE SELECT SPRING SEAT NO.2 AND SHIFT INNER LEVER NO.2

(a) Using a screwdriver, pry out the E–ring.

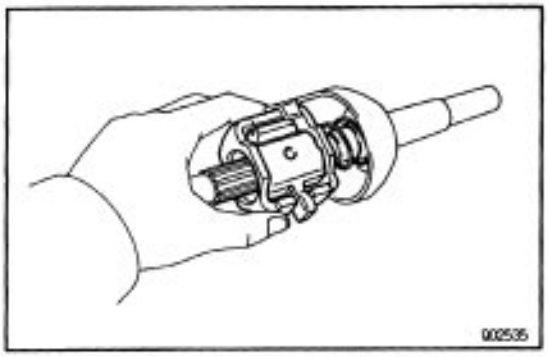


(b) Remove the reverse restrict pin holder, spring and shift inner lever No.2.

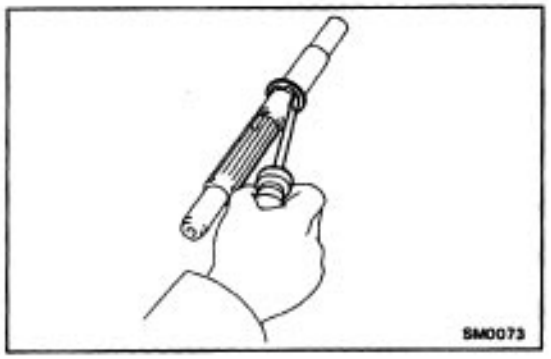


3. REMOVE SHIFT INTERLOCK PLATE, SHIFT INNER LEVER NO.1 AND SELECT SPRING SEAT

(a) Using a pin punch and hammer, drive out the slotted spring pin.



(b) Remove the shift interlock plate, shift inner lever No.1 and select spring seat.



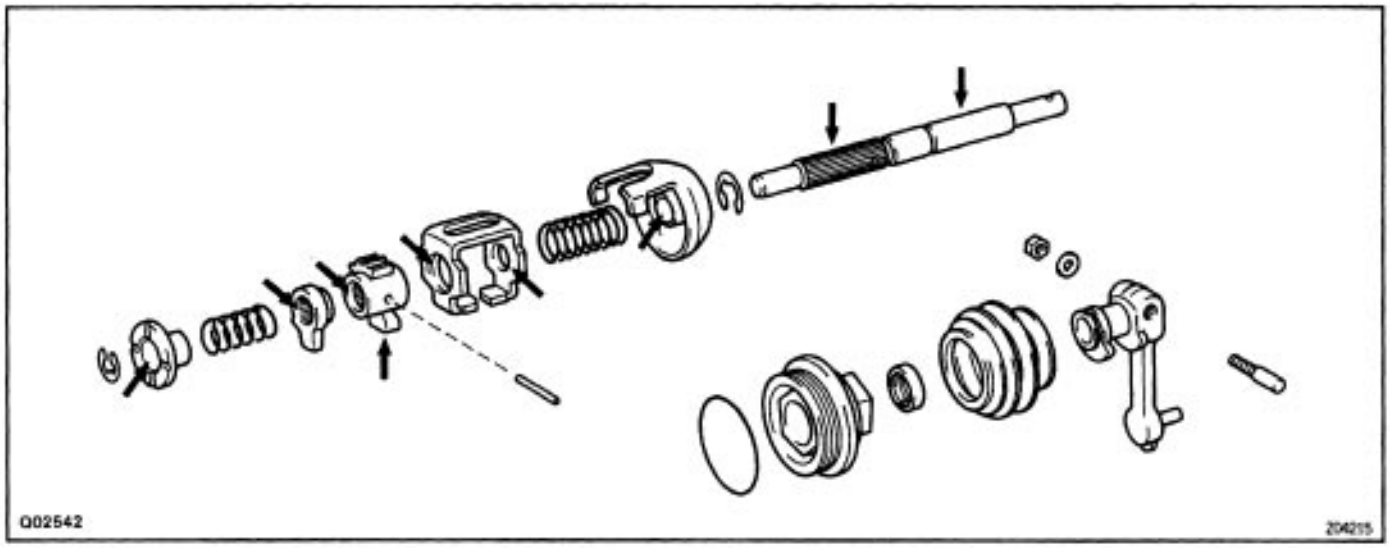
4. REMOVE E – RING FROM SHIFT AND SELECT LEVER SHAFT

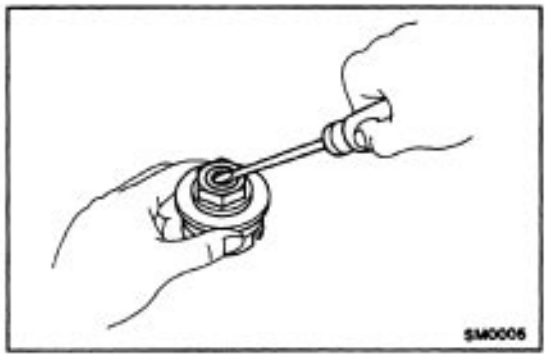
Using a screwdriver, pry out the E–ring.

SHIFT AND SELECT LEVER SHAFT ASSEMBLY

(See page MX–48)

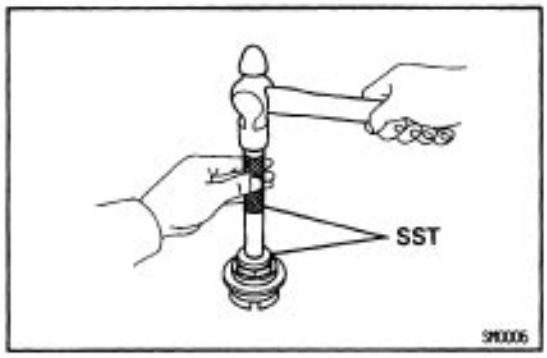
1. APPLY MP GREASE TO PARTS, AS SHOWN





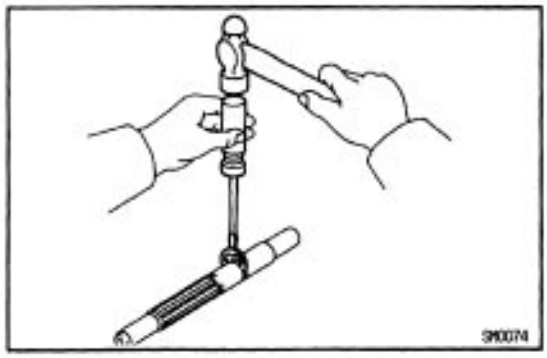
2. IF NECESSARY, REPLACE CONTROL SHAFT COVER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

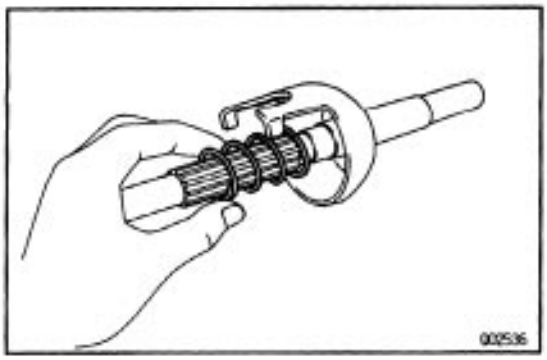


(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the shaft cover surface.
SST 09608–20012 (09608–00080, 09608–03020)

(c) Coat the lip of the oil seal with MP grease.

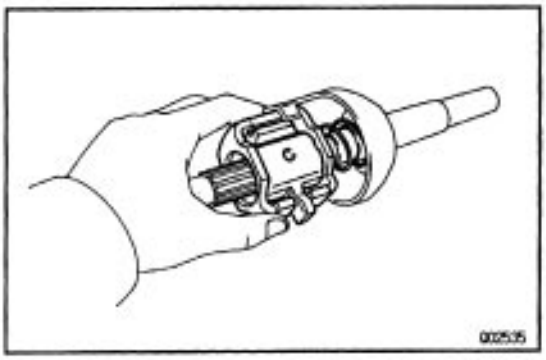


3. INSTALL E–RING TO SHIFT AND SELECT LEVER SHAFT



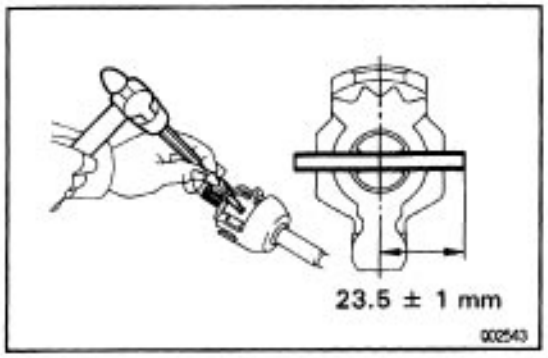
4. INSTALL SELECT SPRING SEAT, SHIFT INNER LEVER NO.1 AND SHIFT INTERLOCK PLATE

(a) Install the select spring seat and Spring.



(b) Install the shift inner lever No. 1 with the shift interlock plate.

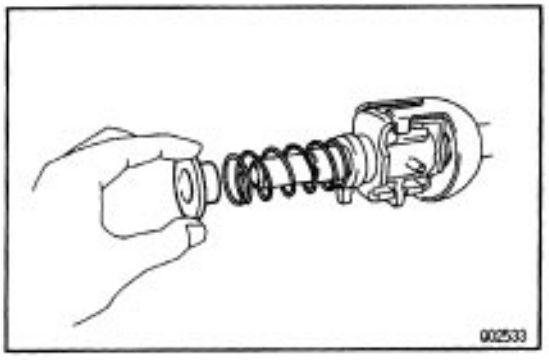
HINT: One of the spline teeth of the shift and select lever shaft has been eliminated. Therefore, be certain to correctly align this portion to the matching portions on the parts during assembly.



(c) Using a pin punch and hammer, drive in the slotted spring pin.

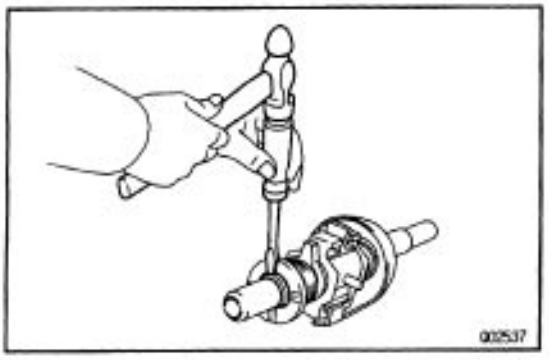
Drive in depth:

23.5 ± 1.0 mm (0.925 ± 0.039 in.)

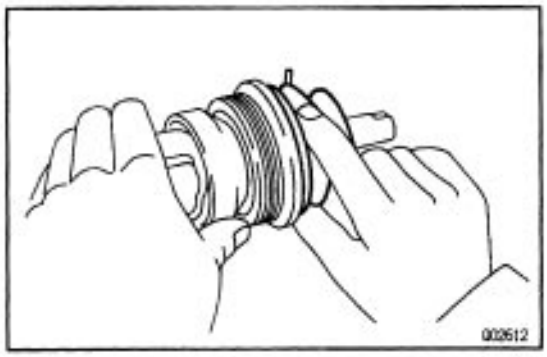


6. INSTALL SHIFT INNER LEVER NO.2 AND SELECT SPRING SEAT NO.2

(a) Install the shift inner lever No.2, spring and select spring seat No.2.



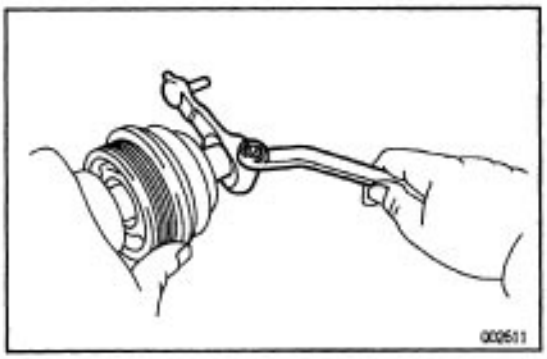
(b) Using a screwdriver and hammer, tap in the E–ring.



6. INSTALL CONTROL SHAFT COVER, DUST BOOT AND CONTROL SHIFT LEVER

(a) Install the control shaft cover and dust boot.

HINT: Make sure to install the boot in correct direc–tion. Position the air bleed of the boot downward.



(b) Install the control shift lever.

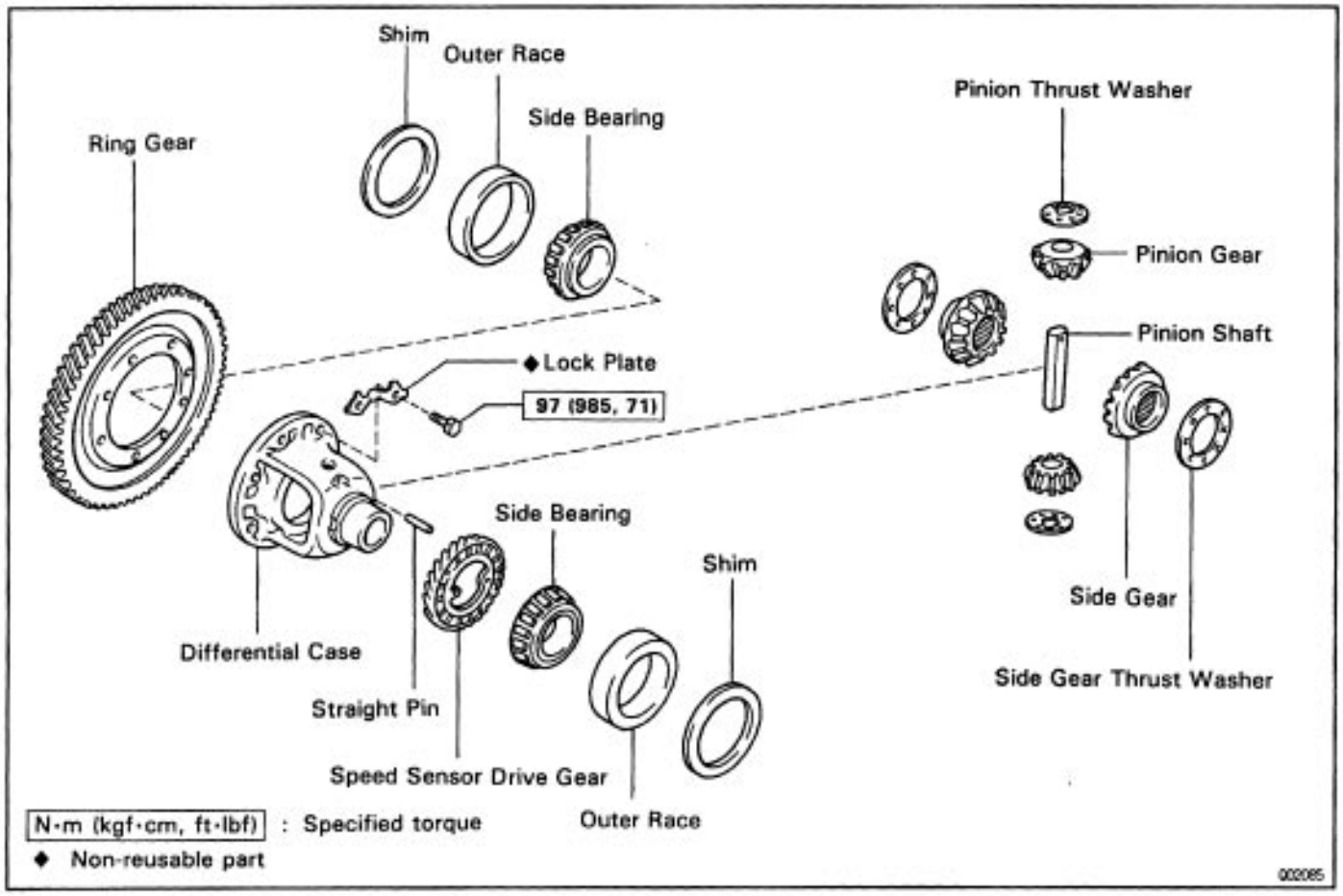
(c) Install the lever lock pin to the control shift lever.

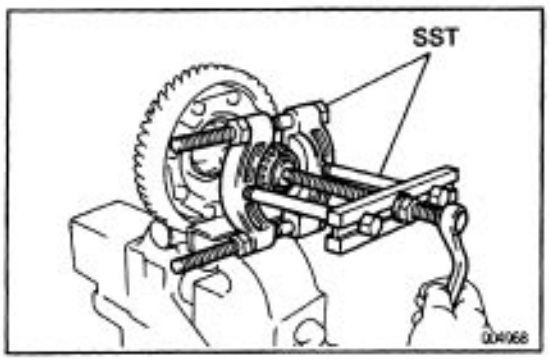
(d) Install the washer and lock nut.

Torque: 6.4 N–m (65 kgf–cm, 56 in.–lbf)

DIFFERENTIAL CASE

COMPONENTS





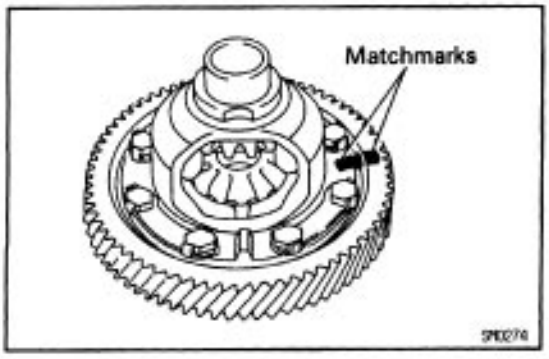
DIFFERENTIAL CASE DISASSEMBLY

1. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE (SPEED SENSOR DRIVE GEAR SIDE)

(a) Using SST, remove the bearing from drive gear side of the case.

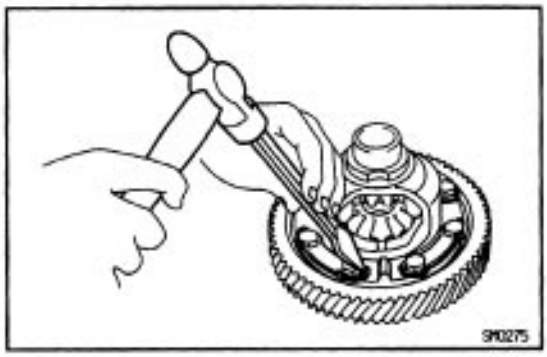
SST 09950–00020, 09950–00030

(b) Remove the speed sensor drive gear.

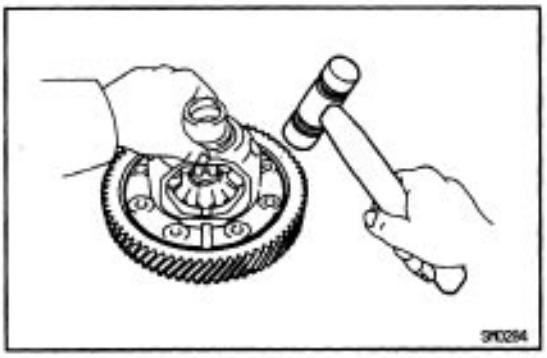


2. REMOVE RING GEAR

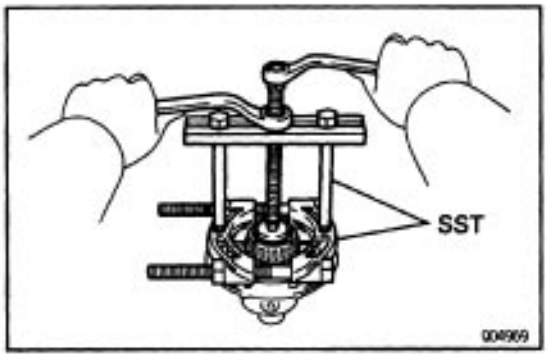
(a) Place matchmarks on the ring gear and the case.



(b) Using a chisel and hammer, unstake the lock plates.
(c) Remove the 8 bolts and 4 lock plates.

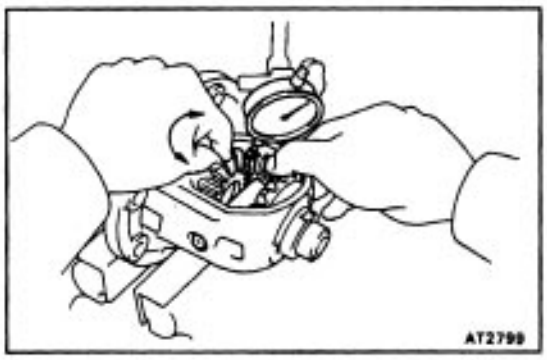


(d) Using a copper hammer, tap on the ring gear to remove it from the case.



3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE (RING GEAR SIDE)

Using SST, remove the bearing from ring gear of side of the case.
SST 09950–00020, 09950–00030



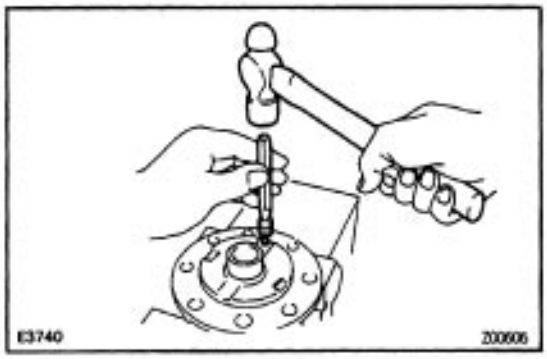
4. INSPECT SIDE GEAR BACKLASH

Using a dial indicator, measure the backlash of one side gear while holding one pinion toward the case.

Standard backlash:

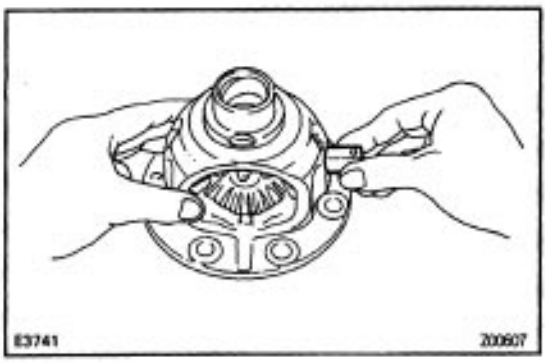
0.05–0.20 mm (0.0020–0.0079 In.)

If the backlash does not meet specification, install the correct thrust washer to the side gears.

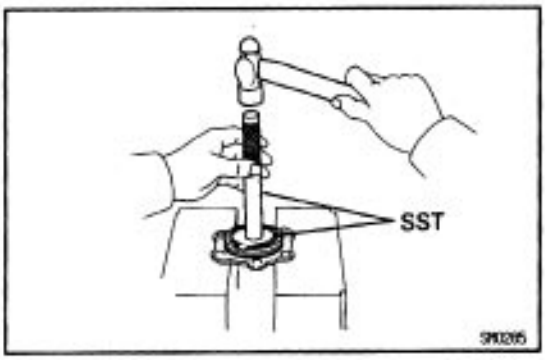


6. DISASSEMBLY DIFFERENTIAL CASE

(a) Using a pin punch and hammer, drive out the straight pin.

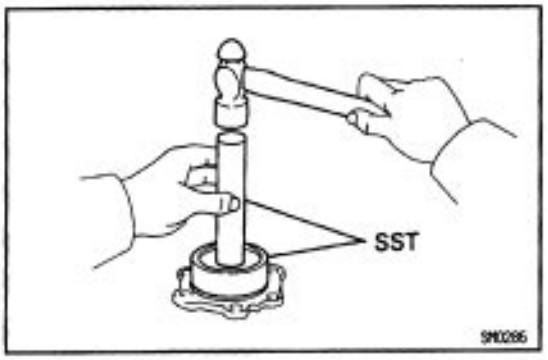


(b) Remove the pinion shaft from the case.
(c) Remove the 2 pinions and 2 side gears with the 4 thrust washers from each gear.

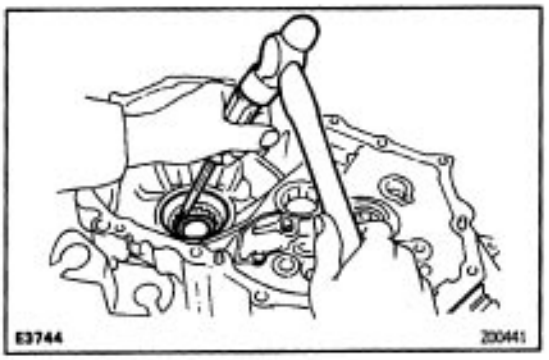


6. TRANSMISSION CASE SIDE:
IF NECESSARY, REPLACE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

(a) Using SST and a hammer, drive out the oil seal from the retainer.
SST 09608–20012 (09608–03020, 09608–03060)

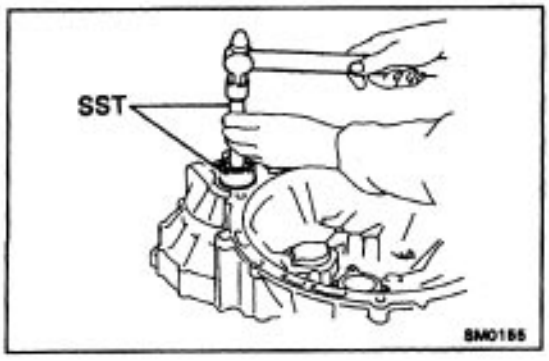


(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the case surface.
SST 09350–32014 (09351–32130, 09351–32150)
(c) Coat the lip of the oil seal with MP grease.

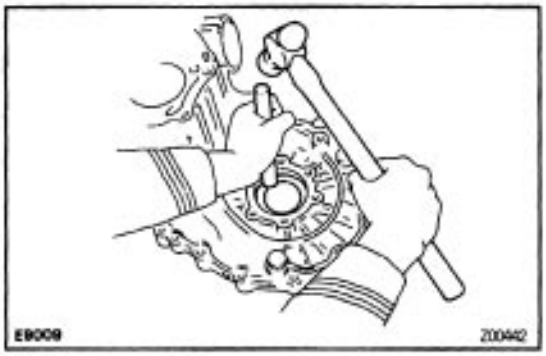


7. TRANSAXLE CASE SIDE:
IF NECESSARY, REPLACE SIDE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



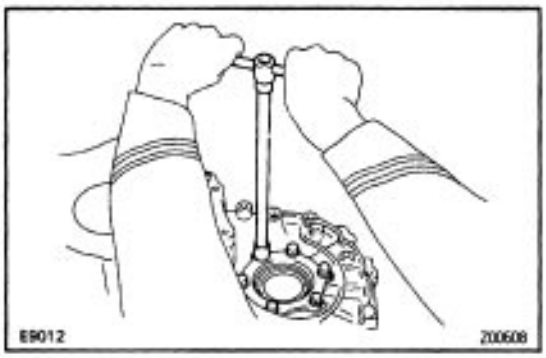
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the case surface.
SST 09350–32014 (09351–32130, 09351–32150)
(c) Coat the lip of oil seal with MP grease.



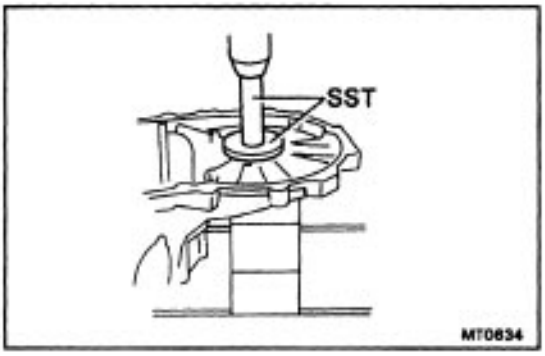
8. TRANSMISSION CASE SIDE:

IF NECESSARY, REPLACE SIDE BEARING OUTER RACE

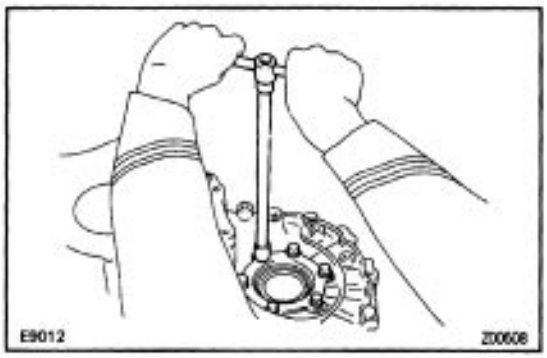
(a) Using a brass bar and hammer, drive out the bearing outer race.



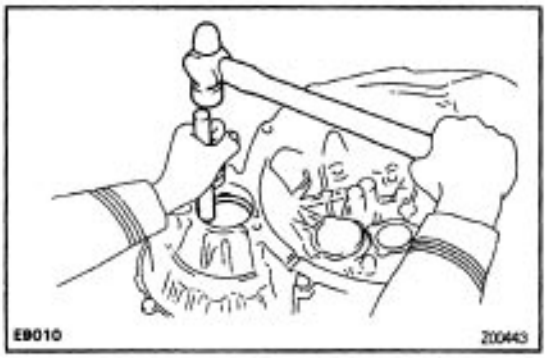
(b) Install the bearing retainer without an O–ring.
(c) Install and torque the bearing retainer bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



(d) Place the thinnest shim into the case.
(e) Using SST and a press, install a new bearing outer race.
SST 09608–20012 (09608–03020, 09608–03060)



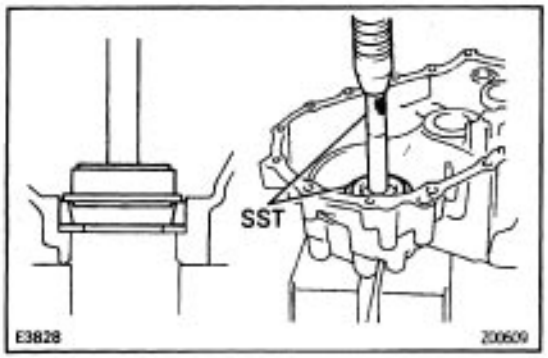
(f) Remove the retainer bolts.
(g) Remove the bearing retainer and shim.



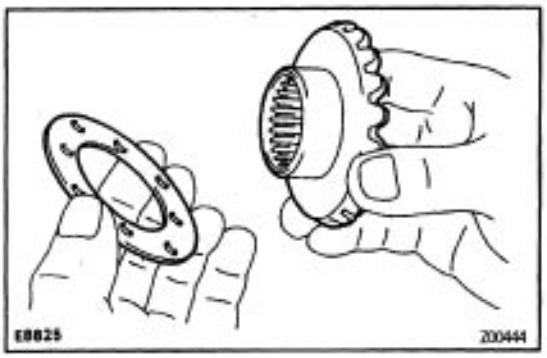
9. TRANSAXLE CASE SIDE:

IF NECESSARY, REPLACE SIDE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race and shim.



(b) Place the shim into the case.
(c) Using SST and a press, install a new bearing outer race.
SST 09608–20012 (09608–03020, 09608–03060)



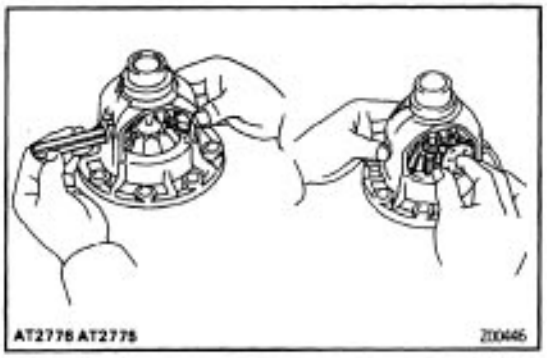
DIFFERENTIAL CASE ASSEMBLY (See page MX–53)

1. ASSEMBLY DIFFERENTIAL CASE

(a) Install the correct thrust washers and side gears. Referring to the table below, select thrust washers which will ensure that the backlash is within specification. Try to select washers of the same size for both sides.

Standard backlash:

0.05–0.20 mm (0.0020–0.0079 in.)

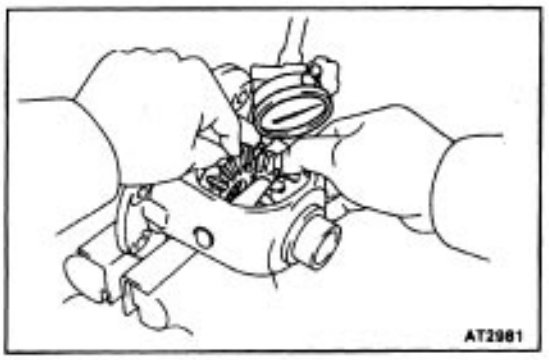


Thickness mm (in.)	Thickness mm (in.)
0.95 (0.0374)	1.10 (0.0433)
1.00 (0.0394)	1.15 (0.0453)
1.05 (0.0413)	1.20 (0.0472)

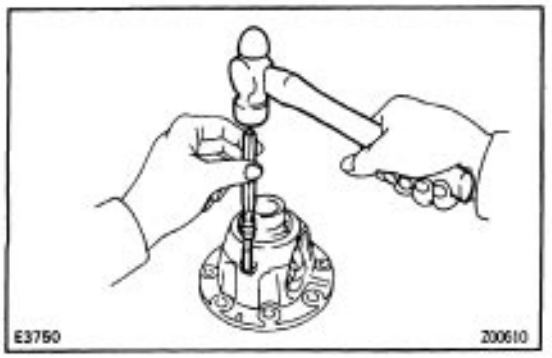
Install the thrust washers and side gears in the differential case.
(b) Install the pinion shaft.
(c) Inspect the side gear backlash.
Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:

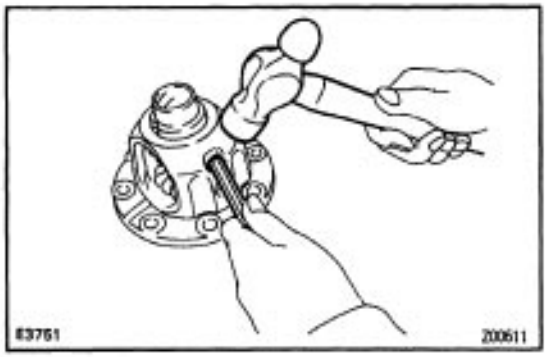
0.05–0.20 mm (0.0020–0.0079 in.)



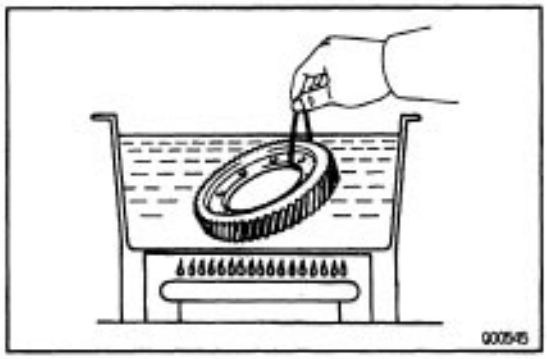
If the backlash is not within specification, install a thrust washer of different thickness.



(d) Using a pin punch and hammer, drive in the straight pin through the case and hole in the pinion shaft.



(a) Stake the differential case.



2. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surface of the differential case and the threads of the ring gear and differential case.
(b) Heat the ring gear in boiling water.
(c) Carefully remove the ring gear from the water.
(d) After moisture on the ring gear has completely evapo–rated, quickly install the ring gear to the differential case.

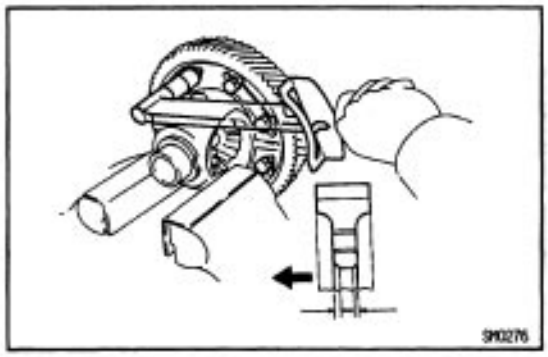
HINT: Align the matchmarks on the differential case and contact the ring gear.

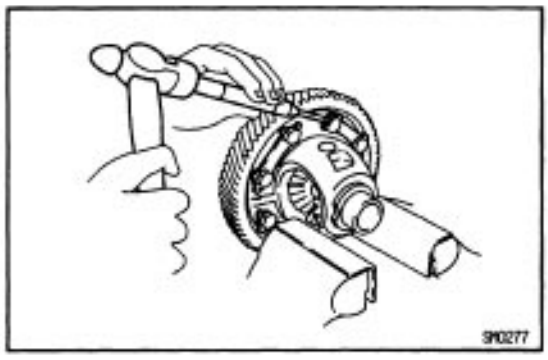
(e) Temporarily install the 8 bolts and 4 lock plates.

NOTICE: The ring gear set bolts should not be torqued until the ring gear has cooled sufficiently.

(f) After the ring gear has cooled sufficiently, torque the ring gear set bolts.

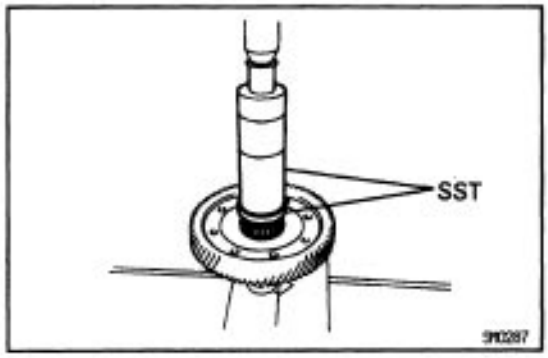
Torque: 90 N–m (920 kgf–cm, 67 ft–lbf)





(g) Using a pin punch and hammer, stake the lock plates.

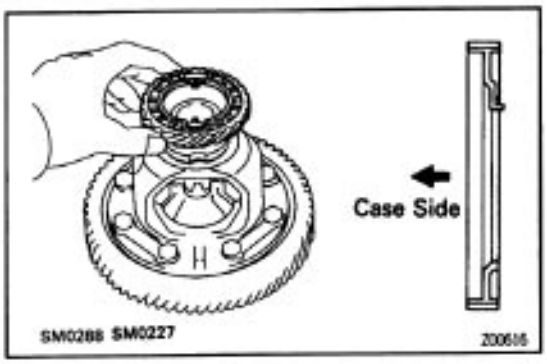
HINT: Stake one claw flush with the flat surface of the bolt. For the claw contacting the protruding portion of the bolt, stake only the tightened side.



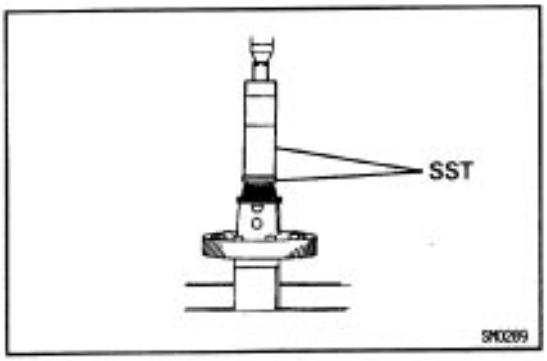
3. INSTALL SIDE BEARING TO DIFFERENTIAL CASE

(a) Using SST and a press, install the side bearing to the transmission case side.

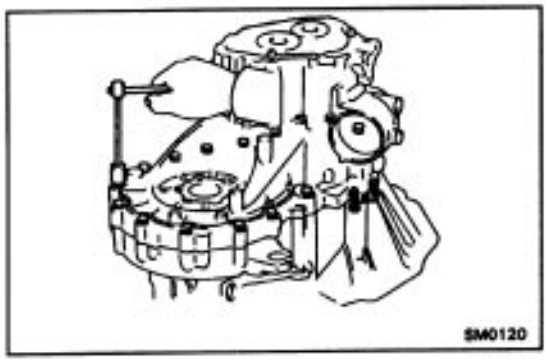
SST 09316–60010 (09316–00010)
09350–32014 (09351–32120)



(b) Install the speed sensor drive gear to the transaxle case side.

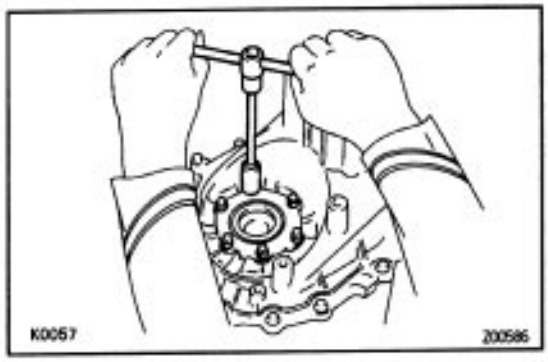


(c) Using SST and a press, install the side bearing to the transaxle case side.
SST 09316–60010 (09316–00010)
09350–32014 (09351–32120)
NOTICE: Install the black cage bearing on the speed sensor drive gear side.

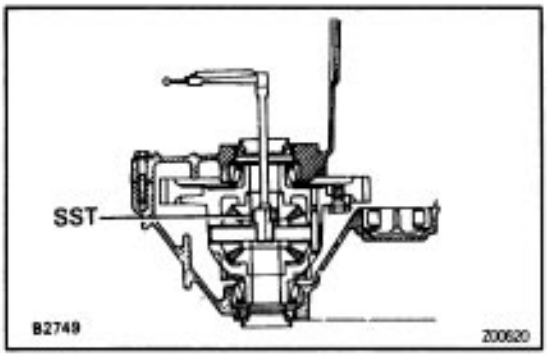


4. ADJUST DIFFERENTIAL CASE SIDE BEARING PRE–LOAD

(a) Install the differential to the transaxle case.
(b) Install the transmission case.
(c) Install and torque the case bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

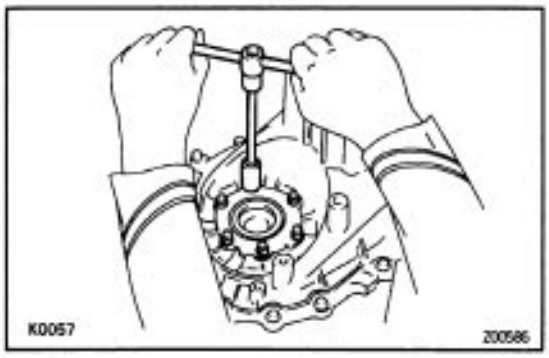


(d) Install the shim into the transmission case.
(e) Install the bearing retainer without an O–ring.
(f) Install and torque the retainer bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

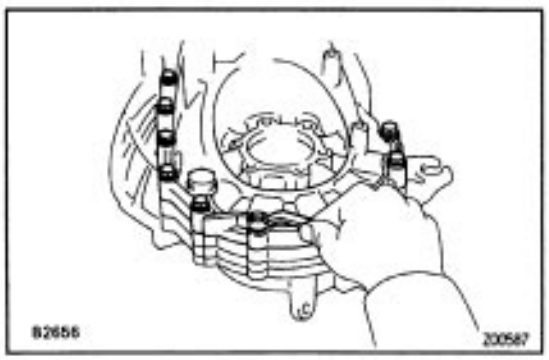


(g) Using SST and torque meter, measure the preload.
SST 09564–32011
Preload (at starting):
0.8–1.6 N–m (8–16 kgf–cm,6.9–13.9 in.–lbf)
If the preload is not within specification, remove the transmission case side bearing retainer.
Select another shim.
HINT: The preload will change about 0.3–0.4 N–m (3–4 kgf–cm, 2.6–3.5 in.–lbf) with each shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	1.90 (0.0748)	11	2.40 (0.0945)
2	1.95 (0.0768)	12	2.45 (0.0965)
3	2.00 (0.0787)	13	2.50 (0.0984)
4	2.05 (0.0807)	14	2.55 (0.1004)
5	2.10 (0.0827)	15	2.60 (0.1024)
6	2.15 (0.0846)	16	2.65 (0.1043)
7	2.20 (0.0866)	17	2.70 (0.1063)
8	2.25 (0.0886)	18	2.75 (0.1083)
9	2.30 (0.0906)	19	2.80 (0.1102)
10	2.35 (0.0925)		



(h) Remove the retainer bolts.
(i) Remove the bearing retainer and shim.



(j) Remove the case bolts.
(k) Remove the transmission case.

COMPONENT PARTS INSTALLATION

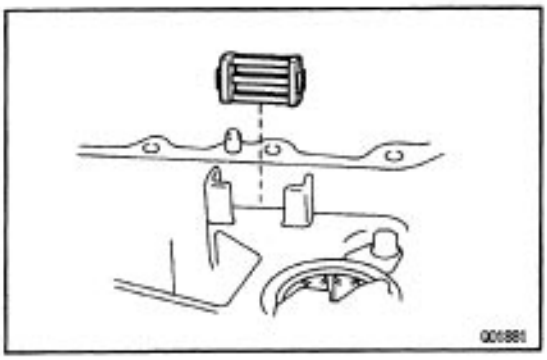
BASIC SUBASSEMBLY REASSEMBLY

(See page MX–20 and MX–21)

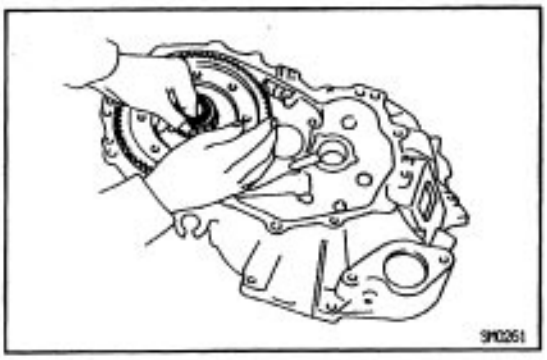
HINT: Coat all of the sliding and rotating surface with gear oil before assembly.

1. INSPECT DIFFERENTIAL SIDE BEARING PRELOAD

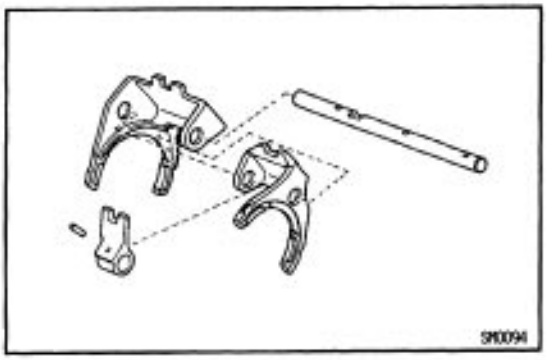
(See step 4 on page MX–59)



2. INSTALL MAGNET TO TRANSAXLE CASE

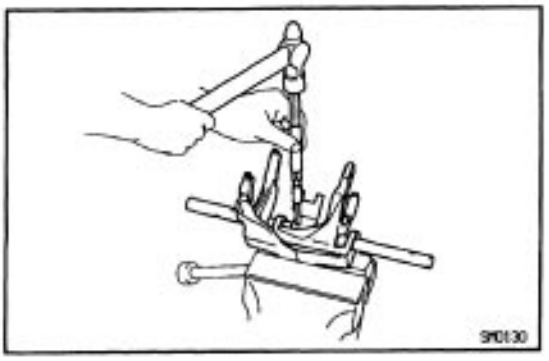


3. INSTALL DIFFERENTIAL CASE ASSEMBLY



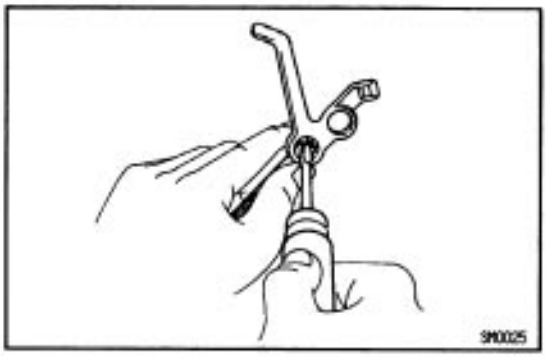
4. . ASSEMBLE NO.1 SHIFT FORK SHAFT, NO.1 SHIFT HEAD, NO.1 AND NO.2 SHIFT FORKS

(a) Assemble the No.1 shift fork shaft, No.1 shift head, No.1 and No.2 shift forks.



(b) Mount the shift forks to the vise.

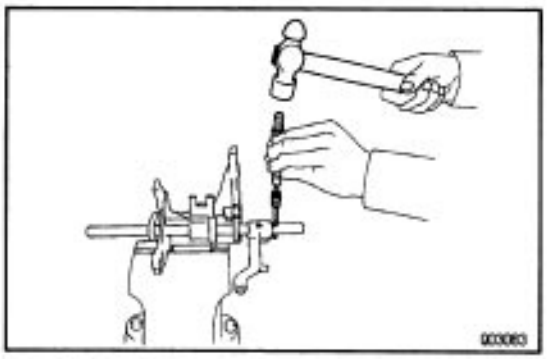
(c) Using a pin punch and hammer, drive in the slotted spring pin to the No.1 fork shaft as shown in the figure.



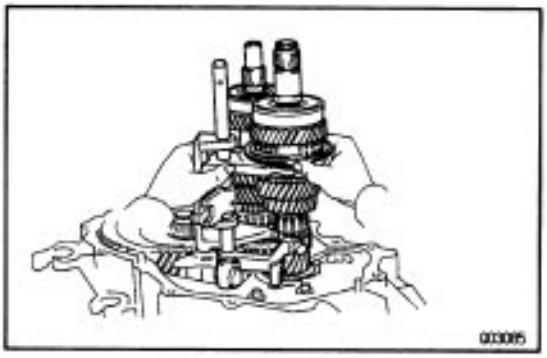
(d) Coat the interlock pin with MP grease.
(e) Using a screwdriver, install the interlock pin into the reverse shift fork hole.
(f) Install the reverse shift fork to the No.1 shift fork shaft.

HINT: When installing the reverse shift fork with inter–lock pin to the No.1 shift fork shaft, make sure the interlock pin does not drop out.

NOTICE: Be careful not to damage the bushing.

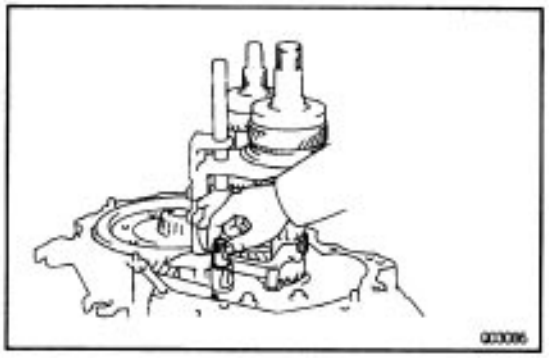


(g) Using a pin punch and hammer, drive in the slotted spring pin to the No.1 fork shaft.



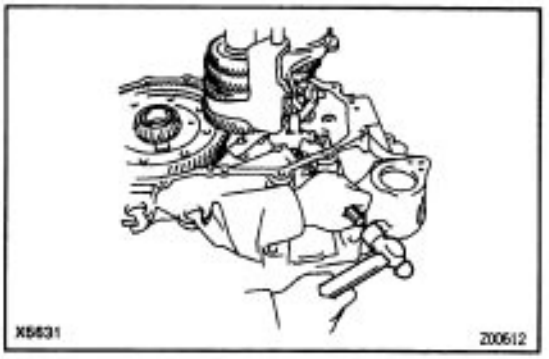
5. INSTALL NO.1 SHIFT FORK SHAFT, NO.1 SHIFT HEAD, NO.1, NO.2 SHIFT FORKS, REVERSE SHIFT FORK WITH INTERLOCK PIN, INPUT AND OUTPUT SHAFT ASSEMBLY

Install the input and output shaft assembly together with the No.1 fork shaft, shift head and shift forks with the interlock pin to the transaxle case.

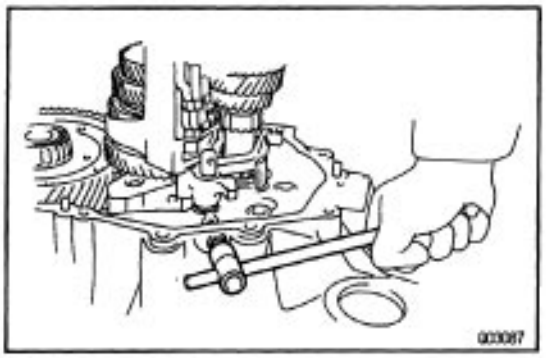


6. INSTALL NO.2 FORK SHAFT

(a) Install the No.2 fork shaft to the transaxle case thr–ough the reverse shift fork.



(b) Using a pin punch and hammer, drive in the slotted spring pin.



(c) Apply sealant to the plug threads.

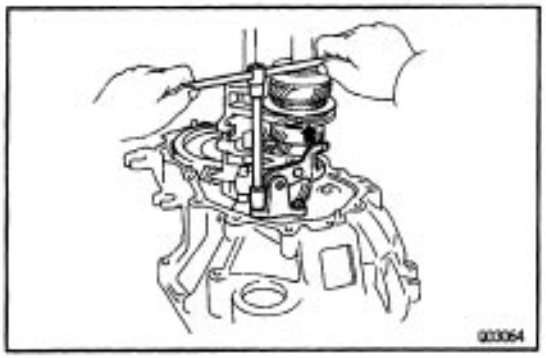
Sealant:

Part No.08833 – 00080. THREE BOND 1344, LOC–TITE 242 or equivalent

(d) Using a hexagon wrench, install the straight screw plug.

Torque: 13 N–m (130 k9f¿cm, 9 ft–lbf)

7. INSTALL REVERSE SHIFT ARM



(a) Put the reverse shift fork pivot into the reverse shift arm and install the reverse shift arm to the transaxle case.

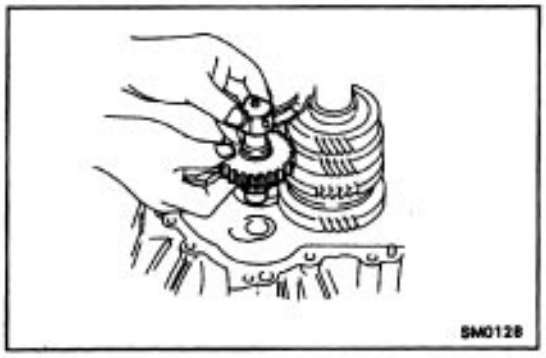
(b) Shift the reverse shift arm into the reverse.

(c) Install and torque the 2 bolts.

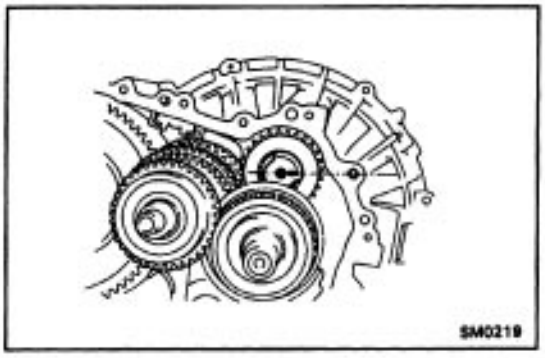
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

(d) Shift the reverse shift arm to the neutral position.

8. INSTALL REVERSE IDLER GEAR AND SHAFT

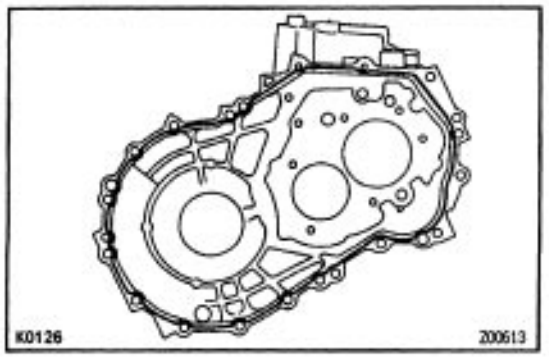


(a) Install the washer and reverse idler gear to the shaft.



(b) Install the reverse idler gear and shaft as shown.

9. INSTALL TRANSMISSION CASE

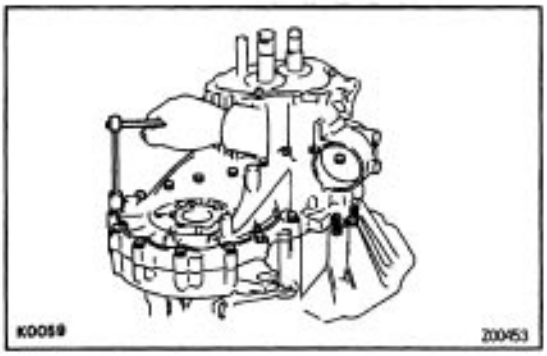


(a) Remove any FIPG material and be careful not to drop oil on the contacting surface of the transaxle case or transmission case.

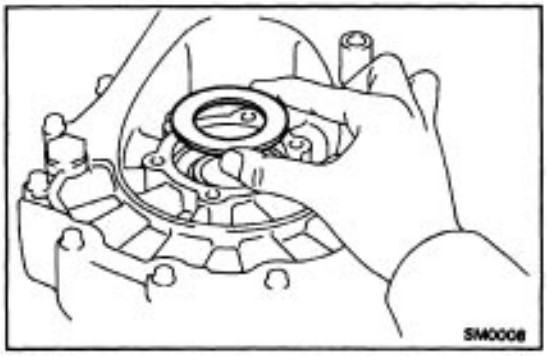
(b) Apply FIPG to the transmission case as shown.

FIPG:

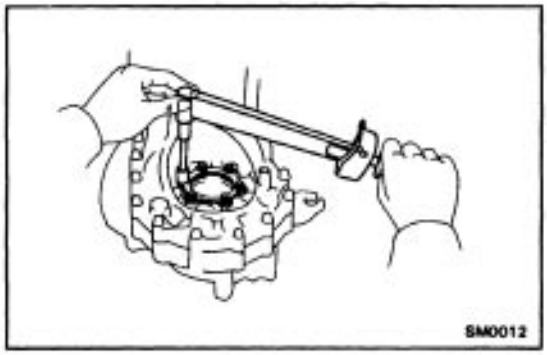
Part No.08833–00090, THREE BOND 1281 or equivalent



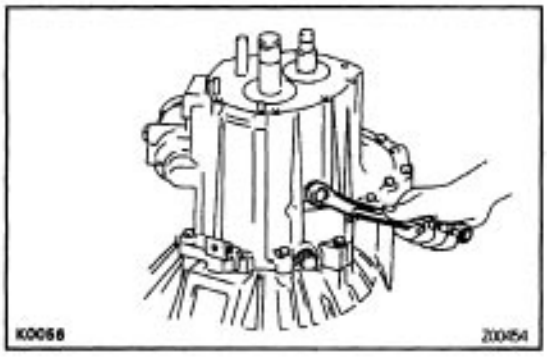
(c) Install and torque the 17 bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



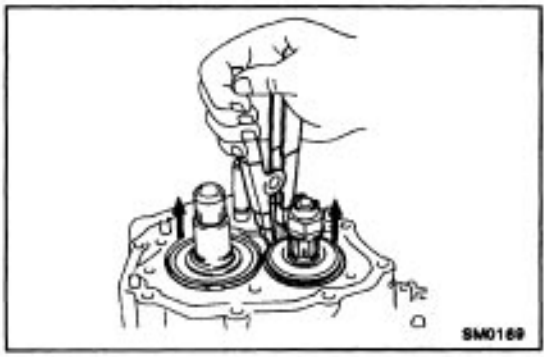
10. INSTALL SHIM AND SIDE BEARING RETAINER WITH O–RING
(a) Install a new O–ring on the retainer.
(b) Instal) the shim and retainer.



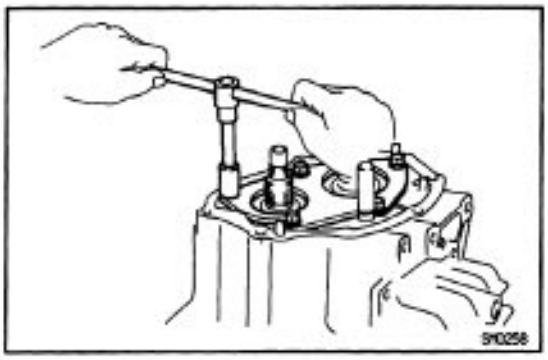
(c) Apply sealant to the bolt threads.
Sealant:
Part No.08833–00080, THREE BOND 1344, LOC–TITE 242 or equivalent
(d) Install and torque the 6 bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



11. INSTALL AND TORQUE REVERSE IDLER GEAR SHAFT LOCK BOLT
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



12. INSTALL BEARING SNAP RINGS
Using a snap ring expander, install the 2 snap rings.
HINT: If it is difficult to install the snap ring, pull up the shafts.



13. INSTALL REAR BEARING RETAINER

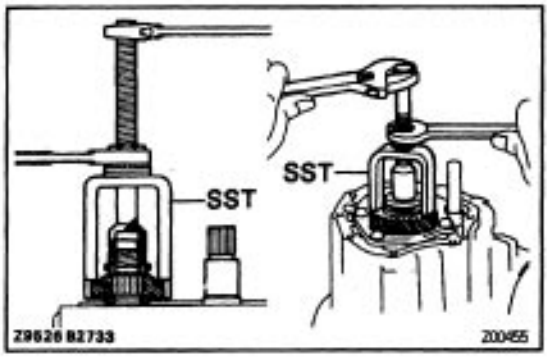
(a) Apply sealant to the bolt threads.

Sealant:

Part No.08833–00070, THREE BOND 1324 or equivalent

(b) Install and torque the 5 bolts.

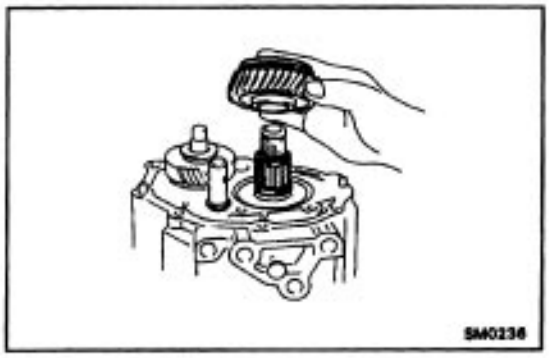
Torque: 42 N–m (430 kgf–cm, 31 ft–lbf)



14. INSTALL 5TH DRIVEN GEAR

Using SST, install the 5th driven gear.

SST 09309–12020

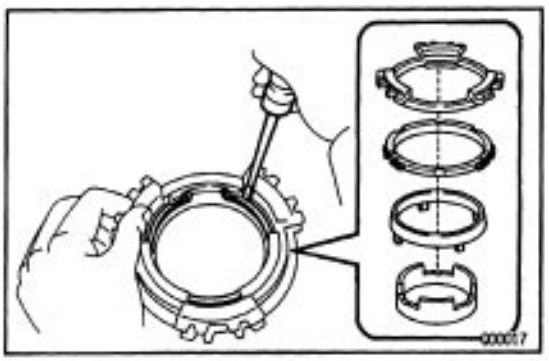


15. INSTALL SPACER, NEEDLE ROLLER BEARINGS, 5TH GEAR AND SYNCHRONIZER RING

(a) Install the spacer.

(b) Apply gear oil to the needle roller bearings.

(c) Install the 5th gear with the needle roller bearings and synchronizer ring.

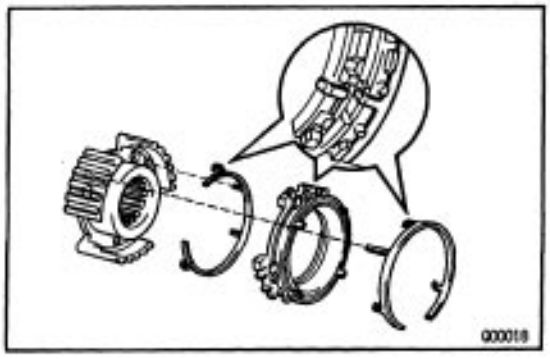


16. INSTALL NO.5 SYNCHRONIZER RINGS WITH KEY SPRING TO NO.3 CLUTCH HUB

(a) Assemble the No.5 synchronizer rings.

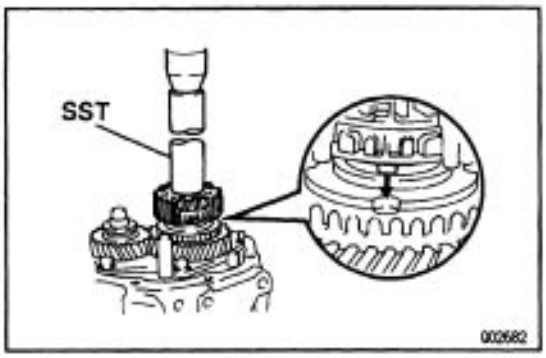
(b) Using a screwdriver, install the snap ring.

HINT: Wrap vinyl tape on the screwdriver to prevent damaging the synchronizer ring.



(c) Install the No.5 synchronizer rings with key springs to the No.3 clutch hub.

HINT: Align the holes of the clutch hub with key spring.

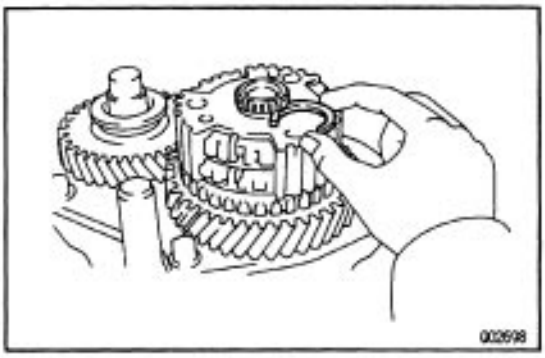


17. INSTALL N0.3 CLUTCH HUB

Using SST and a press, install the No.3 clutch hub assembly.

SST 09612–22011

NOTICE: Align the holes of the 5th gear and synchronizer ring.

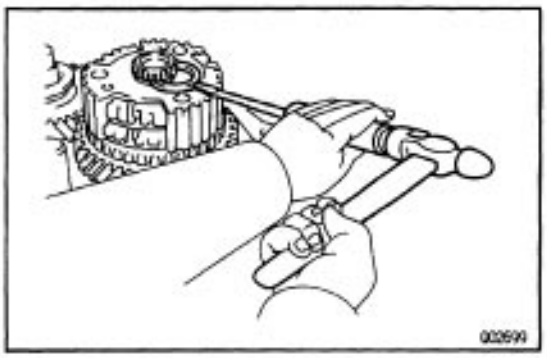


18. INSTALL SHIFTING KEY RETAINER AND SNAP RING

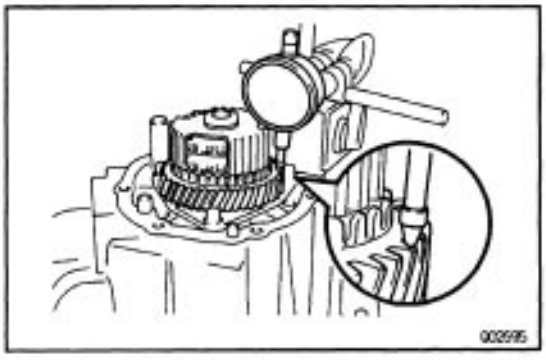
(a) Install the retainer.

(b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
13	2.20–2.25 (0.0866–0.0886)	21	2.60–2.65 (0.1024–0.1043)
14	2.25–2.30 (0.0886–0.0906)	22	2.65–2.70 (0.1043–0.1063)
15	2.30–2.35 (0.0906–0.0925)	23	2.70–2.75 (0.1063–0.1083)
16	2.35–2.40 (0.0925–0.0945)	24	2.75–2.80 (0.1083–0.1102)
17	2.40–2.45 (0.0945–0.0965)	25	2.80–2.85 (0.1102–0.1122)
18	2.45–2.50 (0.0965–0.0984)	26	2.85–2.90 (0.1122–0.1142)
19	2.50–2.55 (0.0984–0.1004)	27	2.90–2.95 (0.1142–0.1161)
20	2.55–2.60 (0.1004–0.1024)		



(c) Using a screwdriver and hammer, tap in the snap ring.

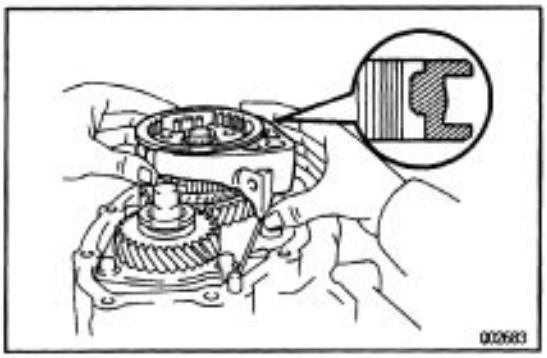


19. INSPECT 6TH GEAR THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance.

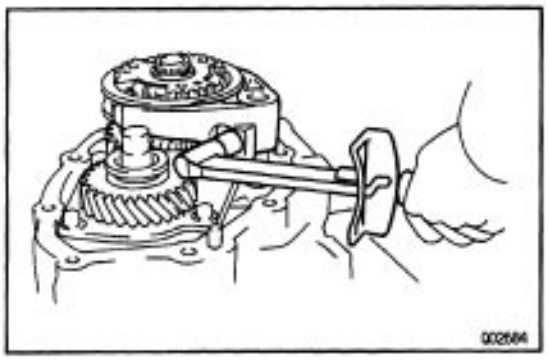
Standard clearance:

0.20–0.40 mm (0.0079–0.0157 in.)



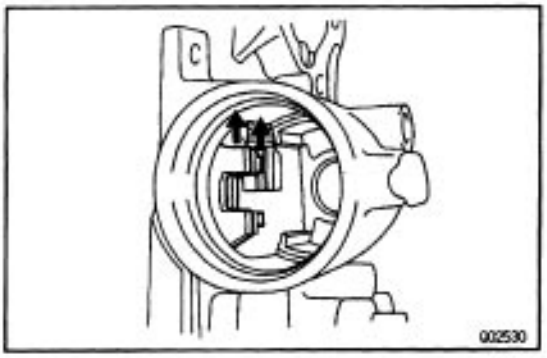
20. INSTALL NO. 3 HUB SLEEVE WITH NO. 3 SHIFT FORK

(a) Install No.3 hub sleeve with No.3 shift fork to the No.3 clutch hub.



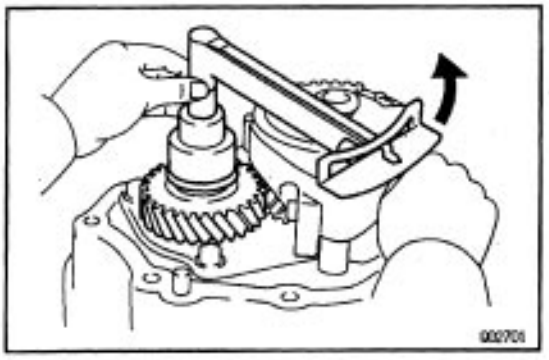
(b) Install and torque the set bolt.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



21. INSTALL OUTPUT SHAFT LOCK NUT

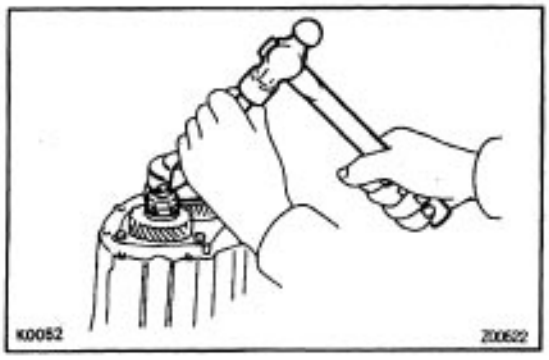
(a) Engage the gear double meshing.



(b) Install and torque the new lock nut.

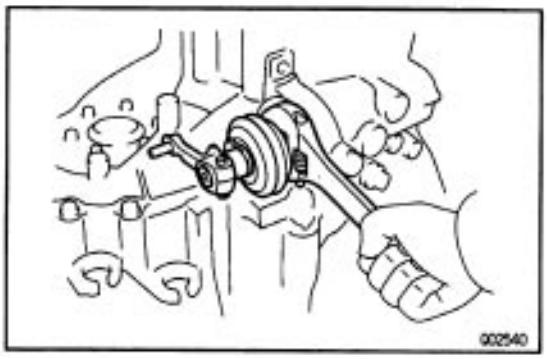
Torque: 123 N–m (1,250 kgf–cm. 90 ft–lbf)

HINT: The lock nut has LH threads.



(c) Stake the lock nut.

(d) Disengage the gear double meshing.



22. INSTALL SHIFT AND SELECT LEVER ASSEMBLY

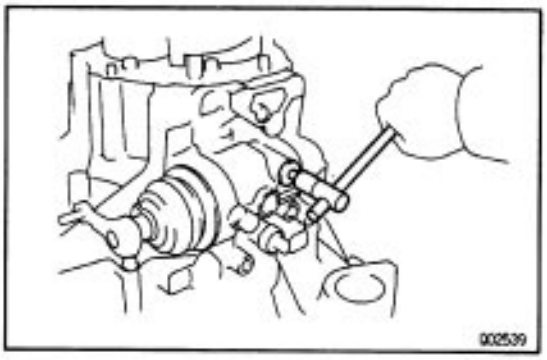
(a) Apply FIPG to the underside of the flanged portion of the control shaft cover.

FIPG:

Part No.08826–00090. THREE BOND 1281 or equivalent

(b) Install the shift and select lever assembly and torque the control shaft cover.

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



23. INSTALL PLUG

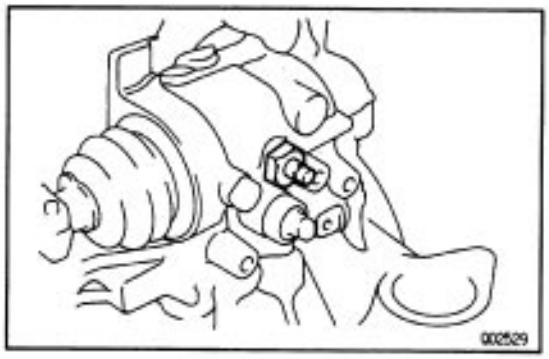
(a) Apply sealant to plug threads.

Sealant:

Part No.08833–00080. THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using a hexagon wrench, install and torque the plug.

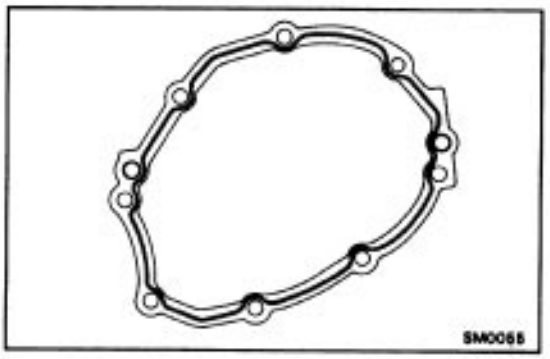
Torque: 23 N–m (230 kgf–cm, 17 ft–lbf)



24. INSTALL LOCK BALL

Install and torque the No.1 lock ball.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



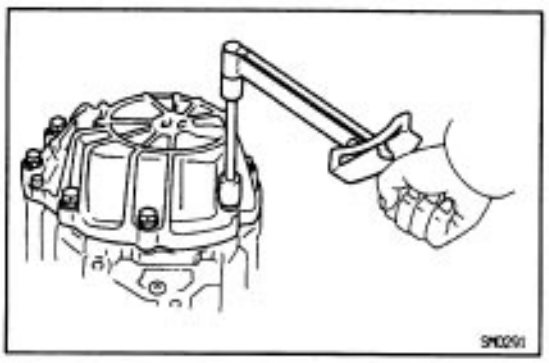
25. INSTALL TRANSMISSION CASE COVER

(a) Remove the FIPG material and be careful not to drop oil on the contacting surface of the transmission case or tranmission case cover.

(b) Apply FIPG to the transmission case cover as shown.

FIPG:

Part No.08826–00090, THREE BOND 1281 or equivalent



(c) Install the transmission case cover.

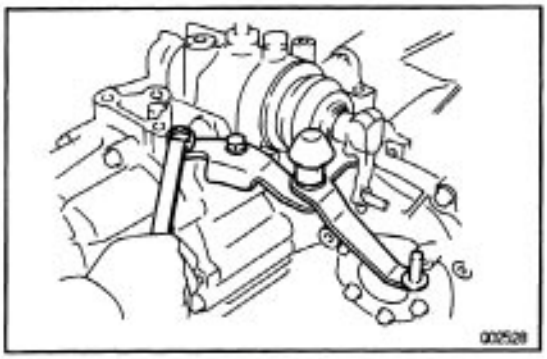
(d) Apply sealant to the bolt threads.

Sealant:

Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(e) Install and torque the 8 bolts.

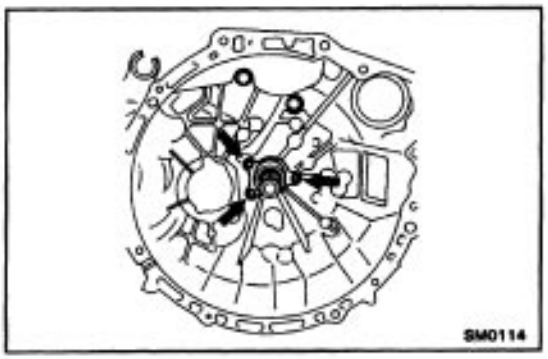
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



26. INSTALL SELECTING BELLCRANK AND ENGINE MOUNT BRACKET

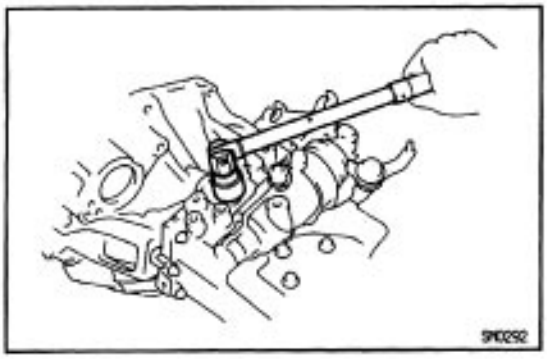
(a) Install the selecting bellcrank and 2 bolts.
Torque: 37 N–m (380 kgf–cm. 27 ft–lbf)

(b) Install the engine mount bracket and torque the 3 bolts.
Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



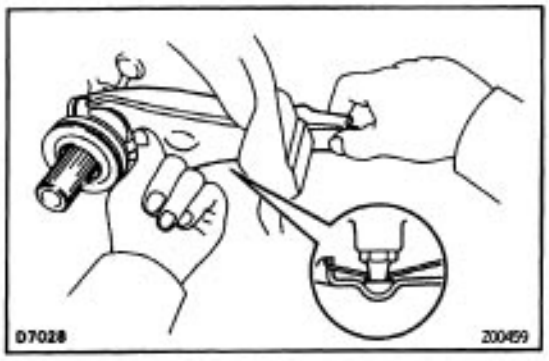
27. INSTALL RELEASE BEARING RETAINER

Install the release bearing retainer and torque the 3 bolts.
Torque: 7.4 N–m (75 kgf–cm, 65 in.¿lbf)



28. INSTALL BACK–UP LIGHT SWITCH
Torque: 44 N–m 1450 kgf–cm, 33 ft.–lbf

29. INSTALL VEHICLE SPEED SENSOR



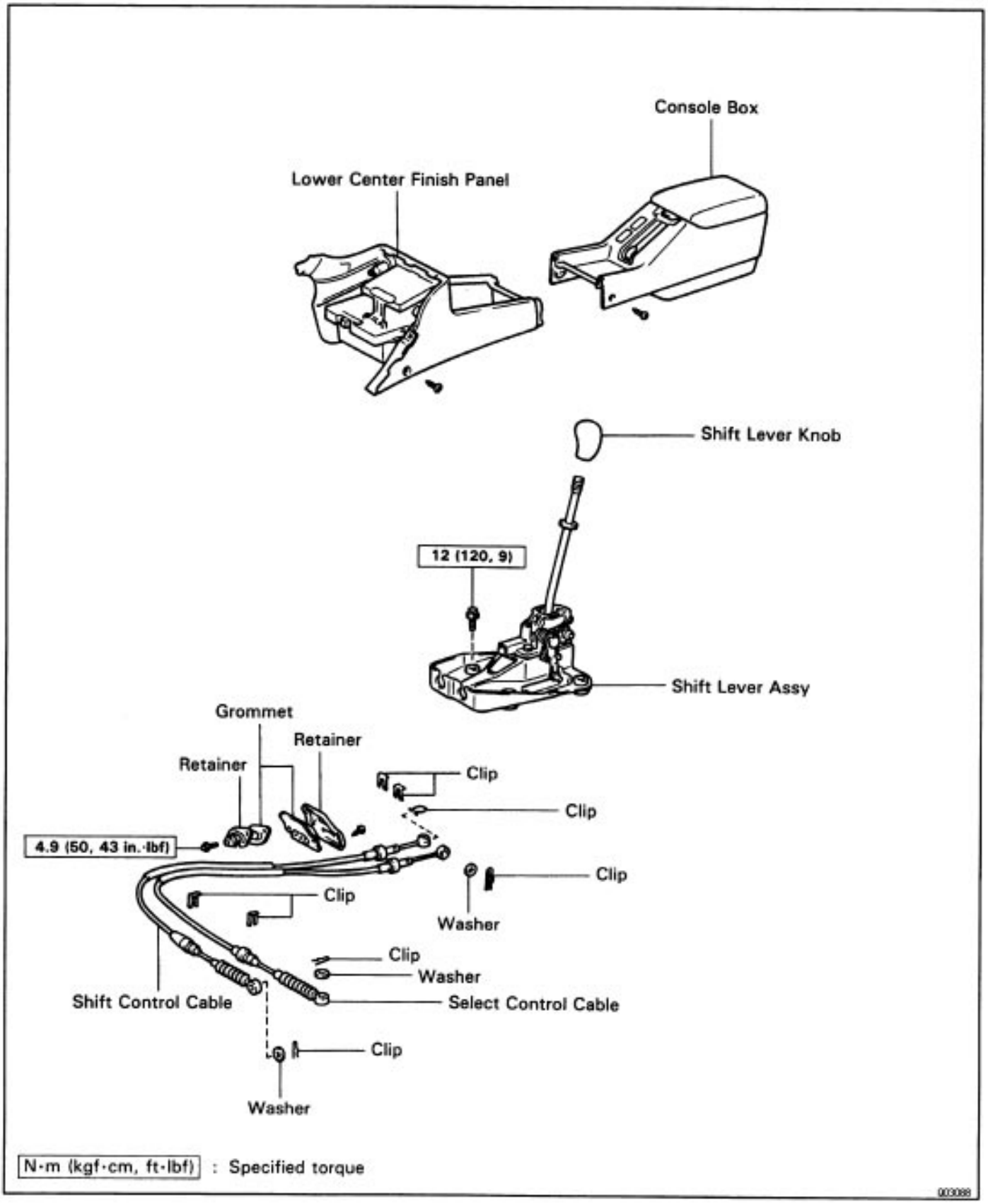
30. INSTALL RELEASE FORK AND BEARING

(a) Apply molybdenum disulphide lithium base grease to the following parts:
- Input shaft spline
- Release fork contact surface

(b) Apply MP grease to the front surface of the release bearing.

SHIFT LEVER AND CONTROL CABLE

COMPONENTS



SERVICE SPECIFICATIONS

SERVICE DATA

Input shaft	
Roller bearing journal diameter	
Limit	29.970 mm (1.1799 in.)
3rd gear journal diameter	
Limit	33.090 mm (1.3028 in.)
4th gear journal diameter	
Limit	32.470 mm (1.2783 in.)
5th gear journal diameter	
Limit	26.970 mm (1.0618 in.)
Runout	
Limit	0.05 mm (0.0020 in.)
Output shaft	
Roller bearing journal diameter	
Limit	31.970 mm (1.2587 in.)
1 st gear journal diameter	
Limit	37.970 mm (1.4949 in.)
2nd gear journal diameter	
Limit	31.990 mm (1.2594 in.)
Runout	
Limit	0.05 mm (0.0020 in.)
Gear thrust clearance 1 st	
STD	0.10–0.29 mm (0.0039–0.0114 in.)
Limit	0.35 mm (0.0138 in.)
Gear thrust clearance 2nd	
STD	0.20–0.44 mm (0.0079–0.0173 in.)
Limit	0.50 mm (0.0197 in.)
Gear thrust clearance 3rd	
STD	0.10–0.25 mm (0.0039–0.0098 in.)
Limit	0.30 mm (0.0118 in.)
Gear thrust clearance 4th	
STD	0.20–0.45 mm (0.0079–0.0177 in.)
Limit	0.50 mm (0.0197 in.)
Gear thrust clearance 5th	
STD	0.20–0.40 mm (0.0079–0.0157 in.)
Limit	0.45 mm (0.0177 in.)
Gear radial clearance 1 st, 2nd, 3rd and 4th	
STD	0.009–0.053 mm (0.0004–0.0021 in.)
Limit	0.070 mm (0.0028 in.)
Gear radial clearance 5th	
STD	0.009–0.050 mm (0.0004–0.0020 in.)
Limit	0.070 mm (0.0028 in.)
Shift fork to hub sleeve clearance	
Limit	1.0 mm (0.039 in.)
Synchronizer ring to gear clearance 1 at, 3rd and 4th	
Limit	0.6 mm (0.024 in.)

Synchronizer ring to gear clearance 2nd		
Limit		0.7 mm (0.028 in.)
Input shaft snap ring thickness		
No.2 clutch hub	Mark 1	1.95 – 2.00 mm (0.0768 – 0.0787 in.)
No.2 clutch hub	Mark 2	2.00 – 2.05 mm (0.0787 – 0.0807 in.)
No.2 clutch hub	Mark 3	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
No.2 clutch hub	Mark 4	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
No.2 clutch hub	Mark 5	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
No.2 clutch hub	Mark 6	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
No.3 clutch hub	Mark 13	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
No.3 clutch hub	Mark 14	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
No.3 clutch hub	Mark 15	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
No.3 clutch hub	Mark 16	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
No.3 clutch hub	Mark 17	2.40 – 2.45 mm (0.0945 – 0.0965 in.)
No.3 clutch hub	Mark 18	2.45 – 2.50 mm (0.0965 – 0.0984 in.)
No.3 clutch hub	Mark 19	2.50 – 2.55 mm (0.0984 – 0.1004 in.)
No.3 clutch hub	Mark 20	2.55 – 2.60 mm (0.1004 – 0.1024 in.)
No.3 clutch hub	Mark 21	2.60 – 2.65 mm (0.1024 – 0.1043 in.)
No.3 clutch hub	Mark 22	2.65 – 2.70 mm (0.1043 – 0.1063 in.)
No.3 clutch hub	Mark 23	2.70 – 2.75 mm (0.1063 – 0.1083 in.)
No.3 clutch hub	Mark 24	2.75 – 2.80 mm (0.1083 – 0.1102 in.)
No.3 clutch hub	Mark 25	2.80 – 2.85 mm (0.1102 – 0.1122 in.)
No.3 clutch hub	Mark 26	2.85 – 2.90 mm (0.1122 – 0.1142 in.)
No.3 clutch hub	Mark 27	2.90 – 2.95 mm (0.1142 – 0.1161 in.)
Rear bearing		
	Mark A	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	Mark B	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	Mark C	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	Mark D	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	Mark E	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
Differential side bearing adjusting shim thickness		
	Mark 1	1.90 mm (0.0748 in.)
	Mark 2	1.95 mm (0.0768 in.)
	Mark 3	2.00 mm (0.0787 in.)
	Mark 4	2.05 mm (0.0807 in.)
	Mark 5	2.10 mm (0.0827 in.)
	Mark 6	2.15 mm (0.0846 in.)
	Mark 7	2.20 mm (0.0866 in.)
	Mark 8	2.25 mm (0.0886 in.)
	Mark 9	2.30 mm (0.0906 in.)
	Mark 10	2.35 mm (0.0925 in.)
	Mark 11	2.40 mm (0.0945 in.)
	Mark 12	2.45 mm (0.0965 in.)
	Mark 13	2.50 mm (0.0984 in.)
	Mark 14	2.55 mm (0.1004 in.)
	Mark 15	2.60 mm (0.1024 in.)
	Mark 16	2.65 mm (0.1043 in.)
	Mark 17	2.70 mm (0.1063 in.)

	Mark 18	2.75 mm (0.1083 in.)
	Mark 19	2.80 mm (0.1102 in.)
Shift lever preload adjusting shim thickness		
	Mark A	0.5 mm (0.020 in.)
	Mark B	0.6 mm (0.024 in.)
	Mark C	0.7 mm (0.028 in.)
	Mark D	0.8 mm (0.031 in.)
	Mark E	0.9 mm (0.035 in.)
	Mark F	1.0 mm (0.039 in.)
	Mark G	1.1 mm (0.043 in.)
	Mark H	1.2 mm (0.047 in.)
	Mark J	1.3 mm (0.051 in.)
	Mark K	1.4 mm (0.055 in.)
	Mark L	1.5 mm (0.059 in.)
	Mark M	1.6 mm (0.063 in.)
	Mark N	1.7 mm (0.067 in.)
Differential case side bearing preload (at starting)		0.8 – 1.6 N·m (8 – 16 kgf·cm, 6.9 – 13.9 in.·lbf)
Differential pinion to side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)
Differential side gear thrust washer thickness		
	None Mark	0.95 mm (0.0374 in.)
	None Mark	1.00 mm (0.0394 in.)
	None Mark	1.05 mm (0.0413 in.)
	None Mark	1.10 mm (0.0433 in.)
	None Mark	1.15 mm (0.0453 in.)
	None Mark	1.20 mm (0.0472 in.)

TORQUE SPECIFICATIONS

Part tightened	N-m	kgf-cm	ft-lbf
Transmission case x Transaxle case	29	300	22
Transmission case x Case cover	29	300	22
Transmission case protector	18	185	13
Rear bearing retainer	42	430	31
Output shaft front bearing lock plate	18	185	13
Input shaft oil receiver	7.4	75	65 in.-lbf
5th driven gear lock nut	123	1,250	90
Reverse idler shaft lock bolt	29	300	22
Control shaft cover	37	375	27
Control shift lever x lever shaft	6.4	65	56 in.-lbf
Ring gear x Differential case	90	920	67
Selecting bellcrank x Transmission case	37	380	27
Reverse shift arm bracket	18	185	13
No.3 shift fork x Shift fork shaft	18	185	13
Lock ball assembly	29	300	22
Plug	23	230	17
Filler plug	49	500	36
Drain plug	49	500	36
Back–up light switch	44	450	33
Side bearing retainer	18	185	13
Clutch release bearing retainer	7.4	75	65 in.-lbf
Straight screw plug (Shift fork shaft)	13	130	9
Straight screw plug (Reverse restrict pin)	13	130	9
Transaxle x Engine (12mm bolt)	64	650	47
Transaxle x Engine (l0 mm bolt)	46	470	34
Engine left mounting x Transmission case	52	530	38
Engine left mounting x Sub frame	80	820	59
Engine front mounting x Sub frame	80	820	59
Engine rear mounting x Sub frame	80	820	59
Sub frame x Body	181	1,850	134
Lower brace x Body (Bolt)	32	330	24
Lower brace x Body (Nut)	36	370	27
Exhaust front pipe x Catalytic converter	62	630	46
Exhaust front pipe x Exhaust center pipe	43	440	32
Stiffener plate x Clutch housing	37	380	27
Stiffener plate x Engine	37	380	27
Steering gear housing x Sub frame	181	1,850	134
Stabilizer bar bush bracket x Sub frame	19	195	14
Starter x Clutch housing	39	400	29
Clutch release cylinder x Clutch housing	13	130	9

A140E AUTOMATIC TRANSAXLE

DESCRIPTION

A700Y–01

PRECAUTIONS

When working with FIPG material, you must observe the following.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the FIPG in approx.1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

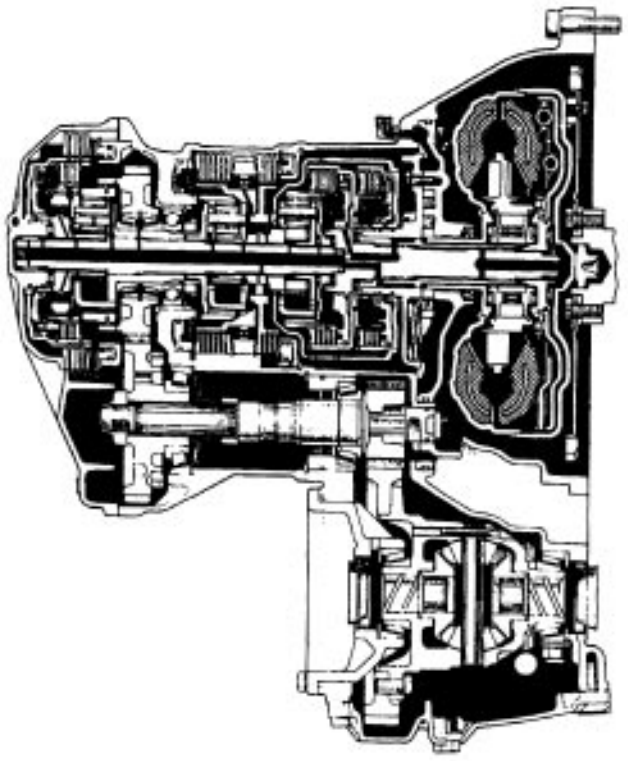
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

AX0CJ–02

GENERAL DESCRIPTION

The A140E Electronically Controlled automatic transaxle described in this AX section is a lock–up four–speed automatic transaxle developed exclusively for use with transversely–mounted engines.

Sectional View

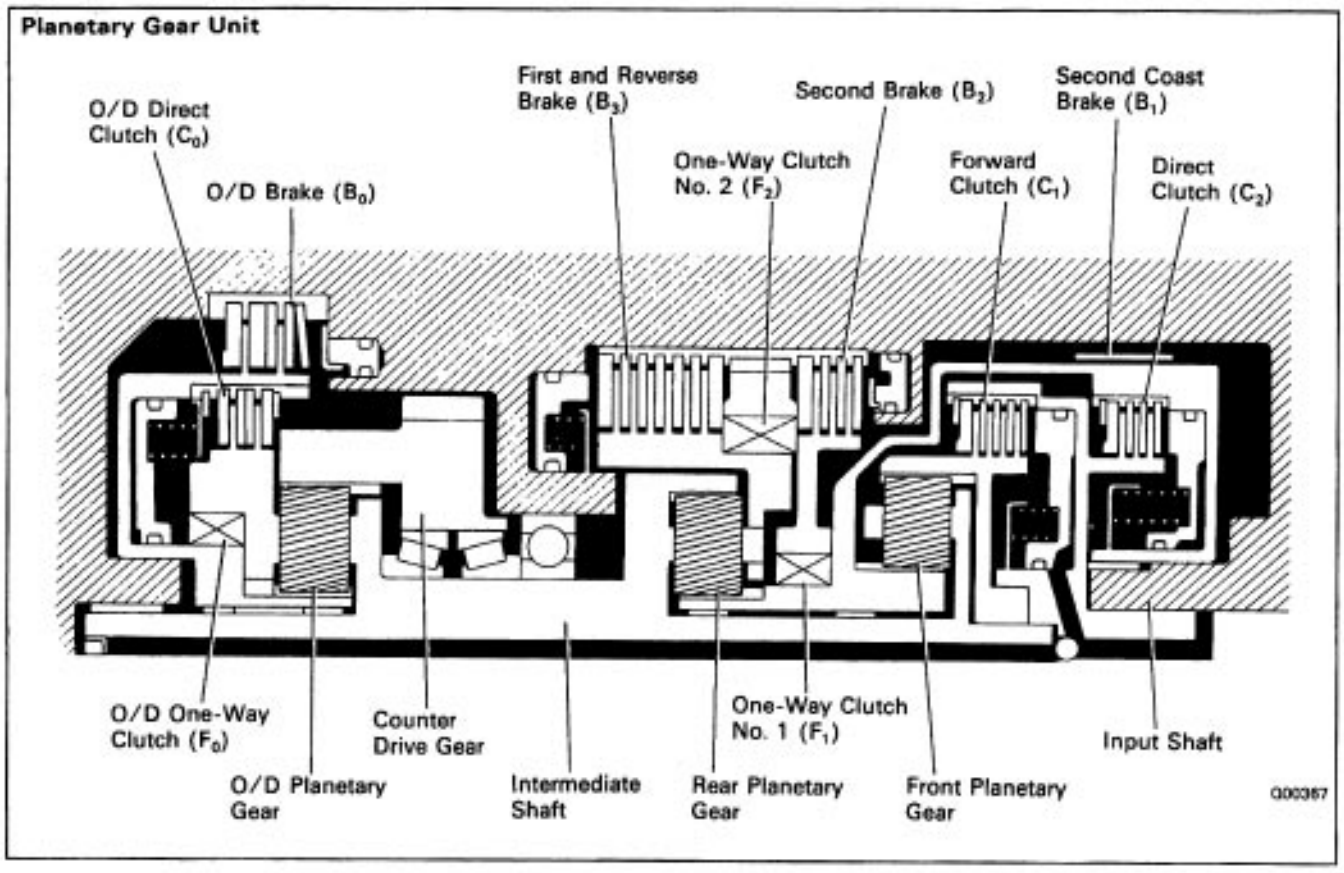


00490

SPECIFICATIONS

Type of Transaxle		A140E
Type of Engine		5S–FE
Torque Converter Clutch Stall Torque Ratio		2.0 : 1
Torque Converter Clutch Lock–up Mechanism		Equipped
Gear Ratio	1 st Gear	2.810
	2nd Gear	1.549
	3rd Gear	1.000
	0/D Gear	0.706
	Reverse Gear	2.296
Transaxle	Number of Discs / Plates	
	O/D Direct Clutch (Co)	2 / 1
	Forward Clutch (C,)	4 / 4
	Direct Clutch (Ct)	3 / 3
	2nd Brake (Bz)	3 / 3
	1 st & Reverse Brake (B,)	6 / 5
	O/D Brake (Bo)	2 / 3
2nd Coast Brake (B,) Band Width	mm (in.)	25 (0.98)
ATF Type		ATF DEXRON® II
Capacity liter (US qts, Imp.qts)	Total	5.6 (5.9, 4.9)
	Drain & Refill	1.6 (1.7, 1.4)

OPERATION



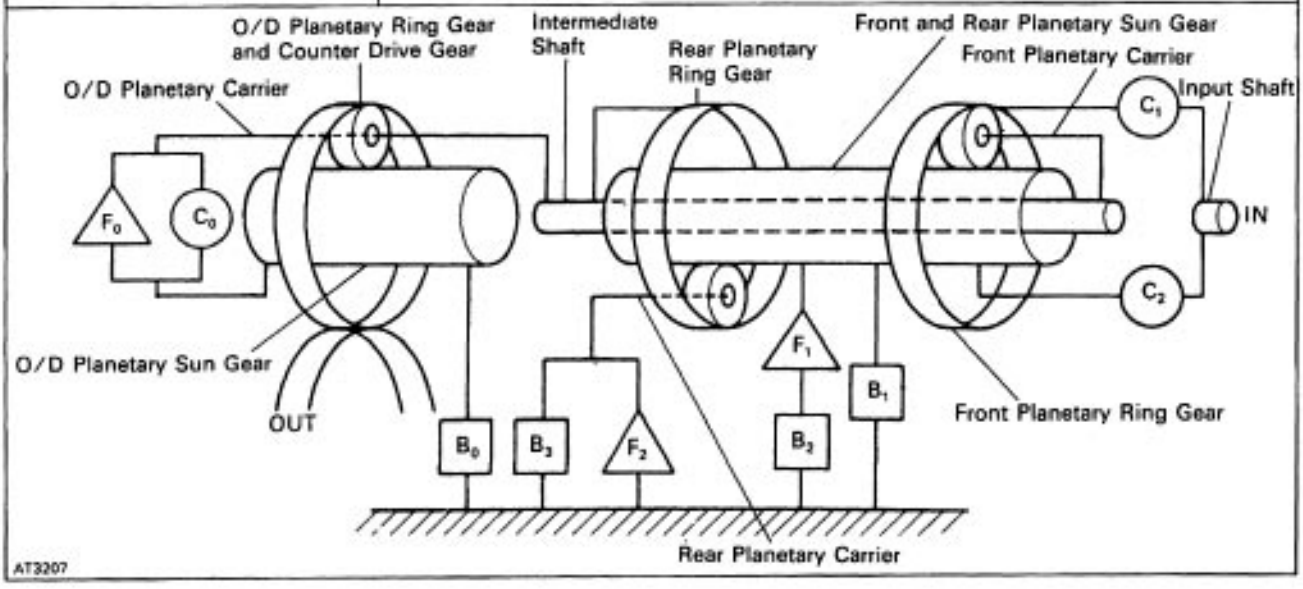
0 . . . . . Operating

Shift lever position	Gear Position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	” 3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	*2nd	○	○			○	○		○	○	

’ Down–shift only–no up–shift

1. FUNCTION OF COMPONENTS

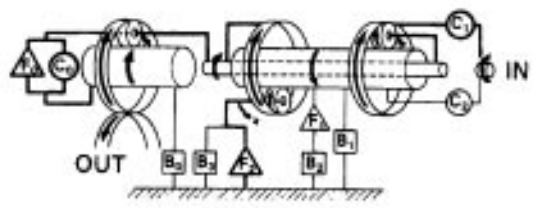
COMPONENT	FUNCTION
O/D Direct Clutch (Co)	Connects Overdrive sun gear and overdrive carrier.
0/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise.
O/D One–Clutch (Fo)	When transaxle is being driven by engine, connects overdrive sun gear and overdrive carrier.
Front Clutch (C_1)	Connects input shaft and intermediate shaft.
Rear Clutch (C_2)	Connects input shaft and front & rear planetary gear.
No. 1 Brake (B_1)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise.
No. 2 Brake (B_2)	Prevents outer race of F, from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise.
No. 3 Brake (B_3)	Prevents front planetary carrier from turning either clockwise or counterclockwise.
No. 1 One–Way Clutch (F_1)	When B2 is operating, prevents front & rear planetary sun gear from turning counterclockwise.
No. 2 One–Way Clutch (F_2)	Prevents front planetary carrier from turning counterclockwise.



V04839

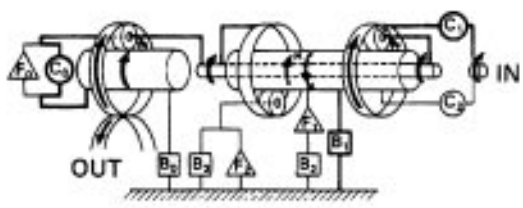
Power from the engine transmitted to the input shaft via the torque converter clutch is then transmitted to the planetary gears by the operation of the clutch.
By operation of the brake and one–way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the planetary gear unit.
Shift change is carried out by altering the combination of clutch and brake operation.
Each clutch and brake operates by hydraulic pressure. Gear position are decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Position 1st Gear



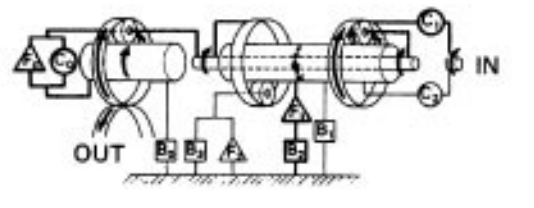
AT1097

2 Position 2nd Gear



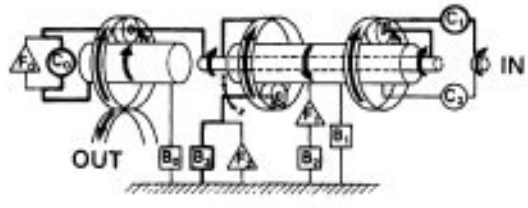
AT1102

D Position 2nd Gear



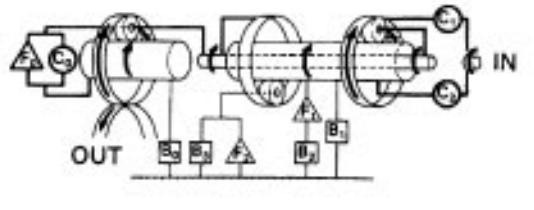
AT1098

L Position 1st Gear



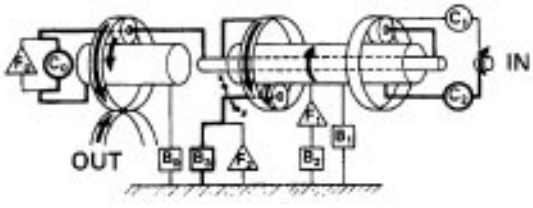
AT1103

D Position 3rd Gear



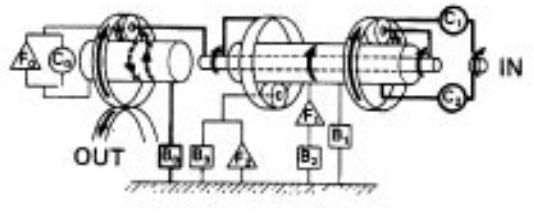
AT1099

R Position Reverse Gear



AT1101

D Position O/D Gear



AT1100

V02258

2. Hydraulic Control System

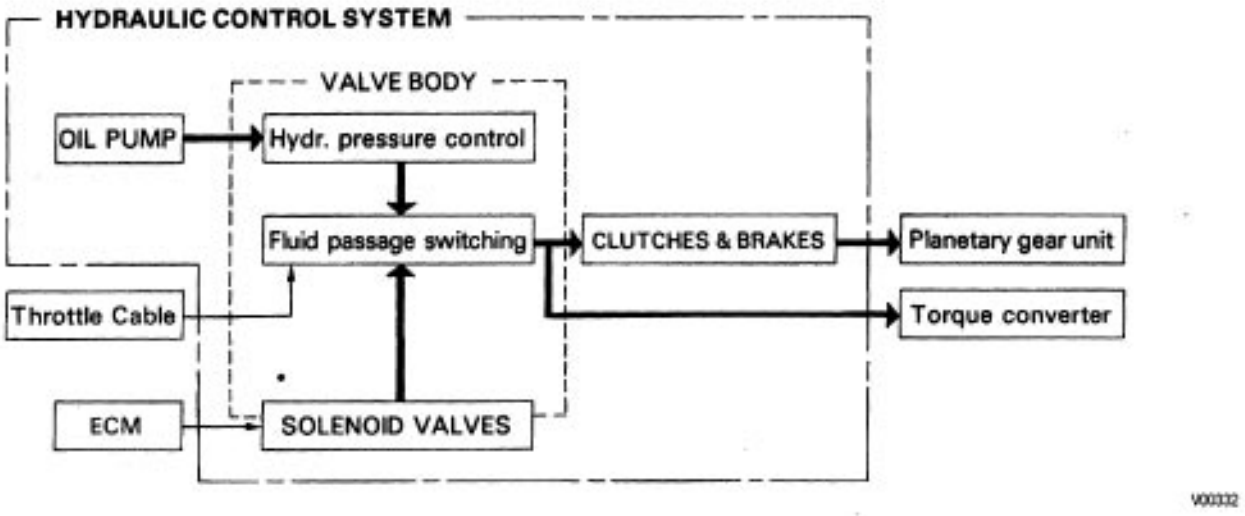
The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulator, the clutches and brakes, and the governor valve as well as the fluid passages which connect all of these components.

Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body.

The shift solenoid valves No. 1 and No.2 are turned on and off by signals from the ECM to operate the shift valves and change the gear shift position.

The No.3 solenoid valve is operated by signals from the ECM to engage or disengage the lock–up clutch of the torque converter clutch.



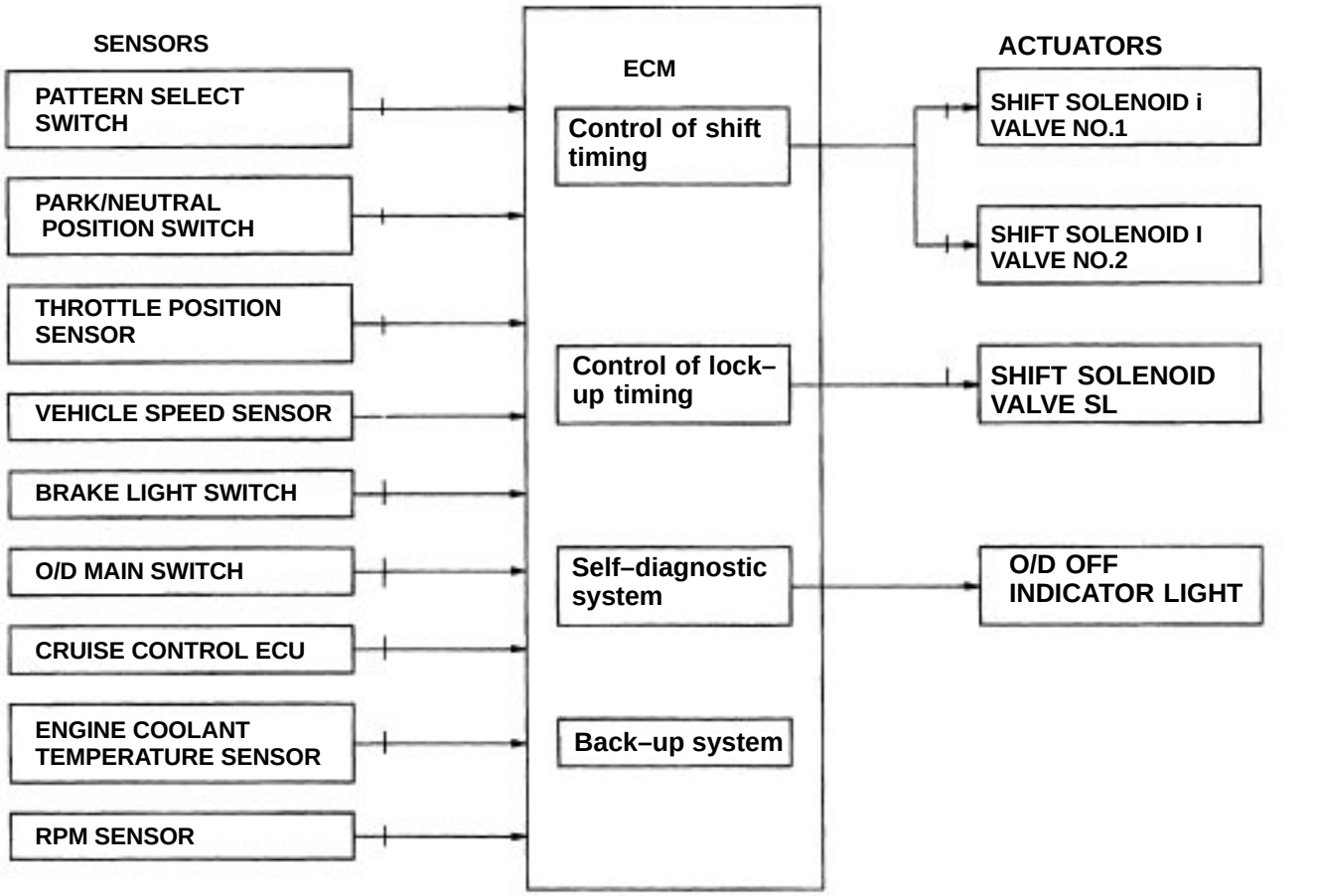
3. Electronic Control System

The electronic control system for controlling the shift timing and the operation of the lock–up clutch is composed of the following three parts:

(a) Sensors: These sense the vehicle speed and throttle position and send this data to the ECM in the form of electronic signals.

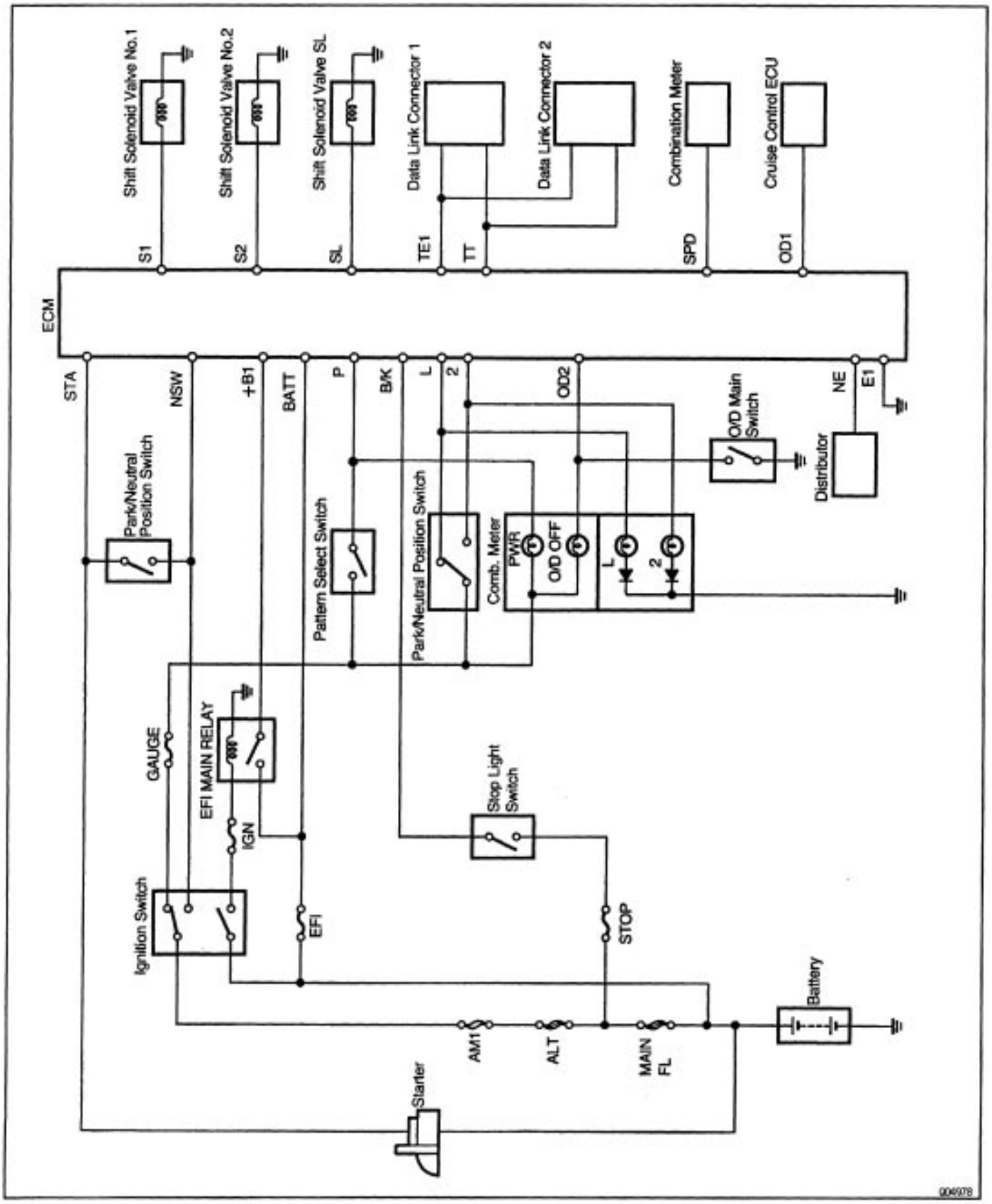
(b) ECM: This determines the shift and lock–up timing based upon the signals from the sensors.

(c) Actuators: Solenoid valves divert hydraulic pressure from one circuit of the hydraulic control unit to another, thus controlling shifting and lock–up timing.

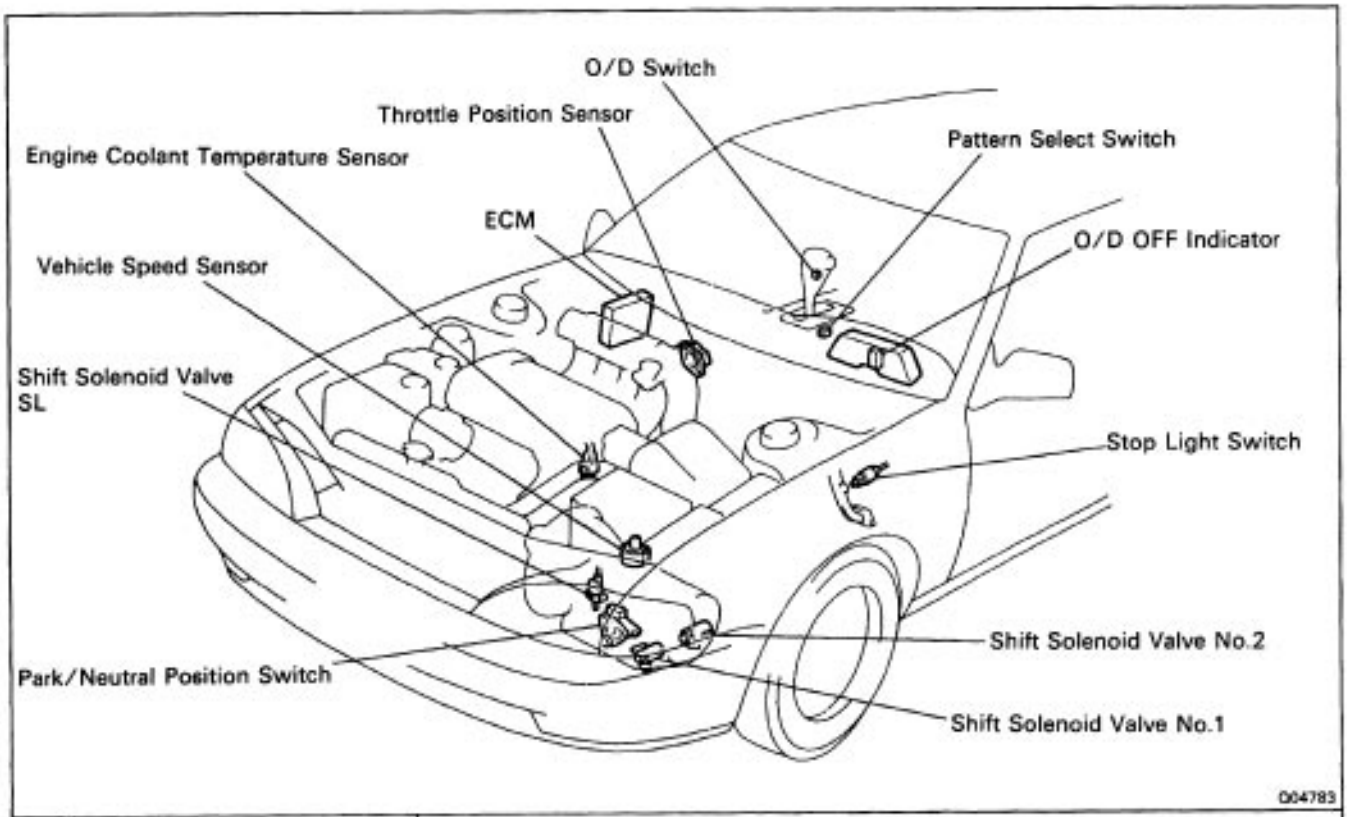


V04940

SYSTEM DIAGRAM



ARRANGEMENT OF COMPONENTS

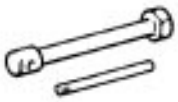


No.	Components	Functions
①	O/D OFF Indicator Light	Blinks and warns the driver, while the 0/D main switch is pushed in, when the electronic control circuit is malfunctioning.
②	Pattern Select Switch	Selects the Power mode or the Normal mode for shift and lock–up timing.
③	0/D Switch	Prevents up shift to the O/D gear if the O/D switch is off.
④	Throttle Position Sensor	Detects the throttle valve opening angle.
⑤	ECM	Controls the engine and transaxle,actuators based on signals from each sensor.
⑥	Engine Coolant Temp. Sensor	Detects the engine coolant temperature.
⑦	Vehicle Speed Sensor	Detect the vehicle speed. Ordinarily, transaxle control uses signals from the vehicle speed sensor.
⑧	Park/Neutral Position Switch	Detects the shift lever position.
⑨	Shift Solenoid Valves No.1 and No.2	Control the hydraulic pressure applied to each shift valve, and control the gear shift position and timing.
⑩	Shift Solenoid Valves SL For lock–up control pressure modulation	Controls the hydraulic pressure applied to the lock–up clutch and controls lock–up timing.
⑪	Stop Light Switch	Detects if the brake pedal is depressed.

V04841

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09043–38100 Hexagon 10 mm Wrench	Remove and install oil pan drain plug.
	09308–00010 Oil Seal Puller	Remove side gear shaft oil seal.
	09350–32014 TOYOTA Automatic Transmission Tool Set	
	(09351–32010) One–way Clutch Test Toot	
	(09351–32020) Stator Stopper	
	(09351–32130) Handle	
	(09351–32150) Oil Seal Replacer	
	09843–18020 Diagnosis Check Wire	
	09992–00094 Automatic Transmission Oil Pressure Gauge Set	Line pressure

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Straight edge	Check torque converter clutch installation.
Vernier calipers	Check torque converter clutch installation.
Dial indicator or dial indicator with magnetic base	Measures drive plate runout.
Torque wrench	

LUBRICANT

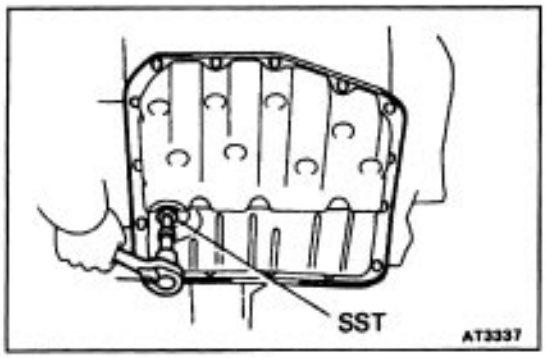
Item	Capacity	Classification
Automatic transaxle fluid (w/o Differential oil) Dry fill Drain and refill	 5.6 liters (5.9 US qts, 4.9 Imp.qts) 2.5 liters (2.6 US qts, 2.2 Imp.qts)	ATF DEXRON ®)
Differential oil (w/ Automatic transaxle)	1.6 liters (1.7 US qts, 1.4 Imp. qts)	ATF DEXRON ®)

SSM (SPECIAL SERVICE MATERIALS)

08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Torque converter clutch mounting bolt

ON–VEHICLE REPAIR

VALVE BODY REMOVAL



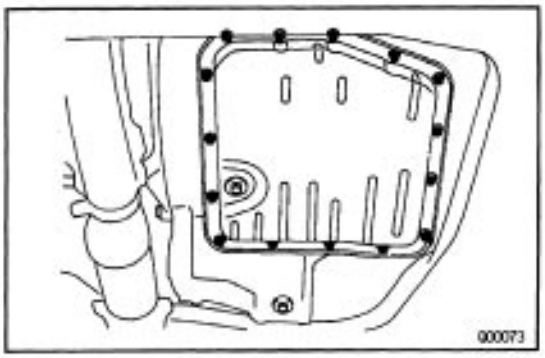
1. CLEAN TRANSAXLE EXTERIOR

To help prevent contamination, clean the exterior of the transaxle.

2. DRAIN TRANSAXLE FLUID

Remove the drain plug with SST, and drain the fluid into a suitable container.

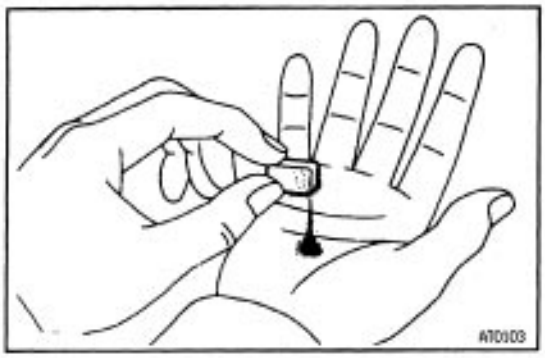
SST 09043–38100



3. REMOVE OIL PAN AND GASKET

NOTICE: Some fluid will remain in the oil pan.

Remove all pan bolts, and carefully remove the pan assembly discarding the gasket.

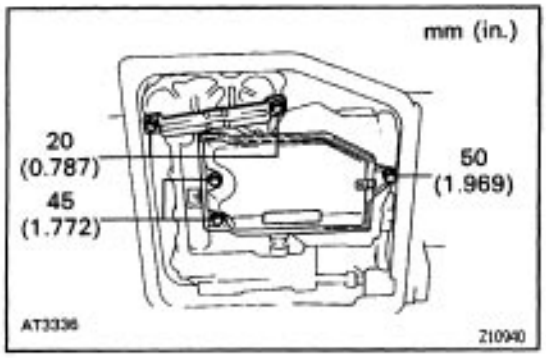


4. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic): bearing, gear and plate wear

Brass (non–magnetic): bushing wear

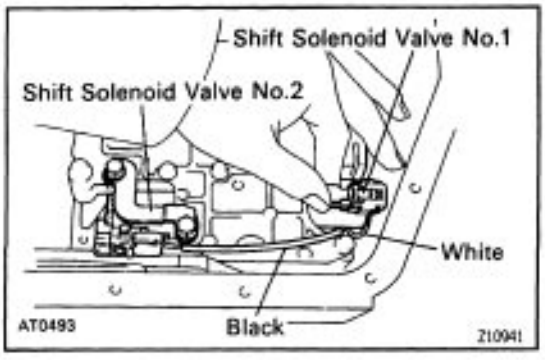


5. REMOVE OIL STRAINER AND APPLY TUBE BRACKET

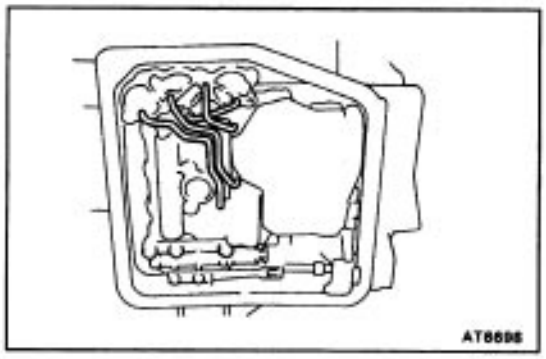
(a) Remove the 3 bolts and the oil strainer.

NOTICE: Be careful as oil will come out of the strainer when it is removed.

(b) Remove the 2 bolts and the apply tube bracket.

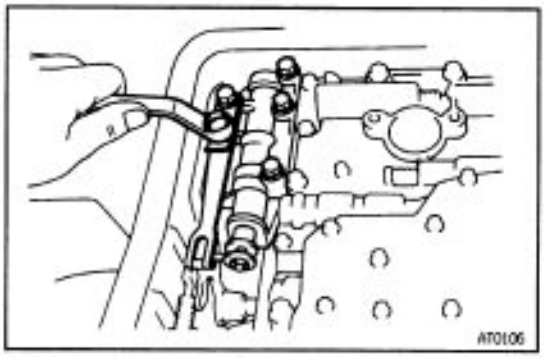


6. DISCONNECT SOLENOID CONNECTORS



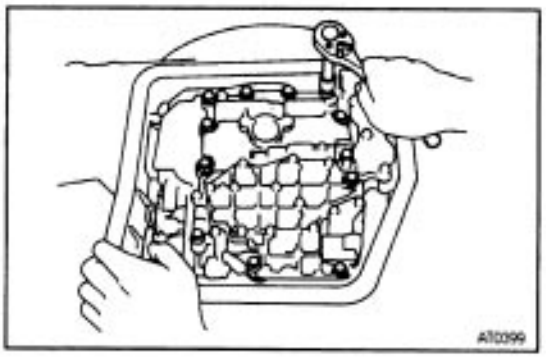
7. REMOVE OIL TUBES

Pry up the both tube ends with a large screwdriver and remove the four tubes.



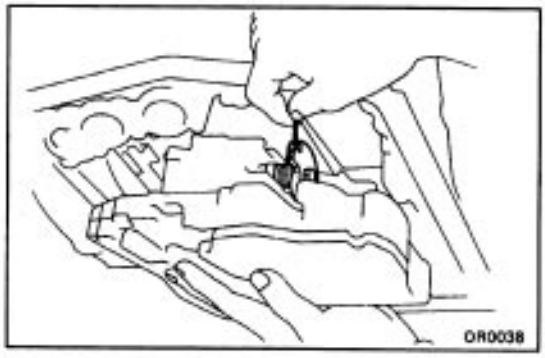
8. REMOVE MANUAL DETENT SPRING

9. REMOVE MANUAL VALVE AND MANUAL VALVE BODY



10. REMOVE VALVE BODY

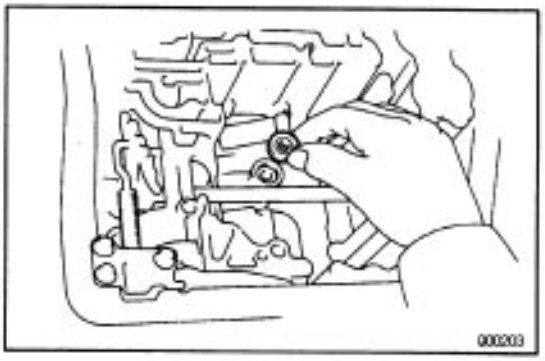
Remove the 12 bolts.



11. REMOVE THROTTLE CABLE

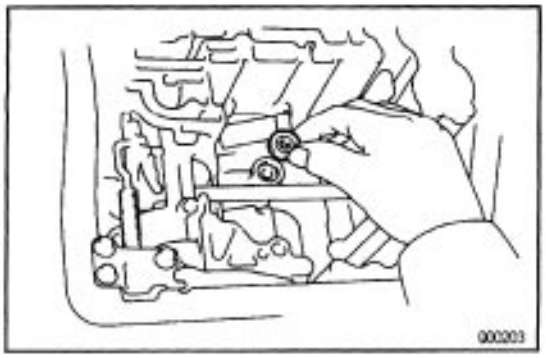
(a) Disconnect the throttle cable.

(b) Remove the valve body.

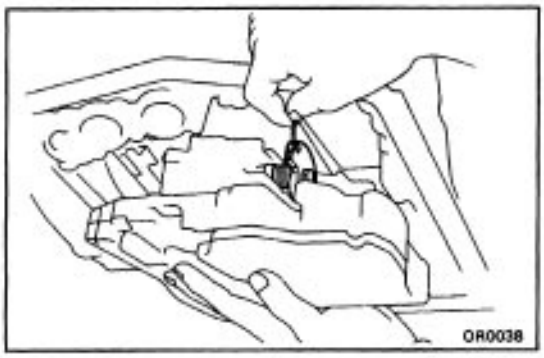


12. REMOVE SECOND BRAKE APPLY GASKET

VALVE BODY INSTALLATION



1. INSTALL SECOND BRAKE APPLY GASKET

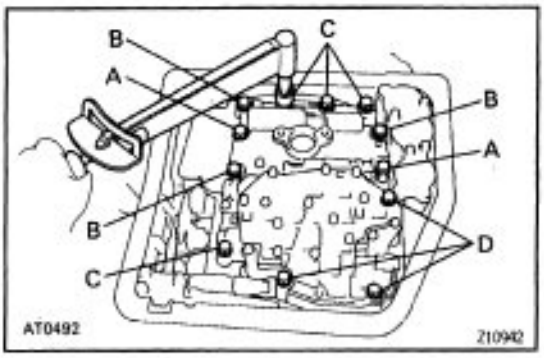


2. INSTALL VALVE BODY

(a) While holding the cam down with your hand, slip the cable and into the slot.

(b) Bring valve body into place.

NOTICE: Be careful not to entangle the solenoid wire.



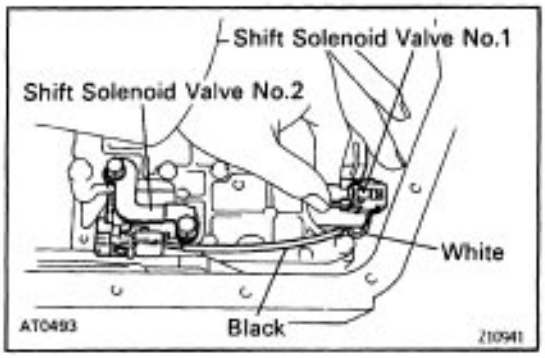
3. INSTALL BOLTS IN VALVE BODY

Hand tighten the 12 bolts first, then torque with a torque wrench.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

Bolt length:

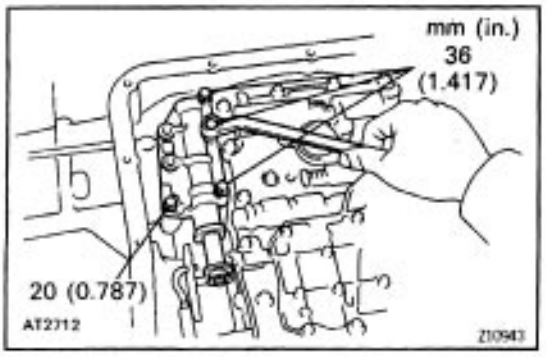
A 20 mm (0.79 in.)
B 25 mm (0.98 in.)
C 36 mm (1.42 in.)
D50mm(1.97in.)



4. CONNECT SOLENOID WIRING

(a) Connect the shift solenoid valve No. 1 connector (white and shorter wire).

(b) Connect the shift solenoid valve No. 2 connector (black and longer wire).



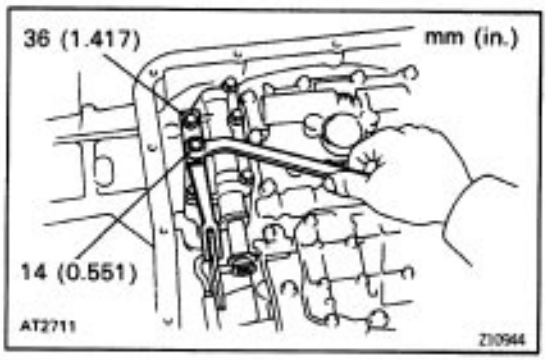
5. INSTALL MANUAL VALVE BODY DETENT SPRING

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

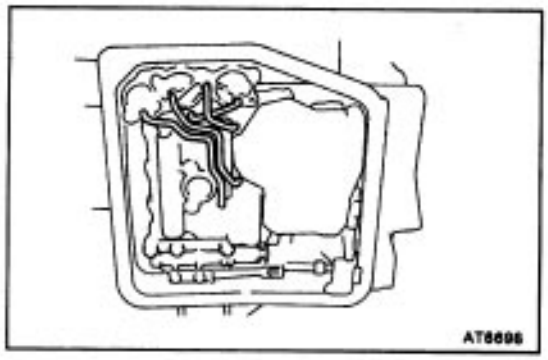
(c) Hand tighten the 4 bolts first. Then, tighten them with a torque wrench.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



(d) Place the detent spring on the manual valve body and hand tighten the 2 bolts first.
Then, tighten them with a torque wrench.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

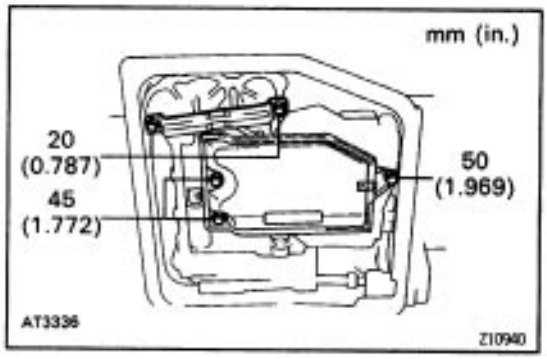
(e) Check that the manual valve lever is touching the center of the detent spring tip roller.



6. INSTALL OIL TUBES

Tap the tubes with a plastic hammer to install them into the positions indicated in the illustration.

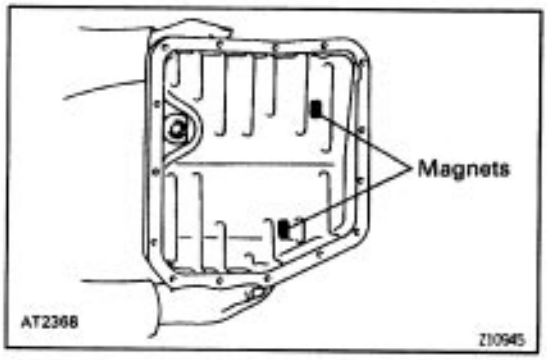
NOTICE: Be careful not to bend or damage the tubes.



7. INSTALL OIL STRAINER AND APPLY TUBE BRACK–ET

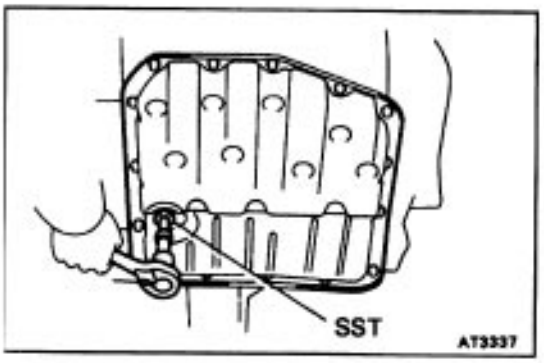
(a) Install the oil strainer and torque the 3 bolts.

(b) Install the apply tube bracket and the 2 bolts.
Torque: 10 N–m (100 kgf–cm, 7s. ft–lbf)



8. INSTALL MAGNETS IN PAN

Install the 2 magnets in the indentations of the pan.



9. INSTALL OIL PAN WITH NEW GASKET

NOTICE: Make sure that the magnet does not interfere with the oil tubes.

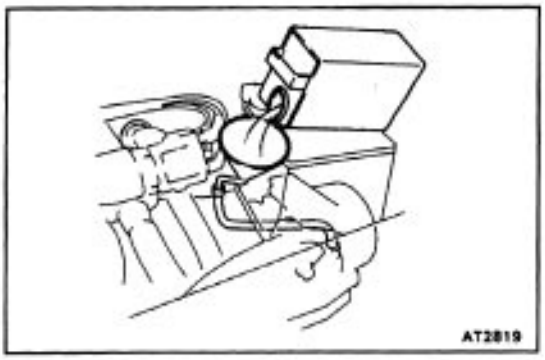
Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)

10. INSTALL DRAIN PLUG WITH NEW GASKET

Using SST, install the drain plug with a new gasket and tighten it.

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)

SST 09043–38100



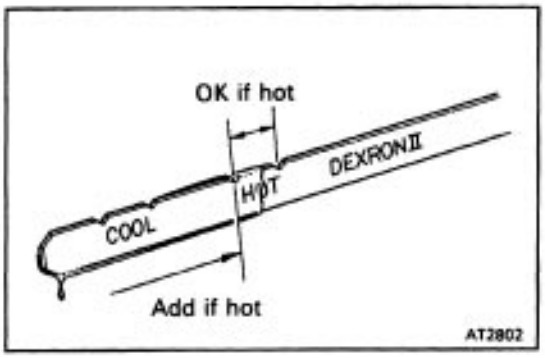
11. FILL TRANSAXLE WITH ATF

Add only about 2 liters of ATF.

NOTICE: Do not overfill.

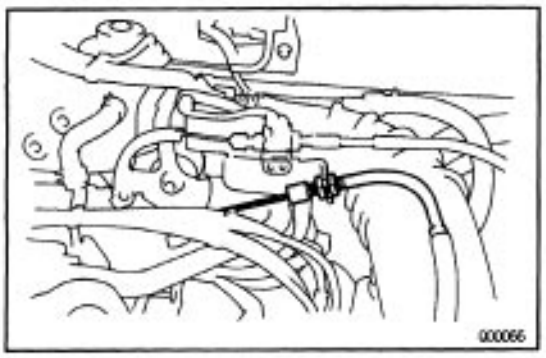
Fluid type:

ATF DEXRON® II



12. CHECK FLUID LEVEL

(See page AX1–54)

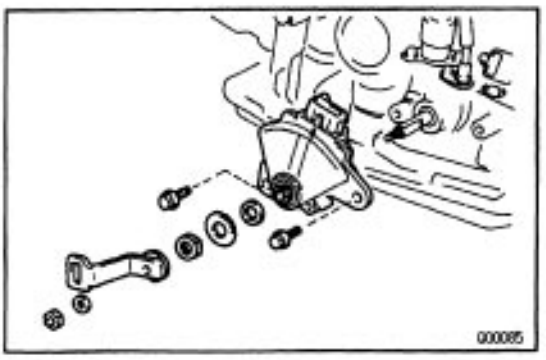


THROTTLE CABLE REMOVAL

1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.

(b) Disconnect the cable from the throttle linkage.



2. REMOVE PARK/NEUTRAL POSITION SWITCH

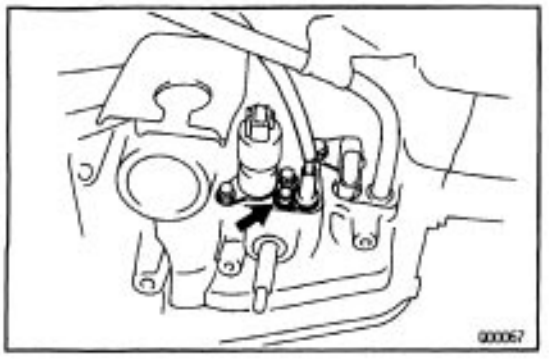
(a) Remove the clips and, disconnect the transaxle con–trol cable from manual shift lever.

(b) Remove the manual shift lever.

(c) Remove the park/neutral position switch.

3. REMOVE VALVE BODY

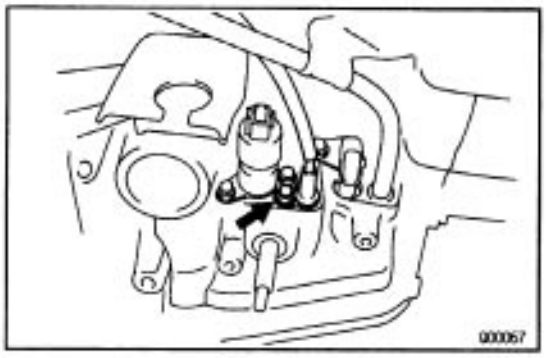
(See page AX–13)



4. PULL THROTTLE CABLE OUT OF TRANSAXLE CASE

(a) Remove the bolt and retaining plate.

(b) Pull the cable out of the transaxle case.



THROTTLE CABLE INSTALLATION

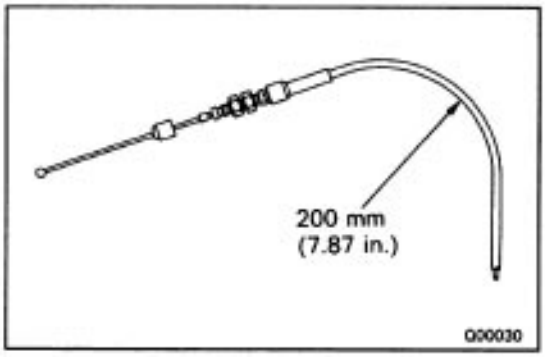
1. INSTALL CABLE IN TRANSAXLE CASE

(a) Be sure to push it in all the way.

(b) Install the retaining plate and the bolt.

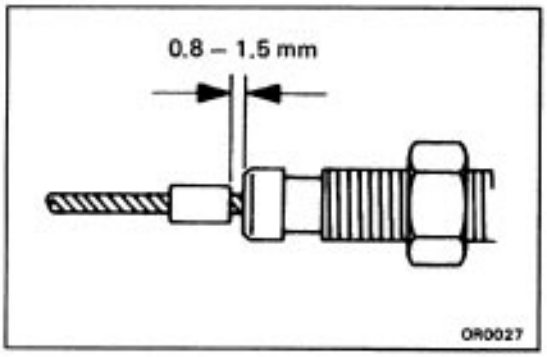
2. INSTALL VALVE BODY

(See page AX–15)



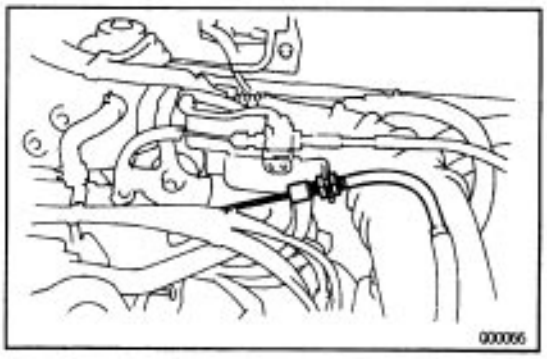
3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).



(b) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(c) Stake the stopper 0.8–1.5 mm (0.031–0.059 in.) from the end of outer cable, as shown.



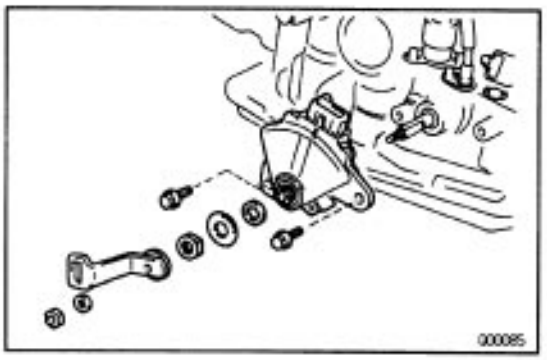
4. CONNECT THROTTLE CABLE

(a) Connect the cable to the throttle linkage.

(b) Connect the cable housing to the bracket.

5. ADJUST THROTTLE CABLE

(See page AX1–55)



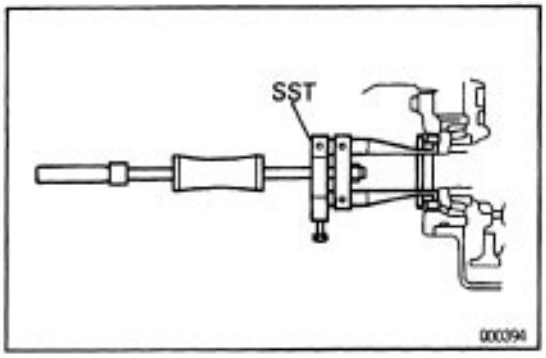
6. INSTALL PARK/NEUTRAL POSITION SWITCH

(a) Install the park/neutral position switch.

(b) Install the manual shift lever.

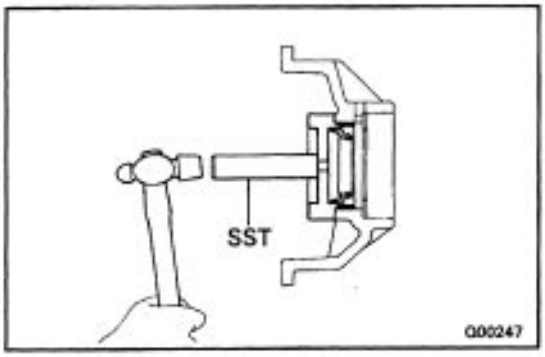
(c) Adjust the park/neutral position switch.
(See page AX1–56)

(d) Connect the transaxle control cable.



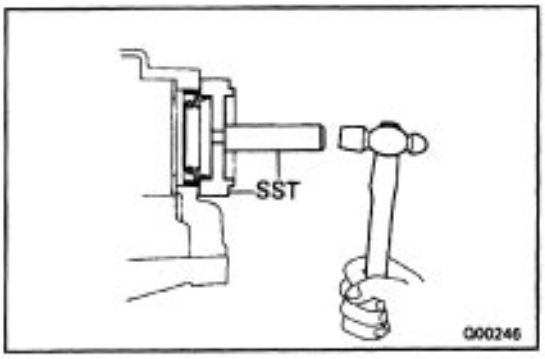
DIFFERENTIAL OIL SEAL REMOVAL

1. REMOVE BOTH DRIVE SHAFTS
(See page SA–38)
2. REMOVE BOTH SIDE GEAR SHAFT OIL SEALS
Using SST, pull out the oil seal.
SST 09308–00010



DIFFERENTIAL OIL SEAL INSTALLATION

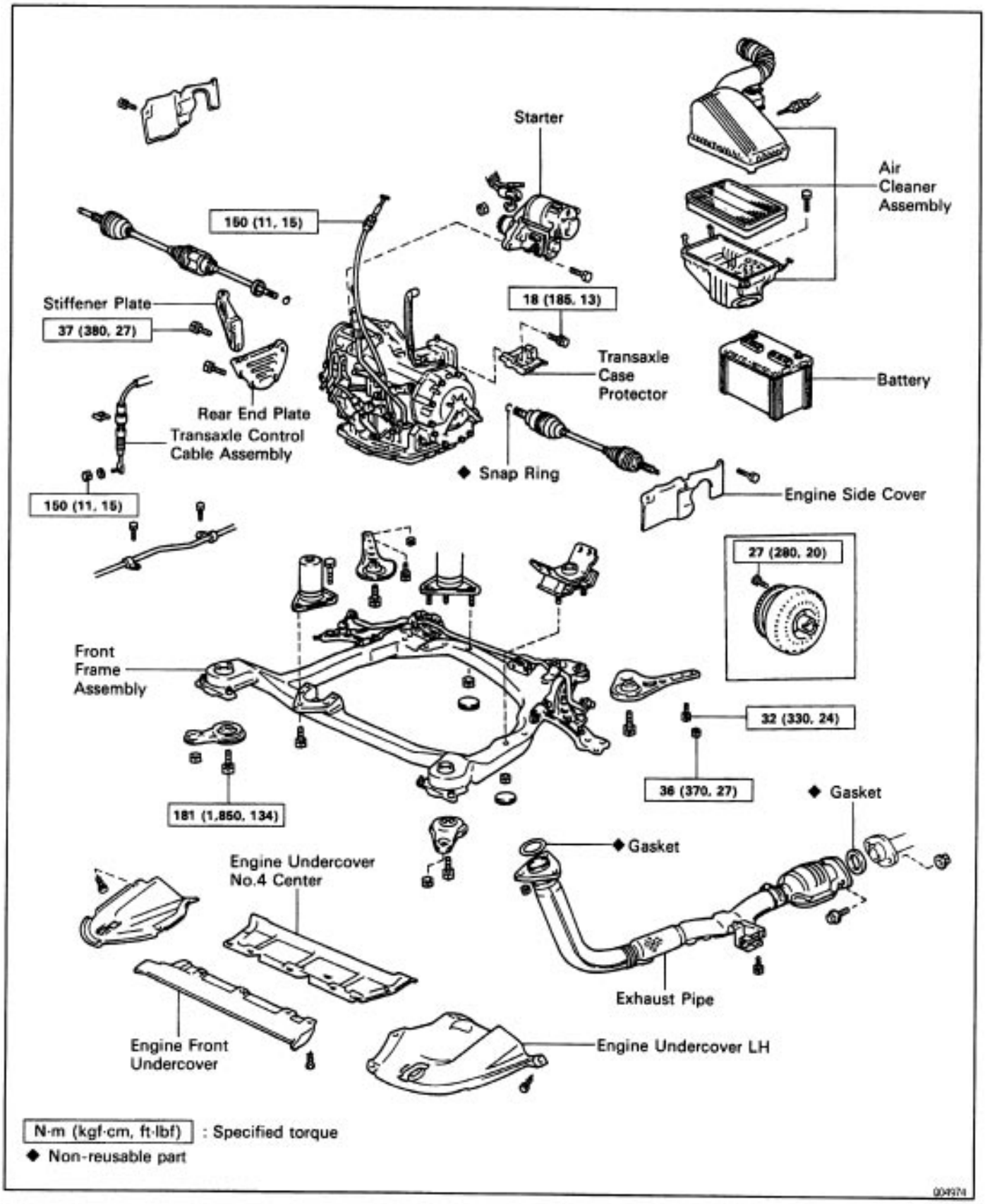
1. INSTALL LEFT SIDE GEAR SHAFT OIL SEAL
(1) Using SST, drive in a new oil seal.
SST 09350–32014 (09351–32130, 08351–32150)
Oil seal depth:
2.7 ±0.5 mm (0.11 ±0.02 in.)
(2) Coat the lip of oil seal with MP grease.

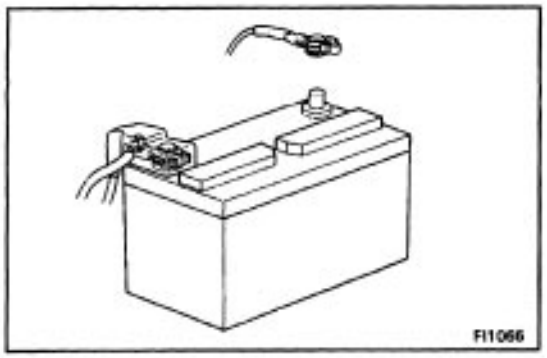


2. INSTALL RIGHT SIDE GEAR SHAFT OIL SEAL
(1) Using SST, drive in a new oil seal.
SST 09350–32014 (09351–32130, 09351–32150)
Oil seal depth:
0 ± 0.5 mm (0 ~ 0.02 in.)
(2) Coat the lip of seal with MP grease.
3. INSTALL BOTH DRIVE SHAFTS
(See page SA–40)
4. CHECK TRANSAXLE FLUID LEVEL
(See page AX1–54)

ASSEMBLY REMOVAL AND INSTALLATION

ASSEMBLY COMPONENTS

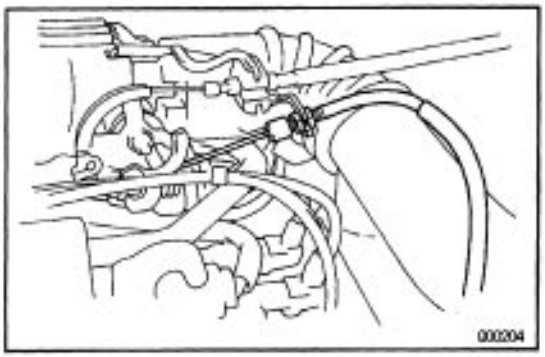




TRANSAXLE REMOVAL

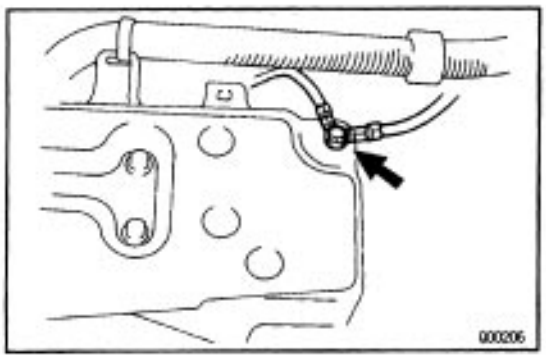
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

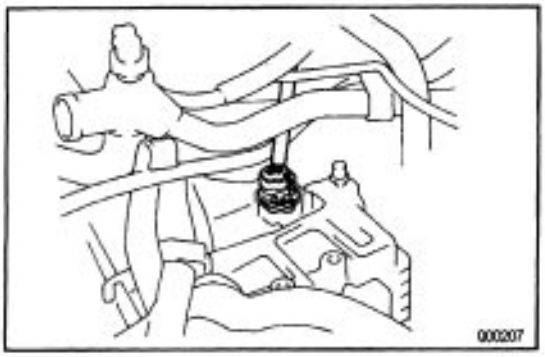


2. REMOVE AIR CLEANER ASSEMBLY
3. REMOVE THROTTLE CABLE FROM ENGINE

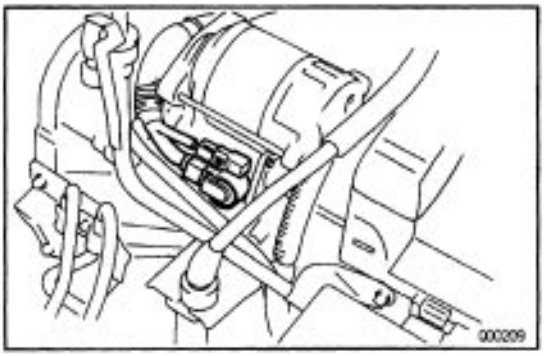
w/ Cruise Control System:
4. REMOVE CRUISE CONTROL ACTUATOR COVER
5. DISCONNECT CONNECTOR FROM CRUISE CONTROL ACTUATOR



6. REMOVE GROUND TERMINAL

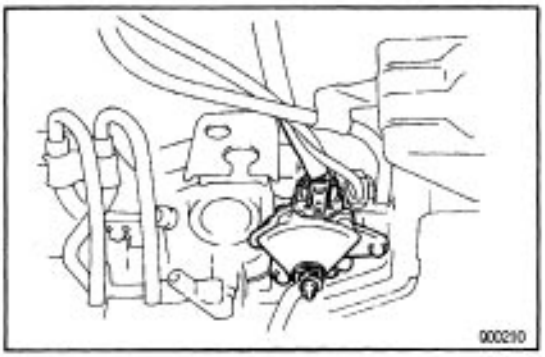


7. DISCONNECT CONNECTOR FROM VEHICLE SPEED SENSOR

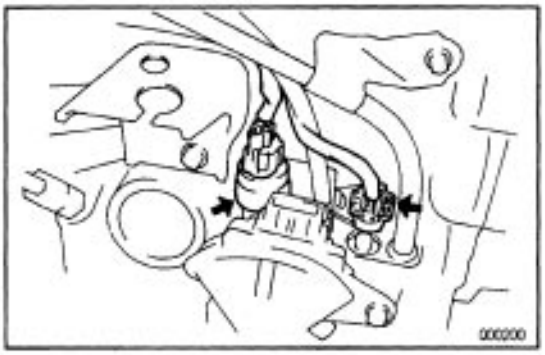


8. REMOVE STARTER

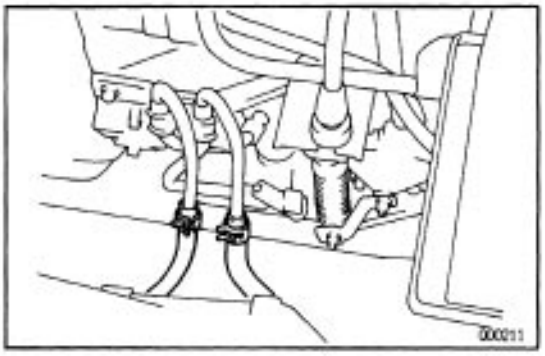
(a) Disconnect the connector and nut.
(b) Remove the 2 bolts and the starter.



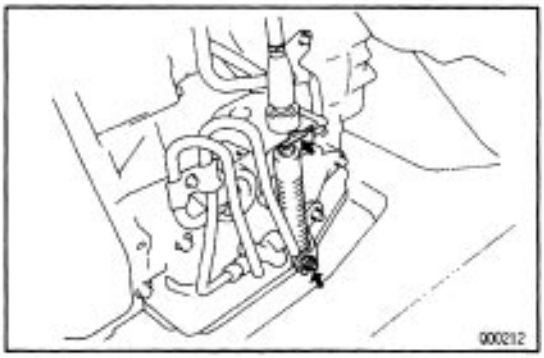
9. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR



10. DISCONNECT SOLENOID CONNECTOR

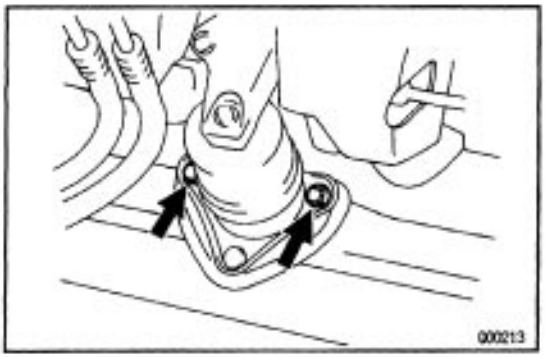


11. DISCONNECT OIL COOLER HOSE

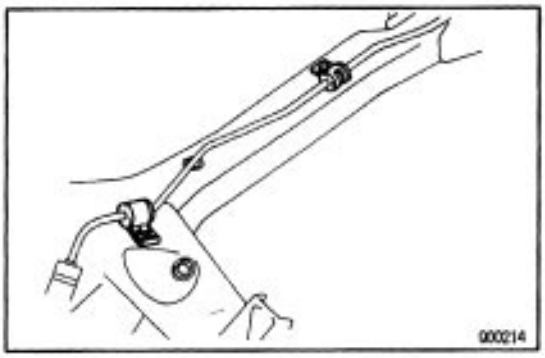


12. DISCONNECT SHIFT CONTROL CABLE

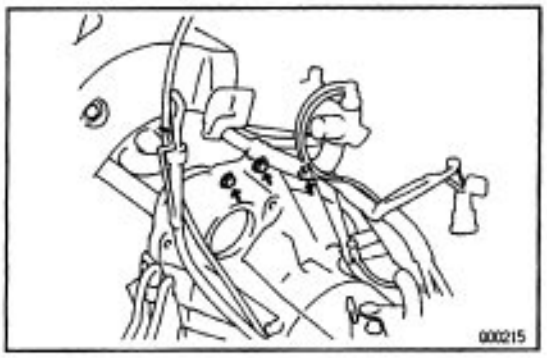
(a) Remove the clip from the control cable.
(b) Remove the nut.



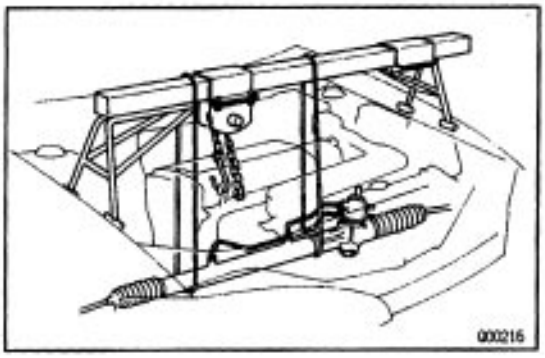
13. REMOVE 2 FRONT SIDE ENGINE MOUNTING BOLT



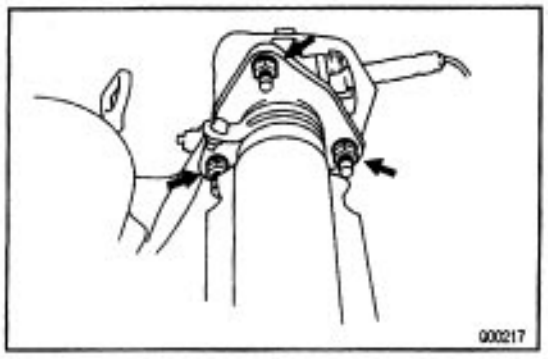
14. REMOVE 2 BOLT AND CLAMP FROM FRONT FRAME ASSEMBLY



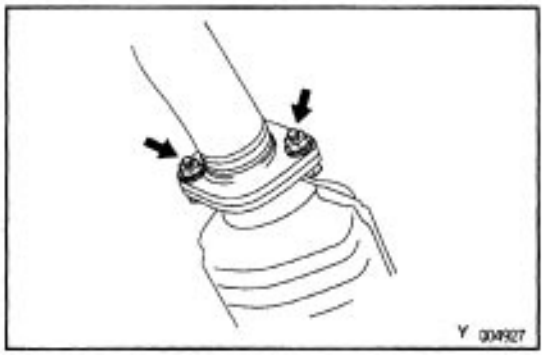
15. REMOVE 3 UPPER TRANSAXLE TO ENGINE BOLT



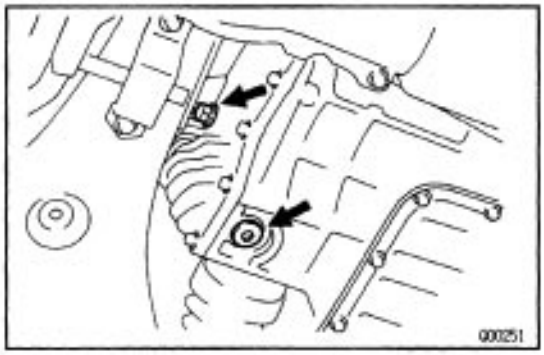
16. INSTALL ENGINE SUPPORT FIXTURE
17. TIE STEERING GEAR HOUSING TO ENGINE SUP
– PORT FIXTURE BY CORD OR EQUIVALENT



18. RAISE AND SUITABLE SUPPORT VEHICLE
19. REMOVE FRONT WHEEL
20. REMOVE EXHAUST PIPE
(a) Remove the 3 nuts.

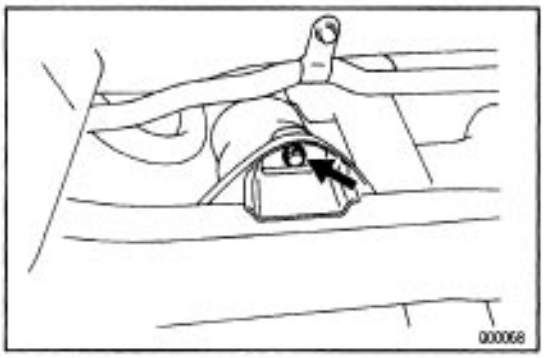


(b) Remove the 2 bolts and nuts from rear exhaust pipe.

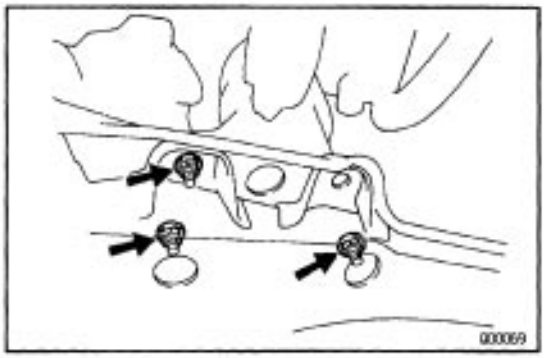


21. REMOVE DIFFERENTIAL FLUID DRAIN PLUG AND GASKET
22. DRAIN DIFFERENTIAL FLUID INTO A SUITABLE CONTAINER

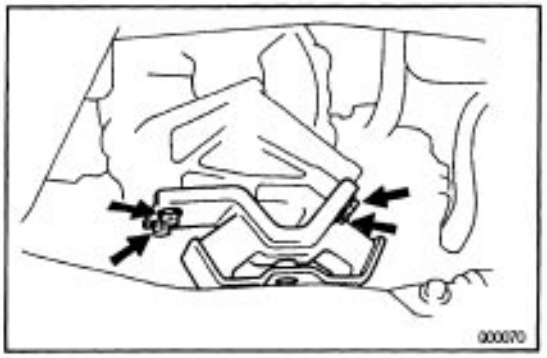
23. REMOVE RIGHT AND LEFT ENGINE SIDE COVER NO.2
24. REMOVE ENGINE UNDER FRONT COVER NO.1 AND NO.2



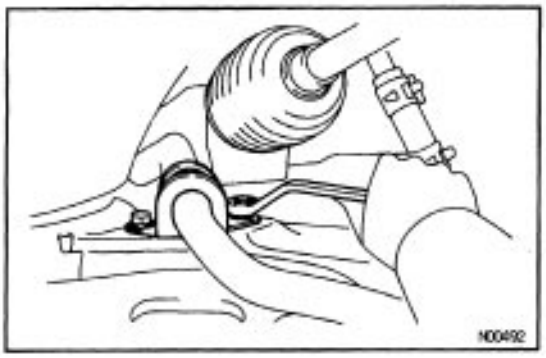
25. REMOVE DRIVE SHAFT
(See page SA–38)
26. REMOVE FRONT SIDE ENGINE MOUNTING NUT



27. REMOVE 3 REAR SIDE ENGINE MOUNTING NUTS

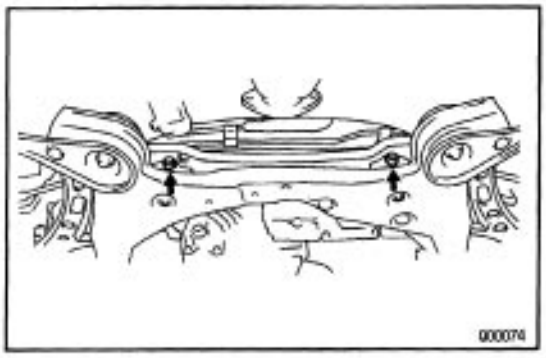


28. REMOVE ENGINE 4 TRANSAXLE MOUNTING BOLTS

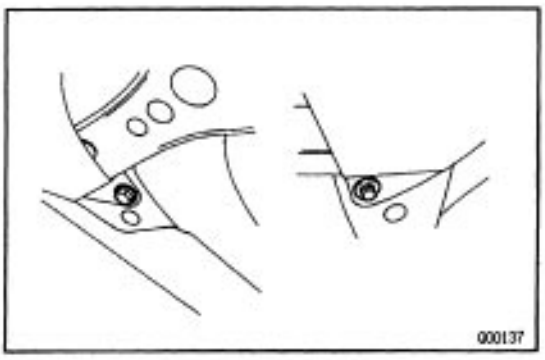


29. REMOVE STEERING GEAR HOUSING

(a) Remove the 4 bolts and disconnect stabilizer bar bushing bracket from the front frame assembly.

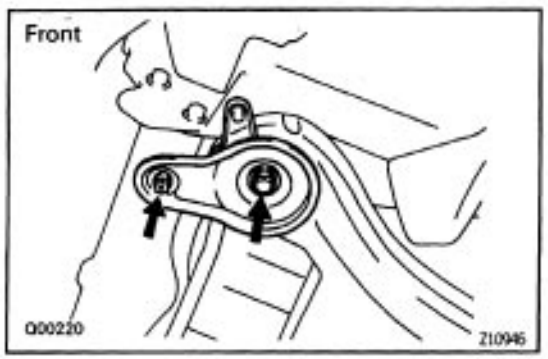


(b) Remove the 2 bolts and nuts from the steering gear housing.
(c) Remove the steering gear housing.

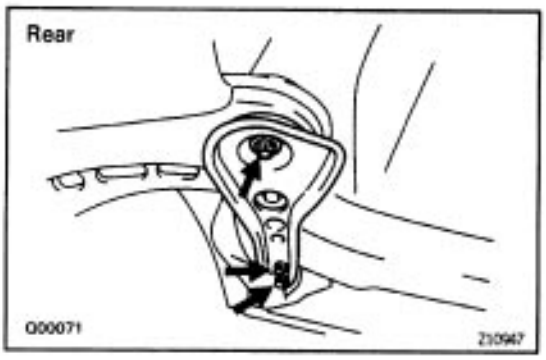


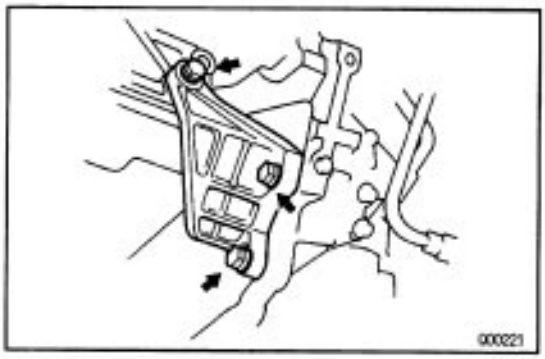
30. REMOVE FRONT FRAME ASSEMBLY

(a) Hold the front frame assembly with a jack.
(b) Remove the 2 set screws from the right and left fender liners.



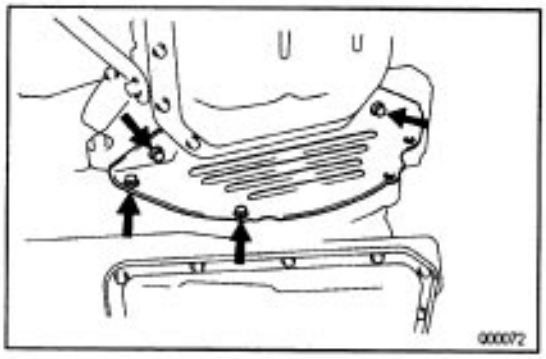
(c) Remove the 6 bolts and 4 nuts.
(d) Remove the front frame assembly.





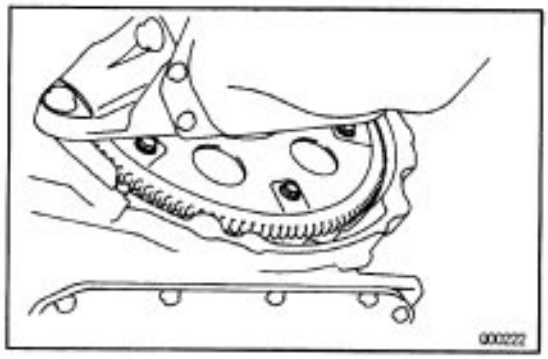
31. REMOVE STIFFENER PLATE

(a) Hold the transaxle with a jack.
(b) Remove the 3 bolts and stiffener plate.



32. REMOVE REAR END PLATE

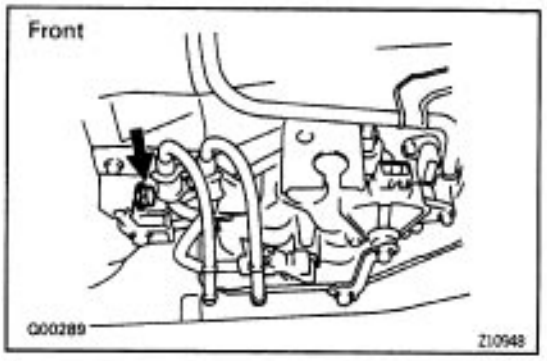
(a) Remove the 4 bolts.
(b) Remove the rear end plate.



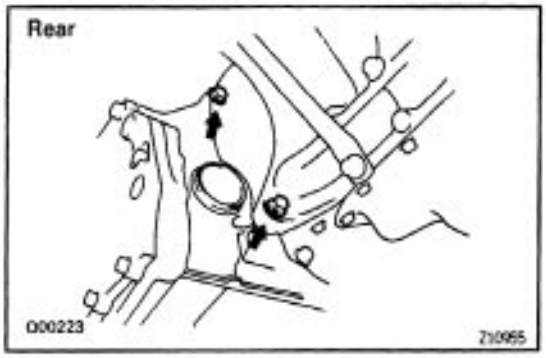
33. REMOVE TORQUE CONVERTER CLUTCH MOUNT – ING BOLT

(a) Turn the crankshaft to gain access to each bolt.
(b) Hold the crankshaft pulley nut with a wrench and remove 6 bolts.

HINT: First remove dark green colored bolt and then remove the others.



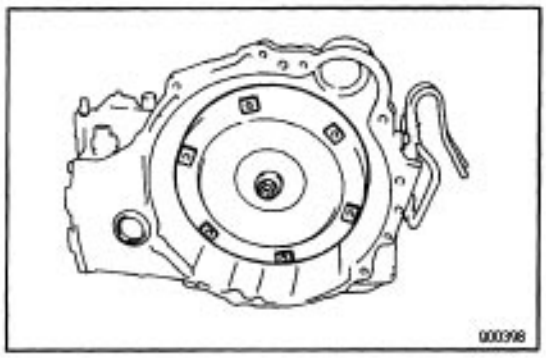
34. REMOVE 3 TRANSAXLE TO ENGINE BOLTS



35. REMOVE TRANSAXLE ASSEMBLY

Separate transaxle and engine, and lower the transaxle.

36. REMOVE TORQUE CONVERTER CLUTCH FROM TRANSAXLE



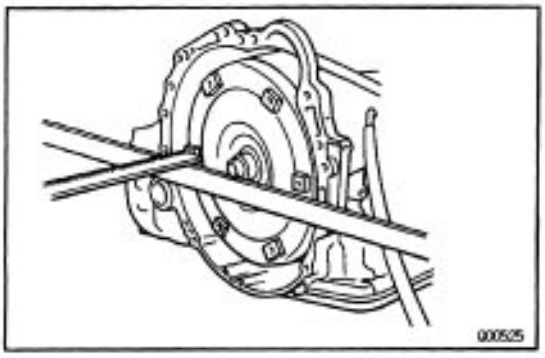
TRANSAXLE INSTALLATION

1. INSTALL TORQUE CONVERTER CLUTCH IN TRANSAXLE

If the torque converter clutch has been drained and washed, refill with new ATF.

Fluid Type:

ATF DEXRON ® II

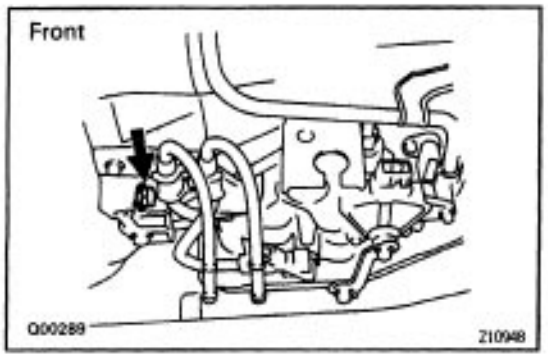


2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using a scale and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance:

13.0 mm (0.51 in.) or more



3. ALIGN TRANSAXLE AT INSTALLATION POSITION

(a) Align the 2 knock pins on the block with the converter housing.

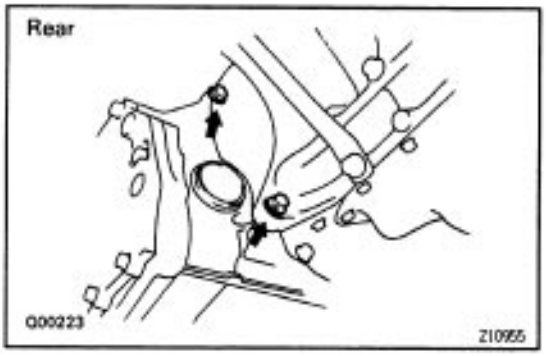
(b) Temporarily install the bolt.

4. INSTALL TRANSAXLE TO ENGINE BOLT

Install the transaxle to engine bolts.

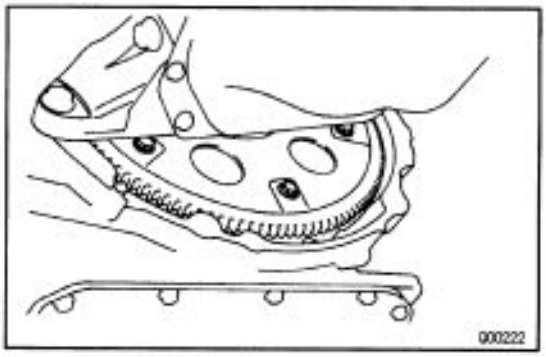
12 mm head bolt

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



10 mm head bolt

Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)



5. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLT

(a) Clean the threads of the bolts with the gasoline.

(b) Coat the threads of the bolts with sealer.

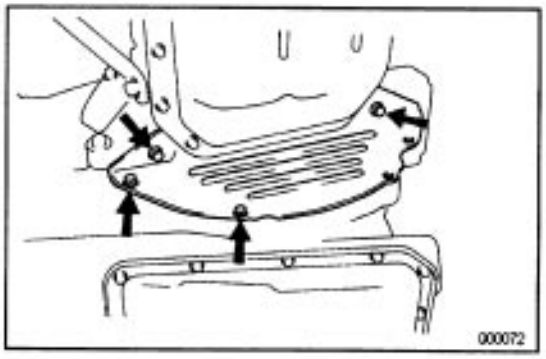
Sealer:

Part No.08833–00070, THREE BOND 1324 or equivalent.

(c) Tighten the bolts evenly.

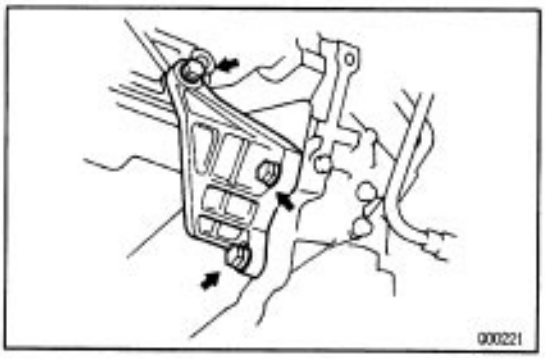
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

HINT: First install dark green colored bolt and then the 5 bolts.



6. INSTALL REAR END PLATE

Install the rear end plate with the 4 bolts.

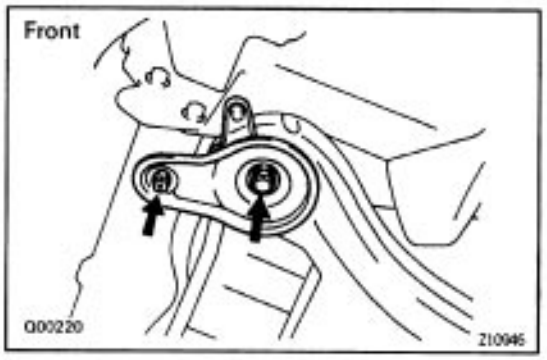


7. INSTALL STIFFENER PLATE

(a) Install the stiffener plate with the 3 bolts.

(b) Torque the 3 bolts.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



8. INSTALL FRONT FRAME ASSEMBLY

(a) Hold the front frame assembly with a jack.

(b) Install the front frame assembly with the 6 bolts and 4 nuts.

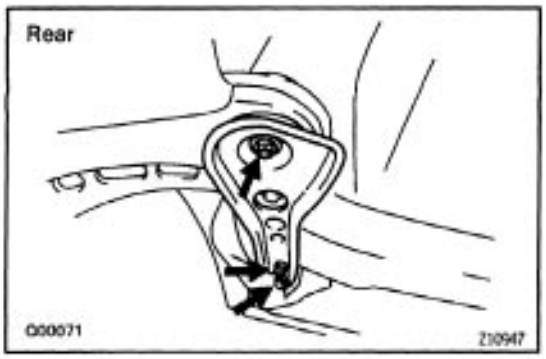
(c) Torque the bolts.

19 mm head bolt

Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)

12 mm head bolt

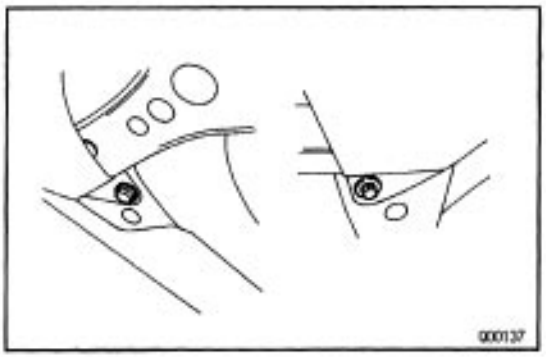
Torque: 32 N–m (330 kgf–cm, 24 ft–lbf)



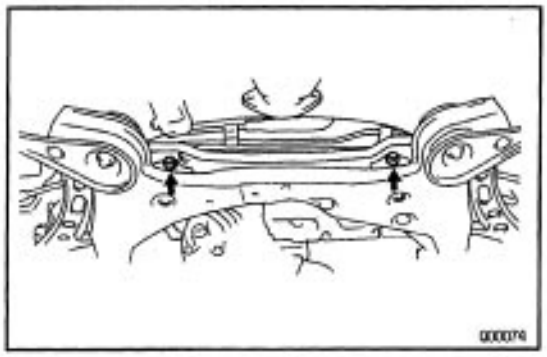
(d) Torque the nuts.

Nut

Torque: 36 N–m (370 kgf–cm. 27 ft–lbf)



(c) Install the 2 set screws in the right and left fender liners.

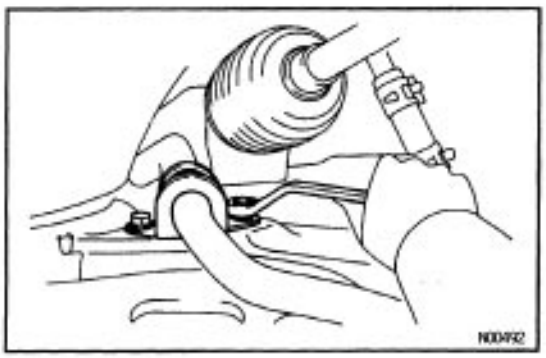


9. INSTALL STEERING GEAR HOUSING

(a) Install the steering gear housing to the front frame assembly.

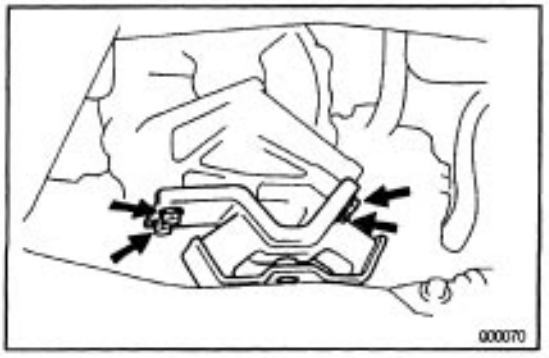
(b) Install and torque the 2 bolts and nuts.

Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)



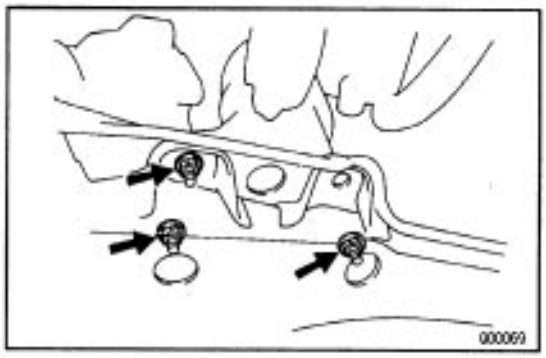
(c) Connect the stabilizer bar bushing bracket with the 4 bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

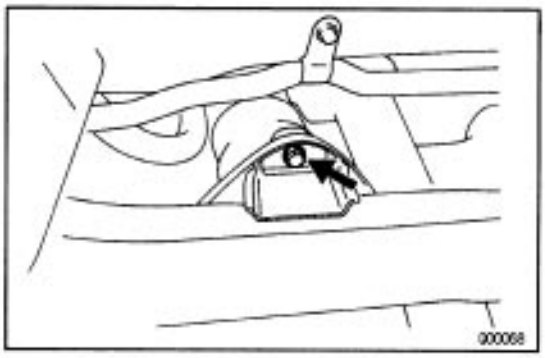


10. INSTALL 4 TRANSAXLE MOUNTING BOLTS

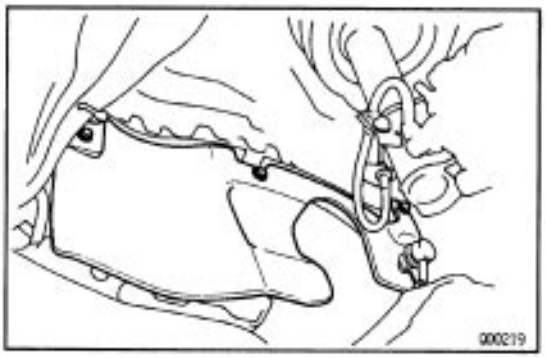
Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



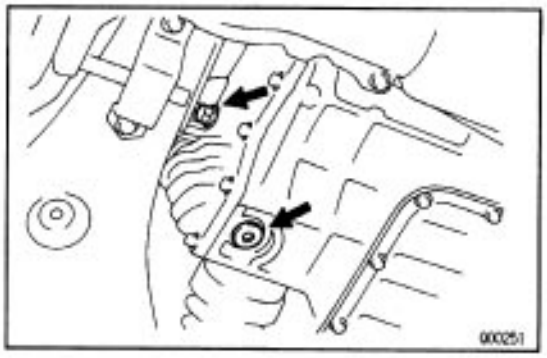
11. INSTALL 3 REAR SIDE ENGINE MOUNTING NUTS
Torque: 66 N–m (670 kgf–cm, 48 ft–lbf)



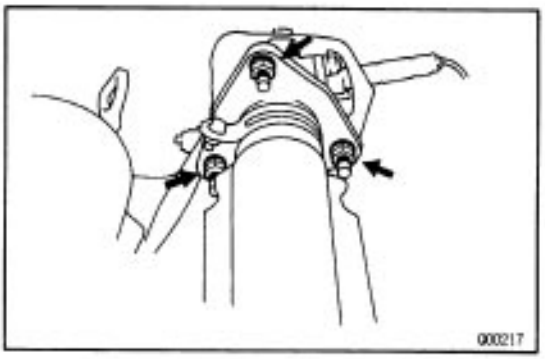
12. INSTALL FRONT SIDE ENGINE MOUNTING NUT
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)
13. INSTALL DRIVE SHAFT
(See page SA–40)



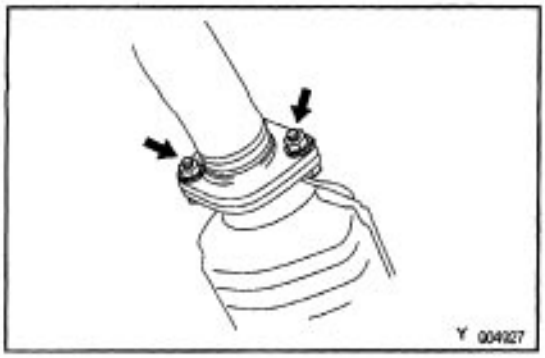
14. INSTALL RIGHT AND LEFT ENGINE SIDE COVER N O.2
15. INSTALL ENGINE UNDER FRONT COVER NO.1 AND NO.2



16. INSTALL DIFFERENTIAL FLUID DRAIN PLUG WITH A NEW GASKET
17. FILL DIFFERENTIAL FLUID
Fluid Type:
ATF DEXRON® II
Capacity:
Differential 1.6 liters (1.7 US qts, 1.4 Imp. qts)
18. CHECK DIFFERENTIAL FLUID LEVEL



19. INSTALL EXHAUST PIPE
(a) Install and torque the 3 nuts.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

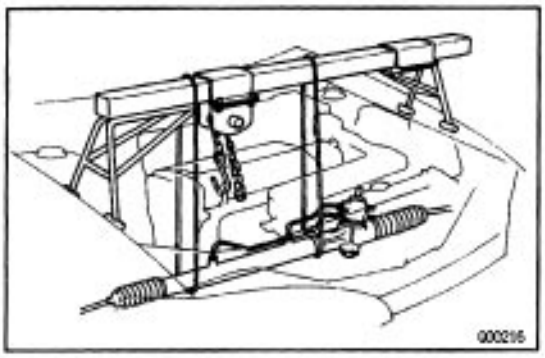


(b) Install the rear exhaust pipe with the 2 bolts and nuts.

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

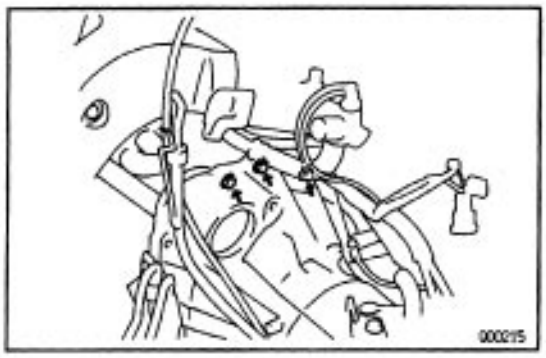
20. INSTALL FRONT WHEEL AND LOWER VEHICLE

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)



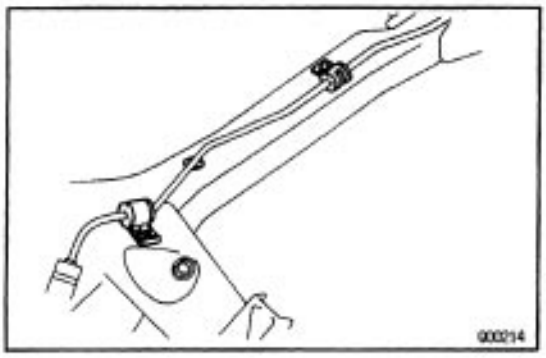
21. UNTIE STEERING GEAR HOUSING TO ENGINE SUP – PORT FIXTURE BY CORD OR EQUIVALENT

22. REMOVE ENGINE SUPPORT FIXTURE

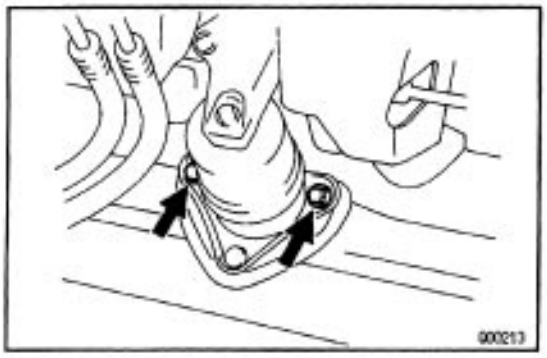


23. INSTALL 3 UPPER TRANSAXLE TO ENGINE BOLTS

Torque: 64 N–m (650 kgf–cm. 47 ft–lbf)

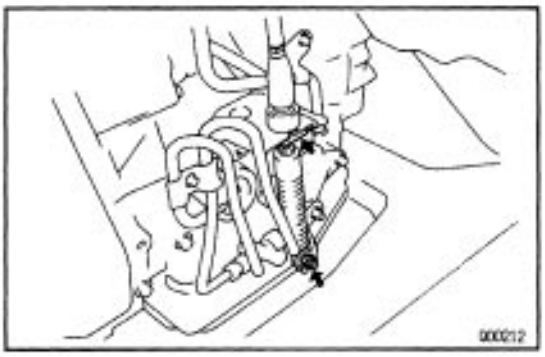


24. INSTALL 2 BOLTS AND CLAMP FROM TO FRAME ASSEMBLY



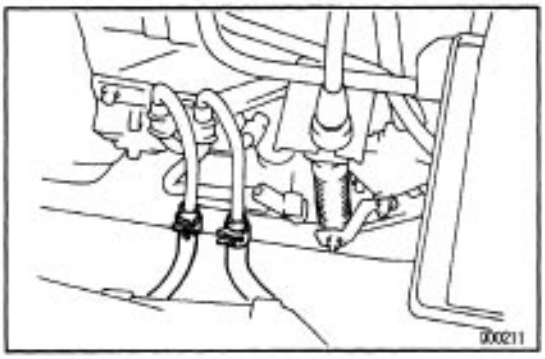
25. INSTALL 2 FRONT SIDE ENGINE MOUNTING BOLTS

Torque: 80 N–m l820 kgf–cm, 59 ft–lbfj

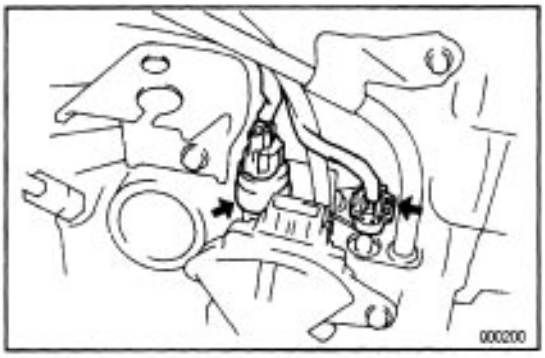


26. CONNECT SHIFT CONTROL CABLE

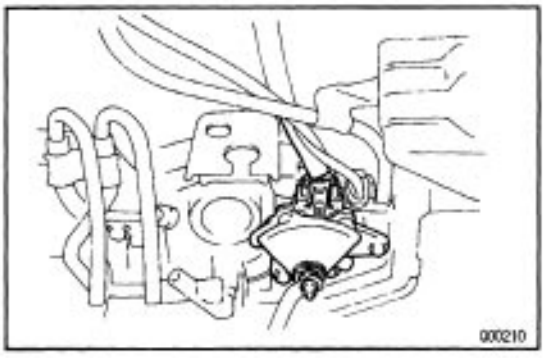
(a) Install the clip to the control cable.
(b) Install the nut.
(c) Adjust the control cable.
(See page AX1–55)



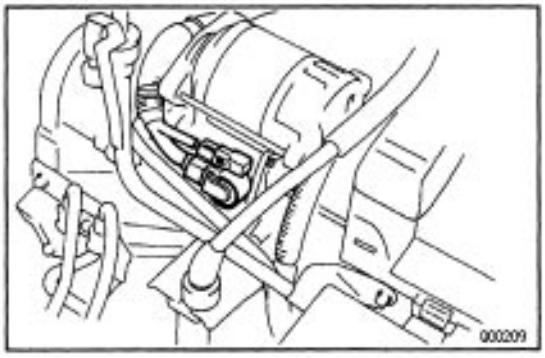
27. CONNECT OIL COOLER HOSE



28. CONNECT SOLENOID CONNECTOR

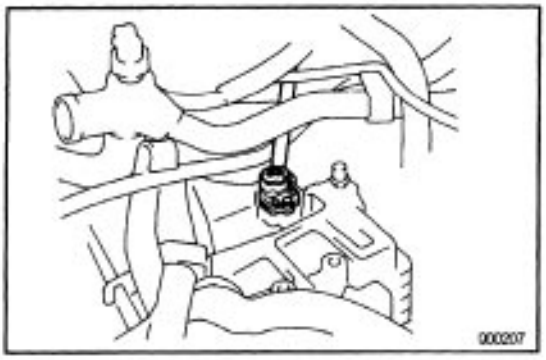


29. CONNECT PARK/ NEUTRAL POSITION SWITCH CONNECTOR

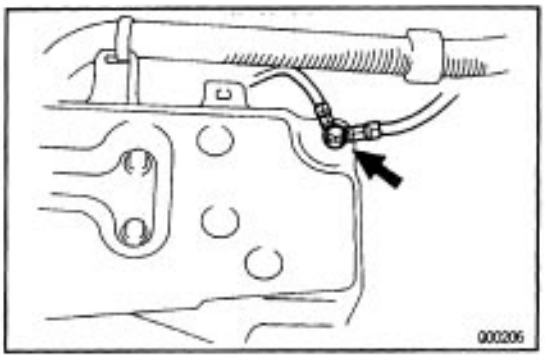


30. INSTALL STARTER

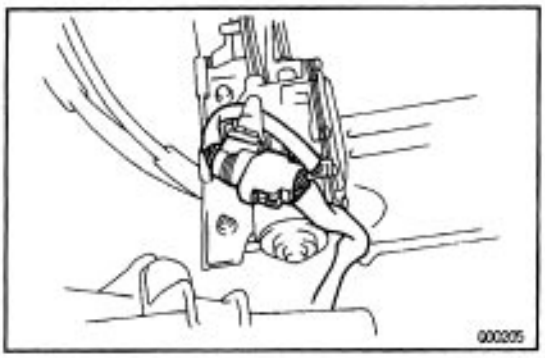
(a) Install the starter with 2 bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)
(b) Connect the connector and nut.



31. CONNECT VEHICLE SPEED SENSOR CONNECTOR



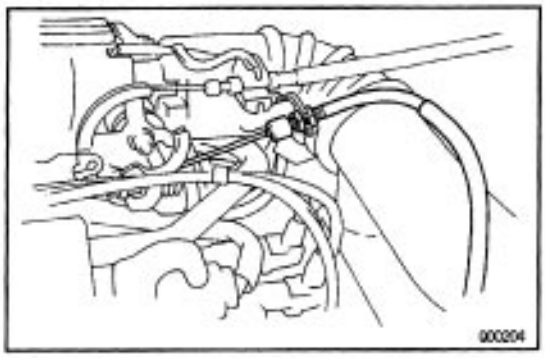
32. INSTALL GROUND TERMINAL



w/ Cruise Control System:

33. CONNECT CONNECTOR TO CRUISE CONTROL ACTUATOR

34. INSTALL CRUISE CONTROL ACTUATOR COVER



35. INSTALL THROTTLE CABLE TO ENGINE

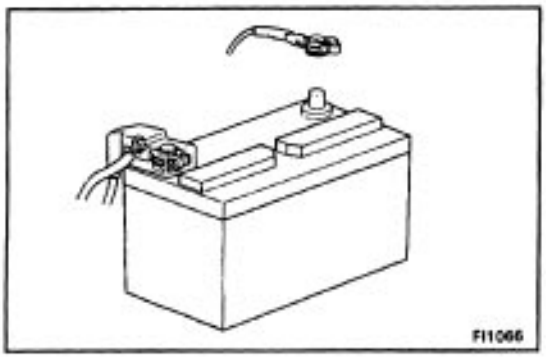
(a) Torque the nuts.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

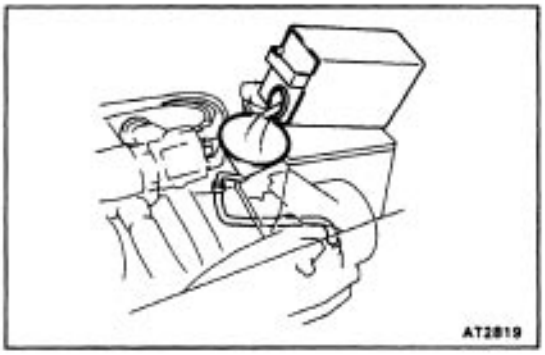
(b) Adjust the throttle cable.

(See page AX1–55**)**

36. INSTALL AIR CLEANER ASSEMBLY



37. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



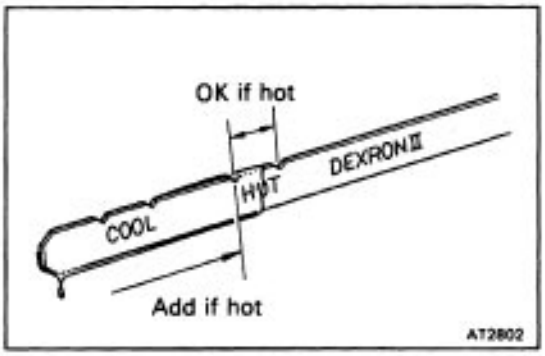
38. FILL TRANSAXLE WITH ATF

Fluid type:

ATF DEXRON ® II

Capacity:

5.6 liters (5.9 US gts, 4.9 Imp.gts)



39. CHECK FLUID LEVEL (See page AX1–64)

40. INSPECT FRONT WHEEL ALIGNMENT

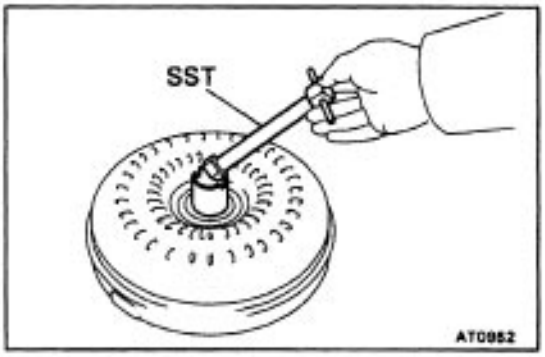
(See page SA–40)

41. PERFORM ROAD TEST

Check for abnormal noise and smooth shifting.

TORQUE CONVERTER CLEANING

If the transaxle is contaminated, the torque converter and transmission cooler should be thoroughly flushed with ATF.

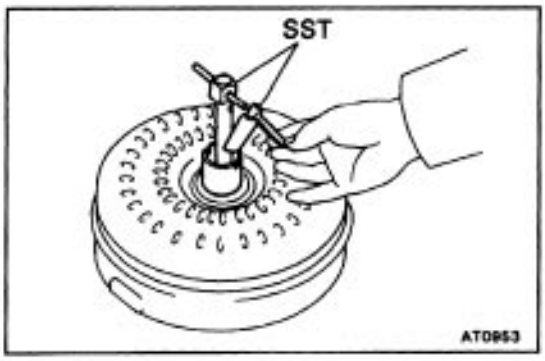


TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION

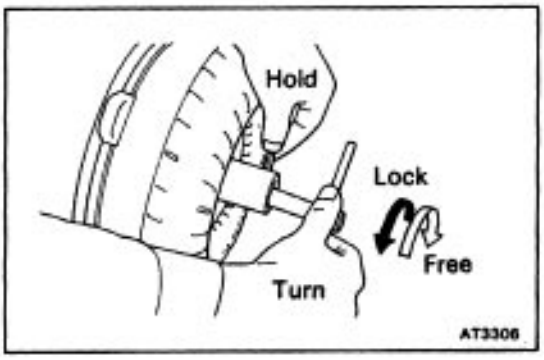
1. INSPECT ONE–WAY CLUTCH

(a) Install SST into the inner race of the one–way clutch.

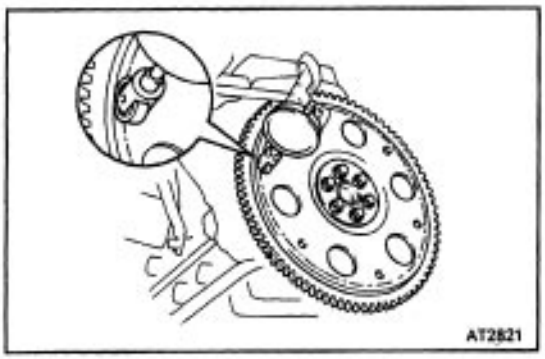
SST 09350–33014 (09351–32010)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



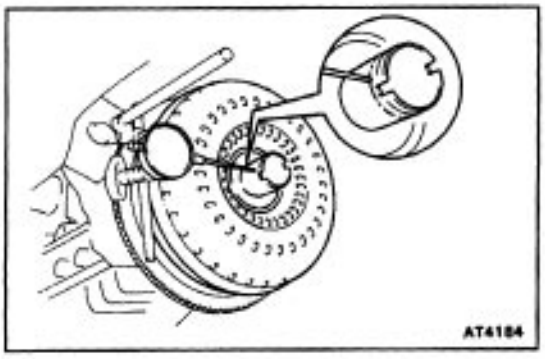
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter clutch and retest the clutch.
Replace the converter clutch if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

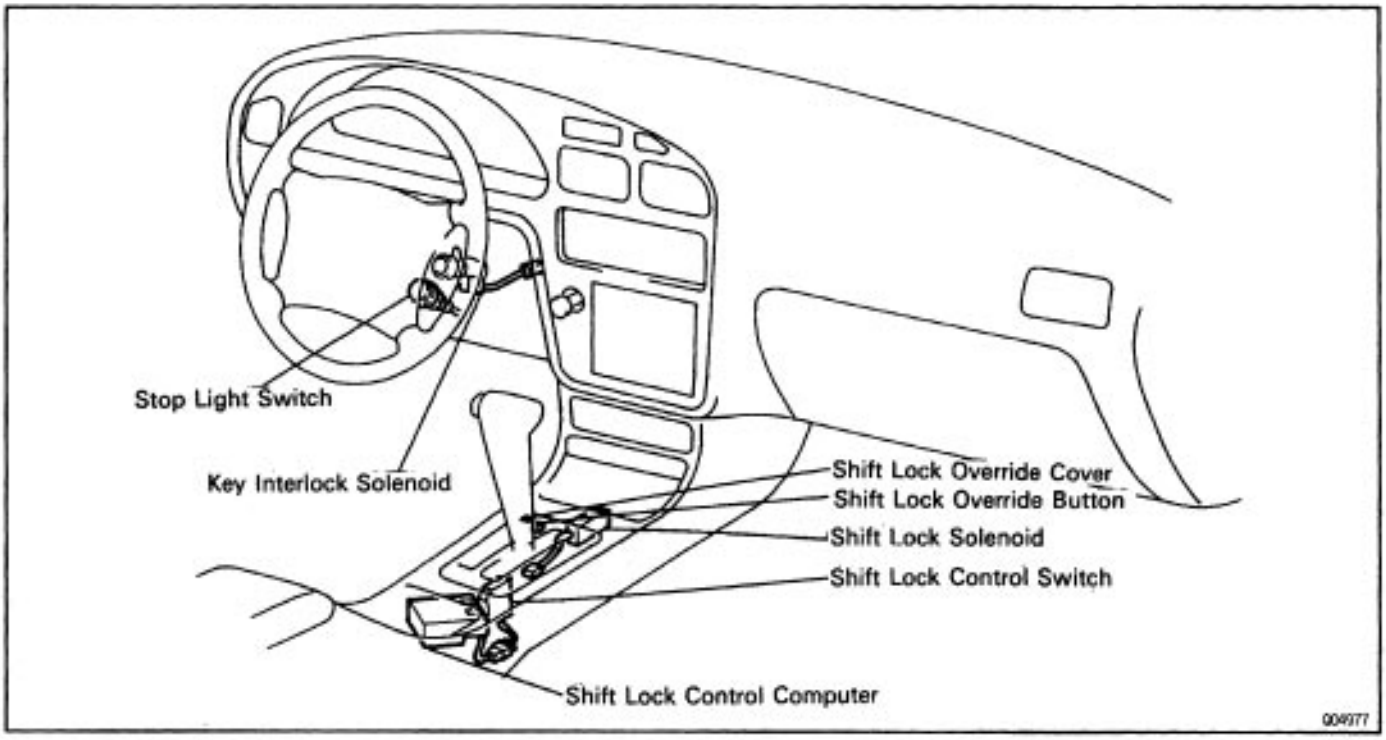
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch .

HINT: Mark the position of the converter clutch to ensure correct installation.

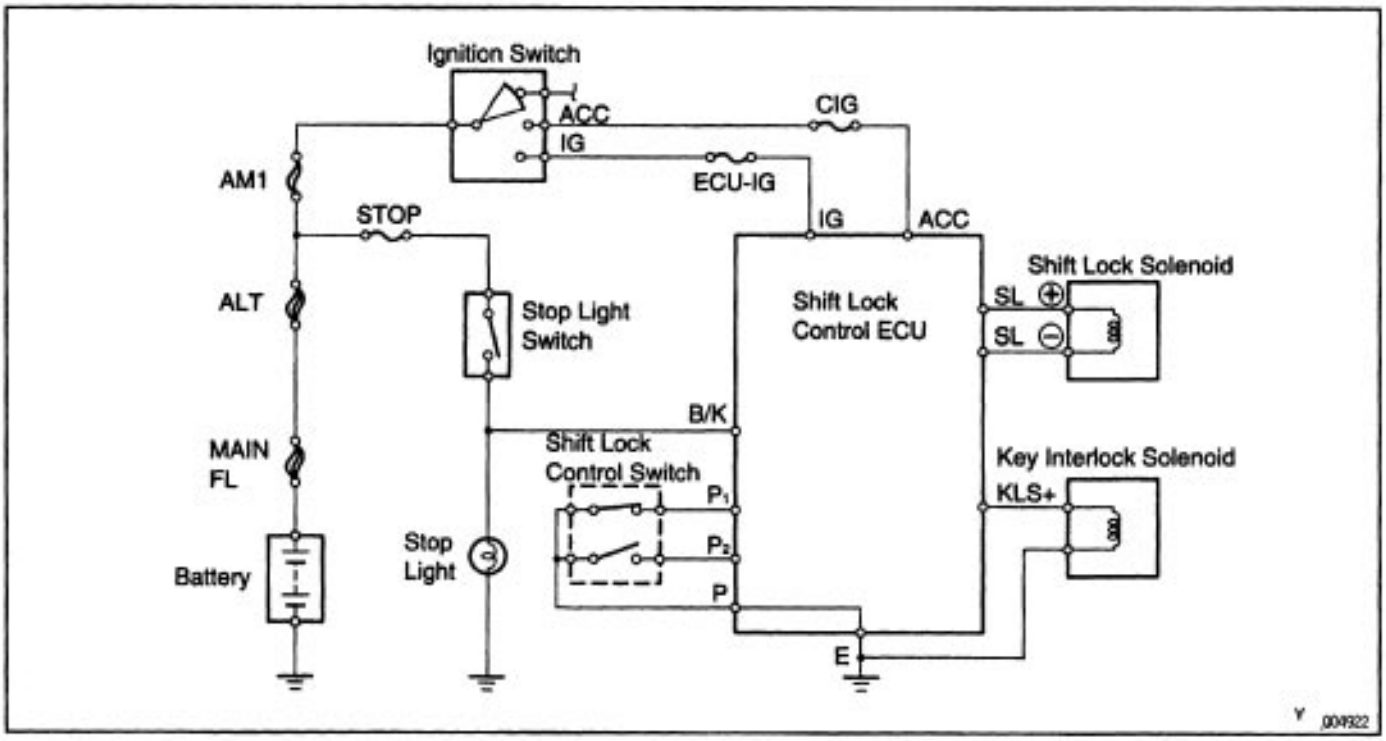
(b) Remove the torque converter clutch.

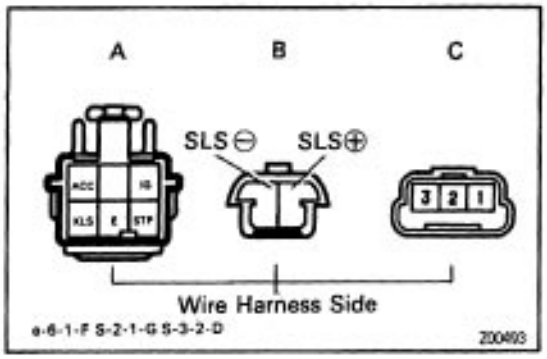
SHIFT LOCK SYSTEM

COMPONENT PARTS LOCATION



WIRING DIAGRAM





ELECTRIC CONTROL COMPONENTS INSPECTION

1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminals.

HINT: Do not disconnect the ECU connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	Ignition switch ACC position	10 – 14
	IG – E	Ignition switch ON position	10 – 14
	B/K – E	Depress brake pedal	10 – 14
	KLS – E	① Ignition switch ACC position and P position	0
		② Ignition switch ACC position and except P position	10 – 14
		③ (Approx–after 1 second)	6 – 9
B	SLS + – SLS-	① Ignition switch ON position and P position	0
		② Depress brake pedal	8.5 – 13.5
		③ (Approx–after 20 seconds)	5.5 – 9.5
		④ Except P position	0
C	P_1 – P	① Ignition switch ON, P position and depress brake pedal	0
		② Shift except P position under conditions above	9 – 13.5
	P_2 – P	① Ignition switch ACC position and P position	9 – 13.5
		② Shift except P position under condition above	0

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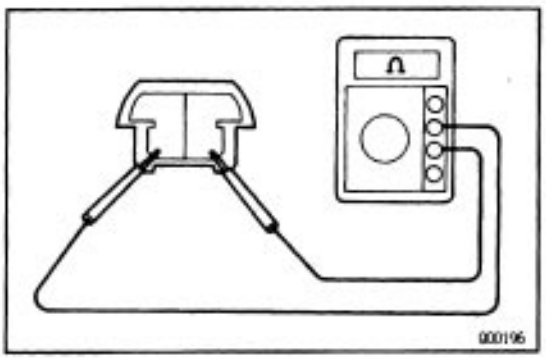


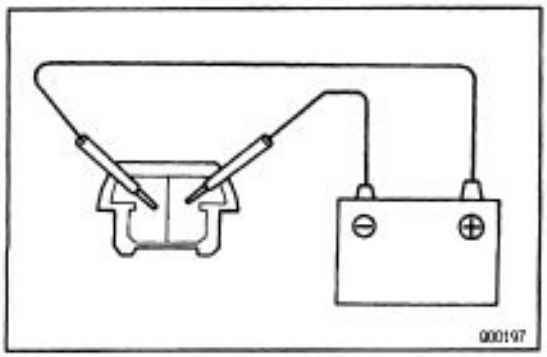
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

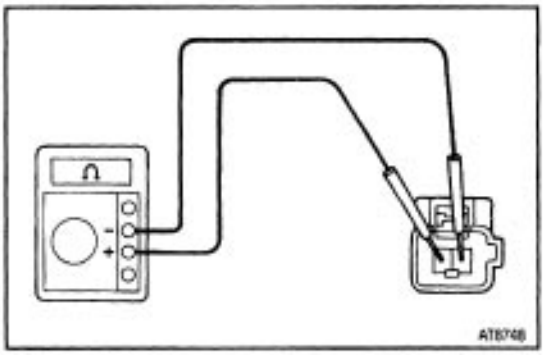
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance:

21–27Ω



(c) Apply the battery positive voltage between terminals. Check that an operation noise can be heard from the solenoid.



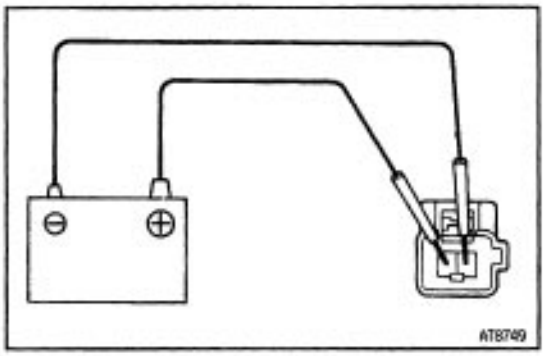
3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.

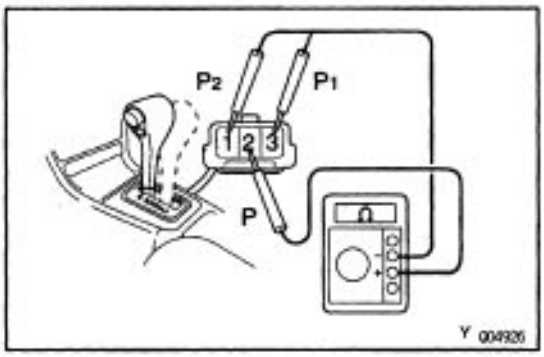
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance:

12.5–16.50



(c) Apply the battery positive voltage between terminals. Check that an operation noise can be heard from the solenoid.



4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminal.

Shift Position \ Terminal	P	P_1	P_2
P position (Release button is not pushed)	○—○	○—○	
P position (Release button is pushed)	○—○	○—○	○
	○	○	○
R, N, D, 2, L Position	○	○	○

TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

For troubleshooting using a volt/ohm meter, see page AX1–40±42.

HOW TO PROCEED WITH TROUBLESHOOTING USING VOLT OHM METER

1. CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

2. CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

Before confirming the problem symptom, first check the diagnostic trouble code if there are any trouble codes stored in memory. When there are trouble codes, make a note of them, then clear them and proceed to “3. Problem Symptom Confirmation”.

3. PROBLEM SYMPTOM CONFIRMATION

Confirm the problem symptoms.

4. SYMPTOM SIMULATION

If the problem does not reappear, be sure to simulate the problem by mainly checking the circuits indicated by the diagnostic trouble code in step 2, using “Problem Simulation method”.

5. DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes. Check if there is abnormality in the sensors or the wire harness.

If a trouble code is output, proceed to “6. Diagnostic Trouble Code Chart”.

If the normal code is output, proceed to “7. Matrix Chart of Problem Symptoms”.

Be sure to proceed to “6. Diagnostic Trouble Code Chart” after steps 2 and 3 are completed.

If troubleshooting is attempted only by following the trouble code stored in the memory is output, errors could be made in the diagnosis.

6. DIAGNOSTIC TROUBLE CODE CHART

If a trouble code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

7. PRELIMINARY CHECK

Carry out a preliminary check of the transaxle oil level, throttle cable adjustment, etc.

8. SHIFT POSITION SIGNAL CHECK

Carry out the shift position signal check when the transaxle gears do not up–shift, down–shift or lock–up. This is to check the signal output condition from the ECM to each solenoid. If the results are NG, then it is likely that the trouble is in the electrical system (particularly in the sensors or the ECM).

Proceed to Part 1 (Electrical System) under “

11. Matrix Chart of Problem Symptoms”. If all the

circuits specified in Part 1 are OK, check the ECM and replace it.

9. MECHANICAL SYSTEM TEST

(Stall Test, Time Leg Test, Line Pressure Test)

If the malfunction is found in the stall test, time lag test or line pressure test, check the parts indicated in the respective tests.

14. MANUAL SHIFTING TEST

If the results of the manual driving test are NG, it is likely that the trouble is in the mechanical system or hydraulic system. Proceed to Part 2 (Mechanical System) under the Matrix Chart of Problem Symptoms.

11. MATRIX CHART OF PROBLEM SYMPTOMS

If the normal code is confirmed in the diagnostic trouble code check, perform inspection according to the inspection order in the matrix chart of problem symptoms. Perform diagnosis of each circuit or part in the order shown in the Matrix Chart. The Matrix Chart contains 3 chapters, Electronically Controlled Circuits in Chapter 1, On–vehicle Inspection in Chapter 2 and Off–vehicle Inspection in Chapter 3. If all the circuits indicated in Chapter 1 are normal, proceed to Chapter 2. If all the parts indicated in Chapter 2 are normal, proceed to Chapter 3. If all the circuits and parts in Chapter 1–Chapter 3 are normal and the trouble still occurs, check and replace the ECM.

12. CIRCUIT INSPECTION

Perform diagnosis of each circuit in accordance with the inspection order confirmed in steps 6 and 11. Judge whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECM. In some cases, the Flow Chart instructs that a throttle signal check, brake signal check or kick–down signal check (in test mode), be performed. These are diagnosis functions used to check if signals are being input correctly to the ECM.

13. PART INSPECTION

Check the individual parts of the mechanical system and hydraulic system in the order of the numbers indicated in the Matrix Chart.

14. REPAIRS

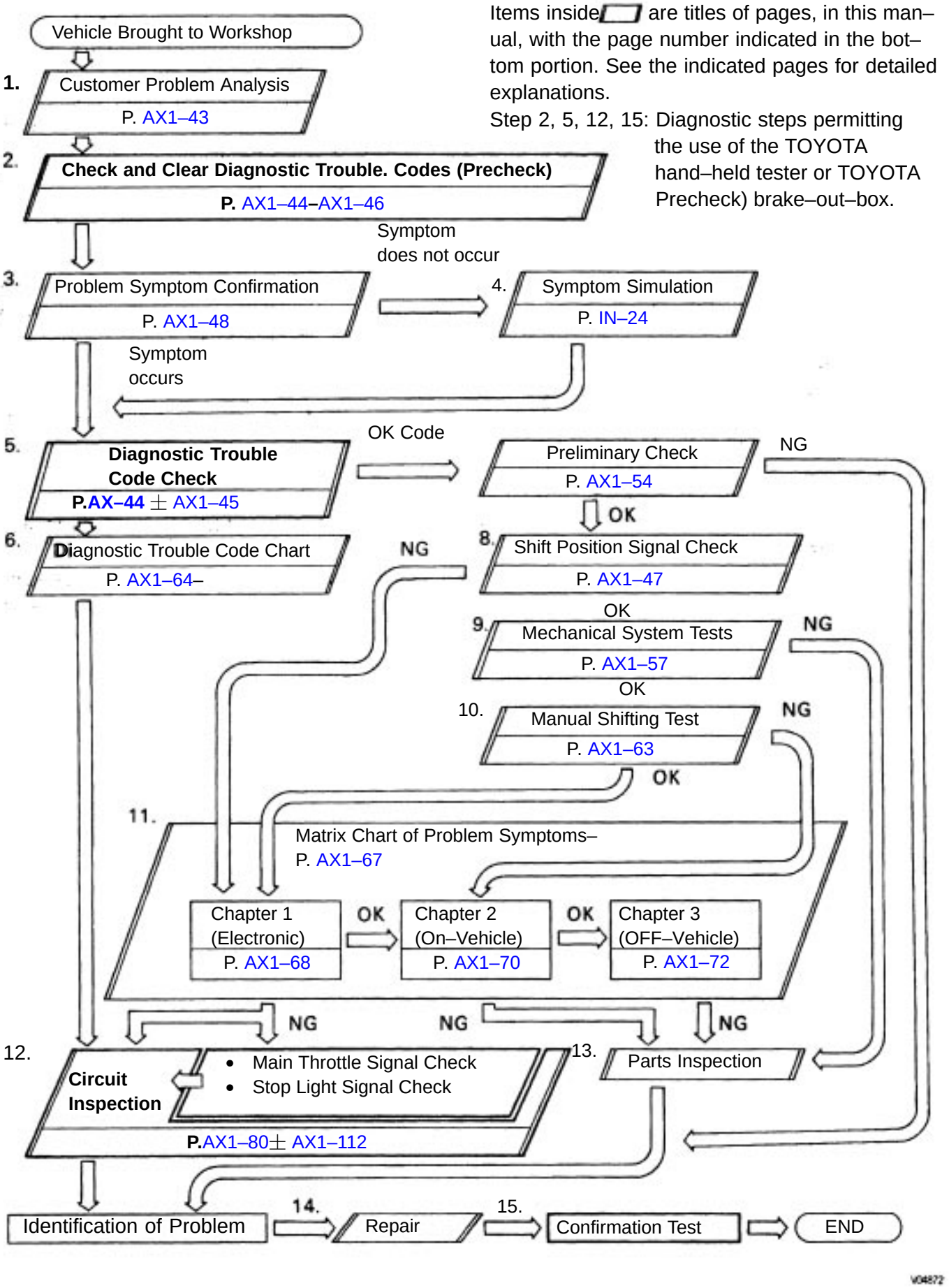
After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual or’94 Al 40E AUTOMATIC TRANSAXLE Repair Manual.

15. CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive, etc., to make sure the entire electronically controlled transaxle system is operating correctly.

Items inside ▭ are titles of pages, in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 12, 15: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA Precheck) brake–out–box.



CUSTOMER PROBLEM ANALYSIS

Electronically Controlled Transaxle Check Sheet	Inspector's Name:

Customer's name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Mile

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)
	☐ No up-shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down-shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock-up malfunction
	☐ Shift point too high or too low.
	☐ Harsh engagement (☐ N → D ☐ Lock-up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick-down
	☐ No pattern select
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal	☐ Remains ON

Diagnostic Trouble Code Check (O/D OFF Indicator Light)	1st Time	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

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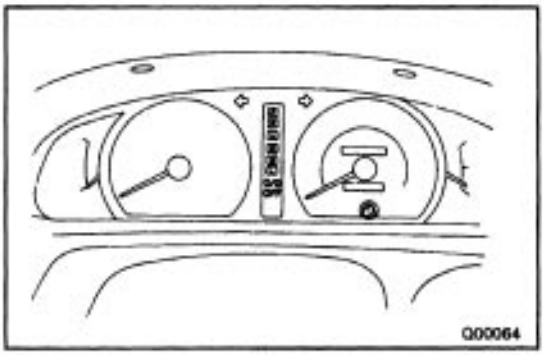
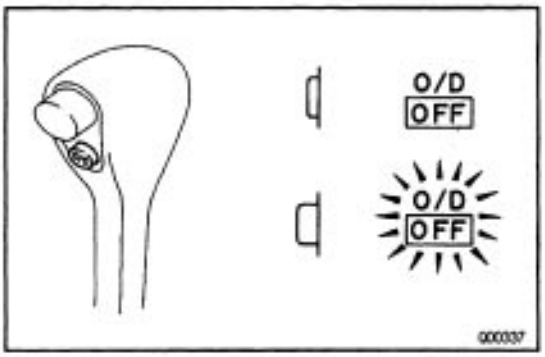


DIAGNOSIS SYSTEM

The Electronically Controlled Transaxle has built–in self–diagnostic functions. If the malfunction occurs in the system, the ECM stores the diagnostic trouble code in memory and the O/D OFF (Overdrive OFF) indicator light blinks to inform the driver. The diagnos–tic trouble code stored in memory can be read out by the following procedure.



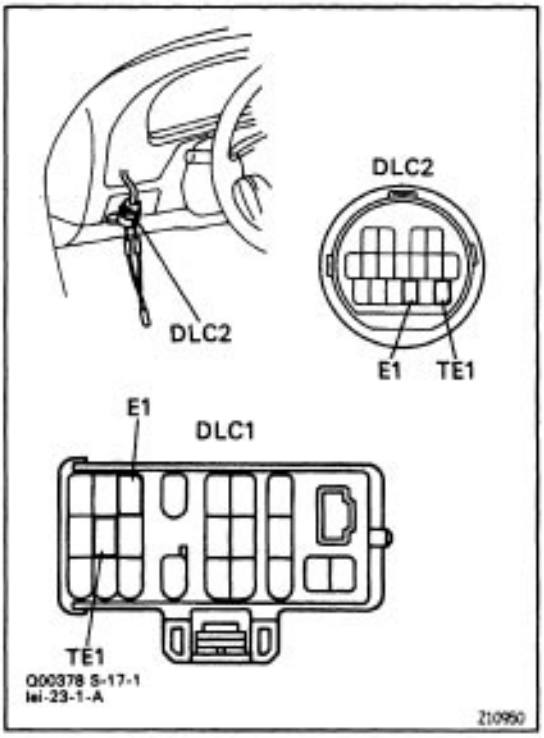
O/D OFF INDICATOR LIGHT INSPECTION

1. Turn the ignition switch to ON.

2. Check if the O/D OFF indicator light lights up when the O/D main switch is pushed out to OFF and goes off when the O/D main switch is pushed in to ON.

HINT:

- **If the O/D OFF indicator light does not light up or stay on all the time, carry out the check for 'O/D OFF Indicator Light Circuit" on page AX–102.**
- **If the O/D OFF indicator light blinks, a trouble code is stored in the ECM memory.**



DIAGNOSTIC TROUBLE CODE CHECK

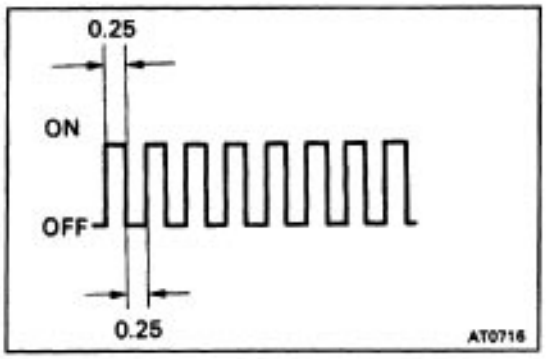
1. Turn the ignition switch ON, but do not start the engine.

2. Push in the O/D main switch to ON.

HINT: Warning and diagnostic trouble codes can be read only when the O/D main switch is ON. If it is OFF, the 0/D OFF indicator light up will light continu–ously and will not blink.

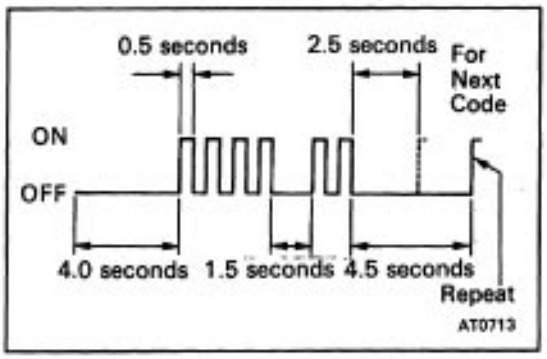
3. Using SST, connect terminals TE1 and El of the DLC1 or DLC2.

SST 09843–18020



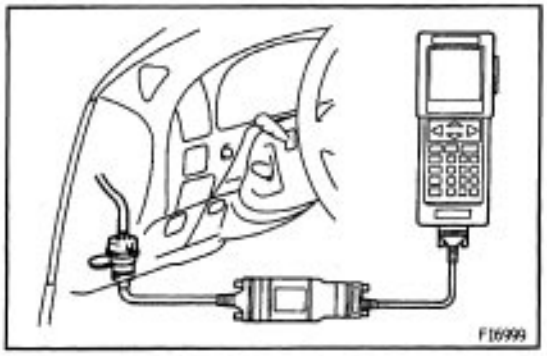
4: Read the diagnostic trouble code indicated by the number of times the O/D OFF indicator light blinks.

HINT: If the system is operating normally, the light will blink 2 times per second.



Diagnostic trouble code “42” is shown as an example.

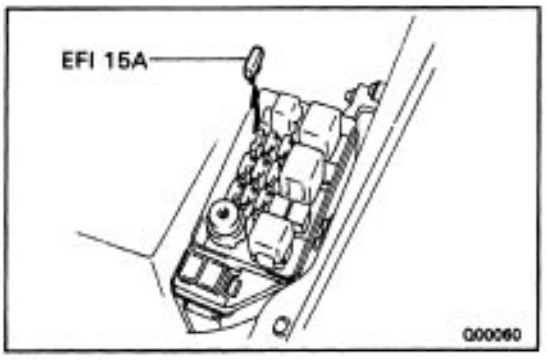
HINT: When 2 or more trouble codes are stored in memory, the lower–numbered code is displayed first. If no diagnostic trouble code is output, or if a diagnostic trouble code is output even though no diagnostic trouble code output operation is performed, check the TE1 terminal circuit on page AX1–110.



DIAGNOSTIC TROUBLE CODE CHECK BY USING TOYOTA HAND–HELD TESTER

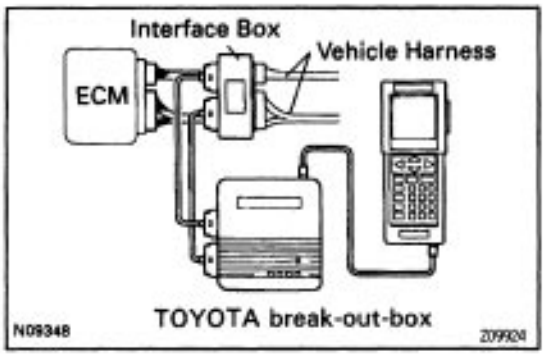
1. Hook up the TOYOTA hand–held tester to the DLC2.

2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the TOYOTA hand–held tester operator’s manual for further details.



CANCELLING DIAGNOSTIC TROUBLE CODE

After repair of the trouble area, the diagnostic trouble code retained in the ECM memory must be cancelled out by removing the EM fuse for 10 seconds or more, with the ignition switch off.
Check that the normal code is output after connecting the fuse.



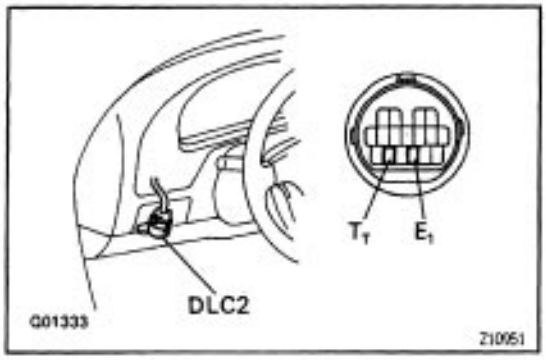
ECM TERMINALS STANDARD VALUE

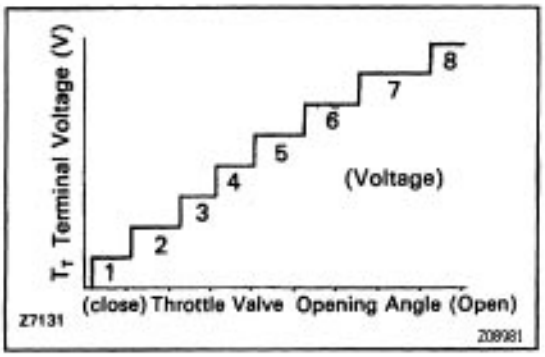
ECM TERMINAL VALUES

MEASUREMENT BY USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.
2. Read the ECM input/output values by following the prompts on the tester screen.

   HINT: TOYOTA hand–held tester has a “Snapshot” function. This records the measured values and is effective in the diagnosis of intermittent problems. Please refer to the TOYOTA hand–held tester / TOYOTA break–out–box operator’s manual for further details.





CHECK TERMINAL TT OUTPUT VOLTAGE

When a voltmeter is connected to the DLC2, the following items can be checked:

1. Throttle position sensor signal

2. Brake signal

3. Shift position signal

1. VOLTMETER CONNECTION

Connect the positive (+) probe of the voltmeter to terminal Tt and the negative (–) probe to terminal E1 of the DLC2.

HINT: If a voltmeter with small internal resistance is used, the correct voltage will not be indicated, so use a voltmeter with an internal resistance of at least 10 k) .

2. TURN IGNITION SWITCH TO ON (DO NOT START THE ENGINE)

3. CHECK THROTTLE POSITION SENSOR SIGNAL

Check if the voltage changes from approximately 0 V to approximately 8 V when the accelerator pedal is gradually depressed from the fully closed position.

4. CHECK BRAKE SIGNAL (LOCK–UP CUT SIGNAL)

(a) Open the throttle valve fully to apply approximately 8 V to terminal Tt.

(b) In this condition, check terminal Tr voltage when the brake pedal is depressed and released.

Tt terminal voltage:

0 V (When brake pedal is depressed)

8 V (When brake pedal is released)

5: START ENGINE

6. CHECK SHIFT POSITION SIGNAL

(VEHICLE SPEED ABOVE 10 KM/H OR 6 MPH)

Check up–shifting together with terminal TT voltage.

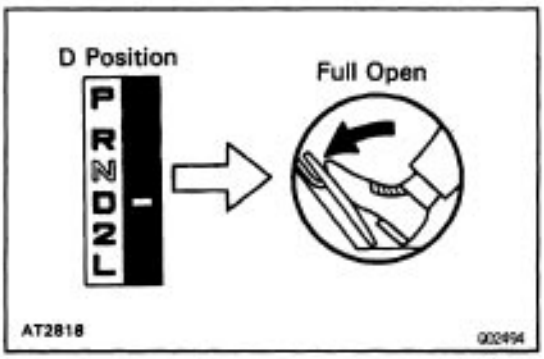
HINT: Check for light shocks from up–shifting and for changes in the tachometer.

Gear Position	Terminal TT output voltage
1 st Gear	Below 0.5 V
2nd Gear	1.5–2.6 V
2nd Lock–up	2.5–3.6 V
3rd Gear	3.5–4.6 V
3rd Lock–up	4.5–5.6 V
O/D	5.5–6.6 V
0/D Lock–up	6.5–7.6 V

If terminal TT output voltage check cannot be perfo–rmed, check TT terminal circuit on page AX1–112.

PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transaxle does not up–shift, does not down –shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.



ROAD TEST

NOTICE: Perform the test at normal ATF operating tem–perature 50–80 ℃ (122–176 ℉).

1. D POSITION TEST

Shift into the D position and keep the accelerator pedal constant at the full throttle valve opening posi–tion, and check the following points:

(a) Check up–shift operation.

Check that 1–2, 2–3 and 3–O/D up–shift takes place, at the shift point shown in the automatic shift schedule. (See page AX1–52)

HINT:

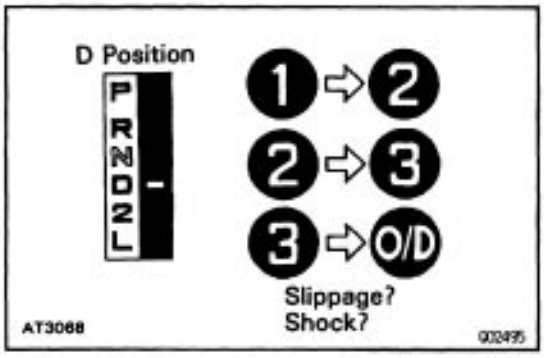
(1) 0/D Gear Up–shift Prohibition Control.

- Coolant temp. is 50℃ (122℉) or less
- If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.
- 0/D main switch is pushed ON

(During the O/D OFF indicator light lights up.)

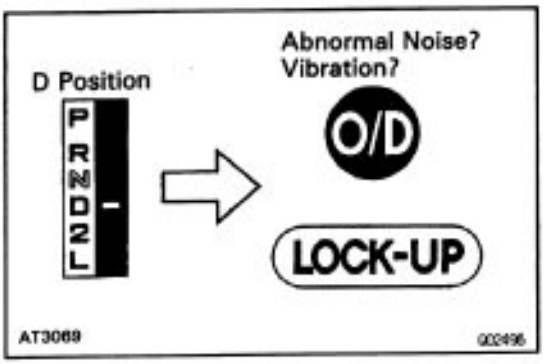
(2) 0/D Gear Lock–up Prohibition Control.

- Brake pedal is depressed.
- Coolant temp. is 50 ℃ (122 ℉) or less.



(b) Check for shift shock and slip.

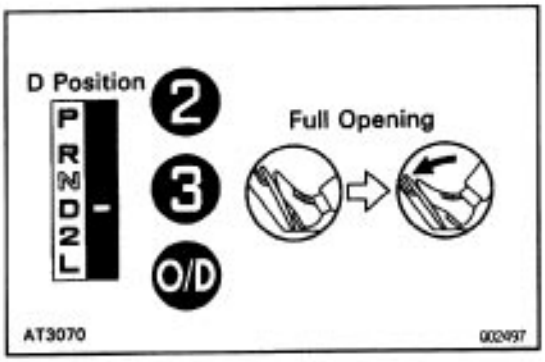
Check for shock and slip at the 1–2, 2–3 and 3–0/D up–shifts.



(c) Check for abnormal noise and vibration.

Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

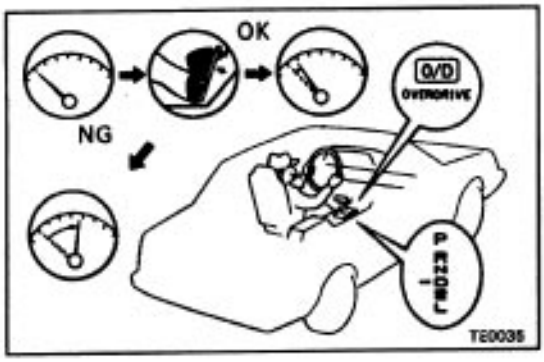
HINT: The check for the cause of abnormal noise and vibration must be performed very thoroughly as it could also be due to loss of balance in the torque converter clutch, etc.



(d) Check kick–down operation.

While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 ~ 1, 3 ~ 2 and O/D ~ 3 kick–downs conform to those indicated on the automatic shift schedule. (See page **AX1–52**)

(e) Check abnormal shock and slip at kick–down.

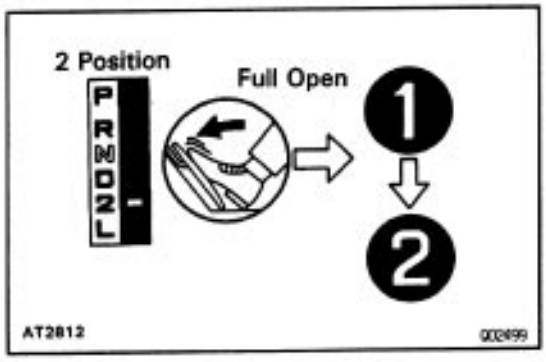


(f) Check the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

(2) Lightly depress the accelerator pedal and check that the RPM does not change abruptly.

If there is a big jump in RPM, there is no lock–up.



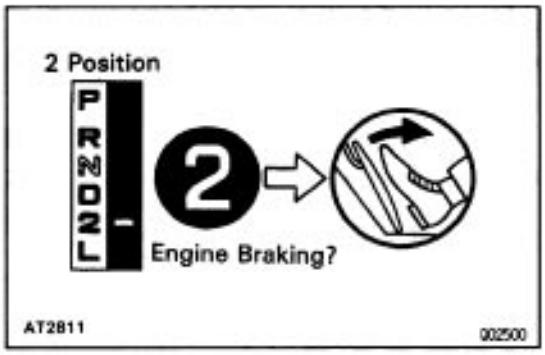
2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position and check on the following points:

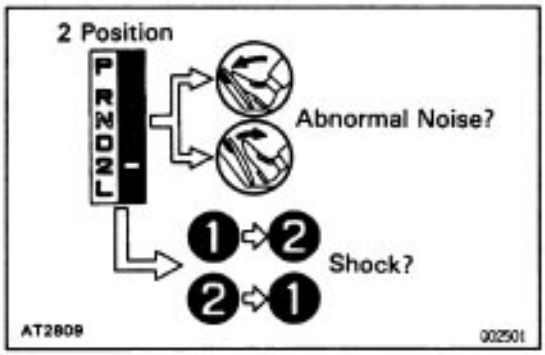
(a) Check up–shift operation

Check to see that the 1 ~ 2 up–shift takes place and that the shift point conforms to the automatic shift schedule. (See page AX1–52)

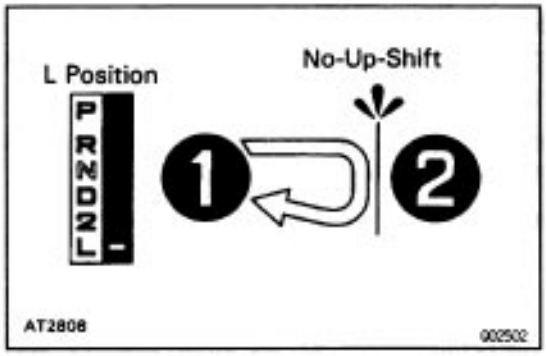
HINT: There is no O/D up–shift and lock–up in the 2 position.



(b) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



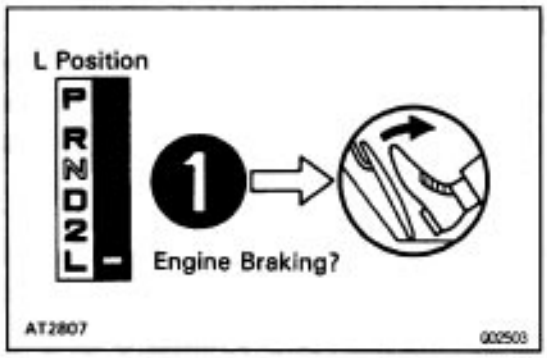
(c) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.



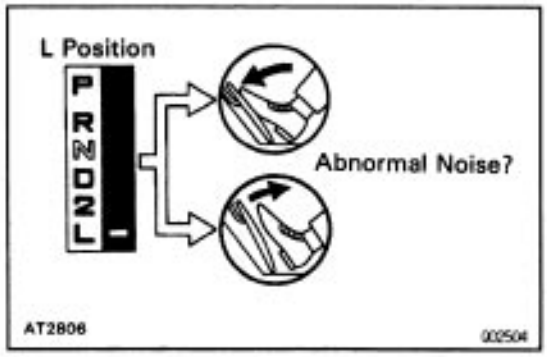
3. L POSITION TEST

Shift into the L position and while driving with the accelerator pedal held constantly at the full throttle valve opening position, and check the following points:

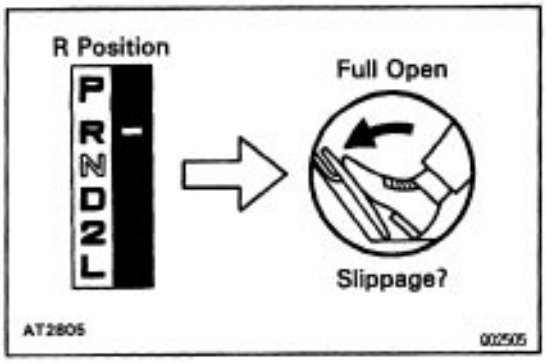
(a) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.



(b) Check engine braking.
While running in the L position, release the accelera–tor pedal and check the engine braking effect.



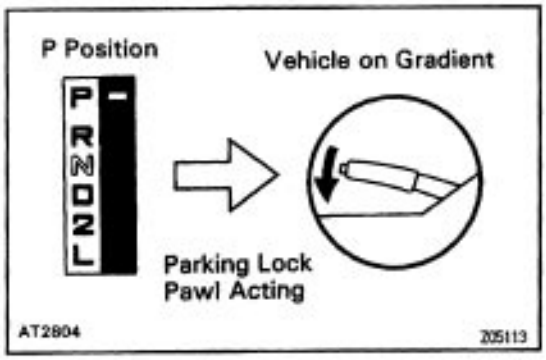
(c) Check for abnormal noises during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and while starting at full throttle, check for slipping.

CAUTION: Before conducting this rest ensure that the test area is free from personnel and obstructions.



5. P POSITION TEST

Stop the vehicle on a gradient (more than 5 ®) and after shifting into the P position, release the parking brake.

Then check to see that the parking lock pawl holds the vehicle in place.

AUTOMATIC SHIFT SCHEDULE

AX2WW–06

SHIFT POINT

NORM Mode

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	58–65 (36–40)
		2→3	110–120 (68–75)
		3→O/D	147–157 (91–98)
		O/D→3	138–150 (86–93)
		3→2	98–108 (61–67)
		2→1	42–49 (26–30)
	Throttle valve fully closed	3→O/D	38–45 (24–28)
		O/D→3	17–24 (11–15)
2 position	Throttle valve fully opened	1→2	58–65 (36–40)
		3→2	89–99 (55–62)
		2→1	42–49 (26–30)
L position	Throttle valve fully opened	2→1	50–56 (31–35)

PWR Mode

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	58–65 (36–40)
		2→3	110–120 (68–75)
		3→O/D	147–157 (91–98)
		O/D→3	139–149 (86–93)
		3→2	101–111 (63–69)
		2→1	51–58 (32–36)
	Throttle valve fully closed	3→O/D	38–45 (24–28)
		O/D→3	17–24 (11–15)
2 position	Throttle valve fully opened	1→2	58–65 (36–40)
		3→2	89–99 (55–62)
		2→1	42–49 (26–30)
L position	Throttle valve fully opened	2→1	50–56 (31–35)

LOCK–UP POINT

NORM Mode

D position Throttle valve opening 596	Lock–up ON km/h (mph)	Lock–up OFF km/h (mph)
3rd Gear	* 85–92 (53–57)	* 79–86 (49–53)
O/D Gear	67–74 (42–46)	64–71 (35–38)

PWR Mode

D position Throttle valve opening 596	Lock–up ON km/h (mph)	Lock–up OFF km/h (mph)
3rd Gear	* 85–92 (53–57)	* 79–86 (49–53)
O/D Gear	73–80 (45–50)	70–77 (43–48)

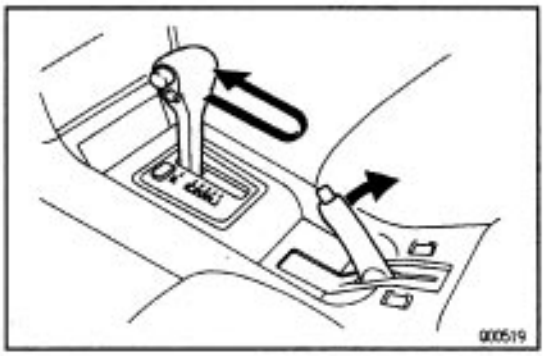
*O/D main switch OFF

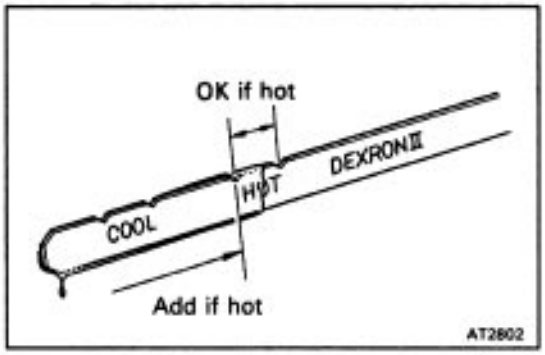
HINT:

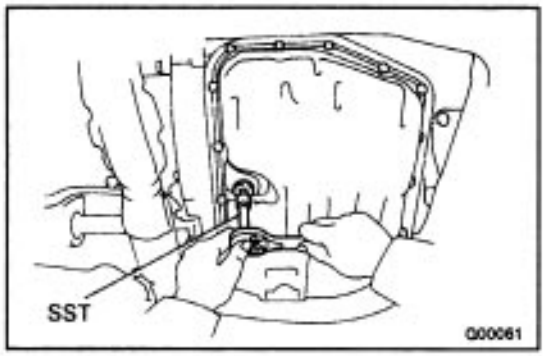
(1) In the 2 and L positions, all stages lock–up is OFF.

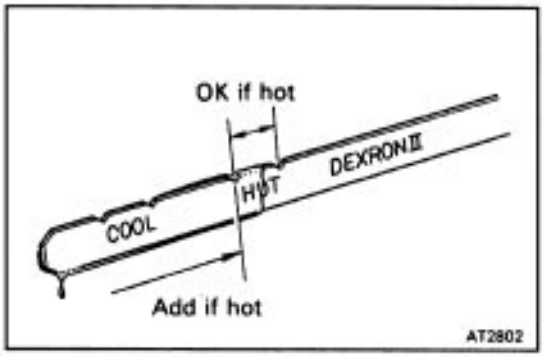
(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle valve is completely closed.
- When the brake light switch is ON.









PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT:

- Drive the vehicle so that the engine and transaxle are at normal operating temperature.
  Fluid temp.: 70–80 $_3$C (158–176 $_3$F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.

(a) Park the vehicle on a level surface and set the parking brake.

(b) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.

(c) Pull out the oil level gauge and wipe it clean.

(d) Push it back fully into the tube.

(e) Pull it out and check that–the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.

3. REPLACE TRANSAXLE FLUID

(a) Using SST, remove the drain plug and drain the fluid.

SST 09043–38100

(b) Reinstall the drain plug securely.

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type:

ATF DEXRON^II

Capacity:

Total: 5.6 liters (5.9 US qts, 4.9 Imp. qts)

Drain and refill: 2.5 liters (2.6 US qts. 2.2 Imp. qts)

(d) Start the engine and shift the shift lever into all posi–tions from P to L position and then shift into P posi–tion.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

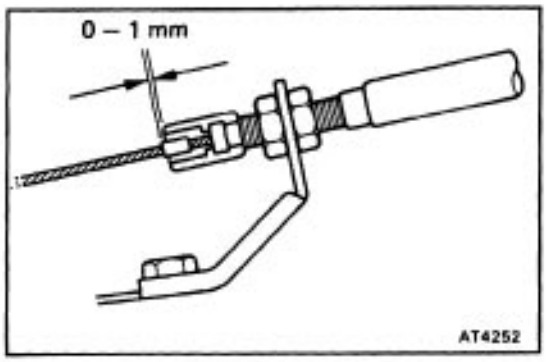
(f) Check the fluid level at the normal operating tempera–ture 70–80 $_3$C (158–176 $_3$F) and add as neces–sary.

NOTICE: Do not overfill.

4. CHECK FLUID LEAKS

Check for leaks in the transaxle.

If there are leaks, it is necessary to repair or replace O –rings, seal packings, oil seals, plugs or other parts.



5. INSPECT AND ADJUST THROTTLE CABLE

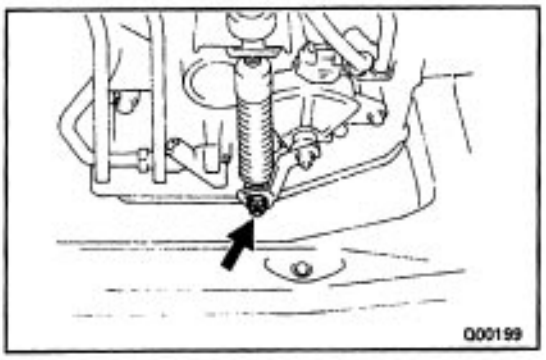
(a) Check that the throttle valve is fully closed.
(b) Check that the inner cable is not slack.
(c) Measure the distance between the outer cable end and stopper on the cable.

Standard distance:
0–1 mm (0–0.04 in.)

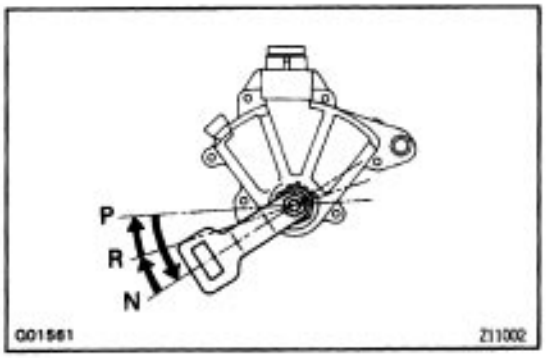
If the distance is not standard, adjust the cable by the adjusting nuts.

6. INSPECT AND ADJUST SHIFT CABLE

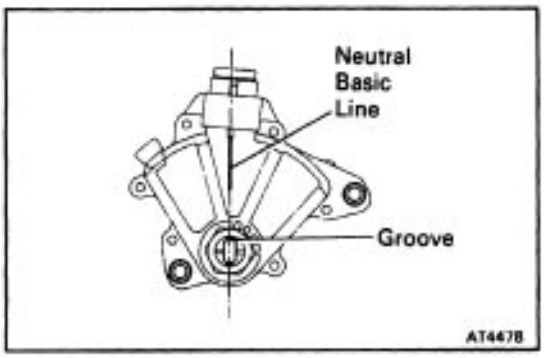
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.
If the indicator is not aligned with the correct position, carry out the following adjustment procedures:



(a) Loosen the swivel nut on the manual shaft lever.
(b) Push the manual shaft lever fully toward the right side of the vehicle.



(c) Return the control shaft lever 2 notches to U position.
(d) Set the shift lever to N position.
(e) While holding the shift lever lightly toward the R position side, tighten the shift lever nut.



7. INSPECT AND ADJUST PARK/NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as started above, carry out the following adjust–ment procedure:

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)

8. INSPECT IDLE SPEED (N POSITION)

Idle speed:

750 rpm

(In N position and air conditioner OFF)

MECHANICAL SYSTEM TESTS

AX0081–01

STALL TEST

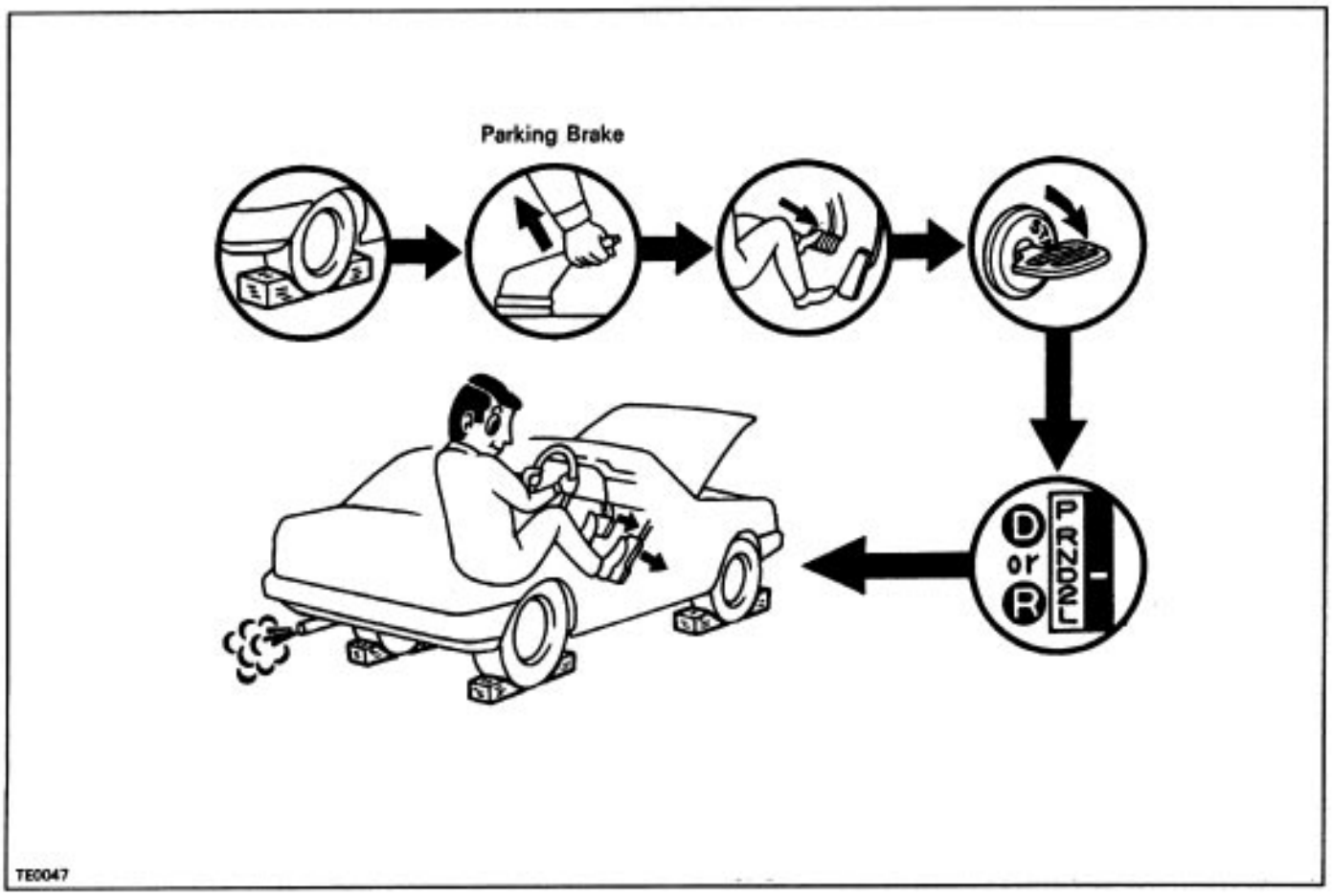
The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature 50–80 ℃ (122–176 ℉).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of the wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the 4 wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Start the engine.
(f) Shift into the D position. Fully depress the accelerator pedal with your right foot.
Quickly read the stall speed.
Stall speed:
2,450 ±150 rpm
(g) Perform the same test in R position.
Quickly read the stall speed.
Stall speed:
2,450 ±150 rpm



EVALUATION

Problem	Possible cause
(a) Stall speed low in D and R positions.	• Engine output may be insufficient. • Stator one–way clutch is operating properly HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty.
(b) Stall speed high in D position.	• Line pressure too low • Forward clutch slipping • No.2 one–way clutch not operating properly • 4/D one–way clutch not operating properly
(c) Stall speed high in R position.	• Line pressure too low • Direct clutch slipping • First and reverse brake slipping • O/D clutch slipping
(d) Stall speed high in D and R position.	• Line pressure too low • Improper fluid level • 0/D one–way clutch not operating properly

TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the 4/D direct clutch, forward clutch, direct clutch, and first and reverse brake.

NOTICE:

- Perform the test at normal operating fluid temperature 50–80 ®C (122–176 ®F).
- Be sure to allow a one minute Interval between tests.
- Make 3 measurements and take the average value.
- **MEASURE TIME LAG**

(a) Fully apply the parking brake

(b) Start the engine and check idle speed.

Idle speed:

750 rpm (in N position and air conditioner OFF)

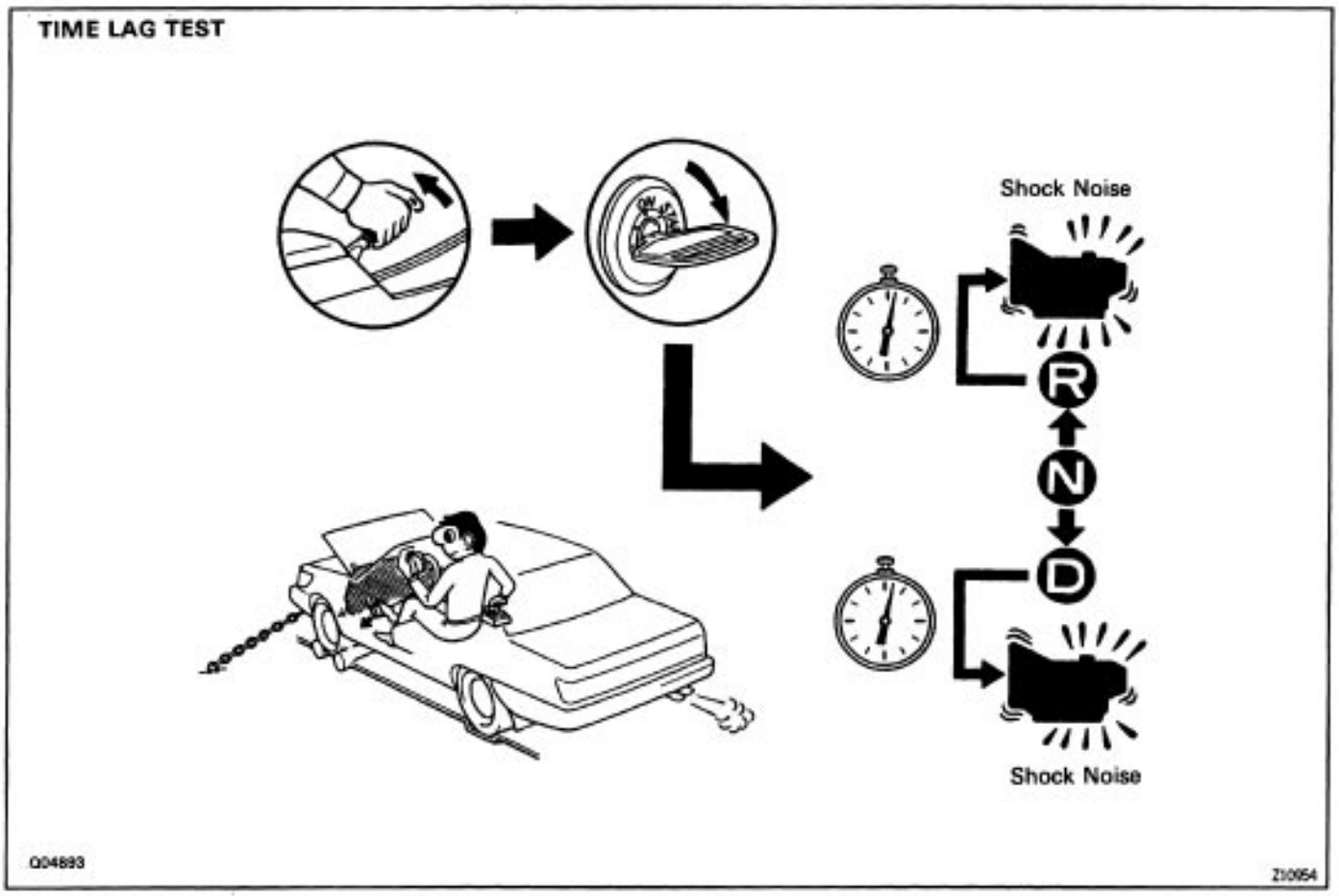
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

In same manner, measure the time lag for N–R.

Time lag:

N±D Less than 1.2 seconds

N±R Less than 1 .5 seconds



EVALUATION

If N±D or N±R time lag are longer than specified:

Problem	Possible cause
N～D time lag is longer	• Line pressure too low • Forward clutch worn • O/D one–way clutch not operating properly
N～R time lag is longer	• Line pressure too low • Direct clutch worn • First and reverse brake worn • O/D clutch worn

HYDRAULIC TEST

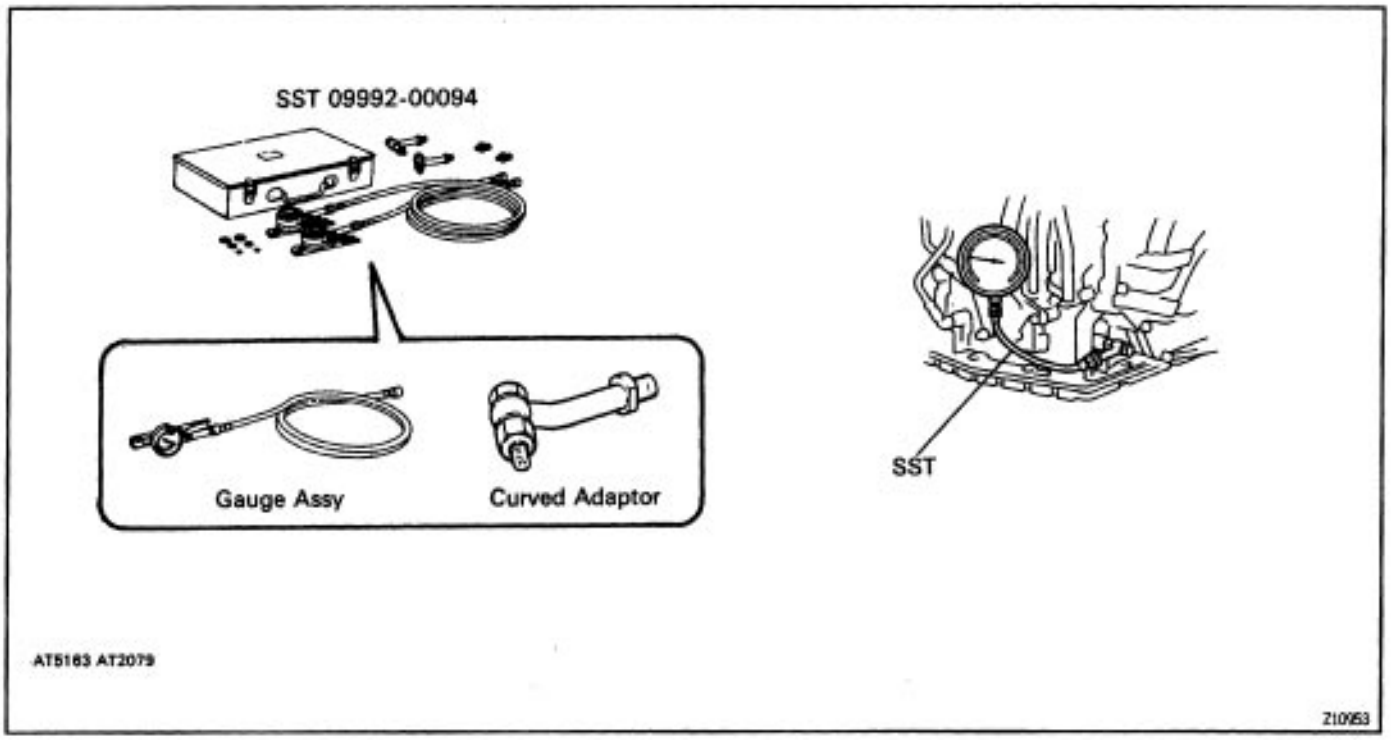
MEASURE LINE PRESSURE

NOTICE:

- **Perform the test at normal operating fluid temperature 50–80 ®C (122–176 ®F).**
- **The line, pressure test should always be carried out in pairs. One technician should observe the conditions of the wheels or wheel stoppers outside the vehicle while the other is performing the test.**

(a) Warm up the transaxle fluid.

(b) Remove the test plug on the transaxle case left side and connect the oil pressure gauge SST.
SST 09992–00094



(c) Fully apply the parking brake and chock the 4 wheels.

(d) Start the engine and check idling RPM.

(e) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(f)' Measure the line pressure when the engine is idling.

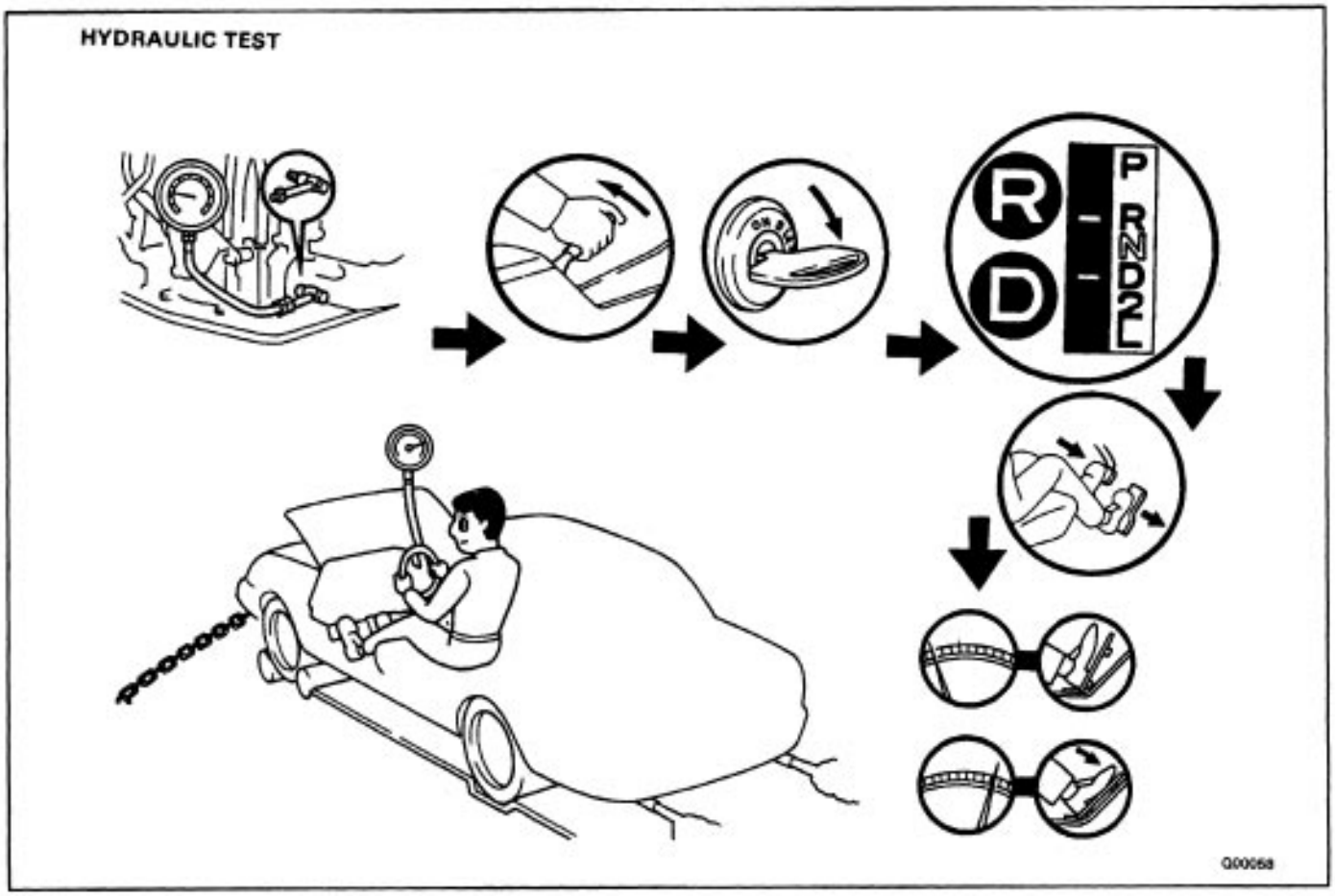
(g) Fully depress the accelerator pedal. Quickly read the highest line pressure when engine speed reaches stall speed.

(h) In the same manner, perform the test in R position.

SPECIFIED LINE PRESSURE

Line pressure	D position kPa (kgf/emt, psi)	R position kPa (kgf/cmt, psi)
Idling	362–422 (3.7–4.3, 53–61)	618–794 (6.3–8.1,90–115)
Stall	750–897 (7.7–9.2,109–130)	1,373–1,608 (14.0–16.4,199–233)

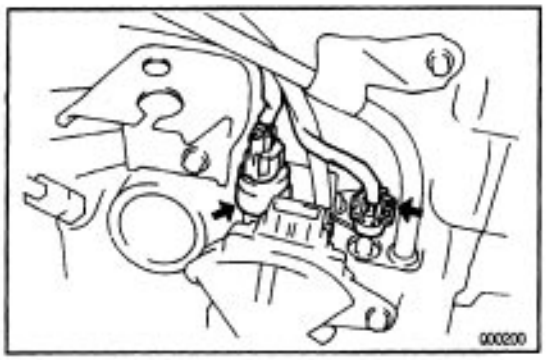
If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.



EVALUATION

Problem	Possible cause
If the measured values at all positions are higher.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured values at all positions are lower.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective • Oil pump defective • O/D direct clutch defective
If pressure is low in the D position only.	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only.	• R position circuit fluid leakage • Direct clutch defective • First and reverse brake defective

MANUAL SHIFTING TEST



HINT: With this test, it can be determined whether the trouble is within the electrical circuit or is a mechani–cal problem in the transaxle.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift Position	Gear Position
D Position	O/D
2 Position	3rd
L Position	1st
R Position	Reverse
P Position	Pawl Lock

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- **While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.**

If any abnormality is found in the above test, the problem is in the transaxfe itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

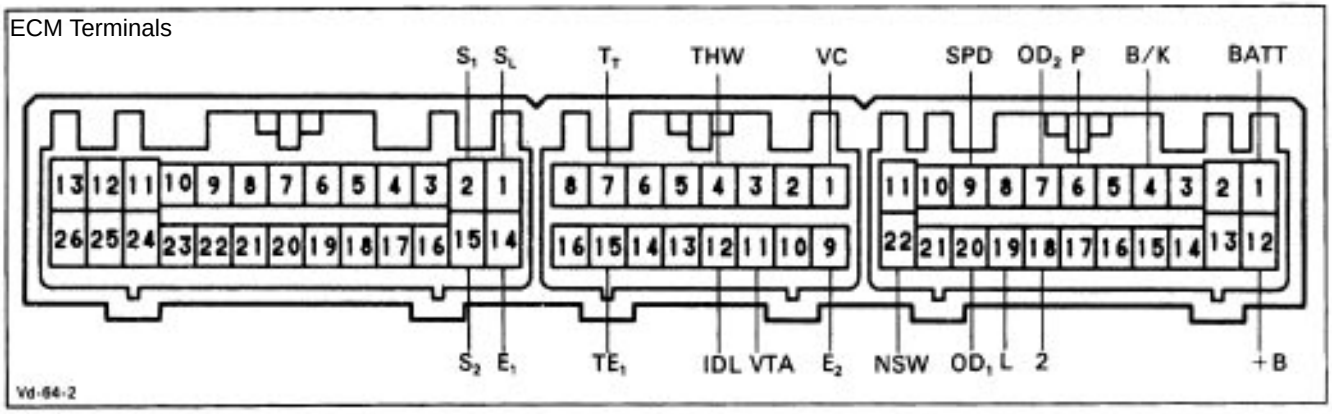
(See page AX1–45)

-Memo

-Memo

STANDARD VALUE OF ECM TERMINAL

AX088-01



Symbols	Wiring Color	Condition		Standard Value
$S_1 - E_1$	V ↔ BR	IG OFF		11 – 15 Ω
		IG ON		10 – 14 V
		Vehicle driving in 2nd gear position		10 – 14 V
$S_2 - E_1$	P-L ↔ BR	IG OFF		11 – 15 Ω
		• G ON		Below 1 V
		Vehicle driving in 2nd gear position		10 – 14 V
$SL - E_1$	L-Y ↔ BR	IG OFF		11 – 15 Ω
		IG ON		Below 1 V
		Vehicle driving under lock–up position		10 – 14 V
$P - E_1$	L-R ↔ BR	IG ON	Pattern select SW: PWR	10 – 14 V
			Pattern select SW: NORM	Below 1 V
$B/K - E_1$	G-W ↔ BR	IG ON	Brake pedal is depressed	10 – 14 V
			Brake pedal is released	Below 1 V
$THW - E_2$	G ↔ BR	IG ON	Engine Coolant temp. 80℃ (1 76T)	0.1 – 1.0 V
$IDL - E_2$	L ↔ BR	• G ON	Accel. pedal is released	Below 1 V
			Accel. pedal is depressed	10 – 14 V
$VTA - E_2$	B ↔ BR	IG ON	Accel. pedal is released	Below 1.5 V
			Accel. pedal is depressed	3 – 5.5 V
$OD_1 - E_1$	Y-B ↔ BR	tG ON		10 – 14 V
$OD_2 - E_1$	G-O ↔ BR	IG ON	OD main SW: ON	10 – 14 V
			OD main SW: OFF	Below 1 V
$SPD - E_1$	V-Y ↔ BR	IG ON Disconnect following connectors: • Cruise control ECU	Standing still	Below 1 V
			Turn one front wheel slowly.	Plus signal is output Below 1 V ↔ 4.5 – 5.5 V
$NSW - E_1$	B-W ↔ BR	IG ON	P or N position	10 – 14 V
			P and N position	Below 1 V
$2 - E_1$	O ↔ BR	IG ON	2 position	10 – 14 V
			Except 2 position	Below 1 V
$L - E_1$	Y-L ↔ BR	IG ON	L position	10 – 14 V
			Except L position	Below 1 V

VD6644

MATRIX CHART OF PROBLEM SYMPTOMS

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart

Chapter 2: On–vehicle Repair Matrix Chart

Chapter 3: Off–vehicle Repair Matrix Chart

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to Chapter 2 or 3, proceed as instructed.

1. **If the instruction “Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.**
2. **If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check or replace the ECM.**

Chapter 1. Electronic Circuit

Suspect Area / Symptom		See page	AX1–80	AX1–84	AX1–88	AX1–90	EG–396	AX1–92	AX1–96
			Vehicle speed sensor circuit	Shift solenoid valve No.1, No.2 circuit	Shift solenoid valve SL circuit	Throttle position sensor circuit	IDL switch circuit	Park/neutral position switch circuit	Stop light circuit
Vehicle does not move in any forward position and reverse position									
Vehicle does not move in a particular position or positions									
No up–shift	1 st ± 2nd		3	2		1			
	2nd¿¿ 3rd		3	2		1			
	3rd →O/D		4	3					
No down–shift	0 / D→3rd		2	1					
	3rd →2nd		2	1		3			
	2nd →1 st		2	1		3			
No lock–up			3		1	2			5
No lock–up off					1	2	3		4
Shift point too high or *too low			2		3	1			
Up–shifts to 2nd while in L position Up–shifts to 3rd while in L position								1	
Up–shifts to O/D from 3rd while O/D switch is OFF									
Up–shifts to O/D from 3rd while engine is cold									
Harsh engagement	N → D								
	Lock–up				1				
	Any driving position								
Slip or Shudder	Forward and reverse								
	Particular position								
No engine braking									
Poor acceleration			2	1					
No–kick–down			2	1					
No pattern select			2						
Large shift shock or engine stalls when starting off or stopping.									

V04845

AX1–98	AX1–102	AX1–108	EG–356	EG–318	AX1–70	AX1–72
Pattern select switch circuit	O/D switch and O/D OFF indicator switch circuit	O/D cancel signal circuit	Engine coolant temperature sensor circuit	ECM	On–Vehicle repair matrix chart	OFF–Vehicle repair matrix chart
					1	2
					1	2
				4	5	6
				4	5	6
	1	2	5	6	7	8
		3		4	5	–
				4	5	–
				4	5	6
		4	6	7	8	9
			5	6	7	8
5		4		6	–	–
				2	–	–
	1			2	–	–
			1	2	3	4
					1	2
				2	3	4
					1	2
					1	2
					1	2
					1	2
				3	–	4
				3	4	–
1				3	–	–
					–	1

Chapter 2. On–Vehicle Repair
(*:'94 A140E AUTOMATIC TRANSAXLE Repair Manual)

See page		AX1–13	*	*	*	*	*	*	*
Suspect Area / Symptom		Oil strainer	Manual valve	1–2 shift valve	2–3 shift valve	3–4 shift valve	C, accumulator	B2 accumulator.	C2 accumulator
Vehicle does not move in R position				1	2				
Vehicle does not move in any forward position or reverse position			1						
No lock–up									
No lock–up OFF									
No kick–down				1	2	3			
No engine braking	1st								
	2nd								
No up–shift	1st →2nd			1					
	3rd →2nd				1				
	3rd→ O/D					1			
No down–shift	O/D→ 3rd					1			
	3rd→2nd				1				
	2nd→1st			1					
Harsh engagement	N→R								2
	N→D						1		
	N→L								
	1 st→2nd (D position							1	
	1 st→2nd (2 position)								
	1 st→2nd→3rd								
	1st→2nd→3rd→O/D								
	2nd→3rd								1
	3rd→O/D								
	O/D→3rd								
	3rd→2nd							1	
Sliper shudder in forward and reverse (Directry after E/G start)		2							

V04647

*	*	*	*	*	*	*	*	*	*	AX1–72
Bo accumulator	Co accumulator	Accumulator control valve	Low modulator valve	2nd modulator valve	Throttle modulator valve	Lock–up relay valve	Throttle valve	Cut back valve	Primary regulator valve	OFF–vehicle repair matrix chart
										3
									2	3
						1				2
						1				2
			1							2
				1						2
										2
										2
										2
										2
		1					3			4
							2			3
							1			
										2
			4	3	1		2	5		
1										2
2	1									
3	2			4						5
							1			2

Chapter 3. Off–Vehicle Repair
(*:'94 A140E AUTOMATIC TRANSAXLE Repair Manual)

See page / Suspect Area / Symptom		AX1–34	*	*	*	*	*
		Torque converter clutch	Parking lock pawl	Co O/D direct clutch	C, Forward clutch	C, Direct clutch	Bo O/D brake
Vehicle does not move in any forward position					1	6	
Vehicle does not move in reverse position				5		4	
Vehicle does not move in any forward position and reverse position			1	3			4
No lock–up		1					
No lock–up OFF		1					
Large shock during lock–up		1					
E/G stalls when starting off and stopping		1					
No up–shift	1 st→2nd						
	2nd→3rd					1	
	3rd ± O/D						1
No down shift 2nd→1 st							
Harsh engagement	N→R					1	
	N →D				1		
	1 st→ 2nd (D position)						
	2nd→3rd						
	3rd →O/D			1			2
Slip or shudder	Forward and reverse (After warm–up)	1		3			
	Forward and reverse (Directly after E/G start)	1					
	R position			2		1	
	1 St				1		
	2nd						
	2nd →3rd (Up–shift					1	
	3rd					1	
	O/D						1
No engine braking	1 st ~3rd			1			
	1st						
	2nd						
Poor acceleration	All positions	1					
	O/D			1			
	Other than O/D						1
	Other than 2nd						
	1st and 2nd						1
	1st and R position						
	R position				1		

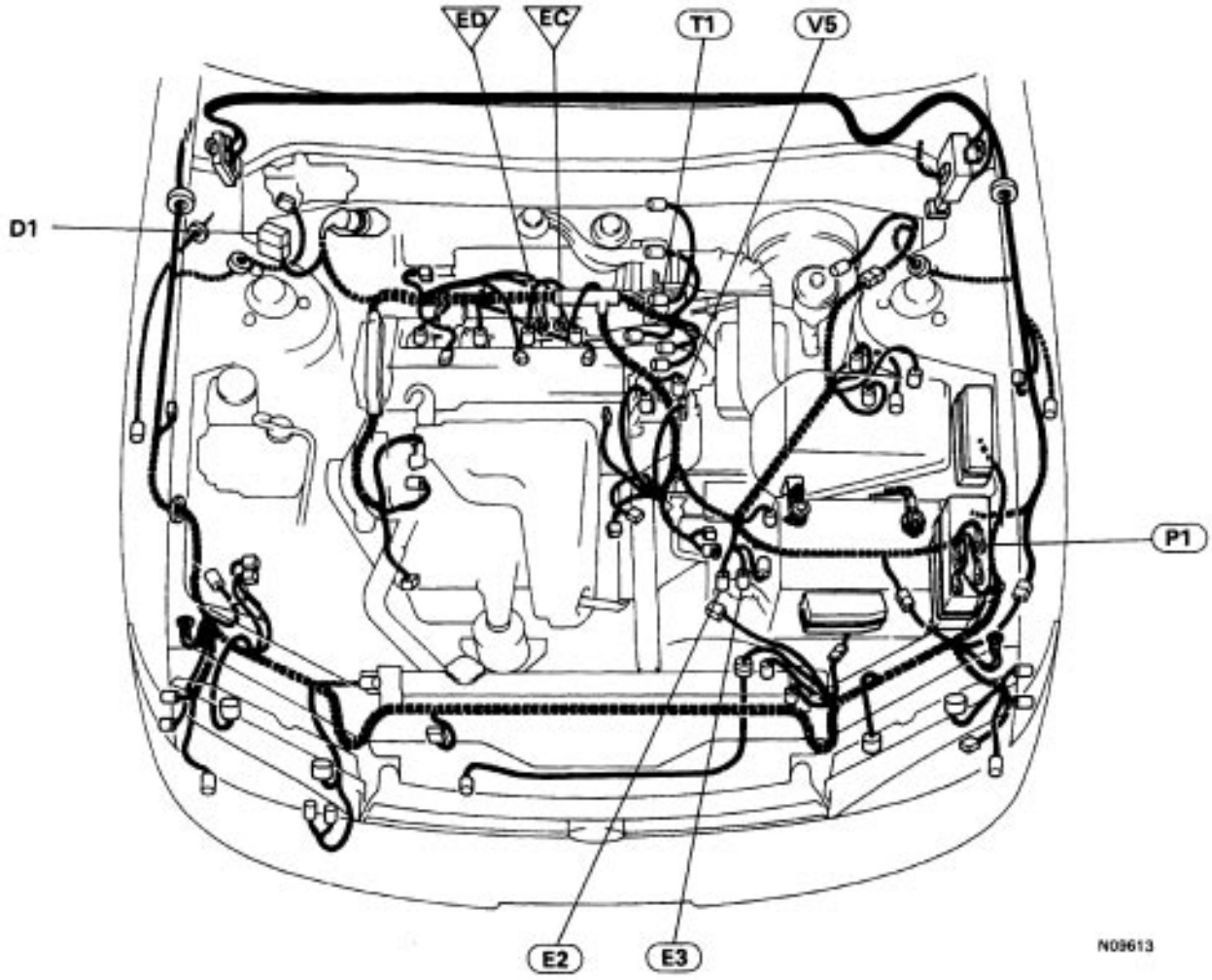
*	*	*	*	*	*	*	*	*
B, 2nd coast brake	B2 Second brake	B31 st and reverse brake	FO O/D one–way clutch	F, No.1 one–way clutch	F2 No.2 one–way clutch	O/D planetary gear	Front planetary gear	Rear planetary gear
4	5	3			2			
1		6					2	3
			2			7	5	6
	1			2				
1								
		2						
		1						
1								
						3		
				2				
			3					
					2			
	1			2				
		1						
1								
						2		
						2		
1	2							
		1						

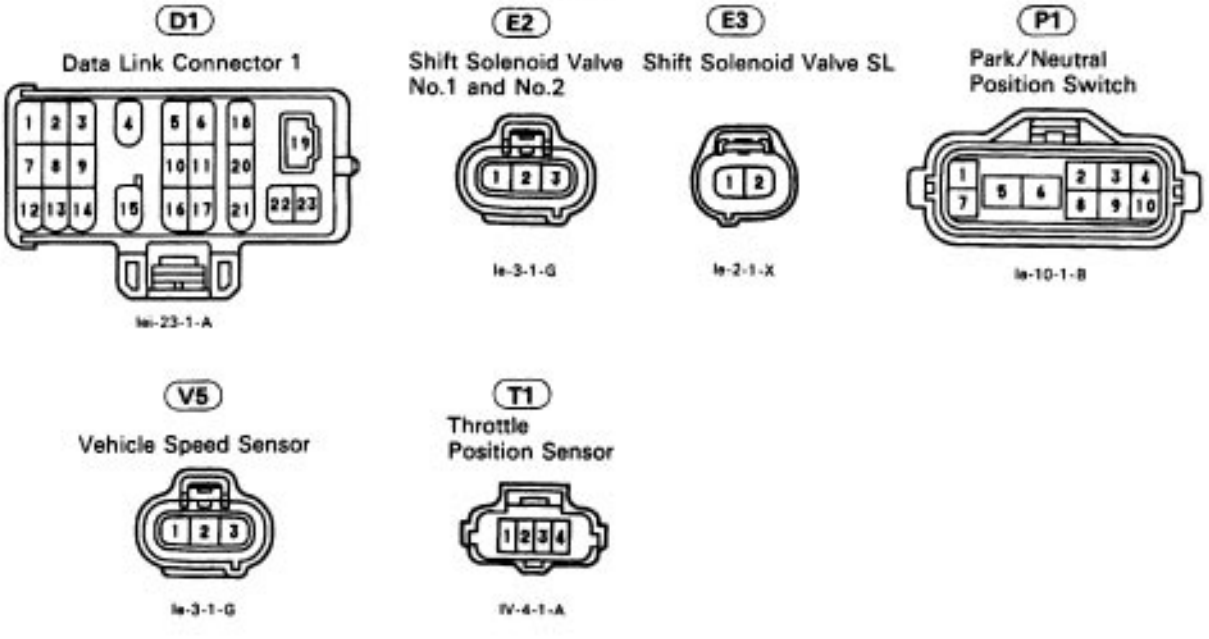
VO4927

LOCATION OF CONNECTORS

AT6LA–04

Location of Connectors in Engine Compartment

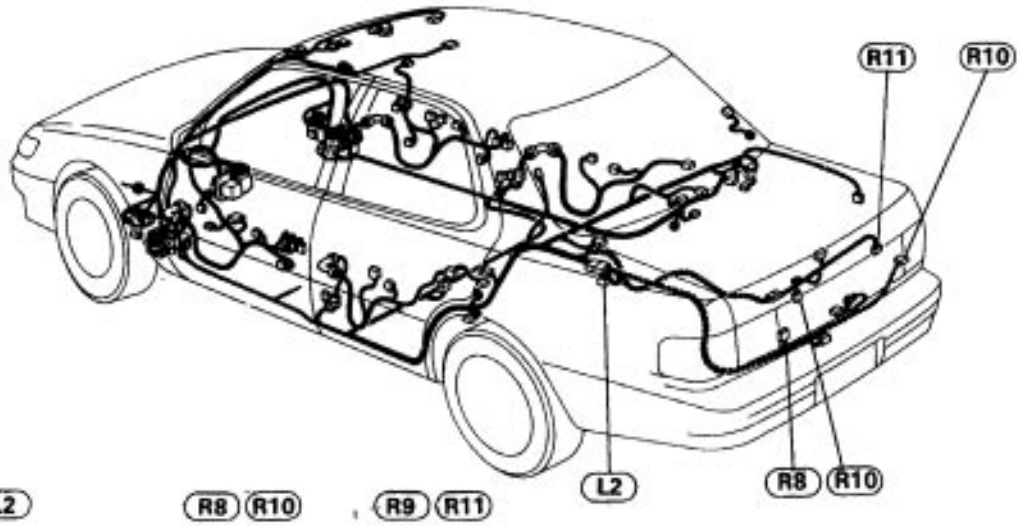




V04952

Location of Connectors in Body

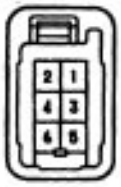
Sedan



L2 Light Failure Sensor

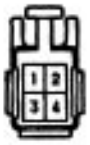
e-12-1

R8 R10 Stop Light LH, RH



e-6-2-E

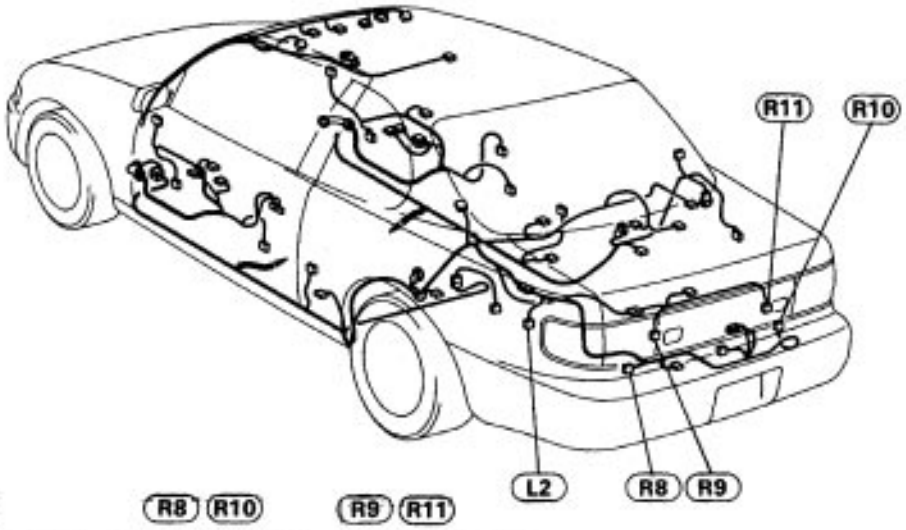
R9 R11 Stop Light LH, RH



e-4-1

N09615

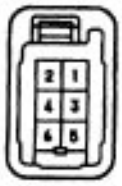
Coupe



L2 Light Failure Sensor

e-12-1

R8 R10 Stop Light LH, RH



e-6-2-E

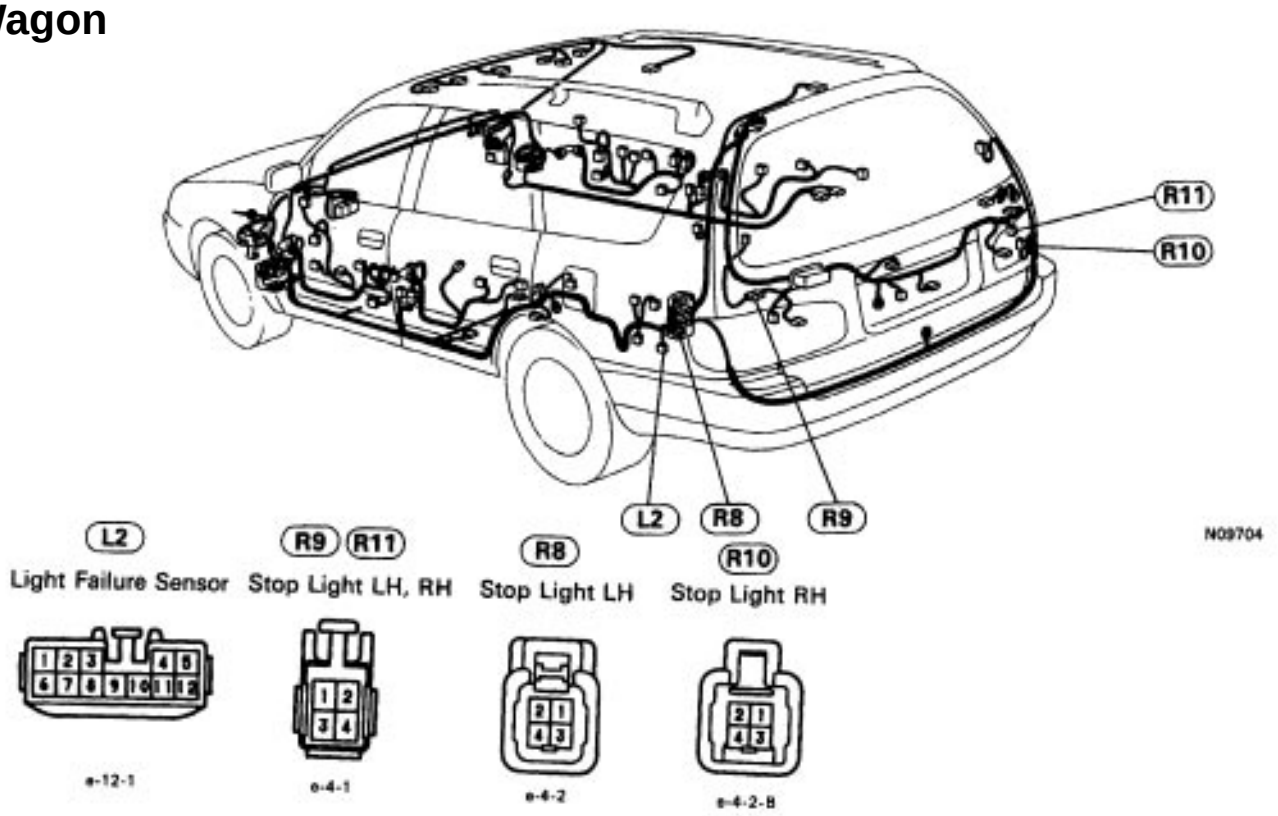
R9 R11 Stop Light LH, RH

e-4-1

N09703

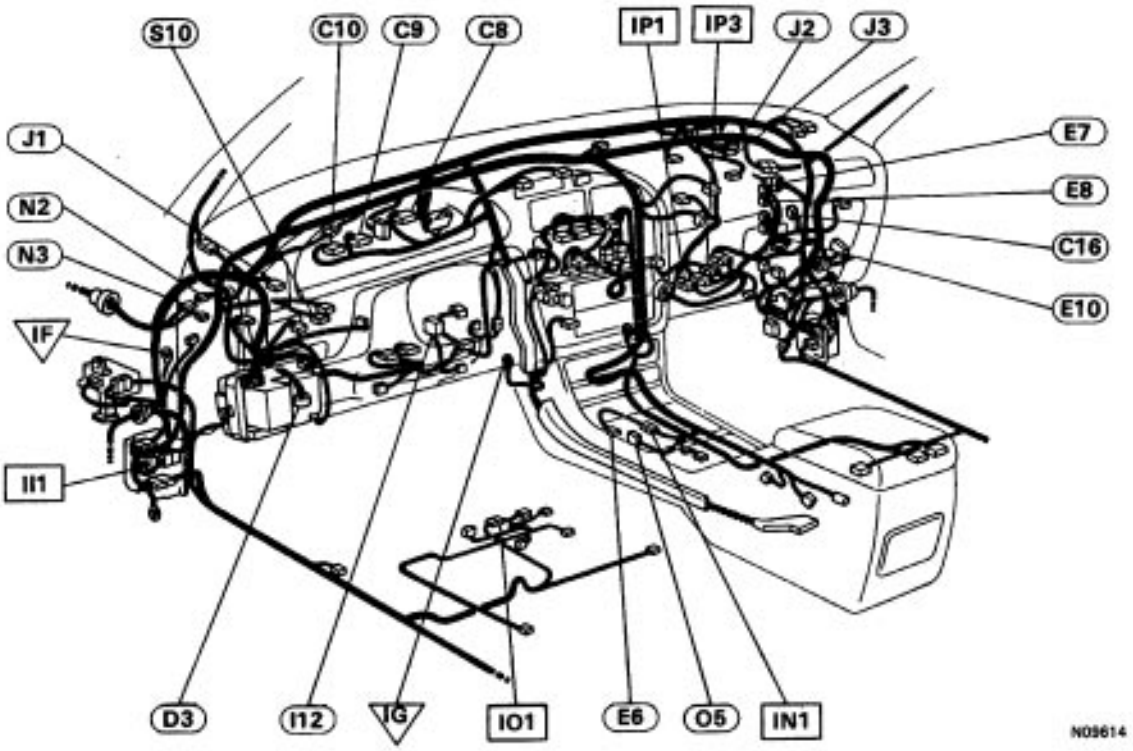
V04853

Wagon

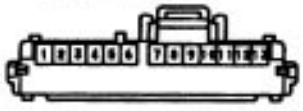


V0485A

Location of Connectors in Instrument Panel

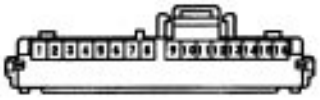


C8
Combination Meter



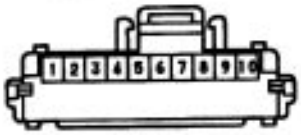
j-13-1-A

C9
Combination Meter



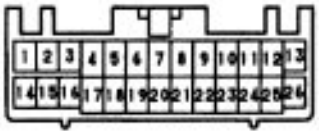
j-16-1

C10
Combination Meter



j-10-1

C16
Cruise Control ECU



mn-26-1-B

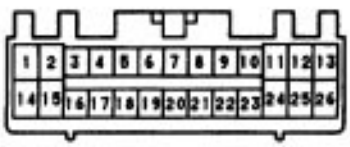
D3
DLC2

S-17-1

E6
Pattern
Select Switch

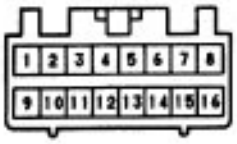
e-6-1

E7
ECM



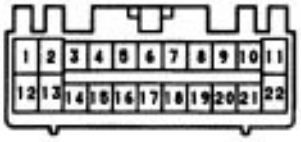
mn-26-1

E8
ECM



n-16-1-A

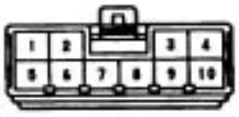
E10
ECM



mn-22-1

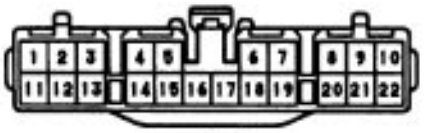
V04855

I12
Ignition Switch



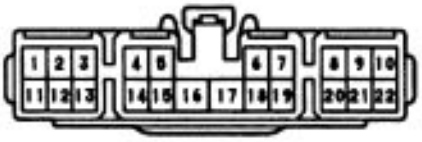
g-10-1-B

J1
Junction Connector



e-22-1-A

J2
Junction Connector



e-22-1

J3
Junction Connector

e-14-1-A

N2
Noise Filter

g-2-2

N3

g-2-1

O5
O/D Main Switch

S-4-2-B

S10
Stop Light Switch

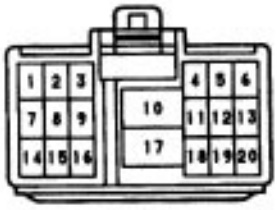
eg-4-1

I11

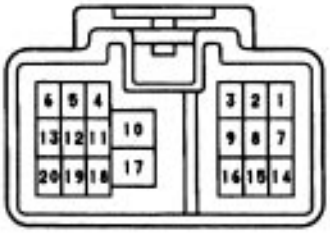
e-10-1

e-10-2

I12



e-20-1-B



e-20-2-B

IN1

e-6-1

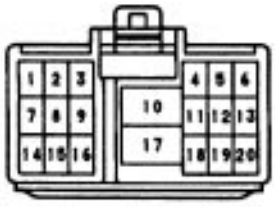
e-6-2

IO1

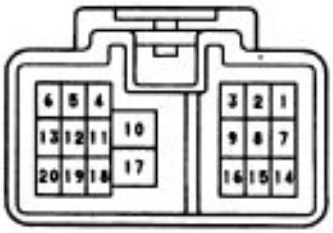
e-6-1

e-6-2

IP1



e-20-1-B



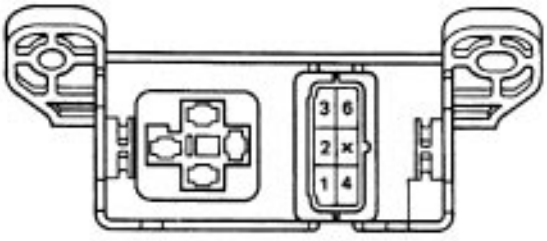
e-20-2-B

IP3

ef-19-1

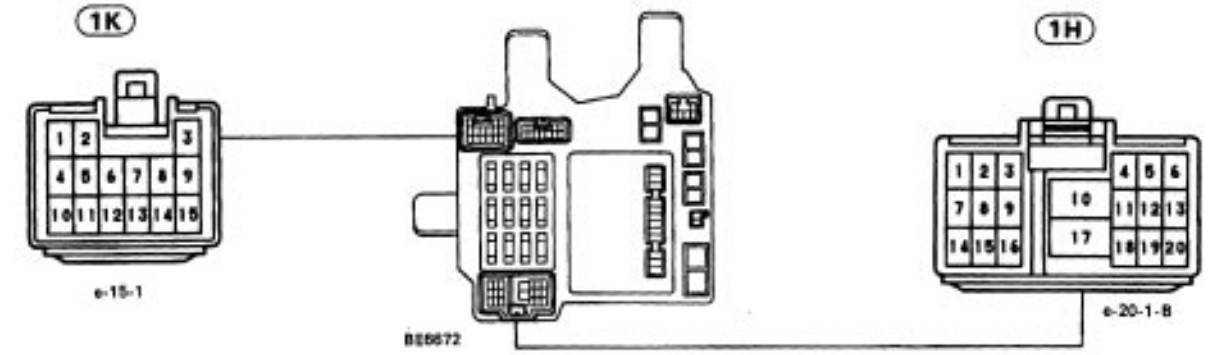
ef-19-2

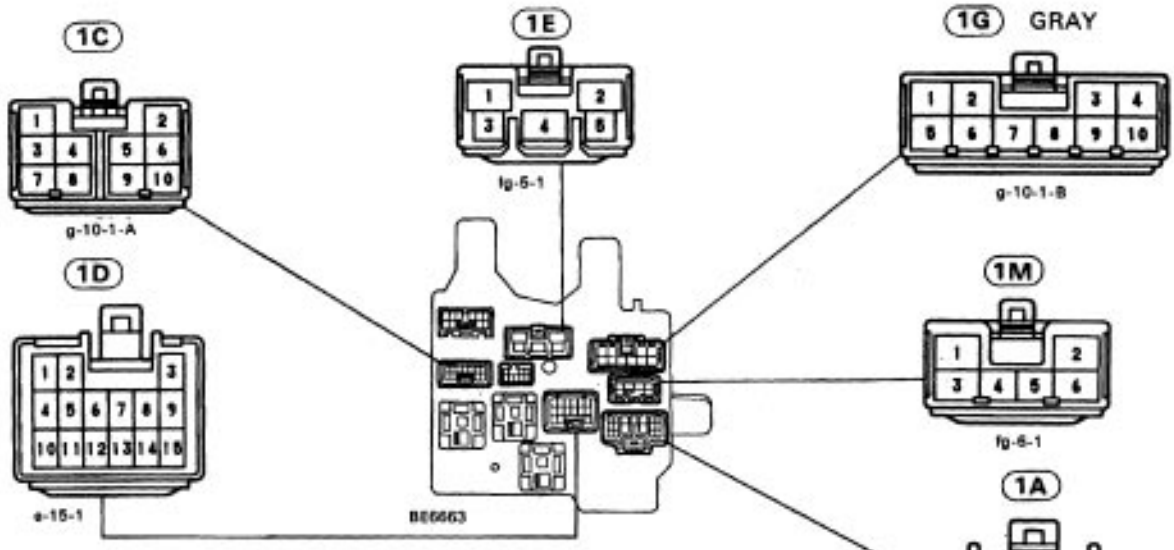
R/B No.6



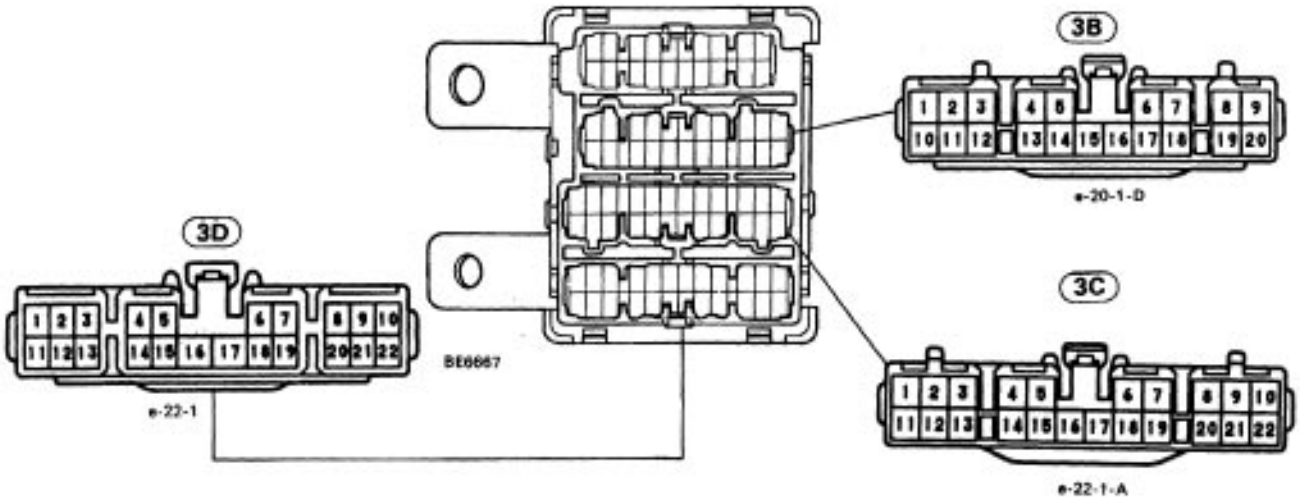
N09664
V04856

J/B No–1


1K
e-15-1
BE6672
1H
e-20-1-B


1C
g-10-1-A
1E
fg-6-1
1G GRAY
g-10-1-B
1D
e-15-1
BE6663
1M
fg-6-1
1A
eg-16-1

J/B No.3

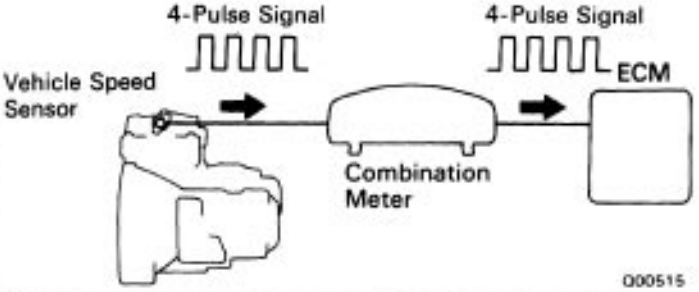

3B
e-20-1-D
3D
e-22-1
BE6667
3C
e-22-1-A

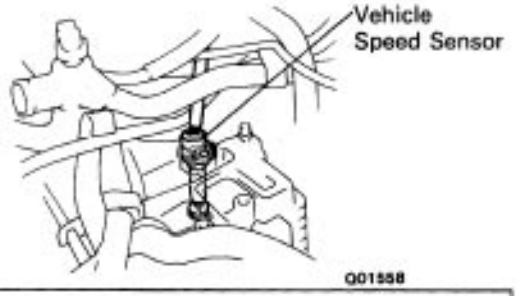
CIRCUIT INSPECTION

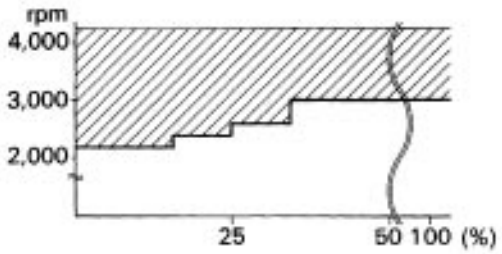
Diag. Trouble Code 42 No.1 Vehicle Speed Sensor Circuit

CIRCUIT DESCRIPTION

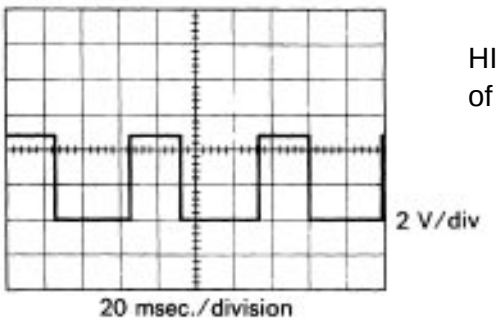
The No. 1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the differential case. After this signal has been converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the ECM.





DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
42	If the vehicle speed sensor signal is not input for 2 seconds or longer after condition A or B (described below) occurs, DTC 42 is recorded and the OD OFF indicator light lights up simultaneously. **CONDITION A** • 30 seconds or more elapses after the park/ neutral position switch goes OFF. • The throttle opening ratio and engine RPM are within the shadded area.  Throttle Opening Ratio **CONDITION B** • 1 second or more elapses after the park/neutral position switch goes OFF. • A vehicle speed sensor signal of 14 km/h ($.7 mph) or more was input. • The stop light switch is OFF (brake pedal is released). voi 547	• Vehicle speed sensor • Combination meter • Harness or connector between vehicle speed sensor and ECM • ECM

< Reference >



- Waveform between terminals SPD and E1 when vehicle speed is approx. 20 km/h (12 MPH).

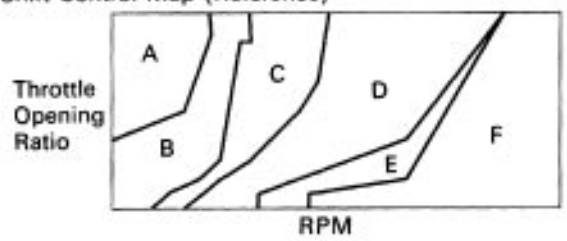
HINT: The greater the vehicle speed, the greater the number of vehicle speed sensor signals produced.

CIRCUIT DESCRIPTION

Fail Safe Function

If the vehicle speed sensor fails, shift control takes place so that the throttle opening ratio and RPM are controlled according to the shift control map.

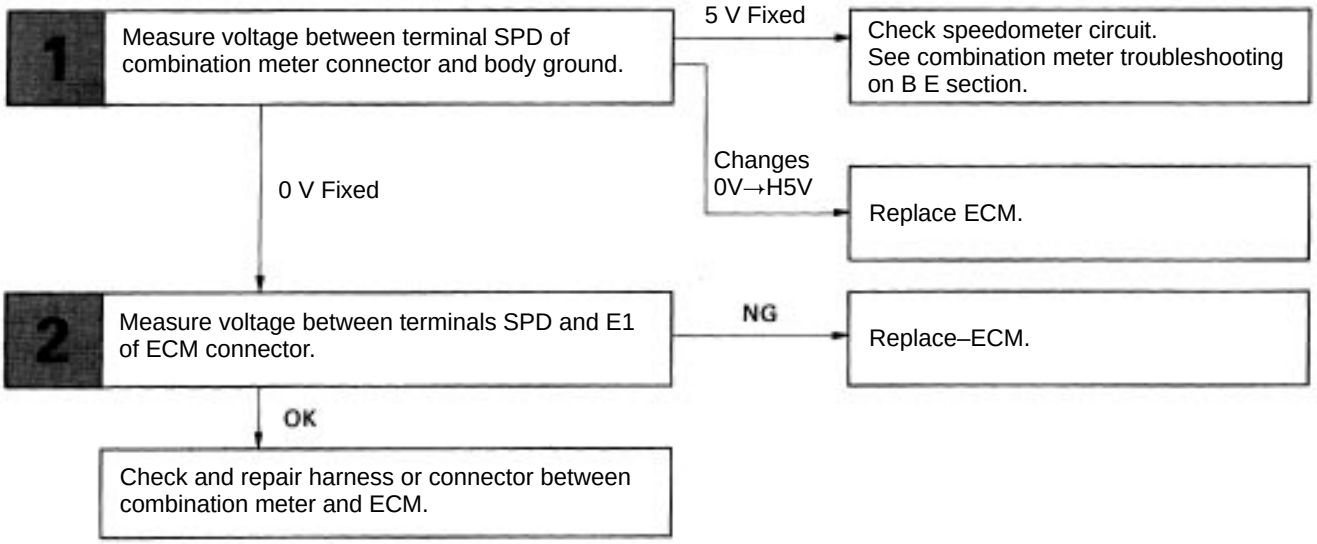
Shift Control Map (Reference)



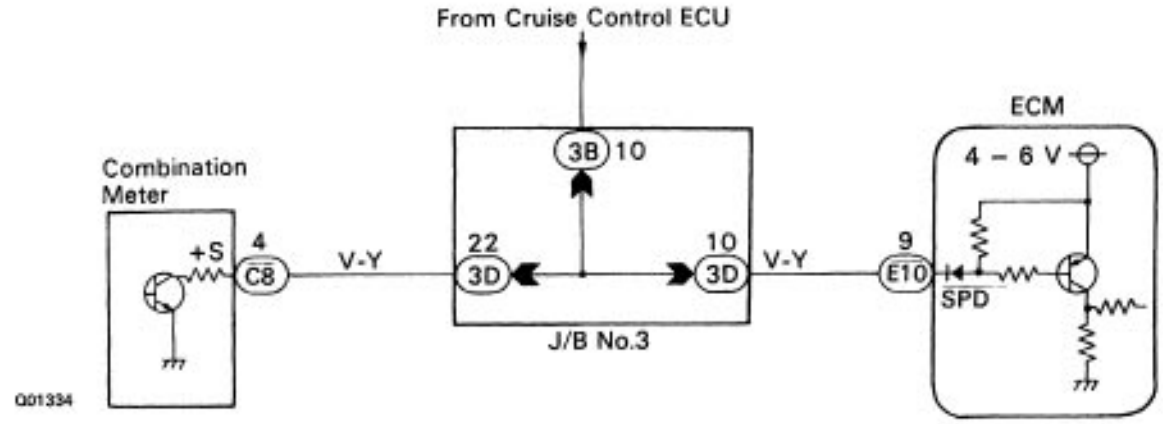
A Zone: Shift down 2 gears
B Zone: Shift down 1 gear
C Zone: No change
D Zone: Shift up 1 gear
E Zone: Shift up 2 gears
F Zone: Shift up 3 gears

V01546

DIAGNOSTIC CHART

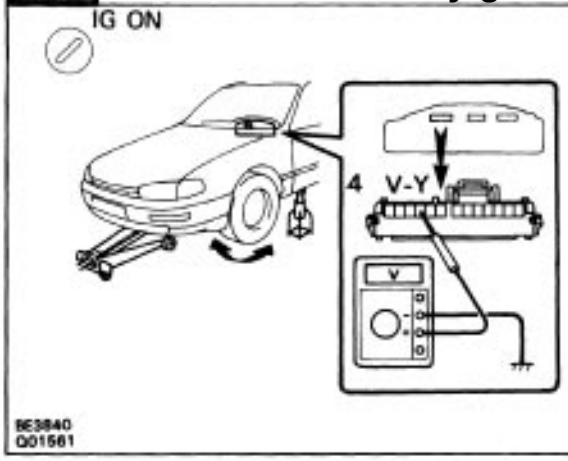


WIRING DIAGRAM



INSPECTION PROCEDURE

1 Measure voltage between terminal S P D of combination meter connector and body ground.



P (a) Shift the shift lever to N position.
(b) Jack up one of the front wheels.
(c) Disconnect the cruise control ECU and PPS connectors.
(d) Turn IG switch ON.

C Measure voltage between terminal SPD of combination meter connector and body ground when slowly turning the Jack up wheel.

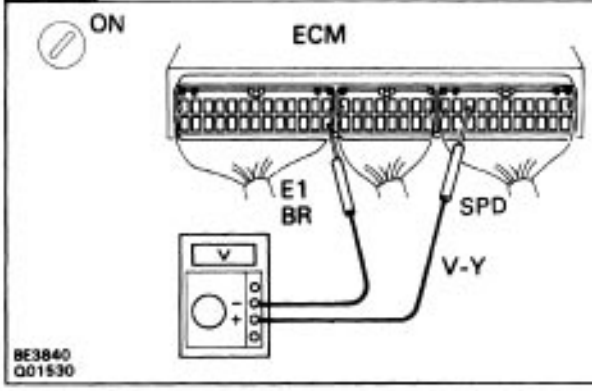
Voltage:

Constantly 0 V..... Go to Next Step
Constantly 4–6 V..... Go to NG 1
Changes 0 V H 4 H 6 V ..... Go to N G 2

NG1 **Check combination meter circuit. See combination meter troubleshooting.**

NG2 **Replace ECM.**

2 Measure voltage between terminals SPD and E, of ECM.



P (1) Disconnect combination meter and cruise control ECU connectors.
(2) Turn IG switch ON.
(3) Measure voltage between terminals SPD and E, of ECM connector.

OK **Voltage: 4–6 V**

OK

NG **Replace ECM.**

Check and repair harness or connector between combination meter and ECM.

-Memo

Diag. Trouble Code 62 63 Shift Solenoid Valve No–1 and No.2 Circuit

CIRCUIT DESCRIPTION

Shifting from 1 st to O/D is performed in combination with ON and OFF of the shift solenoid valves No.1 and No.2 controlled by the ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid to allow the vehicle to be operated smoothly (Fail safe function).

Fail Safe Function

If either of the solenoid valve circuits develops a short or an open, the ECM turns the other solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the lock–up solenoid valve OFF at this time. If both solenoids malfunction, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the following table must be done. (in the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Position	NORMAL			SOLENOID VALVE NO.1 MALFUNCTIONING			SOLENOID VALVE N0.2 MALFUNCTIONING			BOTH SOLENOID VALVES MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No. 2		No. 1	No.2		
D	ON	OFF	1st	×	ON	3rd	ON	×	1st	O/D
	ON	ON	2nd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	O/D
2	ON	OFF	1st	×	ON	3rd	ON	×	1st	3rd
	ON	ON	2nd	×	ON	3rd	OFF	×	3rd	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	×	3rd	3 rd
L	ON	OFF	1st	×	OFF	1st	ON	×	1st	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1st	1st

x : Malfunctions

Check the shift solenoid valve No.1 when diagnostic trouble code 62 is output and check the shift solenoid valve No.2 when diagnostic trouble code 63 is output.

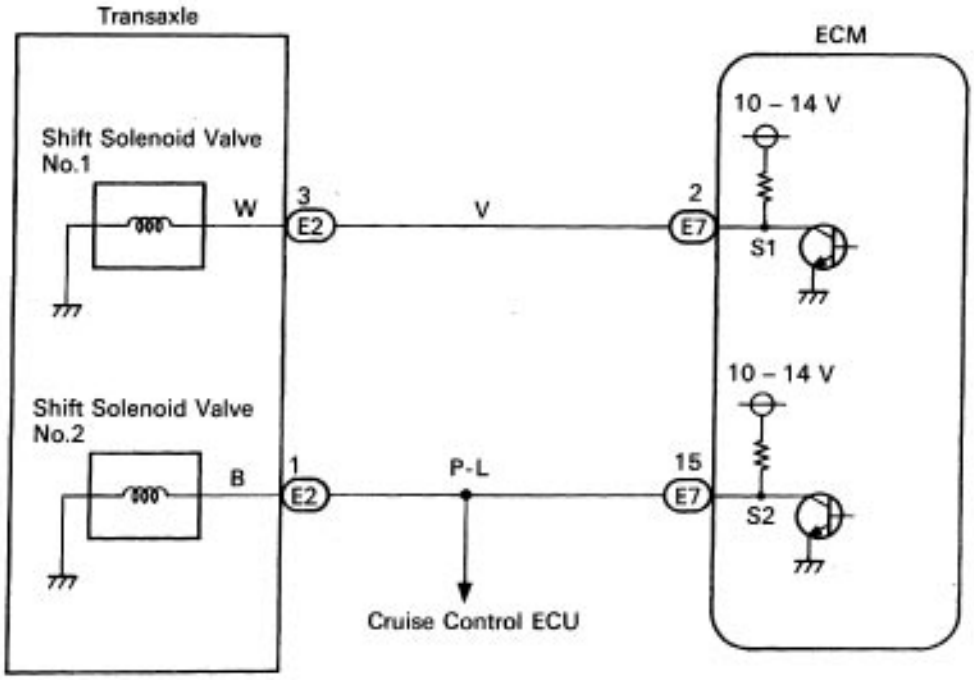
Code No.	Diag. Trouble Code Detection Condition	Trouble area
62,63	(a) Solenoid resistance is 8) or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 k) or higher (open circuit) when solenoid is not energized. The ECM checks for an open or short circuit in the shift solenoid valve No–1 and No.2 circuit when it changes gear position. The ECM records diag. trouble code 62 or 63 if condi tion (a) or (b) is detected once, but it does not blink the O/D OFF indicator light. After the ECM detects condition (a) or (b) con–tinuously 8 times or more, it cancels the O/D OFF indi cator light to blink until condition (a) or (b) disappears After that, if the ECM detects condition (a) or (b) once, it starts blinking the O/D OFF indi–cator light again.	• Shift solenoid valve No.1 or No.2 • Harness or connector between shift solenoid valve No.1 or No.2 and ECM connector • ECM

DIAGNOSTIC CHART

1. Measure resistance between .terminals of electronically controlled transaxle solenoid connector and body ground.
   - NG → Repair or replace malfunctioned part.
   - OK ↓
2. Check shift solenoid valve No.1 or No.2 in transaxle.
   - NG → Repair or replace malfunctioned part.
   - OK ↓
3. Check harness and connector between electronically controlled transaxle solenoid connector and ECM.
   - NG → Repair or replace harness or connector.
   - OK ↓

Replace ECM.

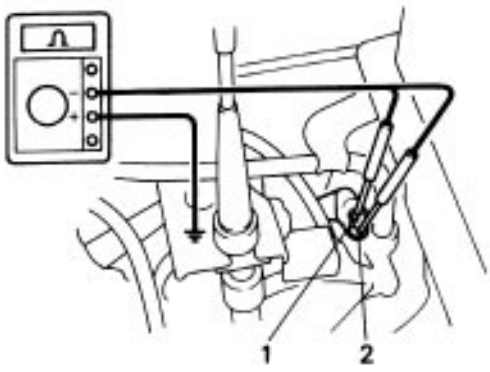
WIRING DIAGRAM



G04928

INSPECTION PROCEDURE

1 Measure resistance between terminals of electronically controlled transaxle solenoid connector and body ground.



P Disconnect electronically controlled transaxle solenoid connector.

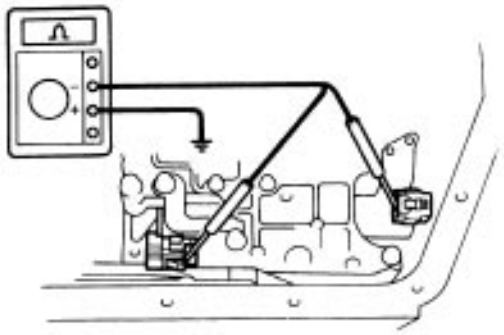
C Measure resistance between terminals of electronically controlled transaxle solenoid connector and body ground as shown in the illustration.

OK **Resistance:**
1, 2–Body ground 11–15 0

NG

OK 〉 **Go to step 3**

2 Check shift solenoid valve No.1 or No.2 in transaxle.



P (1) Jack up the vehicle.
(2) Remove oil pan.

C (1) Check shift solenoid valve No.1 and No.2 connector connection.
(2) Measure resistance between shift solenoid valve No.1 and No.2 connector terminals and body ground.

OK **Resistance: 11–15II**

C Check for operation sound of solenoids sound when you apply battery voltage to shift solenoid valve No.1 and No.2 connector terminals and body ground.

C Check continuity of solenoid wire.

OK **Continuity (Below 1II)**

OK

NG 〉 **Repair or replace malfunctioned part.**

3 Check harness and connector between electronically controlled transaxle solenoid connector and ECM.

OK

NG 〉 **Repair or replace harness or connector.**

Replace ECM.

-Memo

Diag. Trouble Code 64 Shift Solenoid Valve SL Circuit

CIRCUIT DESCRIPTION

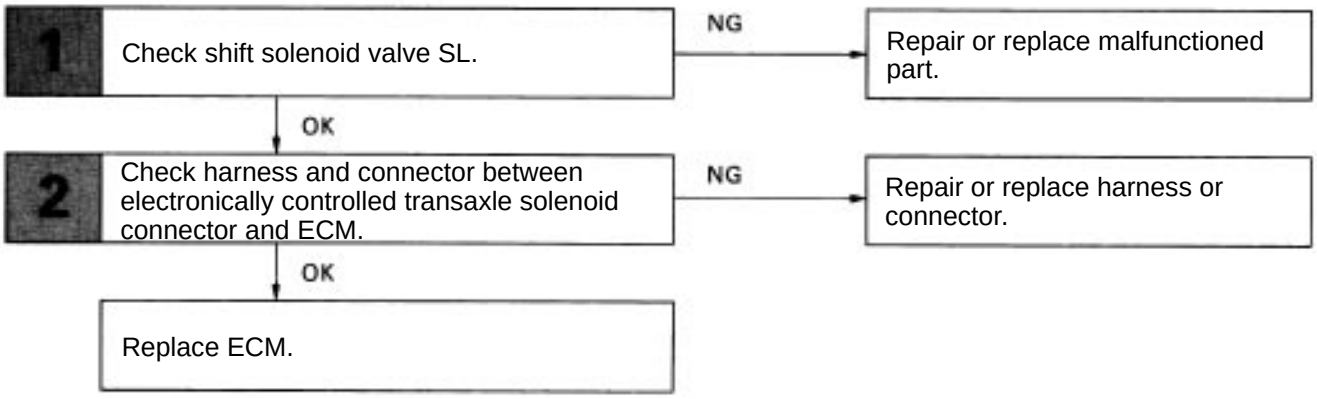
The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch. If a malfunction occurs in this circuit and diagnostic trouble code 64 is stored in memory, the O/D OFF indicator light does not blink.

Fail Safe Function

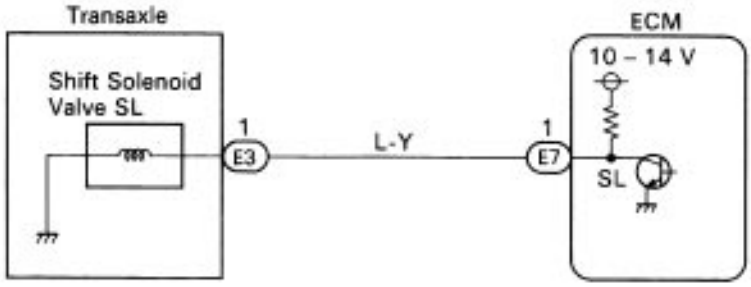
If the ECM detects a malfunction, it turns the lock–up solenoid valve OFF.

Code No.	Diag. Trouble Code Detection Condition	Trouble area
64	(a) Solenoid resistance is 8Ω or lower (short circuit) when solenoid energized. (b) Solenoid resistance is 100 kΩ or higher (open circuit) when solenoid is not energized. ECM memorizes diag. trouble code 64 if above (a) or (b) condition is detected once or more, but ECM does not start O/D OFF indicator light blinking.	• Shift solenoid valve SL • Harness or connector between shift solenoid valve SL and ECM • ECM

DIAGNOSTIC CHART



WIRING DIAGRAM



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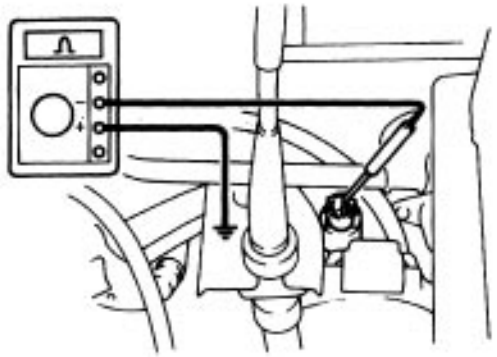
INSPECTION PROCEDURE

1 Check shift solenoid valve SL.



C (1) Check shift solenoid valve SL connector connection.
(2) Measure resistance between shift solenoid valve SL connector terminals and body ground.

OK **Resistance: 11–15Ω**

C Check that shift solenoid valve SL makes operation sound when apply battery voltage shift solenoid valve SL connector terminal and body ground.

C **Check continuity of solenoid wire.**

OK **Continuity (Below 1Ω)**

OK

NG → **Repair or replace malfunctioned part.**

2 Check harness and connector between electronically controlled transaxle solenoid connector–and ECM.

OK

NG → **Repair or replace harness or connector.**

Replace ECM.

Throttle Position Sensor Circuit

CIRCUIT DESCRIPTION.

The throttle position sensor detects the throttle valve opening angle and sends signals to the ECM.

DIAGNOSTIC CHART

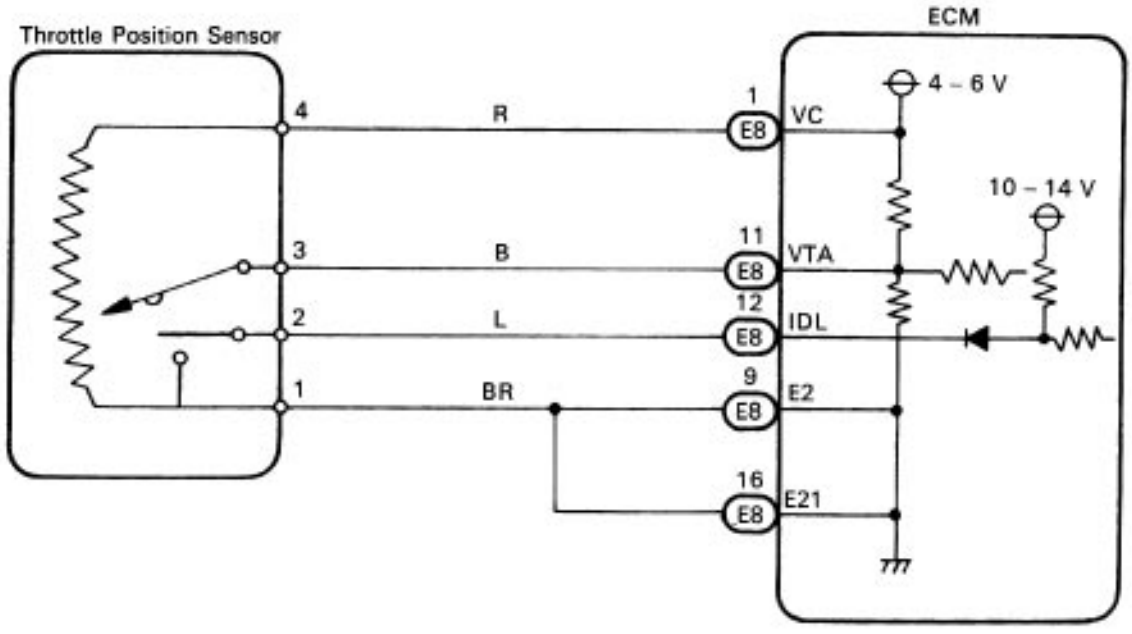
1 Throttle position signal check.
- OK → Proceed to next circuit inspection shown on matrix chart (See page AX1–68).
- NG ↓

2 Check throttle position sensor.
- NG → Replace throttle position sensor.
- NG ↓

3 Check harness and connector between ECM and throttle position sensor (See page IN–31).
- NG → Repair or replace harness or connector.
- OK ↓

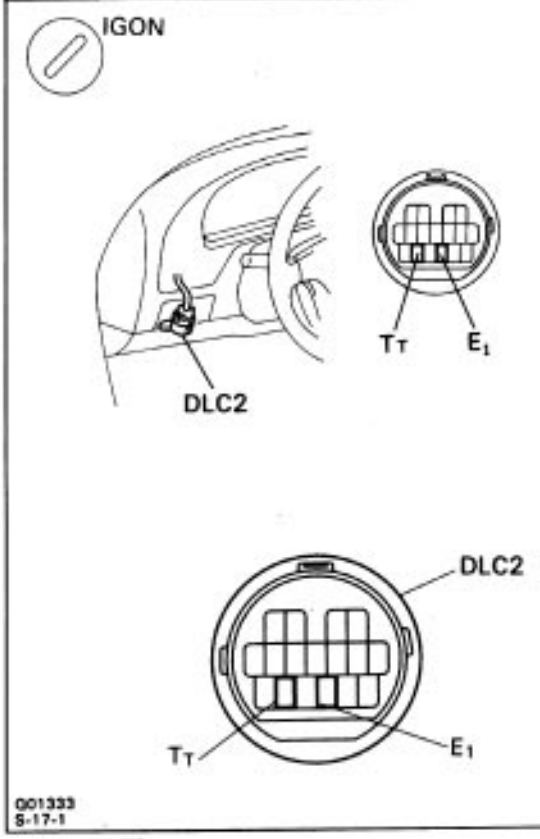
Check and replace ECM.

WIRING DIAGRAM



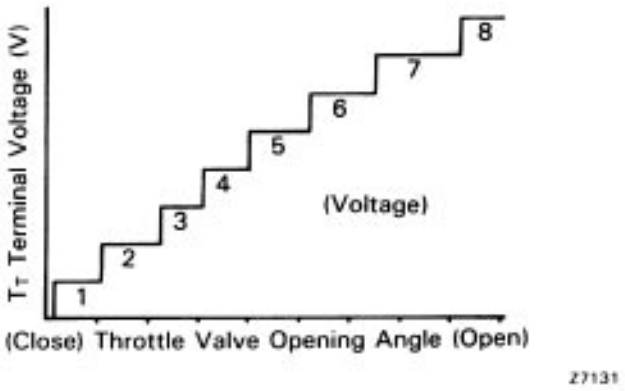
INSPECTION PROCEDURE

1 Throttle position signal check.



P Turn ignition switch ON (Do not start the engine).
C Check voltage at terminal TT of the DLC2 while gradually depressing the accelerator pedal from the fully closed position to the fully opened position.

OK **Voltage changes from 0 V to 8 V by stages.**



Hint Do not depress the brake pedal during this test. The voltage will stay at 0 V if it is depressed.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

2 Check throttle position sensor.

See engine troubleshooting section on page EG–376.

OK

NG → **Replace throttle position sensor.**

3 Check harness and connector between ECM and throttle position sensor (See page IN–31).

OK

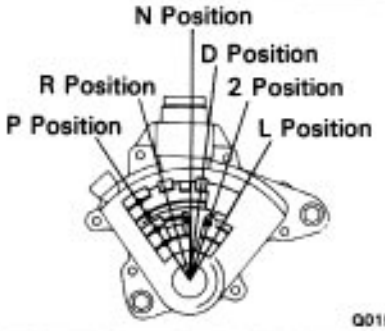
NG → **Repair or replace harness or connector.**

Check and replace ECM.

Park Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (NSW, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in the D position.

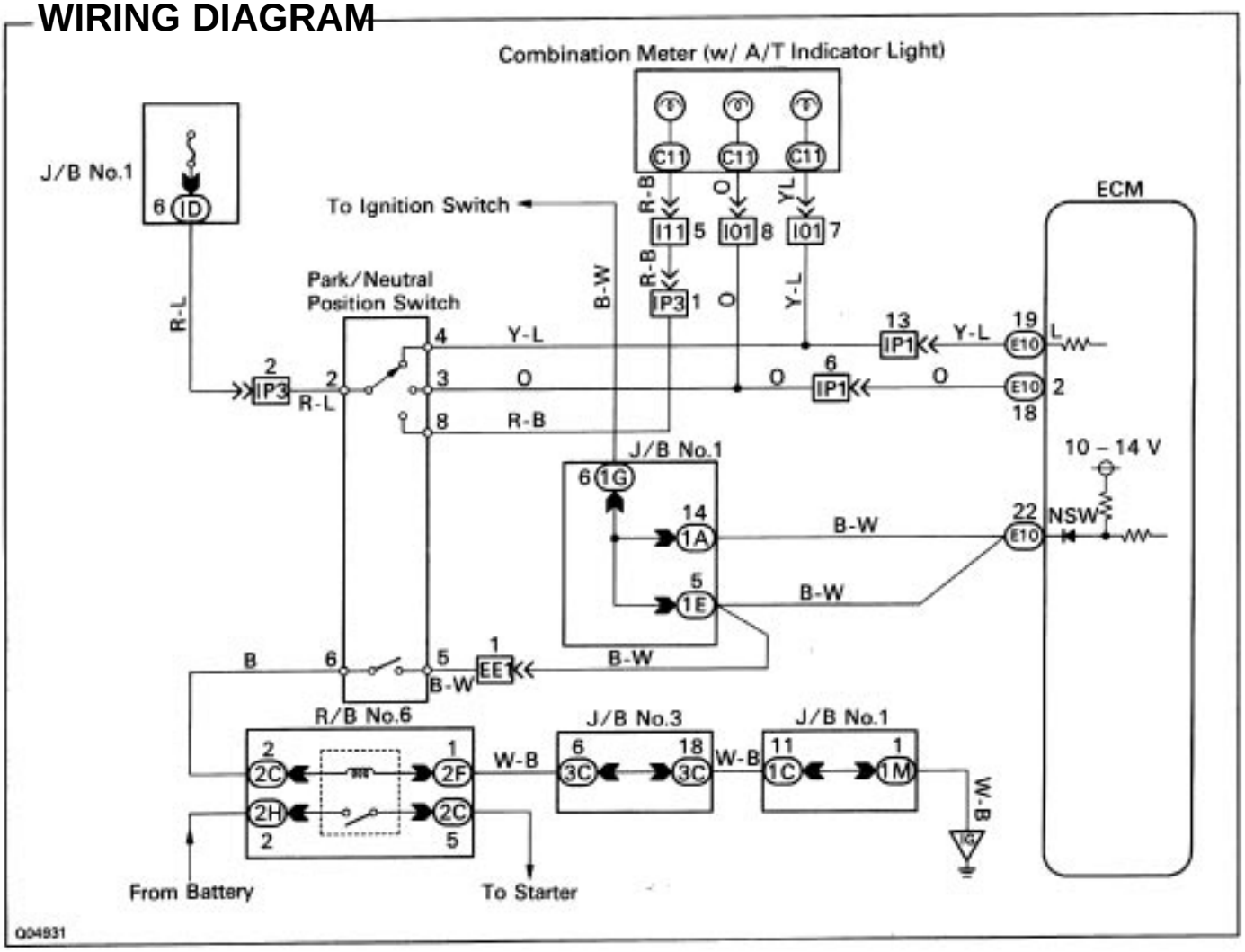


DIAGNOSTIC CHART

1. Check voltage between terminals NSW, 2, L of ECM connector and body ground.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page AX1–68).
   - NG ↓
2. Check park/neutral position switch.
   - NG → Replace park/neutral position switch.
   - OK ↓
3. Check harness and connector between ECM and park/neutral position switch, park/neutral position switch and battery (See page IN–31).
   - NG → Repair or replace harness or connector.
   - OK ↓

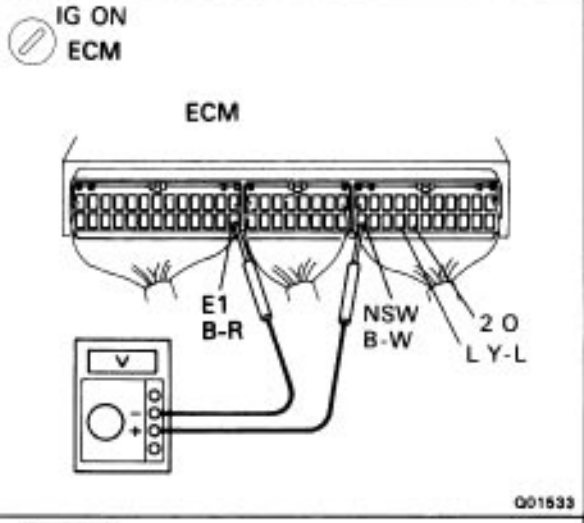
Check and replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check voltage between terminals NSW, 2, L of ECM connector and body ground.



P Turn ignition switch ON.

C Measure voltage between terminals NSW, 2, L of ECM connector and body ground when the shift lever is put in the following positions.

OK

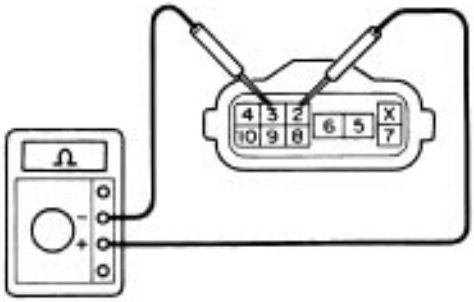
Position	NSW–body ground	2–body ground	L–body ground
P, N	Below 1 V	Below 1 V	Below 1 V
R	10–14 V*	Below 1 V	Below 1 V
D	10–14 V	Below 1 V	Below 1 V
2	10–14 V	10–14V	Below 1 V
L	10–14 V	Below 1 V	10–14 V

*: The voltage will drop slightly due to lighting up of the back up light.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

2 Check park/neutral position switch.



P Remove park/neutral position switch.

C Check continuity between each terminal shown below when the shift lever is put in each position.

O—O Continuity

Shift Position \ Terminal	5	6	2	7	8	9	10	3	4
P	O—O		O—O						
R			O—	——	—O				
N	O—O		O—	——	——	—O			
D			O—	——	——	——	—O		
2			O—	——	——	——	——	—O	
L			O—	——	——	——	——	——	—O

OK

NG → **Replace park/neutral position switch.**

3 Check harness and connector between ECM and park/neutral position switch, park/neutral position switch and battery (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

-Memo

Stop Light Circuit

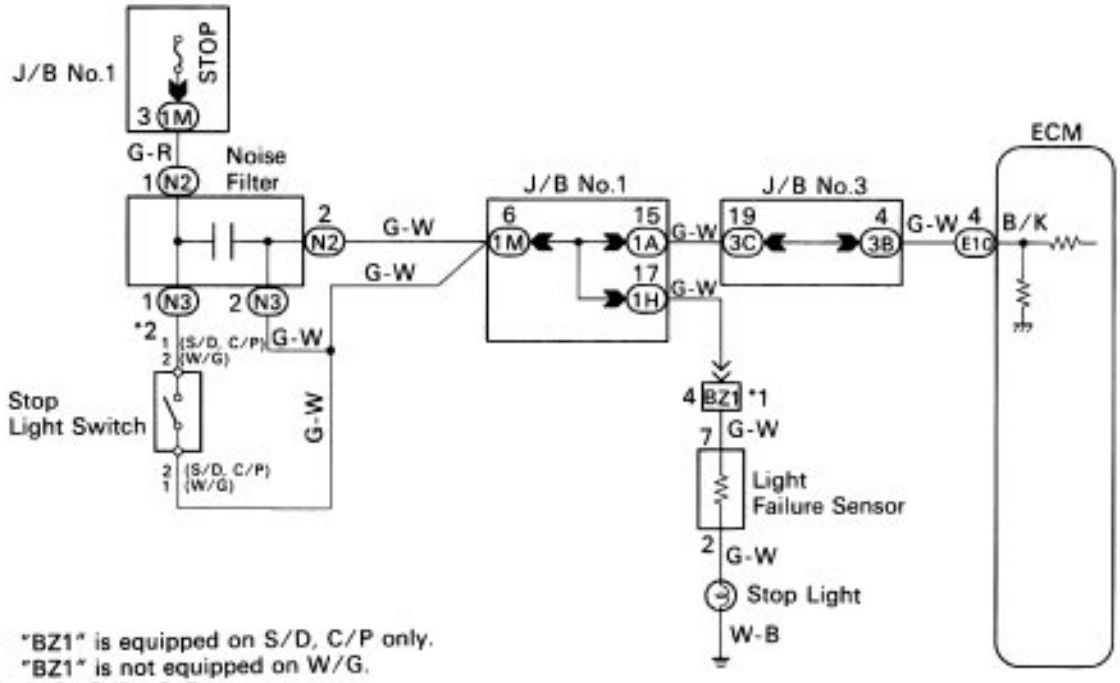
CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling when the brakes are suddenly applied while driving in lock–up condition.
When the brake pedal is operated, this switch sends a signal to the ECM. Then the ECM cancels operation of the lock–up clutch while braking is in progress.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Check and repair stop light circuit (See page BE–62).
OK			
2	Check stop light signal.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX1–50).
NG			
3	Check harness and connector between ECM and stop light switch (See page IN–31) .	NG	Repair or replace harness of connector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



*1 "BZ1" is equipped on S/D, C/P only.
"BZ1" is not equipped on W/G.
*2 S/D, C/P : G-R
W/G : G-W

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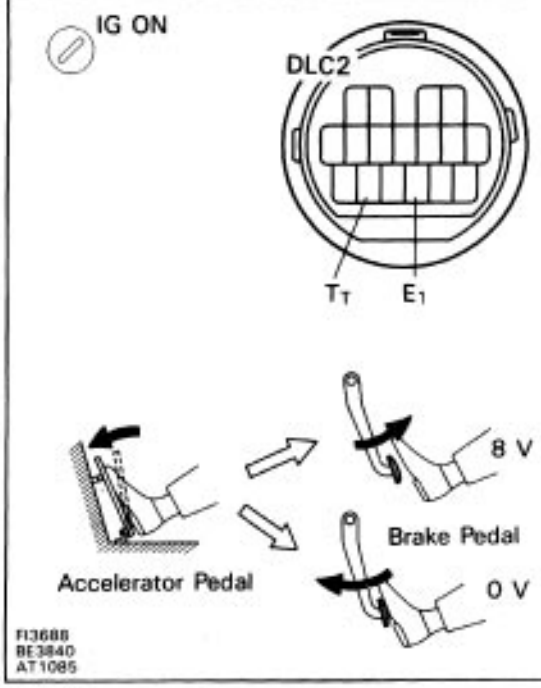
INSPECTION PROCEDURE

1 Check operation of stop light.

C Check if the stop light goes on and off normally when the brake pedal is depressed and released .

NG → **Check and repair stop light circuit (See page BE–50)**

2 Check stop light signal.



C
(1) Connect voltmeter to terminals TT and E l of the DLC2.
(2) Turn ignition switch ON (Do not start the engine).
(3) Fully depress the accelerator pedal until the voltmeter indicates 8 v and hold it.
(4) Depress and release the brake pedal and check the voltage.

OK

Brake pedal	Voltage
Depressed	0 V
Released	8 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

3 Check harness and connector between ECM and stop light switch (See page IN–31).

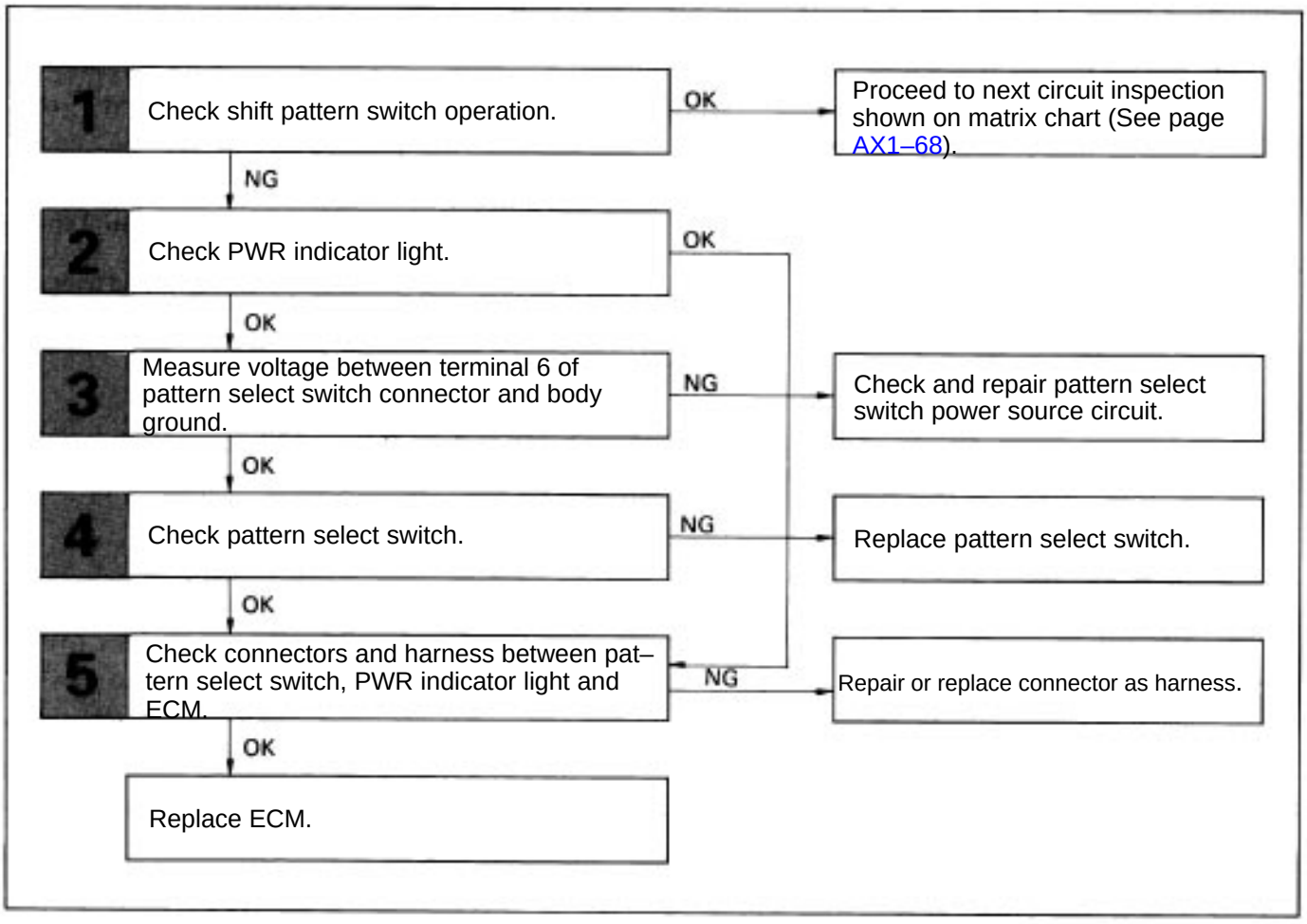
OK

NG → **Repair or replace harness or connector.**

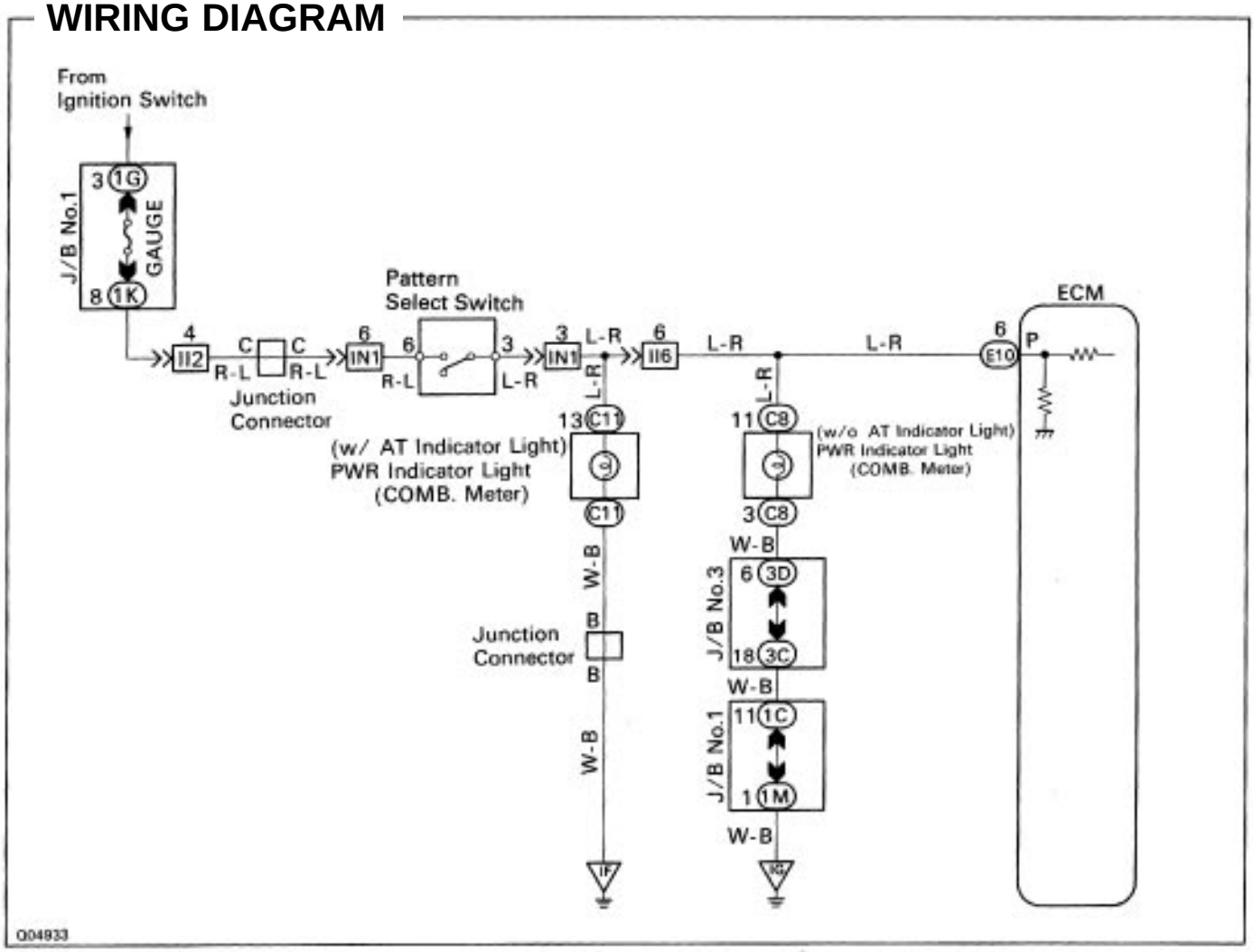
Check and replace ECM.

Pattern Select Switch Circuit

The ECM has stored in its memory the gear shift patterns for D position, 2nd position and L position, and also the lock–up pattern for D position. Two types of gear shifting pattern and lock–up pattern are recorded for D position; for POWER use and NORMAL use. The ECM selects the D position gear shift pattern and lock–up pattern in accordance with the signal from the pattern select switch.



WIRING DIAGRAM



INSPECTION PROCEDURE

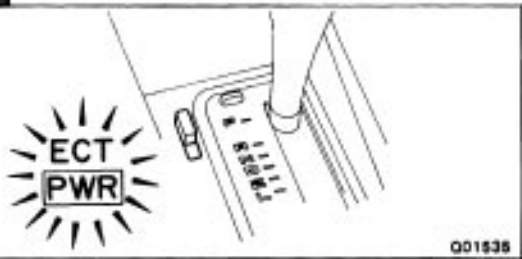
1 Check shift pattern switch operation.

C Check that the shift point changes when the pattern select switch is operated.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

2 Check PWR indicator light.



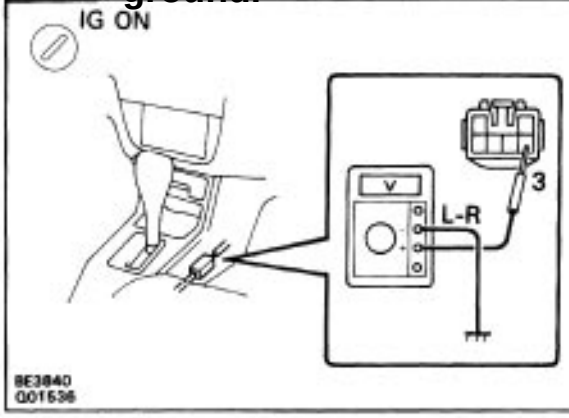
P Turn IG switch 4N.

C Check that the PWR indicator light lights up when you push the pattern select switch to PWR.

NG

OK → **Go to step 6**

3 Measure voltage between terminal 6 of pattern select switch and body ground.



P (1) Push pattern select switch to NORMAL.
(2) Turn IG switch ON.

C Measure voltage between terminal 6 of pattern select switch connector and body ground.

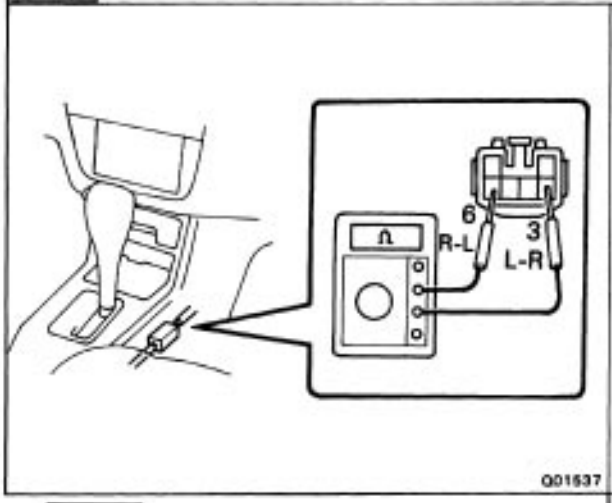
OK **Voltage: 10–14 V**

OK

NG → **Check and repair pattern select switch power source circuit.**

INSPECTION PROCEDURE

4 Check pattern select switch.



P Disconnect pattern select switch connector.

C Measure resistance between terminals 3 and6 of pattern select switch connector when the select switch is set to PWR and NORMAL positions.

OK

Pattern	Resistance
PW R	0) (continuity)
NORM	±) (open)

OK

NG → **Replace pattern select switch.**

5 Check connectors and harness between pattern select switch, PWR indicator light and ECM (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

Replace ECM.

O–D Main Switch & O–D OFF Indicator Light Circuit

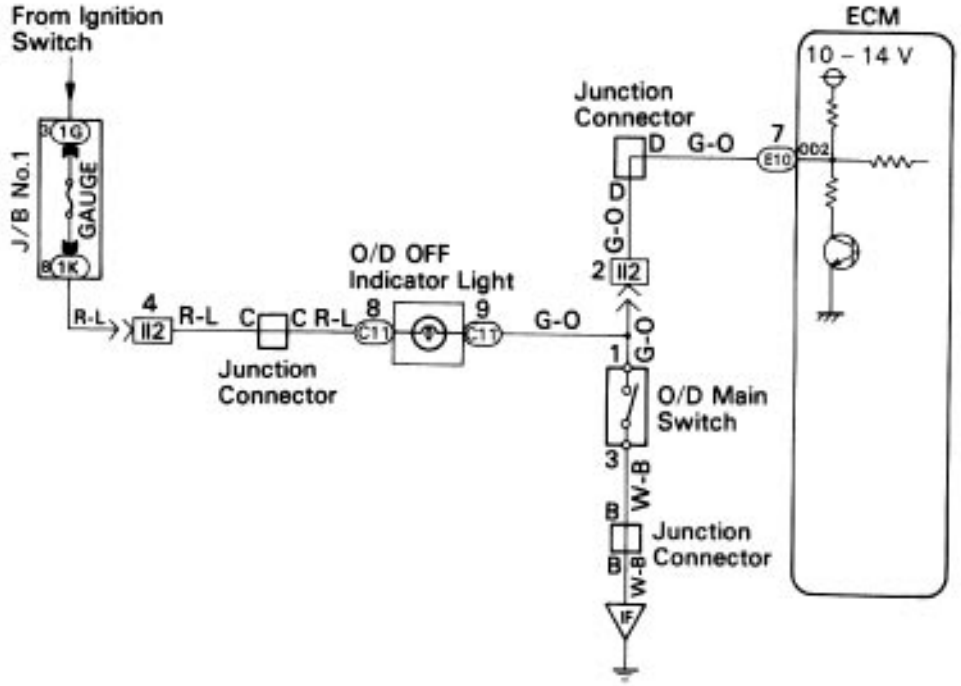
CIRCUIT DESCRIPTION

The O/D main switch contacts go off when the switch is pushed in and come on when it is pushed out. In O/D main switch OFF position, the O/D OFF indicator lights up, and the ECM prohibits shifting to overdrive. The ECM also causes the O/D OFF indicator light to blink when a malfunction is detected. However, when the O/D main switch is OFF, the O/D indicator light does not blink, but stays on.
In this case, connecting the terminals in the DLC2 or DLC1 can display the malfunction code.

DIAGNOSTIC CHART

See next page.

WIRING DIAGRAM



(*) O/D Main Switch
Contacts go off with switch pushed in.
Contacts go on with switch pushed out.

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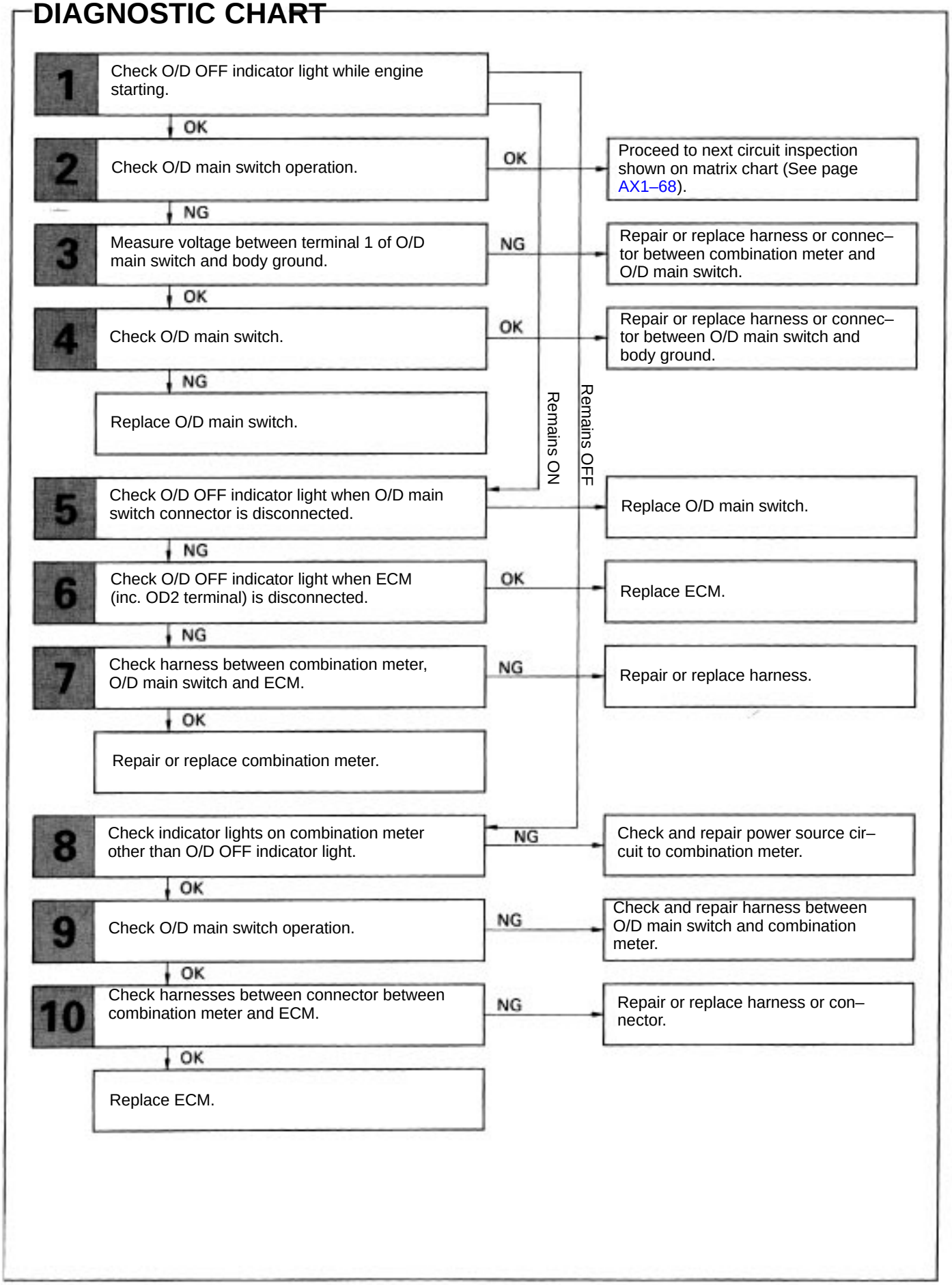
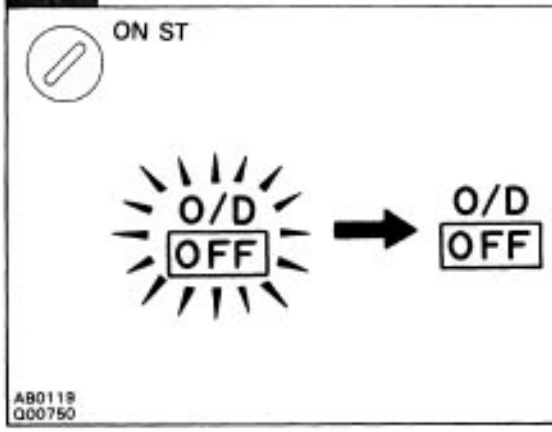
DIAGNOSTIC CHART



INSPECTION PROCEDURE

1 Check 0 /D OFF indicator light when engine starting.



P When starting the engine, check the operating con–dition of the O/D OFF indicator light.

OK **O/D OFF indicator lights immediately after the engine is started.**
Remains ON..... NG 1
Remains OFF.... NG2

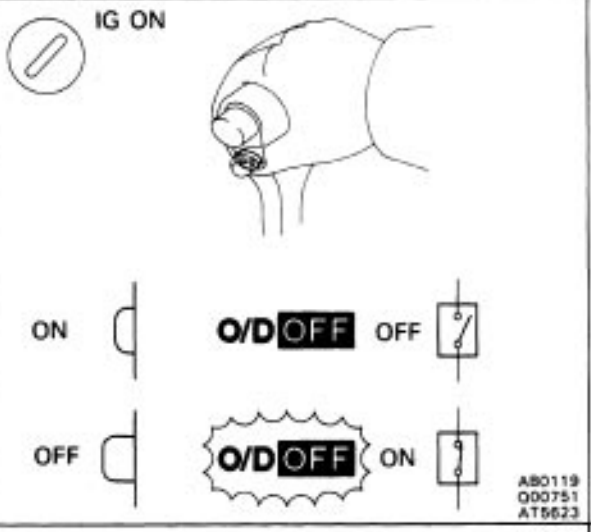
Hint If the O/D OFF indicator light keeps blinking, check the diag. trouble code and repair the problem.

OK

NG1 **Go to step 5**

NG2 **Go to stop 8**

2 Check O/D main switch operation.



C (1) Turn ignition switch ON.
(2) Check–O/D OFF" light when O/D main switch is pushed in to ON.
(3) Start the engine.

OK **"O/D OFF" light goes off.**

C (3) Check "O/D OFF" light when O/D main switch is pushed again, to OFF.

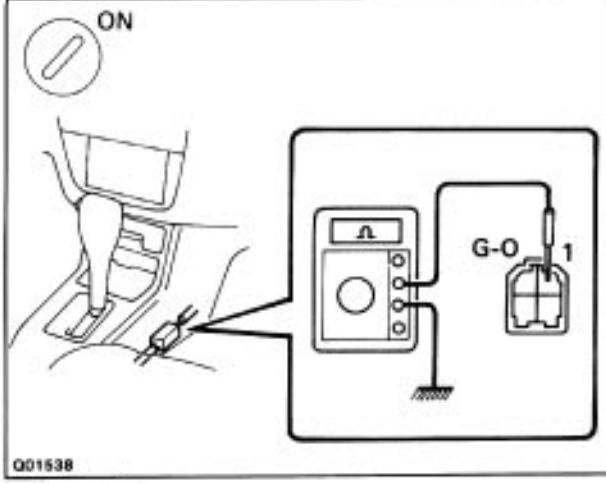
C **"O/D OFF" light lights up.**

Hint If the–O/D OFF" light blinks when the O/D main switch is pushed in to ON, a malfunction is occur–ing in the system.
Check the diagnostic trouble code.

OK

NG **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

3 Measure voltage between terminal 1 of O/D main switch connector and body ground.



P (1) Disconnect O/D main switch connector.
(2) Turn IG switch ON.

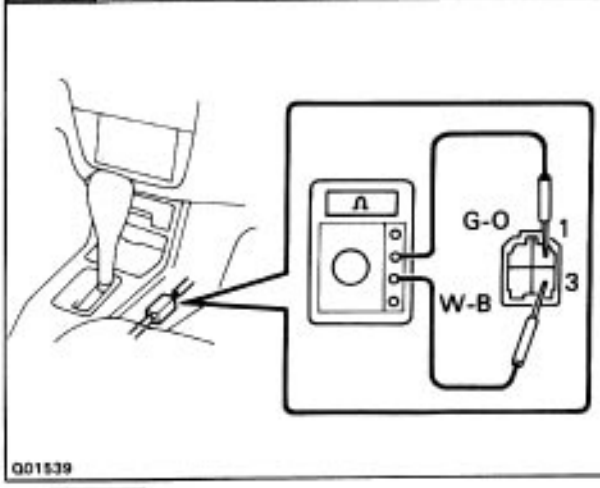
C Measure voltage between terminal 1 of O/D main switch harness side connector and body ground.

OK **Voltage: 10–14 V**

OK

NG **Repair or replace harness or connector between combination meter and O/D main switch.**

4 Check continuity of O/D main switch.



P Disconnect O/D main switch connector.

C Check continuity between terminals 1 and 3 of O/D main switch connector.

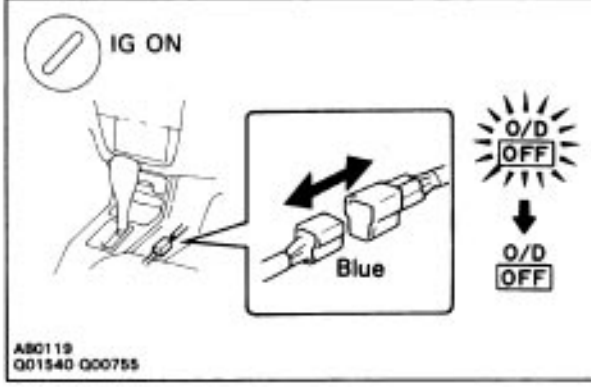
OK **ON Position: No continuity (More than 10 kΩ)**
OFF Position: Continuity (Below 1Ω)

OK

NG **Replace O/D main switch.**

Repair or replace harness or connector between O/D main switch and body ground.

5 Check O/D OFF indicator light when you disconnect O/D main switch connector.

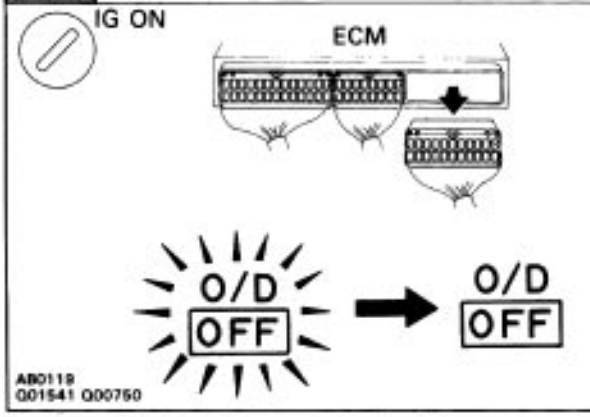


P Turn IG switch ON.
C Check that the O/D OFF indicator light goes off when you disconnect the O/D main switch con–nector.

OK

NG → **Replace O/D main switch.**

6 Check 0 /D OFF indicator light when you disconnect ECM connector (including OD2 terminal).



P Turn IG switch ON.
C Check that the O/D OFF indicator light goes off when you disconnect the ECM connector (includ–ing OD2 terminal).

NG

OK → **Replace ECM.**

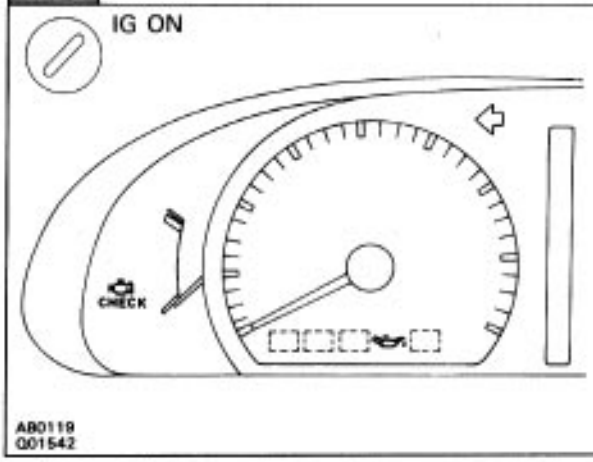
7 Check harness between combination meter, O/D main switch and ECM.

OK

NG → **Repair or replace harness.**

Repair or replace combination meter (See page BE–65).

8 Check indicator lights on combination meter other than O/D OFF indicator light.



P Turn IG switch ON.

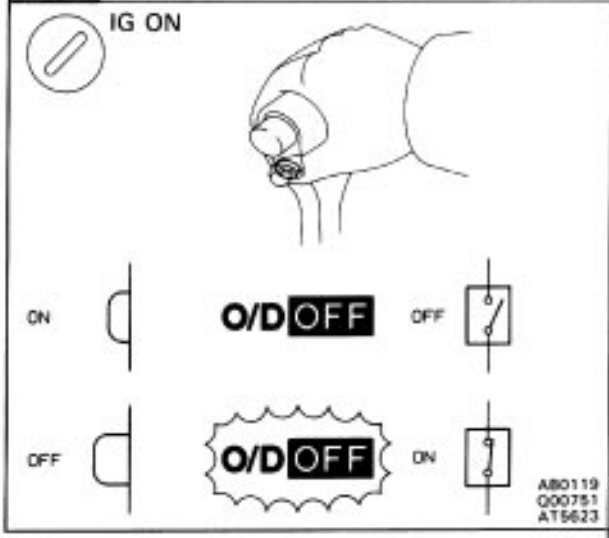
C Check the following indicator lights on combination meter:
- Check Engine Light
- Low Oil Pressure Warning Light
- ABS Warning Light etc.

OK **Above indicator lights light up.**

OK

NG **Check and repair power source circuit to combination meter, or combination meter.**

9 Check O/D main switch operation.



C (1) Turn ignition switch ON.
(2) Check–O/D OFF" light when O/D main switch is pushed in to ON.
(3) Start the engine.

OK **"O/D OFF" light goes off.**

C (3) Check "O/D OFF" light when O/D main switch is pushed again, to OFF.

OK **"O/D OFF" light lights up.**

Hint If the–O/D OFF" light blinks when the O/D main switch is pushed in to ON, a malfunction is occur–ing in the system.
Check the diagnostic trouble code.

OK

NG **Check and repair harness between O/D main switch and combination meter.**

10 Check harness and connector between combination meter and ECM.

OK

NG **Repair or replace harness or connector.**

Replace ECM.

O–D Cancel Signal Circuit

CIRCUIT DESCRIPTION

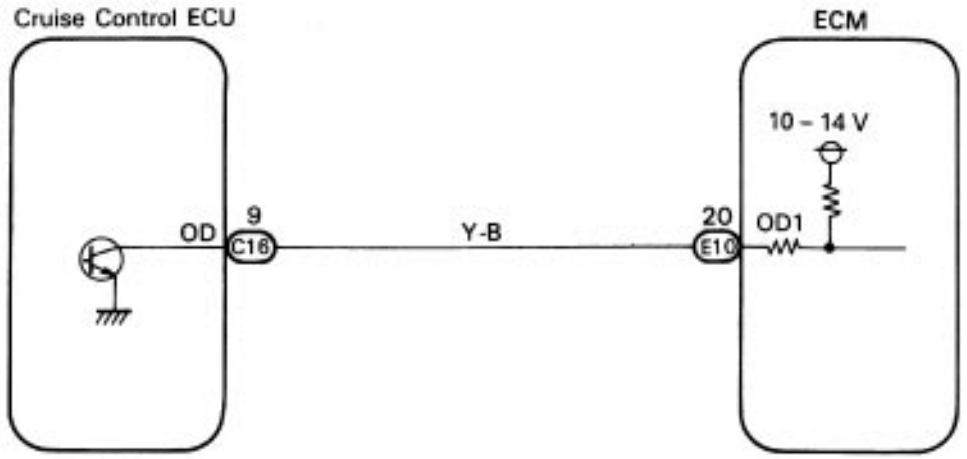
While driving with cruise control activated, in order to minimize gear shifting and provide smooth cruising uphill, overdrive may be prohibited temporarily in some conditions.
The cruise control ECU sends OD cut signals to the ECM as necessary and the ECM cancels overdrive shifting until these signals are disconnected.

DIAGNOSTIC CHART

1. Check voltage between terminals OD 1 of ECM connector and body ground.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page AX1–68).
   - NG ↓
2. Check voltage between terminal OD of cruise control ECU harness side connector and body ground.
   - OK → Check and replace cruise control ECU.
   - NG ↓
3. Check harness and connector between cruise control ECU and ECM (See page IN–31).
   - NG → Repair on replace harness or con–nector.
   - OK ↓

Check and replace ECM.

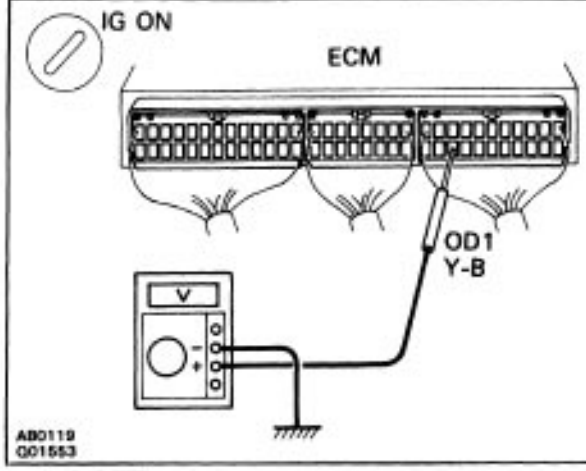
WIRING DIAGRAM



Q00758

INSPECTION PROCEDURE

1 Check voltage between terminal OD1 of ECM connector and body ground.



P Turn ignition switch ON.

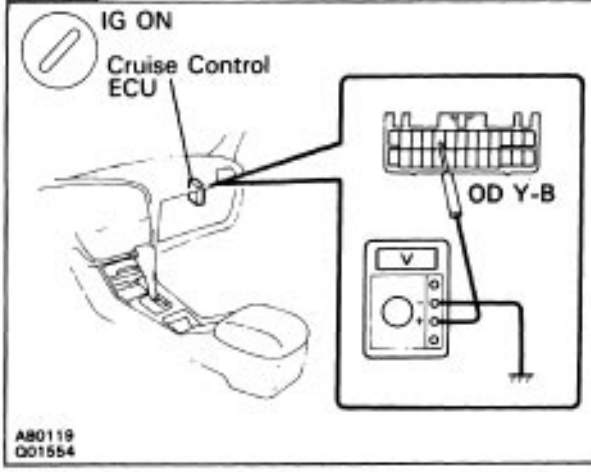
C Measure voltage between terminal 01 31 of ECM connector and body ground.

OK **Voltage: 10–14 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

2 Check voltage between terminal OD of cruise control ECU harness side connector and body ground.



P (1) Disconnect cruise control ECU connector.
(2) Turn ignition switch ON.

C Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.

OK **Voltage: 10–14 V**

NG

OK → **Check and replace cruise control ECU.**

3 Check harness or connector between cruise control ECU and ECM (See page IN–31).

'OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

TE1 Terminal Circuit

CIRCUIT DESCRIPTION

The ECM displays diagnostic trouble codes using the O/D OFF indicator light when terminals TE1 and E1 of the DLC2 or DLC1 are connected.

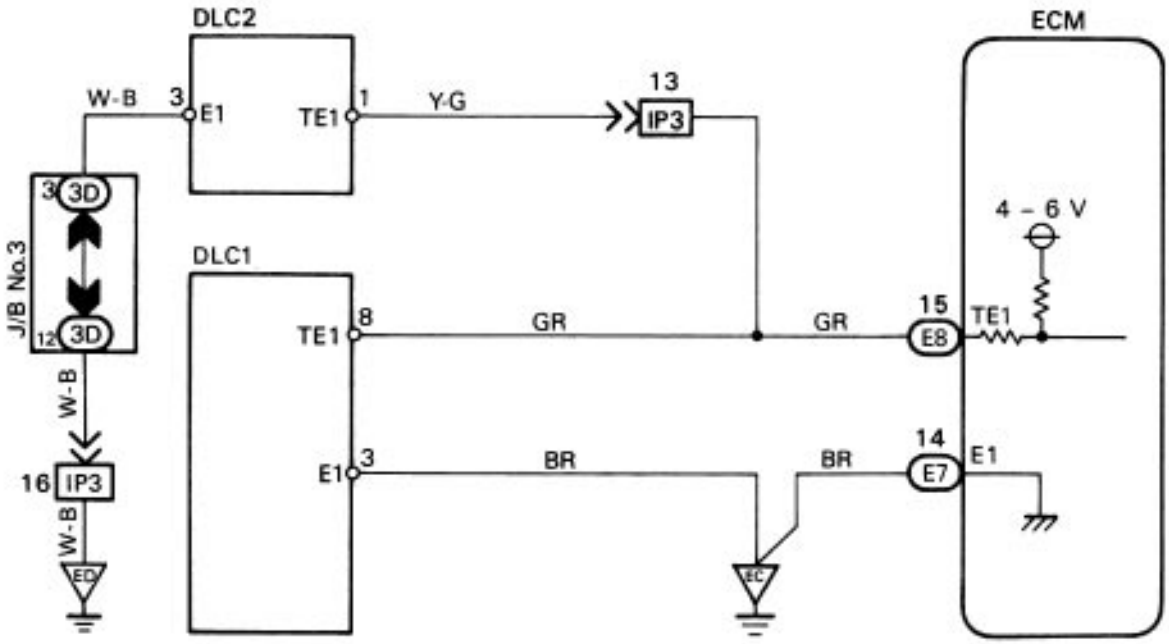
DIAGNOSTIC CHART

1 Check voltage between terminals TE1 and E1 of DLC2 or DLC1.
- OK → Proceed to next circuit inspection shown on matrix chart (See page AX1–68).
- NG →

2 Check harness and connector between ECM and DLC2, DLC1 and body ground (See page IN–31).
- NG → Repair or replace harness or connector.
- OK →

Check and replace ECM.

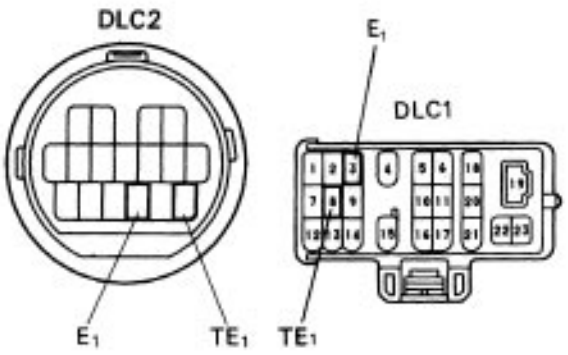
WIRING DIAGRAM



Q00761

INSPECTION PROCEDURE

1 Check voltage between terminals TE, and E, of DLCZ or DLC1.



C Measure voltage between terminals TE, and E, of DLC2 or D LC1.

OK **Voltage: 4–6 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX1–68).**

2 Check harness and connector between ECM and DLC2, DLC1 and body ground (See page IN–31).

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

T_T Terminal Circuit

CIRCUIT DESCRIPTION

Checks of ECM input and output signals related to the throttle position sensor, brakes, shift position and other circuits can be performed by measuring the voltages at terminal T, of DLC1.

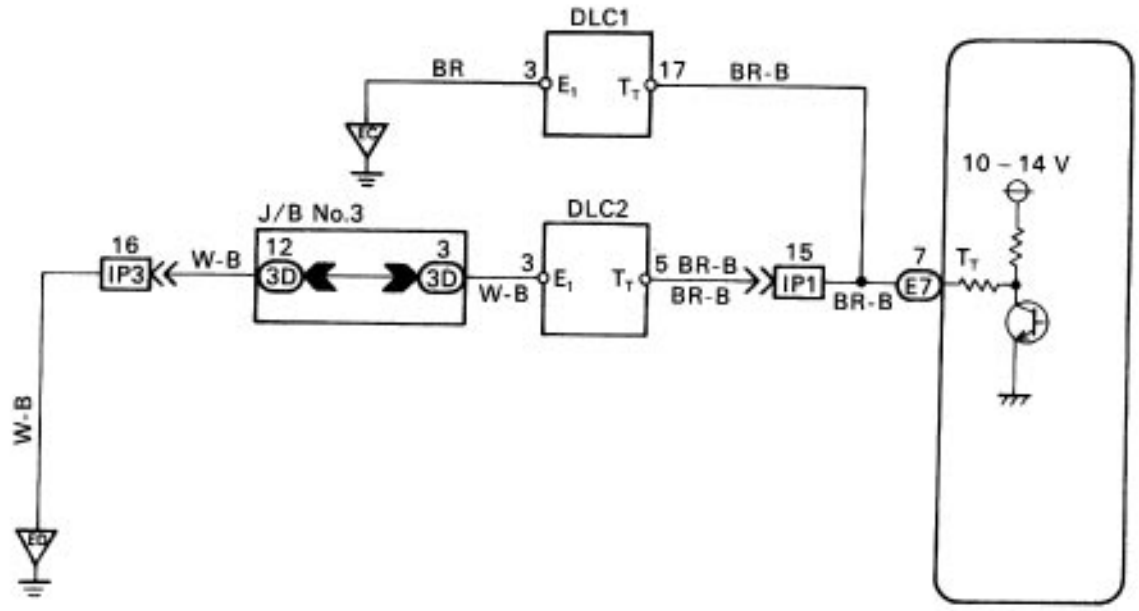
DIAGNOSTIC CHART

1 Check harness and connector between ECM and DLC2, DLC1 and body. ground (See page IN–31).

NG → Repair or replace harness or connector.

OK → Check and replace ECM.

WIRING DIAGRAM



004934

SERVICE SPECIFICATIONS

SERVICE DATA

Line pressure (whell locked)	Engine idling D position R position AT stall D position R position	363–422 kPa 618–794 kPa 750–897 kPa 1,373–1,608 kPa	3.7–4.3 kgf/cm² 6.3–8.1 kgf/cm² 7.7–9.1 kgf/cm² 14.0–16.4 kgf/cm²	53–61 psi 90–115 psi 109–130 psi 199–233 psi
Engine stall revolution		2,450±150 rpm		
Time lag	N position → D position N position → R position	Less than 1.2 seconds Less than 1.5 seconds		
Engine idle speed (Cooling fan and A/C OFF) N position		700 rpm		
Throttle cable adjustment (Throttle valve fully opened)		Between boot and face and inner cable stopper 0–1 mm		0–0.04 in.
Torque converter runout Drive plate runout	Limit Limit	0.30 mm 0.20 mm		0.0118 in. 0.0079 in.

SHIFT POINT

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	58–65 (36–40)
		2→3	110–120 (68–75)
		3→O/D	147–157 (91–98)
		O/D→3	139–149 (86–93)
		3→2	98–108 (61–67)
		2→1	42–49 (26–30)
	Throttle valve fully closed	3→O/D	38–45 (24–28)
		O/D→3	17–24 (11–15)
2 position	Throttle valve fully opened	1→2	58–65 (36–40)
		3→2	89–99 (55–62)
		2→1	42–49 (26–30)
L position	Throttle valve fully opened	2→1	50–56 (31–35)

LOCK–UP POINT

D position km/h (mph) Throttle valve opening 596		Lock–up ON	Lock–up OFF
'3rd Gear (O/D switch OFF)		85–92 (53–57)	79–86 (49–53)
O/D Gear	NORM	67–74 (42–46)	64–71 (40–44)
	PW R	73–80 (45–50)	70–77 (43–48)

'O/D switch OFF

TORQUE SPECIFICATIONS

AX01A–06

Part tightened	N·m	kgf·cm	ft·lbf
Engine rear mounting bracket x Front suspention member	80	820	59
Engine rear mounting bracket x Front suspention member	66	670	48
LH transaxle mounting	52	530	38
Transaxle x Engine 12 mm bolt	64	650	47
Transaxle x Engine 10 mm bolt	46	470	34
Torque converter clutch x Drive plate	27	280	20
Valve body x Transaxle case	11	110	8
Oil strainer	11	110	8
Oil pan	4.9	50	43 in.·lbf
Oil pan drain plug	49	500	36
Testing plug	7.4	75	65 in.·lbf
Transaxle rear cover x Transaxle case	37	380	27
Park/neutral position switch x Transaxle case (bolt)	5.4	55	48 in.·lbf
Park/neutral position switch (nut)	6.9	70	61 in.·lbf

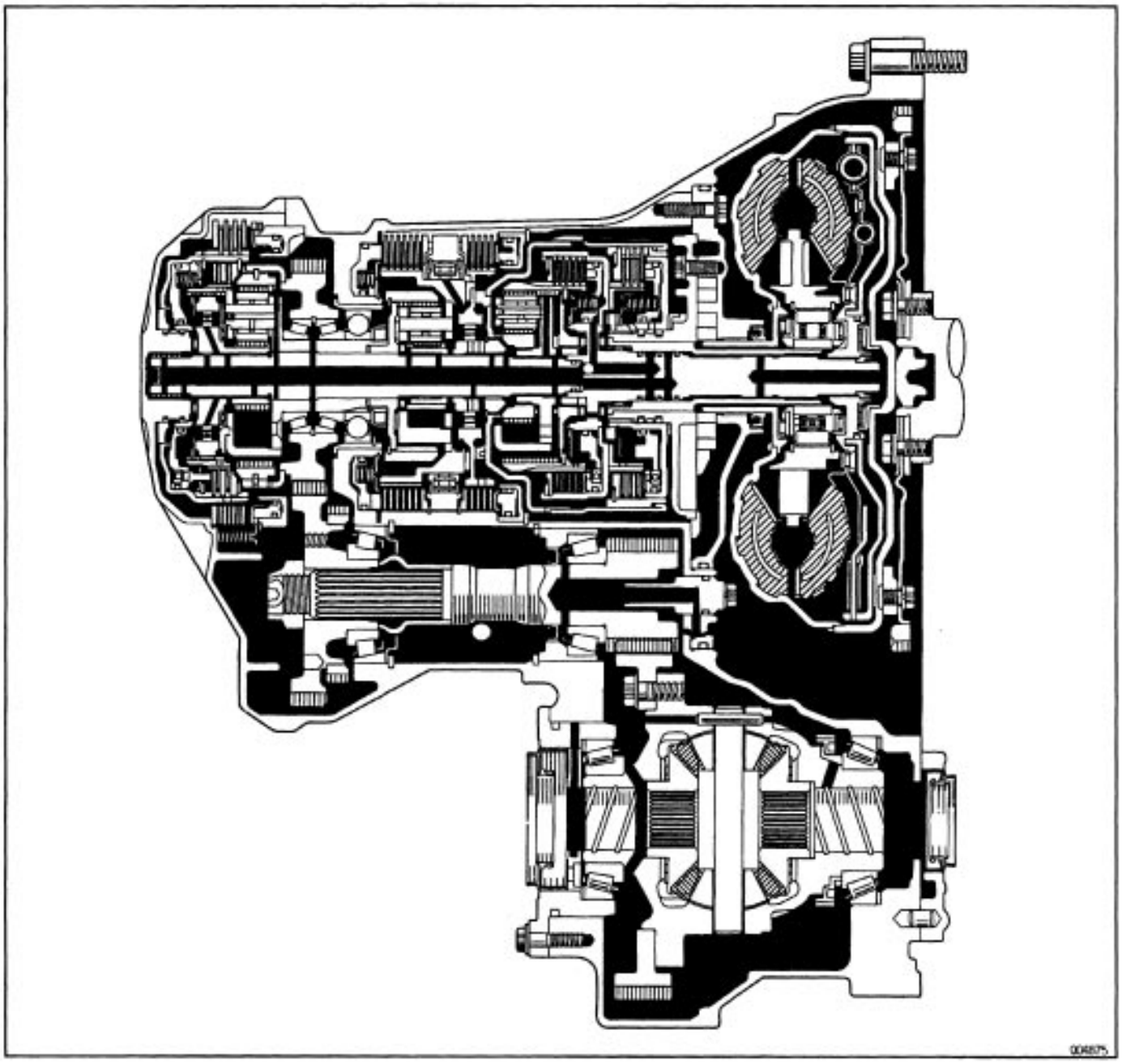
A541E AUTOMATIC TRANSAXLE

DESCRIPTION

GENERAL DESCRIPTION

The ’94 model years A541 E automatic transaxle is a revised version of the previous model year’s A540E automatic transaxle. The following changes have been made to match the brand new 1 MZ –FE engine:

- Adoption of an Electronically Controlled Transaxle with an intelligent control system. This version has evolved from the previous electronically Controlled Transaxle system.
- The hydraulic pressure contrl system has been revised accordingly.
- The torque converter clutch and the gear train have been revised.

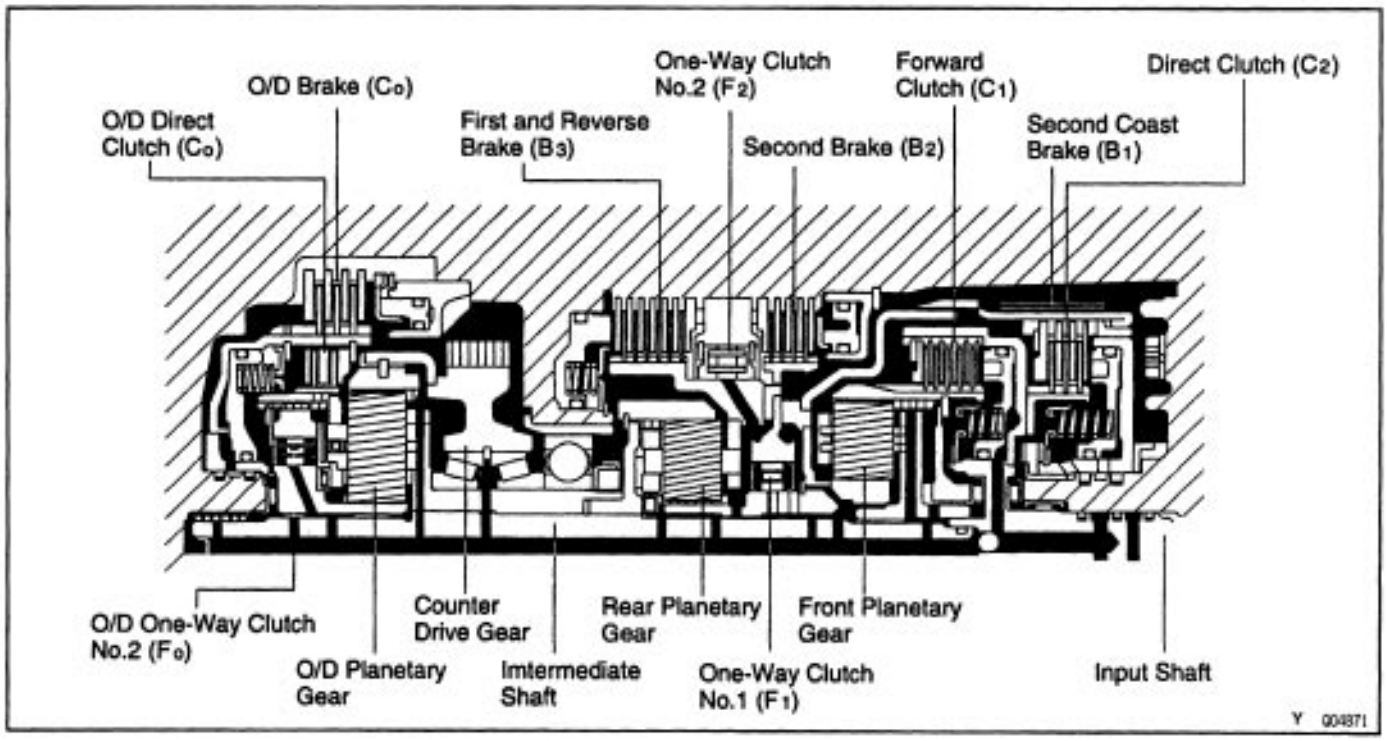


GENERAL SPECIFICATIONS

Type of Transaxle		A541E
Type of Engine		1MZ–FE
Torque Converter Clutch Stall Torque Ratio		1.8 : 1
Torque Converter Clutch Lock–up Mechanism		Equipped
Gear Ratio	1 st Gear	2.810
	2nd Gear	1.549
	3rd Gear	1.000
	O/D Gear	0.735
	Reverse Gear	2.296
Transaxle	Number of Discs and Plates	
	0/D Direct Clutch (Co)	2 / 2
	Forward Clutch (C,)	5 / 5
	. Direct Clutch (Ct)	3 / 3
	2nd Brake (B:j	4 / 4
	First and Reverse Brake (Bj	6 / 6
	O/D Brake (Bo)	3 / 3
B, Band Width	mm (in.)	31 (1.22)
ATF Type		ATF DEXRON® II
Capacity liter (US qts, Imp.qts)	A/T	6.75(7.1, 5.9)
	D/F	0.85 (0.9, 0.7)

OPERATION

1. MECHANICAL OPERATION



p . . . . . Operating

Shift lever position	Gear Position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	*3rd	○	○	○			○		○		
L	1 St	○	○					○	○		○
	‘2nd	○	○			○	○		○	○	

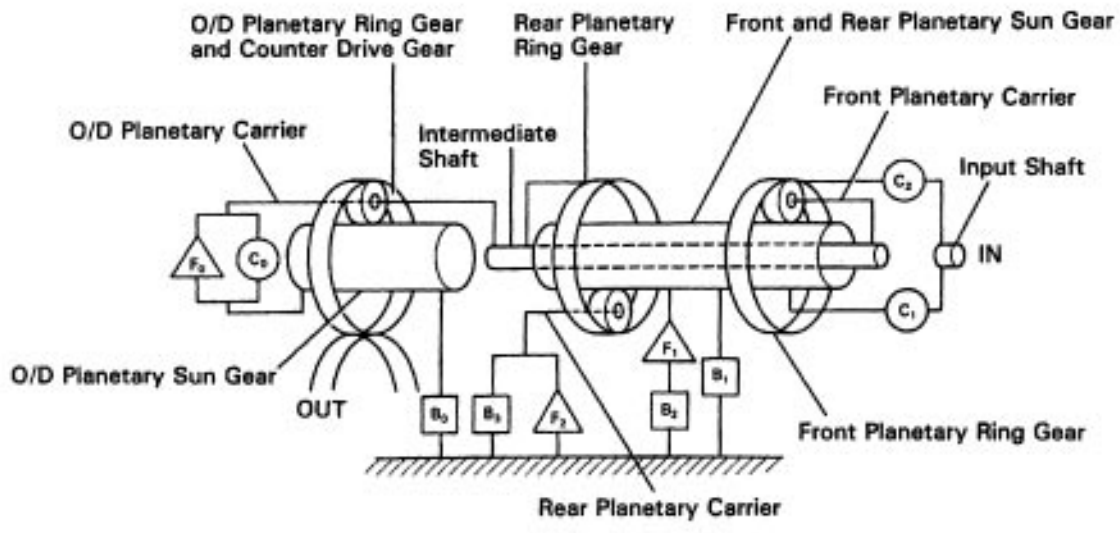
*Down–shift only – no up–shift

V04753

AX218–38

2. FUNCTION OF COMPONENTS

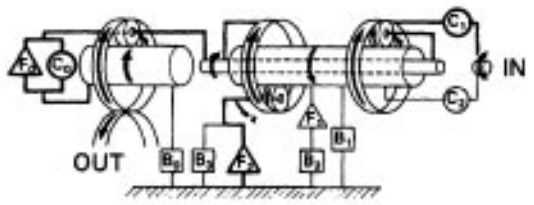
COMPONENT		FUNCTION
Forward Clutch	C_1	Connects input shaft and front planetary ring gear
Direct Clutch	C_2	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake	B_1	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwi
2nd Brake	B_2	Prevents outer race o I from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake	B_3	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch	F_1	When BZ is operating, prevents front & rear planetary sun gear from turning counterclockwise .
No.2 One–Way Clutch	F_2	Prevents rear .planetary carrier from turning counterclockwise
O/D Direct Clutch	C_0	Connects overdrive sun gear and overdrive planetary carrier
O/D Brake	B_0	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch	F_0	When transaxle is– being driven by engine, connects overdrive sun gear and overdrive carrier
Planetary Gears		These gears change the route through which driving force is transmitted in accor–dance with the operation of each clutch and brake in order to increase or reduce the in–put and output speed



V02257

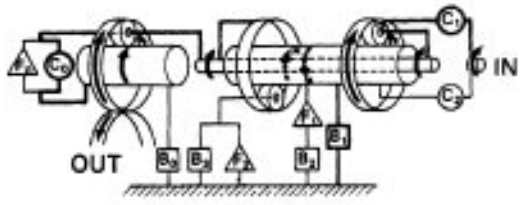
Power from the engine transmitted to the input shaft via the torque converter clutch is then transmitted to the planetary gears by the operation of the clutch.
By operation of the brake and one–way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the planetary gear unit.
Shift change is carried out by altering the combination of clutch and brake operation.
Each clutch and brake operates by hydraulic pressure; gear position is decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Position 1 st Gear



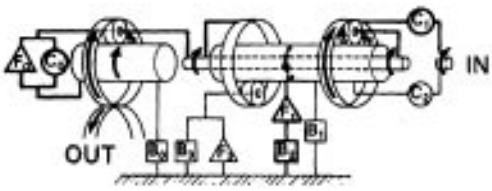
AT1097

2 Position 2nd Gear



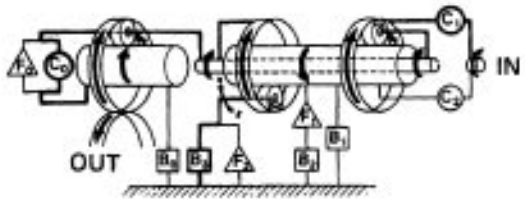
AT1102

D Position 2nd Gear



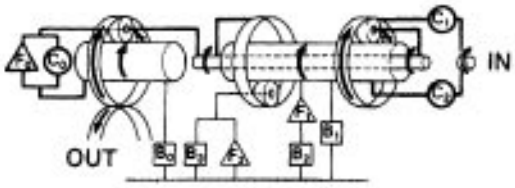
AT1098

L Position 1 st Gear



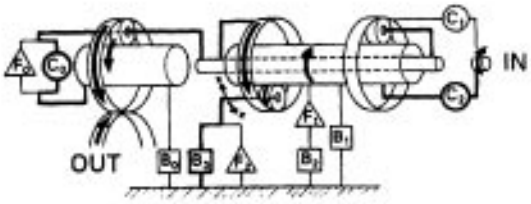
AT1103

D Position 3rd Gear



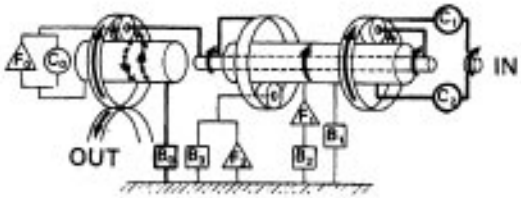
AT1099

R Position Reverse Gear



AT1101

D Position O/D Gear



AT1100

V22258

AX01A–08

3. HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes as well as the fluid passagas which connect all of these components.

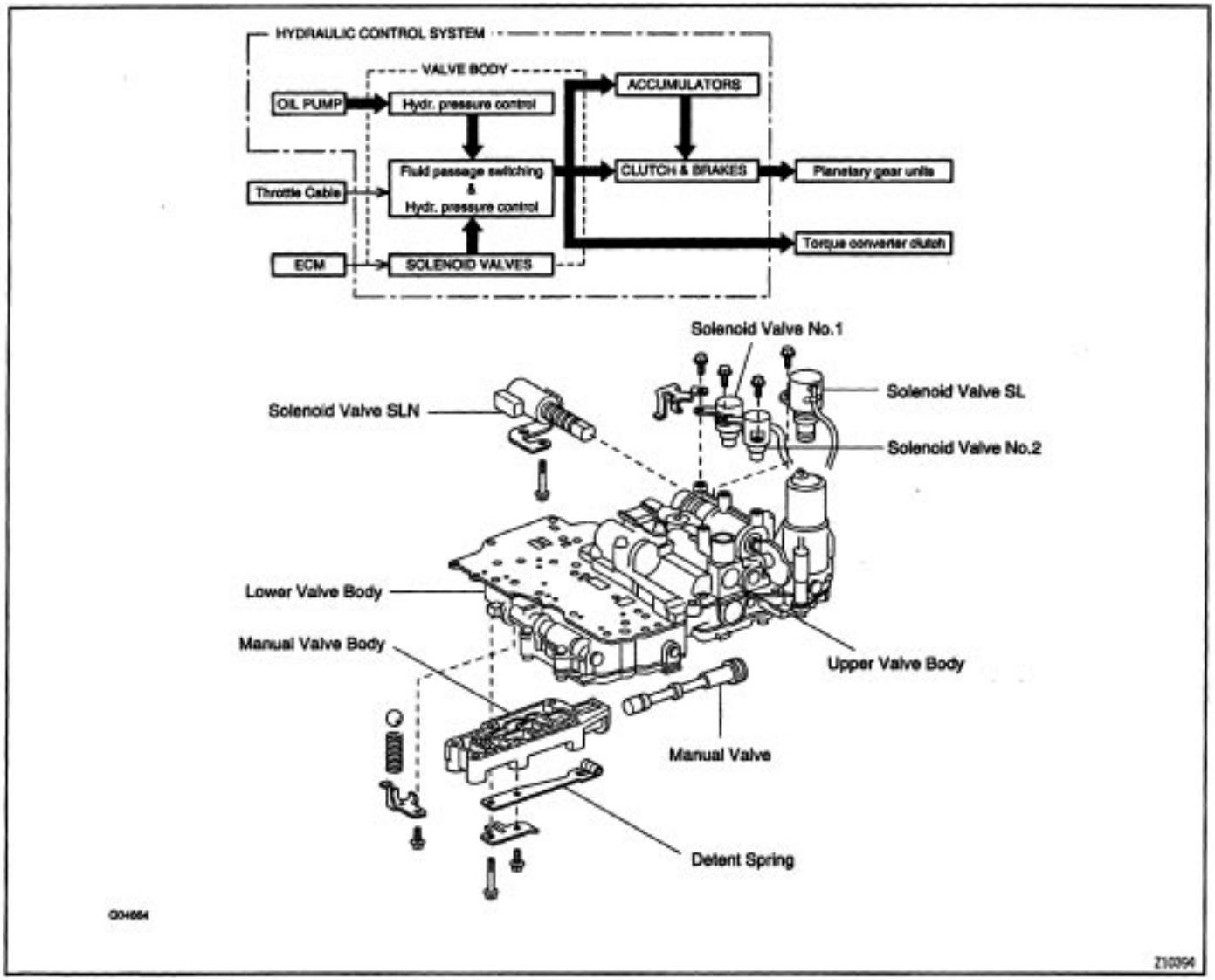
Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body.

The No. 1 and No.2 solenoid vales are turned on and off by signals from the ECM to operate the shift valves and change the gear shift position.

The SL solenoid valve is operated by signals from the ECM to engage or disengage the lock –up clutch of the torque converter clutch.

The SLN solenoid valve is operated by signals from the ECM to control the engagement speed and reduce gear shift shock.



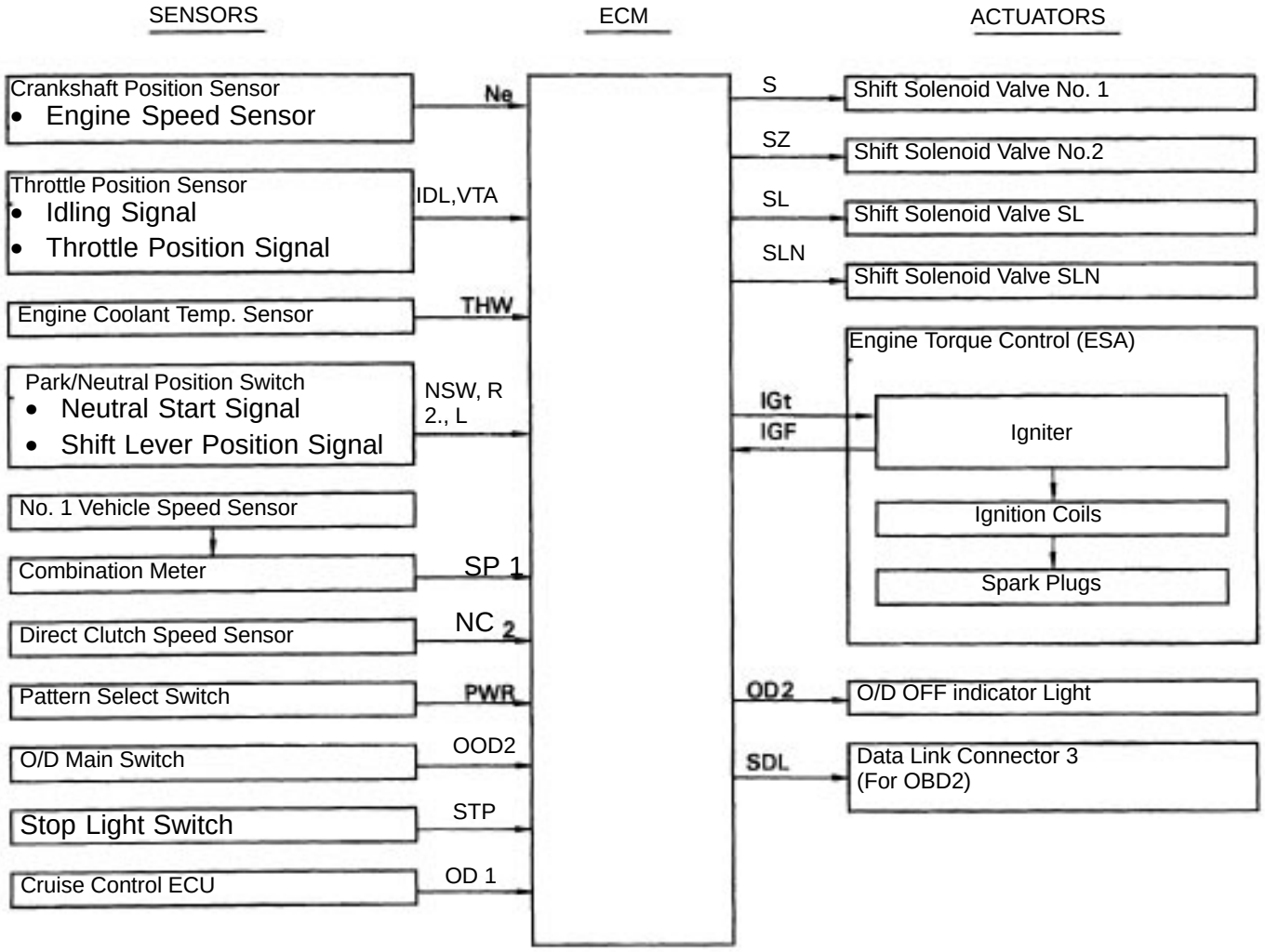
4. ELECTRONIC CONTROL SYSTEM

GENERAL

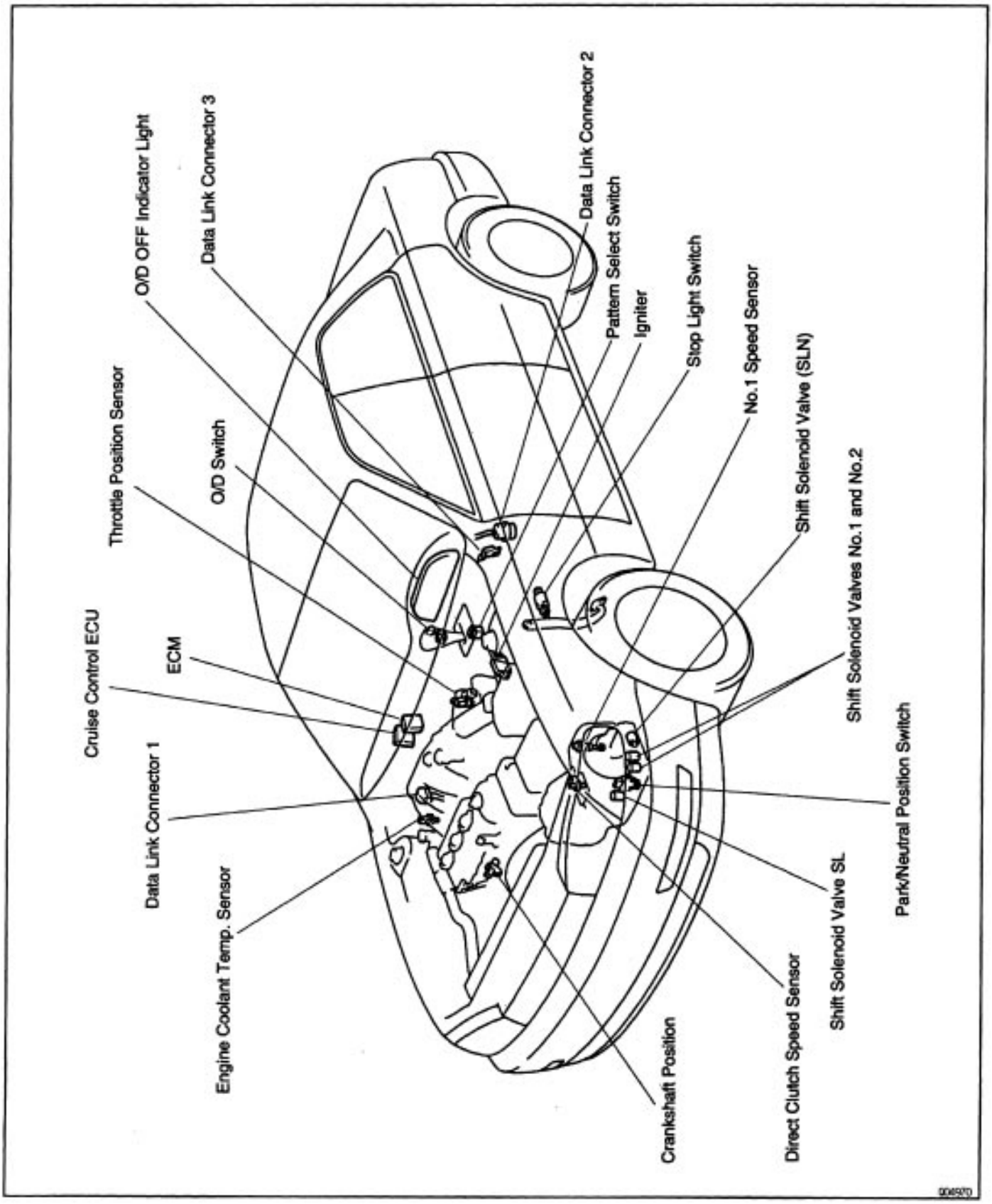
The electronic control system for the A541 E automatic transaxte provides extremely precise control of the gear shift timing and lock–up timing in response to driving conditions as sensed by various sensors located throughout the vehicle and in response to the engine's running condition. At the same time, the ECM control reduces vehicle squat when the vehicle starts out and gear shift shock. The electronic control system is also equipped with a self diagnosis system which diagnoses malfunctions of electronically controlled components and warns the driver, and a fail–safe system which makes it possible for the vehicle to continue functioning when a malfunction occurs.

CONSTRUCTION

The electronic control system can be broadly divided into three groups; the sensors, ECM, and actuators.

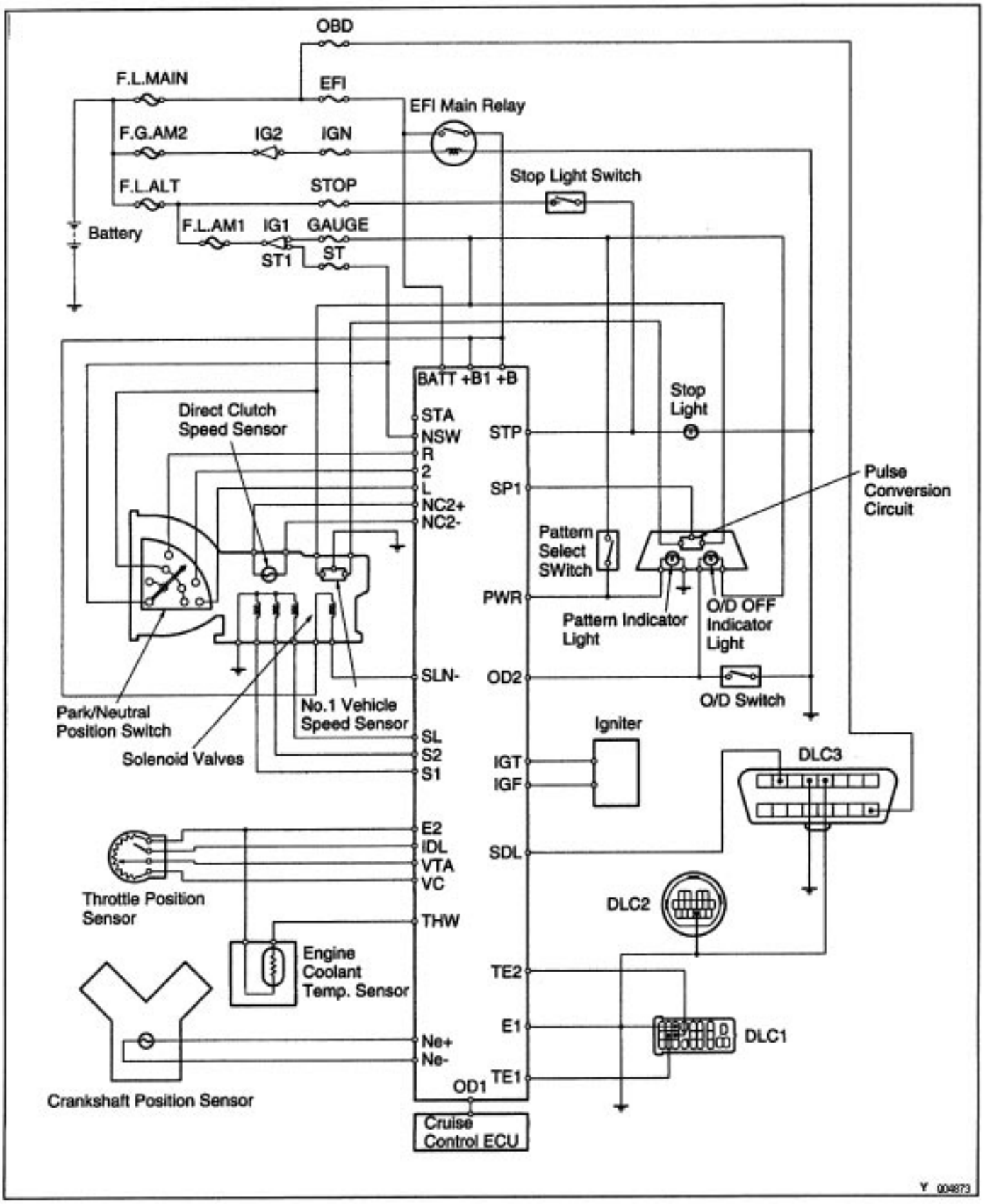


ARRANGEMENT OF COMPONENTS



No.	Components	functions
①	Park/Neutral Position Switch	Detects the shift lever position.
②	Direct Clutch Speed Sensor	Detects the input shaft speed from 1 st gear to 3rd gear.
③	Shift Solenoid Valve SL	Controls the hydraulic pressure applied to the lock–up clutch and controls lock–up timing.
④	Shift Solenoid Valve SLN	Controls the hydraulic pressure applied to the back cham–ber of the accumulator and smooths the engagement of clutches and brakes during shifting .
⑤	Shift Solenoid Valve No. 1 and No.2	Controls the hydraulic pressure applied to each shift valve, and control the gear shift position and timing.
⑥	Stop Light Switch	Detects if the brake pedal is depressed.
⑦	Vehicle Speed Sensor	Detects and sends a vehicle speed signal to the ECM.
⑧	Pattern Select Switch	Selects the Power mode or the Normal mode for shift and lock–up timing.
⑨	0/D OFF Indicator Light	Blinks and warns the driver, while the 0/D main switch is pushed in, when the electronic control circuit is malfunc–tioning. ’
⑩	O/D Switch	Prevents up–shift to the O/D gear if the O/D switch is off.
⑪	ECM	Controls the engine and transaxle actuators based on signals from each sensor.
⑫	Throttle Position Sensor	Detects the throttle valve opening angle.
⑬	Engine Coolant Temp. Sensor	Detects the engine coolant temperature.
⑭	Cruise Control ECU	This ECM prevents the transaxle from shifting into over–drive and prohibits lock–up control when the vehicle’s speed drops below the auto drive set speed parameter.
⑮	Data Link Connector 3	By connecting the OBD II scan tool or TOYOTA hand–held tester the transaxle control data can be read.

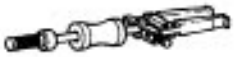
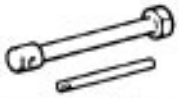
SYSTEM DIAGRAM



PREPARATION

SST (SPECIAL SERVICE TOOLS)

AX011E–38

	09043–38100 Hexagon 10 mm Wrench	Remove and install oil pan drain plug.
	09223–15010 Crankshaft Rear Oil Seal Replacer	
	09308–00010 Oil Seal Puller	Remove side gear shaft oil seal.
	09316–60010 Transmission & Transfer Bearing Reptacer	Install RH side bearing to differential case.
	(09316–00010) Replacer Pipe	Install right sid, gear shaft oil seal.
	09350–32014 TOYOTA Automatic Transmission Tool Set	
	(09351–32010) One–way Clutch Test Tool	
	(09351–32020) Stator Stopper	
	09992–00094 Automatic Transmission Oil Pressure Gauge Set	Line pressure

RECOMMENDED TOOLS

	09031–00030 Pin Punch	Pin diameter 3 mm(0.12 in.)
	09082–00050 TOYOTA Electrical Tester Set	

EQUIPMENT

Straight edge	Check torque converter clutch installation.
Vernier calipers	Check torque converter clutch installation.
Dial indicator or dial indicator with magnetic base	Measure drive plate runout.
Torque wrench	

LUBRICANT

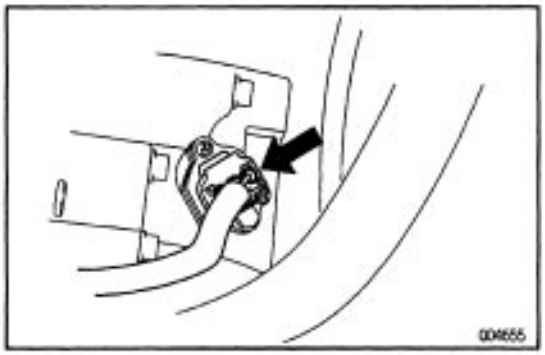
Item	Capacity	Classification
Automatic transaxle fluid (w/o Differential oil) Dry fill Drain and refill	 6.75 liters (7.1 US qts, 5.9 Imp. qts) 3.5 liters (3.7 US qts, 3.1 imp. qts)	 ATF DEXRON' II
Differential Fluid	0.85 liters (0.9 US qts, 0.7 Imp. qts)	ATF DEXRON' 1I

SSM (Special Service Materials)

08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Torque converter clutch mounting bolt

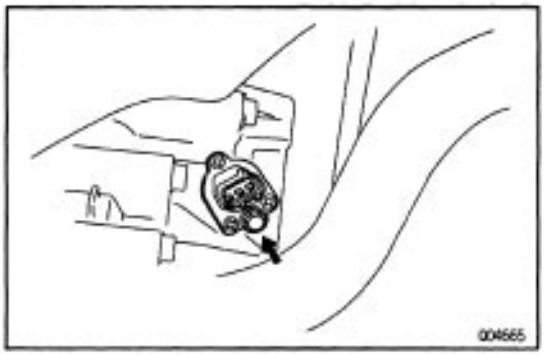
ON–VEHICLE REPAIR

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery.



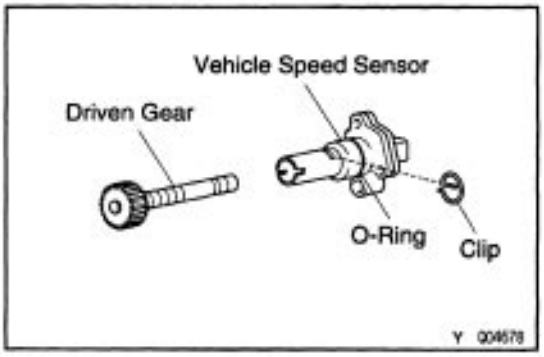
VEHICLE SPEED SENSOR REPLACEMENT (w/Speedometer Driven Gear)

1. DISCONNECT VEHICLE SPEED SENSOR CONNECTOR



2. REMOVE VEHICLE SPEED SENSOR ASSEMBLY

(a) Remove the bolt and vehicle speed sensor assembly.



(b) Remove the clip and speedometer driven gear from vehicle speed sensor.

(c) Remove the O–ring from vehicle speed sensor.

3. INSPECT VEHICLE SPEED SENSOR

4. INSTALL VEHICLE SPEED SENSOR ASSEMBLY

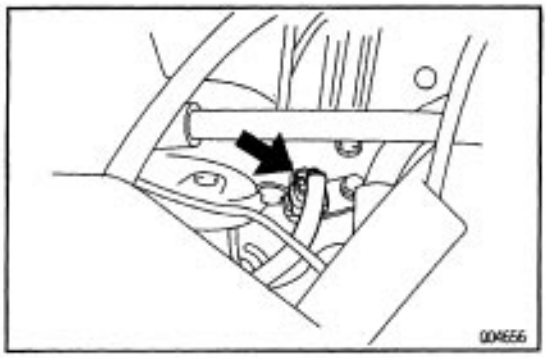
(a) Coat a new 0–ring with ATF and install it to the vehicle speed sensor.

(b) Install the speedometer driven gear to the vehicle speed sensor and clip.

(c) Install the vehicle speed sensor assembly and torque the bolts.

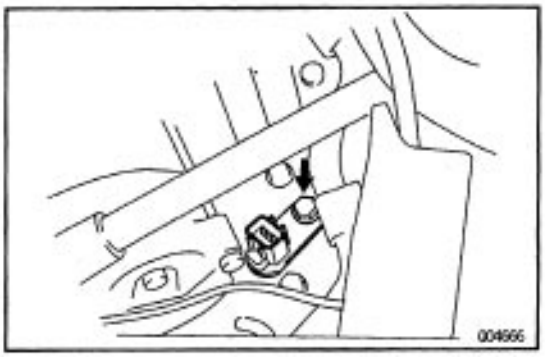
Torque: 16 N–m (160 kgf–cm. 12 ft–lbf)

5. CONNECT VEHICLE SPEED SENSOR CONNECTOR



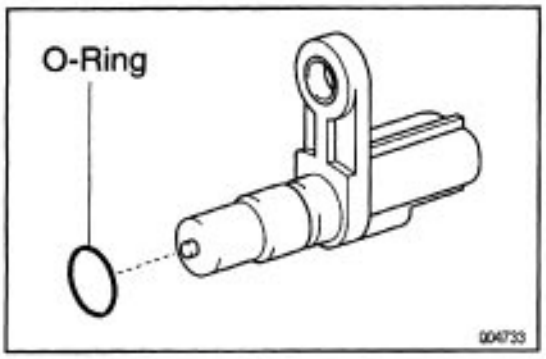
DIRECT CLUTCH SPEED SENSOR REPLACEMENT

1. DISCONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



2. REMOVE DIRECT CLUTCH SPEED SENSOR

(a) Remove the bolt and direct clutch speed sensor.



(b) Remove the 0 –ring from direct clutch speed sensor.

3. INSPECT DIRECT CLUTCH SPEED SENSOR

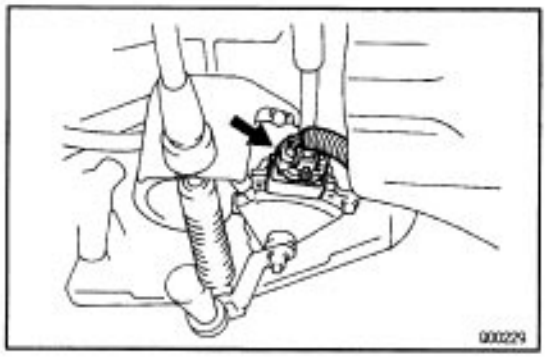
(See page AX2–108)

4. INSTALL DIRECT CLUTCH SPEED SENSOR

(a) Coat a new 0–ring with ATF and install it to the direct clutch speed sensor.

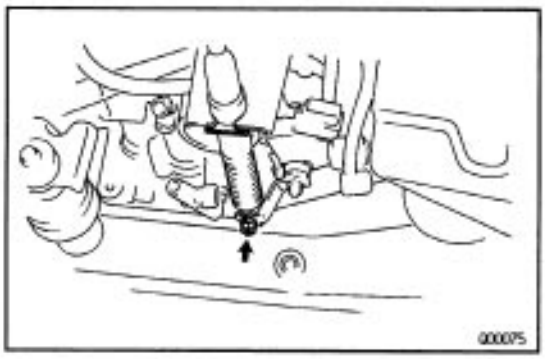
(b) Install the direct clutch speed sensor and torque the bolt.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



PARK/NEUTRAL POSITION SWITCH REPLACEMENT

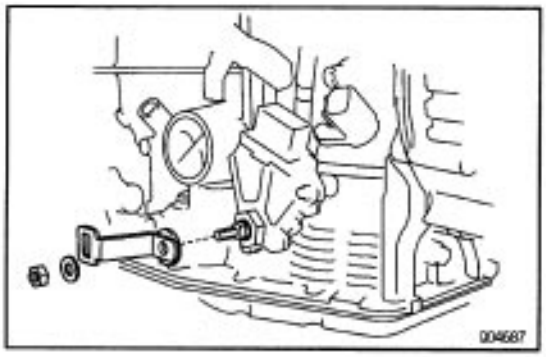
1. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR



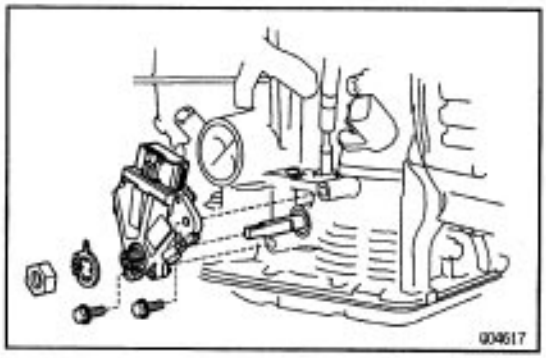
2. REMOVE PARK/NEUTRAL POSITION SWITCH

(a) Remove the clip from the shift control cable.

(b) Remove the nut and control cable.



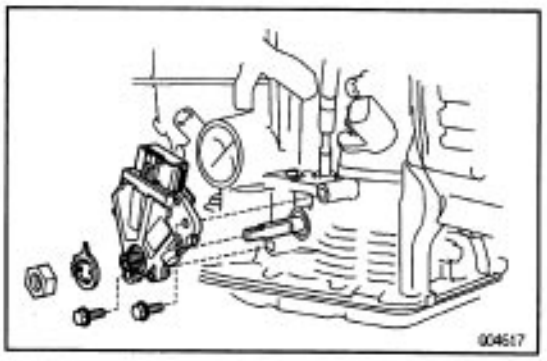
(c) Remove the transaxle control shaft lever.



(d) Remove the park/neutral position switch.

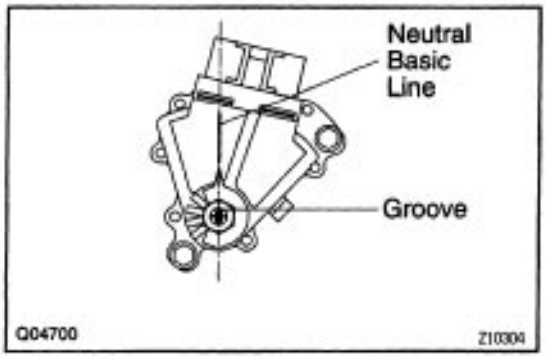
3. INSPECT PARK/NEUTRAL POSITION SWITCH

(See page AX2–116)

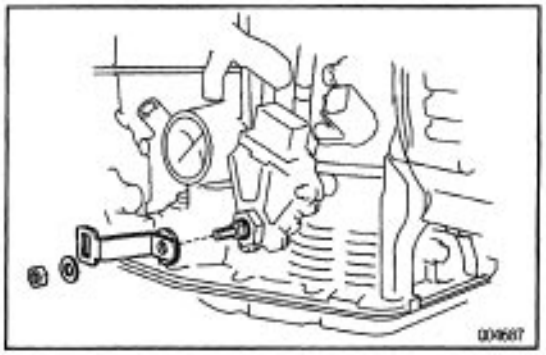


4. INSTALL AND ADJUST PARK/NEUTRAL POSITION SWITCH

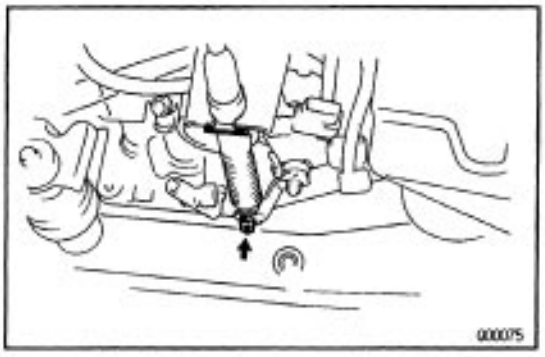
(a) Install the park/neutral position switch.



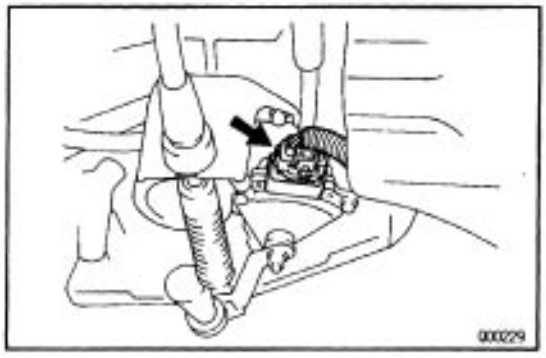
(b) Adjust the park/neutral position switch.
(See page AX2–69)



(c) Install the transaxle control shaft lever.

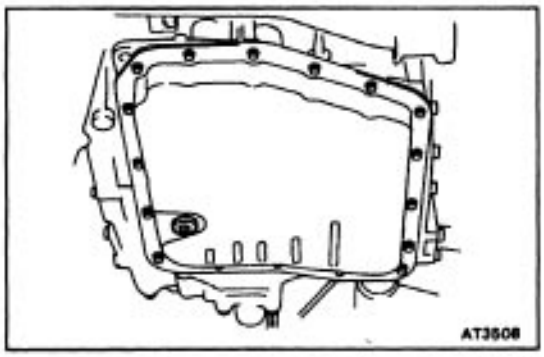


(d) Install the control cable and nut.
(e) Install the clip to the shift control cable.



5. CONNECT PARK/ NEUTRAL POSITION SWITCH CONNECTOR

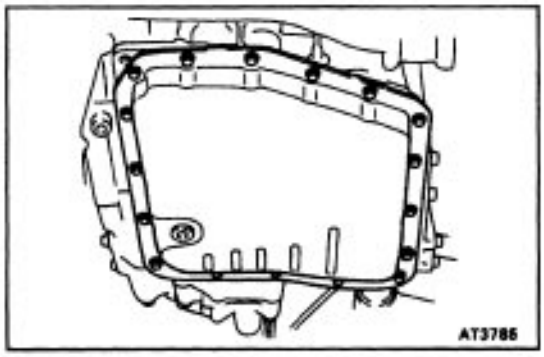
6. TEST DRIVE VEHICLE



VALVE BODY REMOVAL

1. CLEAN TRANSAXLE EXTERIOR

To help prevent contamination, clean the exterior of the transaxle.



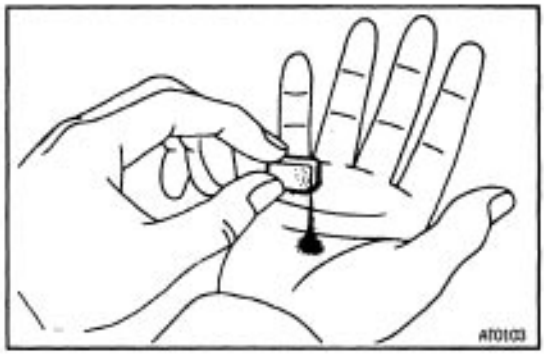
2. DRAIN TRANSAXLE FLUID

Using SST, remove the drain plug and the fluid into suitable container.

SST 09043 – 38100

3. REMOVE OIL PAN AND GASKET

NOTICE: Some fluid will remain in the oil pan. Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.

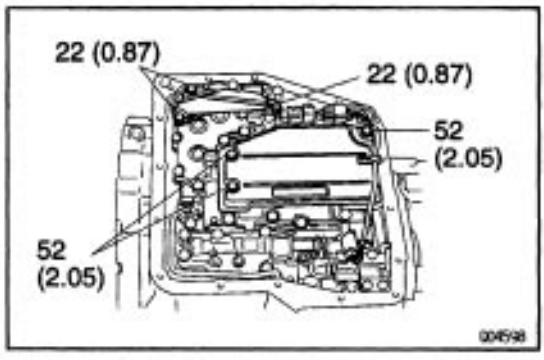


4. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the pan and the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic): bearing, gear and plate wear

Brass (non–magnetic): bushing wear

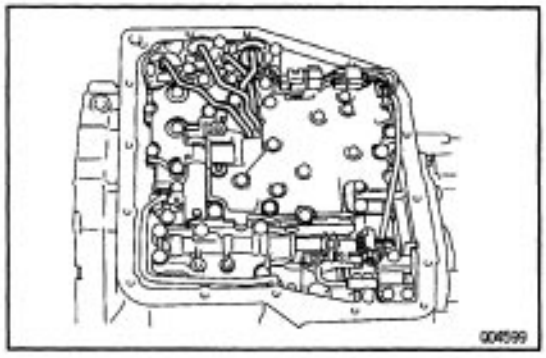


5. REMOVE OIL STRAINER AND APPLY TUBE BRACK–ET

(a) Remove the 3 bolts and the oil strainer.

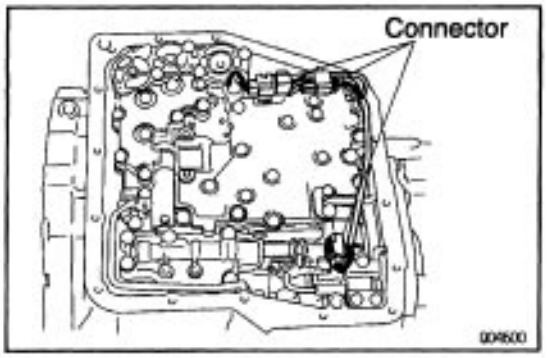
NOTICE: Be careful as oil will come out of the strainer when it is removed.

(b) Remove the 3 bolts and the apply tube bracket.

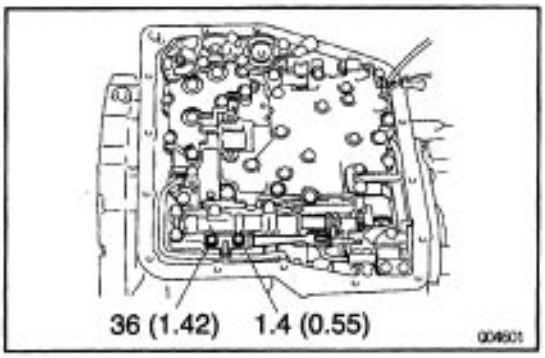


6. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the 5 tubes.

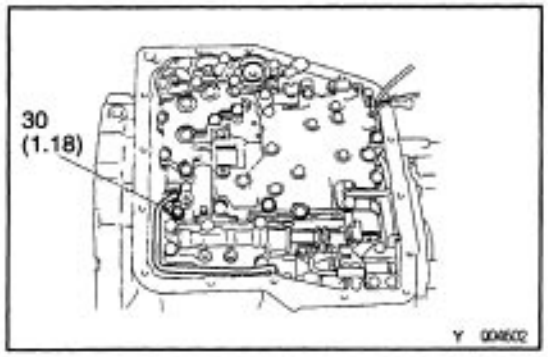


7. DISCONNECT SOLENOID CONNECTORS

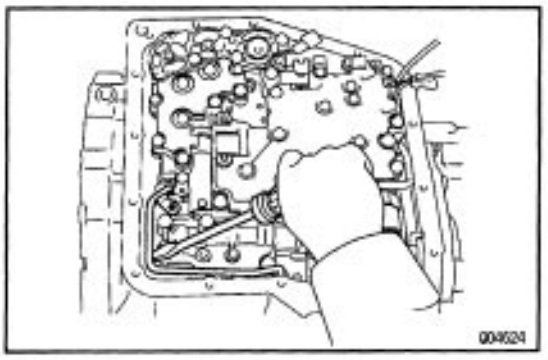


8. REMOVE TRANSFER LUBRICATION APPLY TUBE

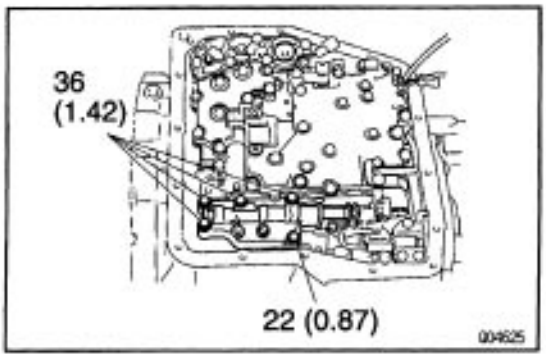
(a) Remove the 2 bolts and detent spring.



(b) Remove the tube set bolts.

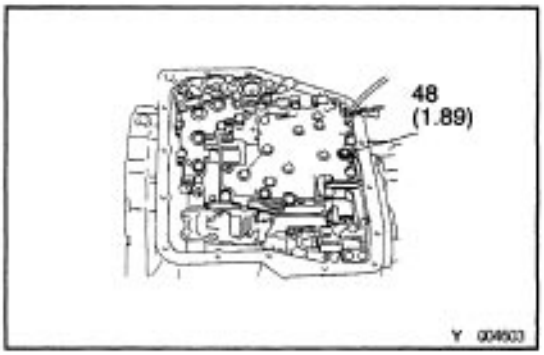


(c) Pry up the tube with a screwdriver and remove the tube.



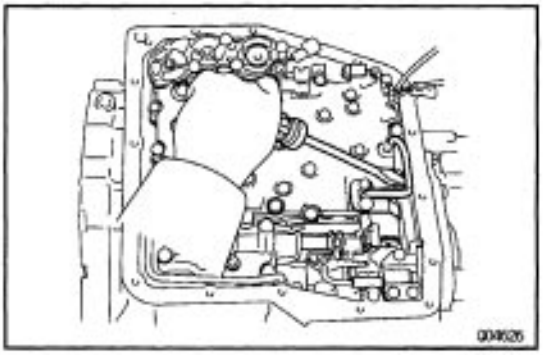
9. REMOVE MANUAL VALVE BODY

Remove the 5 bolts and manual valve body.

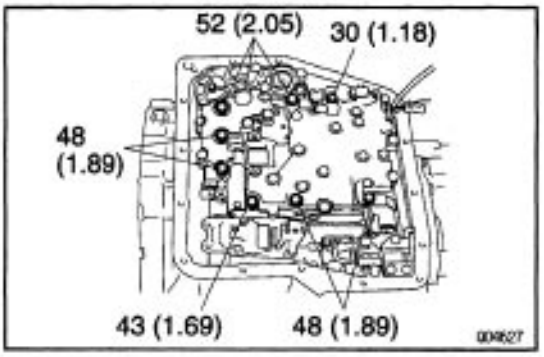


10. REMOVE B3 APPLY TUBE

(a) Remove the tube retainer.

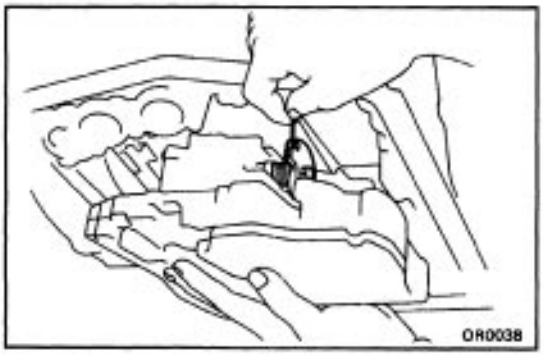


(b) Pry up the tube with a screwdriver and remove the tube.

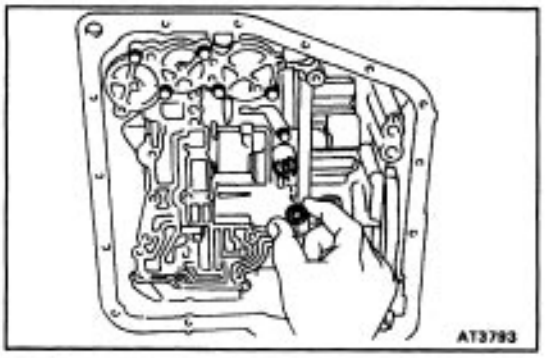


11. REMOVE VALVE BODY

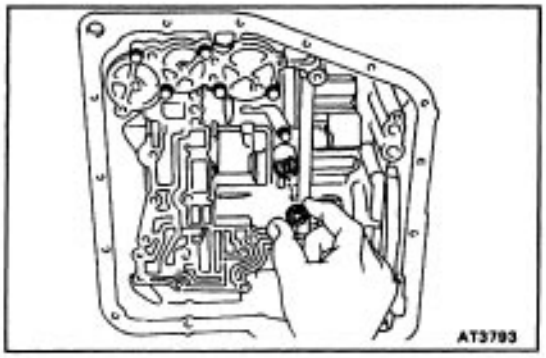
(a) Remove the 11 bolts.



(b) Disconnect the throttle cable from cam and remove the valve body.

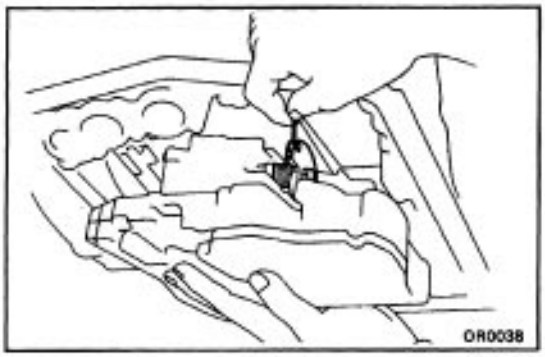


12. REMOVE SECOND BRAKE APPLY GASKET



VALVE BODY INSTALLATION

1. INSTALL NEW SECOND BRAKE APPLY GASKET

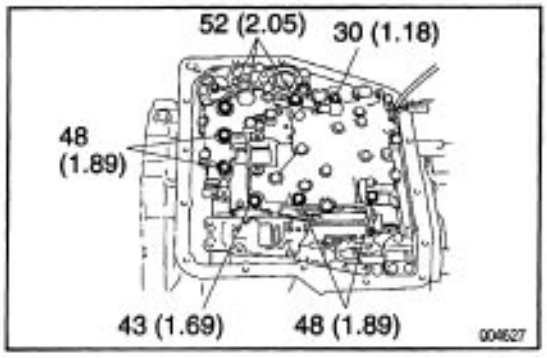


2. INSTALL VALVE BODY

(a) While holding the cam down with your hand, slip the cable end into the slot.

(b) Bring valve body into place.

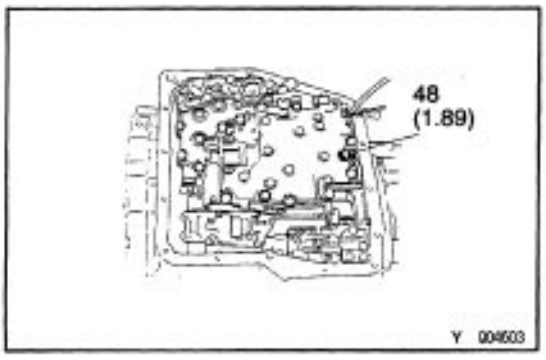
NOTICE: Be careful not to entangle the solenoid wire.



(c) Finger tighten all bolts first. Then tighten them with a torque wrench.

HINT: Each bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm. 8 ft–lbf)



3. INSTALL 133 APPLY TUBE

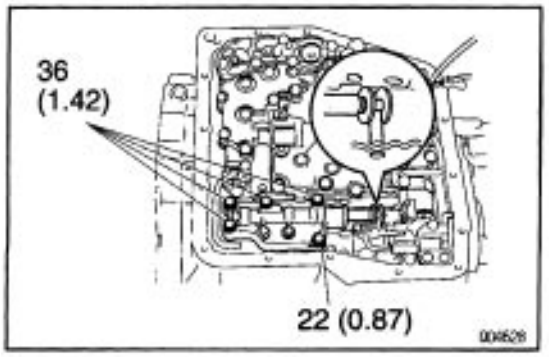
(a) Using a plastic hammer, install the tube into the position indicated in the illustration.

NOTICE: Be careful not to bend or damage the tubs.

(b) Install the tube retainer.

HINT: The bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)



4. INSTALL MANUAL VALVE BODY

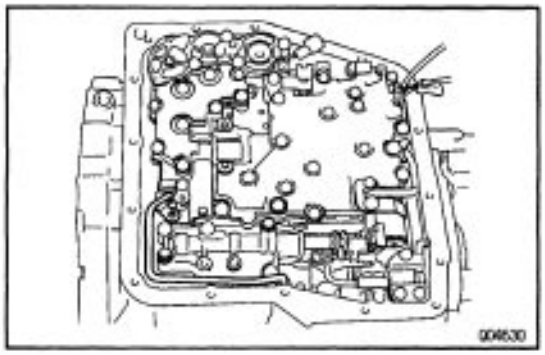
(a) Align the manual valve with the pin on the manual valve lever.

(b) Install the valve body into place.

(c) Finger tighten the 5 bolts first. Then tighten them with a torque wrench.

HINT: Each bolt length (mm, in.) is indicated in the illustration.

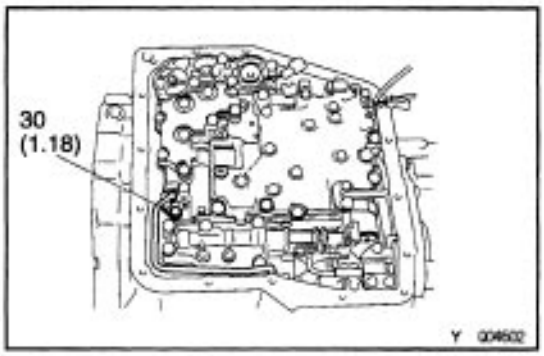
Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)



5. INSTALL TRANSFER LUBRICATION APPLY TUBE AND DETENT SPRING

(a) Using a plastic hammer, install the tube into the position indicated in the illustration.

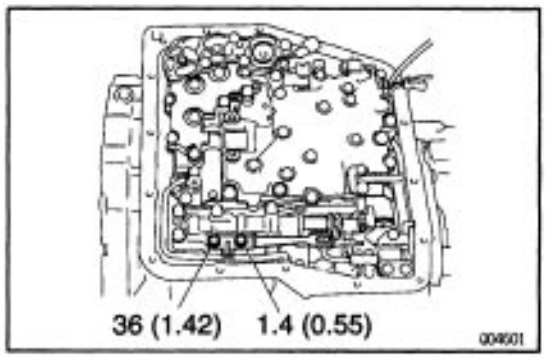
NOTICE: Be careful not to bend or damage the tube.



(b) Install the bolt.

HINT: The bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (170 kgf–cm, 8 ft–lbf)

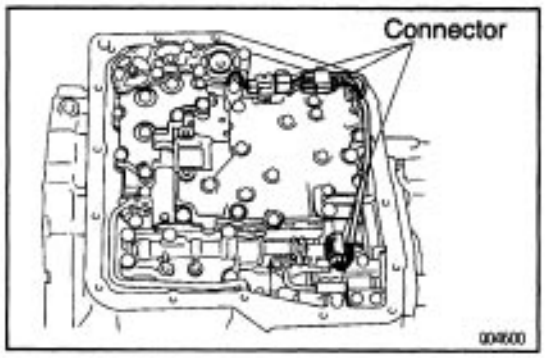


(c) Install the detent spring.

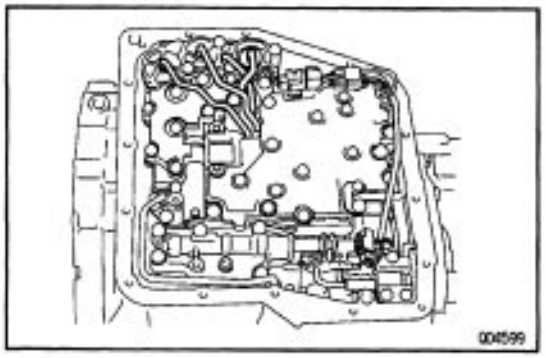
HINT: Each bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)

(d) Check that the manual valve lever is in contact with the center of the roller at the tip of the detent spring.



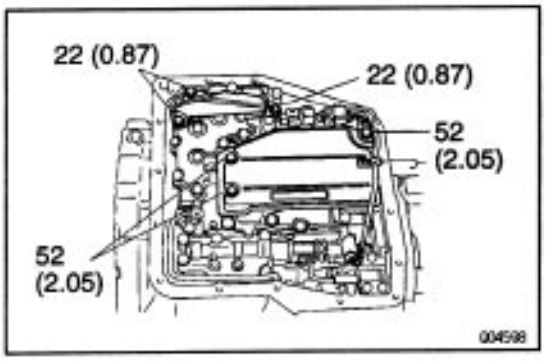
6. CONNECT SOLENOID CONNECTORS



7. INSTALL OIL TUBES

(a) Using a plastic hammer, install the tubes into the positions indicated in the illustration.

NOTICE: Be careful not to bend or damage the tubes.



8. INSTALL OIL STRAINER AND APPLY TUBE BRACK–ET

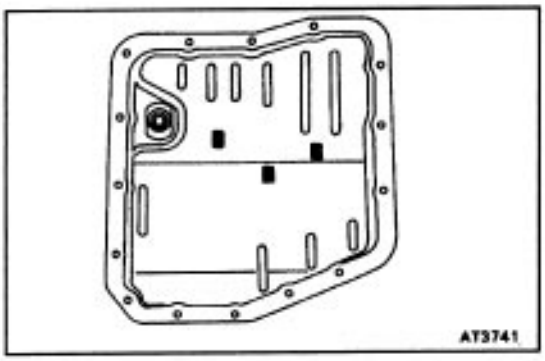
Install the oil strainer.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)

Install the tube bracket.

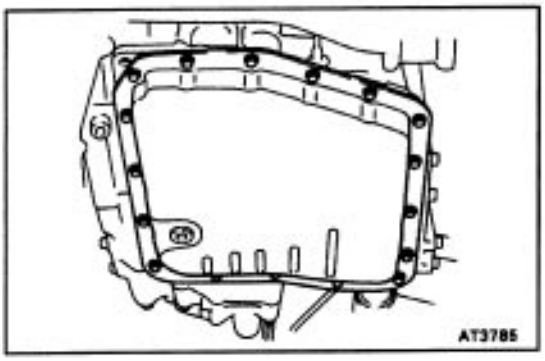
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

HINT: Each bolt length (mm, in.) is indicated in the illustration.



9. INSTALL MAGNETS

NOTICE: Make sure that the magnet does not interfere with the oil tubes.

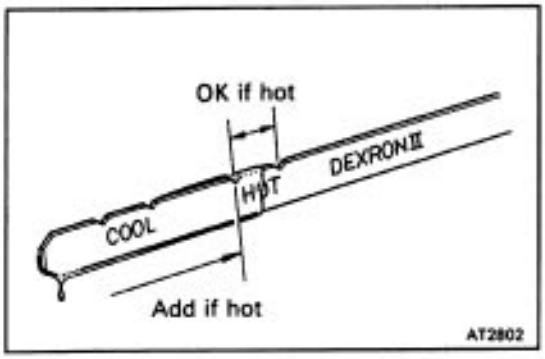


10. INSTALL OIL PAN

(a) Install a new gasket and oil pan.

(b) Install and torque 17 bolts.

Torque: 4.9 N–m (50 kgf–cm, 43 ft–lbf)



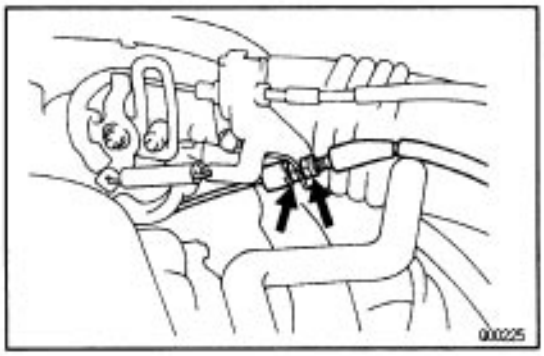
11. FILL TRANSAXLE WITH ATF

NOTICE: Do not overfill.

Fluid type:

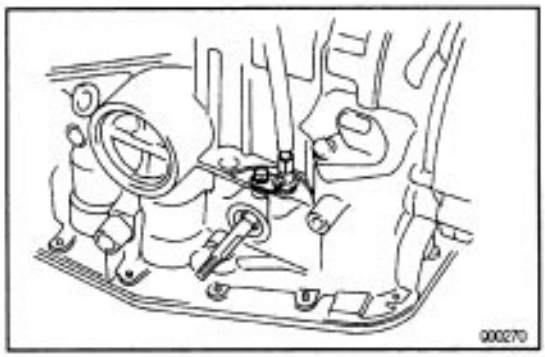
ATF DEXRON®II

12. CHECK FLUID LEVEL (See page AX2–68)

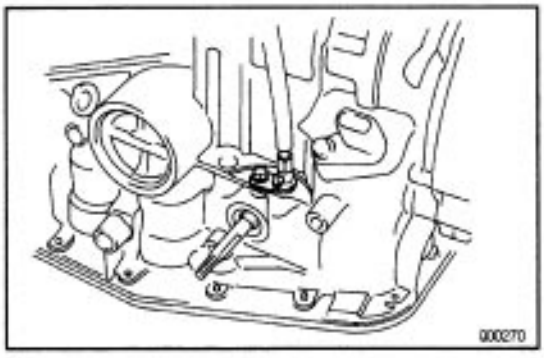


THROTTLE CABLE REMOVAL

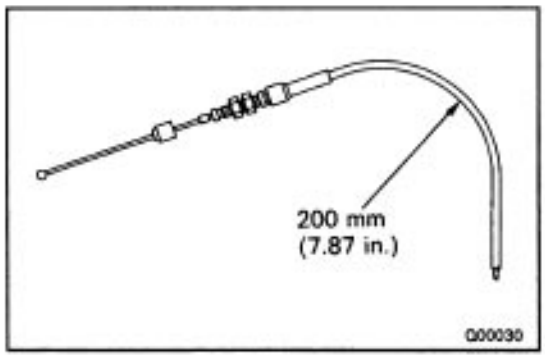
1. DISCONNECT THROTTLE CABLE FROM ENGINE
Disconnect the cable from the throttle linkage.
2. REMOVE PARK/NEUTRAL POSITION SWITCH
(See page AX2–61)
3. REMOVE VALVE BODY
(See page AX2–18)



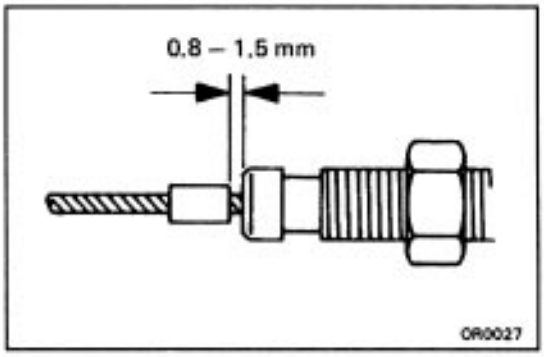
4. REMOVE THROTTLE CABLE
(a) Remove the bolt and retaining plate.
(b) Pull out the cable from the transaxle case.



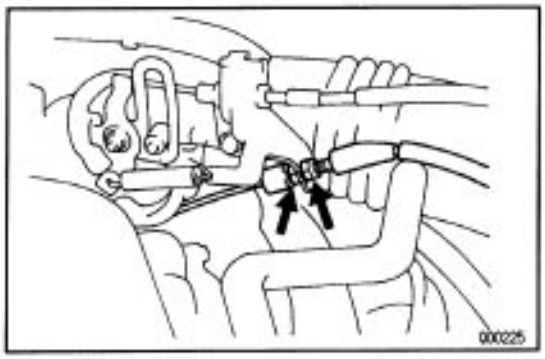
THROTTLE CABLE INSTALLATION
1. INSTALL CABLE INTO TRANSAXLE CASE
(a) Be sure to push it in all the way.
(b) Install the retaining plate and bolt.
2. INSTALL VALVE BODY (See page AX2–21)



3. IF THROTTLE CABLE IS NEW, STAKE STOPPER OR
PAINT MARK ON INNER CABLE
HINT: New cables do not have a staked cable stopper.
(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).
(b) Pull the inner cable lightly until a light resistance is felt, and hold it in position there.



(c) Stake the stopper, 0.8–1.5 mm (0.031 –0.059 in.) from the end of outer cable.



4. CONNECT THROTTLE CABLE TO ENGINE

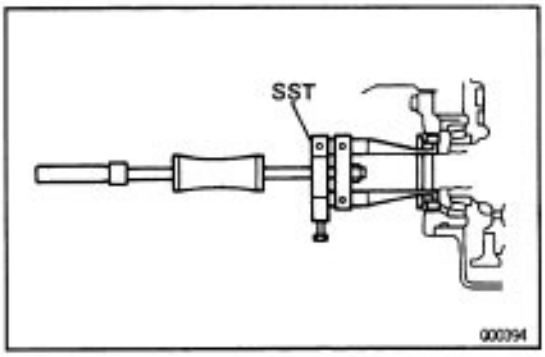
5. ADJUST THROTTLE CABLE

(See page AX2–69)

6. INSTALL PARK/NEUTRAL POSITION SWITCH

(See page AX2–16)

7. TEST DRIVE VEHICLE



SIDE GEAR SHAFT OIL SEAL REPLACEMENT

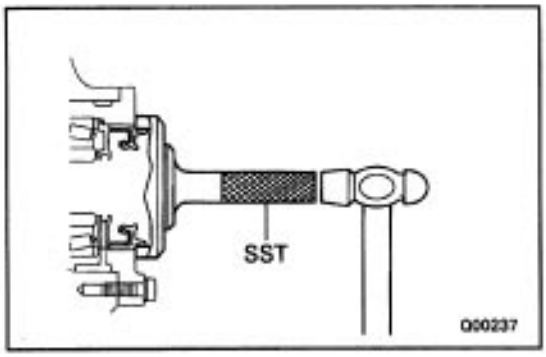
1. REMOVE BOTH DRIVE SHAFTS

(See page SA–22)

2. REMOVE BOTH SIDE GEAR SHAFT OIL SEALS

Using SST, pull out the oil seal.

SST 09308–00010



3. INSTALL LEFT SIDE GEAR SHAFT OIL SEAL

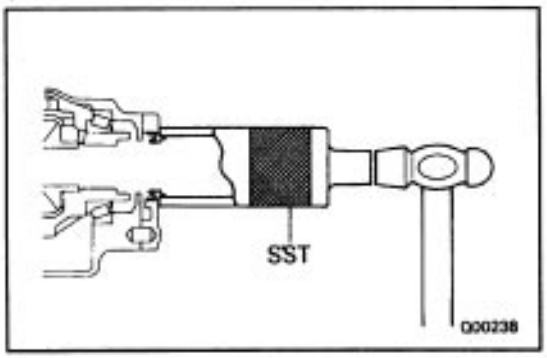
(a) Using SST, drive in a new oil seal.

SST 09223–15010

Oil seal depth:

0 ± 0.5 mm (0 ± 0.02 in.)

(b) Coat the lip of oil seal with MP grease.



4. INSTALL RIGHT SIDE GEAR SHAFT OIL SEAL

(a) Using SST, drive in a new oil seal.

SST 09316–60010 (09316–00010)

Oil seal depth:

0 ± 0.5 mm (0 ± 0.02 in.)

(b) Coat the lip of oil seal with MP grease.

5. INSTALL BOTH DRIVE SHAFTS

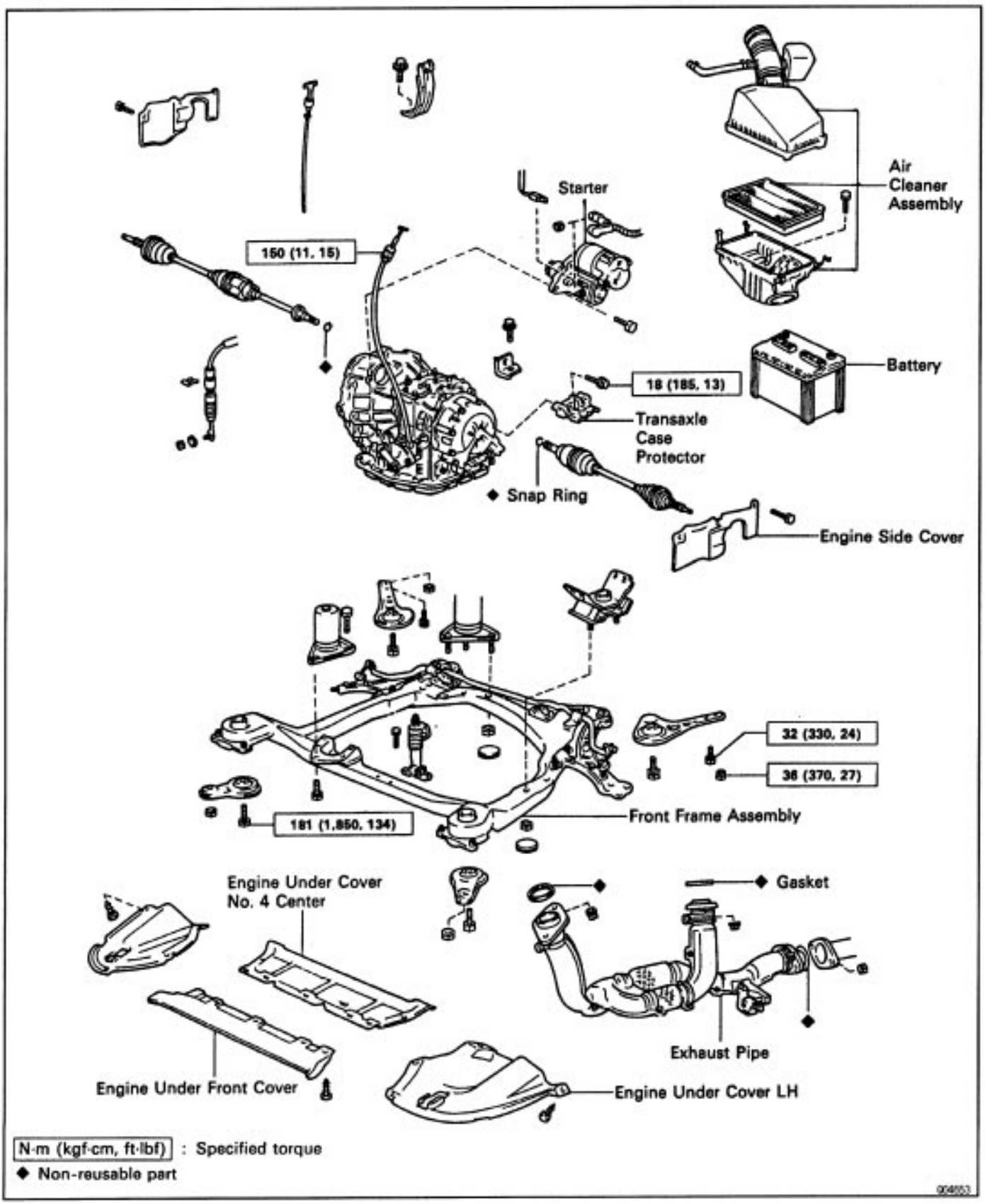
(See page SA–25)

6. CHECK TRANSAXLE FLUID LEVEL

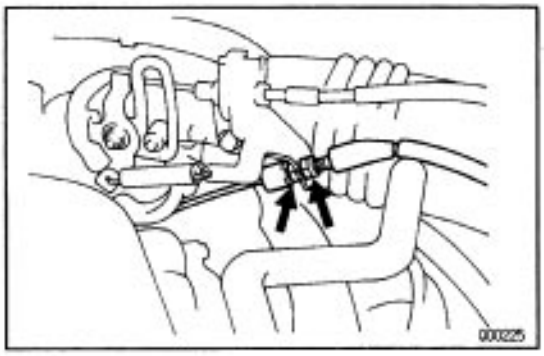
(See page AX2–68)

ASSEMBLY REMOVAL AND INSTALLATION

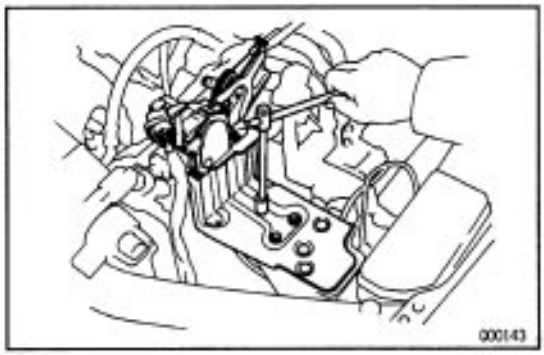
Remove and install the parts as shown.



TRANSAXLE REMOVAL

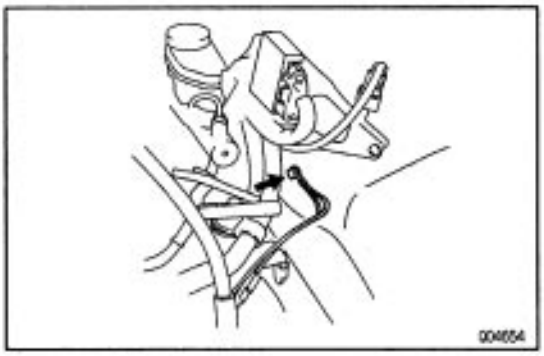


1. DISCONNECT AND REMOVE BATTERY
2. REMOVE AIR CLEANER ASSEMBLY
3. REMOVE THROTTLE CABLE FROM ENGINE

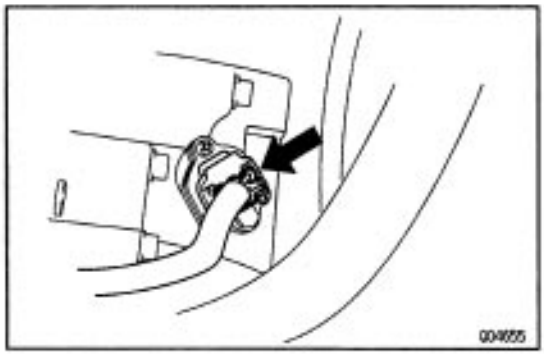


4. REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the cruise control actuator cover.
(b) Disconnect the connector.
(c) Remove the 3 bolts and cruise control actuator with bracket.

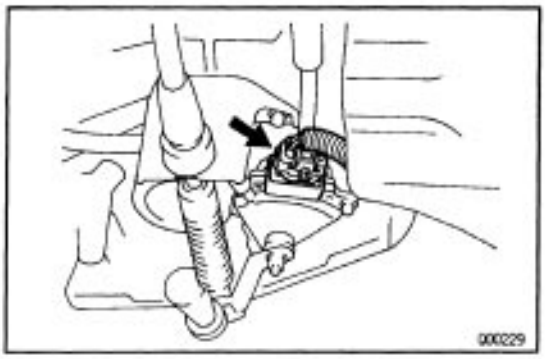


5. REMOVE GROUND TERMINAL

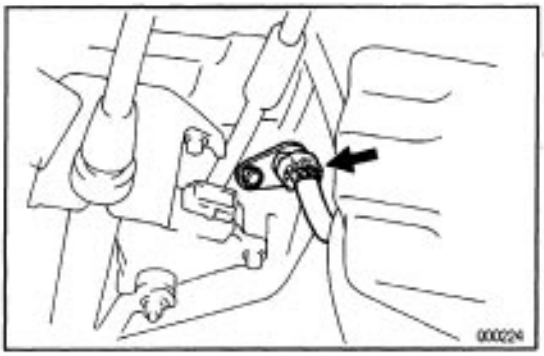


6. DISCONNECT VEHICLE SPEED SENSOR CONNEC–TOR

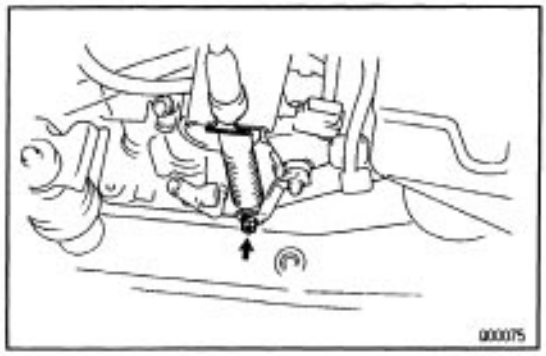
7. DISCONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



8. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

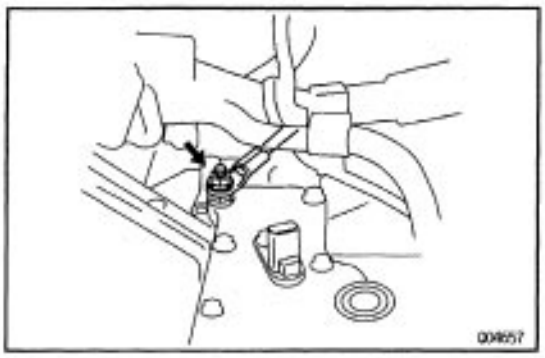


9. DISCONNECT SOLENOID CONNECTOR

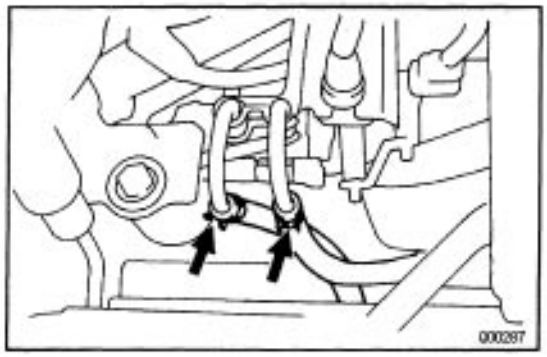


10. DISCONNECT SHIFT CONTROL CABLE

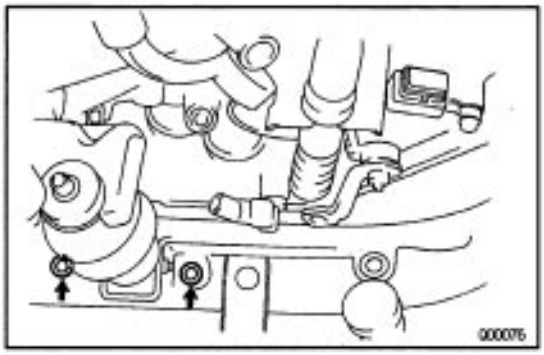
(a) Remove the clip from the shift control cable.
(b) Remove the unit.



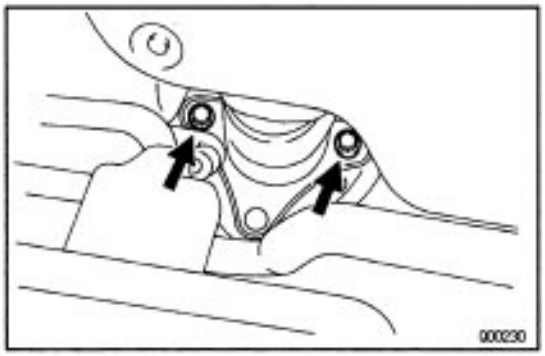
11. REMOVE EARTH CABLES



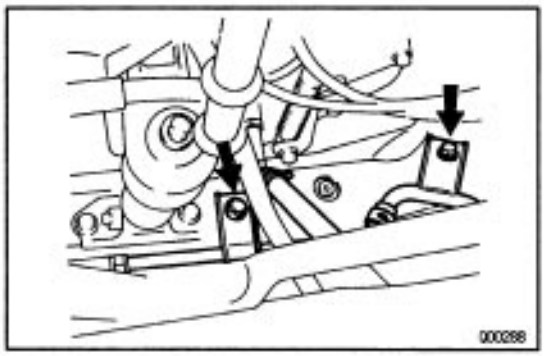
12. DISCONNECT OIL COOLER HOSE



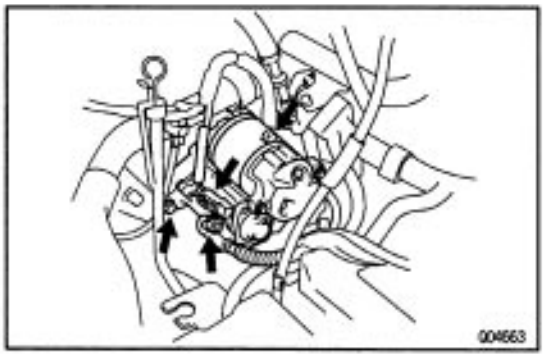
13. REMOVE 2 FRONT SIDE TRANSAXLE MOUNTING BOLTS



14. REMOVE 2 FRONT SIDE ENGINE MOUNTING BOLTS

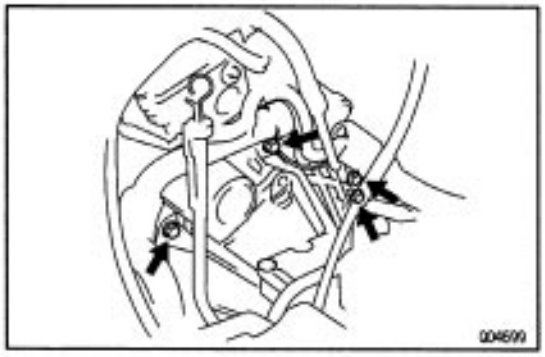


15. REMOVE 2 OIL COOLER CLAMPING BOLTS FROM FRONT FRAME ASSEMBLY

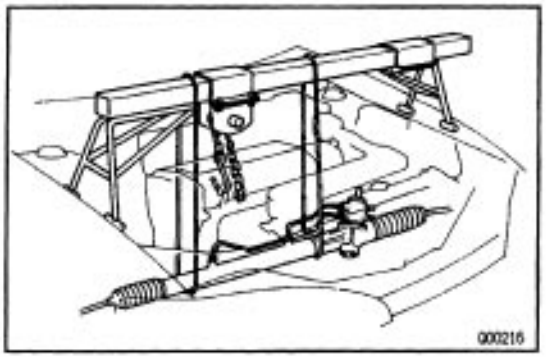


16. REMOVE STARTER

(a) Disconnect the connector and remove the nut.
(b) Remove the 2 bolts and the starter.

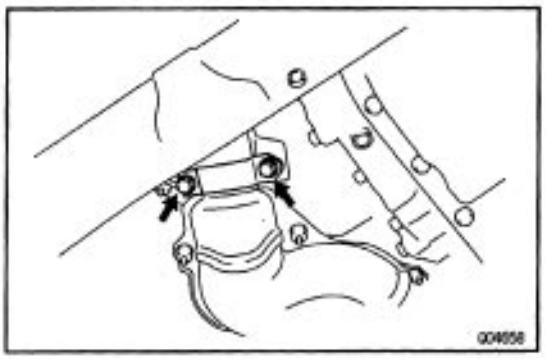


17. REMOVE 4 UPPER TRANSAXLE TO ENGINE BOLTS



18. INSTALL ENGINE SUPPORT FIXTURE

19. TIE STEERING GEAR HOUSING TO ENGINE SUPPORT FIXTURE BY CODE OR EQUIVALENT

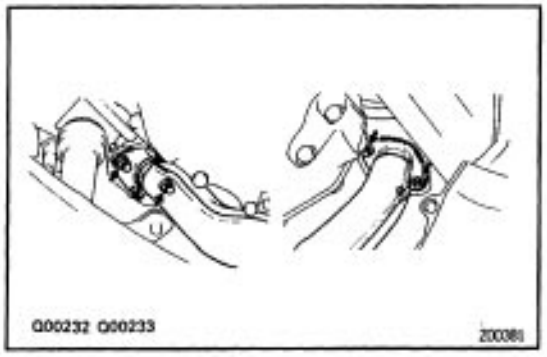


20. RAISE AND SUITABLY SUPPORT VEHICLE

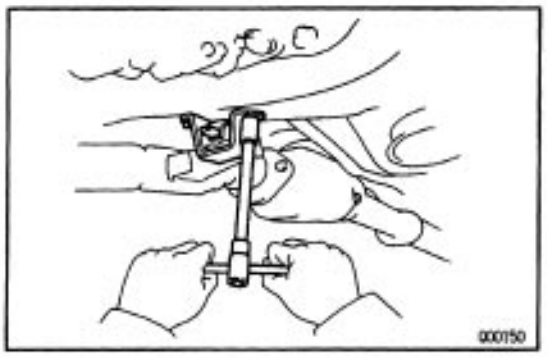
21. REMOVE FRONT WHEEL

22. REMOVE EXHAUST FRONT PIPE

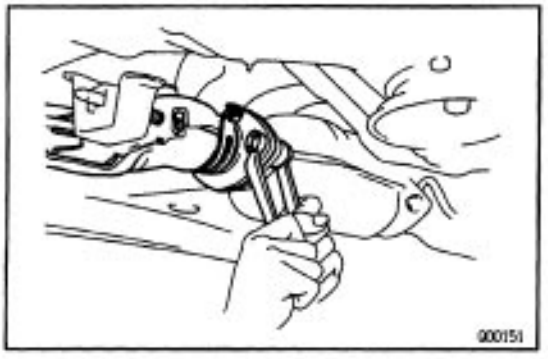
(a) Remove the 2 bolts and exhaust front pipe clamp.



(b) Remove the 4 nuts.



(c) Remove the 2 bolts and exhaust front pipe support.

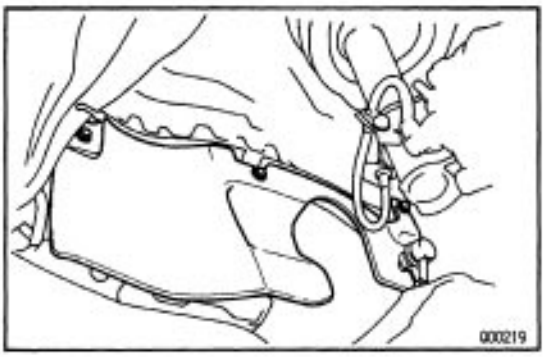


(d) Remove the 2 bolts and nuts.

(e) Remove the exhaust front pipe.

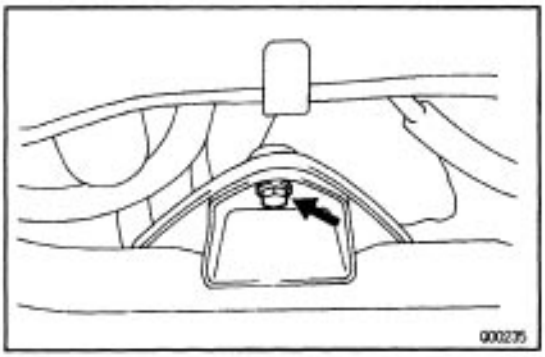
23. REMOVE DIFFERENTIAL FLUID DRAIN PLUG AND GASKET

24. DRAIN DIFFERENTIAL FLUID INTO A SUITABLE CONTAINER



26. REMOVE RIGHT AND LEFT ENGINE SIDE COVER NO.2

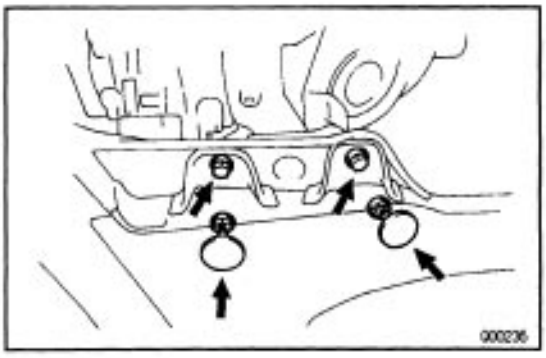
26. REMOVE ENGINE UNDER FRONT COVER NO.1 AND NO.2



27. REMOVE DRIVE SHAFT

(See page SA–22)

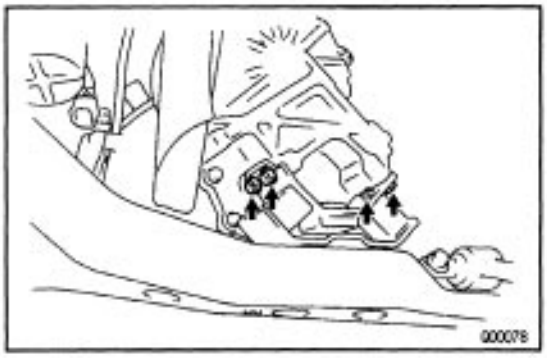
28. REMOVE FRONT SIDE ENGINE MOUNTING NUT



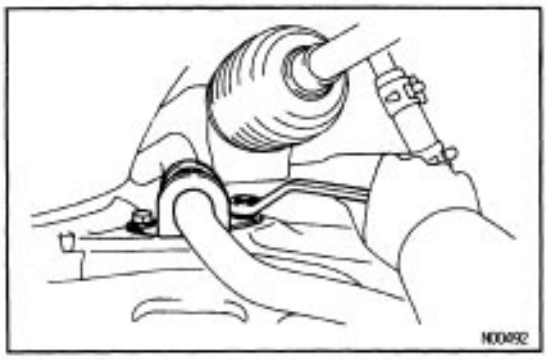
29. REMOVE REAR SIDE ENGINE MOUNTING BOLTS

(a) Remove 2 hole plugs.

(b) Remove 2 bolts and nuts.

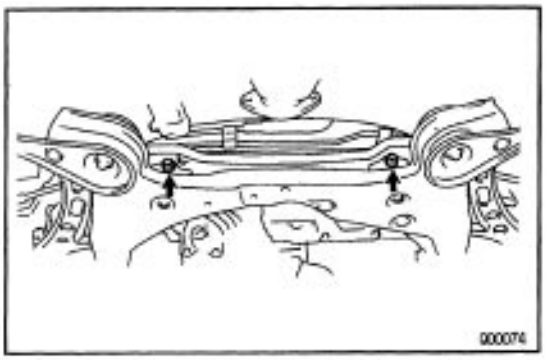


30. REMOVE 4 LEFT SIDE TRANSAXLE MOUNTING BOLTS

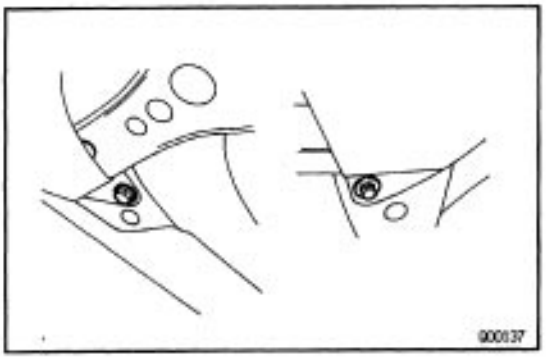


31. REMOVE STEERING GEAR HOUSING

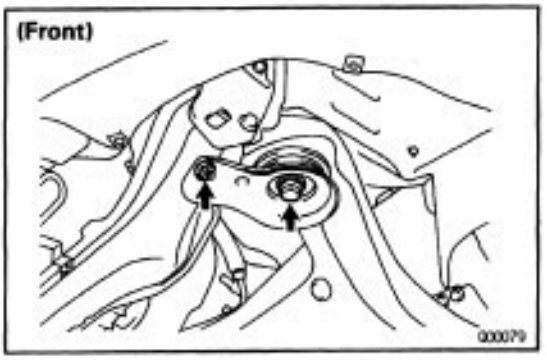
(a) Remove the 4 bolts and disconnect the stabilizer bar bushing bracket from the front frame assembly.



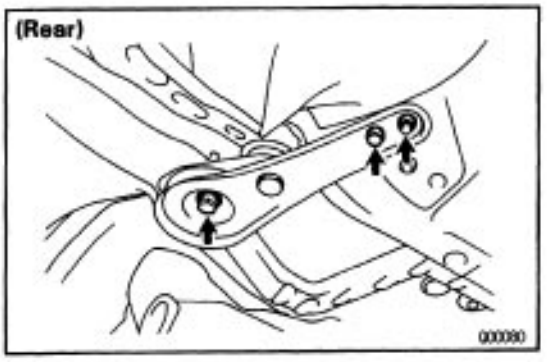
(b) Remove 2 bolts and nuts from the steering gear housing.
(c) Remove the steering gear housing.

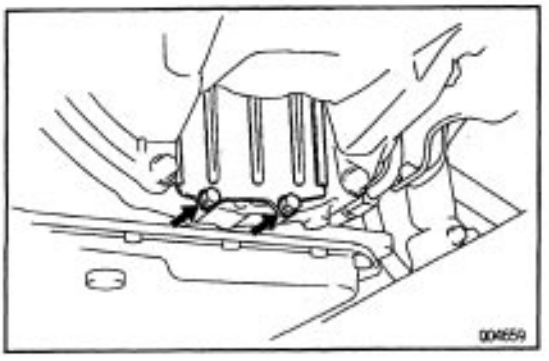


32. REMOVE FRONT FRAME ASSEMBLY
(a) Hold the front frame assembly with a jack.
(b) Remove 2 set screws from the right and left fender liners.

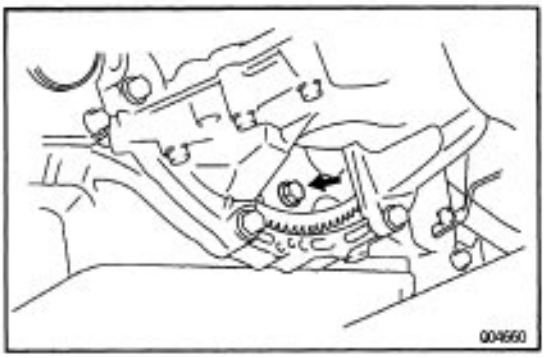


(c) Remove 6 bolts and 4 nuts.
(d) Remove the front frame assembly.

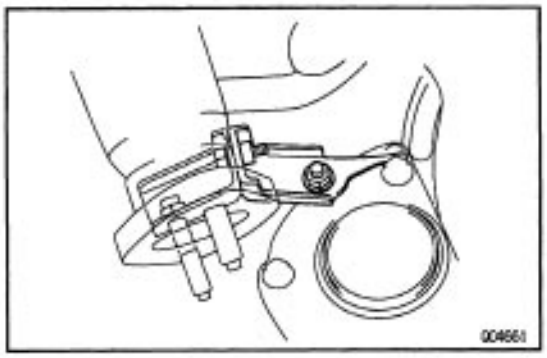




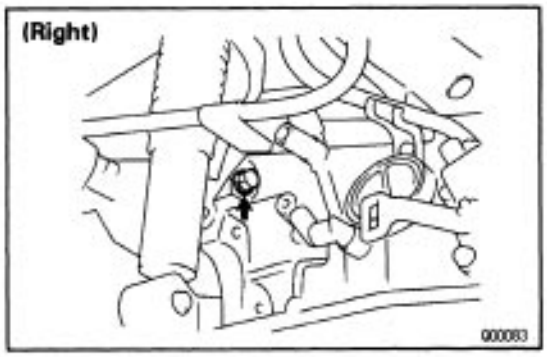
33. HOLD TRANSAXLE WITH A JACK
34. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS
(a) Remove the 2 bolts and hole cover.



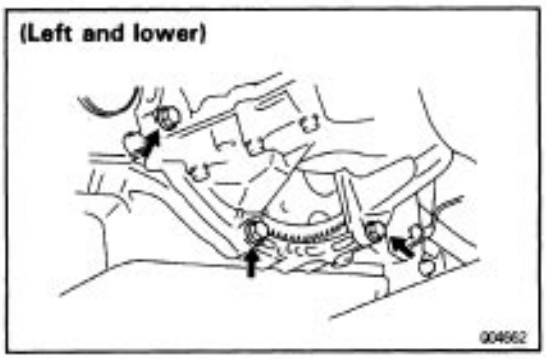
(b) Turn the crankshaft to gain access to each bolt.
(c) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.

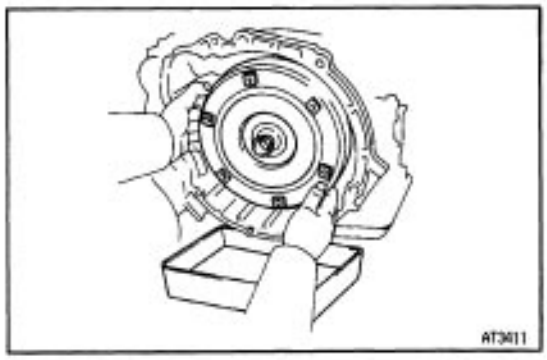


35. REMOVE EXHAUST MANIFOLD PLATE



36. REMOVE TRANSAXLE TO ENGINE BOLTS

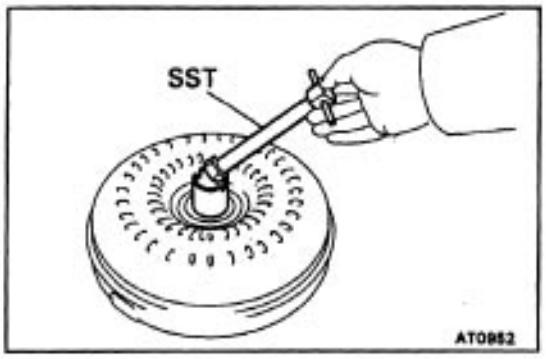




37. REMOVE TRANSAXLE ASSEMBLY

Separate transaxle and engine, and lower the transaxle.

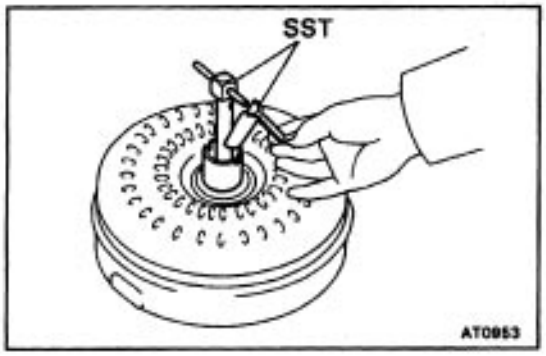
38. REMOVE TORQUE CONVERTER CLUTCH FROM TRANSAXLE



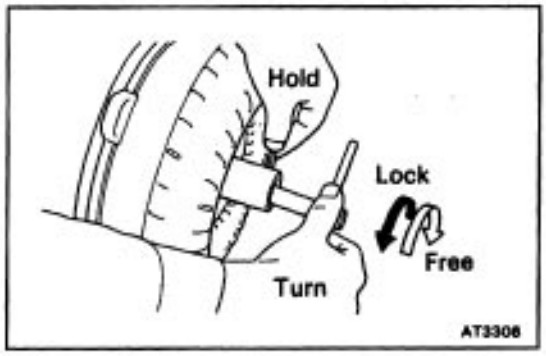
TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION

1. INSPECT ONE–WAY CLUTCH

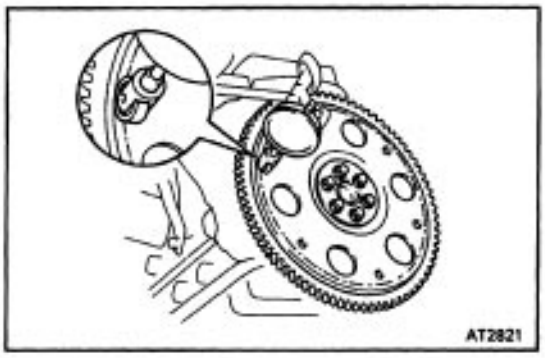
(a) Install SST into the inner race of the one–way clutch.
SST 09350–32014 (09351–32020)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351 –32020)



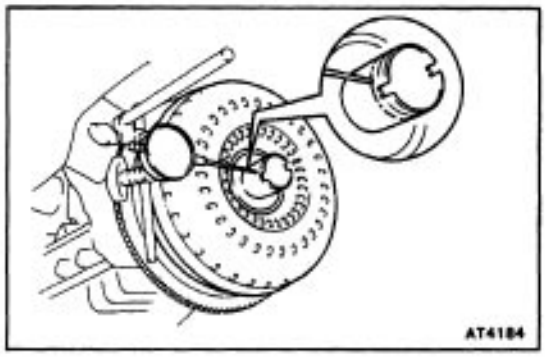
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



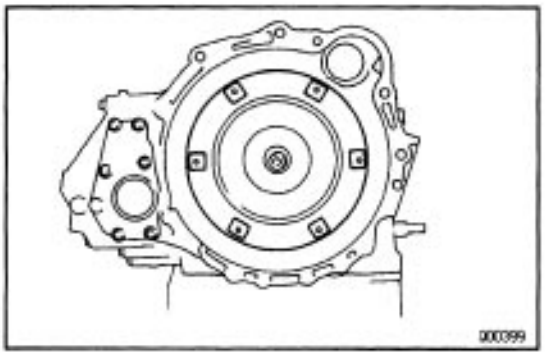
3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

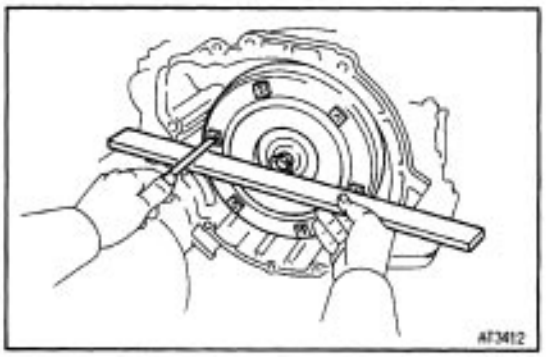
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected replace the torque converter clutch.

HINT: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter clutch.





TRANSAXLE INSTALLATION

1. INSTALL TORQUE CONVERTER CLUTCH IN TRANSAXLE

If the torque converter clutch has been drained and washed, refill with new ATF.

Fluid type:

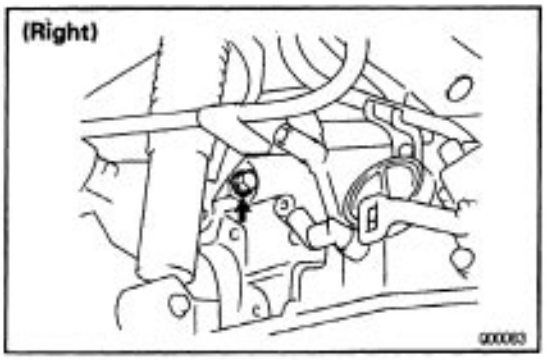
ATF DEXRON$_3$ II

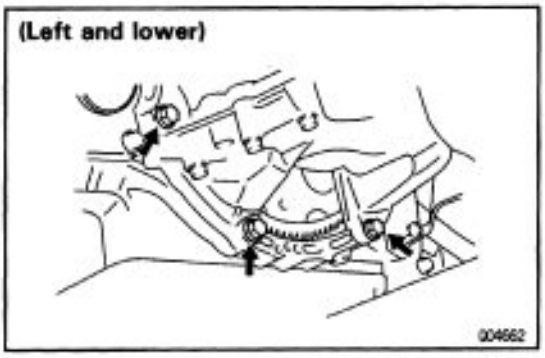
2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance:

More than 13.7 mm (0.539 in.)





3. ALIGN TRANSAXLE AT INSTALLATION POSITION

(a) Align the 2 knock pins on the block with the converter housing.

(b) Temporarily install the bolt.

4. INSTALL TRANSAXLE TO ENGINE BOLTS

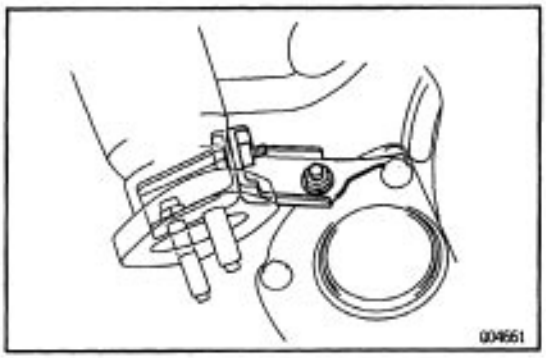
Install the transaxle to engine bolts.

12 mm head bolt

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

10 mm head bolt

Torque: 46 N–m (470 kgf–cm. 34 ft–lbf)



5. INSTALL EXHAUST MANIFOLD PLATE

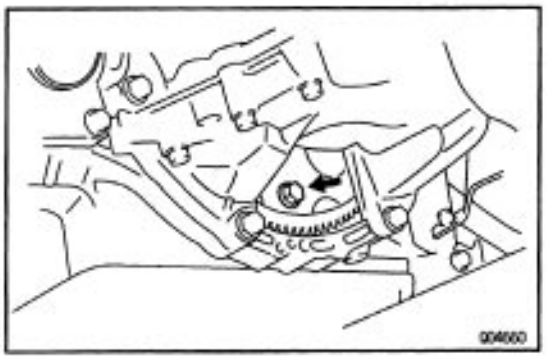
(a) Install the exhaust manifold plate.

(b) Install and torque the bolt and nut.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(c) Install and torque the nut.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)



6. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS

(a) Clean the threads of the bolts with gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer:

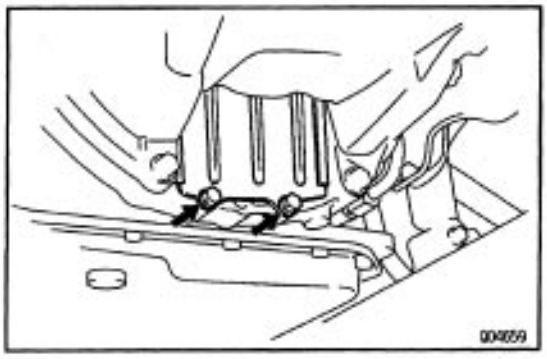
Part No.08833–00070, THREE BOND 1324 or equivalent

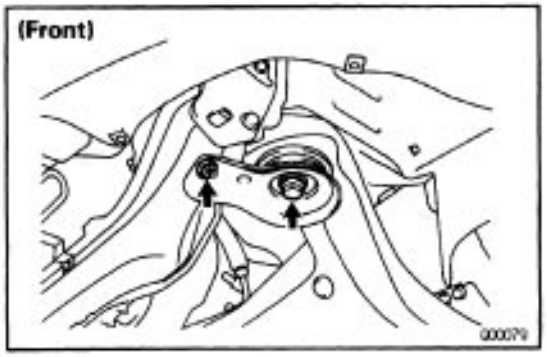
(c) Tighten the bolts evenly.

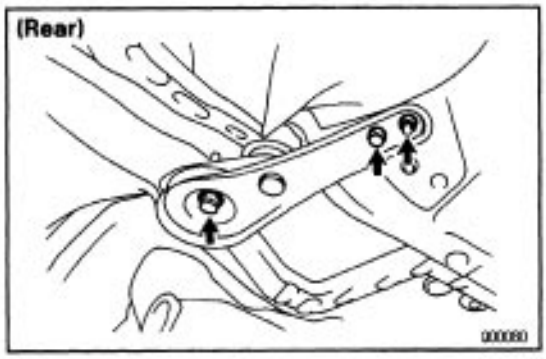
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

HINT: First install dark green colored bolt and then the 5 bolts.

(d) Install the hole cover with 2 bolts.

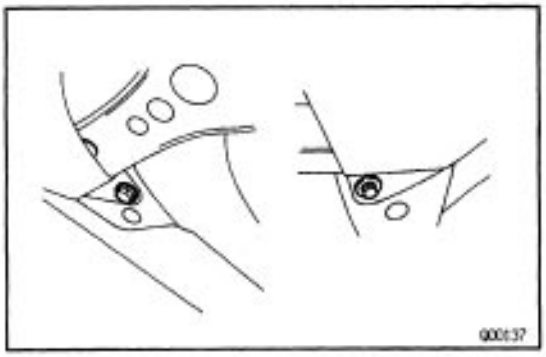




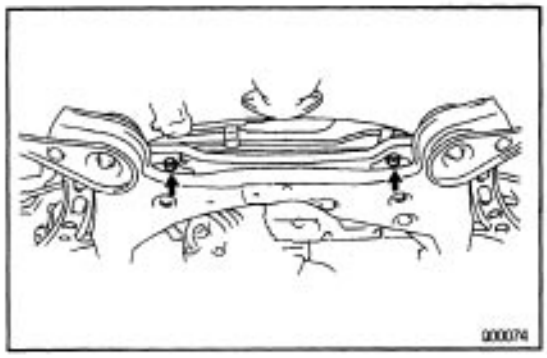


7. INSTALL FRONT FRAME ASSEMBLY

(a) Hold the front frame assembly.
(b) Install the6 bolts and 4 nuts.
(c) Torque the bolts and nuts.
19 mm head bolt
Torque: 1$1 N–m (1,850 kgf–cm, 134 ft–lbf)
12 mm head bolt
Torque: 32 N–m (330 kgf–cm, 24 ft–lbf)
Nut
Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

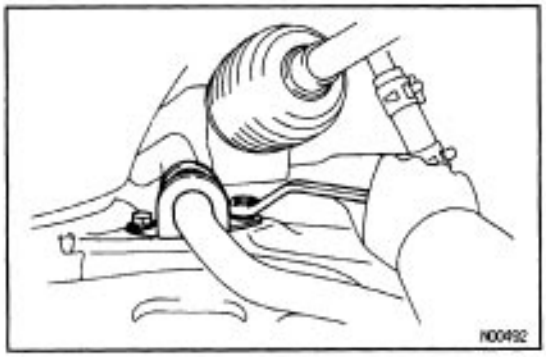


(d) Install the 2 set screws in the right and left fender liners.

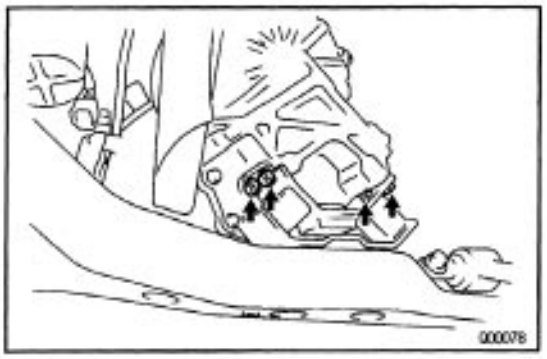


8. INSTALL STEERING GEAR HOUSING

(a) Install the steering gear housing to the front frame assembly.
(b) Install and torque the 2 bolts and nuts.
Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)

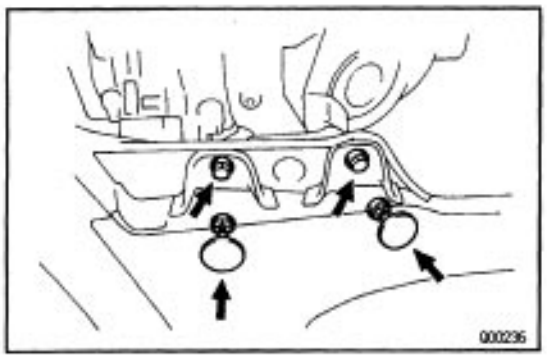


(c) Connect the stabilizer bar bushing bracket with the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



9. INSTALL FOUR LEFT SIDE TRANSAXLE MOUNTING BOLTS

Torque: 52 N–m (530 kgf–cm. 38 ft–lbf)

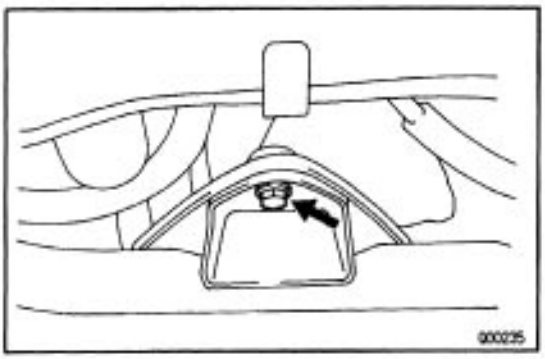


10. INSTALL REAR SIDE MOUNTING BOLTS AND NUTS

(a) Install and torque the 2 bolts and nuts.

Torque:66 N–m (670 kgf–cm, 48 ft–lbf)

(b) Install 2 hole plugs.

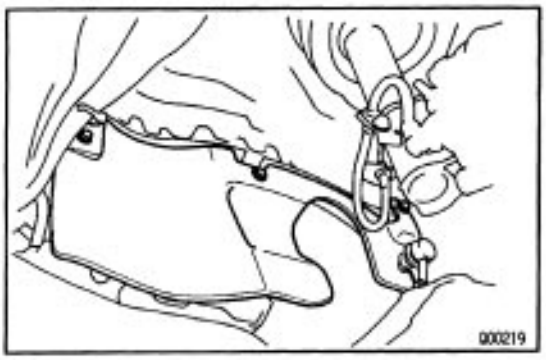


11. INSTALL FRONT SIDE ENGINE MOUNTING NUT

Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)

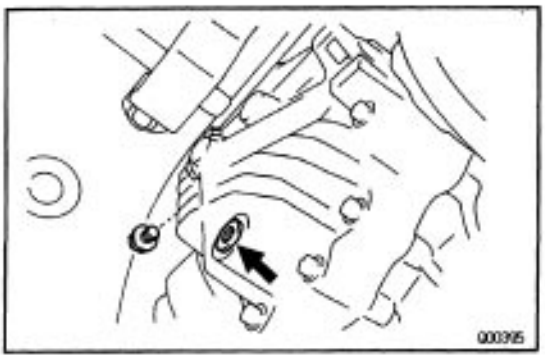
12. INSTALL DRIVE SHAFT

(See page SA–25)



13. INSTALL RIGHT AND LEFT ENGINE SIDE COVER NO.2

14. INSTALL ENGINE UNDER FRONT COVER NO.1 AND NO.2



15. INSTALL DIFFERENTIAL FLUID DRAIN PLUG WITH A NEW GASKET

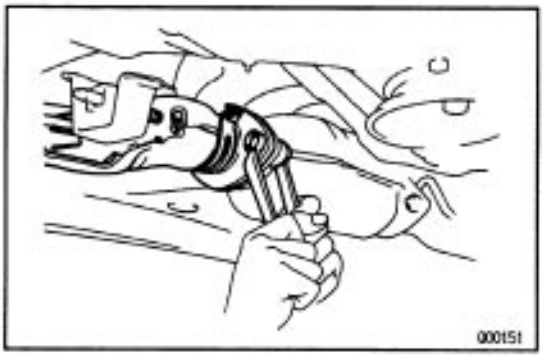
16. FILL DIFFERENTIAL

Fluid Type:

ATF DEXRON$_3$ II Capacity:

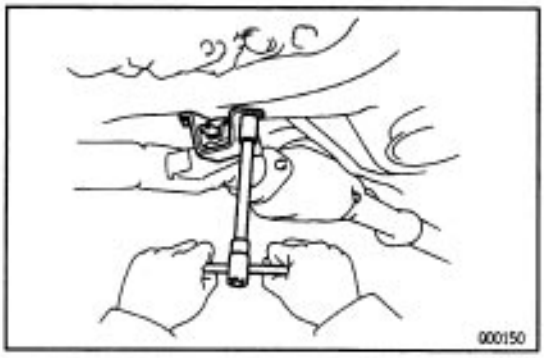
0.85 liters (0.9 US qts, 0.7 Imp. qts)

17. CHECK DIFFERENTIAL FLUID LEVEL

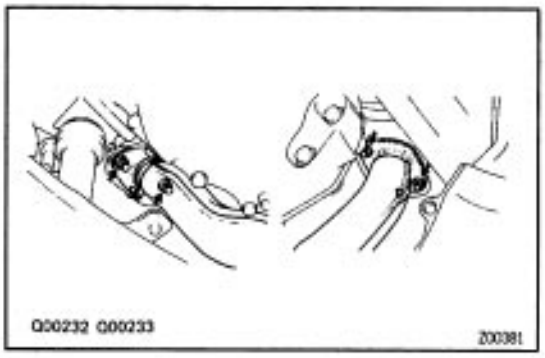


18. INSTALL EXHAUST FRONT PIPE

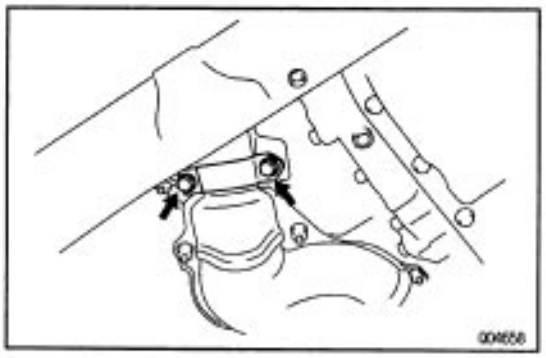
(a) Install a new gasket.
(b) Install the exhaust front pipe.
(c) Install and torque 2 bolts and new nuts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



(d) Install the exhaust front pipe support and 2 bolts.

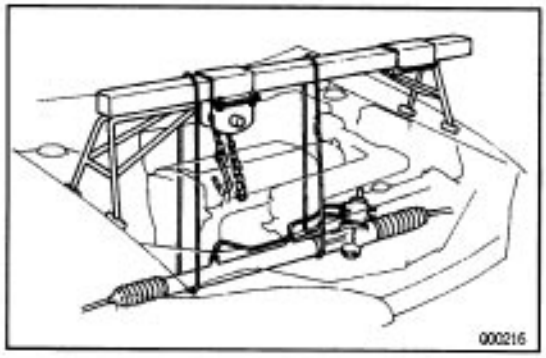


(e) Install 2 new gaskets.
(f) Install and torque 4 new nuts.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

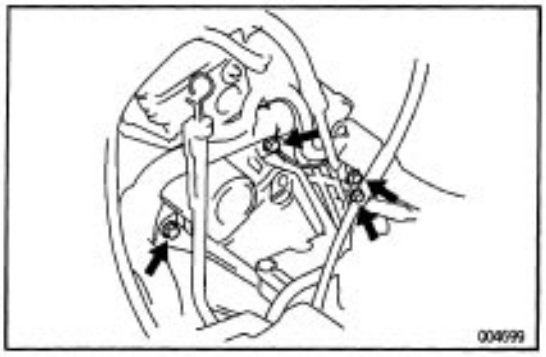


(g) Install the exhaust front pipe clamp and 2 bolts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

19. INSTALL FRONT WHEEL AND LOWER VEHICLE
Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

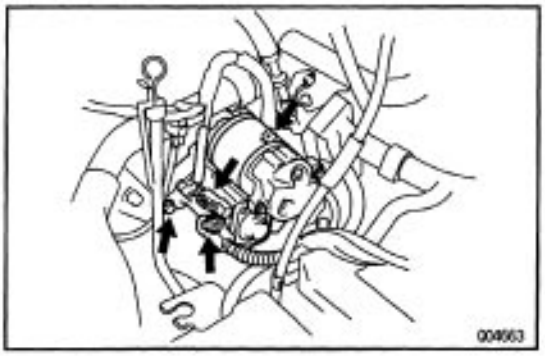


20. UNTIE STEERING GEAR HOUSING REMOVE ENGINE SUPPORT FIXTURE



21. INSTALL 4 UPPER TRANSAXLE TO ENGINE BOLTS

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



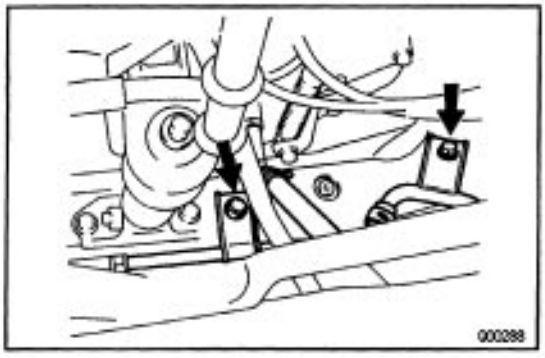
22. INSTALL STARTER

(a) Install the starter with the 2 bolts.

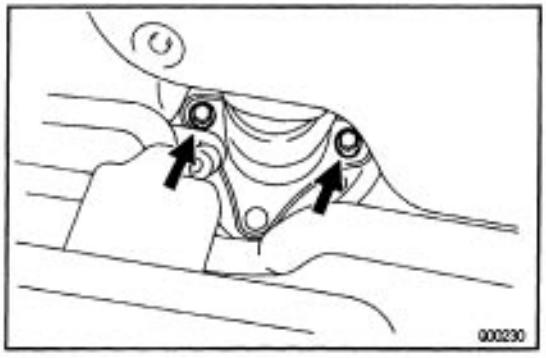
(b) Torque the 2 bolts.

Torque: 38 N–m (400 kgf–cm, 29 ft–lbf)

(c) Connect the connector and install the nut.

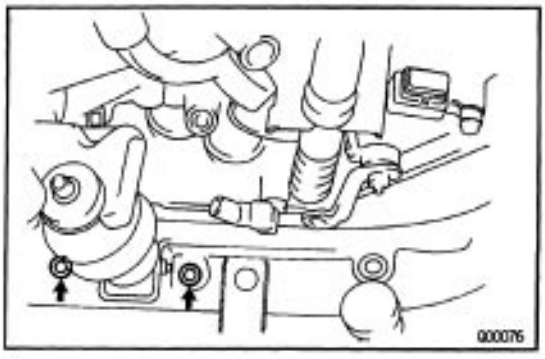


23. INSTALL OIL COOLER CLAMPING BOLTS TO FRONT FRAME ASSEMBLY



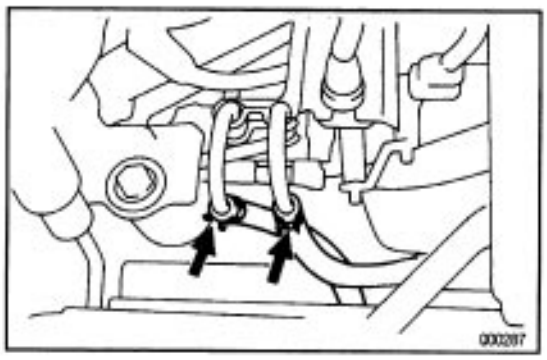
24. INSTALL TWO FRONT SIDE ENGINE MOUNTING BOLTS

Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)

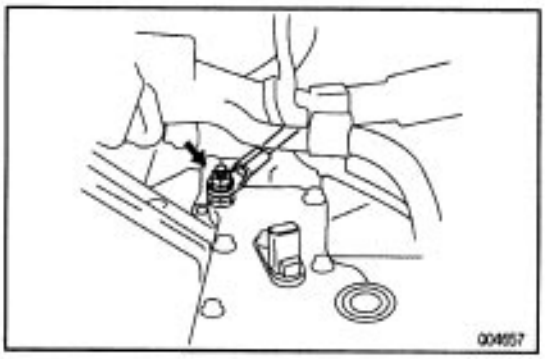


25. INSTALL TWO FRONT SIDE TRANSAXLE MOUNTING BOLTS

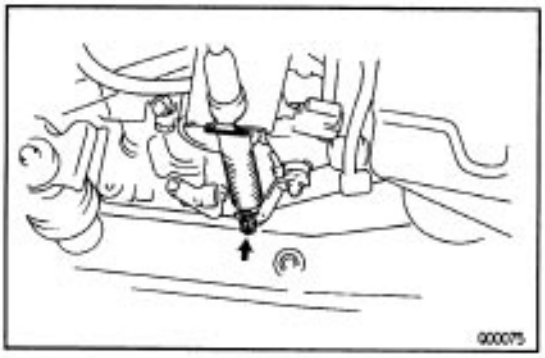
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)



26. CONNECT OIL COOLER HOSE

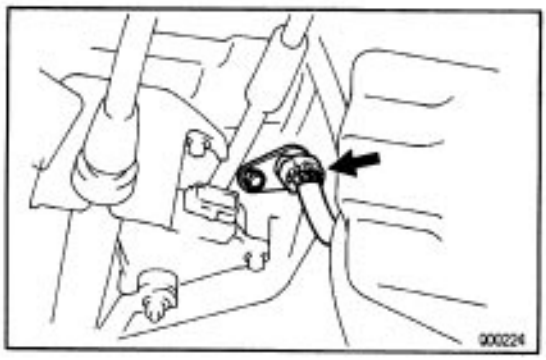


27. INSTALL EARTH CABLES

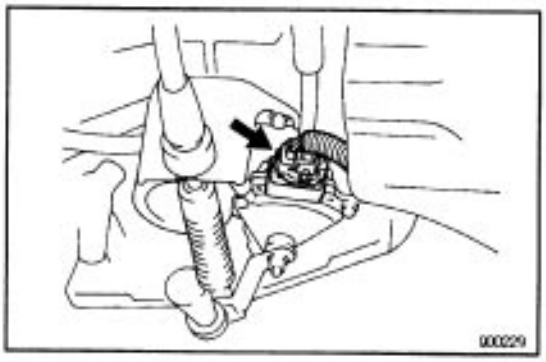


28. CONNECT SHIFT CONTROL CABLE

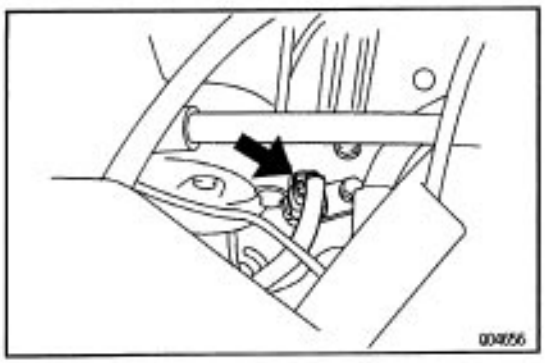
(a) Install the clip from the shaft control cable.
(b) Install and torque the nut.
(c) Adjust the shift control cable.
(See page AX2–69)



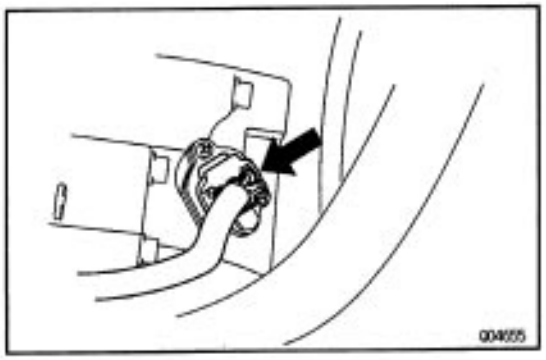
29. CONNECT SOLENOID CONNECTOR



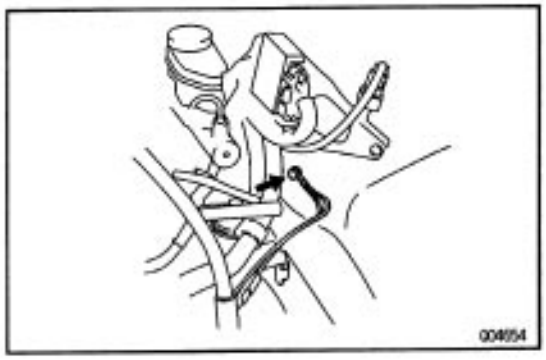
30. CONNECT PARK/ NEUTRAL POSITION SWITCH CONNECTOR



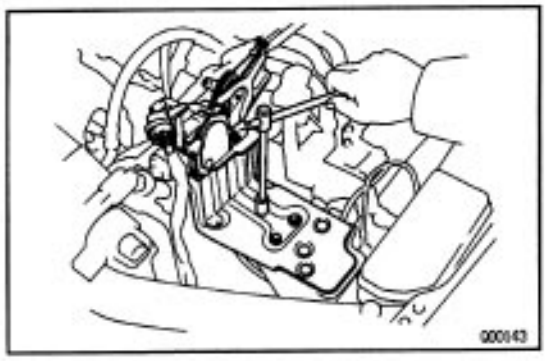
31. CONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



32. CONNECT VEHICLE SPEED SENSOR CONNECTOR



33. INSTALL GROUND TERMINAL

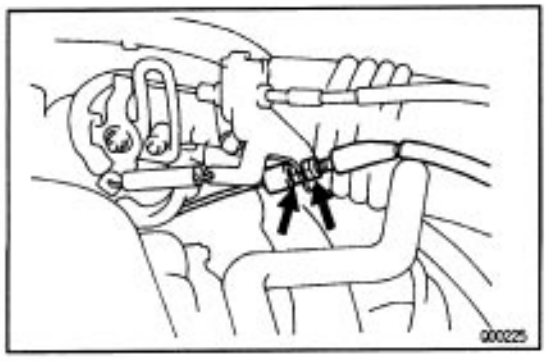


34. INSTALL CRUISE CONTROL ACTUATOR

(a) Install the cruise control actuator with bracket the 3 bolts.

(b) Connect the connector.

(c) Install the cruise control actuator cover.



35. INSTALL THROTTLE CABLE TO ENGINE

(a) Torque the nuts.

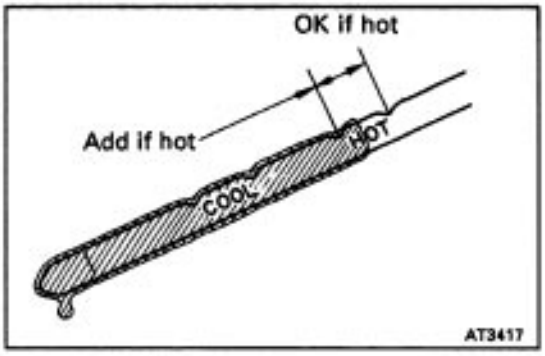
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

(b) Adjust the throttle cable.

(See page AX2–69)

36. INSTALL AIR CLEANER ASSEMBLY

37. INSTALL BATTERY



38. FILL TRANSAXLE WITH ATF AND CHECK FLUID LEVEL

(See page AX2–68)

NOTICE: Do not overfill.

Fluid type:

ATF DEXRON$_3$ II

39. INSPECT FRONT WHEEL ALIGNMENT

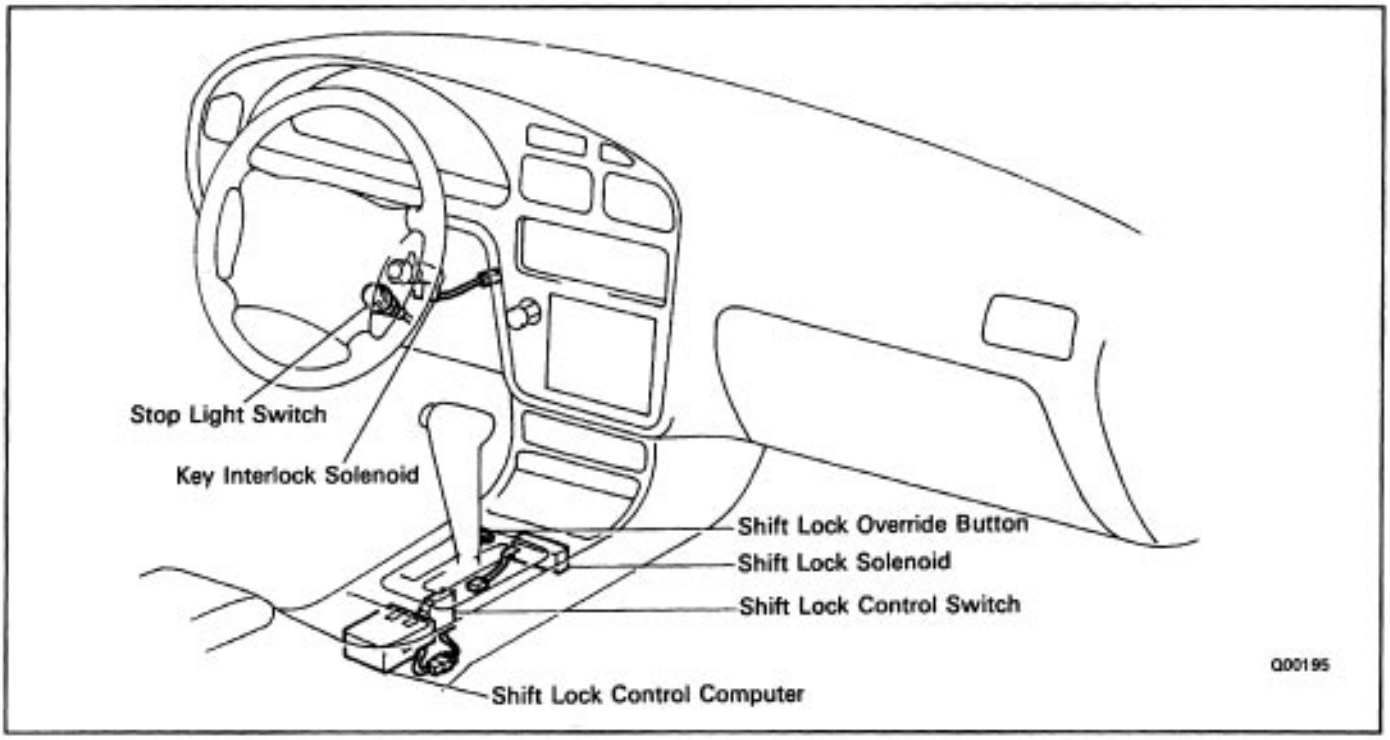
(See page SA–4)

40. PERFORM ROAD TEST

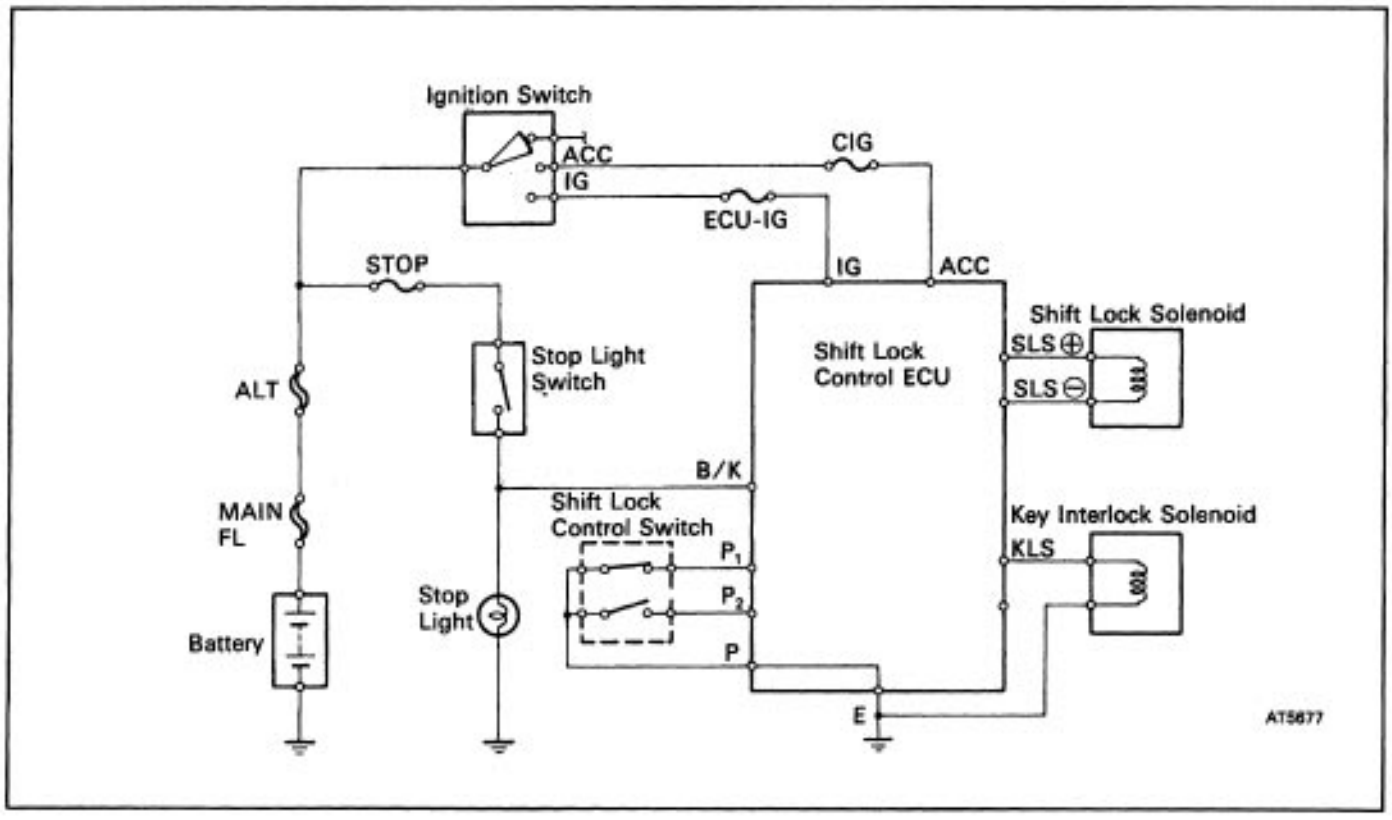
Check for abnormal noise and smooth shifting.

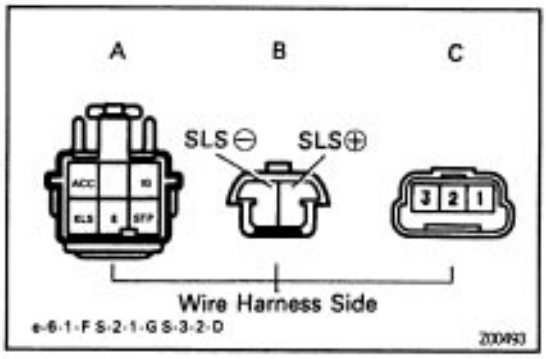
SHIFT LOCK SYSTEM

COMPONENT PARTS LOCATION



WIRING DIAGRAM





ELECTRIC CONTROL COMPONENTS INSPECTION

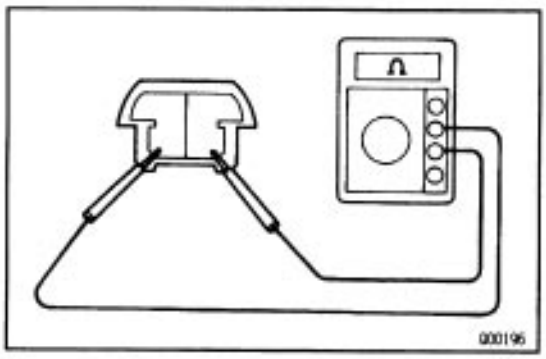
1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminal.

HINT: Do not disconnect the computer connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	Ignition switch ACC position	10 – 14
	IG – E	Ignition switch ON position	10 – 14
	B/K – E	Depress brake pedal	10 – 14
	KLS – E	① Ignition switch ACC position and P position	0
		② Ignition switch ACC position and except P position	10 – 14
		③ (Approx–after one second)	6 – 9
B	SLS+ – SLS–	① Ignition switch ON position and P position	0
		② Depress brake pedal	8.5 – 13.5
		③ (Approx–after 20 seconds)	5.5 – 9.5
		④ Except P position	0
C	P_1 – P	① Ignition switch ON, P position and depress brake pedal	0
		② Shift except P position under conditions above	9 – 13.5
	P_2 – P	① Ignition switch ACC position and P position	9 – 13.5
		② Shift except P position under condition above	0

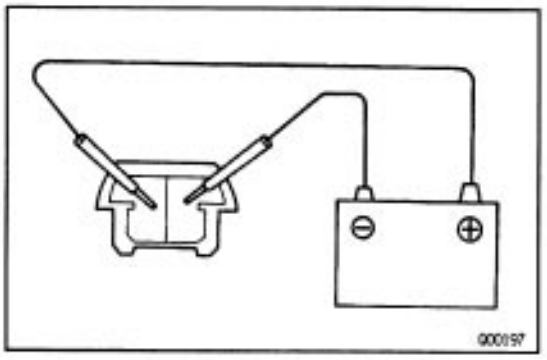
V02273



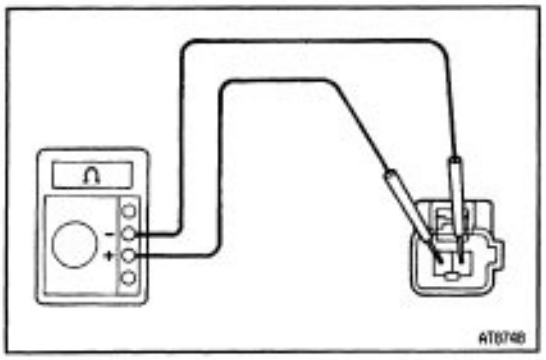
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals.
Standard resistance:
21–27Ω



(c) Apply the battery positive voltage between terminals.
Check that an operation noise can be heard from the solenoid.



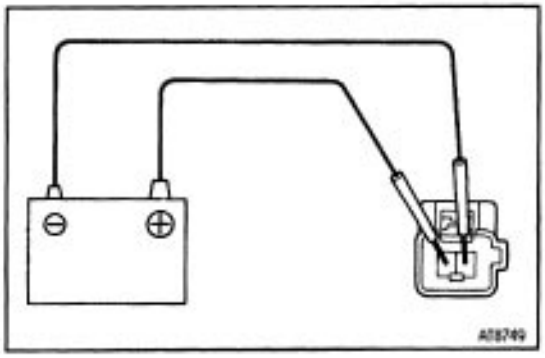
3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.

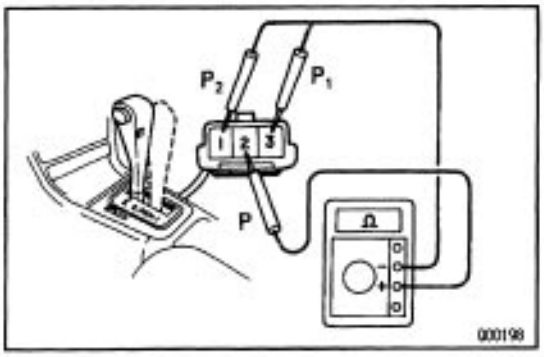
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance:

12.5–16–60



(c) Apply the battery positive voltage between terminals. Check that an operation noise can be heard from the solenoid.



4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminal.

Shift Position \ Terminal	P	P_1	P_2
P position (Release button is not pushed)	○—○	○—○	
P position (Release button is pushed)	○—○	○—○	○
R, N, D, 2, L position	○	○	○

–Memo–

TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

The Transaxle Control System broadly consists of the sensors, ECM and actuators. The ECM receives signals from various sensors, judges the operating conditions and determines the shift and lock–up timing.

When troubleshooting OBD n vehicles, use an OBD II Scan Tool complying with SAE J 1978 or TOYOTA hand–held tester to confirm the diagnostic trouble codes, freezed frame data and engine data.

This will enable you to determine the system causing the problem.

This section explains the best method of troubleshooting and how to carry out the necessary repairs.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CONNECT THE OBDII SCAN TOOL OR TOYOTA HAND–HELD TESTER TO DLC3

Connect the OBD ll scan tool complying with SAE J 1978 or TOYOTA hand–held tester to the vehicle’s data link connector 3.

NOTICE: For OBDll scan tool or TOYOTA hand–held tester operating instructions, see the instruction booklet accompanying the scan tool.

If your display shows ”UNABLE TO CONNECT TO VEHICLE” when you have you have connected the scan tool/TOYOTA hand–held tester cable to DLC3, turned the ignition switch ON and operated the scan tool/TOYOTA hand–held tester, inspect DLC3 (See page AX2–57).

(3) CHECK DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA (PRECHECK)

First check the diagnostic trouble codes. If a code is output, make a note of it.

Also check and note the freezed frame data.

HINT: Output of the malfunction code indicates a circuit malfunction. However, it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. To determine this, first confirm the problem symptoms in (7) and then recheck the diagnostic trouble code in¿¿. If troubleshooting has begun based only on the malfunction code in the diagnostic trouble code check in 0, it could result in a misdiagnosis and troubleshooting of circuits which are normal, making it more difficult to locate the cause of the problem.

(4) CLEAR DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA

Use the OBDII scan tool or TOYOTA hand – held tester to erase the diagnostic trouble codes and freezed frame data.

NOTICE: For OBDII scan tool or TOYOTA hand–held tester operating instructions, see the instruction booklet accompanying the scan tool.

(5) VISUAL INSPECTION

(6) SETTING THE CHECK MODE DIAGNOSIS

(7) PROBLEM SYMPTOM CONFIRMATION

Confirm the problem symptoms.

(8) SYMPTOM SIMULATION

If the problem does not reappear, be sure to simulate the problem by mainly checking the circuits indicated by the diagnostic trouble code in step (3), using ”Problem Simulation method”.

(9) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes. Check if there is abnormality in the sensors or the wire harness.

If a malfunction code is output, proceed to (9) Diagnostic Trouble Code Chart”. If the normal code is output, proceed to (14) Matrix Chart of Problem Symptoms”.

Be sure to proceed to (9) Diagnostic Trouble Code Chart” after the steps (2) to (6) inclusive are

completed. If troubleshooting is attempted only by following the malfunction code stored in the memory is output, errors could be made in the diagnosis.

⑩ **DIAGNOSTIC TROUBLE CODE CHART**

If a trouble code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

⑪ **PRELIMINARY CHECK**

Carry out a preliminary check of the transmission oil level, throttle cable adjustment, etc..

⑫ **MECHANICAL SYSTEM TEST**

(Stall Test, Time Leg Test, Line Pressure Test)

If the malfunction is found in the stall test, time lag test or line pressure test, check the parts indicated in the respective tests.

⑬ **MANUAL SHIFTING TEST**

If the results of the manual driving test are NG, it is likely that the trouble is in the mechanical system or hydraulic system. Proceed to Part 2 (Mechanical System) under the Matrix Chart of Problem Symptoms.

⑭ **MATRIX CHART OF PROBLEM SYMPTOMS**

If the normal code is confirmed in the diagnostic trouble code check, perform inspection according to the inspection order in the matrix chart of problem symptoms. Perform diagnosis of each circuit or part in the order shown in the Matrix Chart. The Matrix Chart contains 3 chapters, Electronically Controlled Circuits in Chapter 1, On–vehicle Inspection in Chapter 2 and Off–vehicle Inspection in Chapter 3. If all the circuits indicated in Chapter 1 are normal, proceed to Chapter 2. If all the parts indicated in Chapter 2 are normal, proceed to Chapter 3. If all the circuits and parts in Chapter 1 – Chapter 3 are normal and the trouble still occurs, check and replace the ECM.

⑮ **CIRCUIT INSPECTION**

Perform diagnosis of each circuit in accordance with the inspection order confirmed in (9) and (13). Judge whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECM. In some cases, the Flow Chart instructs that a throttle signal check or brake signal check be performed. These are diagnosis functions used to check if signals are being input correctly to the ECM.

⑯ **PARTS INSPECTION**

Check the individual parts of the mechanical system and hydraulic system in the order of the numbers indicated in the Matrix Chart.

⑰ **REPAIRS**

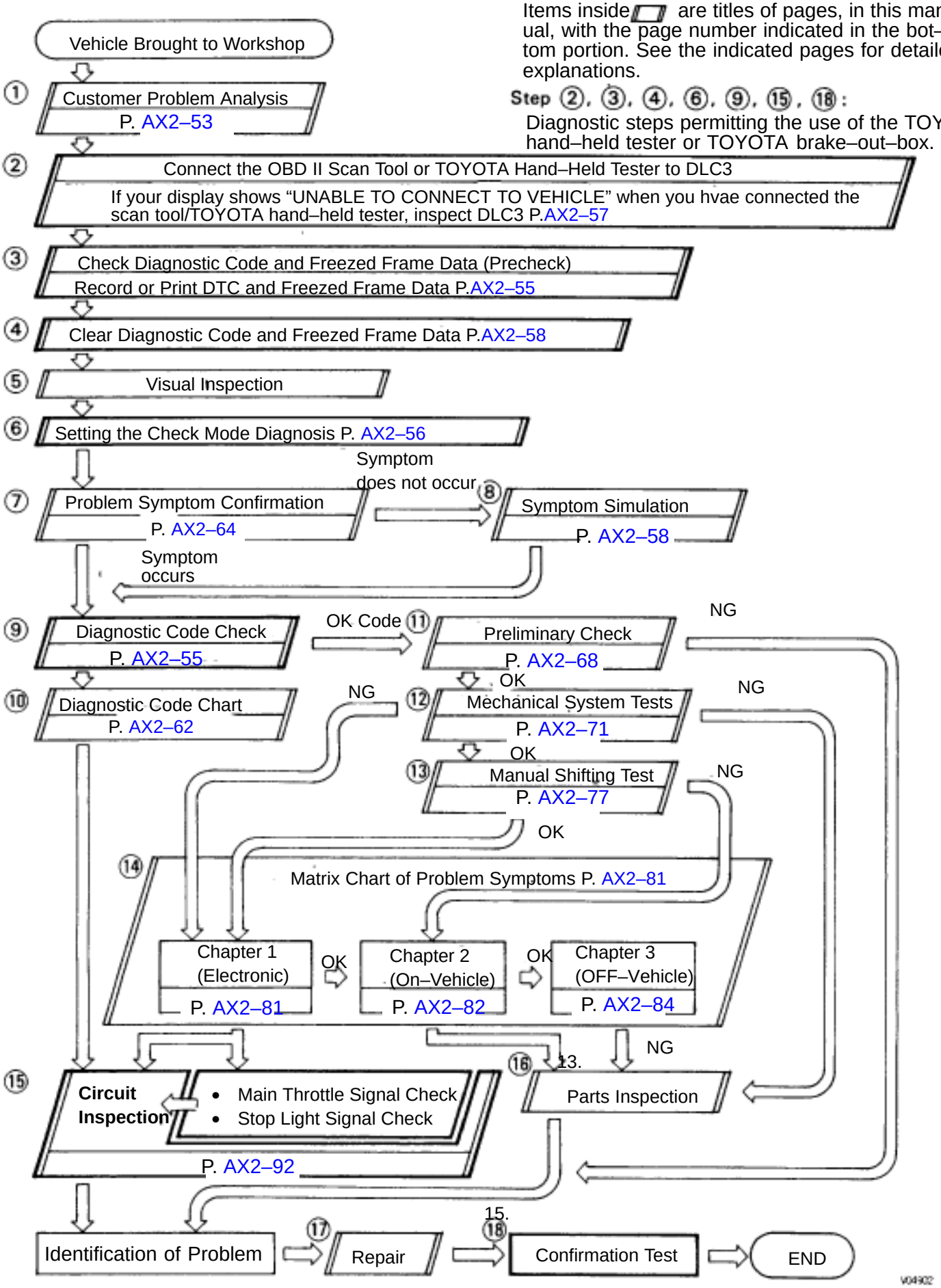
After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual or’94 A541 E Automatic Transaxle Repair Manual.(for’94 CAM RY)

⑱ **CONFIRMATION TEST**

After completing adjustment or repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive, etc., to make sure the entire Engine Control System is operating normally.

Items inside ▱ are titles of pages, in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step ②, ③, ④, ⑥, ⑨, ⑮, ⑱:
Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA brake–out–box.



CUSTOMER PROBLEM ANALYSIS CHECK SHEET

Electronically Controlled Transaxle Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

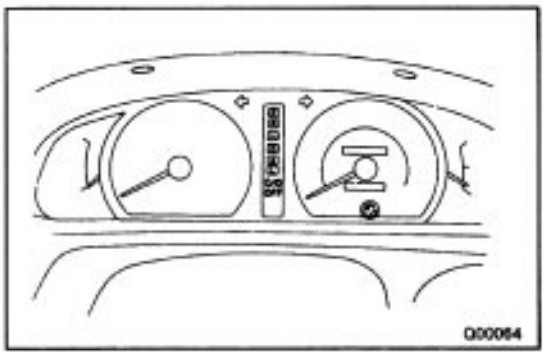
Date of Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)
	☐ No up-shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd →O/D)
	☐ No down-shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock-up malfunction
	☐ Shift point too high or too low.
	☐ Harsh engagement (☐ N → D ☐ Lock-up ☐ Any drive position)
	☐ Slip or shudder
	☐ No Kick-down
	☐ No pattern select
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

Diagnostic Trouble Code Chack	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd time	☐ Normal Code ☐ Malfunction Code (Code)

V04851



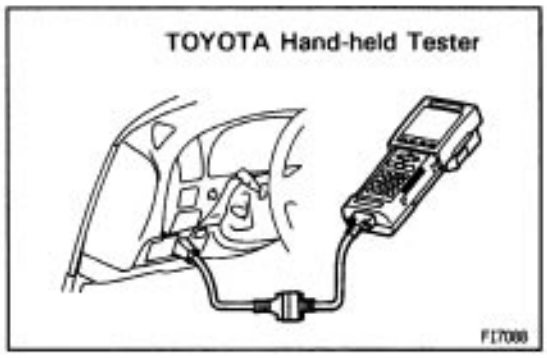
DIAGNOSIS SYSTEM

DESCRIPTION

When troubleshooting OBDII vehicles, the only dif–ference from the usual troubleshooting procedure is that you connect to the vehicle the OBDII scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.

OBD ll regulations require that the vehicle's on –board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the com–puter detects a malfunction in the computer itself or in drive system components which affect vehicle emi–ssions. As in previous models, when the ECM detects a malfunction in the transaxle control section, the MIL lights up and the O/D OFF indicator light blinks. In addition to the MIL lighting up when a malfunction is detected, the applicable diagnostic trouble codes pre–scribed by SAE J 2012 are recorded in the ECM memory. (See page EG–404)

If the malfunction only occurs in 3 trips, the MIL goes off but the diagnostic trouble codes remain recorded in the ECM memory. The O/D OFF indicator light goes off as soon as the trouble is no longer detected.



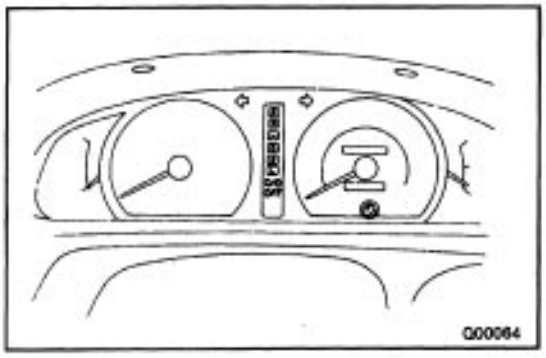
To check the diagnostic trouble codes, connect the OBDII scan tool or TOYOTA hand–held tester to Data Link Connector 3 on the vehicle. The OBD ll scan tool or TOYOTA hand–held tester also enables you to erase the diagnostic trouble codes and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD III scan tool's instruction book.)

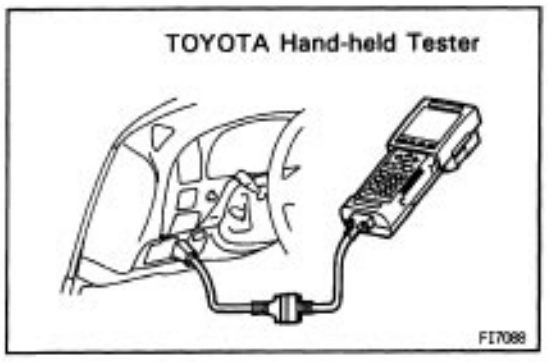
Diagnostic trouble codes include SAE controlled codes and Manufacturer controlled codes.

SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.

(See diagnostic trouble code chart on page AX2–62)

The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most diagnostic trouble codes use 2 trip detection logic(') to prevent errone–ous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up and 0/D OFF indicator lights to blink for a malfunction that is only detected once or mo–mentarily. (TOYOTA hand–held tester)
(See page AX2–56)
' 2 trip detection logic:
When a logic malfunction is first detected, the mal–function is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to light up and O/D OFF indicator lights to blink.





DIAGNOSIS INSPECTION (NORMAL MODE)

MALFUNCTION INDICATOR LAMP CHECK

1. The malfunction indicator lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT: If the malfunction indicator lamp does not light up, troubleshoot the combination meter (See page BE–65)

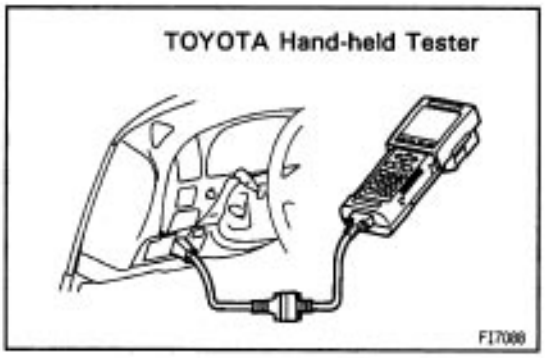
2. When the engine is started, the malfunction indicator lamp should go oft. If the lamp remains on, the diagno–sis system has detected a malfunction or abnormality in the system

DIAGNOSTIC TROUBLE CODE CHECK

NOTICE (TOYOTA hand–held tester only): When the diagnostic system is switched from normal mode to check node, it erases all diagnostic trouble codes and freezed frame data recorded in normal mode. So before switching modes, always check the diagnostic trouble codes and freezed frame data, and note them down.

1. Prepare the OBDII scan tool (complying with SAE J 1978) or TOYOTA hand–held tester.
2. Connect the OBDll scan tool or TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.
3. Turn the ignition switch ON and turn the OBDII scan tool or TOYOTA hand–held tester switch ON.

4. Use the OBD n scan tool or TOYOTA hand–held tester to check the diagnostic trouble codes and freezed frame data. Note them down. (For operating instructions, see the OBD n scan tool's instruction book.)
5. See page AX2–62 to confirm the details of the diagnostic trouble codes.
   NOTICE: When simulating symptoms with an OBD ll scan tool (excluding TOYOTA hand–held tester) to check the diagnostic trouble codes, use normal mode. For codes on the diagnostic trouble code chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated the first time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the diagnostic trouble codes are recorded in the ECM.



DIAGNOSIS INSPECTION (CHECK MODE)

TOYOTA hand–held tester only

Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

DIAGNOSTIC TROUBLE CODE CHECK

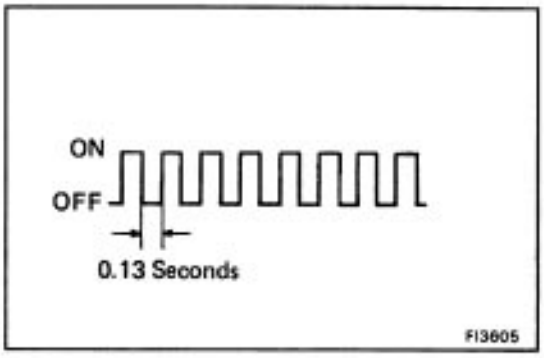
1. Initial conditions.
   (a) Battery positive voltage 11 V or more.
   (b) Throttle valve fully closed.
   (c) Transaxle in PARK position.
   (d) Air conditioning switched off.

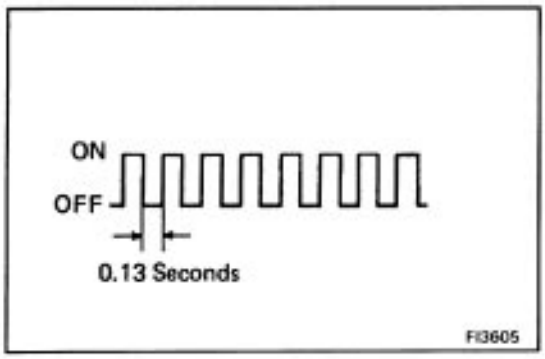
2. Turn ignition switch off.

3. Prepare the TOYOTA hand–held tester.

4. Connect the TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.

5. Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.





6. Switch the TOYOTA hand – held tester normal mode check mode. (Check that the MIL flashes.)

7. Start the engine. (MIL and O/D OFF indicator light go out after the engine starts.)

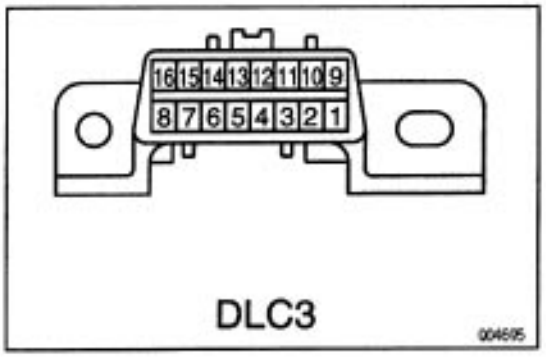
8. Simulate the conditions of the malfunction descr–ibed by the customer.

NOTICE: Leave the ignition switch ON until you have checked the diagnostic trouble codes, etc.

9. After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the diagnostic trouble codes and freezed frame data, etc.

HINT: Take care not to turn the ignition switch OFF, Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all diag–nostic codes, etc. are erased.

10. After checking the diagnostic trouble code, inspect the applicable circuit.



DATA LINK CONNECTOR 3 INSPECTION

The vehicle's ECM uses V.P.

W. (Variable Pulse Width)

for communication to comply with SAE J1850. The

terminal arrangement of DLC 3 complies with SAE J 1962 and matches the V.P.

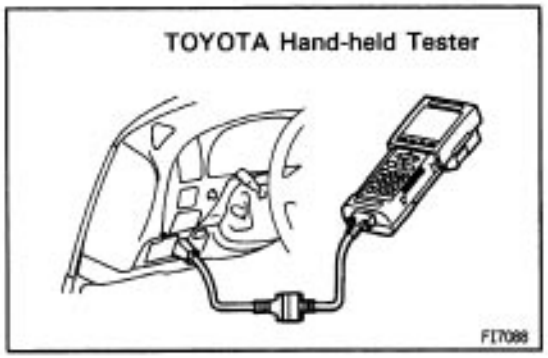
W. format.

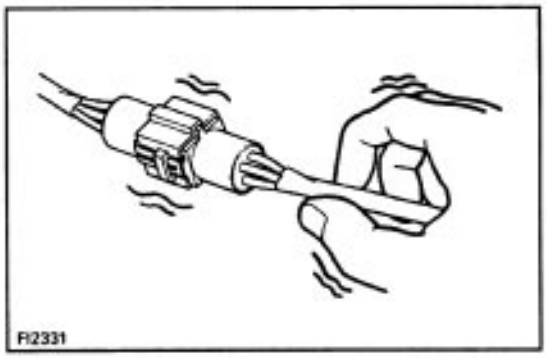
Terminal No.	Conn¿ection/Voltage or Resistance	Condition
2	Bus 〉 Line	During transmission
4	Chassis Ground 〈 Body 1) or less	Always
5	Signal Ground 〈 Body 1) or less	Always
16	Battery Positive 〈 Body 1) Body 9 ~ 14 V	Always

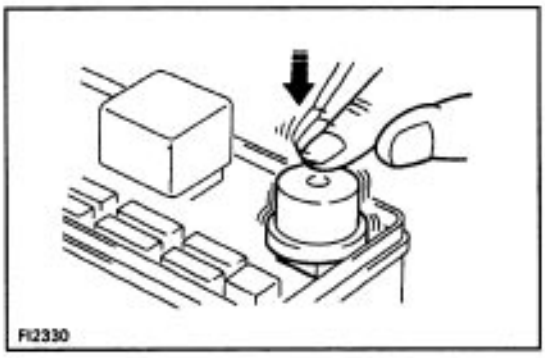
HINT: If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD ll scan tool or TOYOTA hand–held tester to DLC 3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

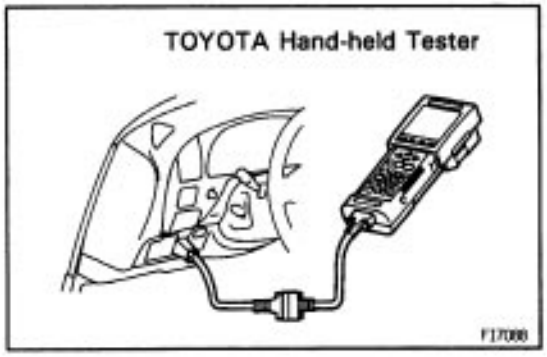
(1) If communication is normal when the tool is con–nected to another vehicle, inspect DLC 3 on the original vehicle.

(2) If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.









AXON–M

CHECK FOR INTERMITTENT PROBLEMS

–TOYOTA hand–held tester only–
By putting the vehicle's EC11A in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased, This makes it easier to detect a intermittent problems.

CLEAR DIAGNOSTIC TROUBLE CODES

See page AX2–58

SET CHECK MODE

See page AX2–56

PERFORM A SIMULATION TEST

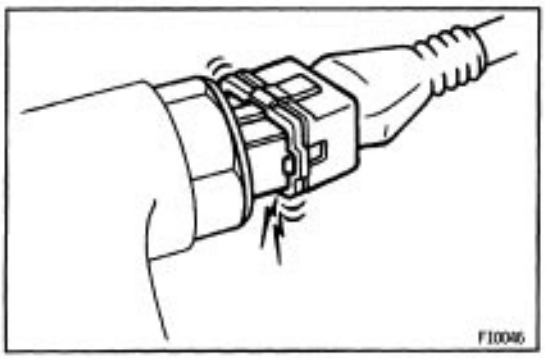
Using the symptom simulation (See page IN–24), apply vibration to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code. In this test, if the malfunction indicator lamp lights up, it indicates that the place where the wire harness, connector or terminals being pulled or vibrated has faulty contact. Check that point for loose connection, dirt on the terminals, poor fit or other problems and repair as necessary.
HINT: After canceling out the diagnostic trouble code in memory and setting the check mode, if the malfunction indicator lamp does not go off after the engine is started, check thoroughly for faulty contact, etc., then try the check again. If the malfunction indicator lamp still does not go off, check and replace the EC11A.

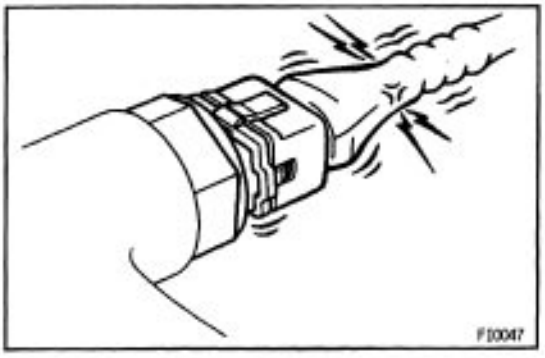
DIAGNOSTIC TROUBLE CODE CLEARANCE

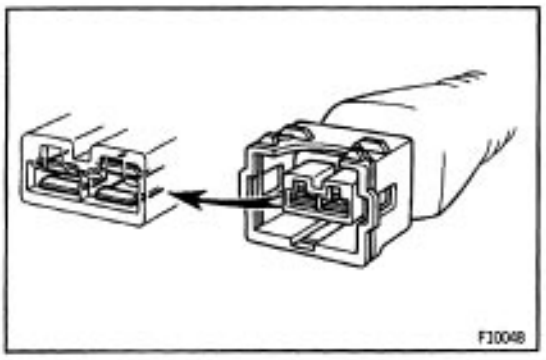
The following actions will erase the diagnostic trouble codes and freezed frame data.

1. Operating the OBD ll scan tool (complying with SAE J 1978) or TOYOTA hand–held tester to erase the codes. (See the OBDII scan tool's instruction book for operating instructions.)
2. Disconnect the battery terminal or EFI fuse.

NOTICE: If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice – versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the diagnostic trou–ble codes and freeted frame dada will be erased.







CONNECTOR CONNECTION AND TERMINAL IN–SPECTION

When checking for an open circuit or short circuit, it is important to check the connector connection and the condition of the terminals.

OPEN CIRCUIT:

This could be due to a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc.

HINT:

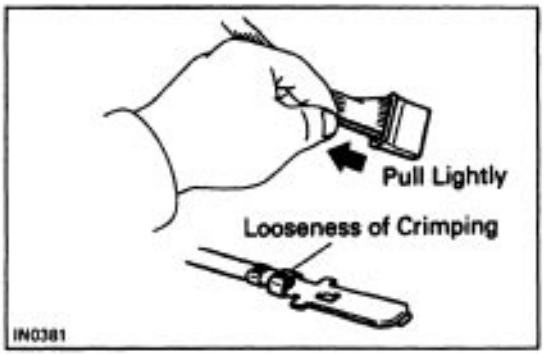
1. A wire rarely breaks in the middle of it's length. Most cases occur at the connector. In particular, carefully check the connectors of sensors and ac–tuators.
2. Faulty contact could be due to rusting of the con–nector terminals, to foreign materials entering ter–minal or a drop in the contact pressure between the male and female terminals of the connector. Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation. There–fore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, them the cause is considered to be in the wire harness or connec–tors.

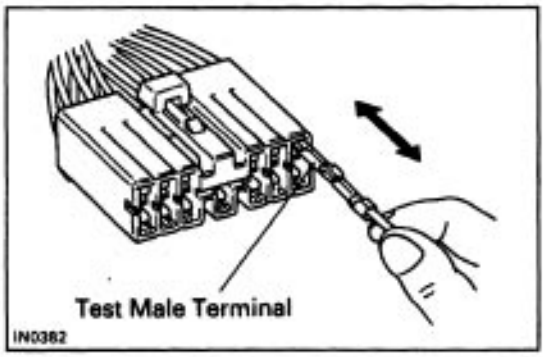
SHORT CIRCUIT:

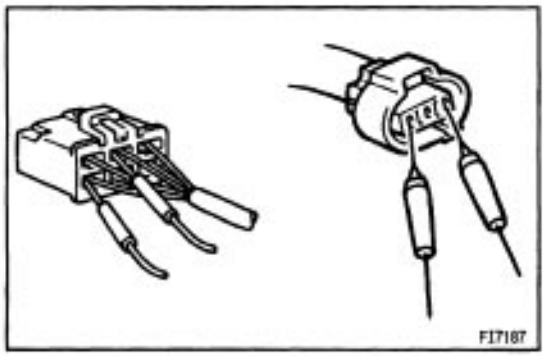
This could be due to a short circuit between the wire harness and the body ground or to a short inside the switch etc.

HINT:

When there is a short between the wire harness and body ground, check thoroughly whether the wire har–ness is caught in the body or is clamped properly.







VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.
(b) Check for rust or foreign material, etc. in the terminals of the connectors.
(c) Check crimped portions for looseness or damage and check if the terminals are secured in the lock portion.

HINT: The terminals should not come out when pulled lightly.

(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

NOTICE: When testing a gold–plate female terminal, always use a gold–plated male terminal.

HINT: When the test terminal is pulled out more easily than others, there may be poor contact in that section.

CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.

–MEMO–

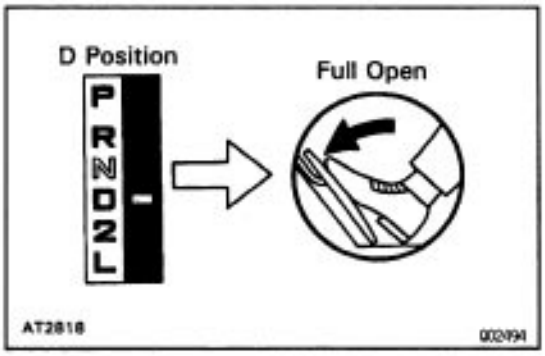
DIAGNOSTIC TROUBLE CODE CHART

If a diagnostic trouble code is displayed during the diagnostic trouble code check, check the circuit listed for that code in the table below and proceed to the page given.

DTC No.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0720	Output Speed Sensor Circuit Malfunction (for Electronically Controlled Transaxle)	When DTC No. P0500 is detected
P0750	Shift Solenoid A Malfunction	During normal driving the gear required by the ECM does not match the actual gear. (2 trip detection logic)
P0753	Shift Solenoid A Electrical (Shift Solenoid Valve No.1 j	Open or short in shift solenoid A circuit.
P0755	Shift Solenoid B Malfunction (Shift Solenoid Valve No.2)	Same as for DTC No.P0750
P0758	Shift Solenoid B Electrical (Shift Solenoid Valve No.2)	Open or short in shift solenoid B circuit
P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h (50 mph). Or lock–up remains ON in the lock–up OFF range. (2 trip detection logic)
P0773	Shift Solenoid E Electrical (Shift Solenoid Valve SL)	Open or short in shift solenoid E circuit for 1 time. (2 trip detection logic)
P1705	”NC2” Revolution Sensor Circuit Malfunction (Direct Clutch Speed Sensor)	Output of direct clutch speed sensor (NC2) is 300 rpm or less under condition a) or b) a) Vehicle speed: 32 km/h (20 mph) or more b) Park/neutral position switch: OFF (2 trip detection logic)
P1765	Shift Solenoid Valve SLN Circuit (For Accumulator Back Pressure Modulation)	After the engine is warmed up, the current flow to the shift solenoid valve SLN is 0.2 A or less for at least 1 second under condition a) or b) (2 trip detection logic) a) Engine speed: 500 RPM or more b) Park/neutral position switch: ON (P or N position)
P1780	Park/neutral Position Switch Malfunction	Two or more switches are ON simultaneously for ’N’, ’2’ and ’L’ position. (2 trip detection logic) ——— When driving under condition a) and b) for 30 seconds or more the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed: 44 mph (70 km/h) or more b) Engine speed: 1,500–2,500 rpm

–...MIL does not light up
〈 ...MIL lights up
C...MIL lights up, O/D OFF indicator light blinks

Trouble Area	MIL	Memory	See page
• Same as for DTC No. P0500.	●	○	AX2–92
• Shift solenoid valve No.1 is stuck open or closed • Valve body is blocked up or stuck.	●	○	AX2–96
• Open or short in shift solenoid valve No.1 circuit. • Shift solenoid valve No.1 • ECM	●	○	AX2–98
• Shift solenoid valve No.2 is stuck open or closed • Valve body is blocked up or stuck.	●	○	AX2–96
• Open or short in shift solenoid valve No.2 circuit. • Shift solenoid valve No.2 ECM	●	○	AX2–98
• Shift solenoid valve SL is stuck open or closed. • Lock–up clutch • Valve body is blocked up or stuck.	●	○	AX2–102
• Open or short in shift solenoid valve SL circuit. • Shift solenoid valve SL • ECM	●	○	AX2–104
• Open or short in direct clutch speed sensor circuit. • Direct clutch speed sensor • ECM	●	○	AX2–108
• Open or short in shift solenoid valve SLN circuit. • Shift solenoid valve SLN • ECM	–	○	AX2–112
• Short in park/neutral position switch circuit. • Park/neutral position switch • ECM	●	○	AX2–116



ROAD TEST

NOTICE: Perform the test at normal ATF operating temperature 50–80 ℃ (122–176 ℉).

1. D POSITION TEST (NORM AND PWR PATTERN)

Shift into the D position and fully depress the accelerator pedal and check the following points:

(a) Check up–shift operation.1〈 2, 2〈 3 and 3〈 O/D up–shift takes place, at the shift point shown in the automatic shift schedule. (See page AX2–67)

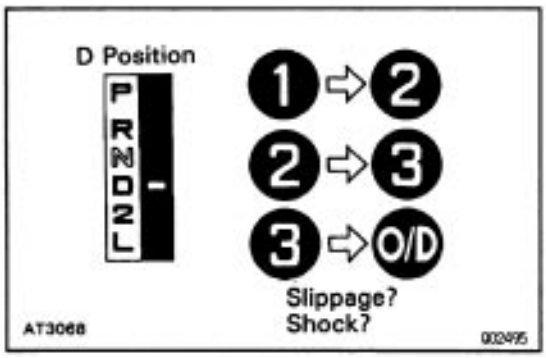
HINT:

(1) O/D Gear Up–shift Prohibition Control

- Coolant temp. is 55℃ (131℉) or less
- If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.
- 0/D main switch is pushed ON
  (During the O/D OFF indicator light lights up.)

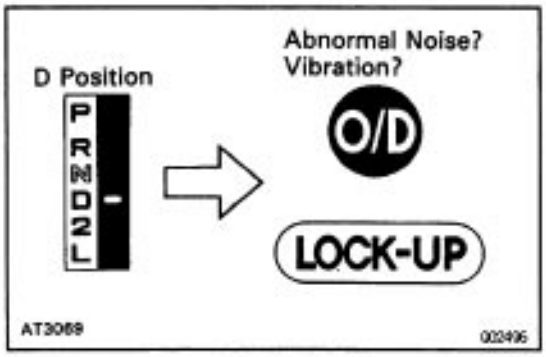
(2) O/D Gear Lock–up Prohibition Control

- Brake pedal is depressed.
- Coolant temp. is 55 ℃ (131 ℉) or less.



(b) Check for shift shock and slip.

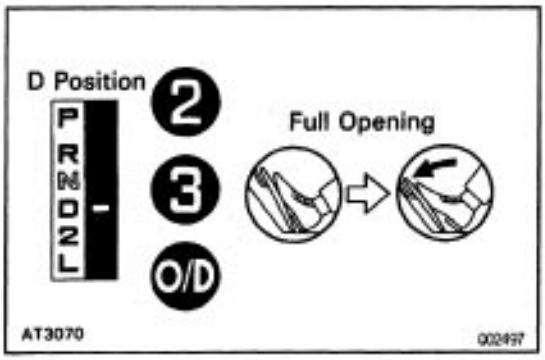
Check for shock and slip at the 1–2, 2–3 and 3–O/D up–shifts.



(c) Check for abnormal noises and vibration.

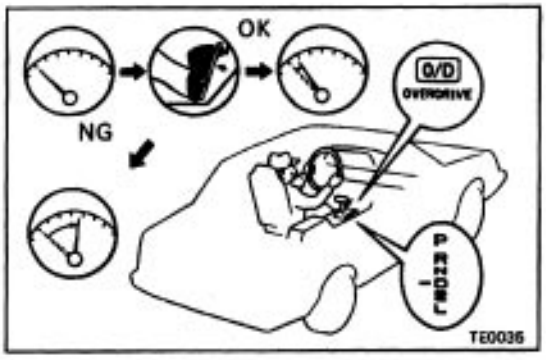
Run at the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT: The check for the cause of abnormal noises and vibration must be performed very thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc..



(d) Check kick–down operation
While running in the D position, 2nd, 3rd and 0/D gears, check to see that the possible kick–down vehicle speed limits for 2±1, 3±2 and 0/D±3 kick–downs conform to those indicated on the automatic shift schedule. (See page AX2–67)

(e) Check abnormal shock and slip at kick–down.

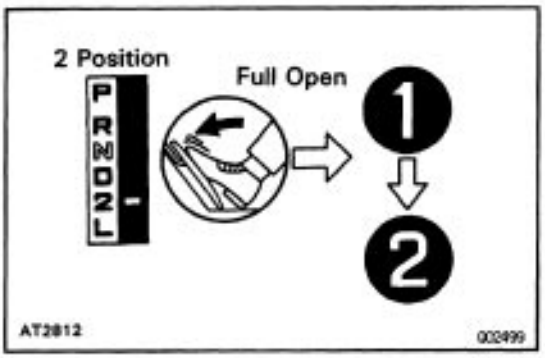


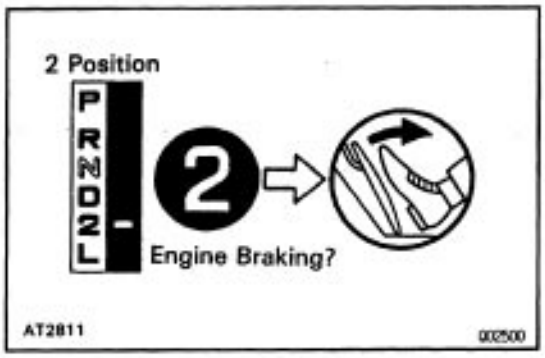
(f) Check the lock–up mechanism.
(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).
(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly. If there is a big jump in engine RPM, there is no lock–up.

2. 2 POSITION TEST

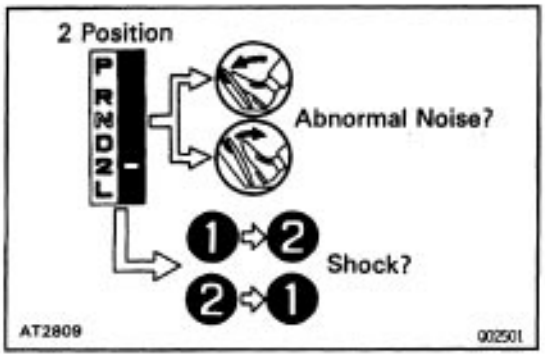
Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(a) Check up–shift operation.
Check to see that the 1–)2 up–shift takes place and that the shift point conforms to the automatic shift schedule.(See page AX2–67)
HINT: There is no 0/D up–shift and lock–up in the 2 position.

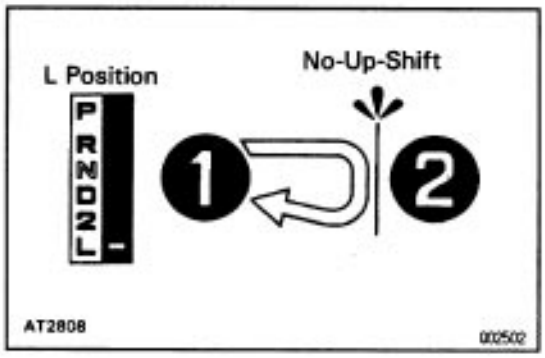




(b) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



(c) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

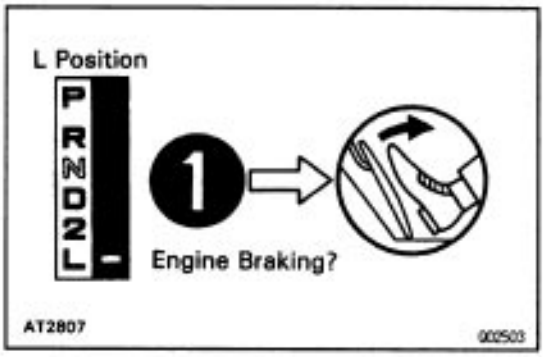


3. L POSITION TEST

Shift into the 2 position and fully depress the acceler–ator pedal and check the following points:

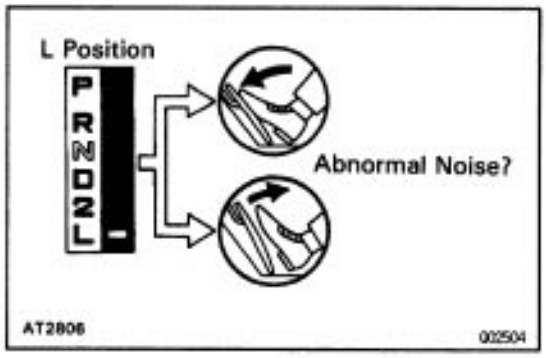
(a) Check no up–shift.

While running in the L position, check that there is no up–shift to 2nd gear.

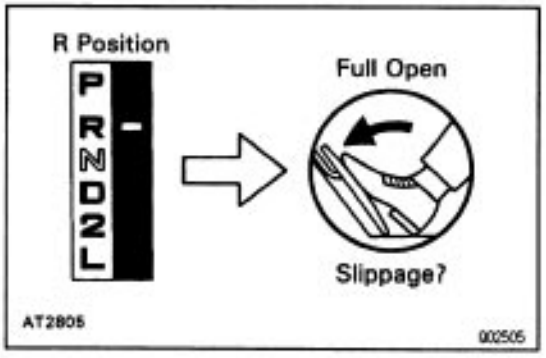


(b) Check engine braking.

While running in the L position, release the accelera–tor pedal and check the engine braking effect.



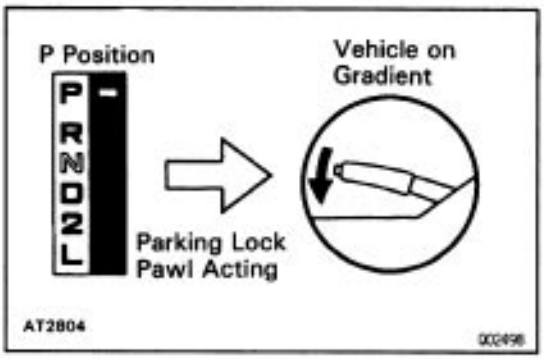
(c) Check for abnormal noises during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and fully depress the acceler–ator pedal and check for slipping.

CAUTION: Before conducting this test ensure that the test area is free from personnel and obstruction.



5. P POSITION TEST

Stop the vehicle on a gradient (more than 5®) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

AUTOMATIC SHIFT SCHEDULE

SHIFT POINT

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	60–65 (37–40)
		2→3	113–121 (70–75)
		3→O/D	174–182 (108–113)
		O/D→3	168–176 (104–109)
		3→2	104–112 (65–70)
		2→1	50–54 (31–34)
	Throttle valve fully closed	3→O/D	40–44 (25–27)
		O/D→3	20–24 (12–15)
2 position	Throttle valve fully opened	1→2	60–65 (37–40)
		3→2	122–130 (76–81)
		2→1	50–54 (31–34)
L position	Throttle valve fully opened	3→2	107–114 (66–71)
		2→1	55–59 (34–37)

LOCK–UP POINT

D position km/h (mph) Throttle valve opening 596	Lock–up ON	Lock–up OFF
'3rd Gear	60–65 (37–40)	53–57 (33–35)
0/D Gear	60–64 (37–40)	53–57 (33–35)

*: 0/D Switch OFF

HINT:

(1) There is no lock–up in the 2 and L positions.

(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

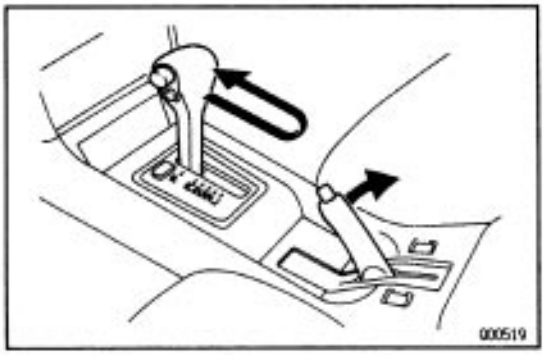
- **When the throttle valve is completely closed.**
- **When the brake light switch is ON.**

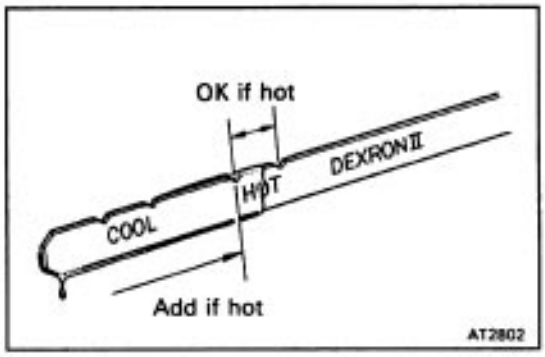
(3) Shift up to 3rd will not occur when the engine coolant temp. is below 35℃ (95℉) and the vehicle speed is below 40 km/h (25 mph).

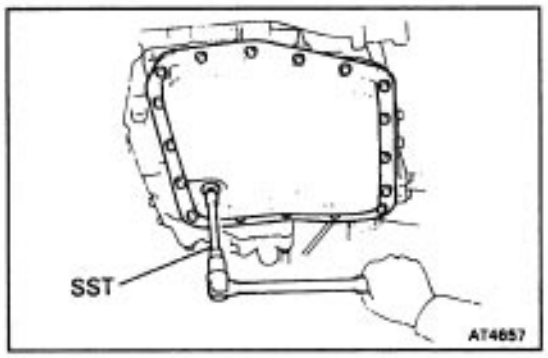
(4) Shift–up to 0/D will not occur when the engine coolant temp. is below 60 ℃ (140 ℉) and the vehicle speed is below 63 km/h (39 mph).

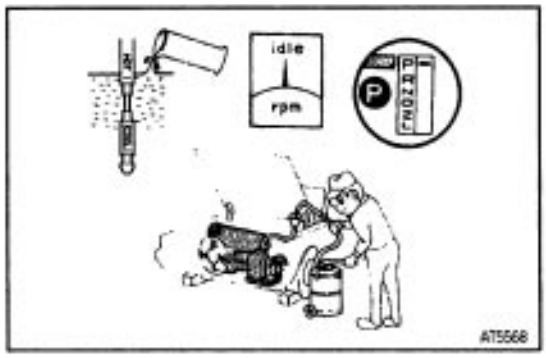
(5) During cruise control operation ; the shift pattern is fixed in NORM. And when the vehicle speed drops to 10 km/h (6 mph) or more below the cruise control set vehicle speed, shift down from 0/D to 3rd occurs.

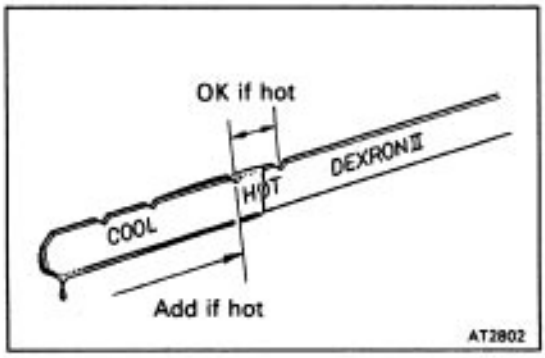
(6) The kick–down foot switch turns ON when the accelerator pedal is depressed further with the throttle valve already fully open.











PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT:

- Drive the vehicle so that the engine and transmis–sion are at normal operating temperature.
  Fluid temp. : 70–80 $_3$C (158–176 $_3$F)
- Only use the COOL position on the dipstick as a rough reference when the fluid is replaced or the engine does not run.

(a) Park the vehicle on a level surface and set the parking brake.

(b) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.

(c) Pull out the dipstick and wipe it clean.

(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT position.

If the level is at the low side, add fluid.

Fluid type:

DEXRON ® II or equivalent

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.

3. REPLACE TRANSAXLE FLUID

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type:DEXRON^II or Equivalent

Capacity:

Total: 6.75 liters (7.1 US qts, 5.9 Imp. qts)

Drain and refill: 3.5 liters (3.7 US qts, 3.1 Imp. qts)

(d) Start the engine and shift the shift lever into all posi–tions from P to L position and then shift into P posi–tion.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

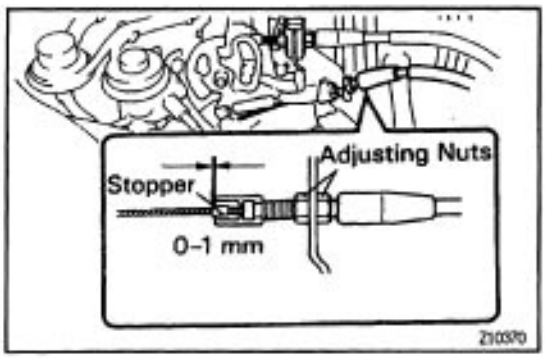
(f) Check the fluid level at the normal operating tempera–ture, 70–80 $_3$C (158–176 *F), and add as necessary.

NOTICE: Do not overfill.

4. CHECK FLUID LEAKS

Check for leaks in the transmission.

If there are leaks, it is necessary to repair or replace 0 –rings, seal packings, oil seals, plugs or other parts.



5. INSPECT AND ADJUST THROTTLE CABLE

(a) Check that the accelerator pedal is fully released.
(b) Check that the inner cable is not slack.
(c) Measure the distance between the outer cable end and stopper on the cable.

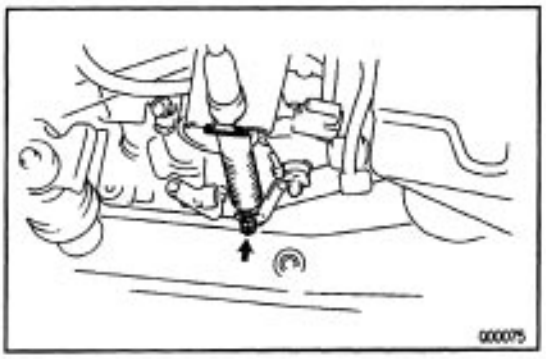
Standard distance:

0–1 mm (0–0.04 In.)

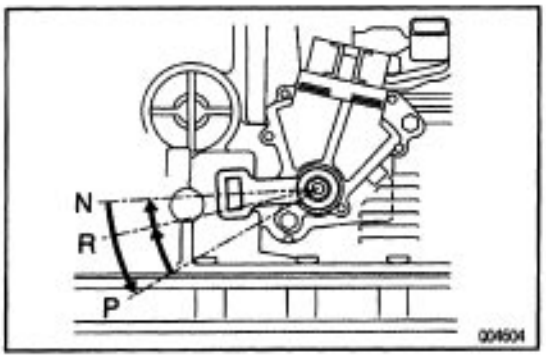
If the distance is not standard, adjust the cable by the adjusting nuts.

6. INSPECT AND ADJUST SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.



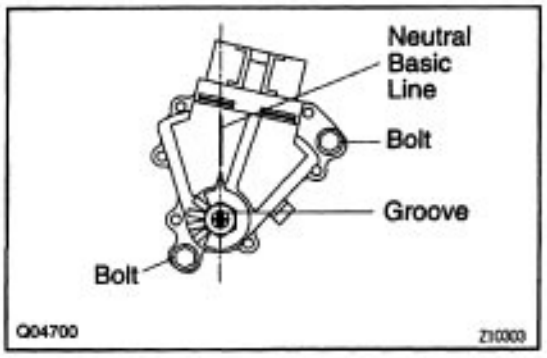
(a) Loosen the swivel nut on the manual shift lever.
(b) Push the manual lever fully toward the right side of the vehicle.



(c) Return the lever 2 notches to N position.
(d) Set the shift lever to N position.
(e) While holding the shift lever lightly toward the R position side, tighten the swivel nut.
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R posi–tion.

7. INSPECT AND ADJUST PARK/NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.
If not as started above, carry out the following adjust–ment procedure.



(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(b) Align the groove and neutral basic line.
(c) Hold in position and tighten the bolt.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

For continuity inspection of the park/neutral position switch, see page AX–116.

8. INSPECT IDLE SPEED

Idle speed:

650–750 RPM

(In N position and air conditioner OFF)

MECHANICAL SYSTEM TESTS

STALL TEST

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature 50–80 ®C (122–176 ®F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

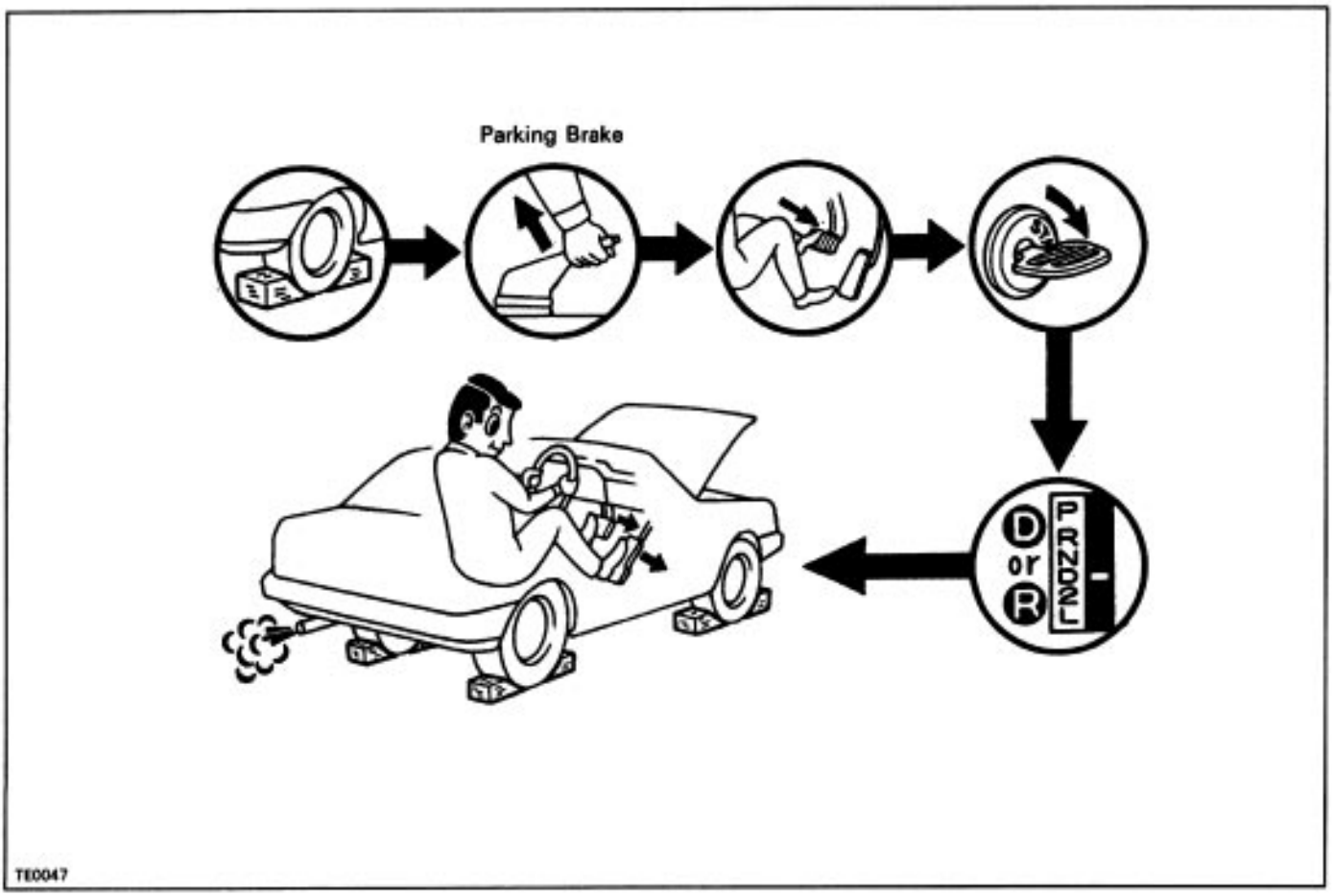
MEASURE STALL SPEED

(a) Chock the four wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Start the engine.
(f) Shift into the D position. Press all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

Stall speed:

2,600 ±150 RPM

(g) Perform the same test in R position.



EVALUATION

Problem	Possible cause
(a) Stall speed low in D and R positions.	• Engine output may be insufficient. • Stator one–way clutch is operating properly HINT: If more than 600 RPM below the specified value, the torque converter could be faulty.
(b) Stall speed high in D position.	• Line pressure too low • Forward clutch slipping • No.2 one–way clutch not operating properly • O/D one–way clutch not operating properly
(c) Stall speed high in R position.	• Line pressure too low • Direct clutch slipping • First and reverse brake slipping • O/D clutch slipping
(d) Stall speed high in D and R position.	• Line pressure too low • Improper fluid level • O/D one–way clutch not operating properly

TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the 0/D direct clutch, forward clutch, direct clutch, and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature 50–80 ®C (122–176 ®F).**
- **Be sure to allow a one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake .

(b) Start the engine and check idle speed.

Idle speed:

650–750 RPM (In N position and air conditioner OFF)

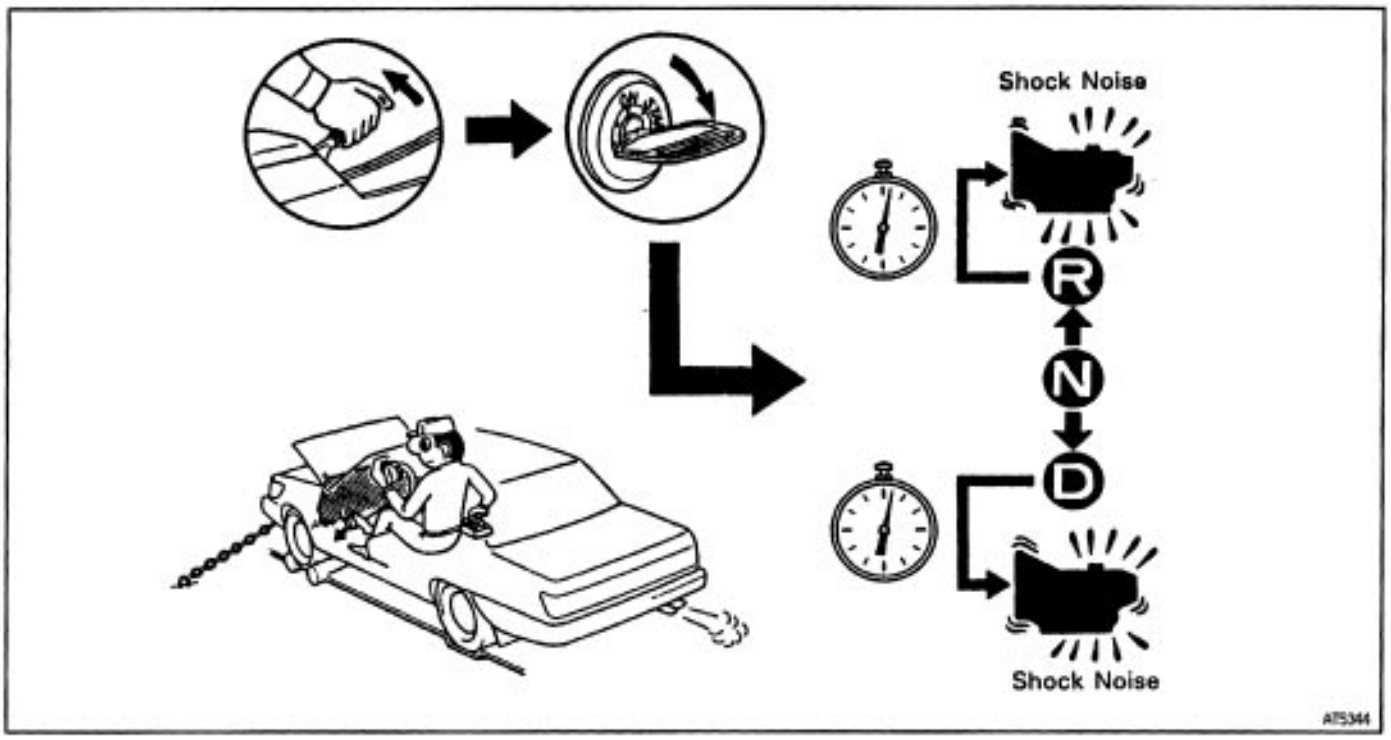
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

In same manner, measure the time lag for N R.

Time lag:

N D Less than 1.2 seconds

N R Less than 1.5 seconds



EVALUATION

If N⟨ D or N⟨ R time lag are longer than specified:

Problem	Possible cause
N D time lag is longer	• Line pressure too low • Forward clutch worn • 0/D one–way clutch not operating properly
N R time lag is longer	• Line pressure too low • Direct clutch worn • First and reverse brake worn • O/D one–way clutch not operating properly

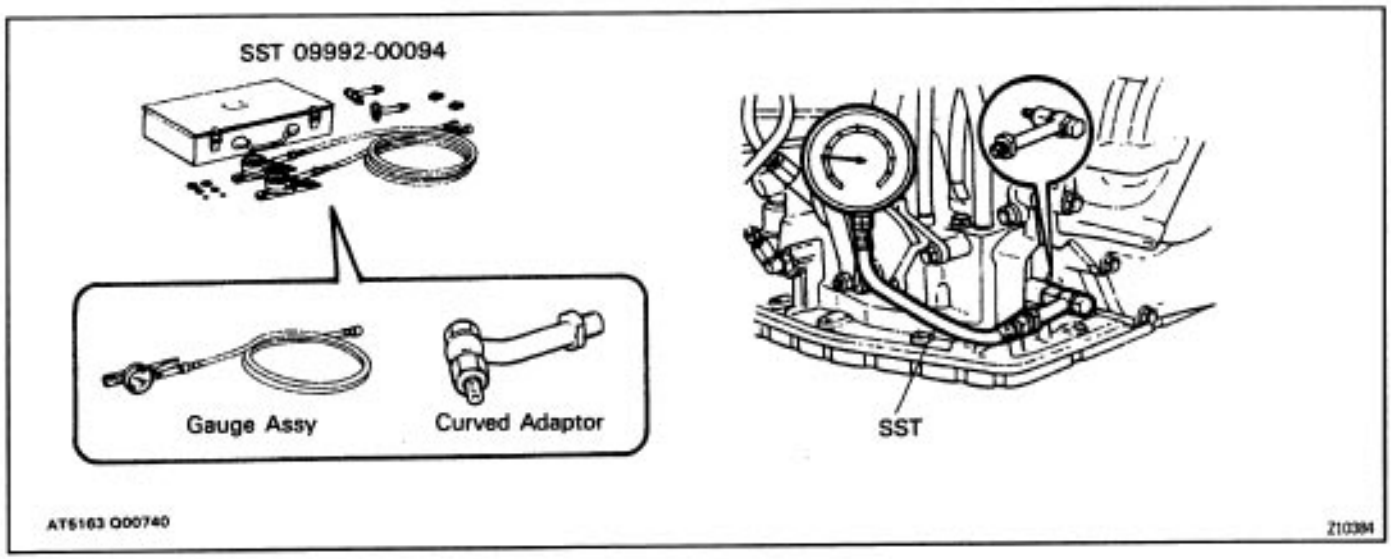
MEASURE LINE PRESSURE

NOTICE:

- Perform the test at normal operating fluid temperature 50–80 ®C (122–176 ®F).
- The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.
- Be careful to prevent the oil pressure gauge hose from interfering with the exhaust pipe.

(a) Warm up the transmission fluid.

(b) Remove the test plug on the transaxle case left side and connect the oil pressure gauge SST.
SST 09992–00094



(c) Fully apply the parking brake and chock the four wheels.

(d) Start the engine and check idling RPM.

(e) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(f) Measure the line pressure when the engine is idling.

(g) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(h) In the same manner, perform the test in R position.

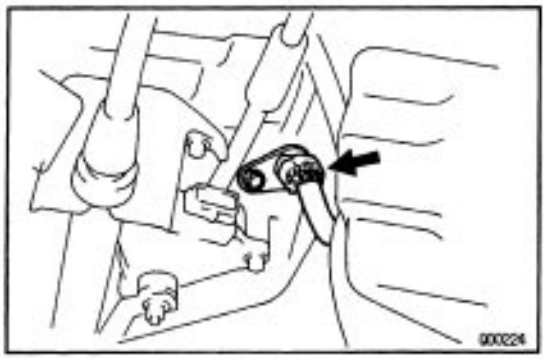
SPECIFIED LINE PRESSURE

Condition	D position kPa (kgf/cm2, psi)	R position kPa (kgf/cm2, psi)
Idling	401–461 (4.1–4.7, 58–66)	804–882 (8.2–9.0, 117–128)
Stall	1,138–1,236 (11.6–12.6, 165–179)	1,716–1,854 (17.5–18.9, 249–269)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

EVALUATION

Problem	Possible cause
If the measured values at all positions are higher.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured values at all positions are lower.	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective • Oil pump defective • 0/D direct clutch defective
If pressure is low in the D position only.	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only.	• R position circuit fluid leakage • Direct clutch defective • First and reverse brake defective



MANUAL SHIFTING TEST

HINT: With this test, it can be determined whether the trouble is within the electrical circuit or is a mechani–cal problem in the transaxle.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift Position	Gear Position
D Position	O/D
2 Position	3rd
L Position	1st
R Position	Reverse
P Position	Pawl Lock

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- **While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.**

If any abnormality is found in the above test, the problem is in the transmission itself.

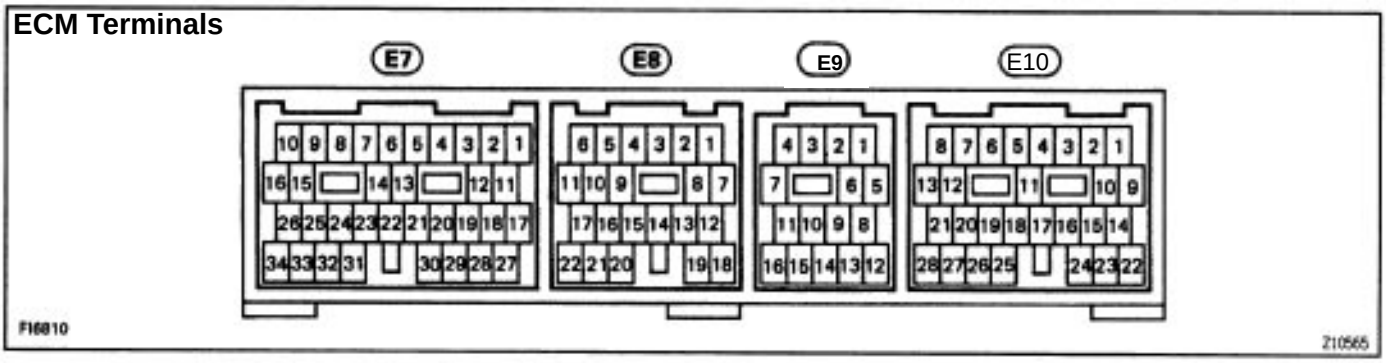
3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AX2–58**)**

STANDARD VALUE OF ECM TERMINAL

AX0082–01



Connector,Terminal No. Symbols Wiring Color	Condition	Standard Value
E10,12 – E9,16 SP1 – E1 V·Y – BR	1. Disconnect cruise control connector. 2. Turn ignition switch ON. Standing still Turn one front wheel slowly	Below 1 V Pulse signal is output Below 1V ↔ 5V
E7,11 – E9,16 S1 – E1 V – BR	IG OFF IG ON 1 st or 2nd gear 3rd or O/D gear	11 – 15 Ω B+ B+ Below 1V
E7,17 – E9,16 S2 – E1 P·L – BR	IG OFF IG ON 2nd or 3rd gear 1 st or O/D gear	11 – 15 Ω Below 1V B+ Below 1 V
E7,27 – E9,16 SL – E1 Y·L – BR	IG OFF IG ON Vehicle driving under lock–up position	11 – 15 Ω Below 1 V B+
E8,9 – E8,4 NC2⊕ – NC2⊖ Y·L – W·L	IG OFF Engine is running	580 – 680 Ω Puls signal is output Below 1 V ↔ 4–5 V
E7,3 – E9,16 SLN⁻ – E1 Y·G – BR	IG switch ON	B+
E10,7 – E9,16 OD1 – E1 Y·B – BR	IG switch ON	B+
E10,6 – E9,16 OD2 – E1 G·O – BR	0/D main switch ON O/D main switch OFF	B+ Below 1 V
E10,3 – E9,16 P – E1 L·R – BR	IG switch ON Pattern select switch 'NORM' Pattern select switch 'PWR'	Below 1 V B+

E10,2 – E9,16 L – E1 Y-L – BR	IG switch ON Shift lever L position Shift lever other than L position	 B+ Below 1 V
E10,10 – E9,16 2 – E1 O – BR	1G switch ON Shift lever 2 position Shift lever other than 2 position	 B+ Below 1 V
E10,15 – E9,16 R – E1 R-B – BR	IG switch ON Shift lever R position Shift lever other than R position	 B+ Below 1 V
E10,14 – E9,16 NSW – E1 B-W – BR	IG switch ON Shift lever P or N position Shift lever other than P and N position	 B+ Below 1 V
E10,24 – E9,16 STP – E1 G-W – BR	IG switch ON Brake pedal is depressed Brake pedal is released	 B+ Below 1 V

AXXRY–01

MATRIX CHART OF PROBLEM SYMPTOMS

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart

Chapter 2: On–vehicle Repair Matrix Chart

Chapter 3: Off–vehicle Repair Matrix Chart

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to Chapter 2 or 3, proceed as instructed.

1. If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.

2. If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check or replace the ECM.

Chapter 1. Electronic Circuit

Suspect Area / Symptom		See Page	OD Cansel Signal Circuit AX2–120	0/D Main Switch & O/D OFF Indicator Light Circuit AX2–122	Pattern Select Switch Circuit AX2–126	Park/Neutral Position Switch Circuit AX2–116	Stop Light Switch Circuit AX2–128	On–Vehicle repair matrix chart AX2–82	Of–Vehicle repair matrix chart AX2–84
Vehicle does not move in any forward range and reverse range								1	2
Vehicle does not move in particular range or ranges								1	2
No up–shift	1st→2nd							1	2
	2nd→3rd							1	2
	3rd→O/D		1		2			3	4
No down–shift	O/D→3rd							1	
	3rd→2nd							1	2
	2nd→1st							1	2
No lockup							1	2	3
No lockup off							1	2	
Shift point too high or too low						1			
Upshifts is to 2nd while in L range Upshifts to 3rd while in L range									
Upshifts to O/D from 3rd while O/D switch is OFF					1				
Upshifts to O/D from 3rd while engine is cold								1	2
Harsh engagement	N→D							1	2
	Lockup							1	2
	Any driving range							1	2
Slip or Shudder	Forward and reverse							1	2
	Particular range							1	2
No engine Braking								1	2
Poor acceleration									1
No kickdown								1	
No pattern select									
Large shift shock or Engine stalls when starting off or stopping.									1

VD08524

Chapter 2. On–Vehicle Repair
(* : A541 E AUTOMATIC TRANSAXLE Repair Manual)

See page / Suspect Area / Symptom		★ Manual valve	★ Primary regulator valve	★ Throttle valve	★ Down–shift plug	★ Cut–Back valve	★ Secondary regulator valve	★ 2nd coast modulator valve	★ Low coast modulator valve
Vehicle does not move in R position									
Vehicle does not move in any forward position or reverse position		1	2						
No lock–up							2		
No lock–up OFF									
No kick–down									
No engine braking	1st								1
	2nd							1	
No up–shift	1st⊖2nd								
	2nd ⊖ 3rd								
	3rd⊖O/D								
No down–shift	O/D ⊖3rd								
	3rd ⊖2nd								
	2nd→1 st								
Harsh engagement	N⊖R								
	N⊖D								
	N ⊖L								
	1 st⊖2nd (D position)								
	1 st⊖2nd (2 Position)								
	1st⊖2nd⊖3rd								
	1st⊖2nd ⊖3rd⊖O/D		1	2	3				
	2nd⊖3rd								
	3rd⊖O/D								
	O/D⊖3rd								
	3rd⊖2nd							2	
Sliper shudder in forward and reverse (Directly after E/G start)			3	4	5				

V04625

★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
2nd lock valve	B_1 Orifice control valve	Lock–up relay valve,	1–2 shift valve	2–3 shift valve	3–4 shift valve	Accumulator control valve	Solenoid modulator valve	Co accumulator	C_1 a cumulator	C_2 accumulator	Bo accumulator	B_2accumulator	Pressure relief valve	Parking lock pawl	Oil strainer	OFF–Vehicle repair matrix chart
			1	2												3
																3
		1														3
		1														2
			1	2	3											
																2
																2
			1													2
				1												2
					1											2
					1											
				1												
			1													2
										1						2
									1							2
									1							
												1				2
						4										
										1						
											1					2
								1			2					
												1				3
													1		2	6

AX2–84

V04626

Chapter 3. Off–Vehicle Repair
(* : A541 E AUTOMATIC TRANSAXLE Repair Manual)

See page / Suspect Area / Symptom		*	★	★	★	★	★
		Torque converter clutch	Parking lock pawl	O/D direct clutch (CO)	Forward clutch (C_1)	Direct Clutch (C2)	O/D brake (Bo)
Vehicle does not move in any forward position					1	6	
Vehicle does not move in reverse position				5		4	
Vehicle does not move in any forward position and reverse position			1	3			4
No lock–up		1					
No lock–up OFF		1					
Large shock during lock–up		1					
E/G stalls when starting off and stopping		1					
No up–shift	1 st⊖2nd						
	2nd⊖3rd					1	
	3rd⊖O/D						1
No down shift 2nd→1 st							
Harsh engagement	N⊖R					1	
	N⊖D				1		
	1 st⊖2nd (D position)						
	2nd⊖3rd						
	3rd⊖O/D			1			2
Slip on shudder	Forward and reverse (After warm–up)	1		3			
	Forward and reverse (Directly after E/G start)	1					
	R position			2		1	
	1 st				1		
	2nd						
	2nd⊖3rd (Up–shift)					1	
	3rd					1	
	O/D						1
No engine braking	1 st ⊕3rd			1			
	1st						
	2nd						
Poor acceleration	A11 positions	1					
	O/D			1			
	Other than O/D						1
	Other than 2nd						
	1 st and 2nd						1
	1 st and R position						
	R position				1		

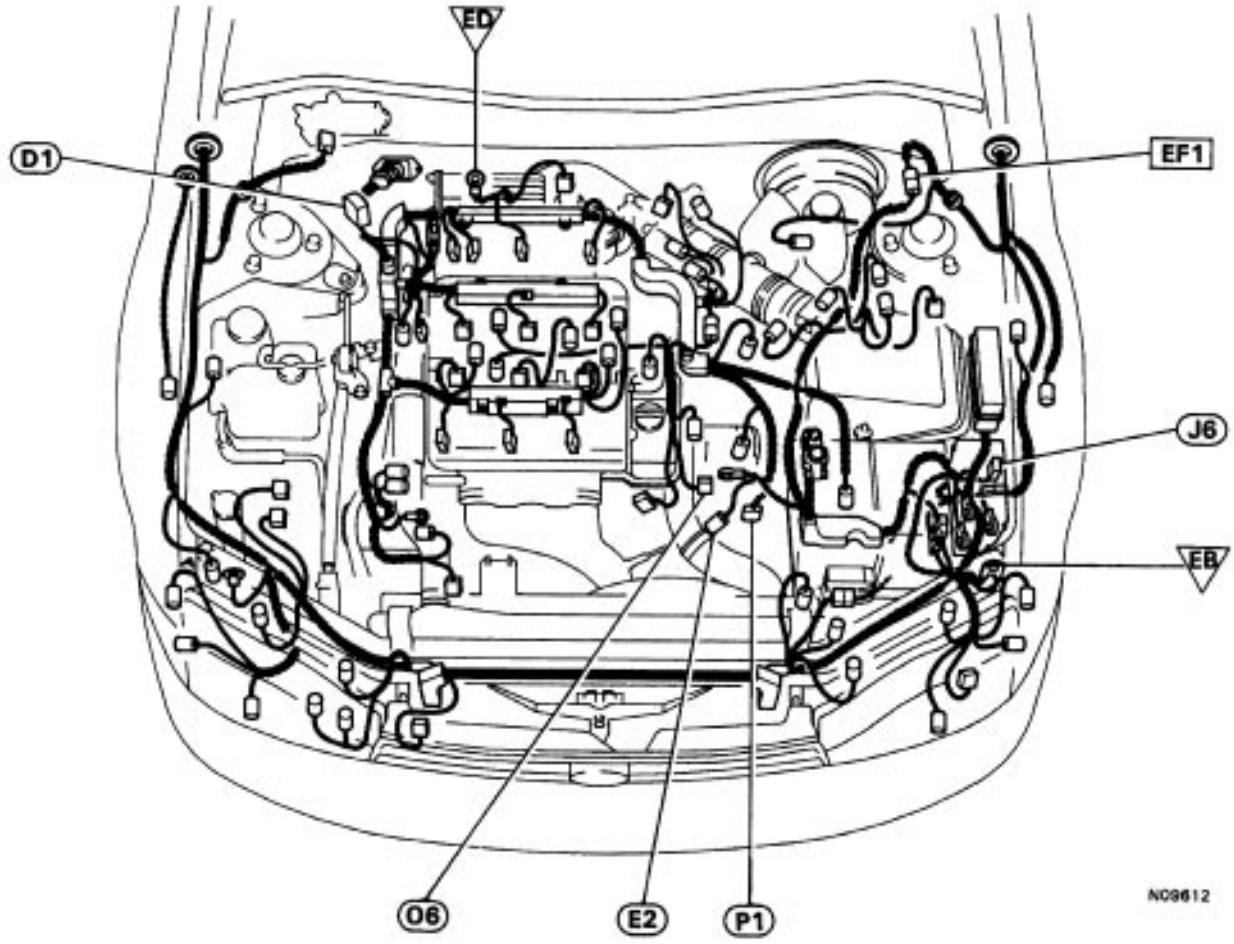
V04627

★	★	★	★	★	★	★	★	★
2nd coast brake (B,)	Second brake (621	1 st and reverse brake (B3)	O/D one–way clutch (FD)	No. 1 one–way clutch (F i)	No.2 one–way clutch IF21	O/D planetary gear	Front planetary gear	Rear planetary gear
4	5	3			2			
1		6					2	3
			2			7	5	6
	1			2				
1								
		2						
		1						
1								
						3		
				2				
			3					
					2			
	1			2				
		1						
1								
						2		
						2		
1	2							
		1						

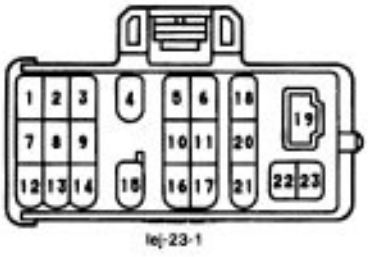
LOCATION OF CONNECTORS

AX0MW–01

Location of Connectors in Engine Compartment



D1
Data Link Connector 1

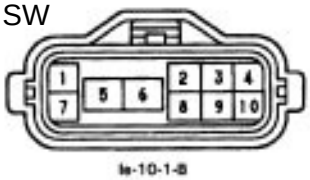


E2
Electronic Controlled Transaxle Connector

J6
Junction Connector

O6
O/D Direct Clutch Speed Sensor

P1
Park/neutral Position SW

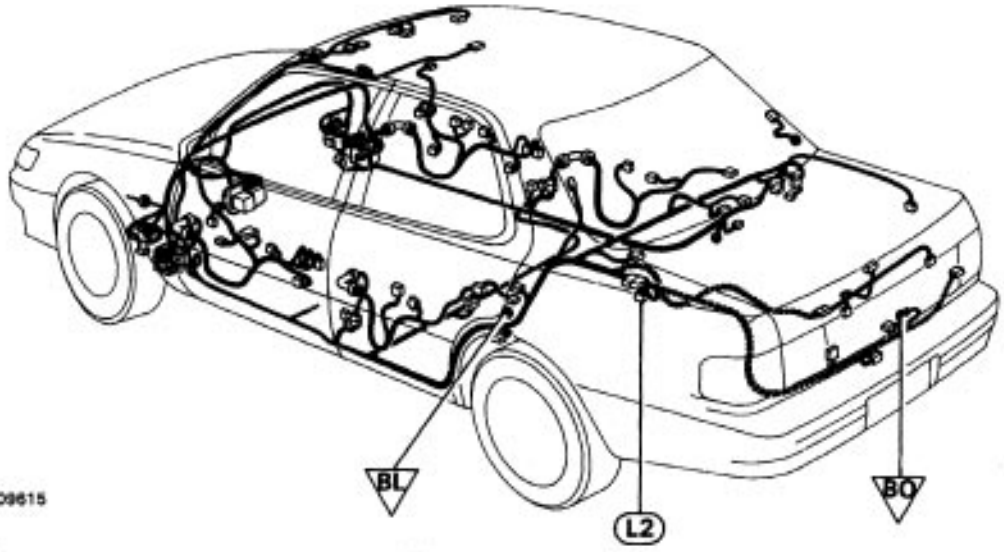


EF 1

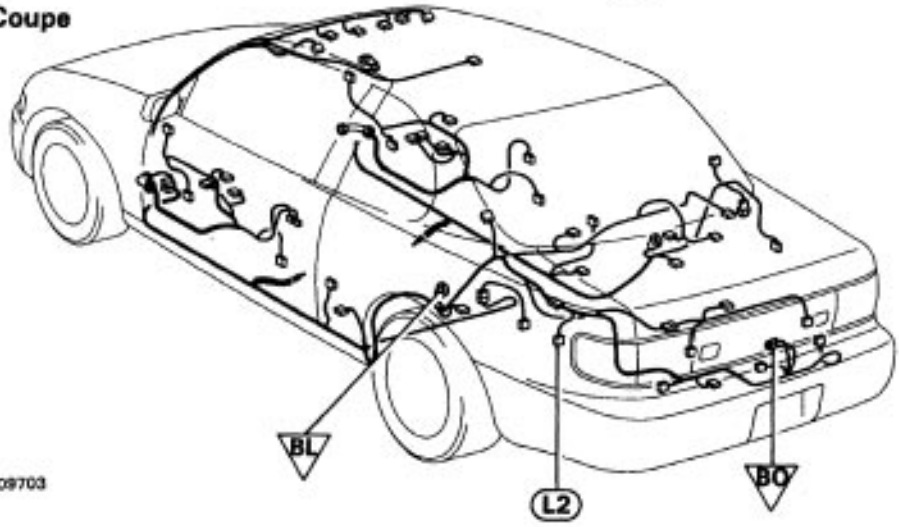
V04860

Location of Connectors in Body

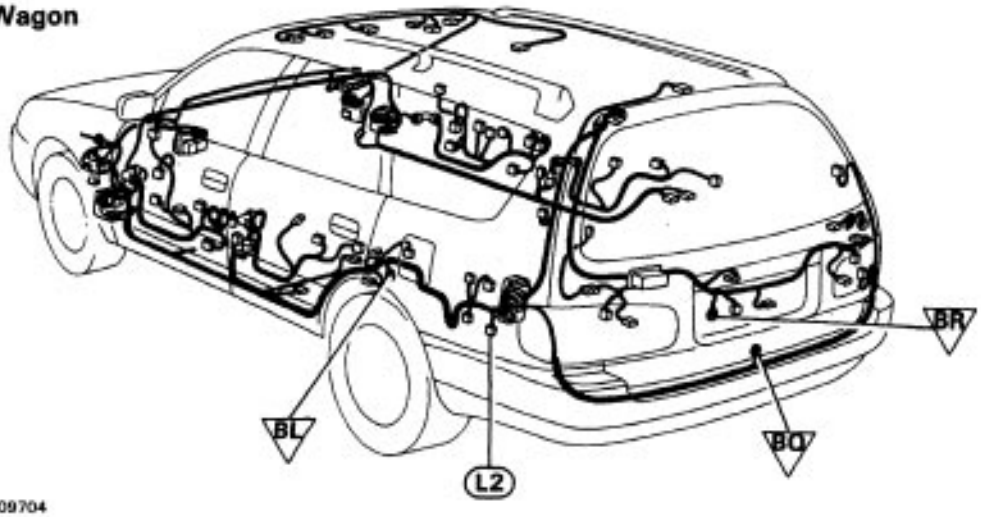
Sedan



Coupe



Wagon

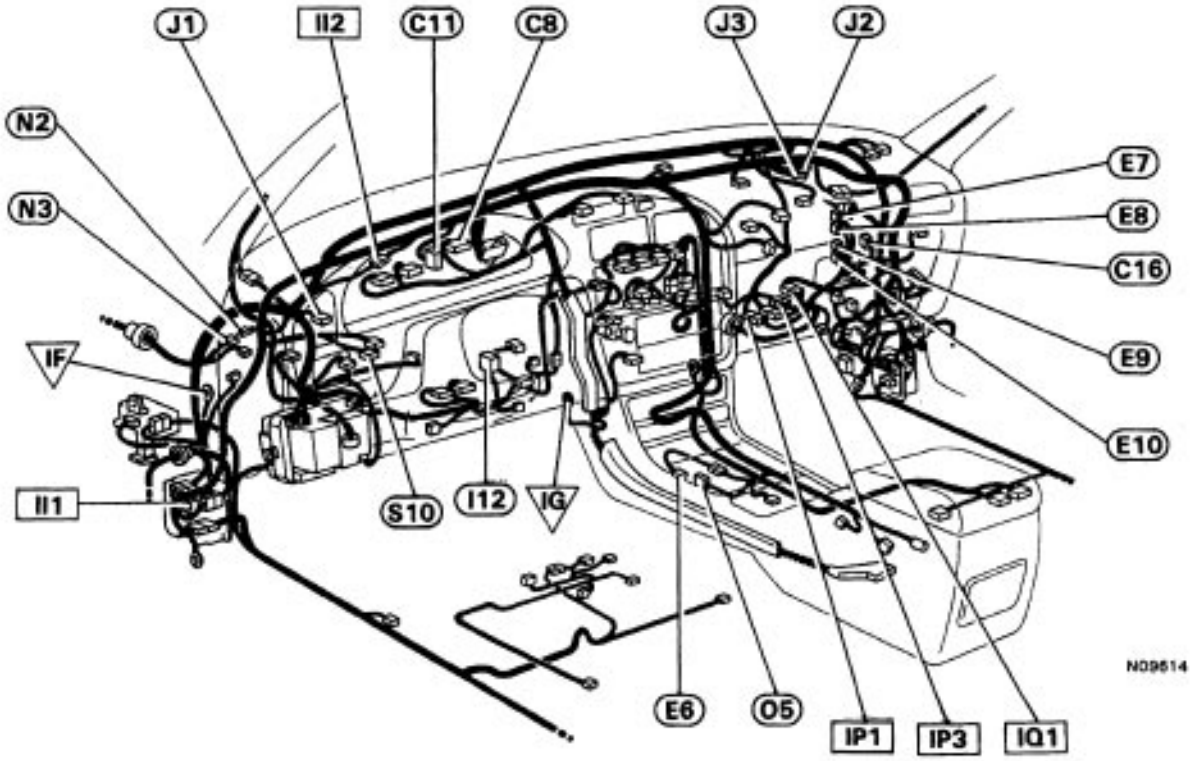


L2
Light Failure Sensor

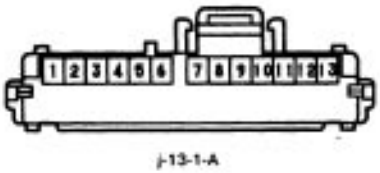
e-12-1

V04863

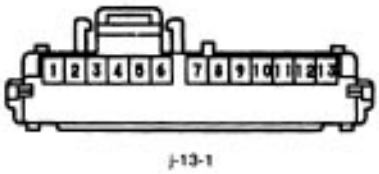
Location of Connectors in Instrument Panel



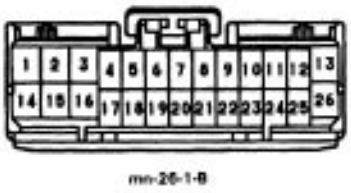
C8
Combination Meter



C11
Combination Meter

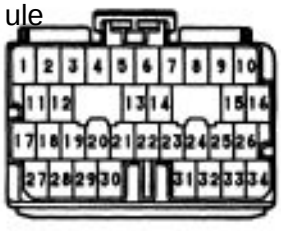


C16
Cruise Control ECU



E6
Electronic Controlled Transaxle Pattern Select Switch

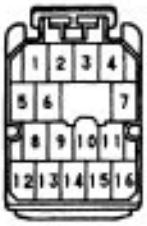
E7
Engine Control Module



E8
Engine Control Module

V04851

E9
Engine Control Module

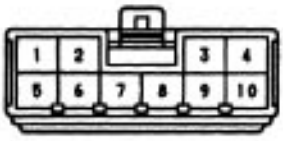


n-16-1

E10
Engine Control Module

n-28-1

112
Ignition SW and Unlock Warning SW



e-1c-1-B

N2
Noise Filter

g-2-2

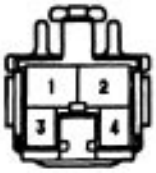
N3
Noise Filter

g-2-1

O5
O/D Main SW

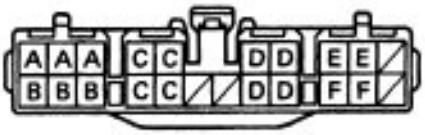
s-4-2-B

S10
Stop Light Switch



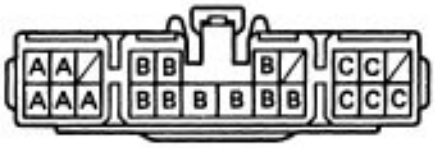
eg-4-1

J1
Junction Connector



e-22-1-A

J2
Junction Connector



e-22-1

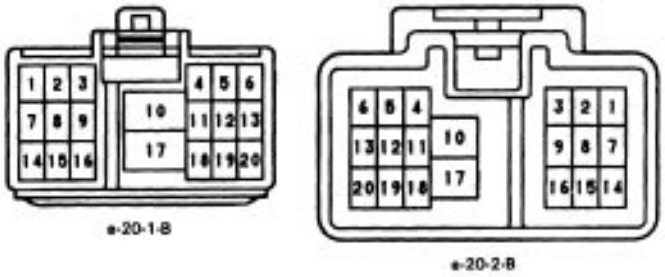
J3
Junction Connector

e-14-1-A

I11

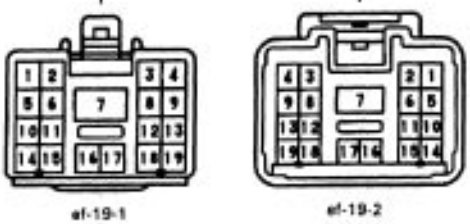
e-10-1
e-10-2

112 **1P1**



e-20-1-B
e-20-2-B

IP3



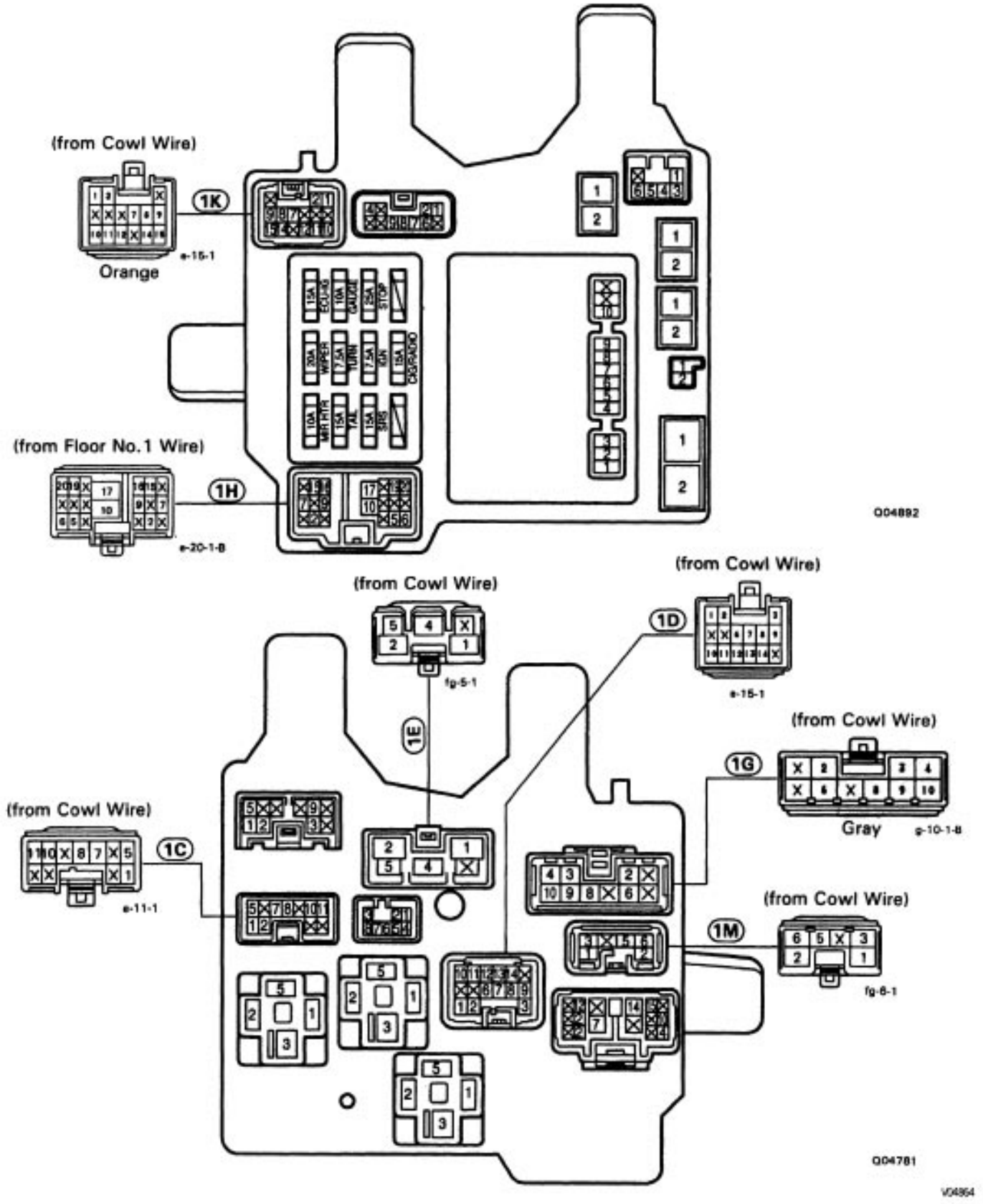
ef-19-1
ef-19-2

Ia1

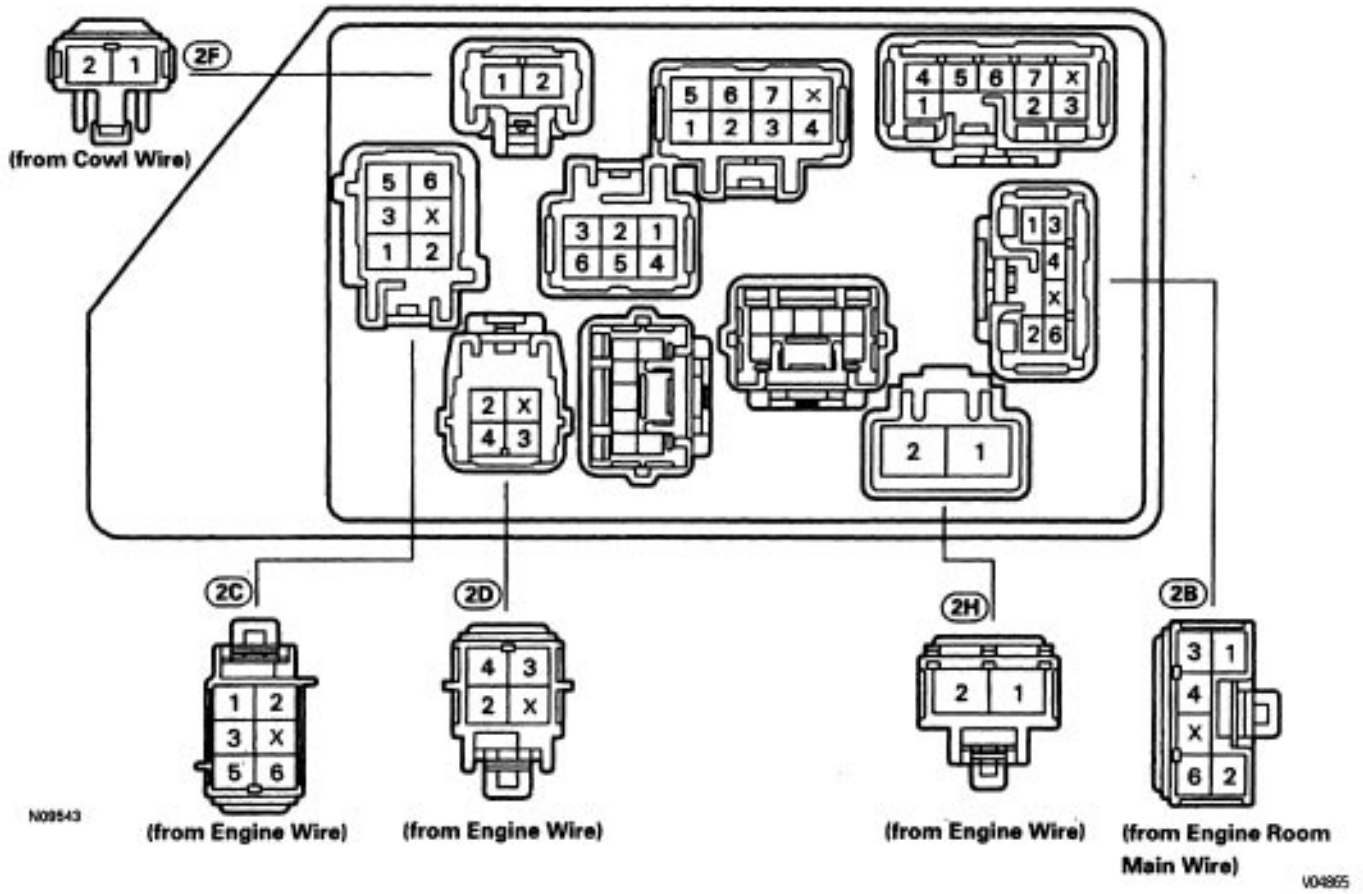
e-6-1
e-6-2

V04852

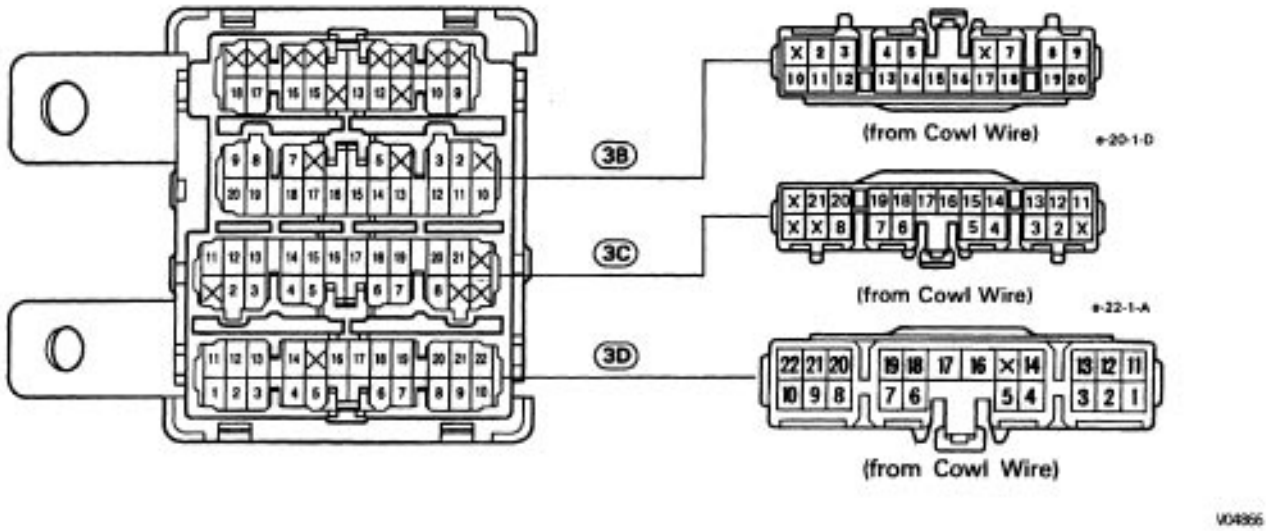
J/B No.1


(from Cowl Wire)
1K
e-15-1
Orange
(from Floor No.1 Wire)
1H
e-20-1-8
Q04892
(from Cowl Wire)
1D
e-15-1
(from Cowl Wire)
fg-5-1
1E
(from Cowl Wire)
1G
Gray
e-10-1-8
(from Cowl Wire)
1C
e-11-1
(from Cowl Wire)
1M
fg-6-1
Q04781
V04864

J/B No.2


2F
(from Cowl Wire)
2C
(from Engine Wire)
2D
(from Engine Wire)
2H
(from Engine Wire)
2B
(from Engine Room Main Wire)
N09543
V04865

J/B No–3


3B
3C
3D
(from Cowl Wire)
(from Cowl Wire)
(from Cowl Wire)
V04866

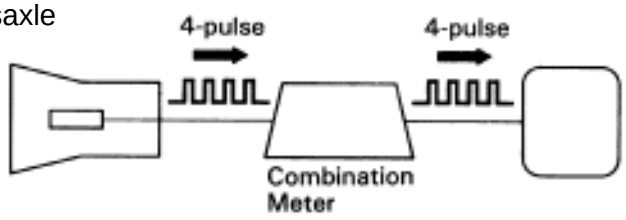
CIRCUIT INSPECTION

DTC P0720 Output Speed Sensor Circuit Malfunction (For Electronically Controlled Transaxle)

CIRCUIT DESCRIPTION

The vehicle speed sensor outputs a 4–pulse signal for every revolution of the transaxle differential.
After this signal has been converted into a more precise rectangular wave form by the wave form shaping circuit inside the combination meter, it is then transmitted to the ECM.

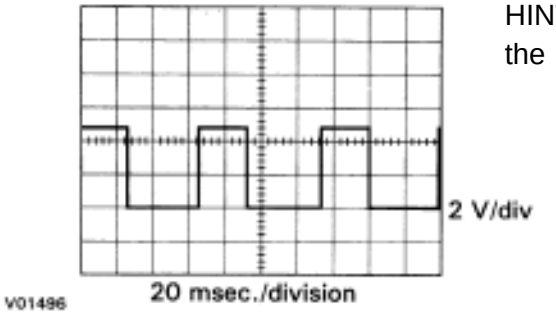
Transaxle



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0720	When DTC No. P0500 is detected	• Same as for DTC No. P0500

< Reference >

- Waveform between terminals SP 1 and E l when vehicle speed is approx. 20 km/h (12 MPH).

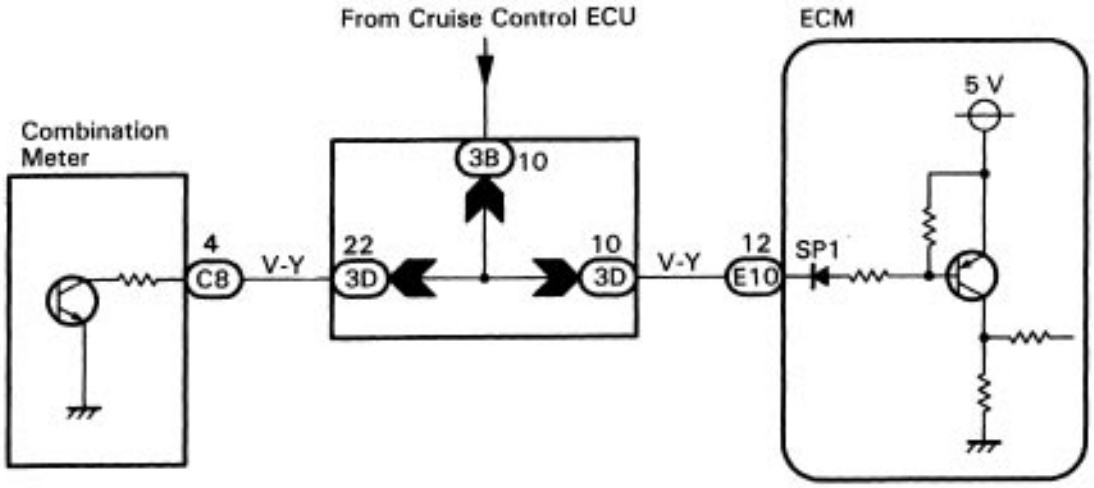


HINT: The greater the vehicle speed, the greater the number of VSS signals produced.

DIAGNOSTIC CHART

1	Measure voltage between terminals SP 1 and E, of ECM connector.	NG	Go to step 3
OK			
2	Measure voltage between terminal 14 of combination meter center connector and body ground.	NG	Check for open circuit between ECM and combination meter.
OK			
Check combination meter.		NG	Check for short circuit between ECM, cruise control ECU and combination meter.
3	Check continuity between terminal SP1 of ECM connector and body ground.		
OK			
Replace ECM.			

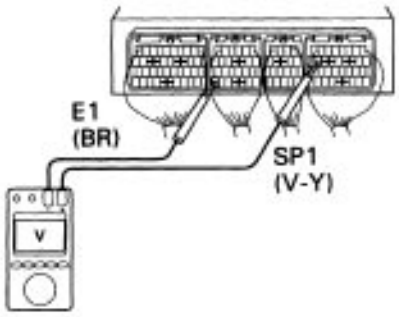
WIRING DIAGRAM



Q04759

INSPECTION PROCEDURE

1 **Measure voltage between terminals SP 1 and E 1 of ECM connector.**



QO1558

P 1. Disconnect cruise control ECU connector.
2. Turn IG switch ON.

C Measure voltage between terminals SP1 and E1 of ECM connector.

OK **Voltage: 5 V**

OK → NG → **Go to step 3.**

2 **Measure voltage between terminal 14 of combination meter center connector and body ground.**

Q04767

P 1. Remove the combination meter, but do not disconnect the connectors.
2. Turn 1 G switch ON.

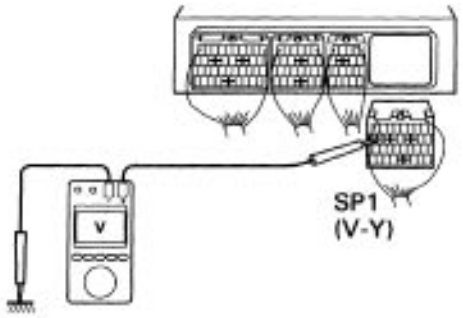
C Measure voltage between terminal 4 of combination meter connector and body ground.

OK **Voltage: 5 V**

OK → NG → **Check for open circuit between ECM and combination meter.**

Check combination meter.

3 Check continuity between terminal SP1 of ECM connector and body ground.



Q004757

P Disconnect connector from ECU.

C Check continuity between terminal SP1 of ECM connector and body ground.

OK **No continuity**

OK

NG **Check for short circuit between ECM, cruise control ECU and combination meter.**

Replace ECM.

DTC P0750 Shift Solenoid A Malfunction Shift Solenoid No.1
DTC P0755 Shift Solenoid B Malfunction Shift Solenoid No.2

SYSTEM DESCRIPTION

The ECM uses signals from the NC2 revolution sensor and vehicle speed sensor to detect the actual gear position(1 st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0750 P0755	During normal driving the gear required by the ECM does not match the actual gear. (2 trip detection logic)	• Shift solenoid valve No.1lNo.2 is stuck open or closed. • Valve body is blocked up or stuck.

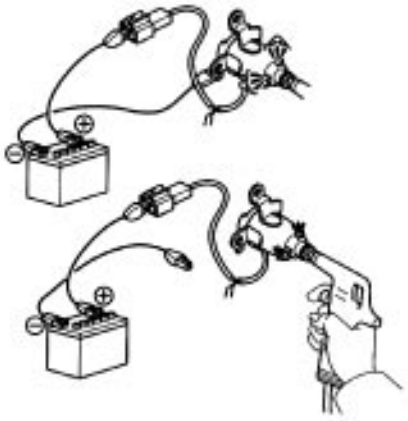
Check the No. 1 solenoid when diagnostic trouble code P0750 is output and check No.2 solenoid when diagnostic trouble code P0755 is output

DIAGNOSTIC CHART

1	Check solenoid valve No. 1 or No. 2 opera–tion.	NG	Replace No. 1 or No. 2 solenoid valve.
OK			
2	Check valve body (See page AX2–82).	NG	Repair or replace valve body.
OK			
Repair or replace transaxle (See page AX2–27).			

INSPECTION PROCEDURE

1 Check solenoid valve No. 1 or No.2 operation.



G04773

P
1. Remove the oil pan.
2. Remove the No. 1 or No. 2 solenoid valve.

C
1. Applying 490 kPa (5 kg/flcm2, 71 psi) of com–pressed air, check that the solenoid valves do not leak the air.
2. When battery voltage is supplied to the solenoid valves, check that the solenoid valves open.

OK

NG → **Replace No. 1 or No.2 solenoid valve.**

2 Check valve body (See page AX2–82).

OK

NG → **Repair or replace valve body.**

Repair or replace transaxle (See page AX2–27).

DTC P0753 Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No. 7)
DTC P0758 Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No. 2)

CIRCUIT DESCRIPTION

The ECM controls the shifting from 1st to O/D in combination with ON and OFF of the shift solenoid valves No. 1 and No. 2. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Fail Safe Function

If either of the shift solenoid valve circuits develops an open or a short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be perform–ed electronically and must be done manually.

Manual shifting as shown in the following table must be done. (in the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No. 1	No. 2		No. 1	No.2		No. 1	No. 2		
D	ON	OFF	1 st	×	ON	3rd	ON	×	1 st	O/D
	ON	ON	2nd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	O/D
2	ON	OFF	1 st	×	ON	3rd	ON	×	1 st	O/D
	ON	ON	2nd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	O/D
L	ON	OFF	1 st	×	OFF	1 st	ON	×	1 st	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1 st	1 st

x; Malfunctions

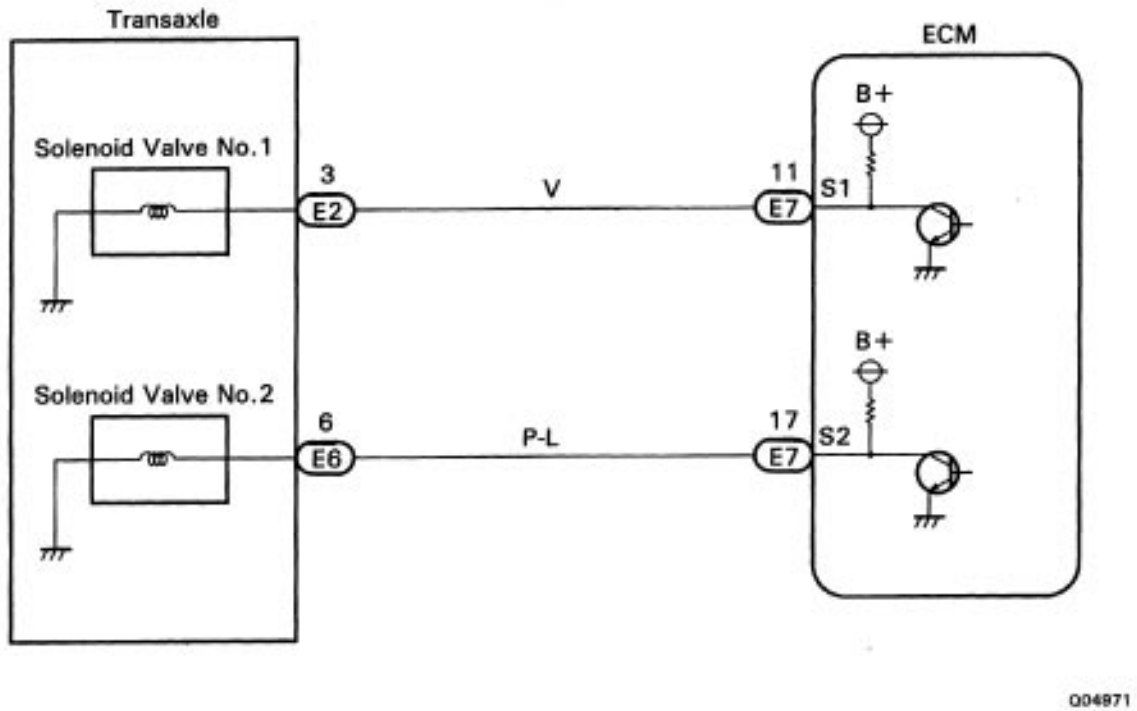
Check the shift solenoid valve No. 1 when diagnostic trouble code P0753 is output and check the shift solenoid valve No.2 when diagnostic trouble code P0758 is output.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0753 **P0758**	Short or open in shift solenoid valve No. 1 l No. 2 circuit.	• Shift solenoid valve No. 1 INo.2 circuit. • Shift solenoid valve No. 1INo.2. • ECM

DIAGNOSTIC CHART

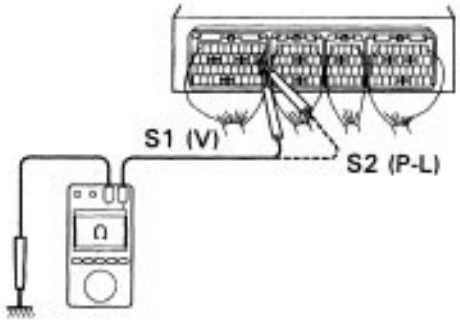
1	Measure resistance between S 1 or S2 terminal of ECM connector and body ground.	OK	Replace ECM.
NG			
2	Check harness and connector between ECM and automatic transaxle solenoid connector.	NG	Repair or replace harness or connector.
OK			
3	Inspect No.1 or No.2 solenoid valve.	NG	Replace malfunctioned solenoid valve.
OK			
Repair or replace solenoid wire.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Measure resistance between S 1 or S2 terminals of ECM connector and body ground.



Q04756

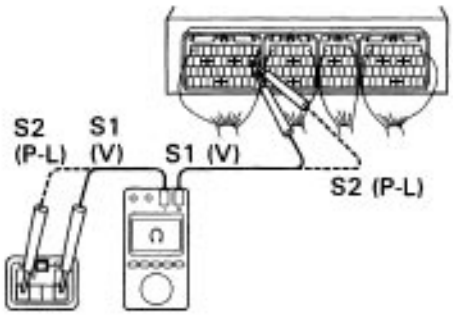
C Measure resistance between S 1 or S2 terminals of ECM connector and body ground.

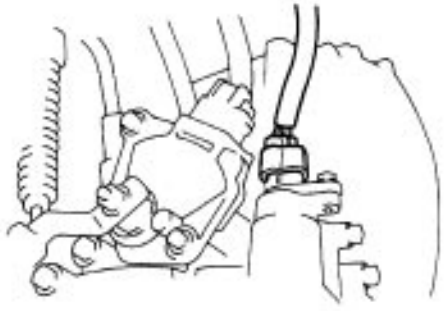
OK **Resistance: 10–16 9**

NG

OK **Replace ECM.**

2 Check harness and connector between ECM and automatic transaxle solenoid connector.





Q04748
Q02283

P Disconnect the solenoid connector on the automatic transaxle.

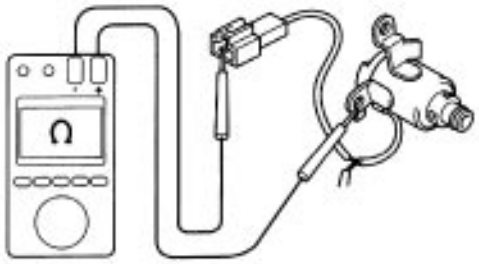
C Check harness and connector between S 1 and S2 terminals of ECM connector and 3 terminals of solenoid connector.

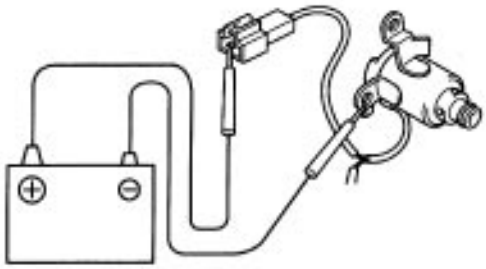
OK **There is no open and no short circuit.**

OK

NG **Repair or replace harness or connector.**

3 Check No. 1 or No.2 solenoid valves.





G04771
G04772

P 1. Jack up the vehicle.
2. Remove oil pan.
3. Disconnect solenoid connector.
4. Remove No. 1 or No. 2 solenoid valve.

C Measure resistance between solenoid connector and body ground.

Resistance: 10–16 Ω

OK Connect positive⊕ lead to terminal of solenoid connector, negative⊖ lead to solenoid body

C

OK **The solenoid makes an operating noise.**

OK

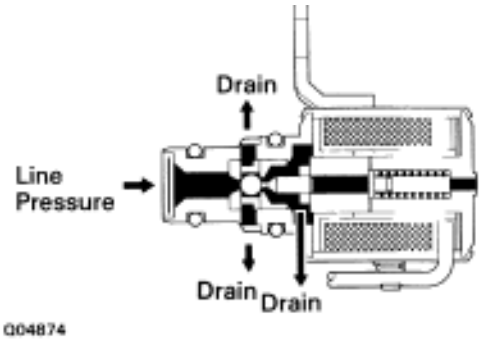
NG **Replace solenoid valve.**

Repair or replace solenoid wire.

DTC P0770 Shift Solenoid E Malfunction (Shift Solenoid Valve SL)

SYSTEM DESCRIPTION

The ECM uses the signals from the NC2 revolution sensor and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter.



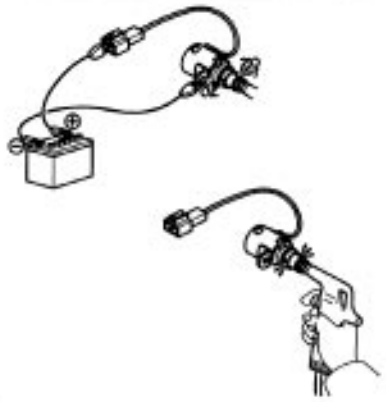
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0770	Lock–up does not occur when driving in the lock–up range (normal driving at 50mph [80kmlh]. Or lock–up remains ON in the lock–up OFF range. (2 trip detection logic)	• Shift solenoid valve SL is stuck open or closed. • Valve body, blocked up or stuck. • Lock–up clutch.

DIAGNOSTIC CHART

1	Check solenoid valve SL operation.	NG	Replace solenoid valve SL.
OK			
2	Check valve body (See page AX2–82).	NG	Repair or replace valve body.
OK			
Replace torque converter clutch (See page AX2–27).			

INSPECTION PROCEDURE

1 Check solenoid valve SL operation.



D04770

P Remove SL solenoid valve from valve body.

C
1. Applying 490 kPa (5 kgf/cm2, 71 psi)of com–pressed air, check that the solenoid valves do not leak air.
2. When battery voltage is supplied to the solenoid valves, check that the solenoid valves open.

OK

NG → **Replace solenoid valve SL.**

2 Check valve body (See page AX2–82).

OK

NG → **Repair or replace valve body.**

Replace torque converter clutch.

DTC P0773 Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.

Fail Safe Function

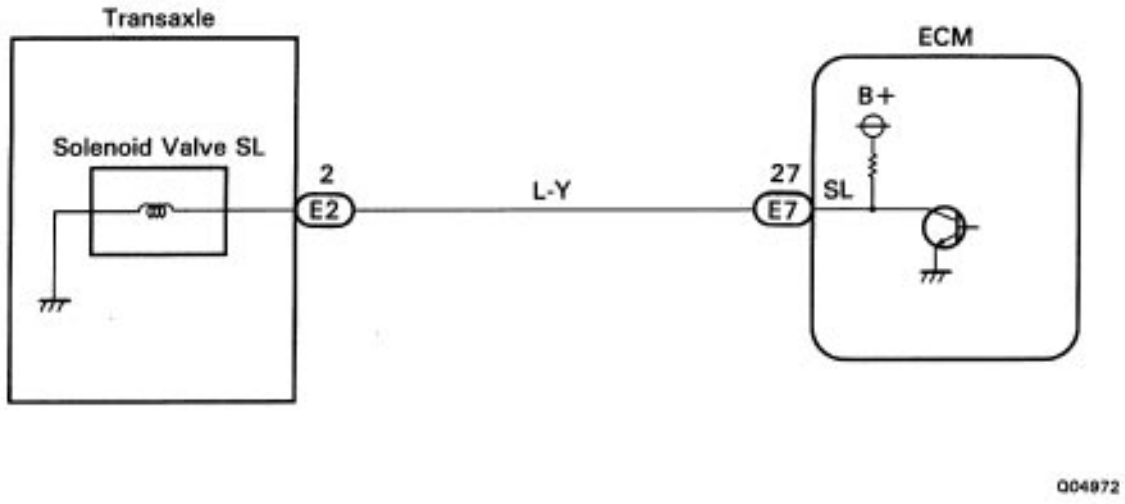
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0773	Open or short in shift solenoid SL circuit for 1 time. (2 trip detection logic)	• Open or short in shift solenoid valve SL circuit. • Shift solenoid valve SL. • ECM

DIAGNOSTIC CHART

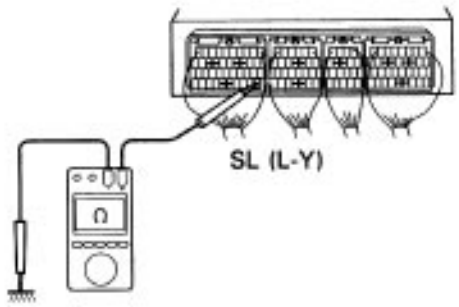
1	Measure resistance between terminals SL and E, of ECM connector.	OK	Replace ECM.
NG			
2	Check harness and connector between ECM and automatic transaxle.	NG	Repair or replace harness or connector between ECM and automatic transaxle solenoid connector.
OK			
3	Check SL solenoid valve.	NG	Replace SL solenoid valve.
OK			
Check and replace or repair the solenoid wire.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Measure resistance between terminals SL of ECM connector and body ground.



Q04755

P Disconnect connector from the ECM.

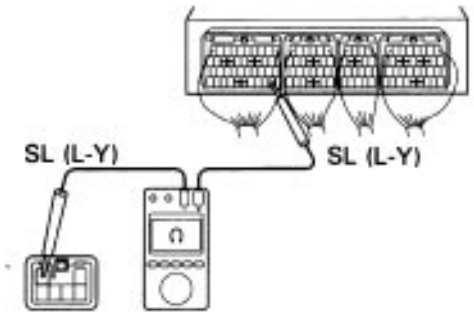
C Measure resistance between terminals SL and E, of the ECM.

OK **Resistance: 8–100,000Ω**

NG

OK **Replace ECM.**

2 Check harness and connector between ECM and automatic transaxle.



Q04749

P 1. Disconnect the connector from the ECM.
2. Disconnect the solenoid connector from the transaxle.

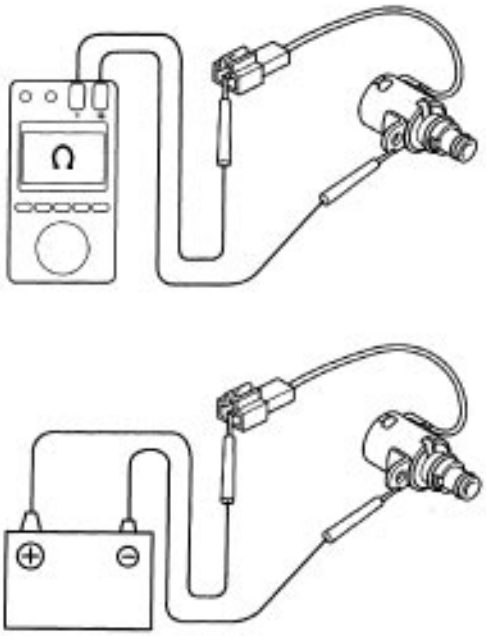
C Check harness between terminal SL of the ECM connector and terminal 3 of automatic transaxle solenoid connector.

OK **There is no open or short circuit.**

OK

NG **Repair or replace harness or connector between ECM connector and automatic transaxle solenoid connector.**

3 Check SL solenoid valve.



G04774
G04775

P
1. Jack–up the vehicle.
2. Remove oil pan.
3. Disconnect SL solenoid valve connector.
4. Remove SL solenoid valve.

C
Measure resistance between SL solenoid connec–tor terminal and its body ground.

OK
Resistance: 10–16 9

C
Check SL solenoid valve operation noise when applying battery voltage to the solenoid connec–tor terminal and it's body.

OK
The SL solenoid valve makes operation noise.

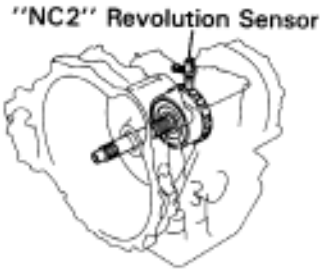
OK

NG → **Replace SL solenoid valve.**

Check and replace or repair the solenoid wire.

DTC PI705 “NC2” Revolution Sensor Circuit Malfunction (Direct Clutch Speed Sensor)

CIRCUIT DESCRIPTION



Q04869

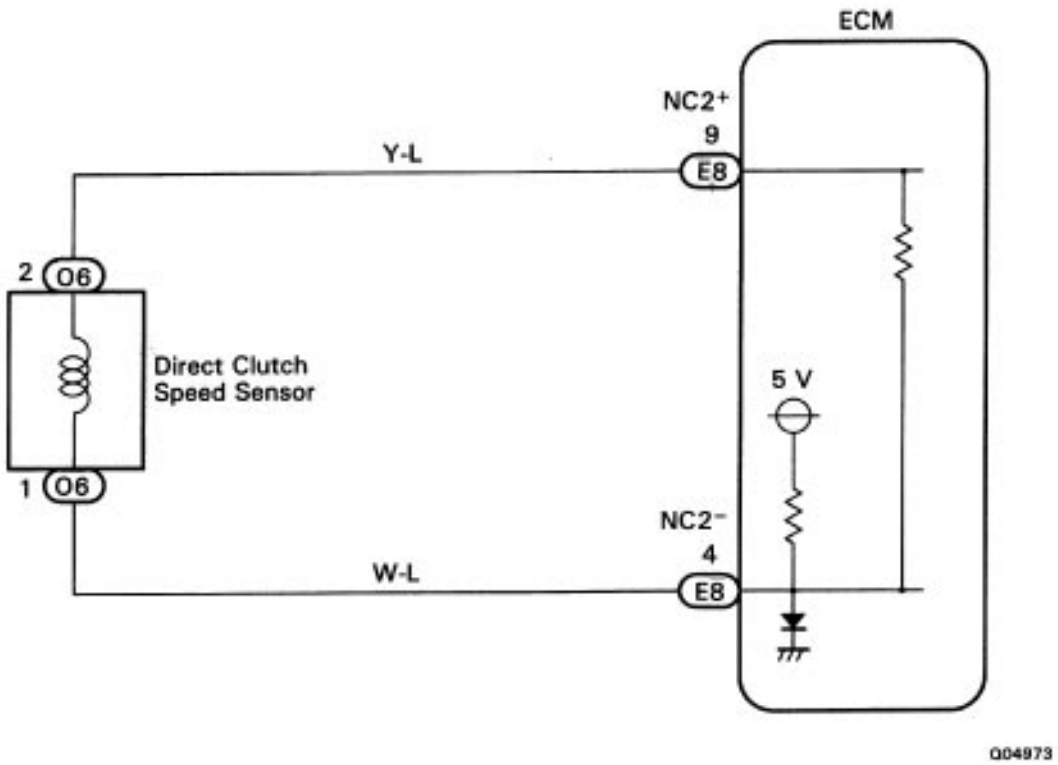
This sensor detects the rotation speed of the direct clutch drum. By comparing the direct clutch speed signal and the vehicle speed sensor signal, the ECM detects the shift timing of the gears and ap–propriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shif–ting.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1705	Out put of direct clutch speed sensor (NC2) is 300 rpm or less under condition a) and b). a) Vehicle speed: 32 km/h (20 mph) or more b) Park/neutral position switch: OFF (2 trip detection logic)	• Open or short in direct clutch speed sen–sor circuit. • Direct clutch speed sensor. • ECM

DIAGNOSTIC CHART

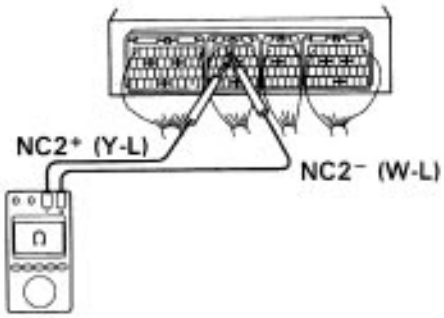
1	Check resistance between terminals NC2+ and NC2–of ECM connector.	OK	Replace ECM.
NG			
2	Check direct clutch speed sensor.	NG	Replace direct clutch speed sen–sor.
OK			
Check and repair harness and connector between ECM and O/D direct clutch speed sensor.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check resistance between terminals NC2+ and NC2–of ECM connector.



C Check resistance between terminals NC2+ and NC2–of ECM connector.

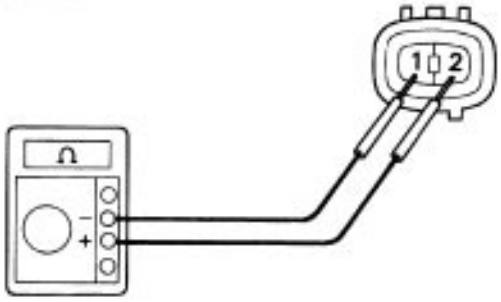
OK **Resistance: 560–680 9**

Q04754

NG

OK → **Replace ECM.**

2 Check direct clutch speed sensor.



P Remove direct clutch speed sensor.
(See page AX2–1 5)

C Measure resistance between terminals 1 and 2 of speed sensor.

OK **Resistance: 560–680II**
〈 Reference 〉
Check the speed sensor's function

C Check voltage between terminals 1 and 2 of the speed sensor when a magnet is put close to the front end of the speed sensor then taken away quickly.

OK **Voltage is generated intermittently.**

Hint **The voltages generated is extremely low.**

AT5629
Q04949

OK

NG → **Replace direct clutch speed sensor.**

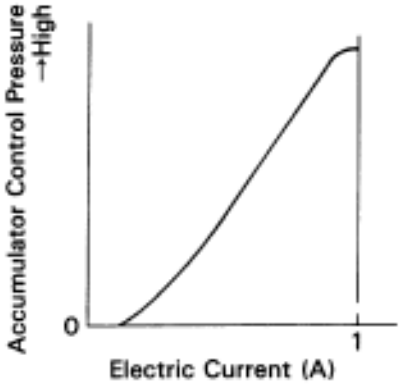
Check and repair harness and connector between ECM and direct clutch speed sensor.

–MEMO–

DTC P1765 Shift Solenoid Valve SLN Circuit (For Accumulator Back Pressure Modulation)

CIRCUIT DESCRIPTION

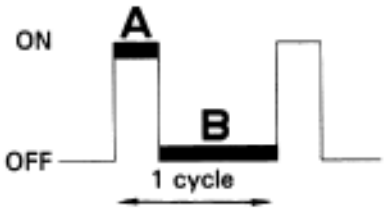
The shift solenoid valve SLN controls the hydraulic pressure acting on the accumulator control valve when gears are shifted and per–forms smooth gear shifting.
The ECM determines optimum operating pressure according to the signals from the throttle position sensor, vehicle speed sensor and direct clutch speed sensor and controls the volume of current flow to the solenoid valve.
The amount of current to the solenoid is controlled by the (*) duty ratio of ECM output signals, causing a momentary change to the hydraulic pressure acting on the clutches during gear shifting.
When the duty ratio is high, the hydraulic pressure acting on the clutches is low.



AT5808

(*) Duty Ratio
The duty ratio is the ratio of the period of continuity in one cycle.
For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

$$\text{Duty Ratio} = \frac{A}{A+B} \times 100\%$$

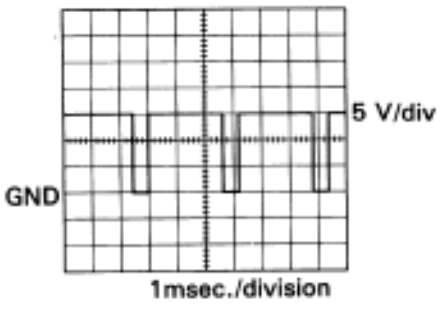


8E4056

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1765	After the engine is warmed up, the current flow to the shift solenoid valve SLN is 0.2A or less for at least 1 sec. under condition ay or b). (2 trip detection logic) aj Engine speed: 500 rpm or more b) Park/neutral position switch: ON (P or N position)	• Open or short in shift solenoid valve SLN circuit. • Shift solenoid valve SLN. • ECM

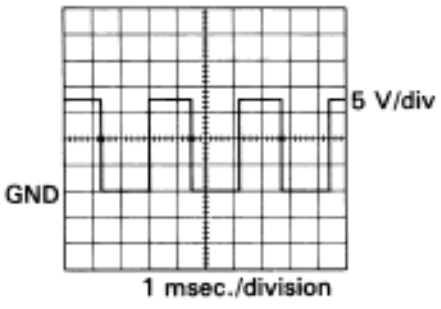
< Reference >

- Waveform between terminals SLN– and E 1 when engine is idling.



AT8764

- Waveform between terminals SLN– and E 1 during shift change.



AT8766

DIAGNOSTIC CHART

1	Check solenoid valve SLN.	NG	Replace solenoid valve SLN.

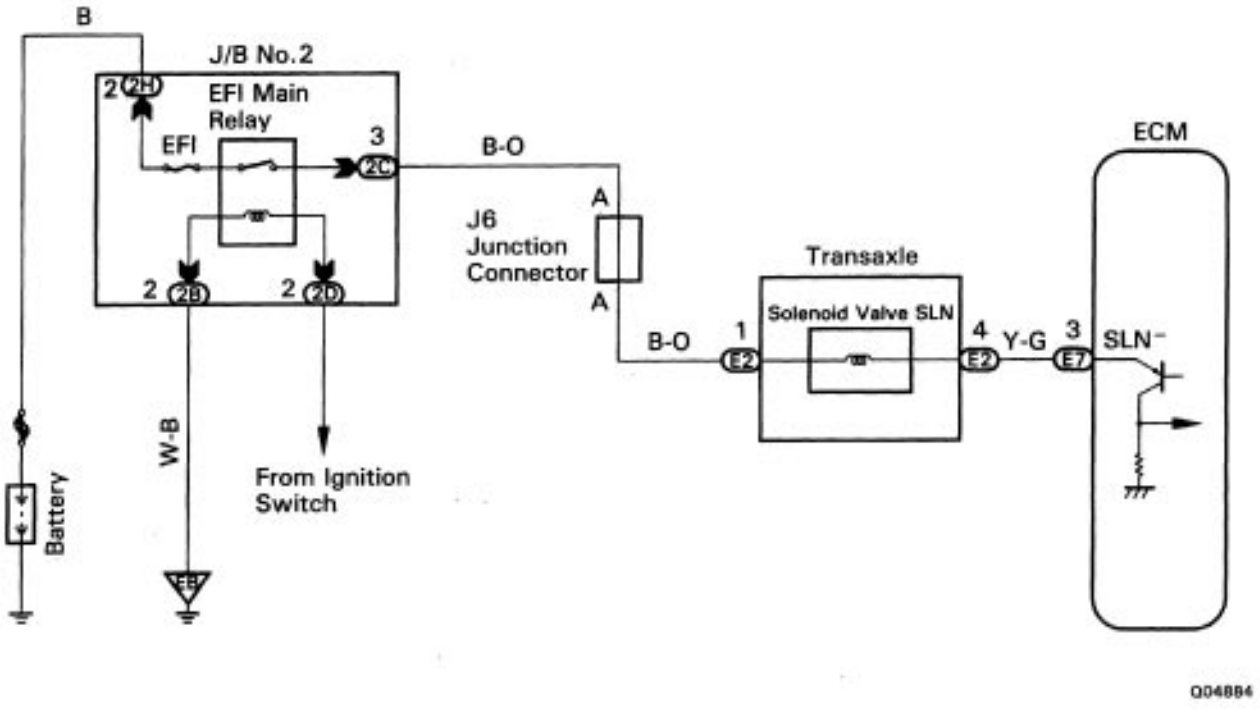
OK

2	Check harness and connector between battery and solenoid valve SLN, solenoid valve SLN and ECM (See page IN–31).	NG	Repair or replace harness or connector.

OK

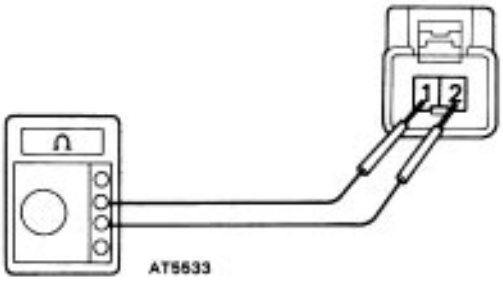
Replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check shift solenoid valve SLN.

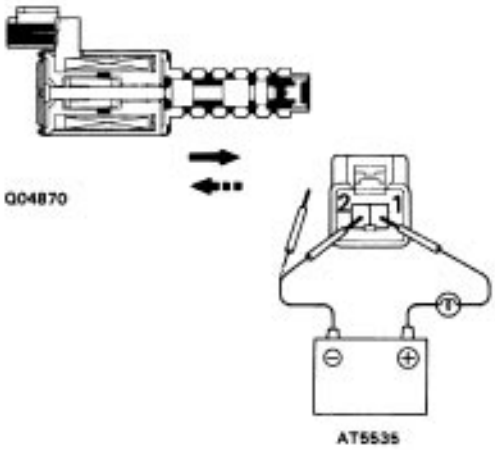


Check solenoid resistance

P 1. Jack up the vehicle.
2. Remove oil pan.
3. Disconnect the connector.

C Measure resistance between terminals 1 and 2 of solenoid connector.

OK **Resistance: 5.1–5.5 9**

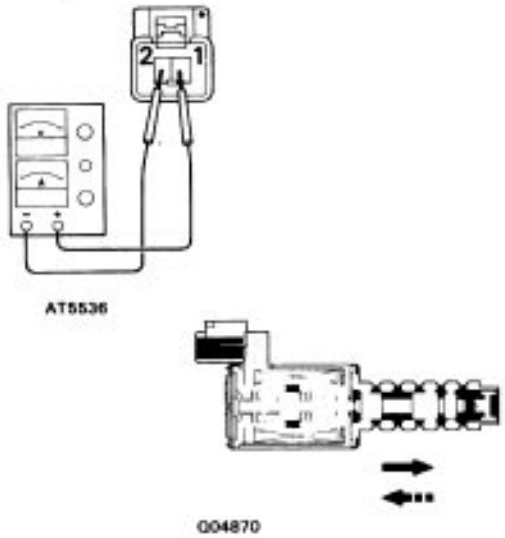


Check solenoid operation

C Connect positive ⊕ lead with an 8–10 w bulb to terminal 1 of solenoid connector and negative⊖ lead to terminal 2, then check the movement of the valve.

OK

When battery voltage is applied.	Valve moves in mm1 ➡ direction in illustration. (on the left)
When battery voltage is cut off.	Valve moves in ⬅ direction in illustration. (on the right)



< Reference >

Check solenoid operation

C 1. Prepare a variable power supply.
2. Connect positive ⊕ lead of the variable power supply to terminal 1 of solenoid connector and negative 0 lead to terminal 2.
3. Check the movement of the valve when the voltage is gradually increased. (A current greater than 1 A should not be supplied.)

OK **As the voltage is increased, the valve should move slowly in the ➡ direction.**

C 4. Check the movement of the valve when the voltage is cut off.

OK **The valve should return in the ⬅ direction.**

OK

NG **Replace solenoid valve SLN.**

2	**Check harness and connector between battery and shift solenoid valve SLN, shift solenoid valve SLN and ECM (See page IN–31).**

OK

Replace ECM.

NG

Repair or replace harness or connector.

DTC P1780 Park Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to ECM.
The ECM receives signals (R, NSW, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in the D position.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P 1780	Two or more switches are ON simultaneously for "N", "2" and "L" position. (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions a) and b) for 30 seconds or more, the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed: 44 mph (70 km/h) or more b) Engine speed: 1,500–2,500 rpm	

DIAGNOSTIC CHART

1 Check voltage between terminal R, NSW, 2, L of ECM connector and body ground.

OK → Proceed to next circuit inspection shown on matrix chart (See page AX2–8 1).

NG

2 Check PNP switch.

NG → Replace PNP switch.

OK

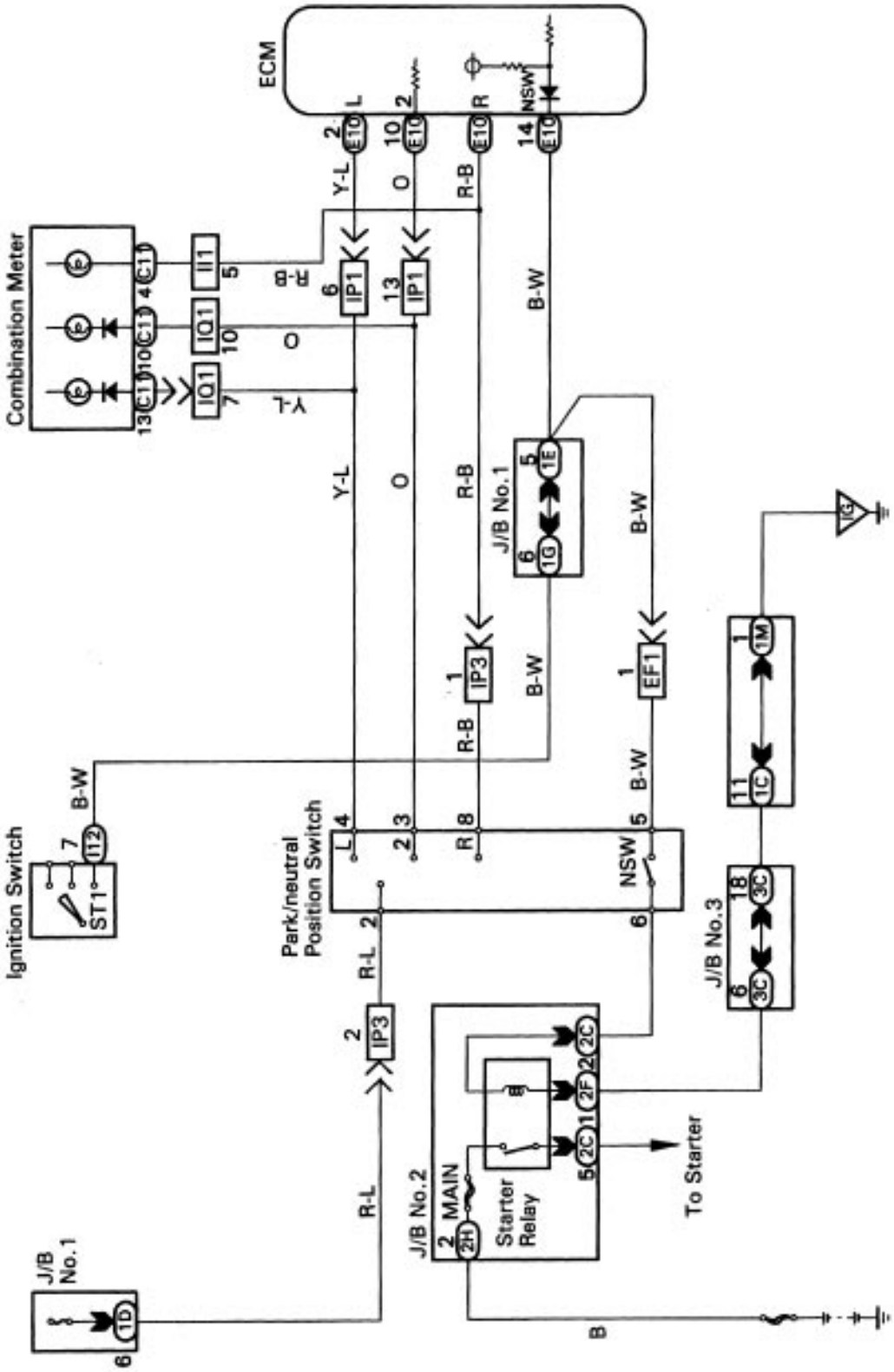
3 Check harness and connector between ECM and PNP switch, PNP switch and battery.

NG → Repair or replace harness or connector.

OK

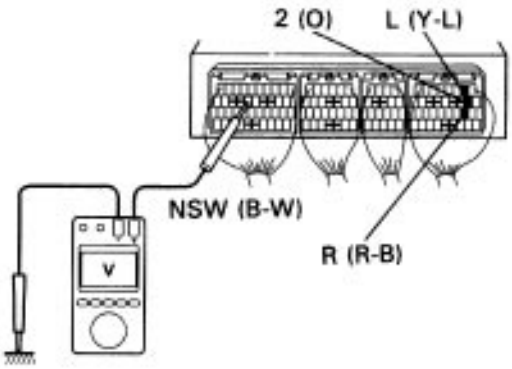
Check and replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminal R, NSW, 2, L of ECM connector and body ground.**



Q04750

P Turn ignition switch ON.

C Measure voltage between terminals R, NSW, 2, L of ECM connector and body ground when the shift lever is shifted to the following positions.

OK

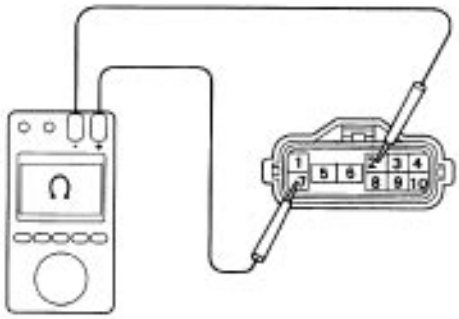
Position	R–body ground	NSW–body ground	2–body ground	L–body ground
P, N	0 V	0 V	0 V	0 V
R	10–14V*	10–14V*	0 V	0 V
D	0 V	10–14V	0 V	0 V
2	0 V	10–14V	10–14 V	0 V
L	0 V	10–14V	0 V	10–14V

*: The voltage will drop slightly due to lighting up of the back up light.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

2 **Check PNP switch.**



Q04767

[ ] Remove PNP switch (See page AX2–16).

[ ] Check continuity between each terminal shown below when the shift lever is shifted to each position.

○—○ Continuity

Shift Position \ Terminal	5	6	2	7	8	9	10	3	4
P	○—○		○—○						
R			○	—○					
N	○—○		○		—○				
D			○			—○			
2			○				—○		
L			○					—○	

OK

NG → **Replace PNP switch.**

3	**Check harness and connector between ECM and PNP switch, PNP switch and battery.**

OK

Check and replace ECM.

NG

Repair or replace harness and connector.

OD Cancel Signal Circuit

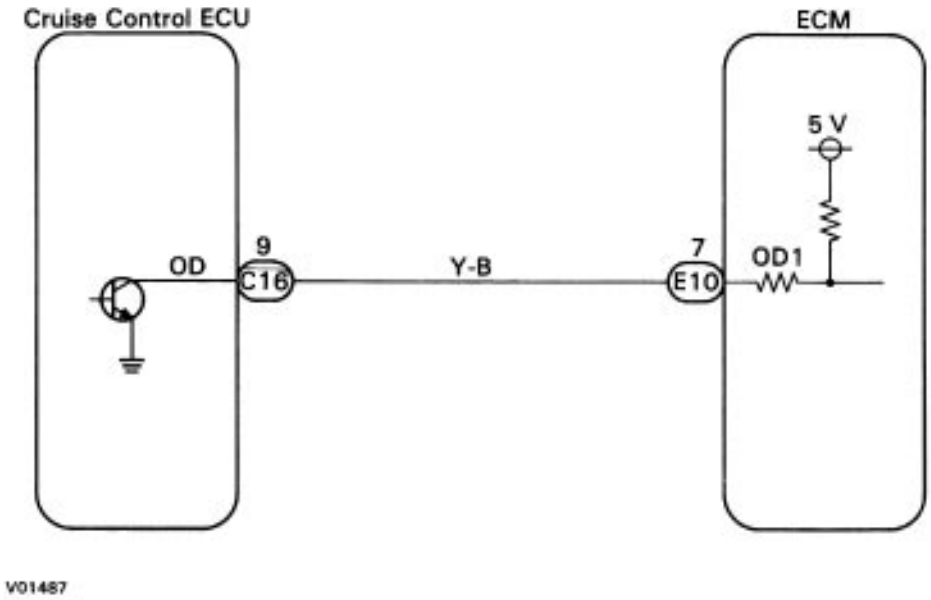
CIRCUIT DESCRIPTION

While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruis–ing, overdrive may be prohibited temporarily in some conditions.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels overdrive shif–ting until these signals are discontinued.

DIAGNOSTIC CHART

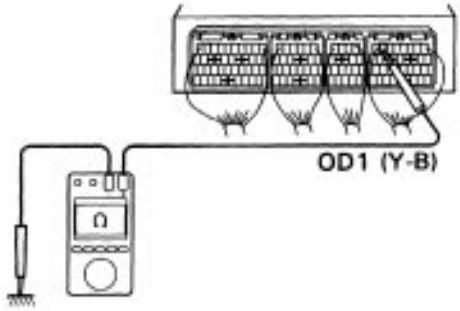
1	Check voltage between terminal OD 1 of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See Page AX2–81).
NG			
2	Check voltage between terminal OD of cruise control ECU harness side connector and body ground.	OK	Check and replace cruise control ECU.
NG			
3	Check harness and connector between cruise control ECU and ECM.	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminal OD 1 of ECM connector and body ground.**



Q04753

P Turn ignition switch ON.

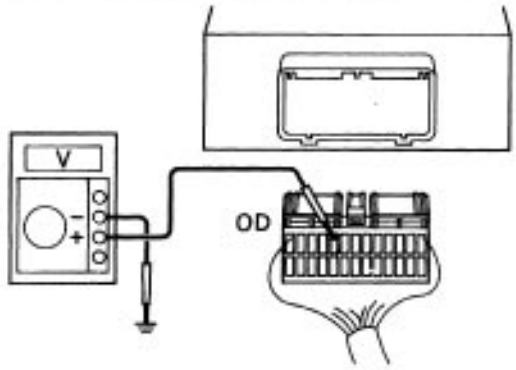
C Measure voltage between terminal OD 1 of ECM connector and body ground.

OK **Voltage: 4–6 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

2 **Check voltage between terminal OD of cruise control ECU harness side connector and body ground.**



BE6653
BE6623

P 1. Disconnect cruise control ECU connector.
2. Turn ignition switch ON.

C Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.

OK **Voltage: 4–6 V**

NG

OK → **Check and replace cruise control ECU.**

3 **Check harness or connector between cruise control ECU and ECM.**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

OD Main Switch & OD OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go off when the switch is pushed in and come on when it is pushed out. In O/D main switch OFF position, the O/D OFF indicator lights up, and the ECM prohibits shifting to overdrive. The ECM also causes the O/D OFF indicator light to blink when a malfunction is detected. In this case, connecting the OBD II scan tool or TOYOTA hand–held tester to the DLC3 can display the diagnostic trouble code.

DIAGNOSTIC CHART

O/D OFF indicator light does not light up.

1	Check operation of O/D main switch.	NG	Go to step 4
OK			
2	Check voltage between terminal OD2 of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX–81).
NG			
3	Check. harness and connector between O/D off indicator light and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			
4	Check O/D main switch.	NG	Replace O/D main switch.
OK			
Check and replace combination meter. (See combination meter troubleshooting)			

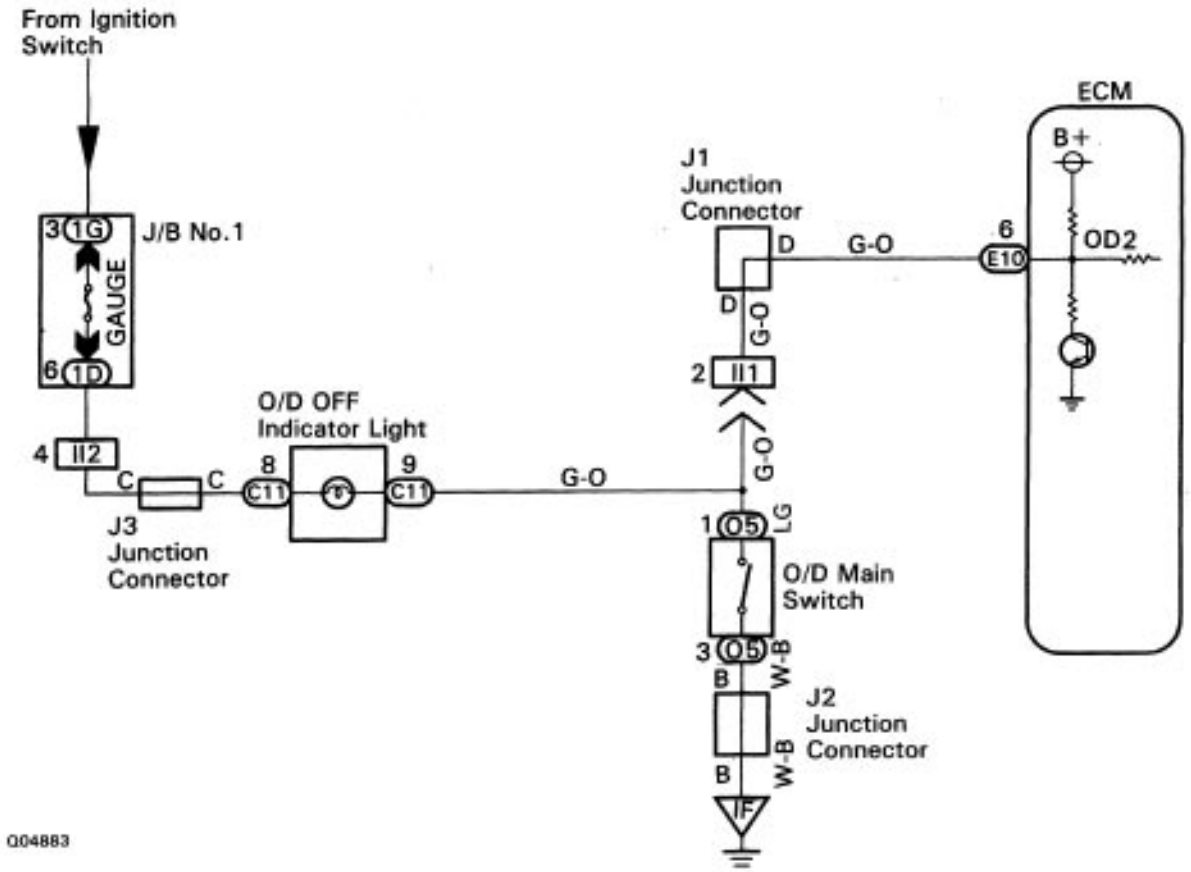
O/D OFF indicator light remains ON

1	Check O/D main switch.	NG	Replace O/D main switch.
OK			
2	Check harness and connector between O/D off indicator light and O/D main switch, O/D off indicator light and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			

O/D OFF indicator light blinks

Perform diagnostic code check (See page **AX2–55**).

WIRING DIAGRAM



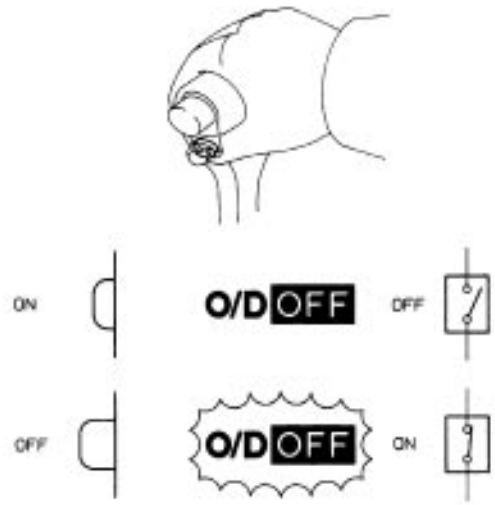
(*) O/D Main Switch

Contacts go off with switch pushed in.

Contacts go on with switch pushed out.

INSPECTION PROCEDURE

1 Check operation of O/D Main Switch.



Q00751
AT5623

C 1. Turn ignition switch ON
2. Check ”O/D OFF” light when O/D main switch is pushed in to ON.

OK **“O/D OFF” light goes off.**

C 3. Check ”O/D OFF” light when O/D main switch is pushed again, to OFF.

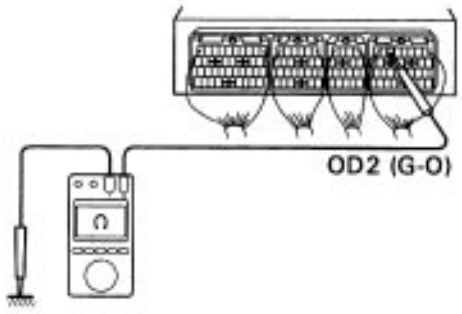
OK “**O/D OFF” light lights up.**

Hint If the–O/D OFF” lights blinks when the O/D main switch is pushed in to ON, a malfunction is occurr–ing in the system.
Check the diagnostic trouble code.

OK

NG **Go to step 4 .**

2 Check voltage between terminal OD2 of ECM connector and body ground.



Q04752

P Turn ignition switch ON.

C Check voltage between terminal OD2 of ECM and body ground.

OK

O/D Main Switch	Voltage
OFF	Below 1 V
ON	10 ^–14 V

NG

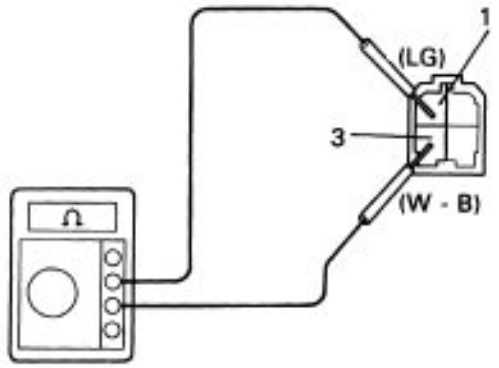
OK **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

3 **Check harness and connector between O/D off indicator light and ECM.**

OK → **Check and replace ECM.**

NG → **Repair or replace harness or connector.**

4 **Check O/D Main Switch.**



AT5529

C

1. Disconnect O/D main switch connector.
2. Measure resistance between terminals 1 and 3 of O/D main switch connector.

OK

O/D Main Switch	Resistance
ON	^ 9 (open)
OFF	0 S2 (continuity)

OK → **Check and replace combination meter. (See combination meter troubleshooting.)**

NG → **Replace O/D Main Switch.**

Pattern Select Switch Circuit

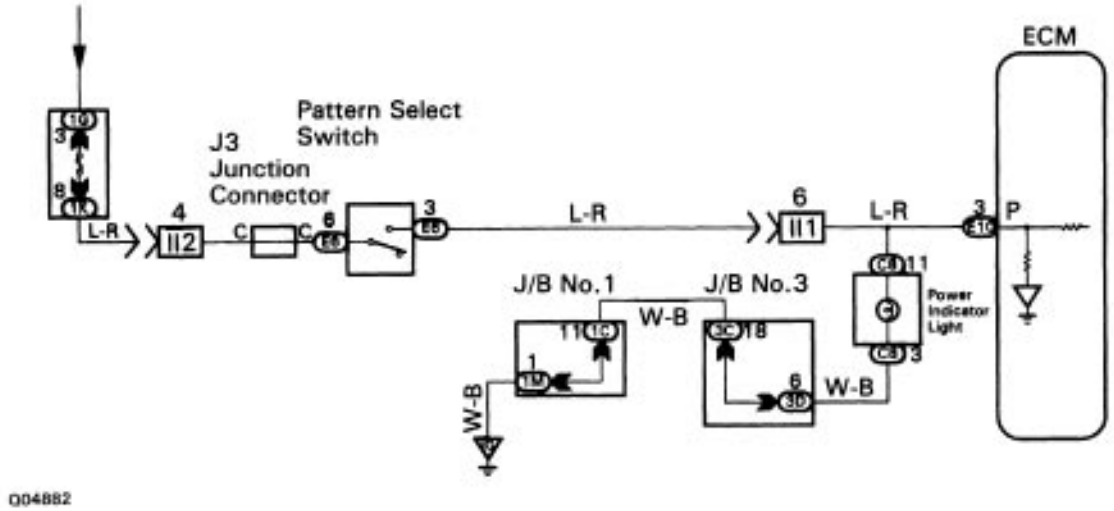
CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 position, and L position and the lockup patterns. Following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors the ECM switches the solenoid valves ON and OFF, thereby controlling the transaxle gear change and the lockup clutch operation.

DIAGNOSTIC CHART

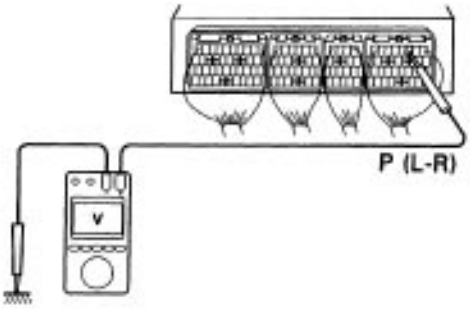
1	Check voltage between terminal P of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX2–81) .
NG			
2	Check pattern select switch.	NG	Replace pattern select switch.
OK			
3	Check harness and connector between ECM and pattern select switch, pattern select switch and battery (See page IN–31).	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check voltage between terminal P of ECM connector and body ground.



Q04751

P Turn ignition switch ON.

C Measure voltage between terminal P of ECM connector and body ground when the pattern select switch is set to the PWR (POWER) position and NORM (NORMAL) position.

OK

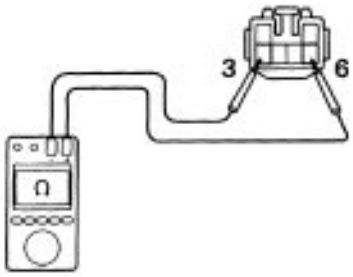
Pattern select switch	Voltage
PW R	10–14 V
NORM	Below 1 V

Hint **The ECU uses the normal pattern signal if the power signal is not input.**

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

2 Check pattern select switch.



Q04768

P Disconnect pattern select switch connector. (See BO–section)

C Measure resistance between terminals 3 and 6 of pattern select switch connector when the select switch is set to PWR and NORM positions.

OK

Pattern	Resistance
PWR	0 Q (continuity)
NORM	^ 0 (open)

OK

NG **Replace pattern select switch.**

3 Check harness and connector between ECM and pattern select switch, pattern select switch and battery (See page IN–31).

OK

NG **Repair or replace harness or connector.**

Check and replace ECM.

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

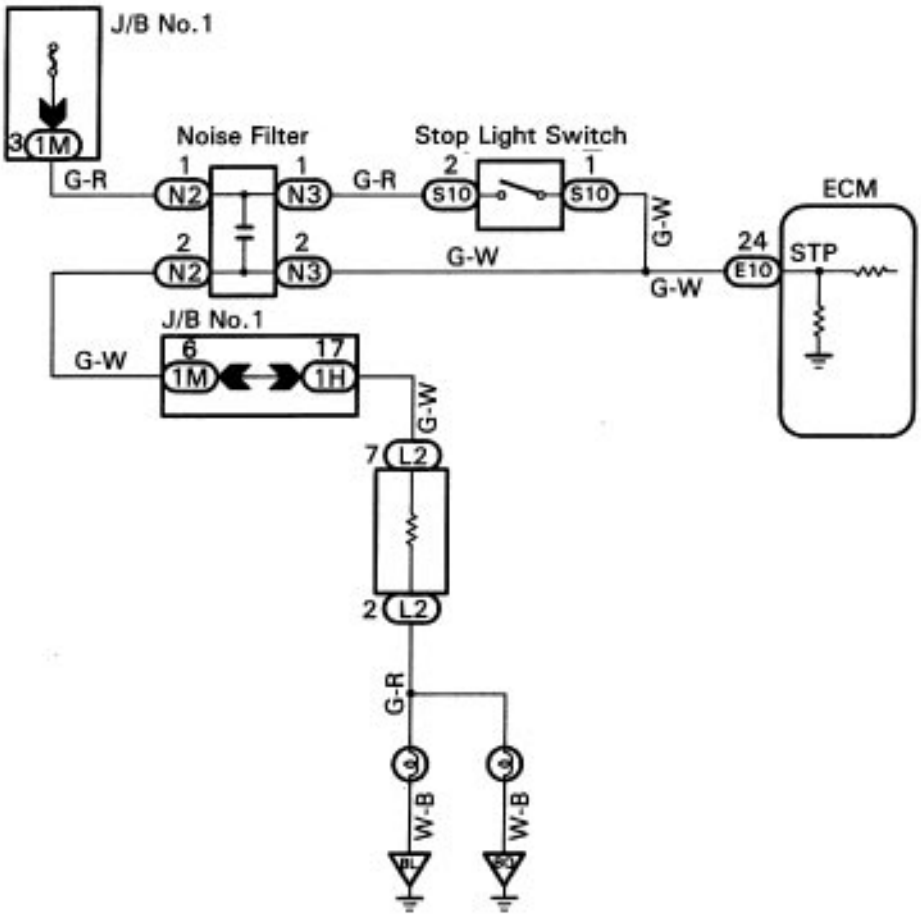
The purpose of this circuit is to prevent the engine from stalling, while driving in lockup condition, when brakes are suddenly applied.

When the brake pedal is operated, this switch sends a signal to ECM. Then the ECM cancels operation of the lockup clutch while braking is in progress.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Check and repair stop light circuit.
OK			
2	Connect the TOYOTA hand–held tester and check STP signal.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX2–8 1).
NG			
3	Check harness and connector between ECM and stop light switch.	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



004880

INSPECTION PROCEDURE

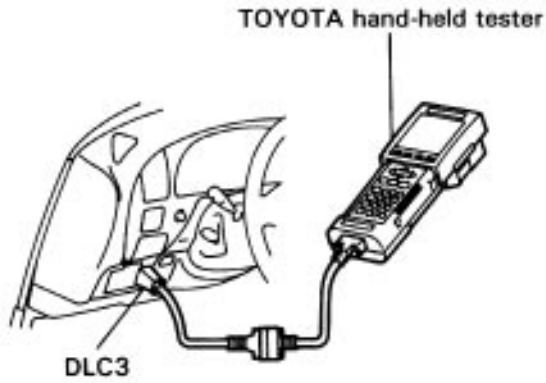
1 Check operation of stop light.

C Check if the stop lights go on and off normally when the brake pedal is operated and released.

OK

NG → **Check and repair stop light circuit.**

2 Connect TOYOTA hand–held tester and check STP signal.



P
1. Remove the fuse cover on the instrument panel.
2. Connect the TOYOTA hand–held tester to the DLC 3 (OBD II connector).
3. Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read the STP signal on the TOYOTA hand–held tester.

OK
Brake pedal is depressed: STP ON
Brake pedal is released: STP OFF

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

3 Check harness and connector between ECM and stop light switch.

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

SERVICE SPECIFICATIONS

SERVICE DATA

Line pressure (whell locked)	Engine idling D position R position AT stall D position R position	401–461 kPa 804–882 kPa 1,138–1,236 kPa 1,716–1,854 kPa	4.1–4.7 kgf/cm² 8.2–9.0 kgf/cm² 11.6–12.6 kgf/cm² 17.5–18.9 kgf/cm²	58–66 psi 117–128 psi 165–179 psi 249–269 psi
Engine stall revolution		2,600±150 RPM		
Time lag	N position–D position N position–R position	Less than 1.2 seconds Less than 1.5 seconds		
Engine idle speed (Cooling fan and A/C OFF) N position		650–750 RPM		
Throttle cable adjustment (Throttle valve fully opened)		Between boot and face and inner cable stopper 0–1 mm		0–0.04 in.
Torque converter clutch runout Drive plate runout	Limit Limit	0.30 mm 0.20 mm		0.0118 in. 0.0079 in.

SHIFT POINT

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	60–65 (37–40)
		2→3	113–121 (70–75)
		3→O/D	174–182 (108–113)
		O/D→3	168–176 (104–109)
		3→2	104–112 (65–70)
		2→1	50–54 (31–34)
	Throttle valve fully closed	3→O/D	40–44 (25–27)
		O/D→3	20–24 (12–15)
2 position	Throttle valve fully opened	1→2	60–65 (37–40)
		3→2	112–130 (76–81)
		2→1	50–54 (31–34)
L position	Throttle valve fully opened	3→2	107–114 (66–71)
		2→1	55–59 (34–37)

LOCK–UP POINT

D position km/h (mph) Throttle valve opening 596	Lock–up ON	Lock–up OFF
3rd Gear (O/D switch OFF)	60–65 (38–40)	53–57 (33–35)
O/D Gear	60–64 (37–40)	53–57 (33–35)

TORQUE SPECIFICATIONS

Part tightened		N–m	kgf–cm	ft–lbf
Engine front mounting bracket x Front suspention menber		80	820	59
Engine rear mounting bracket x Front suspention menber		66	670	48
LH transaxle mounting		52	530	38
Transaxle x Engine	12mm bolt	64	650	47
Transaxle x Engine	10mm bolt	46	470	34
Torque converter clutch x Drive–plate		27	280	20
Valve body x Transaxle case		11	110	8
Oil strainer		11	110	8
Oil pan		4.9	50	43 in.-lbf
Oil pan drain plug		49	500	36
Park/Neutral position switch x Transaxle case (bolt)		5.4	55	48 in.-lbf
Park/Neutral position switch (nut)		6.9	70	61 in.-lbf
B, apply tube retainer		11	110	8
Manual valve body		11	110	8
Detent spring		11	110	8
Oil tube bracket		10	100	7
Steering gear housing x Front suspention Menber		181	1850	134
Stabilizer bar bracket		19	195	14
Vehicle speed sensor		16	160	12
Direct clutch speed sensor		5.4	55	48in.-lbf
Transfer lubulication apply tube retainer		11	110	8
Exhaust manifold plate		20	200	14
Front frame x Body	19 mm	181	1,850	134
Front frame x Body	12 mm	32	330	24
Front frame x Body	Nut	36	370	27
Exhaust front pipe x Exhaust tale pipet		43	440	32
Exhaust manifold x Exhaust front pipe		62	630	46
Exhaust pipe clamp		43	440	32
Starter		39	400	29
Throttle cable adjusting nut		15	150	11

SUSPENSION AND AXLE

TROUBLESHOOTING

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

See Page / Parts Name / Trouble	Tires	Cold tire inflation pressure	Wheel alignment	Springs	Stabilizer bar	Shock absorber	Ball joint	Hub bearings	Steering linkage	Steering gear	Suspension parts	Overloaded	Wheel balance
See Page	SA–3	SA–96	SA–4 SA–6	SA–52	SA–66	SA–52	SA–63	SA–10					SA–3
Wander/pulls	1		2					4	3	5	6		
Bottoming				2		3						1	
Sways/pitches	1				2	3							
Front wheel shimmy	1		4			3	5	6	7	8			2
Abnormal tire wear		1	2			4					3		

V00313

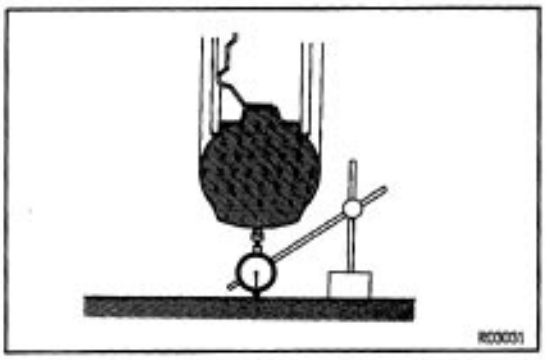
GENERAL INSPECTION

1. INSPECT TIRE

(a) Check the tires for wear and for the proper inflation pressure.

Cold inflation pressure:

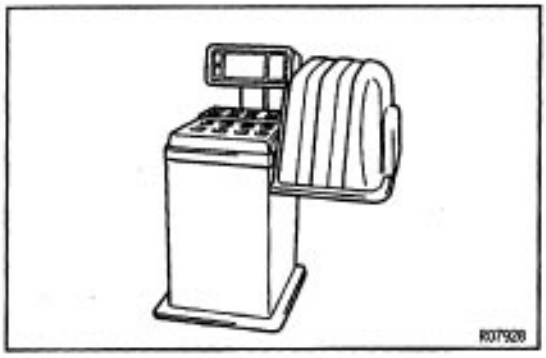
See page SA–96



(b) Check the tire runout.

Tire runout:

1.0 mm (0.039 in.) or less



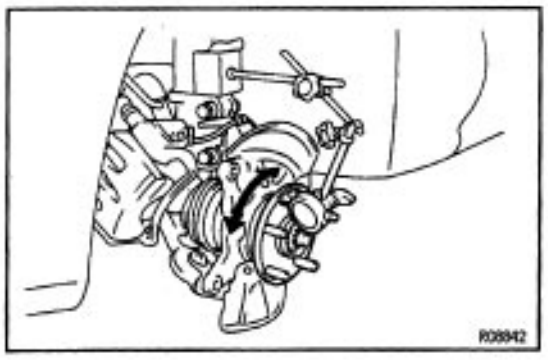
2. INSPECT WHEEL BALANCE

(a) Check and adjust the Off–the–car balance.

(b) If necessary, check and adjust the On–the–car balance.

Unbalance after adjustment:

8.0 g (0.018 lb) or less



3. CHECK WHEEL BEARING LOOSENESS

(a) Check the backlash in bearing shaft direction.

Maximum: 0.05 mm (0.0020 in.)

(b) Check the axle hub deviation.

Maximum: 0.05 mm (0.0020 in.)

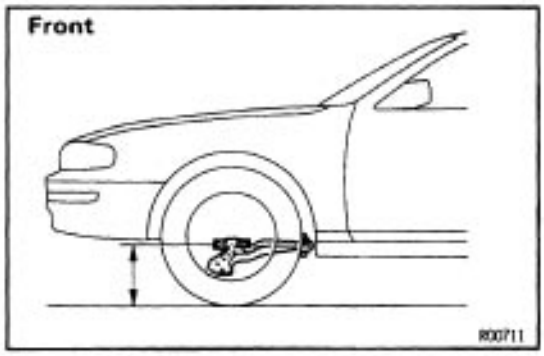
4. CHECK FRONT SUSPENSION FOR LOOSENESS

5. CHECK STEERING LINKAGE FOR LOOSENESS

6. CHECK BALL JOINT FOR EXCESSIVE LOOSENESS

7. CHECK SHOCK ABSORBERS WORK PROPERLY

- Check for oil leaks
- Check mounting bushings for looseness
- Bounce the vehicle up and down several times to stabilize the suspension.



WHEEL ALIGNMENT

FRONT WHEEL ALIGNMENT

SA1AZ–01

1. MEASURE VEHICLE HEIGHT

Front vehicle height:

SEDAN/COUPE:

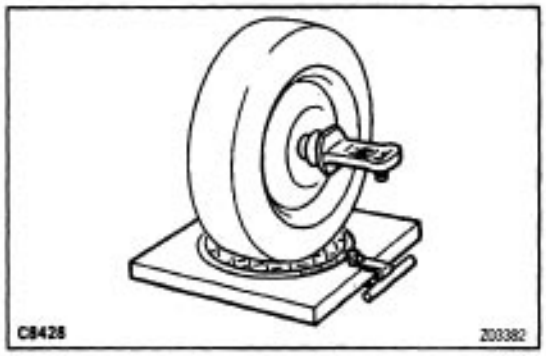
Tire size	Front
P195/70R14	210 mm (8.27 in.)
P205/65 R15	213 mm (8.39 in.)

WAGON:

Tire size	Front
P 195/70R 14	210 mm (8.27 in.)
P205/65R15	214 mm (8.43 in.)

Measuring point:

Measure from the ground to the center of the front side lower arm mounting bolt.

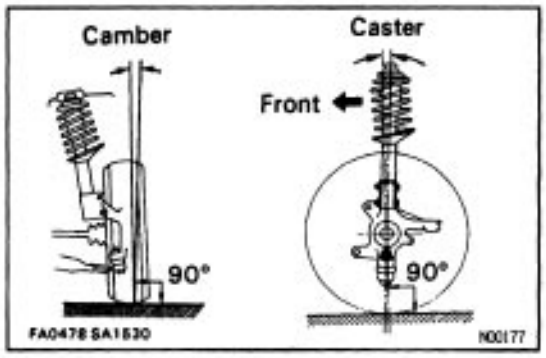


NOTICE: Before inspecting the wheel alignment, adjust the vehicle height to specification.

If the vehicle height is not standard, try to adjust it by pushing down on or lifting the body.

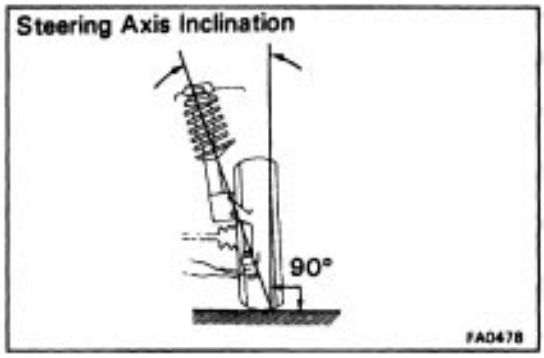
2. INSTALL CAMBER – CASTER – KINGPIN GAUGE ONTO VEHICLE OR POSITION VEHICLE ON WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

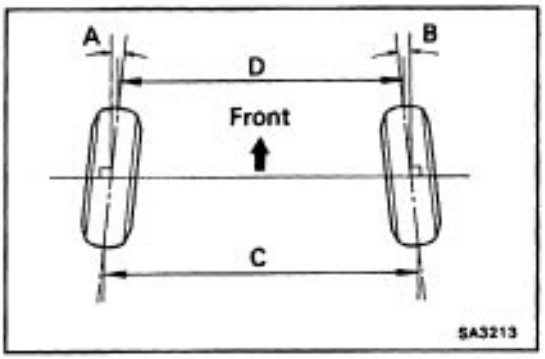


3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION

	SEDAN/COUPE	WAGON
Cambar (Left –right error)	$-0_3$35' ± 45' (45' or less)	-0_3 35'±45' (45' or less)
Caster (Left–right error)	1_3 10' ±45' (45' or less)	1_3 05'±45' (45' or less)
Steering axis inclination	13_3 05' ±45'	$13_3$00'±45'



HINT: Camber, caster and steering axis inclination are not adjustable. If measurements are not within speci–fication, inspect the suspension parts for damaged and/or worn out parts and replace them as necessary.



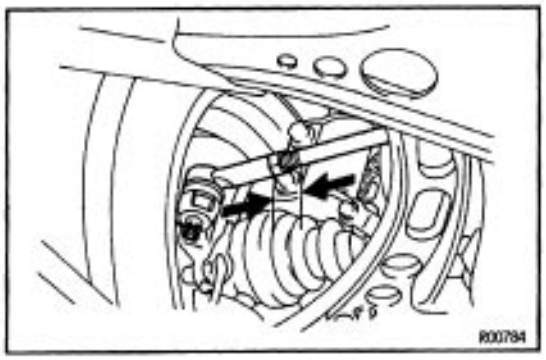
4. INSPECT TOE–IN

Toe–in (total):

A+B $0_3 \pm 0.2_3$

(C–D 0 ± 2 mm, 0 ± 0.08 in.)

If the toe–in is not within specification, adjust it at the tie rod end.



5. ADJUST TOE–IN

(a) Remove the boot clamps.

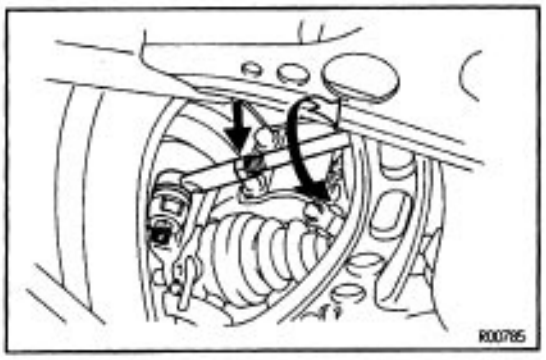
(b) Loosen the tie rod end lock nuts.

(c) Turn the left and right tie rod ends an equal amount to adjust the toe–in.

HINT: Ensure that the lengths of the left and right tie rod end length are the same.

Tie rod end length difference:

1.5 mm (0.059 in.) or less

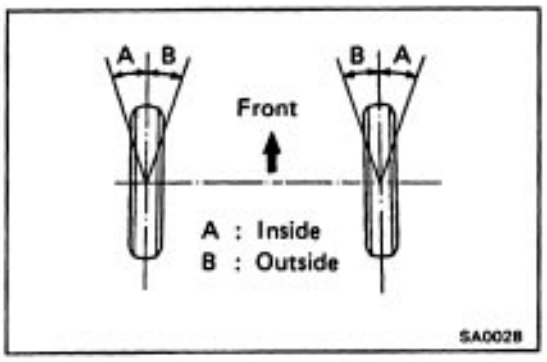


(d) Torque the tie rod end lock nuts.

Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

(e) Place the boot on the seat and install the clamp.

HINT: Make sure that the boots are not twisted.



7. INSPECT WHEEL ANGLE

Wheel angle:

SEDAN/COUPE:

Tire size	Inside wheel	Outside wheel (reference)
P195/70R14	37_3 20'± 2_3	32_3 10'
P205/65R15	$36_3$00' ± 2_3	31 $_3$15'

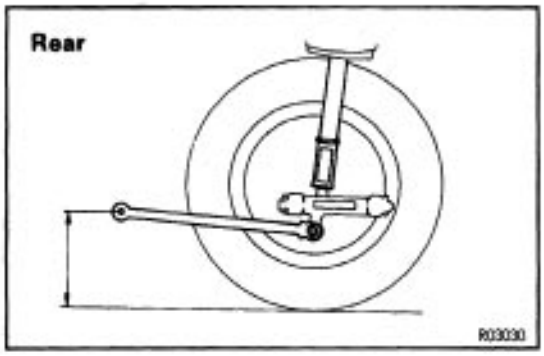
WAGON:

Tire size	Inside wheel	Outside wheel (reference)
P195/70R14	$37_3$20' ± 2_3	32_3 15'
P205/65R15	36_3 00' ± 2_3	31 $_3$ 20'

If the wheel angles differ from specification, check the left and right tie rod end length.

Tie rod end length difference:

1.5 mm (0.059 in.) or less



REAR WHEEL ALIGNMENT

7. MEASURE VEHICLE HEIGHT

Rear vehicle height:

SEDAN/COUPE:

Tire size	Rear
P 19 5/78 R 14	262 mm (10.31 in.)
P205/65R15	267 mm (10.51 in.)

WAGON:

Tire size	Rear
P195/70R14	272 mm (10.71 in.)
P205/65 R15	277 mm (10.91 in.)

Measuring point:

Measure from the ground to the center of the strut rod mounting bolt.

NOTICE: Before inspecting the wheel alignment, adjust the vehicle height to specification.

If the vehicle height is not standard, try to adjust it by pushing down on or lifting the body.

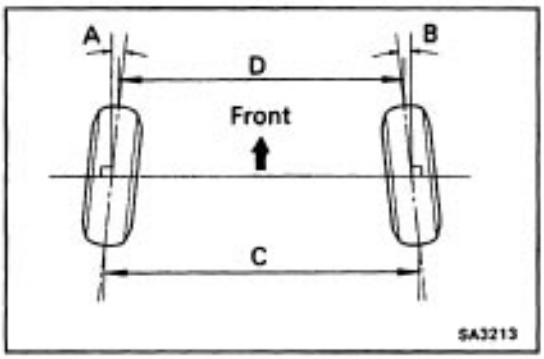
2. INSTALL CAMBER – CASTER – KINGPIN GAUGE ONTO VEHICLE OR POSITION VEHICLE ON WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER

	SEDAN/COUPE	WAGON
Camber (Left–right error)	– 0°26' ± 45' (45' or less)	–0°15' ± 45' (45' or less)

HINT: Camber is not adjustable, if measurement is not within specification, inspect and replace the suspen–sion parts as necessary.



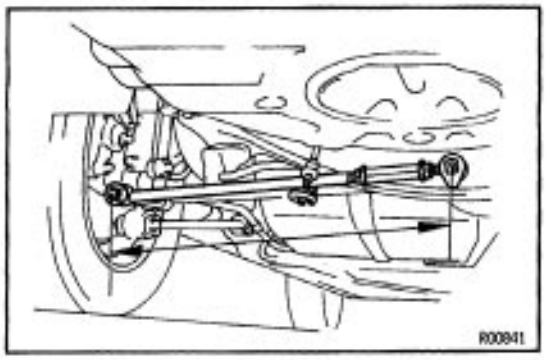
4. INSPECT TOE–IN

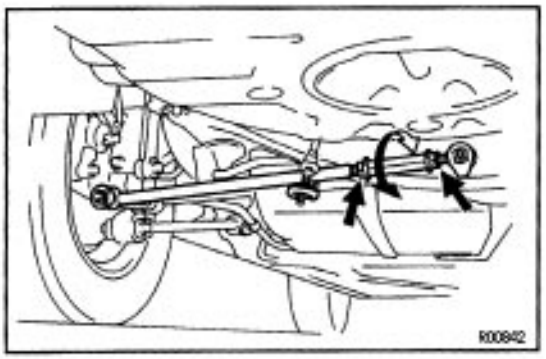
Toe–in (total):

A+B 0.4°± 0.2°

(C – D 4 ± 2 mm, 0.16 ± 0.08 in.)

If the toe–in is not within the specification, adjust it at the No.2 lower suspension arm.





5. ADJUST TOE–IN

(a) Measure the length of the left and right No.2 lower suspension arm.

Left–right difference:

1 mm (0.04 in.) or less

If the left–right difference is greater than the specifi–cation, adjust the length.

(b) Loosen the lock nuts.

(c) Turn the left and right adjusting tubes an equal amount to adjust toe–in.

HINT: One full turn of each adjusting tube will adjust the toe–in by about O.6®(6.7 mm, 0.264 in.).

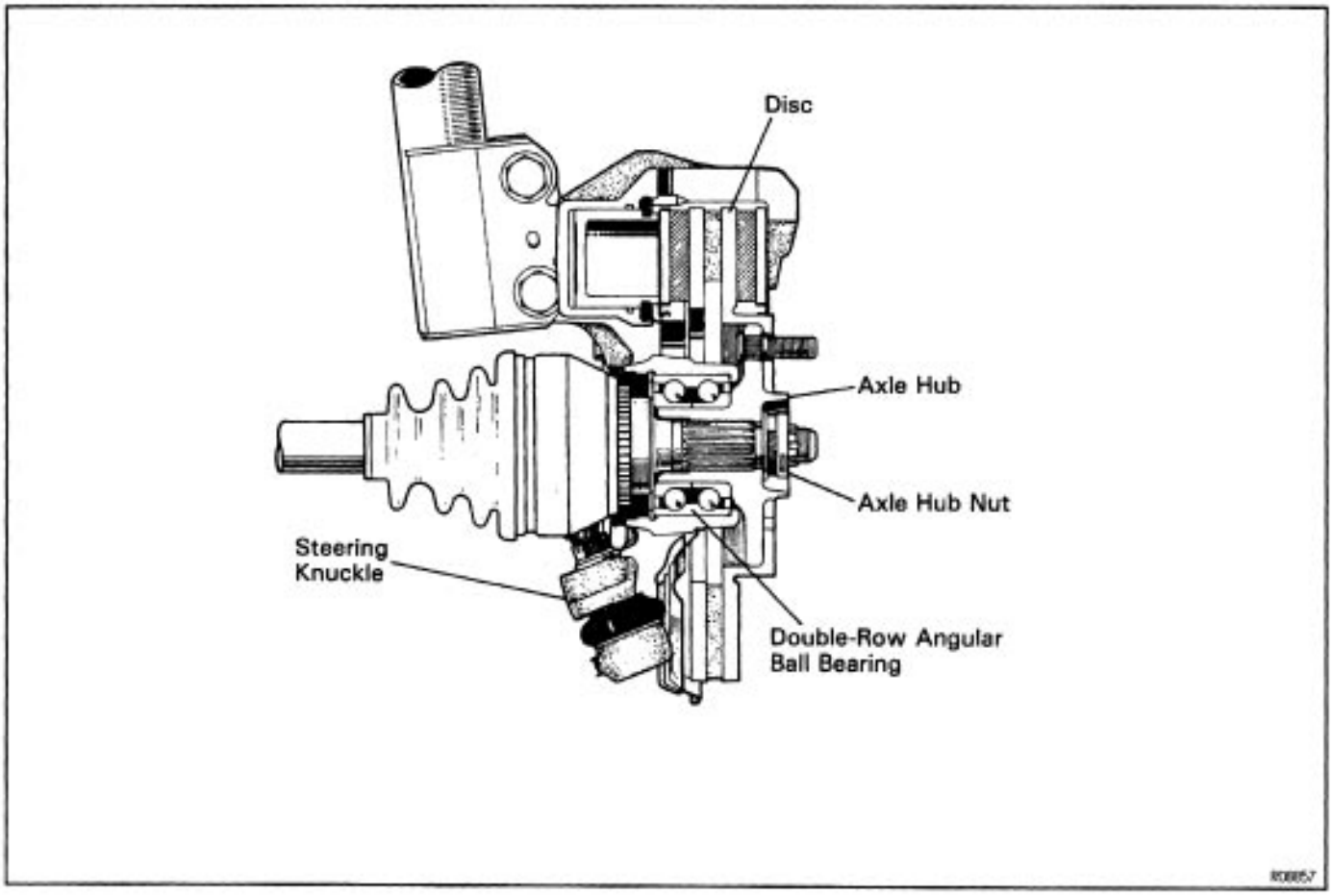
(d) Torque the lock nuts.

Torque: 56 N·m (570 kgf·cm, 41 ft·lbf)

FRONT AXLE

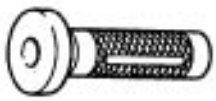
DESCRIPTION

The wheel bearings are double–row angular ball bearings combined with the oil seal. They have a small rolling resistance and are free from maintenance.
The preload of the bearings can be determined only by tightening the axle hub nut to a specified torque, improving serviceability.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09310–35010 Countershaft Bearing Replacer	Bearing removal Axle shaft installation
	09316–60010 Transmission & Transfer Bearing Replacer	Dust deflector Installation
	(09316–00010) Replacer Pipe	
	(09316–00040) Replacer “C“	
	09520–00031 Rear Axle Shaft Puller	
	09608–32010 Steering Knuckle Oil Seal Replacer	Bearing installation Axle hub installation Dust deflector installation
	09628–10011 Ball Joint Puller	Hub bolt removal
	09628–62011 BaII ,Joint Puller	
	09950–00020 Bearing Remover	

RECOMMENDED TOOLS

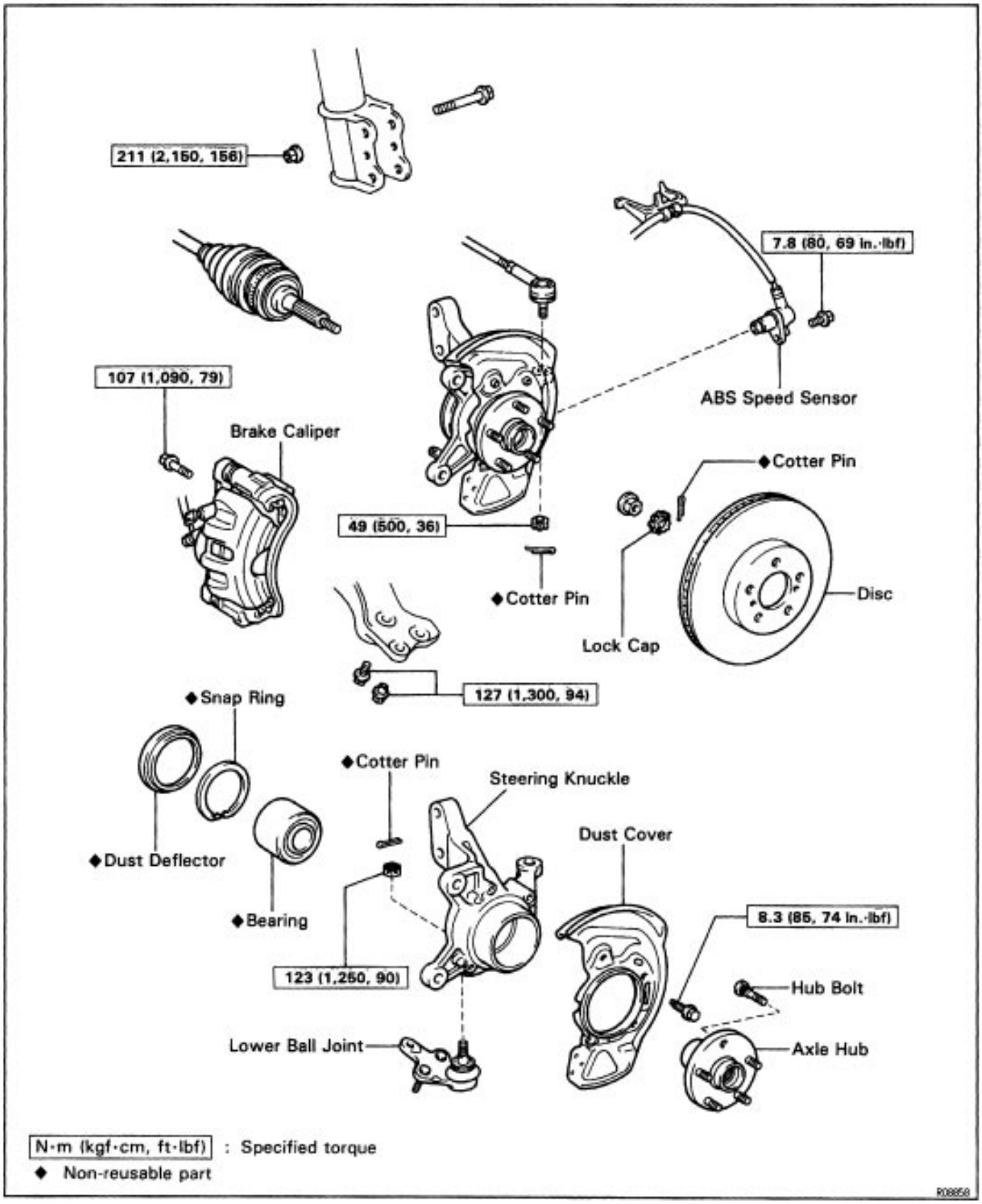
	09905–00013 Snap Ring Pliers	

EQUIPMENT

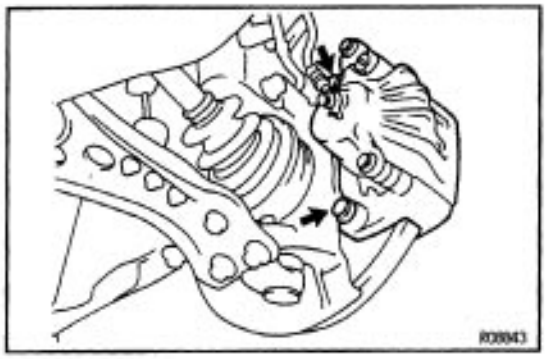
Dial indicator	
Torque wrench	

FRONT AXLE HUB

COMPONENTS



STEERING KNUCKLE WITH AXLE HUB REMOVAL



1. JACK UP VEHICLE, REMOVE FRONT WHEEL

2. CHECK BEARING BACKLASH AND AXLE HUB DE–VIATION

(a) Remove the 2 brake caliper set bolts.

(b) Hang up the brake caliper using wire, etc.

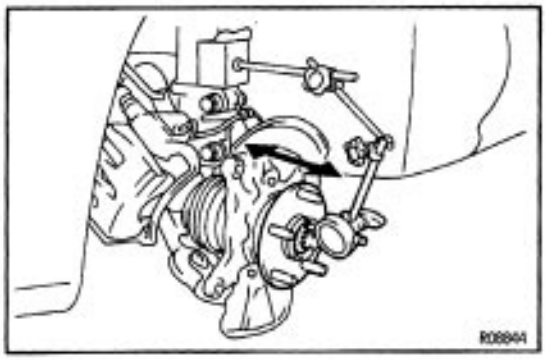
(c) Remove the disc.

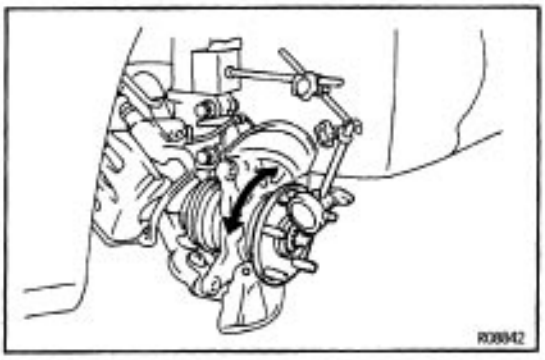
(d) Place the dial indicator near the center of the axle hub and check the backlash in the bearing shaft direction.

Maximum:

0.05 mm (0.0020 in.)

If greater than the specified maximum, replace the bearing.



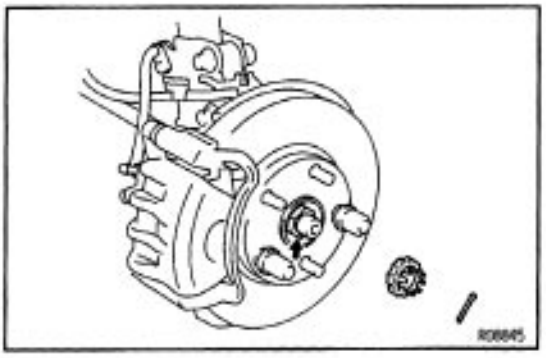


(e) Using a dial indicator, check the deviation at the surface of the axle hub outside the hub bolt.

Maximum:

0.05 mm (0.0020 in.)

If greater than the specified maximum, replace the axle hub.



3. REMOVE DRIVE SHAFT LOCK NUT

(a) Install the disc and brake caliper.

(b) Remove the cotter pin and lock cap.

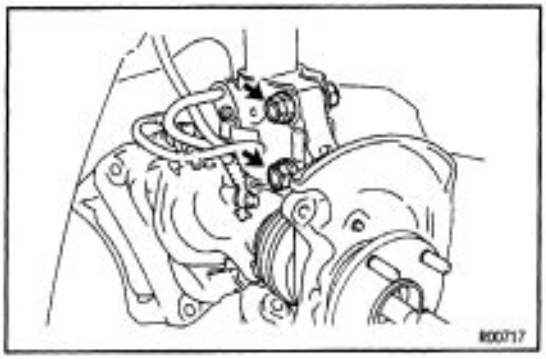
(c) While applying the brakes, remove the nut.

(d) Remove the brake caliper and disc.

4. w/ ABS:

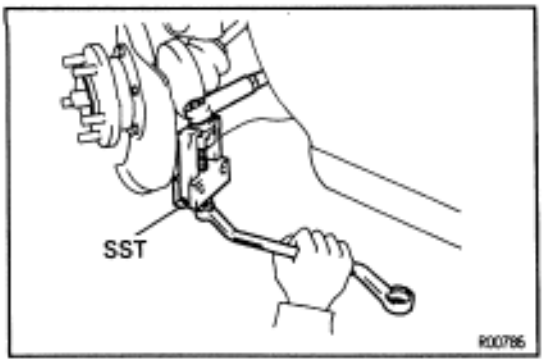
REMOVE ABS SPEED SENSOR

Remove the ABS speed sensor from the steering knuckle.



5. LOOSEN NUTS ON LOWER SIDE OF SHOCK ABS–ORBER

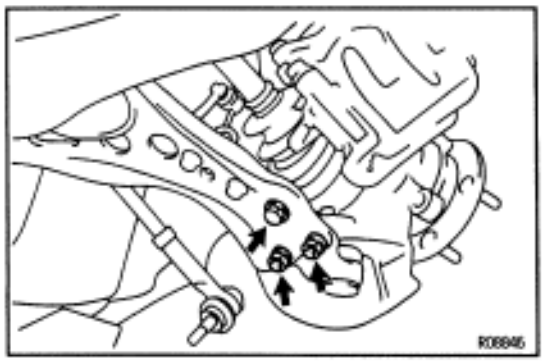
HINT: Do not remove the bolts.



6. DISCONNECT TIE ROD END FROM STEERING KNU–CKLE

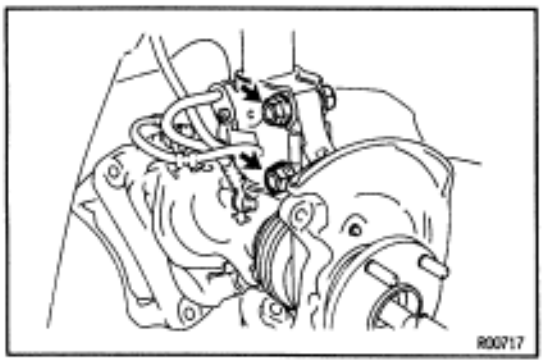
(a) Remove the cotter pin and remove the nut.

(b) Using SST, disconnect the tie rod end from the steer–ing knuckle.
SST 09628–62011



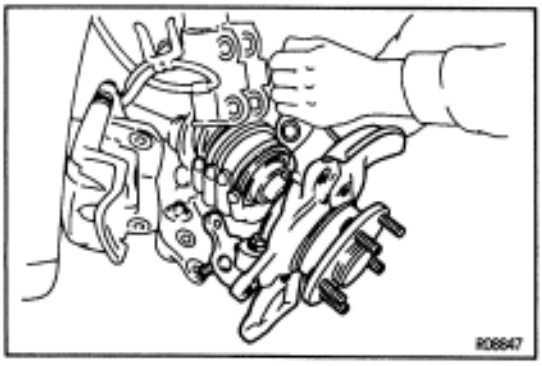
7. DISCONNECT LOWER BALL JOINT FROM LOWER ARM

Remove the bolt and the two nuts.

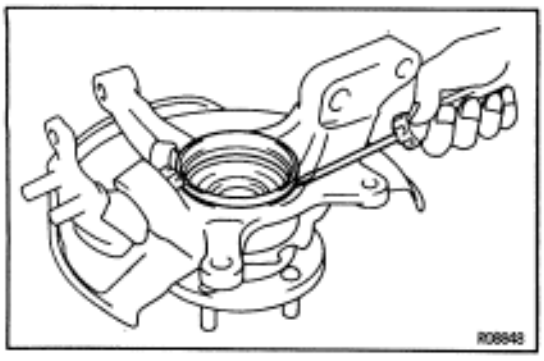


8. REMOVE STEERING KNUCKLE WITH AXLE HUB

(a) Remove the 2 nuts and bolts on lower side of the shock absorber.



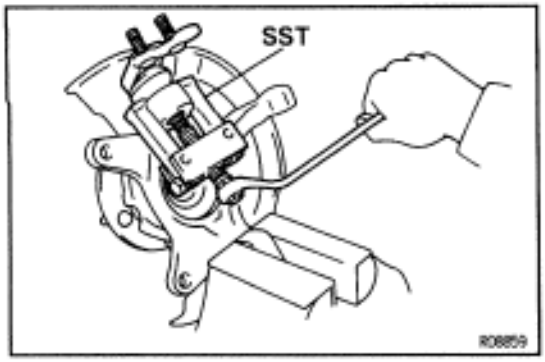
(b) Remove the steering knuckle with axle hub.



FRONT AXLE HUB DISASSEMBLY

1. REMOVE DUST DEFLECTOR

Using a screwdriver, remove the dust deflector.

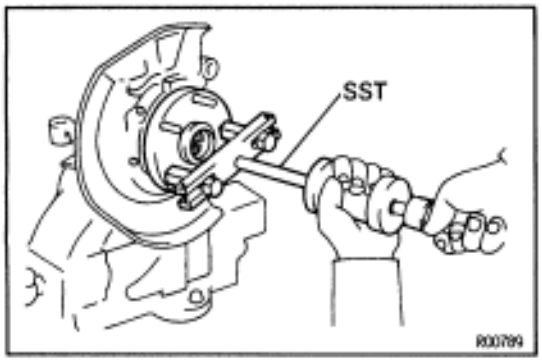


2. REMOVE LOWER BALL JOINT

(a) Remove the cotter pin and nut.

(b) Using SST, remove the lower ball joint.

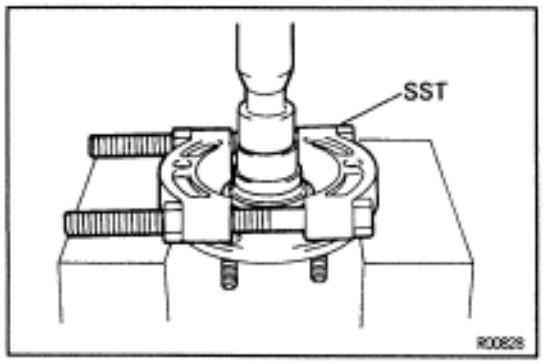
SST 09628–62011



3. REMOVE AXLE HUB

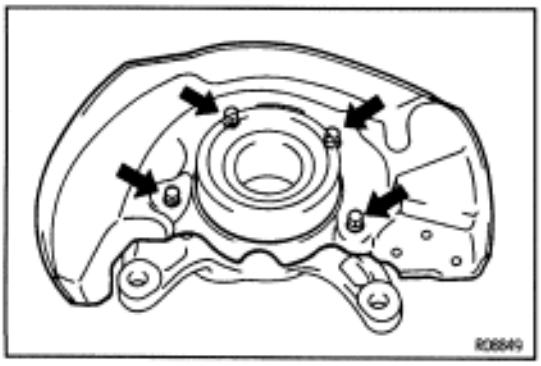
(a) Using SST, remove the axle hub.

SST 09520–00031



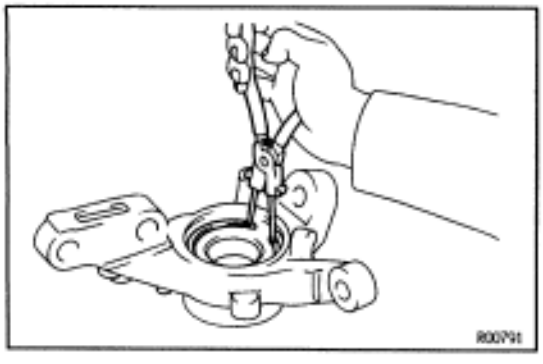
(b) Using SST and a press, remove the inner race (outside) from the axle hub.

SST 09950–00020



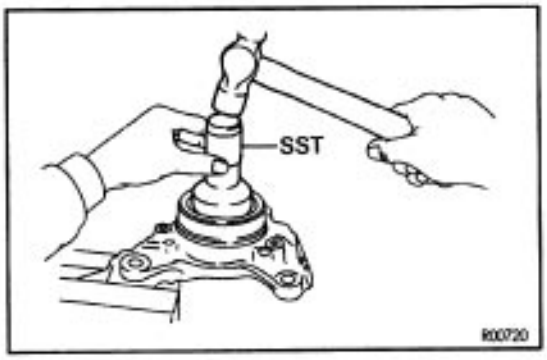
4. REMOVE DUST COVER

Remove the 4 bolts and dust cover–.

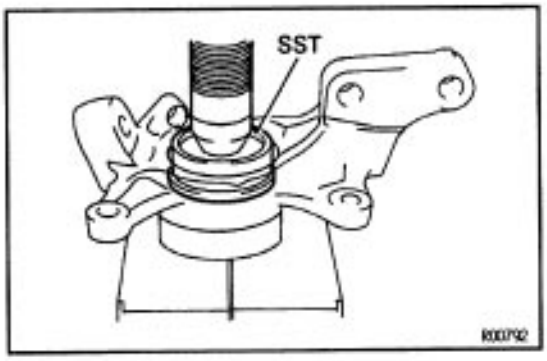


5. REMOVE BEARING FROM STEERING KNUCKLE

(a) Using snap ring pliers, remove the snap ring.



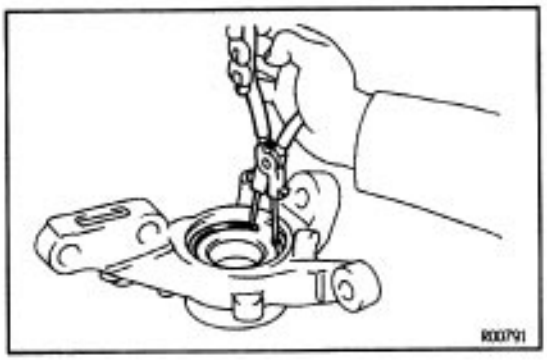
(b) Place the inner race on the outside of the bearing.
(c) Using SST and a hammer, remove the bearing.
SST 09310–35010



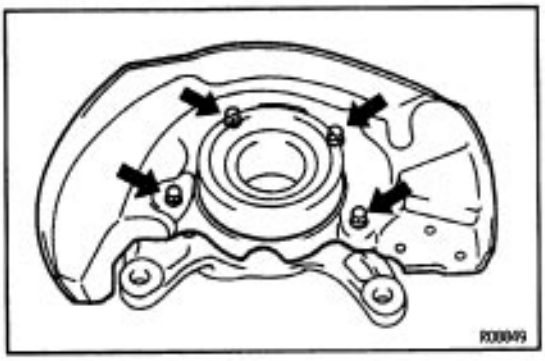
FRONT AXLE HUB ASSEMBLY

1. INSTALL BEARING

(a) Using SST and a press, install a new bearing to the steering knuckle.
SST 09608–32010

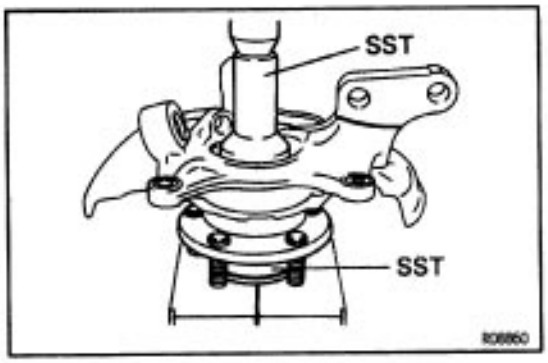


(b) Using snap ring pliers, install a new snap ring.



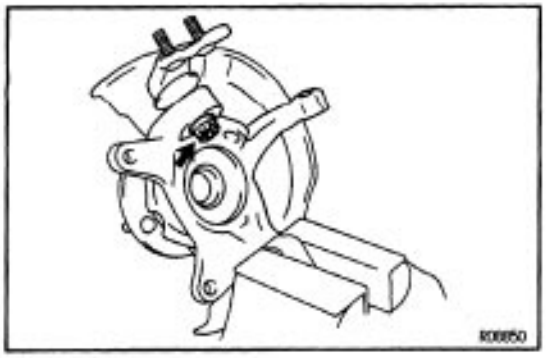
2. INSTALL DUST COVER

Place the dust cover and torque the 4 bolts.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)



3. INSTALL FRONT AXLE HUB

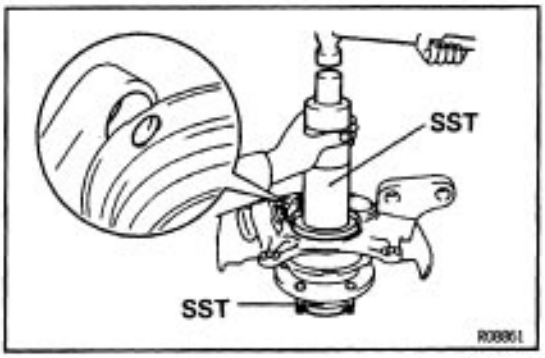
Using SST and a press, install the axle hub.
SST 09310 – 35010, 09608 – 32010



4. INSTALL LOWER BALL JOINT

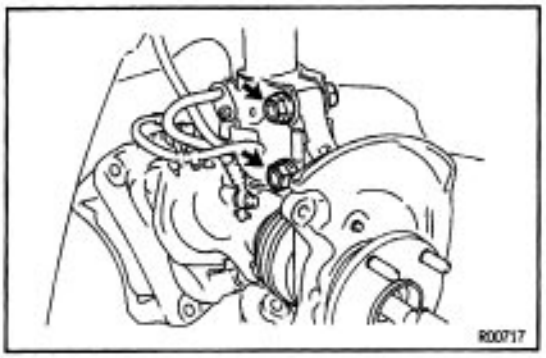
(a) Install the lower ball joint and torque the nut.
Torque: 123 N·m (1,250 kgf·cm. 90 ft·lbf)

(b) Install a new cotter pin.



5. INSTALL DUST DEFLECTOR

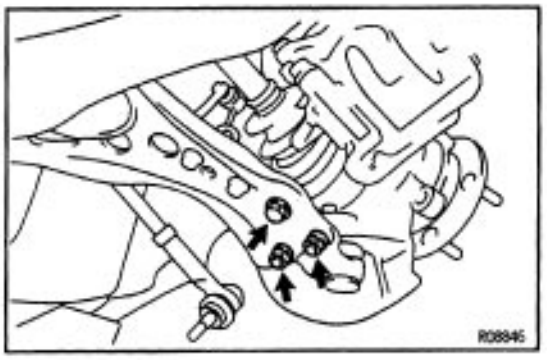
Using SST and a hammer, install a new dust deflector.
SST 09316–60010(09316–00010, 09316–00040)
09608–32010
HINT: Align the holes for the ABS speed sensor in the dust deflector and steering knuckle.



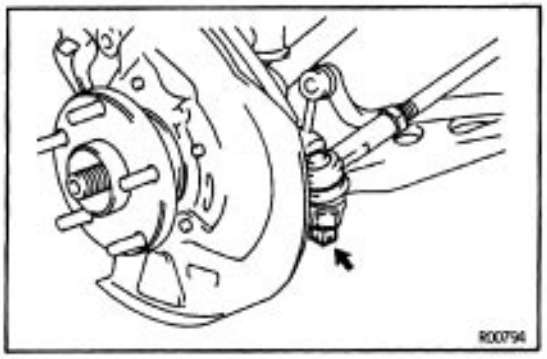
STEERING KNUCKLE WITH AXLE HUB INSTALLATION

1. INSTALL STEERING KNUCKLE

(a) Place the steering knuckle and temporarily install the 2 bolts and nut on lower side of shock absorber.
HINT: Coat the threads of nuts with engine oil.



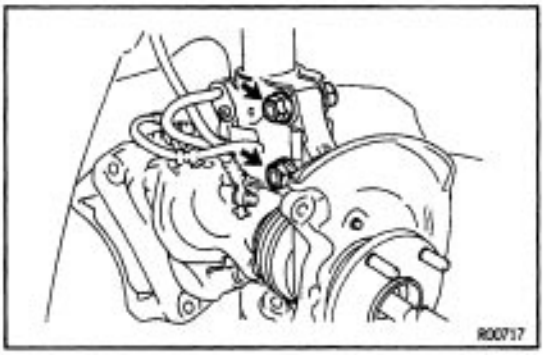
(b) Connect the lower ball joint to the lower arm and tighten the bolt and nuts.
Torque: 127 N·m (1,300 kgf·cm. 94 ft·lbf)



2. CONNECT TIE ROD END TO STEERING KNUCKLE

(a) Connect the tie rod end to the steering knuckle and tighten the nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install a new cotter pin.



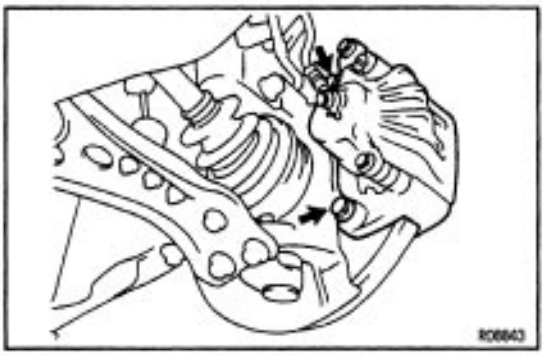
3. TORQUE BOLTS ON LOWER SIDE OF SHOCK ABSORBER

Torque: 211 N·m (2,150 kgf·cm, 156 ft·lbf)

4. w/ ABS:

INSTALL ABS SPEED SENSOR

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

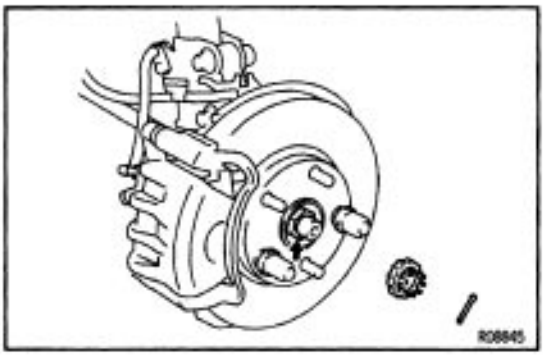


5. INSTALL FRONT BRAKE CALIPER

(a) Install the disc.

(b) Install the brake caliper.

Torque: 107 N·m (1,090 kgf·cm, 79 ft·lbf)



6. INSTALL DRIVE SHAFT LOCK NUT

(a) While applying the brakes, install the nut.

Torque: 294 N·m (3,000 kgf·cm, 217 ft·lbf)

(b) Install the lock cap and a new cotter pin.

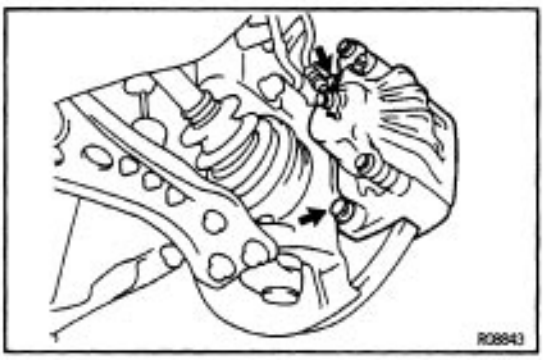
7. INSTALL FRONT WHEEL AND LOWER VEHICLE

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

8. INSPECT FRONT WHEEL ALIGNMENT

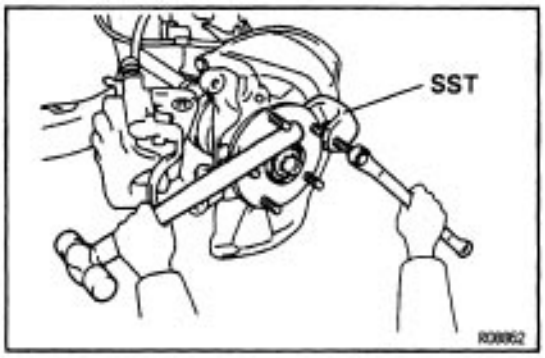
(SEE PAGE SA–4)

HUB BOLT REPLACEMENT



1. JACK UP VEHICLE AND REMOVE FRONT WHEEL

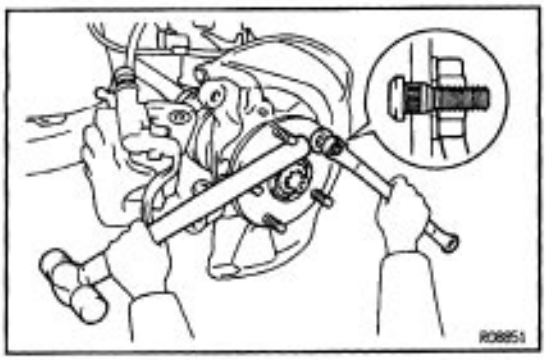
2. REMOVE FRONT BRAKE CALIPER AND DISC



3. REMOVE HUB BOLT

Using SST, remove the hub bolt.

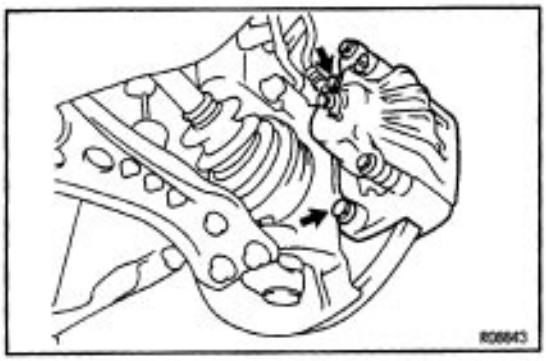
SST 09628 –10011



4. INSTALL HUB BOLT

(a) Install washer and nut to the hub bolt as shown in the illustration.

(b) Install the hub bolt with torquing the nut. Install the hub bolt with torquing the nut.



5. INSTALL FRONT DISC AND BRAKE CALIPER

Torque: 107 N·m (1,090 kgf·cm, 79 ft·lbf)

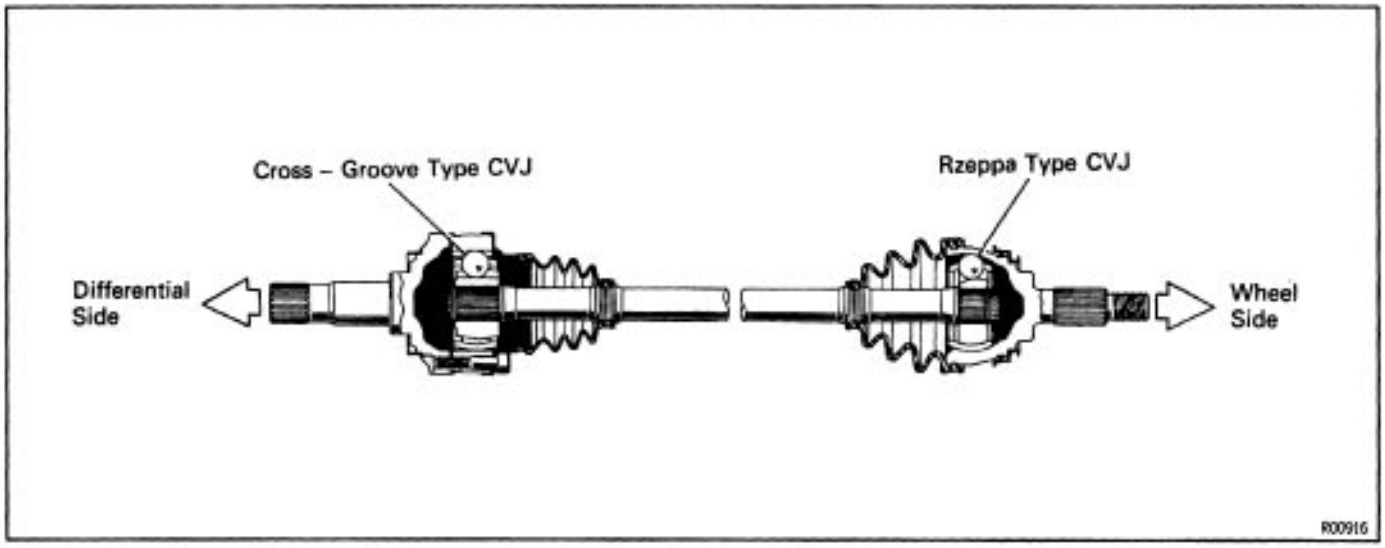
6. INSTALL FRONT WHEEL AND LOWER VEHICLE

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

FRONT DRIVE SHAFT (1 MZ–FE)

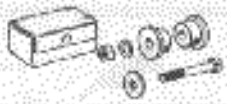
DESCRIPTION

The drive shaft has a cross–groove type CVJ (Constant Velocity Joint) on the differential side and Rzeppa type CVJ on the wheel side.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09608–1 6041 Front Hub Bearing Adjusting Tool	
	(09608–02020) Bolt & Nut	
	(09608–02040) Retainer	
	09628–62011 Ball ,Joint Puller	Tie rod end
	09726–10010 Lower Suspension Arm Bushing Remover & Replacer	
	(09726–00030) Spacer	Drive shaft inboard joint
	09923–00020 Hexagon 8 mm Wrench	
	09950–00020 Bearing Remover	Center drive shaft dust cover
	09521–24010 Drive Shaft Boot Clamping Tool	
	09240–00020 Wire Gauge Set	
	09242–00190 Wire Gauge	

RECOMMENDED TOOLS

SA334–01

	09905–00012 Snap Ring No. 1 Expander	For removing and installing snap ring

EQUIPMENT

Torque wrench	

LUBRICANT

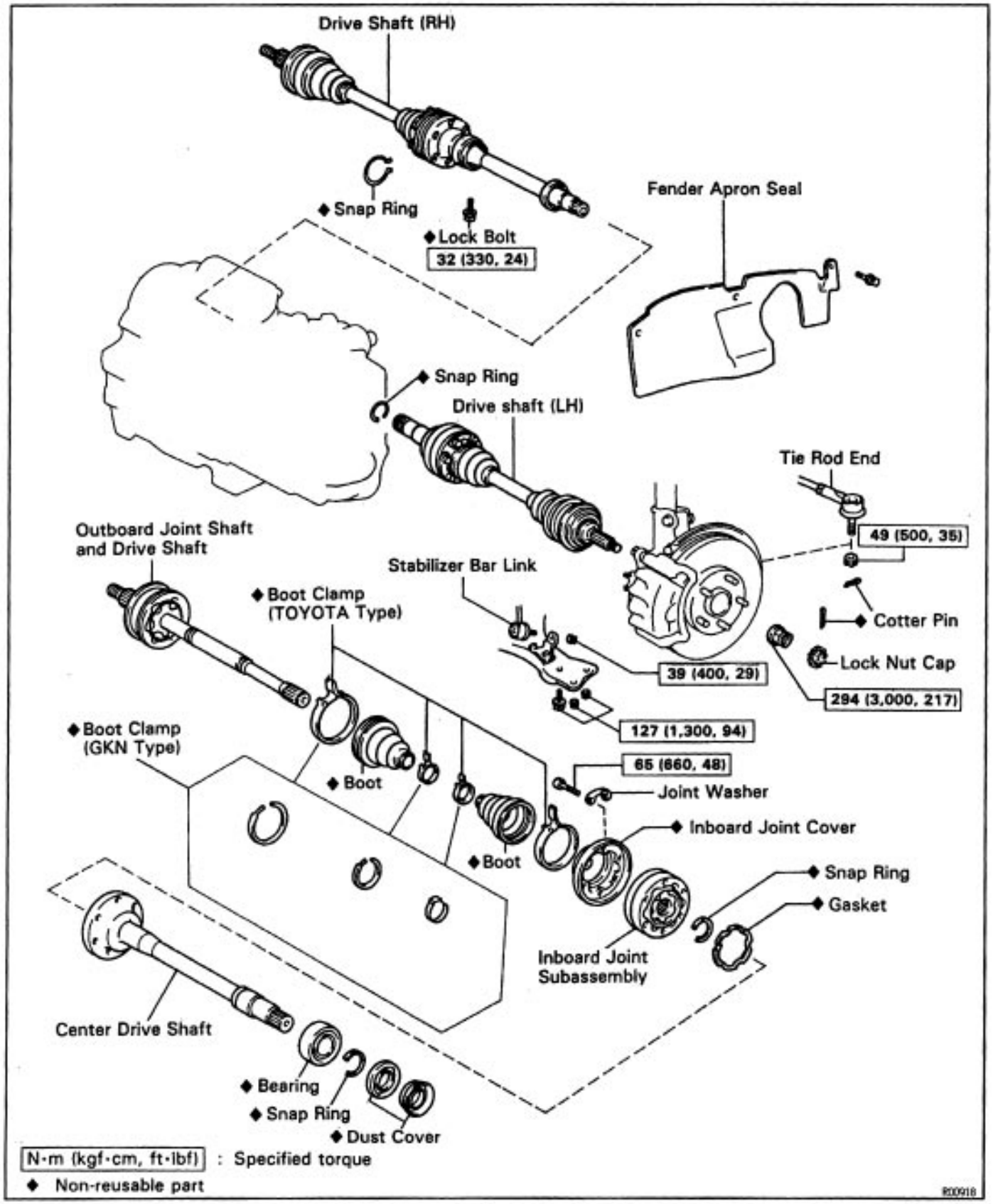
Drive shaft	Item	Capacity
Toyota type	Outboard joint grease Inboard joint grease	120–130 g (4.2–4.6 oz.) 133–153 g (4.7–5.4 oz.)

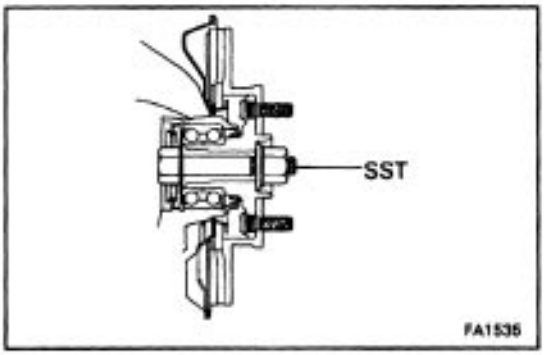
SSM (SPECIAL SERVICE MATERIALS)

08826–00801 Seal Packing 1121, THREE BOND 1121 or equivalent	Drive shaft inboard joint cover

FRONT DRIVE SHAFT

COMPONENTS

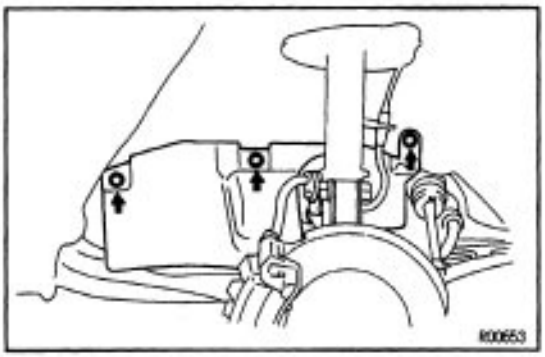




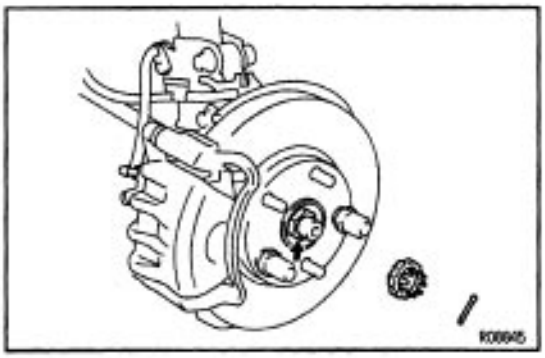
FRONT DRIVE SHAFT REMOVAL

NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed.
Therefore, if it is absolutely necessary to place the vehicle weight on the hub bearing, first support it with SST.

SST 09608–16041(09608–02020, 09608–02040)

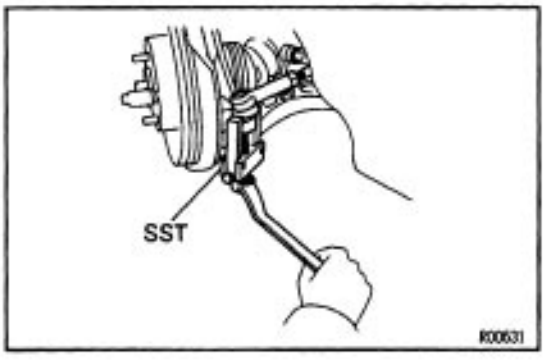


1. REMOVE FRONT FENDER APRON SEAL



2. REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT

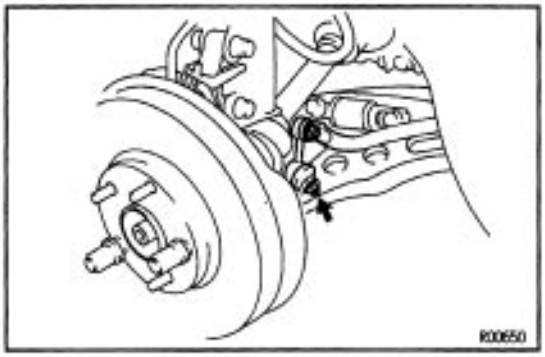
(a) Remove the cotter pin and lock nut cap.
(b) Loosen the bearing lock nut while depressing the brake pedal.



3. DRAIN TRANSAXLE OIL

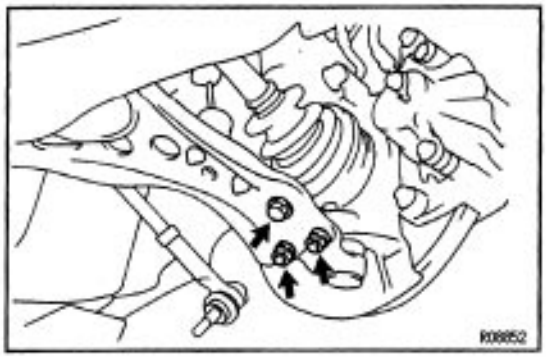
4. DISCONNECT TIE ROD END FROM STEERING KNUCKLE

(a) Remove the cotter pin and nut from the tie rod end.
(b) Using SST, disconnect the tie rod end from the steering knuckle.
SST 09628–62011



5. DISCONNECT STABILIZER BAR LINK FROM LOWER ARM

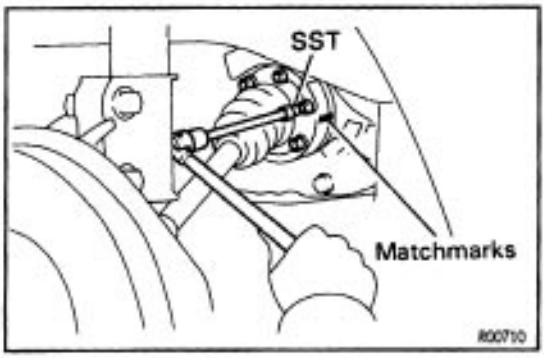
Remove the nut and disconnect the stabilizer bar link from lower arm.



6. DISCONNECT STEERING KNUCKLE FROM LOWER BALL JOINT

(a) Remove the bolt and the 2 nuts.

(b) Disconnect the steering knuckle from the lower ball joint.



7. LOOSEN 6 BOLTS HOLDING DRIVE SHAFT TO DIF–FERENTIAL SIDE GEAR SHAFT OR CENTER DRIVE SHAFT

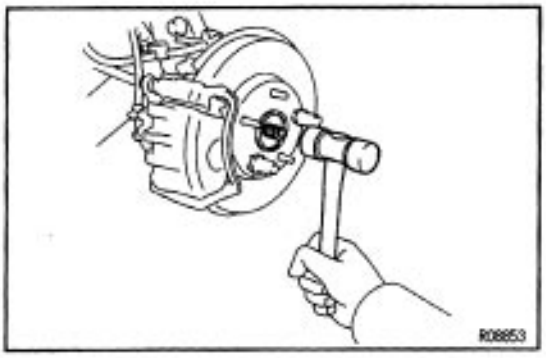
(a) Place matchmarks on the drive shaft and side gear shaft or center drive shaft.

NOTICE: Do not use a punch to mark the matchmarks. Use paint, etc.

(b) Using SST, loosen the 6 hexagon bolts while depress–ing the brake pedal.

SST 09923 – 00020

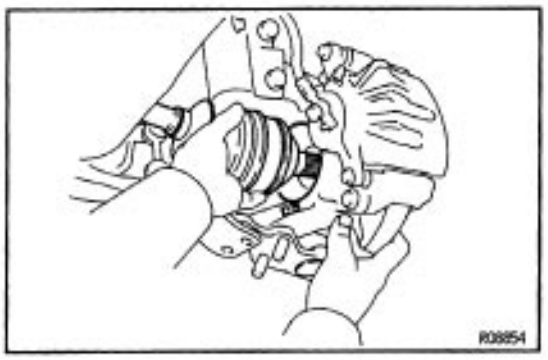
HINT: Do not remove the bolts, leave them finger tight to avoid drop ping the drive shaft.



8. DISCONNECT DRIVE SHAFT FROM AXLE HUB

(a) Using a plastic hammer, discontinued the drive shaft from the axle hub.

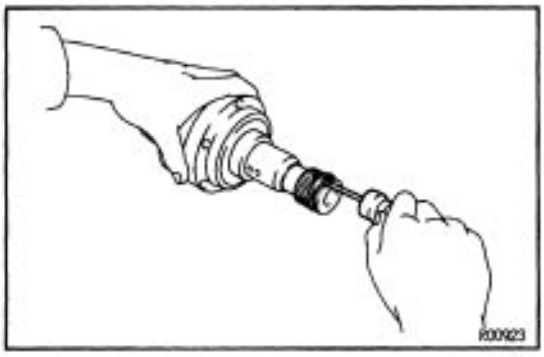
NOTICE: Cover the drive shaft boot with cloth to protect it from damage.



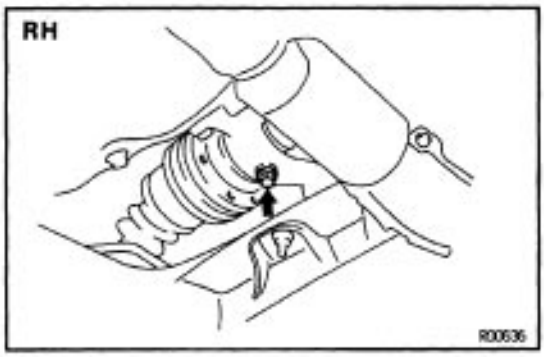
(b) Push the front axle hub toward the outside of the vehicle, and separate the drive shaft from the axle hub.

9. REMOVE LH DRIVE SHAFT

(a) Using hub nut wrench and hammer handle or equiva–lent, pull out the drive shaft as shown.

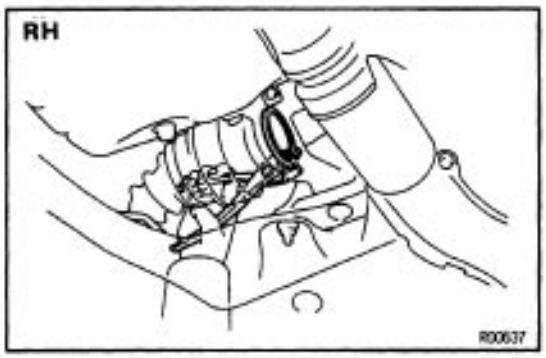


(b) Using a screwdriver, remove the snap ring.



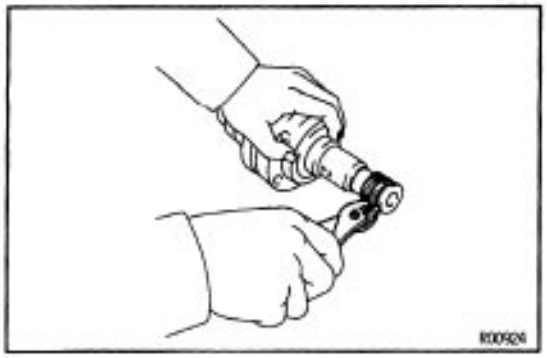
10. REMOVE RH DRIVE SHAFT

(a) Remove the bearing lock bolt.

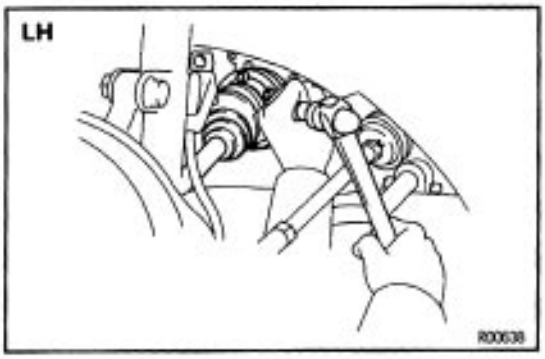


(b) Using pliers, remove the snap ring, and pull out the drive shaft.

FRONT DRIVE SHAFT INSTALLATION



1. INSTALL LH DRIVE SHAFT
(a) Using pliers, install a new snap ring.



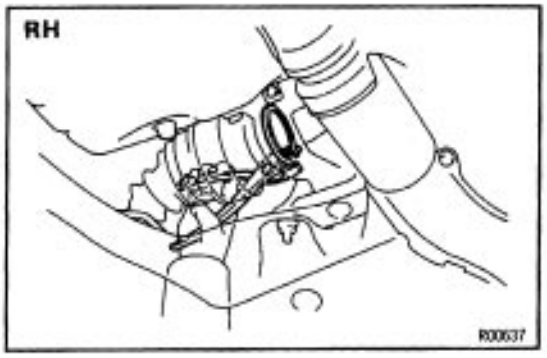
(b) Coat gear oil to the side gear shaft and differential case sliding surface.
(c) Using a brass bar and hammer, tap in the drive shaft until it makes contact with the pinion shaft.

HINT:

- Before installing the drive shaft, set the snap ring opening side facing downward.
- Whether or not the side gear shaft is making contact with the pinion shaft can be known by the sound or feeling when driving it in.

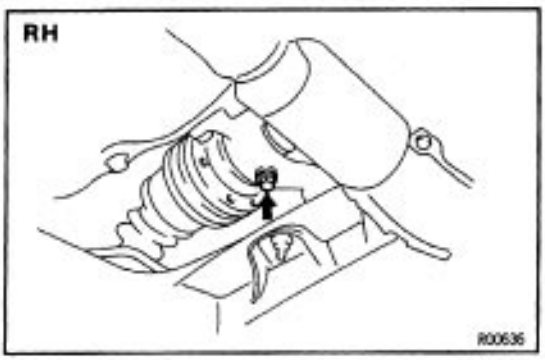
2. CHECK INSTALLATION OF LH DRIVE SHAFT

(a) Check that there is 2–3 mm (0.08–0.12 in.) of play in the axial direction.
(b) Check that the drive shaft can not be removed by hand.

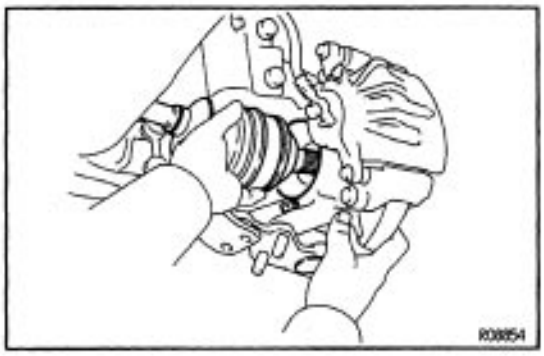


3. INSTALL RH DRIVE SHAFT

(a) Coat gear oil to the inboard joint and differential sliding surface.
(b) Install the drive shaft to the transaxle through the bearing bracket.
NOTICE: Do not damage the oil seal lip.
(c) Using pliers, install a new snap ring.



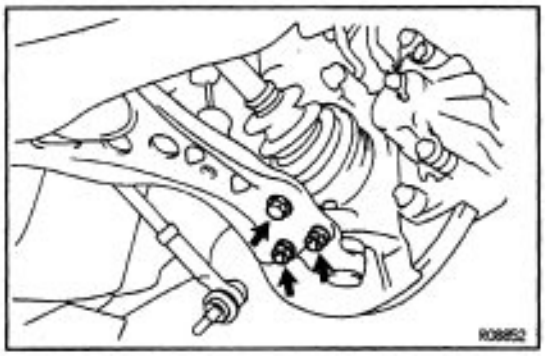
(d) Install a new bearing lock bolt and tighten it.
Torque: 32 N·m (330 kgf·cm, 24 ft·lbf)



4. CONNECT DRIVE SHAFT TO AXLE HUB

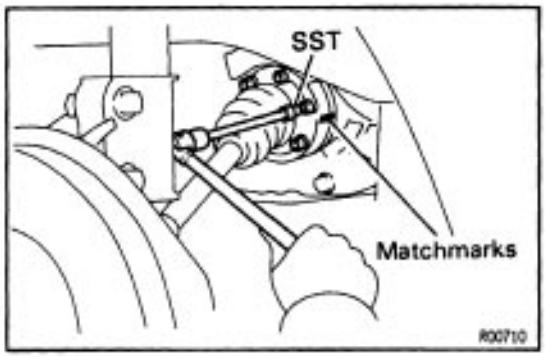
Install the outboard joint side of the drive shaft to the axle hub.

NOTICE: Do not damage the boot.



5. CONNECT STEERING KNUCKLE TO LOWER ARM

Torque: 127 N·m (1,300 kgf·cm, 94 ft·lbf)

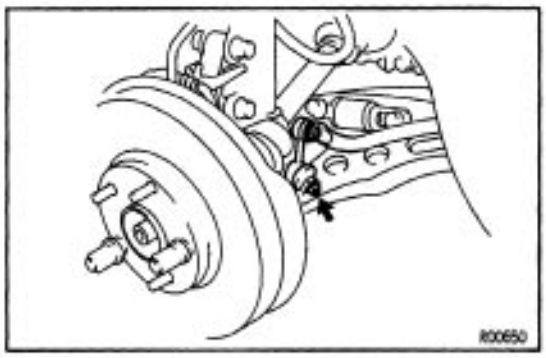


6. TIGHTEN6 HEXAGON BOLTS

Using SST, tighten the6 hexagon bolts while depress–ing the brake pedal.

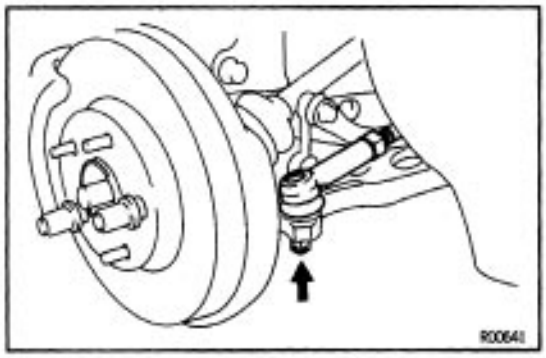
SST 09043–88010

Torque: 65 N·m (660 kgf·cm, 48 ft·lbf)



7. CONNECT STABILIZER BAR LINK TO LOWER ARM

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



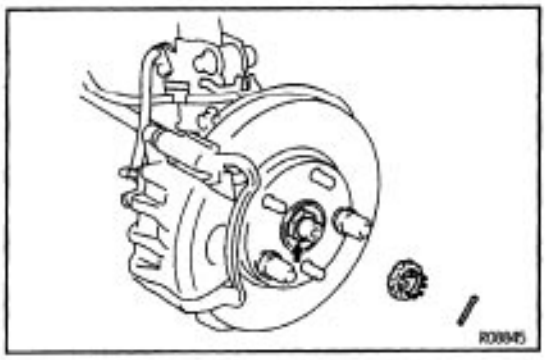
8. CONNECT TIE ROD END TO STEERING KNUCKLE

(a) Connect the tie rod end to the steering knuckle and torque the nut.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install a new cotter pin.

HINT: If the cotter pin hole does not line up, correct by tightening the nut by the smallest amount possible.

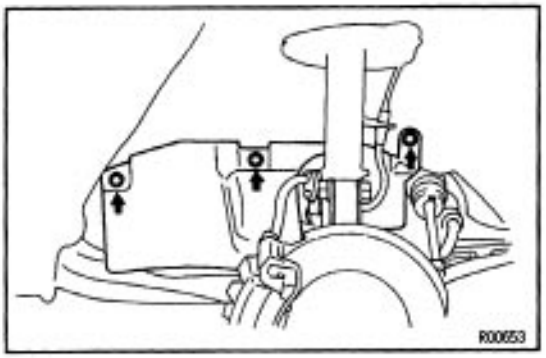


9. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND NEW COTTER PIN

(a) Install and torque the bearing look nut

Torque: 294 N·m (3,000 kgf·cm, 217 ft·lbf)

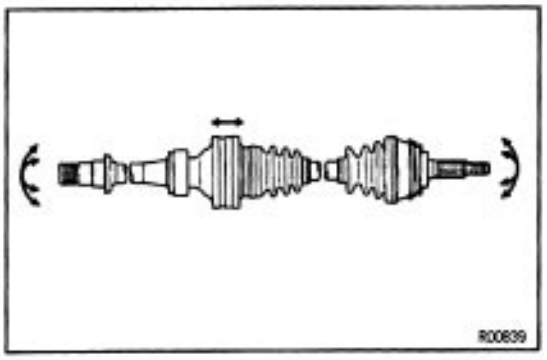
(b) Install the lock nut cap and secure it with a new cotter pin.



10. FILL TRANSAXLE WITH GEAR OIL

11. INSTALL FRONT FENDER APRON SEAL

12. CHECK FRONT WHEEL ALIGNMENT



FRONT DRIVE SHAFT DISASSEMBLY

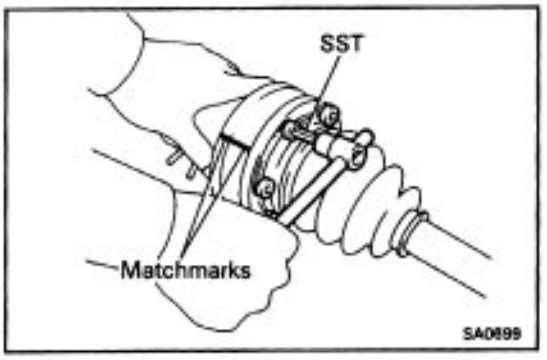
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard and outboard joints.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is no significant play in the radial direction of the inboard joint.

(d) Check the boot for damage.



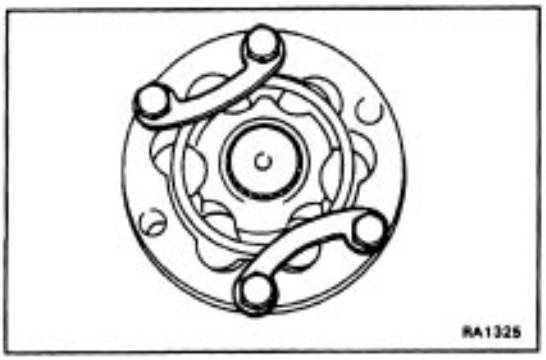
2. DISCONNECT CENTER DRIVE SHAFT OR SIDE GEAR SHAFT

(a) Using SST, remove the 6 bolts and 3 washers, and disconnect the center drive shaft or side gear shaft from the drive shaft.

SST 09923–00020

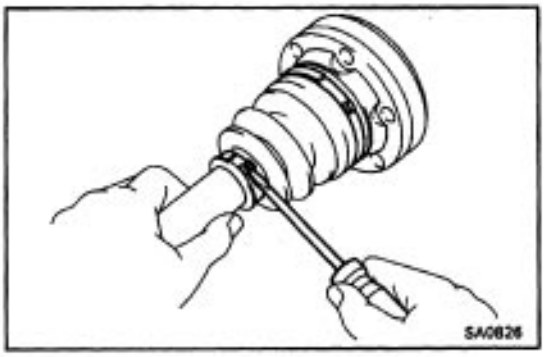
NOTICE: Do not compress the inboard boot.

(b) Remove the joint end cover gasket from the drive shaft.

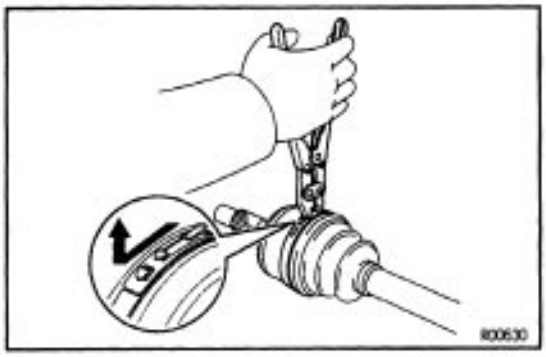


(c) Use bolts, nuts and washers to keep the inboard joint together.

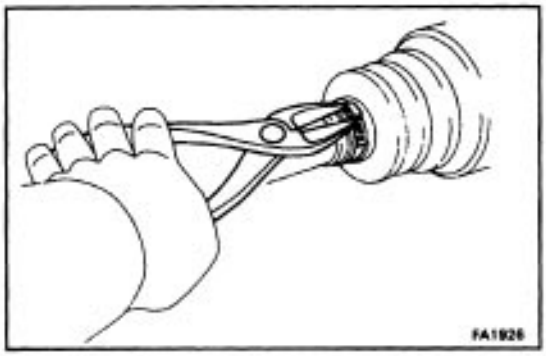
NOTICE: Tighten the bolts by hand to avoid scratching the flange surface.



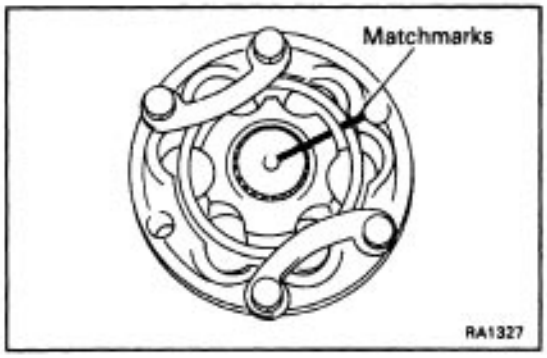
3. TOYOTA TYPE:
REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS
Using a screwdriver, remove the inboard and outboard joint clamps.



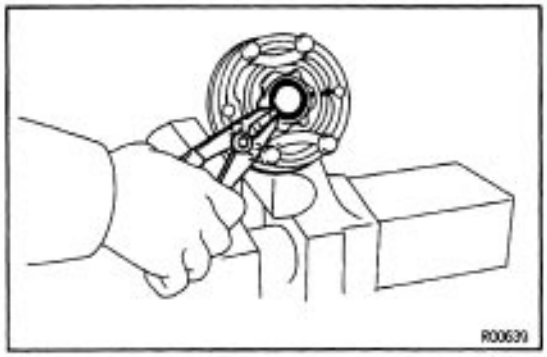
GKN TYPE:
REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS
(a) Using a boot clamp tool, draw hooks together and remove the clamps.



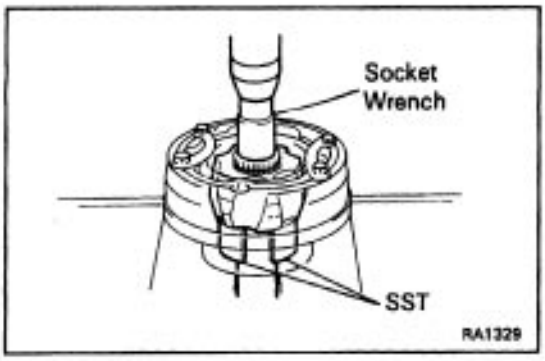
(b) Using side cutters, cut the small boot clamps and remove them.



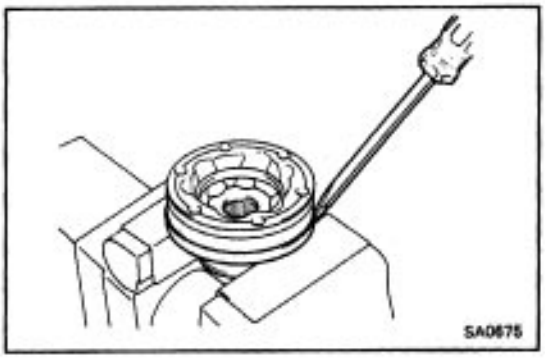
4. DISASSEMBLE INBOARD JOINT
(a) Place matchmarks on the inboard joint and drive shaft.



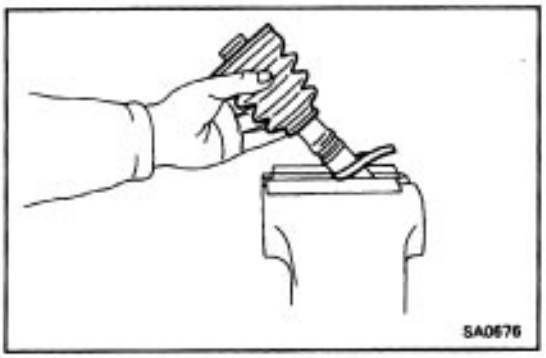
(b) Using a snap ring expander remove the snap ring.



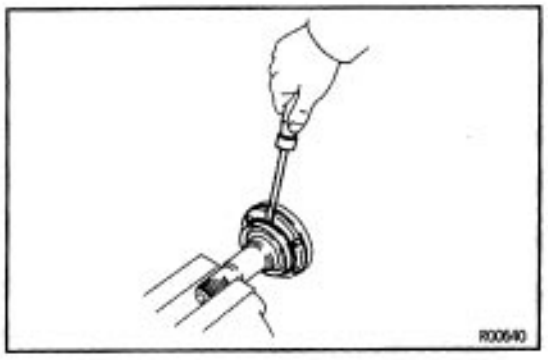
(c) Using SST, a socket wrench and a press, remove the inboard joint from the drive shaft.
SST 09726–10010(09726–00030)
(d) Remove the bolts, nuts and washers.



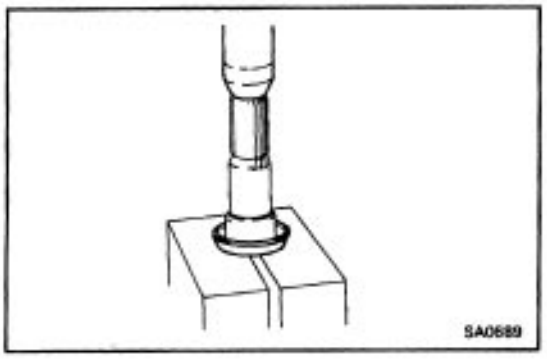
(e) Using a screwdriver and a hammer, pry around the whole perimeter of the inboard joint cover.
(f) Using a screwdriver, remove the inboard joint from inboard joint cover.
NOTICE: When lifting the inboard joint, hold onto the inner race and outer race.



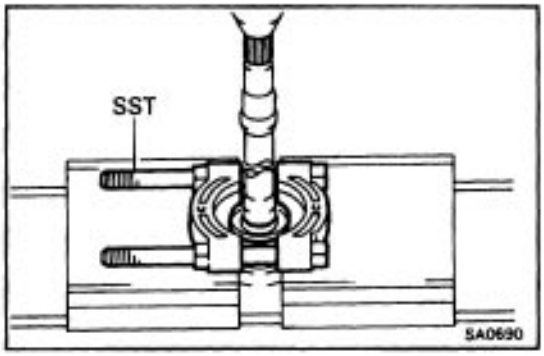
5. REMOVE BOOTS
Remove the inboard joint boot and outboard joint boot.



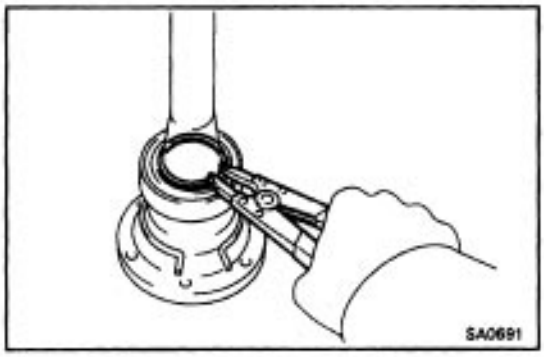
6. LH DRIVE SHAFT:
DISASSEMBLE SIDE GEAR SHAFT
Using a screwdriver, remove the dust cover.



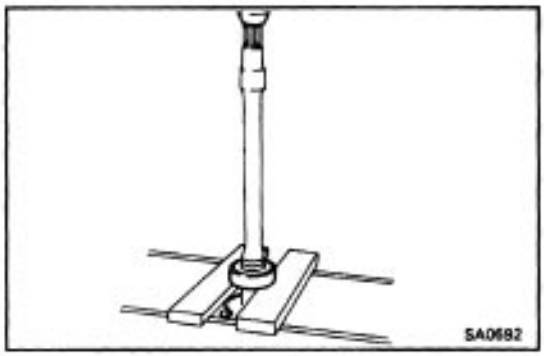
7. RH DRIVE SHAFT:
DISASSEMBLE CENTER DRIVE SHAFT
(a) Using a press, press out the transaxle side dust cover.



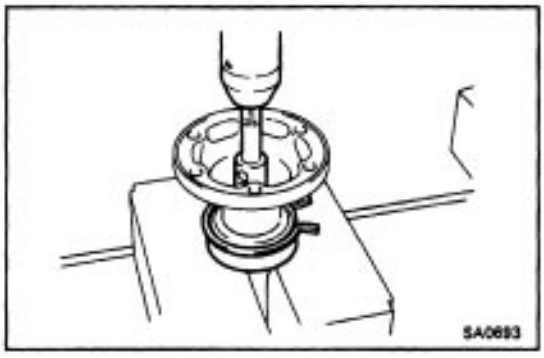
(b) Using SST and a press, press out the drive shaft side dust cover.
SST 09950–00020



(c) Using snap ring pliers, remove the snap ring.



(d) Using a press, press out the bearing.
(e) Remove the snap ring.

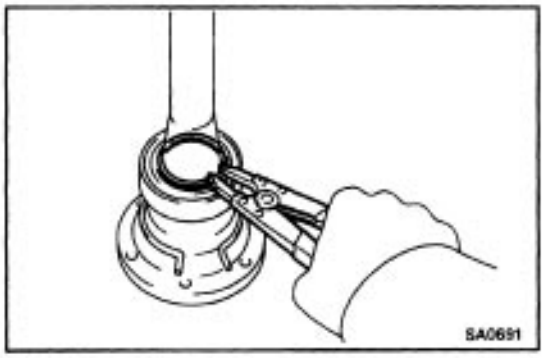


FRONT DRIVE SHAFT ASSEMBLY

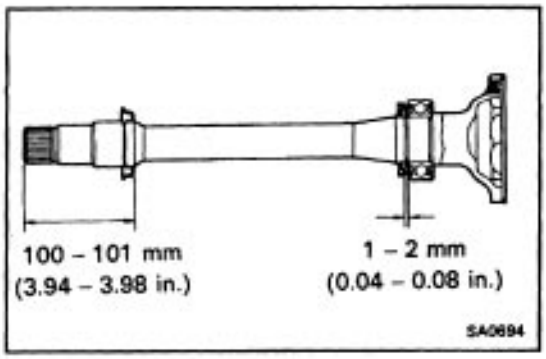
1. RH DRIVE SHAFT:

ASSEMBLE CENTER DRIVE SHAFT

(a) Install a new snap ring to the center drive shaft.
(b) Using a press and extension bar, press in a new bearing.



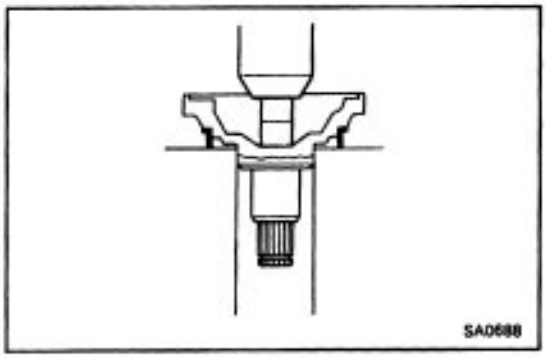
(c) Using a snap ring expander, install a new snap ring.



(d) Using a press, press in a new drive shaft side dust cover.

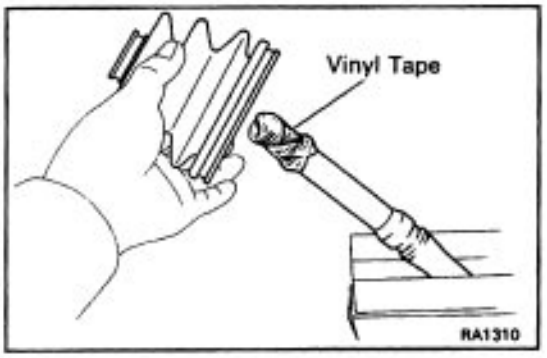
HINT: The clearance between the dust cover and the bearing should be kept in the range shown in the illustration.

(e) Using a press, press in a new transaxle side dust cover.



2. LH DRIVE SHAFT:
ASSEMBLE SIDE GEAR SHAFT

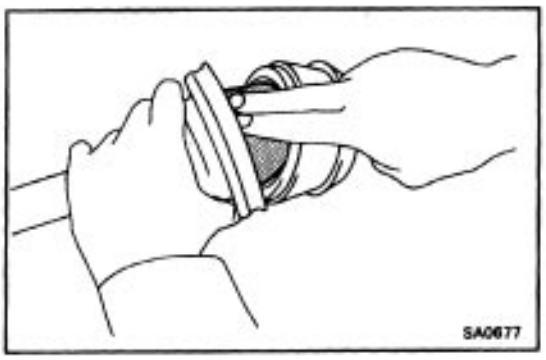
Using a press, press in a new dust cover.



3. INSTALL NEW OUTBOARD JOINT BOOT AND NEW BOOT CLAMP

HINT:

- Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.
- Temporarily install the new boot and new clamps to the outboard joint.

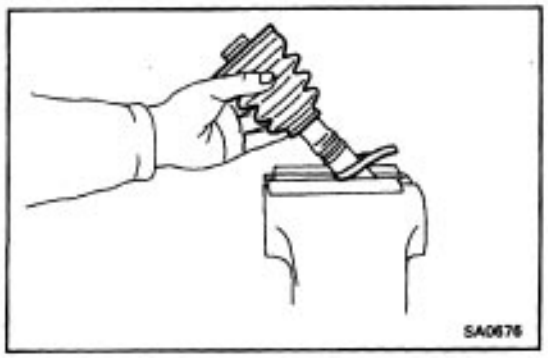


4. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, pack in grease.

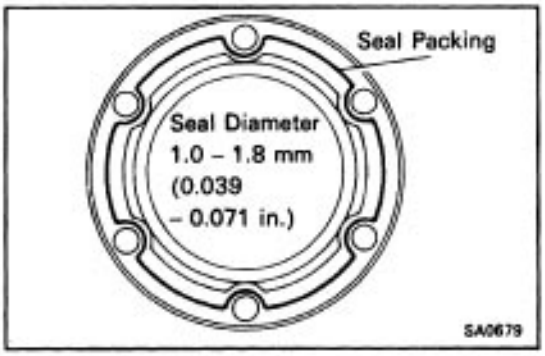
HINT: Use the grease supplied in the boot kit.

Grease capacity:
135–155 g (4.8–5.5 oz.)



5. INSTALL NEW BOOT CLAMPS AND INBOARD JOINT BOOT

Temporarily install the 2 new boot clamps and inboard joint boot.



6. ASSEMBLE NEW INBOARD JOINT COVER

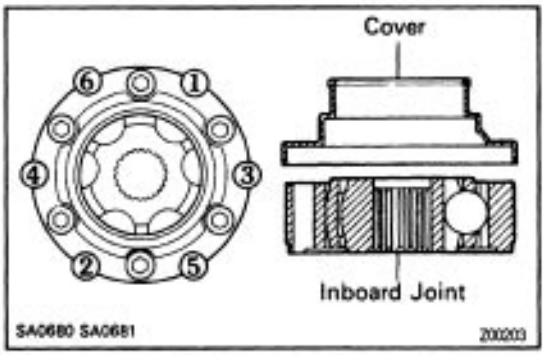
(a) Clean contacting surfaces of any residual packing material using cleaner.

(b) Apply seal packing to the inboard joint cover as shown in the illustration.

Seal packing:

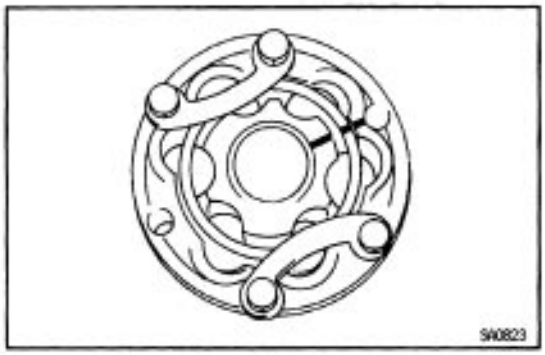
Part No. 08826–00801. THREE BOND 1122 or equivalent

HINT: Avoid applying an excess amount to the surface.



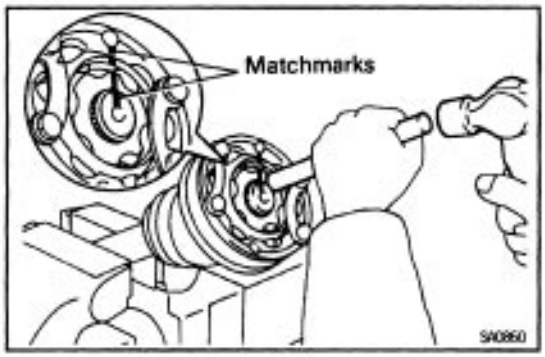
(c) Align the bolt holes of the cover with those of the inboard joint, then insert the hexagon bolts.

(d) Use a plastic hammer to tap the rim of the inboard joint cover into place. Do this in the order shown, and repeat several times.



(e) Use bolts, nuts and washers to keep the inboard joint together.

NOTICE: Tighten the bolts by hand to avoid scratching the flange surface.

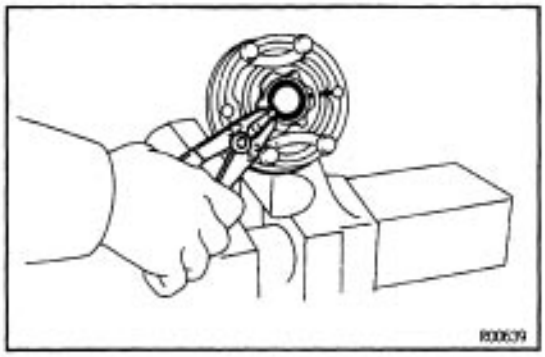


7. ASSEMBLE INBOARD JOINT

(a) Align the matchmarks placed before disassembly.

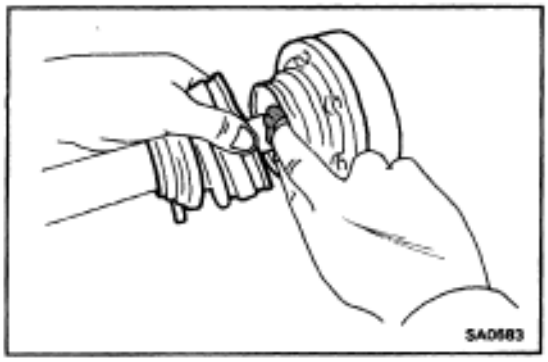
(b) Using a brass bar and hammer, tap the inboard joint onto the drive shaft.

NOTICE: Check that the brass bar is touching the inner race, and not the cage.



(c) Using a snap ring expander, install a new snap ring.

NOTICE: Work carefully so that the outer race does not come off.



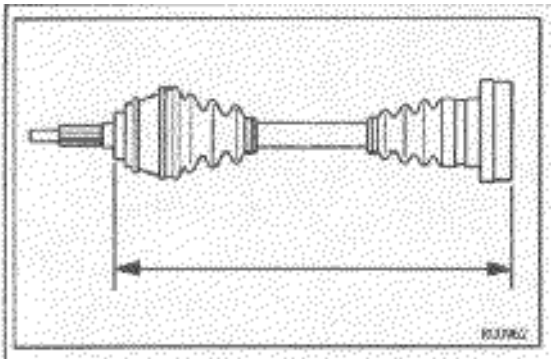
8. ASSEMBLE INBOARD JOINT BOOT TO INBOARD JOINT

Pack in grease to the inboard tulip and boot.

HINT: Use the grease supplied in the boot kit.

Grease capacity:

140–150 g (4.9–5.3 oz.)



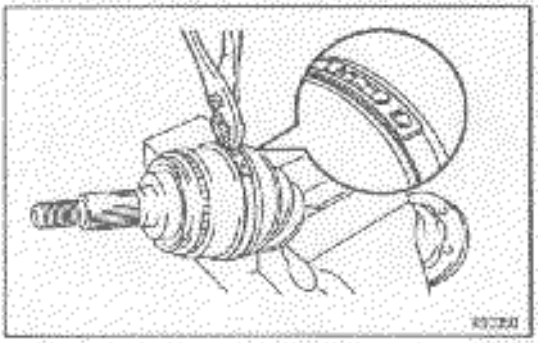
9. ASSEMBLE BOOT CLAMPS TO BOTH BOOTS

(a) Be sure the boots are in the shaft groove.

(b) Ensure that the boots are not stretched or contracted when the drive shaft is at standard length.

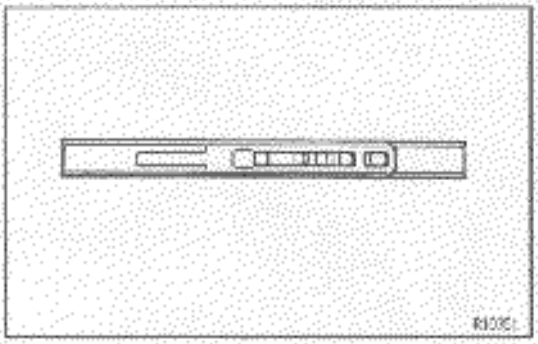
Drive shaft standard length:

452.35±2.0 mm (17.8090± 0.079 in.)

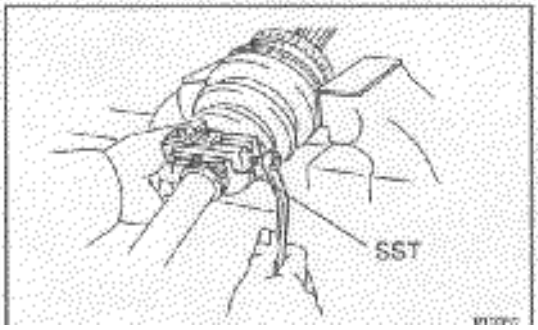


(c) Holding the clamp near the closing hooks, using pliers, position the holers in the clamp's free end over the closing hooks.

(d) Secure clamp by drawing the closing hooks together.



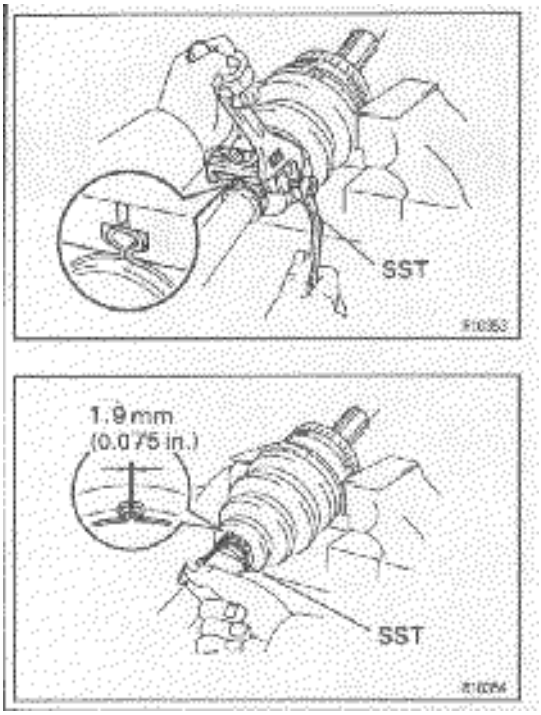
(e) Check that the clamp at closed position is the same as that shown in the illustration.



(f) Secure the clamp onto the boot.

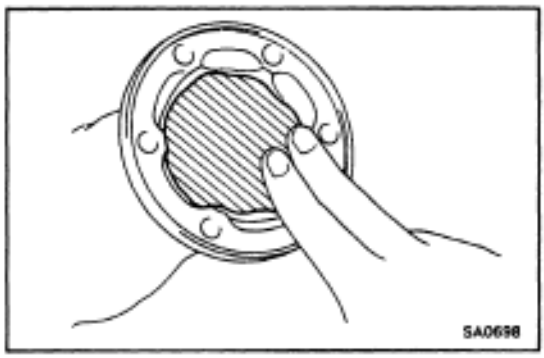
(g) Place SST onto the clamp

SST 09521 – 24010



(h) Tighten SST so that the clamp is pinched.
HINT: Pinch the inboard side of the boot clamp, as shown in the illustration.
NOTICE: Do not overtighten the SST.

(i) Using SST, adjust the clearance of the clamp.
SST 09240 – 00020
Clearance:
1.9 mm(0.0075 in.) or less

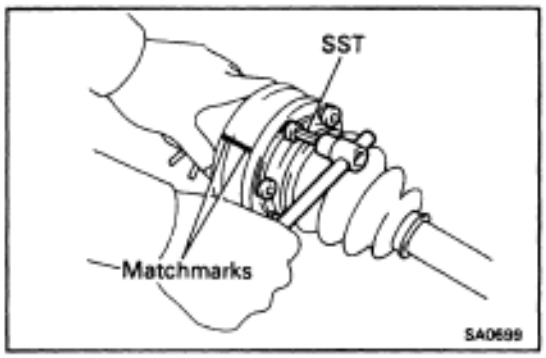


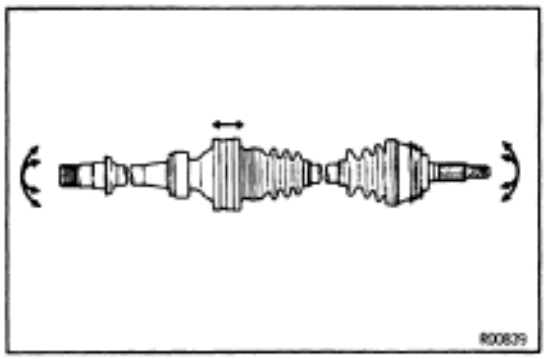
10. PACK IN GREASE TO CENTER DRIVE SHAFT OR SIDE GEAR SHAFT

Pack grease into the center drive shaft or side gear shaft.
Grease capacity:
50–60 g (1.8–2.1 oz.)
HINT: Use the grease supplied in the boot kit.

11. CONNECT DRIVE SHAFT AND CENTER DRIVE SHAFT OR SIDE GEAR SHAFT

(a) Remove the bolts, nuts and washers.
(b) Align the matchmarks on the drive shaft and center drive shaft or side gear shaft.
(c) Place a new gasket on the inboard joint.
(d) Install the center drive shaft or side gear shaft to the drive shaft.
NOTICE: When moving the drive shaft, do not compress the inboard boot.
(e) Install the 3 washers and 6 hexagon bolts, and using SST, temporarily tighten them.
SST 09923–00020





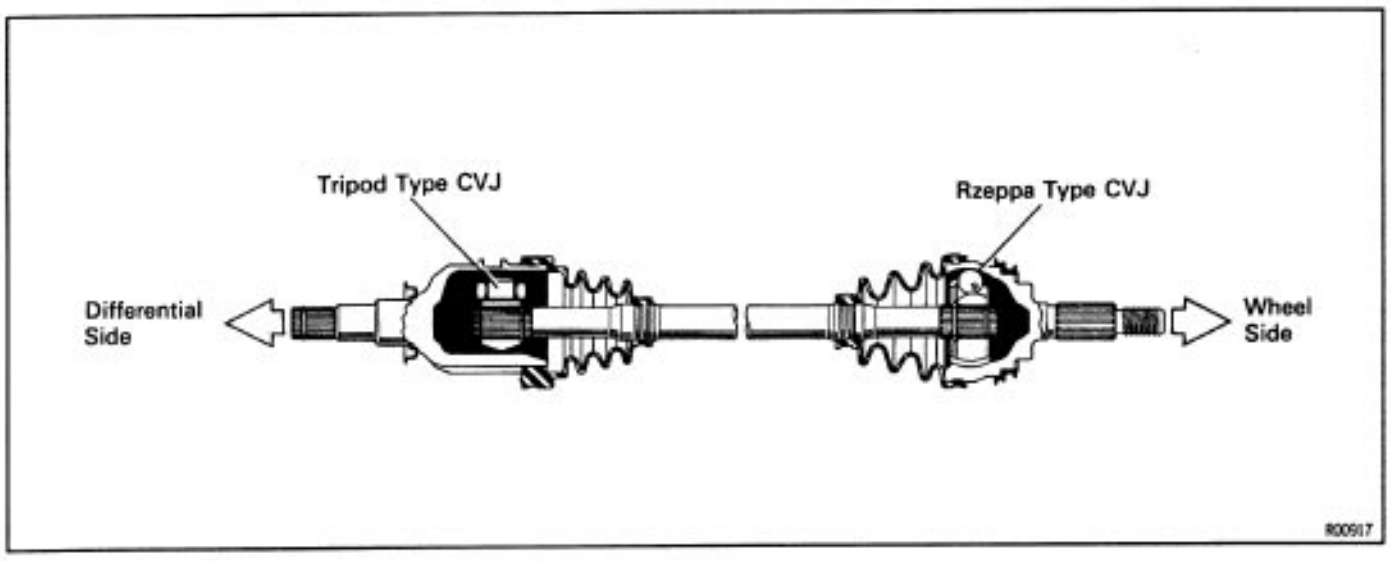
12. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the inboard joint and outboard joint.
(b) Check to see that inboard joint slides smoothly in the thrust direction.

FRONT DRIVE SHAFT (5S–FE)

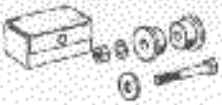
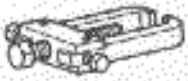
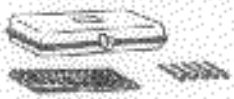
DESCRIPTION

The drive has a tripod type CVJ (Constant Velocity Joint) on the differential side and Rzeppa type CVJ on the wheel side.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	0950fi–35010 Differential Drive Pinion Rear Bearing Replacer	
	09608–1fi041 Front Hub Bearing Adjusting Tool	
	(09608–02020) Bolt & Nut	
	(09608–02040) Retainer	
	09628–62011 Ball ,Joint Puller	Tie rod end
	09950–00020 Bearing Remover	Center drive shaft dust cover
	09521–24010 Drive Shaft Boot Clamping Tool	
	09240–00020 Wire Gauge Set	
	(09242–00190) Wire Gauge	

RECOMMENDED TOOLS

	09905–00012 Snap Ring No. 1 Expander	For removing and installing snap ring

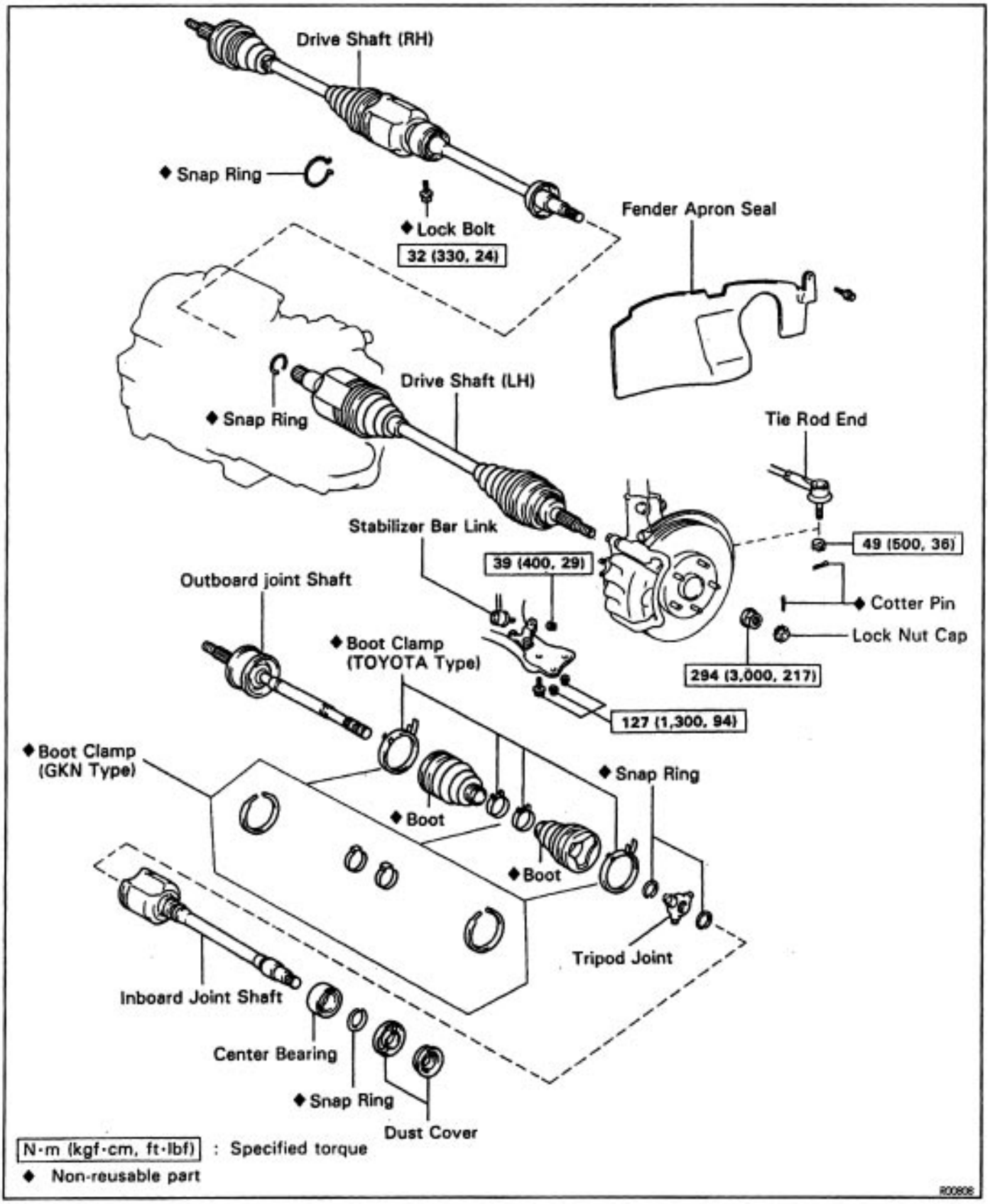
EQUIPMENT

Torque wrench	

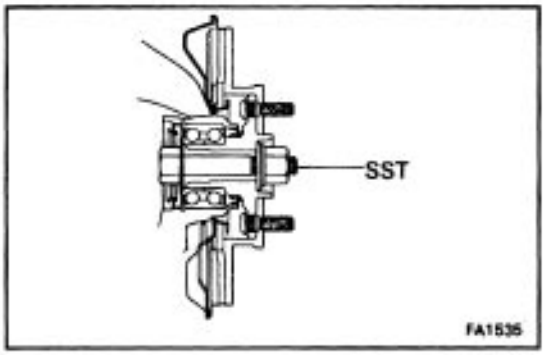
Correction for Pub. No. RM361U2, December 1993.

FRONT DRIVE SHAFT

COMPONENTS

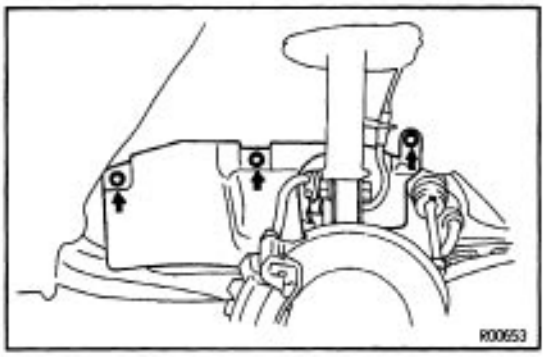


FRONT DRIVE SHAFT REMOVAL

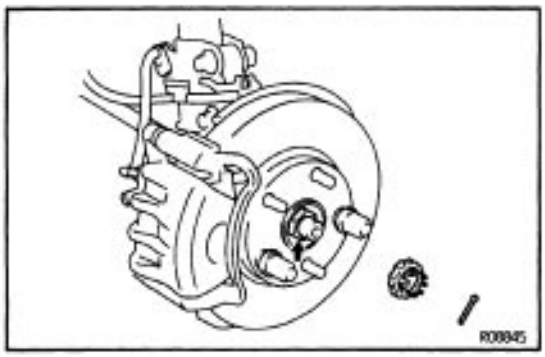


NOTICE: The hub bearing could be damaged if it is subjected to the vehicle weight, such as when moving the vehicle with the drive shaft removed. Therefore, if it is bearing first support it with SST.

SST 09608–16041(09608–02020,09608–02040)



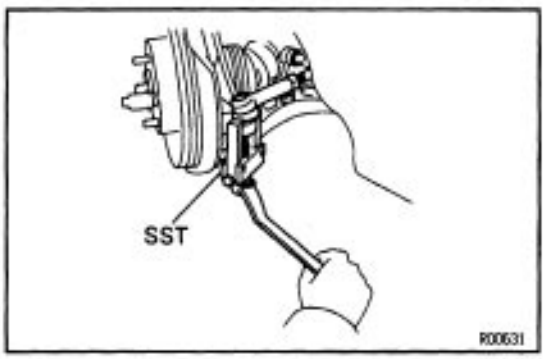
1. REMOVE FRONT FENDER APRON SEAL



2. REMOVE COTTER PIN, LOCK NUT CAP AND LOCK NUT

(a) Remove the cotter pin and lock nut cap.

(b) Loosen the bearing lock nut while depressing the brake pedal.



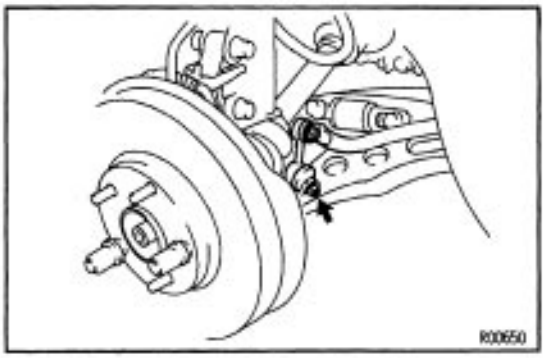
3. DRAIN TRANSAXLE OIL

4. DISCONNECT TIE ROD END FROM STEERING KNUCKLE

(a) Remove the cotter pin and nut from the steering knuckle.

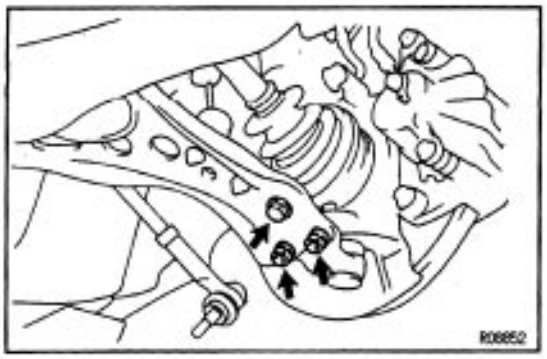
(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09628–62011



5. DISCONNECT STABILIZER BAR LINK FROM LOWER ARM

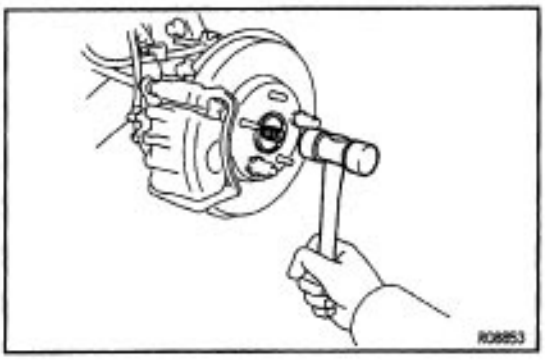
Remove the nut and disconnect the stabilizer bar link from lower arm.



6. DISCONNECT STEERING KNUCKLE FROM LOWER BALL JOINT

(a) Remove the bolt and the 2 nuts.

(b) Disconnect the steering knuckle from lower ball joint.



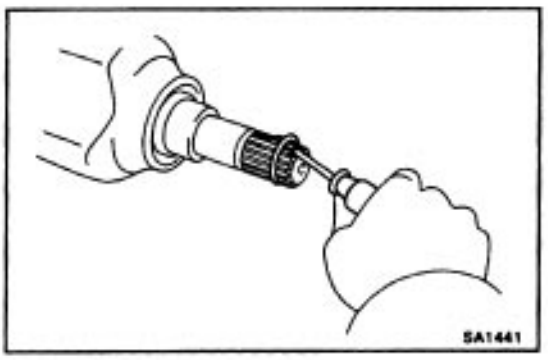
7. DISCONNECT DRIVE SHAFT FORM AXLE HUB

Using a plastic hammer, disconnect the drive shaft from the axle hub.

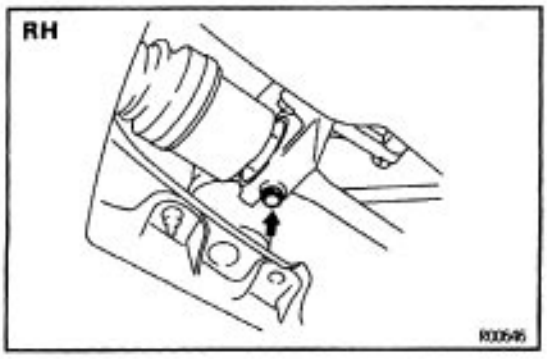
NOTICE: Cover the drive shaft boot with cloth to protect it from damage.

8. REMOVE LH DRIVE SHAFT

(a) Using hub nut wrench and hammer handle or an equivalent, pull out the drive shaft as shown.

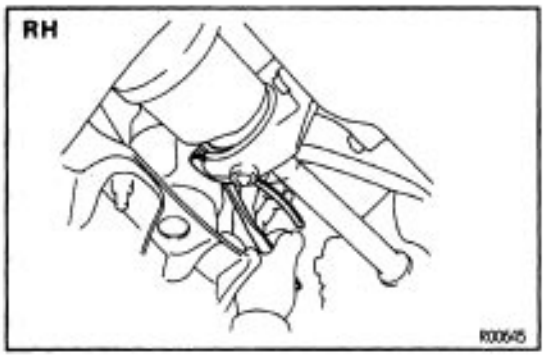


(b) Using a screwdriver, remove the snap ring.

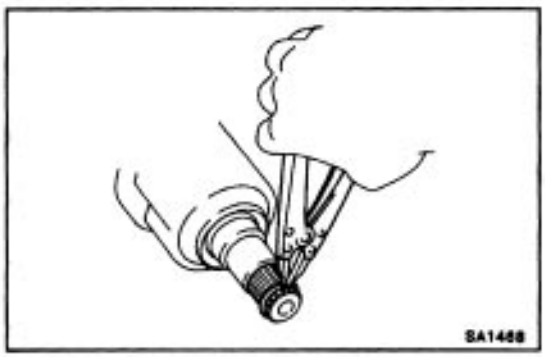


9. REMOVE RH DRIVE SHAFT

(a) Remove the bearing lock bolt.



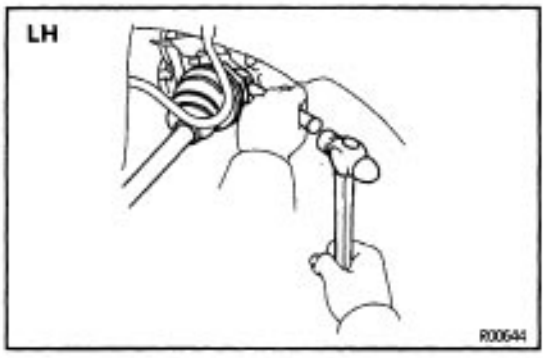
(b) Using pliers, remove the snap ring, and pull out the drive shaft.



FRONT DRIVE SHAFT INSTALLATION

1. INSTALL LH DRIVE SHAFT

(a) Using a snap ring expander, install a new snap ring.



(b) Coat gear oil to the inboard joint tulip and differential case sliding surface.

(c) Using a brass bar and hammer, tap in the drive shaft until it makes contact with the pinion shaft.

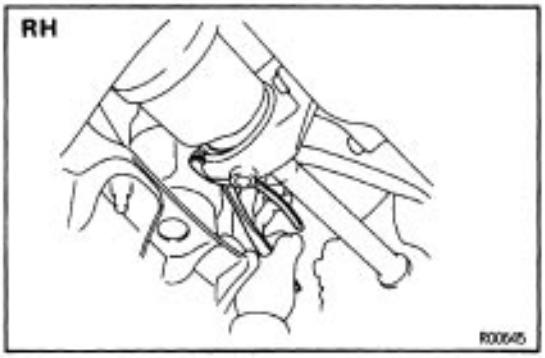
HINT:

- Before installing the drive shaft, set the snap ring opening side facing downward.
- Whether or not the drive shaft is making contact with the pinion shaft can be known by the sound or feeling when driving it in.

2. CHECK INSTALLATION OF LH DRIVE SHAFT

(a) Check that there is 2–3 mm (0.08–0.12 in.) of play in the axial direction.

(b) Check that the drive shaft can not be removed by hand.



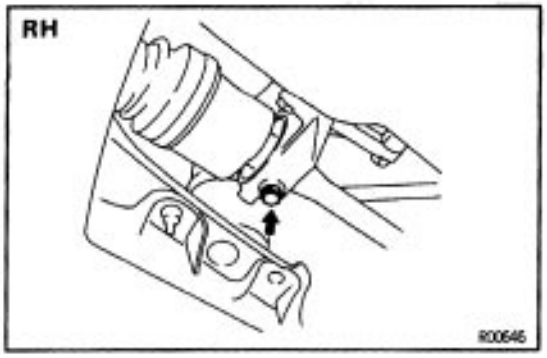
3. INSTALL RH DRIVE SHAFT

(a) Coat gear oil to the inboard joint and differential sliding surface.

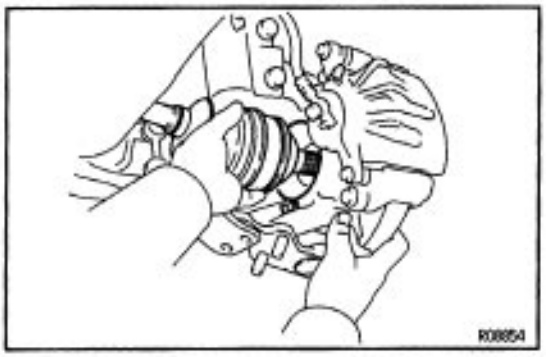
(b) Install the drive shaft to the transaxle through the bearing bracket.

NOTICE: Do not damage the oil seal lip.

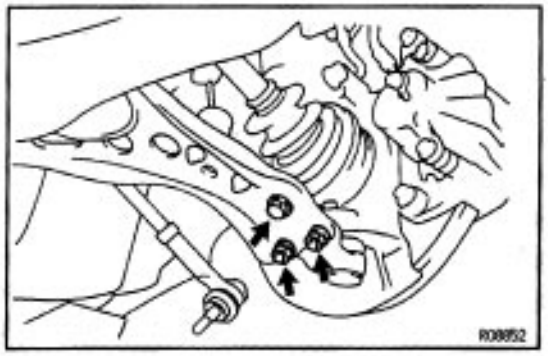
(c) Using pliers, install a new snap ring.



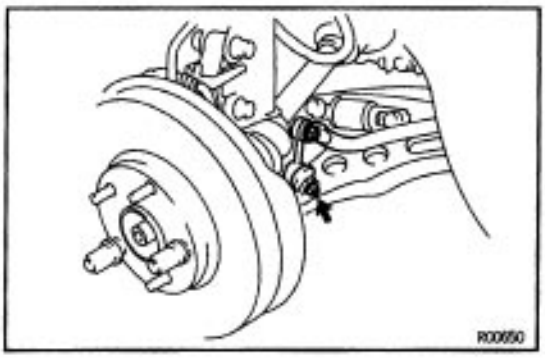
(d) Install a new bearing lock bolt and tighten it.
Torque: 32 N·m (330 kgf·cm, 24 ft·lbf)



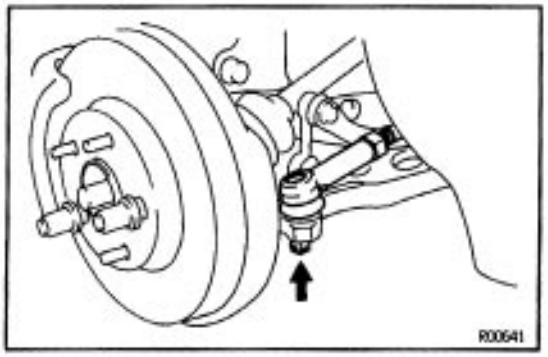
4. CONNECT DRIVE SHAFT TO AXLE HUB
Install the outboard joint side of the drive shaft to the axle hub.
NOTICE: Do not damage the boot.



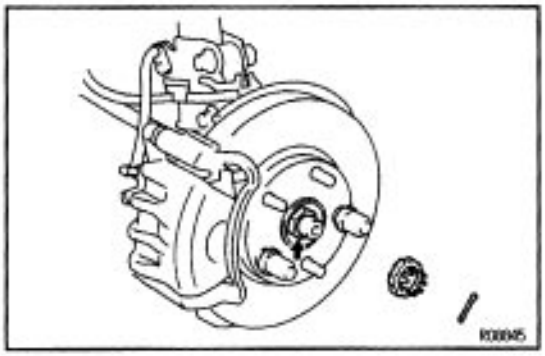
5. CONNECT STEERING KNUCKLE TO LOWER ARM
Torque: 127 N·m (1,300 kgf·cm, 94 ft·lbf)



6. CONNECT STABILIZER BAR LINK TO LOWER ARM
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



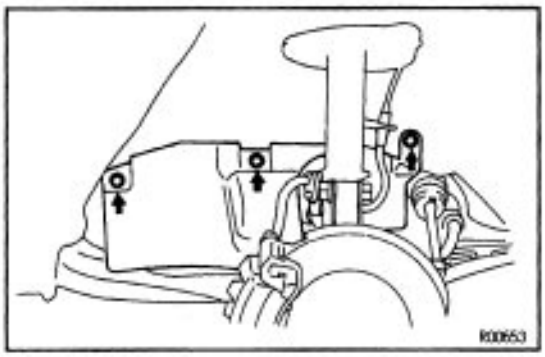
7. CONNECT TIE ROD END TO STEERING KNUCKLE
(a) Connect the tie rod end to the steering knuckle and torque the nut.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)
(b) Install a new cotter pin.
HINT: (f the cotter pin hole does not line up, correct by tightening the nut by the smallest amount possible.



8. INSTALL BEARING LOCK NUT, LOCK NUT CAP AND NEW COTTER PIN

(a) Install and torque the bearing lock nut.
Torque: 284 N·m (3,000 kgf·cm, 217 ft·lbf)

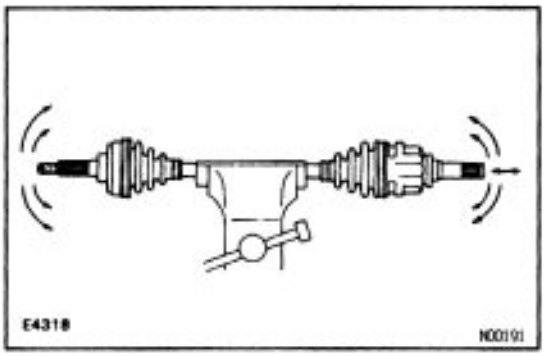
(b) Install the lock nut cap and secure it with a new cotter pin.



9. FILL TRANSAXLE WITH FLUID

10. INSTALL FRONT FENDER APRON SEAL

11. CHECK FRONT WHEEL ALIGNMENT



FRONT DRIVE SHAFT DISASSEMBLY

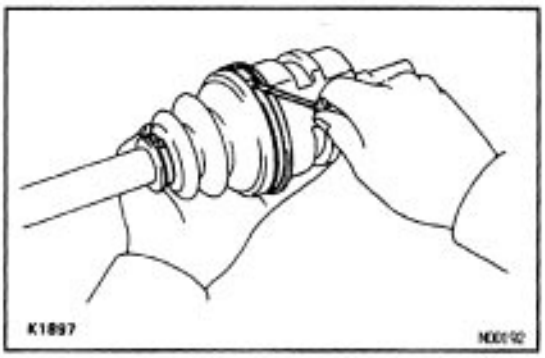
1. CHECK DRIVE SHAFT

(a) Check to see that there is no play in the outboard joint.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is not significant play in the radial direction of the inboard joint.

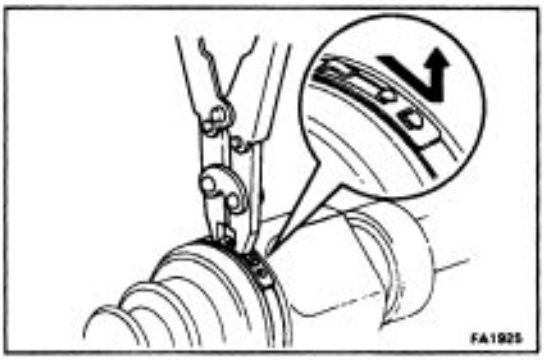
(d) Check for damage to boots.



2. TOYOTA TYPE:
REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS

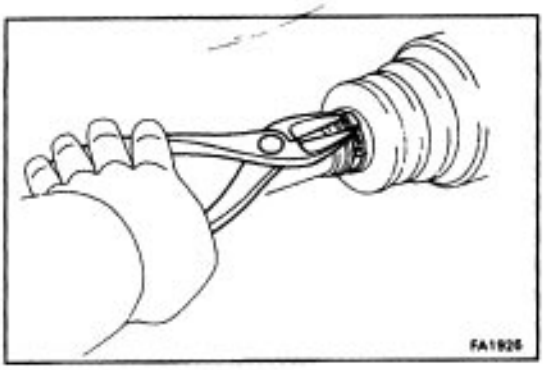
(a) Using a screwdriver, remove the 4 boot clamps.

(b) Slide the inboard joint boot toward the outboard joint.

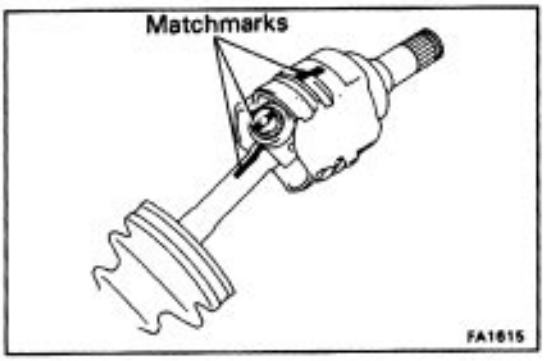


GKN TYPE:
REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS

(a) Using a boot clamp tool, draw hooks together and remove the 2 large clamps.

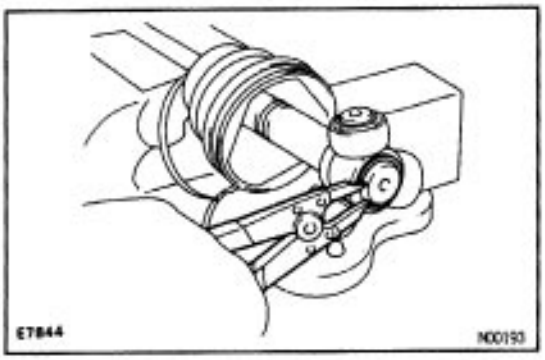


(b) Using side cutters, cut small boot clamp and remove them.
(c) Slide the inboard joint toward the outboard joint.



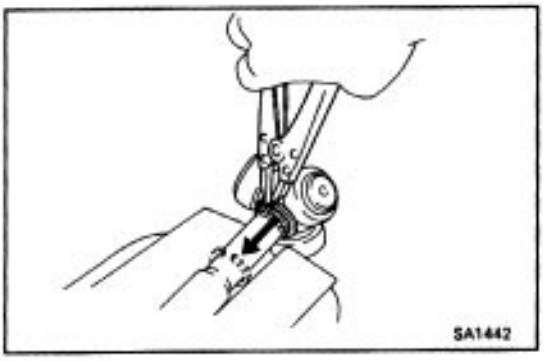
3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the tripod and inboard joint tulip or center drive shaft.
NOTICE: Do not punch the marks.
(b) Remove the inboard joint tulip or center drive shaft from the drive shaft.

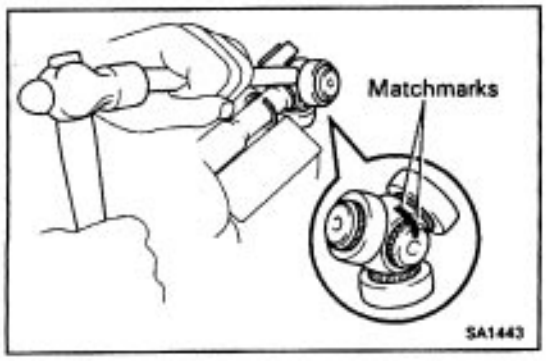


4. REMOVE TRIPOD JOINT

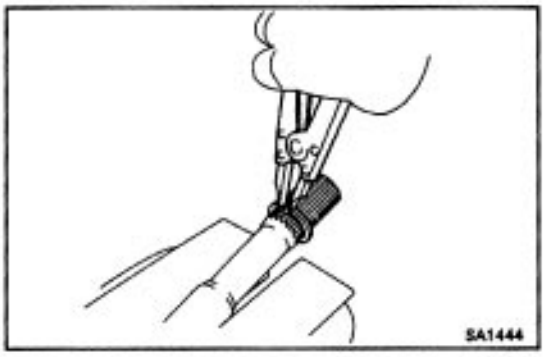
(a) Using a snap ring expander remove the snap ring.



(b) Using a snap ring expander, temporarily, slide the snap ring toward the outboard joint side.



(c) Place matchmarks on the drive shaft and tripod.
(d) Using a brass bar and a hammer, remove the tripod joint from the drive shaft.

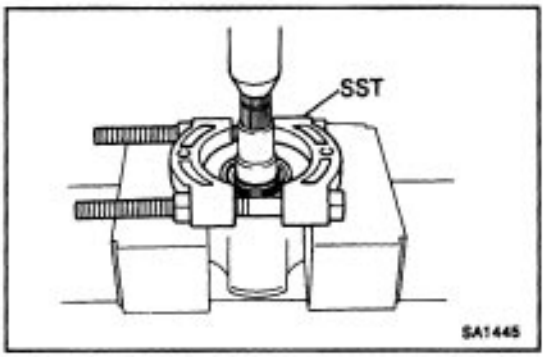


(e) Using a snap ring expander, remove the snap ring.

5. REMOVE INBOARD AND OUTBOARD JOINT BOOTS

Slide out the two boots.

NOTICE: Do not disassemble the outboard joint.

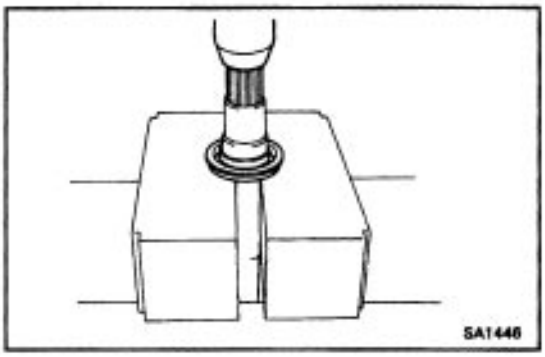


6. REMOVE DUST COVER

LH Drive Shaft:

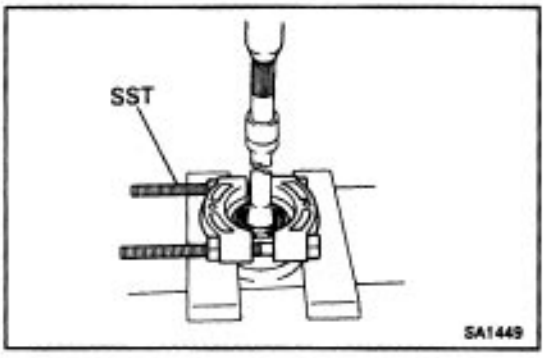
Using SST and a press, press out the dust cover from the inboard joint tulip.

SST 09950–00020



RH Drive Shaft:

Using a press, press out the dust cover from the center drive shaft.

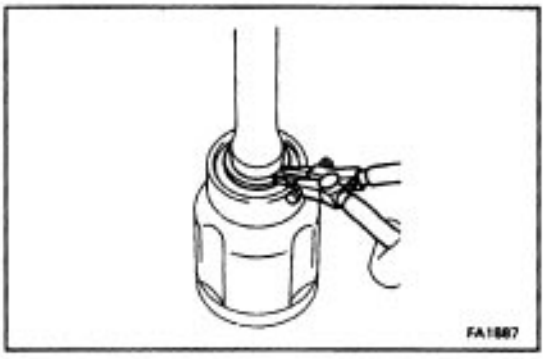


7. RH DRIVE SHAFT:

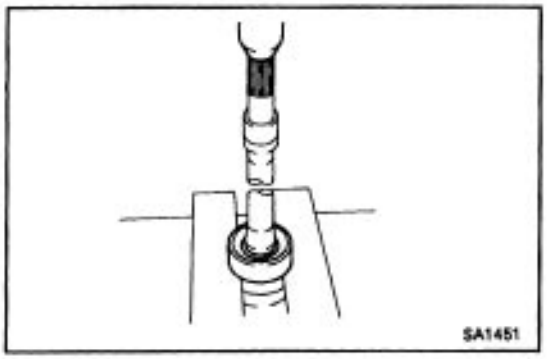
DISASSEMBLE CENTER DRIVE SHAFT

(a) Using SST and a press, press out the dust cover.

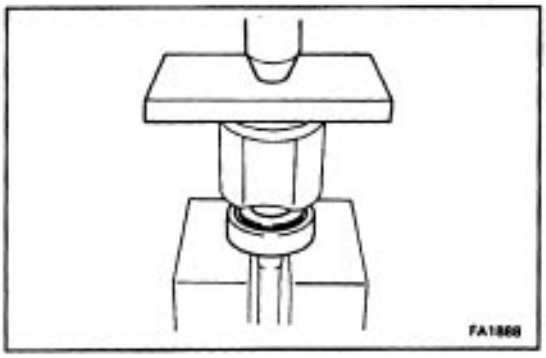
SST 09950–00020



(b) Using a snap ring expander, remove the snap ring.



(c) Using a press, press out the bearing.
(d) Remove the snap ring.

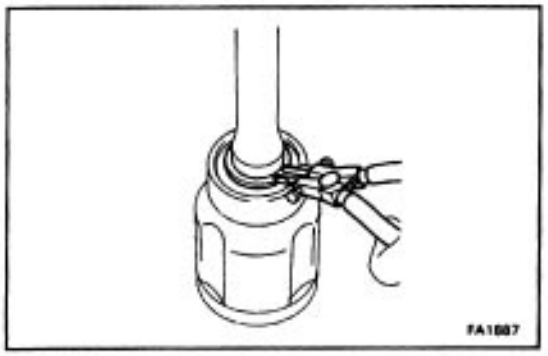


FRONT DRIVE SHAFT ASSEMBLY

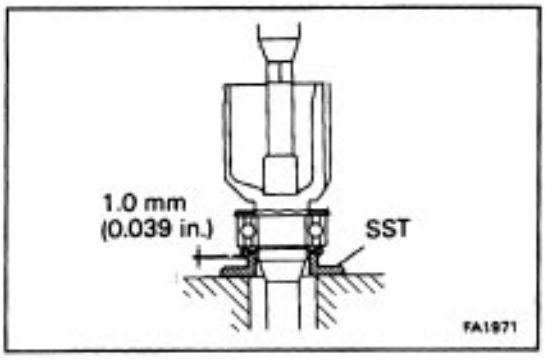
1. RH DRIVE SHAFT:

ASSEMBLE CENTER DRIVE SHAFT

(a) Install a new snap ring to the center drive shaft.
(b) Using a steel plate and press, press in the bearing.

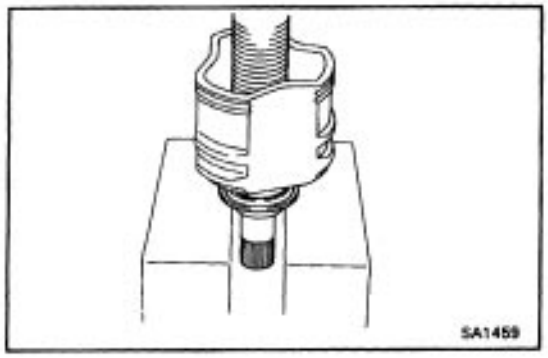


(c) Using a snap ring expander, install a new snap ring.



(d) Using SST, an extension bar and press, press in a new dust cover.
SST 09506 – 35010

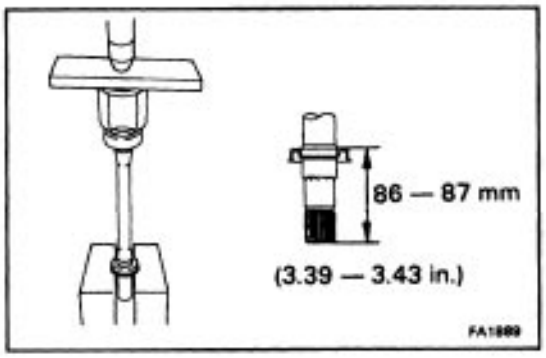
HINT: The clearance between the dust cover and the bearing should be kept in the range shown in the illustration.



2. INSTALL DUST COVER

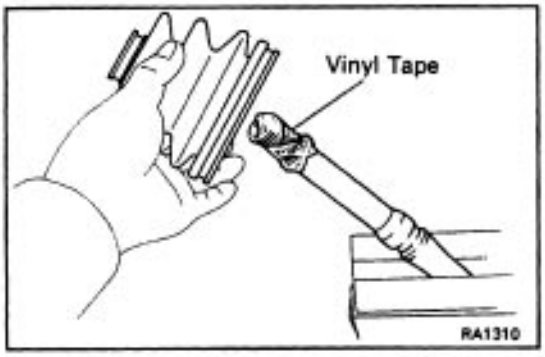
LH Drive Shaft:

Using a press, install a new dust cover.



RH Drive Shaft:

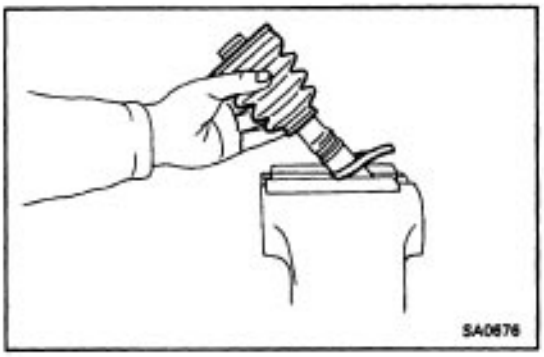
Using a steel plate and press, press in a new dust cover until the distance from the tip of the center drive shaft to the dust cover falls within the specification as shown in the illustration.



3. TEMPORARILY INSTALL OUTBOARD JOINT BOOT AND NEW BOOT CLAMPS

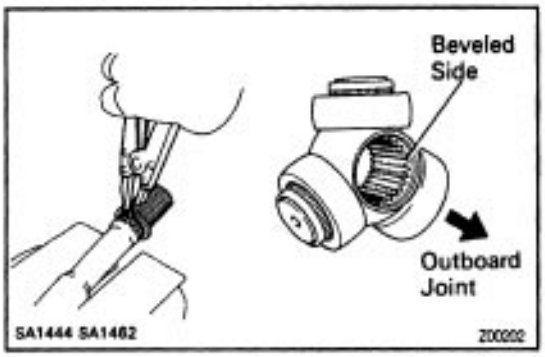
Temporarily install the boot and 2 new boot clamps for the outboard joint to the drive shaft.

HINT: Before installing the boot, wrap vinyl tape around the spline of the drive shaft to prevent damaging the boot.



4. TEMPORARILY INSTALL INBOARD JOINT BOOT AND NEW BOOT CLAMPS

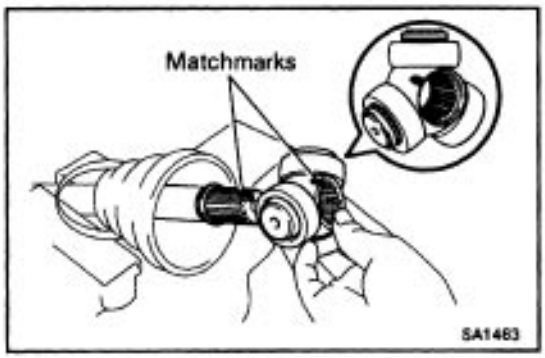
Temporarily install the boot and 2 new boot clamps for the inboard joint to the drive shaft.



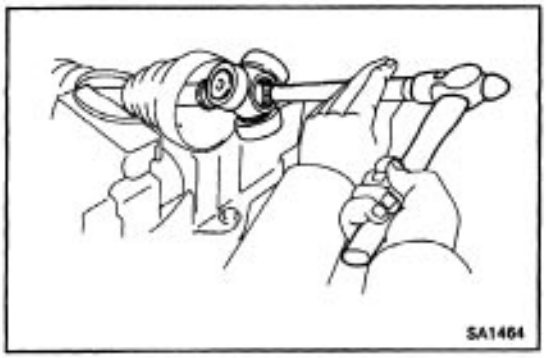
5. INSTALL TRIPOD JOINT

(a) Using a snap ring expander, install a new snap ring.

(b) Place the beveled side of the tripod joint axial spline toward the outboard joint.

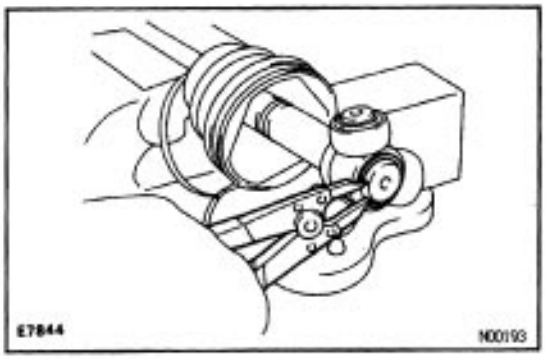


(c) Align the matchmarks placed before removal.



(d) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.

NOTICE: Do not tap the roller.



(e) Using a snap ring expander, install a new snap ring.

6. INSTALL BOOT TO OUTBOARD JOINT

Before assembling the boot, fill grease into the out–board joint and boot.

HINT: Use the grease supplied in the boot kit.

Grease capacity:

TOYOTA Type:

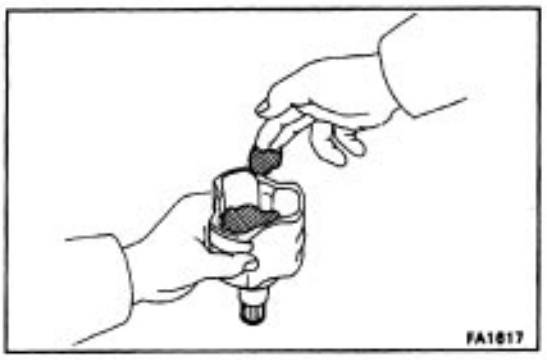
120–130 g (4.2–4.6 oz.)

GKN Type:

140–160 9 (4.9–5.6 oz.)

Grease color:

Black



7. INSTALL INBOARD JOINT TULIP TO FRONT DRIVE SHAFT

(a) Pack in the grease to the boot and inboard joint tulip.

HINT:– Use the grease supplied in the boot kit.

Grease capacity:

TOYOTA Type:

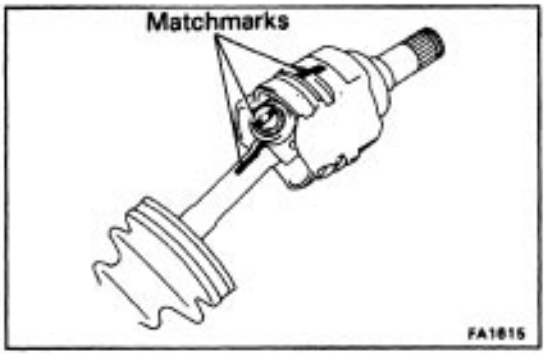
232–242 g (8.2–8.5 oz.)

GKN Type:

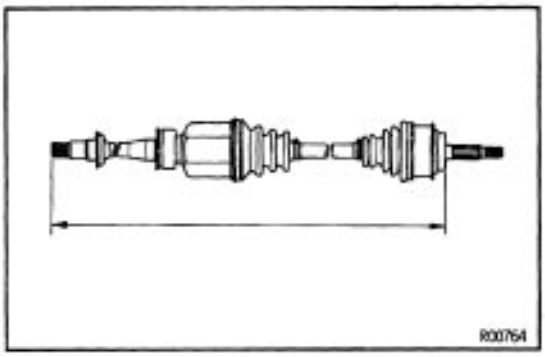
185–215 g (6.5–7.6 oz.)

Grease color:

Yellow ocher



(b) Align the matchmarks placed before removal, and install the inboard joint tulip to the drive shaft.
(c) Install the boot to the inboard joint tulip.



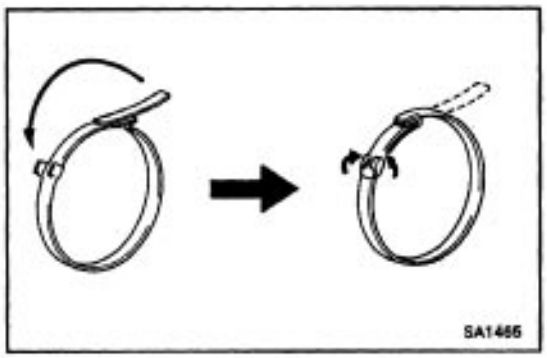
S. TOYOTA TYPE:

ASSEMBLE BOOT CLAMPS TO BOTH BOOTS

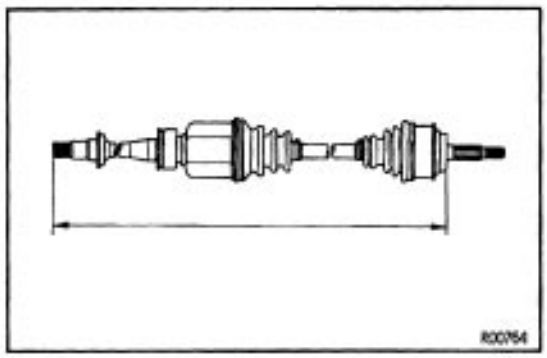
(a) Be sure the boot is in the shaft groove.
(b) Ensure that the boot is not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

LH 608.1 ±5.0 mm (23.941±0.197 in.)
RH 866.2±5.0 mm (34.102±0.197 in.)



(c) Using a screwdriver, bend the band and lock it as shown in the illustration.



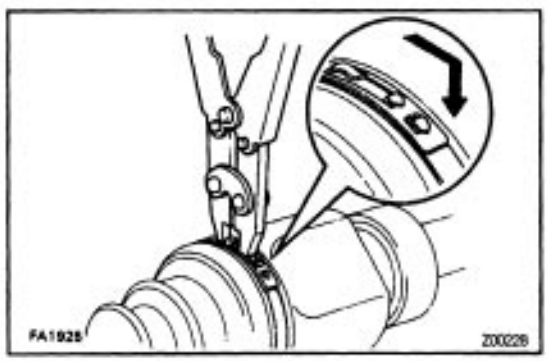
GKN TYPE:

ASSEMBLE BOOT CLAMPS TO BOTH BOOT

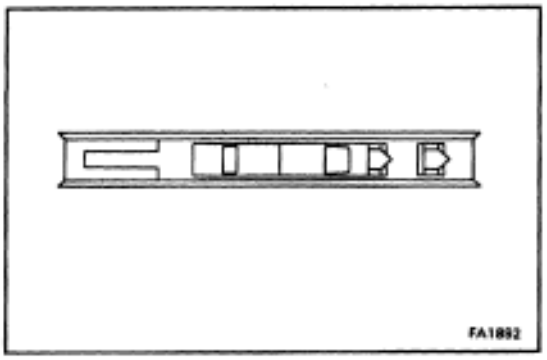
(a) Be sure the boots are in the shaft groove.
(b) Ensure that the boot is not stretched or contracted when the drive shaft is at standard length.

Drive shaft standard length:

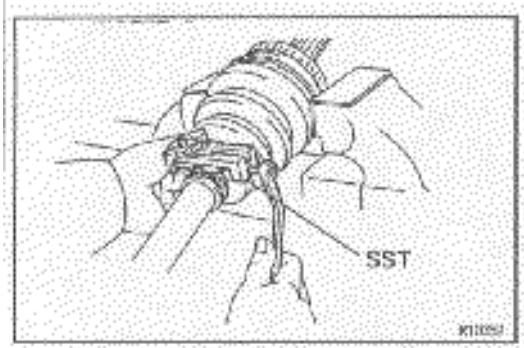
LH609Z±2.0 mm (23.984±0.079 in.)
RH 880.8±2.0 mm (34.677±0.079 in.)



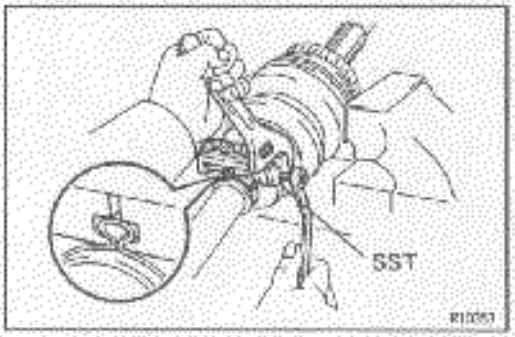
(c) Using a boot clamp tool, place pincer jaws in closing hooks of large clamps.
(d) Secure clamp by drawing closing hooks together.



(e) Check that the clamp at closed position is the same as in the illustration.

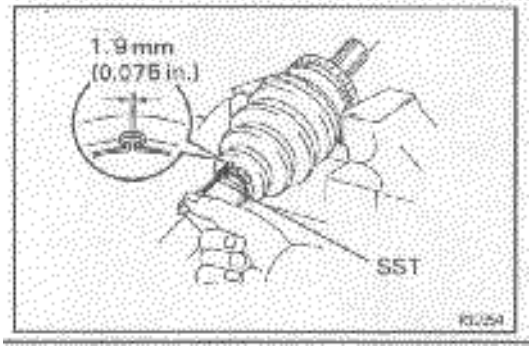


(f) Secure the clamp onto the boot.
(g) Place SST onto the clamp.
SST 09521 – 24010



(h) Tighten SST so that the clamp is pinched.
HINT: Pinch the inboard side of the boot clamp, as shown in the illustration.

NOTICE: Do not overtighten the SST.



(i) Using SST, adjust the clearance of the clamp.
SST 09240 – 00020

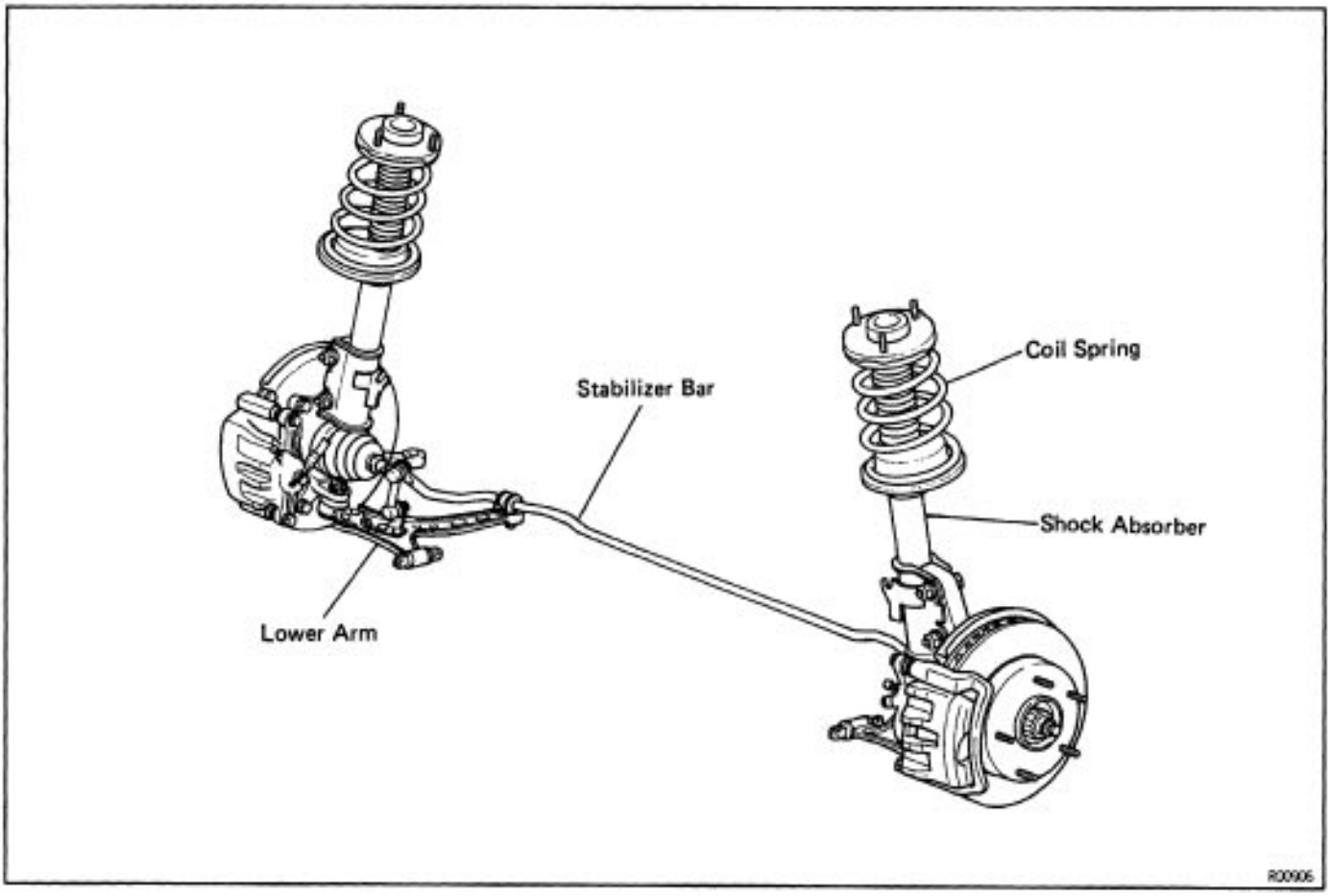
Clearance:

1.9 mm (0.075 in.) or less

FRONT SUSPENSION

DESCRIPTION

The front suspension is MacPherson strut type suspension with L–shape lower arm.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09316–60010 Transmission & Transfer Bearing Replacer	Dust deflector installation
	(09316–00010) Replacer Pipe	
	(09316–00040) Replacer 'C'	
	09608–32010 Steering Knuckle Oil Seal Replacer	Dust deflector installation
	09628–62011 Ball Joint Puller	
	09727–00045 Arm Set "B"	
	09727–30020 Coil Spring Compressor	
	09729–22031 Front Spring Upper Seat Holder	

RECOMMENDED TOOLS

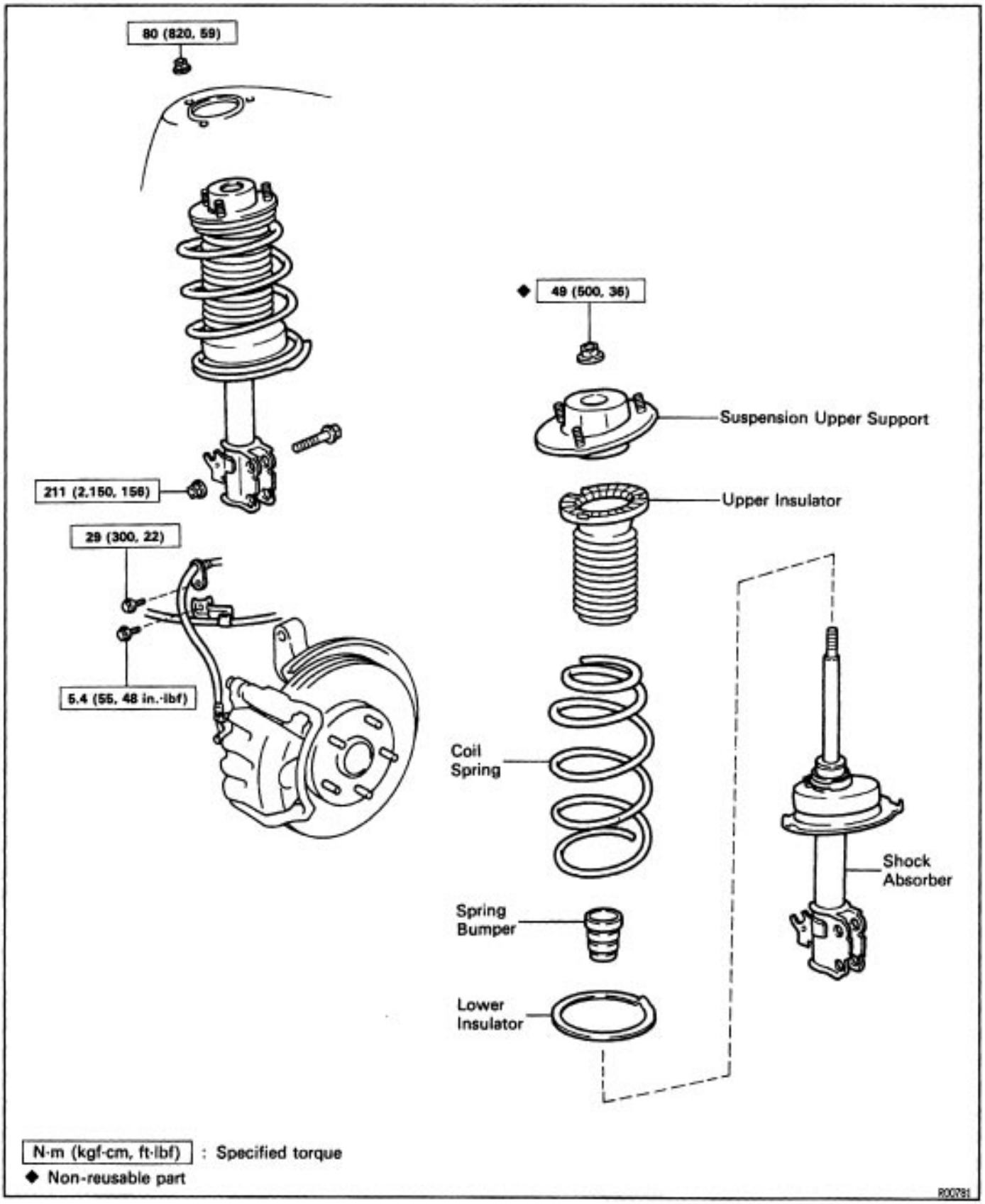
	09025–00010 Small Torque Wrench	

EQUIPMENT

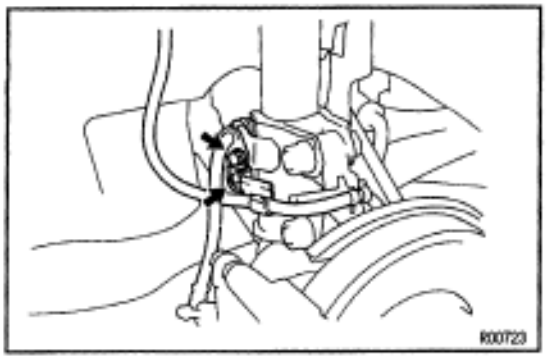
Torque wrench	

FRONT SHOCK ABSORBER

COMPONENTS

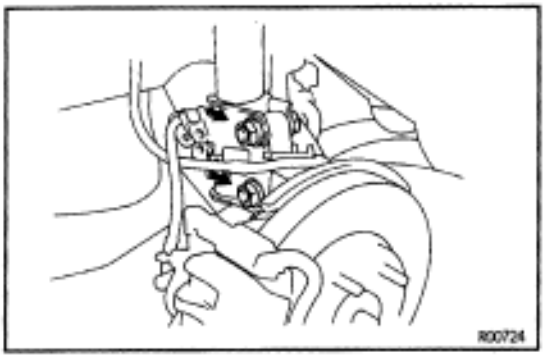


FRONT SHOCK ABSORBER REMOVAL



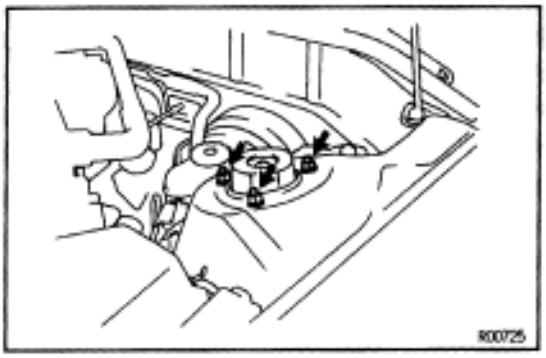
1. JACK UP VEHICLE AND REMOVE FRONT WHEEL

2. REMOVE BRAKE HOSE AND ABS SPEED SENSOR WIRE (W/ ABS) FROM SHOCK ABSORBER



3. DISCONNECT SHOCK ABSORBER FROM STEERING KNUCKLE

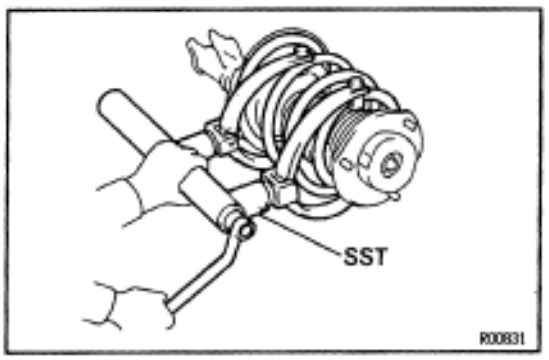
Remove the 2 nuts and bolts and disconnect the shock absorber from the steering knuckle.



4. REMOVE SHOCK ABSORBER WITH COIL SPRING

(a) Remove the 3 nuts on upper side of the shock absorber.

(b) Remove the shock absorber with coil spring.

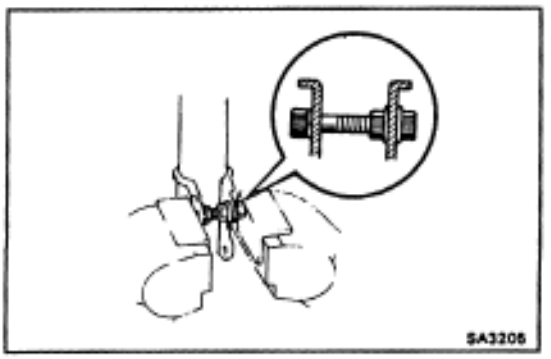


5. REMOVE COIL SPRING

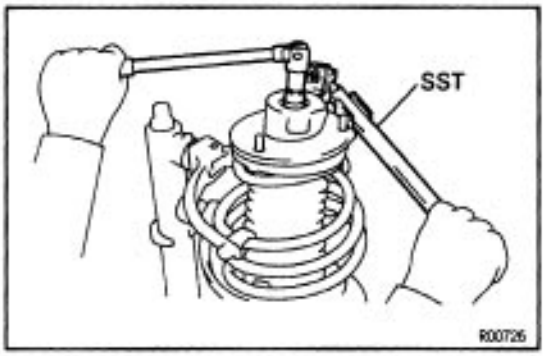
(a) Using SST, compress the coil spring.

SST 09727–00045,09727–30020

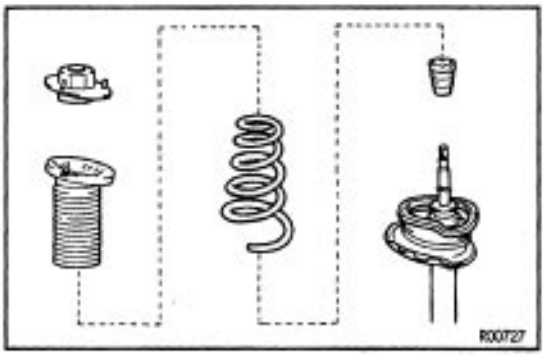
NOTICE: When holding the shock absorber with the coil spring removed, do not hold it by the spring lower seat. Also, do not knock the spring lower seat.



(b) Install a bolt and 2 nuts to the bracket at the lower portion of the shock absorber and secure it in a vise.



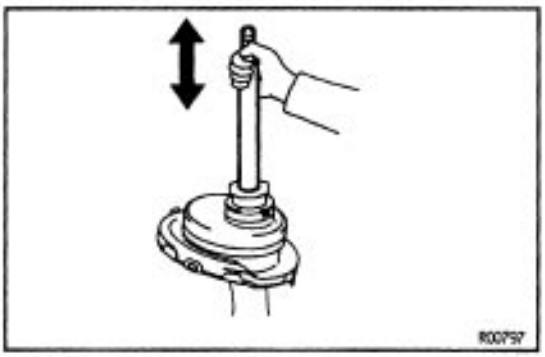
(c) Using SST to hold the upper support remove the nut.
SST 09729–22031



(d) Remove the following parts.

- Suspension upper support
- Upper insulator
- Coil spring
- Spring bumper
- Lower insulator

NOTICE: Do not disassemble the spring lower seat.



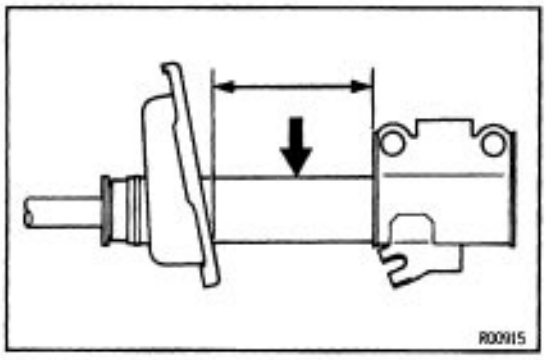
FRONT SHOCK ABSORBER INSPECTION

1. INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds.

If there is any abnormality, replace the shock absorber with a new one.

NOTICE: When discarding the shock absorber, use the following procedure.



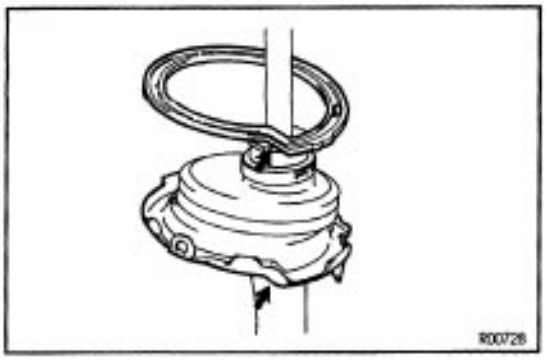
FRONT SHOCK ABSORBER DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

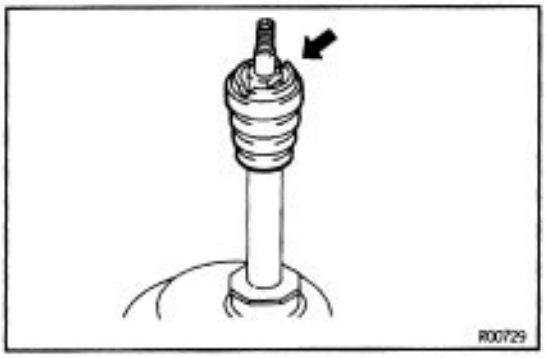
Using a drill, make a hole in the cylinder as shown to remove the gas inside.

CAUTION: The gas coming out is harmless, but be careful of chips which may fly up when drilling.

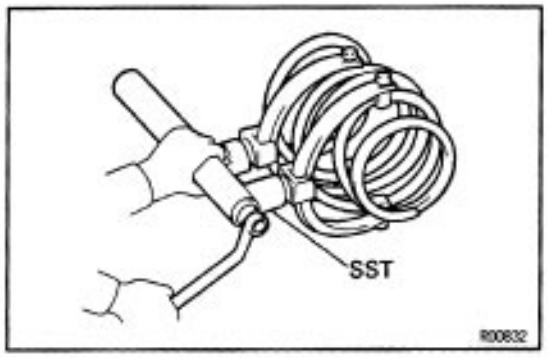


FRONT SHOCK ABSORBER INSTALLATION

7. INSTALL LOWER INSULATOR ONTO SHOCK ABS–ORBER

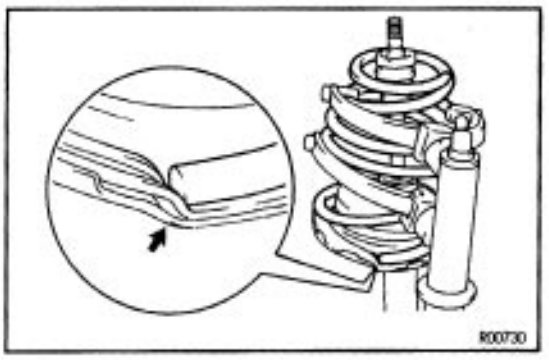


2. INSTALL SPRING BUMPER TO PISTON ROD

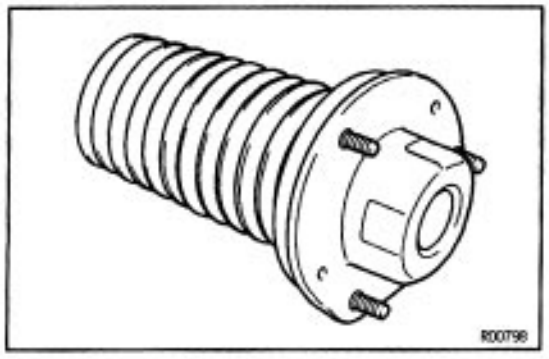


3. INSTALL COIL SPRING

(a) Using SST, compress the coil spring.
SST 09727–00045,09727–30020

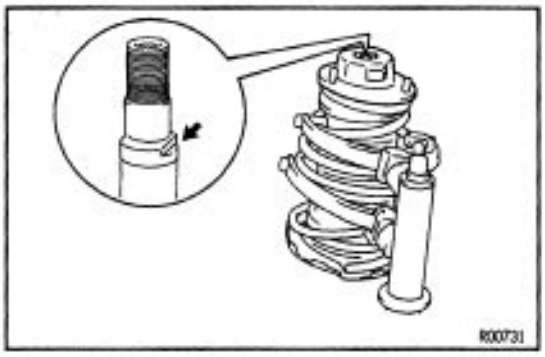


(b) Install the coil spring to the shock absorber.
HINT: Fit the lower end of the coil spring into the gap of the lower seat.

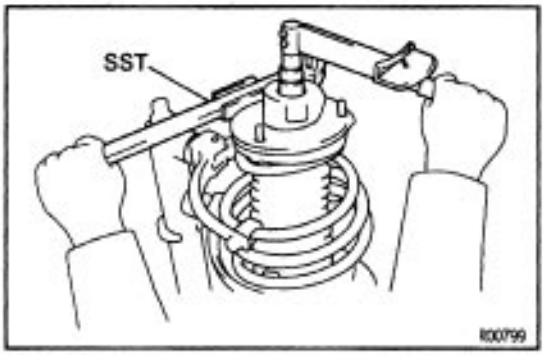


4. INSTALL UPPER INSULATOR AND UPPER SUP–PORT

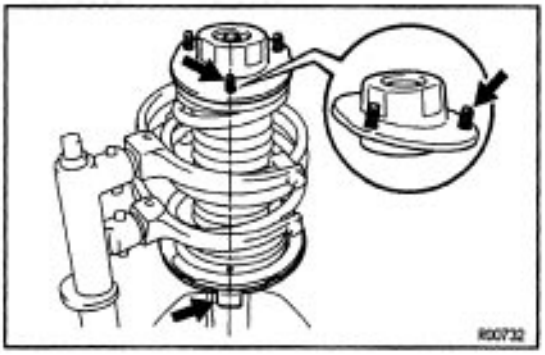
(a) Install the upper insulator to the upper support.



(b) Install the upper support to the piston rod.

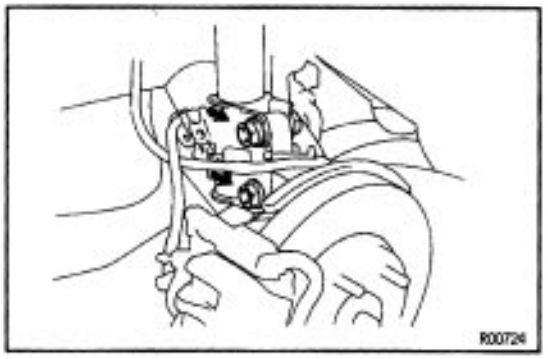


(c) Using SST to hold the upper support, install a new nut.
SST 09729–20031
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

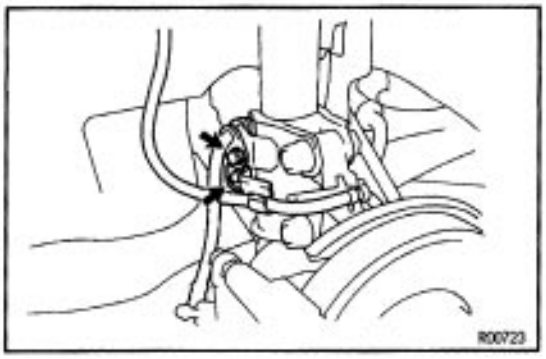


(d) Rotate the upper support so that the lowest bolt on the upper support is aligned with the projection part of the spring lower seat shown in the illustration.
(e) Remove the SST.
HINT: After removing SST, again check the direction of the upper support.

5. INSTALL SHOCK ABSORBER WITH COIL SPRING
Place the shock absorber and install the 3 nuts.
Torque: 80 N·m (820 kgf·cm, 59 ft·lbf)



6. CONNECT SHOCK ABSORBER TO STEERING KNU–CKLE
(a) Coat the threads of the nuts with engine oil.
(b) Install the 2 bolts and nuts.
Torque: 211 N·m (2,150 kgf·cm, 156 ft·lbf)



7. INSTALL BRAKE HOSE AND ABS SPEED SENSOR WIRE (W/ ABS) TO SHOCK ABSORBER

Brake hose

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

ABS wire

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

8. INSTALL FRONT WHEEL AND LOWER VEHICLE

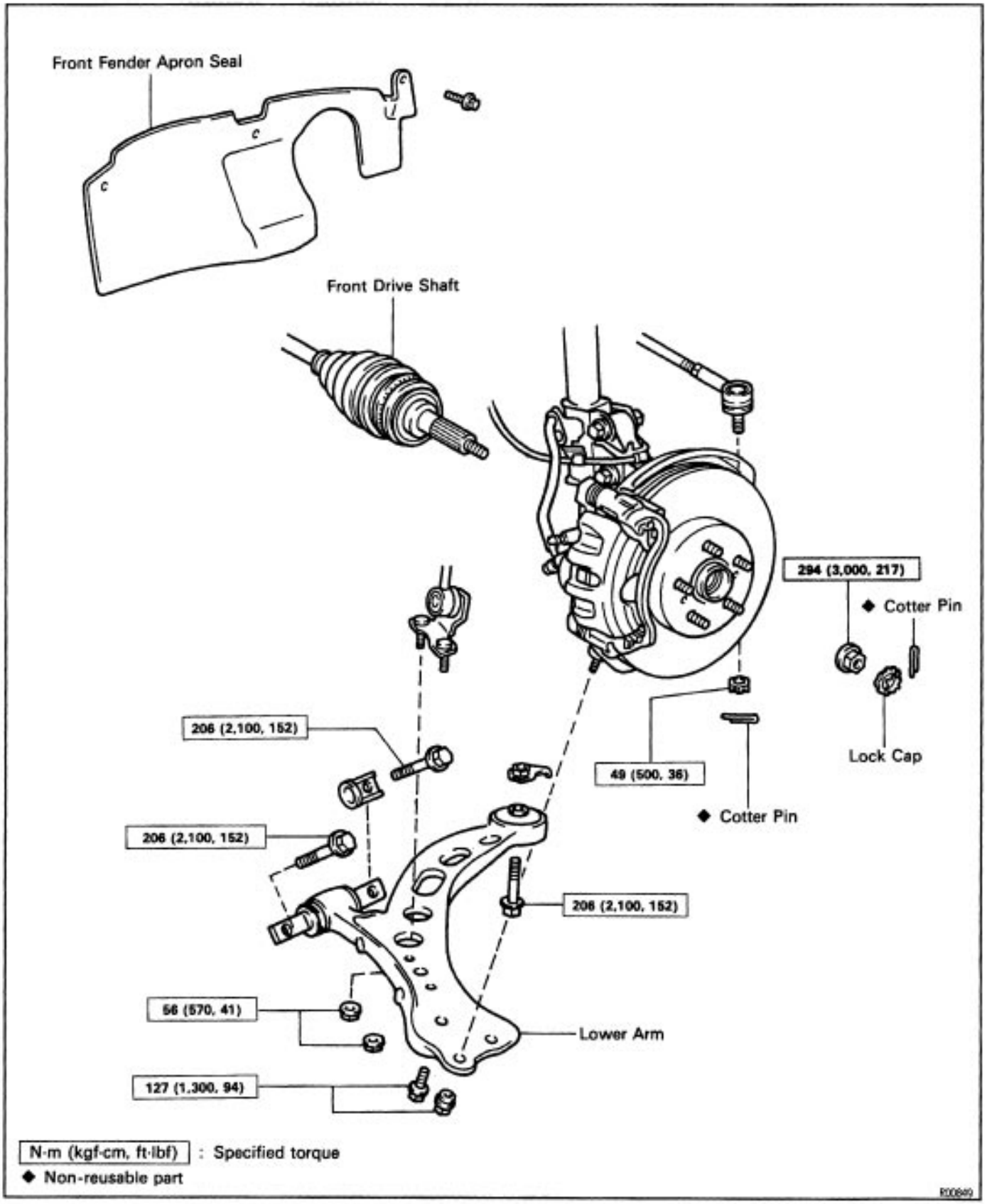
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

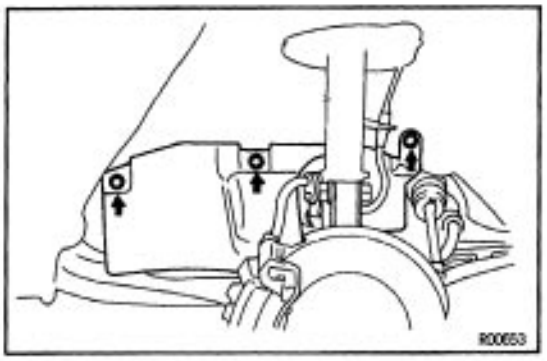
9. INSPECT FRONT WHEEL ALIGNMENT

(See page SA–4)

LOWER SUSPENSION ARM

COMPONENTS

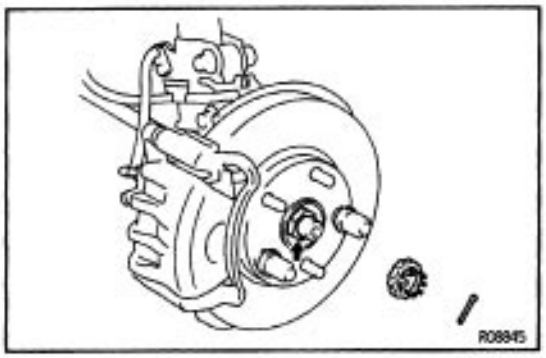




LOWER ARM REMOVAL

1. JACK UP VEHICLE AND REMOVE FRONT WHEEL

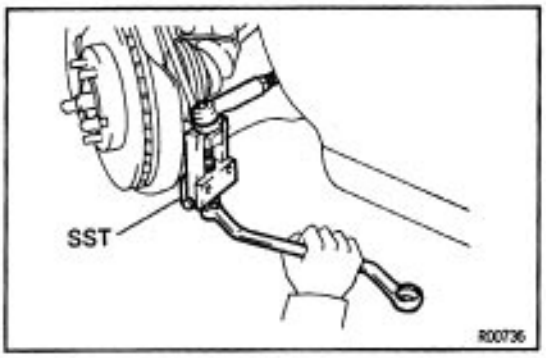
2. REMOVE FRONT FENDER APRON SEAL



3. REMOVE DRIVE SHAFT LOCK NUT

(a) Remove the cotter pin and lock cap.

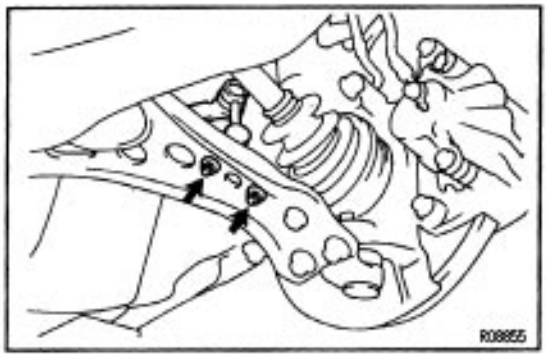
(b) While applying the brakes, remove the nut.



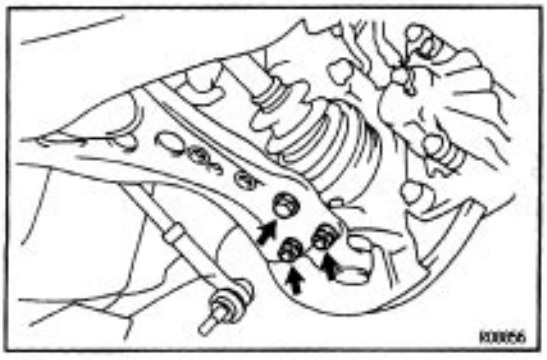
4. DISCONNECT TIE ROD END FROM STEERING KNU–CKLE

(a) Remove the cotter pin and remove the nut.

(b) Using SST, disconnect the tie rod end from the steer–ing knuckle.
SST 09628–62011

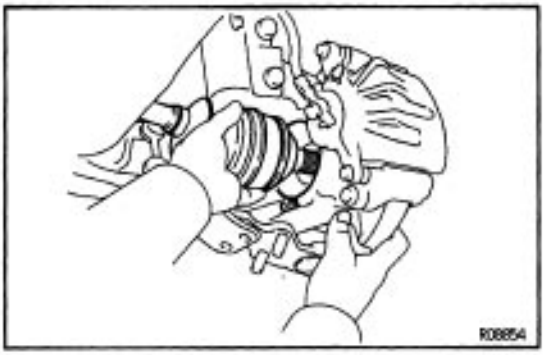


5. REMOVE LEFT AND RIGHT STABILIZER END BRA–CKETS FROM LOWER ARMS



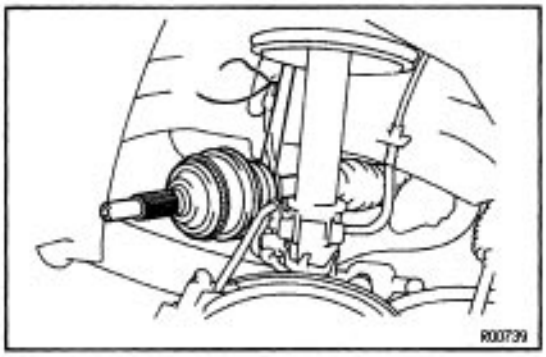
6. DISCONNECT LOWER ARM FROM LOWER BALL JOINT

Remove the bolt and 2 nuts.



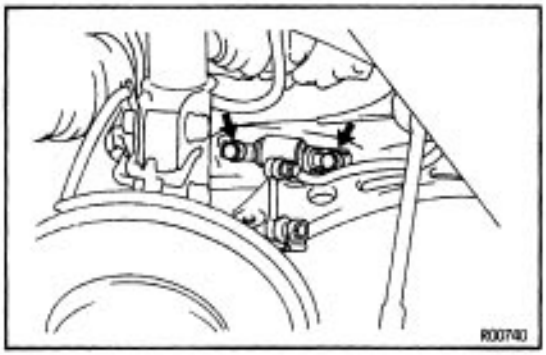
7. REMOVE DRIVE SHAFT PROM AXLE HUB

(a) Remove the drive shaft from the axle hub.



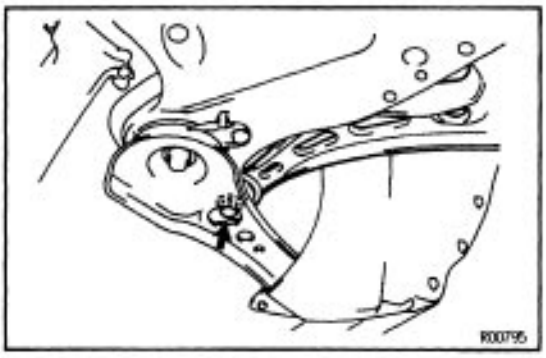
(b) Hang up the drive shaft using wire, etc.

NOTICE: Be careful not to damage the drive shaft boot and ABS sensor rotor.

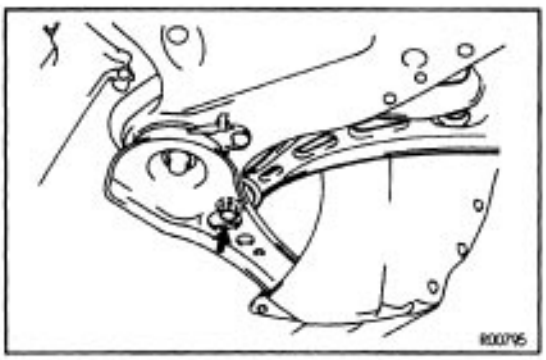


8. REMOVE LOWER ARM

(a) Remove the 2 bolts on front side of the lower arm.



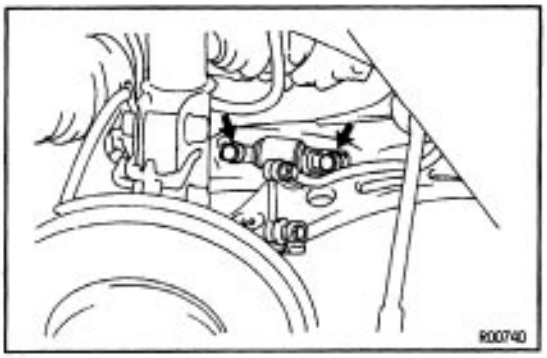
(b) Remove the bolt and nut on rear side of the lower arm.
(c) Remove the lower arm.
(d) Remove the lower arm bushing stopper from the lower arm shaft.



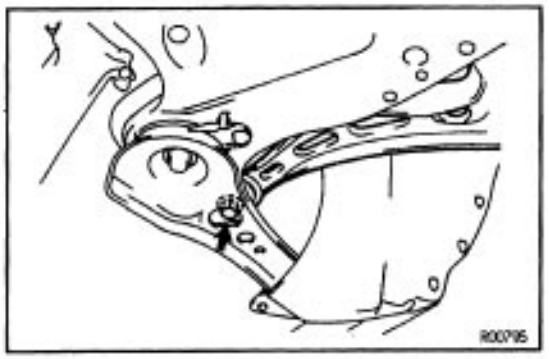
LOWER ARM INSTALLATION

1. INSTALL LOWER ARM

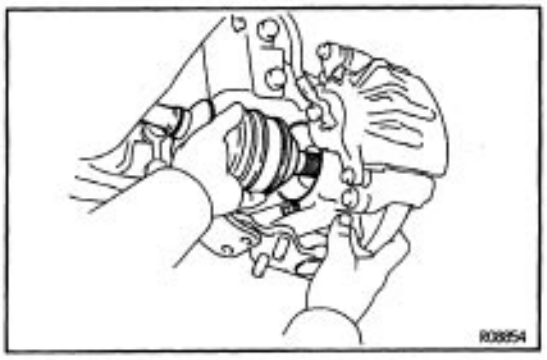
(a) Place the lower arm and temporarily install the rear side bolt and nut



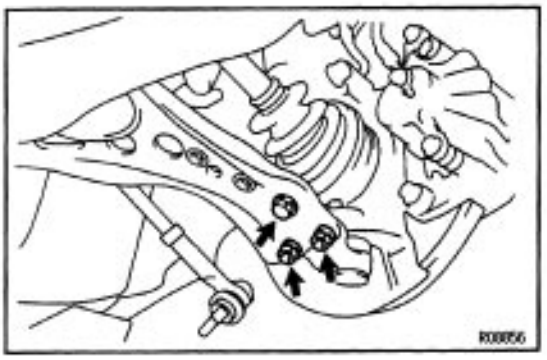
(b) Install the lower arm bushing stopper to the lower arm shaft.
(c) Install the 2 bolts on the front side of the lower arm.
Torque: 206 N·m (2,100 kgf·cm, 152 ft·lbf)



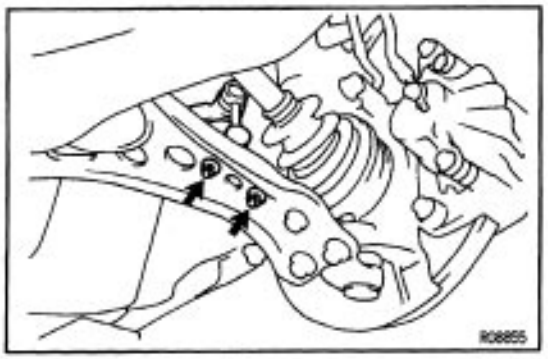
(d) Tighten the bolt on rear side of the lower arm.
Torque: 206 N·m (2,100 kgf·cm, 152 ft·lbf)



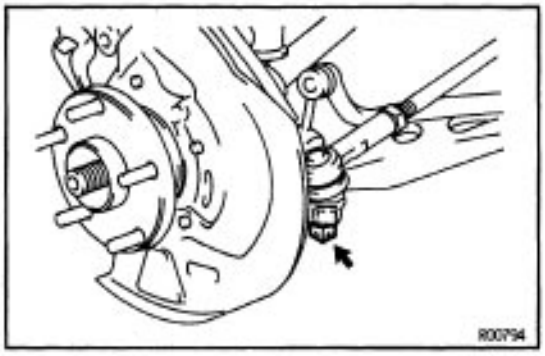
2. INSTALL DRIVE SHAFT TO AXLE HUB



3. CONNECT LOWER ARM TO LOWER BALL JOINT
Install the bolt and 2 nuts.
Torque: 127 N·m (1,300 kgf·cm, 94 ft·lbf)



4. INSTALL LEFT AND RIGHT STABILIZER END BRACKETS TO LOWER ARMS
Torque: 56 N·m (570 kgf·cm, 41 ft·lbf)

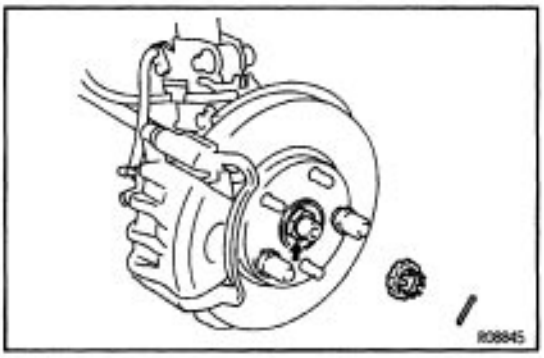


5. CONNECT TIE ROD END TO STEERING KNUCKLE

(a) Connect the tie rod end to the steering knuckle and tighten the nut.

Torque: 49 N·m (500 kgf·cm. 36 ft·lbf)

(b) Install a new cotter pin.

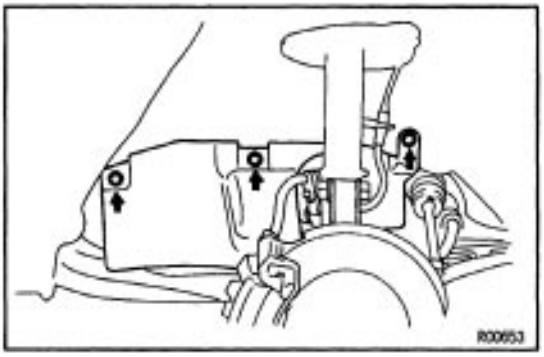


6. INSTALL DRIVE SHAFT LOCK NUT

(a) While applying the brakes, install the nut.

Torque: 294 N·m (3,000 kgf·cm, 217 ft·lbf)

(b) Install the lock cap and a new cotter pin.



7. INSTALL FRONT FENDER APRON SEAL

8. INSTALL FRONT WHEEL AND LOWER VEHICLE

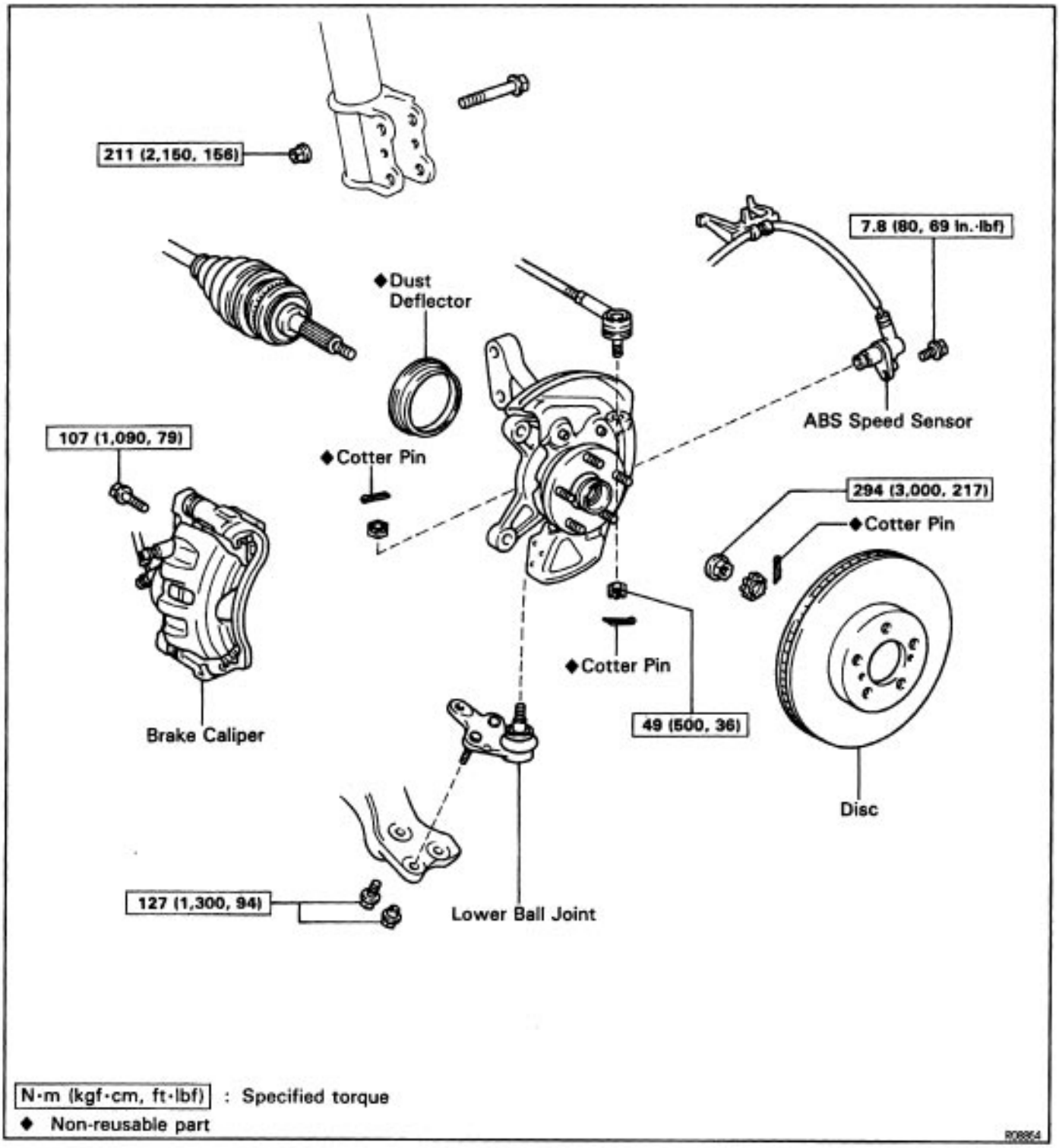
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

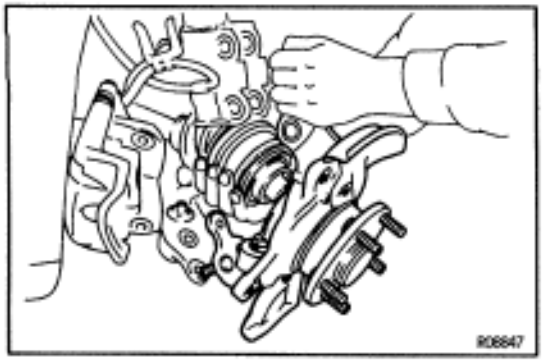
9. INSPECT FRONT WHEEL ALIGNMENT

(See page SA–4)

LOWER BALL JOINT

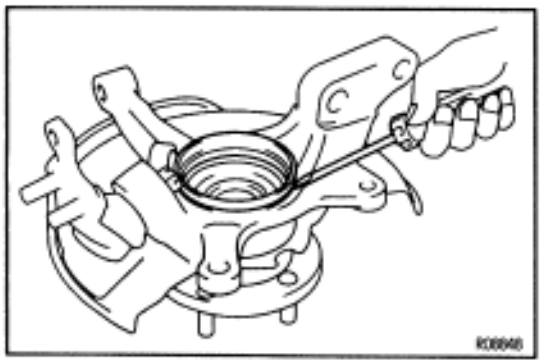
COMPONENTS



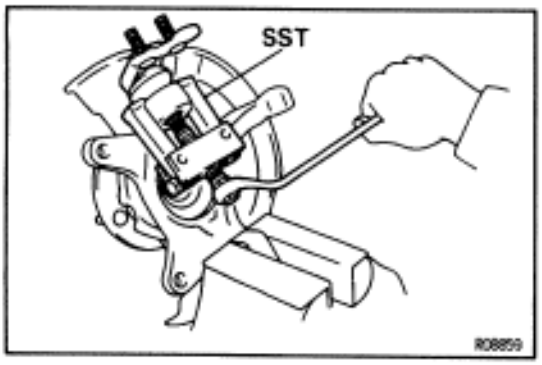


LOWER BALL JOINT REMOVAL

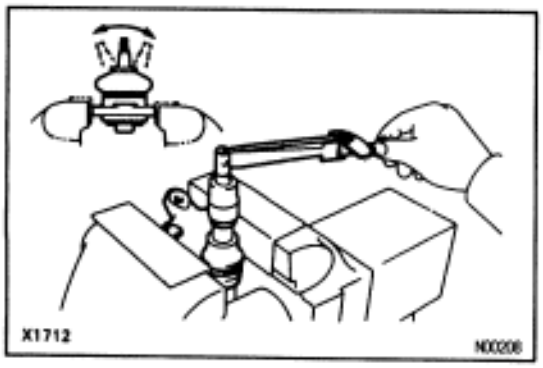
1. REMOVE STEERING KNUCKLE WITH AXLE HUB
(See page SA–11)



2. REMOVE LOWER BALL JOINT
(a) Using a screwdriver, remove the dust deflector.

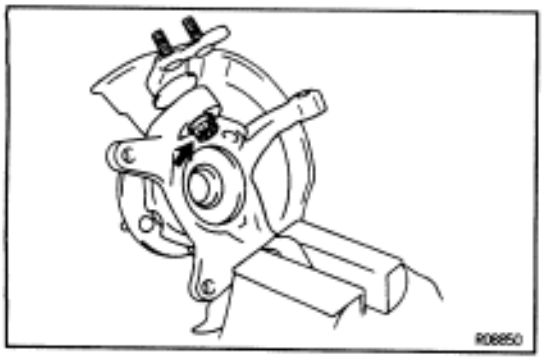


(b) Remove the cotter pin and nut.
(c) Using SST, remove the lower ball joint.
SST 09628–62011



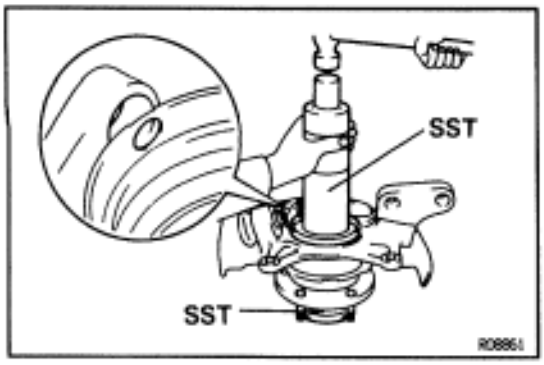
LOWER BALL JOINT INSPECTION

1. INSPECT BALL JOINT FOR ROTATION CONDITION
(a) As shown, flip the ball joint stud back and forth 5 times before installing the nut.
(b) Using a torque gauge, turn the nut continuously one turn per 2–4 seconds and take the torque reading on the 5th turn.
Turning torque:
1.0–2.9 N·m (10–30 kgf·cm, 8.7–26 in.·lbf)



LOWER BALL JOINT INSTALLATION

1. INSTALL LOWER BALL JOINT
(a) Install the lower ball joint and tighten the nut.
Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)
(b) Install a new cotter pin.



2. INSTALL DUST DEFLECTOR

Using SST and a hammer, install a new dust deflector.

SST 09316–60010 (09316–00010, 09316–00040)
09608–32010

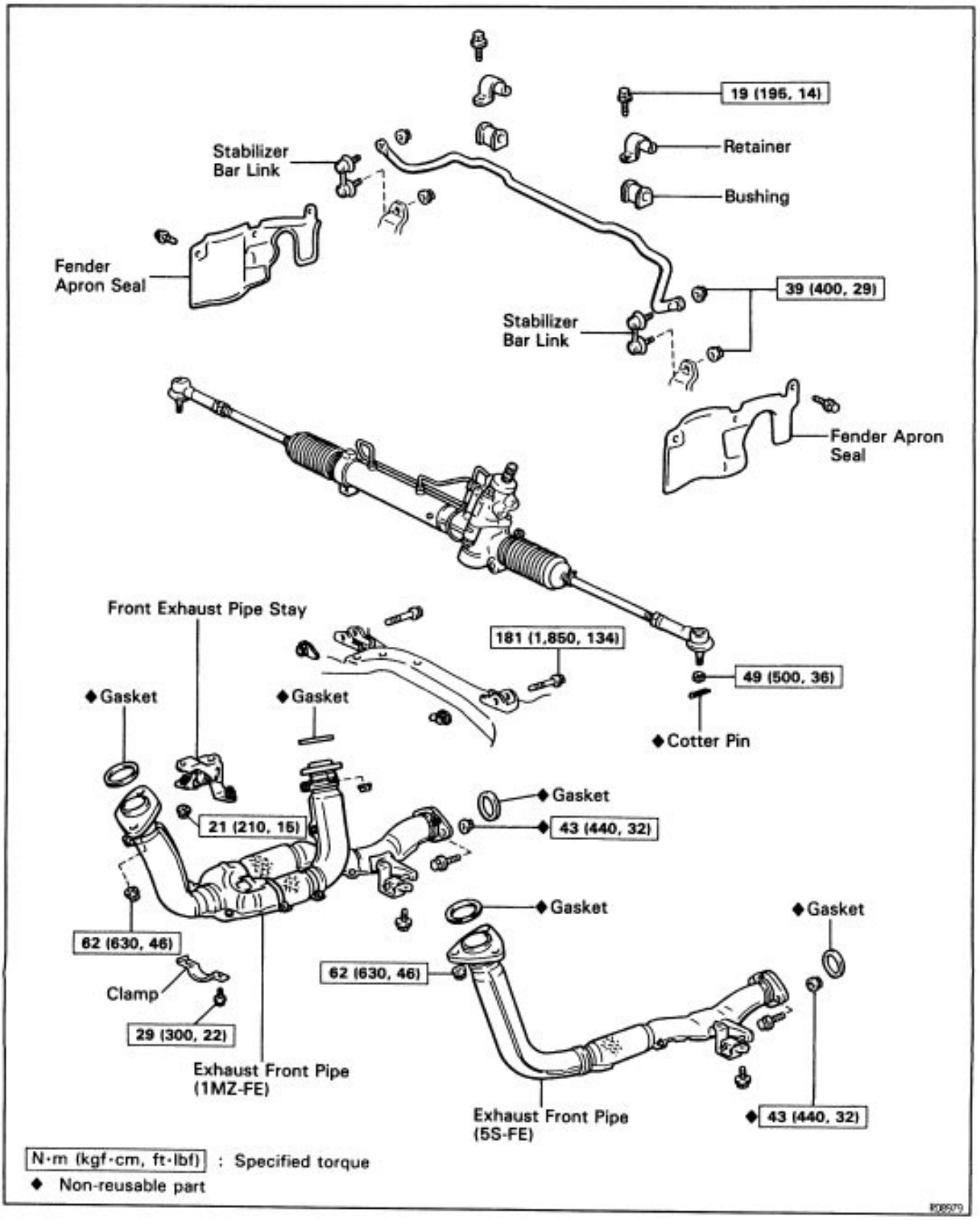
HINT: Align the hoses for the ABS speed sensor in the dust deflector and steering knuckle.

3. INSTALL STEERING KNUCKLE WITH AXLE HUB

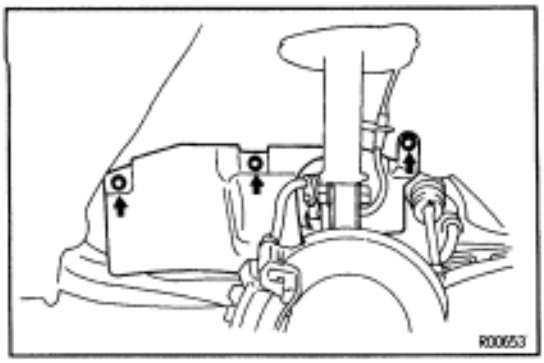
(See page SA–15)

STABILIZER BAR

COMPONENTS

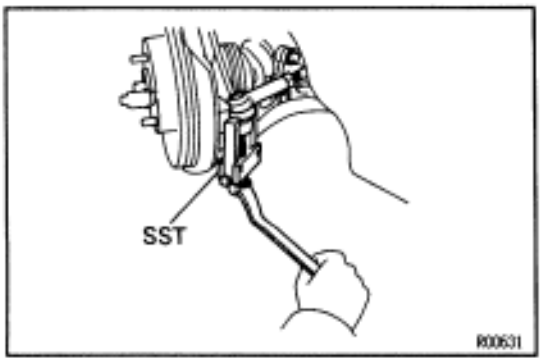


STABILIZER BAR REMOVAL



1. JACK UP VEHICLE AND REMOVE LEFT AND RIGHT FRONT WHEELS

2. REMOVE LEFT AND RIGHT FENDER APRON SEALS

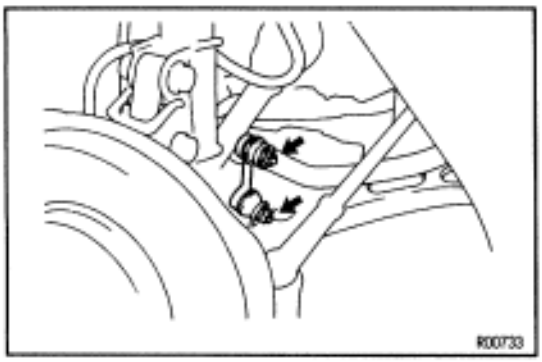


3. DISCONNECT LEFT AND RIGHT TIE ROD ENDS FROM STEERING KNUCKLES

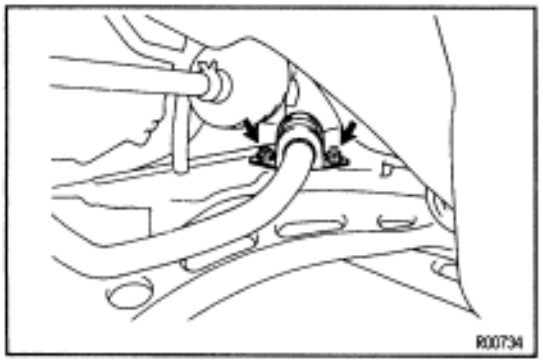
(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end from the steering knuckle.

SST 09628–62011



4. REMOVE LEFT AND RIGHT STABILIZER BAR LINKS



5. REMOVE LEFT AND RIGHT STABILIZER BAR BUSHINGS

(a) Remove the left and right bushing retainers.

(b) Remove the stabilizer bar bushings.

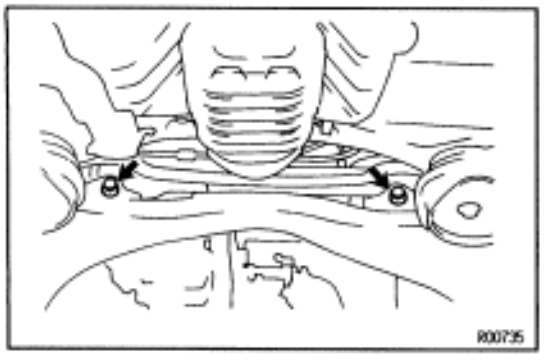
6. REMOVE EXHAUST FRONT PIPE

5S–FE Engine:

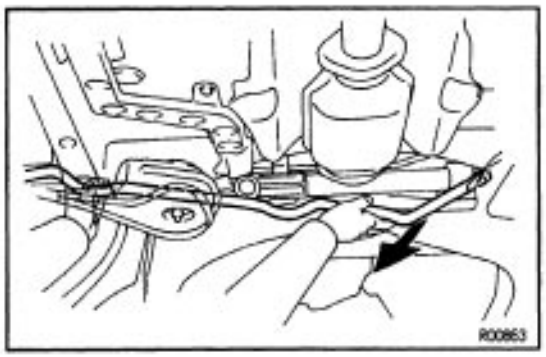
(See page EG–139)

1 MZ–FE Engine:

(See page EG–188)

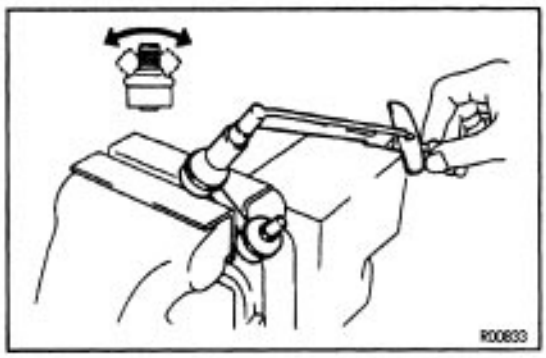


7. REMOVE STEERING GEAR BOX MOUNTING BOLTS AND NUTS



8. REMOVE STABILIZER BAR

HINT: Lift the steering gear box and remove the stabi–lizer bar.



STABILIZER BAR LINK INSPECTION

1. INSPECT BALL JOINT FOR ROTATION CONDITION

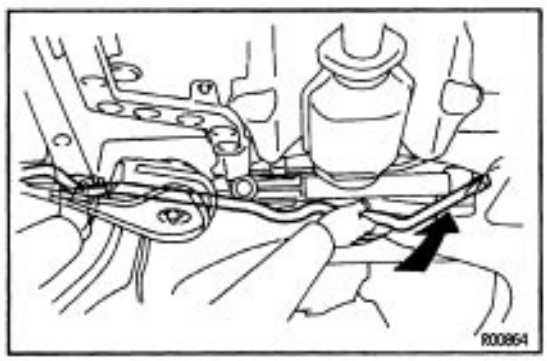
(a) Flip the ball joint stud back and forth 5 times as shown in the illustration, before installing the nut.

(b) Using a torque gauge, turn the nut continuously one turn every 2–4 seconds and take the torque reading on the fifth turn.

Turning torque:

0.05–1.0 N·m (0.5–10 kgf·cm, 0.4–8.7 in.·lbf)

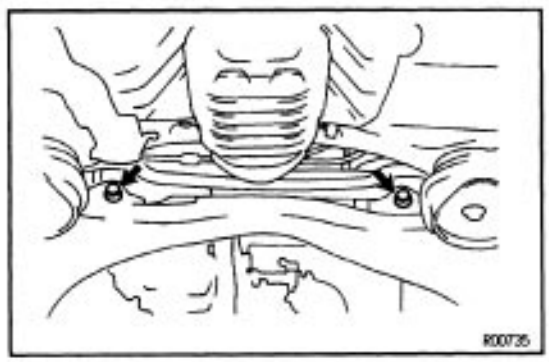
If not within specification, replace the stabilizer bar link.



STABILIZER BAR INSTALLATION

1. POSITION STABILIZER BAR

HINT: Lift the steering gear box and position the stabilizer bar.



2. INSTALL STEERING GEAR BOX MOUNTING BOLTS AND NUTS

Torque: 181 N·m (1.850 kgf·cm, 134 ft·lbf)

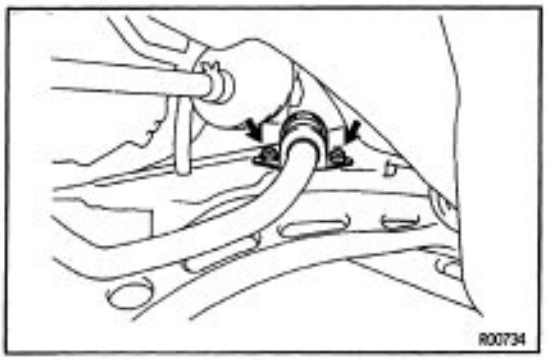
3. INSTALL EXHAUST FRONT PIPE

SS–FE Engine:

(See page EG–139)

1 MZ–FE Engine:

(See page EG–189)

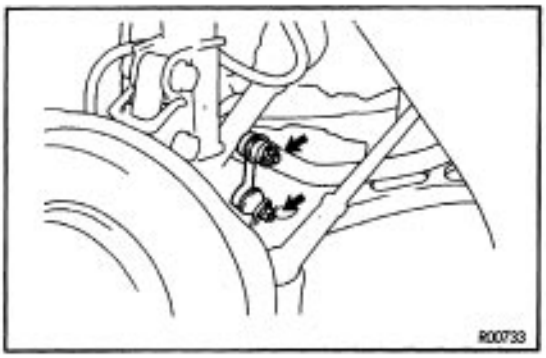


4. INSTALL LEFT AND RIGHT STABILIZER BAR BUSHINGS

(a) Install the stabilizer bar bushings.

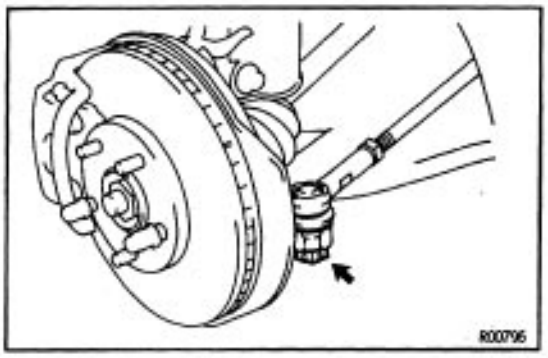
(b) Install the bushing retainers and bolts.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



5. INSTALL LEFT AND RIGHT STABILIZER BAR LINKS

Torque: 39 N·m (400 kgf·cm. 29 ft·lbf)

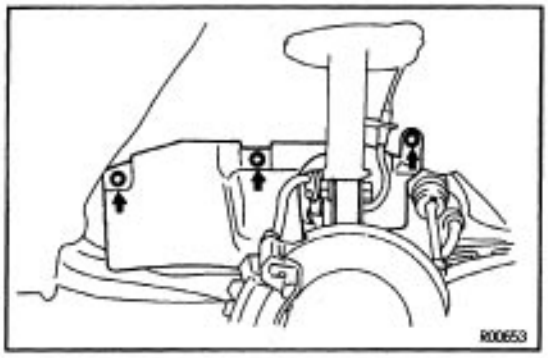


6. CONNECT LEFT AND RIGHT TIE ROD ENDS TO STEERING KNUCKLES

(a) Connect the tie rod end to the steering knuckle and tighten the nut.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install a new cotter pin.



7. INSTALL LEFT AND RIGHT FENDER APRON SEALS

8. INSTALL FRONT WHEELS AND LOWER VEHICLE

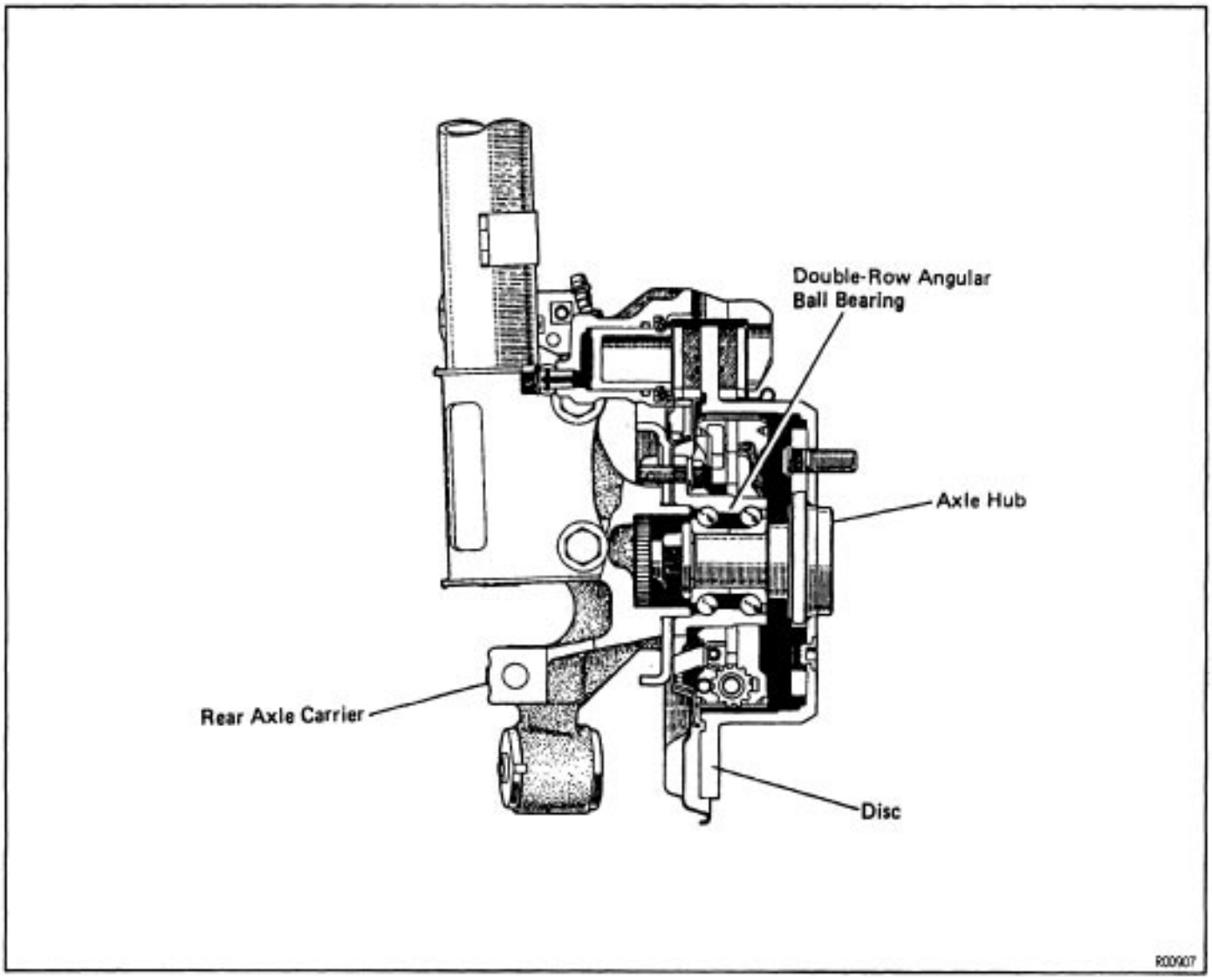
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

REAR AXLE

DESCRIPTION

SA037–06

The rear axle uses oil–sealed double–row angular ball bearings for wheel bearings. There is no need for bearing grease maintenance or preload adjustment.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

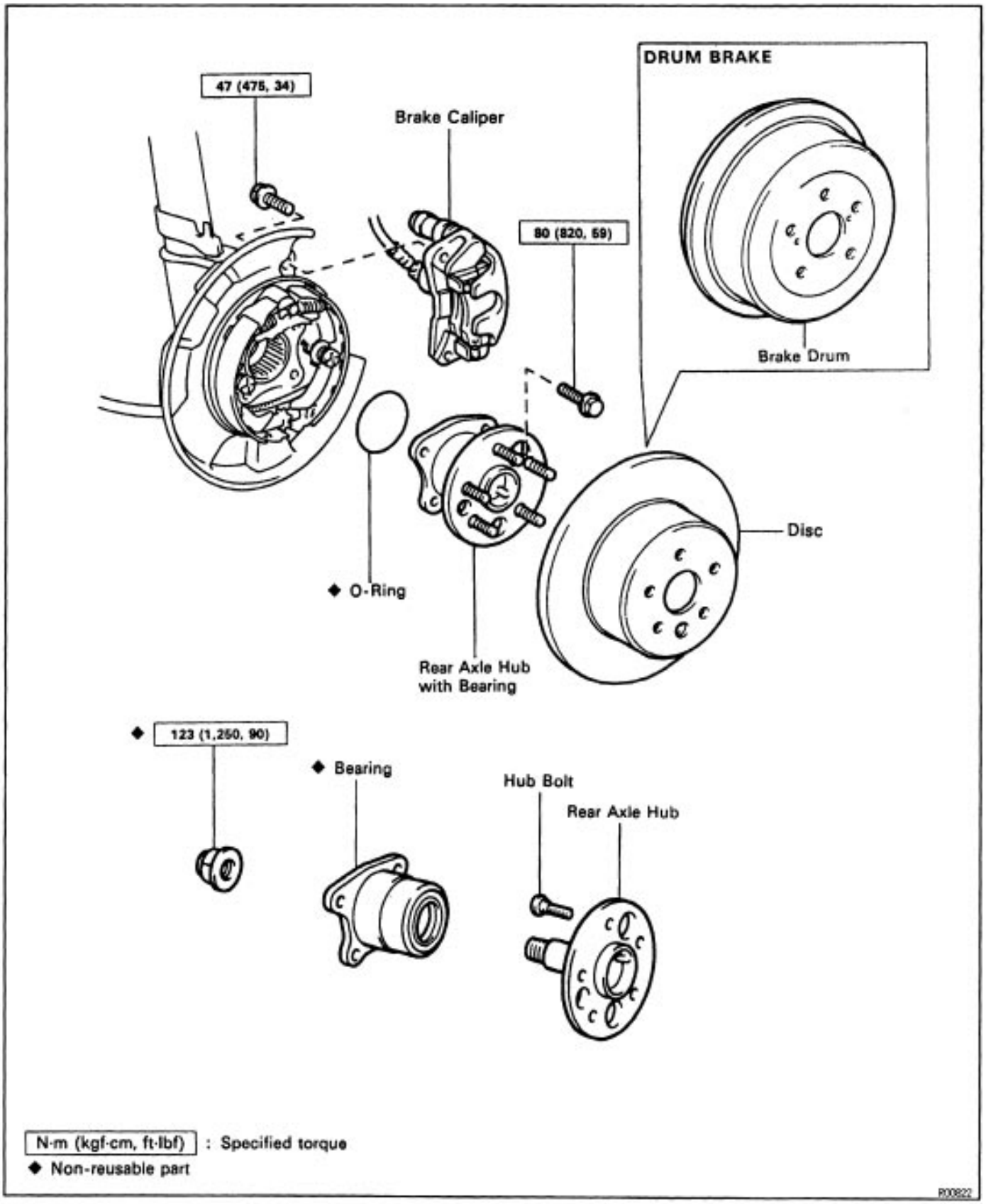
	09608–32010 Steering Knuckle oil Seal Replacer	Axle hub installation (w/o A8S)
	09628–10011 Ball Joint Puller	Hub bolt removal
	09636–20010 Upper Ball Joint Dust Cover Replacer	Axle hub installation (w/o ASS)
	09950–20017 Universal Puller	(w/o ABS)

EQUIPMENT

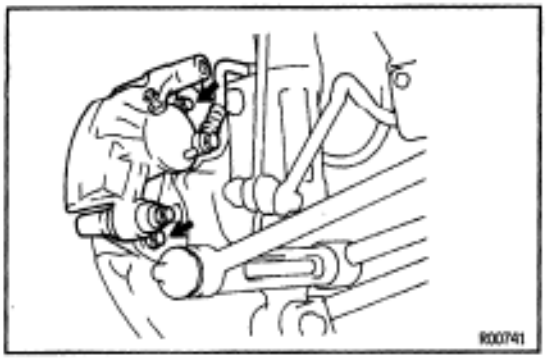
Dial indicator	
Torque wrench	

REAR AXLE HUB

COMPONENTS



REAR AXLE HUB REMOVAL



1. JACK UP VEHICLE AND REMOVE REAR WHEEL

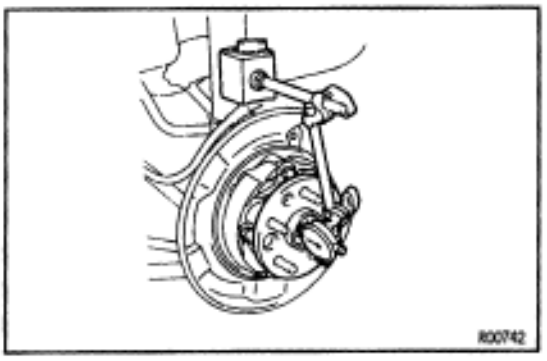
2. W/ DISC BRAKE:

REMOVE BRAKE CALIPER AND DISC

(a) Remove the 2 brake caliper set bolts.

(b) Hang up the brake caliper using wire, etc.

(c) Remove the disc.



3. w/ DRUM BRAKE:

REMOVE BRAKE DRUM

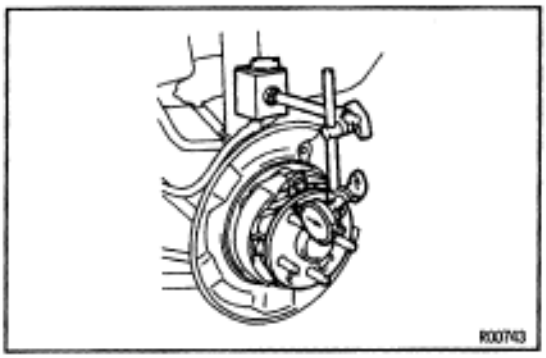
4. CHECK BEARING BACKLASH AND AXLE HUB DE–VIATION

(a) Place the dial indicator near the center of the axle hub and check the backlash in the bearing shaft direction.

Maximum:

0.05 mm (0.0020 in.)

If greater than the specified maximum, replace the bearing.

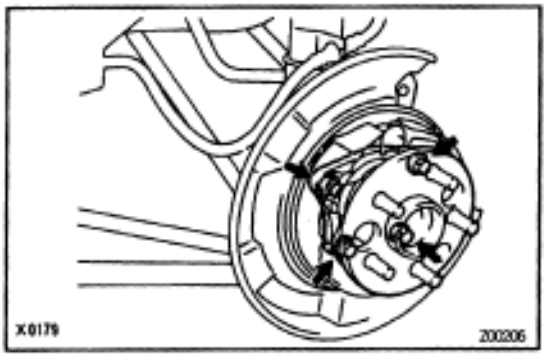


(b) Using a dial indicator, check the deviation at the surface of the axle hub outside the hub bolt.

Maximum:

0.47 mm (0.0028 in.)

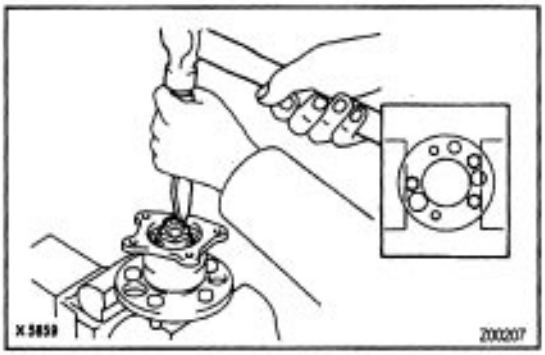
If greater then the specified maximum, replace the axle shaft and bearing.



6. REMOVE REAR AXLE HUB

(a) Remove the 4 bolts and rear axle hub.

(b) Remove the O–ring.



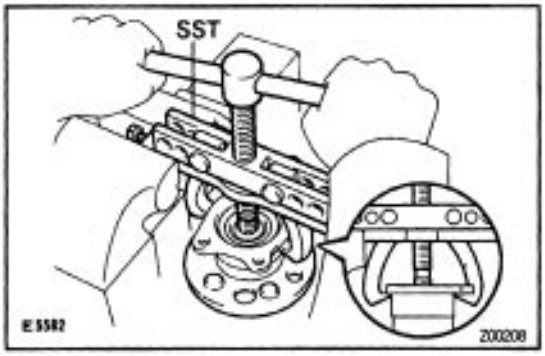
REAR AXLE HUB DISASSEMBLY

NOTICE: If equipped with ABS, do not disassemble the rear axle shaft and bearing.

1. REMOVE LOCK NUT

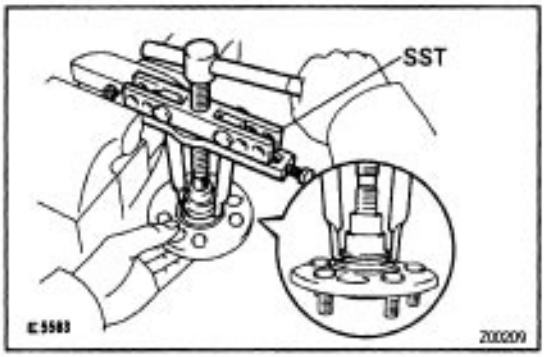
(a) Using a hammer and chisel, release the nut caulking.

(b) Remove the lock nut.

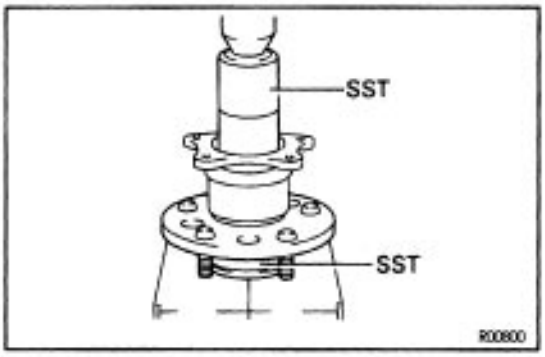


2. REMOVE AXLE SHAFT FROM BEARING

(a) Using SST, remove the axle shaft from bearing.
SST 09950 – 20017



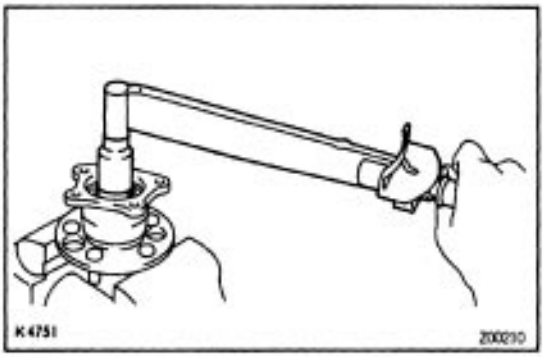
(b) Using SST, remove the inner race (outside) from the axle shaft.
SST 09950–20017



REAR AXLE HUB ASSEMBLY

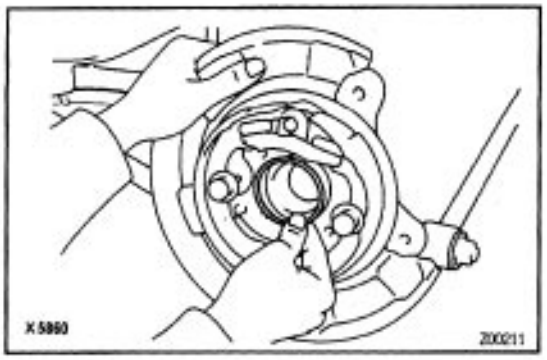
1. INSTALL AXLE SHAFT TO BEARING

(a) Using SST and a press, install the axle shaft to a new bearing.
ST 09608–32010,09636–20010



(b) Install a new lock nut.
Torque: 123 N·m (1250 kgf·cm, 90 ft·lbf)

(c) Stake the lock nut.

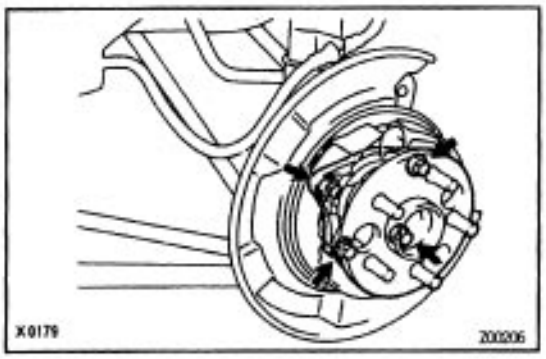


REAR AXLE HUB INSTALLATION

1. INSTALL REAR AXLE HUB

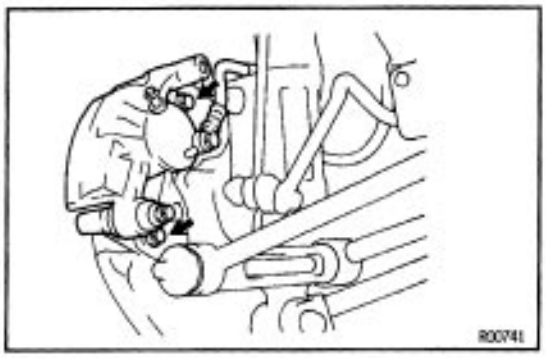
(a) Install a new 0–ring.

HINT: Coat the 0–ring with MP grease.



(b) Install the rear axle hub with the 4 bolts.

Torque: 80 N·m (820 kgf·cm, 59 ft·lbf)



2. w/ DISC BRAKE:

INSTALL DISC AND BRAKE CALIPER.

(a) Install the disc.

(b) Install the brake caliper.

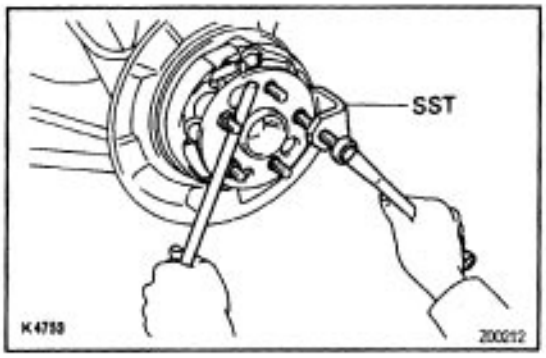
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

3. w/ DRUM BRAKE:

INSTALL BRAKE DRUM

4. INSTALL REAR WHEEL AND LOWER VEHICLE

Torque: 103 N·m (1,050 kgf·cm. 76 ft·lbf)



HUB BOLT REPLACEMENT

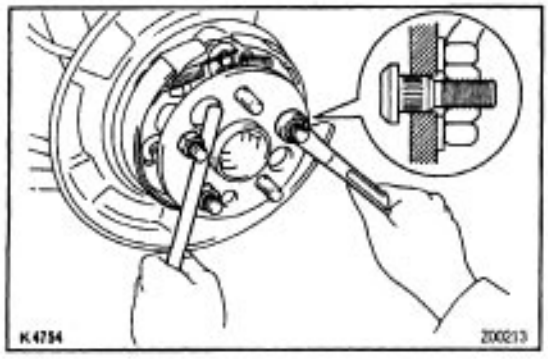
1. JACK UP VEHICLE AND REMOVE REAR WHEEL

2. REMOVE REAR DISC OR DRUM

3. REMOVE HUB BOLT

Using SST, remove the hub bolt.

SST 09628–10011



4. INSTALL HUB BOLT

Install washer– and nut to the hub bolt as shown in the illustration, and install the hub bolt by tightening the nut.

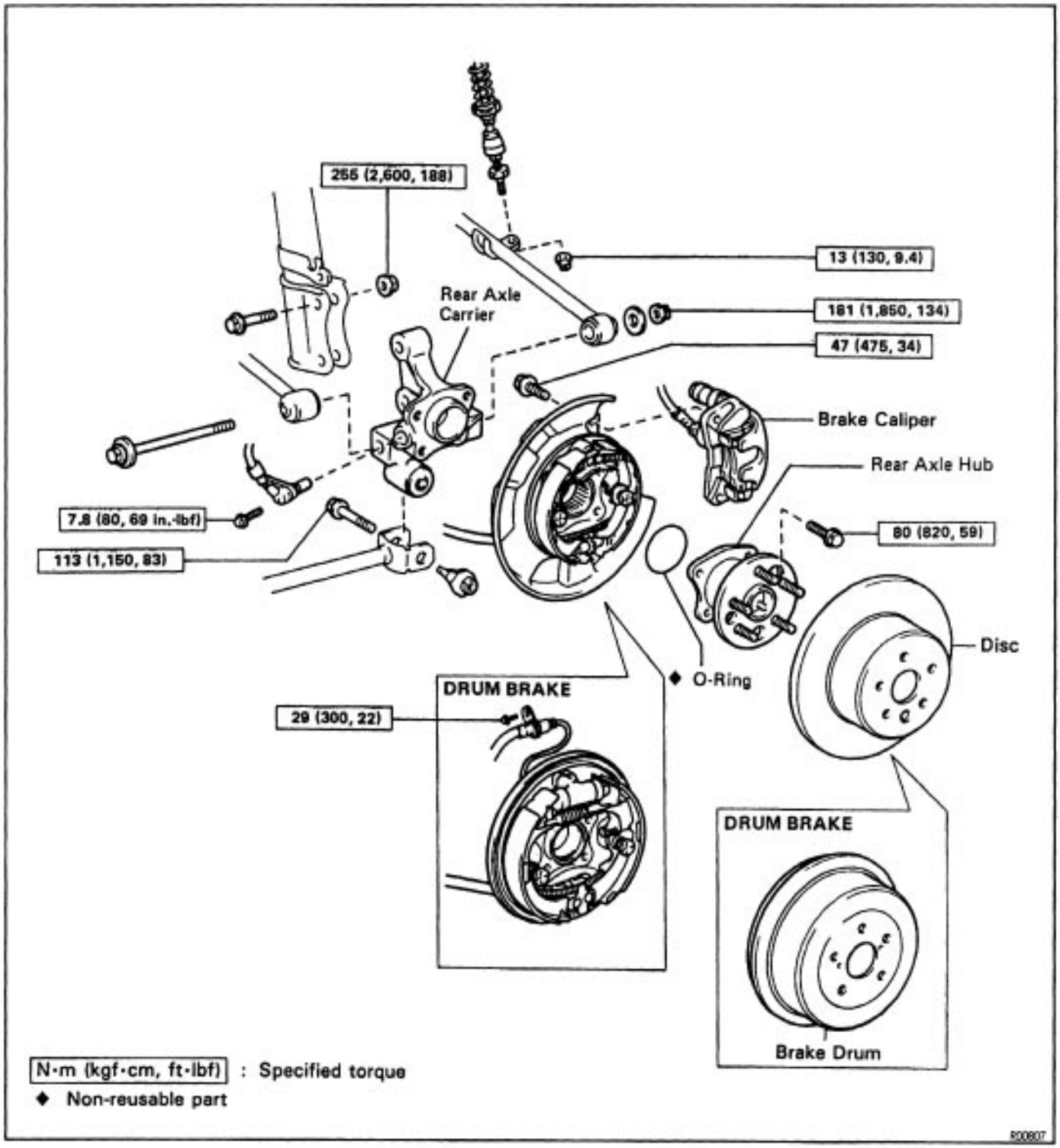
5. INSTALL REAR DISC OR DRUM

6. INSTALL REAR WHEEL AND LOWER VEHICLE

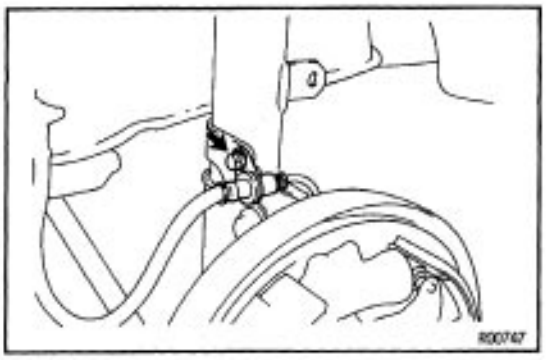
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

REAR AXLE CARRIER

COMPONENTS



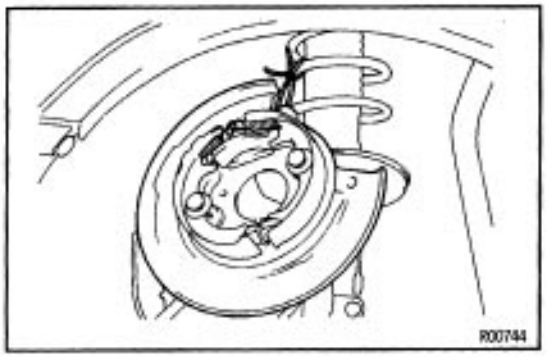
REAR AXLE CARRIER REMOVAL



1. REMOVE REAR AXLE HUB

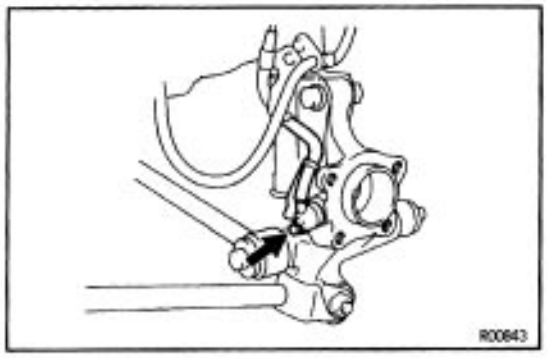
2. w/ DRUM BRAKE:

REMOVE BRAKE HOSE FROM SHOCK ABSORBER



3. REMOVE BACKING PLATE FROM REAR AXLE CARRIER

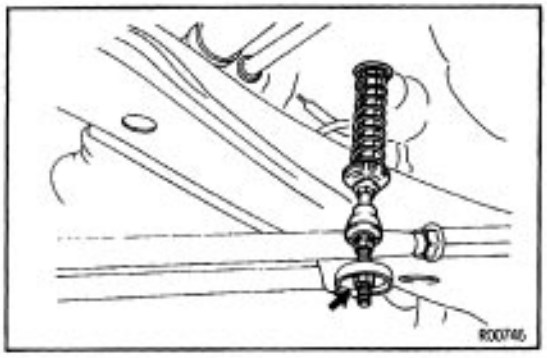
Hang up the backing plate using wire, etc.



4. w/ ABS:

REMOVE ABS SPEED SENSOR

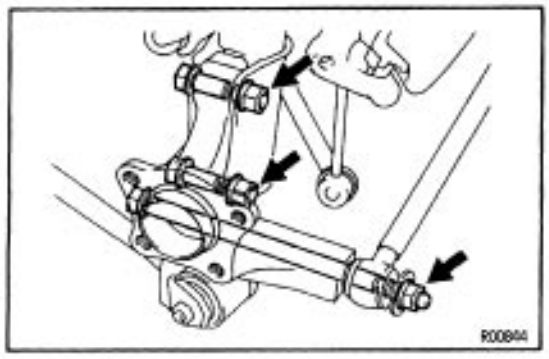
Remove the ABS speed sensor from rear axle carrier.



5. WAGON only:

REMOVE LSPV SPRING

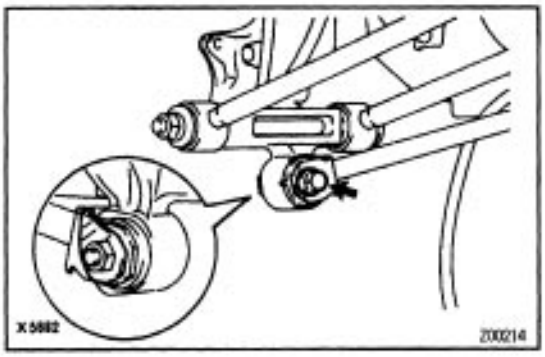
Disconnect the LSPV spring from the lower arm.



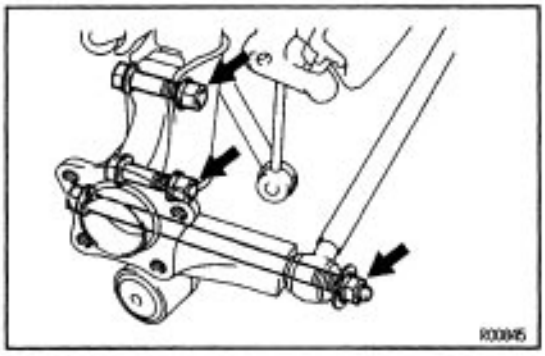
6. REMOVE REAR AXLE CARRIER

(a) Loosen the 3 nuts.

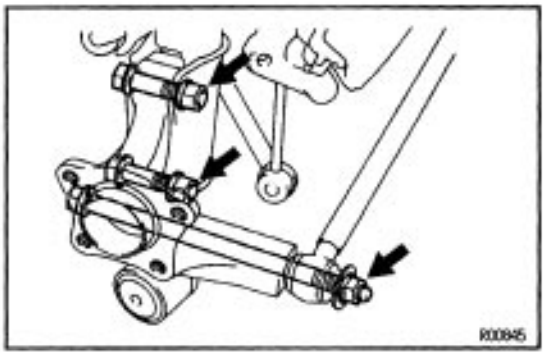
HINT: Do not remove the bolts.



(b) Remove the bolt and nut and disconnect the strut rod from the rear axle carrier.



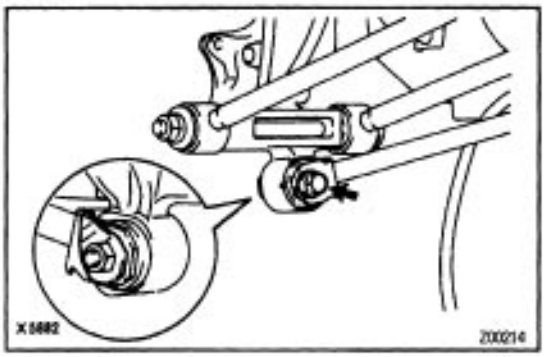
(c) Remove the 3 nuts and bolts.
(d) Remove the rear axle carrier.



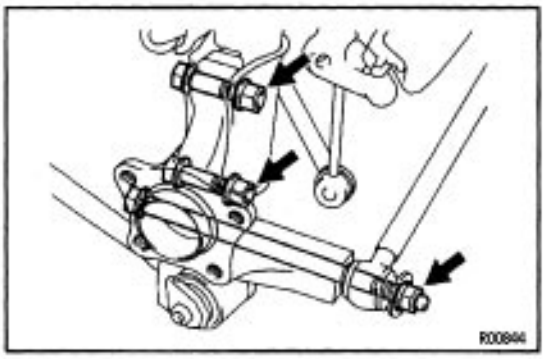
REAR AXLE CARRIER INSTALLATION

1. INSTALL REAR AXLE CARRIER

(a) Place the rear axle carrier and temporarily install the 3 bolts and nuts.



(b) Connect the strut rod to the rear axle carrier.
(c) Temporarily install the bolt and nut.



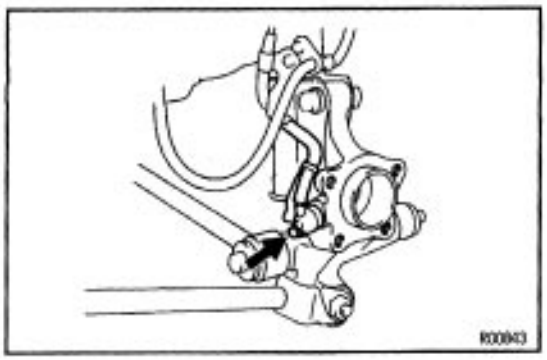
(d) Torque the 3 nuts.

Lower side of shock absorber:

Torque: 255 N·m (2,600 kgf·cm, 188 ft·lbf)

Lower arm:

Torque: 181 N·m (1,850 kgf·cm, 134 ft·lbf)

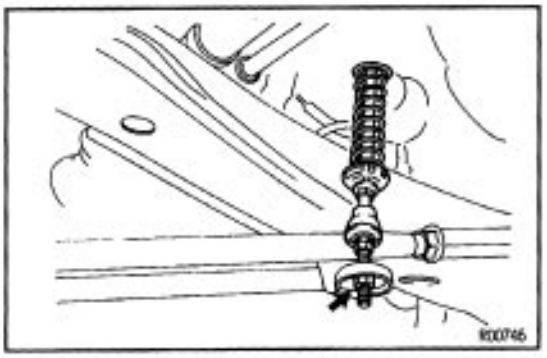


2. w/ ABS:

INSTALL ABS SPEED SENSOR

Install the ABS speed sensor to the rear axle carrier.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

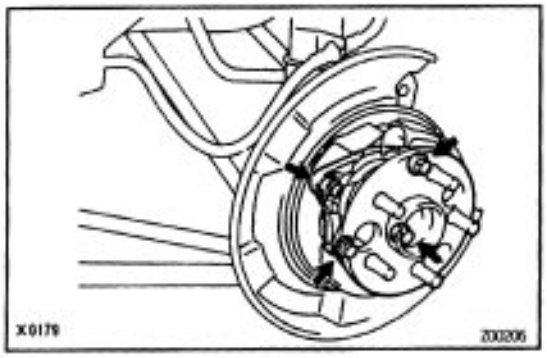


3. WAGON only:

INSTALL LSPV SPRING

Connect the LSPV spring to the lower arm.

Torque: 13 N·m (130 kgf·cm, 9.4 ft·lbf)



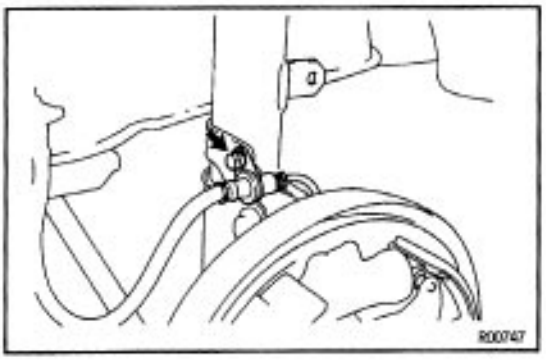
4. INSTALL BACKING PLATE AND REAR AXLE HUB

(a) Place the backing plate.

(b) Install a new O–ring.

(c) Install the rear axis hub.

Torque: 80 N·m (820 kgf·cm, 59 ft·lbf)



5. w/ DRUM BRAKE:

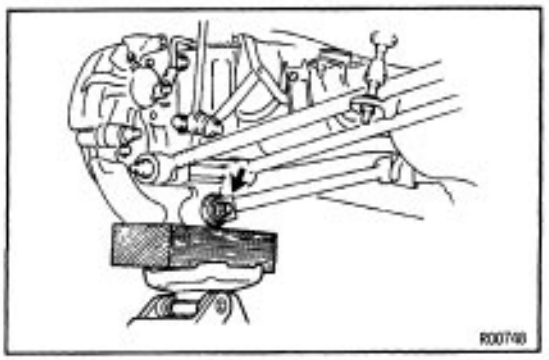
INSTALL BRAKE LINE TO SHOCK ABSORBER

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

6. STABILIZE SUSPENSION

(a) Install the rear wheel and lower the vehicle.

(b) Bounce the vehicle up and down several times to stabilize the suspension.



7. TORQUE STRUT ROD BOLT

(a) Jack up the vehicle and support the body.

(b) Remove the rear wheel.

(c) Support the rear axle carrier with a jack.

(d) Torque the bolt.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

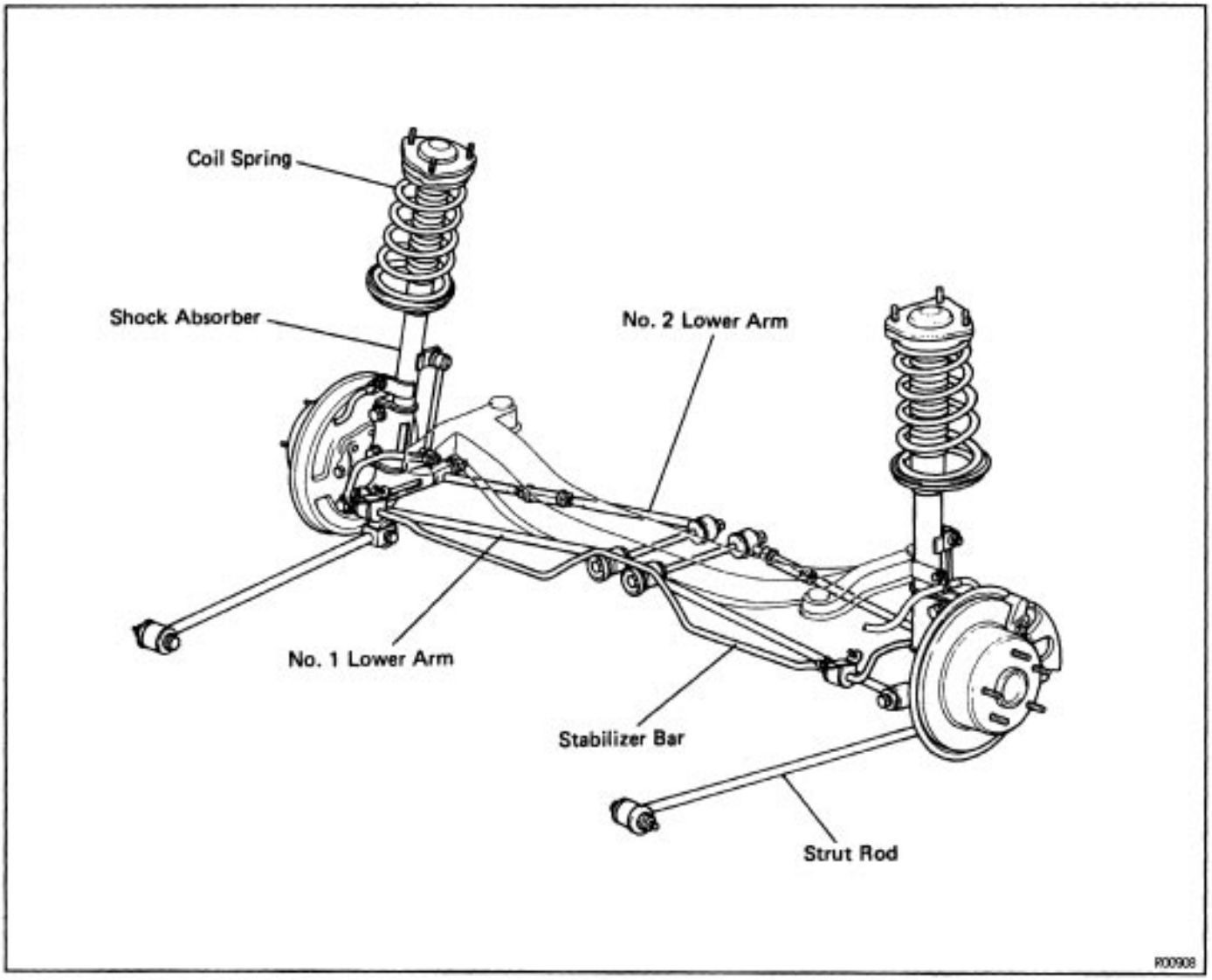
8. INSTALL REAR WHEEL AND LOWER VEHICLE

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

REAR SUSPENSION

DESCRIPTION

The rear suspension is a dual–link strut independent suspension type composed of two lower arms in parallel at the side, and strut rods which extend forward.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09727–30020 Coil Spring Compressor	
	09729–22031 Front Spring Upper Seat Holder	

RECOMMENDED TOOLS

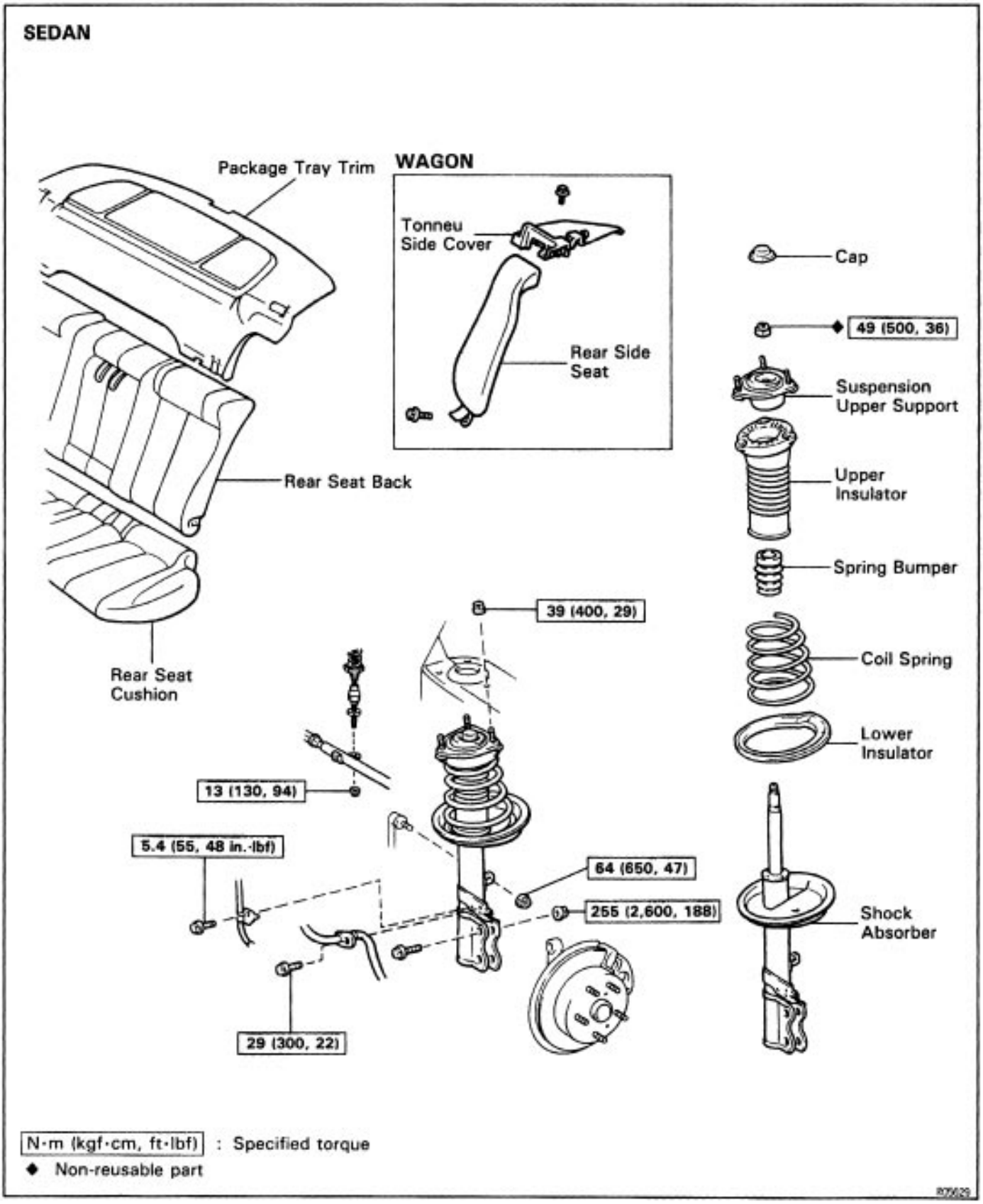
	09025–00010 Small Torque Wrench	

EQUIPMENT

Torque wrench	

REAR SHOCK ABSORBER

COMPONENTS

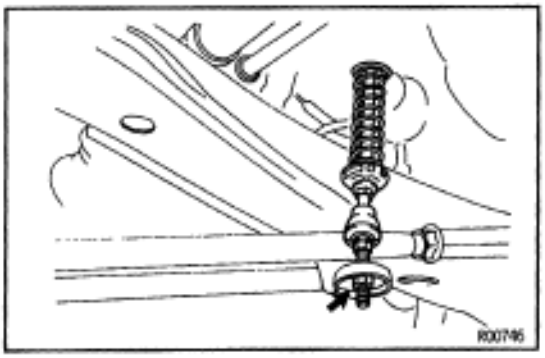


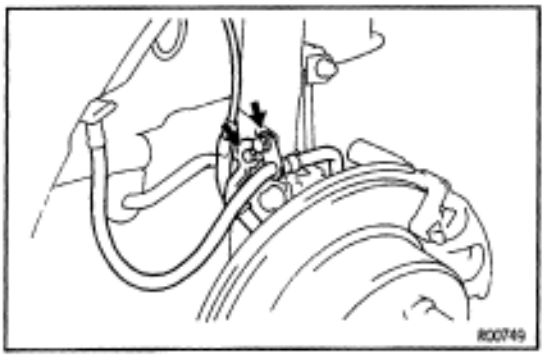
REAR SHOCK ABSORBER REMOVAL

1. SEDAN/COUPE
REMOVE REAR SEAT AND PACKAGE TRAY TRIM (SEE THE BO SECTION)
WAGON:
REMOVE REAR SIDE SEATBACK AND TONNEAU SIDE COVER
(SEE PAGE BO SECTION)

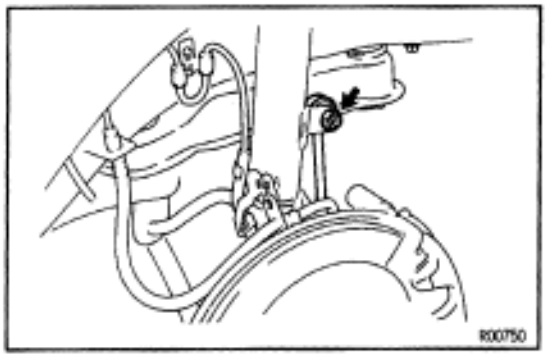
2. JACK UP VEHICLE AND REMOVE REAR WHEEL

3. WAGON ONLY:
DISCONNECT LSPV SPRING FROM LOWER ARM

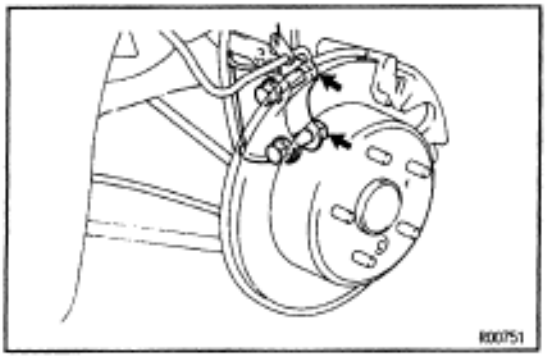




4. REMOVE ABS SPEED SENSOR WIRE (w/ ABS) AND BRAKE HOSE FROM SHOCK ABSORBER

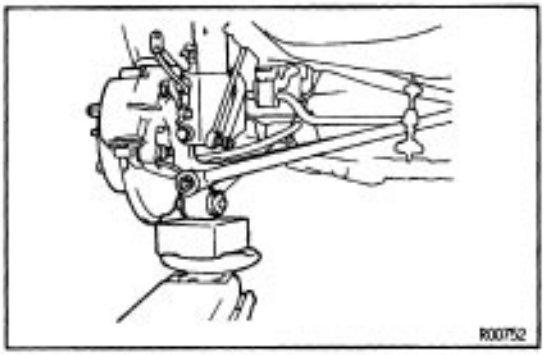


5. DISCONNECT STABILIZER BAR LINK FROM SHOCK ABSORBER

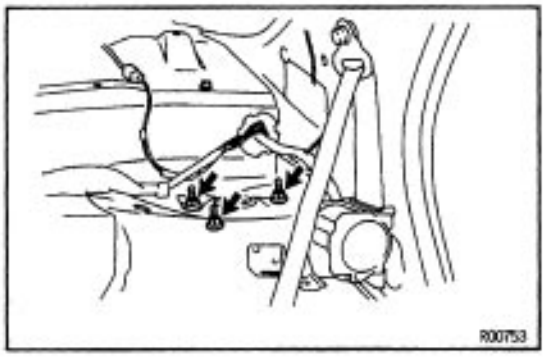


6. REMOVE SHOCK ABSORBER WITH COIL SPRING

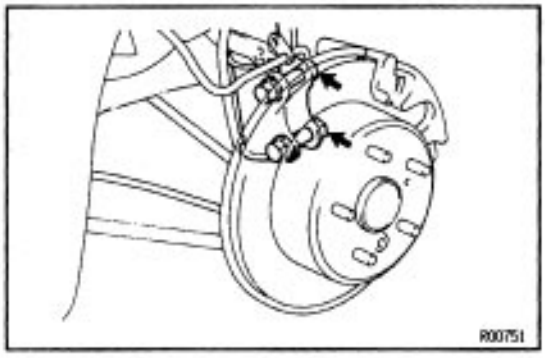
(a) Loosen the 2 nuts on lower side of shock absorber.



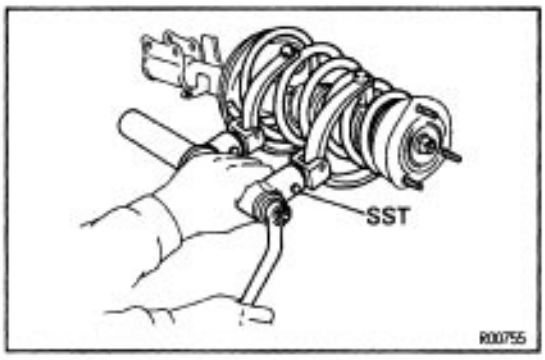
(b) Support the rear axle carrier with a jack.



(c) Remove the 3 nuts of upper support.

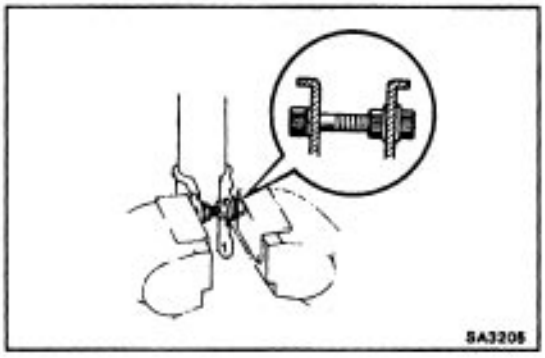


(d) Lower the rear axle carrier and remove the 2 bolts.
(e) Remove the shock absorber with coil spring.

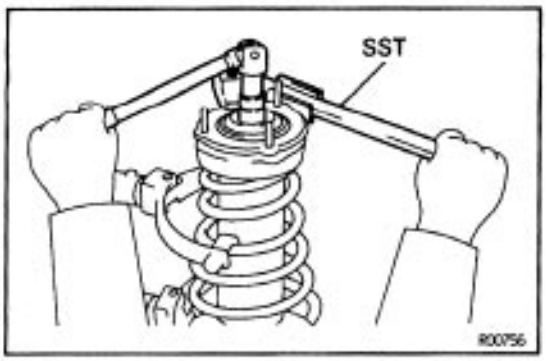


7. REMOVE COIL SPRING

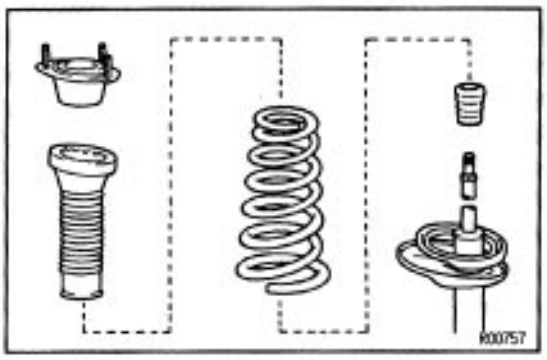
(a) Remove the cap.
(b) Using SST, compress the coil spring.
SST 09727–30020



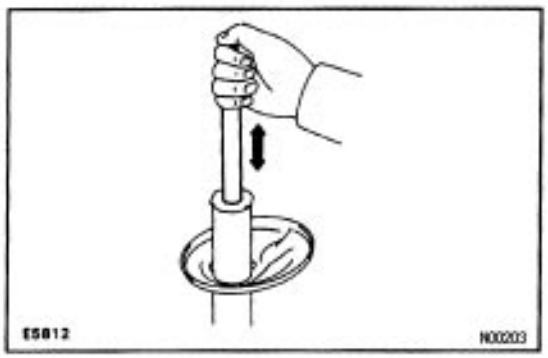
(c) Install a bolt and 2 nuts to the bracket at the lower portion of the shock absorber and secure it in a visa.



(d) Using SST to hold the upper support, remove the nut.
SST 09729–22031



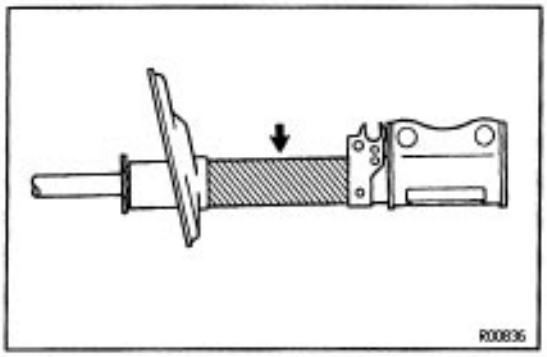
(e) Remove the following parts.
- Suspension upper support
- Upper insulator
- Coil spring
- Spring bumper
- Lower insulator



REAR SHOCK ABSORBER INSPECTION

INSPECT SHOCK ABSORBER
Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds.
If there is any abnormality, replace the shock absorber with a new one.

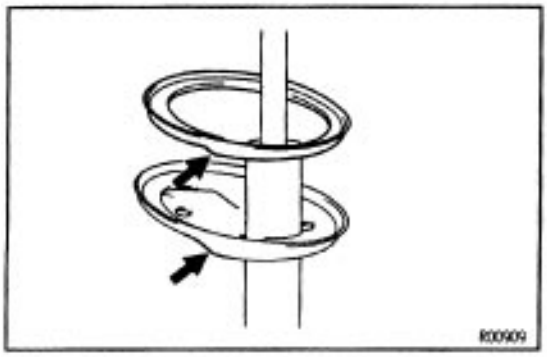
NOTICE: When discarding the shock absorber, use the following procedure.



REAR SHOCK ABSORBER DISPOSAL

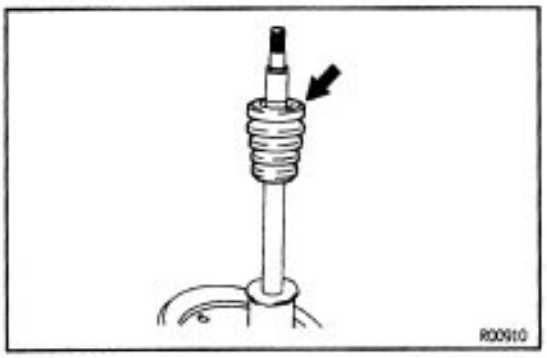
1. FULLY EXTEND SHOCK ABSORBER ROD
2. DRILL HOLE TO REMOVE GAS FROM CYLINDER
Using a drill, make a hole in the cylinder as shown to remove the gas inside.

CAUTION: The gas coming out is harmless, but be careful of chips which may fly up when drilling.

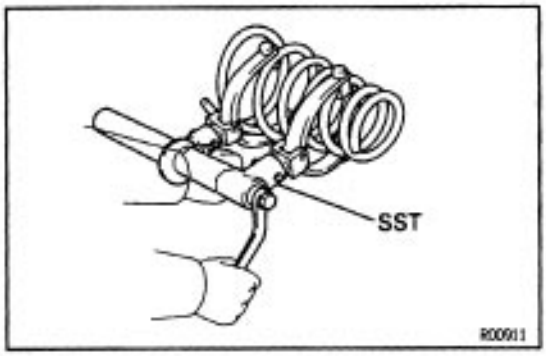


REAR SHOCK ABSORBER INSTALLATION

1. INSTALL LOWER INSULATOR ONTO SHOCK ABSORBER

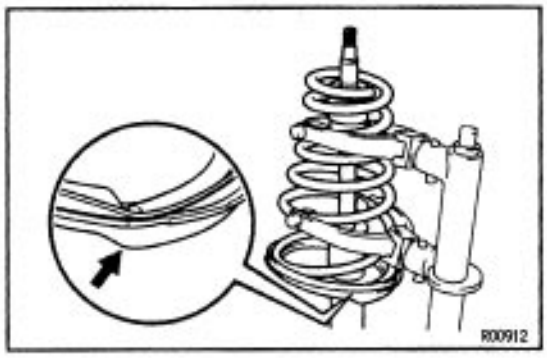


2. INSTALL SPRING BUMPER TO PISTON ROD

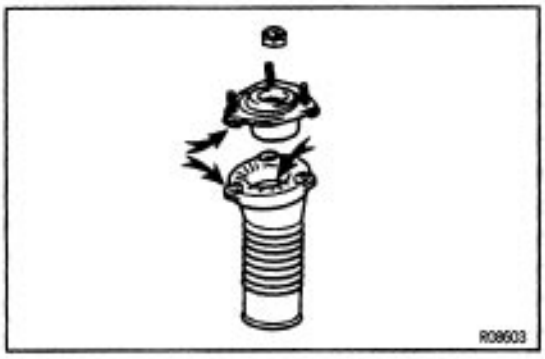


3. INSTALL COIL SPRING

(a) Using SST, compress the coil spring
SST 09727–30020

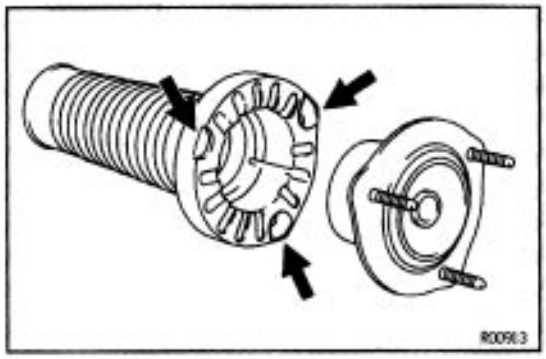


(b) Install the coil spring to the shock absorber.
HINT: Fit the lower end of the coil spring into the gap of the lower seat.

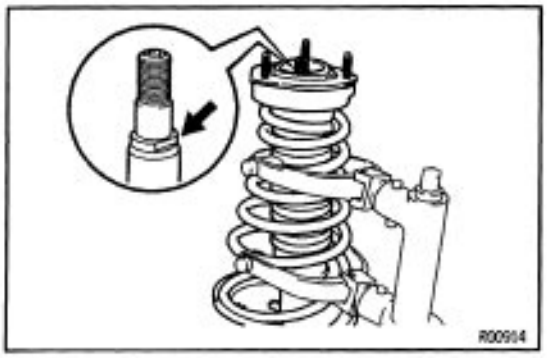


4. INSTALL UPPER INSULATOR AND UPPER SUPPORT

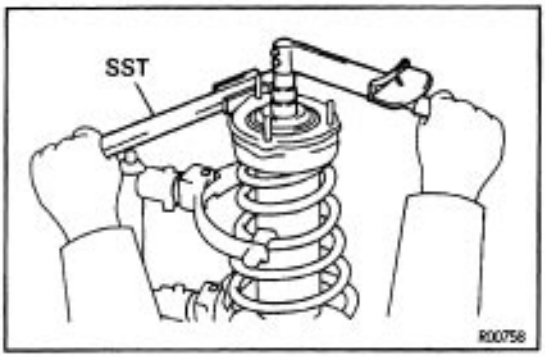
(a) Before installing the upper support and insulator, apply the lithium or silicon based grease as shown in the illustration.



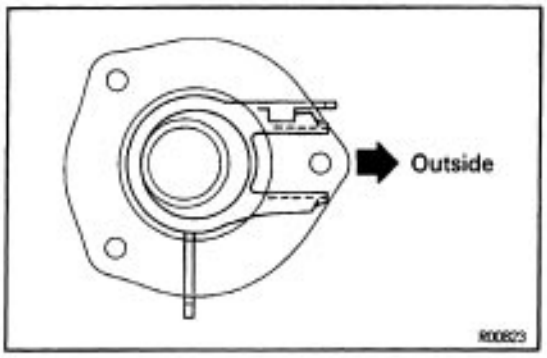
(b) Install the upper insulator to the upper support.
HINT: Match the bolt of the upper support with the cut–off part of the insulator.



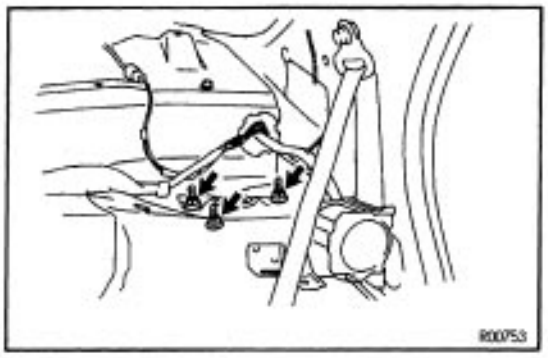
(c) Install the upper support to the piston rod.



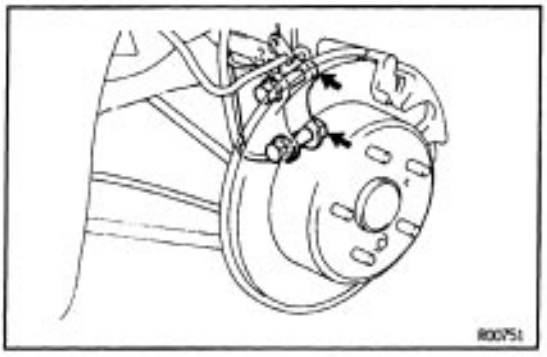
(d) Using SST to hold the upper support, install a new nut.
SST 09729–22031
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)



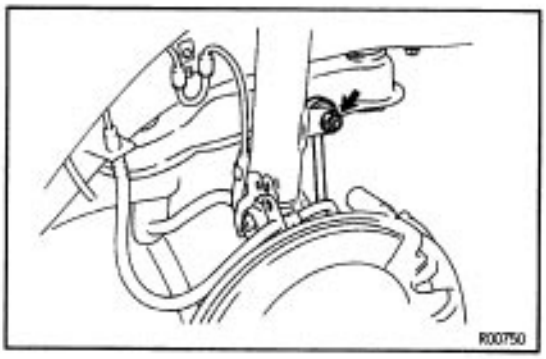
(e) Rotate the upper support and set it in the direction shown in the illustration.
(f) Remove the SST.
HINT: After removing SST, again check the direction of the upper support.
(g) Install the cap.



5. INSTALL SHOCK ABSORBER WITH COIL SPRING
Install the shock absorber and install the 3 nuts of upper support.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

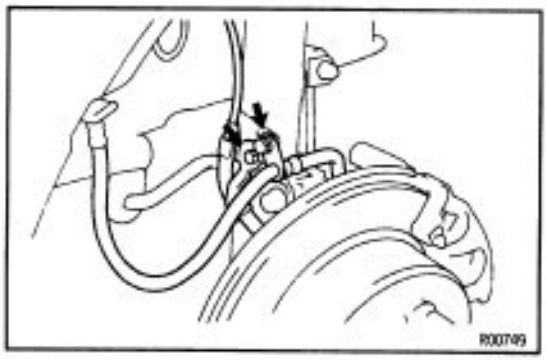


6. CONNECT SHOCK ABSORBER TO REAR AXLE CARRIER
(a) Coat the threads of the nuts with engine oil.
(b) Install the 2 bolts and nuts.
Torque: 255 N·m (2,600 kgf·cm, 188 ft·lbf)



7. CONNECT STABILIZER BAR LINK TO SHOCK ABSORBER

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



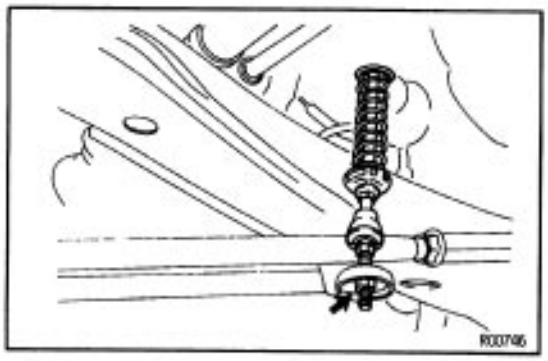
8. INSTALL ABS SPEED SENSOR WIRE (w/ ABS) AND BRAKE HOSE TO SHOCK ABSORBER

Broke hose

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

ABS wire

Torque: 5.4 N·m (55 kgf·cm. 48 in.·lbf)



9. WAGON only:

CONNECT LSPV SPRING FROM LOWER ARM

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

10. INSTALL REAR WHEEL AND LOWER VEHICLE

Torque: 103 N·m (1,050 kgf·cm. 76 ft·lbf)

11. SEDAN/COUPE:

INSTALL PACKAGE TRAY TRIM AND REAR SEAT

(See the BO section)

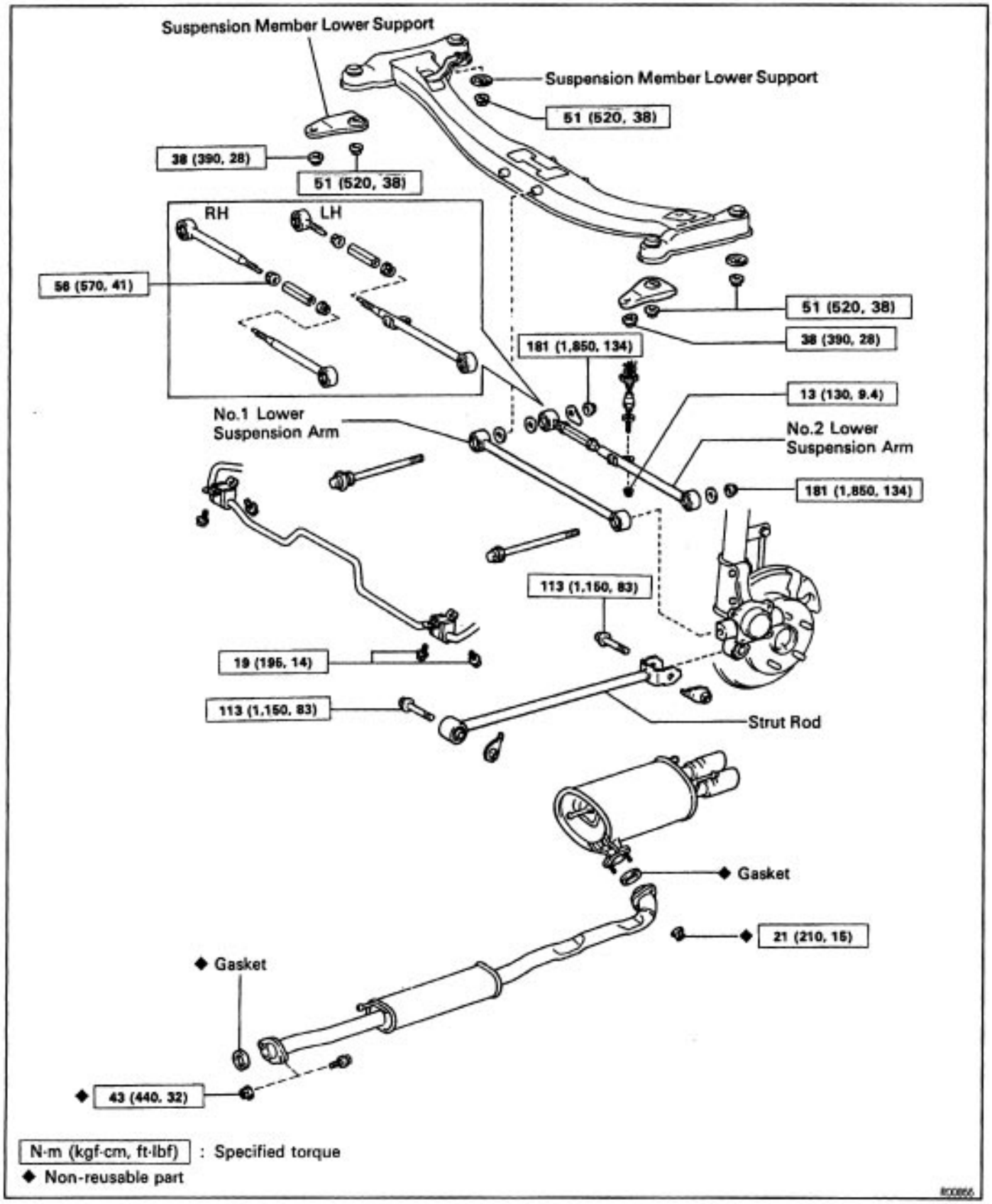
WAGON:

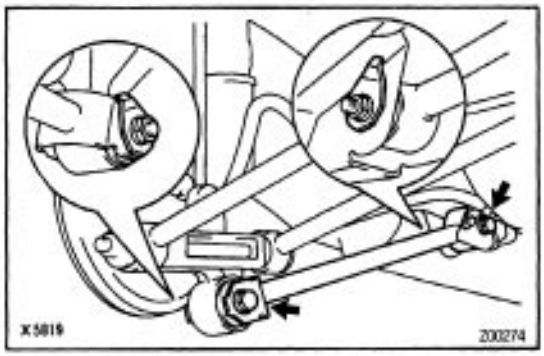
INSTALL TONNEAU SIDE COVER AND REAR SIDE SEATBACK

(See the BO section)

LOWER SUSPENSION ARM AND STRUT ROD

COMPONENTS





4^T–06

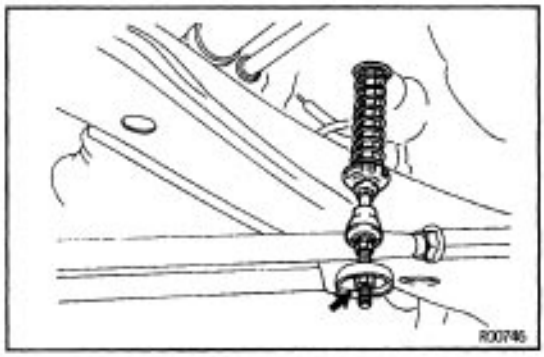
LOWER SUSPENSION ARM AND STRUT ROD REMOVAL

1. JACK UP VEHICLE AND REMOVE REAR WHEEL

2. REMOVE STRUT ROD

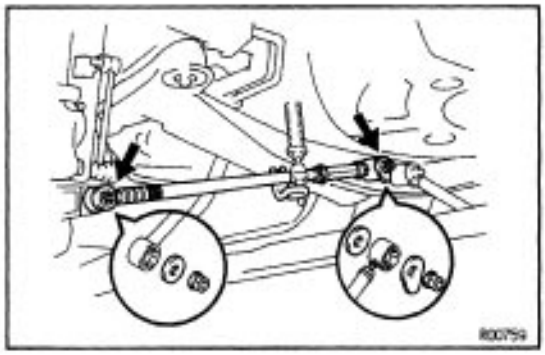
(a) Remove the 2 bolts and nuts.

(b) Remove the strut rod.



3. WAGON only:

DISCONNECT LSPV SPRING FROM LOWER ARM



4. REMOVE NO.2 LOWER SUSPENSION ARM

(a) Remove the 2 nuts and washers.

(b) Remove the No.2 lower suspension arm.

5. REMOVE LEFT AND RIGHT STABILIZER BUSHING RETAINER

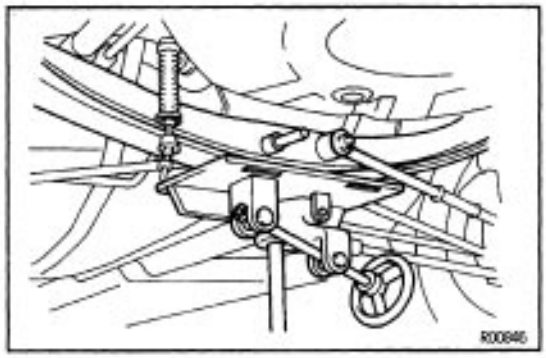
6. REMOVE EXHAUST CENTER PIPE AND TALE PIPE

5S–FE Engine:

(See page EG1–139)

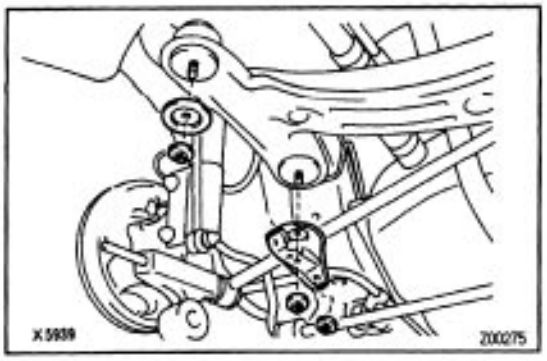
1MZ–FE Engine:

(See page EG2–189)

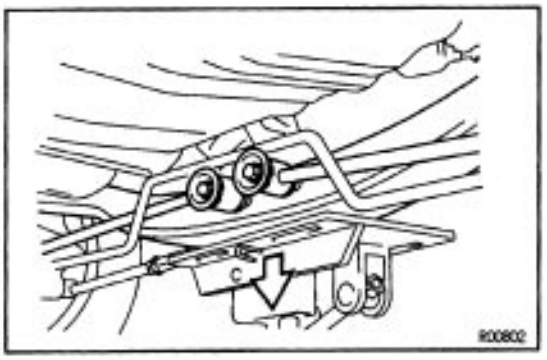


7. REMOVE NO.1 LOWER SUSPENSION ARM

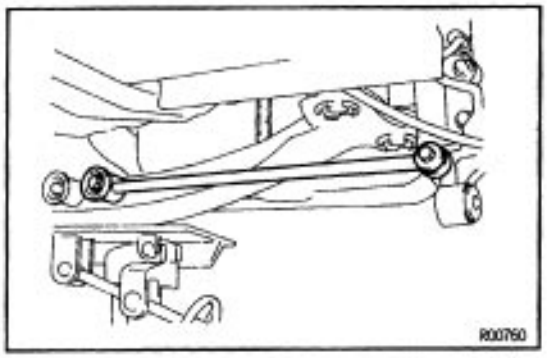
(a) Support the suspension member with a jack.



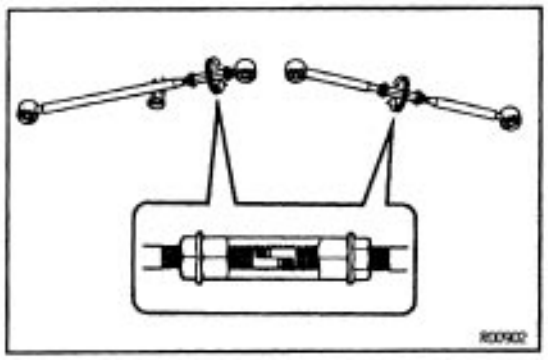
(b) Remove the 6 nuts and the left and right suspension member lower stopper.



(c) Lower the suspension member.



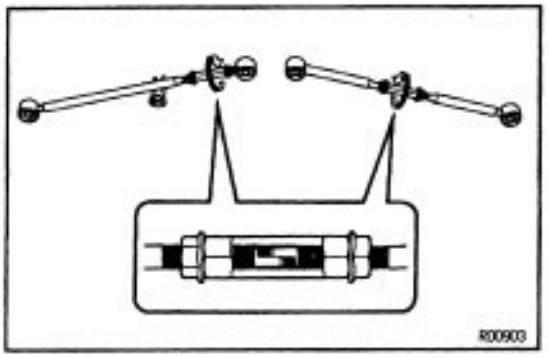
(d) Remove the No. 1 lower suspension arm with the 2 bolts and the washer.



NO.2 LOWER SUSPENSION ARM DISASSEMBLY

1. DISASSEMBLE NO.2 LOWER SUSPENSION ARM

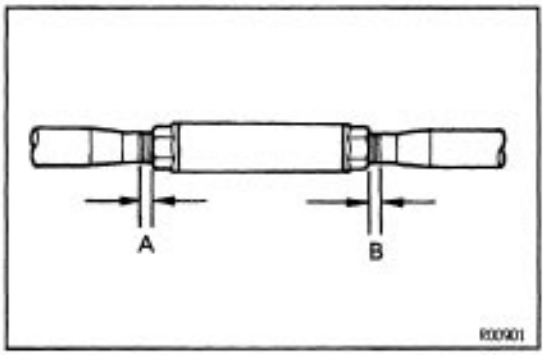
(a) Loosen the 2 lock nuts.
(b) Turn the adjusting tube and disassemble the No.2 lower suspension arm.
(c) Remove the lock nuts from the arms.



NO.2 LOWER SUSPENSION ARM ASSEMBLY

1. ASSEMBLE NO.2 LOWER SUSPENSION ARM

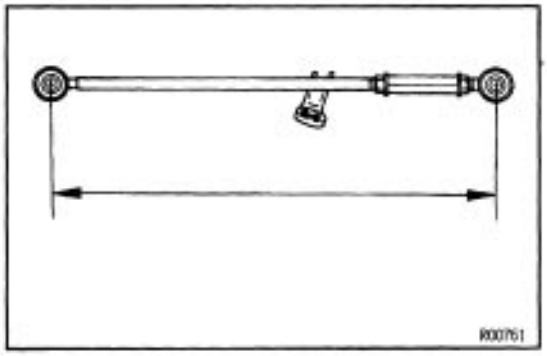
(a) Install the lock nuts to the arms.
(b) Turn the adjusting tube and assemble the No.2 lower suspension arm.



HINT: When assembling the No.2 lower suspension arm, try to make dimensions A and B shown in the illustration as close as possible.

Maximum difference:

3 mm (0.12 in.)



(c) Adjust the No.2 lower suspension arm length by turning the adjusting tube.

Arm length:

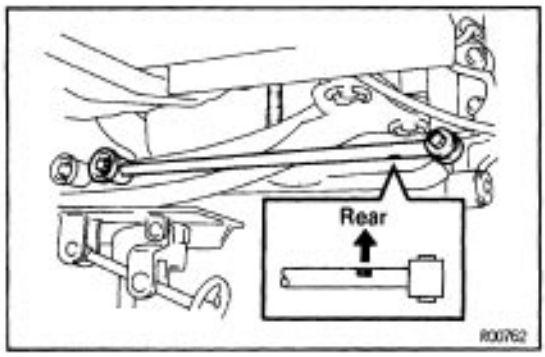
584.2 mm (23.000 in.)

(d) Temporarily tighten the 2 lock nuts.

HINT: After adjusting the rear wheel alignment, torque the lock nuts.

401W–06

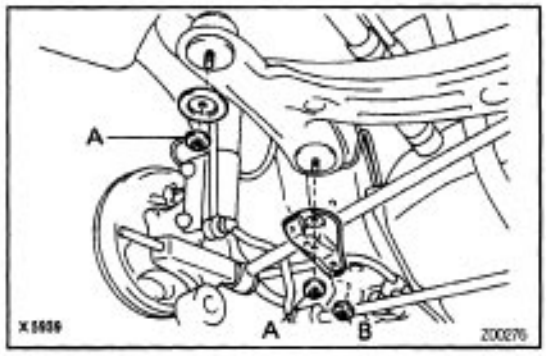
LOWER SUSPENSION ARM AND STRUT ROD INSTALLATION



1. INSTALL NO.1 LOWER SUSPENSION ARM

Install the No. 1 lower suspension arm with the washer and the 2 bolts.

HINT: Face the paint mark to the rear.



2. INSTALL SUSPENSION MEMBER TO BODY

(a) Jack up the suspension member.

(b) Install the suspension member lower supports and the 6 nuts.

Nut A:

Torque: 51 N·m (520 kgf·cm, 38 ft·lbf)

Nut B:

Torque: 38 N·m (390 kgf·cm, 28 ft·lbf)

3. INSTALL LEFT AND RIGHT STABILIZER BUSHING RETAINERS

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

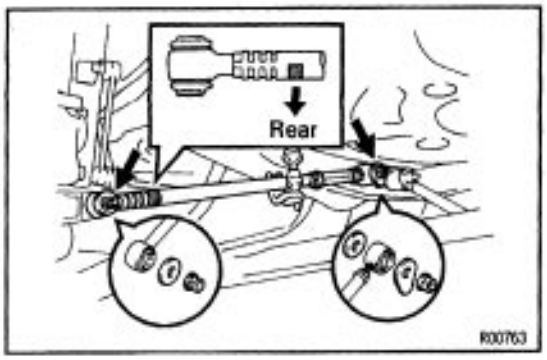
4. INSTALL EXHAUST CENTER PIPE AND TALE PIPE

5S–FE Engine:

(See page EG1–139)

1MZ–FE Engine:

(See page EG2–189)

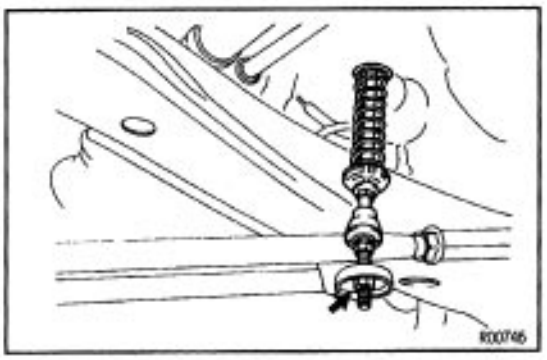


5. INSTALL NO.2 LOWER SUSPENSION ARM

(a) Install the No.2 lower suspension arm with the 3 washers.

HINT: Face the paint mark to the rear.

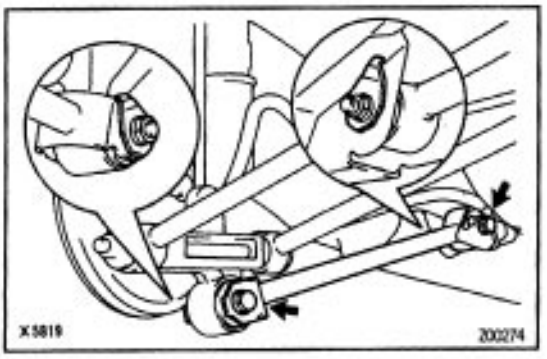
(b) Temporarily install the 2 lock nuts.



6. WAGON only:

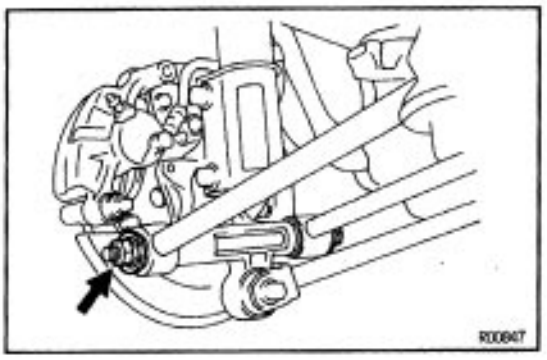
CONNECT LSPV SPRING TO LOWER ARM

Torque: 13 N·m (130 kgf·cm, 9.4 ft·lbf)



7. INSTALL STRUT ROD

Place the strut rod and temporarily install the 2 bolts and nuts.



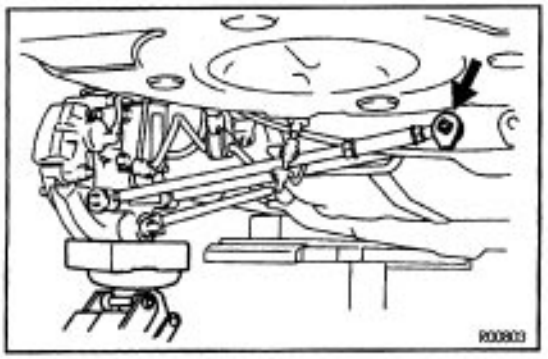
8. TORQUE BOLTS AND NUTS

(a) Torque the nut on outside of the lower arm.

Torque: 181 N·m (1,850 kgf·cm, 134 ft·lbf)

(b) Install the rear wheel and lower the vehicle.

(c) Bounce the vehicle up and down several times to stabilize the suspension.



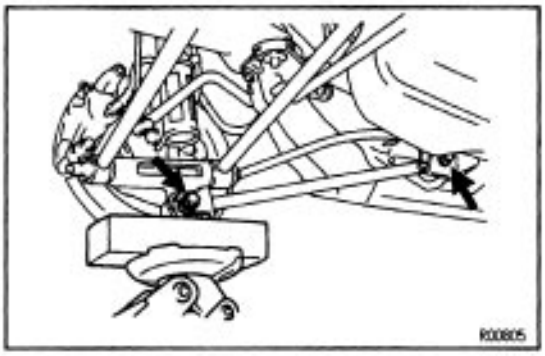
(d) Jack up the vehicle and support the body with stands.

(e) Remove the rear wheel.

(f) Support the rear axle carrier with a jack.

(g) Torque the nut on inside of lower arm.

Torque: 181 N·m (1.850 kgf·cm, 134 ft·lbf)



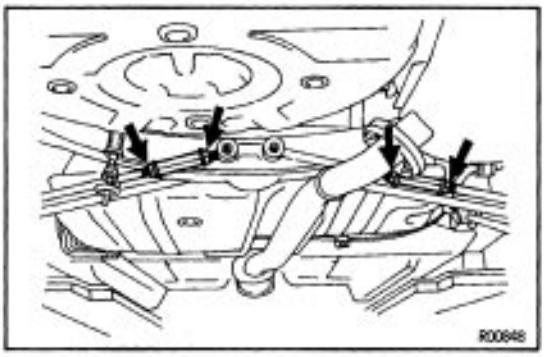
(h) Torque the strut rod set bolts.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

9. INSTALL REAR WHEEL AND LOWER VEHICLE

10. INSPECT AND ADJUST REAR WHEEL ALIGNMENT

(See page SA–6)

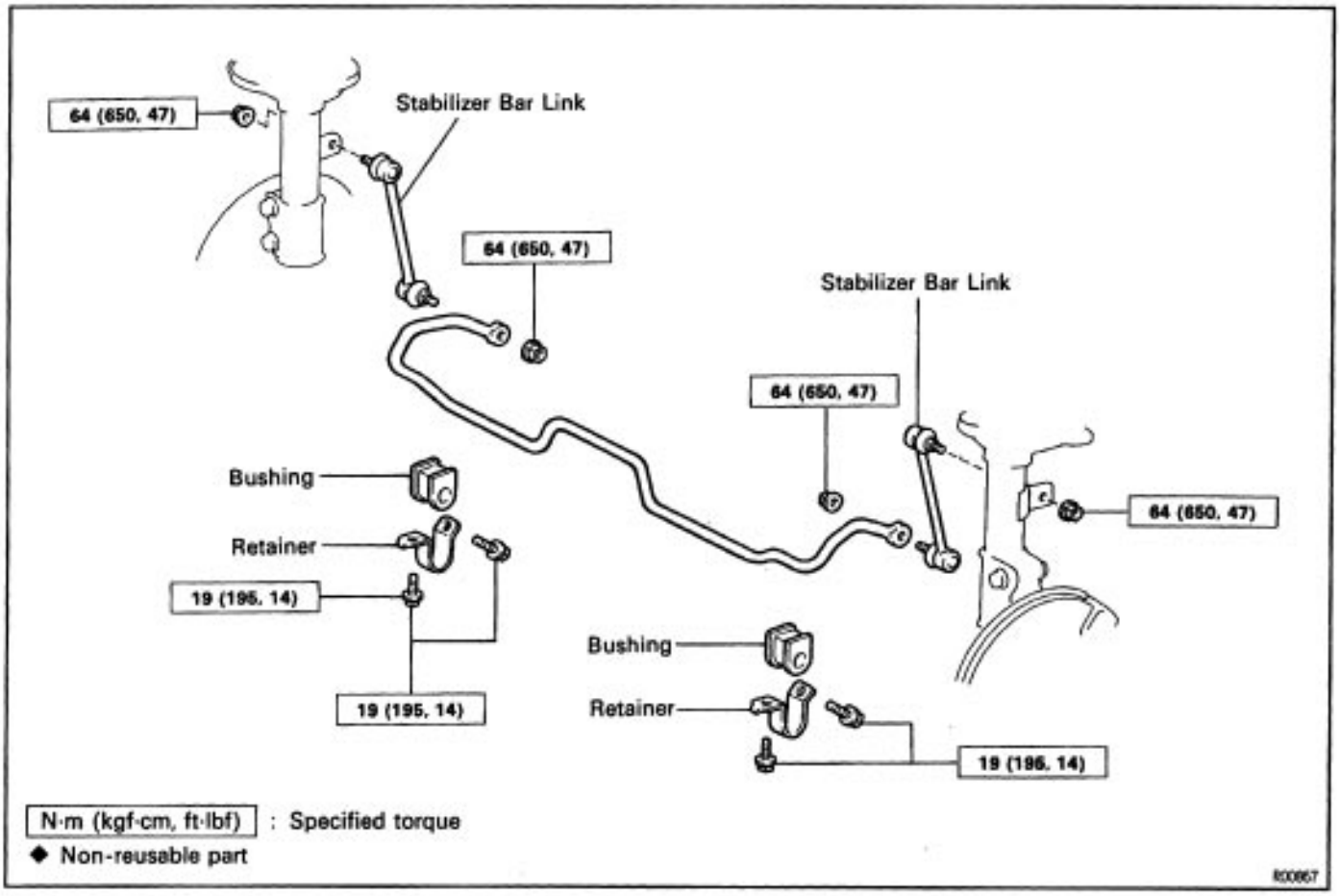


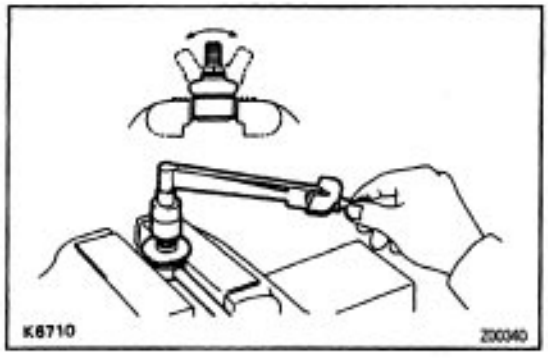
11. TORQUE NO.2 LOWER SUSPENSION ARM LOCK NUTS

Torque: 56 N·m (570 kgf·cm. 41 ft·lbf)

STABILIZER BAR

COMPONENTS





STABILIZER BAR LINK INSPECTION

INSPECT BALL JOINT FOR ROTATION CONDITION

(a) Flip the ball joint stud back and forth 5 times as shown in the illustration, before installing the nut.

(b) Using a torque gauge, turn the nut continuously one turn every 2–4 seconds and take the torque reading on the fifth turn.

Turning torque:

0.05–1.0 N·m (0.5–10 kgf·cm, 0.4–8.7in.·lbf)

If not within specification, replace the stabilizer bar link.

SERVICE SPECIFICATIONS

SERVICE DATA

SEDAN/COUPE

Cold tire inflation pressure	Tire size		Pressure	
			Front	Rear
	P195/70R14 90H		180 kPa (1.8 kgf/cm², 26 psi)	180 kPa (1.8 kgf/cm², 26 psi)
	P205/65R15 92H		180 kPa (1.8 kgf/cm², 26 psi)	180 kPa (1.8 kgf/cm², 26 psi)
	P205/65R15 92V		220 kPa (2.2 kgf/cm², 32 psi)	205 kPa (2.05 kgf/cm², 30 psi)
Tire runout			1.0 mm (0.039 in.) or less	
Wheel balance	Unbalance after adjustment		8.0 g (0.018 lb) or less	
Vehicle height	Tire size		Height	
			Front	Rear
	P195/70R14		210 mm (8.27 in.)	262 mm (10.31 in.)
	P205/65R15		213 mm (8.39 in.)	267 mm(10.51 in.)
Front wheel alignment	Toe – in (total)		0° ± 0.2° (0 ± 2 mm, 0 ± 0.08 in.)	
	Wheel angle	Tire size	Inside wheel	Outside wheel (reference)
		P195/70R14	37°20′ ± 2°	32°10′
		P205/65R15	36°00′ ± 2°	31°15′
	Camber Left–right error		−0°35′ ± 45′ 45′or less	
	Caster Left–right error		1°10′ ± 45′ 45′or less	
	Steering axis inclination		13°05′ ± 45′	
Rear wheel alignment	Toe–in (total)		0.4° ± 0.2° (4 ± 2 mm, 0.16 ± 0.08 in.)	
	Camber Left – right error		−0°26′ ± 45′ 45′ or less	
Front axle	Axle bearing backlash		0.05 mm (0.0020 in.) or less	
	Axle hub deviation		0.05 mm (0.0020 in.) or less	
Front suspension	Lower ball joint turning torque		1.0 – 2.9 N·m (10 – 30 kgf·cm, 8.7 – 26 in.·lbf)	
	Stabilizer bar link turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)	
Rear axle	Axle bearing backlash		0.05 mm (0.0020 in.) or less	
	Axle hub deviation		0.07 mm (0.0028 in.) or less	
Rear suspension	Stabilizer bar link turning torque		0.05 – 1.0N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)	

WAGON

Cold tire inflation pressure		Tire size	Pressure	
			Front	Rear
	For all roads including full rated loads	P195/70R14 90H	220 kPa (2.2 kgf/cm², 32 psi)	240 kPa (2.4 kgf/cm², 35 psi)
		P205/65R15 92H	220 kPa (2.2 kgf/cm², 32 psi)	240 kPa (2.4 kgf/cm², 35 psi)
	Optional inflation for reduced loads (1 or 4 passengers)	P195/70R14 90H	200 kPa (2.0 kgf/cm², 29 psi)	200 kPa (2.0 kgf/cm², 29 psi)
		P205/65R15 92H	200 kPa (2.0 kgf/cm², 29 psi)	200 kPa (2.0 kgf/cm², 29 psi)
Tire runout			1.0 mm (0.039 in.) or less	
Wheel balance	Unbalance after adjustment		8.0 g (0.018 lb) or less	
Vehicle height	Tire size		Height	
			Front	Rear
	P195/70R14		210 mm (8.27 in.)	272 mm (10.71 in.)
	P205/65R15		214 mm (8.43 in.)	277 mm (10.91 in.)
Front wheel alignment	Toe –in (total)		0° ± 0.2° (0 ± 2 mm, 0 ± 0.08 in.)	
	Wheel angle	Tire size	Inside wheel	Outside wheel (reference)
		P195/70R14	37°20′ ± 2°	32°15′
		P205/65R15	36°00′ ± 2°	31°20′
	Camber Left–right error		–0°35′ ± 45′ 45′or less	
	Caster Left–right error		1°05′ ± 45′ 45′or less	
	Steering axis inclination		13°00′ ± 45′	
Rear wheel alignment	Toe–in (total)		0.4° ± 0.2° (4 ± 2 mm, 0.16 ± 0.08 in.)	
	Camber Left – right error		–0°15′ ± 45′ 45′ o less	
Front axle	Axle bearing backlash		0.05 mm (0.0020 in.) or less	
	Axle hub deviation		0.05 mm (0.0020 in.) or less	
Front suspension	Lower ball joint turning torque		1.0 – 2.9 N·m (10 – 30 kgf·cm, 8.7 – 26 in.·lbf)	
	Stabilizer bar link turning torque		0.05 – 1.0 N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)	
Rear axle	Axle bearing backlash		0.05 mm (0.0020 in.) or less	
	Axle hub deviation		0.07 mm (0.0028 in.) or less	
Rear suspension	Stabilizer bar link turning torque		0.05 – 1.0N·m (0.5 – 10 kgf·cm, 0.4 – 8.7 in.·lbf)	

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TORQUE SPECIFICATIONS
FRONT

Part tightened	N·m	kgf·cm	ft·lbf
Tie rod end lock nut	74	750	54
Steering knuckle x Shock absorber	211	2,150	156
Steering knuckle x Brake caliper	107	1,090	79
Steering knuckle x Tie rod end	49	500	36
Axle hub nut	294	3,000	217
Ball joint x Lower arm	127	1,300	94
Ball joint x Steering knuckle	123	1,250	90
Steering knuckle x Disc brake dust cover	8.3	85	74in.·lbf
Drive shaft x Side gear shaft (1 MZ–FE)	65	660	48
Drive shaft center bearing lock bolt	32	330	24
Suspension upper support x Body	80	820	59
Suspension upper support x Piston rod	49	500	36
Brake hose x Shock absorber	29	300	22
ABS speed sensor wire x Shock absorber	5.4	55	48in.·lbf
Lower arm set bolt	206	2,100	152
Lower arm x Stabilizer bar link bracket	56	570	41
Stabilizer bar bushing retainer	19	195	14
Stabilizer bar link set nut	39	400	29
Steering gear box set bolt	181	1,850	134
Front exhaust pipe stay x Clamp (1 MZ–FE)	29	300	22
Front exhaust pipe stay x Body (1 MZ–FE)	21	210	15

REAR

Part tightened	N·m	kgf·cm	ft·lbf
Brake caliper x Rear axle carrier	47	475	34
Axle bearing set bolt	80	820	59
Bearing lock nut (w/o ABS)	123	1,250	90
Shock absorber x Rear axle carrier	255	2,600	188
Brake hose x Shock absorber	29	300	22
ABS speed sensor set bolt	7.8	80	69in.·lbf
ABS speed sensor wire x Shock absorber	5.4	55	48in.·lbf
Suspension upper support x Body	39	400	29
Suspension upper support x Piston rod	49	500	36
Lower suspension arm x Suspension member	181	1,850	134
Lower suspension arm X Rear axis carrier	181	1,850	134
Strut rod x Body	113	1,150	83
Strut rod x Rear axle carrier	113	1,150	83
Suspension member x Body (17mm)	51	520	38
Suspension member x Body (14mm)	38	390	28
LSPV spring x Lower suspension arm	13	130	9.4
Stabilizer bar bushing retainer	19	195	14
Stabilizer bar link set nut	64	650	47

LUBRICANT

Drive shaft	Item	Capacity
Toyota type	Outboard joint grease Inboard joint grease	120–130 g (4.2–4.6 oz.) 232–242 g (8.2–8.5 oz.)
GKN type	Outboard joint grease Inboard joint grease	140–160 g (4.9–5.6 oz.) 185–215 g (6.5–7.6 oz.)

BRAKE SYSTEM

GENERAL DESCRIPTION

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

2. It is very important to keep parts and the area clean when repairing the brake system.

3. If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

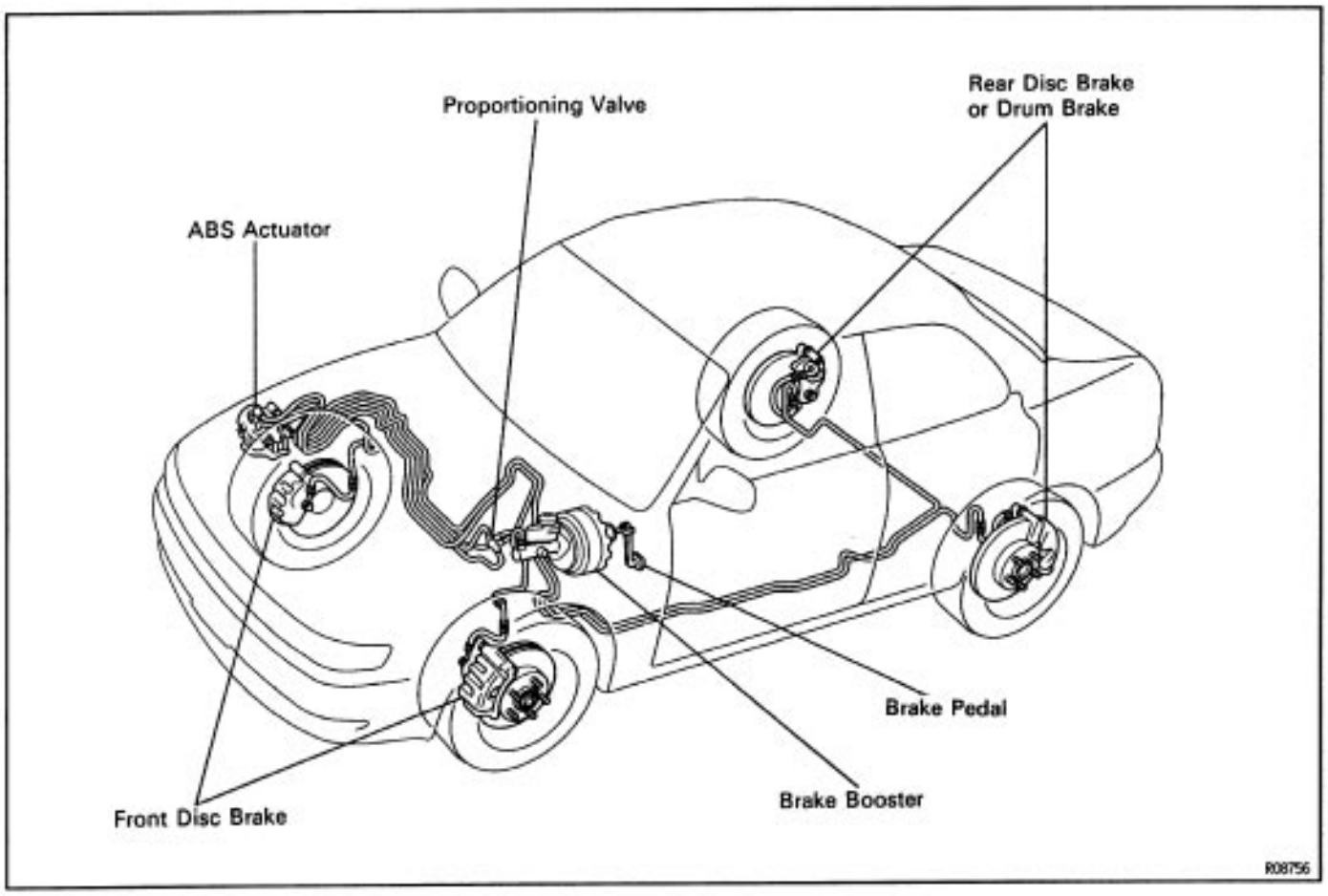
DESCRIPTION

The service brakes consist of a foot brake which changes rotational energy to thermal energy to stop the vehicle while it is being driven and a parking brake to keep the vehicle from moving while it is parked.

OPERATION

FOOT BRAKE

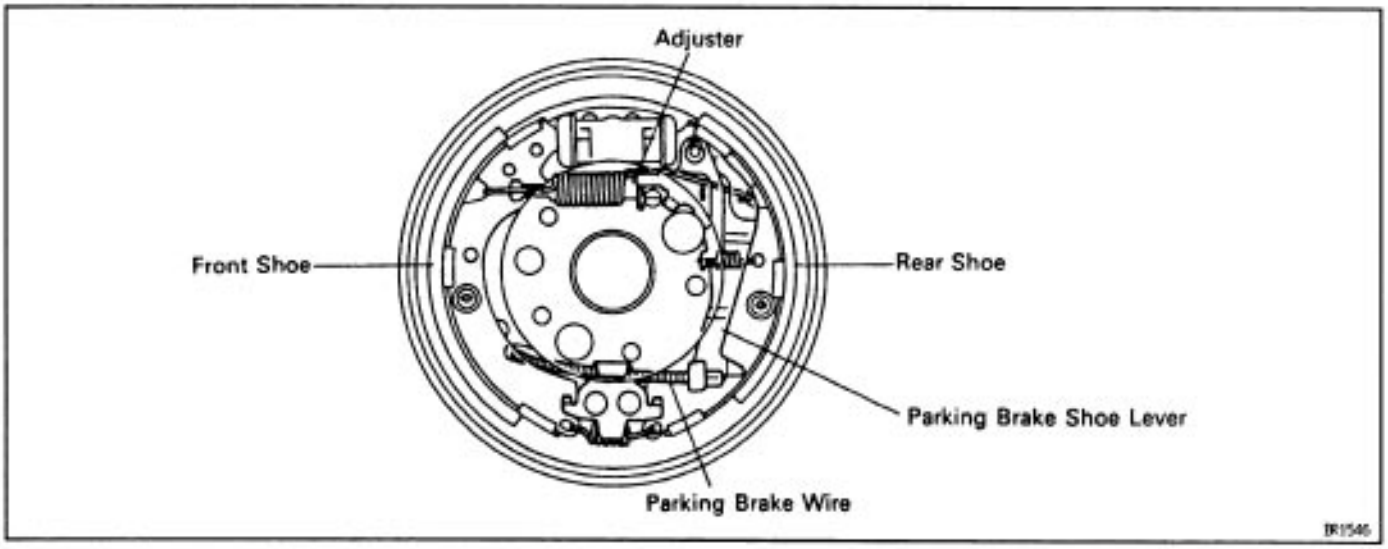
when the brake pedal is depressed, a vacuum builds up in the booster which amplifies the pedal force, pressing on the piston in the master cylinder. The piston movement raises the hydraulic pressure in the cylinder. This hydraulic pressure is then applied to each front caliper and rear wheel cylinder (or rear caliper), and acts to press the front brake pads and rear brake shoes (or rear brake pads) against the rotating drums (or discs). The resulting friction converts the rotational energy to thermal energy, stopping the vehicle.



PARKING BRAKE

Rear Drum Brake:

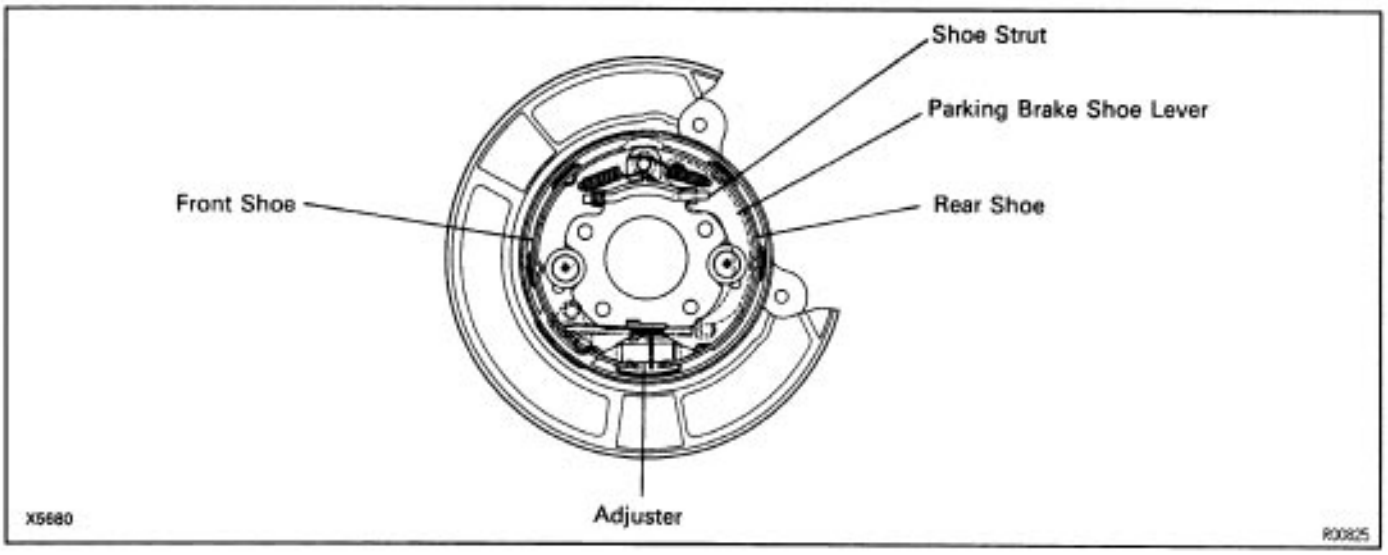
When the parking brake lever is pulled, the parking brake shoe lever is pulled via the parking brake wire. This causes the adjuster to push the front shoe, which expands and is pressed against the brake drum. If the parking brake lever continues to be pulled, the contact point of the parking brake shoe lever and adjuster then becomes the fulcrum so that the parking brake shoe lever causes the rear shoe to expand. This results in the brake drum being locked by the front shoe and rear shoe.



PARKING BRAKE

Rear Disc Brake:

When the parking brake lever is pulled or pedal is depressed, the parking brake shoe lever is pulled via the parking brake wire. This causes the shoe strut to push the front shoe, which expands and is pressed against the disc. If the parking brake lever or pedal continues to be pulled or depressed, the contact point of the parking brake shoe lever and shoe strut then becomes the fulcrum so that the parking brake shoe lever causes the rear shoe to expand. This results in the disc being locked by the front shoe and rear shoe.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09023–00100 Union Nut Wrench 10 mm	
	09703–30010 Brake Shoe Return Spring Tool	
	09709–29017 LSPV Gauge Set	
	09718–00010 Shoe Hold Down Spring Driver	
	09737–00010 Brake Booster Push Rod Gauge	
	09751–36011 Brake Tube Union Nut 10 x 12 mm Wrench	
	09843–18020 Diagnosis Check Wire	
	09990–00150 A6S Actuator Checker and Sub–harness	TMC made vehicle (NIPPONDENSO ABS)
	09990–00163 ABS Actuator Checker Sheet 'A'	TMC made vehicle (NIPPONDENSO ABS)
	09990–00200 ABS Actuator Checker Sub–harness "C"	TMC made vehicle (NIPPONDENSO ABS)
	09990–00210 ABS Actuator Checker Sub–harness "E"	TMC made vehicle (NIPPONDENSO ABS)

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set	
	09905–00013 Snap Ring Pliers	

EQUIPMENT

Torque wrench	
Micrometer	Brake disc
Dial indicator	Brake disc
Vernier calipers	Brake drum and disc

LUBRICANT

Item	Capacity	Classification
Brake fluid	–	SAE J 1703 or FMVSS No. 116 DOT3

TROUBLESHOOTING

!M19-0F

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

See page			BR–21,29,37,44	BR–21,29,44	BR–8	BR–12	BR–37,44	BR–10,11		BR–17	BR–37	BR–21,29,37,44	BR–21,29,37,44	BR–21,29,37,44	BR–21,29,37,44	BR–9	BR–21,29,44	BR–21,29,37,44	BR21, 29, 44	BR–21,29,44	BR–21,29,37,44	BR–21,29,37,44	BR–21,29,44	BR–37
Part Name (Trouble)	Brake system (Fluid leaks)	Brake system (Air in)	Brake pad or lining (Worn)	Piston seal (Worn or damaged)	Brake pedal (Freeplay minimal)	Master cylinder (Faulty)	Rear brake (Shoe clearance out of adjustment)	Parking brake (Lever or pedal travel out of adjustment)	Parking brake wire (Sticking)	Booster push rod (Out of adjustment)	Anchor or return spring (Faulty)	Pad or lining (Cracked or distorted)	Piston (Stuck)	Pad or lining (oily)	Piston (Frozen)	Booster system (Vacuum leaks)	Pad support plate (Loose)	Installation bolt (Loose)	Sliding pin (Worn)	Rotor (Scored)	Pad or lining (Dirty)	Pad or lining (Hardened)	Anti–squeal shim (Damaged)	Hold–down spring (Damaged)
Low pedal or spongy pedal	1	2		3		5	4			6														
Brake drag					1	11	4	2	3	9	8	5	6		7	10								
Brake pull												5	1	2	3					4				
Hard pedal but brake inefficient	1	2	3				5			9		4		6		10				8		7		
Noise from brakes											8	1					4	2	5	3	6	7	9	10

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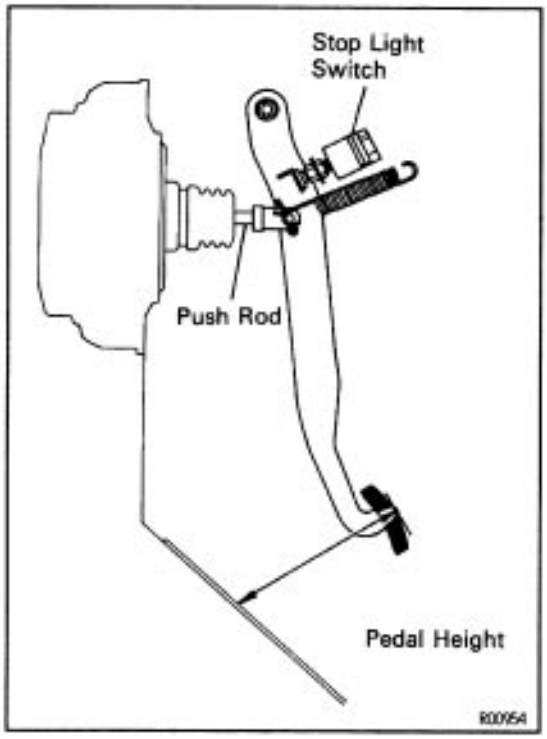
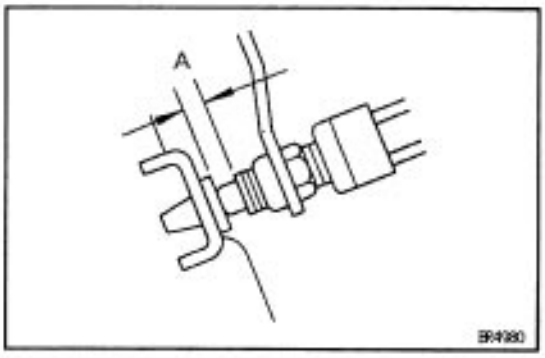
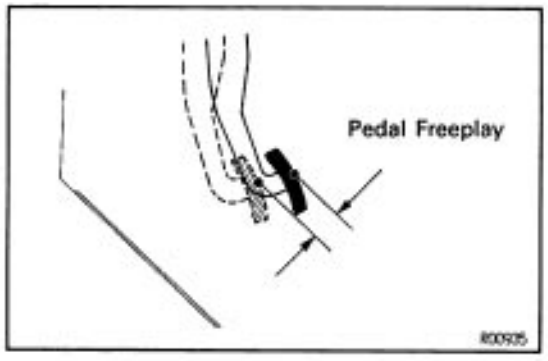






CHECK AND ADJUSTMENT

BRAKE PEDAL CHECK AND ADJUSTMENT

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from asphalt sheet:

147.5–157.5 mm (5.81–6.20 fn.)

If the pedal height is incorrect, adjust it.

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Disconnect the connector from the stop light switch.
(b) Loosen the stop light switch lock nut and remove the stop light switch.
(c) Loosen the push rod lock nut.
(d) Adjust the pedal height by turning the pedal push rod.
(e) Tighten the push rod lock nut.

Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.
(g) Turn the stop light switch back one turn.
(h) Check the clearance (A) between stop light switch and pedal.

Clearance:

0.5–2.4 mm (0.02–0.09 in.)

(i) Tighten the stop light switch lock nut.
(j) Connect the connector to the stop light switch.
(k) Check that the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.
(l) After adjusting the pedal height, check that pedal freeplay.

HINT: If clearance (A) between the stop light switch and the brake pedal stopper has been adjusted cor–rectly, the pedal freeplay will meet the specifications.

3. CHECK THAT PEDAL FREEPLAY IS CORRECT

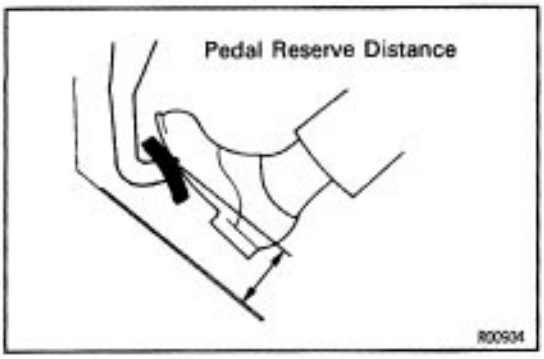
(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the boost–er.
(b) Push in the pedal by hand until the beginning of the resistance is felt, then measure the distance.

Pedal freeplay:

1–6 mm (0.04–0.24 in.)

HINT: The freeplay to the 1st point of resistance is due to the play between the clevis and pin. It is 1–3 mm (0.04–0.12 in.) on the pedal.

If incorrect, check the stop light switch clearance. And if the clearance is OK, then troubleshoot the brake system.



4. CHECK THAT PEDAL RESERVE DISTANCE IS COR–RECT

Release the parking brake.

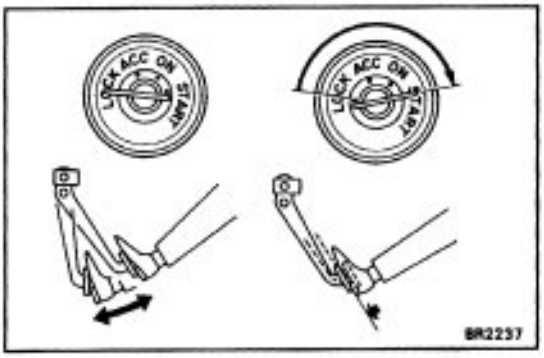
With the engine running, depress the pedal and meas–ure the pedal reserve distance.

Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):

More than 70 mm (2.76 in.)

If the reserve distance is incorrect, troubleshoot the brake system.

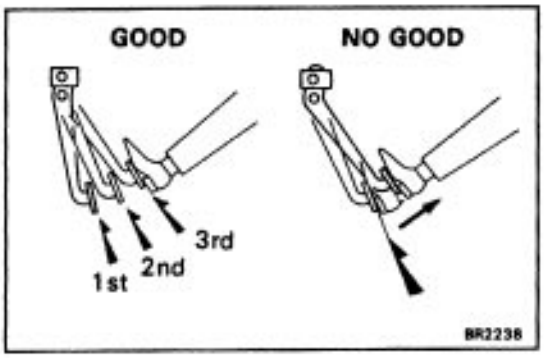
BRAKE BOOSTER OPERATIONAL TEST



1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.

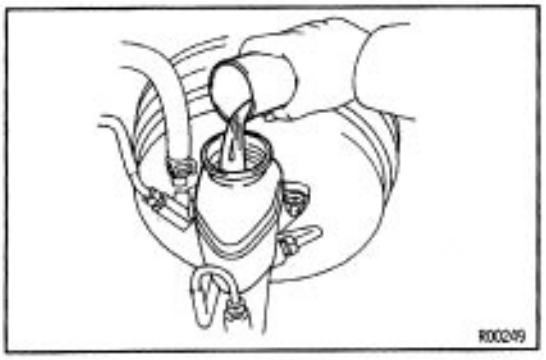


2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly. If the pedal goes down farthest the 1 st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed. If there is no change in the pedal reverse travel after holding the pedal for 30 seconds, the booster is air tight.

BRAKE SYSTEM BLEEDING

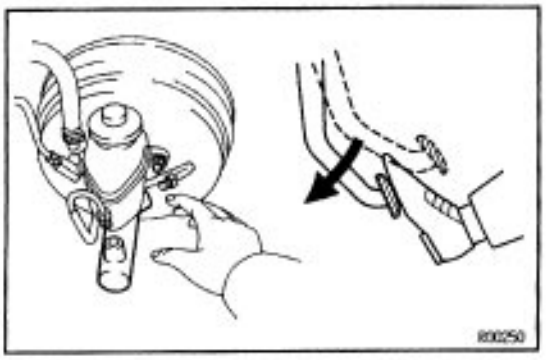


HINT: If any work is done on the brake system or if air in the brake lines is suspected, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted sur–face. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Fluid: SAE J1703 or FMVSS No. 116 DOT3

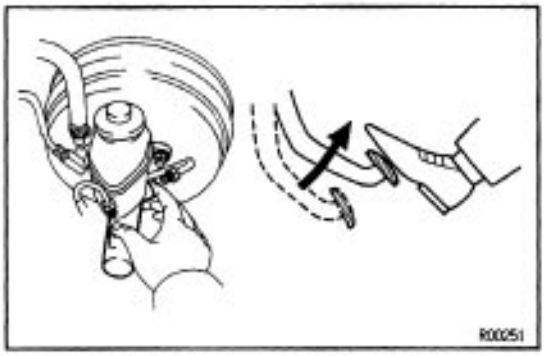


2. BLEED MASTER CYLINDER

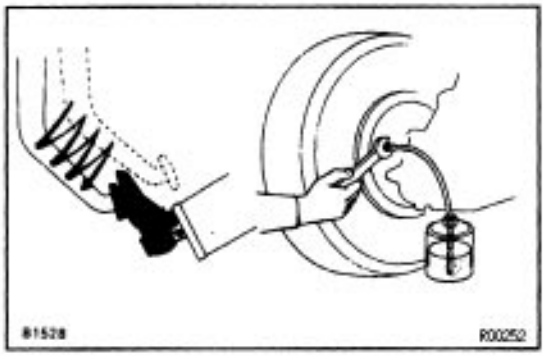
HINT: If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

(a) Disconnect the brake lines from the master cylinder.

(b) Slowly depress the brake pedal and hold it.

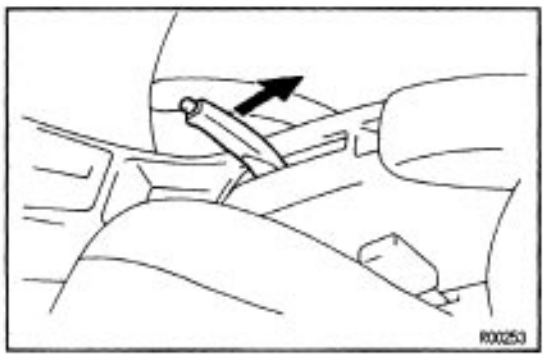


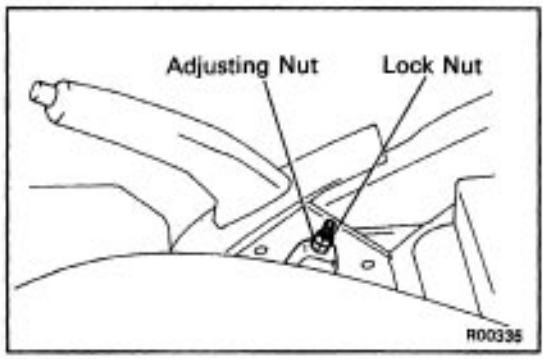
(c) Block off the outer holes with your fingers, and release the brake pedal.
(d) Repeat (b) and (c) 3 or 4 times.



3. BLEED BRAKE LINE
(a) Connect the vinyl tube to the brake caliper.
(b) Depress the brake pedal several times, then loosen the bleeder plug with the pedal held down.
(c) At the point when fluid stops coming out, tighten the bleeder plug, then release the brake pedal.
(d) Repeat (b) and (c) until all the air in the fluid has been bled out.
(e) Repeat the above procedure to bleed the air out of the brake line for each wheel.

4. CHECK FLUID LEVEL IN RESERVOIR
Check the fluid level and add fluid if necessary.
Fluid: SAE J1703 or FMVSS No.116 DOT3



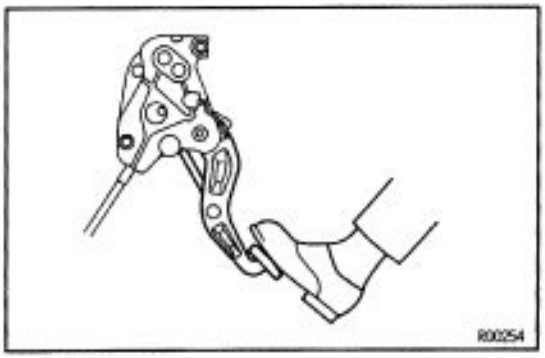


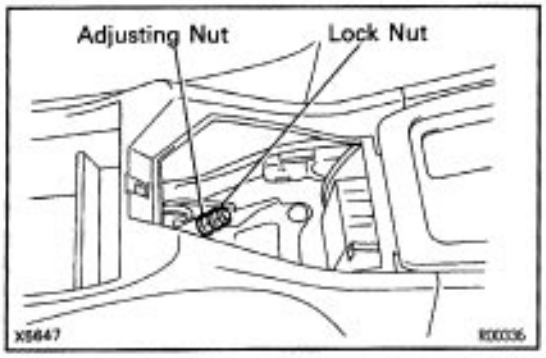
LEVER TYPE PARKING BRAKE CHECK AND ADJUSTMENT

1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT
Pull the parking brake lever all the way up, and count the number of clicks.
Parking brake lever travel at 196 N (20 kgf, 44 lbf): 5–8 clicks
If incorrect, adjust the parking brake.

2. IF NECESSARY, ADJUST PARKING BRAKE LEVER TRAVEL
HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.
For shoe clearance adjustment, see step 9 on page BR–43 or step 8 on page BR–58.
(a) Remove the rear console box.
(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.

(c) Tighten the lock nut.
Torque: 5.4 N–m (55 kgf–cm. 48 in.¿lbf)
(d) Install the rear console box.





PEDAL TYPE PARKING BRAKE CHECK AND ADJUSTMENT

1. CHECK THAT PARKING BRAKE PEDAL TRAVEL IS CORRECT

Slowly depress the parking brake pedal all the way, and count the number of clicks.

Parking brake pedal travel at 294 N (30 kgf,66 lbf): 3–6 clicks

If incorrect, adjust the parking brake.

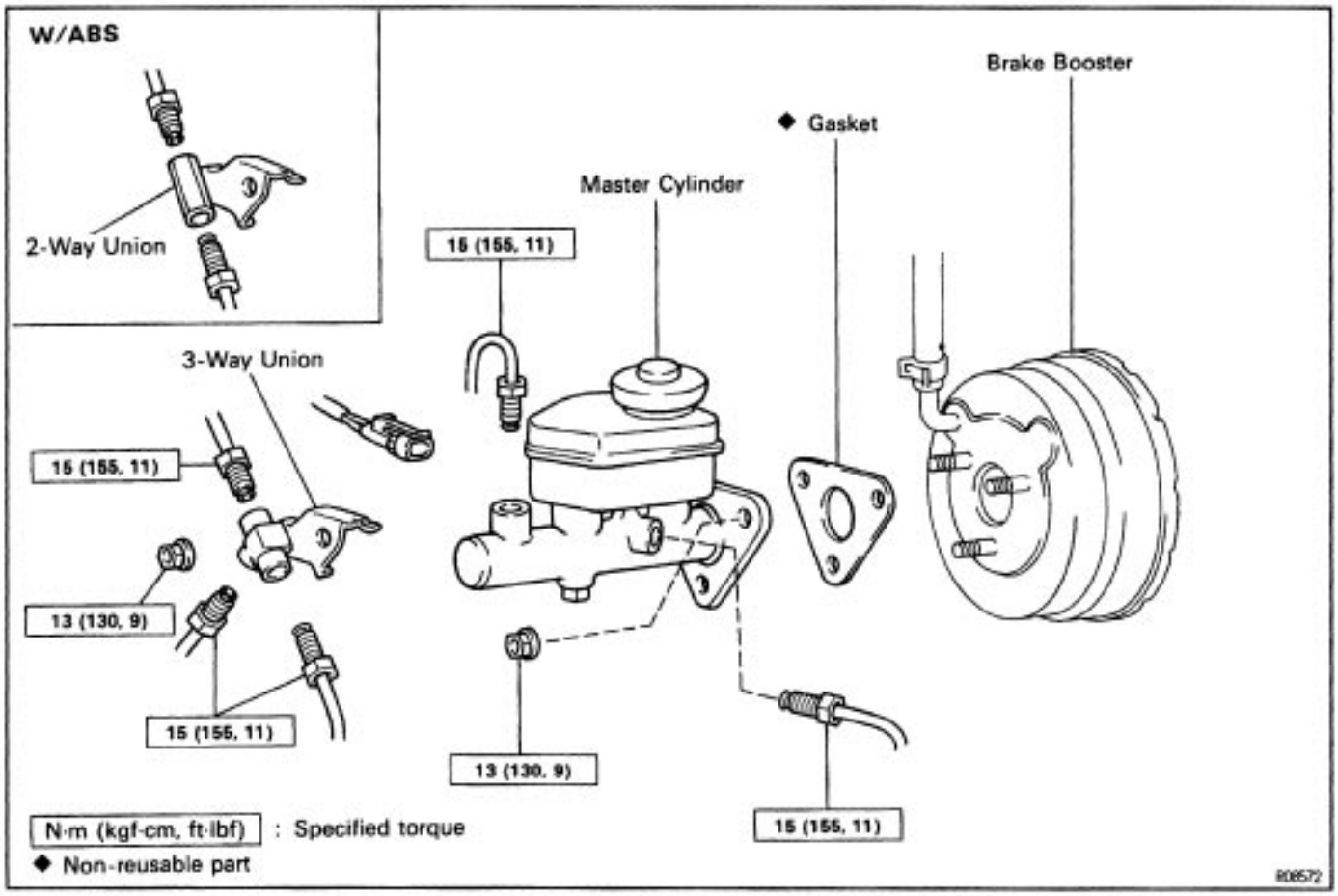
2. IF NECESSARY, ADJUST PARKING BRAKE PEDAL TRAVEL

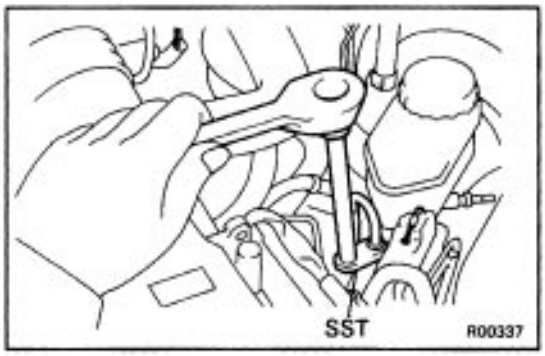
HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. For shoe clearance adjustment, see step 8 on page BR –58.

(a) Remove the hole cover.
(b) Loosen the lock nut and turn the adjusting nut until the lever travel is correct.
(c) Tighten the lock nut.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(d) Install the hole cover.

MASTER CYLINDER

MASTER CYLINDER REMOVAL





1. DISCONNECT LEVEL WARNING SWITCH CONNEC – TOR

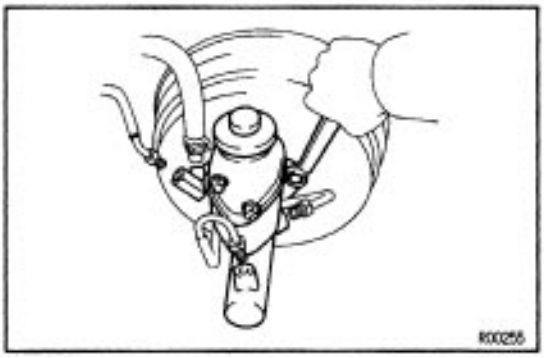
2. TAKE OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE LINES

Using SST, disconnect the brake lines from the master cylinder.

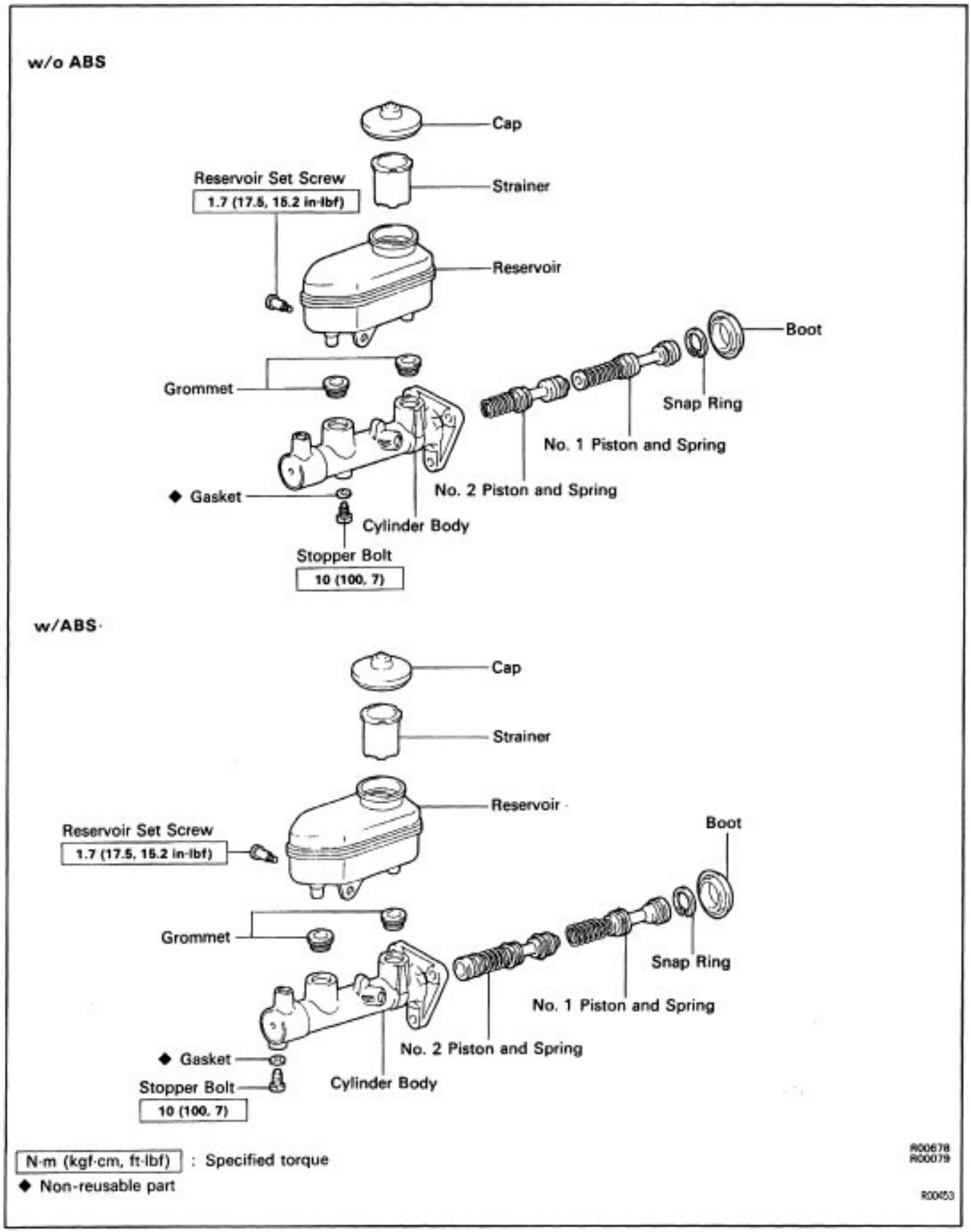
SST 09023–00100

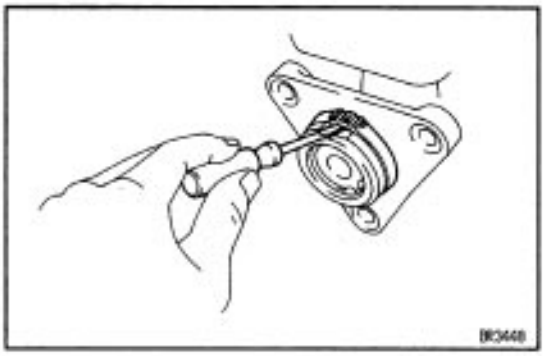


4. REMOVE MASTER CYLINDER

Remove the mounting nuts and pull out the master cylinder and gasket.

COMPONENTS

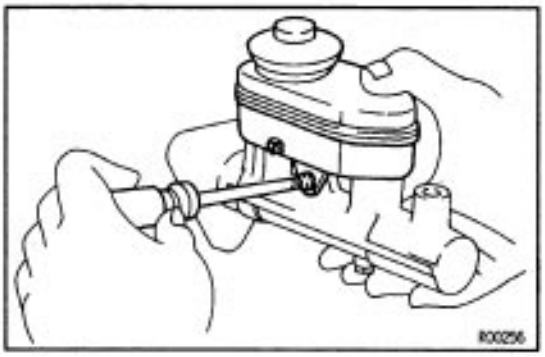

w/o ABS
Cap
Reservoir Set Screw
1.7 (17.5, 15.2 in-lbf)
Strainer
Reservoir
Boot
Grommet
Snap Ring
No. 1 Piston and Spring
No. 2 Piston and Spring
◆ Gasket
Cylinder Body
Stopper Bolt
10 (100, 7)
w/ABS
Cap
Strainer
Reservoir
Reservoir Set Screw
1.7 (17.5, 15.2 in-lbf)
Boot
Grommet
Snap Ring
No. 1 Piston and Spring
No. 2 Piston and Spring
◆ Gasket
Stopper Bolt
10 (100, 7)
Cylinder Body
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
R00678
R00079
R00053



MASTER CYLINDER DISASSEMBLY

1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.



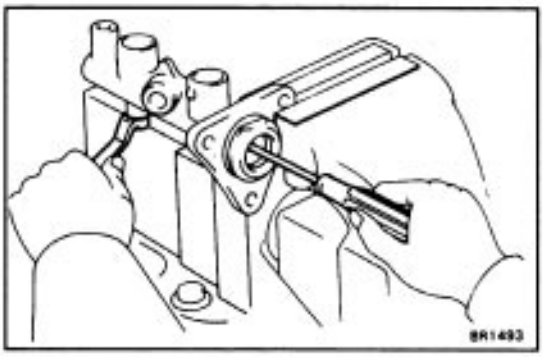
2. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.

(b) Remove the cap and strainer from the reservoir.

3. REMOVE 2 GROMMETS

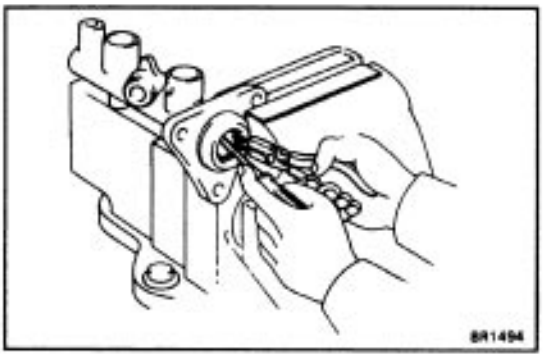
4. PLACE CYLINDER IN VISE



5. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT: Tape the screwdriver tip before use.

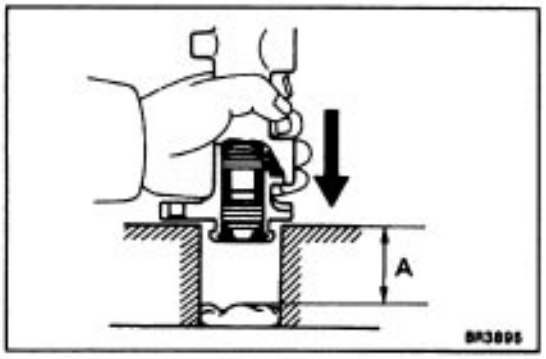


6. REMOVE 2 PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

(b) Remove the No.1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is a possibility that the cylinder bore could be damaged.



(c) Place a rag and 2 wooden blocks on the work table and lightly tap the cylinder flange against the blocks until the piston drops out of the cylinder.

HINT: Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

MASTER CYLINDER INSPECTION

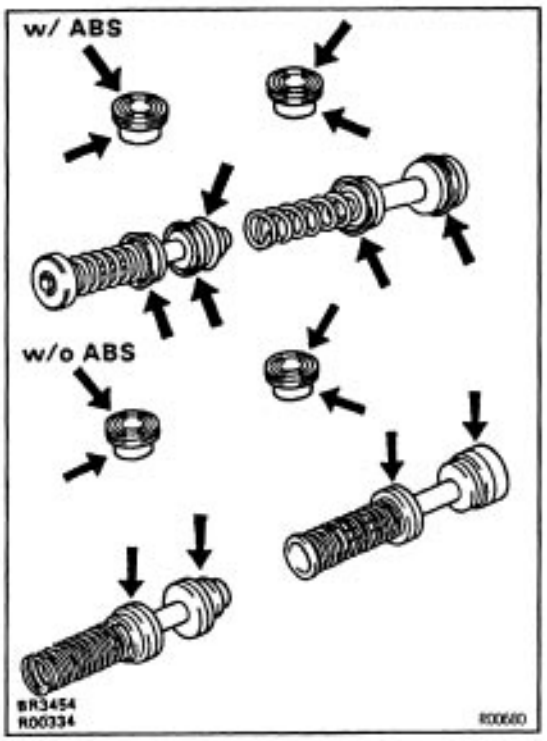
HINT: Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

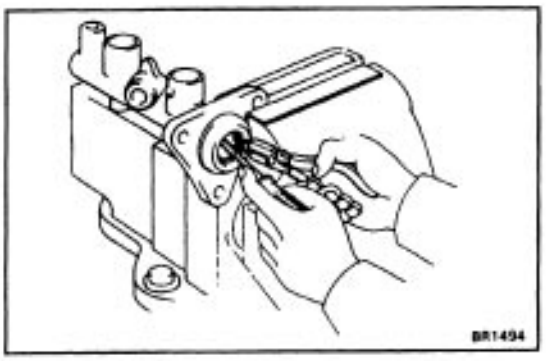
2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

MASTER CYLINDER ASSEMBLY



1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL 2 SPRINGS AND PISTONS

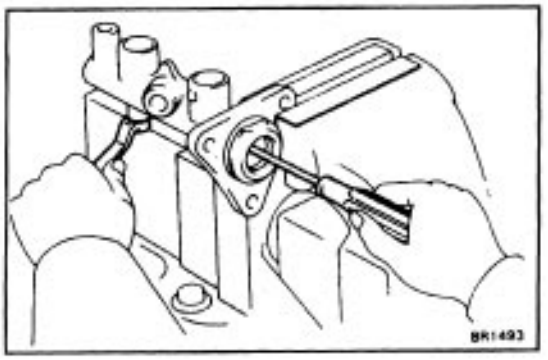
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Install the 2 springs and pistons straight in, not at an angle.

NOTICE: If install at an angle, there is a possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

HINT: Tape the screwdriver tip before use.

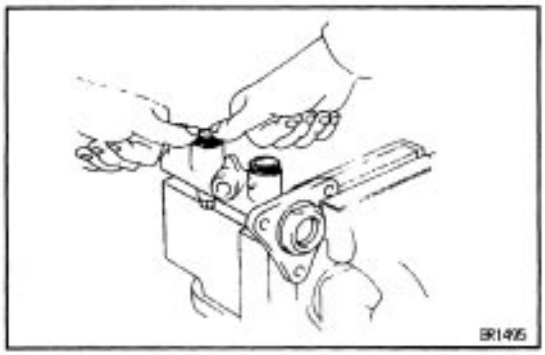


3. INSTALL PISTON STOPPER BOLT

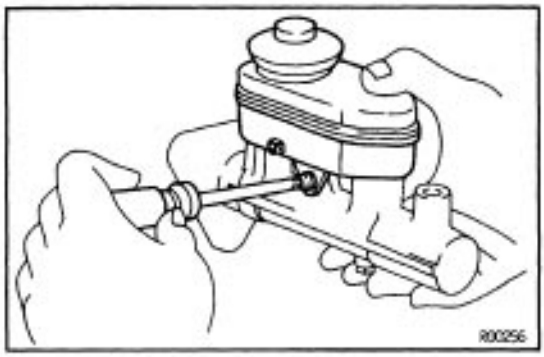
Using a screwdriver, push the piston in all the way and install the piston stopper bolt over a new gasket.

Torque the bolt.

Torque: 10 N .m (100 kgf–cm, 7 ft–lbf)

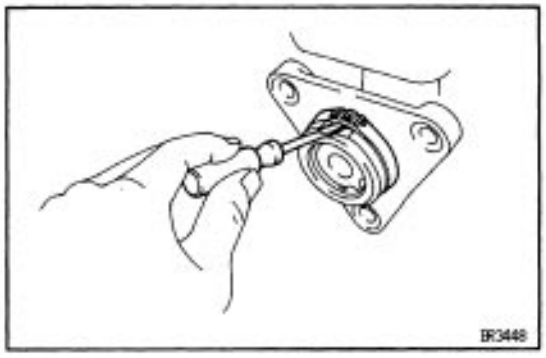


4. INSTALL 2 GROMMETS



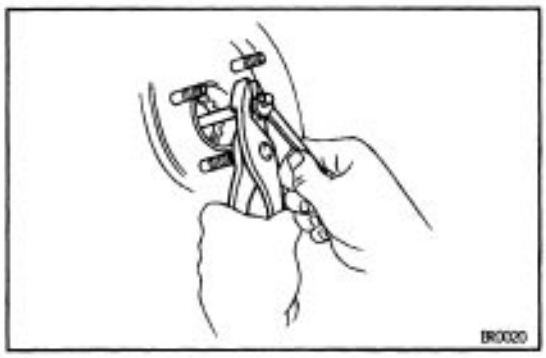
5. INSTALL RESERVOIR

(a) Install the strainer and cap to the reservoir.
(b) Push the reservoir onto the cylinder.
(c) Install the set screw while pushing on the reservoir.
Torque: 1.7 N–m (17.5 kgf–cm, 15.2 in.–lbf)



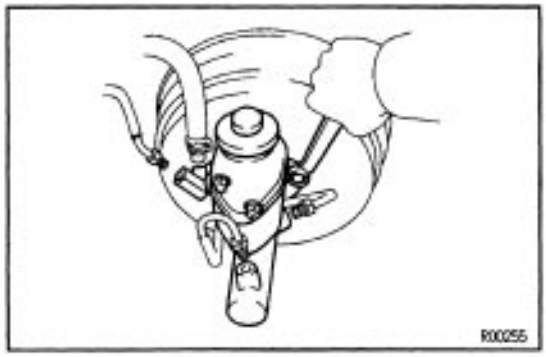
6. INSTALL MASTER CYLINDER BOOT

Facing the UP mark on the master cylinder boot upwards, install the cylinder boot to the master cylinder.



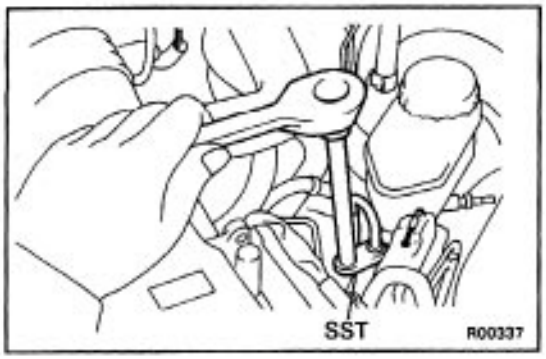
MASTER CYLINDER INSTALLATION

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER
(See page BR–19**)**



2. INSTALL MASTER CYLINDER

Install the master cylinder and a new gasket on the brake booster with 3 nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



3. CONNECT 2 BRAKE LINES

Using SST, connect the brake lines to the master cylinder_ Torque the union nuts.

SST 09023–00100

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

4. CONNECT LEVEL WARNING SWITCH CONNECTOR

5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9)

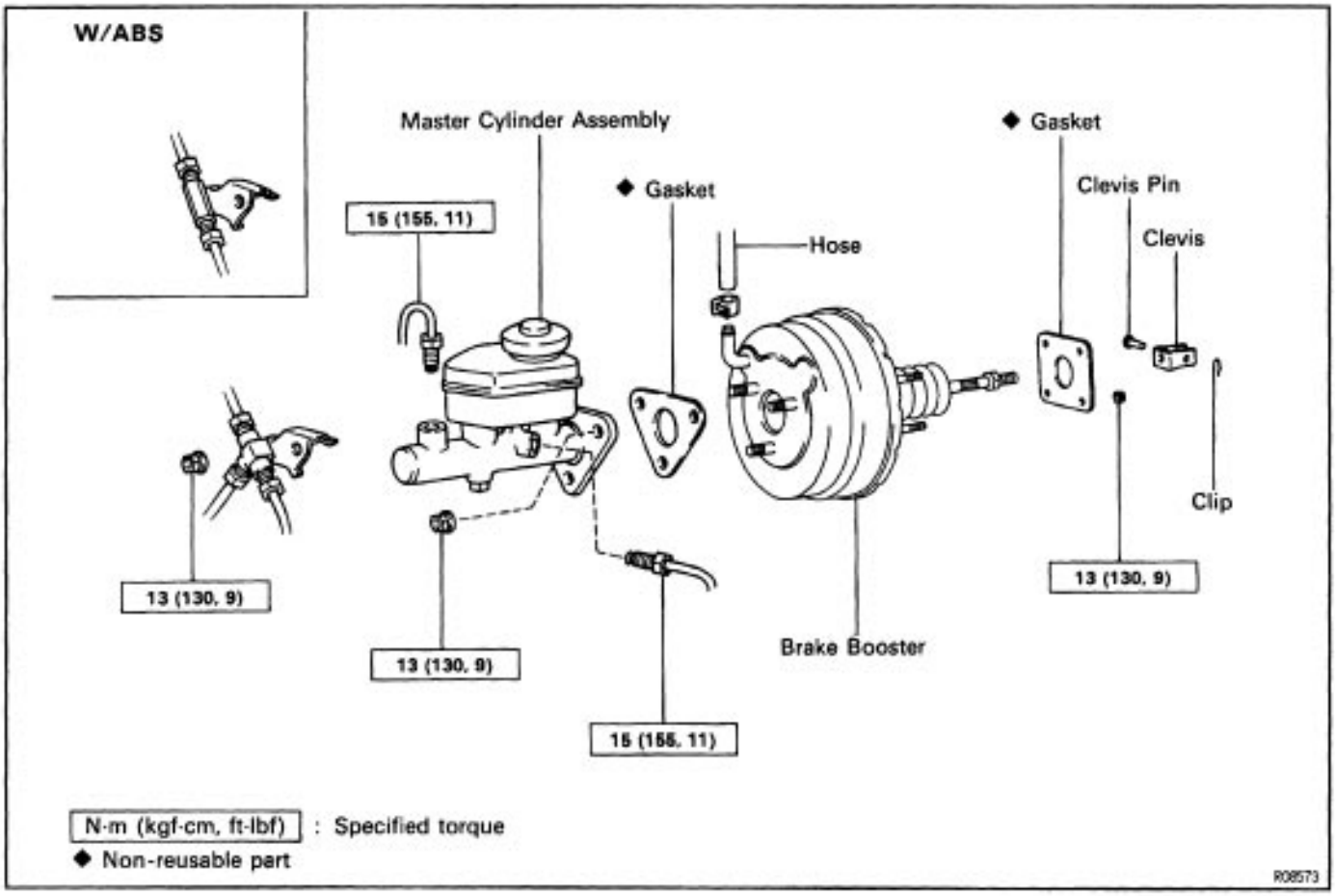
6. CHECK FOR LEAKS

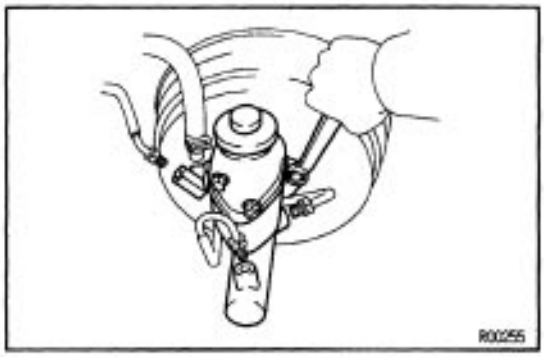
7. CHECK AND ADJUST BRAKE PEDAL

(See page BR–8)

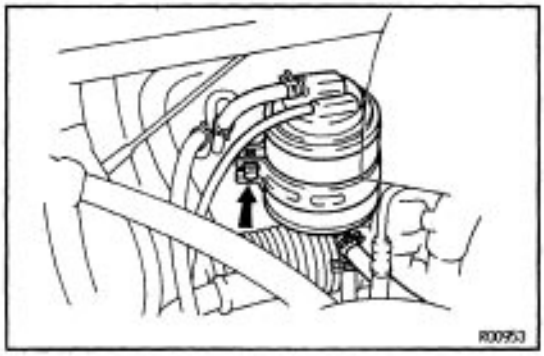
BRAKE BOOSTER

BRAKE BOOSTER REMOVAL

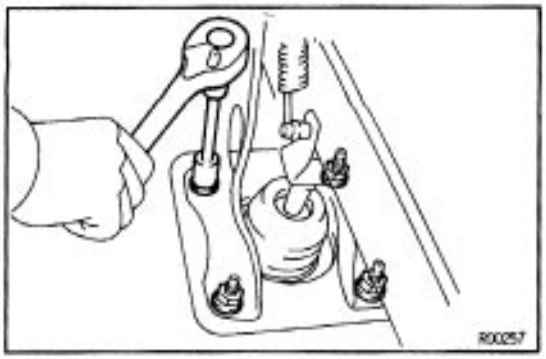




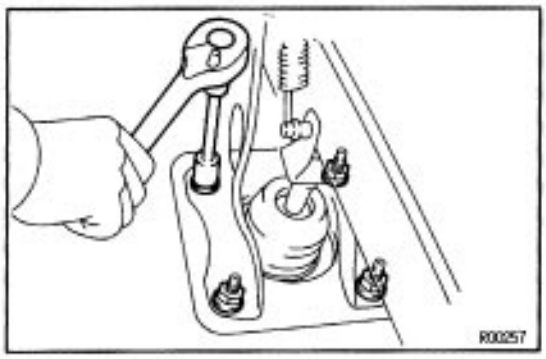
1. REMOVE MASTER CYLINDER
(See page BR–12)



2. PUSH DOWN CHARCOAL CANISTER
Loosen the clamp screw and push the charcoal canis–ter down slightly.



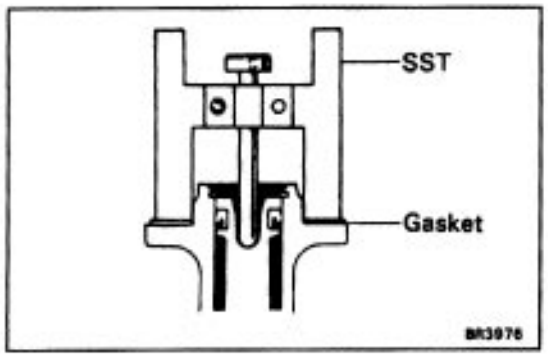
3. DISCONNECT VACUUM HOSE FROM BRAKE BOO–STER
4. REMOVE PEDAL RETURN SPRING
5. REMOVE CLIP AND CLEVIS PIN
6. REMOVE BRAKE BOOSTER, GASKET AND CLEVIS
(a) Remove the 4 nuts and clevis.
(b) Pull out the brake booster and gasket.

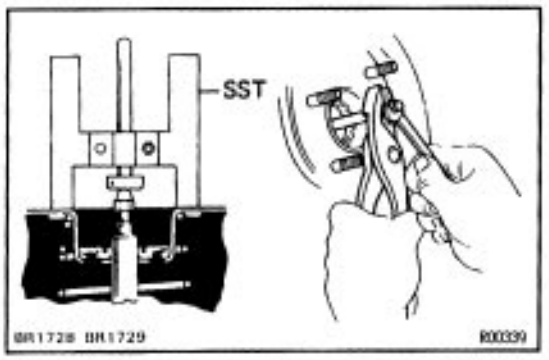


BRAKE BOOSTER INSTALLATION

1. INSTALL BRAKE BOOSTER
(a) Install the booster and a new gasket.
(b) Install the clevis to the operating rod.
(c) Install and torque the booster installation nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(d) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
(e) Install the pedal return spring.

2. ADJUST LENGTH OF BOOSTER PUSH ROD
(a) Install the gasket on the master cylinder.
(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.





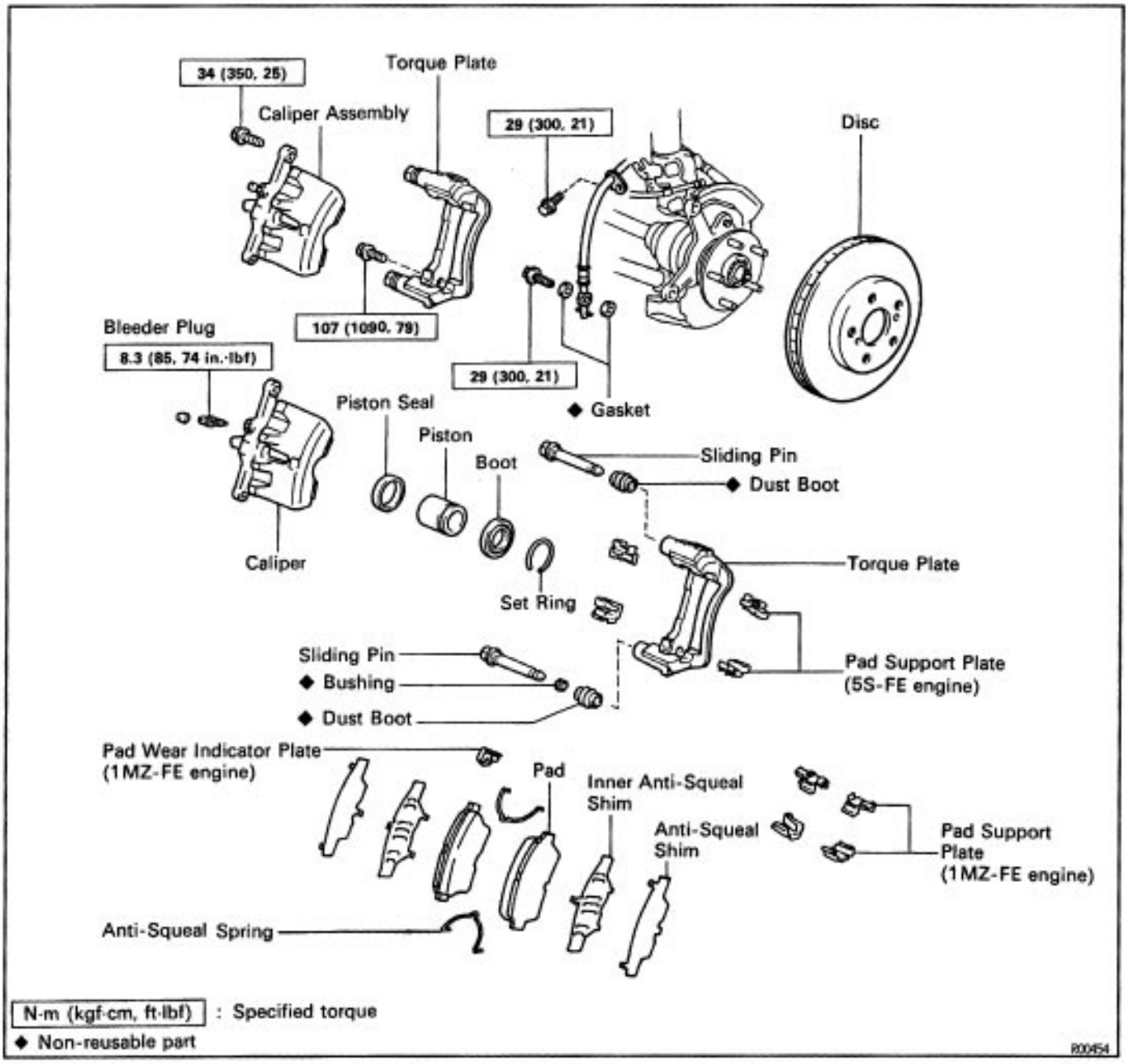
(c) Turn the SST upside down, and set it on the booster.
(d) Measure the clearance between the booster push rod and pin head (SST).
Clearance:
0 mm (0 in.)
(e) Adjust the booster push rod length until the push rod slightly touches the pin head.

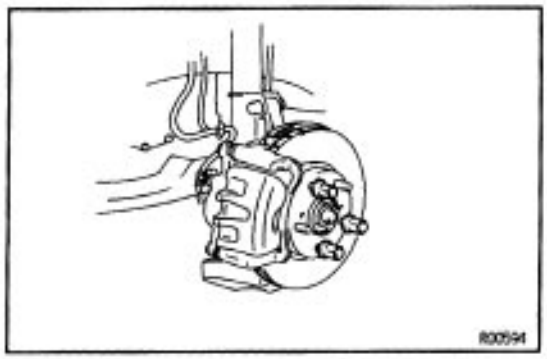
3. INSTALL CHARCOAL CANISTER TO ORIGINAL PO–SITION
4. INSTALL MASTER CYLINDER
5. CONNECT VACUUM HOSE TO BRAKE BOOSTER
6. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–9)
7. CHECK FOR LEAKS

8. CHECK AND ADJUST BRAKE PEDAL
(See page BR–8**)**
Check and adjust the brake pedal, then tighten the clevis lock nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

9. PERFORM OPERATIONAL CHECK
(See page BR–9**)**

FRONT BRAKE
(Single–Piston Type)
COMPONENTS

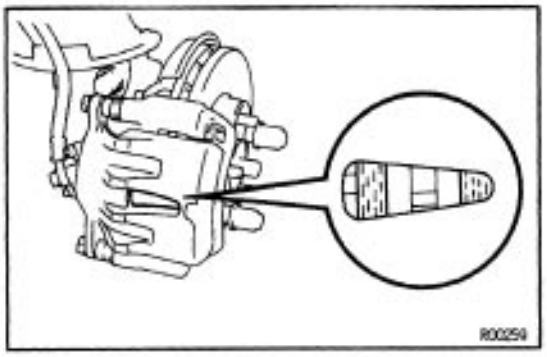




BRAKE PADS REPLACEMENT

1. REMOVE FRONT WHEEL

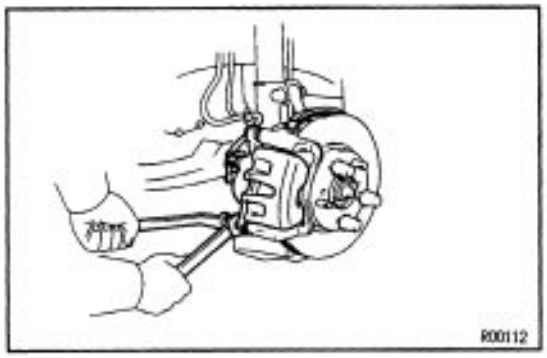
Remove the wheel and temporarily fasten the disc with hub nuts.



2. INSPECT PAD LINING THICKNESS

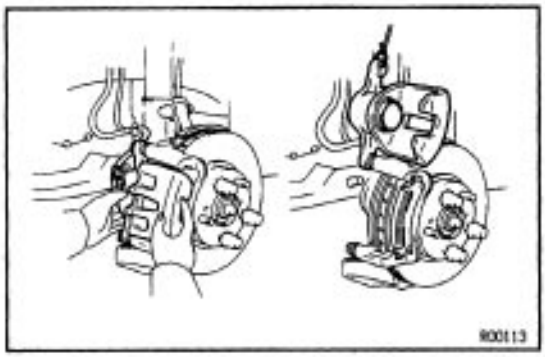
Check the pad thickness through the caliper inspection hole and replace the pads if it is not within the specification.

Minimum thickness:
1.0 mm (0.039 in.)



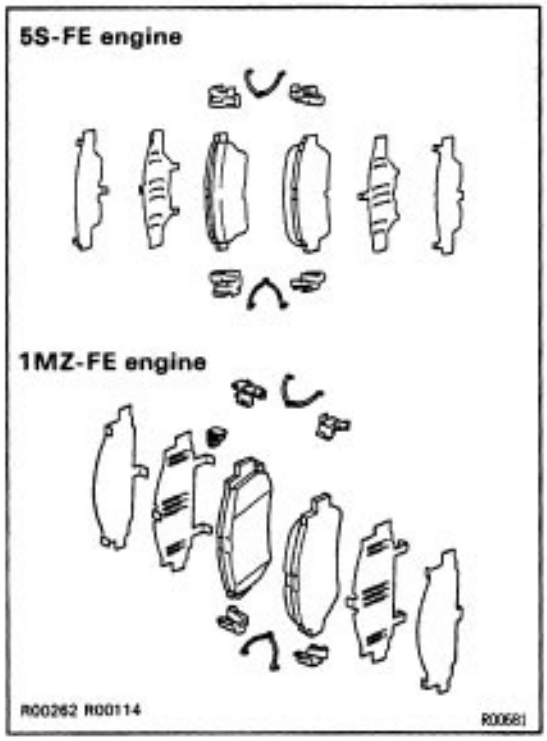
3. LIFT UP CALIPER

(a) Hold the sliding pin on the bottom and loosen the installation bolt.
(b) Remove the installation bolt.



(c) Lift up the caliper and suspend the caliper with string.

HINT: Do not disconnect the flexible hose from the caliper.

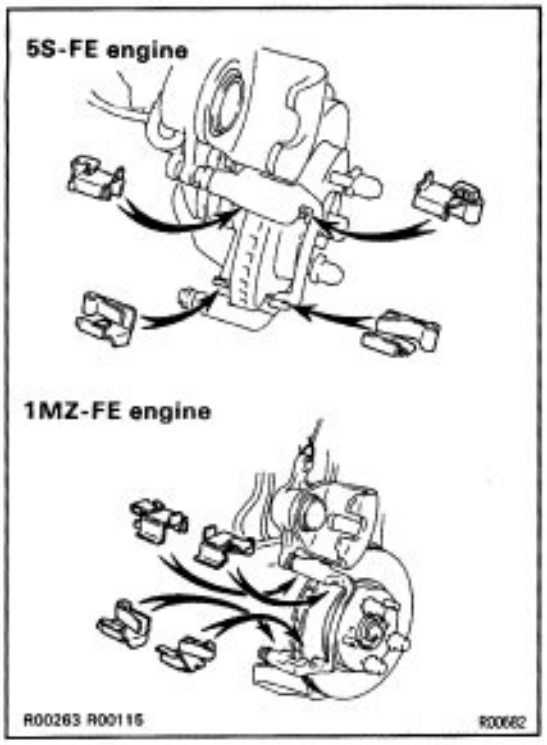


4. REMOVE FOLLOWING PARTS:

(a) 2 anti–squeal springs
(b) 2 brake pads
(c) 4 anti–squeal shims
(d) 1 MZ–FE engine:
Pad wear indicator
(e) 4 pad support plates

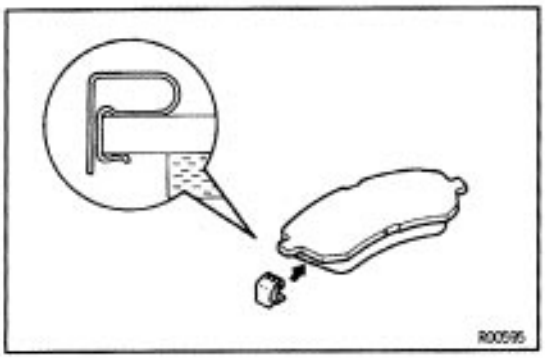
5. CHECK DISC THICKNESS AND RUNOUT

(See page BR–26**)**



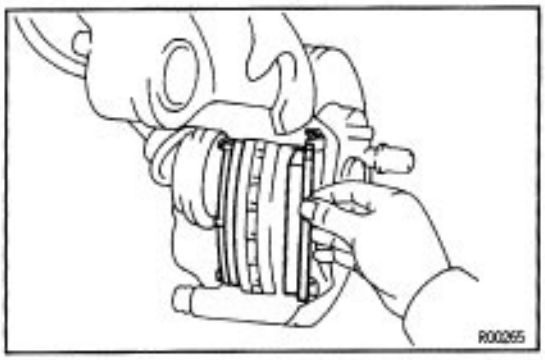
6. INSTALL PAD SUPPORT PLATES

Install the 4 pad support plates.



7. INSTALL NEW PADS

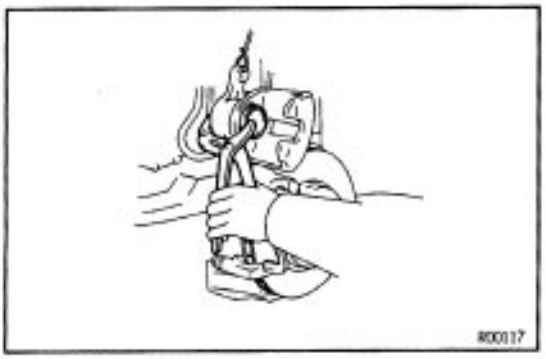
(a) 1 MZ–FE engine:
Install a pad wear indicator plate on the inside pad.
(b) Apply disc brake grease to both sides of the inner anti –squeal shim.
(c) Install the 2 anti–squeal shims on each pad.



(d) install inside pad with the pad wear indicator plate facing upward.
(e) Install outside pad.

NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.

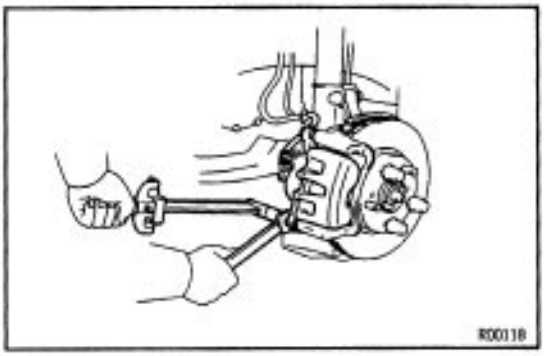
(f) Install the 2 anti–squeal springs.



8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with water pump pliers or similar implement.

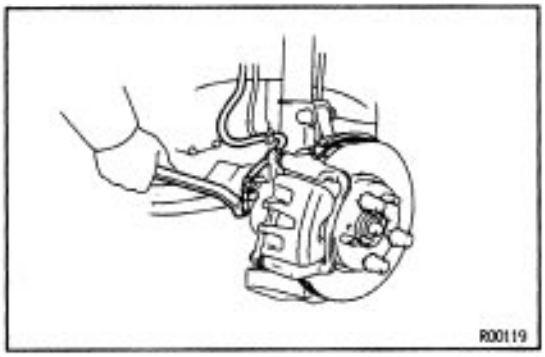
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.



(c) Install the caliper.
(d) Hold the sliding pin and torque the installation bolt.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

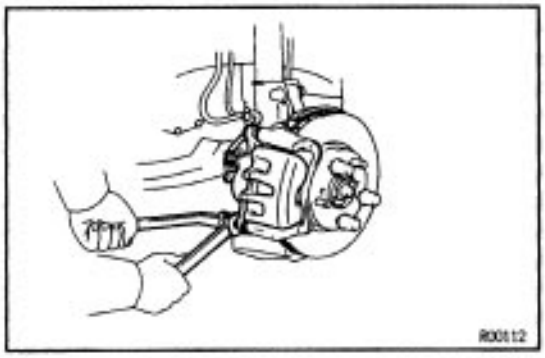
9. INSTALL FRONT WHEEL

10. CHECK THAT FLUID LEVEL IS AT MAX LINE

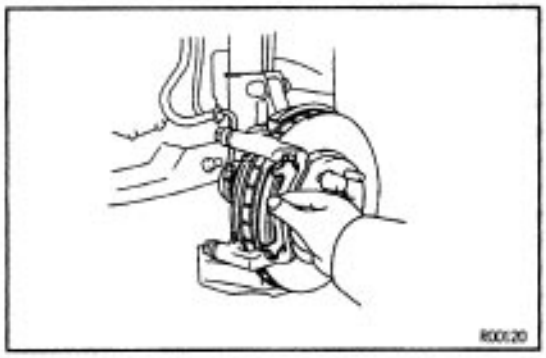


CALIPER REMOVAL

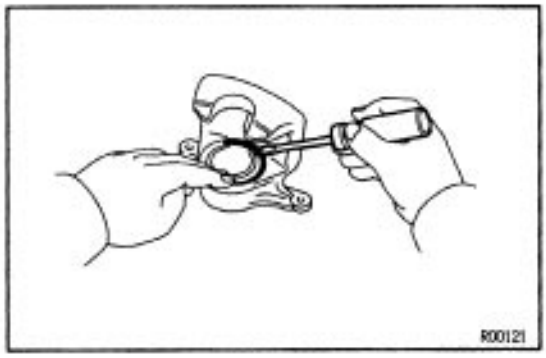
1. DISCONNECT FLEXIBLE HOSE
(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.



2. REMOVE CALIPER
(a) Hold the sliding pin and loosen the 2 installation bolts.
(b) Remove the 2 installation bolts.
(c) Remove the caliper from the torque plate.

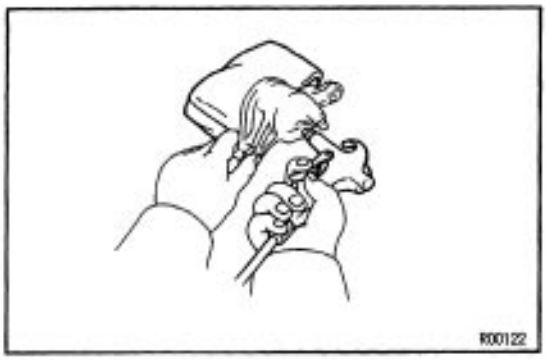


3. REMOVE 2 BRAKE PADS
Remove the inside and outside pads.



CALIPER DISASSEMBLY

1. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT
Using a screwdriver, remove the cylinder boot set ring and cylinder boot from the caliper.

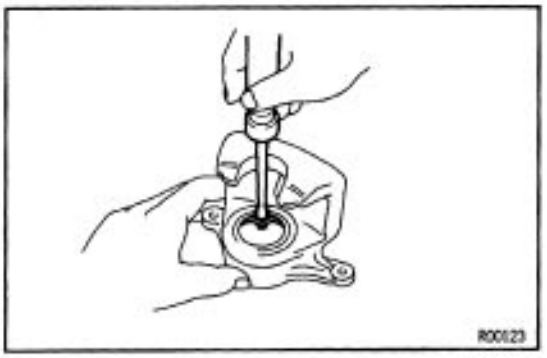


2. REMOVE PISTON

(a) Place a piece of cloth or similar article between the piston and the caliper.

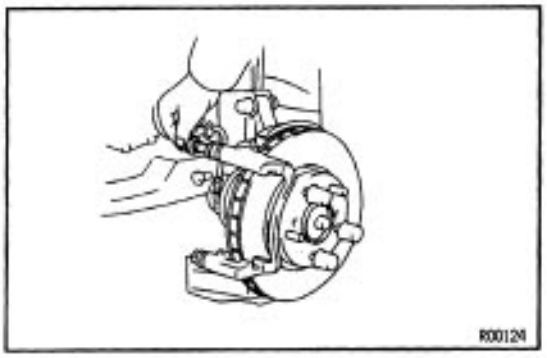
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed sir.



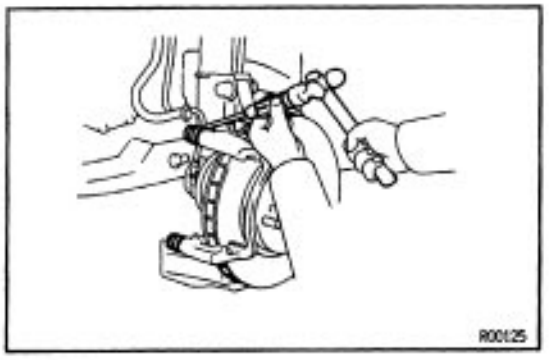
3. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.

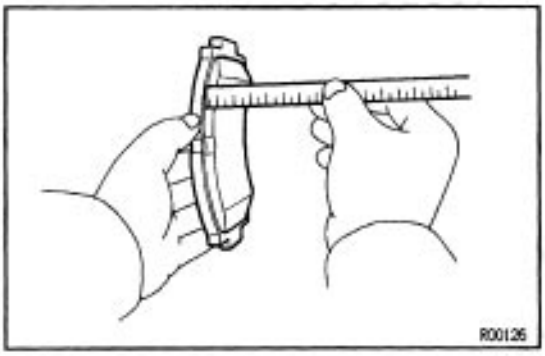


4. REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.



(b) Using a screwdriver and hammer, tap out the 2 dust boots.



FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness:

5S–FE engine

12.0 mm (0.472 In.)

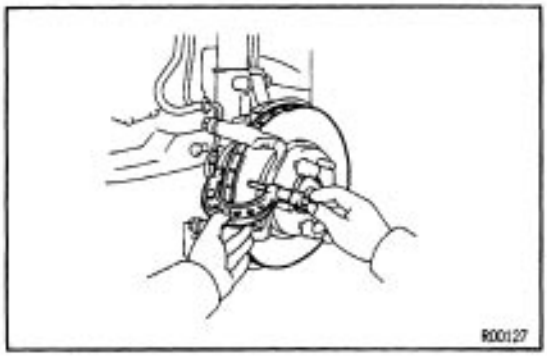
1 MZ–FE engine

11.0 mm (0.433 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

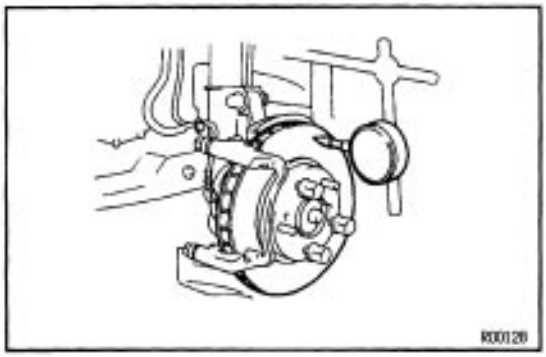
Standard thickness:

28.0 mm (1.102 in.)

Minimum thickness:

26.0 mm (1.024 in.)

Replace the disc if the disc's thickness is at the mini–mum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

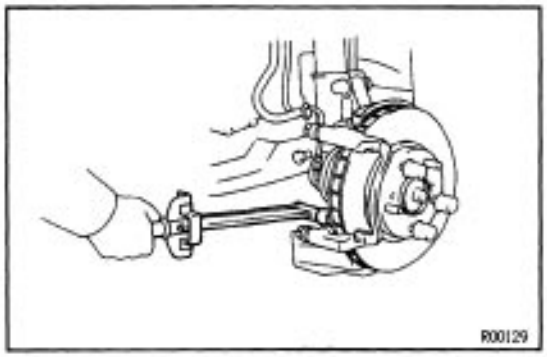
Measure disc runout 10 mm (0.39 in.) from the outer edge of the disc.

Maximum disc runout:

0.05 mm (0.0020 in.)

If runout is greater than maximum, attempt to adjust to below this maximum figure.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.



4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the torque plate from the knuckle.

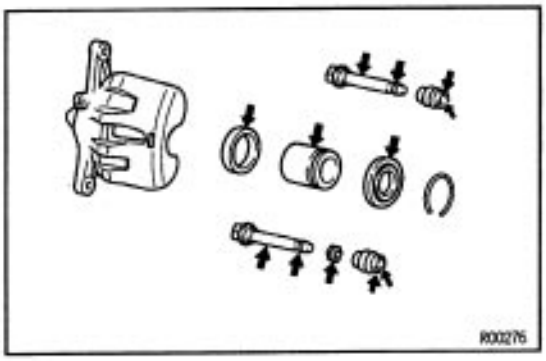
(b) Remove the hub nuts and the disc. Reinstall the disc 1/5 of a turn round from its original position on the hub. Install and torque the hub nuts.

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

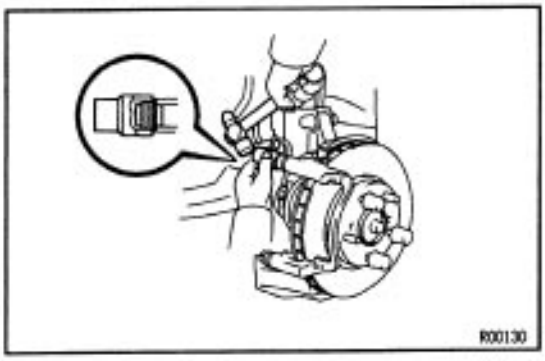
Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(c) Repeat (b) until the disc has been installed on the 3 remaining hub positions.
(d) If the minimum runout recorded in (b) and (c) is less than 0.05 mm (0.0020in.), install the disc in that position.
(e) If the minimum runout recorded in (b) and (c) is greater than 0.05 mm (0.0020 in.), replace the disc and repeat step 3.
(f) Install the torque plate and torque the mounting bolts.
Torque: 107 N–m (1,090 kgf–cm, 79 ft–lbf)

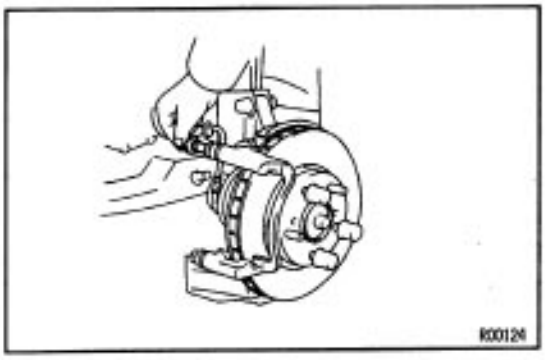
CALIPER ASSEMBLY



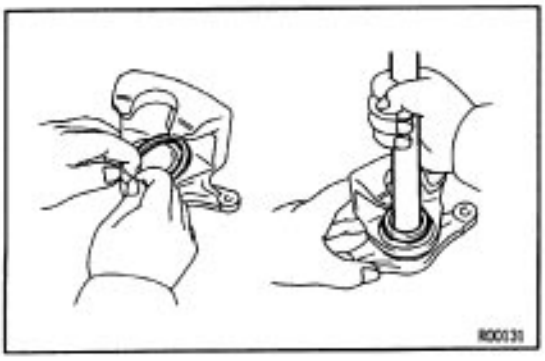
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



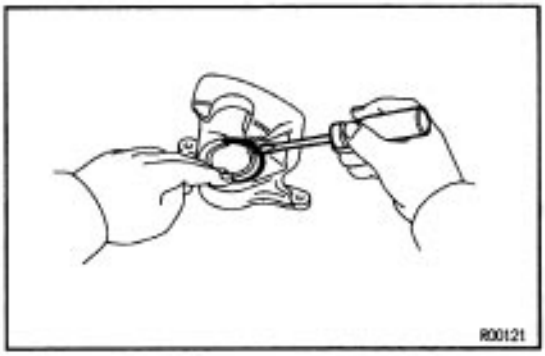
2. INSTALL DUST BOOTS AND SLIDING PINS
(a) Using a 19 mm socket wrench and hammer, tap in 2 new dust boots into the torque plate.
(b) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.



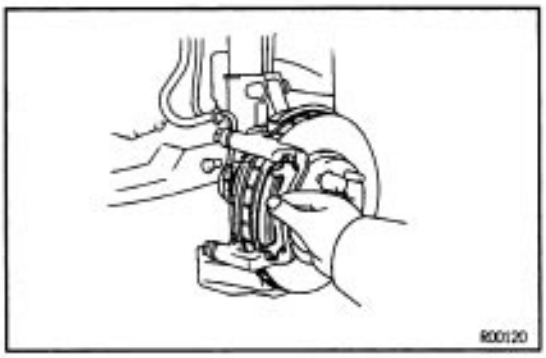
(c). Insert 2 sliding pins into the torque plate.
NOTICE: Insert the sliding pin with sliding bushing into the bottom side.



3. INSTALL PISTON SEAL AND PISTON IN CYLINDER



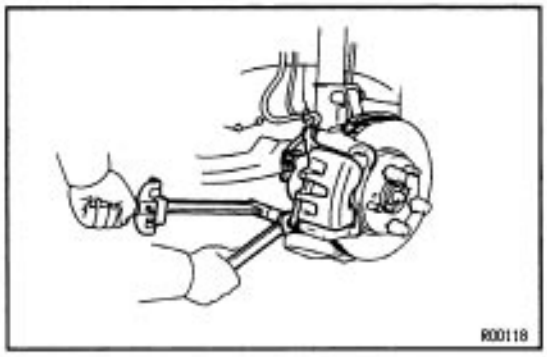
4. INSTALL CYLINDER BOOT AND CYLINDER BOOT SET RING



CALIPER INSTALLATION

1. INSTALL 2 BRAKE PADS

Install the inside and outside pads.

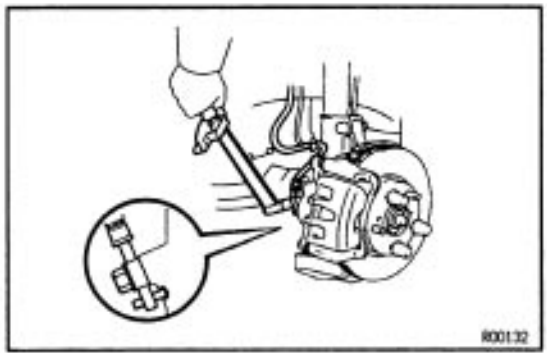


2. INSTALL CALIPER

(a) Temporarily install the caliper on the torque plate with the 2 installation bolts.

(b) Hold the sliding pin and torque the installation bolt.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

HINT: Install the flexible hose lock securely in the lock hole in the caliper.

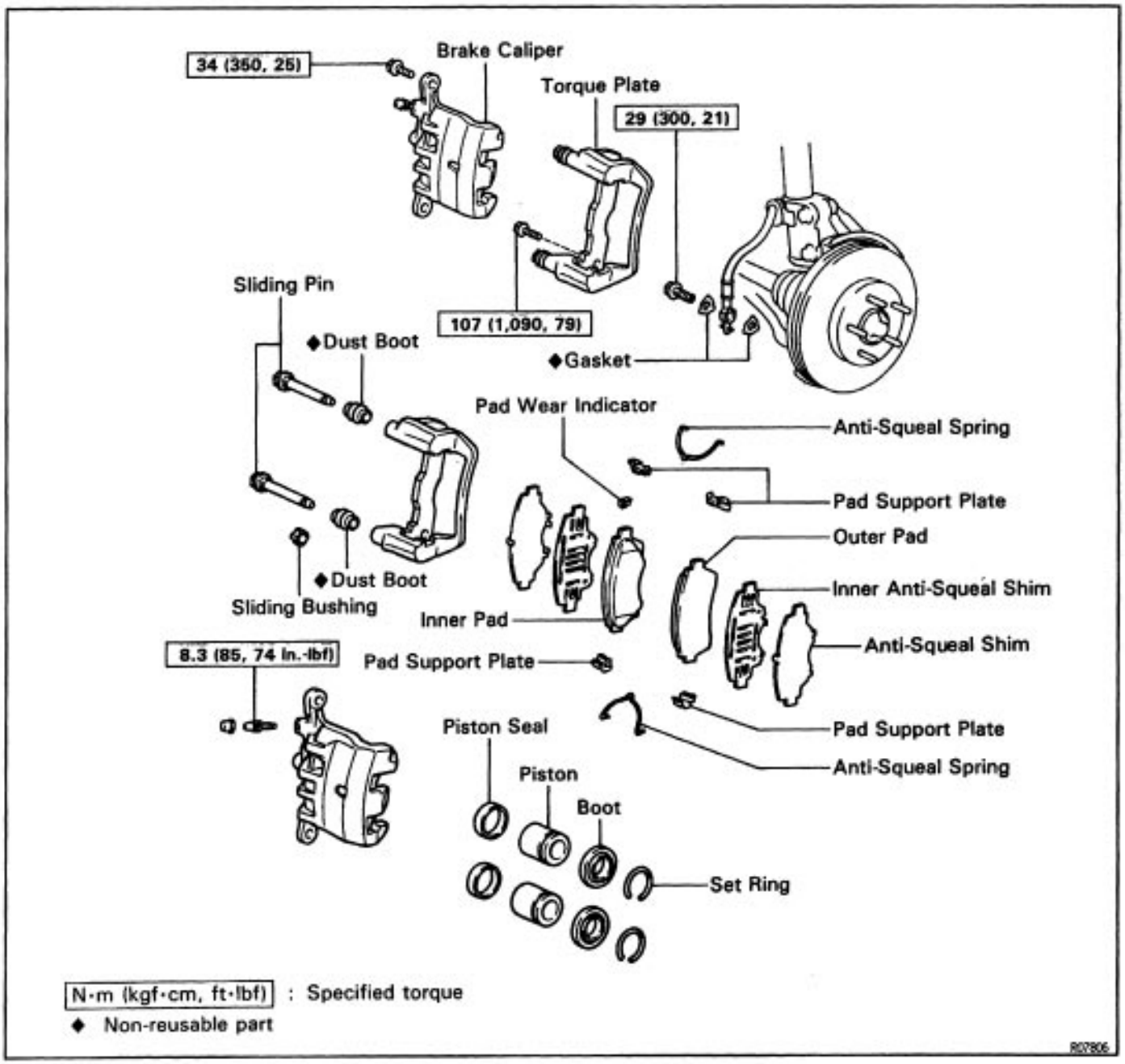
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

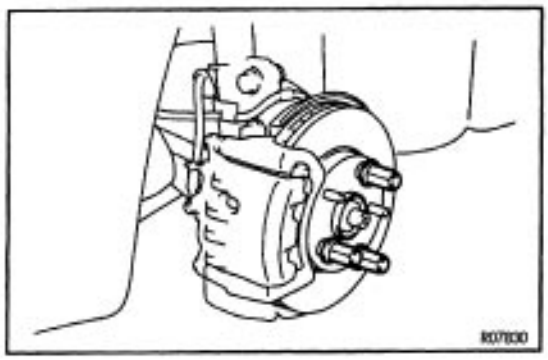
(See page BR–9)

5. CHECK FOR LEAKS

FRONT BRAKE (2–Piston Type)

COMPONENTS

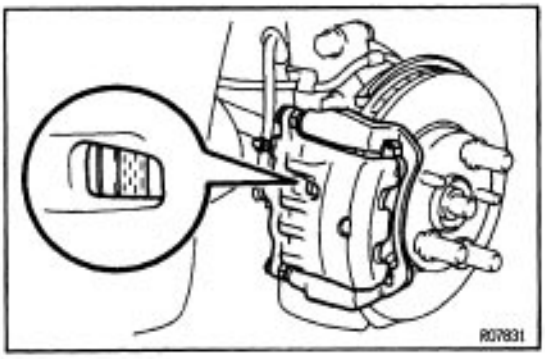




BRAKE PADS REPLACEMENT

1. REMOVE FRONT WHEEL

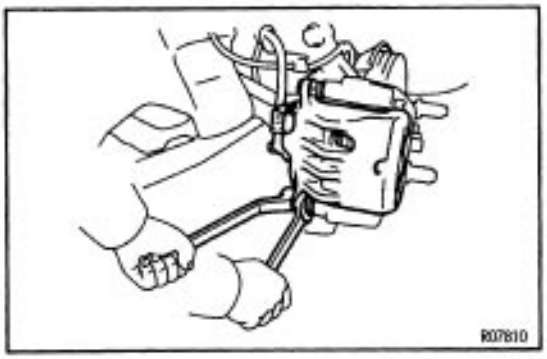
Remove the wheel and temporarily fasten the disc with the hub nuts.



2. INSPECT PAD LINING THICKNESS

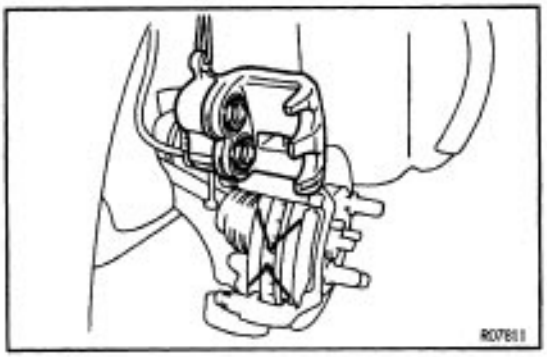
Check the pad thickness through the caliper inspec–tion hole and replace the pads if it is not within the specification.

Minimum thickness:
1.0 mm (0.039 in.)



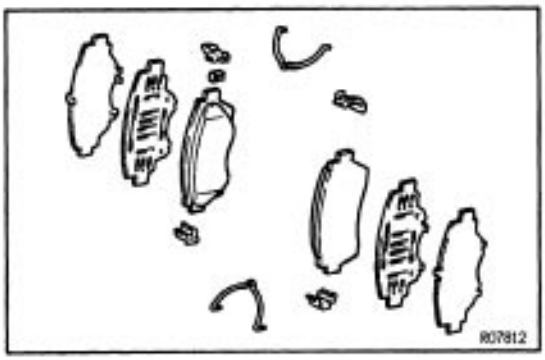
3. LIFT UP CALIPER

(a) Hold the sliding pin on the bottom and loosen the installation bolt.
(b) Remove the installation bolt.



(c) Lift up and suspend the caliper.

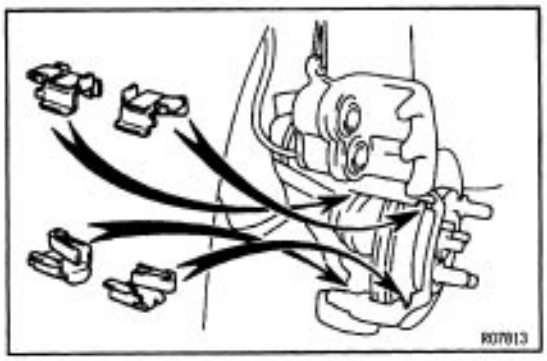
HINT: Do not disconnect the flexible hose from the brake caliper.



4. REMOVE FOLLOWING PARTS:

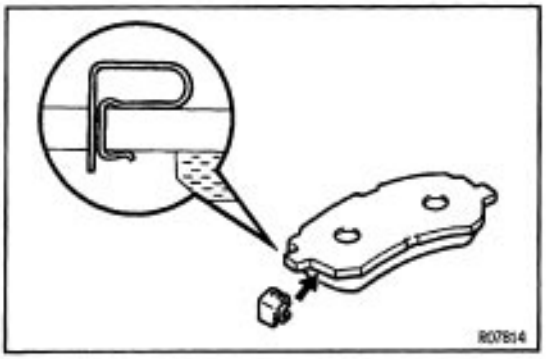
(a) 2 anti–squeal springs
(b) 2 brake pads
(c) 4 anti–squeal shims
(d) 4 pad support plates
(e) Pad wear indicator

5. CHECK DISC THICKNESS AND RUNOUT
(See page BR–33**)**



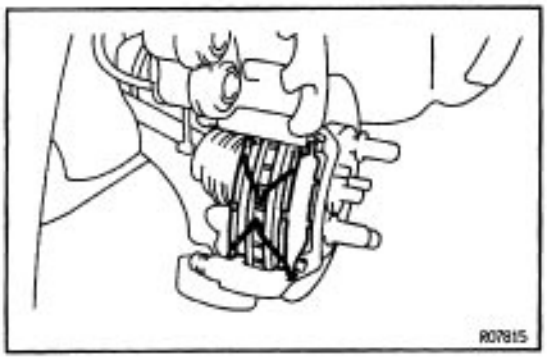
6. INSTALL PAD SUPPORT PLATES

Install the 4 pad support plates.



7. INSTALL NEW PADS

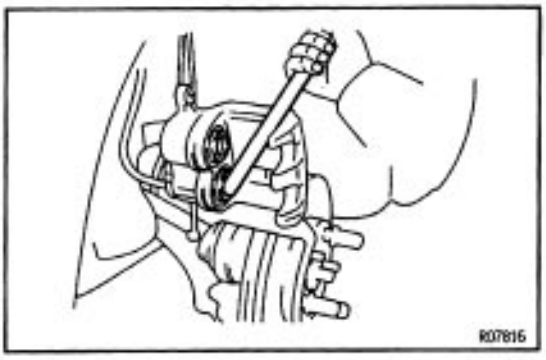
(a) Install the pad wear indicator plate on the pad.
(b) Apply disc brake grease to both sides of the inner anti–squeal shim.
(c) Install the 2 anti–squeal shims on each pad.



(d) Install the inner pad with the pad wear indicator plates facing upward.
(e) Install the outer pad.

NOTICE: There should be no oil or grease adhering to the friction surface's of the pads or the disc.

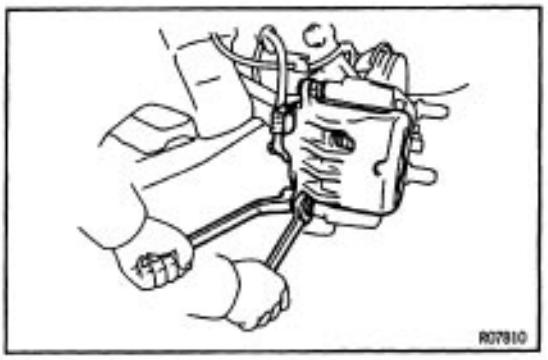
(f) Install the 2 anti–squeal springs.



8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with a hammer handle or similar implement.

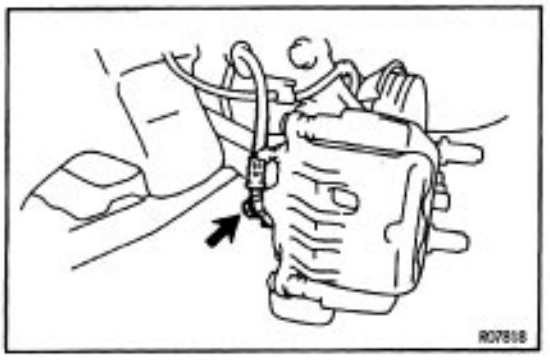
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.



(c) Install the caliper.
(d) Hold the sliding pin and torque the installation bolt.
Torque: 34 N .m (350 kgf–cm, 25 ft–lbf)

9. INSTALL FRONT WHEEL

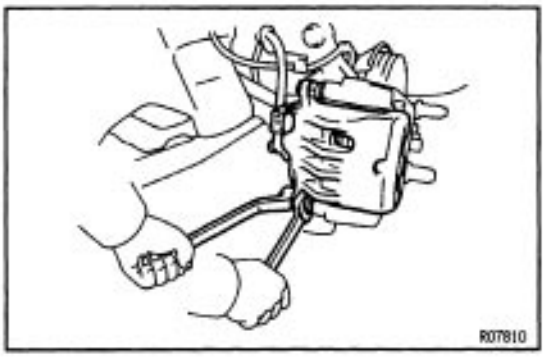
10. CHECK THAT FLUID LEVEL IS AT MAX LINE



CALIPER REMOVAL

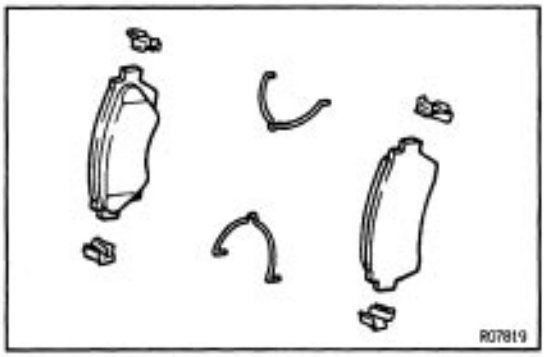
1. DISCONNECT FLEXIBLE HOSE

(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.



2. REMOVE CALIPER

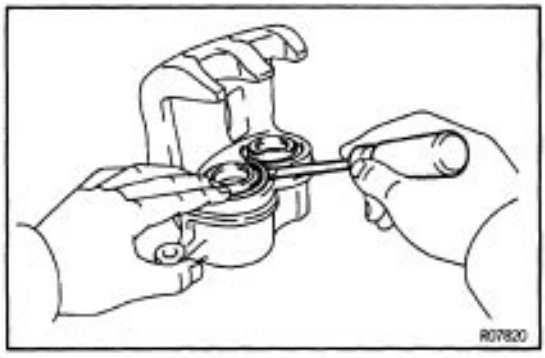
(a) Hold the sliding pin and loosen the 2 installation bolts.
(b) Remove the 2 installation bolts.
(c) Remove the caliper from the torque plate.



3. REMOVE FOLLOWING PARTS:

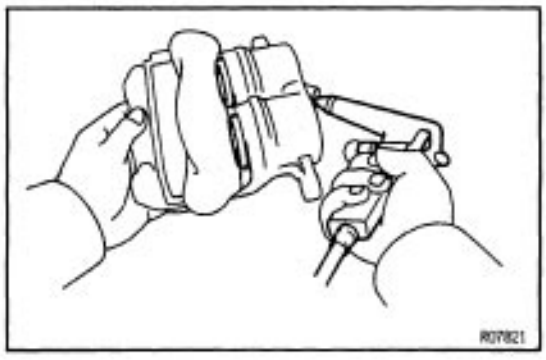
(a) 2 anti–squeal springs
(b) 2 brake pads with anti–squeal shims
(c) 4 pad support plates

CALIPER DISASSEMBLY



1. REMOVE CYLINDER BOOT SET RINGS AND CYLIN–DER BOOTS

Using a screwdriver, remove the 2 cylinder boot set rings and cylinder boots from the caliper.



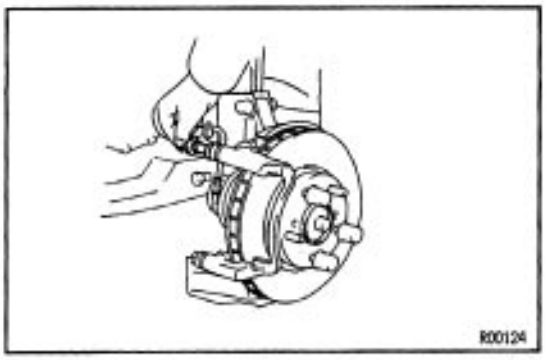
2. REMOVE PISTONS

(a) Place a piece of cloth or similar article between the piston and caliper.
(b) Use compressed air to remove the pistons from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.

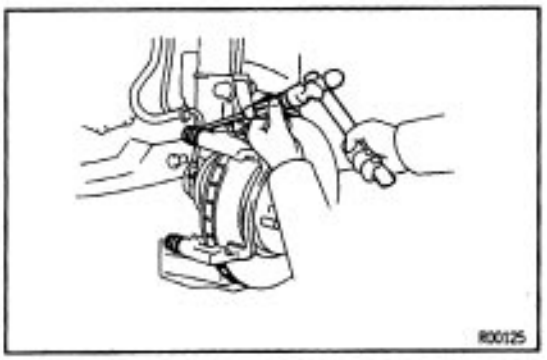
3. REMOVE PISTON SEALS

Using a screwdriver, remove the 2 piston seals from the cylinder.

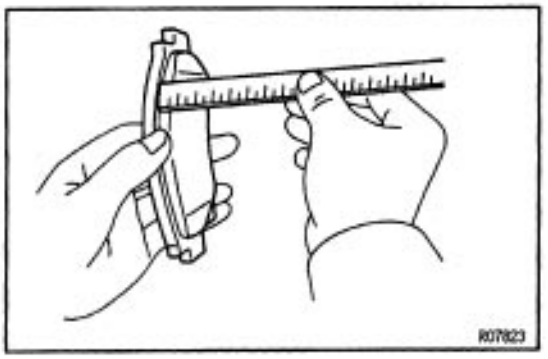


4. REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.



(b) Using a screwdriver and hammer, tap out the 2 dust boots.



FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

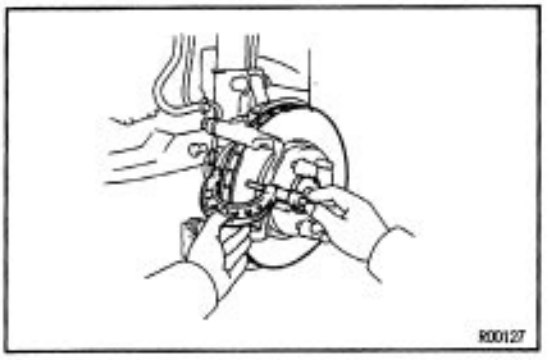
Standard thickness:

11.0 mm (0.433 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

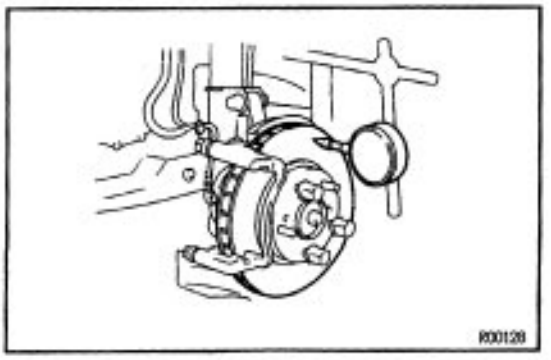
Standard thickness:

28 mm (1.102 in.)

Minimum thickness:

26 mm (1.024 in.)

Replace the disc if the disc's thickness is at the mini–mum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

Measure disc runout 10 mm (0.39 in.) from the outer edge of the disc.

Maximum disc runout:

0.05 mm (0.0020 in.)

If runout is greater than maximum, attempt to adjust to below this maximum figure.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the torque plate from the knuckle.

(b) Remove the hub nuts and the disc. Reinstall the disc 1/5 of a turn round from its original position on the hub. Install and torque the hub nuts.

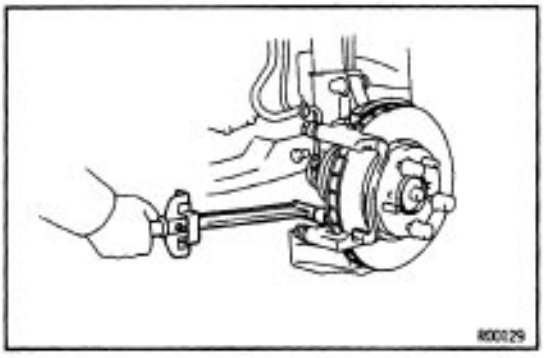
Torque: 103 N–m (1,050¿¿f¿cm, 76 ft–lbf)

Remeasure the disc runout. Make a note of the runout and disc's position on the hub.

(c) Repeat (b) until the disc has been installed on the 3 remaining hub positions.

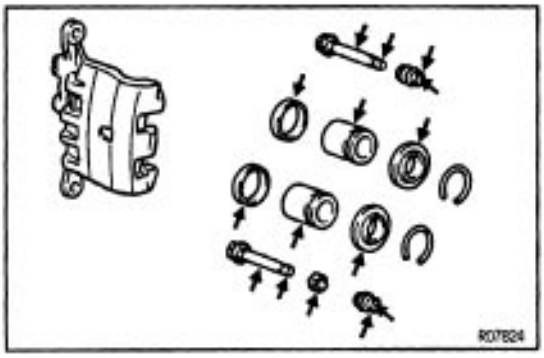
(d) If the minimum runout recorded in (b) and (c) is less than 0.05 mm (0.0020 in.), install the disc in that position.

(e) If the minimum runout recorded in (b) and (c) is greater than 0.05 mm (0.0020 in.), replace the disc and repeat step 3.



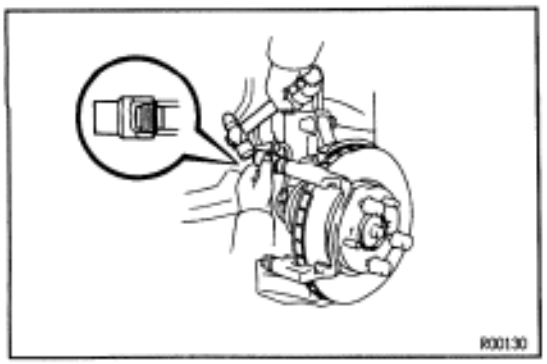
(f) Install the torque plate and torque the mounting bolts.

Torque: 107 N–m (1,090 kgf–cm, 79 ft–lbf)



CALIPER ASSEMBLY

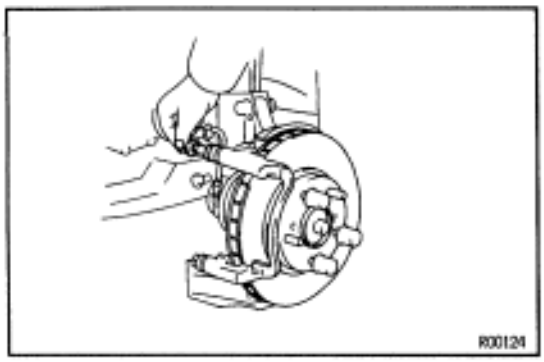
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL DUST BOOTS AND SLIDING PINS

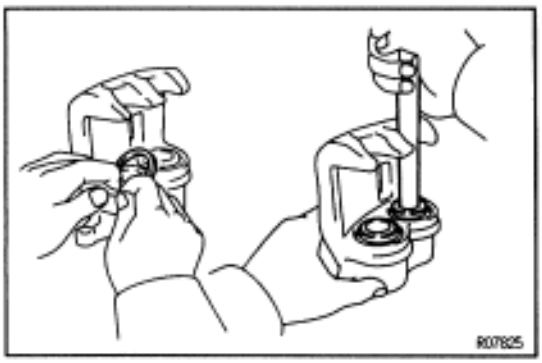
(a) Using a 19 mm socket and a hammer, tap in 2 new dust boots into the torque plate.

(b) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.

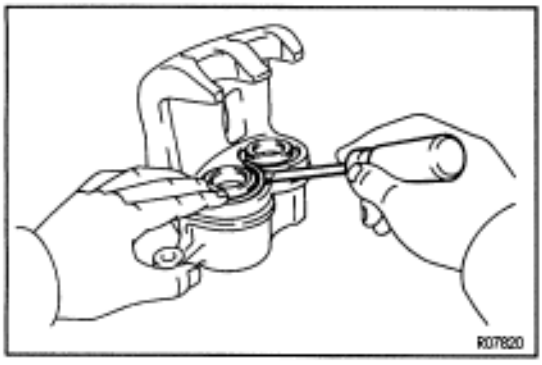


(c) Insert 2 sliding pins into the torque plate.

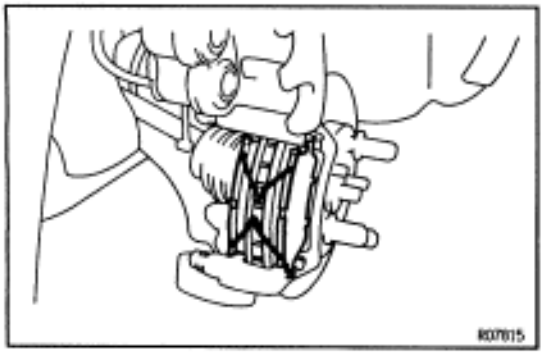
NOTICE: Insert the sliding pin with sliding bushing into the bottom side



3. INSTALL PISTON SEALS AND PISTONS IN CYLIN – DER



4. INSTALL CYLINDER BOOTS AND CYLINDER BOOT SET RINGS



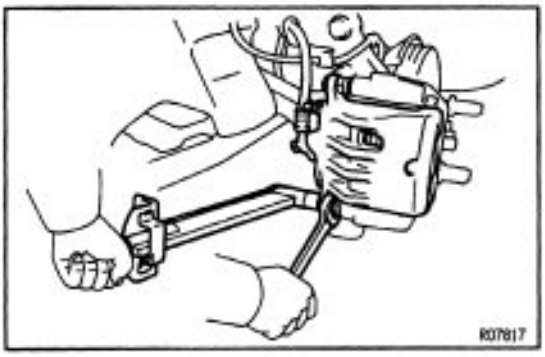
CALIPER INSTALLATION

1. INSTALL FOLLOWING PARTS:

(a) 4 pad support plates

(b) 2 brake pads with anti–squeal shims

(c) 2 anti–squeal springs

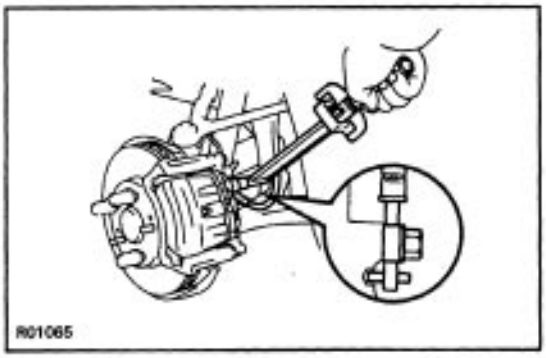


2. INSTALL CALIPER

(a) Temporarily install the caliper on the torque plate with the 2 installation bolts.

(b) Hold the sliding pin and torque the installation bolt.

Torque: 34 N–m (350 kgf–cm, 26 ft–lbf)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the brake caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

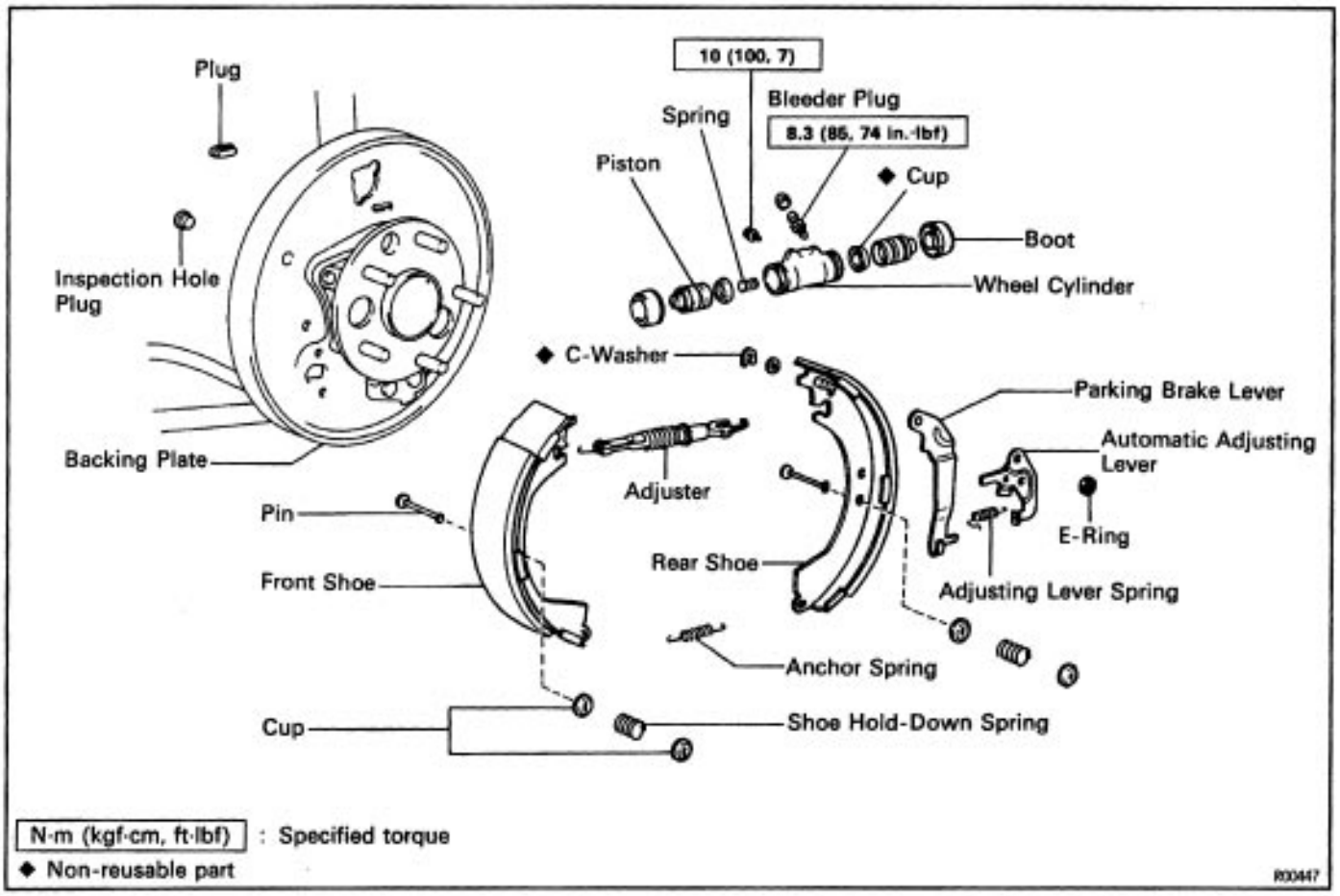
HINT: Insert the flexible hose lock securely in the lock hole in the brake caliper.

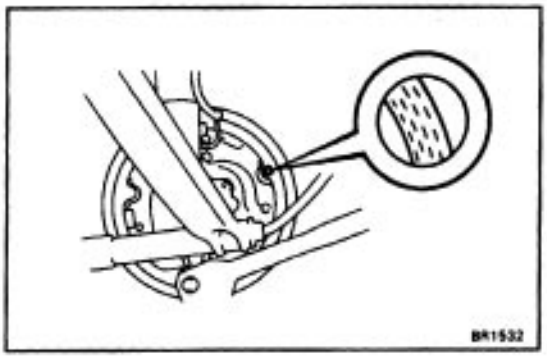
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9**)**

5. CHECK FOR LEAKS

REAR BRAKE (Drum Brake) COMPONENTS





REAR DRUM BRAKE REMOVAL

1. INSPECT SHOE LINING THICKNESS

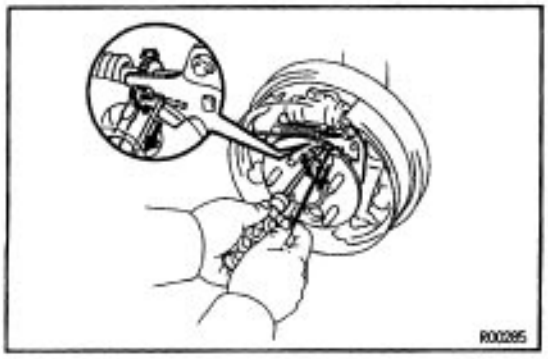
Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness:

1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

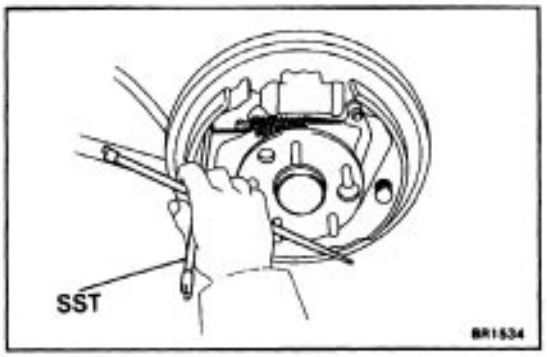


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, perform the following steps.

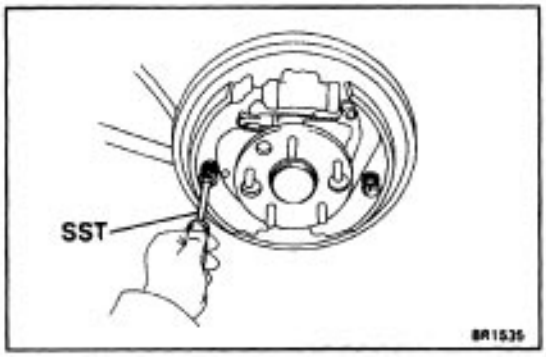
(a) Insert a bent wire or an equivalent through the hole in the brake drum, and hold the automatic adjusting lever away from the adjuster.

(b) Using a screwdriver, reduce the brake shoe adjust–ment by turning the adjuster.



4. REMOVE FRONT SHOE

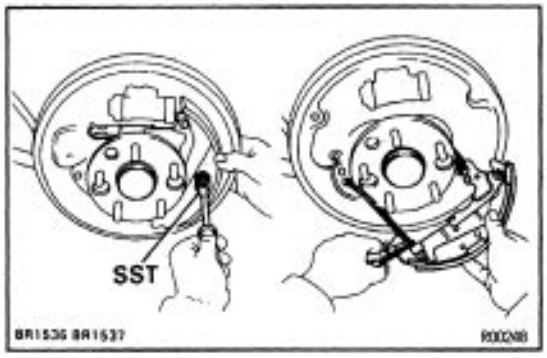
(a) Using SST, disconnect the return spring.
SST 09703–30010



(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(c) Disconnect the anchor spring from the front shoe and remove the front shoe.

(d) Remove the anchor spring from the rear shoe.



5. REMOVE REAR SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

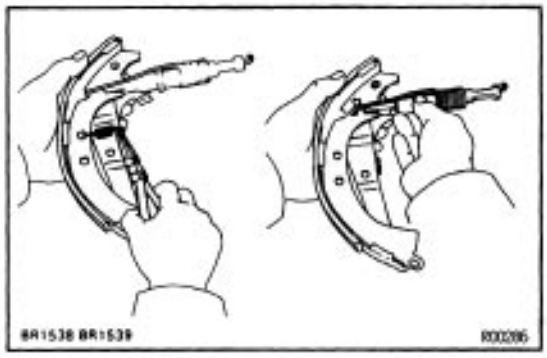
(b) Using a screwdriver, disconnect the parking brake cable from the anchor plate.

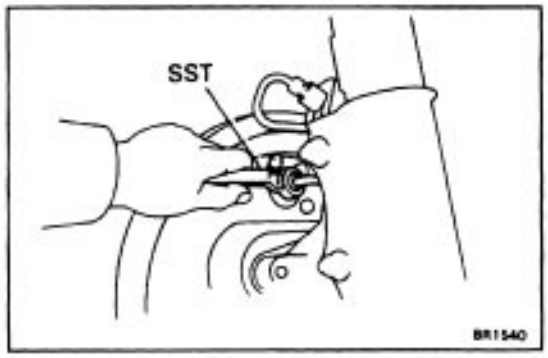
(c) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe together with the adjuster.

6. REMOVE ADJUSTER FROM REAR SHOE

(a) Remove the adjusting lever spring.

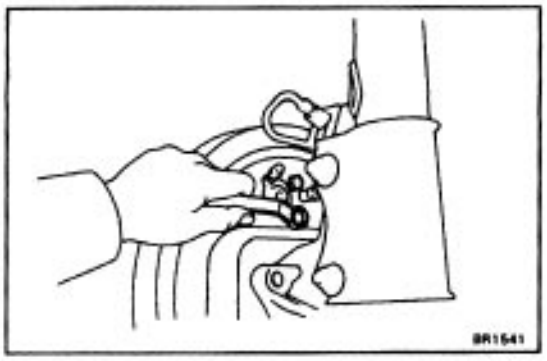
(b) Remove the adjuster together with the return spring.



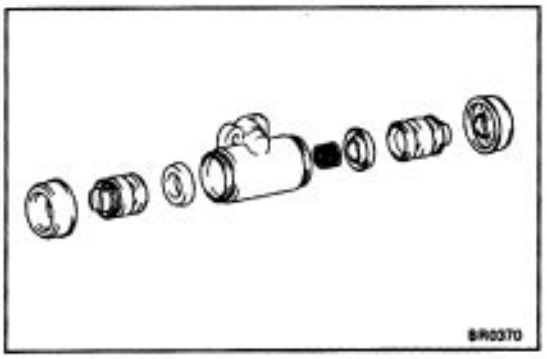


7. DISCONNECT BRAKE LINE FROM WHEEL CYLINDER

Using SST, disconnect the brake line. Use a container to catch the brake fluid.
SST 09751–36011



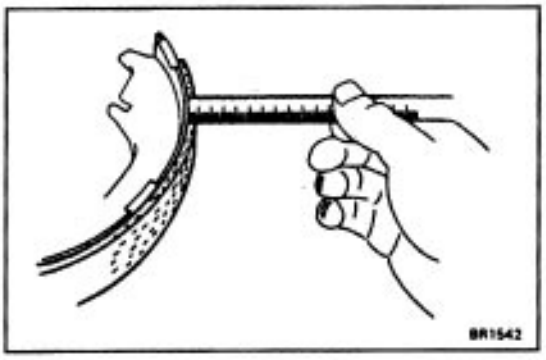
8. REMOVE WHEEL CYLINDER
Remove the 2 bolts and the wheel cylinder.



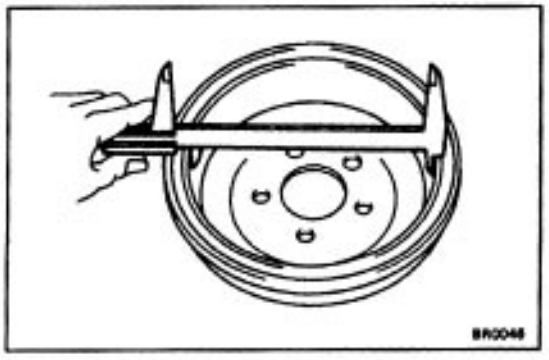
9. IF NECESSARY, DISASSEMBLE WHEEL CYLINDER
Remove the following parts from the wheel cylinder.
- 2 boots
- 2 pistons
- 2 piston cups
- Spring

REAR DRUM BRAKE COMPONENTS INSPECTION AND REPAIR

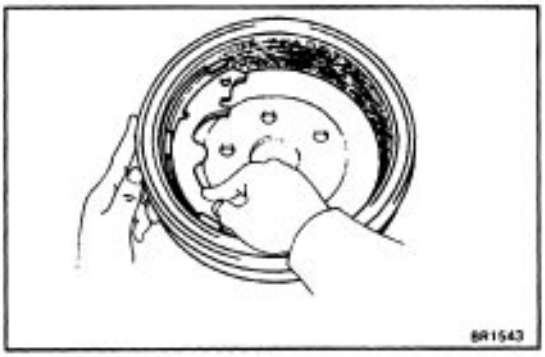
1. INSPECT DISASSEMBLED PARTS
Inspect the disassembled parts for wear, rust or damage.



2. MEASURE BRAKE SHOE LINING THICKNESS
Standard thickness:
5.0 mm (0.197 in.)
Minimum thickness:
1.0 mm (0.039 in.)
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.
HINT: If any of the brake shoes have to be replaced, replace all of the rear shoes in order to maintain even braking.



3. MEASURE BRAKE DRUM INSIDE DIAMETER
Standard inside diameter:
228.6 mm (9.000 in.)
Maximum inside diameter:
230.6 mm (9.079 in.)
If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

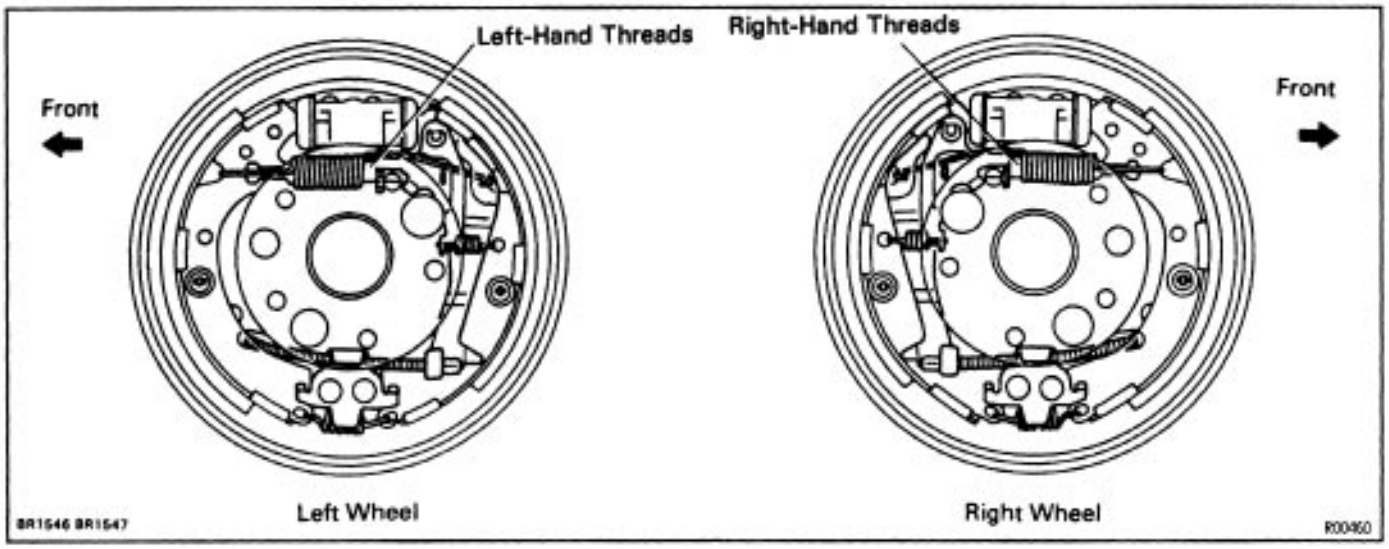


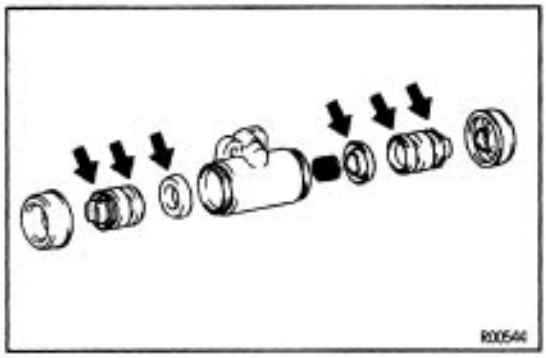
4. INSPECT REAR BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

REAR DRUM BRAKE INSTALLATION

HINT: Assemble the parts in the correct direction as shown.





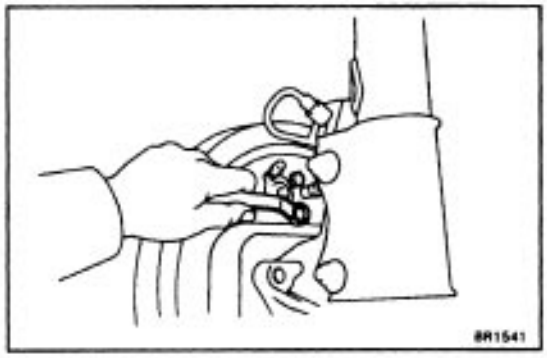
1. ASSEMBLE WHEEL CYLINDER

(a) Apply lithium soap base glycol grease to the cups and pistons as shown.

(b) Assemble the wheel cylinder.

HINT: Install in proper direction only.

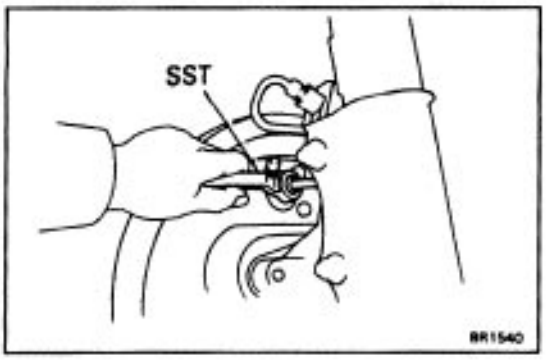
- Spring
- 2 cups
- 2 pistons
- 2 boots



2. INSTALL WHEEL CYLINDER

Install the wheel cylinder on the backing plate with the 2 bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

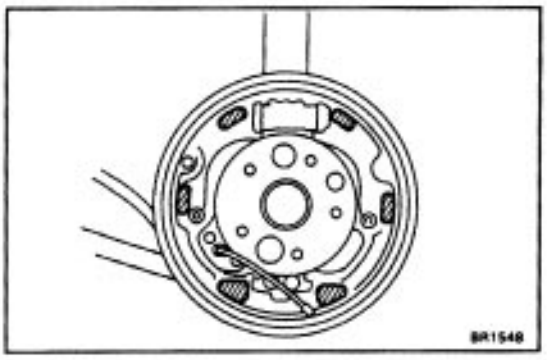


3. CONNECT BRAKE LINE TO WHEEL CYLINDER

Using SST, connect the brake line.

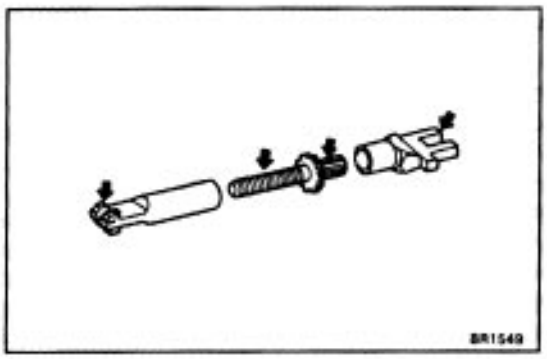
SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

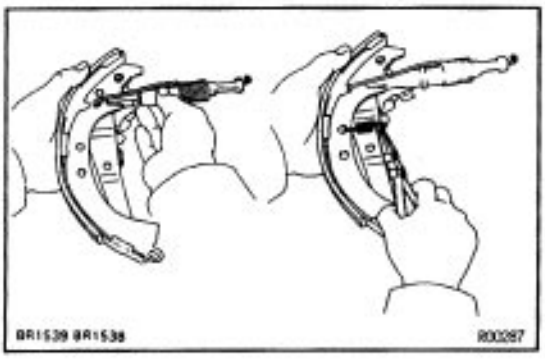


4. APPLY HIGH TEMPERATURE GREASE TO BACK – ING PLATE AND ADJUSTER

(a) Apply high temperature grease to the brake shoe contact surfaces.

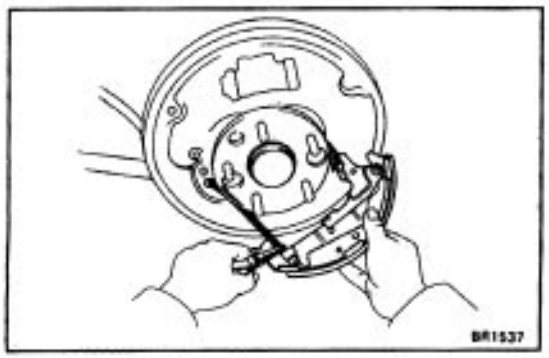


(b) Apply high temperature grease to the adjuster bolt threads and ends.



5. INSTALL ADJUSTER ONTO REAR SHOE

Set the adjuster and return spring and install the adjusting lever spring.

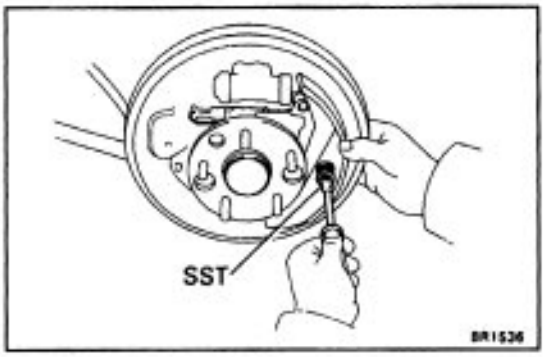


6. INSTALL REAR SHOE

(a) Using pliers, connect the parking brake cable to the lever.

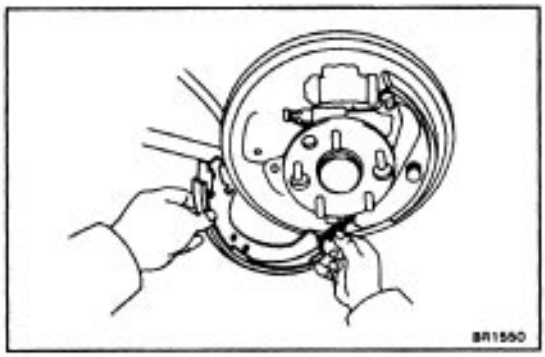
(b) Pass the parking brake cable through the notch in the anchor plate.

(c) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the other end in the anchor plate.



(d) Using SST, install the shoe hold–down spring, cups and pin.
SST 09718–00010

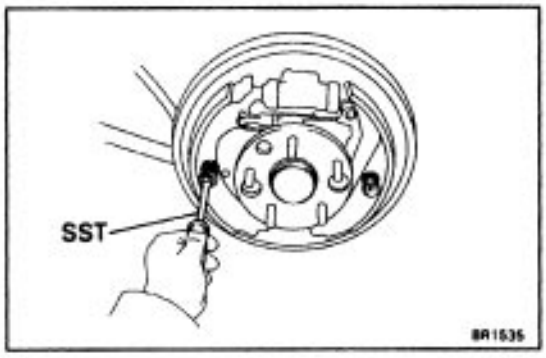
NOTICE: Do not allow oil or grease to get on the rubbing face.



7. INSTALL FRONT SHOE

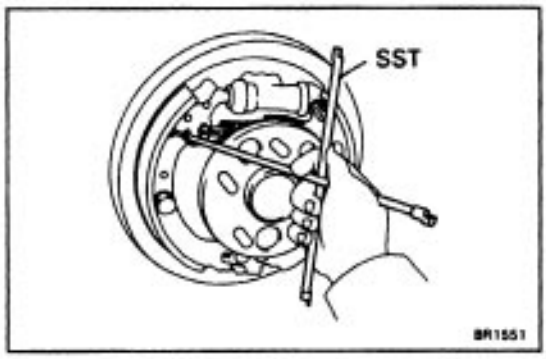
(a) Install the anchor spring between the front and rear shoes.

(b) Set the front shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.

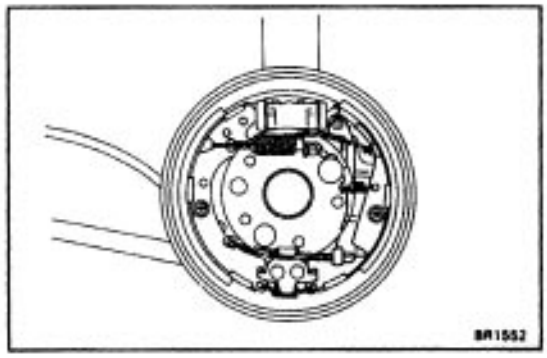


(c) Using SST, install the shoe hold–down spring, cups and pin.
SST 09 718–00010

NOTICE: Do not allow oil or grease to get on the rubbing face.



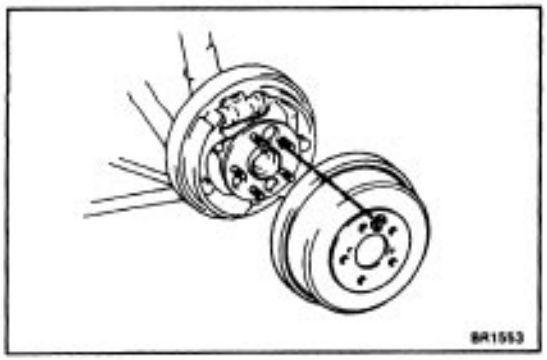
(d) Using SST, connect the return spring.
SST 09703–30010



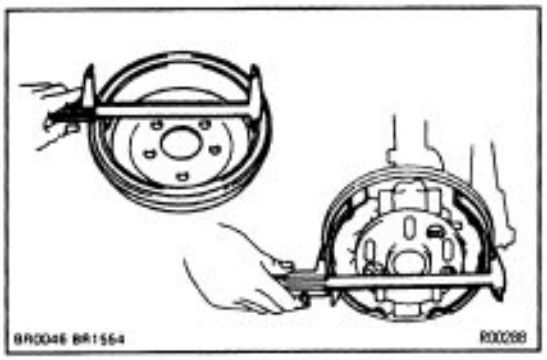
8. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(a) Move the parking brake lever of the rear shoe back and forth. Check that the adjuster turns.
If the adjuster does not turn, check for incorrect installation of the rear brakes.

(b) Adjust the adjuster length to the shortest possible amount.



(c) Align the adjusting hole on the brake drum and largest hole on the axle carrier, install the brake drum.
(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



9. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

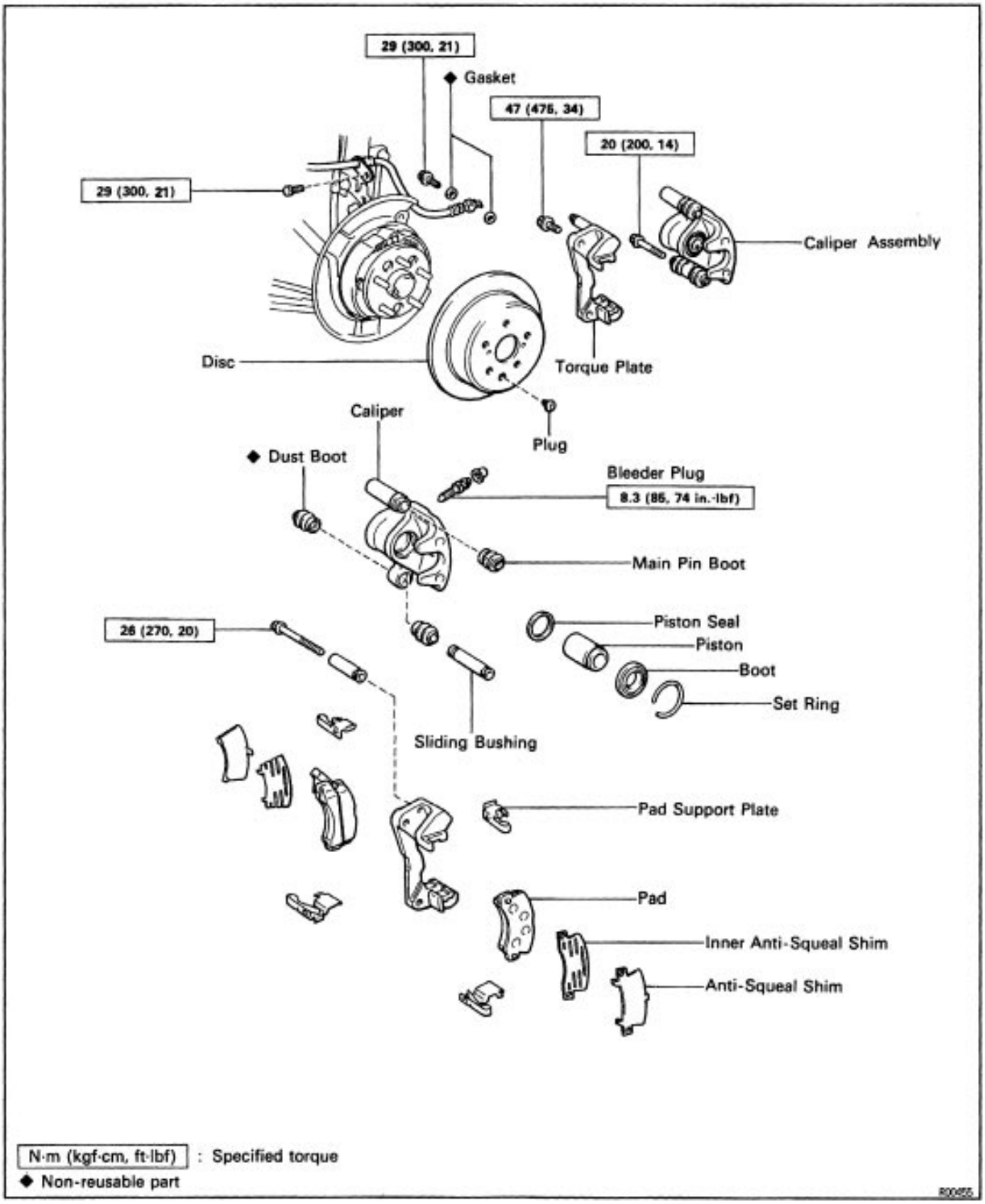
(a) Remove the brake drum.
(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance:
0.6 mm (0.024 in.)

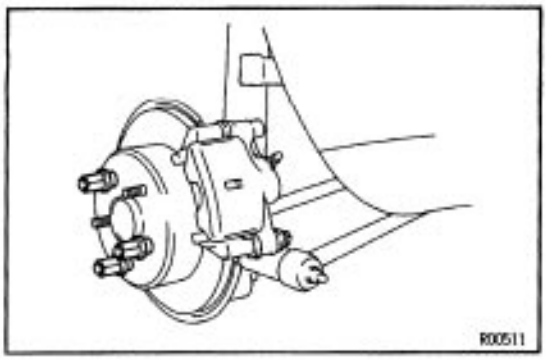
If incorrect, check the parking brake system.

10. INSTALL BRAKE DRUM
11. INSTALL REAR WHEEL
12. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–9)
13. CHECK FOR LEAKS

REAR BRAKE (Disc Brake) COMPONENTS

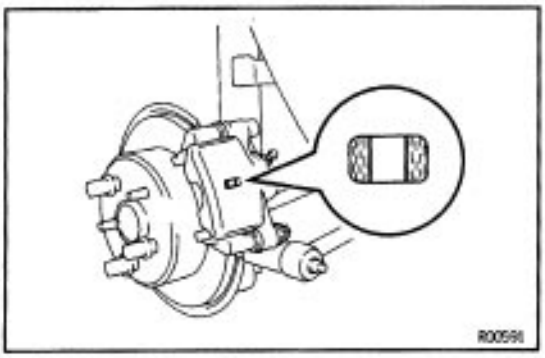


BRAKE PADS REPLACEMENT



1. REMOVE REAR WHEEL

Remove the wheel and temporarily fasten the disc with the hub nuts.

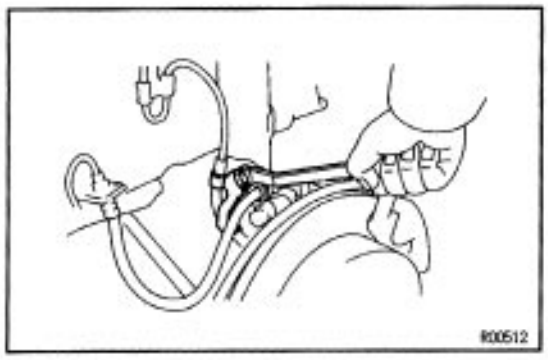


2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspec–tion hole and replace pads if not within specification.

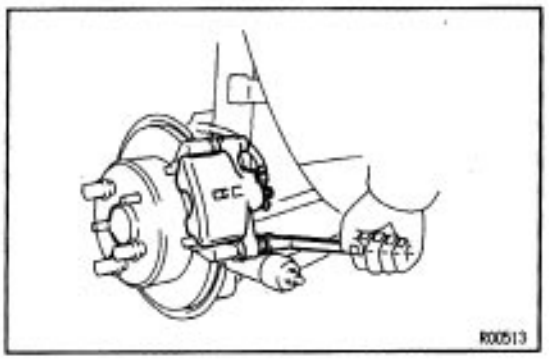
Minimum thickness:

1.0 mm (0.039 in.)

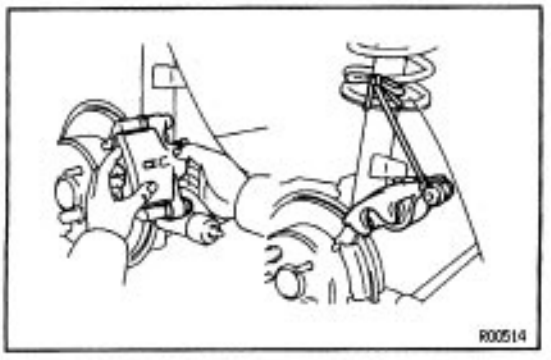


3. LIFT UP CALIPER

(a) Remove the flexible hose bracket.

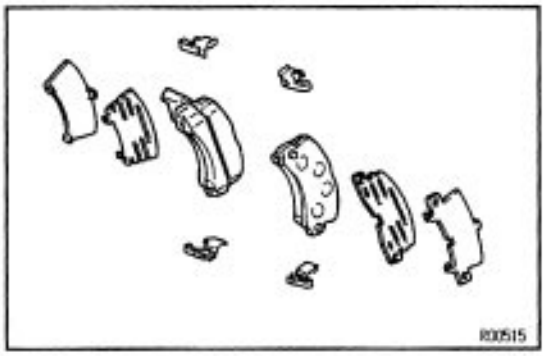


(b) Remove the installation bolt from the torque plate.



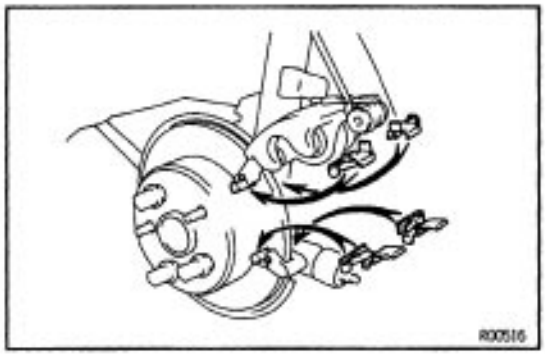
(c) Lift up the caliper and suspend the caliper with string.

HINT: Do not disconnect the flexible hose from the caliper.

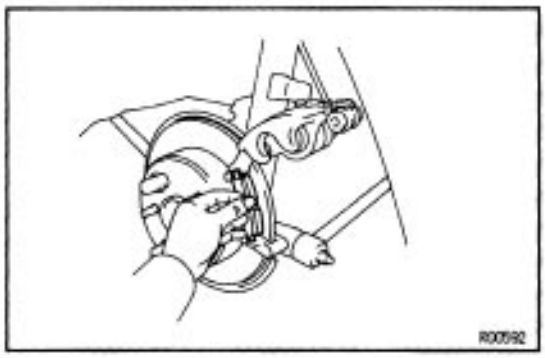


4. REMOVE FOLLOWING PARTS:
(a) 2 brake pads
(b) 4 anti–squeal shims
(c) 4 pad support plates

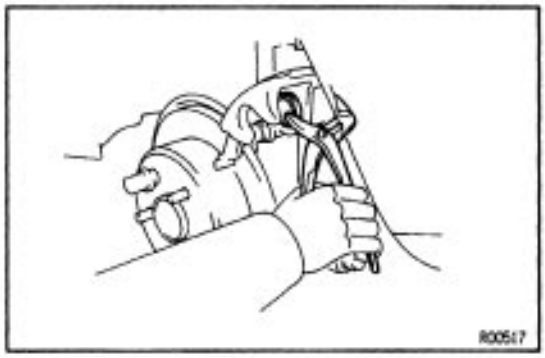
5. CHECK DISC THICKNESS AND RUNOUT
(See page BR–50**)**



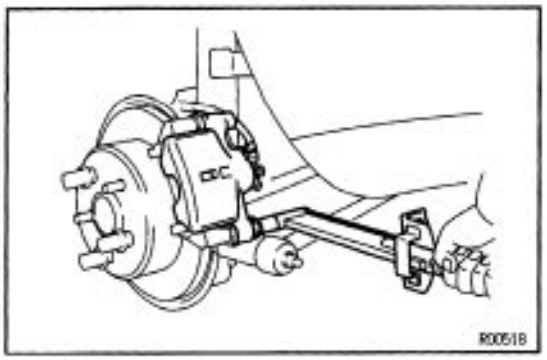
6. INSTALL PAD SUPPORT PLATES
Install the 4 pad support plates.



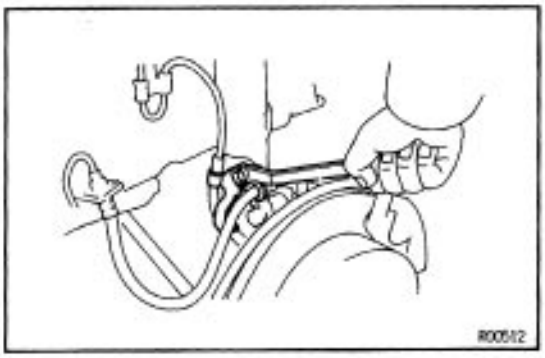
7. INSTALL NEW PADS
(a) Apply disc brake grease to both side of the inner anti –squeal shims.
(b) Install the 2 anti–squeal shims on each pad.
(c) Install 2 pads with the pad wear indicator plates facing up ward.
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



6. INSTALL CALIPER
(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with water pump pliers or similar implement.
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

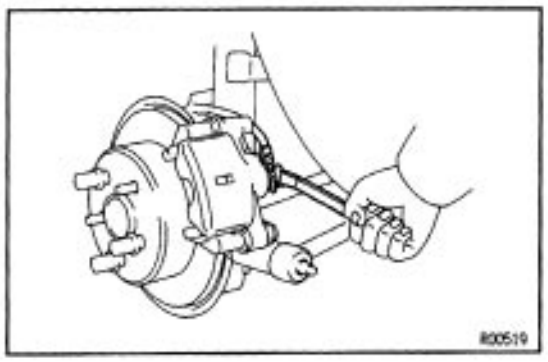


(c) Install the caliper and torque the installation bolt.
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)



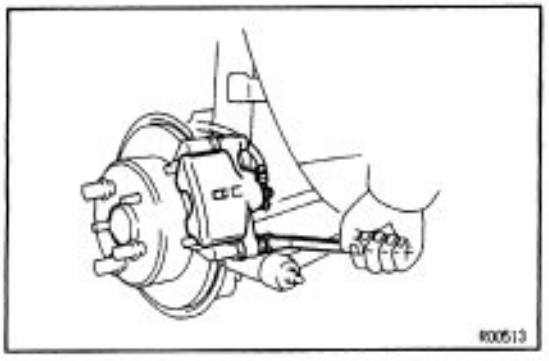
(d) Install the flexible hose bracket.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

9. INSTALL REAR WHEEL
14. CHECK THAT FLUID LEVEL IS AT MAX LINE

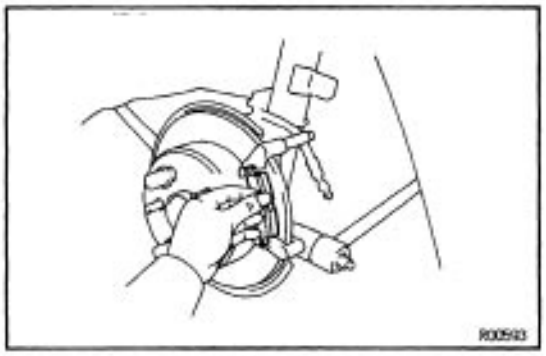


CALIPER REMOVAL

1. DISCONNECT FLEXIBLE HOSE
(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.

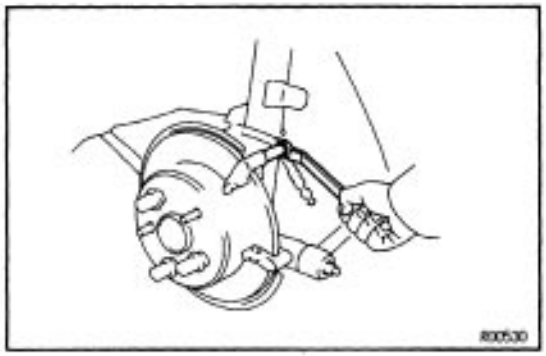


2. REMOVE CALIPER
(a) Remove the installation bolt.
(b) Remove the caliper from the torque plate.



3. REMOVE 2 PADS

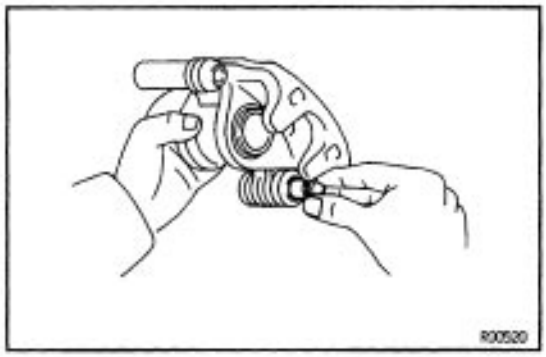
Remove the inside and outside pads.



4. REMOVE MAIN PIN

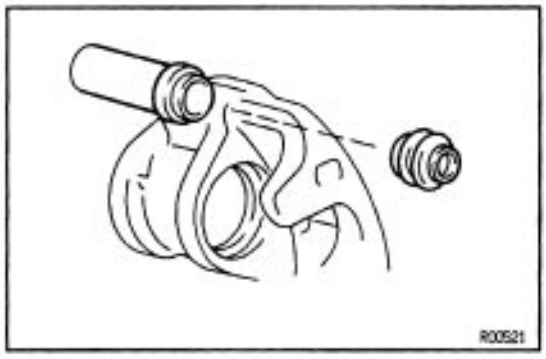
Loosen the. main pin installation bolt and remove the main pin.

CALIPER DISASSEMBLY



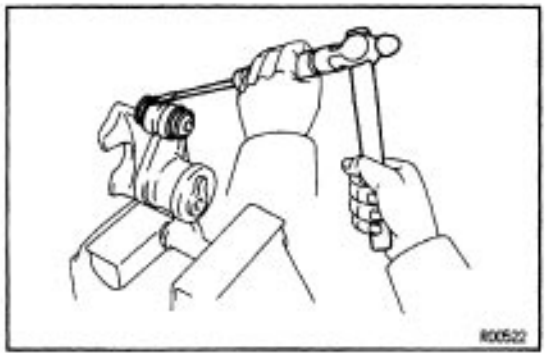
1. REMOVE SLIDING BUSHING

Pull out the sliding bushing.



2. REMOVE MAIN PIN BOOT

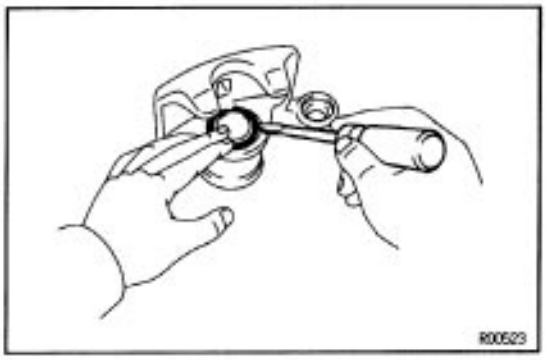
Pull out the main pin boot.



3. REMOVE DUST BOOTS

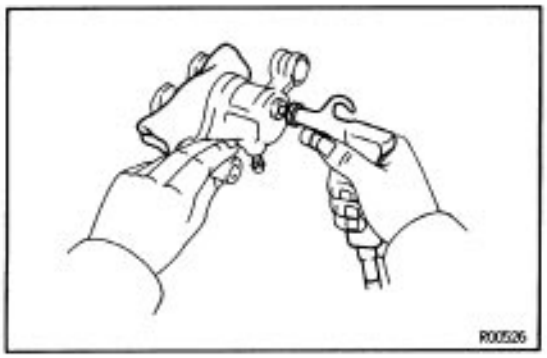
(a) Place the caliper in vise.

(b) Using a screwdriver and hammer, tap out the 2 dust boots.



4. REMOVE CYLINDER BOOT SET RING AND CYLIN–DER BOOT

Using a screwdriver, remove the cylinder boot set ring and cylinder boot from the cylinder.

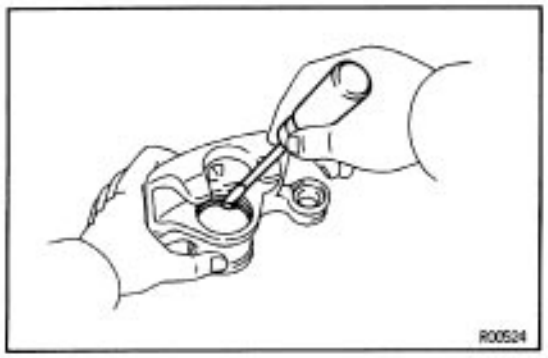


5. REMOVE PISTON

(a) Place a piece of cloth or similar article between the piston and the caliper.

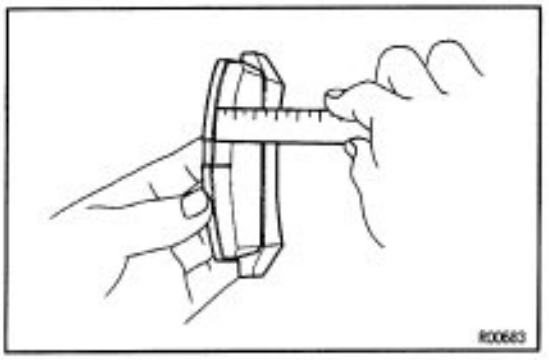
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



6. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.



REAR DISC BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

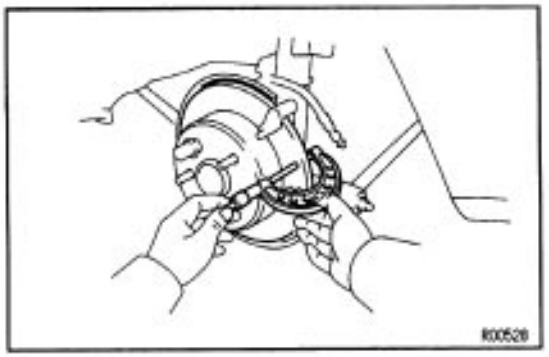
Standard thickness:

10.0 mm (0.394 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



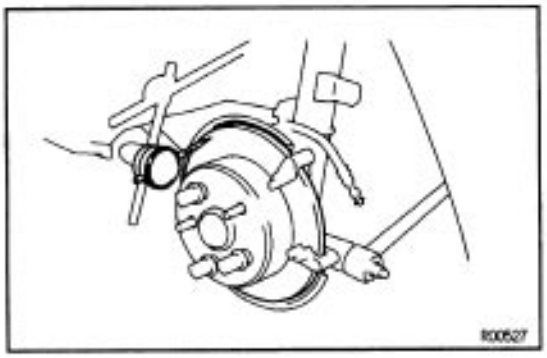
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness:
10.0 mm (0.394 in.)

Minimum thickness:
9.0 mm (0.354 in.)

Replace the disc if the disc's thickness is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

Measure the disc runout 10 mm (0.39 in.) from the outer edge of the disc.

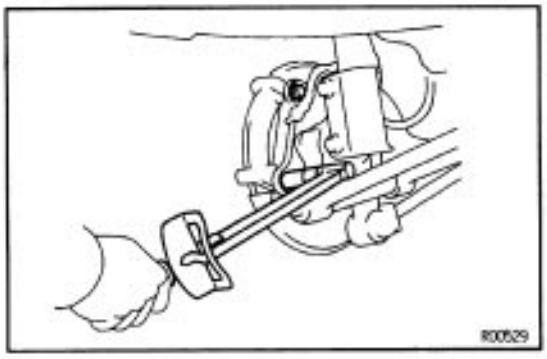
Maximum disc runout:
0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

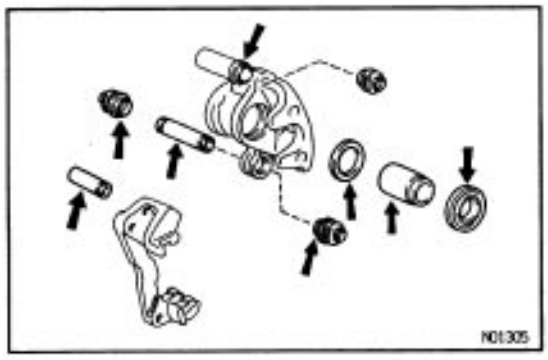
HINT: Before measuring the runout, confirm that the hub bearing play is within specification.

4. IF NECESSARY, REPLACE DISC

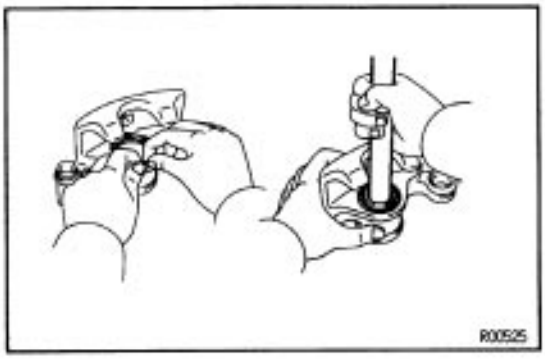
(a) Remove the torque plate.
(b) Remove the hub nuts of the temporarily installed disc and pull off the disc.
(c) Install a new disc and loosely install the hub nuts.
(d) Install the torque plate and tighten the mounting bolts.
Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)



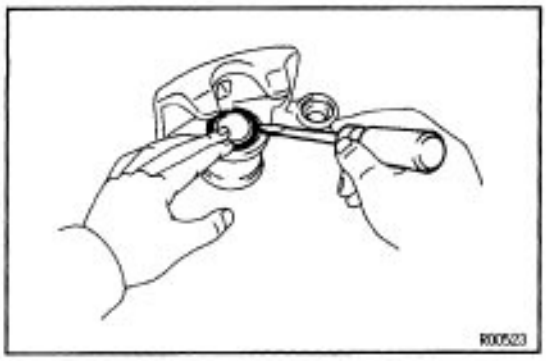
CALIPER ASSEMBLY



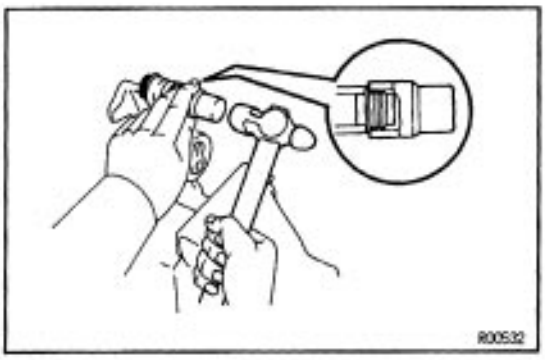
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

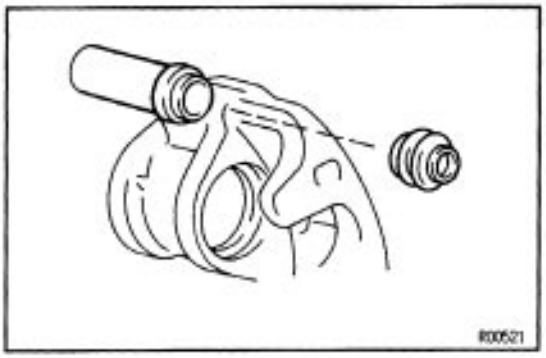


3. INSTALL CYLINDER BOOT AND SET RING IN CYL–INDER

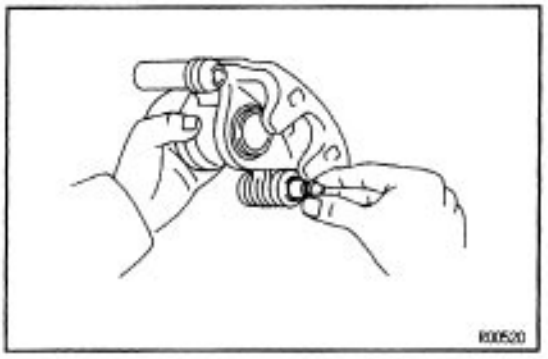


4. INSTALL DUST BOOTS

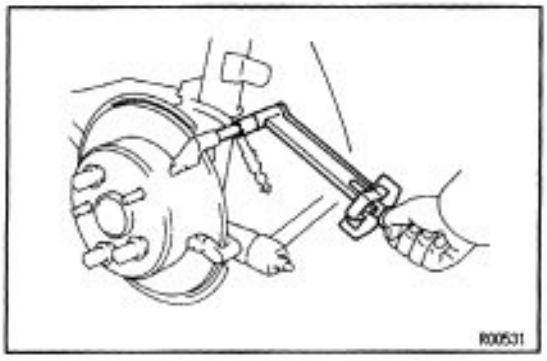
(a) Place the caliper in vise.
(b) Using a 19 mm socket wrench and hammer, tap in 2 new dust boots into the torque plate.
(c) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.



5. INSTALL MAIN PIN BOOT



6. INSTALL SLIDING BUSHING

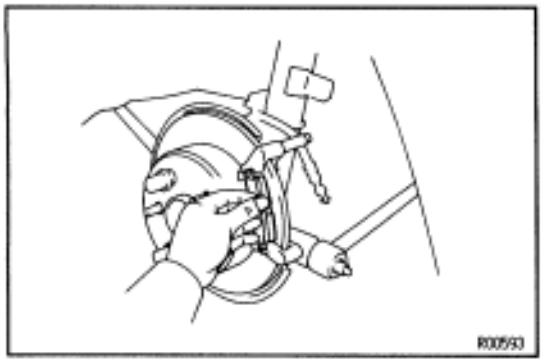


CALIPER INSTALLATION

1. INSTALL MAIN PIN

Install the main pin and torque the main pin installation bolt.

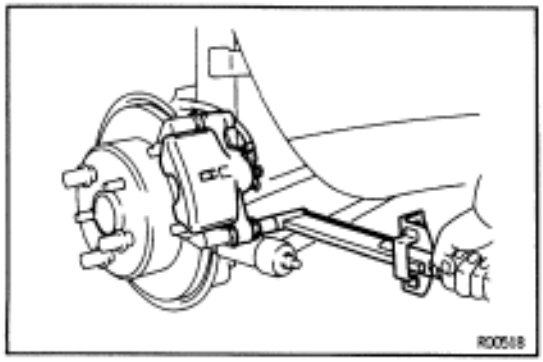
Torque: 26 N–m (270 kgf–cm. 20 ft–lbf)



2. INSTALL 2 PADS

Install 2 pads with the pad wear indicator plate facing upward.

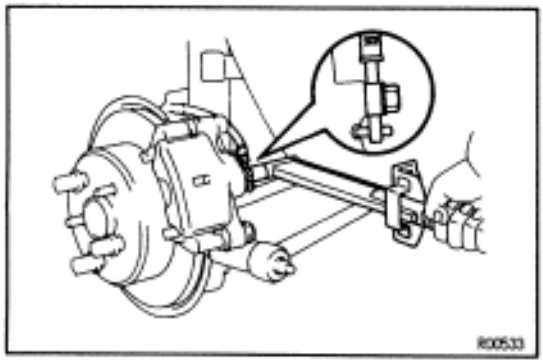
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



3. INSTALL CALIPER

Install the caliper and torque the installation bolt.

Torque: 20 N–m (200 k9f¿cm, 14 ft–lbf)



4. CONNECT FLEXIBLE HOSE

Install the flexible hose on the caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

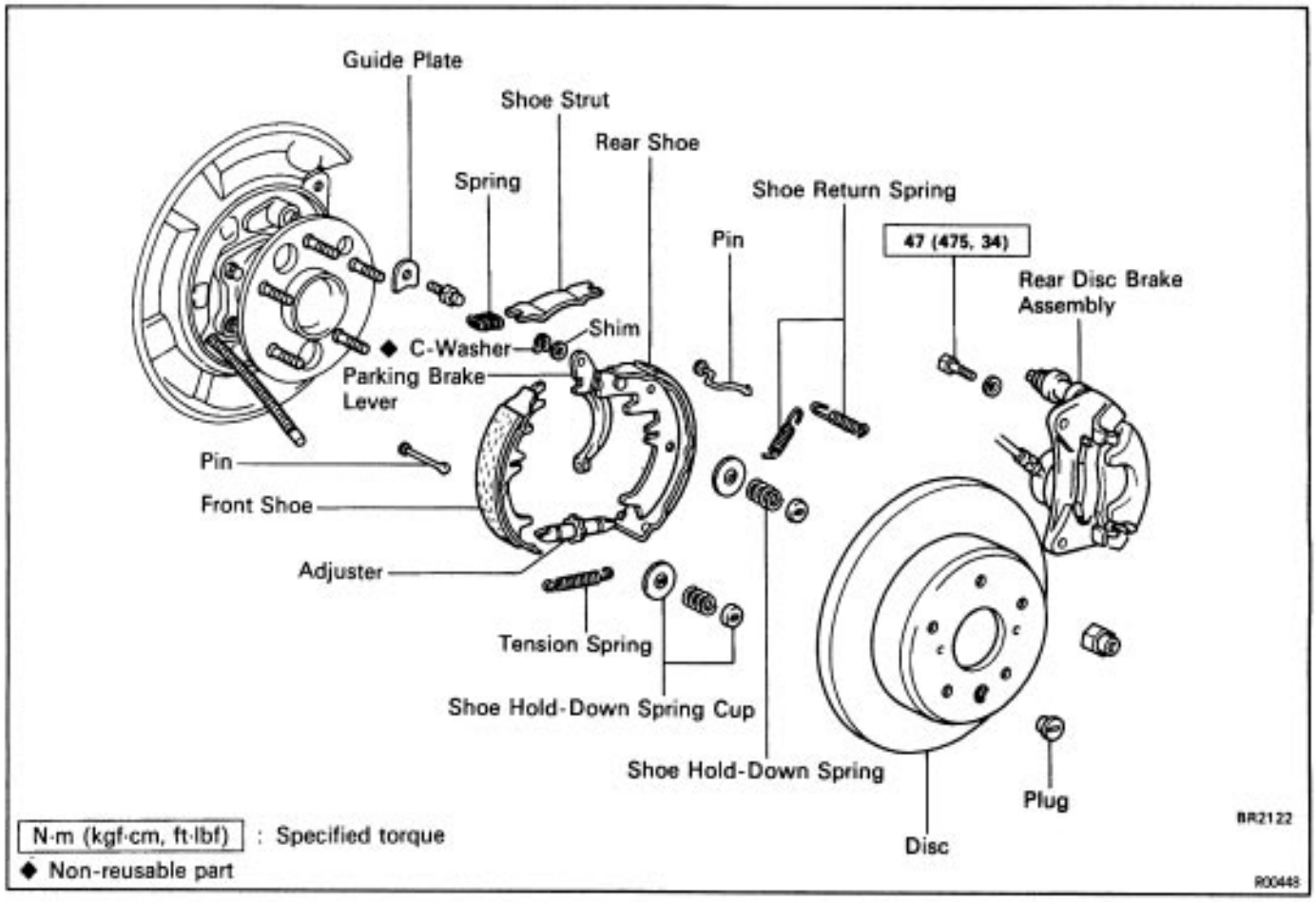
HINT: Insert the flexible hose lock securely in the lock hole in the caliper.

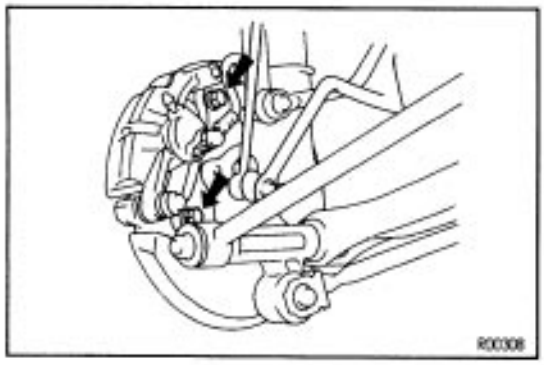
5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9)

6. CHECK FOR LEAKS

REAR BRAKE
(Parking Brake for Rear Disc Brake)
COMPONENTS





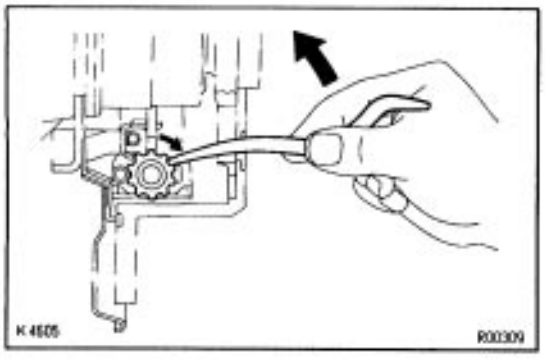
PARKING BRAKE DISASSEMBLY

1. REMOVE REAR WHEEL

2. REMOVE REAR DISC BRAKE ASSEMBLY

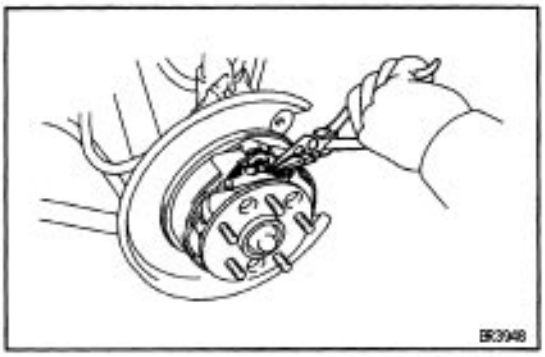
(a) Remove the 2 mounting bolts and remove the disc brake assembly.

(b) Suspend the disc brake so the hose is not stretched.



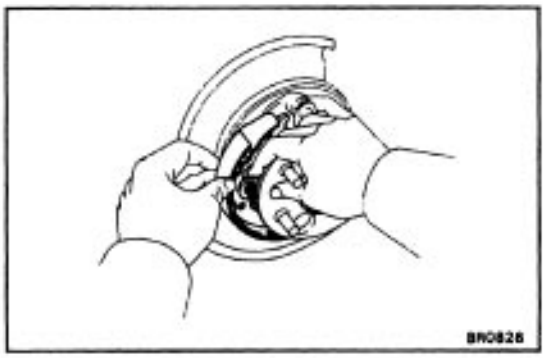
3. REMOVE DISC

HINT: If the disc cannot be removed easily, turn the shoe adjuster



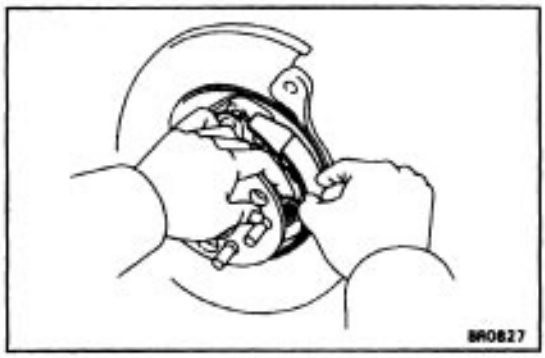
4. REMOVE SHOE RETURN SPRINGS

Using needle–nose pliers, remove the shoe return springs.



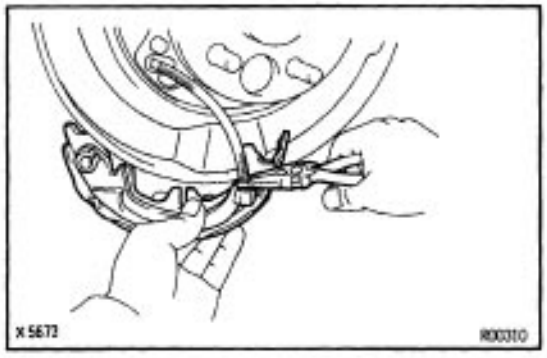
5. REMOVE FRONT SHOE, ADJUSTER AND TENSION SPRING

(a) Slide out the front shoe and remove the shoe adjuster.
(b) Remove the shoe strut with the spring.
(c) Disconnect the tension spring and remove the front shoe.



6. REMOVE REAR SHOE

(a) Slide out the rear shoe.
(b) Remove the tension spring from the rear shoe.

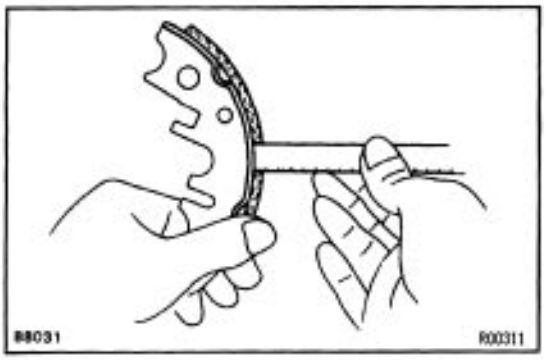


(c) Using needle–nose pliers, disconnect the parking brake cable from the parking brake shoe lever.
(d) Remove the shoe hold–down spring cups, springs and pins.

PARKING BRAKE COMPONENTS INSPECTION AND REPAIR

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

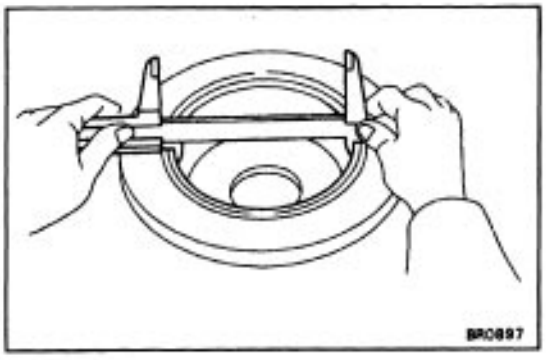


2. MEASURE BRAKE SHOE LINING THICKNESS

Using a scale, measure the thickness of the shoe lining.

Standard thickness:
2.0 mm (0.079 in.)
Minimum thickness:
1.0 mm (0.039 in.)

If the lining thickness is at the minimum thickness or less, or if there is excessively uneven wear, replace the brake shoe.

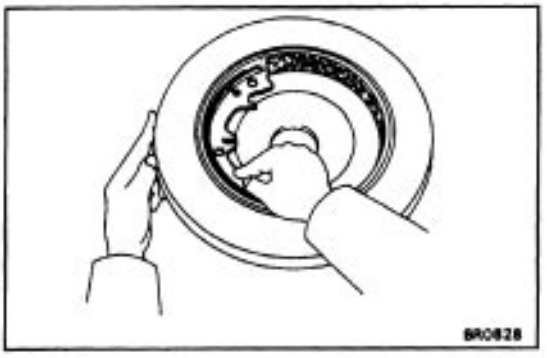


3. MEASURE DISC INSIDE DIAMETER

Using a vernier caliper, measure the inside diameter of the disc.

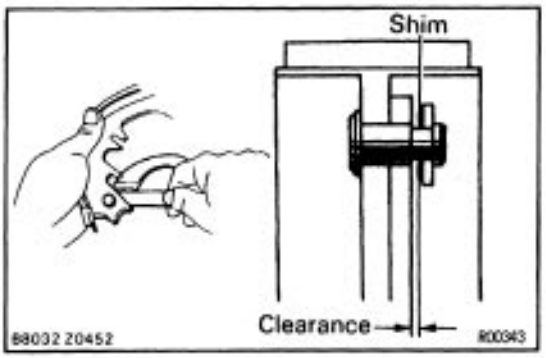
Standard inside diameter:
170 mm (6.69 in.)
Maximum inside diameter:
171 mm (6.73 in.)

Replace the disc if the inside diameter is at the maximum value or more. Replace the disc or grind it with a lathe if the disc is badly scored or worn unevenly.



4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

Apply chalk to the inside surface of the disc, then grind down the brake shoe lining to fit. If the contact between the disc and the brake shoe lining is improper, repair it using a brake shoe grinder or replace the brake shoe assembly.



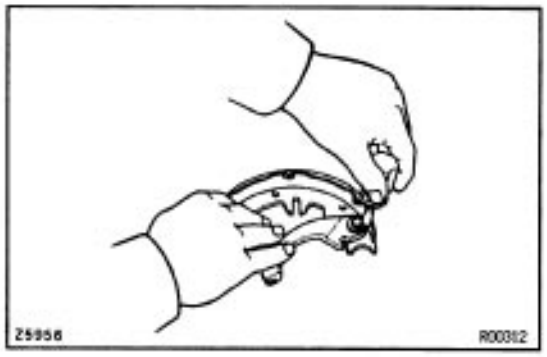
5. MEASURE CLEARANCE BETWEEN PARKING BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance.

Standard clearance:
Less than 0.35 mm (0.0138 in.)

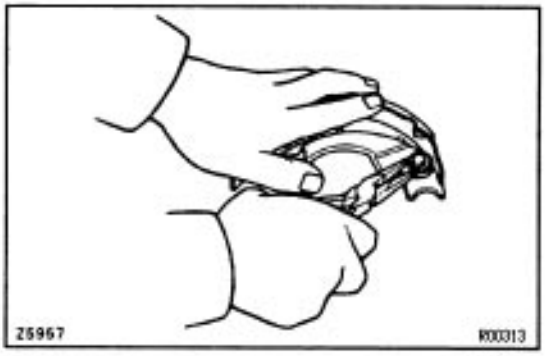
If the clearance is not within the specification, replace the shim with one of the correct size.

Shim Thickness	Shim Thickness
0.3 mm (0.012 in.)	0.9 mm (0.035 in.)
0.6 mm (0.024 in.)	



6. IF NECESSARY, REPLACE SHIM

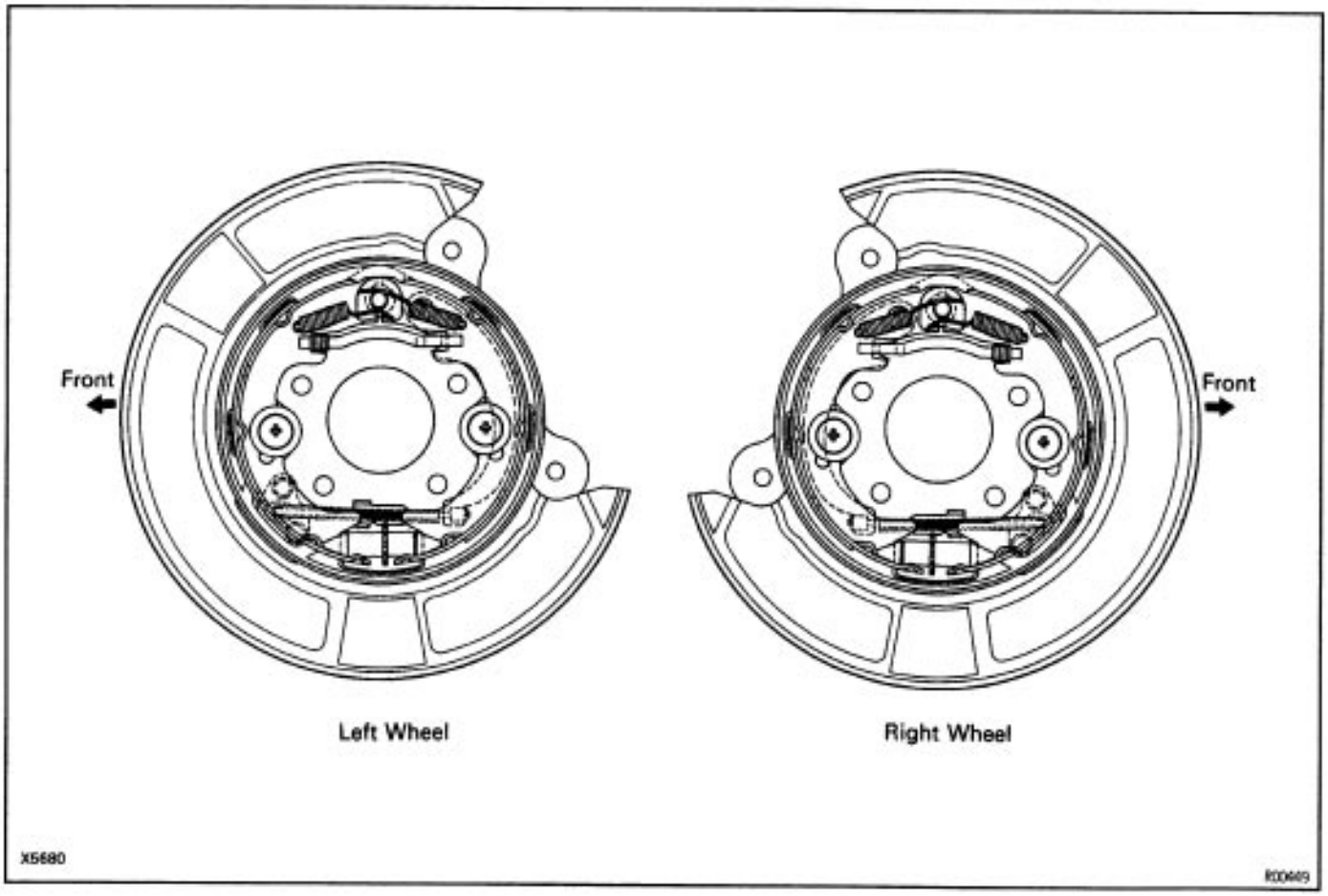
(a) Remove the parking brake lever, and install the correct size shim.

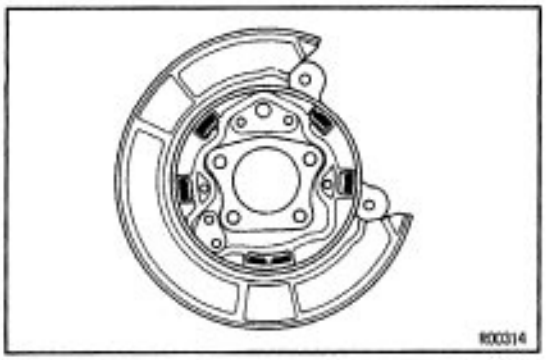


(b) Install the parking brake lever with a new C–washer.
(c) Remeasure the clearance.

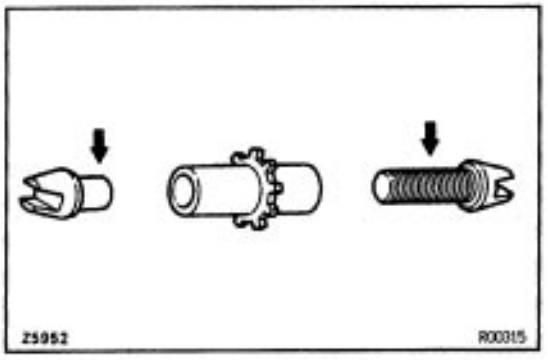
PARKING BRAKE ASSEMBLY

HINT: Assemble the parts in the correct direction as shown.

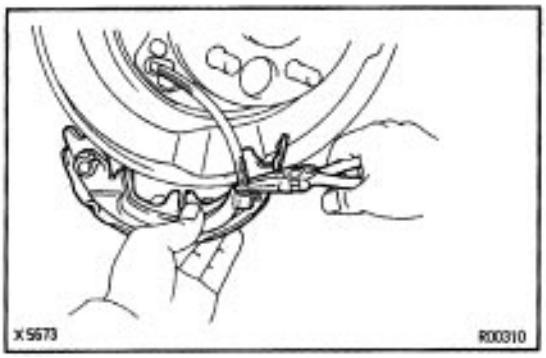




1. APPLY HIGH TEMPERATURE GREASE ON BACK–ING PLATE

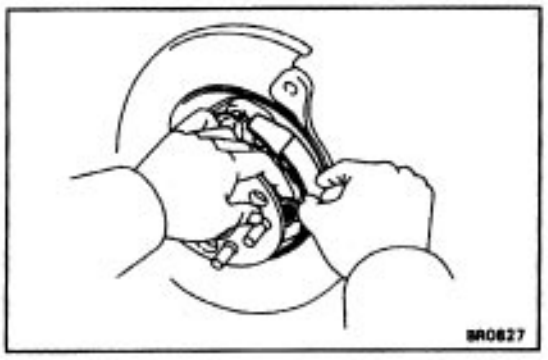


2. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER



3. CONNECT PARKING BRAKE CABLE TO PARKING BRAKE LEVER

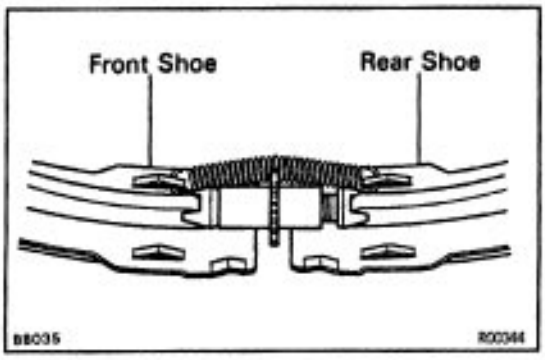
(a) Install the shoe hold–down springs, cups and pins.
(b) Using needle–nose pliers, connect the parking brake cable to the parking brake lever.



4. INSTALL REAR SHOE

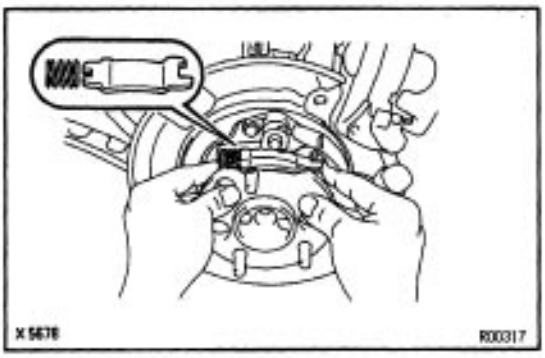
Slide in the rear shoe between the shoe hold–down spring cup and the backing plate.

NOTICE: Do not allow oil or grease to get on the rubbing faces.

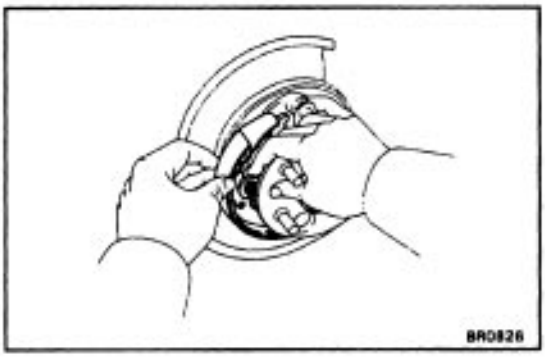


5. INSTALL TENSION SPRING, FRONT SHOE, AD–JUSTER AND STRUT

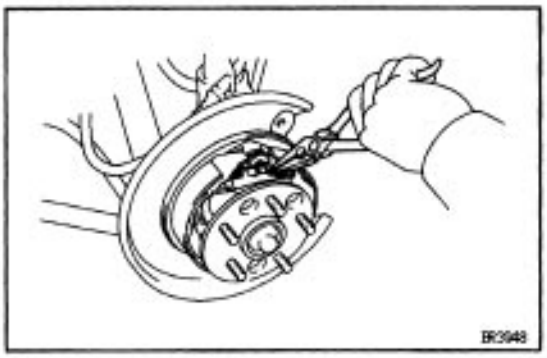
(a) Install the tension spring to the rear shoe.
(b) Install the front shoe to the tension spring.
(c) Install the adjuster between the front and rear shoes.



(d) Install the shoe strut with the spring.

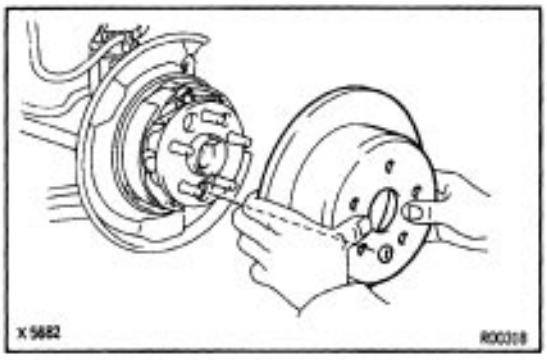


(e) Slide in the front shoe between the shoe hold–down spring cup and the backing plate.



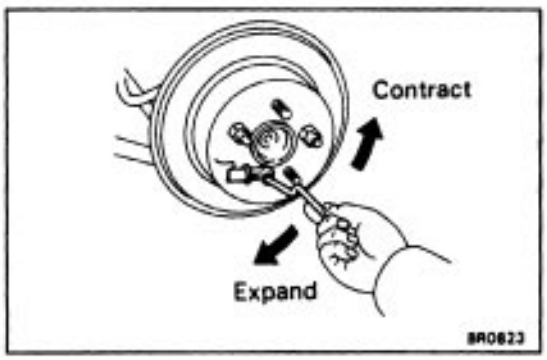
6. INSTALL SHOE RETURN SPRINGS

Using needle–nose pliers, install the shoe return spr–ings.



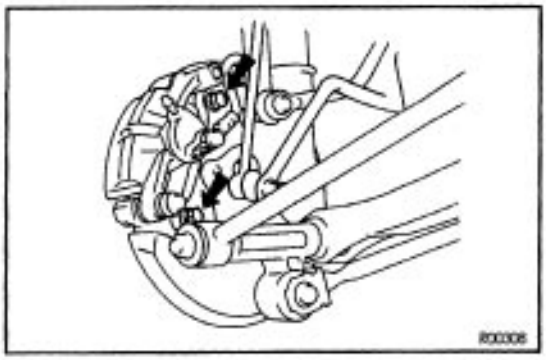
7. INSTALL DISC

(a) Before installing, polish the disc and shoe surfaces with sandpaper.
(b) Align the hole on the rear axle hub flange and service hole on the disc.



8. ADJUST PARKING BRAKE SHOE CLEARANCE

(a) Temporarily install the hub nuts.
(b) Remove the hole plug.
(c) Turn the adjuster and expand the shoes until the disc locks.
(d) Return the adjuster 8 notches.
(e) install the hole plug.



9. INSTALL DISC BRAKE ASSEMBLY

Install the disc brake assembly and torque the 2 mot nting bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

10. INSTALL REAR WHEEL

11. SETTLING PARKING BRAKE SHOES AND DISC

(a) LEVER TYPE:

With the parking brake release button pushed in, pull the lever with 98 N (10 kgf, 22 lbf) of force.

(b) PEDAL TYPE:

Depress the parking brake pedal with 147 N (15 kgf, 33 lbf).

(c) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.

(d) Drive the vehicle for about 400 meters (0.25 mile) in this condition.

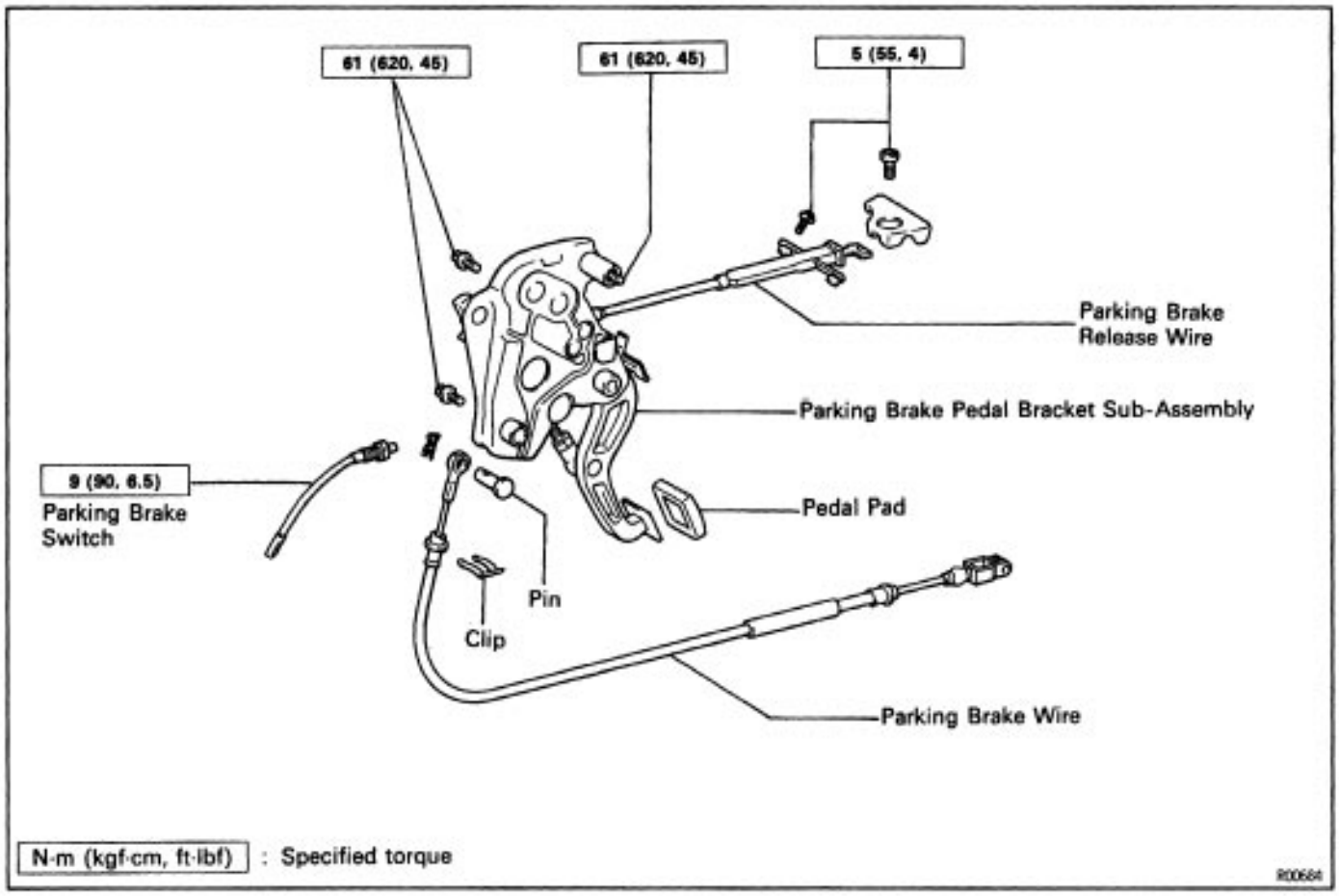
(e) Repeat this procedure 2 or 3 times.

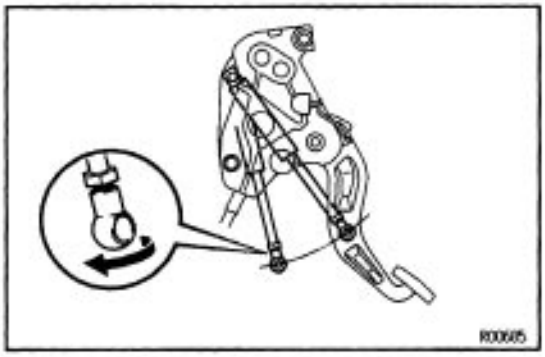
12. RECHECK AND ADJUST PARKING BRAKE LEVER/ PEDAL TRAVEL

PARKING BRAKE

PARKING BRAKE PEDAL DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





MAIN POINT OF PEDAL INSTALLATION

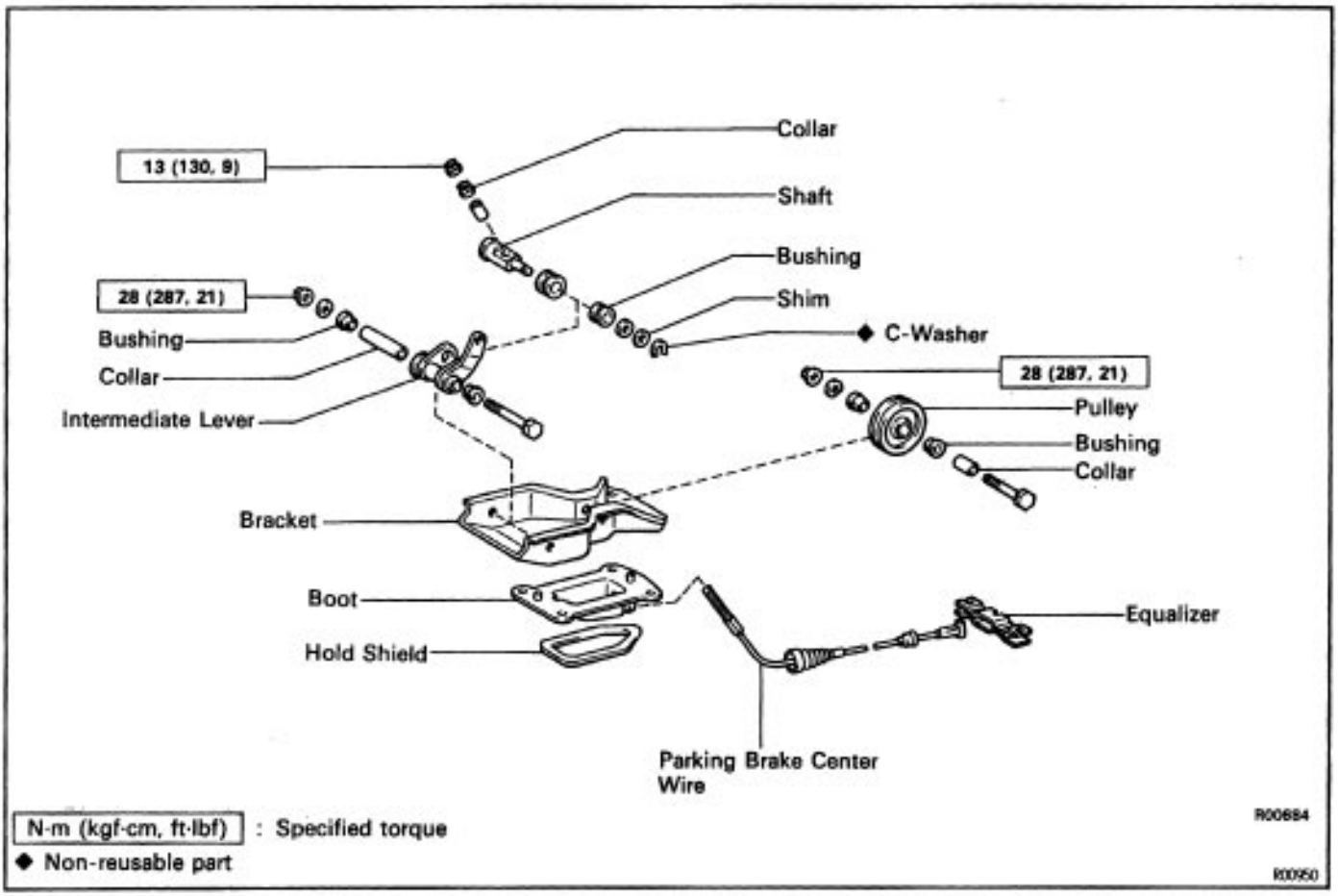
INSTALL SHOCK ABSORBER

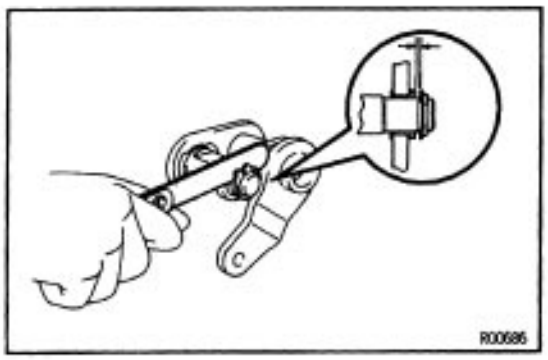
(a) Loosen the union lock nut.
(b) Install the shock absorber to the pin on the pedal bracket side, then extend the piston rod fully.
(c) Return the pedal until it hits the cushion.
(d) Make adjustments so that the shock absorber's union and the pin on the pedal side are aligned, then turn the union 1 turn counterclockwise.
(e) Install the shock absorber to the pedal and tighten the lock nut.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

PARKING BRAKE INTERMEDIATE LEVER DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





MAIN POINT OF INTERMEDIATE LEVER INSTALLATION

MEASURE CLEARANCE BETWEEN INTERMEDIATE LEVER SHAFT AND LEVER

Using a feeler gauge, measure the clearance.

Standard clearance:

0.09–0.5 mm (0.004–0.02 in.)

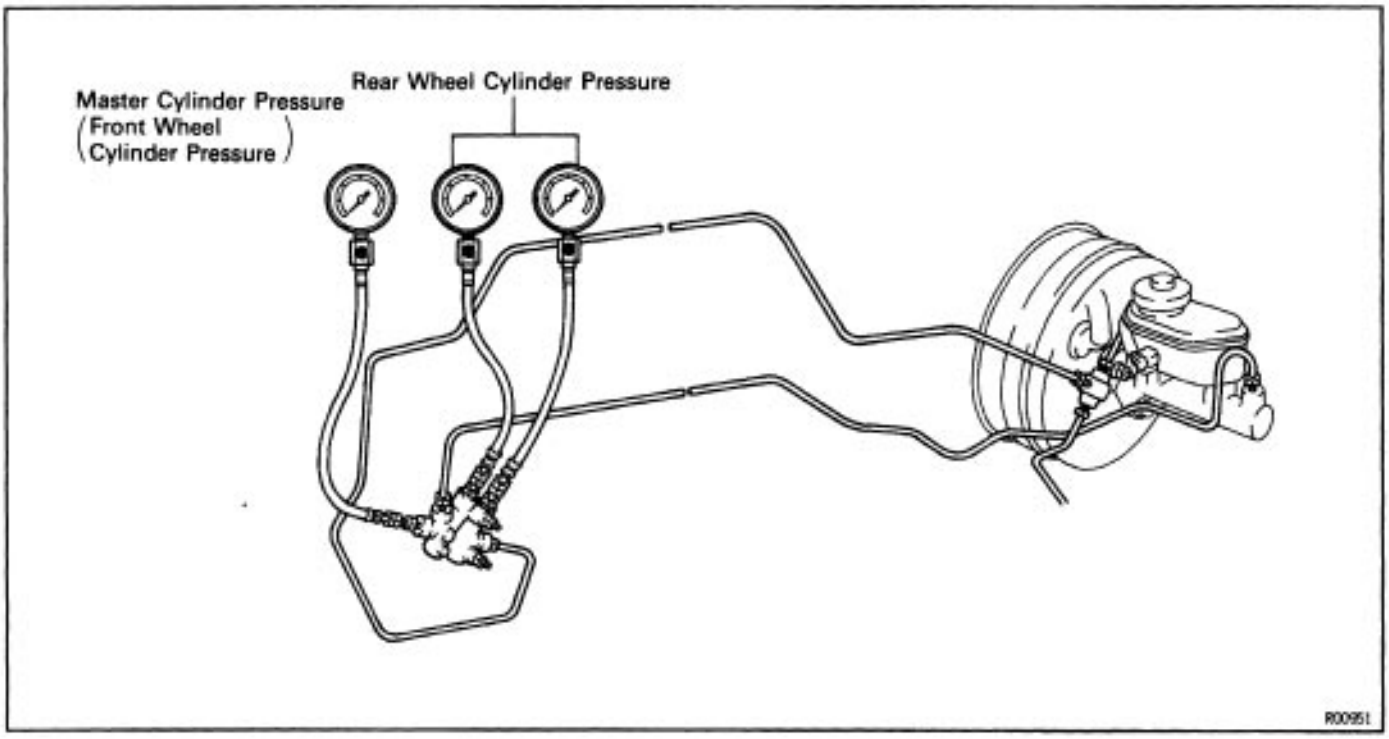
If the clearance is not within the specification, replace the shim with one of the correct size.

Shim Thickness	Shim Thickness
0.3 mm (0.012 in.)	1.2 mm (0.047 in.)
0.6 mm (0.024 in.)	1.5 mm (0.059 in.)
0.9 mm (0.035 in.)	1.8 mm (0.071 in.)

PROPORTIONING VALVE (P VALVE)

P VALVE INSPECTION

1. CONNECT FLUID PRESSURE GAUGE TO P VALVE



2. BLEED AIR FROM FLUID 'PRESSURE GAUGE

3. RAISE MASTER CYLINDER PRESSURE AND CHECK REAR WHEEL CYLINDER PRESSURE

Master cylinder fluid pressure	Rear brake cylinder fluid pressure
5S–FE w/o ABS:	
2,452 kPa (25 kgf/cm^2 , 356 psi)	2,452 kPa (25 kgf/cm^2 , 356 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	4,452 kPa (45.4 kgf/cm^2 , 648 psi)
1 MZ–FE w/o A6S:	
2,942 kPa–(30 kgf/cm^2 , 427 psi)	2,942 kPa (30 kgf/cm^2 , 427 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	4,756 kPa (48.5 kgf/cm^2 , 690 psi)
5S–FE w/ABS, 1 MZ–FE w/ABS:	
3,432 kPa (35 kgf/cm^2 , 498 psi)	3,432 kPa (35 kgf/cm^2 , 498 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	5,070 kPa (51.7 kgf/crn2 , 735 psi)

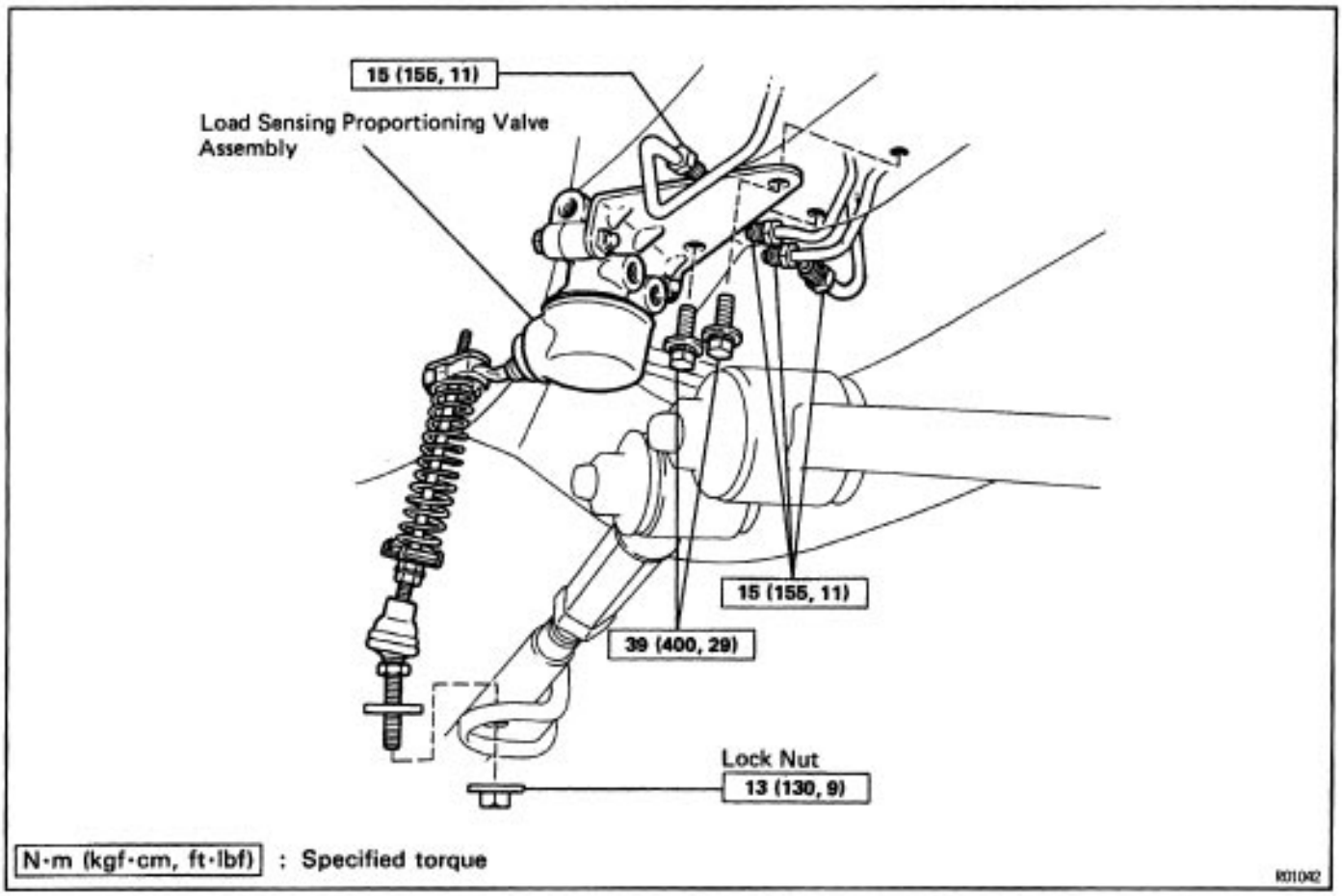
If the rear brake cylinder pressure is incorrect, replace the P valve assembly.

4. BLEED BRAKE SYSTEM

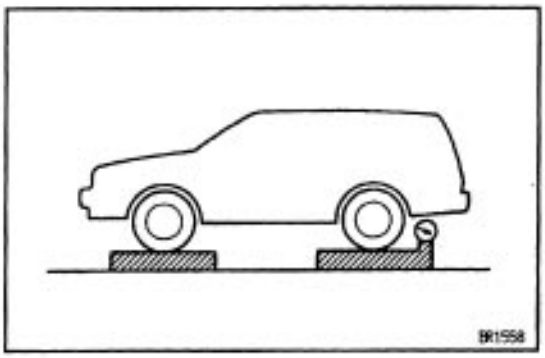
5. CHECK FOR LEAKS

LOAD SENSING PROPORTIONING VALVE (LSPV)

COMPONENTS



FLUID PRESSURE INSPECTION



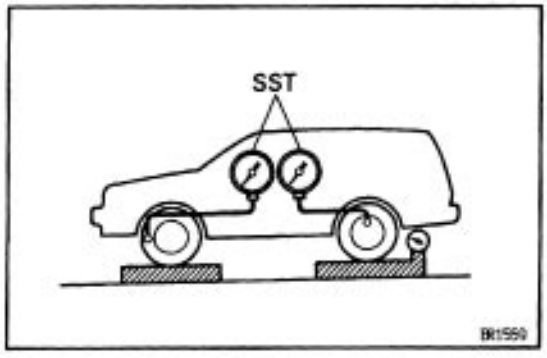
1. SET REAR AXLE LOAD

(a) Set the vehicle to its curb weight.

(b) Measure the rear axle load and note the value.

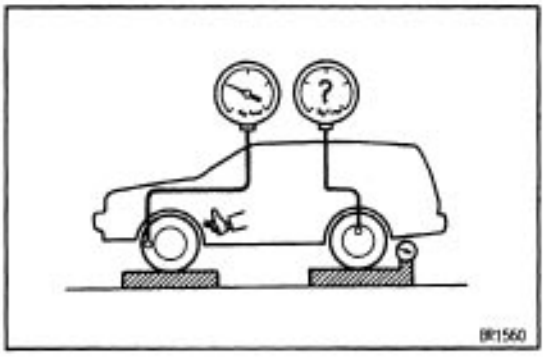
(c) Set the rear axle load.

Rear axle load: Rear axle curb weight + 31 kg (68 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED BRAKE SYSTEM

SST 09709–.29017



3. RAISE FRONT BRAKE FLUID PRESSURE TO FOL–LOWING SPECIFICATION AND CHECK REAR BRAKE FLUID PRESSURE

Rear brake fluid pressure:

5S–FE All, 1 MZ–FE w/ABS

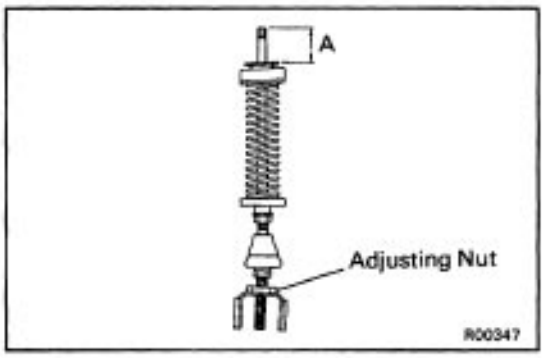
Front brake fluid pressure kPa (kgf/cm^2 , psi)	Rear brake fluid pressure kPa (kgf/cm^2 , psi)
9,807 (100, 1,422)	6,139–7,120 (62.6–72.6, 890–1,033)

1 MZ–FE w/o A6S

Front brake fluid pressure kPa (kgf/cm^2 , psi)	Rear brake fluid pressure kPa (kgf/cm^2 , psi)
12,747 (130 , 1,849)	8,865–9,846 (90.4–100.4,1,286–1,428)

HINT:

- Depress the brake pedal while the engine is run–ning.
- The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear pressure 2 sec–onds after adjusting to the specified fluid pres–sure.



4. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Set the shaft length A to initial set length and tighten the adjusting bolt lock nut.

Initial set length:

26.0 mm (1.02 in.)

(b) Check the rear brake fluid pressure.

(c) If not within the specification, adjust the fluid pres–sure by changing the shaft length.

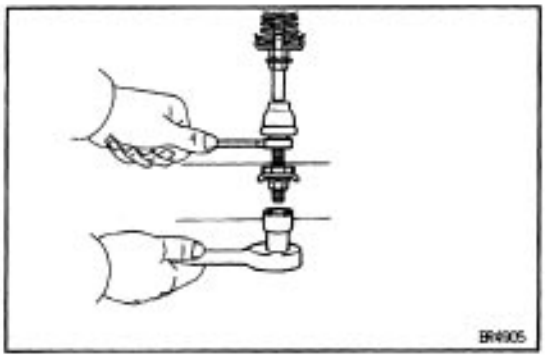
Low pressure–Lengthen A

High pressure–Shorten A

HINT:–For every full turn of the adjusting nut, the fluid pressure will change as follows:

Fluid Pressure changed kPa (kgf/cm^2, psi)

5S–FE All, 1 MZ–FE w/ABS	294 (3.0, 42.7)
1 MZ–FE w/o ABS	422 (4.3, 61.2)

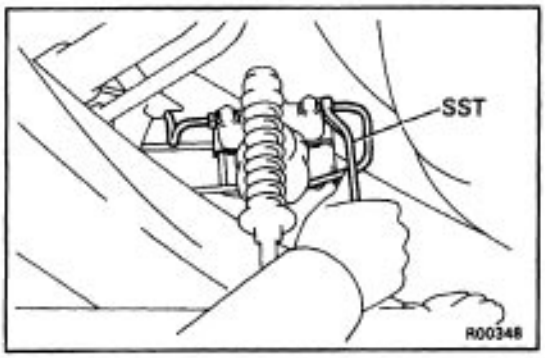


(d) Torque the lock nut.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

If it cannot be adjusted, replace the valve body.

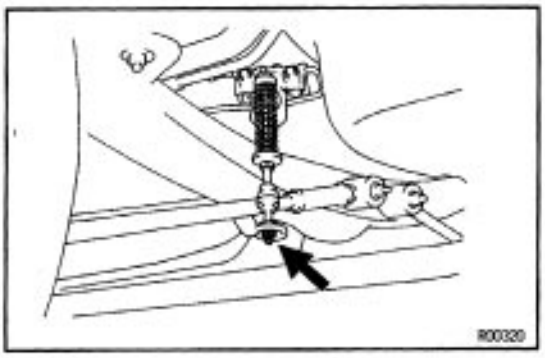
LSPV REMOVAL



1. DISCONNECT BRAKE LINES

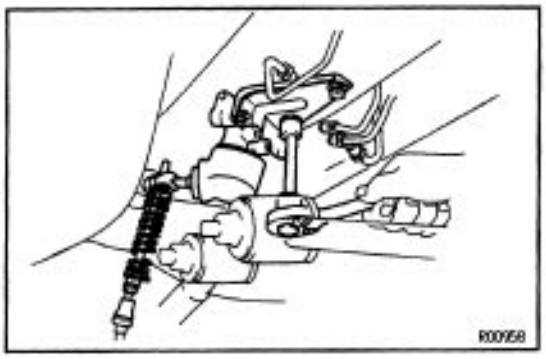
Using SST, disconnect the brake lines from the valve body.

SST 09751–36011



2. REMOVE LSPV ASSEMBLY

(a) Remove the lock nut and disconnect the adjusting bolt from the rear suspension arm.



(b) Remove the 2 mounting bolts and remove the LSPV assembly.

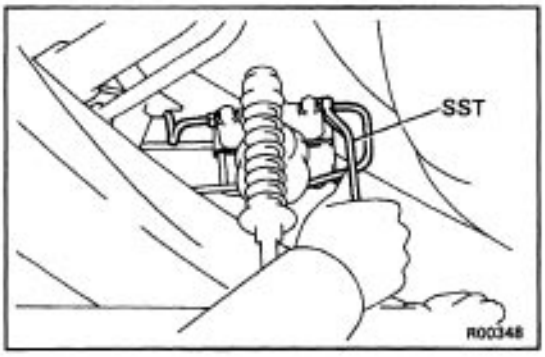
LSPV INSTALLATION

1. INSTALL LSPV ASSEMBLY

(a) Install the valve assembly with the 2 mounting bolts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(b) Install the adjusting nut to the adjusting bolt and then install the adjusting bolt to the rear suspension arm with the lock nut.



2. CONNECT BRAKE LINES

Using SST, connect the brake lines.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

3. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9)

4. CHECK FOR LEAKS

5. CHECK AND ADJUST FLUID PRESSURE

(See page BR–63)

6. REMOVE LSPV GAUGE (SST) AND BLEED BRAKE SYSTEM

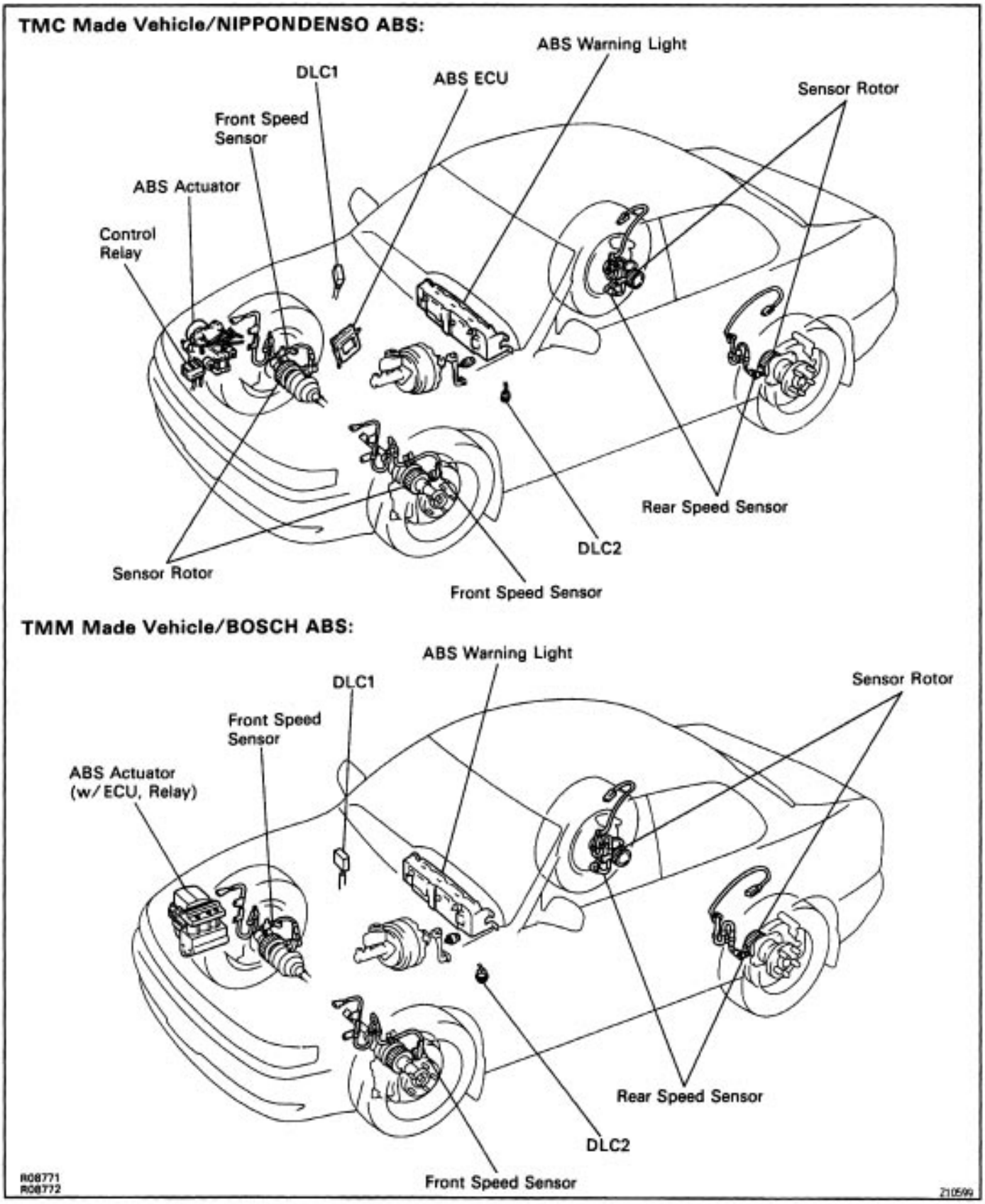
7. CHECK FOR LEAKS

ANTI–LOCK BRAKE SYSTEM (ABS)

DESCRIPTION

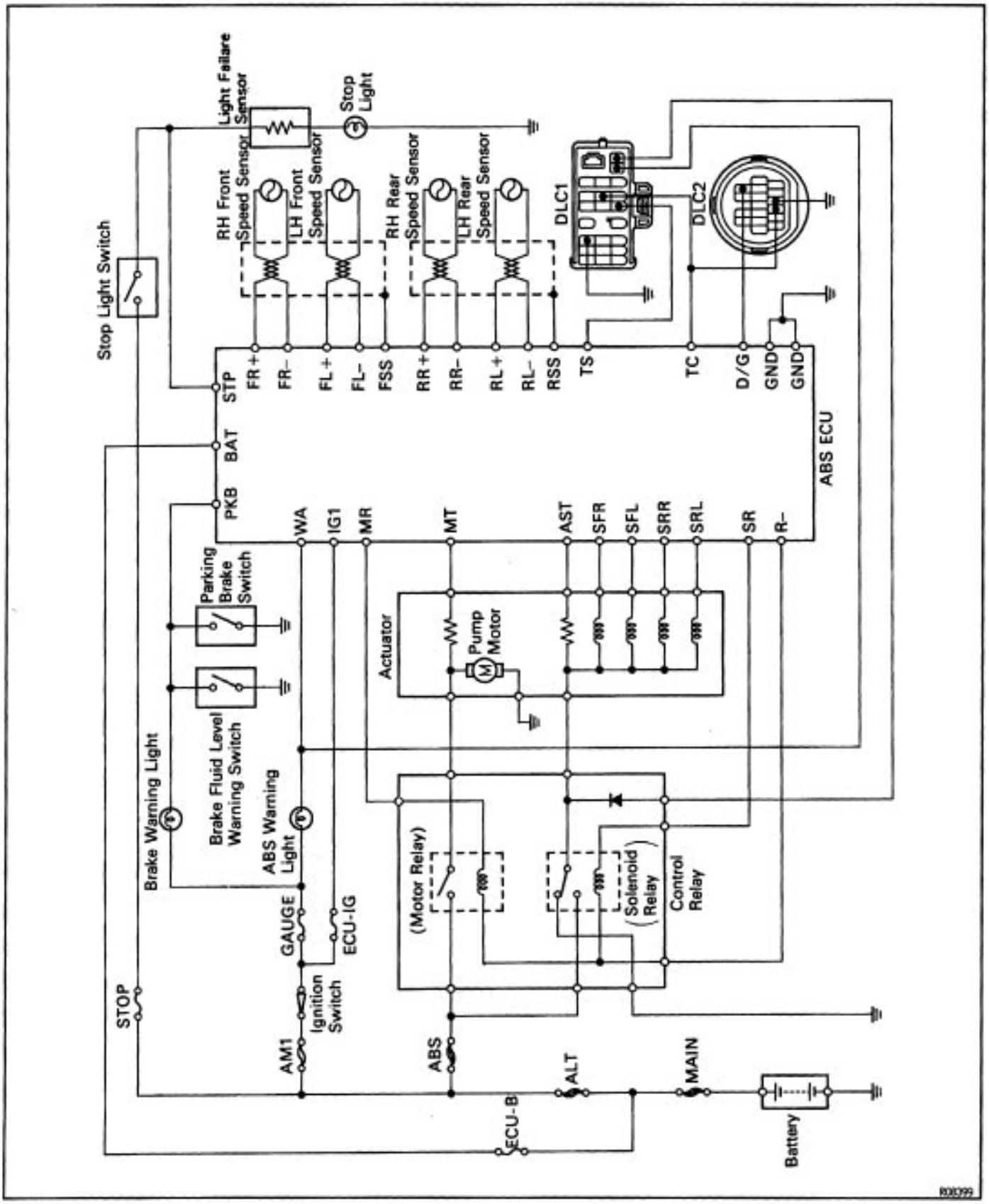
- ABS controls the brake cylinder hydraulic pressure to all 4 wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. ABS provides the following benefits:
  (1) Steering round an obstacle with a greater degree of certainty even when panic braking.
  (2) Stopping during panic braking while keeping the effect up on stability and steerability to a minimum, even on curves.
- In case a malfunction occurs, a diagnosis function and fail–safe system have been adopted for the ABS.
- An ABS actuator manufactured by BOSCH is used on the Camry produced by TMM (Toyota Motor Manufacturing U.S.A., Inc.).

SYSTEM PARTS LOCATION



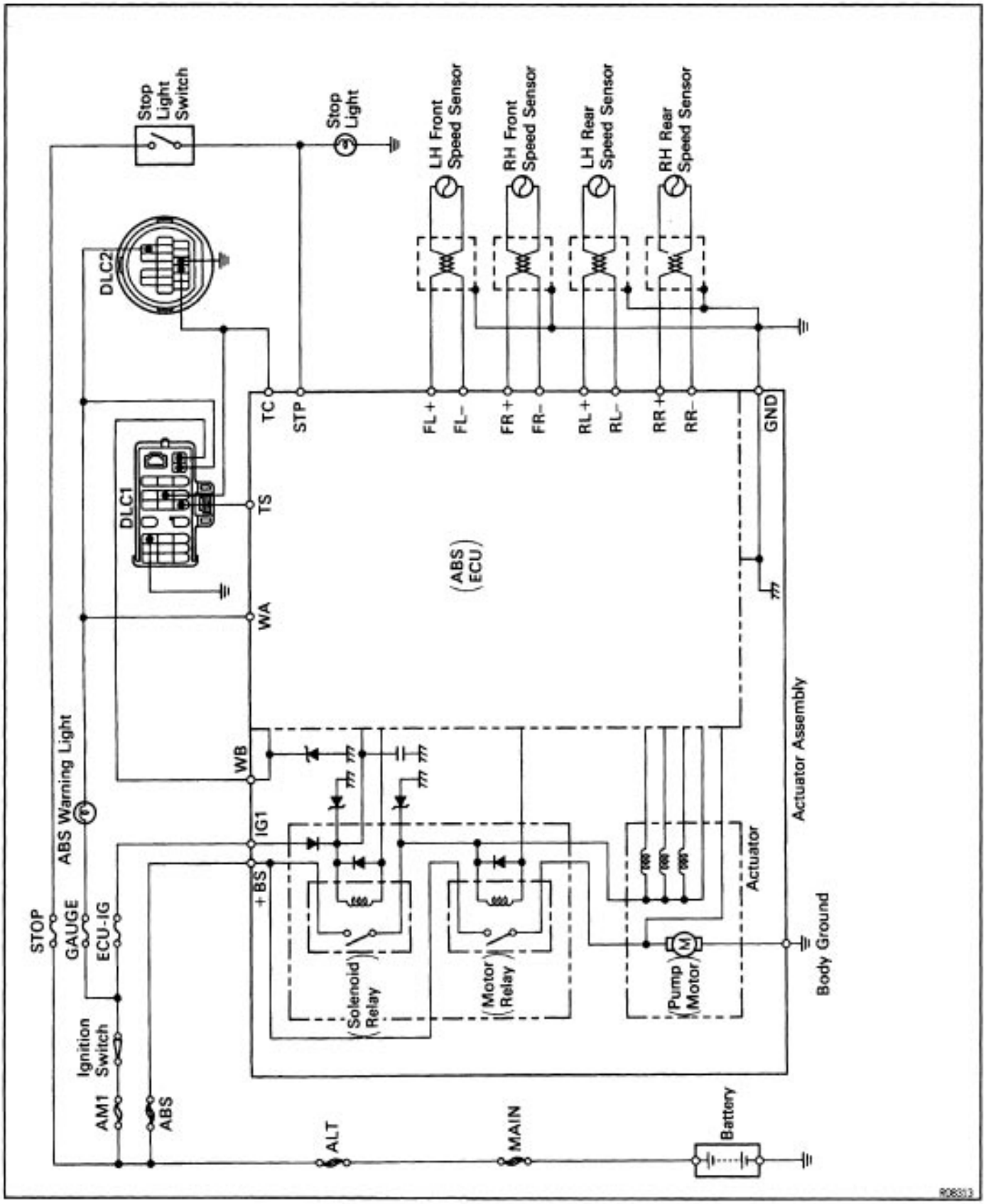
WIRING DIAGRAM

TMC Made Vehicle/NIPPONDENSO ABS:



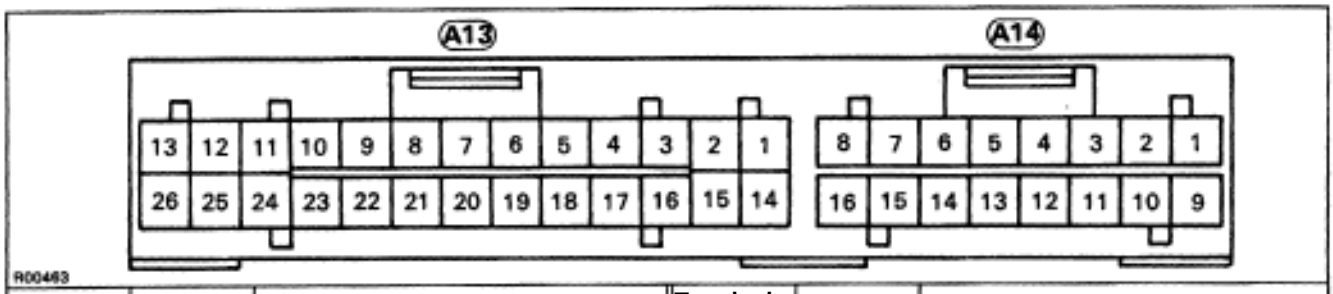
WIRING DIAGRAM

TMM Made Vehicle/BOSCH ABS:



ECU TERMINALS

TMC Made Vehicle/NIPPONDENSO ABS:



Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
A13- 1	SFR	Right front solenoid	A14- 1	RL–	Left rear speed sensor
2	GND	Ground	2	–	–
3	FR–	Right front speed sensor	3	–	–
4	–	–	4	D/G	DLC2
5	TC	DLC1, DLC2	5	–	–
6	MT	ABS control (motor) relay monitor	6	STP	Stop light switch
7	–	–	7	RSS	Sealed wiring harness
8	–	–	8	RR+	Right rear speed sensor
9	FL+	Left front speed sensor	9	RL+	Left rear speed sensor
10	FSS	Sealed wiring harness	10	–	–
11	SR	ABS control (solenoid) relay	11	–	–
12	IG1	Ignition switch	12	–	–
13	SFL	Left front solenoid	13	WA	ABS warning light
14	SRL	Left rear solenoid	14	PKB	Parking brake switch
15	GND	Ground	15	TS	DLC1
16	FR+	Right front speed sensor	16	RR–	Right rear speed sensor
17	–	–			
18	AST	A8S control (solenoid) relay monitor			
19	–	–			
20	–	–			
21	–	–			
22	FL–	Left front speed sensor			
23	MR	ABS control (motor) relay			
24	R–	Relay ground			
25	BAT	Battery			
26	SRR	Right rear solenoid			

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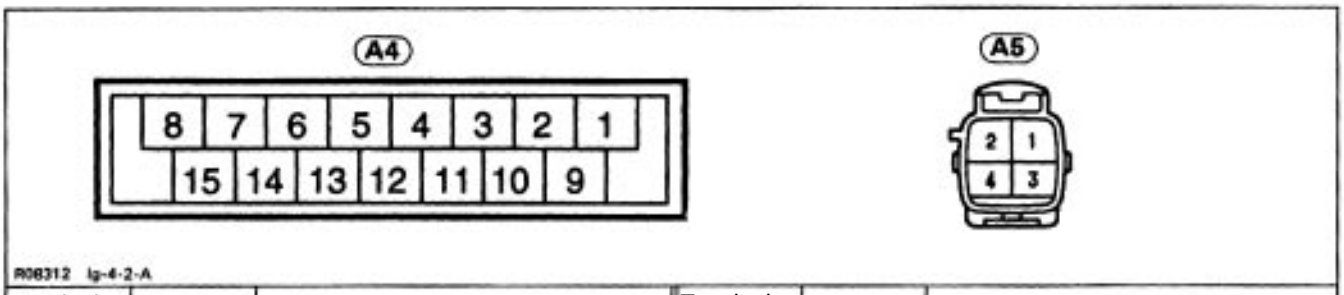
ECU TERMINALS

TMM Made Vehicle/BOSCH ABS:



Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
A4- 1	WA	A6S warning fight	A5-1	+BS	Battery
2	RL–	Left rear speed sensor	2	IG1	Ignition switch
3	–	–	3	WB	DLC1
4	RL+	Left rear speed sensor	4	GND	Ground
5	FR–	Right front speed sensor			
6	RR+	Right rear speed sensor			
7	FL–	Left front speed sen-			
8	–	sor –			
9	STP	Stop light switch			
10	–	–			
11	FR+	Right front speed sensor			
12	TC	DLC1, DLC2			
13	FL+	Left front speed sensor			
14	RR–	Right rear speed sensor			
15	TS	DLC1			

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ECU TERMINALS STANDARD VALUE

TMC Made Vehicle/NIPPONDENSO ABS:

Symbols (Terminals No.)	STD Voltage (V)	Condition
BAT (A13-25) – GND (A13-2, 15)	10 – 14	Always
IG1 (A13-12) – GND (A13-2, 15)	10 – 14	IG switch ON
SR (A13-11) – R– (A13-24)	8.4 – 14	IG switch ON, ABS warning light OFF
MR (A13-23) – R– (A13-24)	Below 1.0	IG switch ON
SFR (A13-1) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
SFL (A13-13) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
SRR (A13-26) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
AST (A13-18) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
WA (A14-13) – GND (A13-2, 15)	Below 2.0	IG switch ON, AIRS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
PKB (A14-14) – GND (A13-2, 15)	Below 1.5	IG switch ON, PKB switch ON, Fluid in M/C reservoir above MIN level
	10 – 14	IG switch ON, PKB switch OFF, Fluid in M/C reservoir above MIN level
STP (A14-6) – GND (A13-2, 15)	Below 1.5	Stop light switch OFF
	8 – 14	Stop light switch ON
D/G (A14-4) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
TC (A13-5) – GND (A13-2, 15)	10 – 14	!G switch ON
TS (A14-15) – GND (A13-2, 15)	10 – 14	IG switch ON
FR+ (A13-16) – FR– (A13-3)	AC generation	IG switch ON Slowly turn right front wheel
FL+ (A13-9) – FL– (A13-22)	AC generation	IG switch ON Slowly turn left front wheel
RR+ (A14-8) – RR– (A14-16)	AC generation	IG switch ON Slowly turn right rear wheel
RL+ (A14-9) – RL– (A14-1)	AC generation	IG switch ON Slowly turn left rear wheel

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ECU TERMINALS STANDARD VALUE

TMM Made Vehicle/BOSCH ABS:

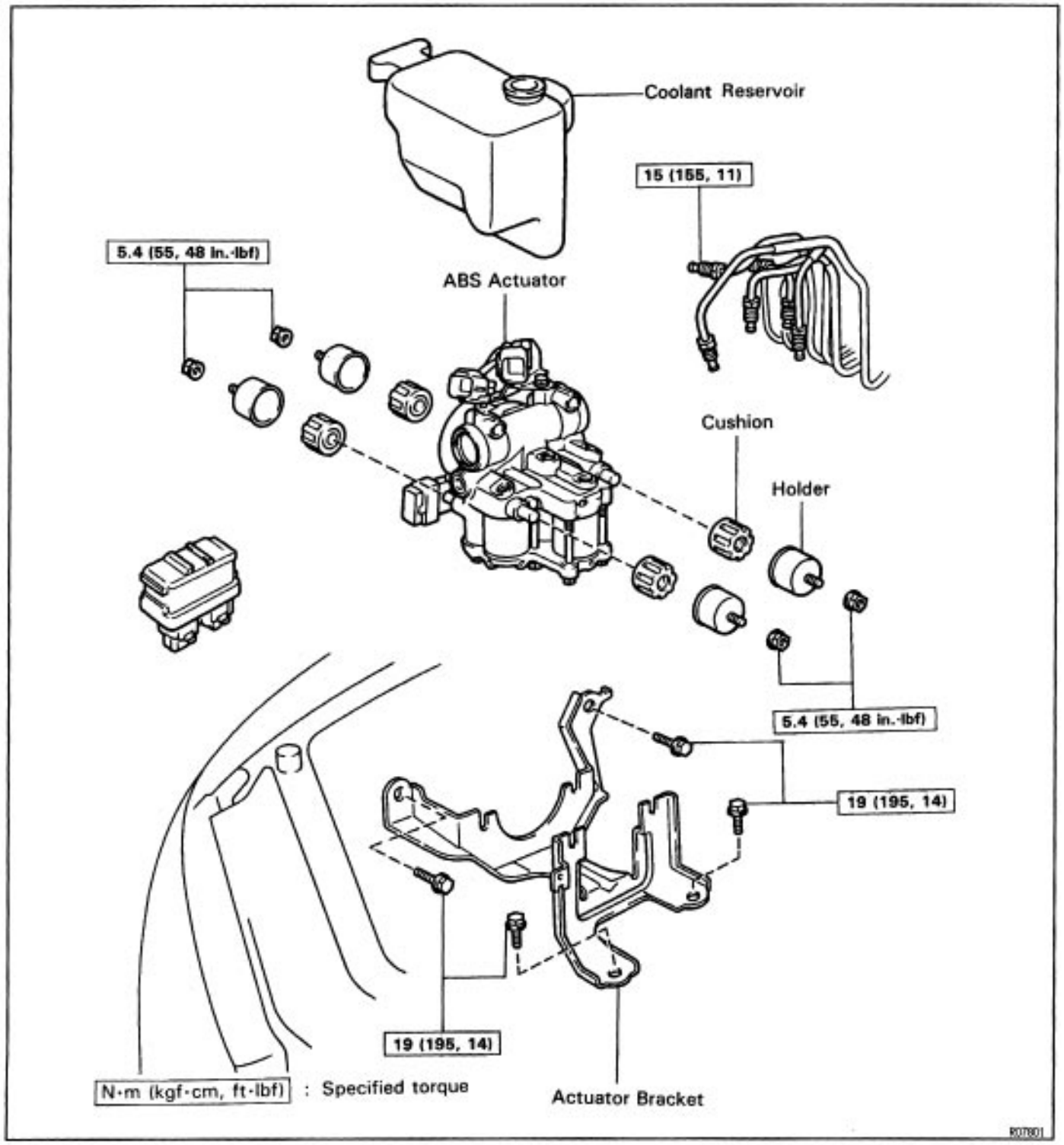
Symbols (Terminals No.)	STD Voltage (V)	Condition
+BS (A5-1) – GND (A5-4)	10 – 14	Always
IG1 (A5-2) – GND (A5-4)	10 – 14	IG switch ON
WA (A4-1) – GND (A5-4)	Below 2.6	IG switch ON, A6S warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
WB (A5-3) – GND (A5-4)	Below 2.6	IG switch ON, ABS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
STP (A4-9) – GND (A5-4)	Below 1.5	Stop light switch OFF
	5 – 14	Stop light switch ON
Tc (A4-12) – GND (A5-4)	5.7 – 8.1	lG switch ON
Ts (A4-15) – GND (A5-4)	5.7 – 8.1	I G switch 0 N
FR+ (A4-11) – FR– (A4-5)	AC generation	IG switch ON, slowly turn right front wheel
FL+ (A4-13) – FL– (A4-7)	AC generation	IG switch ON, slowly turn left front wheel
RR+ (A4-6) – RR– (A4-14)	AC generation	IG switch ON, slowly turn right rear wheel
RL+ (A4-4) – RL– (A4-2)	AC generation	IG switch ON, slowly turn left rear wheel

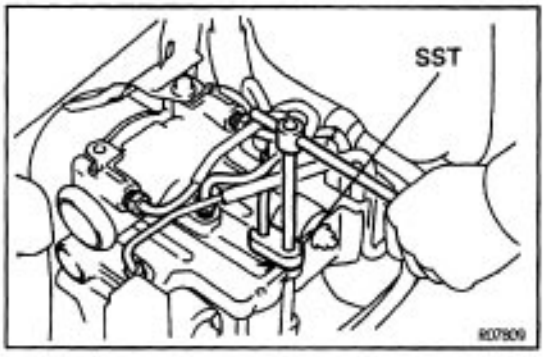
V04539

ABS ACTUATOR (TMC Made Vehicle NIPPONDENSO ABS)

ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





MAIN POINTS OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT BRAKE LINE

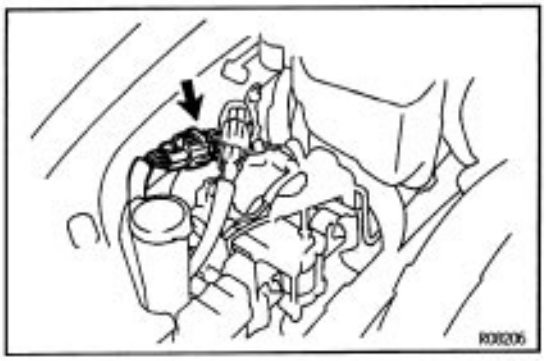
Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09023–00100

Torque: 15 N–m (155 kgf–cm. 11 ft–lbf)

2. BLEED BRAKE SYSTEM

(See page BR–9)



ABS ACTUATOR INSPECTION

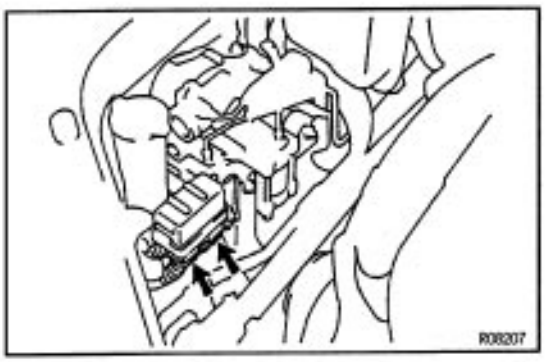
1. INSPECT BATTERY POSITIVE VOLTAGE

Battery positive voltage:

10–14.5 V

2. DISCONNECT CONNECTORS

(a) Disconnect the connector from the actuator.



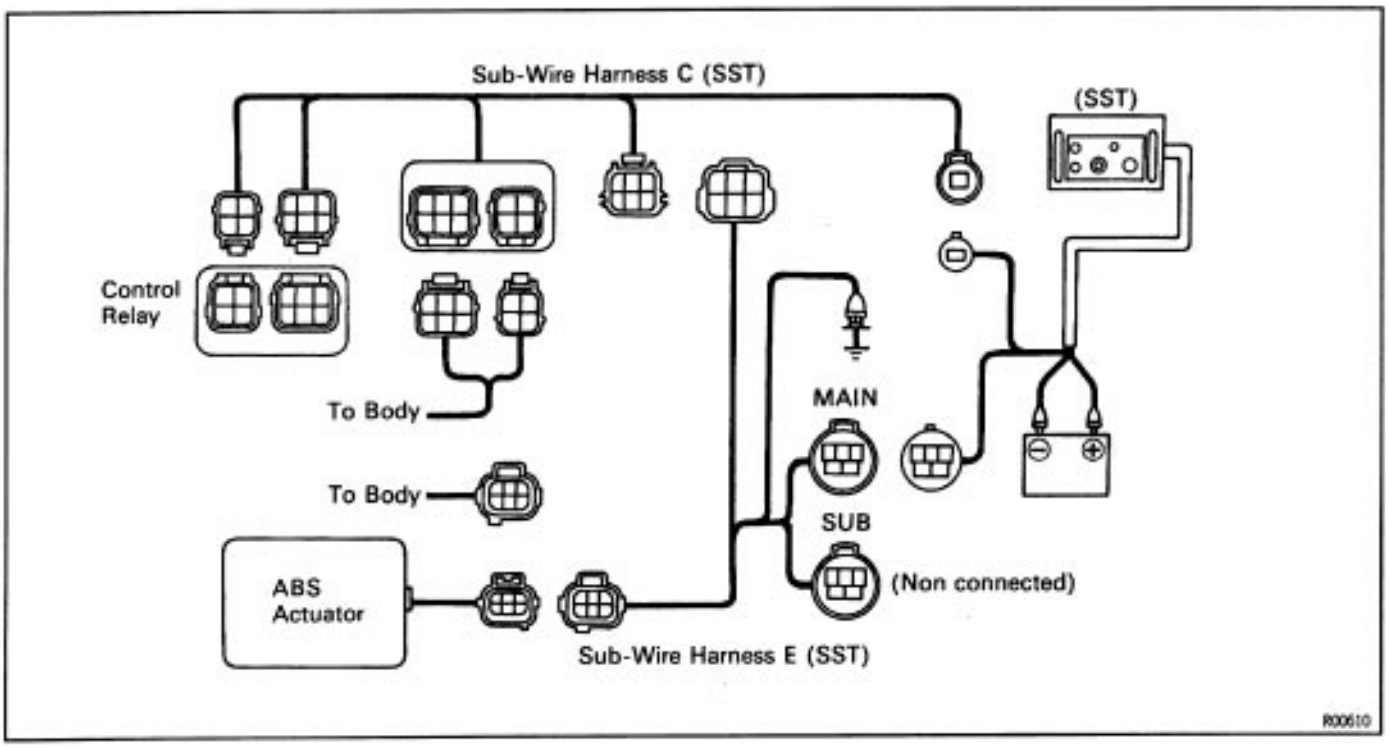
(b) Disconnect the 2 connectors from the control relay.

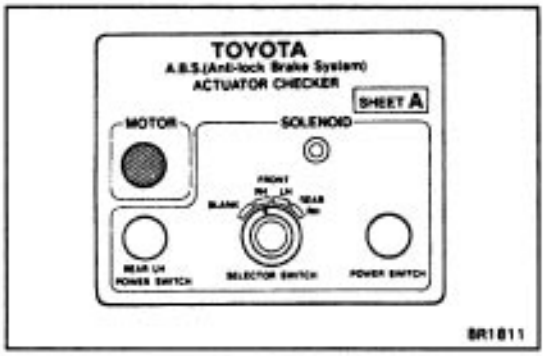
3. CONNECT ACTUATOR CHECKER (SST) TO ACTUA–TOR

(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub–wire harness C and E (SST) as shown.

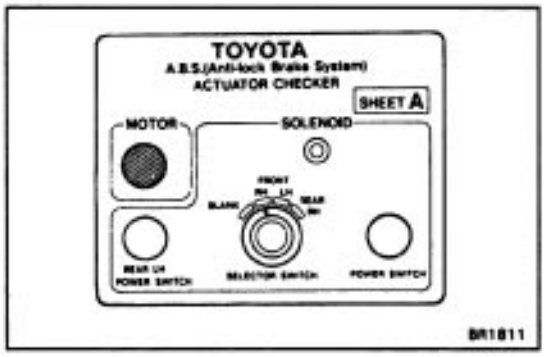
SST 09990–00150, 09990–00200, 09990–00210

(b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (–) terminal. Connect the black cable of the sub–wire harness to the battery negative (–) terminal or body ground.



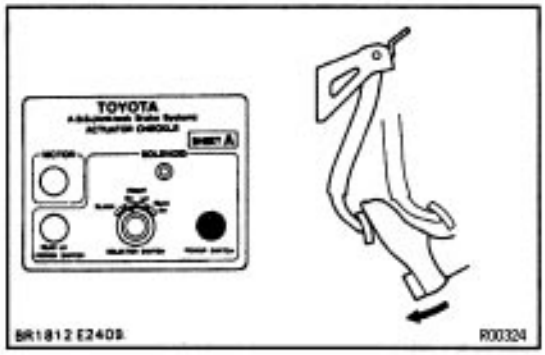


(c) Place the ”SHEET A” (SST) on the actuator checker.
SST 09990–00163

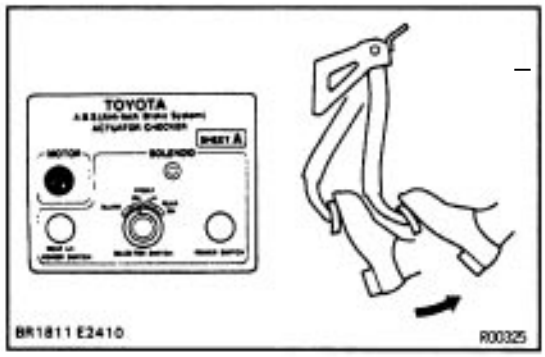


4. INSPECT BRAKE ACTUATOR OPERATION

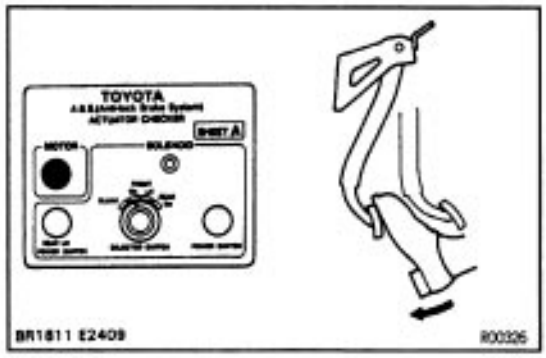
(a) Start the engine, and run it at idle.
(b) Turn the selector switch of the actuator checker to ”FRONT RH” position.
(c) Push and hold in the MOTOR switch for a few sec–onds.
(d) Depress the brake pedal and hold it until step (g) is com pleted.



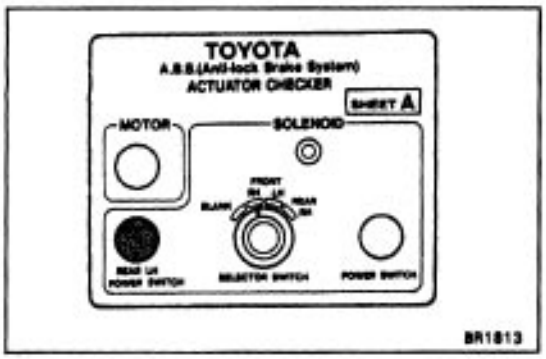
(e) Push the POWER SWITCH, and check that the brake pedal does not go down.
NOTICE: Do not keep the POWER SWITCH pushed down for more than 10 seconds.
(f) Release the switch, and check that the pedal goes down.



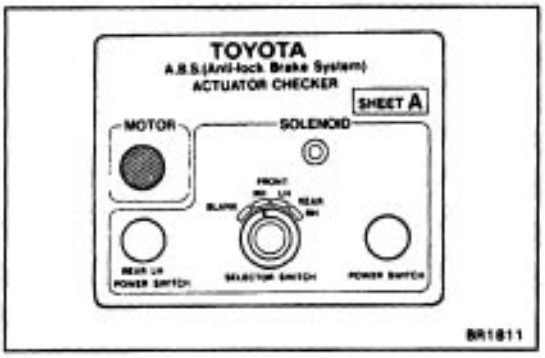
(g) Push and hold in the MOTOR switch for a few sec onds, and check that the pedal returns.
(h) Release the brake pedal.



(i) Push and hold in the MOTOR switch for a few sec–onds.
(j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.
(k) Release the brake pedal.



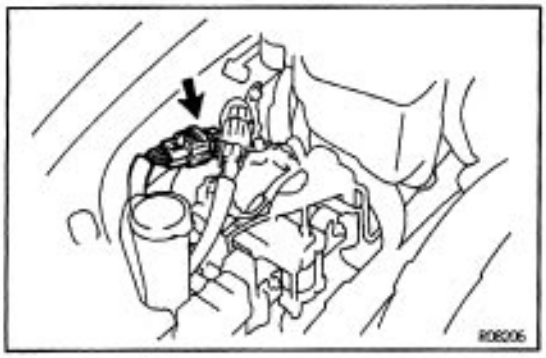
(l) Turn the selector switch to ”FRONT LH” position.
(m) Repeat (c) to 6), checking the actuator operation sim–ilarly.
(n) Similarly, inspect ”REAR RH” and ”REAR LH” position.
HINT: When inspecting ”REAR LH” position, push the REAR LH switch instead of the POWER SWITCH, and you can inspect in any selector switch position.



(o) Push and hold in the MOTOR switch for a few sec–onds.
(p) Stop the engine.

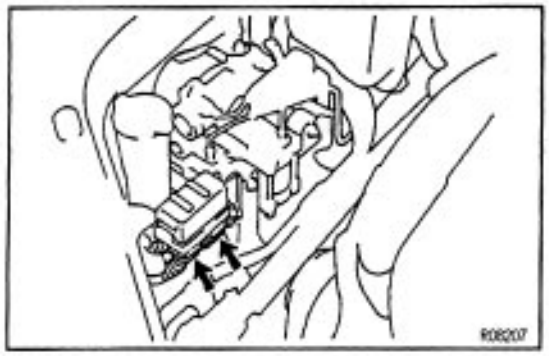
5. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Remove the ”SHEET A” (SST) and disconnect the actuator checker (SST) and sub–wire harness (SST) from the actuator, control relay and body side wire harness.
SST 09990–00150, 09990–00200, 09990–00210 , 09990–00163



6. CONNECT CONNECTORS

(a) Connect the 2 connectors to the control relay.



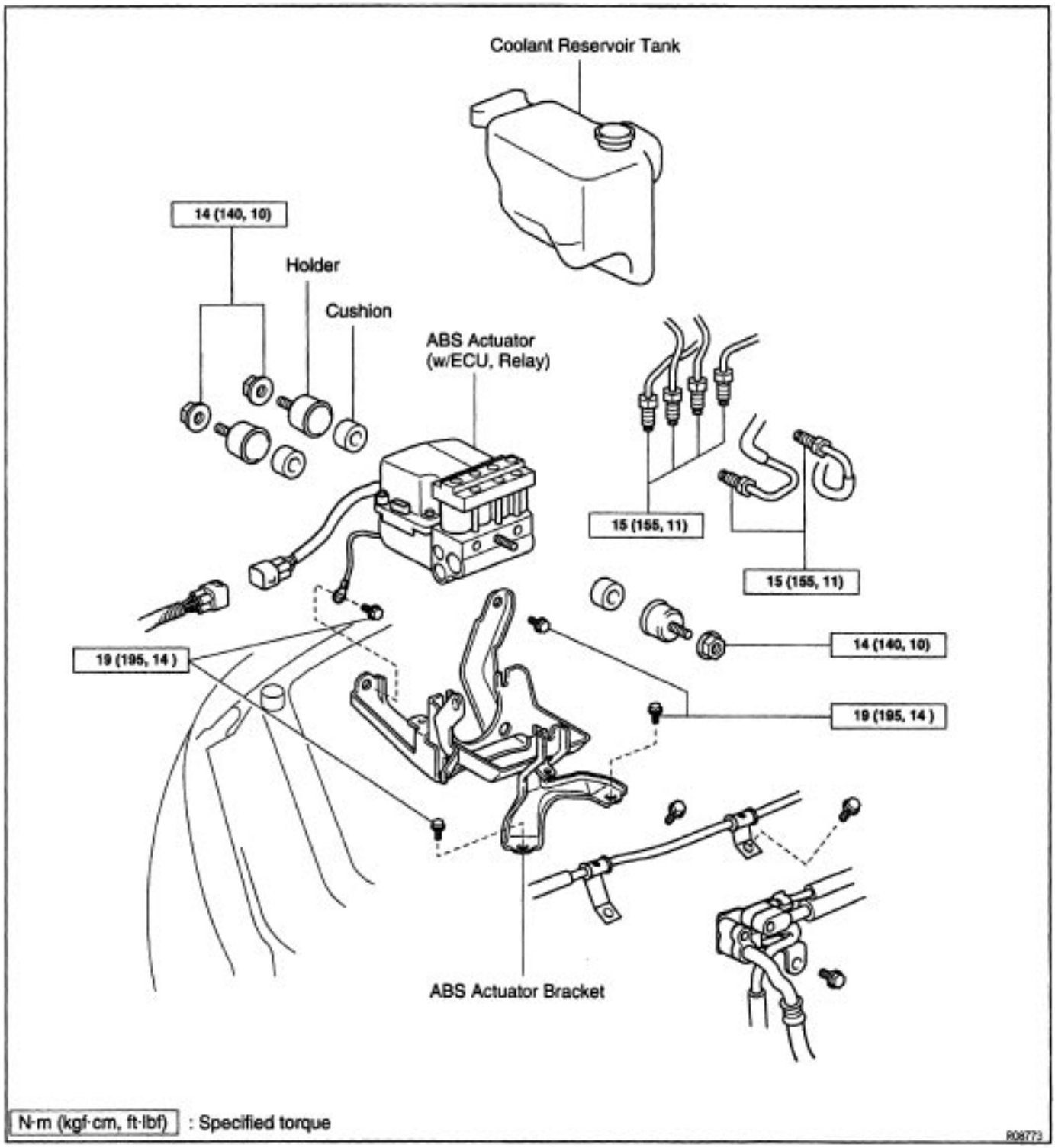
(b) Connect the connector to the actuator.

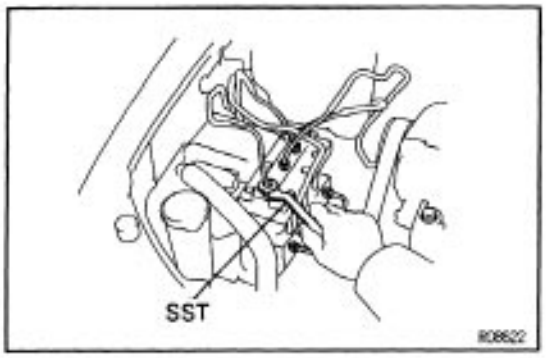
7. CLEAR DIAGNOSTIC TROUBLE CODES
(See page BR–94**)**

ABS ACTUATOR (TMM Made Vehicle BOSCH ABS)

ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





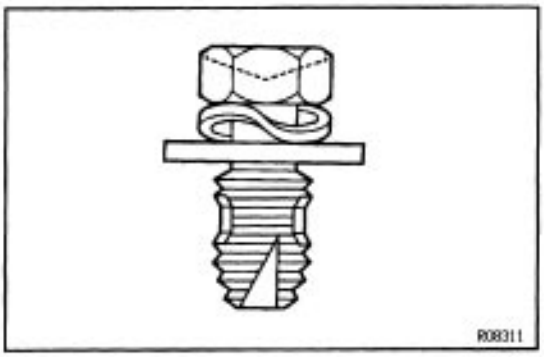
MAIN POINTS OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT BRAKE LINE

Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



2. INSTALL ABS ACTUATOR

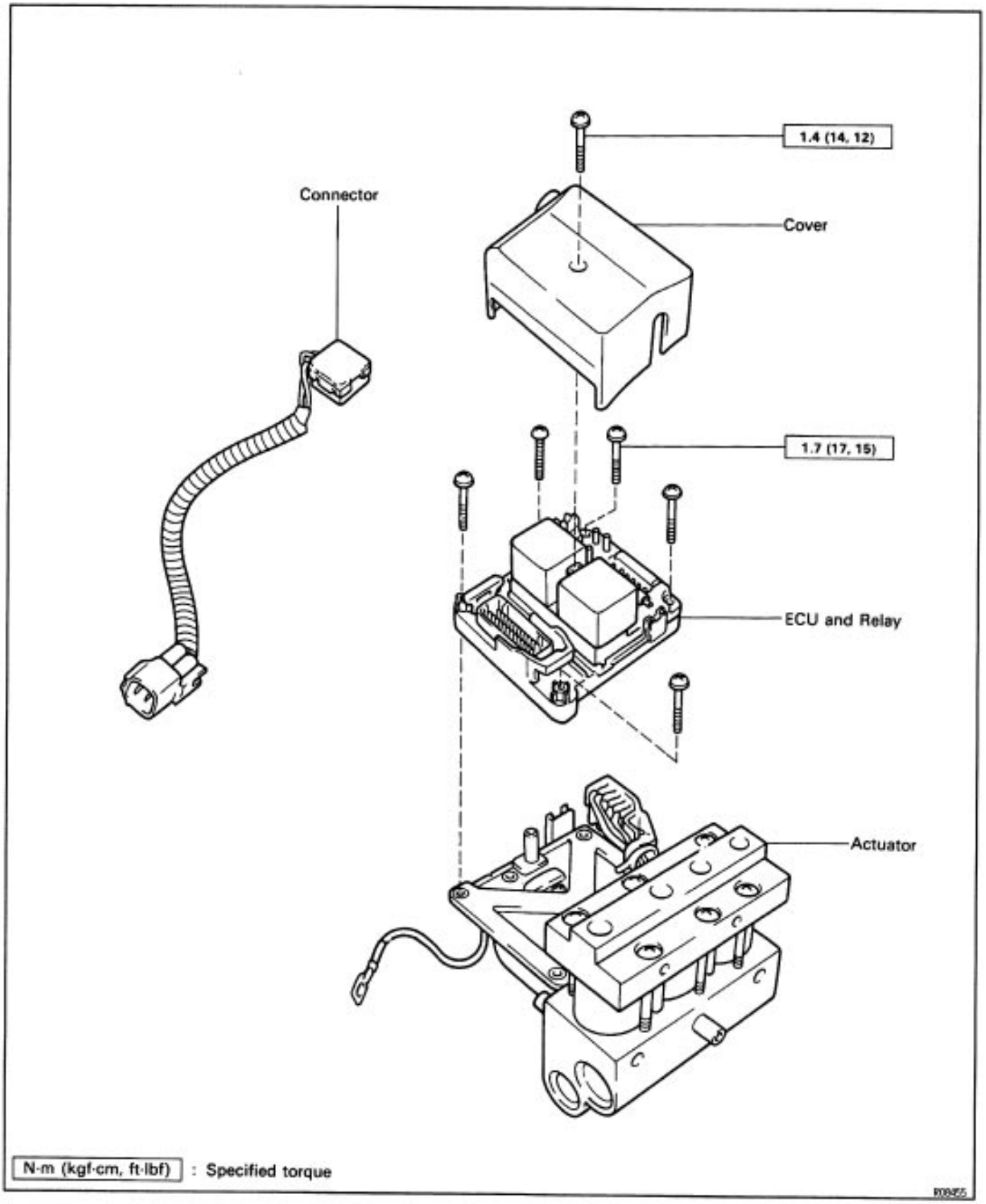
NOTICE: Use the bolts which have a notch to securely ground the actuator ground wire.

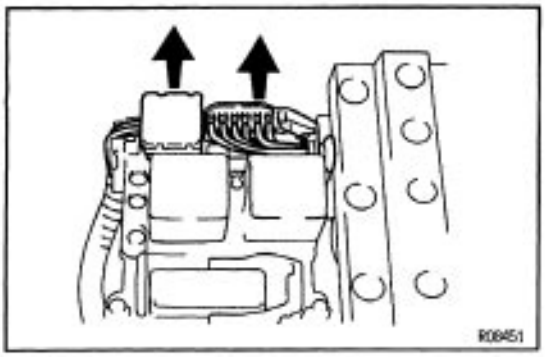
3. BLEED BRAKE SYSTEM

(See page BR–9)

ABS ACTUATOR DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





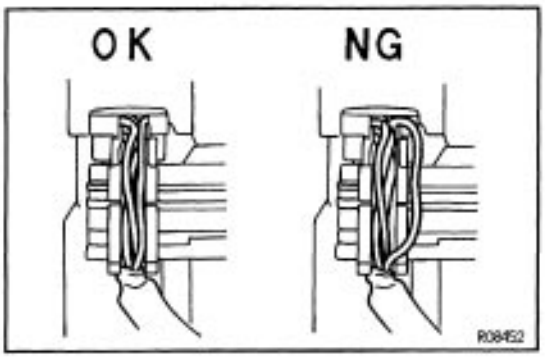
MAIN POINTS OF DISASSEMBLY AND ASSEMBLY

1. REMOVE AND INSTALL COVER

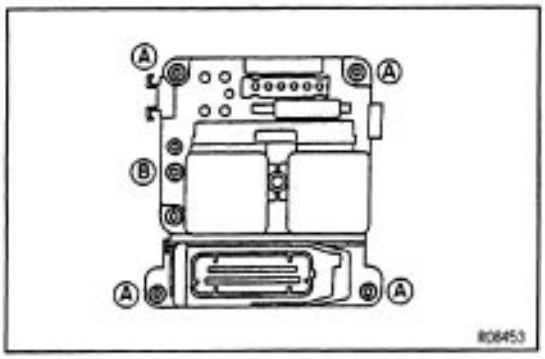
Using a T15 torx wrench, loosen and tighten the screw.

Torque: 1.4 N–m(14 kgf–cm, 12 in.lbf)

2. DISCONNECT AND CONNECT 4–PIN AND 6–PIN CONNECTORS



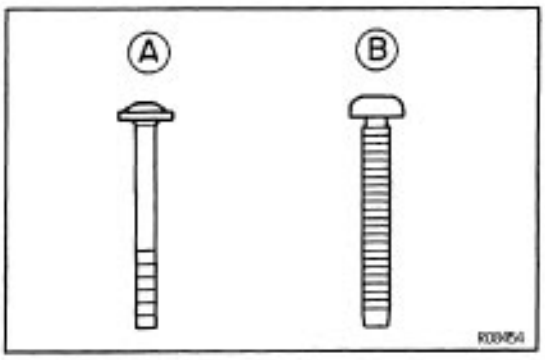
NOTICE: When installing, place the 4–pin connector's cables into the cable guide.



3. REMOVE AND INSTALL ECU

Using T15 and T20 torx wrenches, loosen and tighten the 5 screws.

Torque: 1.7 N–m(17 kgf–cm, 15 in.–lbf)



NOTICE: There are 2 kinds of screw, so install a correct screw into each hole.

4. PERFORM TEST DRIVE

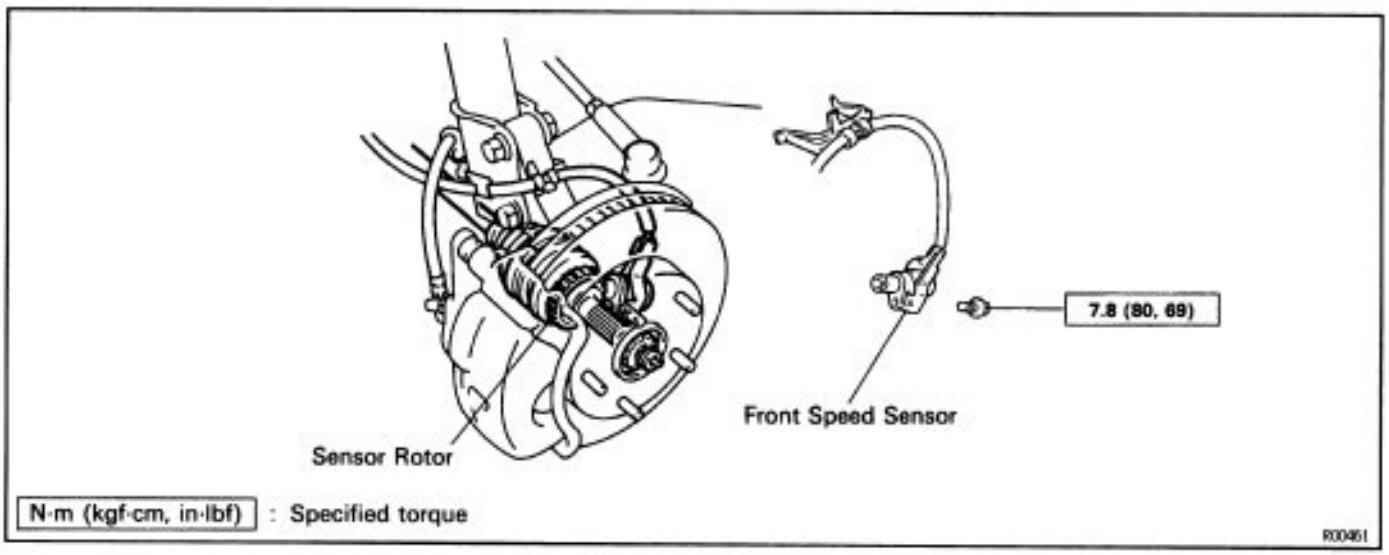
(a) Drive for at least 20 seconds at 30 Km/h (119 mph).

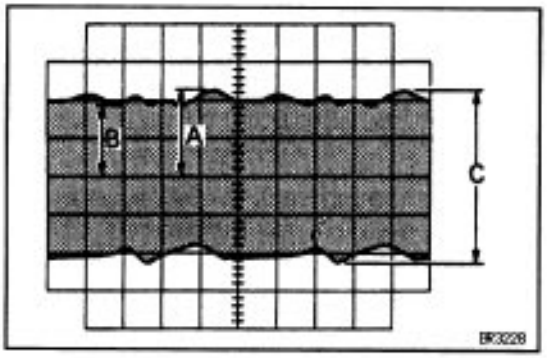
(b) The ABS warning light may not light.

If the ABS warning light lights, read the diagnostic trouble code.

FRONT SPEED SENSOR

COMPONENTS

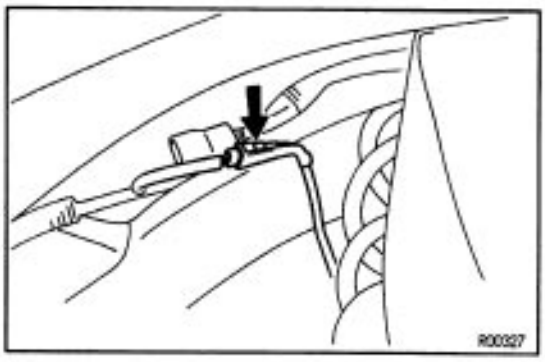




FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLO–SCOPE

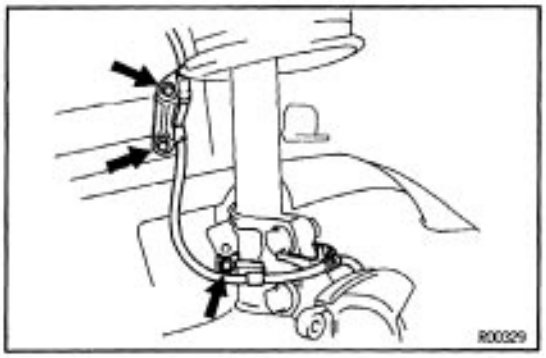
(a) Connect an oscilloscope to the speed sensor connec–tor.
(b) Run the vehicle at 20 km/h (112.4 mph), and inspect speed sensor output wave.
(c) Check that C is 0.5 V or more.
If not as specified, replace the speed sensor.
(d) Check that B is 30% or more of A.
If not as specified, replace the drive shaft.



FRONT SPEED SENSOR REMOVAL

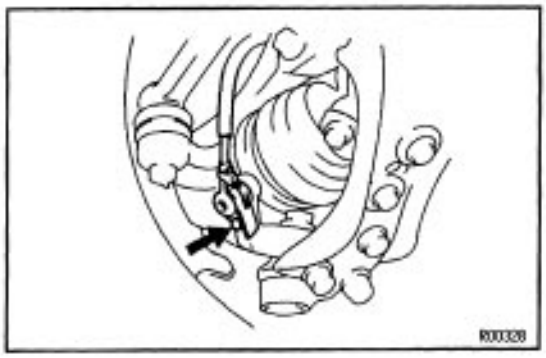
1. DISCONNECT SPEED SENSOR CONNECTOR

(a) Remove the fender shield.
(b) Disconnect the speed sensor connector.



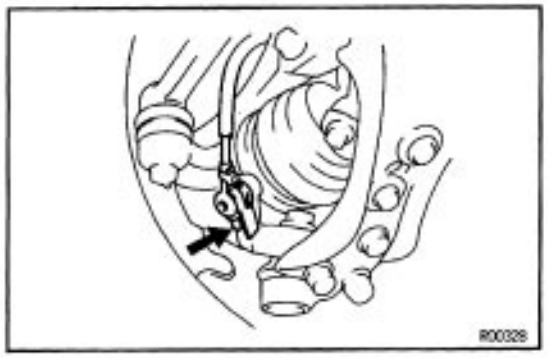
2. REMOVE SPEED SENSOR

(a) Remove the 3 clamp bolts holding the sensor harness to the body and shock absorber_



(b) Remove the speed sensor from the steering knuckle.

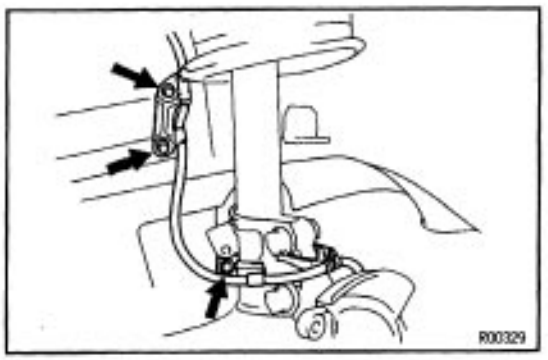
FRONT SPEED SENSOR INSTALLATION ¿¿"–07



1. INSTALL SPEED SENSOR

Install the speed sensor to the steering knuckle.

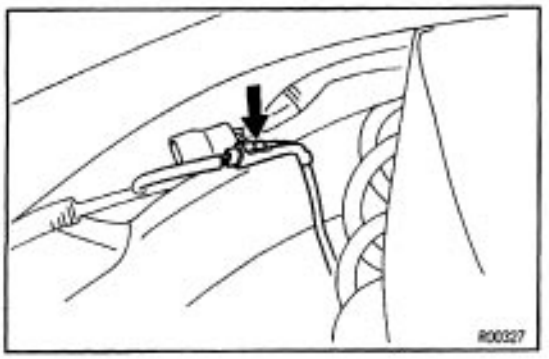
Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)



2. CONNECT SPEED SENSOR CONNECTOR

(a) Install the sensor harness.

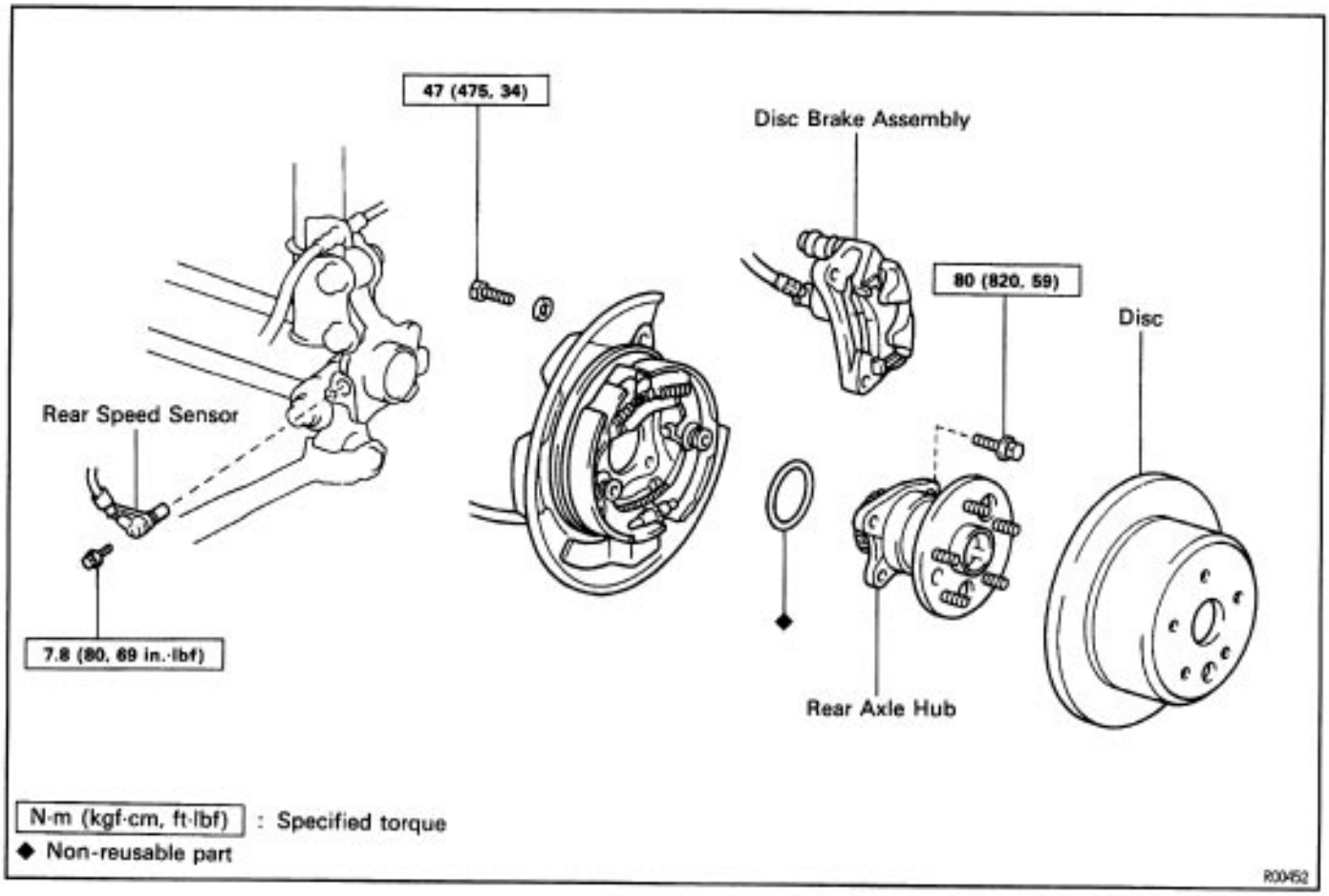
Torque: 5.4 N–m (55 kgf–cm. 48 in.–lbf)

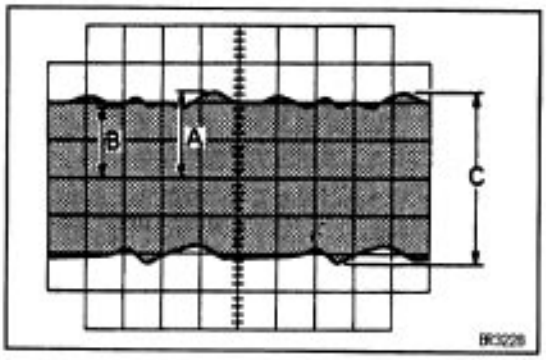


(b) Connect the speed sensor connector.

REAR SPEED SENSOR

COMPONENTS





REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

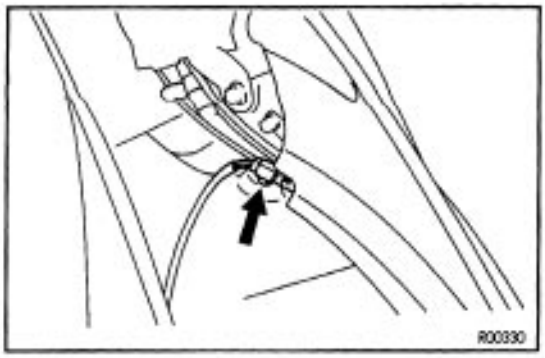
INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLO–SCOPE

(a) Connect an oscilloscope to the speed sensor connec–tor.

(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.

(c) Check that C is 0.5 V or more.
If not as specified, replace the speed sensor.

(d) Check that B is 40 96 or more of A.
If not as specified, replace the rear axle hub.

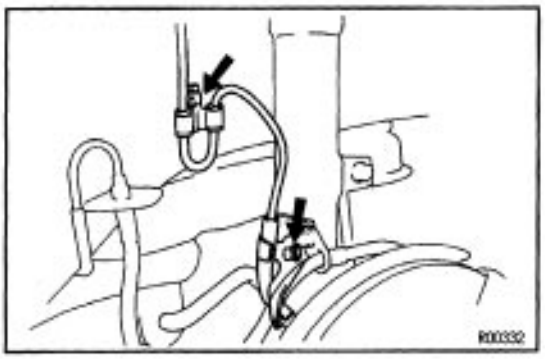


REAR SPEED SENSOR REMOVAL

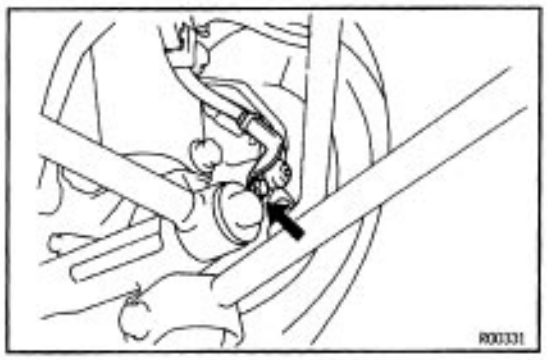
1. DISCONNECT SPEED SENSOR CONNECTOR

(a) Remove the seat cushion and side seatback.

(b) Disconnect the speed sensor connector, and pull out the sensor wire harness with the grommet.



(c) Remove the 2 clamp bolts holding the sensor wire harness to the body and shock absorber.



2. REMOVE SPEED SENSOR

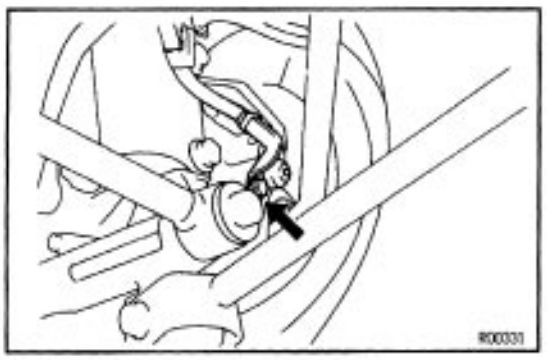
Remove the speed sensor from the axle carrier.

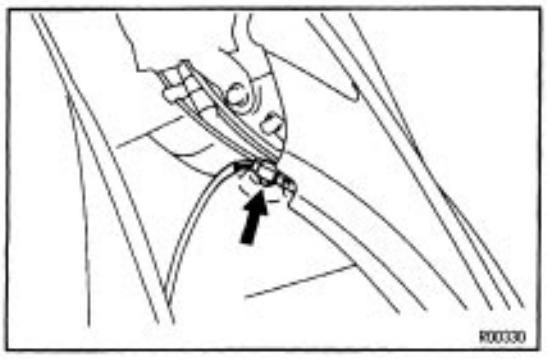
REAR SPEED SENSOR INSTALLATION

1. INSTALL SPEED SENSOR

Install the speed sensor to the axle carrier.

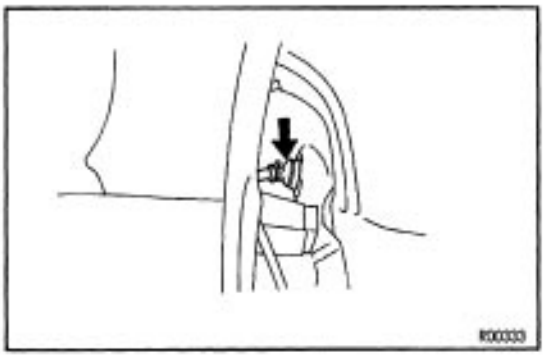
Torque: 7.8 N–m (80 kgf–cm, 69 in.lbf)



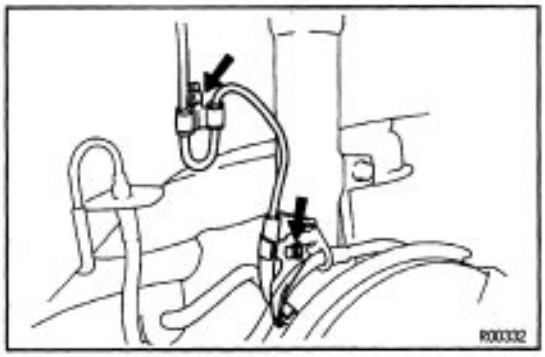


2. CONNECT SPEED SENSOR CONNECTOR

(a) Pass the sensor harness through the body panel hole, and connect the connector.



(b) install the grommet securely.



(c) Install the sensor harness.
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

–MEMO–

TROUBLESHOOTING (TMC Made Vehicle NIPPONDENSO ABS)

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following pages.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

If the ABS warning light lights up, and the ABS does not operate, the ECU stores diagnostic trouble codes corresponding to the problem in memory.

Before confirming the trouble, first check the diagnostic trouble codes to see if there are any malfunction codes stored in memory. When there are malfunction codes, make a note of them, then clear them and proceed to ”3” Problem Symptom Confirmation”.

(3) PROBLEM SYMPTOM CONFIRMATION, (4) SYMPTOM SIMULATION

Confirm the problem symptoms. If the problem does not recur, simulate the problem by initially checking the circuits indicated by the diagnostic trouble code in step “2” , using ”Problem simulation method”.

(5) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes.

If a malfunction code is output, proceed to ” 6” Diagnostic Trouble Code Chart”. If the normal code is output, proceed to ” 7” Problem Symptoms Chart”.

Be sure to proceed to ” 6” Diagnostic Trouble Code Chart” after steps “2” and “3” are completed. If troubleshooting is attempted only by following the malfunction code stored in the memory, errors could be made in the diagnosis.

(6) DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

(7) PROBLEM SYMPTOMS CHART

If the normal code is confirmed in the diagnostic trouble code check, perform inspection in accordance with the inspection order in the problem symptoms chart.

(8) CIRCUIT INSPECTION

Proceed with diagnosis of each circuit in accordance with the inspection order confirmed in 6 and 7 . Determine whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECU.

(9) SENSOR CHECK

Use the ABS warning light to check if each of the signals from the speed sensors are being input correctly to the ECU. Instructions for this check are given in the circuit inspection.

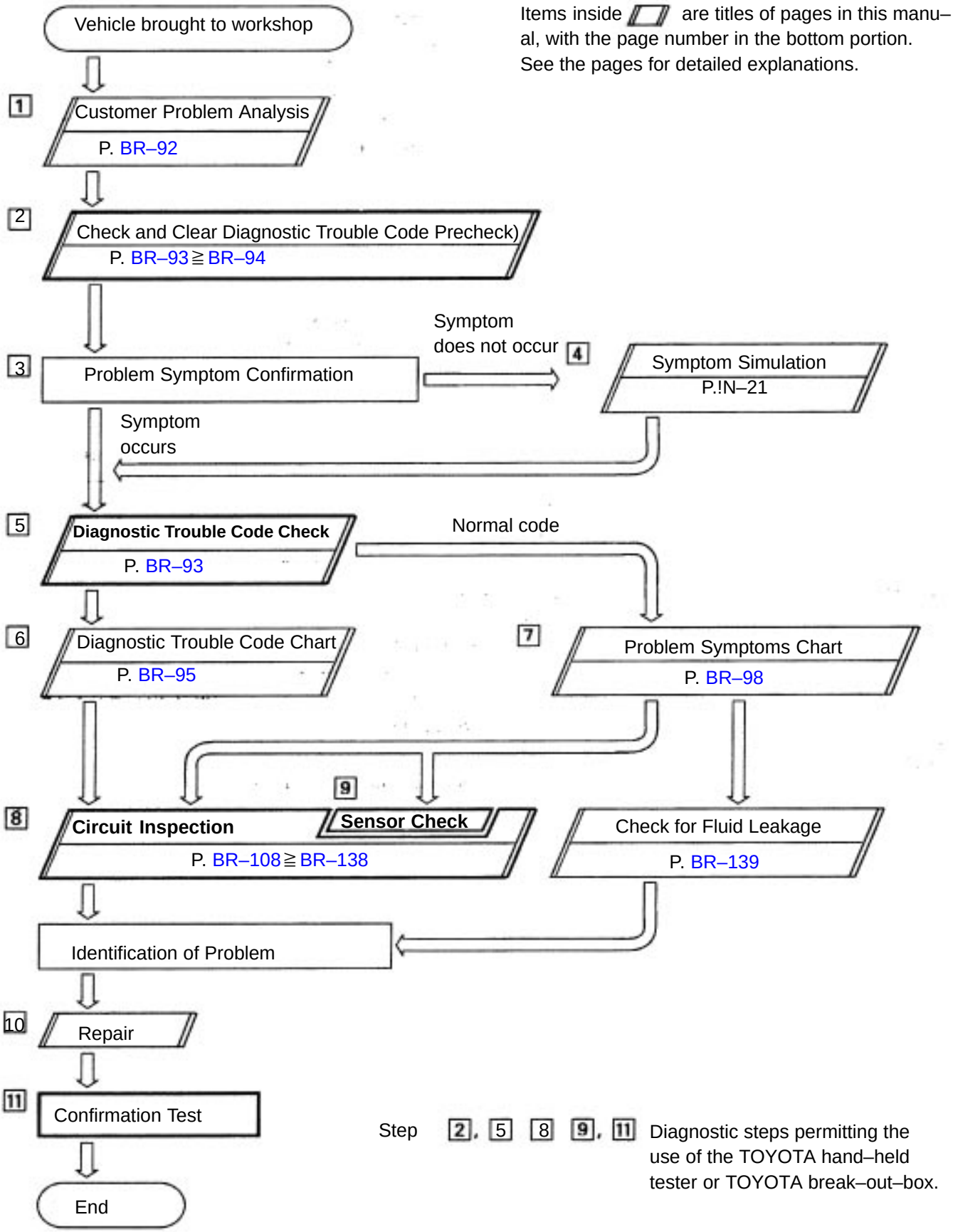
(10) REPAIRS

After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual.

(11) CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive to make sure the entire ABS system is operating correctly.

Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the pages for detailed explanations.



Step 2, 5, 8, 9, 11 Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ABS Check Sheet

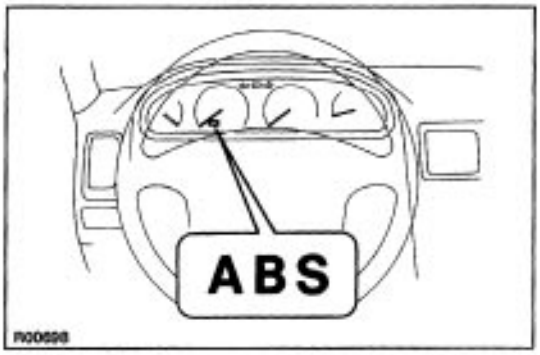
Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

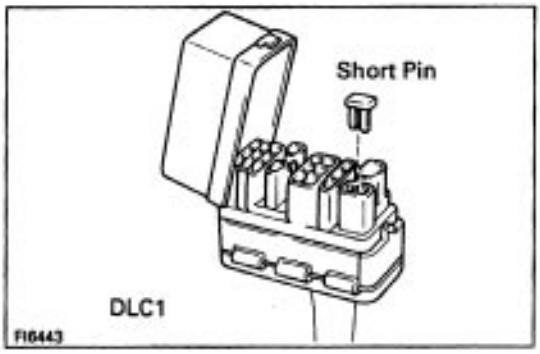
Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)



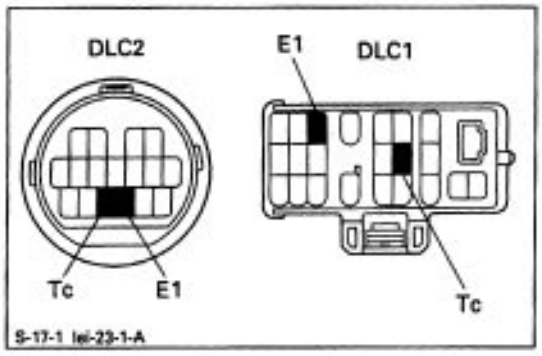
DIAGNOSIS SYSTEM INDICATOR CHECK

When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.
HINT: If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page BR–130).



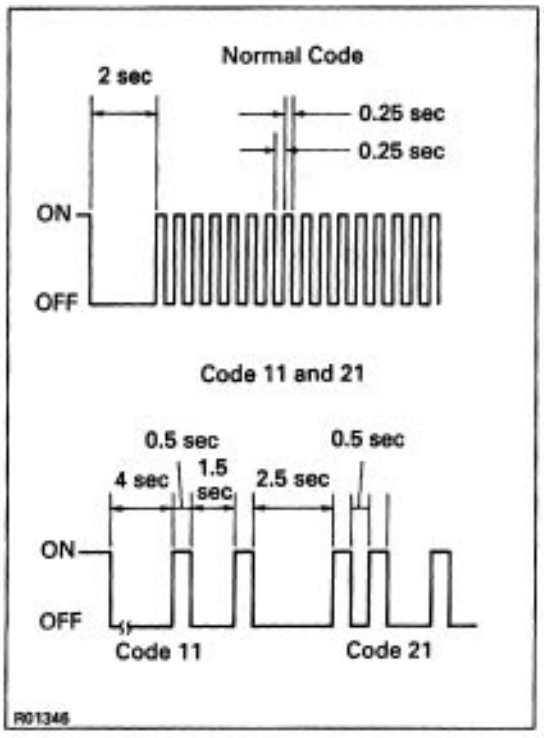
DIAGNOSTIC TROUBLE CODE CHECK

1. Disconnect the Short Pin from DLC1.



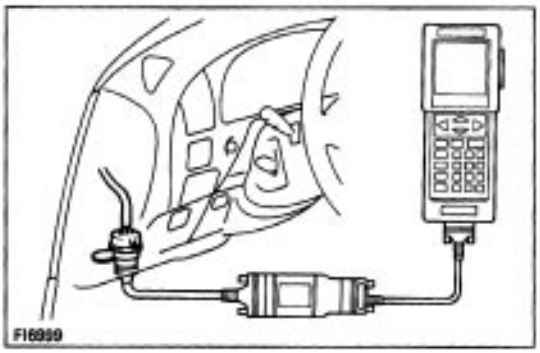
2. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
3. Turn the ignition switch to ON.
4. Read the diagnostic trouble code from the ABS warning light on the combination meter.

HINT: If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page BR–134 or BR–130).



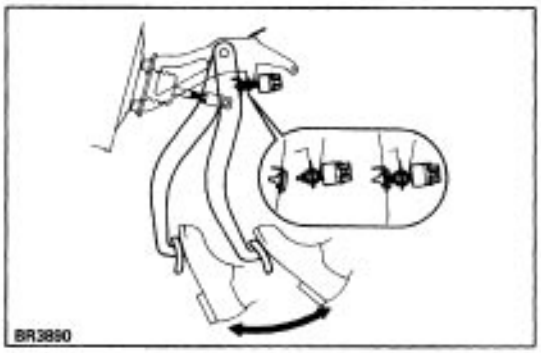
As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

5. Codes are explained in the code table on page BR–95.
6. After completing the check, disconnect terminals Tc and E1, and turn off the display.
   If 2 or more malfunctions are indicated at the same time, the–lowest numbered diagnostic trouble code will be displayed first. .



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

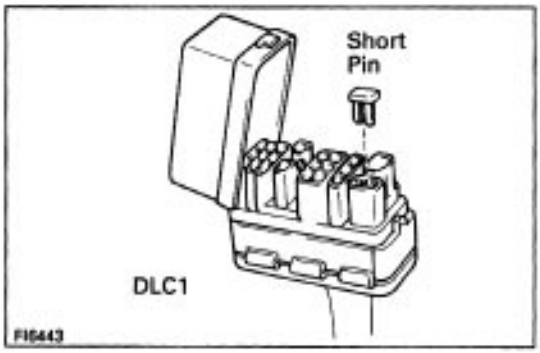
1. Hook up the Toyota hand–held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.

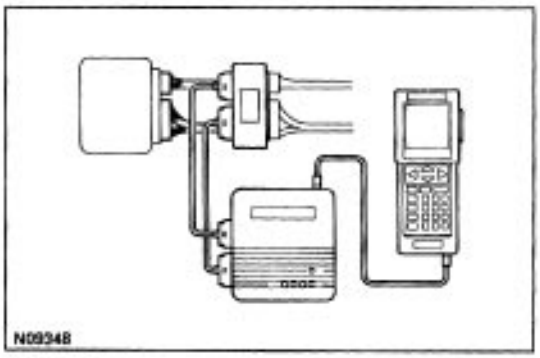


DIAGNOSTIC TROUBLE CODE CLEARANCE

1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1 and remove the short pin from DLC1.
   SST 09843–18020
2. IG switch ON.
3. Clear the diagnostic trouble codes stored in ECU by de–pressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the SST from the terminals of DLC2 or DLC1.
6. Connect the Short Pin to DLC1

HINT: Cancellation can also be done by removing the ECU–13 fuse, but in this case, other memory systems will also be cancelled out.





ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

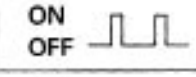
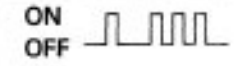
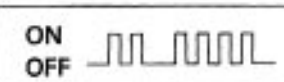
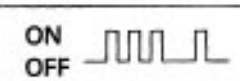
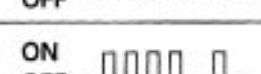
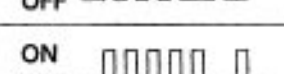
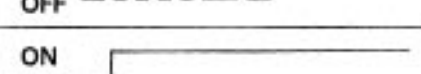
1. Hook up the Toyota break–out–box and Toyota hand–held tester to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.

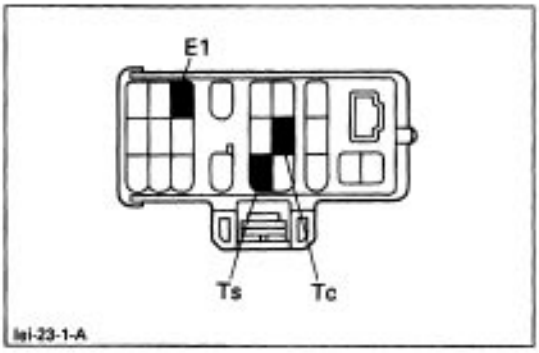
HINT: Toyota hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the Toyota hand–held tester/Toyota break–out–box operator's manual for further details.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code.

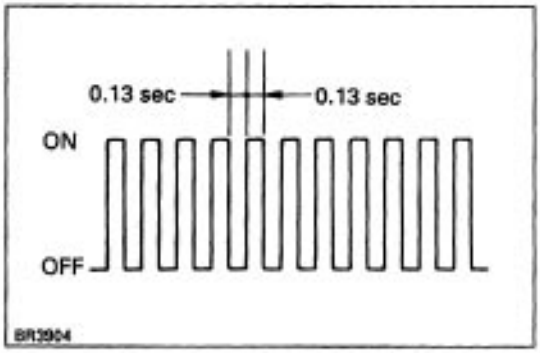
HINT: Using SST 09843–18020, connect the terminals Tc and E1, and remove the short pin.

Code	ABS Warning Light Blinking Pattern	Diagnosis
11		Open circuit in ABS control (solenoid) relay circuit
12		Short circuit in ABS control (solenoid) relay circuit
13		Open circuit in ABS control (motor) relay circuit
14		Short circuit in ABS control (motor) relay circuit
21		Open or short circuit in 3–position solenoid circuit for right front wheel
22		Open or short circuit in 3–position solenoid circuit for left front wheel
23		Open or short circuit in 3–position solenoid circuit for right rear wheel
24		Open or short circuit in 3–position solenoid circuit for left rear wheel
31		Right front wheel speed sensor signal malfunction
32		Left front wheel speed sensor signal malfunction
33		Right rear wheel speed sensor signal malfunction
34		Left rear wheel speed sensor signal malfunction
35		Open circuit in left front or right rear speed sensor circuit
36		Open circuit in right front or left rear speed sensor circuit
37		Faulty rear speed sensor rotor
41		Low battery positive voltage or abnormally high battery positive voltage
51		Pump motor is locked Open in pump motor ground
Always ON		Malfunction in ECU



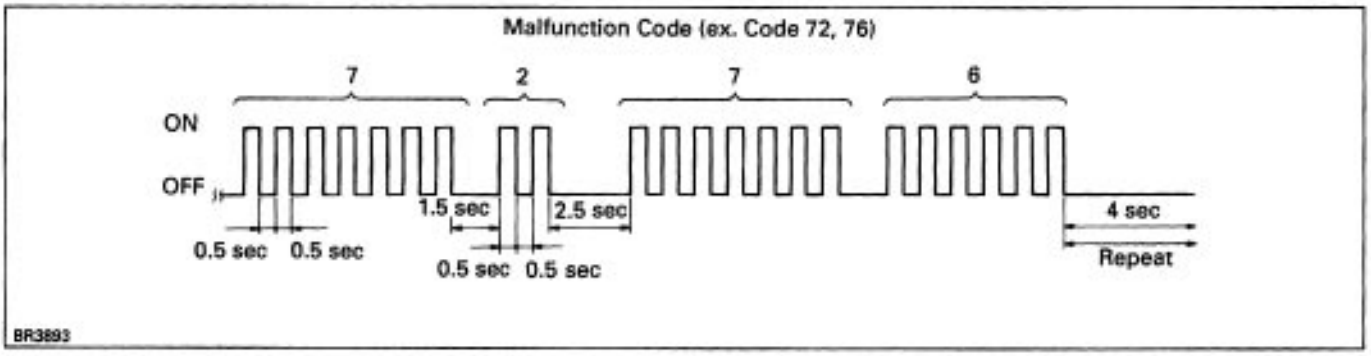
SPEED SENSOR SIGNAL CHECK

1. Turn the ignition switch to OFF.
2. Using SST, connect terminals Ts and E1 of DLC1.
   SST 09843–18020
3. Start the engine.

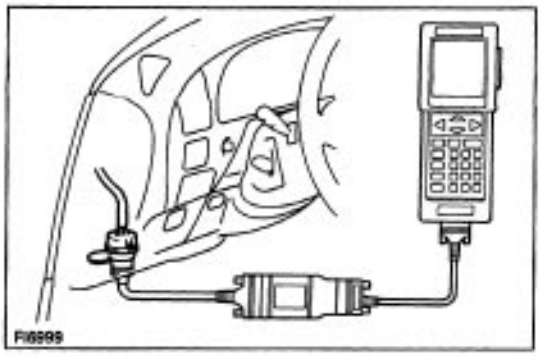


4. Check that the ABS warning light blinks
   HINT: If the ABS. warning light does not blink, inspect the ABS warning light circuit (See page BR–130).
5. Drive vehicle straight forward.
   HINT: Drive vehicle faster than 45 km/h (28 mph) for several seconds.
6. Stop the vehicle.
7. Using SST, connect terminals Tc and E1 of DLC1.
   SST 09843–18020
8. Read the number of blinks of the ABS warning light.
   HINT: See the list of diagnostic trouble codes shown on the next page.

If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



9. After performing the check, disconnect terminals Ts and E1, Tc and E1 of DLC1, and ignition switch turned off.



DIAGNOSTIC TROUBLE CODE CHECK

USING TOYOTA HAND–HELD TESTER

1. Perform steps 1.–6. on the previous page.
2. Hook up the Toyota hand–held tester to the DLC2.
3. Read the diagnostic trouble codes by following the prompts on the tester screen.

Please refer to the Toyota hand–held tester operator's manual for further details.

Diagnostic Trouble Code of Speed Sensor Check Function

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor

PROBLEM SYMPTOMS CHART

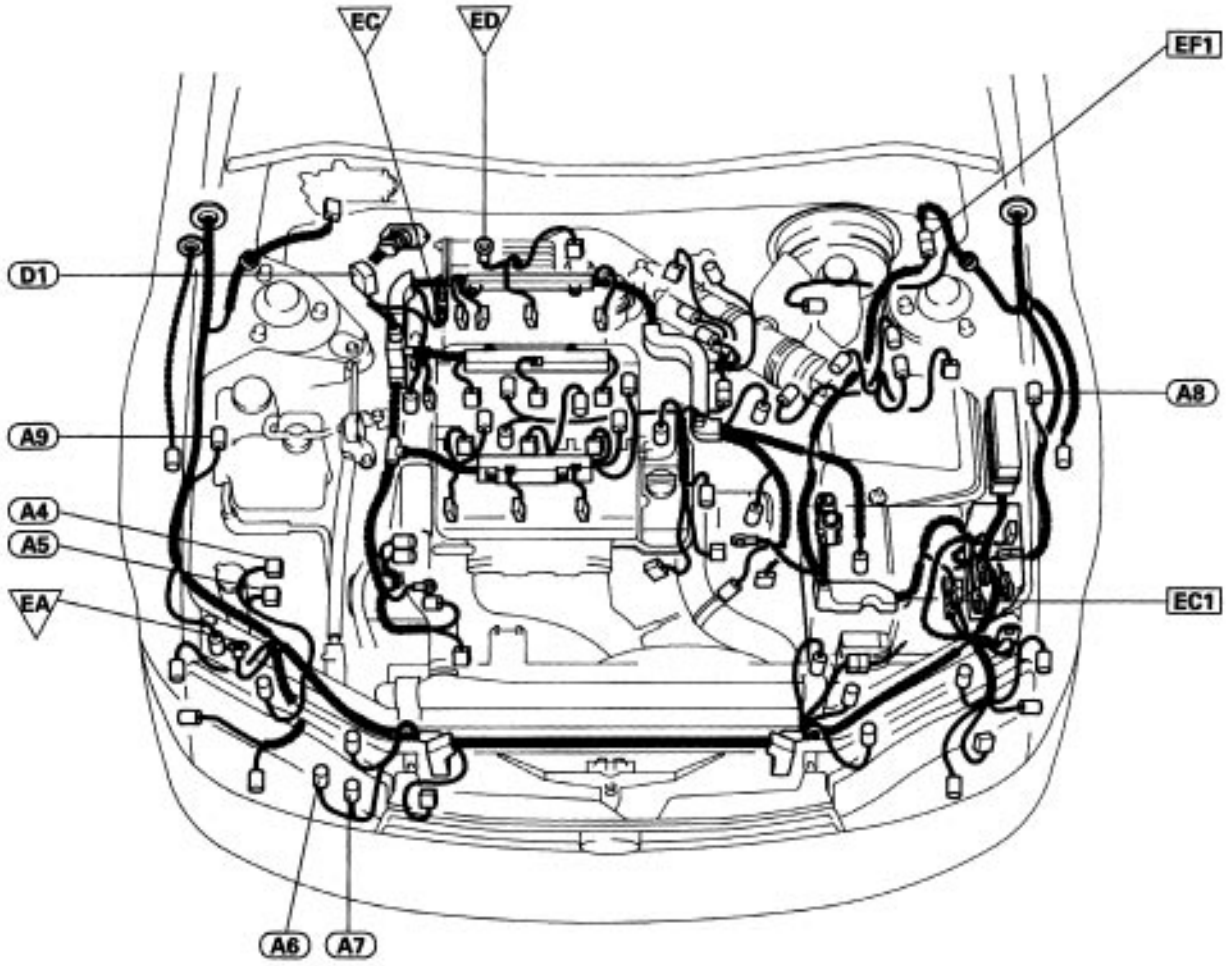
If a normal code is displayed during the diagnostic trouble code check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
A6S does not operate.	Only when 1.–4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (see page BR–139).	**BR–93** **BR–123** **BR–119** **BR–77**
A6S does not operate efficiently.	Only when 1.–4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (see page BR–139).	**BR–93** **BR–119** **BR–128** **BR–77**
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	**BR–130**
Diagnostic trouble code check cannot be performed.	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	**BR–130** **BR–134**
Speed sensor signal check cannot be performed.	1. Ts terminal circuit. 2. ABS ECU.	**BR–137**

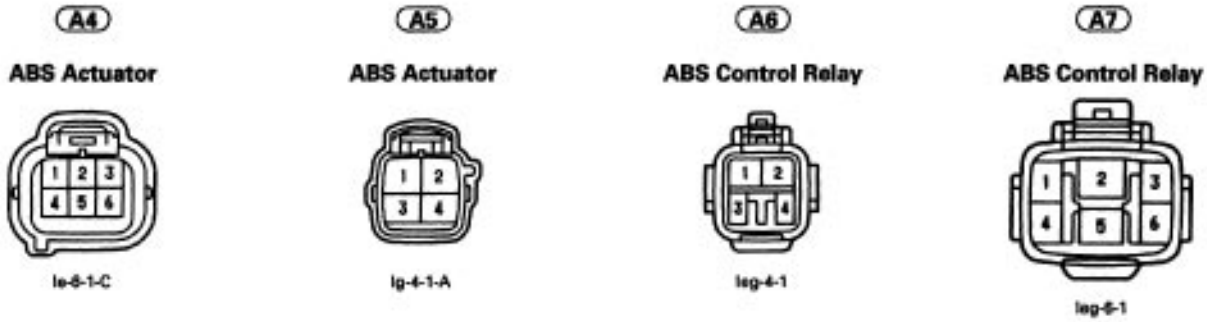
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1MZ–FE Engine:



N09612



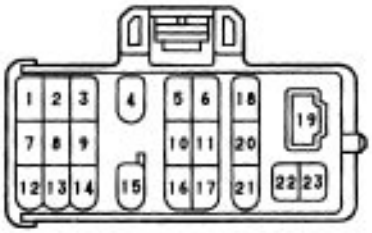
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

le-2-1-T

D1

DLC1



lei-23-1

EC1

lef-8-1

lef-8-2

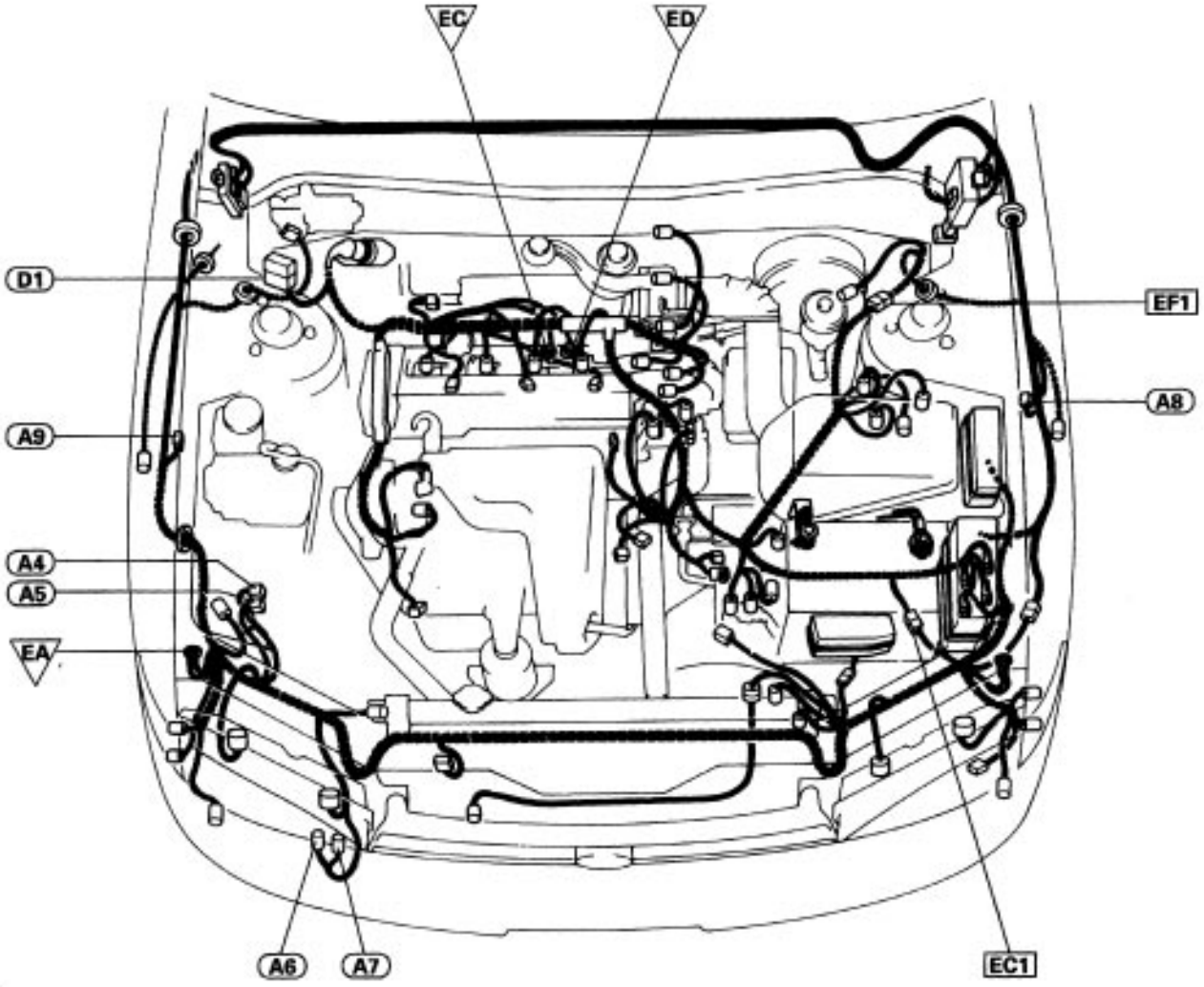
EF1

lfg-4-1

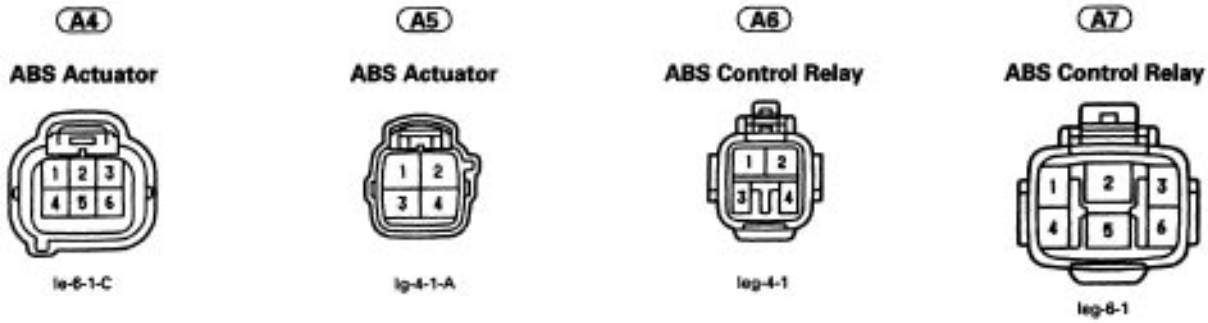
lfg-4-2

Location of Connectors in Engine Compartment

5S–FE Engine:



N09613



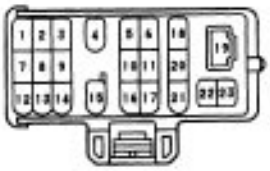
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

le-2-1-T

D1

DLC1



lei-23-1-A

EC1

lef-8-1

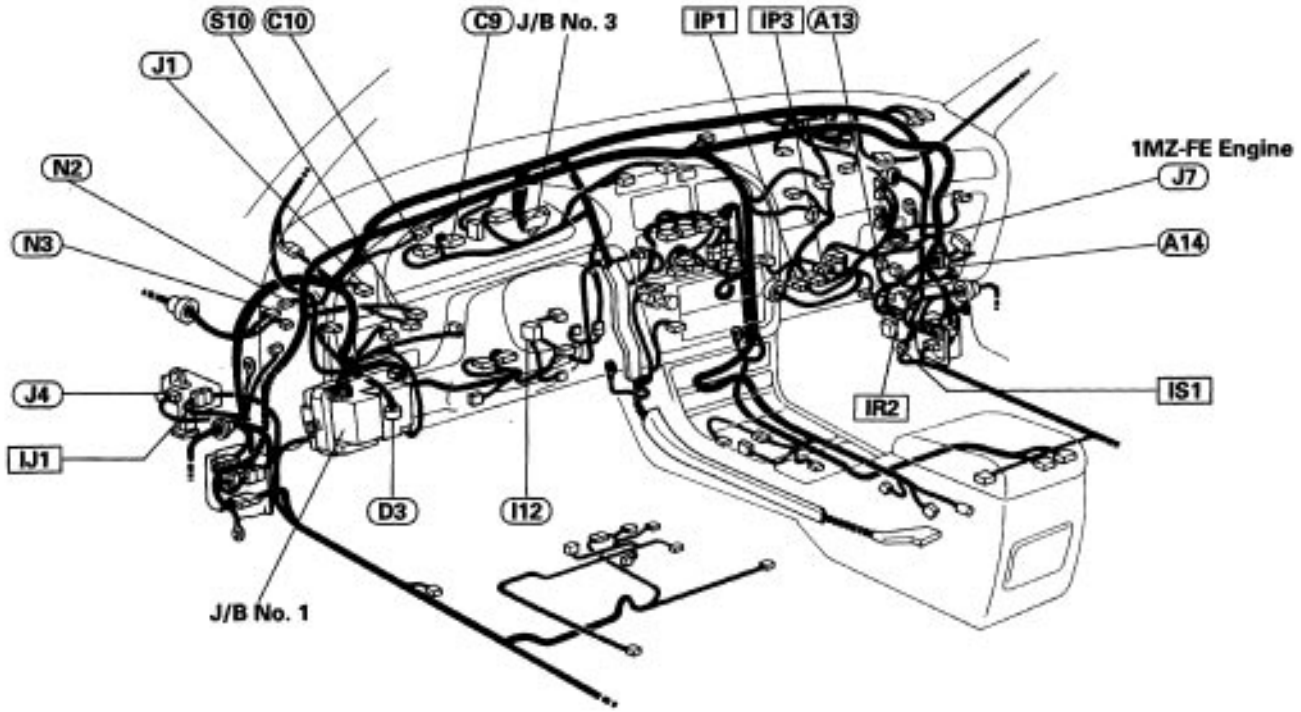
lef-8-2

EF1

lfg-4-1

lfg-4-2

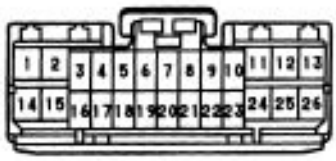
Location of Connectors in Instrument Panel



N09614

A13

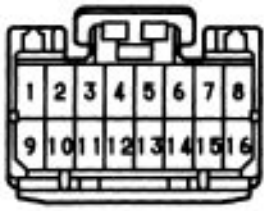
ABS ECU



mn-26-1

A14

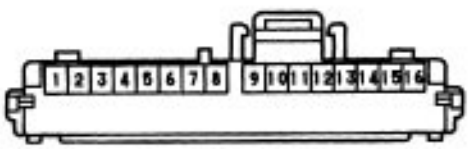
ABS ECU



n-16-1-A

C9

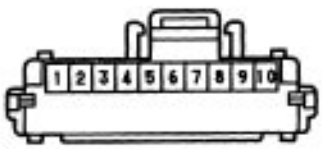
ABS Warning Light



j-16-1

C10

ABS Warning Light



j-10-1

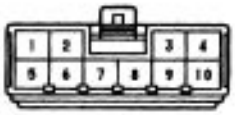
D3

DLC2

S-17-1

I12

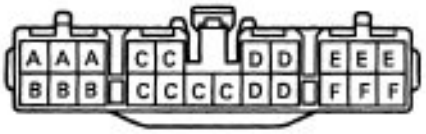
Ignition Switch



g-10-1-B

J1

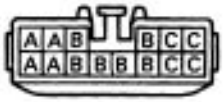
Junction Connector



e-22-1-A

J3

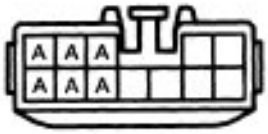
Junction Connector



e-14-1-A

J7 **1MZ-FE**

Junction Connector



e-12-1

N2

Noise Filter

g-2-2

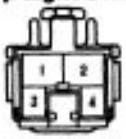
N3

Noise Filter

g-2-1

S10

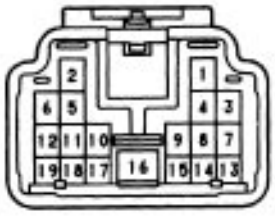
Stop Light Switch



eg-4-1

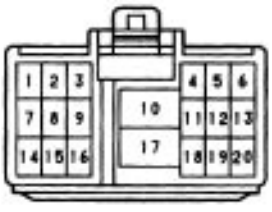
IJ1

eg-19-1

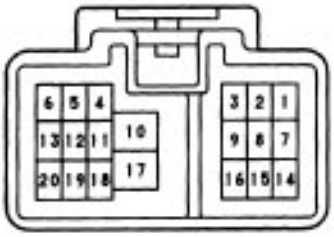


eg-19-2

IP1



e-20-1-B



e-20-2-B

IP3

e4-19-1

ef-19-2

IR2

e-8-1

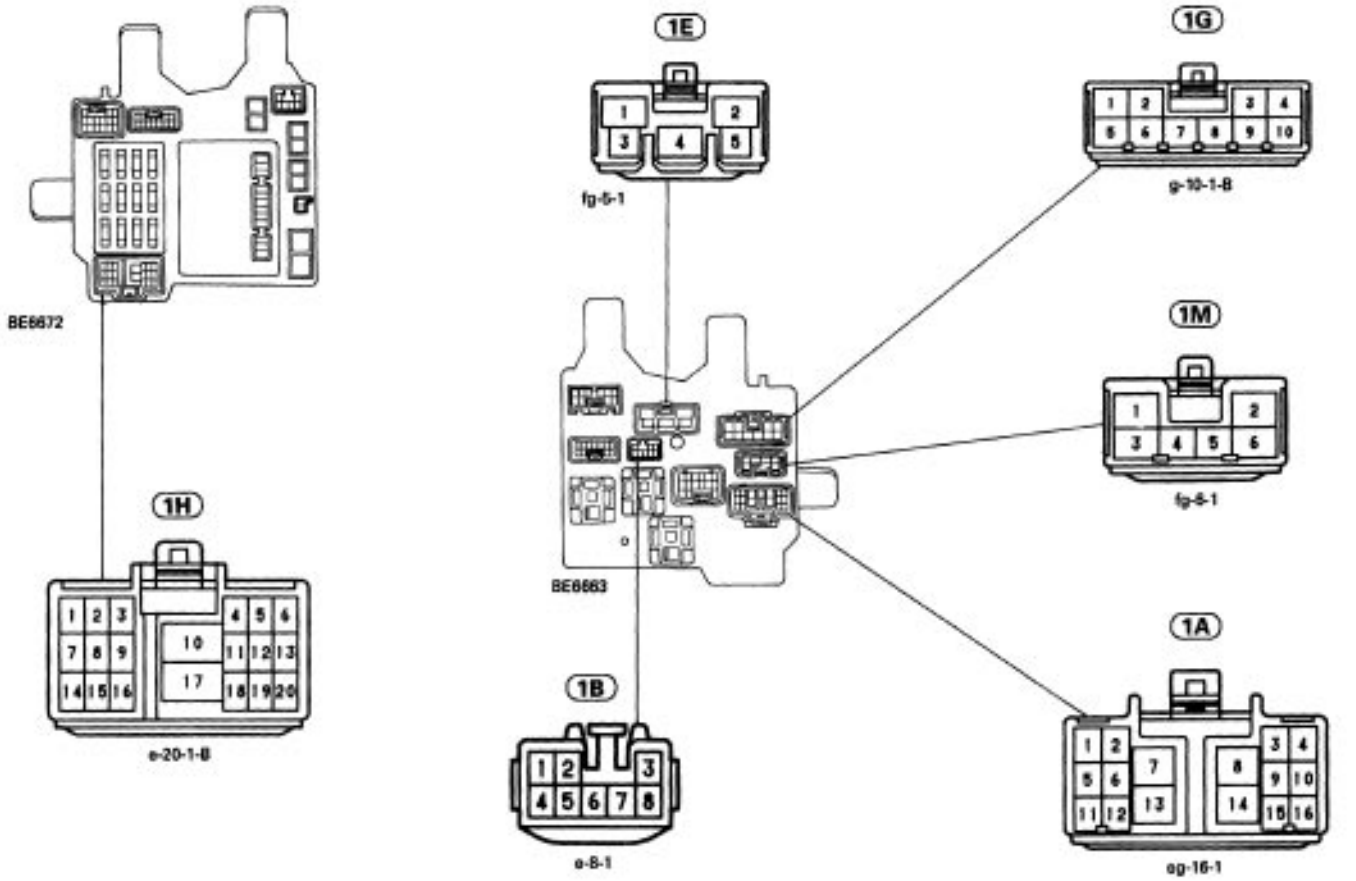
e-8-2

IS1

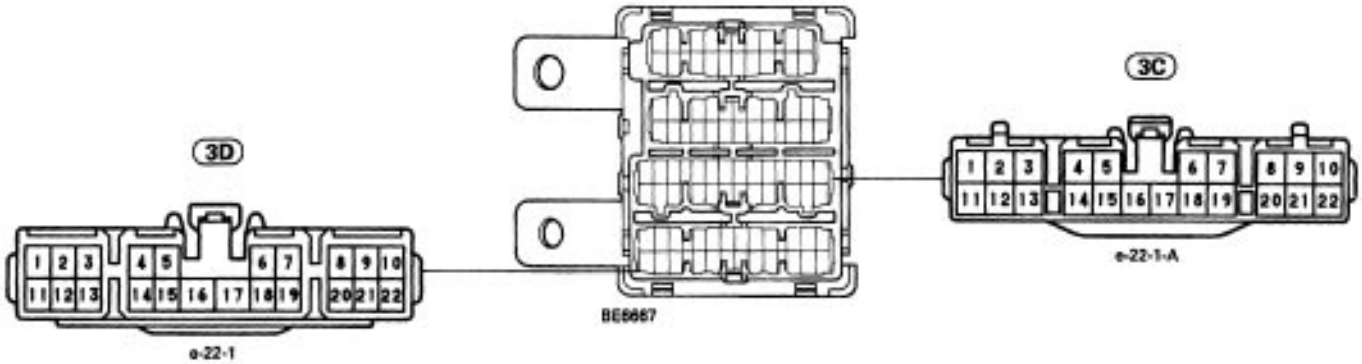
e-6-1

e-6-2

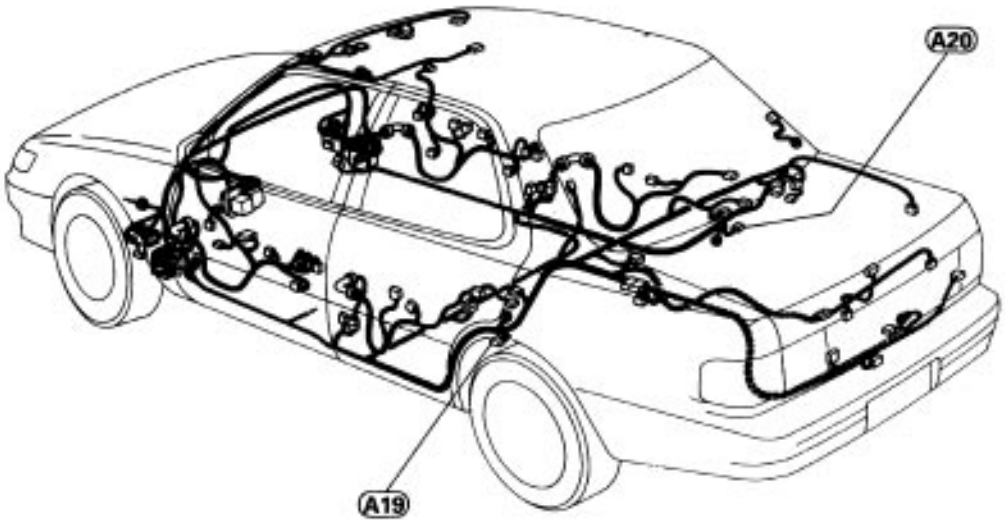
J/B No. 1


BE6872
1H
e-20-1-B
1E
fg-5-1
BE6883
1B
e-8-1
1G
g-10-1-B
1M
fg-6-1
1A
eg-16-1

J/B No. 3


3D
e-22-1
BE6887
3C
e-22-1-A

Location of Connectors in Body



N09615

A19 A20

ABS Speed Sensor Left Rear
ABS Speed Sensor Right Rear

e-2-2-L

CIRCUIT INSPECTION

DTC 11,12 ABS Control (Solenoid) Relay Circuit

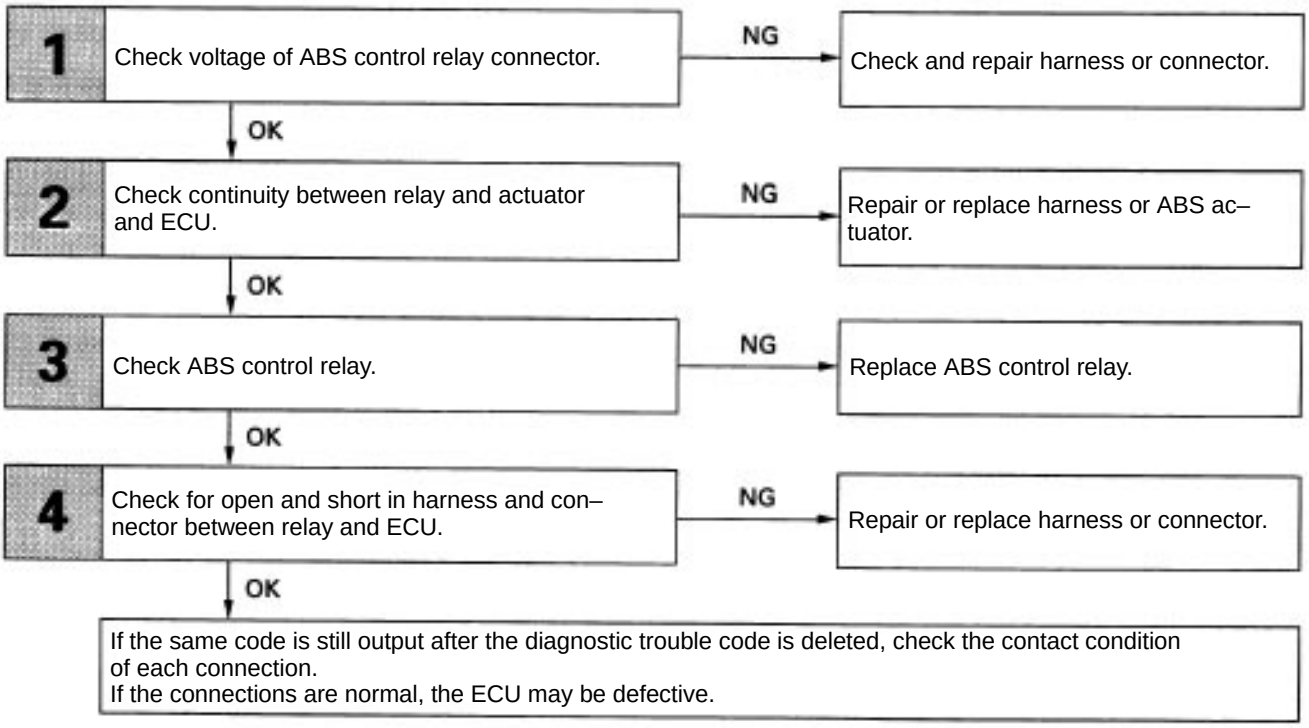
CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

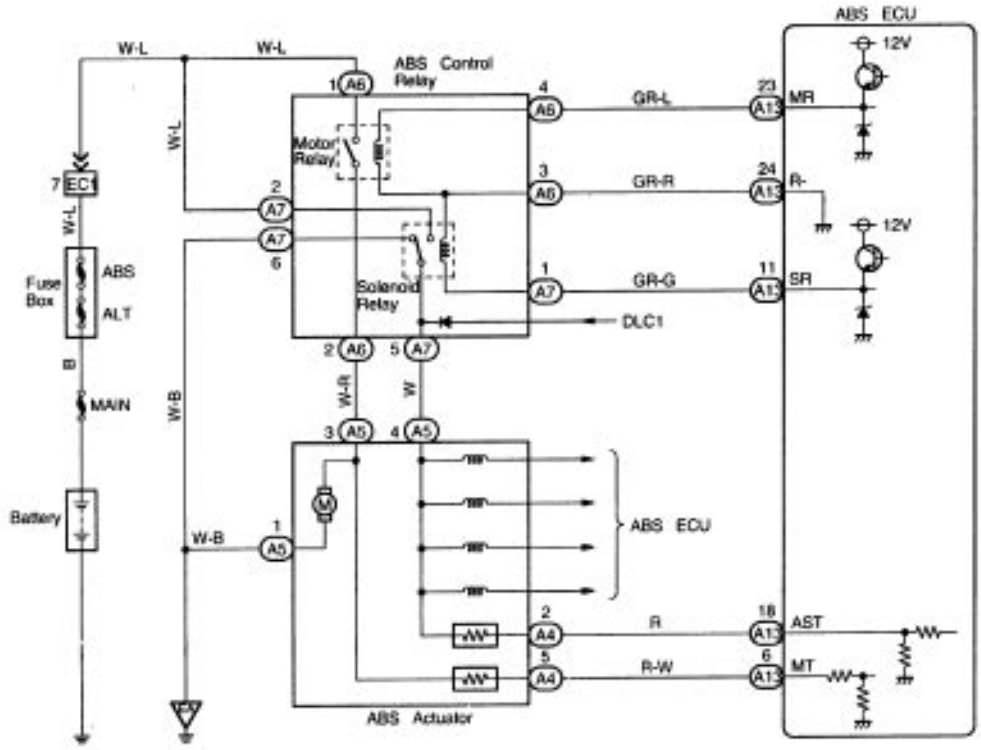
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
11	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) ABS control (solenoid) relay monitor terminal (AST) voltage: 0 V	• ABS control (solenoid) relay. • Open or short in ABS control (solenoid) relay circuit. • ECU.
12	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: 0 V (2) ABS control (solenoid) relay monitor terminal (AST) voltage: Battery positive voltage	• ABS control (solenoid) relay. • B+ short in ABS control (solenoid) relay circuit. • ECU.

Fail safe function: If trouble occurs in the control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

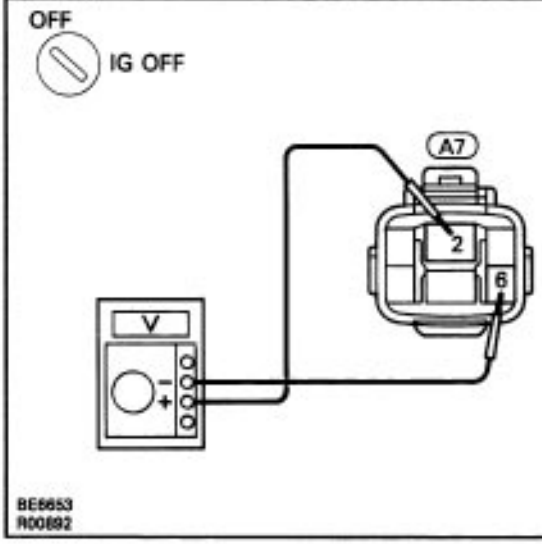


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals (A7) 2 and (A7) 6 of ABS control relay connector.**



P Disconnect the ABS control relay connector.

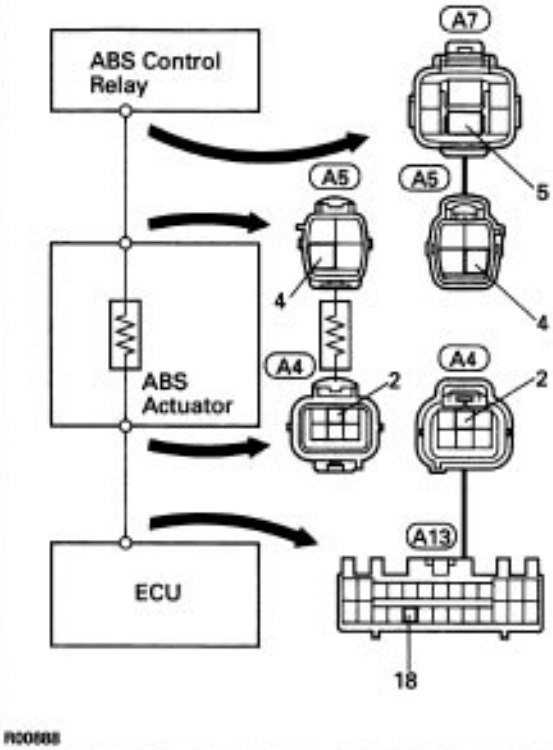
C Measure voltage between terminals (A72) and (A76) of ABS control relay harness side connector.

OK **Voltage: 10–14 V**

OK

NG **Check and repair harness or connector.**

2 **Check continuity between terminals (A7) 5 and (A5) 4, (A5) 4 and (A4) 2, (A4) 2 and (A13) 18.**



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals (A7) 5 and (A5)4, (A5)4 and (A4)2, (A4)2 and (A13)18.

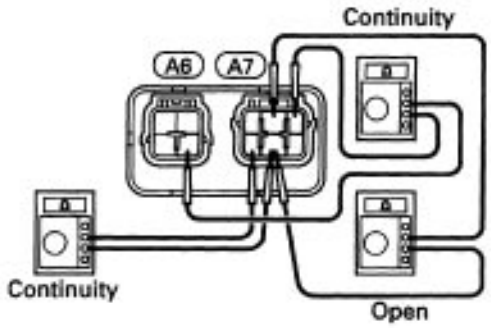
OK **Continuity**

HINT: There is a resistance of 4–6 between terminals (A5) 4 and (A4) 2.

OK

NG **Repair or replace harness or ABS actuator.**

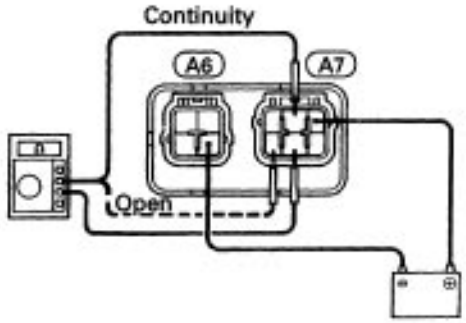
3 Check ABS control relay.



C Check continuity between each terminal of ABS control relay.

OK

Terminals A7 1 and A6 3	Continuity (Reference value 80)
Terminals A7 5 and A7 6	Continuity
Terminals A7 2 and A7 5	Open



C
1. Apply battery positive voltage between terminals A7 1 and A6 3.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals A7 5 a rid A7 6	Open
Terminals A7 2 and A7 5	Continuity

R03889
R03895

OK

NG → **Replace ABS control relay.**

4 Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–28).

OK

NG → **Repair or replace harness or connector.**

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

DTC 13,14 ABS Control (Motor) Relay Circuit

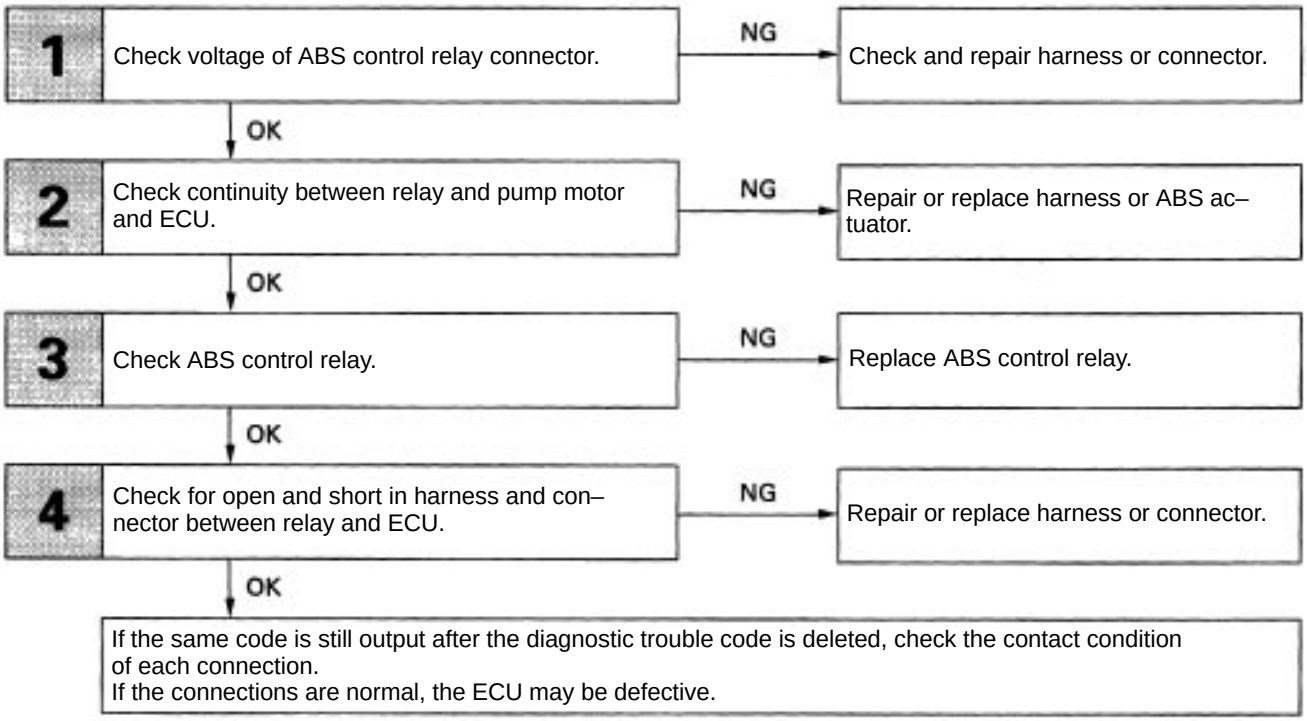
CIRCUIT DESCRIPTION

The ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the control (motor) relay ON and operates the ABS pump motor.

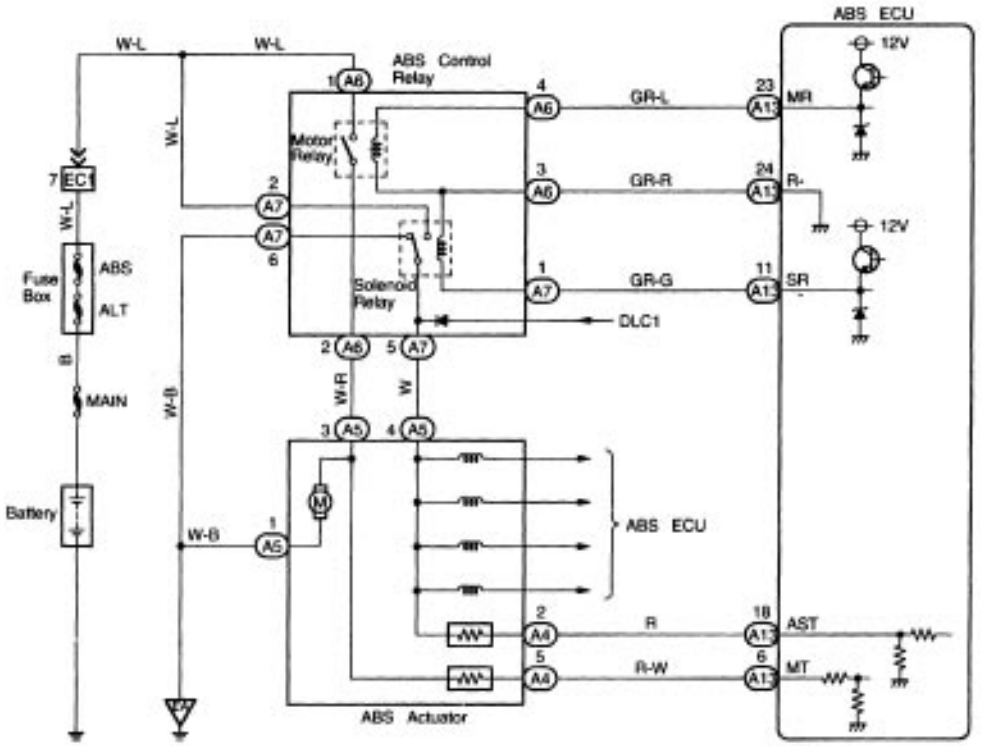
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
13	Conditions (1) and (2) continued for 0.2 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: Battery positive voltage (2) ABS control (motor) relay monitor terminal (MT) voltage: 0 V	• ABS control (motor) relay. • Open or short in ABS control (motor) relay circuit. • ECU.
14	Conditions (1) and (2) continued for 4 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: 0 V (2) ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	• ABS control (motor) relay. • B+ short in ABS control (motor) relay circuit. • ECU.

Fail safe function: If trouble occurs in the control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART



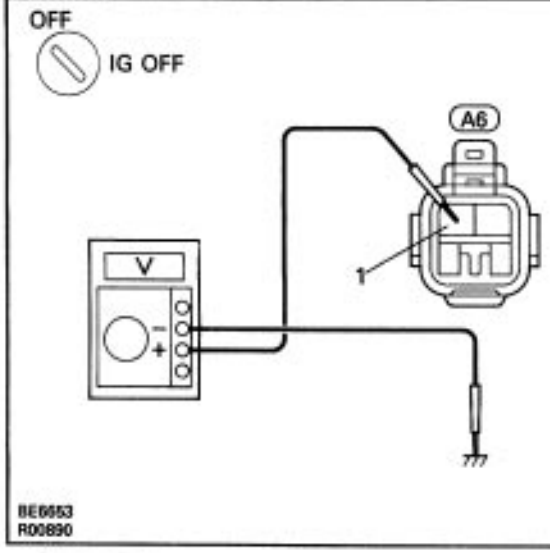
WIRING DIAGRAM



R08715

INSPECTION PROCEDURE

1 **Check voltage between terminals (A6) 1 of ABS control relay and body ground.**



P Disconnect the ABS control relay connector.

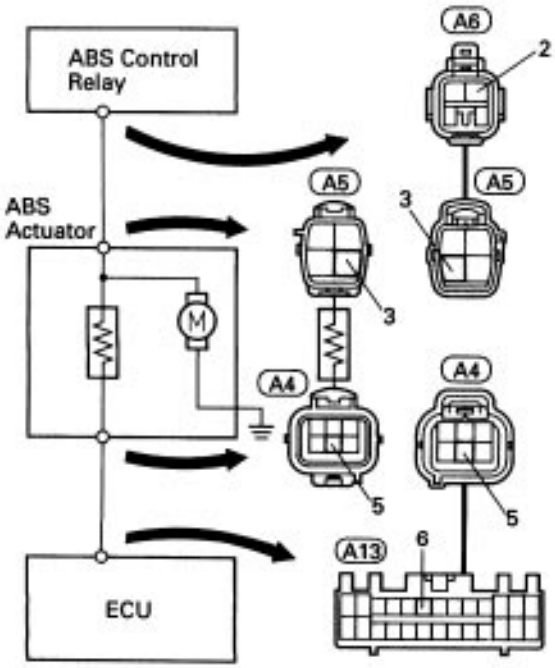
C Measure voltage between terminals A6 1 of ABS control relay harness side connector and body ground.

OK **Voltage: 10–14 V**

OK

NG **Check and repair harness or connector.**

2 **Check continuity between terminals (A6) 2 and (A5) 3, (A5) 3 and (A4) 5, (A4) 5 and (A13) 6.**



P Disconnect the 2 connectors from ABS actuator.

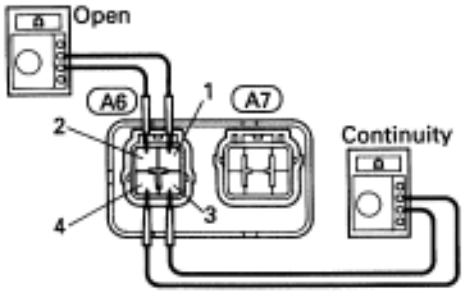
C Check continuity between terminals A6 2 and A5 3, A5 3 and A4 5, A4 5 and A13 6.
Continuity

OK HINT: There is a resistance of 4–6 between terminals A5 3 and A4 5.

OK

NG **Repair or replace harness or ABS actuator.**

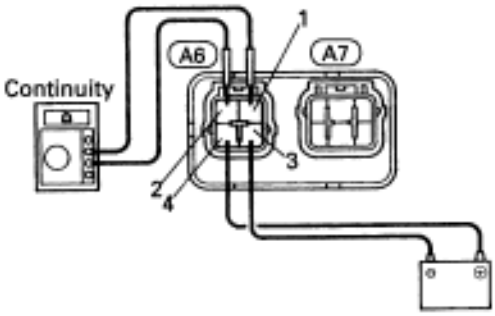
3 **Check ABS control relay.**



C Check continuity between each terminal of ABS control relay.

OK

Terminals A6 3 and A6 4	Continuity (Reference value 62)
Terminals A6 1 and A6 2	Open



C
1. Apply battery positive voltage between terminals A6 3 and A6 4.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals A6 1 and A6 2	Continuity

R00894
R00893

OK

NG **Replace ABS control relay.**

4 **Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–28).**

OK

NG **Repair or replace harness or connector.**

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection. If the connections are normal, the ECU may be defective.

DTC 21, 22, 23, 24 ABS, Actuator Solenoid Circuit

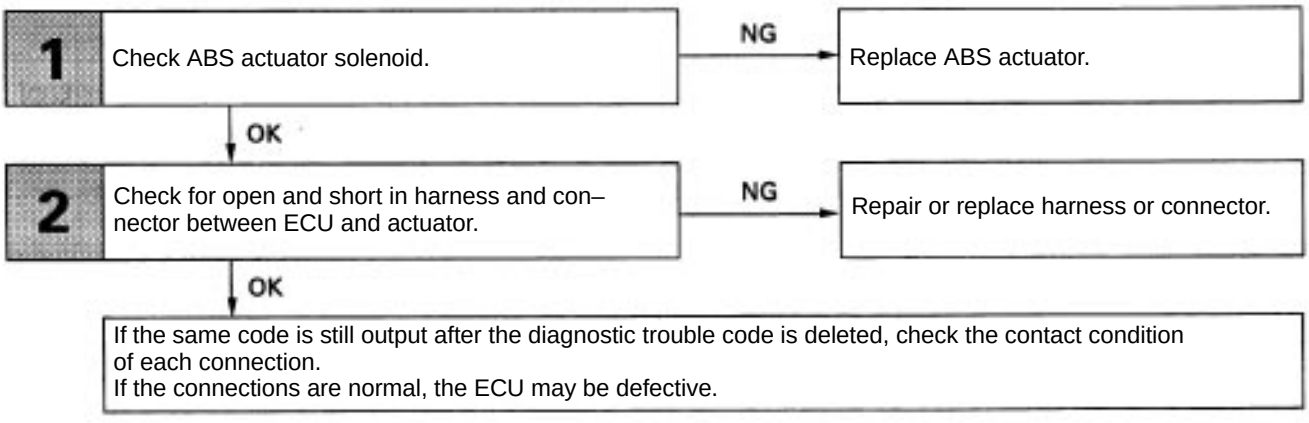
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

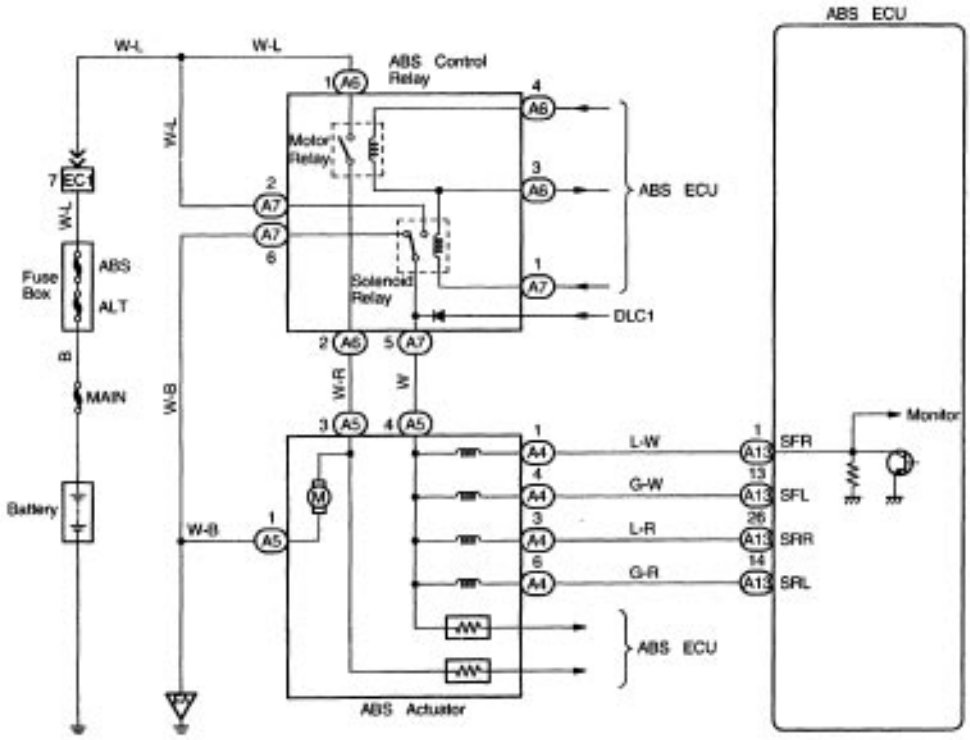
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
21	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFR is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SFR circuit. • ECU.
22	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFL is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SFL circuit. • ECU.
23	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SRR is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SRR circuit. • ECU.
24	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SRL is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SRL circuit. • ECU.

Fail safe function: If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART



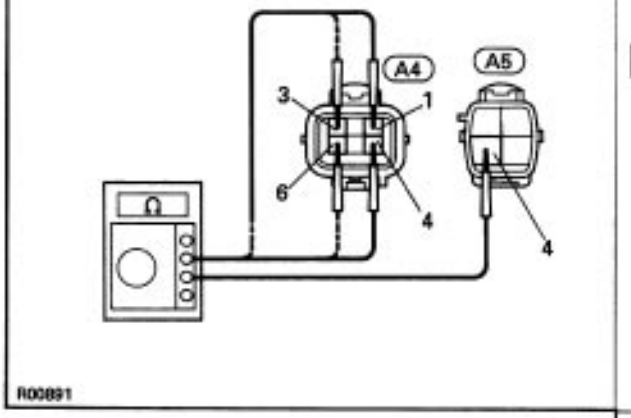
WIRING DIAGRAM



R08716

INSPECTION PROCEDURE

1 Check ABS actuator solenoid.



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals A5 4and A4 1, 3, 4, 6 of ABS actuator connector.

OK **Continuity**

HINT: Resistance of each solenoid coil is 1.2 .

OK → **2 Check for open and short in harness and connector between ABS ECU and actuator (See page IN–28).**

NG → **Replace ABS actuator.**

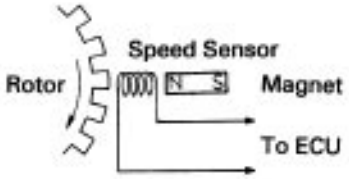
OK → **If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection. If the connections are normal, the ECU may be defective.**

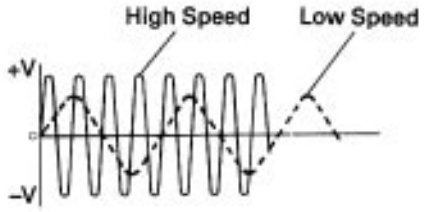
NG → **Repair or replace harness or connector.**

DTC 31, 32, 33, 34, 35, 36 Speed Sensor Circuit

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations. When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.





BR3583
BR3582

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
31,32, 33,34	Detection of any of conditions (1) through (3): (1) At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 5 sec. (2) Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. (3) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h (12 mph) or more.	• Right front, left front, right rear and left rear speed sensor. • Open or short in each speed sensor circuit. • ECU.
35	Speed sensor signal is not input for about 1 sec. while the left front and right rear speed sensor signals are being checked with the IG switch ON.	• Open in left front or right rear speed sensor circuit. • ECU.
36	Speed sensor signal is not input for about 1 sec. while the right front and left rear speed sensor signals are being checked with the IG switch ON.	• Open in right front or left rear speed sensor circuit. • ECU.

HINT: DTC No. 31 is for the right front speed sensor.
DTC No. 32 is for the left front speed sensor.
DTC No. 33 is for the right rear speed sensor
DTC No. 34 is for the left rear speed sensor.

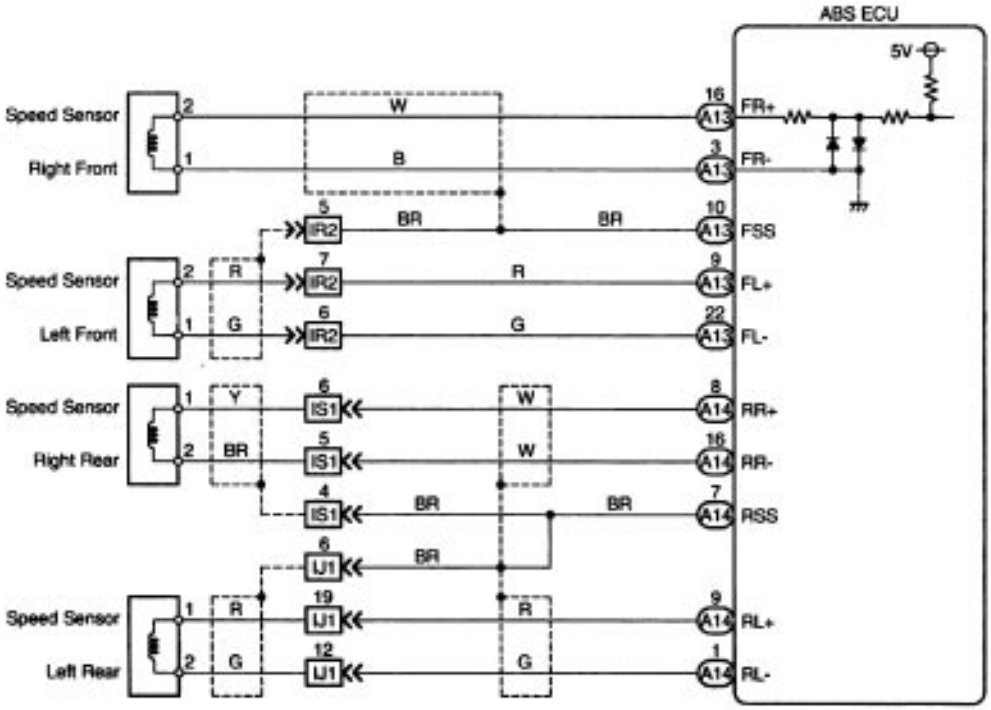
Fail safe function: If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

1. Check speed sensor.
   - NG → Replace speed sensor.
   - OK ↓
2. Check for open and short in harness and connector between each speed sensor and ECU.
   - NG → Repair or replace harness or connector.
   - OK ↓
3. Check sensor rotor and sensor installation.
   - NG → Replace speed sensor or rotor.
   - OK ↓

Check and replace ABS ECU.

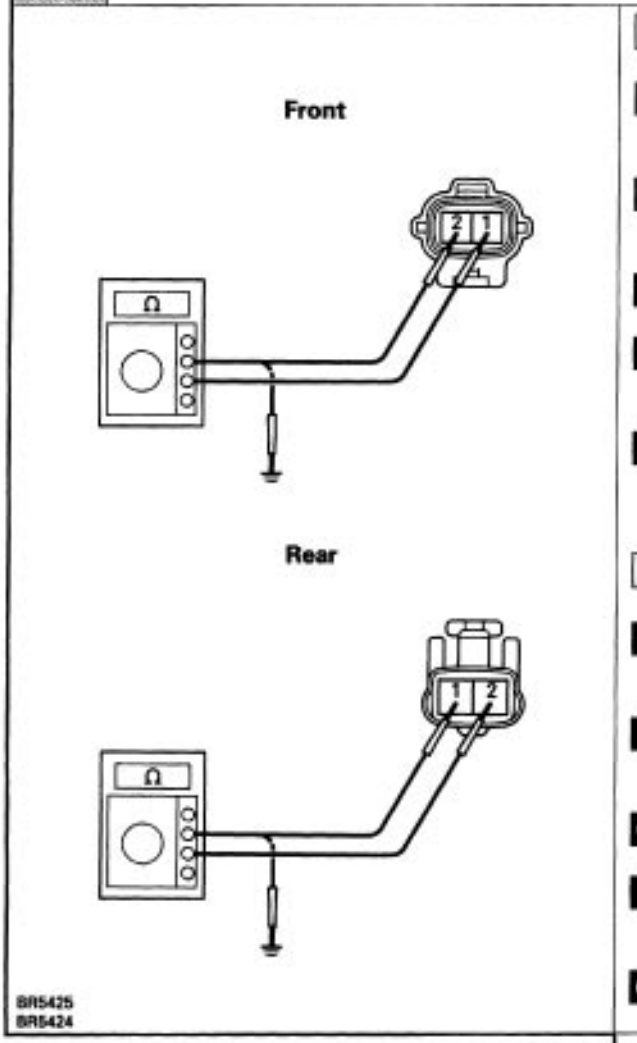
WIRING DIAGRAM



R08717

INSPECTION PROCEDURE

1 Check speed sensor.



Front

P 1. Remove front fender liner.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.
Resistance: 0.6–1.8 kΩ

OK Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

C **Resistance: 1 MΩ or higher**

OK

Rear

P 1. Remove the seat cushion and side seat back.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.
Resistance: 0.9–1.3 kΩ

OK Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

C **Resistance: 1 MΩ or higher**

OK

OK

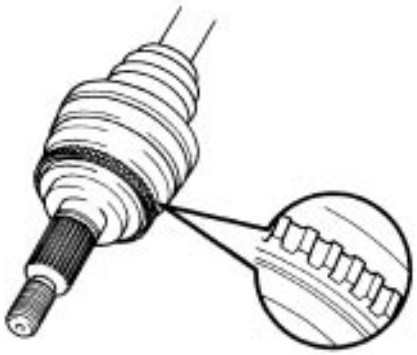
NG **Replace speed sensor.**

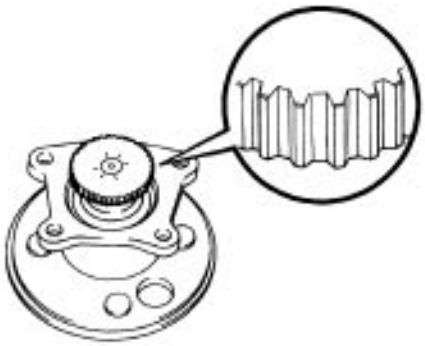
2 Check for open and short in harness and connector between each speed sensor and ECU (See page IN–28).

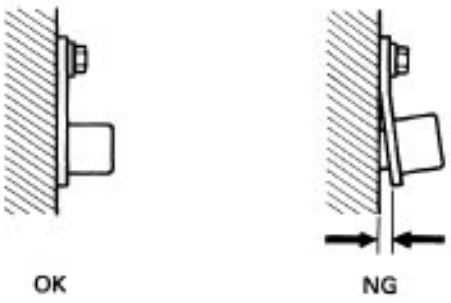
OK

NG **Repair or replace harness or connector.**

3 Check sensor rotor and sensor installation.







R00948
R00947
BR3795

Front

P Remove front drive shaft (See SA section).

C Check sensor–rotor serrations.

OK **No scratches or missing teeth.**

C Check the front speed sensor installation

OK **The installation bolt is tightened properly.**

Rear

P Remove the axle hub (See SA section).

C Check the sensor rotor serrations.

OK **No scratches or missing teeth.**

C Check the speed sensor installation

OK **The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.**

OK

NG **Replace speed speed or rotor.**

Check and replace ABS ECU.

DTC 41 IG Power Source Circuit

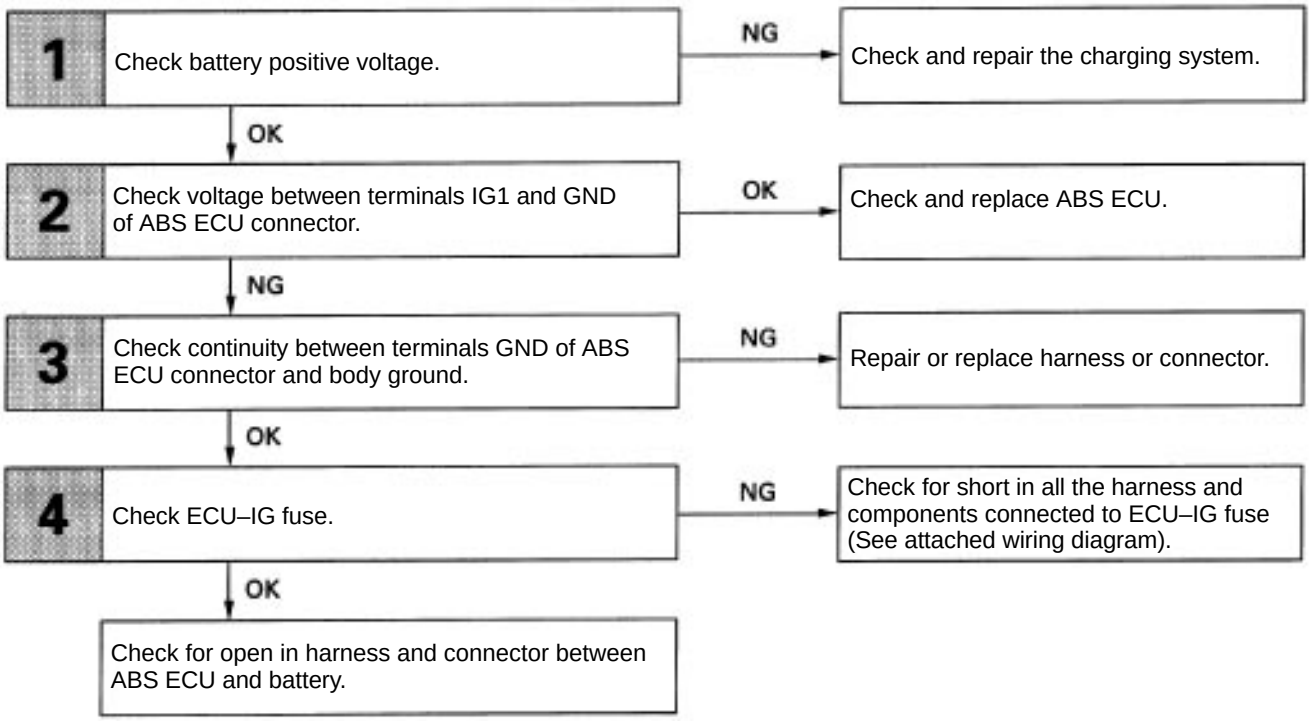
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU and the actuators.

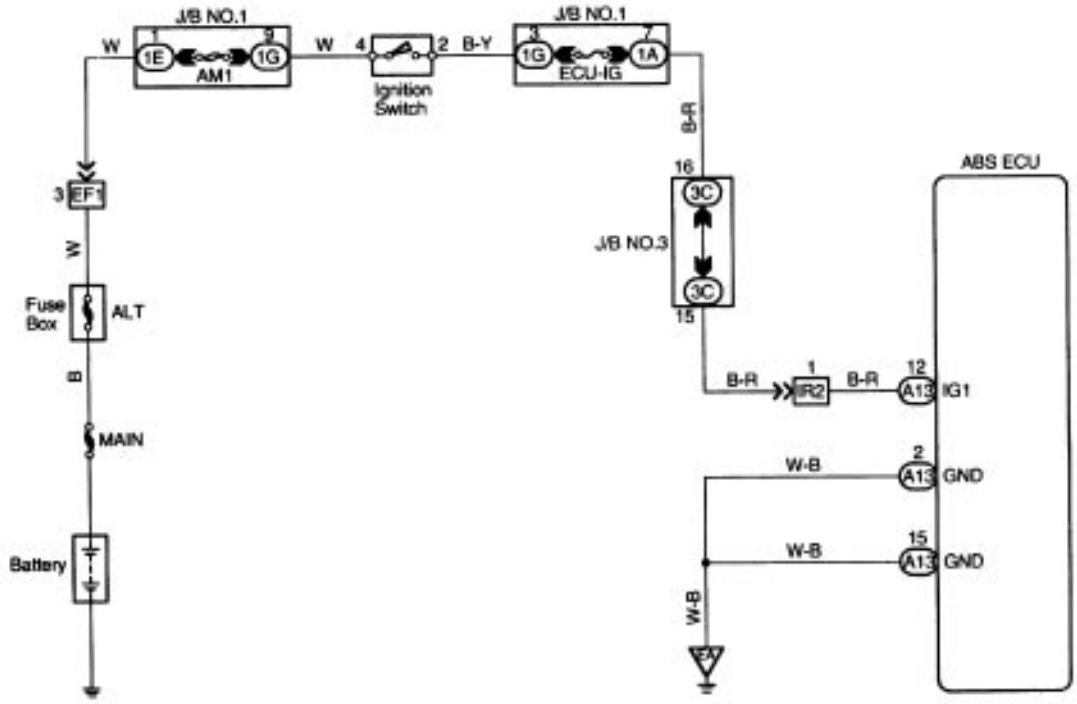
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9.5 V for more than 10 sec.	• Battery. • IC regulator. • Open or short in power source circuit. • ECU.

Fail safe function: If trouble occurs in the power source circuit, the ECU cuts oft current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

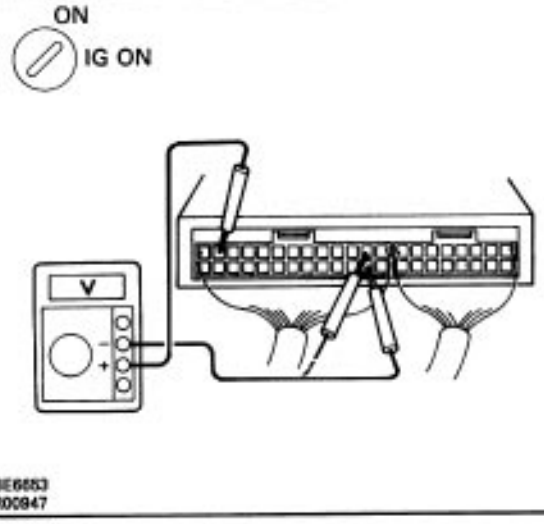
1 Check battery positive voltage.

OK: Voltage: 10–14V

NG: Check and repair the charging system,

OK

2 Check voltage between terminals IG1 and GND of ABS ECU connector.



P: Remove ABS ECU with connectors still connected.

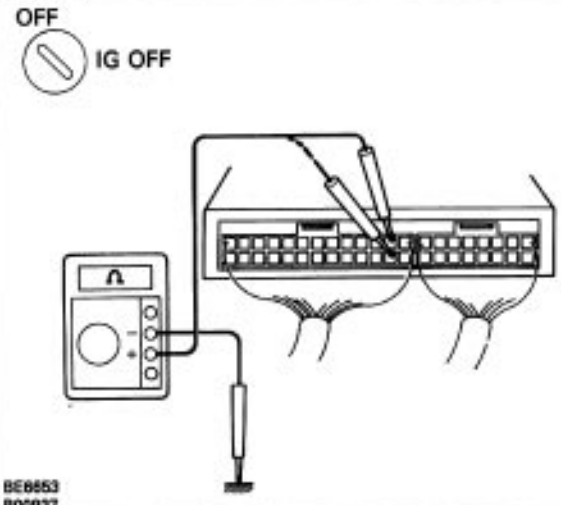
C:
1. Turn ignition switch ON.
2. Measure voltage between terminals IG1 and GND of ABS ECU connector.

OK: Voltage: 10–14 V

NG: Check and replace ABS ECU.

OK

3 Check continuity between terminals GND of ABS ECU connector and body ground.



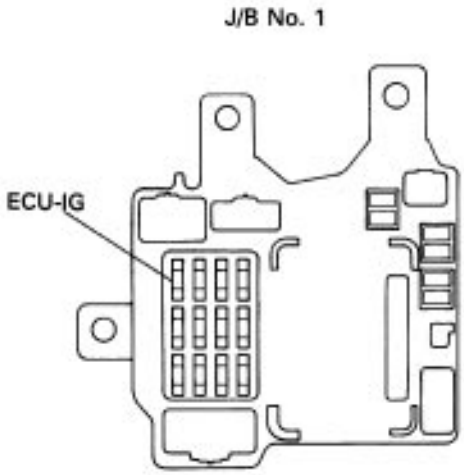
C: Measure resistance between terminals GND of ABS ECU connector and body ground.

OK: Resistance: 1Ω or less

NG: Repair or replace harness or connector.

OK

4 Check ECU–IG fuse.



P Remove ECU–IG fuse from J/6 No. 1.

C Check continuity of ECU–IG fuse.

OK **Continuity**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–28).

NG

Check for short in all the harness and components connected to ECU–IG fuse (See attached wiring diagram).

DTC 51 ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
51	Pump motor is not operating normally during initial check.	• ABS pump motor.

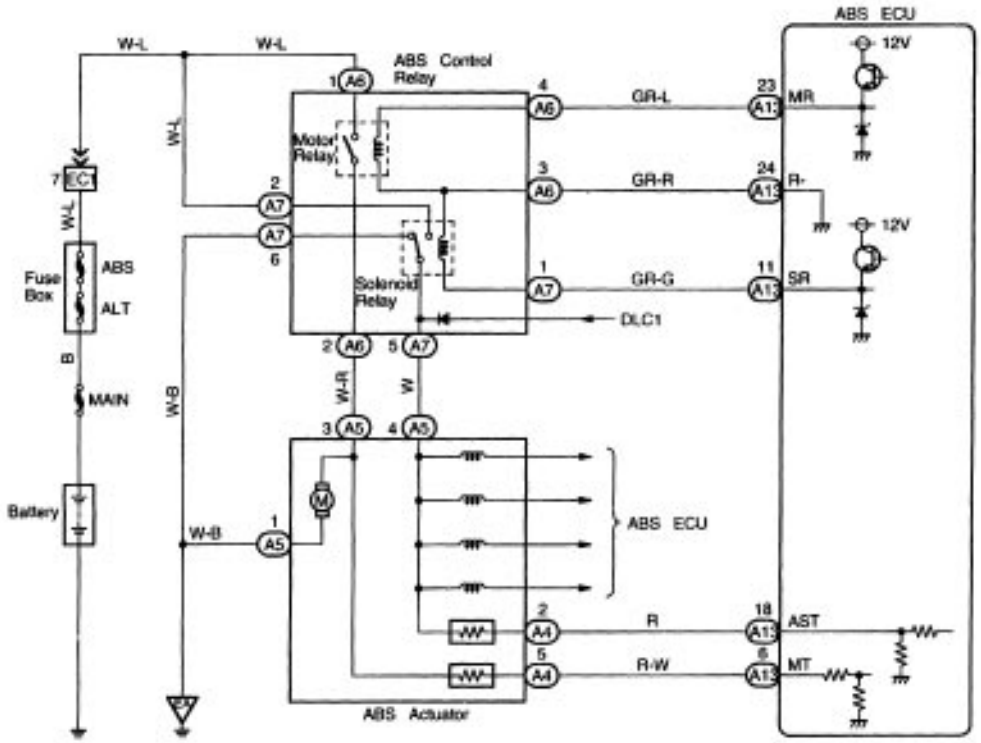
Fail safe function: If trouble occurs in the ABS pump motor, the ECU cuts off current to the control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

See inspection of ABS actuator (See page BR–77).

WIRING DIAGRAM

(Reference)



R08715

Stop Light Switch Circuit

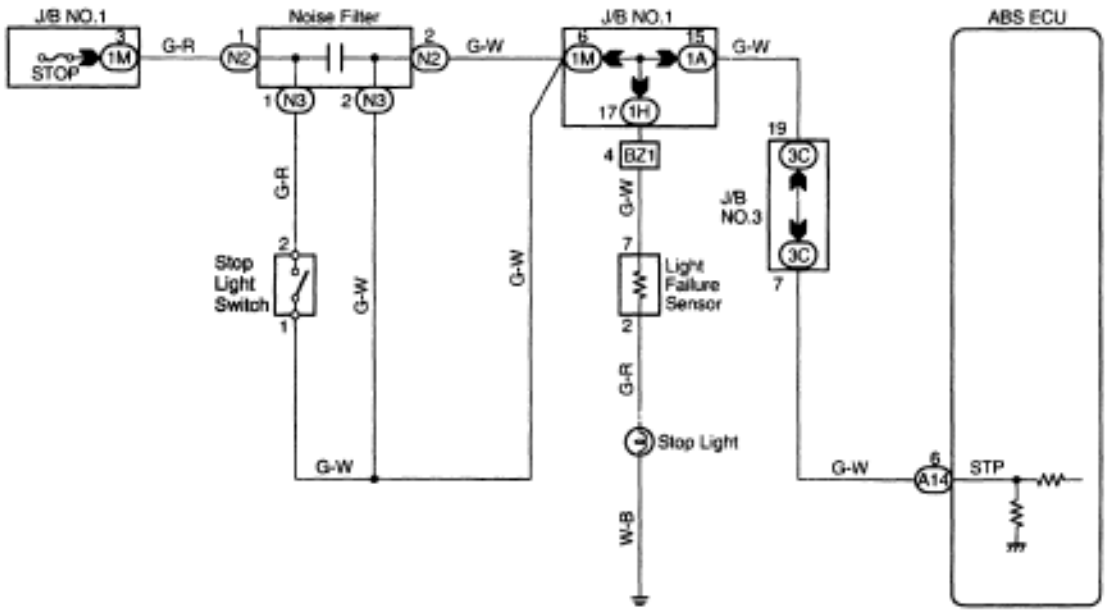
CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Repair stop light circuit (See page BE–65).
OK ↓			
2	Check voltage of terminal STP.	OK	Proceed to next circuit inspection shown on problem symptoms chart (See page BR–98).
NG ↓			
3	Check for open in harness and connector between ABS ECU and stop light switch (See page IN–27).	NG	Repair or replace harness or connector.
OK ↓			
Check and replace ABS ECU.			

WIRING DIAGRAM



R08719

INSPECTION PROCEDURE

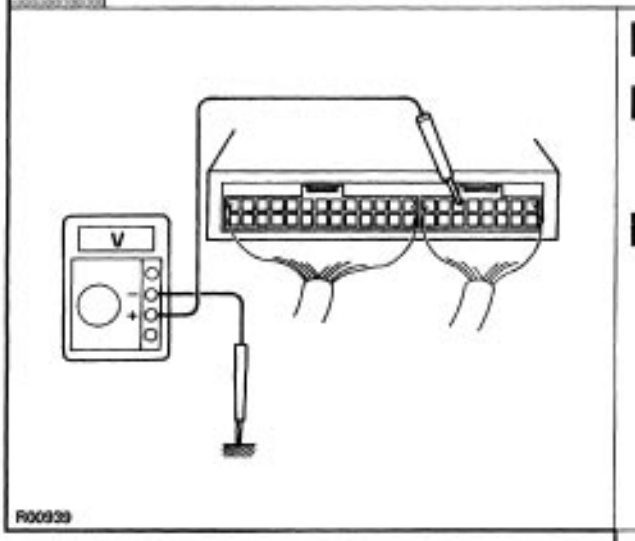
1 Check operation of stop light.

C Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

OK

NG → **Repair stop light circuit (See page BE–65).**

2 Check voltage between terminal STP of ABS ECU and body ground.



P Remove ABS ECU with connectors still connected.

C Measure voltage between terminal STP of ABS ECU and body ground when brake pedal is de–pressed.

OK **Voltage: 8–14 V**

NG

OK → **Proceed to next circuit inspection shown on problem symptoms chart (See page BR–98).**

3 Check for open in harness and connector between ABS ECU and stop light switch (See page IN–28).

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

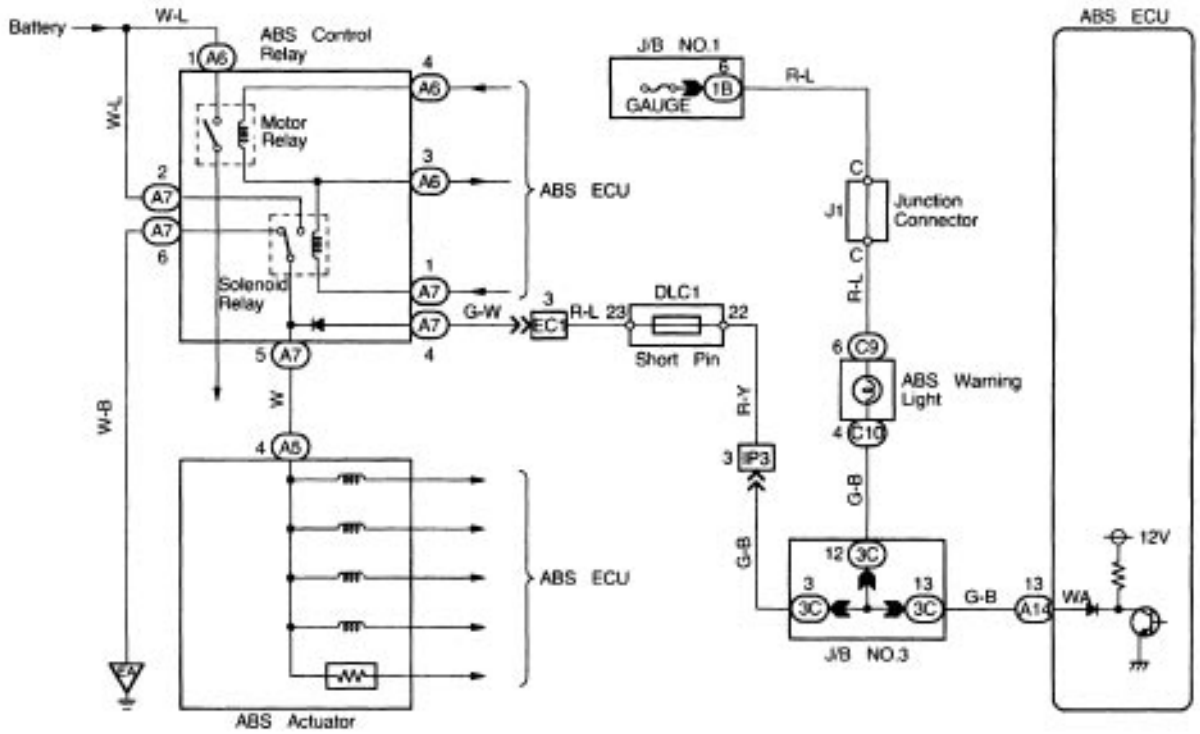
If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a diagnostic trouble code in memory.
After removing the short pin of the DLC1, connect terminals Tc and E1 of the DLC1 or DLC2 to make the ABS warning light to blink and output the diagnostic trouble code.

DIAGNOSTIC CHART

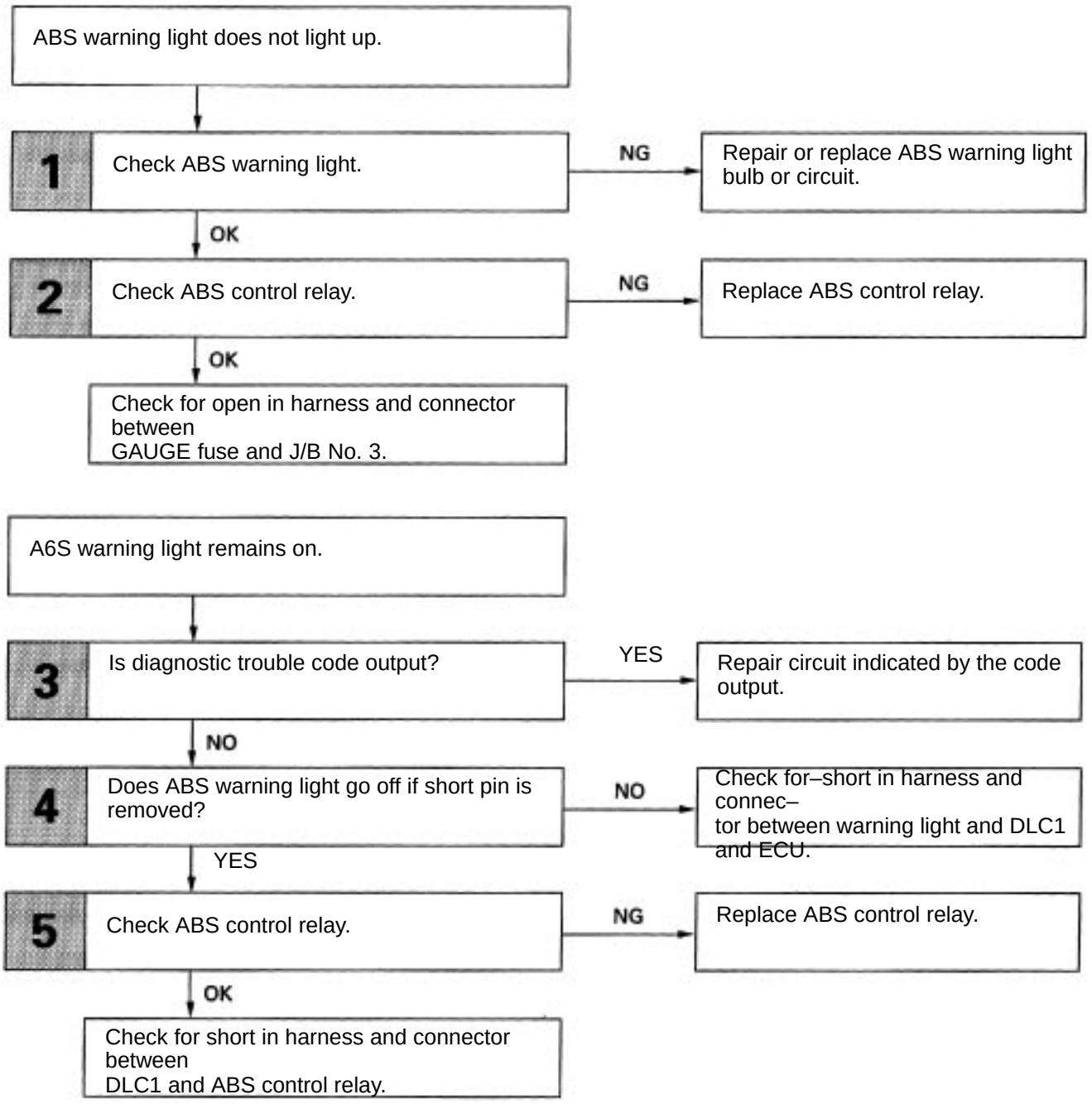
Perform troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	G o to step 1
ABS warning light remains on	Go to step 3

WIRING DIAGRAM



R08720


ABS warning light does not light up.
1
Check ABS warning light.
NG
Repair or replace ABS warning light bulb or circuit.
OK
2
Check ABS control relay.
NG
Replace ABS control relay.
OK
Check for open in harness and connector between
GAUGE fuse and J/B No. 3.
A6S warning light remains on.
3
Is diagnostic trouble code output?
YES
Repair circuit indicated by the code output.
NO
4
Does ABS warning light go off if short pin is removed?
NO
Check for–short in harness and connec–
tor between warning light and DLC1 and ECU.
YES
5
Check ABS control relay.
NG
Replace ABS control relay.
OK
Check for short in harness and connector between
DLC1 and ABS control relay.

INSPECTION PROCEDURE

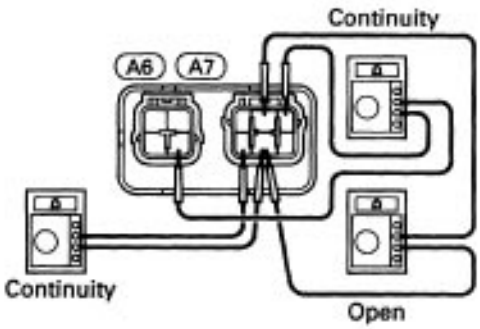
1 Check ABS warning light.

See Combination Meter Troubleshooting on page BE–1 18.

OK

NG → **Replace bulb or combination meter assembly.**

2 Check ABS control relay.

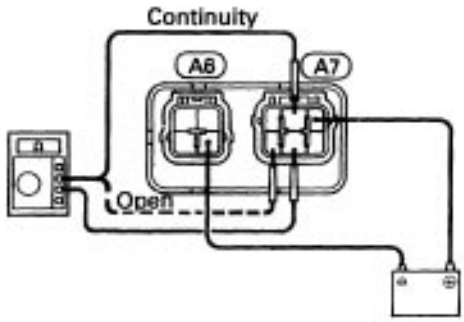


P Disconnect the connectors from control relay.

C Check continuity between each terminal of ABS control relay.

OK

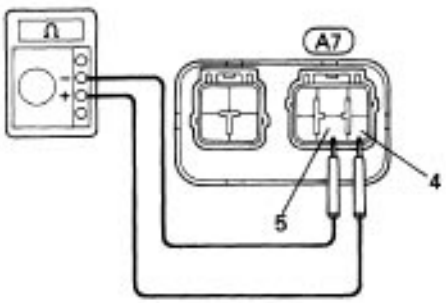
Terminals A7 1 and A6 3	Continuity (Reference value 80)
Terminals A7 5 and A7 6	Continuity
Terminals A7 2 and A7 5	Open



C
1. Apply battery positive voltage between terminals A7 1 and A6 3.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals A7 5 and A7 6	Open
Terminals A7 2 and A7 5	Continuity



R00889
R00895
R00940

C Connect the test lead to terminal 4 of A7 and the lead to terminal 5 of A7. Check continuity between the terminals.

OK Continuity

If there is no continuity, connect the test lead to terminal 4 of A7 and the lead to terminal 5 of A7. Recheck continuity between terminals.

OK

NG → **Replace ABS control relay.**

Check for open in harness and connector between DLC1 and A6S control relay and body ground (See page IN–27).

3 **Is diagnostic trouble code output?**

Perform diagnostic trouble code check on page BR–93.

NO

YES → **Repair circuit indicated by the code output.**

4 **Does ABS warning light go off if short pin is removed?**

YES

NO → **Check for short in harness and connector between warning light and DLC1 and ECU (See page IN–28).**

5 **Check ABS control relay (See step No. 2).**

OK

NG → **Replace ABS control relay.**

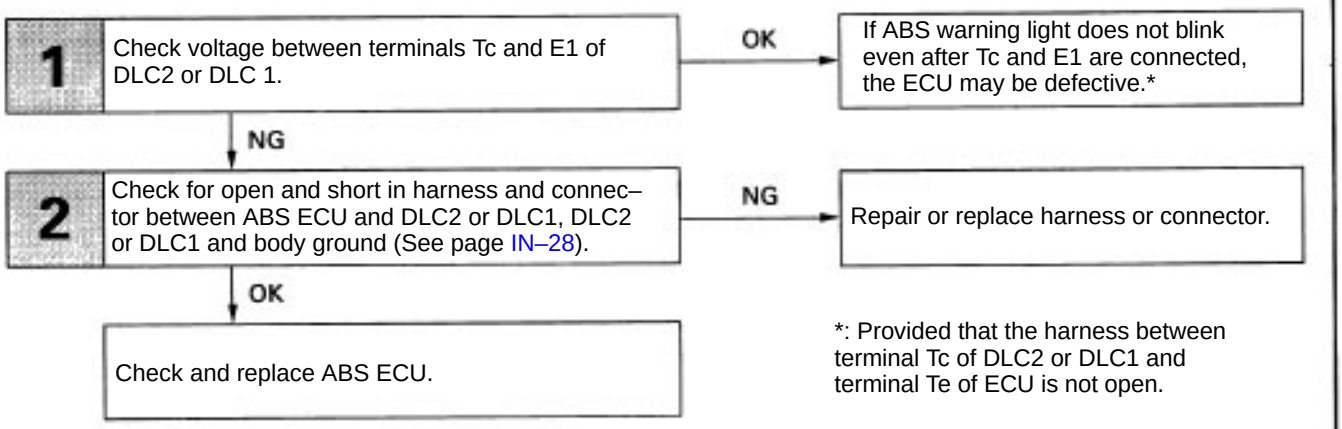
Check for short in harness and connector between DLC1 and ABS control relay (See page IN–28).

Tc Terminal Circuit

CIRCUIT DESCRIPTION

Connecting terminals Te and E1 of the DLC1 or the DLC2 causes the ECU to display the diagnostic trouble code by flasing the ABS warning light.

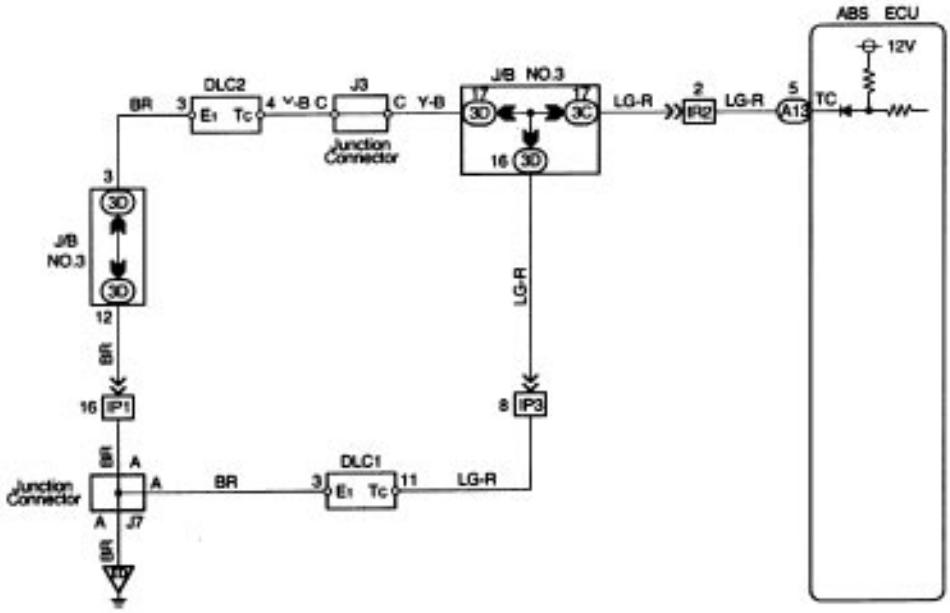
DIAGNOSTIC CHART



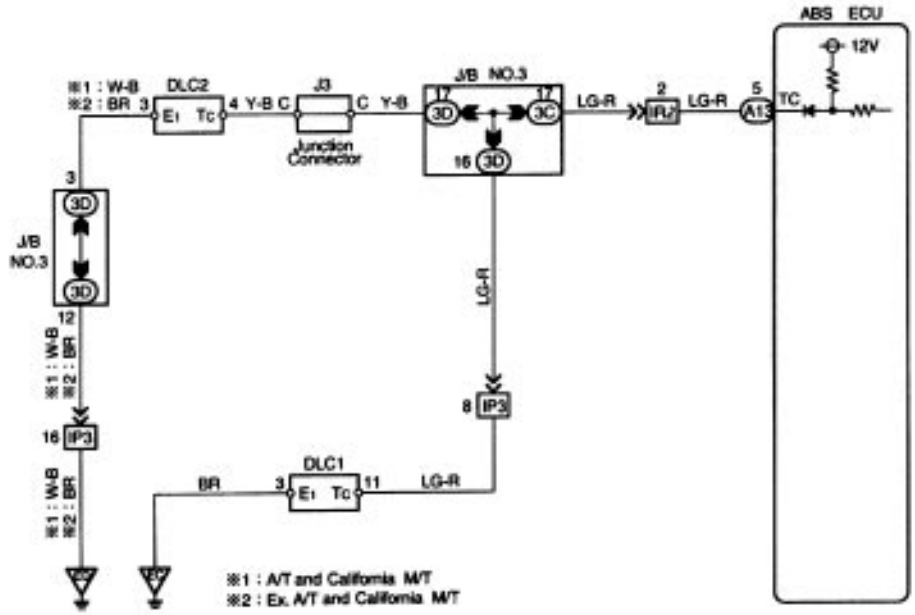
*: Provided that the harness between terminal Tc of DLC2 or DLC1 and terminal Te of ECU is not open.

WIRING DIAGRAM

1 MZ–FE:



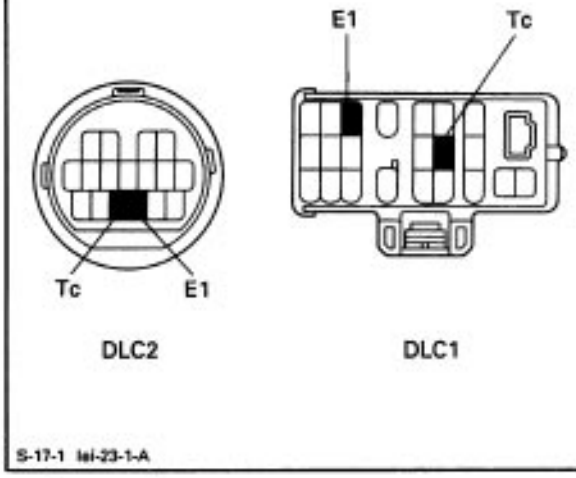
5S–FE:



R08721
R08722

INSPECTION PROCEDURE

1 **Check voltage between terminals Te and E1 of DLC2 or DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Tc and E1 of DLC2 or DLC1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Tc and E1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC2 or DLC1, DLC2 or DLC1 and body ground (See page IN–28).**

OK

NG → **Repair or replace harness or connector.**

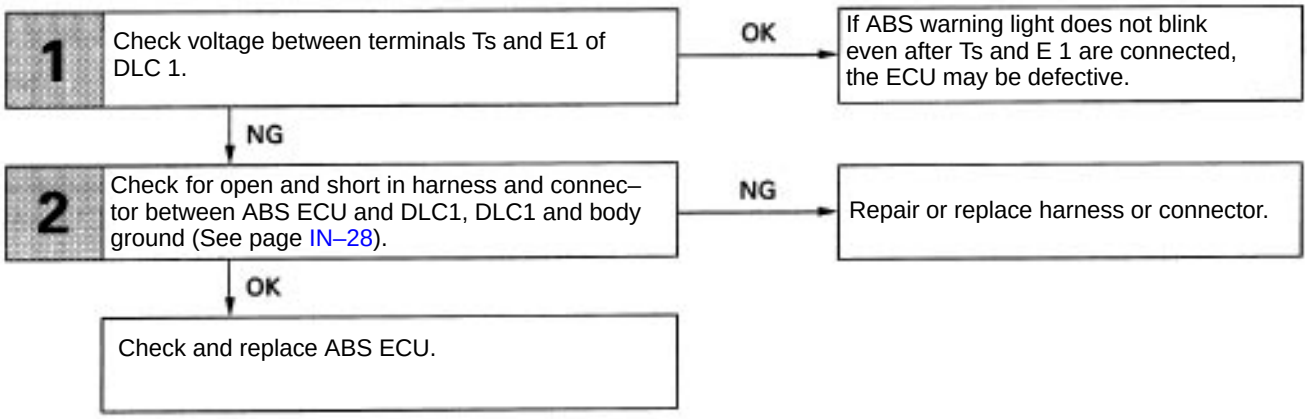
Check and replace ABS ECU.

Ts Terminal Circuit

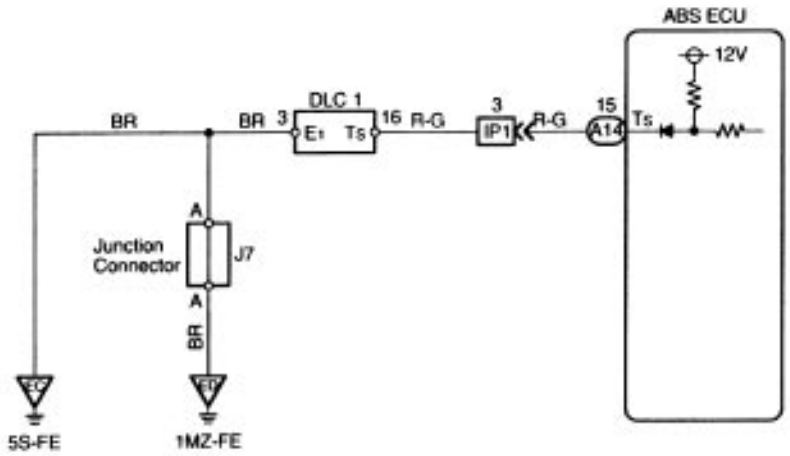
CIRCUIT DESCRIPTION

The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the diagnostic trouble code check.
Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

DIAGNOSTIC CHART



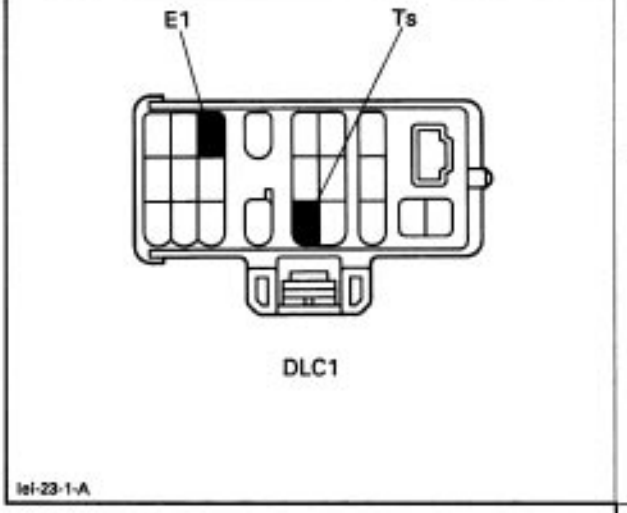
WIRING DIAGRAM



R08723

INSPECTION PROCEDURE

1 Check voltage between terminals and E1 of DLC1.



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Ts and E1 of DLC 1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.**

2 Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).

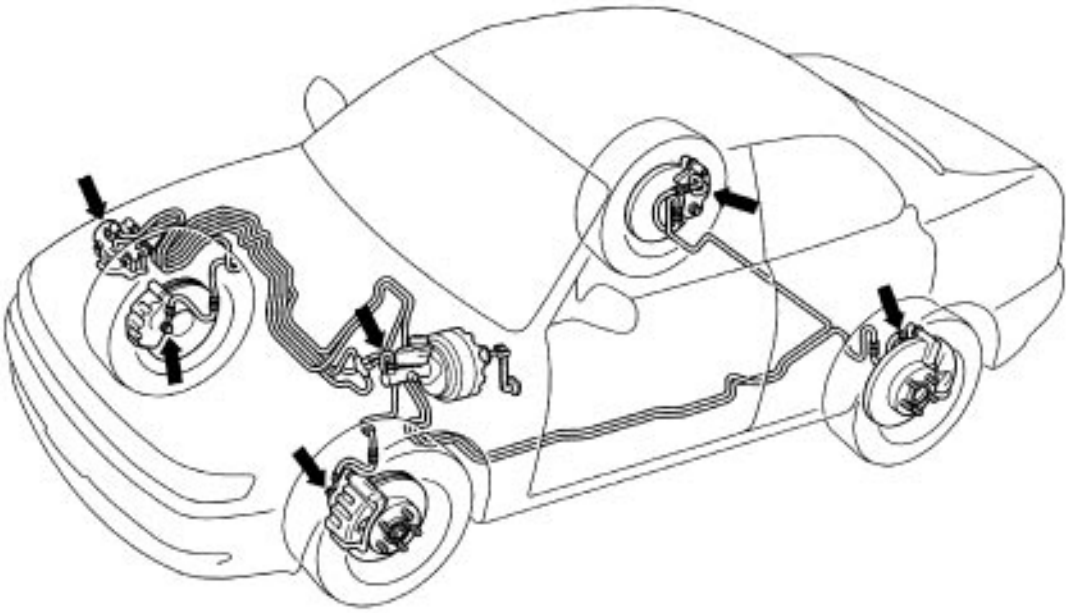
OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



RD8756

TROUBLESHOOTING (TMM Made Vehicle BOSCH ABS)

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following pages.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

If the ABS warning light lights up, and the ABS does not operate, the ECU stores diagnostic trouble codes corresponding to the problem in memory.

Before confirming the trouble, first check the diagnostic trouble codes to see if there are any malfunc–tion codes stored in memory. When there are malfunction codes, make a note of them, then clear them and proceed to ”3” Problem Symptom Confirmation”.

(3) PROBLEM SYMPTOM CONFIRMATION, (4) SYMPTOM SIMULATION

Confirm the problem symptoms. If the problem does not recur, simulate the problem by initially checking the circuits indicated by the diagnostic trouble code in step 2 , using ”Problem simulation method”.

(5) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes.

If a malfunction code is output, proceed to ”6” Diagnostic Trouble Code Chart”. If the normal code is output, proceed to ” 7” “Problem Symptoms Chart”.

Be sure to proceed to ” 6 “Diagnostic Trouble Code Chart” after steps “2” and “3” are completed. If troubleshooting is attempted only by following the malfunction code stored in the memory, errors could be made in the diagnosis.

(6) DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

(7) PROBLEM SYMPTOMS CHART

If the normal code is confirmed in the diagnostic trouble code check, perform inspection in accordance with the inspection order in the problem symptoms chart.

(8) CIRCUIT INSPECTION

Proceed with diagnosis of each circuit in accordance with the inspection order confirmed in 6 and 7 . Determine whether the cause of the problem is in the sensor, actuators, wire harness and con–nectars, or the ECU.

(9) SENSOR CHECK

Use the ABS warning light to check if each of the signals from the speed sensors are being input correctly to the ECU. Instructions for this check are given in the circuit inspection.

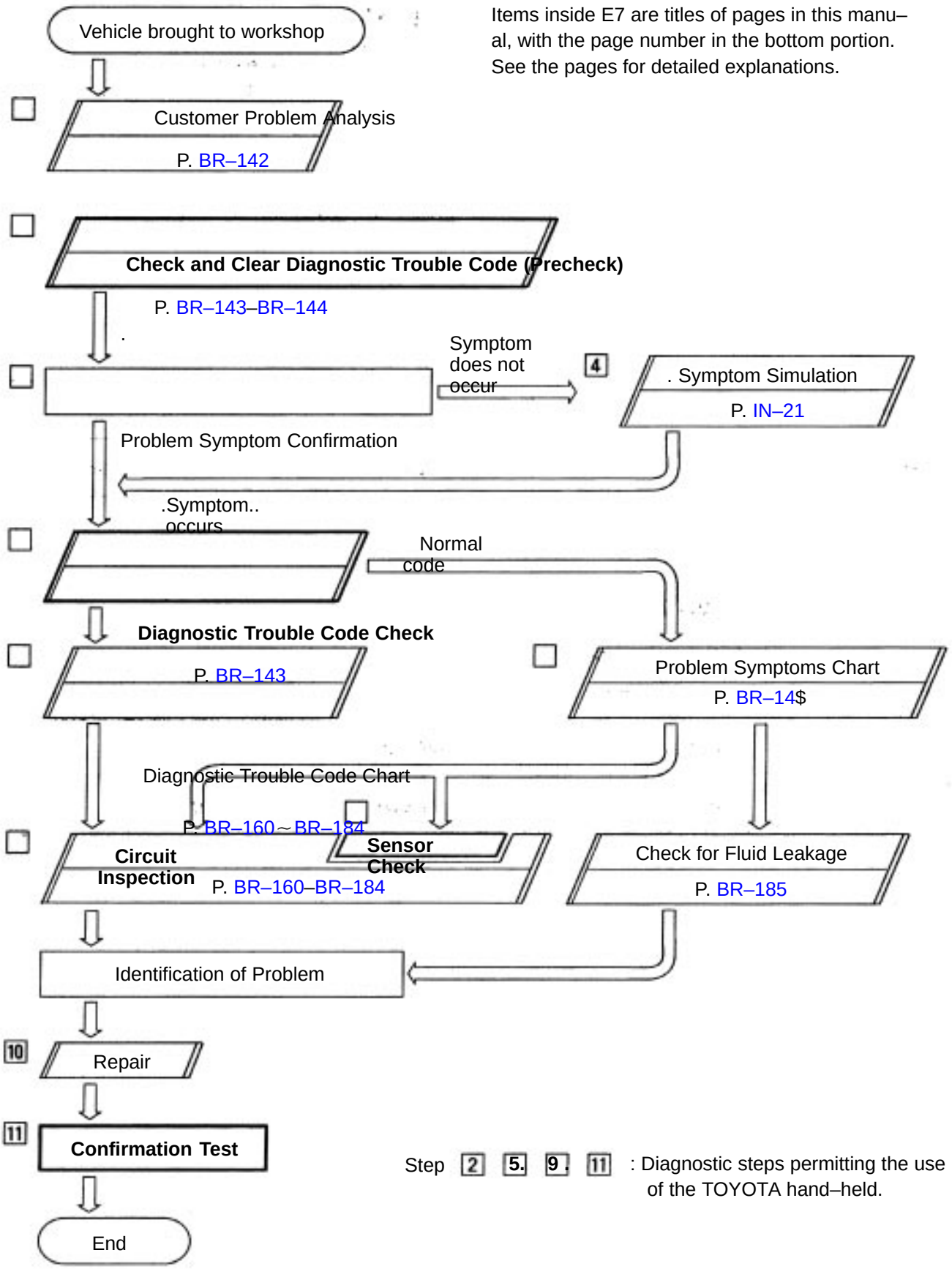
(10) REPAIRS

After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual.

(11) CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive to make sure the entire ABS system is operating correctly.

Items inside E7 are titles of pages in this manu–al, with the page number in the bottom portion. See the pages for detailed explanations.



Step 2 5. 9. 11 : Diagnostic steps permitting the use of the TOYOTA hand–held.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ABS Check Sheet

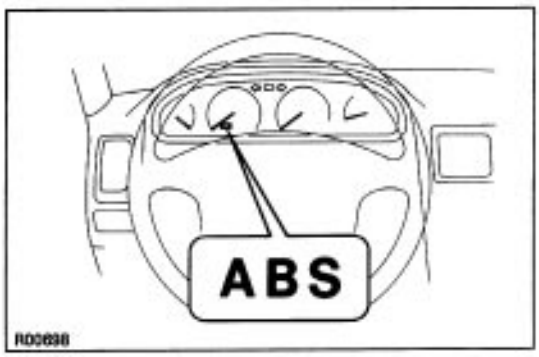
Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

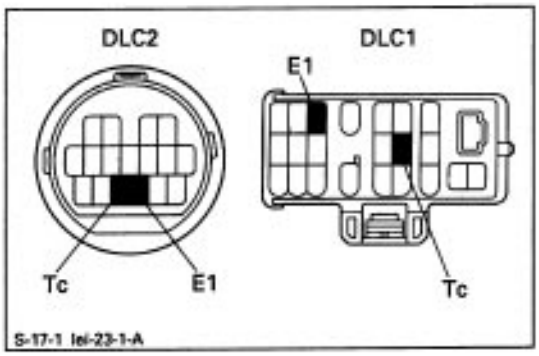


DIAGNOSIS SYSTEM

INDICATOR CHECK

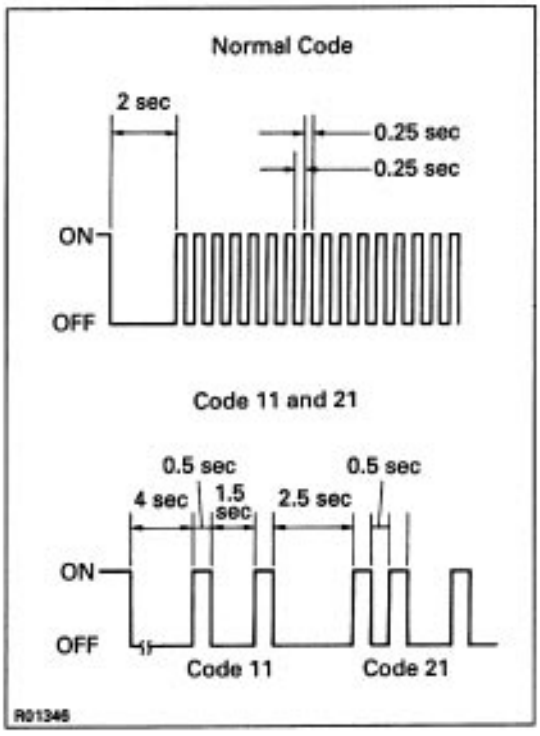
When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT: If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page BR–177).



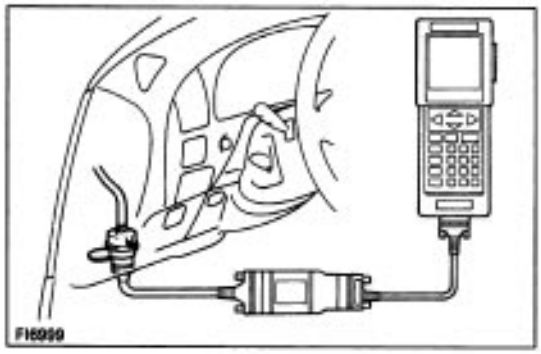
DIAGNOSTIC TROUBLE CODE CHECK

1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
2. Turn the ignition switch to ON.
3. Read the diagnostic trouble code from the ABS warning light on the combination meter.
   HINT: If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page BR–180 or BR–177y.



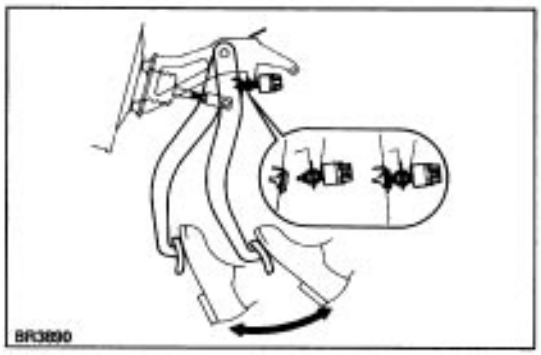
As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

4. Codes are explained in the code table on page BR–145.
5. After completing the check, disconnect terminals Tc and E1, and turn off the display.
   If 2 or more malfunctions are indicated at the same time, the lowest numbered diagnostic trouble code will be displayed first.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

1. Hook up the Toyota hand–held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.



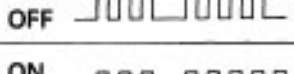
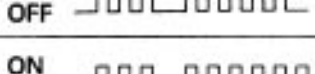
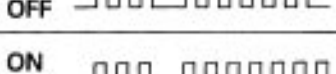
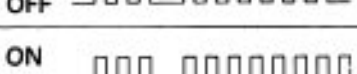
DIAGNOSTIC TROUBLE CODE CLEARANCE

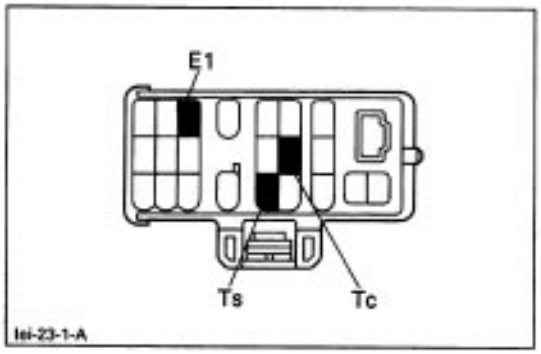
1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
2. IG switch ON.
3. Clear the diagnostic trouble codes stored in ECU by de–pressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the SST from the terminals of DLC2 or DLC1.

HINT: Cancellation cannot be done by removing the battery cable or ECU–13 fuse.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code.

Code	ABS Warning Light Blinking Pattern	Diagnosis
11		Open or short circuit in ABS solenoid relay circuit
13		Open or short circuit in ABS motor relay circuit
21		Open or short circuit in 3–position solenoid circuit for right front wheel
22		Open or short circuit in 3–position solenoid circuit for left front wheel
23		Open or short circuit in 3–position solenoid circuit for rear wheels
31		Right front wheel speed sensor signal malfunction
32		Left front wheel speed sensor signal malfunction
33		Right rear wheel speed sensor signal malfunction
34		Left rear wheel speed sensor signal malfunction
35		Open circuit in right front speed sensor circuit
36		Open circuit in left front speed sensor circuit
37		Faulty rear speed sensor rotor
38		Open circuit in right rear speed sensor circuit
39		Open circuit in left rear speed sensor circuit
41		Low battery positive voltage
51		Pump motor is locked Open in pump motor circuit in actuator
62		Malfunction in ECU

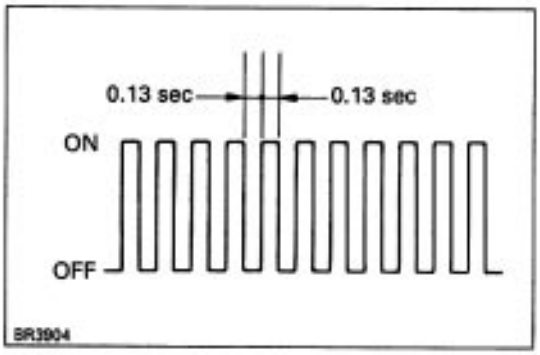


SPEED SENSOR SIGNAL CHECK

1. When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.
2. Turn the ignition switch to OFF.
3. Using SST, connect terminals Ts and El of DLC1.

SST 09843–18020

4. Start the engine.



5. Check that the ABS warning light blinks

   HINT: If the ABS warning light does not blink, inspect the ABS warning light circuit (See page BR–177j.

6. Drive vehicle straight forward.

   HINT:

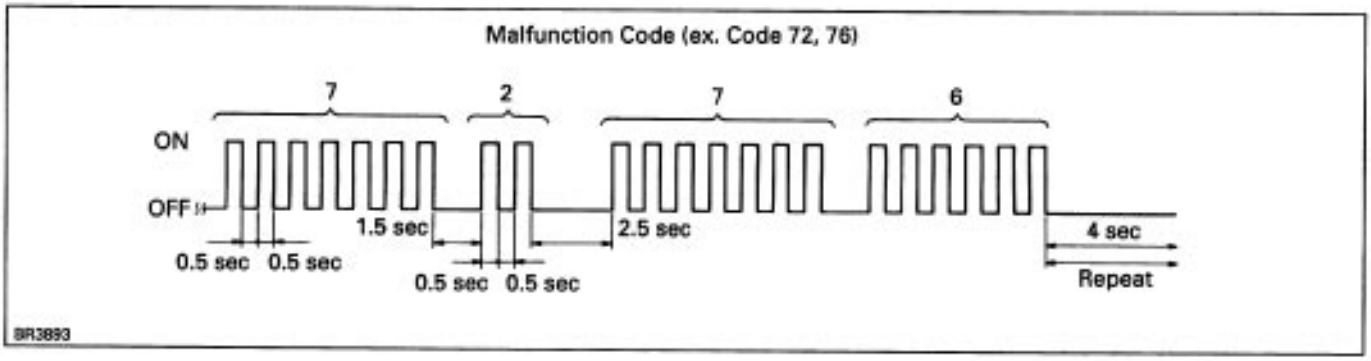
   - Drive vehicle at 45–55 km/h (28–34 mph) for several seconds.
   - If the brake is applied during the check, the check routine must be started again.

7. Stop the vehicle.
8. Turn the ignition switch to OFF.
9. Disconnect terminals Ts and E1, and connect Te and E1.
10. Turn the ignition switch to ON.
11. Read the number of blinks of the ABS warning light.

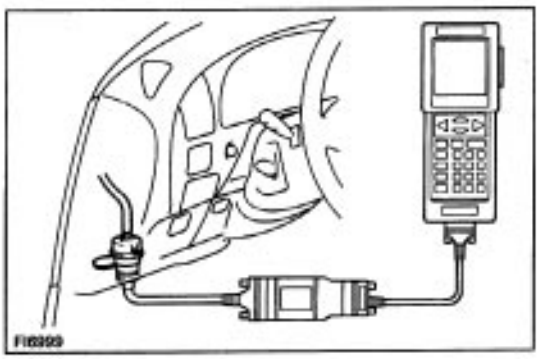
    HINT: See the list of diagnostic trouble codes shown on the next page.

    If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).

    If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



12. After performing the check, disconnect terminals Tc and E1 of DLC1, and ignition switch turned off.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

1. Perform steps 1. ~ 7. on the previous page.
2. Hook up the Toyota hand–held tester to the DLC2.
3. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.

Diagnostic Trouble Code of Speed Sensor Check Function

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor

PROBLEM SYMPTOMS CHART

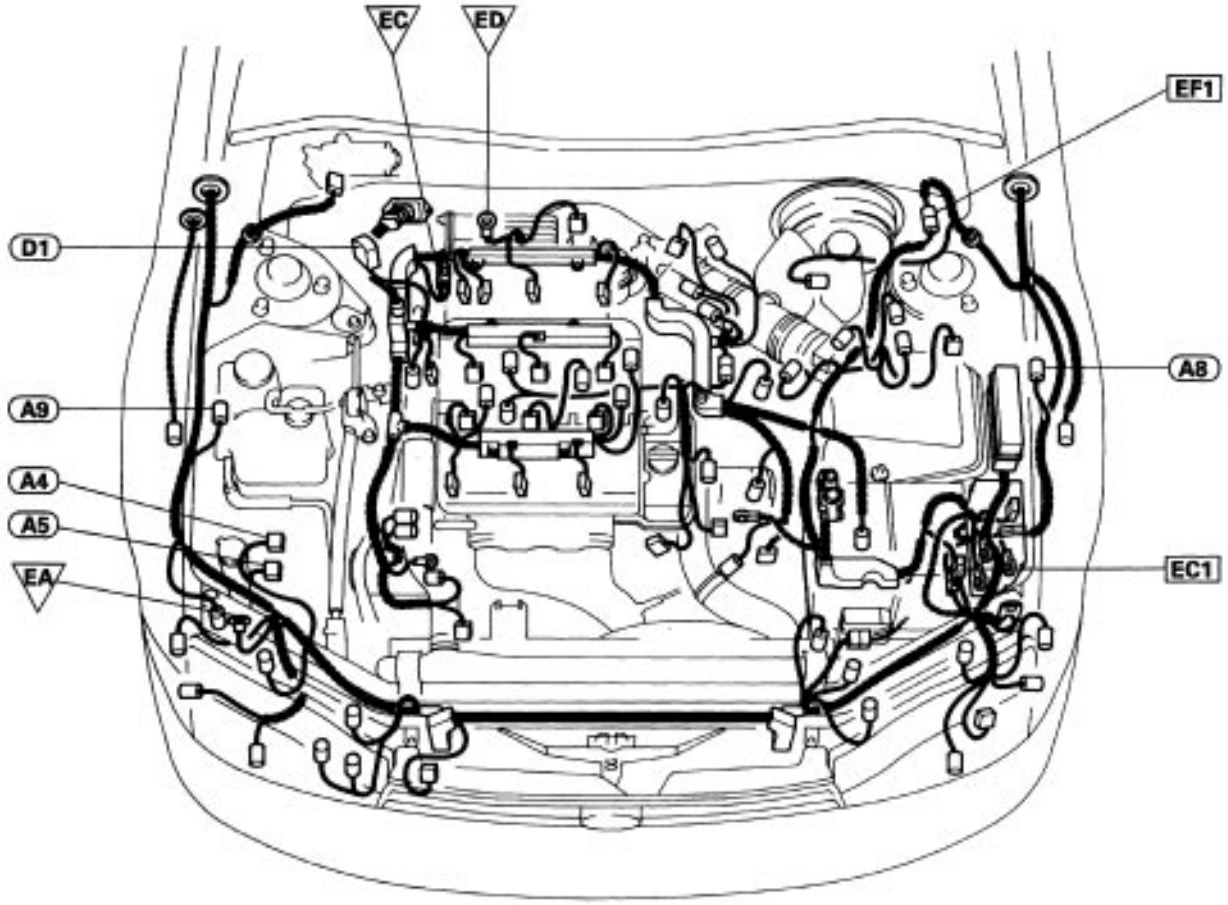
If a normal code is displayed during the diagnostic trouble code check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
ABS does not operate.	Only when 1. ~ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the hydraulic circuit for leakage.	BR–143 BR–170 BR–166 BR–185
ABS does not operate efficiently.	Only when 1.~ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the hydraulic circuit for leakage.	BR–143 BR–166 BR–175 BR–185
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	BR–177
Diagnostic trouble code check cannot be performed.	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	BR–177 BR–180
Speed sensor signal check cannot be performed.	1. Ts terminal circuit. 2. ABS ECU.	BR–183

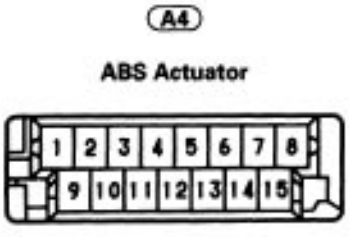
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1M2–FE Engine:



N09612



R08674

Ig-4-1-A

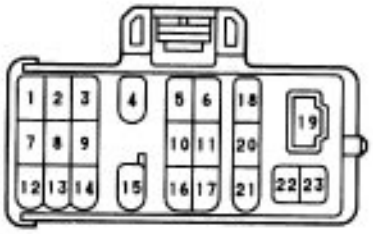
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

ls-2-1-T

D1

DLC1



lel-23-1

EC1

lef-8-1

lef-8-2

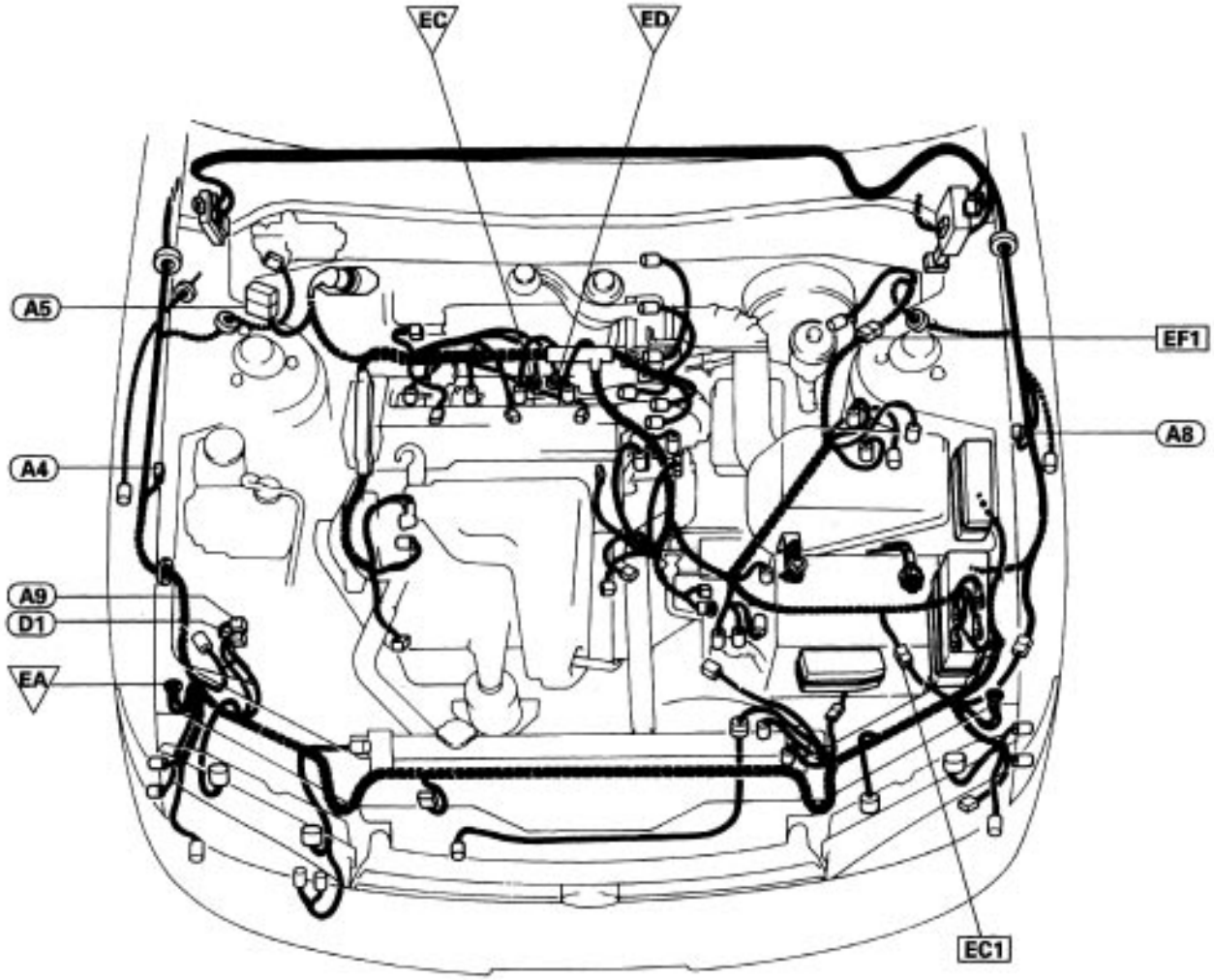
EF1

lfg-4-1

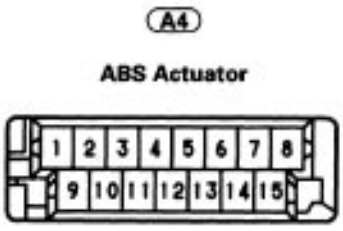
lfg-4-2

Location of Connectors in Engine Compartment

5S–FE Engine:



N09613



R08674

Ig-4-1-A

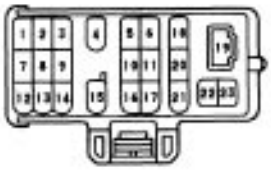
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

Ie-2-1-T

D1

DLC1



Iei-23-1-A

EC1

Ief-8-1

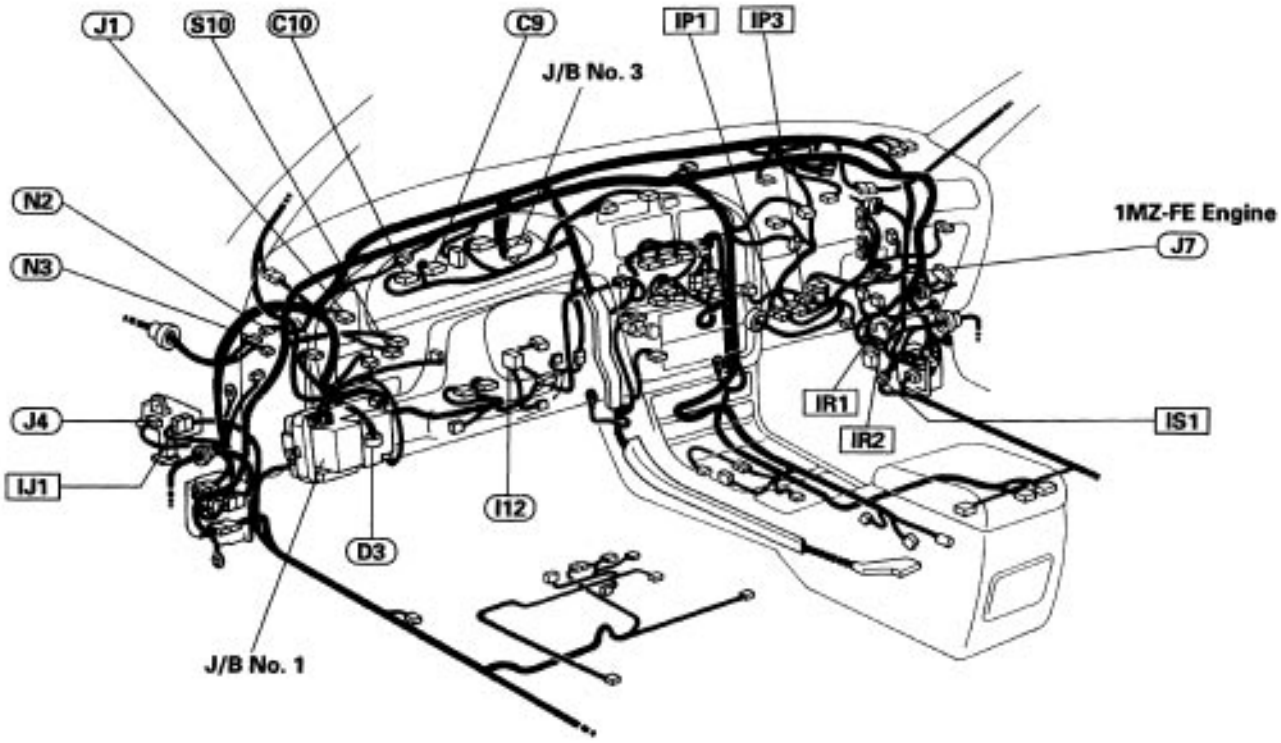
Ief-8-2

EF1

Ifg-4-1

Ifg-4-2

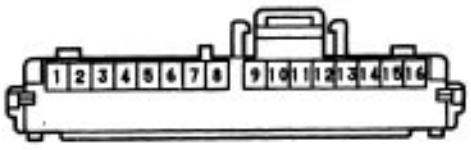
Location of Connectors in instrument Panel



N09614

C9

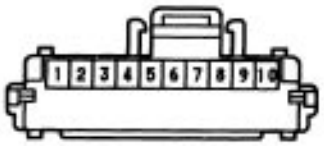
ABS Warning Light



j-16-1

C10

ABS Warning Light



j-10-1

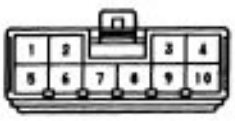
D3

DLC2

s-17-1

I12

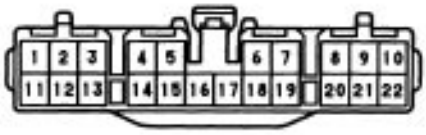
Ignition Switch



g-10-1-B

J1

Junction Connector



e-22-1-A

J3

Junction Connector

e-14-1-A

J7 1MZ-FE

Junction Connector

e-12-1

J7

Noise Filter

g-2-2

N3

Noise Filter

g-2-1

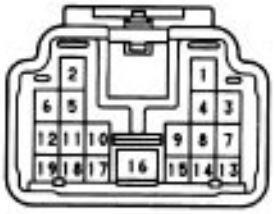
S10

Stop Light Switch

eg-4-1

IJ1

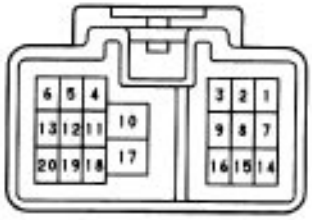
eg-19-1



eg-19-2

IP1

e-20-1-B



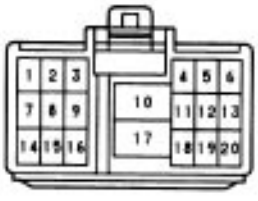
e-20-2-B

IP3

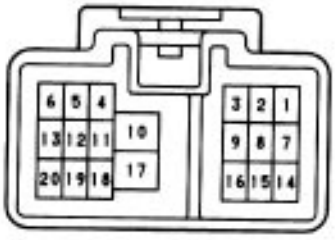
ef-19-1

ef-19-2

IR1



e-20-1-B



e-20-2-B

IR2

e-8-1

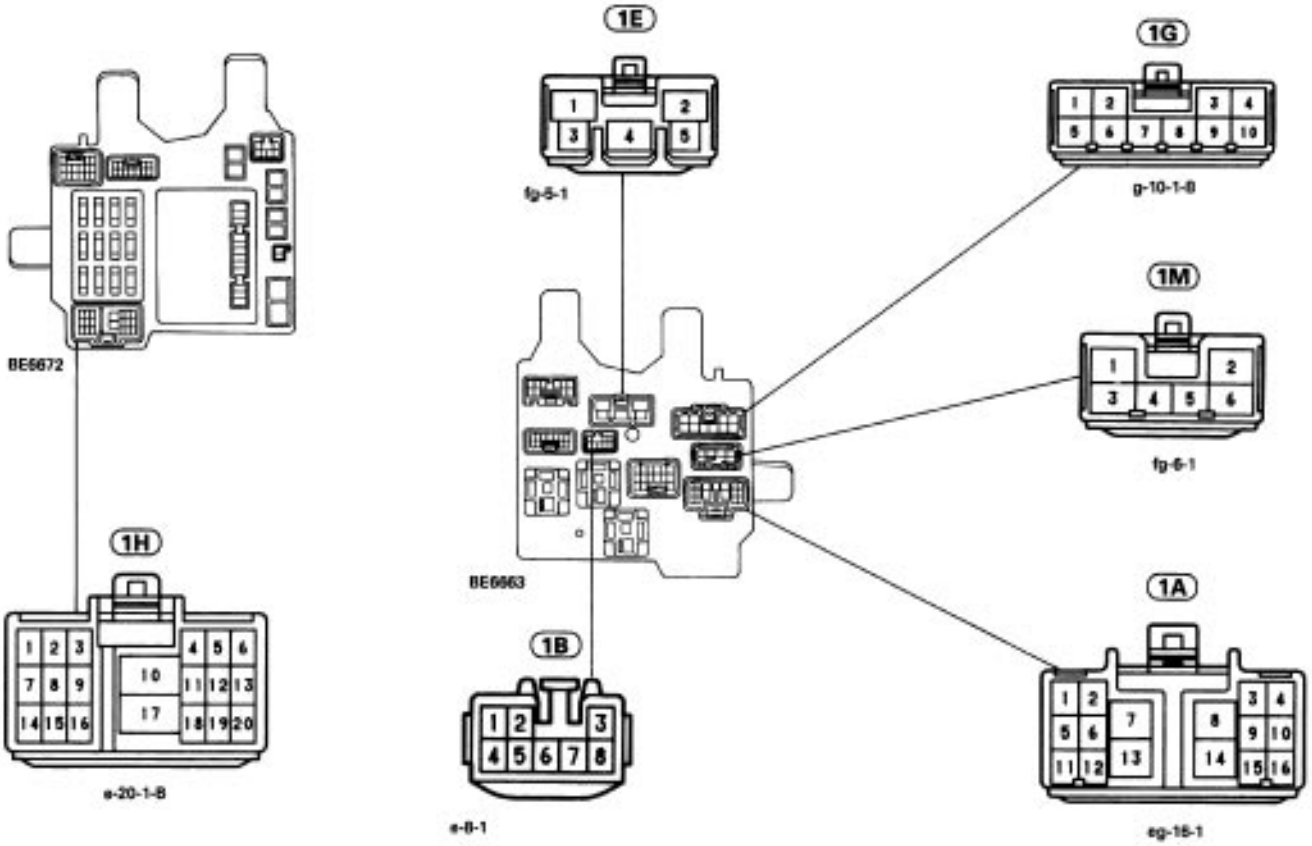
e-8-2

IS1

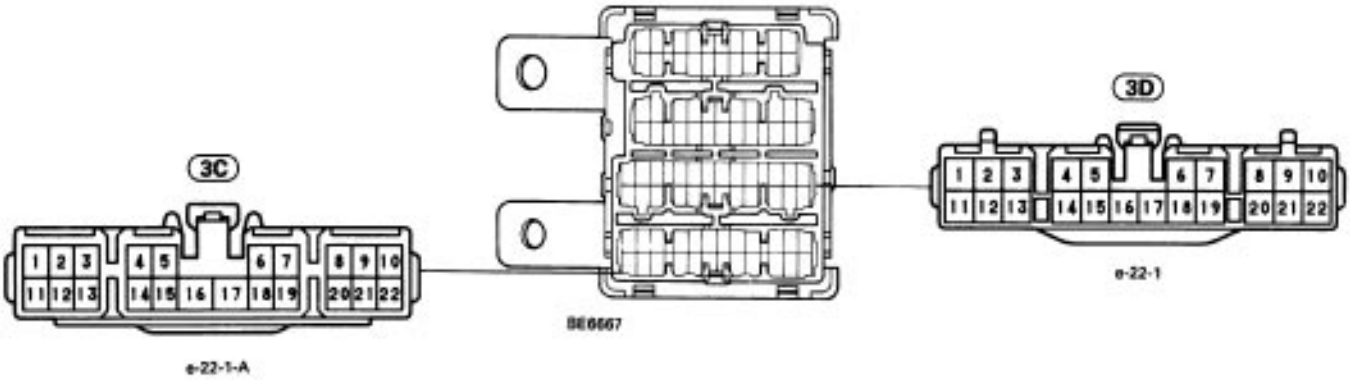
e-6-1

e-6-2

J/B No. 1

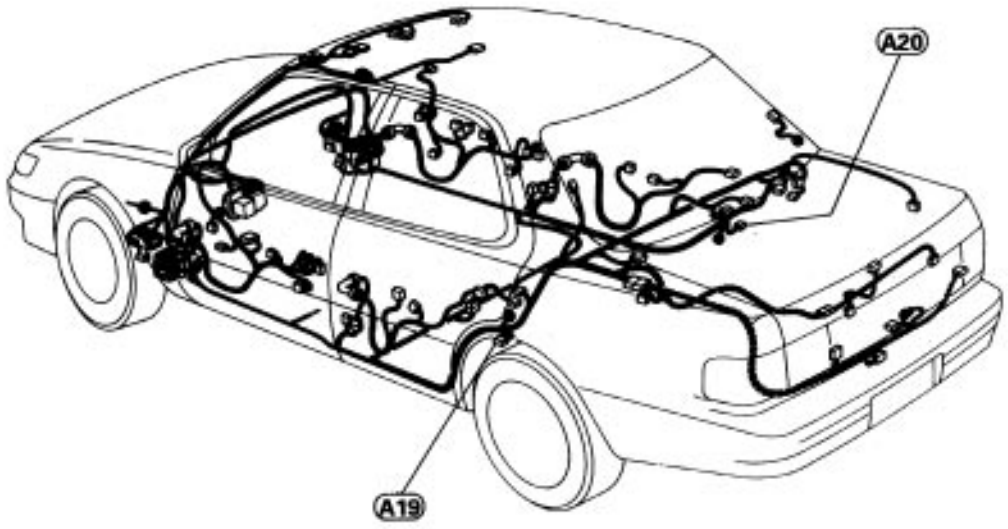

1E
fg-6-1
1G
g-10-1-B
1M
fg-6-1
BE6672
BE6663
1H
e-20-1-B
1B
e-8-1
1A
eg-16-1

J/B No. 3


3C
e-22-1-A
BE6667
3D
e-22-1

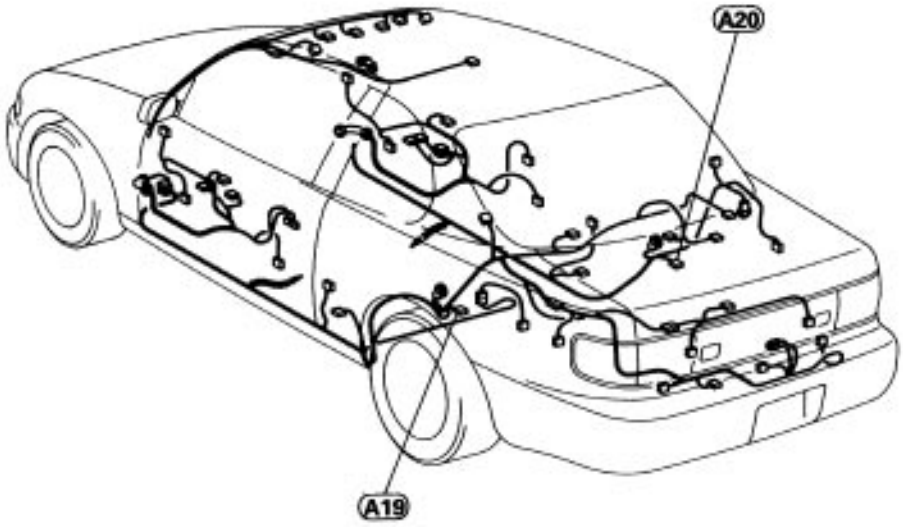
Location of Connectors in Body

Sedan:



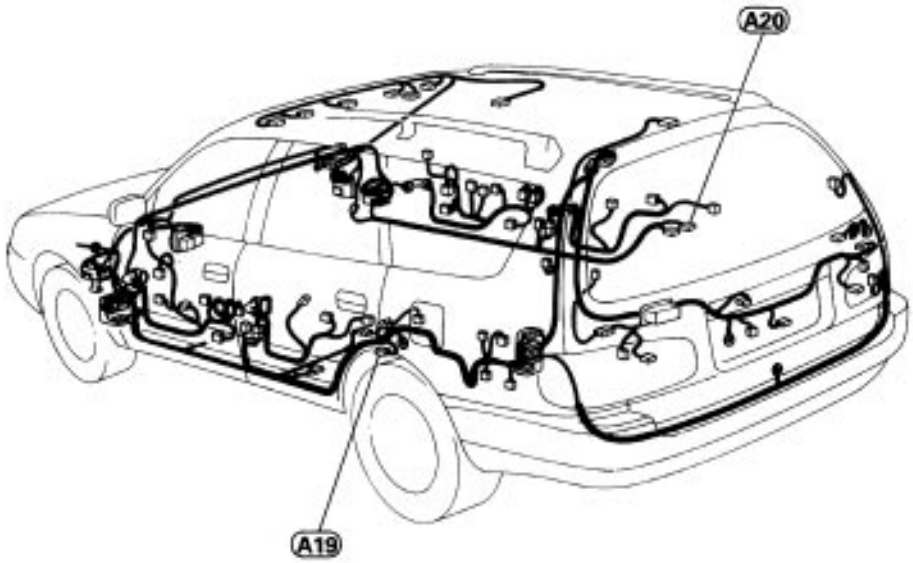
N09615

Coupe:



N09703

Wagon:



N09704

A19 A20

ABS Speed Sensor Left Rear
ABS Speed Sensor Right Rear

e-2-2-L

–MEMO–

CIRCUIT INSPECTION

DTC 11,13 ABS Solenoid and Motor Relay Circuit

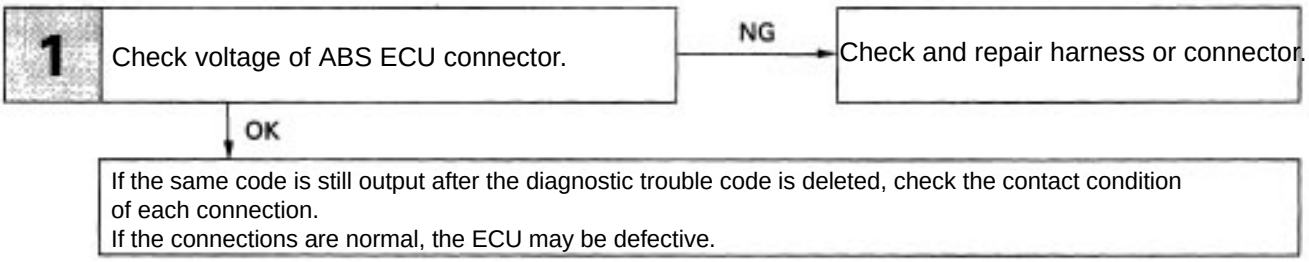
CIRCUIT DESCRIPTION

The solenoid relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on. The motor relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
11	(1) 5V is applied to the solenoid voltage monitor terminal (AST) for 30 sec. or more, with the IG switch ON and the warning light on. (2) 5V is applied to the solenoid voltage monitor terminal (AST) for 0.02 sec. or more, after the warning light goes off.	• Open or short in ABS solenoid relay circuit. • ECU.
13	(1) The motor voltage monitor terminal (MT) is ON for 5 sec. or more, with the motor relay operation signal OFF. (2) The motor voltage monitor terminal (MT) is OFF for 0.04 sec. with the motor relay operation signal ON.	• Pump motor. • Open in ABS motor relay circuit. • ECU.

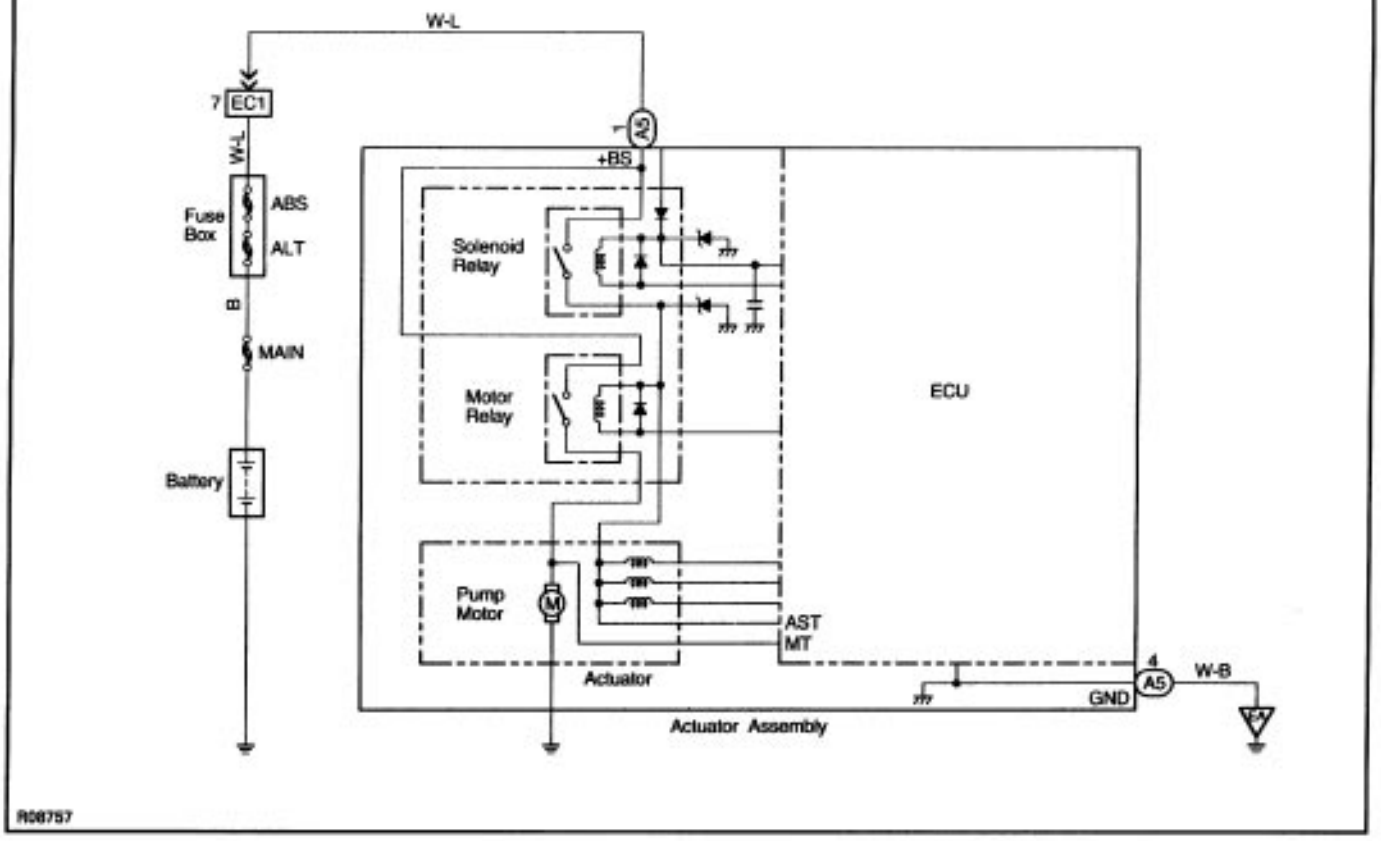
Fail safe function: If trouble occurs in the control (solenoid) relay circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART



HINT: When DTC13 is output, check that the pump motor ground wire is installed correctly.

WIRING DIAGRAM

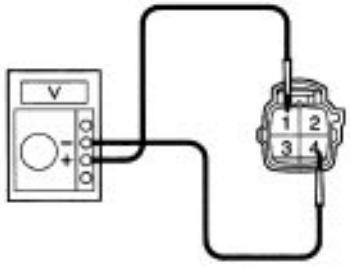


INSPECTION PROCEDURE

1 **Check voltage between terminals connector. (A5) 1 and (A5) 4 of ABS ECU**

OFF

IG OFF



R08545

P Disconnect the ABS ECU connector.

C Measure voltage between terminals (A5) 1 and (A5) 4 of ABS ECU harness side connector.

OK **Voltage: 10–14 V**

OK

NG **Check and repair harness or connector.**

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

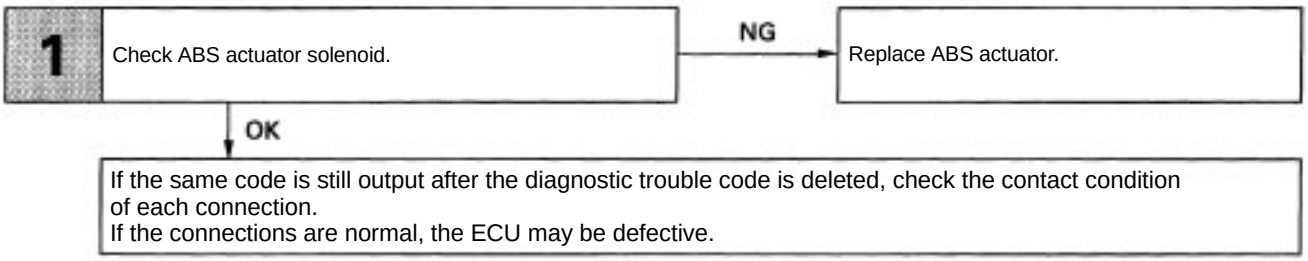
DTC 21, 22, 23 ABS Actuator Solenoid Circuit

CIRCUIT DESCRIPTION

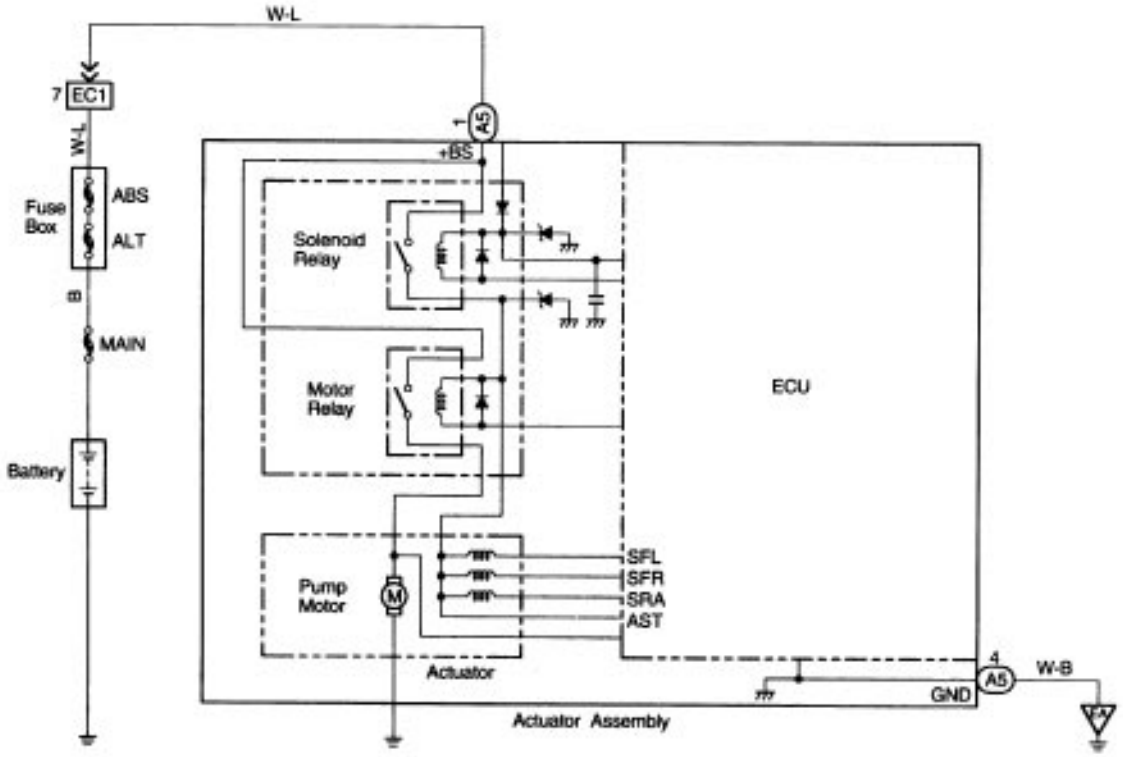
This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
21	(1) OV is applied to terminal SFR for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST) and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SFR for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power transistor is ON.	• ABS actuator (solenoid valve). • Open or short in right front solenoid circuit. • ECU.
22	(1) OV is applied to terminal SFL for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST)and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SFL for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power–transistor is ON.	• ABS actuator (solenoid valve). • Open or short in left front solenoid circuit. • ECU.
23	(1) OV is applied to terminal SRA for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST) and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SRA for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power transistor is ON.	• ABS actuator (solenoid valve). • Open or short in rear solenoid circuit. • ECU.

Fail safe function; If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the solenoid relay and prohibits ABS control.



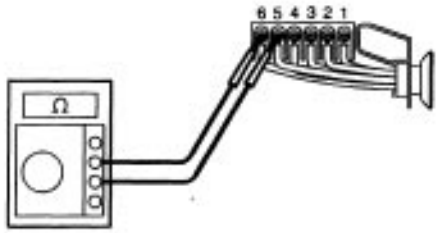
WIRING DIAGRAM



R08757

INSPECTION PROCEDURE

1 Check ABS actuator solenoid.



P Remove the ABS ECU cover and disconnect 6–pin connector.

C Check continuity between terminals 1 and 2, 3 and 4, 5 and6.

OK **Continuity**
HINT: Resistance of each solenoid coil is 1.1) .

OK

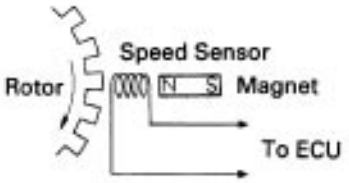
NG **Replace ABS actuator.**

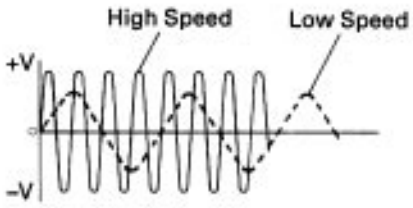
If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

DTC 31,32,33,34,35, 36, 38, 39 Speed Sensor Circuit

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations. When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.



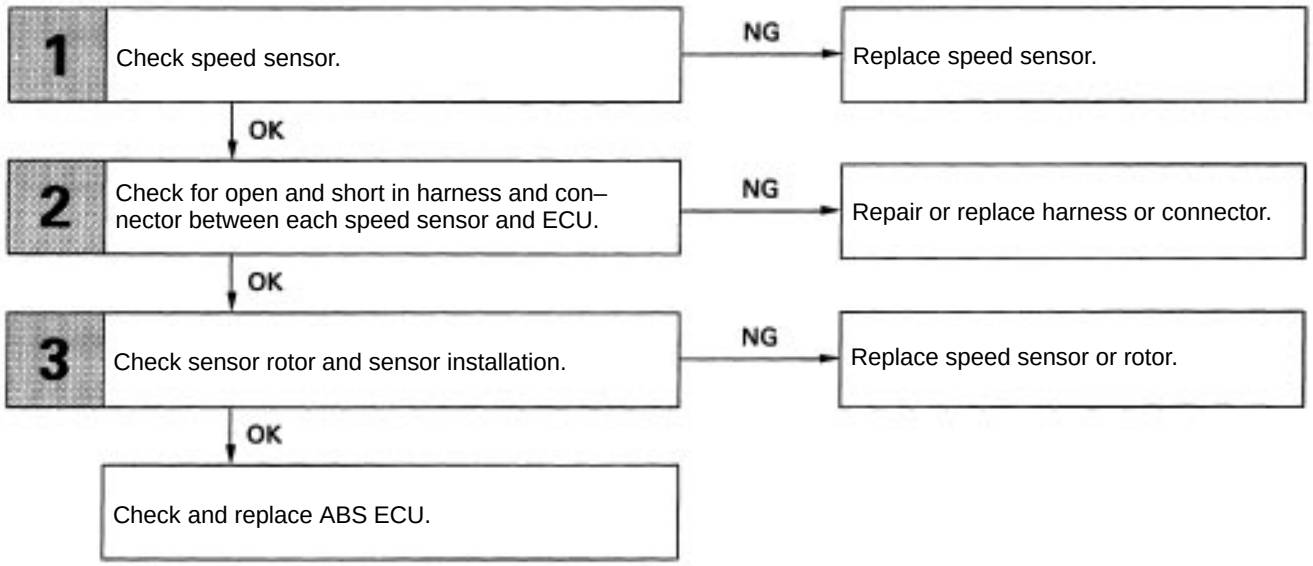


BR3583
BR3582

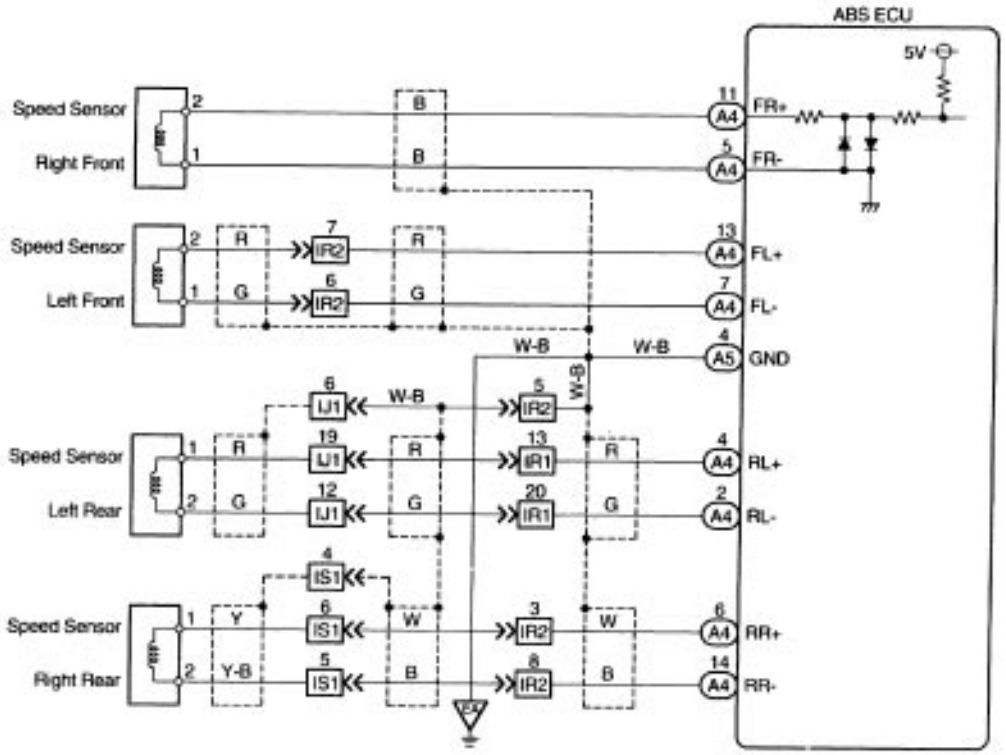
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
31,32, 33,34	(1) No pulse is input when the vehicle speed reaches 12 km/h (7 mph). (2) No pulse is input when the vehicle speed reaches 20 km/h (12 mph). (3) When the vehicle speed is 10 km/h (7 mph) or above, a pulse is not input for at least 20 sec.	• Right front, left front, right rear and left rear speed sensor. • Open in each speed sensor circuit. • Sensor installation • Sensor rotor • ECU.
35,36, 38,39	The hardware detects a constant open is each sensor circuit.	• Right front, left front, right rear and left rear speed sensor. • Open in each speed sensor circuit. • ECU.

HINT: DTC Nos. 31 and 35 are for the right front speed sensor.
DTC Nos. 32 and 36 are for the left front speed sensor.
DTC Nos. 33 and 38 are for the right rear speed sensor
DTC Nos. 34 and 39 are for the left rear speed sensor.
Fail safe function: If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART



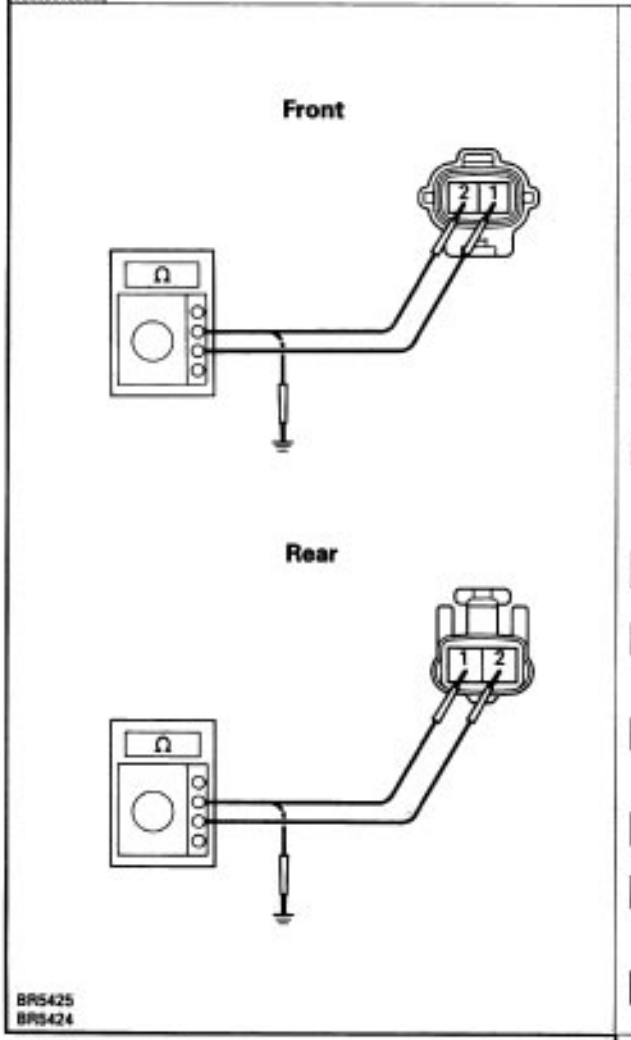
WIRING DIAGRAM



R08758

INSPECTION PROCEDURE

1 **Check speed sensor.**



Front

P 1. Remove front fender liner.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.

OK **Resistance: 0.6–1.8 kΩ**

C Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK **Resistance: 1 MΩ or higher**

Rear

P 1. Remove the seat cushion (and side seat back).
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.

OK **Resistance: 0.6–1.8 tcΩ**

C Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK **Resistance: 1 MΩ or higher**

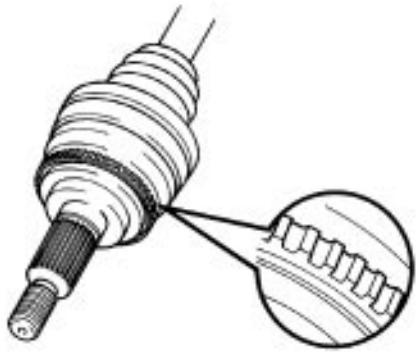
OK → **2** **Check for open and short in harness and connector between each speed sensor and ECU (See page IN–28).**

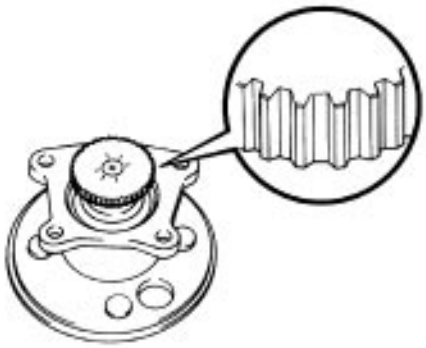
OK → **Proceed to next circuit inspection shown on problem symptoms table.**

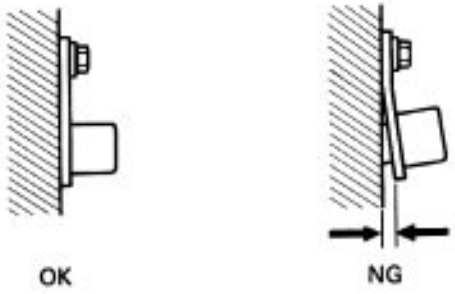
NG → **Repair or replace harness or connector.**

NG → **Replace speed sensor.**

3 Check sensor rotor and sensor installation.







R00948
R00947
BR3795

Front

P Remove front drive shaft (See SA section).
Check sensor rotor serrations.

C

OK **No scratches or missing teeth.**

C Check the front speed sensor installation

OK **The installation bolt is tightened properly.**

Rear

P Remove the axle hub (See SA section).

C Check the sensor rotor serrations.

OK **No scratches or missing teeth.**

C Check the speed sensor installation

OK **The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.**

OK

NG **Replace speed speed or rotor.**

Check and replace ABS ECU.

DTC 41 +BS Power Source Circuit

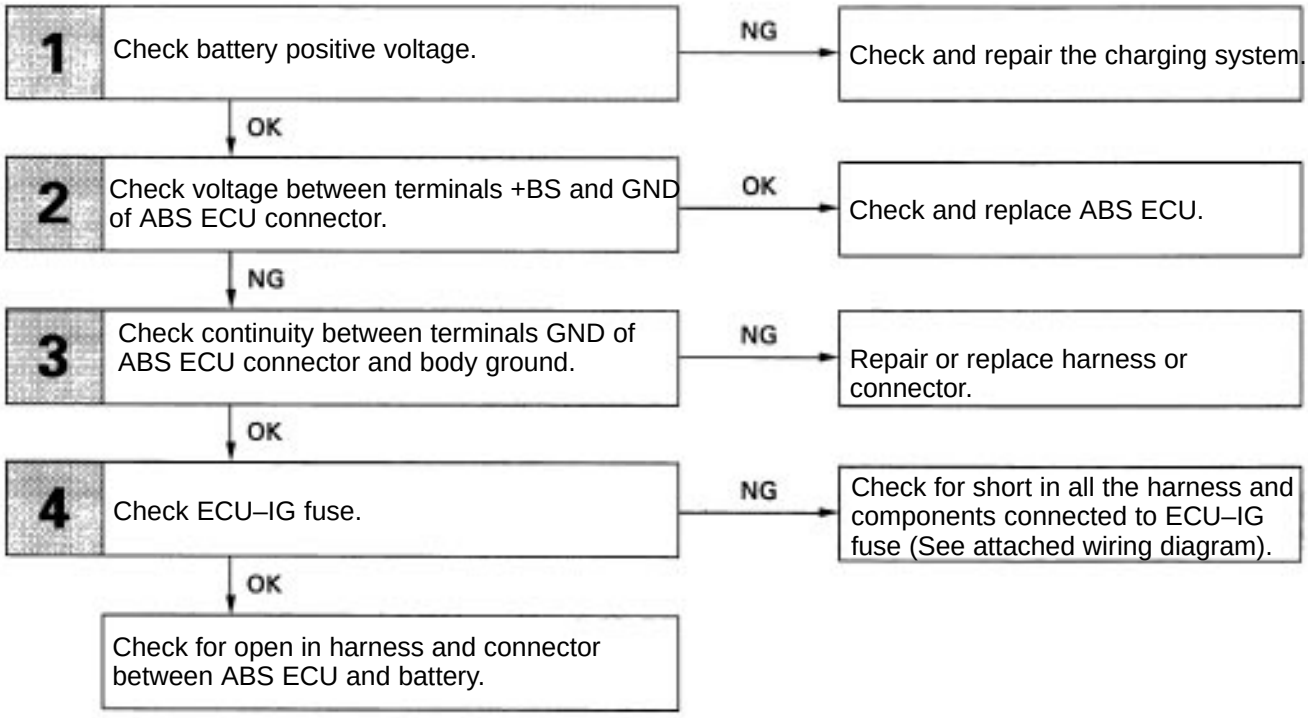
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU, and the actuators.

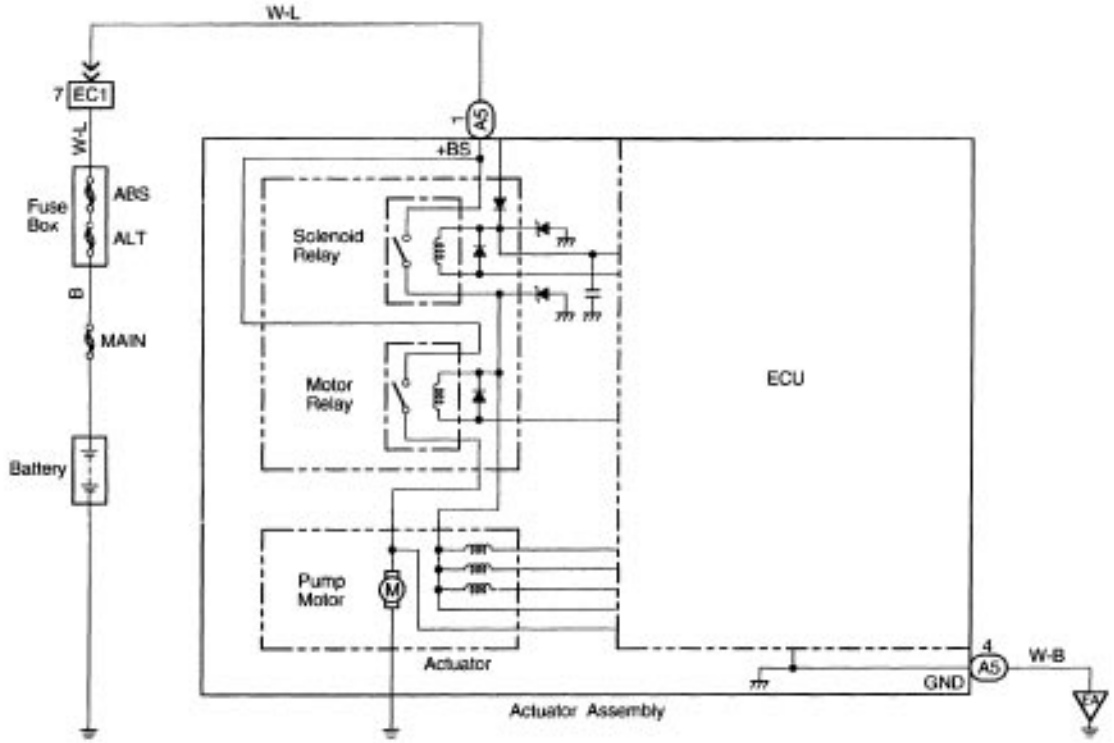
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
41	(1) Voltage of 5V or more, or 9.4V or less, is applied for at least 60 sec. to terminal +BS before the ABS primary check and ABS operation. (2) Voltage of 5V or more, or 9.4V or less, is applied to terminal +BS for 0.2 sec. or more, after the ABS primary check and before ABS operation. (3) During ABS operation, voltage of 5V or more, or 8.8V or less, is applied to terminal +BS for 0.2 sec. or more.	• Battery. • IC regulator. • Open or short in power source circuit. • ECU.

Fail safe function: If trouble occurs in the power source circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.
If the voltage applied to terminal +BS becomes 9.9V or less, the warning light goes off and ABS control becomes possible.

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check battery positive voltage.

OK **Voltage: 10–14 V**

OK → Check and repair the charging system.

NG

2 Check voltage between terminals +BS and GND of ABS ECU connector.

P Disconnect ABS ECU connector.

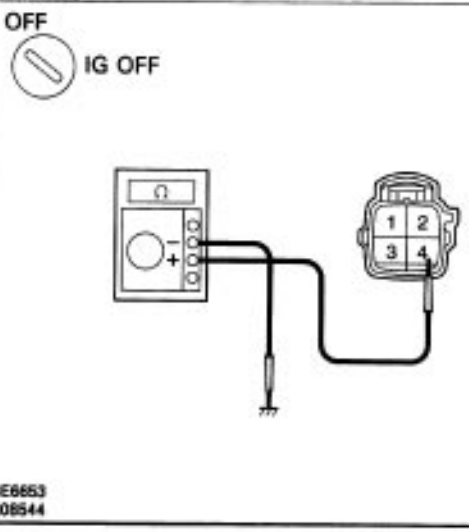
C
1. Turn ignition switch ON.
2. Measure voltage between terminals IG1 and GND of ABS ECU connector.

OK **Voltage: 10–14 V**

OK → Check and replace ABS ECU.

NG

3 Check continuity between terminal GND of ABS ECU connector and body ground.



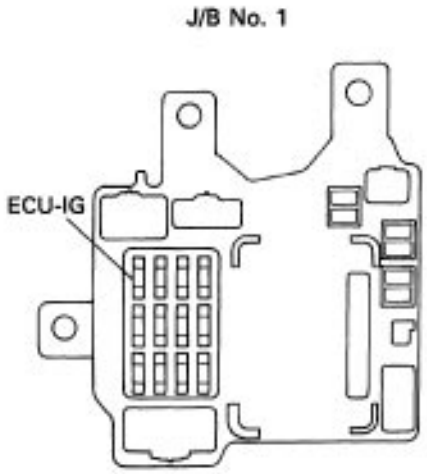
C Measure resistance between terminal GND of ABS ECU connector and body ground.

OK **Resistance: 1Ω or less**

OK → Repair or replace harness or connector.

NG

4 Check ECU–IG fuse.



P Remove ECU–IG fuse from J/B No. 1.

C Check continuity of ECU–IG fuse.

OK **Continuity**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–28).

NG

Check for short in. a1l the harness and components connected to ECU–IG fuse (See attached wiring diagram).

DTC 51 ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
51	Pump motor is not operating normally during initial check.	• ABS pump motor.

Fail safe function: If trouble occurs in the ABS pump motor, the ECU cuts off current to the solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART

Check that the pump motor ground wire is installed correctly.
If it is OK, replace the ABS actuator assembly.

Stop Light Switch Circuit

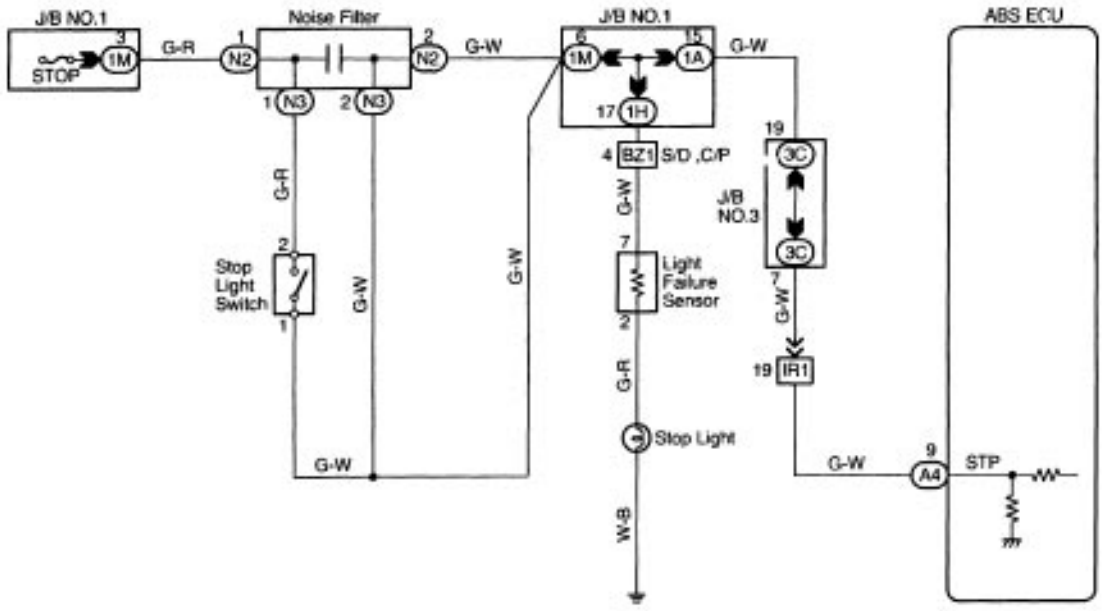
CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Repair stop light circuit (See page BE–65).
	OK ↓		
2	Check voltage of terminal STP.	OK	Proceed to next circuit inspection shown on problem symptoms chart (See page BR–148y.
	NG ↓		
3	Check for open in harness and connector between ABS ECU and stop light switch (See page IN–27).	NG	Repair–or replace harness or connector.
	OK ↓		
	Check and replace ABS ECU.		

WIRING DIAGRAM



R08760

INSPECTION PROCEDURE

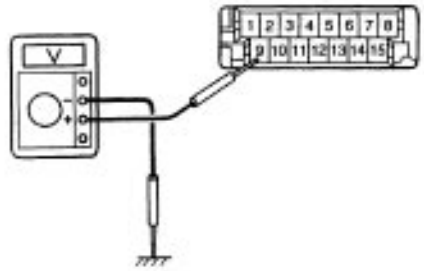
1 Check operation of stop light.

C Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

OK

NG → **Repair stop light circuit (See page BE–65).**

2 Check voltage between terminal STP of ABS ECU connector and body ground.



P Disconnect ABS ECU connector.

C Measure voltage between terminal STP and body ground.

OK **Voltage: 8–14 V**

NG

OK → **Proceed to next circuit inspection shown on problem symptoms chart (See page BR–148).**

3 Check for open in harness and connector between ABS ECU and stop light switch (See page IN–28).

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

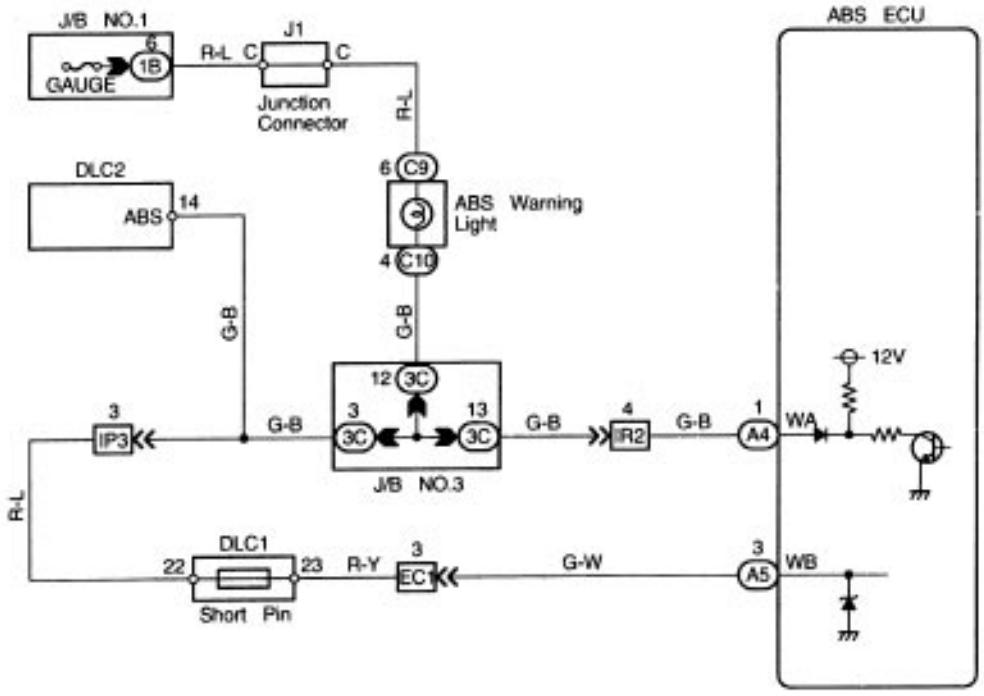
If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a diagnostic trouble code in memory.
Connect terminals Tc and E1 of the DLC1 or DLC2 to make the ABS warning light to blink and output the diagnostic trouble code.

DIAGNOSTIC CHART

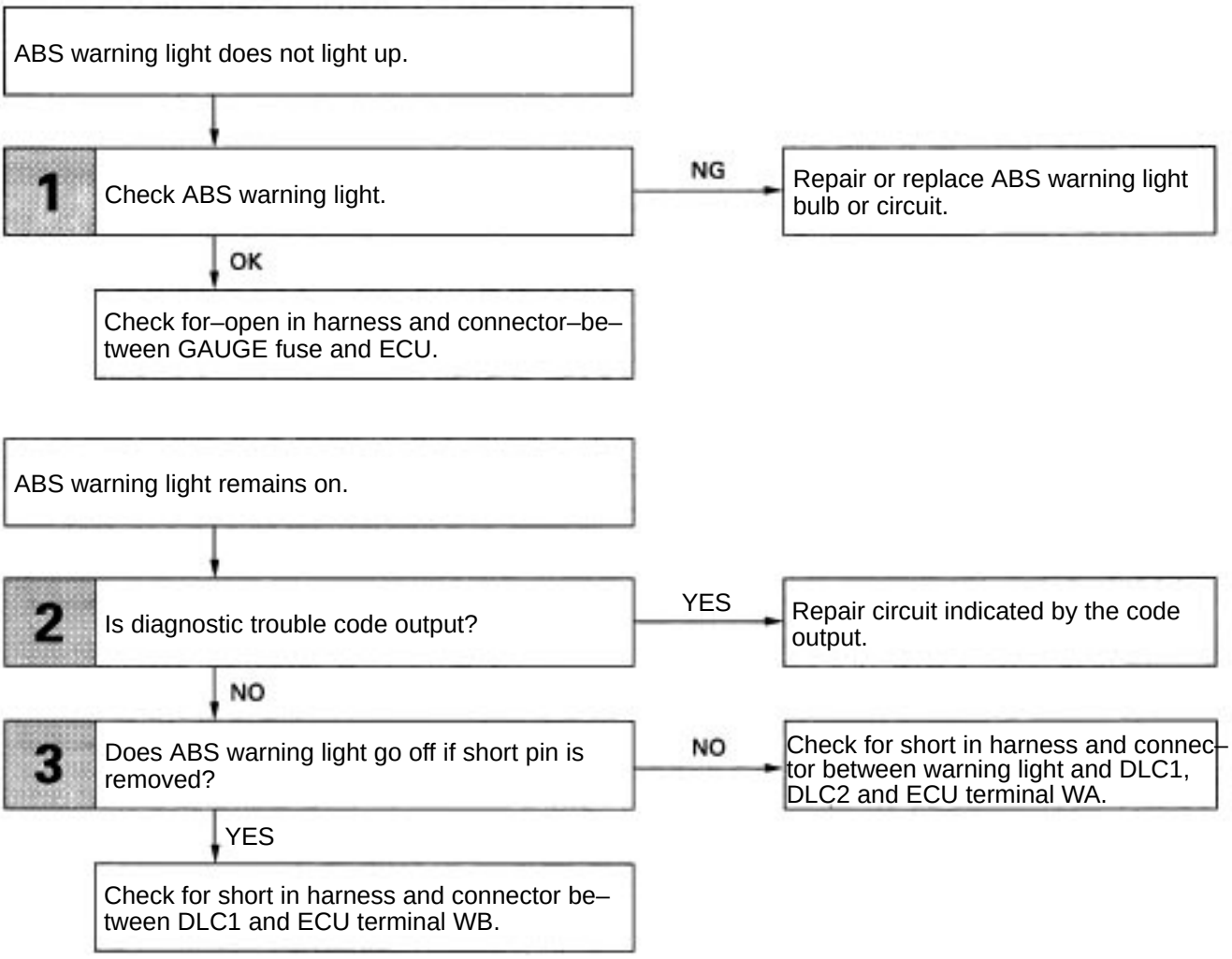
Perform troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 2

WIRING DIAGRAM



R08761


ABS warning light does not light up.
1
Check ABS warning light.
NG
Repair or replace ABS warning light bulb or circuit.
OK
Check for–open in harness and connector–between GAUGE fuse and ECU.
ABS warning light remains on.
2
Is diagnostic trouble code output?
YES
Repair circuit indicated by the code output.
NO
3
Does ABS warning light go off if short pin is removed?
NO
Check for short in harness and connector between warning light and DLC1, DLC2 and ECU terminal WA.
YES
Check for short in harness and connector between DLC1 and ECU terminal WB.

INSPECTION PROCEDURE

1 Check ABS warning light.

See Combination Meter–Troubleshooting on page BE–1 18.

OK

NG → **Replace bulb or combination meter assembly.**

Check for open in harness and connector between GAUGE fuse and ECU (See page IN–27).

2 Is diagnostic trouble code output?

Perform diagnostic trouble code check on page BR–143.

NO

YES → **Repair circuit indicated by the code output.**

3 Does ABS warning light go off if short pin is removed?

YES

NO → **Check for short in harness and connector between warning light and DLC1, DLC2 and ECU terminal WA (See page IN–28).**

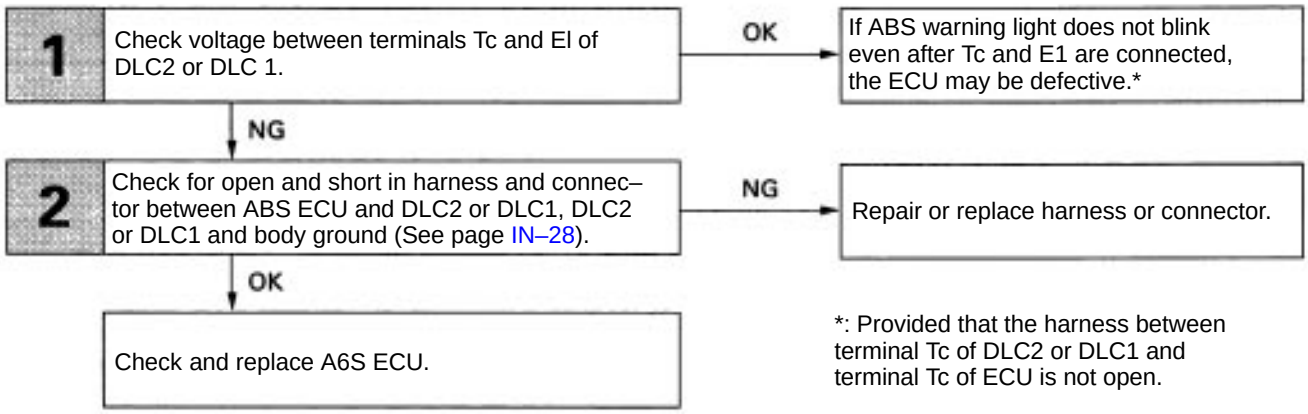
Check for short in harness and connector between DLC1 and ECU terminal WB (See page IN–27).

Terminal Circuit

CIRCUIT DESCRIPTION

Connecting terminals Te and E1 of the DLC1 or the DLC2 causes the ECU to display the diagnostic trouble code by flasing the ABS warning light.

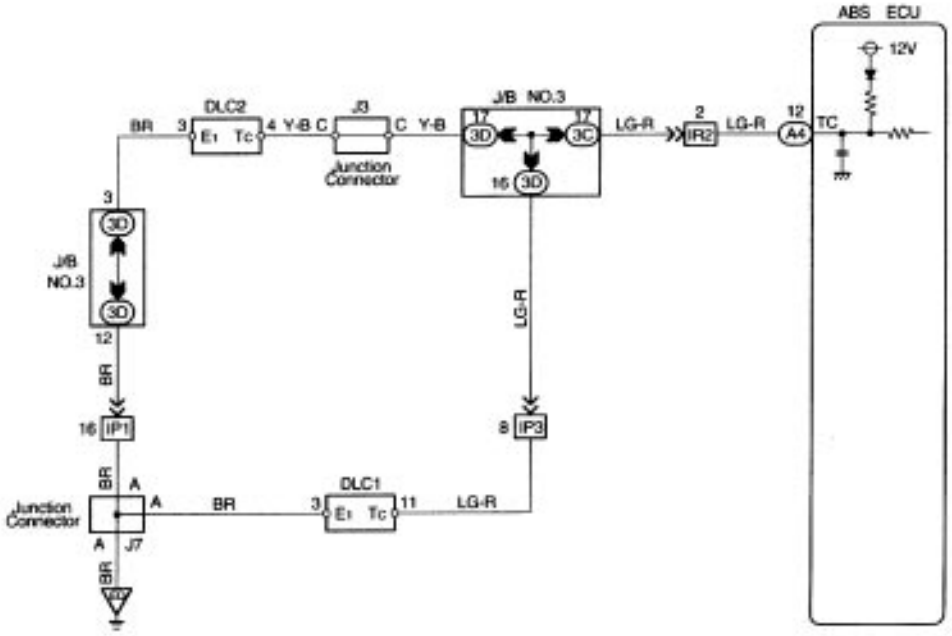
DIAGNOSTIC CHART



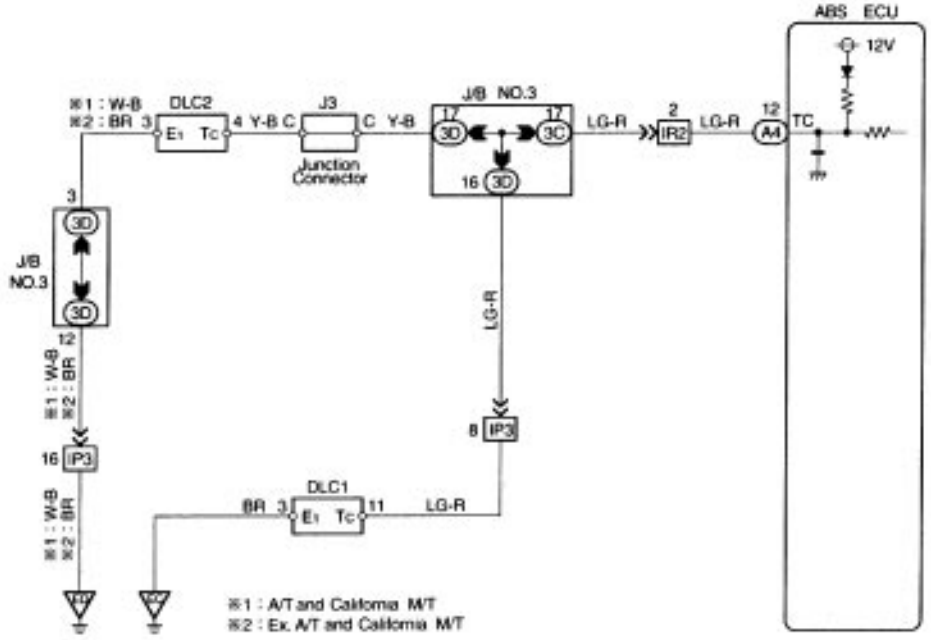
*: Provided that the harness between terminal Tc of DLC2 or DLC1 and terminal Tc of ECU is not open.

WIRING DIAGRAM

1 M^–FE:



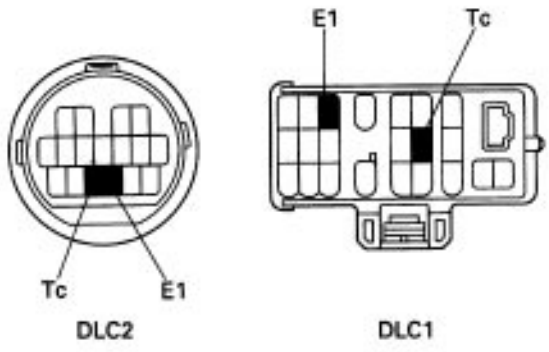
5S–FE:



R08762
R08763

INSPECTION PROCEDURE

1 **Check voltage between terminals Te and E1 of DLC2 or DLC1.**



C 1. Turn ignition switch ON.
2. Measure voltage between terminals Tc and E1 of DLC2 or DLC1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Tc and E 1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC2 or DLC1, DLC2 or DLC1 and body ground (See page IN–28).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Ts Terminal Circuit

CIRCUIT DESCRIPTION

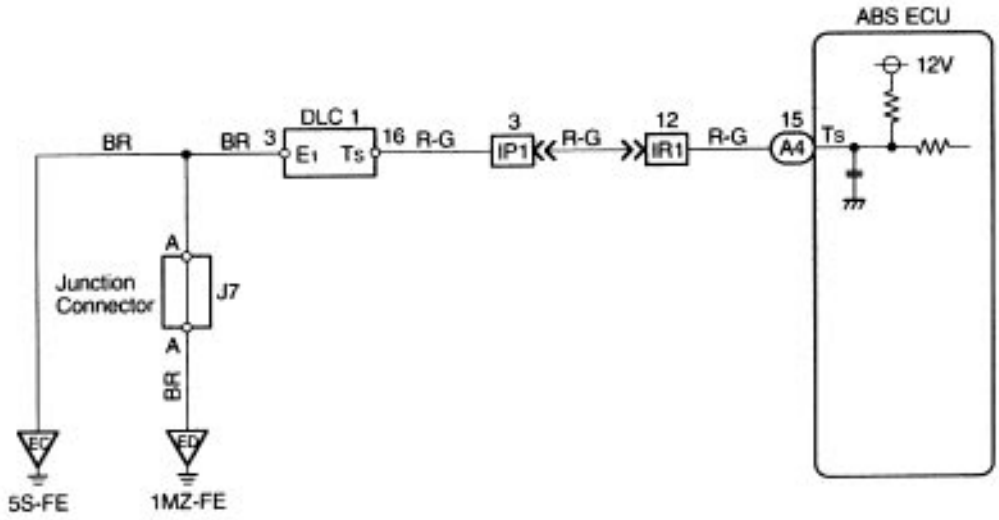
The sensor check circuit detects abnormalities in the speed sensor signal which can not be detected with the diagnostic trouble code check.
Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

DIAGNOSTIC CHART

1. Check voltage between terminals Ts and E1 of DLC1.
   - OK → If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.
   - NG ↓
2. Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace ABS ECU.

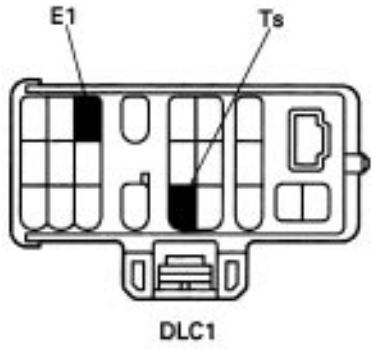
WIRING DIAGRAM



R08784

INSPECTION PROCEDURE

1 **Check voltage between terminals¿¿and E1 of DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Ts and E1 of DLC 1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).**

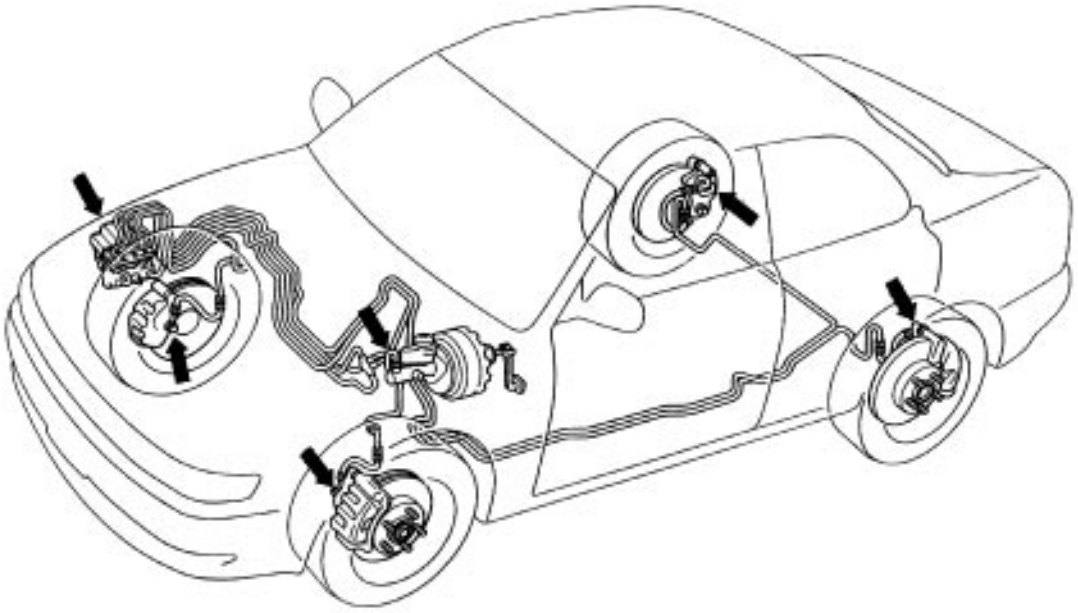
OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Check for Fluid Leakage

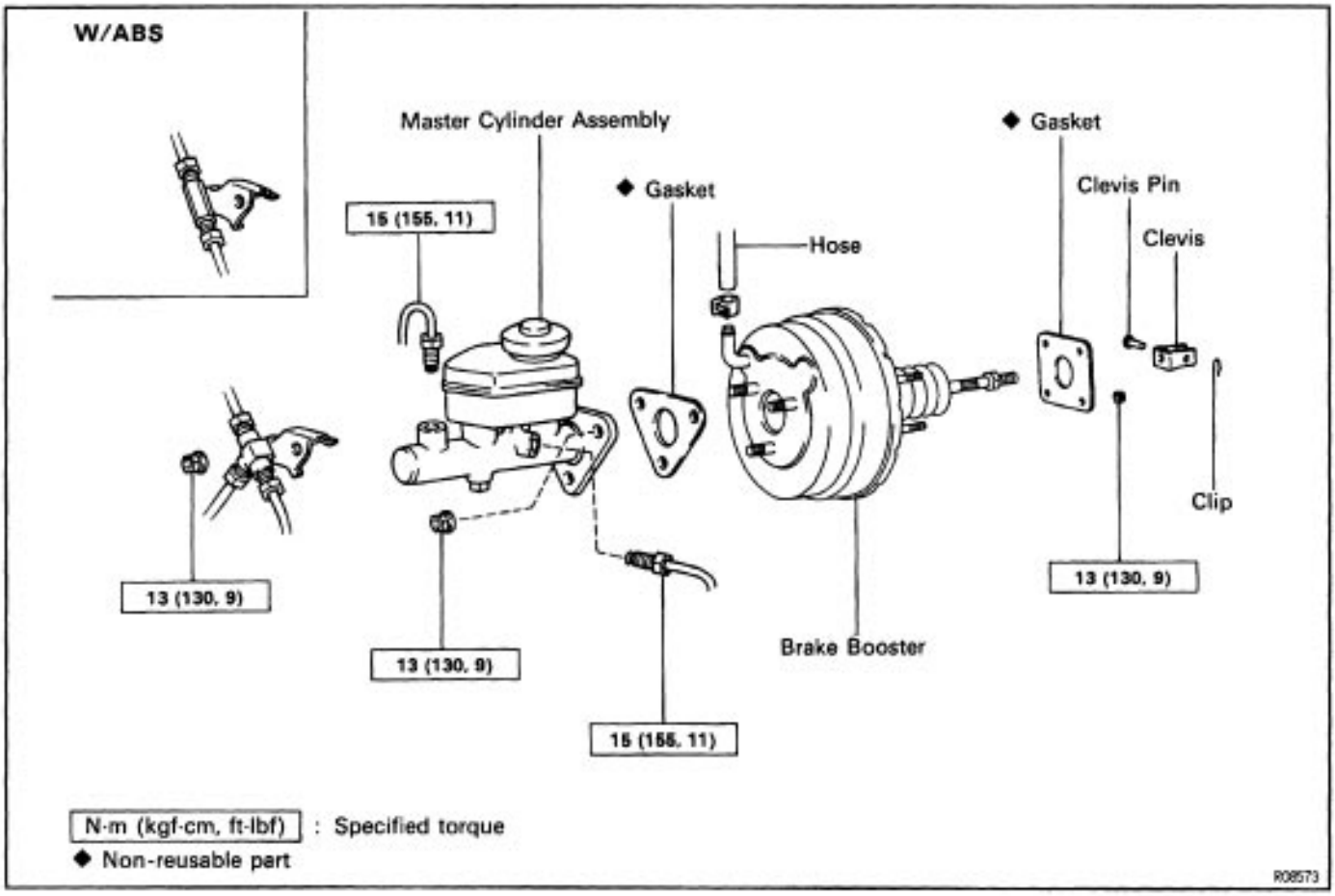
Check for fluid leakage from actuator or hydraulic lines.



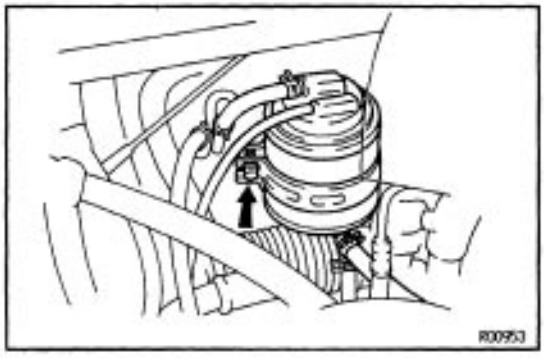
RO8882

BRAKE BOOSTER

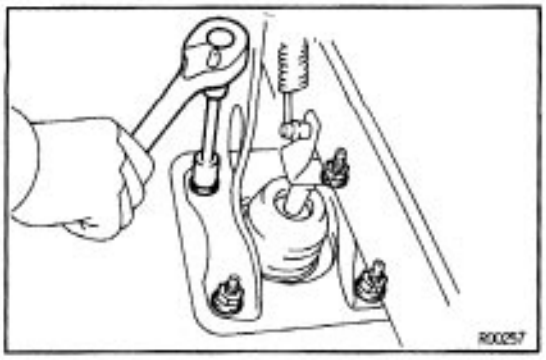
BRAKE BOOSTER REMOVAL



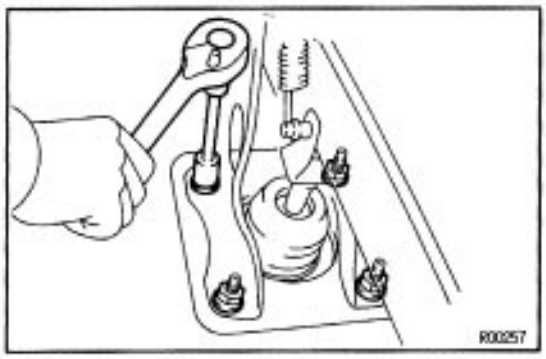
1. REMOVE MASTER CYLINDER
(See page BR–12)



2. PUSH DOWN CHARCOAL CANISTER
Loosen the clamp screw and push the charcoal canis–ter down slightly.



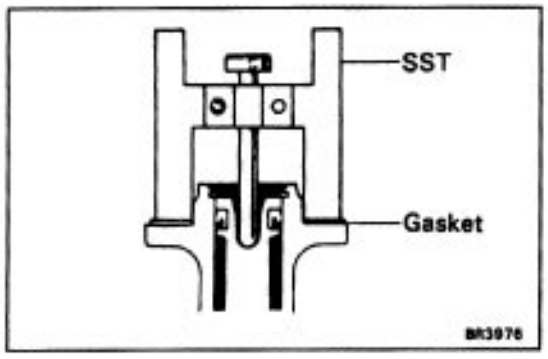
3. DISCONNECT VACUUM HOSE FROM BRAKE BOO – STER
4. REMOVE PEDAL RETURN SPRING
5. REMOVE CLIP AND CLEVIS PIN
6. REMOVE BRAKE BOOSTER, GASKET AND CLEVIS
(a) Remove the 4 nuts and clevis.
(b) Pull out the brake booster and gasket.

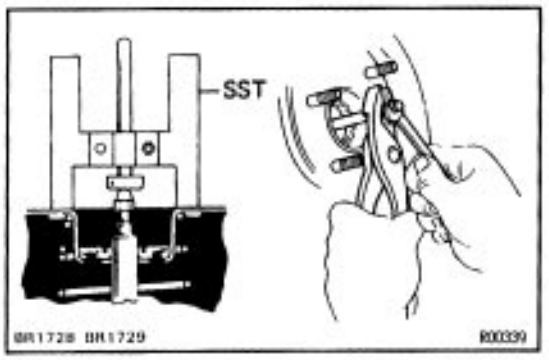


BRAKE BOOSTER INSTALLATION

1. INSTALL BRAKE BOOSTER
(a) Install the booster and a new gasket.
(b) Install the clevis to the operating rod.
(c) Install and torque the booster installation nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(d) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
(e) Install the pedal return spring.

2. ADJUST LENGTH OF BOOSTER PUSH ROD
(a) Install the gasket on the master cylinder.
(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.





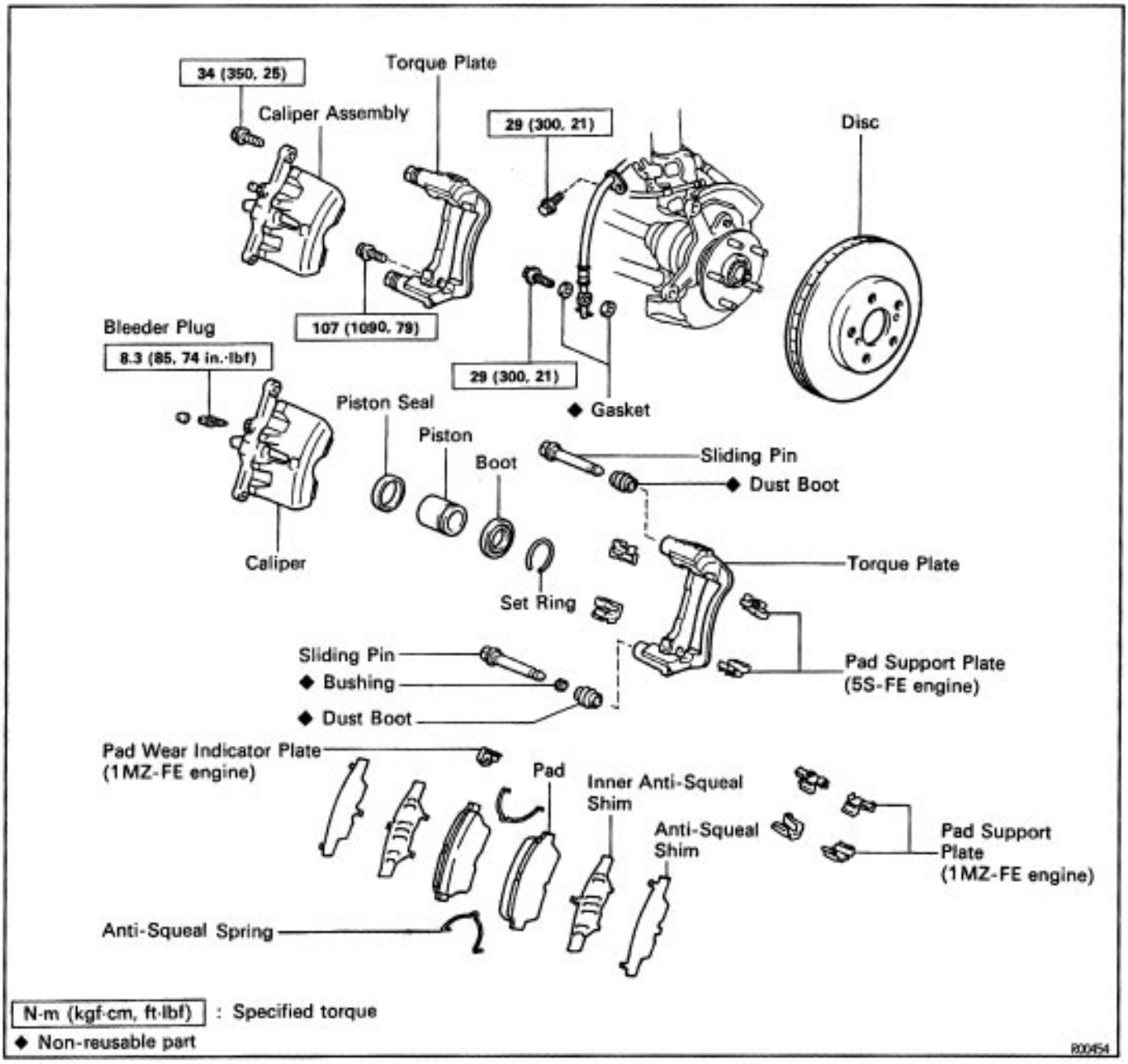
(c) Turn the SST upside down, and set it on the booster.
(d) Measure the clearance between the booster push rod and pin head (SST).
Clearance:
0 mm (0 in.)
(e) Adjust the booster push rod length until the push rod slightly touches the pin head.

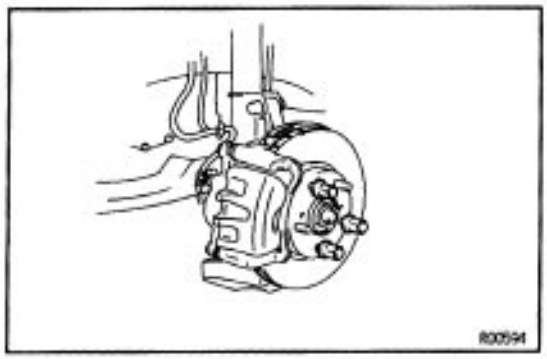
3. INSTALL CHARCOAL CANISTER TO ORIGINAL PO– SITION
4. INSTALL MASTER CYLINDER
5. CONNECT VACUUM HOSE TO BRAKE BOOSTER
6. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–9)
7. CHECK FOR LEAKS

8. CHECK AND ADJUST BRAKE PEDAL
(See page BR–8)
Check and adjust the brake pedal, then tighten the clevis lock nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

9. PERFORM OPERATIONAL CHECK
(See page BR–9)

FRONT BRAKE
(Single–Piston Type)
COMPONENTS

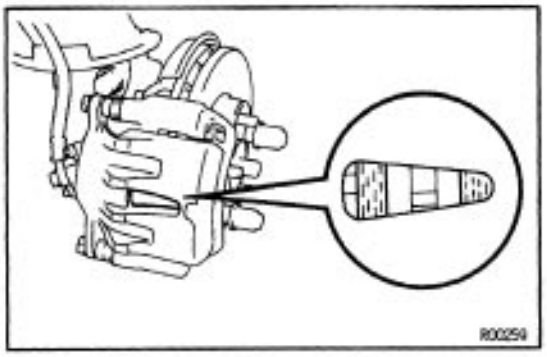




BRAKE PADS REPLACEMENT

1. REMOVE FRONT WHEEL

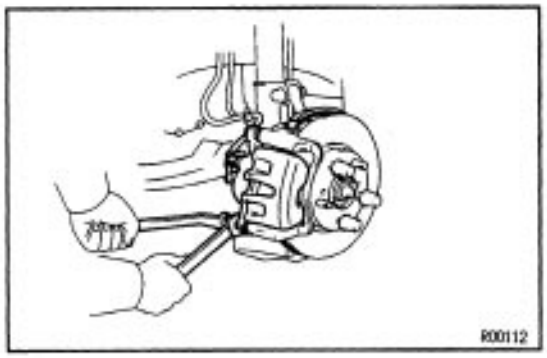
Remove the wheel and temporarily fasten the disc with hub nuts.



2. INSPECT PAD LINING THICKNESS

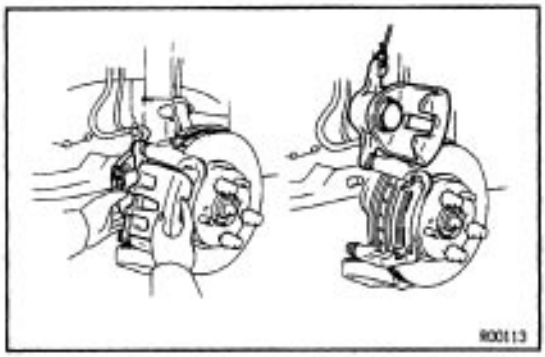
Check the pad thickness through the caliper inspection hole and replace the pads if it is not within the specification.

Minimum thickness:
1.0 mm (0.039 in.)



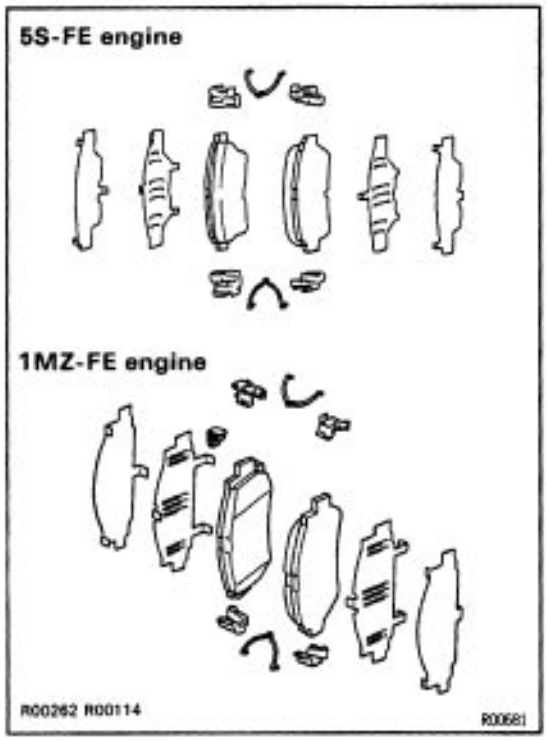
3. LIFT UP CALIPER

(a) Hold the sliding pin on the bottom and loosen the installation bolt.
(b) Remove the installation bolt.



(c) Lift up the caliper and suspend the caliper with string.

HINT: Do not disconnect the flexible hose from the caliper.

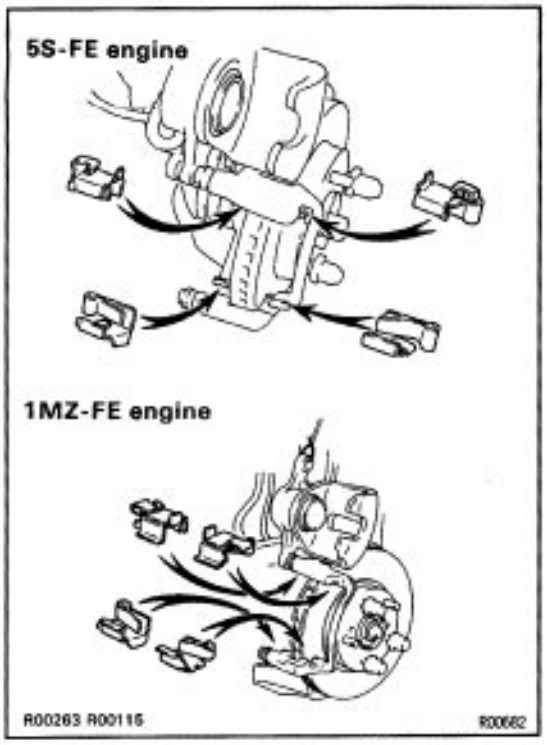


4. REMOVE FOLLOWING PARTS:

(a) 2 anti–squeal springs
(b) 2 brake pads
(c) 4 anti–squeal shims
(d) 1 MZ–FE engine:
Pad wear indicator
(e) 4 pad support plates

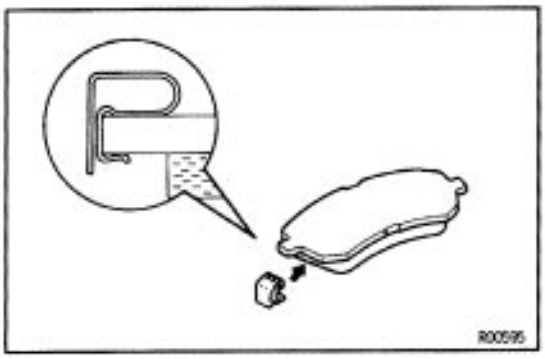
5. CHECK DISC THICKNESS AND RUNOUT

(See page BR–26**)**



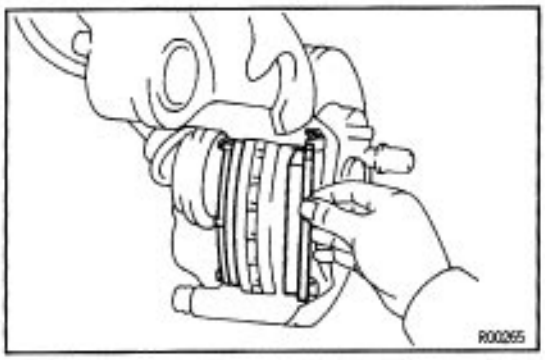
6. INSTALL PAD SUPPORT PLATES

Install the 4 pad support plates.



7. INSTALL NEW PADS

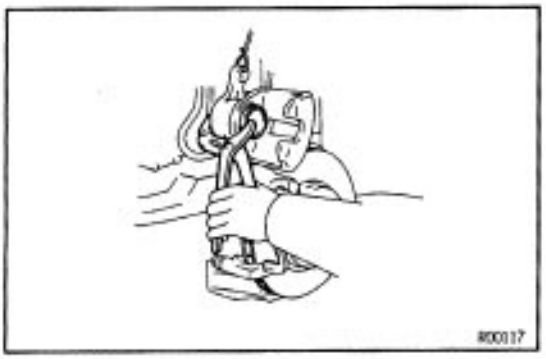
(a) 1 MZ–FE engine:
Install a pad wear indicator plate on the inside pad.
(b) Apply disc brake grease to both sides of the inner anti –squeal shim.
(c) Install the 2 anti–squeal shims on each pad.



(d) install inside pad with the pad wear indicator plate facing upward.
(e) Install outside pad.

NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.

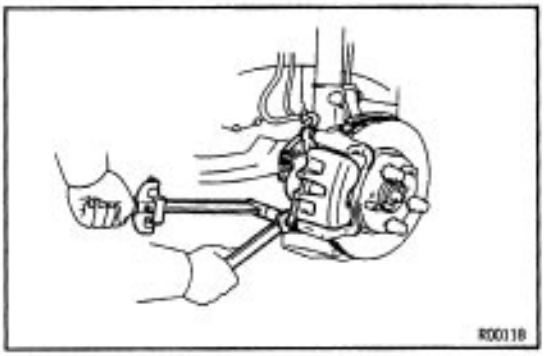
(f) Install the 2 anti–squeal springs.



8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with water pump pliers or similar implement.

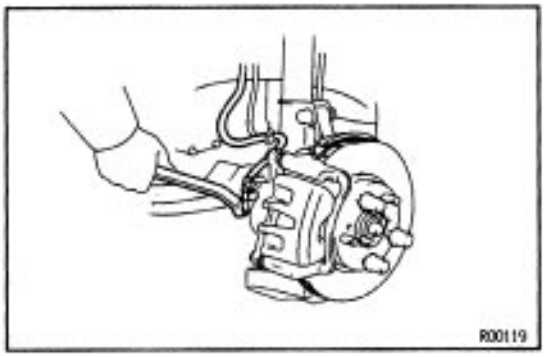
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.



(c) Install the caliper.
(d) Hold the sliding pin and torque the installation bolt.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

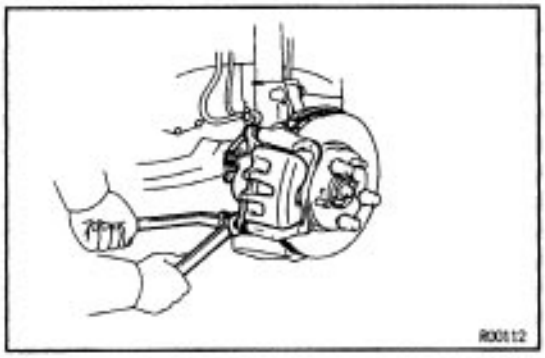
9. INSTALL FRONT WHEEL

10. CHECK THAT FLUID LEVEL IS AT MAX LINE

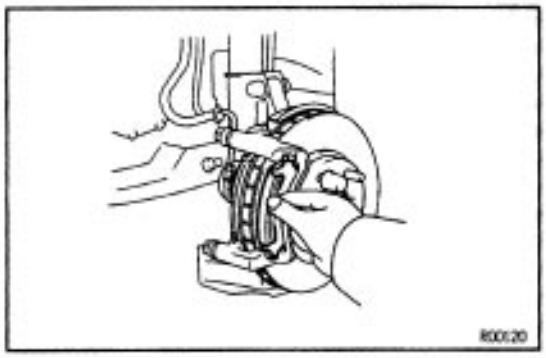


CALIPER REMOVAL

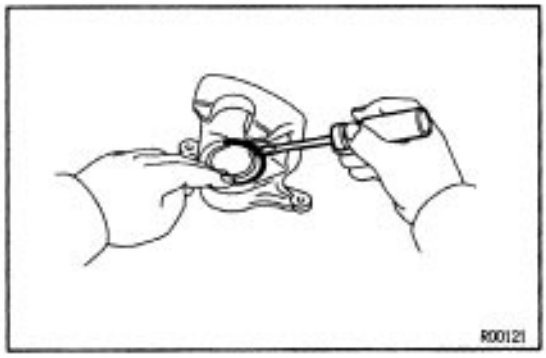
1. DISCONNECT FLEXIBLE HOSE
(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.



2. REMOVE CALIPER
(a) Hold the sliding pin and loosen the 2 installation bolts.
(b) Remove the 2 installation bolts.
(c) Remove the caliper from the torque plate.

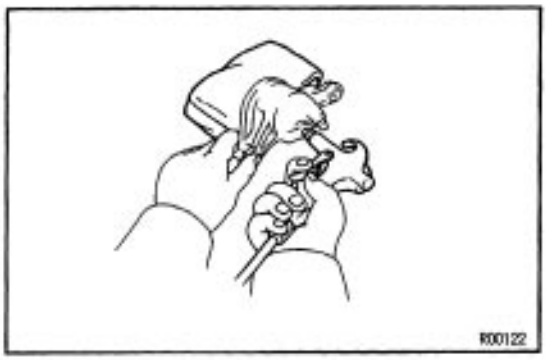


3. REMOVE 2 BRAKE PADS
Remove the inside and outside pads.



CALIPER DISASSEMBLY

1. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT
Using a screwdriver, remove the cylinder boot set ring and cylinder boot from the caliper.

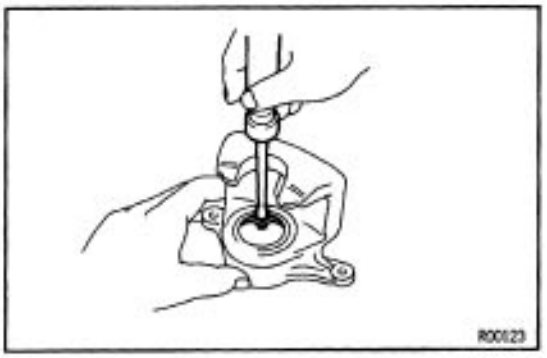


2. REMOVE PISTON

(a) Place a piece of cloth or similar article between the piston and the caliper.

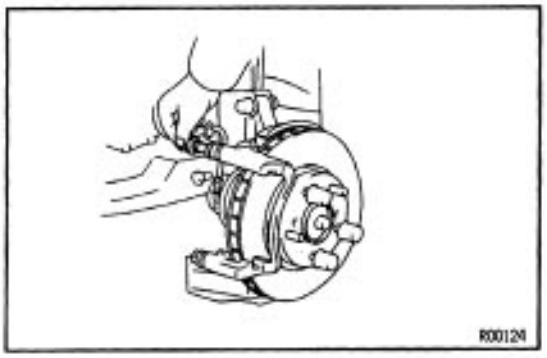
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed sir.



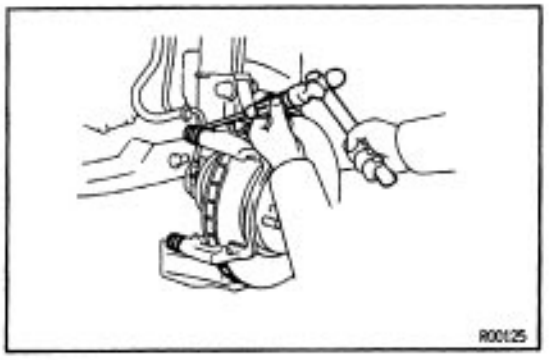
3. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.

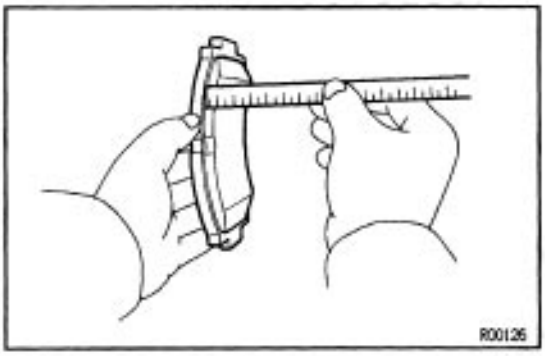


4. REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.



(b) Using a screwdriver and hammer, tap out the 2 dust boots.



FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness:

5S–FE engine

12.0 mm (0.472 In.)

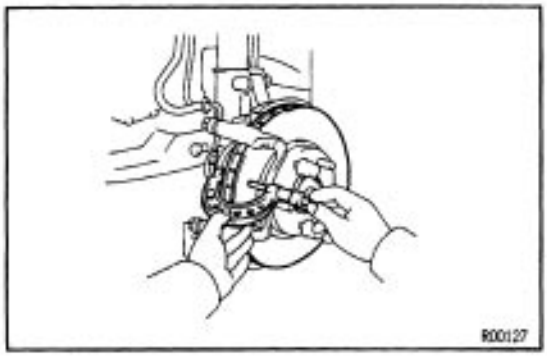
1 MZ–FE engine

11.0 mm (0.433 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

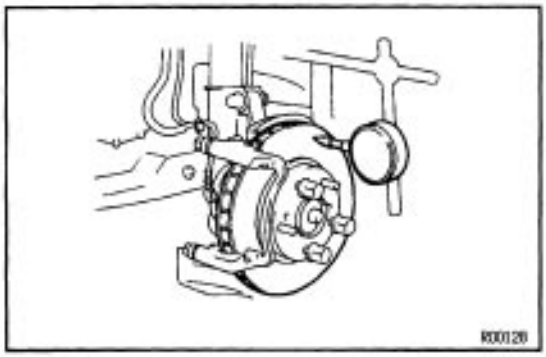
Standard thickness:

28.0 mm (1.102 in.)

Minimum thickness:

26.0 mm (1.024 in.)

Replace the disc if the disc's thickness is at the mini–mum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

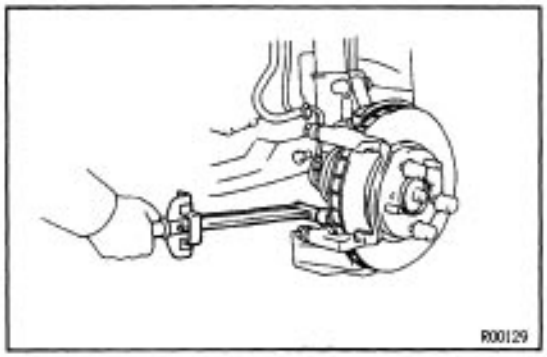
Measure disc runout 10 mm (0.39 in.) from the outer edge of the disc.

Maximum disc runout:

0.05 mm (0.0020 in.)

If runout is greater than maximum, attempt to adjust to below this maximum figure.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.



4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the torque plate from the knuckle.

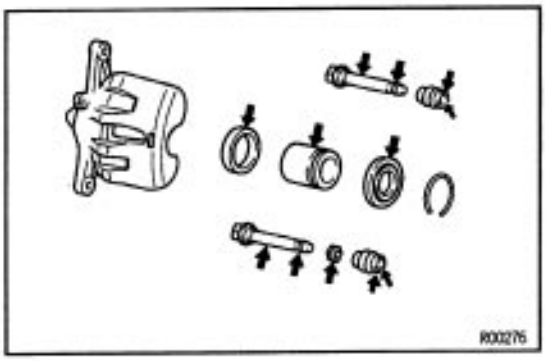
(b) Remove the hub nuts and the disc. Reinstall the disc 1/5 of a turn round from its original position on the hub. Install and torque the hub nuts.

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

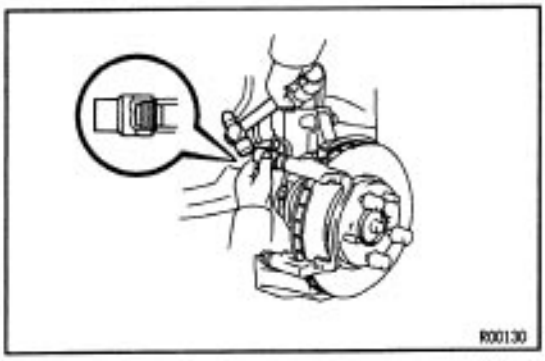
Remeasure the disc runout. Make a note of the runout and the disc's position on the hub.

(c) Repeat (b) until the disc has been installed on the 3 remaining hub positions.
(d) If the minimum runout recorded in (b) and (c) is less than 0.05 mm (0.0020in.), install the disc in that position.
(e) If the minimum runout recorded in (b) and (c) is greater than 0.05 mm (0.0020 in.), replace the disc and repeat step 3.
(f) Install the torque plate and torque the mounting bolts.
Torque: 107 N–m (1,090 kgf–cm, 79 ft–lbf)

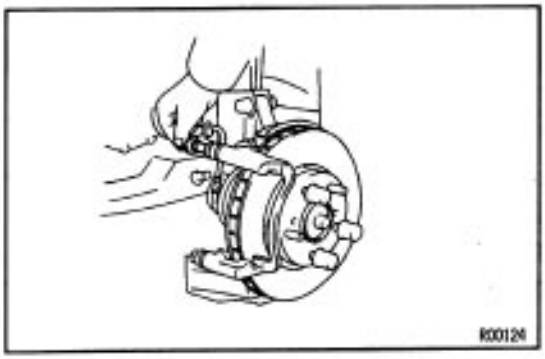
CALIPER ASSEMBLY



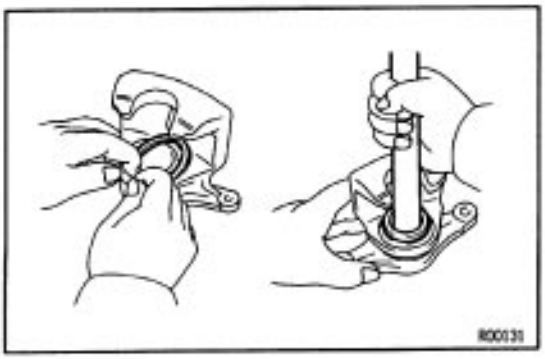
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



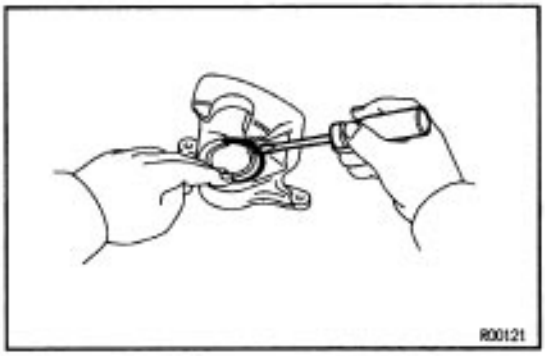
2. INSTALL DUST BOOTS AND SLIDING PINS
(a) Using a 19 mm socket wrench and hammer, tap in 2 new dust boots into the torque plate.
(b) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.



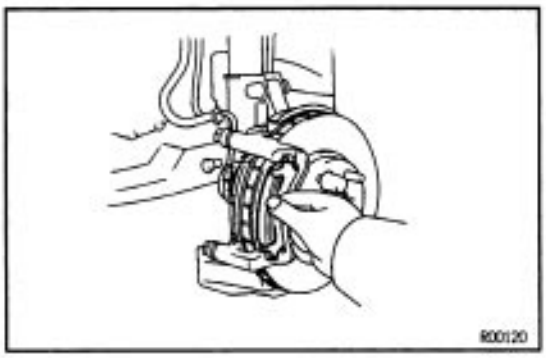
(c). Insert 2 sliding pins into the torque plate.
NOTICE: Insert the sliding pin with sliding bushing into the bottom side.



3. INSTALL PISTON SEAL AND PISTON IN CYLINDER



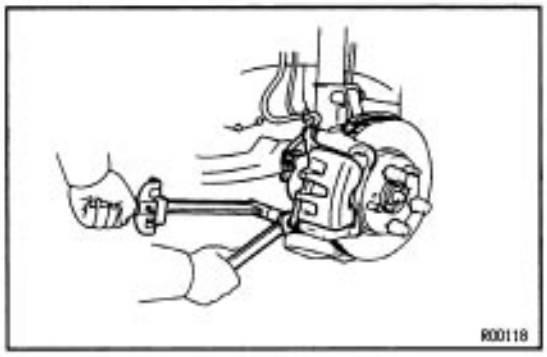
4. INSTALL CYLINDER BOOT AND CYLINDER BOOT SET RING



CALIPER INSTALLATION

1. INSTALL 2 BRAKE PADS

Install the inside and outside pads.

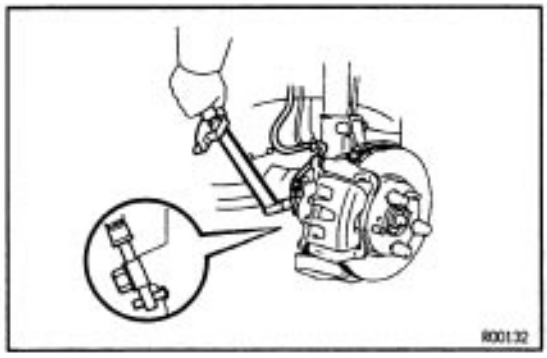


2. INSTALL CALIPER

(a) Temporarily install the caliper on the torque plate with the 2 installation bolts.

(b) Hold the sliding pin and torque the installation bolt.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

HINT: Install the flexible hose lock securely in the lock hole in the caliper.

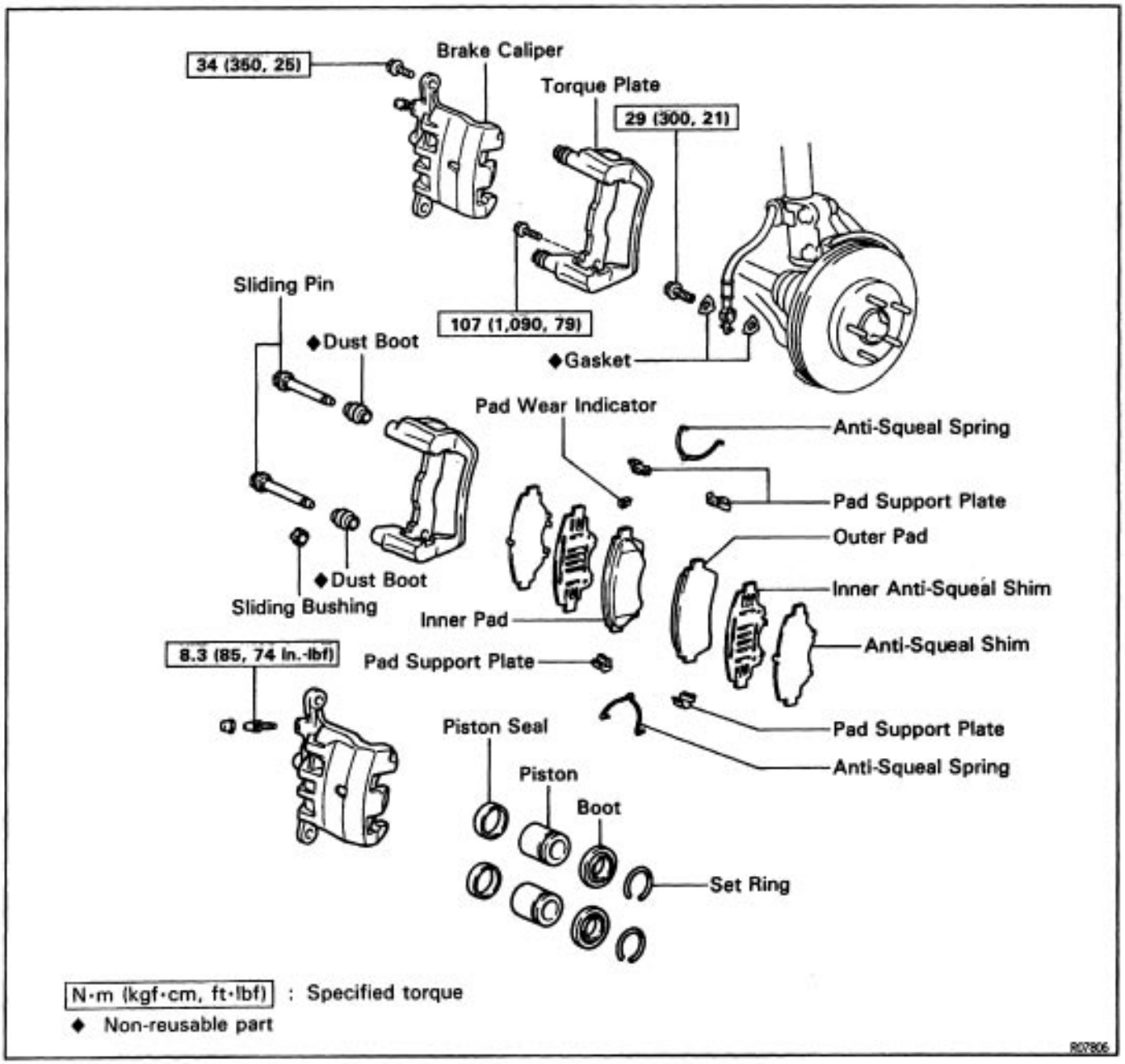
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

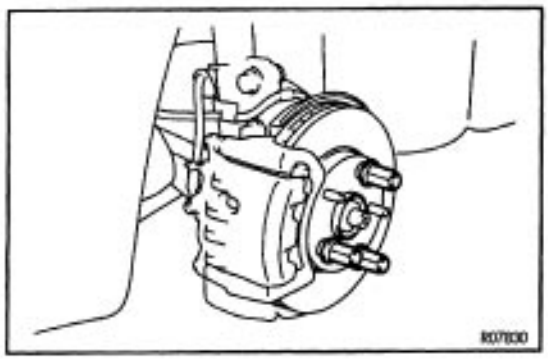
(See page BR–9)

5. CHECK FOR LEAKS

FRONT BRAKE (2–Piston Type)

COMPONENTS

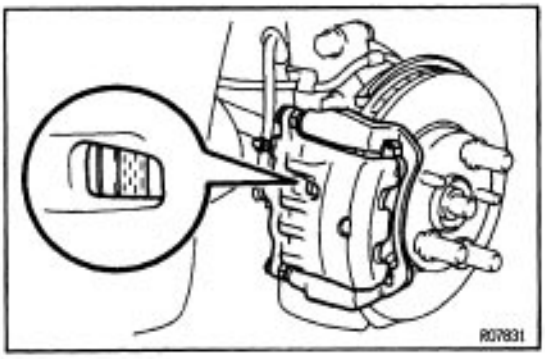




BRAKE PADS REPLACEMENT

1. REMOVE FRONT WHEEL

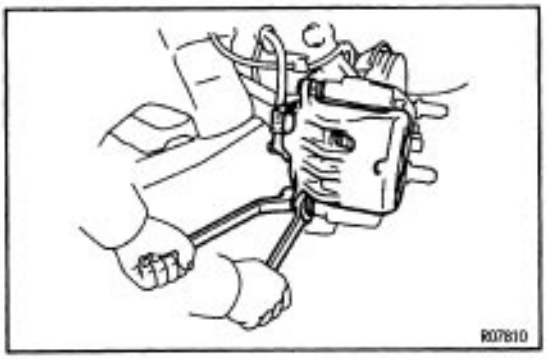
Remove the wheel and temporarily fasten the disc with the hub nuts.



2. INSPECT PAD LINING THICKNESS

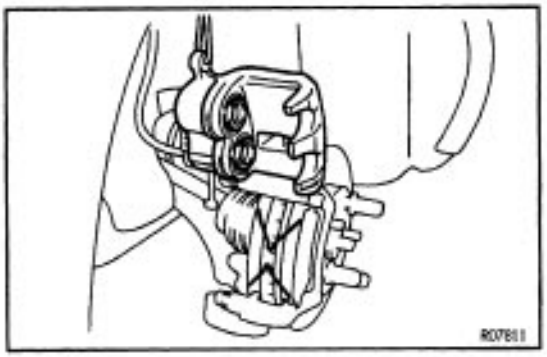
Check the pad thickness through the caliper inspec–tion hole and replace the pads if it is not within the specification.

Minimum thickness:
1.0 mm (0.039 in.)



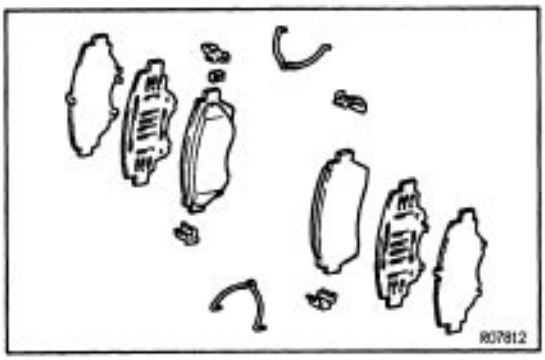
3. LIFT UP CALIPER

(a) Hold the sliding pin on the bottom and loosen the installation bolt.
(b) Remove the installation bolt.



(c) Lift up and suspend the caliper.

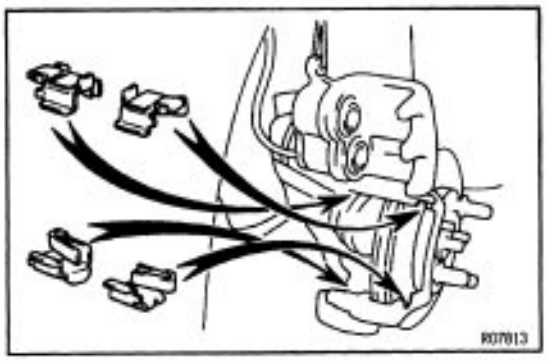
HINT: Do not disconnect the flexible hose from the brake caliper.



4. REMOVE FOLLOWING PARTS:

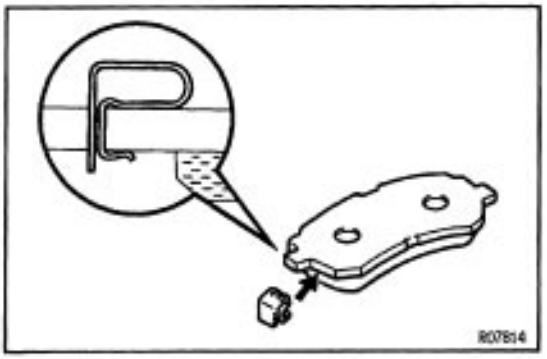
(a) 2 anti–squeal springs
(b) 2 brake pads
(c) 4 anti–squeal shims
(d) 4 pad support plates
(e) Pad wear indicator

5. CHECK DISC THICKNESS AND RUNOUT
(See page BR–33**)**



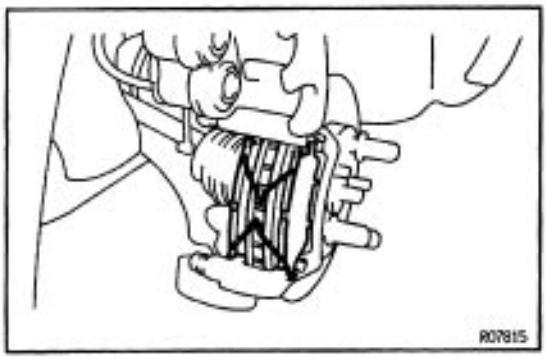
6. INSTALL PAD SUPPORT PLATES

Install the 4 pad support plates.



7. INSTALL NEW PADS

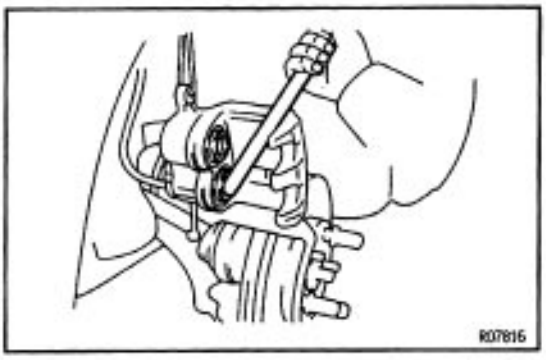
(a) Install the pad wear indicator plate on the pad.
(b) Apply disc brake grease to both sides of the inner anti–squeal shim.
(c) Install the 2 anti–squeal shims on each pad.



(d) Install the inner pad with the pad wear indicator plates facing upward.
(e) Install the outer pad.

NOTICE: There should be no oil or grease adhering to the friction surface's of the pads or the disc.

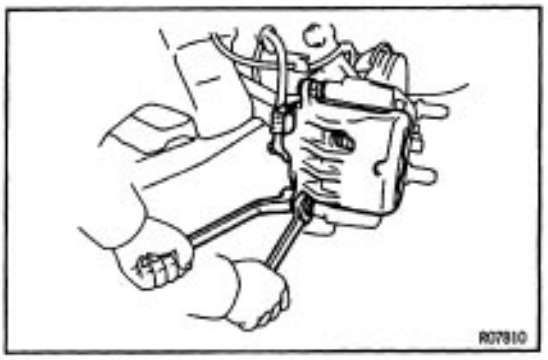
(f) Install the 2 anti–squeal springs.



8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with a hammer handle or similar implement.

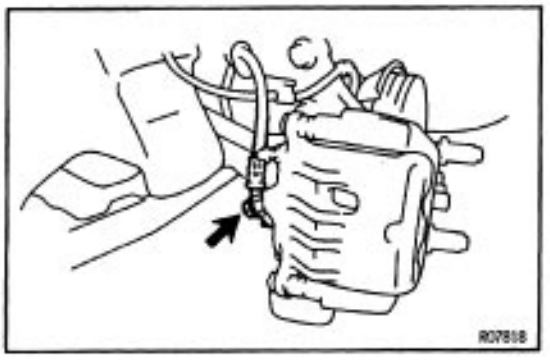
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.



(c) Install the caliper.
(d) Hold the sliding pin and torque the installation bolt.
Torque: 34 N .m (350 kgf–cm, 25 ft–lbf)

9. INSTALL FRONT WHEEL

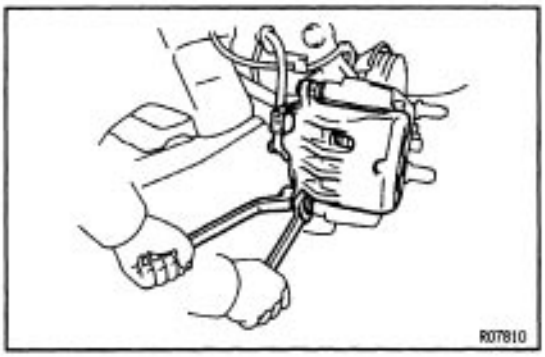
10. CHECK THAT FLUID LEVEL IS AT MAX LINE



CALIPER REMOVAL

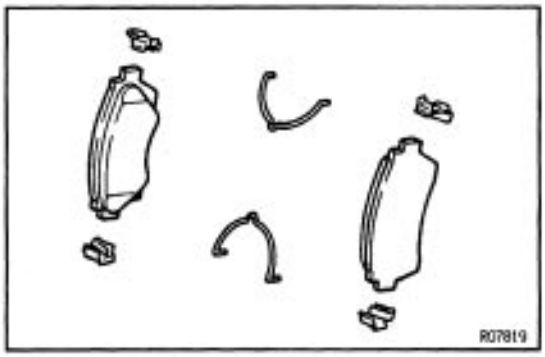
1. DISCONNECT FLEXIBLE HOSE

(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.



2. REMOVE CALIPER

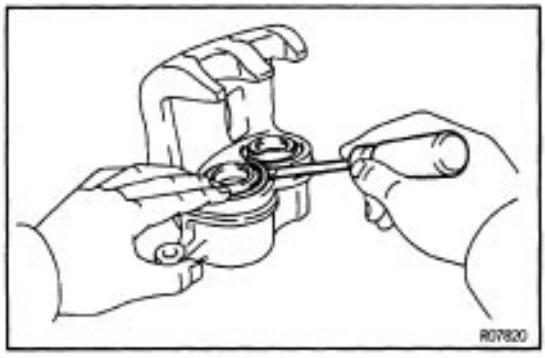
(a) Hold the sliding pin and loosen the 2 installation bolts.
(b) Remove the 2 installation bolts.
(c) Remove the caliper from the torque plate.



3. REMOVE FOLLOWING PARTS:

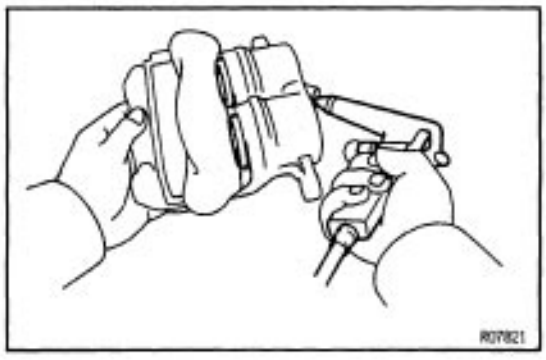
(a) 2 anti–squeal springs
(b) 2 brake pads with anti–squeal shims
(c) 4 pad support plates

CALIPER DISASSEMBLY



1. REMOVE CYLINDER BOOT SET RINGS AND CYLIN–DER BOOTS

Using a screwdriver, remove the 2 cylinder boot set rings and cylinder boots from the caliper.



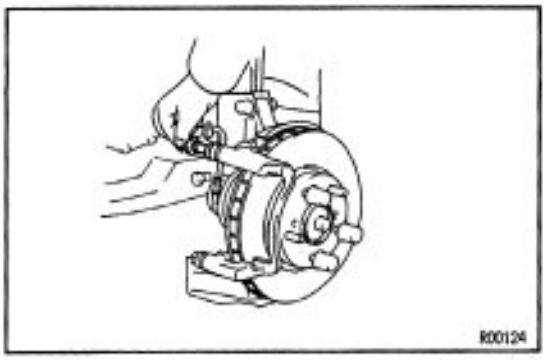
2. REMOVE PISTONS

(a) Place a piece of cloth or similar article between the piston and caliper.
(b) Use compressed air to remove the pistons from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.

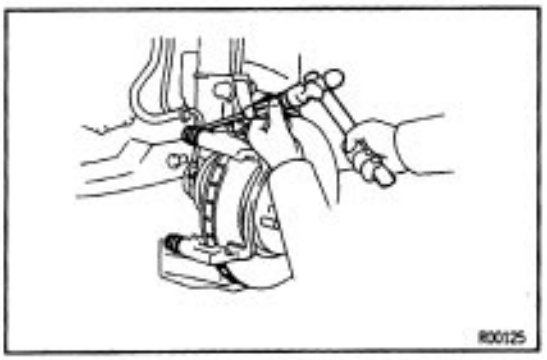
3. REMOVE PISTON SEALS

Using a screwdriver, remove the 2 piston seals from the cylinder.

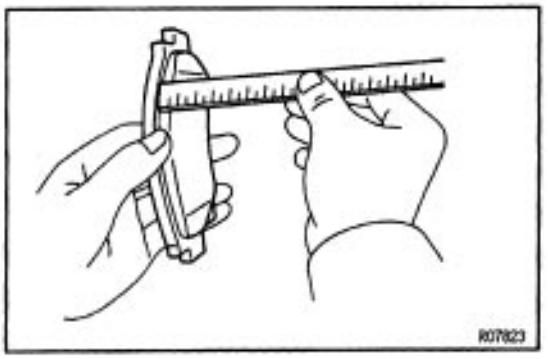


4. REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.



(b) Using a screwdriver and hammer, tap out the 2 dust boots.



FRONT BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

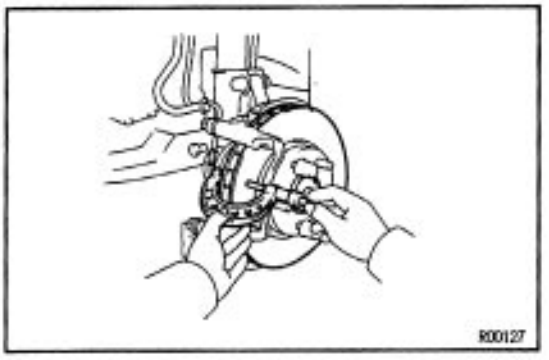
Standard thickness:

11.0 mm (0.433 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

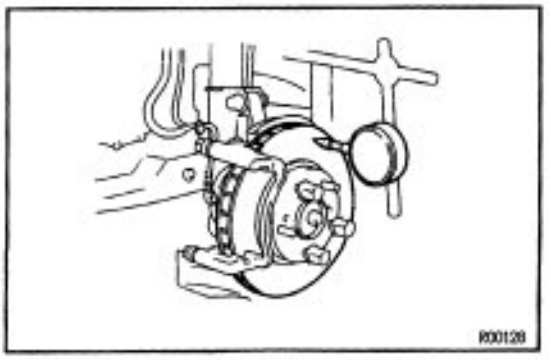
Standard thickness:

28 mm (1.102 in.)

Minimum thickness:

26 mm (1.024 in.)

Replace the disc if the disc's thickness is at the mini–mum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

Measure disc runout 10 mm (0.39 in.) from the outer edge of the disc.

Maximum disc runout:

0.05 mm (0.0020 in.)

If runout is greater than maximum, attempt to adjust to below this maximum figure.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, ADJUST DISC RUNOUT

(a) Remove the torque plate from the knuckle.

(b) Remove the hub nuts and the disc. Reinstall the disc 1/5 of a turn round from its original position on the hub. Install and torque the hub nuts.

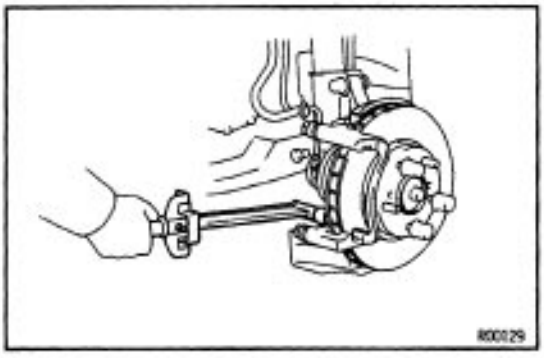
Torque: 103 N–m (1,050¿¿f¿cm, 76 ft–lbf)

Remeasure the disc runout. Make a note of the runout and disc's position on the hub.

(c) Repeat (b) until the disc has been installed on the 3 remaining hub positions.

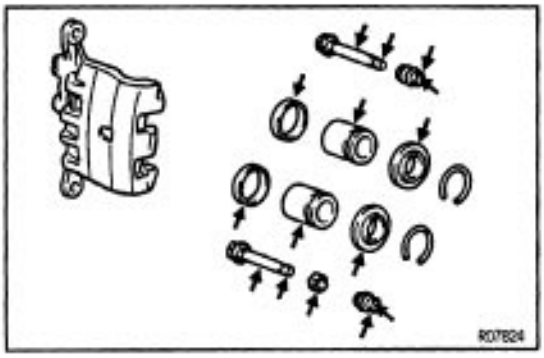
(d) If the minimum runout recorded in (b) and (c) is less than 0.05 mm (0.0020 in.), install the disc in that position.

(e) If the minimum runout recorded in (b) and (c) is greater than 0.05 mm (0.0020 in.), replace the disc and repeat step 3.



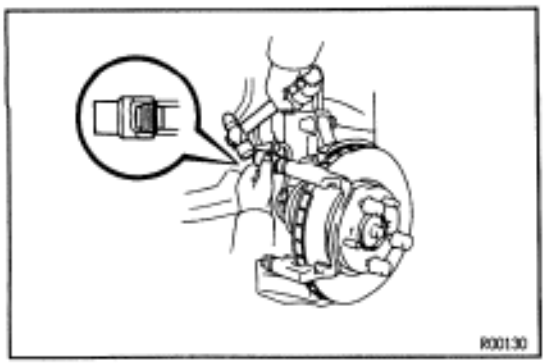
(f) Install the torque plate and torque the mounting bolts.

Torque: 107 N–m (1,090 kgf–cm, 79 ft–lbf)



CALIPER ASSEMBLY

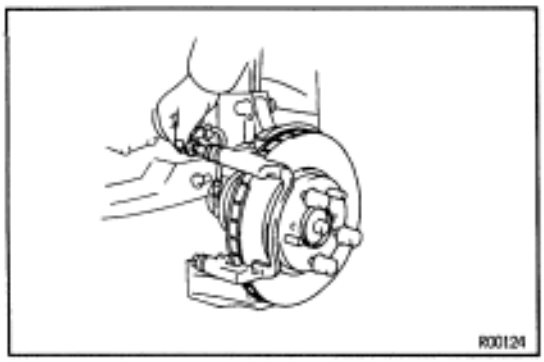
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL DUST BOOTS AND SLIDING PINS

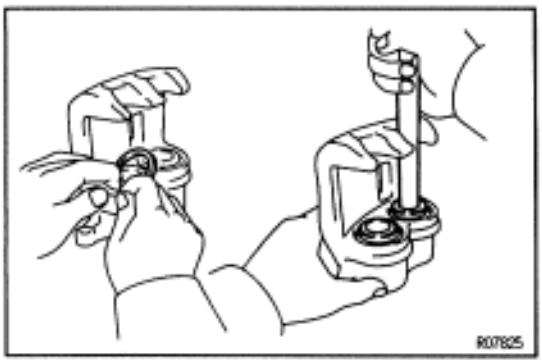
(a) Using a 19 mm socket and a hammer, tap in 2 new dust boots into the torque plate.

(b) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.

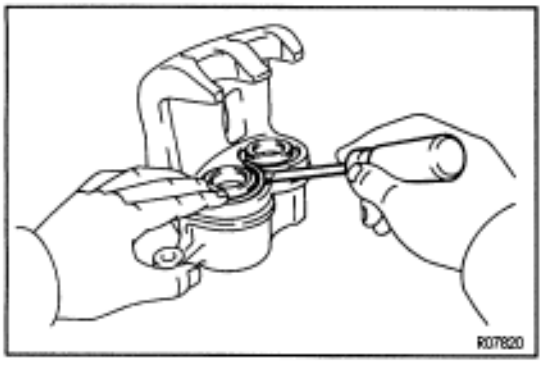


(c) Insert 2 sliding pins into the torque plate.

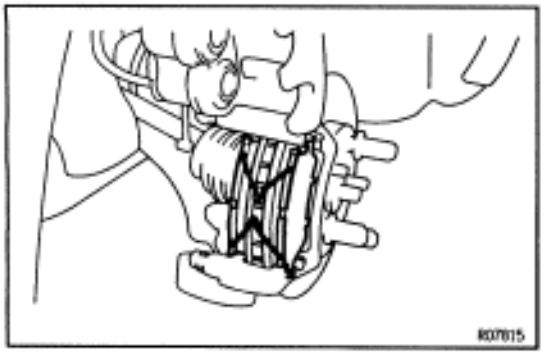
NOTICE: Insert the sliding pin with sliding bushing into the bottom side



3. INSTALL PISTON SEALS AND PISTONS IN CYLIN – DER



4. INSTALL CYLINDER BOOTS AND CYLINDER BOOT SET RINGS



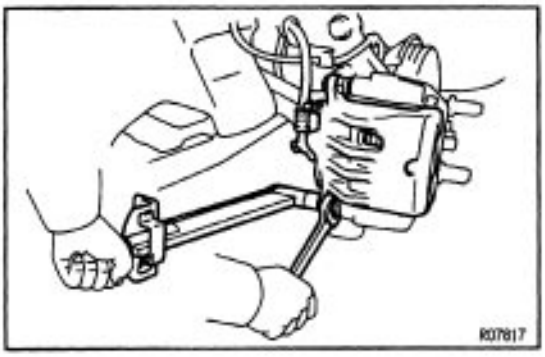
CALIPER INSTALLATION

1. INSTALL FOLLOWING PARTS:

(a) 4 pad support plates

(b) 2 brake pads with anti–squeal shims

(c) 2 anti–squeal springs

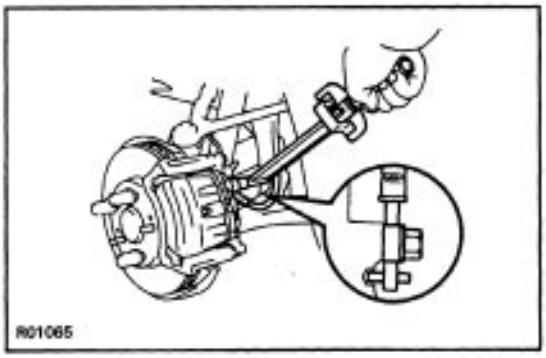


2. INSTALL CALIPER

(a) Temporarily install the caliper on the torque plate with the 2 installation bolts.

(b) Hold the sliding pin and torque the installation bolt.

Torque: 34 N–m (350 kgf–cm, 26 ft–lbf)



3. CONNECT FLEXIBLE HOSE

Install the flexible hose on the brake caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

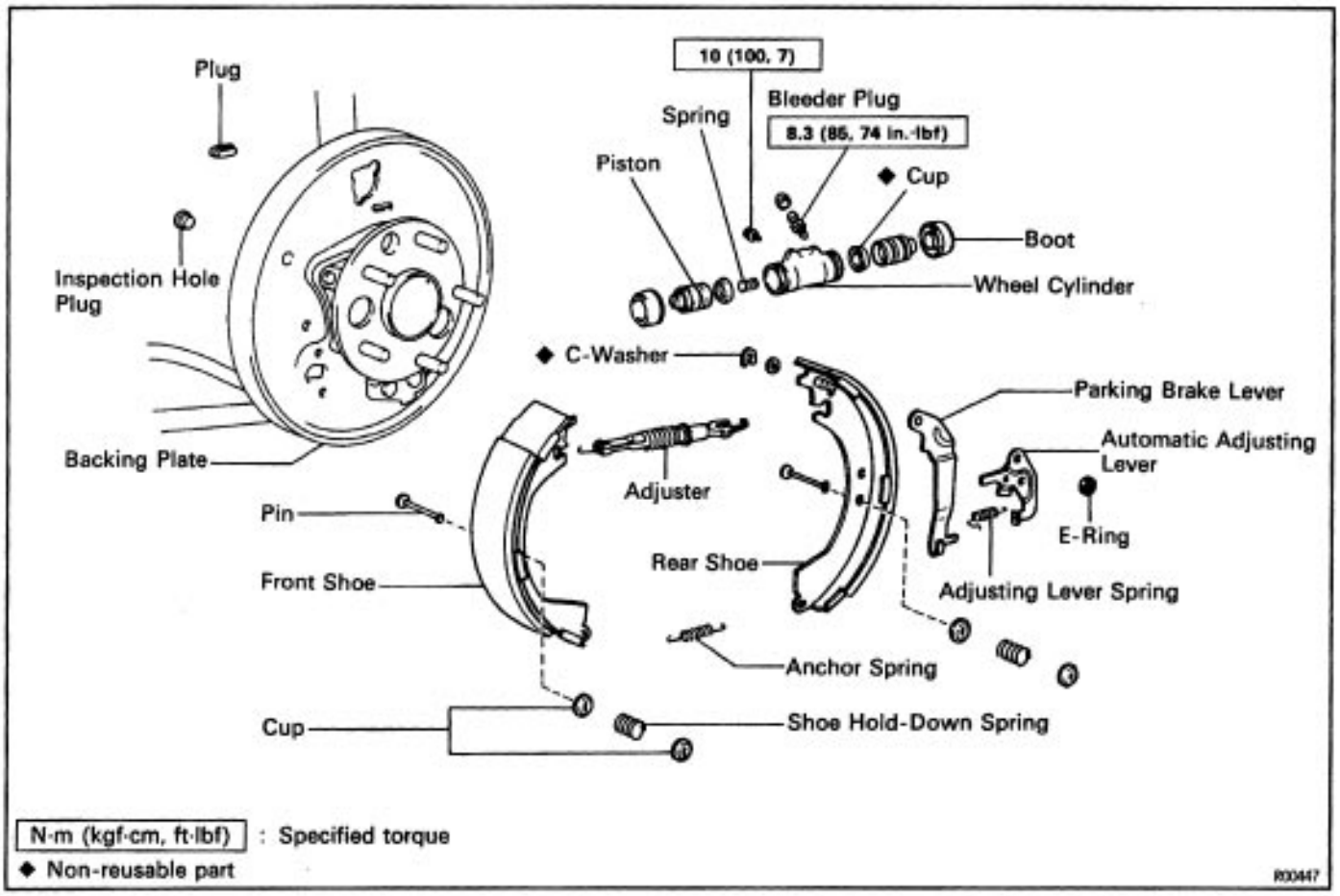
HINT: Insert the flexible hose lock securely in the lock hole in the brake caliper.

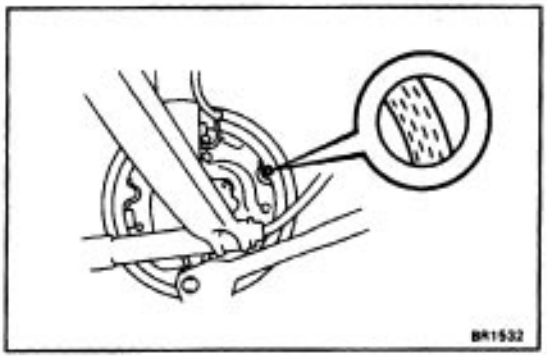
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9**)**

5. CHECK FOR LEAKS

REAR BRAKE (Drum Brake) COMPONENTS





REAR DRUM BRAKE REMOVAL

1. INSPECT SHOE LINING THICKNESS

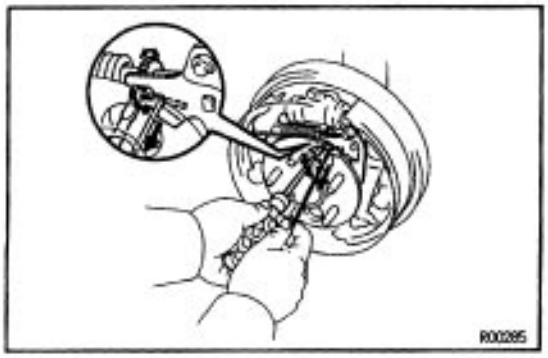
Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness:

1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

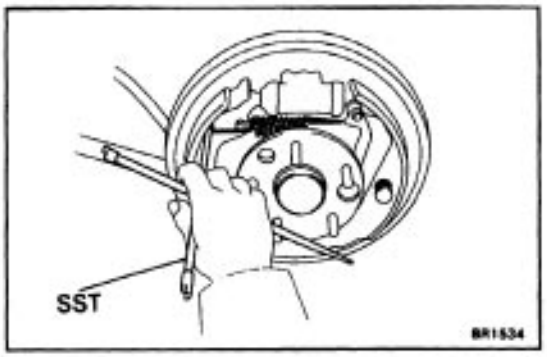


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, perform the following steps.

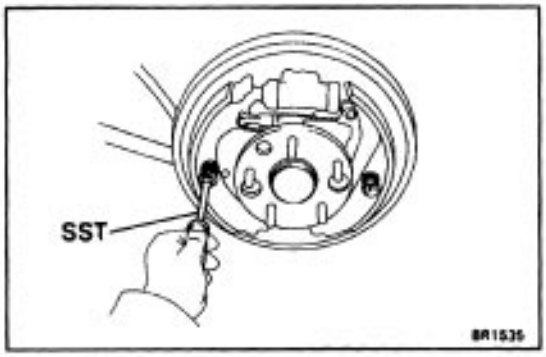
(a) Insert a bent wire or an equivalent through the hole in the brake drum, and hold the automatic adjusting lever away from the adjuster.

(b) Using a screwdriver, reduce the brake shoe adjust–ment by turning the adjuster.



4. REMOVE FRONT SHOE

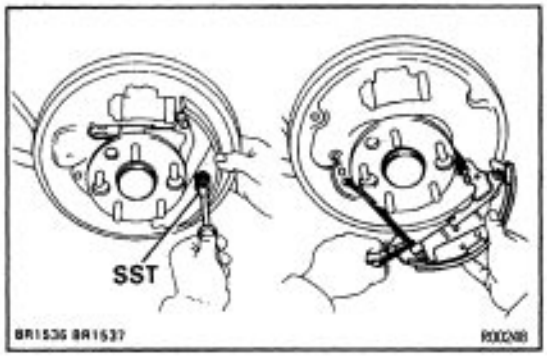
(a) Using SST, disconnect the return spring.
SST 09703–30010



(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(c) Disconnect the anchor spring from the front shoe and remove the front shoe.

(d) Remove the anchor spring from the rear shoe.



5. REMOVE REAR SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

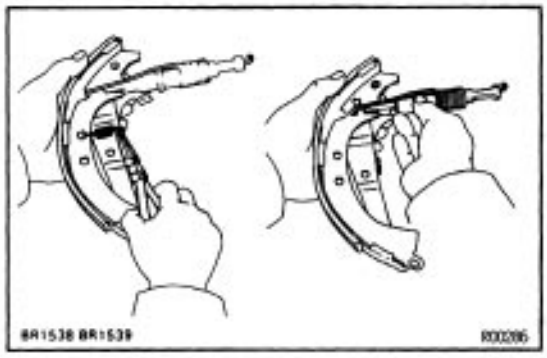
(b) Using a screwdriver, disconnect the parking brake cable from the anchor plate.

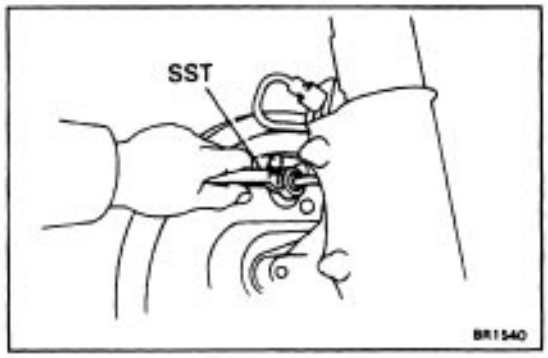
(c) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe together with the adjuster.

6. REMOVE ADJUSTER FROM REAR SHOE

(a) Remove the adjusting lever spring.

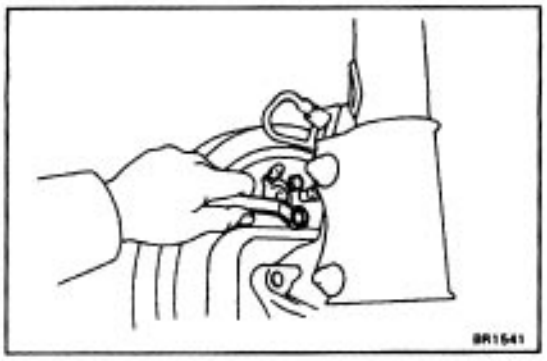
(b) Remove the adjuster together with the return spring.



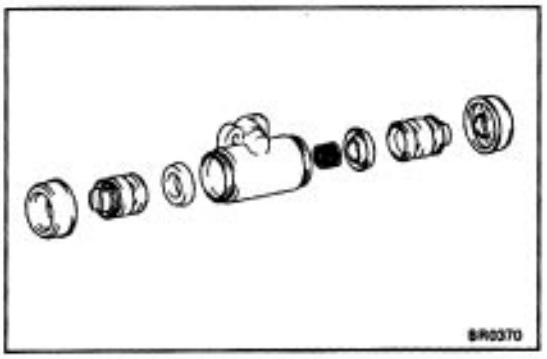


7. DISCONNECT BRAKE LINE FROM WHEEL CYLIN – DER

Using SST, disconnect the brake line. Use a container to catch the brake fluid.
SST 09751–36011



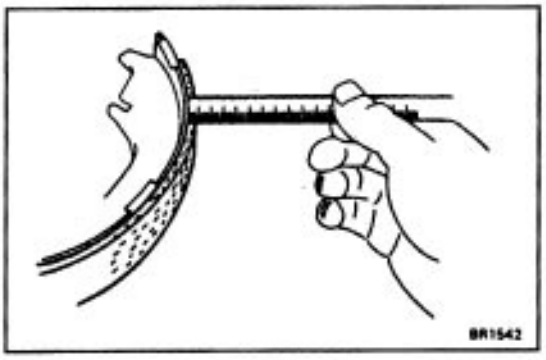
8. REMOVE WHEEL CYLINDER
Remove the 2 bolts and the wheel cylinder.



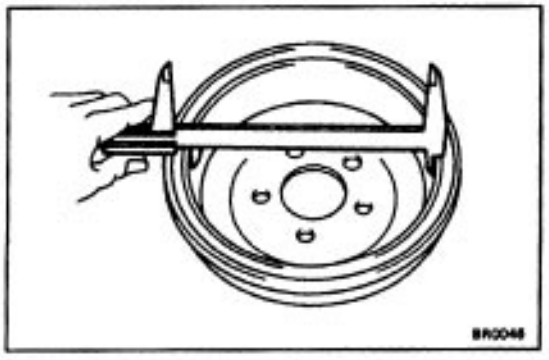
9. IF NECESSARY, DISASSEMBLE WHEEL CYLINDER
Remove the following parts from the wheel cylinder.
- 2 boots
- 2 pistons
- 2 piston cups
- Spring

REAR DRUM BRAKE COMPONENTS INSPECTION AND REPAIR

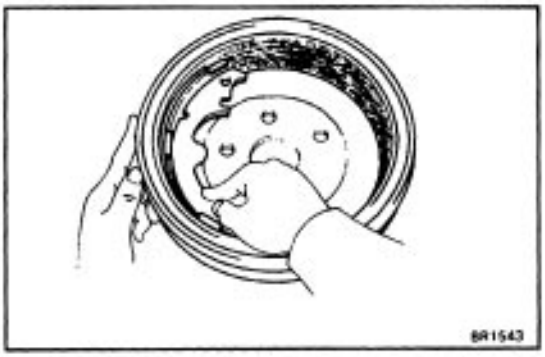
1. INSPECT DISASSEMBLED PARTS
Inspect the disassembled parts for wear, rust or damage.



2. MEASURE BRAKE SHOE LINING THICKNESS
Standard thickness:
5.0 mm (0.197 in.)
Minimum thickness:
1.0 mm (0.039 in.)
If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.
HINT: If any of the brake shoes have to be replaced, replace all of the rear shoes in order to maintain even braking.



3. MEASURE BRAKE DRUM INSIDE DIAMETER
Standard inside diameter:
228.6 mm (9.000 in.)
Maximum inside diameter:
230.6 mm (9.079 in.)
If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

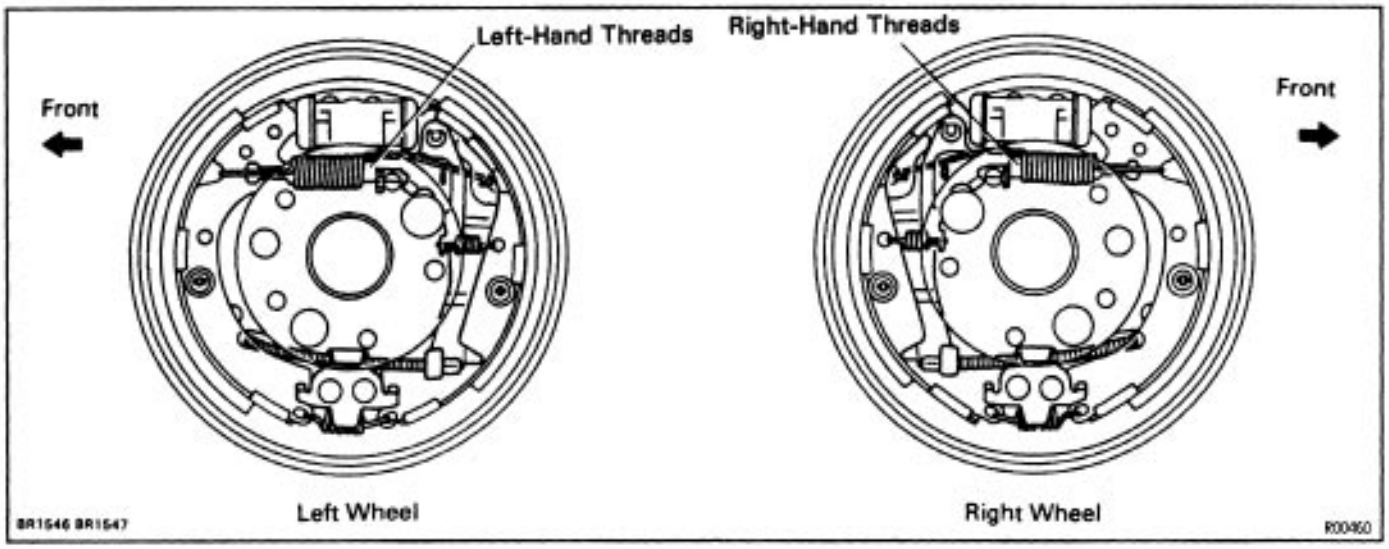


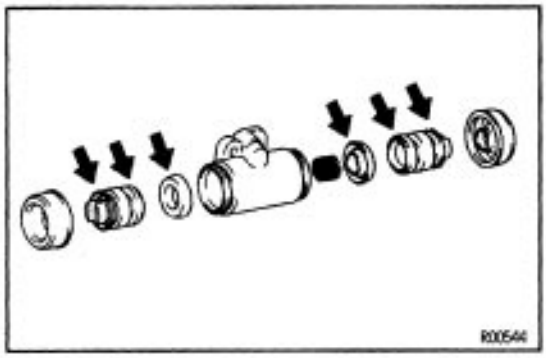
4. INSPECT REAR BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

REAR DRUM BRAKE INSTALLATION

HINT: Assemble the parts in the correct direction as shown.





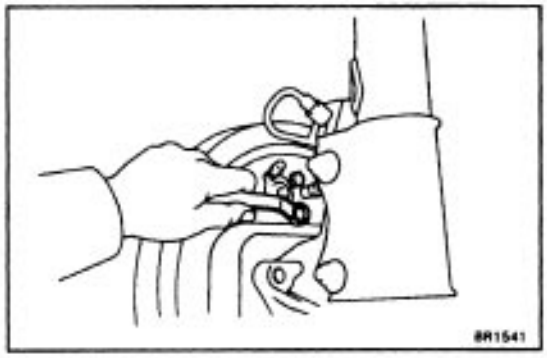
1. ASSEMBLE WHEEL CYLINDER

(a) Apply lithium soap base glycol grease to the cups and pistons as shown.

(b) Assemble the wheel cylinder.

HINT: Install in proper direction only.

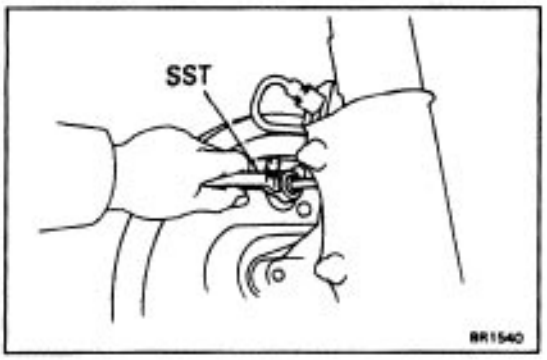
- Spring
- 2 cups
- 2 pistons
- 2 boots



2. INSTALL WHEEL CYLINDER

Install the wheel cylinder on the backing plate with the 2 bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

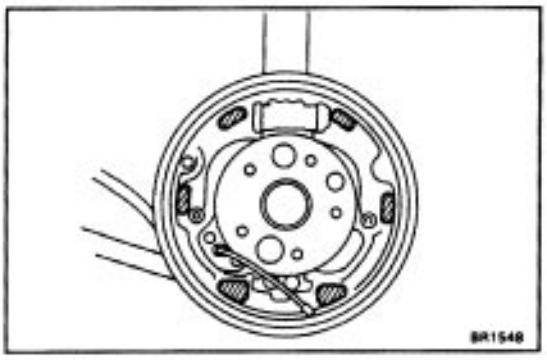


3. CONNECT BRAKE LINE TO WHEEL CYLINDER

Using SST, connect the brake line.

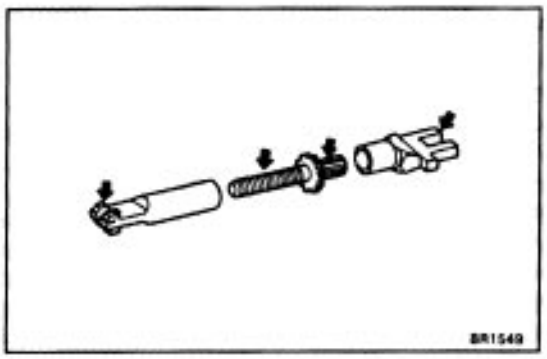
SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

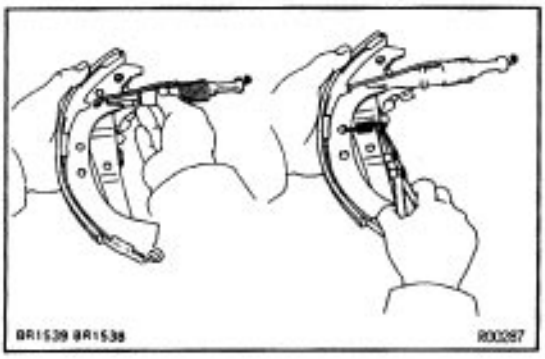


4. APPLY HIGH TEMPERATURE GREASE TO BACK – ING PLATE AND ADJUSTER

(a) Apply high temperature grease to the brake shoe contact surfaces.

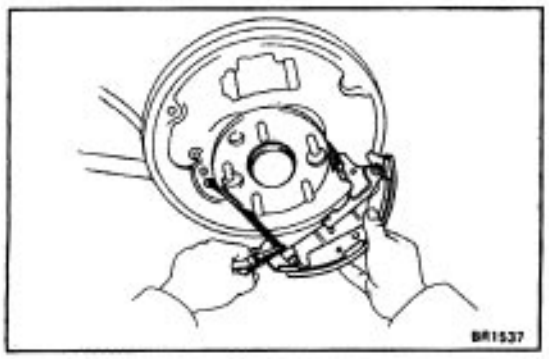


(b) Apply high temperature grease to the adjuster bolt threads and ends.



5. INSTALL ADJUSTER ONTO REAR SHOE

Set the adjuster and return spring and install the adjusting lever spring.

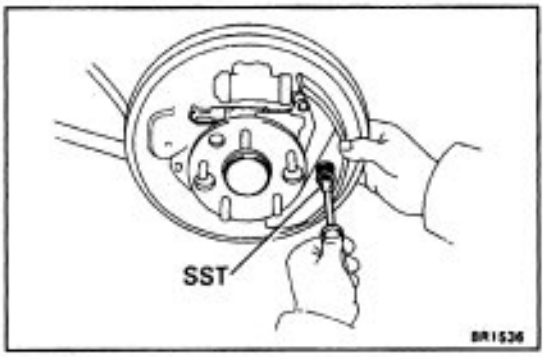


6. INSTALL REAR SHOE

(a) Using pliers, connect the parking brake cable to the lever.

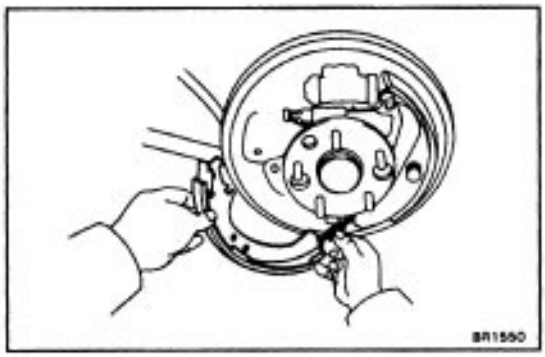
(b) Pass the parking brake cable through the notch in the anchor plate.

(c) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the other end in the anchor plate.



(d) Using SST, install the shoe hold–down spring, cups and pin.
SST 09718–00010

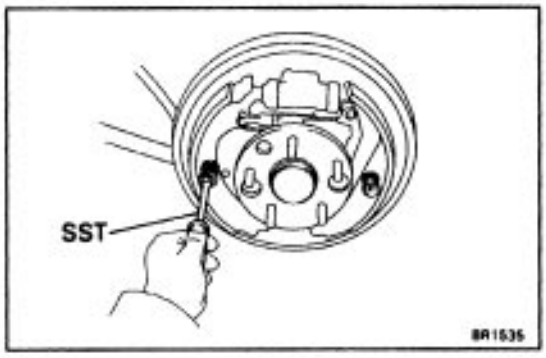
NOTICE: Do not allow oil or grease to get on the rubbing face.



7. INSTALL FRONT SHOE

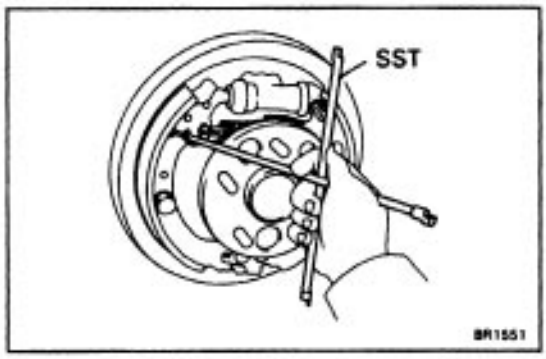
(a) Install the anchor spring between the front and rear shoes.

(b) Set the front shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.

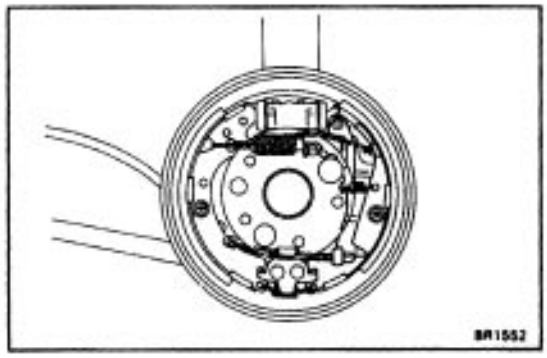


(c) Using SST, install the shoe hold–down spring, cups and pin.
SST 09 718–00010

NOTICE: Do not allow oil or grease to get on the rubbing face.



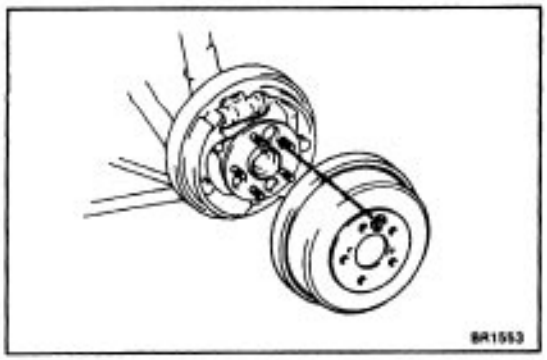
(d) Using SST, connect the return spring.
SST 09703–30010



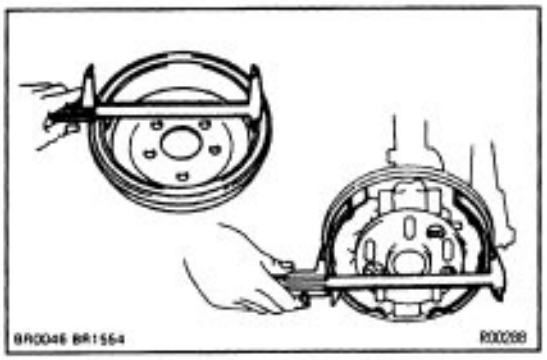
8. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(a) Move the parking brake lever of the rear shoe back and forth. Check that the adjuster turns.
If the adjuster does not turn, check for incorrect installation of the rear brakes.

(b) Adjust the adjuster length to the shortest possible amount.



(c) Align the adjusting hole on the brake drum and largest hole on the axle carrier, install the brake drum.
(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.



9. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

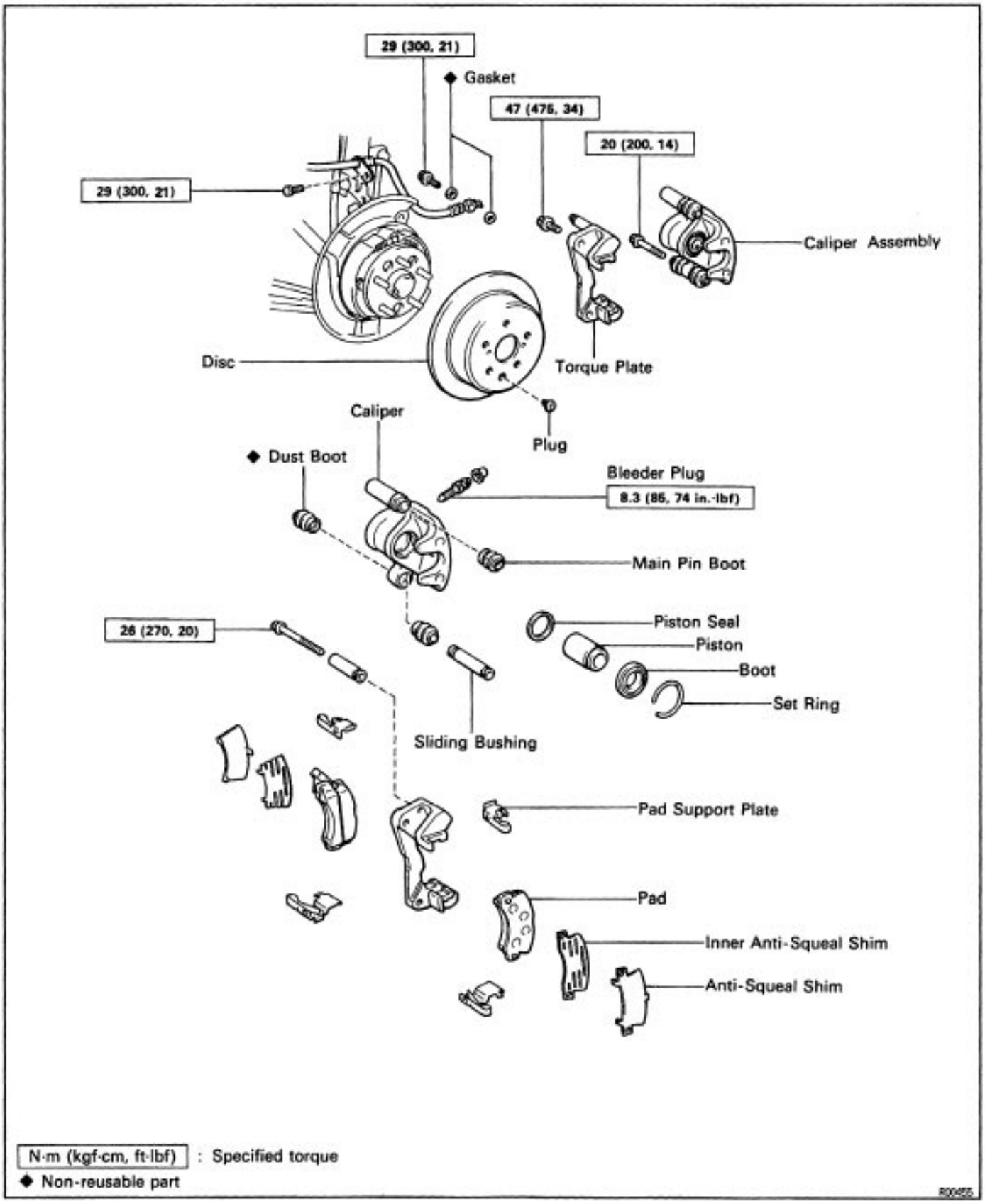
(a) Remove the brake drum.
(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance:
0.6 mm (0.024 in.)

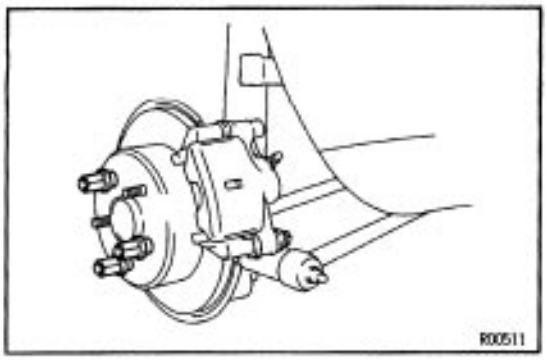
If incorrect, check the parking brake system.

10. INSTALL BRAKE DRUM
11. INSTALL REAR WHEEL
12. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–9)
13. CHECK FOR LEAKS

REAR BRAKE (Disc Brake) COMPONENTS

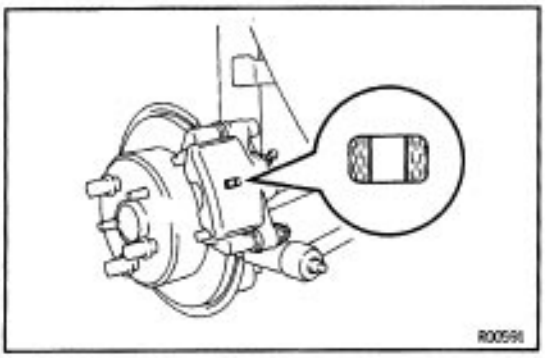


BRAKE PADS REPLACEMENT



1. REMOVE REAR WHEEL

Remove the wheel and temporarily fasten the disc with the hub nuts.

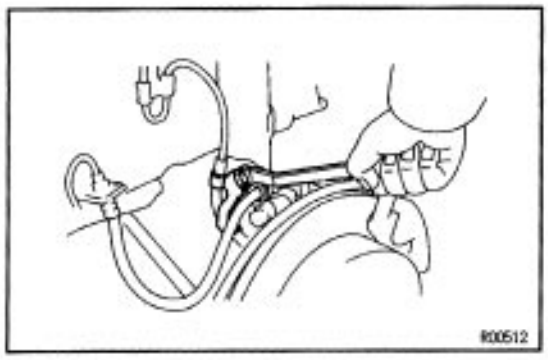


2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspec–tion hole and replace pads if not within specification.

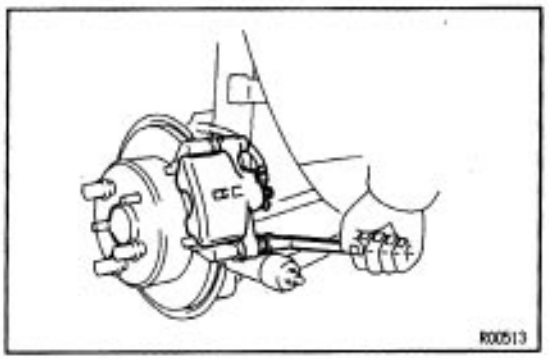
Minimum thickness:

1.0 mm (0.039 in.)

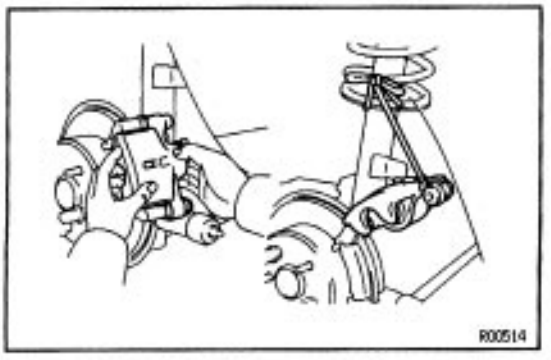


3. LIFT UP CALIPER

(a) Remove the flexible hose bracket.

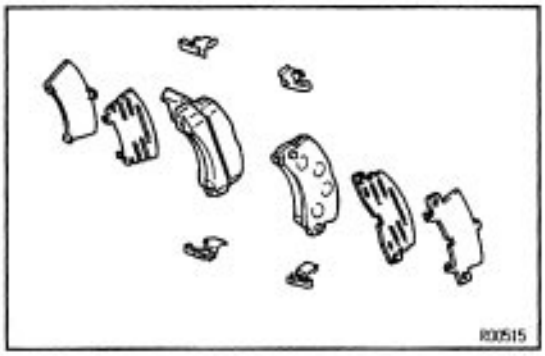


(b) Remove the installation bolt from the torque plate.



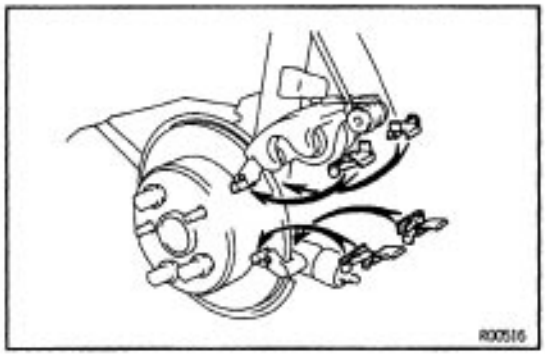
(c) Lift up the caliper and suspend the caliper with string.

HINT: Do not disconnect the flexible hose from the caliper.

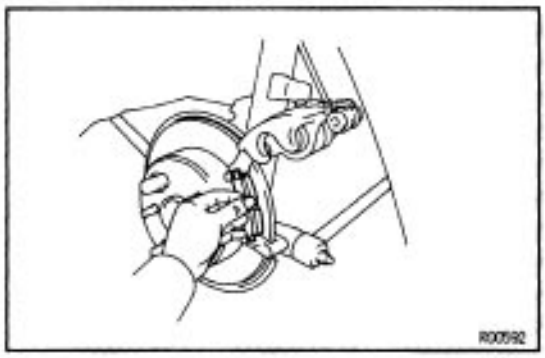


4. REMOVE FOLLOWING PARTS:
(a) 2 brake pads
(b) 4 anti–squeal shims
(c) 4 pad support plates

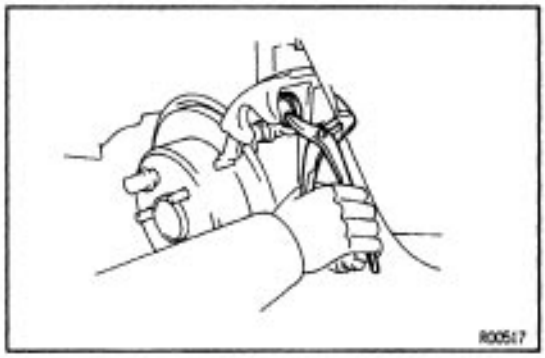
5. CHECK DISC THICKNESS AND RUNOUT
(See page BR–50**)**



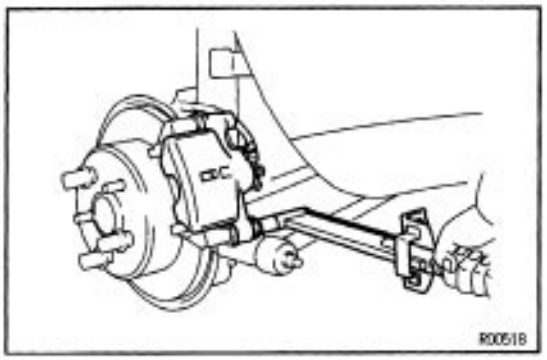
6. INSTALL PAD SUPPORT PLATES
Install the 4 pad support plates.



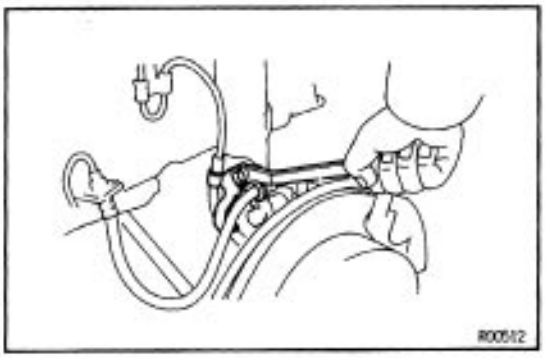
7. INSTALL NEW PADS
(a) Apply disc brake grease to both side of the inner anti –squeal shims.
(b) Install the 2 anti–squeal shims on each pad.
(c) Install 2 pads with the pad wear indicator plates facing up ward.
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



6. INSTALL CALIPER
(a) Draw out a small amount of brake fluid from the reservoir.
(b) Press in the piston with water pump pliers or similar implement.
HINT: If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

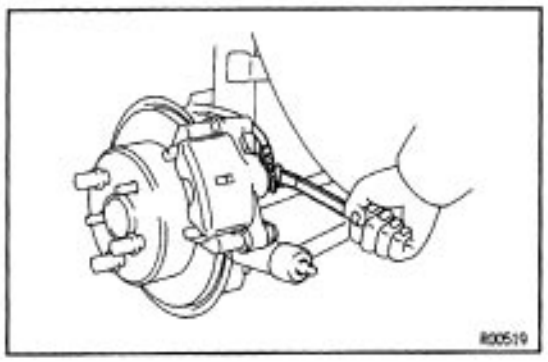


(c) Install the caliper and torque the installation bolt.
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)



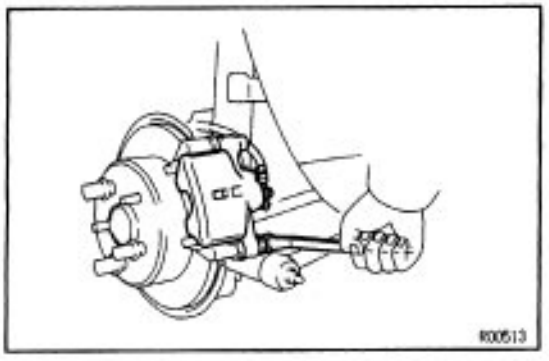
(d) Install the flexible hose bracket.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

9. INSTALL REAR WHEEL
14. CHECK THAT FLUID LEVEL IS AT MAX LINE

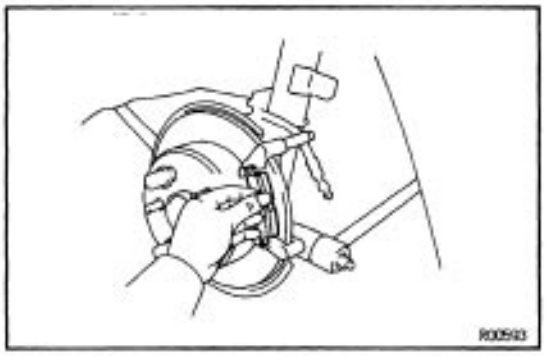


CALIPER REMOVAL

1. DISCONNECT FLEXIBLE HOSE
(a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.
(b) Use a container to catch the brake fluid as it drains out.

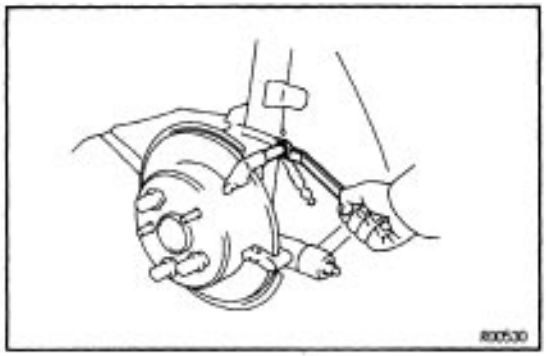


2. REMOVE CALIPER
(a) Remove the installation bolt.
(b) Remove the caliper from the torque plate.



3. REMOVE 2 PADS

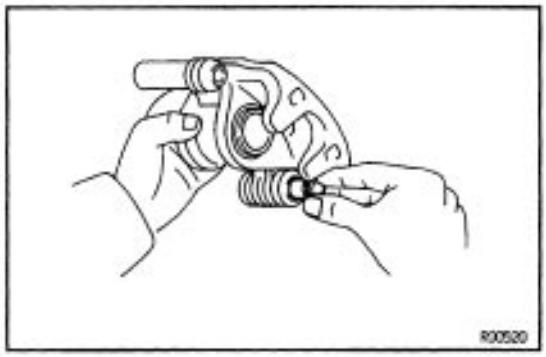
Remove the inside and outside pads.



4. REMOVE MAIN PIN

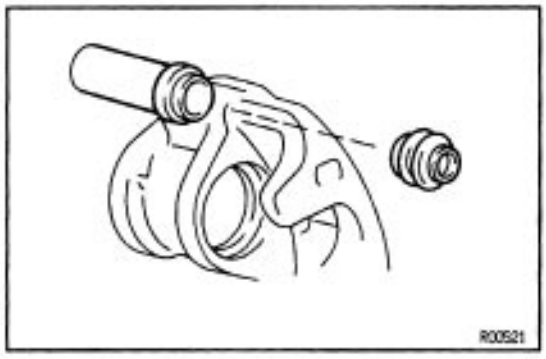
Loosen the. main pin installation bolt and remove the main pin.

CALIPER DISASSEMBLY



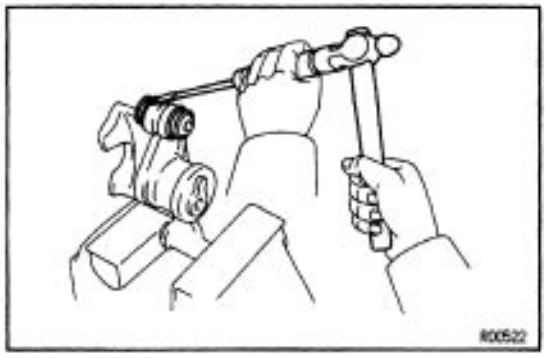
1. REMOVE SLIDING BUSHING

Pull out the sliding bushing.



2. REMOVE MAIN PIN BOOT

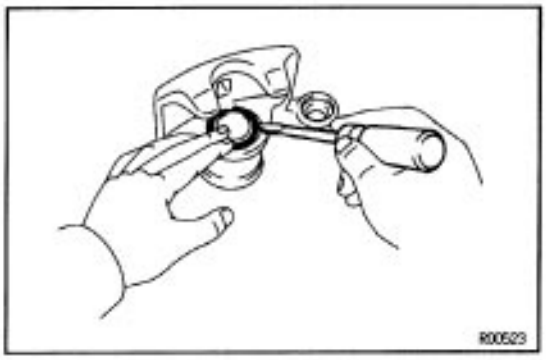
Pull out the main pin boot.



3. REMOVE DUST BOOTS

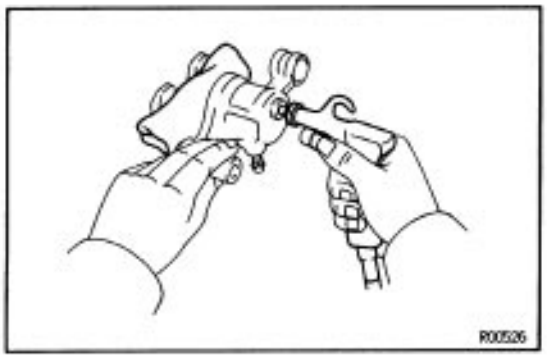
(a) Place the caliper in vise.

(b) Using a screwdriver and hammer, tap out the 2 dust boots.



4. REMOVE CYLINDER BOOT SET RING AND CYLIN–DER BOOT

Using a screwdriver, remove the cylinder boot set ring and cylinder boot from the cylinder.

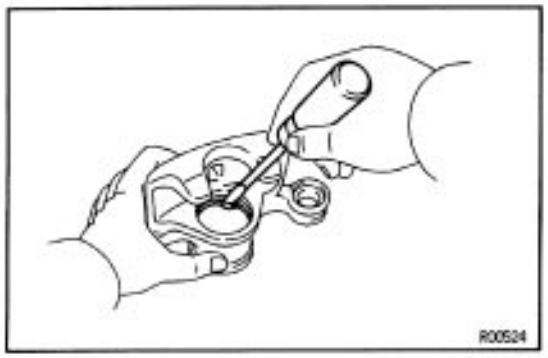


5. REMOVE PISTON

(a) Place a piece of cloth or similar article between the piston and the caliper.

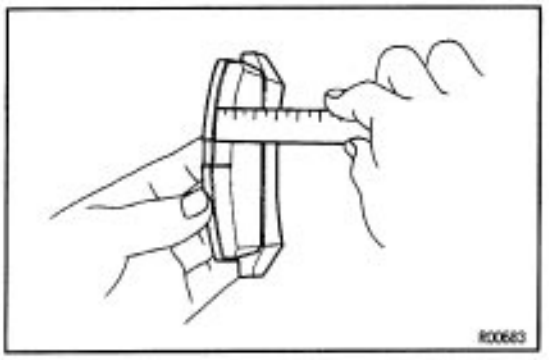
(b) Use compressed air to remove the piston from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



6. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.



REAR DISC BRAKE COMPONENTS INSPECTION AND REPAIR

1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

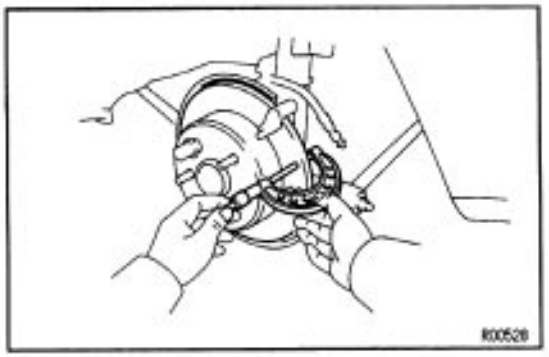
Standard thickness:

10.0 mm (0.394 in.)

Minimum thickness:

1.0 mm (0.039 in.)

Replace the pad if the pad's thickness is at the mini–mum thickness or less, or if the pad has excessively uneven wear.



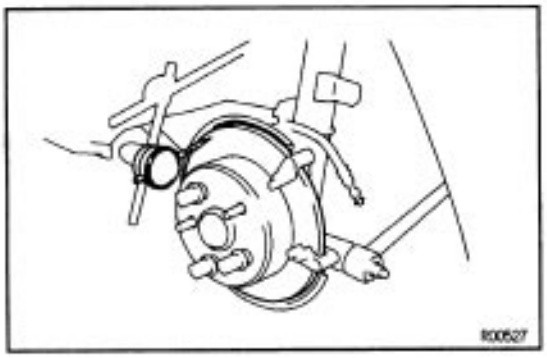
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness:
10.0 mm (0.394 in.)

Minimum thickness:
9.0 mm (0.354 in.)

Replace the disc if the disc's thickness is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is badly scored or worn unevenly.



3. MEASURE DISC RUNOUT

Measure the disc runout 10 mm (0.39 in.) from the outer edge of the disc.

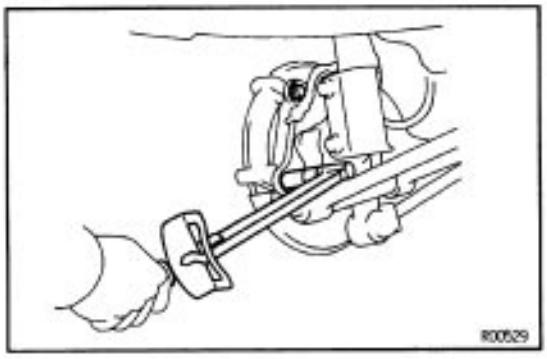
Maximum disc runout:
0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc.

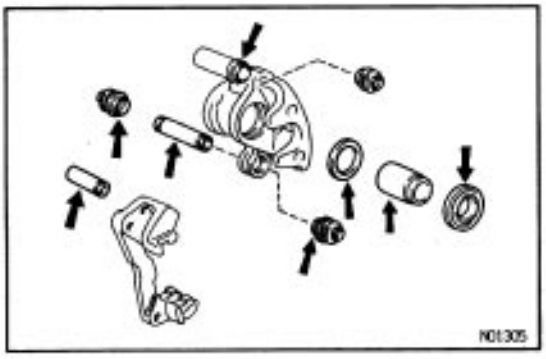
HINT: Before measuring the runout, confirm that the hub bearing play is within specification.

4. IF NECESSARY, REPLACE DISC

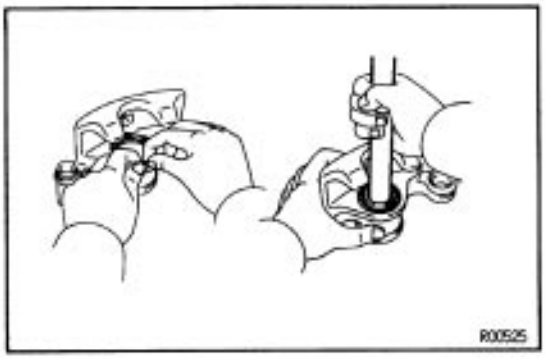
(a) Remove the torque plate.
(b) Remove the hub nuts of the temporarily installed disc and pull off the disc.
(c) Install a new disc and loosely install the hub nuts.
(d) Install the torque plate and tighten the mounting bolts.
Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)



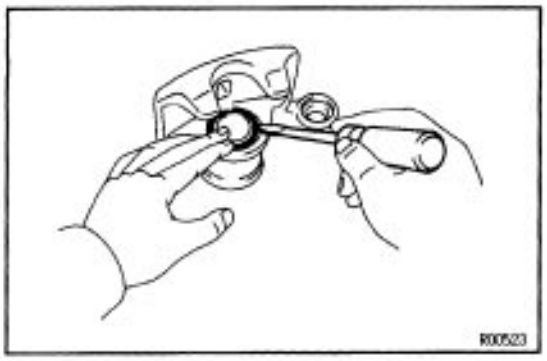
CALIPER ASSEMBLY



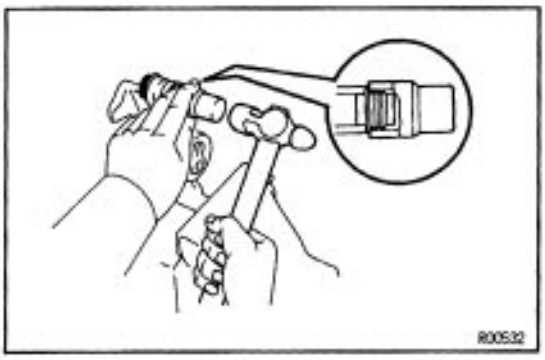
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL PISTON SEAL AND PISTON IN CYLINDER

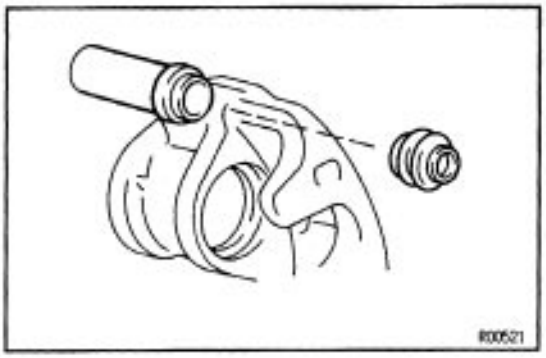


3. INSTALL CYLINDER BOOT AND SET RING IN CYL–INDER

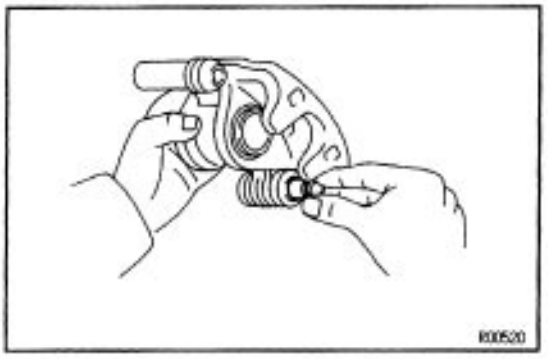


4. INSTALL DUST BOOTS

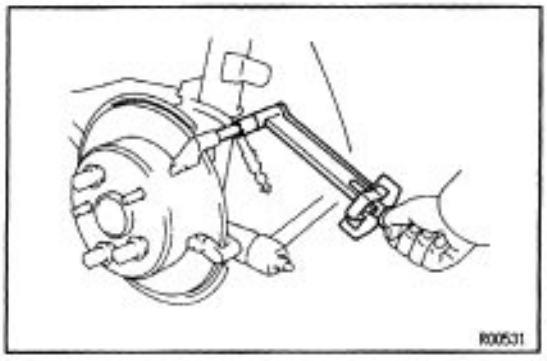
(a) Place the caliper in vise.
(b) Using a 19 mm socket wrench and hammer, tap in 2 new dust boots into the torque plate.
(c) Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.



5. INSTALL MAIN PIN BOOT



6. INSTALL SLIDING BUSHING

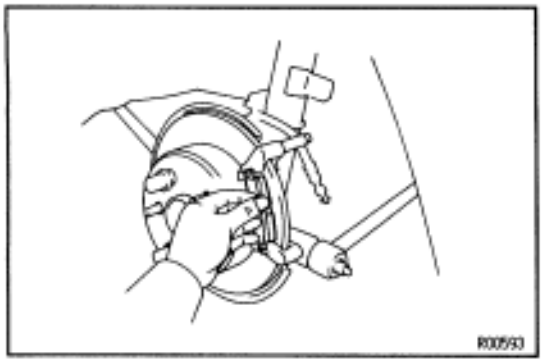


CALIPER INSTALLATION

1. INSTALL MAIN PIN

Install the main pin and torque the main pin installation bolt.

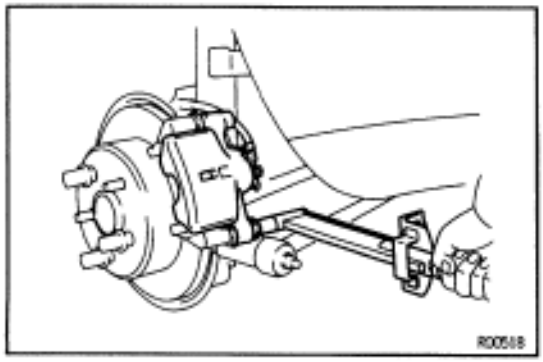
Torque: 26 N–m (270 kgf–cm. 20 ft–lbf)



2. INSTALL 2 PADS

Install 2 pads with the pad wear indicator plate facing upward.

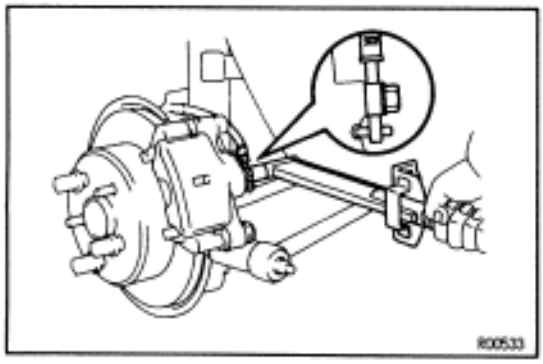
NOTICE: There should be no oil or grease adhering to the friction surfaces of the pads or the disc.



3. INSTALL CALIPER

Install the caliper and torque the installation bolt.

Torque: 20 N–m (200 k9f¿cm, 14 ft–lbf)



4. CONNECT FLEXIBLE HOSE

Install the flexible hose on the caliper with 2 new gaskets.

Torque: 29 N–m (300 kgf–cm, 21 ft–lbf)

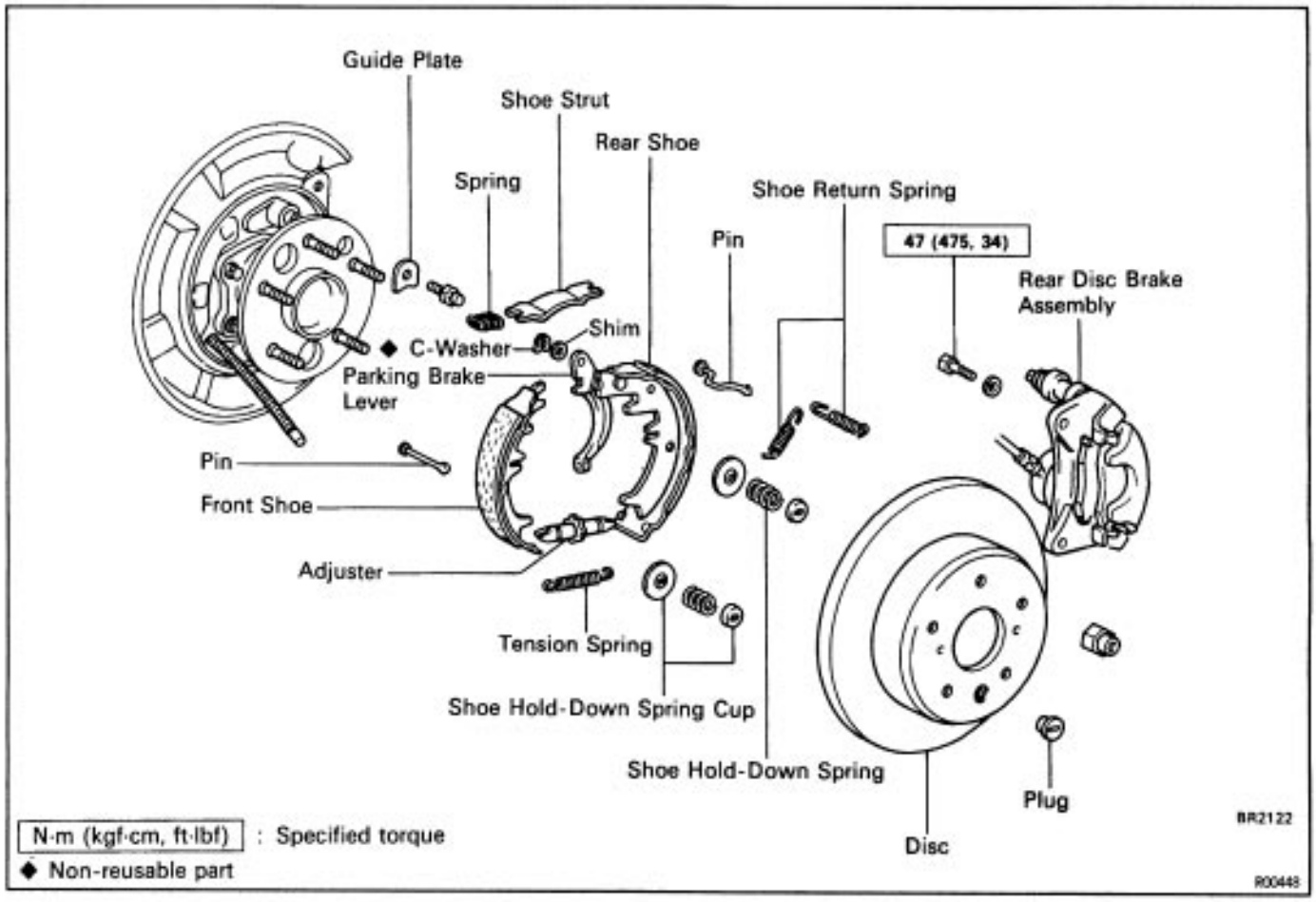
HINT: Insert the flexible hose lock securely in the lock hole in the caliper.

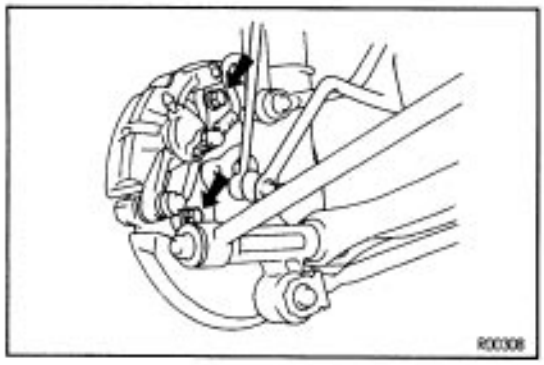
5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9)

6. CHECK FOR LEAKS

REAR BRAKE
(Parking Brake for Rear Disc Brake)
COMPONENTS





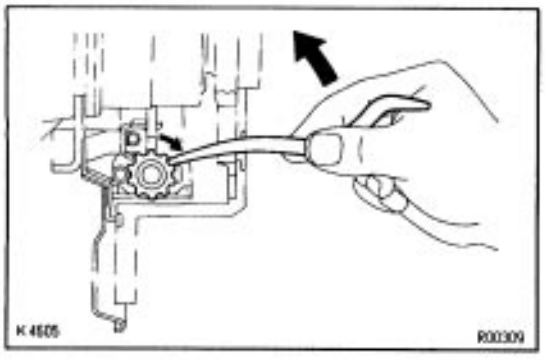
PARKING BRAKE DISASSEMBLY

1. REMOVE REAR WHEEL

2. REMOVE REAR DISC BRAKE ASSEMBLY

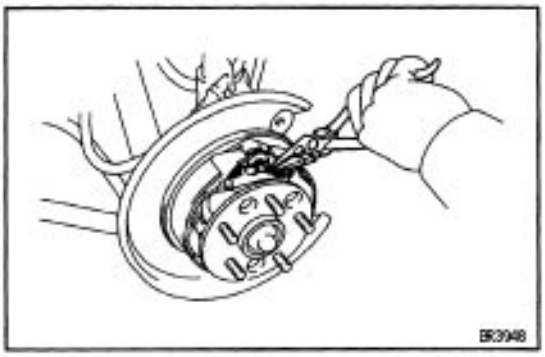
(a) Remove the 2 mounting bolts and remove the disc brake assembly.

(b) Suspend the disc brake so the hose is not stretched.



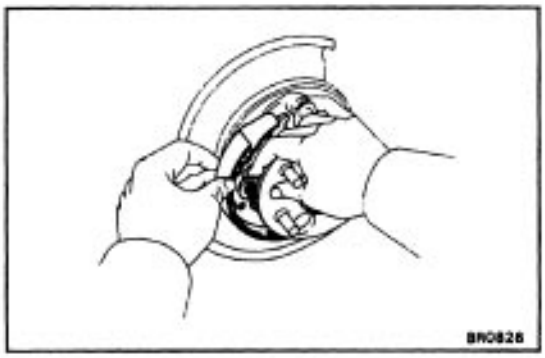
3. REMOVE DISC

HINT: If the disc cannot be removed easily, turn the shoe adjuster



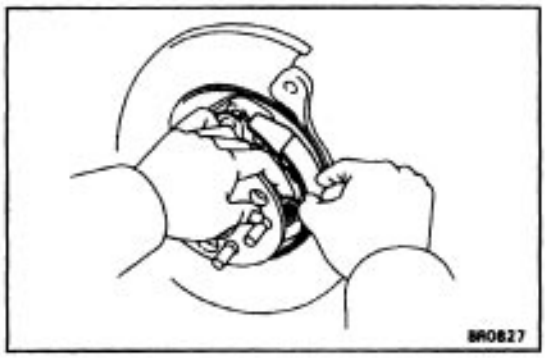
4. REMOVE SHOE RETURN SPRINGS

Using needle–nose pliers, remove the shoe return springs.



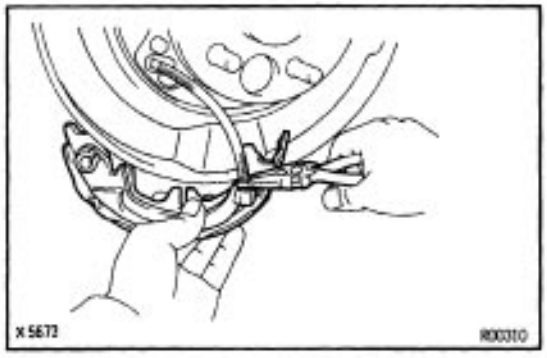
5. REMOVE FRONT SHOE, ADJUSTER AND TENSION SPRING

(a) Slide out the front shoe and remove the shoe adjuster.
(b) Remove the shoe strut with the spring.
(c) Disconnect the tension spring and remove the front shoe.



6. REMOVE REAR SHOE

(a) Slide out the rear shoe.
(b) Remove the tension spring from the rear shoe.

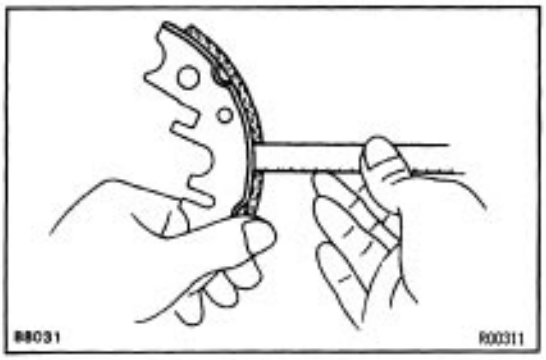


(c) Using needle–nose pliers, disconnect the parking brake cable from the parking brake shoe lever.
(d) Remove the shoe hold–down spring cups, springs and pins.

PARKING BRAKE COMPONENTS INSPECTION AND REPAIR

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

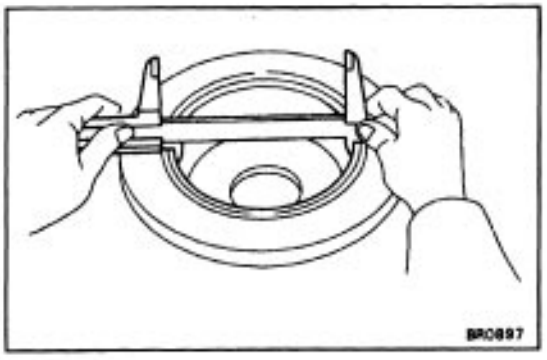


2. MEASURE BRAKE SHOE LINING THICKNESS

Using a scale, measure the thickness of the shoe lining.

Standard thickness:
2.0 mm (0.079 in.)
Minimum thickness:
1.0 mm (0.039 in.)

If the lining thickness is at the minimum thickness or less, or if there is excessively uneven wear, replace the brake shoe.

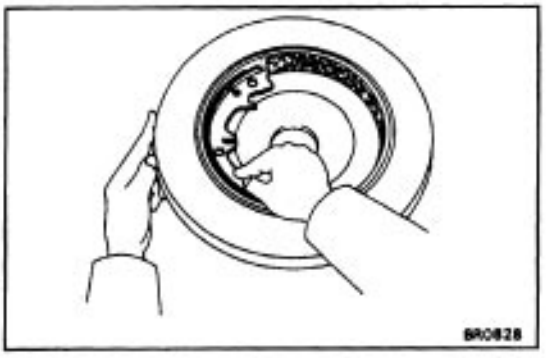


3. MEASURE DISC INSIDE DIAMETER

Using a vernier caliper, measure the inside diameter of the disc.

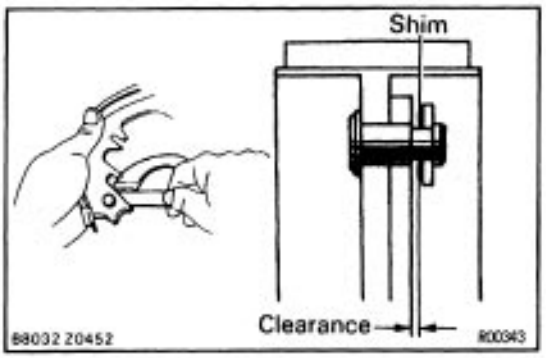
Standard inside diameter:
170 mm (6.69 in.)
Maximum inside diameter:
171 mm (6.73 in.)

Replace the disc if the inside diameter is at the maxi–mum value or more. Replace the disc or grind it with a lathe if the disc is badly scored or worn unevenly.



4. INSPECT PARKING BRAKE LINING AND DISC FOR PROPER CONTACT

Apply chalk to the inside surface of the disc, then grind down the brake shoe lining to fit. If the contact between the disc and the brake shoe lining is improp–er, repair it using a brake shoe grinder or replace the brake shoe assembly.



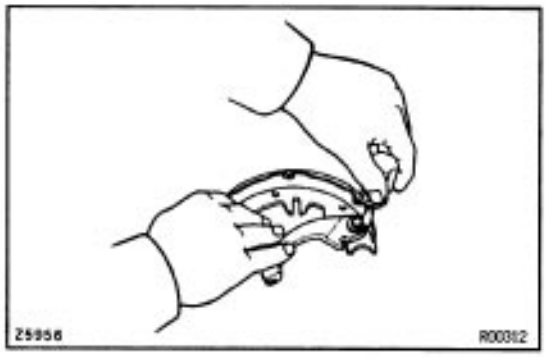
5. MEASURE CLEARANCE BETWEEN PARKING BRAKE SHOE AND LEVER

Using a feeler gauge, measure the clearance.

Standard clearance:
Less than 0.35 mm (0.0138 in.)

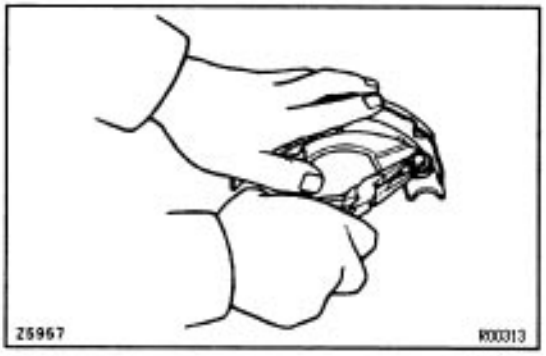
If the clearance is not within the specification, replace the shim with one of the correct size.

Shim Thickness	Shim Thickness
0.3 mm (0.012 in.)	0.9 mm (0.035 in.)
0.6 mm (0.024 in.)	



6. IF NECESSARY, REPLACE SHIM

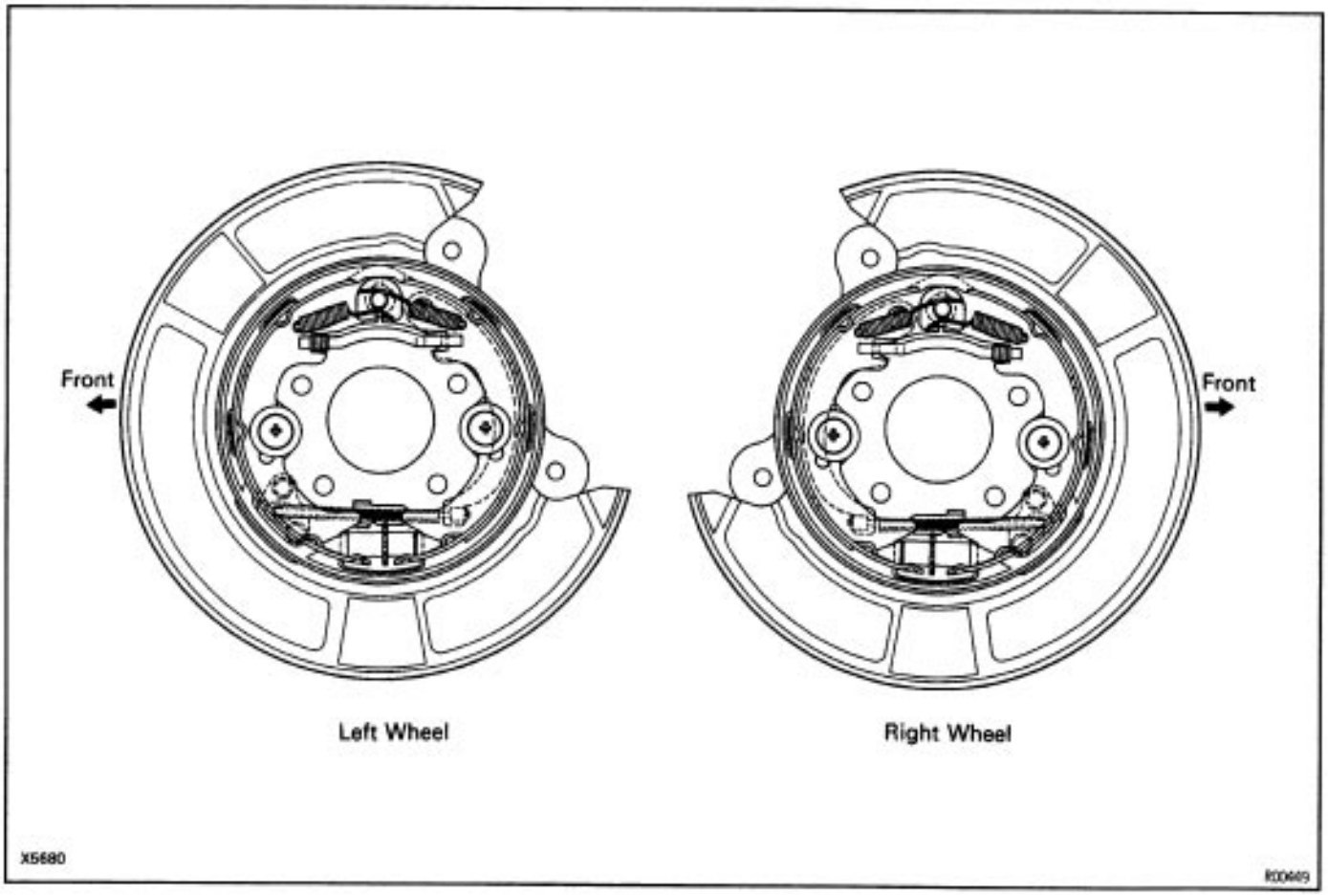
(a) Remove the parking brake lever, and install the correct size shim.

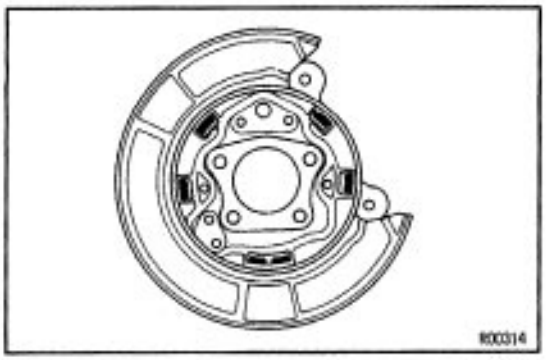


(b) Install the parking brake lever with a new C–washer.
(c) Remeasure the clearance.

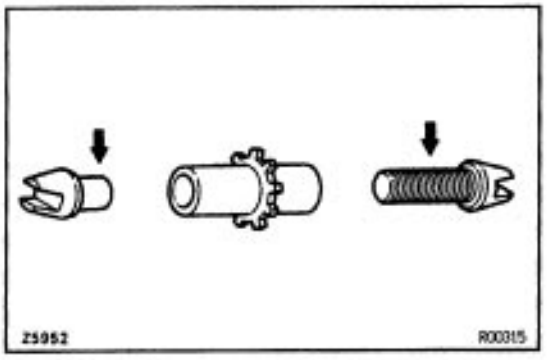
PARKING BRAKE ASSEMBLY

HINT: Assemble the parts in the correct direction as shown.

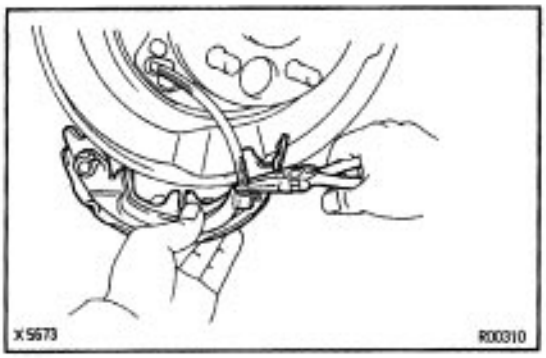




1. APPLY HIGH TEMPERATURE GREASE ON BACK – ING PLATE

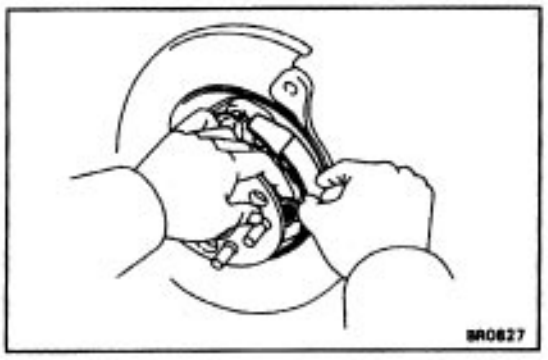


2. APPLY HIGH TEMPERATURE GREASE TO ADJUSTER



3. CONNECT PARKING BRAKE CABLE TO PARKING BRAKE LEVER

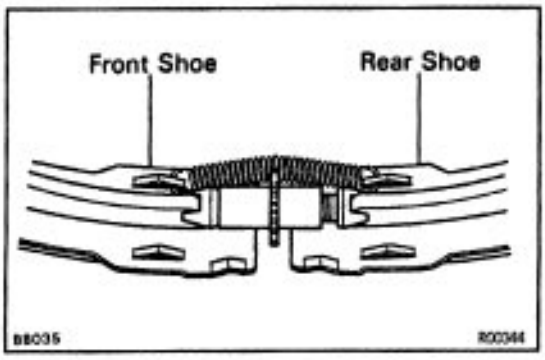
(a) Install the shoe hold–down springs, cups and pins.
(b) Using needle–nose pliers, connect the parking brake cable to the parking brake lever.



4. INSTALL REAR SHOE

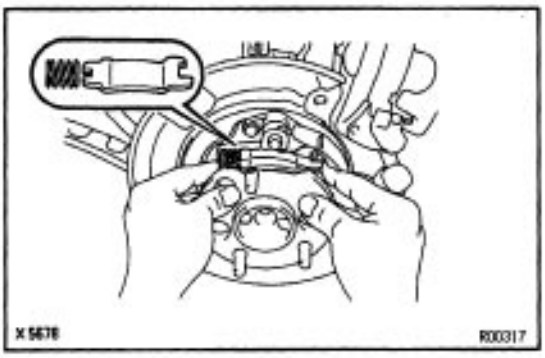
Slide in the rear shoe between the shoe hold–down spring cup and the backing plate.

NOTICE: Do not allow oil or grease to get on the rubbing faces.

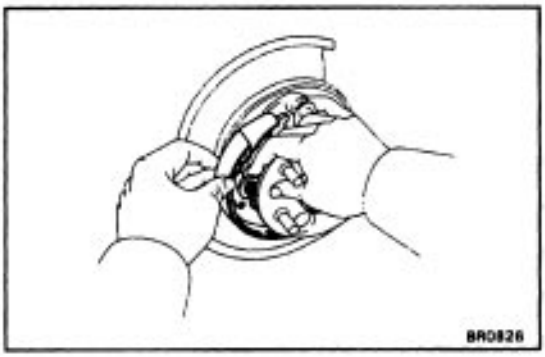


5. INSTALL TENSION SPRING, FRONT SHOE, AD–JUSTER AND STRUT

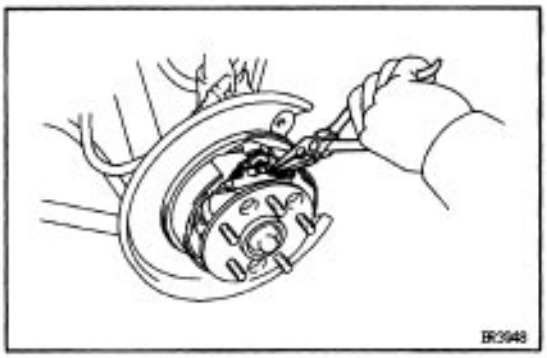
(a) Install the tension spring to the rear shoe.
(b) Install the front shoe to the tension spring.
(c) Install the adjuster between the front and rear shoes.



(d) Install the shoe strut with the spring.

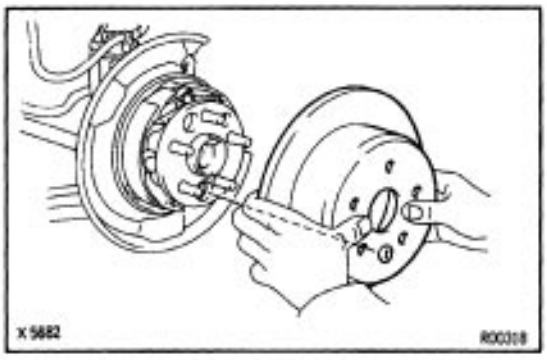


(e) Slide in the front shoe between the shoe hold–down spring cup and the backing plate.



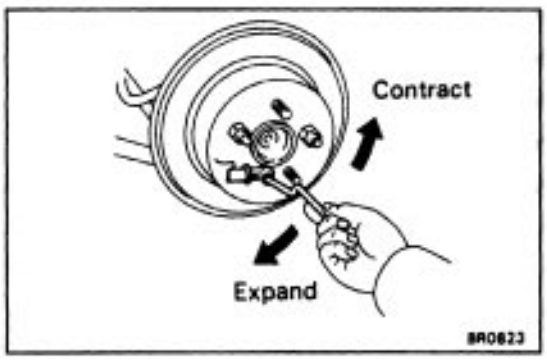
6. INSTALL SHOE RETURN SPRINGS

Using needle–nose pliers, install the shoe return spr–ings.



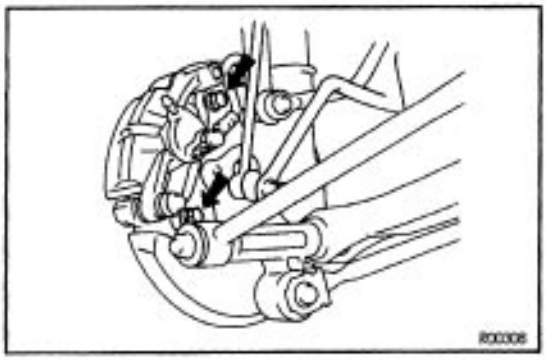
7. INSTALL DISC

(a) Before installing, polish the disc and shoe surfaces with sandpaper.
(b) Align the hole on the rear axle hub flange and service hole on the disc.



8. ADJUST PARKING BRAKE SHOE CLEARANCE

(a) Temporarily install the hub nuts.
(b) Remove the hole plug.
(c) Turn the adjuster and expand the shoes until the disc locks.
(d) Return the adjuster 8 notches.
(e) install the hole plug.



9. INSTALL DISC BRAKE ASSEMBLY

Install the disc brake assembly and torque the 2 mot nting bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

10. INSTALL REAR WHEEL

11. SETTLING PARKING BRAKE SHOES AND DISC

(a) LEVER TYPE:

With the parking brake release button pushed in, pull the lever with 98 N (10 kgf, 22 lbf) of force.

(b) PEDAL TYPE:

Depress the parking brake pedal with 147 N (15 kgf, 33 lbf).

(c) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.

(d) Drive the vehicle for about 400 meters (0.25 mile) in this condition.

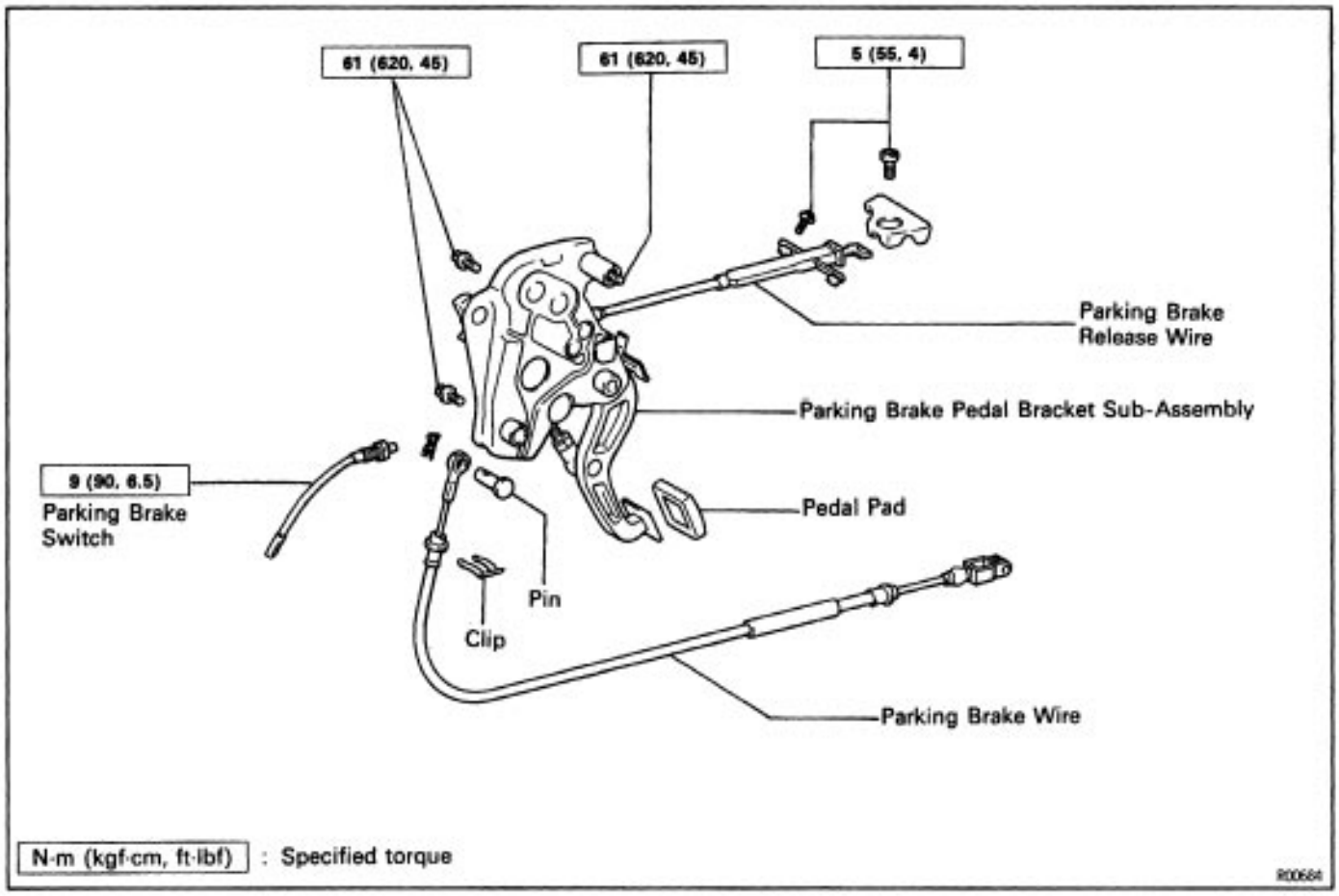
(e) Repeat this procedure 2 or 3 times.

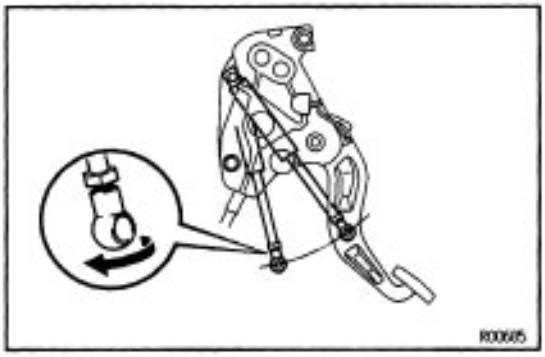
12. RECHECK AND ADJUST PARKING BRAKE LEVER/ PEDAL TRAVEL

PARKING BRAKE

PARKING BRAKE PEDAL DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





MAIN POINT OF PEDAL INSTALLATION

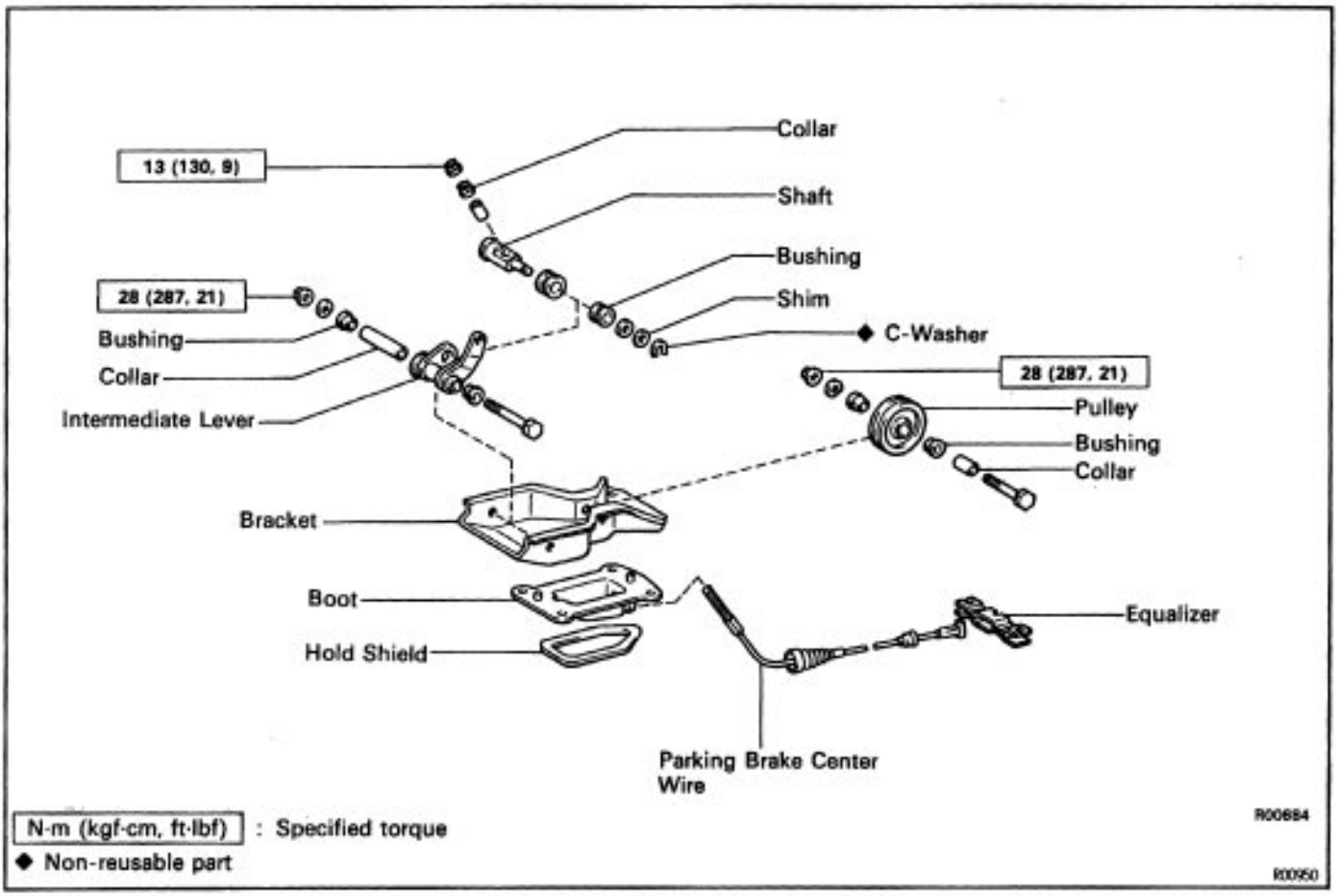
INSTALL SHOCK ABSORBER

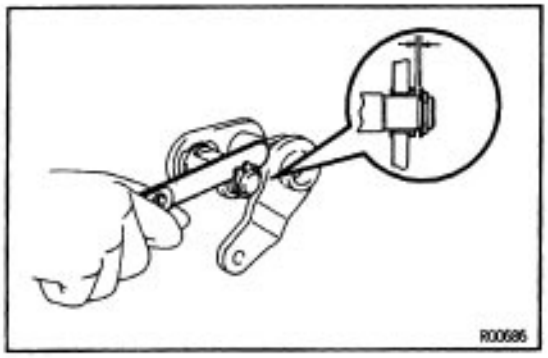
(a) Loosen the union lock nut.
(b) Install the shock absorber to the pin on the pedal bracket side, then extend the piston rod fully.
(c) Return the pedal until it hits the cushion.
(d) Make adjustments so that the shock absorber's union and the pin on the pedal side are aligned, then turn the union 1 turn counterclockwise.
(e) Install the shock absorber to the pedal and tighten the lock nut.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

PARKING BRAKE INTERMEDIATE LEVER DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





MAIN POINT OF INTERMEDIATE LEVER INSTALLATION

MEASURE CLEARANCE BETWEEN INTERMEDIATE LEVER SHAFT AND LEVER

Using a feeler gauge, measure the clearance.

Standard clearance:

0.09–0.5 mm (0.004–0.02 in.)

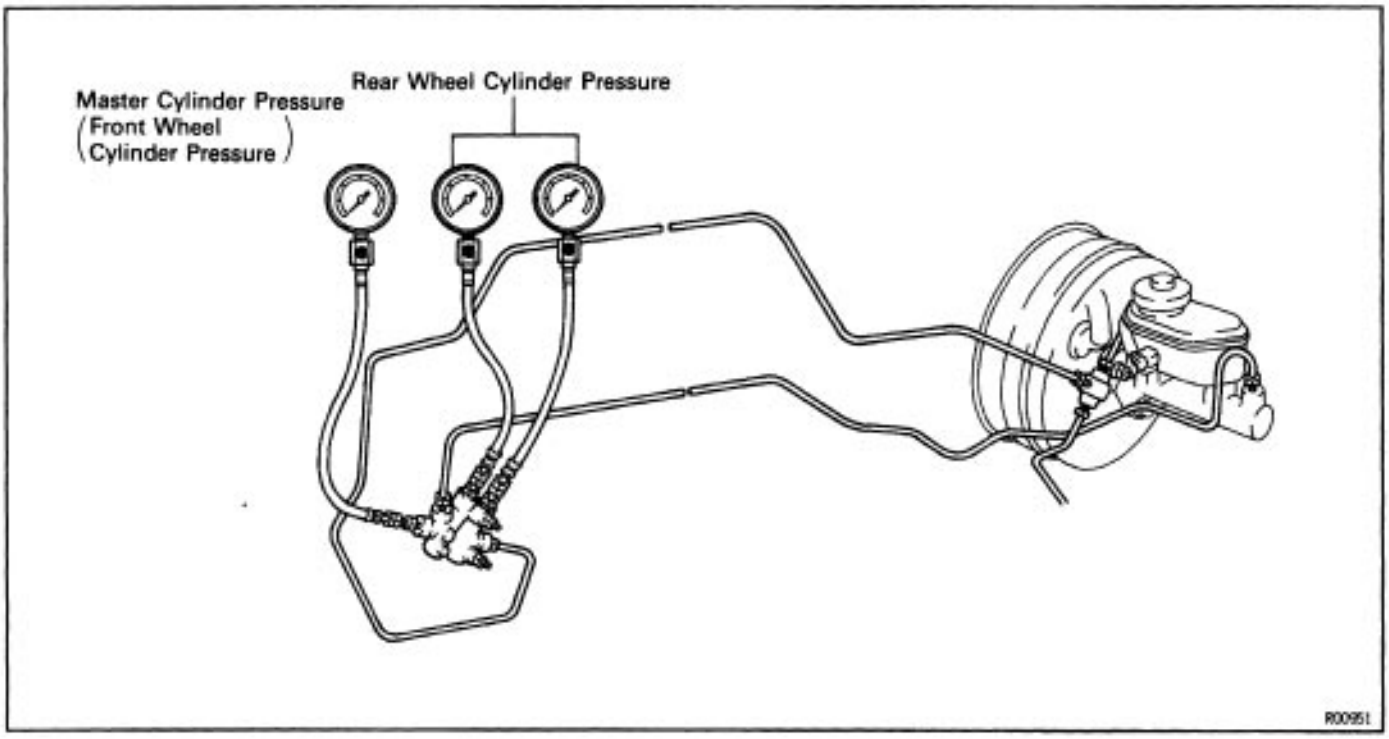
If the clearance is not within the specification, replace the shim with one of the correct size.

Shim Thickness	Shim Thickness
0.3 mm (0.012 in.)	1.2 mm (0.047 in.)
0.6 mm (0.024 in.)	1.5 mm (0.059 in.)
0.9 mm (0.035 in.)	1.8 mm (0.071 in.)

PROPORTIONING VALVE (P VALVE)

P VALVE INSPECTION

1. CONNECT FLUID PRESSURE GAUGE TO P VALVE



2. BLEED AIR FROM FLUID 'PRESSURE GAUGE

3. RAISE MASTER CYLINDER PRESSURE AND CHECK REAR WHEEL CYLINDER PRESSURE

Master cylinder fluid pressure	Rear brake cylinder fluid pressure
5S–FE w/o ABS:	
2,452 kPa (25 kgf/cm^2 , 356 psi)	2,452 kPa (25 kgf/cm^2 , 356 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	4,452 kPa (45.4 kgf/cm^2 , 648 psi)
1 MZ–FE w/o A6S:	
2,942 kPa–(30 kgf/cm^2 , 427 psi)	2,942 kPa (30 kgf/cm^2 , 427 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	4,756 kPa (48.5 kgf/cm^2 , 690 psi)
5S–FE w/ABS, 1 MZ–FE w/ABS:	
3,432 kPa (35 kgf/cm^2 , 498 psi)	3,432 kPa (35 kgf/cm^2 , 498 psi)
7,845 kPa (80 kgf/cm^2 , 1,138 psi)	5,070 kPa (51.7 kgf/crn2 , 735 psi)

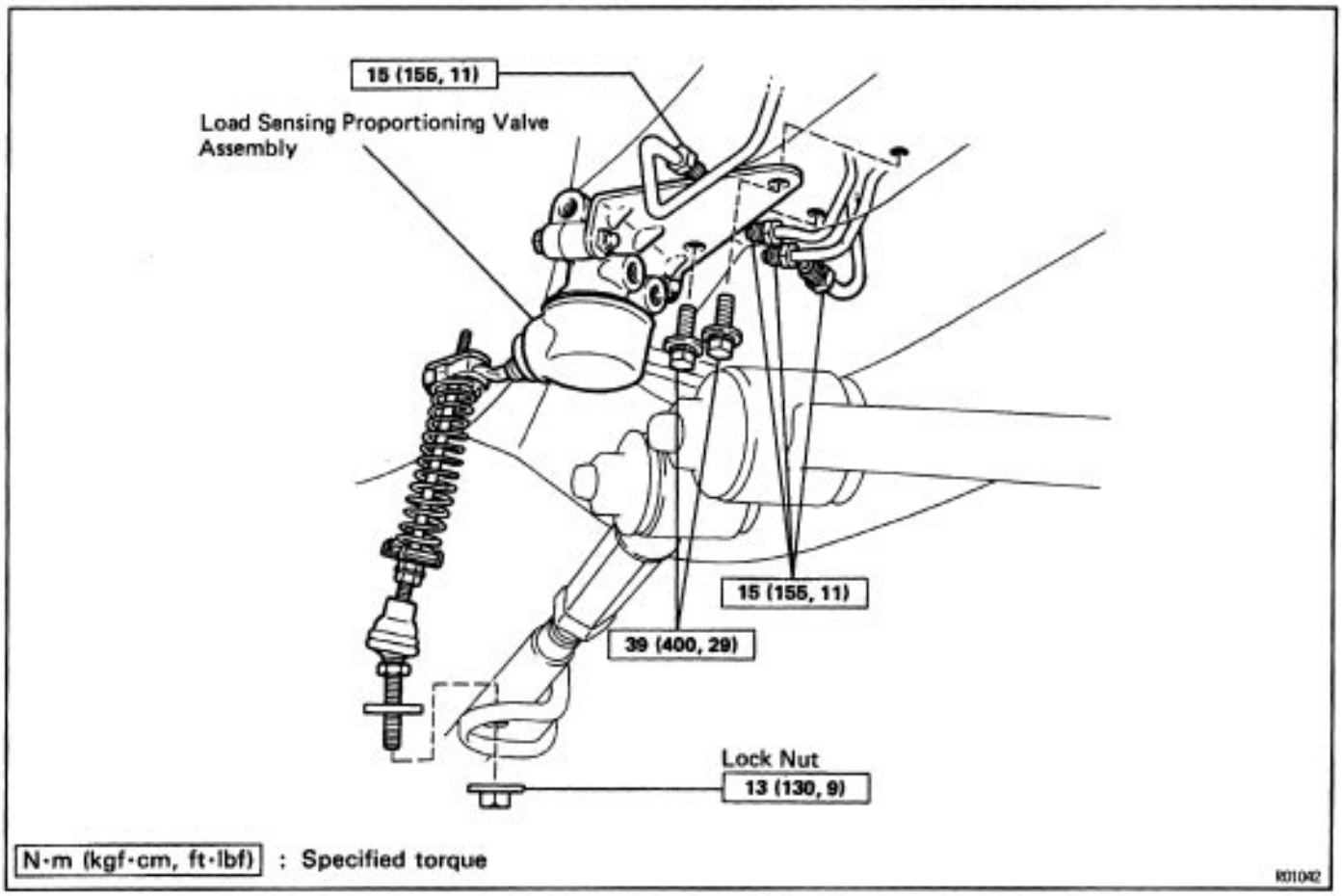
If the rear brake cylinder pressure is incorrect, replace the P valve assembly.

4. BLEED BRAKE SYSTEM

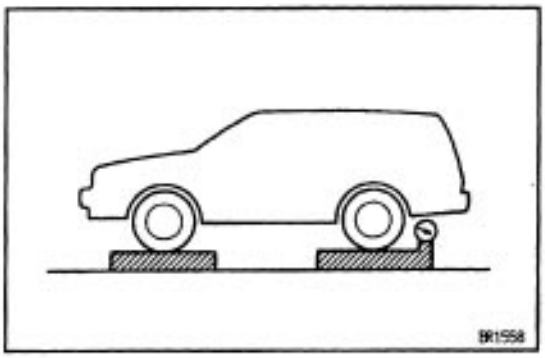
5. CHECK FOR LEAKS

LOAD SENSING PROPORTIONING VALVE (LSPV)

COMPONENTS



FLUID PRESSURE INSPECTION



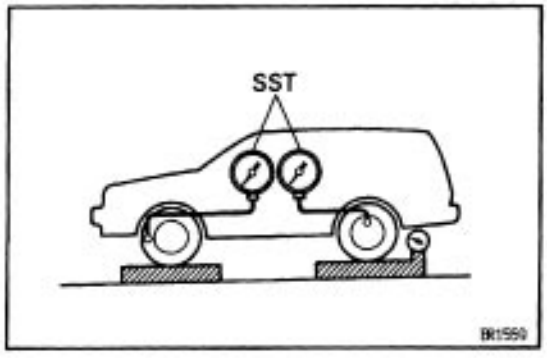
1. SET REAR AXLE LOAD

(a) Set the vehicle to its curb weight.

(b) Measure the rear axle load and note the value.

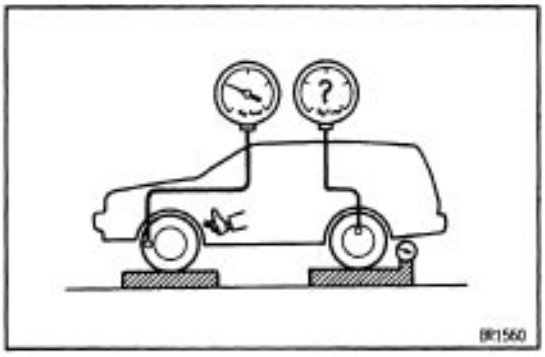
(c) Set the rear axle load.

Rear axle load: Rear axle curb weight + 31 kg (68 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED BRAKE SYSTEM

SST 09709–.29017



3. RAISE FRONT BRAKE FLUID PRESSURE TO FOL–LOWING SPECIFICATION AND CHECK REAR BRAKE FLUID PRESSURE

Rear brake fluid pressure:

5S–FE All, 1 MZ–FE w/ABS

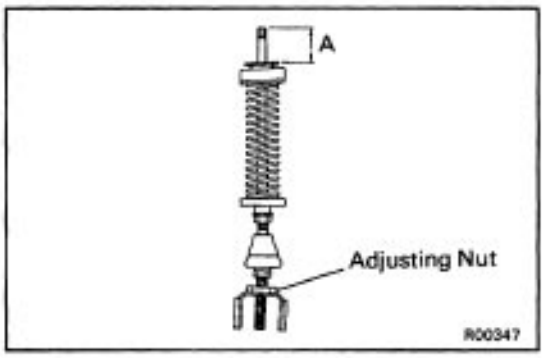
Front brake fluid pressure kPa (kgf/cm^2 , psi)	Rear brake fluid pressure kPa (kgf/cm^2 , psi)
9,807 (100, 1,422)	6,139–7,120 (62.6–72.6, 890–1,033)

1 MZ–FE w/o A6S

Front brake fluid pressure kPa (kgf/cm^2 , psi)	Rear brake fluid pressure kPa (kgf/cm^2 , psi)
12,747 (130 , 1,849)	8,865–9,846 (90.4–100.4,1,286–1,428)

HINT:

- Depress the brake pedal while the engine is run–ning.
- The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear pressure 2 sec–onds after adjusting to the specified fluid pres–sure.



4. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Set the shaft length A to initial set length and tighten the adjusting bolt lock nut.

Initial set length:

26.0 mm (1.02 in.)

(b) Check the rear brake fluid pressure.

(c) If not within the specification, adjust the fluid pres–sure by changing the shaft length.

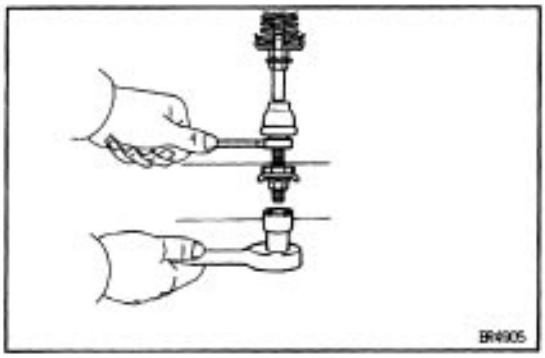
Low pressure–Lengthen A

High pressure–Shorten A

HINT:–For every full turn of the adjusting nut, the fluid pressure will change as follows:

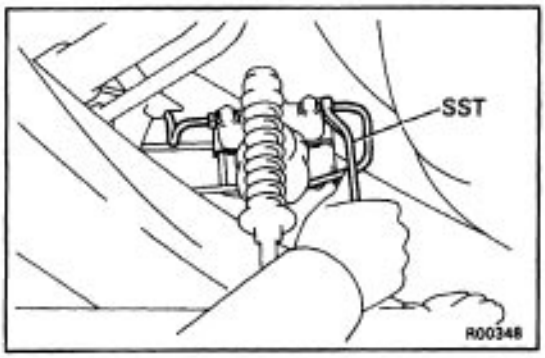
Fluid Pressure changed kPa (kgf/cm^2, psi)

5S–FE All, 1 MZ–FE w/ABS	294 (3.0, 42.7)
1 MZ–FE w/o ABS	422 (4.3, 61.2)

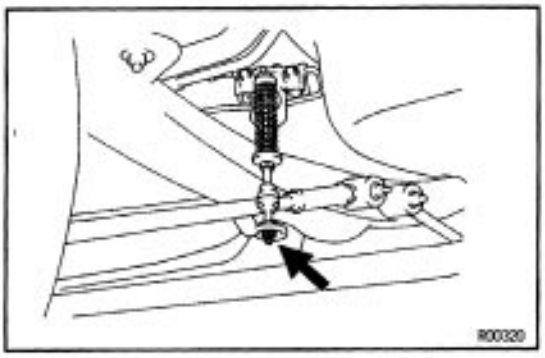


(d) Torque the lock nut.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
If it cannot be adjusted, replace the valve body.

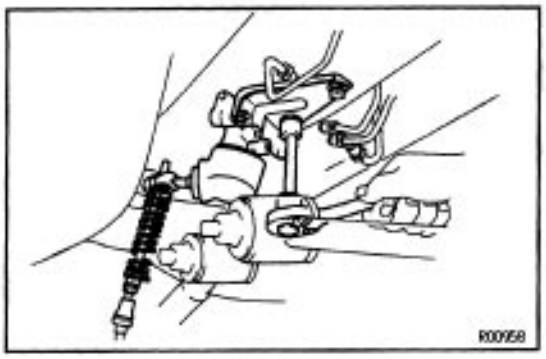
LSPV REMOVAL



1. DISCONNECT BRAKE LINES
Using SST, disconnect the brake lines from the valve body.
SST 09751–36011



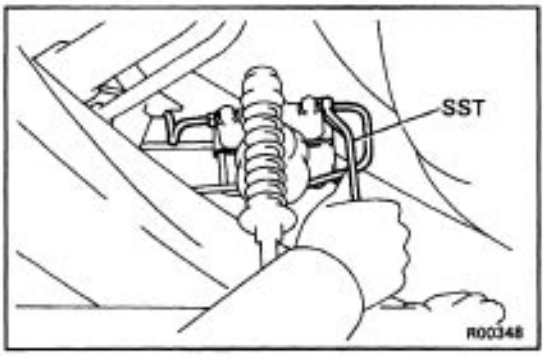
2. REMOVE LSPV ASSEMBLY
(a) Remove the lock nut and disconnect the adjusting bolt from the rear suspension arm.



(b) Remove the 2 mounting bolts and remove the LSPV assembly.

LSPV INSTALLATION

1. INSTALL LSPV ASSEMBLY
(a) Install the valve assembly with the 2 mounting bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)
(b) Install the adjusting nut to the adjusting bolt and then install the adjusting bolt to the rear suspension arm with the lock nut.



2. CONNECT BRAKE LINES

Using SST, connect the brake lines.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

3. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–9)

4. CHECK FOR LEAKS

5. CHECK AND ADJUST FLUID PRESSURE

(See page BR–63)

6. REMOVE LSPV GAUGE (SST) AND BLEED BRAKE SYSTEM

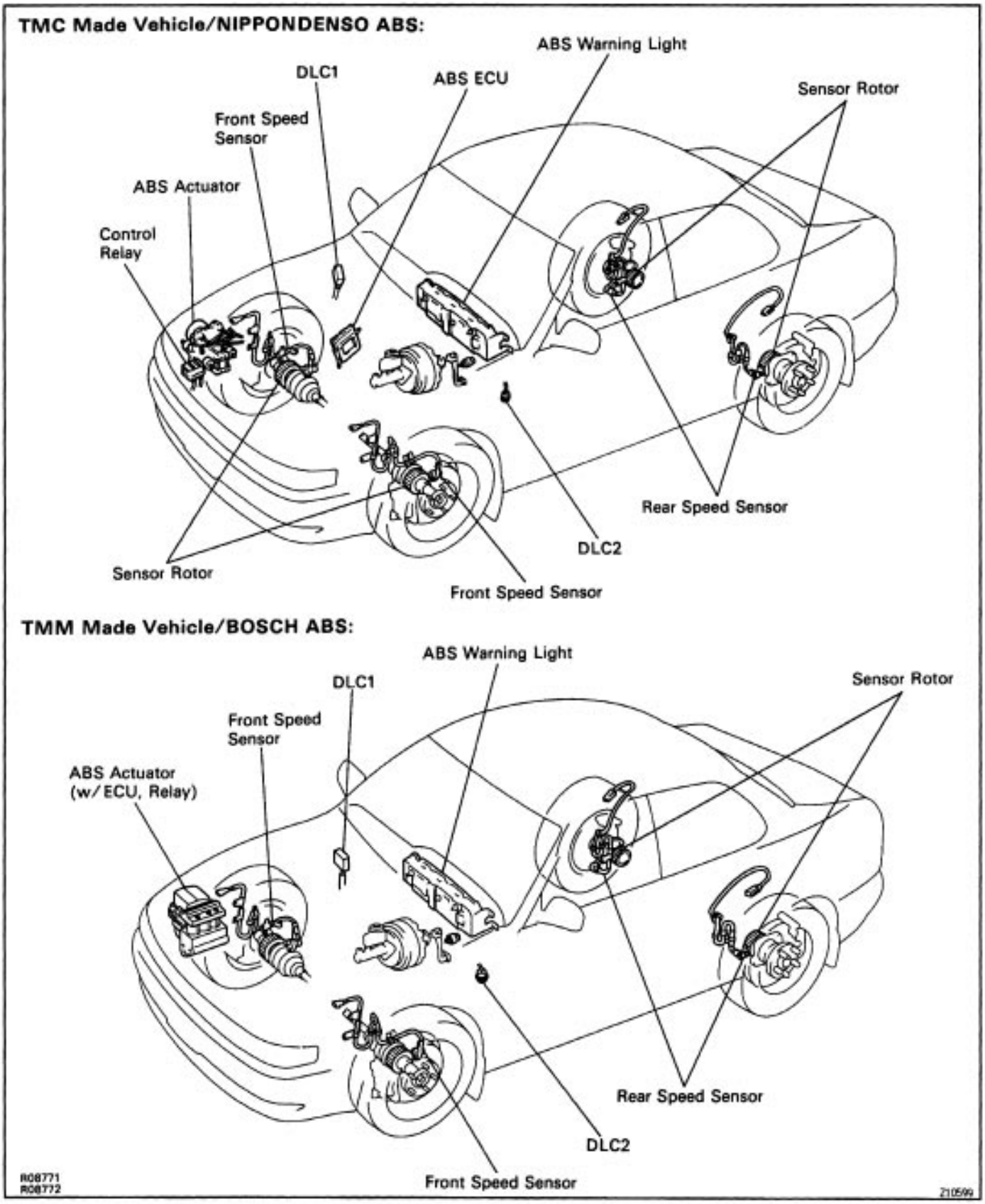
7. CHECK FOR LEAKS

ANTI–LOCK BRAKE SYSTEM (ABS)

DESCRIPTION

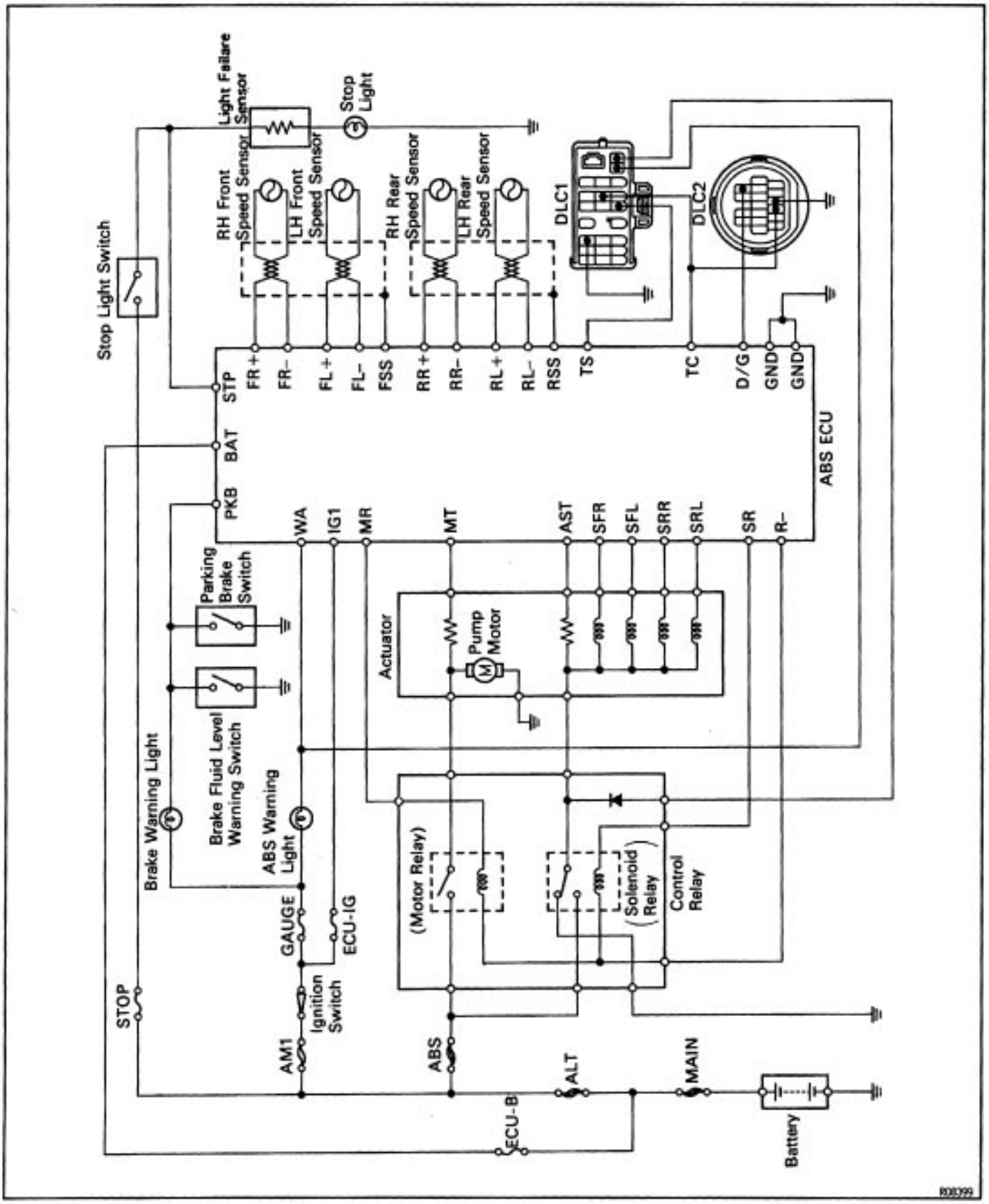
- ABS controls the brake cylinder hydraulic pressure to all 4 wheels during sudden braking and braking on slippery road surfaces, preventing the wheels from locking. ABS provides the following benefits:
  (1) Steering round an obstacle with a greater degree of certainty even when panic braking.
  (2) Stopping during panic braking while keeping the effect up on stability and steerability to a minimum, even on curves.
- In case a malfunction occurs, a diagnosis function and fail–safe system have been adopted for the ABS.
- An ABS actuator manufactured by BOSCH is used on the Camry produced by TMM (Toyota Motor Manufacturing U.S.A., Inc.).

SYSTEM PARTS LOCATION



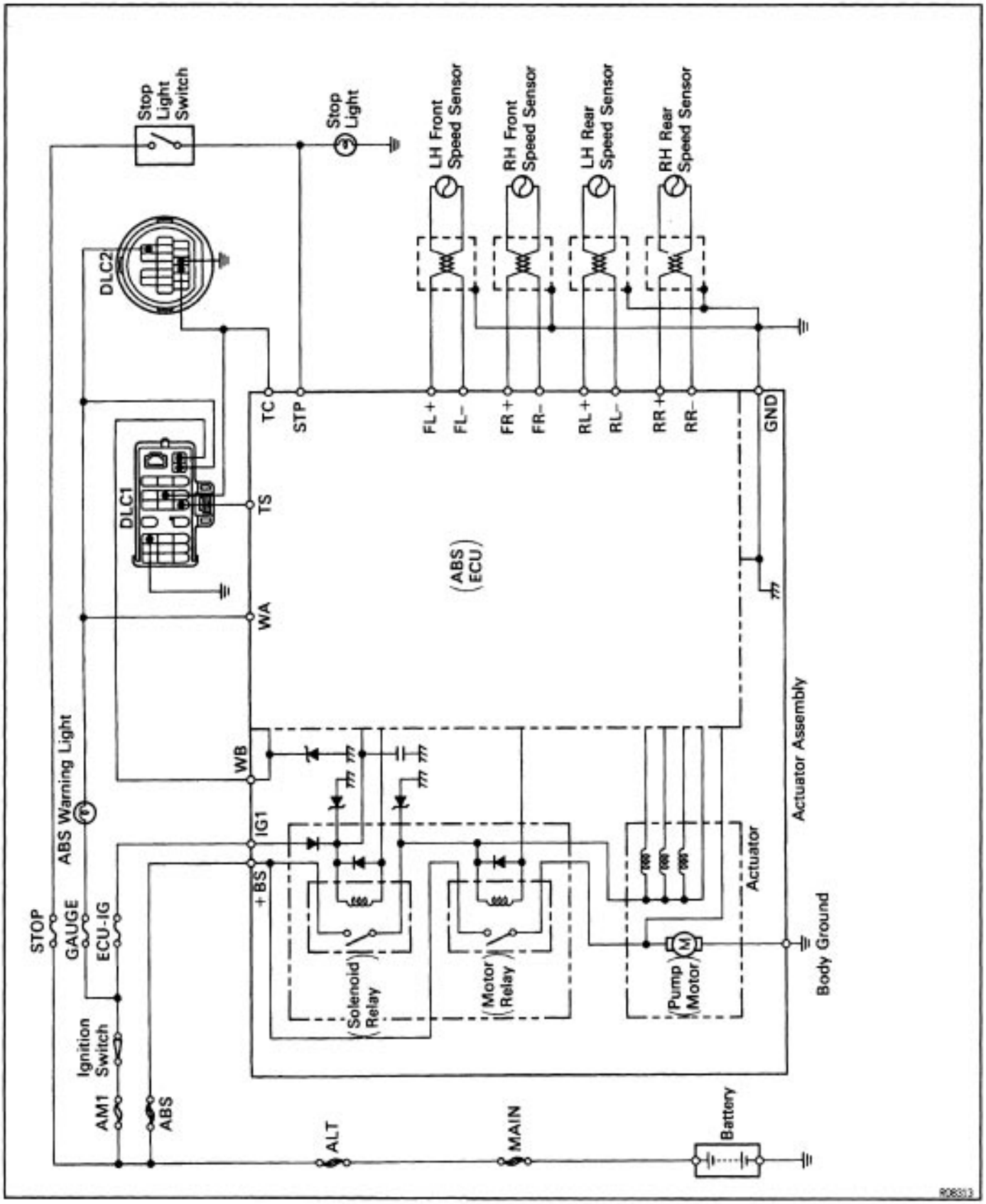
WIRING DIAGRAM

TMC Made Vehicle/NIPPONDENSO ABS:



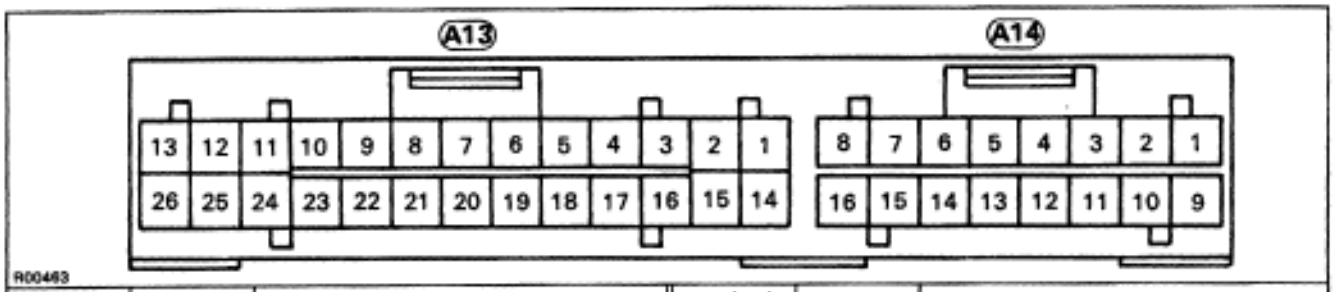
WIRING DIAGRAM

TMM Made Vehicle/BOSCH ABS:



ECU TERMINALS

TMC Made Vehicle/NIPPONDENSO ABS:



Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
A13- 1	SFR	Right front solenoid	A14- 1	RL–	Left rear speed sensor
2	GND	Ground	2	–	–
3	FR–	Right front speed sensor	3	–	–
4	–	–	4	D/G	DLC2
5	TC	DLC1, DLC2	5	–	–
6	MT	ABS control (motor) relay monitor	6	STP	Stop light switch
7	–	–	7	RSS	Sealed wiring harness
8	–	–	8	RR+	Right rear speed sensor
9	FL+	Left front speed sensor	9	RL+	Left rear speed sensor
10	FSS	Sealed wiring harness	10	–	–
11	SR	ABS control (solenoid) relay	11	–	–
12	IG1	Ignition switch	12	–	–
13	SFL	Left front solenoid	13	WA	ABS warning light
14	SRL	Left rear solenoid	14	PKB	Parking brake switch
15	GND	Ground	15	TS	DLC1
16	FR+	Right front speed sensor	16	RR–	Right rear speed sensor
17	–	–			
18	AST	A8S control (solenoid) relay monitor			
19	–	–			
20	–	–			
21	–	–			
22	FL–	Left front speed sensor			
23	MR	ABS control (motor) relay			
24	R–	Relay ground			
25	BAT	Battery			
26	SRR	Right rear solenoid			

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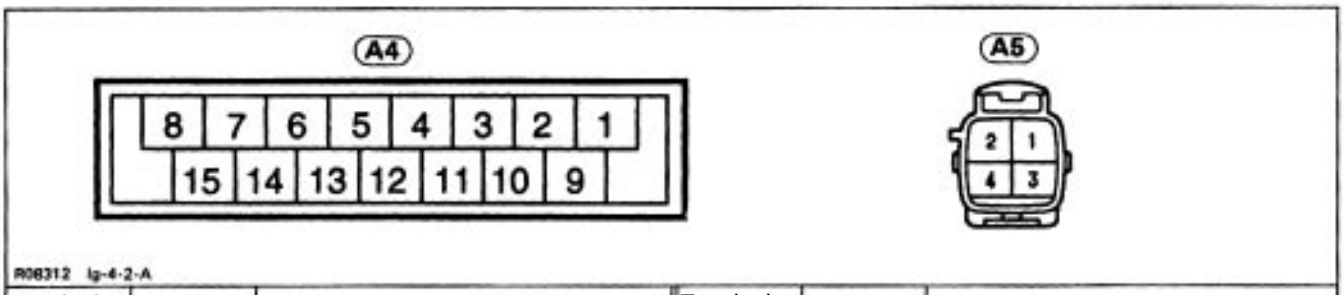
ECU TERMINALS

TMM Made Vehicle/BOSCH ABS:



Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
A4- 1	WA	A6S warning fight	A5-1	+BS	Battery
2	RL–	Left rear speed sensor	2	IG1	Ignition switch
3	–	–	3	WB	DLC1
4	RL+	Left rear speed sensor	4	GND	Ground
5	FR–	Right front speed sensor			
6	RR+	Right rear speed sensor			
7	FL–	Left front speed sen-			
8	–	sor –			
9	STP	Stop light switch			
10	–	–			
11	FR+	Right front speed sensor			
12	TC	DLC1, DLC2			
13	FL+	Left front speed sensor			
14	RR–	Right rear speed sensor			
15	TS	DLC1			

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ECU TERMINALS STANDARD VALUE

TMC Made Vehicle/NIPPONDENSO ABS:

Symbols (Terminals No.)	STD Voltage (V)	Condition
BAT (A13-25) – GND (A13-2, 15)	10 – 14	Always
IG1 (A13-12) – GND (A13-2, 15)	10 – 14	IG switch ON
SR (A13-11) – R– (A13-24)	8.4 – 14	IG switch ON, ABS warning light OFF
MR (A13-23) – R– (A13-24)	Below 1.0	IG switch ON
SFR (A13-1) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
SFL (A13-13) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
SRR (A13-26) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
AST (A13-18) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
WA (A14-13) – GND (A13-2, 15)	Below 2.0	IG switch ON, AIRS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
PKB (A14-14) – GND (A13-2, 15)	Below 1.5	IG switch ON, PKB switch ON, Fluid in M/C reservoir above MIN level
	10 – 14	IG switch ON, PKB switch OFF, Fluid in M/C reservoir above MIN level
STP (A14-6) – GND (A13-2, 15)	Below 1.5	Stop light switch OFF
	8 – 14	Stop light switch ON
D/G (A14-4) – GND (A13-2, 15)	10 – 14	IG switch ON, ABS warning light OFF
TC (A13-5) – GND (A13-2, 15)	10 – 14	!G switch ON
TS (A14-15) – GND (A13-2, 15)	10 – 14	IG switch ON
FR+ (A13-16) – FR– (A13-3)	AC generation	IG switch ON Slowly turn right front wheel
FL+ (A13-9) – FL– (A13-22)	AC generation	IG switch ON Slowly turn left front wheel
RR+ (A14-8) – RR– (A14-16)	AC generation	IG switch ON Slowly turn right rear wheel
RL+ (A14-9) – RL– (A14-1)	AC generation	IG switch ON Slowly turn left rear wheel

V04538

ECU TERMINALS STANDARD VALUE

TMM Made Vehicle/BOSCH ABS:

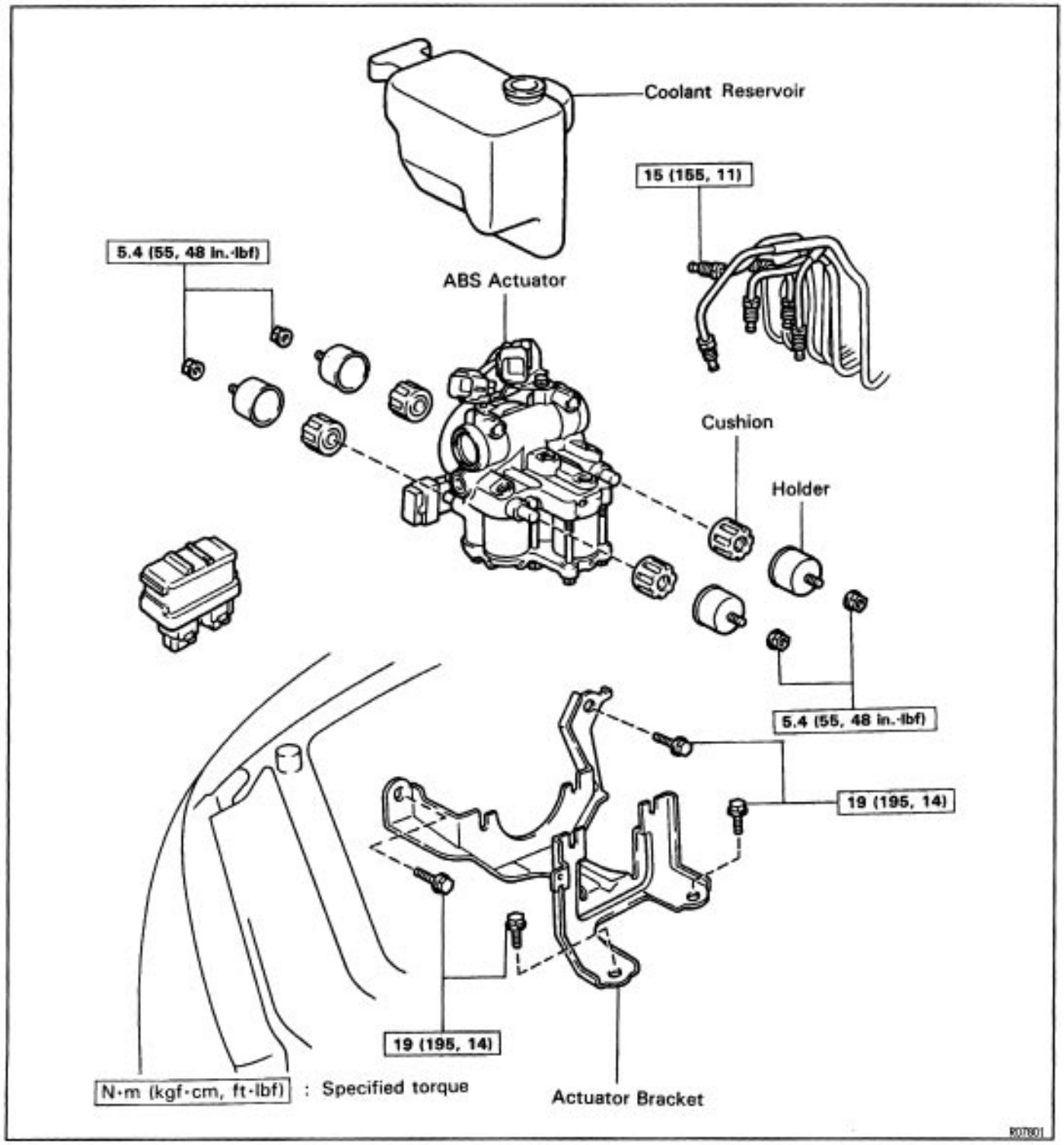
Symbols (Terminals No.)	STD Voltage (V)	Condition
+BS (A5-1) – GND (A5-4)	10 – 14	Always
IG1 (A5-2) – GND (A5-4)	10 – 14	IG switch ON
WA (A4-1) – GND (A5-4)	Below 2.6	IG switch ON, A6S warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
WB (A5-3) – GND (A5-4)	Below 2.6	IG switch ON, ABS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
STP (A4-9) – GND (A5-4)	Below 1.5	Stop light switch OFF
	5 – 14	Stop light switch ON
Tc (A4-12) – GND (A5-4)	5.7 – 8.1	lG switch ON
Ts (A4-15) – GND (A5-4)	5.7 – 8.1	I G switch 0 N
FR+ (A4-11) – FR– (A4-5)	AC generation	IG switch ON, slowly turn right front wheel
FL+ (A4-13) – FL– (A4-7)	AC generation	IG switch ON, slowly turn left front wheel
RR+ (A4-6) – RR– (A4-14)	AC generation	IG switch ON, slowly turn right rear wheel
RL+ (A4-4) – RL– (A4-2)	AC generation	IG switch ON, slowly turn left rear wheel

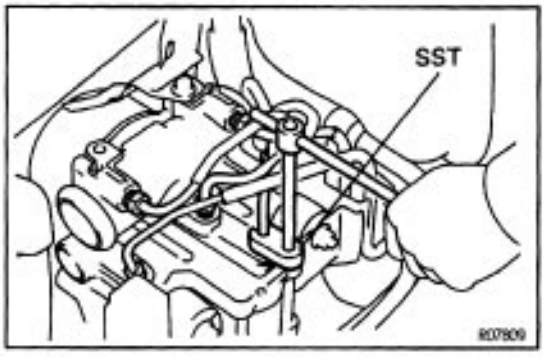
V04539

ABS ACTUATOR (TMC Made Vehicle NIPPONDENSO ABS)

ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





MAIN POINTS OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT BRAKE LINE

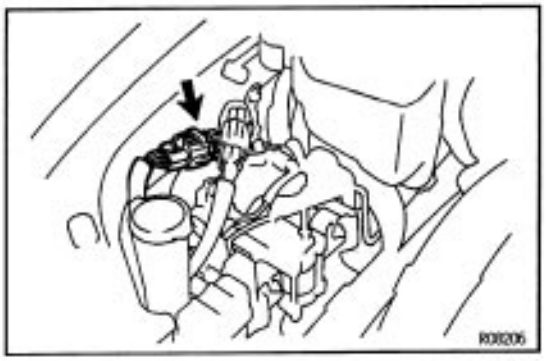
Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09023–00100

Torque: 15 N–m (155 kgf–cm. 11 ft–lbf)

2. BLEED BRAKE SYSTEM

(See page BR–9)



ABS ACTUATOR INSPECTION

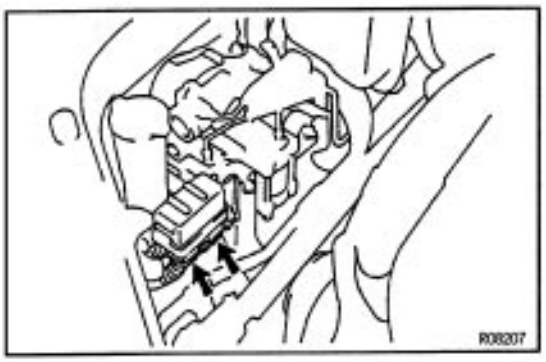
1. INSPECT BATTERY POSITIVE VOLTAGE

Battery positive voltage:

10–14.5 V

2. DISCONNECT CONNECTORS

(a) Disconnect the connector from the actuator.



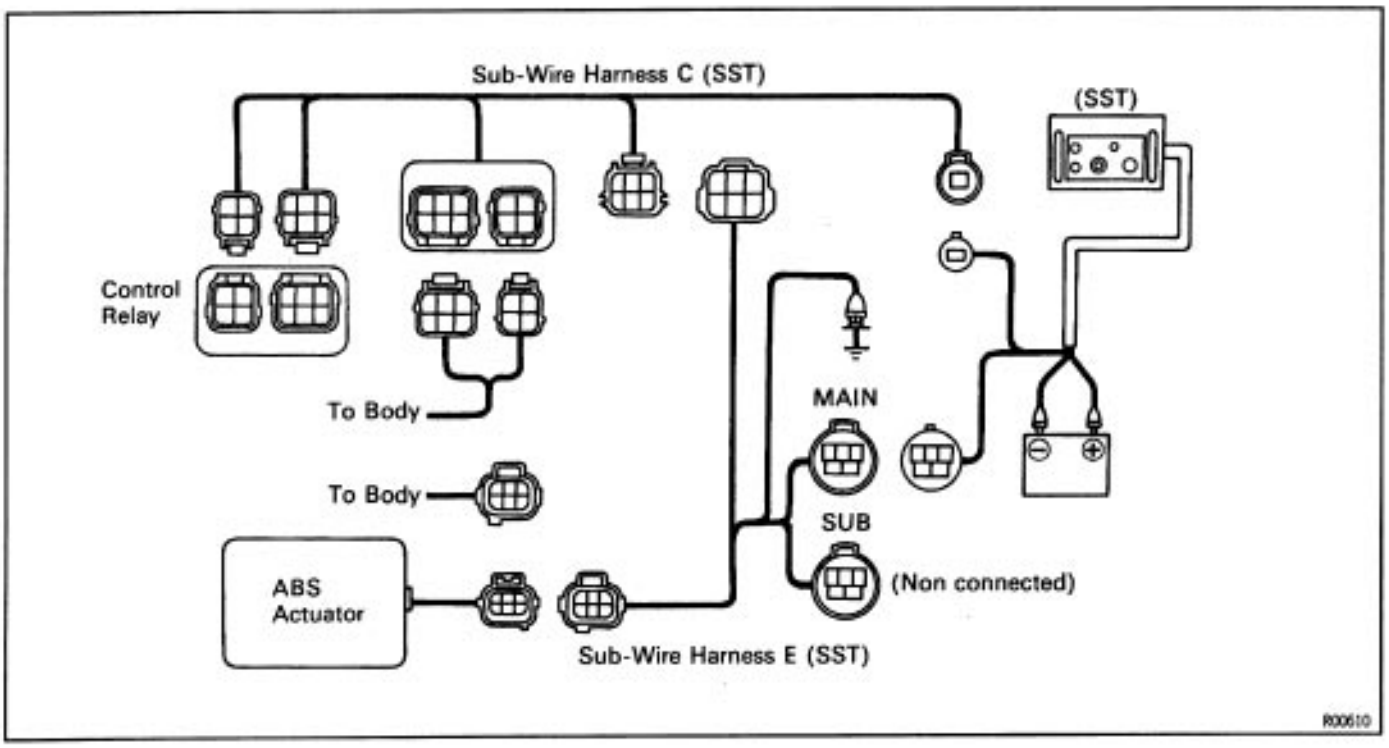
(b) Disconnect the 2 connectors from the control relay.

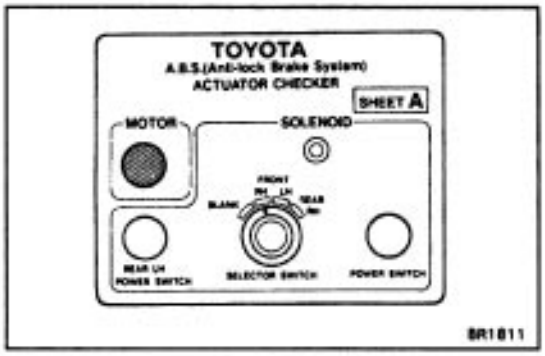
3. CONNECT ACTUATOR CHECKER (SST) TO ACTUA – TOR

(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub–wire harness C and E (SST) as shown.

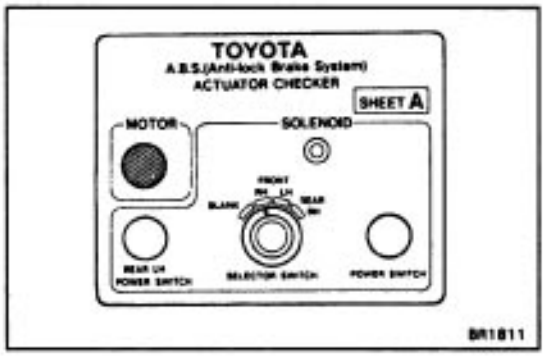
SST 09990–00150, 09990–00200, 09990–00210

(b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (–) terminal. Connect the black cable of the sub–wire harness to the battery negative (–) terminal or body ground.



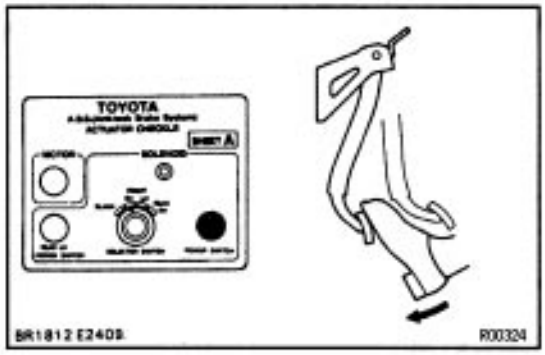


(c) Place the ”SHEET A” (SST) on the actuator checker.
SST 09990–00163

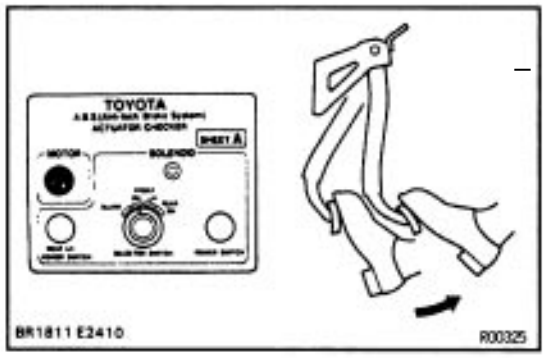


4. INSPECT BRAKE ACTUATOR OPERATION

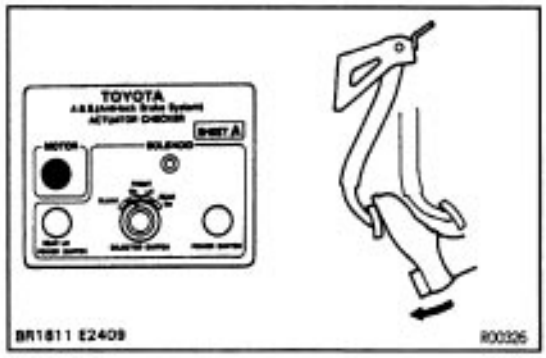
(a) Start the engine, and run it at idle.
(b) Turn the selector switch of the actuator checker to ”FRONT RH” position.
(c) Push and hold in the MOTOR switch for a few sec–onds.
(d) Depress the brake pedal and hold it until step (g) is com pleted.



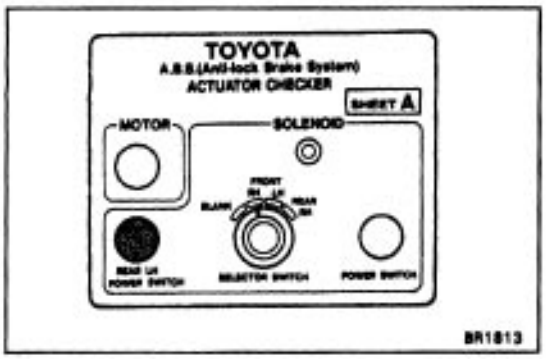
(e) Push the POWER SWITCH, and check that the brake pedal does not go down.
NOTICE: Do not keep the POWER SWITCH pushed down for more than 10 seconds.
(f) Release the switch, and check that the pedal goes down.



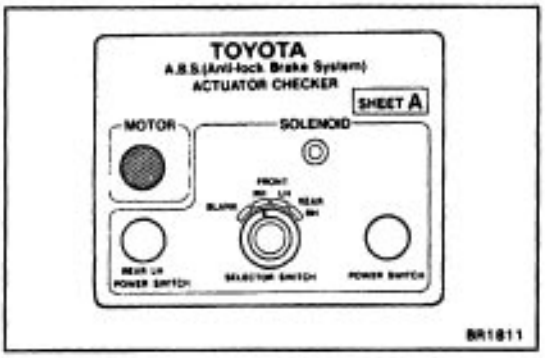
(g) Push and hold in the MOTOR switch for a few sec onds, and check that the pedal returns.
(h) Release the brake pedal.



(i) Push and hold in the MOTOR switch for a few sec–onds.
(j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.
(k) Release the brake pedal.



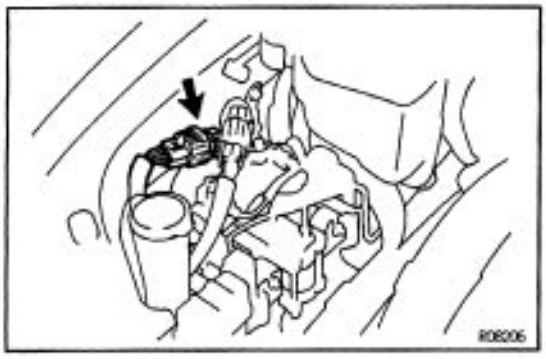
(l) Turn the selector switch to ”FRONT LH” position.
(m) Repeat (c) to 6), checking the actuator operation sim–ilarly.
(n) Similarly, inspect ”REAR RH” and ”REAR LH” position.
HINT: When inspecting ”REAR LH” position, push the REAR LH switch instead of the POWER SWITCH, and you can inspect in any selector switch position.



(o) Push and hold in the MOTOR switch for a few sec–onds.
(p) Stop the engine.

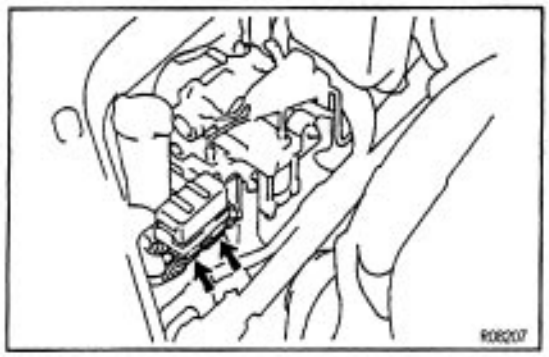
5. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Remove the ”SHEET A” (SST) and disconnect the actuator checker (SST) and sub–wire harness (SST) from the actuator, control relay and body side wire harness.
SST 09990–00150, 09990–00200, 09990–00210 , 09990–00163



6. CONNECT CONNECTORS

(a) Connect the 2 connectors to the control relay.



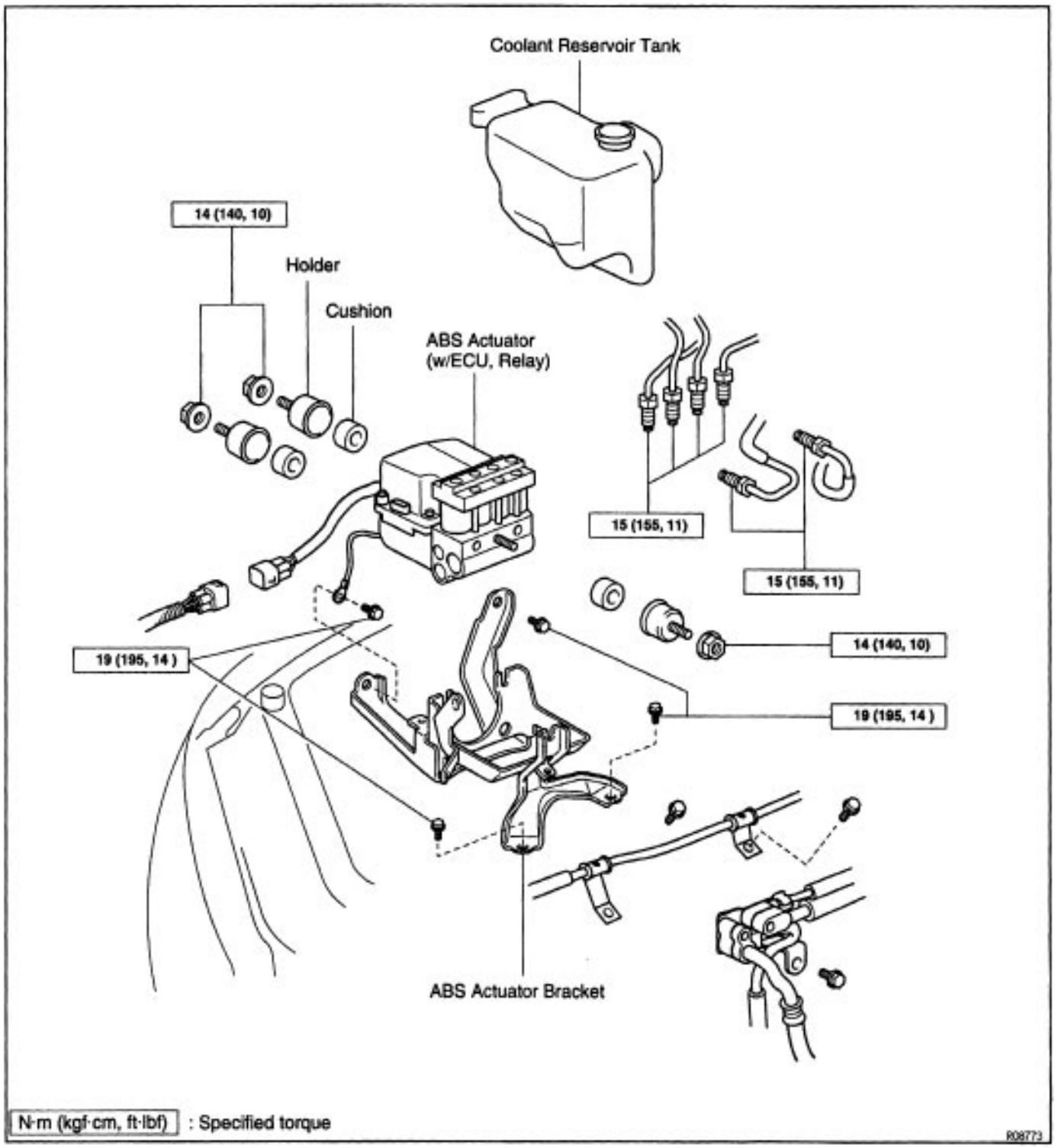
(b) Connect the connector to the actuator.

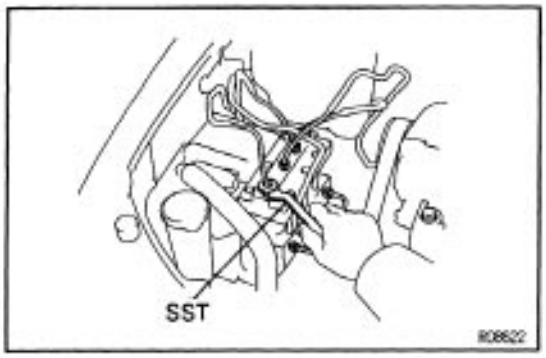
7. CLEAR DIAGNOSTIC TROUBLE CODES
(See page BR–94**)**

ABS ACTUATOR (TMM Made Vehicle BOSCH ABS)

ABS ACTUATOR REMOVAL AND INSTALLATION

Remove and install the parts as shown.





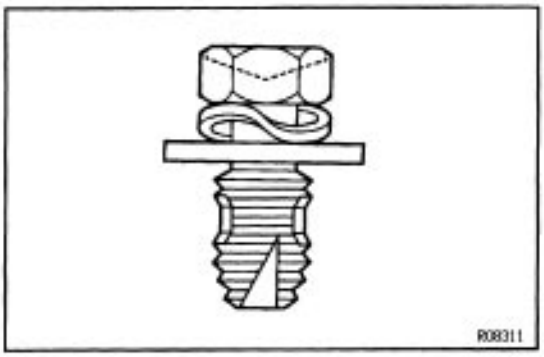
MAIN POINTS OF REMOVAL AND INSTALLATION

1. DISCONNECT AND CONNECT BRAKE LINE

Using SST, disconnect and connect the brake lines from/to the ABS actuator.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



2. INSTALL ABS ACTUATOR

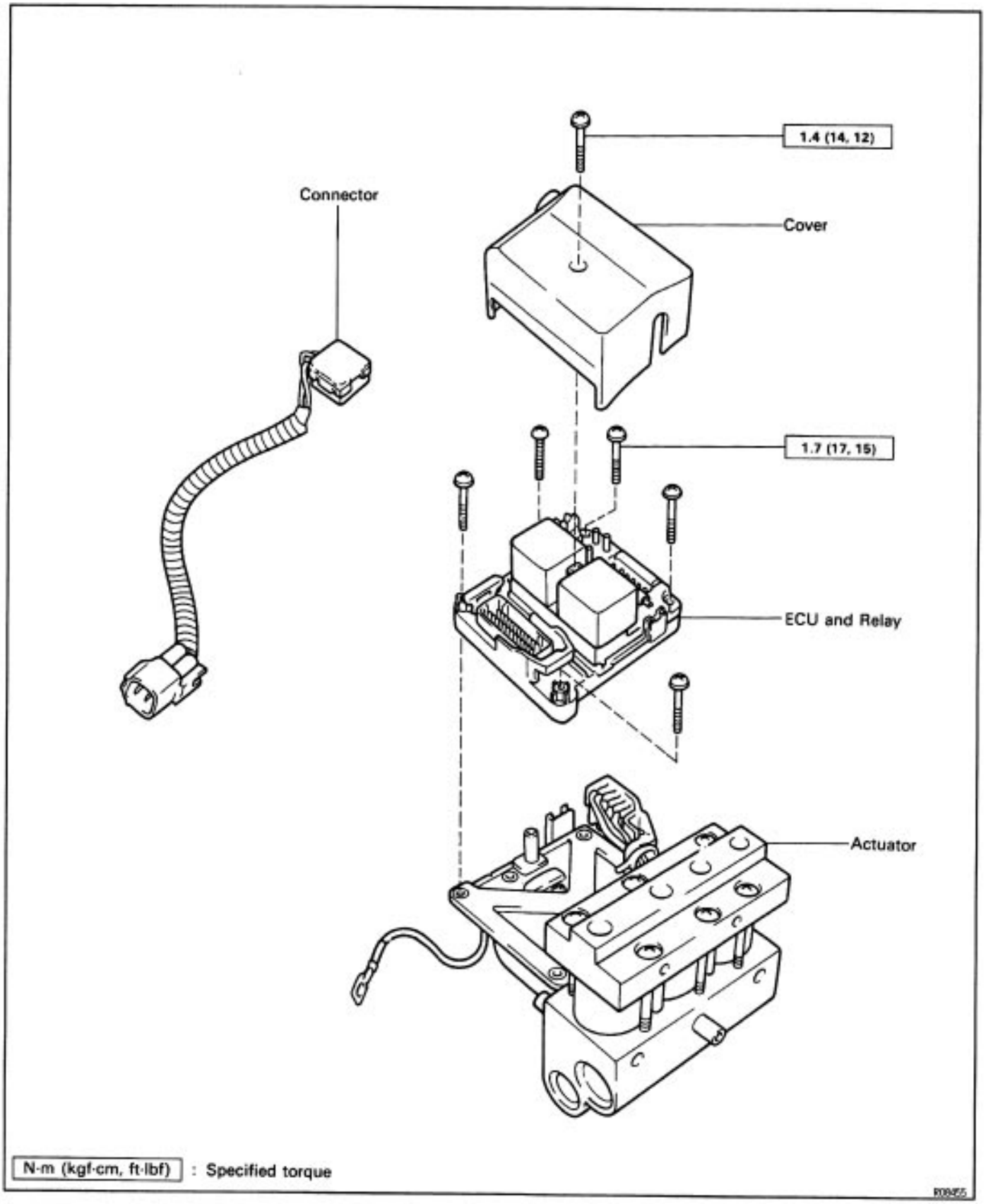
NOTICE: Use the bolts which have a notch to securely ground the actuator ground wire.

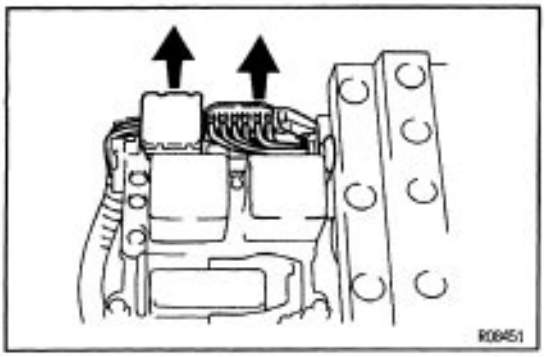
3. BLEED BRAKE SYSTEM

(See page BR–9)

ABS ACTUATOR DISASSEMBLY AND ASSEMBLY

Remove and install the parts as shown.





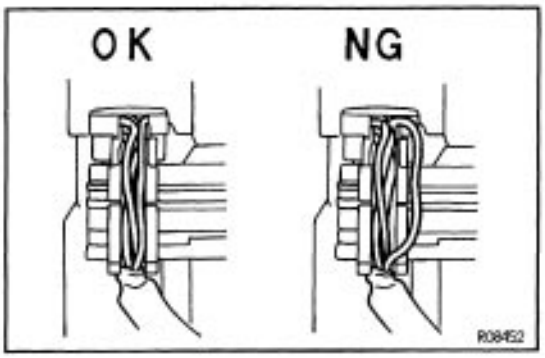
MAIN POINTS OF DISASSEMBLY AND ASSEMBLY

1. REMOVE AND INSTALL COVER

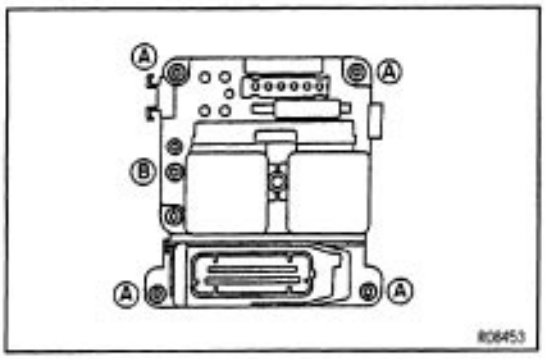
Using a T15 torx wrench, loosen and tighten the screw.

Torque: 1.4 N–m(14 kgf–cm, 12 in.lbf)

2. DISCONNECT AND CONNECT 4–PIN AND 6–PIN CONNECTORS



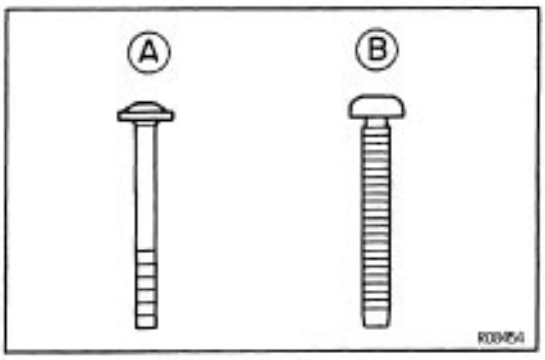
NOTICE: When installing, place the 4–pin connector's cables into the cable guide.



3. REMOVE AND INSTALL ECU

Using T15 and T20 torx wrenches, loosen and tighten the 5 screws.

Torque: 1.7 N–m(17 kgf–cm, 15 in.–lbf)



NOTICE: There are 2 kinds of screw, so install a correct screw into each hole.

4. PERFORM TEST DRIVE

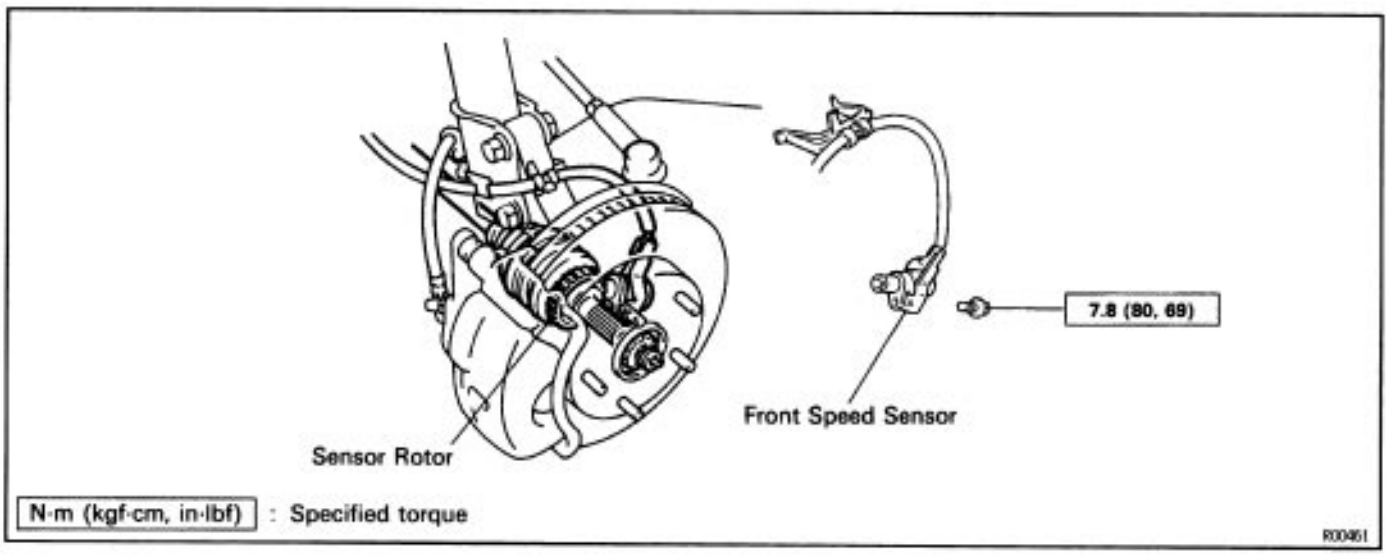
(a) Drive for at least 20 seconds at 30 Km/h (119 mph).

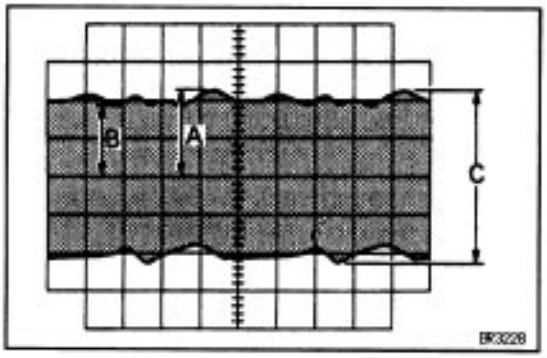
(b) The ABS warning light may not light.

If the ABS warning light lights, read the diagnostic trouble code.

FRONT SPEED SENSOR

COMPONENTS

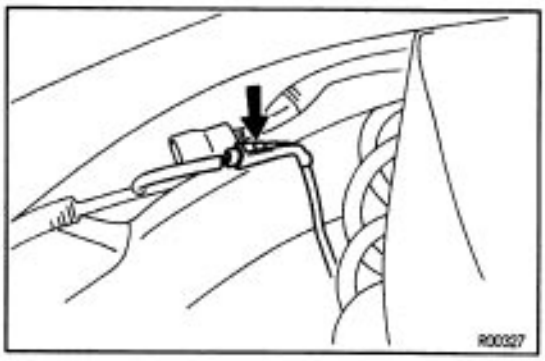




FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

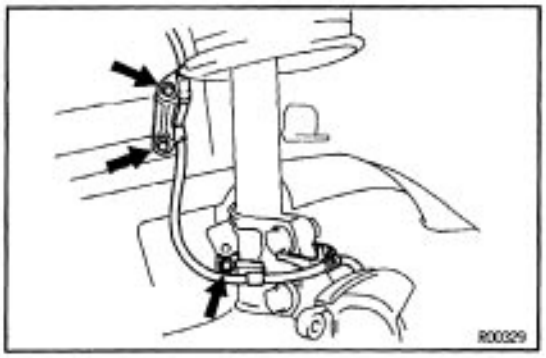
INSPECT FRONT SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLO–SCOPE

(a) Connect an oscilloscope to the speed sensor connec–tor.
(b) Run the vehicle at 20 km/h (112.4 mph), and inspect speed sensor output wave.
(c) Check that C is 0.5 V or more.
If not as specified, replace the speed sensor.
(d) Check that B is 30% or more of A.
If not as specified, replace the drive shaft.



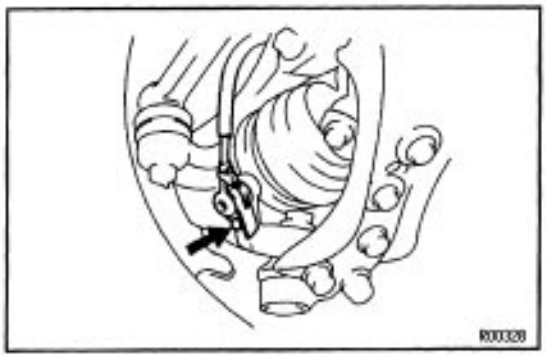
FRONT SPEED SENSOR REMOVAL

1. DISCONNECT SPEED SENSOR CONNECTOR
(a) Remove the fender shield.
(b) Disconnect the speed sensor connector.



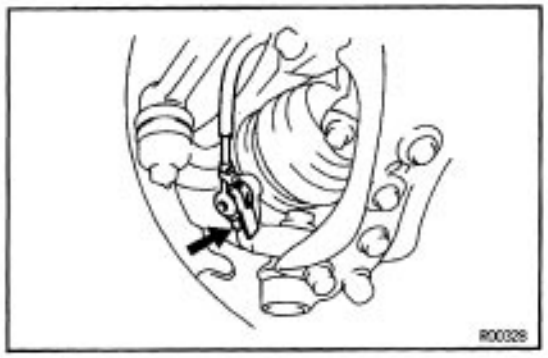
2. REMOVE SPEED SENSOR

(a) Remove the 3 clamp bolts holding the sensor harness to the body and shock absorber_



(b) Remove the speed sensor from the steering knuckle.

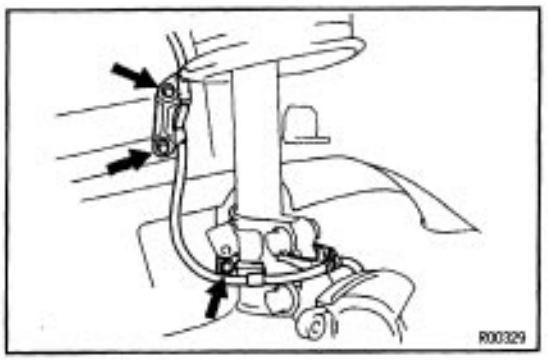
FRONT SPEED SENSOR INSTALLATION ¿¿"–07



1. INSTALL SPEED SENSOR

Install the speed sensor to the steering knuckle.

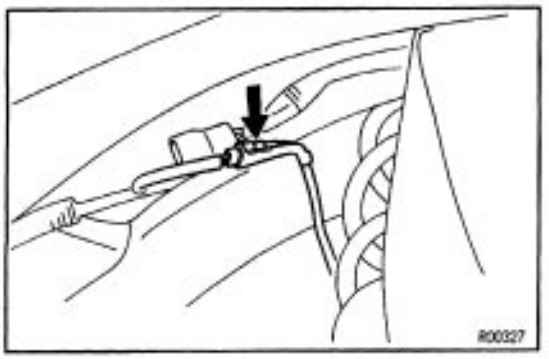
Torque: 7.8 N–m (80 kgf–cm, 69 MAW)



2. CONNECT SPEED SENSOR CONNECTOR

(a) Install the sensor harness.

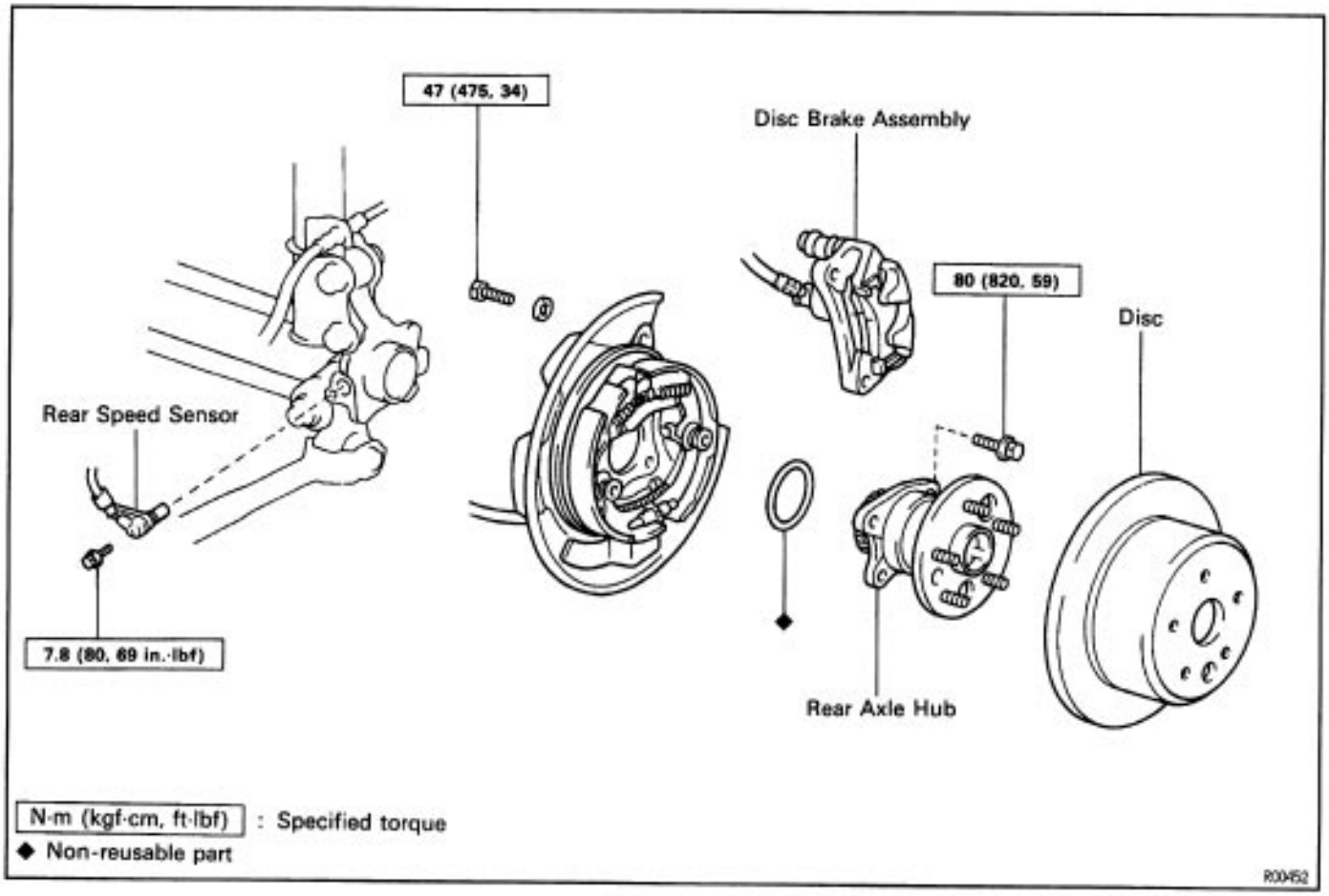
Torque: 5.4 N–m (55 kgf–cm. 48 in.–lbf)

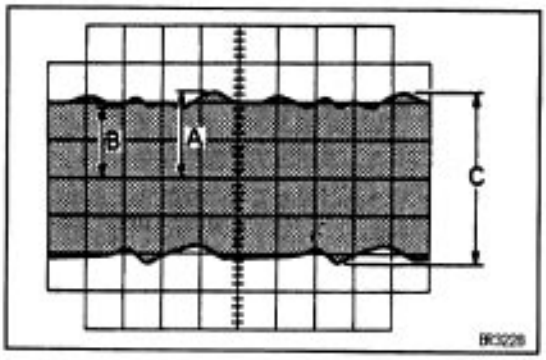


(b) Connect the speed sensor connector.

REAR SPEED SENSOR

COMPONENTS





REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS INSPECTION (REFERENCE)

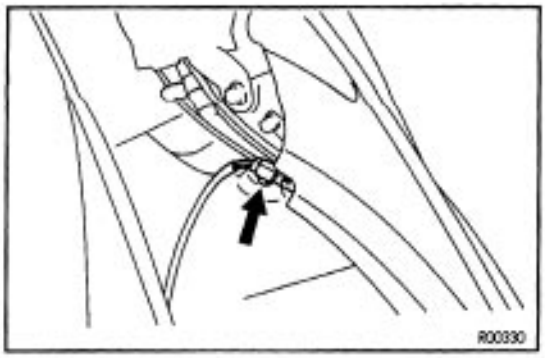
INSPECT REAR SPEED SENSOR AND SENSOR ROTOR SERRATIONS BY USING AN OSCILLO–SCOPE

(a) Connect an oscilloscope to the speed sensor connec–tor.

(b) Run the vehicle at 20 km/h (12.4 mph), and inspect speed sensor output wave.

(c) Check that C is 0.5 V or more.
If not as specified, replace the speed sensor.

(d) Check that B is 40 96 or more of A.
If not as specified, replace the rear axle hub.

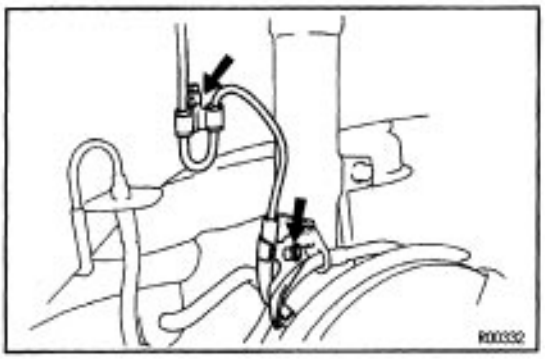


REAR SPEED SENSOR REMOVAL

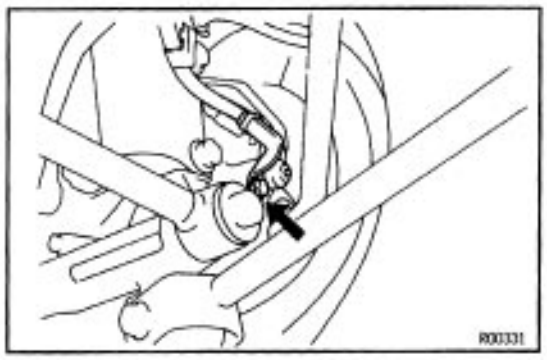
1. DISCONNECT SPEED SENSOR CONNECTOR

(a) Remove the seat cushion and side seatback.

(b) Disconnect the speed sensor connector, and pull out the sensor wire harness with the grommet.



(c) Remove the 2 clamp bolts holding the sensor wire harness to the body and shock absorber.



2. REMOVE SPEED SENSOR

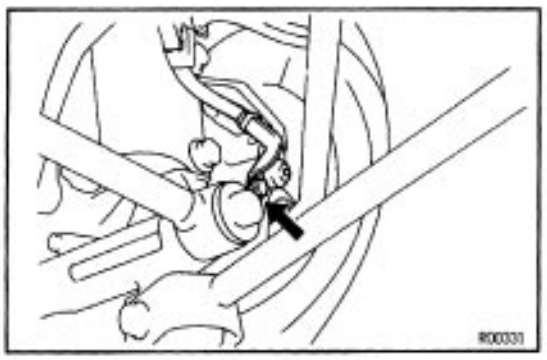
Remove the speed sensor from the axle carrier.

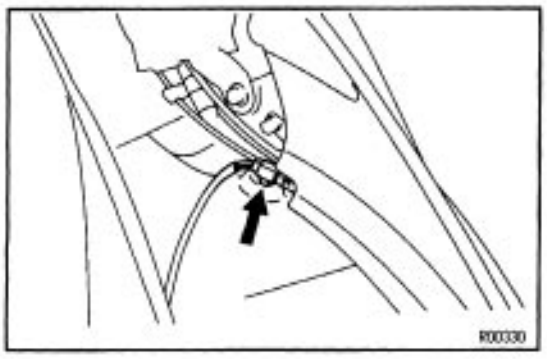
REAR SPEED SENSOR INSTALLATION

1. INSTALL SPEED SENSOR

Install the speed sensor to the axle carrier.

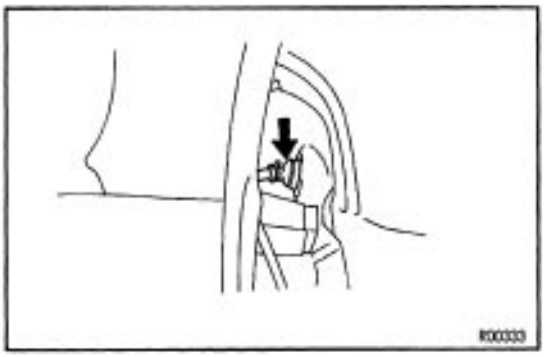
Torque: 7.8 N–m (80 kgf–cm, 69 in.lbf)



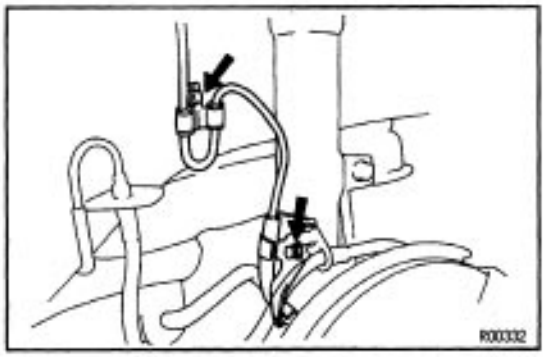


2. CONNECT SPEED SENSOR CONNECTOR

(a) Pass the sensor harness through the body panel hole, and connect the connector.



(b) install the grommet securely.



(c) Install the sensor harness.
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

–MEMO–

TROUBLESHOOTING (TMC Made Vehicle NIPPONDENSO ABS)

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following pages.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

If the ABS warning light lights up, and the ABS does not operate, the ECU stores diagnostic trouble codes corresponding to the problem in memory.

Before confirming the trouble, first check the diagnostic trouble codes to see if there are any malfunction codes stored in memory. When there are malfunction codes, make a note of them, then clear them and proceed to ”3” Problem Symptom Confirmation”.

(3) PROBLEM SYMPTOM CONFIRMATION, (4) SYMPTOM SIMULATION

Confirm the problem symptoms. If the problem does not recur, simulate the problem by initially checking the circuits indicated by the diagnostic trouble code in step “2” , using ”Problem simulation method”.

(5) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes.

If a malfunction code is output, proceed to ” 6” Diagnostic Trouble Code Chart”. If the normal code is output, proceed to ” 7” Problem Symptoms Chart”.

Be sure to proceed to ” 6” Diagnostic Trouble Code Chart” after steps “2” and “3” are completed. If troubleshooting is attempted only by following the malfunction code stored in the memory, errors could be made in the diagnosis.

(6) DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

(7) PROBLEM SYMPTOMS CHART

If the normal code is confirmed in the diagnostic trouble code check, perform inspection in accordance with the inspection order in the problem symptoms chart.

(8) CIRCUIT INSPECTION

Proceed with diagnosis of each circuit in accordance with the inspection order confirmed in 6 and 7 . Determine whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECU.

(9) SENSOR CHECK

Use the ABS warning light to check if each of the signals from the speed sensors are being input correctly to the ECU. Instructions for this check are given in the circuit inspection.

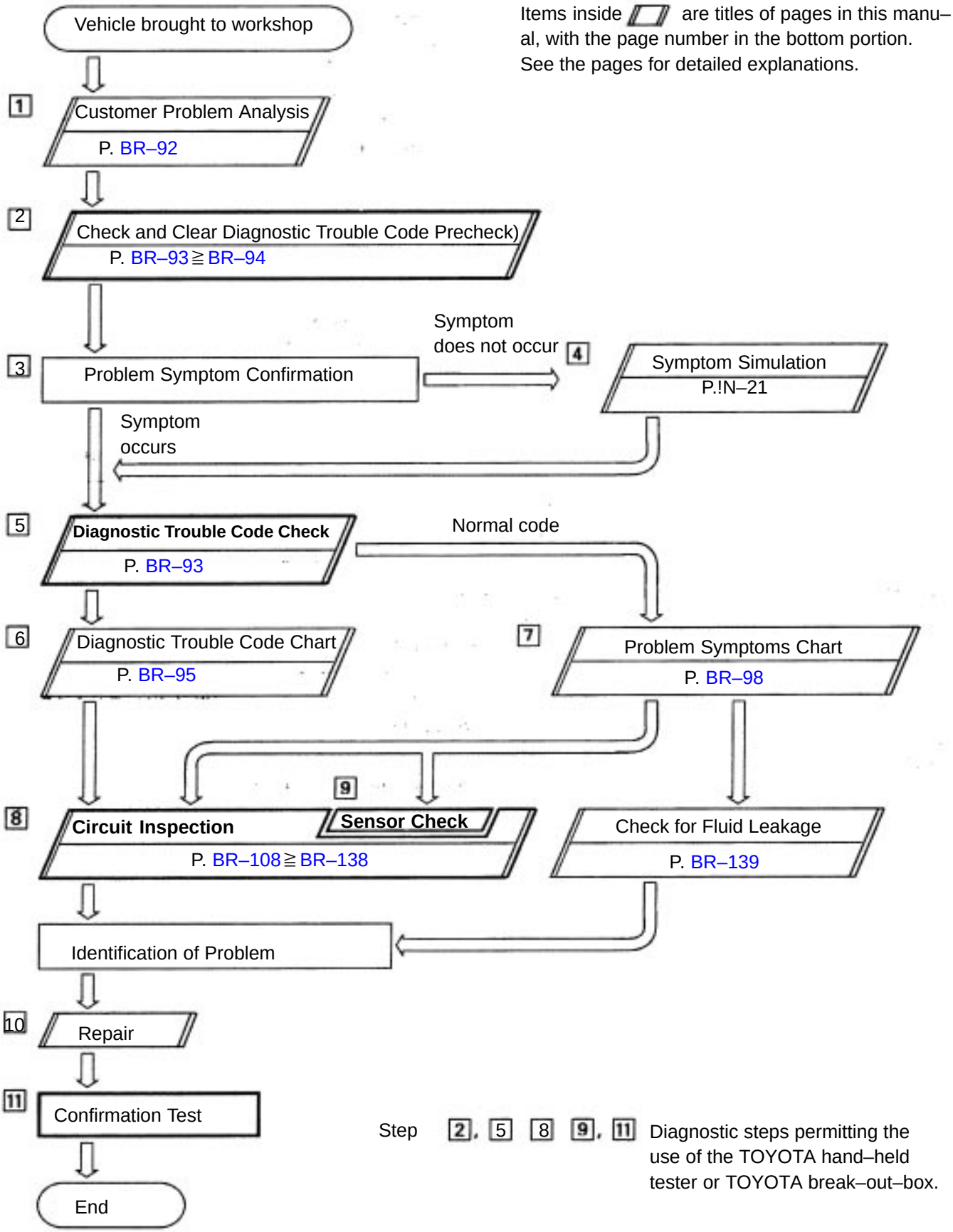
(10) REPAIRS

After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual.

(11) CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive to make sure the entire ABS system is operating correctly.

Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the pages for detailed explanations.



Step 2, 5, 8, 9, 11 Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ABS Check Sheet

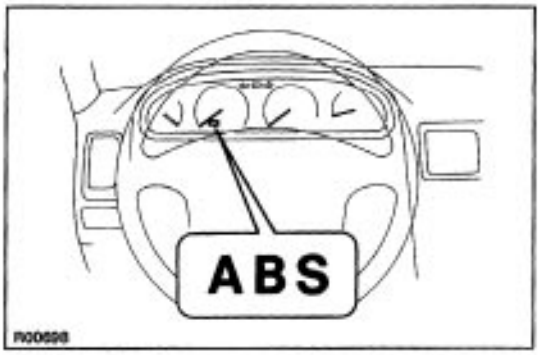
Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

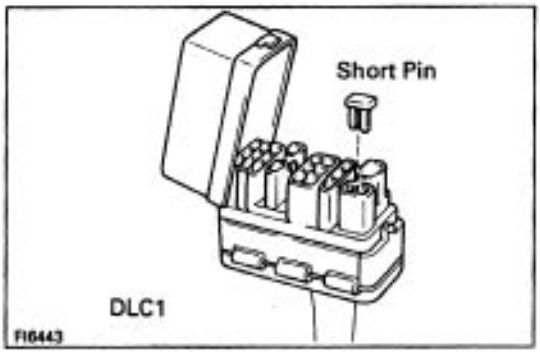
Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)



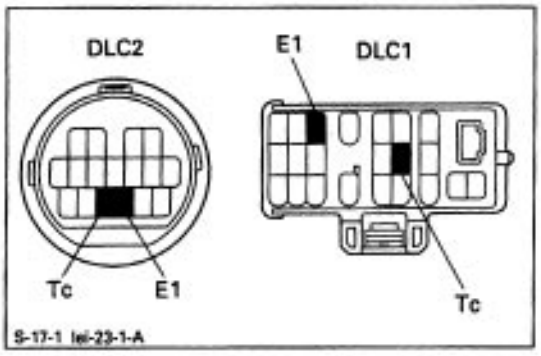
DIAGNOSIS SYSTEM INDICATOR CHECK

When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.
HINT: If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page BR–130).



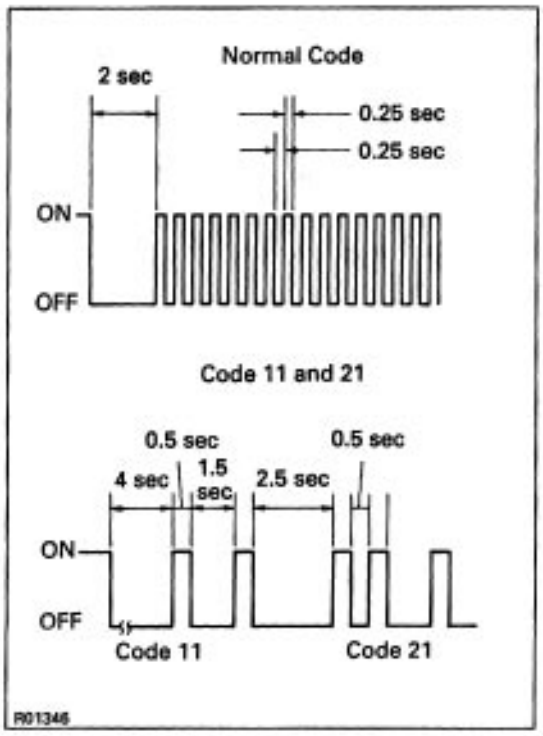
DIAGNOSTIC TROUBLE CODE CHECK

1. Disconnect the Short Pin from DLC1.



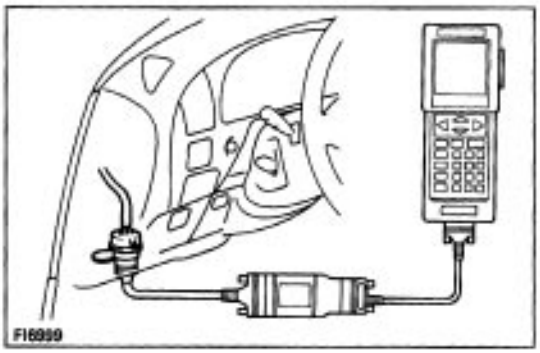
2. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
3. Turn the ignition switch to ON.
4. Read the diagnostic trouble code from the ABS warning light on the combination meter.

HINT: If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page BR–134 or BR–130).



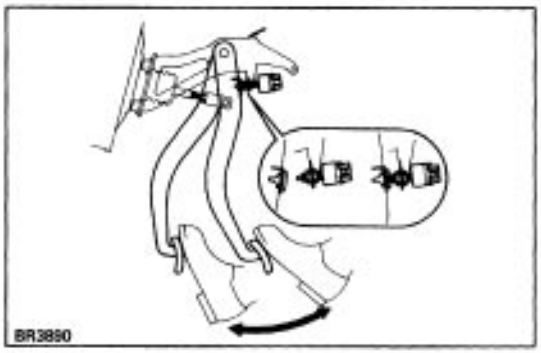
As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

5. Codes are explained in the code table on page BR–95.
6. After completing the check, disconnect terminals Tc and E1, and turn off the display.
   If 2 or more malfunctions are indicated at the same time, the–lowest numbered diagnostic trouble code will be displayed first. .



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

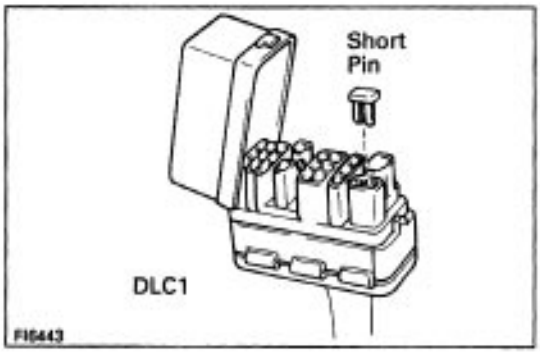
1. Hook up the Toyota hand–held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.

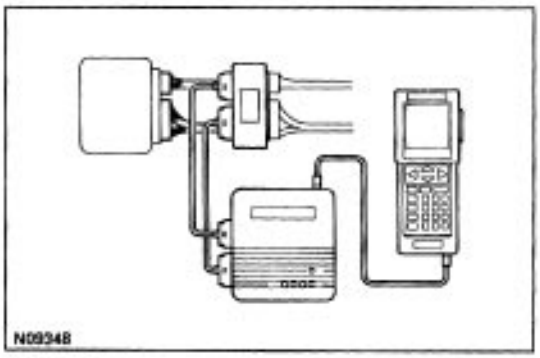


DIAGNOSTIC TROUBLE CODE CLEARANCE

1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1 and remove the short pin from DLC1.
   SST 09843–18020
2. IG switch ON.
3. Clear the diagnostic trouble codes stored in ECU by de–pressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the SST from the terminals of DLC2 or DLC1.
6. Connect the Short Pin to DLC1

HINT: Cancellation can also be done by removing the ECU–13 fuse, but in this case, other memory systems will also be cancelled out.





ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

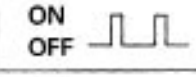
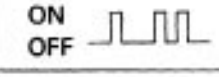
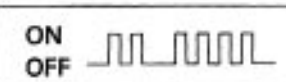
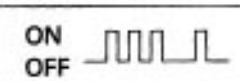
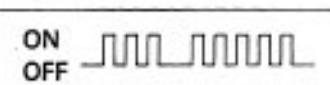
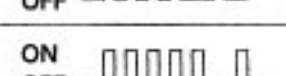
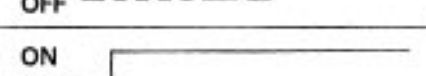
1. Hook up the Toyota break–out–box and Toyota hand–held tester to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.

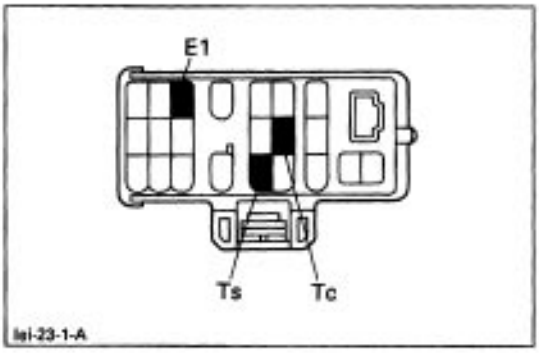
HINT: Toyota hand–held tester has a "Snapshot" function. This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the Toyota hand–held tester/Toyota break–out–box operator's manual for further details.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code.

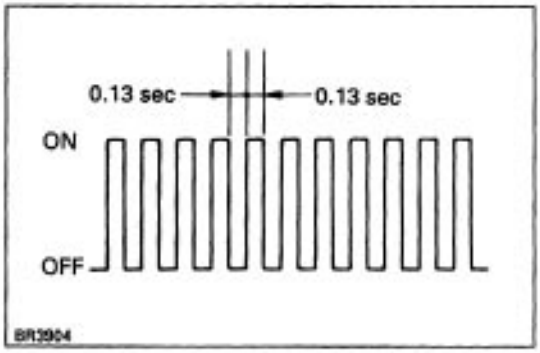
HINT: Using SST 09843–18020, connect the terminals Tc and E1, and remove the short pin.

Code	ABS Warning Light Blinking Pattern	Diagnosis
11		Open circuit in ABS control (solenoid) relay circuit
12		Short circuit in ABS control (solenoid) relay circuit
13		Open circuit in ABS control (motor) relay circuit
14		Short circuit in ABS control (motor) relay circuit
21		Open or short circuit in 3–position solenoid circuit for right front wheel
22		Open or short circuit in 3–position solenoid circuit for left front wheel
23		Open or short circuit in 3–position solenoid circuit for right rear wheel
24		Open or short circuit in 3–position solenoid circuit for left rear wheel
31		Right front wheel speed sensor signal malfunction
32		Left front wheel speed sensor signal malfunction
33		Right rear wheel speed sensor signal malfunction
34		Left rear wheel speed sensor signal malfunction
35		Open circuit in left front or right rear speed sensor circuit
36		Open circuit in right front or left rear speed sensor circuit
37		Faulty rear speed sensor rotor
41		Low battery positive voltage or abnormally high battery positive voltage
51		Pump motor is locked Open in pump motor ground
Always ON		Malfunction in ECU



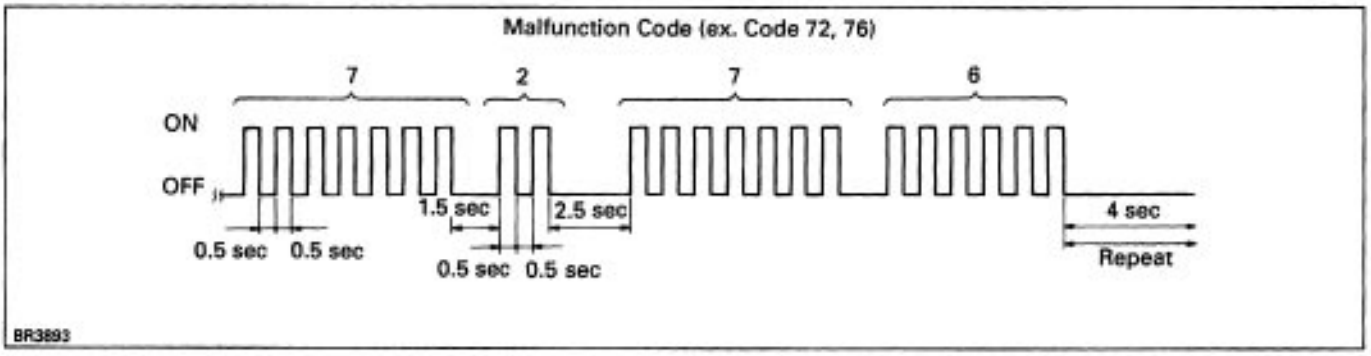
SPEED SENSOR SIGNAL CHECK

1. Turn the ignition switch to OFF.
2. Using SST, connect terminals Ts and E1 of DLC1.
   SST 09843–18020
3. Start the engine.

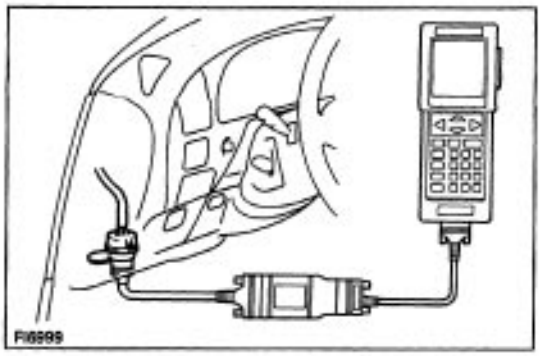


4. Check that the ABS warning light blinks
   HINT: If the ABS. warning light does not blink, inspect the ABS warning light circuit (See page BR–130).
5. Drive vehicle straight forward.
   HINT: Drive vehicle faster than 45 km/h (28 mph) for several seconds.
6. Stop the vehicle.
7. Using SST, connect terminals Tc and E1 of DLC1.
   SST 09843–18020
8. Read the number of blinks of the ABS warning light.
   HINT: See the list of diagnostic trouble codes shown on the next page.

If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



9. After performing the check, disconnect terminals Ts and E1, Tc and E1 of DLC1, and ignition switch turned off.



DIAGNOSTIC TROUBLE CODE CHECK

USING TOYOTA HAND–HELD TESTER

1. Perform steps 1.–6. on the previous page.
2. Hook up the Toyota hand–held tester to the DLC2.
3. Read the diagnostic trouble codes by following the prompts on the tester screen.

Please refer to the Toyota hand–held tester operator's manual for further details.

Diagnostic Trouble Code of Speed Sensor Check Function

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor

PROBLEM SYMPTOMS CHART

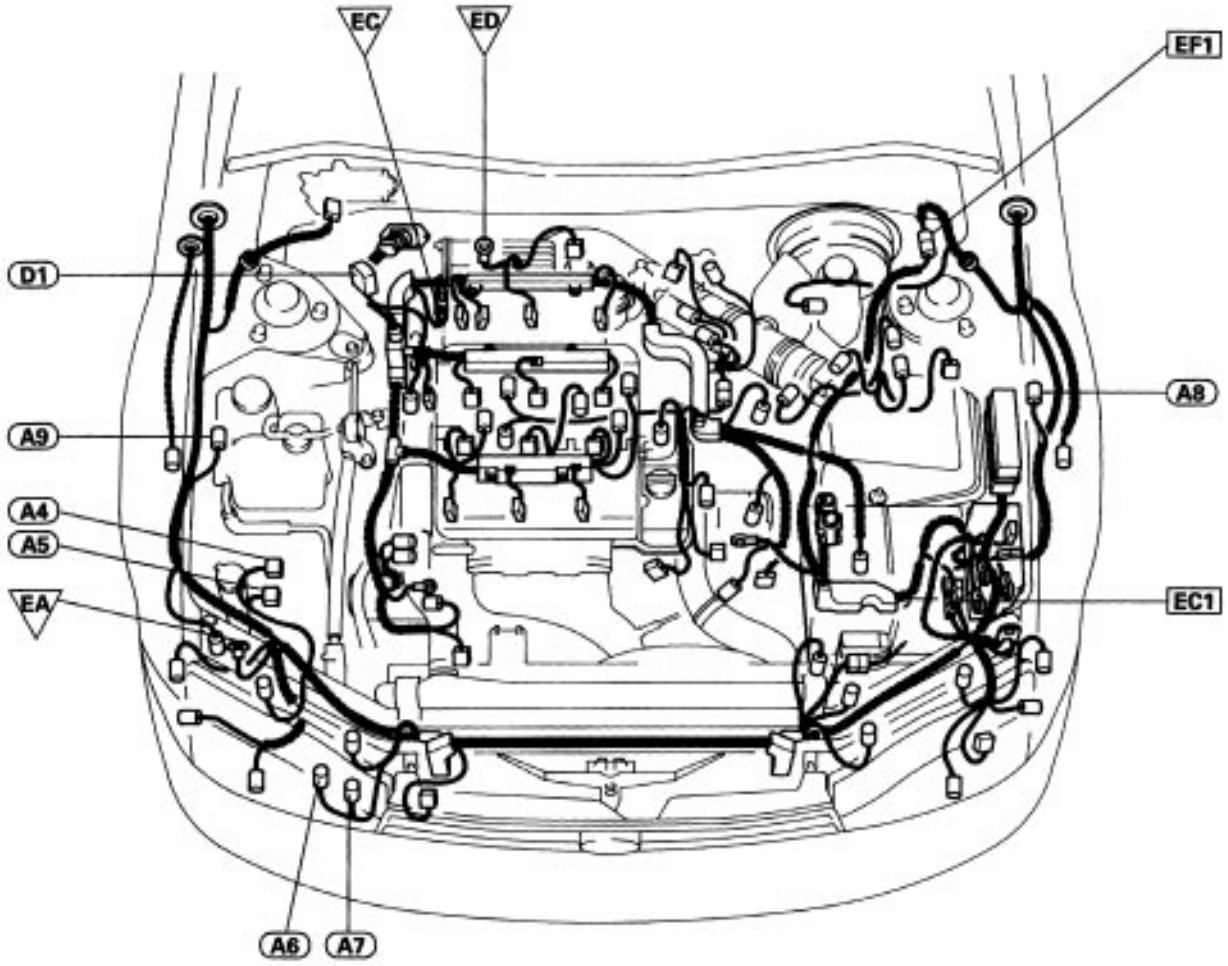
If a normal code is displayed during the diagnostic trouble code check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
A6S does not operate.	Only when 1.–4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (see page BR–139).	**BR–93** **BR–123** **BR–119** **BR–77**
A6S does not operate efficiently.	Only when 1.–4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (see page BR–139).	**BR–93** **BR–119** **BR–128** **BR–77**
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	**BR–130**
Diagnostic trouble code check cannot be performed.	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	**BR–130** **BR–134**
Speed sensor signal check cannot be performed.	1. Ts terminal circuit. 2. ABS ECU.	**BR–137**

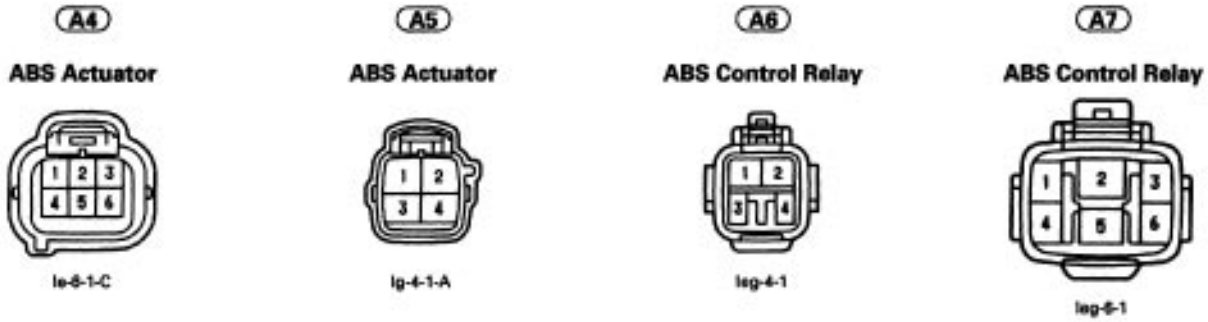
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1MZ–FE Engine:



N09612



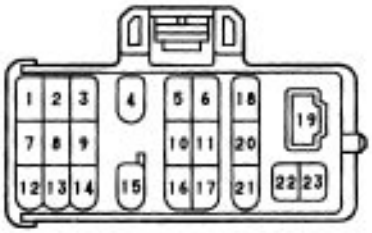
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

le-2-1-T

D1

DLC1



lei-23-1

EC1

lef-8-1

lef-8-2

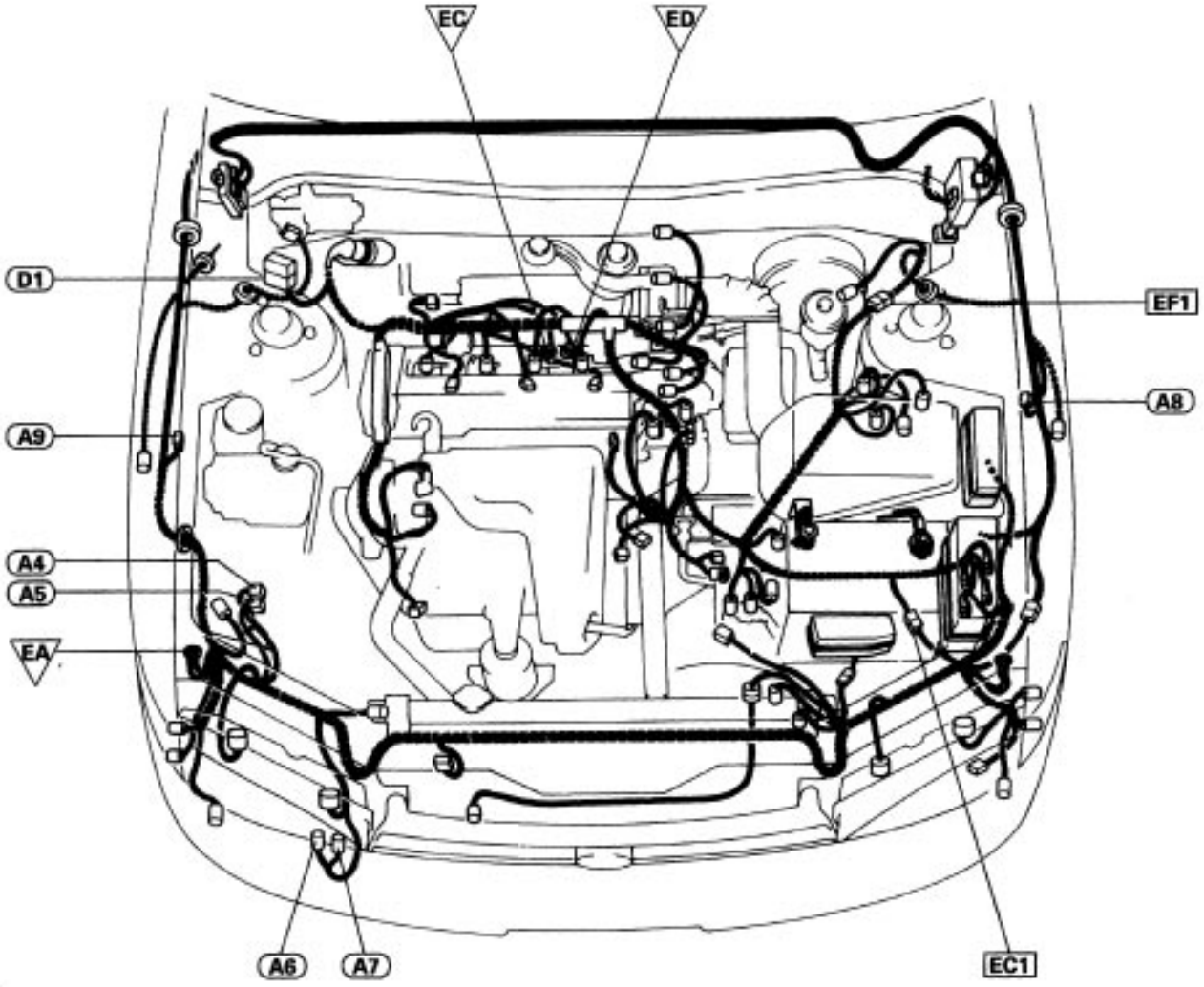
EF1

lfg-4-1

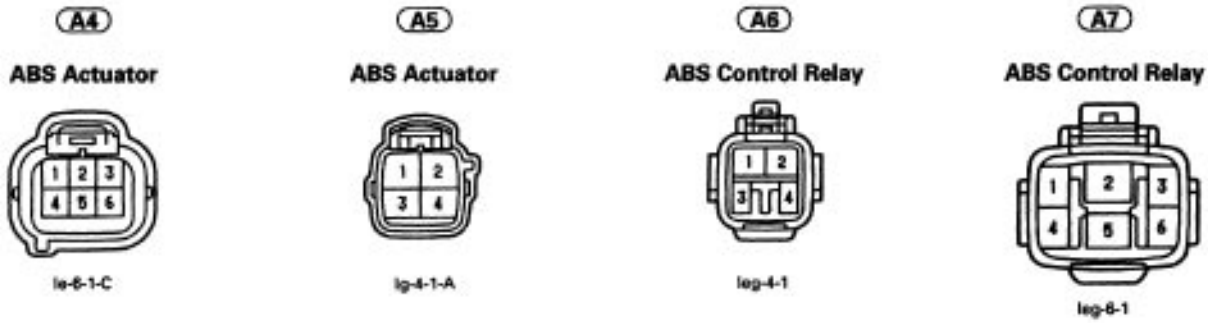
lfg-4-2

Location of Connectors in Engine Compartment

5S–FE Engine:



N09613



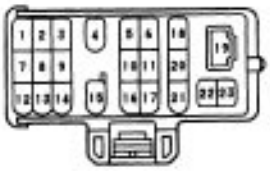
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

le-2-1-T

D1

DLC1



lei-23-1-A

EC1

lef-8-1

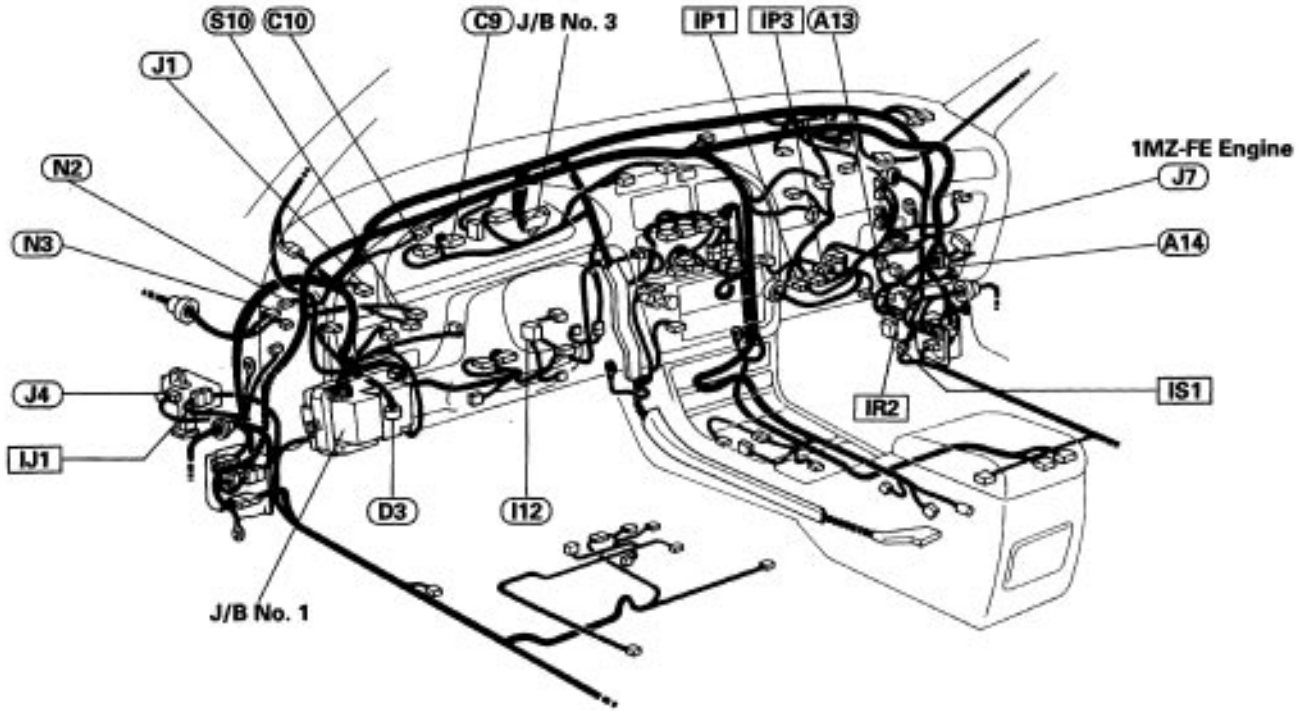
lef-8-2

EF1

lfg-4-1

lfg-4-2

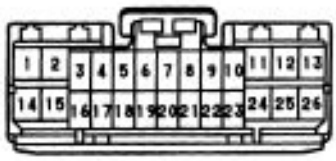
Location of Connectors in Instrument Panel



N09614

A13

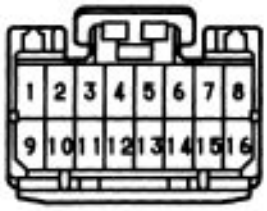
ABS ECU



mn-26-1

A14

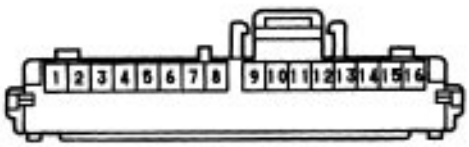
ABS ECU



n-16-1-A

C9

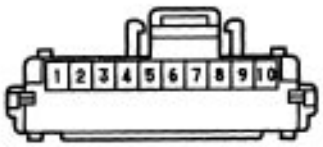
ABS Warning Light



j-16-1

C10

ABS Warning Light



j-10-1

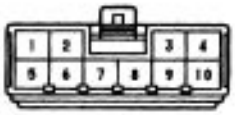
D3

DLC2

S-17-1

I12

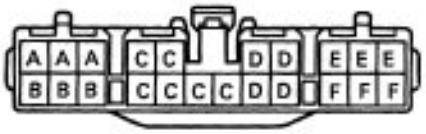
Ignition Switch



g-10-1-B

J1

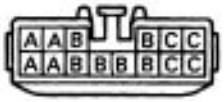
Junction Connector



e-22-1-A

J3

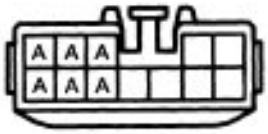
Junction Connector



e-14-1-A

J7 1MZ-FE

Junction Connector



e-12-1

N2

Noise Filter

g-2-2

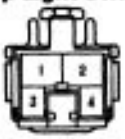
N3

Noise Filter

g-2-1

S10

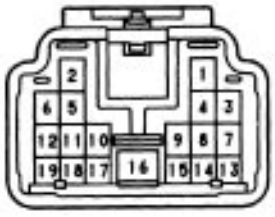
Stop Light Switch



eg-4-1

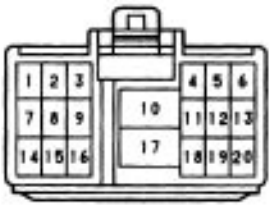
IJ1

eg-19-1

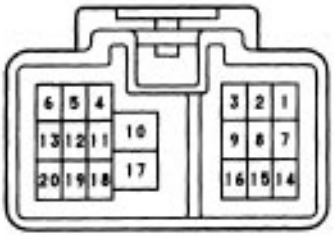


eg-19-2

IP1



e-20-1-B



e-20-2-B

IP3

e4-19-1

ef-19-2

IR2

e-8-1

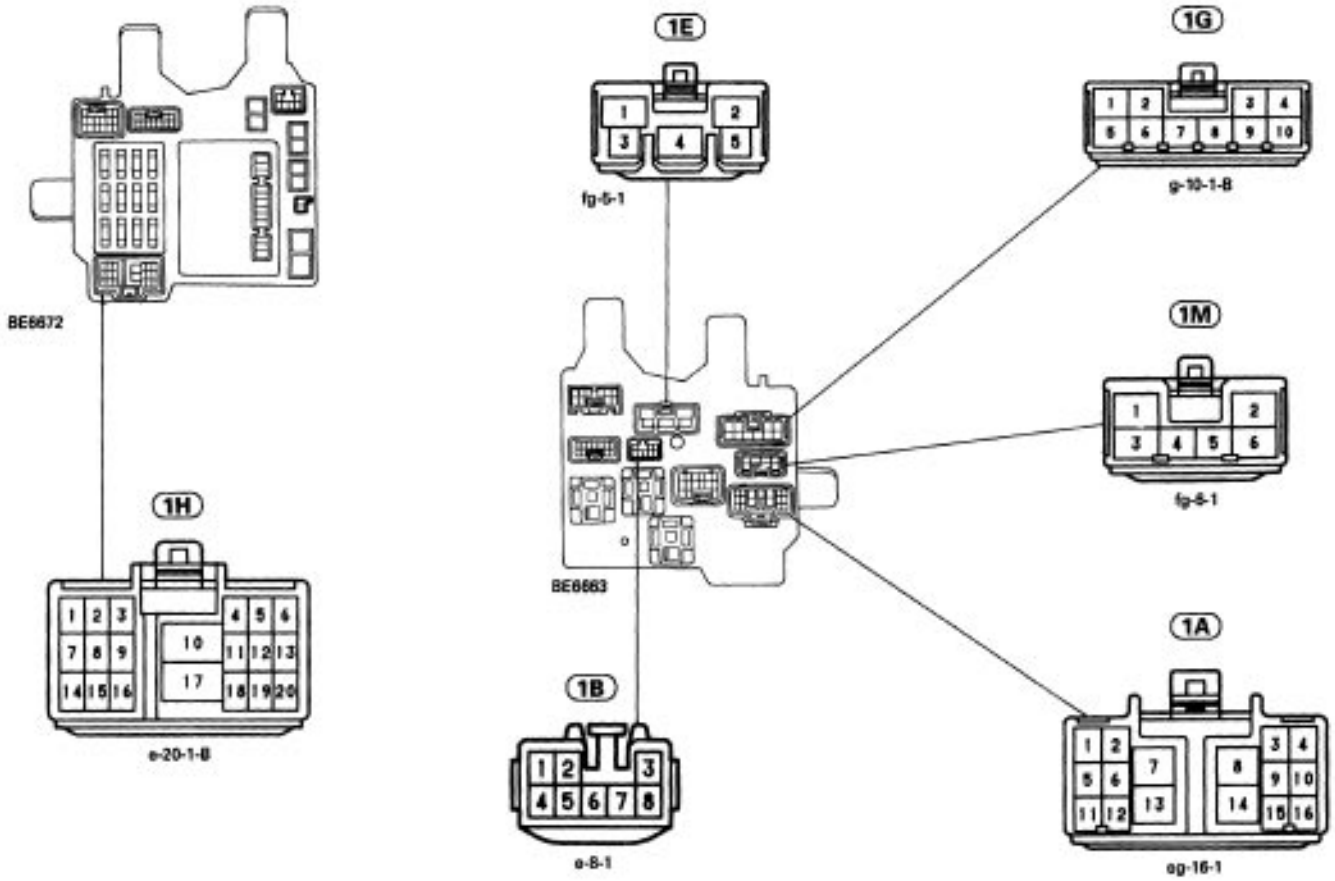
e-8-2

IS1

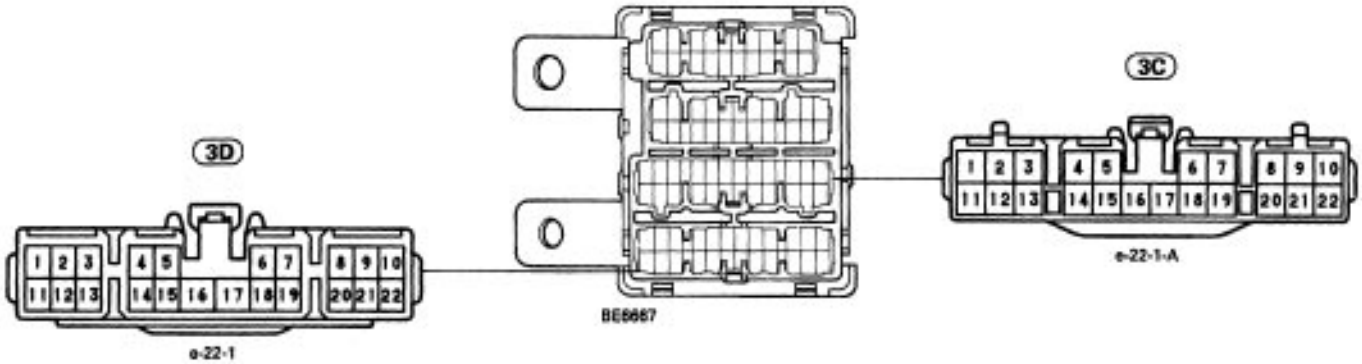
e-6-1

e-6-2

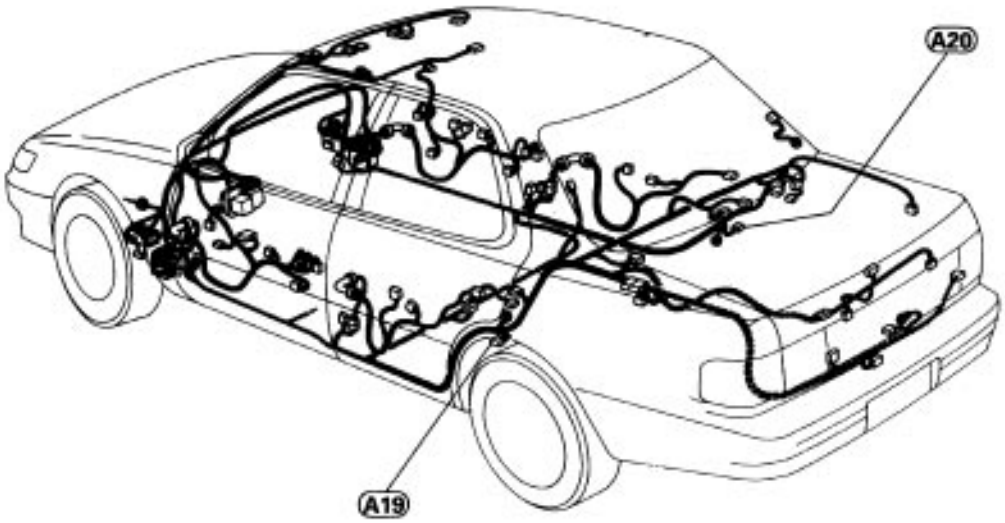
J/B No. 1


BE6672
1H
e-20-1-B
1E
fg-5-1
BE6663
1B
e-8-1
1G
g-10-1-B
1M
fg-6-1
1A
eg-16-1

J/B No. 3


3D
e-22-1
BE6667
3C
e-22-1-A

Location of Connectors in Body



N09615

A19 A20

ABS Speed Sensor Left Rear
ABS Speed Sensor Right Rear

e-2-2-L

CIRCUIT INSPECTION

DTC 11,12 ABS Control (Solenoid) Relay Circuit

CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
11	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) ABS control (solenoid) relay monitor terminal (AST) voltage: 0 V	• ABS control (solenoid) relay. • Open or short in ABS control (solenoid) relay circuit. • ECU.
12	Conditions (1) and (2) continue for 0.2 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: 0 V (2) ABS control (solenoid) relay monitor terminal (AST) voltage: Battery positive voltage	• ABS control (solenoid) relay. • B+ short in ABS control (solenoid) relay circuit. • ECU.

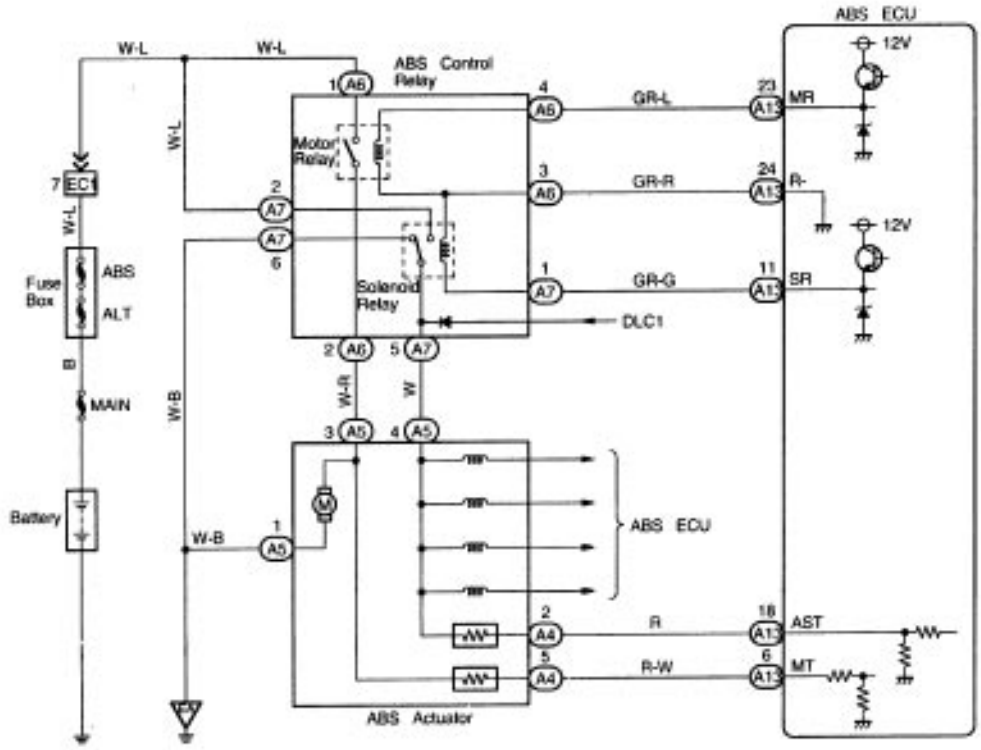
Fail safe function: If trouble occurs in the control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

1. Check voltage of ABS control relay connector.
   - NG → Check and repair harness or connector.
   - OK ↓
2. Check continuity between relay and actuator and ECU.
   - NG → Repair or replace harness or ABS actuator.
   - OK ↓
3. Check ABS control relay.
   - NG → Replace ABS control relay.
   - OK ↓
4. Check for open and short in harness and connector between relay and ECU.
   - NG → Repair or replace harness or connector.
   - OK ↓

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

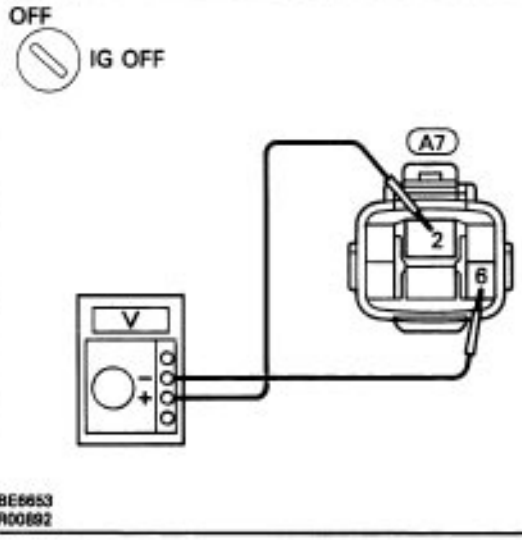
WIRING DIAGRAM



R08715

INSPECTION PROCEDURE

1 **Check voltage between terminals (A7) 2 and (A7) 6 of ABS control relay connector.**



P Disconnect the ABS control relay connector.

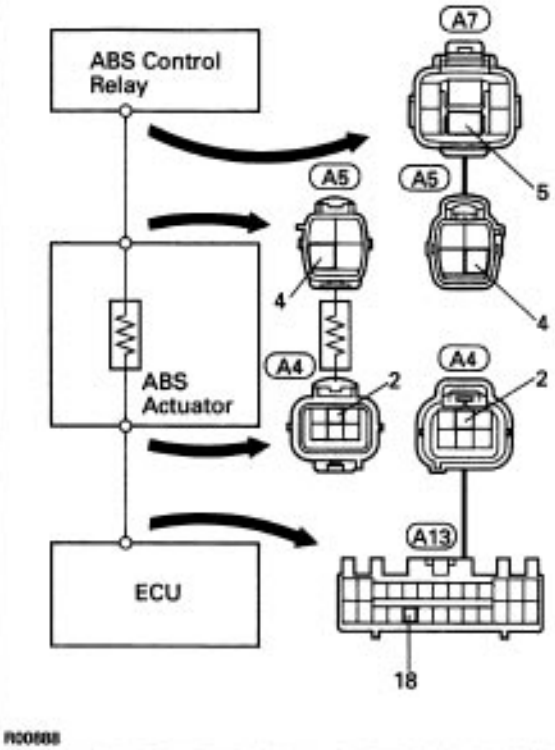
C Measure voltage between terminals (A72) and (A76) of ABS control relay harness side connector.

OK **Voltage: 10–14 V**

OK

NG **Check and repair harness or connector.**

2 **Check continuity between terminals (A7) 5 and (A5) 4, (A5) 4 and (A4) 2, (A4) 2 and (A13) 18.**



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals (A7) 5 and (A5) 4, (A5) 4 and (A4) 2, (A4) 2 and (A13) 18.

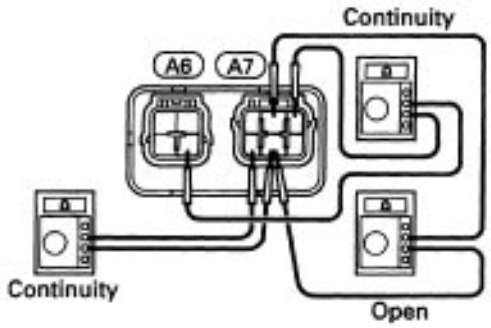
OK **Continuity**

HINT: There is a resistance of 4–6 between terminals (A5) 4 and (A4) 2.

OK

NG **Repair or replace harness or ABS actuator.**

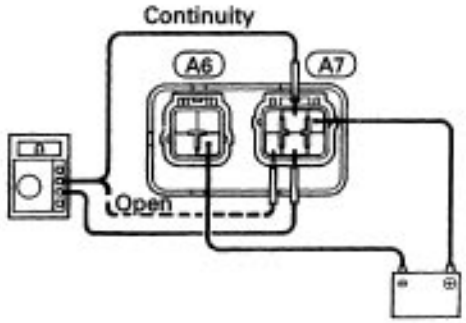
3 Check ABS control relay.



C Check continuity between each terminal of ABS control relay.

OK

Terminals A7 1 and A6 3	Continuity (Reference value 80)
Terminals A7 5 and A7 6	Continuity
Terminals A7 2 and A7 5	Open



C
1. Apply battery positive voltage between terminals A7 1 and A6 3.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals A7 5 a rid A7 6	Open
Terminals A7 2 and A7 5	Continuity

R03889
R03895

OK

NG → Replace ABS control relay.

4 Check for open and short in harness and connector between ABS control relay a ABS ECU (See page IN–28).

OK

NG → Repair or replace harness or connector.

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

DTC 13,14 ABS Control (Motor) Relay Circuit

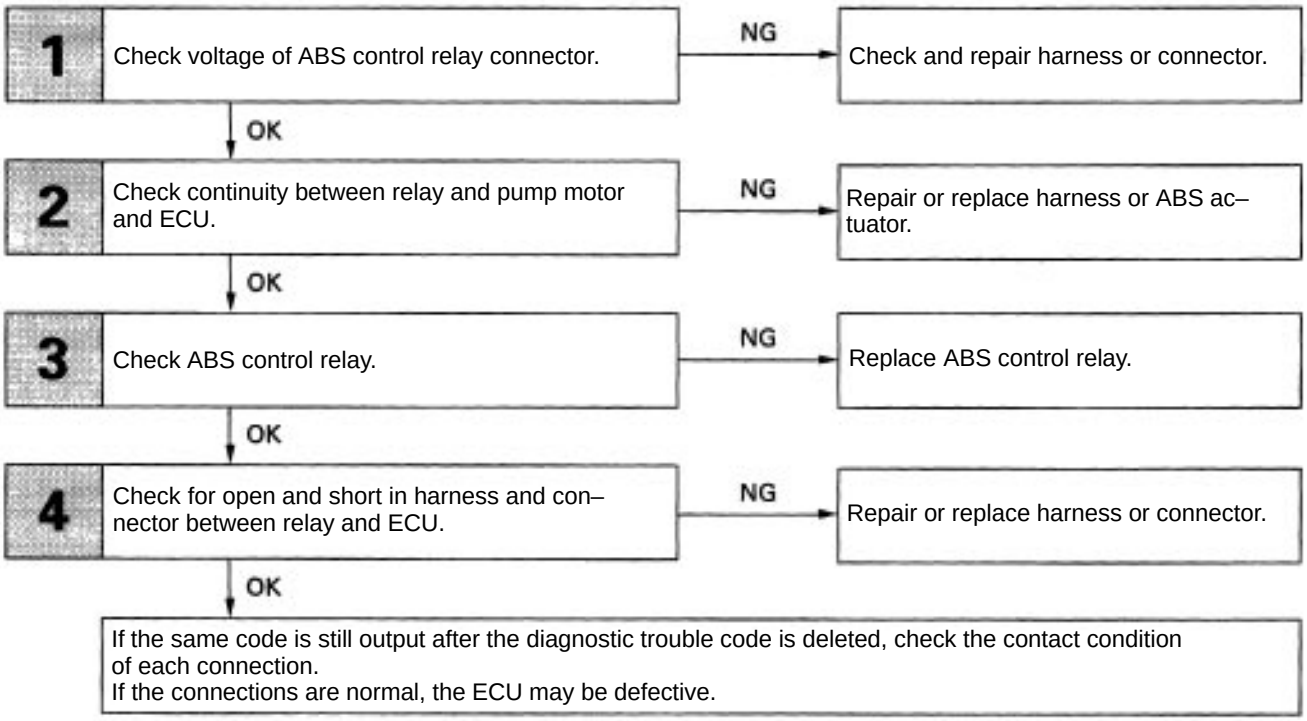
CIRCUIT DESCRIPTION

The ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the control (motor) relay ON and operates the ABS pump motor.

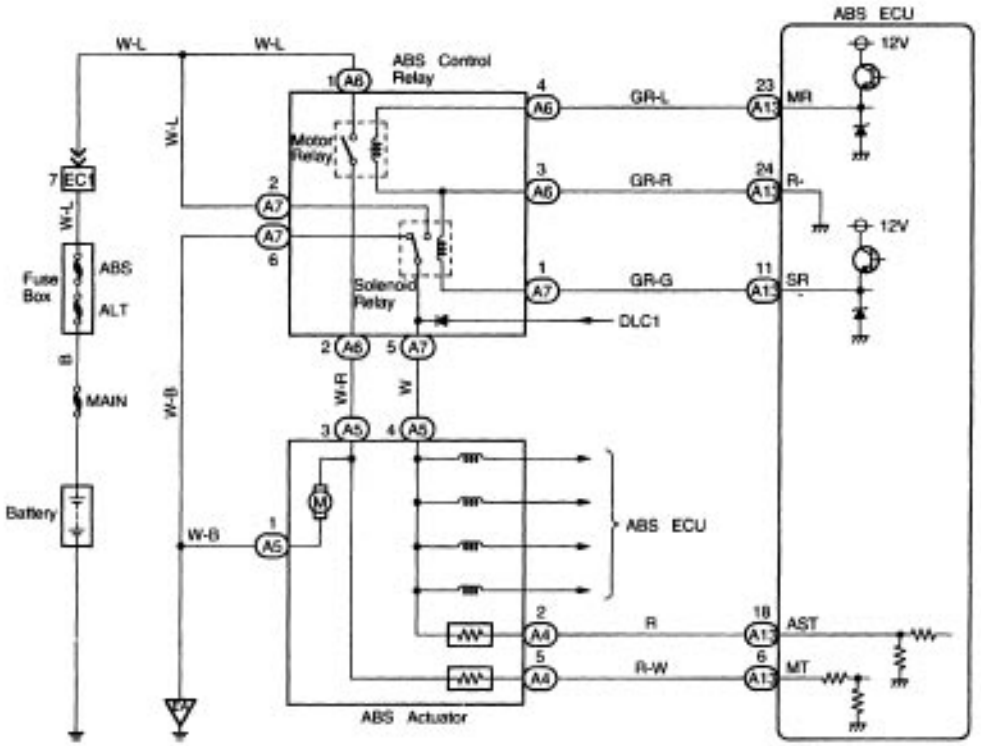
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
13	Conditions (1) and (2) continued for 0.2 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: Battery positive voltage (2) ABS control (motor) relay monitor terminal (MT) voltage: 0 V	• ABS control (motor) relay. • Open or short in ABS control (motor) relay circuit. • ECU.
14	Conditions (1) and (2) continued for 4 sec. or more: (1) ABS control (motor) relay terminal (MR) voltage: 0 V (2) ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	• ABS control (motor) relay. • B+ short in ABS control (motor) relay circuit. • ECU.

Fail safe function: If trouble occurs in the control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

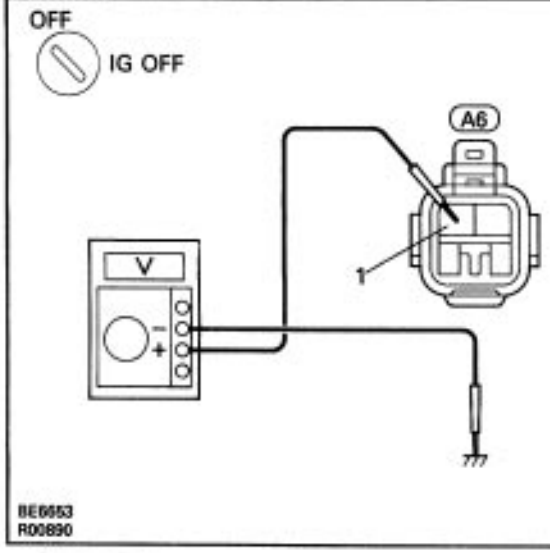


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals A6 1 of ABS control relay and body ground.**



P Disconnect the ABS control relay connector.

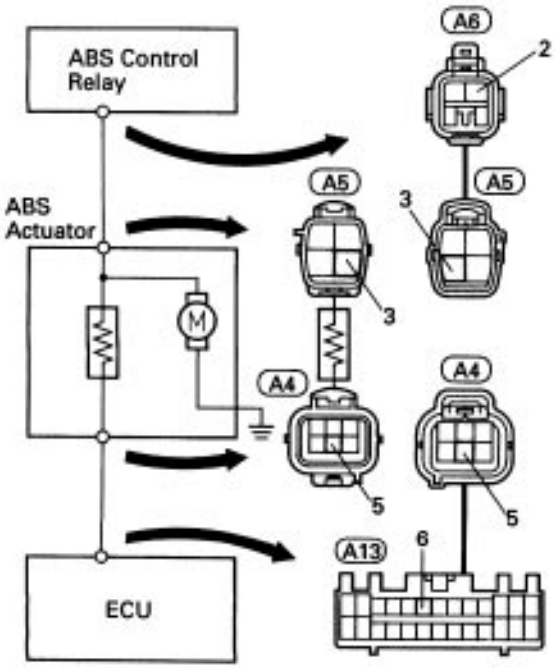
C Measure voltage between terminals A6 1 of ABS control relay harness side connector and body ground.

OK **Voltage: 10–14 V**

OK

NG **Check and repair harness or connector.**

2 **Check continuity between terminals A6 2 and A5 3, A5 3 and A4 5, A4 5 and A13 6.**



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals A6 2 and A5 3, A5 3 and A4 5, A4 5 and A13 6.

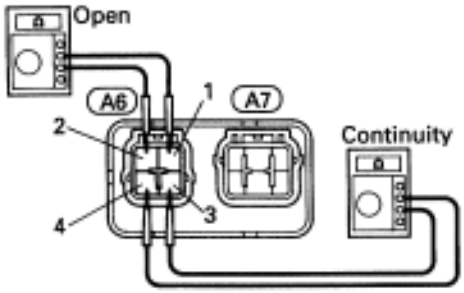
OK **Continuity**

HINT: There is a resistance of 4–6 between terminals A5 3 and A4 5.

OK

NG **Repair or replace harness or ABS actuator.**

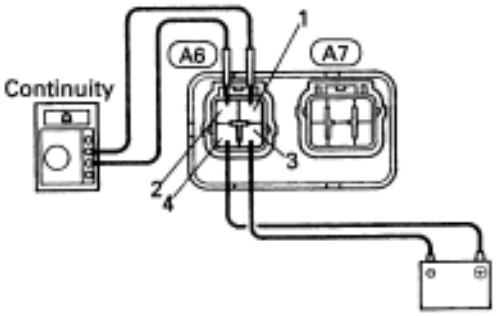
3 **Check ABS control relay.**



C Check continuity between each terminal of ABS control relay.

OK

Terminals A6 3 and A6 4	Continuity (Reference value 62)
Terminals A6 1 and A6 2	Open



C
1. Apply battery positive voltage between terminals A6 3 and A6 4.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals A6 1 and A6 2	Continuity

R00894
R00893

OK

NG → **Replace ABS control relay.**

4 **Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–28).**

OK

NG → **Repair or replace harness or connector.**

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

DTC 21 22 23 24 ABS Actuator Solenoid Circuit

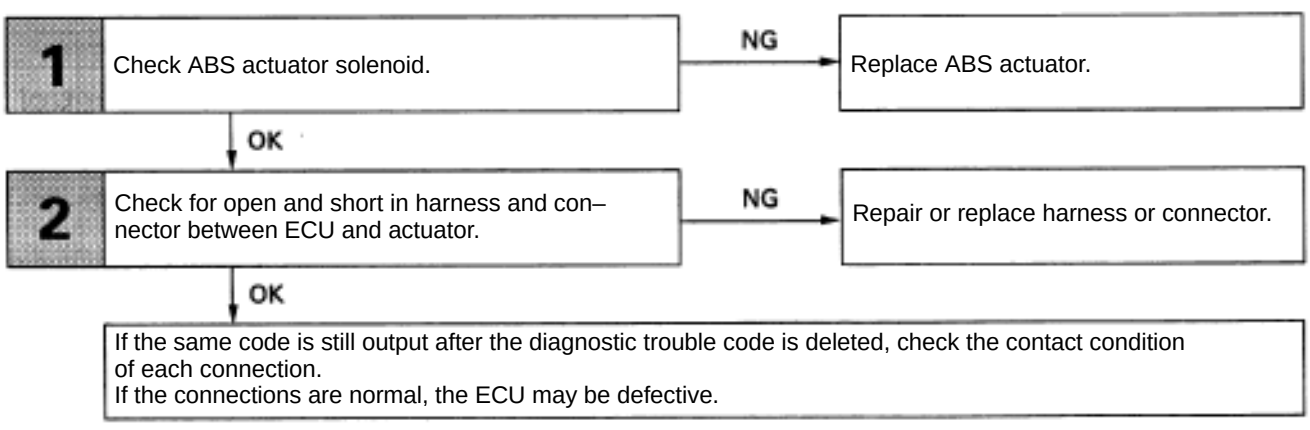
CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

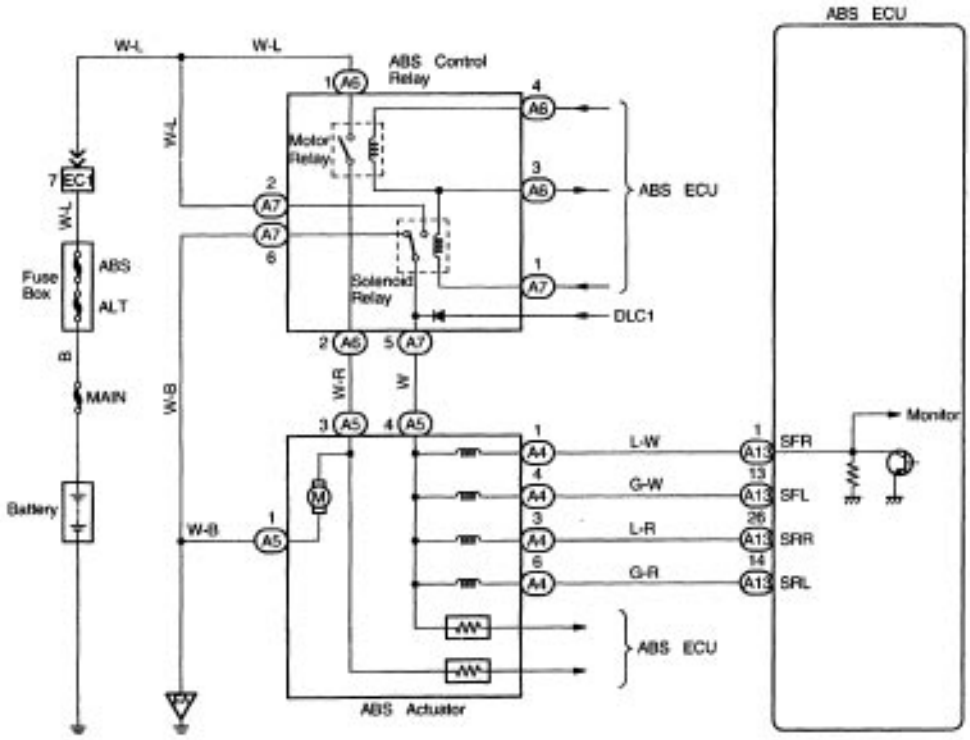
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
21	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFR is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SFR circuit. • ECU.
22	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SFL is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SFL circuit. • ECU.
23	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SRR is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SRR circuit. • ECU.
24	Conditions (1) through (3) continue for 0.05 sec. or more: (1) ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage (2) Voltage of ABS ECU terminal AST: Battery positive voltage (3) When power transistor of ECU is ON, voltage of terminal SRL is 0 V or battery positive voltage.	• ABS actuator. • Open or short in SRL circuit. • ECU.

Fail safe function: If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART



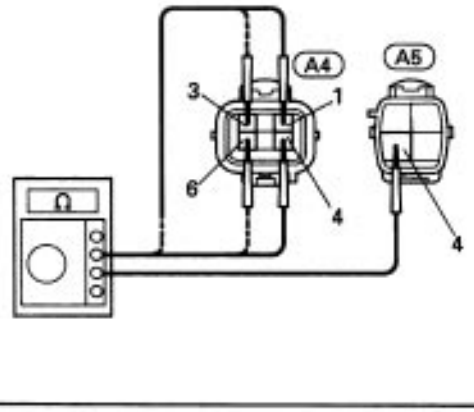
WIRING DIAGRAM



R08716

INSPECTION PROCEDURE

1 Check ABS actuator solenoid.



P Disconnect the 2 connectors from ABS actuator.

C Check continuity between terminals A5 4and A4 1, 3, 4, 6 of ABS actuator connector.

OK **Continuity**

HINT: Resistance of each solenoid coil is 1.2 .

OK → **2 Check for open and short in harness and connector between ABS ECU and actuator (See page IN–28).**

NG → **Replace ABS actuator.**

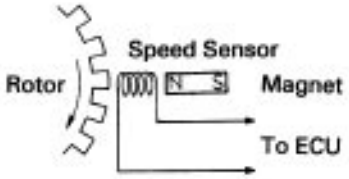
OK → If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

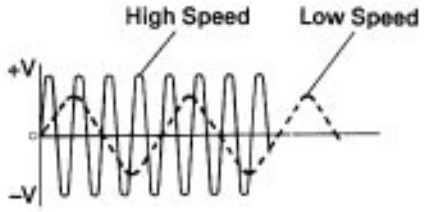
NG → **Repair or replace harness or connector.**

DTC 31, 32, 33, 34, 35, 36 Speed Sensor Circuit

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations. When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.





BR3583
BR3582

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
31,32, 33,34	Detection of any of conditions (1) through (3): (1) At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 5 sec. (2) Momentary interruption of the speed sensor signal occurs at least 7 times in the time between switching the ignition switch ON and switching it OFF. (3) Abnormal fluctuation of speed sensor signals with the vehicle speed 20 km/h (12 mph) or more.	• Right front, left front, right rear and left rear speed sensor. • Open or short in each speed sensor circuit. • ECU.
35	Speed sensor signal is not input for about 1 sec. while the left front and right rear speed sensor signals are being checked with the IG switch ON.	• Open in left front or right rear speed sensor circuit. • ECU.
36	Speed sensor signal is not input for about 1 sec. while the right front and left rear speed sensor signals are being checked with the IG switch ON.	• Open in right front or left rear speed sensor circuit. • ECU.

HINT: DTC No. 31 is for the right front speed sensor.
DTC No. 32 is for the left front speed sensor.
DTC No. 33 is for the right rear speed sensor
DTC No. 34 is for the left rear speed sensor.

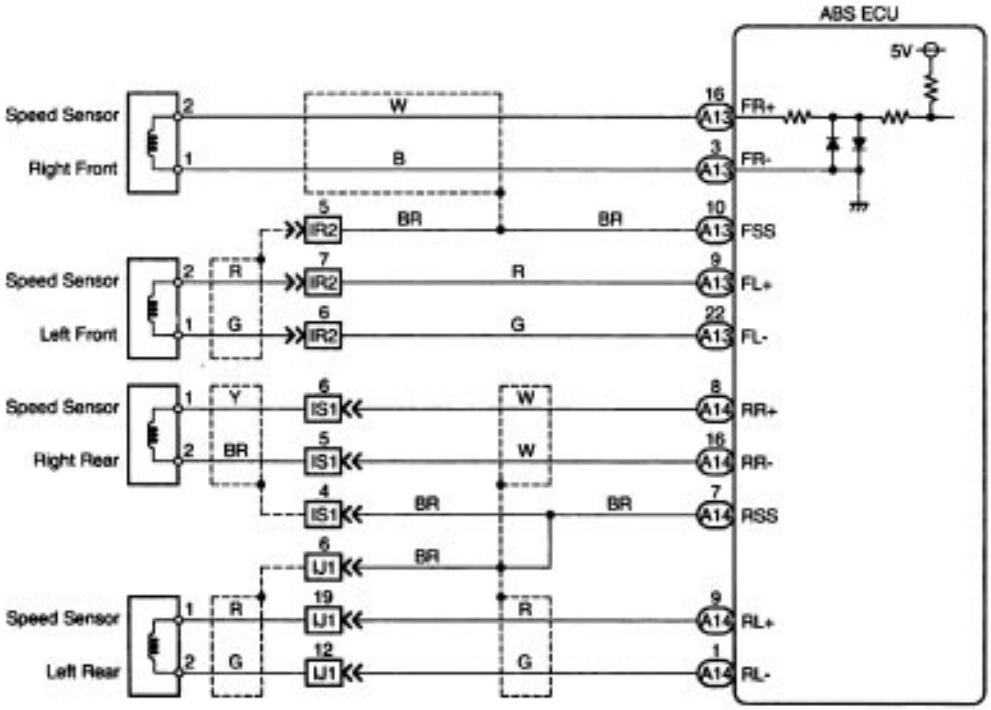
Fail safe function: If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

1. Check speed sensor.
   - NG → Replace speed sensor.
   - OK ↓
2. Check for open and short in harness and connector between each speed sensor and ECU.
   - NG → Repair or replace harness or connector.
   - OK ↓
3. Check sensor rotor and sensor installation.
   - NG → Replace speed sensor or rotor.
   - OK ↓

Check and replace ABS ECU.

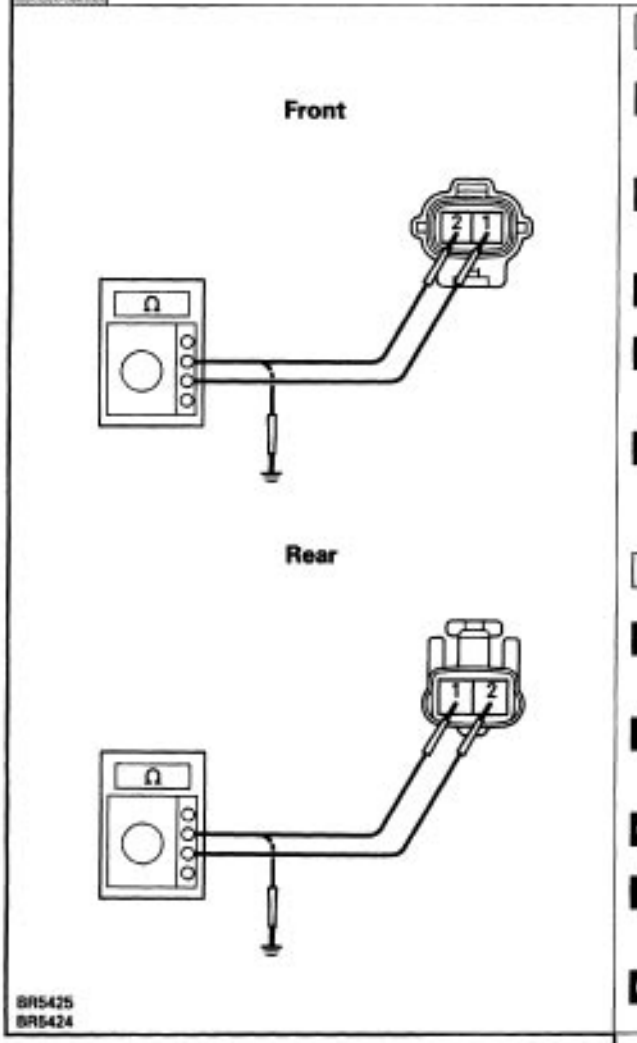
WIRING DIAGRAM



R08717

INSPECTION PROCEDURE

1 Check speed sensor.



Front

P 1. Remove front fender liner.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.
Resistance: 0.6–1.8 kΩ

OK Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

C **Resistance: 1 MΩ or higher**

OK

Rear

P 1. Remove the seat cushion and side seat back.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.
Resistance: 0.9–1.3 kΩ

OK Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

C **Resistance: 1 MΩ or higher**

OK

OK

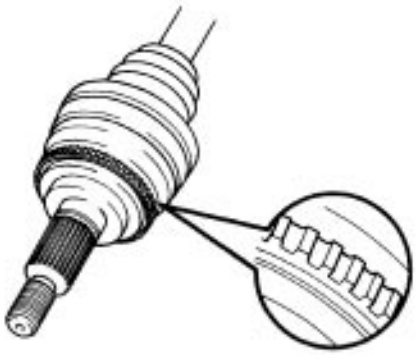
NG **Replace speed sensor.**

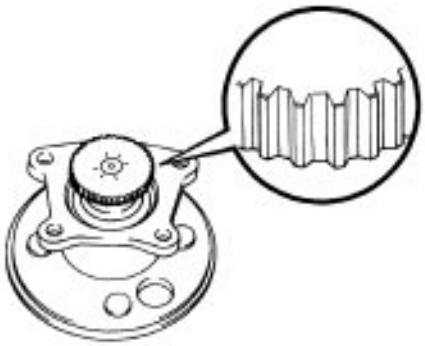
2 Check for open and short in harness and connector between each speed sensor and ECU (See page IN–28).

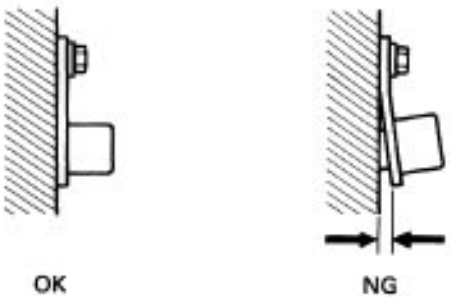
OK

NG **Repair or replace harness or connector.**

3 Check sensor rotor and sensor installation.







R00948
R00947
BR3795

Front

P Remove front drive shaft (See SA section).

C Check sensor–rotor serrations.

OK **No scratches or missing teeth.**

C Check the front speed sensor installation

OK **The installation bolt is tightened properly.**

Rear

P Remove the axle hub (See SA section).

C Check the sensor rotor serrations.

OK **No scratches or missing teeth.**

C Check the speed sensor installation

OK **The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.**

OK

NG **Replace speed speed or rotor.**

Check and replace ABS ECU.

DTC 41 IG Power Source Circuit

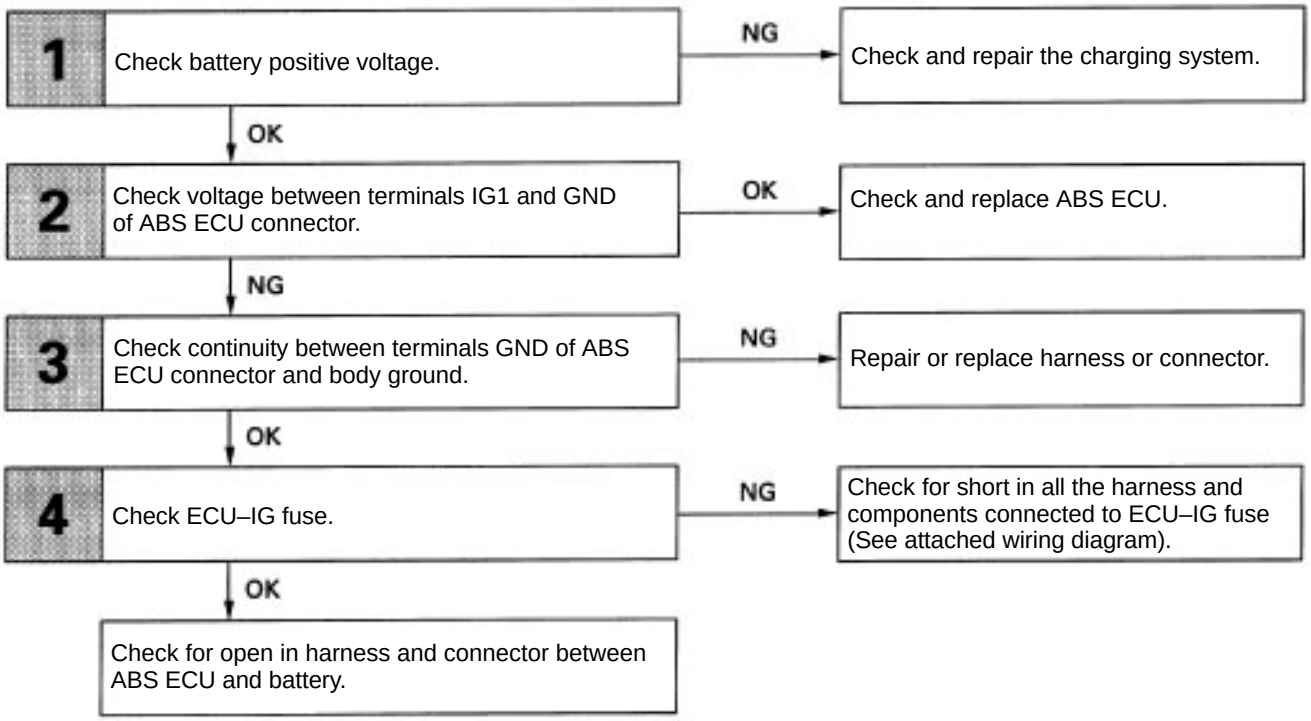
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU and the actuators.

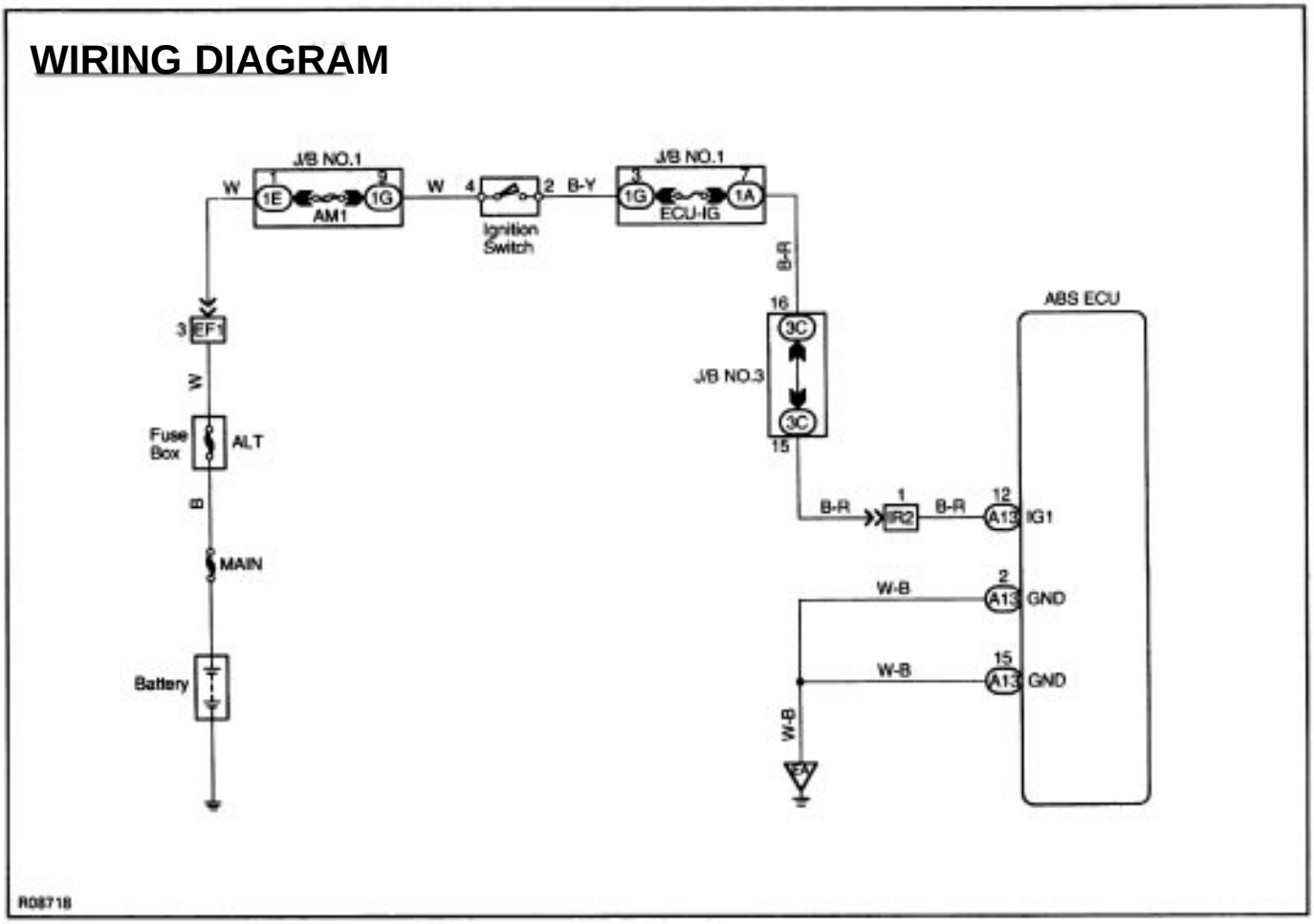
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9.5 V for more than 10 sec.	• Battery. • IC regulator. • Open or short in power source circuit. • ECU.

Fail safe function: If trouble occurs in the power source circuit, the ECU cuts oft current to the ABS control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

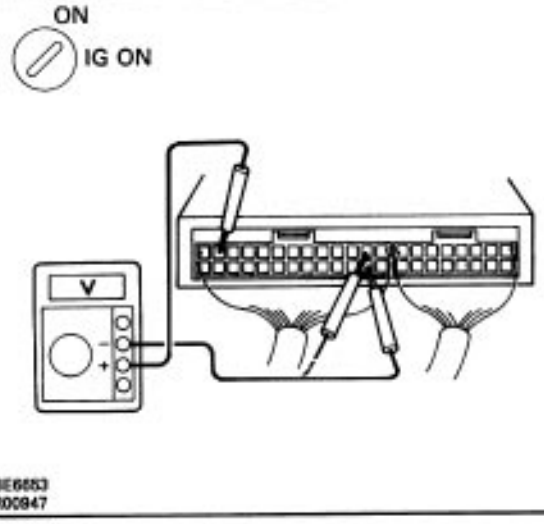
1 **Check battery positive voltage.**

OK: Voltage: 10 – 14 V

NG → Check and repair the charging system.

OK

2 **Check voltage between terminals IG1 and GND of ABS ECU connector.**



P: Remove ABS ECU with connectors still connected.

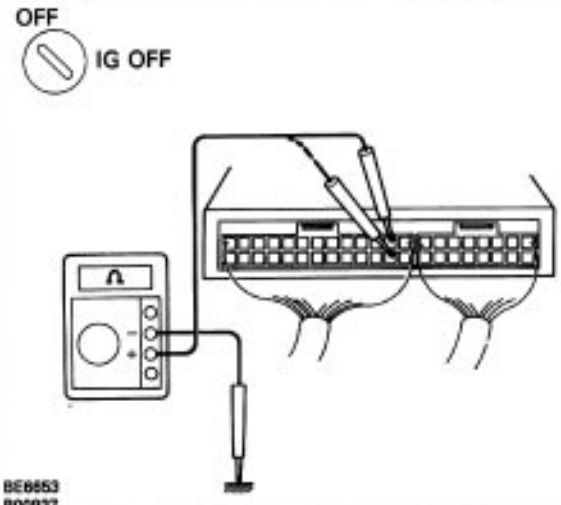
C:
1. Turn ignition switch ON.
2. Measure voltage between terminals IG1 and G N D of ABS ECU connector.

OK: **Voltage: 10–14 V**

NG → Check and replace ABS ECU.

OK

3 **Check continuity between terminals GND of ABS ECU connector and body ground.**



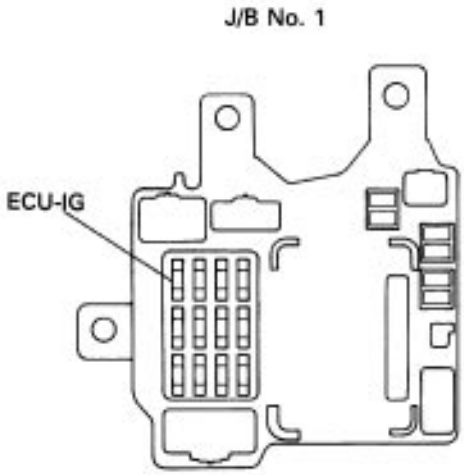
C: Measure resistance between terminals GND of ABS ECU connector and body ground.

OK: **Resistance: 1Ω or less**

NG → Repair or replace harness or connector.

OK

4 Check ECU–IG fuse.



P Remove ECU–IG fuse from J/6 No. 1.

C Check continuity of ECU–IG fuse.

OK **Continuity**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–28).

NG **Check for short in all the harness and components connected to ECU–IG fuse (See attached wiring diagram).**

DTC 51 ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
51	Pump motor is not operating normally during initial check.	• ABS pump motor.

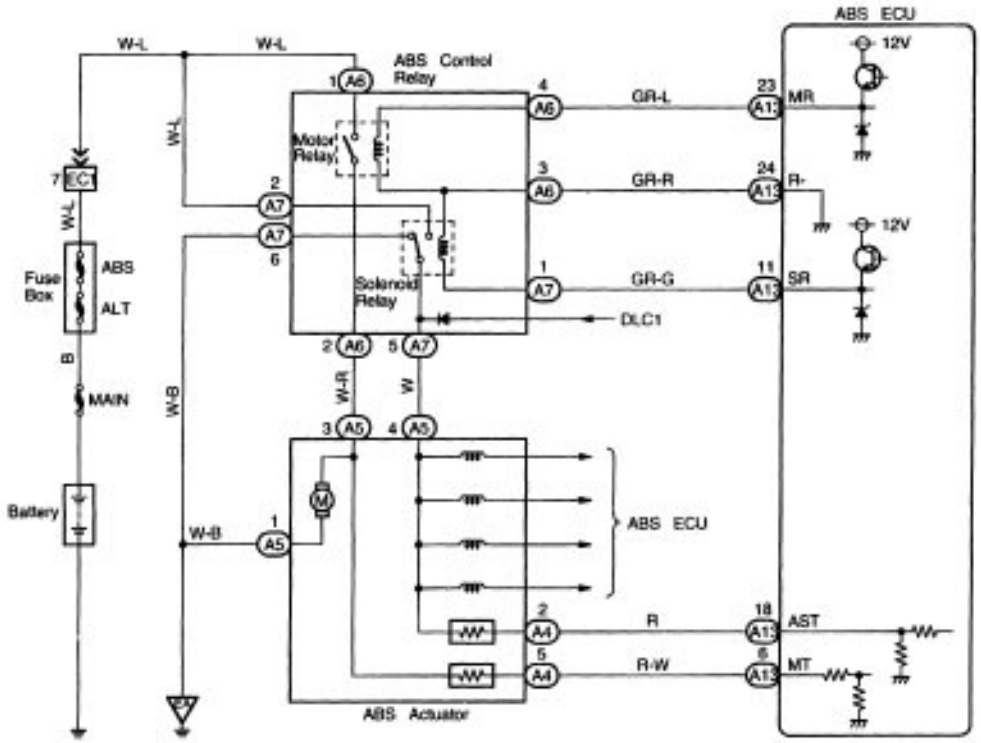
Fail safe function: If trouble occurs in the ABS pump motor, the ECU cuts off current to the control (solenoid) relay and prohibits ABS control.

DIAGNOSTIC CHART

See inspection of ABS actuator (See page BR–77).

WIRING DIAGRAM

(Reference)



R08715

Stop Light Switch Circuit

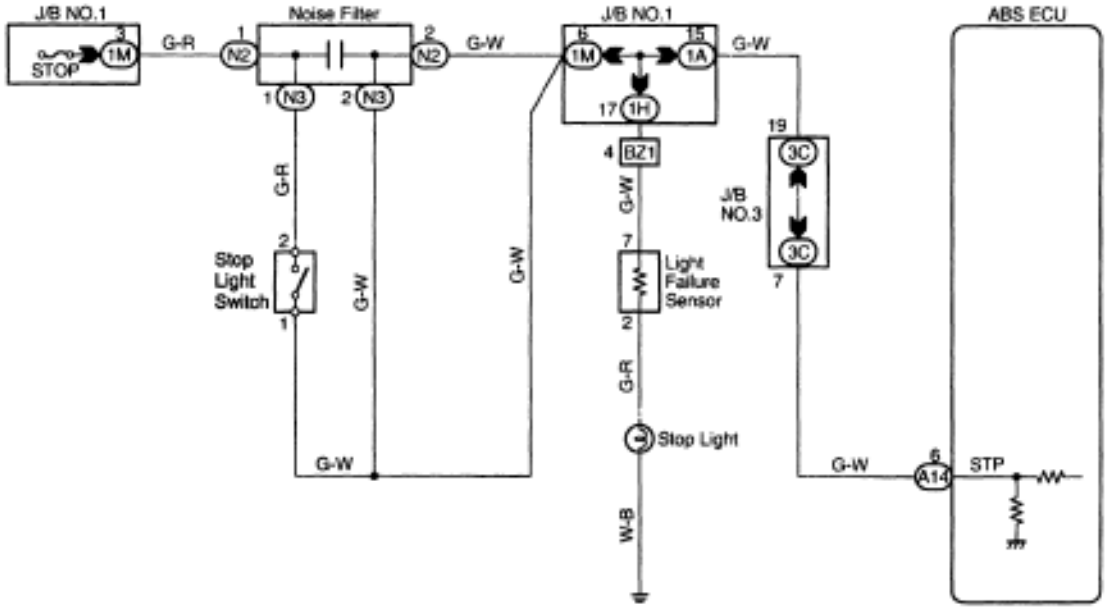
CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Repair stop light circuit (See page BE–65).
OK ↓			
2	Check voltage of terminal STP.	OK	Proceed to next circuit inspection shown on problem symptoms chart (See page BR–98).
NG ↓			
3	Check for open in harness and connector between ABS ECU and stop light switch (See page IN–27).	NG	Repair or replace harness or connector.
OK ↓			
Check and replace ABS ECU.			

WIRING DIAGRAM



R08719

INSPECTION PROCEDURE

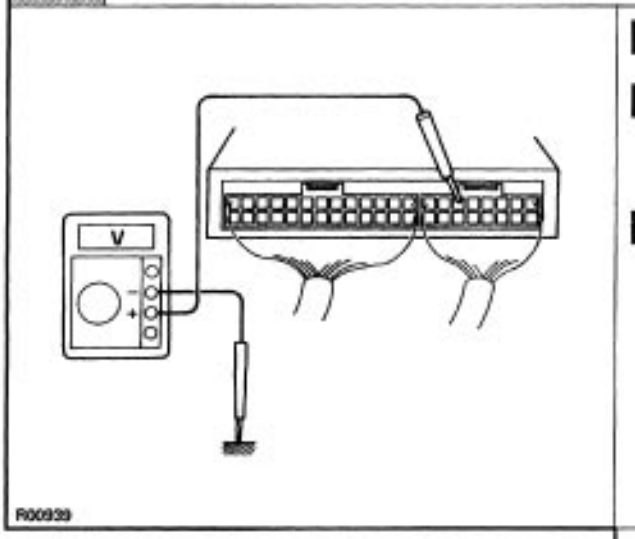
1 Check operation of stop light.

C Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

OK

NG → **Repair stop light circuit (See page BE–65).**

2 Check voltage between terminal STP of ABS ECU and body ground.



P Remove ABS ECU with connectors still connected.

C Measure voltage between terminal STP of ABS ECU and body ground when brake pedal is de–pressed.

OK **Voltage: 8–14 V**

NG

OK → **Proceed to next circuit inspection shown on problem symptoms chart (See page BR–98).**

3 Check for open in harness and connector between ABS ECU and stop light switch (See page IN–28).

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

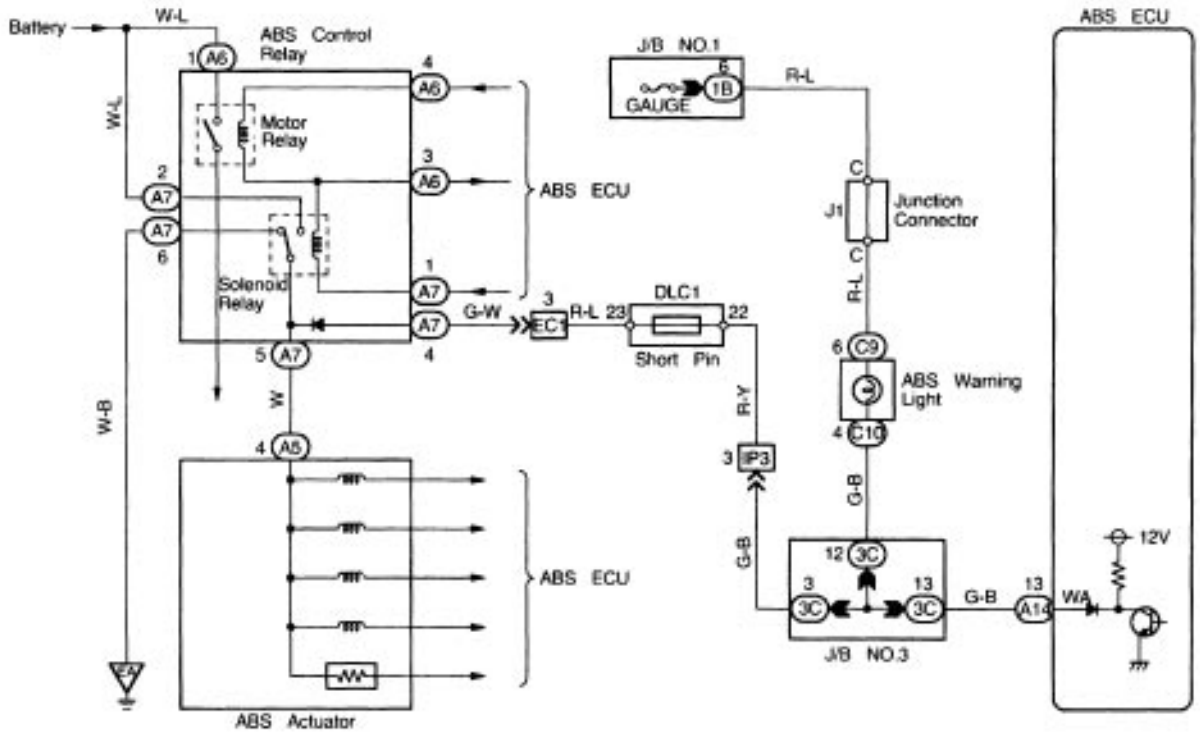
If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a diagnostic trouble code in memory.
After removing the short pin of the DLC1, connect terminals Tc and E1 of the DLC1 or DLC2 to make the ABS warning light to blink and output the diagnostic trouble code.

DIAGNOSTIC CHART

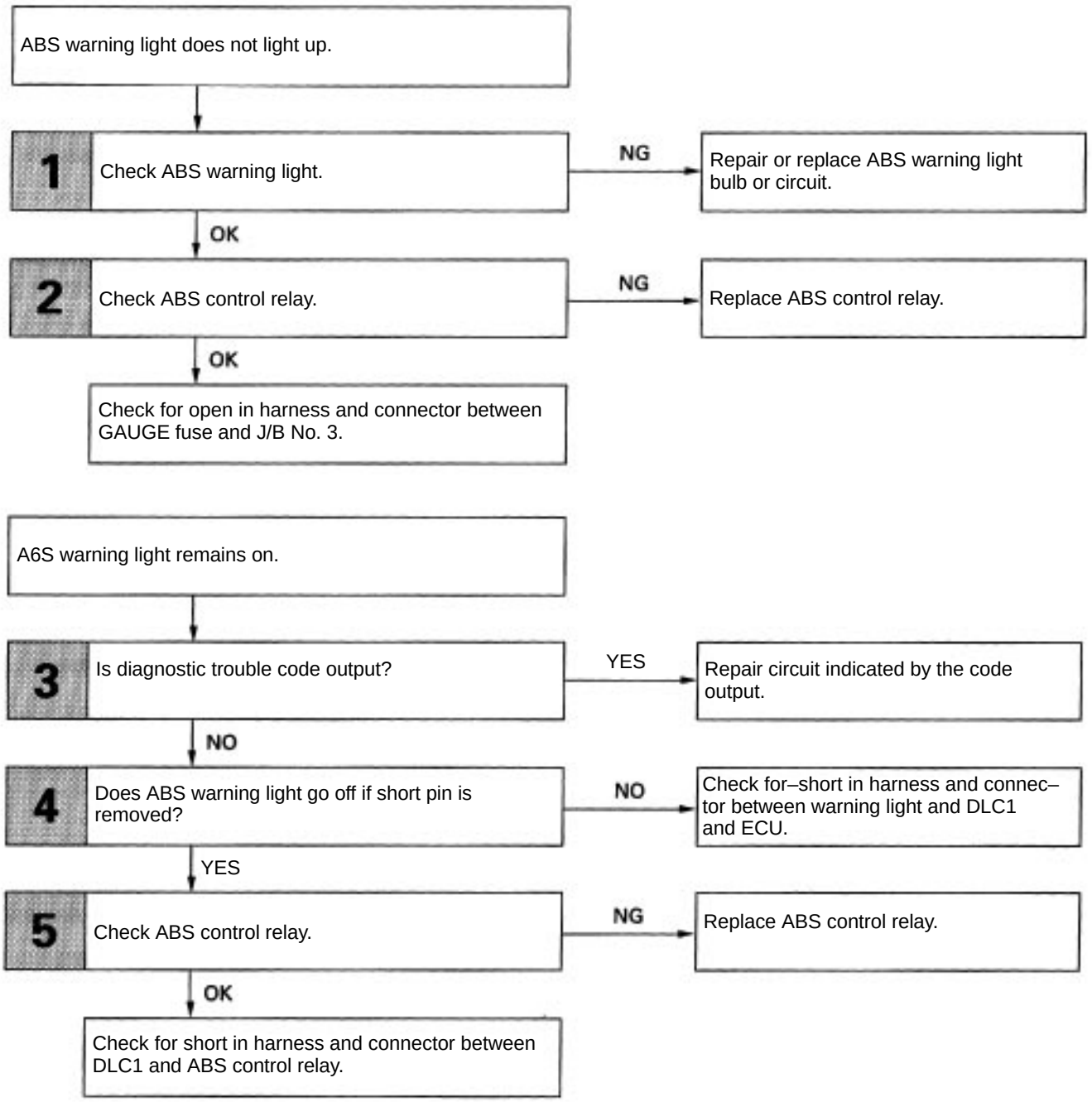
Perform troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	G o to step 1
ABS warning light remains on	Go to step 3

WIRING DIAGRAM



R08720


ABS warning light does not light up.
1
Check ABS warning light.
NG
Repair or replace ABS warning light bulb or circuit.
OK
2
Check ABS control relay.
NG
Replace ABS control relay.
OK
Check for open in harness and connector between GAUGE fuse and J/B No. 3.
A6S warning light remains on.
3
Is diagnostic trouble code output?
YES
Repair circuit indicated by the code output.
NO
4
Does ABS warning light go off if short pin is removed?
NO
Check for–short in harness and connec–tor between warning light and DLC1 and ECU.
YES
5
Check ABS control relay.
NG
Replace ABS control relay.
OK
Check for short in harness and connector between DLC1 and ABS control relay.

INSPECTION PROCEDURE

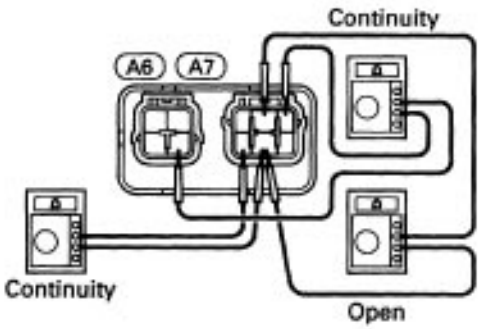
1 Check ABS warning light.

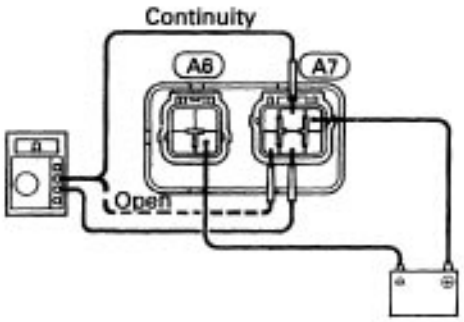
See Combination Meter Troubleshooting on page BE–1 18.

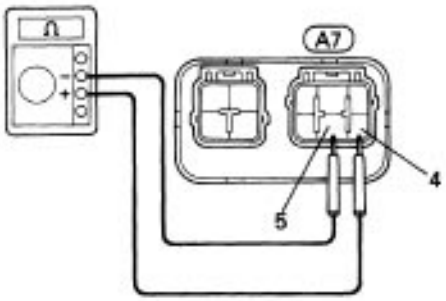
OK

NG → **Replace bulb or combination meter assembly.**

2 Check ABS control relay.







R00889
R00895
R00940

P Disconnect the connectors from control relay.

C Check continuity between each terminal of ABS control relay.

OK

Terminals (A7) 1 and (A6) 3	Continuity (Reference value 80)
Terminals (A7) 5 and (A7) 6	Continuity
Terminals (A7) 2 and (A7) 5	Open

C
1. Apply battery positive voltage between terminals (A7) 1 and (A6) 3.
2. Check continuity between each terminal of ABS control relay.

OK

Terminals (A7) 5 and (A7) 6	Open
Terminals (A7) 2 and (A7) 5	Continuity

C Connect the test lead to terminal 4 of (A7) and the lead to terminal 5 of (A7). Check continuity between the terminals.

OK Continuity

If there is no continuity, connect the test lead to terminal 4 of (A7) and the lead to terminal 5 of (A7). Recheck continuity between terminals.

OK

NG → **Replace ABS control relay.**

Check for open in harness and connector between DLC1 and A6S control relay and body ground (See page IN–27).

3 Is diagnostic trouble code output?

Perform diagnostic trouble code check on page BR–93.

NO

YES → **Repair circuit indicated by the code output.**

4 Does ABS warning light go off if short pin is removed?

YES

NO → **Check for short in harness and connector between warning light and DLC1 and ECU (See page IN–28).**

5 Check ABS control relay (See step No. 2).

OK

NG → **Replace ABS control relay.**

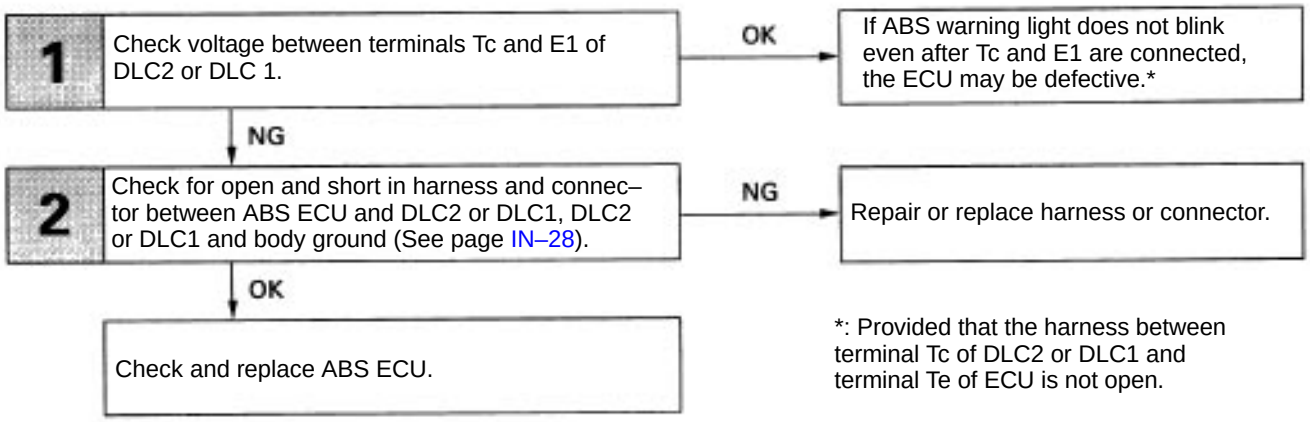
Check for short in harness and connector between DLC1 and ABS control relay (See page IN–28).

Tc Terminal Circuit

CIRCUIT DESCRIPTION

Connecting terminals Te and E1 of the DLC1 or the DLC2 causes the ECU to display the diagnostic trouble code by flasing the ABS warning light.

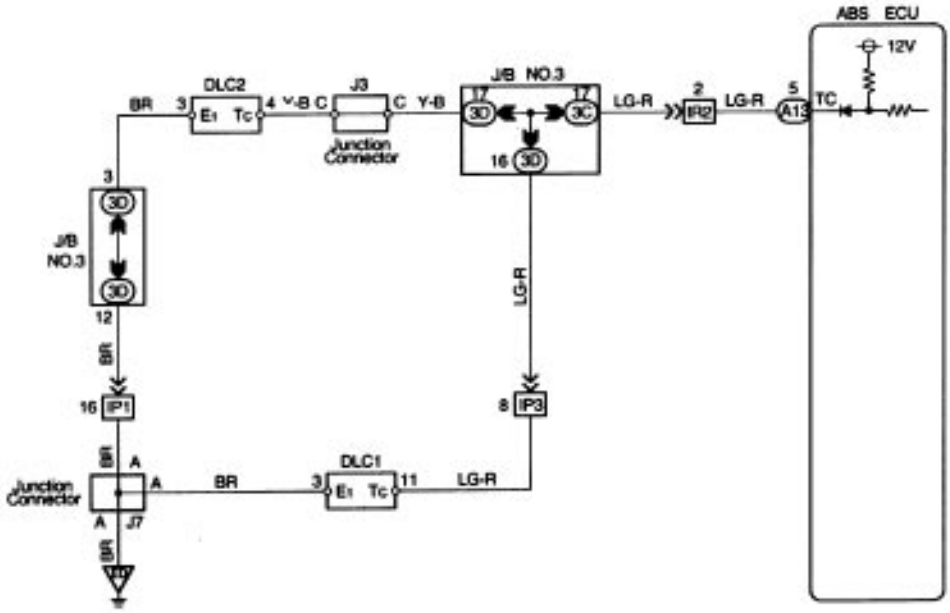
DIAGNOSTIC CHART



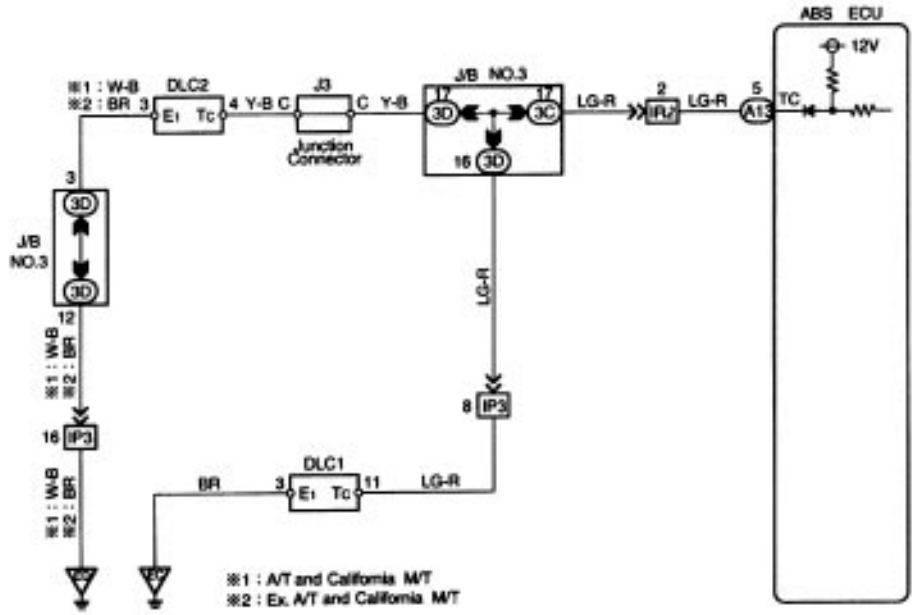
*: Provided that the harness between terminal Tc of DLC2 or DLC1 and terminal Te of ECU is not open.

WIRING DIAGRAM

1 MZ–FE:



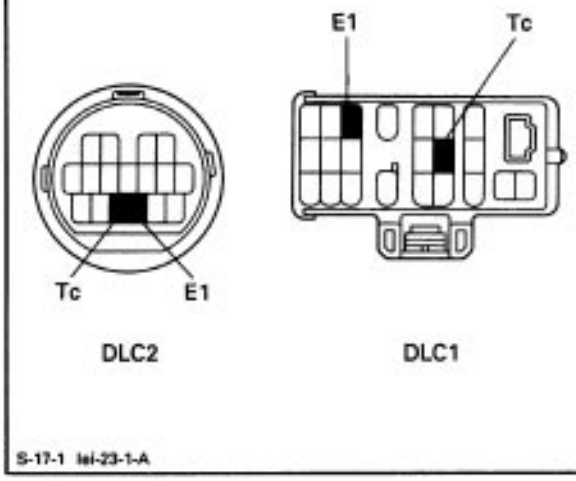
5S–FE:



R08721
R08722

INSPECTION PROCEDURE

1 **Check voltage between terminals Te and E1 of DLC2 or DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Tc and E1 of DLC2 or DLC1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Tc and E1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC2 or DLC1, DLC2 or DLC1 and body ground (See page IN–28).**

OK

NG → **Repair or replace harness or connector.**

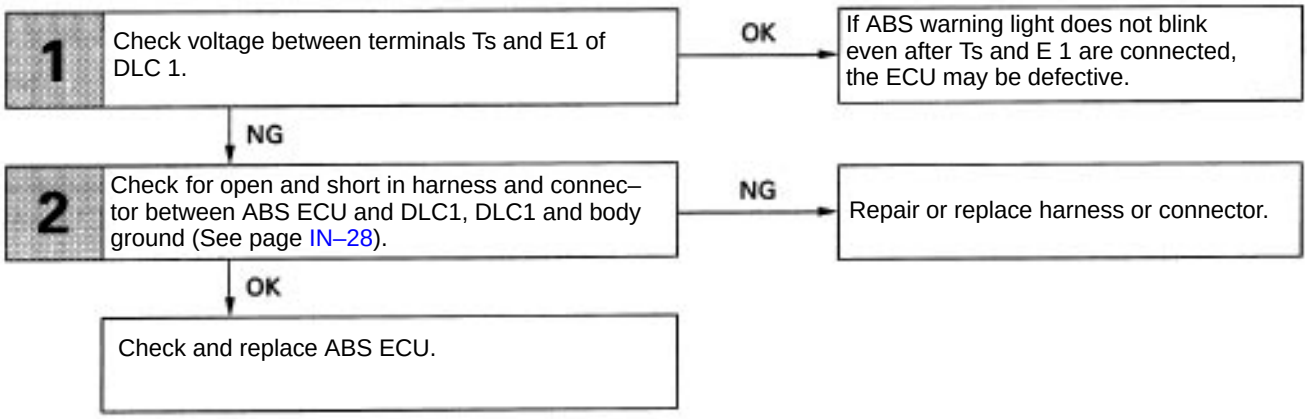
Check and replace ABS ECU.

Ts Terminal Circuit

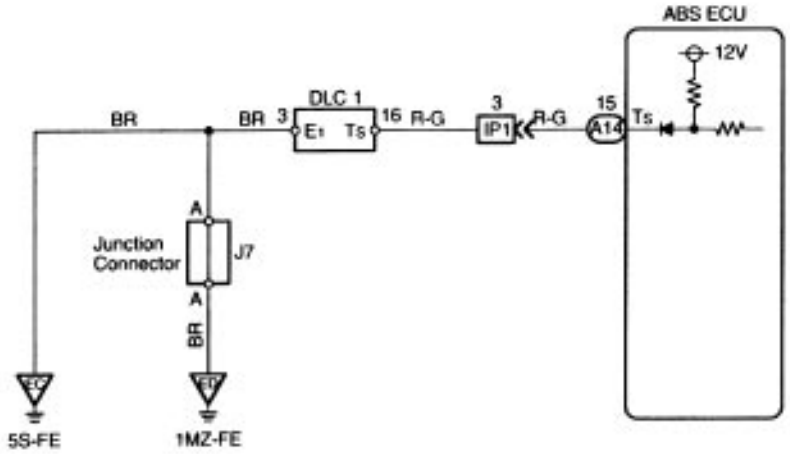
CIRCUIT DESCRIPTION

The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the diagnostic trouble code check.
Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

DIAGNOSTIC CHART



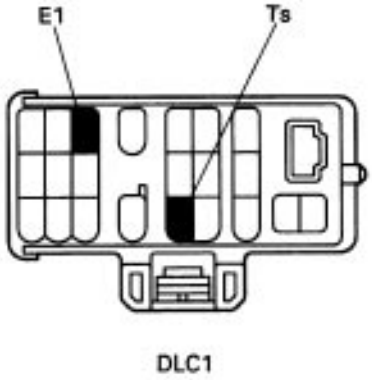
WIRING DIAGRAM



R08723

INSPECTION PROCEDURE

1 **Check voltage between terminals and E1 of DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Ts and E1 of DLC 1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).**

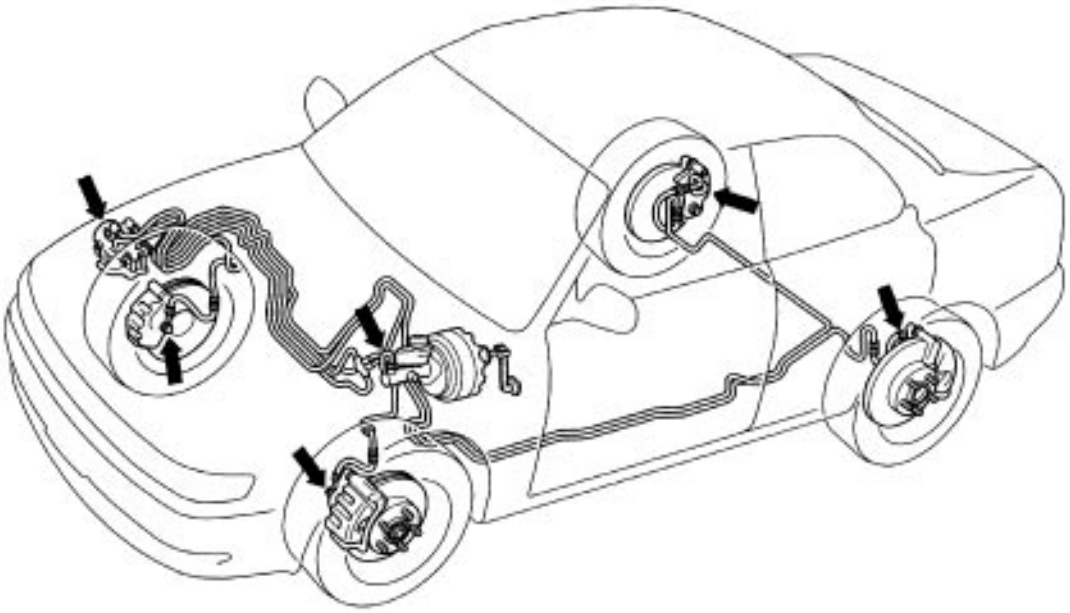
OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



RD8756

TROUBLESHOOTING (TMM Made Vehicle BOSCH ABS)

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following pages.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

If the ABS warning light lights up, and the ABS does not operate, the ECU stores diagnostic trouble codes corresponding to the problem in memory.

Before confirming the trouble, first check the diagnostic trouble codes to see if there are any malfunc–tion codes stored in memory. When there are malfunction codes, make a note of them, then clear them and proceed to ”3” Problem Symptom Confirmation”.

(3) PROBLEM SYMPTOM CONFIRMATION, (4) SYMPTOM SIMULATION

Confirm the problem symptoms. If the problem does not recur, simulate the problem by initially checking the circuits indicated by the diagnostic trouble code in step 2 , using ”Problem simulation method”.

(5) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes.

If a malfunction code is output, proceed to ”6” Diagnostic Trouble Code Chart”. If the normal code is output, proceed to ” 7” “Problem Symptoms Chart”.

Be sure to proceed to ” 6 “Diagnostic Trouble Code Chart” after steps “2” and “3” are completed. If troubleshooting is attempted only by following the malfunction code stored in the memory, errors could be made in the diagnosis.

(6) DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

(7) PROBLEM SYMPTOMS CHART

If the normal code is confirmed in the diagnostic trouble code check, perform inspection in accordance with the inspection order in the problem symptoms chart.

(8) CIRCUIT INSPECTION

Proceed with diagnosis of each circuit in accordance with the inspection order confirmed in 6 and 7 . Determine whether the cause of the problem is in the sensor, actuators, wire harness and con–nectars, or the ECU.

(9) SENSOR CHECK

Use the ABS warning light to check if each of the signals from the speed sensors are being input correctly to the ECU. Instructions for this check are given in the circuit inspection.

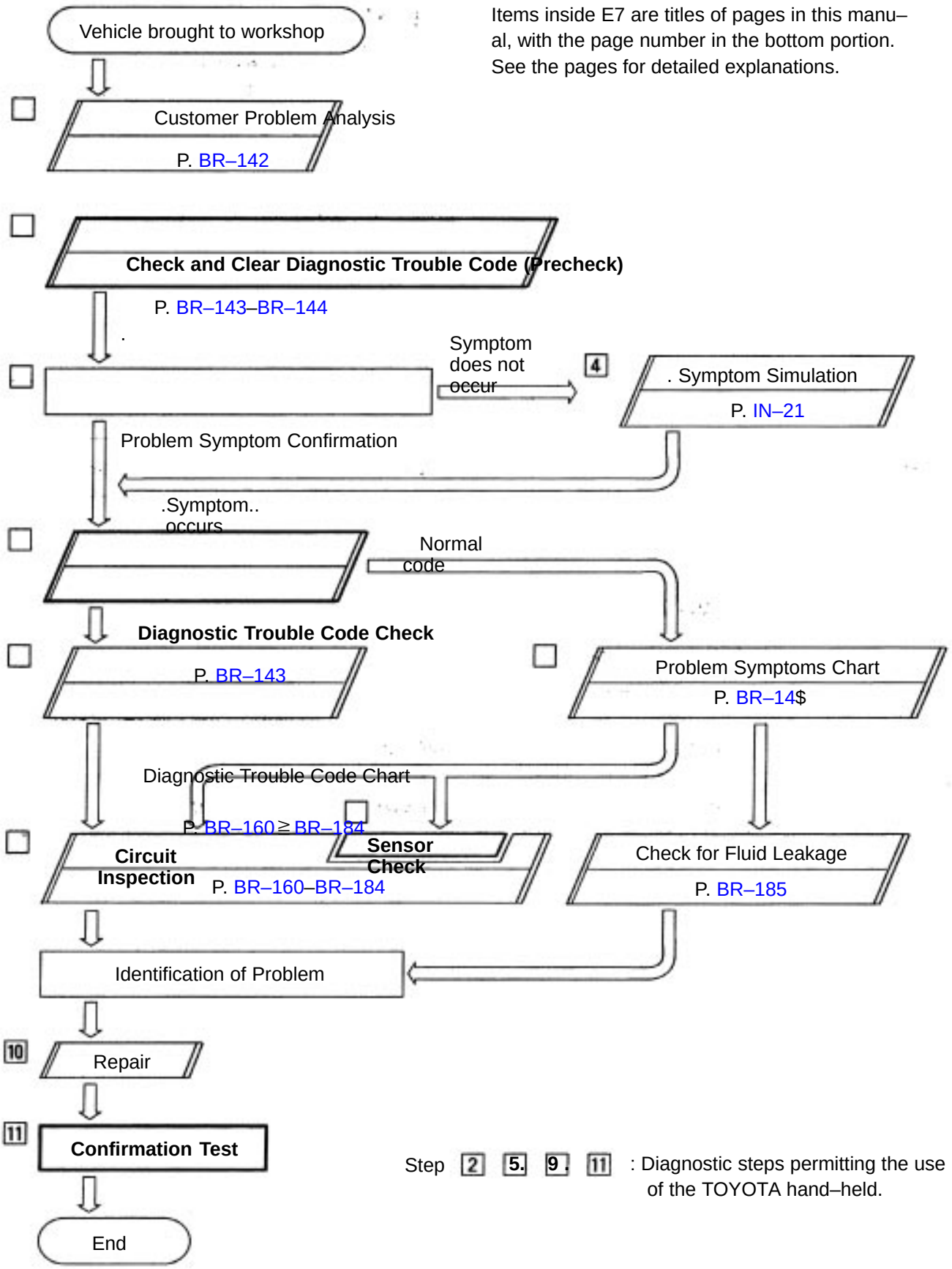
(10) REPAIRS

After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual.

(11) CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive to make sure the entire ABS system is operating correctly.

Items inside E7 are titles of pages in this manu–al, with the page number in the bottom portion. See the pages for detailed explanations.



Step 2 5. 9. 11 : Diagnostic steps permitting the use of the TOYOTA hand–held.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ABS Check Sheet

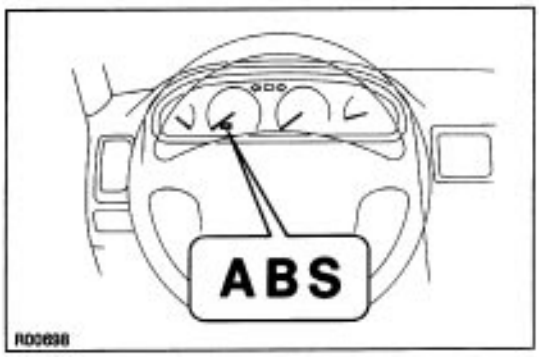
Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

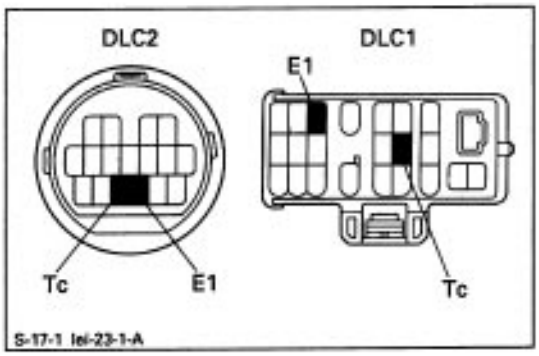


DIAGNOSIS SYSTEM

INDICATOR CHECK

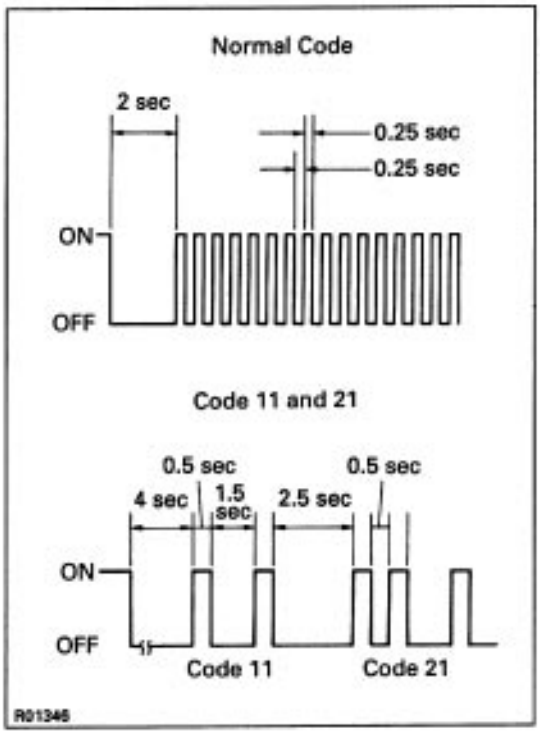
When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT: If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page BR–177).



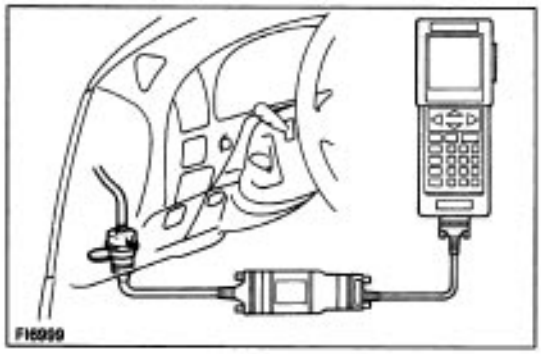
DIAGNOSTIC TROUBLE CODE CHECK

1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
2. Turn the ignition switch to ON.
3. Read the diagnostic trouble code from the ABS warning light on the combination meter.
   HINT: If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page BR–180 or BR–177y.



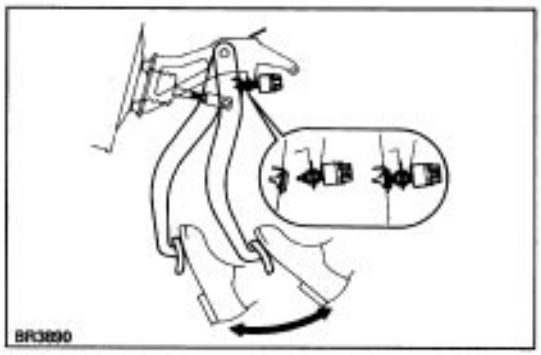
As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.

4. Codes are explained in the code table on page BR–145.
5. After completing the check, disconnect terminals Tc and E1, and turn off the display.
   If 2 or more malfunctions are indicated at the same time, the lowest numbered diagnostic trouble code will be displayed first.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

1. Hook up the Toyota hand–held tester to the DLC2.
2. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.



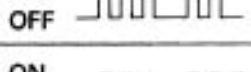
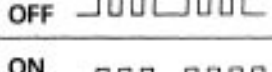
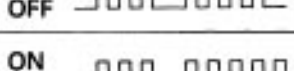
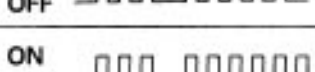
DIAGNOSTIC TROUBLE CODE CLEARANCE

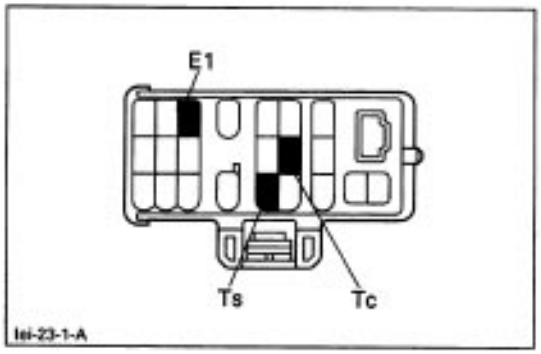
1. Using SST, connect terminals Tc and E1 of DLC2 or DLC1.
   SST 09843–18020
2. IG switch ON.
3. Clear the diagnostic trouble codes stored in ECU by de–pressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the SST from the terminals of DLC2 or DLC1.

HINT: Cancellation cannot be done by removing the battery cable or ECU–13 fuse.

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code.

Code	ABS Warning Light Blinking Pattern	Diagnosis
11		Open or short circuit in ABS solenoid relay circuit
13		Open or short circuit in ABS motor relay circuit
21		Open or short circuit in 3–position solenoid circuit for right front wheel
22		Open or short circuit in 3–position solenoid circuit for left front wheel
23		Open or short circuit in 3–position solenoid circuit for rear wheels
31		Right front wheel speed sensor signal malfunction
32		Left front wheel speed sensor signal malfunction
33		Right rear wheel speed sensor signal malfunction
34		Left rear wheel speed sensor signal malfunction
35		Open circuit in right front speed sensor circuit
36		Open circuit in left front speed sensor circuit
37		Faulty rear speed sensor rotor
38		Open circuit in right rear speed sensor circuit
39		Open circuit in left rear speed sensor circuit
41		Low battery positive voltage
51		Pump motor is locked Open in pump motor circuit in actuator
62		Malfunction in ECU

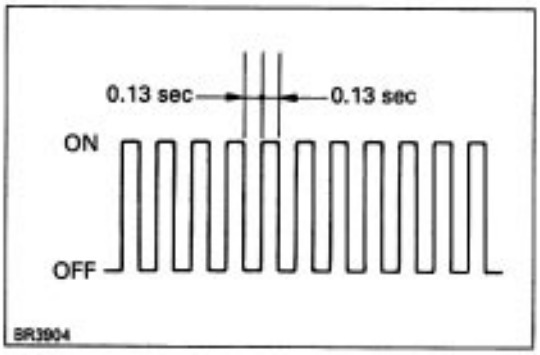


SPEED SENSOR SIGNAL CHECK

1. When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.
2. Turn the ignition switch to OFF.
3. Using SST, connect terminals Ts and El of DLC1.

SST 09843–18020

4. Start the engine.



5. Check that the ABS warning light blinks

   HINT: If the ABS warning light does not blink, inspect the ABS warning light circuit (See page BR–177j.

6. Drive vehicle straight forward.

   HINT:

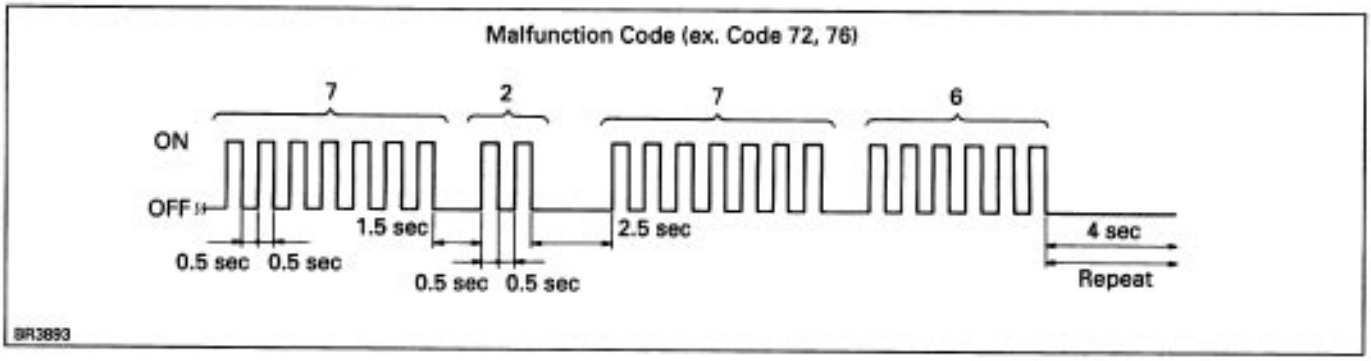
   - Drive vehicle at 45–55 km/h (28–34 mph) for several seconds.
   - If the brake is applied during the check, the check routine must be started again.

7. Stop the vehicle.
8. Turn the ignition switch to OFF.
9. Disconnect terminals Ts and E1, and connect Te and E1.
10. Turn the ignition switch to ON.
11. Read the number of blinks of the ABS warning light.

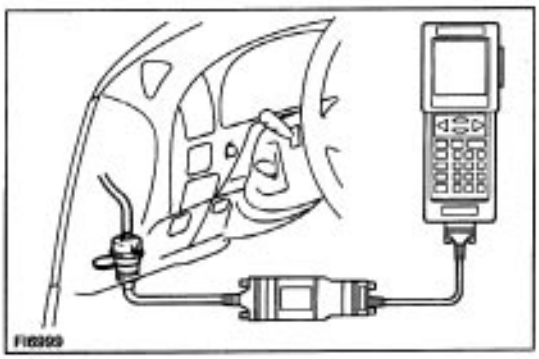
    HINT: See the list of diagnostic trouble codes shown on the next page.

    If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).

    If 2 or more malfunctions are indicated at the same time, the lowest numbered code will be displayed first.



12. After performing the check, disconnect terminals Tc and E1 of DLC1, and ignition switch turned off.



DIAGNOSTIC TROUBLE CODE CHECK USING TOYOTA HAND–HELD TESTER

1. Perform steps 1. ≧ 7. on the previous page.
2. Hook up the Toyota hand–held tester to the DLC2.
3. Read the diagnostic trouble codes by following the prompts on the tester screen.
   Please refer to the Toyota hand–held tester operator's manual for further details.

Diagnostic Trouble Code of Speed Sensor Check Function

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor

PROBLEM SYMPTOMS CHART

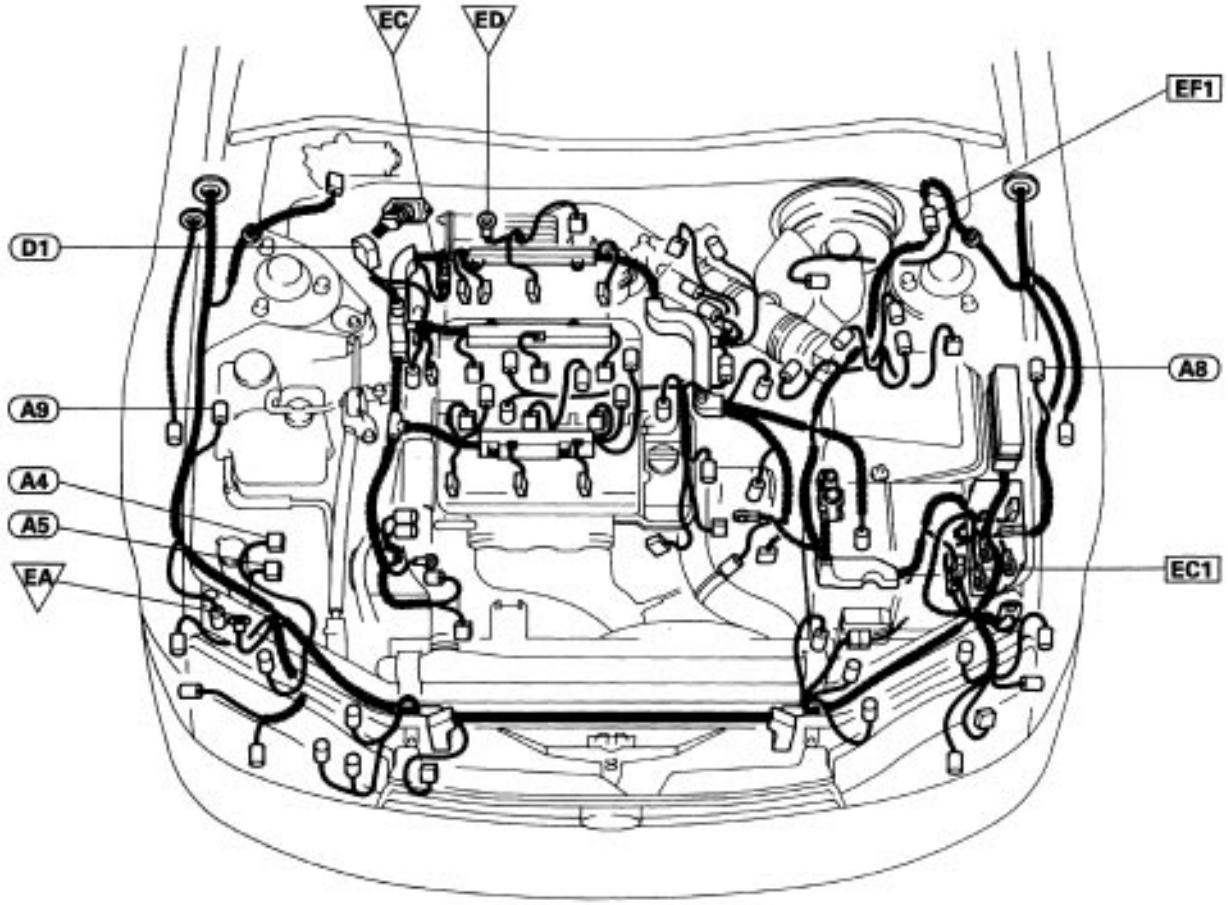
If a normal code is displayed during the diagnostic trouble code check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
ABS does not operate.	Only when 1. ≧ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the hydraulic circuit for leakage.	BR–143 BR–170 BR–166 BR–185
ABS does not operate efficiently.	Only when 1.≧ 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the diagnostic trouble code, reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the hydraulic circuit for leakage.	BR–143 BR–166 BR–175 BR–185
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	BR–177
Diagnostic trouble code check cannot be performed.	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	BR–177 BR–180
Speed sensor signal check cannot be performed.	1. Ts terminal circuit. 2. ABS ECU.	BR–183

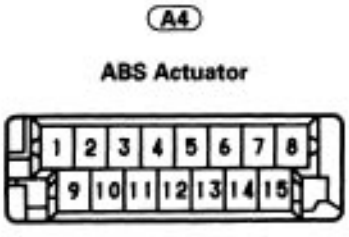
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1M2–FE Engine:



N09612



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Ig-4-1-A

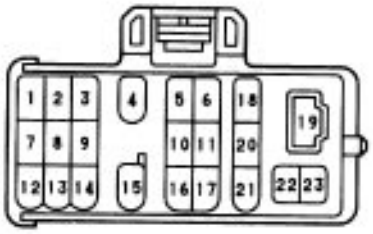
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

ls-2-1-T

D1

DLC1



lel-23-1

EC1

lef-8-1

lef-8-2

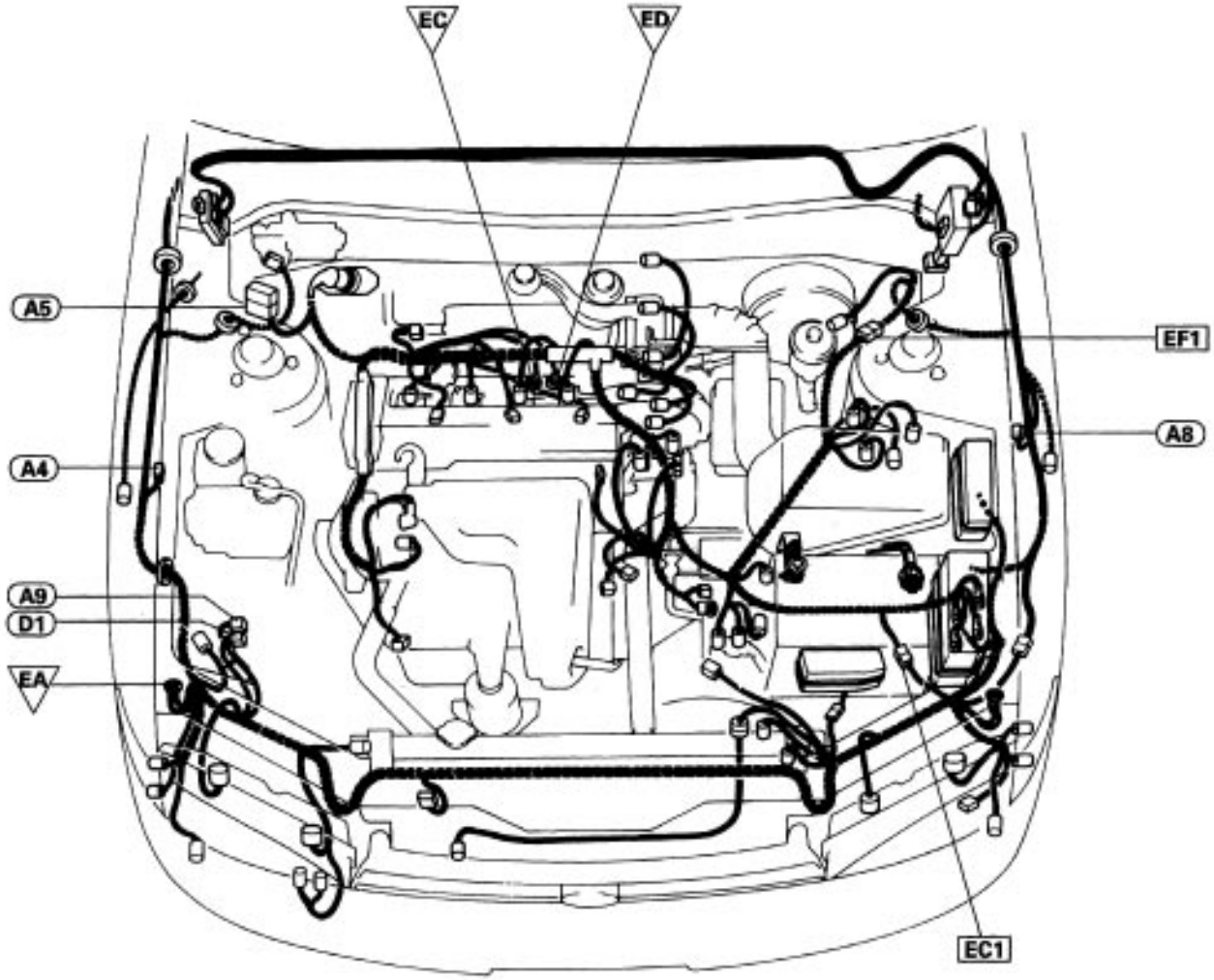
EF1

lfg-4-1

lfg-4-2

Location of Connectors in Engine Compartment

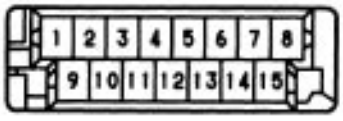
5S–FE Engine:



N09613

A4

ABS Actuator



R08674

A5

ABS Actuator

Ig-4-1-A

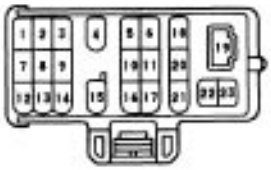
A8 A9

ABS Speed Sensor Left Front
ABS Speed Sensor Right Front

le-2-1-T

D1

DLC1



lei-23-1-A

EC1

lef-8-1

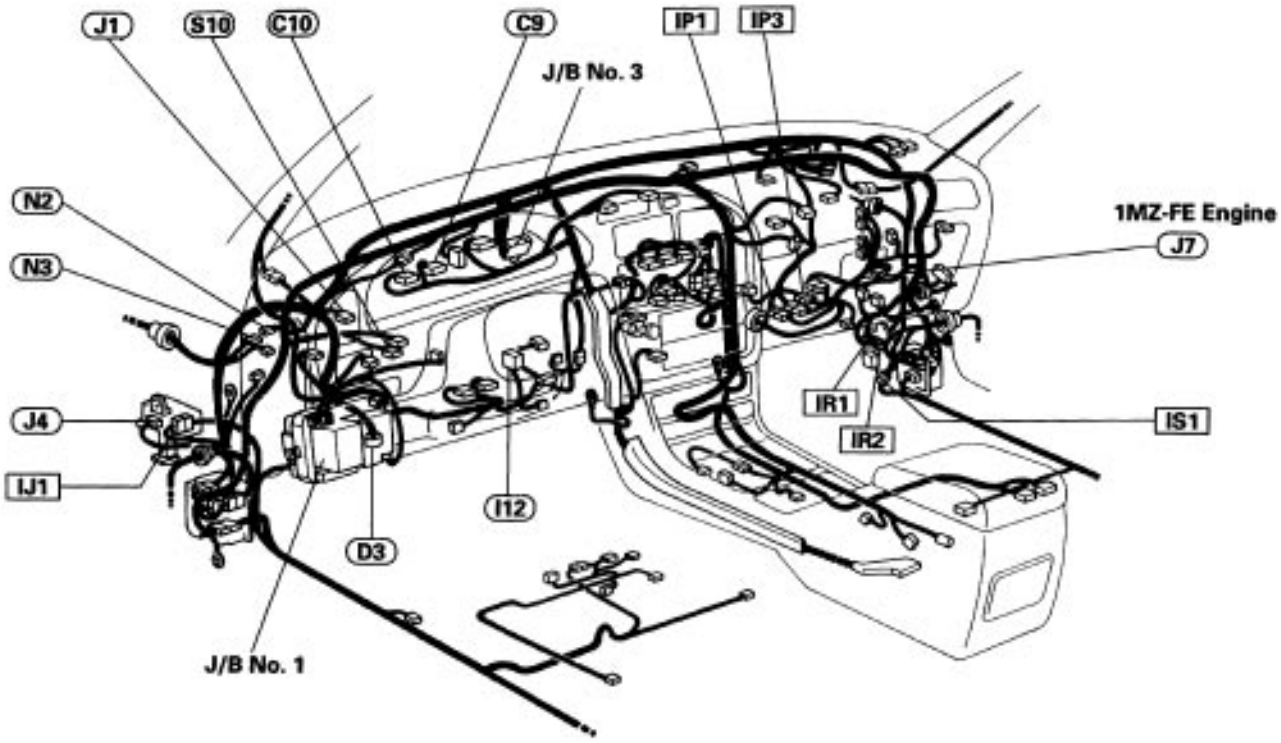
lef-8-2

EF1

lfg-4-1

lfg-4-2

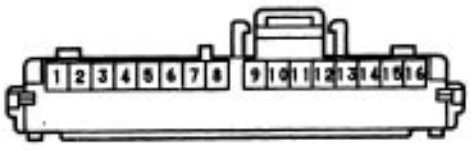
Location of Connectors in instrument Panel



N09614

C9

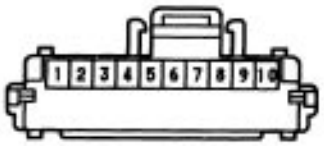
ABS Warning Light



j-16-1

C10

ABS Warning Light



j-10-1

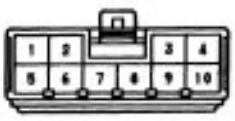
D3

DLC2

s-17-1

I12

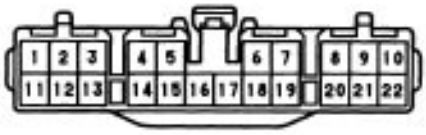
Ignition Switch



g-10-1-B

J1

Junction Connector



e-22-1-A

J3

Junction Connector

e-14-1-A

J7 1MZ-FE

Junction Connector

e-12-1

J7

Noise Filter

g-2-2

N3

Noise Filter

g-2-1

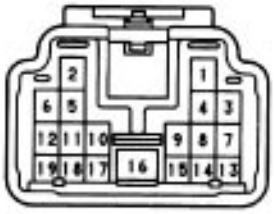
S10

Stop Light Switch

eg-4-1

IJ1

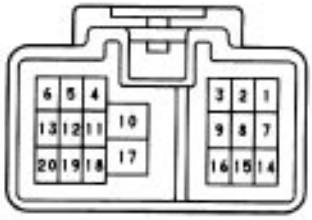
eg-19-1



eg-19-2

IP1

e-20-1-B



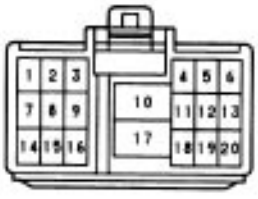
e-20-2-B

IP3

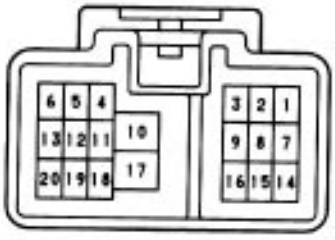
ef-19-1

ef-19-2

IR1



e-20-1-B



e-20-2-B

IR2

e-8-1

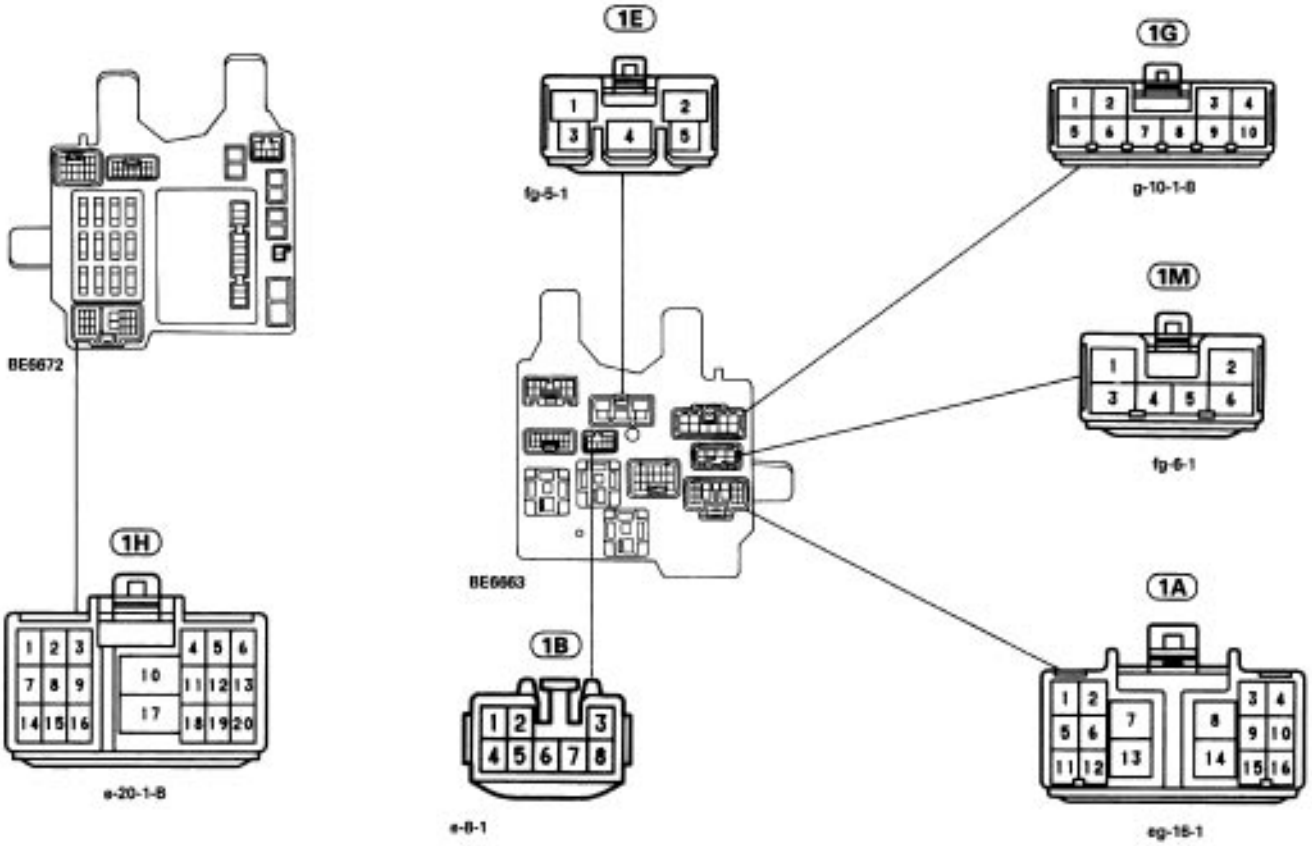
e-8-2

IS1

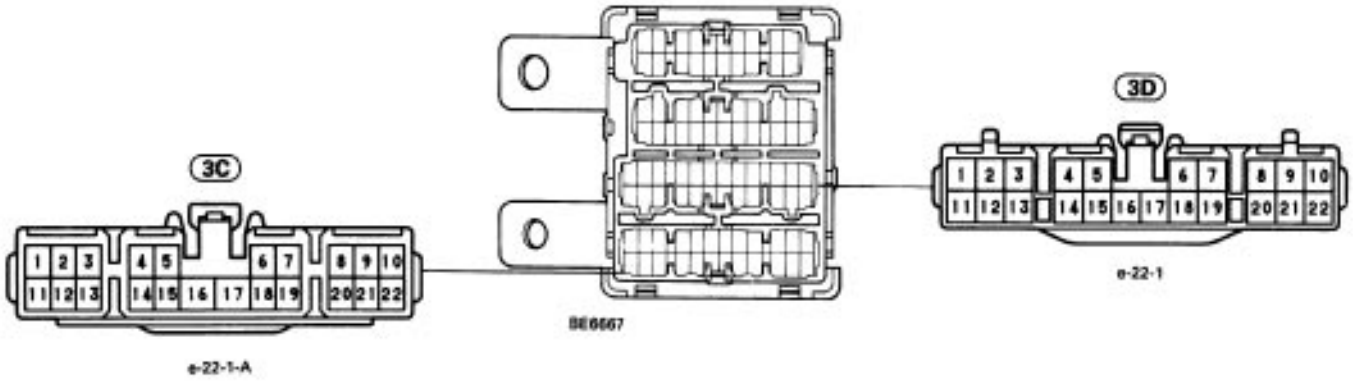
e-6-1

e-6-2

J/B No. 1

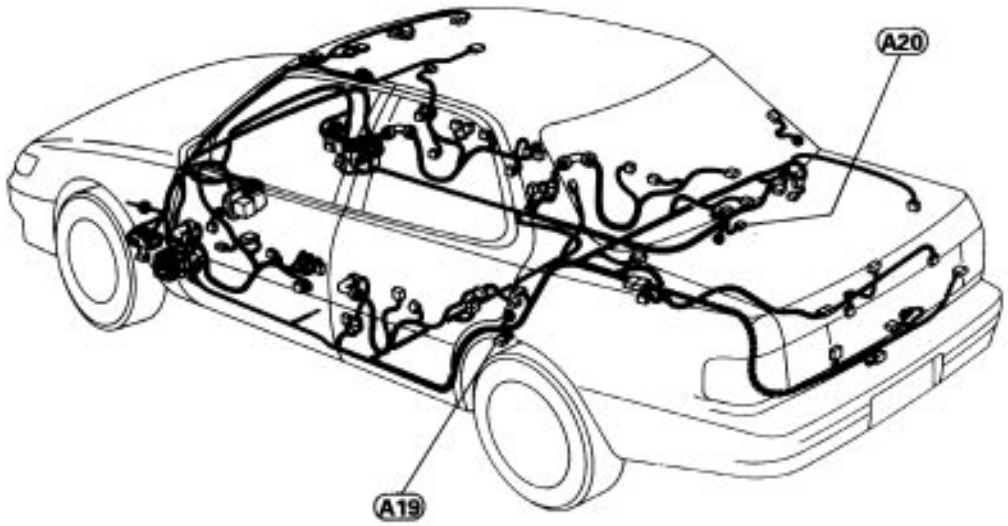

1E
fg-6-1
1G
g-10-1-B
1M
fg-6-1
BE6672
BE6663
1H
e-20-1-B
1B
e-8-1
1A
eg-16-1

J/B No. 3


3C
e-22-1-A
BE6667
3D
e-22-1

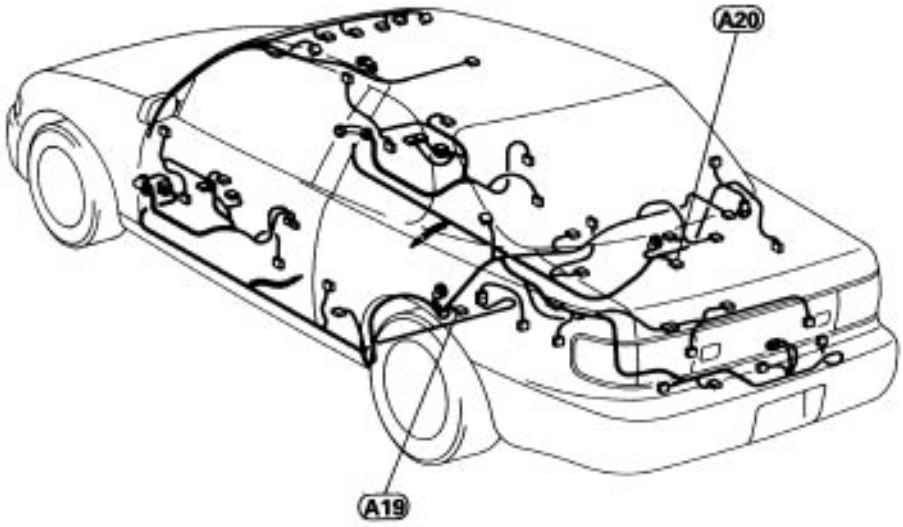
Location of Connectors in Body

Sedan:



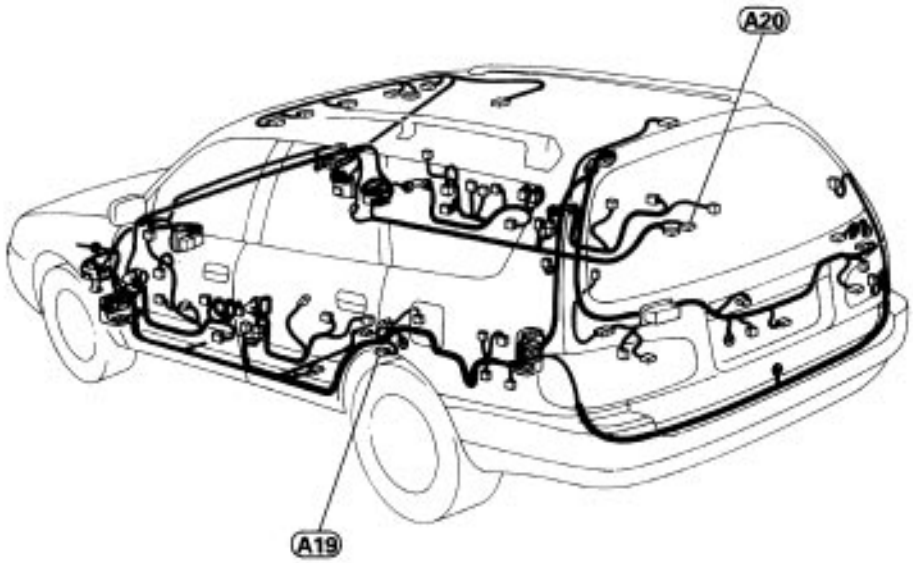
N09615

Coupe:



N09703

Wagon:



N09704

A19 A20

ABS Speed Sensor Left Rear
ABS Speed Sensor Right Rear

e-2-2-L

–MEMO–

CIRCUIT INSPECTION

DTC 11,13 ABS Solenoid and Motor Relay Circuit

CIRCUIT DESCRIPTION

The solenoid relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on. The motor relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the motor relay ON and operates the ABS pump motor.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
11	(1) 5V is applied to the solenoid voltage monitor terminal (AST) for 30 sec. or more, with the IG switch ON and the warning light on. (2) 5V is applied to the solenoid voltage monitor terminal (AST) for 0.02 sec. or more, after the warning light goes off.	• Open or short in ABS solenoid relay circuit. • ECU.
13	(1) The motor voltage monitor terminal (MT) is ON for 5 sec. or more, with the motor relay operation signal OFF. (2) The motor voltage monitor terminal (MT) is OFF for 0.04 sec. with the motor relay operation signal ON.	• Pump motor. • Open in ABS motor relay circuit. • ECU.

Fail safe function: If trouble occurs in the control (solenoid) relay circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART

1 Check voltage of ABS ECU connector.

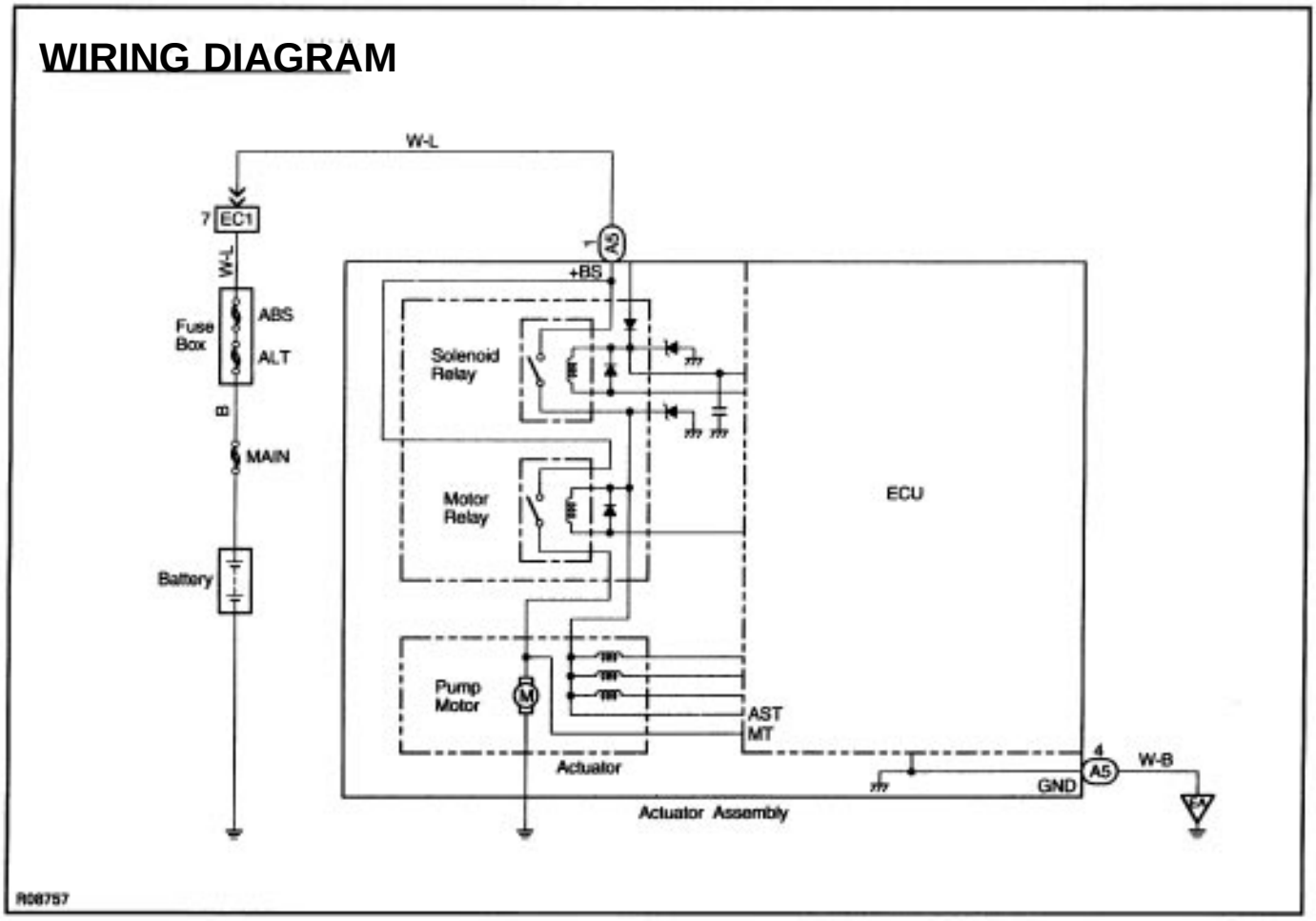
NG → Check and repair harness or connector.

OK ↓

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

HINT: When DTC13 is output, check that the pump motor ground wire is installed correctly.

WIRING DIAGRAM

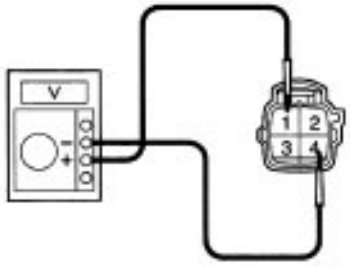


INSPECTION PROCEDURE

1 **Check voltage between terminals connector. (A5) 1 and (A5) 4 of ABS ECU**

OFF

IG OFF



R08545

P Disconnect the ABS ECU connector.

C Measure voltage between terminals (A5) 1 and (A5) 4 of ABS ECU harness side connector.

OK **Voltage: 10–14 V**

OK →

NG → **Check and repair harness or connector.**

If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

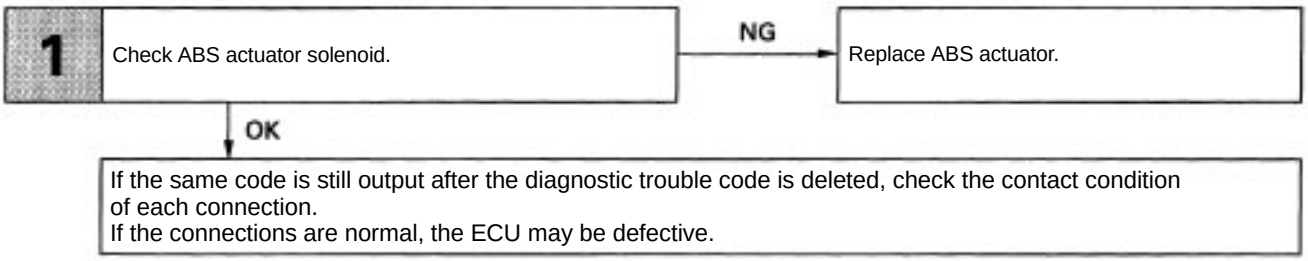
DTC 21, 22, 23 ABS Actuator Solenoid Circuit

CIRCUIT DESCRIPTION

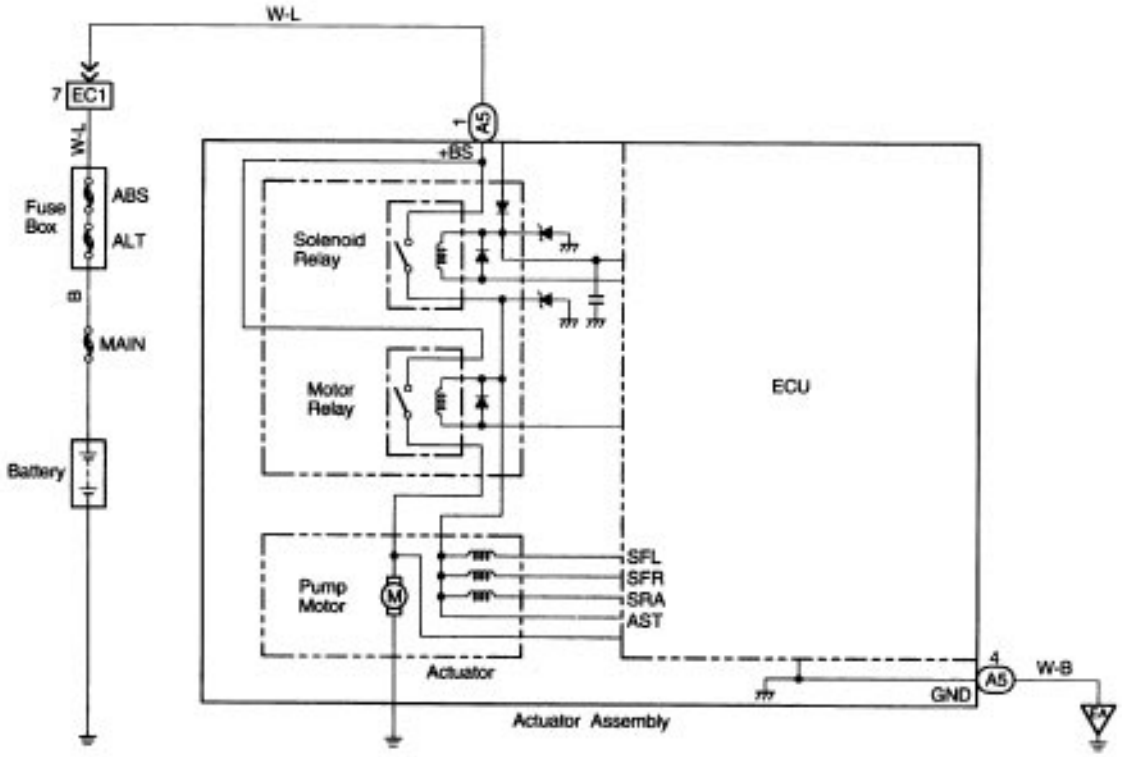
This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders, thus controlling the braking force.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
21	(1) OV is applied to terminal SFR for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST) and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SFR for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power transistor is ON.	• ABS actuator (solenoid valve). • Open or short in right front solenoid circuit. • ECU.
22	(1) OV is applied to terminal SFL for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST)and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SFL for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power–transistor is ON.	• ABS actuator (solenoid valve). • Open or short in left front solenoid circuit. • ECU.
23	(1) OV is applied to terminal SRA for 0.035 sec. while battery voltage is applied to the sole–noid voltage monitor terminal (AST) and the ECM power transistor is OFF. (2) Battery voltage is applied to terminal SRA for 0.035 sec. while battery voltage is applied to the solenoid voltage monitor terminal (AST) and the ECM power transistor is ON.	• ABS actuator (solenoid valve). • Open or short in rear solenoid circuit. • ECU.

Fail safe function; If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the solenoid relay and prohibits ABS control.



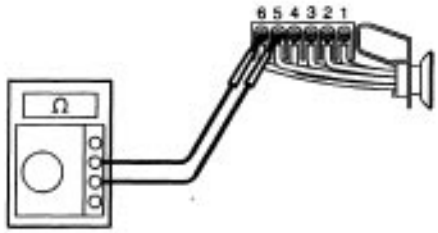
WIRING DIAGRAM



R08757

INSPECTION PROCEDURE

1 Check ABS actuator solenoid.



P Remove the ABS ECU cover and disconnect 6–pin connector.

C Check continuity between terminals 1 and 2, 3 and 4, 5 and6.

OK **Continuity**
HINT: Resistance of each solenoid coil is 1.1 .

OK

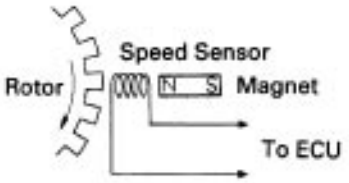
NG → **Replace ABS actuator.**

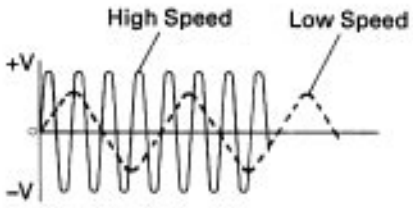
If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the ECU may be defective.

DTC 31,32,33,34,35, 36, 38, 39 Speed Sensor Circuit

CIRCUIT DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations. When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.





BR3583
BR3582

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
31,32, 33,34	(1) No pulse is input when the vehicle speed reaches 12 km/h (7 mph). (2) No pulse is input when the vehicle speed reaches 20 km/h (12 mph). (3) When the vehicle speed is 10 km/h (7 mph) or above, a pulse is not input for at least 20 sec.	• Right front, left front, right rear and left rear speed sensor. • Open in each speed sensor circuit. • Sensor installation • Sensor rotor • ECU.
35,36, 38,39	The hardware detects a constant open is each sensor circuit.	• Right front, left front, right rear and left rear speed sensor. • Open in each speed sensor circuit. • ECU.

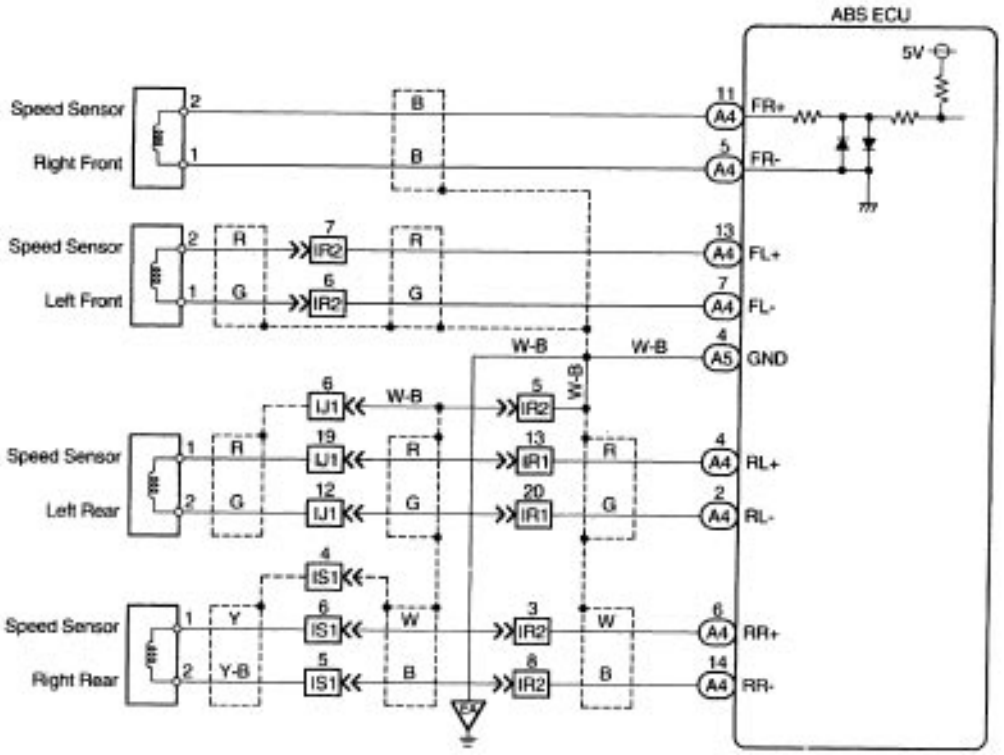
HINT: DTC Nos. 31 and 35 are for the right front speed sensor.
DTC Nos. 32 and 36 are for the left front speed sensor.
DTC Nos. 33 and 38 are for the right rear speed sensor
DTC Nos. 34 and 39 are for the left rear speed sensor.
Fail safe function: If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART

1. Check speed sensor.
   - NG → Replace speed sensor.
   - OK ↓
2. Check for open and short in harness and connector between each speed sensor and ECU.
   - NG → Repair or replace harness or connector.
   - OK ↓
3. Check sensor rotor and sensor installation.
   - NG → Replace speed sensor or rotor.
   - OK ↓

Check and replace ABS ECU.

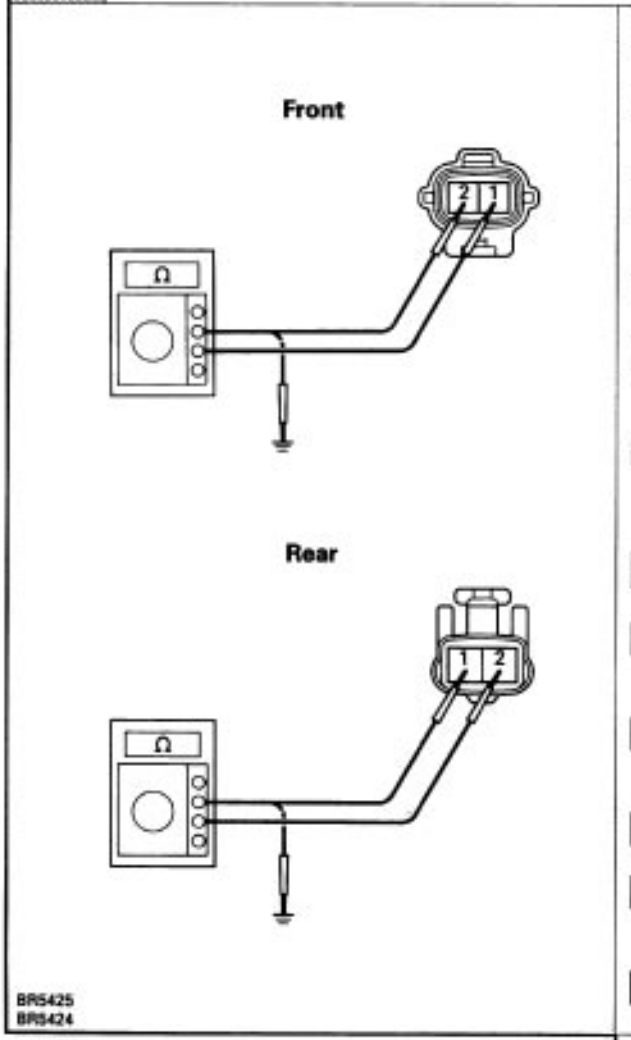
WIRING DIAGRAM



R08758

INSPECTION PROCEDURE

1 **Check speed sensor.**



Front

P 1. Remove front fender liner.
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.

OK **Resistance: 0.6–1.8 kΩ**

C Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK **Resistance: 1 MΩ or higher**

Rear

P 1. Remove the seat cushion (and side seat back).
2. Disconnect speed sensor connector.

C Measure resistance between terminals 1 and 2 of speed sensor connector.

OK **Resistance: 0.6–1.8 tcΩ**

C Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

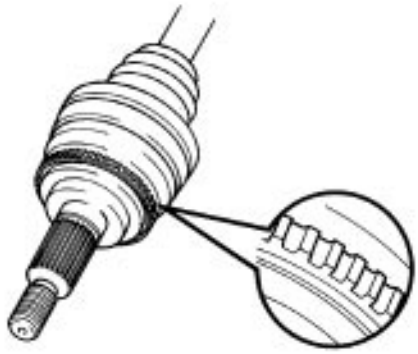
OK **Resistance: 1 MΩ or higher**

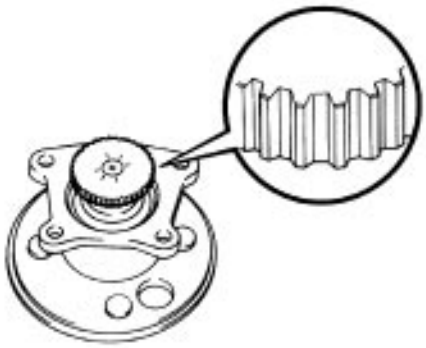
OK → **2** **Check for open and short in harness and connector between each speed sensor and ECU (See page IN–28).**

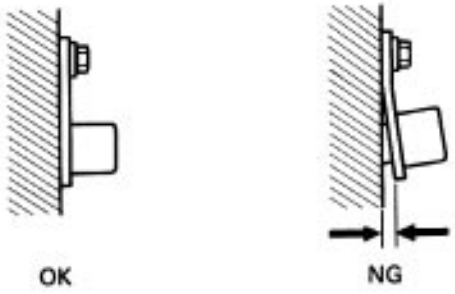
OK → **Repair or replace harness or connector.**

NG → **Replace speed sensor.**

3 Check sensor rotor and sensor installation.







R00948
R00947
BR3795

Front

P Remove front drive shaft (See SA section).
Check sensor rotor serrations.

C

OK **No scratches or missing teeth.**

C Check the front speed sensor installation

OK **The installation bolt is tightened properly.**

Rear

P Remove the axle hub (See SA section).

C Check the sensor rotor serrations.

OK **No scratches or missing teeth.**

C Check the speed sensor installation

OK **The installation bolt is tightened properly and there is no clearance between the sensor and rear axle carrier.**

OK

Check and replace ABS ECU.

NG **Replace speed speed or rotor.**

DTC 41 +BS Power Source Circuit

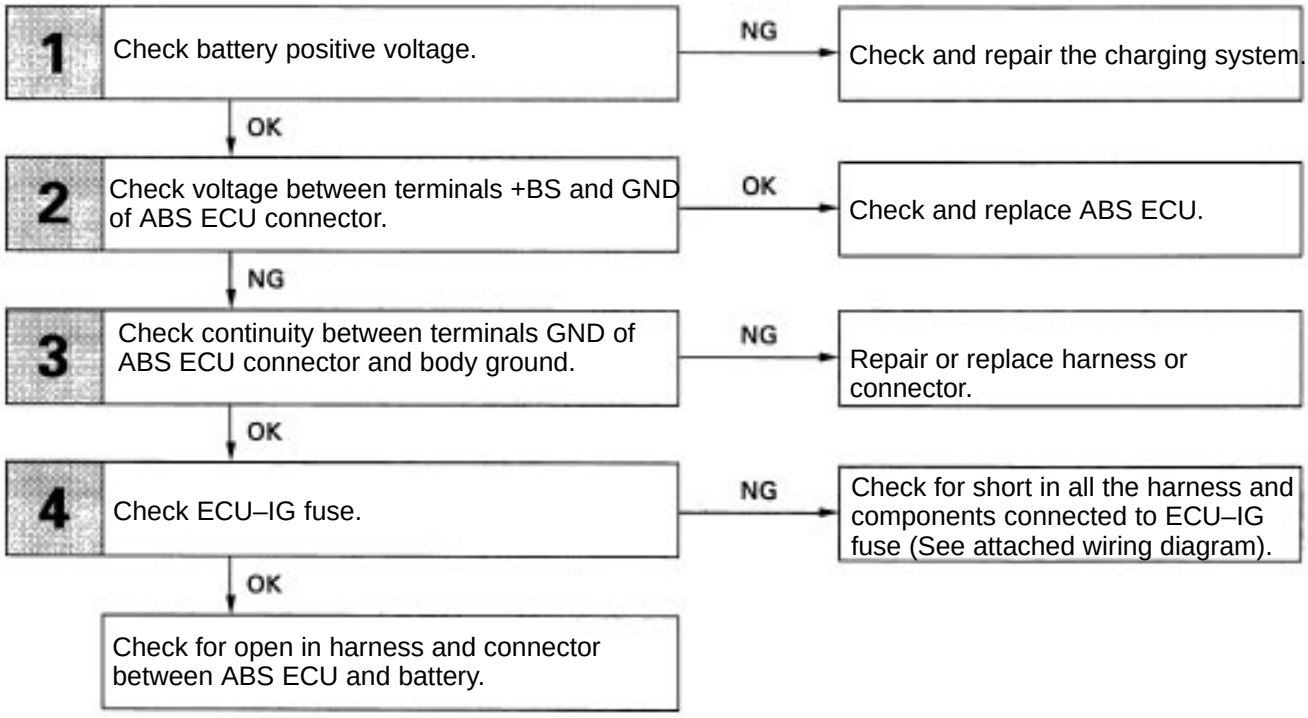
CIRCUIT DESCRIPTION

This is the power source for the ECU, hence the CPU, and the actuators.

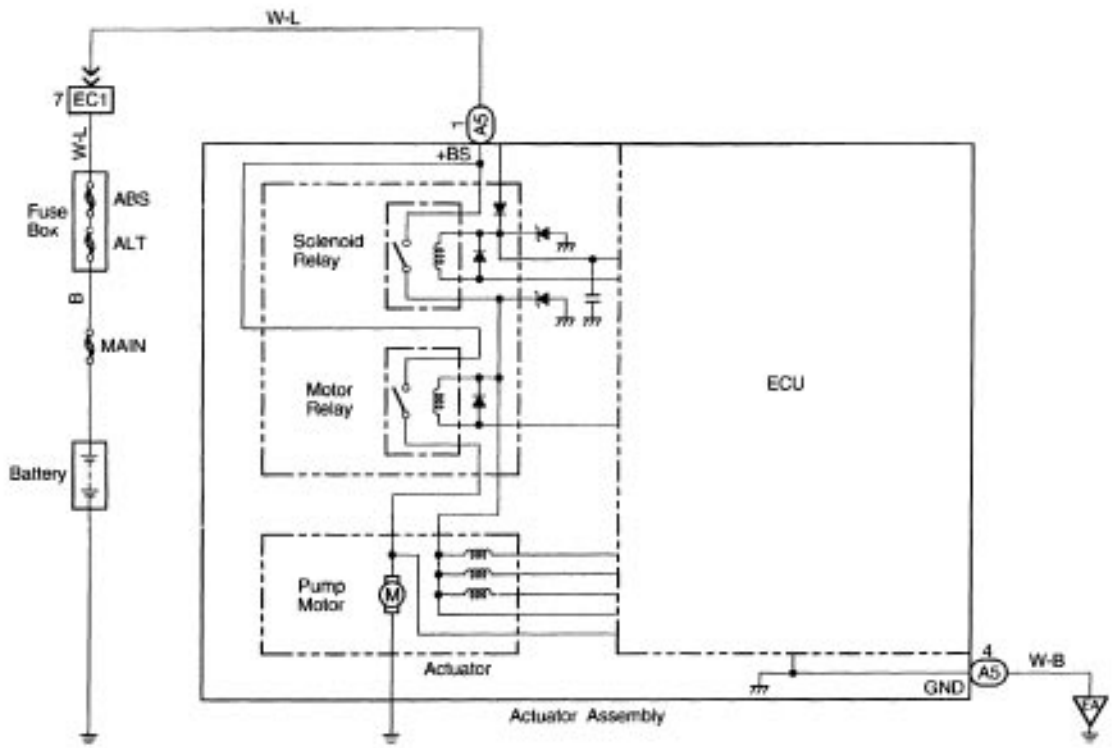
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
41	(1) Voltage of 5V or more, or 9.4V or less, is applied for at least 60 sec. to terminal +BS before the ABS primary check and ABS operation. (2) Voltage of 5V or more, or 9.4V or less, is applied to terminal +BS for 0.2 sec. or more, after the ABS primary check and before ABS operation. (3) During ABS operation, voltage of 5V or more, or 8.8V or less, is applied to terminal +BS for 0.2 sec. or more.	• Battery. • IC regulator. • Open or short in power source circuit. • ECU.

Fail safe function: If trouble occurs in the power source circuit, the ECU cuts off current to the ABS solenoid relay and prohibits ABS control.
If the voltage applied to terminal +BS becomes 9.9V or less, the warning light goes off and ABS control becomes possible.

DIAGNOSTIC CHART



WIRING DIAGRAM



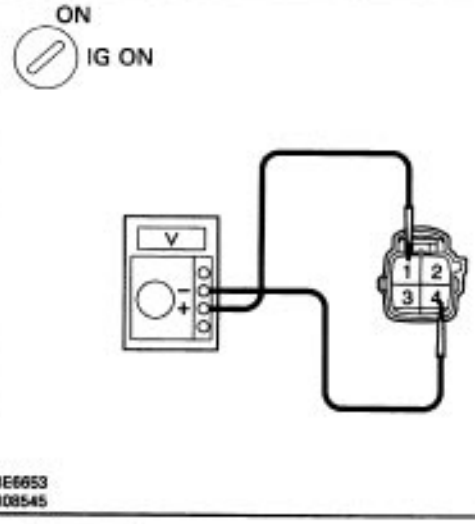
INSPECTION PROCEDURE

1 Check battery positive voltage.

OK **Voltage: 10–14 V**

OK → NG: **Check and repair the charging system.**

2 Check voltage between terminals +BS and GND of ABS ECU connector.



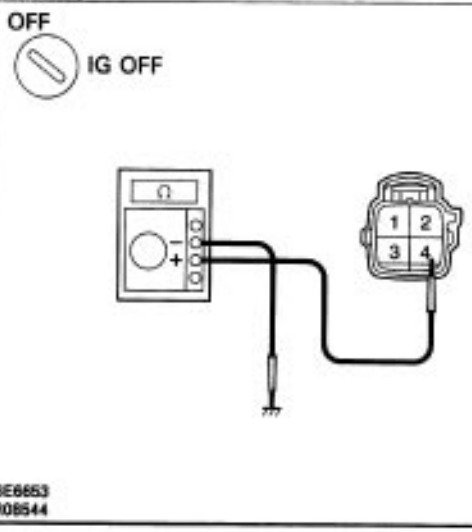
P Disconnect ABS ECU connector.

C
1. Turn ignition switch ON.
2. Measure voltage between terminals IG1 and GND of ABS ECU connector.

OK **Voltage: 10–14 V**

OK → NG: **Check and replace ABS ECU.**

3 Check continuity between terminal GND of ABS ECU connector and body ground.

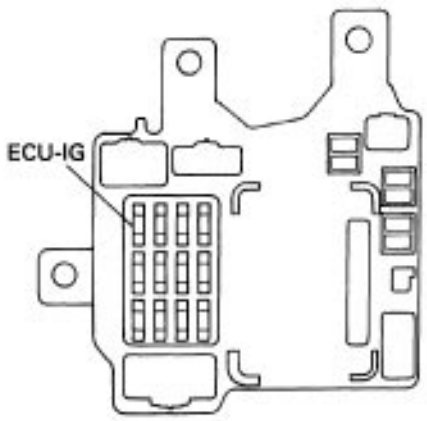


C Measure resistance between terminal GND of ABS ECU connector and body ground.

OK **Resistance: 1Ω or less**

OK → NG: **Repair or replace harness or connector.**

4 Check ECU–IG fuse.



P Remove ECU–IG fuse from J/B No. 1.

C Check continuity of ECU–IG fuse.

OK **Continuity**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–28).

NG

Check for short in. a1l the harness and components connected to ECU–IG fuse (See attached wiring diagram).

DTC 51 ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble area
51	Pump motor is not operating normally during initial check.	• ABS pump motor.

Fail safe function: If trouble occurs in the ABS pump motor, the ECU cuts off current to the solenoid relay and prohibits ABS control.

DIAGNOSTIC CHART

Check that the pump motor ground wire is installed correctly.
If it is OK, replace the ABS actuator assembly.

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

This stop light switch senses whether the brake pedal is depressed or released, and sends the signal to the ECU.

DIAGNOSTIC CHART

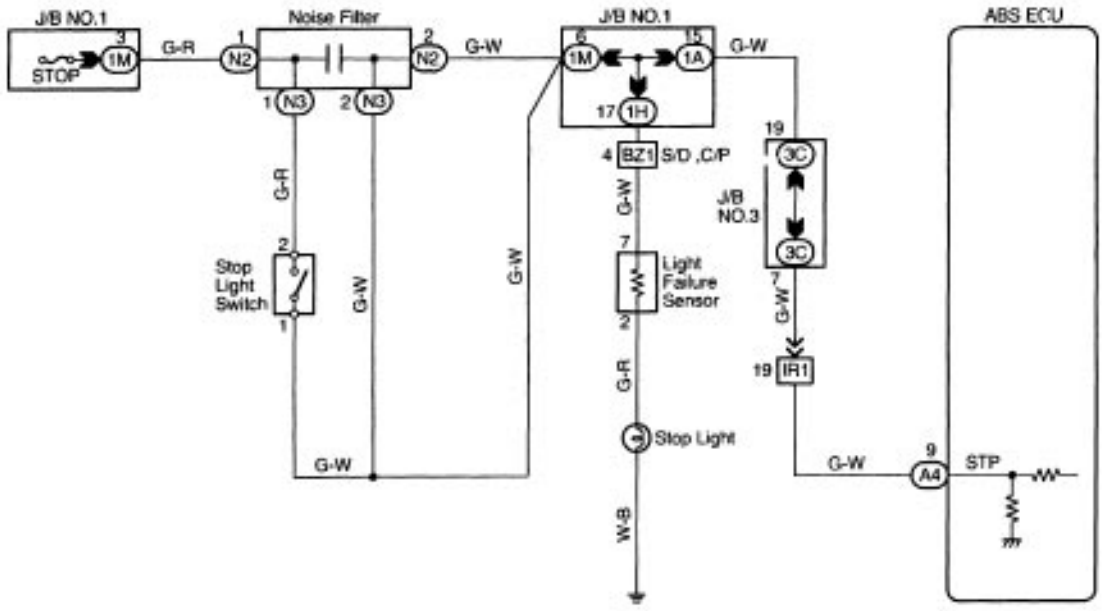
1 Check operation of stop light.
- NG → Repair stop light circuit (See page BE–65).
- OK ↓

2 Check voltage of terminal STP.
- OK → Proceed to next circuit inspection shown on problem symptoms chart (See page BR–148y.
- NG ↓

3 Check for open in harness and connector between ABS ECU and stop light switch (See page IN–27).
- NG → Repair–or replace harness or connector.
- OK ↓

Check and replace ABS ECU.

WIRING DIAGRAM



R08760

INSPECTION PROCEDURE

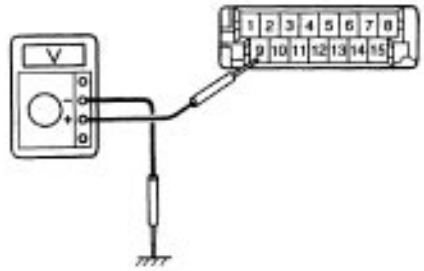
1 Check operation of stop light.

C Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

OK

NG → **Repair stop light circuit (See page BE–65).**

2 Check voltage between terminal STP of ABS ECU connector and body ground.



P Disconnect ABS ECU connector.

C Measure voltage between terminal STP and body ground.

OK **Voltage: 8–14 V**

NG

OK → **Proceed to next circuit inspection shown on problem symptoms chart (See page BR–148).**

3 Check for open in harness and connector between ABS ECU and stop light switch (See page IN–28).

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

ABS Warning Light Circuit

CIRCUIT DESCRIPTION

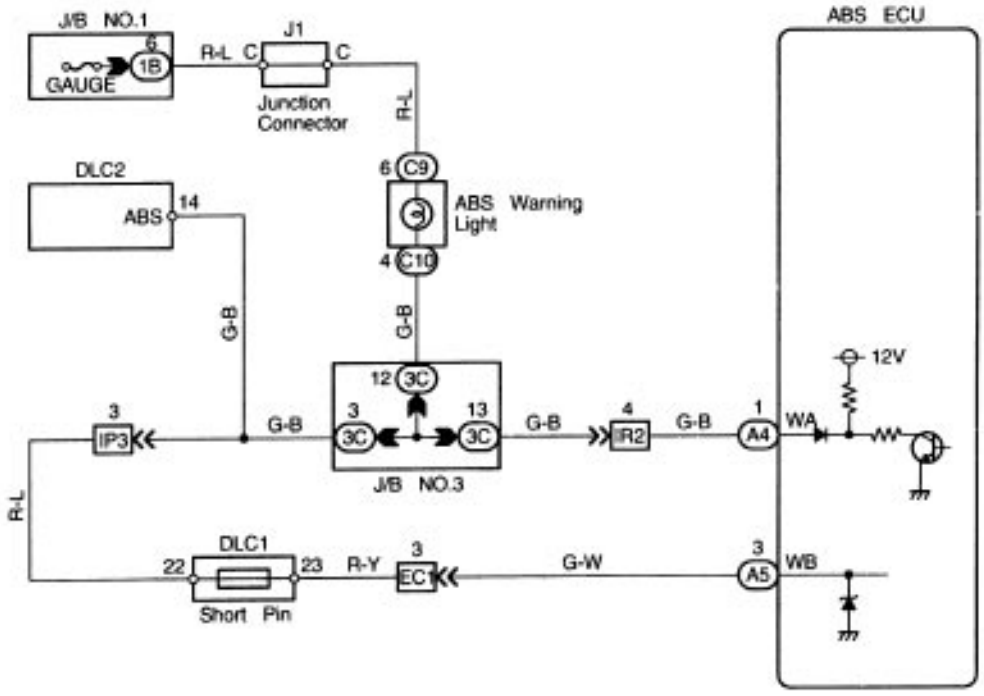
If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a diagnostic trouble code in memory.
Connect terminals Tc and E1 of the DLC1 or DLC2 to make the ABS warning light to blink and output the diagnostic trouble code.

DIAGNOSTIC CHART

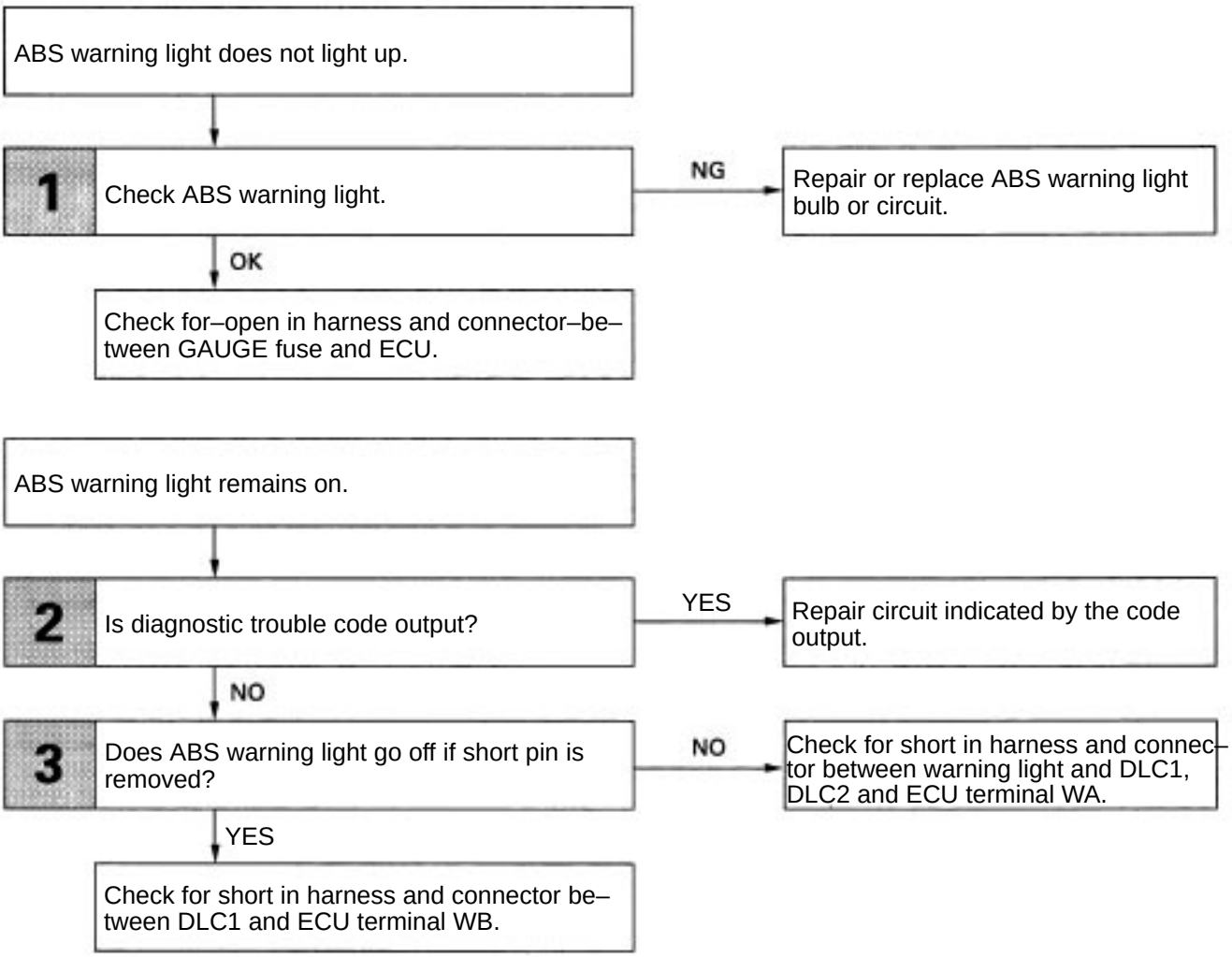
Perform troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 2

WIRING DIAGRAM



R08761


ABS warning light does not light up.
1
Check ABS warning light.
NG
Repair or replace ABS warning light bulb or circuit.
OK
Check for–open in harness and connector–between GAUGE fuse and ECU.
ABS warning light remains on.
2
Is diagnostic trouble code output?
YES
Repair circuit indicated by the code output.
NO
3
Does ABS warning light go off if short pin is removed?
NO
Check for short in harness and connector between warning light and DLC1, DLC2 and ECU terminal WA.
YES
Check for short in harness and connector between DLC1 and ECU terminal WB.

INSPECTION PROCEDURE

1 Check ABS warning light.

See Combination Meter–Troubleshooting on page BE–1 18.

OK → **Check for open in harness and connector between GAUGE fuse and ECU (See page IN–27).**

NG → **Replace bulb or combination meter assembly.**

2 Is diagnostic trouble code output?

Perform diagnostic trouble code check on page BR–143.

NO → **3 Does ABS warning light go off if short pin is removed?**

YES → **Check for short in harness and connector between DLC1 and ECU terminal WB (See page IN–27).**

NO → **Check for short in harness and connector between warning light and DLC1, DLC2 and ECU terminal WA (See page IN–28).**

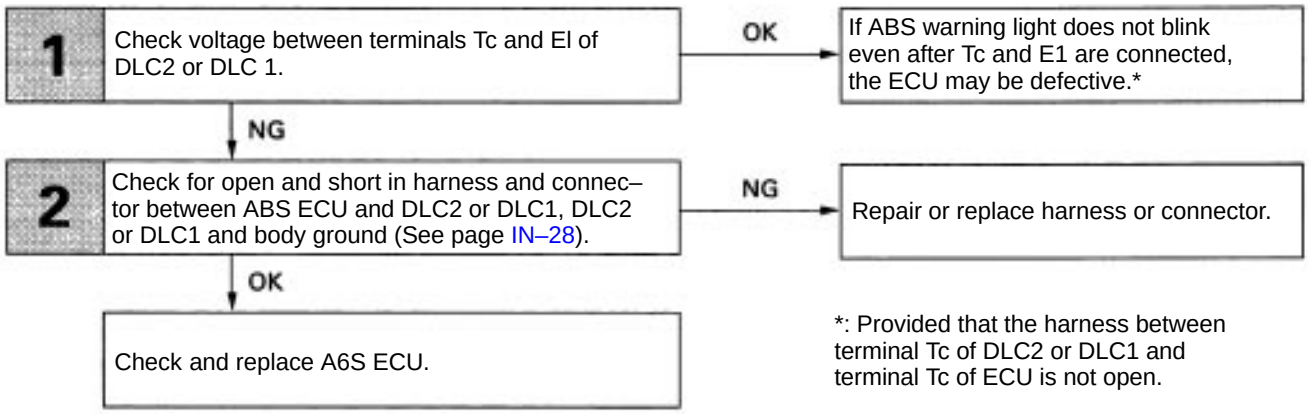
YES → **Repair circuit indicated by the code output.**

Terminal Circuit

CIRCUIT DESCRIPTION

Connecting terminals Te and E1 of the DLC1 or the DLC2 causes the ECU to display the diagnostic trouble code by flasing the ABS warning light.

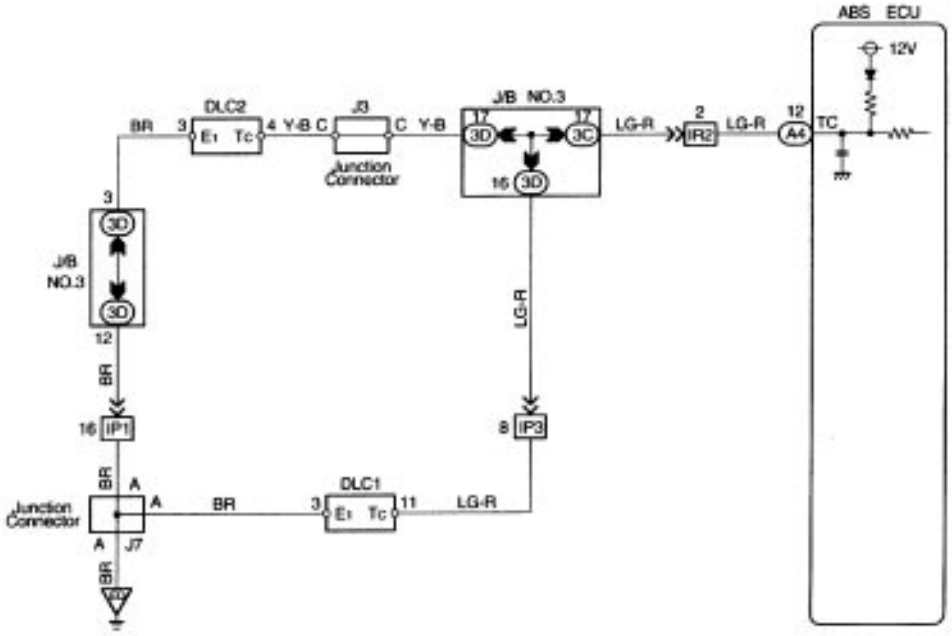
DIAGNOSTIC CHART



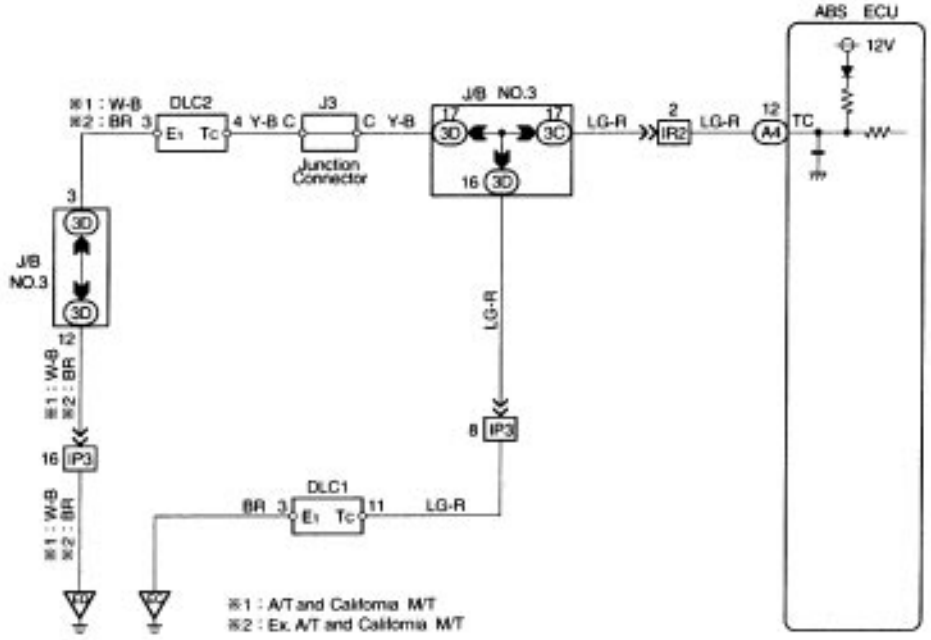
*: Provided that the harness between terminal Tc of DLC2 or DLC1 and terminal Tc of ECU is not open.

WIRING DIAGRAM

1 M^–FE:



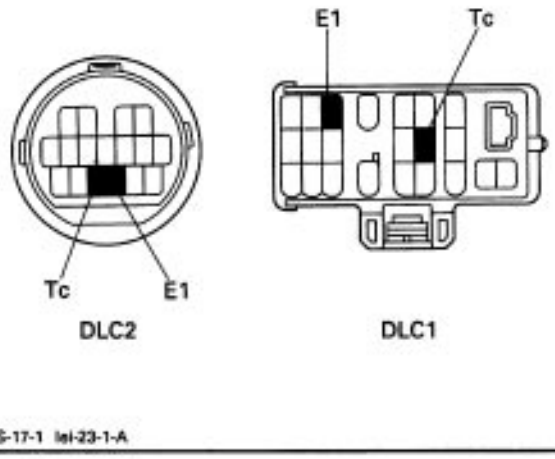
5S–FE:



R08762
R08763

INSPECTION PROCEDURE

1 **Check voltage between terminals Te and E1 of DLC2 or DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Tc and E1 of DLC2 or DLC1.

OK
Voltage: 10–14 V

NG

OK → **If ABS warning light does not blink even after Tc and E 1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC2 or DLC1, DLC2 or DLC1 and body ground (See page IN–28).**

OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Ts Terminal Circuit

CIRCUIT DESCRIPTION

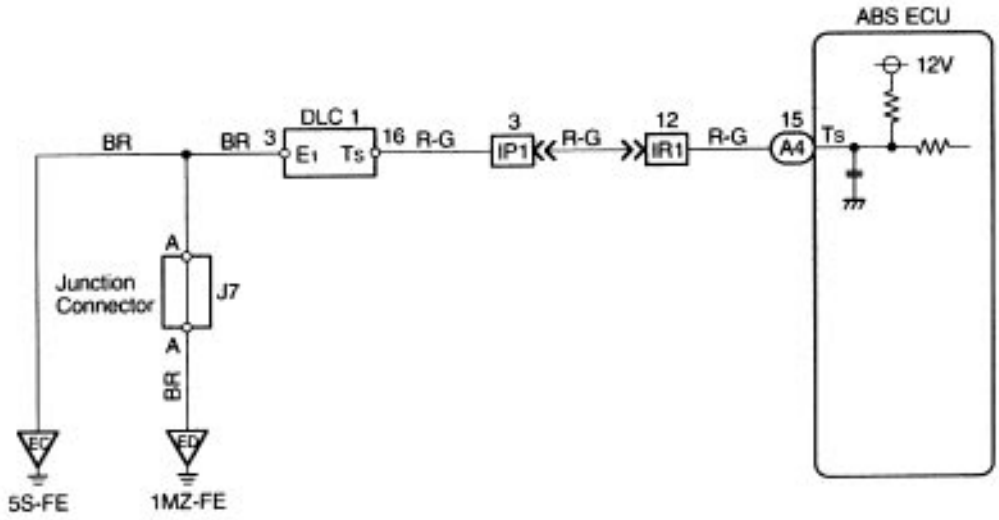
The sensor check circuit detects abnormalities in the speed sensor signal which can not be detected with the diagnostic trouble code check.
Connecting terminals Ts and E1 of the DLC1 in the engine compartment starts the check.

DIAGNOSTIC CHART

1. Check voltage between terminals Ts and E1 of DLC1.
   - OK → If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.
   - NG ↓
2. Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace ABS ECU.

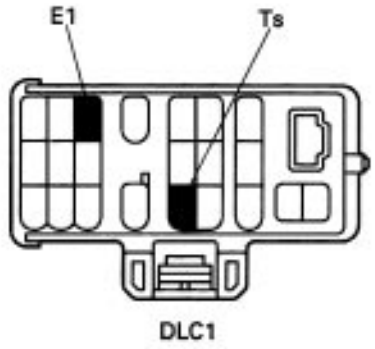
WIRING DIAGRAM



R08784

INSPECTION PROCEDURE

1 **Check voltage between terminals¿¿and E1 of DLC1.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals Ts and E1 of DLC 1.

OK **Voltage: 10–14 V**

NG

OK → **If ABS warning light does not blink even after Ts and E1 are connected, the ECU may be defective.**

2 **Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–28).**

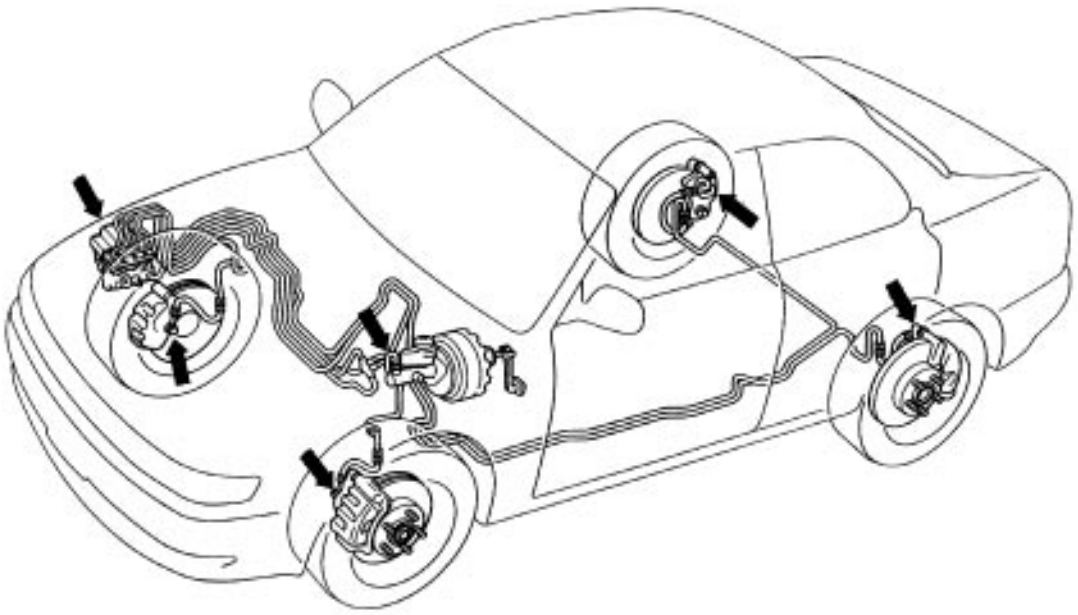
OK

NG → **Repair or replace harness or connector.**

Check and replace ABS ECU.

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



RO8882

SERVICE SPECIFICATIONS

SERVICE DATA

Brake pedal height (from asphalt sheet)		147.5 – 157.5 mm (5.81 – 6.20 in.)
Brake pedal freeplay		1 – 6 mm (0.04 – 0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than 70 mm (2.76 in.)
Brake booster push rod to piston clearance (w/SST)		0 mm (0 in.)
Front brake pad thickness (5S–FE engine)	STD	12.0 mm (0.472 in.)
Front brake pad thickness (5S–FE engine)	Limit	1.0 mm (0.039 in.)
Front brake pad thickness (1 MZ–FE engine)	STD	11.0 mm (0.433 in.)
Front brake pad thickness (1 MZ–FE engine)	Limit	1.0 mm (0.039 in.)
Front brake disc thickness	STD	28.0 mm (1.102 in.)
Front brake disc thickness	Limit	26.0 mm (1.024 in.)
Front brake disc runout	Limit	0.05 mm (0.0020 in.)
Rear brake drum inside diameter	STD	228.6 mm (9.000 in.)
Rear brake drum inside diameter	Limit	230.6 mm (9.079 in.)
Rear brake shoe lining thickness	STD	5.0 mm (0.197 in.)
Rear brake shoe lining thickness	Limit	1.0 mm (0.039 in.)
Rear brake drum to shoe clearance		0.6 mm (0.024 in.)
Rear brake pad thickness	STD	10.0 mm (0.394 in.)
Rear brake pad thickness	Limit	1.0 mm (0.039 in.)
Rear brake disc thickness	STD	10.0 mm (0.394 in.)
Rear brake disc thickness	Limit	9.0 mm (0.354 in.)
Rear brake disc runout	Limit	0.15 mm (0.0059 in.)
Rear brake disc inside diameter	STD	170 mm (6.69 in.)
Rear brake disc inside diameter	Limit	171 mm (6.73 in.)
Parking brake lining thickness for rear disc brake	STD	2.0 mm (0.079 in.)
Parking brake lining thickness for rear disc brake	Limit	1.0 mm (0.039 in.)
Parking brake lever travel at 196 N (20 kgf, 44 lbf)		5 – 8 clicks
Parking brake pedal travel at 294 N (30 kgf, 66 lbf)		3 – 6 clicks
Parking brake clearance between rear shoe and lever		Less than 0.35 mm (0.0138 in.)
Parking brake adjusting shim thickness for rear disc brake		0.3 mm (0.012 in.) 0.6 mm (0.024 in.) 0.9 mm (0.035 in.)

STEERING

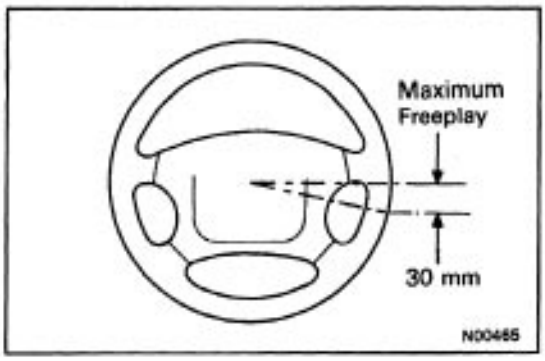
GENERAL DESCRIPTION

- **Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.**
- **The steering wheel pad has an airbag built in, so take all due precautions when handling it. For more details, see the SUPPLEMENTAL RESTRAINT SYSTEM (SRS) section.**

TROUBLESHOOTING

Use the table below to help you find the cause of the problem.
The numbers indicate the priority of the likely cause of the problem. Check each parts in order. If necessary, replace these parts.

See page / Parts Name / Trouble	Tires (improperly inflated)	Front wheel alignment (Incorrect)	Fluid level (Low)	Drive belt (Loose)	Steering system joints (Worn)	Suspension arm ball joints (Worn)	Steering column (Binding)	Sliding yoke (Worn)	Steering gear housing	Front wheel bearing (Worn)
See page	SA–4	SA–4	SR–24	SR–24		SA–63, 72				SA–10
Hard steering	1	4	2	3	5	6	7		8	
Poor return	1	2					3		4	
Excessive play					1	2		3	5	4
Abnormal noise			1		2				3	



ON–VEHICLE INSPECTION

CHECK THAT STEERING WHEEL FREEPLAY IS COR–RECT

With the vehicle stopped and tires pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

Freeplay should not exceed the maximum.

Maximum freeplay:

30 mm (1.18 In.)

If incorrect, repair.

STEERING COLUMN

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09213–31021 Crankshaft Pulley Puller	Steering wheel
	09612–22011 Tilt Handle Bearing Replacer	
	09309–37010 Transmission Bearing Replacer	
	09236–00101 Water Pump Overhaul Tool Set	
	(09237–00010) Water Pump Bearing Remover & Replacer	

RECOMMENDED TOOLS

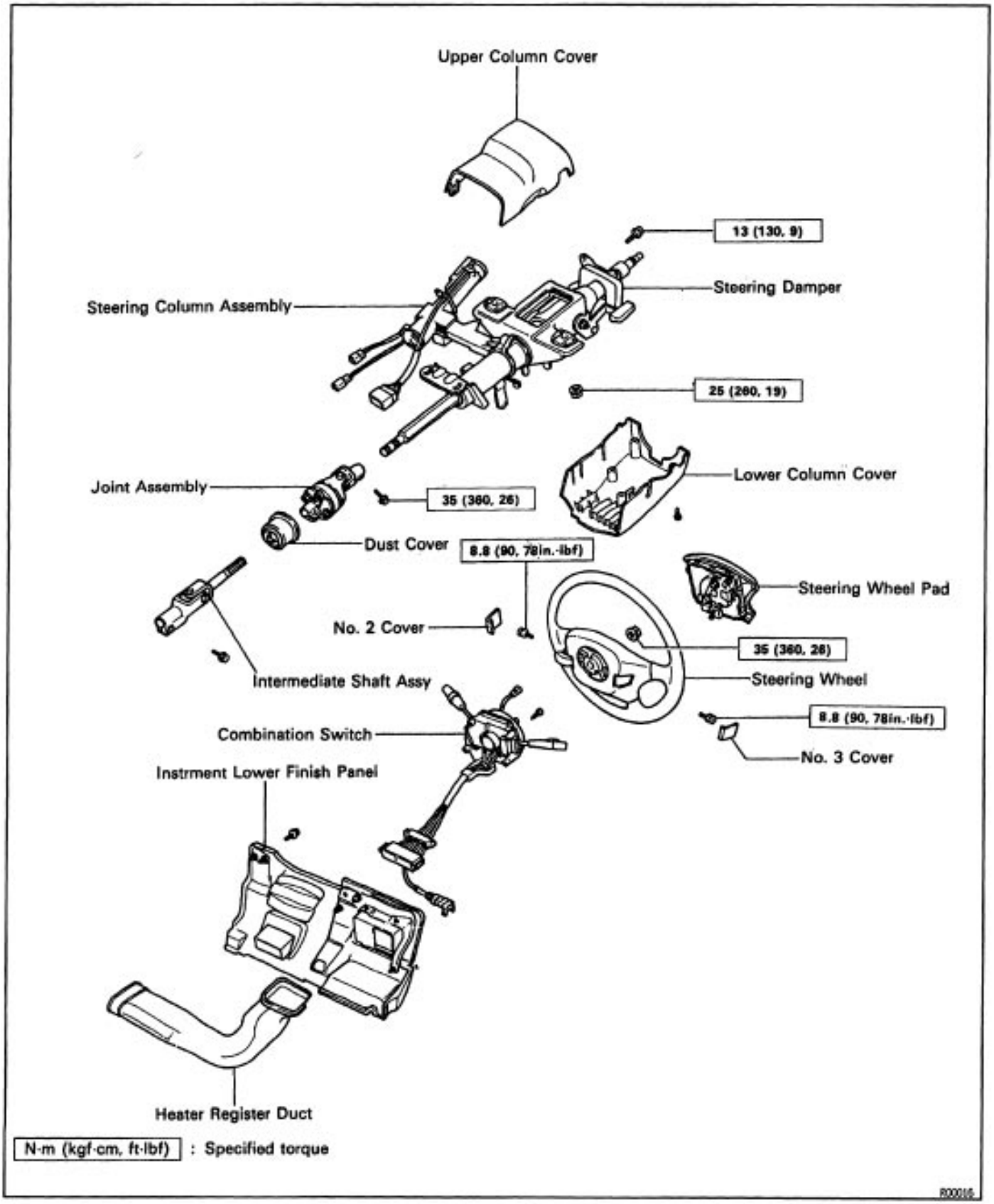
	09042–00010 Torx Socket T30	Steering wheel pad
	09904–00010 Expander Set	
	(09904–00050) No. 4 Claw	

EQUIPMENT

Torque wrench	

ASSEMBLY REMOVAL AND INSTALLATION

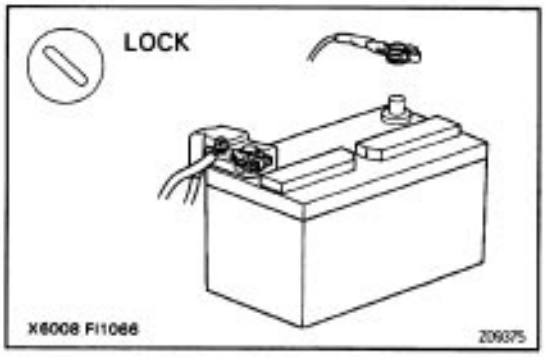
Remove and install the parts, as shown.



MAIN POINTS OF REMOVAL AND INSTALLATION

NOTICE:

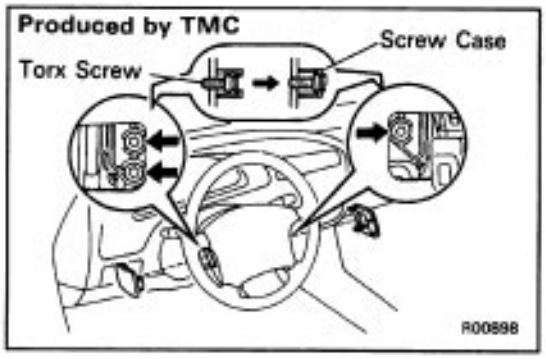
- **If the SRS (Supplemental Restraint System) connec–tor is disconnected with the ignition switch at ON or ACC, diagnostic trouble codes will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace with new parts.**



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is discon–nected from the battery.

(See RS section)



2. REMOVE STEERING WHEEL PAD

(a) Place the front wheels facing straight ahead.

(b) Remove the No.2 and No.3 covers.

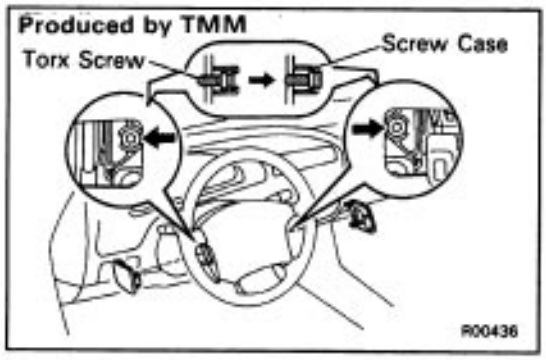
(c) Using a torx wrench, loosen the screws.

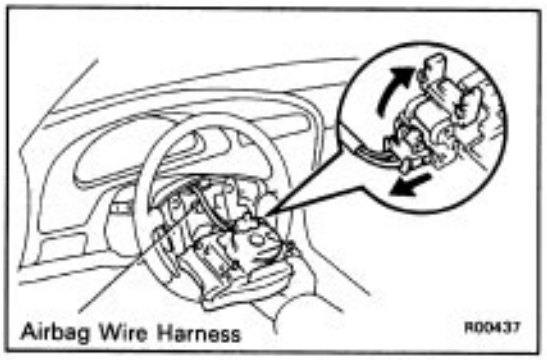
Produced by TMC: 3 screws

Produced by TMM: 2 screws

Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)

HINT: Loosen the torx screws until groove along the screw circumference catches on the screw case.



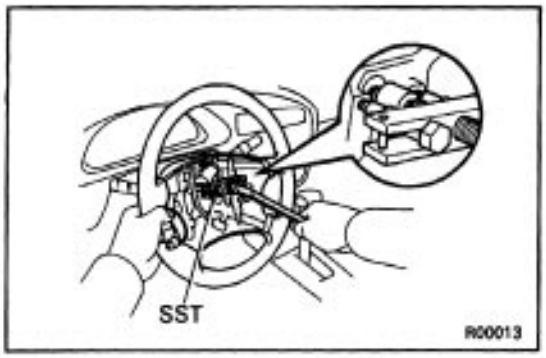


(d) Pull the wheel pad out from the steering wheel and disconnect the SRS connector.

NOTICE: When removing the wheel pad, take care not to pull the airbag wire harness.

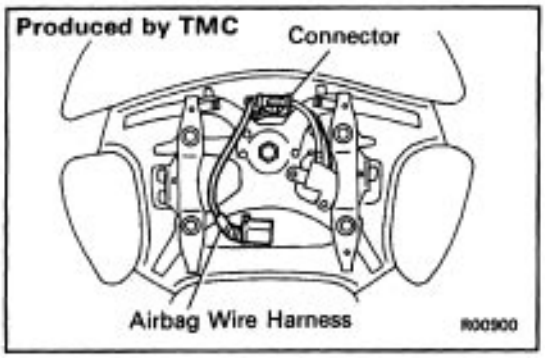
CAUTION:

- **When storing the wheel pad, keep the upper surface of the pad facing upward.**
- **Never disassemble the wheel pad.**



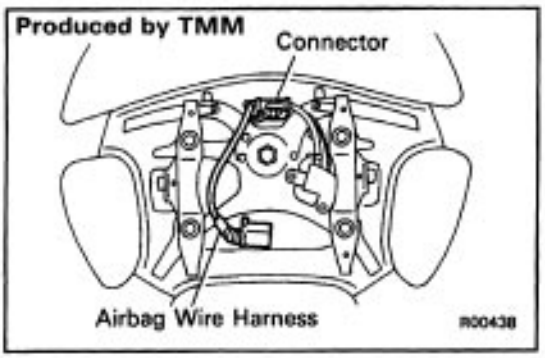
3. REMOVE STEERING WHEEL

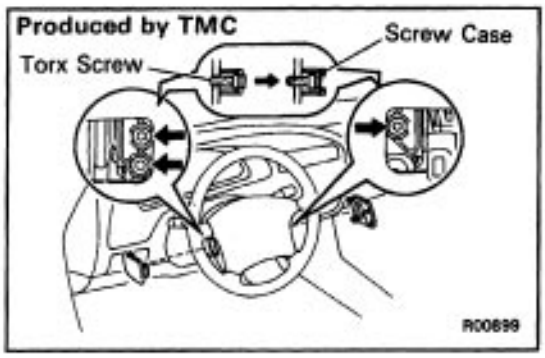
(a) Disconnect the connector.
(b) Remove the set nut.
(c) Place matchmarks on the steering wheel and main shaft.
(d) Using SST, remove the steering wheel.
SST 09213–31021



4. INSTALL STEERING WHEEL

(a) Align matchmarks on the steering wheel and main shaft, and install the wheel to the shaft.
(b) Tighten the wheel set nut.
Torque: 35 N–m (360 kgf–cm, 26 ft–lbf)
(c) Connect the connector.

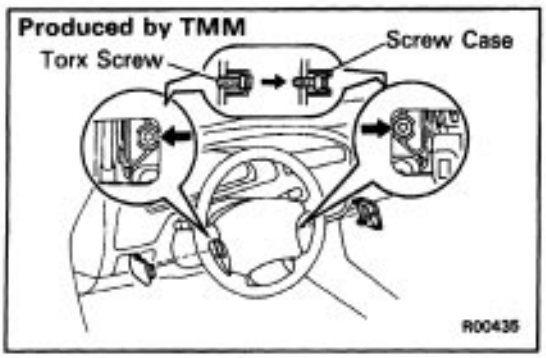




5. INSTALL STEERING WHEEL PAD

(a) Connect the SRS connector.
(b) Install the wheel pad after confirming that the circum–ference groove of the torx screws is caught on the screw case.
(c) Using a torx wrench, tighten the screws.
Produced by TMC: 3 screws
Produced by TMM: 2 screws
Torque: 8.8 N–m (90 kgf–cm, 78 in–lbf)
NOTICE:

- **Make sure the wheel pad is installed to the specified torque.**
- **If the wheel pad has been dropped, or there are cracks, dents or other defects in the case or connec–tor, replace the wheel pad with a new one.**
- **When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**



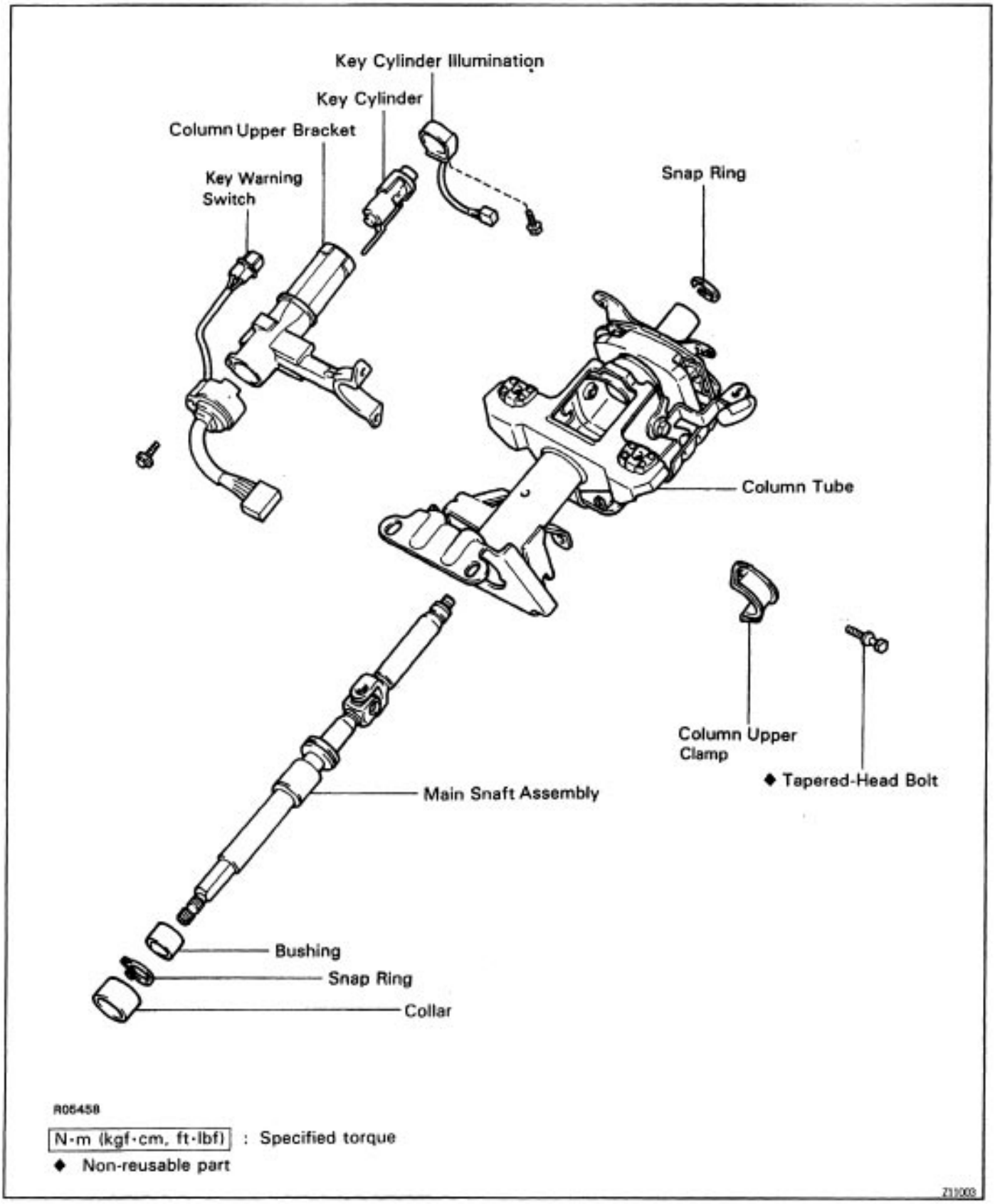
(d) Install the No.2 and No.3 covers.

6. CHECK STEERING WHEEL CENTER POINT AFTER INSTALLING STEERING COLUMN

7. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

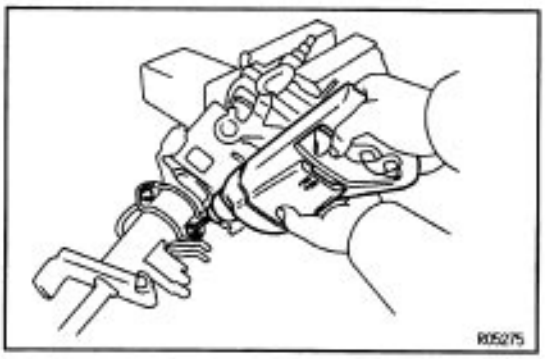
STEERING COLUMN

COMPONENTS



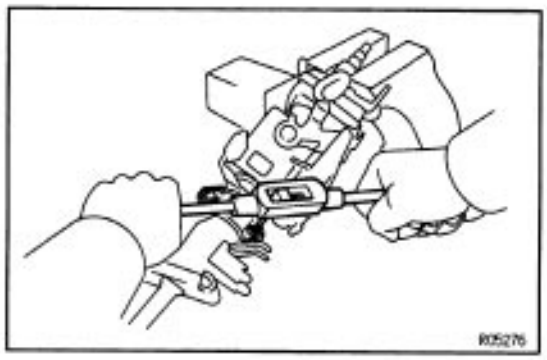
STEERING COLUMN DISASSEMBLY

1. REMOVE IGNITION KEY CYLINDER ILLUMINATION

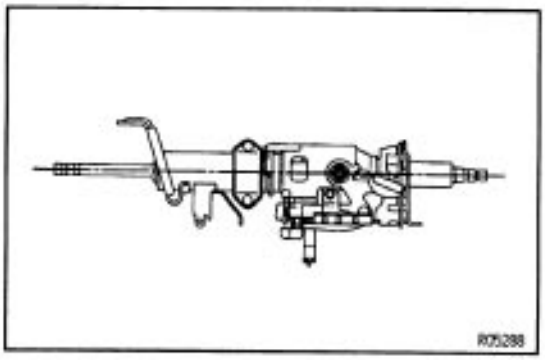


2. REMOVE COLUMN UPPER BRACKET

(a) Using a centering punch, mark the center of the 2 tapered–head bolts.
(b) Using a 3–4 mm (0.12–0.16 in.) drill, drill into the 2 tapered–head bolts.



(c) Using a screw extractor, remove the 2 tapered–head bolts.
(d) Remove the column upper clamp bracket and the column tube.

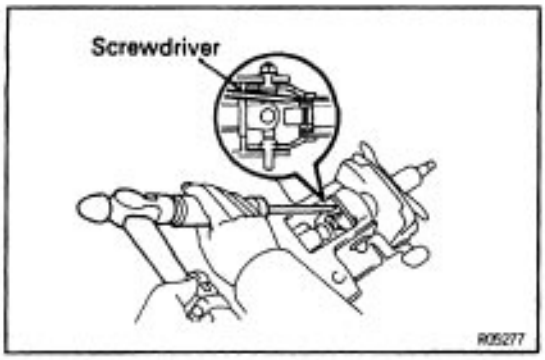


3. ALIGN STEERING COLUMN

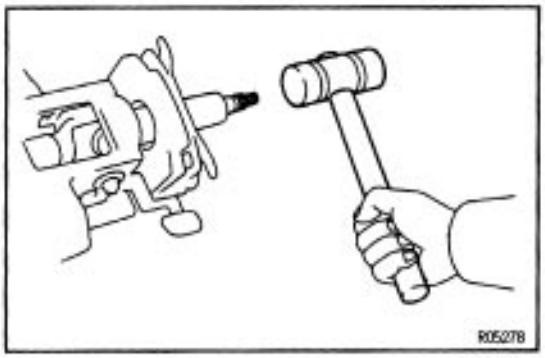
Align the upper column tube and lower column tube.

4. REMOVE MAIN SHAFT

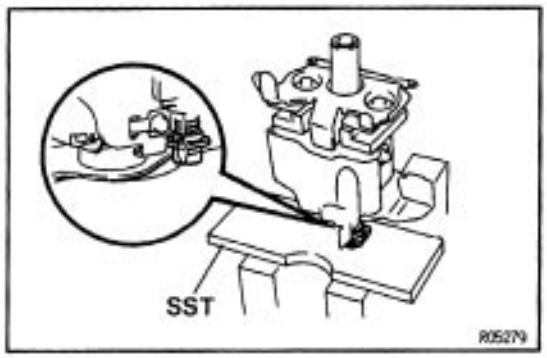
(a) Using snap ring pliers, remove the snap ring.



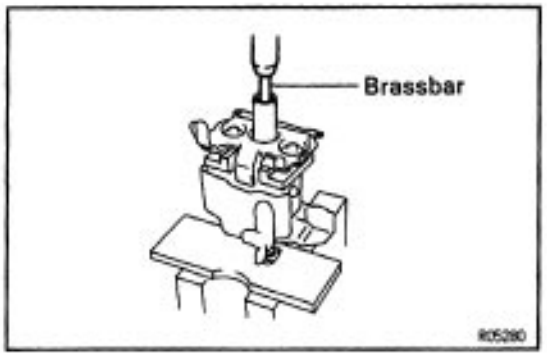
(b) Using a screwdriver, loosen the staked parts of the upper column tube.



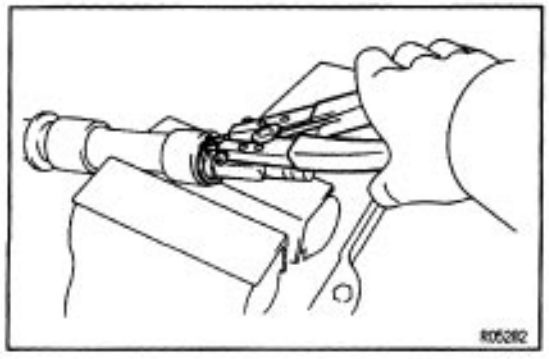
(c) Using a plastic hammer, tap the main shaft until the main stopper contacts the collar.



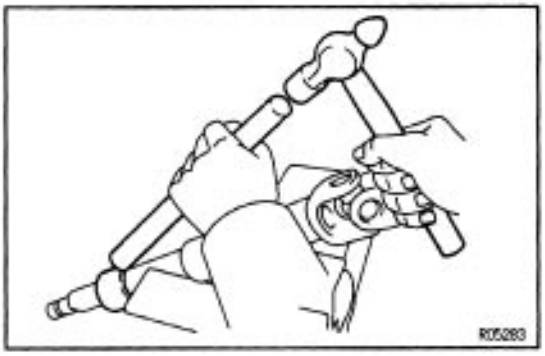
(d) Using SST, set the steering column on a press, as shown.
SST 09236 –00101 (09237–00010)



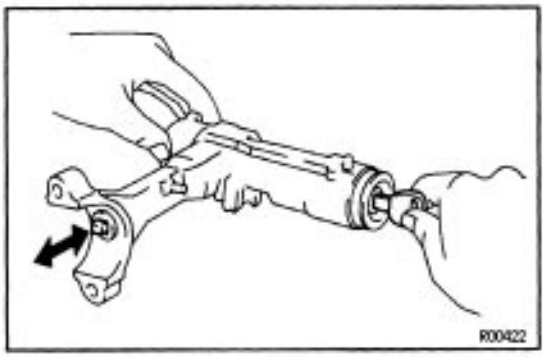
(e) Using a brass bar, press out the main shaft.
NOTICE: To prevent damage to the main shaft avoid dropping it.



5. REMOVE MAIN SHAFT COLLAR AND BUSHING
(a) Remove the collar from the main shaft.
(b) Using snap ring pliers, remove the snap ring.



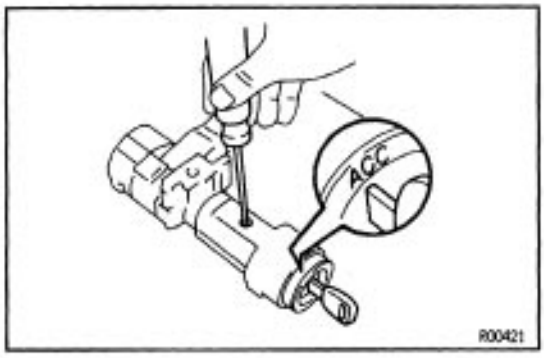
(c) Using a brassbar, tap the bushing off the main shaft.



STEERING COLUMN INSPECTION AND REPLACEMENT

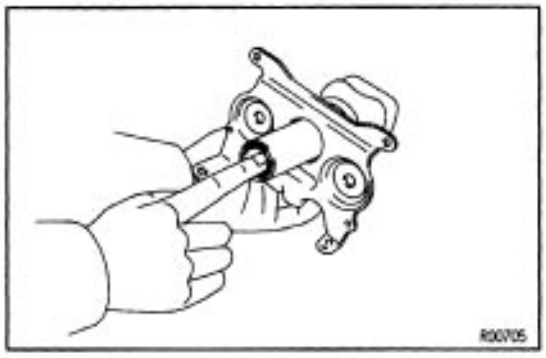
1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates pro–perly.



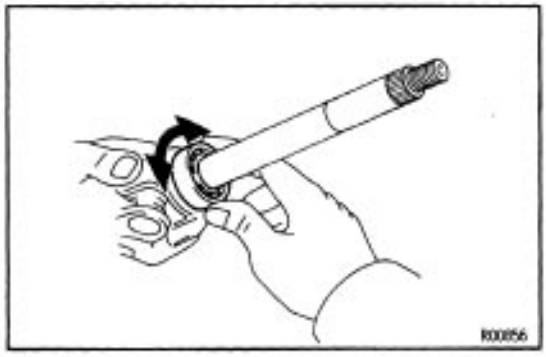
2. IF NECESSARY, REPLACE KEY CYLINDER

(a) Place the ignition key at the ACC position.
(b) Push down the stop pin with a thin rod, and pull out the key cylinder.
(c) Make sure the ignition key is at the ACC position.
(d) Install a new key cylinder.



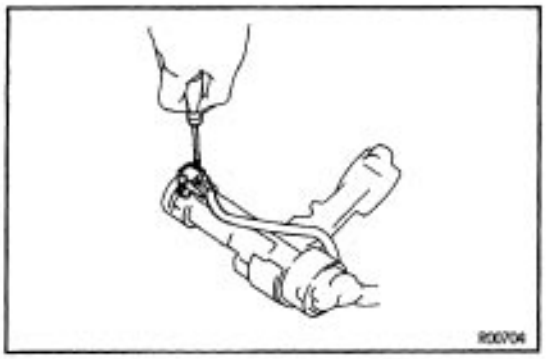
3. INSPECT UPPER BEARING

Check the upper bearing condition by manually turn–ing the load bearing surface inside the column tube. If there is resistance to turning, or an uneven force is required to turn the bearing surface, replace the column tube.

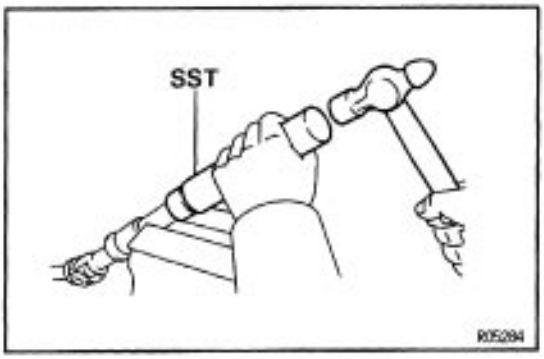


4. INSPECT LOWER BEARING

Check the lower bearing condition by manually turn–ing the load bearing surface outside the main shaft. If there is resistance to turning, or an uneven force is required to turn the bearing surface, replace the main shaft.

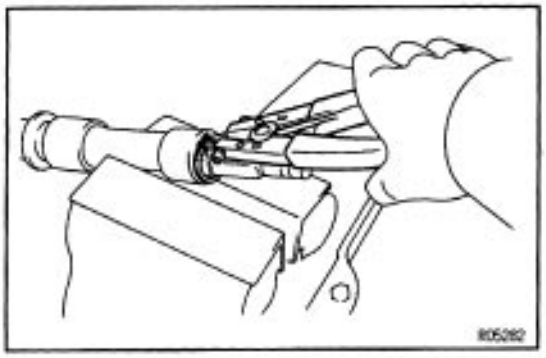


5. (A/T)
INSPECT KEY INTERLOCK SOLENOID
(See AX section)
6. (A/T)
IF NECESSARY, REPLACE KEY INTERLOCK SOLE–NOID
(a) Remove the 2 screws and the solenoid.
(b) Install a new solenoid with the 2 screws.

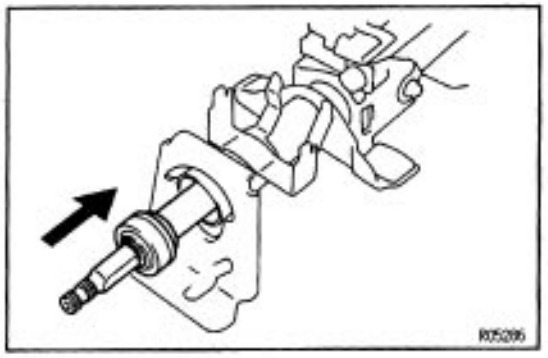


STEERING COLUMN ASSEMBLY

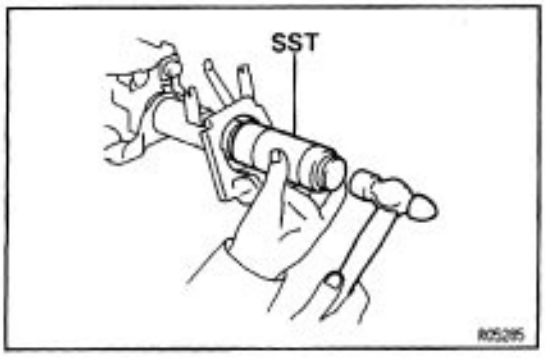
1. COAT ALL RUBBING PARTS WITH MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE
2. INSTALL MAIN SHAFT BUSHING AND COLLAR
(a) Using SST, tap the bushing onto the main shaft.
SST 09612–22011



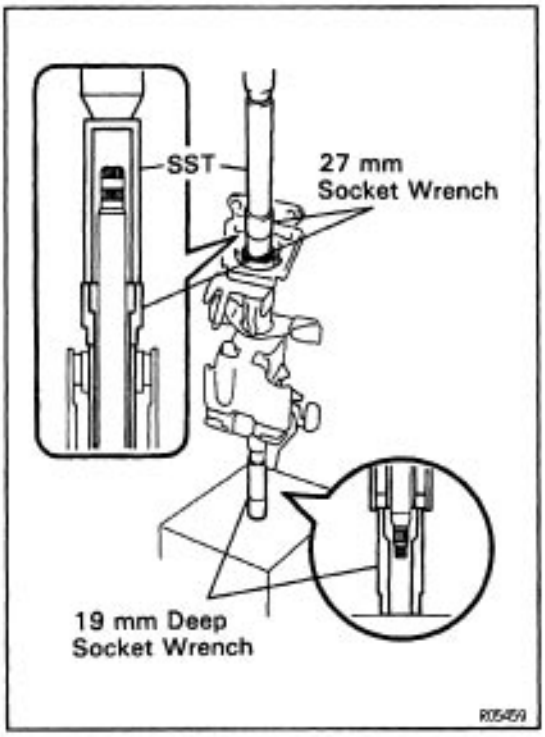
(b) Using snap ring pliers, install the snap ring.
(c) Install the collar on the bushing.



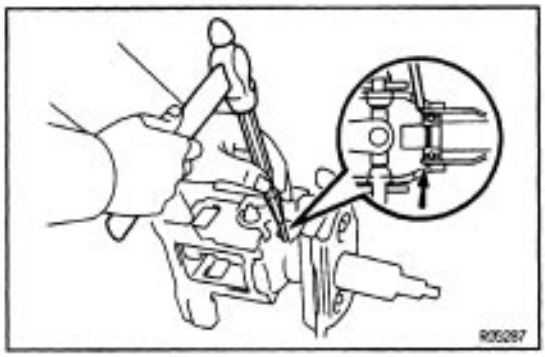
(d) Insert the main shaft in the column tube.



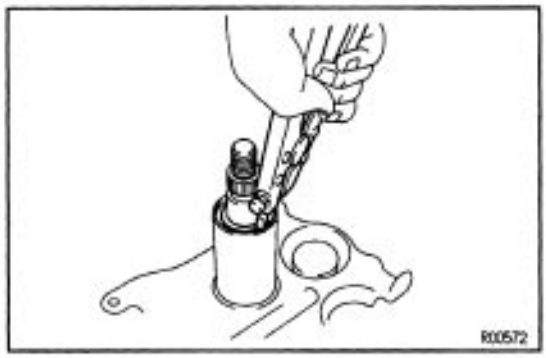
(e) Using SST, tap in the collar to the column tube.
SST 09309–37010



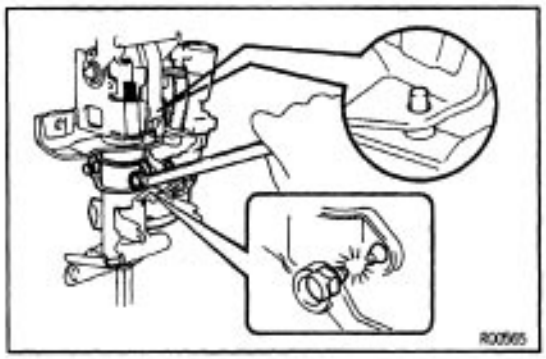
(f) Using SST, a 27 mm socket wrench (insert extension bar into the socket 19 mm) and a 19mm deep socket wrench, press in the main shaft.
SST 09612 – 22011



(g) Using a pin punch and hammer, stake the upper column tube.



(h) Using snap ring pliers, install the snap ring.



3. INSTALL UPPER BRACKET
(a) Install the upper bracket with 2 new tapered–head bolts.
(b) Tighten the 2 tapered–head bolts until the bolt head breaks off.
4. INSTALL IGNITION KEY CYLINDER ILLUMINATION

POWER STEERING

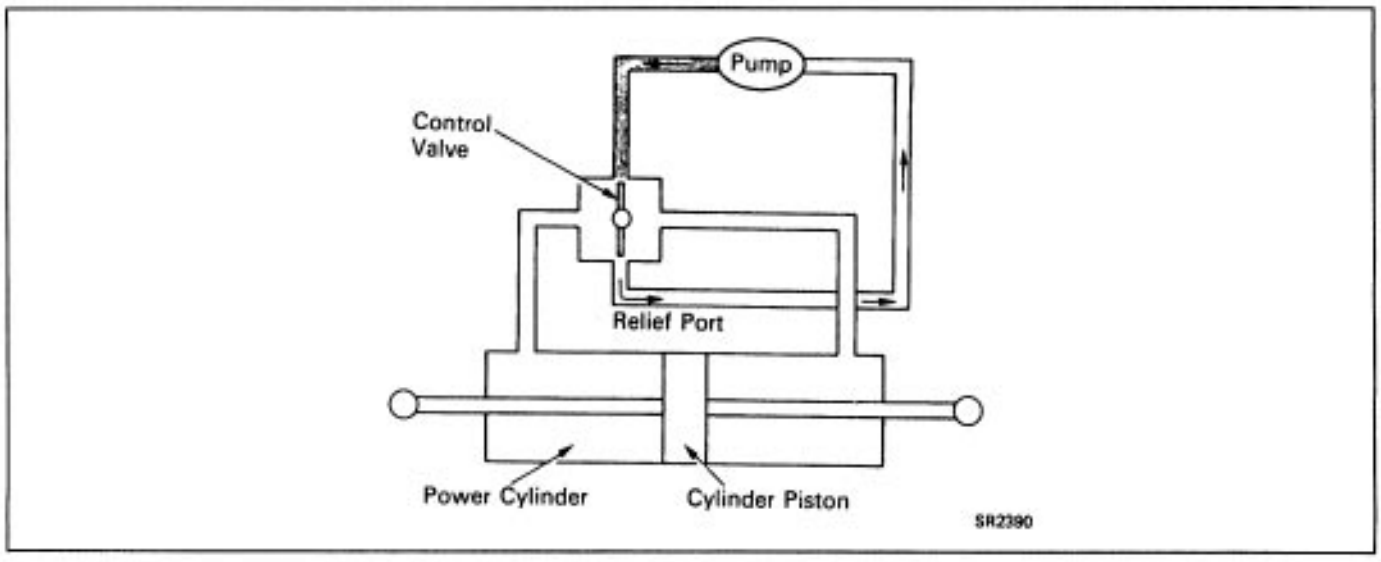
DESCRIPTION

POWER STEERING PRINCIPLES

Power steering is a hydraulic device which utilizes engine power to reduce steering effort. Consequently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the power cylinder so that the piston assists the rack effort. The amount of this assistance depends on the extent of pressure acting on the piston. Therefore, if more steering force is required, the pressure must be raised. The variation in the fluid pressure is accomplished by a control valve which is linked to the steering main shaft.

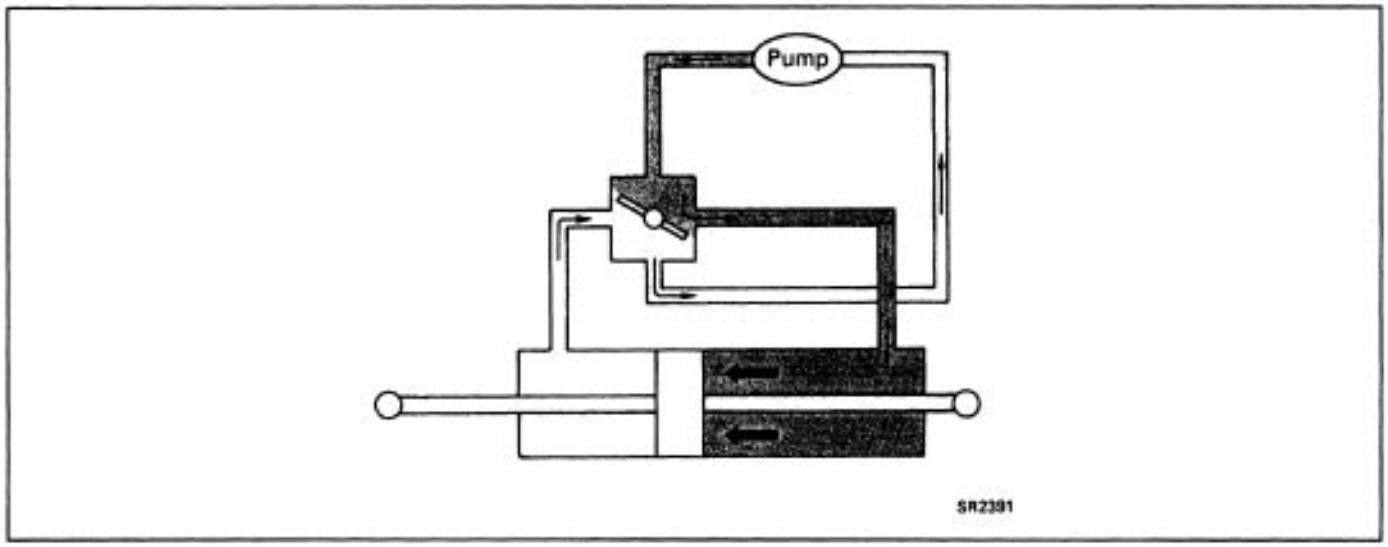
NEUTRAL (STRAIGHT–AHEAD) POSITION

Fluid from the pump is sent to the control valve. If the control valve is in the neutral position, all the fluid will flow through the control valve into the relief port and back to the pump. At this time, hardly any pressure is created and because the pressure on the cylinder piston is equal on both sides, the piston will not move in either direction.



WHEN TURNING

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages. The other passage then opens wider, causing a change in fluid flow volume and, at the same time, a differential pressure is created between both sides of the piston. Consequently, the piston moves in the direction of the lower pressure so that the fluid in the cylinder is forced back to the pump through the control valve.



SERVICE HINT

Trouble with the power steering system usually involves hard steering resulting from lack of assistance. In such cases, before attempting to make repairs, you should determine whether the trouble lies with the pump or with the gear housing. To do this, use a pressure gauge to perform an on–vehicle inspection.

(1MZ – FE Engine)

This model is fitted with a hydraulic cooling fan system which is driven by the power steering flu,id. Accordingly, when inspecting the power steering system, you should also inspect the fluid passages of the hydraulic cooling fan system.

ON–VEHICLE INSPECTION

Power steering is a hydraulic device and problems are normally due to insufficient fluid pressure acting on the piston. This could be caused by either the pump not producing the specified fluid pressure or the control valve in the gear housing not functioning properly so that the proper fluid pressure can not be obtained.

If the fault lies with the pump, the same symptoms will generally occur whether the steering wheel is turned fully to the right or left. On the other hand, if the fault lies with the control valve, there will generally be a difference between the amount of assistance when the steering wheel is turned to the left and right, causing harder steering. However, if the piston seal of the power cylinder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and the symptoms will be the same for both.

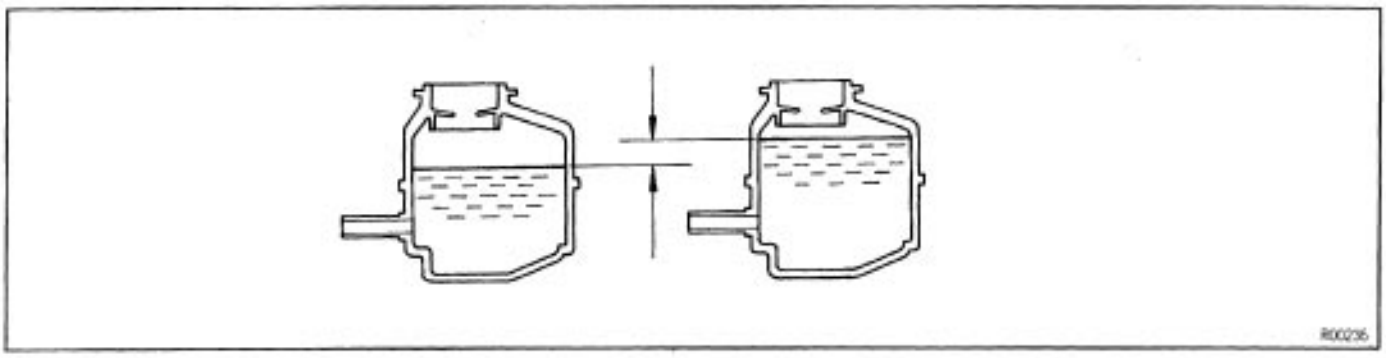
Before performing an on–vehicle inspection, a check must first be made to confirm that the

power steering system is completely free of any air. If there is any air in the system, the volume of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly. To determine if there is any air in the system, check if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left.

If there is air in the system, it will be compressed to a smaller volume when the steering wheel is turned, causing a considerable drop in the fluid level. If the system is free of air, there will be very little change in the level even when the fluid pressure is raised. This is because the fluid, being a liquid, does not change volume when compressed. The small change in the fluid level is due to expansion of the hoses between the pump and gear housing when pressure rises.

Also, air in the system sometimes causes abnormal noise in the pump or gear housing when the steering wheel is fully turned in either direction.

This on–vehicle inspection must be performed every time after overhauling or repairing the pump or gear housing to ensure that the power steering system is working properly.

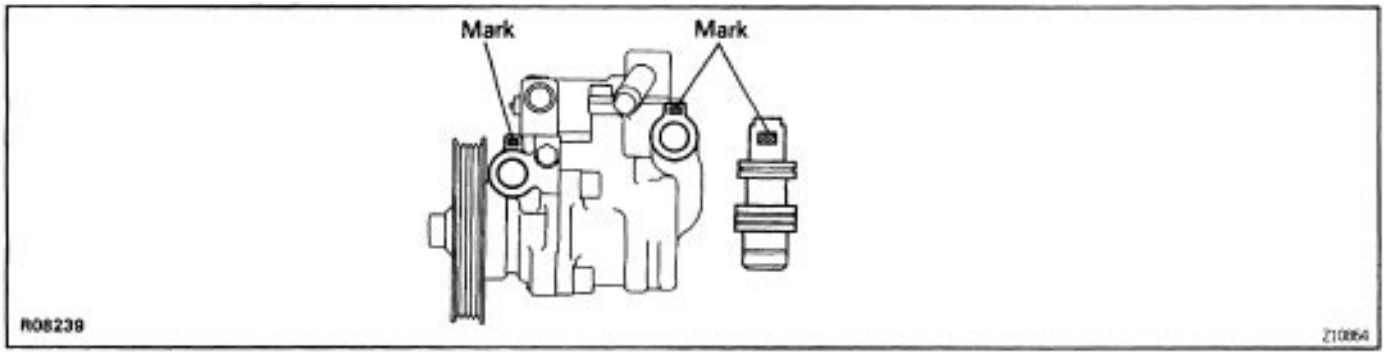


VANE PUMP

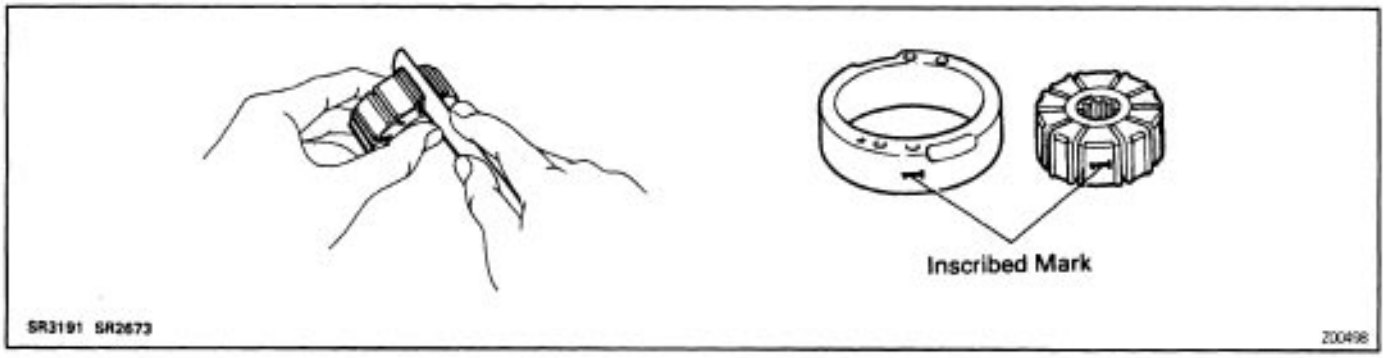
The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow control valve are high precision parts and must be handled carefully. Also, because this pump produces a very high fluid pressure, 0–rings are used for sealing each part. When reassembling the pump, always use new 0 – rings.

In the flow control valve, there is a relief valve which controls the maximum pressure of the pump. The amount of this maximum pressure is very important; if it is too low, there will be insufficient power steering assistance and if too high, it will have an adverse effect on the pressure hoses, oil seals, etc. If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly.

The clearance between the flow control valve and pump body installation hole is very important. After manufacture, the factory measures the size of the installation hole and outer circumference of the flow control valve, and punches a mark accordingly. Therefore, when replacing the flow control valve, be sure to do so with one having the same mark in order to ensure the proper clearance.

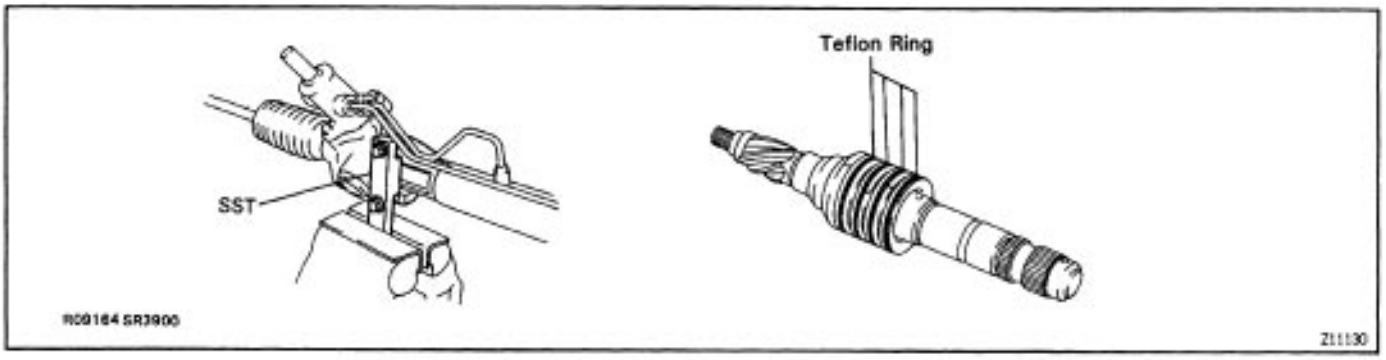


The functional parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked for wear. If the clearance between each is not within standard when reassembling, any worn parts should be replaced.
In this case, the replaced cam ring and rotor should be of the same length (have the same mark), and the vanes should be replaced with those having a length corresponding to that mark, otherwise the proper thrust clearance cannot be obtained. If there is too much thrust clearance, there will be insufficient fluid pressure at low speeds. If there is too little thrust clearance, it may result in seizure of the vanes.



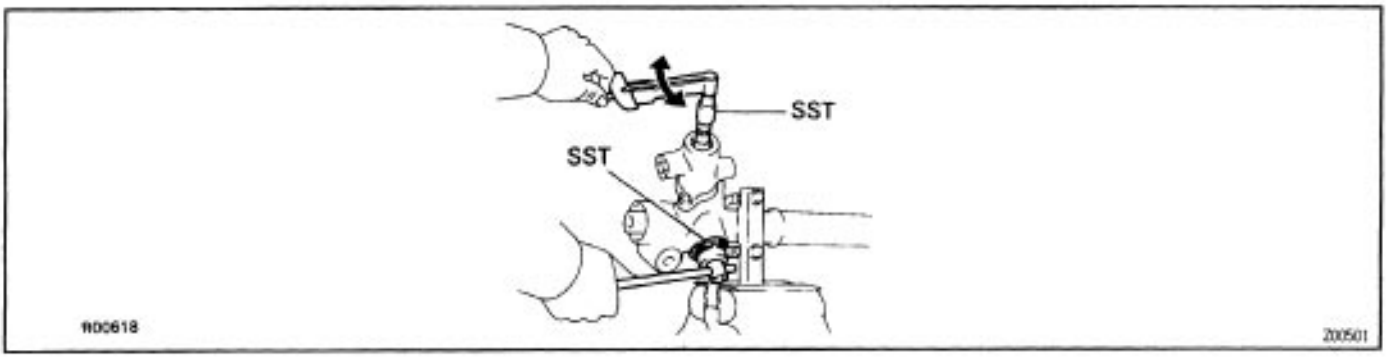
GEAR HOUSING

If the gear housing is secured directly in a vise during overhaul, there is danger of deforming it, so always first secure it in the SST provided (rack and pinion steering rack housing stand) before placing it in the vise.



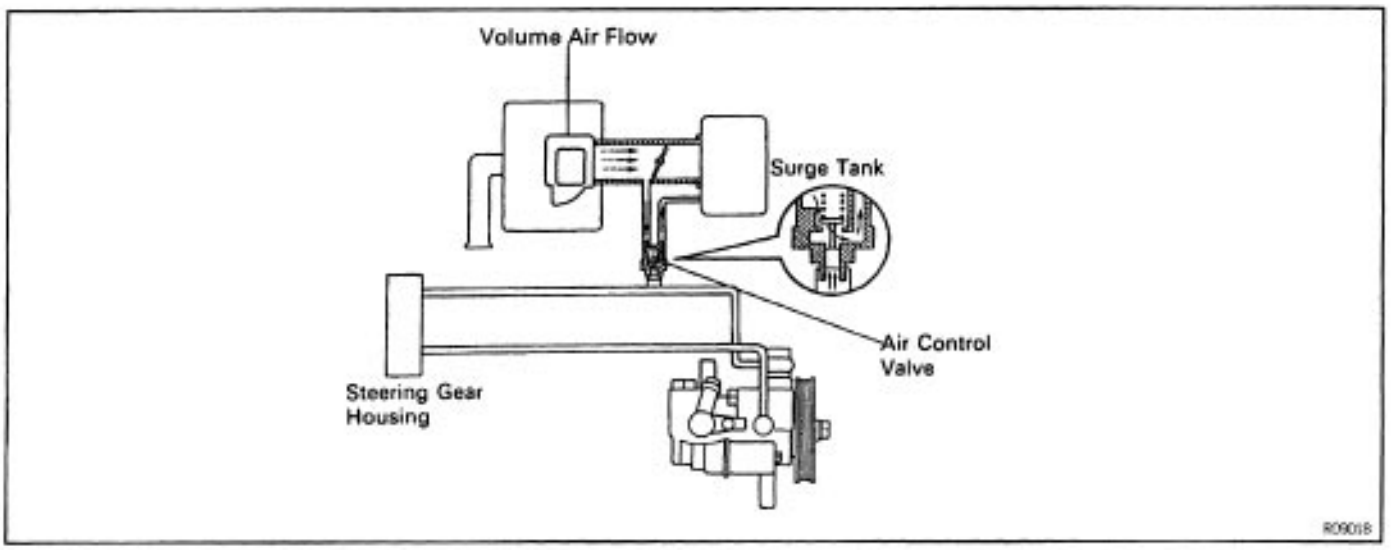
The oil seals on both sides of the power cylinder are for the prevention of leakage of the high pressure fluid which acts on the piston. Always use new oil seals when reassembling and be very careful not to scratch or damage them.

Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system.
Also, be very careful not to scratch the sliding portion of the rack which makes contact with the oil seals. When removing the rack ends from the rack, it is very easy to cause a burr when holding the tip of the rack with a wrench. Therefore, before assembling the rack, first check the tip for burrs and remove any with an oil stone.
Teflon rings are used for the piston and control valve. These teflon rings are highly durable against wear, but if it is necessary to replace them, be careful not so stretch the new ones. After installing a teflon ring into its groove, snug it down into the groove before assembly of the cylinder or housing to prevent possible damage.
As with the rack and pinion type steering, preload is very important. If the preload is not correct, it could result in such trouble as steering wheel play or shimmy or lack of durability, so always make sure that it is correct.



IDLE–UP DEVICE

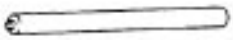
The pump produces the maximum fluid pressure when the steering wheel is turned fully to the right or left and, at this time, there is a maximum load on the pump which causes a decrease in engine idle rpm. To solve this problem, vehicles are equipped with an idle– up device which acts to raise the engine idle rpm whenever there is a heavy load on the pump.
On EFI engines, when the piston of the air control valve is pushed by fluid pressure, the air valve opens and the volume of air by–passing the throttle valve is increased to regulate engine rpm.



PREPARATION

SST (SPECIAL SERVICE TOOLS)

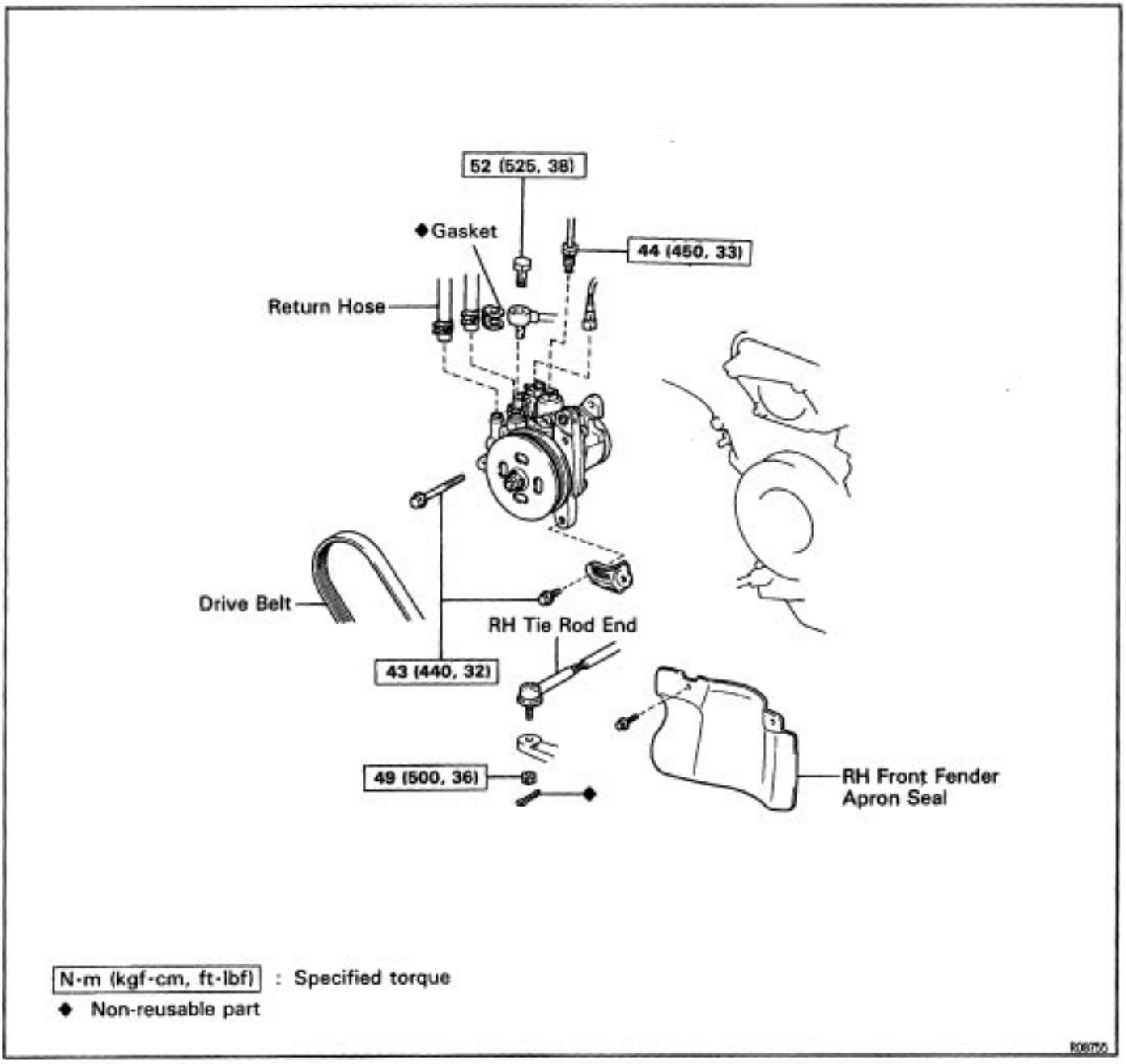
	09238–47012 Water Pump Bearing Remover & Replacer	PS pump bearing (3VZ–FE)
	09608–12010 Front Hub & Drive Pinion Bearing Replacer Set	Gear housing oil seal
	(09608–00080) Replacer	
	09612–00012 Rack & Pinion Steering Rack Housing Stand	
	09612–22011 Tilt Handle Bearing Replacer	Control valve oil seal
	09612–24014 Steering Gear Housing Overhaul Tool Set	
	(09613–22011) Steering Rack Shaft Bushing Puller	
	(09617–24020) Steering Pinion Bearing Adjusting Screw Lock Nut Wrench	
	(09617–24030) Steering Rack End Wrench	
	09616–00010 Steering Worm Bearing Adjusting Socket	
	09616–30020 Steering Worm Bearing Adjusting Screw Wrench	
	09617–14010 Steering Rack End Wrench	
	09620–30010 Steering Gear Box Replacer Set	

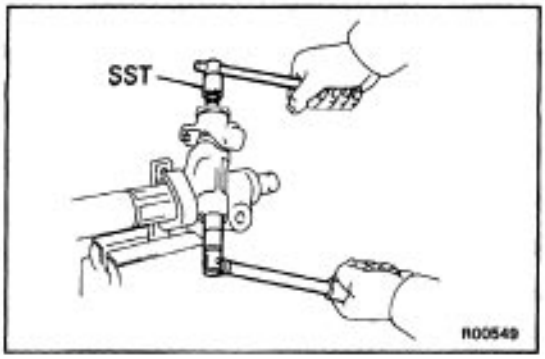
	(09623–30010) Steering Worm Bearing & Oil Seal Replacer	
	(09631 –00020) Handle	
	09628–62011 Ball Joint Puller	Tie rod end
	09630–24013 Steering Rack Oil Seal Tool Set	
	(09620–24010) Valve Cup Oil Seal Remover	
	(09620–24020) Valve Cup Oil Seal Replacer	
	09631–10021 Rack Stopper Wrench	
	09631 –10030 Oil Seal Remover	
	09631 –12020 Handle	
	09631–12071 Steering Rack Oil Seal Test Tool	
	09631–16010 Cylinder End Stopper Nut Wrench	
	09631–20081 Seal Ring Tool	
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	
	09631–33010 Steering Rack Cover ”I”	

POWER STEERING PUMP (1 MZ–FE)

POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown.

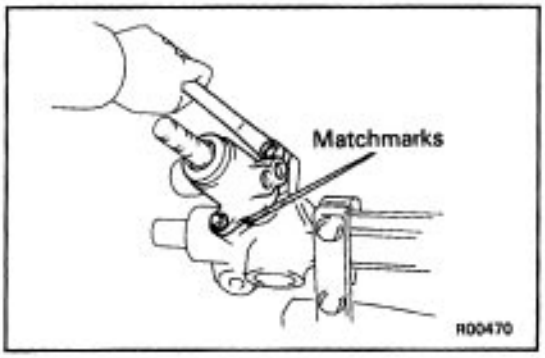




10. REMOVE SELF– LOCKING NUT

Using SST to hold the control valve, remove the self–locking nut.

SST 09616 – 00010



11. REMOVE CONTROL VALVE HOUSING

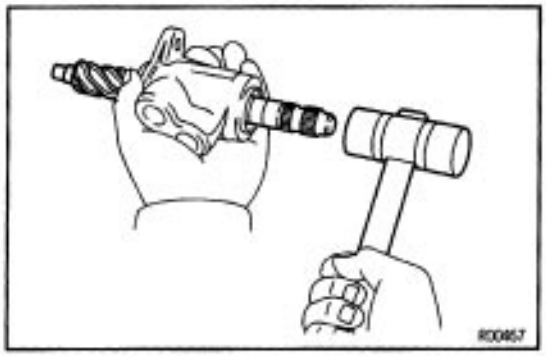
(a) Remove the dust cover.

(b) Place matchmarks on the valve housing and rack housing.

(c) Remove the 2 bolts.

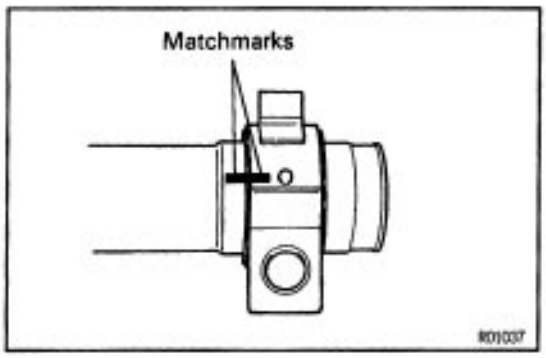
(d) Pull out the valve with the valve housing.

(e) Remove the gasket from the rack housing.



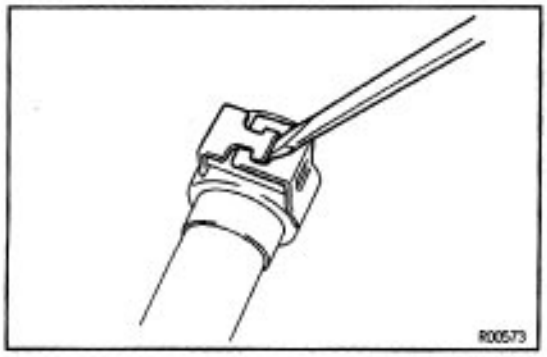
12. REMOVE CONTROL VALVE FROM HOUSING

Tap out the control valve and oil seal.



13. REMOVE N0.2 BRACKET

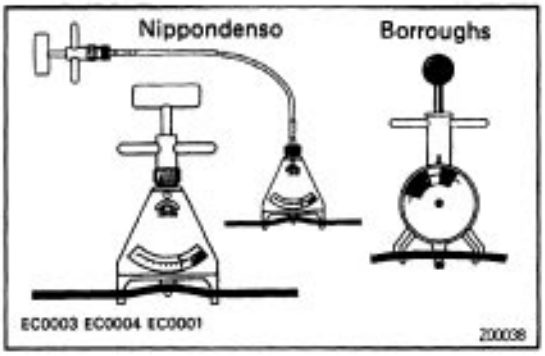
(a) Place matchmarks on the bracket and rack housing.

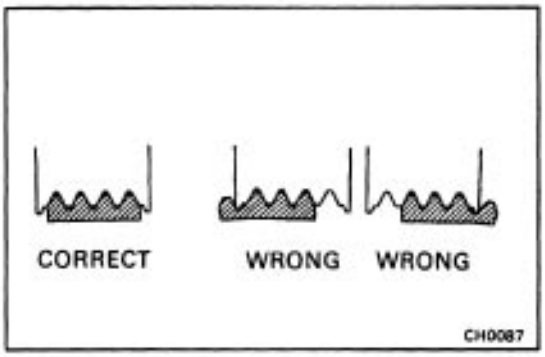


(b) Using a screwdriver, pry a part the clasp of the No.2 bracket.

(c) Remove the bushing and bracket from the rack housing.

(d) Remove the bushing from the bracket.





ON–VEHICLE INSPECTION

DRIVE BELT TENSION CHECK

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or Borroughs No.BT–33–73F

Drive belt tension:

1 MZ–FE

New belt

667–824 N (68–84 kgf, 150–185 lbf)

Used belt

422–598 N (43–61 kgf, 95–135 lbf)

5S–FE

New belt

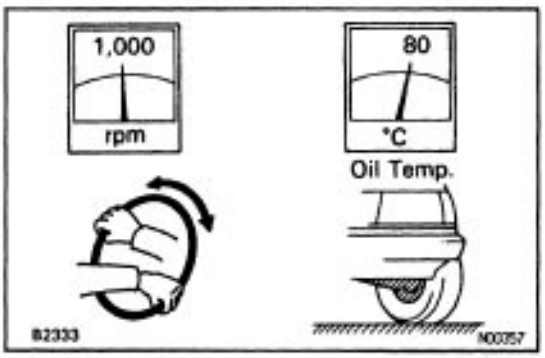
441–667 N (45–68 kgf, 100–150 lbf)

Used belt

275–441 N (28–45 kgf,60–100 lbf)

HINT:

- ”New belt’” refers to a belt which has been less than 5 minutes on a running engine.
- ”Used belt’ refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.



FLUID LEVEL CHECK

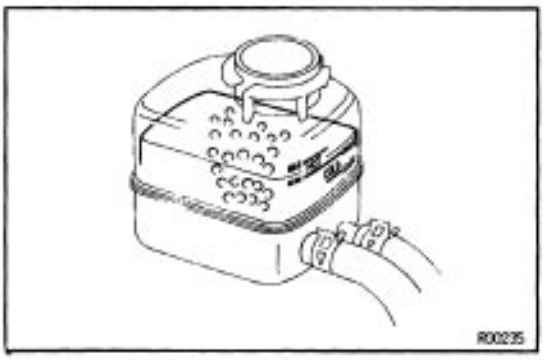
1. KEEP VEHICLE LEVEL

2. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature:

80°C (176°F)



3. CHECK FOR FOAMING OR EMULSIFICATION

HINT: Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low.

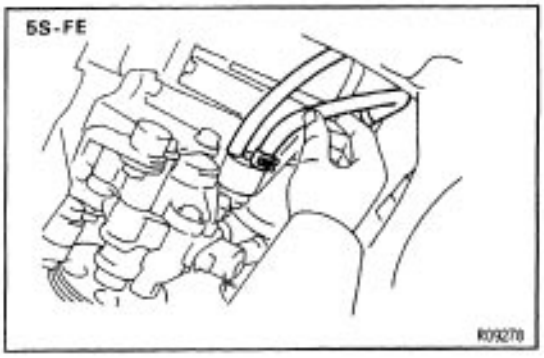
4. CHECK FLUID LEVEL IN OIL RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid:

ATF DEXRON©II

HINT: Check that the fluid level is within the HOT LEVEL of the tank. If the fluid is cold, check that it is within the COLD LEVEL of the tank.



IDLE–UP CHECK

1. WARM UP ENGINE

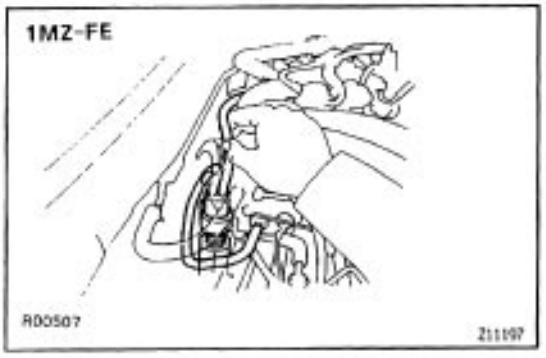
2. TURN AIR CONDITIONER SWITCH OFF

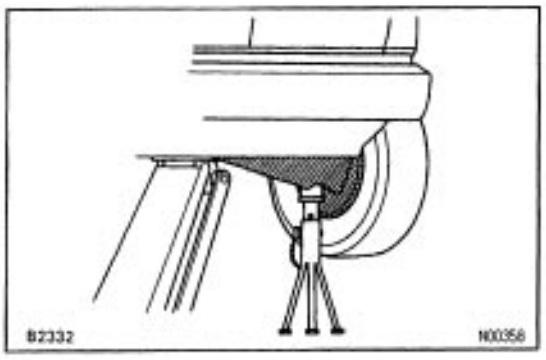
3. CHECK IDLE–UP

(a) Fully turn the steering wheel.

(b) Check that the engine rpm decreases when the air control valve hose is pinched.

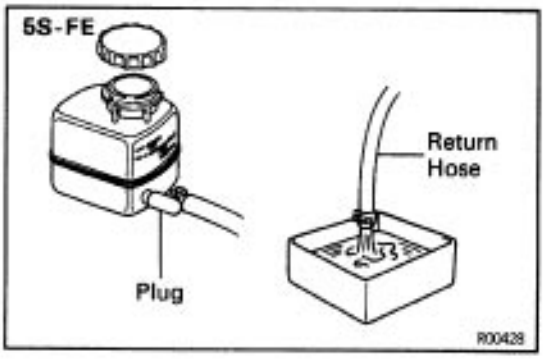
(c) Check that the engine rpm increases when the air control valve hose is released.



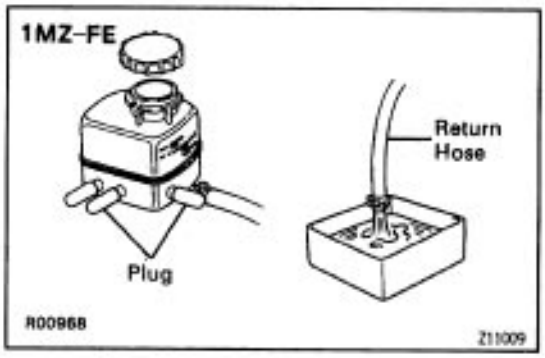


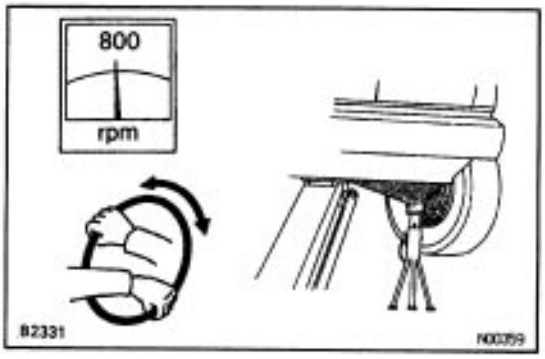
POWER STEERING FLUID REPLACEMENT

1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS

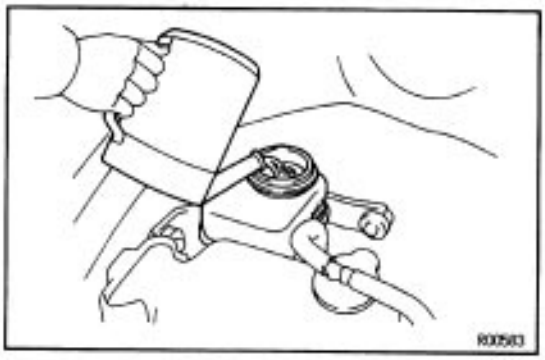


2. REMOVE FLUID RETURN HOSE FROM OIL RESER–VOIR AND DRAIN FLUID INTO CONTAINER

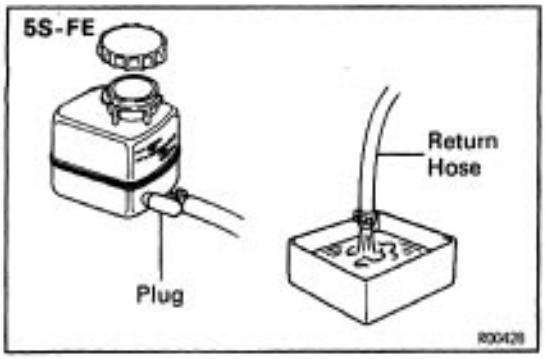




3. TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID



4. FILL OIL RESERVOIR WITH FRESH FLUID
Fluid:
ATF DEXRON©II



5. START ENGINE AND RUN IT AT 1,000 RPM

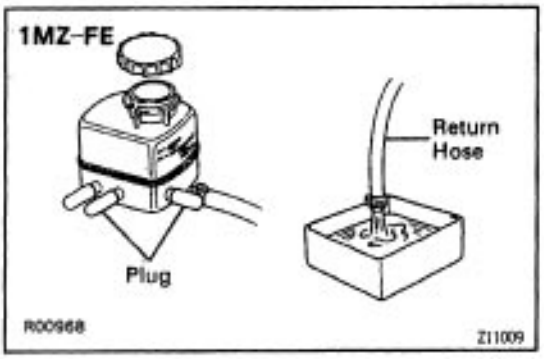
After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

NOTICE: Take care that some fluid remains left in the oil reservoir.

6. REPEAT STEPS 5 AND6 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

7. CONNECT RETURN HOSE TO OIL RESERVOIR

8. BLEED POWER STEERING SYSTEM



POWER STEERING SYSTEM BLEEDING

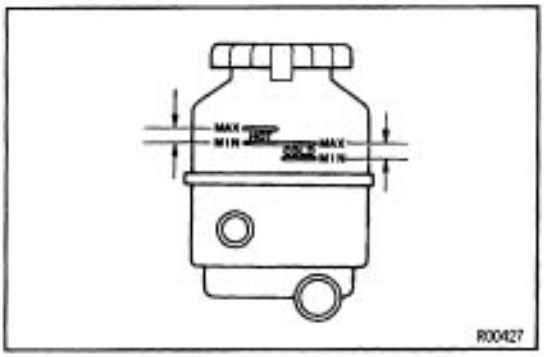
1. CHECK FLUID LEVEL IN OIL RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid:

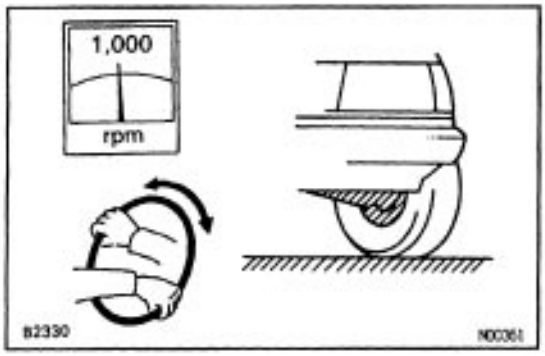
ATF DEXRON© II

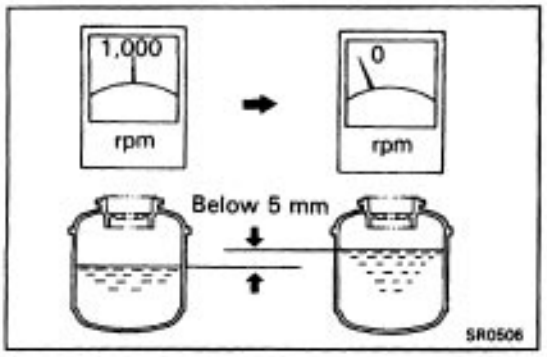
HINT: Check that the fluid level is within the HOT LEVEL of the dipstick of the oil reservoir. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.



2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK 3 OR 4 TIMES

With the engine speed below 1,000 rpm, turn the steering wheel to left or right full lock and keep it there for 2–3 seconds, then turn the wheel to the opposite full lock and keep it there for 2–3 seconds.





3. CHECK THAT FLUID IN OIL RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

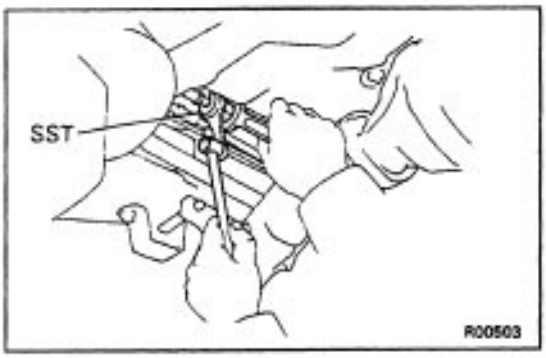
Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

Maximum rise:

5 mm (0.20 in.)

If a problem is found, repeat steps 5 to6 on page SR–27. Repair the PS if the problem persists.

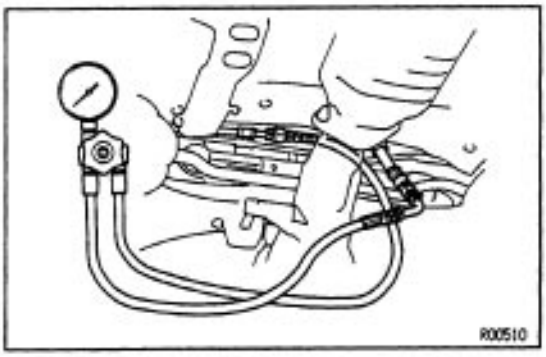
OIL PRESSURE CHECK



1. CONNECT OIL PRESSURE GAUGE

1 MZ–FE

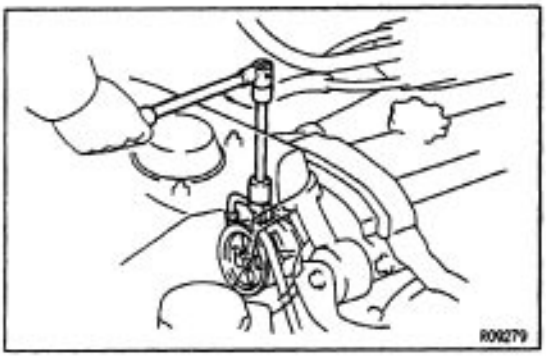
(a) Using SST, disconnect the pressure line joint.
SST 09631 –22020



(b) Connect the gauge side of the pressure gauge to the PS pump side and the valve side to the gear housing side.

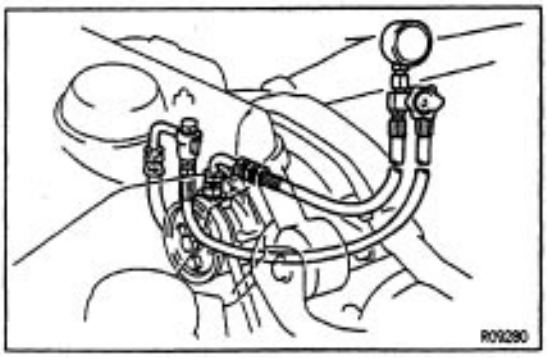
2. BLEED POWER STEERING SYSTEM

(See page SR–27)



5S–FE

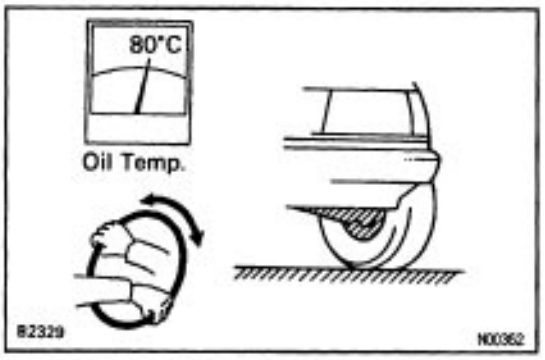
(a) Disconnect the pressure tube from the PS pump.



(b) Connect the gauge side of the pressure gauge to the PS pump and the valve side to the pressure line.

3. BLEED POWER STEERING SYSTEM

(See page SR–27)

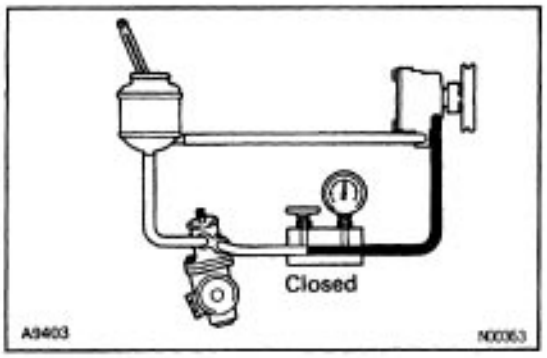


4. START ENGINE AND RUN IT AT IDLE

5. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80 °C (176 °F)



6. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the oil pressure gauge valve and observe the reading on the gauge.

Minimum pressure:

1 MZ – FE

9,120 kPa (93 kgf/cm^2, 1,323 psi)

5S–FE

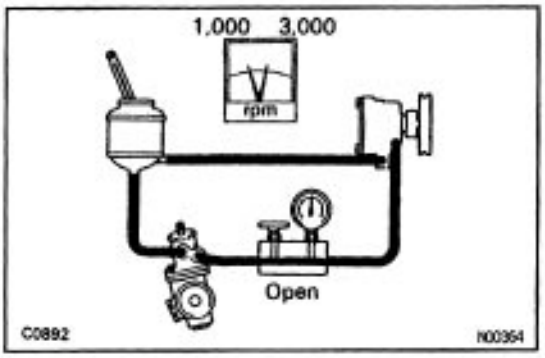
8,336 kPa (85 kgf/cm^2, 1,209 psi)

NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, repair or replace the PS pump.

7. OPEN VALVE FULLY

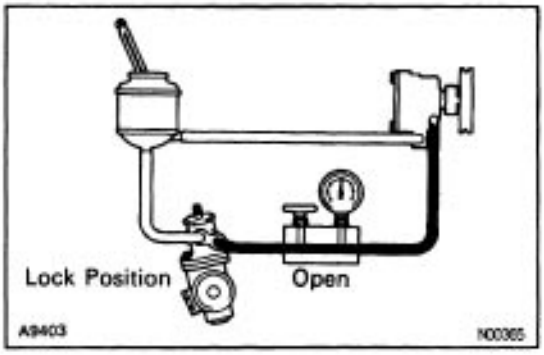


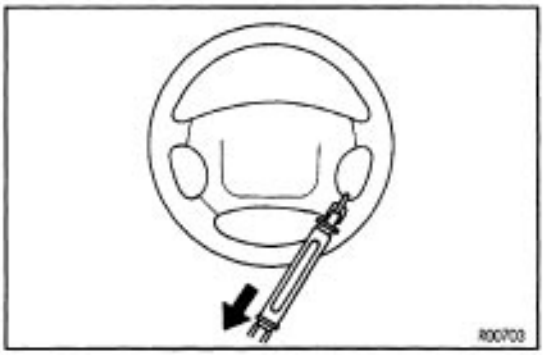
8. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

9. CHECK AND RECORD PRESSURE READING AT 3,000 RPM

Check that there is 490 kPa (5 kgf/cm^2, 71 psi) or less difference in pressure between the 1,000 rpm and 3,000 rpm checks.

If the difference is excessive, repair or replace the flow control valve of the PS pump.





10. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:

1 MZ–FE

9,120 kPa (93 kgf/cm^2, 1,323 psi)

5S–FE

8,336 kPa (85 kgf/cm^2, 1,209 psi)

NOTICE:

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

11. MEASURE STEERING EFFORT

(a) Center the steering wheel and run the engine at idle.

(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort:

39 N (4 kgf, 8.8 lbf)

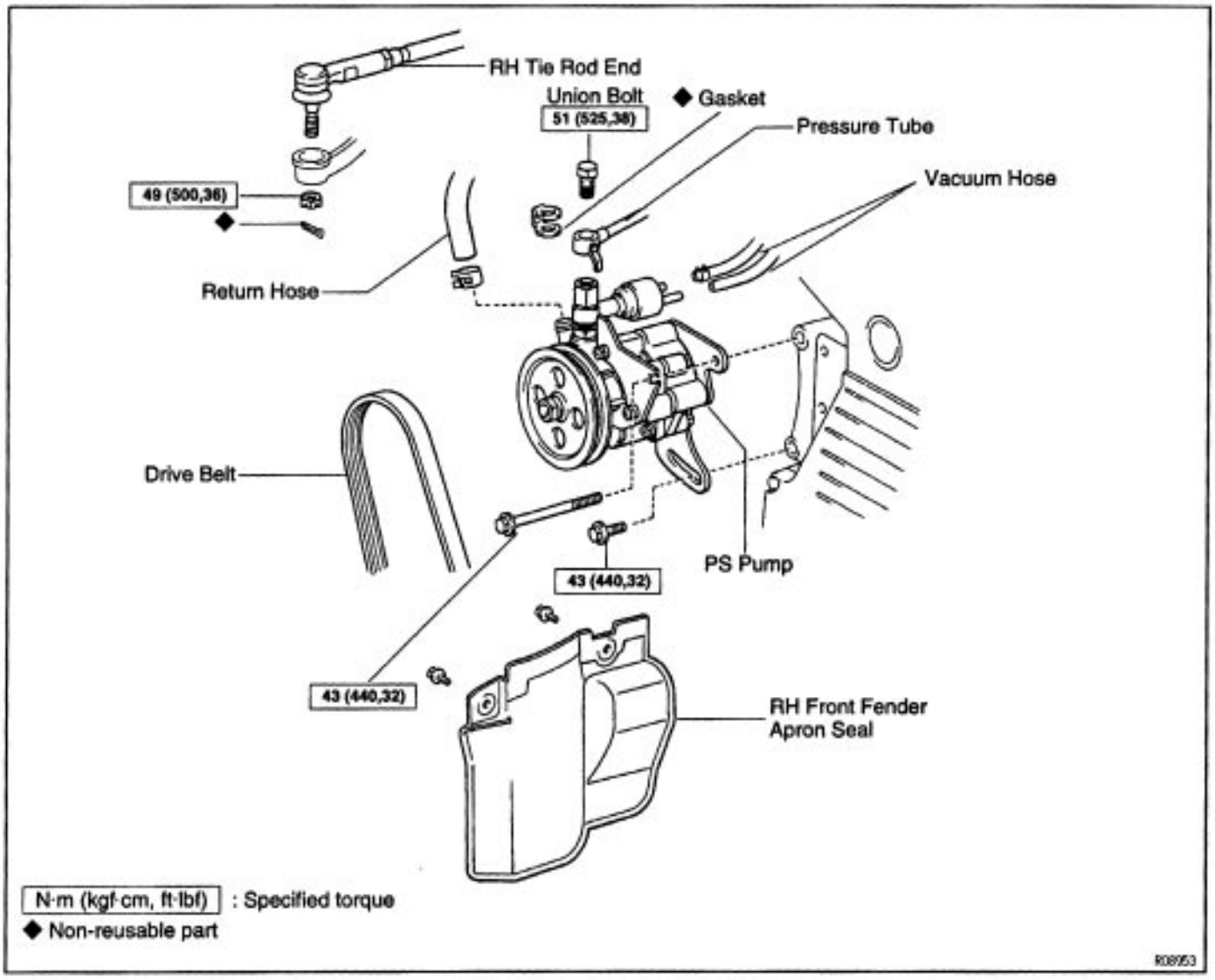
If steering effort is excessive, repair the PS unit.

HINT: Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

POWER STEERING PUMP (5S–FE)

POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown.

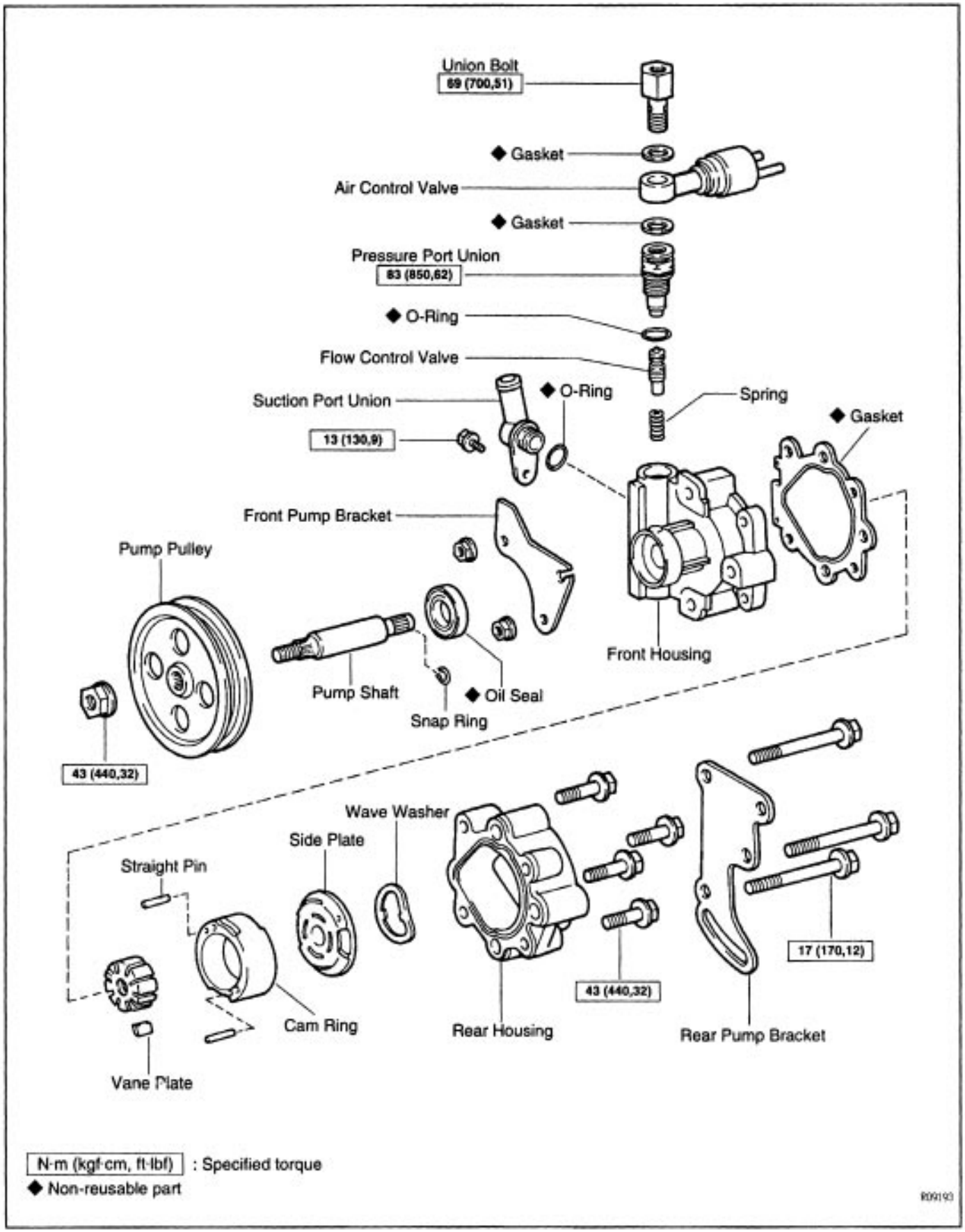


MAIN POINTS OF REMOVAL AND INSTALLATION

1. ADJUST DRIVE BELT TENSION AFTER INSTALL–ING PS PUMP

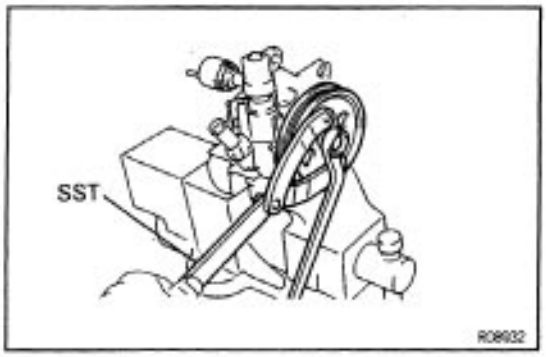
2. BLEED POWER STEERING SYSTEM

COMPONENTS


Union Bolt
69 (700,51)
◆ Gasket
Air Control Valve
◆ Gasket
Pressure Port Union
83 (850,62)
◆ O-Ring
Flow Control Valve
Suction Port Union
13 (130,9)
◆ O-Ring
Spring
◆ Gasket
Front Pump Bracket
Pump Pulley
Front Housing
Pump Shaft
◆ Oil Seal
Snap Ring
43 (440,32)
Wave Washer
Side Plate
Straight Pin
Cam Ring
Vane Plate
Rear Housing
43 (440,32)
17 (170,12)
Rear Pump Bracket
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
R09193

–1 –01

POWER STEERING PUMP DISASSEMBLY



1. MOUNT POWER STEERING PUMP IN VISE

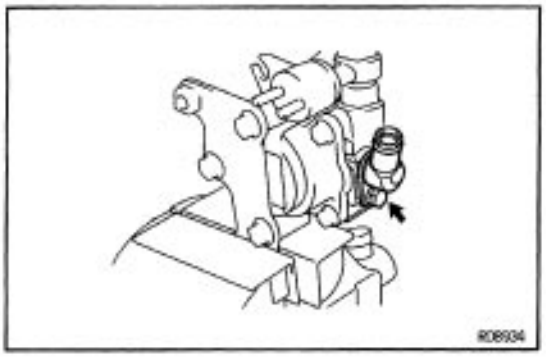
NOTICE: Do not tighten the vise too tight.

2. REMOVE PS PUMP PULLEY

(a) Using SST, remove the pulley set nut.

SST 09960–10010 (09963–01000)

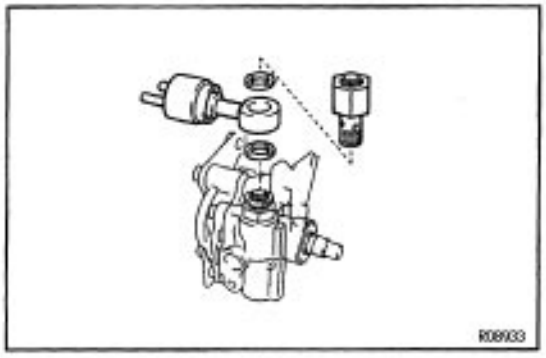
(b) Remove the pump pulley from the shaft.



3. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union.

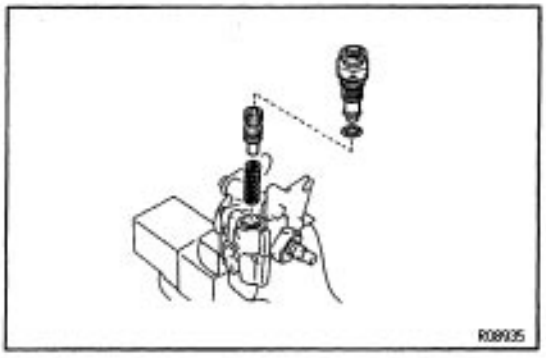
(b) Remove the O–ring from the union.



4: REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.

(b) Remove the gasket.

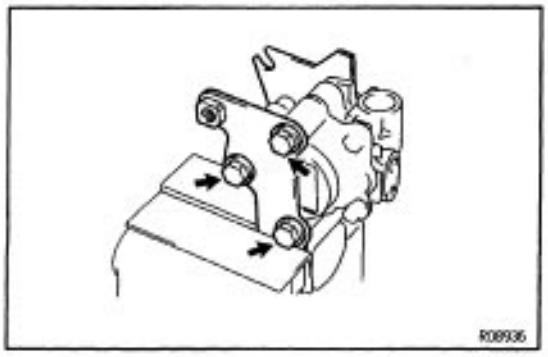


5. REMOVE FLOW CONTROL VALVE

(a) Remove the pressure port union.

(b) Remove the 0–ring from the union.

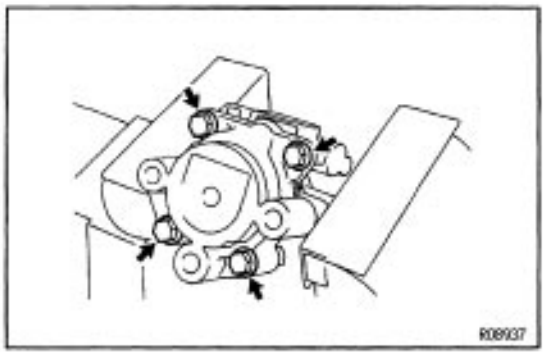
(c) Remove the flow control valve and spring.



6. REMOVE PUMP BRACKET

(a) Remove the 3 bolt.

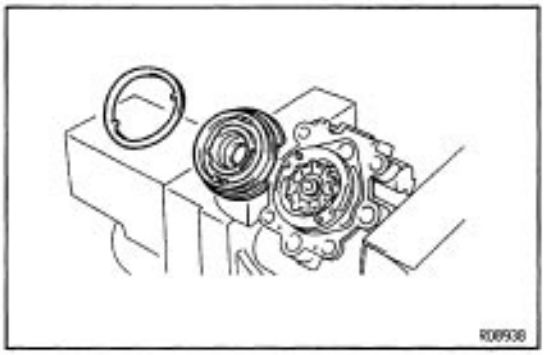
(b) Remove the pump bracket from the pump assy.



7. REMOVE REAR HOUSING

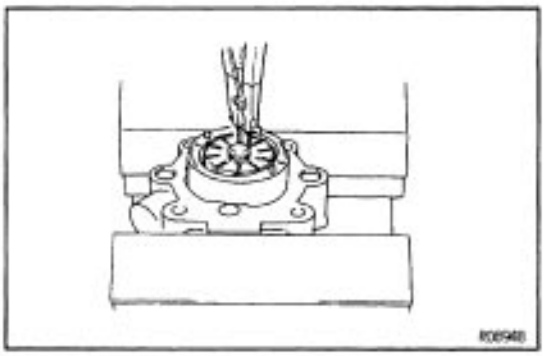
(a) Remove the 4 bolt.

(b) Remove the rear housing.



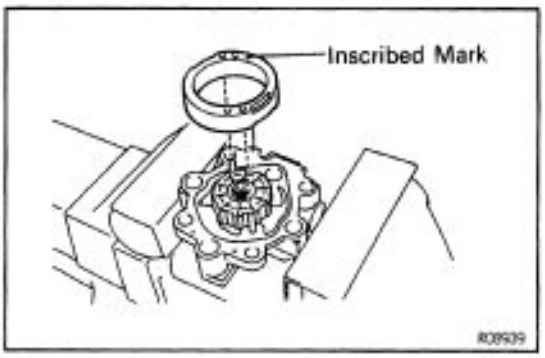
(c) Remove the wave washer.

(d) Remove the side plate.

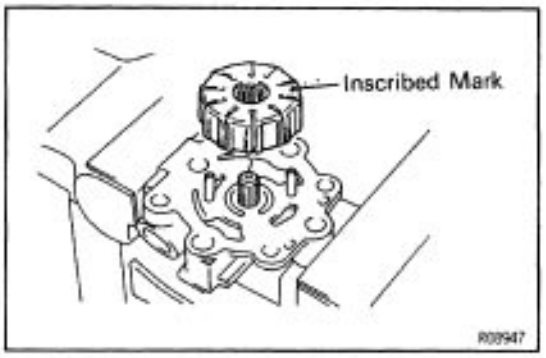


8. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Using snap ring pliers, remove the snap ring.

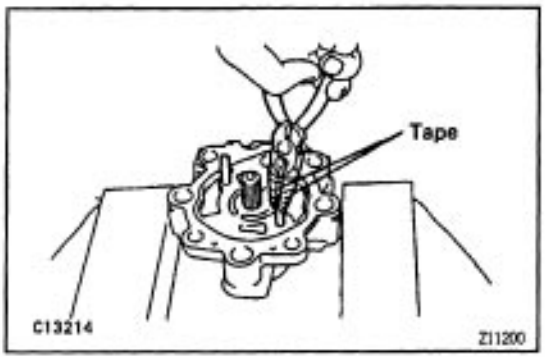


(b) Remove the cam ring and 10 vane plates from the front housing.

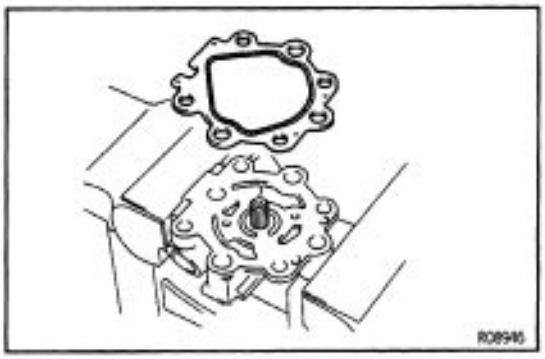


9. REMOVE ROTER

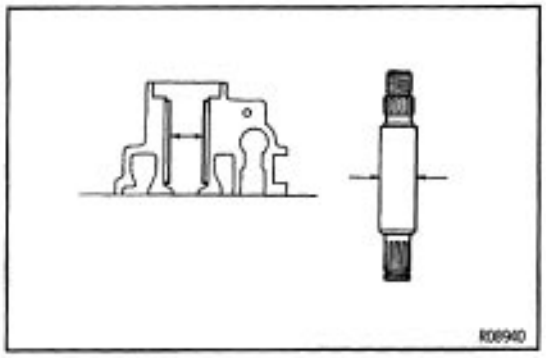
(a) Remove the roter from the pump shaft.



(b) Remove the 2 straight pins from the front housing.



(c) Remove the gasket.
(d) Remove the pump shaft.



POWER STEERING PUMP INSPECTION AND REPLACEMENT

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, measure the oil clearance.

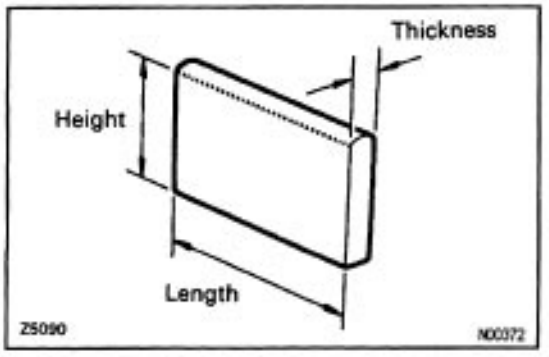
Standard clearance:

0.03–0.05 mm (0.0012–0.0020 in.)

Maximum clearance:

0.07 mm (0.0028 in.)

If more than maximum, replace the entire power steering pump.



2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plates.

Minimum height:

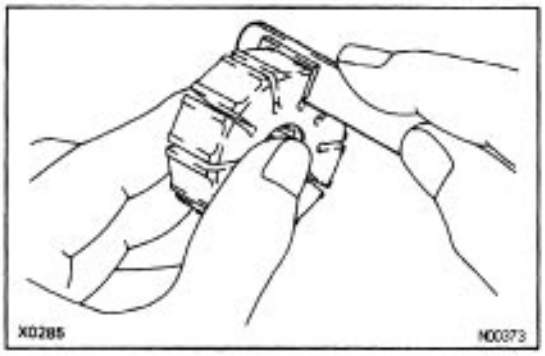
8.6 mm (0.339 in.)

Minimum thickness:

1.4 mm (0.055 in.)

Minimum length:

14.99 mm (0.5902 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate.

Maximum clearance:

0.03 mm (0.0012 in.)

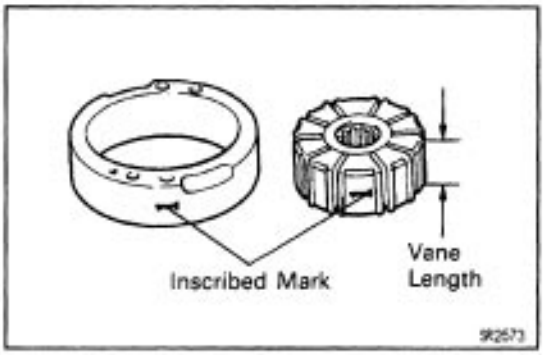
If more than maximum, replace the vane plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark:

1, 2, 3, 4 or None

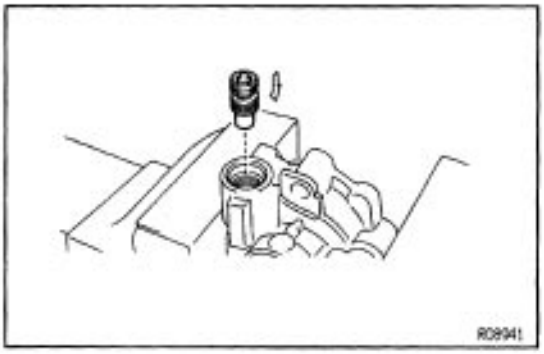
HINT: There are 5 vane lengths with the following rotor and cam ring marks:

Rotor and cam ring mark	Vane length mm (in.)
None	14.999 –15.001 (0.59051 –0.59059)
1	14.997–14.999 (0.59043–0.59051)
2	14.995–14.997 (0.59035–0.59043)
3	14.993–14.995 (0.59027–0.59035)
4	14.911 –14.993 (0.59020–0.59027)



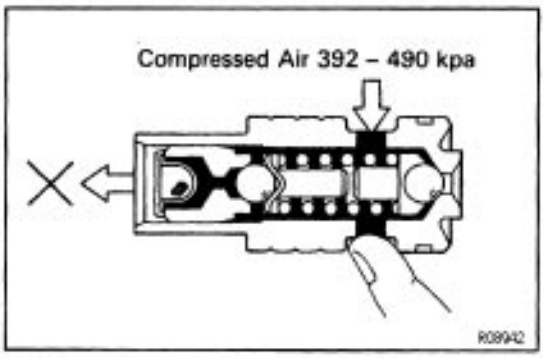
3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



(b) Check the flow control valve for leakage.

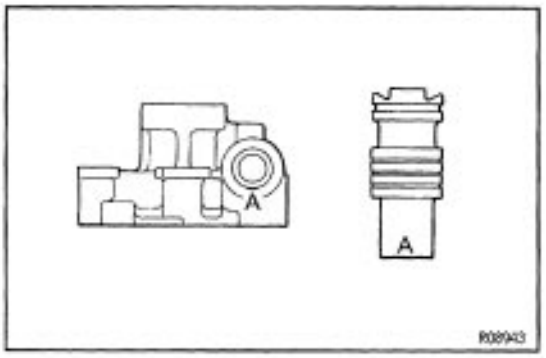
Close one of the holes and apply compressed air [392 –490 kPa (4–5 kgf/cm^2, 57–71 psi)] into the oppo–site side, and confirm that air does not come out from the end holes.

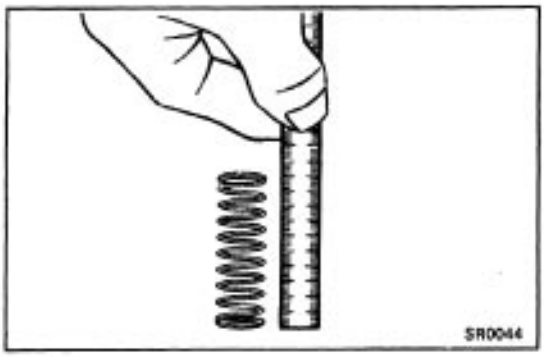


If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark:

A, B, C, D, E or F





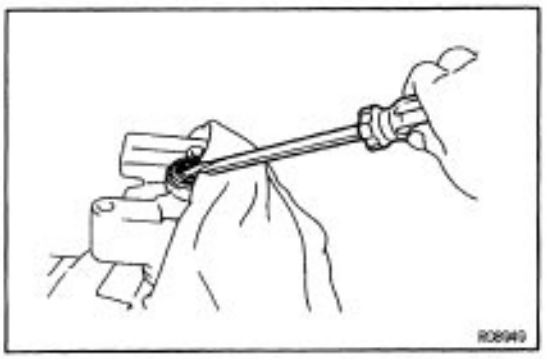
4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring.

Spring length:

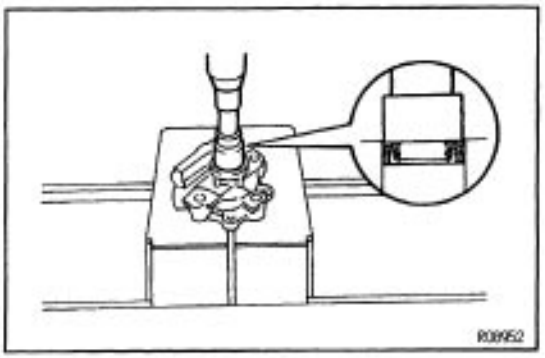
36–38 mm (1.42–1.49 in.)

If not within specification, replace the spring.



5. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

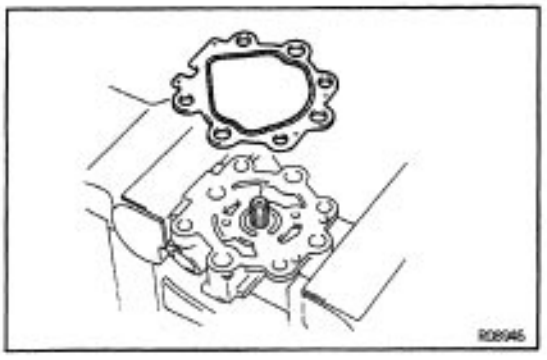


(b) Coat a new oil seal lip with power steering fluid.

NOTICE: Make sure you install the oil seal facing the correct direction.

(c) Using a socket wrench (24mm) and hummer, drive in a new oil seal.

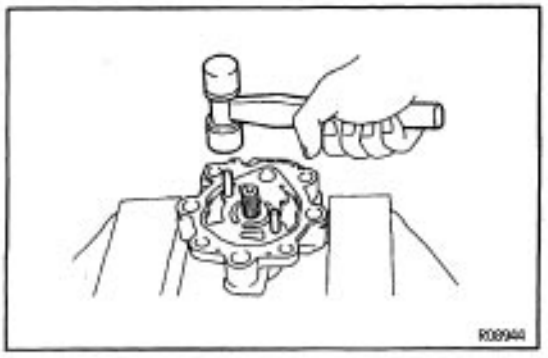
POWER STEERING PUMP ASSEMBLY



1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY

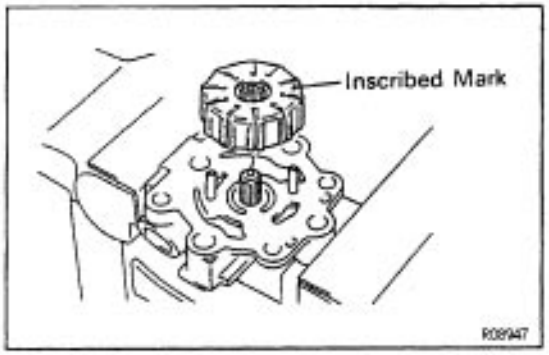
2. INSTALL PUMP SHAFT

3. INSTALL GASKET



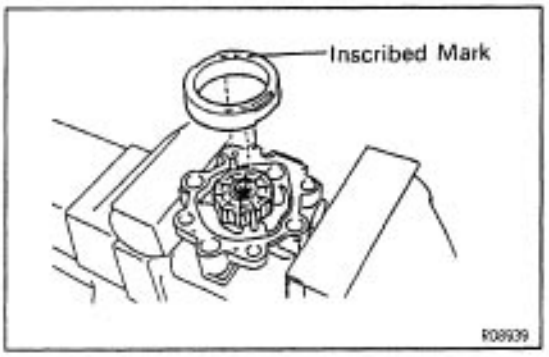
4. INSTALL STRAIGHT PINS

Using a plastic hammer, drive the 2 straight pin to the front plate.

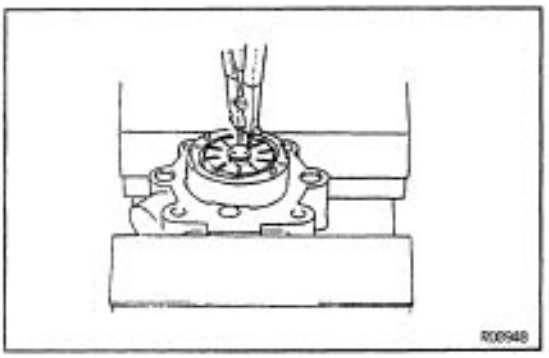


5. INSTALL CAM RING, ROTOR AND VANE PLATES

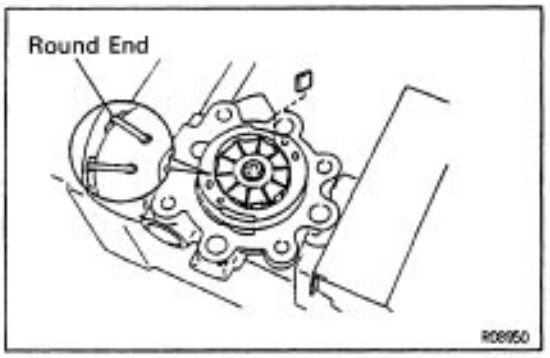
(a) Install the roter to the shaft with the inscribed mark facing outward.



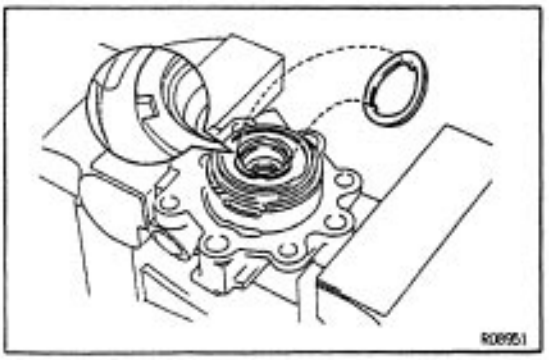
(b) Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.



(c) Using snap ring pliers, install the snap ring.

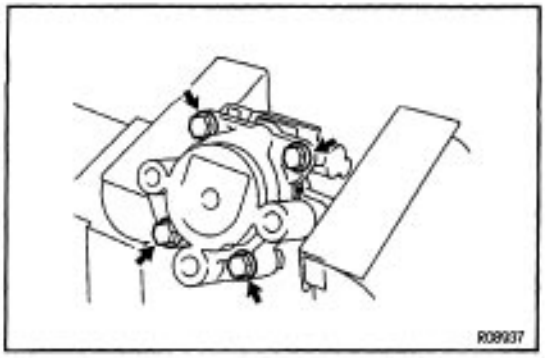


(d) Coat the vane plates with power steering fluid.
(e) Install the 10 vane plates with the round end facing outward.

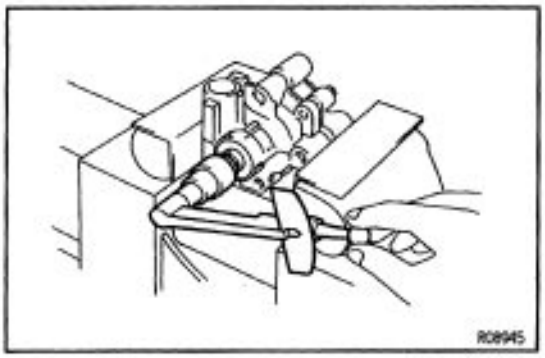


6. INSTALL SIDE PLATE AND WAVE WASHER

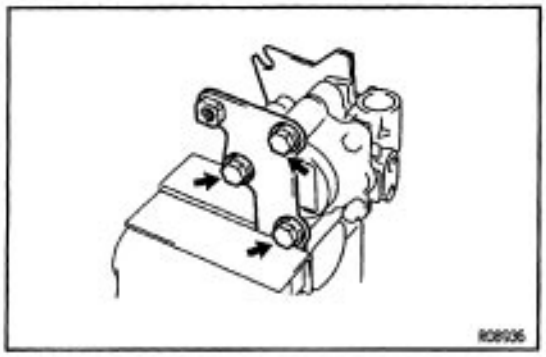
(a) Align the holes of the side plate with the pins, and install the plate.
(b) Install the wave washer.



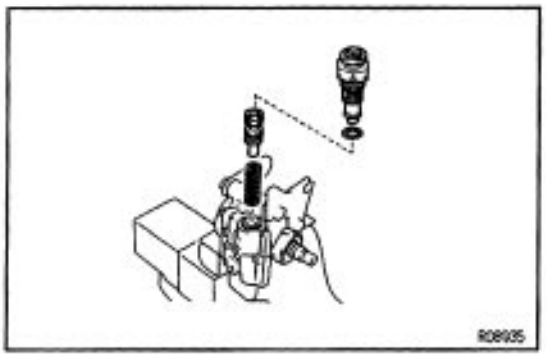
7. INSTALL REAR HOUSING
Install and torque the 4 bolts.
Torque: 43 N–m (440 kgf–cm, 22 ft–lbf)



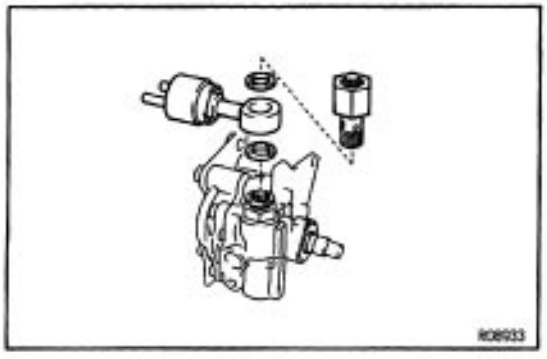
8. MEASURE PUMP SHAFT PRELOAD
(a) Check that the shaft rotates smoothly without abnor–mal noise.
(b) Temporarily install the pulley nut and check the rotat–ing torque.
Rotating torque: 0.3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less



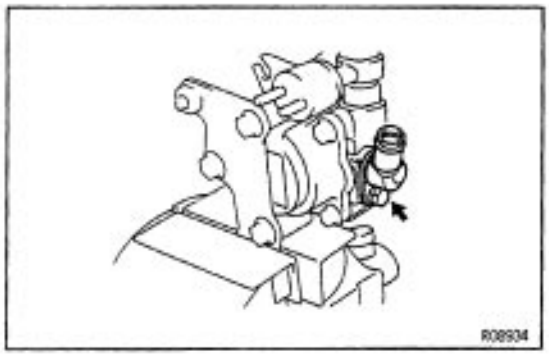
9. INSTALL PUMP BRACKET
Install the pump bracket with the 3 bolts.
Torque: 17 N–m (170 kgf–cm, 12 ft–lbf)



10. INSTALL FLOW CONTROL VALVE
(a) Install the spring and flow control valve into the hous–ing.
(b) Coat a new O–ring with power steering fluid, and install it to the pressure port union.
(c) Install and torque the pressure port union.
Torque: 83 N–m (850 kgf–cm, 62 ft–lbf)

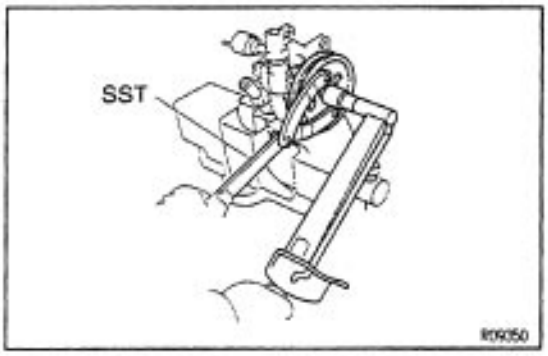


11. INSTALL AIR CONTROL VALVE
(a) Install a new gasket.
(b) Install the air control valve.
Torque: 69 N–m (700 kgf–cm. 51 ft–lbf)



12. INSTALL SUCTION PORT UNION

(a) Coat a new O–ring with power steering fluid, and install it to the suction port union.
(b) Install the suction port union.
(c) Install and torque the bolt.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



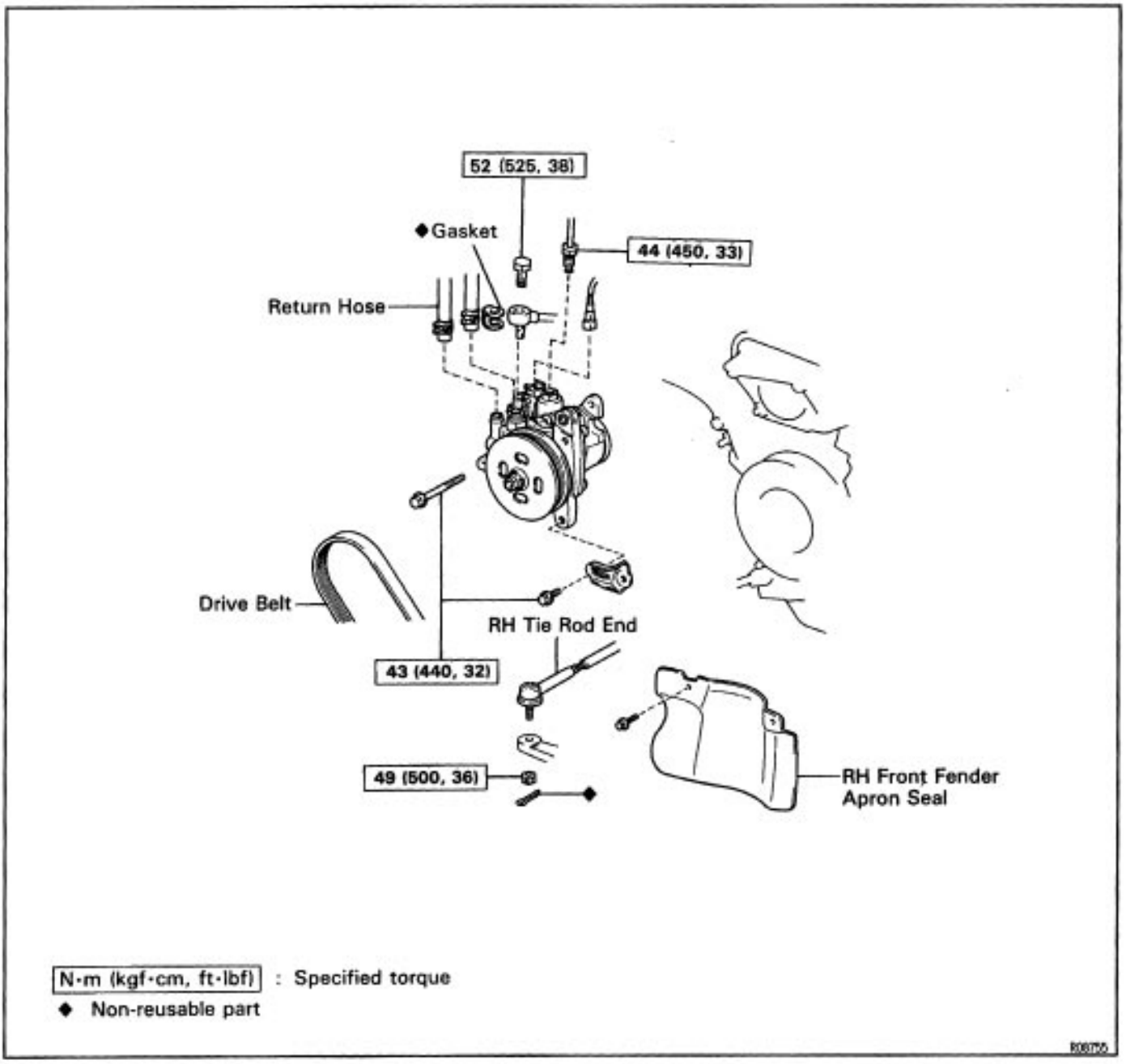
13. INSTALL PS PUMP PULLEY

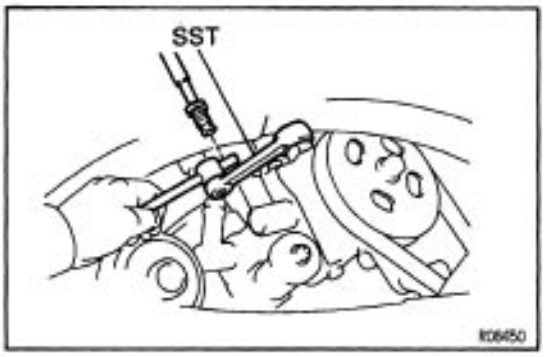
(a) Install the pump pulley to the shaft.
(b) Using SST, install and torque the pulley set nut.
SST 09960–10010 (09963–01000)
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

POWER STEERING PUMP (1MZ–FE)

POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown.





MAIN POINTS OF REMOVAL AND INSTALLATION

1. REMOVE PRESSURE TUBES

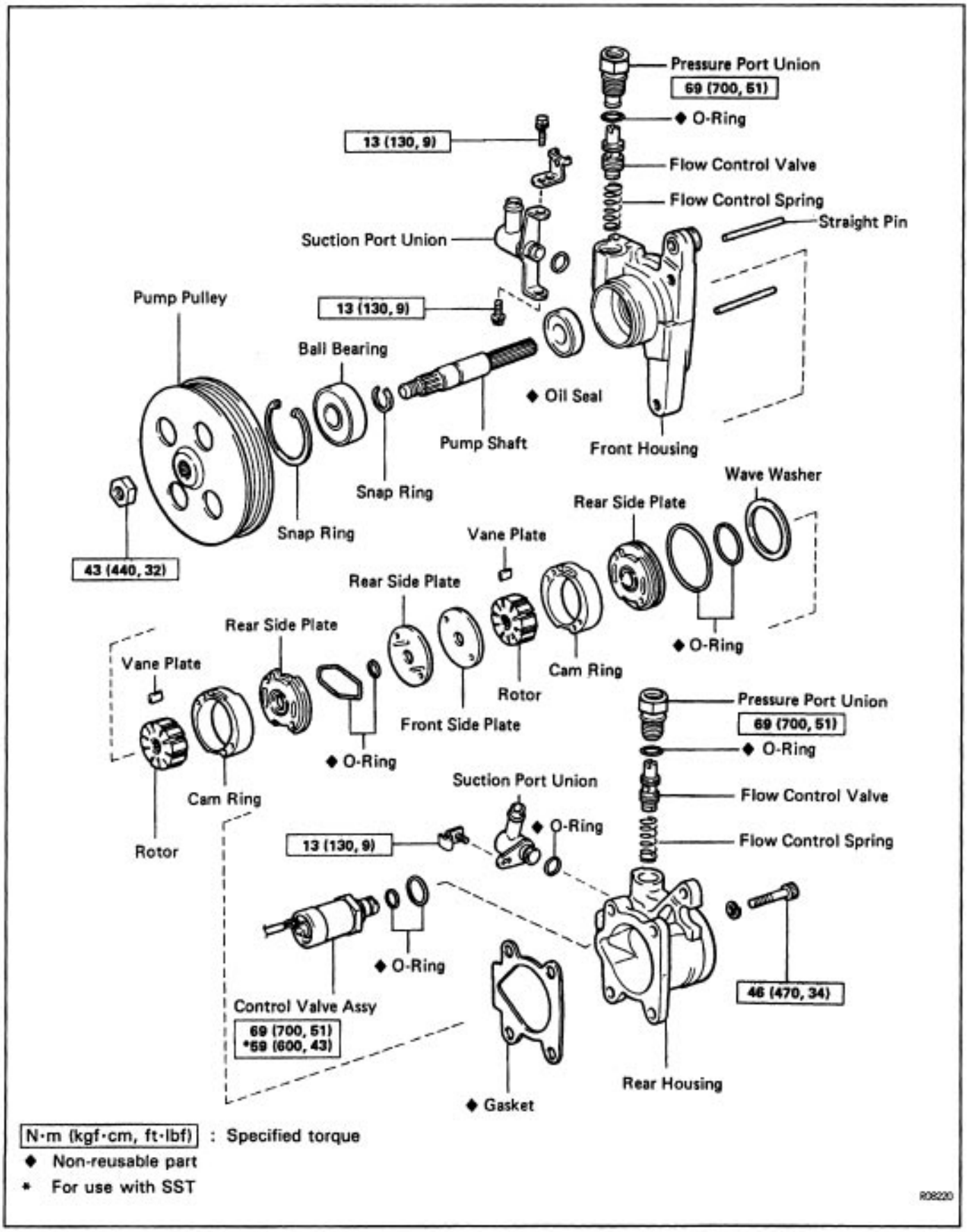
Using SST, remove the pressure tubes.

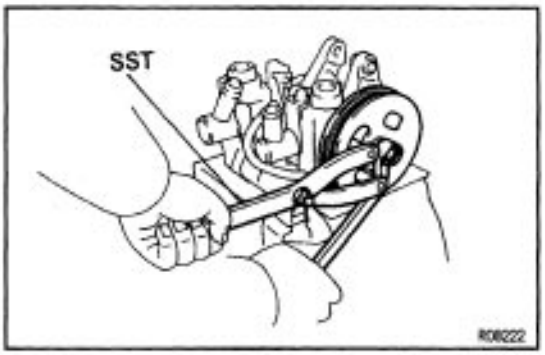
SST 09631–22020

2. ADJUST DRIVE BELT TENSION AFTER INSTALL–ING PS PUMP

3. BLEED POWER STEERING SYSTEM

COMPONENTS


Pressure Port Union
69 (700, 51)
◆ O-Ring
13 (130, 9)
Flow Control Valve
Flow Control Spring
Straight Pin
Suction Port Union
13 (130, 9)
Pump Pulley
Ball Bearing
◆ Oil Seal
Pump Shaft
Front Housing
Snap Ring
Snap Ring
43 (440, 32)
Wave Washer
Rear Side Plate
Vane Plate
Rear Side Plate
Rear Side Plate
Vane Plate
◆ O-Ring
Cam Ring
Rotor
Front Side Plate
◆ O-Ring
Cam Ring
Rotor
Pressure Port Union
69 (700, 51)
◆ O-Ring
Suction Port Union
Flow Control Valve
◆ O-Ring
Flow Control Spring
13 (130, 9)
◆ O-Ring
46 (470, 34)
Control Valve Assy
69 (700, 51)
*59 (600, 43)
◆ Gasket
Rear Housing
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* For use with SST
R08220



POWER STEERING PUMP DISASSEMBLY

1. MOUNT POWER STEERING PUMP IN VISE

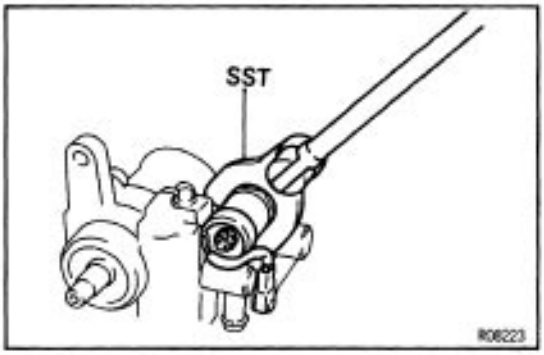
NOTICE: Do not tighten the vise to tight.

2. REMOVE PS PUMP PULLEY

(a) Using SST, remove the pulley set nut.

SST 09960–10010 (09963–01000)

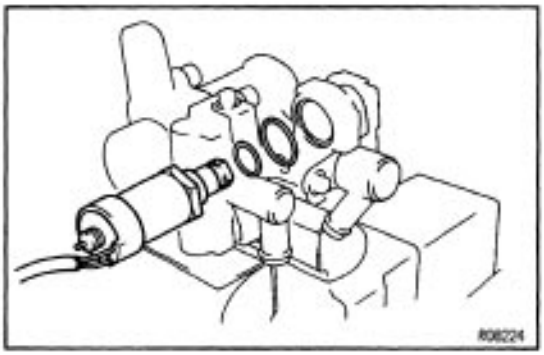
(b) Remove the pump pulley from the shaft.



3. REMOVE CONTROL VALVE

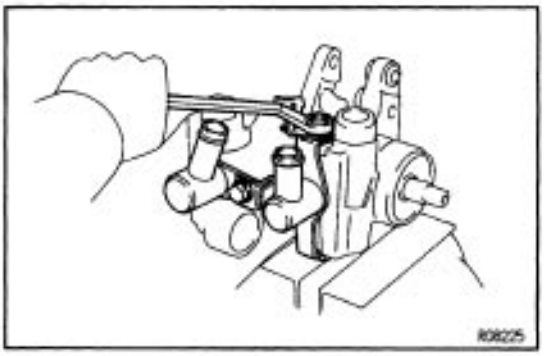
(a) Using SST, remove the control valve.

SST 09612–24014 (09617–24030)



(b) Remove the O–ring from the control valve.

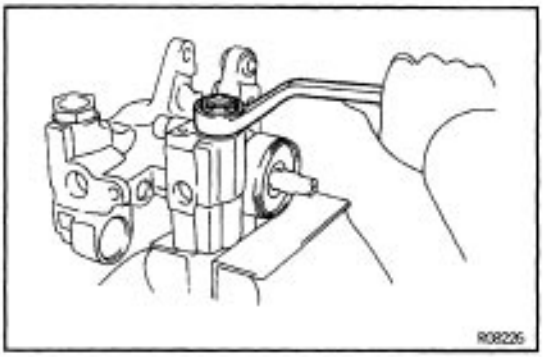
(c) Remove the O–ring from the rear housing.



4. REMOVE SUCTION PORT UNIONS

(a) Remove the 3 bolts and 2 suction port unions.

(b) Remove the O–ring from each suction port union.

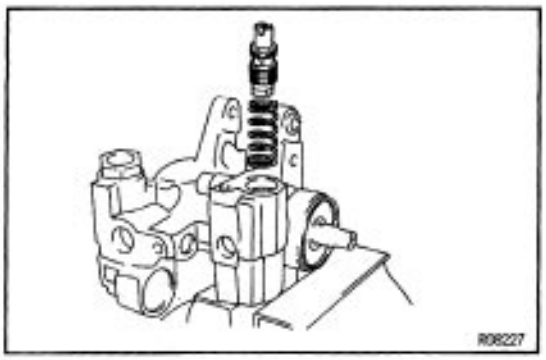


5. REMOVE FLOW CONTROL VALVE

For PS:

(a) Remove the pressure port union.

(b) Remove the 0–ring from the pressure port union.



(c) Using a magnetic finger, remove the flow control valve and spring.

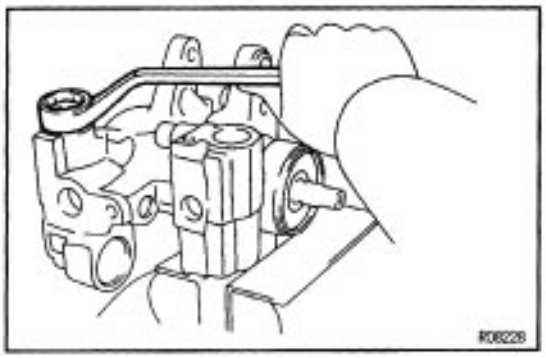
NOTICE: Be careful not to confute the flow control valve of the PS with that of the hydraulic cooling fan system.

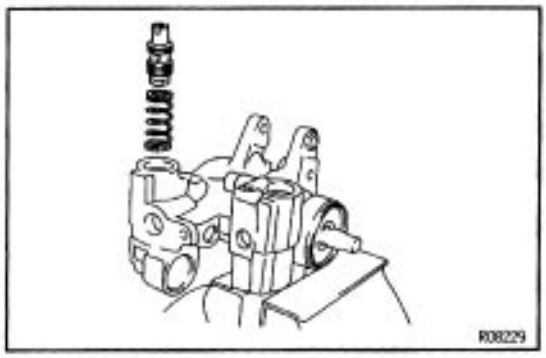
6. REMOVE FLOW CONTROL VALVE

For Hydraulic Cooling Fan System:

(a) Remove the pressure port union.

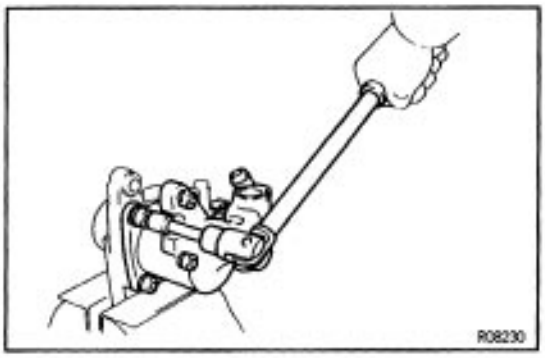
(b) Remove the O–ring from the pressure port union.





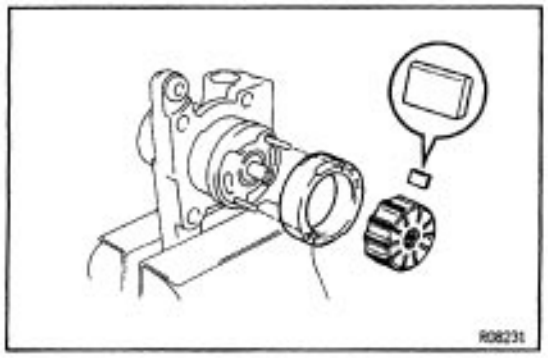
(c) Using a magnetic finger, remove the flow control valve and spring.

NOTICE: Be careful not to confuse the flow control valve of the hydraulic cooling fan system with that of the PS.



7. REMOVE REAR HOUSING

Using a hexagon wrench (8 mm), remove the 4 bolts, rear housing and gasket.

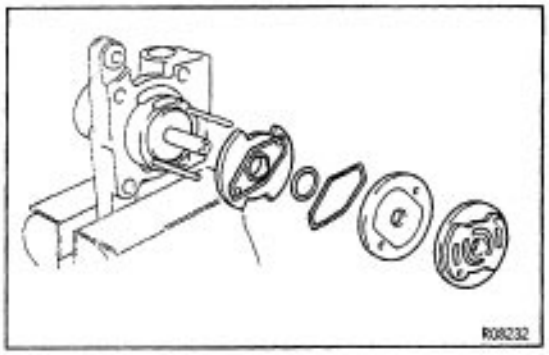


8. REMOVE CAM RING, ROTOR AND VANE PLATE

For Hydraulic Cooling Fan System:

Remove the cam ring, rotor and 10 vane plates.

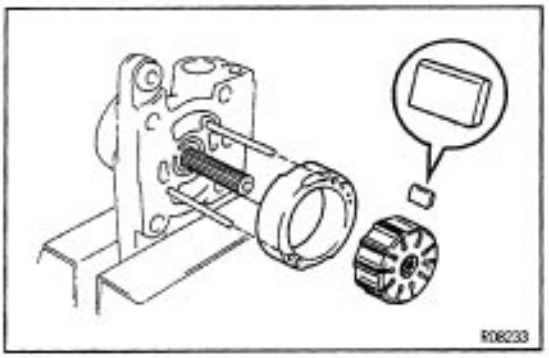
NOTICE: Be careful not to confuse the cam ring, rotor and vane plates of the hydraulic cooling fan system with those of the PS.



9. REMOVE FRONT SIDE PLATE AND 2 REAR SIDE PLATES

(a) Remove the front side plate and 2 rear side plates.

(b) Remove the 2 0–rings from the rear side plate.

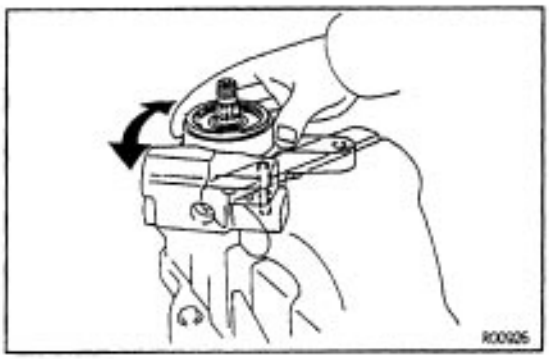


10. REMOVE CAM RING, ROTOR AND VANE PLATES

For PS:

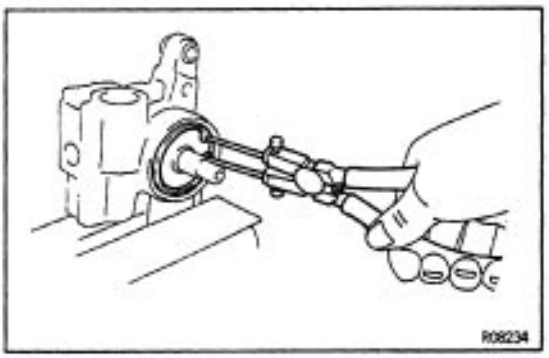
Remove the cam ring, rotor and 10 vane plates.

NOTICE: Be careful not to confuse the cam ring, rotor and vane plates of the PS with those of the hydraulic cooling fan system.



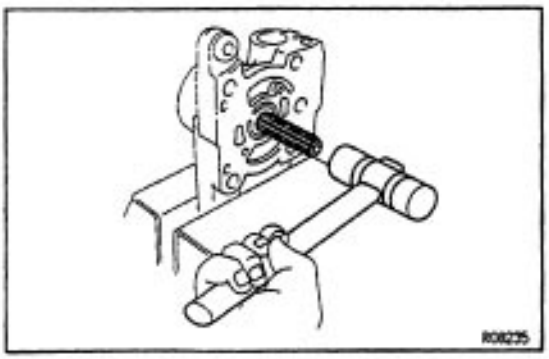
11. REMOVE STRAIGHT PINS

Put each straight pin in the vise and rotate the hous–ing to pull the straight pin out from the housing.

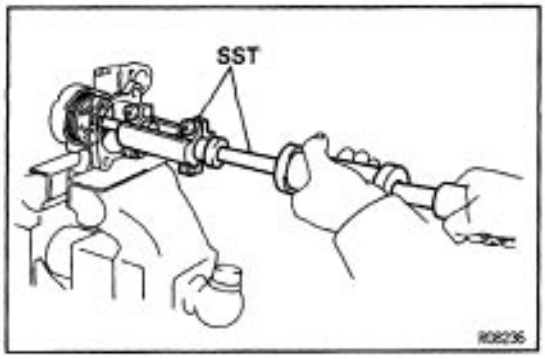


12. REMOVE PUMP SHAFT

(a) Using snap ring pliers, remove the snap ring.



(b) Using a plastic hammer, tap out the pump shaft.

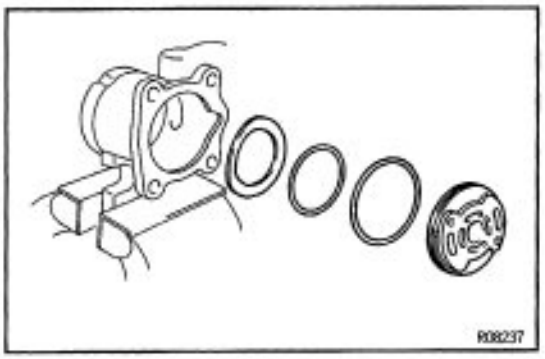


13. REMOVE REAR SIDE PLATE AND WAVE WASHER FROM REAR HOUSING

(a) Install a suitable bolt and plate washer to the rear plate.

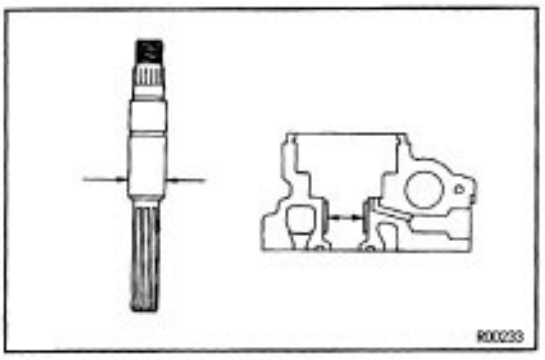
(b) Using SST, remove the rear plate.

SST 09910 – 00015 (09911– 00011, 09912 – 00010)



(c) Remove the 2 0– rings from the rear side plate.

(d) Remove the wave washer.



POWER STEERING PUMP INSPECTION AND REPLACEMENT

NOTICE: Be careful not to confuse the parts of the PS with those of the hydraulic cooling fan system.

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSH–ING

Using a micrometer and calipers, measure the oil cle–arance.

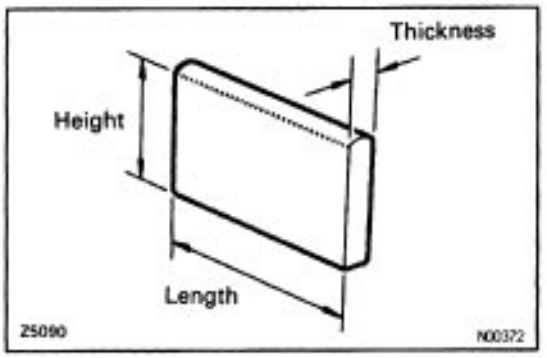
Standard clearance:

0.03–0.05 mm (0.0012–0.0020 in.)

Maximum clearance:

0.07 mm (0.0028 in.)

If more than maximum, replace the entire power steer–ing pump.



2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plates.

For PS

Minimum height:

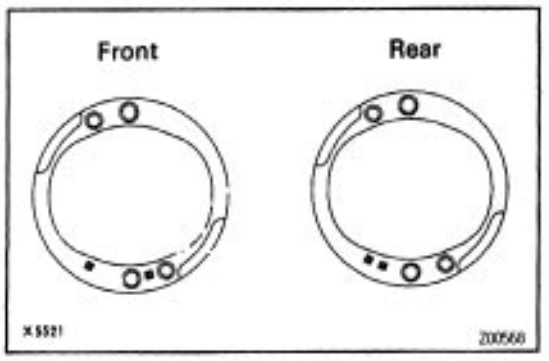
8.6 mm (0.339 in.)

Minimum thickness:

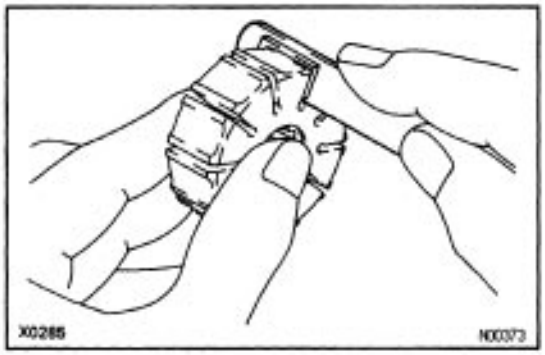
1.4 mm (0.055 in.)

Minimum length:

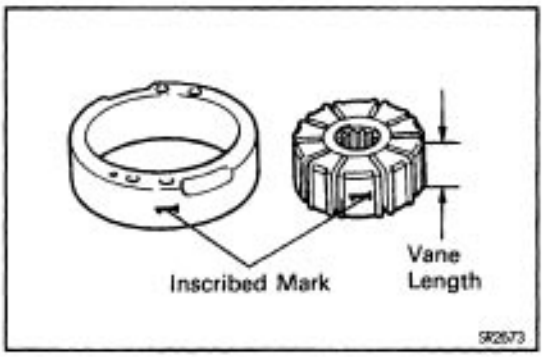
14.99 mm (0.5902 in.)



For Hydraulic Cooling Fan System
Minimum height:
8.1 mm (0.319 in.)
Minimum thickness:
1.8 mm (0.071 in.)
Minimum length:
14.98 mm (0.5898 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate.
Maximum clearance:
0.035 mm (0.0014 in.)
If more than maximum, replace the vane plate and/or rotor.
HINT: There are 5 lengths with the following rotor and cam ring marks.

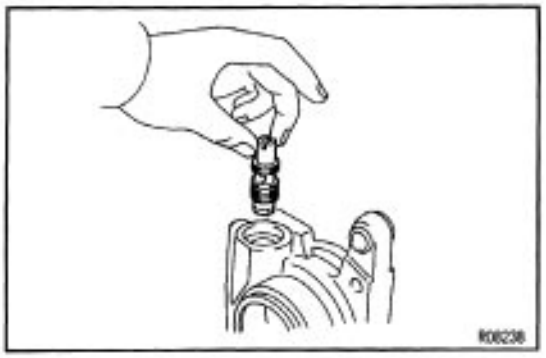


Power Steering Vane Lengths

Cam ring mark	Rotor mark	Vane length mm (in.)
2	None	15.003 – 15.005 (0.59067 – 0.59075)
3	1	15.001 – 15.003 (0.59059 – 0.59067)
4	2	14.999 – 15.001 (0.59051 – 0.59059)
5	3	14.997 – 14.999 (0.59043 – 0.59051)
6	4	14.995 – 14.997 (0.59035 – 0.59043)

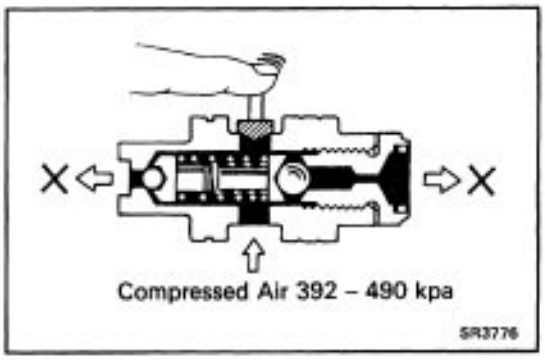
Hydraulic Cooling Fan System Vane Lengths

Cam ring mark	Rotor mark	Vane length mm (in.)
None	1	14.996 – 14.998 (0.59039 – 0.59047)
1	2	14.994 – 14.996 (0.59031 – 0.59039)
2	3	14.992 – 14.994 (0.59024 – 0.59031)
3	4	14.990 – 14.992 (0.59016 – 0.59024)

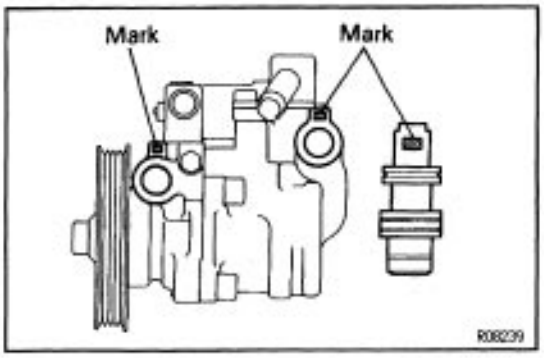


3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



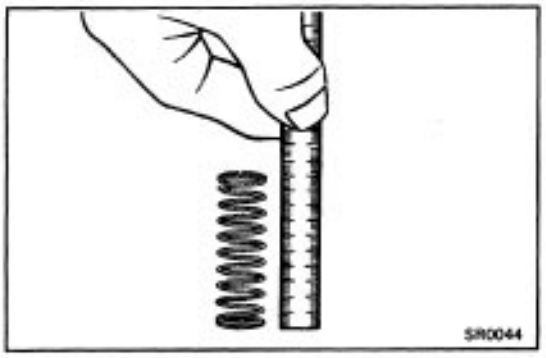
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air [392 –490 kpa (4–5 kgf/cm^2, 57–71 psi)] into the oppo–site side, and confirm that air does not come out from the end holes.



If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark:

A, B, C, D, E or F

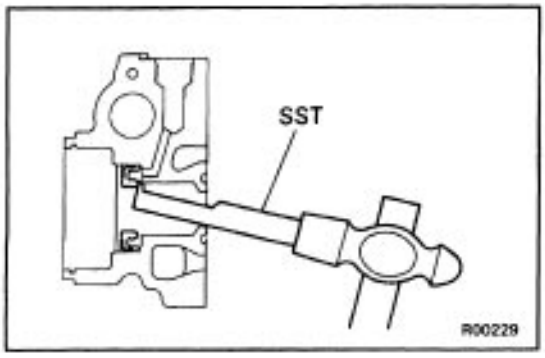


4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring.

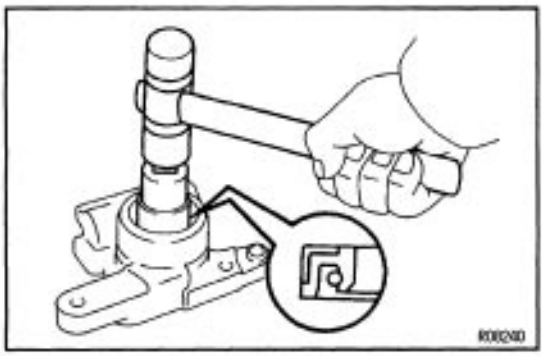
Spring length:

37–39 mm (1.46–1.54 in.)

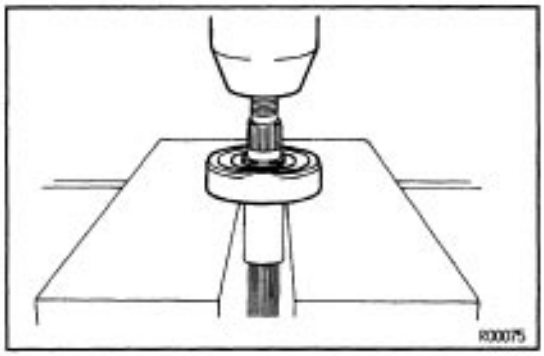


5. IF NECESSARY, REPLACE OIL SEAL

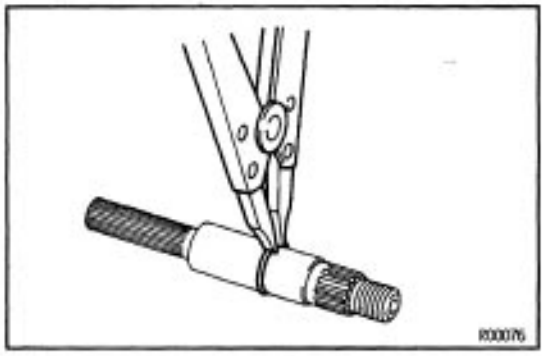
(a) Using SST and a hammer, drive out the oil seal.
SST 09631–10030



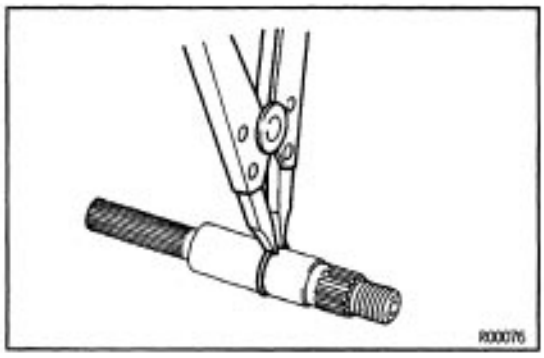
(b) Coat a new oil seal lip with power steering fluid.
NOTICE: Make sure you install the oil seal facing the correct direction.
(c) Using a socket wrench (24 mm) and hammer, drive in a new oil seal.



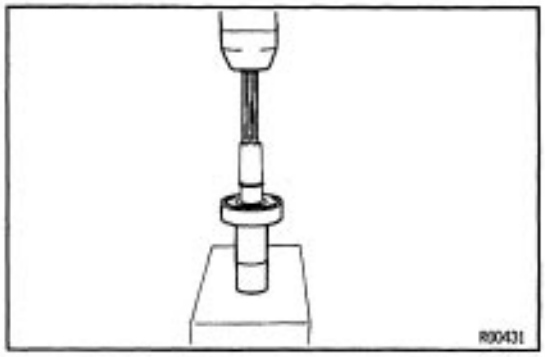
6. IF NECESSARY, REPLACE BALL BEARING
(a) Using a press, remove the ball bearing from the pump shaft.



(b) Using snap ring pliers, remove the snap ring from the pump shaft.

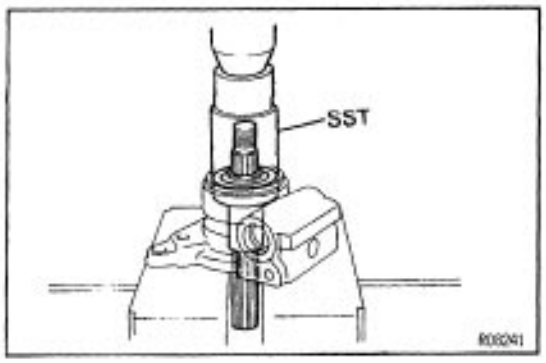


(c) Using snap ring pliers, install the snap ring to the pump shaft.



(d) Using a press and deep socket wrench (17 mm), install a new ball bearing to the pump shaft.

POWER STEERING PUMP ASSEMBLY

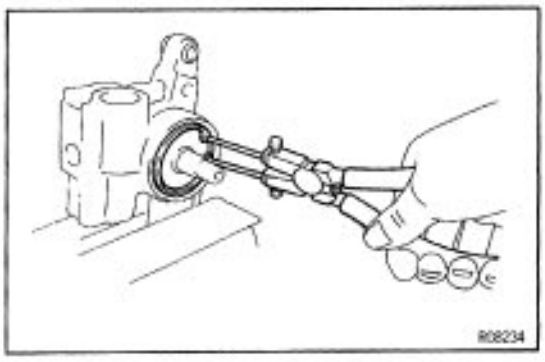


1. COAT ALL SLIDING SURFACES WITH POWER STE–ERING FLUID BEFORE ASSEMBLY

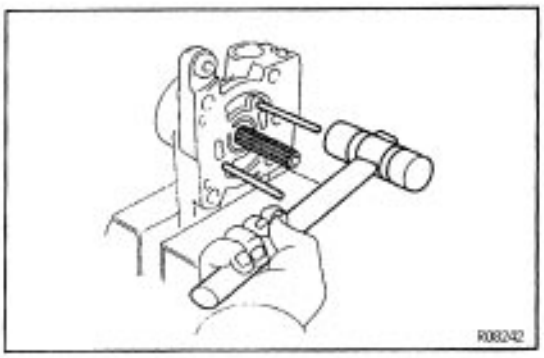
2. INSTALL PUMP SHAFT

(a) Using SST and a press, install the pump shaft with the ball bearing.

SST 09238–47012

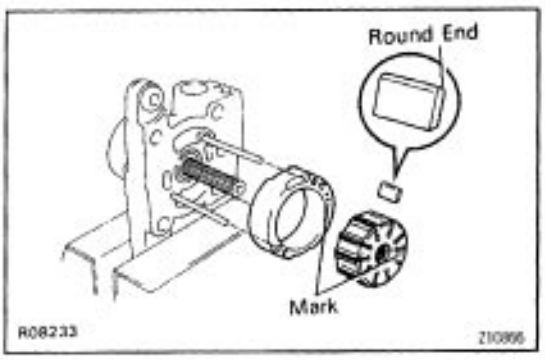


(b) Using snap ring pliers, install the snap ring.



3. INSTALL STRAIGHT PINS

Using a plastic hammer, tap in the 2 straight pins.



4. INSTALL CAM RING, ROTOR AND VANE PLATES

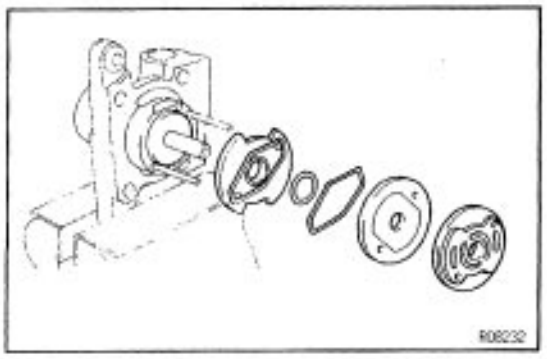
For PS:

(a) Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.

(b) Install the rotor to the shaft with the inscribed mark facing outward.

(c) Coat the vane plates with power steering fluid.

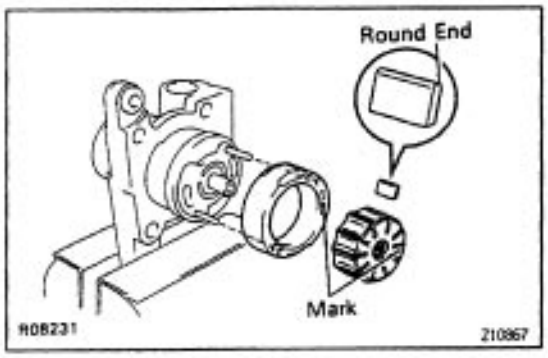
(d) Install the 10 vane plates with the round end facing outward.



5. INSTALL FRONT SIDE PLATE AND 2 REAR SIDE PLATES

(a) Install 2 new 0–rings to the rear side plate.

(b) Align the holes of the plates and straight pins, and install the plates.



6. INSTALL CAM RING, ROTOR AND VANE PLATES

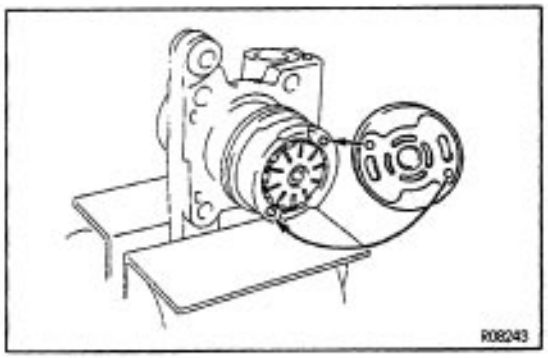
For Hydraulic Cooling Fan System:

(a) Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.

(b) Install the rotor to the shaft with the inscribed mark facing outward.

(c) Coat the vane plates with power steering fluid.

(d) Install the 10 vane plates with the round end facing outward.

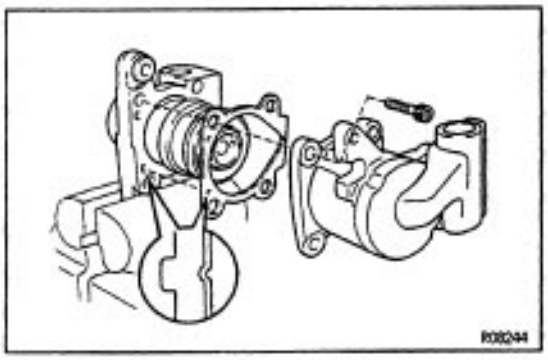


7. INSTALL REAR SIDE PLATE AND WAVE WASHER

(a) Install 2 new 0–rings to the rear side plate.

(b) Align the holes of the side plate with the pins, and install the plate.

(c) Install the wave washer.



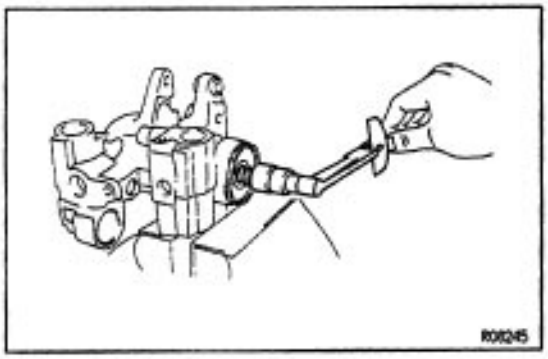
8. INSTALL REAR HOUSING

(a) Install a new gasket and the rear housing.

HINT: Be careful when aligning the gasket.

(b) Using a hexagon wrench (8 mm), install and torque the 4 bolts.

Torque: 46 N–m (470 kgf–cm, 34 ft–lbf)



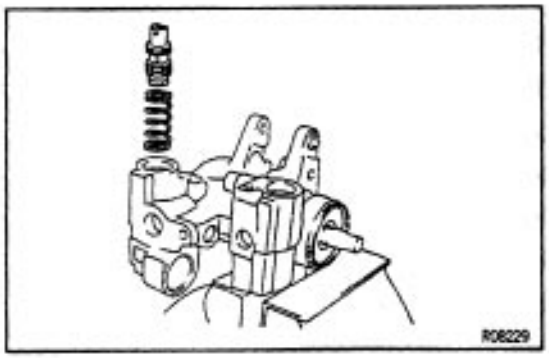
9. MEASURE PUMP SHAFT PRELOAD

(a) Check that the shaft rotates smoothly with out abnor–mal noise.

(b) Temporarily install the pulley nut and check the rotat–ing torque.

Rotating torque:

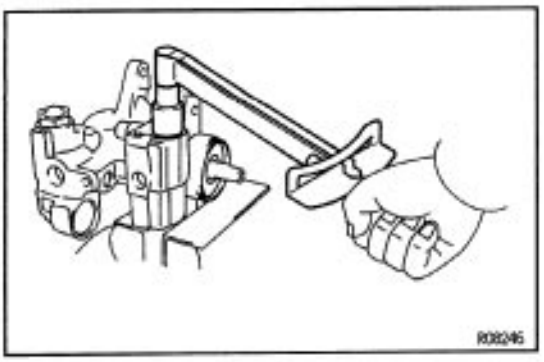
0.3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less



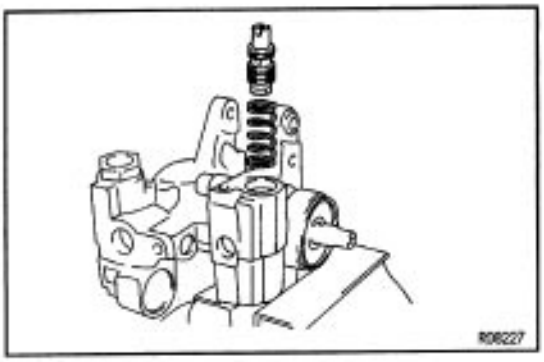
10. INSTALL FLOW CONTROL VALVE

For Hydraulic Cooling Fan System:

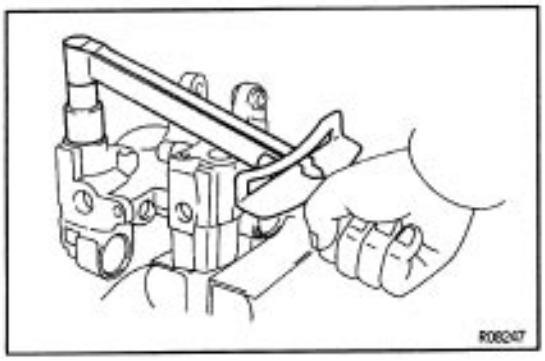
(a) Install the spring and flow control valve into the hous–ing.



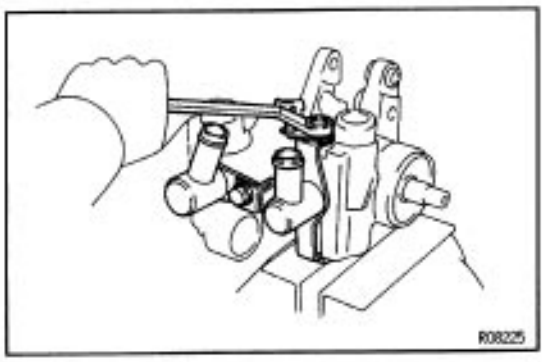
(b) Coat a new O–ring with power steering fluid, and install it to the pressure port union.
(c) Install and torque the pressure port union.
Torque: 69 N–m (700 kgf–cm, 61 ft–lbf)



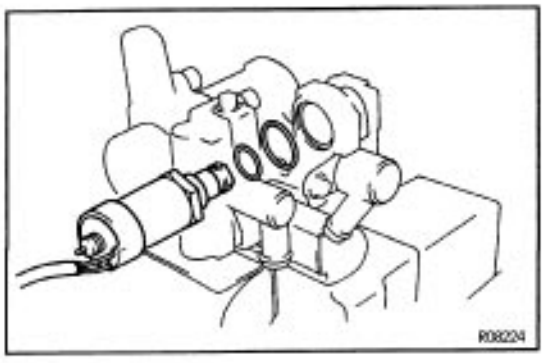
11. INSTALL FLOW CONTROL VALVE
For PS:
(a) Install the spring and flow control valve into the hous–ing.



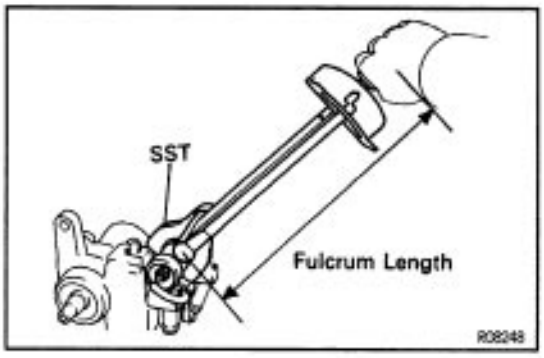
(b) Coat a new O–ring with power steering fluid, and install it to the pressure port union.
(c) Install and torque the pressure port union.
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)



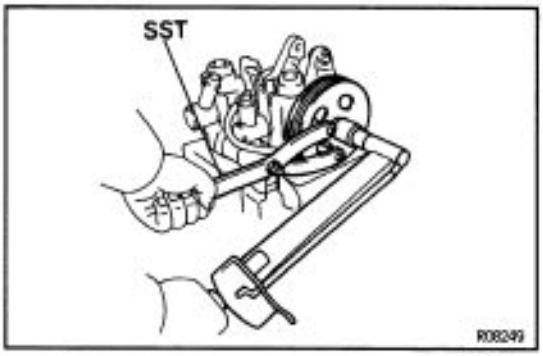
12. INSTALL SUCTION PORT UNIONS
(a) Coat 2 new 0–rings with power steering fluid, and install them to each suction port union.
(b) Install the suction port union with the 3 bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



13. INSTALL CONTROL VALVE
(a) Coat a new O–ring with power steering fluid, and install it to the rear housing.
(b) Install a new O–ring to the control valve.



(c) Using SST, install and torque the control valve.
SST 09612–24014 (09617–24030)
Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

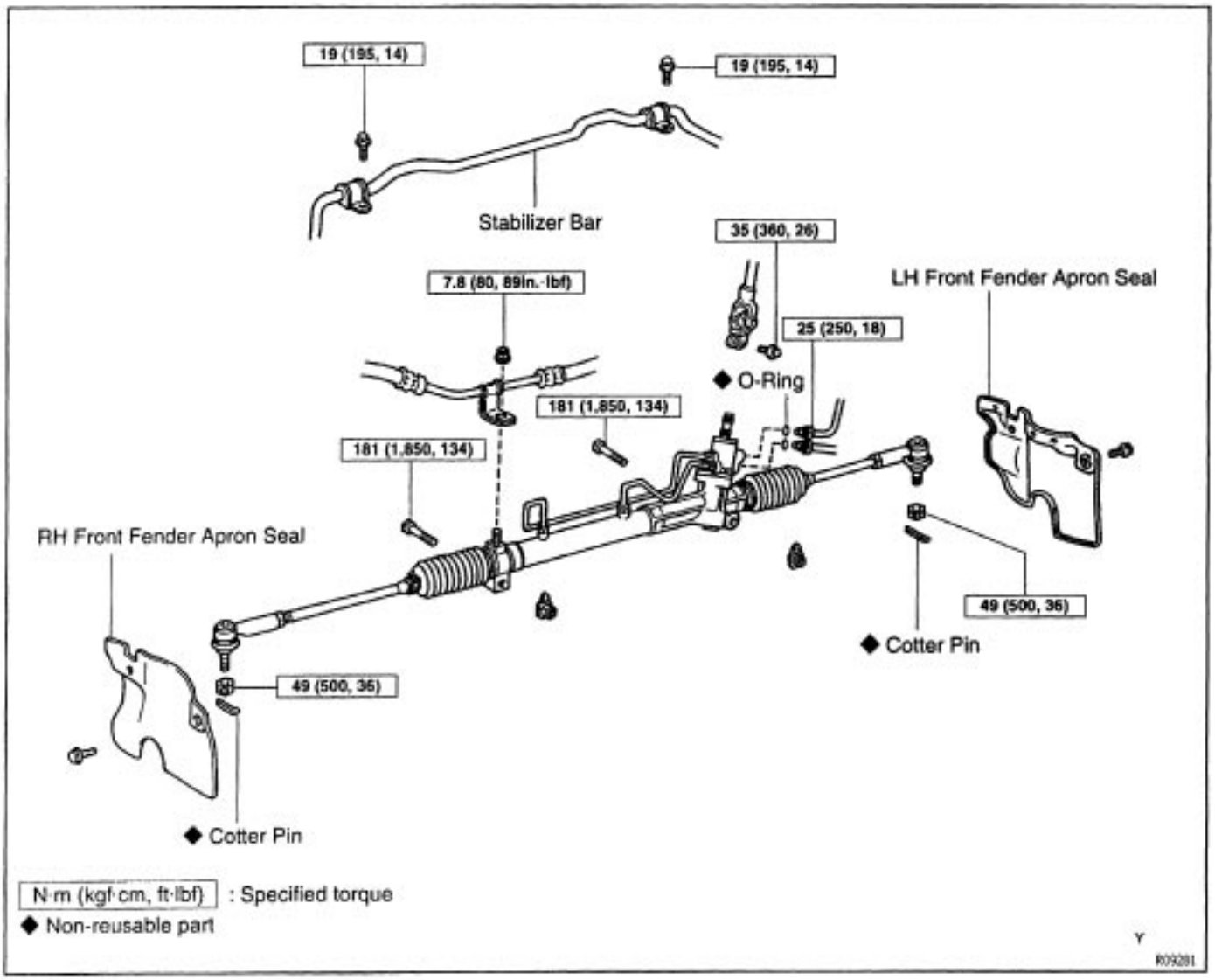


14. INSTALL PS PUMP PULLEY
(a) Install the pump pulley to the shaft.
(b) Using SST, install and torque the pulley set nut.
SST 09960–10010 (09963–01000)
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

GEAR HOUSING

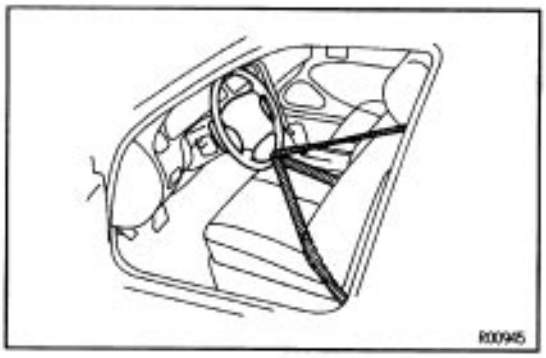
STEERING GEAR HOUSING REMOVAL AND INSTALLATION

Remove and install the parts, as shown.

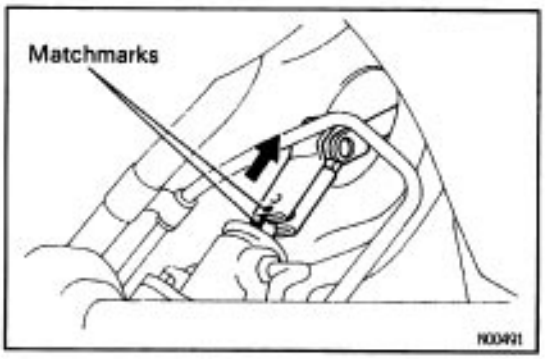


MAIN POINTS OF REMOVAL AND INSTALLATION

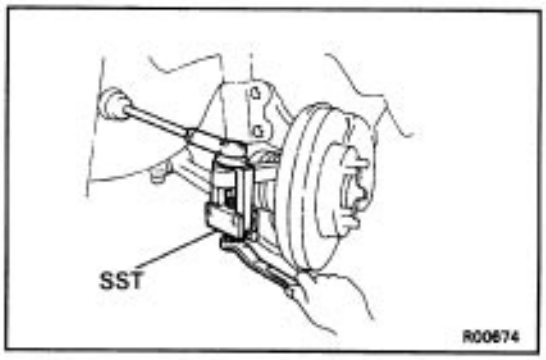
NOTICE: When disconnecting the sliding yoke during removal of the gear housing, remove the steering wheel and perform centering of the spiral cable.
(See page RS–20)
If the operation is performed without removing the steering wheel, use the procedure below to make sure the steering wheel is firmly fixed in position and cannot turn.



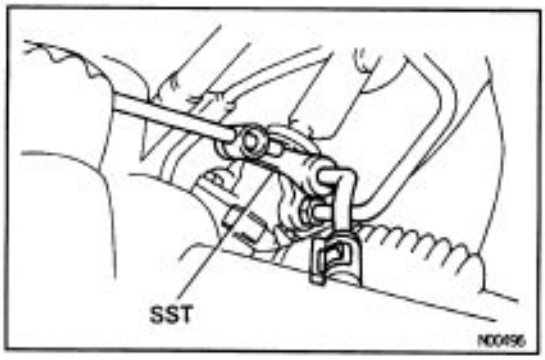
1. DISCONNECT SLIDING YOKE
(a) Position the front wheels facing straight ahead.
(b) Using the seat belt of the driver's seat, fix the steering wheel so that it does not turn.



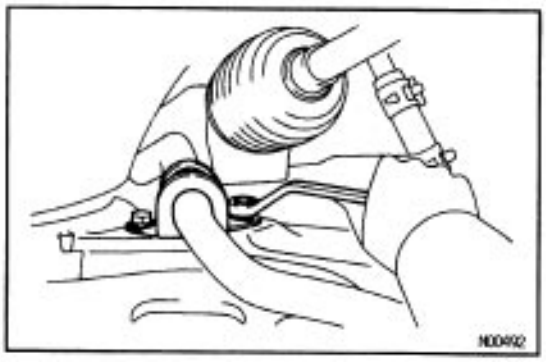
(c) Place matchmarks on the sliding yoke and control valve shaft.
(d) Loosen the bolt on the upper side of the sliding yoke, remove the bolt on the lower side and disconnect the sliding yoke.



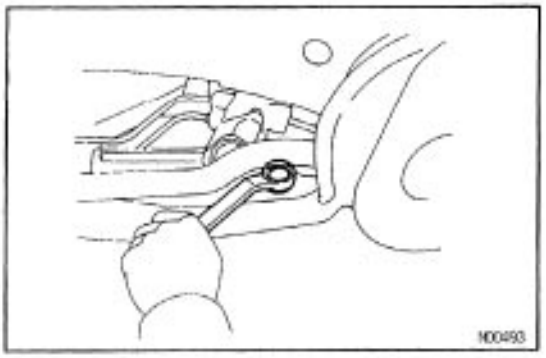
2. DISCONNECT TIE ROD ENDS
(a) Remove the cotter pins and nuts.
(b) Using SST, disconnect the tie rod end from the knuck–le arm.
SST 09628–62011



3. DISCONNECT PRESSURE AND RETURN TUBES
Using SST, disconnect and connect the pressure and return tubes.
SST 09631 –22020
Torque: 25 N–m (250 kgf–cm, 18 ft.–lbf)

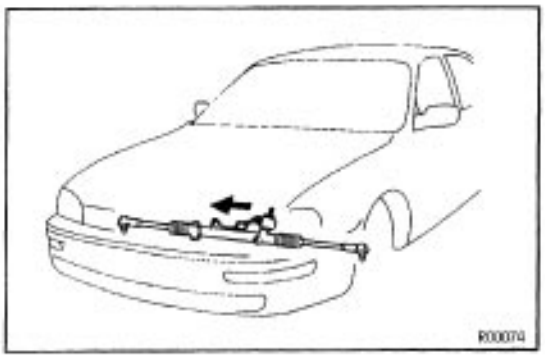


4. REMOVE STABILIZER BAR SET BOLTS
Remove the 4 stabilizer bar set bolts.



5. REMOVE GEAR HOUSING

(a) Remove the 2 set bolts.

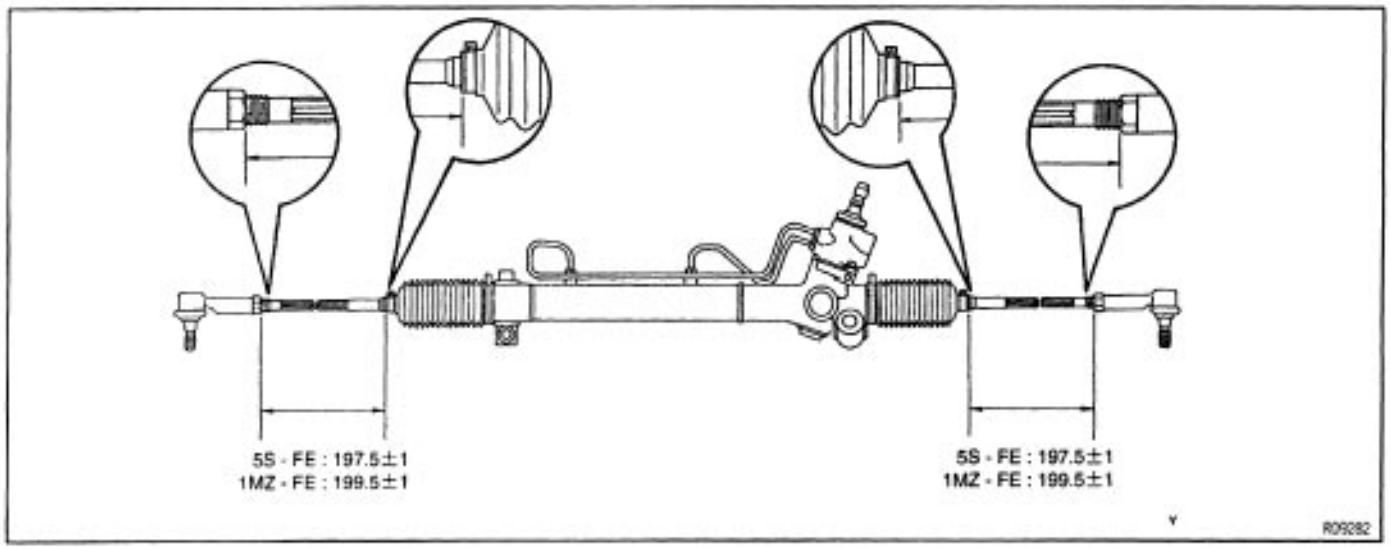


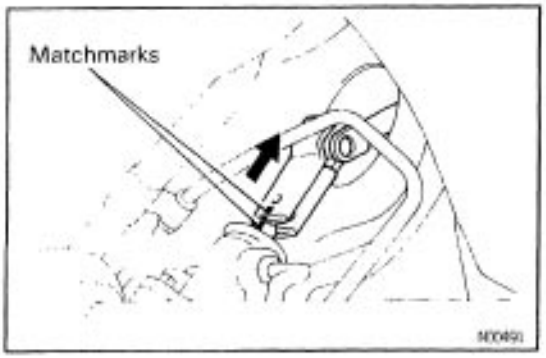
(b) Slide the gear housing to the RH side.

NOTICE: Do not damage the turn pressure tube.

6. CONNECT SLIDING YOKE

(a) Set the gear housing so that it matches the dimen–sions shown below, with the gear housing at the center point.





(b) Align matchmarks on the sliding yoke and control valve shaft and connect them.

7. CENTER SPIRAL CABLE

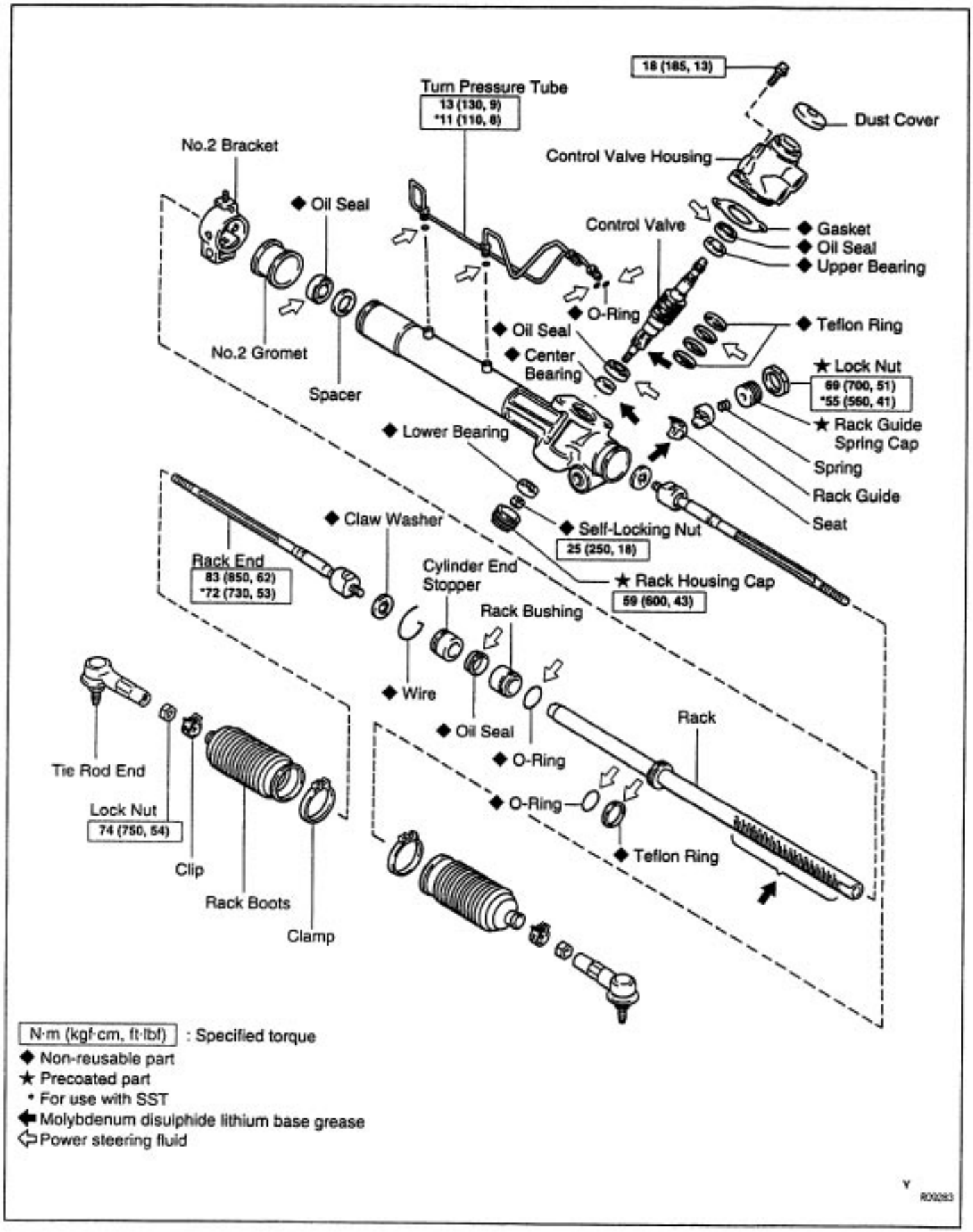
If the steering wheel has been removed, or the steer–ing wheel may have moved during the operation, always perform centering of the spiral cablle.

(See page RS–20)

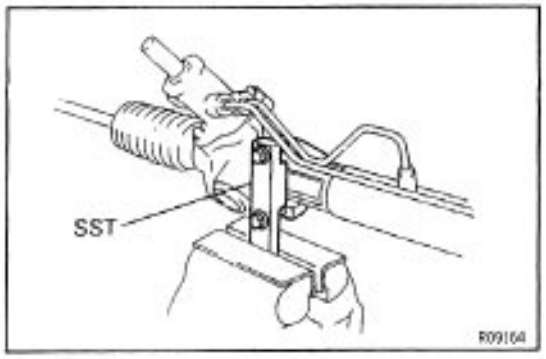
8. CHECK STEERING WHEEL CENTER POINT

9. CHECK TOE–IN

COMPONENTS

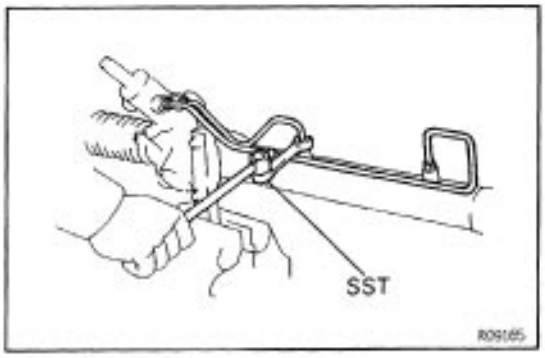

18 (185, 13)
Turn Pressure Tube
13 (130, 9)
*11 (110, 8)
Dust Cover
No.2 Bracket
Control Valve Housing
◆ Oil Seal
Control Valve
◆ Gasket
◆ Oil Seal
◆ Upper Bearing
◆ O-Ring
◆ Oil Seal
◆ Teflon Ring
No.2 Gromet
◆ Center Bearing
★ Lock Nut
69 (700, 51)
*55 (560, 41)
Spacer
★ Rack Guide Spring Cap
◆ Lower Bearing
Spring
Rack Guide
Seat
◆ Claw Washer
◆ Self-Locking Nut
25 (250, 18)
Rack End
83 (850, 62)
*72 (730, 53)
Cylinder End Stopper
★ Rack Housing Cap
59 (600, 43)
Rack Bushing
◆ Wire
Rack
◆ Oil Seal
◆ O-Ring
Tie Rod End
◆ O-Ring
Lock Nut
74 (750, 54)
◆ Teflon Ring
Clip
Rack Boots
Clamp
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part
* For use with SST
Molybdenum disulphide lithium base grease
Power steering fluid
R03283

STEERING GEAR HOUSING DISASSEMBLY



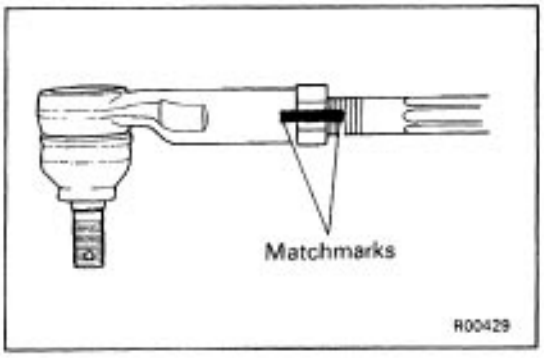
1. CLAMP GEAR HOUSING IN VISE

Using SST, secure the steering gear in a vise.
SST 09612–00012



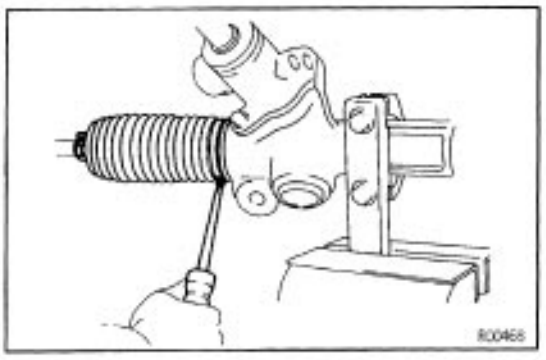
2. REMOVE LEFT AND RIGHT TURN PRESSURE TUBES

(a) Using SST, remove the turn pressure tubes.
SST 09630–00020
(b) Remove the 0–rings from the turn pressure tubes.



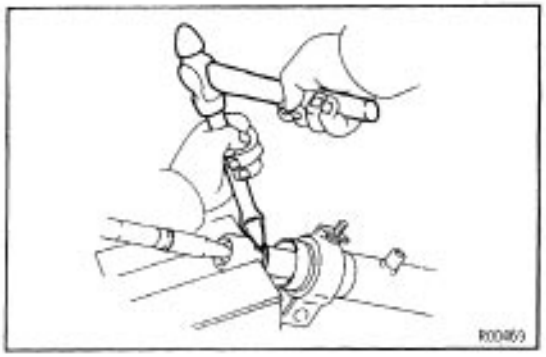
3. REMOVE TIE ROD ENDS

(a) Loosen the lock nut and place matchmarks on the tie rod end and rack end.
(b) Remove the tie rod ends and lock nuts.



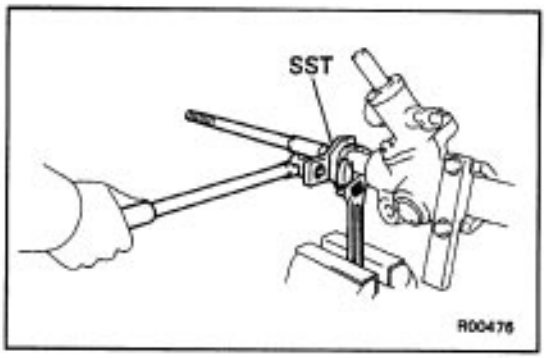
4. REMOVE RACK BOOTS

(a) Using a screwdriver, remove the clips and clamps.
(b) Remove the rack boots.
NOTICE: Be careful not to damage the rack boots and rack housing.

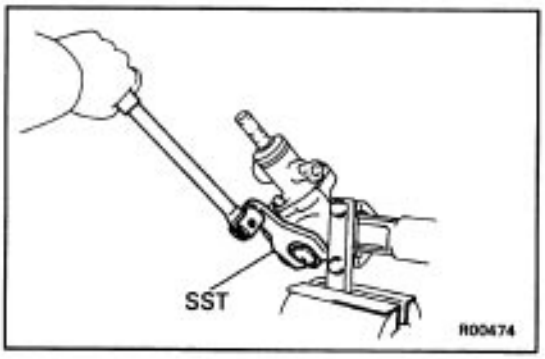


5. REMOVE RACK ENDS AND CLAW WASHERS

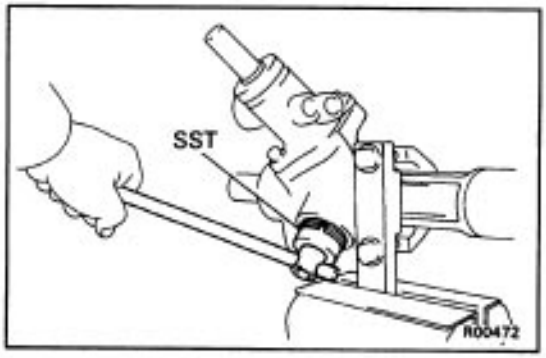
(a) Unstake the claw washers.
NOTICE: Avoid any impact to the rack.



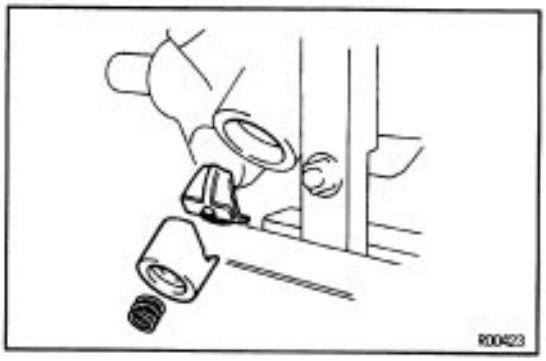
(b) Using SST, remove the rack ends.
SST 09617–14010
(e) Mark the left and right rack ends accordingly.
(d) Remove the claw washers.



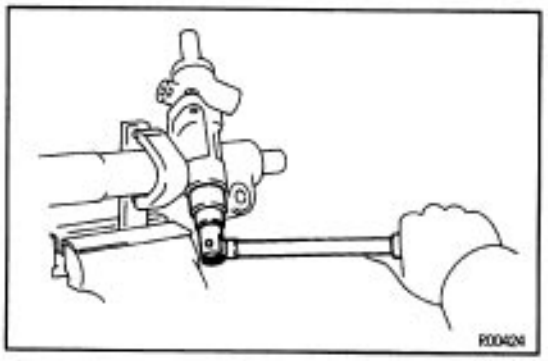
6. REMOVE RACK GUIDE SPRING CAP LOCK NUT
Using SST, remove the rack guide spring cap lock nut.
SST 09612 – 24014 (09617 – 24020)



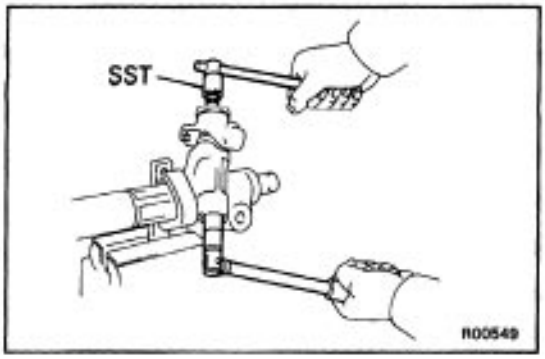
7. REMOVE RACK GUIDE SPRING CAP
Using SST, remove the rack guide spring cap.
SST 09631 –10021



8. REMOVE RACK GUIDE SPRING, RACK GUIDE AND SEAT



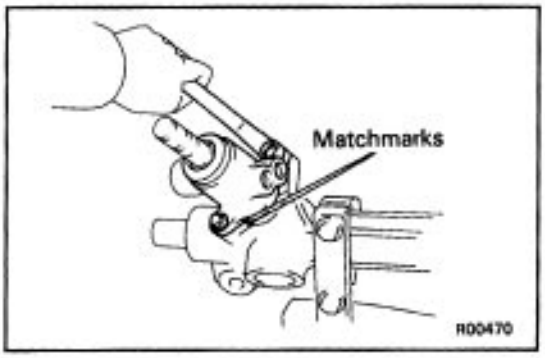
9. REMOVE RACK HOUSING GAP



10. REMOVE SELF– LOCKING NUT

Using SST to hold the control valve, remove the self–locking nut.

SST 09616 – 00010



11. REMOVE CONTROL VALVE HOUSING

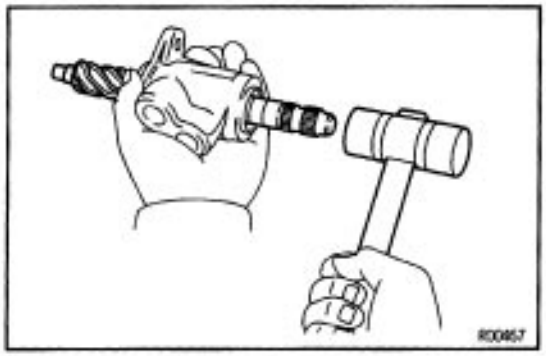
(a) Remove the dust cover.

(b) Place matchmarks on the valve housing and rack housing.

(c) Remove the 2 bolts.

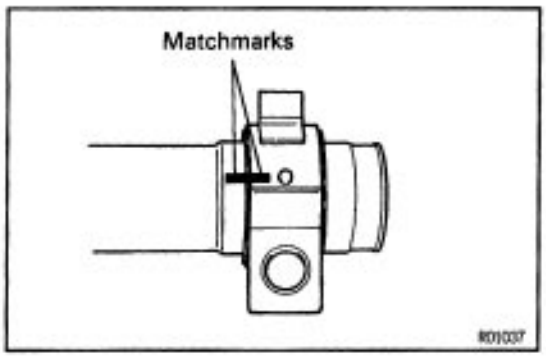
(d) Pull out the valve with the valve housing.

(e) Remove the gasket from the rack housing.



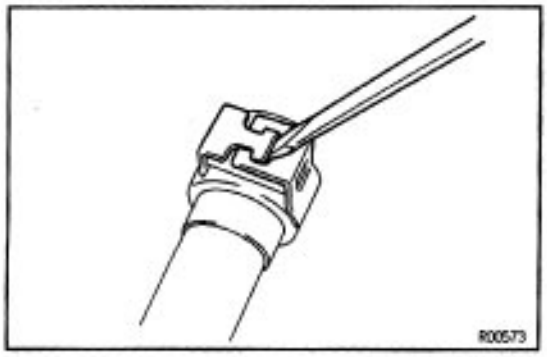
12. REMOVE CONTROL VALVE FROM HOUSING

Tap out the control valve and oil seal.



13. REMOVE N0.2 BRACKET

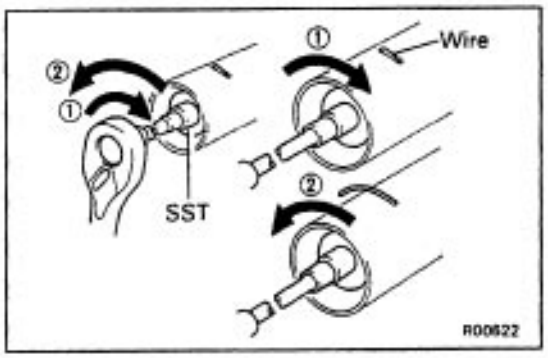
(a) Place matchmarks on the bracket and rack housing.



(b) Using a screwdriver, pry a part the clasp of the No.2 bracket.

(c) Remove the bushing and bracket from the rack housing.

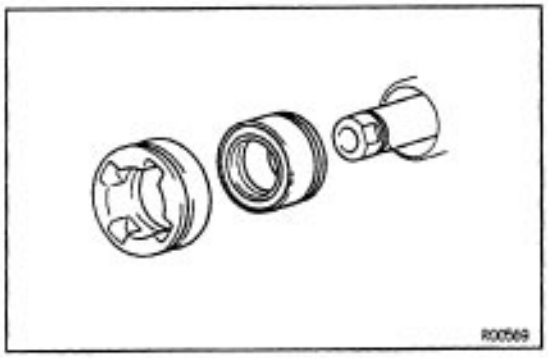
(d) Remove the bushing from the bracket.



14. REMOVE CYLINDER END STOPPER

(a) Using SST, turn the cylinder end stopper clockwise until the wire end comes out.
SST 09631 –16010

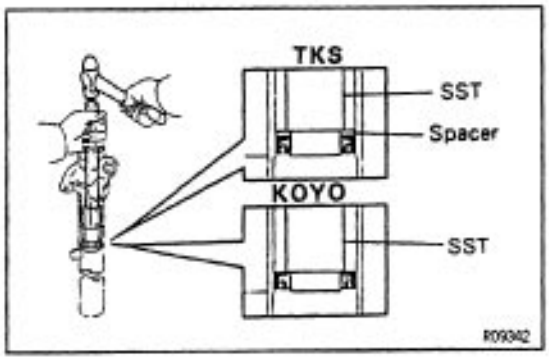
(b) Using SST, turn the cylinder end stopper counter–clockwise, and remove the wire.
SST 09631 –16010



15. REMOVE RACK BUSHING AND RACK

(a) Using a brass bar, tap out the rack with the rack busing.

(b) Remove the 0–ring from the bushing.

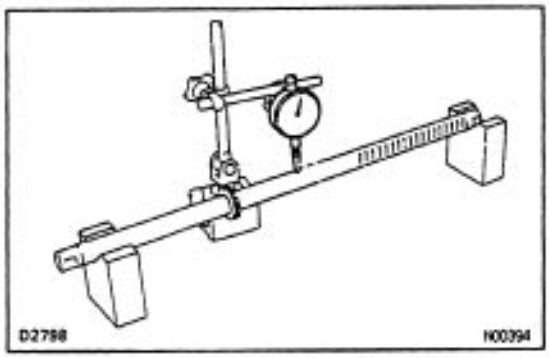


16. REMOVE CYLINDER SIDE OIL SEAL AND SPACER

Using SST and a brass bar, drive out the oil seal and spacer.
SST 09620–30010 (09623–30010)

W" -01

STEERING GEAR HOUSING INSPECTION AND REPLACEMENT



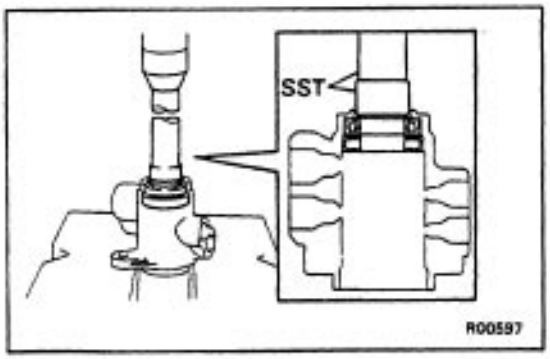
1. INSPECT RACK

(a) Using a dial indicator, check the rack for runout and for tooth wear or damage.

Maximum runout:

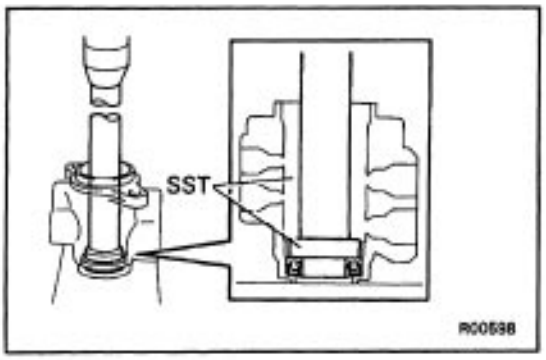
0.3 mm (0.012 in.)

(b) Check the back surface for wear or damage.
If faulty, replace it.

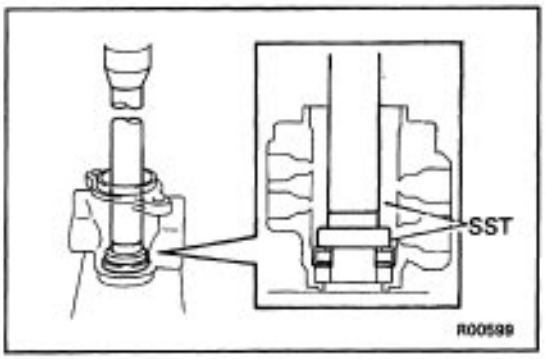


2. IF NECESSARY, REPLACE CONTROL VALVE HOUS–ING OIL SEAL AND UPPER BEARING

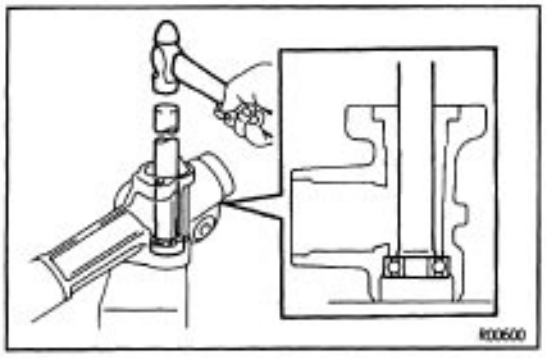
(a) Using SST, press out the oil seal and upper bearing.
SST 09620–30010 (09631 –00020)
09630–24013 (09620–24020)



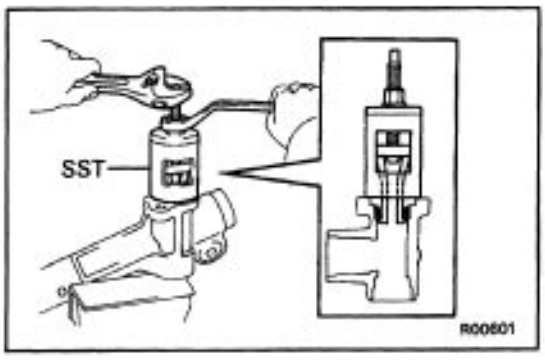
(b) Coat a new oil seal with power steering fluid.
(c) Using SST, press in a new oil seal, as shown.
SST 09620–30010 (09631–00020)
09630–24013 (09620–24020)



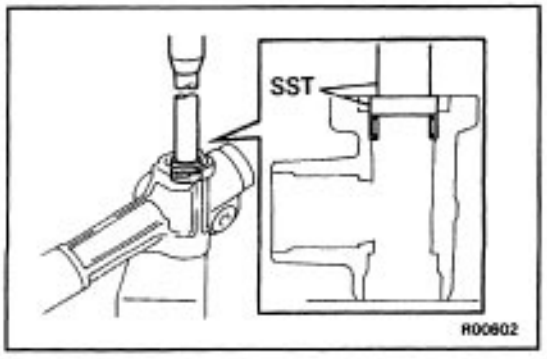
(d) Using SST, press in a new upper bearing, as shown.
SST 09620–30010 (09631–00020)
09630–24013 (09620–24020)
NOTICE: Press in the bearing so that the inscribed mark on the bearing can be seen.



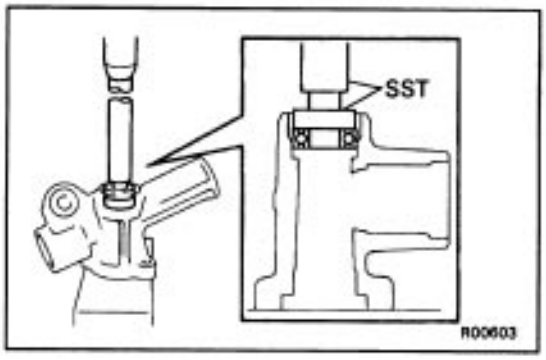
3. IF NECESSARY, REPLACE CONTROL VALVE LOWER BEARING AND CENTER BEARING
(a) Using a brass bar, drive out the lower bearing.



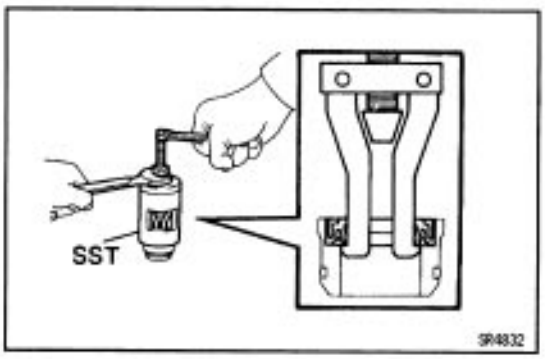
(b) Using SST, remove the center bearing.
SST 09612 – 24014 (09613 – 22011)



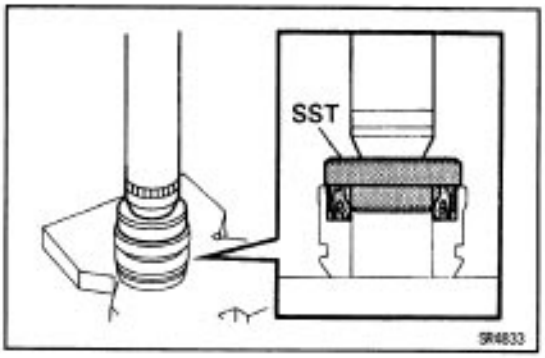
(c) Coat a new center bearing with grease.
(d) Using SST, press in a new center bearing, as shown.
SST 09630–24013 (09620–24020),
09631–12020



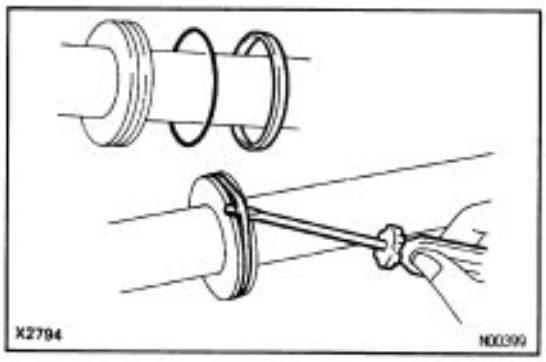
(e) Using SST, press in a new lower bearing.
SST 09630–24013 (09620–24020),
09631 –12020



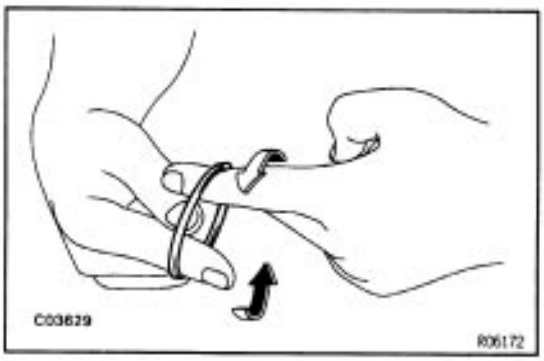
4. IF NECESSARY, REPLACE RACK BUSHING OIL SEAL
(a) Using SST, remove the oil seal.
SST 09612 – 24014 (09613 – 22011)



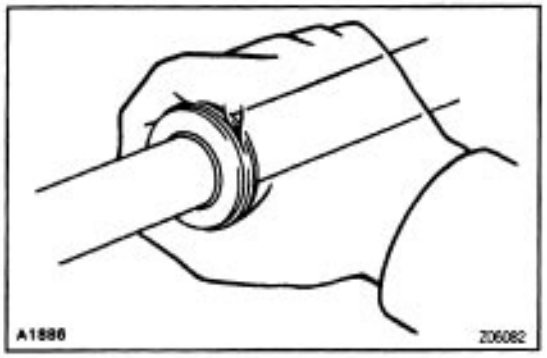
(b) Coat a new oil seal with power steering fluid.
(c) Using SST, press in the oil seal.
SST 09631–32010



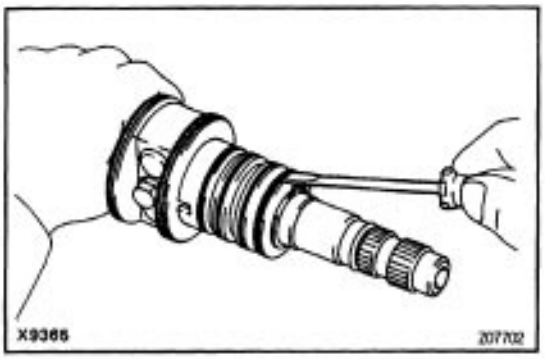
5. IF NECESSARY, REPLACE STEERING RACK TEFLON RING AND O–RING
(a) Using a screwdriver, remove the teflon ring and 0–ring.
NOTICE: Be careful not to damage the groove for the teflon ring.
(b) Coat a new O–ring with power steering fluid and install it.



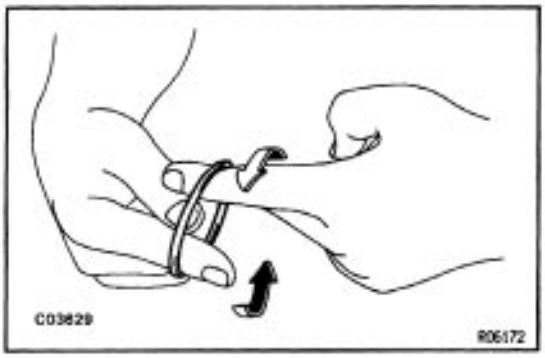
(c) Expand a new teflon ring with your fingers.
NOTICE: Be careful not to over–expand the teflon ring.



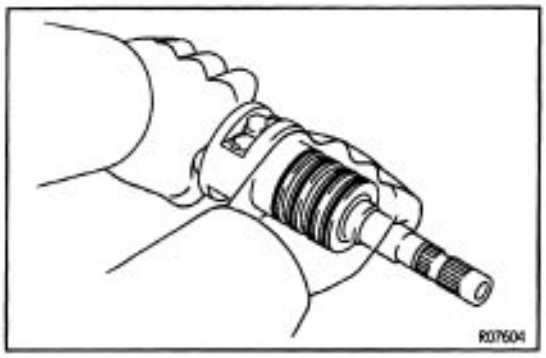
(d) Install the teflon ring to the rack.
(e) Install the expanded teflon ring to the steering rack and snug it down with your fingers.



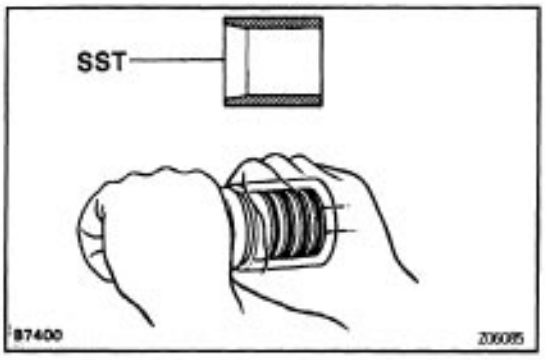
6. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RINGS
(a) Using a screwdriver, remove the 4 teflon rings.
NOTICE: Be careful not to damage the grooves for the teflon ring.



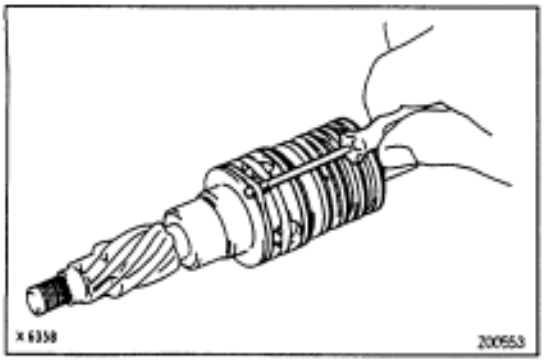
(b) Expand 4 new teflon rings with your fingers.
NOTICE: Be careful not to over–expand the teflon ring.



(c) Install the 4 teflon rings to the control valve.
(d) Coat the 4 teflon rings with power steering fluid and snug them down with your fingers.



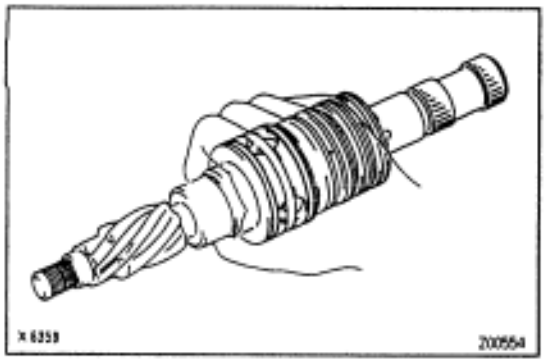
(e) Carefully slide the tapered end of the SST over the teflon rings to seat the rings.
SST 09631– 20081
NOTICE: Be careful not to damage the teflon rings.



7. IF NECESSARY, REPLACE HYDRAULIC REACTION CHAMBER TEFLON RINGS AND O–RINGS

(a) Remove the teflon rings and 0–rings.

NOTICE: Be careful not to damage the control valve.



(b) Install new 0–rings to the control valve.

(c) Install the expanded new teflon rings to the control valve.

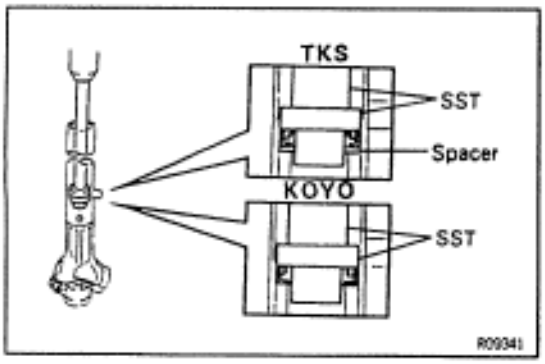
(d) Carefully position the teflon rings into the control valve grooves.

NOTICE: Be careful not over–expand the teflon rings.

(e) Coat the teflon rings with power steering fluid, and snug them down with your fingers.

NOTICE: Be careful not to damage the teflon rings.

STEERNG GEAR HOUSING ASSEMBLY”



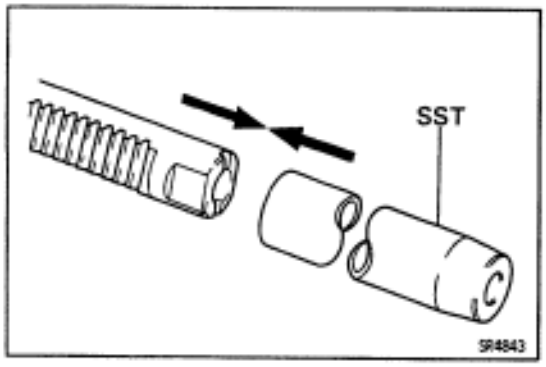
1. INSTALL CYLINDER HOUSING OIL SEAL AND SPACER

(a) Coat a new oil seal lip with power steering fluid.

(b) Tape the showing part of SST before use.

(c) Install the oil seal to SST, and press in it.

SST 09608–12010 (09608–00080),
09631 –12020

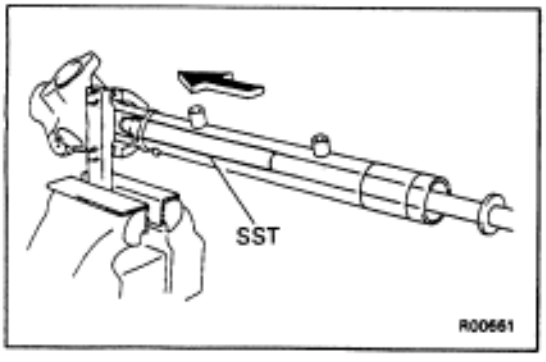


2. INSTALL RACK

(a) Install SST to the rack.

HINT: If necessary, scrape the burrs off the rack teeth end and burnish.

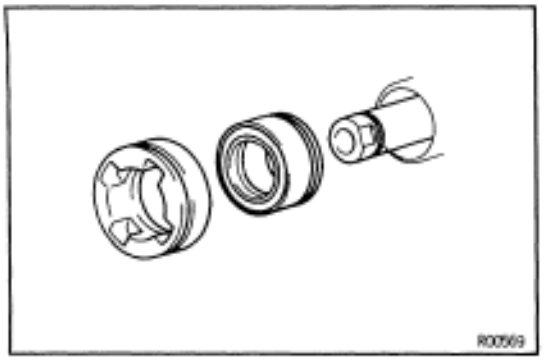
SST 09631 –33010



(b) Coat SST with power steering fluid.

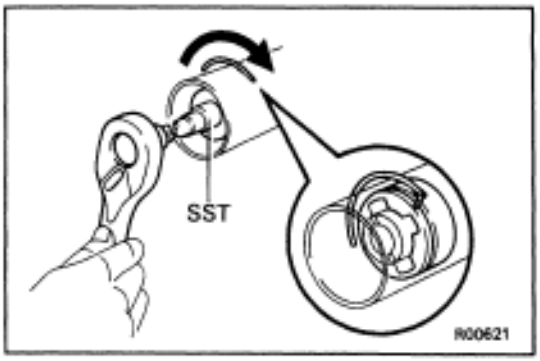
(e) Insert the rack into the cylinder.

(d) Remove SST.



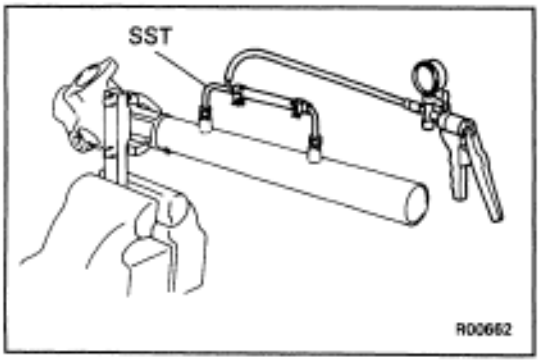
3. INSTALL RACK BUSHING AND CYLINDER END STOPPER

(a) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.
(b) Coat a new O–ring with power steering fluid and install it to the bushing.
(c) Push in the rack bushing and cylinder end stopper until the wire installation hole appears.



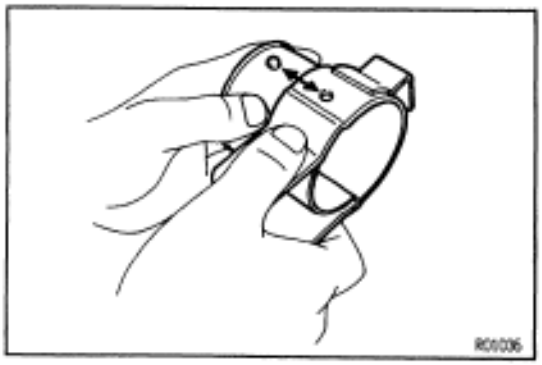
4. INSTALL WIRE

(a) Insert a new wire end into the hole.
(b) Using SST, turn the cylinder end stopper clockwise until the wire end disappears.
SST 09631–16010
NOTICE: Take care to avoid tightening the rack more than needed.



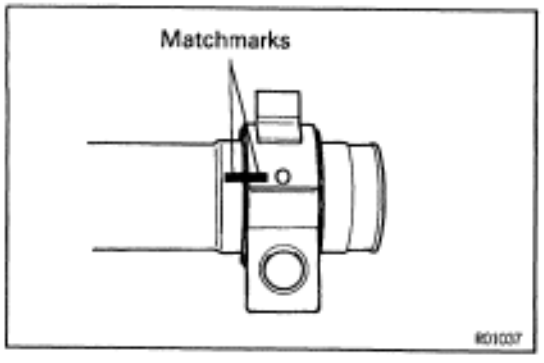
5. AIR TIGHTNESS TEST

(a) Install SST to the unions of the cylinder housing.
SST 09631–12071
(b) Apply 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.
(c) Check that there is no change in the vacuum.
If there is change in the vacuum, check the installation of the rack housing oil seal.

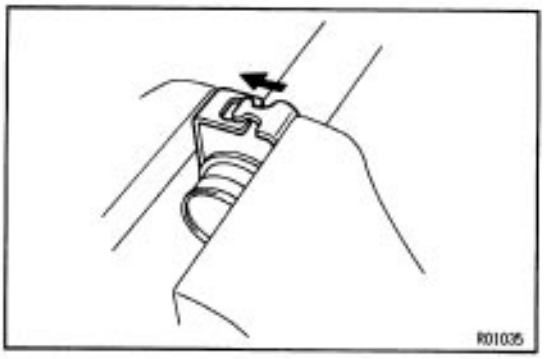


6. INSTALL NO.2 BRACKET

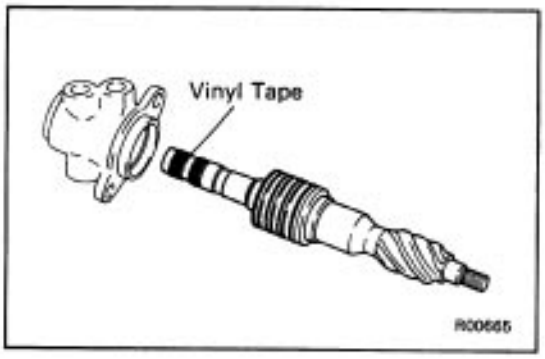
(a) Coat the grommets inner edge with the grease.
(b) Install the bushing to the bracket.



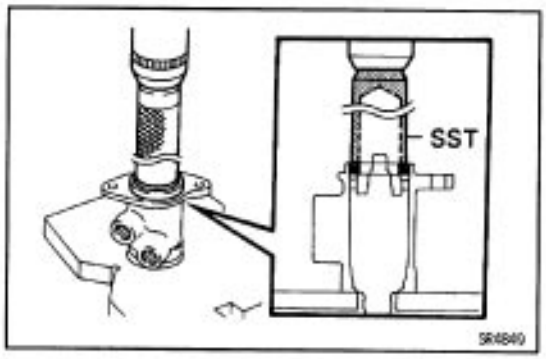
(c) Install the bushing and bracket to the rack housing.
HINT: Align the matchmarks on the bracket and rack housing.



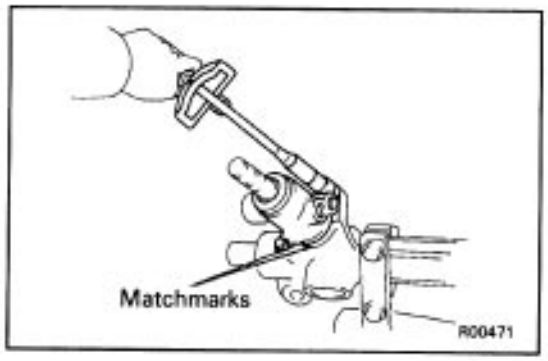
(d) Place the No.2 bracket in a vise and tighten the vise to fasten the clasp.
NOTICE: Take care not to drop the from the No.2 bracket.



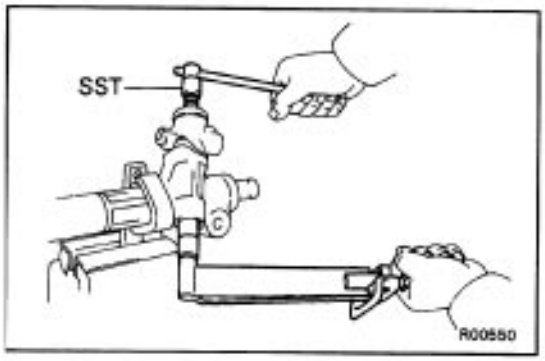
7. INSTALL CONTROL VALVE
(a) Wind vinyl tape on the control valve.
(b) Coat the teflon rings with power steering fluid.
(c) Push the control valve into the housing.
NOTICE: Be careful not to damage the teflon rings and oil seal.



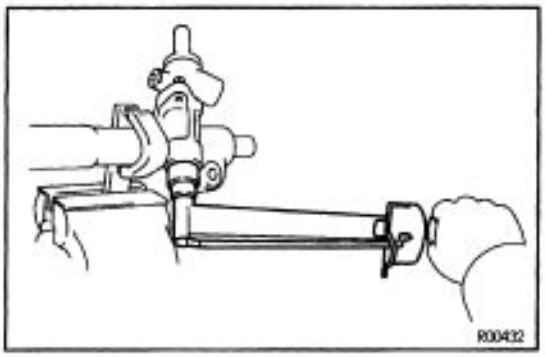
(d) Coat a new oil seal with power steering fluid.
(e) Using SST, press in the new oil seal.
SST 09612–22011



8. INSTALL CONTROL VALVE HOUSING
(a) Place a new gasket on the rack housing.
(b) Align the matchmarks on the valve housing and rack housing.
(c) Torque the 2 bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)
(d) Install the dust cover.



9. INSTALL SELF– LOCKING NUT
Using SST to hold the control valve, install a new self –locking nut.
SST 09616 – 00010
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)
NOTICE: Take care to avoid tightening the rack more than needed.



10. INSTALL RACK HOUSING CAP

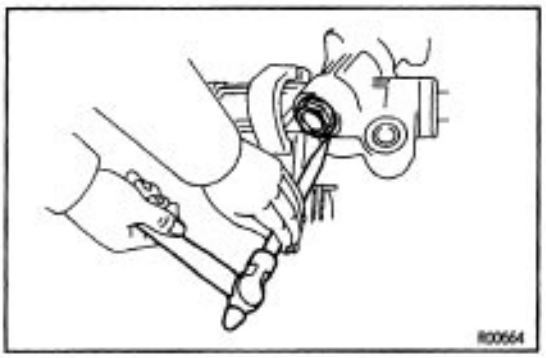
(a) Apply sealant to 2 or 3 threads of the housing cap.

Sealant:

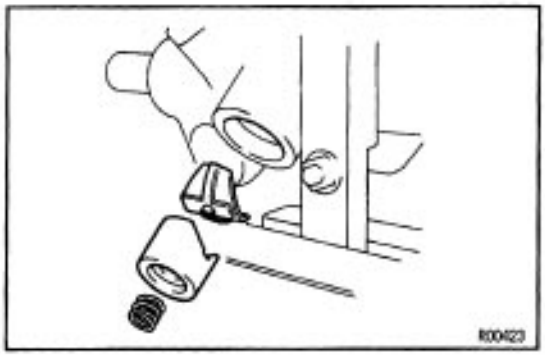
Part No.08833 – 00080, THREE BOND 1344, LOC–TITE 242 or equivalent

(b) Install the rack housing cap.

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)



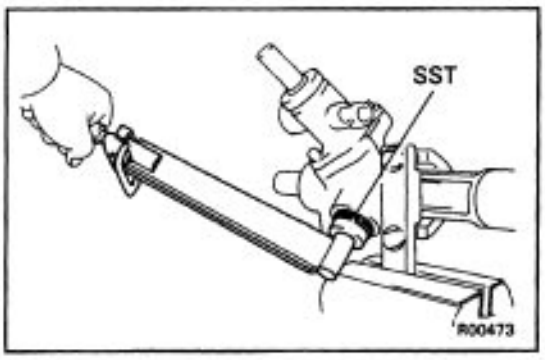
(c) Using a center punch, stake the housing at 2 places.



11. INSTALL RACK GUIDE SEAT, RACK GUIDE AND SPRING

(a) Coat the fitting surfaces between the rack guide seat and the rack guide with grease.

(b) Install the rack guide seat, rack guide and spring.



12. ADJUST TOTAL PRELOAD

(a) Apply sealant to 2 or 3 threads of the spring cap.

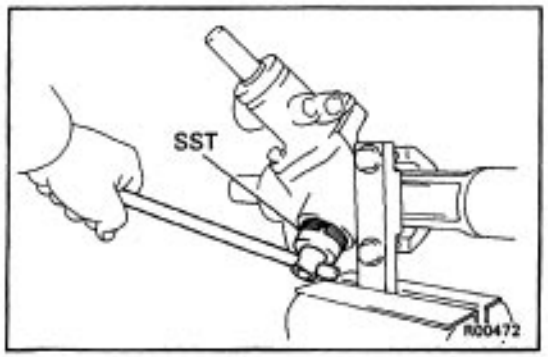
Sealant:

Part No.08833–00080, THREE BOND 1344, LOC–TITE 242 or equivalent

(b) Using SST, install and torque the spring cap.

SST 09631 –10021

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

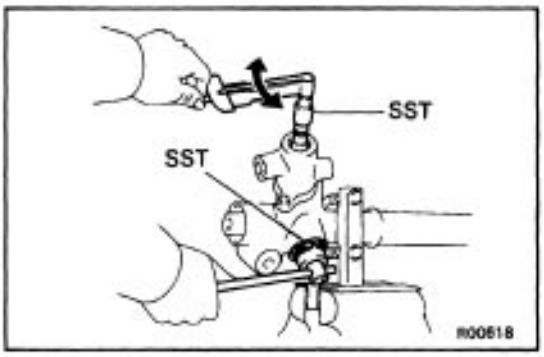


(c) Using SST, return the rack guide spring cap 12©

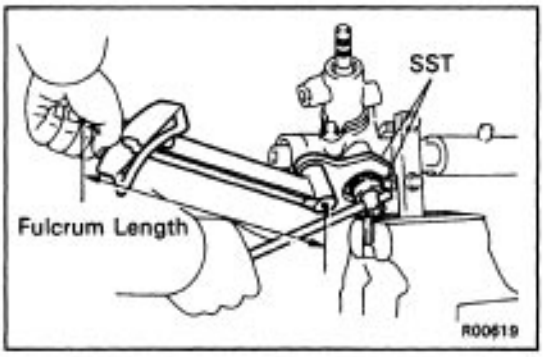
SST 09631–10021

(d) Turn the control valve shaft right and left 1 or 2 times.

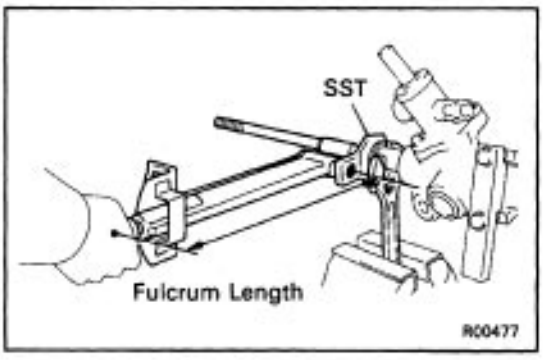
(e) Loosen the spring cap until the rack guide compres–sion spring is not functioning.



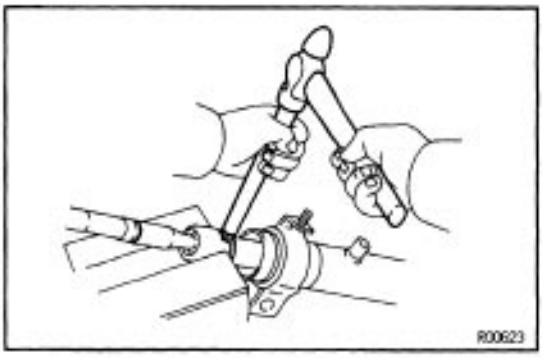
(f) Using SST and torque meter, tighten the rack guide spring cap until the preload is within specification.
SST 09616–00010, 09631 –10021
Preload (turning):
0.8–1.4 N–m (8–14 kgf–cm, 6.9–12.2 in.–lbf)



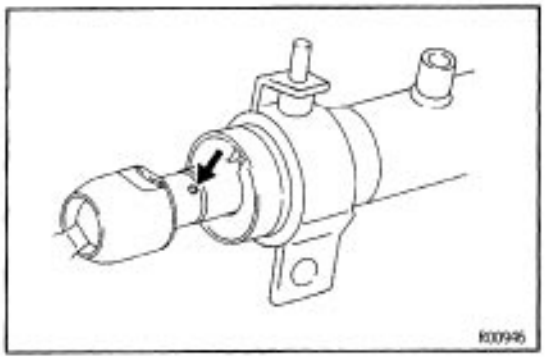
13. INSTALL RACK GUIDE SPRING CAP LOCK NUT
(a) Apply sealant to 2 or 3 threads of the lock nut.
Sealant:
Part No.08833–00080, THREE BOND 1344, LOC–TITE 242 or equivalent
(b) Using SST, install and torque the lock nut.
SST 09612–24014 (09617–24020), 09631–10021
Torque: 55 N–m (560 kgf–cm. 41 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
(c) Recheck the total preload.



14. INSTALL RACK ENDS
(a) Install a new claw washer.
(b) Using SST, install the rack ends.
SST 09617 –14010
Torque: 72 N–m (730 kgf–cm, 53 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).

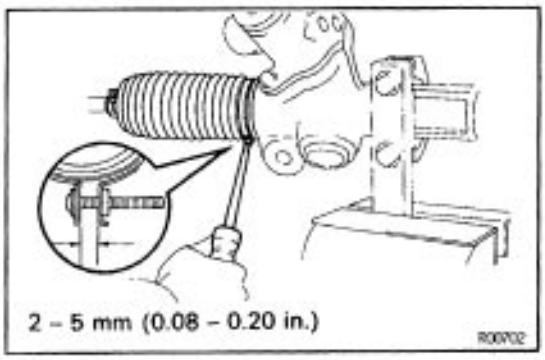


(c) Using a brass bar and hammer, stake the claw wash–ers.

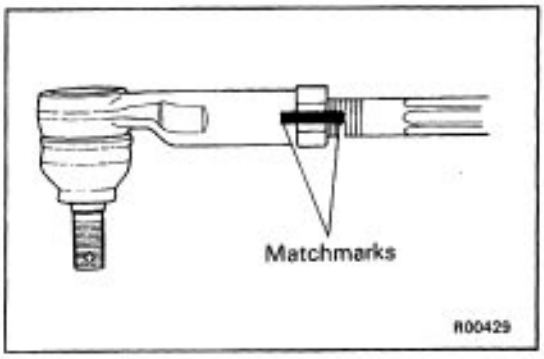


15. INSTALL RACK BOOTS

(a) Ensure that the tube hole is not clogged with grease.
HINT: If the tube hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel turned.
(b) Install the boots.
HINT: Be careful not to damage or twist the boot.

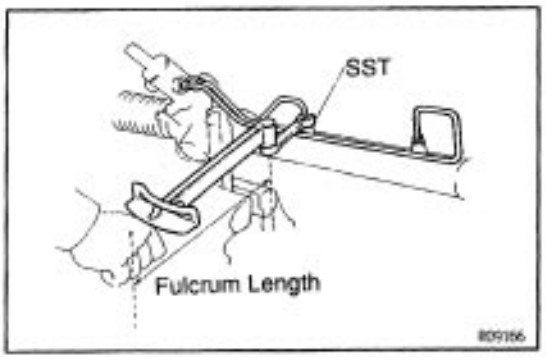


(c) install the clamps and clips.



16. INSTALL TIE ROD ENDS

(a) Screw the lock nuts and tie rod ends onto the rack ends until the matchmarks are aligned.
(b) After adjusting toe–in, torque the lock nut.
Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)



17. INSTALL RIGHT AND LEFT TURN PRESSURE TUBES

(a) Install new O–rings to the tube.
(b) Using SST, install and torque the tubes.
SST 09633–00020
Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).

SERVICE SPECIFICATIONS

SERVICE DATA

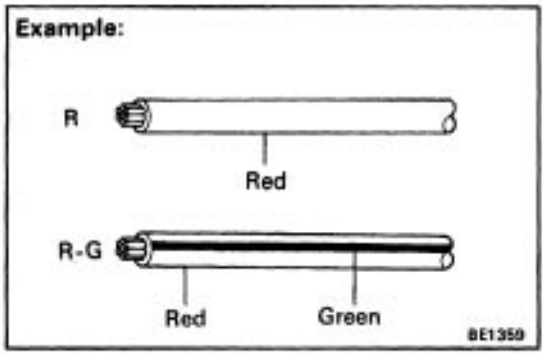
Steering wheel freeplay (Maximum)	30mm (1.18in.) or less
PS ON–VEHICLE INSPECTION	
Drive belt tension 1 MZ– FE (New belt)	539 – 637 N (55 – 65 kgf, 121 – 143 lbf)
Drive belt tension 1 MZ–FE (Used belt)	245 – 392 N (25 – 40 kgf, 55 – 88 lbf)
Drive belt tension 5S–FE (New belt)	432 – 539 N (44 – 55 kgf, 97 – 121 lbf)
Drive belt tension 5S–FE (Used belt)	196 – 343 N (20 – 35 kgf, 44 – 77 lbf)
Maximum rise of oil level	5 mm (0.20 in.)
Oil pressure at idle speed with valve closed (Minimum) 1 MZ–FE	9,120 kpa (93 kgf/cm², 1,323 psi)
Oil pressure at idle speed with valve closed (Minimum) 5S–FE	8,336 kpa (85 kgf/cm², 1,209 psi)
Steering effort at idle speed (Maximum)	39 N (4 kgf, 8.8 lbf)
PS PUMP	
Rotor shaft bushing oil clearance (STD) 1 MZ– FE	0.03 – 0.05 mm (0.0012 – 0.0020 in.)
Rotor shaft bushing oil clearance (Maximum) 1 MZ–FE	0.07 mm (0.0028 in.)
Vane plate to rotor groove clearance (Maximum) 1 MZ–FE	0.035 mm (0.0014 in.)
Rotor shaft bushing oil clearance (STD) 5S–FE	0.01 – 0.03 mm (0.0004 – 0.0012 in.)
Rotor shaft bushing oil clearance (Maximum) 5S–FE	0.07 mm (0.0028 in.)
Vane plate to rotor groove clearance (Maximum) 5S–FE	0.03 mm (0.0012in.)
Vane plate length (Minimum) 1 MZ–FE for PS	14.99 mm (0.5902 in.)
Vane plate height (Minimum) 1 MZ–FE for PS	8.6 mm (0.339 in.)
Vane plate thickness (Minimum) 1 MZ–FE for PS	1.4 mm (0.055 in.)
Vane plate length (Minimum) 1 MZ–FE for Hydraulic cooling fan	14.98 mm (0.5898 in.)
Vane plate height (Minimum) 1 MZ–FE for Hydraulic cooling fan	8.1 mm (0.319 in.)
Vane plate thickness (Minimum) 1 MZ–FE for Hydraulic cooling fan	1.8 mm (0.071in.)
Vane plate length (Minimum) 5S–FE	14.97 mm (0.5894 in.)
Vane plate height (Minimum) 5S–FE	8.0 mm (0.315 in.)
Vane plate thickness (Minimum) 5S–FE	1.77 mm (0.0697 in.)
Vane plate length 1 MZ–FE for PS	
(Cam ring mark) (Rotor mark)	
2 None	15.003 – 15.005 mm (0.59067 – 0.59075 in.)
3 1	15.001 – 15.003 mm (0.59059 – 0.59067 in.)
4 2	14.999 – 15.001 mm (0.59051 – 0.59059 in.)
5 3	14.997 – 14.999 mm (0.59043 – 0.59051 in.)
6 4	14.995 – 14.997 mm (0.59035 – 0.59043 in.)
Vane plate length 1 MZ–FE for Hydraulic cooling fan	
(Cam ring mark) (Rotor mark)	
None 1	14.996 – 14.998 mm (0.59039 – 0.59047 in.)
1 2	14.994 – 14.996 mm (0.59031 – 0.59039 in.)
2 3	14.992 – 14.994 mm (0.59024 – 0.59031 in.)
3 4	14.990 – 14.992 mm (0.59016 – 0.59024 in.)
Vane plate length 5S–FE	
(Cam ring and rotor mark)	
None	14.996 – 14.998 mm (0.59039 – 0.59047 in.)
1	14.994 – 14.996 mm (0.59031 – 0.59039 in.)
2	14.992 – 14.994 mm (0.59024 – 0.59031 in.)

3	14.990 – 14.992 mm (0.59016 – 0.59024 in.)
4	14.988 – 14.990 mm (0.59008 – 0.59016 in.)
Flow control valve spring length (STD) 1 MZ–FE	39 mm (1.54 in.)
Flow control valve spring length (Minimum) 1 MZ–FE	37 mm (1.46 in.)
Flow control valve spring length (STD) 5S–FE	38 mm (1.49 in.)
Flow control valve spring length (Minimum) 5S–FE	36 mm (1.42 in.)
Pump rotating torque (Maximum)	0.3 N·m (2.8 kgf·cm, 2.4 in.·lbf)
PS GEAR HOUSING	
Steering rack runout (Maximum)	0.3 mm (0.012 in.)
Total preload (Turning)	0.8 – 1.4 N·m (8 – 14 kgf·cm, 6.9 – 12.2 in.·lbf)

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
STEERING COLUMN			
Steering main shaft x Sliding yoke	35	360	26
Column bracket x Body	25	260	19
Steering wheel	35	360	26
Wheel pad	8.8	90	78 in.·lbf
Tilt lever x Column tube	23	225	16
POWER STEERING PUMP FOR 1 MZ–FE			
Pressure port union x Pump housing	69	700	51
Suction port union x Pump housing	13	130	9
Front housing x Rear housing	46	470	34
Control valve assy	59	600	43
Pump pully x Pump shaft	43	440	32
Pressure tube x Pressure port union	44	450	33
PS pump installation bolt	43	440	32
POWER STEERING PUMP FOR 5S–FE			
Pressure port union x Pump housing	69	700	51
Suction port union x Pump housing	13	130	9
Pump pully x Pump shaft	43	440	32
PS pump installation bolt (Adjusting bolt)	43	440	32
PS pump installation bolt (Through bolt)	43	440	32
PS pump x Pressure tube	51	525	38
POWER STEERING GEAR HOUSING			
Control valve housing x Rack housing	18	185	13
Control valve self–locking nut	25	250	18
Rack housing cap	59	600	43
Lock nut	55	560	41
Rack x Rack end	72	730	53
Tie rod end lock nut	74	750	54
Turn pressure tube union nut	11	110	8
Gear housing x Sub frame	181	1,850	134
Control valve shaft x Sliding yoke	35	360	26
Pressure and return tube x Gear housing	25	250	18
Tie rod end x Steering knuckle	49	500	36

BODY ELECTRICAL SYSTEM



GENERAL INFORMATION

WIRING COLOR CODE

Wire colors are indicated by an alphabetical code.

B=Black	L=Blue	R=Red
BR=Brown	LG=Light Green	V =Violet
G=Green	O=Orange	W=White
GR=Gray	P=Pink	Y =Yellow

The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

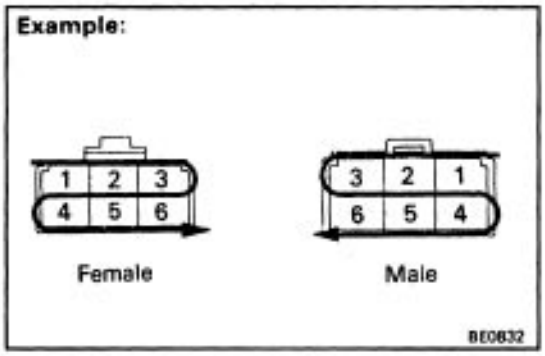
CONNECTOR

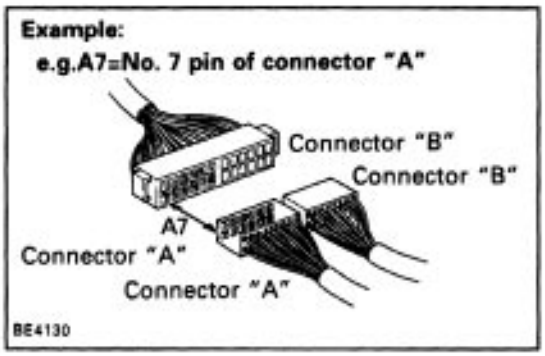
1. PIN NUMBER OF FEMALE CONNECTOR

Numbered in order from upper left to lower right.

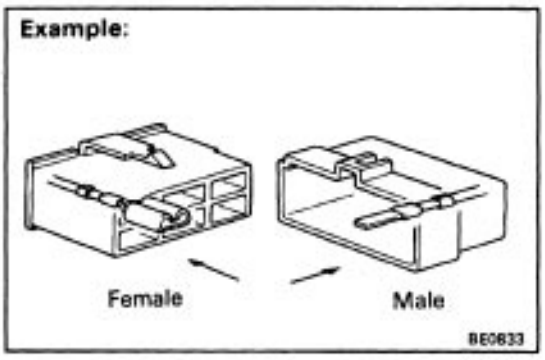
2. PIN NUMBER OF MALE CONNECTOR

Numbered in order from upper right to lower left.





HINT: When connectors with different of the same number of terminals are used with the same parts, each connector name (letter of the alphabet) and pin number is specified.



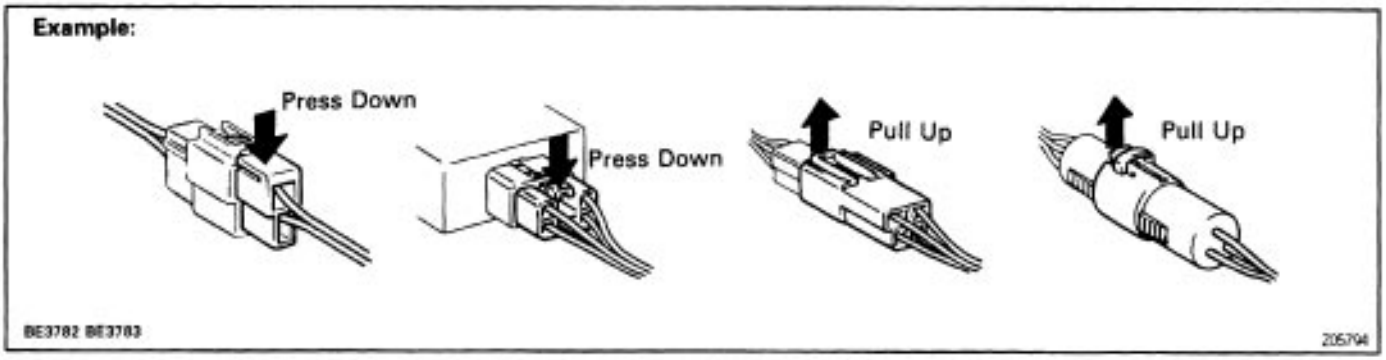
3. DISTINCTION OF MALE AND FEMALE CONNECTORS

Male and female connectors are distinguished by shape of their internal pins.

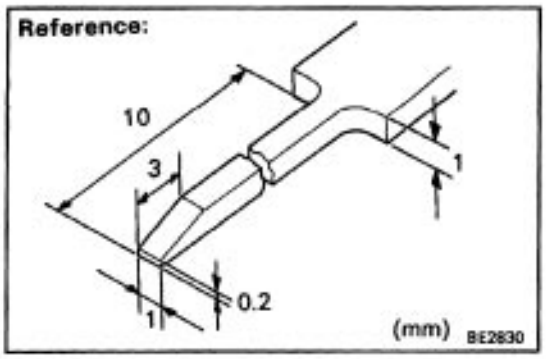
(a) All connectors are –shown from the open end, and the lock is on top.

(b) To pull apart the connectors, pull on the connector itself, not the wires.

HINT: Check to see what kind of connector you are disconnecting before pulling apart.



HOW TO REPLACE TERMINAL

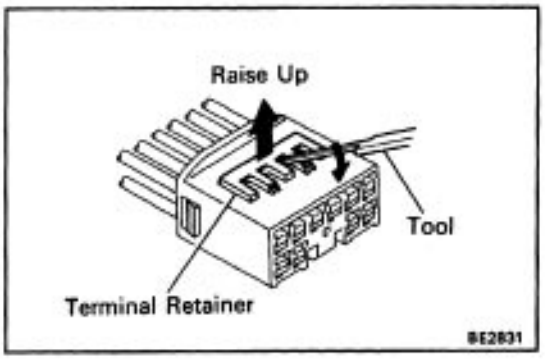


(with terminal retainer or secondary locking device)

1. PREPARE THE SPECIAL TOOL

HINT: To remove the terminal from the connector, please construct and use the special tool or like object shown on the left.

2. DISCONNECT CONNECTOR

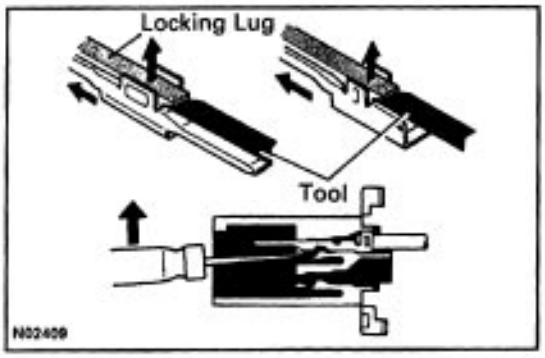


3. DISENGAGE THE SECONDARY LOCKING DEVICE OR TERMINAL RETAINER

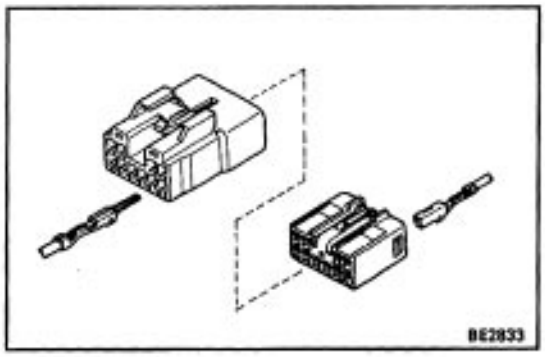
(a) Locking device must be disengaged before the terminal locking clip can be released and the terminal removed from the connector.

(b) Use a special tool or the terminal pick to unlock the secondary locking device or terminal retainer.

NOTICE: Do not remove the terminal retainer from connector body.



(c) Release the locking lug from terminal and pull the terminal out from rear.

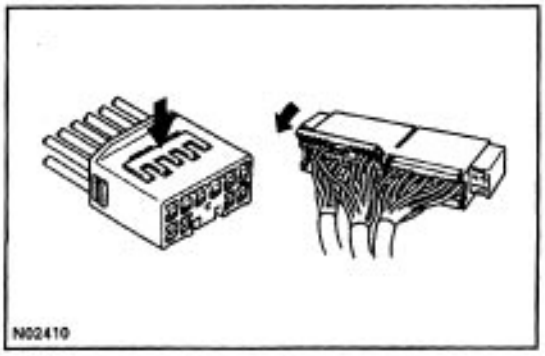


4. INSTALL TERMINAL TO CONNECTOR

(a) Insert the terminal.

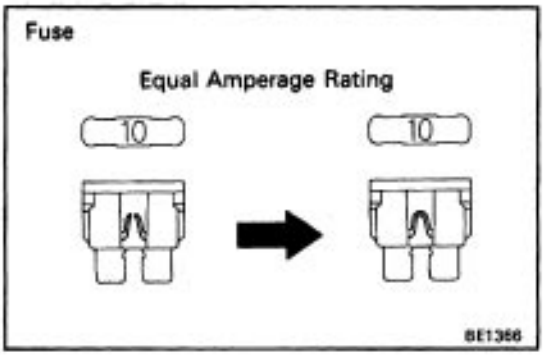
HINT:

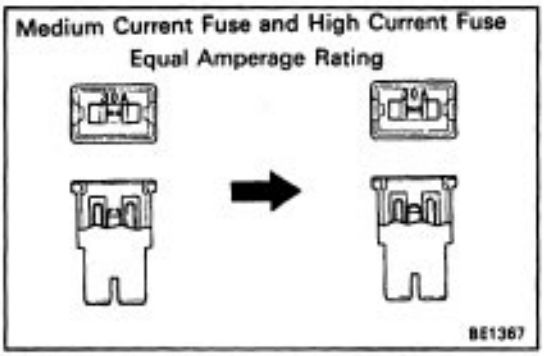
1. Make sure the terminal is positioned correctly.
2. Insert the terminal until the locking lug locks firmly.
3. Insert the terminal with terminal retainer in the temporary lock position.

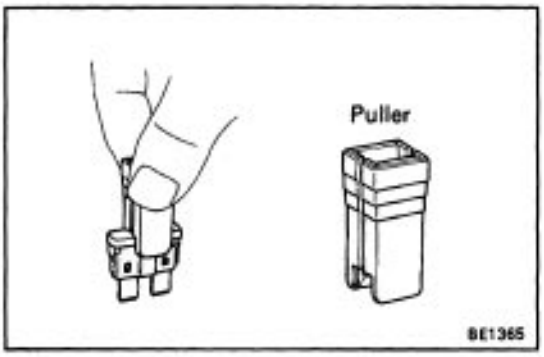


(b) Push the secondary locking device or terminal retainer in to the full lock position.

5. CONNECT CONNECTOR







FUSE REPLACEMENT

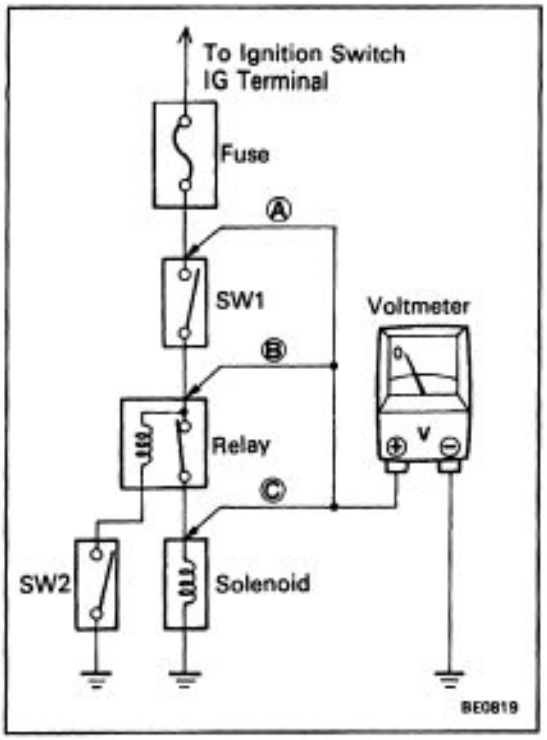
HINT: If replacing the fuse be sure to replace it with a fuse with an equal amperage rating.

NOTICE:

- **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
- **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.

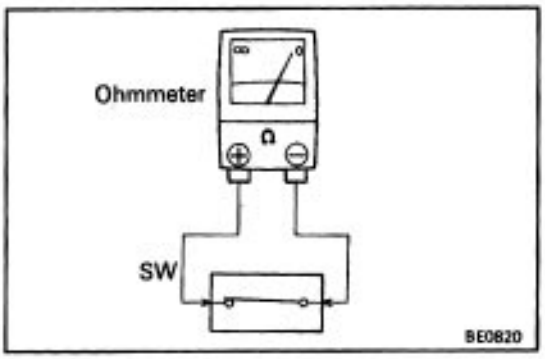
HINT: The puller is located at Junction Block No.2.



VOLTAGE CHECK

(a) Establish conditions in which voltage is present at the check point.
Example:
A–Ignition SW on
B–Ignition SW and SW 1 on
C–Ignition SW, SW 1 and Relay on (SW 2 off)

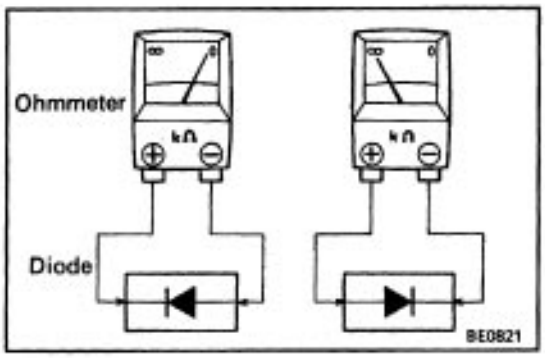
(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or compo–nent terminal. This check can be done with a test bulb instead of a voltmeter.



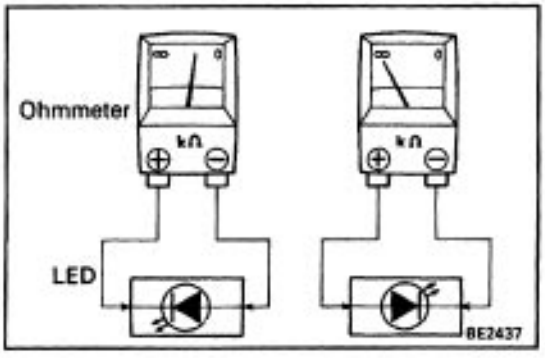
CONTINUITY AND RESISTANCE CHECK

(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

(b) Contact the 2 leads of an ohmmeter to each of the check points.

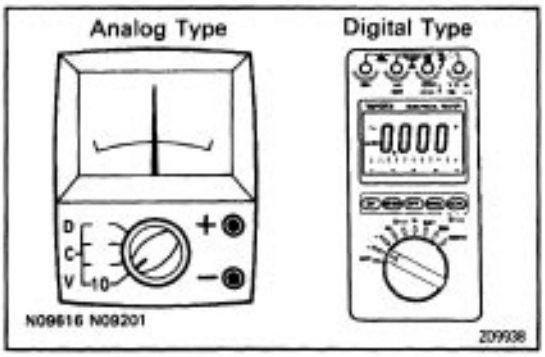


If the circuit has diodes, reverse the 2 leads and check again.
When contacting the negative (–) lead to the diode positive (+) side and the positive (+) lead to the negative (–) side, there should be continuity. When contacting the 2 leads in reverse, there should be no continuity.
HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.

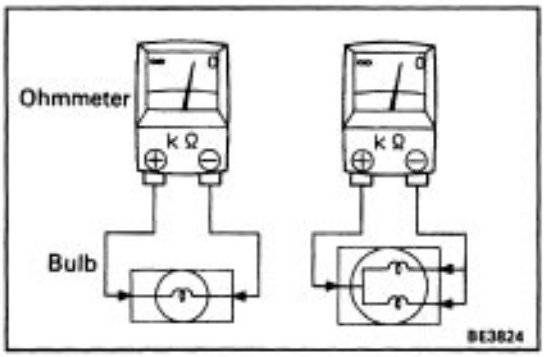


Check LED (Light Emitting Diode) in the same manner as that for diodes.
HINT:

- Use a tester with a power source of 3 V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply battery positive voltage and check that the LED lights up.

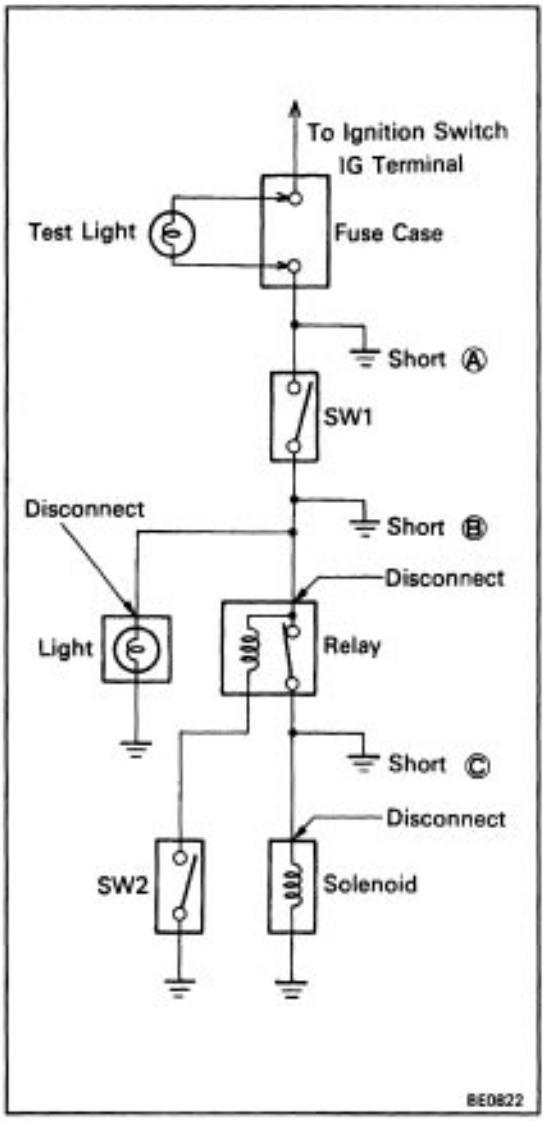


(c) Use a volt/ohmmeter with high impedance (10 k/V minimum) for troubleshooting of the electrical circuit.



BULB CHECKING

(a) Remove the bulb.
(b) There should be continuity between the respective terminals of the bulb together with a certain amount of resistance.
(c) Apply the 2 leads of the ohmmeter to each of the terminals.
(d) Apply battery positive voltage and check that the bulb lights up.



SHORT CIRCUIT CHECK

(a) Remove the blown fuse and eliminate all loads from the fuse.
(b) Connect a test bulb in place of the fuse.
(c) Establish conditions in which the test bulb comes on.
Example:
A–Ignition SW on
B–Ignition SW and SW 1 on
C–Ignition SW, SW 1 and Relay on (Connect the Relay) and SW 2 off (or Disconnect SW 2)
(d) Disconnect and reconnect the connectors while wat–ching the test bulb. The short lies between the con–nector where the test bulb stays lit and the connector where the bulb goes out.
(e) Find the exact location of the short by lightly shaking the problem wire along the body.

PRECAUTION

Take care to observe the following precautions when performing inspections or remOval and replacement of body electrical related parts.

HEADLIGHT SYSTEM

- Halogen bulbs have pressurized gas inside and require special handling. They can burst or scatter if scratched or dropped. Hold a bulb only by its plastic or metal case. Don't touch the glass part of a bulb with bare hands.

SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

- Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
- When disconnecting any of the connectors in the SRS, be sure to lock the ignition switch and disconnect the negative (–) terminal cable from the battery first. Since the connectors are twin lock type connectors, disconnect the connectors only after releasing the first stage lock.
- When connecting SRS connectors, be sure to lock them securely. (If the connectors are not locked securely, the system may not operate when needed.)
- Always store the steering wheel pad with the pad surface facing upward. (Storing the pad with its metallic surface up may lead to a serious accident if the air bag inflates for some reason.)
- When installing the spiral cable, be sure the vehicle is in the straight ahead condition and confirm that the spiral cable is in the neutral position when it is installed. (See page BE–28)
- INFORMATION LABELS (NOTICE) are attached to the periphery of the air bag components. Follow the NOTICE.

AUDIO SYSTEM

- If the negative (–) terminal cable is disconnected from the battery, the preset AM, FM 1 and FM 2 stations stored in memory are erased, so be sure to note the stations and reset them after the battery terminal is reconnected.
- If the negative (–) terminal cable is disconnected from the battery, the "ANTI–THEFT SYSTEM" will operate when the cable is reconnected, but the radio, tape player and CD player will not operate. Be sure to input the correct ID number so that the radio, tape player and CD player can be operated again.

MOBILE COMMUNICATION SYSTEM

- If the vehicle is equipped with a mobile communication system, refer to precautions in the IN section.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09213–31021 Crankshaft Pulley Puller	For removing steering wheel

RECOMMENDED TOOLS

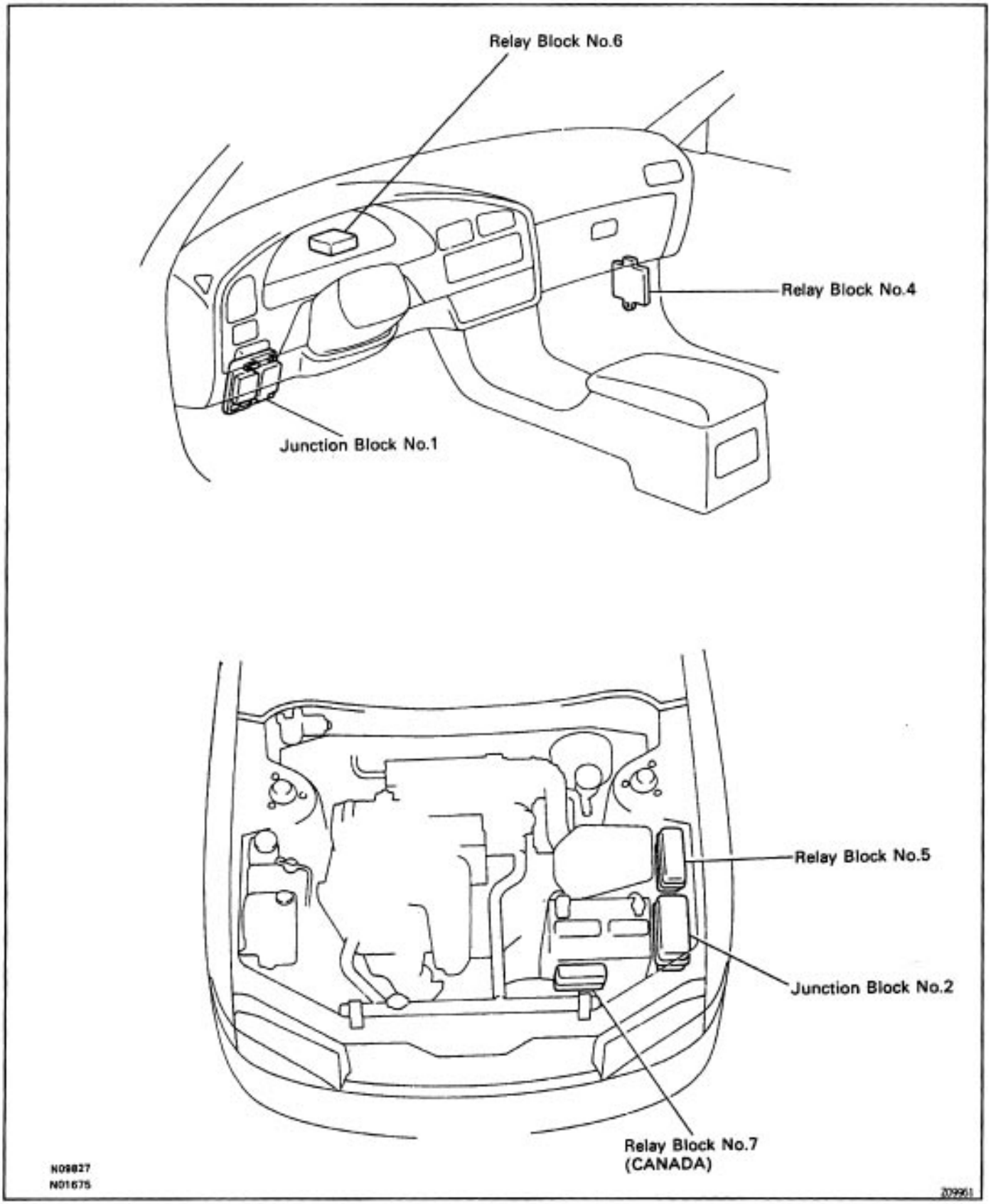
	09062–00050 TOYOTA Electrical Tester Set	
	09041–00030 Torx Driver T30	For removing and installing steering wheel pad
	09042–00010 Torx Socket T30	For removing and installing steering wheel pad

EQUIPMENT

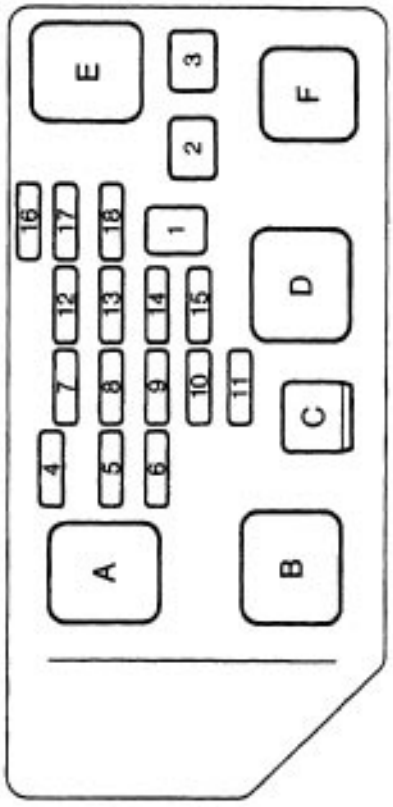
Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Syphon	Brake fluid level warning switch
Bulb (3.4 W)	Fuel sender gauge, Seat belt warning relay
Bulb (21 W)	Turn signal flasher relay
Dry cell battery	Fuel sender gauge
Torque wrench	
Masking tape	Rear window defogger wire
Tin foil	Rear window defogger wire

POWER SOURCE

PARTS LOCATION



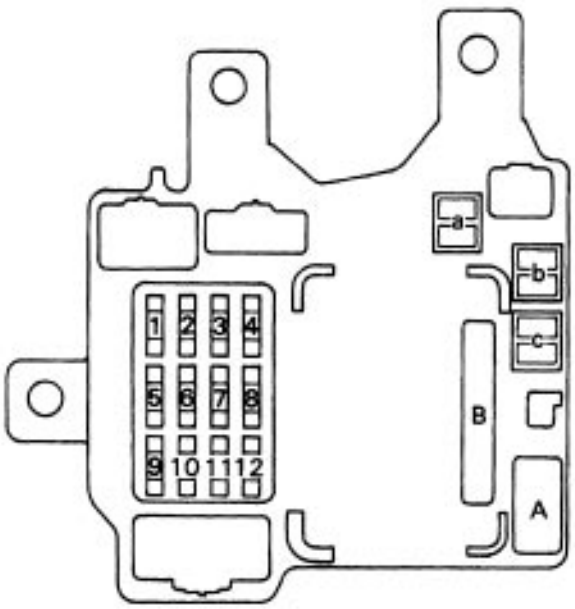
Junction Block No.2



MEDIUM CURRENT FUSES
1. MAIN 40A
2. RDI 30A
3. CDS 30A
FUSES
4. –
5. EFI 15A
6. HORN 10A
7. OBD, TRAC 7.5A
8. HAZ 1 OA
9. DOME 20A
10. H–LP LH 15A
11. H–LP RH 15A
12. ALT 7.5A
13. AMZ 30A
14. ECU–B 15A
15. D.C.
C. SHORT
RELAYS
A. EFI Relay
B. Starter Relay
C. HORN Relay
D. HEAD (Headlight Control) Relay
E. ENG MAI
N. FR–DEF Relay
F. FAN Relay

15A
10A
7.5A
10A
20A
15A
15A
7.5A
30A
15A
SHORT

Junction Block No. 1 (Rear Side)

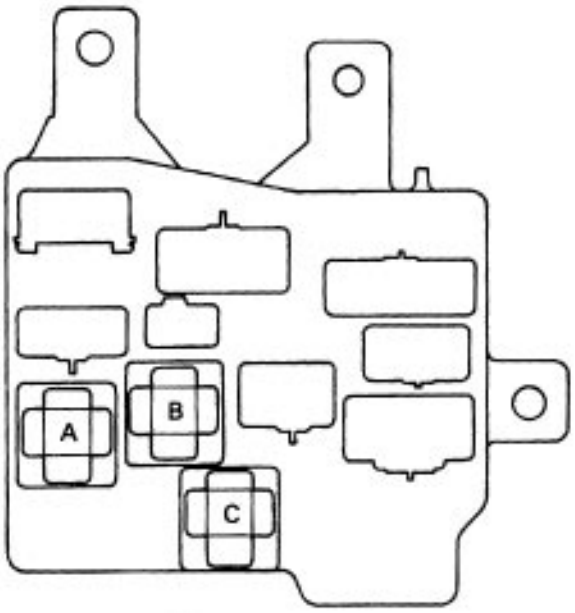


A. Noise Filter
MEDIUM CURRENT FUSES
a. AM 1 40A
b. POWER 30A
c. DEFOG 40A
FUSES
1. ECU–IG 15A
2. GAUGE 10A
3. STOP 15A
4.
5. WIPER 20A
6. TURN 7.5A
7. 1G2 7.5A
8. CIGI RADIO 15A
9. MIR HTR 10A
10. TAIL 15A
11. ECU–S 15A
12. –
RELAY
B. Integration Relay

15A
10A
15A
20A
7.5A
7.5A
15A
10A
15A
15A

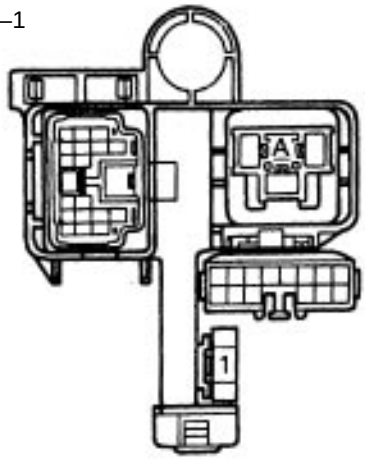
NC9595
N01803

Junction Block No. 1 (Front Side)



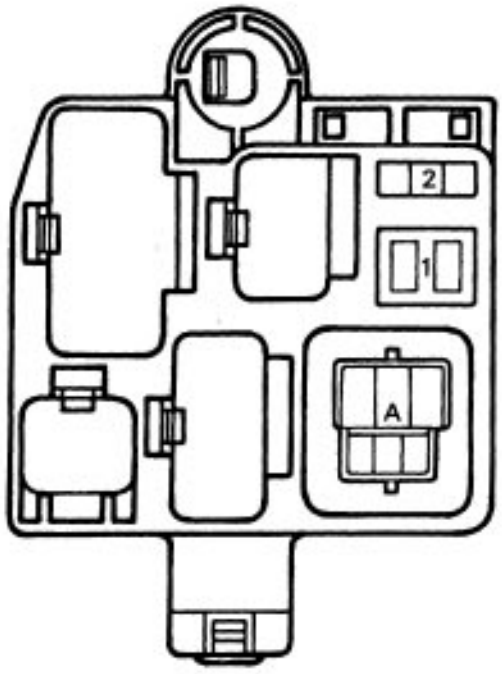
RELAYS
A. Power Main Relay
B. Taillight Control Relay
C. Defogger Relay

Relay Block No–1



FUSE
1. ST Fuse 10A
RELAY
A. Turn Signal Flasher

Relay Block No.4



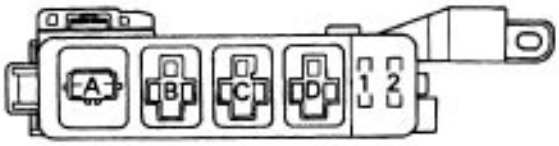
FUSES
Medium Current Fuse
1. HEATER 40A
Fuse
2. A/C 1 OA
RELAY
A. Heater Relay

N01804
N09798
N01805

Z09963

Relay Block No.5

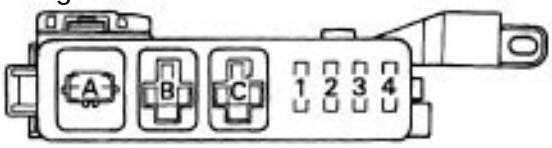
- 5S–FE Engine



FUSES
1. HEAD RH (Lo) 15A (CANADA)
2. HEAD LH (Lo) 15A (CANADA)

RELAYS
A. Daytime Running Light Relay No.2 (CANADA)
B. Magnet Clutch Relay
C. FAN No.2 Relay
D. FAN No.3 Relay

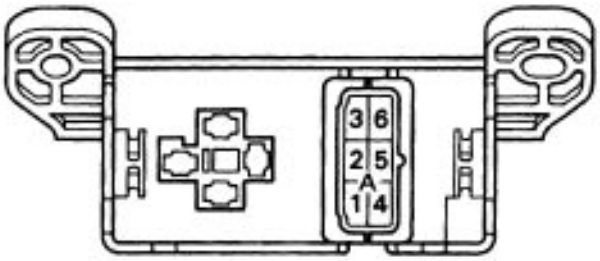
- 1 MZ–FE Engine



FUSES
1. —
2. —
3. HEAD RH (Lo) 15A (CANADA)
4. HEAD LH (Lo) 15A (CANADA)

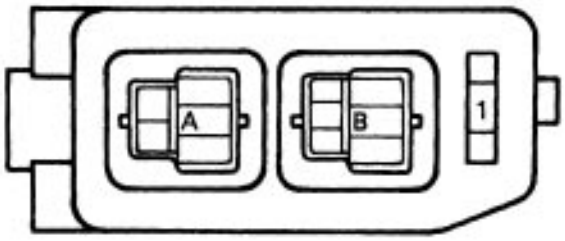
RELAYS
A. Daytime Running Light Relay No.2 (CANADA)
6. Magnet Clutch Relay
C. Fuse Pump Relay

Relay Block No.6



RELAY
A. Circuit Opening Relay

Relay Block No.7 (CANADA)



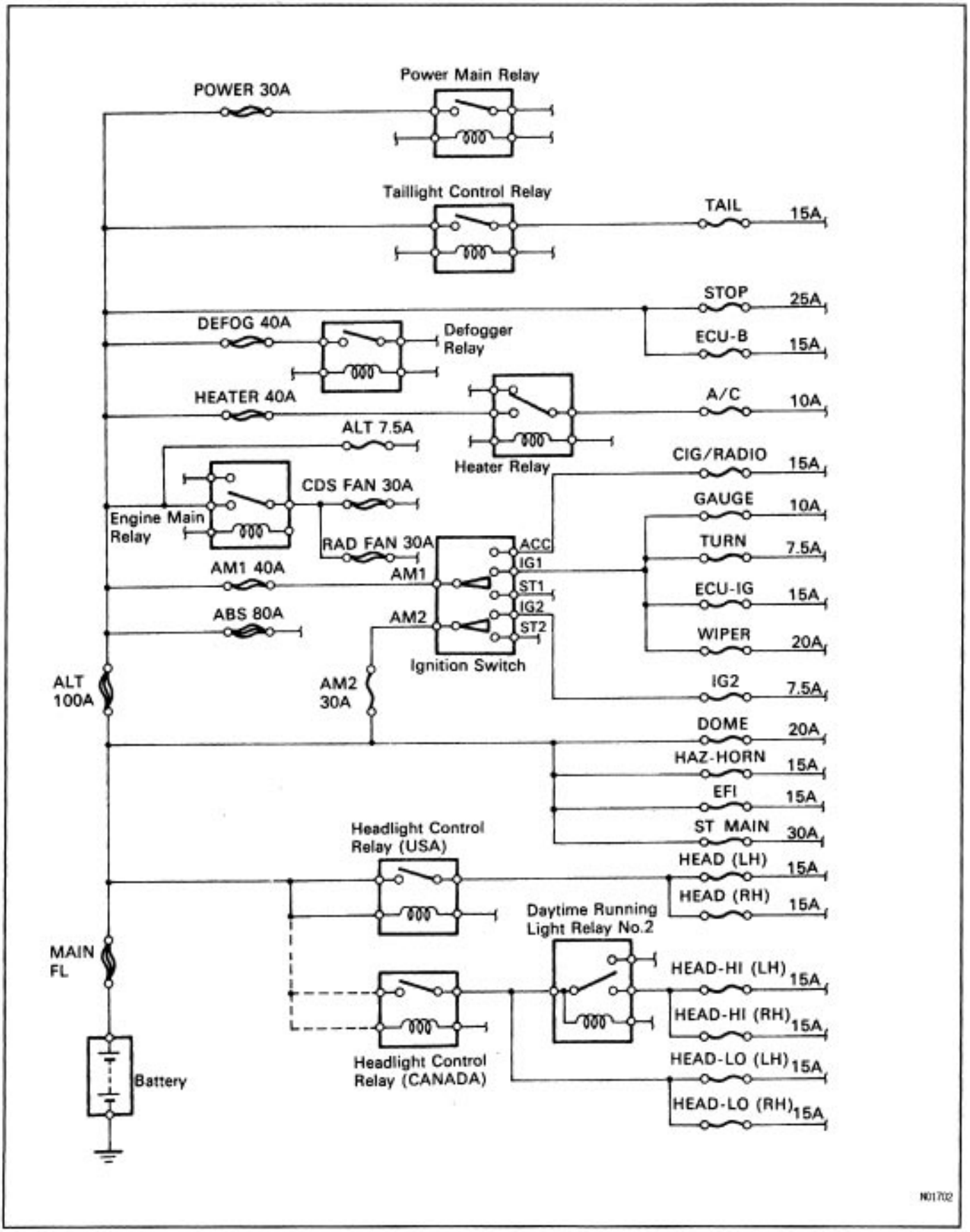
FUSE
1. DRL 7.5A

RELAYS
A. DRL No.4 Relay
B. DRL No.3 Relay

N01860
N01806
N09799
N01808

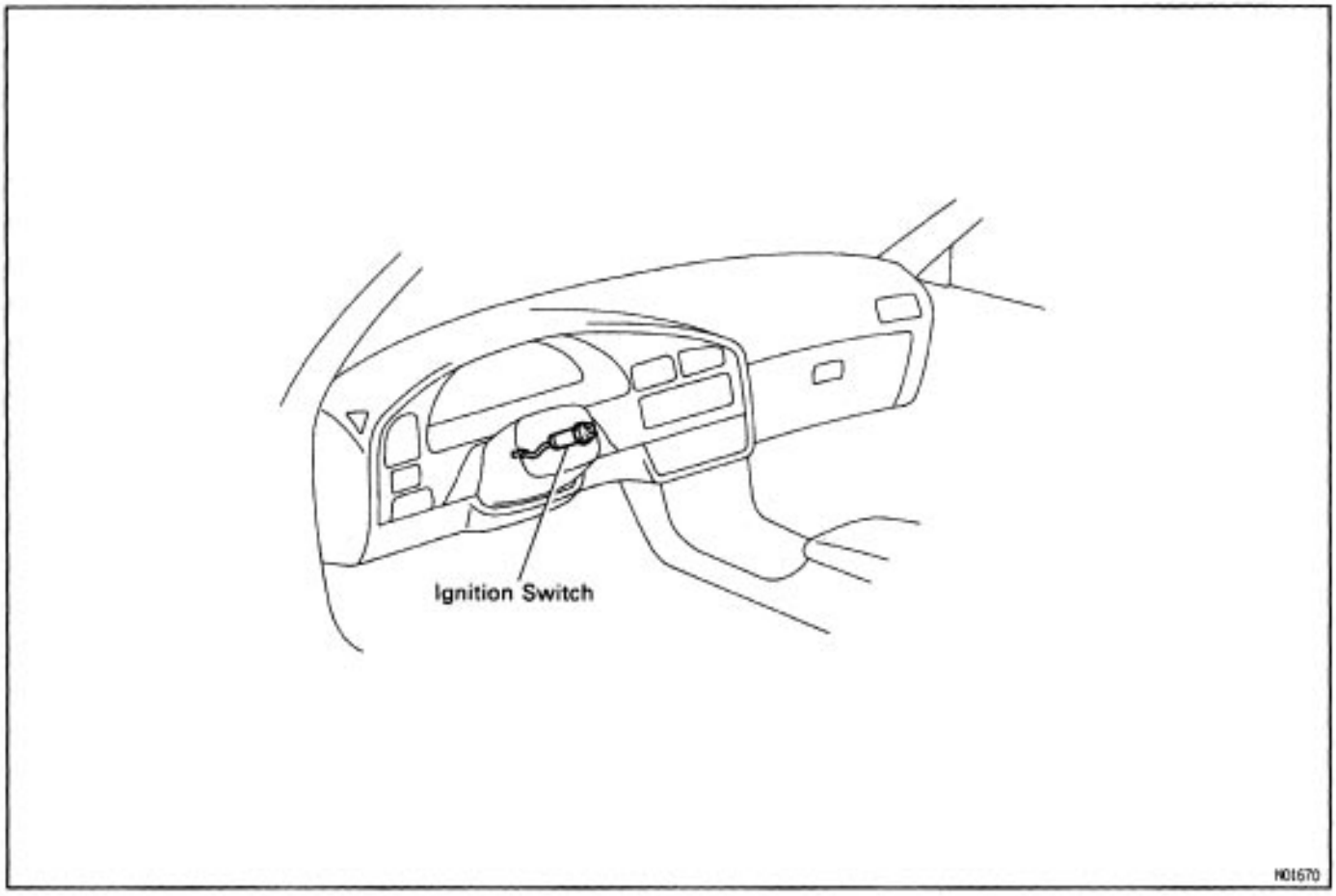
209064

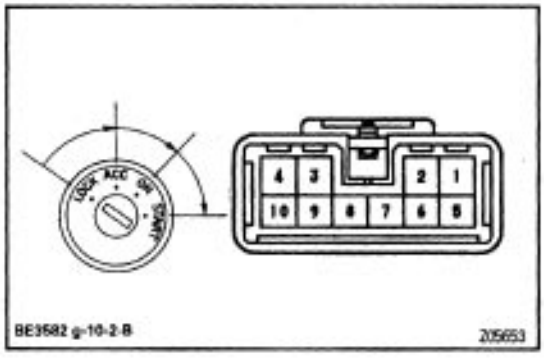
WIRING DIAGRAM



IGNITION SWITCH

PARTS LOCATION





IGNITION SWITCH INSPECTION

INSPECT IGNITION SWITCH

Continuity

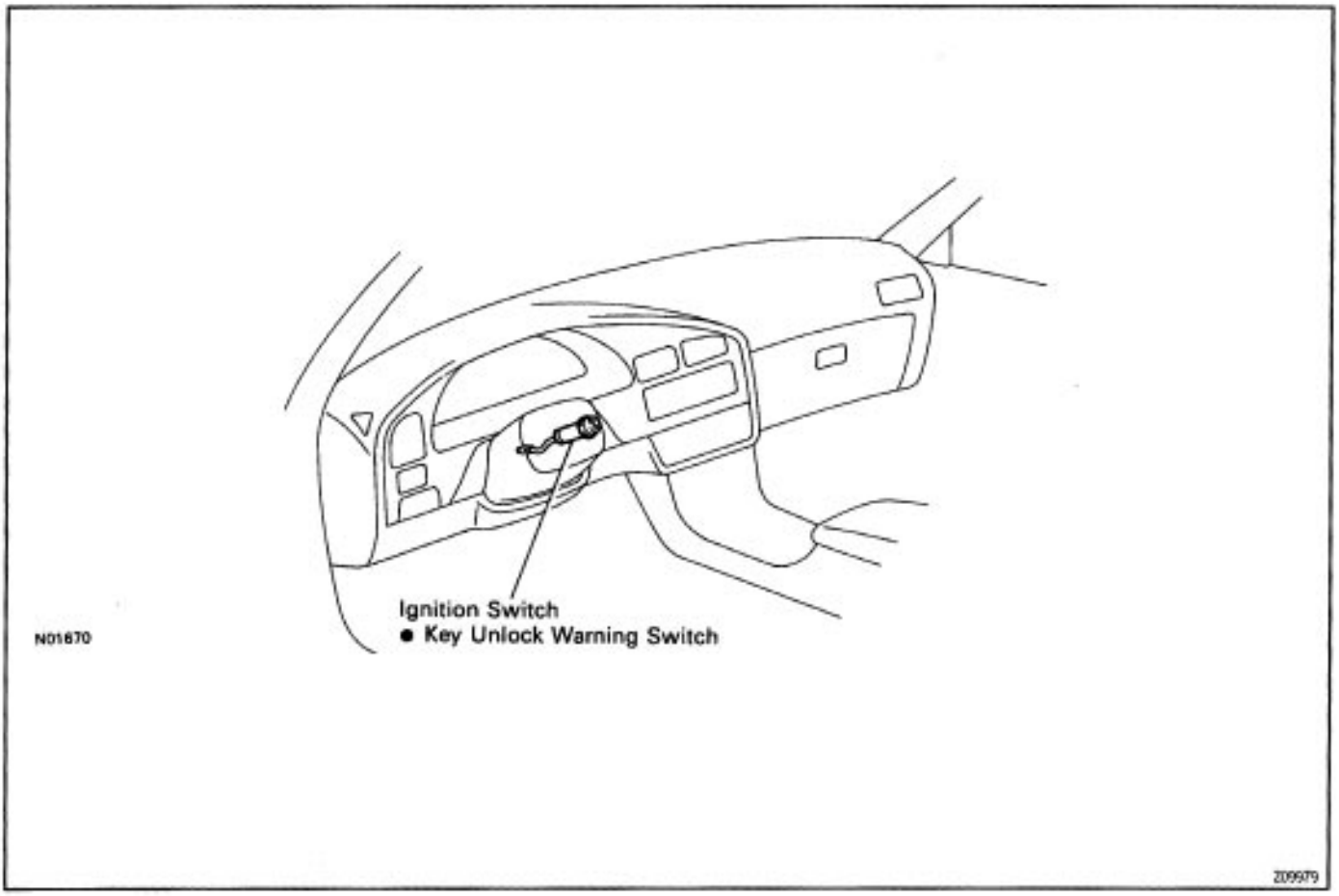
Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
LOCK	–	No continuity
ACC	3–4	Continuity
ON	2–3–4 9–10	Continuity
START	2–4–7 6–9–10	Continuity

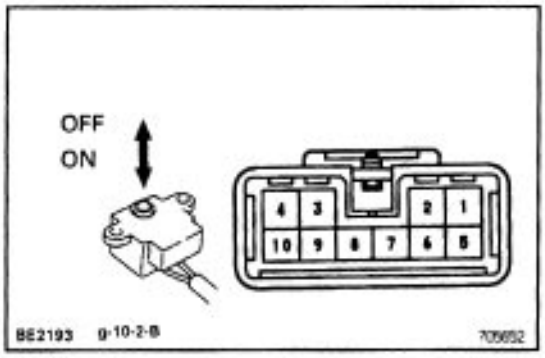
If continuity is not as specified, replace the switch.

KEY UNLOCK WARNING SYSTEM

PARTS LOCATION



KEY UNLOCK WARNING SWITCH INSPECTION



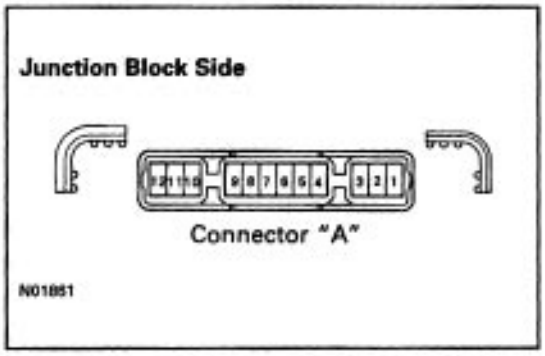
INSPECT KEY UNLOCK WARNING SWITCH

Continuity

Inspect the switch continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Switch OFF (Key removed)	–	No continuity
Switch ON (Key set)	1–5	Continuity

If continuity is not as specified, replace the switch.



INTEGRATION RELAY INSPECTION

INSPECT INTEGRATION RELAY

Relay Circuit/ Key Unlock Warning System

Remove the relay from the junction block No.1 and inspect the connectors on the junction block side.

Tester connection to terminal number	Condition	Specified value (Continuity)
A5 – Ground	Key unlock warning switch OFF	No continuity
A5 – Ground	Key unlock warning switch ON	Continuity
A6 – Ground	Driver's door courtesy switch OFF	No continuity
A6 – Ground	Driver's door courtesy switch ON	Continuity
A 10 – Ground	Constant	Continuity
Tester connection to terminal number	Condition	Specified value (Voltage)
A1 – Ground	Constant	Battery positive voltage
A7 – Ground	Ignition switch position LOCK or ACC	No voltage
A7 – Ground	Ignition switch position ON	Battery positive voltage

If circuit is as specified, trying replacing the relay with a new one.

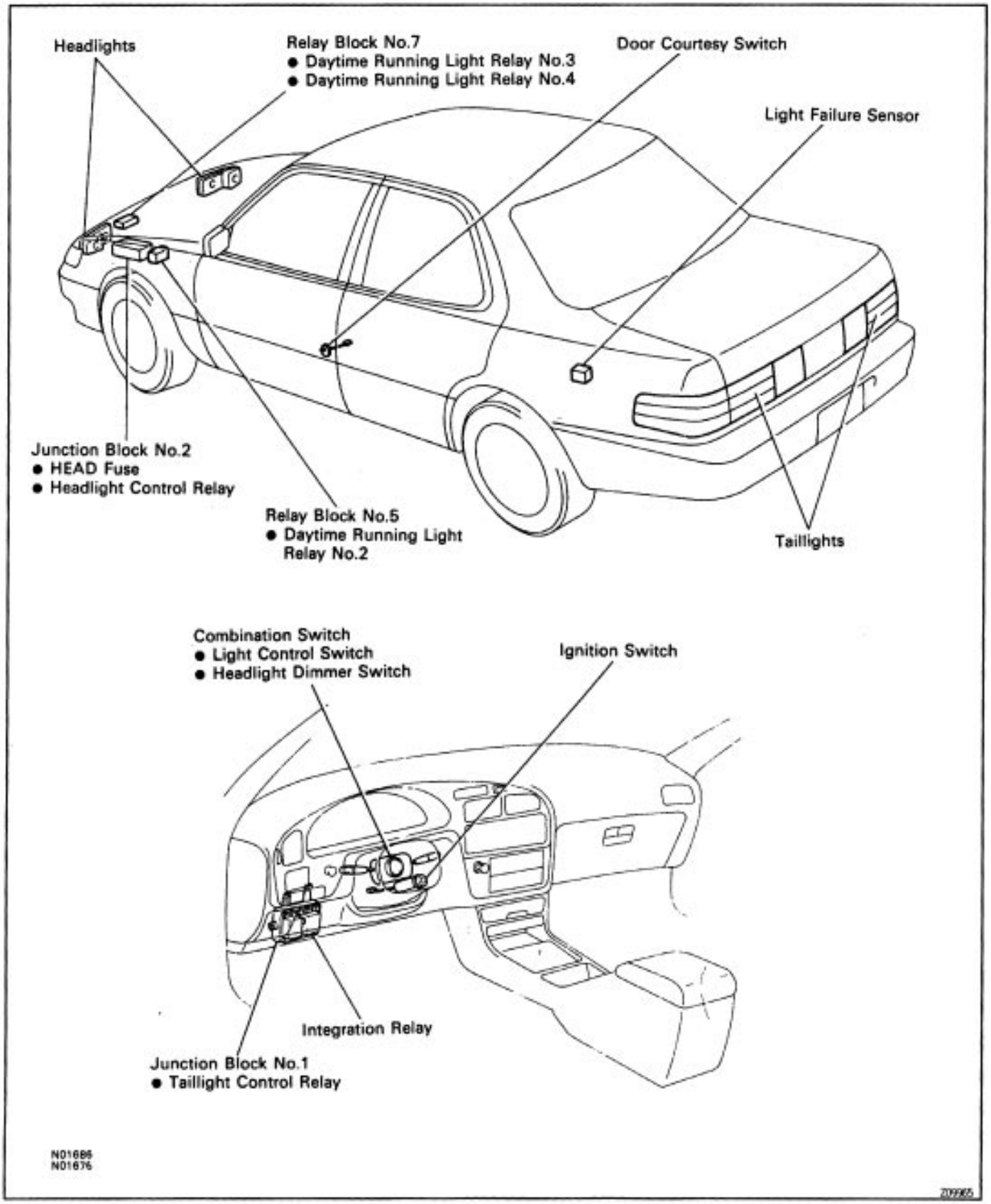
Is circuit is not as specified, inspect the circuits con–nected to other parts.

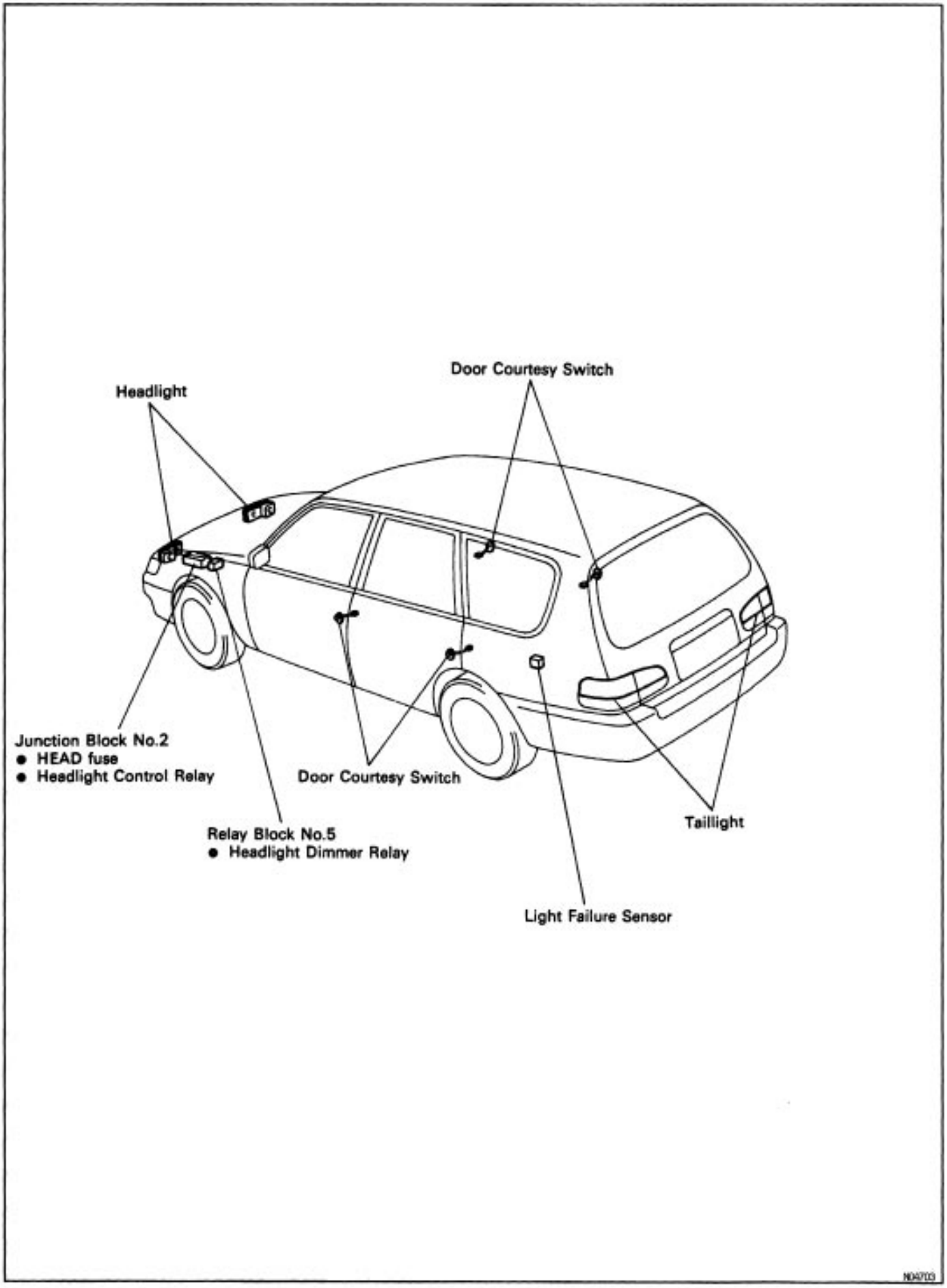
DOOR COURTESY SWITCH

See page BE–43**.**

HEADLIGHT AND TAILLIGHT SYSTEM

PARTS LOCATION




Door Courtesy Switch
Headlight
Junction Block No.2
● HEAD fuse
● Headlight Control Relay
Door Courtesy Switch
Taillight
Relay Block No.5
● Headlight Dimmer Relay
Light Failure Sensor
N0A703

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

HEADLIGHT (USA)

Trouble	Parts name	(See page)
Headlight does not light. (Taillight is normal)	1. MAIN FL 2. Wire Harness 3. HEAD–(LH, RH) Fuse 4. Headlight Bulb	(BE–4)
Headlight does not light. (Taillight does not light up)	1. MAIN FL 2. Wire Harness 3. Headlight Control Relay 4. HEAD–(LH, RH) Fuse 5. Headlight Bulb	(BE–30) (BE–4)
Only one side light does not light.	1. HEAD–(LH, RH) Fuse 2. Headlight Bulb 3. Wire Harness	(BE–4)
”Lo– Beam” does not light.	1. Wire Harness 2. Headlight Bulb 3. Light Control Switch	(BE–29)
”Hi–Beam” does not light.	1. Headlight Dimmer Switch 2. Wire Harness 3. Light Control Switch	(BE–29) (BE–29)
’Flash” does not light.	1. Headlight Dimmer Switch 2. Wire Harness	(BE–29)
”Auto Turn –off System” dose not operate.	1. Integration Relay 2. GAUGE Fuse 3. Ignition Switch 4. Door Courtesy Switch (Driver’s) 5. Wire Harness 6. DOME Fuse	(BE–31) (BE–4) (BE–14) (BE–43) (BE–4)

TAILLIGHT (USA)

Trouble	Parts name	(See page)
Taillight does not light. (Headlight does not light)	1. Light Control Switch 2. Integration Relay 3. Wire Harness	(BE–29) (BE–31)
Taillight does not light. (Headlight is normal)	1. TAIL Fuse 2. Taillight Control Relay 3. Light Control Switch 4. Integration Relay 5. Wire Harness	(BE–4) (BE–30) (BE–29) (BE–31)
Only one side light does not light.	1. Bulb 2. Wire Harness	
Rear Combination light does not light.	1. Wire Harness 2. Light Failure Sensor 3. Bulb	(BE–73)
”Auto Turn–Off System” dose not operate.	1. Integration Relay 2. Wire Harness 3. GAUGE Fuse 4. Door Courtesy Switch (Driver’s)	(BE–31) (BE–4) (BE–43)

HEADLIGHT (CANADA)

Trouble	Parts name	(See page)
Headlight does not light. (Taillight is normal)	1. Wire Harness	
Headlight does not light. (Taillight does not light up)	1. MAIN FL 2. Wire Harness	
Only one side light does not light.	1. HEAD LO (LH, RH) Fuse 2. Headlight Bulb 3. Wire Harness	(BE–4)
”Lo–Beam” does not light.	1. Headlight Control Relay 2. Light Control Switch 3. Integration Relay 4. Wire Harness 5. HEAD LO (LH, RH) Fuse 6. Headlight Bulb	(BE–30) (BE–29) (BE–31) (BE–4)
’Hi–Beam’ does not light.	1. DRL Fuse 2. Daytime Running Light Relay No.2 3. Daytime Running Light Relay (Main) 4. Daytime Running Light Relay No.3 5. Daytime Running Light Relay No.4 6. ECU – B Fuse 7. Headlight Dimmer Switch 8. Wire Harness 9. HEAD HI (LH, RH) Fuse 10. Headlight Bulb	(BE–4) (BE–33) (BE–32) (BE–33) (BE–34) (BE–4) (BE–29) (BE–4)
”Flash” does n6t light.	1. DRL Fuse 2. Daytime Running Light Relay No.2 3. Daytime Running Light Relay (Main) 4. Daytime Running Light Relay No.3 5. Daytime Running Light Relay No.4 6. ECU – B Fuse 7. Headlight Dimmer Switch 8. Wire Harness 9. HEAD HI (LH, RH) Fuse 10. Headlight Bulb	(BE–4) (BE–33) (BE–32) (BE–33) (BE–34) (BE–4) (BE–29) (BE–4)
’Auto Turn–off System’ does not operate.	1. Integration Relay 2. GAUGE Fuse 3. Ignition Switch 4. Door Courtesy Switch (Drivers) 5. Wire Harness 6. DOME Fuse	(BE–31) (BE–4) (BE–14) (BE–43) (BE–4)
Headlight does not light with engine running and light control SW in OFF.	1. GAUGE Fuse 2. ECU – B Fuse 3’. Other Parts 4. Daytime Running Light Relay (Main) 5. Wire Harness 6. HEAD HI (LH, RH) Fuse 7. Headlight Bulb	(BE–4) (BE–4) (BE–32) (BE–4)

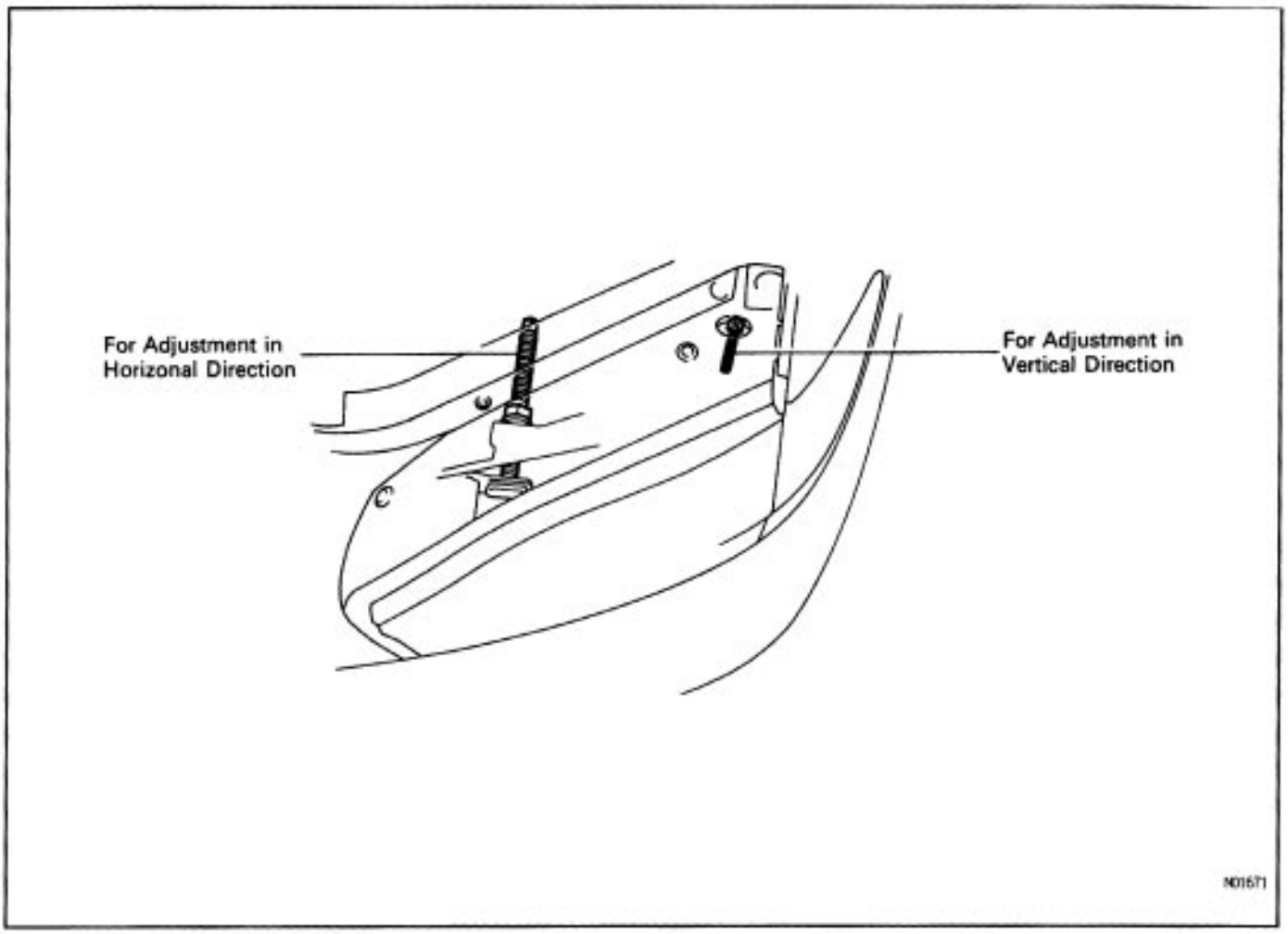
*Terminal L of Generator and Parking Brake Switch

TAILLIGHT (CANADA)

Trouble	Parts name	(See page)
Taillight does not light. (Headlight does not light)	1. Light Control Switch 2. Integration Relay 3. Wire Harness	(BE–29) (BE–31)
Taillight does not light. (Headlight is normal)	1. TAIL Fuse 2. Taillight Control Relay 3. Light Control Switch 4. Integration Relay 5. Wire Harness	(BE–4) (BE–30) (BE–29) (BE–31)
Only one side light does not light.	1. Bulb 2. Wire Harness	
Rear Combination light does not light.	1. Wire Harness 2. Light Failure Sensor 3. Bulb	(BE–73)
”Auto Turn–Off System” does not operate.	1. Integration Relay 2. GAUGE Fuse 3. Wire Harness 4. Door Courtesy Switch (Driver’s)	(BE–31) (BE–4) (BE–43)

*1: Terminal L of Generator and Parking Brake Switch

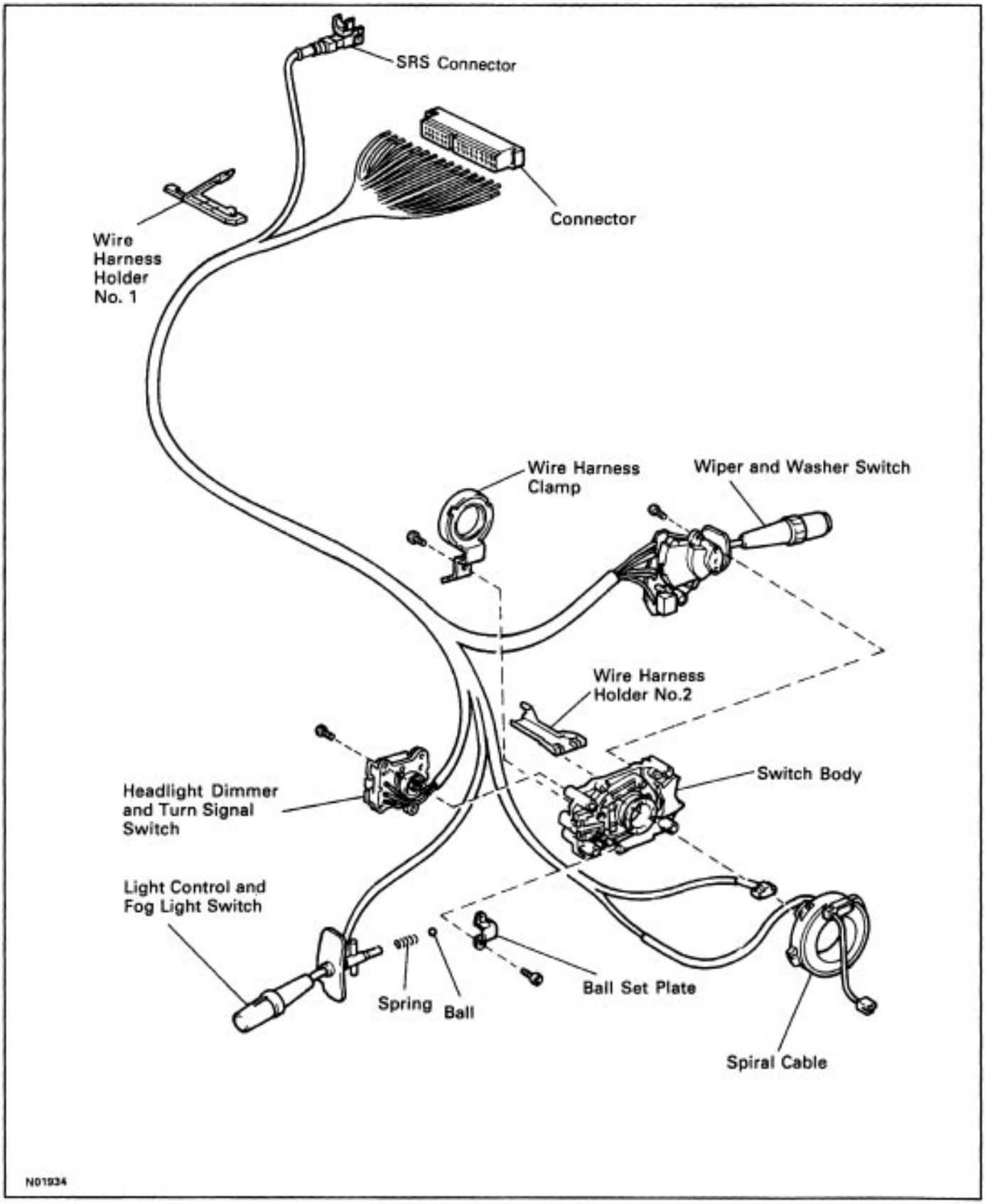
HEADLIGHT AIM ADJUSTMENT

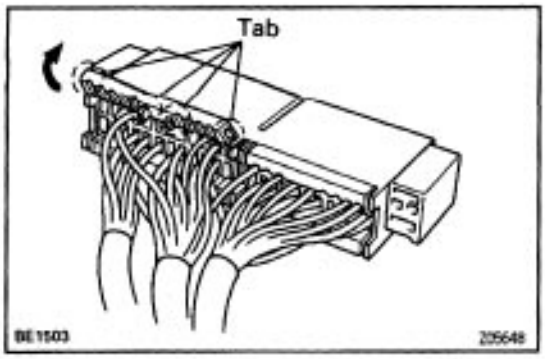


COMBINATION SWITCH REMOVAL

See page BO–108**.**

COMBINATION SWITCH DISASSEMBLY
Components



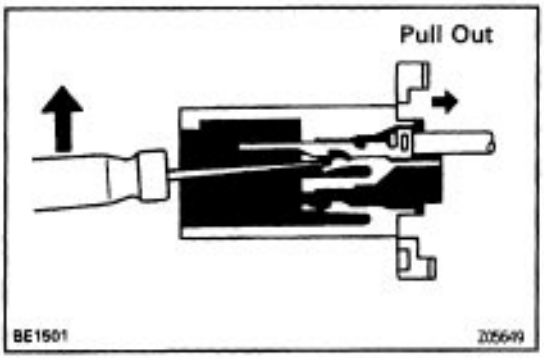


1. REMOVE WIRE HARNESS HOLDER NO.1

2. REMOVE TERMINALS FROM CONNECTOR

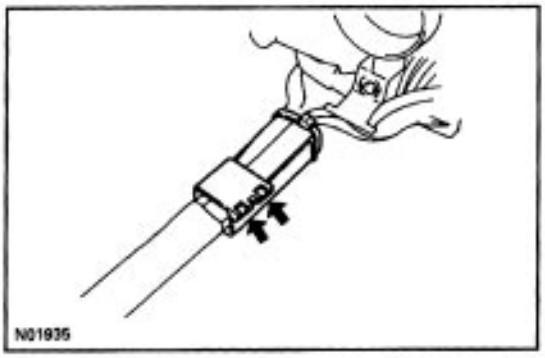
(a) Release the 4 tabs and open the terminal cover.

NOTICE: Do not remove terminal for SRS connector (Yellow).



(b) From the open end, insert a miniature screwdriver between the locking lug and terminal.

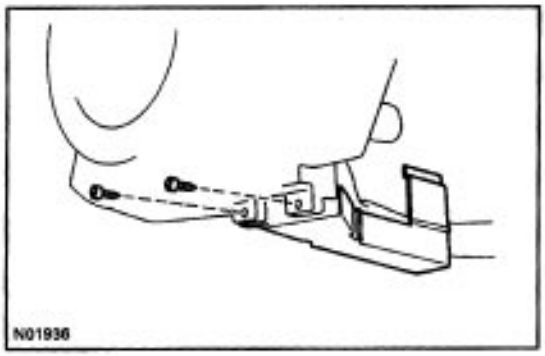
(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear.



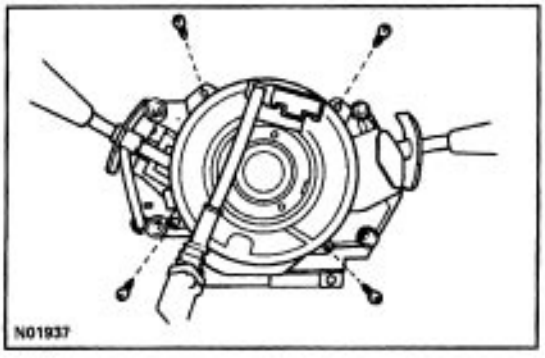
3. REMOVE WIRE HARNESS HOLDER NO. 2

(a) Remove the clamp.

(b) Pry loose 2 locking lugs.



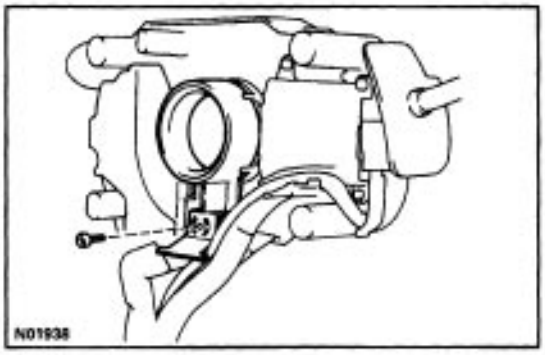
(c) Remove the 2 screws and the wire harness holder No. 2.



4. REMOVE SPIRAL CABLE SUBASSEMBLY

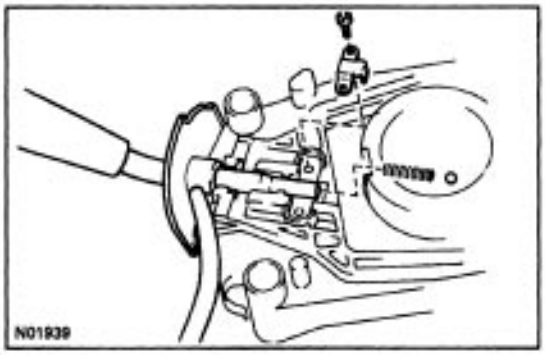
(a) Disconnect the connector.

(b) Remove the 4 screws and the spiral cable sub–assembly.



5. REMOVE WIRE HARNESS CLAMP

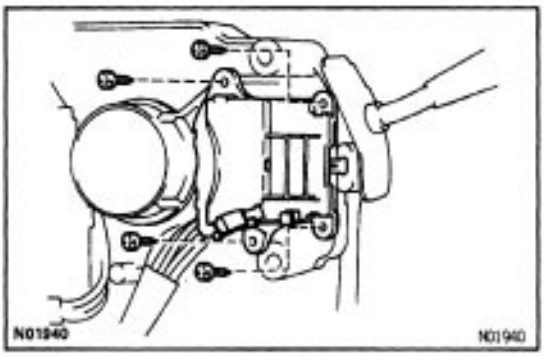
Remove the screw and the wire harness clamp.



6. REMOVE LIGHT CONTROL AND FOG LIGHT SWITCH

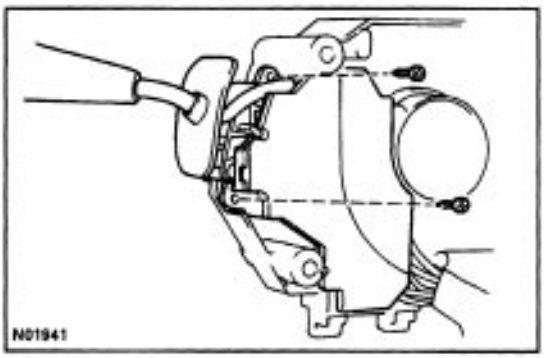
(a) Remove the 2 screws and the ball set plate from the switch body.

(b) Remove the ball and side out the switch from the switch body with the spring.



7. REMOVE HEADLIGHT DIMMER AND TURN SIGNAL SWITCH

Remove the 4 screws and the headlight dimmer and turn signal switch from the switch body.

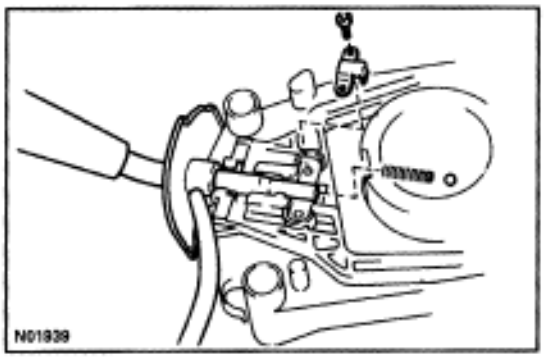


8. REMOVE WIPER AND WASHER SWITCH

Remove the 2 screws and the wiper and washer switch from the switch body.

COMBINATION SWITCH ASSEMBLY

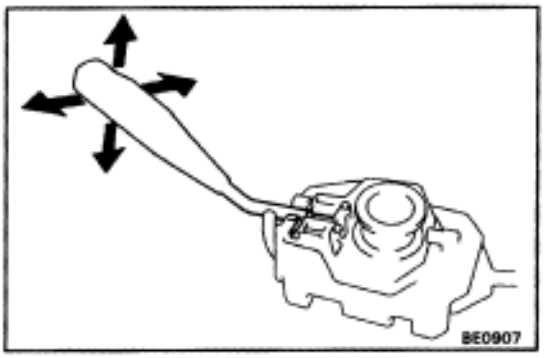
INSTALL PARTS OF COMBINATION SWITCH IN REVERSE SEQUENCE OF DISASSEMBLY
(MAIN POINT OF ASSEMBLY)



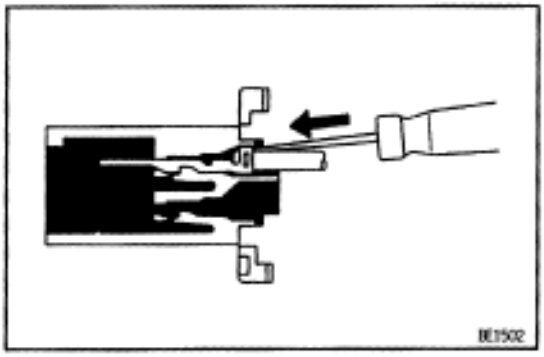
1. INSTALL LIGHT CONTROL SWITCH

(a) Slide the switch and install the switch body.

(b) Set the lever in the HI position, and install the ball and plate.

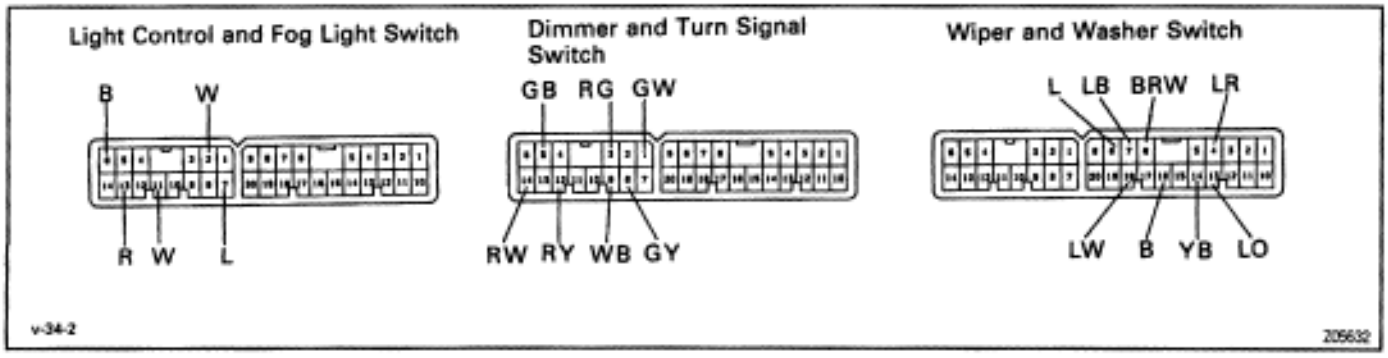


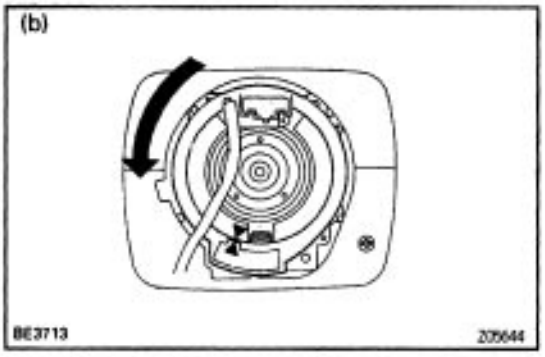
(c) After installing the light control switch to the switch body, insure that the switch operation is smooth.



2. INSTALL TERMINALS TO CONNECTOR

- Push in the terminal until it is securely locked in the connector lug.
- Install each switch terminal, as shown in the figure.





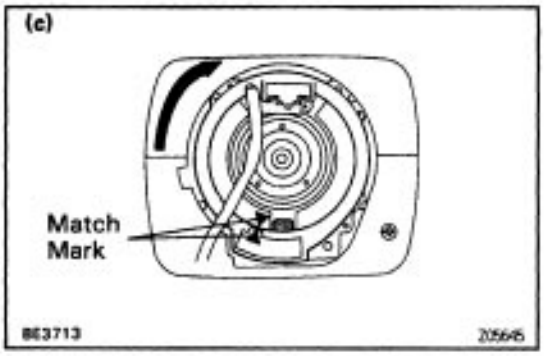
COMBINATION SWITCH INSTALLATION

For installation, follow the removal procedure in re–verse.

(MAIN POINT OF INSTALLATION)

ADJUSTMENT OF SPIRAL CABLE

(a) Check that the front wheels are facing straight ahead.
(b) Turn the spiral cable counterclockwise by hand until it becomes harder to turn the cable.

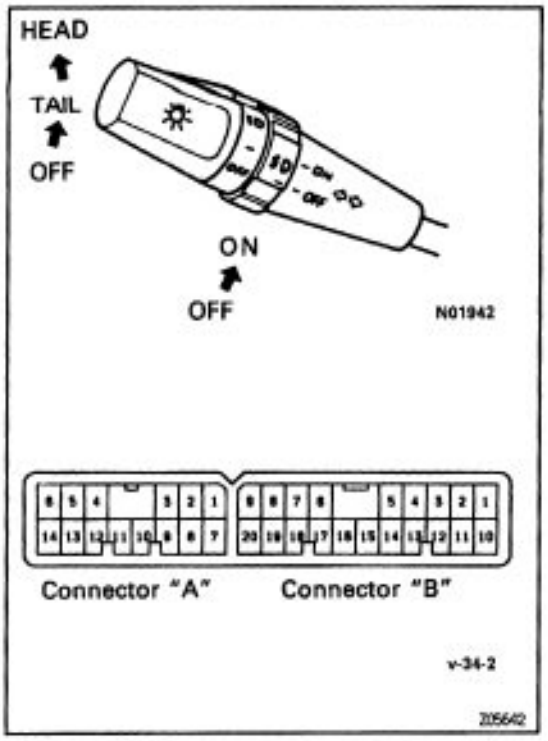


(c) Then rotate the spiral cable clockwise about 3 turns to align the red mark.

HINT:

- The spiral cable will rotate about 3 turns to either left or right of the center.
- The connector should be straight up.

(d) Install the steering wheel so that the match marks will not be misaligned.



COMBINATION SWITCH INSPECTION

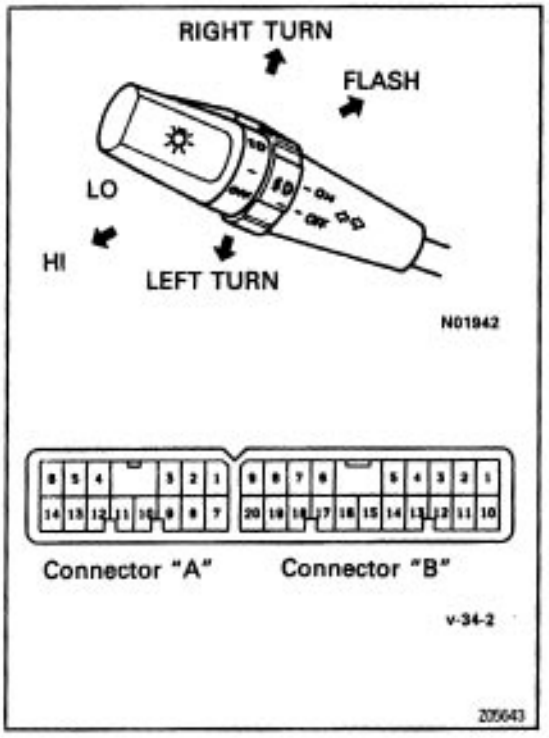
1. INSPECT LIGHT CONTROL SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
TAIL	A2 – All	Continuity
HEAD	A2 –All –A13	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT DIMMER SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
Flash	A9–A12–A14	Continuity
Low beam	A3 – A9	Continuity
High beam	A9 – A12	Continuity

If continuity is not as specified, replace the switch.

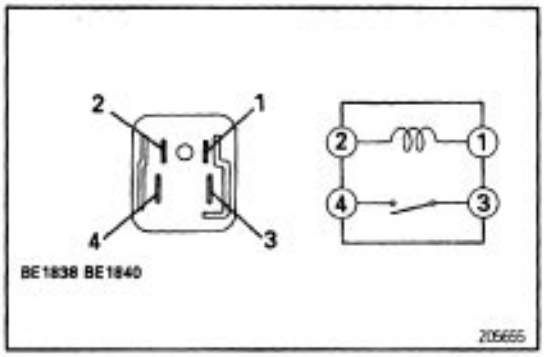
3. INSPECT TURN SIGNAL SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
Left turn	A 1 – A5	Continuity
Neutral	–	No continuity
Right turn	A 1 – A8	Continuity

If continuity is not as specified, replace the switch.



HEADLIGHT CONTROL RELAY INSPECTION

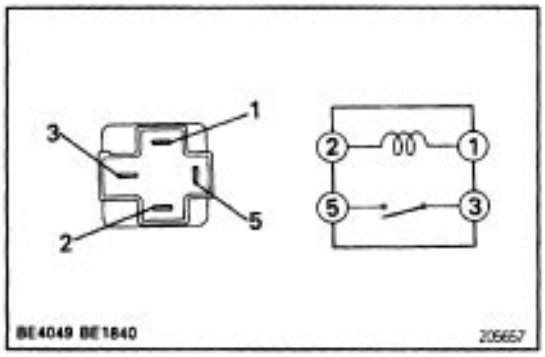
INSPECT HEADLIGHT CONTROL RELAY

Continuity

Inspect the relay continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Constant	1–2	Continuity
Apply B + between terminals 1 and 2.	3–4	Continuity

If continuity is not as specified, replace the relay.



TAILLIGHT CONTROL RELAY INSPECTION

INSPECT TAILLIGHT CONTROL RELAY

Continuity

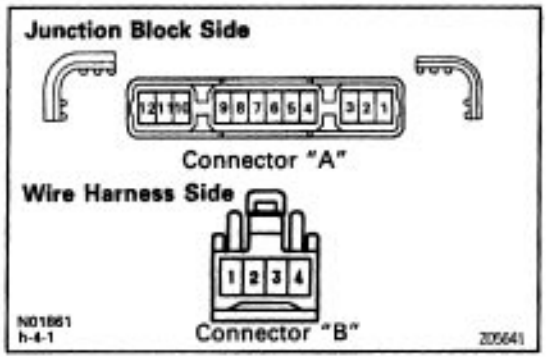
Inspect the relay continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Constant	1–2	Continuity
Apply B + between terminals 1 and 2.	3–5	Continuity

If continuity is not as specified, replace the relay.

LIGHT FAILURE SENSOR

See page BE–73.



INTEGRATION RELAY INSPECTION

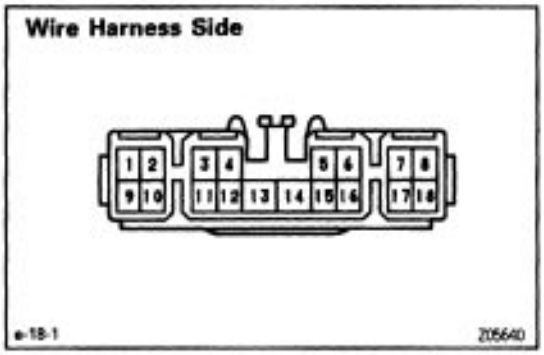
INSPECT INTEGRATION RELAY

Relay Circuit/ Light Auto Turn Off System

Remove the relay from junction block and inspect the connectors on the wire harness and junction block side, as shown in the chart.

Tester connection to terminal number	Condition	Specified value (Continuity)
A6 – Ground	Driver's door courtesy switch OFF	No continuity
A6 – Ground	Driver's door courtesy switch ON	Continuity
A10 – Ground	Constant	Continuity
B1 – Ground	Light control switch position OFF	No continuity
B1 – Ground	Light control switch position TAIL and HEAD	Continuity
B4 – Ground	Light control switch position OFF or TAIL	No continuity
B4 – Ground	Light control switch position HEAD	Continuity
Tester connection to terminal number	Condition	Specified value (Voltage)
A1 – Ground	Constant	Battery positive voltage
A7 – Ground	Ignition switch position LOCK or ACC	No voltage
A7 – Ground	Ignition switch position ON	Battery positive voltage
B2 – Ground	Constant	Battery positive voltage
B3 – Ground	Constant	Battery positive voltage

If the circuit is as specified, trying replacing the relay with a new one.
If the circuit is not as specified, inspect the circuits connected to other parts.



DAYTIME RUNNING LIGHT RELAY (MAIN) INSPECTION (for CANADA)

INSPECT DAYTIME RUNNING LIGHT RELAY (MAIN)

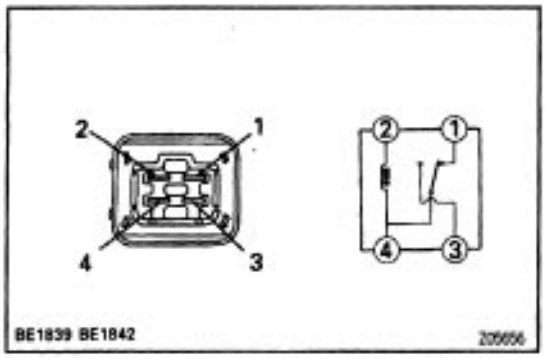
Circuit/ Wire Harness Side

Disconnect the connector from relay and inspect the connector on wire harness side, as shown.

Tester connection to terminal number	Condition	Specified value (Continuity)
5 – Ground	Light control switch position OFF or TAIL	No continuity
5 – Ground	Light control switch position HEAD	Continuity
5 – Ground	Headlight dimmer switch position Low beam or high beam	No continuity
5 – Ground	Headlight dimmer switch position Flash	Continuity
8 – Ground	Parking brake switch position OFF	No continuity
8 – Ground	Parking brake switch position ON	Continuity
13 – Ground	Constant	Continuity
16 – Ground	Headlight dimmer switch position Low beam	No continuity
16 – Ground	Headlight dimmer switch position Flash or High beam	Continuity
Tester connection to terminal number	Condition	Specified value (Voltage)
2 – Ground 18 – Ground	Ignition switch position LOCK or ACC	No voltage
2 – Ground 18 – Ground	Ignition switch position ON or START	Battery positive voltage
4 – Ground 15 – Ground 17 – Ground	Constant	Battery positive voltage
11 – Ground	Engine Stop	No voltage
11 – Ground	Engine Running	Battery positive voltage

If circuit is as specified, perform the inspection on the following page.

If circuit is not as specified, inspect the circuits con–nected to other parts.



DAYTIME RUNNING LIGHT RELAY NO.2 INSPECTION (for CANADA)

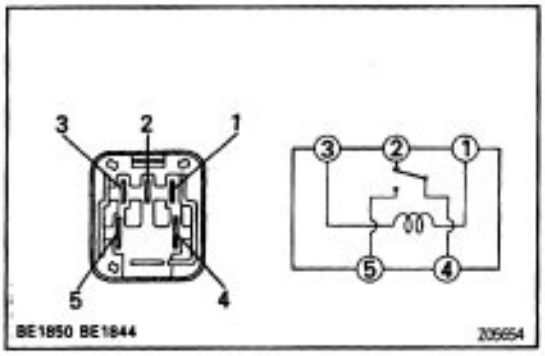
INSPECT DAYTIME RUNNING LIGHT RELAY NO.2

Continuity

Inspect the relay continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Constant	1–4 2–4	Continuity
Apply B + between terminals 2 and 4.	3–4	Continuity

If continuity is not as specified, replace the relay.



DAYTIME RUNNING LIGHT RELAY NO–3 INSPECTION (for CANADA)

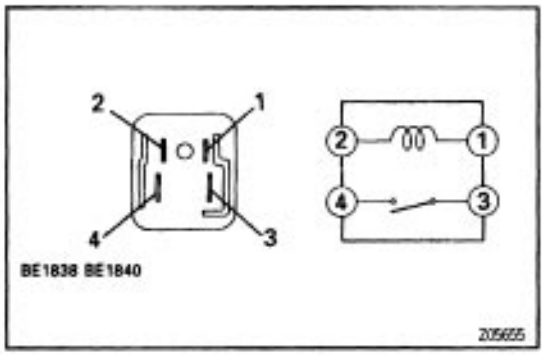
INSPECT DAYTIME RUNNING LIGHT RELAY NO–3

Continuity

Inspect the relay continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Constant	1–3 2–4	Continuity
Apply B + between terminals 1 and 3.	4–5	Continuity

If continuity is not as specified, replace the relay.



DAYTIME RUNNING LIGHT RELAY NO.4 INSPECTION

INSPECT DAYTIME RUNNING LIGHT RELAY NO.4

Continuity

Condition	Tester connection to terminal number	Specified value
Constant	1–2	Continuity
Apply B + between terminals 1 and 2.	3–4	Continuity

If continuity is not as specified, replace the relay.

DOOR COURTESY SWITCH

See page BE–43.

PARKING BRAKE SWITCH

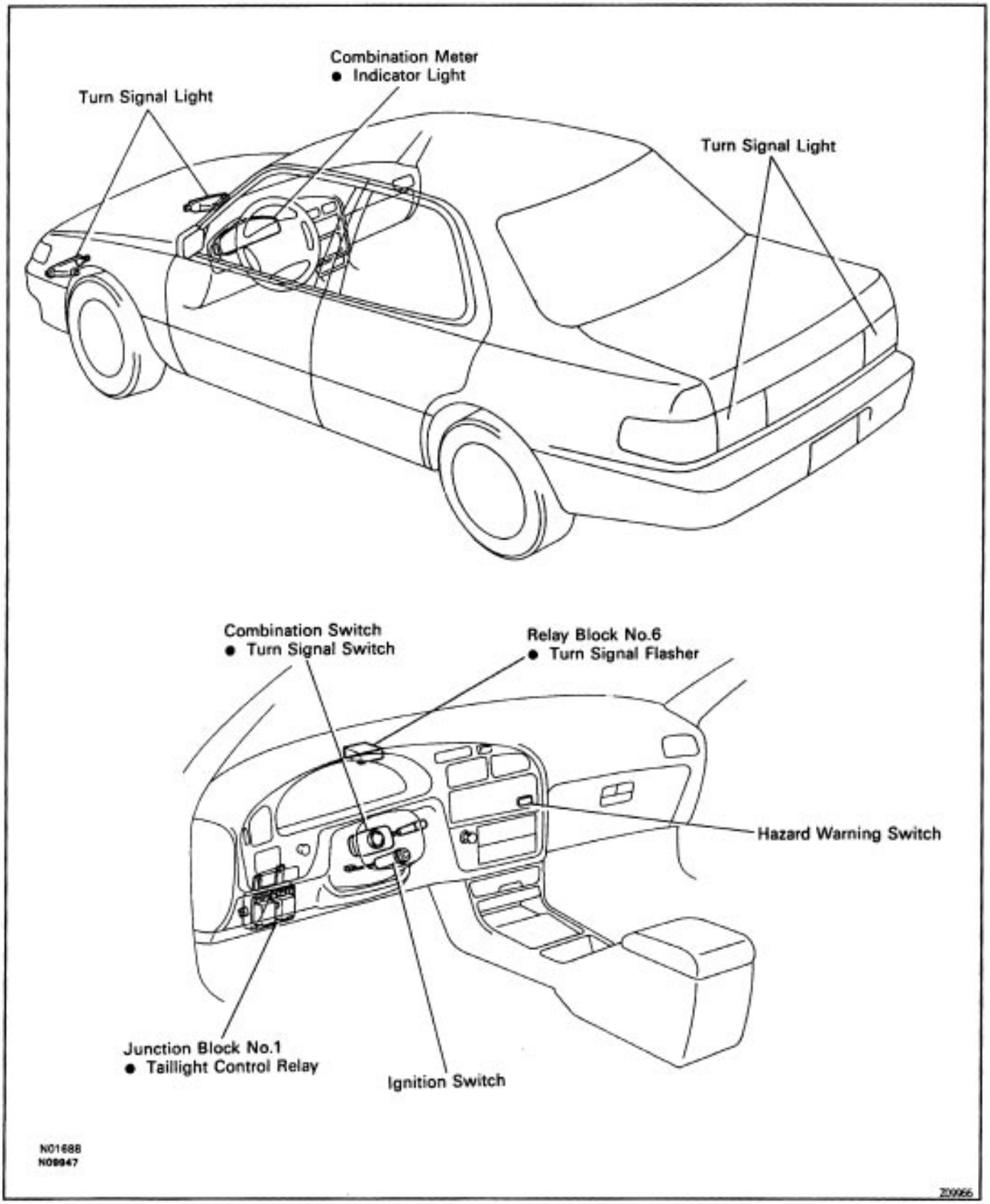
See page BE–72.

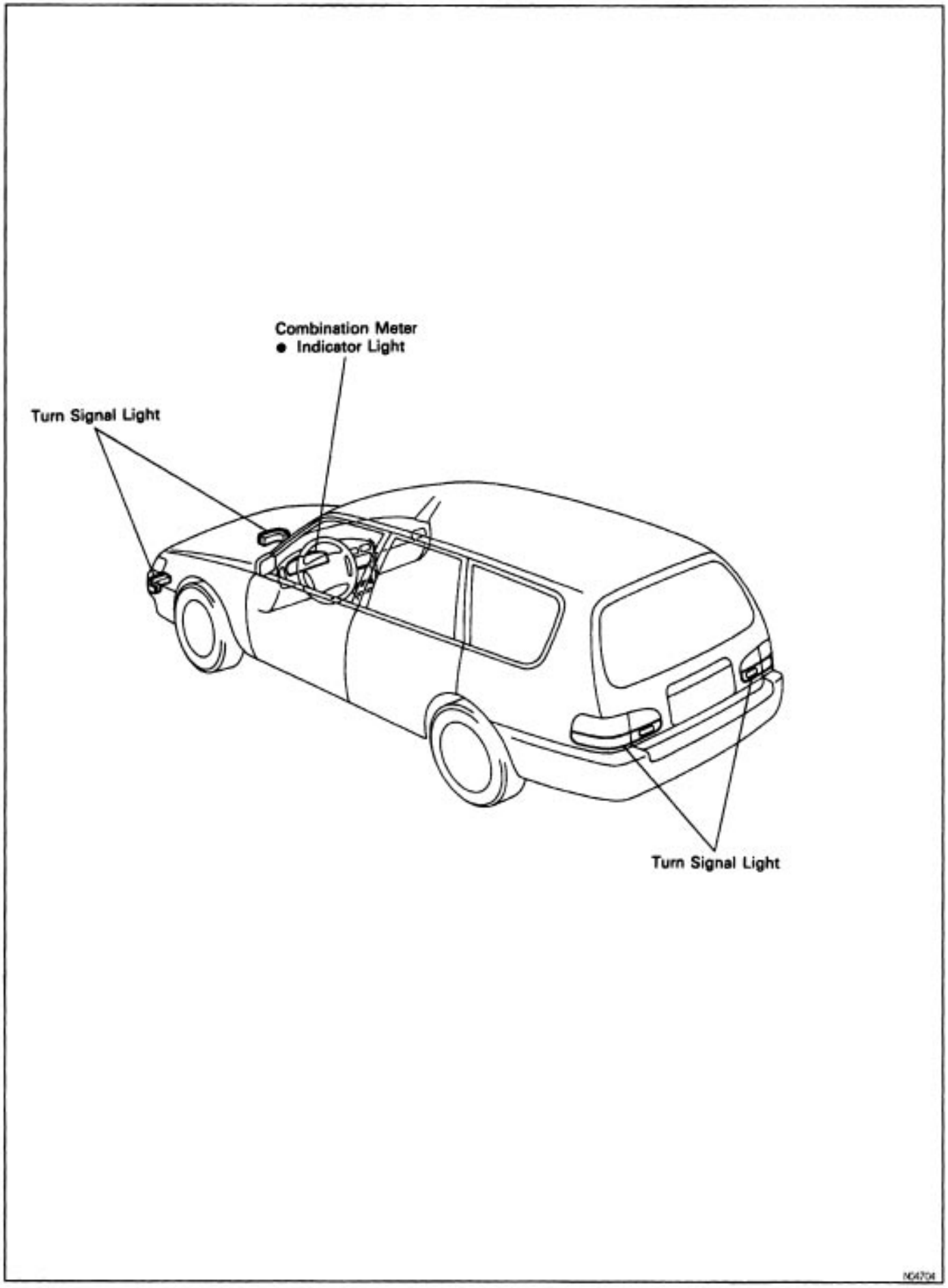
IGNITION SWITCH

See page BE–14.

TURN SIGNAL AND HAZARD WARNING SYSTEM

PARTS LOCATION




Combination Meter
● Indicator Light
Turn Signal Light
Turn Signal Light
N04704

TROUBLESHOOTING

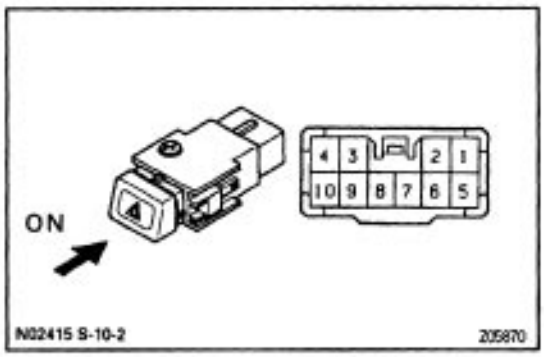
The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
'Hazard' and "Turn" do not light up.	1. Hazard Warning Switch 2. Turn Signal Flasher 3. Wire Harness	(BE–38) (BE–38)
The flashing frequency is abnormal.	1. Bulb 2. Turn Signal Switch 3. Wire Harness	(BE–38)
Hazard warning light does not light up. (Turn is normal)	1. HAZ–HORN Fuse 2. Wire Harness	(BE–4)
Hazard warning light does not light up in one direction.	1. Hazard Warning Switch Z. Wire Harness	(BE–38)
*1 Turn signal does not light up.	1. Ignition Switch 2. TURN Fuse 3. Turn Signal Switch 4. Wire Harness	(BE–14) (BE–4) (BE–38)
*2 Turn signal does not light up.	1. TURN Fuse 2. Turn Signal Switch 3. Wire Harness	(BE–4) (BE–38)
Turn signal does not light up in one direction.	1. Turn Signal Switch 2. Wire Harness	(BE–38)
Only one bulb does not light up.	1. Bulb 2. Wire Harness	

*1: Combination Meter, Wiper and Washer do not operate.
*2: Combination Meter, Wiper and Washer are normal.

TURN SIGNAL SWITCH

See page BE–29**.**



HAZARD WARNING SWITCH INSPECTION

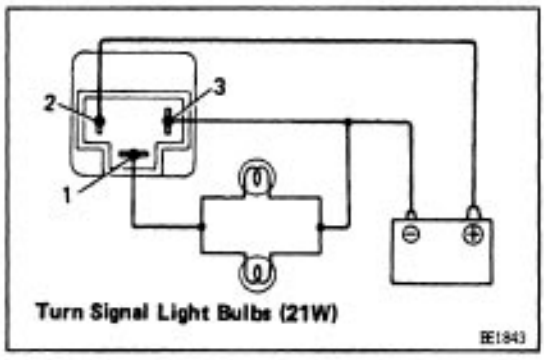
INSPECT HAZARD WARNING SWITCH

Continuity

Inspect the switch continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Switch OFF	7–10	Continuity
Switch ON	7–8 5–6–9	Continuity
Illumination circuit	2–3	Continuity

If continuity is not as specified, replace the switch.



TURN SIGNAL FLASHER INSPECTION

INSPECT TURN SIGNAL FLASHER

Operation

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Connect the 2 turn signal light bulbs parallel to each other to terminals 1 and 3, check that the bulbs flash.

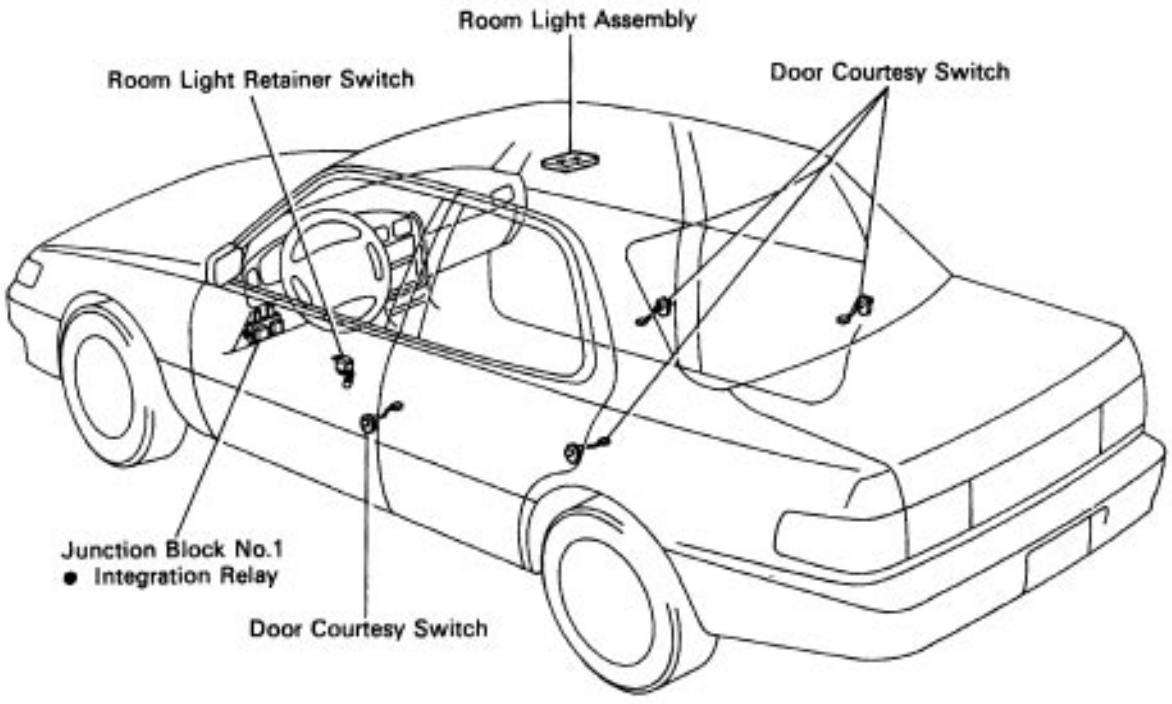
HINT: The turn signal lights should flash 60 or 120 times per minute.

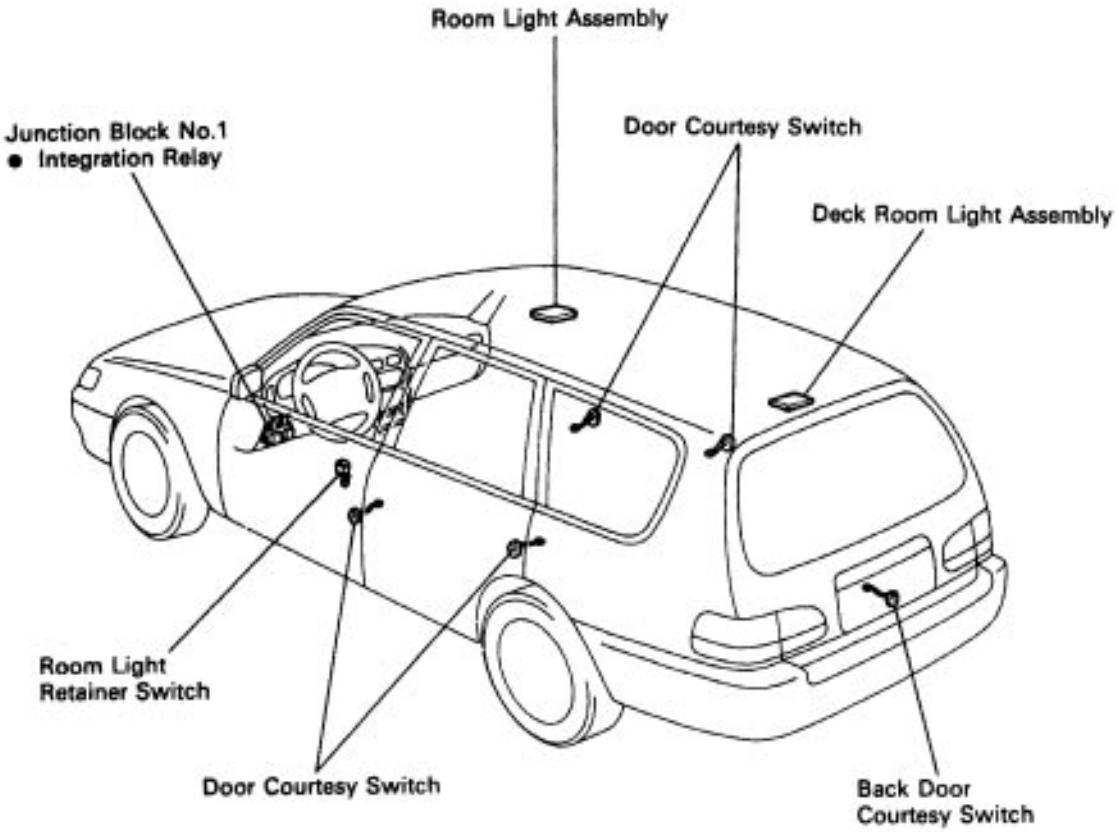
If one of the front or rear turn signal lights has an open circuit, the number of flashers will be more than 140 per minute.

If operation is not as specified, replace the flasher.

INTERIOR LIGHT SYSTEM

PARTS LOCATION




Room Light Assembly
Junction Block No.1
● Integration Relay
Door Courtesy Switch
Deck Room Light Assembly
Room Light
Retainer Switch
Door Courtesy Switch
Back Door
Courtesy Switch

N04705

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
Only one interior light does not light up.	1. Bulb 2. Wire Harness	
Interior light does not light up (All).	1. DOME Fuse 2. Wire Harness	(BE–4)
”Illuminated Entry System” does not operate.	1. Integration Relay 2. Door Open Detection Switch 3. Door Outside Handle Switch 4. Door Courtesy Switch 5. Wire Harness	(BE–42) (BE–93) (BE–43) (BE–43)
Interior light does not light up.	1. Bulb 2. Interior Light 3. Wire Harness	(BE–43)
Front personal light does not light up.	1. Bulb 2. Personal Light 3. Wire Harness	(BE–42)
Luggage compartment light does not light up.	1. Bulb 2. Back Door Courtesy Switch 3. Wire Harness	(BE–44)
Courtesy light does not light up.	1. Bulb 2. Door Open Detection Switch 3. Wire Harness	(BE–94)

PERSONAL LIGHT INSPECTION

INSPECT PERSONAL LIGHT SWITCH

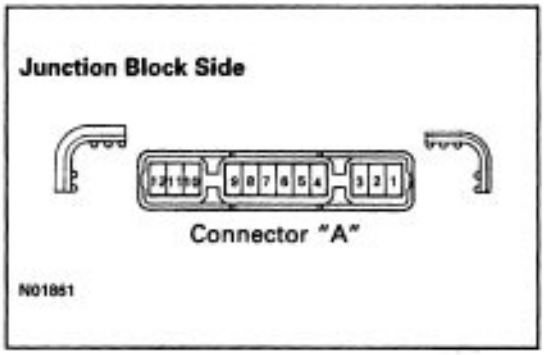
Continuity

Inspect the light switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
ON	1–2 1 –(4)	Continuity

The number in bracket ( ) applies to vehicles with Sliding Roof System.

If continuity is not as specified, replace the light as–sembly or bulb.



INTEGRATION RELAY INSPECTION

INSPECT INTEGRATION RELAY

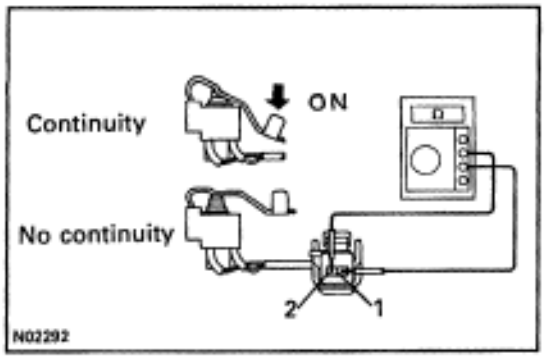
Relay Circuit/ Illuminated Entry System

Remove the relay from junction block and inspect the connector on the junction block side, as shown in the chart.

Tester connection to terminal number	Condition	Specified value (Continuity)
A3 – Ground	Door Outside Handle Switch Position OFF	No continuity
A3 – Ground	Door Outside Handle Switch Position ON	Continuity
A4 – Ground	Courtesy Switch Position OFF (except driver's side)	No continuity
A4 – Ground	Courtesy Switch Position ON (except driver's side)	Continuity
A10 – Ground	Constant	Continuity
Tester connection to terminal number	**Condition**	**Specified value (Voltage)**
A1 – Ground	Constant	Battery positive voltage
A2 – Ground	Constant	Battery positive voltage

If circuit is as specified, trying replacing the relay with a new one.

If the circuit is not as specified, inspect the circuits connected to other parts.



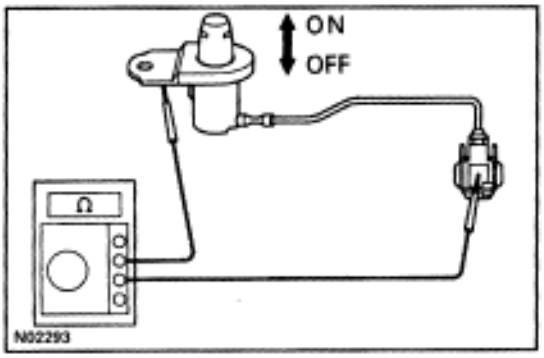
DOOR OUTSIDE HANDLE SWITCH INSPECTION

INSPECT DOOR OUTSIDE HANDLE SWITCH

(a) Check that there is continuity between terminals 1 and 2 when door outside handle is pulled.

(b) Check that there is no continuity between terminals 1 and 2 when door outside handle is released.

If operation is not as specified, replace the switch.



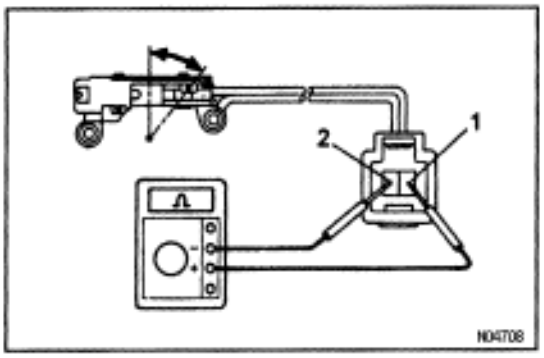
DOOR COURTESY SWITCH INSPECTION

INSPECT DOOR COURTESY SWITCH

(a) Check that there is continuity between terminal and switch body with the switch ON (switch pin released).

(b) Check that there is no continuity between terminal and switch body with the switch OFF (switch pin pushed).

If continuity is not as specified, replace the switch.



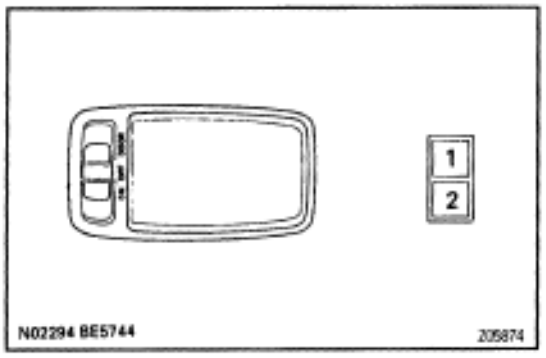
BACK DOOR COURTESY SWITCH INSPECTION

INSPECT BACK DOOR COURTESY SWITCH

(a) Check that there is continuity between terminal 1 and 2 with the switch ON (switch pin released).

(b) Check that there is no continuity between terminal 1 and 2 with the switch OFF (switch pin pushed).

If continuity is not as specified, replace the switch.



INTERIOR LIGHT SWITCH AND DECK ROOM LIGHT SWITCH INSPECTION

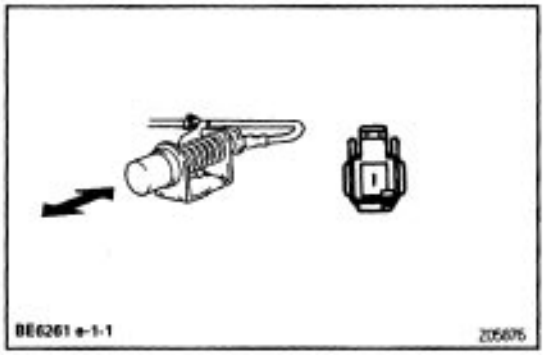
INSPECT INTERIOR LIGHT SWITCH AND DECK ROOM LIGHT SWITCH

Continuity

Inspect the light switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
DOOR	2 – Switch body	Continuity
OFF	–	No continuity
ON	1–2	Continuity

If continuity is not as specified, replace the light assembly or bulb.



LUGGAGE DOOR COURTESY SWITCH INSPECTION

INSPECT LUGGAGE DOOR COURTESY SWITCH

Continuity

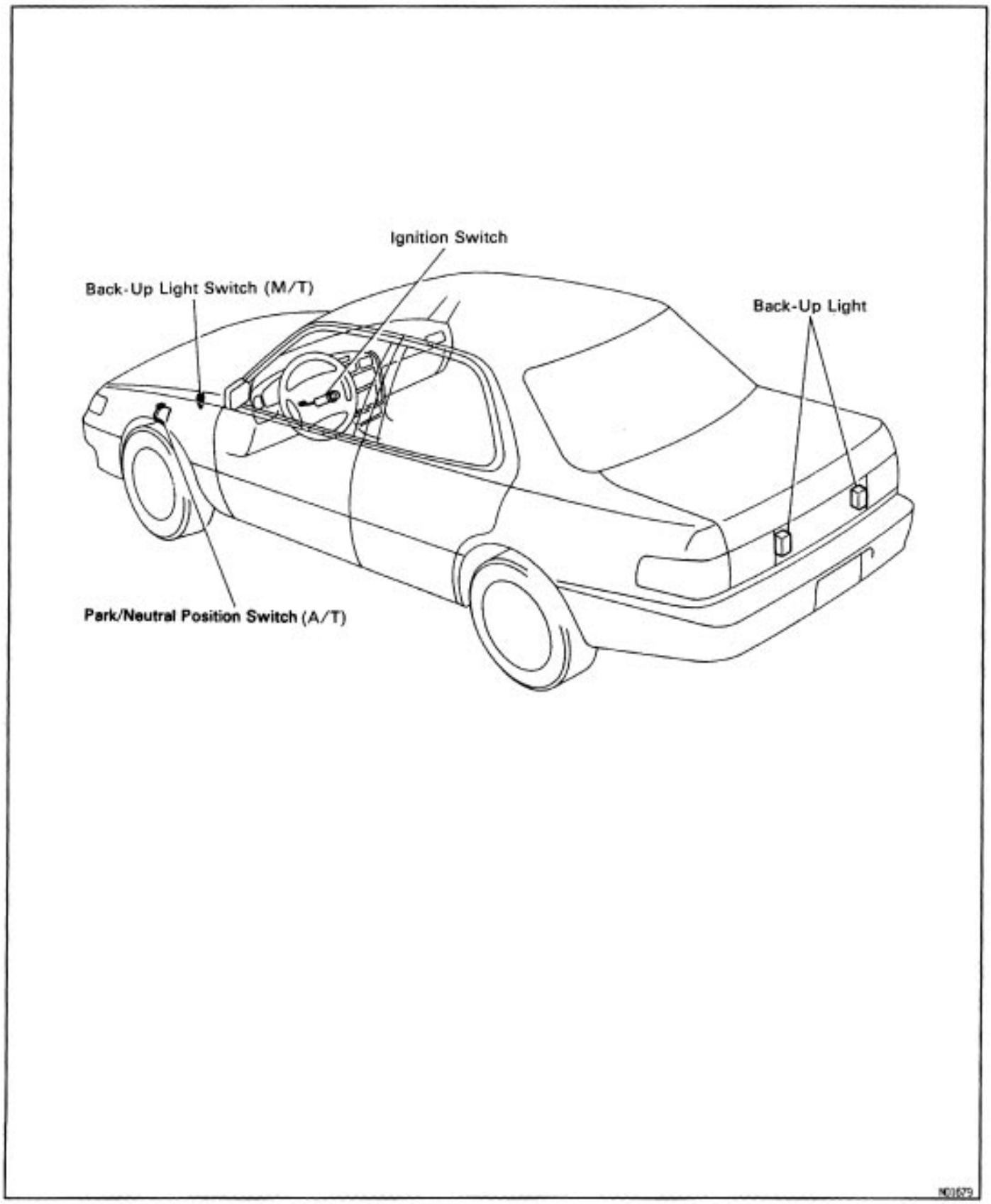
Inspect the switch continuity between terminal and switch body.

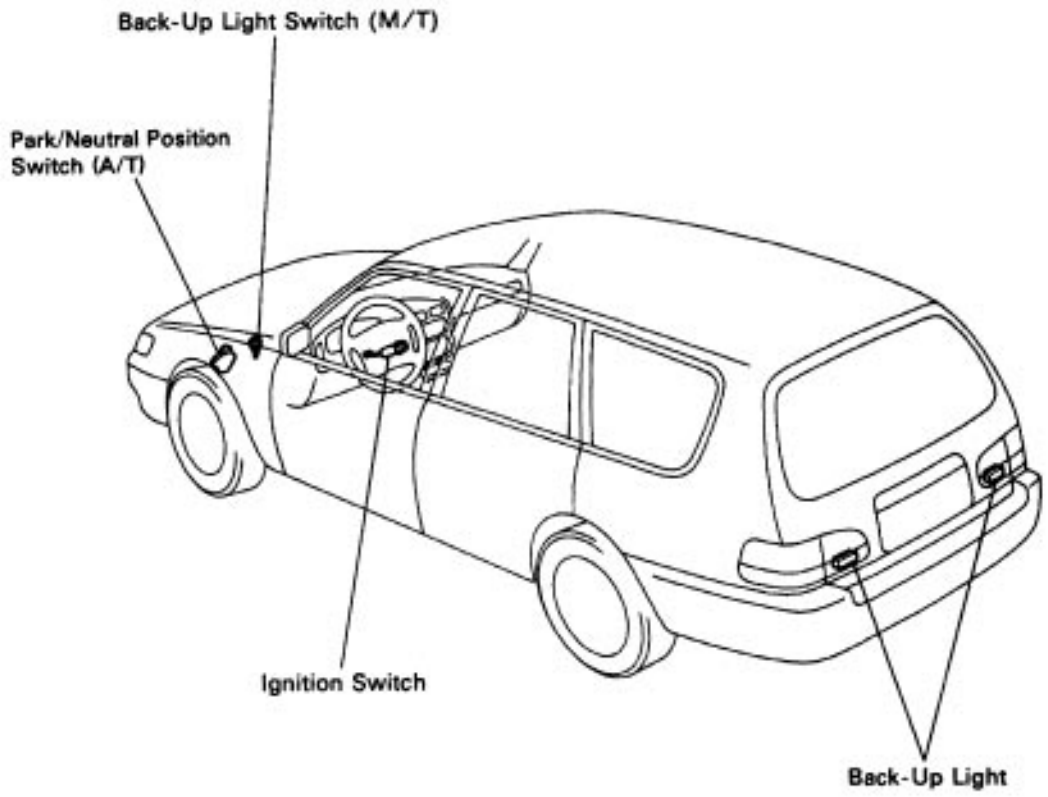
Condition	Tester connection to terminal number	Specified value
Switch OFF	–	No continuity
Switch ON	1 – Switch body	Continuity

If operation is not as specified, replace the switch.

BACK–UP LIGHT SYSTEM

PARTS LOCATION



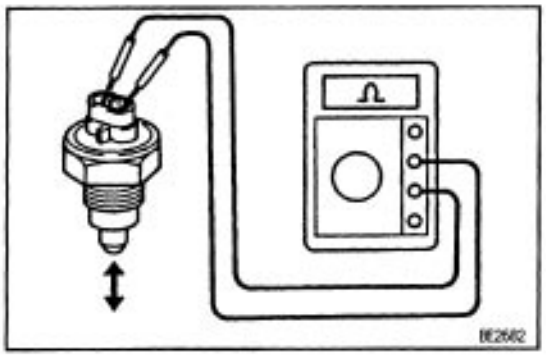

Back-Up Light Switch (M/T)
Park/Neutral Position Switch (A/T)
Ignition Switch
Back-Up Light

N04710

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
Back–Up Light does not light up.	1. GAUGE Fuse 2. Ignition Switch 3. Wire Harness 4. Bulb	(BE–4) (BE–14)
Back–Up Light remains always on.	1. Back–Up Light Switch (M/T) 2. Park/ Neutral Position Switch (A/T) 5S–FE (AX1–92) 1 MZ–FE (AX2– 116) 3. Wire Harness	(BE–47)
Only one light does not light up.	1. Wire Harness 2. Bulb	



BACK–UP LIGHT SWITCH INSPECTION

INSPECT BACK–UP LIGHT SWITCH

Inspect the switch continuity between terminals.

Switch position	Tester connection	Specified value
Free	–	No continuity
Push	1 – 2	Continuity

If continuity is not as specified, replace the switch.

PARK/ NEUTRAL POSITION SWITCH

(5S–FE Engine)

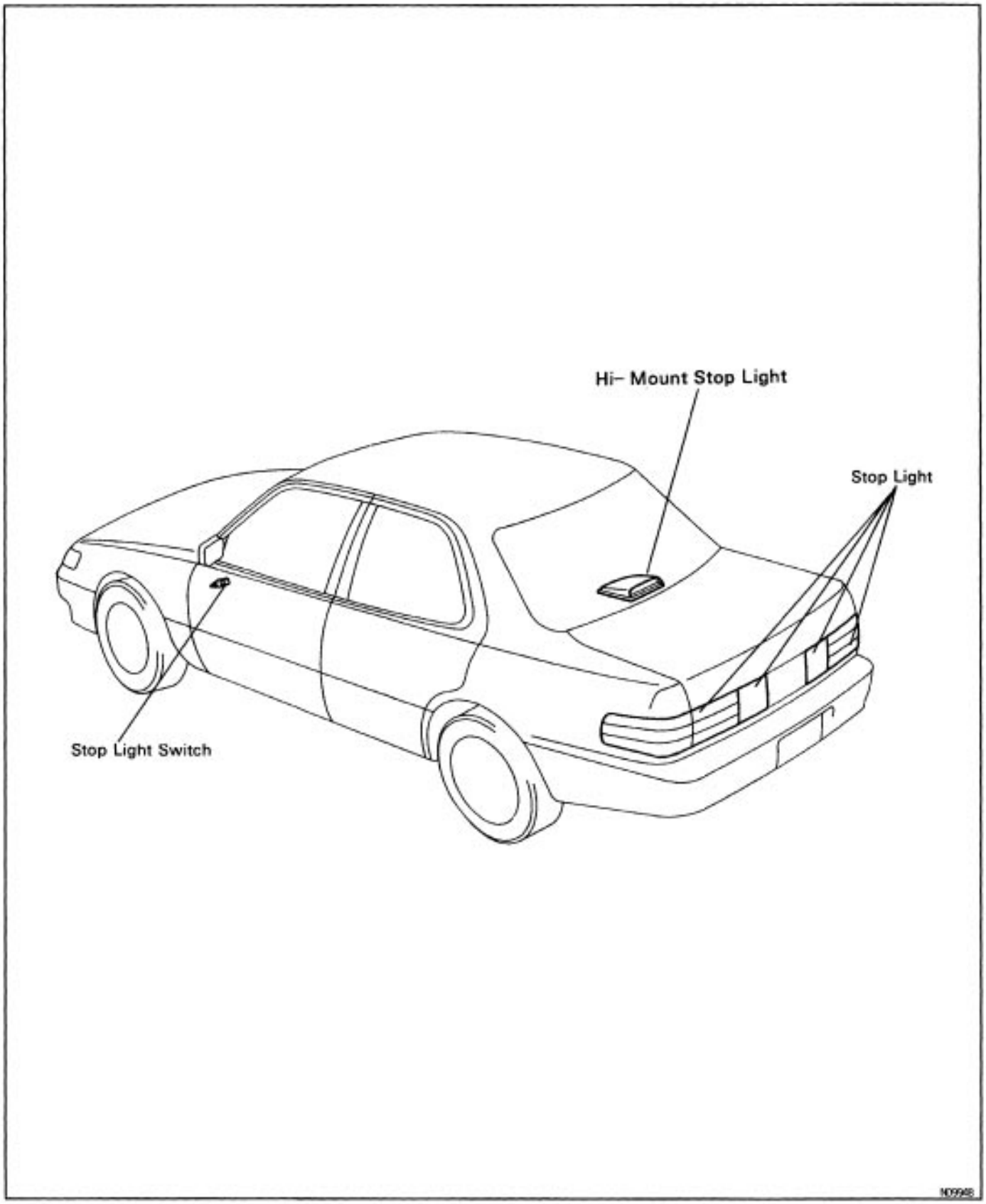
See page AX1–92.

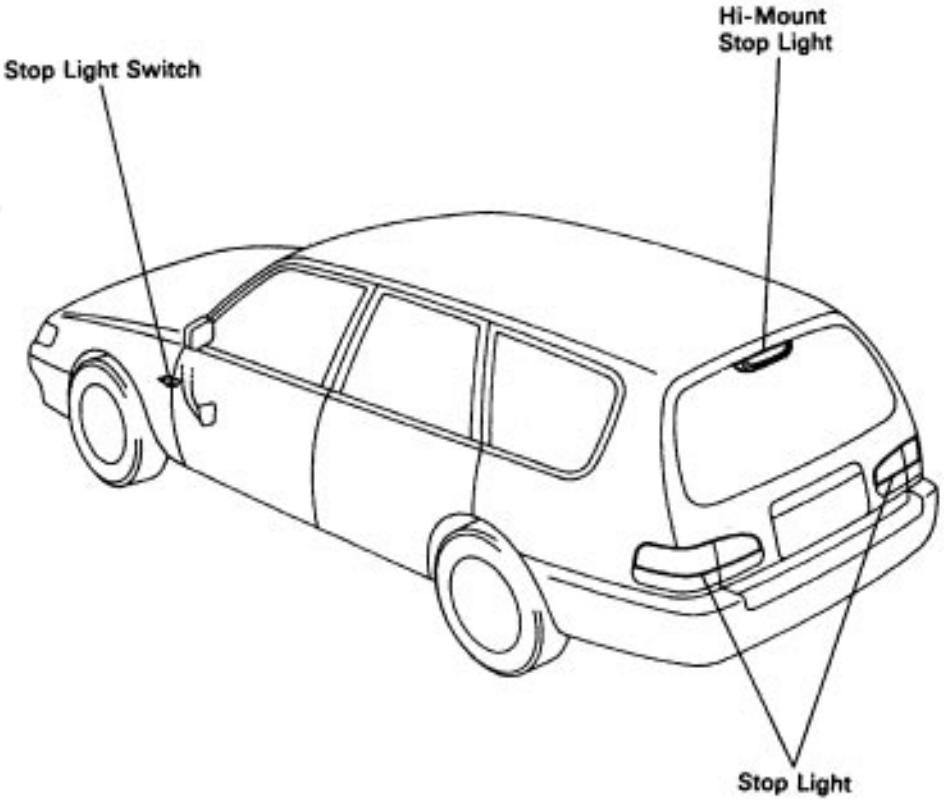
(lMZ–FE Engine)

See page AX2–116.

STOP LIGHT SYSTEM

PARTS LOCATION

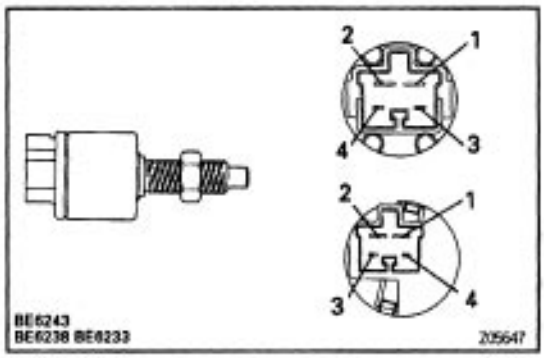



Hi-Mount
Stop Light
Stop Light Switch
Stop Light
N04709

TROUBLESHOOTING

The. table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
Stop light does not light up.	1. STOP Fuse 2. Stop Light Switch 3. Wire Harness	(BE–4) (BE–50)
Only one light always lights up.	1. Wire Harness	
Only one light does not light.	1. Bulb 2. Wire Harness	



STOP LIGHT SWITCH INSPECTION

INSPECT STOP LIGHT SWITCH

Continuity

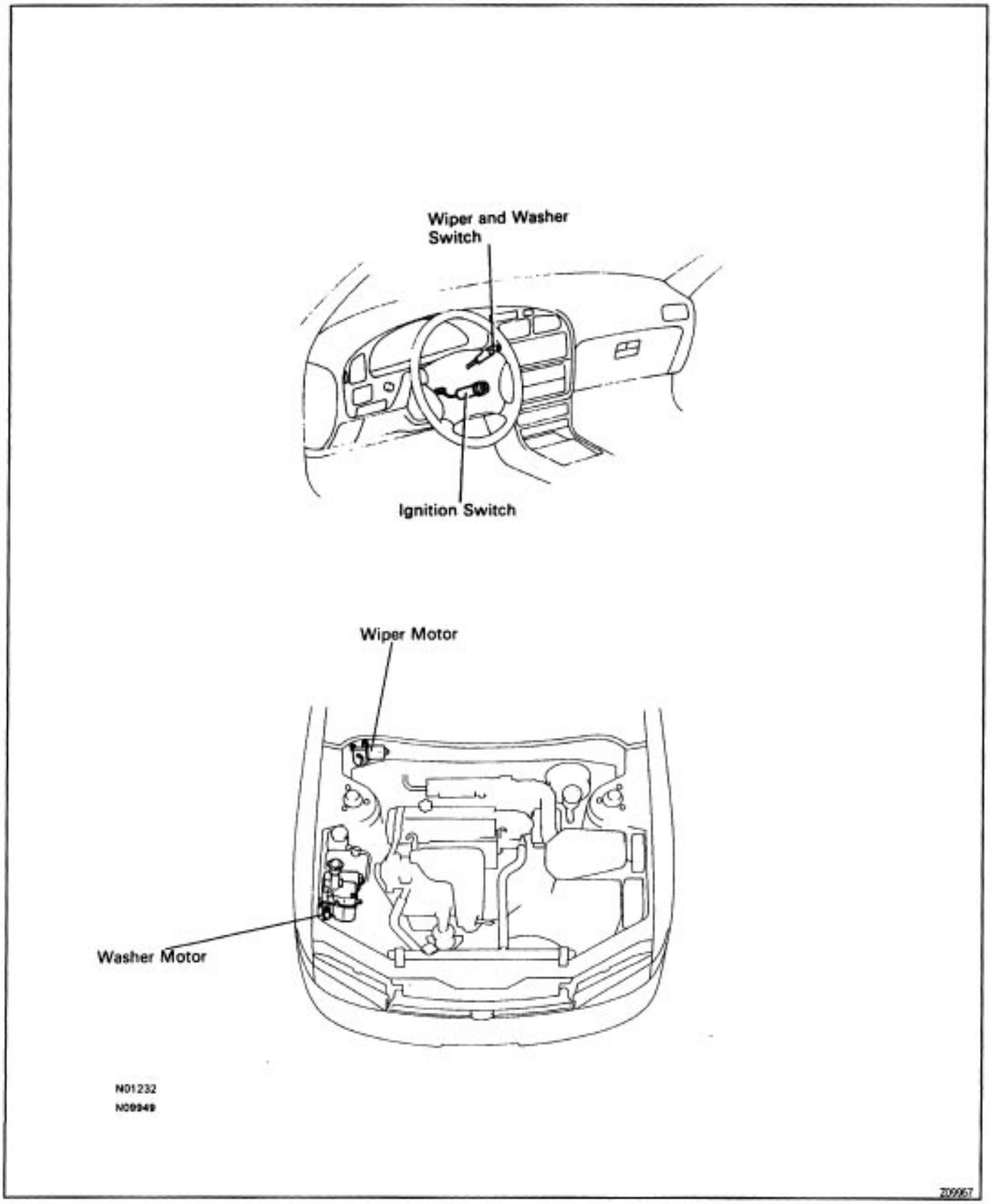
Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
Switch pin free	1–2	Continuity
Switch pin pushed in	3–4	Continuity

If continuity is not as specified, replace the switch.

WIPER AND WASHER SYSTEM

PARTS LOCATION



TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
Wiper and washers do not operate.	1. WIPER Fuse 2. Wiper Switch 3. Wiper Motor 4. Wire Harness	(BE–4) (BE–53) (BE–56)
Wipers do not operate in L0, HI or MIST.	1. Wiper Switch 2. Wiper Motor 3. Wire Harness	(BE–53) (BE–56)
Wipers do not operate in INT.	1. Wiper Switch 2. Wiper Motor 3. Wire Harness	(BE–53) (BE–56)
Washer motor does not operate.	1. Washer Switch 2. Washer Motor 3. Wire Harness	(BE–53) (BE–58)
Wipers do not operate when washer switch in ON.	1. Washer Motor 2. Wire Harness	(BE–58)
Washer fluid does not operate.	1. Washer Hose and Nozzle	
• At wiper switch HI position, the wiper blade is in contact with the body. • When the wiper switch is OFF, the wiper blade does not retract or the retract position wrong.	1. *1 Wiper Relay 2. Wire harness	(BE–54)

*1: Inspect wiper arm and blade set position

COMBINATION SWITCH REMOVAL

See page BO–108

COMBINATION SWITCH DISASSEMBLY

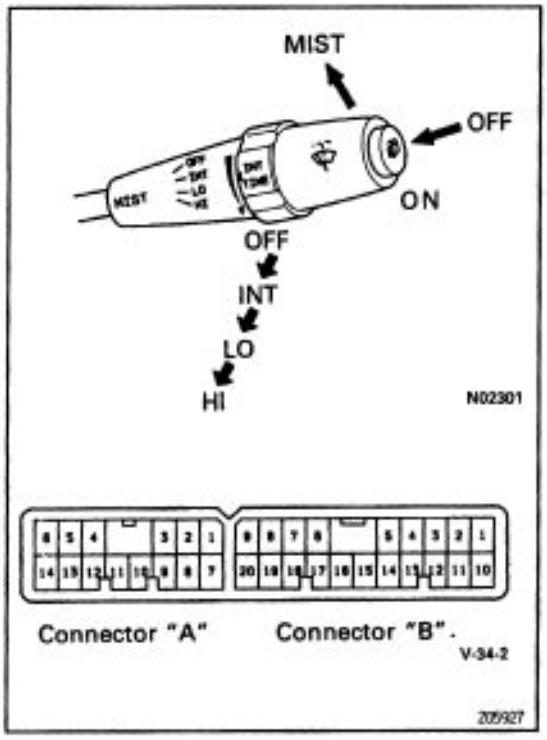
See page BE–25.

COMBINATION SWITCH ASSEMBLY

See page BE–27.

COMBINATION SWITCH INSTALLATION

See page BO–108.



COMBINATION SWITCH INSPECTION

INSPECT WIPER AND WASHER SWITCH

Continuity

Inspect the switch continuity between terminals.

WIPER OFF

Switch position	Tester connection to terminal number	Specified value
MIST OFF	B4–B7	Continuity
MIST ON	B4–B7 B16–B18	Continuity

WIPER INT

Switch position	Tester connection to terminal number	Specified value
MIST OFF	B4–B7 B14–B16	Continuity
MIST ON	B4–B7 B14–B16–B18	Continuity

WIPER LO

Switch position	Tester connection to terminal number	Specified value
MIST OFF	B7–B18	Continuity
MIST ON	B7–B18	Continuity

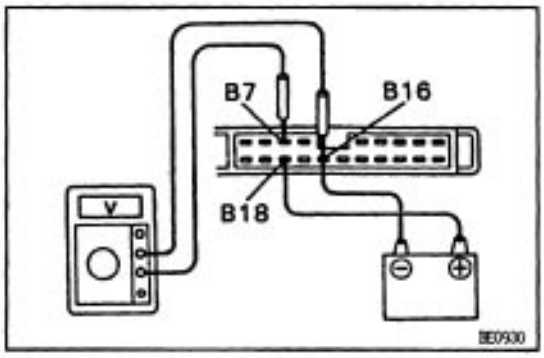
WIPER HI

Switch position	Tester connection to terminal number	Specified value
MIST OFF	B6 B16 B13–B18	Continuity
MIST ON	B6 B16 B13–B18	Continuity

WASHER

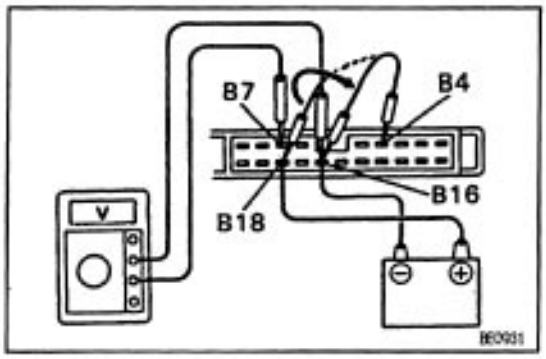
Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
ON	B8–B16	Continuity
Condition	Tester connection to terminal number	Specified value
*1 Constant	B4 – B7 B16 – B18	Continuity
”Apply B+ between terminals 16 and 18.	B7–B18	Continuity

*’: With wiper switch OFF or– INT, and MIST ON.
If continuity is not as specified, replace the switch.



Intermittent Wiper Operation

(a) Turn the wiper switch to INT position.
(b) Turn the intermittent time control switch to FAST position.
(c) Connect the positive (+) lead from the battery to terminal 13– 18 and the negative (–) lead to terminal B –16.
(d) Connect the positive (+) lead from the voltmeter to terminal B–7 and the negative (–) lead to terminal B –16, check that the meter needle indicates battery positive voltage.



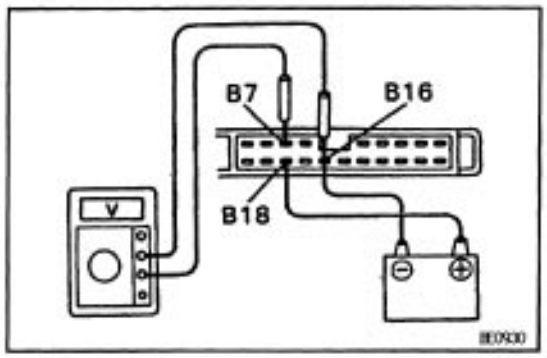
(e) After connecting terminal B–4 to terminal B–18, connect to terminal B–16.

Then, check that the voltage rises from 0 V to battery positive voltage within the times, as shown in the table.

If operation is not as specified, replace the switch.

I NT time control switch position	Voltage
FAST	Approx. 2 sec. Battery positive voltage / 0 V
SLOW	10.7 ± 5 sec. Battery positive voltage / 0 V
Non variable type	3.3 ± 1 sec. Battery positive voltage / 0 V

V04152

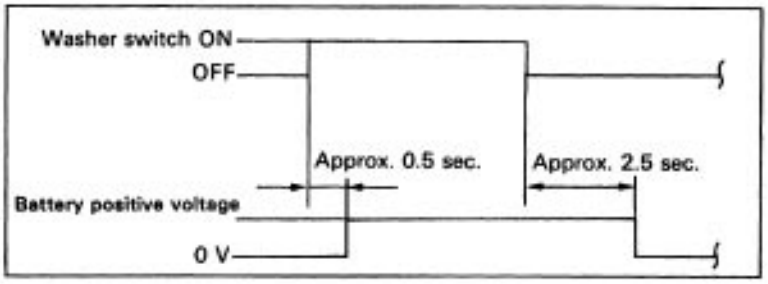


Washer Linked Operation

(a) Connect the positive (+) lead from the battery to terminal 13– 18 and the negative (–) lead to terminal B –16.

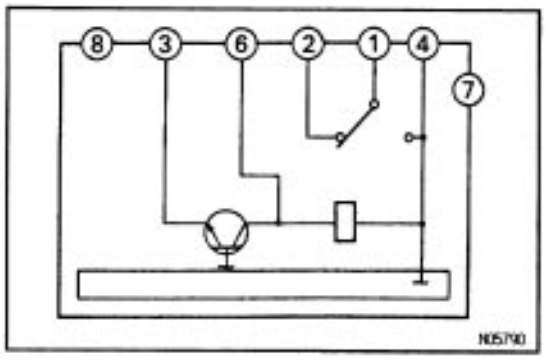
(b) Connect the positive (+) lead from the voltmeter to terminal B–7 and the negative (–) lead to terminal B –16.

(c) Push the washer switch, check that the voltage cha–nges, as shown in the table.

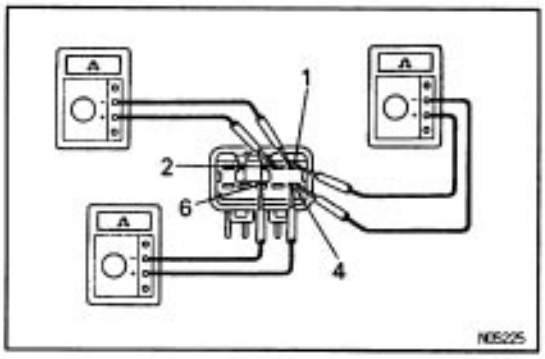


V04153

If operation is not as specified, replace the wiper and washer switch.



WIPER RELAY INSPECTION WAGON Only:



INSPECT REAR WIPER RELAY

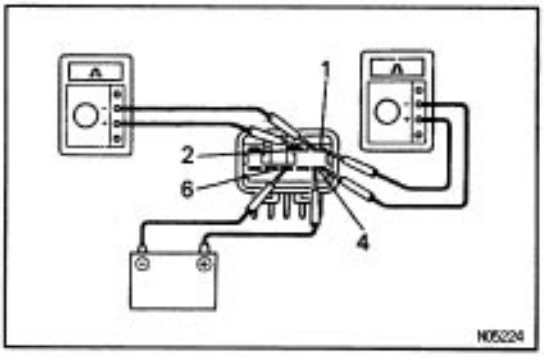
Continuity

(a) Check that there is continuity between terminals 4 and 6.

(b) Check that there is continuity between terminals 1 and 2.

(c) Check that there is no continuity between terminals 1 and 4.

If continuity is not as specified, replace the relay.



Operation

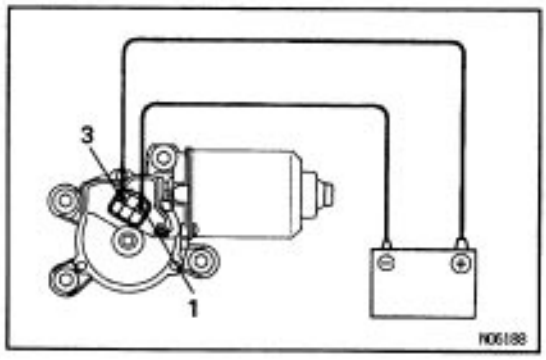
(a) Apply battery positive voltage across terminals 4 and 6.

(b) Check that there is continuity between terminals 1 and 4.

(c) Check that there is no continuity between terminals 1 and 2.

If continuity is not as specified, replace the relay.

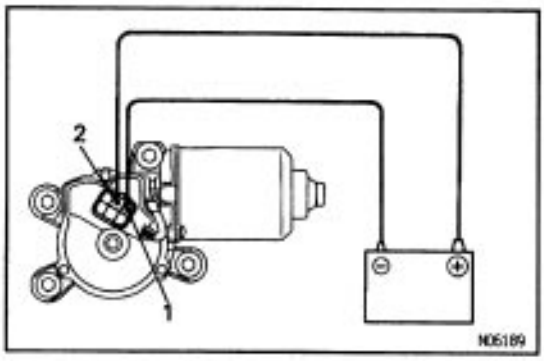
WIPER MOTOR INSPECTION



INSPECT MOTOR

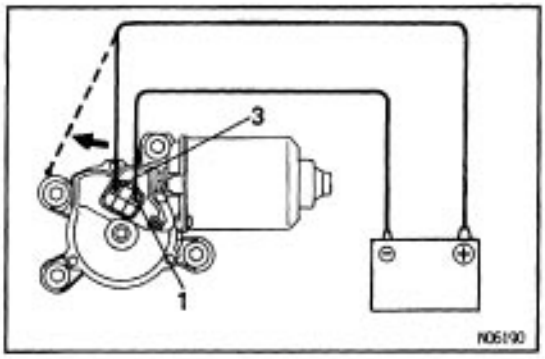
Operation at Low Speed

Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, check that the motor operates at low speed.
If operation is not as specified, replace the motor.



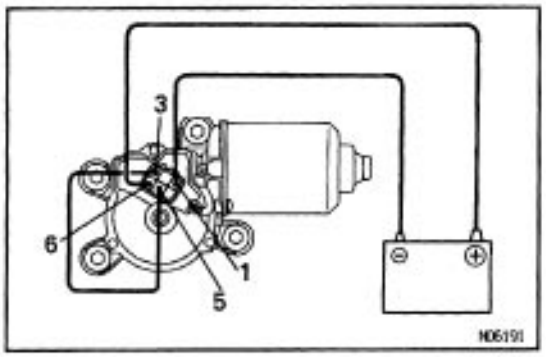
Operation at High Speed

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates at high speed.
If operation is not as specified, replace the motor.



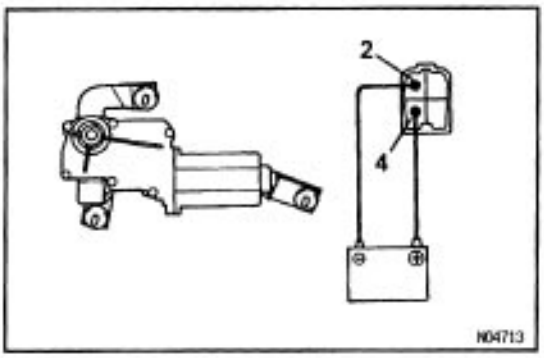
Operation, Stopping at Stop Position

(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3.



(b) Connect terminals 3 and 5.

(c) Connect the positive (+) lead from the battery to terminal 6 and negative (–) lead to terminal 1, check that the motor stops running at the stop position after the motor operates again.
If operation is not as specified, replace the motor.

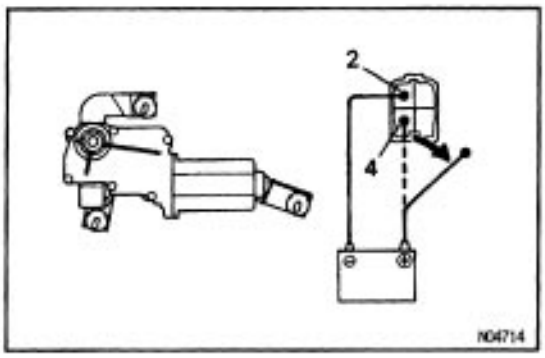


REAR WIPER MOTOR INSPECTION WAGON Only:

INSPECT MOTOR

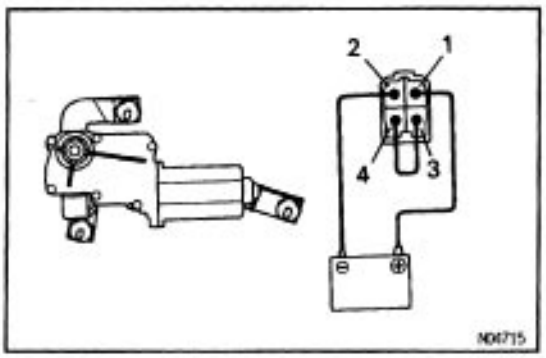
Operation at Low Speed

Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 2, check that the motor operates at low speed.
If operation is not as specified, replace the motor.



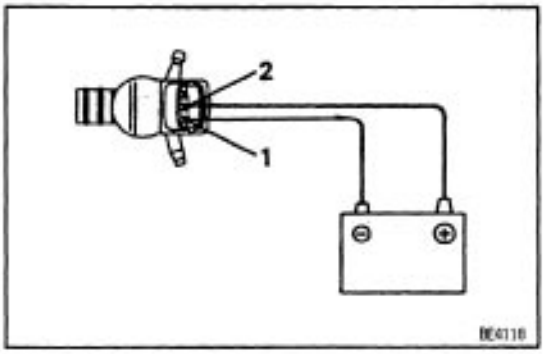
Operation, Stopping at Stop Position

(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 4.



(b) Connect terminals 3 and 4.

(c) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor stops running at the stop position after the motor operates again.
If operation is not as specified, replace the motor.



WASHER MOTOR INSPECTION (WAGON Only)

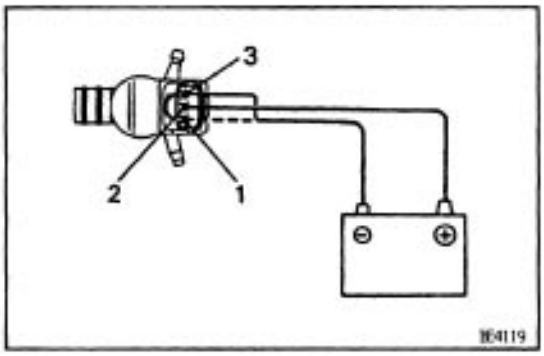
INSPECT WASHER MOTOR

Front Washer Operation

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

NOTICE: These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.

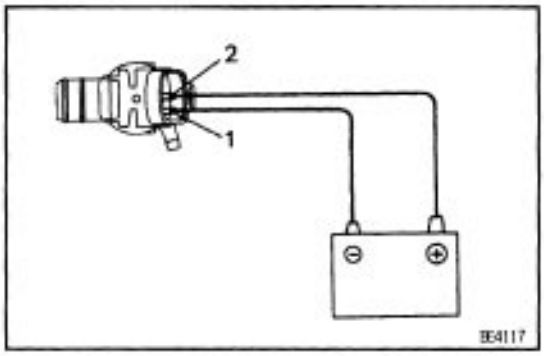


Rear Washer Operation

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3, check that the motor operates.

NOTICE: These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.



(Ex. WAGON)

INSPECT WASHER MOTOR

Operation

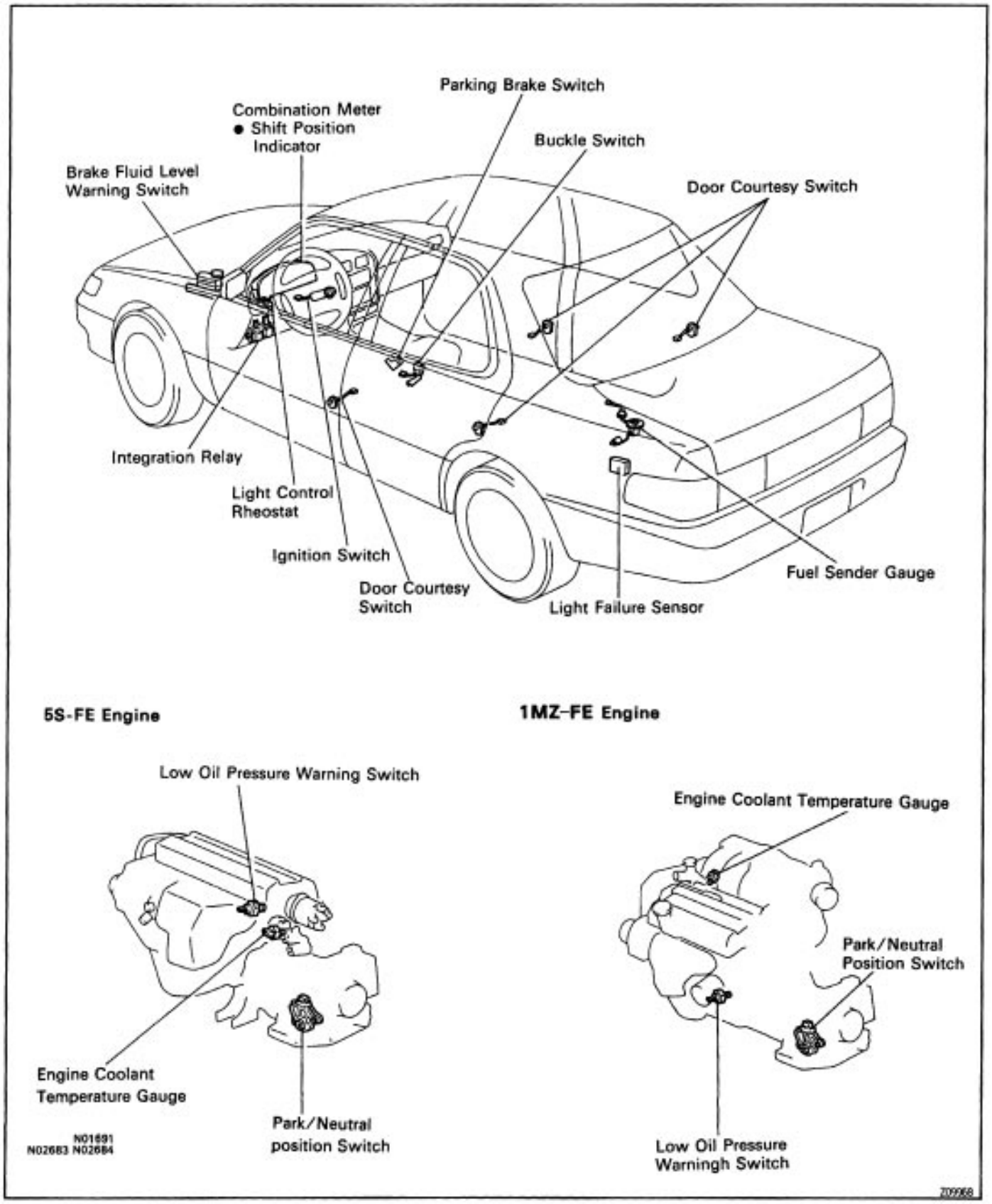
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

NOTICE: There tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

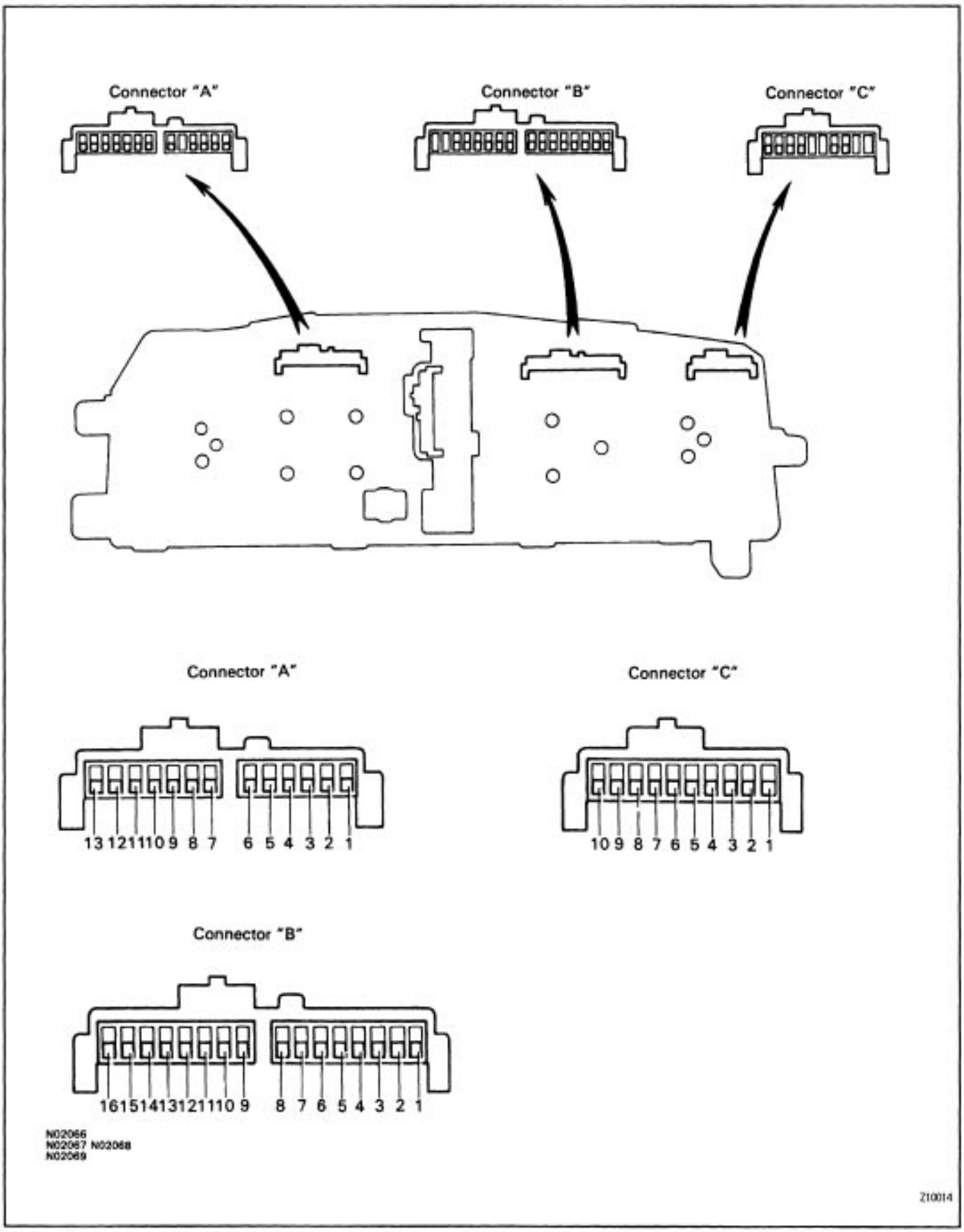
If operation is not as specified, replace the motor.

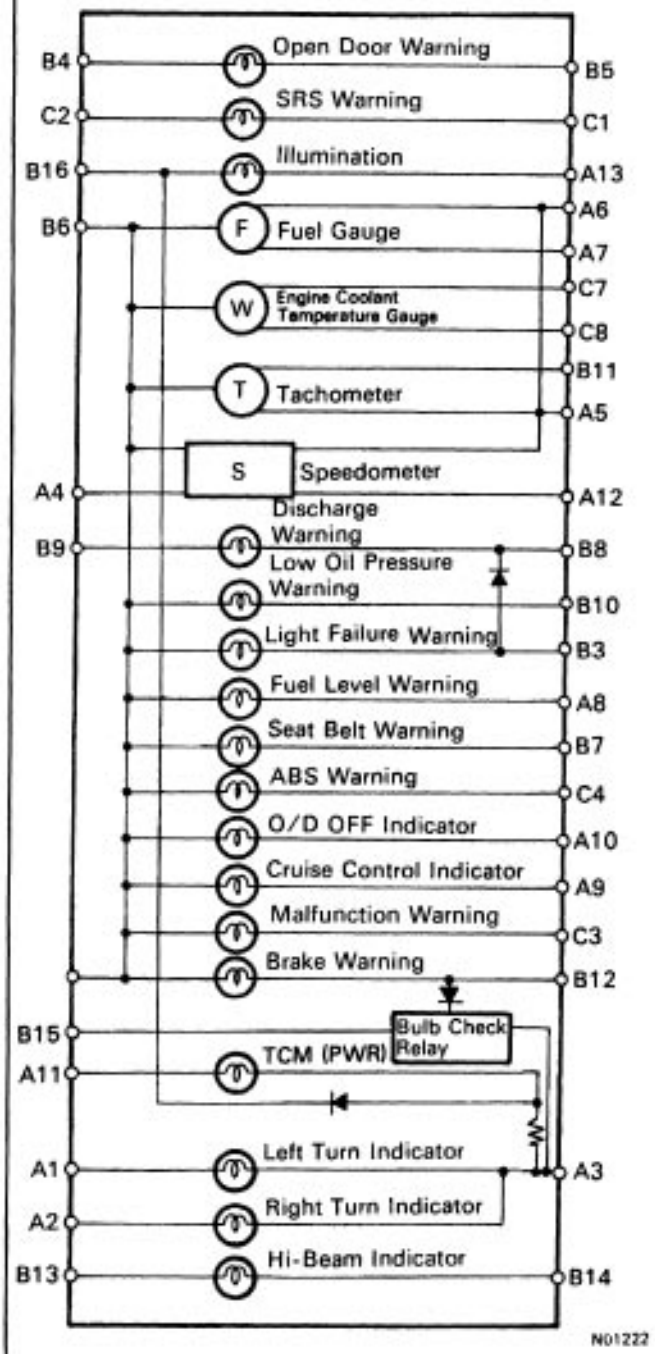
COMBINATION METER

PARTS LOCATION



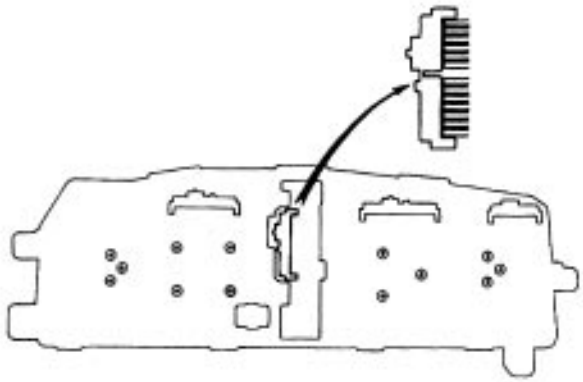
WIRING DIAGRAM

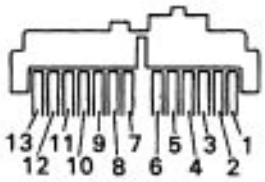


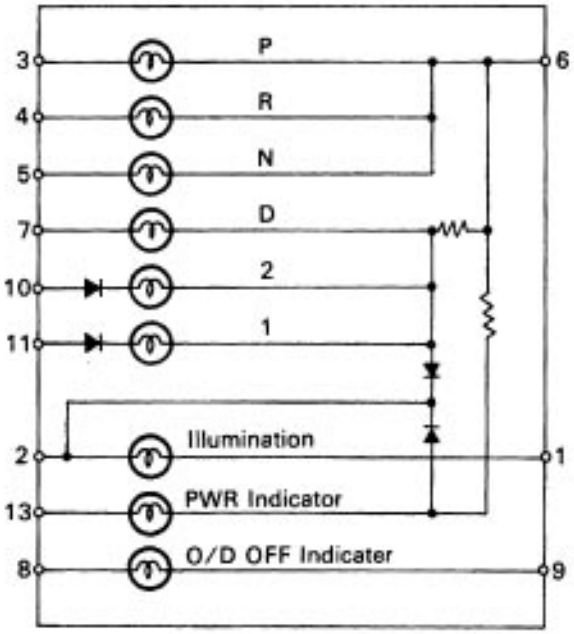


No.		Wiring Connector Side
A	1	Headlight dimmer and turn signal switch
	2	Headlight dimmer and turn signal switch
	3	Ground
	4	ECM
	5	Ground
	6	Ground
	7	Fuel sender gauge–terminal 2
	8	Fuel sender gauge–terminal 3
	9	Cruise Control ECU
	10	0/D OFF Switch
	11	Electronic Controlled Transaxle (PWR)
	12	Speed sensor
	13	Light control rheostat
B	3	Light failure sensor
	4	DOME fuse
	5	Door courtesy switch
	fi	GAUGE fuse
	7	Integration relay
	8	Generator
	9	IG2 fuse
	10	Oil pressure switch
	11	Igniter
	12	Parking brake switch and brake fluid
	13	level warning switch
	14	Headlight dimmer switch
	15	Headlight dimmer switch
	16	Starter relay
		TAIL fuse
C	1	Center Airbag Sensor Assembly
	2	ECU–13 fuse
	3	ECM
	4	ABS ECU
	7	Engine coolant temperature sender gauge
	8	Ground

A/T SHIFT POSITION INDICATOR







N01227 N01220
N01225

No.	Wiring Connector Side
1	Light control rheostat
2	TAIL fuse
3	Park/Neutral Position switch
4	Park/Neutral Position switch
5	Park/Neutral Position switch
6	Ground
7	Park/Neutral Position switch
8	GAUGE fuse
9	0/D switch
10	Park/Neutral Position switch
11	Park/Neutral Position switch
13	Electronic Controlled Transaxle select switch (PWR)

209970

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

METER, GAUGES AND ILLUMINATION

Trouble	Parts name	(See page)
Tachometer, Voltmeter, Fuel Gauge and Engine Coolant Temperature Gauge do not operate.	1. GAUGE Fuse 2. Combination Meter Wiring Circuit 3. Wire Harness 4. Meter Circuit Plate	(BE–4) (BE–61) (BE–60)
Speedometer does not operate.	1. No. 1 vehicle speed Sensor 2. Speedometer Driven Gear and Drive Gear	(BE–67)
Tachometer does not operate.	1. Combination Meter Wiring Circuit 2. Wire Harness 3. Igniter 4. Meter Circuit Plate	(BE–61) 5S–FE (IG–12, 31) 1 MZ–FE (IG–49) (BE–60)
Fuel Gauge does not operate or abnormal operation.	1. Fuel Receiver Gauge 2. Fuel Sender Gauge 3. Combination Meter Wiring Circuit 4. Wire Harness	(BE–68) (BE–69) (BE–61)
Engine Coolant Temperature Gauge does not operate or abnormal operation.	1. Engine Coolant Temperature Receiver Gauge (BE–70) 2. Engine Coolant Temperature Sender Gauge 3. Combination Meter Wiring Circuit (BE–61) 4. Wire Harness	(BE–70)
All illumination lights do not light up.	1. TAIL Fuse 2. Light Control Rheostat 3. Wire Harness	(BE–4) (BE–77)
Brightness does not change even when rheostat turned.	1. Bulb 2. Wire Harness	
Only one illumination light does not light up.	1. Bulb 2. Wire Harness	

WARNING LIGHTS

Trouble	Parts name	(See page)
Warning light do not fight up. (Except. Discharge)	1. GAUGE Fuse 2. Combination Meter Wiring Circuit 3. Wire Harness	(BE–4) (BE–61)
Low Oil Pressure warning light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit 3. Low Oil Pressure Warning Switch 4. Wire Harness	 (BE–61) (BE–71)
Fuel Level warning light does no light up.	1. Bulb 2. Combination Meter Wiring Circuit 3. Fuel Level Warning Switch	 (BE–61) (BE–69)
A6S warning light does no light up.	1. Bulb 2. ABS ECU 3. Wire Harness	 (BR–90)
Malfunction warning light does not light up.	1. Bulb 2. ECM 3. Wire Harness	 (EG–394)
Seat Belt warning light does not light up.	1. Bulb 2. Integration Relay 3. Wiring Harness	 (BE–31)
Discharge warning light does not light up.	1. IG N Fuse 2. Bulb 3. Wire Harness 4. Generator	(BE–4) 5S–FE (CH–7) 1 MZ–FE (CH–31)
Light Failure warning light does no light up.	1. Bulb 2. Light Failure Sensor 3. Wire Harness 4. ”Taillight system”	 (BE–73) (BE–17)
Brake warning light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit 3. Parking Brake Switch 4. Brake Fluid Level Warning Switch	 (BE–61) (BE–72) (BE–71)
SRS warning light does not light up.	1. ECU – B Fuse 2. Bulb 3. Wire Harness 4. Center Airbag Sensor Assembly	(BE–4) (RS–55)
Open Door warning light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit 3. Door Courtesy Switch	 (BE–61) (BE–43)

INDICATOR LIGHTS

Trouble	Parts name (see page)
O/D OFF indicator light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. O/D OFF Switch 5S–FE (AX1–102) 1 MZ–FE (AX2–130) 4. Wire Harness
Cruise Control indicator light does not light up.	1. Bulb 2. Cruise Control ECU (BE–176) 3. Wire Harness
High beam indicator light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. Wire Harness 4. ”Headlight System” (BE–17)
Turn indicator light does not light up.	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. Wire Harness 4. ”Turn Signal and Hazard Warning System” (BE–35)
Electrically Controlled Transmission PWR indicator lights does not light up.	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. TCM Pattern Select Switch 5S–FE (AX1–98) 1 MZ– FE (AX2–126) 4. Wire Harness
Shift indicator lights do not light up. (All)	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. Park / Neutral Position Switch 5S–FE (AX1–92) 1 MZ– FE (AX2–116) 4. Wire Harness
Shift indicator lights do not light up. (L. 2. D)	1. Bulb 2. Combination Meter Wiring Circuit (BE–61) 3. Park / Neutral Position Switch 5S–FE (AX1–92) 1 MZ– FE (AX2–116) 4. Light Control Rheostat (BE–77) 5. Wire Harness
Only one shift indicator does not light up.	1. Bulb 2. Combination Meter Wiring Circuit (BE–61)
Indicator lights do not light up. (Except. Turn, Hi–beam)	1. GAUGE Fuse (BE–4) 2. Wire Harness

SPEEDOMETER INSPECTION

ON–VEHICLE

Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

HINT: Tire wear and tire over or under inflation will increase the indication error.

If error is excessive, replace the speedometer.

mph/ USA:

Standard indication	Allowable range
20	18 – 24
40	38 – 44
60	56 – 66
80	78 – 88
100	98 – 110
120	118 – 132

km/h/ CANADA:

Standard indication	Allowable range
20	17 – 24
40	38 – 46
60	57.5 – 67
80	77 – 88
100	96 – 109
120	115 – 130
140	134 – 151.5
160	153 – 173

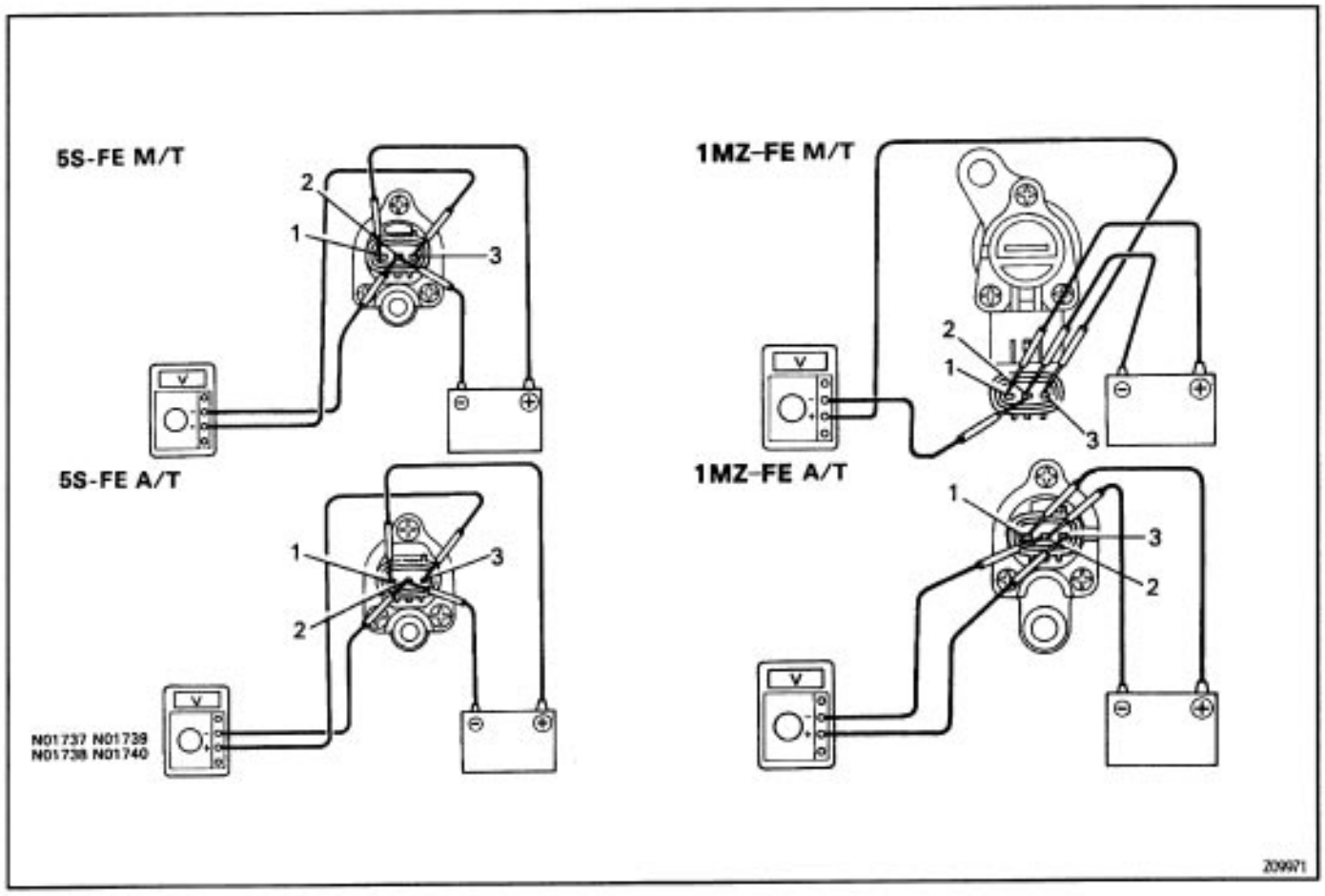
SPEED SENSOR INSPECTION

Operation

(a) Connect the positive (+) lead from battery to terminal 1 and negative (–) lead to terminal 2.
(b) Connect the positive (+) lead from tester to terminal 3 and negative (–) lead to terminal 2.
(c) Revolve shaft.
(d) Check that there is voltage change from approx. 0 V to 1 1 V or more between terminals 2 and 3.

HINT: The voltage change should be 4 times par each revolution of the speed sensor shaft.

If operation is not as specified, replace the sensor.



TACHOMETER INSPECTION

ON–VEHICLE

(a) Connect a tune–up test tachometer, and start the engine.

NOTICE: Reversing the connection of the tachometer will damage the transistors and diodes inside.

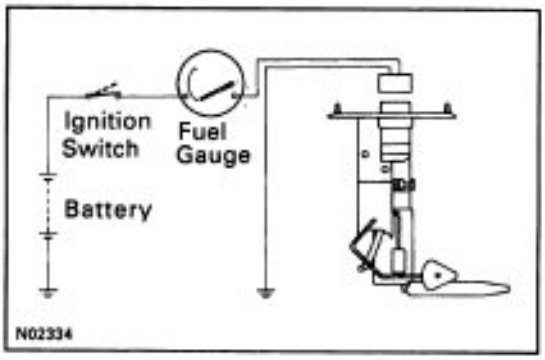
(b) Compare the tester and tachometer indications.

If error is excessive, replace the tachometer.

DC 13.5 V, 25 ®C (77 ®F)/ rpm

Standard indication	Allowable range
700	630 – 770
1,000	915 – 1,115
2,000	1,920 – 2,220
3,000	2,890 – 3,350
4,000	3,940 – 4,400
5,000	5,025 – 5,425
6,500	6,650 – 6,950
7,000	7,025 – 7,625

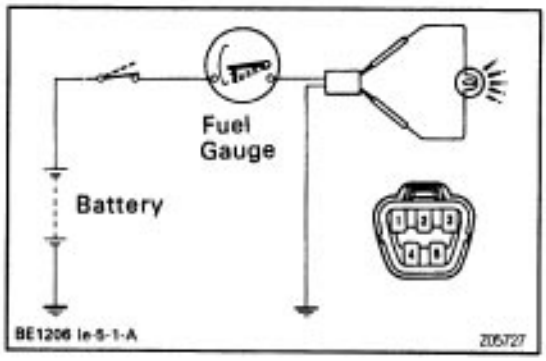
FUEL RECEIVER GAUGE INSPECTION



Operation

(a) Disconnect the connector from the sender gauge assembly.

(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.

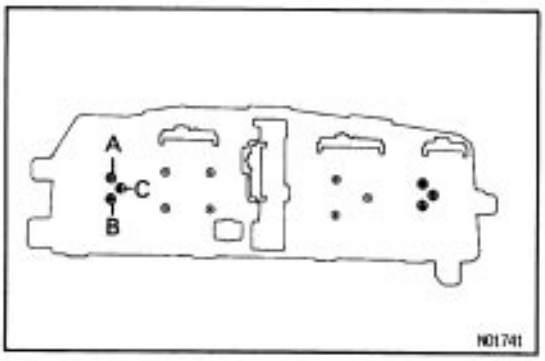


(c) Connect terminals 2 and 3 on the wire harness side connector through a 3.4 w test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and receiver gauge needle moves toward the full side.

HINT: Because of the silicon oil in the gauge, it will take a short time for the needle to stabilize.

If operation is not as specified, inspect the receiver gauge resistance.

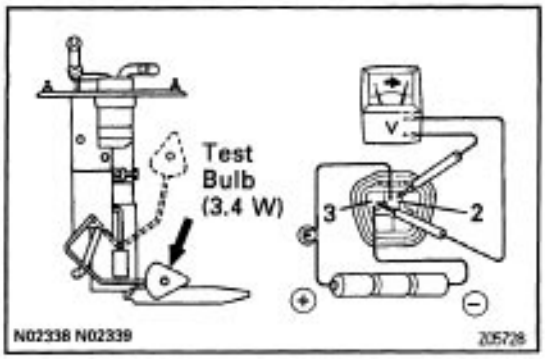


Resistance

Measure the resistance between terminals.

Between terminals	Resistance (Ω)
A–B	Approx. 126
A–C	Approx. 281
B–C	Approx. 154

If resistance value is not as specified, replace the fuel receiver gauge.



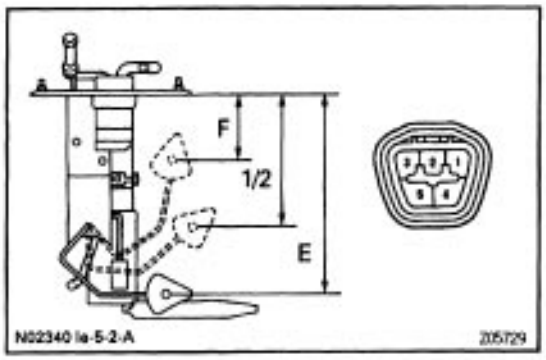
FUEL SENDER GAUGE INSPECTION

Operation

(a) Connect a series of three 1.5 V dry cell batteries.
(b) Connect the positive (+) lead from the dry cell batte–ries to terminal 2 through a 3.4 W test bulb and the negative (–) lead to terminal 3.
(c) Check that the voltage rises between terminals 2 and 3 as the float is moved from the top to bottom posi–tion.

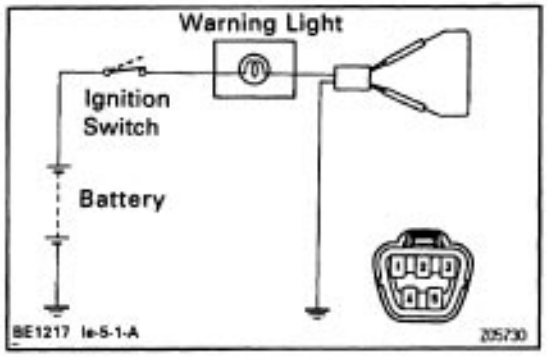
Resistance

Measure the resistance between terminals 2 and 3 for each float position.



Float position mm (in.)		Resistance (Ω)
F	Approx. 35.5 (1.40)	Approx. 3
1/2	Approx. 90.9 (3.59)	Approx. 30.8
E	Approx. 157.4 (6.20)	Approx. 110

If resistance value is not as specified, replace the sender gauge.

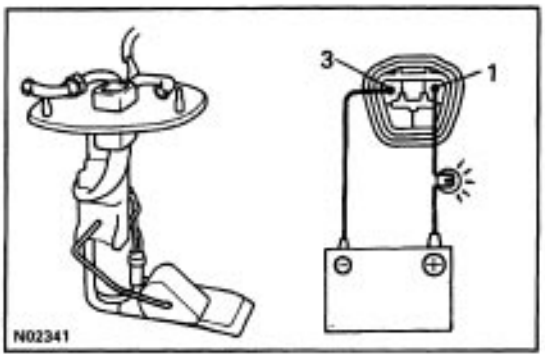


FUEL LEVEL WARNING LIGHT INSPECTION

INSPECT FUEL LEVEL WARNING LIGHT

a) Disconnect the connector from the sender gauge.
b) Connect terminals 1 and 3 on the wire harness side connector.
e) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb or inspect wire harness.

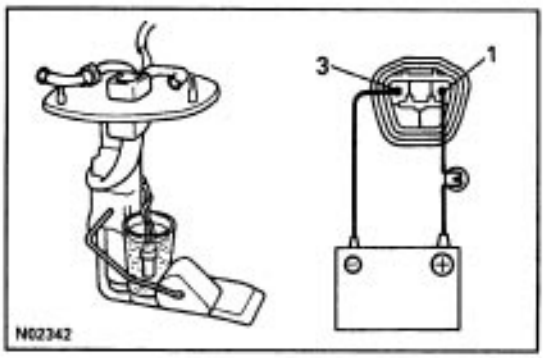


FUEL LEVEL WARNING SWITCH INSPECTION

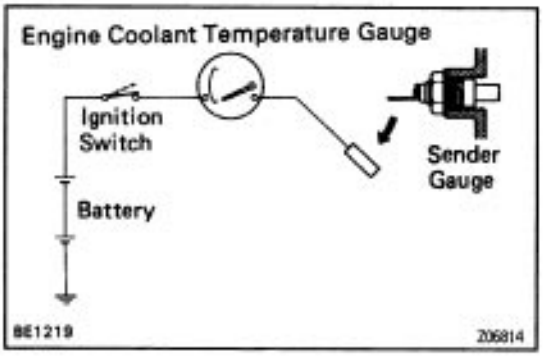
INSPECT FUEL LEVEL WARNING SWITCH

(a) Apply battery positive voltage between terminals 1 and 3 through a 3.4 W test bulb, check that the bulb lights up.

HINT: It will take a short time for the bulb to light up.



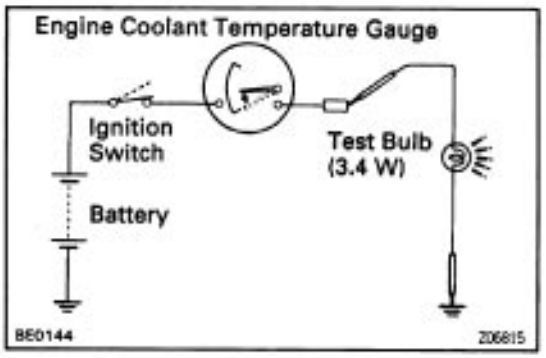
(b) Submerge the switch in fuel, check that the bulb goes out.
If operation is not as specified, replace the sender gauge.



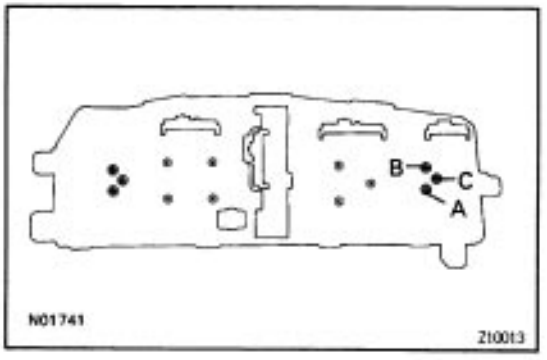
ENGINE COOLANT TEMPERATURE RECEIVER GAUGE AND SENDER GAUGE INSPECTION

Operation

(a) Disconnect the connector from the sender gauge.
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates COOL.



(c) Ground terminal on the wire harness side connector through a 3.4W test bulb.
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves toward the hot side.
If operation is as specified, replace the sender gauge. Then recheck the system.
If operation is not as specified, measure the receiver gauge resistance.

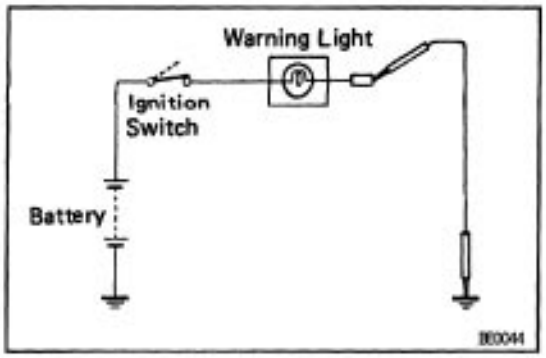


Resistance

Measure the resistance between terminals.
HINT: Connect the test leads so that the current from the ohmmeter can flow according to the chart order.

Between terminals	Resistance (Ω)
A–B	Approx. 54
A–C	Approx. 176
B–C	Approx. 230

If resistance value is not as specified, replace the engine coolant temperature receiver gauge.



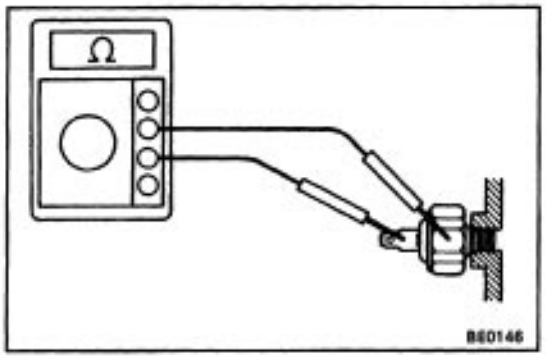
LOW OIL PRESSURE WARNING LIGHT INSPECTION

INSPECT LOW OIL PRESSURE WARNING LIGHT

(a) Disconnect the connector from the warning switch and ground terminal on the wire harness side connector.

(b) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb or inspect wire harness.



LOW OIL PRESSURE WARNING SWITCH INSPECTION

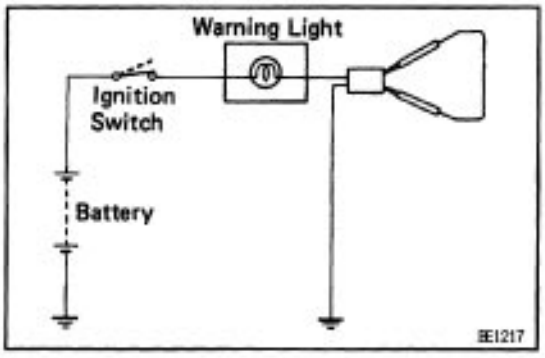
INSPECT LOW OIL PRESSURE WARNING SWITCH

(a) Check that there is continuity between terminal and ground with the engine stopped.

(b) Check that there is no continuity between terminal and ground with the engine running.

HINT: Oil pressure should be over 29 kPa (0.3 kgf/cm^2, 4.3 psi)

If operation is not as specified, replace the switch.



BRAKE FLUID LEVEL WARNING LIGHT INSPECTION

INSPECT BRAKE WARNING LIGHT

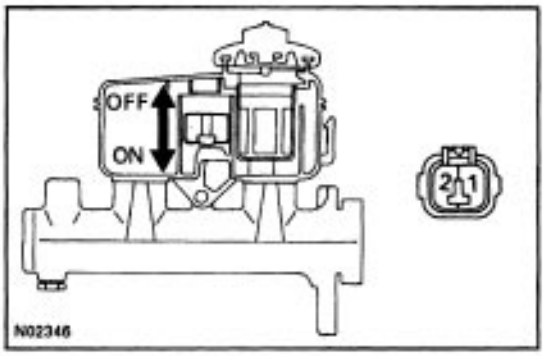
(a) Disconnect the connector from the brake fluid warning switch.

(b) Release the parking brake pedal.

(c) Connect terminals on the wire harness side of the level warning switch connector.

(d) Start the engine, check that the warning light lights up.

If the warning light does not light up, test the bulb or wire harness.

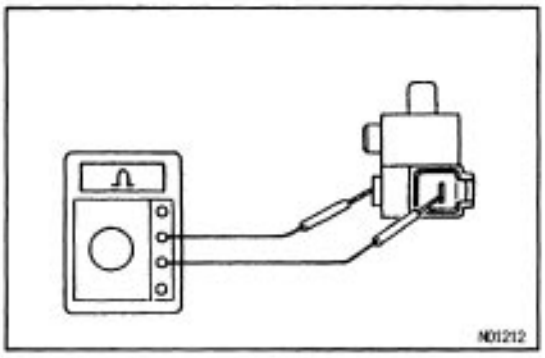


BRAKE FLUID LEVEL WARNING SWITCH INSPECTION

INSPECT BRAKE FLUID LEVEL WARNING SWITCH

(a) Remove the reservoir tank cap and strainer.
(b) Disconnect the connector.
(c) Check that there is no continuity between terminals with the switch OFF (float up).
(d) Use syphon, etc. to take fluid out of the reservoir tank.
(e) Check that there is continuity between terminals with the switch ON (float down).
(f) Pour the fluid back in the reservoir tank.

If operation is not as specified, replace the switch.

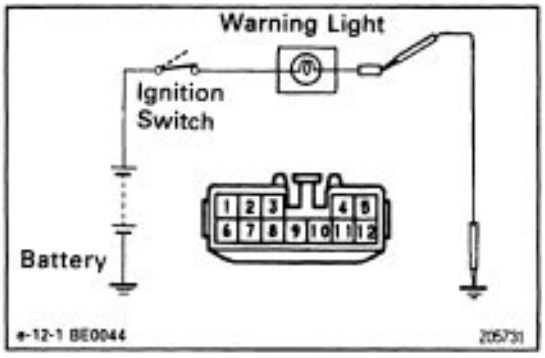


PARKING BRAKE SWITCH INSPECTION

INSPECT PARKING BRAKE SWITCH

(a) Check that there is continuity between terminal and switch body with the switch ON (switch pin released).
(b) Check that there is no continuity between terminal and switch body with the switch OFF (switch pin pushed in).

If operation is not as specified, replace the switch or inspect ground point.

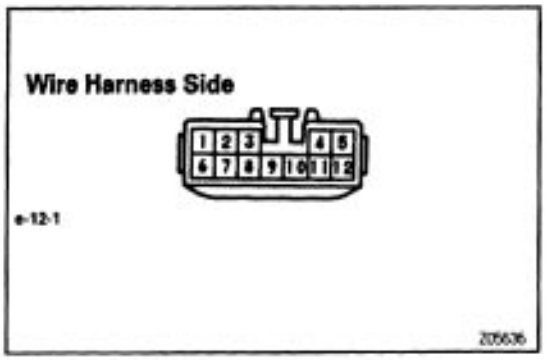


LIGHT FAILURE WARNING LIGHT INSPECTION

INSPECT LIGHT FAILURE WARNING LIGHT

(a) Disconnect the connector from the light failure sensor and ground terminal 4 on the wire harness side con–nector.
(b) Start the engine, check that the warning light lights up.

If the warning light does not light up, test the bulb or inspect wire harness.



LIGHT FAILURE SENSOR INSPECTION

INSPECT LIGHT FAILURE SENSOR

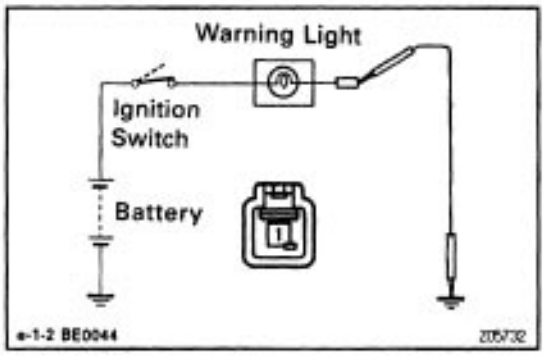
Relay Circuit

Disconnect the connector from the sensor and inspect the connector on the wire harness side, as shown.

Tester connection to terminal number	Condition	Specified value (Continuity)
1 – Ground	Constant	* Continuity
2 – Ground	Constant	* Continuity
9 – Ground	Constant	* Continuity
11 – Ground	Constant	Continuity
Tester connection to terminal number	**Condition**	**Specified value (Voltage)**
3 – Ground	Light control switch position OFF	No voltage
3 – Ground	Light control switch position TAIL or HEAD	Battery positive voltage
4 – Ground	Engine condition Stop	No voltage
4 – Ground	Engine condition Running	Battery positive voltage
8 – Ground	Ignition switch position LOCK or ACC	No voltage
8 – Ground	Ignition switch position ON	Battery positive voltage
9 – Ground 10 – Ground	Stop light switch position OFF	No voltage
9 – Ground 10 – Ground	Stop light switch position ON	Battery positive voltage

*: There is resistance because this circuit is grounded through the bulb.

If circuit is as specified, replace the sensor. If the circuit is not as specified, inspect the circuits connected to other parts.



OPEN DOOR WARNING LIGHT INSPECTION

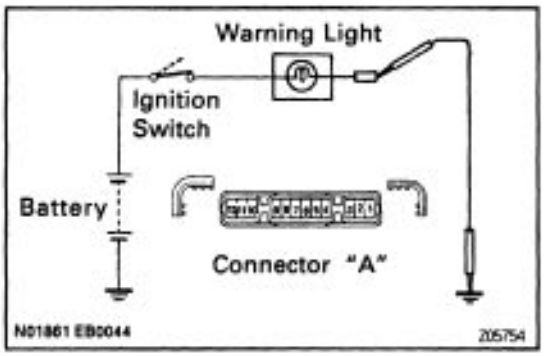
INSPECT OPEN DOOR WARNING LIGHT

Disconnect the connector from the door courtesy switch, and ground terminal 1 on the wire harness side connector and check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.

DOOR COURTESY SWITCH

See page BE–43**.**



SEAT BELT WARNING LIGHT INSPECTION

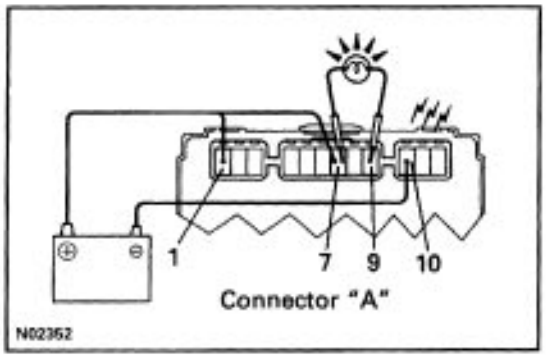
INSPECT SEAT BELT WARNING LIGHT

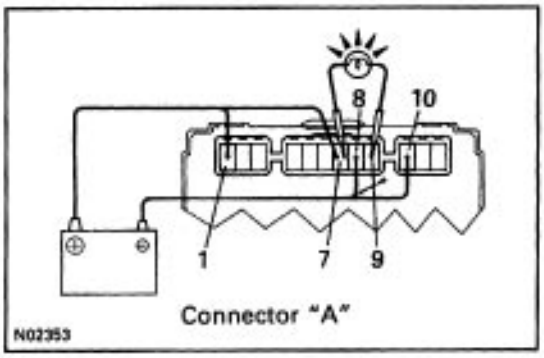
(a) Remove the integration relay from the junction block No. 1.

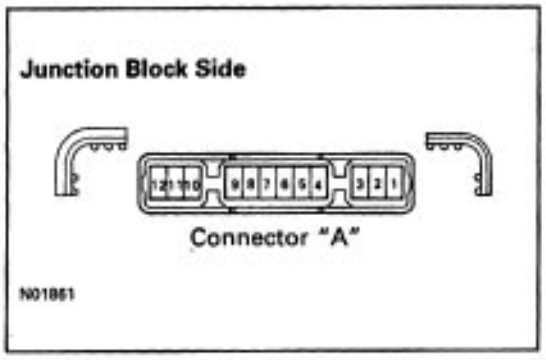
(b) Ground terminal A9 on the junction block side con–nector.

(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.







INTEGRATION RELAY INSPECTION

INSPECT INTEGRATION RELAY

Operation/ Seat belt warning

(a) Connect the positive (+) lead from the battery to terminals Al and A7.
(b) Connect the terminal A7 to terminal A9 through the 3.4 W test bulb.
(c) Connect the negative (–) lead from the battery to terminal Al 0.
(d) Check that the bulb lights and the chime sounds for 4 – 8 seconds.
(e) Return to step
(a), and operate the chime again.
(f) Connect the negative (–) lead from the battery to terminal A8.
(g) Check that the chime stops sounding.

HINT: Check the chime within a period of 4 to 8 seconds.

If operation is not as specified, replace the relay.

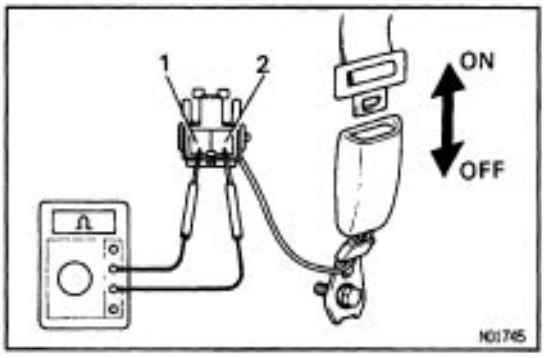
Relay circuit/ Seat belt warning

Remove the relay from the junction block No.1 and inspect the connectors on the junction block side.

Tester connection to terminal number	Condition	Specified value (Continuity)
A8 – Ground	Driver's buckle switch OFF (Seat best unfastened)	No continuity
A8 – Ground	Driver's buckle switch ON (Seat best fastened)	Continuity
A10 – Ground	Constant	Continuity

Tester connection to terminal number	Condition	Specified value (Voltage)
A1 – Ground	Constant	Battery positive voltage
A7 – Ground A9 – Ground	Ignition switch position OFF or ACC	No voltage
A7 – Ground A9 – Ground	Ignition switch position ON	Battery positive voltage

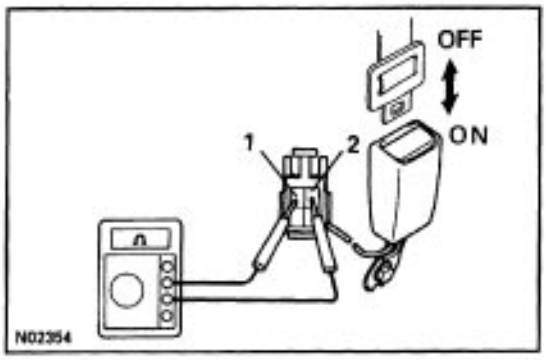
If circuit is as specified, trying replacing the relay with a new one.
Is circuit is not as specified, inspect the circuits con–nected to other parts.



BUCKLE SWITCH INSPECTION

INSPECT BUCKLE SWITCH
w/o POWER SEAT:
Continuity

(a) Check that there is continuity between terminals on the switch side connector with the switch ON (belt fastened).
(b) Check that there is no continuity between terminals on the switch side connector with the switch OFF (belt unfastened).
If operation is not as specified, replace the seat belt inner belt.



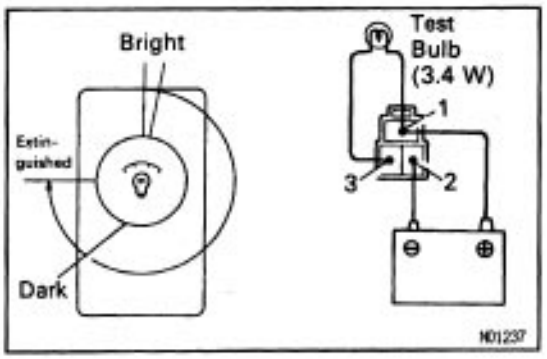
w/ POWER SEAT:

Continuity

(a) Check that there is continuity between terminals 1 and 2 on the switch side connector with the switch ON (belt fastened). ’

(b) Check that there is no continuity between terminals 1 and 2 on the switch side connector with the switch OFF (belt unfastened).

If operation is not as specified, replace the seat belt inner belt.



METER ILLUMINATION CONTROL SYSTEM

INSPECT LIGHT CONTROL RHEOSTAT

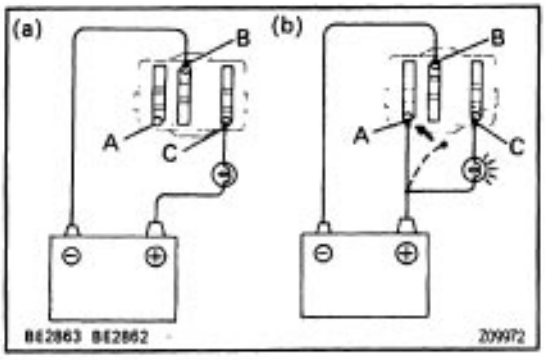
(a) Connect terminals 1 and 3 through a 3.4 W test bulb.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Turn the rheostat knob to fully counterclockwise, check that the test bulb goes out.

(d) Gradually turn the rheostat knob to clockwise, check that the test bulb brightness changes from dark to bright.

If operation is not as specified, replace the rheostat.



BULB CHECK RELAY INSPECTION

INSPECT BULB CHECK RELAY

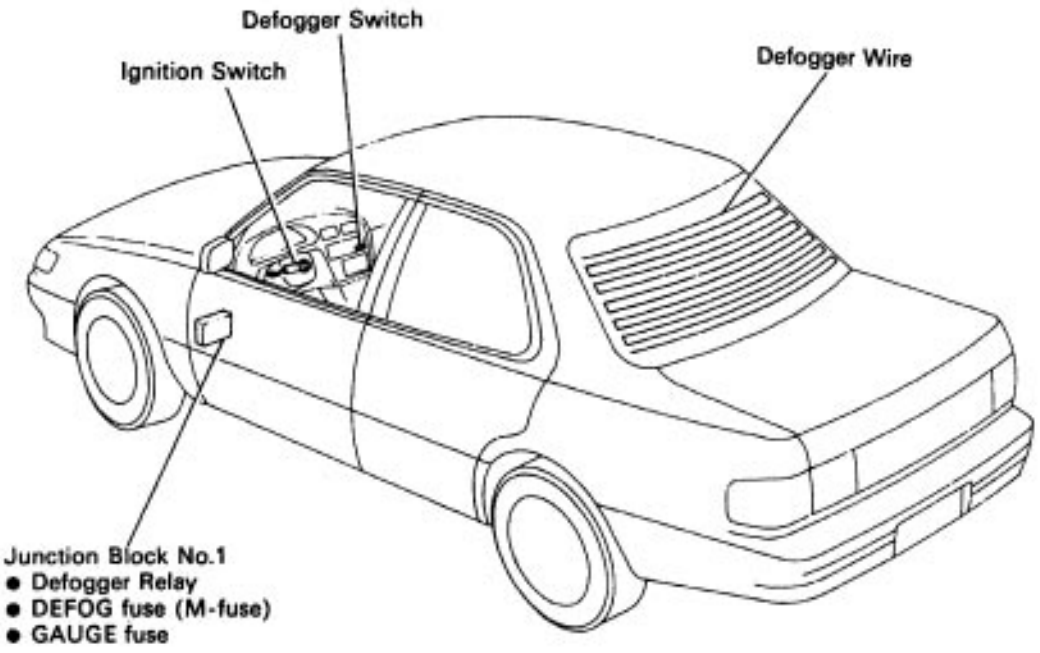
(a) Connect the positive (+) lead from the battery to terminal C through a 1.4 W test bulb and the negative (–) lead to terminal B, check that the test bulb does not light up.

(b) Connect the positive (+) lead from the battery to terminal A , check that the test bulb light up.

If operation is not as specified, replace the relay.

DEFOGGER SYSTEM

PARTS LOCATION

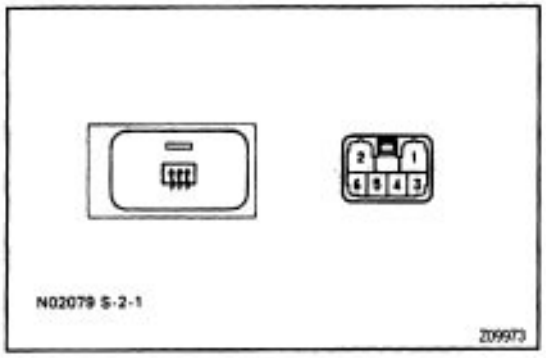


N01210

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Paris name	(See page)
All defogger systems do not operate.	1. DEFOG M – Fuse 2. GAUGE Fuse 3. Defogger Relay 4. Defogger Switch 5. Wire Harness	(BE–4) (BE–4) (BE–80) (BE–79)
Rear window defogger does not operate.	1. Defogger Wire 2. Choke Coil 3. Wire Harness	(BE–80)



DEFOGGER SWITCH INSPECTION

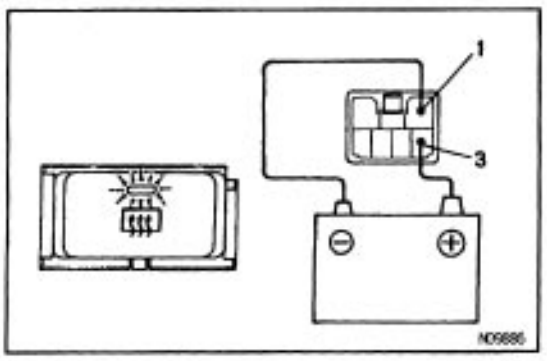
INSPECT DEFOGGER SWITCH

Continuity

Inspect the switch continuity between terminals.

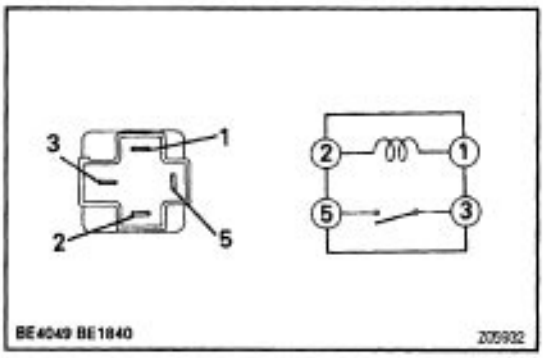
Condition	Tester connection to terminal number	Specified value
Switch OFF	–	No continuity
Switch ON	3–6	Continuity
Illumination circuit	4–5	Continuity

If continuity is not as specified, check the bulb or replace the switch.



INDICATOR LIGHT OPERATION

Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, check that the indicator light does not light up, replace the switch.



DEFOGGER RELAY INSPECTION

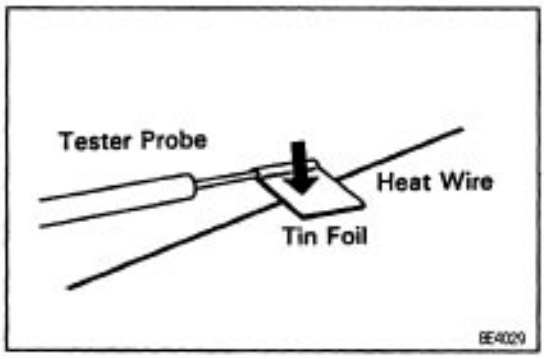
INSPECT DEFOGGER RELAY

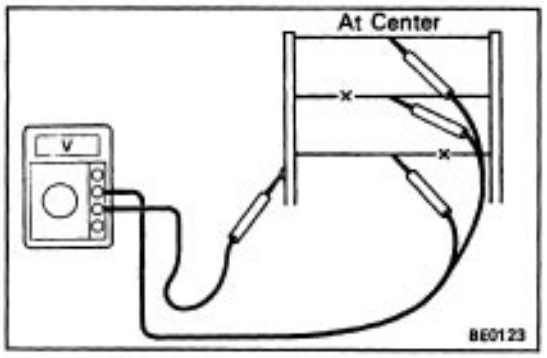
Continuity

Inspect the relay continuity between terminals.

Condition	Tester connection to terminal number	Specified value
Constant	1–2	Continuity
Apply B + between terminals 1 and 2.	3–5	Continuity

If continuity is not as specified, replace the relay.





DEFOGGER WIRE INSPECTION

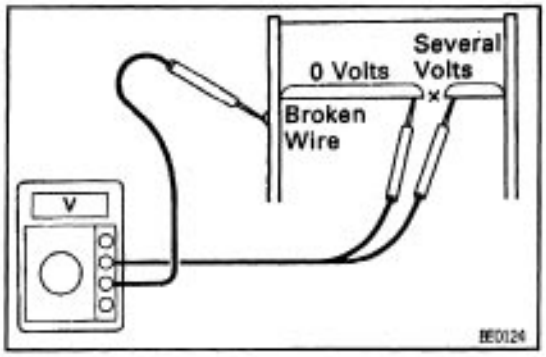
NOTICE:

- **When cleaning the glass, use a soft, dry cloth, and wipe the glass in the direction of the wire. Take care not to damage the wires.**
- **Do not use detergents or glass cleaners with abra–sive ingredients.**
- **When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger, as shown.**

(a) Turn the ignition switch ON.
(b) Turn the defogger switch ON.
(c) Inspect the voltage at the center of each heat wire, as shown.

Voltage	Criteria
Approx. 5V	Okay (No break in wire)
Approx. 1 OV or OV	Broken wire

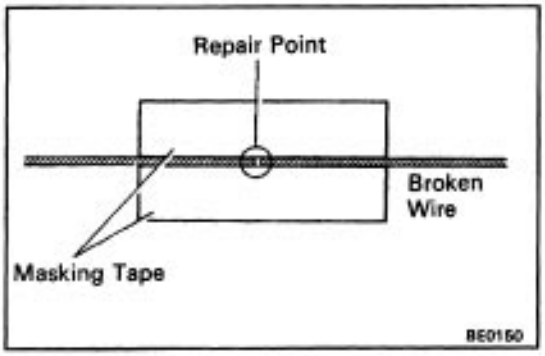
HINT: If there is approximately 10 V, the wire is broken between the center of the wire and the posi–tive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.



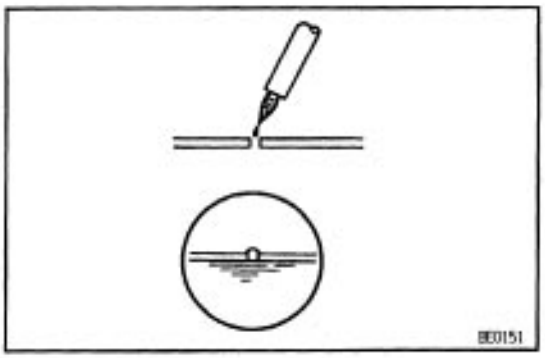
(d) Place the voltmeter positive (+) lead against the defogger positive (+) terminal.
(e) Place the voltmeter negative (–) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (–) terminal end.
(f) The point where the voltmeter deflects from zero to several V is the place where the heat wire is broken.

HINT: If the heat wire is not broken, the voltmeter indicates 0 V at the positive (+) end of the heat wire but gradually increases to about 12 V as the meter probe is moved to the other end.

DEFOGGER WIRE REPAIR



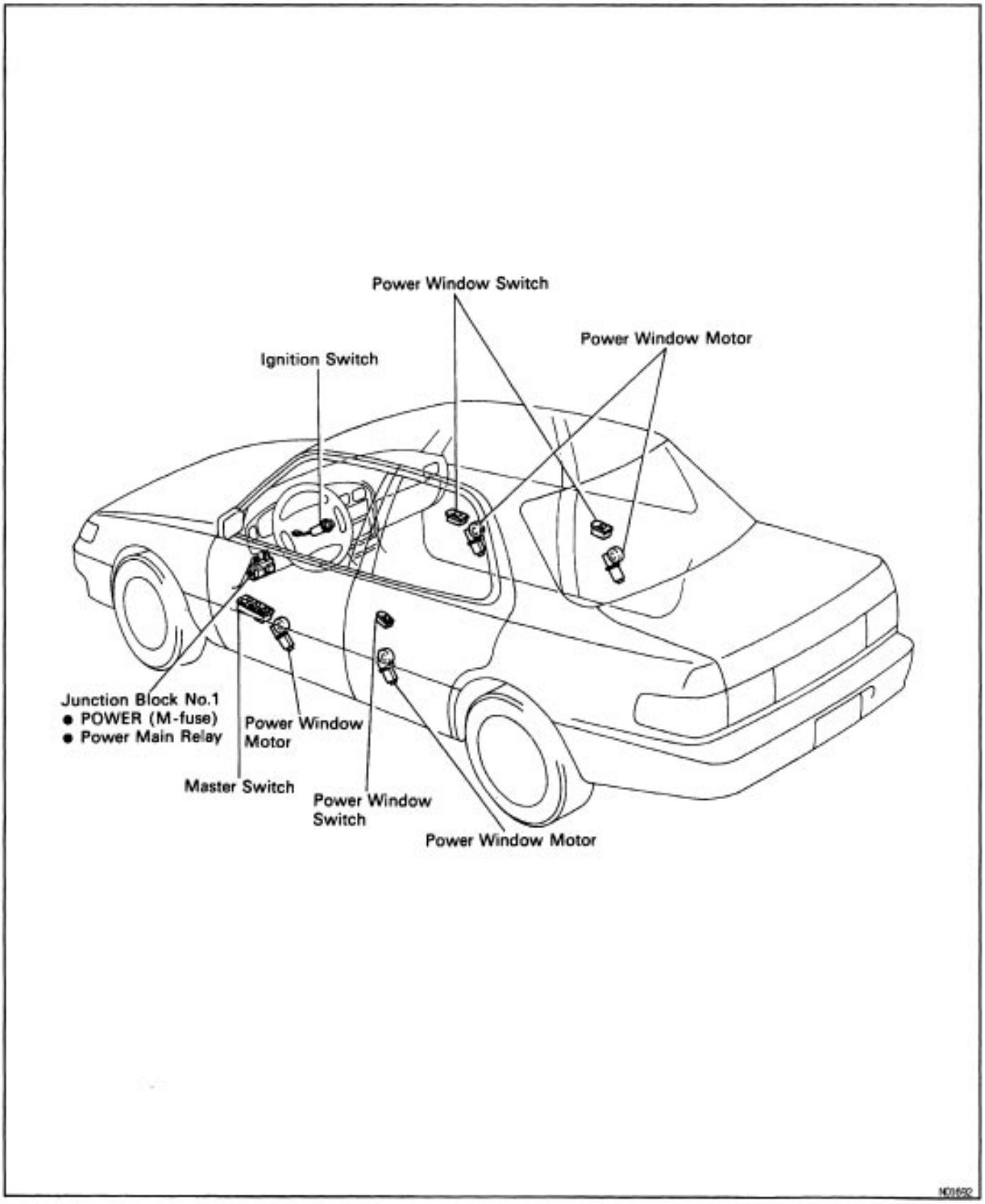
(a) Clean the broken wire tips with a grease, wax and silicone remover.
(b) Place the masking tape along both sides of the wire to be repaired.
(c) Thoroughly mix the repair agent (Dupont paste No. 4817).



(d) Using a fine tip brush, apply a small amount to the wire.
(e) After a few minutes, remove the masking tape.
(f) Allow the repair to stand at least 24 hours.

POWER WINDOW CONTROL SYSTEM

PARTS LOCATION

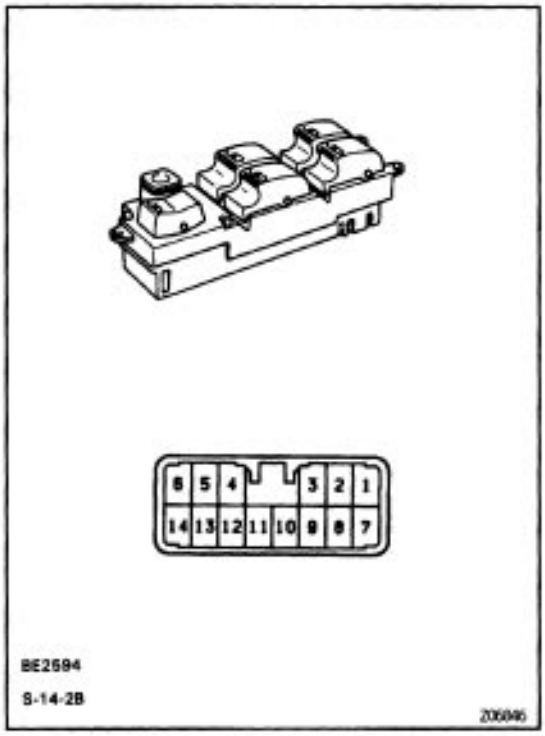


TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
*1 Power window does not operate.	1. ALT H –Fuse 2. P/V11 M–Fuse 3. Wire Harness	(BE–4) (BE–4)
*2 Power window does not operate.	1. GAUGE Fuse 2. Ignition Switch 3. P/W M–Fuse 4. Power Main Relay 5. Power Window Master Switch 6. Wire Harness	(BE–4) (BE–14) (BE–4) (BE–89) (BE–84)
”One Touch Power Window System” does not operate.	1. Power Window Master Switch	(BE–84)
Only one window glass does not move.	1. Power Window Master Switch 2. Power Window Switch 3. Power Window Motor 4. Wire Harness	(BE–84) (BE–87) (BE–87)
”Window Lock System” does not operate.	1. Power Window Master Switch	(BE–84)
”Window Lock Illumination” does not light up.	1. Power Window Master Switch	(BE–84)
Key–off power window does not operate.	1. DOME Fuse 2. GAUGE Fuse 3. Ignition Switch 4. Door Open Detection Switch 5. Wire Harness	(BE–4) (BE–4) (BE–14) (BE–94)

*1: Door Lock does not operate.
*2: Door Lock is normal.



POWER WINDOW MASTER SWITCH INSPECTION

INSPECT POWER WINDOW MASTER SWITCH

Continuity

Inspect the switch continuity between terminals.

Front Driver's Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	6–7–8 1 –2–13	Continuity
OFF	1–2–6–13	Continuity
DOWN	1–2–6 7–8–13	Continuity

Front Driver's Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	6–7–8 1–2–13	Continuity
OFF	1–2–6–13	Continuity
DOWN	1–2–6 7–8–13	Continuity

Front Passenger's Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7–8–12	Continuity
OFF	5–12	Continuity
DOWN	5–7–8	Continuity

Front Passenger's Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	1–2–5 7–8–12	Continuity
OFF	1–2–5–12	Continuity
DOWN	5–7–8 1–2–12	Continuity

Rear Left Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7–8–10	Continuity
OFF	9–10	Continuity
DOWN	7–8–9	Continuity

Rear Left Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7–8–10 1–2–9	Continuity
OFF	1–2–9–10	Continuity
DOWN	7–8–9 1–2–10	Continuity

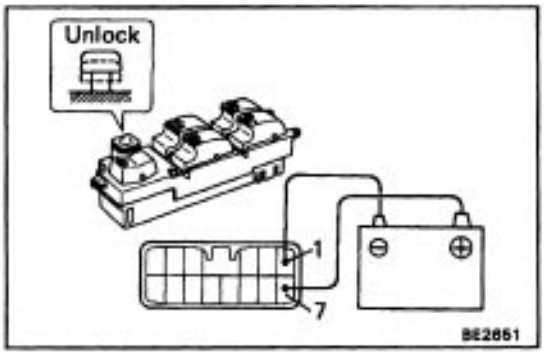
Rear Right Switch (Window unlock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7–8–11	Continuity
OFF	11–14	Continuity
DOWN	7–8–14	Continuity

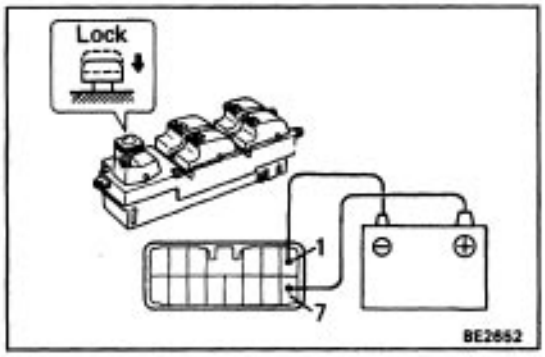
Rear Right Switch (Window lock)/ Continuity

Switch position	Tester connection to terminal number	Specified value
UP	7–8–11 1–2–14	Continuity
OFF	1–2–11–14	Continuity
DOWN	7–8–14 1–2–11	Continuity

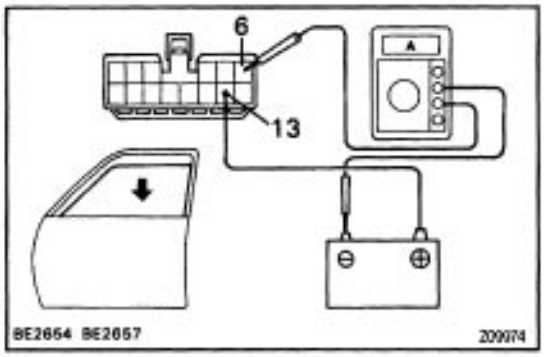
If continuity is not as specified, relace the master switch.



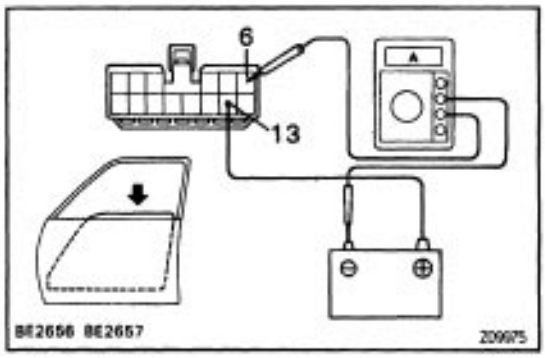
Illumination
(a) Set the window lock switch to the unlock position.
(b) Connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 1, check that all the illuminations light up.

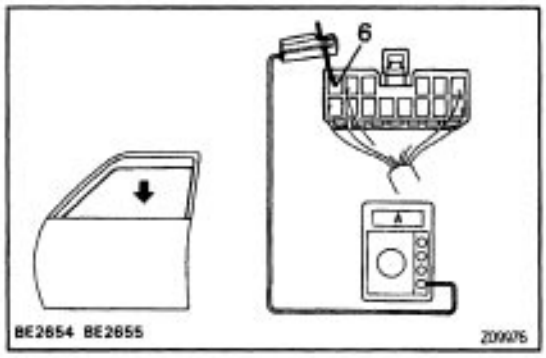


(c) Set the window lock switch to the lock position, check that all the passenger's power window switch illumi–nations go out.
If operation is not as specified, replace the master switch.

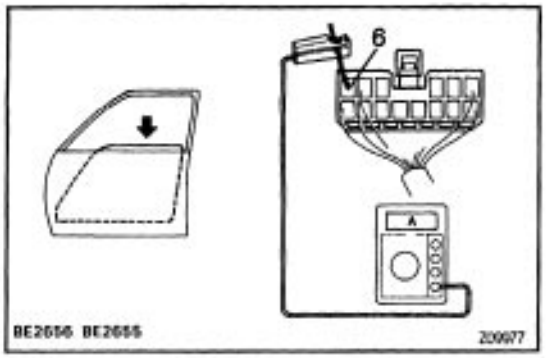


One Touch Power Window System/ Current of Cir–cuit
Inspection using an ammeter.
(a) Disconnect the connector from the master switch.
(b) Connect the positive (+) lead from the ammeter to terminal 6 on the wire harness side connector and the negative (–) lead to negative terminal of the battery.
(c) Connect the positive (+) lead from the battery to terminal 13 on the wire harness side connector.
(d) As the window goes down, check that the current flow is approximately 7 A.
(e) Check that the current increases approximately 14.5 A or more when the window stops going down.
HINT: The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.
If the operation is as specified, replace the master switch.

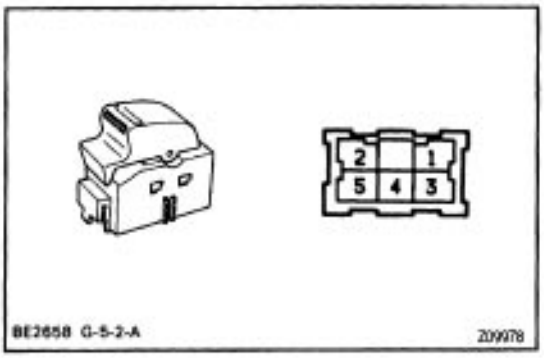




Inspection using an ammeter with a current–meas–uring probe.
(a) Remove the master switch with connector connected.
(b) Attach a current–measuring probe to terminal 6 of the wire harness.
(c) Turn the ignition switch ON and set the power window switch in the down position.
(d) As the window goes down, check that the current flow is approximately 7 A.



(e) Check that the current increases approximately 14.5 A or more when the window stops going down.
HINT: The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.
If operation is as specified, replace the master switch.



POWER WINDOW SWITCH INSPECTION

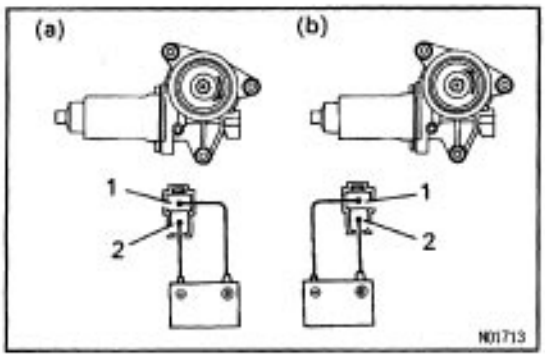
INSPECT POWER WINDOW SWITCH

Switch Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
UP	1–5 3–4	Continuity
OFF	1–Z 3–4	Continuity
DOWN	1–2 4–5	Continuity

If continuity is not as specified, replace the switch.



POWER WINDOW MOTOR INSPECTION

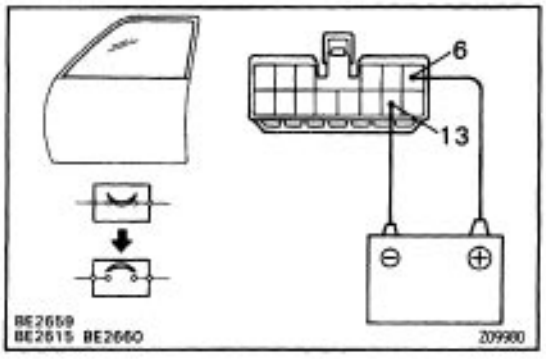
INSPECT POWER WINDOW MOTOR

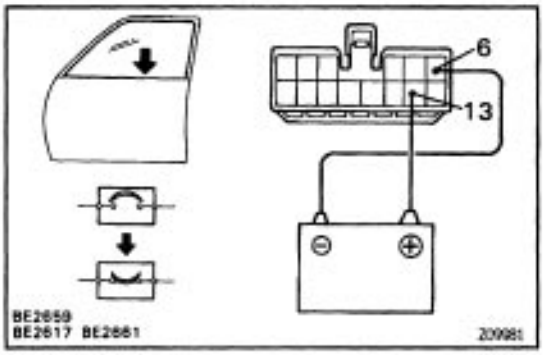
Driver's Door Motor/ Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise.
(b) Reverse the polarity, check that the motor turns coun–terclockwise.
If operation is not as specified, replace the motor.

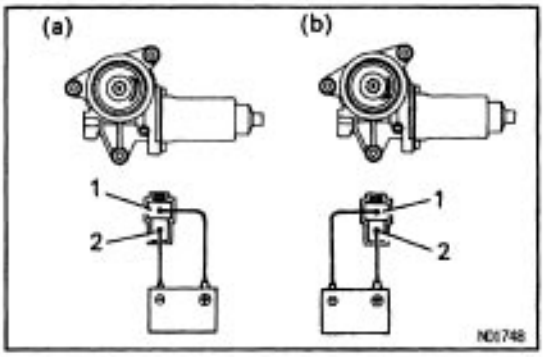
Driver's Door Motor/ Circuit Breaker Operation

(a) Disconnect the connector from the master switch.
(b) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 13 on the wire harness side connector and raise the window to full closed position.
(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds.



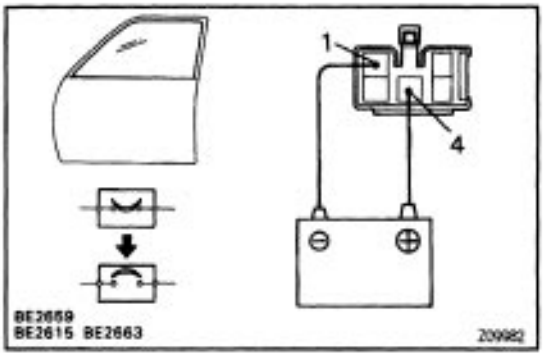


(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.
If operation is not as specified, replace the motor.



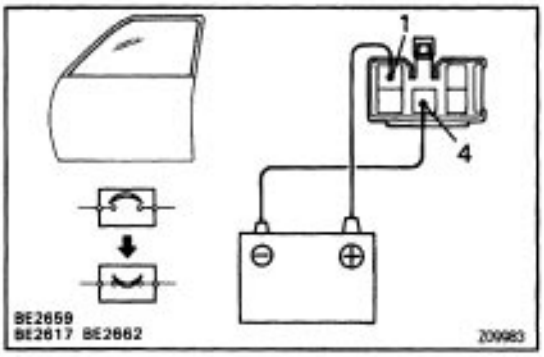
Front Passenger's Door Motor/ Motor Operation

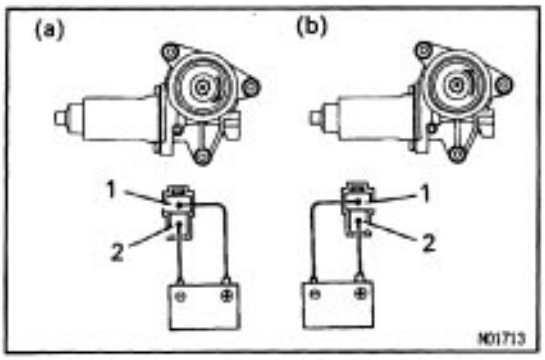
(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns counterclockwise.
(b) Reverse the polarity, check that the motor turns clo–ckwise.
If operation is not as specified, replace the motor.

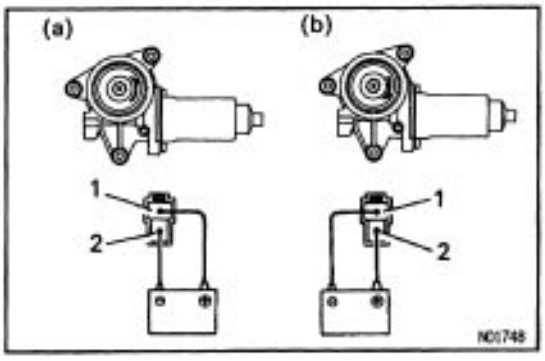


Front Passenger's Door Motor/ Circuit Breaker Op–eration

(a) Disconnect the connector from the power window switch.
(b) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 1 on the wire harness side connector, and raise the window to full closed position.
(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds.
(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.
If operation is not as specified, replace the motor.







Rear Left Side Door Motor/ Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2. check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns coun–terclockwise.

If operation is not as specified, replace the motor.

Rear Left Side Door Motor/ Circuit Breaker Opera–tion

See step of Front Passenger Door Motor on page BE–88.

Rear Right Side Door Motor/ Motor Operation

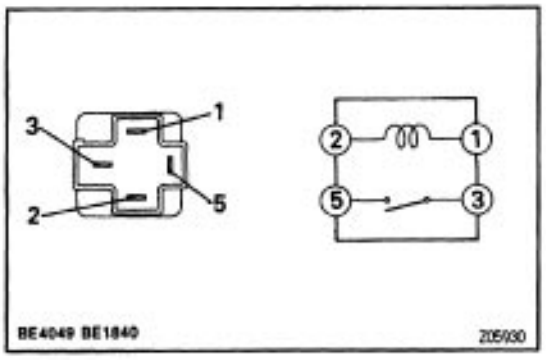
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor turns counterclockwise.

(b) Reverse the polarity, check that the motor turns clo–ckwise.

If operation is not as specified, replace the motor.

Rear Right Side Door Motor/ Circuit Breaker Opera–tion

See step of Front Passenger Door Motor on page BE–88.



POWER MAIN RELAY INSPECTION

INSPECT POWER MAIN RELAY

Continuity

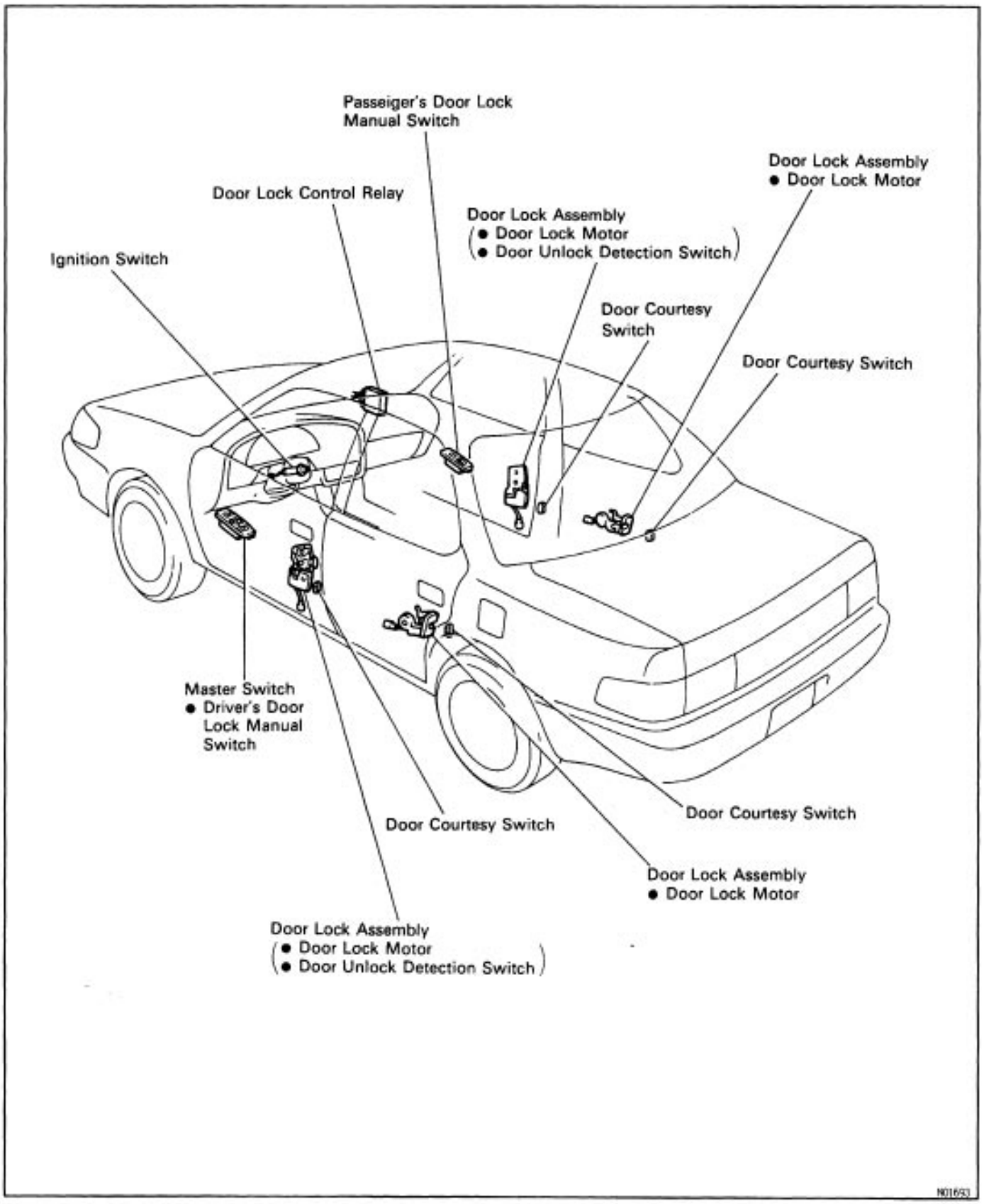
Inspect the relay continuity between terminals.

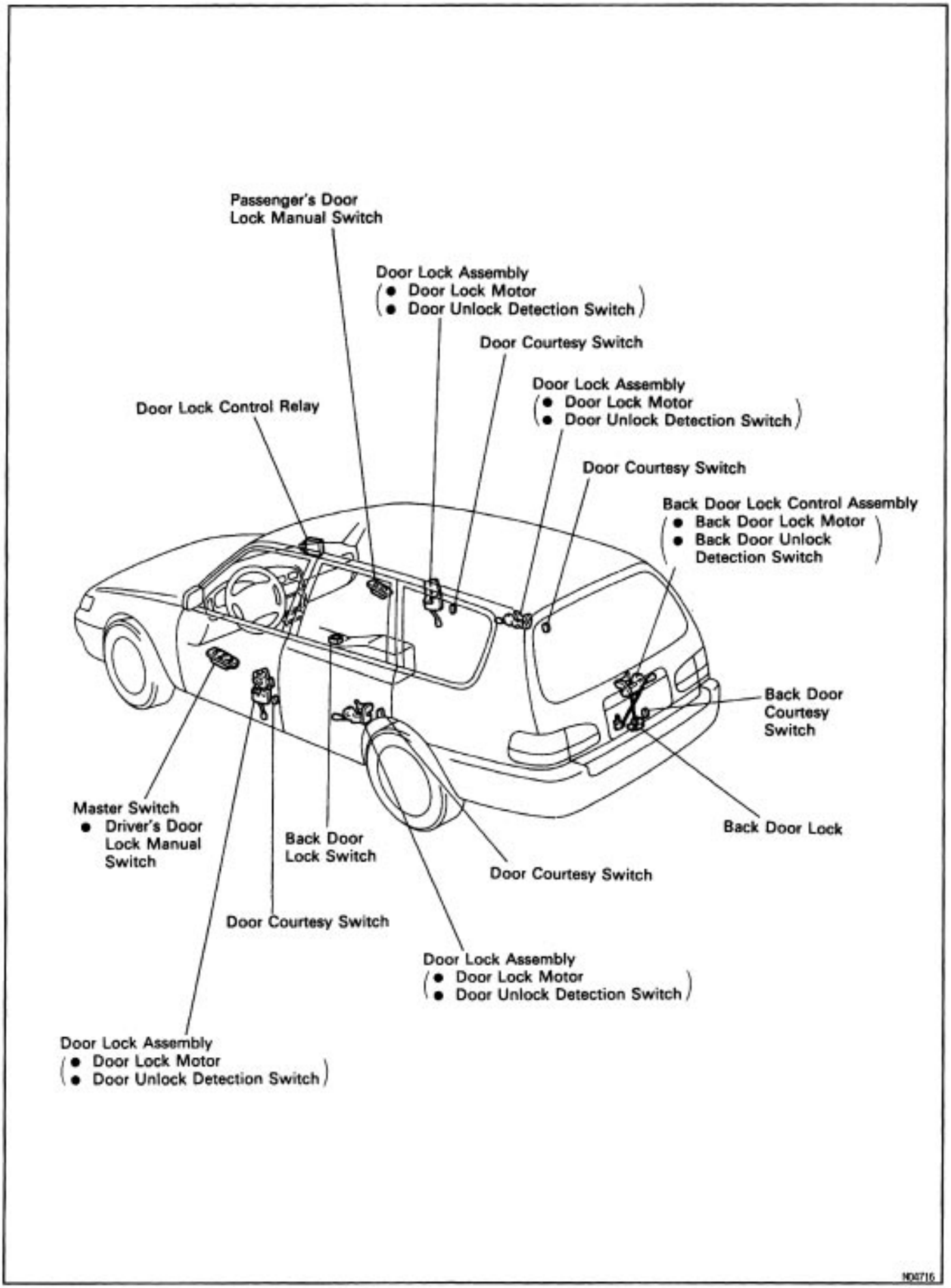
Condition	Tester connection to terminal number	Specified value
Constant	1–2	Continuity
Apply B + between terminals t and 2.	3–5	Continuity

If continuity is not as specified, replace the relay.

POWER DOOR LOCK CONTROL SYSTEM

PARTS LOCATION

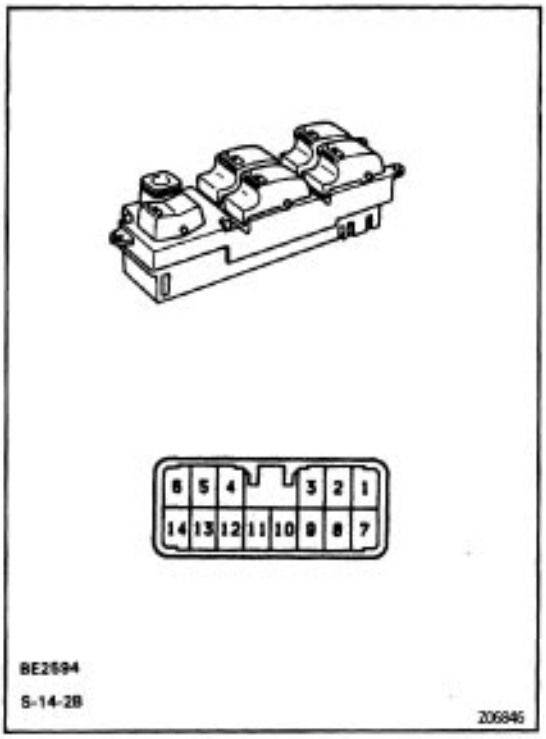



Passenger's Door Lock Manual Switch
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
Door Courtesy Switch
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
Door Lock Control Relay
Door Courtesy Switch
Back Door Lock Control Assembly
● Back Door Lock Motor
● Back Door Unlock Detection Switch
Back Door Courtesy Switch
Master Switch
● Driver's Door Lock Manual Switch
Back Door Lock Switch
Back Door Lock
Door Courtesy Switch
Door Courtesy Switch
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
Door Lock Assembly
● Door Lock Motor
● Door Unlock Detection Switch
HD8716

TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
”Door lock system” does not operate at all.	1. POWER Fuse 2. RADIO/CIG Fuse 3. Door Lock Control Relay 4. Wire Harness	(BE–4) (BE–4) (BE–98)
Door lock system does not operate by manual switch.	1. Power Window Master Switch 2. Door Lock Manual Switch 3. Door Lock Control Relay 4. Wire Harness	(BE–93) (BE–93) (BE–98)
Door lock system does not operate by door key.	1. Door Key Lock and Unlock Switch 2. Door Lock Control Relay 3. Wire Harness 4. Door Lock Link Disconnected	(BE–94) (BE–98)
Fault in 2–Operation unlock function of Driver’s side door key lock and unlock switch.	1. Door Key Lock and Unlock Switch 2. Door Lock Control Relay 3. Wire Harness	(BE–94) (BE–98)
Fault in key confine prevention operate.	1. Door Lock Control Relay 2. Key Unlock Warning Switch 3. Door Courtesy Switch 4. Wire Harness	(BE–98) (BE–15) (BE–43)
Only one door lock does not operate.	1. Door Lock Motor 2. Wire Harness	(BE–94)



POWER WINDOW MASTER SWITCH INSPECTION

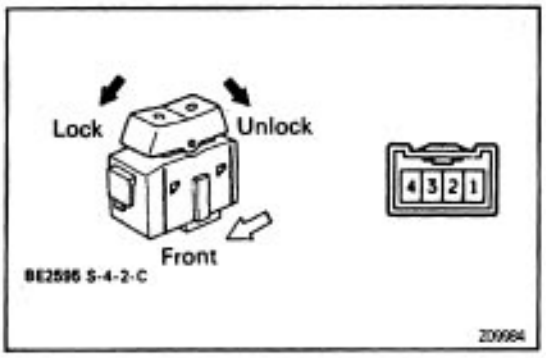
INSPECT POWER WINDOW MASTER SWITCH

Master Switch: Driver's Door Lock Manual Switch/ Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
LOCK	1–2–4	Continuity
OFF	–	No continuity
UNLOCK	1–2–3	Continuity

If continuity is not as specified, replace the switch.



DOOR LOCK MANUAL SWITCH INSPECTION

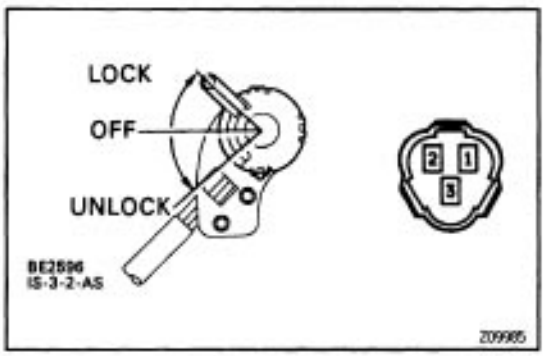
INSPECT DOOR LOCK MANUAL SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
LOCK	3–4	Continuity
OFF	–	No continuity
UNLOCK	2–4	Continuity

If continuity is not as specified, replace the switch.



DOOR KEY LOCK AND UNLOCK SWITCH INSPECTION

INSPECT DOOR KEY LOCK AND UNLOCK SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
LOCK	2–3	Continuity
OFF	–	No continuity
UNLOCK	1–2	Continuity

If continuity is not as specified, replace the switch.

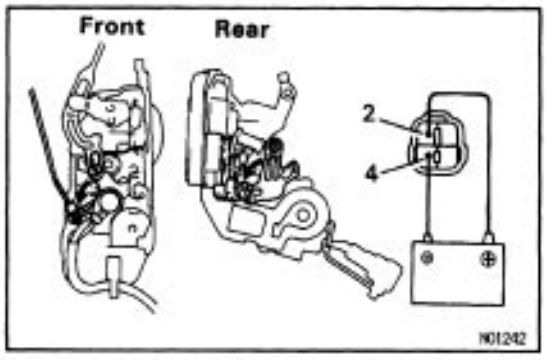
HINT: Door key lock and unlock switch is built into the front door lock assembly.

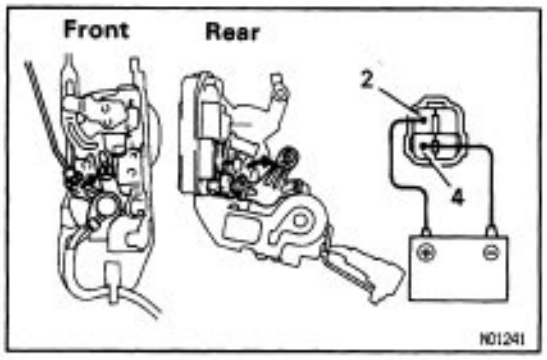
KEY UNLOCK WARNING SWITCH

See key confine prevention system on page BE–15.

DOOR COURTESY SWITCH

See open door warning system on page BE–43.





DOOR LOCK MOTOR INSPECTION (DOOR OPEN DETECTION SWITCH INSPECTION)

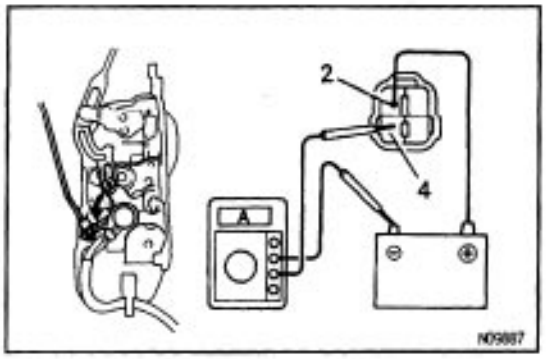
INSPECT DOOR LOCK MOTOR

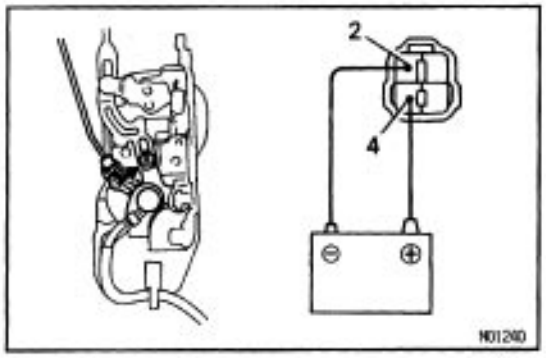
Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4, check that the door lock link moves to UNLOCK posi–tion.

(b) Remove the polarity, check that the door lock link move to LOCK position.

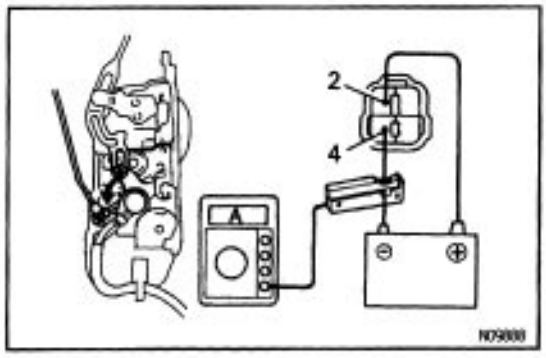
If operation is not as specified, replace the door lock assembly.





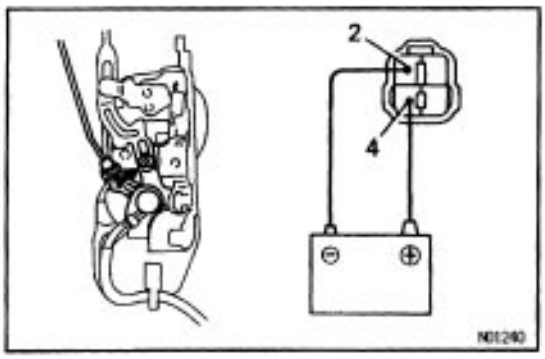
Ex. WAGON:
PTC THERMISTOR OPERATION
INSPECTION USING AN AMMETER

(a) Connect the positive (+) lead from the battery to terminal 2.
(b) Connect the positive (+) lead from the ammeter to terminal 4 and the negative (–) lead to battery nega–tive (–) terminal, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere with 20 to 70 seconds.
(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 4 and the nega–tive (–) lead to terminal 2 check that the door lock moves to LOCK position.
If operation is not as specified, replace the door lock assembly.

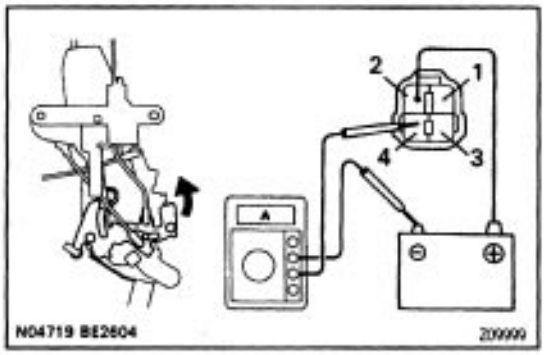


Ex. WAGON:
INSPECTION USING AN AMMETER WITH A CUR–RENT–MEASURING PROBE

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4.
(b) Attach a current–measuring probe to either the pos–itive (+) lead or the negative (–) lead, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere within 20 to 70 seconds.

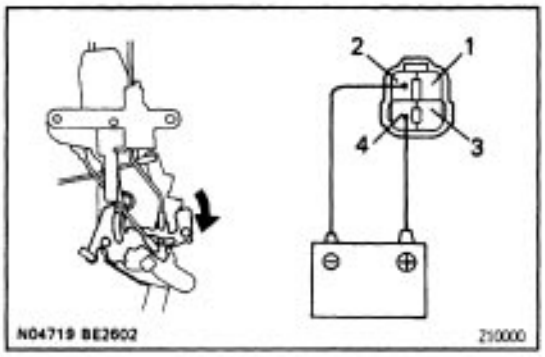


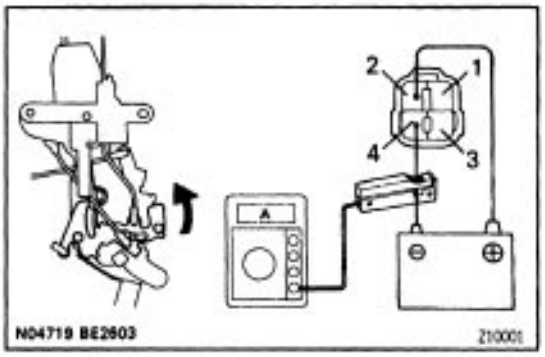
(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, reverse the polarity, check that the door lock moves to LOCK position.
If operation is not as specified, replace the door lock assembly.



WAGON Only:
PTC THERMISTOR OPERATION
INSPECTION USING AN AMMETER

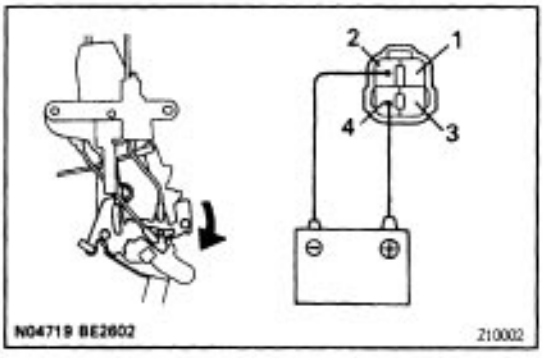
(a) Connect the positive (+) lead from the battery to terminal 2.
(b) Connect the positive (+) lead from the ammeter to terminal 4 and the negative (–) lead to battery nega–tive (–) terminal, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere with 20 to 70 seconds.
(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, connect the positive (+) lead from the battery to terminal 4 and the nega–tive (–) lead to terminal 2 check that the door lock moves to LOCK position.
If operation is not as specified, replace the door lock assembly.



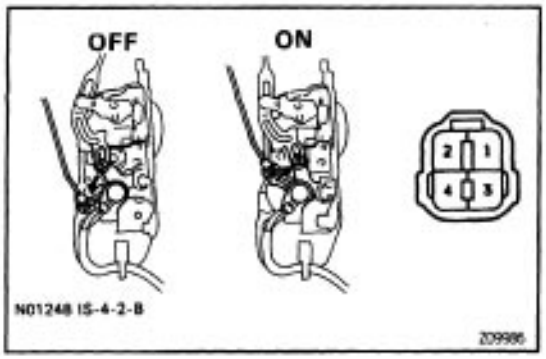


WAGON Only:
INSPECTION USING AN AMMETER WITH A CUR–RENT–MEASURING PROBE

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 4.
(b) Attach a current–measuring probe to either the pos–itive (+) lead or the negative (–) lead, check that the current changes from approximately 3.2 ampere to less than 0.5 ampere within 20 to 70 seconds.



(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, reverse the polarity, check that the door lock moves to LOCK position.
If operation is not as specified, replace the door lock assembly.



DOOR UNLOCK DETECTION SWITCH INSPECTION

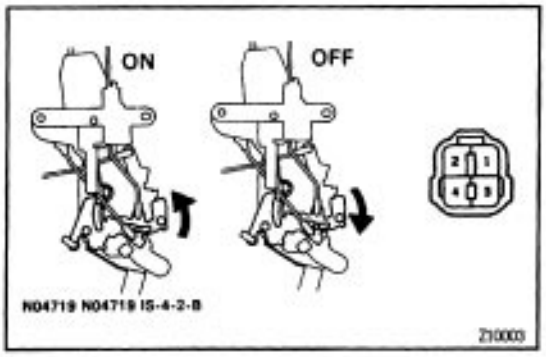
INSPECT DOOR UNLOCK DETECTION SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
OFF (Door lock set to LOCK)	–	No continuity
ON (Door lock set to UNLOCK)	1–3	Continuity

If continuity is not as specified, replace the door lock assembly.



BACK DOOR UNLOCK DETECTION SWITCH INSPECTION
WAGON Only:

INSPECT BACK DOOR UNLOCK DETECTION SWITCH

Continuity

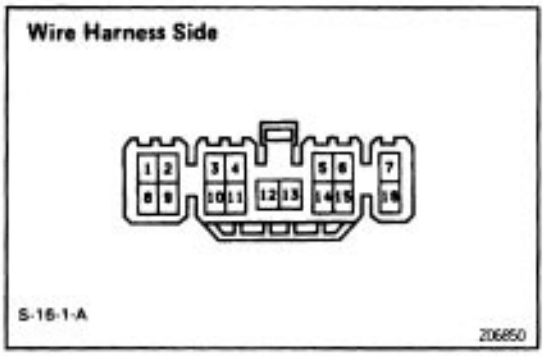
Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
OFF (Door lock set to LOCK)	–	No continuity
ON (Door lock set to UNLOCK)	1–3	Continuity

If continuity is not as specified, replace the door lock assembly.

POWER MAIN RELAY

See power main relay on page BE–89.



DOOR LOCK CONTROL RELAY INSPECTION

INSPECT DOOR LOCK CONTROL RELAY

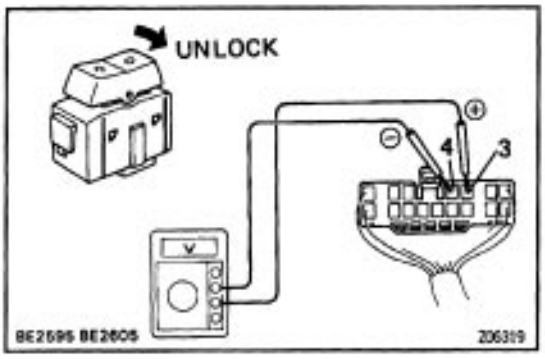
Relay Circuit

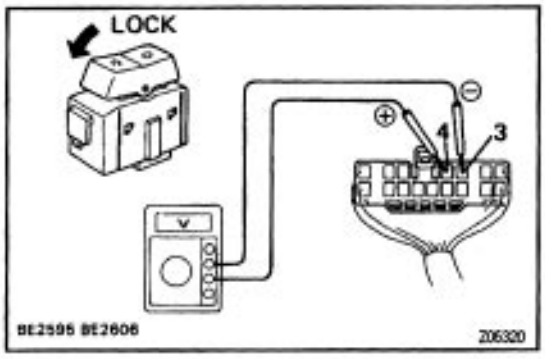
Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart.

Tester connection to terminal number	Condition	Specified value (Continuity)
2 – Ground	Driver's door courtesy switch position OFF (Door closed)	No continuity
2 – Ground	Driver's door courtesy switch position ON (Door opened)	Continuity
5 – Ground	Passenger's Door Lock Switch position OFF (Door locked)	No continuity
5 – Ground	Passenger's Door Lock Switch position ON (Door unlocked)	Continuity
6 – Ground	Driver's Door Lock Switch position OFF (Doorlocked)	No continuity
6 – Ground	Driver's Door Lock Switch position ON (Door unlocked)	Continuity
7 – Ground	Key Unlock Warning Switch position OFF (Ignition Key Removed)	No continuity
7 – Ground	Key Unlock Warning Switch position ON (ignition Key Set)	Continuity
9 – Ground	Driver's Door Key Lock and Unlock Switch Position OFF or LOCK (Door key free or turned to lock)	No continuity
9 – Ground	Driver's Door Key Lock and Unlock Switch Position UNLOCK (Door key turned to unlock)	Continuity
10 – Ground	Door Lock Manual Switch Position OFF or UNLOCK	No continuity
10 – Ground	Door Lock Manual Switch Position LOCK	Continuity
11 – Ground	Door Lock Manual Switch Position OFF or LOCK	No continuity
11 – Ground	Door Lock Manual Switch Position UNLOCK	Continuity
12 – Ground	Passenger's Door Key Lock and Unlock Switch Position OFF or UNLOCK (Door key free or turned to unlock)	No continuity
12 – Ground	Passenger's Door Key Lock and Unlock Switch Position LOCK (Door key turned to lock)	Continuity

Tester connection to terminal number	Condition	Specified value (Continuity)
14 – Ground	Passenger's door courtesy switch position OFF (Door closed)	No continuity
14– Ground	Passenger's door courtesy switch position ON (Door opened)	Continuity
16 – Ground	Constant	Continuity
Tester connection to terminal number	Condition	Specified value (Voltage)
1 – Ground	Ignition switch position LOCK or ACC	No voltage
1 – Ground	Ignition switch position ON	Battery positive voltage
8 – Ground	Constant	Battery positive voltage

If circuit is as specified, inspect the door lock signal.
If the circuit is not as specified, inspect the circuits connected to other parts.





DOOR LOCK SIGNAL

HINT: When the relay circuit is as specified, inspect the door lock signal.

(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4.
(c) Set the door lock manual switch to UNLOCK, check that the voltage rises from 0 volts to battery positive voltage for approximately 0.2 seconds.

(d) Reverse the polarity of the voltmeter leads.
(e) Set the door lock manual switch to LOCK, check that the voltage rises from 0 volts to battery positive voltage for approximately 0.2 seconds.
If operation is not as specified, replace the relay.

SLIDING ROOF SYSTEM

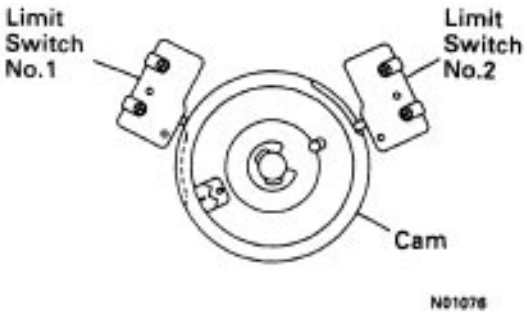
DESCRIPTION

Standby Operation

- Current flows from the DOME fuse to terminal 12 of the sliding roof control relay (hereafter called relay).
- When the ignition switch is ON, the current flows from the power main relay to terminal 6 of the relay.

Operation

1. Limit Switch operation



Roof Position		Fully Open	Momentary Stop		Fully Closed	Down	Up
Function		Sliding Period			Idling Period	Tilting Period	
Limit Switch No.1	ON						
	OFF						
Limit Switch No.2	ON						
	OFF						
Sliding Roof Control Switch	OPEN	○	○	○	○	×	
	CLOSE	○	○	○	×	×	
	UP	×	×	×	○	○	
	DOWN	×	×	×	×	○	

○: Operational ×: Non-operational

W02712

2. OPEN operation

When the switch on the 'OPEN' side of the control switch is pushed, continuity is produced between terminal 1 of the relay and body ground. Then the relay operates, the current flows through terminal6 of the relay –i terminal 5 –i terminal 1 of the sliding roof motor – terminal 3 –) terminal 4 of the relay – terminal 11 – the body ground, and the motor starts to run in order to open the sliding roof.

3. CLOSE operation

When the switch on the "CLOSE" side of the control switch is pushed, continuity is produced between terminal 2 of the relay and body ground. Then the relay operates, the current flows through terminal6 of the relay –i terminal 4 –r terminal 3 of the sliding roof motor –i terminal 1 – terminal 5 of the relay –i terminal 11 –i the body ground, and the motor starts to run in order to close the sliding roof.

Momentary Stop

When the sliding roof reaches about 200 mm (7.87 in.) short of the fully closed position, the limit switch No.1 is turned from ON to OFF, so there is no continuity between terminal 4 of the relay and body ground. As a result, the sliding roof stops at that position.

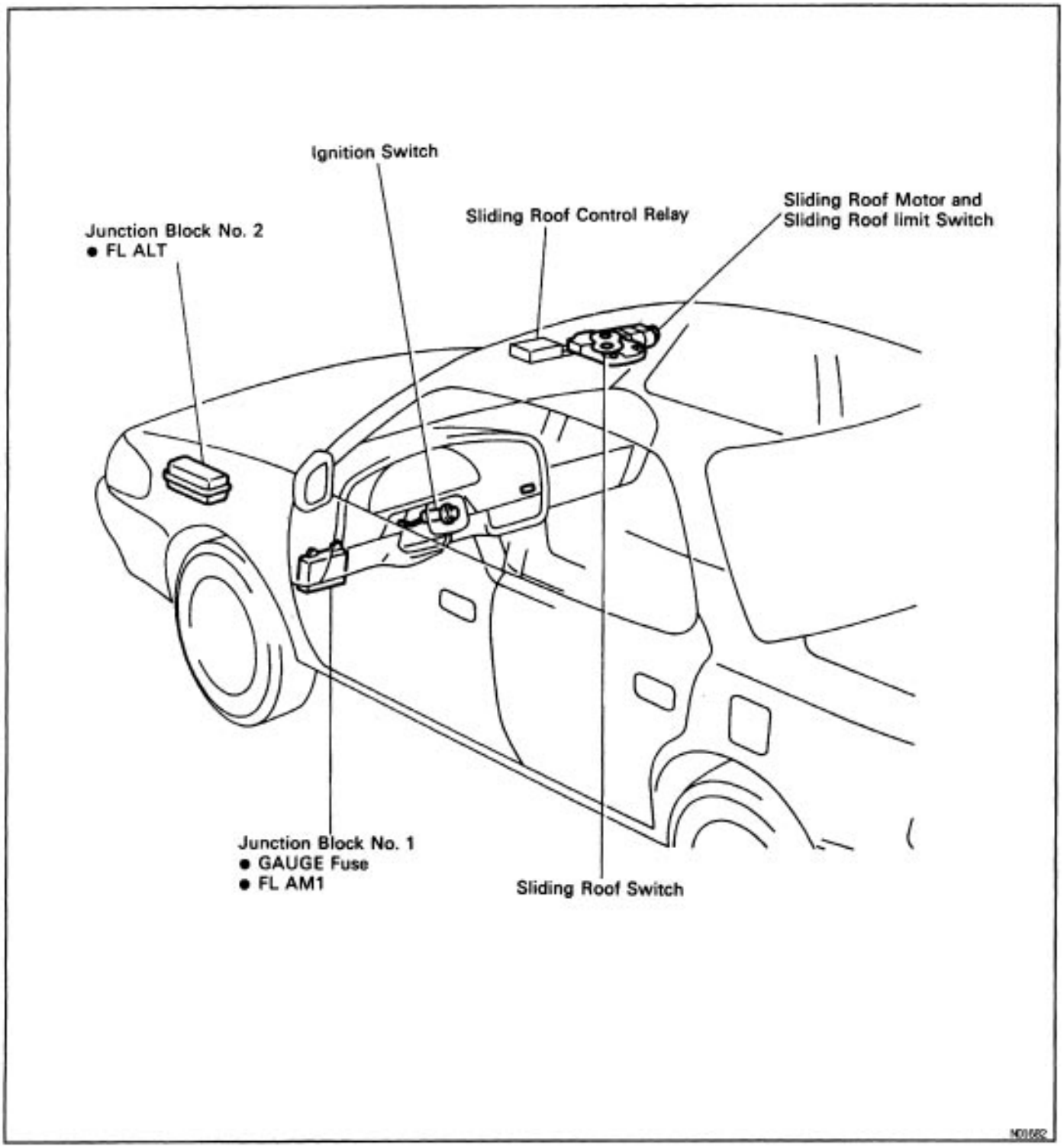
4. TILT UP operation

When the switch on the "UP" side of the control switch is pushed, continuity is produced between terminal 3 of the relay and body ground. Then the relay operates, the current flows through terminal6 of the relay –terminal 4 – terminal 3 of the sliding roof motor –i terminal 1 –i terminal 5 of the relay – terminal 11 – the body ground, and the motor starts to run in order to tilt up the sliding roof.

5. TILT DOWN operation

When the switch on the ”DOWN” side of the control switch is pushed, continuity is produced between terminal 7 of the relay and body ground. Then the relay operates, the current flows through terminal6 of the relay – terminal 5 –terminal 1 of the sliding roof motor –) terminal 3 –) terminal 4 of the relay – terminal 11 – the body ground, and the motor starts to. run in order to tilt down the sliding roof.

PARTS LOCATION

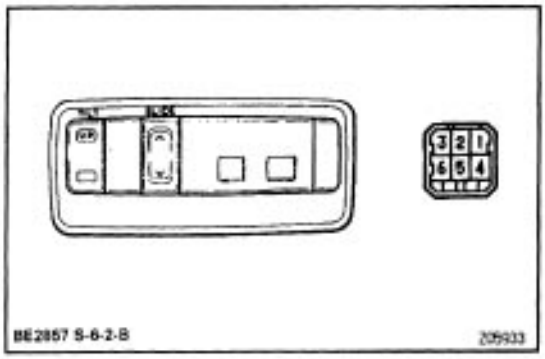


TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
*1 Sliding roof system does not operate.	1. ALT H –Fuse 2. P/W M – Fuse 3. Wire Harness	(BE–4) (BE–4)
*2 Sliding roof system does not operate.	1. GAUGE Fuse 2. Ignition Switch 3. P/W M –Fuse 4. Power Main Relay 5. Sliding Roof Switch 6. Sliding Roof Control Relay 7. Sliding Roof Motor 8. Wire Harness	(BE–4) (BE–14) (BE–4) (BE–89) (BE–103) (BE–104) (BE–103)
Sliding roof system operates abnormally.	1. Sliding Roof Control Relay 2. Limit Switch 3. Sliding Roof Switch	(BE–104) (BE–105) (BE–103)
Sliding roof system stops operation half way.	1. Sliding Roof Control Relay 2. Limit Switch 3. Sliding Roof Switch 4. Sliding Roof Motor (Stones to foreign material trapped in motor assembly)	(BE–104) (BE–105) (BE–103) (BE–103)
”Key–off Sliding Roof” operation does not operate.	1. DOME Fuse 2. GAUGE Fuse 3. Ignition Switch 4. Door Open Detection Switch 5. Wire Harness	(BE–4) (BE–4) (BE–14) (BE–94)

*1: Door– Lock does not operate.
*2: Door– Lock is normal.



SLIDING ROOF SWITCH INSPECTION

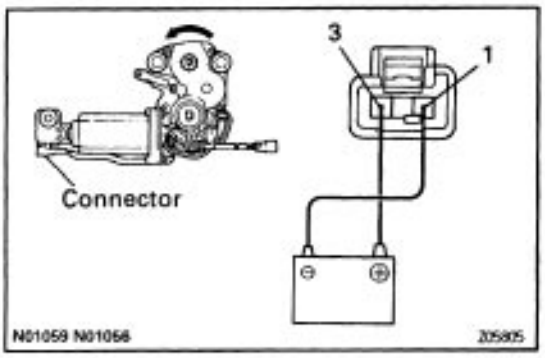
INSPECT SLIDING ROOF SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
SLIDE OPEN	3–4	Continuity
SLIDE OFF	–	No continuity
SLIDE CLOSE	4–6	Continuity
TILT DOWN	2–4	Continuity
TILT OFF	–	No continuity
TILT UP	4–5	Continuity

If continuity is not as specified, replace the switch.

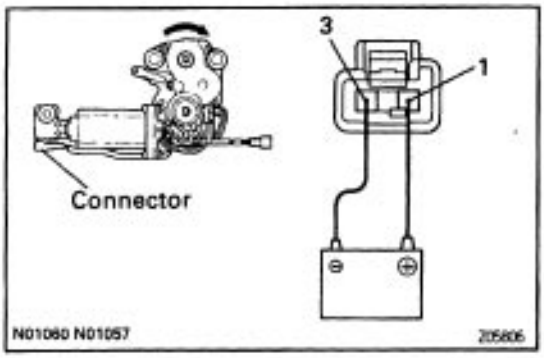


SLIDING ROOF MOTOR INSPECTION

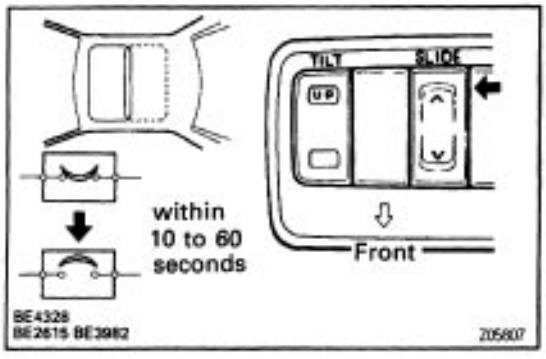
INSPECT SLIDING ROOF MOTOR

Motor Operation

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, check that the motor turns to counterclockwise (moves of the close side).

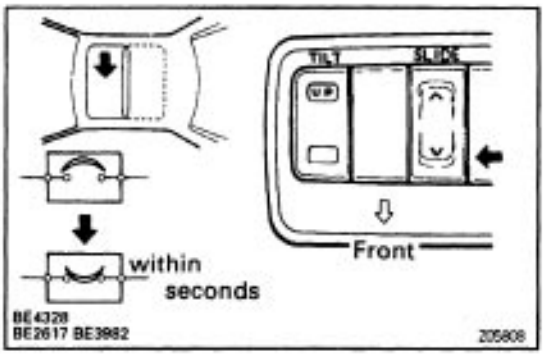


(b). Reverse the polarity, check that the motor turns to clockwise (moves to the open side).
If operation is not as specified, replace the motor.

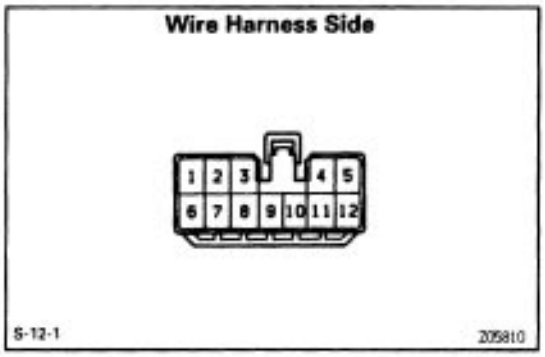


Circuit Breaker operation

(a) With the sliding roof in the fully opened position, hold the sliding roof switch in ”OPEN” position and check that there is a circuit breaker operation noise within 10 to 60 seconds.



(b) With the sliding roof in fully opened position, hold the sliding roof switch in "CLOSE" position and check that the sliding roof begins to close within 60 seconds.
If operation is not as specified, replace the motor.



SLIDING ROOF CONTROL RELAY INSPECTION

INSPECT SLIDING ROOF CONTROL RELAY

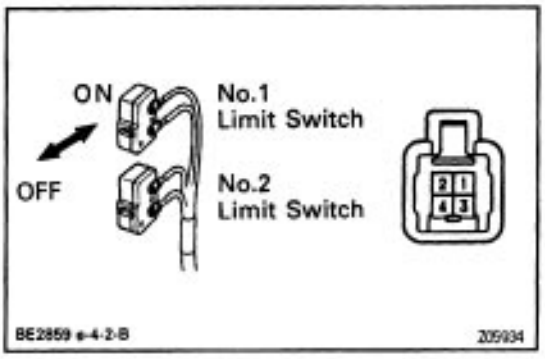
Circuit

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart.

Tester connection to terminal number	Condition	Specified value (Continuity)
1 – Ground	Sliding roof control switch position (SLIDE) OFF or CLOSE	No continuity
1 – Ground	Sliding roof control switch position (SLIDE) OPEN	Continuity
2 – Ground	Sliding roof control switch position (SLIDE) OFF or OPEN	No continuity
2 – Ground	Sliding roof control switch position (SLIDE) CLOSE	Continuity
3 – Ground	Sliding roof control switch position (TILT) OFF or DOWN	No continuity
3 – Ground	Sliding roof control switch position (TILT) UP	Continuity
4 – Ground	Constant	No continuity
4 – 5	Constant	Continuity
5 – Ground	Constant	No continuity
7 – Ground	Sliding roof control switch position (TILT) OFF or UP	No continuity
7 – Ground	Sliding roof control switch position (TILT) DOWN	Continuity
8 – Ground	No. 1 limit switch position OFF (Sliding roof tilted up or open approx. 200 mm (7.87in.))	No continuity
8 – Ground	No. 1 limit switch position ON (Except for conditions mentioned above)	Continuity
9 – Ground	No. 2 limit switch position OFF (Sliding roof closed)	No continuity
9 – Ground	No. 2 limit switch position ON (Sliding roof open)	Continuity

11 – Ground	Constant	Continuity
Tester connection to terminal number	Condition	Specified value (Voltage)
6 – Ground	Ignition switch position LOCK or ACC	*No voltage
6 – Ground	Ignition switch position ON	Battery positive voltage
12 – Ground	Constant	Battery positive voltage

*: Exceptions: During 60 second period after ignition switch ON – OFF (ACC) or until driver or passenger door is opened after ignition switch ON –OFF (ACC). If circuit is as specified, replace the relay.



LIMIT SWITCH INSPECTION

INSPECT LIMIT SWITCH

Continuity

Inspect the switch continuity between terminals.

Switch position	Tester connection to terminal number	Specified value
No. 1 limit switch OFF (SW pin released)	–	No continuity
No. 1 limit switch ON (SW pin pushed in)	1–4	Continuity
No.2 limit switch OFF (SW pin released)	–	No continuity
No.2 limit switch ON (SW pin pushed in)	2–4	Continuity

If continuity is not as specified, replace the switch.

DOOR OPEN DETECTION SWITCH

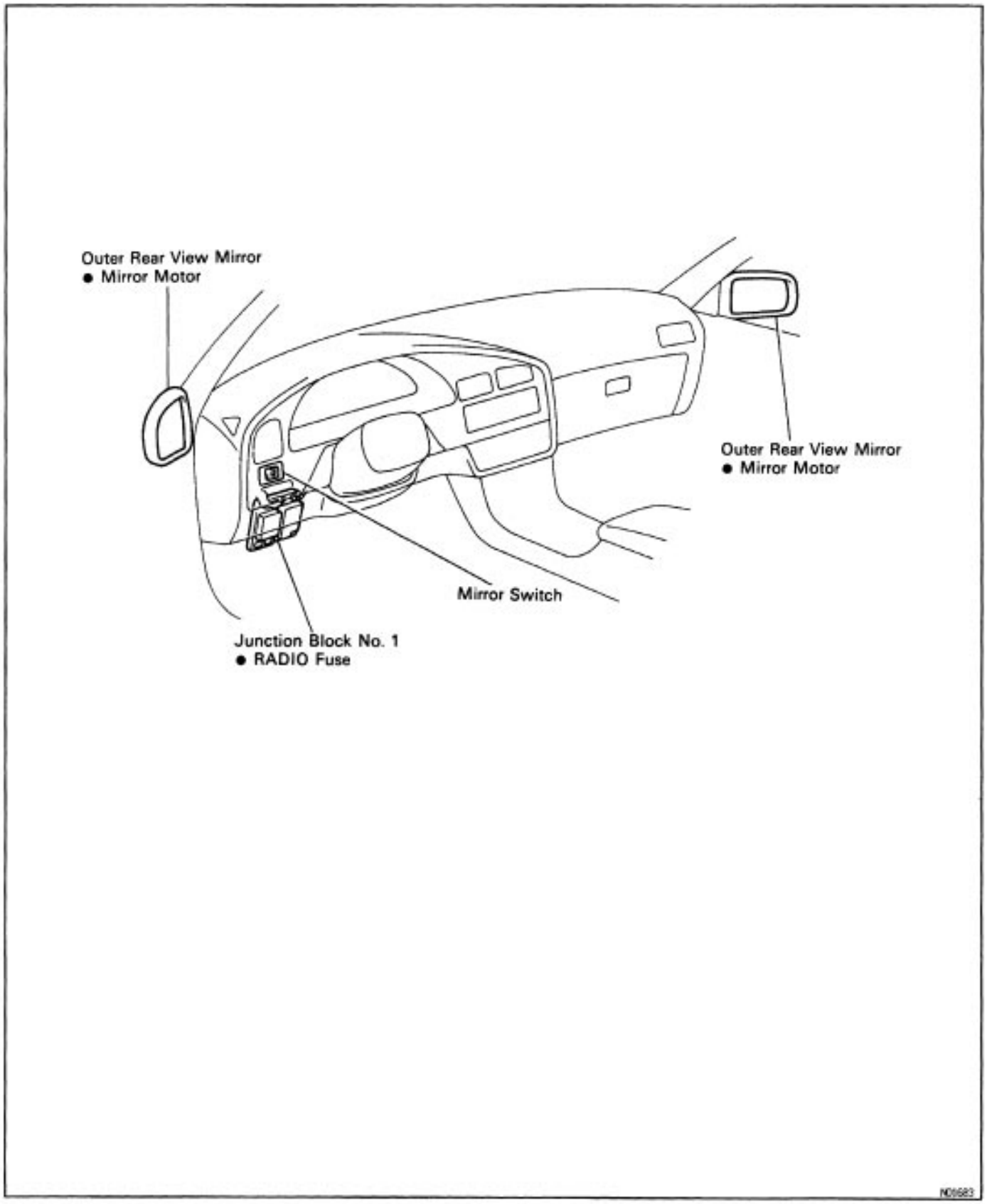
See page BE–94**.**

POWER MAIN RELAY

See Power Main Relay on page BE–89**.**

POWER MIRROR CONTROL SYSTEM

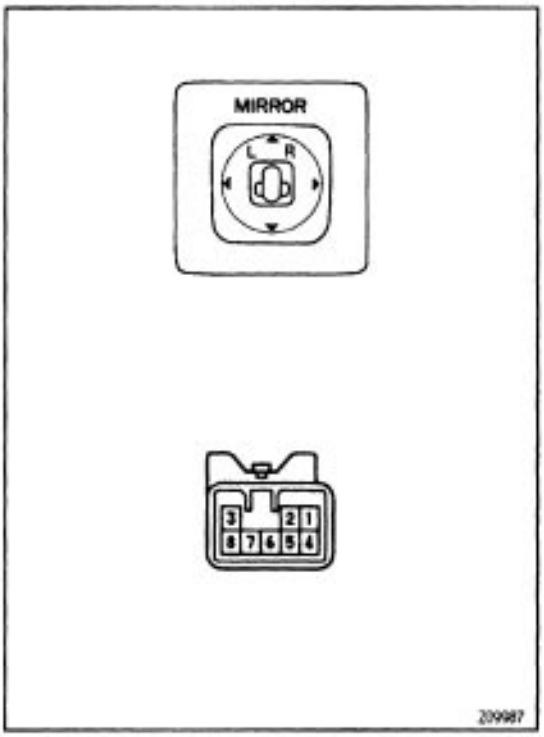
PARTS LOCATION



TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(see page)
Mirror does not operate.	1. RADIO Fuse 2. Mirror Switch 3. Mirror Motor 4. Wire Harness	(BE–4) (BE–108) (BE–109)
Mirror operates abnormally.	1. Mirror Switch 2. Mirror Motor 3. Wire Harness	(BE–108) (BE–109)



MIRROR SWITCH INSPECTION

INSPECT MIRROR SWITCH

Continuity

Inspect the switch continuity between terminals.

LEFT SIDE

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
UP	2 – 5 6 – 8	Continuity
DOWN	2 – 6 5 – 8	Continuity
LEFT	1 – 8 2 – 5	Continuity
RIGHT	1 – 2 5 – 8	Continuity

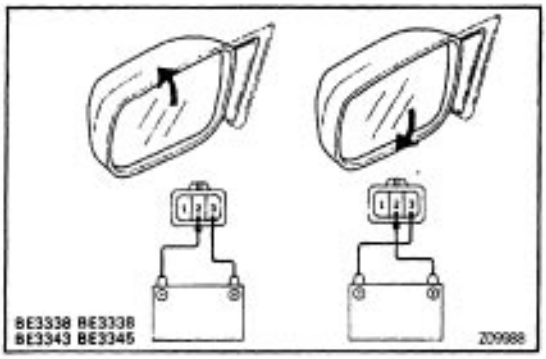
OFF

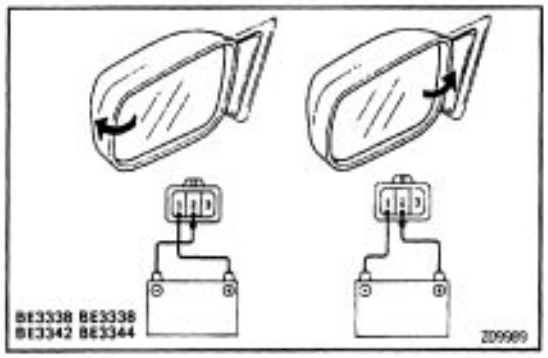
Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
UP	2 – 5	Continuity
DOWN	5 – 8	Continuity
LEFT	2 – 5	Continuity
RIGHT	5 – 8	Continuity

RIGHT SIDE

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
UP	2 – 5 3 – 8	Continuity
DOWN	2 – 3 5 – 8	Continuity
LEFT	2 – 5 7 – 8	Continuity
RIGHT	2 – 7 5 – 8	Continuity

If continuity is not as specified, replace the switch.





MIRROR MOTOR INSPECTION

INSPECT MIRROR MOTOR

Operation

(a) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 2, check that the mirror turns upward.

(b) Reverse the polarity, check that the mirror turns to downward.

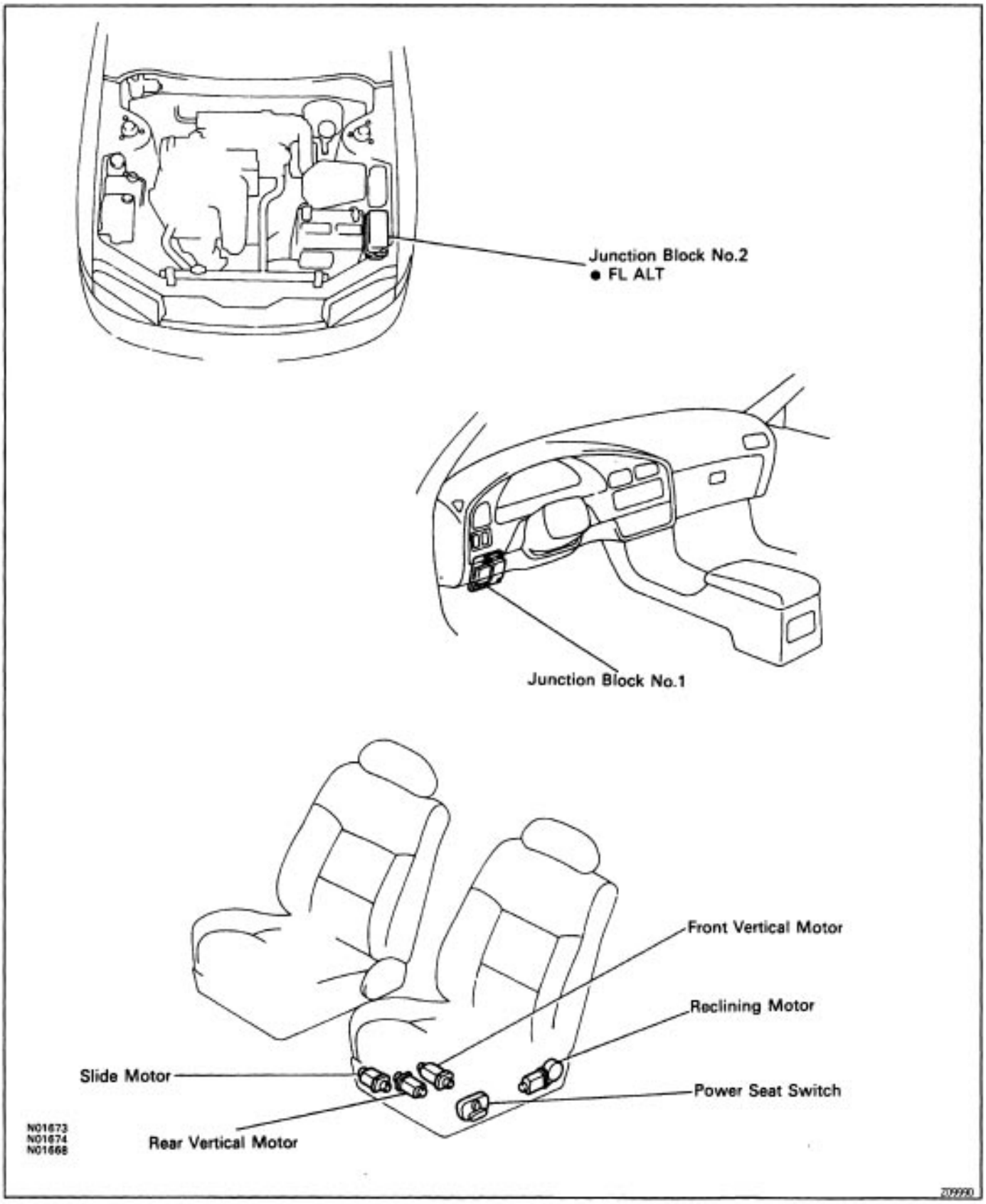
(c) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the mirror turns to left side.

(d) Reverse the polarity, check that the mirror turns to right side.

If operation is not as specified, replace the mirror.

POWER SEAT CONTROL SYSTEM

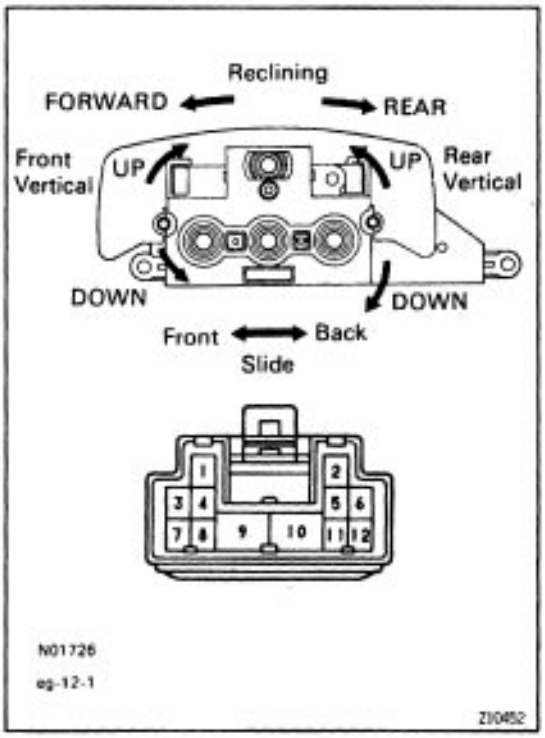
PARTS LOCATION



TROUBLESHOOTING

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

Trouble	Parts name	(See page)
Power seat does not operate. (Door lock system does not operate)	1. ALT H –Fuse 2. Wire Harness 3. P/W M –Fuse	(BE–4) (BE–4)
Power seat does not operate. (Door lock system is normal)	1. P/W M –Fuse 2. Wire Harness 3. Power Seat Switch	(BE–4) (BE–112)
”Slide operation” does not operate.	1. Power Seat Switch 2. Wire Harness 3. Slide Motor	(BE–112) (BE–113)
”Front Vertical Operation” does not operate.	1. Power Seat Switch 2. Wire Harness 3. Front Vertical Motor	(BE–112) (BE–113)
”Rear Vertical Operation” does not operate.	1. Power Seat Switch 2. Wire Harness 3. Rear Vertical Motor	(BE–112) (BE–114)
”Reclining Operation” does not operate.	1. Power Seat Switch 2. Wire Harness 3. Reclining Motor	(BE–112) (BE–115)



POWER SEAT SWITCH INSPECTION

INSPECT POWER SEAT SWITCH

Continuity

Inspect the switch continuity between terminals.

SLIDE SWITCH

Switch position	Tester connection to terminal number	Specified value
FRONT	5–10 8–9	Continuity
OFF	5–9 8–9	Continuity
BACK	5–9 8–10	Continuity

FRONT VERTICAL SWITCH

Switch position	Tester connection to terminal number	Specified value
UP	10–12 4–11	Continuity
OFF	4–11 4–12	Continuity
DOWN	4–12 10–11	Continuity

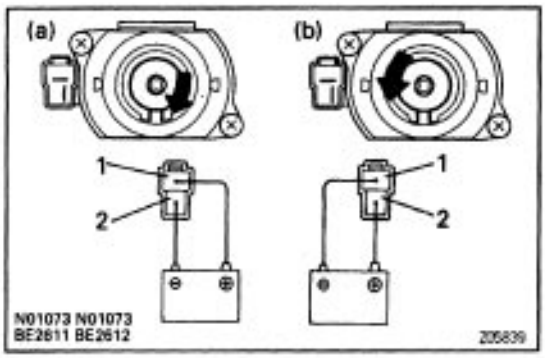
REAR VERTICAL SWITCH

Switch position	Tester connection to terminal number	Specified value
UP	2–10 6–7	Continuity
OFF	2–7 6–7	Continuity
DOWN	2–7 6–10	Continuity

RECLINING SWITCH

Switch position	Tester connection to terminal number	Specified value
FORWARD	4–10 7–9	Continuity
OFF	4–9 7–9	Continuity
REAR	4–9 7–10	Continuity

If continuity is not as specified, replace the switch.



SLIDE MOTOR INSPECTION

INSPECT SLIDE MOTOR

Operation

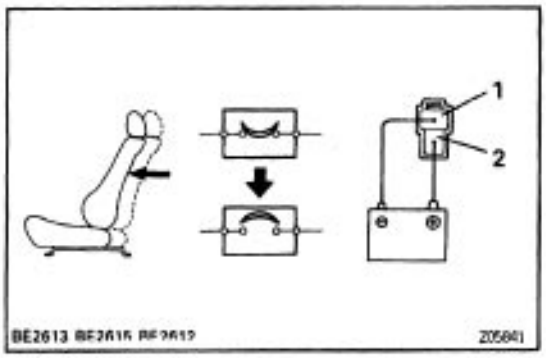
(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns coun–terclockwise.

If operation is not as specified, replace the motor.

Circuit Breaker Operation

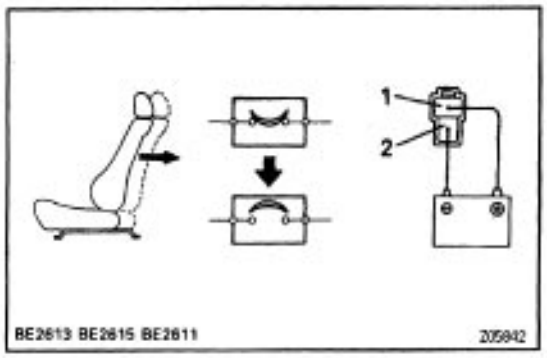
(a) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1 on the slide motor connector, and move the seat front end position.



(b) Continue to apply voltage, check that there is a circuit breaker operation noise within 3 to 60 seconds.

(c) Reverse the polarity, check that the seat begins to move backwards within approximately 60 seconds.

If operation is not as specified, replace the motor.



FRONT VERTICAL MOTOR INSPECTION

INSPECT FRONT VERTICAL MOTOR

Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise.

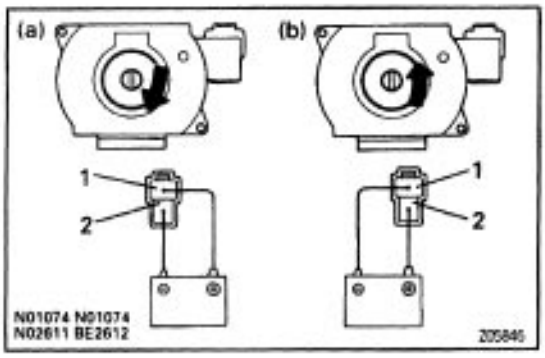
(b) Reverse the polarity, check that the motor turns coun–terclockwise.

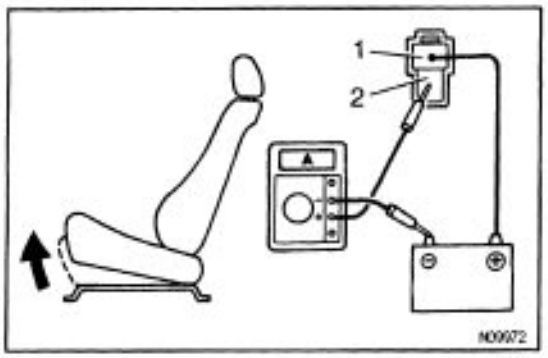
If operation is not as specified, replace the motor.

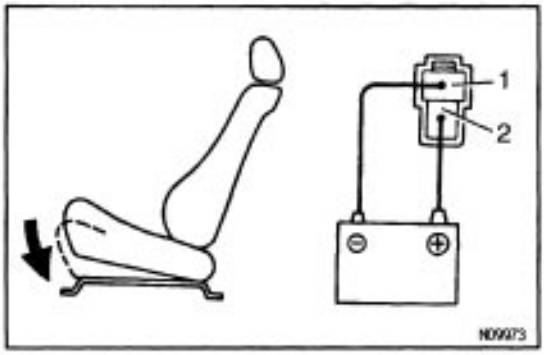
PTC Thermistor Operation / Driver's Seat

(a) Connect the positive (+) lead from the battery to terminal 1, the positive (+) lead from the ammeter to terminal 2 and the negative (–) lead to battery nega–tive (–) terminal, and move the front edge of seat cushion to the highest position.

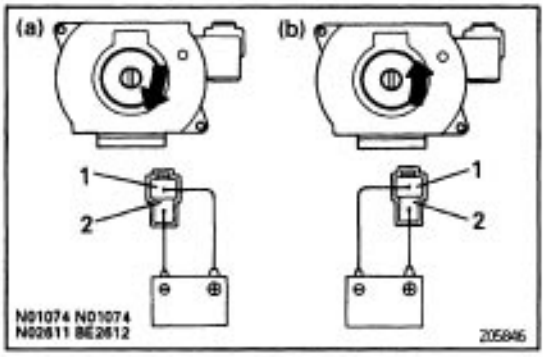
(b) Continue to apply voltage, check the current changes to less than 1 ampere with 4 to 90 seconds.







(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, connect the positive (+) lead from battery to terminal 2 and the negative (–) lead to terminal 1, check that the seat cushion begins to descend.
If operation is not as specified, replace the motor.



REAR VERTICAL MOTOR INSPECTION

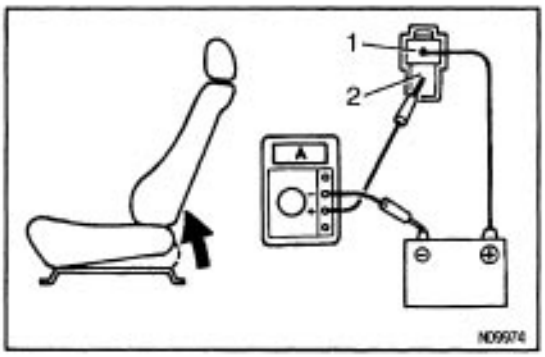
INSPECT REAR VERTICAL MOTOR

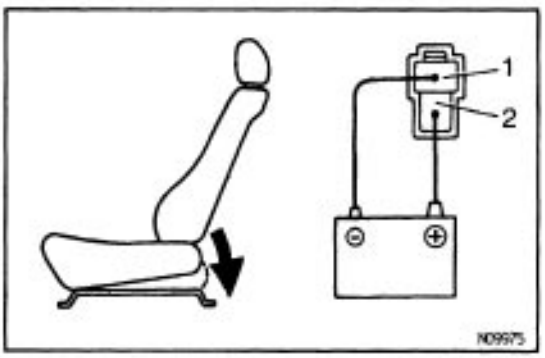
Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor turns clockwise.
(b) Reverse the polarity, check that the motor turns coun–terclockwise.
If operation is not as specified, replace the motor.

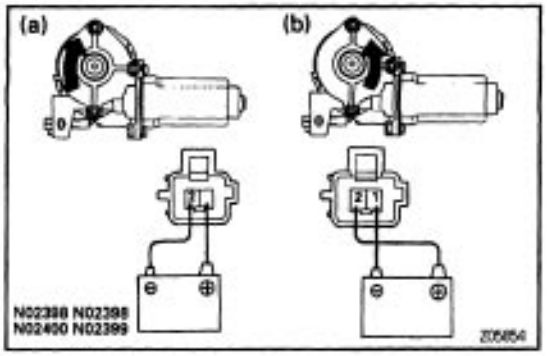
PTC Thermistor Operation / Driver's seat

(a) Connect the positive (+) lead from the battery to terminal 1, the positive (+) lead from the ammeter to terminal 2 and the negative (–) lead to battery nega–tive (–) terminal, and move the rear edge of seat cushion to the highest position.
b) Continue to apply voltage, check the current changes to less than 1 ampere with 4 to 90 seconds.





(c) Disconnect the leads from terminals.
(d) Approximately 60 seconds later, connect the positive (+) lead from battery to terminal 2 and the negative (–) lead to terminal 1, check that the seat cushion begins to descend.
If operation is not as specified, replace the motor.



RECLINING MOTOR INSPECTION (Except 2–door)

INSPECT RECLINING MOTOR

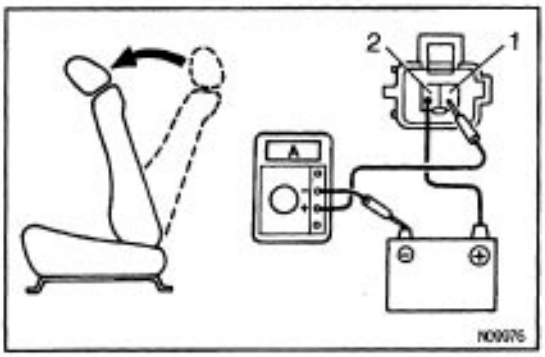
Operation

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns coun–terclockwise.

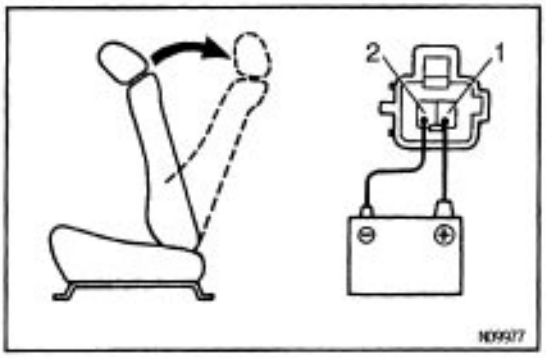
If operation is not as specified, replace the motor.

PTC Thermistor Operation/ Driver's Seat



(a) Connect the positive (+) lead from the battery to terminal 2, the positive (+) lead from the ammeter to terminal 1 and the negative lead to battery negative (–) terminal, and recline the seat back to the most forward position.

(b) Continue to apply voltage , check the current change to less than 1 ampere with 4 to 90 seconds.



(c) Disconnect the lead from terminals.

(d) Approximately 60 seconds later, connect the positive (+) lead from battery to terminal 1 and the negative (–) lead to terminal 2, check that the seat back starts to fall backwards.

If operation is not as specified, replace the motor.

AUDIO SYSTEM

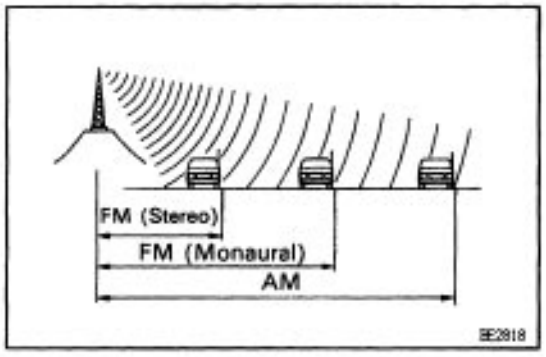
SYSTEM DESCRIPTION

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ← →		FM ← →	
Modulation method	Amplitude modulation			Frequency modulation	

LF: low Frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency



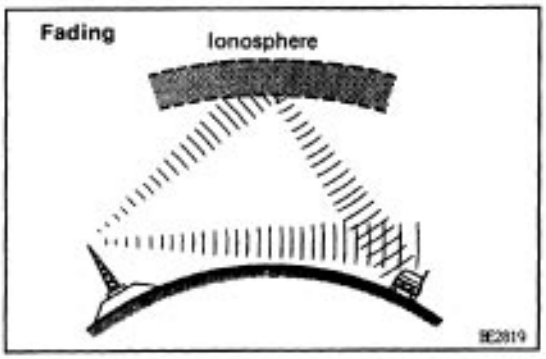
2. SERVICE AREA

There are great differences in the size of the service area for AM, FM monaural, and FM stereo broadcasts cannot be received even though AM comes in very clearly.

Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) easily.

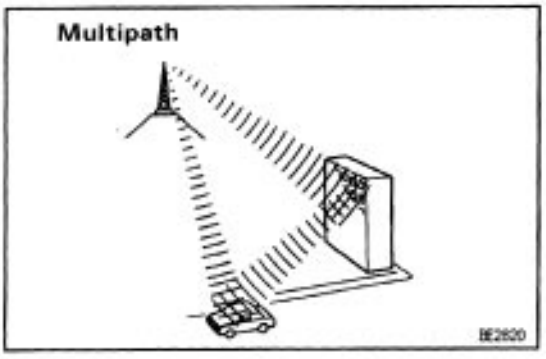
3. RECEPTION PROBLEMS

Besides the problem of static, there are also the prob–lems called ”fading”, ”rnultipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves themselves.



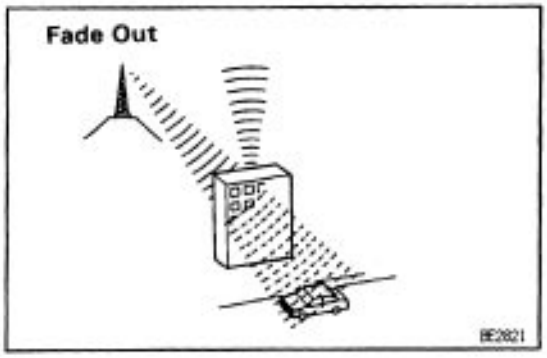
Fading

Besides electrical interference, AM broadcasts are also susceptible to other types of interference, espe–cially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same trans–mitter that reach the vehicle’s antenna directly. This type of interference is called ”fading”.



Multipath

One type of interference caused by the bouncing of radio waves off of obstructions is called ”multipath”. Multipath occurs when a signal from the broadcast transmitter antenna bounces off buildings and moun–tains and interferes with the signal that is received directly



Fade Out

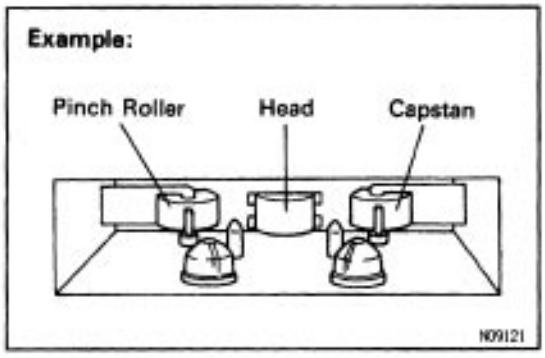
Because FM radio waves are of higher frequencies than AM radio waves, they bounce off buildings, mou–ntains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction. This is called ”fade out”.

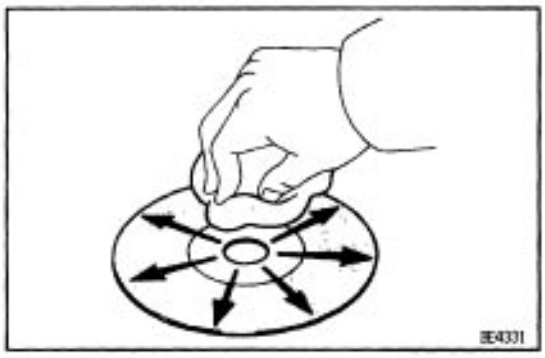
4. COMPACT DISC PLAYER

Compact Disc (hereafter called ”CD”) Players use a laser beam pick–up to read the digital signals recor–ded on the CD and reproduce analog signals of the music, etc. There are 4.7 in. (12 cm) and 3.2 in. (8 cm) discs in the CD player.

HINT: Never attempt to disassemble or oil any part of the player unit. Do not insert any object other than a disc into the magazine.

NOTICE: CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.





MAINTENANCE

Tape Player/Head Cleaning

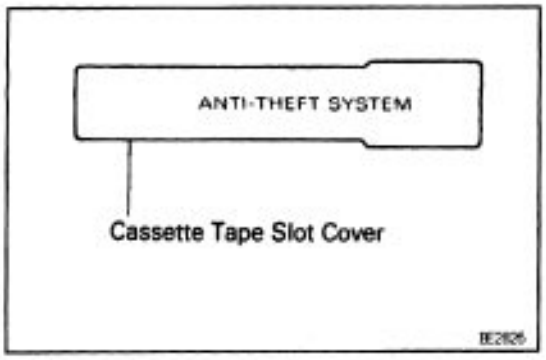
(a) Raise the cassette door with your finger.
Next using a pencil or like object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, punch rollers and capstans.

CD Player/Disc Cleaning

If the disc gets dirty, clean the disc by wiping the surfaces from the center to outside in the radial direc–tions with a soft cloth.

NOTICE: Do not use a conventional record cleaner or anti–static preservative.



ANTI–THEFT SYSTEM

HINT: The words ”ANTI–THEFT SYSTEM” are dis–played on the cassette tape slot cover.
For operation instructions for the anti–theft system, please consult the audio system section in the Owner’s Manual (hereafter called O/M).

1. SETTING SYSTEM

The system is in operation once the customer has pushed the required buttons and entered the custom–er–selected 3–digit ID number.
(Refer to the O/M section, ”Setting the anti–theft system”)
HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

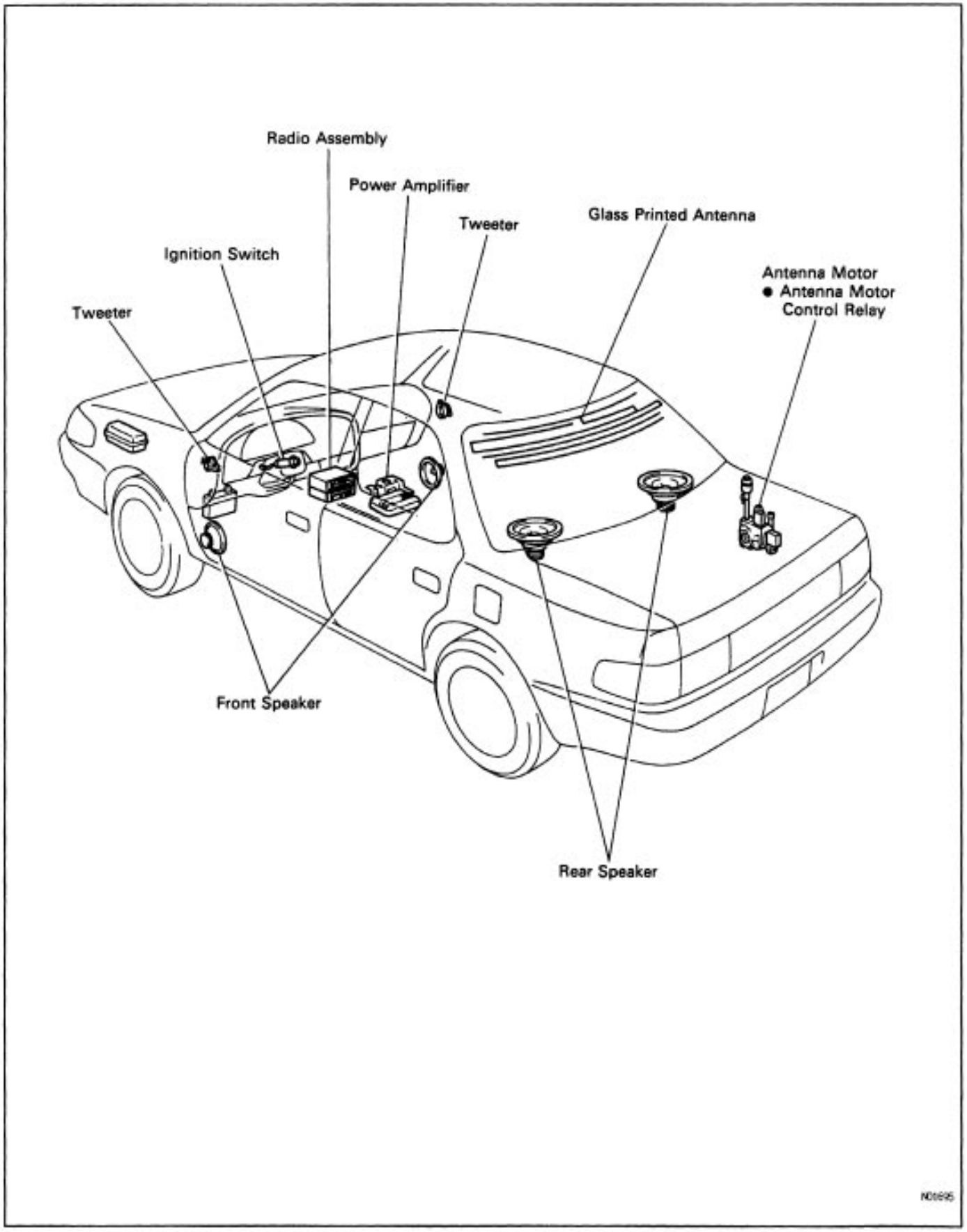
2. ANTI–THEFT SYSTEM OPERATION

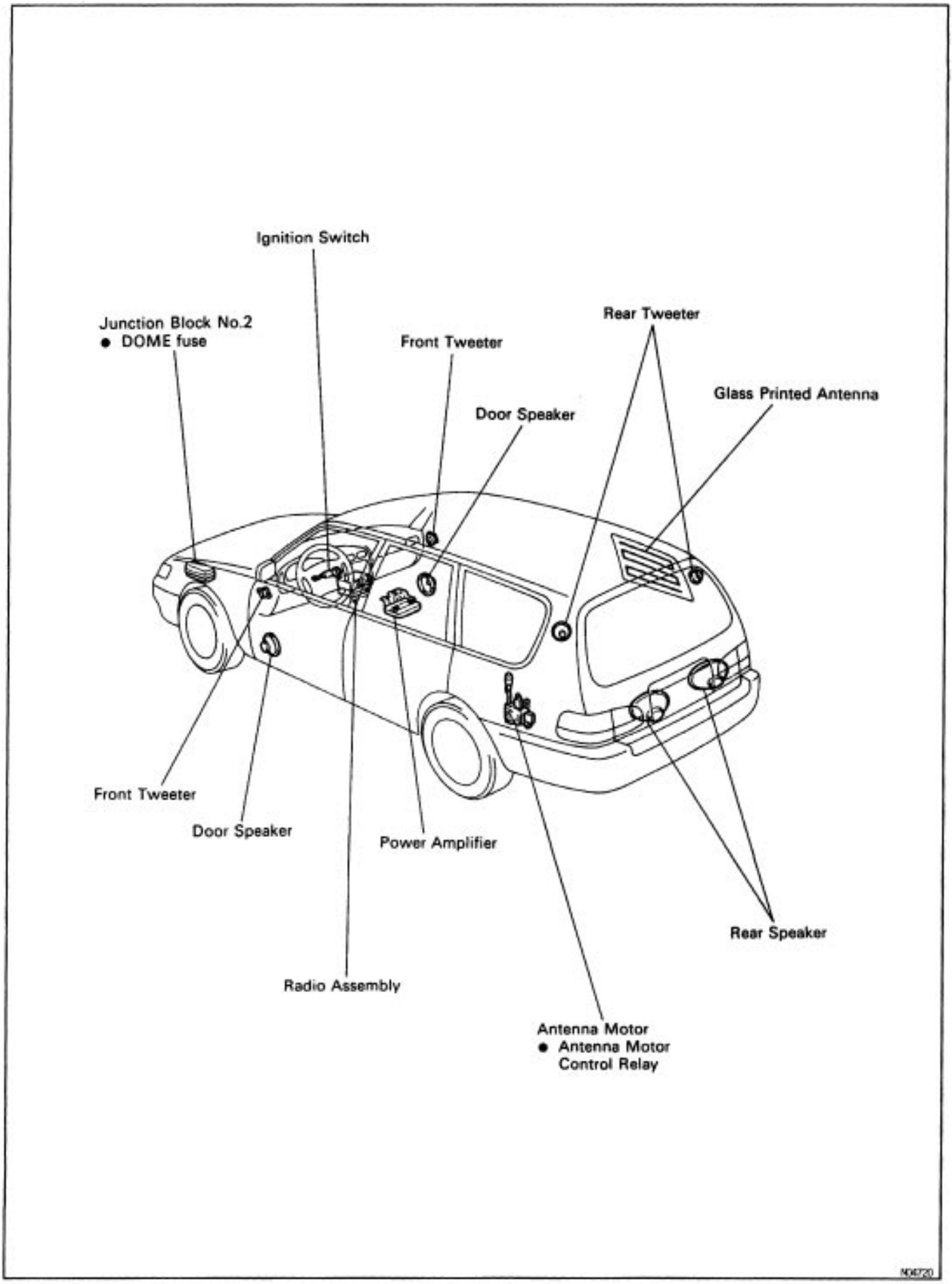
If the normal electrical power source (connector or battery terminal) is cut off, the audio system becomes inoperable, even if the power supply resumes.

3. CANCELLING SYSTEM

The ID number chosen by the customer is input to cancel the anti–theft system.
(Refer to the O/M section, ’if the system is activated”)
HINT: To change or cancel the ID number, please refer to the 0/M section ”Cancelling the system”.

PARTS LOCATION




Ignition Switch
Junction Block No.2
● DOME fuse
Front Tweeter
Rear Tweeter
Door Speaker
Glass Printed Antenna
Front Tweeter
Door Speaker
Power Amplifier
Rear Speaker
Radio Assembly
Antenna Motor
● Antenna Motor Control Relay

TROUBLESHOOTING

NOTICE: When replacing the internal mechanism (ECU part) of the audio system, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC etc. of the replacement part (spare part),

HINT: This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

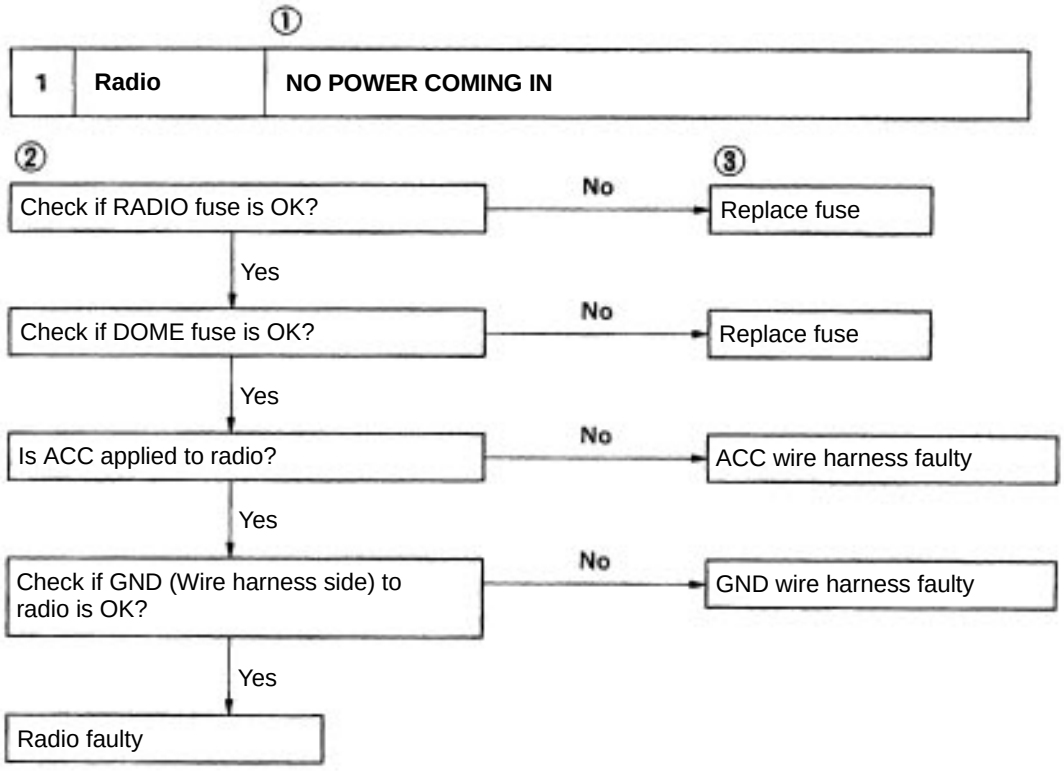
- Open or short circuit of the wire harness
- Connector or terminal connection fault

Problem		No.
Radio	Radio not operating when power switch turned to ”ON’.	1
	Display indicates when power switch turned to ’ON’, but no sound (including ’noise’) is produced.	2
	Noise present, but AM–FM not operating.	3
	Any speaker does not work.	4
	Reception poor.	5
	Sound quality poor.	6
	Preset memory disappears.	7
Tape player	Cassette tape cannot be inserted.	8
	Cassette tape inserts, but no power	9
	Power coming in, but tape player not operating.	10
	Any speaker does not work.	11
	Sound quality poor.	12
	Tape jammed, malfunction with tape speed or auto–reverse	13
	Cassette tape will not eject.	14
CD Player	CD cannot be inserted.	15
	C D inserts, but no power	16
	Power coming in, but CD player not operating.	17
	Sound jumps.	18
	Sound quality poor (Volume faint).	19
	Any speaker does not work.	20
	CD will not eject.	21
Antenna	Antenna–related.	22
Noise	Noise produced by vibration or shock white driving.	23
	Noise produced when engine starts.	24

The term”AM” includes LW, MW and SW, and the term ”FW” includes UKW.

HOW TO USE DIAGNOSTIC CHART

Reference:



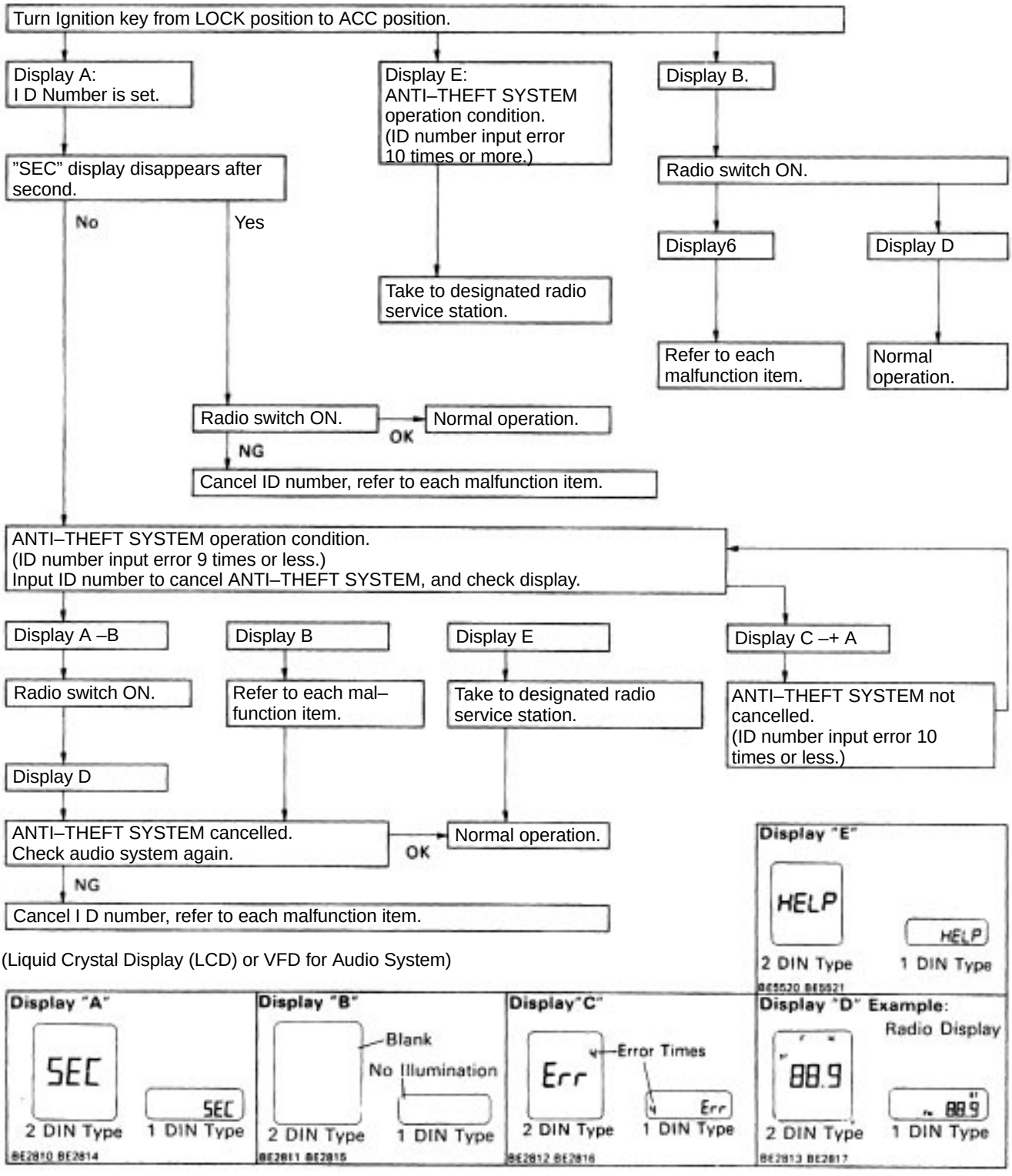
1 : Phenomenon
: Problem

2 : Check item

3 : Trouble part or disposal

V04173

Troubleshooting for ANTI–THEFT SYSTEM

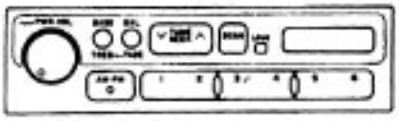


(Liquid Crystal Display (LCD) or VFD for Audio System)

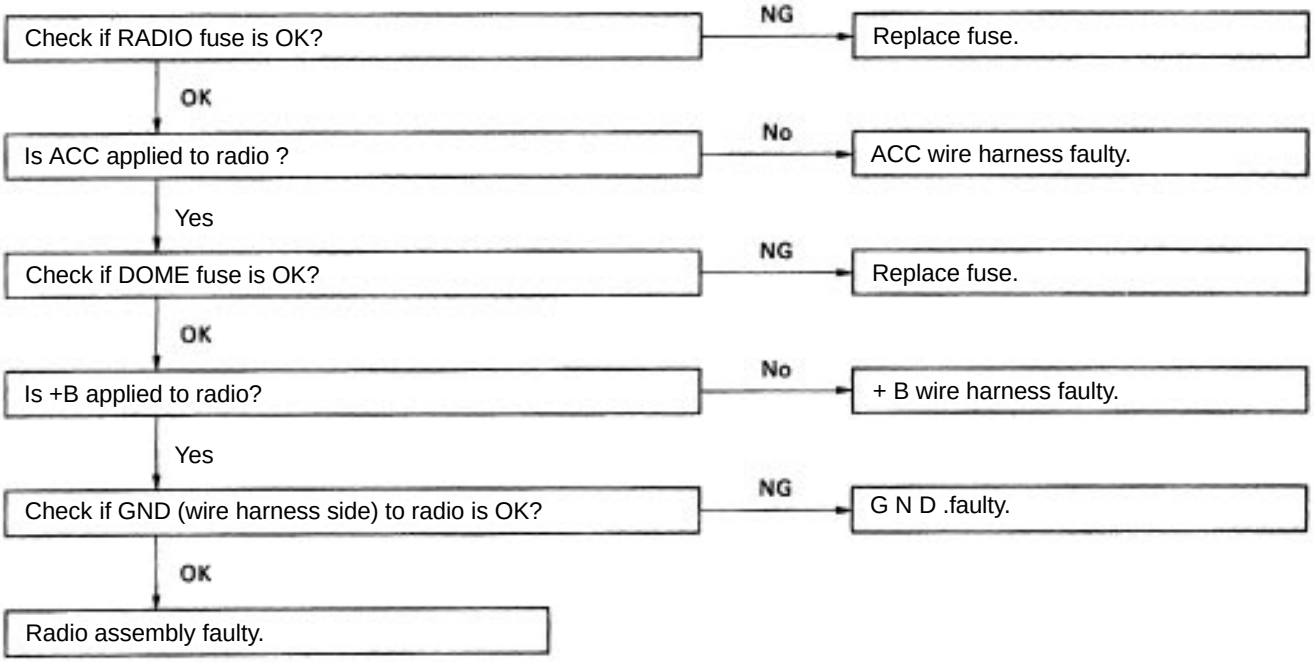
HINT;

- Refer to Owner's Manual for operation details of ANTI–THEFT SYSTEM.
- When the ID number has been cancelled, reset the same number after completing the operation, or inform the customer that it has been cancelled.

1	Radio	RADIO NOT OPERATING WHEN POWER SWITCH TURNED TO 'ON'

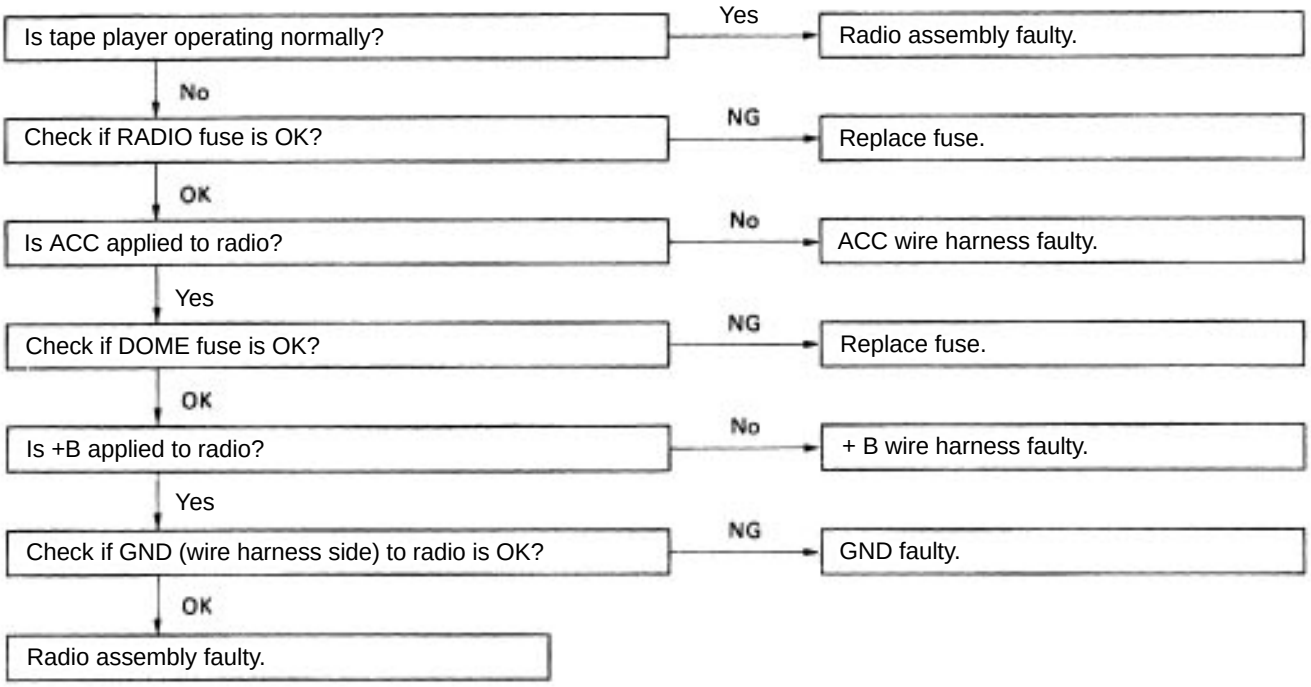


N01720



V04175


N01721



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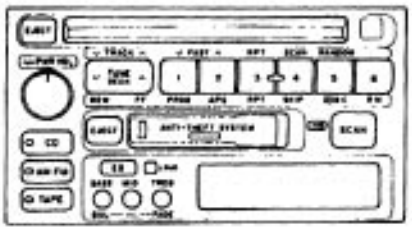
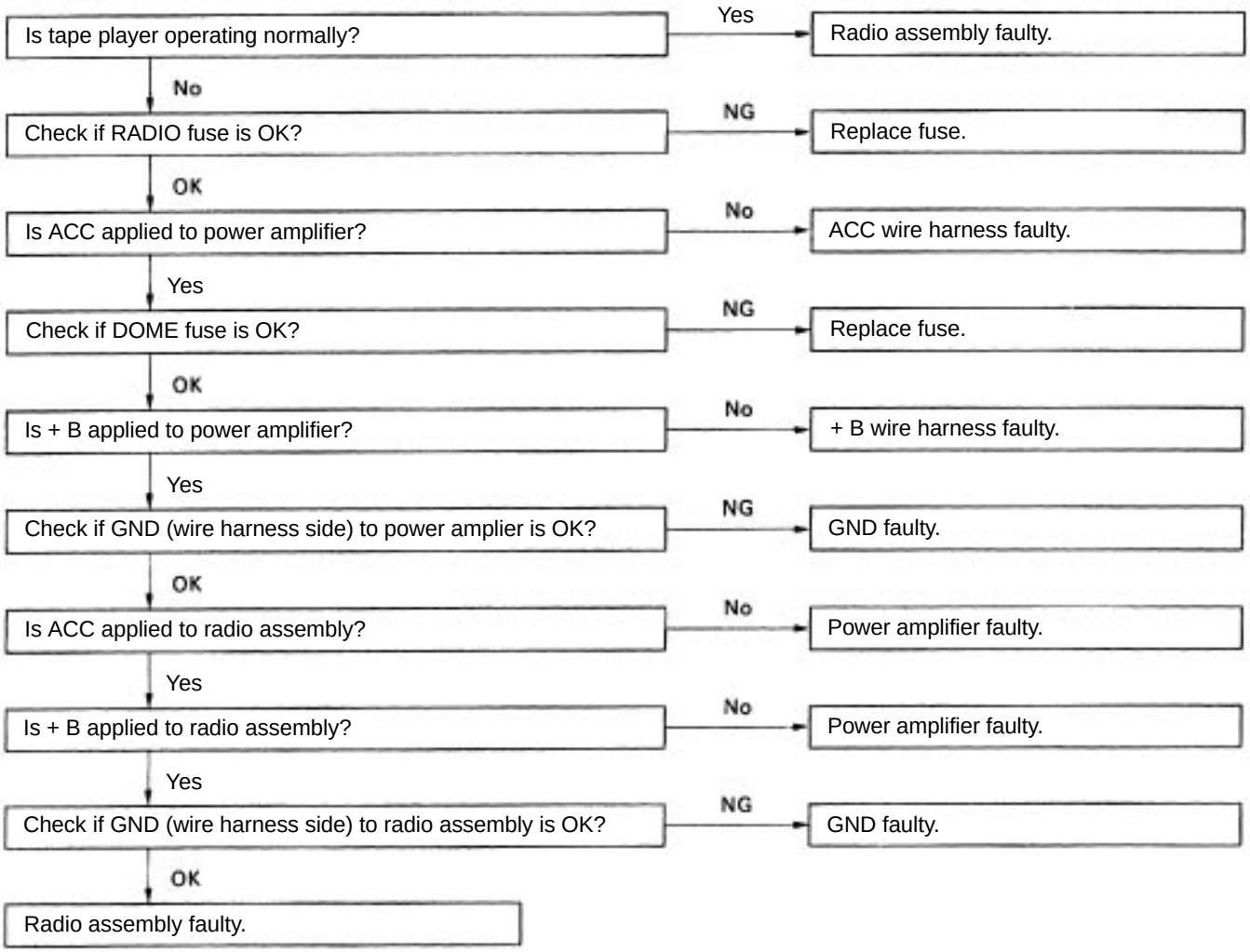
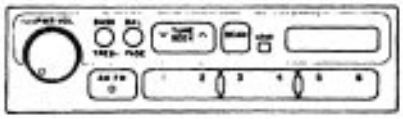
N01722


N01723

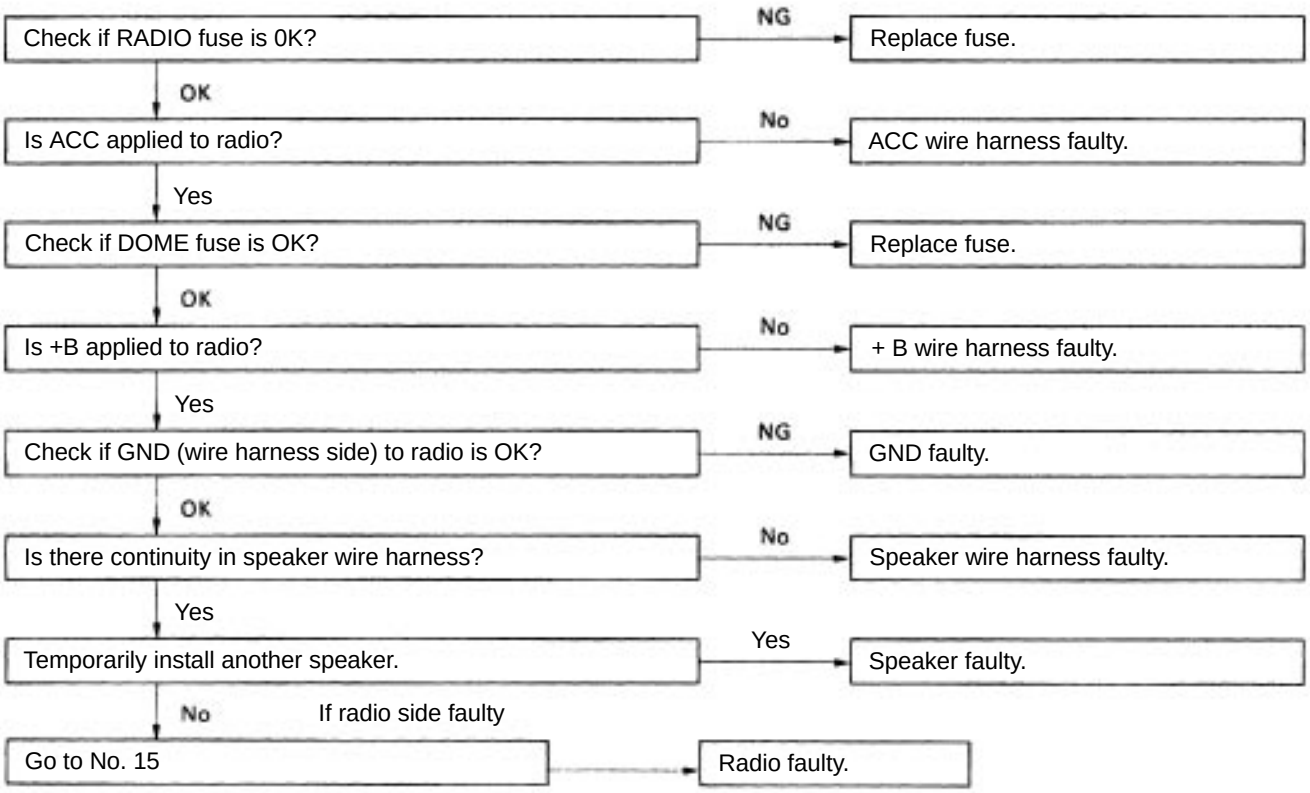


V04177

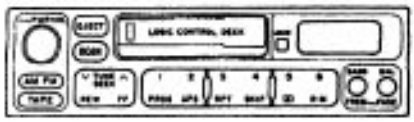
2	Radio	DISPLAY INDICATES WHEN POWER SWITCH TURNED TO 'ON', BUT NO SOUND (INCLUDING 'NOISE') IS PRODUCED



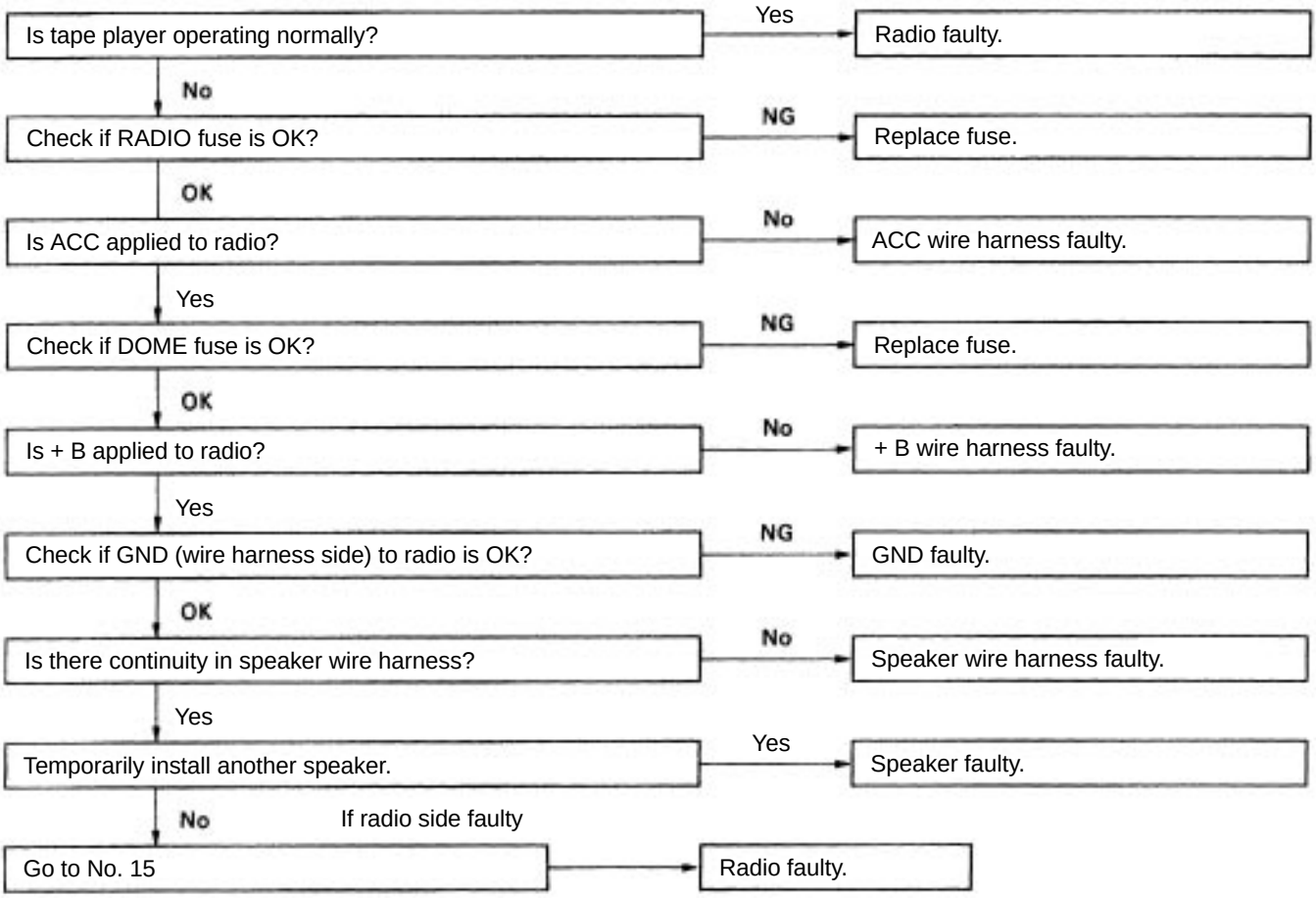
N01720



V04178

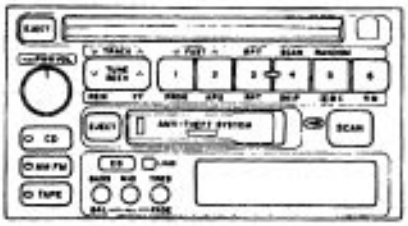


N01721

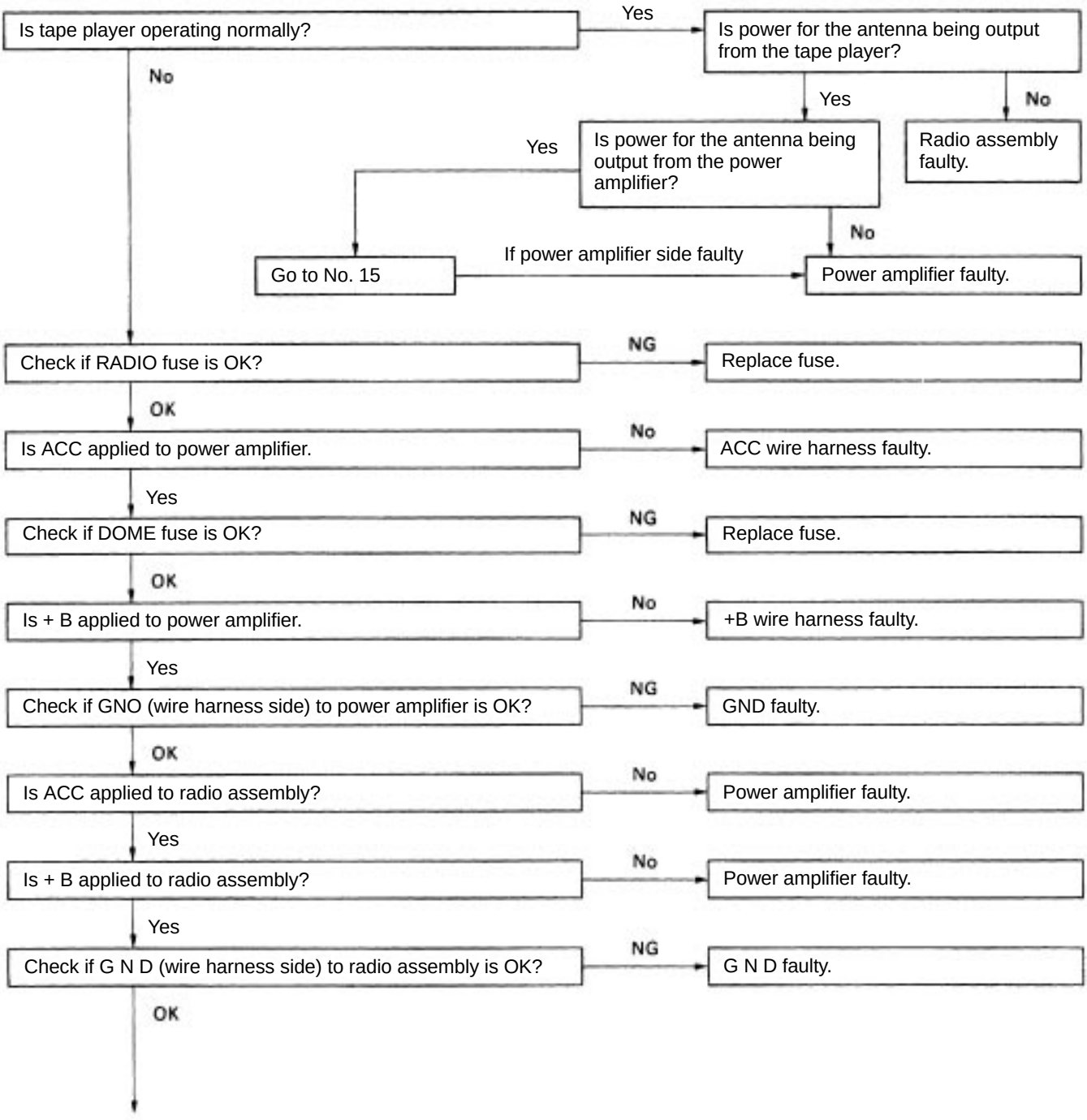


V04179

N01722



N01723



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V04180

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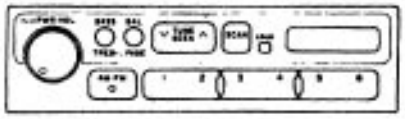
!s there continuity in speaker wire harness?
- No → Speaker wire harness faulty.
- Yes → Temporarily install another speaker. Functions OK?
  - Yes → Speaker faulty.
  - No → Hissing sound from speaker?
    - No → Power amplifier faulty. Recheck system after repair.
    - Yes → Radio assembly faulty. Recheck system after repair.

3	Radio	NOISE PRESENT, BUT AM–FM NOT OPERATING

Go to No. 15
- if radio side faulty → Radio faulty.

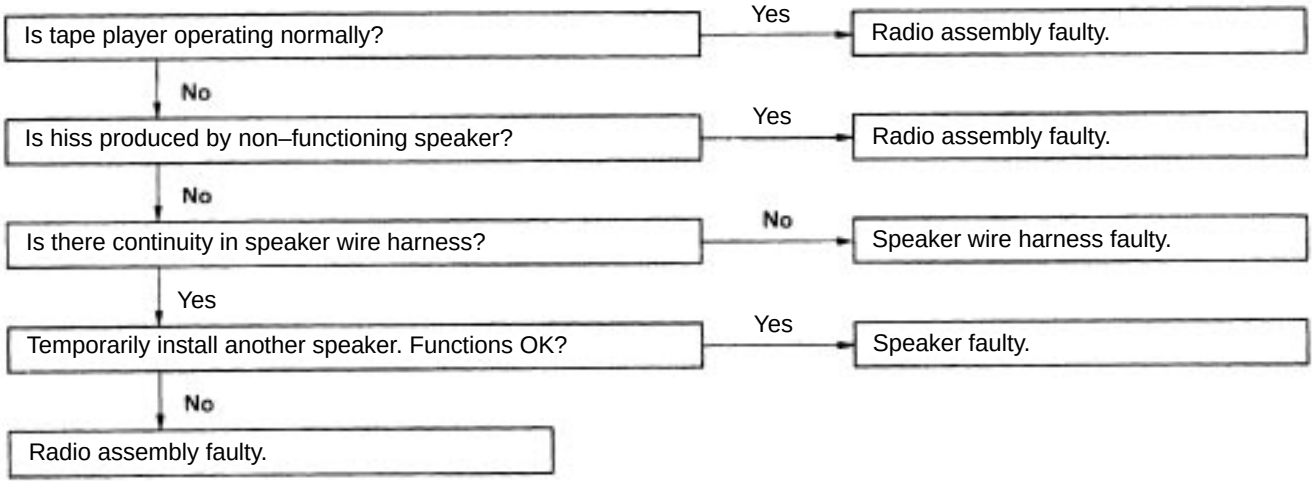
4	Radio	ANY SPEAKER DOES NOT WORK

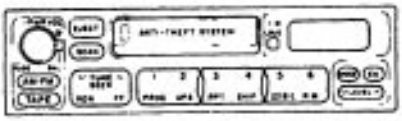


N01720

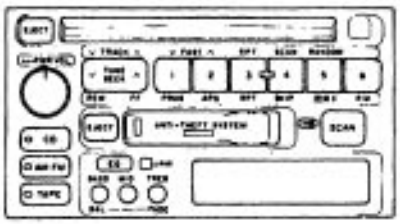
Is hiss produced by non–functioning speaker?
- Yes → Radio faulty.
- No → !s there continuity in speaker wire harness?
  - No → Speaker wire harness faulty.
  - Yes → Temporarily install another speaker. Functions OK?
    - Yes → Speaker faulty.
    - No → Radio faulty.

N01721

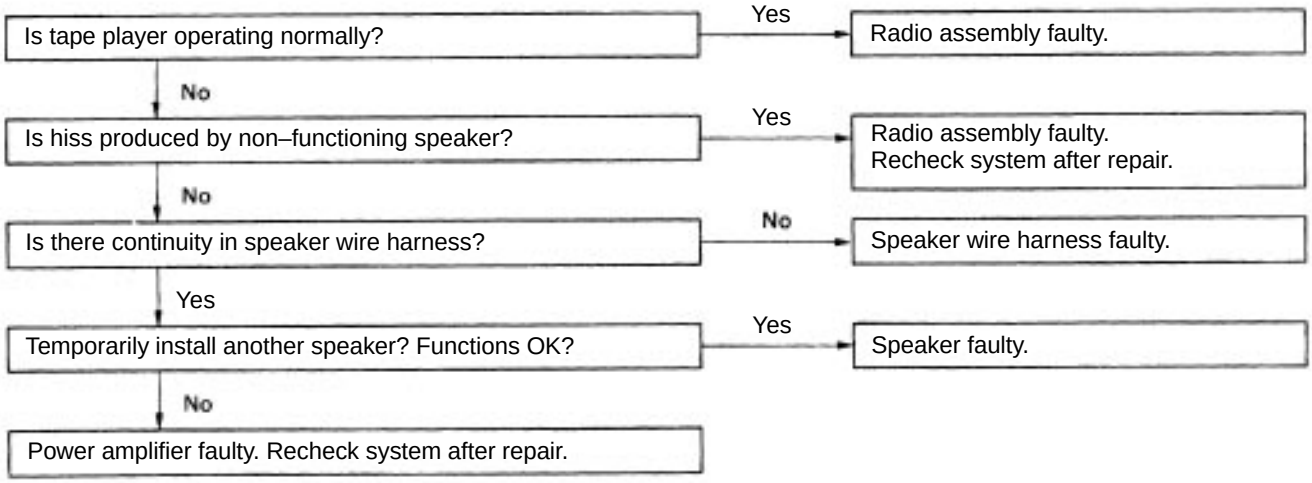




N01722

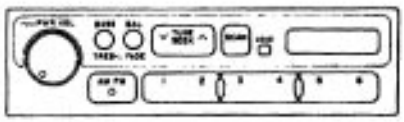


N01723



V04102

5	Radio	EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS



N01720

Problem with radio wave signals or location? — Yes → Poor signals, poor location.

No

Are both AM or FM defective? — No → Radio faulty.

Yes

Is power for the antenna being output from the radio? — No → Radio faulty.

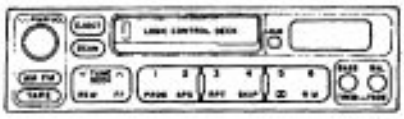
Yes

Go to No. 15

Temporarily install another speaker. Functions OK? — Yes → Speaker faulty.

No

Radio faulty.



N01721

Problem with radio wave signals or location? — Yes → Poor signals, poor location.

No

Are both AM or FM defective? — No → Radio assembly faulty.

Yes

Is power for the antenna being output from the radio assembly? — No → Radio assembly faulty.

Yes

Go to No. 15

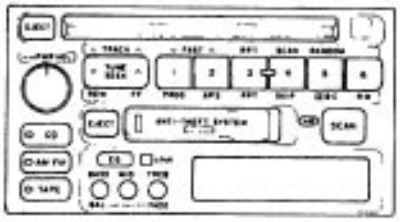
CONTINUED ON NEXT PAGE

V04183

CONTINUED FROM PREVIOUS PAGE

Is tape player operating normally?
- Yes → Radio assembly faulty.
- No → Temporarily install another speaker. Functions OK?
  - Yes → Speaker faulty.
  - No → Radio assembly faulty.

N01722

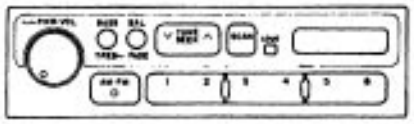


N01723

Problem with radio wave signals or location?
- Yes → Poor signals, poor location.
- No → Are both AM and FM defective?
  - No → Radio assembly faulty.
  - Yes → Is power for the antenna being output from the radio assembly?
    - No → Radio assembly faulty.
    - Yes → Go to No. 15

Is tape player operating normally?
- Yes → Radio assembly faulty.
- No → Temporarily install another speaker. Functions OK?
  - Yes → Speaker faulty.
  - No → Hissing sound from speaker?
    - No → Power amplifier faulty. Recheck system after repair.
    - Yes → Radio assembly faulty. Recheck system after repair.

6 Radio — SOUND QUALITY POOR



N01720

Is sound quality always bed? — No → Is sound quality bad in certain area only? — Yes → Poor signals, poor location.

Is sound quality bad in certain area only? — No → Radio faulty.

Is sound quality always bed? — Yes → is speaker properly installed?

is speaker properly installed? — No → Install properly.

is speaker properly installed? — Yes → Temporarily install another speaker. Functions OK?

Temporarily install another speaker. Functions OK? — Yes → Speaker faulty.

Temporarily install another speaker. Functions OK? — No → Is power for the antenna being output from the radio?

Is power for the antenna being output from the radio? — No → Radio faulty.

Is power for the antenna being output from the radio? — Yes → Go to No. 15

Go to No. 15 — If radio side faulty → Radio faulty.

N01721

Is sound quality always bad? — No → Is sound quality bad in certain area only? — Yes → Poor signals, poor location.

Is sound quality bad in certain area only? — No → Radio assembly faulty.

Is sound quality always bad? — Yes → Is tape player operating normally?

Is tape player operating normally? — Yes → Is power for the antenna being output from the radio assembly? — No → Radio assembly faulty.

Is power for the antenna being output from the radio assembly? — Yes → Go to No. 15

Go to No. 15 — If radio side faulty → Radio assembly faulty.

Is tape player operating normally? — No → Is speaker properly installed?

Is speaker properly installed? — No → Install property.

Is speaker properly installed? — Yes

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V04185

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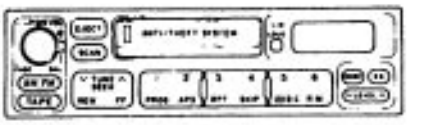
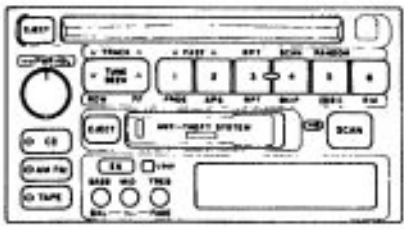
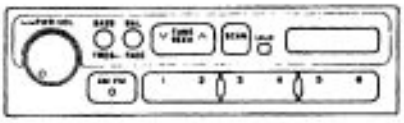
Temporarily install another speaker. Functions OK?
- Yes → Speaker faulty.
- No → Radio assembly faulty.


N01722


N01723

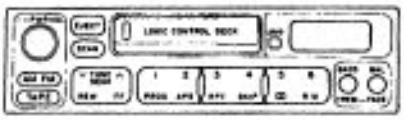
Is sound quality always bad?
- No → Is sound quality bad in certain areas only?
  - Yes → Poor signals, poor location.
  - No → Is tape player operating normally?
    - Yes → Radio assembly faulty.
    - No → Radio assembly or power amplifier faulty.
- Yes → Is tape player operating normally?
  - Yes → Is power for the antenna being output from the radio assembly?
    - No → Radio assembly faulty.
    - Yes → Is power for the antenna being output from the power amplifier?
      - No → Power amplifier faulty.
  - No → Is speaker properly installed?
    - No → Install properly.
    - Yes → Temporarily install another speaker. Functions OK?
      - Yes → Speaker faulty.
      - No → Radio assembly or power amplifier faulty. Recheck system after repair.

7 Radio — PRESET MEMORY DISAPPEARS



N01720

Check if DOME fuse is OK?
- NG → Replace fuse.
- OK → Is + B applied to radio?
  - No → + B wire harness faulty.
  - Yes → Check if GND (wire harness side) to radio?
    - NG → GND faulty.
    - OK → Radio faulty.

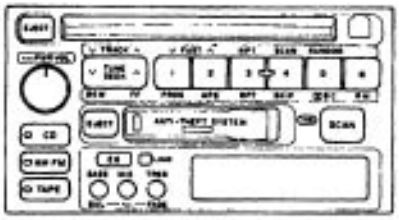


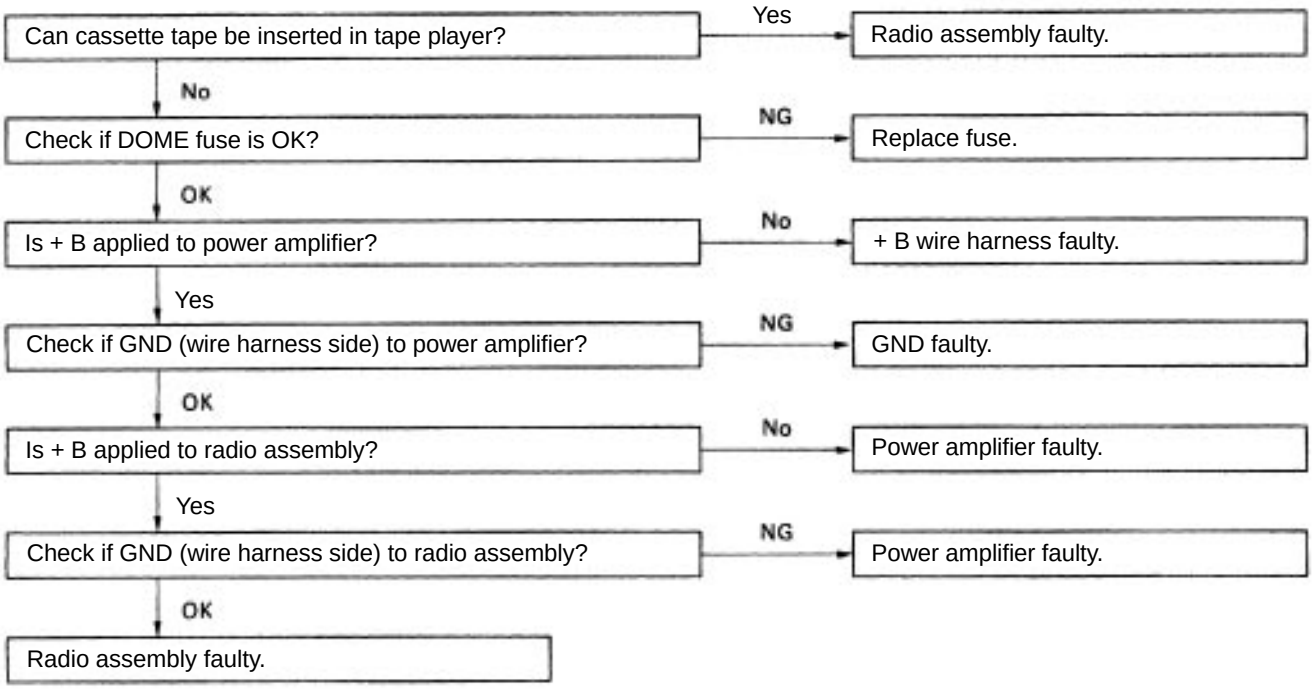
N01721

Can cassette tape be inserted in tape player?
- Yes → Radio assembly faulty.
- No → Check if DOME fuse is OK?
  - NG → Replace fuse.
  - OK → Is + B applied to radio assembly?
    - No → +B wire harness faulty.
    - Yes → Check if GND (wire harness side) to radio?
      - NG → GND faulty.
      - OK → Radio assembly faulty.

V04187


N01722


N01723



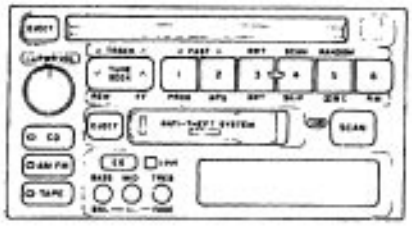
V04188

8	Tape Player	CASSETTE TAPE CANNOT BE INSERTED

N01721

Is there a foreign object inside tape player?
Yes → Remove foreign object.
No ↓
Is auto search button of radio operating normally?
Yes → Radio assembly faulty.
No ↓
Check if DOME fuse is OK?
NG → Replace fuse.
OK ↓
Is +B applied to radio assembly?
No → +B wire harness faulty.
Yes ↓
Check if GND (wire harness side) to radio assembly?
NG → GND faulty.
OK ↓
Radio assembly faulty.

N01722



N01723

Is there a foreign object inside tape player?
Yes → Remove foreign object.
No ↓
Is auto search button radio operating normally?
Yes → Radio assembly faulty.
No ↓
Check if DOME fuse is OK?
NG → Replace fuse.
OK ↓

CONTINUED ON NEXT PAGE

V04189

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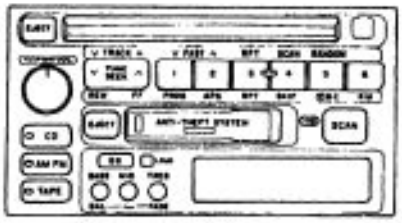
Is + B applied to power amplifier?
- No → + B wire harness faulty.
- Yes → Check if GND (wire harness side) to power amplifier is OK?
  - NG → GND faulty.
  - OK → Is + B applied to radio assembly
    - No → Power amplifier faulty.
    - Yes → Check if GND (wire harness side) to radio assembly is OK?
      - NG → Power amplifier faulty.
      - OK → Radio assembly faulty.

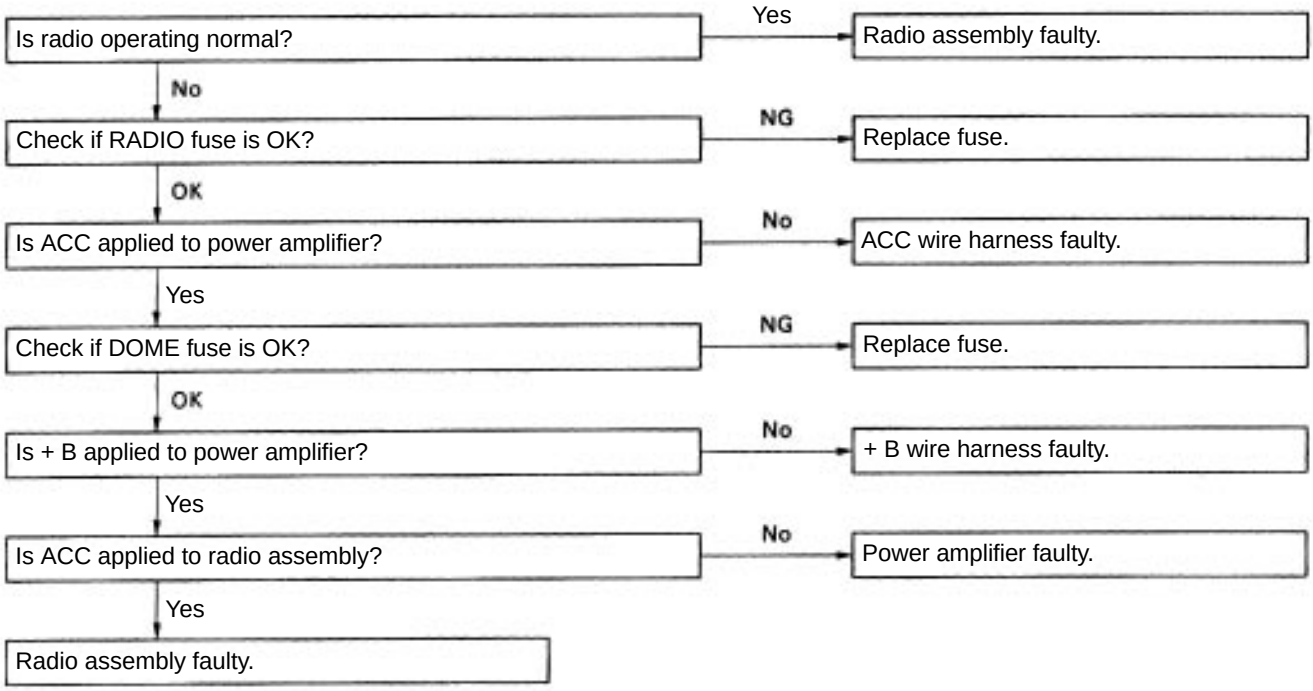
22	Tape Player	**CASSETTE TAPE INSERTS, BUT NO POWER**

N01721

Is radio operating normally?
- Yes → Radio assembly faulty.
- No → Check if RADIO fuse is OK?
  - NG → Replace fuse.
  - OK → Is ACC applied to radio assembly?
    - No → ACC wire harness faulty.
    - Yes → Check if DOME fuse is OK?
      - NG / No → Replace fuse.
      - OK → Is + B applied to radio assembly?
        - → + B wire harness faulty.
        - Yes → Radio assembly faulty.


N01722


N01723



V04198

10	Tape Player	POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

N01721

Functions OK if different cassette tape inserted? — Yes → Cassette tape faulty.

No

Is radio operating normally? — Yes → Radio assembly faulty.

No

Is there continuity in speaker wire harness? — No → Speaker wire harness faulty.

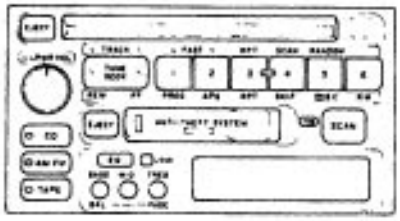
Yes

Temporarily install another speaker.
Functions OK? — Yes → Speaker faulty.

No

Radio assembly faulty.

N01722



N01723

Function 4K if different cassette tape inserted? — Yes → Cassette tape faulty.

No

Is radio operating normally? — Yes → Radio assembly faulty.

No

Is there continuity in speaker wire harness? — No → Speaker wire harness faulty.

Yes

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Temporarily install another speaker.
Function OK?
→ Yes → Speaker faulty.
→ No

Hissing sound from speaker?
→ No → Power amplifier faulty.
Recheck system after repair.
→ Yes

Radio assembly faulty.
Recheck system after repair.

11	Tape Player	EITHER SPEAKER DOES NOT WORK

N01721

Is radio operating normally?
→ Yes → Radio assembly faulty.
→ No

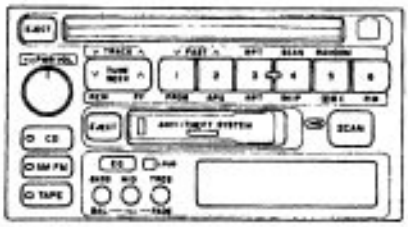
Is hiss produces by non–functioning speaker.
→ Yes → Radio assembly faulty.
→ No

Is there continuity in speaker wire harness?
→ No → Speaker wire harness faulty.
→ No

Temporarily install another speaker.
Functions OK?
→ Yes → Speaker faulty.
→ No

Radio assembly faulty.


N01722


N01723

Is radio operating normally?
Yes → Radio assembly faulty.
No
Is hiss produced by non–functioning speaker?
Yes → Radio assembly faulty. Recheck system after repair.
No
Is there continuity in speaker wire harness?
No → Speaker wire harness faulty.
Yes
Temporarily install another speaker. Function OK?
Yes → Speaker faulty.
No
Radio assembly or power amplifier faulty.

12 Tape Player — SOUND QUALITY POOR (VOLUME FAINT)


N01721

Functions OK if different cassette tape inserted?
Yes → Cassette tape faulty.
No
Operates normally after cleaning the heads?
Yes → Head dirty.
No
Is radio operating normally?
Yes → Radio assembly faulty.
No
Is speaker properly installed?
No → Install properly.
Yes

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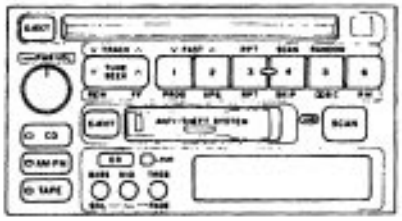
Temporarily install another speaker.
Function OK?
Yes → Speaker faulty.
No → Radio assembly faulty.


N01722


N01723

Functions OK different cassette tape inserted?
Yes → Cassette tape faulty.
No → Operates normally after cleaning the heads?
Yes → Head dirty.
No → Is radio operating normally?
Yes → Radio assembly faulty.
No → Is speaker properly installed?
No → Install properly.
Yes → Temporarily install another speaker.
Functions OK?
Yes → Speaker faulty.
No → Radio assembly faulty,

13 Tape Player — TAPE JAMMED MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE

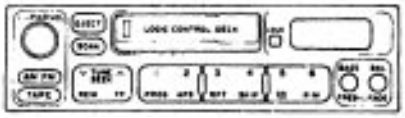
Function OK if different tape (less than 120 mins.) is inserted?
- Yes → Cassette tape faulty.
- No ↓

Is there a foreign abject inside tape player?
- Yes → Remove foreign object.
- No ↓

Operates normally after cleaning the heads?
- Yes → Head dirty.
- No ↓

Radio assembly faulty.

14 Tape Player — CASETTE TAPE WILL NOT EJECT



N01721

Is tape player operating normally?
- No → Cassette tape jammed.
- Yes ↓

Is auto search button of radio operating normally?
- Yes → Radio assembly faulty.
- No ↓

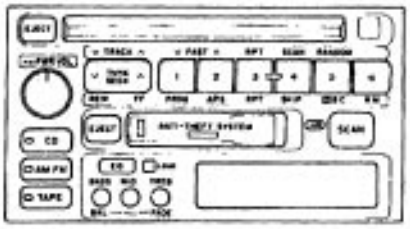
Check if DOME fuse is OK?
- NG → Replace fuse.
- OK ↓

Is + B applied to radio assembly?
- No → + B wire harness faulty.
- Yes ↓

Radio assembly faulty?

V04196


N01722


N01723

Is tape player operating normally?
- No → Cassette tape jammed.
- Yes → Is auto search button of radio operating normally?
  - Yes → Radio assembly faulty.
  - No → Check if DOME fuse is OK?
    - NG → Replace fuse.
    - OK → !s + B applied to power amplifier?
      - No → + B wire harness faulty.
      - Yes → Is +B applied to radio assembly?
        - No → Power amplifier faulty.
        - Yes → Radio assembly faulty.

15 CD Player — CD CANNOT BE INSERTED

Is CD already inserted?
- Yes → Eject CD.
- No → Is auto search button of radio operating normally?
  - Yes → Is + B applied to CD player?
    - No → Radio assembly faulty.
    - Yes → Check if GND wire harness side to CD player is OK?
      - NG → Radio assembly faulty.
      - OK → CD player faulty.
  - No → Check if DOME fuse is OK?
    - NG → Replace fuse.
    - OK

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V04197

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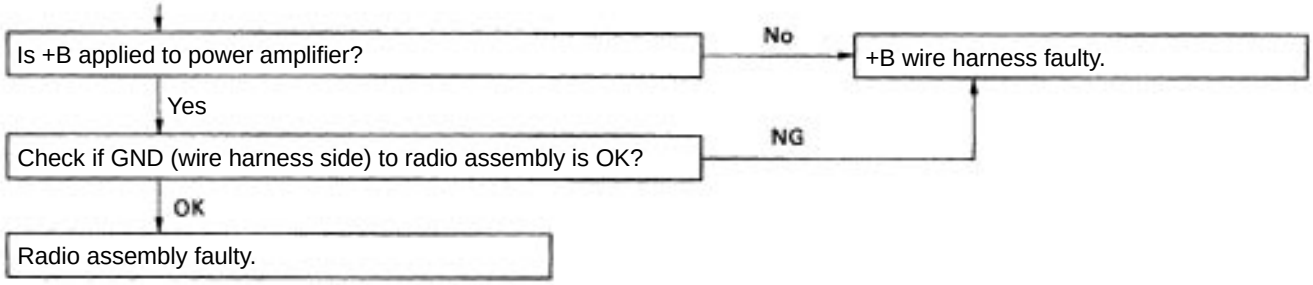
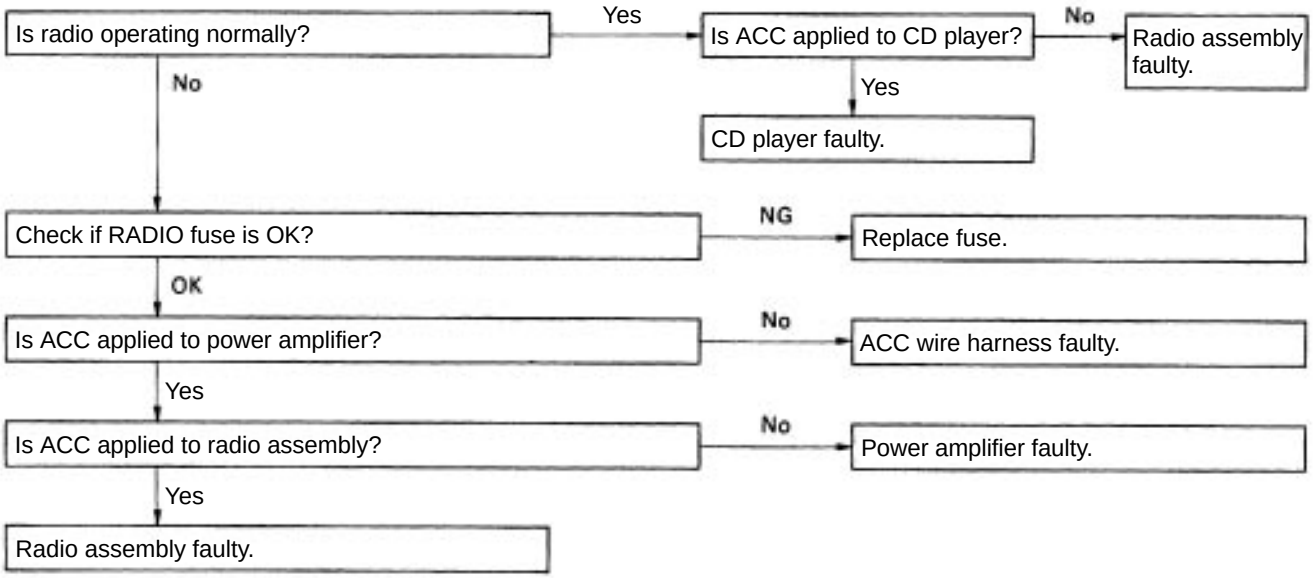
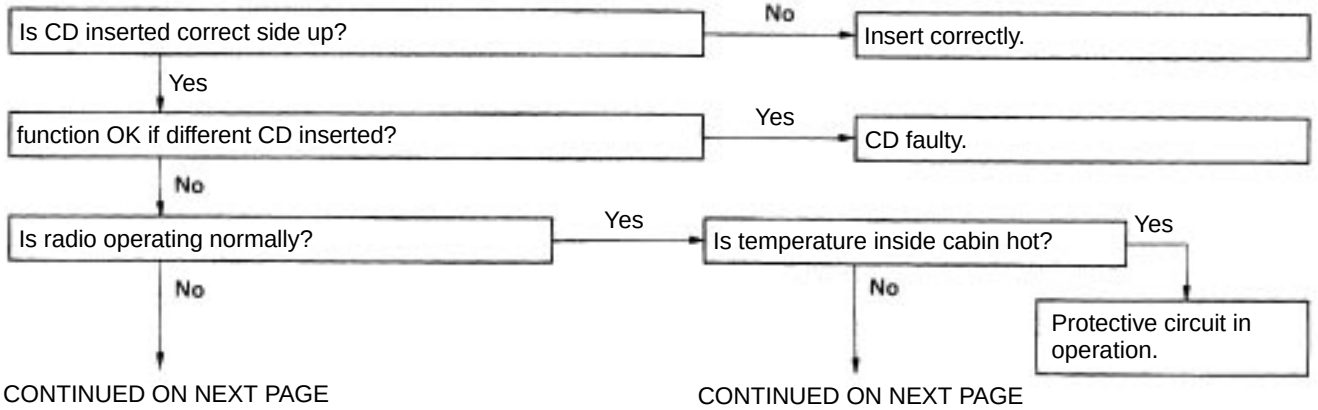


16 CD Player — CD INSERTS, BUT NO POWER



17 CD Player — POWER COMING IN, BUT CD PLAYER NOT OPERATING



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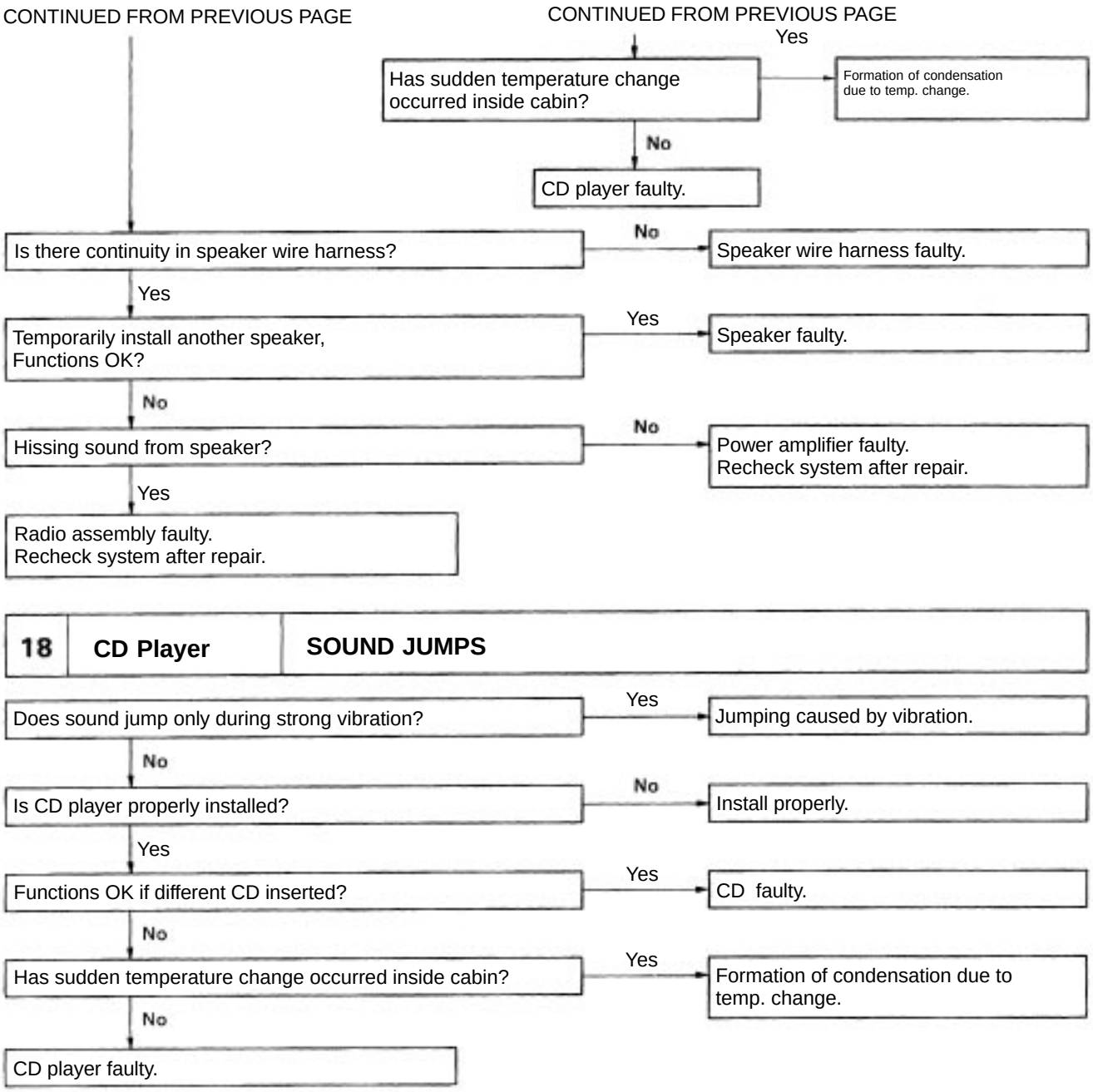
V04198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Yes
Has sudden temperature change occurred inside cabin?
Formation of condensation due to temp. change.
No
CD player faulty.
Is there continuity in speaker wire harness?
No
Speaker wire harness faulty.
Yes
Temporarily install another speaker, Functions OK?
Yes
Speaker faulty.
No
Hissing sound from speaker?
No
Power amplifier faulty. Recheck system after repair.
Yes
Radio assembly faulty. Recheck system after repair.
18
CD Player
SOUND JUMPS
Does sound jump only during strong vibration?
Yes
Jumping caused by vibration.
No
Is CD player properly installed?
No
Install properly.
Yes
Functions OK if different CD inserted?
Yes
CD faulty.
No
Has sudden temperature change occurred inside cabin?
Yes
Formation of condensation due to temp. change.
No
CD player faulty.

V00199

19 CD Player — SOUND QUALITY POOR (VOLUME FAINT)

Functions OK if different CD inserted?
- Yes → CD faulty.
- No ↓

Is radio operating normally?
- Yes → CD player faulty.
- No ↓

Is speaker properly installed?
- No → Install properly.
- Yes ↓

Temporarily install another speaker. Functions OK?
- Yes → Speaker faulty.
- No ↓

Radio assembly or CD player or Power amplifier faulty.

20 CD Player — EITHER SPEAKER DOES NOT WORK

Is radio operating normally?
- Yes → C D player faulty.
- No ↓

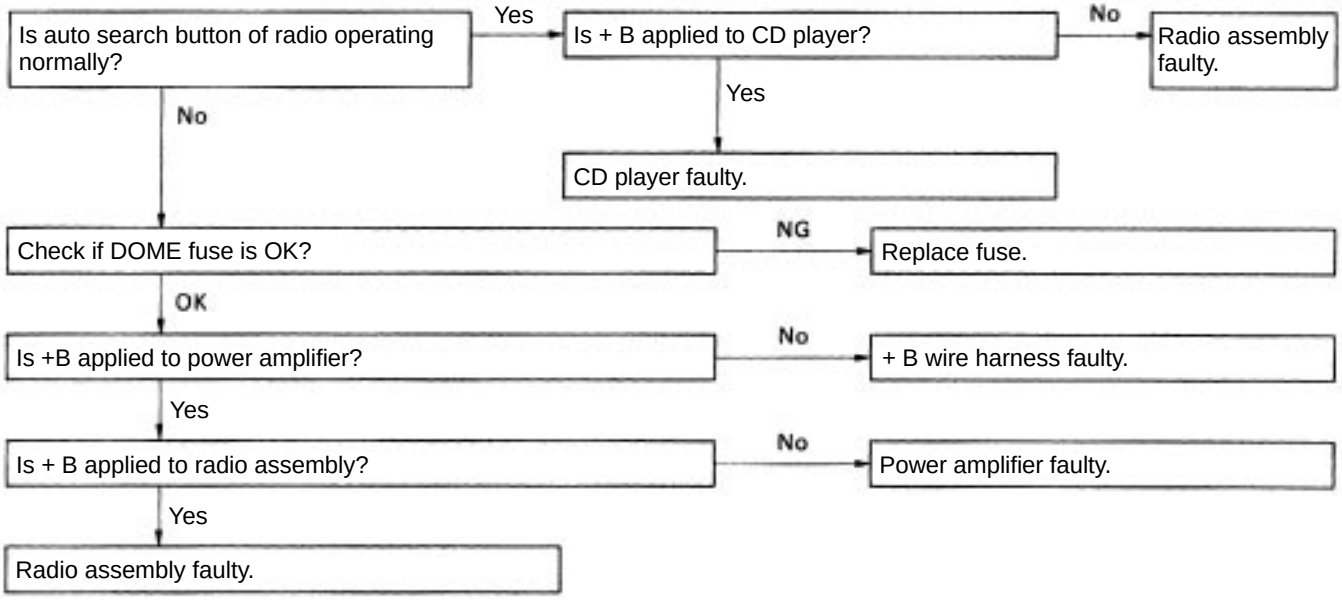
Is hiss produced by non–functioning speaker?
- Yes → Radio assembly faulty. Recheck system after repair.
- No ↓

Is there continuity in speaker wire harness?
- No → Speaker wire harness faulty.
- Yes ↓

Temporarily install another speaker. Function OK.
- Yes → Speaker faulty.
- No ↓

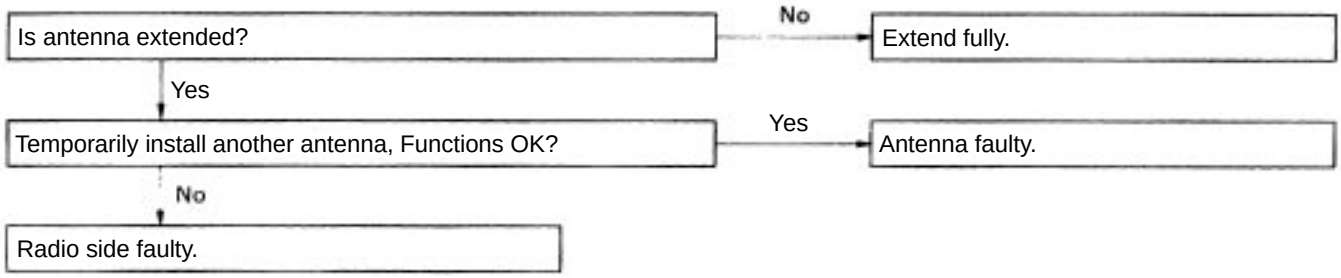
Power amplifier faulty. Recheck system after repair.

21 CD Player — CD WILL NOT EJECT



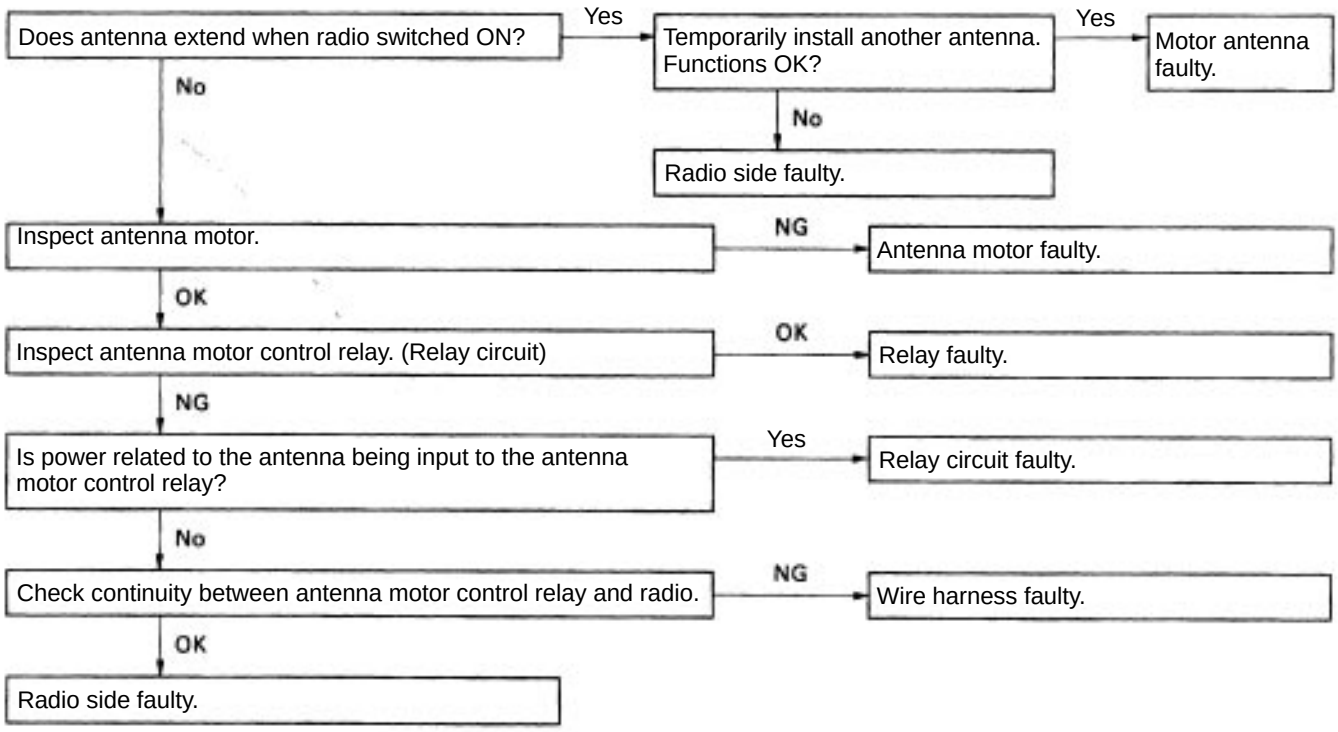
22 Antenna — ANTENNA – RELATED

Antenna w/o Motor Type

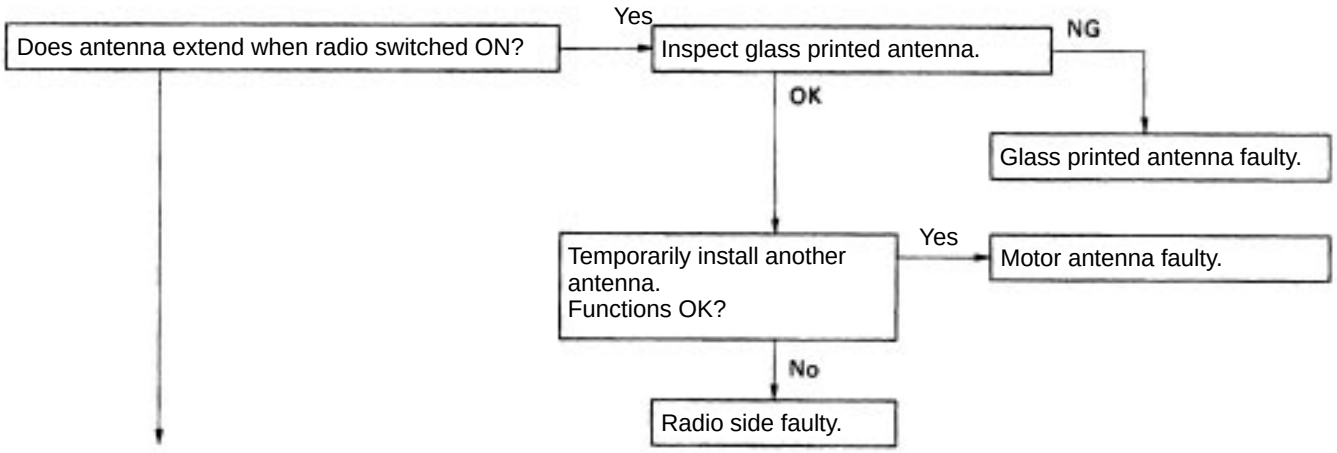


V04201

Motor Antenna Type



Motor Antenna and Glass Printed Antenna Type



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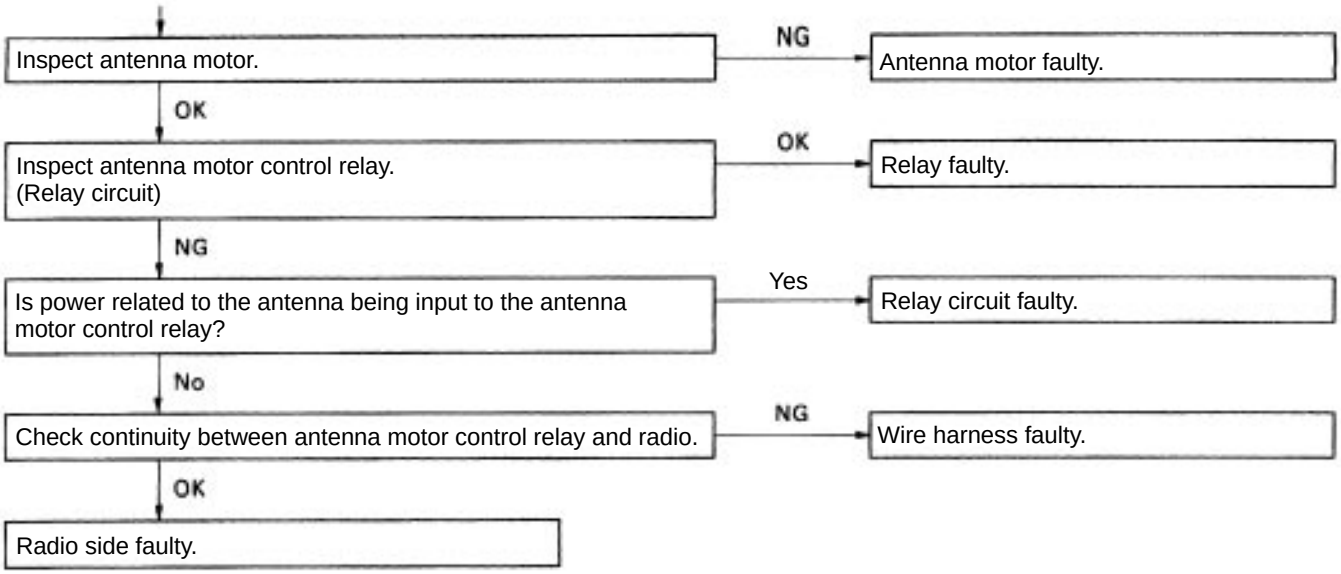
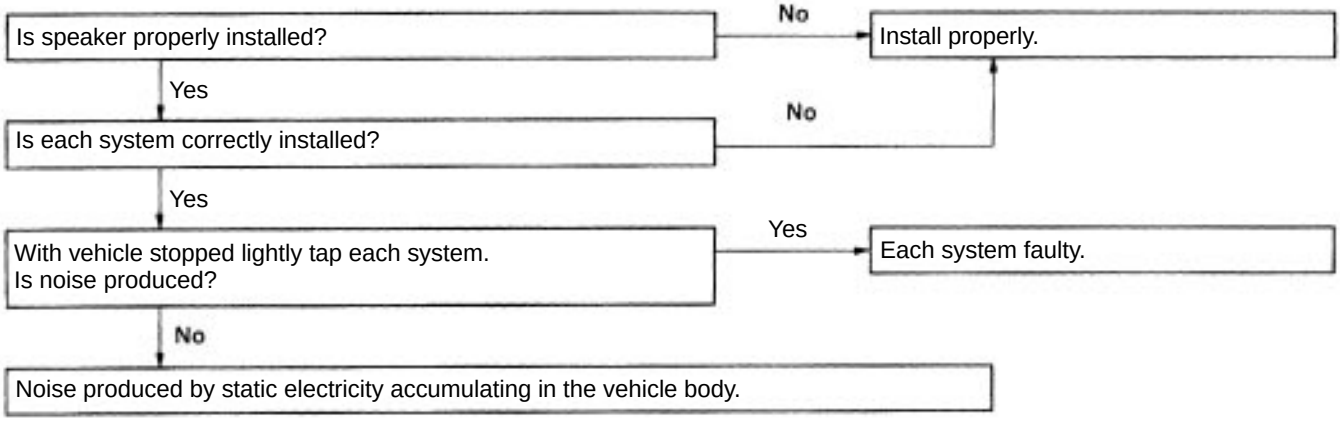
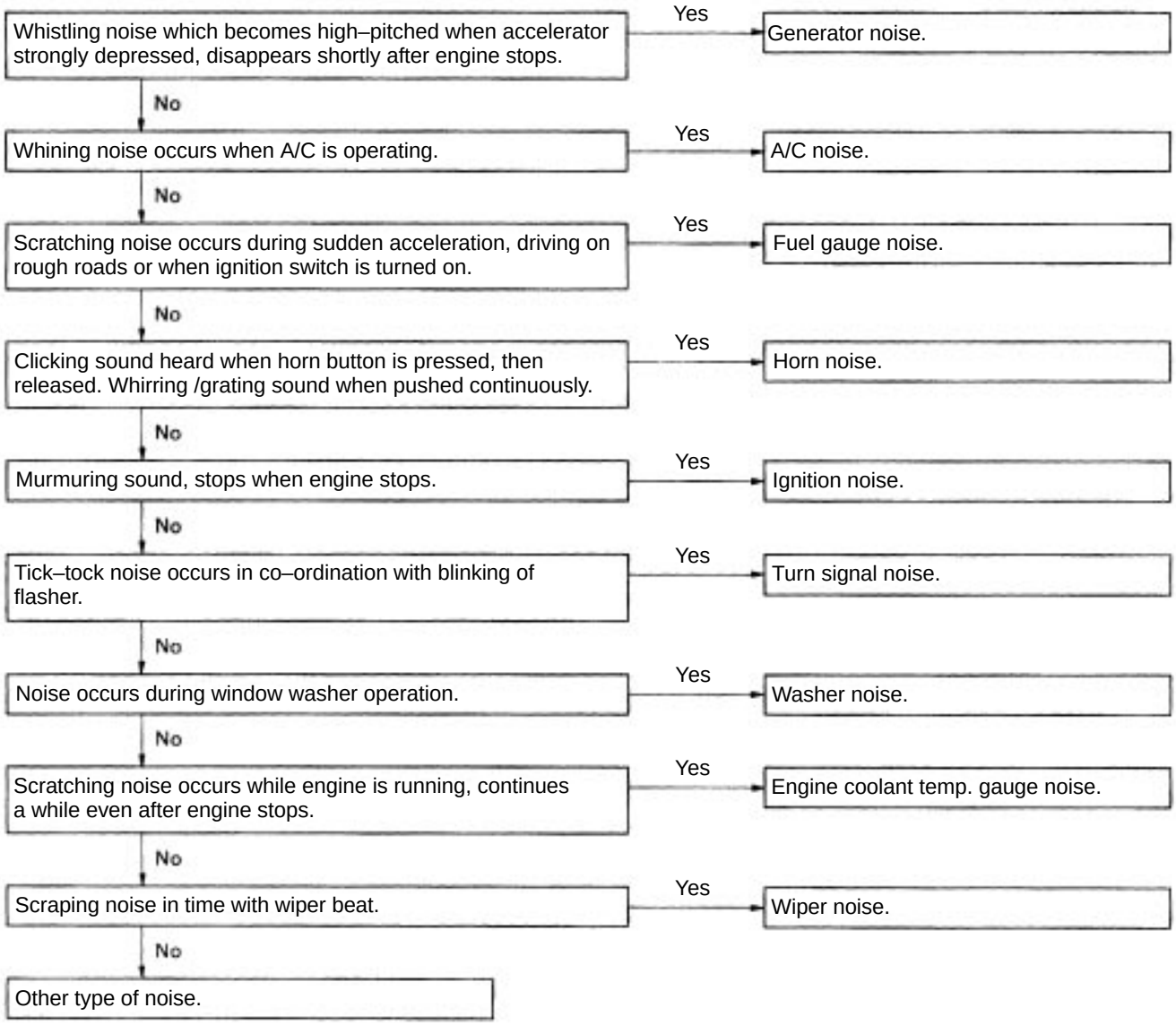


23	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING



24	Noise	NOISE PRODUCED WHEN ENGINE STARTS



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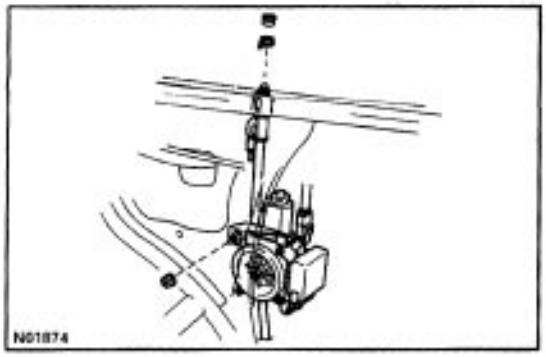


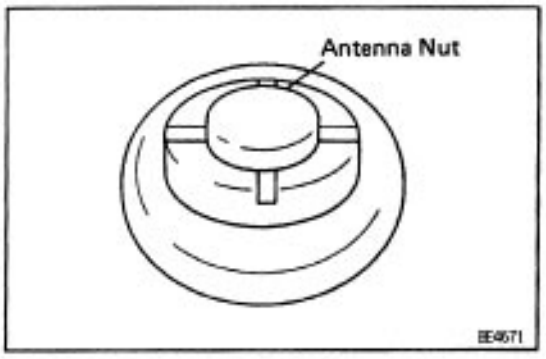
MOTOR ANTENNA REMOVAL AND INSTALLATION

1. REMOVE MOTOR ANTENNA

(a) Remove the antenna nut.
(b) Remove the RH side cover.
(c) Disconnect the motor antenna connector.
(d) Remove the nut and the motor antenna assembly.
(e) Disconnect the antenna cord.
(f) Remove the drain hose.

2. INSTALL MOTOR ANTENNA

(a) Connect the motor antenna connector and the anten–na cord.
(b) Install the antenna nut.
(c) Install the nut.
(d) Connect the drain hose.

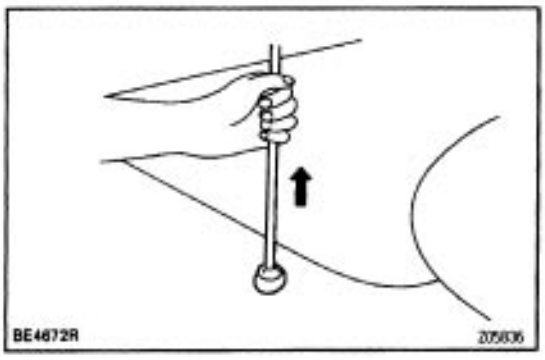


ANTENNA ROD REMOVAL AND INSTALLATION

1. REMOVE ANTENNA ROD

HINT: Perform this operation with the battery nega–tive (–) cable connected to the battery terminal.

(a) Turn the ignition switch to ”LOCK” position.
(b) Remove the antenna nut.

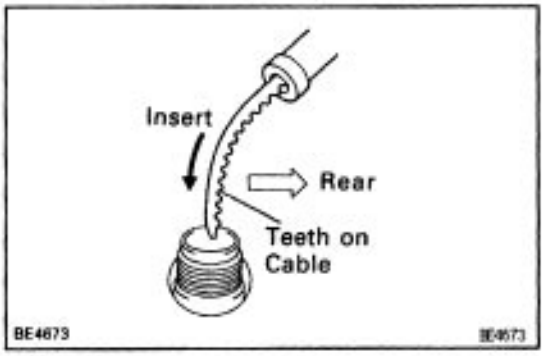


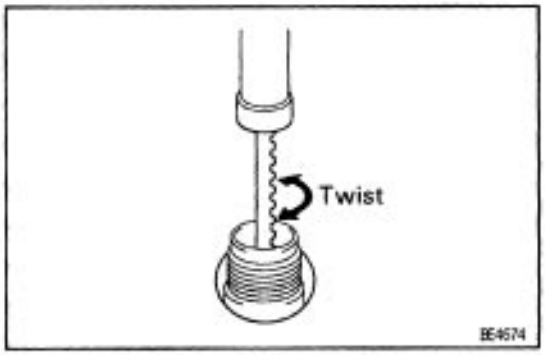
(c) Press the ’AM’ or ”FM” button on the radio receiver, and simultaneously turn the ignition switch to ”ACC” position.

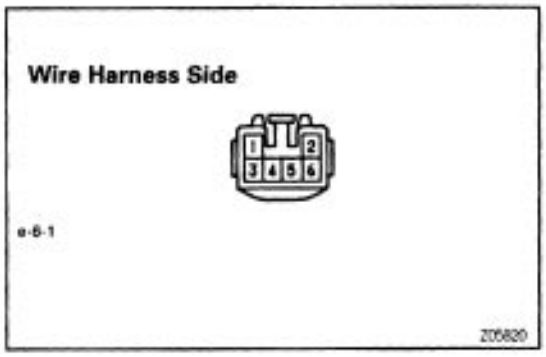
HINT:

- The rod will extend fully and be released from the motor antenna.
- After removing the antenna rod, leave the igni–tion switch at ”ACC”.

NOTICE: To prevent body damage when the antenna rod Is released, hold the rod while It comes out.







2. INSTALL ANTENNA ROD

(a) Insert the cable of the rod until it reaches the bottom.

HINT:

- When inserting the cable, the teeth on the cable must face toward the rear of the vehicle.
- Insert the cable approx. 400 mm (15.7 in.).

(b) Wind the cable to retract the rod by turning the ignition switch to ”LOCK” position.

HINT:

- If the ignition switch is already in ”LOCK” posi–tion, perform step 1 (c) first, then turn the ignition switch to ”ACC” position.
- In case the cable is not wound, twist it, as shown in the illustration.
- Even if the rod has not retracted fully, install the antenna nut and inspect the antenna rod opera–tion. It will finally retract fully.

(c) Inspect the antenna rod operation by pushing the radio wave band select buttons.

MOTOR ANTENNA INSPECTION

1. INSPECT MOTOR ANTENNA

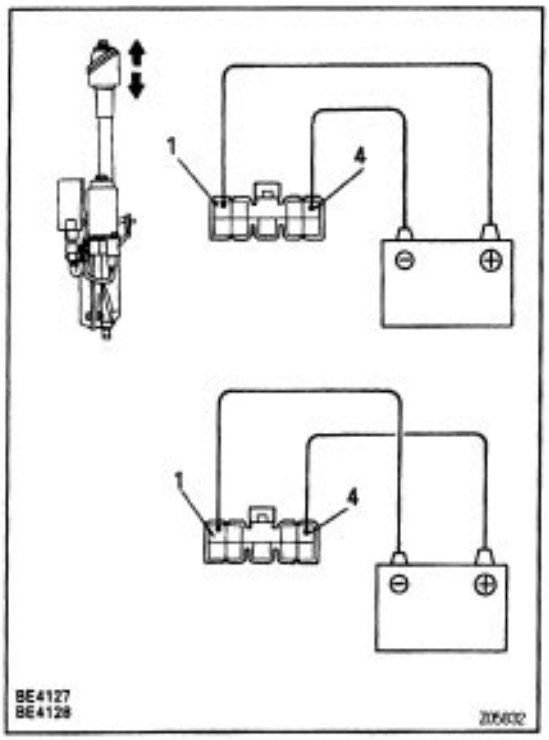
Circuit

Disconnect the motor antenna connector from the body wire harness and inspect the connector on body wire harness side, as shown.

Tester connection to terminal number	Condition	Specified value (Voltage)
2 – Ground	Constant	Battery positive voltage
3 – Ground	Ignition switch ACC or ON and radio switch ON Others	No voltage
3 – Ground	Ignition switch ACC or ON and radio switch ON AM or FM (87.9 – 96.0 MHz)	Battery positive voltage
4 – Ground	Ignition switch ACC or ON Radio switch OFF	No voltage
4 – Ground	Ignition switch ACC or ON Radio switch ON	Battery positive voltage
5 – Ground	Ignition switch position ACC or LOCK	No voltage
5 – Ground	Ignition switch position ON	Battery positive voltage
6 – Ground	Ignition switch position LOCK	No voltage
6 – Ground	Ignition switch position ACC or ON	Battery positive voltage

Tester connection to terminal number	Condition	Specified value (Continuity)
1 – Ground	Constant	Continuity

If circuit is not as specified, inspect radio or wire harness.
If circuit is as specified, replace motor antenna.



2. INSPECT ANTENNA MOTOR

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 4.

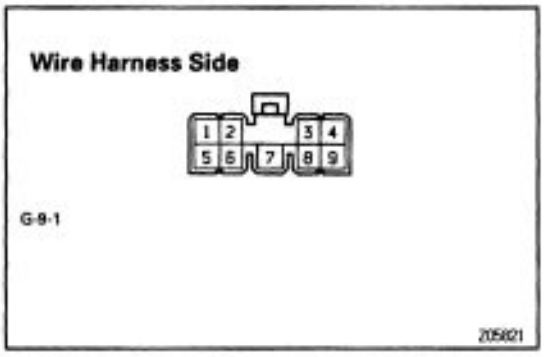
(b) Check that the motor turns (moves upward).

NOTICE: These tests must be performed quickly (within 3 – 5 seconds) to prevent the coil from burning out.

(c) Then, reverse the polarity, check that the motor turns the opposite way (moves downward).

NOTICE: These tests must be performed quickly (within 3 – 5 seconds) to prevent the coil from burning out.

If operation is not as specified, replace the motor.



3. INSPECT ANTENNA MOTOR CONTROL RELAY

Relay Circuit

Disconnect the connector from the relay and inspect the connector on wire harness side, as shown in the chart.

Tester connection to terminal number	Condition	Specified value (Continuity)
1–4	Constant	Continuity
2 – Ground	Constant	Continuity
Tester connection to terminal number	**Condition**	**Specified value (Voltage)**
3 – Ground	Constant	Battery positive voltage
5 – Ground	Ignition switch position LOCK	No voltage
5 – Ground	Ignition switch position ACC or ON	Battery positive voltage
6 – Ground	Ignition switch position LOCK	No voltage
6 – Ground	Ignition switch position ACC or ON Radio switch and cassette OFF	No voltage
6 – Ground	Ignition switch position ACC or ON Radio switch or cassette ON	Battery positive voltage
8 – Ground	Ignition switch position LOCK	No voltage
8 – Ground	Ignition switch position ACC or ON Radio switch OFF or casette ON	No voltage
8 – Ground	Ignition switch position ACC or ON Radio switch ON and casette OFF	Battery positive voltage
9 – Ground	Ignition switch position LOCK or ACC	No voltage
9 – Ground	Ignition switch position ON	Battery positive voltage

If circuit is as specified, replace the relay.

GLASS PRINTED ANTENNA INSPECTION

1. INSPECT GLASS PRINTED ANTENNA

(Use same procedure as for ”INSPECT DEFOGGER WIRES” on page BE–80.)

2. REPAIR GLASS PRINTED ANTENNA

(Use same procedure as for ” REPAIR DEFOGGER WIRES” on page BE–80.)

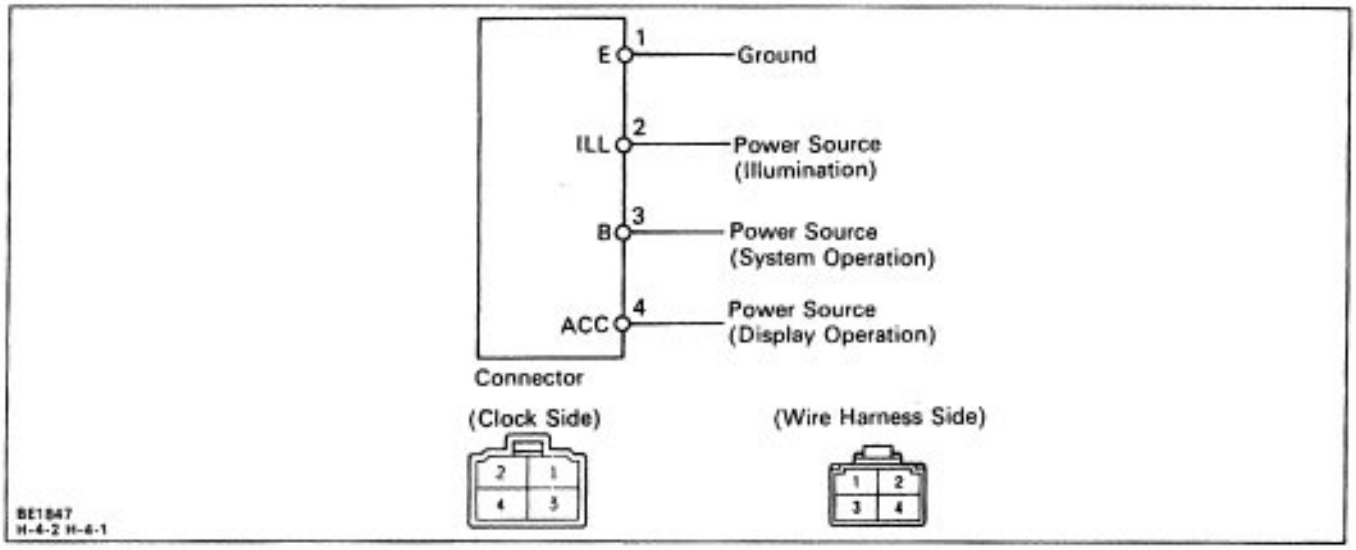
CLOCK

TROUBLESHOOTING

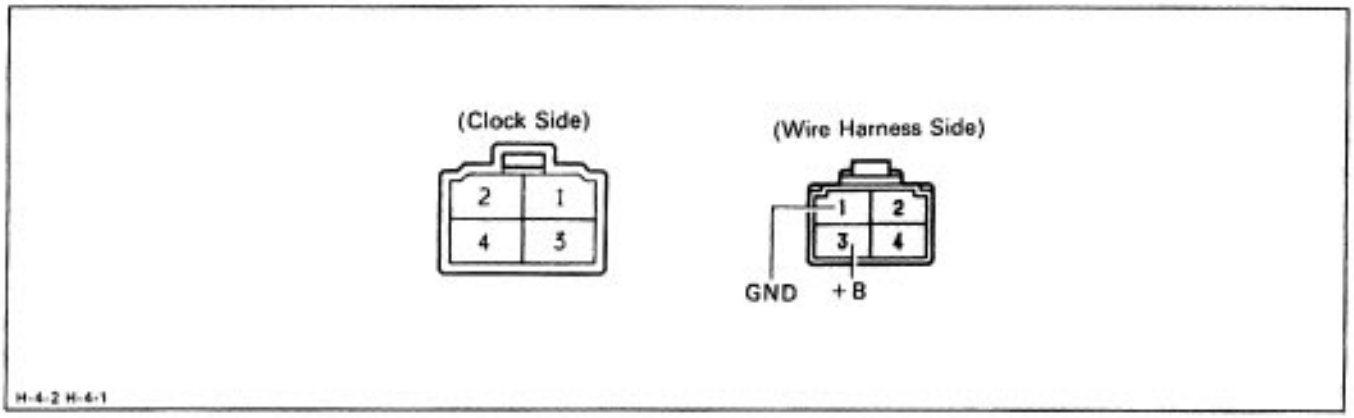
HINT: Troubleshoot the clock according to the table below.

Clock will not operate	1
Clock loses or gains time	2

± 1.5 seconds/day



1 CLOCK WILL NOT OPERATE



(a) Check that the battery positive voltage is 10 – 16 V.
If voltage is not as specified, replace the battery.

(b) Check that the DOME fuse is not blown.
If the fuse is blown, replace the fuse and check for short.

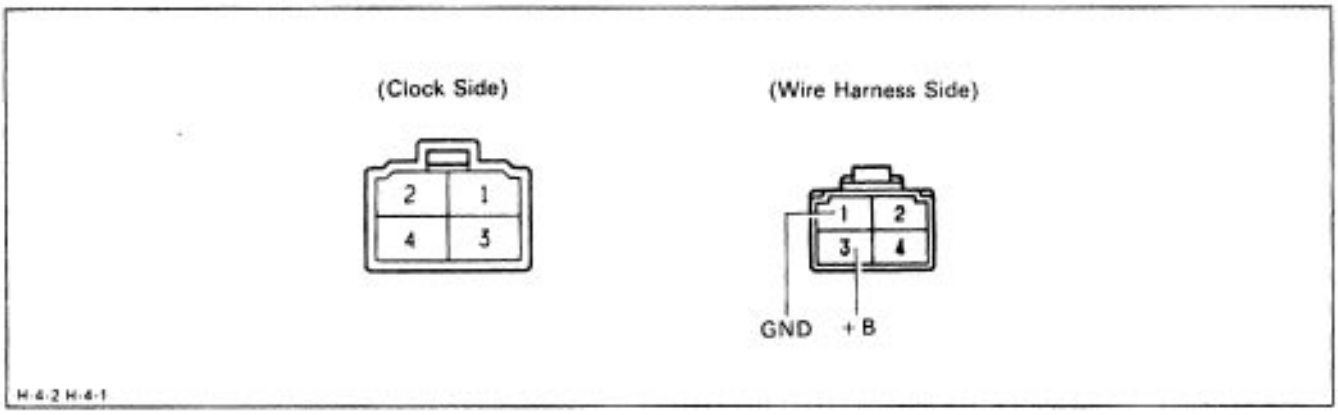
(c) Troubleshoot the clock as follows.

HINT: Inspect the connector on the wire harness side.

Is there battery positive voltage between terminal + B and body ground?
No → Open or short circuit in wire harness between terminal + B and DOME fuse.
Yes
Is there continuity between terminal GND and body ground?
No → Open circuit in wire harness between terminal GND and body ground.
Yes
Replay clock.

2 CLOCK LOSES OR GAINS TIME

(a) Check that the battery positive voltage is 10 – 16 V.
If voltage is not as specified, replace the battery.
(b) Inspect the error of the clock.
Allowable error (per day): ± 1.5 seconds
If the error exceeds the allowable error, replace the clock.
(c) Check that the clock adjusting button is sticking in position and has failed to return.
If the button is not returned, repair or replace the clock.
(d) Troubleshoot the clock as follows.
HINT: Inspect the connector on the wire harness side.



Is there 10 – 16 V between terminal +B and body ground?
Below 10 V → Locate cause and repair, or recharge battery.
Yes
Adjust or replace clock.

– MEMO –

–MEMO –

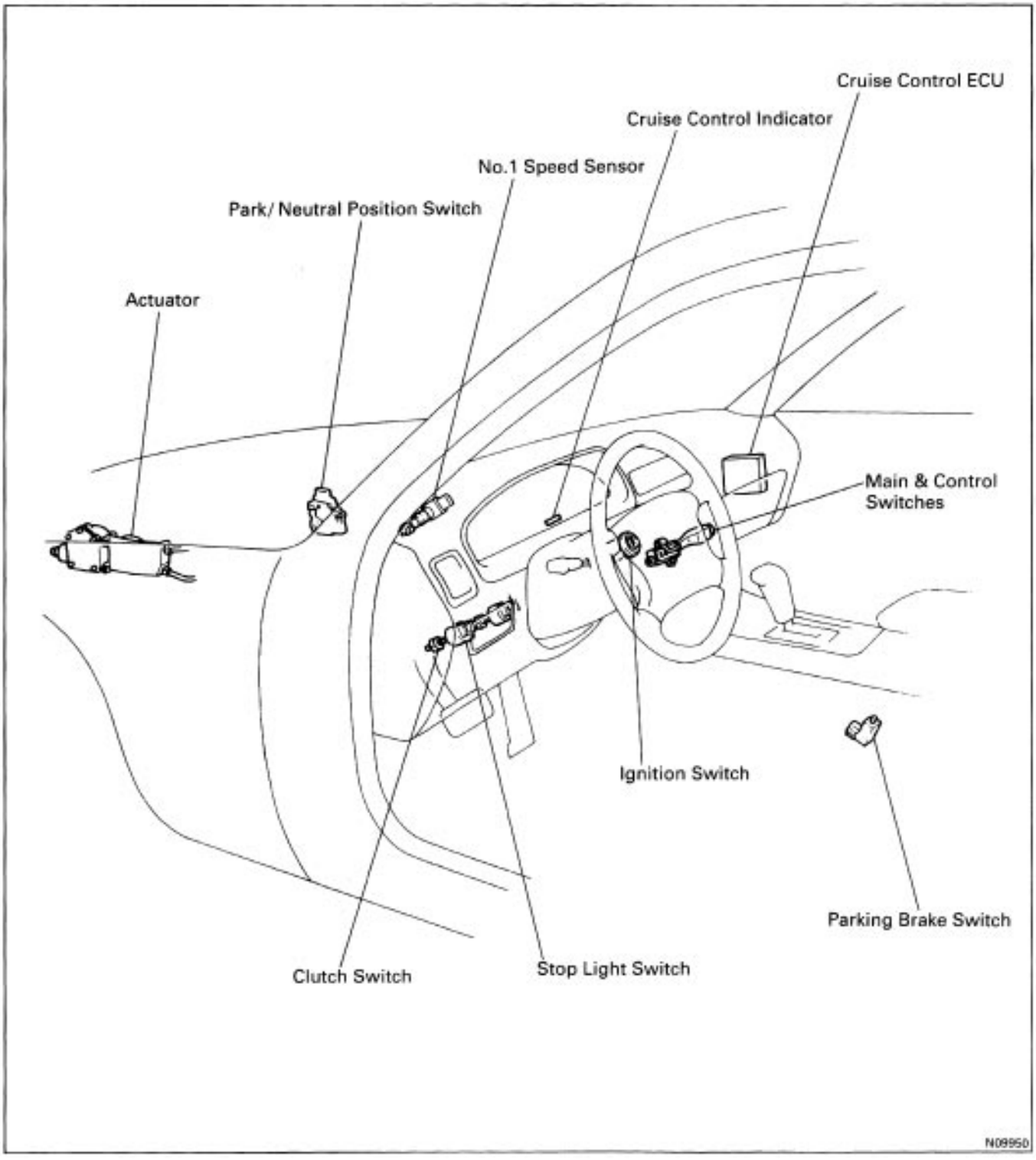
CRUISE CONTROL SYSTEM

DESCRIPTION

The cruise control system is standard, which is convenient when driving continuously at a constant speed. The cruise control ECU controls all cruise control functions.

A diagnosis function is built in. In the unlikely event of a malfunction in the system, the problem area is detected by the cruise control ECU and it causes the power indicator light on the combination meter to blink, warning the driver that there is an abnormality as well as storing a malfunction code in the ECU memory for the service technician to retrieve.

PARTS LOCATION



HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting in accordance with the procedure on the following page.

1. CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

2. CHECK AND CLEAR THE DIAGNOSTIC TROUBLE CODES (PRECHECK)

When there is a problem with the cruise control being canceled or failing to set, first check the diagnostic trouble code if there are any trouble codes stored in memory. If there are trouble codes, make a note of them, then clear them and proceed to "**3** Problem Symptom Confirmation".

3. PROBLEM SYMPTOM CONFIRMATION, 4 SYMPTOM SIMULATION

Confirm the problem symptoms. If the problem does not reappear, be sure to simulate the problem by mainly checking the circuits indicated by the diagnostic trouble code in step **2**, using "Problem Simulation Method".

5. DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes. Determine if the problem is in the sensors or the wire harness.
If a malfunction code is present, proceed to "**6** Diagnostic Trouble Code Chart". If the normal code is output, proceed to "**7** Matrix Chart Problem Symptoms".
Be sure to proceed to "**6** Diagnostic Trouble Code Chart" after **2** and **3** .
If troubleshooting is attempted after only the first malfunction code in the memory is output, errors could be made in the diagnosis.

6. DIAGNOSTIC TROUBLE CODE CHART

If a trouble code is confirmed in the diagnostic trouble code check, proceed to the check procedure indi–cated by the matrix chart for each diagnostic code.

7. MATRIX CHART OF PROBLEM SYMPTOMS

If the normal code is confirmed in the diagnostic trouble code check, perform inspection in accordance with the inspection order in the matrix chart of problem symptoms.

8. CIRCUIT INSPECTION

Proceed with diagnosis of each circuit in accordance with the inspection order in **6** and **7** .
Determine whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECU.

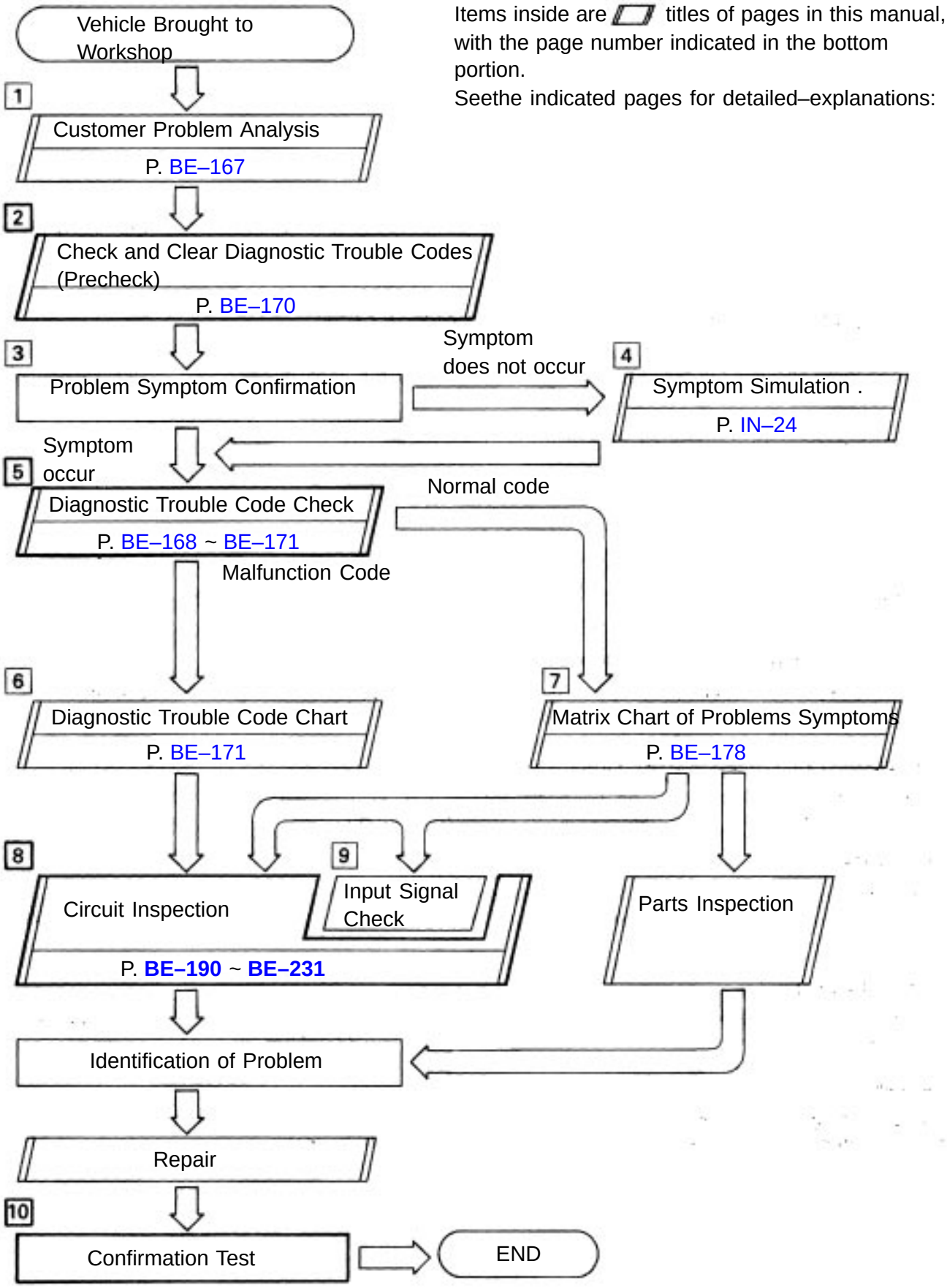
9. INPUT SIGNAL CHECK

Check whether signals from the stop light switch and park/neutral position switch, etc. are input nor–mally to the ECU. This check is indicated in the flow chart for each circuit.

10. CONFIRMATION TEST

After completing repairs, confirm not only that the malfunction is eliminated, but also perform a drive test, etc. to make sure the entire cruise control system is operating correctly.

Items inside are ▱ titles of pages in this manual, with the page number indicated in the bottom portion.
Seethe indicated pages for detailed–explanations:



Step **2 , 5 , 8 , 10** : Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

CRUISE CONTROL Check Sheet

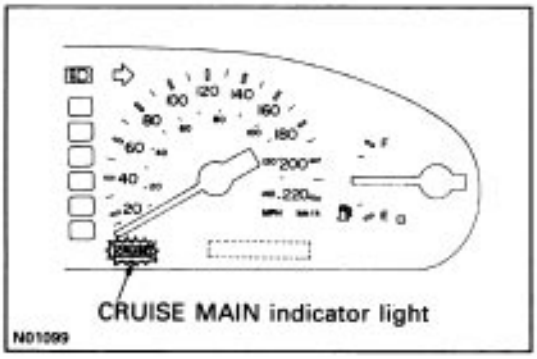
Inspector's Name

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date of Vehicle Brought In	/ /	Odometer Reading	Km Miles

Condition of Problem Occurrence	Date of Problem Occurrence	/ /
	How Often Does Problem Occur ?	☐ Continuous ☐ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	km/h mile/h

Symptoms	☐ Auto cancel occurs	• Driving condition ☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill • After cancel occurred, did the driver activate cruise control again ? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ With parking brake ON ☐ With clutch ON ☐ During N position shift ☐ At 40 km/h (25 mph) or less ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to aeceleration side ☐ Hunting occurs ☐ O/D cut off does not occur ☐ O/D does not return
	☐ Switch malfunction	☐ SET ☐ ACCEL. ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Faulty CRUISE MAIN indicator light	☐ Remains ON ☐ Does not light up ☐ Blinking

Diagnostic Trouble Code Check	1st Time	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

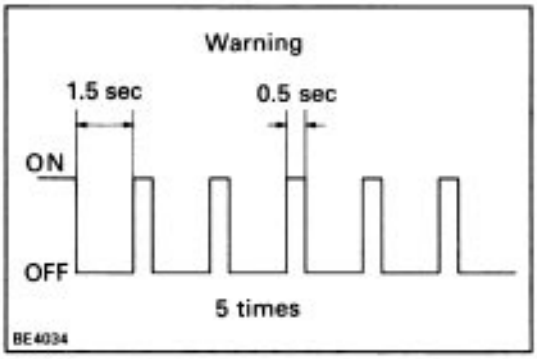


DIAGNOSIS SYSTEM

INDICATOR CHECK

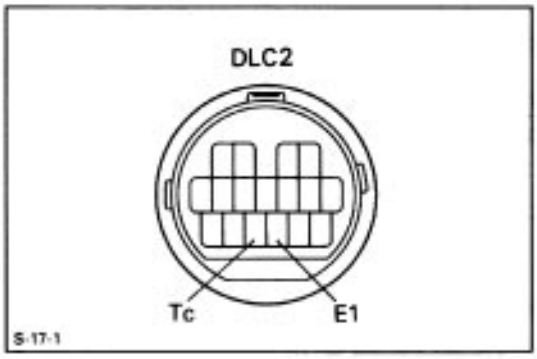
1. Turn the ignition switch to ON.
2. Check that the CRUISE MAIN indicator light comes on when the cruise control main switch is turned on, and that the indicator light goes oft when the main switch is turned OFF.

HINT: If the indicator check result is not normal, pro–ceed to troubleshooting (See page BE–65) for the com–bination meter section.



DIAGNOSTIC TROUBLE CODE CHECK

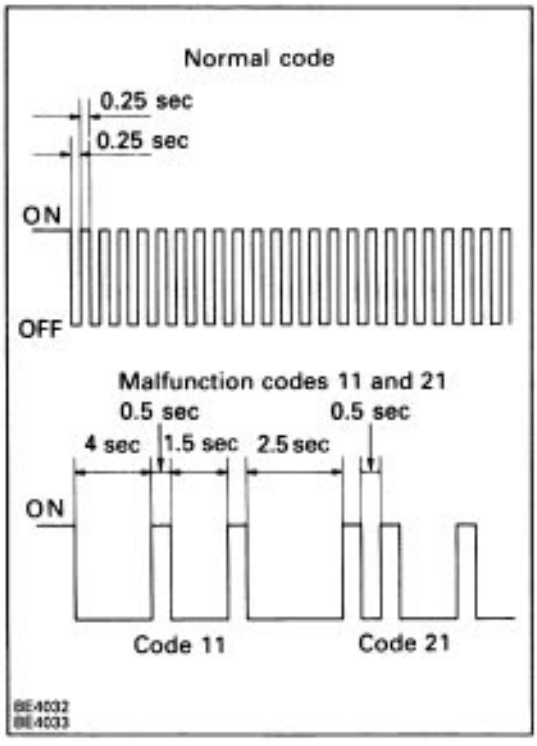
HINT: If a malfunction occurs in the speed sensors or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and blinks the CRUISE MAIN indicator light 5 times to inform the driver of a malfunction. At the same time, the malfunction is stored in memory as a diagnostic trouble code.



Output of Diagnostic Trouble Code

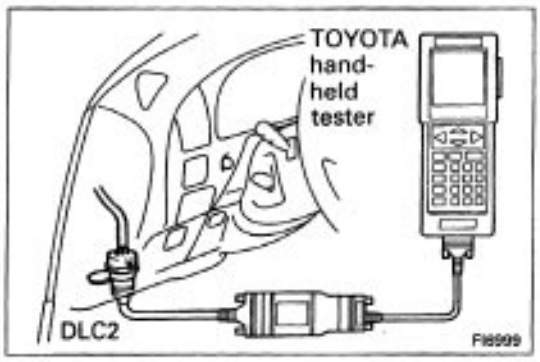
Using diagnosis check wire:

1. Turn the ignition switch ON.
2. Using SST, connect terminals Tc and E_1 of DLC2.
3. Read the diagnostic trouble code on the CRUISE MAIN in–dicator light.
   HINT: If the diagnostic trouble code is not output, in–spect the Tc circuit (See page BE–230).



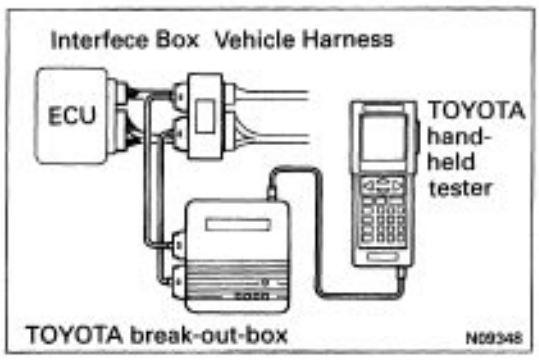
As an example, the blinking patterns for codes; normal, 11 and 21 are shown in the illustration.

4. Check for the problem using the diagnostic trouble code table on the next page.
5. After completing the check, disconnect terminals Tc and E_1, and turn off the display.



ECU DATA MONITOR USING TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA hand–held tester to the DLC2.
2. Monitor the ECU data by following the prompts on the tester screen.
   HINT: TOYOTA hand–held tester had a ”Snapshot” function which records the monitored data.
   Please refer to the TOYOTA hand–held tester operator’s manual for further details.



ECU TERMINAL VALUES MEASUREMENT USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle.
2. Read the ECU input/output values by following the prompts on the tester screen.
   HINT: TOYOTA hand–held tester has a ”Snapshot” function.
   This records the measured values and is effective in the diagnosis of intermittent problems.
   Please refer to the TOYOTA hand–held tester/TOYOTA break out–box operators manual for further details.

DIAGNOSTIC TROUBLE CODE

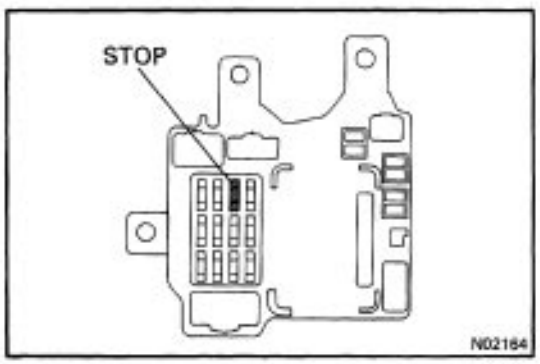
Code No.	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
–		Normal
11		• Duty ratio of 100% output to motor acceleration side. • Overcurrent (short) in motor circuit.
12		• Overcurrent (short) in magnet clutch circuit. • Open in magnet clutch circuit.
13		• Open in actuator motor circuit. • Position sensor detects abnormal voltage. • Position sensor signal value does not change when the motor operates.
21		• Speed signal is not input to the ECU.
*23		• Actual vehicle speed has dropped by 16 km/h (10 mph) or more below the set speed during cruising.
32		• Short in control switch circuit.
34		• Voltage abnormality in control switch circuit.

When 41 code is indicated, replace the cruise control ECU.

41		

HINT: When 2 or more codes are indicated, the lowest numbered code will be displayed first.

(*) When the vehicle speed is reduced on uphill roads, the speed can be set again and driving continued. (This is not a malfunction.)



Diagnostic Trouble Code Clearance

1. After completing repairs the diagnostic trouble code retained in memory can be cleared by removing the STOP fuse for 10 seconds or more, with the ignition switch off.
2. Check that the normal code is displayed after connecting the fuse.

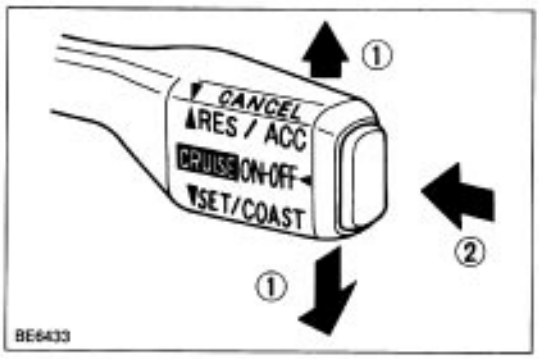
DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code in the table below and proceed to the page given.

Code No.	Circuit Inspection	Page
11	• Actuator Motor Circuit	BE–190
12	• Actuator Magnet Clutch Circuit	BE–192
13	• Actuator Motor Circuit • Actuator Position Sensor Circuit	BE–190 BE–196
21	• Speed Sensor Circuit	BE–198
23	• Actuator Control Cable • Speed Sensor Circuit • Actuator Motor Circuit	BE–232 BE–198 BE–190
32,34	• Control switch circuit. (cruise control switch	BE–202

HINT:

1. If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
2. If the trouble still reappears even though there are no abnormalities in any of the other circuits, then check or replace the Cruise control ECU as the last step.

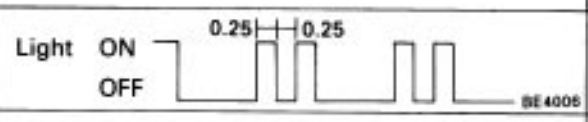
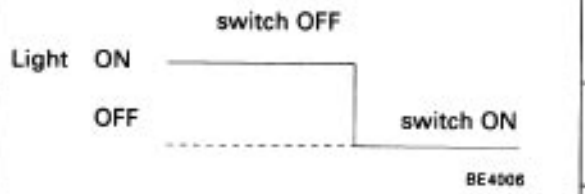
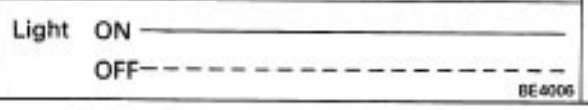


INPUT SIGNAL CHECK

Output of Code

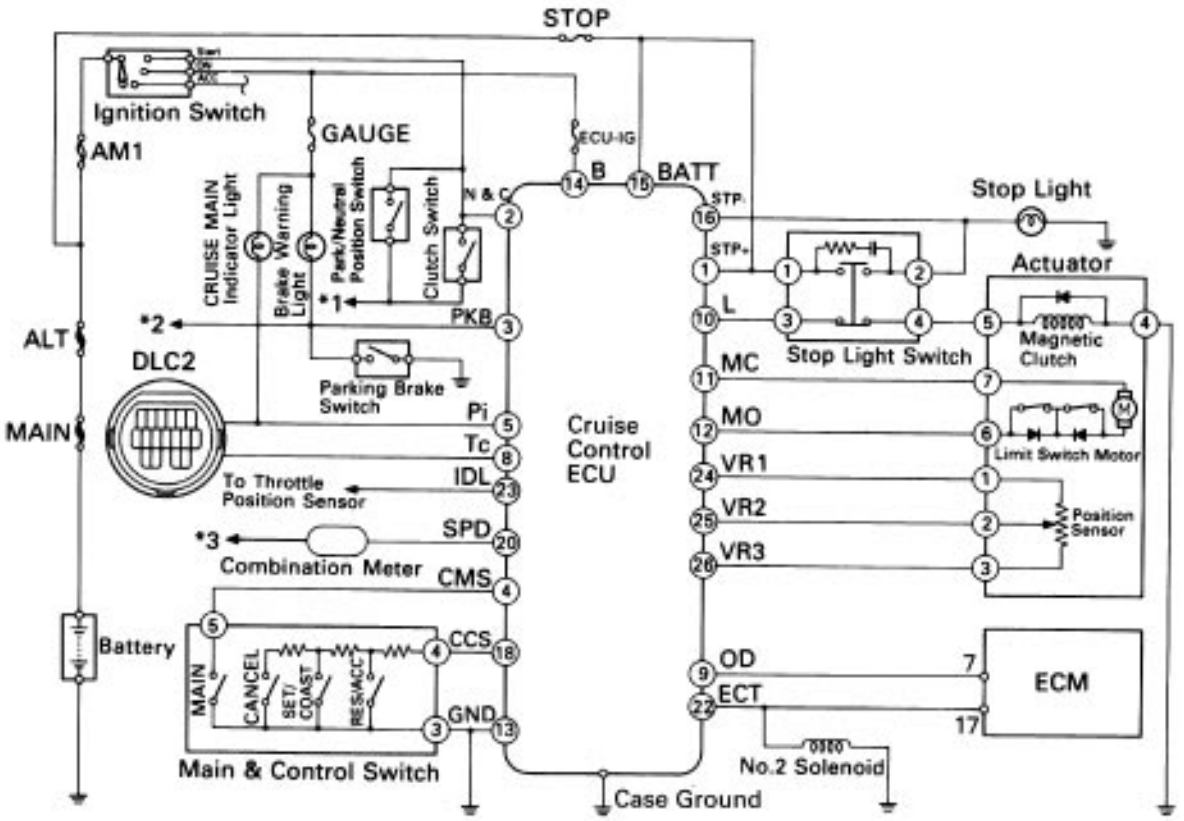
1. (a) For check No. 1 – No.2
   Turn the ignition switch on.
   (b) For check No.3 – No.7
   (1) Turn the ignition switch on.
   (2) Shift to D position.
   (e) For check No.8 – No.9
   (1) Jack up the vehicle.
   (2) Start the engine. (3) shift to D position.
2. Press the control switch to SET/COAST or RES/ACC posi–tion and hold it down **1** or up **1**.
3. Push the main switch on **2**.
4. Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.
5. Turn the SET/COAST or RES/ACC switch oft.
6. Operate each switch as listed in the table below.
7. Read the blinking pattern of the CRUISE MAIN indicator light.
8. After performing the check, turn the main switch oft.

HINT: When two or more signals are input to the ECU, only the lowest–numbered code is displayed.

No.	Operation Method	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
1	Turn SET/COAST switch ON.		SET/COAST switch circuit is norm al.
2	Turn RES/ACC switch ON.		RES/ACC switch circuit is normal.
3	Turn CANCEL switch ON.		CANCEL switch circuit is normal.
4	Turn stop light switch ON. (Depress brake pedal)		Stop light switch circuit is normal.
5	Turn parking brake switch ON.		Par–king brake switch circuit is normal.
6	Turn park/neutral position switch ON. (Shift to N or P position.)		Park/Neutral Position switch circuit is normal.
7	Turn clutch start switch ON. (Depress clutch pedal.)		Clutch switch circuit is normal.
8	Drive at 40 km/h (25 mph) or higher.		Speed sensor is normal.
9	Drive at 40 km/h (25 mph) or below.		

– MEMO –

WIRING DIAGRAM

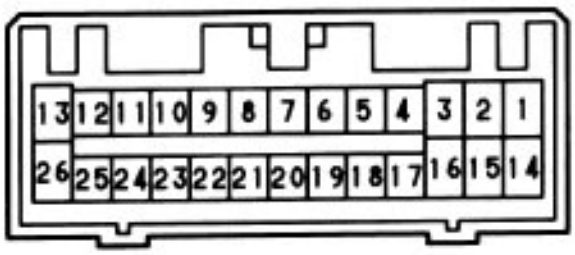


*1 : To Stater Relay
*2 : To Regulator
*3 : To No.1 Speed Sensor

N01272

TERMINALS OF ECU

CRUISE Control ECU



Vd-26-2-B

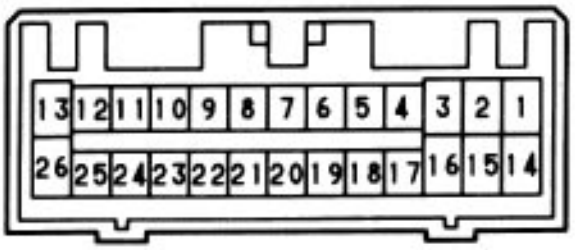
No.	Symbol	Terminal Name	No.	Symbol	Terminal Name
1	STP+	Stop Light Switch	14	B	Power Source
2	N & C	Park/Neutral Position Switch or Clutch Switch	15	BATT	Backup Power Source
3	PKB	Parking Brake Switch	16	STP-	Stop Light Switch
4	CMS	Cruise Main Switch	17	–	–
5	Pi	CRUISE MAIN Indicator Light	18	CCS	CRUISE Control Switch
6	–	–	19	–	–
7	–	–	20	SPD	Speed Sensor
8	Tc	DLC2	21	–	–
9	OD	ECM	22	ECT	Electronically Controlled Transaxle No. 2 Solenoid
10	L	Magnet Clutch (Actuator)	23	IDL	Throttle Position Sensor
11	MC	Motor (Actuator)	24	VR1	Position Sensor (Actuator)
12	MO	Motor (Actuator)	25	VR2	Position Sensor (Actuator)
13	GND	Ground	26	VR3	Position Sensor (Actuator)

STANDARD VALUE OF ECU TERMINAL

Terminals	Symbols	Wiring Color	Condition	Standard Value
C19-1 ← → C19-13	STP+ ← → GND	G-R ← → W-B	Always	10 – 14 V
C19-2 ← → C19-13	N&C ← → GND	B ← → W-B	IG ON. Depress clutch pedal or P or N positions	Below 1 V
			IG ON. Release clutch pedal and other positions.	10 – 14 V
C19-3 ← → C19-13	PKB ← → GND	R-W ← → W-B	IG ON. Parking brake is operating.	Below 1 V
			IG ON. Parking brake is not operating.	10 – 14 V
C19-4 ← → C19-13	CMS ← → GND	W-L ← → W-B	IG ON. Main switch hold ON. (Indicator light ON)	Below 1 V
			IG ON. Main switch OFF. (Indicator light OFF.)	10 – 14 V
C19-5 ← → C19-13	Pi ← → GND	G-L ← → W-B	IG ON. Main switch ON. Main indicator light ON.	Below 1 V
			IG ON. Main switch OFF. Main indicator light OFF.	10 – 14 V
C19-8 ← → C19-13	TC ← → GND	LG-R ← → W-B	Ignition switch ON.	10 – 14 V
C19-9 ← → C19-13	OD ← → GND	Y-B ← → W-B	Ex. during cruise control driving.	10 – 14 V
			During cruise control driving and O/D switch OFF (3rd driving)	Below 1 V
C19-10 ← → C19-13	L ← → GND	G-B ← → W-B	During cruise control driving.	10 – 14 V
			Ex. during cruise control driving.	Below 1 V
C19-11 ← → C19-13	MC ← → GND	R-B ← → W-B	During cruise control driving and SET/COAST Switch hold ON.	8 – 14 V
			Ex. during cruise control driving.	Below 1 V
C19-12 ← → C19-13	MO ← → GND	R-G ← → W-B	During cruise control driving.	8 – 14 V
			Ex. during cruise control driving.	Below 1 V
C19-13 ← → Body Ground	GND ← → Body Ground	W-B ← → Body Ground	Always	Below 1 V
C19-14 ← → C19-13	B ← → GND	B-R ← → W-B	Ignition switch ON.	10 – 14 V
C19-15 ← → C19-13	BATT ← → GND	G-R ← → W-B	Always	10 – 14 V

Terminals	Symbols	Wiring color	Condition	Standard Value
C19-16 ← → C19-13	STP ← → GND	G-W ← → W-B	Depress brake pedal.	10 – 14 V
			Release brake pedal.	Below 1 V
C19-18 ← → C19-13	CCS ← → GND	W ← → W-B	IG ON. Main switch ON. Switch neutral position.	10 – 14 V
			IG ON. Main switch ON. CANCEL Switch hold ON.	4.2 – 8.7 V
			IG ON. Main switch ON. SET/COAST Switch hold ON.	2.5 – 6.2 V
			IG ON. Main switch ON. RESUME/ACCEL Switch hold ON.	0.8 – 3.6 V
C19-20 ← → C19-13	SPD ← → GND	V-Y ← → W-B	English start. Stop a vehicle.	4.5 – 5.5 V
			During driving.	Repeatedly chages from Below 1V to 4.5 – 5.5 V
C19-22 ← → C19-13	ECT ← → GND	V-R ← → W-B	During cruise control. driving. O/D Switch ON.	Below 1 V
			During cruise control driving. O/D Switch OFF (3rd driving)	10 – 14 V
C19-23 ← → C19-13	IDL ← → GND	L ← → W-B	IG ON. Throttle valve fully opened.	10 – 14 V
			IG ON. Throttle valve fully closed.	Below 1 V
C19-24 ← → C19-13	VR1 ← → GND	L ← → W-B	Ignition switch ON.	4.5 – 5.5 V
C19-25 ← → C19-26	VR2 ← → VR3	L-B ← → P	During cruise control driving.	1.1 – 4.5 V
			IG ON. Control plate fully opened.	3.8 – 4.5 V
			IG ON. Control plate fully closed.	1.1 – 1.4 V
C19-26← → C19-13	VR3 ← → GND	L-R ← → W-B	Always	Below 1 V

CRUISE Control ECU



Vd-26-2-B

MATRIX CHART OF PROBLEM SYMPTOMS

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs (re-appears), perform troubleshooting for each problem symptom, checking the circuits for each symptom in the order given in the table below. Proceed to the page located for each circuit.

See Page / Suspect Area / Symptom	BE–190 BE–192 BE–196 Actuator	BE–198 Speed Sensor Circuit	BE–202 Control Switch Circuit (Cruise Control Switch)	BE–206 Stop Light Switch Circuit	BE–210 Idle Switch Circuit (main throttle position sensor)	BE–212 Electrically Controlled Transaxle Communication Circuit	BE–216 Parking Brake Switch Circuit
SET not occurring or CANCEL occurring. (Diag. trouble code is Normal)	8	2	3	4			7
SET not occurring or CANCEL occurring. Diag trouble code does not output.							
Actual vehicle speed deviates above or below the set speed.	4	2			5	3	
Gear shifting is frequent between 3rd and OD when driving on uphill road. (Hunting)						1	
Cruise control not cancelled, even when parking brake pedal is depressed.	3			1			
Cruise control not cancelled, even when parking brake is operating.	3						1
Cruise control not cancelled, even when clutch pedal is depressed.	3						
Cruise control not cancelled, even when transaxle is shifted to "N" position.	3						
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	3		1				
SET possible at 44 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	3	1					
Poor response in ACCEL and RESUME modes.	3					2	
O/D does not Resume, even though the road is not uphill.						1	
Diagnostic trouble code memory is erased.							
Diagnostic trouble code is not output, or is output when it should not be.							
Cruise MAIN indicator light remains ON or fall to light up.	Combination meter troubleshooting on page BE–65.						

HINT:

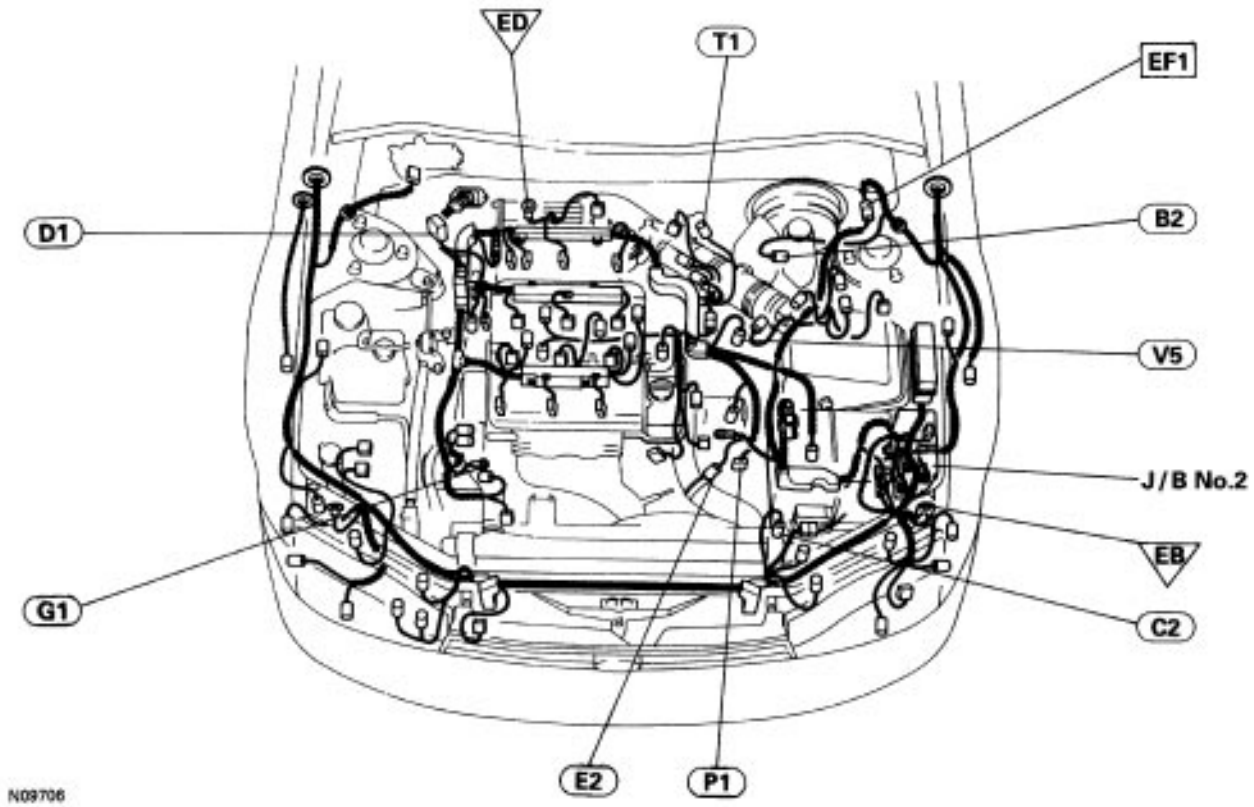
1. If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
2. If the trouble still reappears even though there are no abnormalities in any of the other circuits, then check or replace the cruise control ECU as the last step.

See Page / Suspect Area / Symptom	Park/Neutral Position Switch Circuit (BE–218)	Clutch switch Circuit (BE–220)	ECU Power Source Circuit (BE–222)	Back–up Power Source Circuit (BE–226)	Main Switch Circuit (Cruise Control Switch) (BE–228)	TC Terminal Circuit (BE–230)	Actuator Control Cable (BE–232)	Cruise Control ECU (IN–36)
SET not occurring or CANCEL occurring. (Diag. trouble code is Normal)	5	6			1			9
SET not occurring or CANCEL occurring. Diag trouble code does not output.			1					2
Actual vehicle speed deviates above or below the set speed.							1	6
Gear shifting is frequent between 3rd and OD when driving on uphill road. (Hunting)								3
Cruise control not cancelled, even when parking brake pedal is depressed.								2
Cruise control not cancelled, even when parking brake is operating.								2
Cruise control not cancelled, even when clutch pedal is depressed.		1						2
Cruise control not cancelled, even when transmission is shifted to ”N” position.	1							2
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)								2
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.								2
Poor response in ACCEL and RESUME modes.							1	4
O/D does not Resume, even though the road is not uphill.								2
Diagnostic trouble code memory is erased.				1				2
Diagnostic trouble code is not output, or is output when is should not be.						1		2
Cruise MAIN indicator light remains ON or fall to light up.	Combination meter troubleshooting on page BE–65							

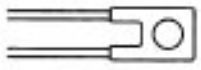
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1MZ-FE

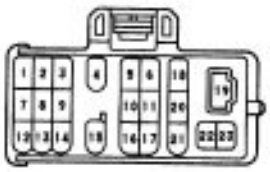


G1
Generator



B2
Brake Fluid Level Switch

D1
Data Link Connector 1



C2
Cruise Control Actuator

E2
Solenoid

P1
Park/Neutral Position Switch (A/T)

T1
Throttle Position Sensor

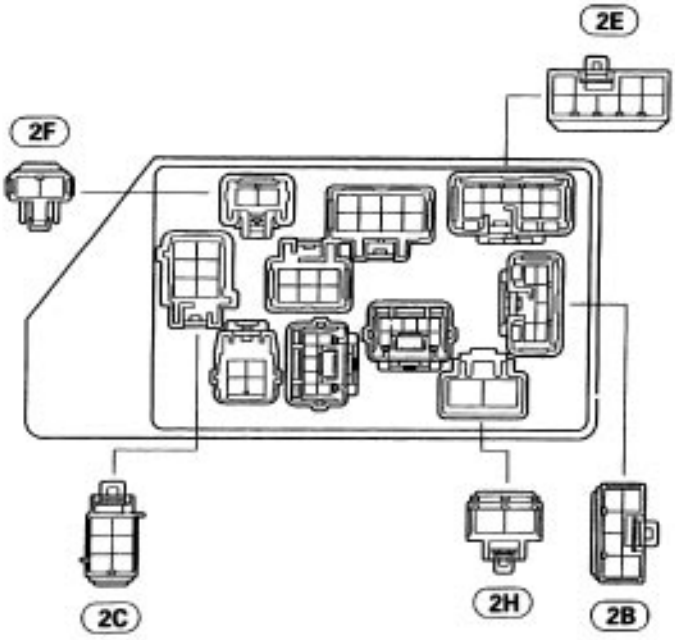
V5
Vehicle Speed Sensor

1 MZ–FE

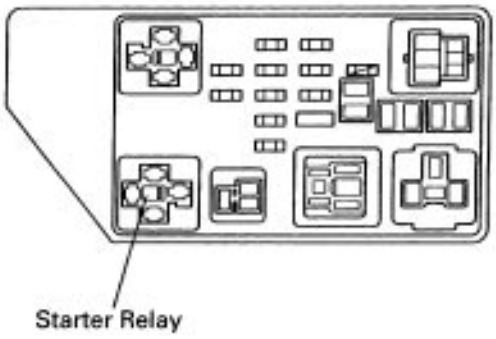
EF1

Ifg-4-1 Ifg-4-2

J/B No.2

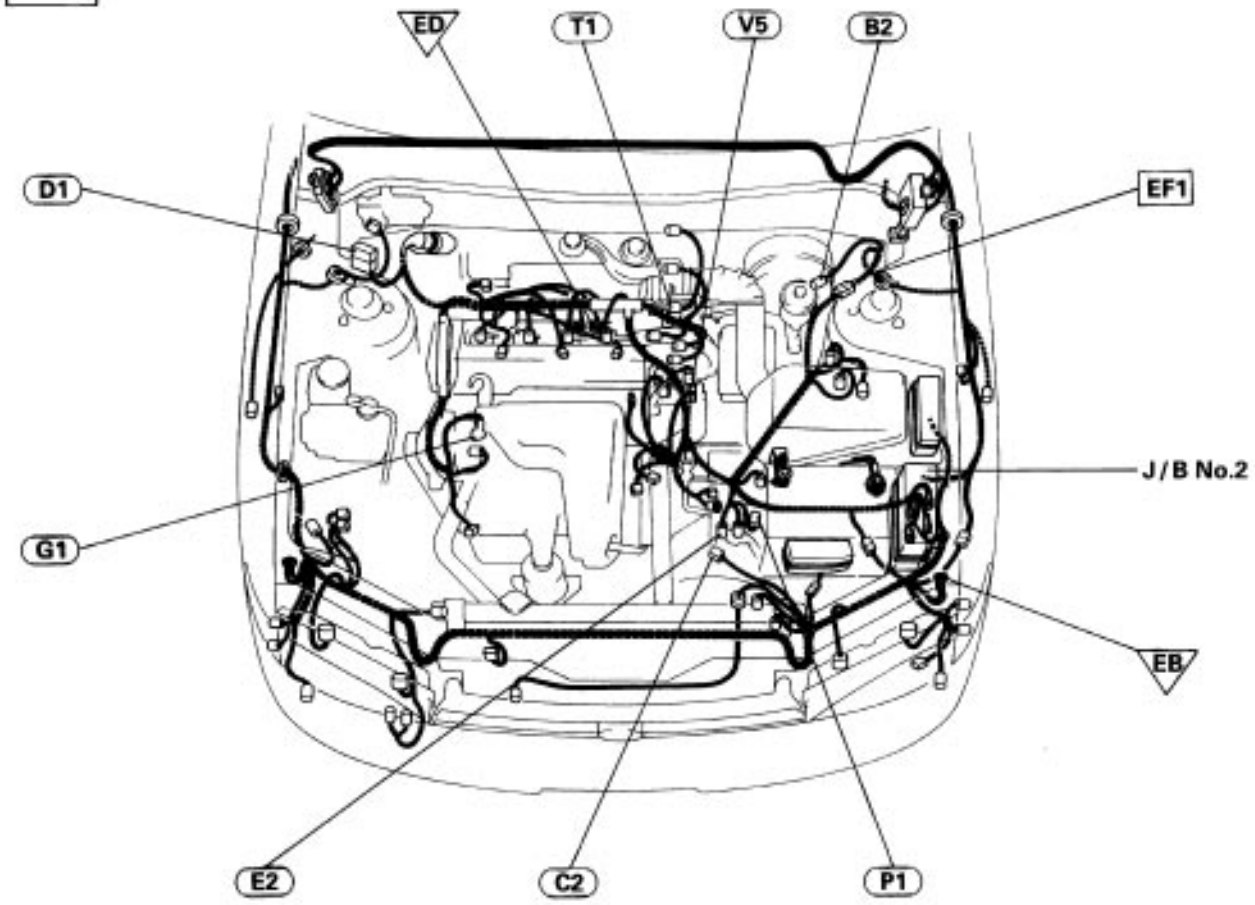


N09716



N09707

5S–FE



N09708

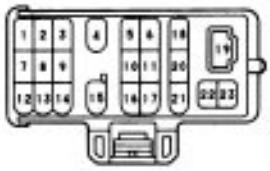
G1
Generator

N09951

B2
Brake Fluid
Level Switch

Ie-2-1-D

D1
Data Link Connector 1



Iej-23-1-A

C2
Cruise
Control Actuator

Ie-7-1

E2
Solenoid

Ie-3-1-G

P1
Park/Neutral Position
Switch (A/T)

Ie-10-1-B

T1
Throttle
Position Sensor

IS-4-1-C

V5
Vehicle Speed Sensor

Ie-3-1-G

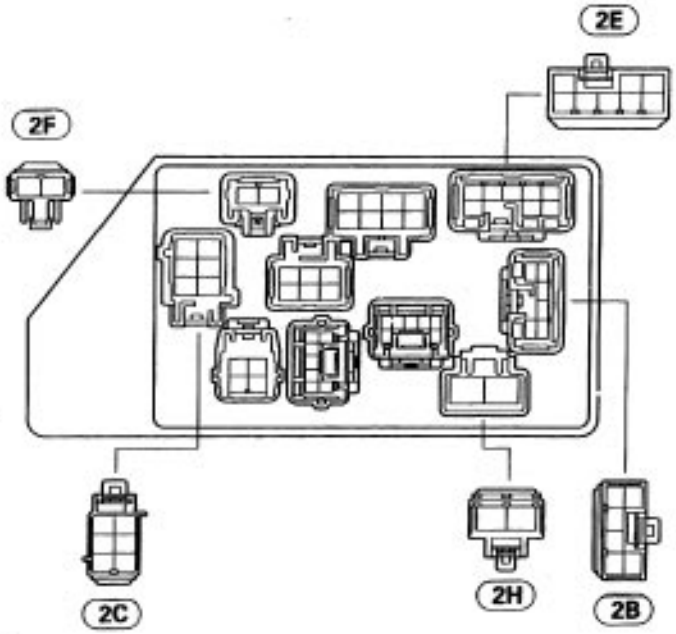
5S–FE

EF1

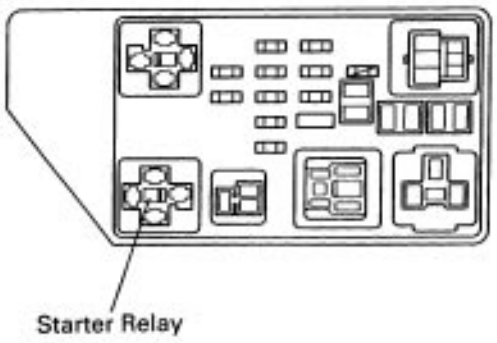
Fig-4-1

Fig-4-2

J/B No.2

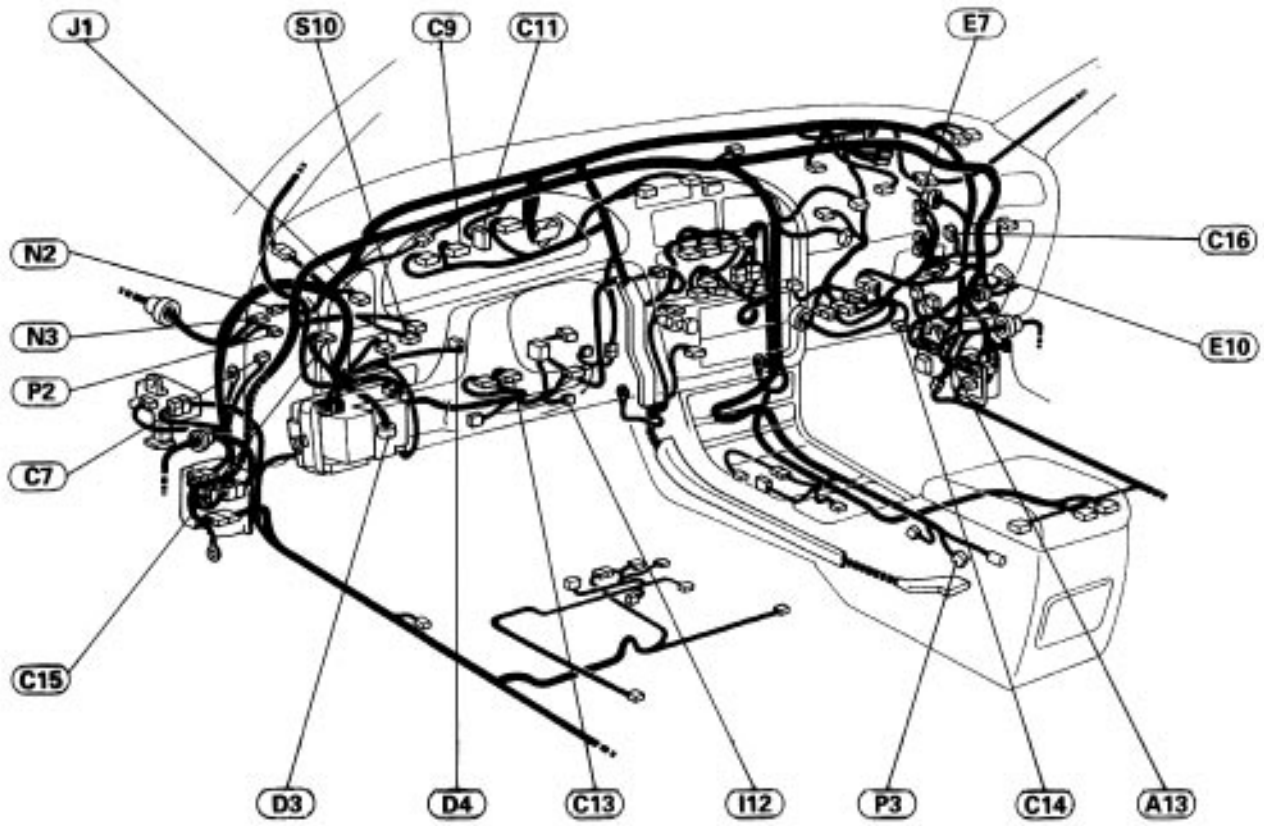


N09716



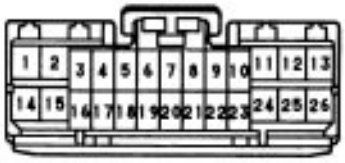
N09707

Location of Connectors in Instrument Panel



N09709

A13
ABS ECU

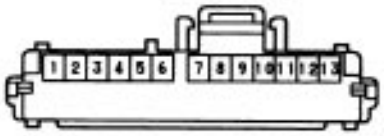


mn-26-1

C7
Clutch Start Switch (M/T)

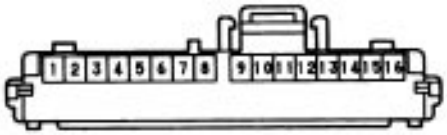
e-2-1

C11
Combination Meter



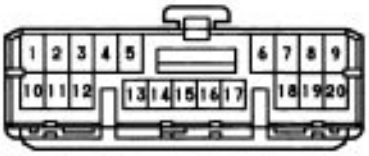
j-13-1-A

C9
Combination Meter



j-16-1

C13
Combination Switch



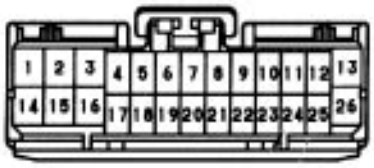
m-20-1

C15
Cruise Control Clutch Switch

e-2-1-H

C16

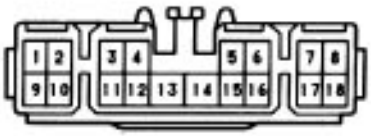
Cruise Control ECU



mn-26-1-B

D4

Daytime Running Light Relay (Canada)



e-18-1

I12

Ignition Switch

e-10-1

N2

Noise Filter

g-2-2

N3

Noise Filter

g-2-1

P2

Parking Brake Switch 1MZ-FE

e-1-2-A

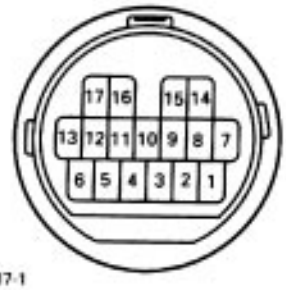
P3

Parking Brake Switch 5S-FE

e-1-1

D3

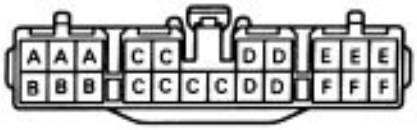
DLC2



S-17-1

J1

Junction Connector



e-22-1-A

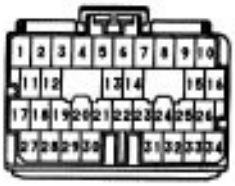
S10

Stop Light Switch

eg-4-1

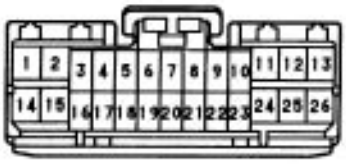
E7

1MZ-FE



n-34-1

5S-FE (A/T)



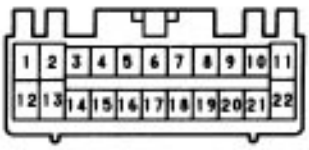
mn-26-1

E10

1MZ-FE

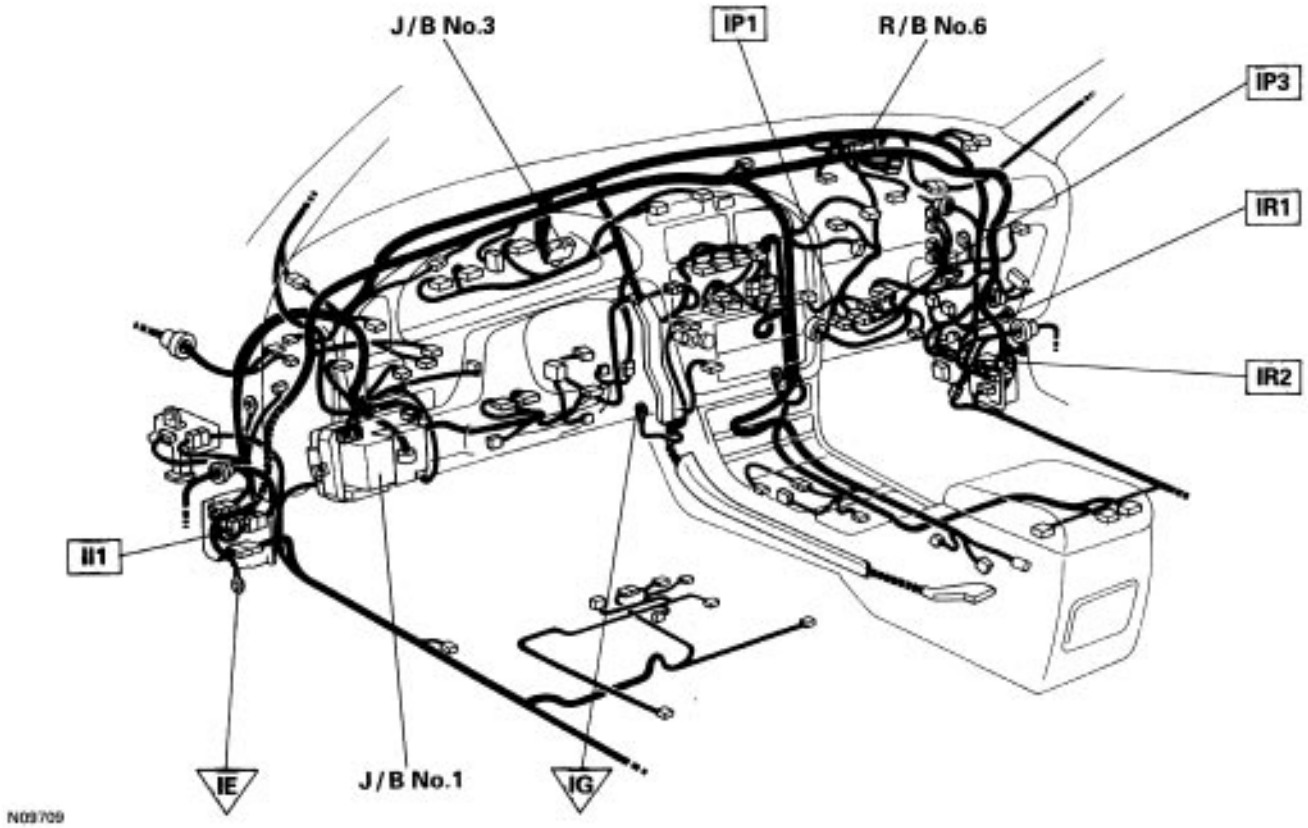
n-28-1

5S-FE (A/T)

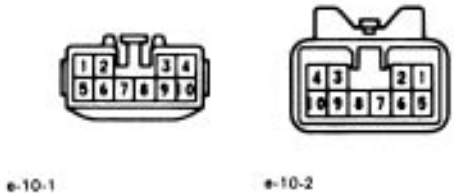


mn-22-1

Location of Connectors in Instrument Panel

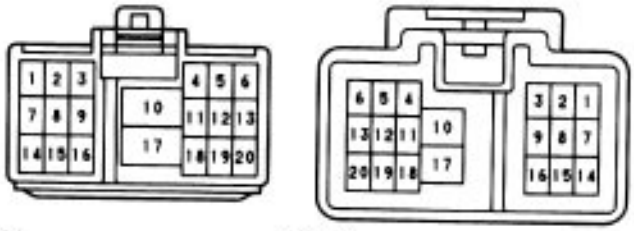


II1



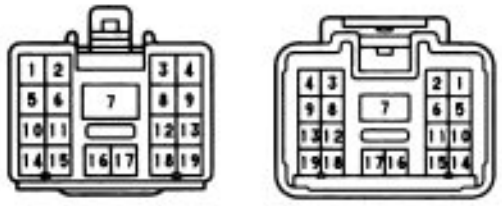
e-10-1 e-10-2

IP1



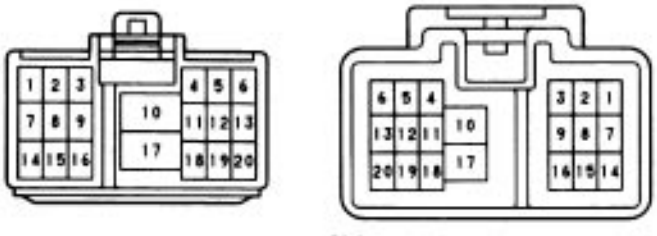
e-20-1-B e-20-2-B

IP3

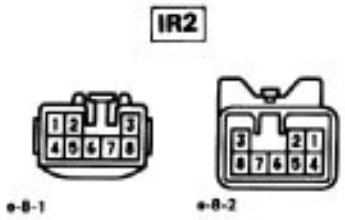


ef-19-1 ef-19-2

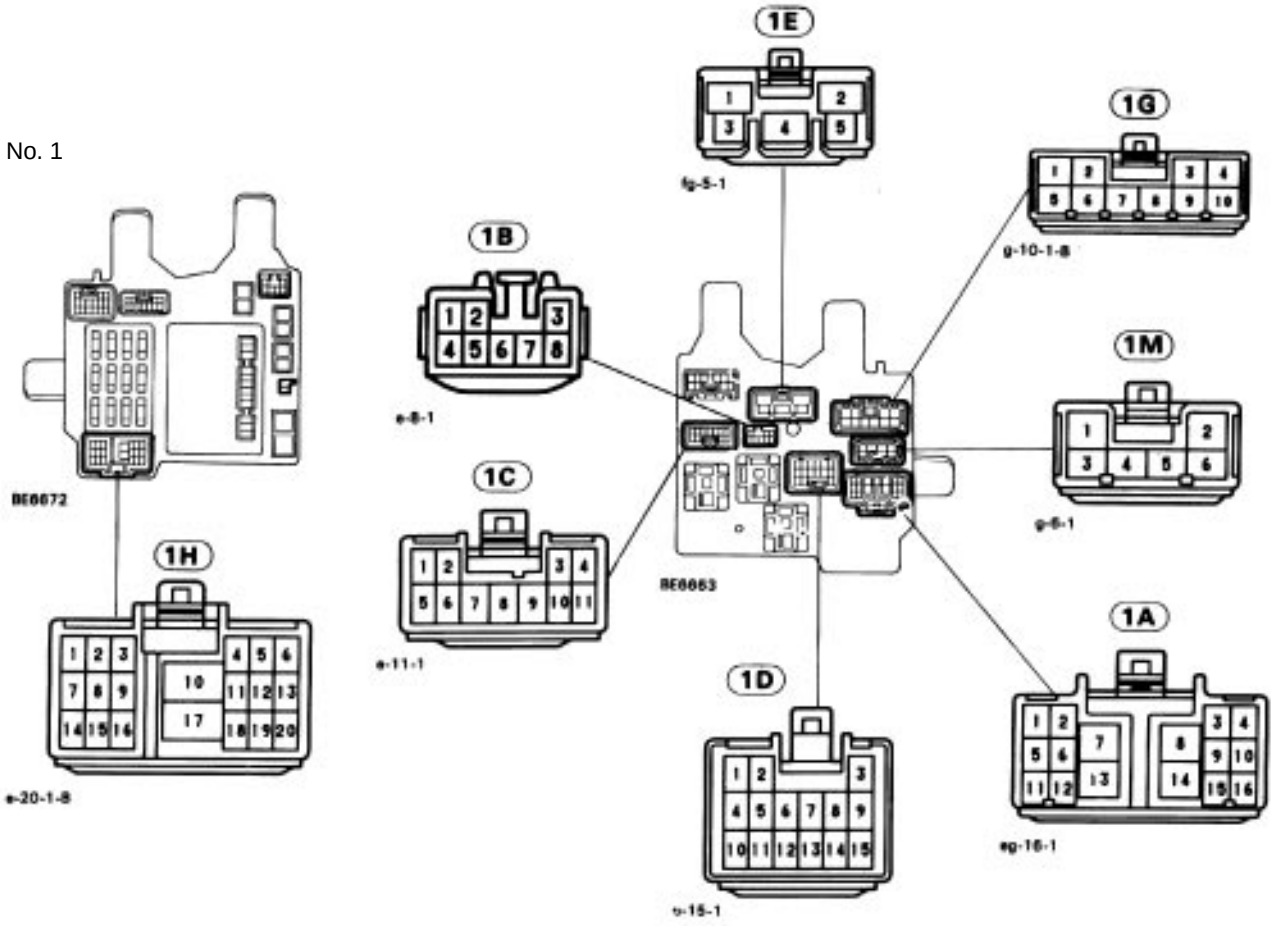
IR1



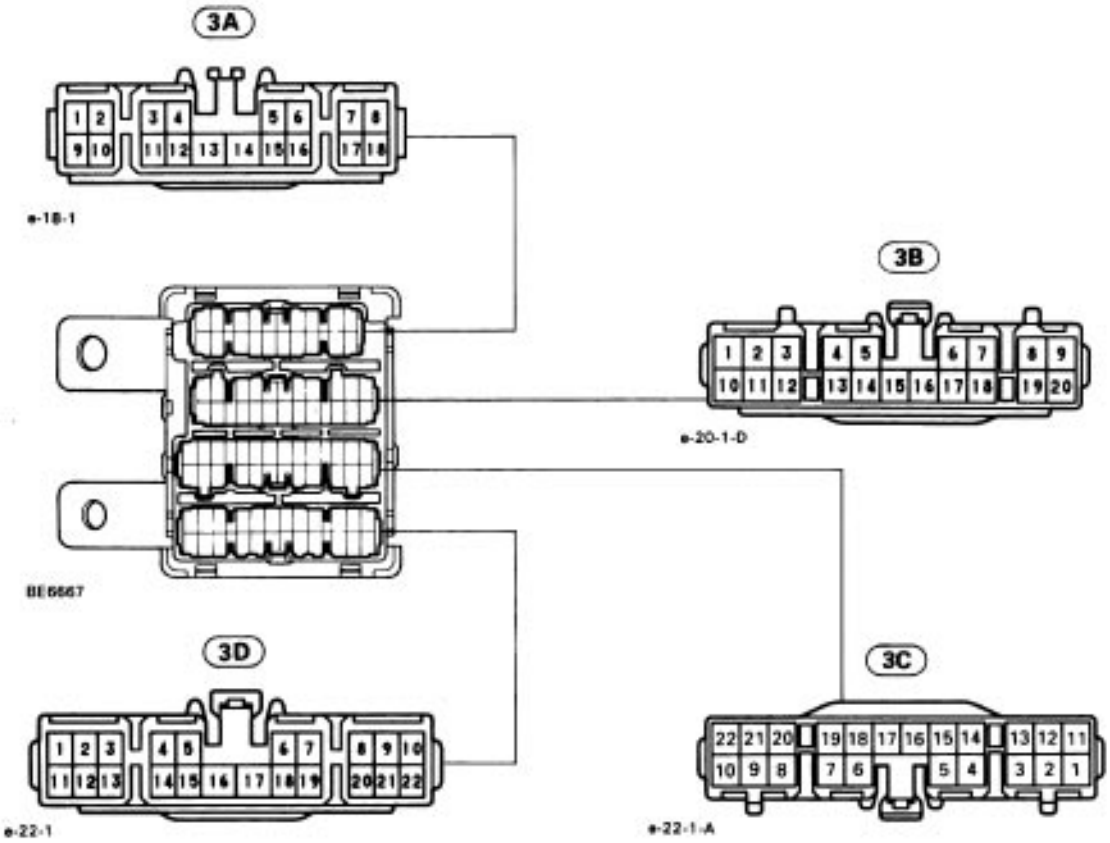
e-20-1-B e-20-2-B


IR2
e-8-1
e-8-2

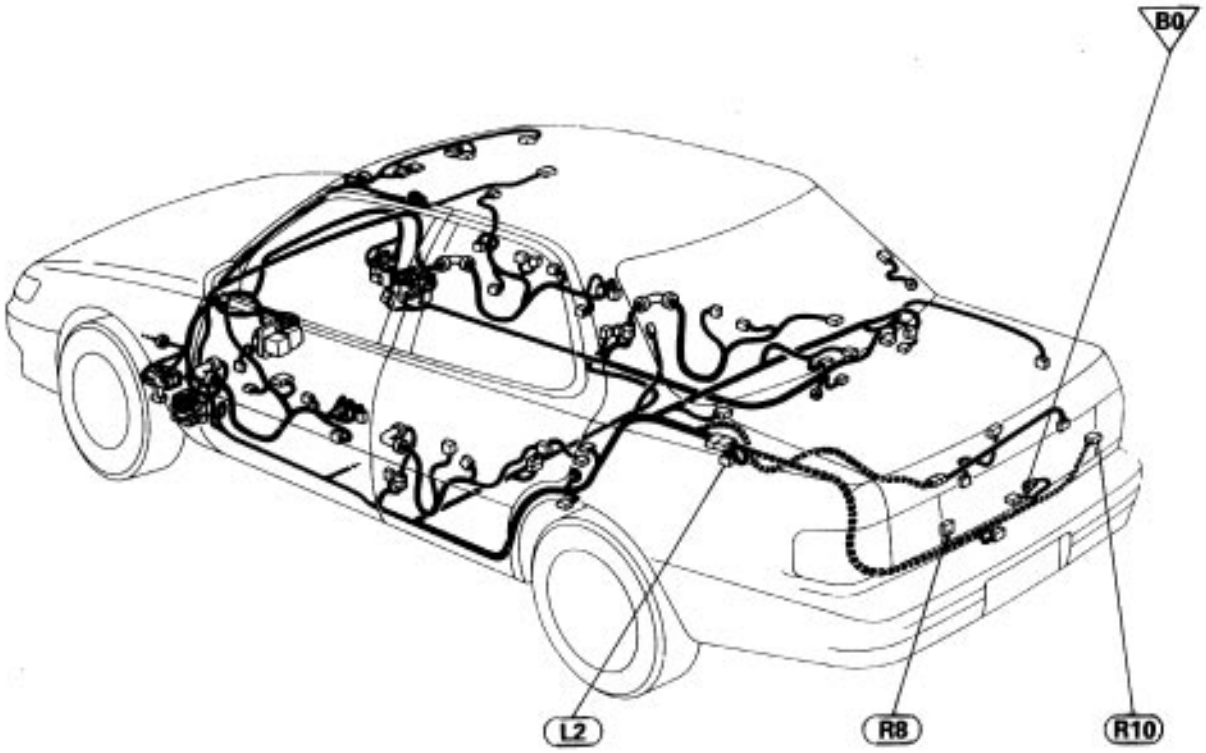
J/B No. 1


1E
fg-5-1
1G
g-10-1-8
1B
e-8-1
1M
g-6-1
1C
e-11-1
BE6663
1H
e-20-1-8
1A
eg-16-1
1D
e-15-1

JI6 No.3



Location of Connectors in Body



N09710

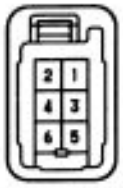
L2

Light Failure Sensor

e-12-1

R8 R10

Stop Light LH, RH



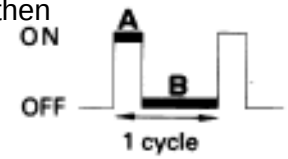
e-6-2-E

CIRCUIT INSPECTION

DTC 11 13 Actuator Motor Circuit

CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the EC
U. Acceleration and deceleration signals are
transmitted by changes in the Duty Ratio (See note below).
Duty Ratio
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then
Duty Ratio = AA B x 100 (®o)



BE4056

Code No.	Diagnosis	Trouble area
11	• Duty ratio of 100% output to motor acceleration side. • Overcurrent (short) in motor circuit.	• Cruise control actuator motor. • Harness or connector between actuator motor and ECU. • ECU
13	• Open in actuator motor circuit.	

DIAGNOSTIC CHART

1 Check actuator motor. — NG → Replace actuator assembly.

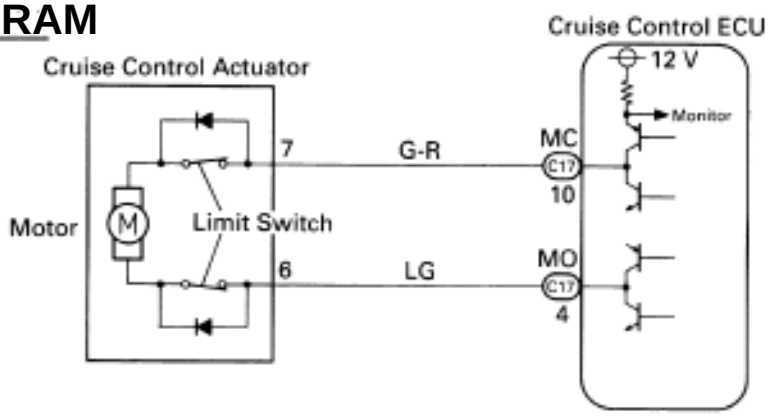
OK ↓

2 Check harness and connector between cruise control ECU and actuator motor. — NG → Repair or replace harness or connector.

OK ↓

Proceed to next circuit inspection shown on matrix chart (See page BE–178). However, when diag. trouble code 11, 13 is displayed, check and replace Cruise Control ECU.

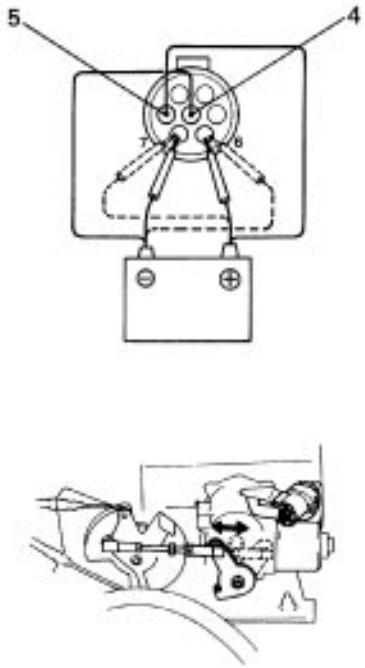
WIRING DIAGRAM



BE3946

INSPECTION PROCEDURE

1 **Check actuator motor.**



P
1. Remove cruise control actuator.
2. Disconnect actuator connector.

C
1. Connect positive **+** lead to terminal 5 and negative **–** lead to terminal 4 of actuator connector. (Magnet clutch ON)
2. When battery positive voltage is applied to each terminals of actuator connector, check that the control plate moves smoothly without hesitating.

○—○ Connect

Terminal / Moving direction	Positive ⊕	Negative ⊖	6	7
Acceleration side	○	○	○	○
Deceleration side	○	○	○	○

3. With the motor rotating as in 2, check that the motor is stopped by limit switches when the control plate moves to fully opened or fully closed position.

OK

NG → **Replace actuator assembly.**

2 **Check harness and connector between cruise control ECU and actuator motor. (See page IN–31)**

OK

NG → **Repair or replace harness or connector.**

Proceed to next circuit inspection shown on matrix chart (See page BE–178).
However, when diag. trouble code 11, 13 is displayed, check and replace Cruise Control ECU.

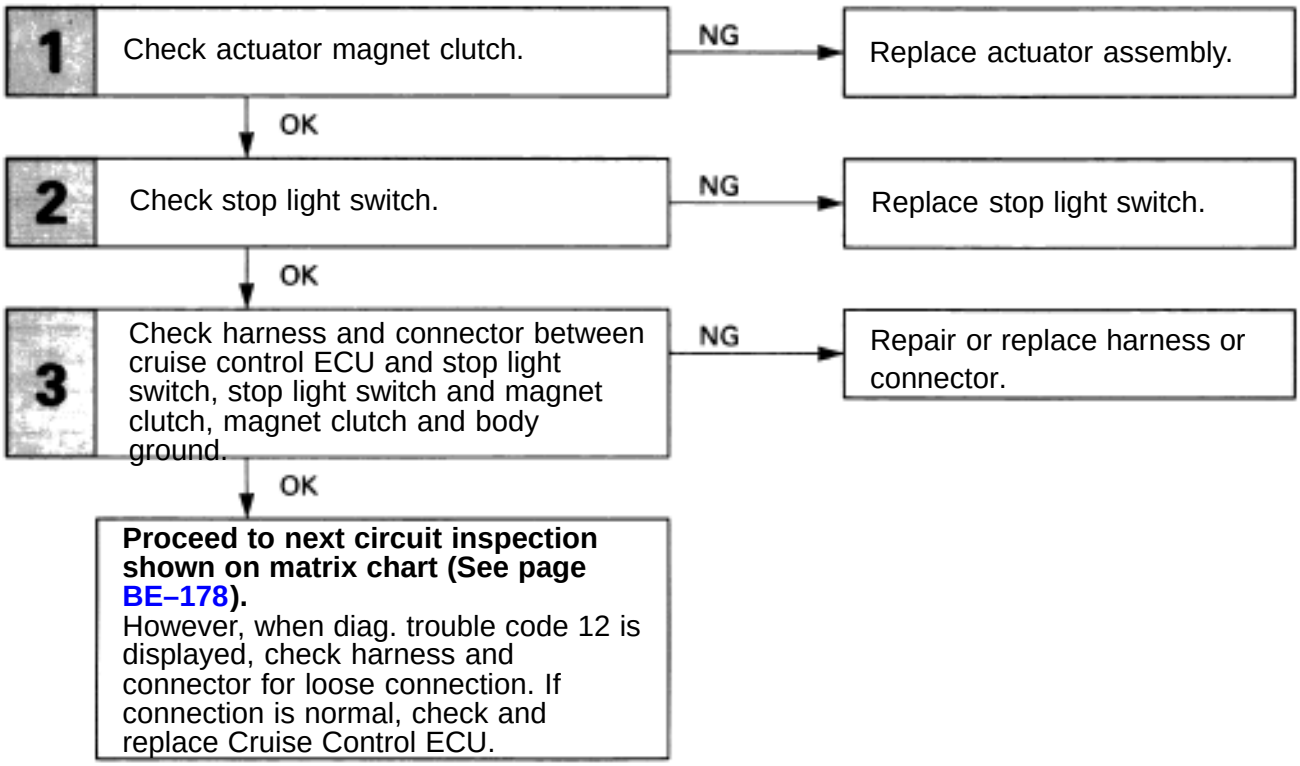
DTC 12 Actuator Magnet Clutch Circuit

CIRCUIT DESCRIPTION

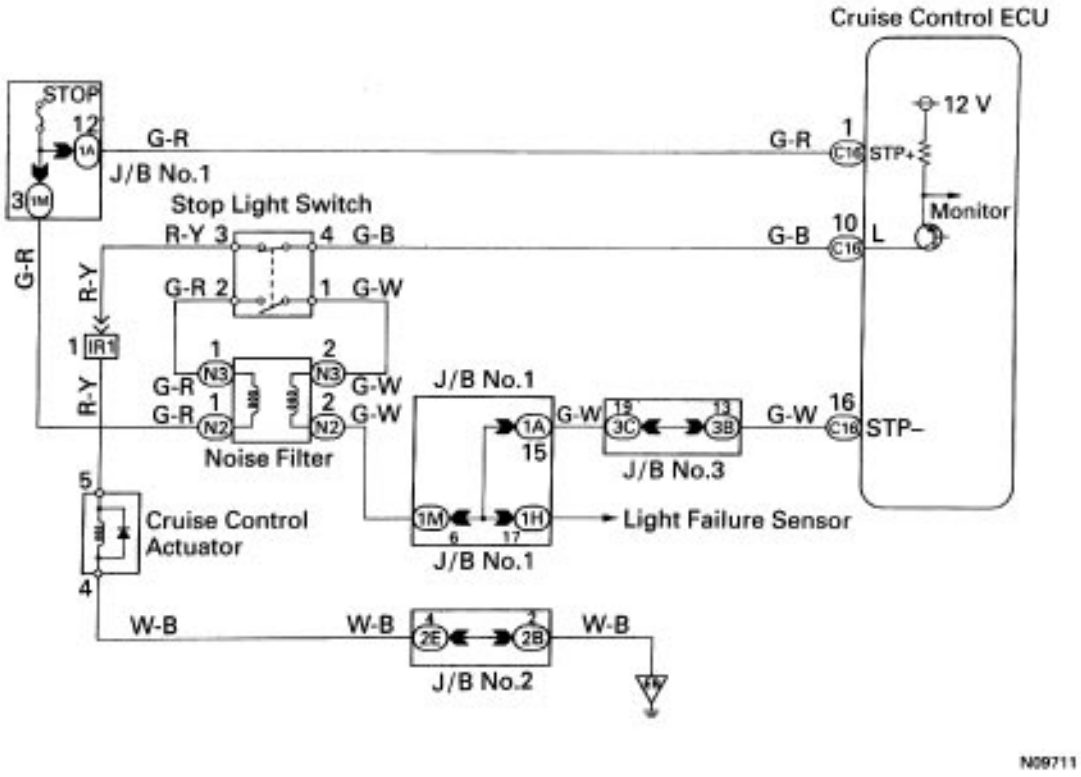
This circuit turns on the magnet clutch inside the actuator during cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during cruise control, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stoplight switch turns on, supplying electrical power to the stoplight. Power supply to the magnet clutch is mechanically cut and the magnet clutch is turned OFF.
When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (9 mph), the ECU turns the magnet clutch OFF. If the vehicle speed later drops to within 10 km/h (6 mph) above the set speed, then cruise control at the set speed is resumed.

Code No.	Diagnosis	Trouble area
12	• Overcurrent (short) in magnet clutch circuit. • Open in magnet clutch circuit.	• Cruise control magnet clutch. • Harness or connector between ECU and magnet clutch, magnet clutch and body ground. • ECU

DIAGNOSTIC CHART

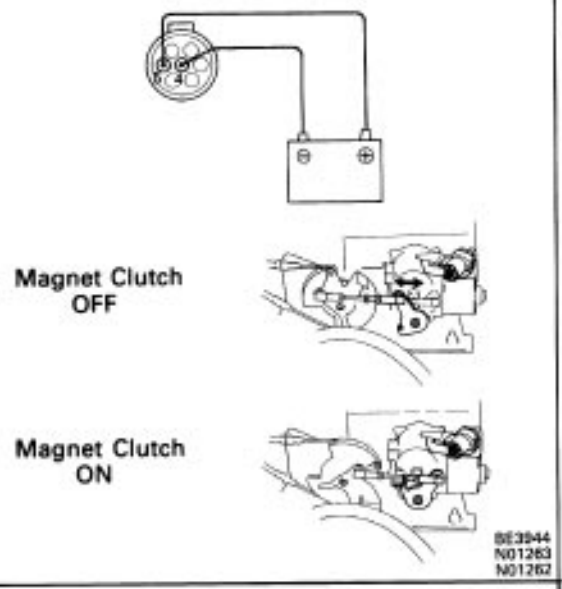


WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check actuator magnet clutch.



P 1. Remove cruise control actuator.
2. Disconnect actuator connector.

C Move the control plate by hand.

OK **Control plate moves. (Magnet clutch off)**

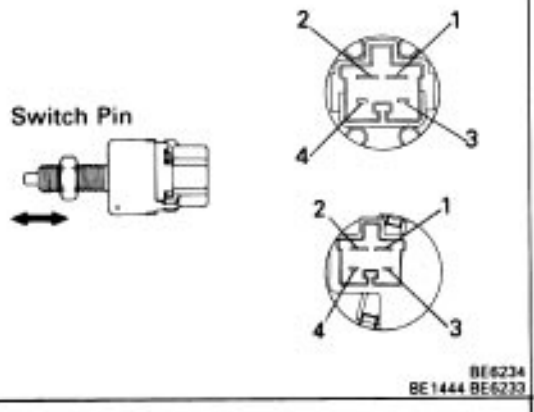
C 1. Connect positive **+** lead to terminal 5 and negative **–** lead to terminal 4 of actuator connector.
2. Move the control plate by hand.

OK **Control plate doesn't move. (Magnet clutch on)**

OK

NG **Replace actuator assembly.**

2 Check stop light switch.



P Disconnect stop light switch connector.

C Check continuity between terminals.

OK

Continuity

Terminal / Switch position	1	2	3	4
Switch pin free (Brake pedal depressed)	○—○			
Switch pin pushed in (Brake pedal released)			○—○	

OK

NG **Replace stop light switch.**

3 Check harness and connectors between cruise control ECU and stop light switch, stop light switch and magnet clutch, magnet clutch and body ground. (See page IN–31)

OK

NG **Repair or replace harness or connector.**

Proceed to next circuit inspection shown on matrix chart (See page BE–178). However, when diag trouble code 12 is displayed, check harness and connector for loose connection. If connection is normal, check and replace Cruise Control ECU.

– MEMO –

DTC 13 Actuator Position Sensor Circuit

CIRCUIT DESCRIPTION

This circuit detects the rotation position of the actuator control plate and sends signal to the ECU.

Code No.	Diagnosis	Trouble area
13	• Position sensor detects abnormal voltage. • Position sensor signal value does not change when the motor operates.	• Cruise control actuator Position sensor. • Harness or connector between actuator position sensor and body ground. • ECU

DIAGNOSTIC CHART

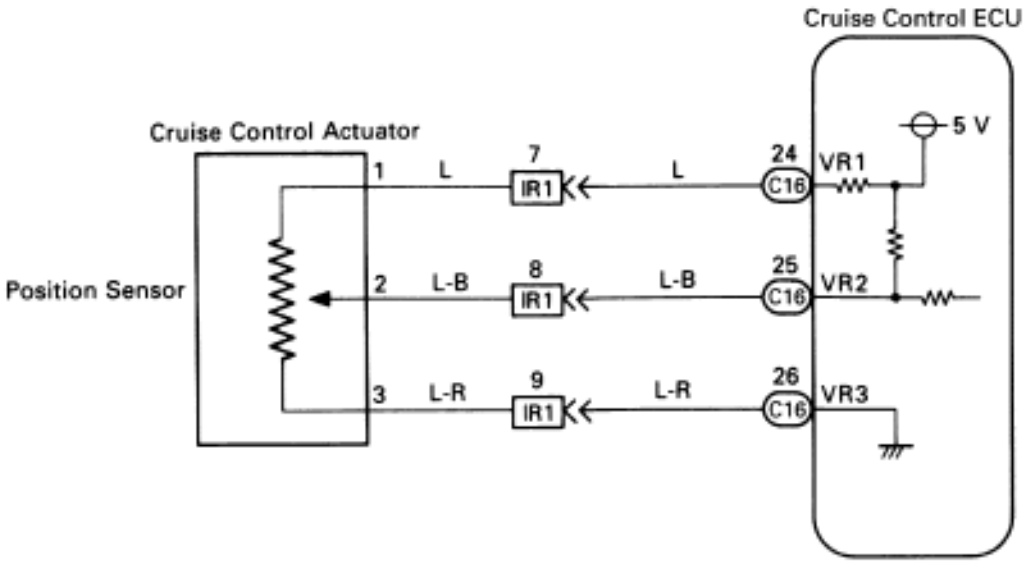
1 Check voltage between terminals VR2 and VR3 of cruise control ECU connector.
- OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
- NG →

2 Check actuator position sensor.
- NG → Replace actuator assembly.
- OK →

3 Check harness and connector between cruise control ECU and actuator position sensor.
- NG → Replace or replace harness or connector.
- OK →

Check harness and connector for loose connection. If connection is normal, check and replace Cruise Control ECU.

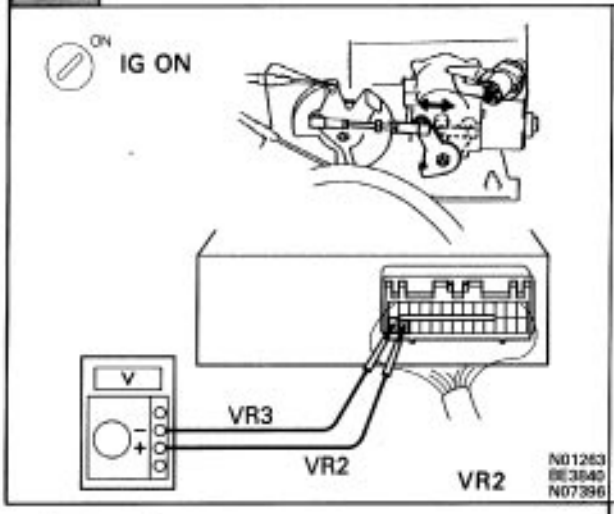
WIRING DIAGRAM



BE39

INSPECTION PROCEDURE

1 **Check voltage between terminals VR2 and VR3 of cruise control ECU connector.**



P Remove cruise control ECU with connectors still connected.

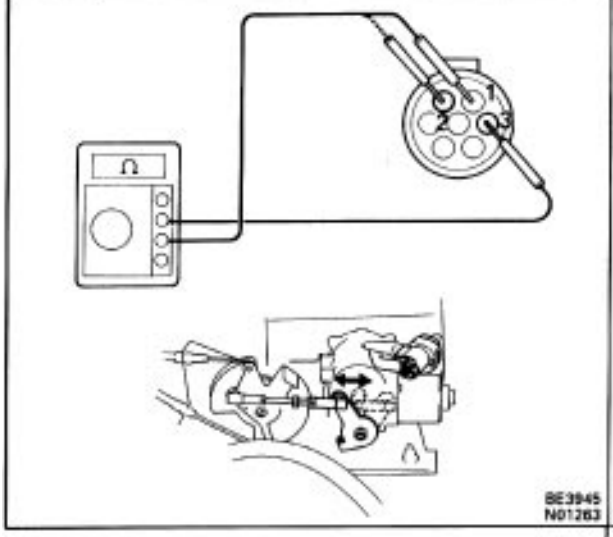
C 1 Turn ignition switch on.
2. Measure voltage between terminals VR2 and VR3 of cruise control ECU connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

OK **Voltage:**
Fully closed: 1.1–1.4 V
Fully opened: 3.8–4.5 V
In addition, as the control plate is turned, the voltage should increase gradually without interruption.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 **Check actuator position sensor.**



P 1 Remove cruise control actuator.
2. Disconnect the actuator connector.

C Measure resistance between actuator terminals 1 and 3 of actuator connector.

OK **Resistance: 1.8–2.2 kΩ**

C Measure resistance between terminals 2 and 3 of actuator connector, while turning the control plate slowly by hand from the deceleration side to the acceleration side.

OK **Resistance:**
Fully closed: 500–550Ω
Fully opened: 1.5–2.0 kΩ
In addition, as the control plate turns, the resistance should increase gradually without interruption.

OK

NG → **Replace actuator assembly.**

3 **Check harness and connector between cruise control ECU and actuator position sensor. (See page IN–31)**

OK

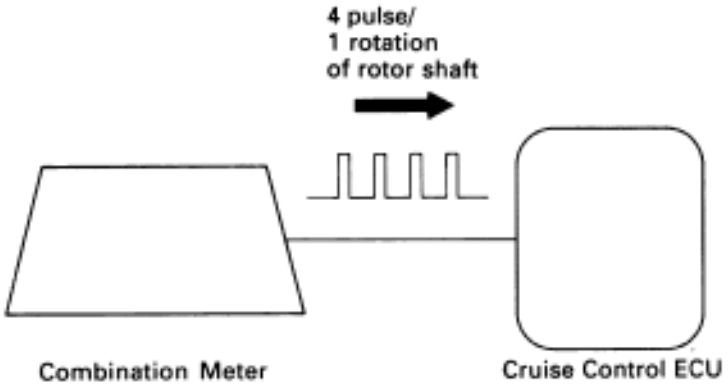
NG → **Repair or replace harness or connector.**

Check harness and connector for loose connection. If connection is normal check and replace cruise control ECU.

DTC 21 23 Speed Sensor Circuit

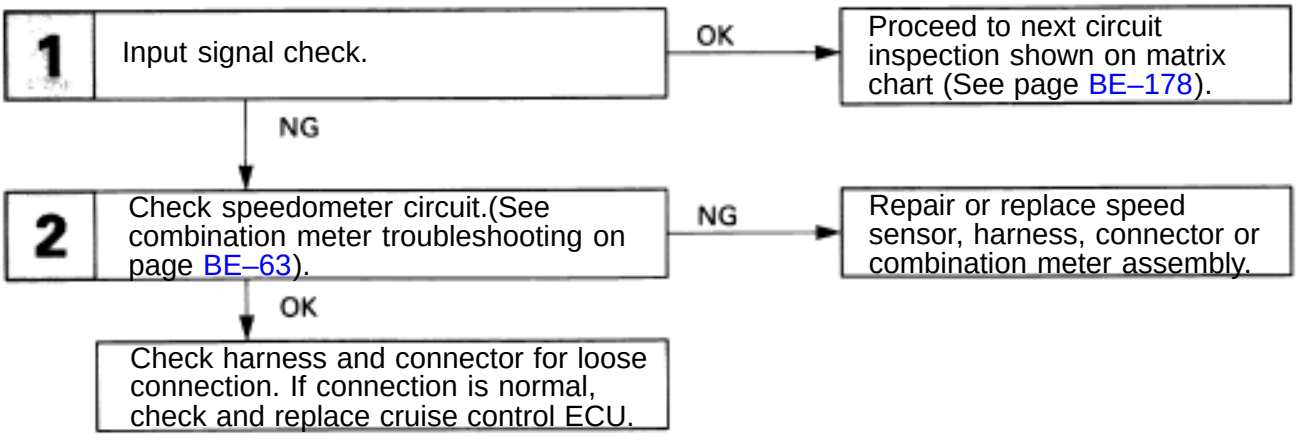
CIRCUIT DESCRIPTION

The speed sensor signal is sent to cruise control ECU as vehicle speed signal.

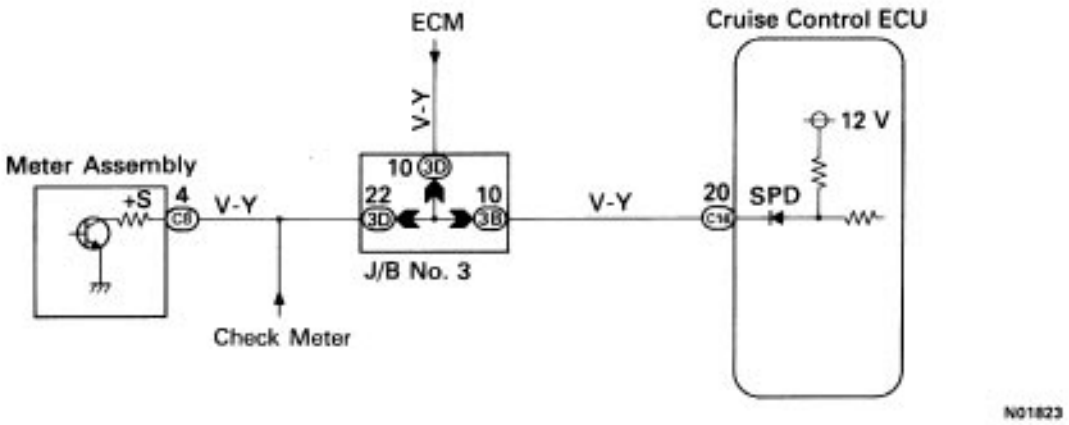


Code No.	Diagnosis	Trouble area
21	Speed signal is not input to the ECU	• Speed sensor • Combination meter • Harness or connector between speed sensor and combination meter, combination meter and ECU. • ECU
23	Actual vehicle speed has dropped by 16 km/h (10 mph) or more below the set speed during cruising. HINT: When speed sensor circuit is opened intermittently (Below 0.2 sec), code 23 is output.	• Actuator • Actuator control cable • Speed sensor • Harness or connector in OD and SPD circuit (Open or short intermittently) • ECU

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Input signal check.**

Vehicle speed	Indicator light blinking pattern
Above 40 km/h (25 mph)	Blinks: ON / OFF, 0.25 sec – 0.25 sec
Below 40 km/h (25 mph)	Stays ON: ON / OFF

BE4006

C 1 See input signal check on page BE–172.
2. Check indicator light operation when driving with vehicle speed above 40 km/h (25 mph), and with vehicle speed below 40 km/h (25 mph).

OK **Vehicle speed above 40 km/h (25 mph)**
: Indicator light blinks
Vehicle speed below 40 km/h (25 mph)
: Indicator light stays on

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 **Check speedometer circuit. (See combination meter troubleshooting on page BE–63).**

OK

NG → **Repair or replace speed sensor, harness, connector or combination meter assembly.**

Check harness and connector for loose connection. If connection is normal, check and replace cruise control ECU.

– MEMO –

DTC 32 34 Control Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU.

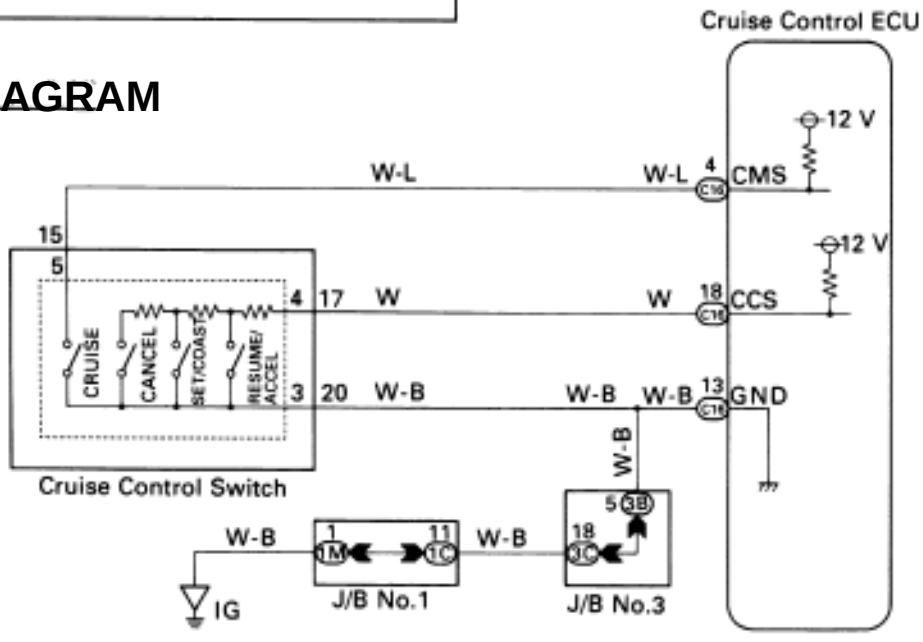
Code No.	Diagnosis	Trouble area
32	Short in, control switch circuit.	• Cruise control switch. • Harness or connector between control switch and ECU. • ECU
34	Voltage abnormality in control switch circuit.	

DIAGNOSTIC CHART

1. Input signal check.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
2. Check voltage between terminal CCS of cruise control ECU connector and body ground.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
3. Check control switch.
   - NG → Replace cruise control switch.
   - OK ↓
4. Check harness and connector between cruise control ECU and control switch.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace cruise control ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Input signal check.

Input signal	Indicator light blinking pattern
SET/COAST SWITCH	ON / OFF — 2 Pulse
RESUME ACCEL SWITCH	ON / OFF — 3 Pulse
CANCEL SWITCH	ON / OFF — switch OFF, switch ON

BE4006

C 1 See input signal check on page BE–172.

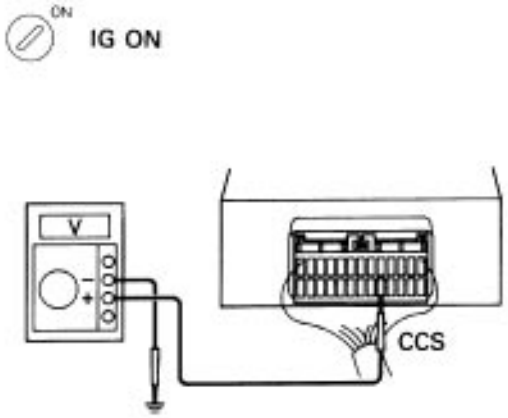
2. Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

OK **SET/COAST, RESUME/ACCEL switch**
The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF. CANCEL switch
The indicator light goes off when the cancel switch is turned ON.

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 Check voltage between terminal CCS of cruise control ECU connector and body ground.



BE6616

P Remove cruise control ECU with connectors still connected.

C 1 Turn ignition switch ON.
2. Measure voltage between terminal CCS of cruise control ECU connector and body ground, when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

OK

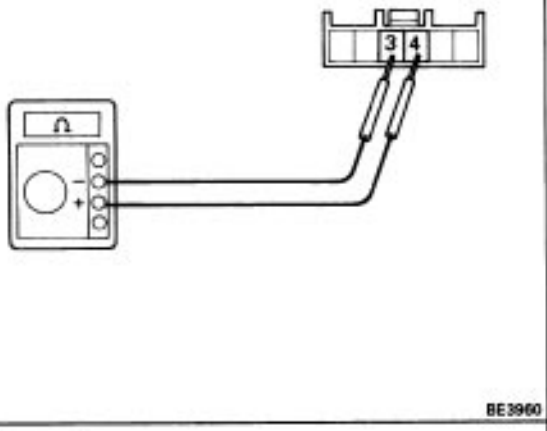
Switch position	Voltage
Neutral	10–14 V
RES/ACC	0.7–2.5 V
SET/COAST	2.3–4.6 V
CANCEL	4.1–7.2 V

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

Go to step 3

3 **Check control switch.**



P 1 Remove steering wheel center pad.
2. Disconnect control switch connector.

C Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated.

OK

Switch position	Resistance
Neutral	1 Mn or higher
RES/ACC	60–80Ω
SET/COAST	190–2100
CANCEL	410–4300

Hint When diagnostic trouble code 34 is displayed, carefully check that resistance is always 1 Mil or higher in neutral position, particularly when switching between REC/ACC and SET/COAST.

OK

NG **Replace cruise control switch.**

4 **Check harness and connector between cruise control ECU and control switch. (See page IN–31)**

OK

NG **Repair or replace harness or connector.**

Check and replace cruise control ECU.

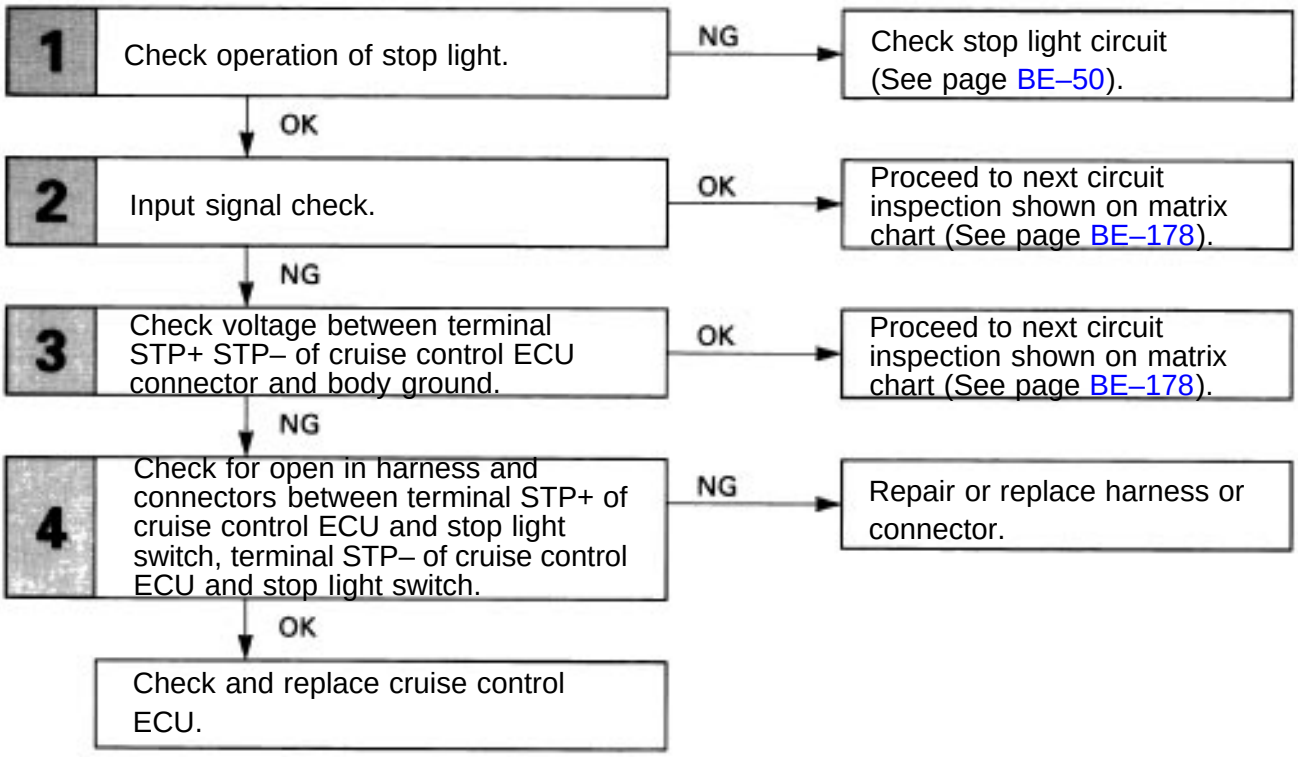
– MEMO –

Stop Light Switch Circuit

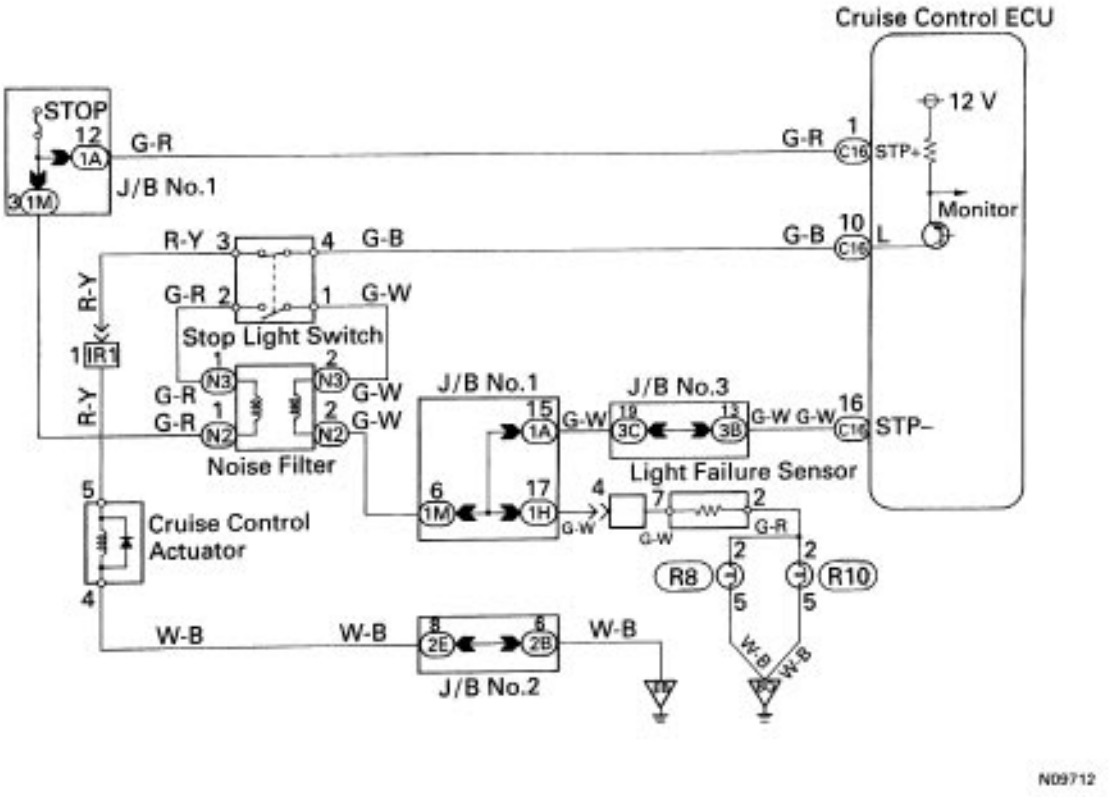
CIRCUIT DESCRIPTION

When the brake is on, battery voltage normally applies through the stop fuse and stop switch to terminal STP– of the ECU, and the ECU turns the cruise control off.
A fail–safe function is provided so that the cancel functions normally, even if there is a malfunction in the stop light signal circuit.
1 If the harness connected to terminal STP– has an open, terminal STP– will have battery positive voltage and the cruise control will be turned off, also SET not occurring.
2 If the stop fuse is open, terminal STP+ becomes approx. 0 V when the brake is turned on, so the ECU performs cancel function normally.
Also, shown the brake is on, the magnet clutch circuit is cut mechanically by the stop light switch, turning the cruise control off. (See page BE–190 for operation of the magnet clutch.)

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

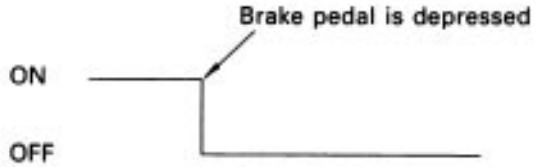
1 **Check operation of stop light.**

C Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released.

OK

NG > **Check stop light circuit (See page BE–50).**

2 **Input signal check.**



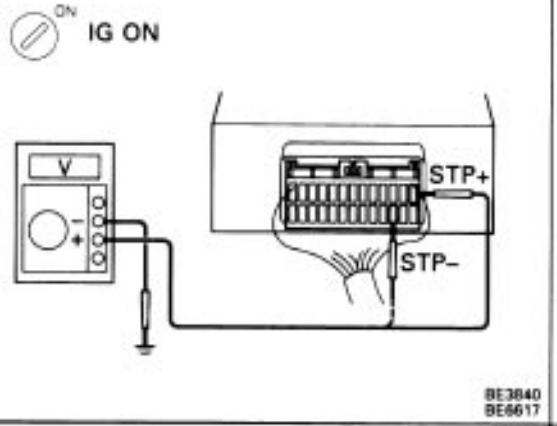
C
1. See input signal check on page BE–172.
2. Check the indicator light when the brake pedal is depressed.

OK The indicator light goes off when the brake pedal is depressed.

NG

OK > **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

3 **Check voltage between terminal STP+, STP– of cruise control ECU connector and body ground.**



P Remove cruise control ECU with connectors still connected.

C
1. Turn ignition switch ON.
2. Measure voltage between terminal STP+, STP– of cruise control ECU connector and body ground, when the brake pedal is depressed and released.

OK

	STP+	STP–
Depressed	10– 14V	10– 14V
Released	10–14V	Below 1 V

NG

OK > **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

4 **Check for open in harness and connectors between terminal STP+ of cruise control ECU and stop light switch, terminal STP– of cruise control ECU and stop light switch. (See page IN–31)**

OK

NG > **Repair or replace harness or connector.**

Check and replace cruise control ECU.

– MEMO –

Idle Switch Circuit

CIRCUIT DESCRIPTION

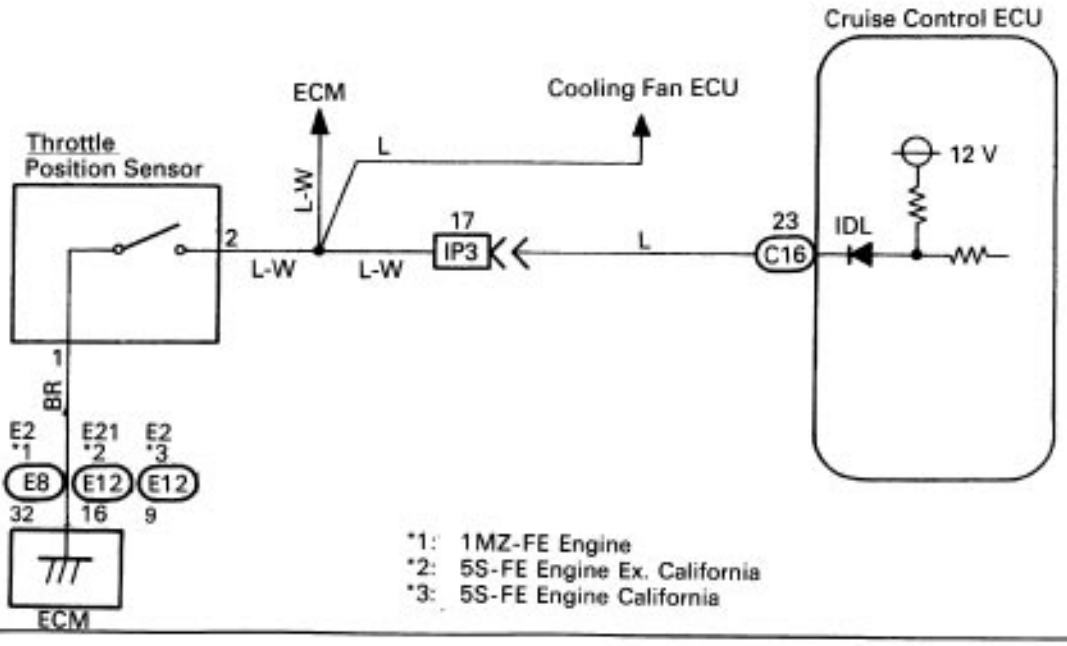
When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to enable accurate cruise control at the set speed quickly. If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect the engine.

DIAGNOSTIC CHART

1. Check voltage between terminal IDL of cruise control ECU connector and body ground.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
2. Check throttle position sensor.
   - NG → Replace throttle position sensor.
   - OK ↓
3. Check harness and connector between cruise control ECU and throttle position sensor, throttle position sensor and body ground.
   - NG → Repair or replace harness or connector.
   - OK ↓

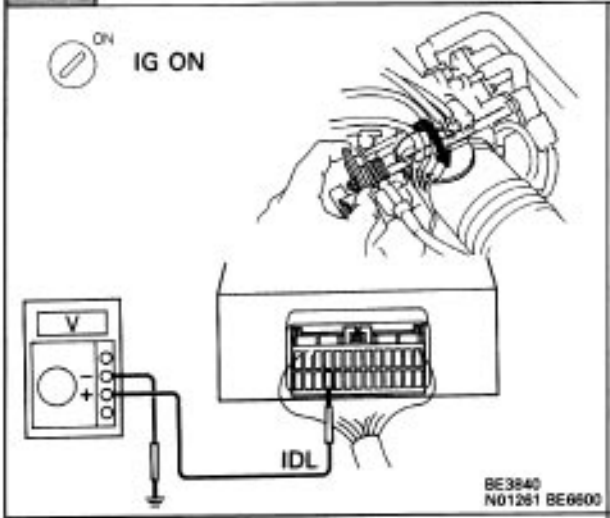
Check and replace cruise control ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminal IDL of cruise control ECU connector and body ground.**



P 1. Remove cruise control ECU with connectors still connected.
2. Disconnect ECM and ABS & TRAC ECU connector.

C 1. Turn ignition switch ON.
2. Measure voltage between terminal IDL of cruise control ECU connector and body ground, when the throttle valve is fully closed and fully opened.

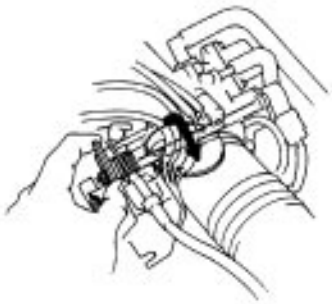
OK

Throttle valve position	Voltage
Fully opened	10– 14V
Fully closed	Below 1 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 **Check throttle position sensor.**



P Disconnect throttle position sensor connector.

C Measure resistance between terminals 1 and 2 of throttle position sensor connector, when the throttle valve is fully closed and fully opened.

OK

Throttle valve position	Resistance
Fully opened	1 Mil or higher
Fully closed	Below 2Ω

OK

NG → **Replace throttle position sensor.**

3 **Check harness and connector between cruise control ECU and throttle position sensor, throttle position sensor and body ground. (See page IN–31)**

OK

NG → **Repair or replace harness or connector.**

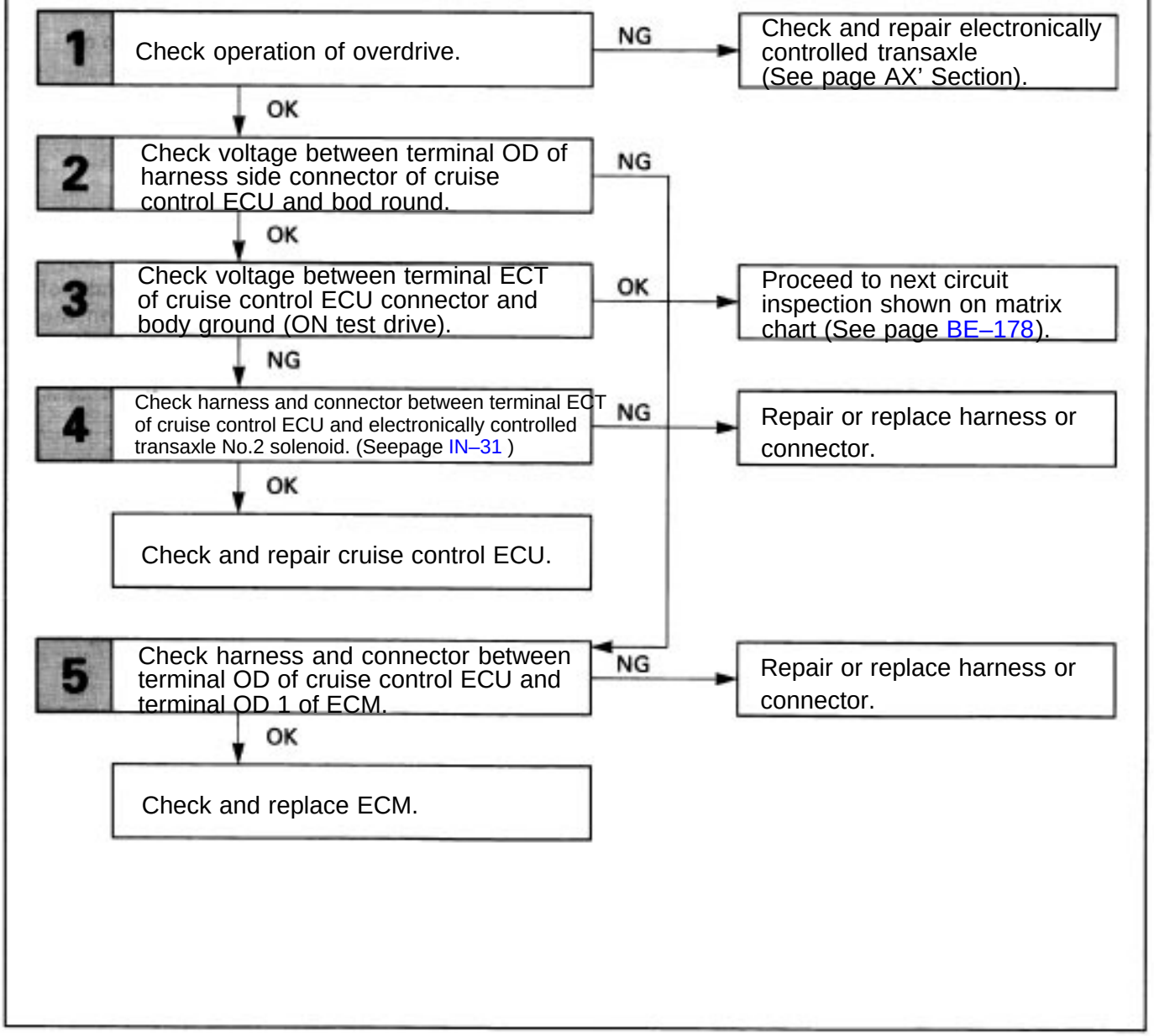
Check and replace cruise control ECU.

Electronically Controlled Transaxle Communication Circuit

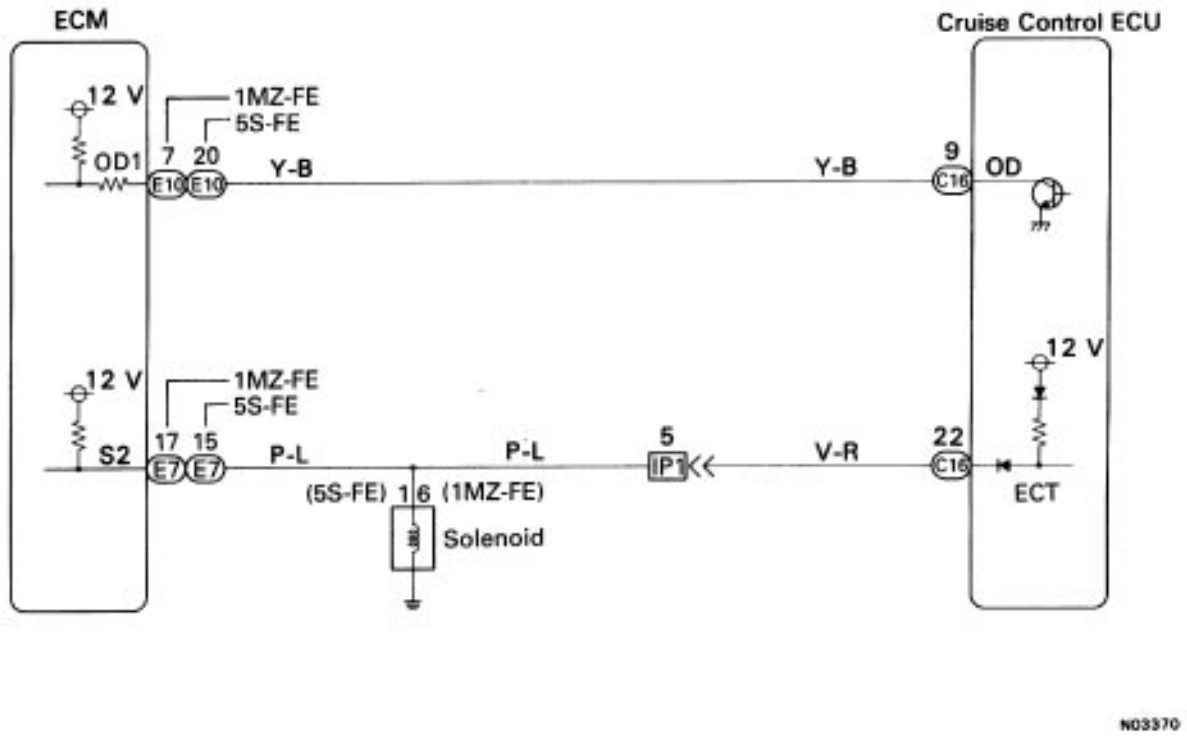
CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON–OFF overdrive opera–tion and to provide smooth driving, when down shifting in the electronically controlled transaxle oc–curs, a signal to prevent upshift until the end of the uphill slope is sent from the cruise control ECU to the ECM.
Terminal ECT of the cruise control ECU detects the shift change signal (out–put to electronically con–trolled transaxle No.2 solenoid) from the ECM.
If vehicle speed down and terminal ECT of the control ECU receivers down shifting signal, it sends a signal from terminal OD to ECM to cut overdrive until the end of the uphill slope, and the gearshifts are reduced.

DIAGNOSTIC CHART



WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check operation of overdrive.**

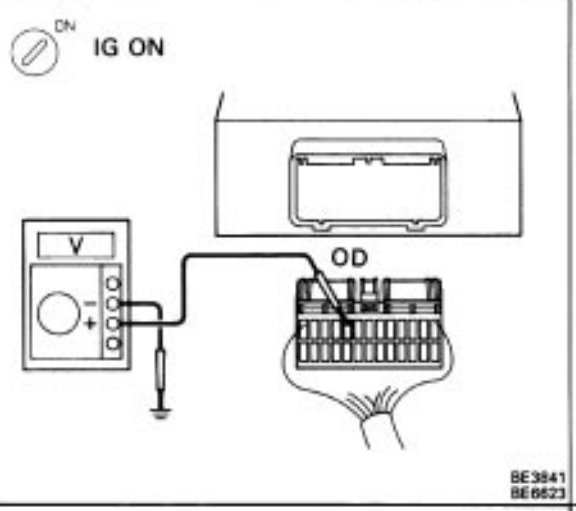
P Test drive after engine warm up.

C Check that overdrive ON H OFF occurs with operation of OD switch ON–OFF.

OK

NG > **Check and Repair Electronically Controlled Transaxle (See page AX Section).**

2 **Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.**



P Remove cruise control ECU with connectors still connected.

C
1. Disconnect cruise control ECU connector.
2. Turn ignition switch ON.
3. Measure voltage between terminal OD of harness side connector of cruise control ECU and body ground.

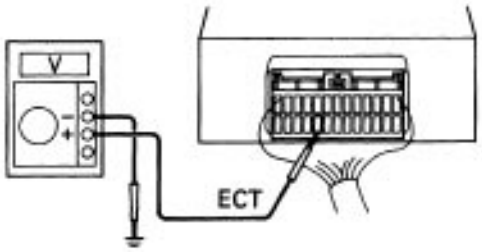
OK **Voltage: 10 – 14 V**

OK

NG > **Go to step 5**

Go to step 3

3 **Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive).**



P 1. Connect cruise control electronically controlled transaxle connector.
2. Test drive after engine warm up.

C Check voltage between terminal ECT of cruise control ECU connector and body ground when OD switch is on and off.

OK

Gear Position	Voltage
O/D	Below 1 V
3rd	10 – 14 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

4 **Check harness and connector between terminal ECT of cruise control ECU and solenoid. (See page IN–31)**

OK

NG → **Repair or replace harness or connector.**

Check and repair cruise control ECU.

5 **Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM. (See page IN–31)**

OK

NG → **Repair or replace harness or connector.**

Check and replace ECU.

Parking Brake Switch Circuit

CIRCUIT DESCRIPTION

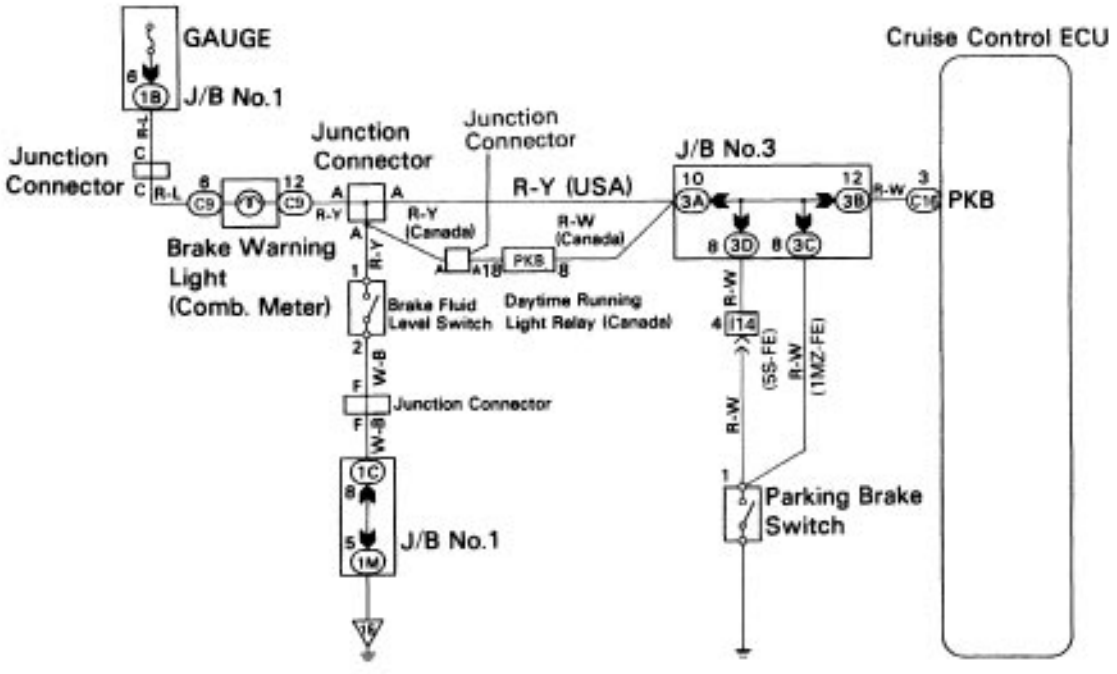
When the parking brake is operating , the parking brake switch sends a signal to the ECU. When this signal is input to the ECU during cruise control driving, the ECU cancels cruise control.

DIAGNOSTIC CHART

1. Check operation of brake warning light.
   - NG → Check brake warning light circuit (See page BE–61).
   - OK ↓
2. Input signal check.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
3. Check voltage between terminal PKB of cruise control ECU connector and body ground.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
4. Check for open in harness and connector between cruise control ECU and brake warning light.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace cruise control ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

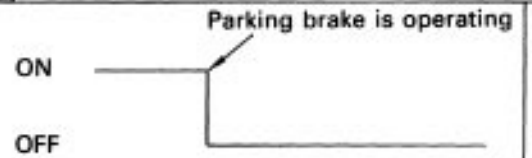
1 **Check operation of brake warning light.**

C Check that the brake warning light in the instrument panel comes on when the parking brake is operating with the engine running, and the light goes off when the parking brake is not operating.

OK

NG → **Check brake warning light circuit (See page BE–64).**

2 **Input signal check.**



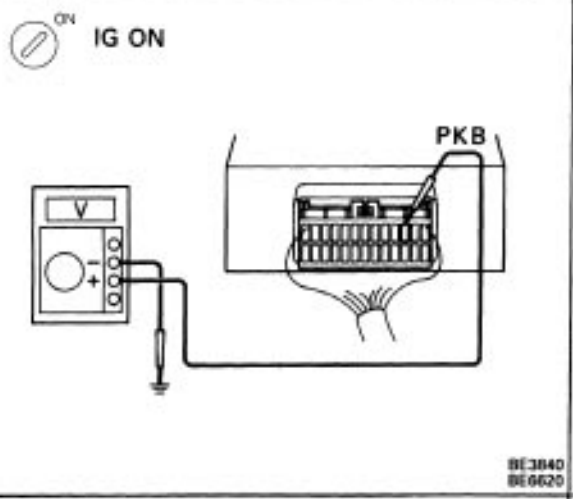
C 1. See input signal check on page BE–172.
2. Check the indicator light when the parking brake is operating.

OK The indicator light goes off when the parking brake is operating.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

3 **Check voltage between terminal PKB of cruise control ECU connector and body ground.**



P Remove cruise control ECU with connectors still connected.

C 1. Turn ignition switch ON.
2. Measure voltage between terminal PKB of cruise control ECU connector and body ground, when the parking brake lever is operating.

OK

Switch Position	Voltage
ON (lever pulled)	Below 1 V
OFF (lever released)	10 – 14 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

4 **Check for open in harness and connector between cruise control ECU and brake warning light. (See page IN–31)**

OK

NG → **Repair or replace harness or connector.**

Check and replace cruise control ECU.

Park Neutral Position Switch Circuit

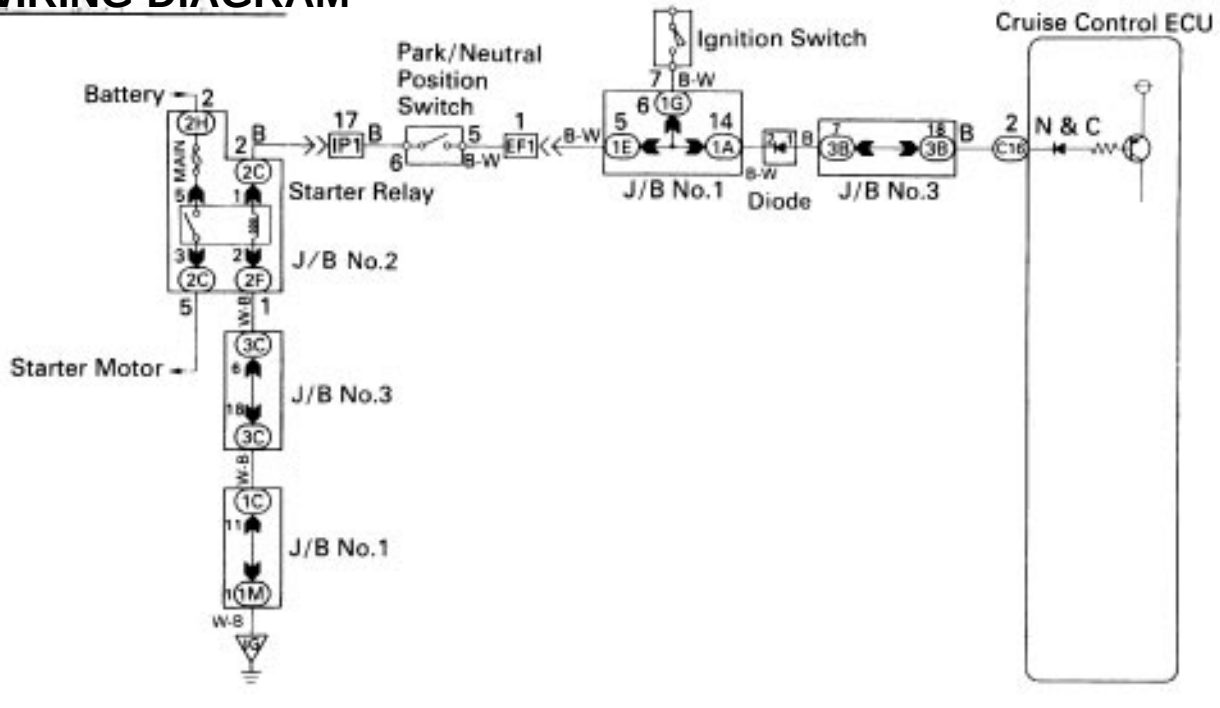
CIRCUIT DESCRIPTION

When the shift position is put in P or N, a signal is sent from the park/neutral position switch to the ECU. When this signal is input during cruise control driving, the ECU cancels the cruise control.

DIAGNOSTIC CHART

1	Check operation of starter.	NG	Proceed to engine trouble–shooting.(See page EG Section)
	OK ↓		
2	Input signal check.	OK	Proceed to next circuit inspection shown on matrix chart (See page BE–178).
	NG ↓		
3	Check voltage between terminal N & C of cruise control ECU connector and body round.	OK	Proceed to next circuit inspection shown on matrix chart (See page BE–178).
	NG ↓		
4	Check for open in harness and connector between cruise control ECU and ST fuse. (See page IN–31)	NG	Repair or replace harness or connector.
	OK ↓		
	Check and replace cruise control ECU.		

WIRING DIAGRAM



INSPECTION PROCEDURE

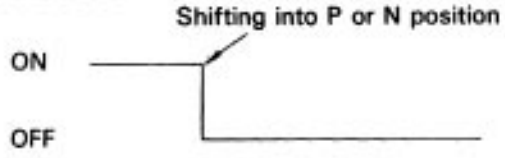
1 **Check operation of starter.**

C Check that the starter operates normally and that the engine starts.

OK

NG **Proceed to engine troubleshooting (See page EG Section).**

2 **Input signal check.**



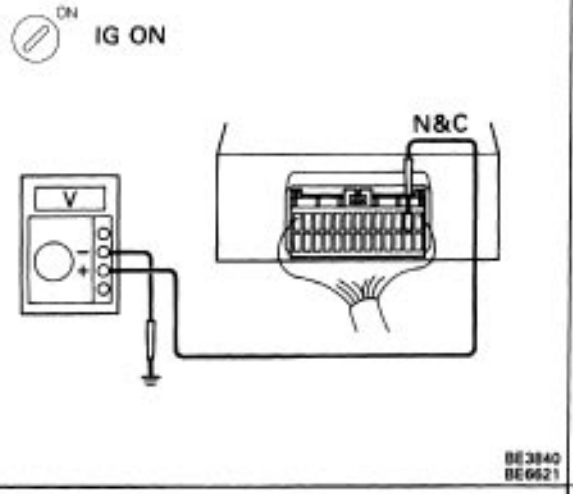
C 1. See input signal check on page BE–172.
2. Check the indicator light when shifting into P position or N position.

OK **The indicator light goes off when shifting into P position or N position.**

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

3 **Check voltage between terminal N & C of cruise control ECU connector and body ground.**



P Remove cruise control ECU with connectors still connected.

C 1. Turn ignition switch ON.
2. Measure voltage between terminal N & C of cruise control ECU connector and body ground, when shifting into P, N position and other positions.

OK

Switch Position	Voltage
P or N position	Below 1 V
Other positions	10– 14V

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

4 **Check for open in harness and connector between cruise control ECU and ST fuse. (See page IN–31)**

OK

NG **Repair or replace harness or connector.**

Check and replace cruise control ECU.

Clutch Switch Circuit (5S–FE MT Vehicles)

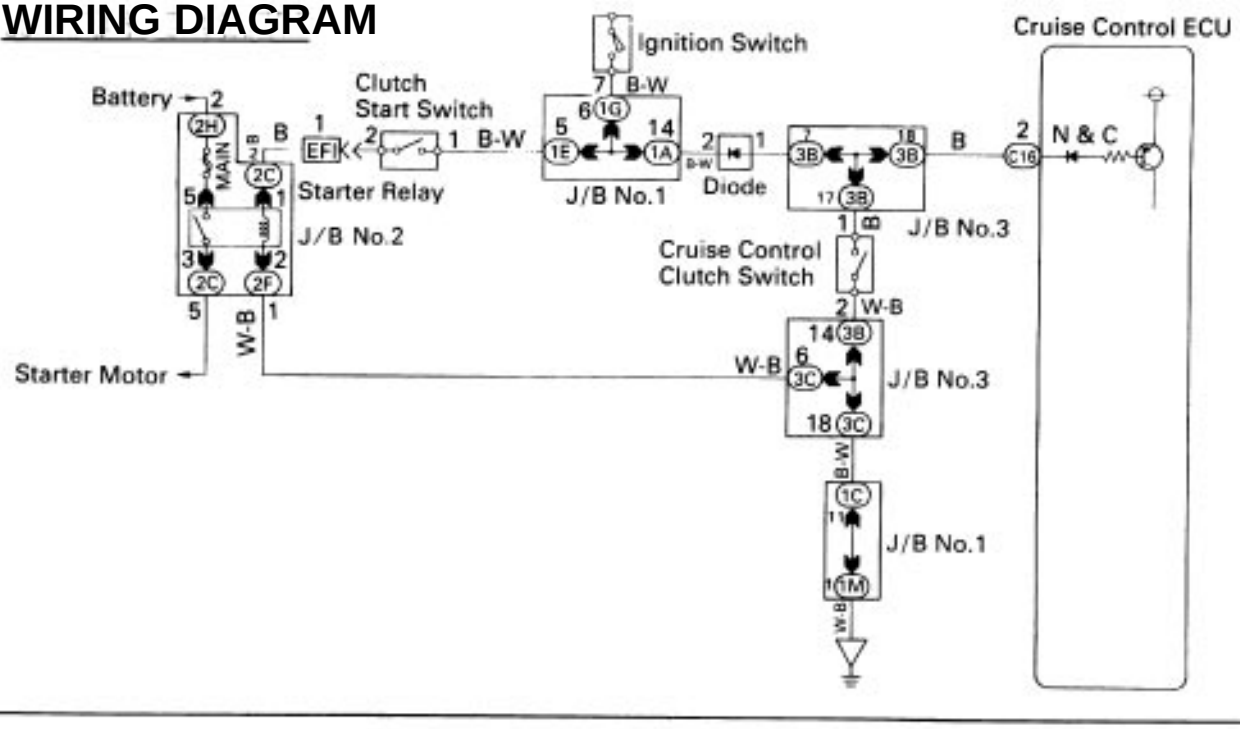
CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the ECU, when this signal is input to the ECU during cruise control driving, the ECU cancels cruise control.

DIAGNOSTIC CHART

1	Check operation of starter.	NG	Proceed to engine trouble–shooting.(See page EGI Section)
	OK ↓		
2	Input signal check.	OK	Proceed to next circuit inspection shown on matrix chart (See page BE–178).
	NG ↓		
3	Check voltage between terminal N & C of cruise control ECU connector ECU connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See page BE–178).
	NG ↓		
4	Check for open in harness and connector between terminal N & C of cruise control ECU and clutch switch. (See page IN–31)	NG	Repair or replace harness or connector.
	OK ↓		
	Check and replace cruise control ECU.		

WIRING DIAGRAM



INSPECTION PROCEDURE

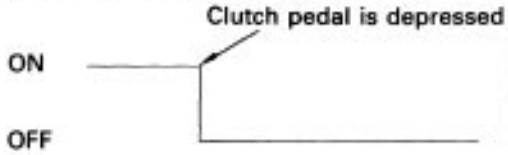
1 **Check operation of starter.**

C Check that the starter operates normally and that the engine starts.

OK

NG → **Proceed to engine troubleshooting (See page EG Section).**

2 **Input signal check.**



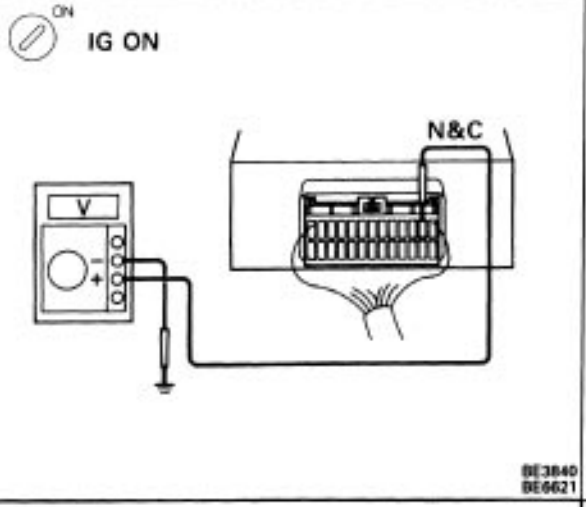
C
1. See input signal check on page BE–172.
2. Check the indicator light when shifting into P range or N position.

OK **The indicator light goes off when the clutch pedal is depressed.**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

3 **Check voltage between terminal N & C of cruise control ECU connector and body ground.**



P Remove cruise control ECU with connectors still connected.

C
1. Turn ignition switch ON.
2. Measure voltage between terminal N & C of cruise control ECU connector and body ground, when the clutch pedal is depressed.

OK

Switch Position	Voltage
ON (pedal depressed)	Below 1 V
OFF	10 – 14 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

4 **Check for open in harness and connector between cruise control ECU and ST fuse.**

OK

NG → **Repair or replace harness or connector.**

Check and replace cruise control ECU.

ECU Power Source Circuit

CIRCUIT DESCRIPTION

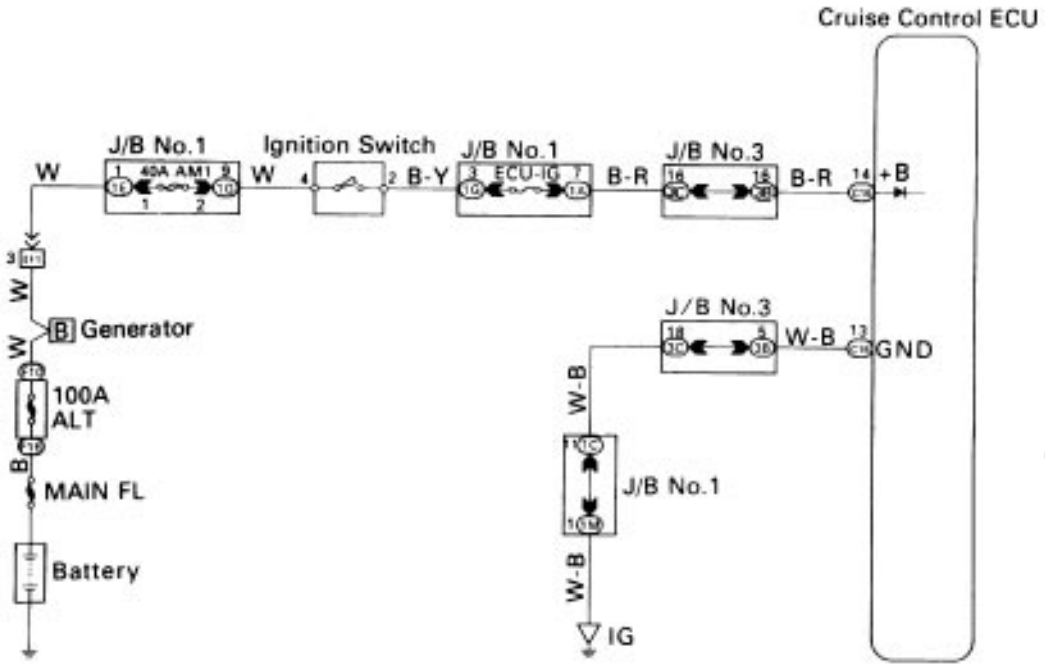
The ECU power source supplies power to the actuator. Terminal GND and the cruise control ECU case are grounded.

DIAGNOSTIC CHART

1. Check ECU–IG fuse.
   - NG → Check for short in all the harness and components connected to the ECU–IG fuse (See attached wire diagram).
   - OK ↓
2. Check voltage between terminals B and GND of cruise control ECU connector.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
3. Check continuity between terminal GND of cruise control ECU connector and body ground.
   - NG → Repair or replace harness or connector.
   - OK ↓

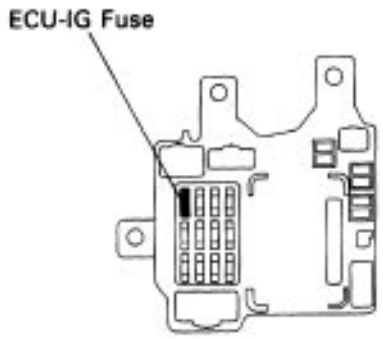
Check and repair harness and connector between battery and cruise control ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check ECU–IG fuse.**



P Remove ECU–IG fuse from J/B No. 1.

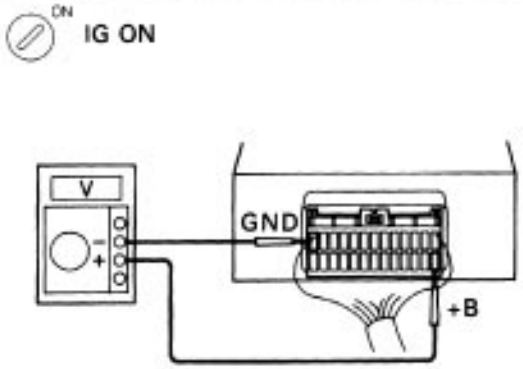
C Check continuity of ECU–IG fuse.

OK **Continuity**

OK

NG → **Check for short in all the harness and components connected to the ECU–IG fuse (See attached wiring diagram).**

2 **Check voltage between terminals +B and GND of cruise control ECU connector.**



P Remove cruise control ECU with connectors still connected.

C 1. Turn ignition switch ON.
2. Measure voltage between terminals +B and GND of cruise control ECU connector.

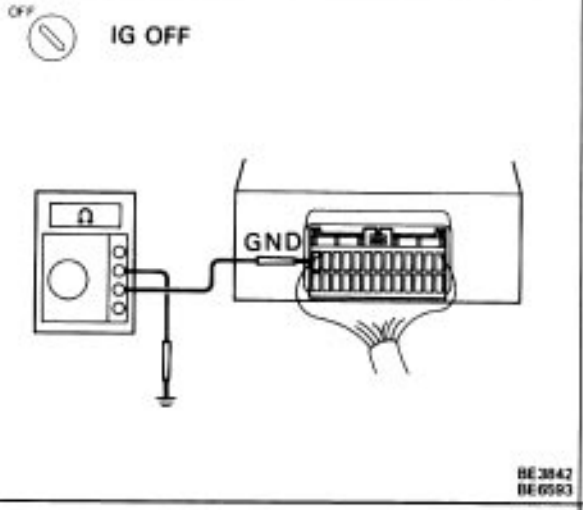
OK **Voltage: 10 – 14 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

Go to step 3

3 **Check continuity between terminal GND of cruise control ECU connector and body ground.**



C Measure resistance between terminal GND of cruise control ECU connector and body ground.

OK **Resistance: Below 1Ω**

OK

NG → **Repair or replace harness or connector.**

Check and repair harness and connector between battery and cruise control ECU.

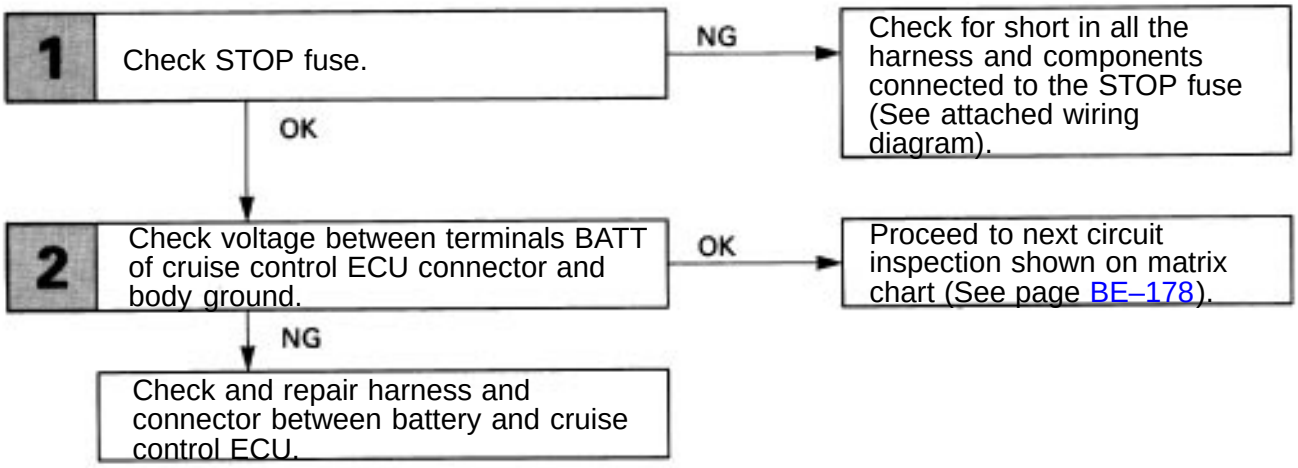
– MEMO –

Back–up Power Source Circuit

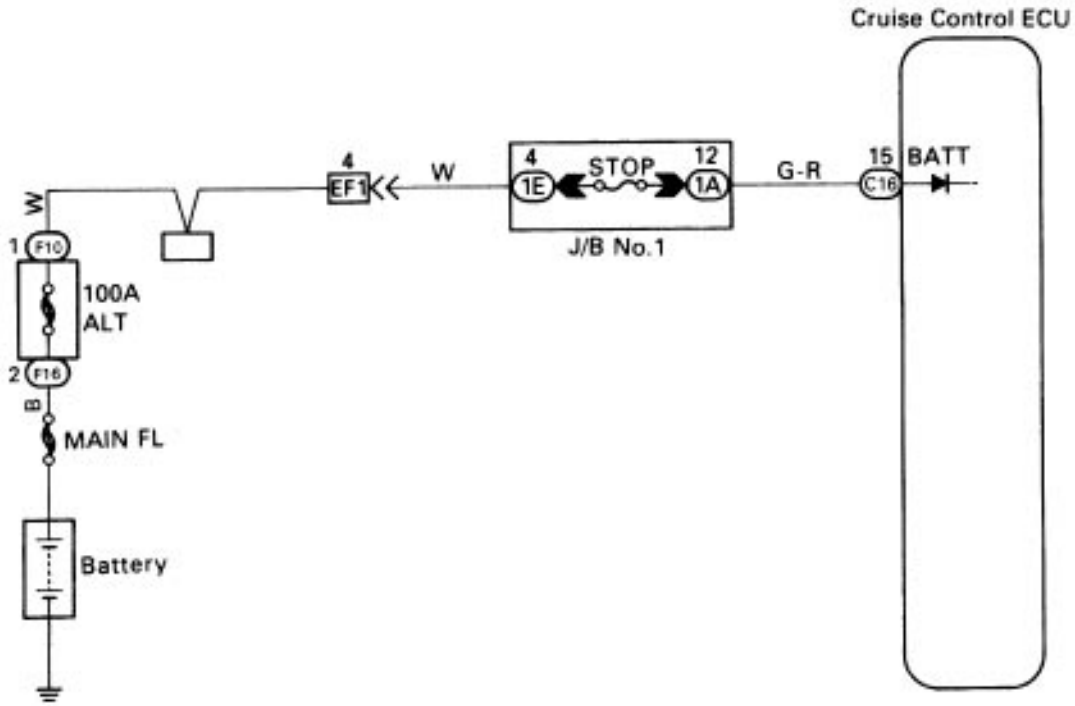
CIRCUIT DESCRIPTION

The ECU back–up power source provides power even when the ignition switch is off and is used for diagnostic code memory, etc.

DIAGNOSTIC CHART

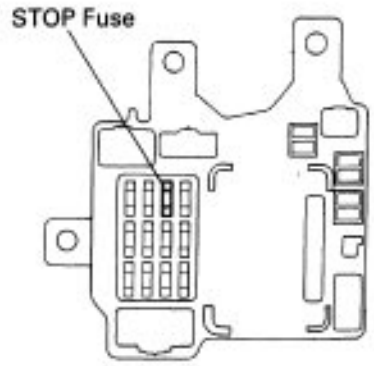


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check STOP fuse.**



P Remove STOP fuse from JIB No. 1.

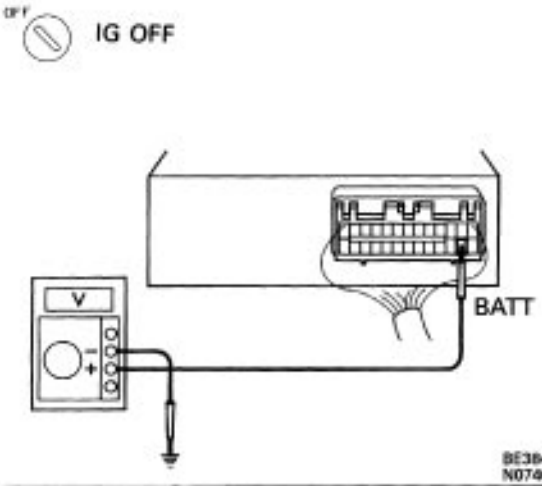
C Check continuity of STOP fuse.

OK **Continuity**

OK

NG → **Check for short in all the harness and components connected to the STOP fuse (See attached wiring diagram).**

2 **Check voltage between terminals BATT of cruise control ECU connector and body ground.**



P Remove cruise control ECU with connectors still connected.

C Measure voltage between terminal BATT of cruise control ECU connector and body ground.

OK **Voltage: 10 – 14 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

Check and repair harness and connector between battery and cruise control ECU.

Main Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

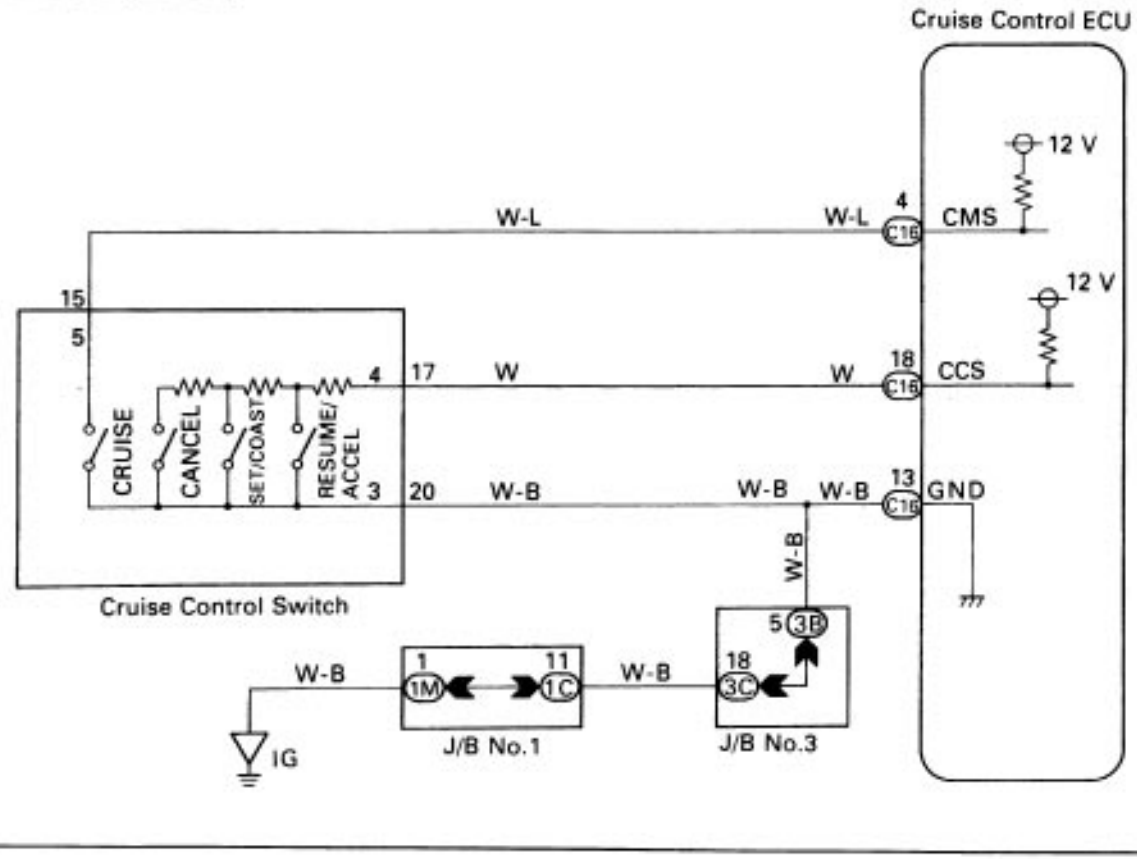
When the cruise control main switch is turned oft, the cruise control does not operate.

DIAGNOSTIC CHART

1. Check voltage between terminals CMS and GND of cruise control ECU connector.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
2. Check main switch.
   - NG → Replace cruise control switch.
   - OK ↓
3. Check harness and connector between cruise control ECU and main switch, main switch and body ground.
   - NG → Repair or replace harness or connector.
   - OK ↓

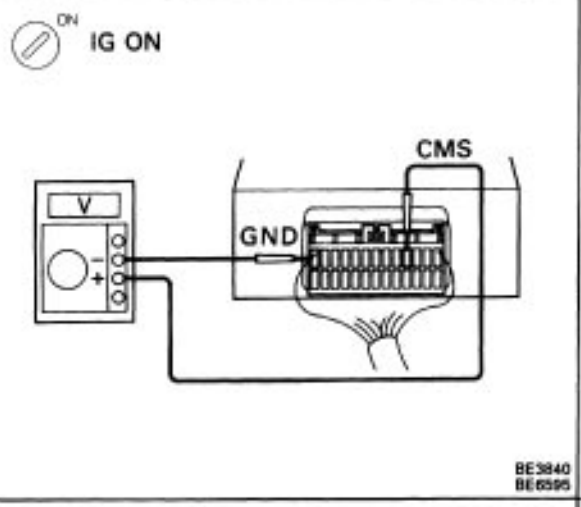
Check and replace cruise control ECU.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals CMS and GND of cruise control ECU connector.**



P 1. Remove cruise control ECU with connectors still connected.
2. Turn ignition switch ON.

C **Measure voltage between terminals CMS and GND of cruise control ECU connector when main switch is hold on and off.**

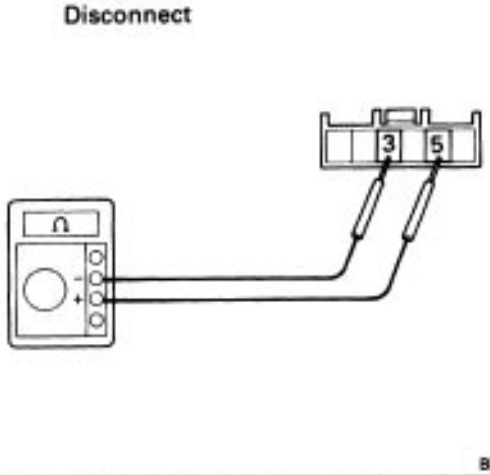
OK

Main switch	Voltage
OFF	10 – 14 V
Hold on	Below 1 V

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 **Check main switch.**



P 1. Remove steering wheel pad (See page RS–19).
2. Disconnect cruise control switch connector.

C Check continuity between terminals 3 and 5 of cruise control switch connector when main switch is hold on and off.

OK

continuity

Terminals / Main switch	3	5
OFF		
Hold on	○	○

OK

NG **Replace control switch.**

3 **Check harness and connector between cruise control ECU and main switch, main switch and body ground.**

OK

NG **Repair or replace harness or connector.**

Check and replace cruise control ECU.

TC Circuit

CIRCUIT DESCRIPTION

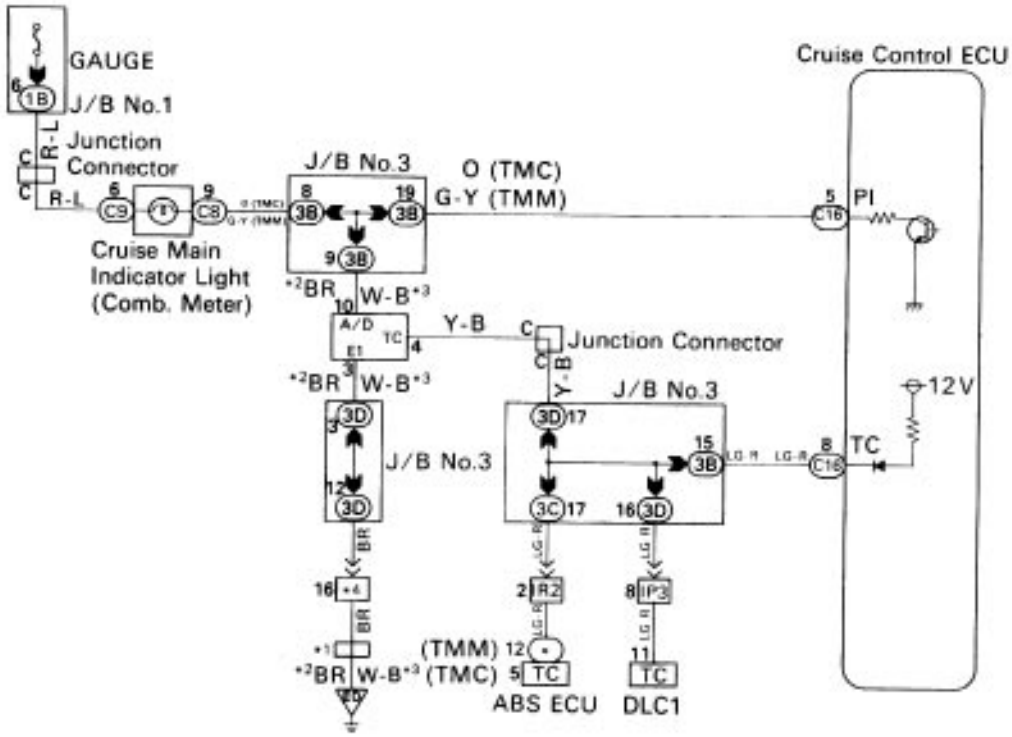
This circuit sends a signal to the ECU that diagnostic code output is required.

DIAGNOSTIC CHART

1. Check voltage between terminals TC and El of DLC2.
   - OK → Proceed to next circuit inspection shown on matrix chart (See page BE–178).
   - NG ↓
2. Check harness and connector between cruise control ECU and DCL2, DLC2 and body ground.
   - NG → Repair or replace harness or connector.
   - OK ↓

Check and replace cruise control ECU.

WIRING DIAGRAM

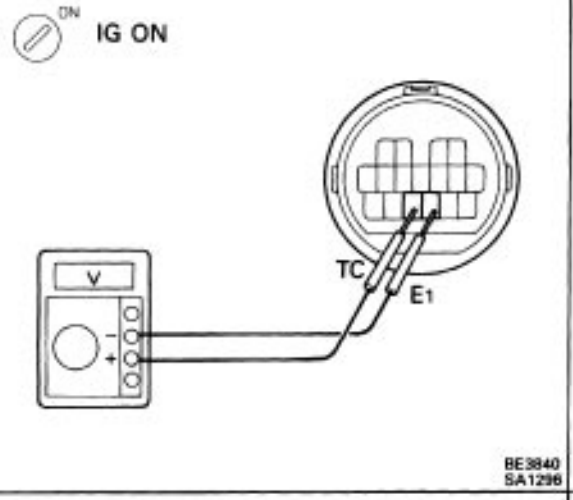


*1: 1MZ-FE
*2: 1MZ-FE and 5S-FE Ex. A/T and California M/T
*3: 5S-FE A/T and California M/T
*4: 1MZ-FE IP1
5S-FE IP3

*: TMC 5 (A13)
TMM 12 (A4)

INSPECTION PROCEDURE

1 **Check voltage between terminals TC and E1 of DLC2.**



C
1. Turn ignition switch ON.
2. Measure voltage between terminals TC and El of DLC2.

OK **Voltage: 10 – 14 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page BE–178).**

2 **Check harness and connector between cruise control ECU and DCL2, DLC2 and body ground. (See page IN–31)**

OK

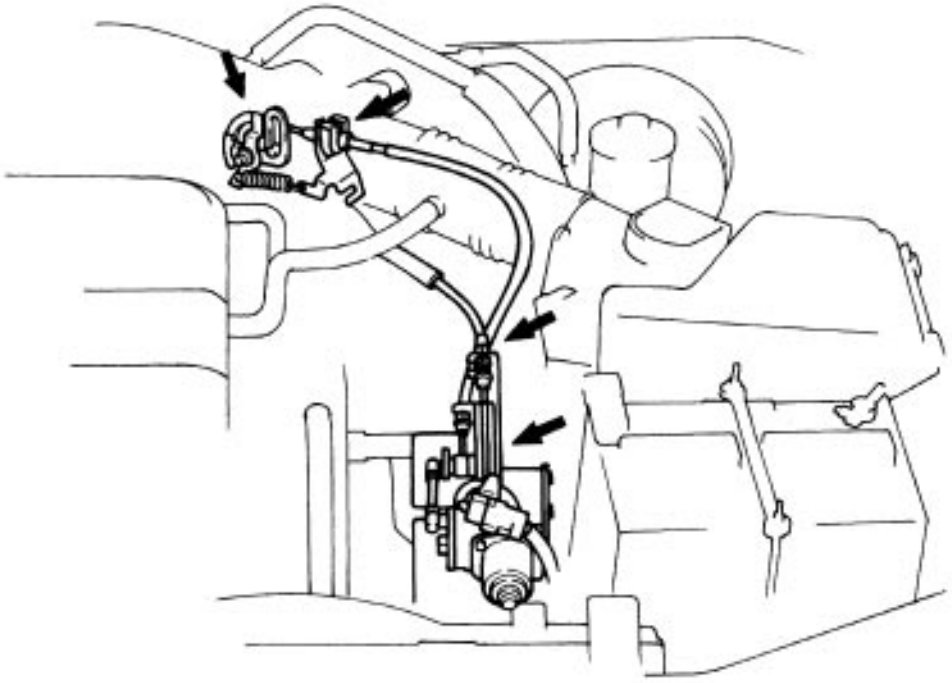
NG → **Repair or replace harness or connector.**

Check and replace cruise control ECU.

Actuator Control Cable Inspection

C 1. Check that the actuator, control cable and throttle link are properly installed and that the cable and link are connected correctly.
2. Check that the actuator and throttle link are operating smoothly.
3. Check that the cable is not loose or too tight.

Hint 1. If the control cable is very loose, the vehicle's loss of speed going uphill will be large.
2. If the control cable is too tight, the idle rpm will become high.



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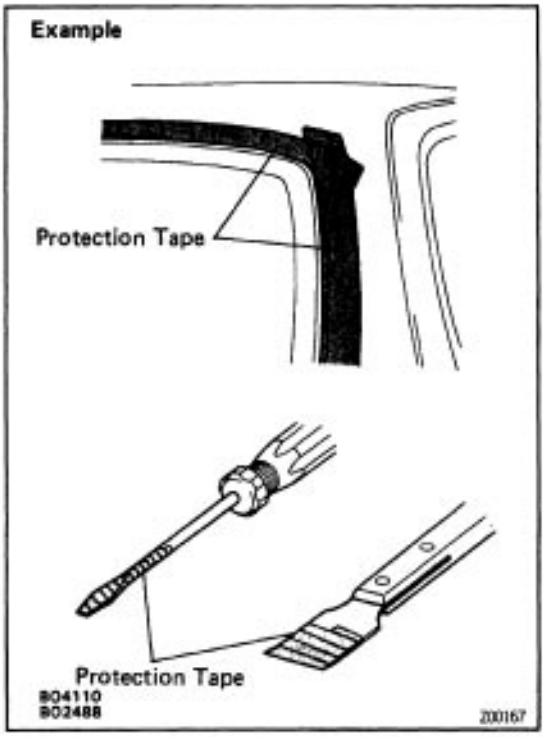
BODY



GENERAL INFORMATION

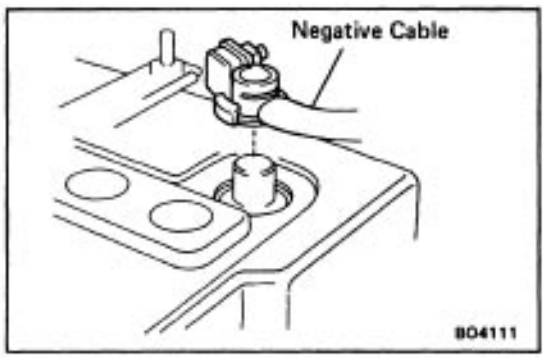
HANDLING PRECAUTIONS

Taping

When it is possible that the body or parts may be scratched during the operation, apply protection tape before starting work.

Example:

1. Before starting work, apply protection tape to body surfaces around parts to be removed and installed.
2. Before prying parts loose with a screwdriver or scraper etc., apply protection tape to the tip of the tool to avoid scratching parts or painted sur–faces of the body.



Battery

In order to prevent a short circuit while doing work on the electrical circuit such as disconnecting a connec–tor, first turn off the ignition switch and disconnect the negative (–) terminal cable from the battery ter–minal before starting work.

HINT: When battery voltage is required for operation of a functioning part, connect the cable to the battery when needed, and promptly disconnect it when no longer necessary.

CAUTION:

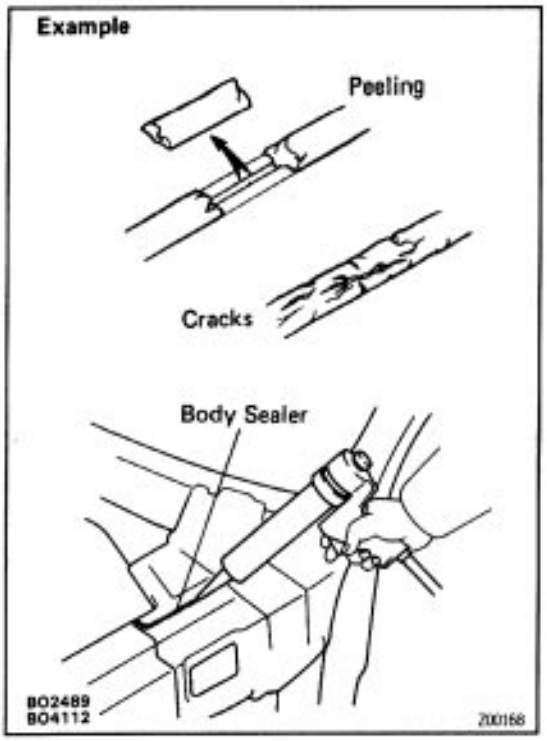
- **Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is dis–connected from the battery.**
- **To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.**

Fitting Adjustments

When removing and installing body panels which have a preload value, after their installation refer to the page containing the installation adjustment methods, and make adjustments according to the required spe–cifications.

HINT: When making adjustments, do not completely loosen the bolts and nuts of the part being adjusted. Tighten them appropriately, and move the panels by hand to align them.

ANTI–RUST TREATMENT



Anti–rust treatment used on the vehicle body includes body sealer, undercoat, rust inhibitor and paint.
HINT: Refer to the Body Collision Damage 'Repair Manual for details of which parts have received anti – rust treatment.

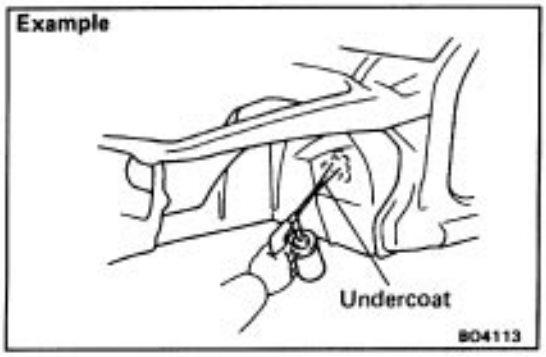
Body Sealer

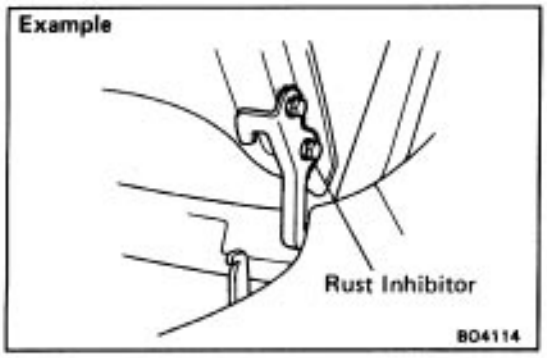
If the body sealer is damaged (peeling, cracks, etc.) during the operation, replace it with new body sealer.
HINT: If body sealer gets on other parts, promptly wipe it off with a clean cloth dipped in a grease, wax and silicone remover.

Undercoat

If the undercoat is damaged during the operation, apply new undercoat.
HINT:

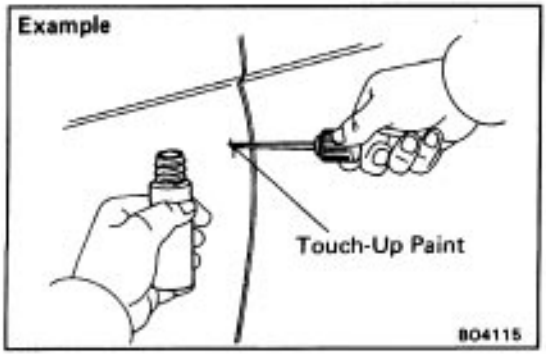
- Cover the surrounding area with masking paper to avoid applying undercoat where it is not needed.
- Do not apply undercoat to high temperature parts such as the tailpipe, or to drive parts such as the drive shaft.





Rust Inhibitor

After removing and re–installing hinges and outer panel parts, apply rust inhibitor to the parts.
HINT: If rust inhibitor gets spilled on other parts, promptly wipe it off with a clean cloth dipped in a grease, wax and silicon remover.

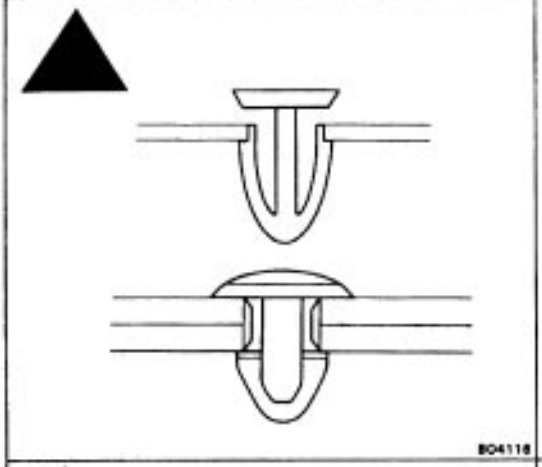
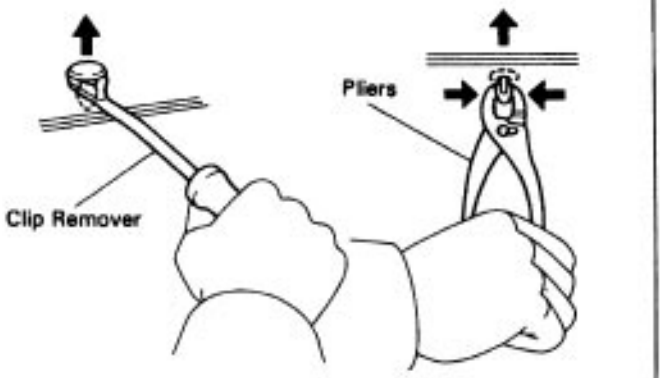
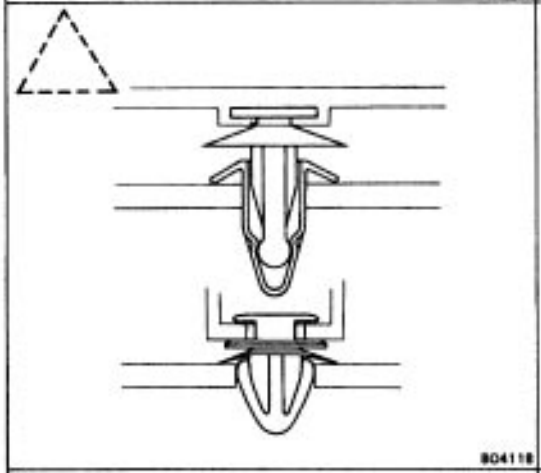
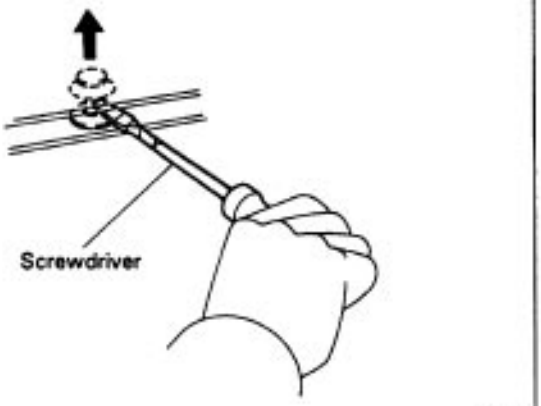
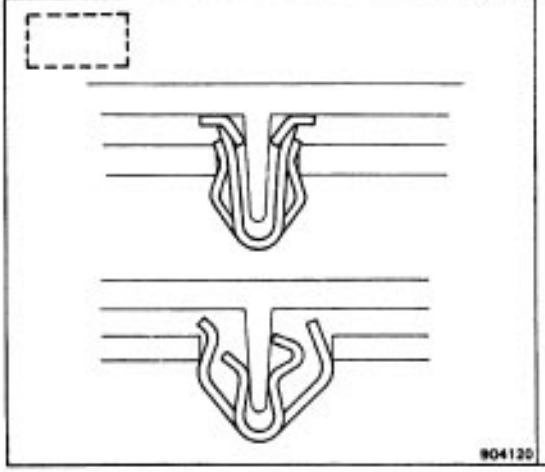
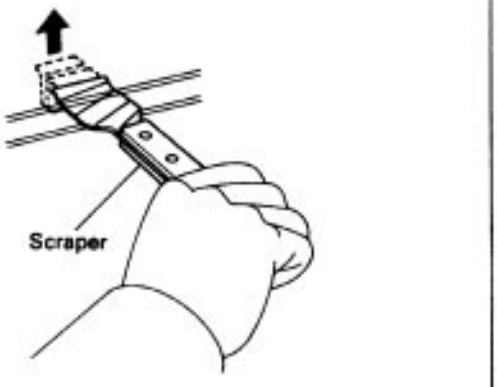


Touch– Up Paint

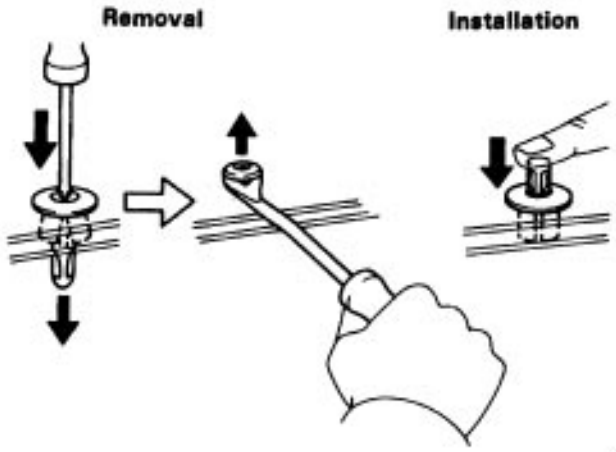
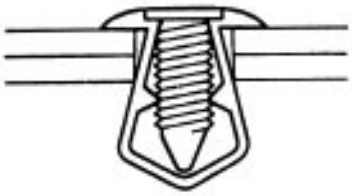
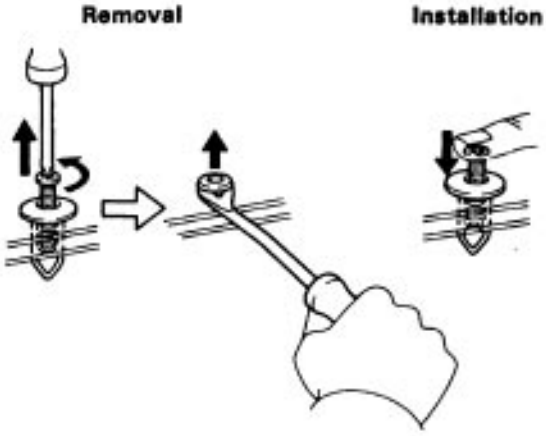
If a small scratch is made in the body surface, correct the scratch using touch–up paint the same color as the body color.

CLIPS

The removal and installation methods of typical clips used in body parts are shown in the table below.
HINT: If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal/installation
	
	
	

CLIPS (Cont'd)

Shape (Example)	Removal/installation
 BO4122	 BO4123
 BO4124	 BO4125

V00012

SRS (Supplemental Restraint System)

The 1994 CAMRY is equipped with an SRS, such as the driver airbag and front passenger airbag assembly. Failure to carry out service operations in the correct sequence could cause the SRS to deploy, possibly leading to a serious accident.
When removing or installing, refer to the pre–cautionary notices in the RS section before perform–ing the operation.

- Work must be started after 90 seconds from the time the ignition switch is set to the LOCK posi–tion and the negative (–) terminal cable is dis–connected from the battery.
  (The SRS is equipped with a back–up power source so that if work is started within 90 sec–onds of disconnecting the negative (–) terminal cable from the battery, the SRS may deploy.)
- To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.
- Before repairs, remove the airbag sensors if shocks are likely to be applied to the sensors during repairs.
- The front airbag sensor set bolt has been anti–rust treated. When the sensor is removed, always replace the set bolt with a new one.
- If the front airbag sensors, center airbag sensor assembly, steering wheel pad or front passenger airbag assembly have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
- Do not expose the front airbag sensors, center airbag sensor assembly, steering wheel pad or front passenger airbag assembly directly to hot air or flames.
- The SRS wire harness is integrated with the cowl wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the SRS wire harness becomes disconnected or the connector bec–omes broken due to an accident, etc., repair or replace it. (See RS section)

- The steering wheel must be fitted correctly to the steering column with the spiral cable at the neu–tral position; otherwise, cable disconnection and other troubles may result. Refer to RS section of this manual concerning correct steering wheel installation.
- When removing or handling the steering wheel pad or front passenger airbag assembly, it should be placed with them top surface facing up. In this case, the twin–lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. (Storing the pad with its metallic sur–face up, the front passenger airbag assembly with the airbag door facing down may lead to a serious accident if the airbag inflates for some reason.)
- Grease should not be applied to the steering wheel pad or the front passenger airbag assem–bly, and they should not be cleaned with deter–gents of any kind.
- Store the steering wheel pad or the front passen–ger airbag assembly where the ambient tempera–ture remains below 93®C (200®F), without high humidity and away from electrical noise.
- Information labels are attached to the periphery of the SRS components. Follow the notices.
- When the ignition switch is at ACC or ON and the SRS warning light remains on, the center airbag sensor assembly has detected a malfunction code. (See RS section)

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09812–00020 Door Hinge Set Bolt Wrench	
	09804–24010 Luggage Compartment Door Torsion Bar Tool	

LUBRICANT

Item	Capacity	Classification
MP grease	–	–

SSM (SPECIAL SERVICE MATERIALS)

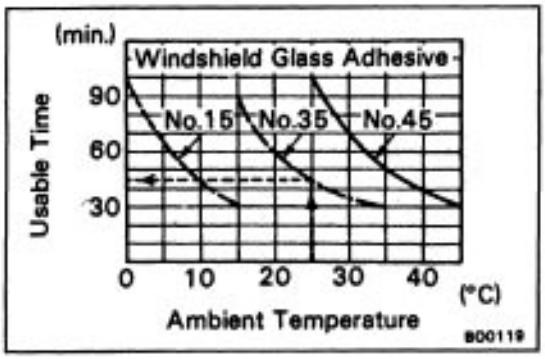
08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Front Door Rear Door Sliding Roof
08850–00070 Windshield glass adhesive set No. 15 or equivalent	Windshield Back Window Glass (0–15°C or 32–59°F)
08850–00080 Windshield glass adhesive set No.35 or equivalent	Windshield Back Window Glass (15–35°C or 59–95°F)
08850–00090 Windshield glass adhesive set No.45 or equivalent	Windshield Back Window Glass (35 – 45°C o r 95 –113°F)
08833–00030 Auto glass sealer or equivalent	Windshield Moulding Back Window Moulding Windshield Back Window Glass
08850–00051 Adhesive (Super Special) or equivalent	Side Protection Moulding

Ambient temperature	Part No.	Part Name
0 – 160C (32 – 59®F)	o8850–00070	Windshield glass adhesive set No. 15
(59 – 95®F)	08850–00080	Windshield glass adhesive set No. 35
35 – 45®C (95 – 113®F)	08850–00090	Windshield glass adhesive set No. 45

V00250

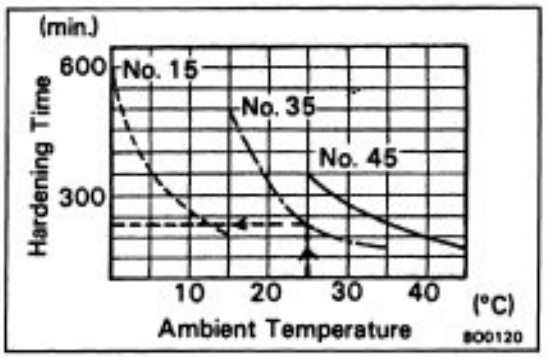
1. CHOOSE SUITABLE ADHESIVE SET

Use an adhesive set suitable for the ambient temper–ature.



2. CHECK ADHESIVE USABLE TIME

After mixing main and hardening agents, finish glass installation within the specified time as shown.
Example: For glass installation in an ambient tempera–ture of 25®C (77®F), apply adhesive set No.35 within 45 minutes.



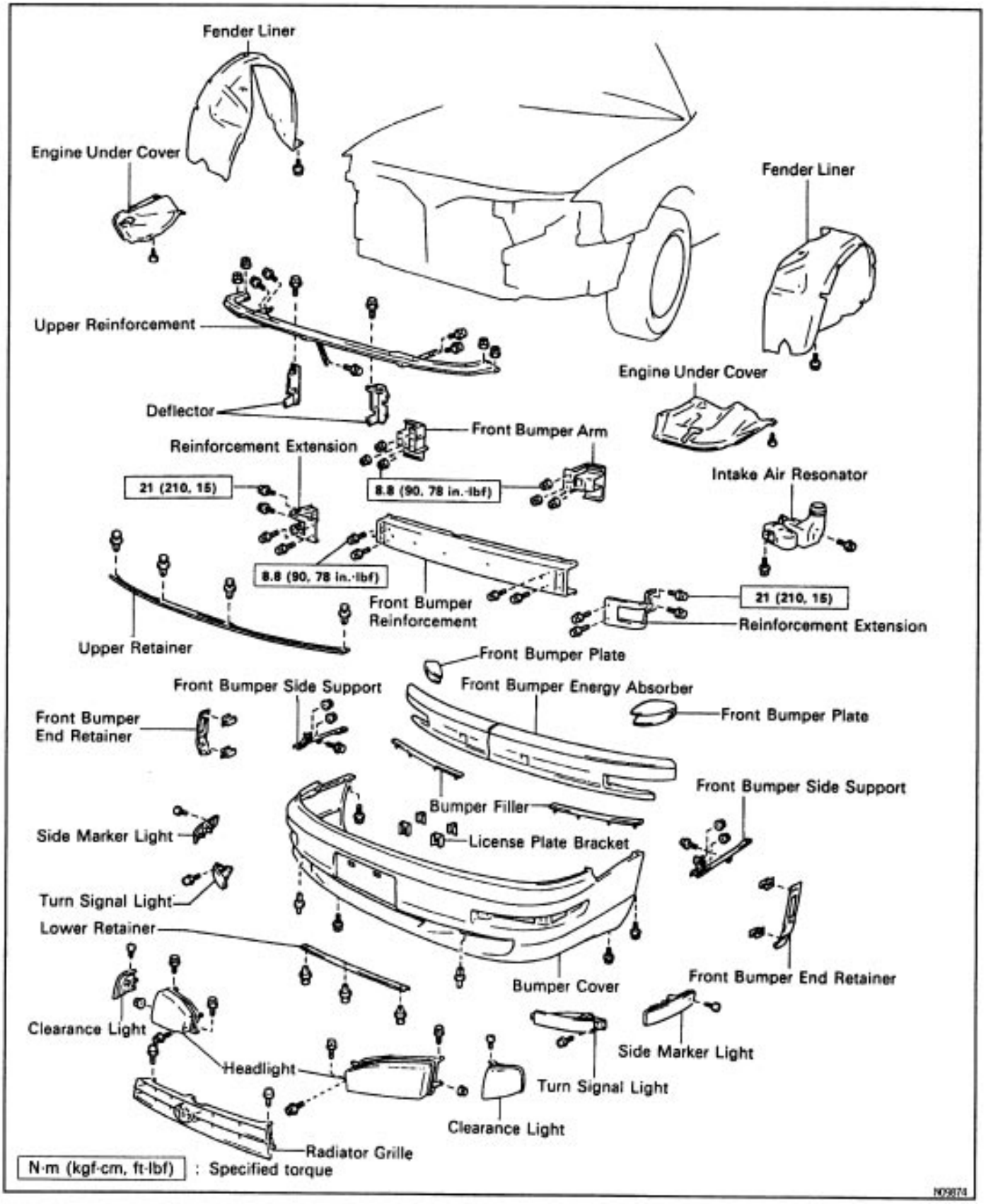
3. CHECK ADHESIVE HARDENING TIME

After main and hardening agents are mixed, leak tests should be made only after the hardening time has elapsed.
Example: The hardening time for adhesive set No.35 with and ambient temperature of 25®C (77®F) is 2 1/2 hours.

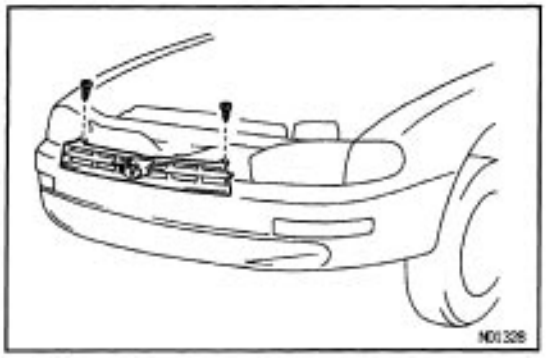
NOTICE: Do not drive the vehicle until at least double the hardening time has elapsed.

FRONT BUMPER

COMPONENTS

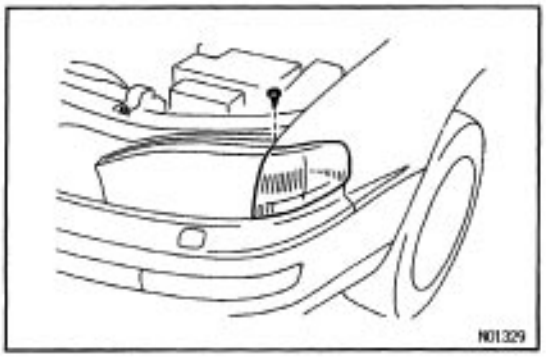


FRONT BUMPER REMOVAL



1. REMOVE RADIATOR GRILLE

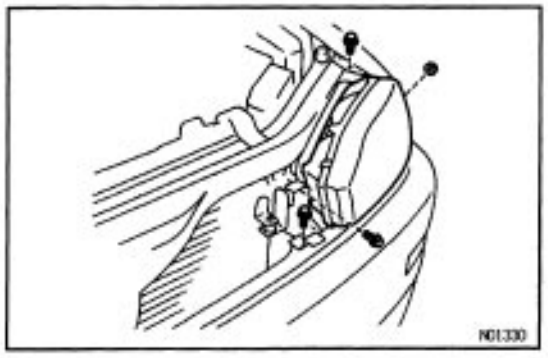
Remove 2 screws and the grille.



2. REMOVE CLEARANCE LIGHT

(a) Remove the screw.

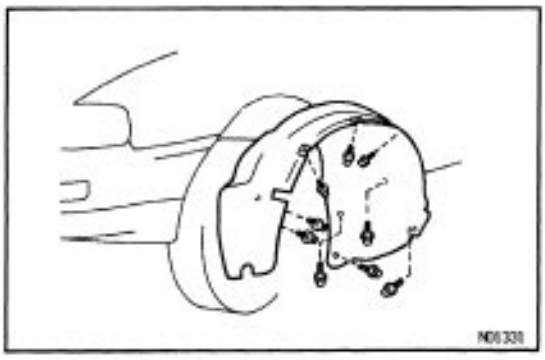
(b) Pull the light forwards to remove it, then disconnect the connector.



3. REMOVE HEADLIGHT

(a) Disconnect the connectors.

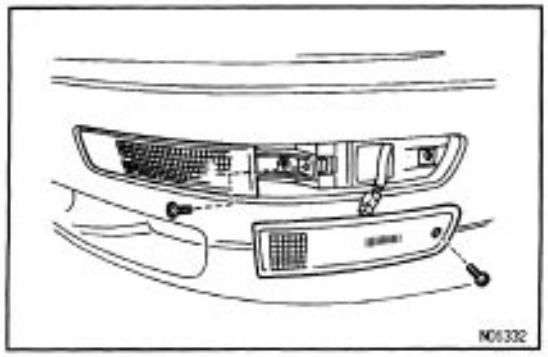
(b) Remove 3 bolts, the nut and the headlight.



4. REMOVE FENDER LINER

(a) Remove 7 screws.

(b) Remove 3 bolts and the fender liner.

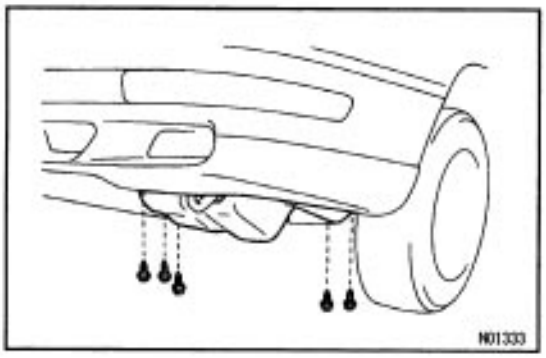


5. REMOVE SIDE MARKER LIGHT

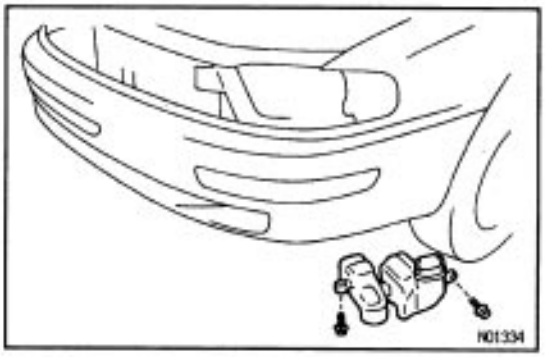
Remove the screw and the light, then disconnect the connector.

6. REMOVE TURN SIGNAL LIGHT

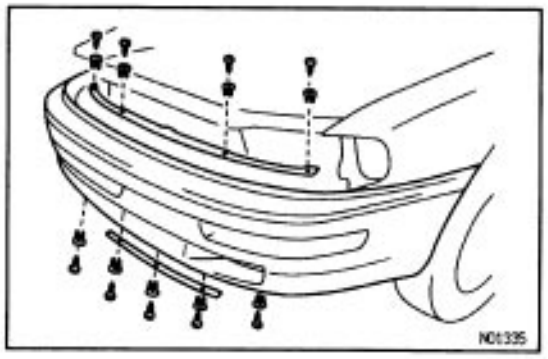
Remove the screw and the light, then disconnect the connector.



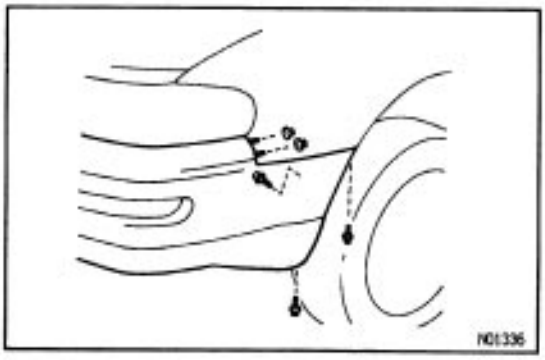
7. REMOVE ENGINE UNDER COVER
(a) Remove the clip
(b) Remove 4 screws an the cover.



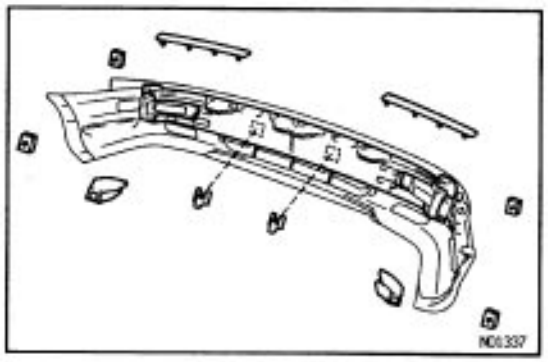
8. REMOVE INTAKE AIR RESONATOR
Remove 2 bolts and the resonator.



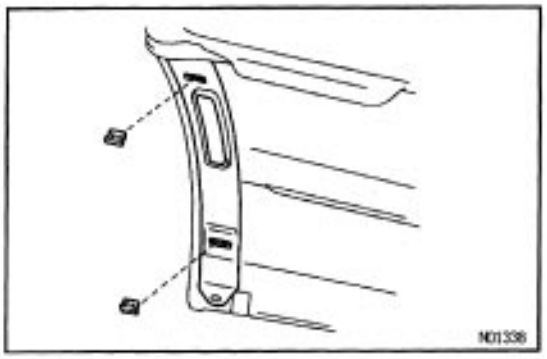
9. REMOVE BUMPER COVER
(a) Remove 4 clips and the upper retainer.
(b) Remove 3 clips and the lower retainer.
(c) Remove 2 clips.



(d) Remove 3 bolts and 2 nuts.
(e) Pull the cover forwards to remove it.

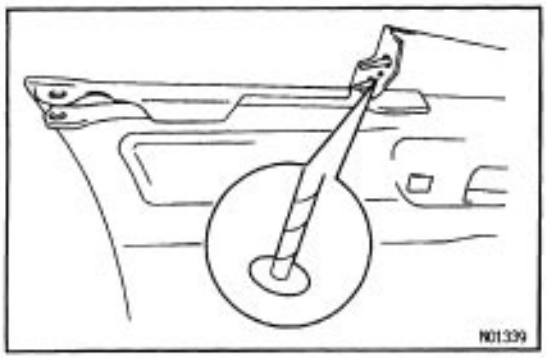


10. REMOVE FRONT BUMPER ENERGY ABSORBER
(a) Remove 2 plates.
(b) Remove 2 absorber from the bumper cover.
(c) Remove 2 clips and 2 license brackets.
(d) Remove 4 nuts.
(e) Remove 2 fillers.



11. REMOVE FRONT BUMPER END RETAINER

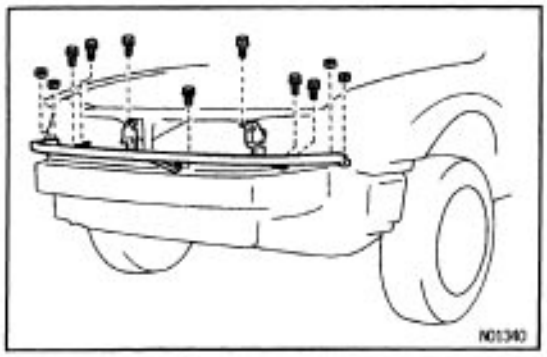
Remove 2 clips and the retainer.



12. REMOVE FRONT BUMPER SIDE SUPPORT

(a) Using about 3.2 mm (0.128 in.) drill, drill out 2 rivet heads.

(b) Remove the side support.

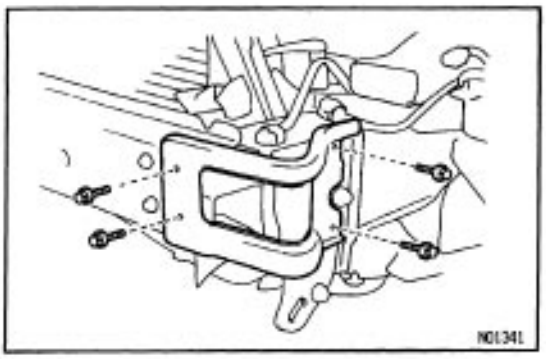


13. REMOVE UPPER REINFORCEMENT

(a) Remove 4 nuts.

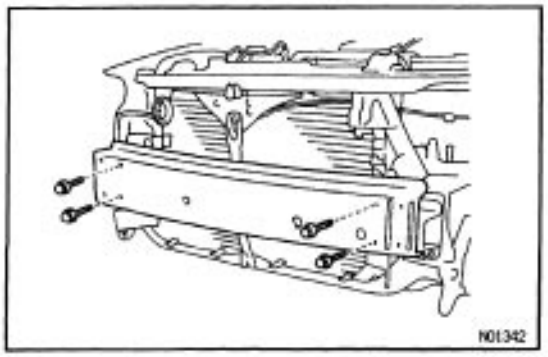
(b) Remove 5 bolts and the upper reinforcement.

(c) Remove 2 bolts and 2 deflectors.



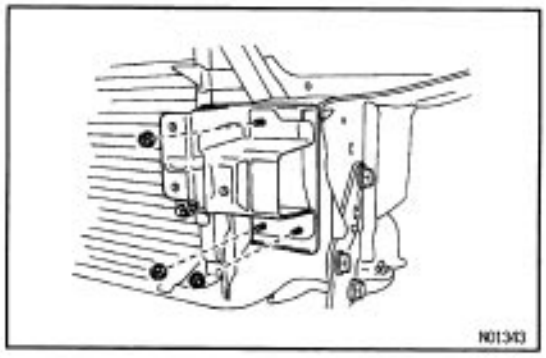
14. REMOVE REINFORCEMENT EXTENSION

Remove 4 bolts and the extension.



15. REMOVE FRONT BUMPER REINFORCEMENT

Remove 4 bolts and the reinforcement.



16. REMOVE FRONT BUMPER ARM

Remove 3 nuts and the bumper arm.

FRONT BUMPER INSTALLATION

B0013W–02

INSTALL FRONT BUMPER PARTS BY FOLLOWING REMOVAL SEQUENCE IN REVERSE

1. INSTALL FOLLOWING PARTS:

(a) Front bumper arm

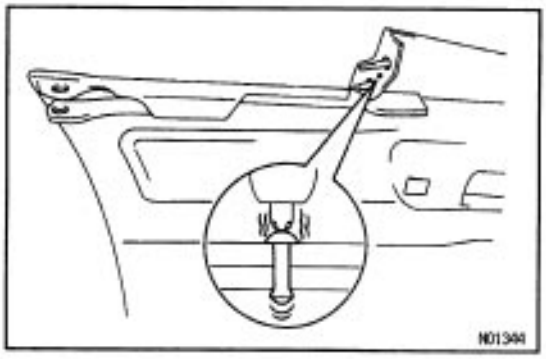
Torque: 8.8 N–m (90 kgf–cm, 78 in.–lbf)

(b) Front bumper reinforcement

Torque: 8.8 N–m (90 kgf–cm, 78in.–lbf)

(c) Reinforcement extension

Torque: 21 N–m (210 kgf–cm. 15 ft.–lbf)



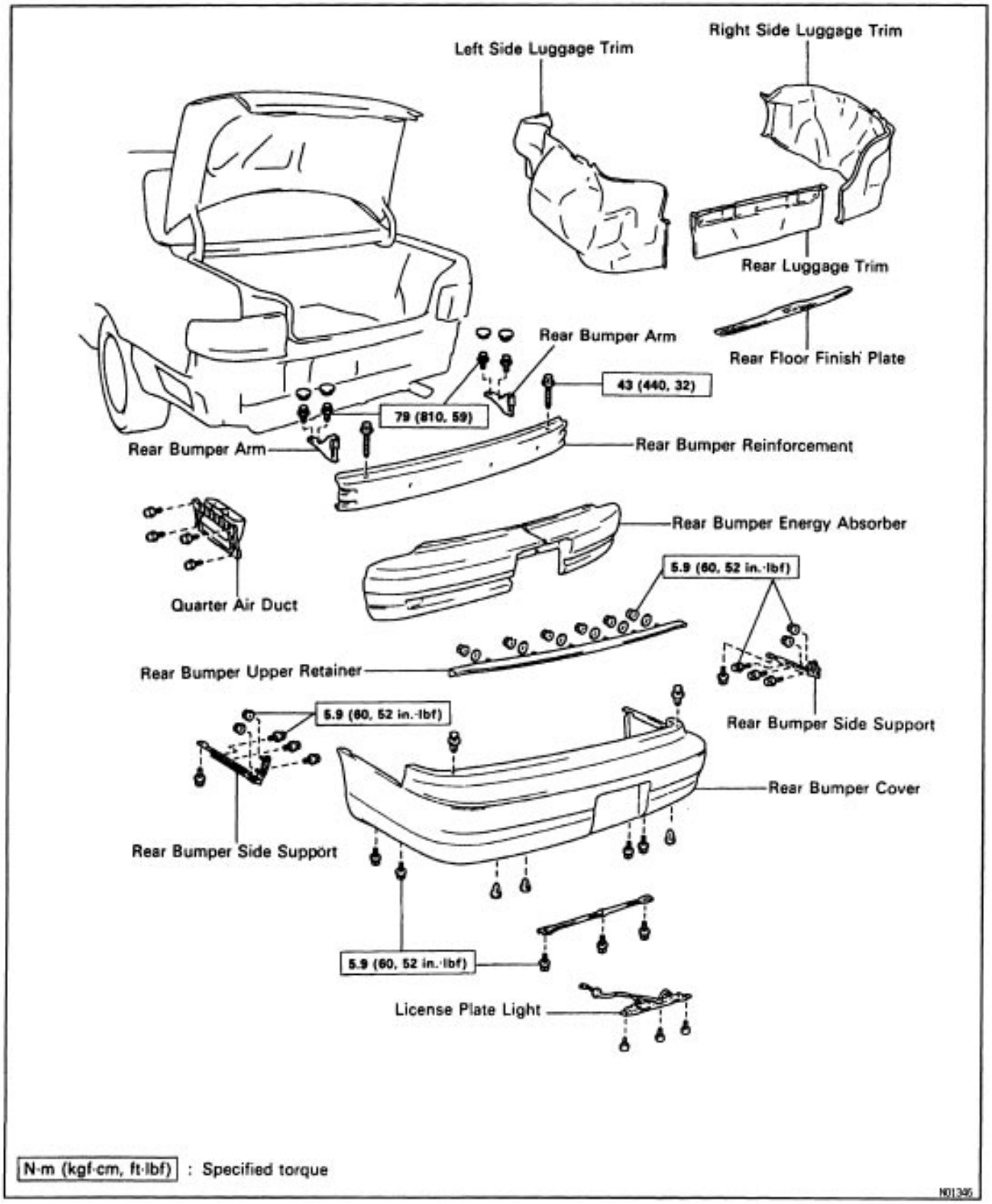
2. INSTALL FRONT BUMPER SIDE SUPPORT

(a) Place the side support in the bumper cover.

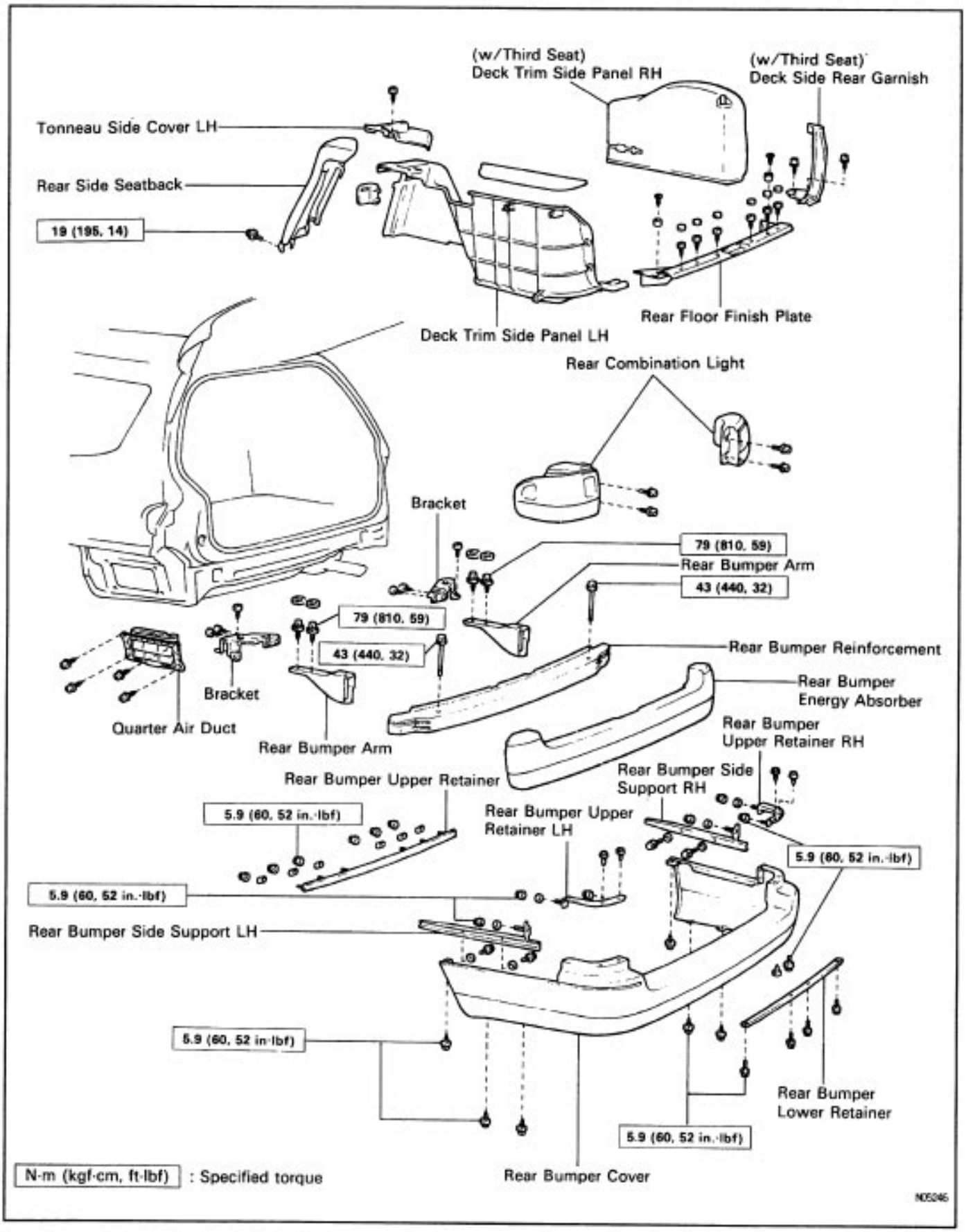
(b) Using a riveter, install 2 rivets.

REAR BUMPER

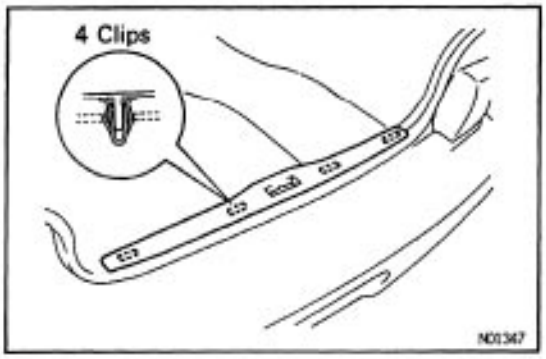
COMPONENTS



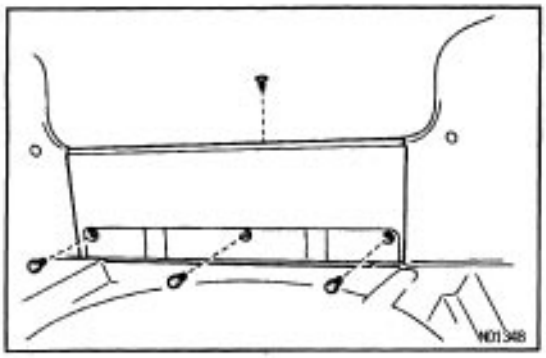
COMPONENTS (Cont'd)



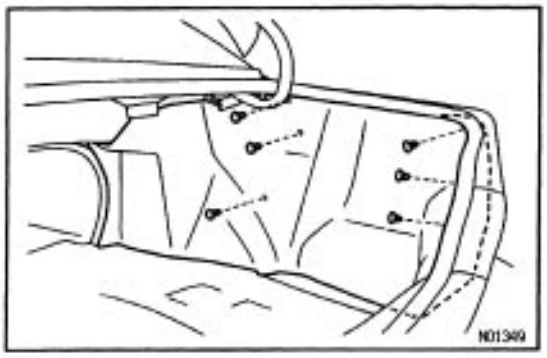
REAR BUMPER REMOVAL



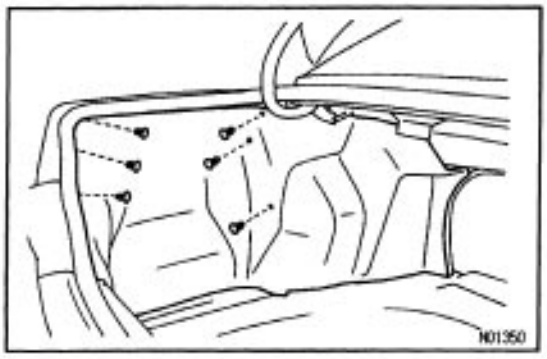
1. REMOVE REAR FLOOR FINISH PLATE
Remove the finish plate by pulling.



2. REMOVE REAR LUGGAGE TRIM
Using a clip remover, remove 4 clips and the trim.

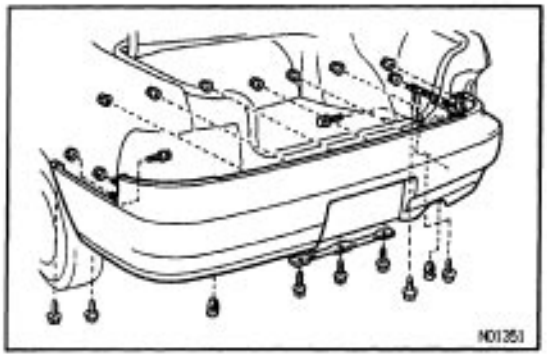


3. REMOVE RIGHT SIDE LUGGAGE TRIM
Using a clip remover, remove 6 clips and the trim.

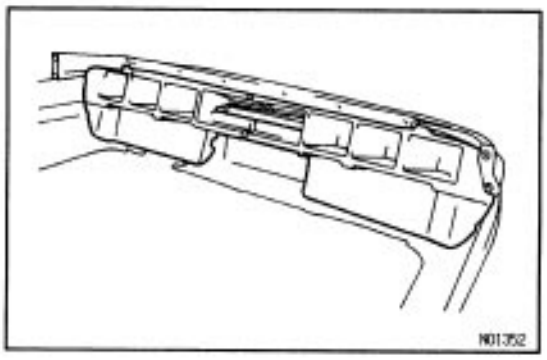


4. REMOVE LEFT SIDE LUGGAGE TRIM
Using a clip remover, remove 6 clips and the trim.

5. REMOVE REAR LICENSE PLATE LIGHT
Remove 3 screws and the light, then disconnect the connector.

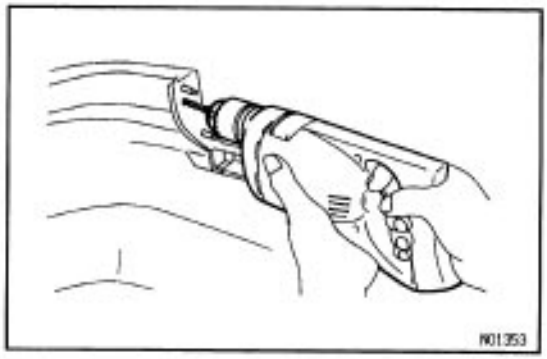


6. REMOVE REAR BUMPER COVER
(a) Remove 9 bolts and 10 nuts.
(b) Pull the cover rearwards to remove it.



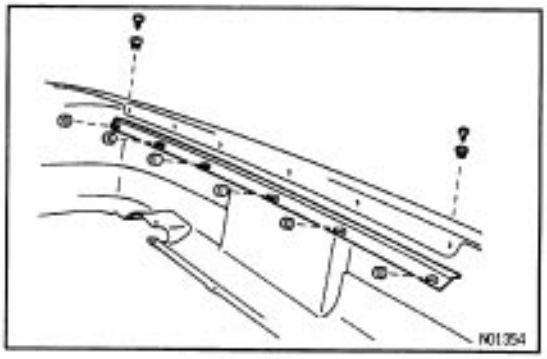
7. REMOVE REAR BUMPER ENERGY ABSORBER

Remove the absorber from the bumper cover.



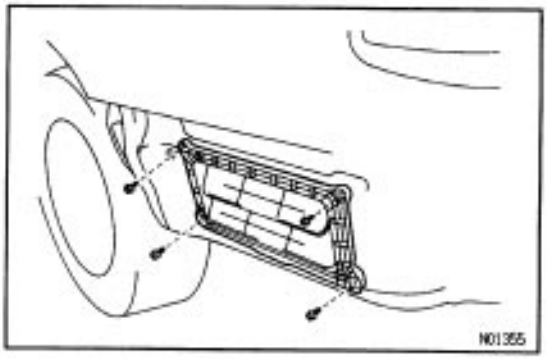
8. REMOVE REAR BUMPER SIDE SUPPORT

(a) Using an approx. 3.2 mm (0.26 in.) drill, drill out 3 rivet heads.
(b) Remove the side support.



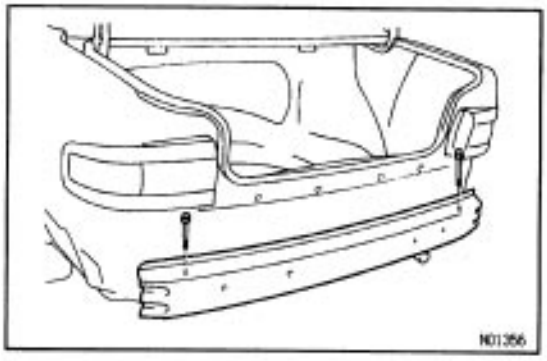
9. REMOVE REAR BUMPER UPPER RETAINER

(a) Remove 2 clips.
(b) Remove 6 spacers.
(c) Remove the retainer from the bumper cover.



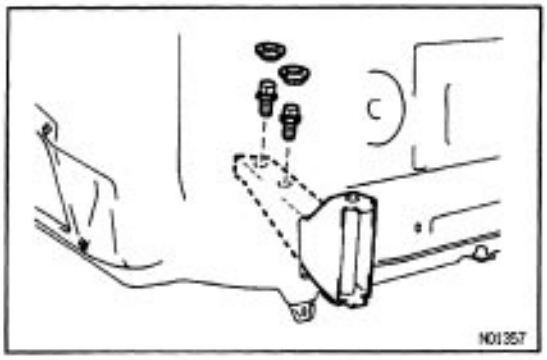
10. REMOVE QUARTER AIR DUCT

Remove 4 screws and the duct.



11. REMOVE REAR BUMPER REINFORCEMENT

Remove 2 bolts and the reinforcement.



12. REMOVE REAR BUMPER ARM

(a) Remove 2 grommets.

(6) Remove 2 bolts and the bumper arm_

REAR BUMPER INSTALLATION

INSTALL REAR BUMPER PARTS BY FOLLOWING RE–MOVAL SEQUENCE IN REVERSE

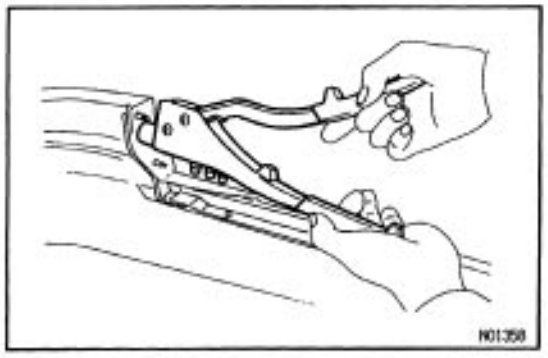
1. INSTALL FOLLOWING PARTS:

(a) Rear bumper arm

Torque: 79 N–m (810 kgf–cm, 59 ft–lbf)

(b) Rear bumper reinforcement

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

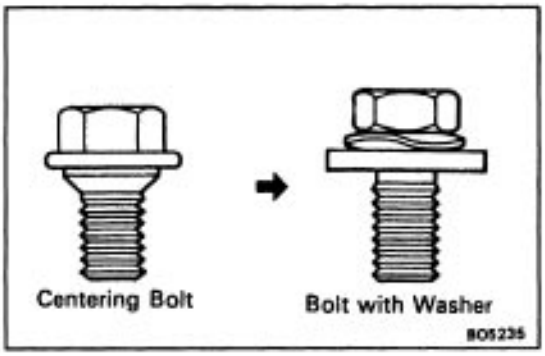


2. INSTALL REAR BUMPER SIDE SUPPORT

(a) Place the side support in the bumper cover.

(b) Using a riveter, install 3 rivets.

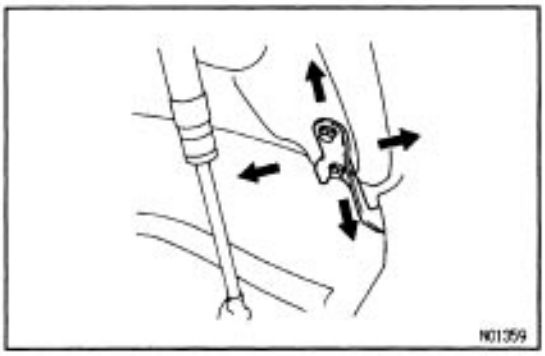
(c) Install 2 seal rubbers to 2 bolts.



HOOD

HOOD ADJUSTMENT

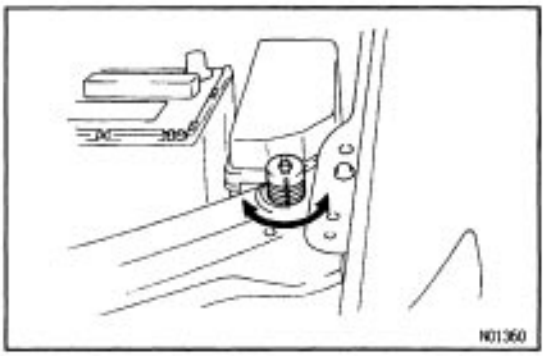
HINT: Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on. Substitute the bolt with washer for the centering bolt.



1. ADJUST HOOD IN FORWARD / REARWARD AND LEFT/RIGHT DIRECTIONS

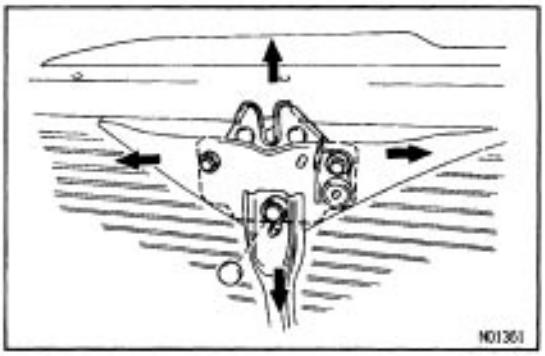
Adjust the hood by loosening the hood side hinge bolts.

Torque: 14 N–m (145 kgf–cm, 10 ft–lbf)



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTIONS

Adjust the hood by turning the cushions.



3. ADJUST HOOD LOCK

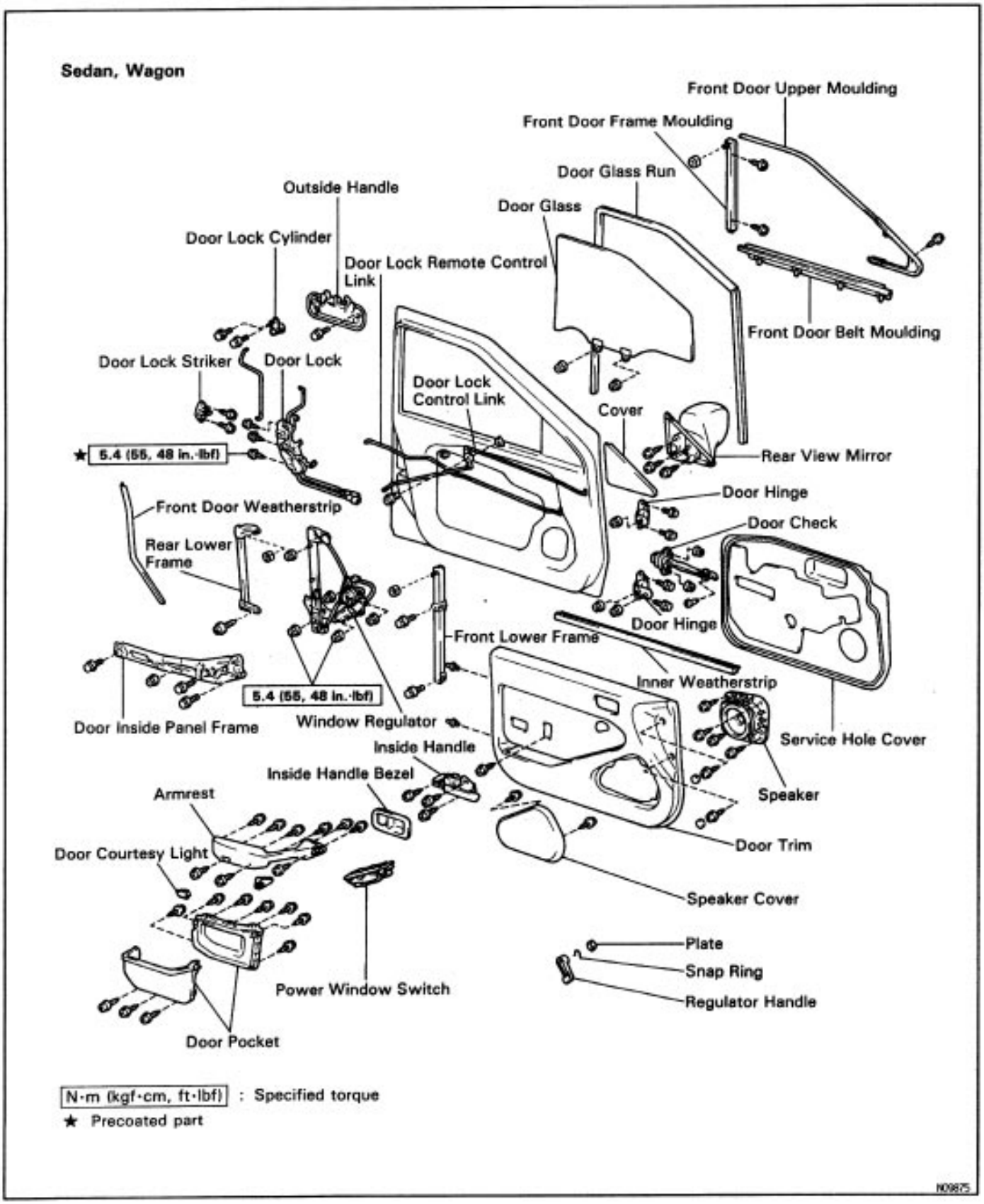
(a) Adjust the lock by loosening the bolts.

Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

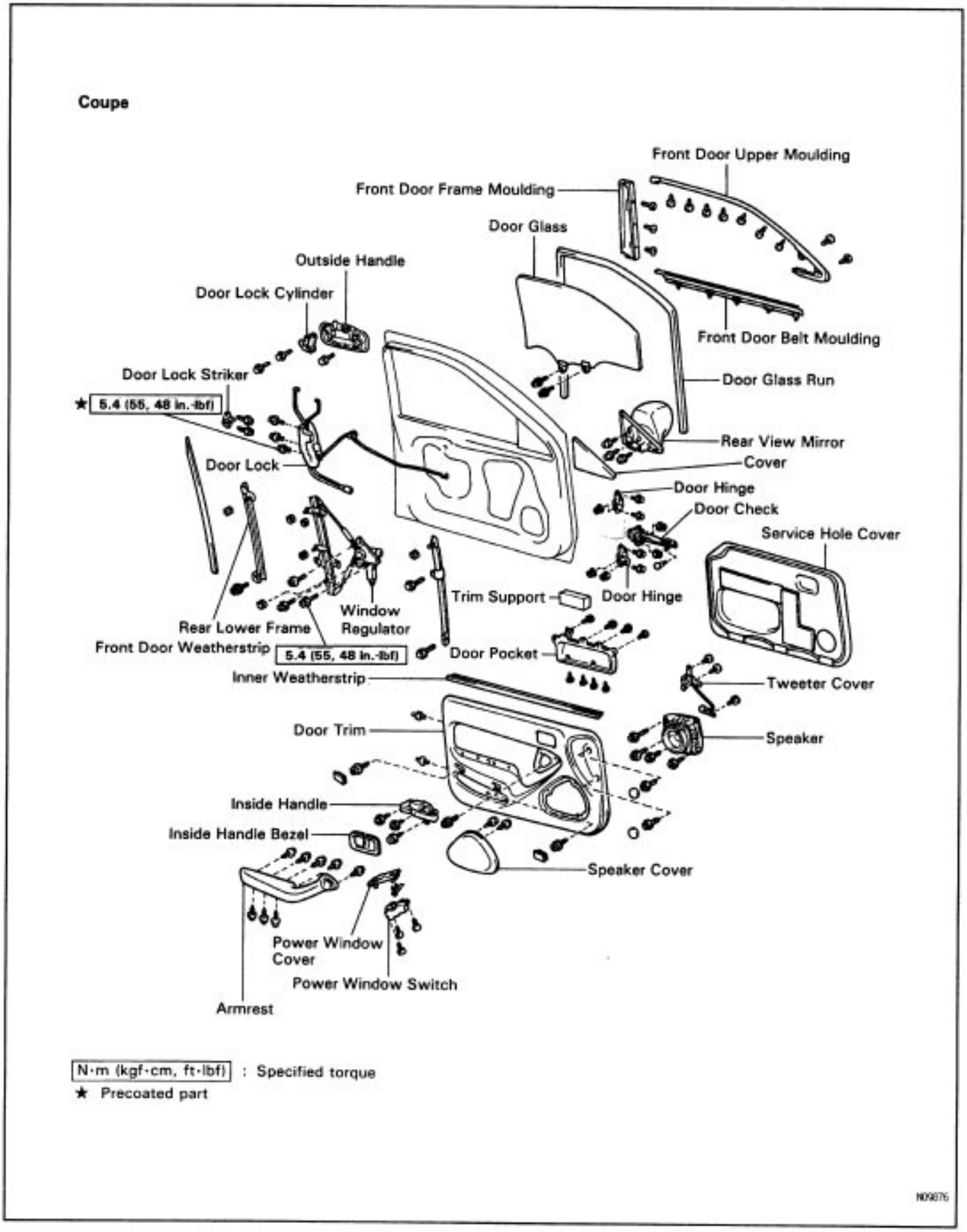
(b) Install radiator support upper seal with 10 clips.

FRONT DOOR

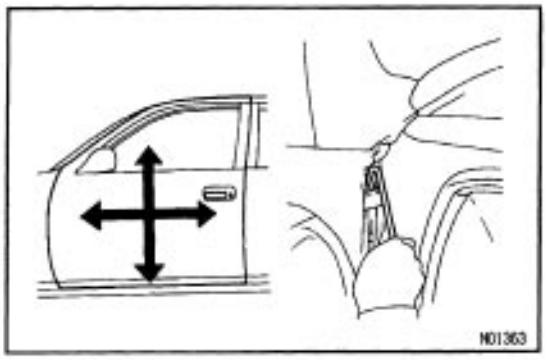
COMPONENTS



COMPONENTS (Cont'd)

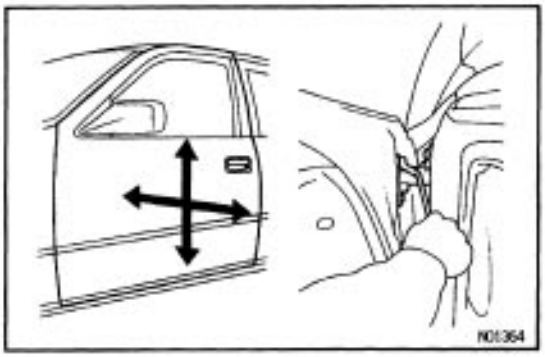


FRONT DOOR ADJUSTMENT



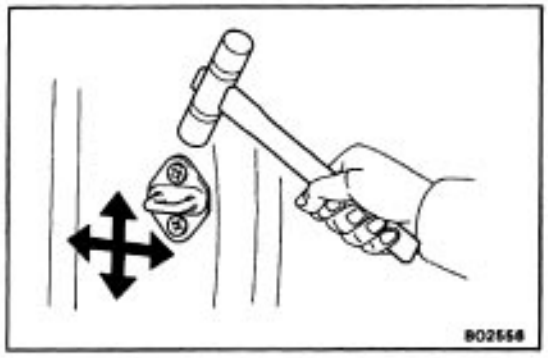
1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.
SST 09812–00020



2. ADJUST DOOR IN LEFT/ RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.
HINT: Substitute the bolt with washer for the centering bolt.

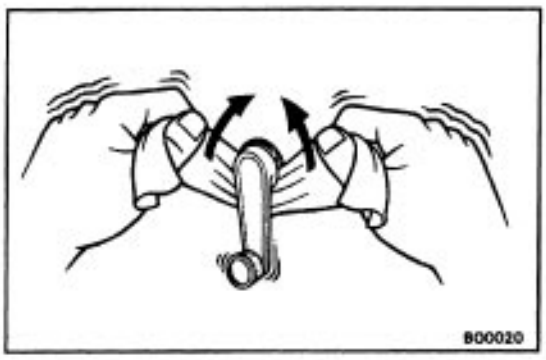


3. ADJUST DOOR LOCK STRIKER

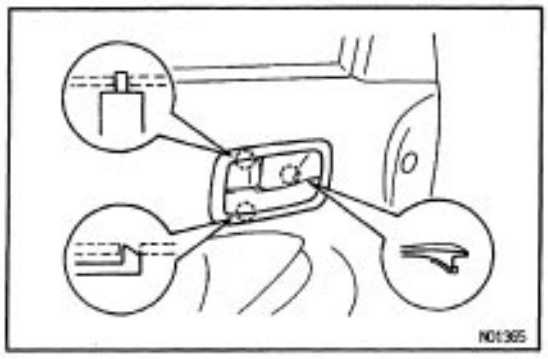
(a) Check that the door fit and door lock linkages are adjusted correctly.
(b) Loosen the striker mounting screws to adjust.
(c) Using a plastic hammer, tap the striker to adjust it.

FRONT DOOR DISASSEMBLY

1. w/o Power Window:
REMOVE REGULATOR HANDLE

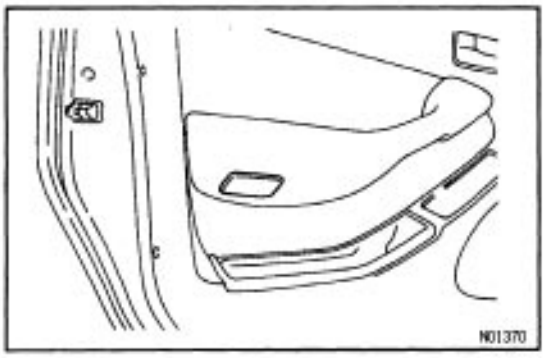


Pull off the snap ring with a shop rag and remove the regulator handle and plate.



2. REMOVE INSIDE HANDLE BEZEL

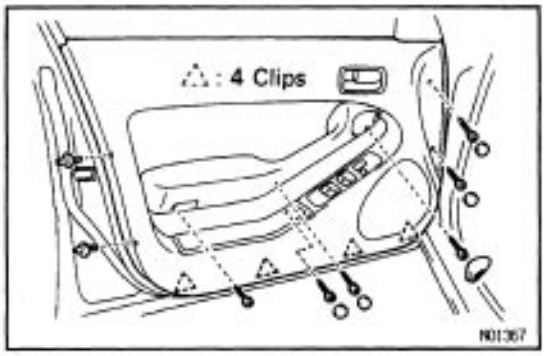
(a) Using a screwdriver, pry out the bezel.
HINT: Tape the screwdriver tip before use.
(b) Pull the bezel rearwards to remove it.

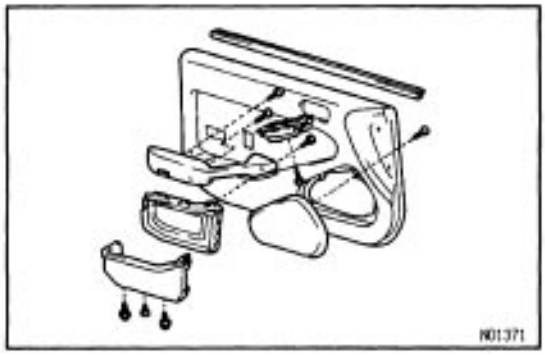


3. Coupe:

REMOVE DOOR COURTESY LIGHT

Remove the light by pulling, then disconnect the con–nector.



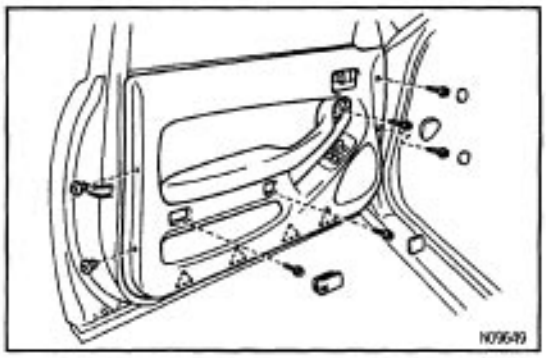


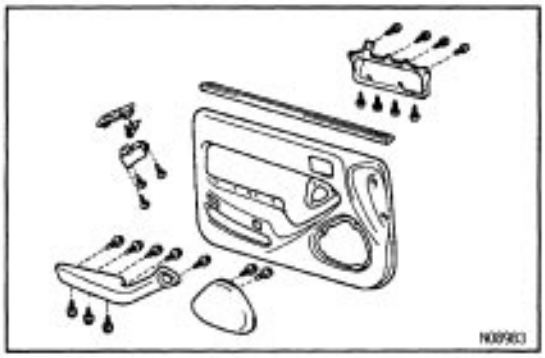
4. REMOVE DOOR TRIM

Sedan, Wagon:

HINT: Tape the screwdriver, remove tip before use.

(a) Remove 2 clips.
(b) Using a screwdriver, remove 2 screw caps and the tweeter cover.
(c) Remove 6 screws.
(d) Insert the screwdriver between the door and the door trim to pry out.
(e) Pull the trim upwards to remove it, then disconnect the connector.
(f) Remove the inner weatherstrip.
(g) Remove 2 screws and the power window switch.
(h) Remove 6 screws and the armrest.
(i) Remove 2 screws and the lower speaker cover.
(j) Remove the clip, 9 screws and the door pocket.

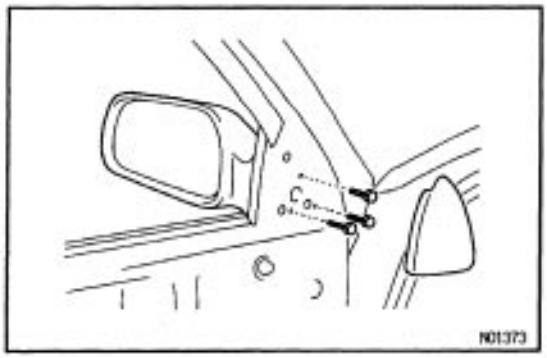




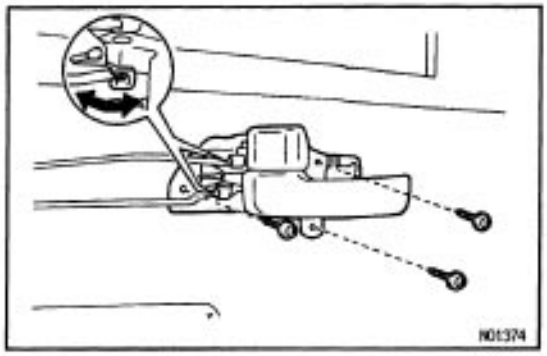
Coupe:

HINT: Tape the screwdriver tip before use.

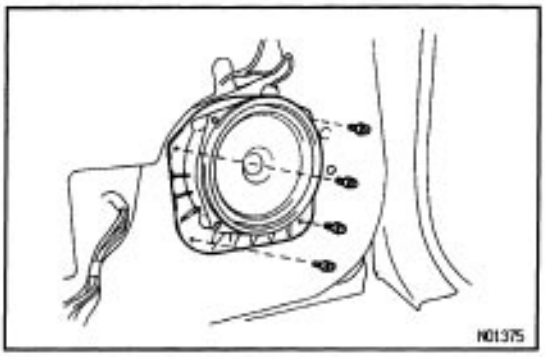
(a) Remove the 2 clips.
(b) Using a screwdriver, remove the 3 caps and tweeter cover.
(c) Remove 5 screws.
(d) Insert the screwdriver between the door and the door trim to pry out.
(e) Pull the trim upwards to remove it, then disconnect the connectors.
(f) Remove the inner weatherstrip.
(g) Remove 3 screws and power window switch.
(h) Remove 3 screws and tweeter speaker.
(i) Remove 2 screws and front speaker cover.
(j) Remove 7 screws and door armrest.
(k) Remove the trim support.
(1) Remove 8 screws and door pocket.



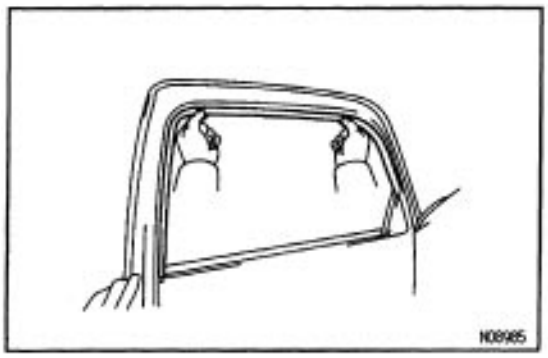
5. REMOVE REAR VIEW MIRROR
(a) Remove the cover.
(b) Remove 3 screws and the mirror.
(c) w/ Remote Control Mirror:
Disconnect the connector.



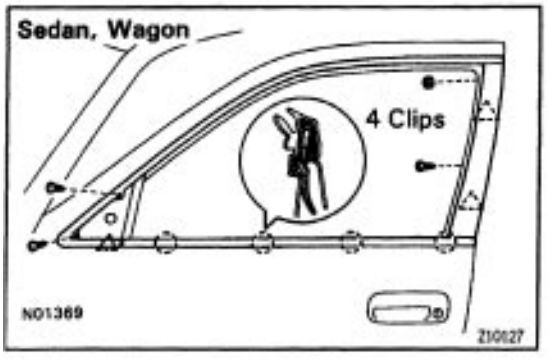
6. REMOVE DOOR INSIDE HANDLE
(a) Disconnect 2 links.
(b) Remove 3 screws and the handle.



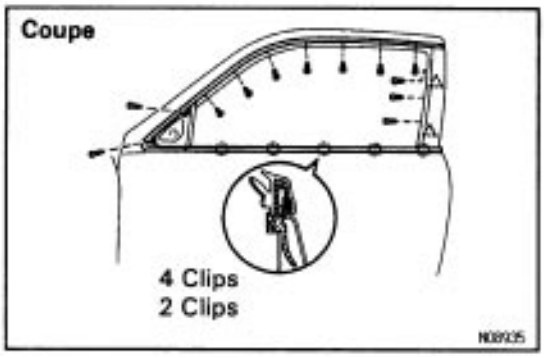
7. REMOVE SPEAKER
(a) Remove 4 screws and the speaker.
(b) Disconnect the connector.
8. REMOVE SERVICE HOLE COVER



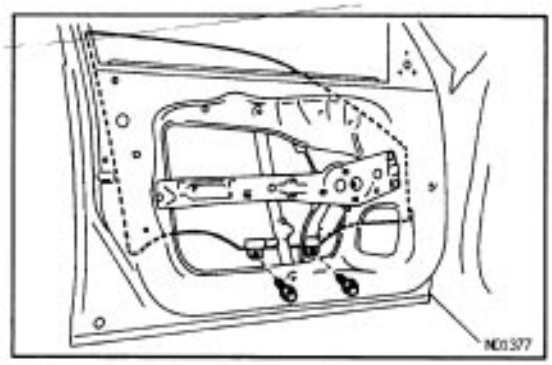
9. REMOVE DOOR GLASS RUN
Pull the glass run upwards and remove it.



10. REMOVE FRONT DOOR BELT MOULDING
Pry out the clips from the edge of the weatherstrip and remove the moulding.
11. REMOVE FRONT DOOR FRAME MOULDING
(a) Sedan, Wagon: Remove 3 screws and the moulding.
(b) Coupe: Remove 3 screws.
(c) Pry out the clips and remove the moulding.
12. REMOVE FRONT DOOR UPPER MOULDING
(a) Sedan, Wagon: Remove 7 screws.



(b) Coupe: Remove 9 screws.
(c) Pry out the clip and remove the moulding.



13. REMOVE DOOR GLASS

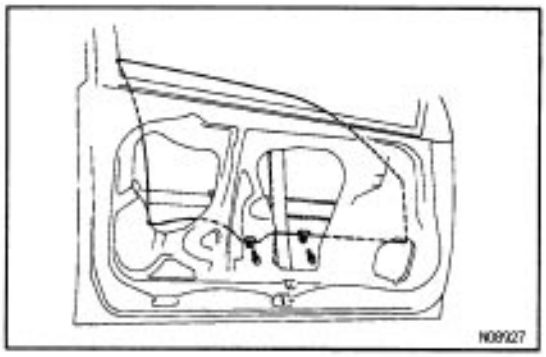
HINT: Insert a shop rag inside the panel to prevent scratching the glass.

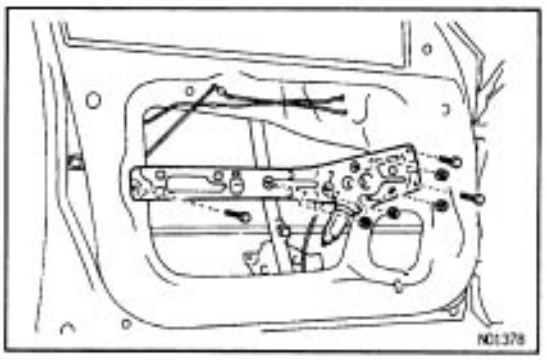
(a) Remove 2 glass mounting bolts.
(b) Remove the door glass by pulling it upwards.

14. REMOVE FRONT DOOR WEATHERSTRIP

While pulling the weatherstrip by hand, remove the clips using a clip remover.

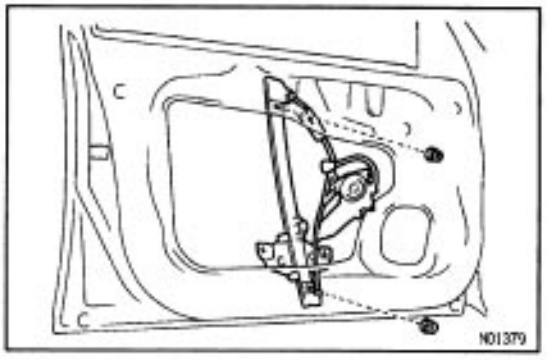
HINT: Do not pull stronger on the weatherstrip as it may tear.





15. Sedan, Wagon:
REMOVE DOOR INSIDE PANEL FRAME

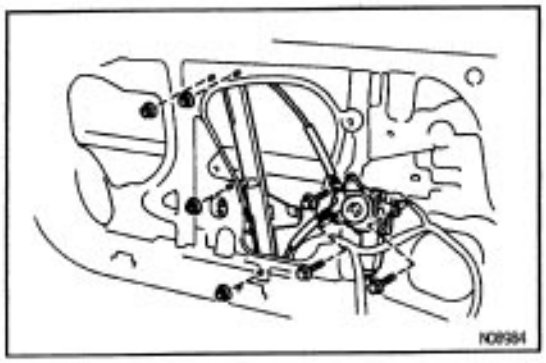
(a) Remove 4 nuts.
(b) Remove 3 bolts and the frame.



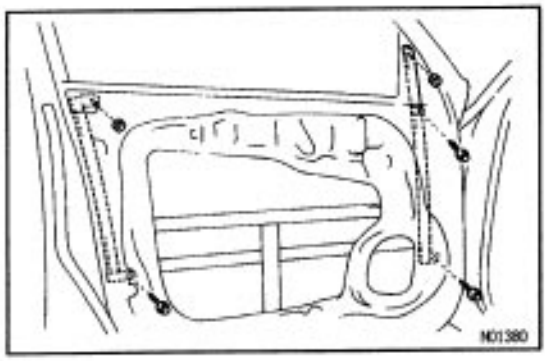
16. REMOVE WINDOW REGULATOR

Sedan, Wagon:

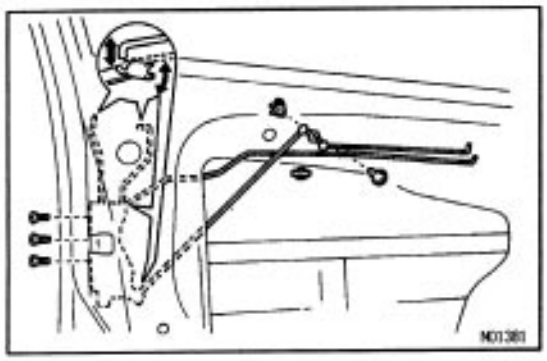
(a) Remove 2 nuts.
(b) w/ Power Window:
Disconnect the connector.
(c) Remove the regulator through the service hole.



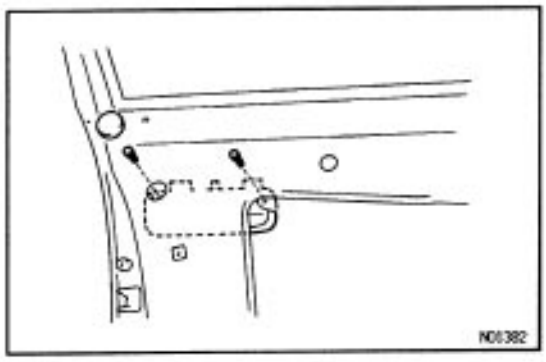
Coupe:
(a) Remove 4 nuts and 3 bolts.
(b) w/ Power Window:
Disconnect the connector.
(c) Remove the regulator through the service hole.



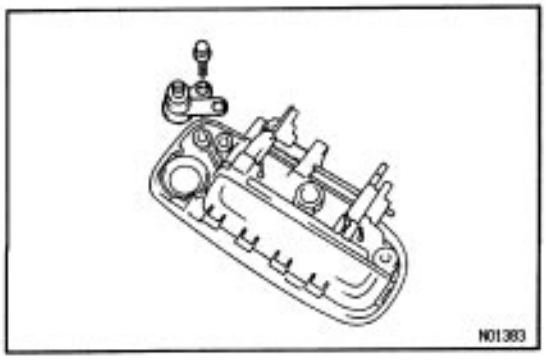
17. REMOVE FRONT LOWER FRAME
Remove the nut, 2 bolts and the frame.
18. REMOVE REAR LOWER FRAME
Remove the nut, the bolt and the frame.



19. REMOVE DOOR LOCK
(a) Remove 2 clips.
(b) Disconnect 2 links from the door lock and remove 2 links.
(c) Disconnect 2 links from the outside handle and the lock cylinder.
(d) Remove 3 screws.
(e) w/ Power Door Lock:
Disconnect the connector.
(f) Remove the door lock through the service hole.

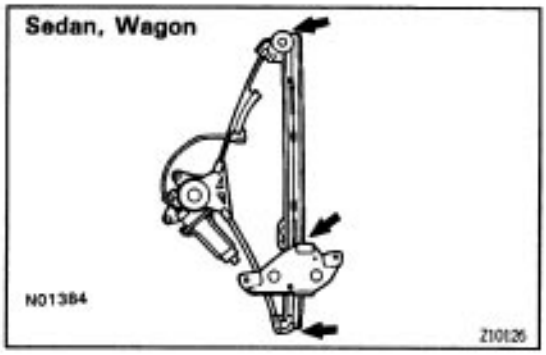


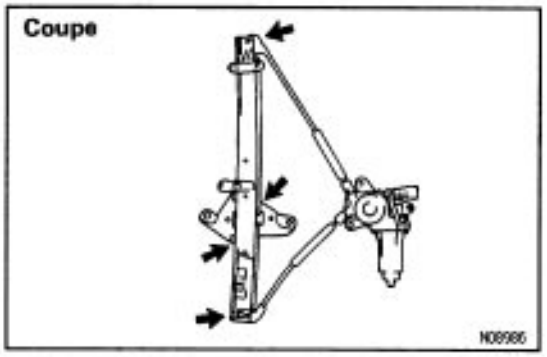
20. REMOVE OUTSIDE HANDLE
(a) Remove the hole plug.
(b) Remove 2 bolts and the outside handle with the lock cylinder.



21. REMOVE DOOR LOCK CYLINDER
Remove the bolt and the lock cylinder from the out–side handle.

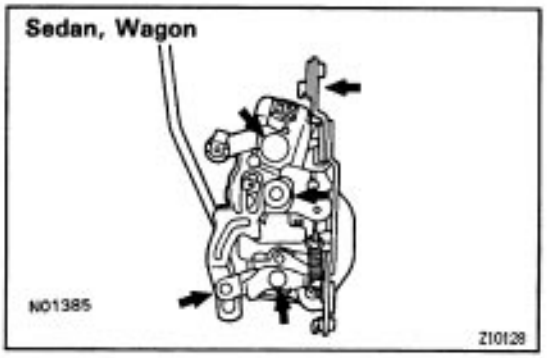
FRONT DOOR ASSEMBLY



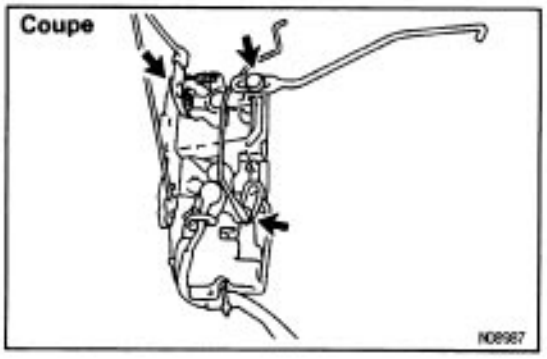


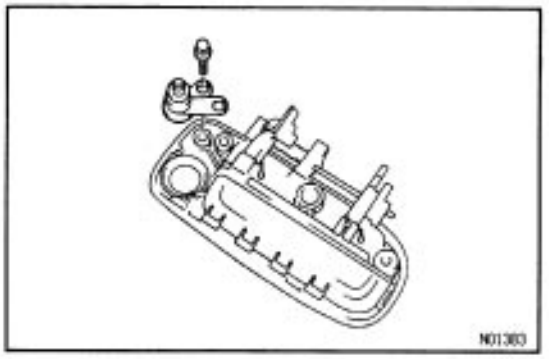
1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

(a) Apply MP grease to the window regulator rollers.



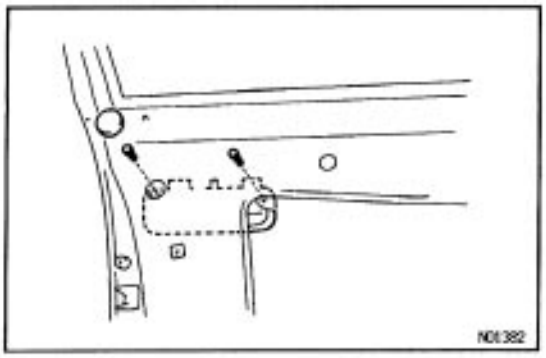
(b) Apply MP grease to the sliding surface of the door lock.





2. INSTALL DOOR LOCK CYLINDER

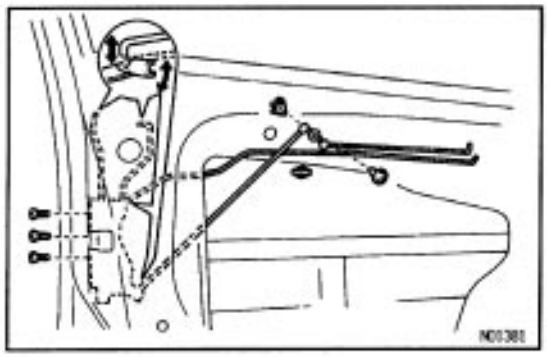
Install the lock cylinder with the bolt to the outside handle.



3. INSTALL OUTSIDE HANDLE

(a) Install the outside handle with 2 bolts.

(b) Install hole plug.



4. INSTALL DOOR LOCK

(a) Apply adhesive to 3 screws.

Part No.08833–00070, THREE BOND 1324 or equivalent

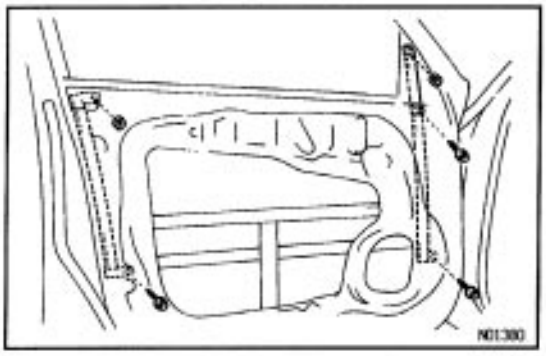
(b) Install the lock with 3 screws.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

(c) w/ Power Door Lock:

Connect the connector.

(d) Connect 2 links to the outside handle and the door lock cylinder.



(e) Connect 2 links to the door lock.

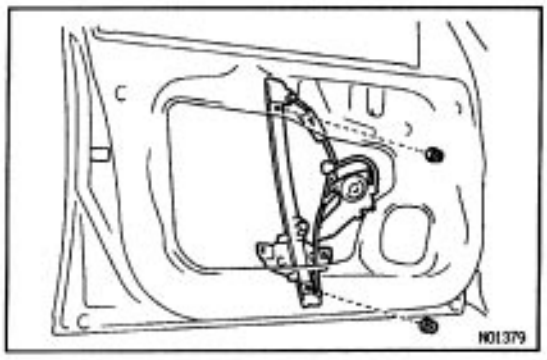
(f) Install 2 clips.

5. INSTALL FRONT LOWER FRAME

Install the frame with the nut and 2 bolts.

6. INSTALL REAR LOWER FRAME

Install the frame with the nut and the screw.



7. INSTALL WINDOW REGULATOR

Sedan. Wagon:

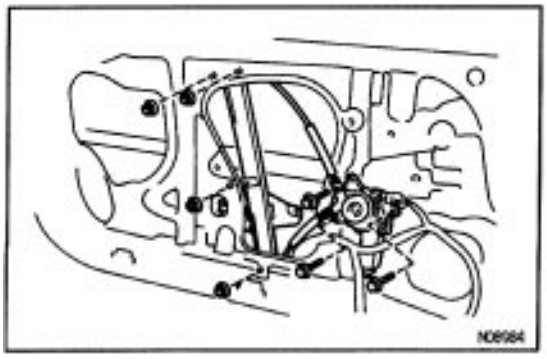
(a) Place the regulator through the service hole.

(b) w/ Power Window:

Connect the connector.

(c) Install the regulator with 2 riuts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



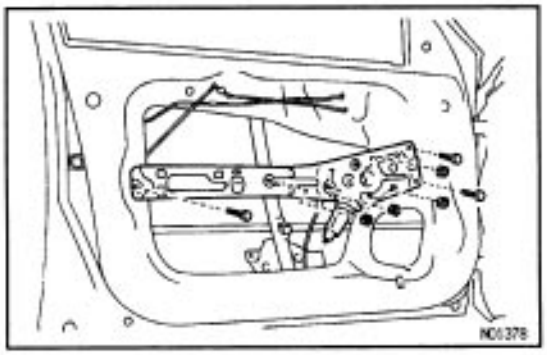
Coupe:

(a) Install the regulator through the service hole.

(b) w/ Power Window:

Connect the connector.

(c) Install the 3 nuts and the 3 bolts.



8. Sedan, Wagon:

INSTALL DOOR INSIDE PANEL

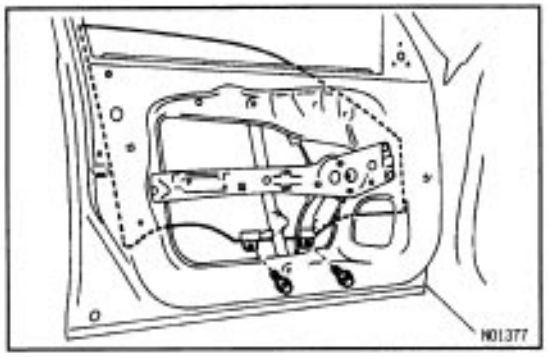
(a) Install the frame with the 3 bolts.

(b) Install the 4 nuts.

Torque: 5.4 N–m (55 kgf–cm, 48in.–lbf)

9. INSTALL FRONT DOOR WEATHERSTRIP

Push down on the clips of the weatherstrip.

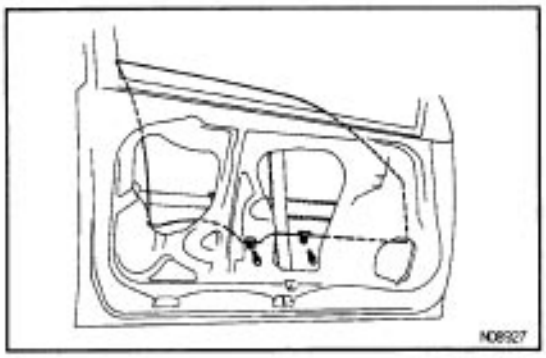


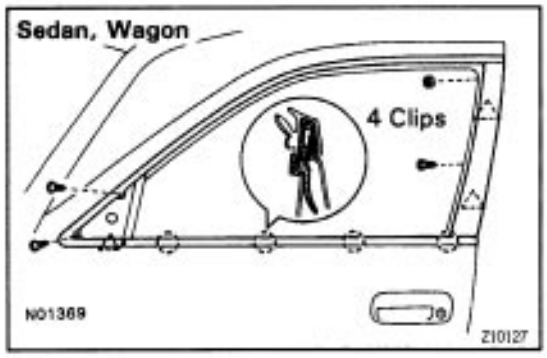
10. INSTALL DOOR GLASS

HINT: Insert a shop rag inside the panel to prevent scratching the glass.

(a) Insert the glass to the frame.

(b) Temporarily tighten 2 glass mounting bolts.





11. INSTALL FRONT DOOR UPPER MOULDING

(a) Sedan, wagon: Install the moulding with the 7 screws.

(b) Coupe: Install the moulding with the 9 screws.

12. INSTALL FRONT DOOR FRAME MOULDING

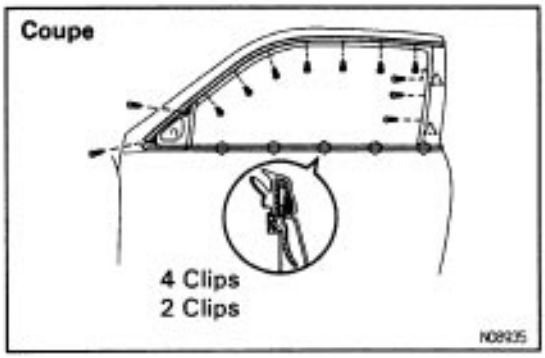
Install the moulding with the 3 screws and the nut.

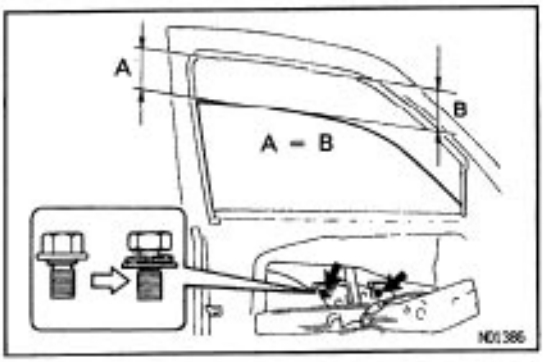
13. INSTALL FRONT DOOR BELT MOULDING

Install the claw of the clips into the upper panel slit and push the moulding onto the panel.

14. INSTALL DOOR GLASS RUN

Insert the glass run to the door frame.

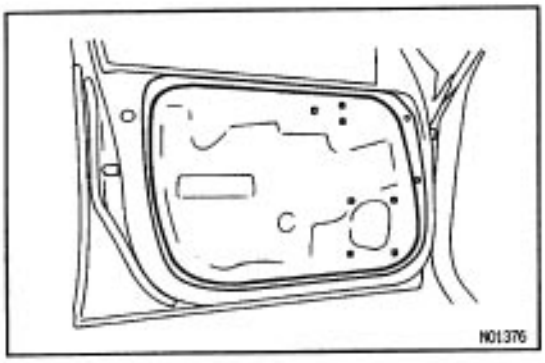




15. ADJUST DOOR GLASS

Adjust the glass and tighten when dimension A and B, as shown, are equal.

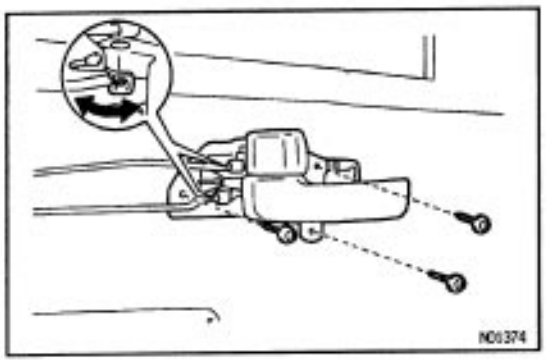
HINT: Substitute the bolt with washer for the centering bolt.



16. INSTALL SERVICE HOLE COVER

Seal the service hole cover with adhesive.

HINT: Bring out the links through the service hole cover.



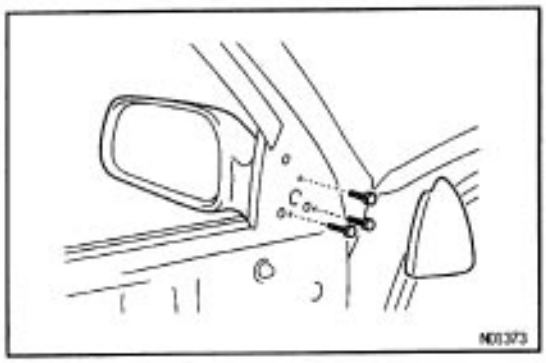
17. INSTALL DOOR INSIDE HANDLE

(a) Install the handle with 3 screws.

(b) Connect the 2 links.

18. INSTALL SPEAKER

Install the speaker with 4 screws, then connect the connector.

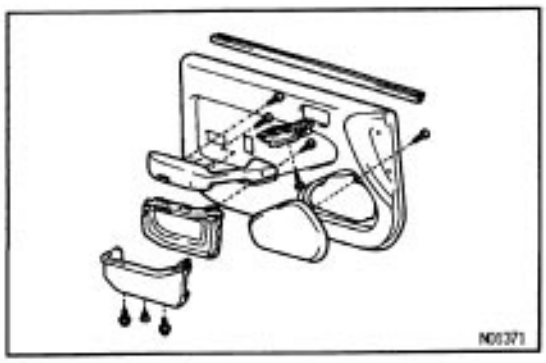


18. INSTALL REAR VIEW MIRROR

(a) w/ Remote Control Mirror:
Connect the connector.

(b) Install the mirror with 3 screws.

(c) Install the cover.



20. INSTALL DOOR TRIM

Sedan, Wagon:

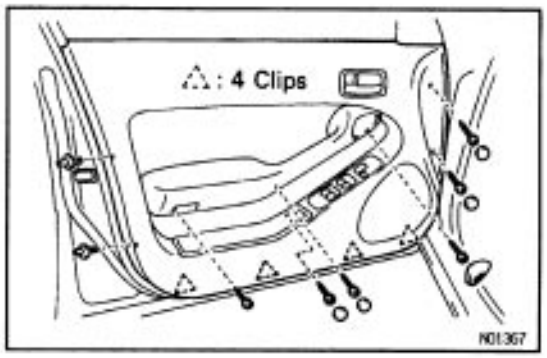
(a) Install the door pocket with the clip and 9 screws.

(b) Install the lower speaker cover with 2 screws.

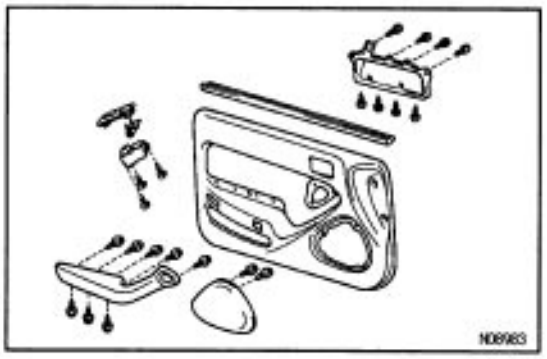
(c) Install the armrest with 6 screws.

(d) Install the power window switch with 2 screws.

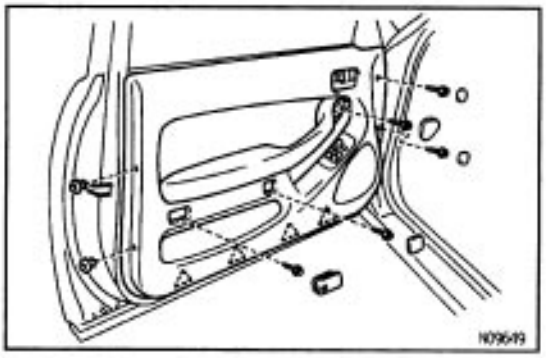
(e) Install the inner weatherstrip.



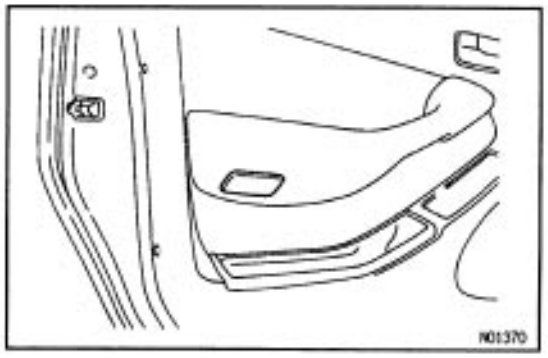
(f) Insert the upper edge of the trim from above, tap the trim by hand, fix it in place with the clips, then connect the connectors.
(g) Install the 6 screws.
(h) Install the 2 screw caps and the tweeter cover.
(i) Install the 2 clips.



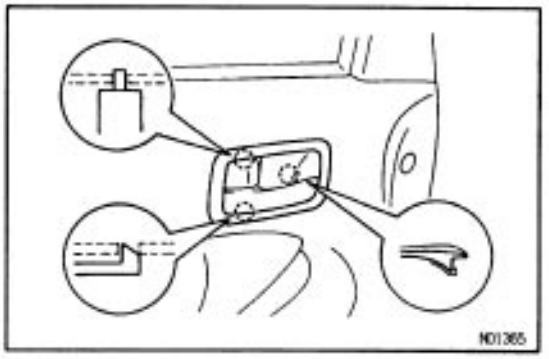
Coupe:
(a) Install the 8 screws and door pocket.
(b) Install the door trim support.
(c) Install the 7 screws and door armrest.
(d) Install the 2 screws and door speaker cover.
(e) Install the 3 screws and tweeter speaker.
(f) Install the 3 screws and power window switch.
(g) Install the inner weatherstrip.



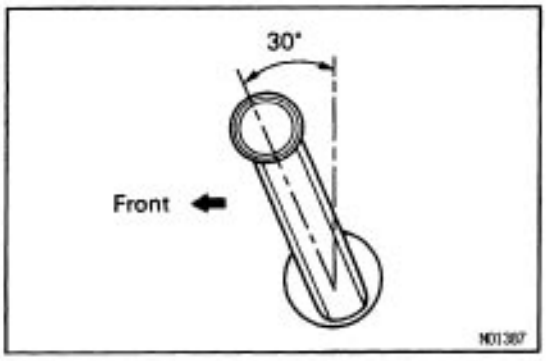
(h) Insert the upper edge of the trim from above, tap the trim by hand, fix it in place with the clips, then connect the connector.
(i) Install the 5 screws.
(j) Install the 3 caps and tweeter cover.
(k) Install the 2 clips.



21. Coupe:
INSTALL DOOR COURTESY LIGHT
Tap the light to install it, then connect the connector.



22. INSTALL INSIDE HANDLE BEZEL
Tap the bezel to install it.

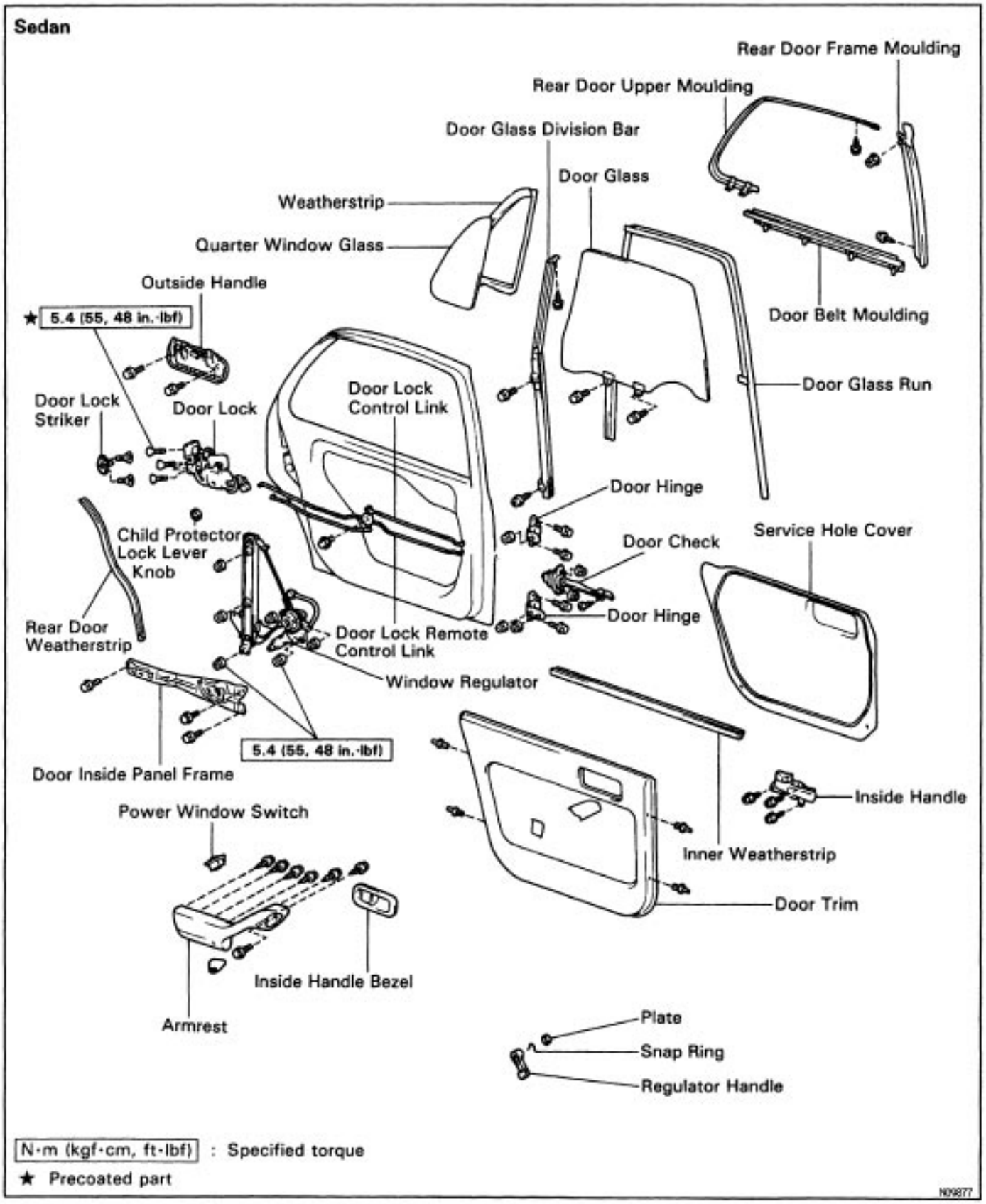


23. INSTALL REGULATOR HANDLE

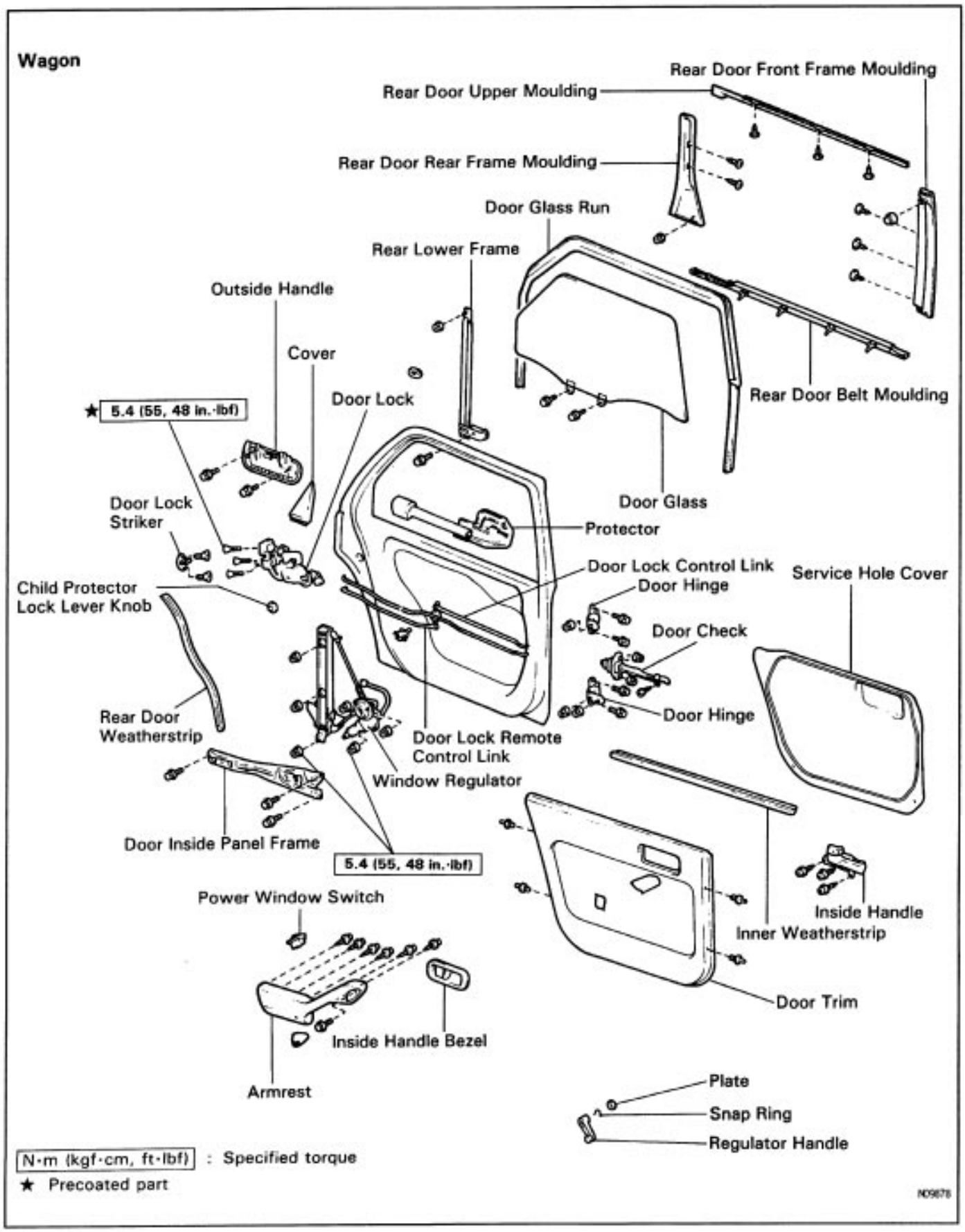
With door window fully closed, install the plate and the regulator handle with the snap ring, as shown.

REAR DOOR

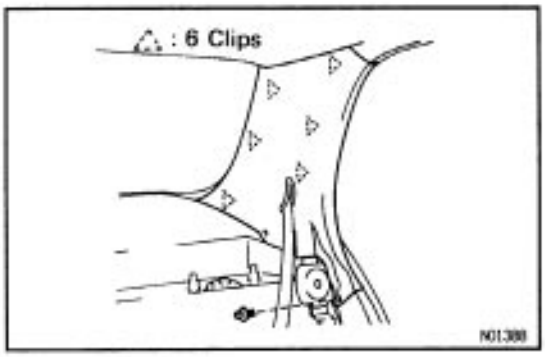
COMPONENTS



COMPONENTS (Cont'd)

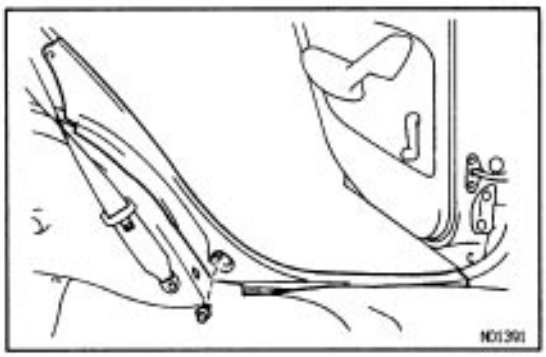


REAR DOOR ADJUSTMENT

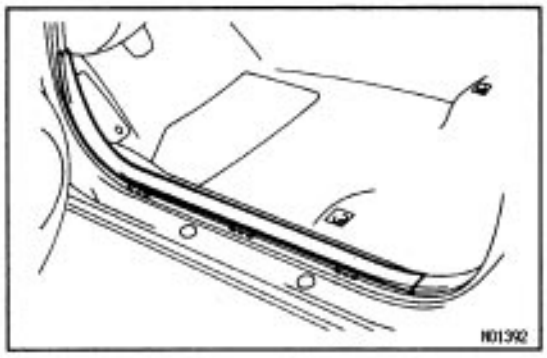


1. ADJUST DOOR IN FORWARD/ REARWARD AND VERTICAL DIRECTIONS

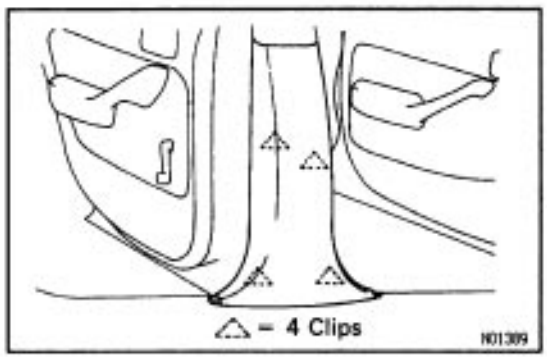
(a) Remove rear seat cushion and rear seat back.
(b) Sedan: Remove roof side inner garnish.



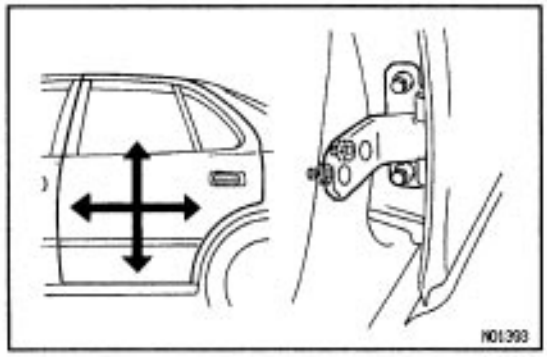
(c) Sedan: Remove rear seat side garnish.



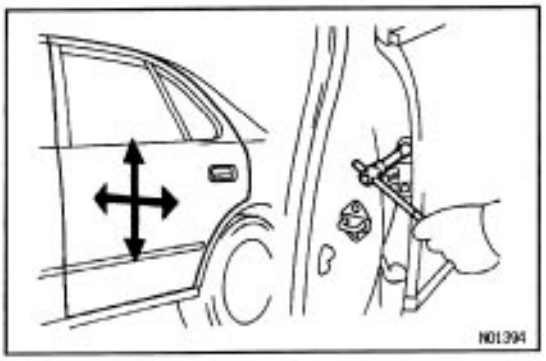
(d) Sedan: Remove front door inside scuff plate.



(e) Remove center pillar lower garnish.

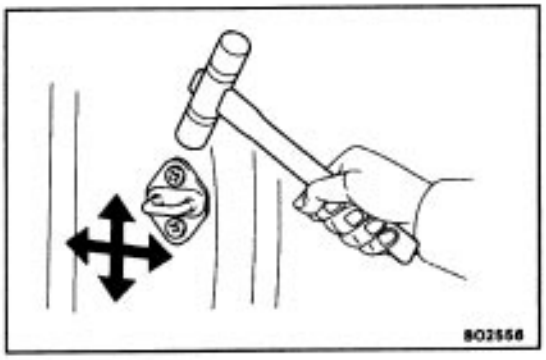


(f) Loosen the body side hinge nuts to adjust.
(g) Install center pillar lower garnish.
(h) Sedan: Install front door inside scuff plate.
(i) Sedan: Install rear seat side garnish.
(j) Sedan: Install roof side inner garnish.
(k) Install rear seat back and rear seat cushion.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

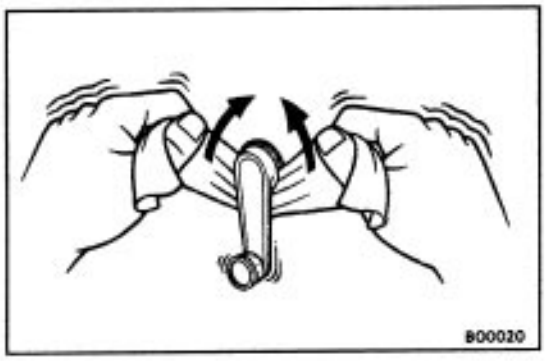
Loosen the door side hinge bolts to adjust.
HINT: Substitute the bolt with washer for the centering bolt.



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.
(b) Loosen the striker mounting screws to adjust.
(c) Using a plastic hammer, tap the striker to adjust it.

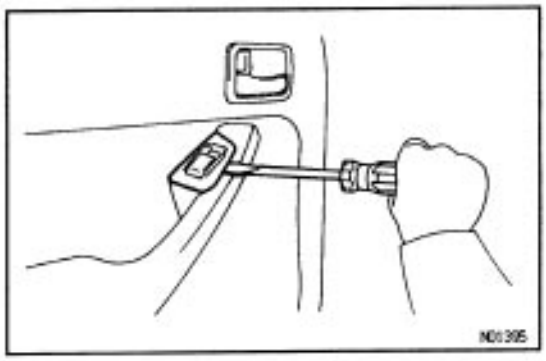
REAR DOOR DISASSEMBLY



1. w/o Power Window:

REMOVE REGULATOR HANDLE

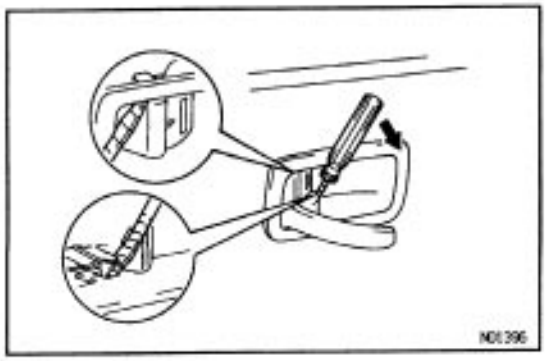
Pull off the snap ring with a shop rag and remove the regulator handle and plate.



2. w/ Power Window:

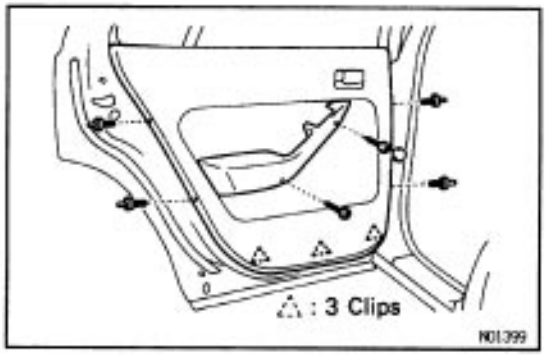
REMOVE POWER WINDOW SWITCH

Using a screwdriver, remove the switch, then disconnect the connector.
HINT: Tape the screwdriver tip before use.



3. REMOVE INSIDE HANDLE BEZEL

(a) Using a screwdriver, pry out the bezel.
HINT: Tape the screwdriver tip before use.
(b) Pull the bezel rearwards to remove it.



4. REMOVE DOOR TRIM

HINT: Tape the screwdriver tip before use.

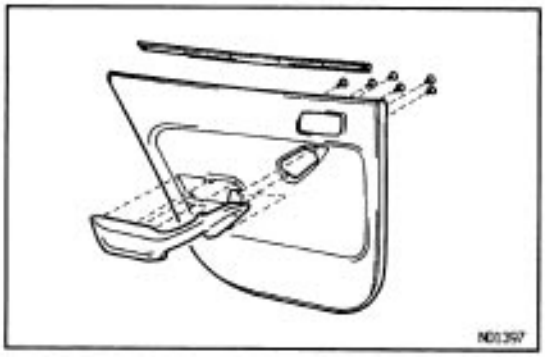
(a) Remove 4 clips.

(b) Using a screwdriver, remove the screw cap.

(c) Remove 2 screws.

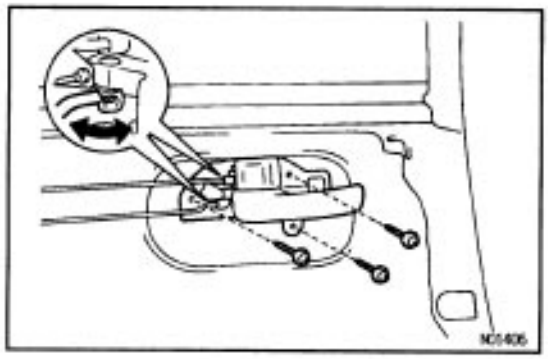
(d) Insert the screwdriver between the door and the door trim to pry out.

(e) Pull the trim upwards to remove it then disconnect the connector.



(f) Remove the inner weatherstrip.

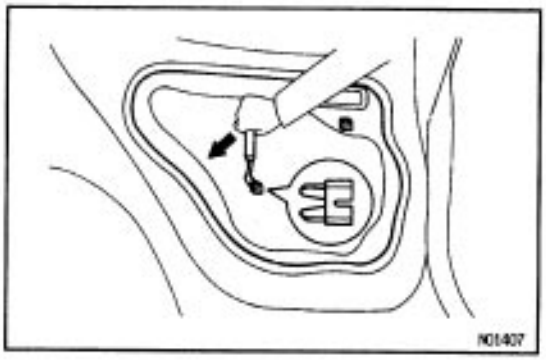
(g) Remove 6 screws and the armrest.



5. REMOVE DOOR INSIDE HANDLE

(a) Disconnect 2 links.

(b) Remove 3 screws and the handle.



6. REMOVE SERVICE HOLE COVER

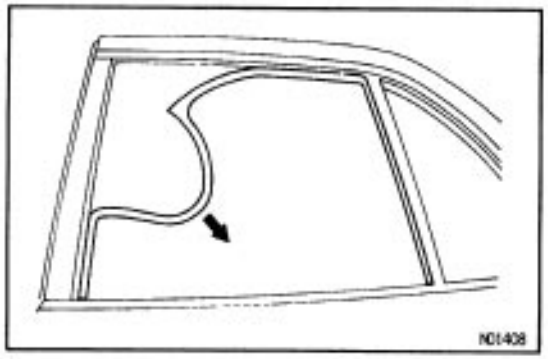
(a) w/ Power Window:

Using a clip remover, remove 2 screw grommets.

w/o Power Window:

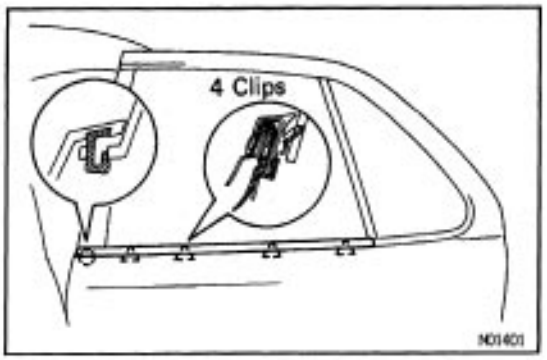
Using a clip remover, remove 3 screw grommets.

(b) Remove service hole cover.



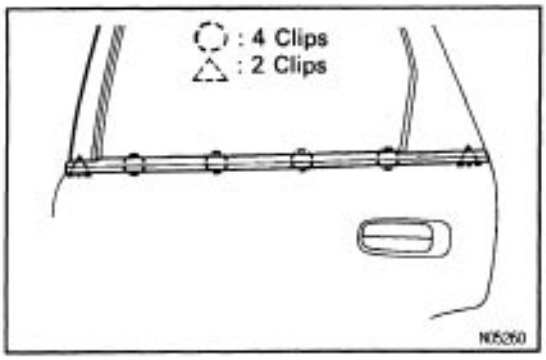
7. REMOVE DOOR GLASS RUN

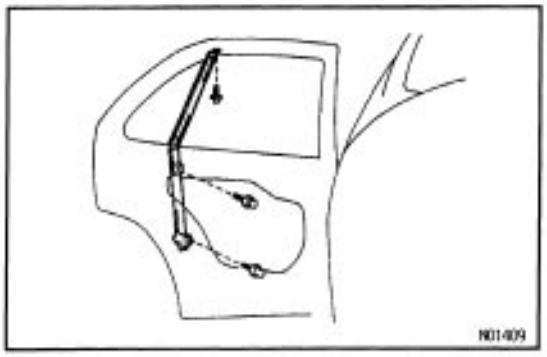
Pull the glass run upwards to remove it.



8. REMOVE REAR DOOR BELT MOULDING

Pry out the clips from the edge of the weatherstrip and remove the moulding.





8. Sedan:

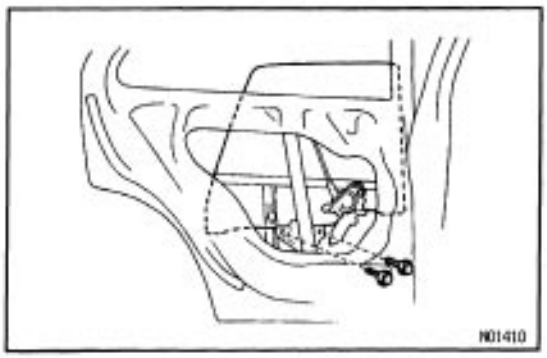
REMOVE DOOR GLASS DIVISION BAR

(a) Remove the screw.
(b) Remove 2 bolts and the division bar.

10. Wagon:

REMOVE REAR LOWER FRAME

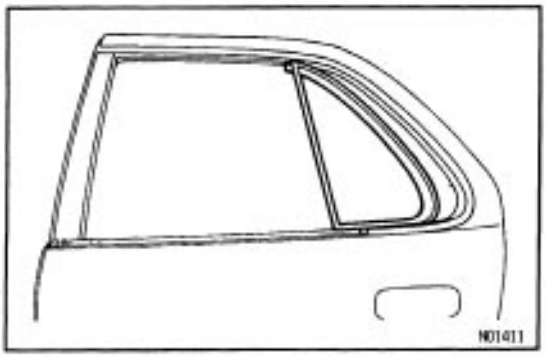
(a) Remove the cover.
(b) Remove nut.
(c) Remove bolt and frame.



11. REMOVE DOOR GLASS

HINT: Insert a shop rag inside the panel to prevent scratching the glass.

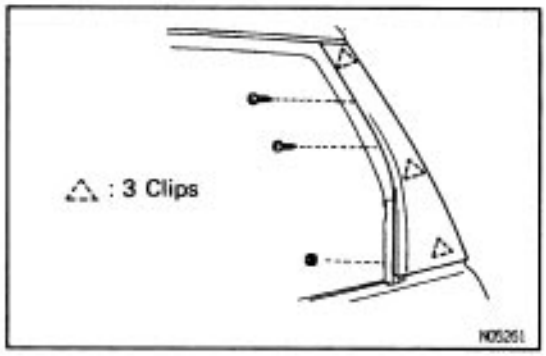
(a) Remove 2 glass mounting bolts.
(b) Remove the door glass by pulling it upwards.



12. Sedan:

REMOVE QUARTER WINDOW GLASS WITH WEA–THERSTRIP

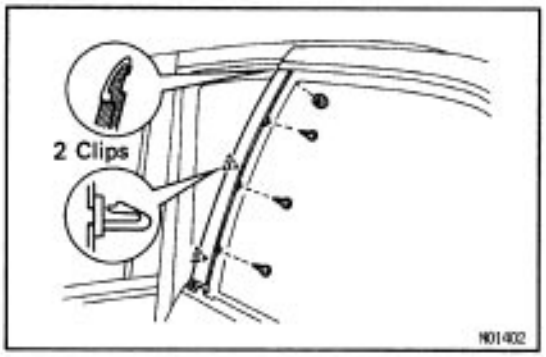
(a) Remove the quarter window glass together with the weatherstrip by pulling it forwards.
(b) Remove the weatherstrip from the quarter window glass.



13. Wagon:

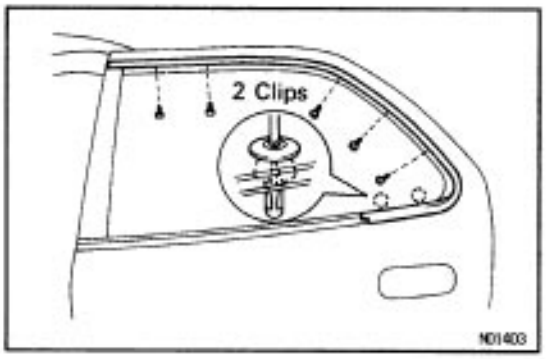
REMOVE REAR DOOR FRAME MOULDING

(a) Remove 2 screws and nut.
(b) Pry out the clips and remove the moulding.



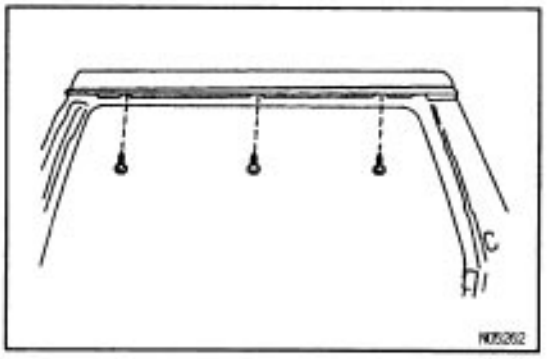
14. REMOVE REAR DOOR FRAME MOULDING

(a) Remove 3 screws.
(b) Pry out the clips and remove the moulding.

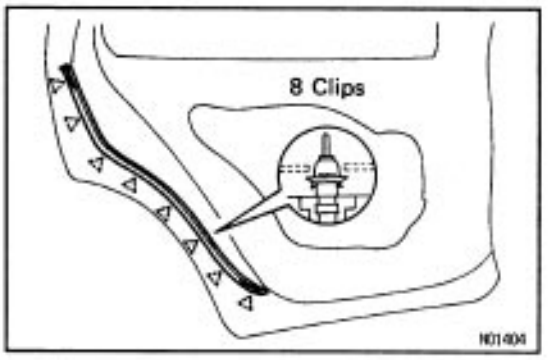


15. REMOVE REAR DOOR UPPER MOULDING

(a) Sedan: Remove the clip.
(b) Remove 5 screws and the moulding.

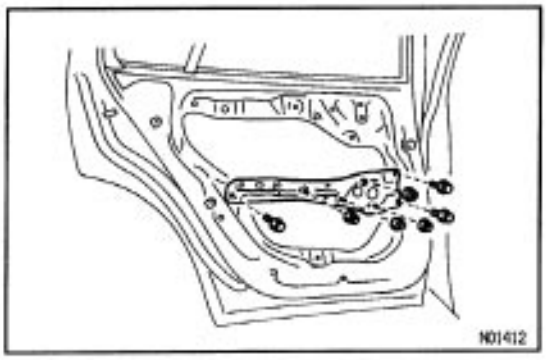


(c) Wagon: Remove 3 screws and the moulding.



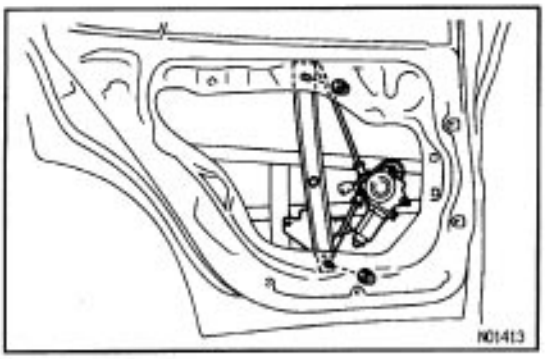
16. REMOVE REAR DOOR WEATHERSTRIP

While pulling the weatherstrip by hand, remove the clips using a clip remover.
HINT: Do not pull strongly on the weatherstrip as it may tear.



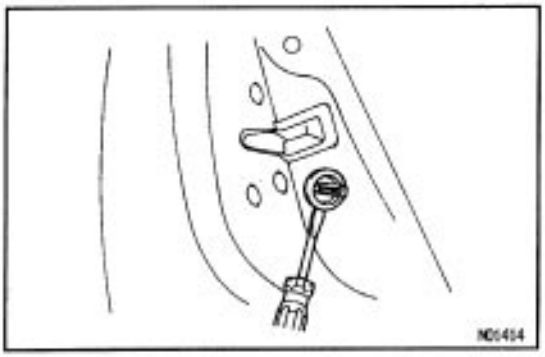
17. REMOVE DOOR INSIDE PANEL FRAME

(a) Remove 4 nuts.
(b) Remove 3 bolts and the frame.



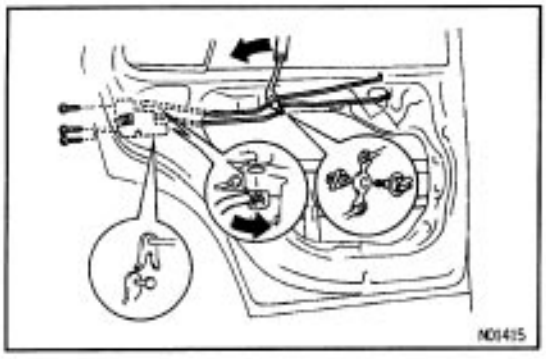
18. REMOVE WINDOW REGULATOR

(a) Remove 2 nuts.
(b) w/ Power Window:
Disconnect the connector.
(c) Remove the regulator through the service hole.



19. REMOVE CHILD PROTECTOR LOCK LEVER KNOB

Using a screwdriver, remove the knob.
HINT: Tape the screwdriver tip before use.

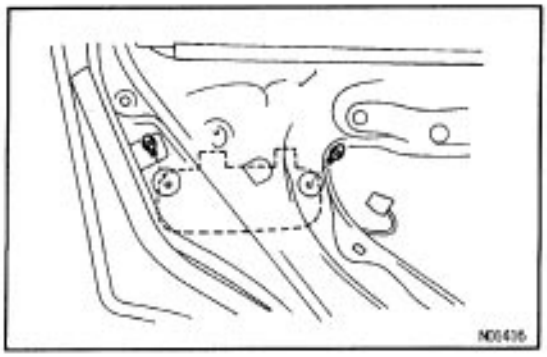


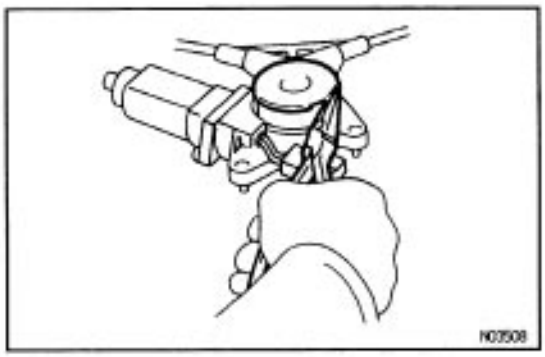
20. REMOVE DOOR LOCK

(a) Remove the clip.
(b) Disconnect 2 links from the door lock and remove 2 links.
(c) Remove 3 screws.
(d) w/ Power Door Lock:
Disconnect the connector.
(e) Remove the door lock through the service hole.

21. REMOVE OUTSIDE HANDLE

Remove 2 bolts and the outside handle.

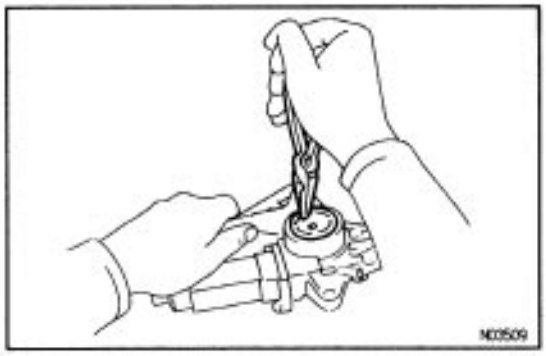




POWER WINDOW MOTOR REMOVAL AND INSTALLATION

1. REMOVE POWER WINDOW MOTOR

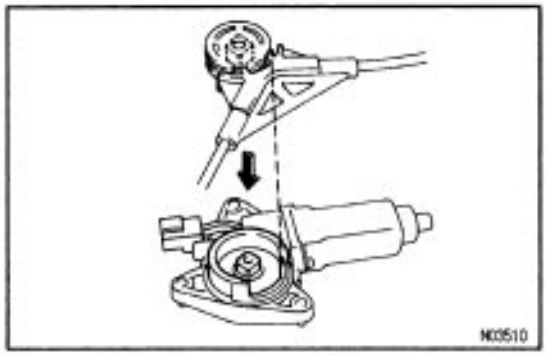
(a) Remove the cover plate by bending its tabs.



(b) Pull out the drum while detaching the cable guide out from the motor.

HINT:

- Pull out the drum and the cable guide evenly without tilting the drum.
- Handle the window regulator carefully so that the cable does not get detached.
- Do not pry above parts with a screwdriver.



2. INSTALL POWER WINDOW MOTOR

(a) Install the motor by fitting the shaft of the motor into the window regulator drum.

HINT:

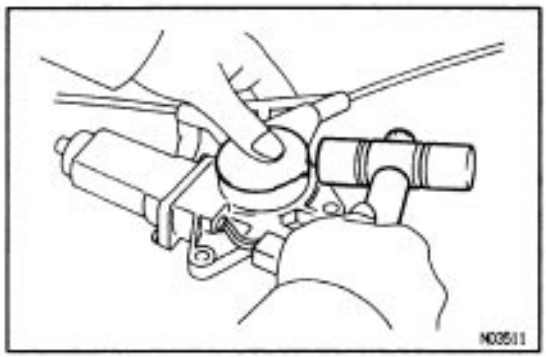
- If the shaft does not fit properly into the drum, slowly move the window glass bracket by hand to turn the drum.
- While turning the drum, make sure that it does not detach away from the cable guide.

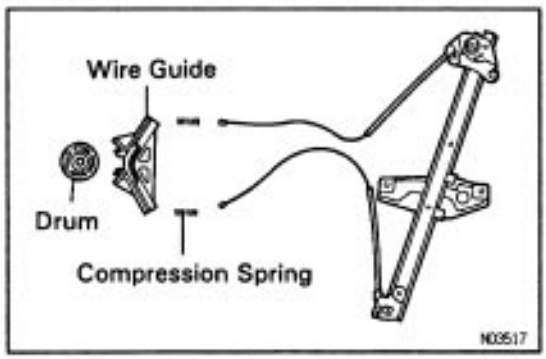
(b) Reattach the cover plate.

(c) Use a plastic hammer to bend the cover plate tabs.

HINT:

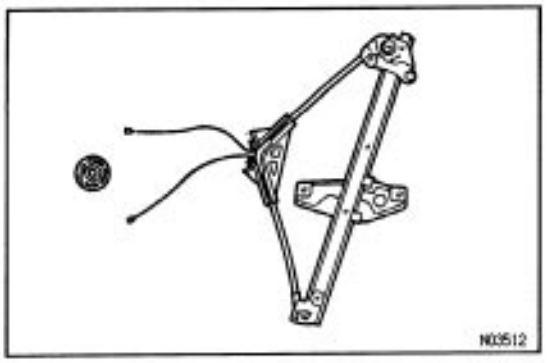
- Do not strike on the tabs with excessive force.
- Attach the cover plate firmly onto the motor to eliminate any looseness.



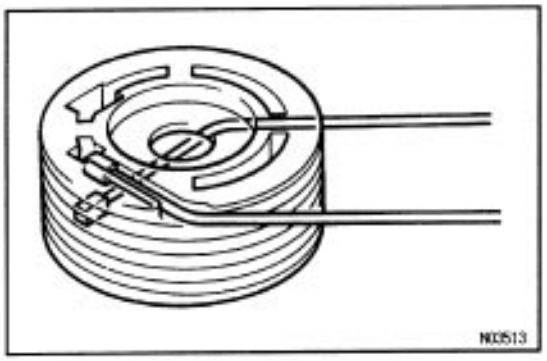


In case the cable detaches from the drum, it can be reattached as follows:

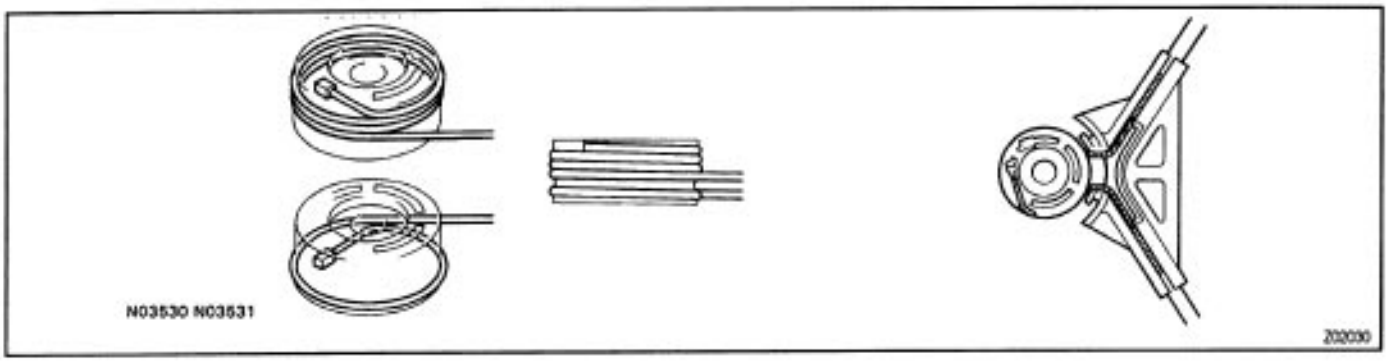
(a) Attach the drum, cable guide, and regulator as shown.

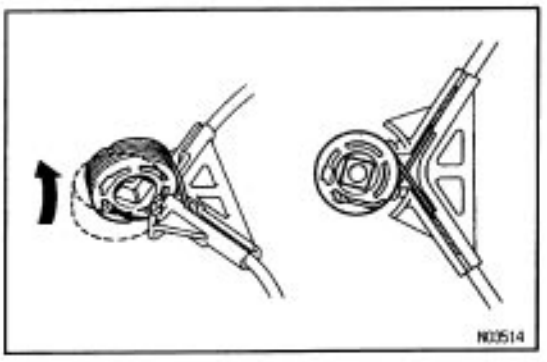


(b) Attach the compression spring onto the cable.
(c) Attach the cable onto the cable guide.

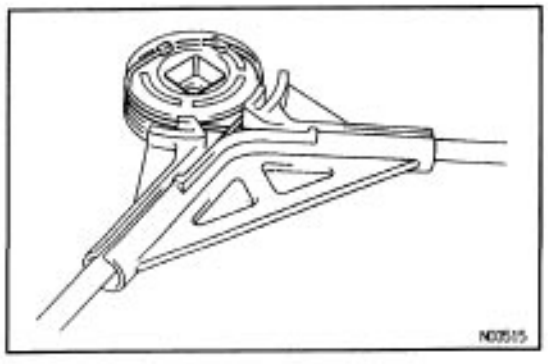


(d) Attach the cable onto the drum.
HINT: Do not cross the cable ends.
(e) Wrap the cable around the drum from the top.
(f) Wrap the cable around the drum from the bottom.
HINT: Do not flip the drum while wrapping the cable around it.
(g) Before installing the drum into the guide, verify that the cable is not taut.
HINT: Verify that the cable ends are not crossed.



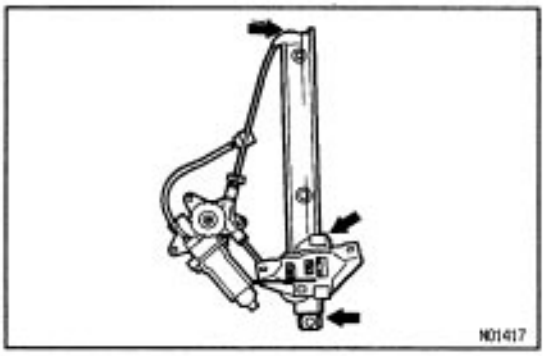


(h) Flip the drum over, and the cable will now be crossed.



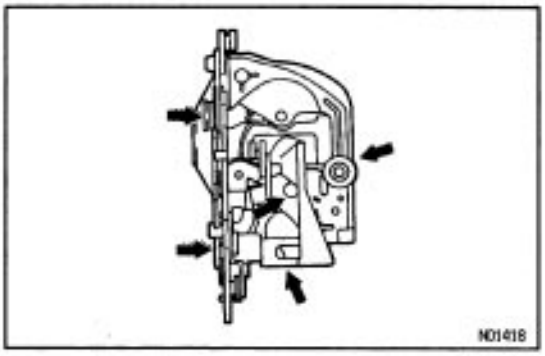
(i) Verify that the cable is wrapped properly in the groove.

REAR DOOR ASSEMBLY

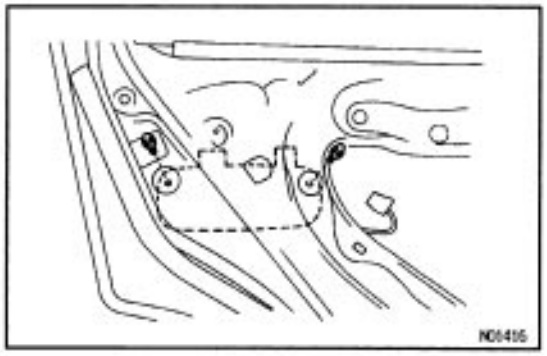


1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

(a) Apply MP grease to the window regulator rollers.

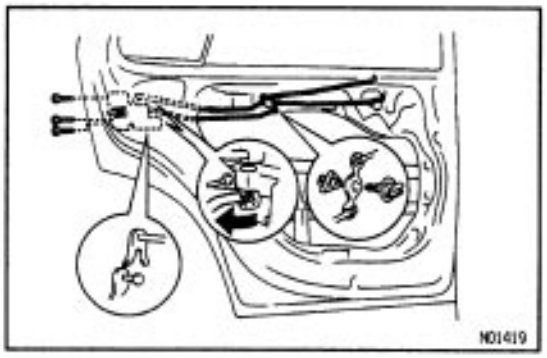


(b) Apply MP grease to the sliding surface of the door lock.



2. INSTALL OUTSIDE HANDLE

Install the outside handle with 2 bolts.



3. INSTALL DOOR LOCK

(a) Apply adhesive to 3 screws.

Part No.08833–00070, THREE BOND 1324 or equivalent

(b) Install the door lock with 3 screws.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

(c) w/ Power Door Lock:

Connect the connector.

(d) Connect 2 links to the door lock.

(e) Install the clip.

4. INSTALL CHILD PROTECTOR LOCK LEVER KNOB

5. INSTALL WINDOW REGULATOR

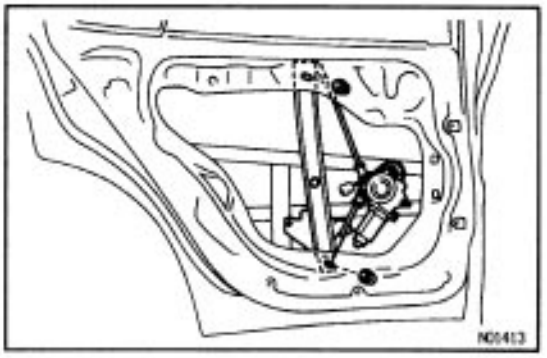
(a) Place the regulator through the service hole.

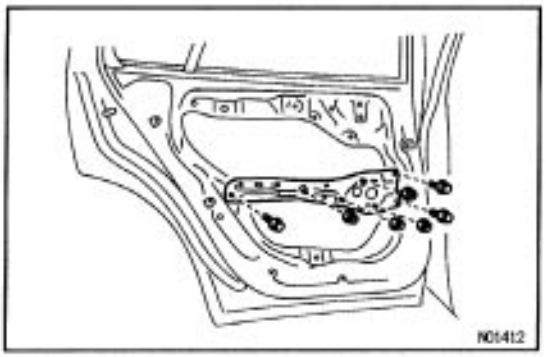
(b) w/ Power Window:

Connect the connector.

(c) Install the regulator with 2 nuts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)





6. INSTALL DOOR INSIDE PANEL FRAME

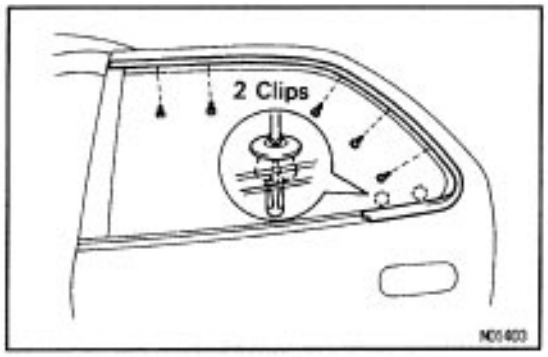
(a) Install the frame with 3 bolts.

(b) Install 4 nuts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

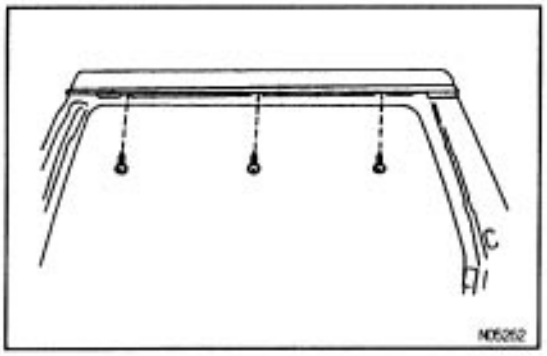
7. INSTALL REAR DOOR WEATHERSTRIP

Push down on the clips of the weatherstrip.

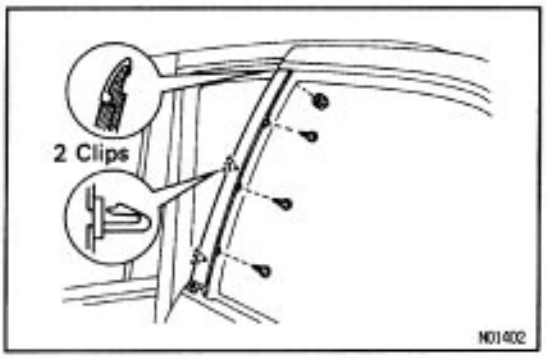


8. INSTALL REAR DOOR UPPER MOULDING

(a) Sedan: Install the moulding with 5 screws and the clip.



(b) Wagon: Install the moulding with 3 screws.



9. INSTALL REAR DOOR FRAME MOULDING

(a) Sedan: Install the moulding with 3 screws.

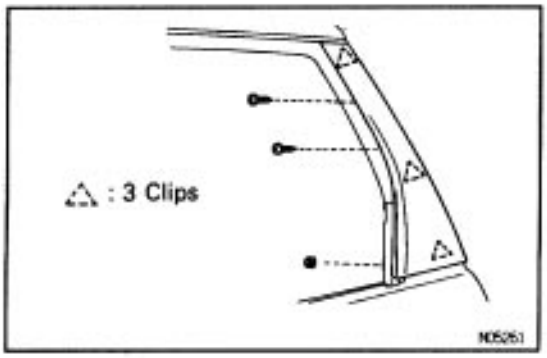
(b) Wagon: Install the moulding with 2 screws and nut.

10. Sedan:

INSTALL QUARTER WINDOW GLASS WITH WEA–THERSTRIP

(a) Install the weatherstrip to the quarter window glass.

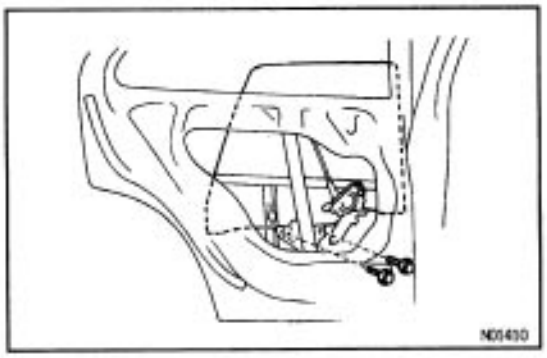
(b) Install the quarter window glass together with the weatherstrip.



11. Wagon:

INSTALL REAR DOOR REAR FRAME MOULDING

Install the moulding with 2 screws and nut.

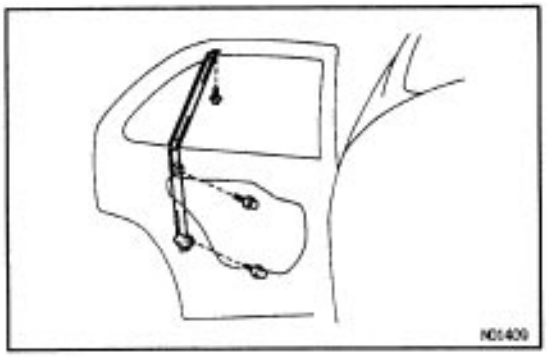


12. INSTALL DOOR GLASS

HINT: Insert a shop rag inside the panel to prevent scratching the glass.

(a) Insert the glass to the frame.

(b) Temporarily tighten 2 glass mounting bolts.



13. Sedan:

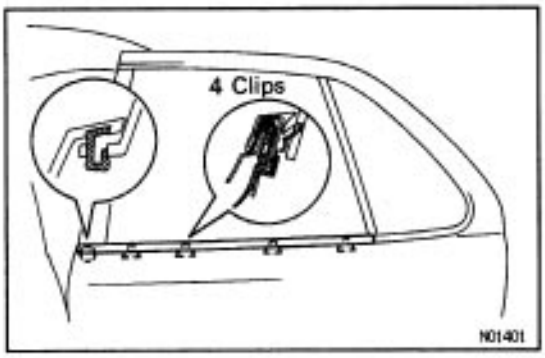
INSTALL DOOR GLASS DIVISION BAR

Install the division bar with 2 bolts and the screw.

14. Wagon:

INSTALL REAR LOWER FRAME

Install the frame with the bolt and screw.

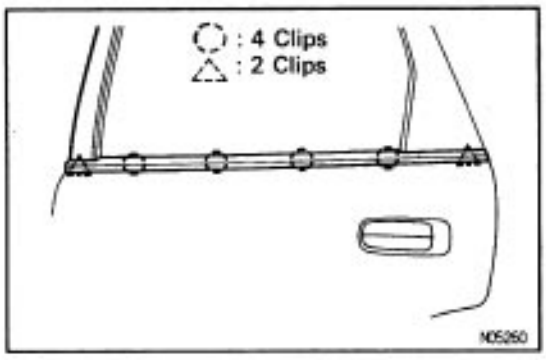


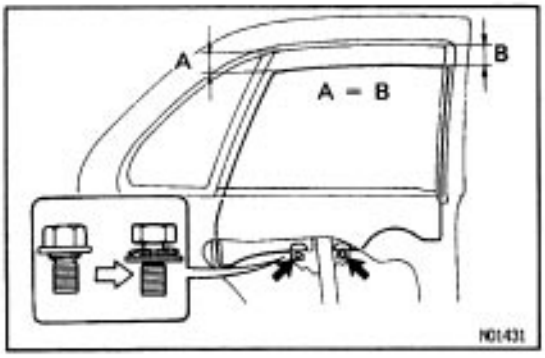
15. INSTALL REAR DOOR BELT MOULDING

Install the claw of the clips into the upper panel slit and push the moulding onto the panel.

16. INSTALL DOOR GLASS RUN

Insert the glass run to the door frame.

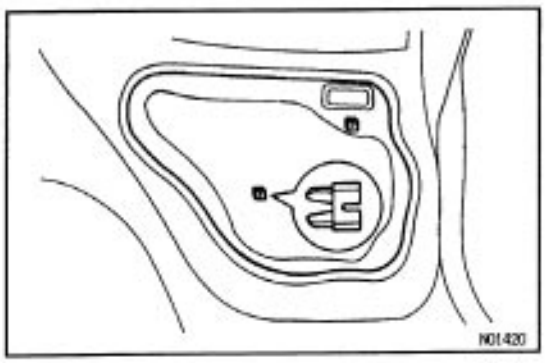




17. ADJUST DOOR GLASS

Adjust the glass and tighten when dimension A and B, as shown, are equal.

HINT: Substitute the bolt with washer for the centering bolt.



18. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

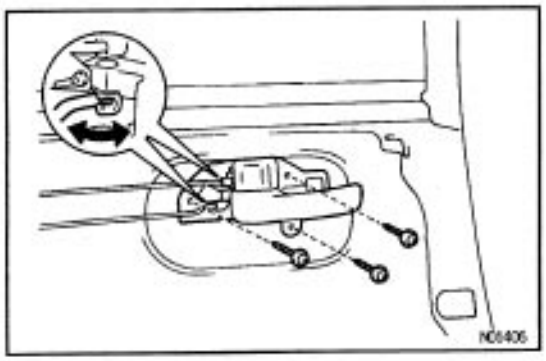
HINT: Bring out the links through the service hole cover.

(b) w/ Power Window:

Install 2 screw grommets.

(c) w/o Power Window:

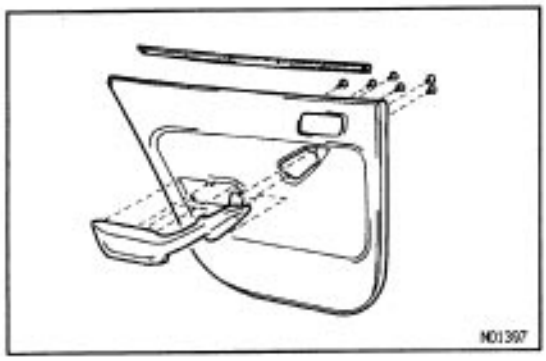
Install 3 screw grommets.



19. INSTALL DOOR INSIDE HANDLE

(a) Install the handle with 3 screws.

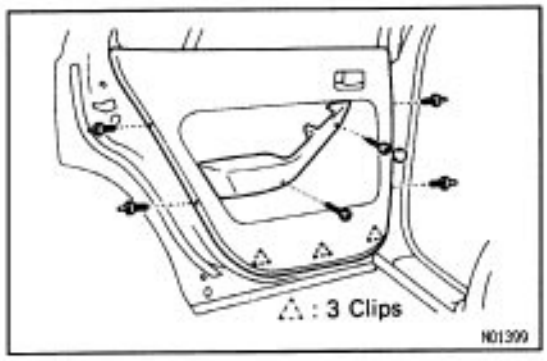
(b) Connect 2 links.



20. INSTALL DOOR TRIM

(a) Install the armrest with 6 screws.

(b) Install the inner weatherstrip.



(c) Insert the upper edge of the trim from above, tap the trim by hand fix it in place with the clips, then connect the connector.

(d) Install 2 screws.

(e) Install the screw cap.

(f) Install 4 clips.

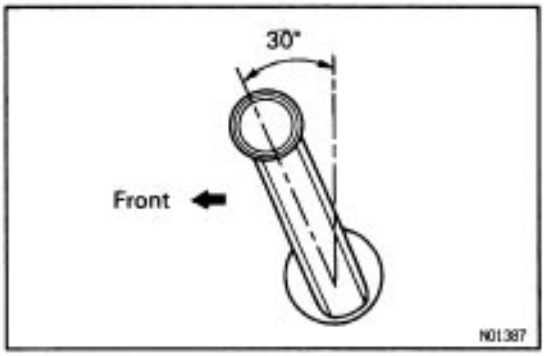
21. INSTALL INSIDE HANDLE BEZEL

Tap the bezel to install it.

22. w/ Power Window:

INSTALL POWER WINDOW SWITCH

Tap the switch to install it, then connect the connector.

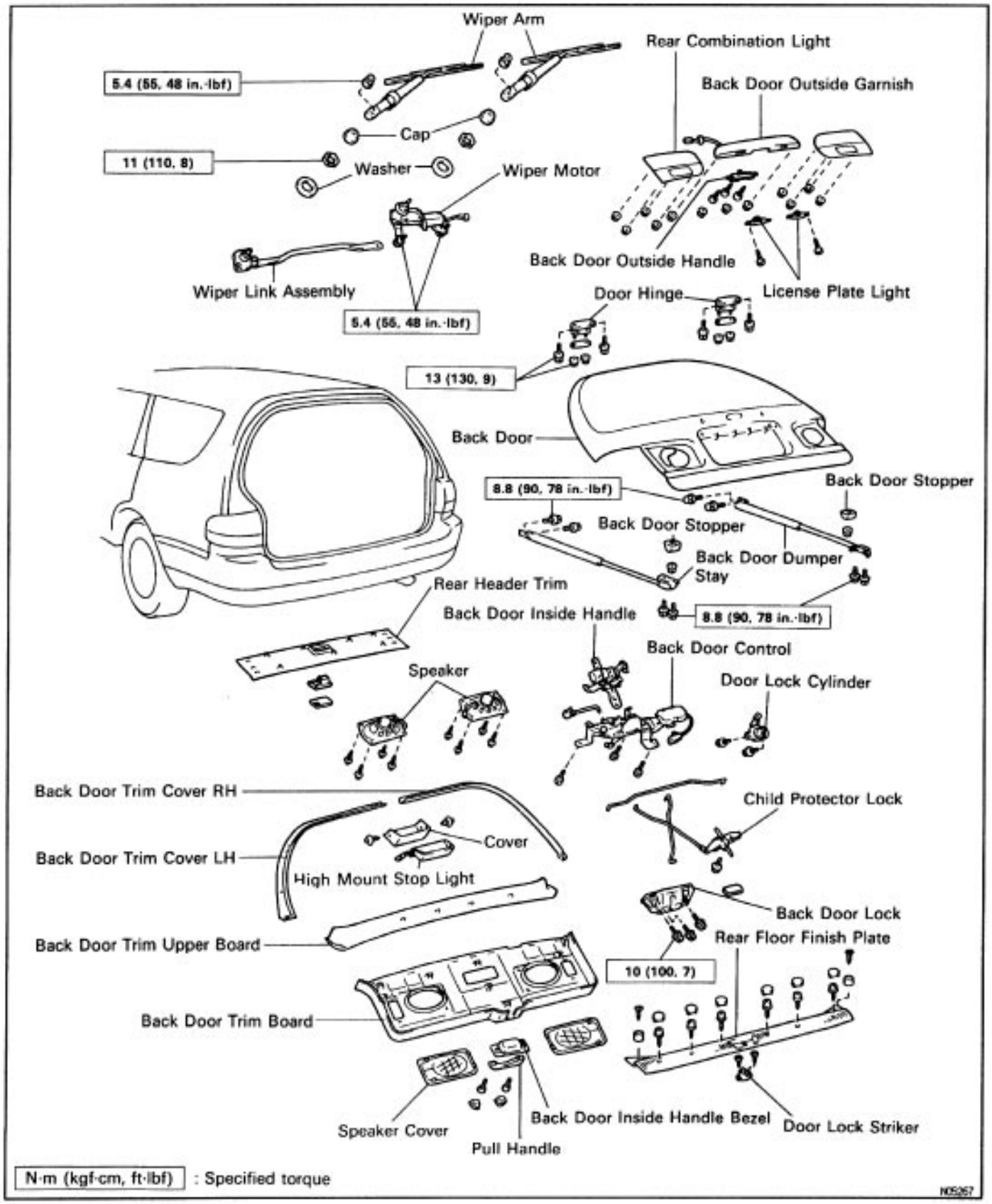


23. INSTALL REGULATOR HANDLE

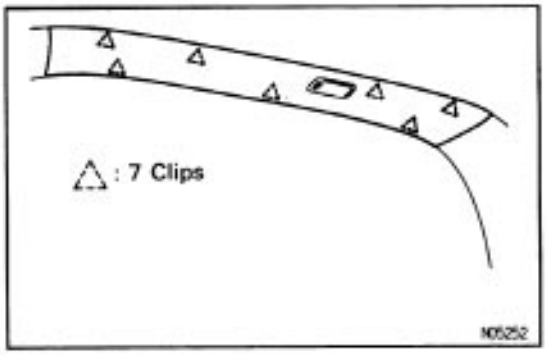
With door window fully closed, install the plate and the regulator handle with the snap ring, as shown.

BACK DOOR

COMPONENTS

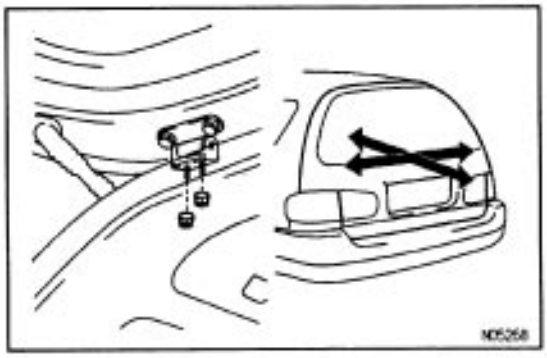


BACK DOOR ADJUSTMENT

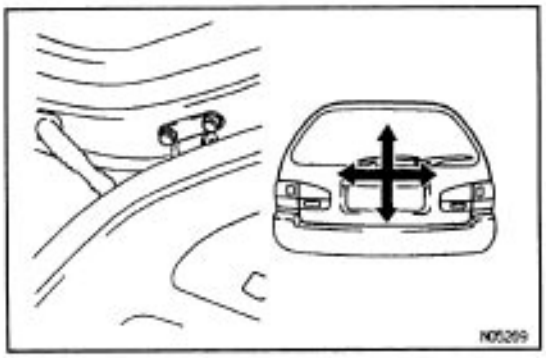


1. ADJUST DOOR IN FORWARD / REARWARD AND LEFT /RIGHT DIRECTIONS

(a) Remove the rear header trim.

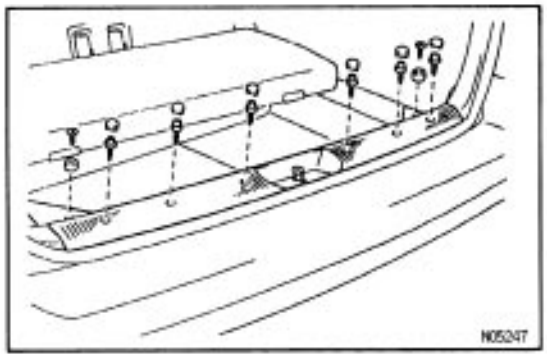


(b) Loosen the body side hinge nuts to adjust.
Torque: 13 N–m (130 kgf–cm, 9.4 ft–lbf)
(c) Install the rear header trim.
(d) Install the rear seat side cushion.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



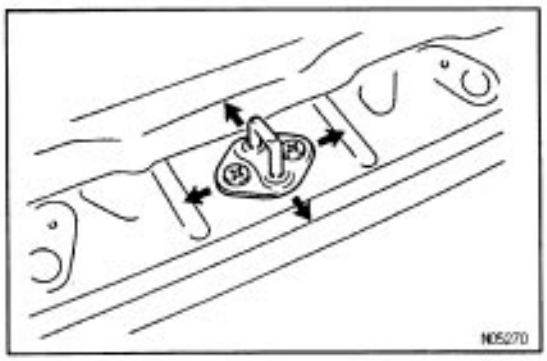
2. ADJUST DOOR IN LEFT /RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.
Torque: 13 N–m (130 kgf–cm, 9.4 ft–lbf)

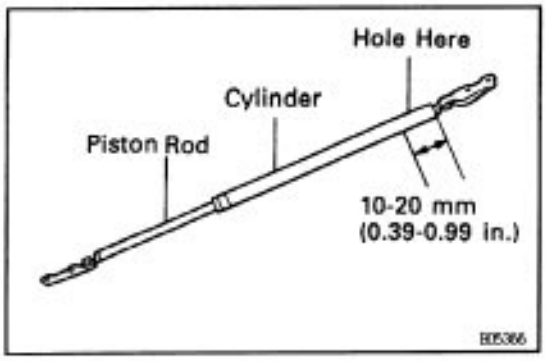


3. ADJUST DOOR LOCK STRIKER

(a) Remove rear floor finish plate by pulling.



(b) Loosen the striker mounting screws to adjust.
(c) Using a plastic hammer, tap the striker to adjust it.
(d) Install the rear floor finish plate.



BACK DOOR DAMPER STAY

NOTICE: Handling the damper.

- **Do not disassemble the damper because the cylinder is filled with pressurized gas.**
- **If the damper is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole in the bottom of the re–moved damper cylinder to completely release the high–pressure gas before disposing of it.**
- **When drilling, chips may fly out so work carefully.**
- **The gas is colorless, odorless and non–toxic.**
- **When working, handle the damper carefully. Never score or scratch the exposed part of the piston rod, and never allow paint or oil to get on it.**
- **Do not turn the piston rod and cylinder with the damper fully extended.**

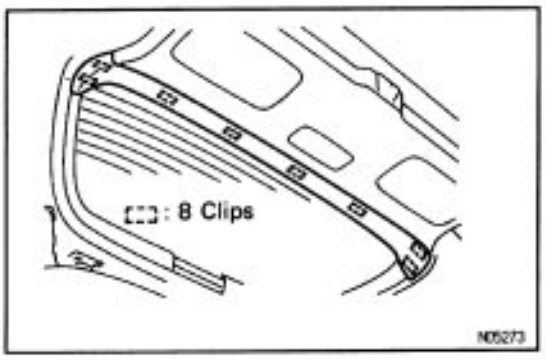
BACK DOOR DISASSEMBLY

REMOVE FOLLOWING PARTS:

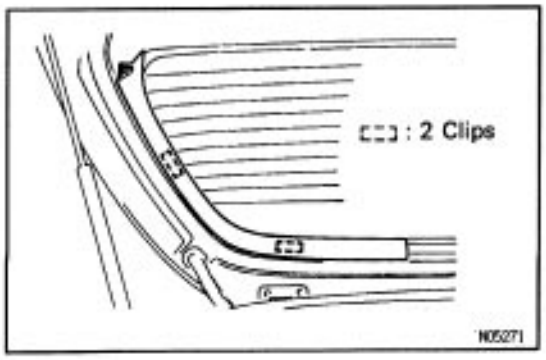
(a) Rear wiper arms

(b) w/ High Mount Stop Light:

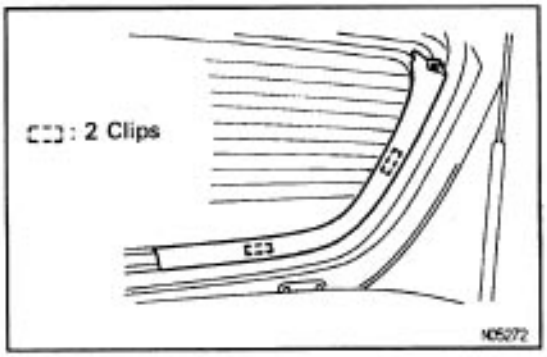
High mount stop light



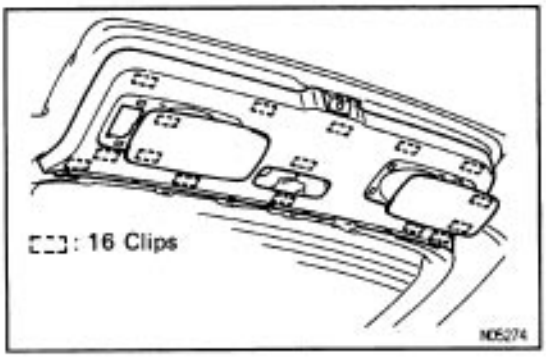
(c) Back door trim upper board



(d) Back door trim cover LH



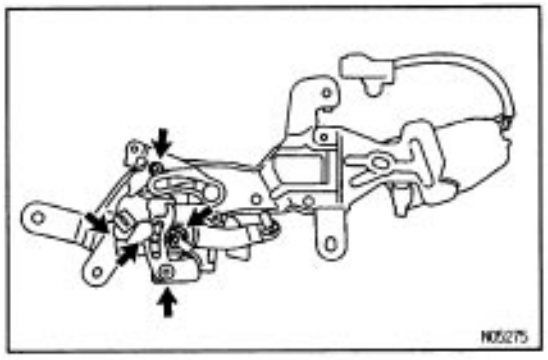
(e) Back door trim cover RH
(f) Back door inside handle bezel
(g) Speaker cover and speaker



(h) Back door trim board
(i) Wiper motor and link
(j) License plate light
(k) Back door outside garnish
(1) Back door outside handle
(m) Rear combination lights
(n) Back door control
(o) Back door inside handle
(p) Child protector lock
(q) Door lock cylinder
(r) Back door lock

BACK DOOR ASSEMBLY

ASSEMBLE BACK DOOR PARTS BY FOLLOWING DISASS–EMBLY SEQUENCE IN REVERSE

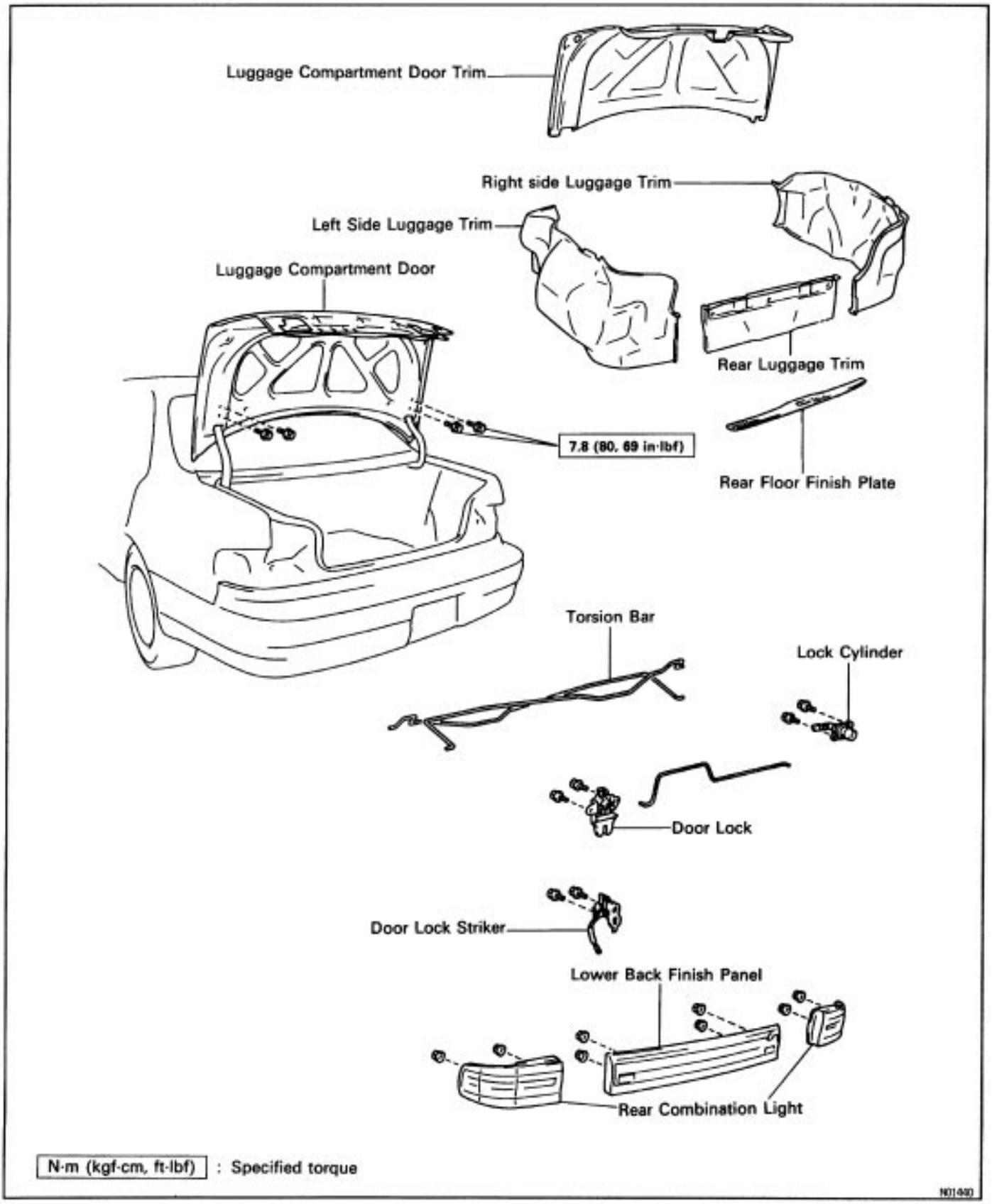


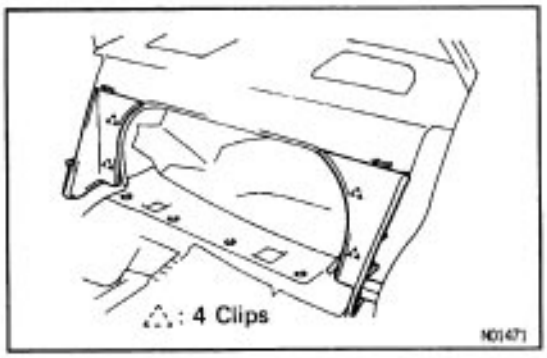
BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

Apply MP grease to the sliding surface of the door lock control.

LUGGAGE COMPARTMENT

COMPONENTS

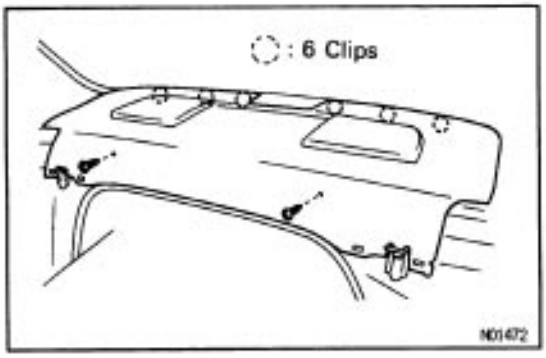




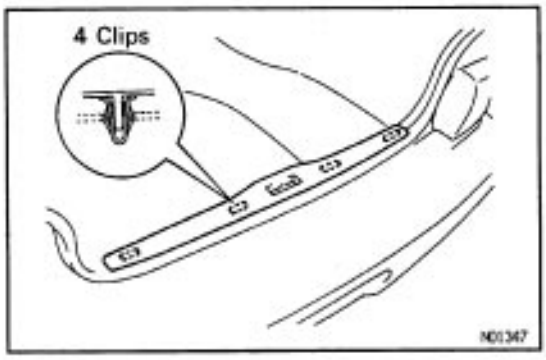
LUGGAGE COMPARTMENT DOOR ADJUSTMENT

1. ADJUST DOOR IN FORWARD/ REARWARD AND LEFT/RIGHT DIRECTIONS

(a) Remove rear seat cushion and rear seat back.
(b) Remove roof side inner garnish.
(c) Remove package tray trim garnish.

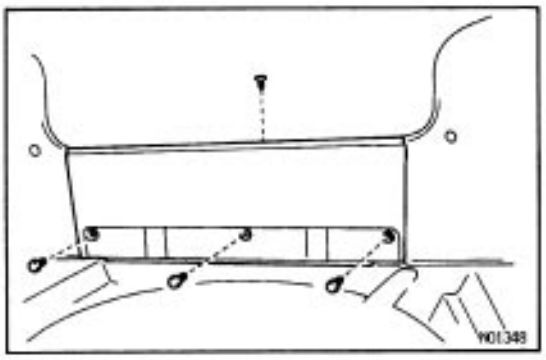


(d) Remove package tray trim.
(e) Loosen 2 body side hinge bolt to adjust.

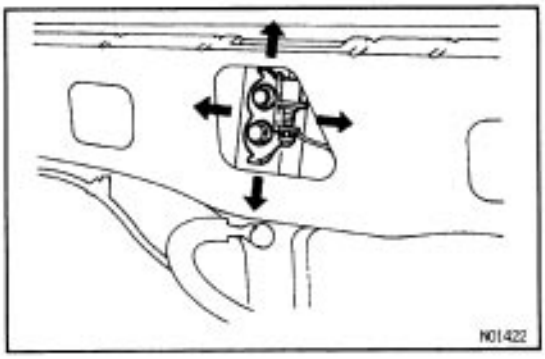


2. ADJUST DOOR LOCK STRIKER

(a) Remove the rear floor finish plate by pulling.



(b) Remove the clips and the rear luggage trim.

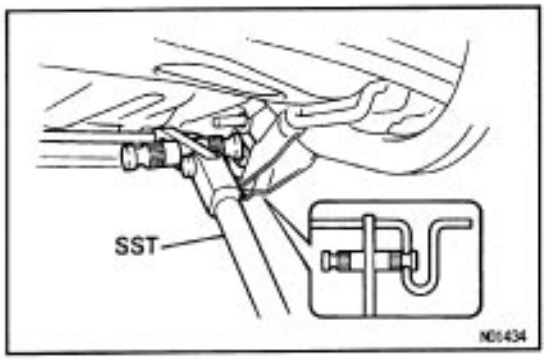


(c) Loosen the bolts to adjust.

TORSION BAR REMOVAL AND INSTALLATION

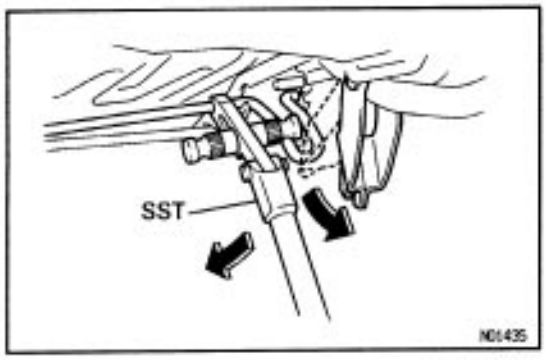
1. REMOVE FOLLOWING PARTS:

(a) Rear floor finish plate
(b) Rear luggage trim
(c) Right side luggage trim
(d) Left side luggage trim

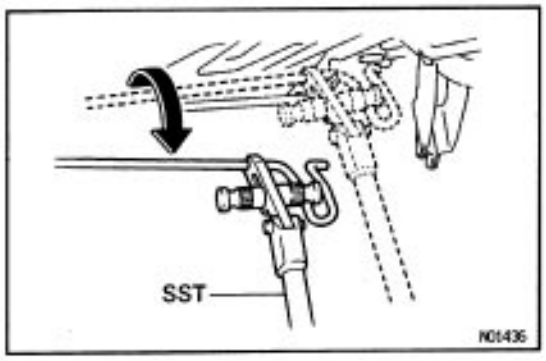


2. REMOVE TORSION BAR

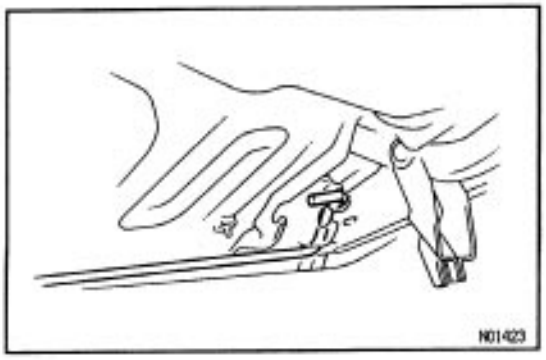
(a) Remove the torsion bar from center bracket.
(b) Install SST to the torsion bar on the hinge side.
SST 09804–24010



(c) Push down on SST, and pull the luggage compartment door hinge from the torsion bar.

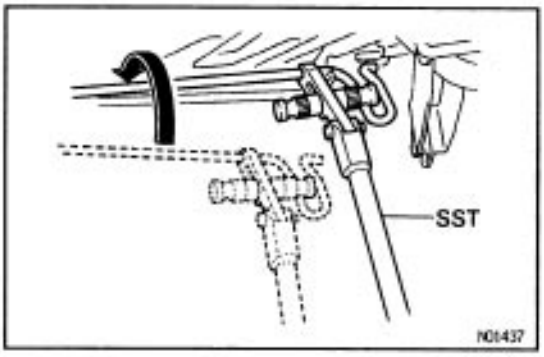


(d) Slowly lift SST, and remove the torsion bar from the torsion bar bracket with SST.
(e) Remove the torsion bar.
(f) Do the same for the other side.

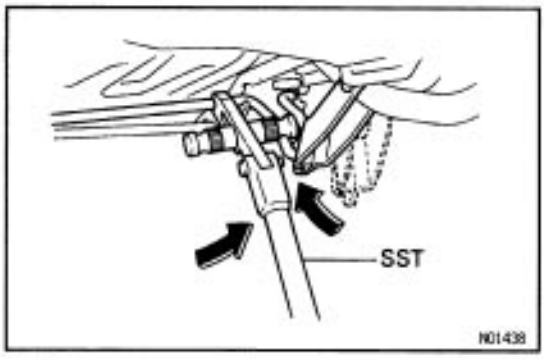


3. INSTALL TORSION BAR

(a) Insert the torsion bar into the bracket as shown.



(b) Install SST to the torsion bar of the hinge side.
SST 09804–24010
(c) Slowly lift the torsion bar with SST and place in the torsion bar bracket.

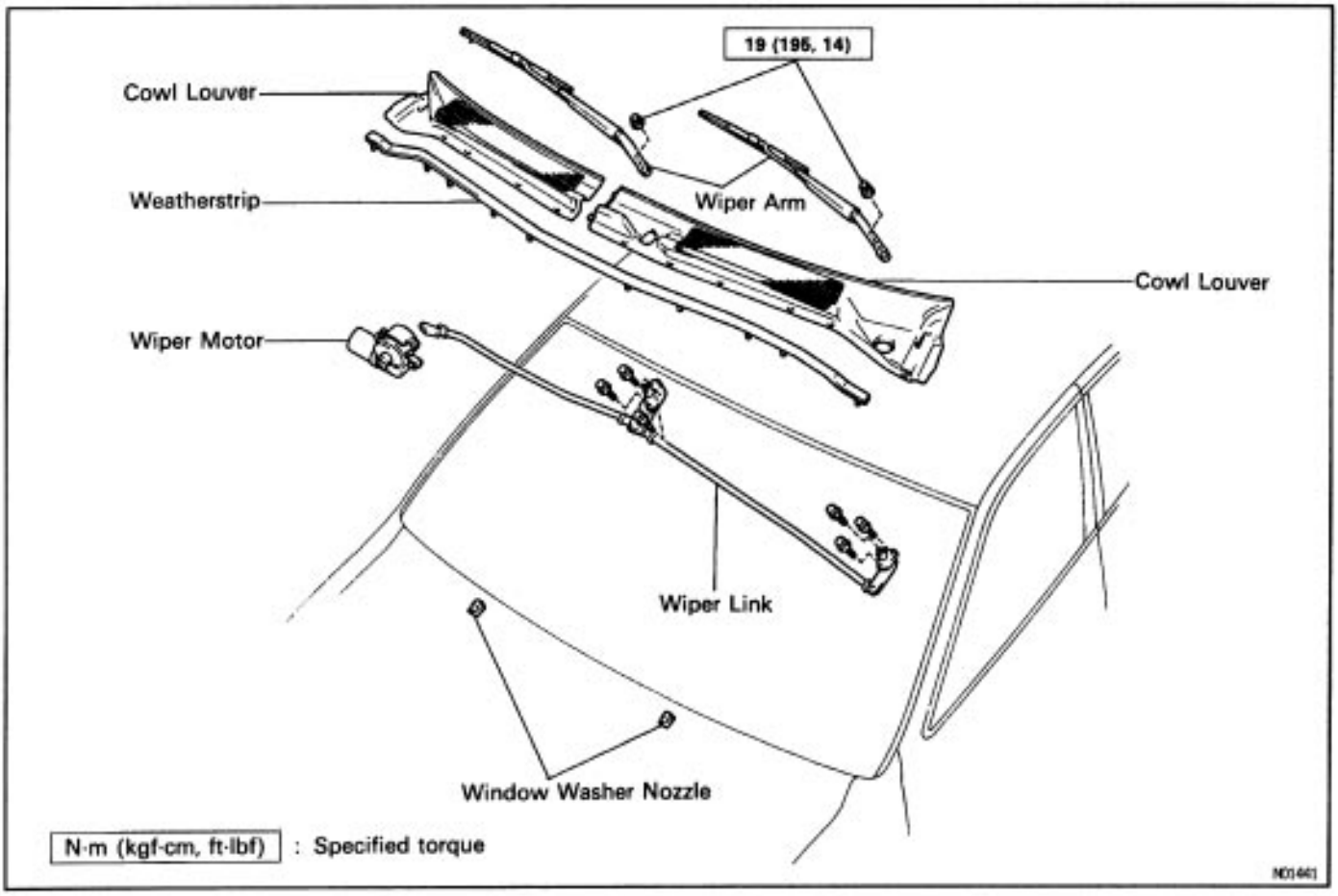


(d) Slowly push down SST, and install the torsion bar to the hinge.
(e) Slowly lift SST, and install the torsion bar.
(f) Install the torsion bar to center bracket.
(g) Do the same for the other side.

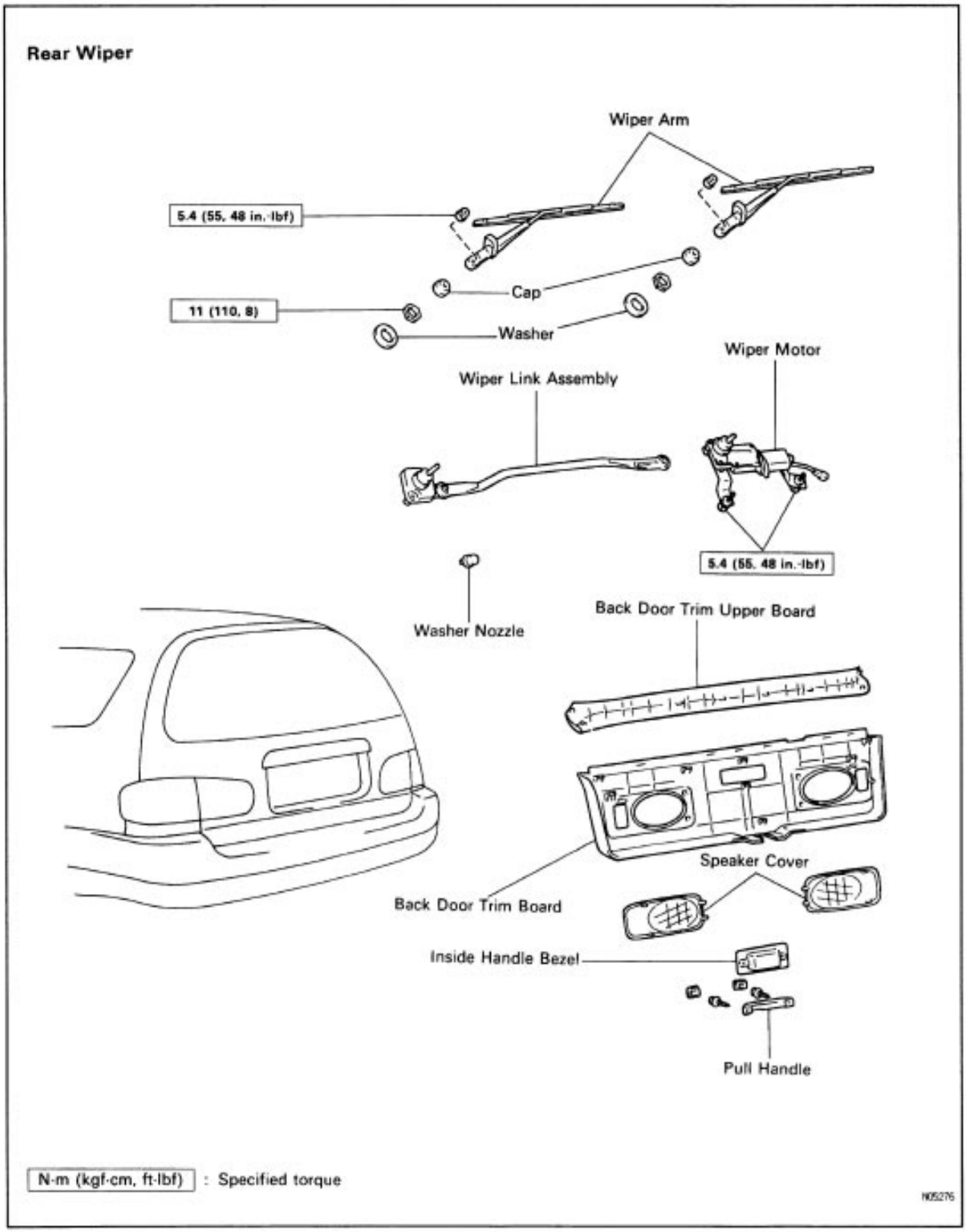
4. INSTALL FOLLOWING PARTS:
(a) Left side luggage trim
(b) Right side luggage trim
(c) Rear luggage trim
(d) Rear floor finish plate

WIPER AND WASHER

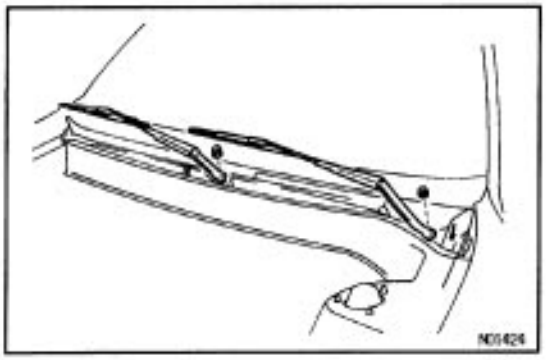
COMPONENTS



COMPONENTS (Cont'd)

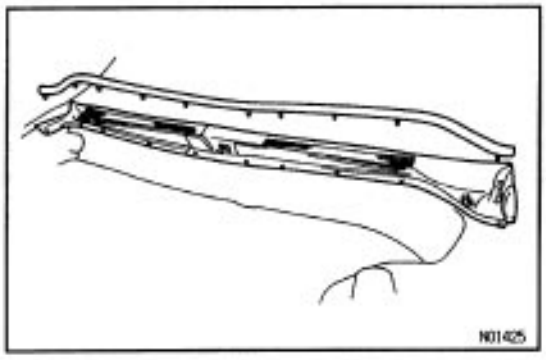


WIPER AND WASHER REMOVAL



1. REMOVE WIPER ARMS

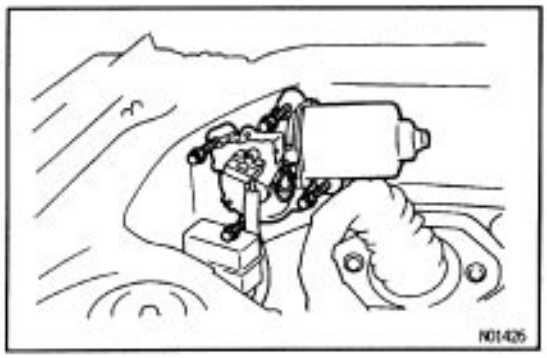
Remove 2 nuts and 2 wiper arms.



2. REMOVE COWL LOUVER

(a) Using a clip remover, remove the clips and the weath–erstrip.

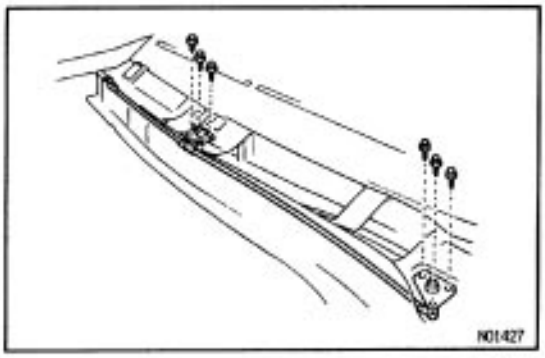
(b) Pull out the cowl louver forwards as shown.



3. REMOVE WIPER MOTOR

(a) Disconnect the connector, then unfasten 4 bolts and remove the motor.

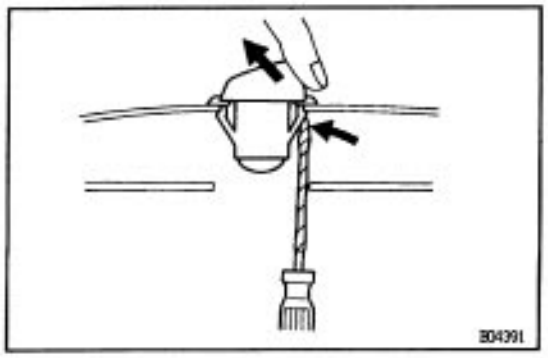
(b) Disconnect the wiper link.



4. REMOVE WIPER LINK

(a) Remove 6 bolts.

(b) Remove the wiper link through the service hole.



5. REMOVE WINDOW WASHER NOZZLE

(a) Remove the cover.

(b) Using a screwdriver, remove the nozzle.

HINT: Tape the screwdriver tip before use.

WIPER AND WASHER INSTALLATION

INSTALL FOLLOWING PARTS:

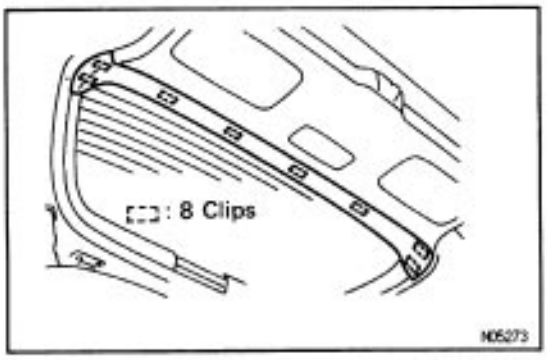
(a) Window washer nozzle
(b) Wiper link
(c) Wiper motor
(d) Wiper arms

Torque: 19 N–m (195 kgf–cm. 14 ft–lbf)

REAR WIPER REMOVAL

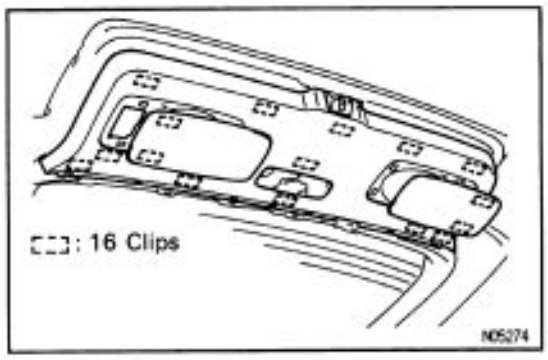
1. REMOVE,REAR WIPER ARMS

(a) Remove 2 ’nuts and 2 wiper arms.
(b) Remove 2 caps.
(c) Remove 2 nuts and 2 washers.



2. REMOVE FOLLOWING PARTS:

(a) Back door trim upper board



(b) Back door trim board

3. REMOVE REAR WIPER MOTOR ASSEMBLY

(a) Disconnect the connector, then unfasten 3 bolts.
(b) Remove the motor assembly.
(c) Remove the wiper link assembly.

REAR WIPER INSTALLATION

ASSEMBLE REAR WIPER PARTS BY FOLLOWING RE–MOVAL SEQUENCE IN REVERSE

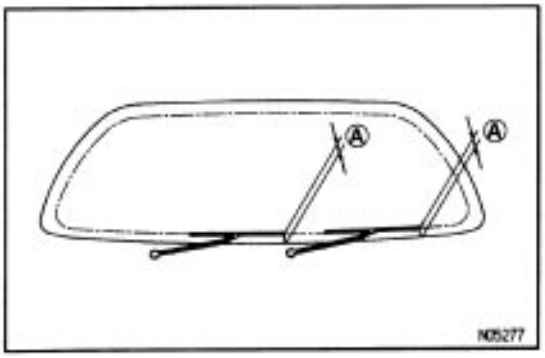
INSTALL REAR WIPER ARM

(a) Install 2 washers with 2 nuts.
Torque: 11 N .m (110 kgf–cm, 8 ft–lbf)

(b) Install the wiper arm and operate the wiper once and turn the wiper switch OFF.

(c) Adjust the installation position of the wiper arm to the position shown in the installation.
(A) Approx. 20 mm (0.79 in.)

(d) Torque the nut.
Torque: 5.4 N–m (55 kgf–cm, 48in.–lbf)

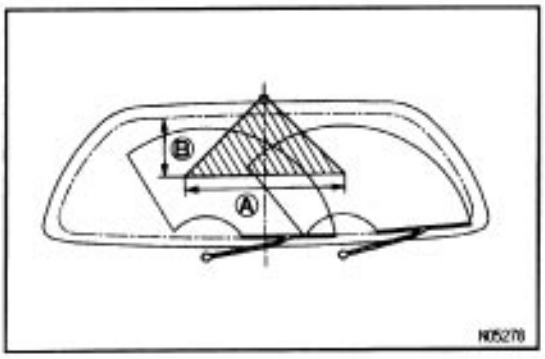


REAR WASHER NOZZLE ADJUSTMENT

1. INSPECT REAR WASHER NOZZLE

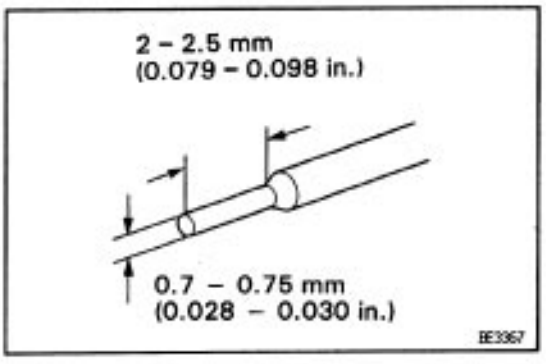
While operating the washer, check whether the point where the washer fluid hits the back door glass and the upsurge area are with in the range indicated by the hatched line.

(A)Approx. 600 mm (23.62 in.)
(B)Approx. 200 mm (7.84 in.)



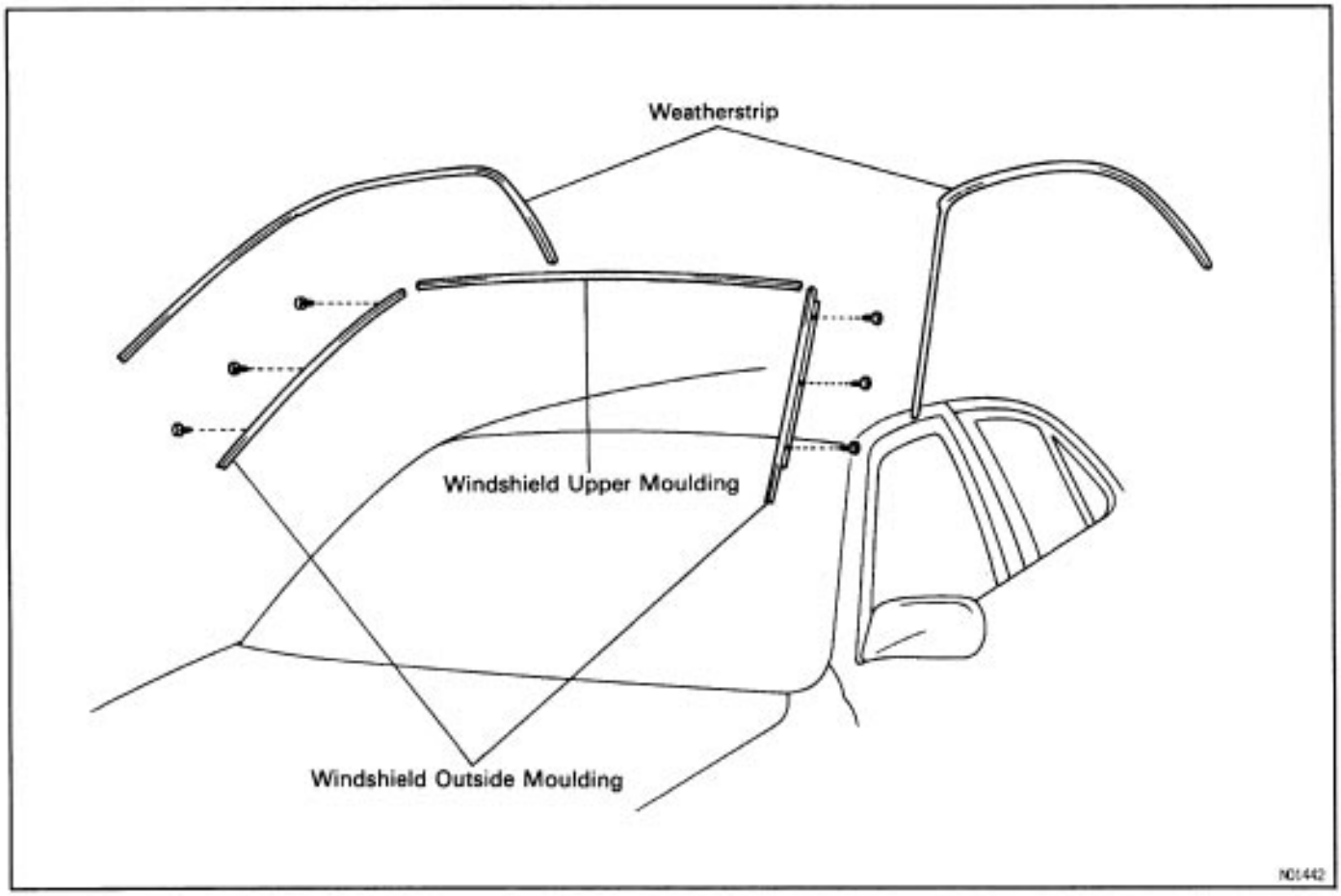
2. ADJUST FRONT WASHER NOZZLE

Using a tool like that shown in the installation, change the direction of the nozzle hole to adjust the point where washer fluid strikes the windshield.

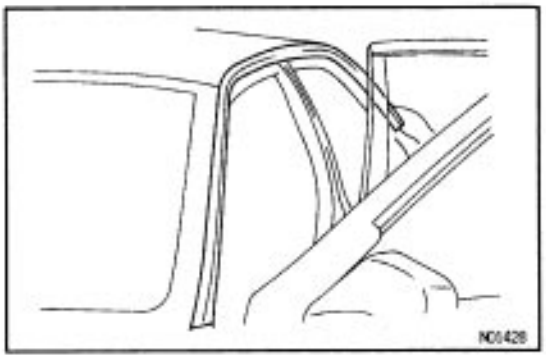


WINDSHIELD MOULDING

COMPONENTS

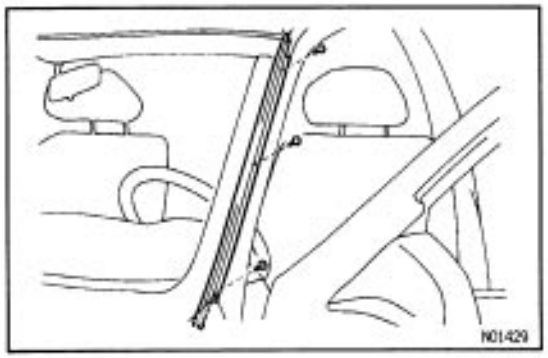


WINDSHIELD MOULDING REMOVAL



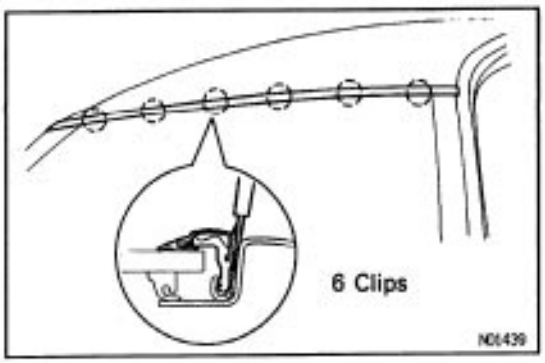
1. REMOVE WEATHERSTRIP

Remove the weatherstrip by pulling.



2. REMOVE WINDSHIELD OUTSIDE MOULDING

Remove 3 screws and the moulding.



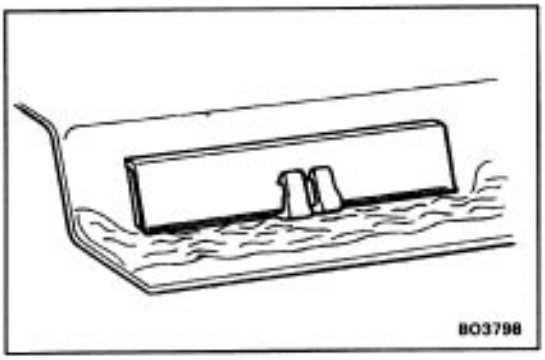
3. REMOVE WINDOWSHIELD UPPER MOULDING

(a) Insert the top of scraper between the body and the moulding.

HINT: Tape the scraper tip before use.

(b) Pry up the scraper to loosen the moulding from the claws of the clips and retainers.

(c) Remove the moulding.



FASTENER REPLACEMENT

REPLACE FASTENER

(a) Remove the damaged fastener.

(b) Cut off the old adhesive around the fastener installation area.

HINT: Be careful not to damage the body.

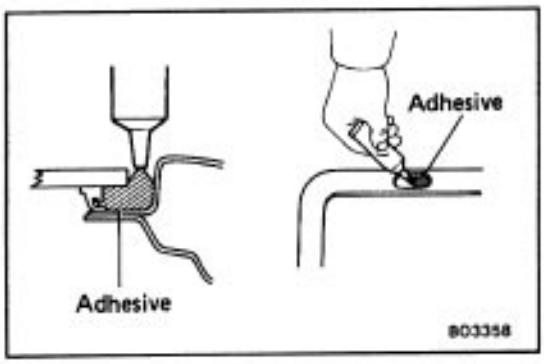
(c) Clean the installation area.

(d) Install a new fastener onto the body.

WINDSHIELD MOULDING INSTALLATION

1. INSTALL NEW CLIP INTO MOULDING

Install the clip to the appropriate place on the moulding, where the clip would engage with the fastener.

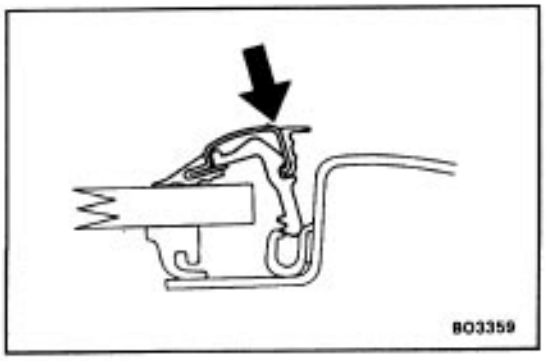


2. APPLY ADHESIVE AT NEW CLIP INSTALLATION AREA

(a) When the clip being engaged with the moulding is removed, cut out the old adhesive around the clip installation area.

NOTICE: Do not damage the body and fastener.

(b) Apply adhesive at the clip installation area so water does not collect there.



3. INSTALL WINDSHIELD UPPER MOULDING

(a) Place the moulding onto the body.

(b) Tap the moulding with your hand to fasten the clips at the glassedge.

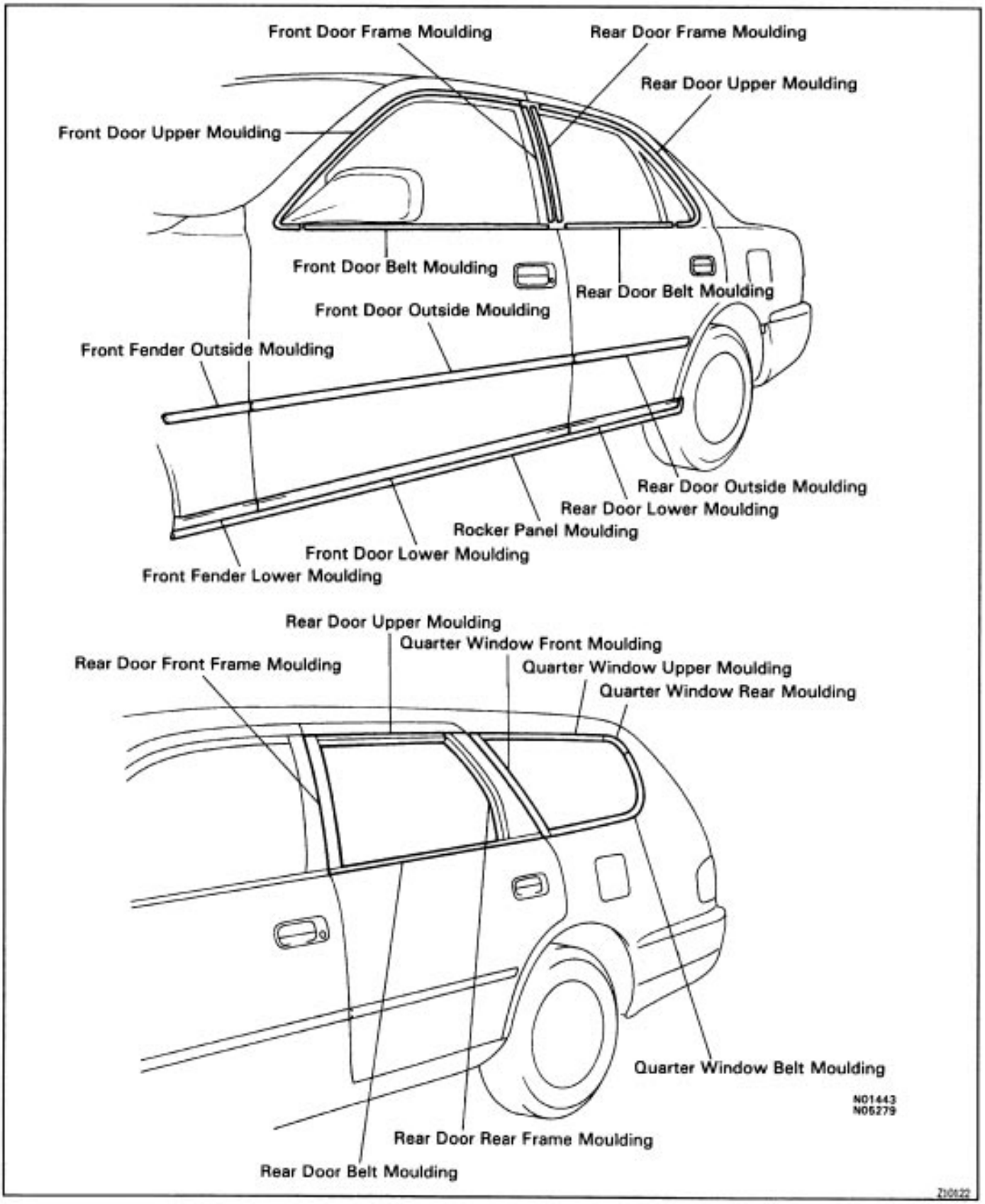
At the same time, install the fastener, by tapping them by hand.

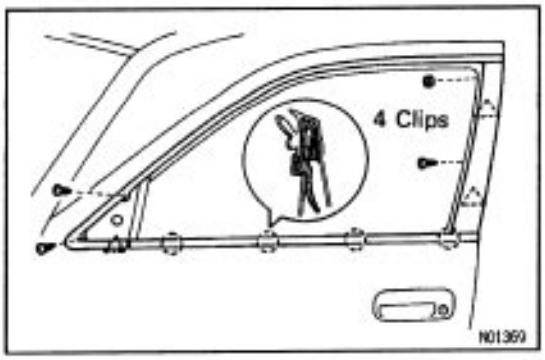
4. INSTALL WINDSHIELD OUTSIDE MOULDING

5. INSTALL WEATHERSTRIP

BODY OUTSIDE MOULDING

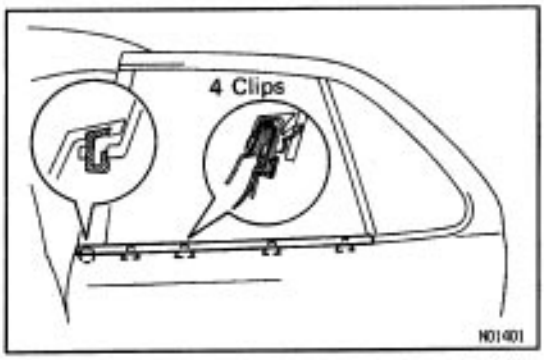
COMPONENTS





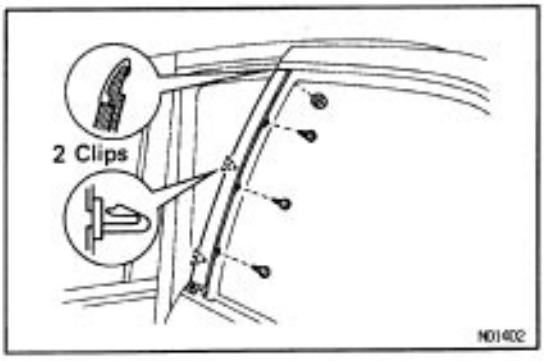
FRONT DOOR BELT AND FRAME MOULDING REMOVAL AND INSTALLATION

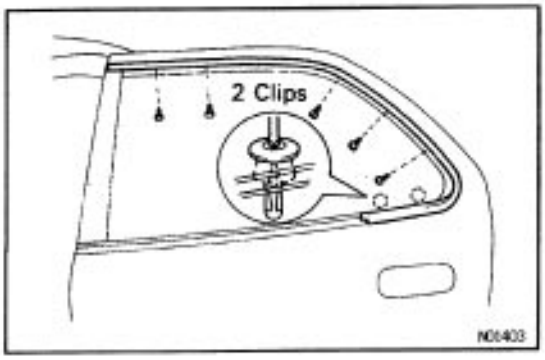
1. REMOVE FRONT DOOR COMPONENT PARTS
(See steps 1 to 5 and 9 pages BO–23 to 25)
2. REMOVE FRONT DOOR BELT MOULDING
(See step 10 on page BO–25)
3. REMOVE FRONT DOOR FRAME MOULDING
(See step 11 on page BO –25)
4. REMOVE FRONT DOOR UPPER MOULDING
(See step 12 on page BO–25 to 26)
5. INSTALL FOLLOWING PARTS:
(See steps 11 to 14 and 19 to 23 on pages BO–30 to 33)
(a) Front door upper moulding
(b) Front door frame moulding
(c) Front door belt moulding
(d) Front door component parts



REAR DOOR BELT AND FRAME MOULDING REMOVAL AND INSTALLATION

1. REMOVE REAR DOOR COMPONENT PARTS
(See steps 1 to 4 on pages BO–37 to 38)
2. REMOVE REAR DOOR BELT MOULDING
(See step 8 on page BO–39)
3. REMOVE REAR DOOR COMPONENT PARTS
(See steps 5 to 7 and 9 to 12 on pages BO–38 to 39)
4. REMOVE REAR DOOR FRAME MOULDING
(See step 14 on page BO–40)





5. REMOVE REAR DOOR UPPER MOULDING
(See step 15 on page BO–40)
6. INSTALL FOLLOWING PARTS:
(a) Rear door upper moulding
(b) Rear door frame moulding
(c) Rear door belt moulding
(d) Rear door component parts

SIDE PROTECTION MOULDING REMOVAL

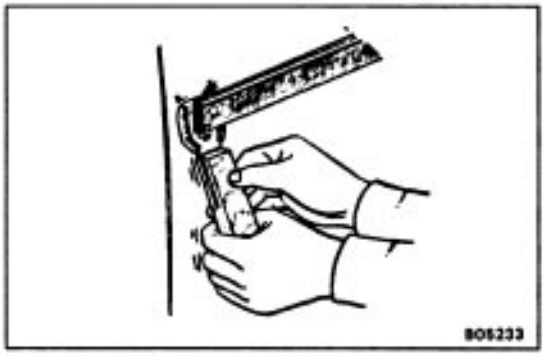
Precautions for storing moulding material:

- Store in a cool place, avoiding direct sunlight, high temperature and dust.
- The moulding is of polyvinyl chloride, so do not allow it to come in contact with thinner or other solvents, open flame, or boiling water.
- The storage time for the moulding and adhesive is limited to about 9 months.

1. REMOVE ENDS OF MOULDING

Using a scraper, pry the moulding loose about 30 mm (1.18 in.) from the ends.

HINT: Tape the scraper tip before use.



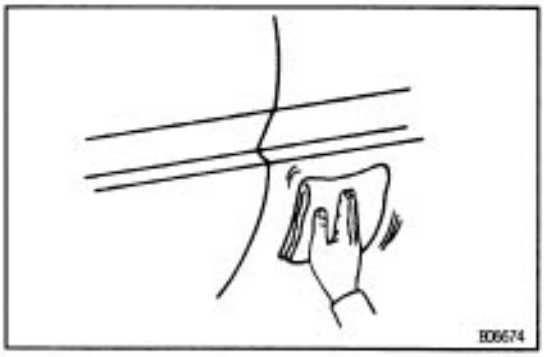
2. REMOVE MOULDING AND ADHESIVE

(a) Pull oft the moulding by cutting the adhesive with a knife.

(b) Scrape oft adhesive from the body with sandpaper cutter.

NOTICE:

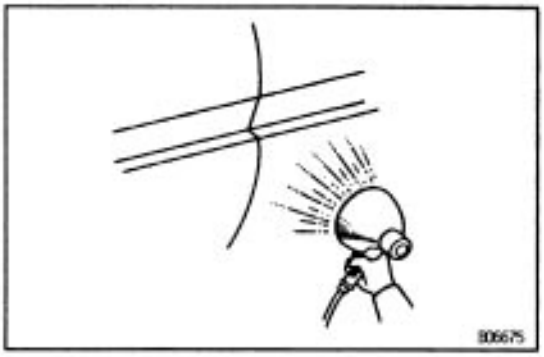
- **Remember that 30–80 mm (1.18–3.15 in.) of the ends of the moulding are glued tightly with a strong adhesive.**
- **Do not reuse moulding.**



SIDE PROTECTION MOULDING INSTALLATION

1. CLEAN MOULDING MOUNTING SURFACE

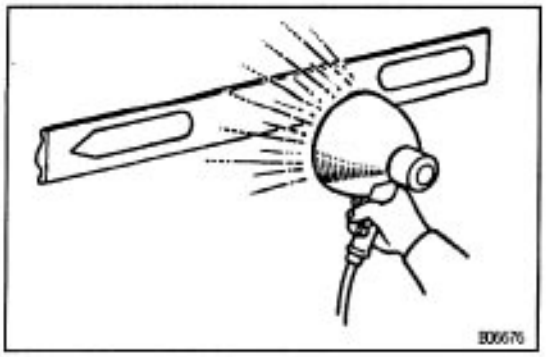
Wipe off stains with cleaner.



2. HEAT BODY MOUNTING SURFACE

Using a heat light, heat the body mounting surface to 40 – 60®C (104 –140®F).

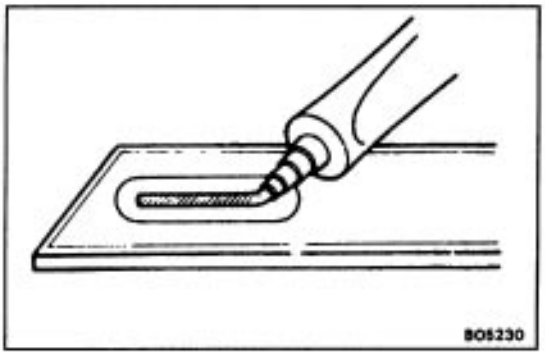
NOTICE: When the moulding is installed, the temperature of the mounting surface should be 20* C (68®F) or higher.



3. HEAT MOULDING

Using a heat light, heat the moulding to 20 – 30®C (68® – 86®F)

NOTICE: Do not heat moulding excessively.
The temperature should not be higher than 80®C (176®F).



4. APPLY ADHESIVE TO DOOR OUTSIDE MOULDING

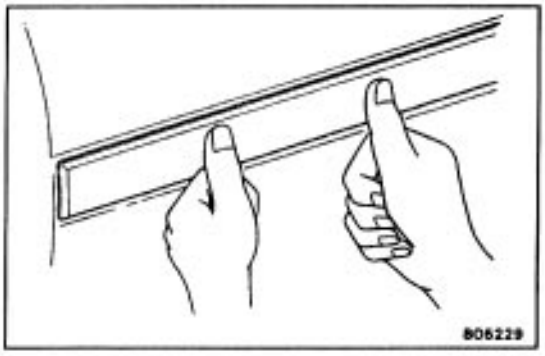
Apply adhesive to both punched out ends of the moulding.

NOTICE: Install the moulding within 30 minutes after applying the adhesive.

Part No. 08850–00051

5. LIFT MOULDING RELEASE SHEET FROM FACE OF MOULDING

NOTICE: When the moulding release sheet is removed, be sure that no dirt or dust can get onto the uncoverd area.

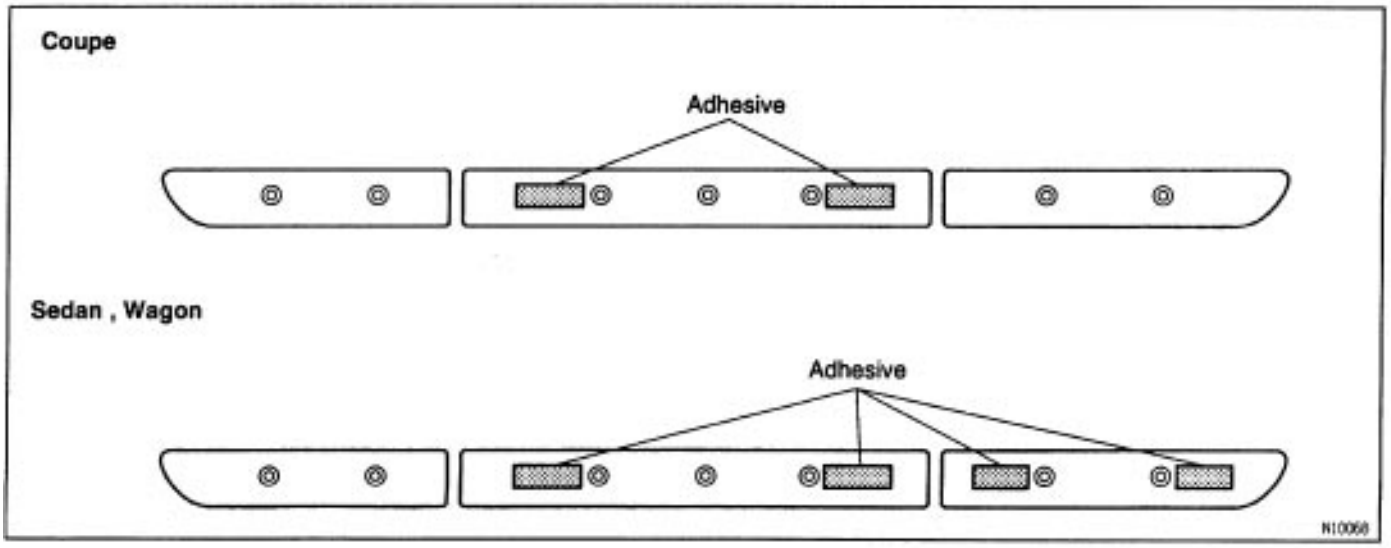


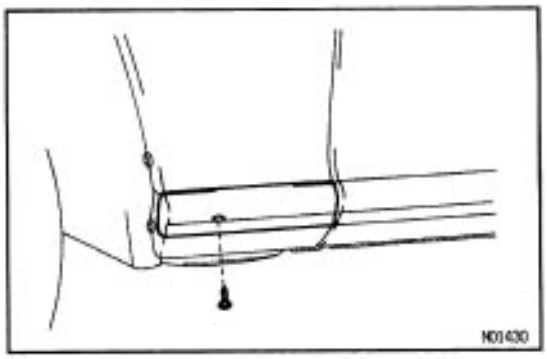
6. INSTALL MOULDING

Align the bosses an the moulding with the body holes, and push the moulding to the body.

NOTICE:

- **Be sure that the body and moulding are heated to the proper temperature.**
- **Do not depress the adhesive – coated parts ex–cessively just hold them down with your thumb.**
- **Scrape off any overflowing adhesive with a plastic spatula and clean the surface with a dry rag.**
- **After installation, do not wash the vehicle for 24 hours.**



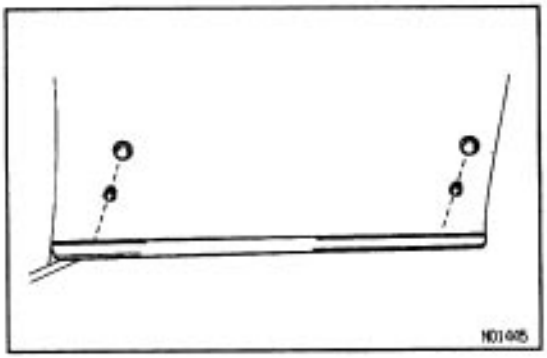


OUTSIDE LOWER MOULDING REMOVAL AND INSTALLATION

1. REMOVE FRONT FENDER LOWER MOULDING

(a) Remove the screw.

(b) Pry out the clip and remove the moulding.

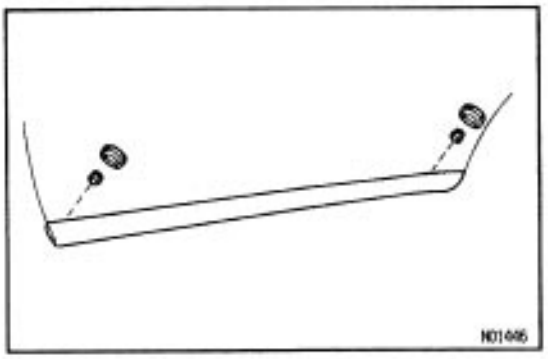


2. REMOVE FRONT DOOR LOWER MOULDING

(a) Remove 2 hole plugs.

(b) Remove 2 nuts.

(c) Pry out the clips and remove the moulding.



3. REMOVE REAR DOOR LOWER MOULDING

(a) Remove 2 hole plugs.

(b) Remove 2 nuts.

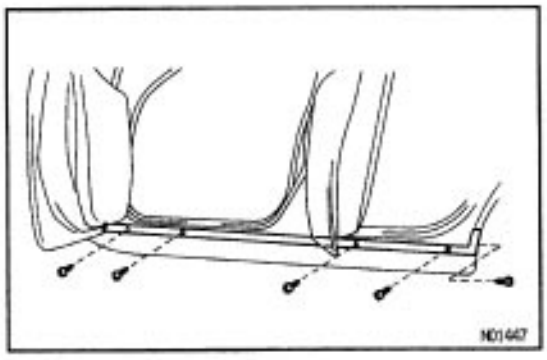
(c) Pry out the clips and remove the moulding.

4. INSTALL FOLLOWING PARTS:

(a) Front fender lower moulding

(b) Front door lower moulding

(c) Rear door lower moulding



ROCKER PANEL MOULDING REMOVAL AND INSTALLATION

1. REMOVE ROCKER PANEL MOULDING

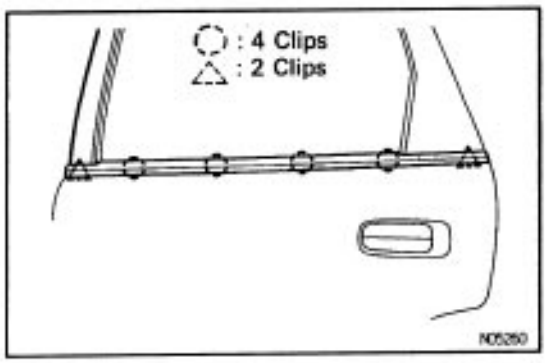
(a) Remove 3 screws.

(b) Pry out the clips and remove the moulding.

2. INSTALL ROCKER PANEL MOULDING

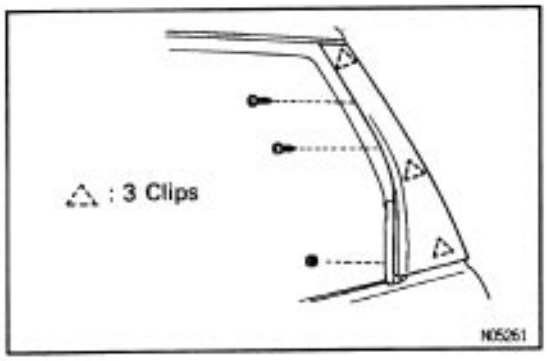
REAR DOOR BELT AND FRAME MOULDING REMOVAL AND INSTALLATION

1. REMOVE REAR DOOR COMPONENT PARTS



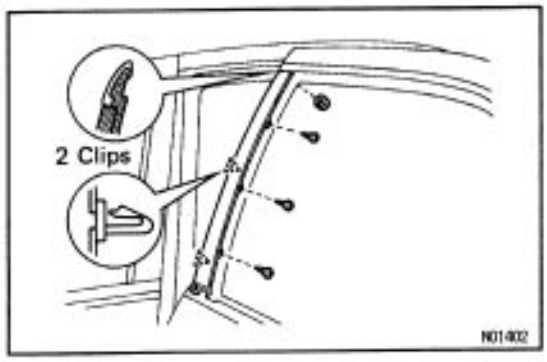
2. REMOVE REAR DOOR BELT MOULDING

Pry out the clips from the edge of the weatherstrip and remove the moulding.



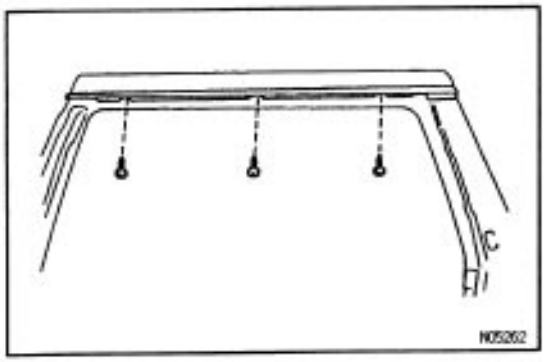
3. REMOVE REAR DOOR REAR FRAME MOULDING

(a) Remove 2 screws and the nut.
(b) Pry out the clips and remove the moulding.



4. REMOVE REAR DOOR FRONT FRAME MOULDING

(a) Remove 3 screws and the nut.
(b) Pry out the clips and remove the moulding.



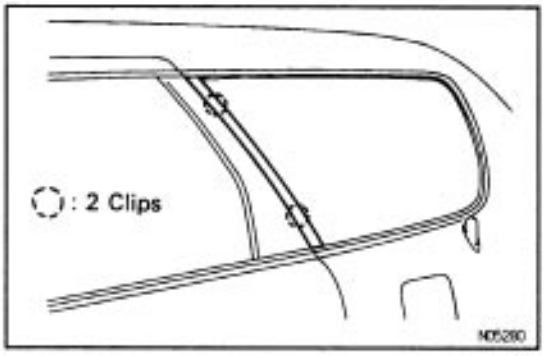
5. REMOVE REAR DOOR UPPER MOULDING

Remove 3 screws and the moulding.

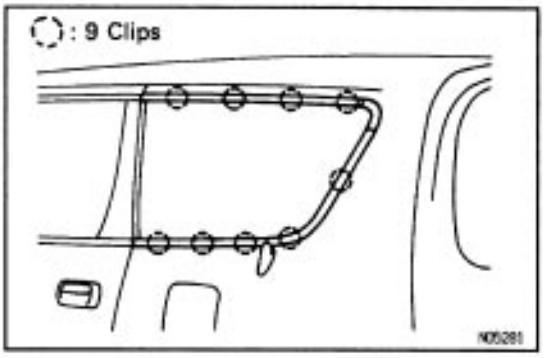
6. INSTALL FOLLOWING PARTS:

(a) Rear door upper moulding
(b) Rear door front frame moulding
(c) Rear door rear frame moulding
(d) Rear door belt moulding
(e) Rear door component parts

QUARTER WINDOW MOULDING REMOVAL AND INSTALLATION



1. REMOVE QUARTER WINDOW FRONT MOULDING
Pry out the clips and remove the moulding.



2. REMOVE QUARTER WINDOW UPPER MOULDING
Pry out the clips and remove the moulding.

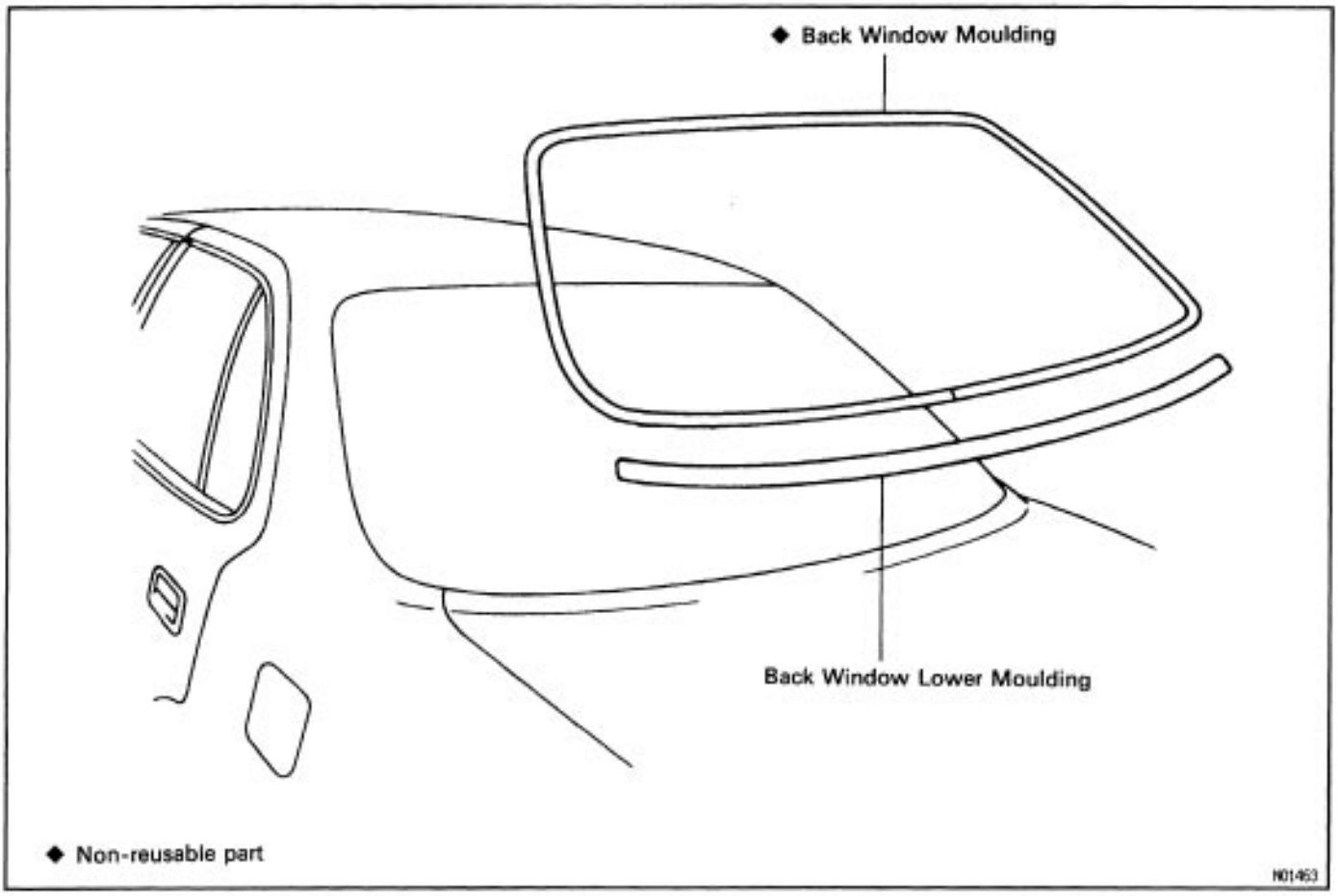
3. REMOVE QUARTER WINDOW REAR MOULDING
Pry out the clips and remove the moulding.

4. REMOVE QUARTER WINDOW BELT MOULDING
Pry out the clips and remove the moulding.

5. INSTALL FOLLOWING PARTS:
(a) Quarter window belt moulding
(b) Quarter window rear moulding
(c) Quarter window upper moulding
(d) Quarter window front moulding

BACK WINDOW MOULDING

COMPONENTS

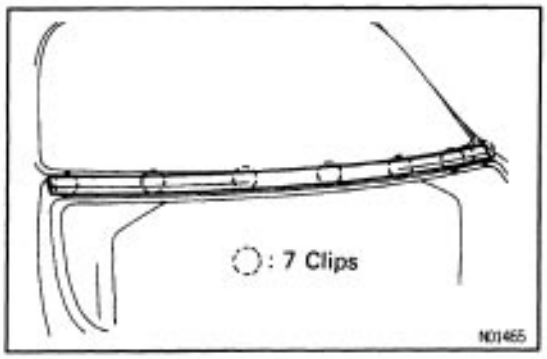


BACK WINDOW MOULDING REMOVAL

1. REMOVE BACK WINDOW LOWER MOULDING

Using a scraper, pry off the moulding from the clips and remove the moulding.

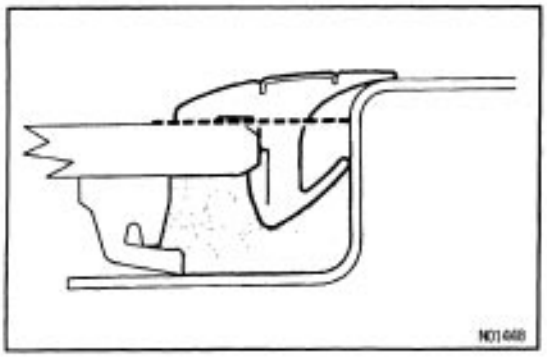
HINT: Tape the scraper tip before use.

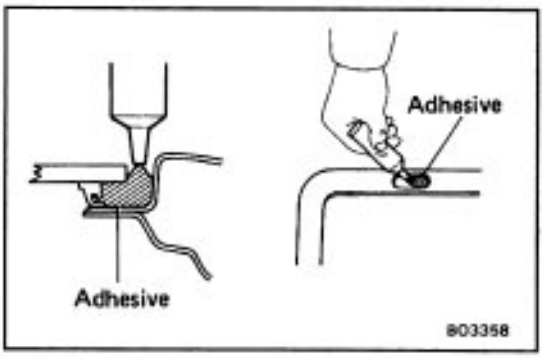


2. REMOVE BACK WINDOW MOULDING

Using a knife, cut off the moulding as shown.

NOTICE: Do not damage the body with the knife.



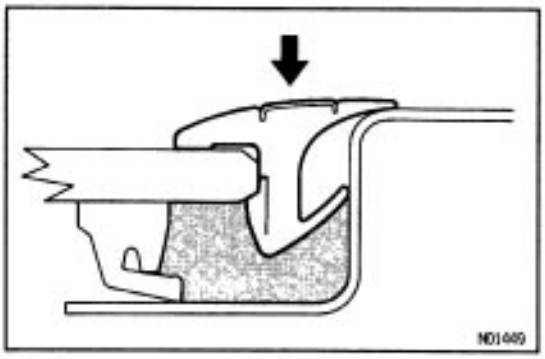


BACK WINDOW MOULDING INSTALLATION

1. CUT ADHESIVE AT MOULDING INSTALLATION AREA

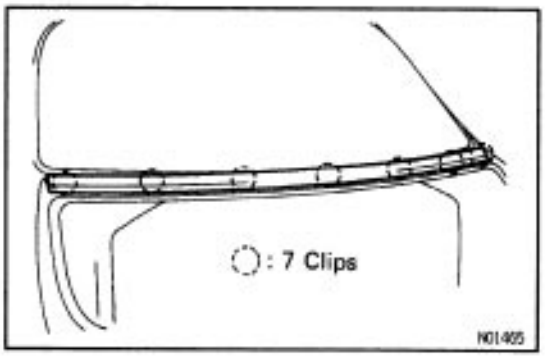
Using the knife, cut off the adhesive around the mou–lding installation area.

2. APPLY ADHESIVE AT MOULDING INSTALLATION AREA



3. INSTALL BACK WINDOW MOULDING

Place the moulding onto the body and tap it by hand.

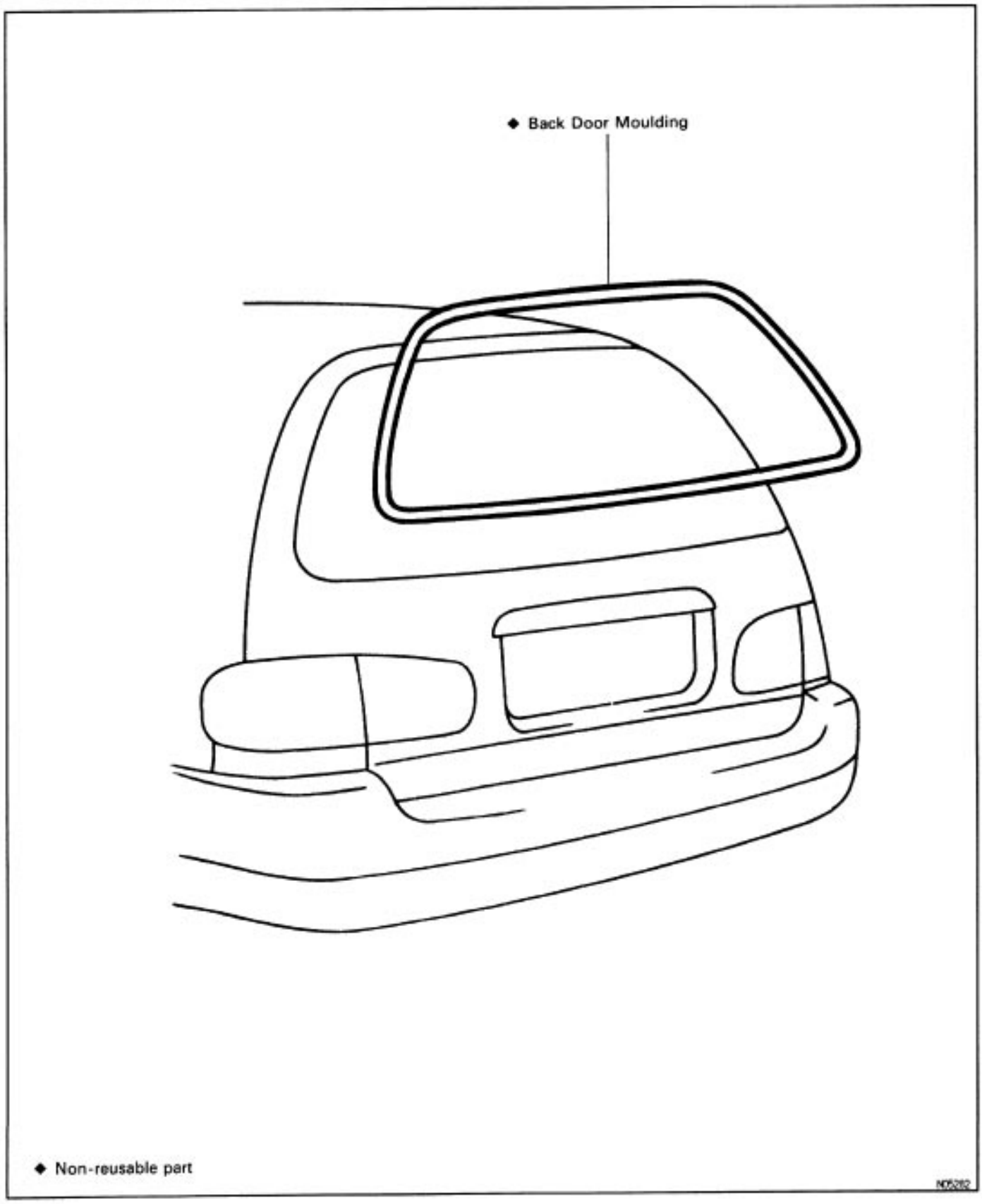


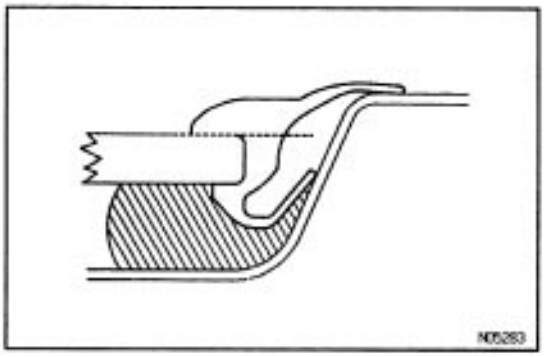
4. INSTALL BACK WINDOW LOWER MOULDING

Place the moulding onto the body and tap it by hand.

BACK DOOR MOULDING

COMPONENTS



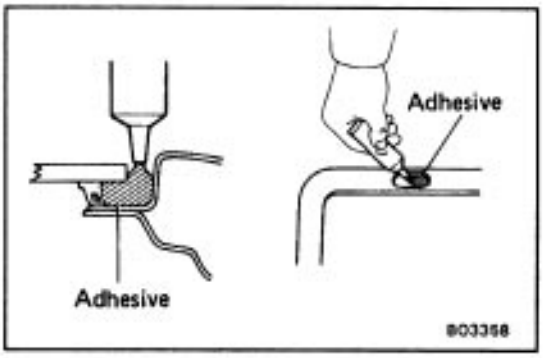


BACK DOOR MOULDING REMOVAL

REMOVE BACK DOOR MOULDING

Using a knife, cut off the moulding as shown.

NOTICE: Do not damage the body with the knife.

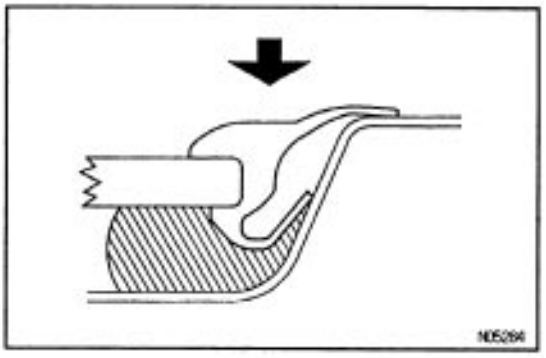


BACK DOOR MOULDING INSTALLATION

1. CUT ADHESIVE AT MOULDING INSTALLATION AREA

Using the knife, cut off the adhesive around the mou–lding installation area.

2. APPLY ADHESIVE AT MOULDING INSTALLATION AREA

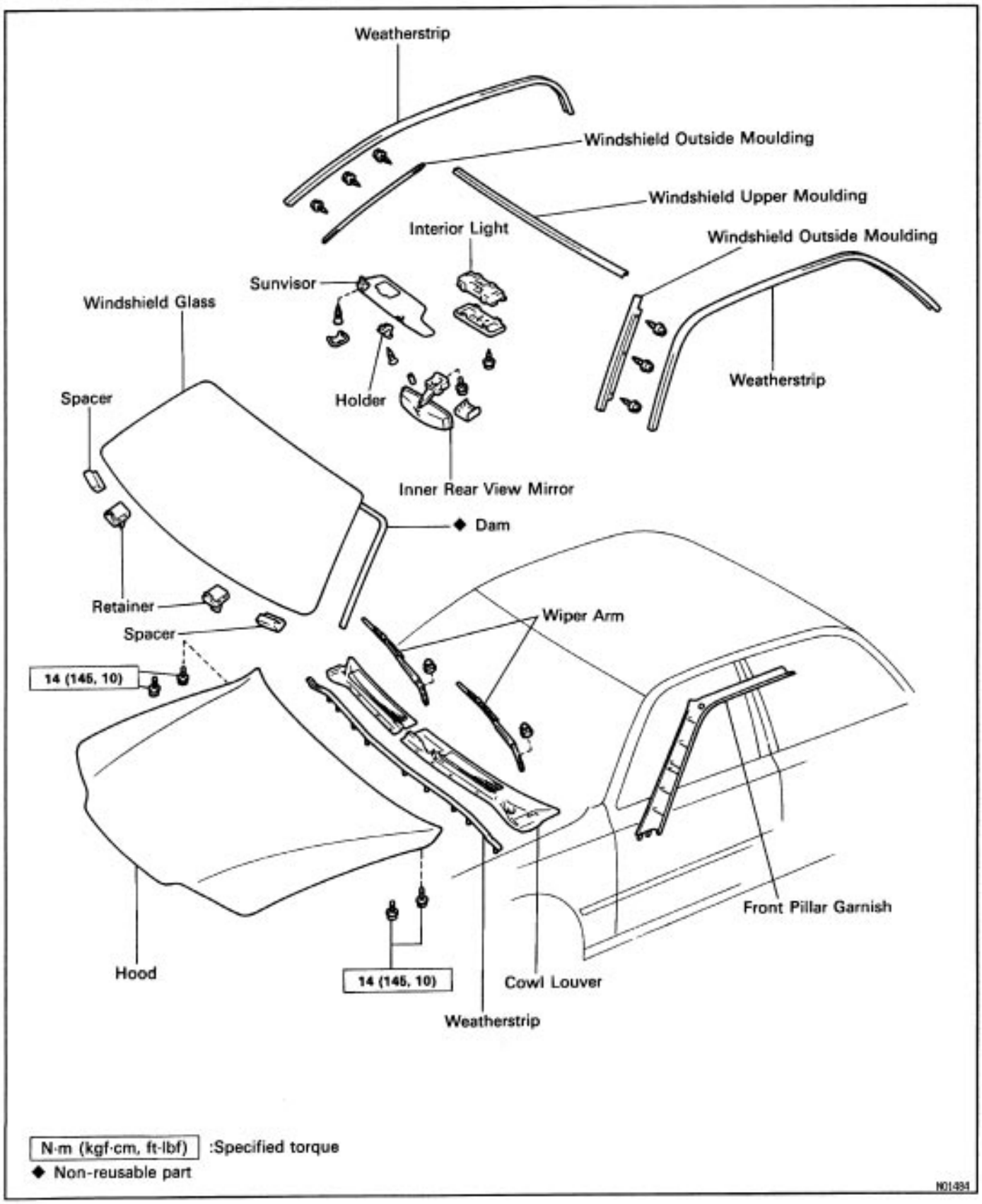


3. INSTALL BACK DOOR MOULDING

Place the moulding onto the body and tap it by hand.

WINDSHIELD

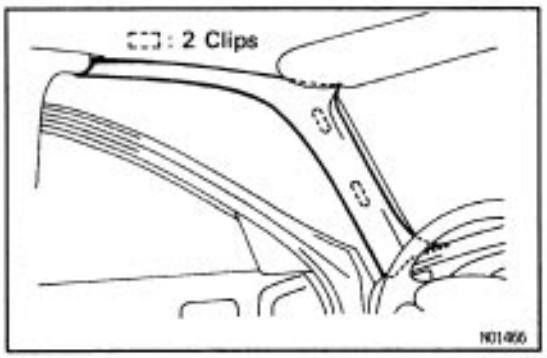
COMPONENTS



WINDSHIELD REMOVAL

1. REMOVE FOLLOWING PARTS:

(a) Inner rear view mirror
(b) Sunvisors and holders
(c) Front assist grip
(d) Interior light



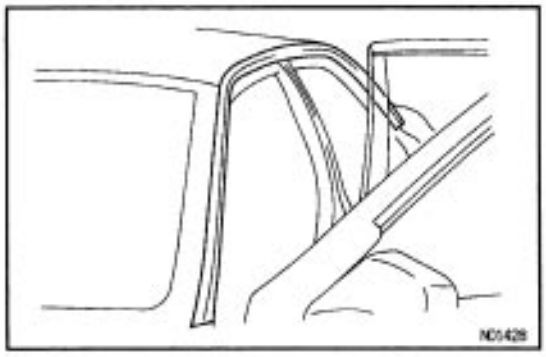
2. REMOVE FRONT PILLAR GARNISH

(a) Sedan, Wagon: Remove the clips by your hand.
(b) Sedan, Wagon: Pull the garnish rearwards to remove it.
(c) Coupe: Rear side garnish must be removed before front piller garnish.

3. REMOVE HOOD

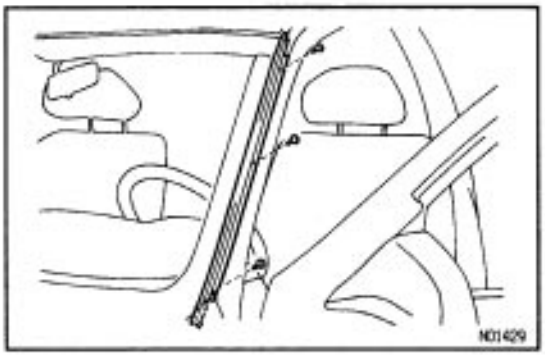
4. REMOVE FOLLOWING PARTS:

(a) Wiper arms
(b) Cowl louver



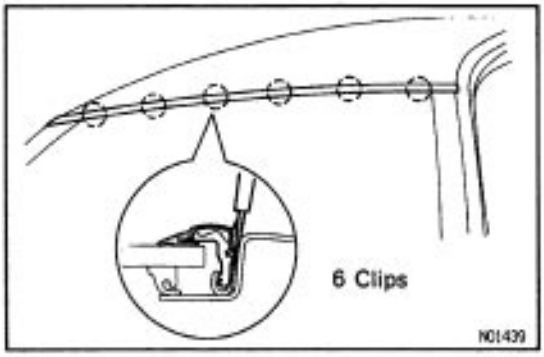
5. REMOVE WEATHERSTRIP

Remove the weatherstrip by pulling.



6. REMOVE WINDSHIELD OUTSIDE MOULDING

Remove 3 screws and the moulding.

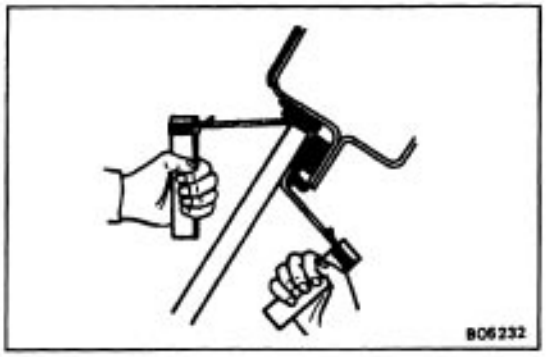


7. REMOVE WINDSHIELD UPPER MOULDING

(a) Insert the top of scraper between the body and the moulding.

HINT: Tape the scraper tip before use.

(b) Pry up the scraper to loosen the moulding from the claw of the clips and retainers.
(c) Remove the moulding.

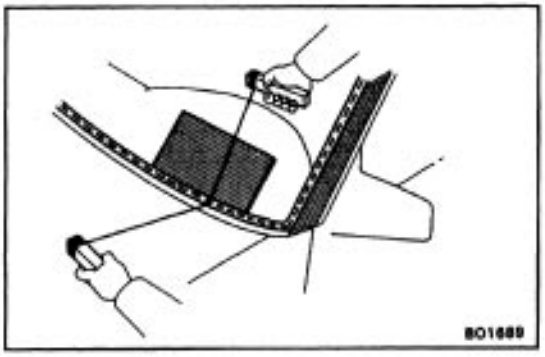


8. REMOVE WINDSHIELD GLASS

(a) Push piano wire through from the interior.

(b) Tie both wire ends to a wooden block or like object_

HINT: Apply adhesive tape to the outer surface to keep the surface from being scratched.

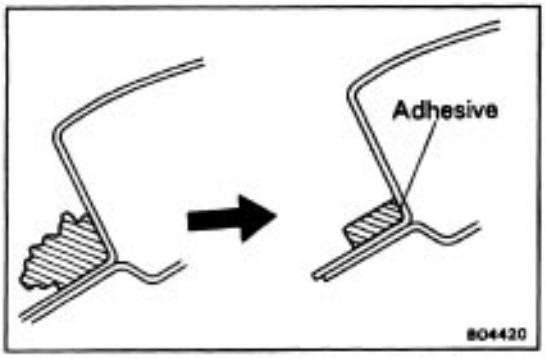


NOTICE: When separating the glass, take care not to damage the paint and interior and exterior ornaments. To prevent scratching the safety pad when removing the w indshield, place a plastic sheet between the piano wir– eand safety pad.

(c) Cut the adhesive by pulling the piano wire around it.

(d) Remove the glass.

NOTICE: Leave as much of the adhesive on the body as possible when cutting off the glass.



WINDSHIELD INSTALLATION

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Using a knife, cut away any rough areas on the body.

HINT: Leave as much of the adhesive on the body as possible.

(b) Clean the cutting surface of the adhesive with a piece of shop rag saturated in cleaner.

HINT: Even if all the adhesive has been removed, clean the body.

2. REPLACE FASTENER

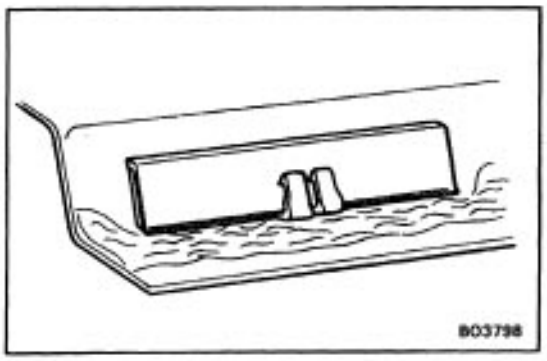
(a) Remove the damaged fastener.

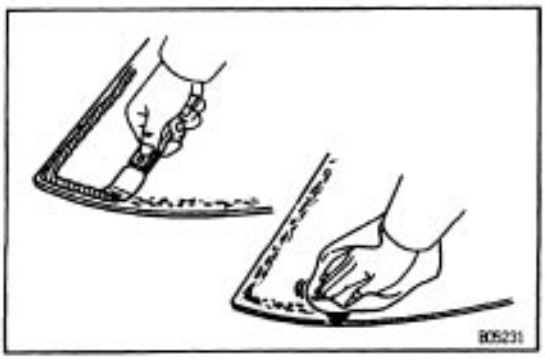
(b) Cut off the old adhesive around the fastener installa– tion area.

HINT: Be careful not to damage the body.

(c) Clean the installation area.

(d) Install a new fastener onto the body.



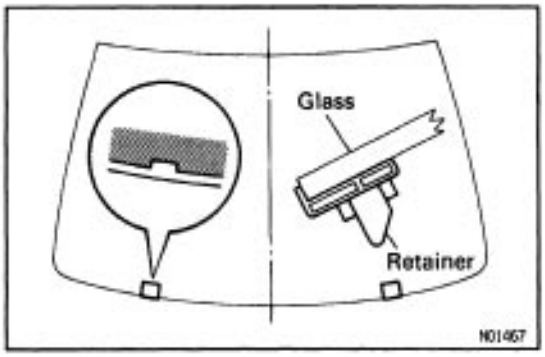


3. CLEAN REMOVED GLASS

(a) Using a scraper, remove the adhesive sticking to the glass.

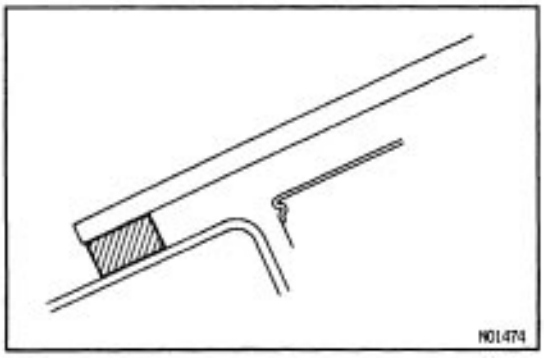
(b) Clean the glass with cleaner.

NOTICE: Do not touch the glass after cleaning it.

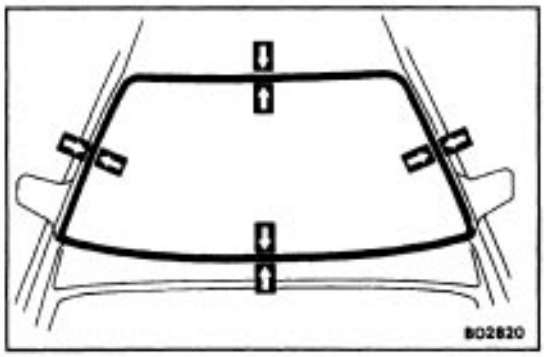


4. INSTALL RETAINER

Install the retainers as shown.

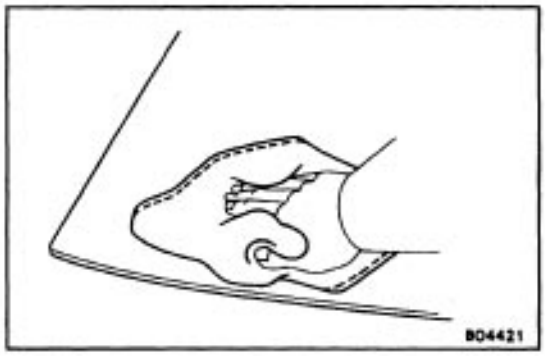


5. INSTALL SPACER



6. POSITION GLASS

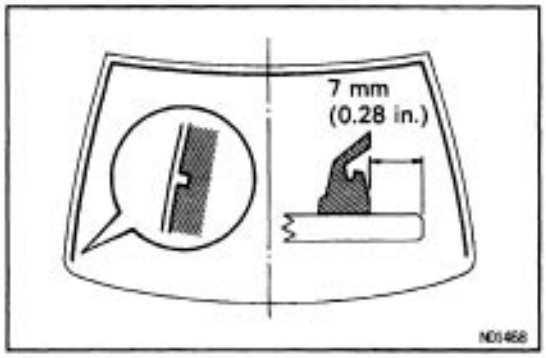
(a) Place glass in correct position.
(b) Check that all contacting parts of the glass rim are perfectly even and do not make contact with the fasteners.
(c) Place reference marks between the glass and body.
(d) Remove the glass.



7. CLEAN CONTACT SURFACE OF GLASS

Using a cleaner, clean the contact surface black–colored area around the entire glass rim.

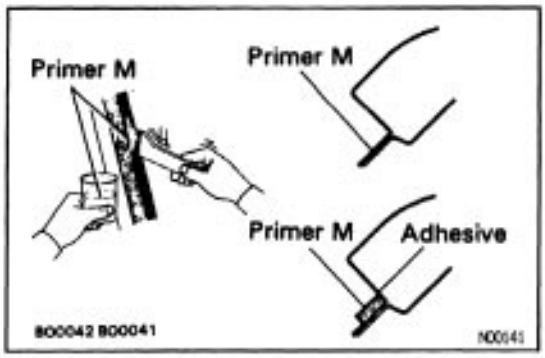
NOTICE: Do not touch the glass face after cleaning it.



8. INSTALL DAM

Install the dam with double–stick tape as shown in the illustration.

NOTICE: Do not touch the glass face after cleaning it.

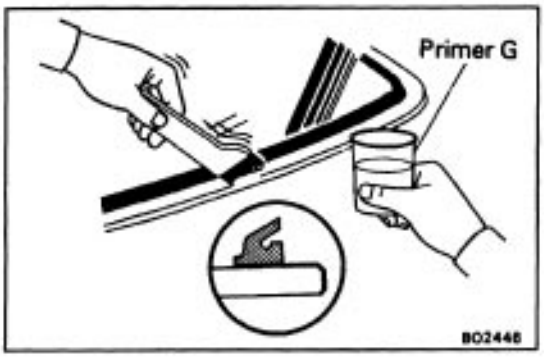


9. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.

NOTICE:

- Let the primer coating dry for 3 minutes or more.
- Do not coat to the adhesive.
- Do not keep any of the opened primer M and G for later use.

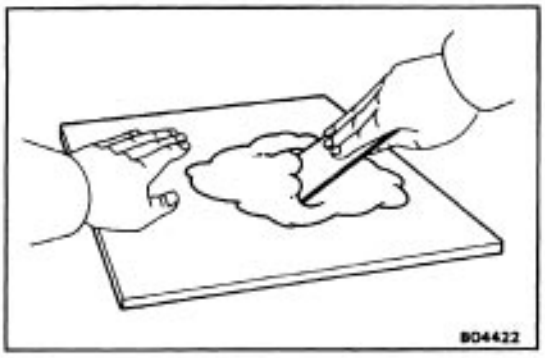


10. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

(b) Before the Primer dries, wipe it off with a clean shop rag.

NOTICE: Let the primer coating dry for 3 minutes or more.



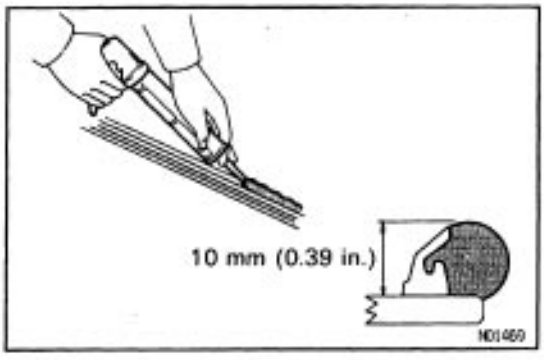
11. MIX ADHESIVE COATING

NOTICE:

- **Be sure that installation of the moulding is finished within usable time. (See step 3 on page BO–9)**
- **The mixture should be made in 5 minutes or less.**

(a) Thoroughly clean the glass plate and putty spatula with solvent.

(b) Thoroughly mix 500 g (117.64 oz.) of the main agent and 75 g (2.65 oz.) of the hardening agent on a glass plate or like object with a putty spatula.

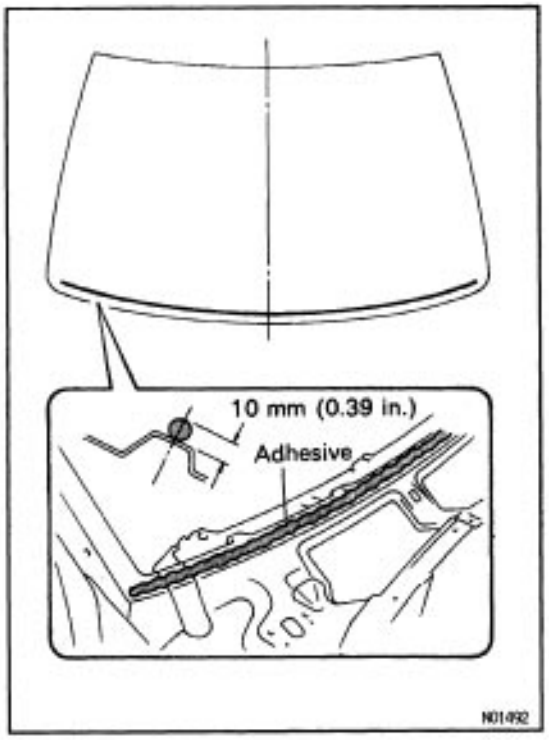


12. APPLY ADHESIVE

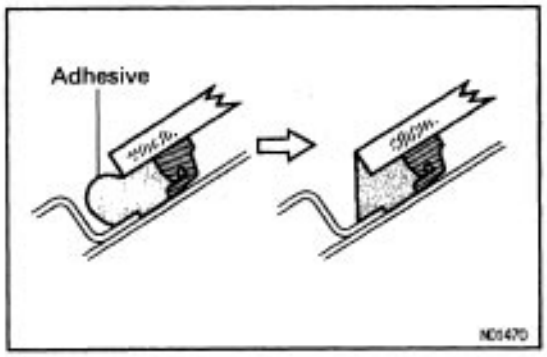
(a) Cut off the tip of the cartridge nozzle. Fill the cartridge with adhesive.

(b) Load the cartridge into the sealer gun.

(c) Coat the glass with adhesive as shown.

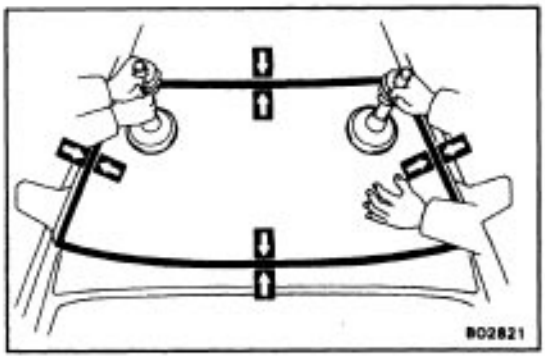


(d) Coat the body with adhesive as shown.

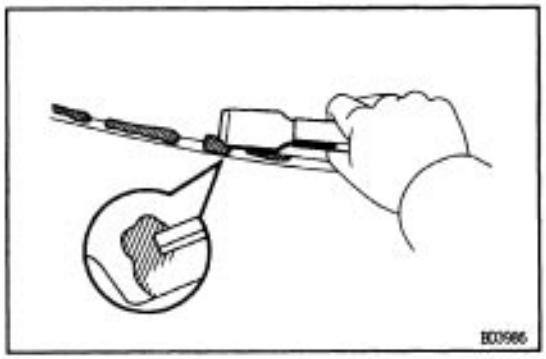


13. INSTALL GLASS

HINT: Confirm that the dam is attached the body panel as shown in the illustration.



(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.
(b) Using a spatula, apply adhesive on the glass rim.



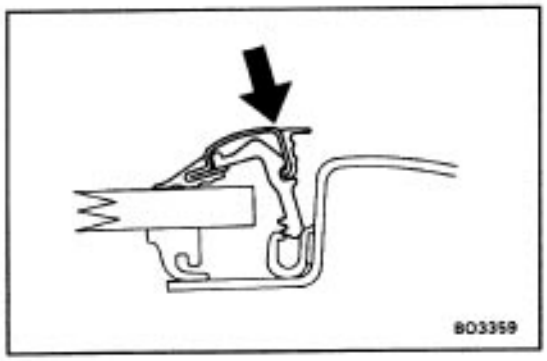
(c) Use a scraper to remove any excess or protruding adhesive.
(d) Fasten glass securely until the adhesive sets.

14. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

(b) Seal any leak with auto glass sealer.

Part No. 08833–00030



15. INSTALL WINDSHIELD UPPER MOULDING

(a) Place the moulding onto the body.

(b) Tap the moulding with your hand to fasten the clips at the glass edge.

At the same time, install the fastener, by tapping them by hand.

16. INSTALL WINDSHIELD OUTSIDE MOULDING

17. INSTALL WEATHERSTRIP

18. INSTALL FOLLOWING PARTS:

(a) Cowl louver

(b) Wiper arms

(c) Hood

(d) Front pillar garnish

(e) Interior light

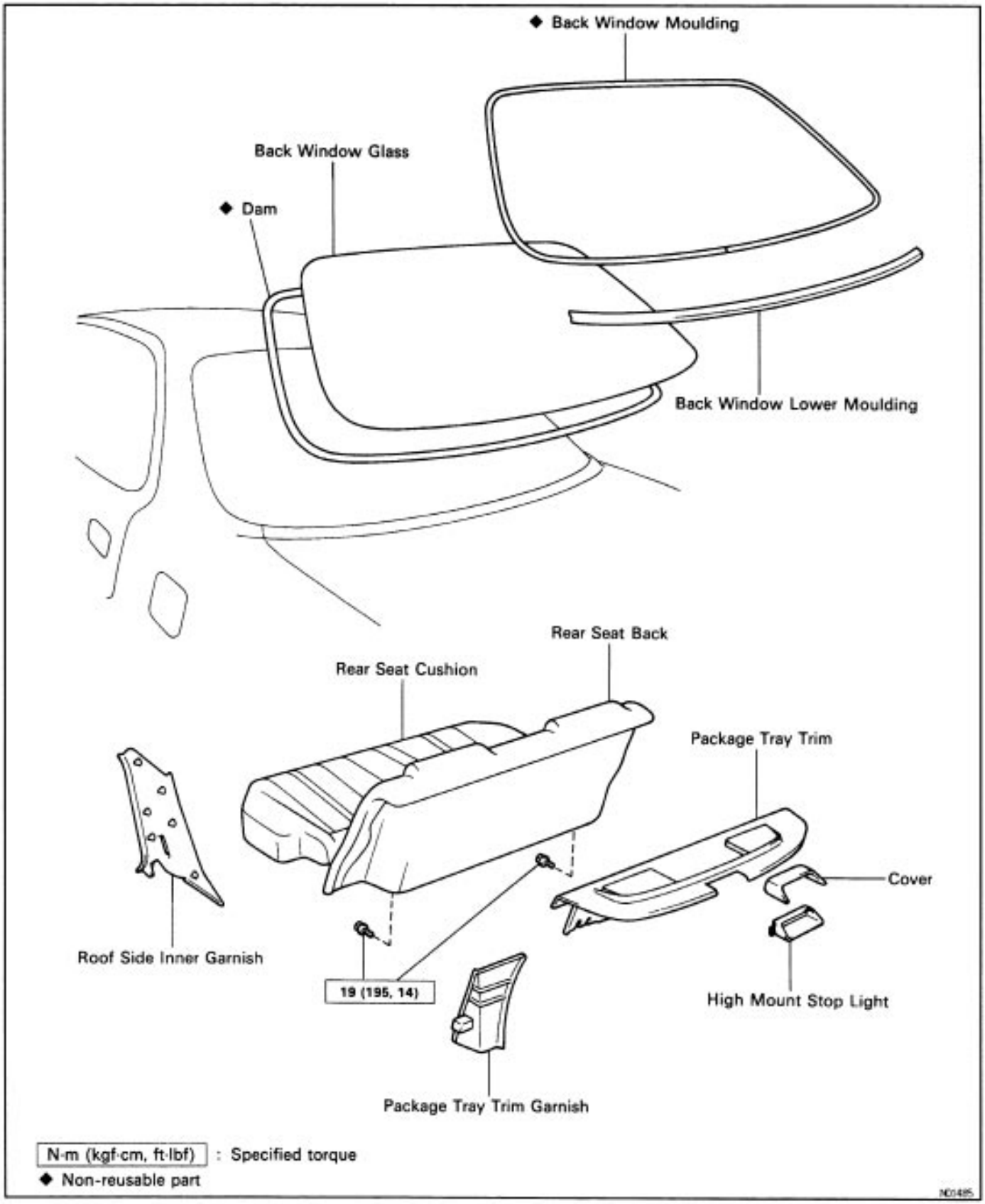
(f) Front assist grip

(g) Sunvisors and holders

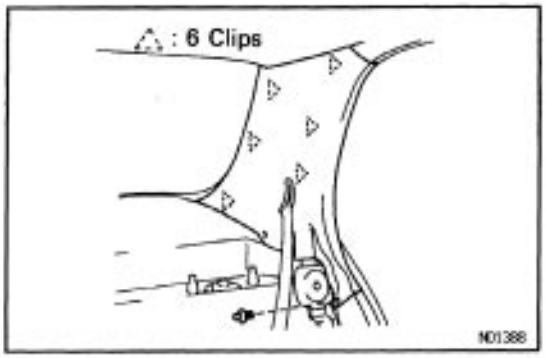
(h) Inner rear view mirror

BACK WINDOW GLASS

COMPONENTS



BACK WINDOW GLASS REMOVAL

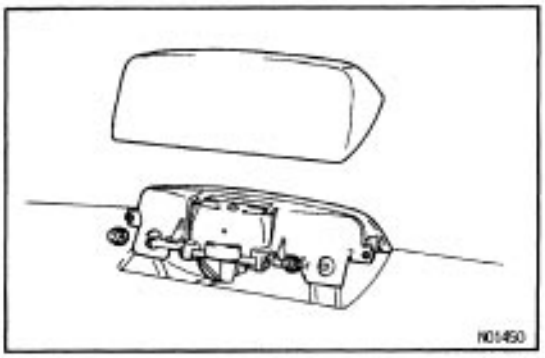


1. REMOVE REAR SEAT CUSHION AND SEAT BACK

2. REMOVE ROOF SIDE INNER GARNISH

(a) Remove the clips.

(b) Remove the garnish by pulling.

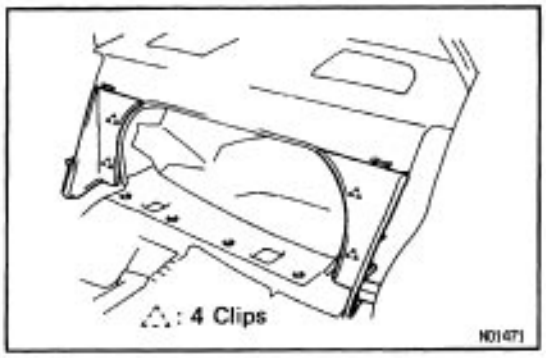


3. w/o Rear Spoiler:

REMOVE HIGH MOUNT STOP LIGHT

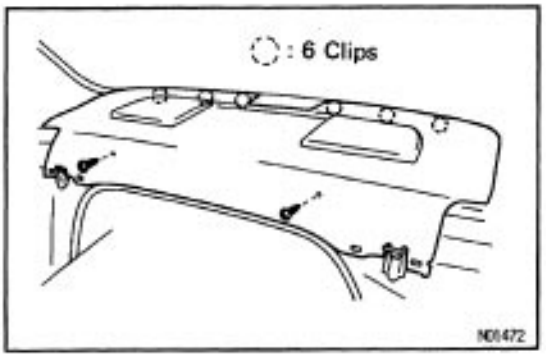
(a) Remove the cover.

(b) Remove 2 bolts and the stop light, then disconnect the connector.



4. REMOVE PACKAGE TRAY GARNISH

Remove the garnish by pulling.



5. REMOVE PACKAGE TRAY TRIM

(a) Remove 2 screw caps.

(b) Remove 2 screws.

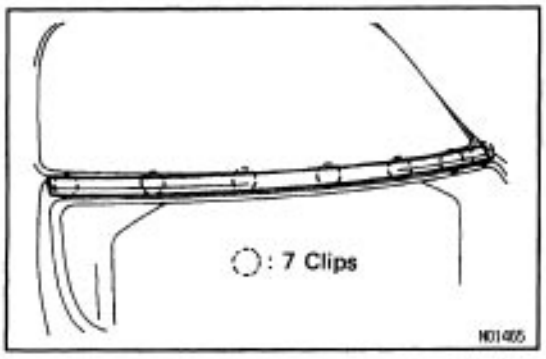
(c) Remove the trim by pulling forwards.

6. REMOVE FOLLOWING PARTS:

(a) Assist grips.

(b) Rear side of roof headlining.

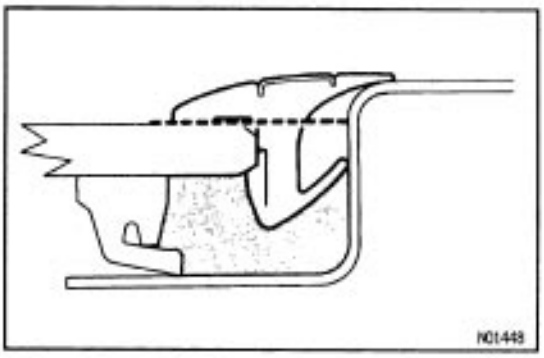
7. DISCONNECT DEFOGGER WIRE CONNECTORS



8. REMOVE SACK WINDOW LOWER MOULDING

Using a scraper, pry off the moulding from the clips and remove the moulding.

HINT: Tape the screwdriver tip before use.



9. REMOVE BACK WINDOW MOULDING

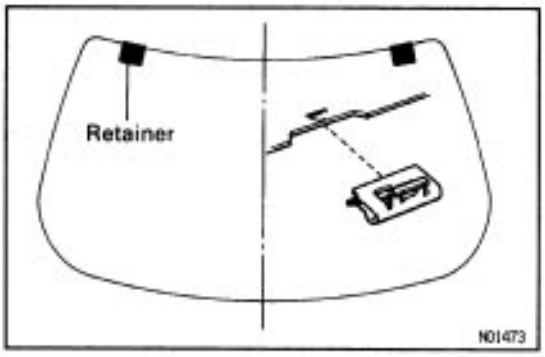
Using a knife, cut off the moulding as shown.

NOTICE: Do not damage the body with the knife.

10. REMOVE BACK WINDOW GLASS

Remove the glass in the same manner as windshield.

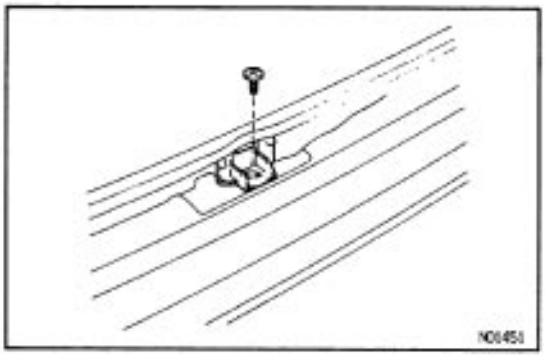
(See step 8 on page BO–77)



11. REMOVE RETAINERS

Remove retainers from the body.

BACK WINDOW GLASS INSTALLATION



1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(See step 1 on page BO–77)

2. REPLACE LOWER MOULDING CLIP

(a) Remove the screw and the damaged clip.

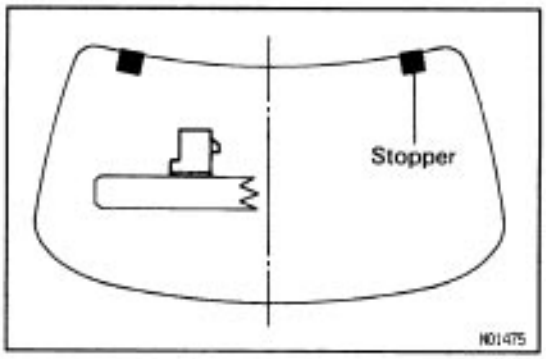
(b) Install the new clip with the screw.

3. CLEAN REMOVED GLASS

(See step 3 on page BO–77)

4. REMOVE STOPPERS

Using a knife, remove the stoppers.

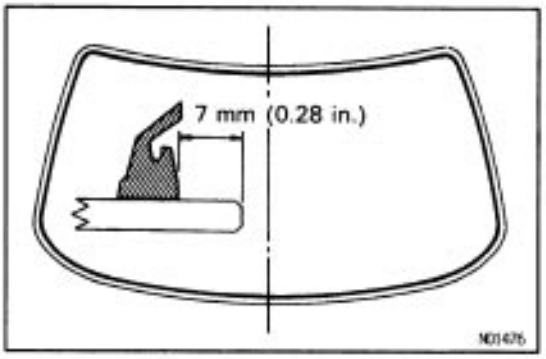


5. POSITION GLASS

(See step6 on page BO–77)

6. CLEAN CONTACT SURFACE OF GLASS

(See step 7 on page BO–78)



7. INSTALL DAM

Install the dam with double–stick tape as shown in the drawing.

NOTICE: Do not touch the glass face after cleaning it.

8. COAT CONTACT SURFACE OF BODY WITH PRIMER 'M'

(See step 9 on page BO–79)

9. COAT CONTACT SURFACE OF GLASS WITH PRIMER 'G"

(SEE STEP 10 ON PAGE BO–79)

10. MIX ADHESIVE COATING

(SEE STEP 11 ON PAGE BO–79)

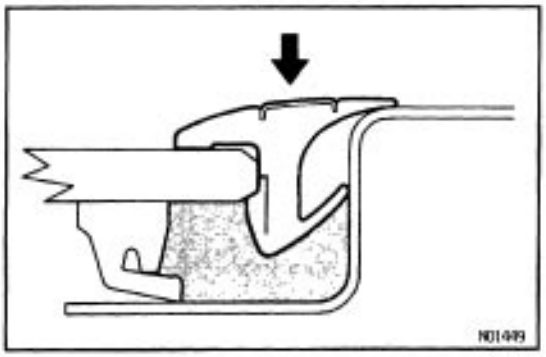
11. APPLY ADHESIVE

(SEE STEP 12 ON PAGE BO–79)

12. INSTALL GLASS

(SEE STEP 13 ON PAGE BO–80)

13. INSTALL BACK WINDOW MOULDING



Place the moulding onto the body and tap it by hand.

14. INSTALL BACK WINDOW LOWER MOULDING

Place the moulding onto the body and tap it by hand.

15. INSPECT FOR LEAKS AND REPAIR

(SEE STEP 14 ON PAGE BO–81)

16. CONNECT DEFOGGER WIRE CONNECTORS

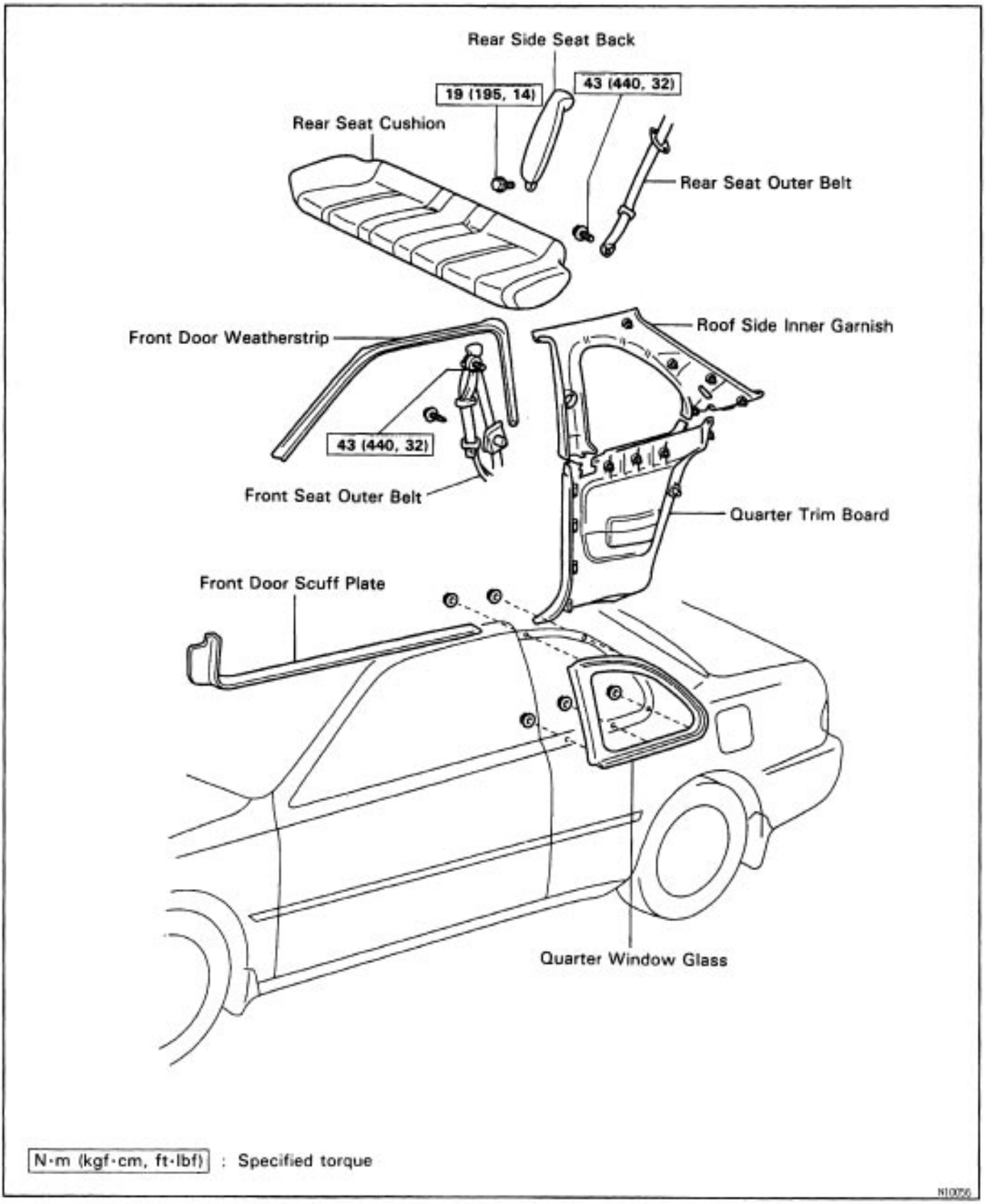
17. INSTALL FOLLOWING PARTS:

(a) Rear side of roof headlining
(b) Assist grips
(c) Package tray trim
(d) Package tray trim garnish
(e) w/o Rear Spoiler:
High mount stop light
(f) Roof side inner garnish
(g) Rear seat back and seat cushion

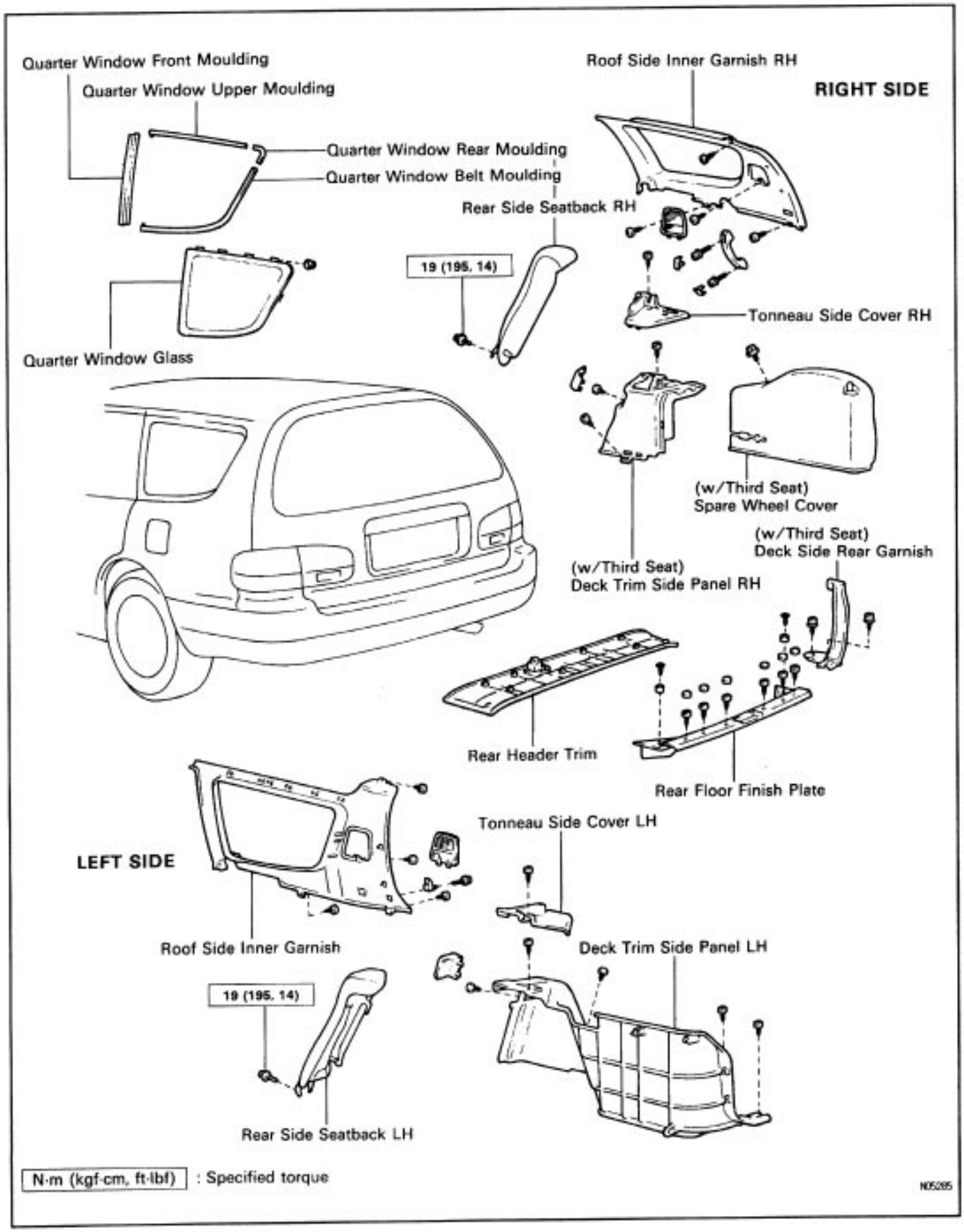
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

QUARTER WINDOW GLASS

COMPONENTS



COMPONENTS (Cont'd)



QUARTER WINDOW GLASS REMOVAL

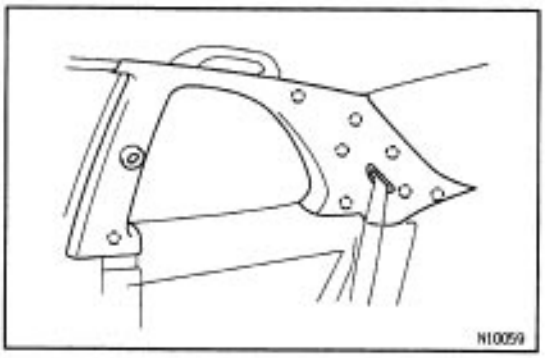
Coupe:

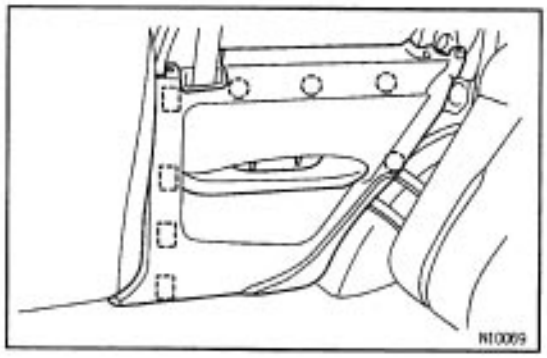
1. REMOVE REAR SEAT CUSHION

2. REAR SIDE SEAT BACK

3. REMOVE FOLLOWING PARTS:

(a) Front seat outer belt shoulder anchor
(b) Front seat outer belt bezel
(c) Rear seat outer belt anchor
(d) Roof side inner garnish.
(e) Front door scuff plate.



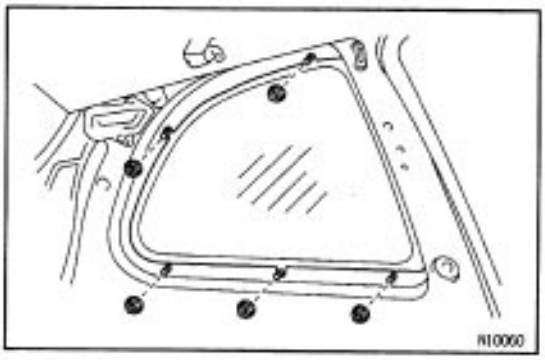


(f) Quarter trim board.
(g) Front door weatherstrip.

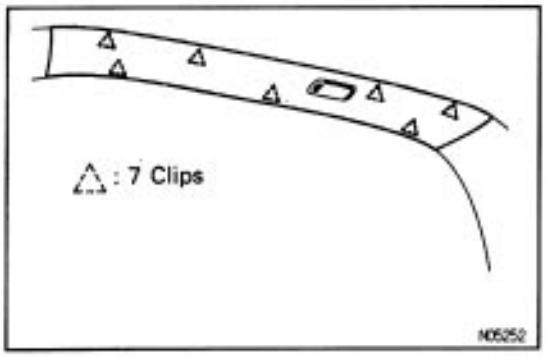
4. REMOVE QUARTER WIND GLASS

(a) Remove 5 nuts.
(b) Using a knife, cut loose the adhesive.
(c) Remove glass.

NOTICE: Do not damege the body.



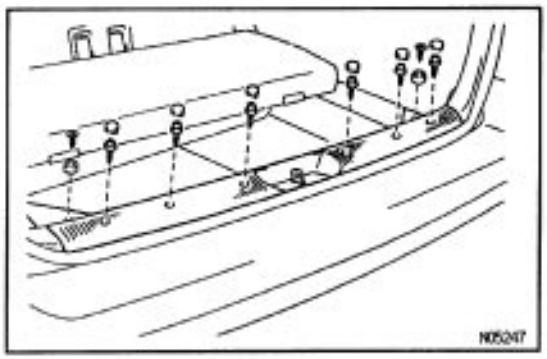
QUARTER WINDOW GLASS REMOVAL



Wagon:

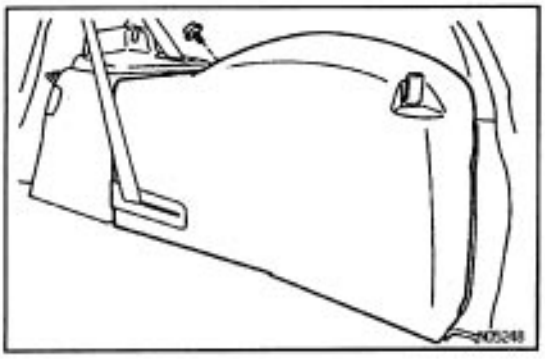
1. REMOVE REAR HEADER TRIM

Remove the trim by pulling, then disconnect the con–nector.



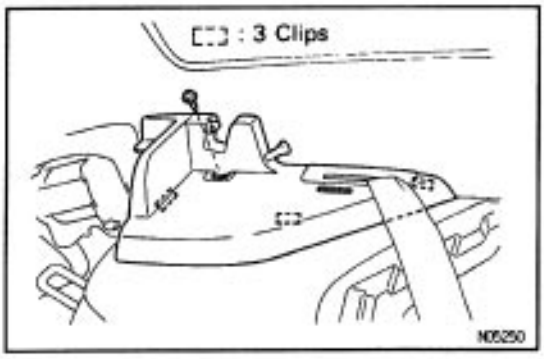
2. REMOVE REAR FLOOR FINISH PLATE

(a) Remove 2 cushions.
(b) Remove 6 covers and 6 screws.
(c) Remove the plate.

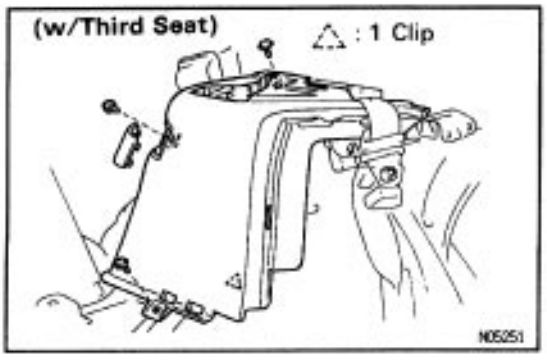


3. REMOVE FOLLOWING PARTS:

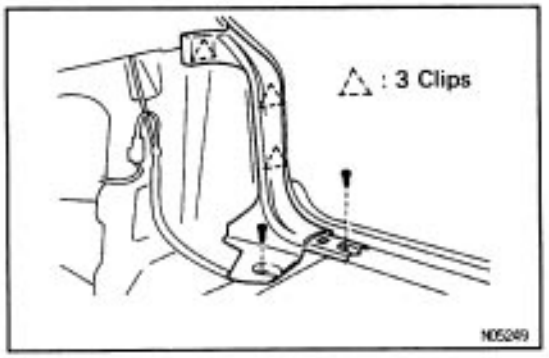
Right Side:
(a) Rear side seatback RH
(b) w/ Third Seat:
Spare wheel cover



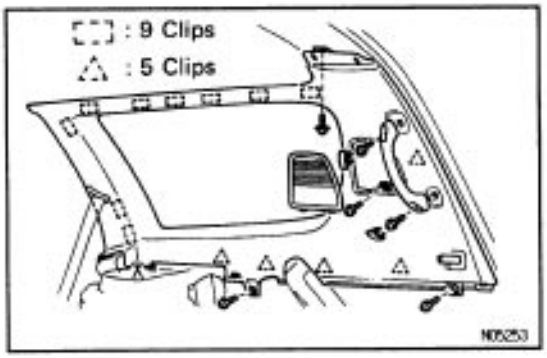
(c) Tonneau side cover RH



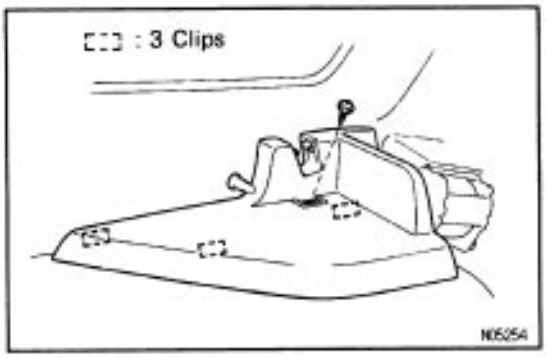
(d) Deck trim side panel RH



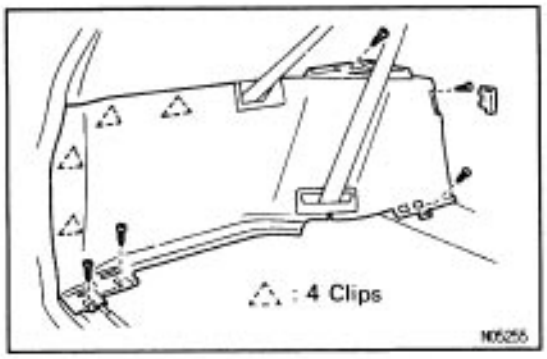
(e) w/ Third Seat:
Deck side rear garnish



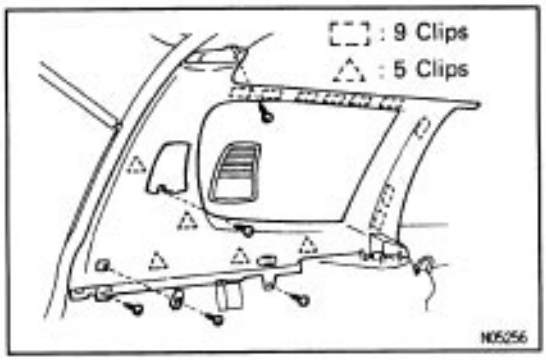
(f) Roof side inner garnish RH



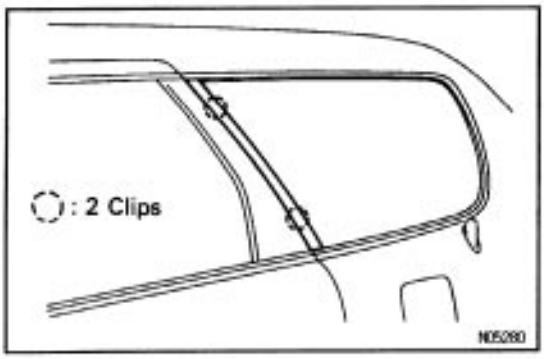
Left Side:
(a) Rear side seatback LH
(b) Tonneau side cover LH



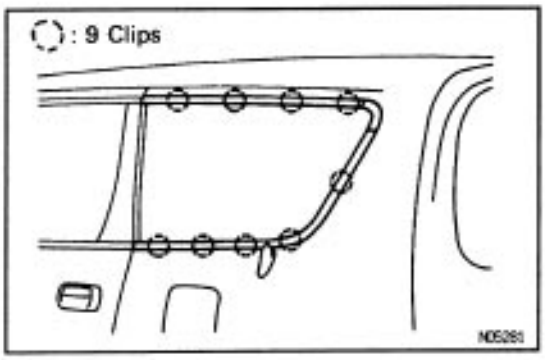
(c) Deck trim side panel LH



(d) Roof side inner garnish LH



4. REMOVE QUARTER WINDOW FRONT MOULDING
Pry out the clips and remove the moulding.



5. REMOVE QUARTER WINDOW UPPER MOULDING
Pry out the clips and remove the moulding.
6. REMOVE QUARTER WINDOW REAR MOULDING
Pry out the clips and remove the moulding.
7. REMOVE QUARTER WINDOW BELT MOULDING
Pry out the clips and remove the moulding.
8. REMOVE QUARTER WINDOW GLASS
(a) Remove 9 nuts.
(b) Using a knife, cut loose the adhesive.
(c) Remove glass.

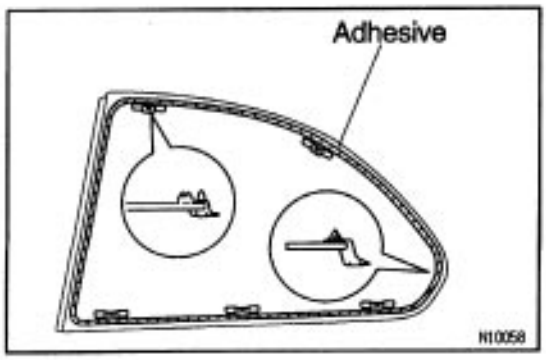
NOTICE: Do not damage the body.

BO16U–01

QUARTER WINDOW GLASS INSTALLATION

Coupe:

1. CLEAN BODY OR GLASS
Wipe off any adhesive left on the body and glass with cleaner.

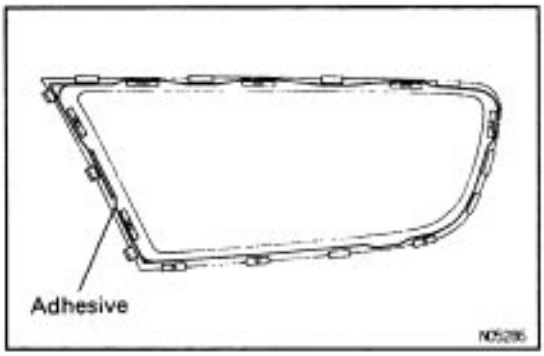


2. INSTALL QUARTER WINDOW GLASS
(a) Apply adhesive at glass installation area.
(b) Install the glass to the body.
(c) Install 5 nuts.

3. INSTALL FOLLOWING PARTS:
(a) Front door weatherstrip.
(b) Quarter trim board
(c) Front door scuff plate
(d) Roof side inner garnish
(e) Rear seat outer belt anchor
Torque: 43 N–m (440 kgf–cm. 32 ft–lbf)
(f) Front seat outer belt bezel
(g) Front seat outer belt shoulder anchor
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)
(h) Rear side seat back
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
(i) Rear seat cushion

QUARTER WINDOW GLASS INSTALLATION

Wagon:
1. CLEAN BODY OR GLASS
Wipe off any adhesive left on the body and glass with cleaner.



2. INSTALL QUARTER WINDOW GLASS
(a) Apply adhesive at glass installation area.
(b) Install the glass to the body.
(c) Install 9 nuts.

3. INSTALL QUARTER WINDOW MOULDING
(a) Install the quarter window belt moulding.
(b) Install the quarter window rear moulding.
(c) Install the quarter window upper moulding.
(d) Install the quarter window front moulding.

4. INSTALL FOLLOWING PARTS:
RIGHT SIDE:
(a) Roof side inner garnish RH

(b) w/ Third Seat:
Deck side rear garnish
(c) Deck trim side panel RH
(d) Tonneau side cover RH
(e) w/ Third Seat:
Spare wheel cover
(f) Rear side seatback RH

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

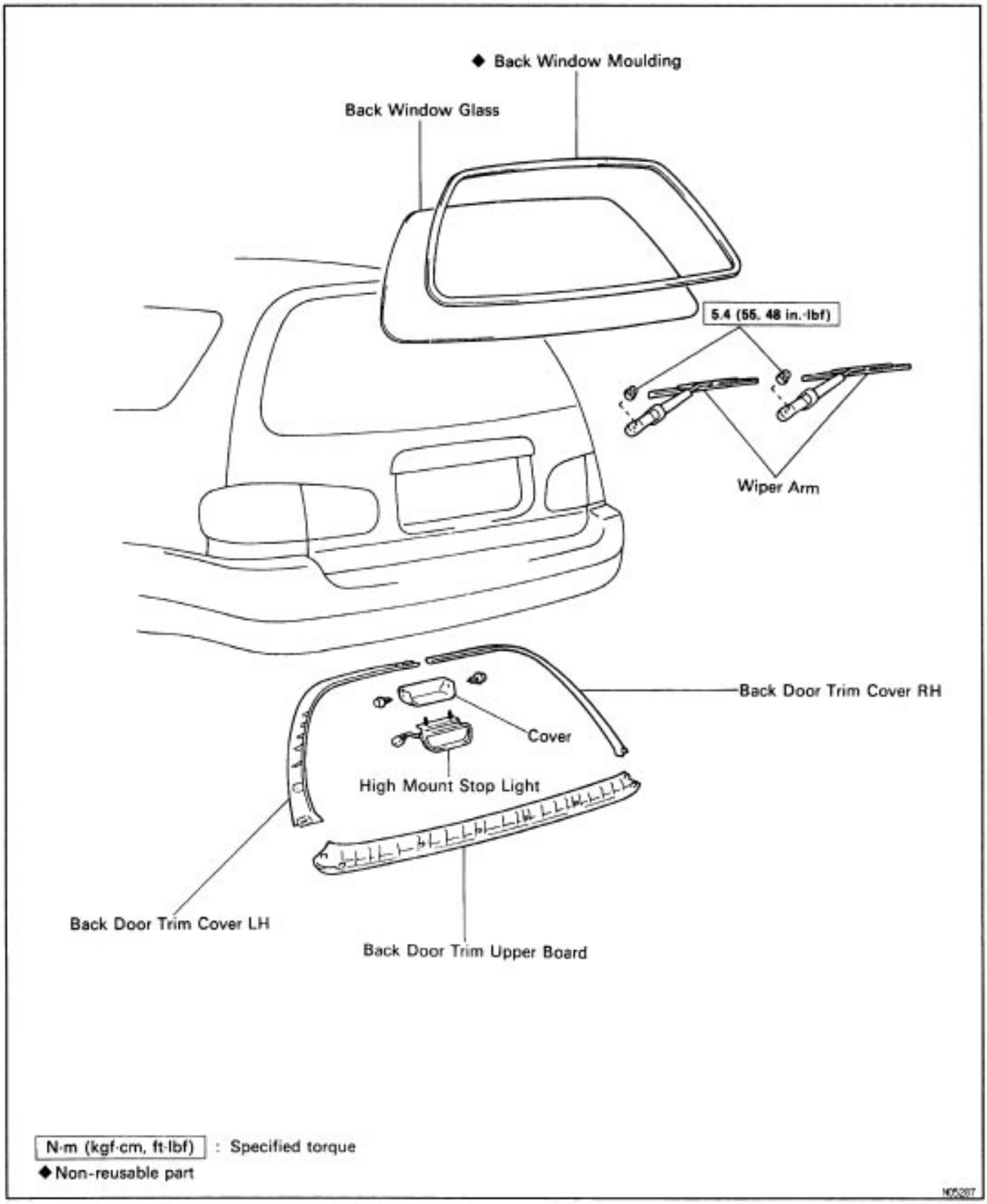
Left Side:

(a) Roof side inner garnish LH
(b) Deck trim side panel LH
(c) Tonneau side cover LH
(d) Rear side seatback LH

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

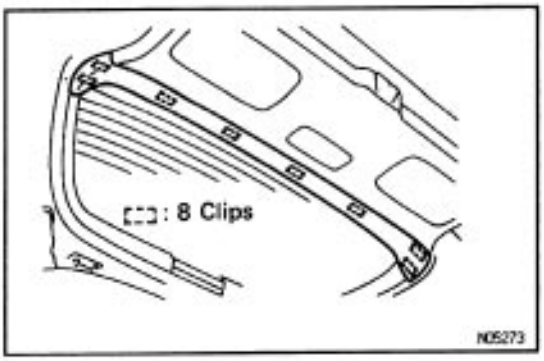
BACK DOOR GLASS

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

BACK DOOR GLASS REMOVAL

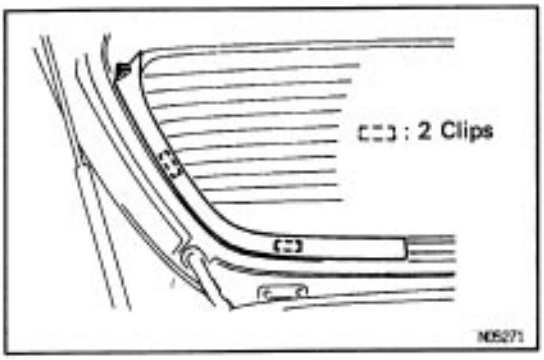


1. REMOVE FOLLOWING PARTS:

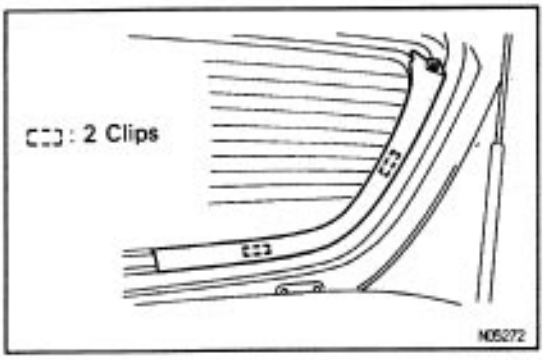
(a) Back door trim upper board

(b) w/ High Mount Stop Light:

High mount stop light

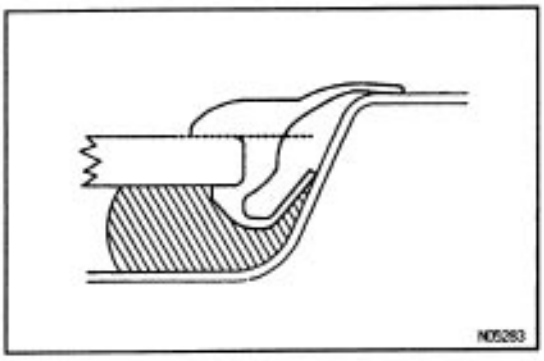


(c) Back door trim cover LH



(d) Back door trim cover RH

2. DISCONNECT DEFOGGER WIRE CONNECTORS



3. REMOVE BACK DOOR MOULDING

Using a knife, cut off the moulding as shown.

NOTICE: Do not damage the body with the knife.

4. REMOVE BACK DOOR GLASS

(a) Remove 2 screws.

(b) Remove the glass in the same manner as windshield.

BACK DOOR GLASS INSTALLATION

HINT: Install the glass in the same manner as the windshield.

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

2. CLEAN REMOVED GLASS

3. POSITION GLASS

4. CLEAN CONTACT SURFACE OF GLASS

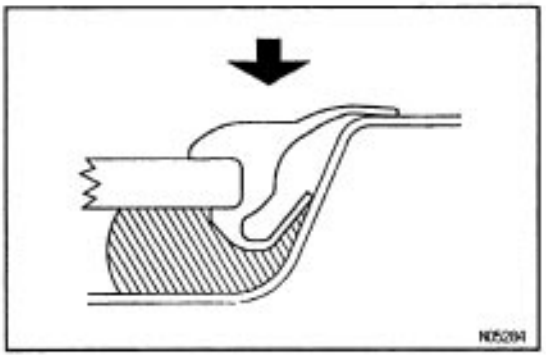
5. COAT CONTACT SURFACE OF BODY WITH PRIM ER ”M”

6. COAT CONTACT SURFACE OF GLASS WITH PRIM ER ”G”

7. MIX ADHESIVE COATING

8. APPLY ADHESIVE

9. INSTALL GLASS



10. INSTALL BACK DOOR MOULDING

Place the moulding onto the body and tap it by hand.

11. INSPECT FOR LEAKS AND REPAIR

12. CONNECT DEFOGGER WIRE CONNECTORS

13. INSTALL FOLLOWING PARTS:

(a) Back door trim cover RH

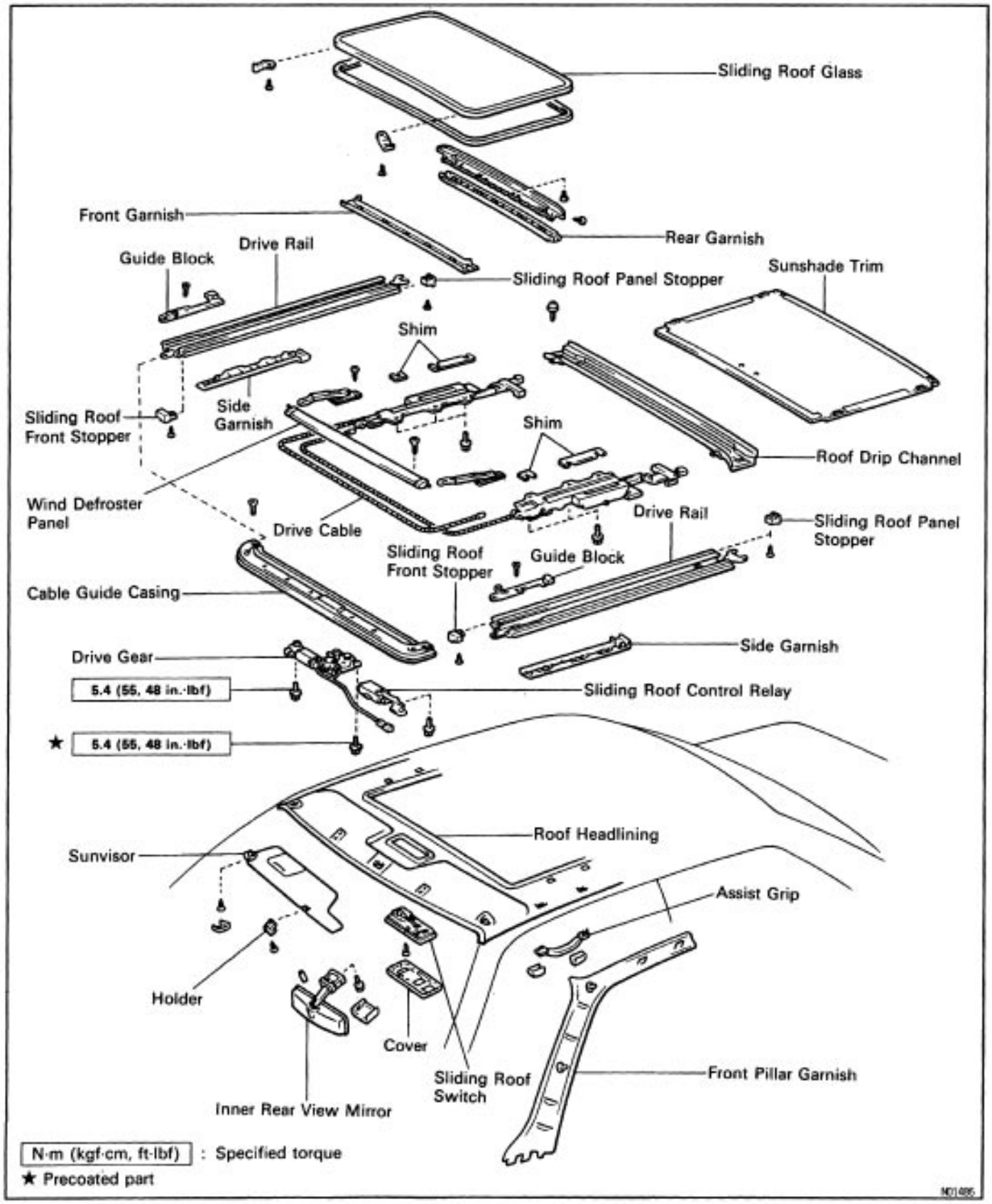
(b) Back door trim cover LH

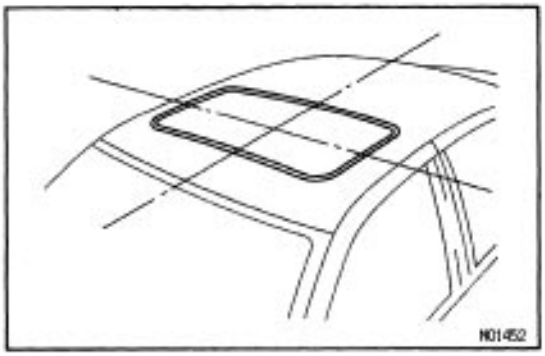
(c) w/ High Mount Stop Light:
High mount stop light

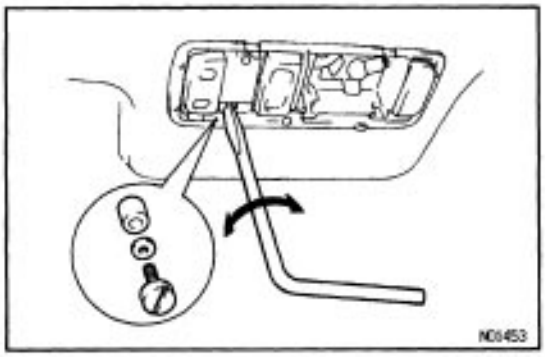
(d) Back door trim upper board

SLIDING ROOF

COMPONENTS







ON–VEHICLE INSPECTION

INSPECT SLIDING ROOF GLASS ALIGNMENT

(a) Start the engine and check the operation time of the sliding roof.

Operation time:

Approx.6 sacs.

(b) Check for abnormal noise or binding during operation.

(c) With the sliding roof fully closed, check for water leakage.

(d) Check for a difference in level between the sliding roof weatherstrip and roof panel.

Front end:

1 ±1 mm (0.039±0.039 in.)

Rear end:

0±1 mm (0±0.039 in.)

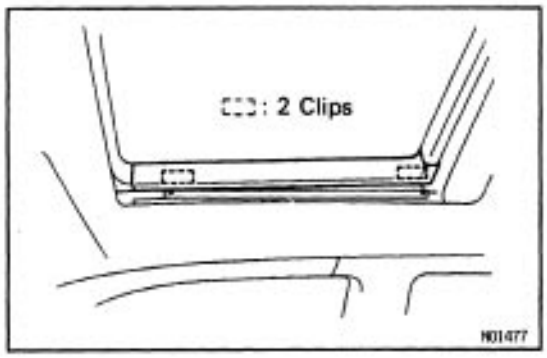
If the sliding roof does not operate:

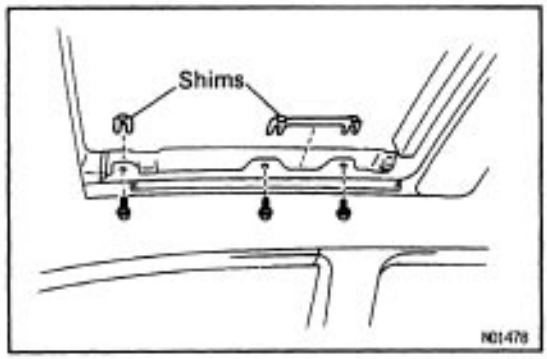
(e) Remove the control switch cover.

(f) Remove the large screw inside.

NOTICE: Be careful not to lose the spring washer or shim.

(g) Manually operate the moon roof by inserting a special crank–shaped screwdriver into the hole and turning the drive shaft.





SLIDING ROOF ADJUSTMENT

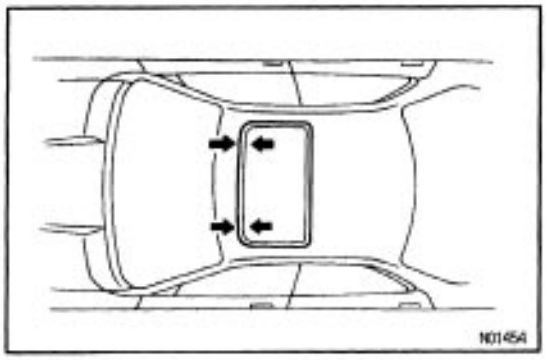
1. REMOVE SLIDING ROOF GARNISHES

Before making adjustments, remove the left and right sliding roof garnishes.

HINT: After adjustment, reinstall the sliding roof gar–nishes.

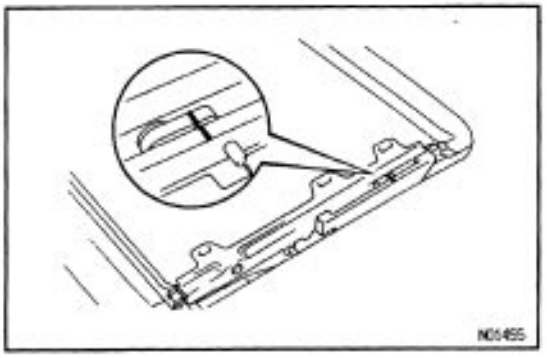
2. TO ADJUST LEVEL DIFFERENCE

Adjust by increasing or decreasing the number of shims between the bracket and sliding roof.



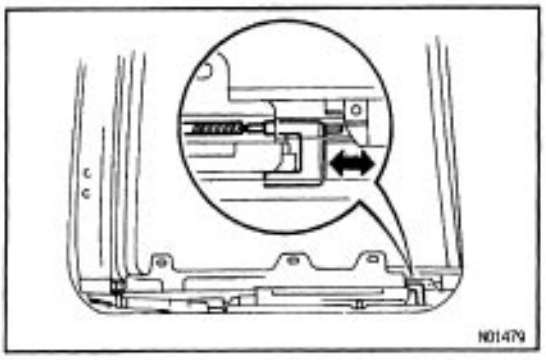
3. TO ADJUST FORWARD OR REARWARD

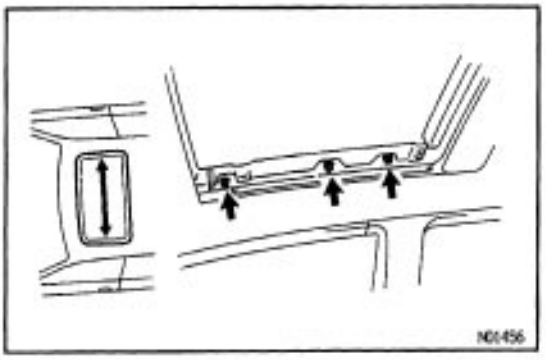
(a) Adjust by loosening the sliding roof installation nuts, and move the sliding roof bracket forwards and back–wards.



(b) When the front or rear alignment is not correct, remove the glass and adjust the drive rail.

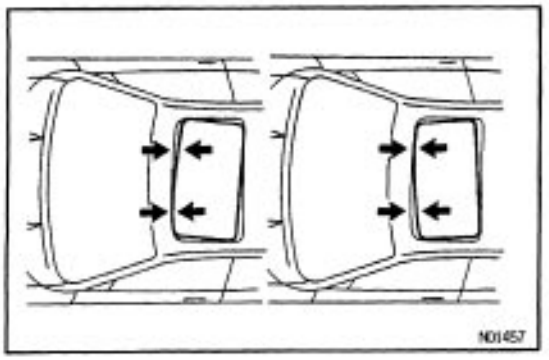
(c) Using a screwdriver, slide the link forwards or back–wards to align the 2 marks as shown.





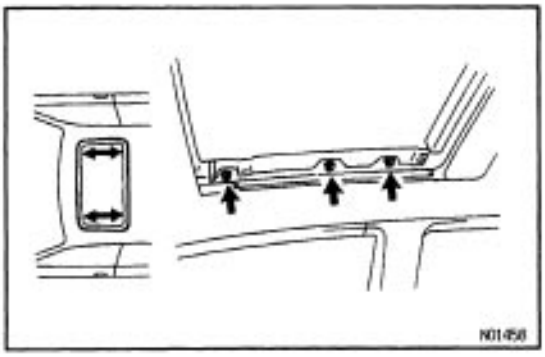
4. TO ADJUST RIGHT OR LEFT

Adjust by loosening the sliding roof rear shoe installa–tion nuts, and move the sliding roof to the right and left.



5. TO ADJUST CLEARANCE

(Difference in left and right clearance)

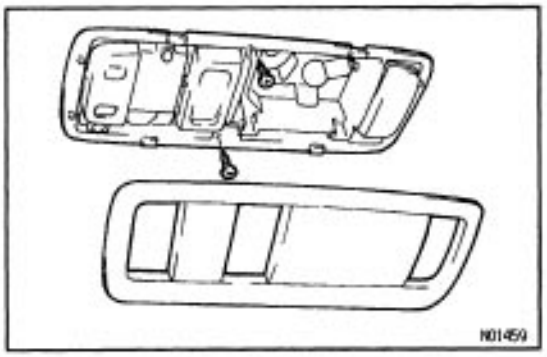


Adjust by loosening the sliding roof installation nuts and readjust the sliding roof to the proper position.

SLIDING ROOF REMOVAL

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

CAUTION: Work must be started after. 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE SLIDING ROOF SWITCH

(a) Using a screwdriver, remove the cover.

HINT: Tape the screw driver tip before use.

(b) Remove 2 screws and the switch, then disconnect the connectors.

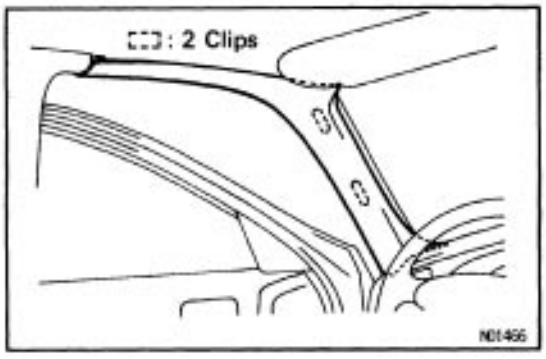
3. REMOVE FOLLOWING PARTS:

(a) Inner rear view mirror

(b) Sunvisors and holders

(c) Front assist grip

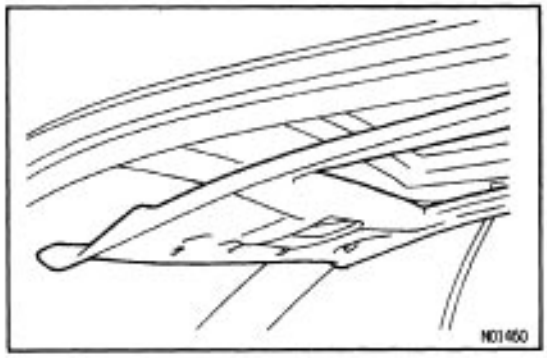
4. REMOVE FRONT PILLAR GARNISH



(a) Sedan, Wagon: Remove the 2 clips by hand.

(b) Sedan, Wagon: Pull the garnish rearwards to remove it.

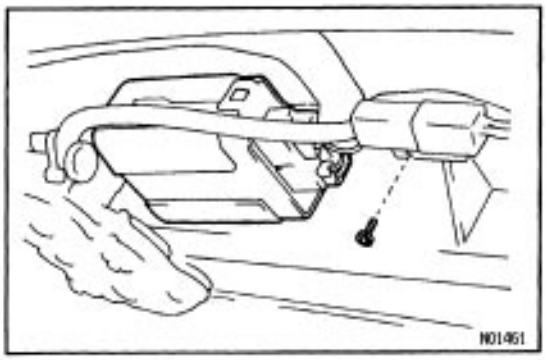
(c) Coupe: Rear side garnish must be removed before front piller garnish.



5. REMOVE FRONT SIDE OF ROOF HEADLINING

(a) Disconnect the front side of roof headlining from the front side of housing.

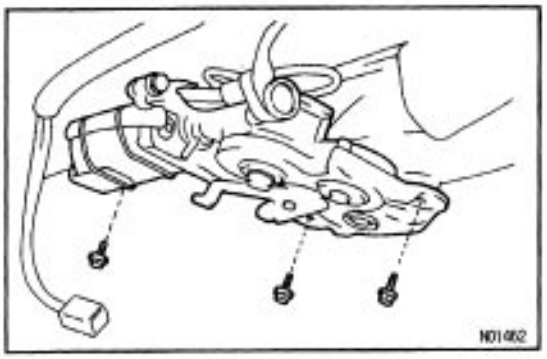
(b) Pull down the front side of roof headlining by hand.



6. REMOVE SLIDING ROOF CONTROL RELAY

(a) Disconnect the connector.

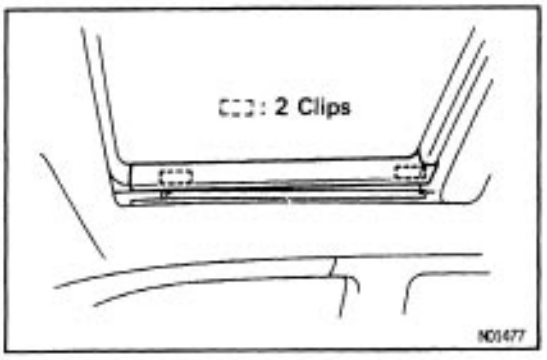
(b) Remove the bolt, the connector and the relay.



7. REMOVE DRIVE GEAR

(a) Disconnect the connectors.

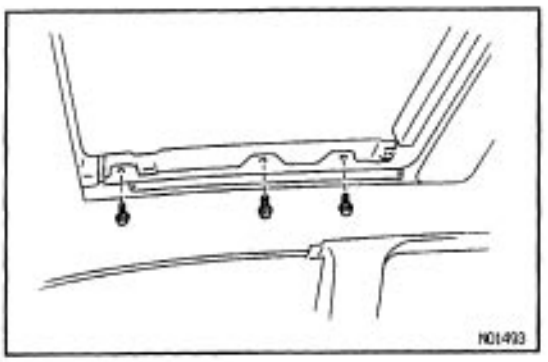
(b) Remove 3 bolts and the drive gear.



8. REMOVE SIDE GARNISH

Using a screwdriver, remove the garnishes.

HINT: Tape the screwdriver tip before use.

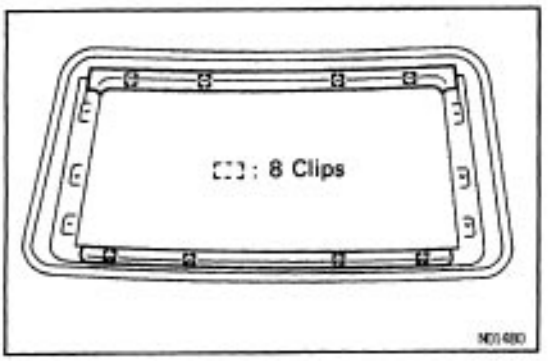


9. REMOVE SLIDING ROOF GLASS

(a) Remove 6 nuts and shims.

HINT: Make sure of the number of shims.

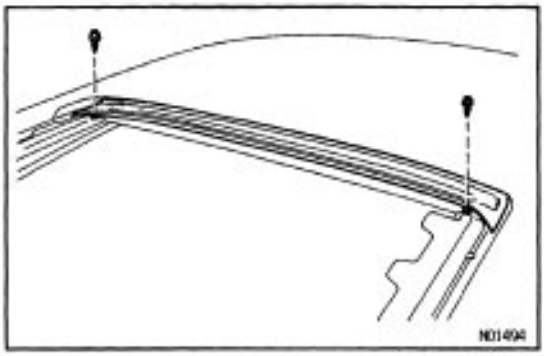
(b) Pull the glass upwards to remove it.



10. REMOVE FRONT AND REAR GARNISH

Using a screwdriver, remove the garnishes.

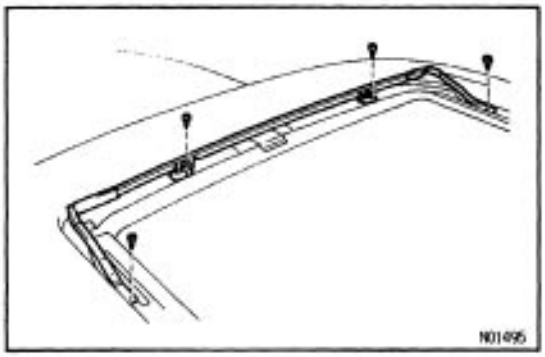
HINT: Tape the screwdriver tip before use.



11. REMOVE ROOF DRIP CHANNEL

(a) Remove 2 screws.

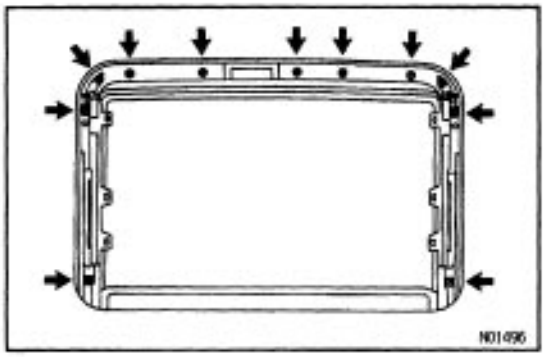
(b) Pull the channel forwards to remove it.



12. REMOVE WIND DEFLECTOR PANEL

(a) Slide the drive cable backwards.

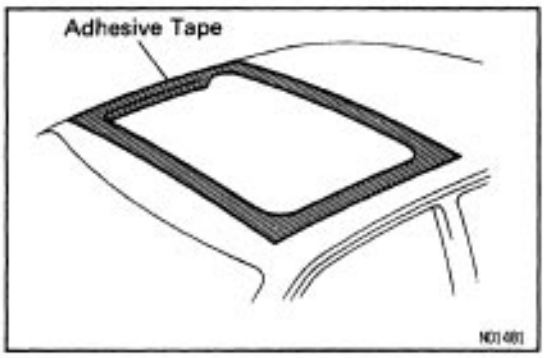
(b) Remove 4 screws and the panel.



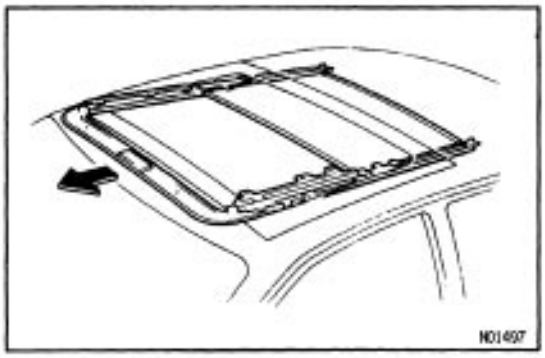
13. REMOVE CABLE GUIDE CASING ASSEMBLY

(a) Slide the drive cable forwards.

(b) Remove 11 screws.

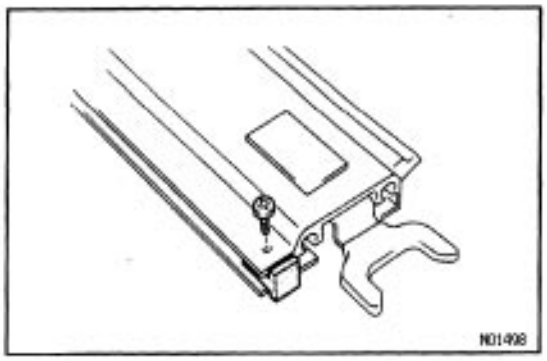


(c) Apply adhesive tape to protect the body.

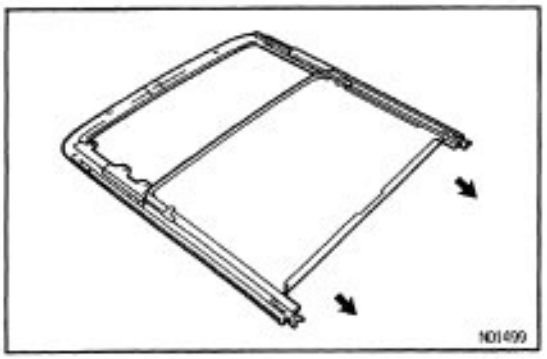


(d) Pull the cable guide casing assembly forwards to remove it.

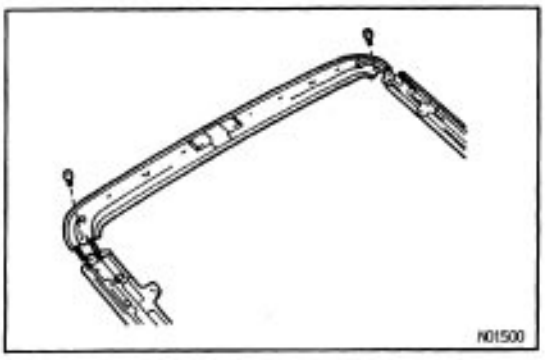
SLIDING ROOF DISASSEMBLY



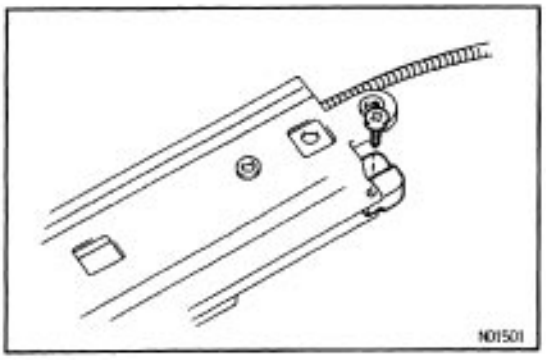
1. REMOVE SLIDING ROOF PANEL STOPPER
Remove the screw and the stopper.



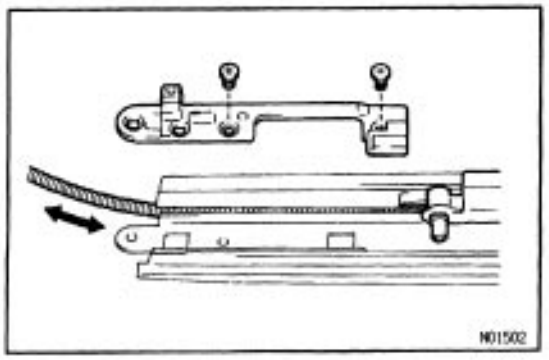
2. REMOVE SUNSHADE TRIM
Pull the trim rearwards to remove it.



3. REMOVE CABLE GUIDE CASING
Remove 2 screws and the casing.

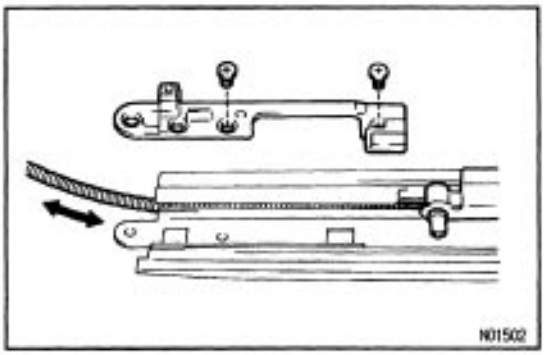


4. REMOVE SLIDING ROOF FRONT STOPPER
Remove the screw and the stopper.



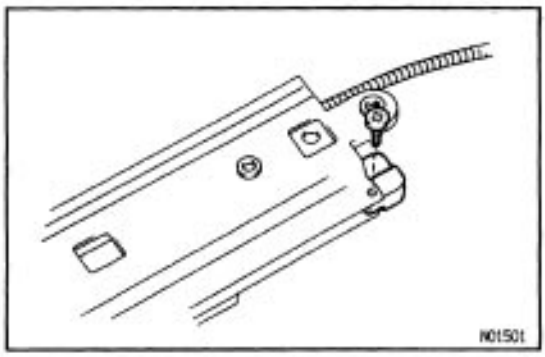
5. REMOVE DRIVE CABLE
(a) Remove 2 screws and the cable guide block.
(b) Pull the drive cable from the guide rail.

SLIDING ROOF ASSEMBLY



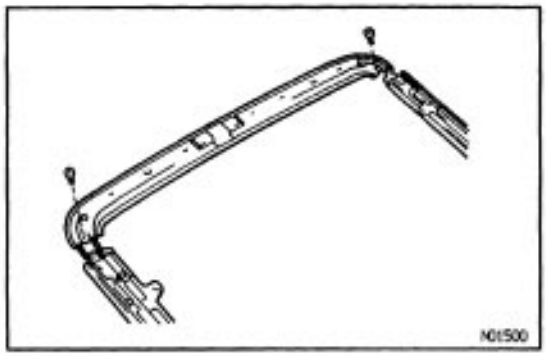
1. INSTALL DRIVE CABLE

(a) Insert the drive cable to the drive rail.
(b) Install the cable guide block with 2 screws.



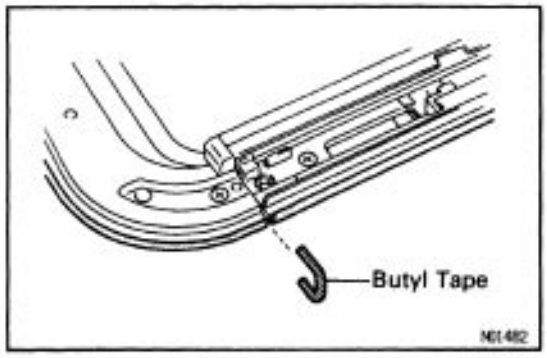
2. INSTALL SLIDING ROOF FRONT STOPPER

Install the stopper with the screw.



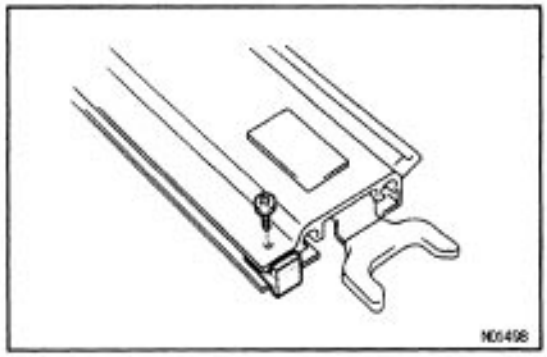
3. INSTALL CABLE GUIDE CASING

(a) Install the casing with 2 screws.



(b) Use butyl tape to cover the cut position of the weath–erstrip at the connection between the guide casing and the guide rail.

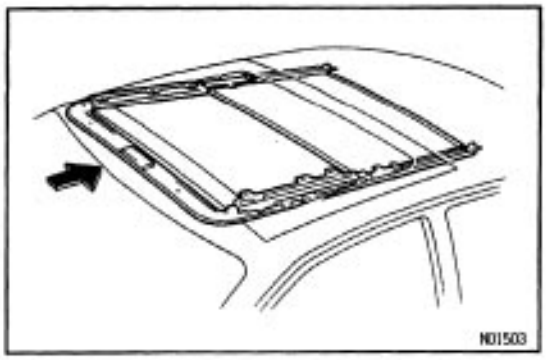
4. INSTALL SUNSHADE TRIM



5. INSTALL SLIDING ROOF PANEL STOPPER

Install the stopper with the screw.

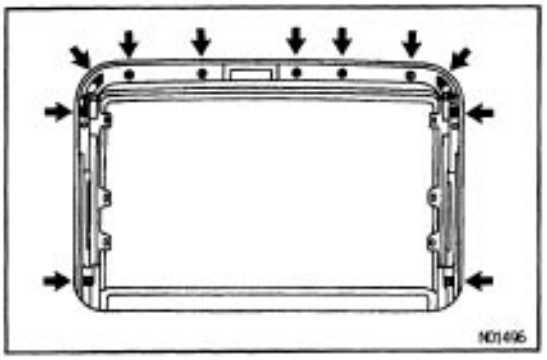
SLIDING ROOF INSTALLATION



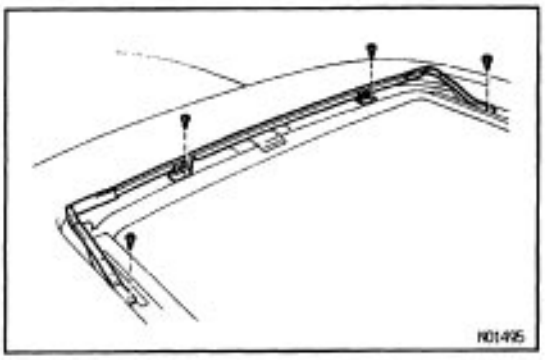
1. INSTALL CABLE GUIDE CASING ASSEMBLY

(a) Apply adhesive tape to protect the body.

(b) Push the cable guide casing assembly rearwards to remove it.

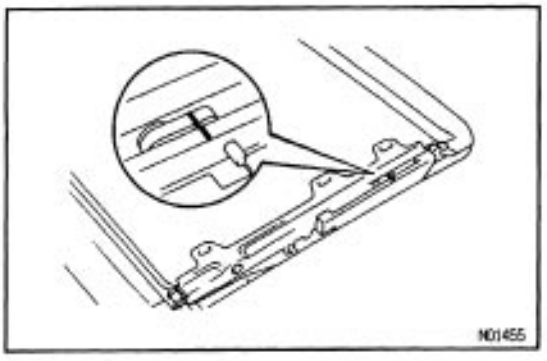


(c) Install 11 screws.



2. INSTALL WIND DEFLECTOR PANEL

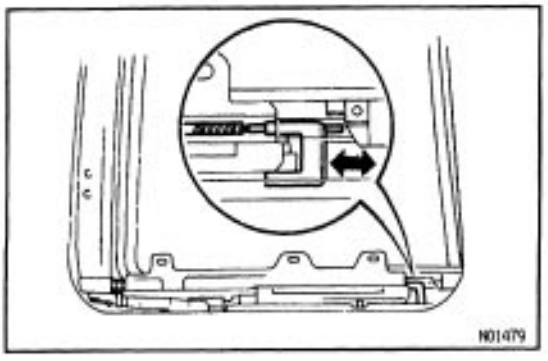
Install the panel with 4 screws.

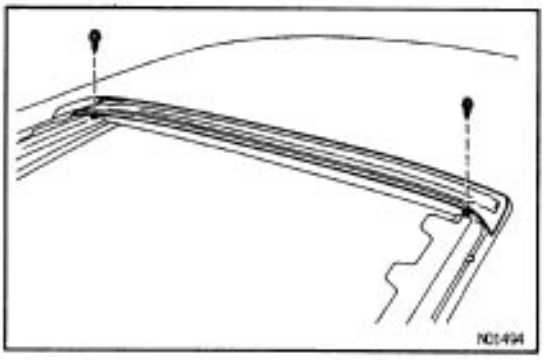


3. ADJUST DRIVE RAIL

HINT: Adjust the drive rail to a closed and tilted down position.

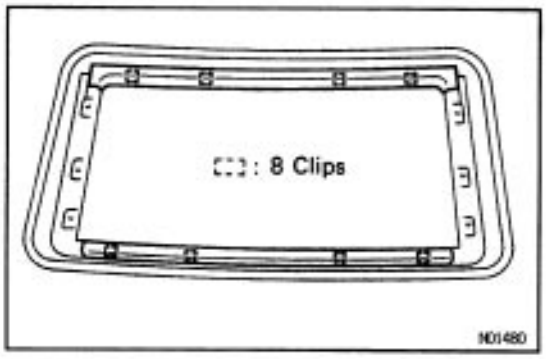
Using a screwdriver, slide the link forwards or rear–wards to align the 2 marks as shown.





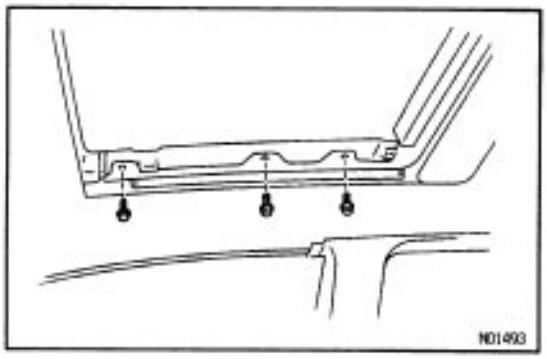
4. INSTALL ROOF DRIP CHANNEL

(a) Push the channel rearwards to install it.
(b) Install 2 screws.



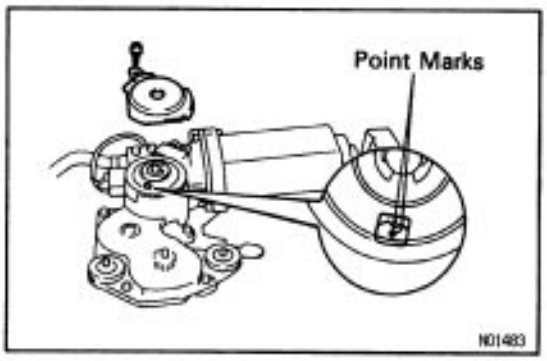
5. INSTALL FRONT AND REAR GARNISH

Tap the garnishes to install it.



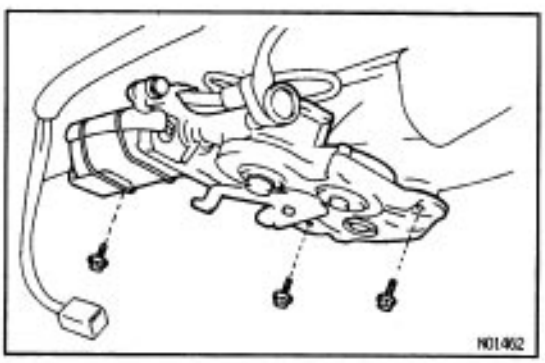
6. INSTALL SLIDING ROOF GLASS

Install the glass and the shims with 6 nuts.

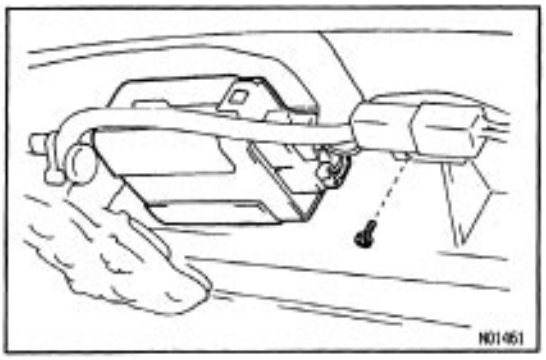


7. INSTALL DRIVE GEAR

(a) Remove the screw and cam plate cover.
(b) Remove the large screw, washers and shims.
(c) Turn the drive shaft by screwdriver to align the housing and gear point mark as shown.
(d) Install the cam plate cover with the screw.



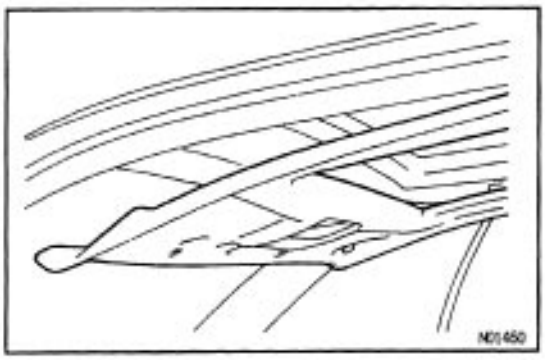
(e) Apply adhesive to 2 gear side bolts.
Part No.08833–00070, THREE BOND 1324 or equivalent
(f) Install the drive gear with 3 bolts.
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)
(g) Connect the connectors.



8. INSTALL SLIDING ROOF CONTROL RELAY

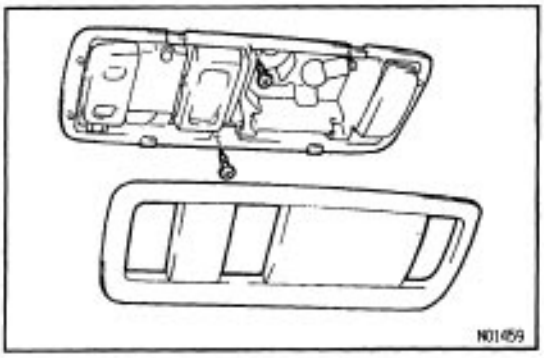
(a) Install the relay with the bolt.

(6) Connect the connector.



9. INSTALL FRONT SIDE OF ROOF HEADLINING

Connect the front side of roof headlining to the front side of housing.



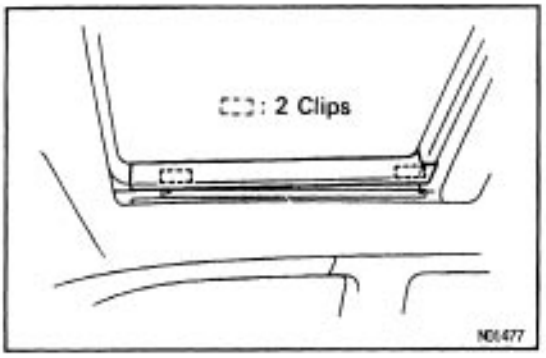
10. INSTALL SLIDING ROOF SWITCH

(a) Install the switch with 2 screws, then connect the connectors.

(b) Install the cover.

11. INSPECT AND ADJUST SLIDING ROOF

(See pages BO–98 to 100)



12. INSTALL SIDE GARNISH

Tap the garnishes to install it.

13. INSTALL FOLLOWING PARTS:

(a) Front pillar garnish

(b) Front assist grip

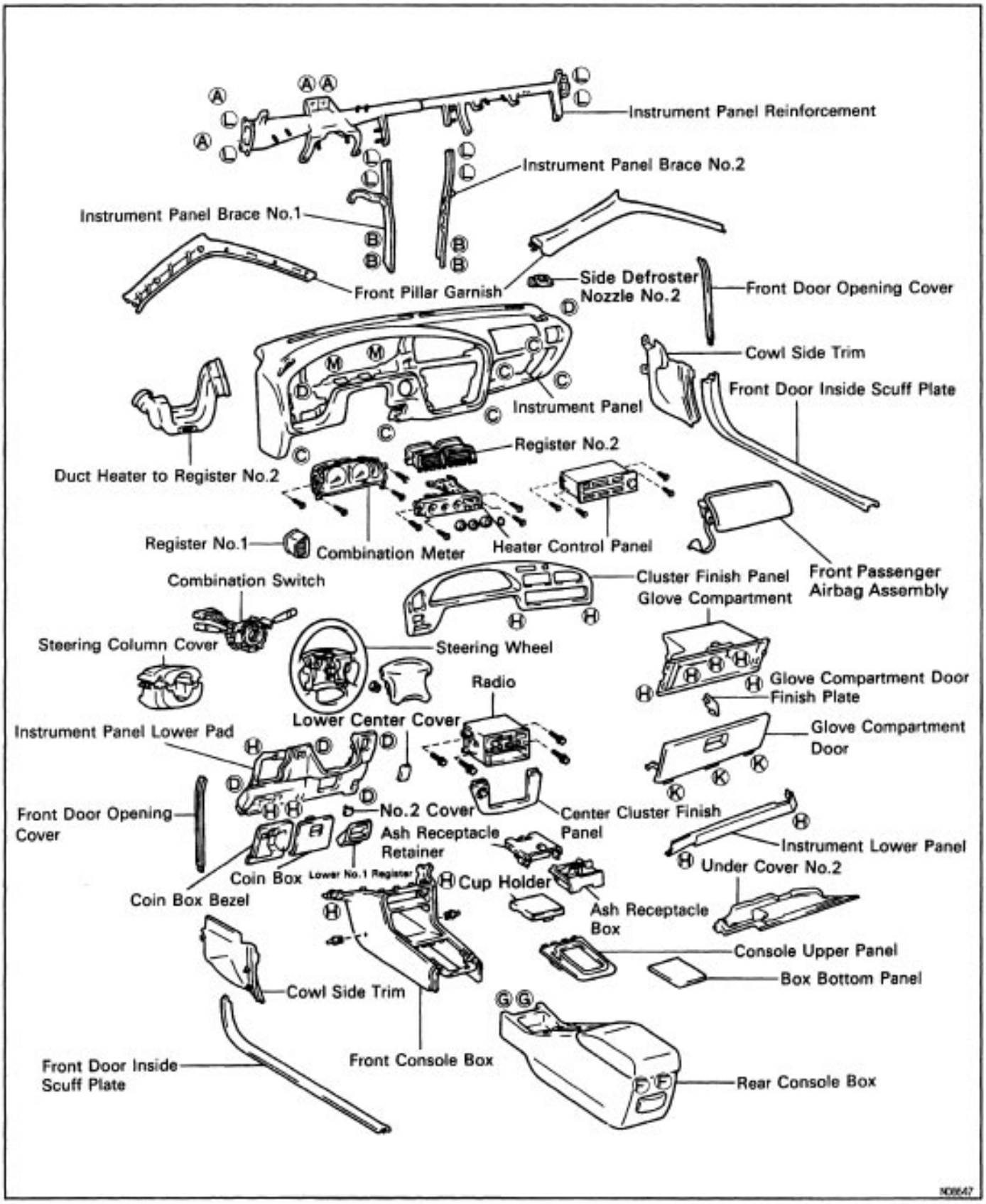
(c) Sunvisors and holders

(d) Inner rear view mirror

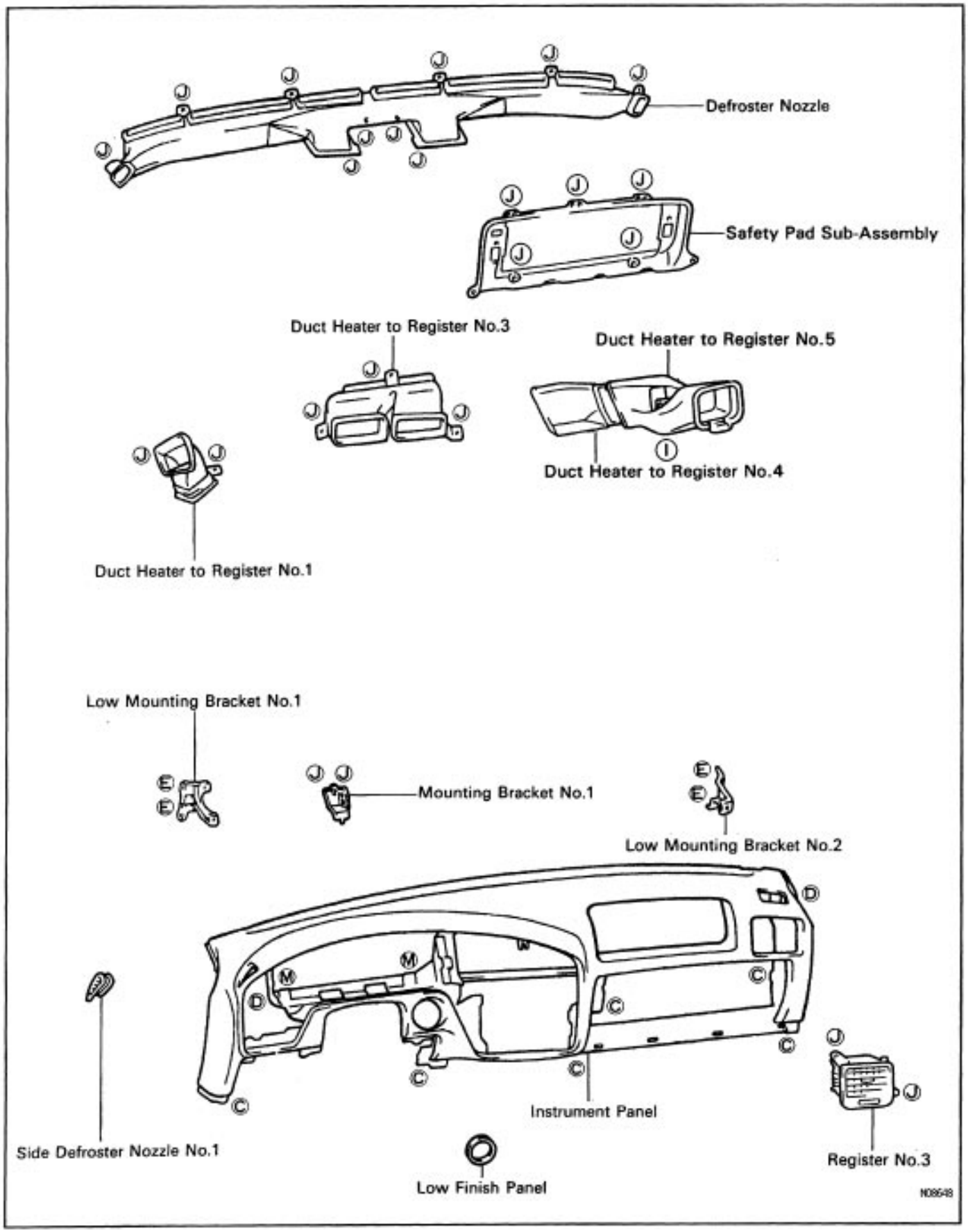
14. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

INSTRUMENT PANEL

COMPONENTS

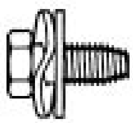
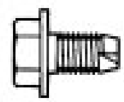
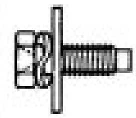
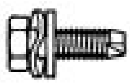
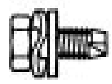
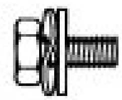
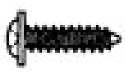
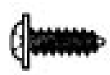
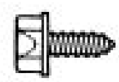
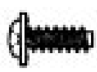
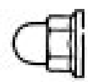
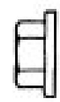
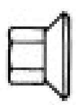


COMPONENTS (Cont'd)



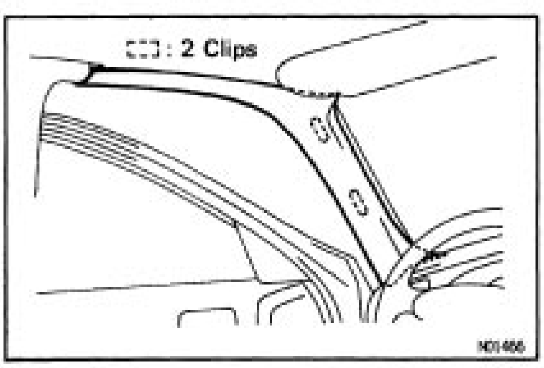
HINT: Screw sizes in the illustration on the previous page are indicated using the code below for removal and installation of instrument panel.

mm (in.)

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		ϕ = 8 (0.31) L = 20 (0.79)	B		ϕ = 8 (0.31) L = 15 (0.59)	C		ϕ = 6 (0.24) L = 20 (0.79)
D		ϕ = 6 (0.24) L = 20 (0.79)	E		ϕ = 6 (0.24) L = 16 (0.63)	F		ϕ = 6 (0.24) L = 16 (0.63)
G		ϕ = 5.22 (0.2055) L = 20 (0.79)	H		ϕ = 5.22 (0.2055) L = 16 (0.63)	I		ϕ = 5 (0.20) L = 14 (0.55)
J		ϕ = 5 (0.20) L = 14 (0.55)	K		—	L		—
M		—						

V03896

INSTRUMENT PANEL REMOVAL



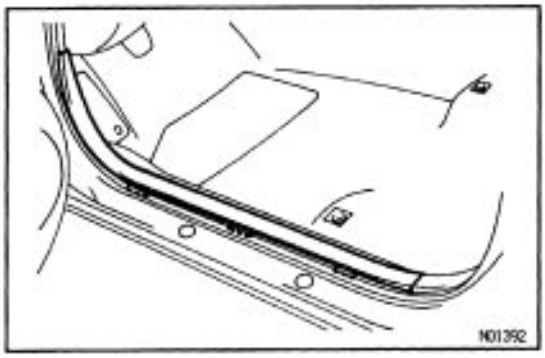
1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.

2. REMOVE FRONT PILLAR GARNISH

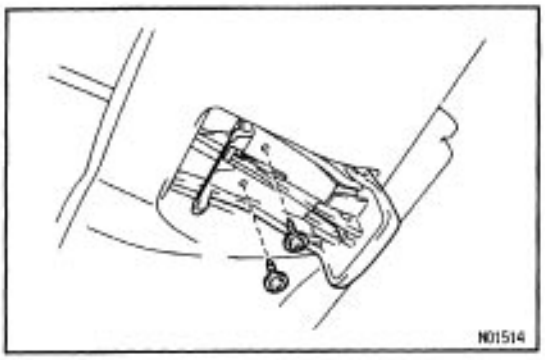
(a) Sedan, Wagon: Remove the clips by your hand.

(b) Sedan, Wagon: Pull the garnish rearwards to remove it.
(e) Coupe: Rear side garnish must ba removed before front piller garnish.

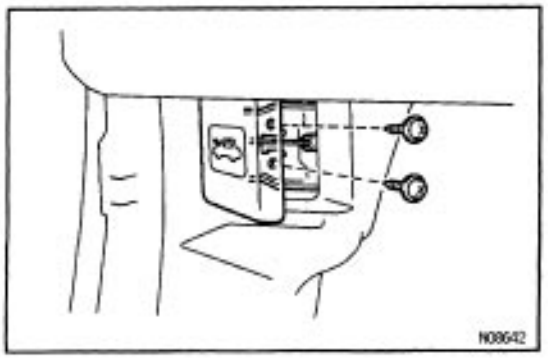


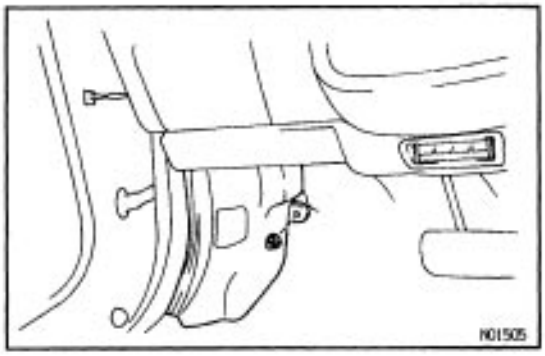
3. REMOVE FRONT DOOR INSIDE SCUFF PLATE
Remove the scuff plate by pulling.

4. REMOVE FRONT DOOR OPENING COVER
Remove the cover by pulling.



5. REMOVE HOOD LOCK RELEASE LEVER
(a) Remove 2 screws.
(b) Slide the lever forwards to remove it.





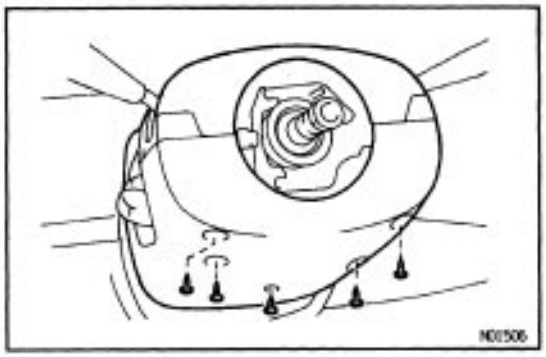
6. REMOVE COWL SIDE TRIM

(a) Remove the clip.

(b) Remove the trim by pulling.

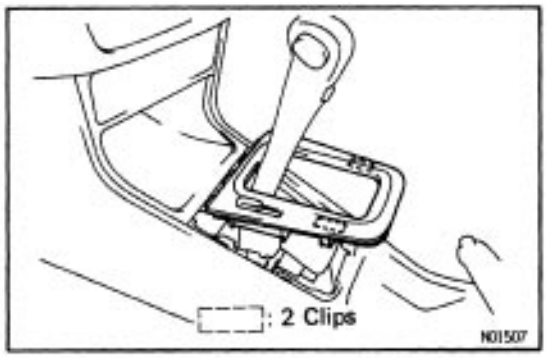
7. REMOVE STEERING WHEEL

(See page SR–5)



8. REMOVE STEERING COLUMN COVER

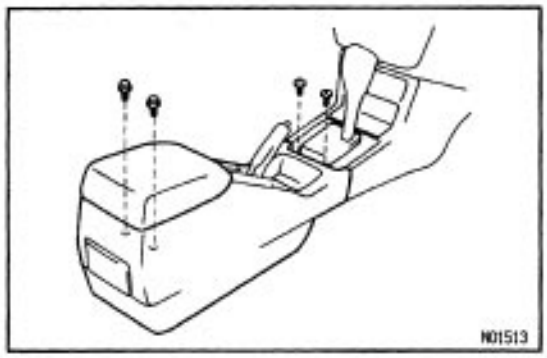
Remove 5 screws and the covers.



9. REMOVE CONSOLE UPPER PANEL

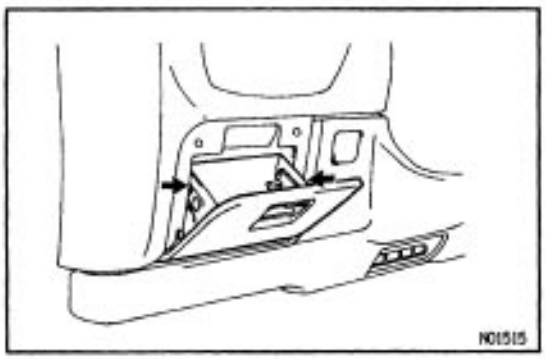
Using a screwdriver, remove the panel then discon–nect the connector.

HINT: Tape the screwdriver tip before use.



10. REMOVE REAR CONSOLE BOX

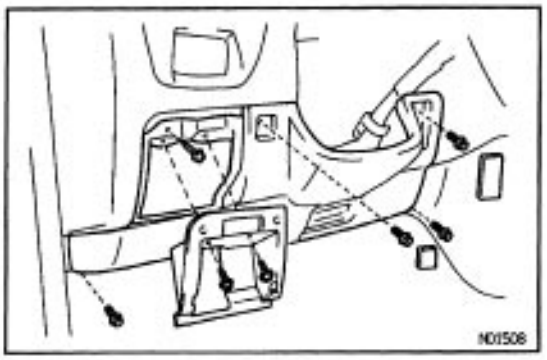
Remove 2 bolts, 2 screws and the box.



11. REMOVE COIN BOX

(a) Press on the sides of the box while pulling the box outwards.

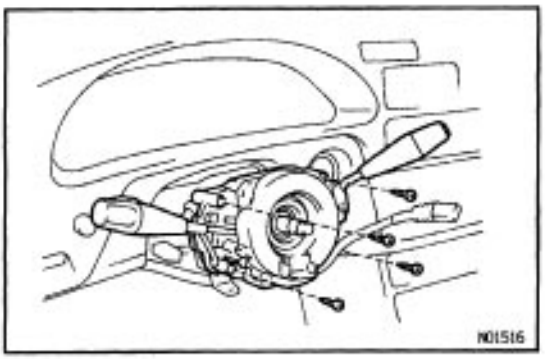
(b) Remove the box.



12. REMOVE INSTRUMENT PANEL LOWER PAD

(a) Remove 2 screws and the coin box bezel.

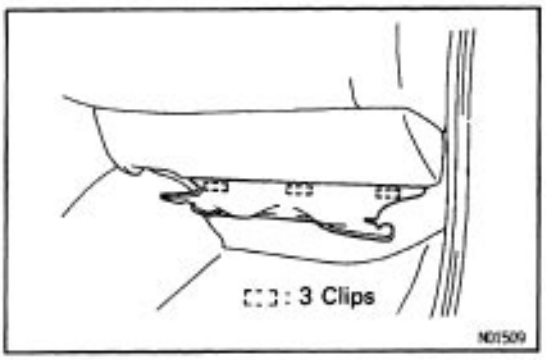
(b) Remove 4 bolts, the screw and the lower pad.



13. REMOVE COMBINATION SWITCH

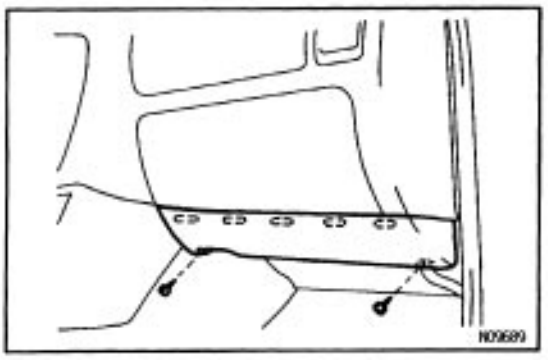
(a) Disconnect the connectors.

(b) Remove 4 screws and the combination switch.



14. REMOVE UNDER COVER NO. 2

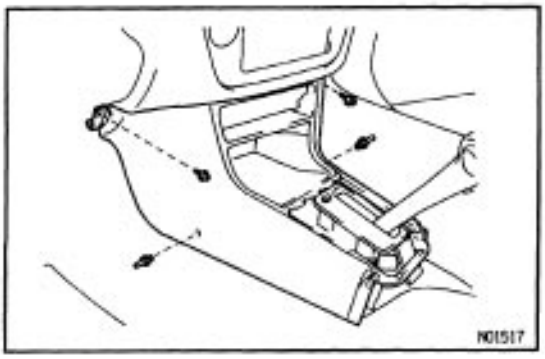
Remove the under cover No.2 by pulling.



15. REMOVE INSTRUMENT LOWER PANEL

(a) Remove 2 screws.

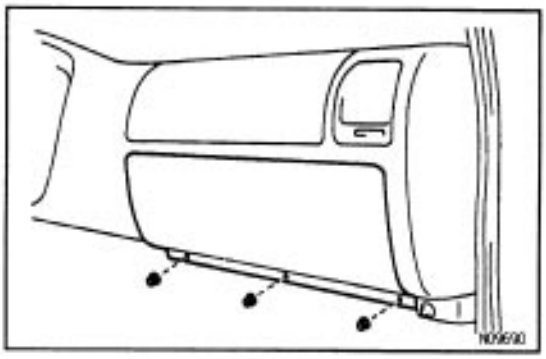
(b) Remove the lower panel by pulling.



16. REMOVE FRONT CONSOLE BOX

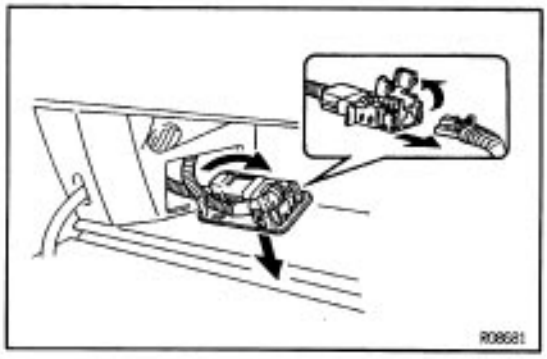
(a) Remove 2 clips.

(b) Remove 2 screws and the box.



17. REMOVE GLOVE COMPARTMENT DOOR

Remove 3 nuts and the door.



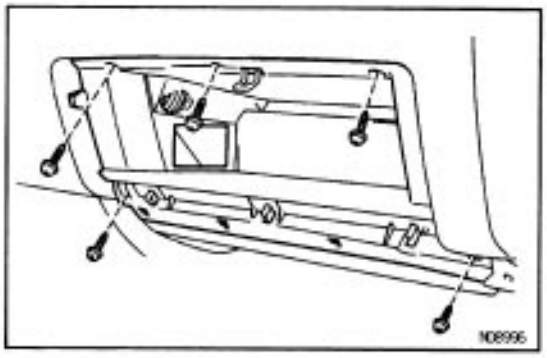
18. REMOVE GLOVE COMPARTMENT

HINT: Tape a screwdriver tip before use.

(a) Remove the glove compartment door finish plate inside the instrument panel box.

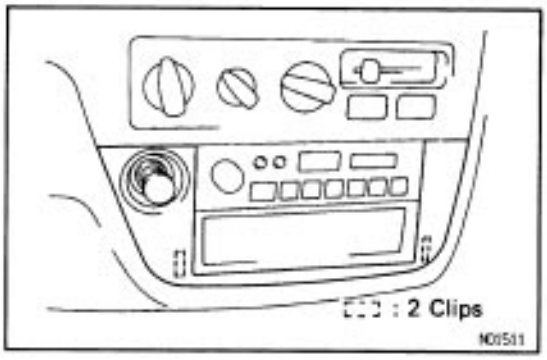
NOTICE: When handling the airbag connector, take care not to damage the airbag wire harness.

(b) Pull up and disconnect the airbag connector.



(c) Remove 5 screws.

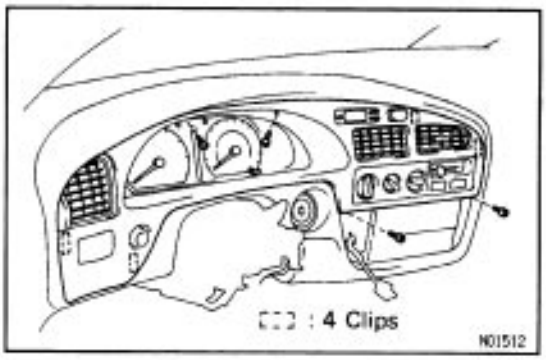
(d) Remove the compartment by pulling.



19. REMOVE CENTER CLUSTER FINISH PANEL

Using a screwdriver, remove the panel then disconnect the connectors.

HINT: Tape the screwdriver tip before use.



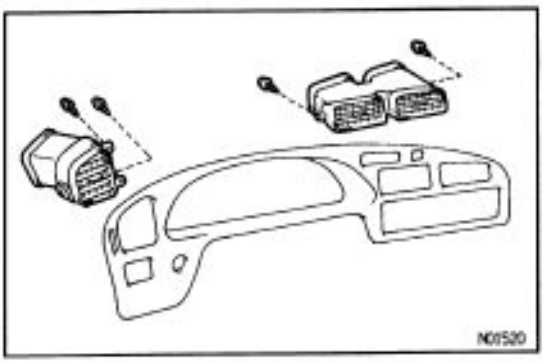
20. REMOVE CLUSTER FINISH PANEL

(a) Remove 4 screws.

(b) Using a screwdriver remove the panel.

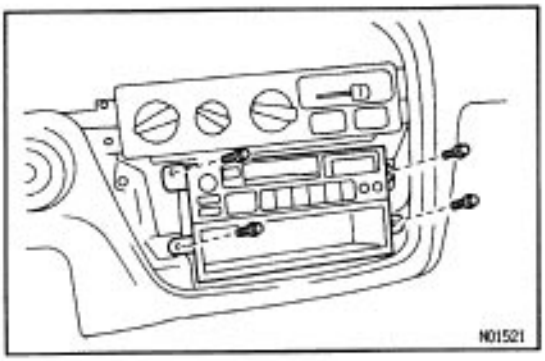
HINT: Tape the screwdriver tip before use.

(c) Disconnect the connectors.



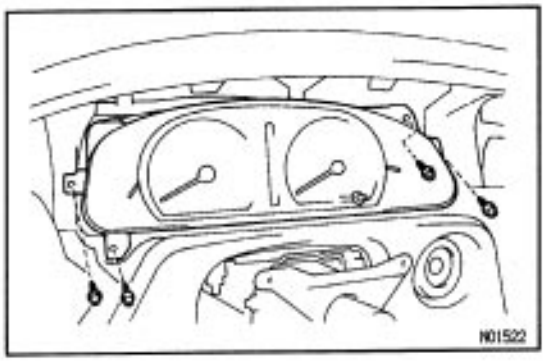
21. REMOVE REGISTER NO. 1 AND NO. 2

(a) Remove 2 screws and the register No.1.
(b) Remove 2 screws and the register No.2.



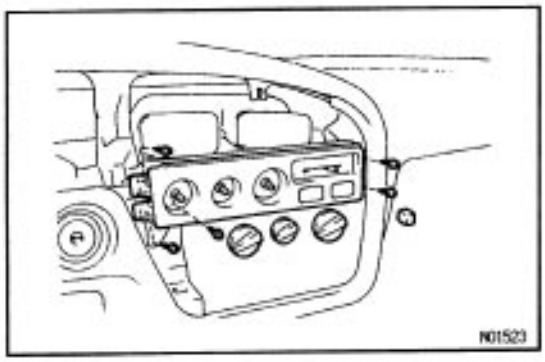
22. REMOVE RADIO

Remove 4 bolts and the radio, then disconnect the connectors.



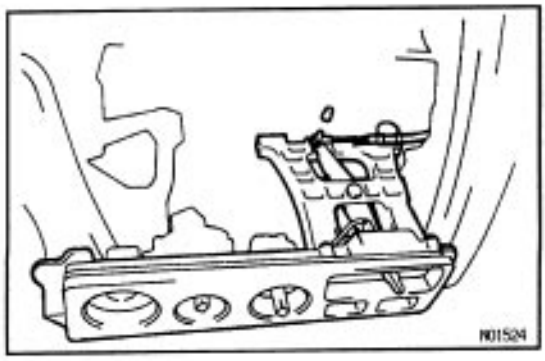
23. REMOVE COMBINATION METER

Remove 4 screws and the meter, then disconnect the connectors.



24. REMOVE HEATER CONTROL

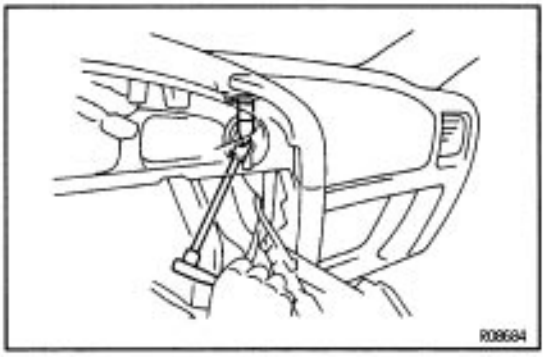
(a) Pull of the heater control knobs.
(b) Remove 5 screws and hang the heater control.



(c) Disconnect the air mix damper control cable.
(d) Remove the heater control.

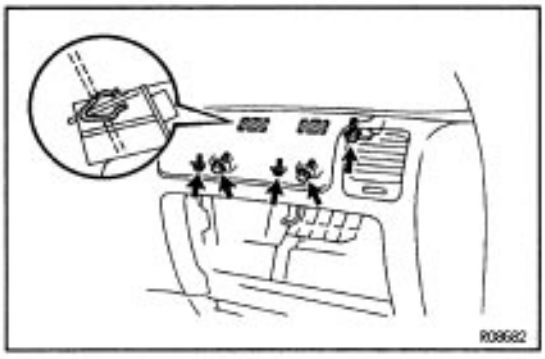
25. REMOVE DUCT HEATER TO REGISTER NO. 2

Remove the clip and the register No.2.



26. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY

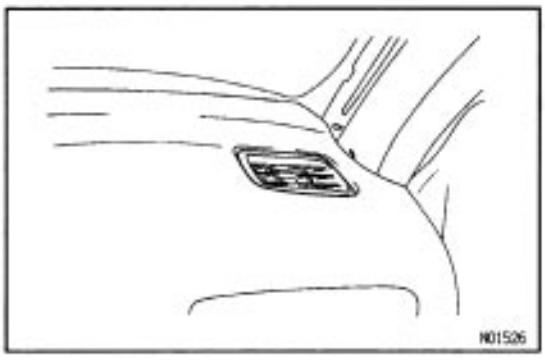
(a) Remove the LH side installation bolt.



(b) Remove 5 bolts and 2 clips.

CAUTION:

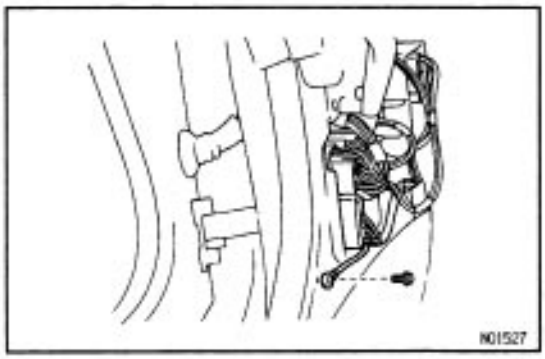
- **Do not store the front passenger airbag assembly with the airbag door facing down.**
- **Never disassemble the front passenger airbag assembly.**



27. REMOVE SIDE DEFROSTER NOZZLE NO. 2

Using a screwdriver, remove the nozzle No.2.

HINT: Tape the screwdriver tip before use.

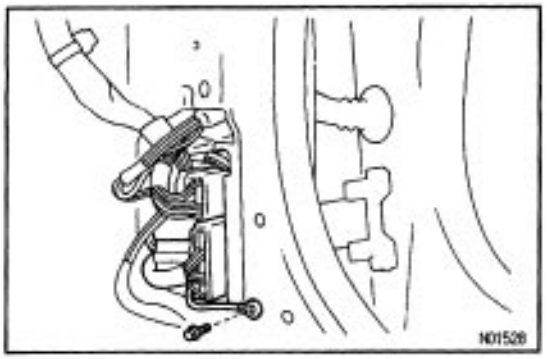


28. REMOVE INSTRUMENT PANEL

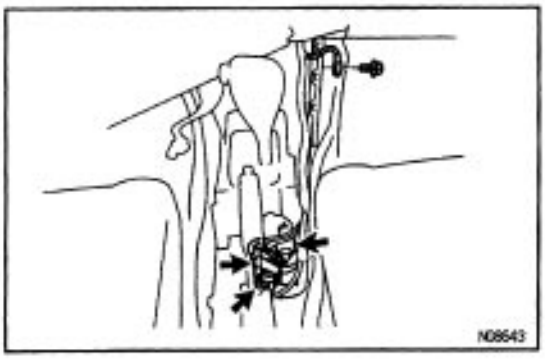
(a) Disconnect the connectors.

(b) Remove the bolt.

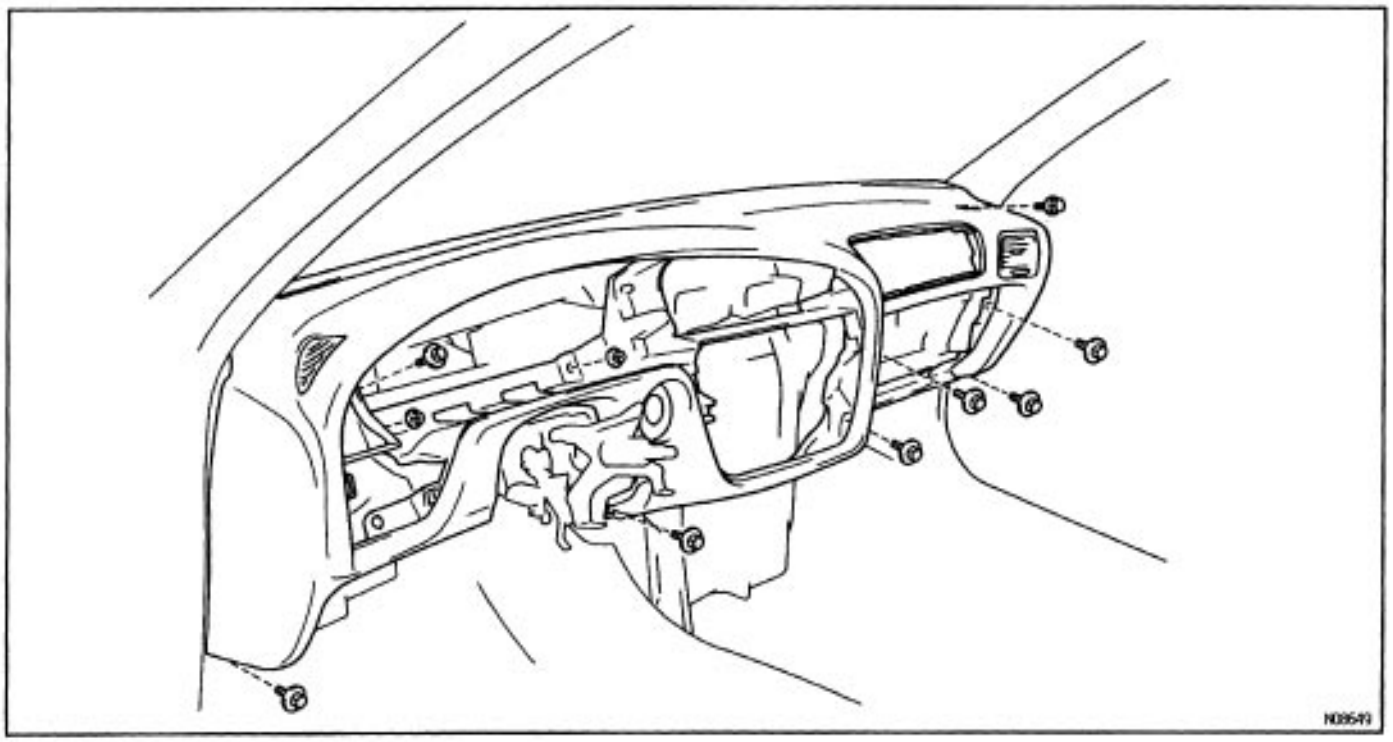
(c) Remove the connector holder.



(d) Disconnect the connectors.
(e) Remove the bolt.
(f) Remove the connector holder.



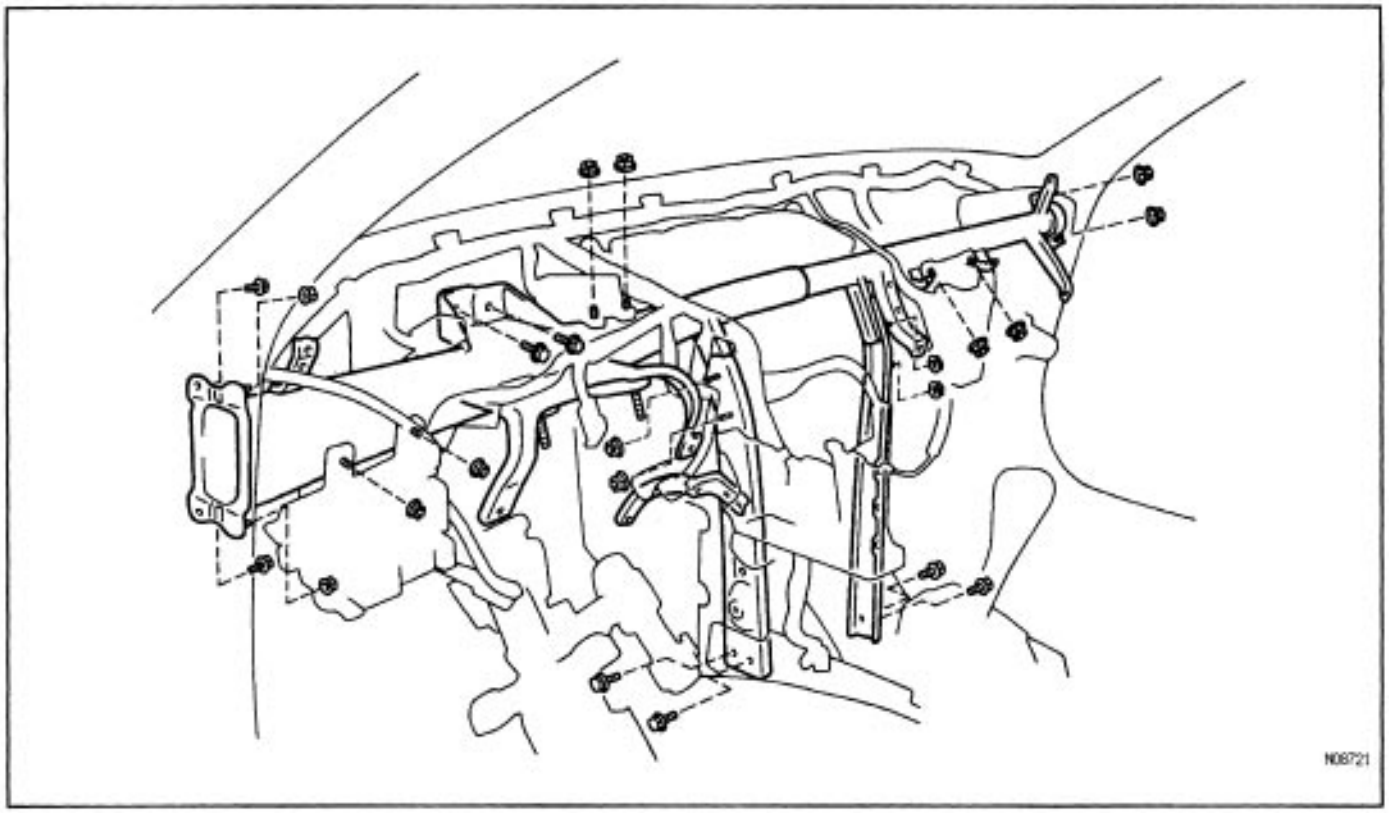
(g) Disconnect the connector.
(h) Remove the bolt.
(i) Remove 8 bolts, 2 nuts and the instrument panel.



(j) Remove the duct heater to register No.4 and No.5.

29. REMOVE INSTRUMENT PANEL REINFORCEMENT

Remove the parts as shown below.



INSTRUMENT PANEL DISASSEMBLY

1. REMOVE FOLLOWING PARTS FROM INSTRUMENT PANEL

(a) Duct heater to register No.1
(b) Duct heater to register No.3
(c) Defroster nozzle
(d) Register No.3
(e) Center bracket
(f) Mounting bracket No.1
(g) Safety Pad Sub–Assembly
(h) Side Defroster nozzle No.1
(i) Lower finish panel

2. REMOVE LOWER MOUNTING BRACKET NO. 1

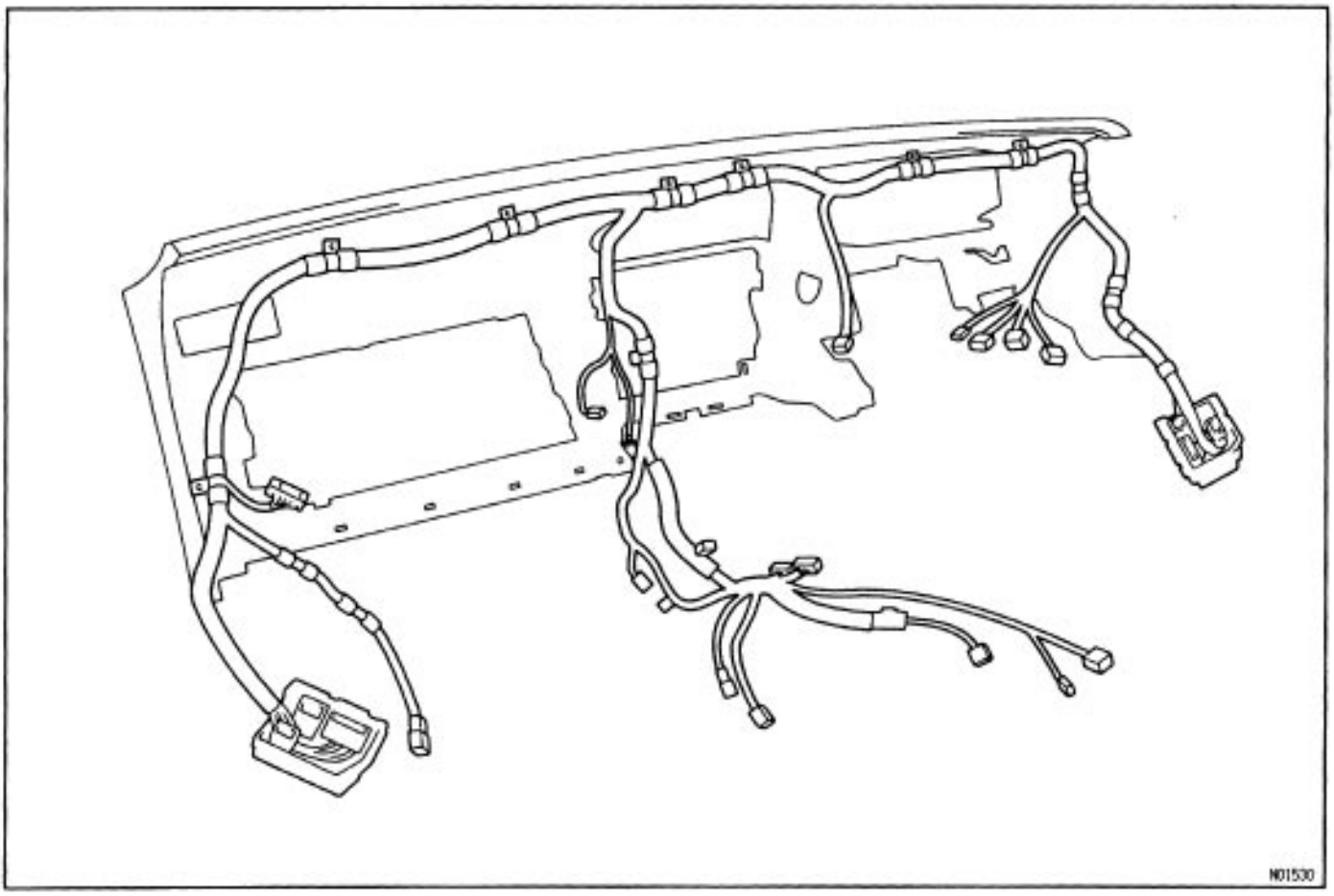
Remove 2 bolts and the bracket No.1.

3. REMOVE LOWER MOUNTING BRACKET NO. 2

Remove 2 bolts and the bracket No.2.

4. REMOVE INSTRUMENT PANEL WIRE

Remove 5 screws, the clip and the wire.



INSTRUMENT PANEL ASSEMBLY

ASSEMBLE INSTRUMENT PANEL PARTS BY FOLLOW–ING DISASSEMBLY SEQUENCE IN REVERSE

INSTRUMENT PANEL INSTALLATION

INSTALL INSTRUMENT PANEL PARTS BY FOLLOWING REMOVAL SEQUENCE IN REVERSE

TORQUE FOLLOWING BOLTS:

Front passenger airbag assembly (See page RS–34)

To instrument panel reinforcement

Torque: 20 N–m (210 kgf–cm, 15 ft–lbf)

To instrument panel

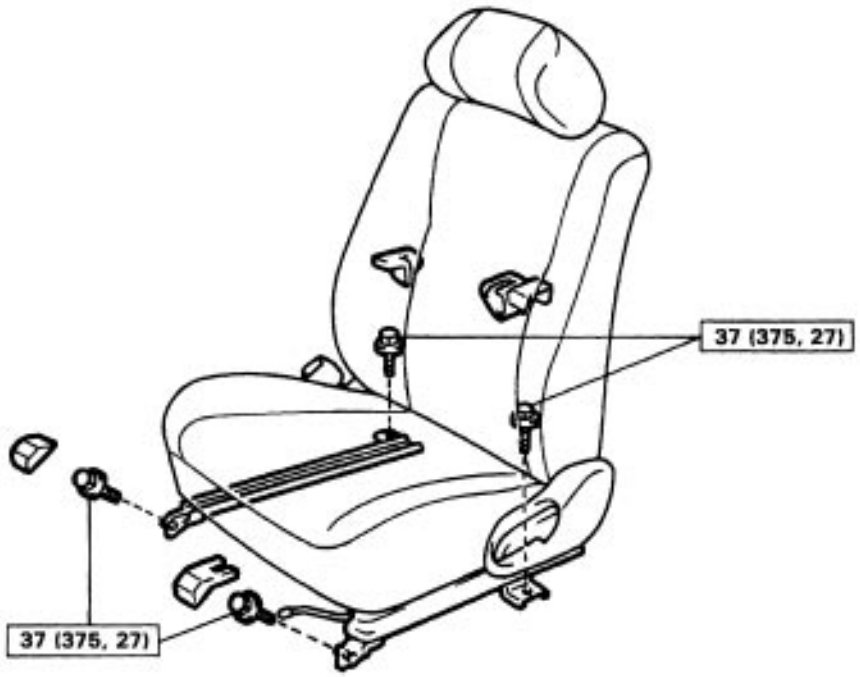
Torque: 8.0 N–m (80 kgf–cm, 69 in.–lbt)

NOTICE: The 2 bolts to the instrument panel have been anti–rust treated. When the front passenger airbag as–sembly is removed, always replace the bolts with now ones.

SEAT

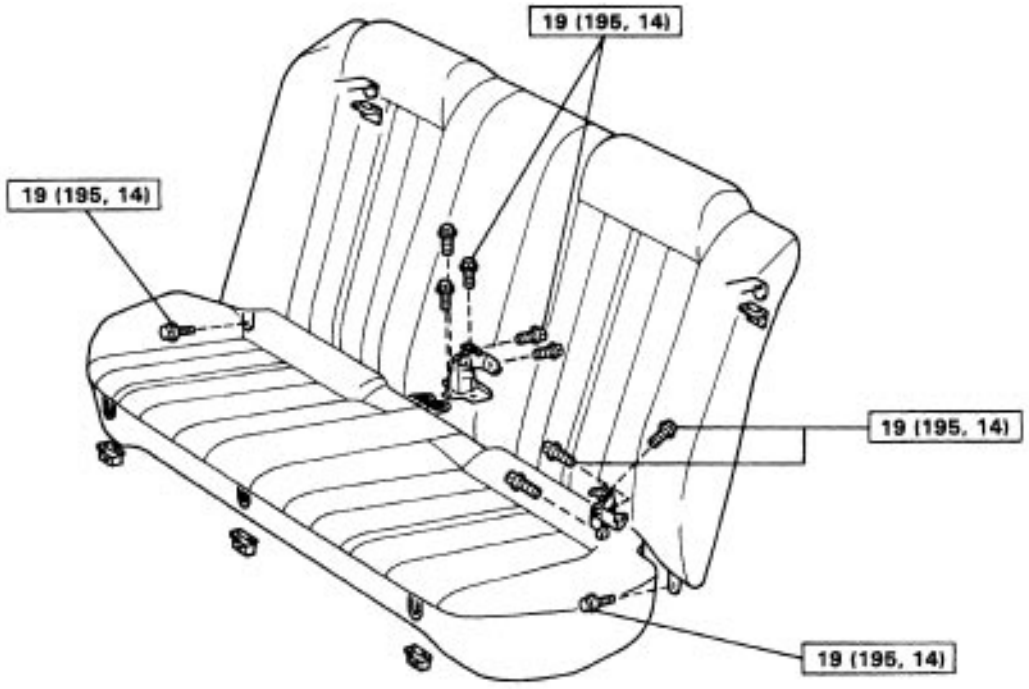
COMPONENTS

Front Seat



N01531

Sedan
Rear Seat



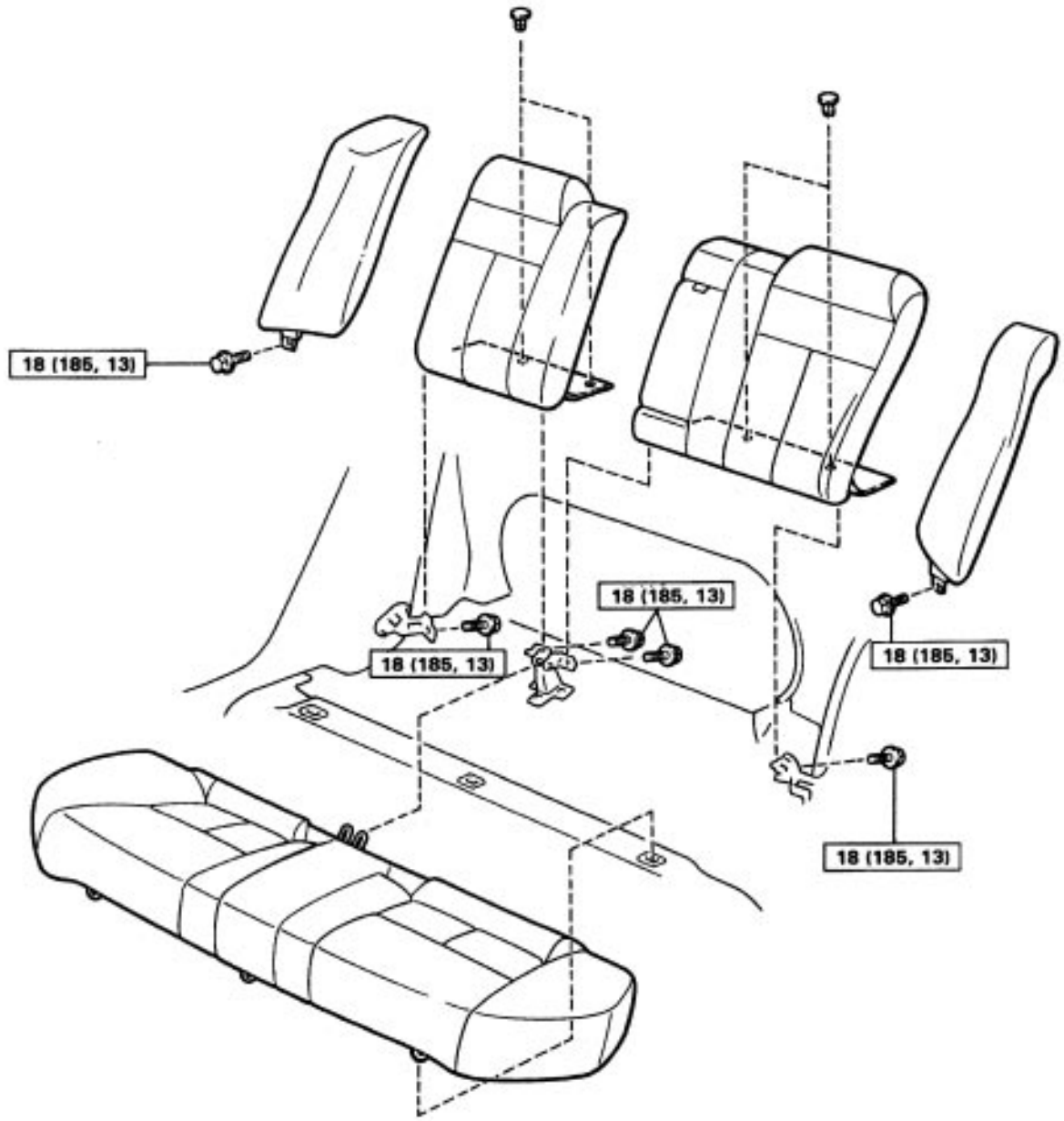
N01464

N·m (kgf·cm, ft·lbf) : Specified torque

Z10023

COMPONENTS (Cont'd)

Fold Down Seat

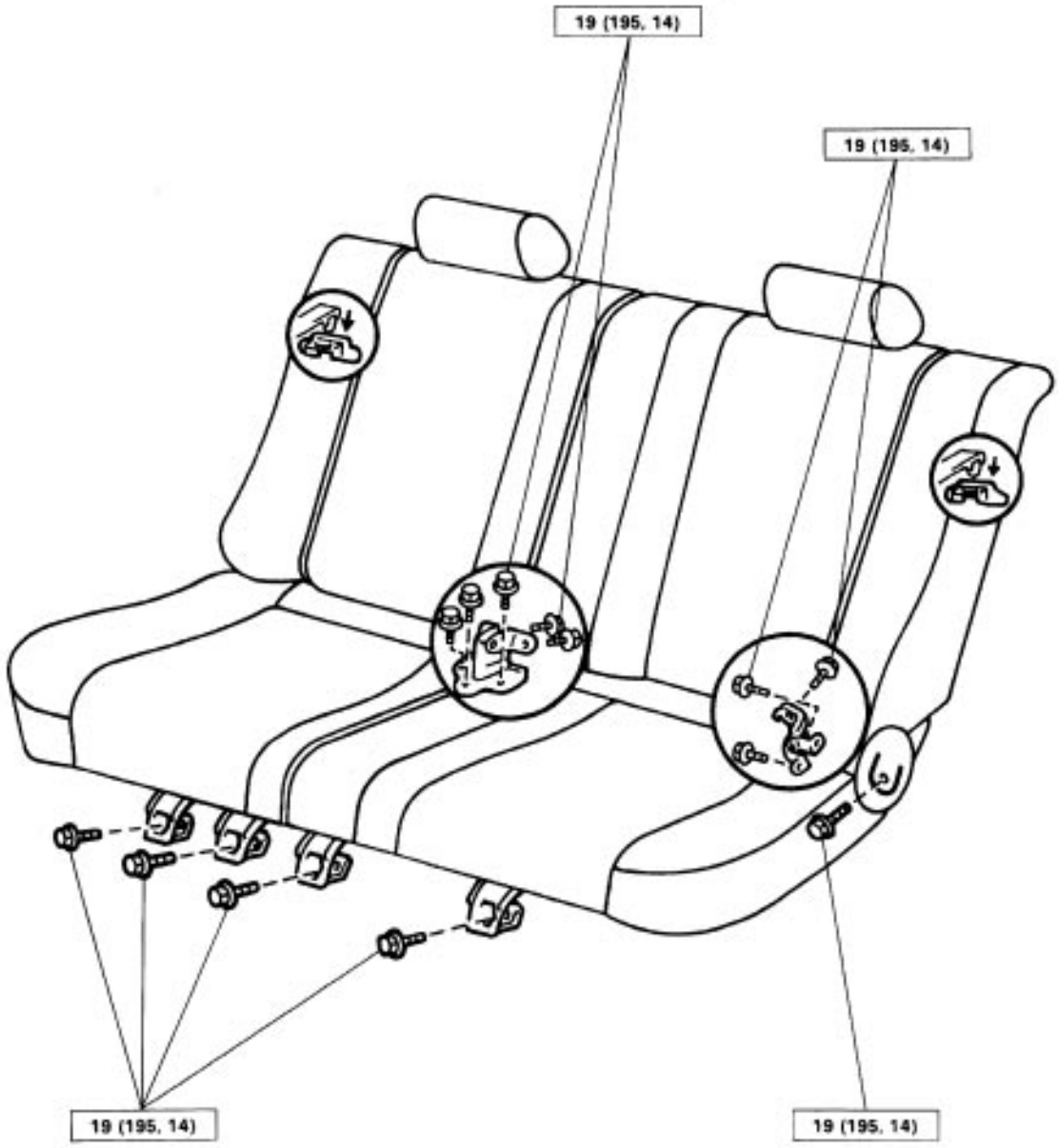


N·m (kgf·cm, ft·lbf) : Specified torque

N09007

COMPONENTS (Cont'd)

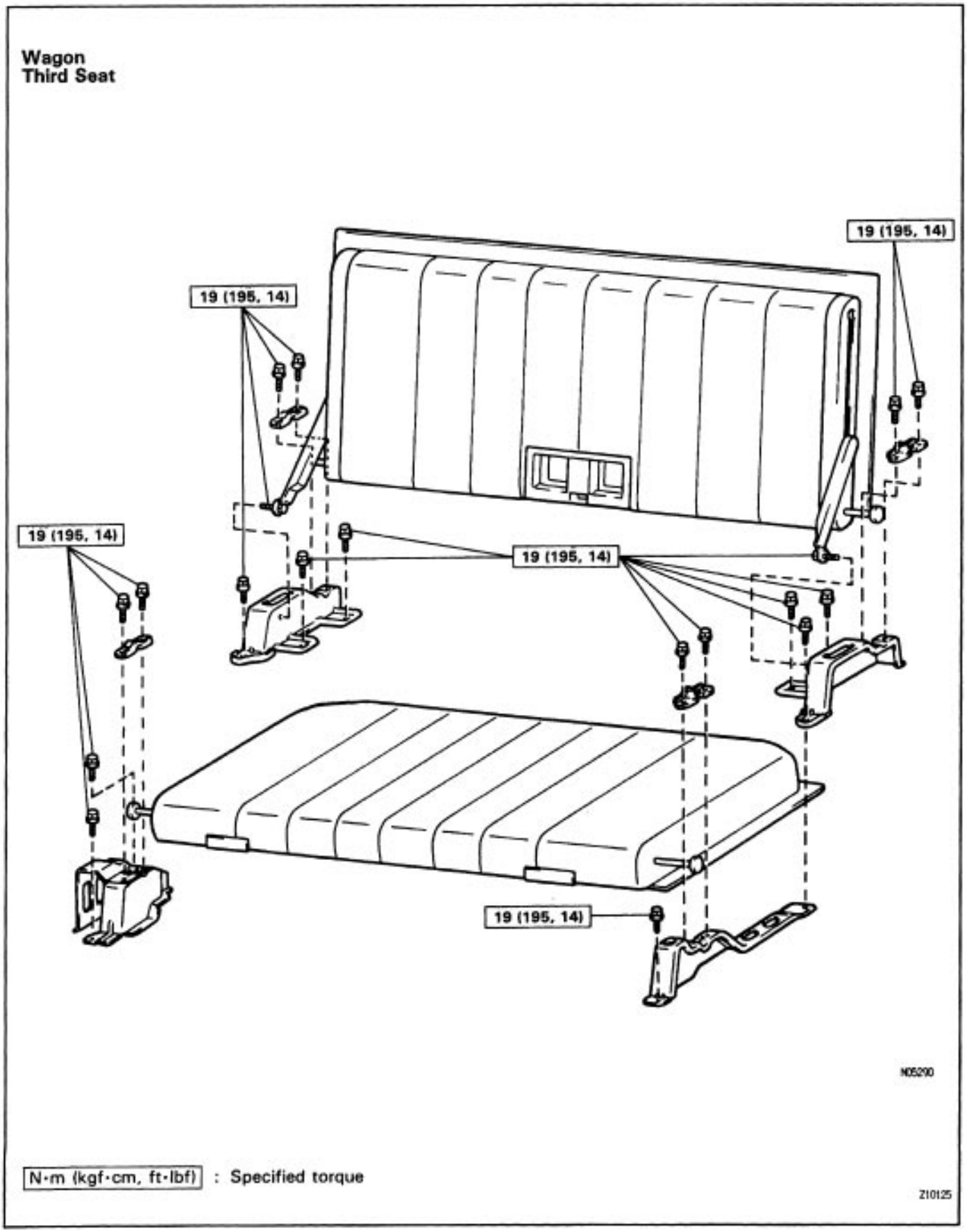
Second Seat



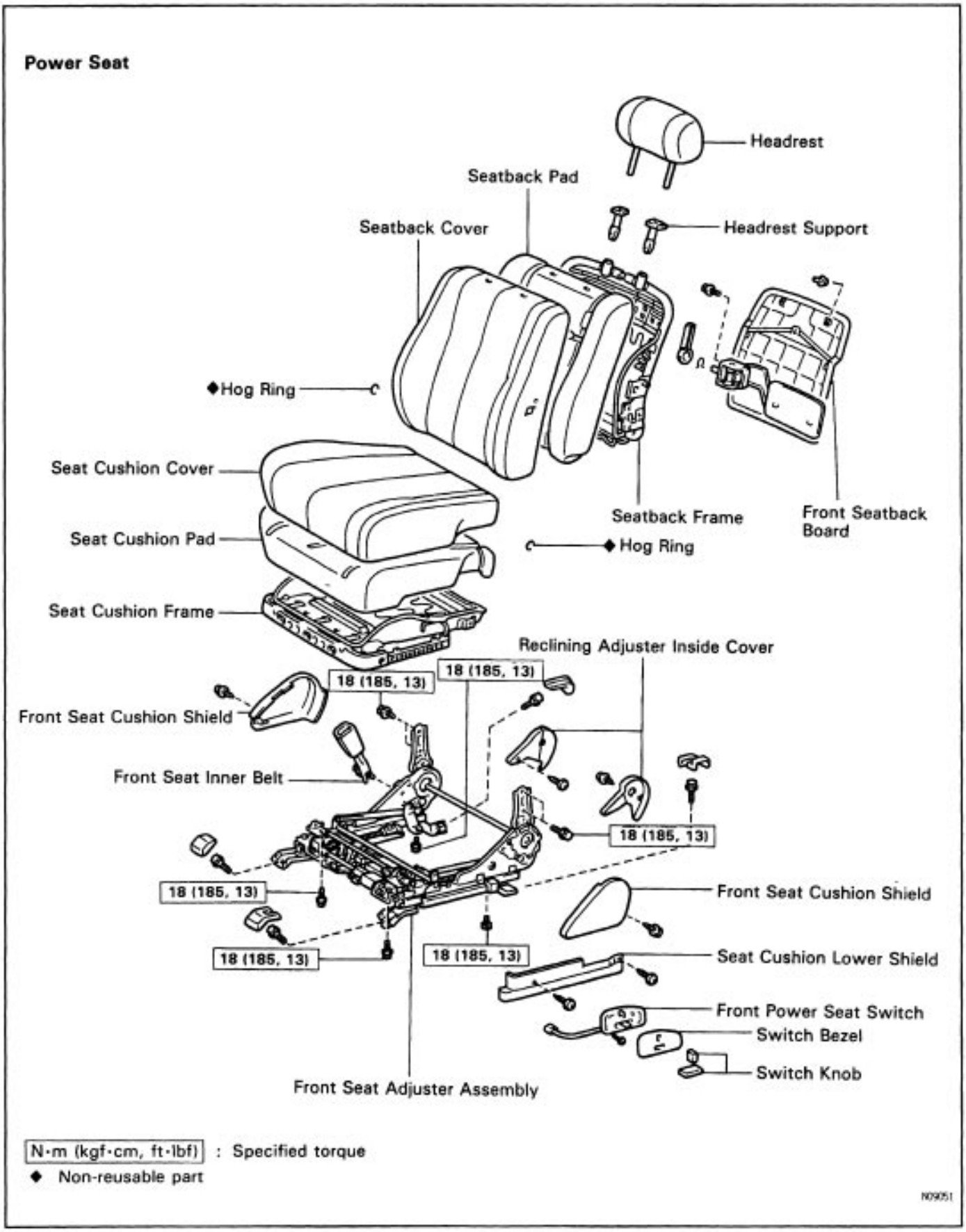
N·m (kgf·cm, ft·lbf) : Specified torque

M05289

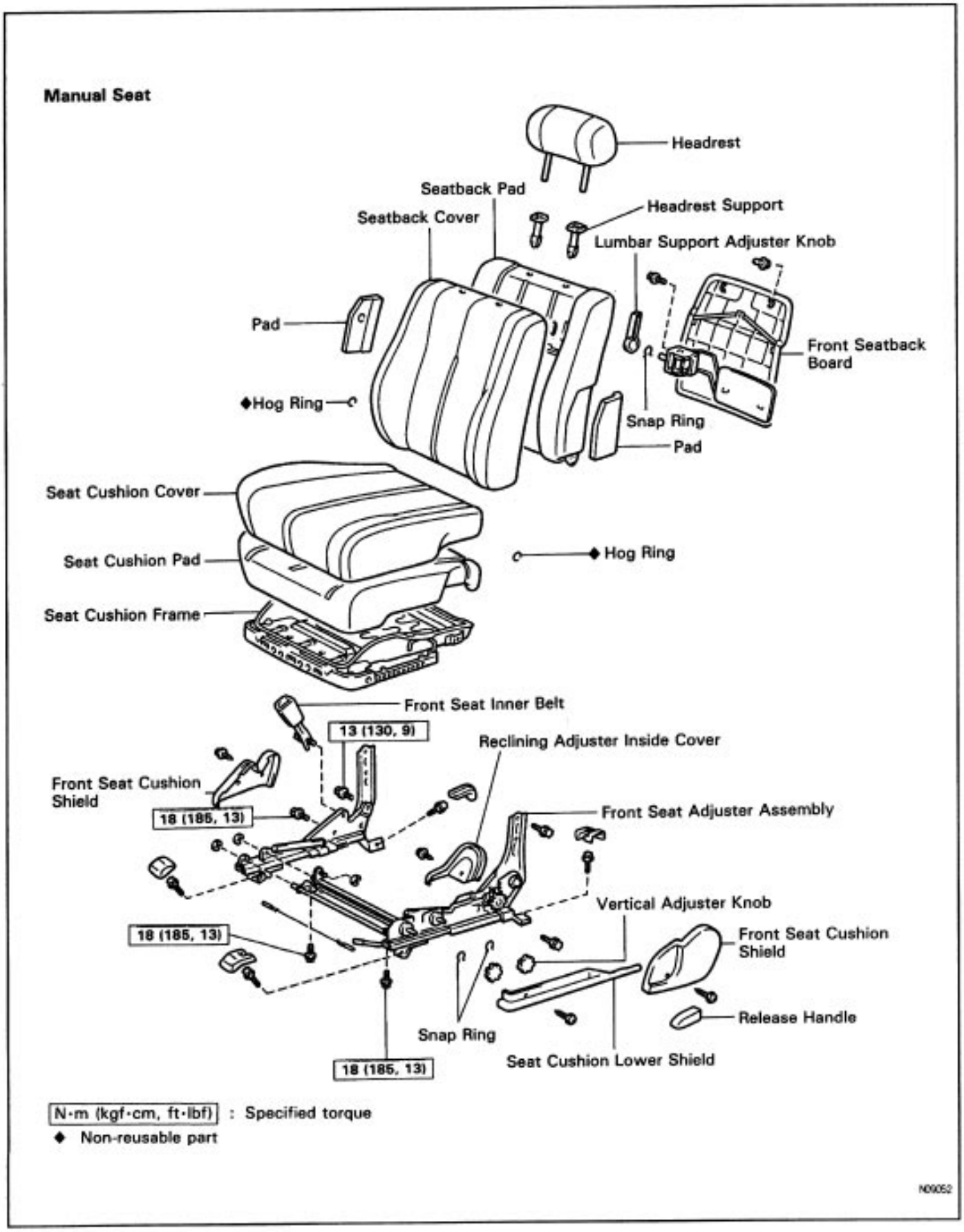
COMPONENTS (Cont'd)



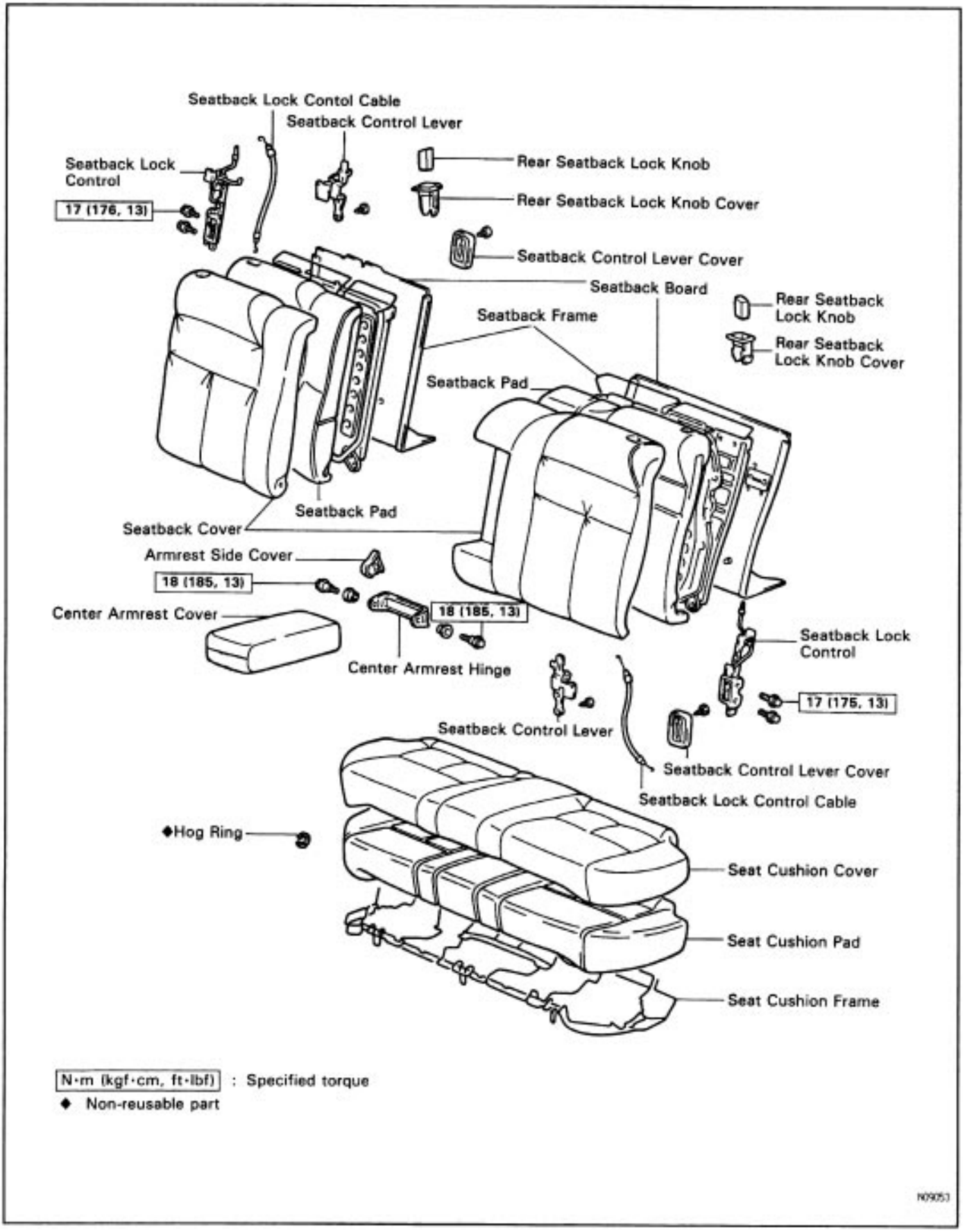
COMPONENTS (Cont'd)



COMPONENTS (Cont'd)

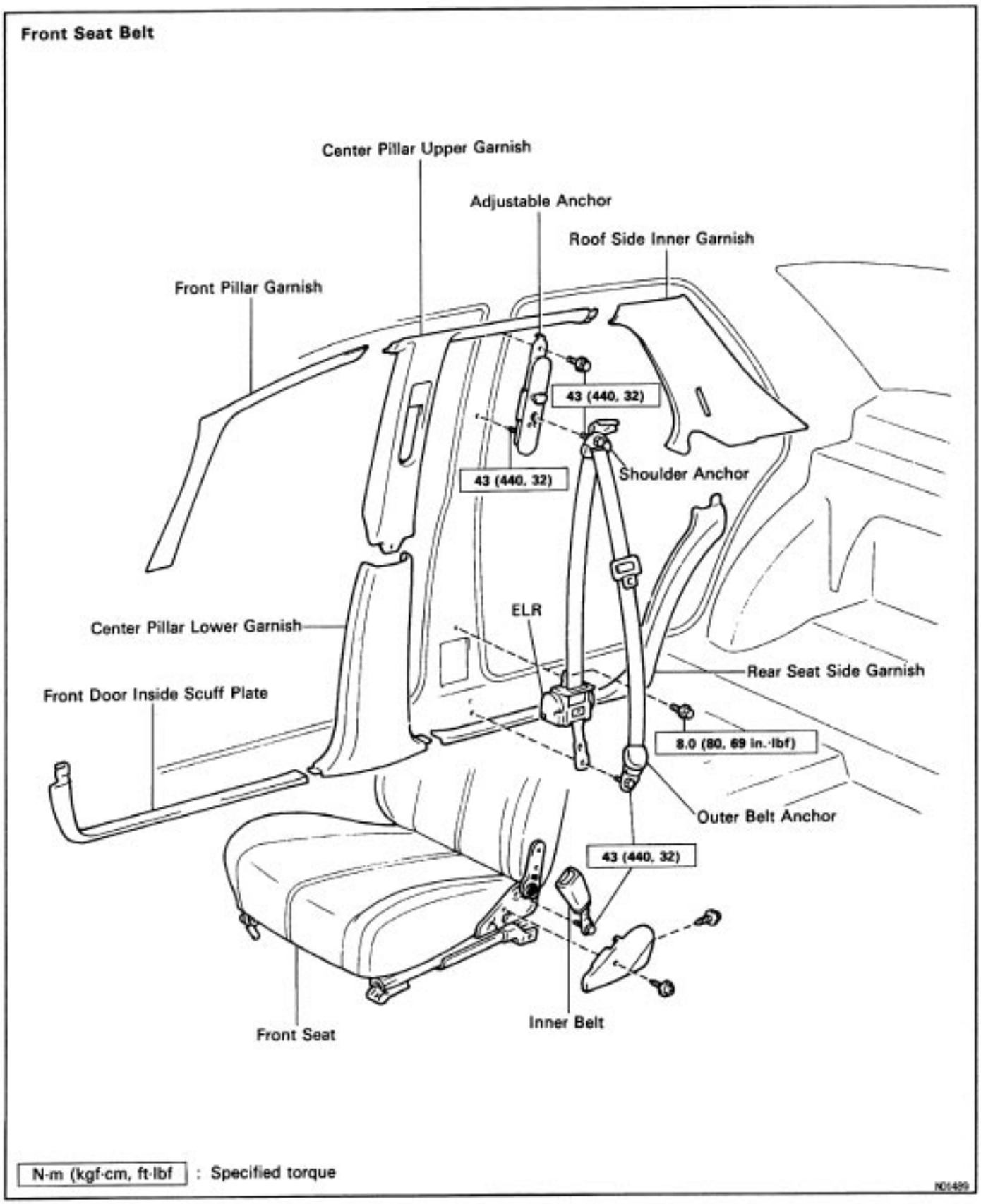


COMPONENTS (Cont'd)

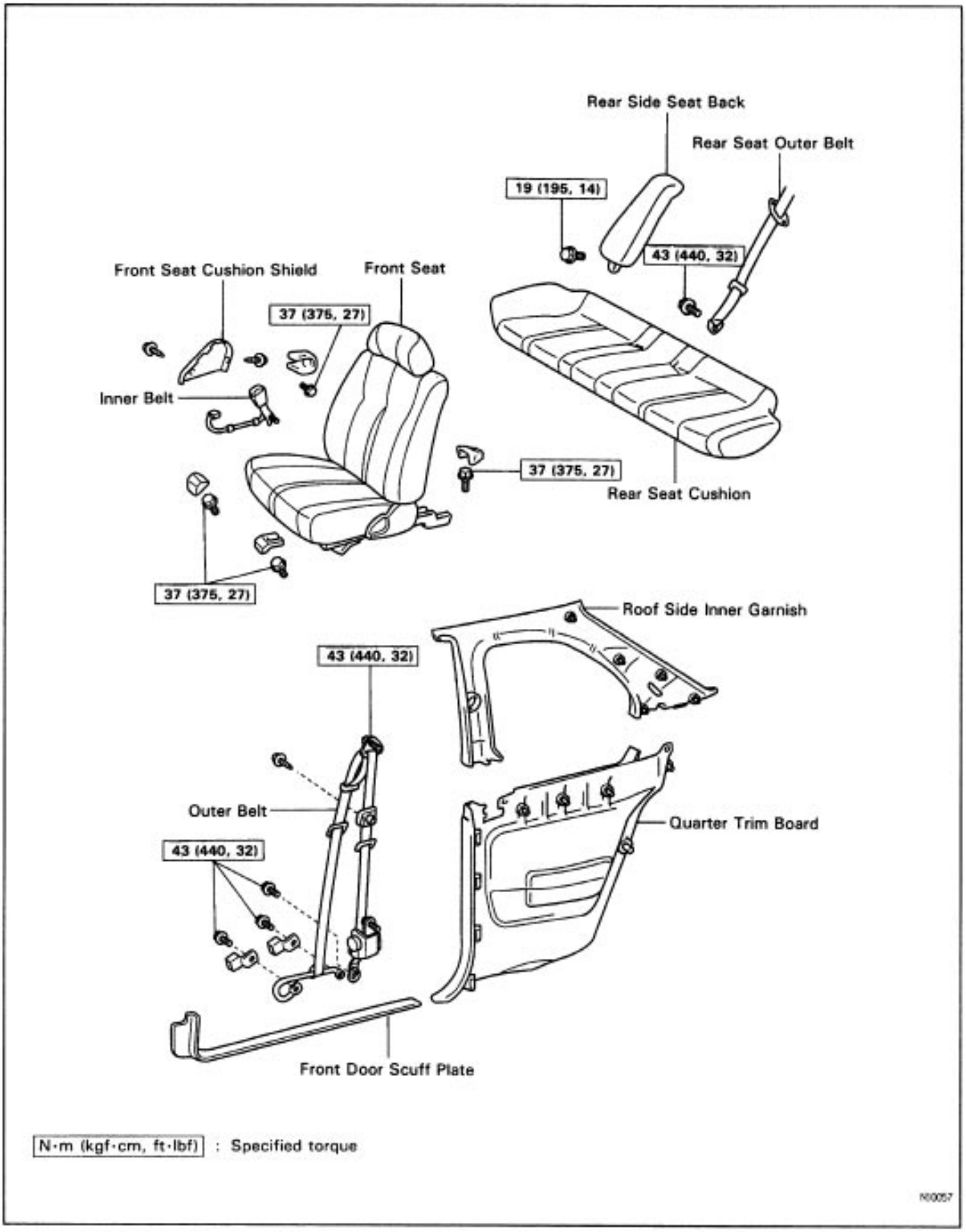


SEAT BELT

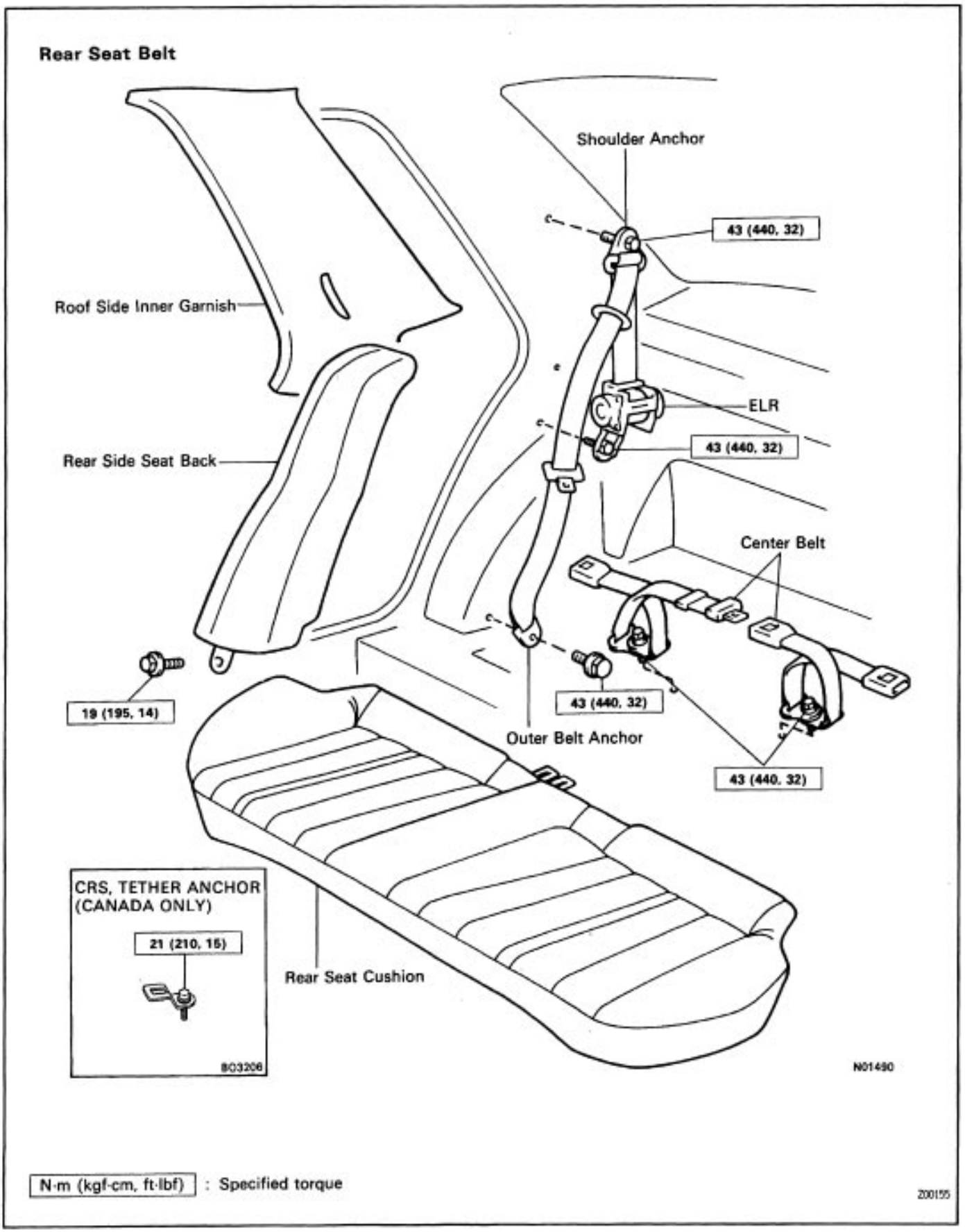
COMPONENTS



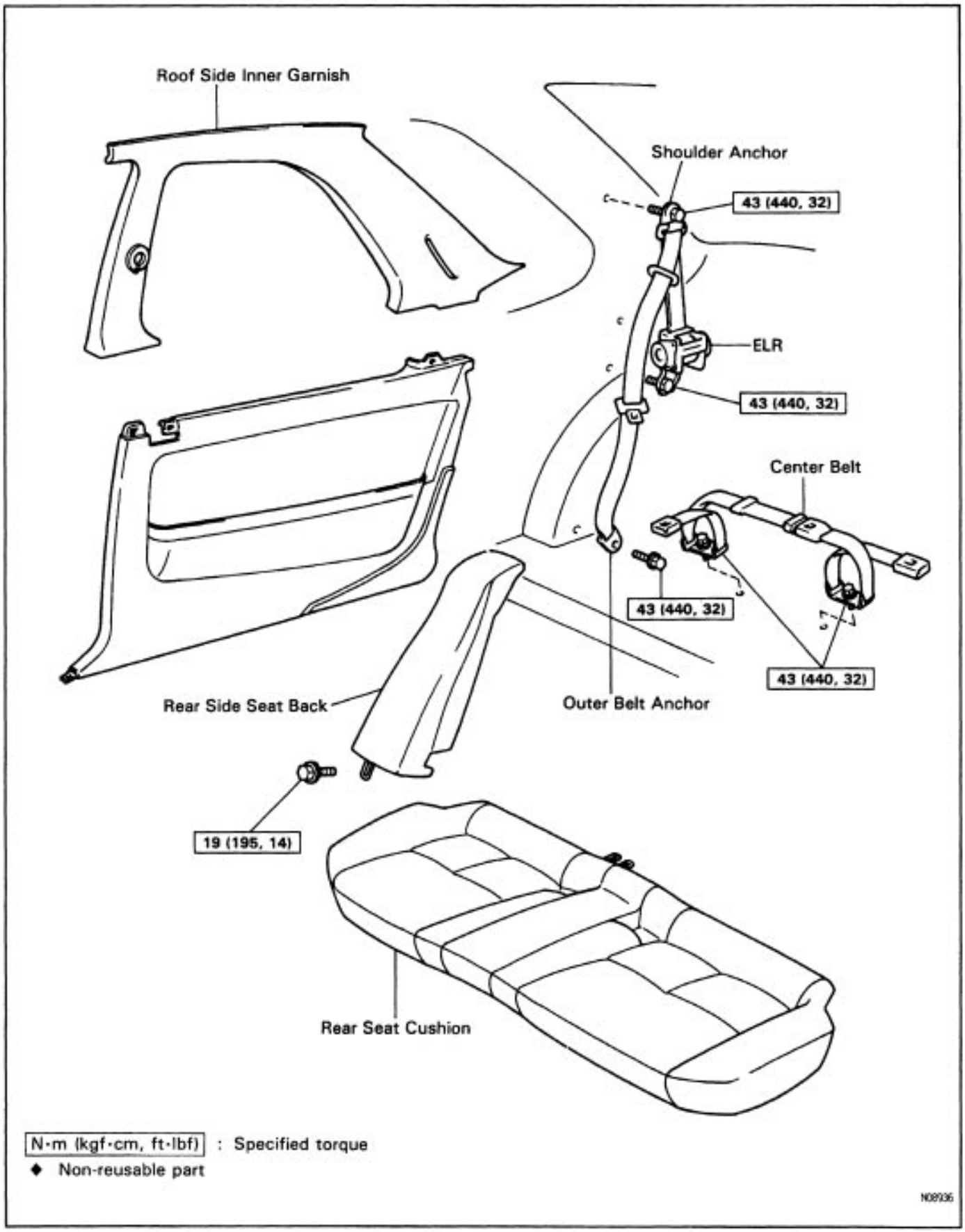
COMPONENTS (Cont'd)



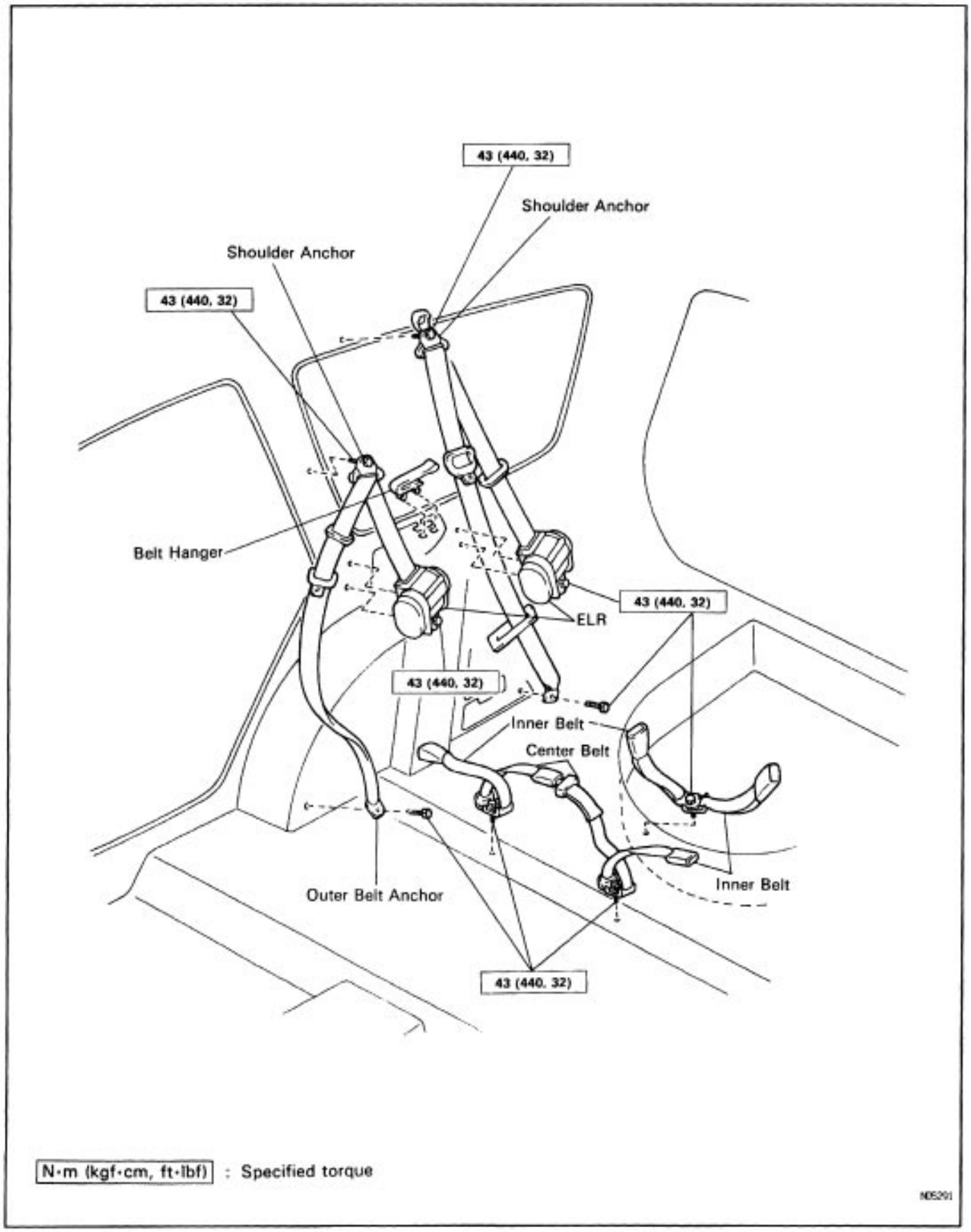
COMPONENTS (Cont'd)



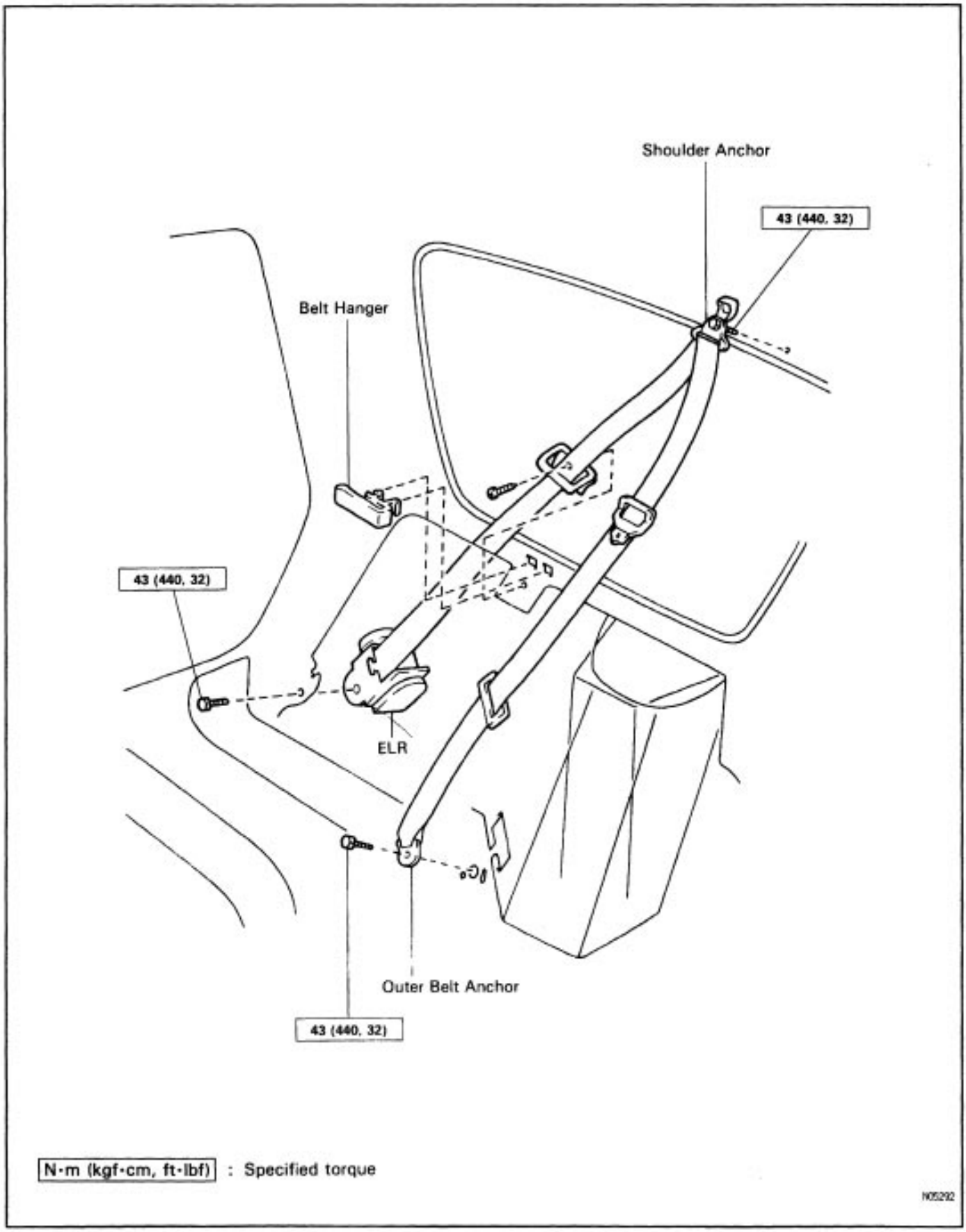
COMPONENTS (Cont'd)

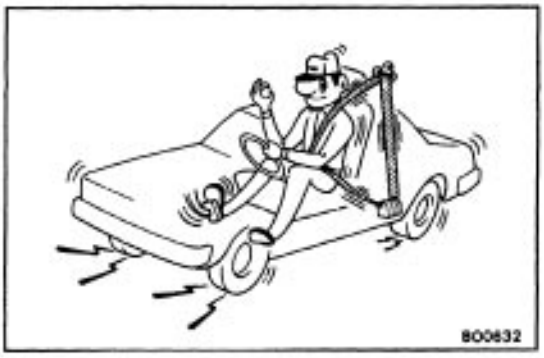


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)





SEAT BELT INSPECTION

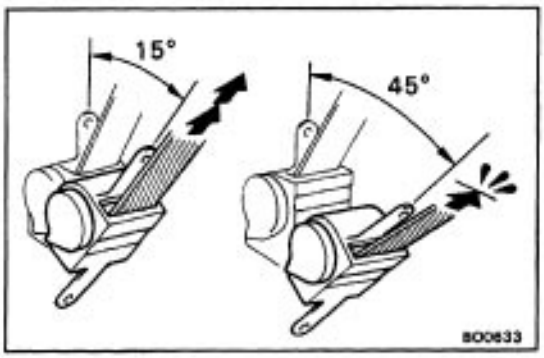
Emergency Locking Retractor (ELR) and Automatic Locking Retractor (ALR) type

1. RUNNING TEST (INN SAFE AREA)

for all seat:

(a) Fasten the front seat belts.
(b) Drive the car at 10 mph (16 km/h) and make a very hard stop.
(c) Check that the belt is locked and cannot be extended at this time.

HINT: Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper oper–ation before installation.



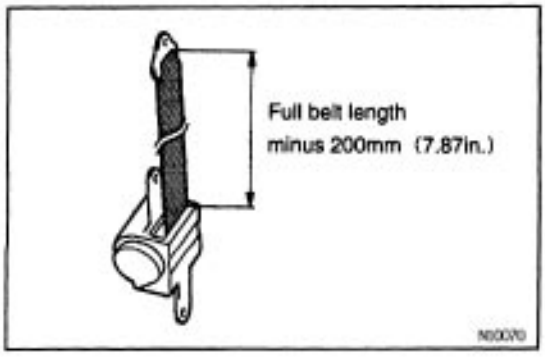
2. STATIC TEST

for driver's seat (ELR):

(a) Verify that the belt locks when pulled out quickly.
(b) Remove the locking retractor assembly.
(c) Tilt the retractor slowly.
(d) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out over 45 degrees of tilt.
If a problem is found, replace the assembly.

except for driver's seat (ALR/ ELR):

(a) Verify that the belt locks when pulled out quickly.
(b) Remove the locking retractor assembly.
(c) Pull out the whole belt and measure the length of the whole belt.
Then retract the belt slightly and pull it out again.
(d) Verify that the belt cannot be extended further.
If a problem is found, replace the assembly.



(e) Retract the whole belt, then pull out the belt until 200 mm (7.87 in.) of belt remains retracted.
(f) Tilt the retractor slowly.
(g) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.
If a problem is found, replace the assembly.

SERVICE SPECIFICATIONS

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
FRONT BUMPER	–	–	–
Front bumper arm x Body	8.8	90	78in.·lbf
Front bumper reinforcement x Front bumper arm	8.8	90	78in.·lbf
Reinforcement extension x Body	21	210	15
REAR BUMPER	–	–	–
Rear bumper arm x Body	79	810	59
Rear bumper reinforcement x Rear bumper arm	43	440	32
Rear bumper cover x Body	5.9	60	52in.·lbf
HOOD.	–	–	–
Hood hinge x Hood	14	145	10
Hood Lock x Body	7.8	80	69in.·lbf
FRONT DOOR AND REAR DOOR	–	–	–
Door lock x Door panel	5.4	55	48in.·lbf
Window regulator x Door inside panel frame	5.4	55	48in.·lbf
Window regulator x Door panel	5.4	55	48in.·lbf
BACK DOOR	–	–	–
Back door hinge x Body	13	130	9
Back door hinge x Back door	13	130	9
Back door lock x Back door	10	100	7
Back door damper stay x Body	8.8	90	78in.·lbf
Back door damper stay x Back door	8.8	90	78in.·lbf
LUGGAGE COMPARTMENT	–	–	–
Luggage compartment door hinge x Luggage compartment door	7.8	80	69in.·lbf
WIPER AND WASHER	–	–	–
Wiper arm x Wiper link	19	195	14
Wiper arm x Wiper pivot	5.4	55	48in.·lbf
Wiper pivot x Back door	11	110	8
SLIDING ROOF	–	–	–
Drive gear x Body	5.4	55	48in.·lbf
SEAT	–	–	–
Front Seat	–	–	–
Seat truck x Body	37	375	27
Rear Seat	–	–	–
Seat back x Body	19	195	14
Seat back x Seat hinge	19	195	14
Seat hinge x Body	19	195	14
Second Seat	–	–	–
Rear side seatback x Body	19	195	14
Seat back x Seatback hinge	19	195	14
Seatback hinge x Body	19	195	14
Seat cushion hinge x Body	19	195	14
Third Seat	–	–	–
Seatback link x Bracket	19	195	14

Bracket x Body	19	195	14
SEAT BELT	–	–	–
Front Seat Belt	–	–	–
Shoulder anchor x Adjustable anchor	43	440	32
Outer belt anchor x Body	43	440	32
ELR x Body	8.0	80	69in.-lbf
Adjustable anchor x Body	43	440	32
Inner belt x Seat	43	440	32
Rear Seat Belt	–	–	–
Shoulder anchor x Body	43	440	32
Outer belt anchor x Body	43	440	32
ELR x Body	43	440	32
Inner belt x Body	43	440	32
Center belt x Body	43	440	32
(CANADA) CRS, tether anchor x Body	21	210	15
Second Seat Belt	–	–	–
Shoulder anchor x Body	43	440	32
Outer belt anchor x Body	43	440	32
ELR x Body	43	440	32
Inner belt x Body	43	440	32
Center belt x Body	43	440	32
(CANADA) CRS, tether anchor x Body	21	210	15
Third Seat Belt	–	–	–
Shoulder anchor x Body	43	440	32
Outer belt anchor x Body	43	440	32
ELR x Body	43	440	32
Inner belt x Body	43	440	32

SUPPLEMENTAL RESTRAINT SYSTEM

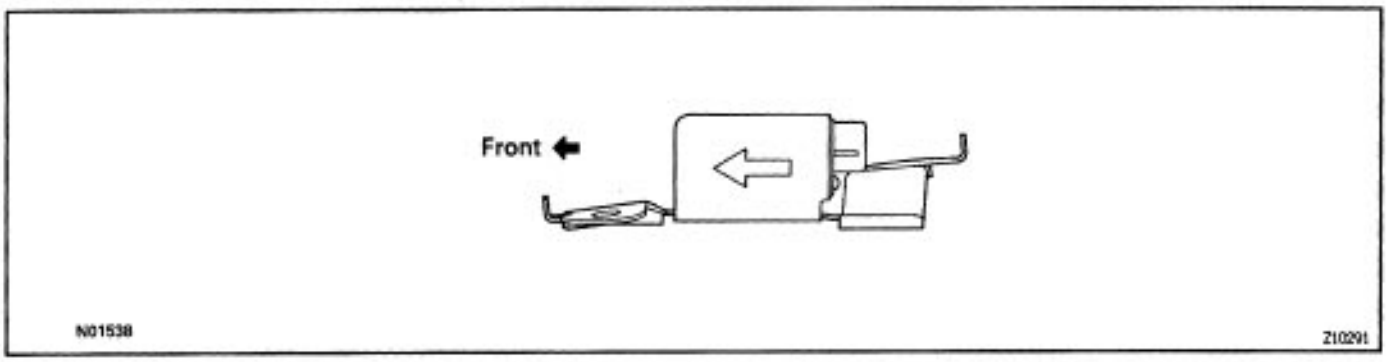
GENERAL DESCRIPTION

The 1994 CAMRY is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deployed during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in the repair manual.

1. Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshoot–ing. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page RS–61).
2. **Work must be started after 90 seconds from the time the ignition switch turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery. (The supple–mental restraint system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable of the battery, the SRS may be deployed.) When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be canceled. So before starting work, make a record of the contents memorized by the audio memory system. When work is finished, reset the audio systems as before and adjust the clock. To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.**
3. Even in cases of a minor collision where the SRS does not deploy, and the front airbag sensors, the steering wheel pad and front passenger airbag assembly should be inspected (See page RS–17, 29, 43 and 46).
4. Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
5. Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensors during repairs.
6. Never disassemble and repair the front airbag sensors, center airbag sensor assembly or steering wheel pad or front passenger airbag assembly in order to reuse it.
7. If the front airbag sensors, center airbag sensor assembly or steering wheel pad or front passenger airbag assembly have been dropped, or if there are cracks, dents or dents or other defects in the case, bracket or connector, replace them with new ones.
8. Do not expose the front airbag sensors, center airbag sensor assembly, steering wheel pad and front passenger airbag assembly directly to hot air or flames.
9. Use a volt/ohmmeter with high impedance (10 k) /V minimum) of troubleshooting of the electrical circuit.
10. Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
11. After work on the supplemental restraint system is completed, perform the SRS warning light check (See page RS–61).
12. If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

FRONT AIRBAG SENSOR

1. Never reuse the front airbag sensor involved in a collision when the airbag has deployed. (Replace both the left and right airbag sensors.)
2. Install the front airbag sensor with the arrow on the sensor facing toward the front of the vehicle.



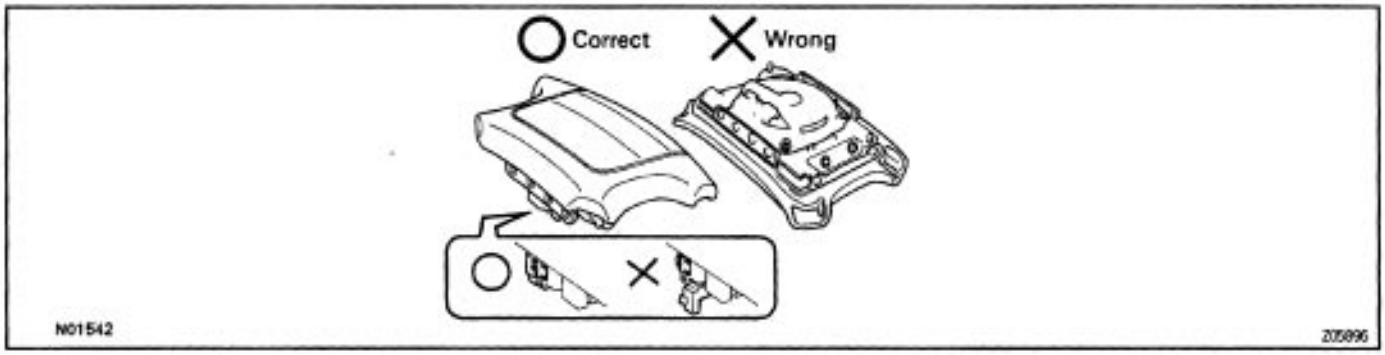
3. The front airbag sensor set bolts have been anti–rust treated.
   When the sensor is removed, always replace the set bolts with new ones.
4. The front airbag sensors is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector.
   If the connector is not securely locked, a malfunction code will be detected by the diagnosis system (See page RS–13).

SPIRAL CABLE (in COMBINATION SWITCH)

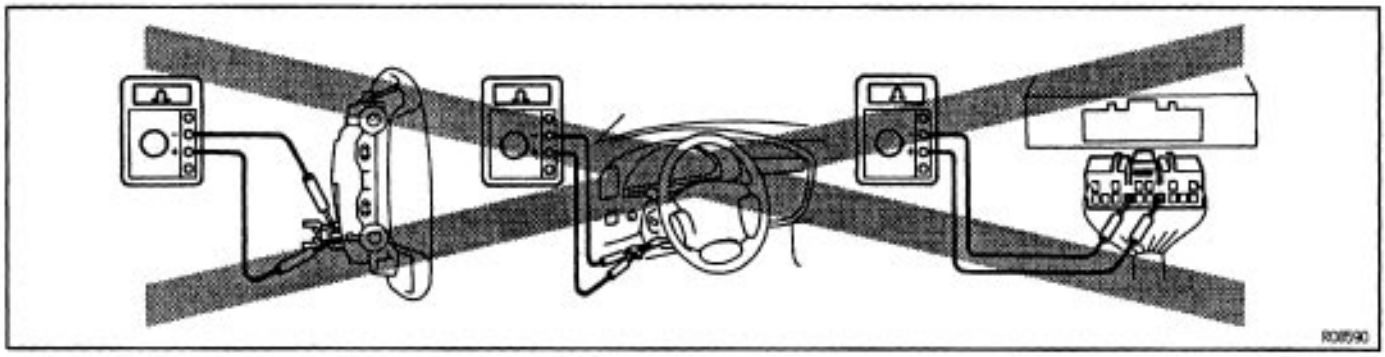
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result. Refer to page RS –20 of this manual concerning correct steering wheel installation.

STEERING WHEEL PAD (with AIRBAG)

1. When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
In this case, the twin–lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. And do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag inflates for some reason.



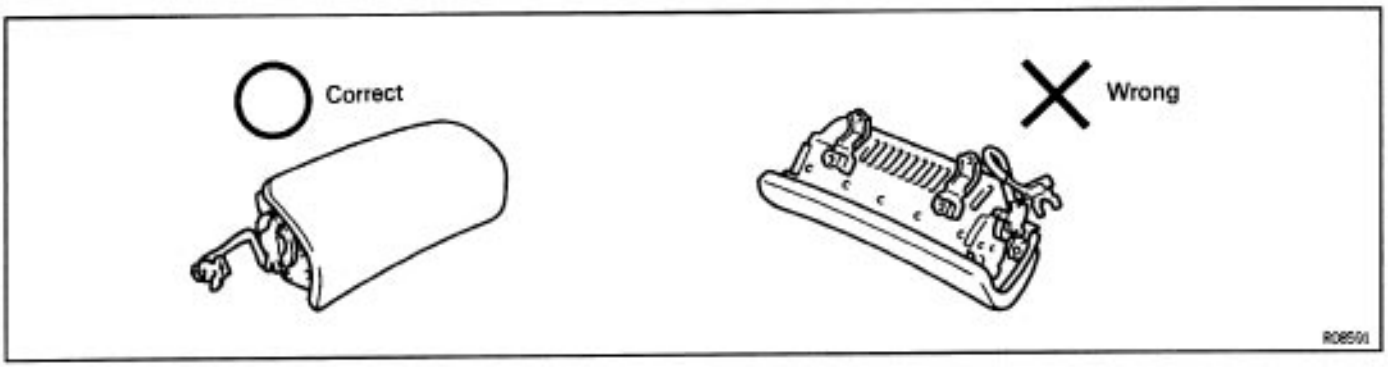
2. Never measure the resistance of the airbag squib.
(This may cause the airbag to deploy, which is very dangerous.)



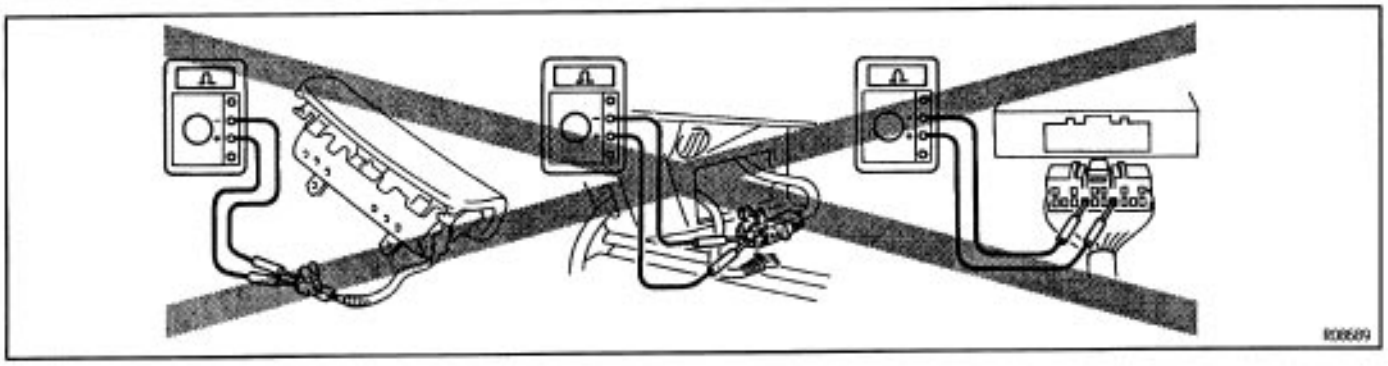
3. Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.
4. Store the steering wheel pad where the ambient temperature below 93°C (200°F), without high humidity and away from electrical noise.
5. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the glove compartment finish plate at the left side of the glove compartment before starting work.
6. When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–23). Perform the operation in a place away from electrical noise.

FRONT PASSENGER AIRBAG ASSEMBLY

1. Always store a removed or new front passenger airbag assembly with the airbag door facing up. Store the airbag assembly with the airbag door facing down could cause a serious accident if the airbag inflates.



2. Never measure the resistance of the airbag squib.
(This may cause the airbag to deploy, which is very dangerous.)



3. Grease should not be applied to the front passenger airbag and the door should not be cleaned with detergents of any kind.
4. Store the front passenger airbag assembly where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
5. When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) installed on the glove compartment finish plate at the left side of the glove compartment before starting work.
6. When disposing of a vehicle or the front passenger airbag assembly alone, the airbag should be deployed using an SST before disposal (See page RS–36). Perform the operation in a place away from electrical noise.

CENTER AIRBAG SENSOR ASSEMBLY

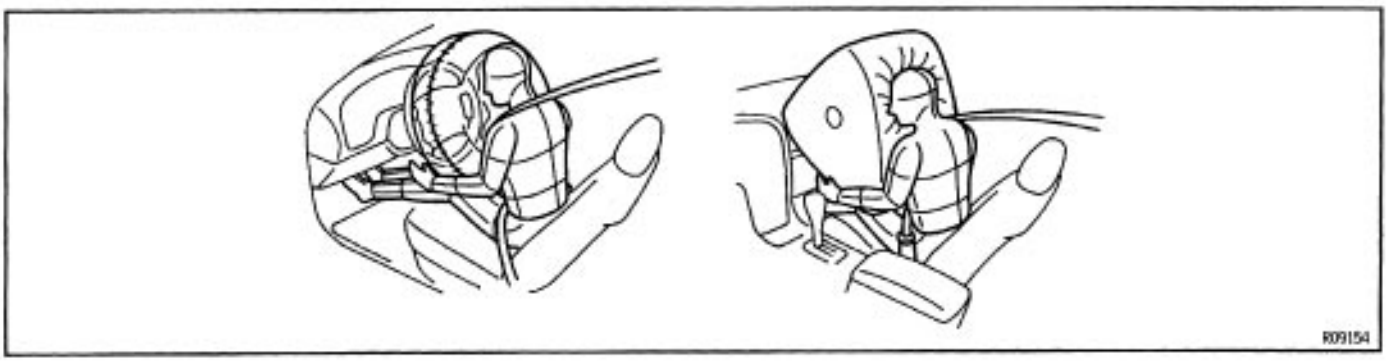
1. Never. reuse the center airbag sensor assembly involved in a collision when the airbag has deployed.
2. The connectors to the center airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the center airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system.
3. Work must be started after 90 seconds from the time the ignition switch is turned to "LOCK" position and the negative (–) terminal cable is disconnected from the battery even just loosing the set bolts of center airbag sensor assembly.

WIRE HARNESS AND CONNECTOR

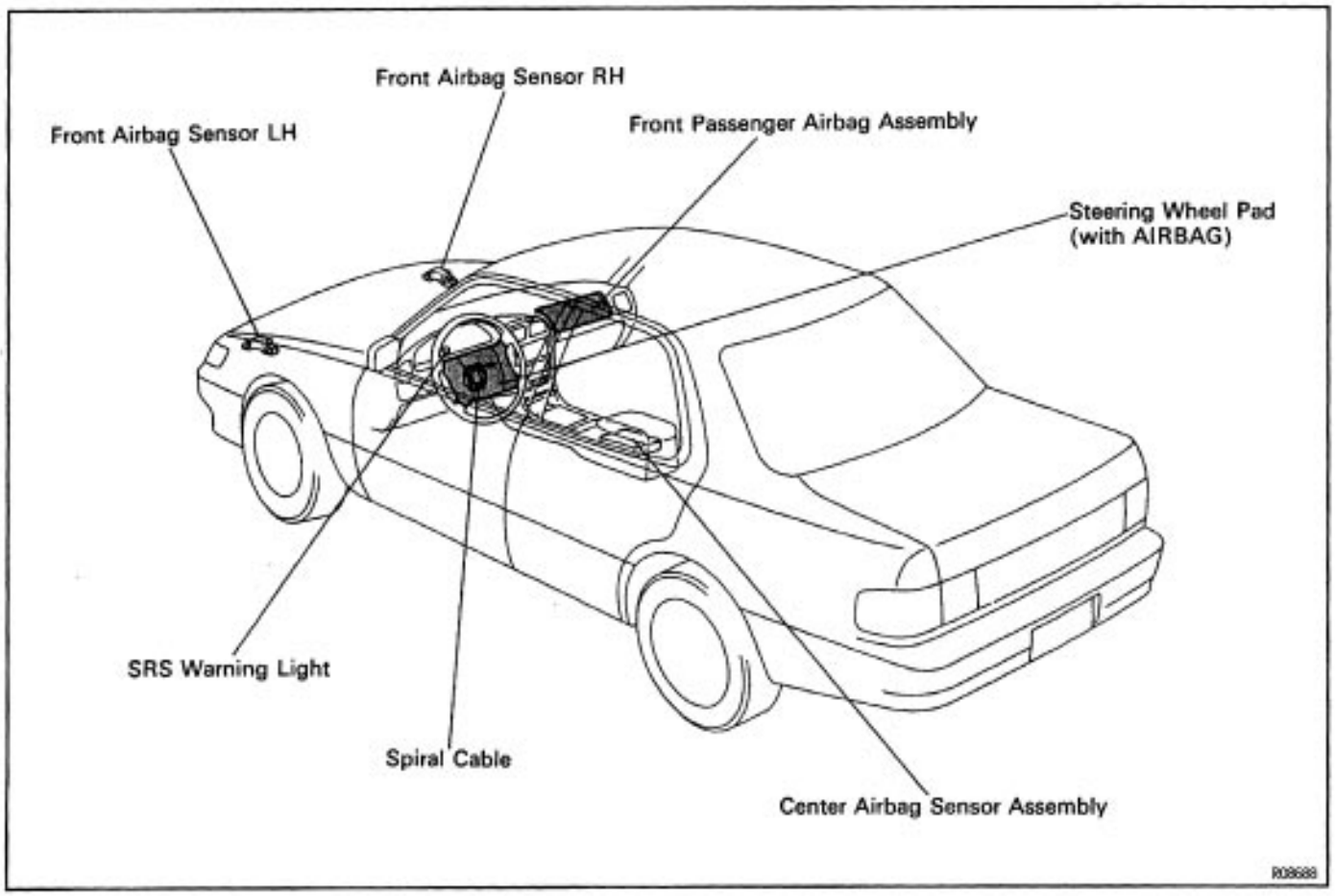
The SRS wire harness is integrated with the cowl wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident etc., repair or replace it as shown on page RS–49.

DESCRIPTION

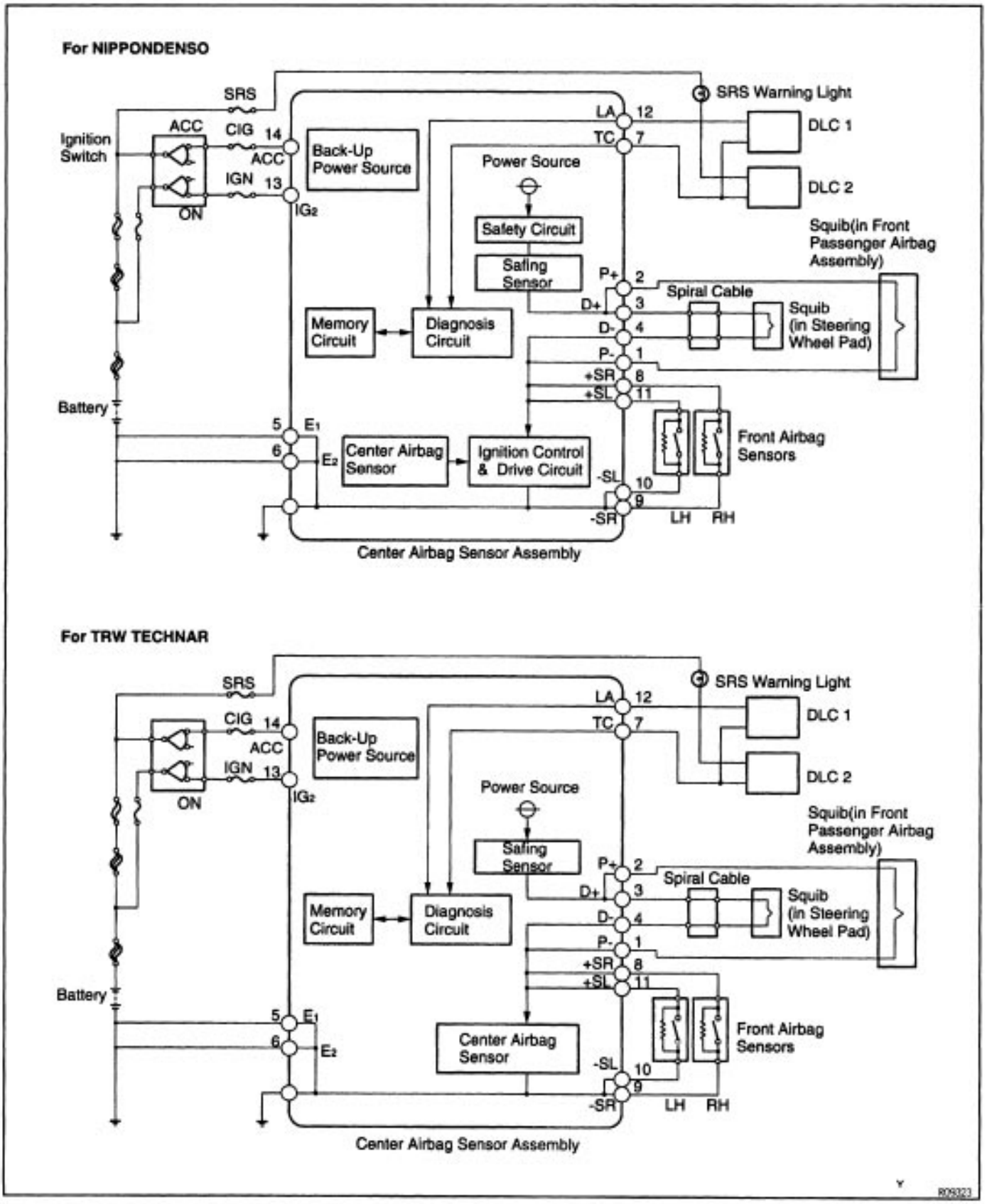
The SRS (Supplemental Restraint System), together with the seat belt, is designed to help protect the driver. In a collision, the airbag sensor detect the shock, and if the front–to–rear shock is greater than a specified value, an airbag stored in the steering wheel pad and front passenger airbag assembly are inflated instantaneously. These operation help to reduce the shock to the driver and front passenger airbag assembly.



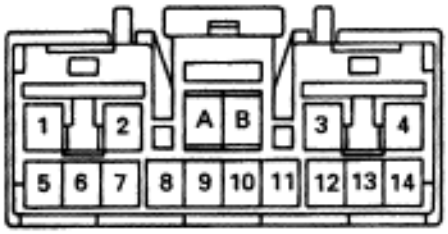
LOCATION OF COMPONENTS



WIRING DIAGRAM



CENTER AIRBAG SENSOR ASSEMBLY CONNECTORS



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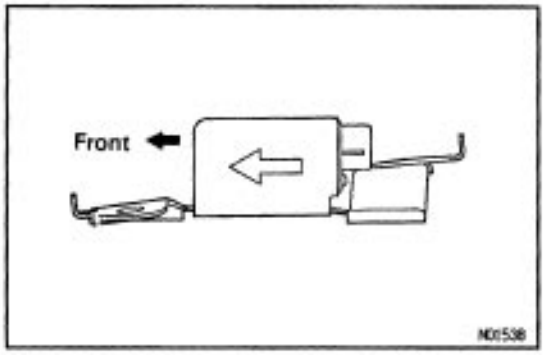
VD4309

Connector

No.	Symbol	Terminal Name
A	–	Electrical Connection Check Mechanism
B	–	Electrical Connection Check Mechanism
1	P^-	Squib(–) (Front Passenger)
2	P^+	Squib(+) (Front Passenger)
3	D^+	Squib(+) (Driver)
4	D^-	Squib(–) (Driver)
5	E_1	Ground
6	E_2	Ground
7	Tc	Diagnosis
8	+SR	Front Airbag Sensor RH(+)
9	−SR	Front Airbag Sensor RH(–)
10	−SL	Front Airbag Sensor LH(–)
11	+SL	Front Airbag Sensor LH(+)
12	LA	SRS Warning Light
13	IG_2	Power Source (AM2 Fuse)
14	ACC	Power Source (CIG Fuse)

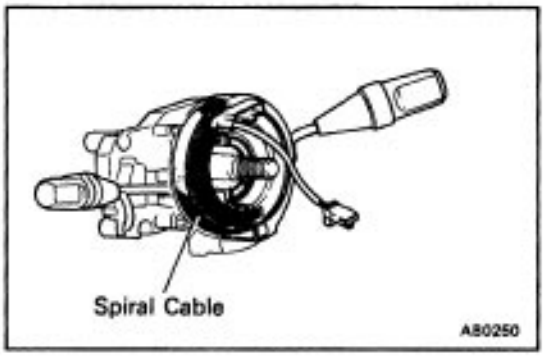
OPERATION

FUNCTION OF COMPONENTS



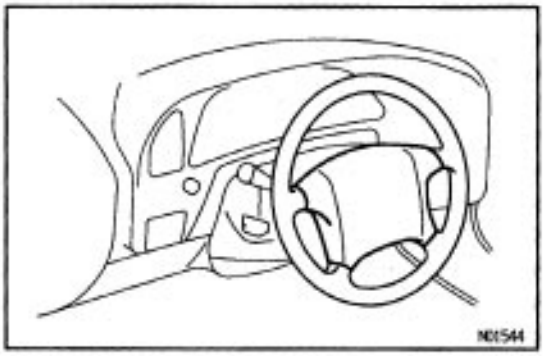
1. FRONT AIRBAG SENSOR

A front airbag sensor is mounted inside each of the front fenders. The sensor unit is a mechanical type. When the sensor detects deceleration force above a predetermined limit in a collision, the contacts in the sensor make contact, sending a signal to the center airbag sensor assembly. The sensor cannot be dis–assembled.



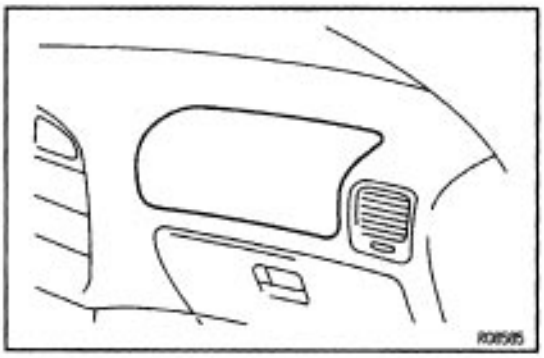
2. SPIRAL CABLE (in COMBINATION SWITCH)

A spiral cable is used as an electrical joint from the vehicle body side to the steering wheel.



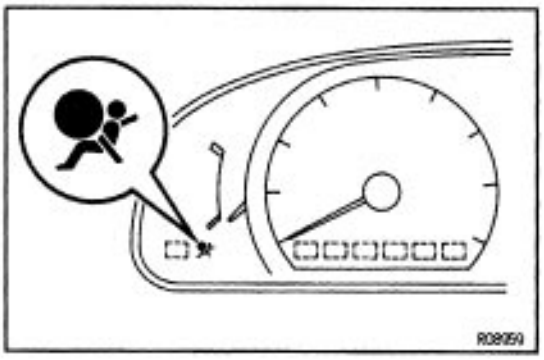
3. STEERING WHEEL PAD (with AIRBAG)

The inflater and bag of the supplemental restraint system are stored in the steering wheel pad and cannot be disassembled. The inflater contains a squib, ignite charge, gas generant, etc., and inflates the bag in case of a frontal collision.



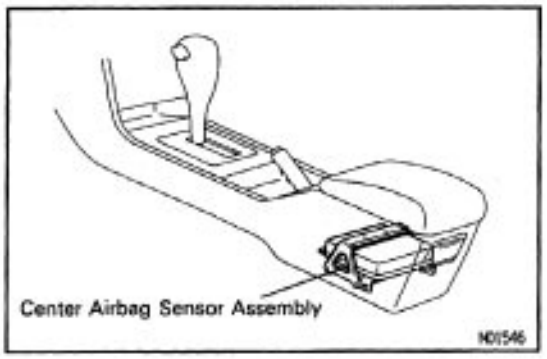
4. FRONT PASSENGER AIRBAG ASSEMBLY

The inflater and bag of the supplemental restraint system are stored in the front passenger airbag as–sembly and cannot be disassernbled. The inflater con–tains a squib, igniter charge, gas generant, etc., and inflates the bag in case of a frontal collision.



5. SRS WARNING LIGHT

The SRS warning light is located on the combination meter. It goes on the alert the driver of trouble in the system when a malfunction is detected in the center airbag sensor assembly self – diagnosis. In normal operating condition when the ignition switch is turned to the ACC or ON position, the light goes on for about 6 seconds and then goes off.

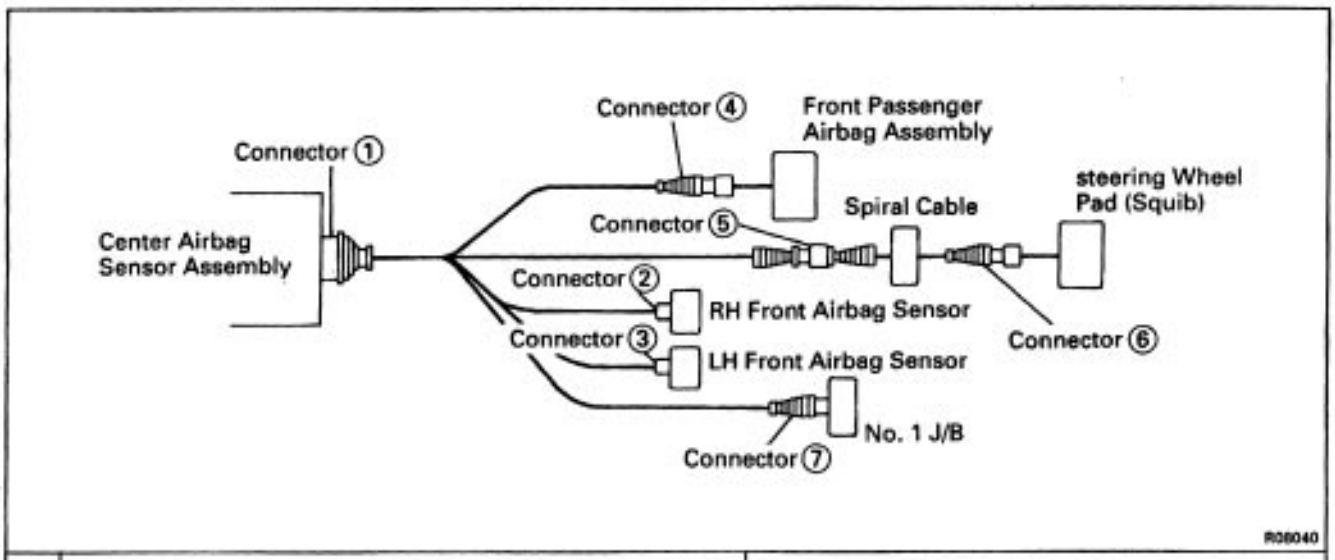


6. CENTER AIRBAG SENSOR ASSEMBLY

The center airbag sensor assembly is mounted on the floor inside the console box. The center airbag sensor assembly consists of a center airbag sensor, saving sensors, ignition control and drive circuit, diagnosis circuit, etc. It receives signals from the airbag sensors, judges whether the SRS must be activated or not and diagnosis system malfunctions.

7. SRS CONNECTORS

A11 connectors in the supplemental restraint system are colored yellow to distinguish them from other connectors. Connectors having special function and specifically designed for SRS are used in the locations shown below to ensure high reliability. These connec–tors use durable gold–plated terminals.



No.	Item	Application
(1)	Terminal Twin–Lock Mechanism	Connectors (1), (2), (3), (4), (5), (6), (7)
(2)	Airbag Activation Prevention Mechanism	Connectors (1), (4), (5), (6)
(3)	Electrical Connection Check Mechanism	Connectors (1), (2), (3)
(4)	Connector Twin–Lock Mechanism	Connectors (4), (5), (6), (7)

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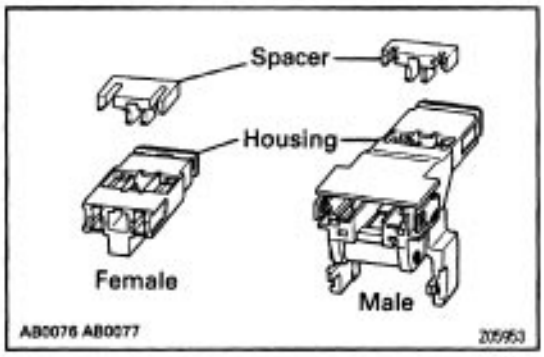
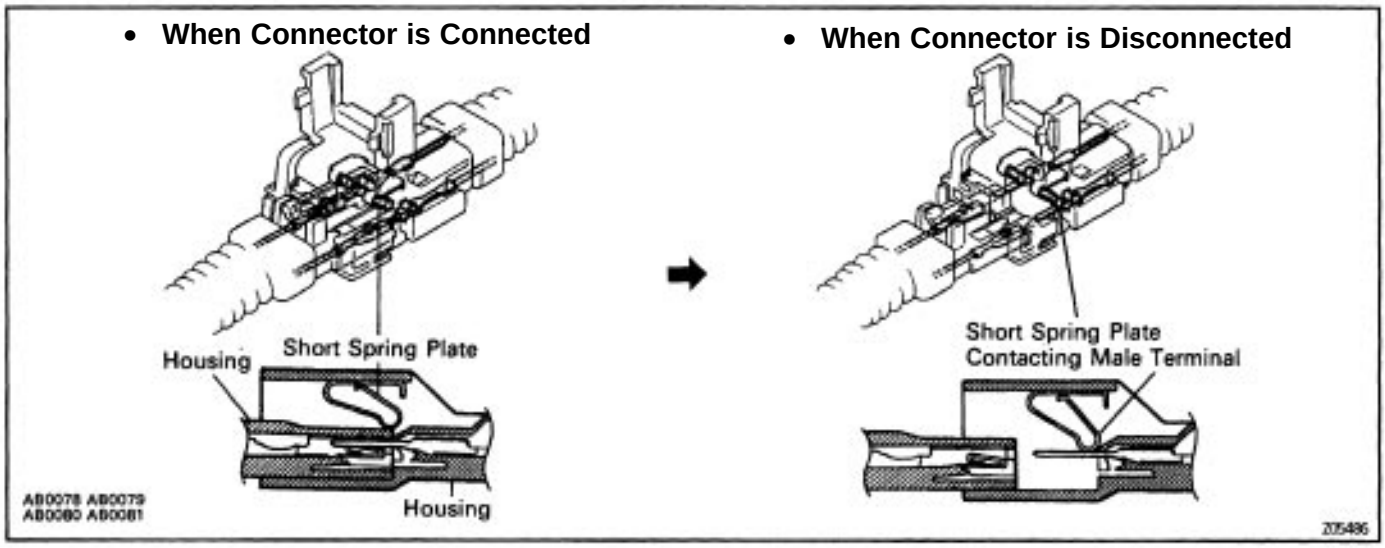


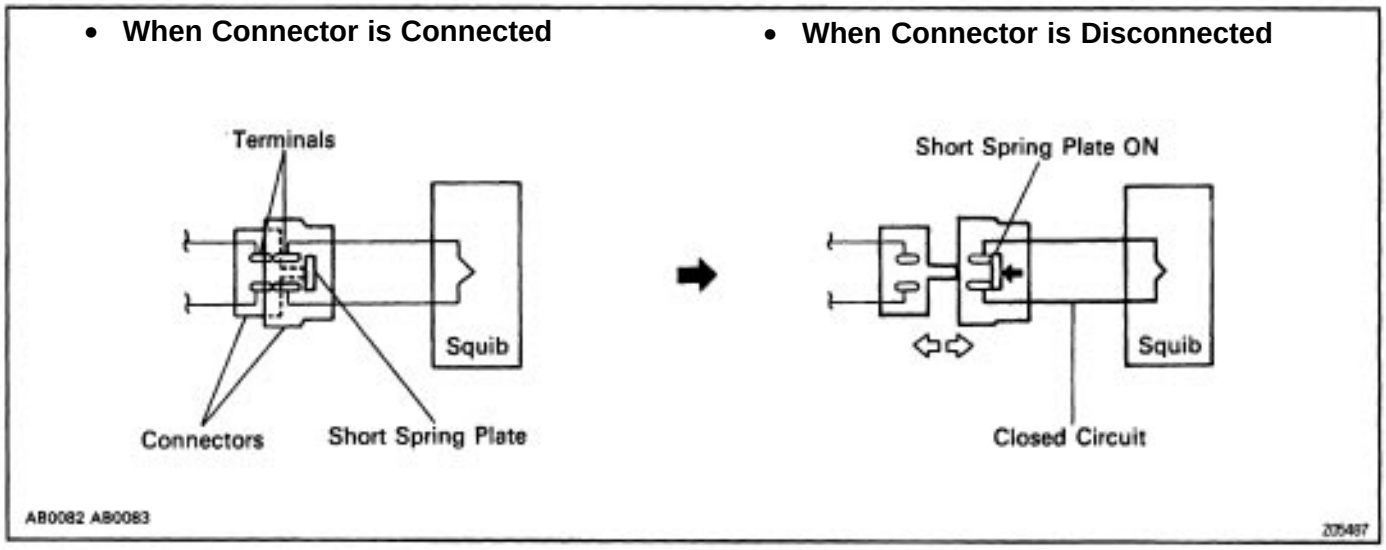
(1) Terminal Twin–Lock Mechanism

Each connector has a two–piece construction consisting of a housing and a spacer. This design secures the locking of the terminal by two locking devices (the spacer and the lance) to prevent terminals from coming out.

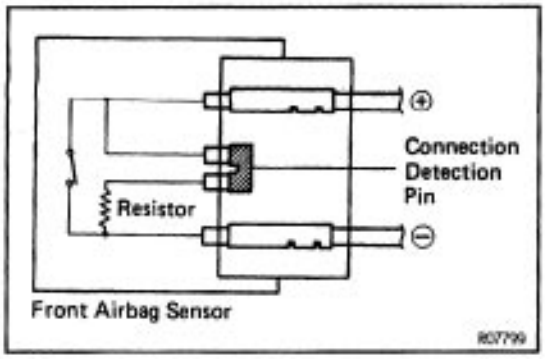
(2) Airbag Activation Prevention Mechanism

Each connector contains a short spring plate. When the connector is disconnected, The short spring plate automatically connects the power source and grounding terminals of the squib.



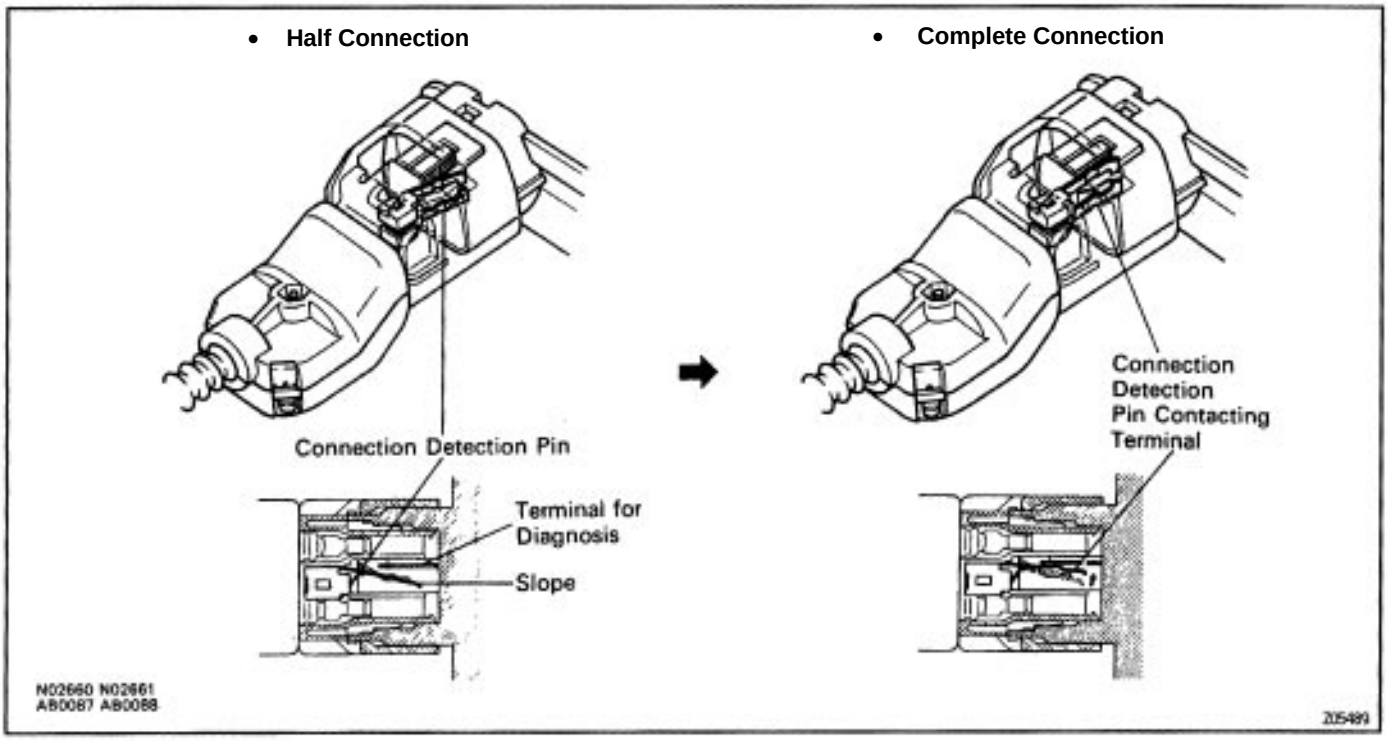


HINT: The illustration shows connectors S and¿¿. Connector (1) has a short spring plate on the female terminal side, but the operating principle is the same.



(3) Electrical Connection Check Mechanism

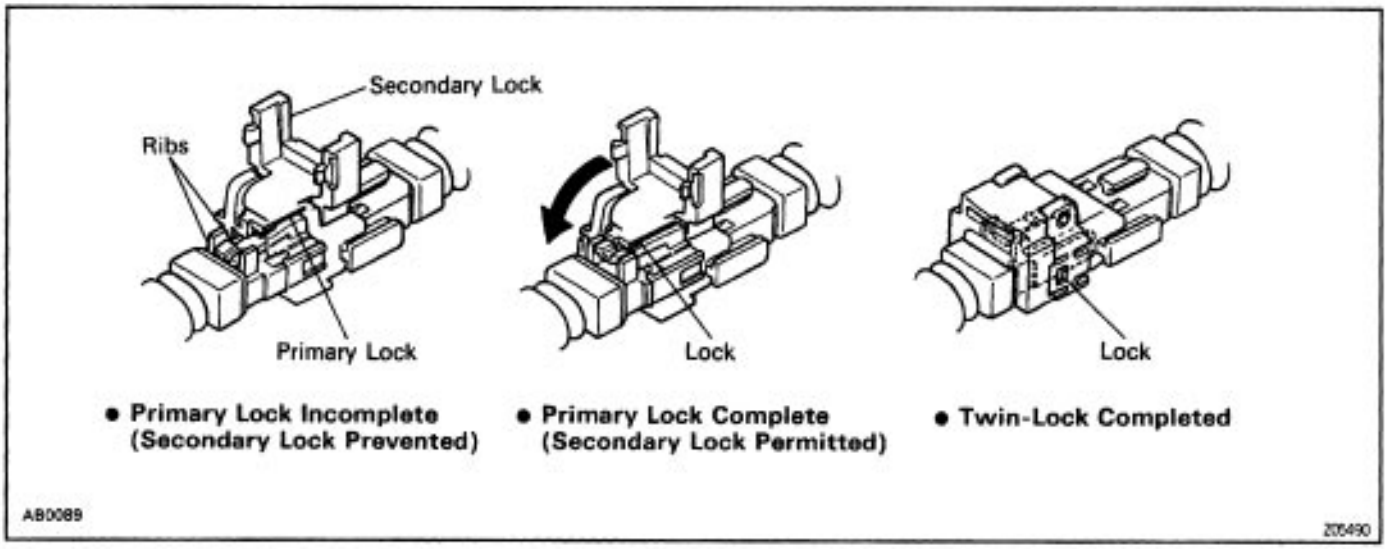
This mechanism is designed to electrically check if connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the connection detection pin connects with the diagnosis terminals when the connector housing lock is in the locked condition.



HINT: The illustration shows connector (5) Connector (1) also has the same operating principle.

(4) Connector Twin–Lock Mechanism

With this mechanism connectors (male and female connectors) are locked by two locking devices to increase connection reliability. If the primary lock is incomplete, ribs interfere and prevent the secondary lock.



When the vehicle is involved in a frontal collision in the hatched area (Fig. 1) and the shock is larger than a predetermined level, the SRS is activated automati–cally. Safing sensors are designed to go on at a sma–ller deceleration rate than the front and center airbag sensors. As illustrated in Fig. 2 below, ignition is caused when current flows to the squib, which hap–pens when a safing sensor and a front airbag sensor and/or the center airbag sensor go on simultaneously. When a deceleration force acts on the sensor, it causes the squib to ignite. Gas is then generated, increasing the pressure inside the bag rapidly. The inflated bag breaks open the steering wheel pad and front passenger airbag assembly. Bag inflation then ends, and the gas is discharged through discharge holes provided behind the bag. The bag becomes deflated as a result.

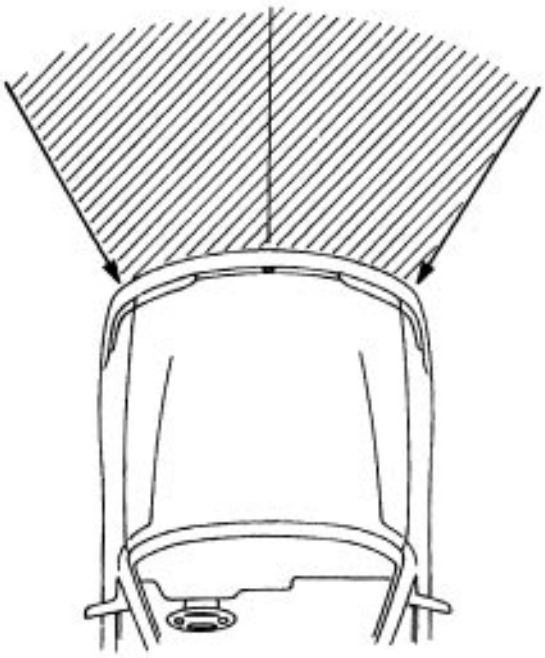


Fig. 1

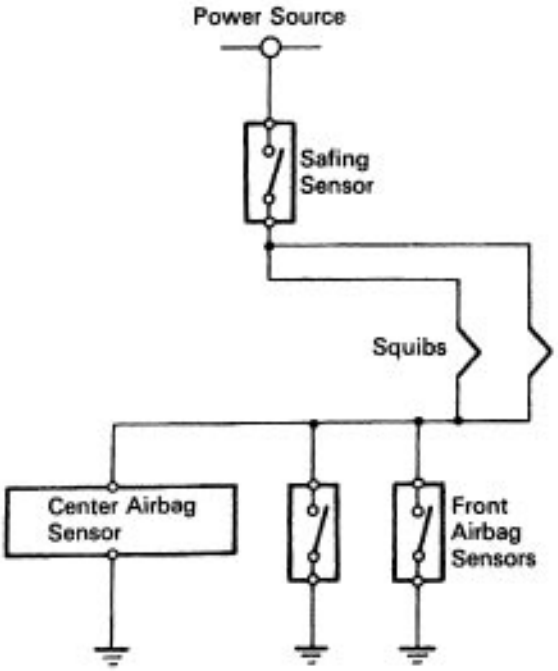


Fig. 2

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PREPARATION

SST (SPECIAL SERVICE TOOLS

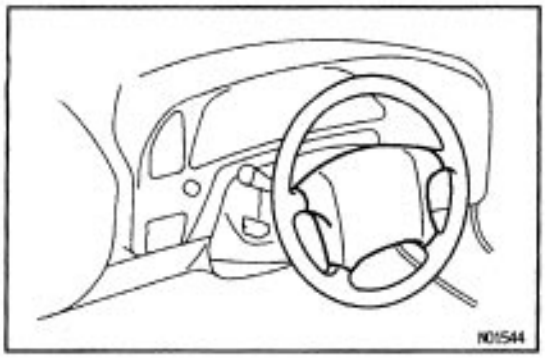
	09082–00700 SRS Airbag Deployment Tool	
	09213–31021 Crankshaft Pulley Puller	Steering wheel
	09843–18020 Diagnosis Check Wire	

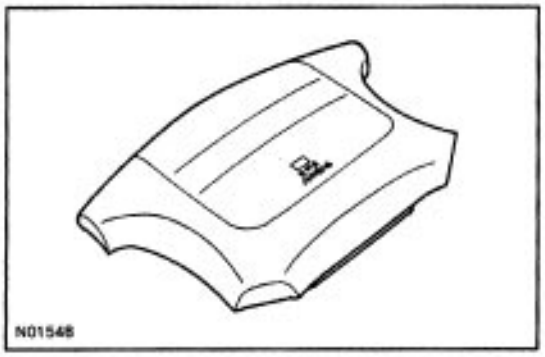
RECOMMENDED TOOLS

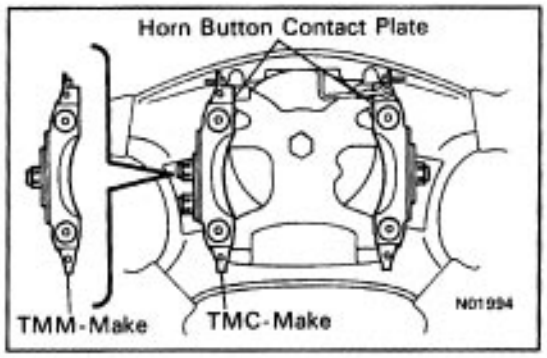
	09042–00010 Torx Socket T30	Steering wheel pad
	09042–00020 Torx Socket T40	Center airbag sensor assembly
	09082–00050 TOYOTA Electrical Tester Set	

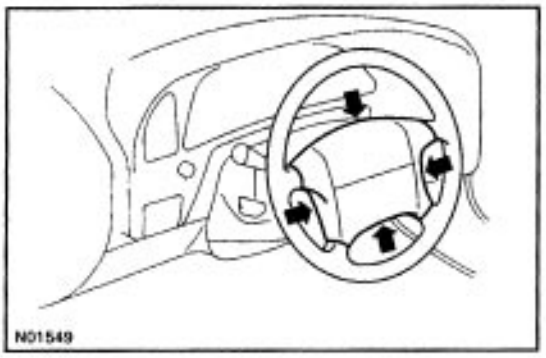
EQUIPMENT

Torque wrench	
Bolt Length: 35 mm (1.38 in.) Pitch: 1.0 mm (0.039 in.) Diam.: 6.0 mm (0.236 in.)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360mm (14.17 in.)	Airbag disposal
Tire with disk wheel Width: 185 mm (7028 in.) Inner diem.: 360 mm (14.17 in.)	Airbag disposal
Vinyl bag	Airbag disposal









STEERING WHEEL PAD AND SPIRAL CABLE

INSPECTION ITEMS

1. VEHICLES NOT INVOLVED IN A COLLISION

(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the steering wheel pad (with airbag) installed in the vehicle.

Check for cuts, minute cracks or marked discoloration of the steering wheel pad top surface and grooved portion.

2. VEHICLES INVOLVED IN A COLLISION
IF THE AIRBAG IS NOT DEPLOYED

(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the steering wheel pad (with airbag) removed from the vehicle.

- Check for cuts or cracks in, or marked discoloration of the steering wheel pad top surface and grooved portion.
- Check for cuts and cracks in, or chipping of connectors and wire harness.
- Check for deformation of the horn button contact plate of the steering wheel.

HINT:

- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.
- There should be no interference between the steering wheel pad and the steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel.

CAUTION: For removal and installation of the steering wheel pad, see page RS–19. REMOVAL AND INSTALLATION' and be sure to follow the correct procedure.

IF THE AIRBAG IS DEPLOYED

(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the steering wheel pad (with airbag) removed from he vehicle.

- Check for deformation of the horn button contact plate of the steering wheel.
- Check for damage to the spiral cable connector and wire harness.

HINT:

- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.
- There should be no interference between the steering wheel pad and the steering wheel, and the clearance should be uniform all the way around when the new steering pad is installed on the steering wheel.

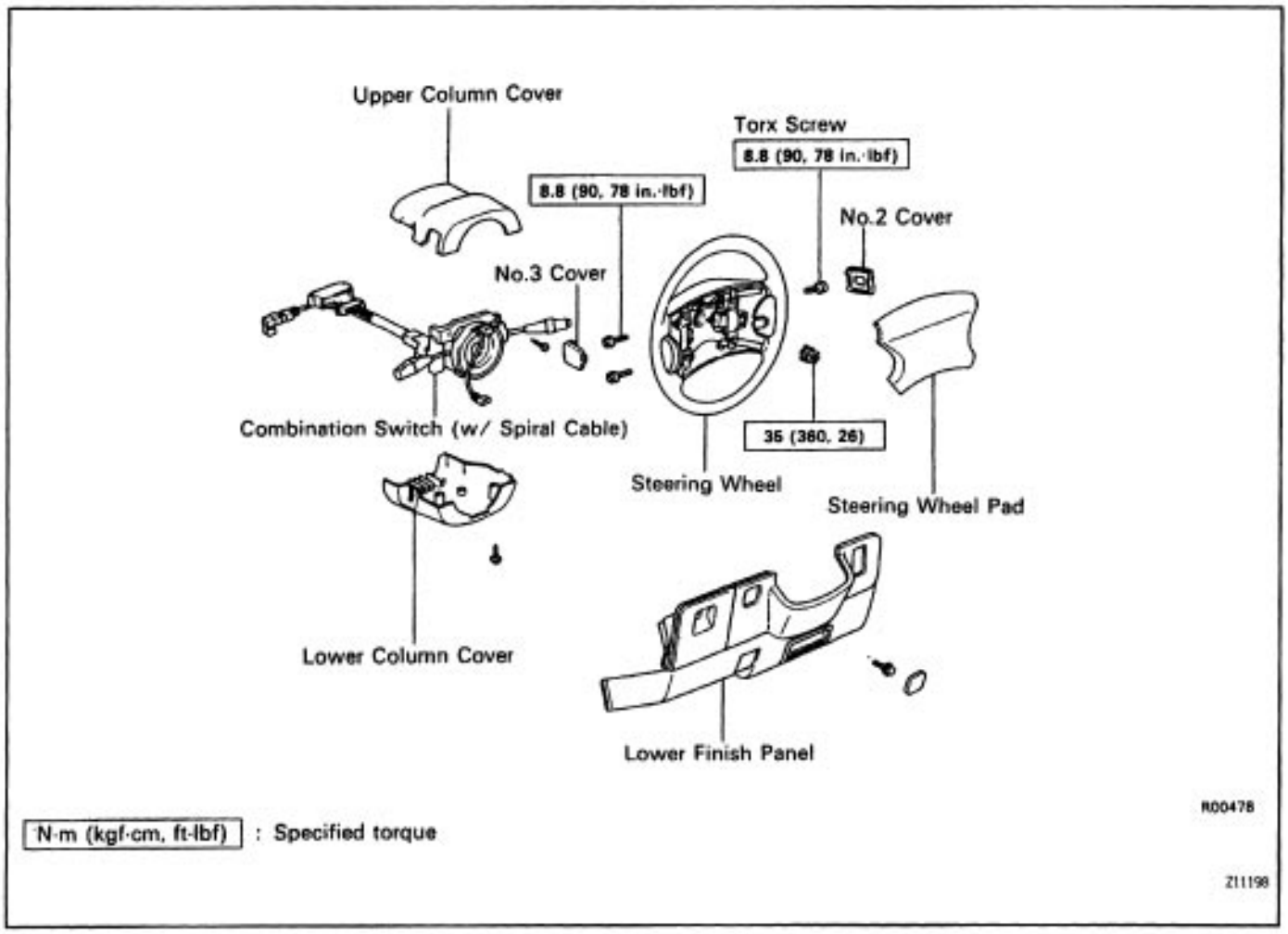
REPLACEMENT REQUIREMENTS

In the following cases, replace the steering wheel pad, steering wheel or spiral cable.

CAUTION: For replacement of the steering wheel pad, see page RS– 19.'STEERING WHEEL PAD AND SPIRAL CABLE REMOVAL AND INSTALLATION' and be sure to follow the correct procedure.

- If the airbag has been deployed.
- If the steering wheel pad or spiral cable has been found to be faulty in troubleshooting.
- If the steering wheel pad, steering wheel or spiral cable has been found to be faulty during the check in item 1–(b) or 2–(b).
- If the steering wheel pad has been dropped.

COMPONENTS



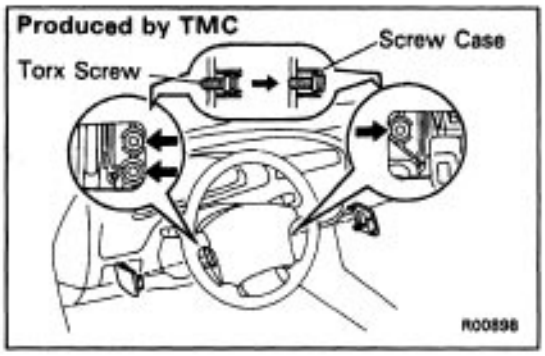
STEERING WHEEL PAD AND– SPIRAL CABLE REMOVAL AND INSTALLATION

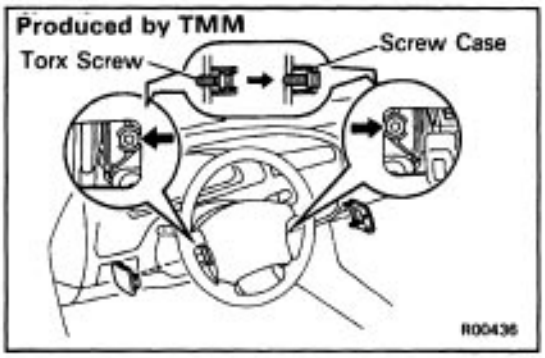
NOTICE:

- **If the wiring connector of the supplemental re–straint system is disconnected with the ignition switch at ON or ACC, diagnostic trouble codes will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace with new parts.**

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery (See page RS–2).





2. REMOVE STEERING WHEEL PAD

(a) Remove negative terminal (–) from the battery and wait at least 90 seconds.

(b) Place the front wheels facing straight ahead.

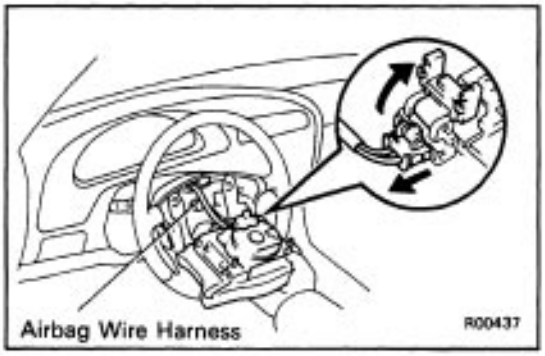
(c) Using a torx wrench, loosen the screws.

Produced by TMC: 3 screws

Produced by TMM: 2 screws

Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)

(d) Loosen the torx screws until the groove along the screw circumference catches on the screw case.



(e) Pull the wheel pad out from the steering wheel and disconnect the airbag connector.

NOTICE: When removing the wheel pad, take care not to pull the airbag wire harness.

CAUTION:

- **When storing the wheel pad, keep the upper surface of the pad facing upward (See pages RS–4).**
- **Never disassemble the wheel pad.**

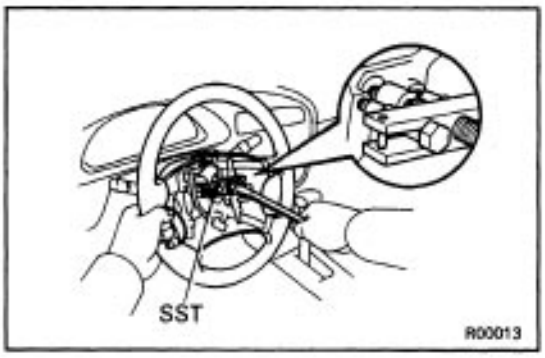
3. REMOVE STEERING WHEEL

(a) Disconnect the connector.

(b) Remove the set nut.

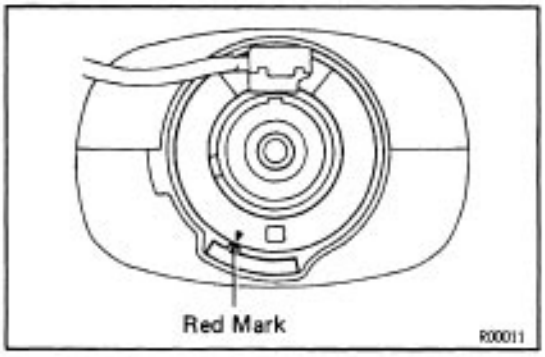
(c) Place matchmarks on the steering wheel and main shaft.

(d) Using SST, remove the steering wheel.
SST 09213–31021



4. REMOVE AND INSTALL SPIRAL CABLE FROM/TO COMBINATION SWITCH

NOTICE: Do not disassemble the spiral cable or apply oil to it.



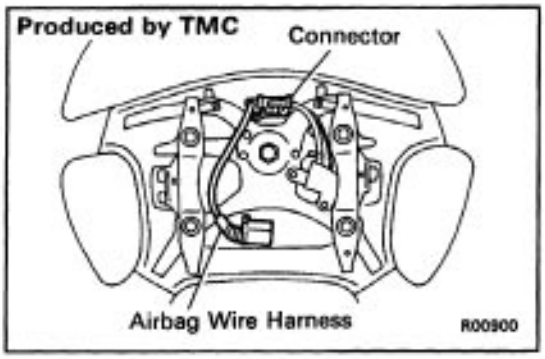
5. CENTER SPIRAL CABLE

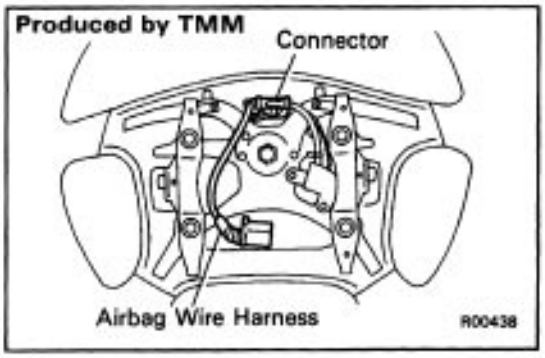
(a) Check that the front wheels are facing straight ahead.

(b) Turn the spiral cable counterclockwise by hand until it becomes harder to turn the cable.

(c) Then rotate the spiral cable clockwise about 3 turns to align the red mark.

HINT: The spiral cable will rotate about 3 turns to either left or right of the center.





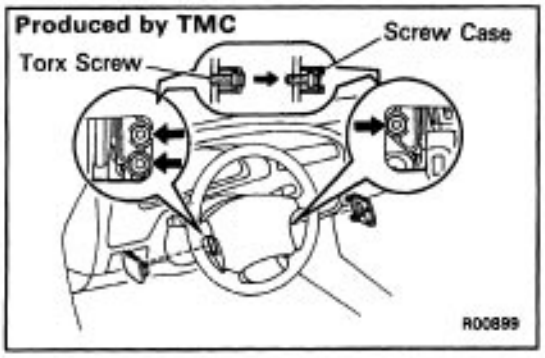
6. INSTALL STEERING WHEEL

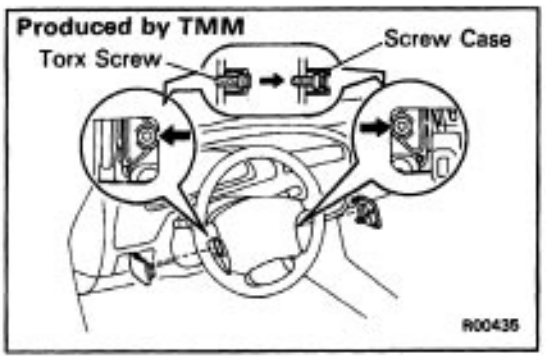
(a) Align matchmarks on the steering wheel and main shaft, and install the steering wheel to the main shaft.

(b) Install and torque the set nut.

Torque: 35 N–m (360 kgf–cm, 26 ft–lbf)

(c) Connect the connector.





7. INSTALL STEERING WHEEL PAD

(a) Connect the airbag connector.

(b) Install the wheel pad after confirming that the circum–ference groove of the torx screws is caught on the screw case.

(c) Using a torx wrench, tighten the screws.

Produced by TMC: 3 screws

Produced by TMM: 2 screws

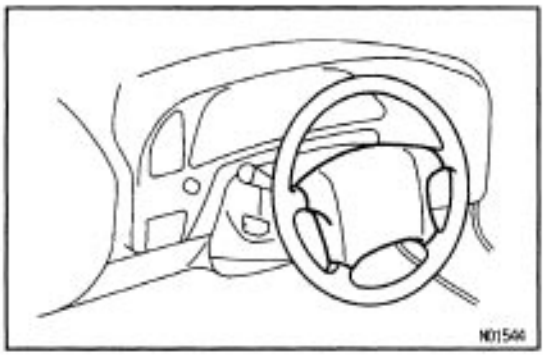
Torque: 8.8 N–m (90 kgf–cm. 78 in.–lbf)

NOTICE:

- **Make sure the wheel pad is installed to the specified torque.**
- **If the wheel pad has been dropped, or there are cracks, dents or other defects in the case or connec–tor, replace the wheel pad with a now one.**
- **When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**

8. CHECK STEERING WHEEL CENTER POINT

9. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

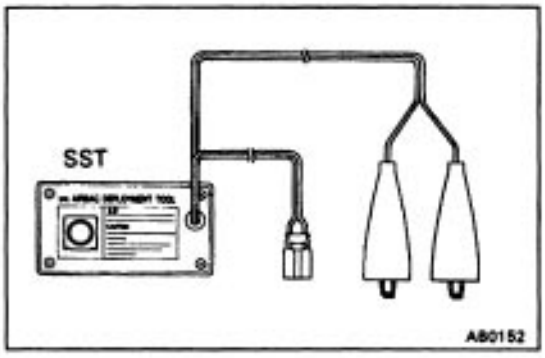


STEERING WHEEL PAD (WITH AIRBAG) DISPOSAL

When scrapping vehicles equipped with a supplemen–tal restraint system or disposing of a steering wheel pad (with airbag), always first deploy the airbag in accordance with the procedure described below.
If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC..

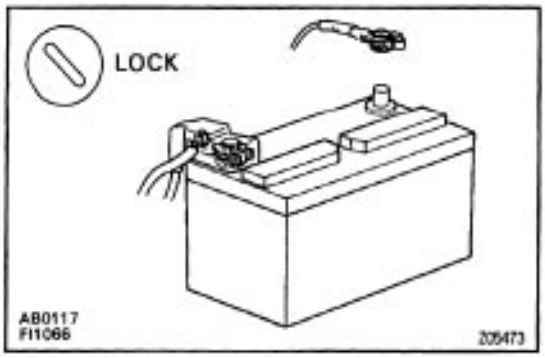
Never dispose of a steering wheel pad which has an undeployed airbag.

When disposing of a steering wheel pad with an airbag deployed in a collision, follow the same proce–dure given under ”When Scrapping Vehicle, part 5, DISPOSAL OF STEERING WHEEL PAD (WITH AIRBAG)”.



PRECAUTIONS FOR AIRBAG DEPLOYMENT

- The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.
- When deploying the airbag, always use the speci–fied SST; SRS AIRBAG DEPLOYMENT TOOL (SST 09082 –00700). Perform the operation in a place away from electrical noise.
- When deploying an airbag, perform the operation from at least 10 m (33 ft) away from the steering wheel pad.
- The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.
- Use gloves and safety glasses when handling a steering wheel pad with deployed airbag.
- Always wash your hands with water after com–pleting the operation.
- Do not apply water, etc. to a steering wheel pad with deployed airbag.



When scrapping vehicle

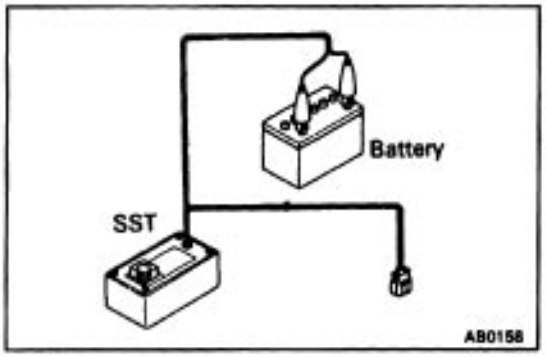
HINT: Have a battery ready as the power source to deploy the airbag.

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery (See page RS–2).

2. CONFIRM FUNCTIONING OF SST (See page RS–28)

SST 09082–00700



3. INSTALL SST

CAUTION: Check that there is no looseness in the steering wheel and steering wheel pad.

(a) Remove the No.1 under cover.

(b) Disconnect the airbag connector of the spiral cable.

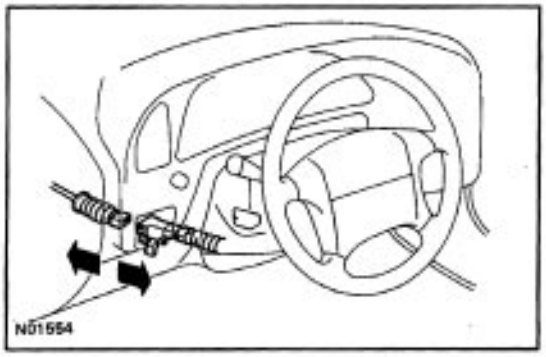
(c) Connect the SST connector to the airbag connector of the spiral cable.
SST 08082–00700

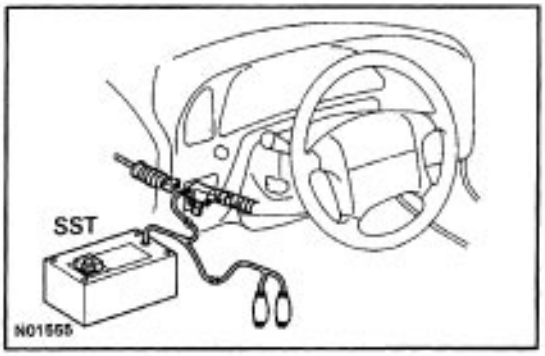
(d) Move the SST to at least 10 m (33 ft) from the front of the vehicle.

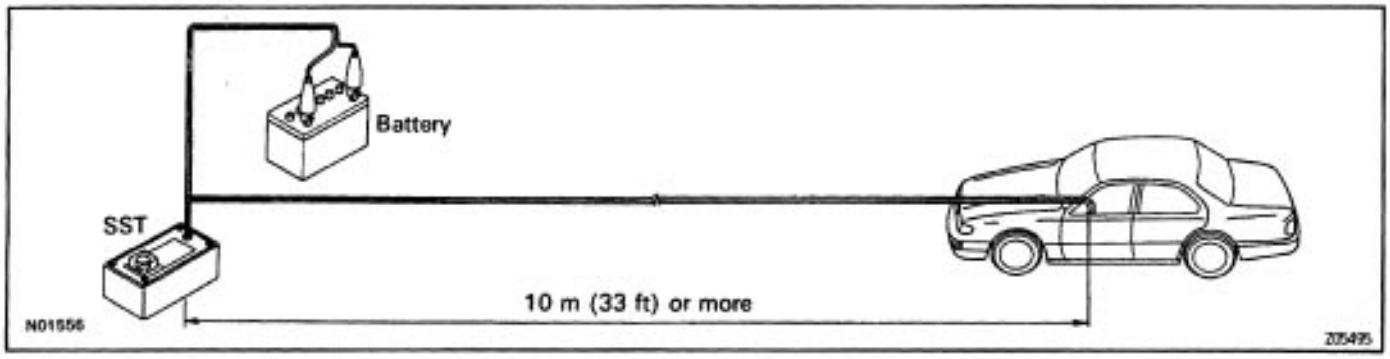
(e) Close all the doors and windows of the vehicle.

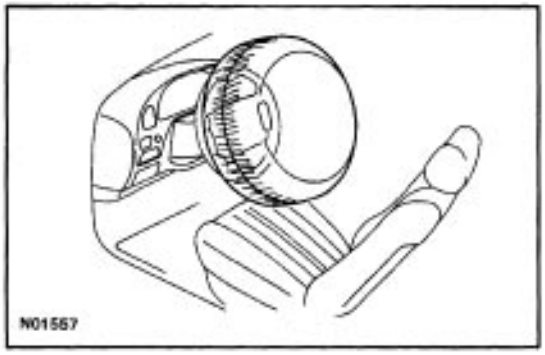
NOTICE: Take care not to damage the SST wire harness.

(f) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.









4. DEPLOY AIRBAG

(a) Confirm that no–one is inside the vehicle or within 10 m (33 ft) of the vehicle.

(b) Press the SST activation switch and deploy the airbag.

HINT: The airbag deploys simultaneously as the LED of the SST activation switch lights up.

5. DISPOSAL OF STEERING WHEEL PAD (WITH AIRBAG)

CAUTION:

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a ste–ering wheel pad with deployed airbag.**
- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after complet–ing the operation.**

(a) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the steering wheel pad still installed.

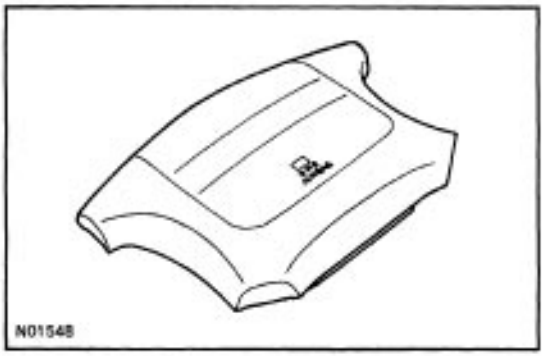
(b) When moving a vehicle for scrapping which has a steering wheel pad with deployed airbag, use gloves and safety glasses.

When disposing of steering wheel pad only

When disposing of the steering wheel pad (with airbag) only, never use the customer's vehicle to deploy the airbag.

Remove the steering wheel pad from the vehicle and be sure to follow the procedure given below when deploying the airbag.

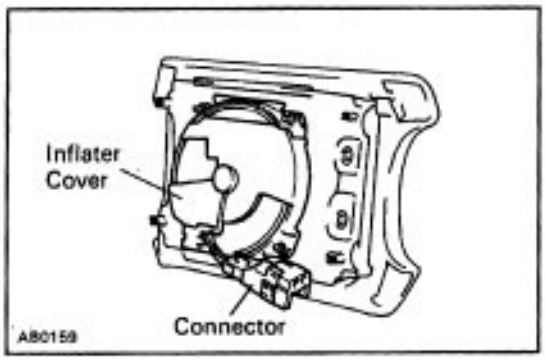
HINT: Have a battery ready as the power source deploy the airbag.



1. REMOVE STEERING WHEEL PAD (Seepage RS–20)

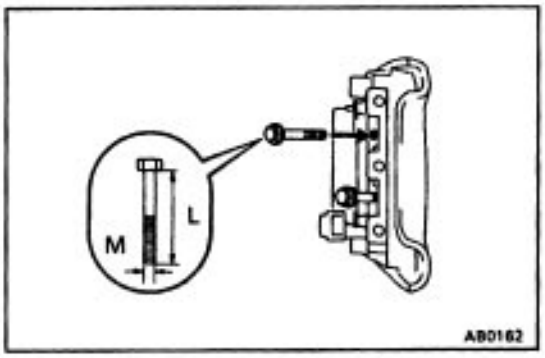
CAUTION:

- **When removing the steering wheel pad (with airbag), work must be started after 90 seconds from the time the Ignition switch is turned to the LOCK position and the negative (–) terminal cable is dis–connected from the battery.**
- **When storing the steering wheel pad, keep the upper surface of the pad facing upward.**



2. REMOVE STEERING WHEEL PAD CONNECTOR

Remove the connector on the steering wheel pad rear surface from the inflater cover.



3. FIX STEERING WHEEL PAD TO DISC WHEEL WITH TIRE

(a) Install bolts with washer in the 3 bolt holes in the steering wheel pad.

Bolt:

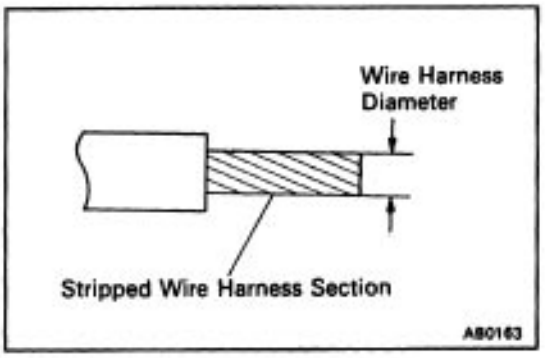
L 35.0 mm (1.4 in.)

M 6.0 mm

Pitch 1.0 mm

NOTICE: Tighten the bolts by hand until the bolts become difficult to turn.

Do not tighten the bolts too much.



(b) Using a service–purpose wire harness for vehicle tie down the steering wheel pad to the disc wheel.

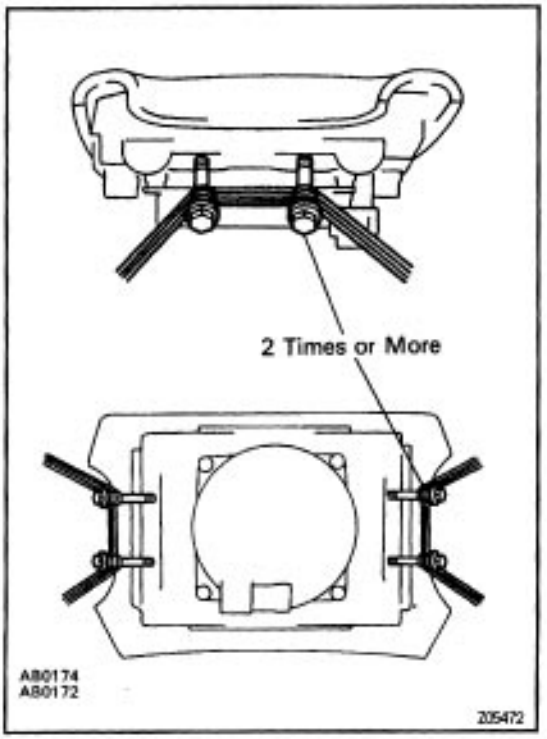
Wire harness:

Stripped wire harness section 1.25 mm^2 or more (0.002 in^2 or more)

HINT: To calculate the square of the stripped wire harness section

Square = 3.14 x $(Diameter)^2$ divided by 4

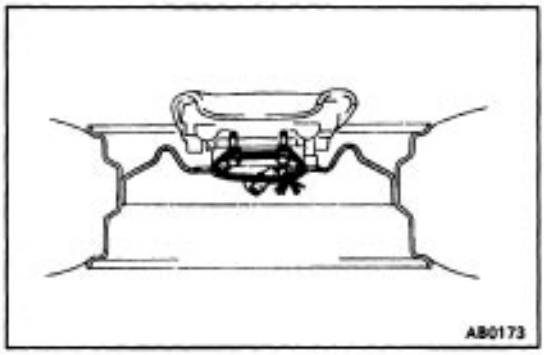
CAUTION: If a wire harness which is too thin or some other thing is used to tie down the steering wheel pad it may be snapped by the chock when the airbag is deplo–yed, this is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 mm^2 (0.002 in^2.).



(1) Using 3 wire harnesses, wrap the wire harnesses at least 2 times each around the bolts installed on the left and right sides of the steering wheel pad.

CAUTION: Tightly wind the wire harness around the bolts so that there is no slack.

If there is slackness in the wire harness, the steering wheel pad may come loose due to the shock when the airbag is deployed, this is highly dangerous.

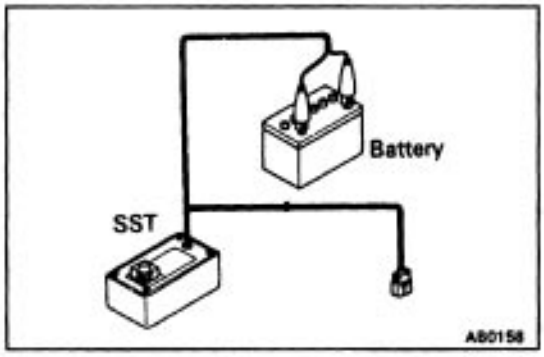


(2) Face the upper surface of the steering wheel pad upward.
Separately tie the left and right sides of the steering wheel pad to the disc wheel through the hub nut holes.
Position the steering wheel pad connector so that it hangs downward through a hub hole in the disc wheel.

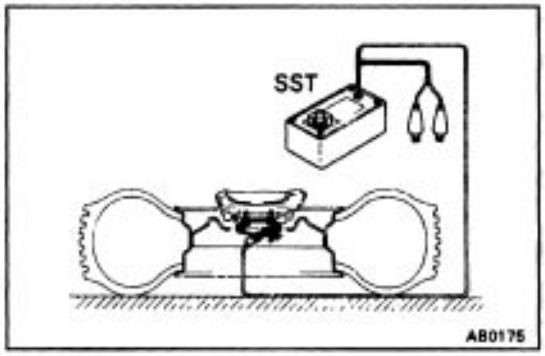
CAUTION:

- **Make sure that the wire harness is tight. It is very dangerous if looseness in the wire harness results in the steering wheel pad coming free through the shock of the airbag deploying.**
- **Always tie down the steering wheel pad with the pad side facing upward. It is very dangerous if the steering wheel pad is tied down with the metal surface facing upward as the wire harness will be cut by the shock of the airbag deploying and the steering wheel pad will be thrown into the air.**

HINT: The disc wheel will be marked by airbag deployment, so use a redundant disc wheel.



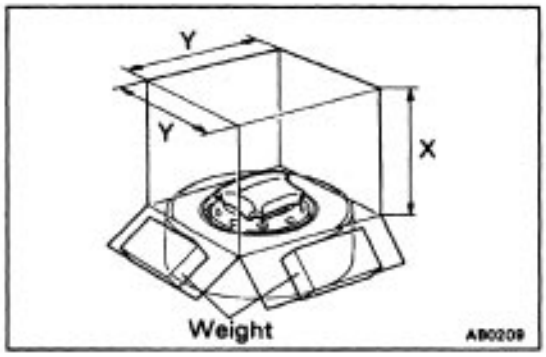
4. CONFIRM FUNCTIONING OF SST
(See page RS–28)
SST 09082–00070



5. INSTALL SST
CAUTION: Place the disc wheel on level ground.
(a) Connect the SST connector to the steering wheel pad connector.
SST 09082–00700

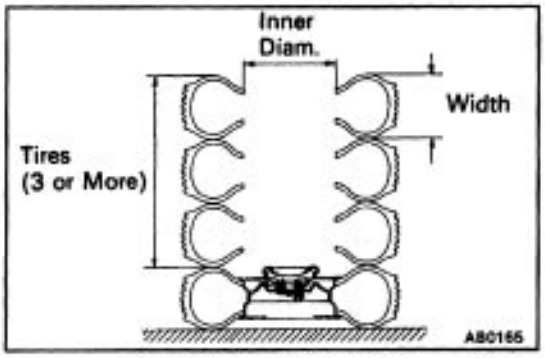
NOTICE: To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also provide some slack for the SST wire harness inside the disc wheel.

(b) Move the SST to at least 10 m (33 ft) away from the steering wheel pad tied down on the disc wheel.



6. COVER STEERING WHEEL PAD WITH CARDBOARD BOX OR TIRES
(Covering Method Using Cardboard Box)

Cover the steering wheel pad with the cardboard box and weigh the cardboard box down in four places with a at least 196 N (20 kgf. 44 lbf).
Size of cardboard box:
Must exceed the following dimensions
x= 460 mm (18.11 in.)
When dimension y of the cardboard box exceeds the diameter of the disc wheel with tire the steering wheel pad is tied to–
x = 460 mm (18.11 in.) + width of tire
y = 650 mm (25.59 in.)



NOTICE: It a cardboard box smaller than the size speci–fied is used, the cardboard box will be broken by the shock of the airbag deployment.

(Covering Method Using Tires)

Place at least three tires without disc wheel on top of the disc wheel with tire to which with tire to which the steering wheel pad is tied.
Tire size: Must exceed the following dimensions–
Width 185 mm (7.28 in.)
Inner diam 360 mm (14.17 in.)

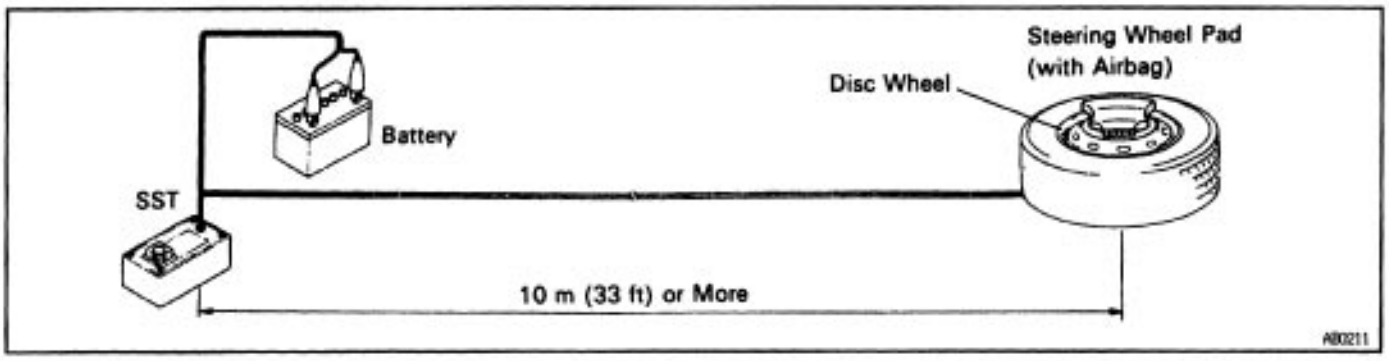
CAUTION: Do not use tires with disc wheels.

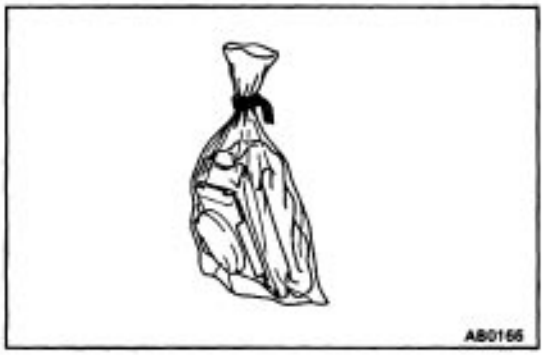
NOTICE: The tires by marked by the airbag deployment, so use redundant tires.

7. AIRBAG DEPLOYMENT

(a) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
(b) Confirm that no–one is within 10 m (33 ft) of the disc wheel the steering wheel pad is tied to.
(c) Press the SST activation switch and deploy the airbag.

HINT: The airbag deploys simultaneously as the LED of the SST activation switch lights up.





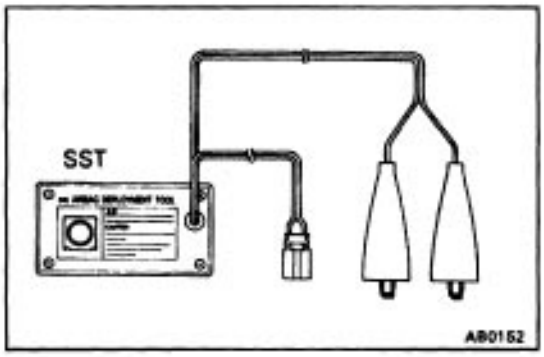
8. DISPOSAL OF STEERING WHEEL PAD (WITH AIRBAG)

CAUTION:

- **The steering wheel pad is battery hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a ste–ering wheel pad with deployed airbag.**
- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after complet–ing the operation.**

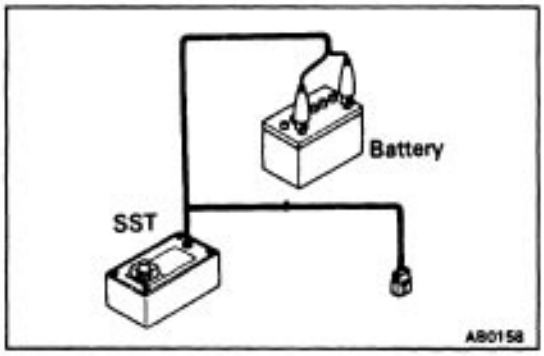
(a) Remove the steering wheel pad from the disc wheel.

(b) Place the steering wheel pad in a vinyl bag, tie the end tightly and dispose of it the same way as other general parts.



CONFIRM FUNCTIONING OF SST

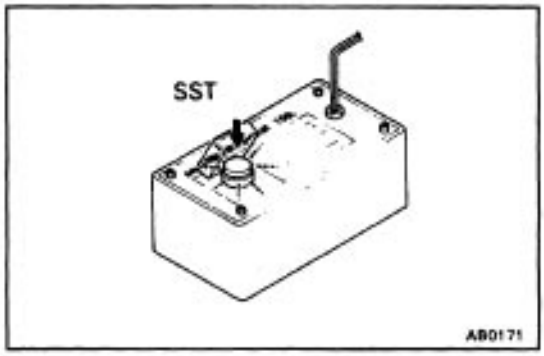
When deploying the airbag, always use the specified SST: SRS AIRBAG DEPLOYMENT TOOL.
SST 09082–00700



1. CONNECT SST TO BATTERY

Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.

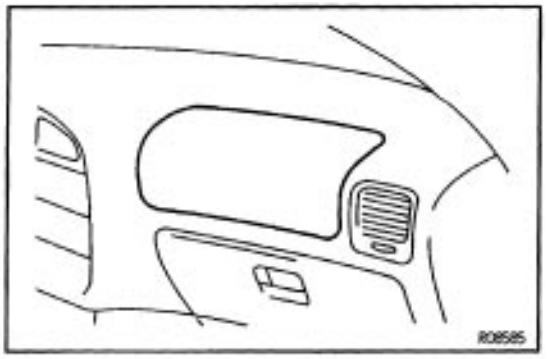
HINT: Do not connect the yellow connector which connects with the airbag system.



2. CONFIRM FUNCTIONING OF SST

Press the SST activation switch, and confirm the LED of the SST activation switch lights up.

CAUTION: If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.



FRONT PASSENGER AIRBAG ASSEMBLY

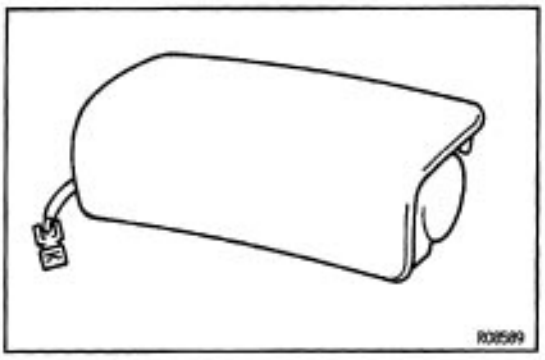
INSPECTION ITEMS

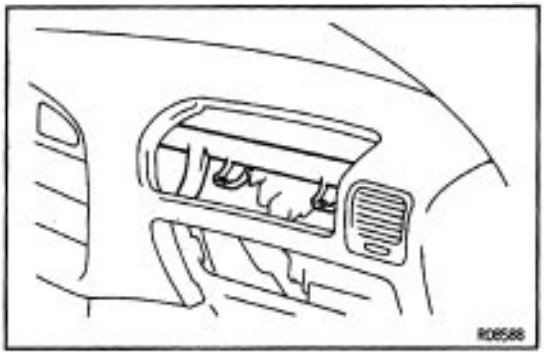
1. VEHICLES NOT INVOLVED IN A COLLISION

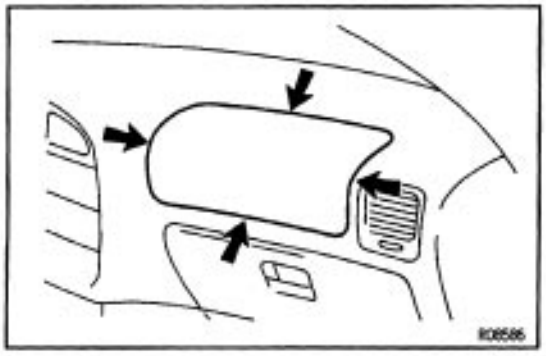
(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the front passenger airbag assembly installed in the vehicle.

- **Check for cuts, minute cracks or marked discoloration of the front passenger airbag door.**







2. VEHICLE INVOLVED IN A COLLISION
IF THE AIRBAG IS NOT DEPLOYED

(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the airbag assembly removed from the vehicle.

- **Check for cuts, cracks in, or marked discoloration of the front passenger aribag door.**
- **Check for cuts, cracks in, or chipping of connectors and wire harness.**
- **Check for deformation of the safety pad and instrument panel reinforcement.**

HINT:

- If the safety pad and instrument panel reinforcement is deformed, never repair it. Always replace it with a new one.
- There should be no interfernce between the safety pad and front passenger airbag door. The clearance should be uniform all the way around when the new airbag assembly is installed on the safety pad.

CAUTION: For removal and installation of the airbag assembly, see page RS–31, and be sure to follow the correct procedure.

IF THE AIRBAG IS DEPLOYED

(a) Perform a diagnostic system check (See page RS–61).

(b) Perform a visual check which includes the following items with the airbag assembly removed from vehicle.

- **Check for deformation of the safety pad, instrument panel reinforcement, glove compartment and door.**
- **Check for damage to the connector and wire harness.**

HINT:

- If the safety pad, instrument panel reinforcement, connector and wire harness is deformed, never repair it. Always replace it with a new one.
- There should be no interference between the safety pad and front passenger airbag door. The clearance should be uniform all the way around when the new aribag assembly is installed on the safety pad.

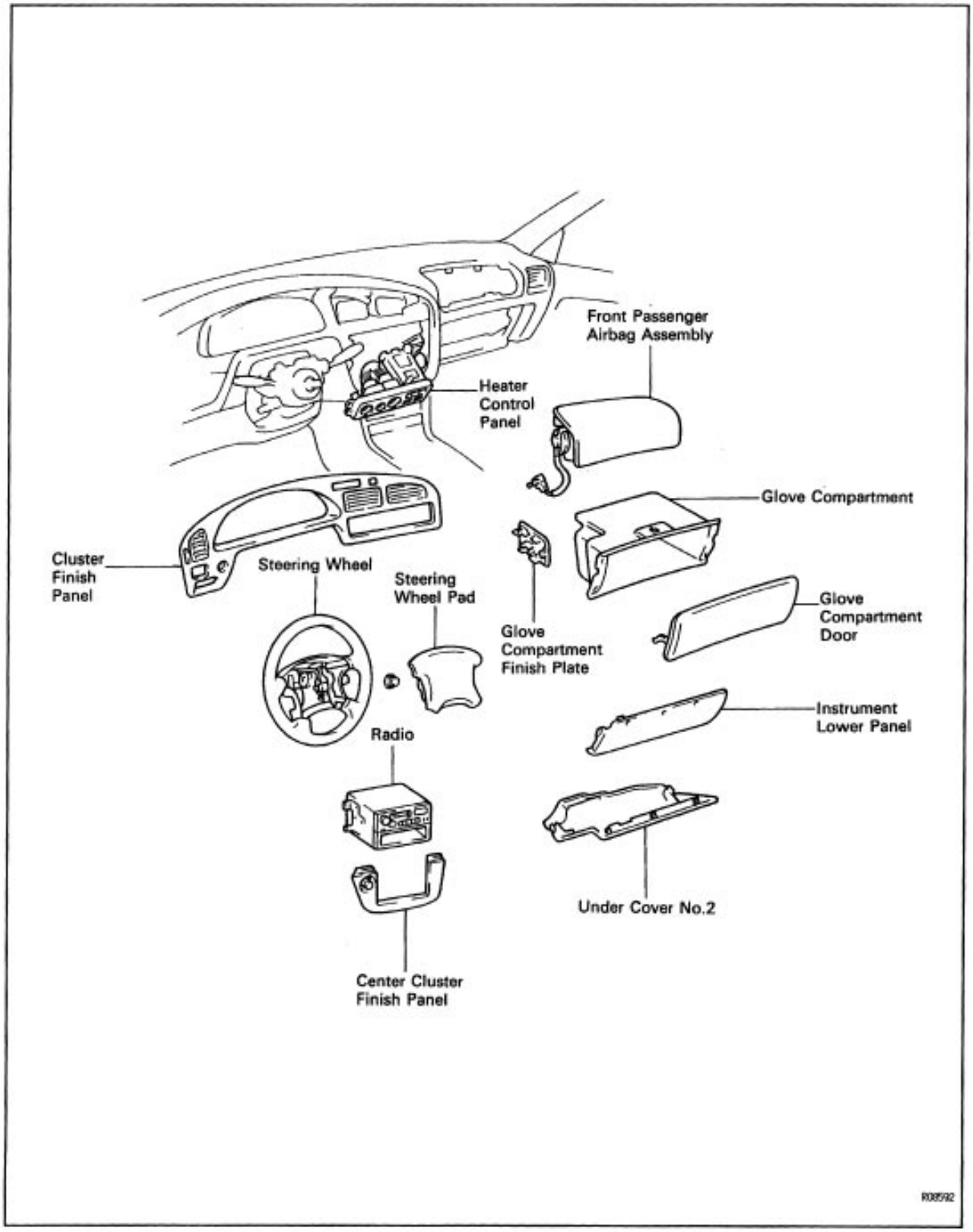
REPLACEMENT REQUIREMENTS

In the following case, replace the airbag assembly, instrument panel, instrument panel reinforcement, glove compartment and door.

CAUTION: For replacement of the airbag assembly, see page RS–31, and be sure to follow the correct procedure.

- If the airbag has been deployed.
- If the front passenger airbag assembly has been found to be fautly in troubleshooting.
- If the front passenger airbag assembly, instrument panel, reinforcement, glove compartment or glove compartment door has been found to be fautly during the check in item 1–(b) or 2– (b).
- If the front passenger airbag assembly has been dropped.

COMPONENTS


Front Passenger Airbag Assembly
Heater Control Panel
Glove Compartment
Cluster Finish Panel
Steering Wheel
Steering Wheel Pad
Glove Compartment Door
Glove Compartment Finish Plate
Instrument Lower Panel
Radio
Under Cover No.2
Center Cluster Finish Panel
R08592

FRONT PASSENGER AIRBAG ASSEMBLY TORQUE SPECIFICATION

Code	Shape	Size mm (in.)	N·m	kgf-cm	ft·lbf
Ⓐ		Φ = 8 (0.32) L = 18 (0.71)	21	210	15
Ⓑ		Φ = 6 (0.24) L = 16 (0.63)	8.0	80	69in.·lbf

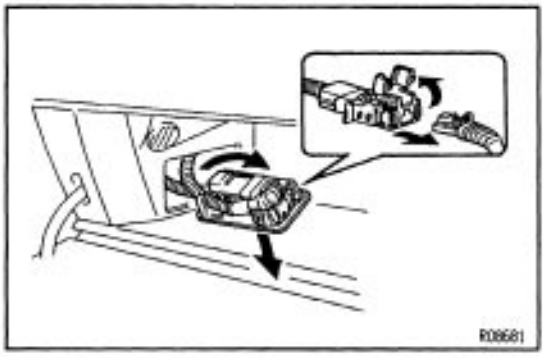
V04734

FRONT PASSENGER AIRBAG ASSEMBLY REMOVAL AND INSTALLATION

NOTICE: Never use airbag parts from another vehicle. When replacing parts, replace with new parts.

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 second from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery (See page RS–2).



2. DISCONNECT FRONT PASSENGER AIRBAG CONNECTOR

(a) Remove negative (–) terminal from the battery and wait at least 90 seconds.

(b) Remove the glove compartment door finish plate inside the glove compartment.

3. DISCONNECT AIRBAG CONNECTER

Disconnect the airbag connector.

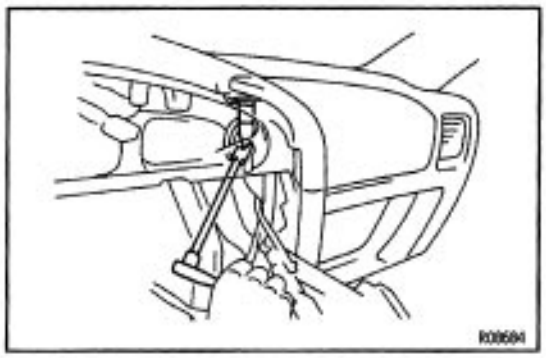
NOTICE: When disconnecting the front passenger airbag connector, take care not to pull the airbag wire harness.

4. REMOVE AND DISCONNECT FOLLOWING PARTS:

- Remove steering wheel pad
  (See page RS–20)
- Remove steering wheel
  (See page RS–20)

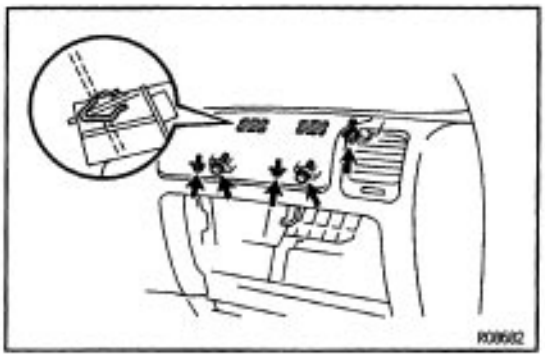
(See page BO –108)

- Remove under cover No.2
- Remove instrument lower panel
- Remove compartment panel
- Remove compartment door
- Remove combination switch
- Remove center cluster finish panel
- Remove radio
- Remove cluster finish panel
- Remove heater control panel



5. REMOVE FRONT PASSENGER AIRBAG

(a) Remove the RH side installation bolt.

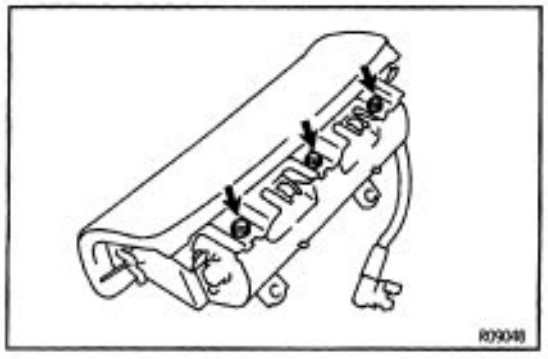


(b) Remove the 5 bolts.

(c) Remove the front passenger airbag assembly.

CAUTION:

- Do not store the front passenger airbag assembly with the airbag door facing down.
- Never disassembly the front passenger airbag assembly.

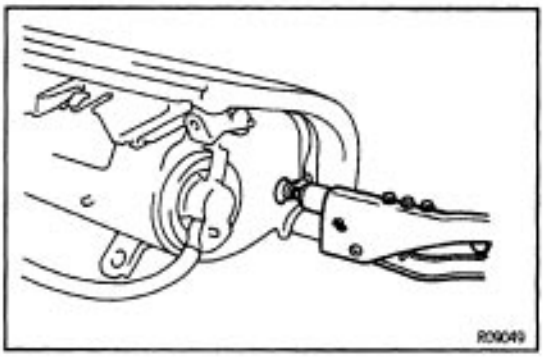


6. INSTALL AIRBAG DOOR AND FRONT PASSENGER AIRBAG ASSEMBLY (W/O AIRBAG DOOR)

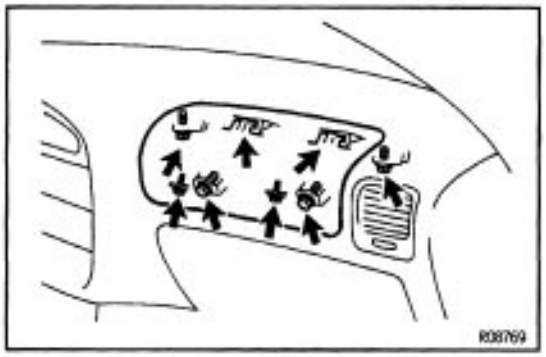
CAUTION: Make sure to replace the new airbag door and the new airbag assembly (w/o Airbag door) in combination, no alone.

(a) Install the airbag door with the 3 bolts.

Torque: 8.0 N–m (80 kgf–cm, 89in.–lbf)



(b) Using a reveter, install the 2 new rivet.



6. INSTALL FRONT PASSENGER AIRBAG ASSEMBLY

(a) Install the front passenger airbag assembly with the 6 bolts.

(b) To instrument panel reinforcement.

Diameter = 8 mm (0.32 in.)

Torque: 20 N–m (210 kgf–cm, 15 ft–lbf)

To instrument panel

Diameter = 6 mm (0.24 in.)

Torque: 8.0 N–m (80 kgf–cm, 69 in.–lbf)

NOTICE:

- **Make sure the front passenger airbag assembly is installed to the specified torque.**
- **If the front passenger airbag assembly has been dropped, or there are cracks, dents or other defects in the case or connector, replace the front passenger airbag assembly with a new one.**
- **When installing the front passenger airbag assembly, take care that the wiring do not interfere with other parts and are not pinched between other parts.**

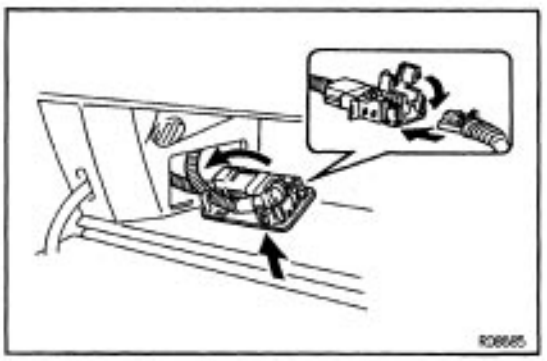
7. INSTALL FOLLOWING PARTS REMOVAL SEQUENCE IN REVERSE

- Steering wheel

Torque: 35 N–m (360 kgf–cm, 26 ft–lbf)

HINT: When installing the glove compartment, pull the airbag wire harness out from the glove compartment opening hole.

NOTICE: Do not pull the airbag wire harnesses too strongly



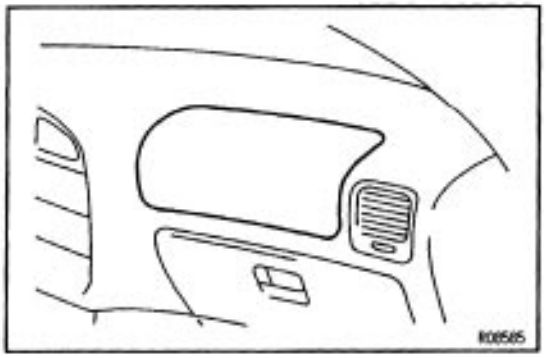
8. CONNECT AIRBAG CONNECTOR

(a) Connect the airbag connector.

(b) Put the connector on the glove compartment door finish plate.

(c) Install the glove compartment door finish plate to the glove compartment.

9. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

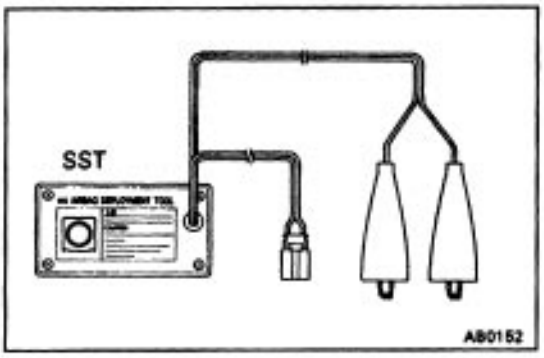


FRONT PASSENGER AIRBAG ASSEMBLY DISPOSAL

When scrapping vehicles equipped with an supple–mental restraint system or disposing of a front pas–senger airbag assembly, always first deploy the airbag in accordance with the procedure described below.
If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC..

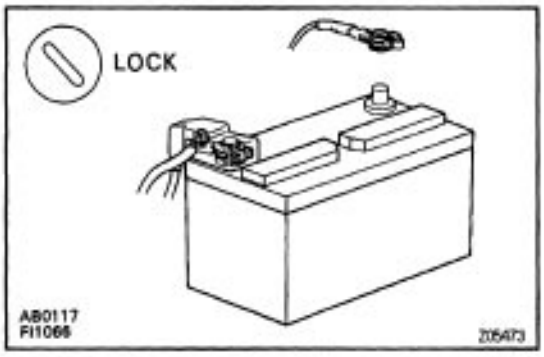
Never dispose of a front passenger airbag assembly which has an undeployed airbag.

When disposing of a front passenger airbag assembly with an airbag deployed in a collision, follow the same procedure given under ”WHEN SCRAPPING THE VE–HICLE, part 5, DISPOSAL OF FRONT PASSENGER AIRBAG ASSEMBLY”.



PRECAUTIONS FOR AIRBAG DEPLOYMENT

- The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.
- When deploying the airbag, always use the speci–fied SST: SRS AIRBAG DEPLOYMENT TOOL (SST 09082–00700). Perform the operation in a place away from electrical noise.
- When deploying an airbag, perform the operation from at least 10 m (33 ft) away from the front passenger airbag assembly.
- The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.
- Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.
- Always wash your hands with water after com–pleting the operation.
- Do not apply water, etc., to a front passenger airbag assembly deployed airbag.



When scrapping vehicle

HINT: Have a battery ready as the power source to deploy the airbag.

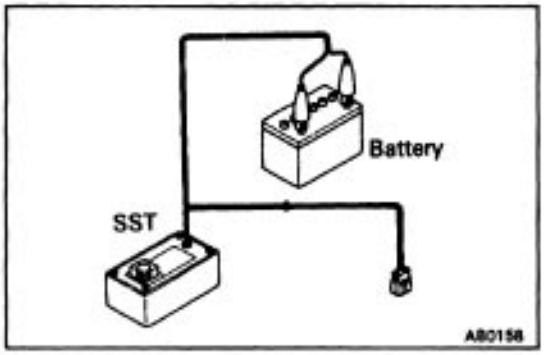
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM THE BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is disconnected from the battery (See page RS–2).

2. CONFIRM FUNCTIONING OF SST

(See page RS–42)

SST 09082–00700

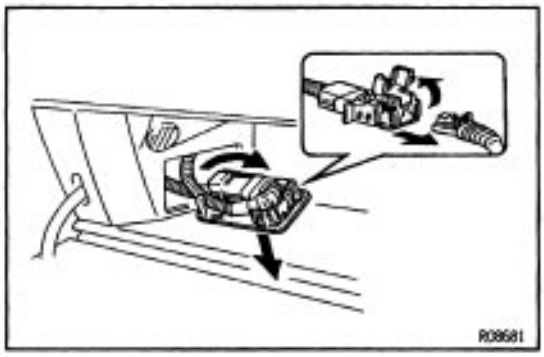


3. DISCONNECT CONNECTOR

CAUTION: Check that there is no looseness in the front passenger airbag assembly.

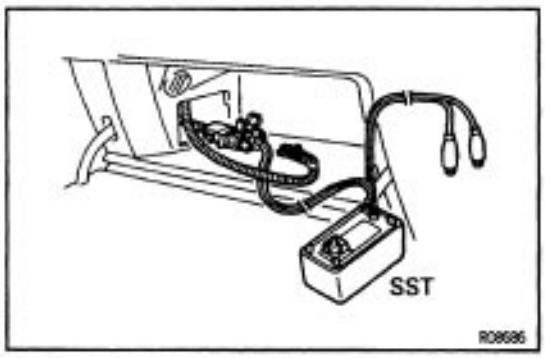
(a) Remove the glove compartment door finish plate inside the glove compartment.

(b) Disconnect the center airbag sensor assembly connector from the wiring harness connector.

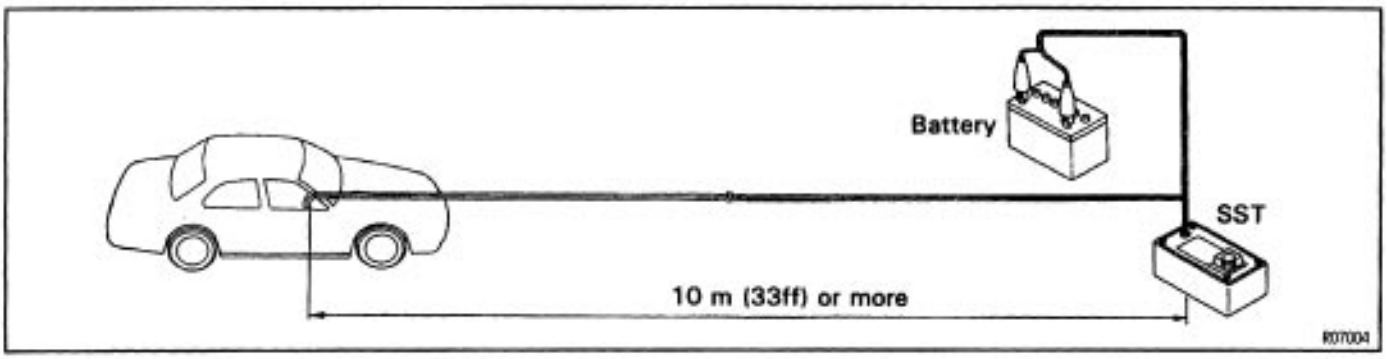


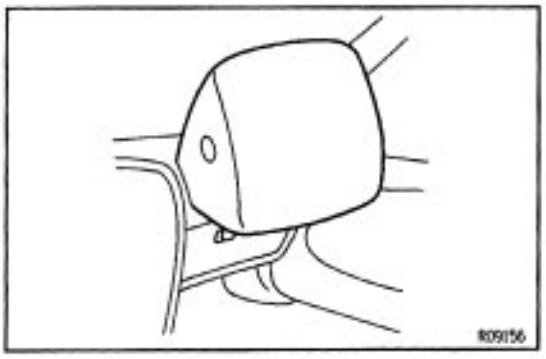
4. INSTALL SST

(a) Connect the SST connector to the airbag connector and lock the secondary lock of the twin lock.
SST 09082–00700



(b) Move the SST to at least 10 m (33 ft) from the front of the vehicle.
(c) close all the doors and windows of the vehicle.
NOTICE: Take care not change the SST wire harness.
(d) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.





6. DEPLOY AIRBAG
(a) Confirm that no–one is inside the vehicle or within 10 m (33 ft) of the vehicle.
(b) Press the SST activation switch and deploy the airbag.
HINT: The airbag deploys simultaneously as the LED of the SST activation switch lights up.

6. DISPOSAL OF FRONT PASSENGER AIRBAG AS–SEMBLY

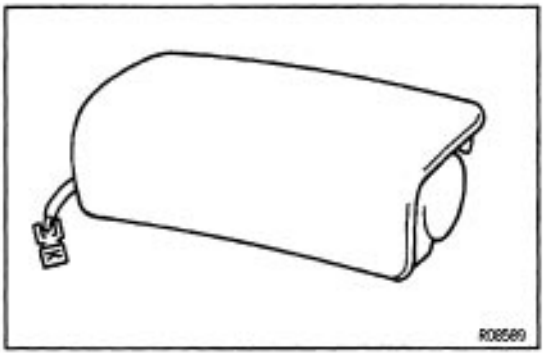
NOTICE:

- **The front passenger airbag assembly is very out not when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.**
- **Do not apply water, etc., to a front passenger airbag asssembly with deployed airbag.**
- **Always wash your hands with water after complet–ing the operation.**

When scrapping a vehicle, deploy the airbag and scrap the vehicle with the front passenger airbag assembly still installed.

When disposing of front passenger airbag assembly only

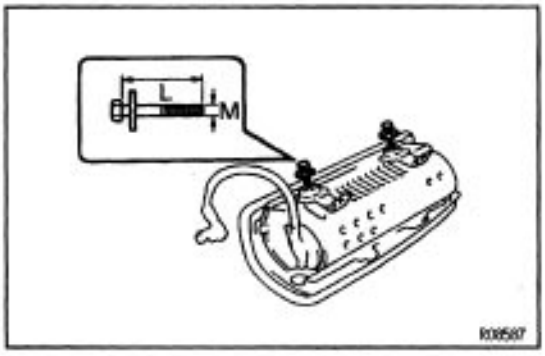
When disposing of the front passenger airbag assem–bly (w/ airbag) only, never use the customer's vehicle to deploy the airbag.
Remove the front passenger airbag assembly from the vehicle and be sure to follow the procedure given below when diploying the airbag.
HINT: Have a battery ready as the power source to deploy the airbag.



1. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY

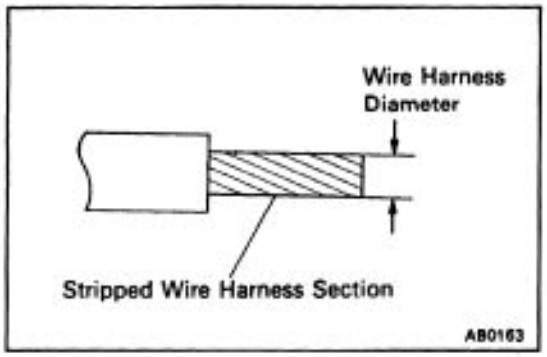
CAUTION:

- **When removing the front passenger airbag assem–bly, work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is dis–connected from the battery (See page RS–2).**
- **Store the front passenger airbag assembly with the airbag door facing up.**



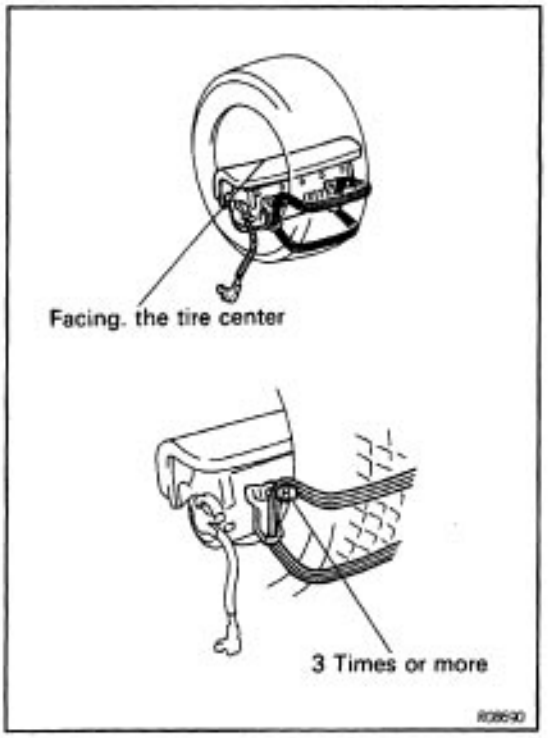
2. FIX FRONT PASSENGER AIRBAG ASSEMBLY TO TIRE

(a) Install bolts with washers in the 2 bolt holes in the front passenger airbag assembly.
Bolt:
L 35.0 mm (1.4 in.)
M 6.0 m m
Pitch 1.0 mm
NOTICE: Tighten the bolts by hand until the bolts become difficult to turn.
Do not tighten the bolts too much.



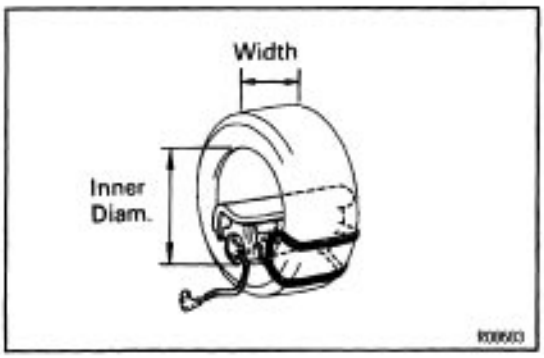
(b) Using a service–purpose wire harness for vehicle, tie down the front passenger airbag assembly to the tire.
Wire harness–. Stripped wire harness section 1.25 mm^2 or more (0.002 in^2 or more).

HINT: To calculate the square of the stripped wire harness section –
Square = 3.14 x $(Diarneter)^2$ divided by 4



CAUTION: If a wire harness which is too thin or some other thing is used to tie down the front passenger airbag assembly, it may be snapped by the shock when the airbag is deployed, this is highly dangerous.
Always use a wire harness for vehicle use which is at least 1.25 mm^2 (0.002 in^2).

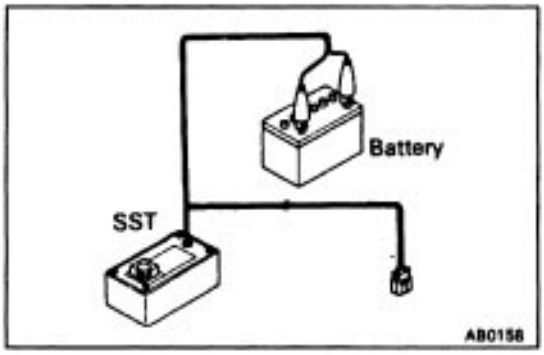
(1) Using 3 wire harness, wrap the wire harnesses at least 2 times each around the bolts installed on the left and right side of the front passenger airbag assembly.
CAUTION: Tightly wind the wire harness around the bolts so that there is o slack. If there is slackness in the wire harness, the front passenger airbag assembly may come loose due to the shock when the airbag is deployed, this is highly dangerous.



(2) Position the front passenger airbag assembly inside the tire with the airbag door facing inside.
Tie the wire harness to the tire.
Tire size: Must exceed the following dimensions
Width 185 mm (7.28 in.)
Inner diameter 360 mm (14.17 in.)

CAUTION:
- **Make sure the wire harness is tight. It is very dan–gerous if a loose wire harness results in the front passenger airbag assembly coming free due to the shock of the airbag deploying.**
- **Always tie down the front passenger airbag assem–bly with the airbag door facing inside.**

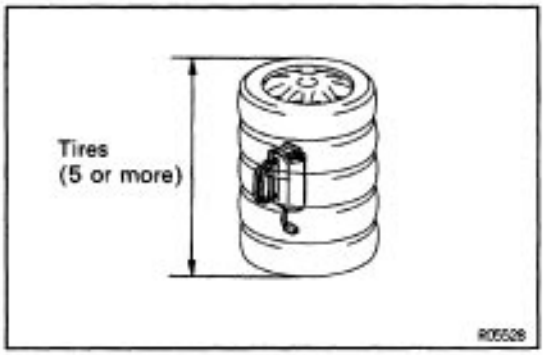
NOTICE: The tire will be marked by the airbag deploy–ment, so use a redundant tire.



3. CONFIRM FUNCTIONING OF SST

(See page RS–42)

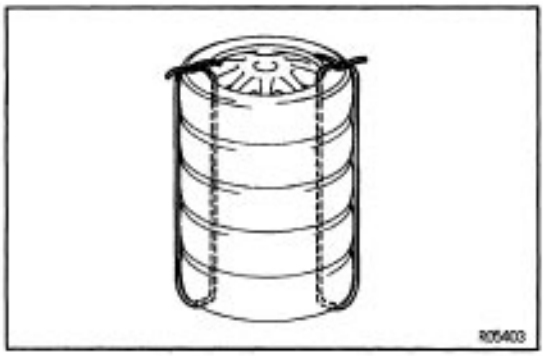
SST 09082–00700



4. PLACE TIRES

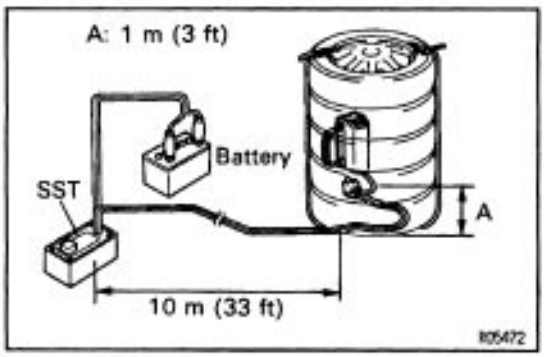
(a) Place at least 2 tires under the tire to which the front passenger airbag assembly is tied.

(b) Place at least 2 tires over the tire to which the front passenger airbag assembly is tied. The top tire should have the wheel installed.



(c) Tie the tires together by 2 wire harnesses.

CAUTION: Make sure that the wire harnesses are tight. It is very dangerous if loose wire harnesses result in the tires coming free due to the shock of the airbag deploy–ing.



HINT: Place the SST connect and wire harness inside tires. Provide at least a meter 1 m (3 ft) of slack for the wire harness.

5. INSTALL SST

(a) Connect the front passenger airbag assembly connec–tor and lock the secondary lock of the twin lock.

(b) Connect the SST connector and lock the secondary lock of the twin lock.
SST 09082–00700

6. AIRBAG DEPLOYMENT

(a) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.

(b) Confirm that no–one is within 10 m (33 ft) of the tire the front passenger airbag assembly is tied to.

(c) Press the SST activation switch and deploy the airbag.

HINT: The airbag deploys simultaneously as the LED of the SST activation switch lights up.

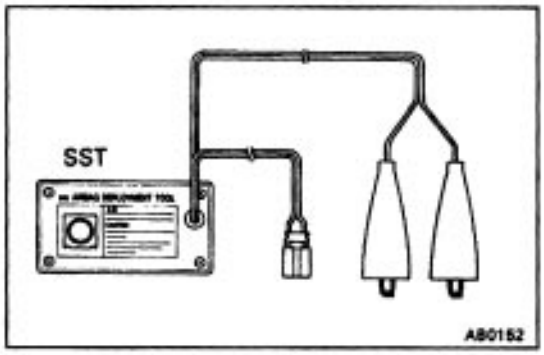
7. DISPOSAL OF FRONT PASSENGER AIRBAG ASSEMBLY

CAUTION:

- **The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a front passenger airbag asssembly with deployed airbag.**
- **Do not apply water, etc., to a front passenger airbag assembly with deployed airbag.**
- **Always wash your hand with water after completing the operation.**

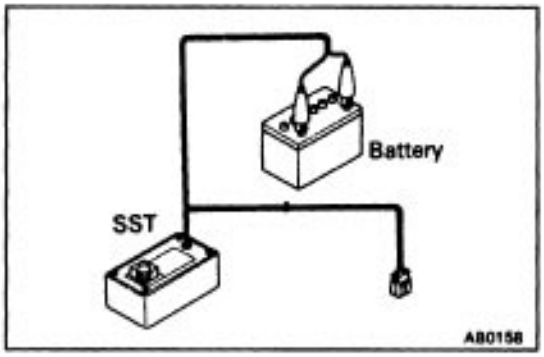
(a) Remove the front passenger airbag assembly from the tire.

(b) Place the front passenger airbag assembly in a vinyl bag, tie the end tightly and dispose of it the same way as other general parts.



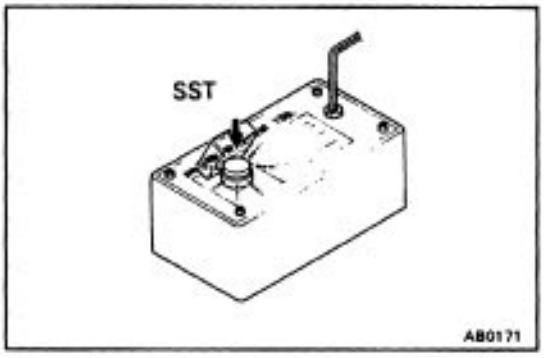
CONFIRM FUNCTIONING OF SST

When deploying the airbag, always use the specified SST: SRS AIRBAG DEPLOYMENT TOOL.
SST 09082–00700



1. CONNECT SST TO BATTERY

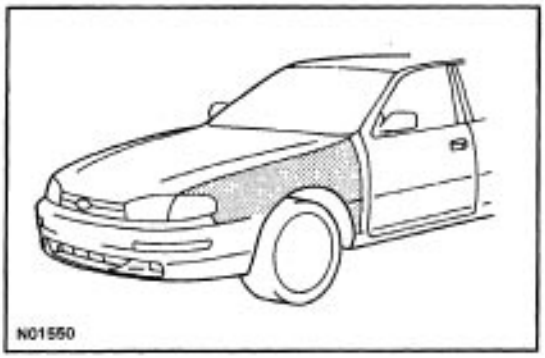
Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
HINT: Do not connect the yellow connector which connects with the supplemental restraint system.

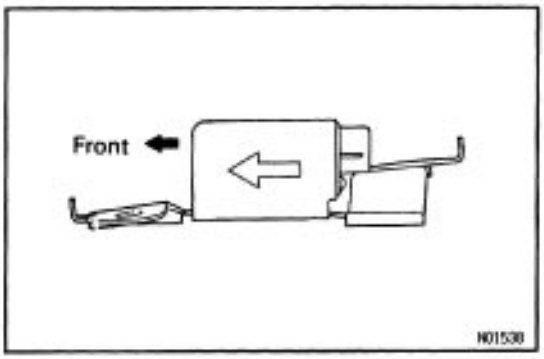


2. CONFIRM FUNCTIONING OF SST

Press the SST activation switch, and confirm the LED of the SST activation switch lights up.

CAUTION: If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.





FRONT AIRBAG SENSOR

INSPECTION ITEMS

1. VEHICLES NOT INVOLVED IN A COLLISION

- Perform a diagnostic system check (See page RS–61).

2. VEHICLES INVOLVED IN A COLLISION

(a) Perform a diagnostic system check (See page RS–61).

(b) If the front fender of the car or its periphery is dam–aged, perform visual check for damage to the front airbag sensor, which includes the following items even if the airbag was not deployed:

- **Bracket deformation.**
- **Peeling of paint from the bracket.**
- **Cracks, dents or chips in the case.**
- **Cracks and dents in, or chipping and scratches of the connector.**
- **Peeling off of the label or damage to the series number.**

Also refer to the body dimension drawings check the dimensions and mounting surface angle of the body area where the front airbag sensors are mounted. (The SRS may malfunction, or may not work, if the mount–ing angle or dimensions of the sensor mount are not correct.)

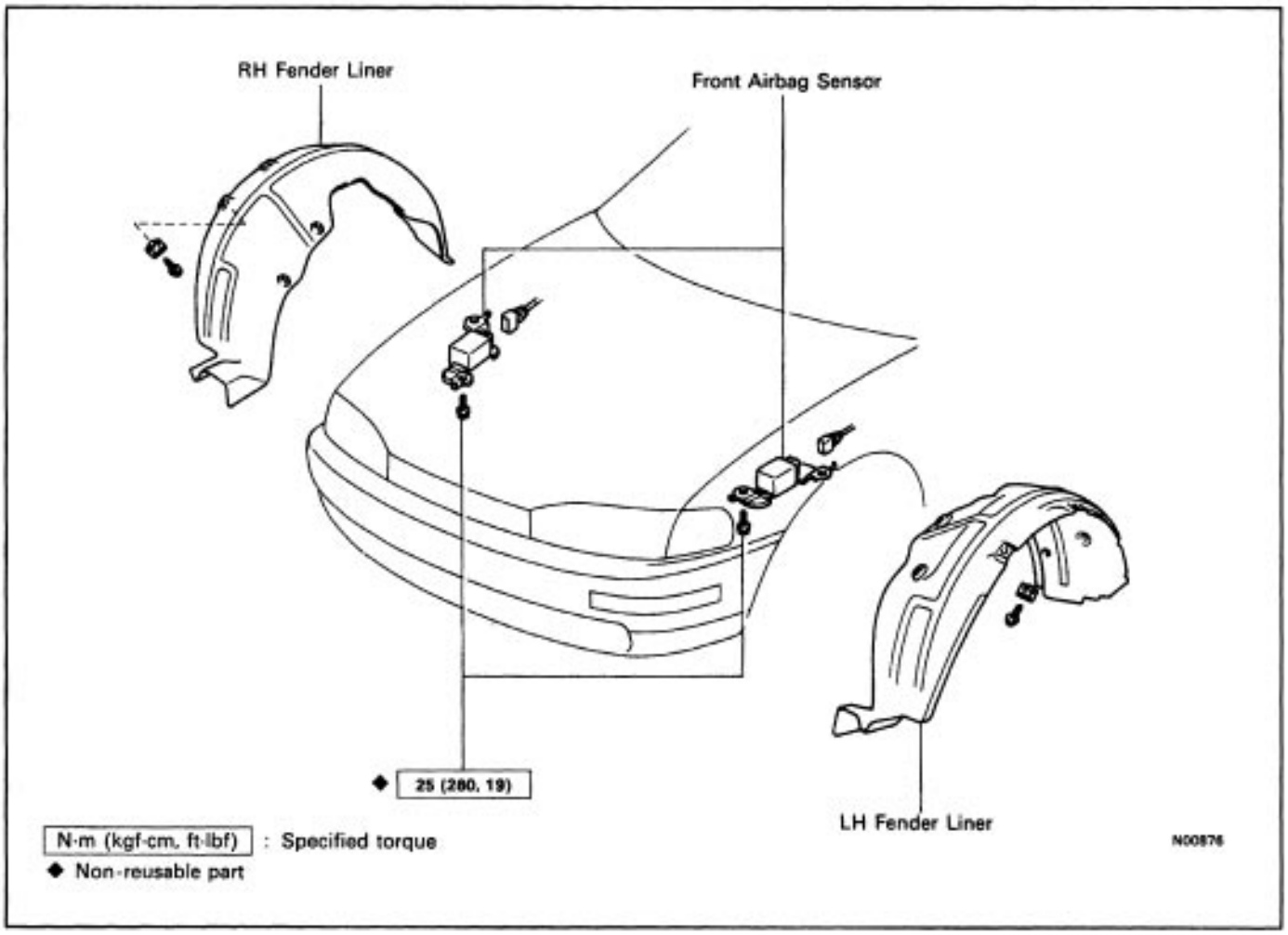
REPLACEMENT REQUIREMENTS

In the following cases, replace the front airbag sensor.

NOTICE: for replacement of the front airbag sensor, see page RS–45,'FRONT AIRBAG SENSOR REMOVAL AND INSTALLATION'.

- If the SRS has been deployed in a collision. (Replace both the left and right airbag sensors.)
- If the front airbag sensor has been found to be faulty in troubleshooting.
- If the front airbag sensor has been found to be faulty during the check in item 2–(b).
- If the front airbag sensor has been dropped.

COMPONENTS



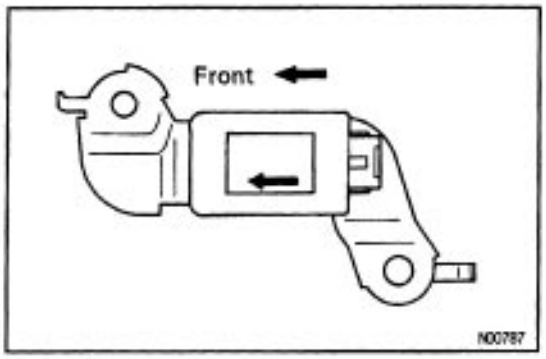
FRONT AIRBAG SENSOR REMOVAL AND INSTALLATION

NOTICE:

- **If the wiring connector of the supplemental re–straint system is disconnected with the ignition switch at ON or ACC, diagnostic trouble codes will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace with now parts.**
- **Never reuse the sensor involved in a collision when the SRS has deployed.**
- **Never repair a sensor in order to reuse it.**

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable Is discon–nected from the battery (See page RS–2).



2. REMOVE FENDER LINER

3. REMOVE FRONT AIRBAG SENSOR

(a) Disconnect the connector.

(b) Remove the bolt and sensor.

4. INSTALL FRONT AIRBAG SENSOR

Install the sensor with the arrow on the sensor facing toward the front of the vehicle.

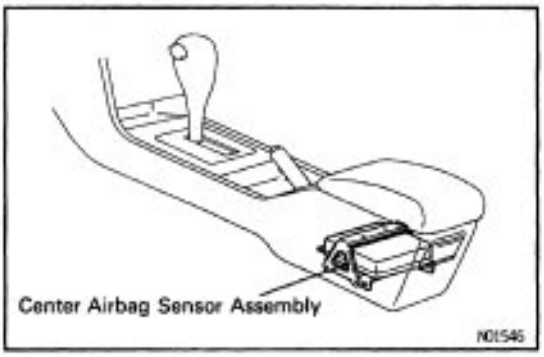
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

NOTICE:

- **Make sure the sensor is installed to the specified torque.**
- **If the sensor has been dropped, or there are cracks dents or other defects in the case, bracket or connector, replace the sensor with a new one.**
- **The sensor set bolts have been anti–rust treated When the sensor is removed, always replace the set bolts with new ones.**
- **After installation, shake the sensor to check that there is no looseness.**
- **The front sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector. If the connector is not securely locked, a malfunction code will be detected by the diagnosis system.**
- **Check that the dimensions of the body where the front airbag sensor is installed match those in the body dimension drawings in the BODY section. (The SRS may malfunction, or may not work, if the mounting angle or dimensions of the sensor mount are not correct.)**

5. INSTALL FENDER LINER

6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY



CENTER AIRBAG SENSOR ASSEMBLY

INSPECTION ITEMS

1. VEHICLES NOT INVOLVED IN A COLLISION

- Perform a diagnostic system check (See page RS–61).

2. VEHICLES INVOLVED IN A COLLISION

IF THE SRS IS NOT DEPLOYED

- **Perform a diagnostic system check (See page RS–61).**

IF THE SRS IS DEPLOYED

- Replace the center airbag sensor assembly certain–ly.

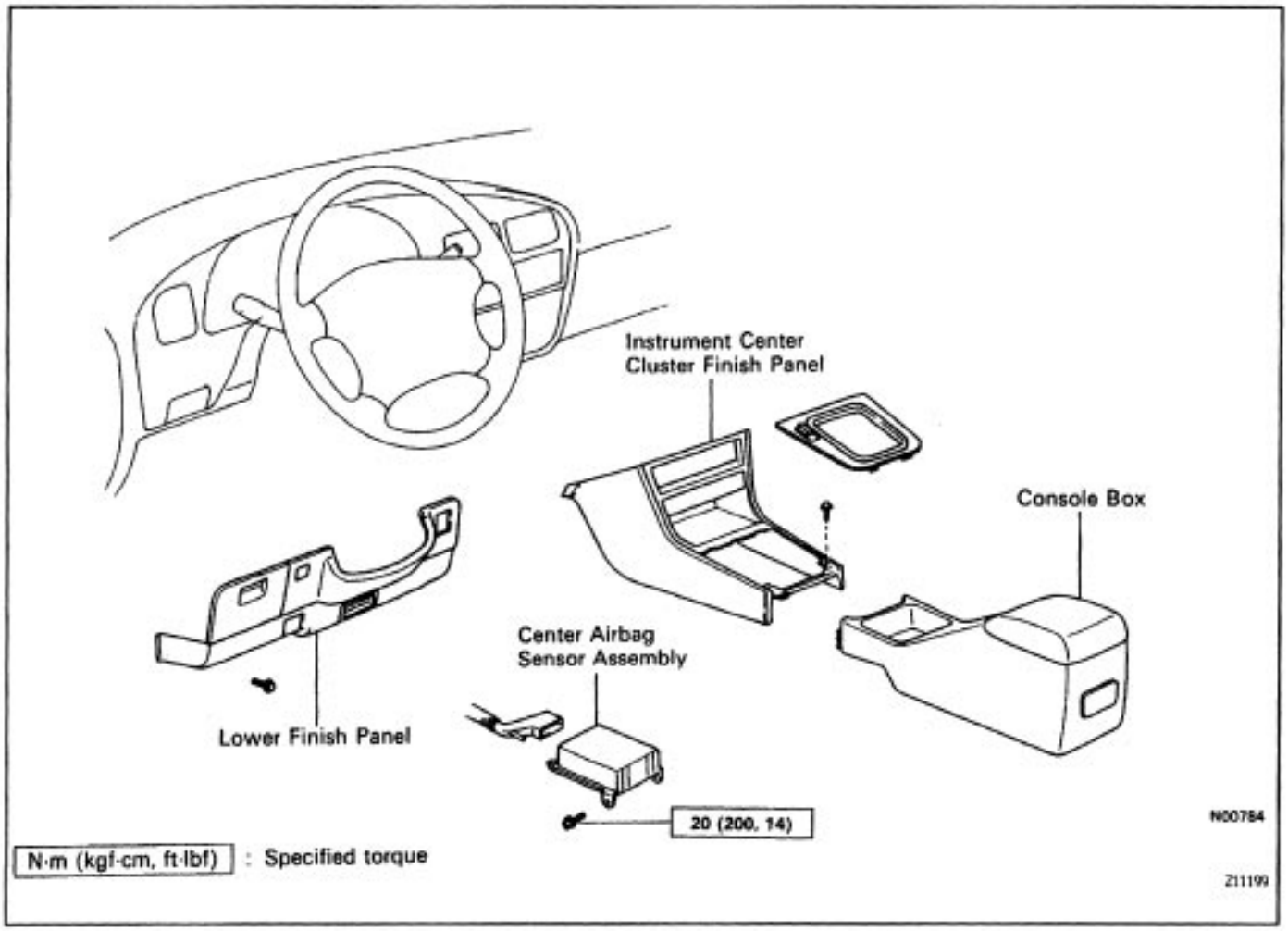
REPLACEMENT REQUIREMENTS

In the following cases, replace the center airbag sensor assembly.

NOTICE: For replacement of the center airbag sensor assembly, see page RS–47, 'CENTER AIRBAG SENSOR ASSEMBLY REMOVAL AND INSTALLATION".

- If the SRS has been deployed in a collision.
- If the center airbag sensor assembly has been found to be faulty in troubleshooting.
- If the center airbag sensor assembly has been dropped.

COMPONENTS



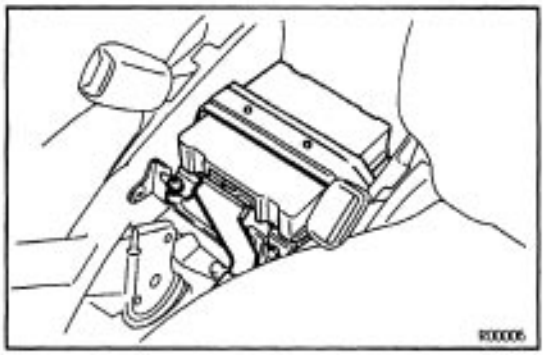
CENTER AIRBAG SENSOR ASSEMBLY REMOVAL AND INSTALLATION

NOTICE:

- **Do not open the cover or the case of the ECU and various computers unless absolutely necessary. (If the IC terminals are touched, the IC may be destr–oyed by static electricity.)**
- **Never use SRS parts from another vehicle. When replacing parts, replace with new parts.**
- **Never reuse the center airbag sensor assembly in–volved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

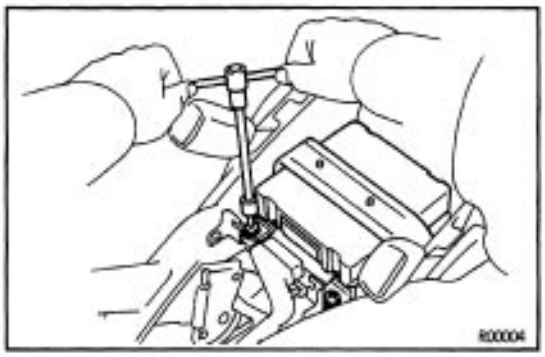
CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery (See page RS–2).



2. REMOVE AND INSTALL CENTER AIRBAG SENSOR ASSEMBLY

(a) Using a torx wrench, loosen and tighten the 3 screws.

Torx wrench: T40 (Part No. 09042–00020 or locally manufactured tool)



(b) Disconnect and connect connector.

NOTICE: Removal and installation of the connector is done with the sensor assembly installed.

(c) Using a torx wrench, tighten the 3 screws.

Torx wrench: T40 (Part No. 09042–00020 or locally manufactured tool)

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

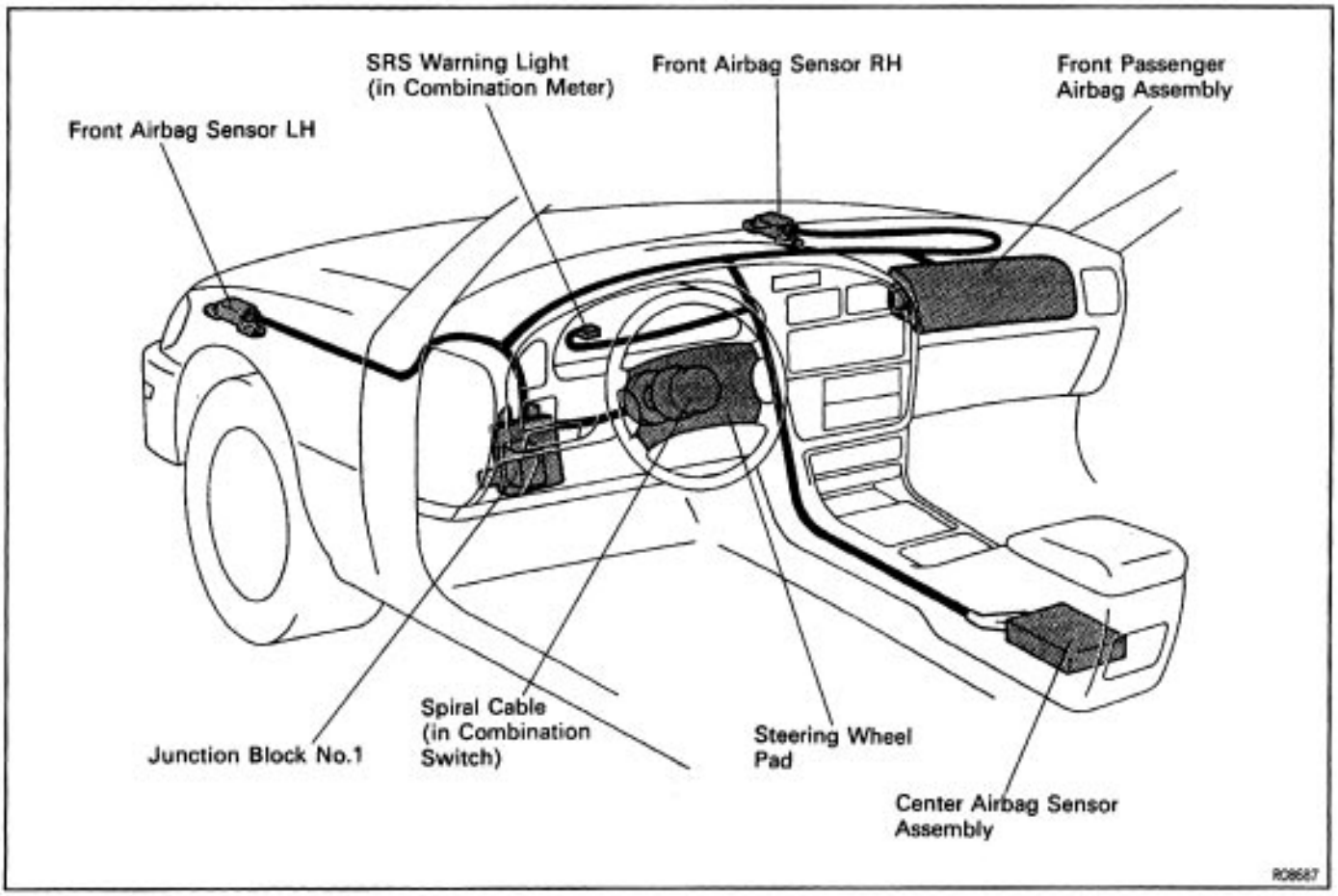
NOTICE:

- **Make sure the sensor assembly is installed to the specified torque.**
- **If the sensor assembly has been dropped, or there are cracks, dents or other defects in the case, brack–et or connector, replace the sensor assembly with a new one.**
- **When installing the sensor assembly, take care that the airbag wiring does not interfere with other parts and is not pinched between other parts.**
- **After installation, shake the sensor assembly to check that there is no looseness.**

3. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

WIRE HARNESS AND CONNECTOR

HINT: The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly.
The wires for the SRS wire harness are encased in a yellow corrugated tube and all the connectors in the system are a standard yellow color.



INSPECTION ITEMS

1. VEHICLES NOT INVOLVED IN A COLLISION

- Perform a diagnostic system check (See page RS–61).

2. VEHICLES INVOLVED IN A COLLISION

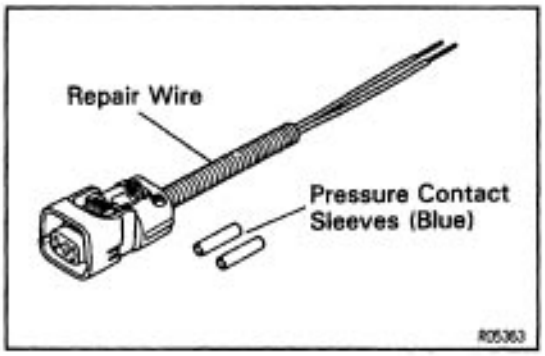
(a) Perform a diagnostic system check
(See page RS–61).
(b) If there is a break in any of the wires in the SRS wire harness, or if conductors are exposed.
(c) In the SRS wire harness connectors are cracked or chipped.

REPLACEMENT REQUIREMENTS

In the following cases, replace the wire harness or connector.

- If any part of the SRS wire harness or any con–nector has been found to be faulty in troublesh–ooting.
- If any pant of the SRS wire harness or any con–nector has been found to be faulty during the check in item 2–(b) or (c).

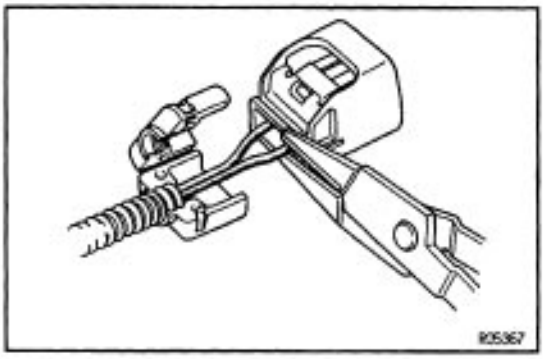
NOTICE: If the wire harness used in the SRS is damaged, replace the whole wire harness assembly.
When the connector to the front airbag sensors can be repaired alone (when there is no damaged to the wire harness), use the repair wire specially designed for the purpose (See page RS–13).



REPAIR WIRE FOR FRONT AIRBAG SENSOR REPLACEMENT

Repair wire with 2 pressure–contact sleeves (Part No. 82988–24010) has been prepared for exclusive use in repairing connector damage etc. caused by frontal collision of the vehicle.
When repairing the front airbag sensor connector on the wire harness side, always use the special repair wire.

NOTICE: Do not replace the connector housing or termi–nal only.



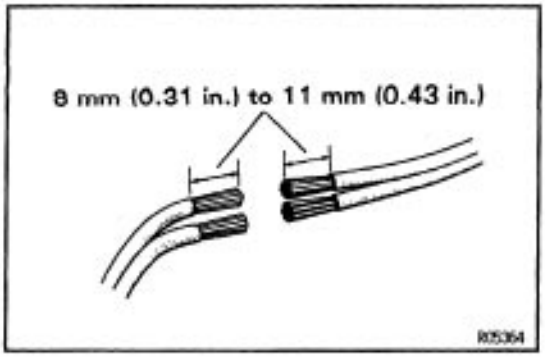
AIRBAG REPAIRWIRE REPLACEMENT

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery (See page RS–2).

1. DISCONNECT WIRE HARNESS AT VEHICLE SIDE

(a) Remove the cover at the rear of the connect housing and expose the wire harness.
(b) Cut the wire harness behind the connector housing.

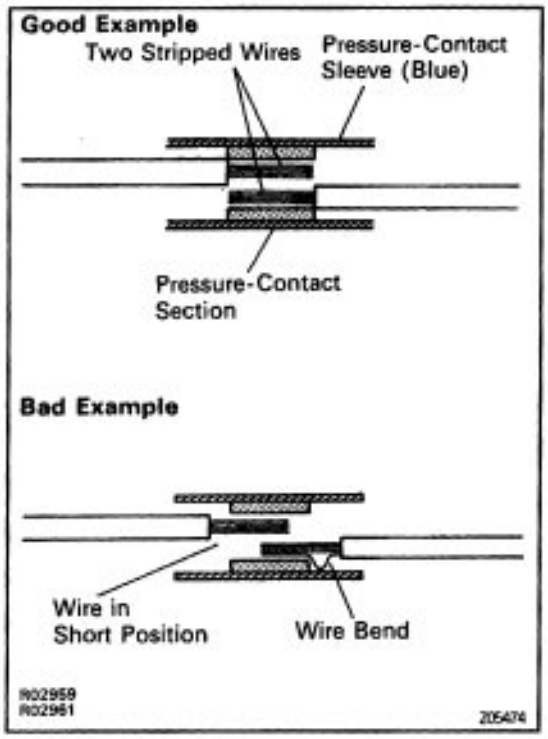
HINT: The operation is performed more easily if the wire harness is left as long as possible.



2. CONNECT FRONT AIRBAG SENSOR WIRE HAR–NESS AT VEHICLE SIDE AND REPAIR WIRE

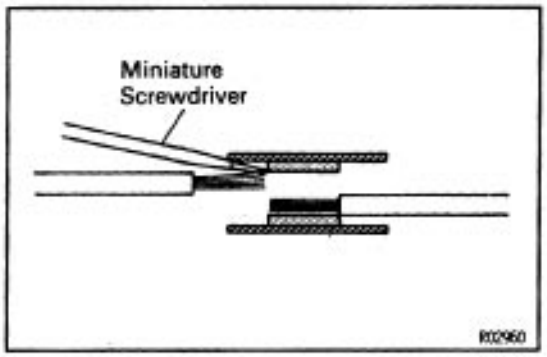
(a) Start stripping at least 8 mm (0.31 in.) to 11 mm (0.43 in.) away from the end of the existing harness at vehicle side and also from the end of the repair wire.

NOTICE: Take care not to damage the wire when stripp–ing the wire harness lead. After finishing the operation, visually inspect the wire. If there Is any damaged. per–form the operation again.

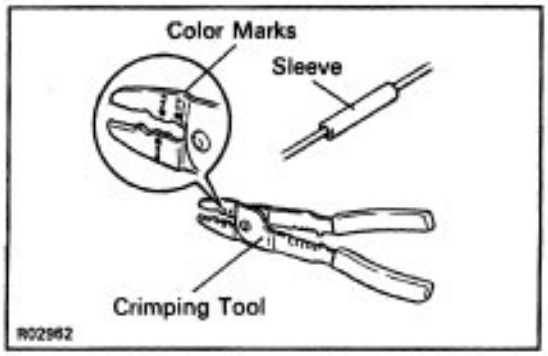


(b) Overlap the 2 stripped wire ends inside of the pres–sure–contact sleeve as illustrated in the left.

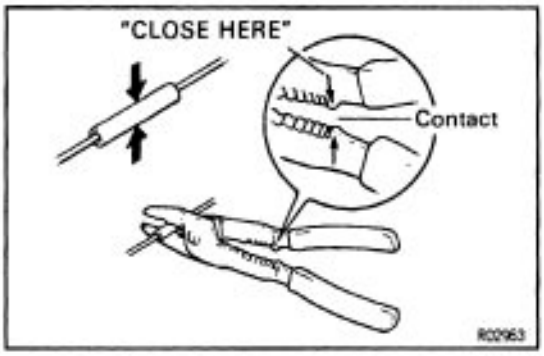
HINT: The blue pressure–contact sleeve (Part No. 82999–12020) is available individually.



HINT: You might find it easier if you use a miniature screwdriver as a guide as you insert wires into the sleeve.

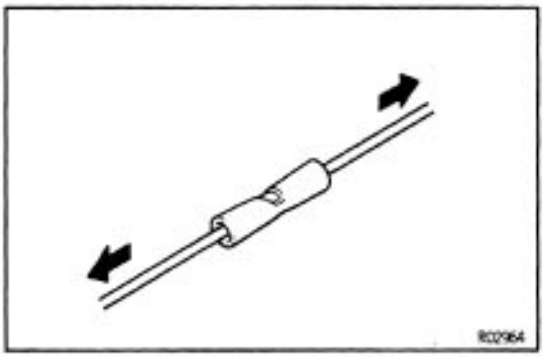


(c) The crimping tool (AMP Part No. 69060) has color marks on it. Place the sleeve in the correct section of the tool according to the color of the sleeve itself.



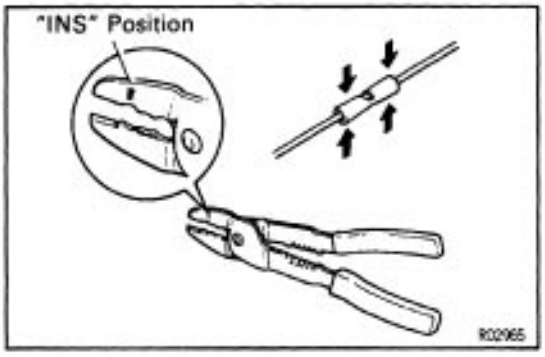
(d) with the center of the sleeve correctly placed be–tween the crimping jaws, squeeze the crimping tool until either end comes into contact at the section marked by ”CLOSE HERE”.

HINT: Check to see that the sleeve and wires are still in the correct position before closing the crimping tool ends with steady pressure.

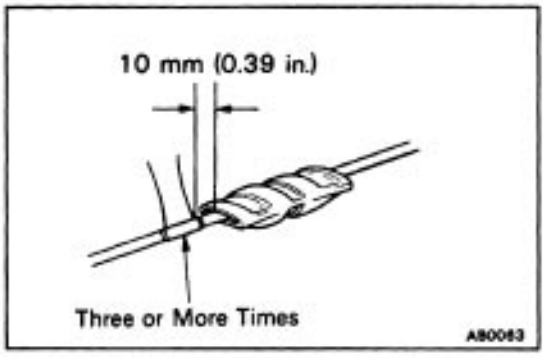


(e) Pull the joined wires to either end. Make sure that they are joined firmly by the sleeve.

NOTICE: If the joined wire come loose the splice is defec–tive, so replace the sleeve and repeat the procedure.



(f) Crimp both ends of the sleeve with the crimping tool at the ”INS” position.



3. PROTECT JOINED SECTION

Wrap silicon tape around the joins to protect them from water.

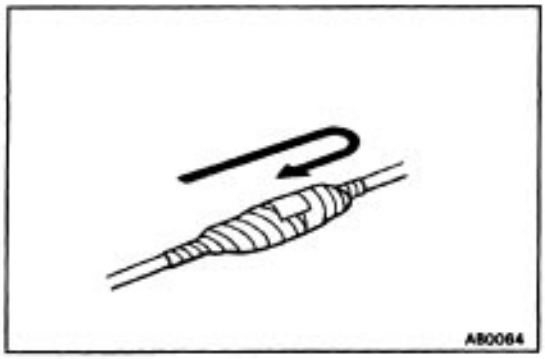
HINT:

- Before starting the operation, thoroughly wipe dirt and grease off the sections to be joined.
- If the adhesive surfaces of two tapes come in contact they will stick together and will not come apart, so do not remove the backing film except when using the tape.
- Do not let oil and dust, etc., get on the tape surface.

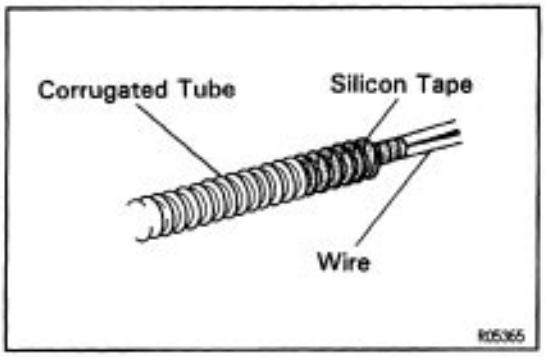
(a) Ready about 100 mm (3.94 in.) of silicon tape (Part No. 08231–00045) and peel oft the film.

(b) Stretch the silicon tape until its width is reduced by half.

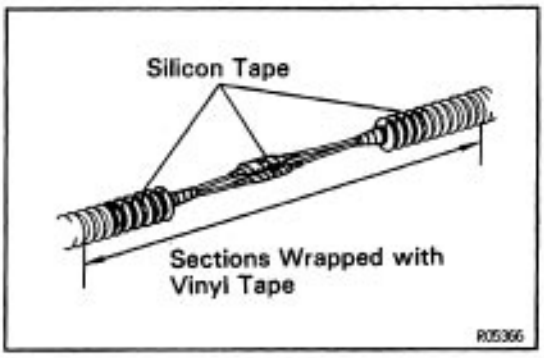
(c) About 10 mm (0.39 in.) from the end of the pressure contact sleeve, wrap the silicon tape around the sleeve 3 or more times while stretching the tape.



(d) Wrap the remaining part of sleeve with half of the tape overlapping at each turn.
(e) Firmly wrap the tap 2 times or more about 10 mm (0.39 in.) from the other end of the pressure contact sleeve, then wrap the tap back towards the start again and firmly finish winding the tape around the center of the sleeve.



(f) Fix the corrugated tube to the wire using silicon tape.



(g) After applying the silicon tape, apply vinyl tape on the corrugated tube of repair wire side over to the corrugated tube of vehicle wire harness side.

– MEMO

TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trou–ble codes become the most important source of information when troubleshooting. Perform troubleshooting of the supplemental restraint system in accordance with the following procedure:

HINT: Do not disconnect the battery negative (–) terminal cable until step [3] , Diagnostic Trouble Code Check and Recording, has been completed.

[1] CUSTOMER PROBLEM ANALYSIS

Using the CUSTOMER PROBLEM ANALYSIS CHECK SHEET (See page RS–60) for reference, ask the customer in as much detail as possible about the problem.

[2] WARNING LIGHT CHECK

Check the SRS warning light. If the light remains on, a malfunction is stored in the center airbag sensor, assembly, so proceed to step [3] . If the SRS warning light is not on, a malfunction has occurred in the SRS warning light circuit, so perform troubleshooting for SRS Warning Light System Malfunction.

HINT: Code 22 is recorded when a malfunction occurs in the SRS warning light system.

If an open malfunction occurs in the SRS warning light system, the SRS warning light does not light up, so that until the malfunction is repaired, the diagnostic trouble codes cannot be confirmed.

[3] DIAGNOSTIC TROUBLE CODE CHECK AND RECORDING

Check the diagnostic trouble codes and make a note of any malfunction codes which are output. If a normal code is output, an abnormality in the power source circuit may have occurred, so perform troubleshooting for source voltage in step [8] .

If code 22 is output, skip steps [4] and [5] and proceed to step [7] .

[4] MALFUNCTION CODE CLEARANCE

Clear the malfunction code.

HINT: The malfunction code output in step [3] indicates that a malfunction has occurred in the circuit designated by the malfunction code, but does not indicate whether the malfunction is still occurring or whether it was in the past. ,

Accordingly, it is necessary to find out the present condition of the malfunction occurrence by clearing the malfunction code and performing the diagnostic trouble code check again. If this operation is neglected and troubleshooting is performed using only the malfunction code confirmed in step [3] , isolating the problem component becomes difficult and invites mistaken diagnosis.

[5] DIAGNOSTIC TROUBLE CODE CHECK AND RECORDING

After repeating ignition switch ON–OFF operation (ON: wait 20 secs., OFF: wait 20 secs.) 5 times, check the diagnostic trouble code. If any code is output, the malfunction is still occurring, so proceed to step [7].

Bearing in mind that a malfunction code was registered in step [3] , provided that the normal code is presently output, use the methods described in step [6] to simulate the malfunction.

NOTICE: When connecting the battery after clearing the malfunction code, always do it with the ignition switch in ”LOCK” position. When the battery has been reconnected, turn the ignition switch to ACC or ON position after at least 2 seconds have elapsed.

If the battery is reconnected with the ignition switch in ACC or ON position, or the ignition switch is turned to ACC or ON within 2 seconds of connecting the battery, it is possible that the diagnosis system will not operate normally.

[6] SYMPTOM SIMULATION

[7] DIAGNOSTIC TROUBLE CODE CHART

Proceed to the appropriate flow chart in step [8] in accordance with the malfunction code found in step [5] or [6] .

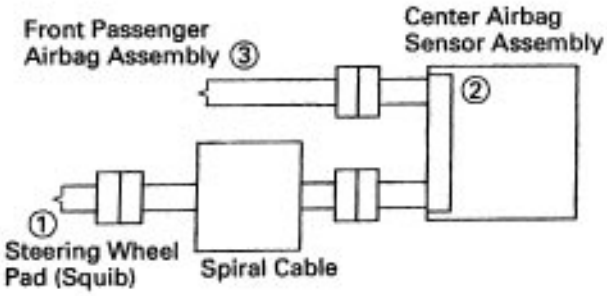
[8] CIRCUIT INSPECTION [9] REPAIR

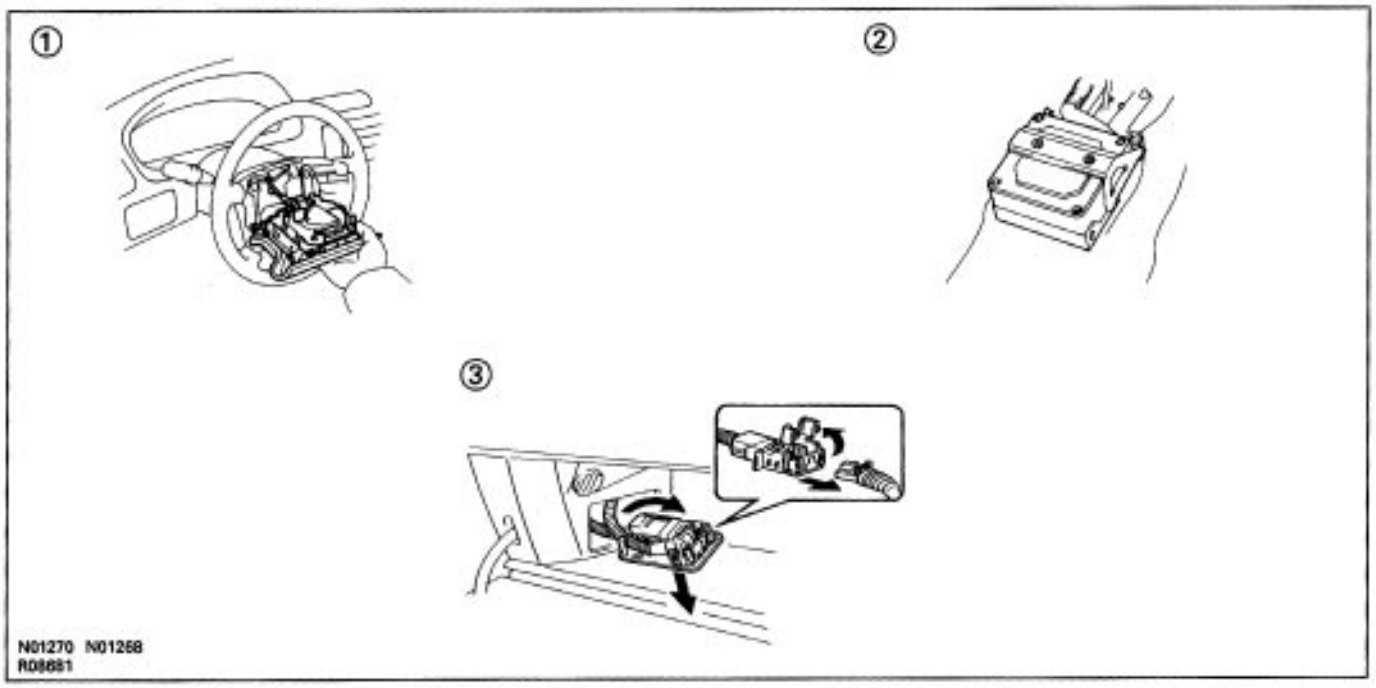
Find out if the problem lies in a sensor, actuator or wire harness and connector, and repair the problem.

After the problem part is repaired, reinstall the disassembled parts. Do not start work until 90 seconds after the ignition switch is turned to the LOCK position and the negative (–) terminal cable is disconnected.

CAUTION: If incorrect procedure is used, a malfunction may occur in the system or there is the danger that airbag may be accidentally deploy during the repair operation. Carefully read the GENERAL DESCRIPTION (See page RS–2) and the cautions for each operation, perform repairs in the correct order using the correct methods.

HINT: The following illustration for the CIRCUIT INSPECTION shows each connector for the SRS squib circuit.





[10] MALFUNCTION CODE CLEARANCE

When all the malfunction codes found in steps [5] and [6] have been repaired, clear the malfunction codes.

[11] DIAGNOSTIC TROUBLE CODE CHECK

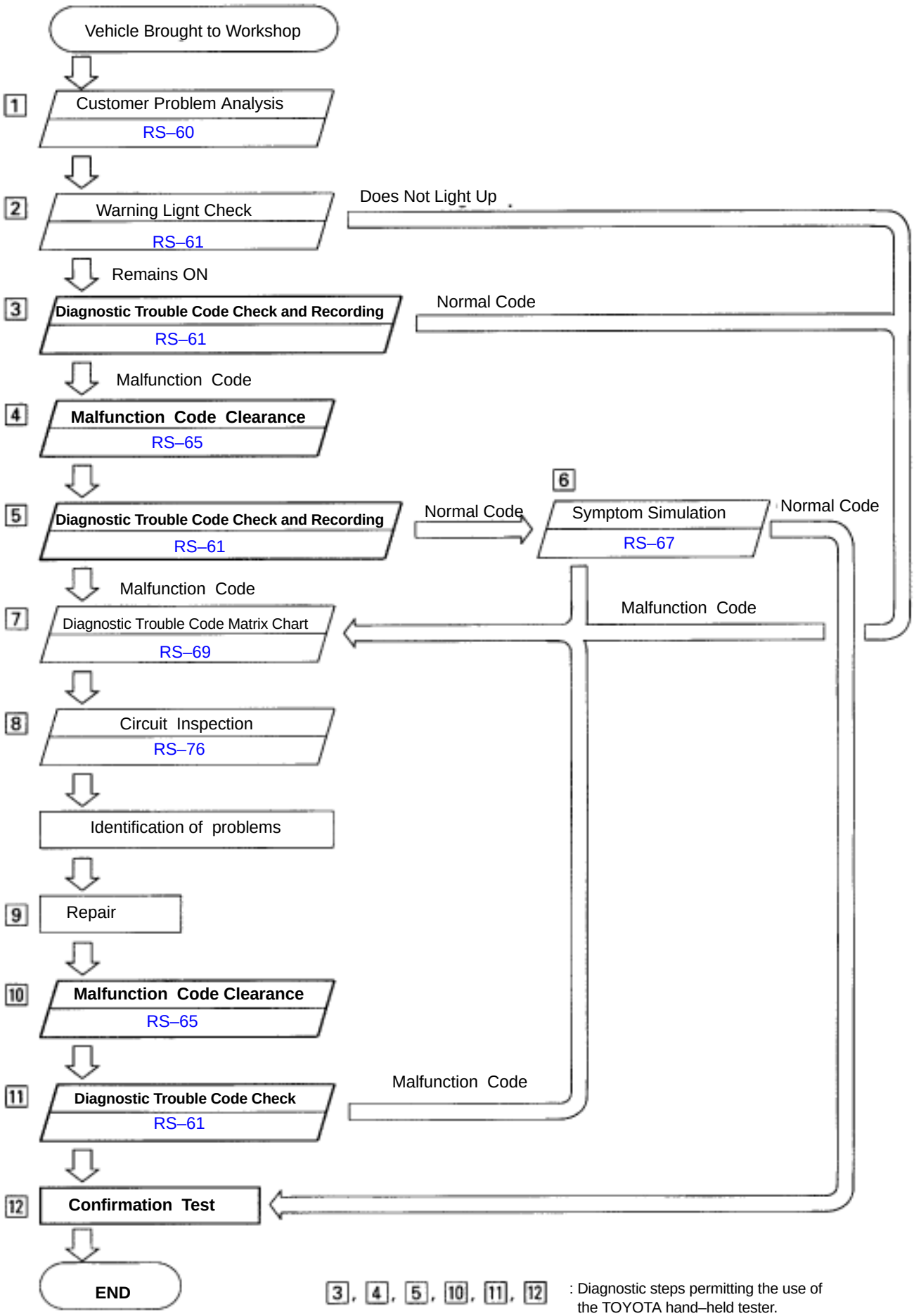
After repeating ignition switch ON–OFF operation (ON: wait 20 secs., OFF: wait 20 secs.) 5 times, check
the diagnostic trouble codes. If a code is displayed, return to step [7] and troubleshoot the displayed malfunction code.

NOTICE: When connecting the battery after clearing the malfunction code, always do it with the ignition switch in "LOCK" position. When the battery has been reconnected, turn the ignition switch to ACC or ON position after at least 20 seconds have elapsed.

If the battery is reconnected with the ignition switch in ACC or ON position, or the ignition switch is turned to ACC or ON within 20 seconds of connecting the battery, it is possible that the diagnosis system will not operate normally.

[12] CONFIRMATION TEST

Check the warning light again and confirm that all the malfunctions have been repaired. If the warning light indicates and abnormally, repeat the operation again from step [2].


Vehicle Brought to Workshop
1
Customer Problem Analysis
RS–60
2
Warning Lignt Check
RS–61
Does Not Light Up
Remains ON
3
Diagnostic Trouble Code Check and Recording
RS–61
Normal Code
Malfunction Code
4
Malfunction Code Clearance
RS–65
5
Diagnostic Trouble Code Check and Recording
RS–61
Normal Code
6
Symptom Simulation
RS–67
Normal Code
Malfunction Code
7
Diagnostic Trouble Code Matrix Chart
RS–69
Malfunction Code
8
Circuit Inspection
RS–76
Identification of problems
9
Repair
10
Malfunction Code Clearance
RS–65
11
Diagnostic Trouble Code Check
RS–61
Malfunction Code
12
Confirmation Test
END
3, 4, 5, 10, 11, 12
: Diagnostic steps permitting the use of the TOYOTA hand–held tester.

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

Supplemental Restraint System Check Sheet

Inspector's Name :

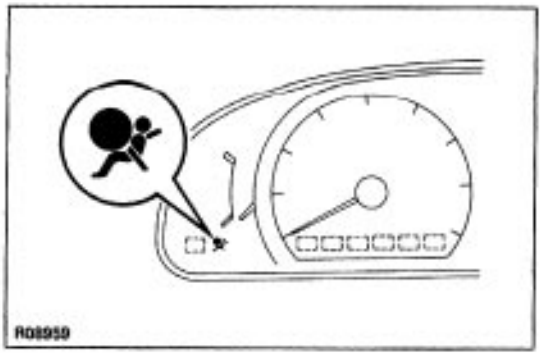
Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km Miles

Date of Problem Occurrence		
Conditions when Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °C (°F))
	Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
	Condition of road	

Details of Problem	
Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnosis System Inspection

SRS Warning Light Inspection	1st Time	☐ Remains ON	☐ Sometimes Lights Up	☐ Does Not Light Up
	2nd Time	☐ Remains ON	☐ Sometimes Lights Up	☐ Does Not Light Up
Diagnostic Trouble Code Inspection	1st Time	☐ Normal Code	☐ Malfunction Code [Code.	]
	2nd Time	☐ Normal Code	☐ Malfunction Code [Code.	]



DIAGNOSIS INSPECTION

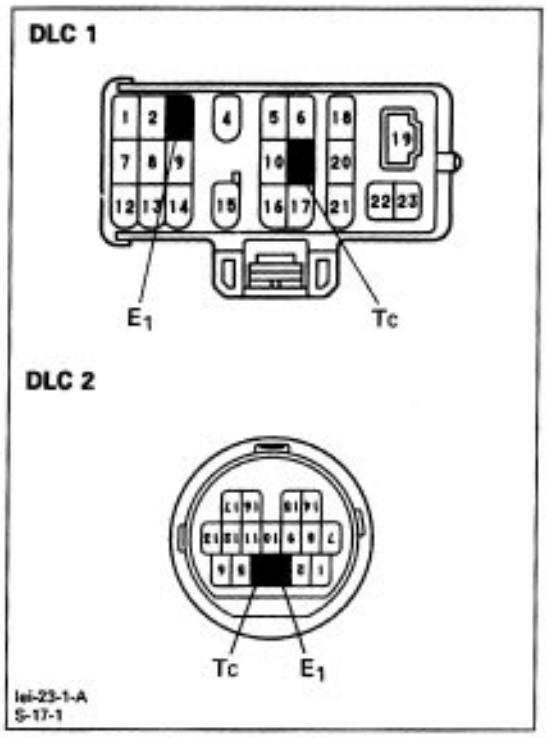
SRS warning light check

(a) Turn the ignition switch to ACC or ON and check that the SRS warning light lights up.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is at ACC or ON and the SRS warning light remains on, the center airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely. Proceed to SRS warning light system (always lit up, when ignition switch LOCK position) on page RS–146.



Diagnostic trouble code check

Using diagnosis check wire:

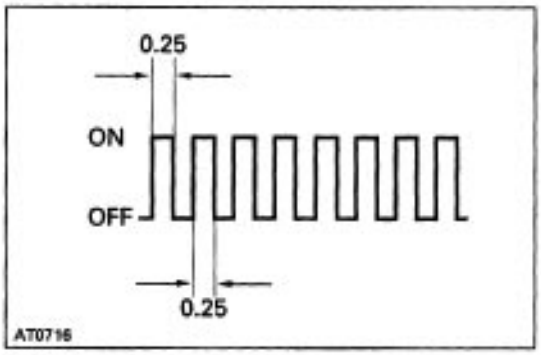
1. OUTPUT DIAGNOSTIC TROUBLE CODE

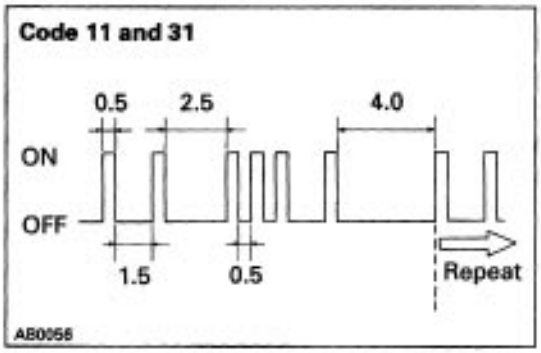
(a) Turn the ignition switch to ACC or ON position and wait Approx. 20 seconds.

(b) Using SST, connect terminals Te and El of the DLC1 or DLC2.

SST 09843 – 18020

NOTICE: Never make a mistake with the terminal connection position as this will cause a malfunction.





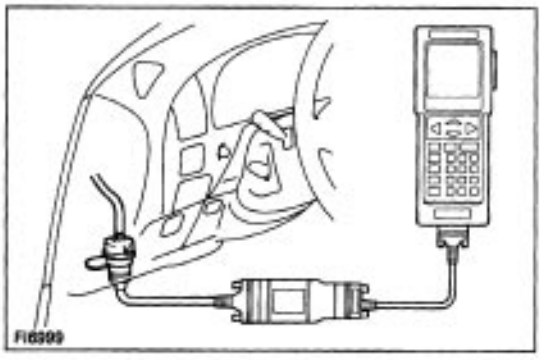
2. READ DIAGNOSTIC TROUBLE CODE

Read the 2–digit diagnostic trouble code as indicated by the number of times the SRS warning light blinks. As an example, the blinking patterns, normal, 11 and 31 are as shown on the illustration.

- Normal code indication
  The light will blink 2 times per second.
- Malfunction code indication
  In the event of a malfunction, the light will blink. The number represented by the first blink code output indicates the first digit of a 2–digit diagnostic trouble code. After a 1.5 second pause, the second blink code will indicate the second digit.
  If there are 2 or more codes, there will be a 2.5 second pause between each. After all the codes have been output, there will be a 4.0 second pause and they will all be repeated.

HINT:

- In the event of a number of trouble codes, indication will 1st from the smallest numbered code to the larger.
- If it does not output a diagnostic trouble code or outputs a diagnostic trouble code without terminal connection, proceed to the Tc terminal circuit inspection on page RS–127.



Using TOYOTA hand–held Tester

(a) Hook up the TOYOTA hand–held tester to the DLC1 or DLC2.

(b) Read the diagnostic trouble codes by following the prompts on the tester screen.

HINT: Please refer to the TOYOTA hand–held tester operator’s manual for further details.

DIAGNOSTIC TROUBLE CODES

DTC No.	Blink Pattern	Diagnosis	Trouble Area	SRS Warning Light
(Normal)	 FI1401	• System normal		OFF
		• Source voltage drop	• Battery • Center airbag sensor assembly	ON
11	 AB0057	• Short in squib circuit or front airbag sensor circuit (to ground) • Front airbag sensor or malfunction • Center airbag sensor assembly malfunction	• Steering wheel pad (squib) • Front passenger airbag sensor (squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness	ON
12	 FI1389	• Short in squib circuit (to +B) • Open in front airbag circuit	• Steering wheel pad (squib) • Front passenger airbag sensor (squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness	ON
13	 FI1390	• Short in squib circuit (between D+ wire harness and D– wire harness)	• Steering wheel pad (squib) • Spiral cable Center airbag sensor assembly • Wire harness	ON
14	 FI1391	• Open in driver side airbag squib circuit	• Steering wheel pad (squib) • Spiral cable • Center airbag sensor assembly • wire harness	ON
15	 AB0058	• Open in front airbag sensor circuit	• Front airbag sensor • Center airbag sensor assembly • Wire harness	ON
22*	 FI1392	• SRS warning light system malfunction	• SRS warning light • Center airbag sensor assembly • Wire harness	ON
24	 BE3932	• Open in center airbag sensor assembly connector malfunction	• Center airbag sensor assembly • Wire harness	ON
31	 FI1394	• Center airbag sensor assembly malfunction	• Center airbag sensor assembly	ON
53	 R04789	• Short in passenger airbag squib circuit (between P+ wire harness and P+ wire harness)	• Front passenger airbag assembly • Wiring harness • Center airbag sensor assembly • Wire harness	ON
54	 R04790	• Open in passenger airbag squib circuit	• Front passenger airbag assembly • Wiring harness • Center airbag sensor assembly • Wire harness	ON

HINT:

- When the SRS warning light remains lit up and the diagnostic trouble code in the normal code, this means a source voltage drop.
  This malfunction is not stored in memory by the center airbag sensor Assembly and if the power source voltage returns to normal, after approx. 10 seconds the SRS warning light will automatically go out.
- Code 22 is recorded when a malfunction occurs in the SRS warning light system.
  If an open malfunction occurs in the SRS warning light system, the SRS warning light does not light up, so that until the malfunction is repaired, the diagnostic trouble codes (including code 22) cannot be con–firmed.
- When 2 or more codes are indicated, the lowest numbered code will appear first.
- If a code not listed on the chart is displayed, then the center airbag sensor assembly is faulty.

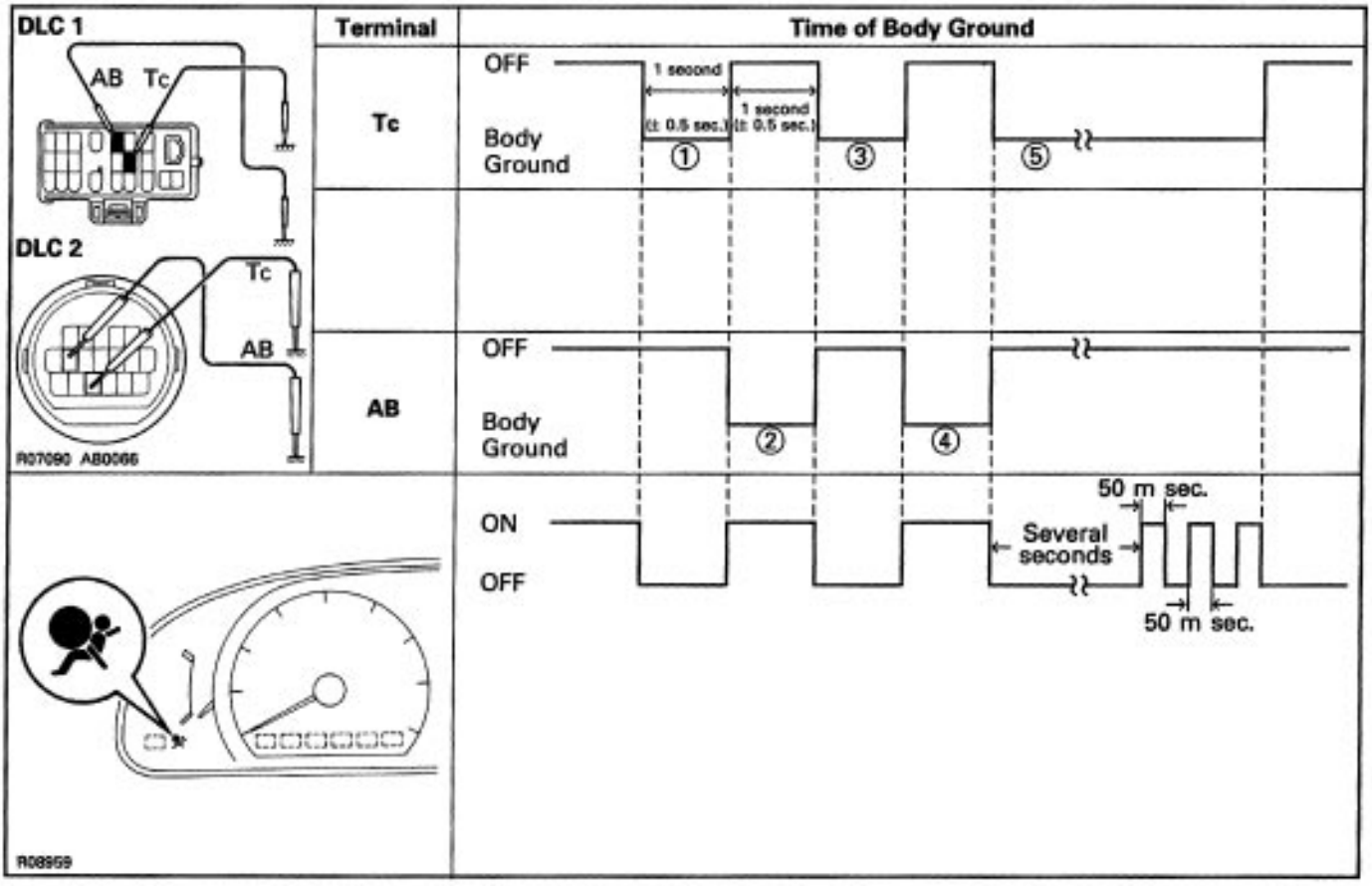
CLEARING OF DIAGNOSTIC TROUBLE CODE

Using diagnosis check wire:

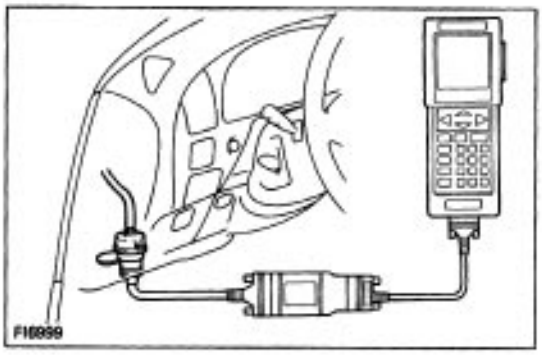
(a) Connect service wires to terminals Tc and AB of the check connector.

(b) Turn the ignition switch ACC or ON and wait approx. 6 seconds.

(c) Starting with the Tc terminal, apply body ground alternately to terminal Tc and terminal AB twice each in cycles of 1.0 ±0.5 seconds. (Confirm that body ground is absolute.)
Finally, keep applying body ground to terminal Tc.
HINT: When alternately grounding terminals Tc and AB, release ground from one terminal and immediately apply it to the other terminal. This action must be done within the time limits shown below. If you are not within the time limits, repeat the above procedure until you clear the codes.



(d) Several seconds after performing the clearing procedure, the SRS warning light will blink in a 50 m sec. cycle to indicate the codes have been cleared.



Using TOYOTA hand–held tester

(a) Hook up the TOYOTA hand–held tester to the DLC1 or DLC2.

(b) Clear the diagnostic trouble codes by following the prompts on the tester screen.

HINT: Please refer to the TOYOTA hand–held tester operator's manual for further details.

SYMPTOM SIMULATION

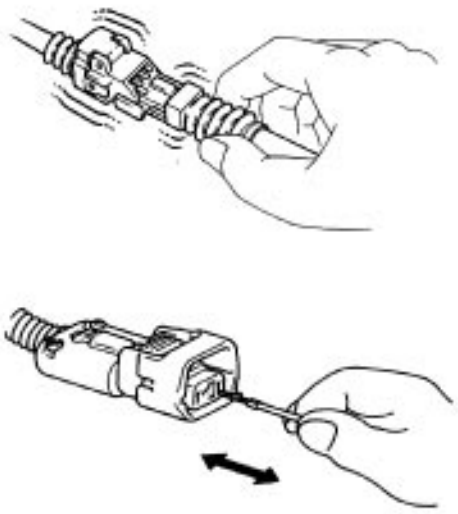
"Intermittent troubles or problems" are the malfunctions about which the customer has a complaint, but which do not occur and can not be conformed in the workshop. The intermittent problems also include complaints about the SRS warning light going on and off erratically.

The self–diagnostic system stores the circuit of the intermittent problem in memory even if the ignition switch is turned off.

And, for accurate diagnosis of the problems, ask the customer to obtain information as much as possible following the customer problem analysis check sheet (See page RS–60) and try to reproduce the intermittent problem.

The problem simulation methods described below are the effective ways for this nature of problem to pro–duce the problem conditions by applying vibration, heat, and humidity.

1 VIBRATION METHOD: when vibration seems to be the major cause.



CONNECTORS

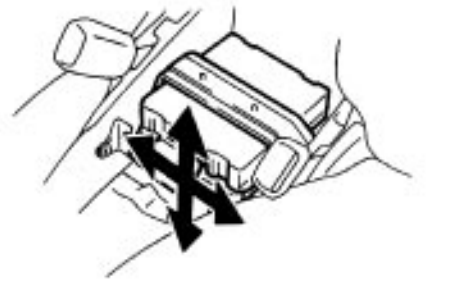
Slightly shake the connector vertically and horizontally.

(inspection of connectors)

(a) Does the wire harness connecting with its cor–responding part have insufficient slack?

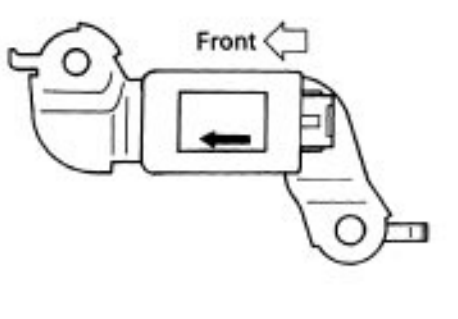
(b) Are the terminals dirty?

(c) Are the terminals making loose contact due to ter–minals spread?



WIRE HARNESS

Slightly shake the wire harness vertically and horizon–tally. The connector joint, fulcrum of the vibration, and body through portion are the major areas to be checked thoroughly.



PARTS AND SENSORS

Apply vibration slightly by a finger to the part or sensor considered to be the problem cause and check if the malfunction will occur.

CAUTION: Do not apply vibration to the center airbag sensor assembly.

2 **HEAT METHOD: When the problem seems to occur when the suspect area is heated.**

Heat the component that is likely the cause of the mal–function with a hair dryer or similar object. Check to see if the malfunction will occur.

NOTICE:

- Do not heat to more than 60°C (140°F) (Tempera–ture limit that the component can be touched with a hand.).
- Do not apply heat directly to part in the ECU.

3 **WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high–humidity condition.**

Sprinkle water onto the vehicle and check to see if the malfunction will occur.

NOTICE: Never apply water directly onto the electronic components.

HINT:

- If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be paid.

4 **OTHER: when a malfunction seems to occur when electrical load is excessive.**

Turn on all electrical loads including the heater blow-er, headlights, rear window defogger, etc. and check to see if the malfunction will occur.

DIAGNOSTIC TROUBLE CODE MATRIX CHART

If a malfunction code is displayed during the diagnostic trouble code check, check the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

DTC No.	Diagnosis	Page
(Normal)*1	• Source volatage drop	RS–76
11	• Short in squib circuit or front airbag sensor circuit (to ground)	RS–80
12	• Short in squib circuit or front airbag sensor circuit (to +B)	RS–88
13	• Short in squib circuit (between D+ wire harness and D– wire harness)	RS–96
14	• Open in squib circuit (between D+ wire harness and D– wire harness)	RS–104
15	• Open in front airbag sensor circuit	RS–110
22*2	• SRS warning light system malfunction	RS–116
24	• Open in center airbag sensor assembly connector malfunction	RS–122
31	• Center airbag sensor assembly malfunction	RS–126
53	• Short in squib circuit (between P+ wire harness and P– wire harness)	RS–128
54	• Open in squib circuit (between P+ wire harness and P– wire harness)	RS–134

HINT:

*1 When the SRS warning light remains lit up and the diagnostic trouble code is the normal code, this means a source voltage drop.

*2 Code 22 is recorded when a malfunction occurs in the SRS warning light system.

If an open malfunction occurs in the SRS warning light system, the SRS warning light does not light up, so that until the malfunction is repaired, the diagnostic trouble codes (including code 22) cannot be confirmed.

PROBLEM SYMPTOM CHART

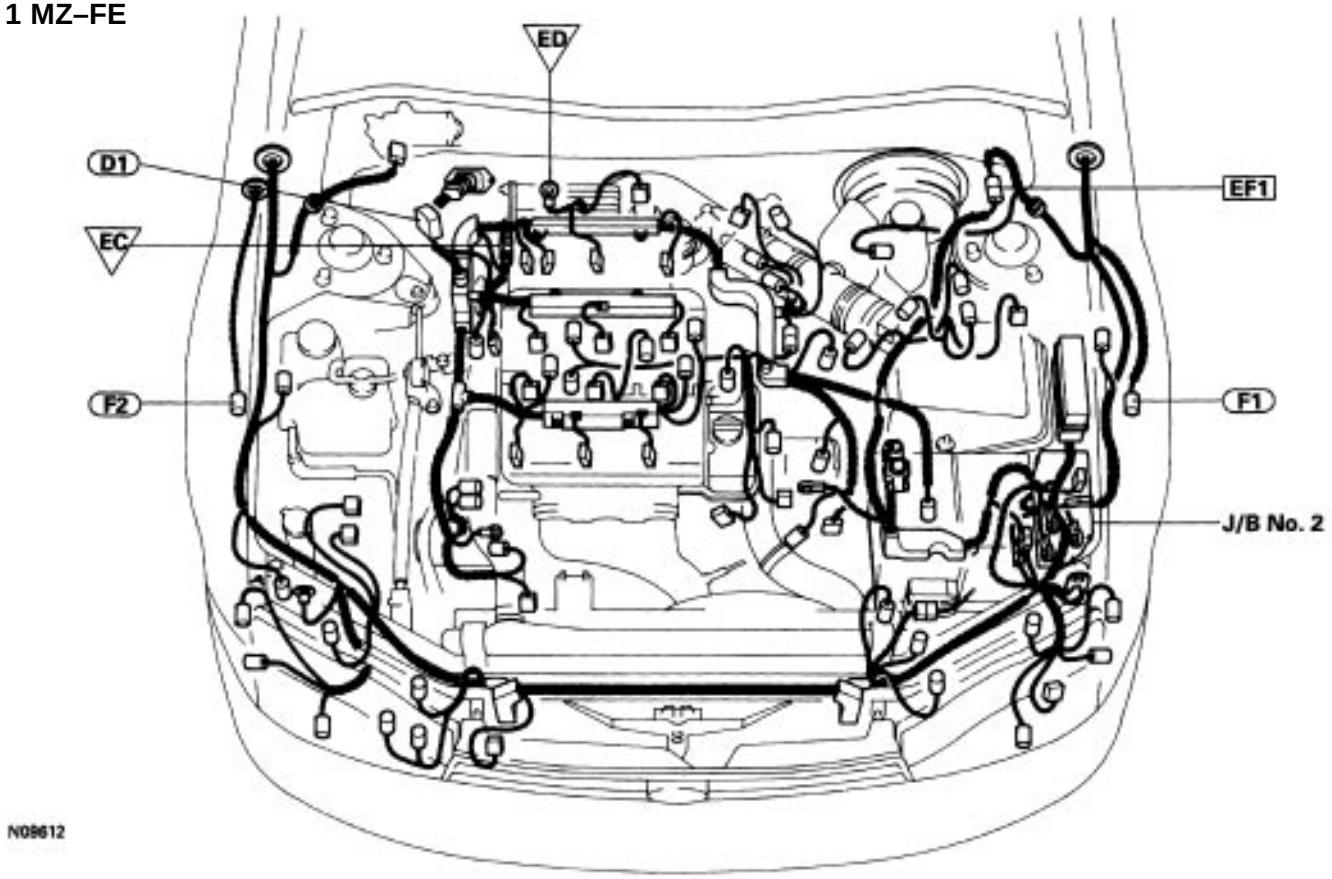
Proceed with troubleshooting of each circuit in the table below.

Problem Symptom	Inspection Item	Page
• With the ignition switch at ACC on ON, the SRS warning light does not lights up.	• SRS warning light malfunc–tion.	RS–140
• With the ignition switch at ACC or ON, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed. • SRS warning light lights up even when ignition switch is in the LOCK position.	• SRS Warning light system (Always lit up when ignition switch is LOCK position)	RS–146
• Diagnostic trouble code not displayed. • Diagnostic trouble code continuously displayed.	• Te terminal circuit	RS–148

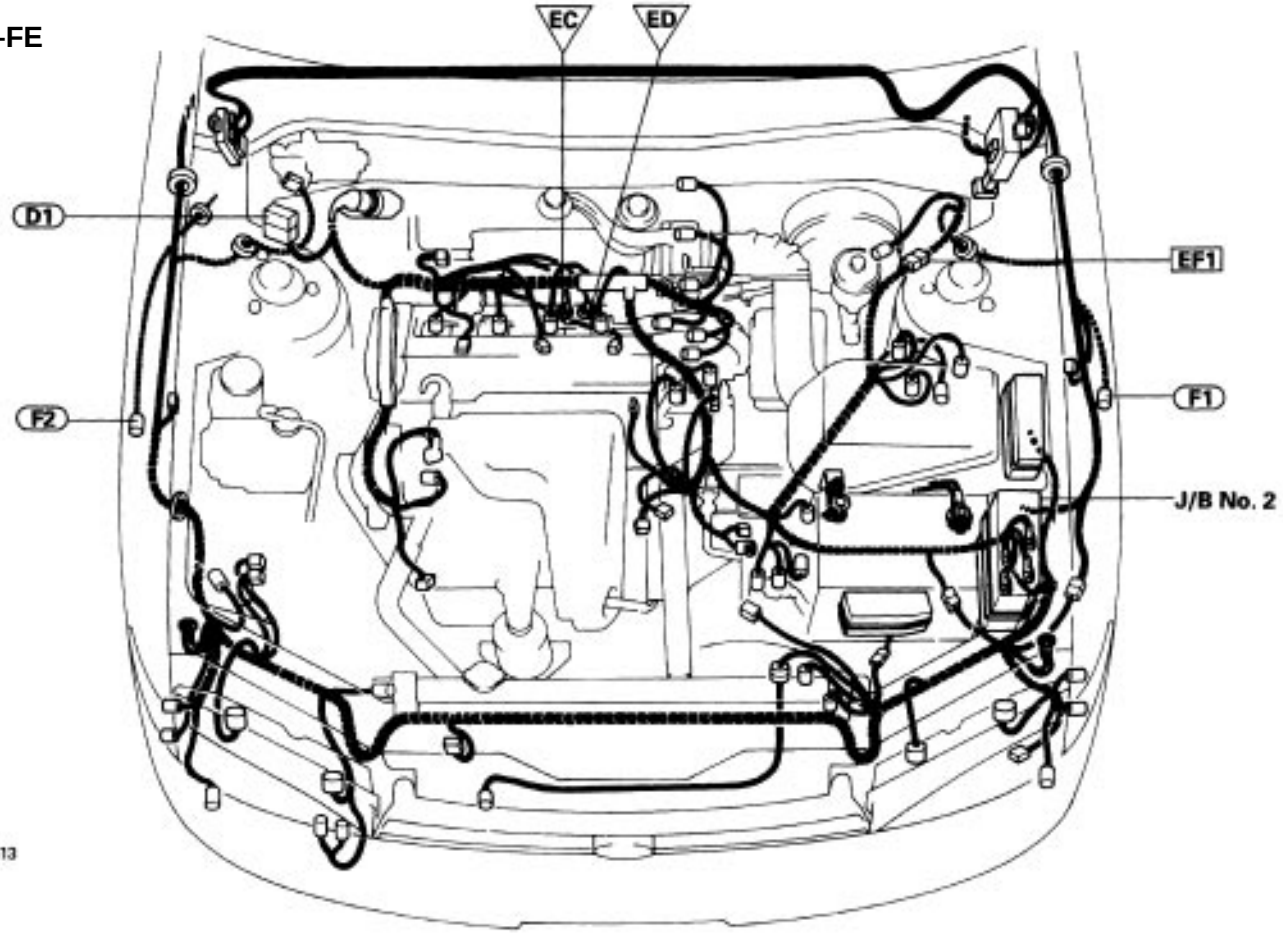
LOCATION OF CONNECTORS

Location of Connectors in Engine Compartment

1 MZ–FE



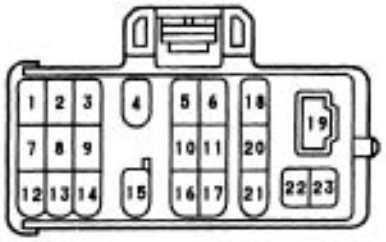
5S–FE



1MZ-FE

D1

DLC1

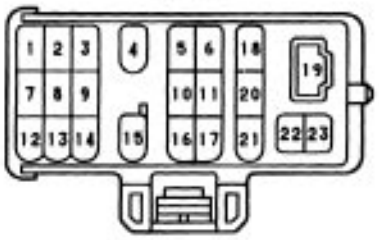


Iei-23-1

5S-FE

D1

DLC1



Iei-23-1-A

F1

Front Airbag Sensor LH

Ie-2-1-B

F2

Front Airbag Sensor RH

Ie-2-1-B

EF1

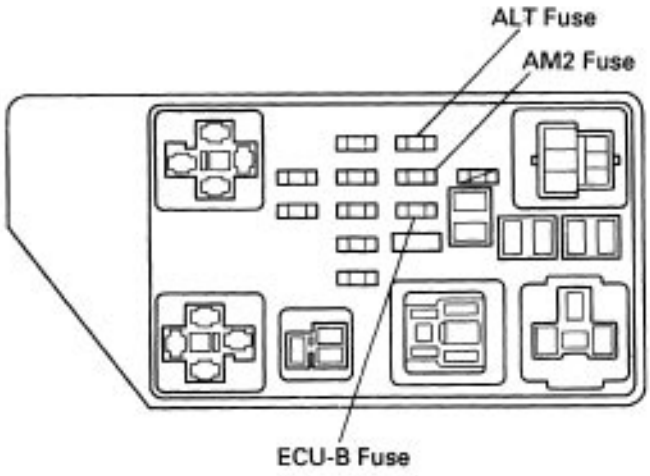
Engine Wire

Ifg-4-1

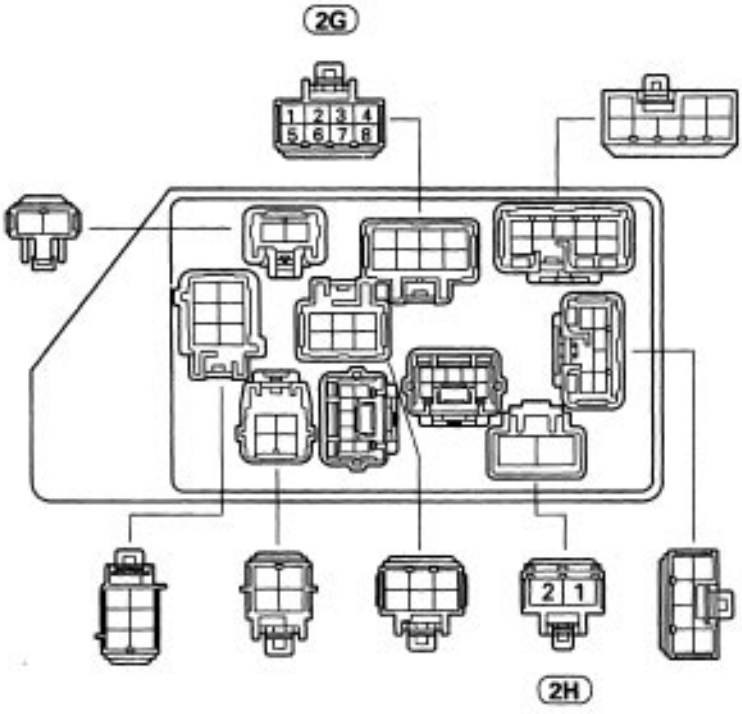
Engine Room Main Wire

Ifg-4-2

JI6 No. 2

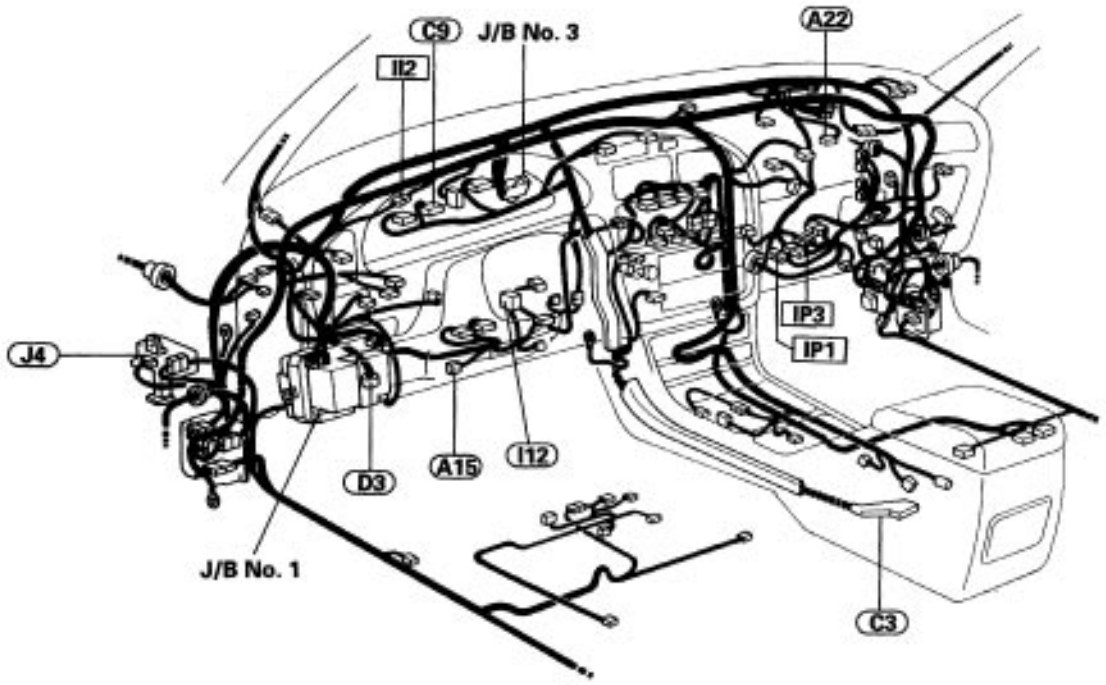


N09542



N09543

Location of Connectors in Instrument Panel



N09614

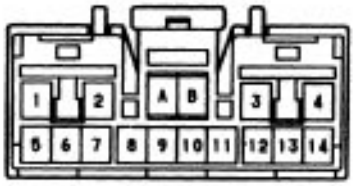
A15
Airbag Squib
(for Driver's)

e-2-1-C

A22
Airbag Squib
(for Passenger's)

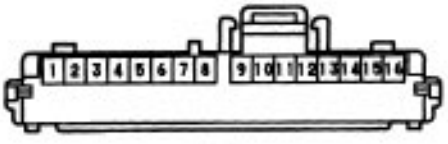
e-2-1-C

C3
Center Airbag
Sensor Assembly



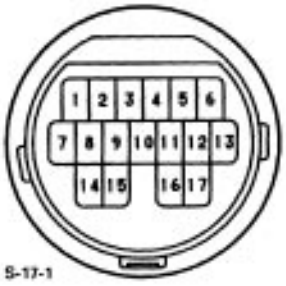
R06611

C9
SRS Warning Light
(COMB. METER)



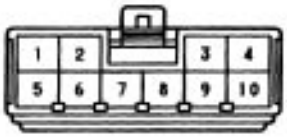
j-16-1

D3
DLC2



S-17-1

I12
Ignition Switch



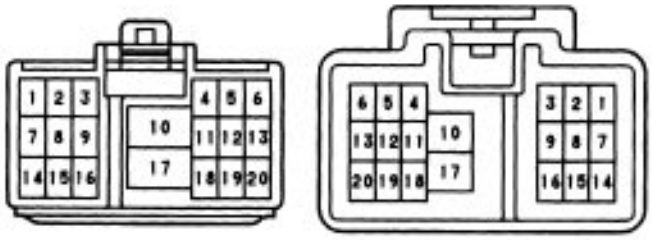
R09352

J4

Junction Connector

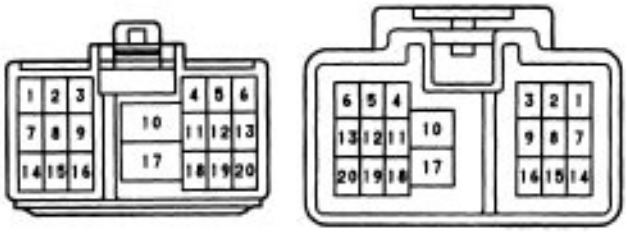
e-14-1-A

II2



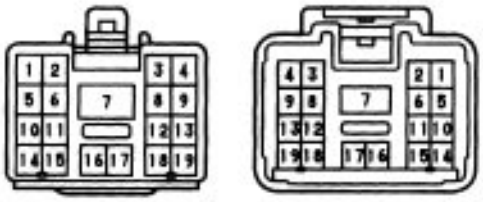
e-20-1-B e-20-2-B

IP1



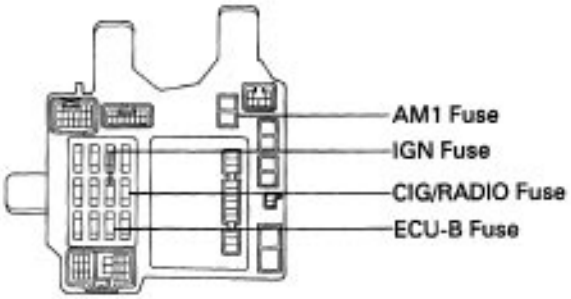
e-20-1-B e-20-2-B

IP3



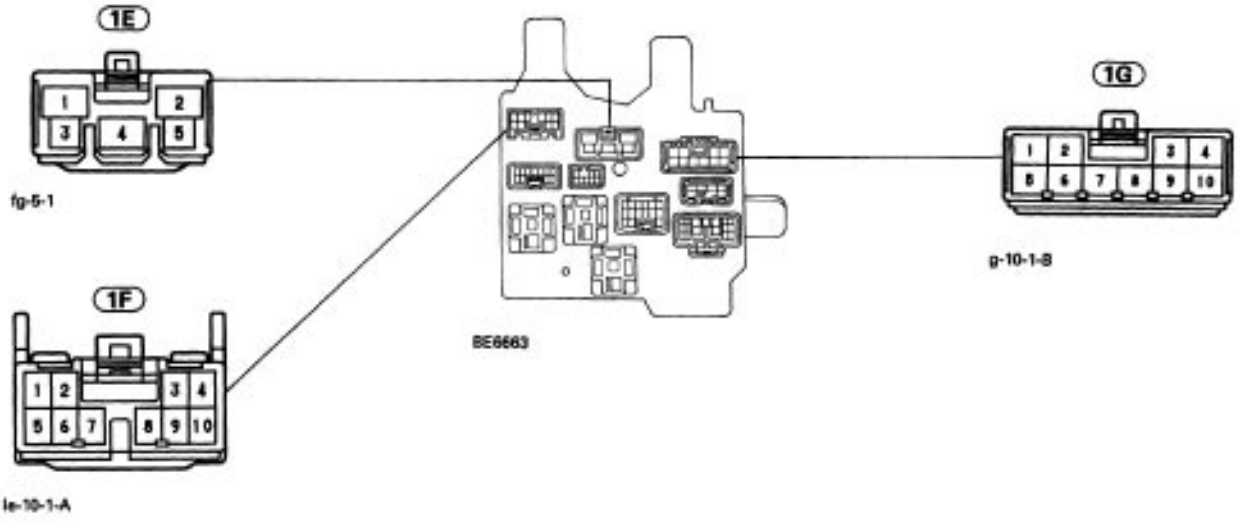
ef-19-1 ef-19-2

J/B No. 1



BE6672

JIB No. 1



1E

fg-5-1

1F

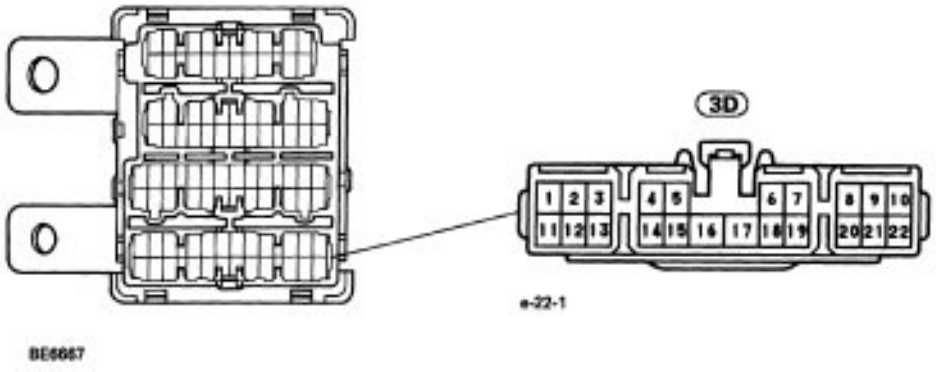
le-10-1-A

BE6663

1G

g-10-1-B

J/B No. 3



CIRCUIT INSPECTION

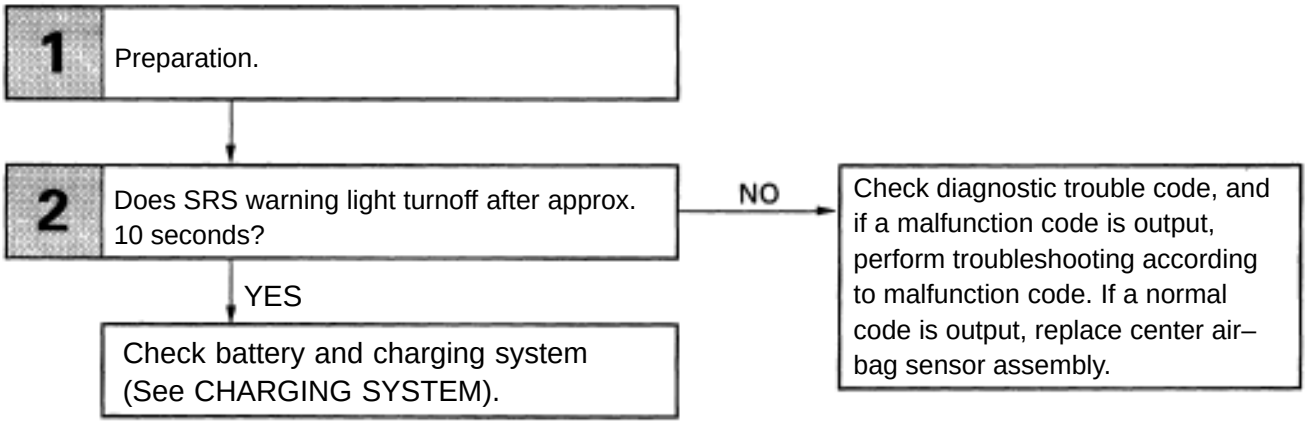
DTC (Normal) Source Voltage Drop

CIRCUIT DESCRIPTION

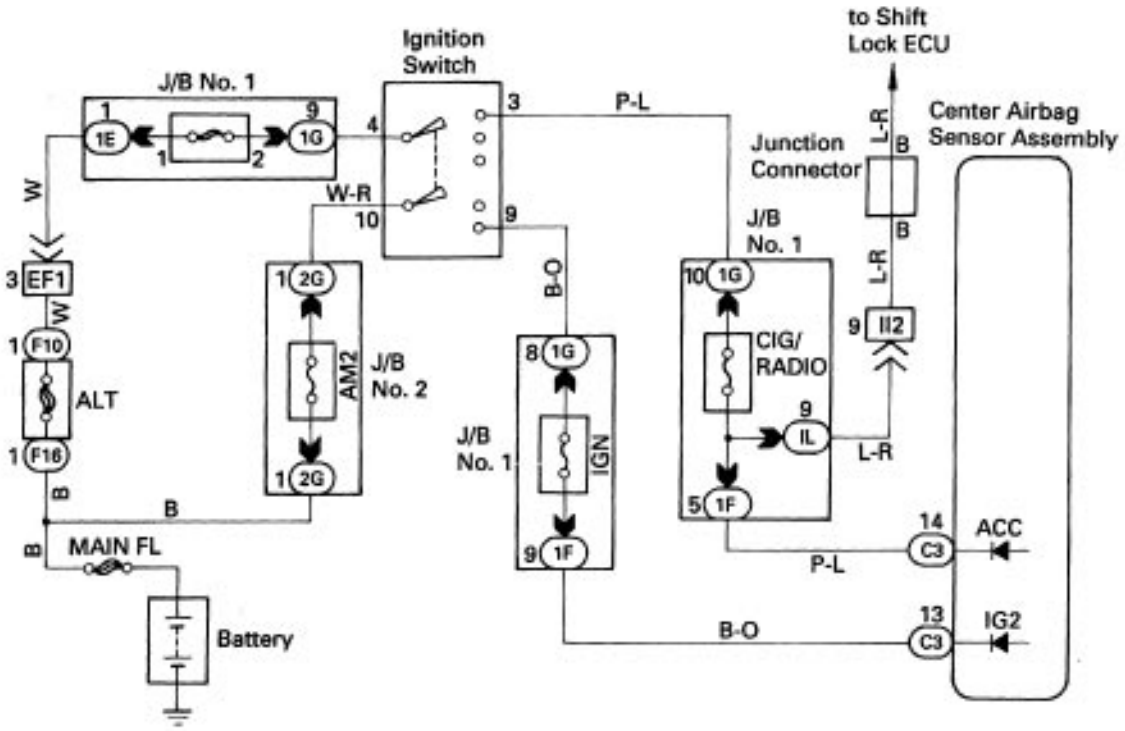
The supplemental restraint system is equipped with a voltage – increase circuit (DC–DC converter) in the center airbag sensor assembly in case the source voltage drops.
When the battery voltage drops, the voltage – increase circuit (DC–DC converter) functions to increase the voltage of the supplemental restraint system to normal voltage.
The diagnosis system malfunction display for this circuit is different to other circuits – when the SRS warning light remains lit up and the diagnostic trouble code is a normal code, source voltage drop is indicated. Malfunction in this circuit is not recorded in the center airbag sensor assembly, and approx. 10 seconds after the source voltage returns to normal, the SRS warning light automatically goes off.

DTC No.	Diagnosis
(Normal)	Source voltage drop.

DIAGNOSTIC CHART



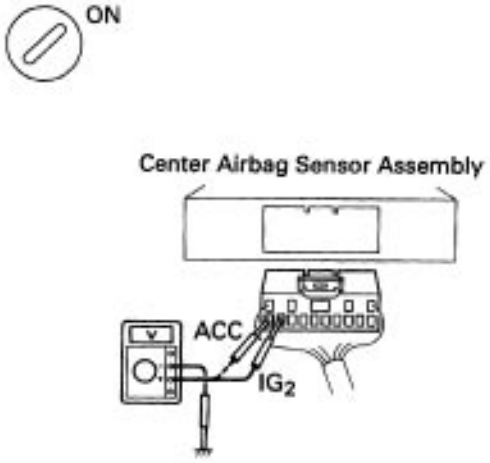
DIAGNOSTIC CHART
WIRING DIAGRAM



INSPECTION PROCEDURES

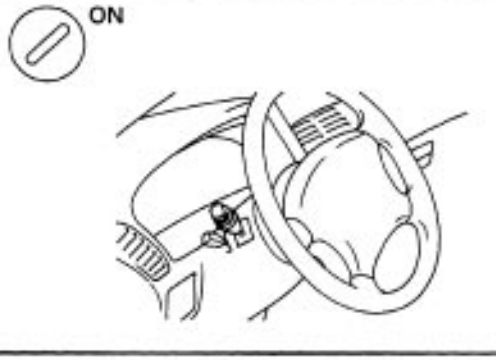
P Preparation C Check

1 Preparation.



P
(1) Turn ignition switch LOCK.
(2) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(3) Connect battery negative (–) terminal cable.
(4) Disconnect center airbag sensor assembly connector.
(5) Turn ignition switch O
N. But do not start engine.
(6) Measure voltage at IG2 or ACC on connector wire harness side of center airbag sensor assembly and operate electric system (defogger, wiper, headlight, heater blower, etc.).
Voltage: 6 V – 11.5 V at IG2 and ACC.
(7) Turn electric system switch OFF.
(8) Turn ignition switch LOCK.
(9) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(10) Remove voltmeter and connect center airbag sensor assembly connector.
(11) Connect battery negative (–) terminal cable.

2 Does SRS warning light turn off?



P Turn ignition switch ON.
C Operate electric system checked in 1 (5) and check that SRS warning light goes off.

YES

NO → **Check diagnostic trouble code, and if a malfunction code is output, perform troubleshooting according to malfunction code. If a normal code is output, replace center airbag sensor assembly.**

Check battery and charging system .

– MEMO –

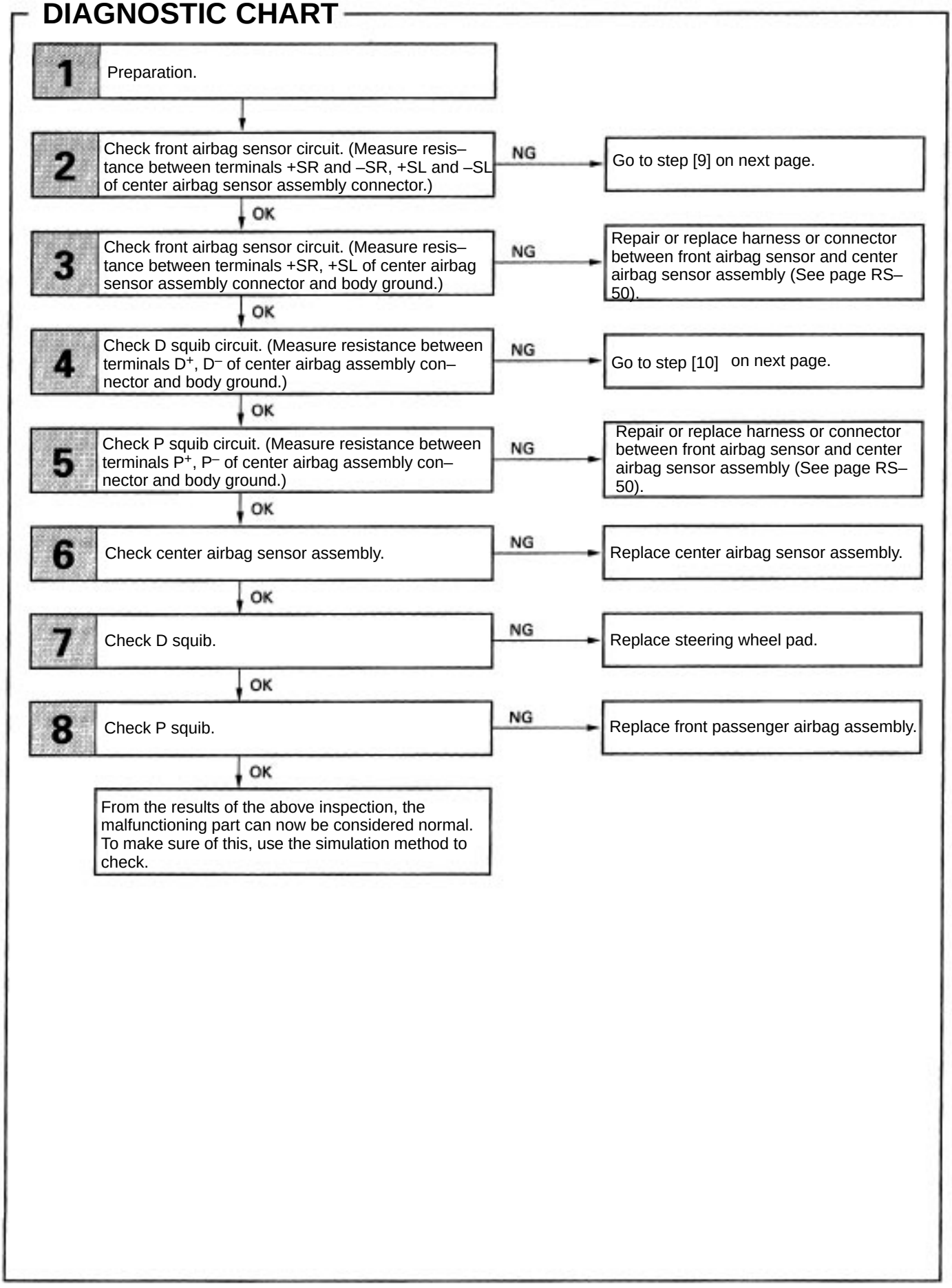
DTC 11 Short in Squib Circuit or Front Airbag Sensor Circuit (to Ground)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable, steering wheel pad (squib), wire harness connector and front passenger airbag assembly(squib). It causes the airbag to operate when the airbag operation conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in front fender on the left and right sides.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.
Diagnostic trouble code 11 is recorded when ground short is detected in the squib circuit or front airbag sensor circuit.

DTC No.	Diagnosis
11	• Short circuit in squib wire harness (to ground). • Squib malfunction. • Short circuit in front airbag sensor +S, D+, D–, P+, P–, wire harness (to ground). • Front airbag sensor malfunction. • Short circuit between +S wire harness and –S wire harness of front airbag sensor. • Spiral cable malfunction. • Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART



DIAGNOSTIC CHART (Cont'd)

9	Check front airbag sensor.	NG	Replace front airbag sensor.

OK

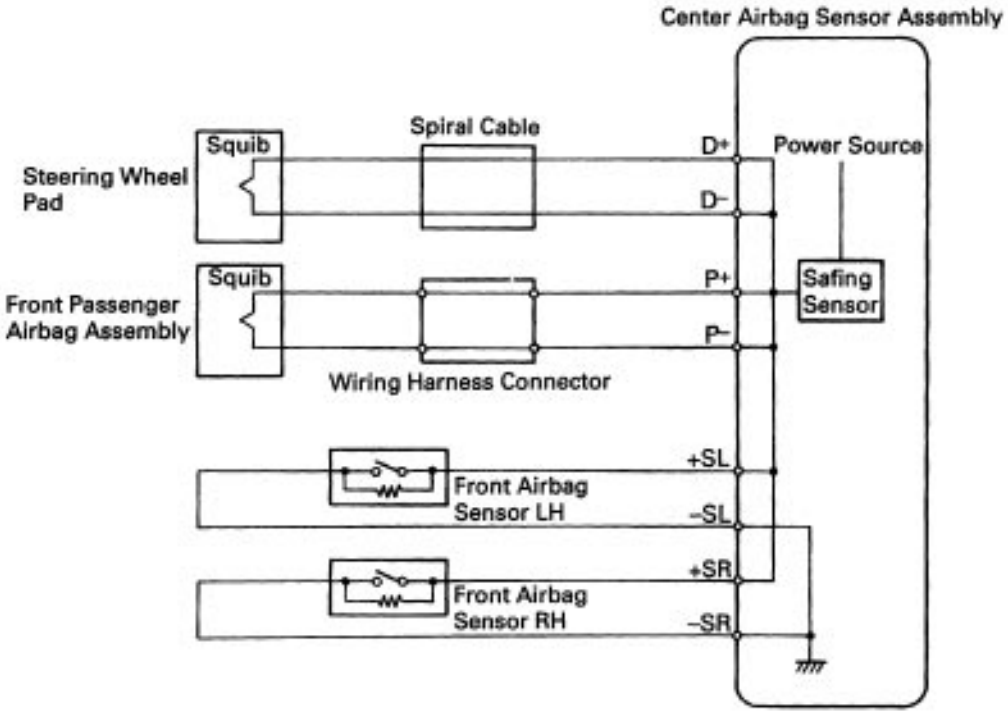
Repair or replace harness or connector between front airbag sensor and center airbag sensor assembly (See page RS–50).

10	Check spiral cable.	NG	Repair or replace spiral cable.

OK

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

WIRING DIAGRAM

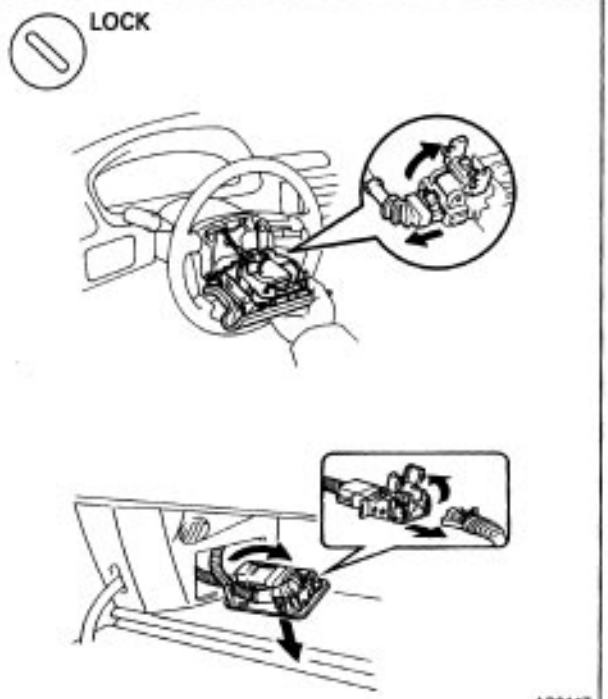


R07905

INSPECTION PROCEDURE

P Preparation C Check

1 Preparation.

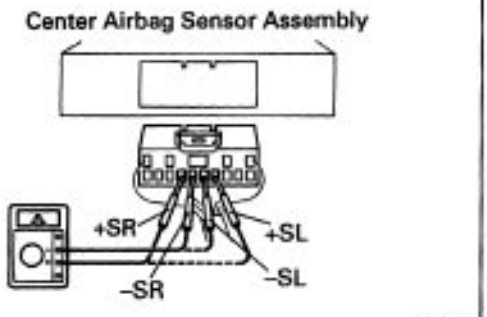


P (1) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(2) Remove steering wheel pad (See page RS–20).
(3) Disconnect connectors of front passenger airbag assembly. (See page RS–29)

Caution

Store the steering wheel pad with the front surface facing upward.

2 Check front airbag sensor circuit. (Measure resistance between terminals +SR and –SR, +SL and –SL of center airbag sensor assembly connector.)



P Disconnect center airbag sensor assembly connectors.

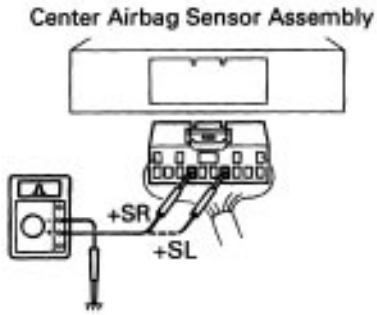
C Measure resistance between terminals +SR and –SR, +SL and –SL of harness side connector of center airbag sensor assembly.

OK **Resistance: 755 Ω – 885 Ω**

OK

NG Go to step 9.

3 **Check front airbag sensor circuit. (Measure resistance between terminals +SR, +SL of center airbag sensor assembly connector and body ground.)**



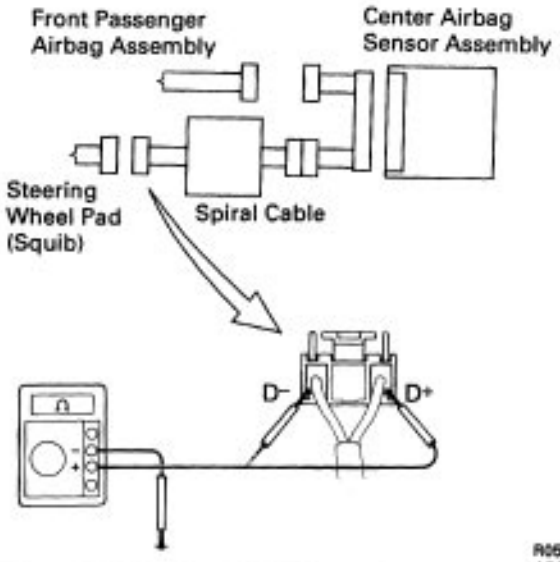
C Measure resistance between terminals +SR, +SL of harness side connector of center airbag sensor assembly and body ground.

OK **Resistance: 1 MΩ or higher.**

OK

NG **Repair or replace harness or connector between front airbag sensor and center airbag sensor assembly (See page RS–50).**

4 **Check D squib circuit.**



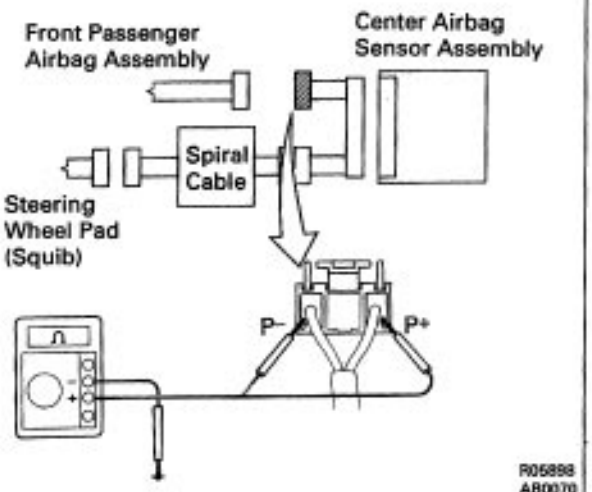
C For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between D+, D– and body ground.

OK **Resistance: 1 MΩ or higher**

OK

NG **Go to step 10.**

5 Check P squib circuit.



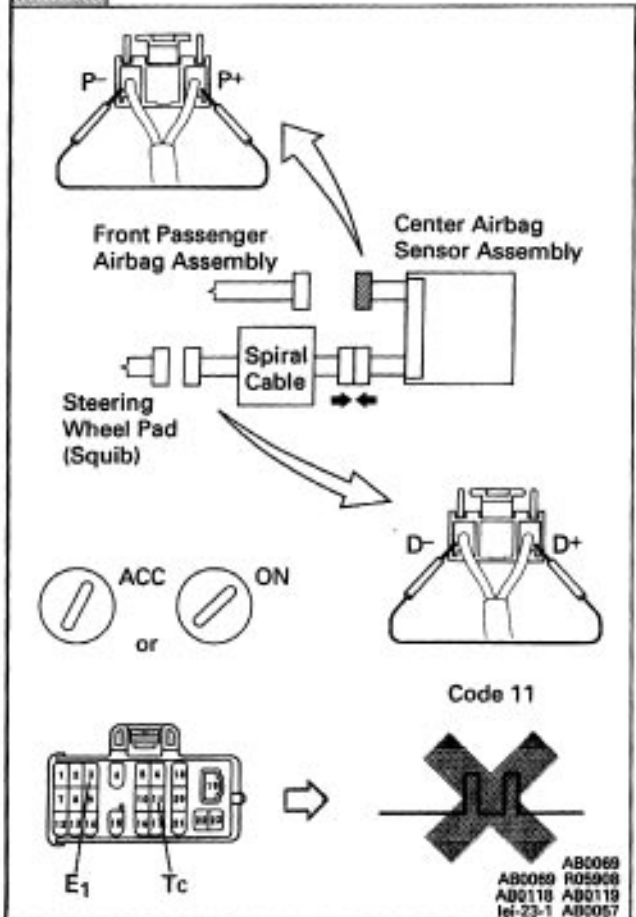
C For the connector (on the wiring harness connector
side) between the wiring harness connector and front passenger airbag assembly, measure the resistance between P+, P– and body ground.

OK **Resistance: 1 MΩ or higher**

OK

NG **Repair or replace harness of connector between the center airbag sensor assembly and front passenger airbag assembly.**

6 Check center airbag sensor assembly.



P (1) Connect connectors to center airbag sensor assembly.
(2) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(3) Using a service wire, connect P+ and P– on center airbag sensor assembly side of connec–
tor between center airbag sensor assembly and front passenger airbag assembly.
(4) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(5) Turn ignition switch ACC or ON, and wait at least 20 seconds.
Clear malfunction code (See page RS–65).
Turn ignition switch LOCK and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

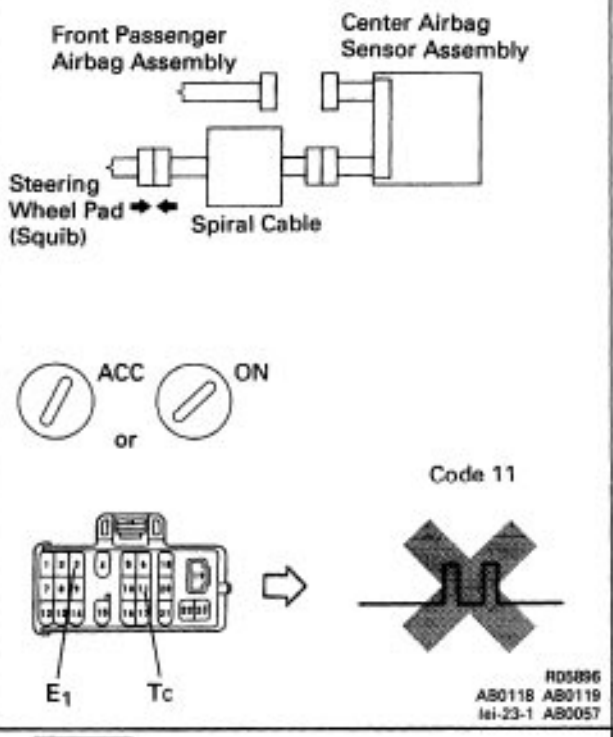
OK **Diagnostic trouble code 11 is not output.**

Hint Codes other than code 11 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

7 Check D squib.



P
(1) Turn ignition switch LOCK.
(2) Disconnect battery negative (–) terminal cable and wait at least 90 seconds.
(3) Connect steering wheel pad (squib) connec–tor.
(4) Connect negative (–) terminal cable to battery and wait at least 2 seconds.
(5) Turn ignition switch ACC or ON, and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C
(1) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020

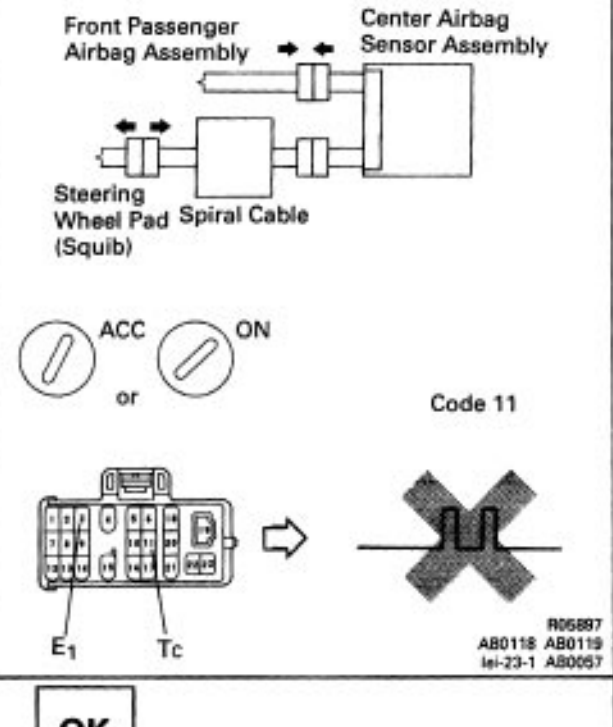
OK
(3) Check diagnostic trouble code.

Hint
Diagnostic trouble code 11 is not output.
Codes other than code 11 may be output at this time, but they are not relevant to this check.

OK

NG → **Replace steering wheel pad.**

8 Check P squib.



P
(1) Turn ignition switch LOCK.
(2) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(3) Connect front passenger airbag assembly (squib) connector.
(4) Disconnect steering wheel pad (squib) con–nector.
(5) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(6) Turn ignition switch ACC or ON, and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C
(1) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
(3) Check diagnostic trouble code.

OK
Diagnostic trouble code 11 is not output.

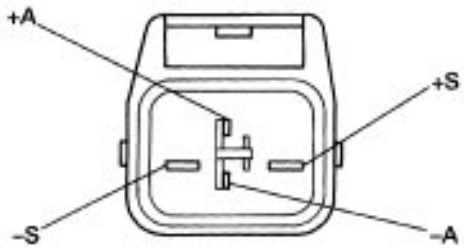
Hint
Codes other than code 11 may be output at this time, but they are not relevant to this check.

OK

NG → **Replace front passenger airbag assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

9 Check front airbag sensor.



P Disconnect front airbag sensor connector.

C Measure resistance between each terminal of front airbag sensor.

OK

Terminal	Resistance
(+)S – (+)A	Below 1 Ω
(+)S – (–) S	M CI or higher
(–)S – (–) A	755 Ω – 885 Ω

Notice

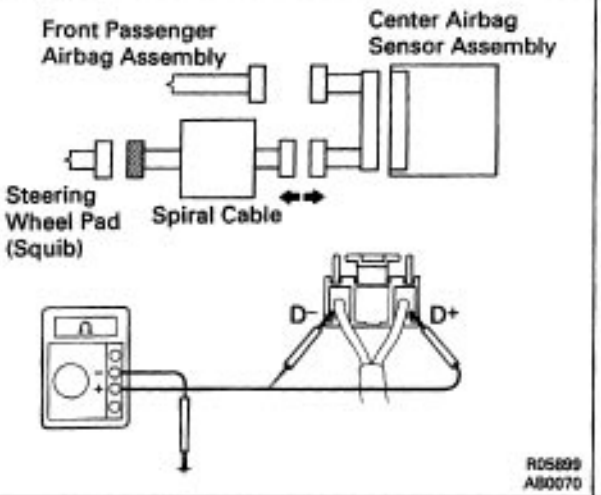
- **Do not press ohmmeter probes strongly against terminals of front airbag sensor.**
- **Make sure the front airbag sensor connector is properly connected.**

OK

NG **Replace front airbag sensor.**

Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–27).

10 Check spiral cable.



P Disconnect connector between center airbag sensor assembly and spiral cable.

C Measure resistance between D+, D– on spiral cable side of connector between spiral cable and steering wheel pad and body ground.

OK **Resistance: 1 M Ω or higher**

OK

NG **Repair or replace spiral cable.**

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

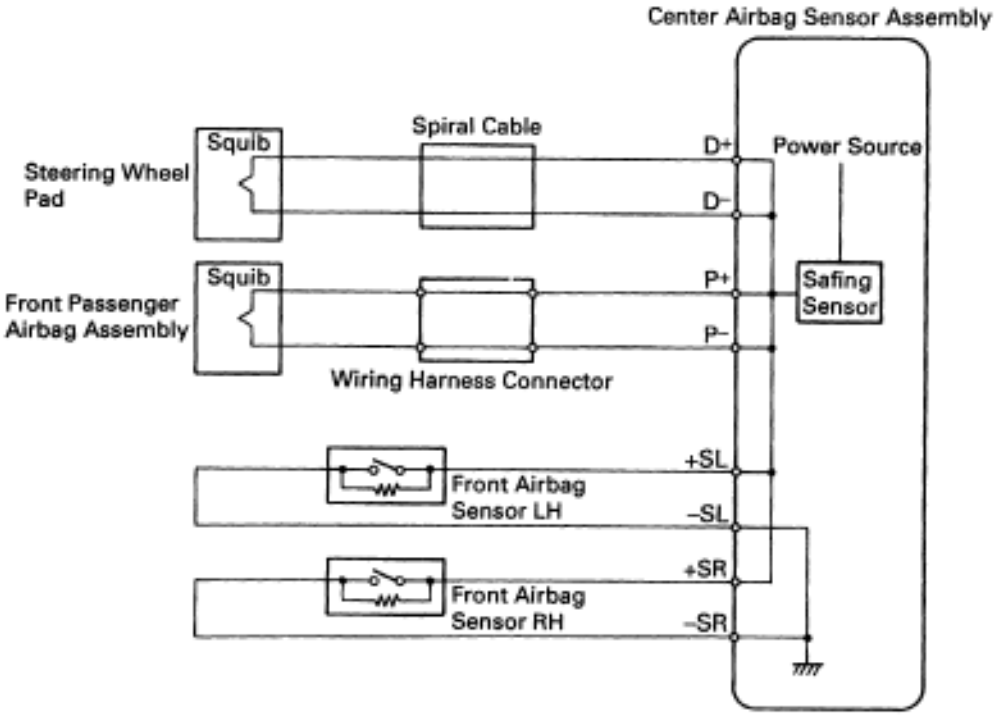
DTC 12 Short in Squib Circuit (to B+)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable and the steering wheel pad (squib). It causes the airbag to deploy when the airbag deployment conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10–
Diagnostic trouble code 12 is recorded when a +B short is detected in the squib circuit or the front airbag sensor circuit.

DTC No.	Diagnosis
12	• Short circuit in squib wire harness (to +B). • Squib malfunction. • Short circuit in front airbag sensor +S wire harness (to +B). • Open circuit in RH and LH front airbag sensor harness. • Spiral cable malfunction. • Center airbag sensor assembly malfunction.

WIRING DIAGRAM



DIAGNOSTIC CHART

1 Preparation.

↓

2 Check front airbag sensor circuit. (Measure resistance between terminals +SR and –SR, +SL and –SL of center airbag sensor assembly connector.)

NG → Go to Code 15 (See page RS–110).

↓ OK

3 Check front airbag sensor circuit. (Measure voltage between terminal +SR or +SL of center airbag sensor assembly connector and body ground.)

NG → Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–50).

↓ OK

4 Check front airbag sensor circuit. (Measure voltage between terminals D+ and D– of center airbag sensor assembly connector and body ground.)

NG → Go to step [9]

↓ OK

5 Check front airbag sensor circuit. (Measure voltage between terminals P+ and P' of center airbag sensor assembly connector and body ground.)

NG → Repair or replace harness or connector between front airbag sensor and center airbag sensor assembly. (See page RS–50).

↓ OK

6 Check center airbag sensor assembly.

NG → Replace center airbag sensor assembly.

↓ OK

7 Check D squib.

NG → Replace steering wheel pad.

↓ OK

8 Check P squib.

NG → Replace front passenger airbag assembly.

↓ OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

9 Check spiral cable.

NG → Repair or replace spiral cable.

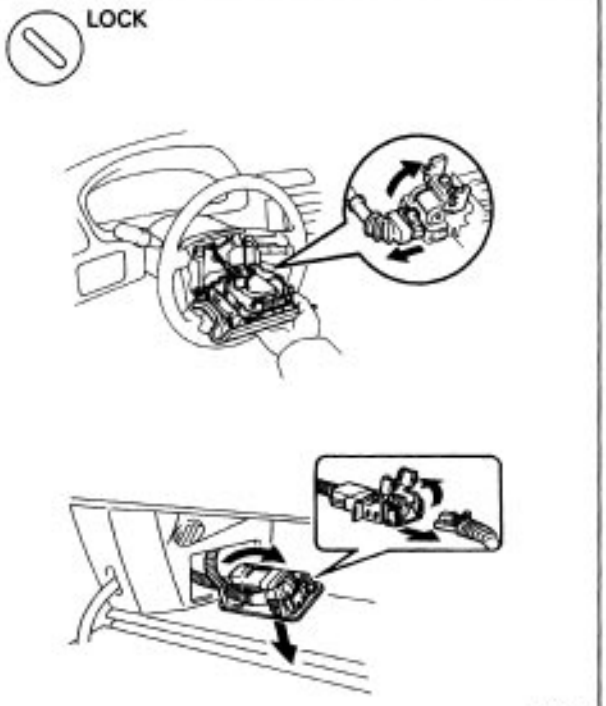
↓ OK

Repair or replace harness or connecter between center airbag sensor assembly and spiral cable.

INSPECTION PROCEDURES

P Preparation C Check

1 **Preparation.**

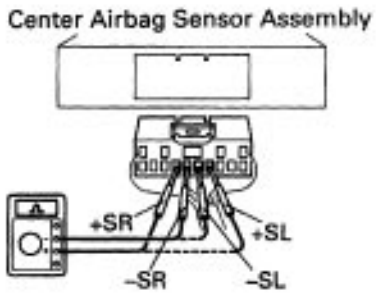


P (1) Disconnect battery negative H terminal cable, and wait at least 90 seconds.
(2) Remove steering wheel pad (See page RS–20).
(3) Disconnect connectors of front passenger airbag assembly. (See page RS–29)

Caution

Store the steering wheel pad with the front surface facing upward.

2 **Check front airbag sensor circuit. (Measure resistance between terminals +SR and –SR, +SL and –SL of center airbag sensor assembly connector.)**



P Disconnect center airbag sensor assembly connector.

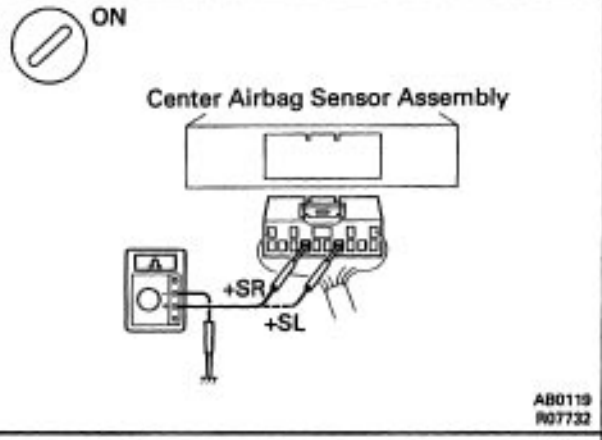
C Measure resistance between terminals +SR and –SR, +SL and –SL of harness side connector of center airbag sensor assembly.

OK **Resistance: 755II – 885II**

OK

NG **Go to Code 15 (See page RS–110).**

3 **Check front airbag sensor circuit. (Measure voltage between terminal +SR or +SL of center airbag sensor assembly connector and body ground.)**



P (1) Connect negative (–) terminal cable to battery.
(2) Turn ignition switch ON.

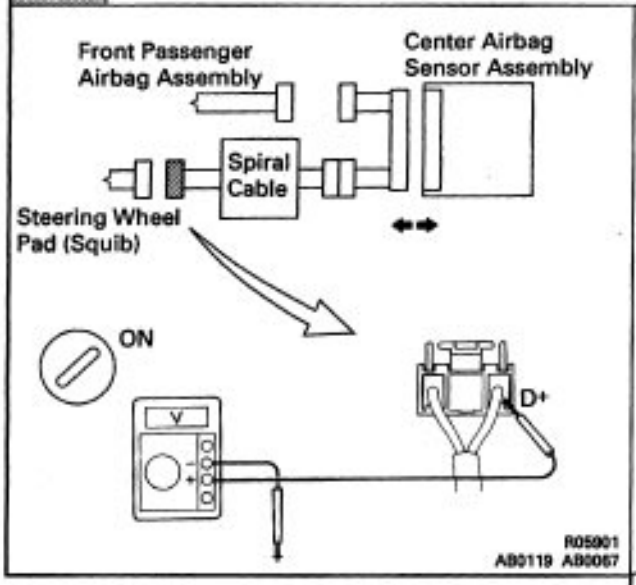
C Measure voltage between terminals +SR or +SL of
harness side connector of center airbag sensor assembly and body ground.

OK **Voltage: Below 1 V**

OK

NG **Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–50).**

4 **Check D squib circuit.**



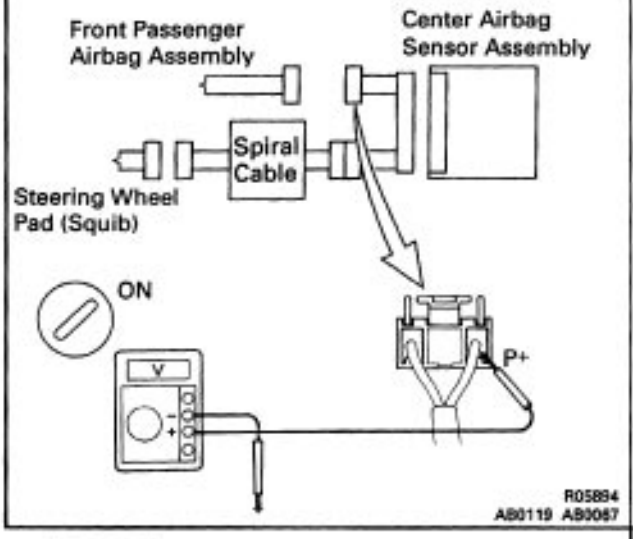
C Measure voltage at D+ on spiral cable side of connector between spiral cable and steering wheelpad.

OK **Voltage: Below 1 V**

OK

NG **G o to step 9 .**

5 Check P squib circuit.



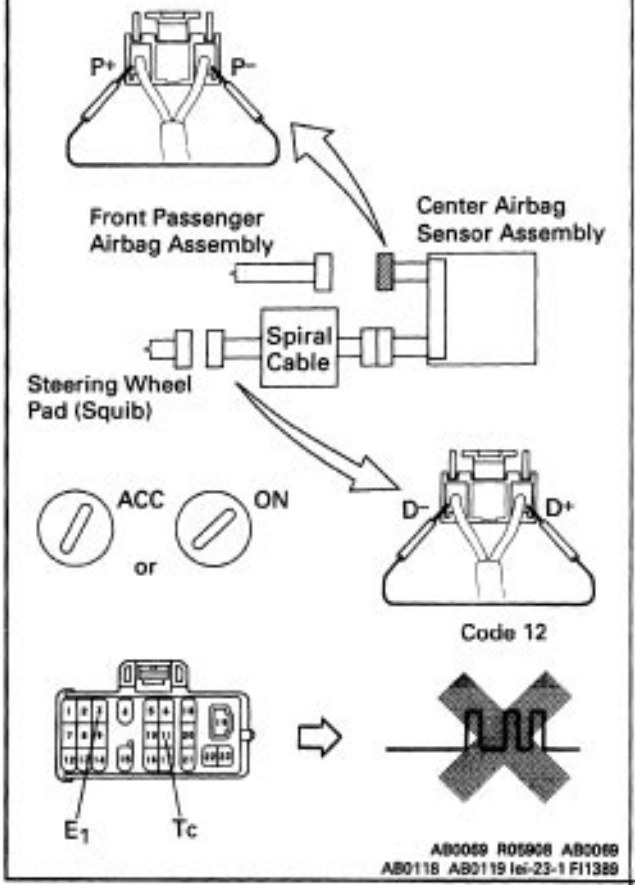
C Measure voltage at P+ on center airbag sensor assembly side of connector between center airbag sensor assembly and front passenger airbag assembly.

OK **Voltage: Below 1 V**

OK

NG **Repair or replace harness or connector between front airbag sensor and center airbag sensor assembly. (See page RS–50).**

6 Check D squib circuit.



P (1) Turn ignition switch LOCK.

(2) Disconnect negative H terminal cable from battery.

(3) Connect connector to center airbag sensor assembly.

(4) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

(5) Using a service wire, connect P+ and P– on wire harness connector and front passenger airbag assembly.

(6) Connect negative H terminal cable to battery, and wait at least 2 seconds.

(7) Turn ignition switch ACC on ON and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON, and wait at least 20 seconds.

(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020

(3) Check diagnostic trouble code.

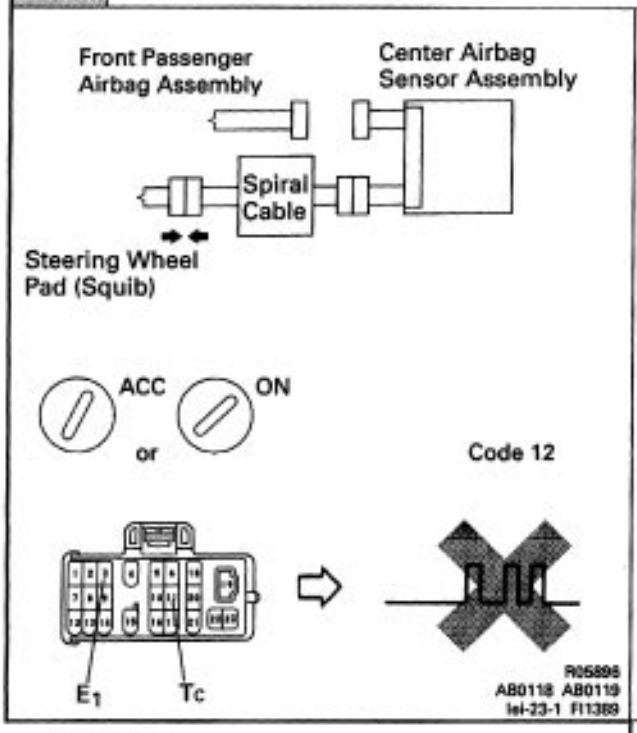
OK **Diagnostic trouble code 12 is not output.**

Hint Codes other than code 12 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

7 Check D squib.



P (1) Turn ignition switch LOCK.
(2) Disconnect battery negative 1–) terminal cable, and wait at least 90 seconds.
(3) Connect steering wheel pad (squib) connector.
(4) Connect negative H terminal cable to battery, and bait at least 2 seconds.
(5) Turn ignition switch, ACC or ON, and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON, and wait at least 20 seconds
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

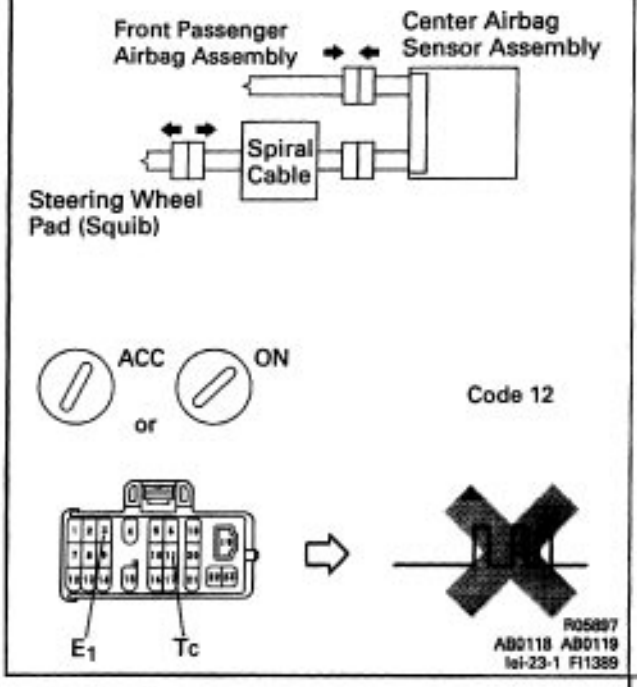
OK **Diagnostic trouble code 12 is not output.**

Hint Code other than code 12 may be output at this time, but they are not relevant to this check.

OK

NG **Replace steering wheel pad.**

8 Check P squib.



P (1) Turn ignition switch LOCK.
(2) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(3) Connect front passenger airbag assembly (squib) connector.
(4) Disconnect steering wheel pad (squib)connector.
(5) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(6) Turn ignition switch ACC or ON and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
(3) Check diagnostic trouble code.

OK **Diagnostic trouble code 12 is not output.**

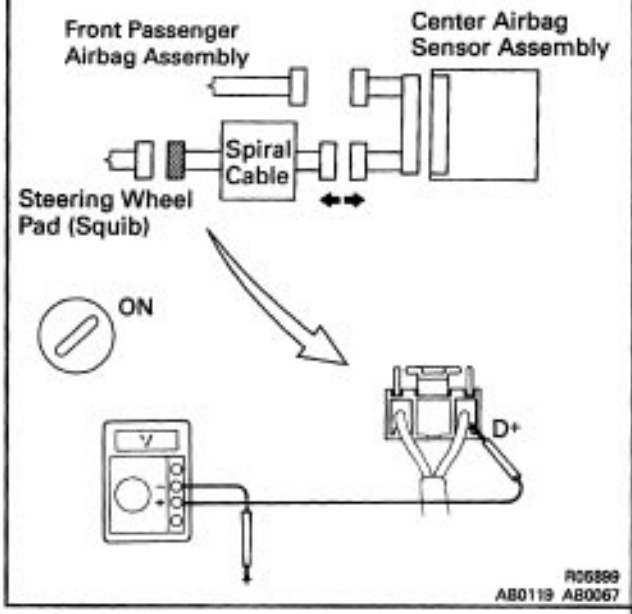
Hint Codes other than code 12 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

7 **Check spiral cable.**



P (1) Turn ignition switch LOCK.
(2) Disconnect connector between center airbag sensor assembly and spiral cable
(3) Turn ignition switch ON.

C Measure voltage at D+ on spiral cable side of con–
nector between spiral cable and steering wheel pad.

OK **Voltage: Below 1 V**

OK

NG **Repair or replace spiral cable.**

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

– MEMO –

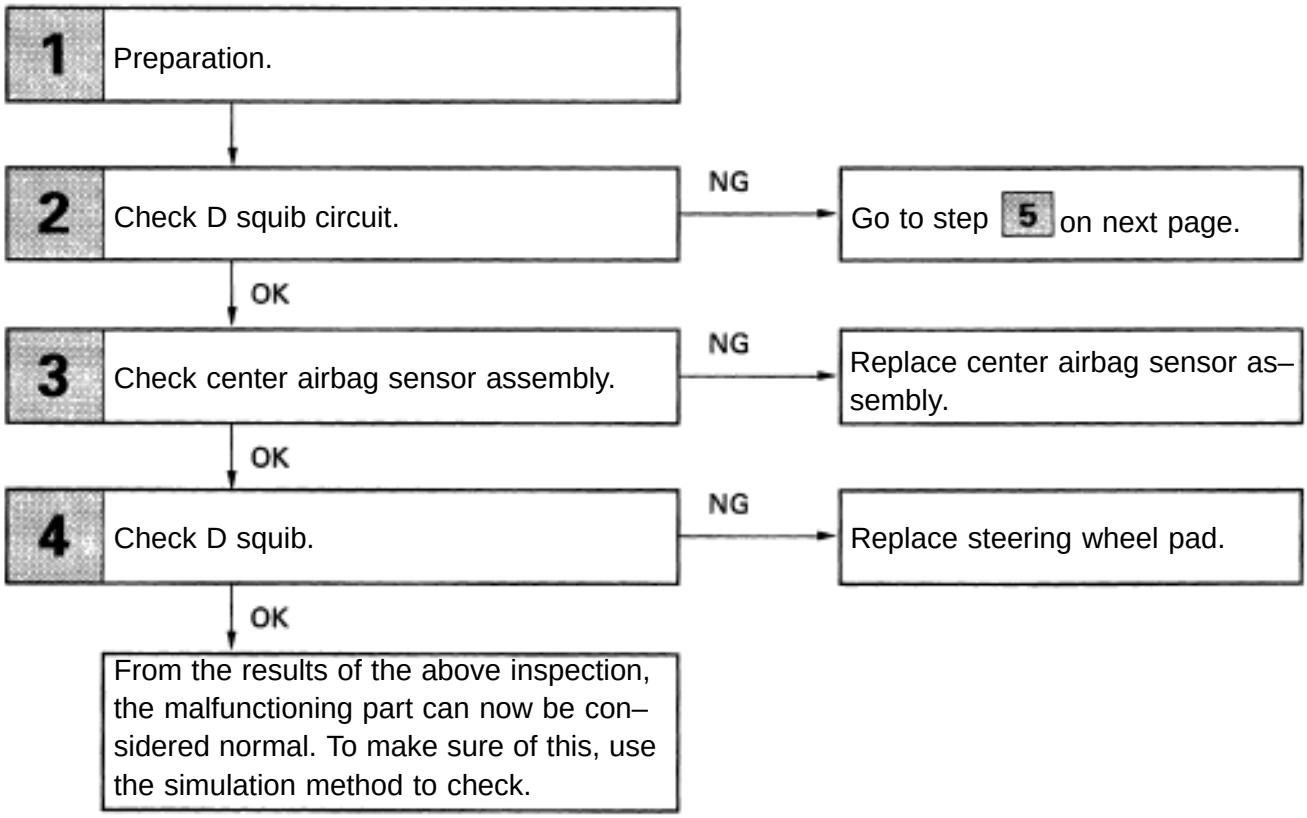
DTC 13 Short in Squib Circuit (Between D+ Wire Harness and D– Wire Harness)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable and the steering wheel pad (squib). It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.
Diagnostic trouble code 13 is recorded when a short is detected in the D+ wire harness and D– wire harness of the squib circuit.

DTC No.	Diagnosis
13	• Short circuit between D+ wire harness and D– wire harness of squib. • Squib malfunction. • Spiral cable malfunction. • Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART

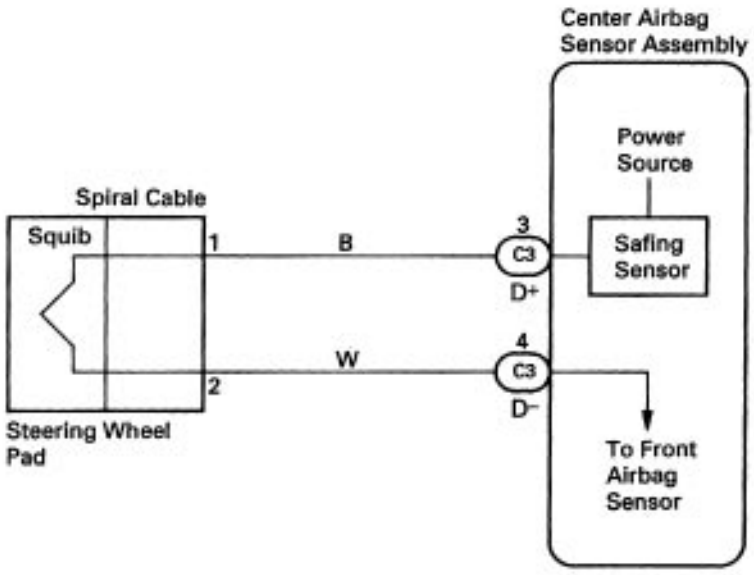


DIAGNOSTIC CHART (Cont'd)

5	Check spiral cable.	NG	Repair or replace spiral cable.
OK			
6	Check harness between center airbag sensor assembly and spiral cable.	NG	Repair or replace harness or connector between center airbag sensor assembly and spiral cable.
OK			
7	Check center airbag sensor assembly.	NG	Replace center airbag sensor assembly.
OK			

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

WIRING DIAGRAM

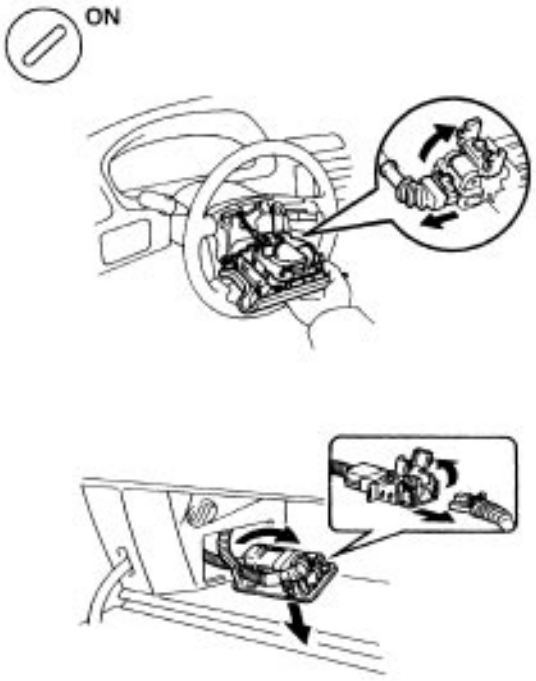


RD5103

INSPECTION PROCEDURE

Preparation
P
C Check

1 Preparation.



AB0117
N01288
R08681

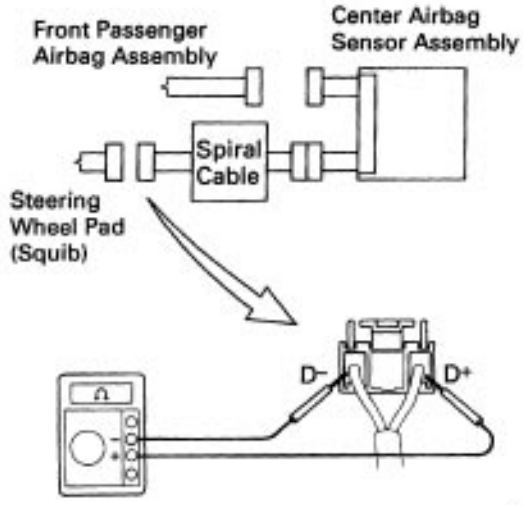
P (1) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(2) Remove steering wheel pad (See page RS–20).
(3) Disconnect connectors of front passenger airbag assembly and seat belt pretensioners. (See page RS–29)

Caution

Store the steering wheel pad with the front surface facing upward.

OK

2 Check D squib circuit.



R05902
AB0068

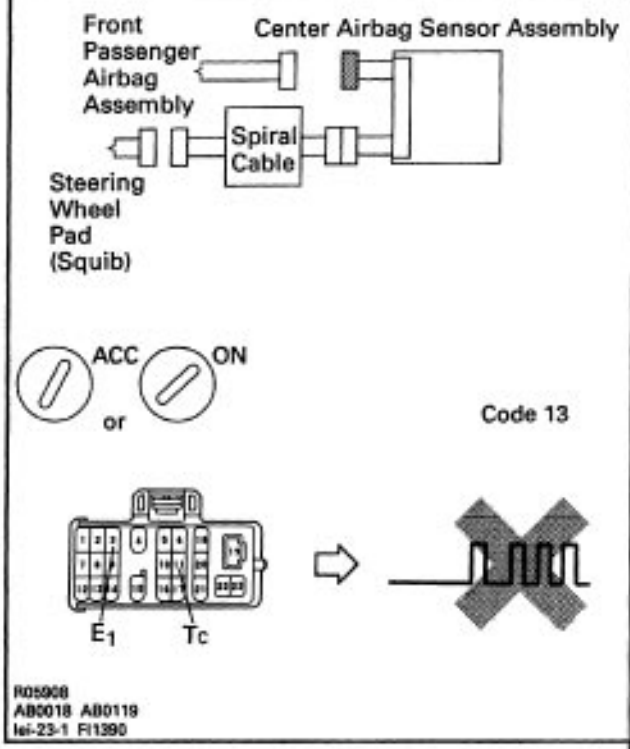
C Measure resistance between D+ and D– on spiral cable side of connector betwen spiral cable and steering wheel pad.

OK **Resistance: 1 kΩ or higher**

OK

NG Go to step 5 .

3 Check center airbag sensor assembly.



P (1) Connect negative (–) terminal cable to battery.
(2) Clear malfunction.
(3) Turn ignition switch LOCK, and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

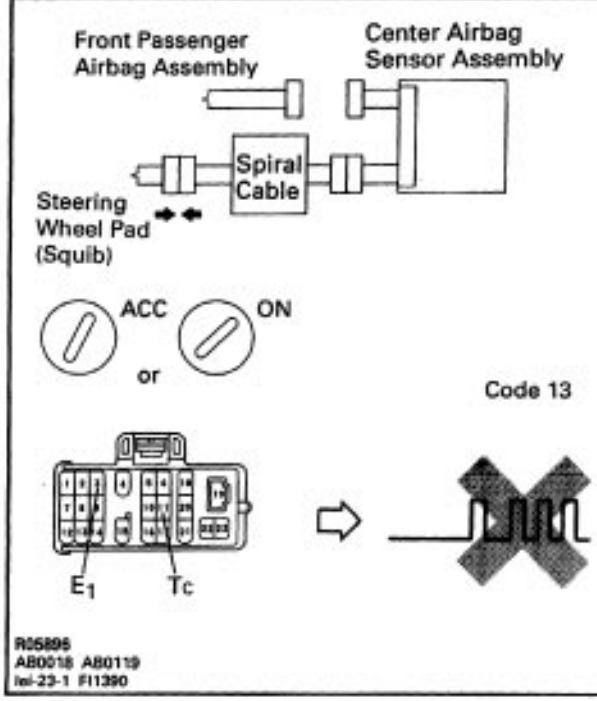
OK **Diagnostic trouble code 13 is not output.**

Hint Codes other than code 13 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

4 Check D squib.



P (1) Turn ignition switch LOCK.
(2) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(3) Connect steering wheel pad (squib) connector.
(4) Connect negative (–) terminal cable to battery.
(5) Clear malfunction.
(6) Turn ignition switch LOCK, and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

OK **Diagnostic trouble code 13 is not output.**

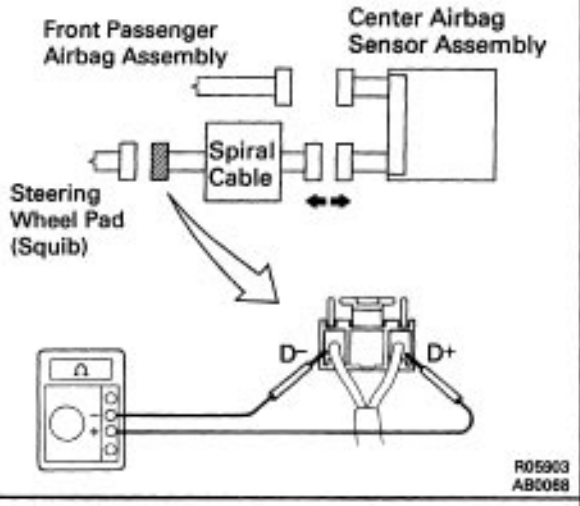
Hint Codes other than code 13 may be output at this time, but they are not relevant to this check.

OK

NG **Replace steering wheel pad.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5 Check spiral cable.



P (1) Disconnect connector between center airbag sensor assembly and spiral cable.
(2) Release airbag activation prevention mechanism on center airbag sensor assembly side of spiral cable connector (See page RS–102).

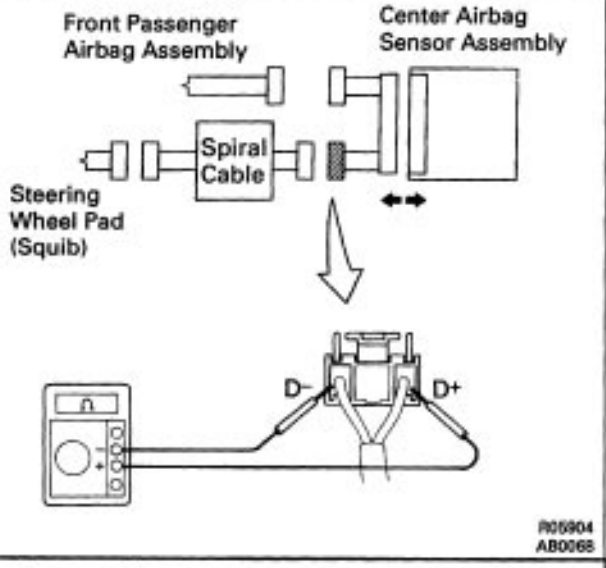
C Measure resistance between D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

OK **Resistance: 1 MΩ or higher**

OK

NG **Repair or replace spiral cable.**

6 Check harness between center airbag sensor assembly and spiral cable.



P (1) Disconnect center airbag sensor assembly connector.
(2) Release airbag activation prevention mechanism on center airbag sensor assembly connector (See page RS–50).

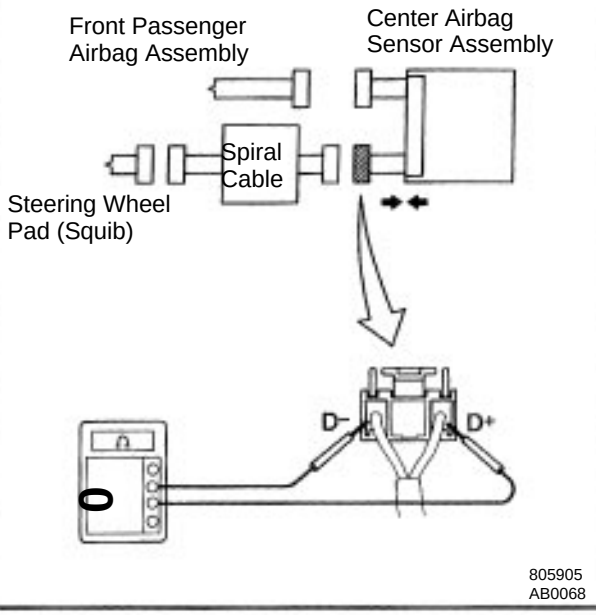
C Measure resistance between D+ and D– on center airbag sensor assembly side of connector between center airbag sensor assembly and spiral cable.

OK **Resistance: 1 MΩ or higher**

OK

NG **Repair or replace harness or connector between center airbag sensor assembly and spiral cable.**

7. Check center airbag sensor assembly.



[P] Connect center airbag sensor assembly connector.

C Measure resistance between D+ and D– on center airbag sensor assembly side of connector between center airbag sensor assembly and spiral cable.

OK **Resistance: 1 KM Ω or higher**

OK

NG **Replace center airbag sensor assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

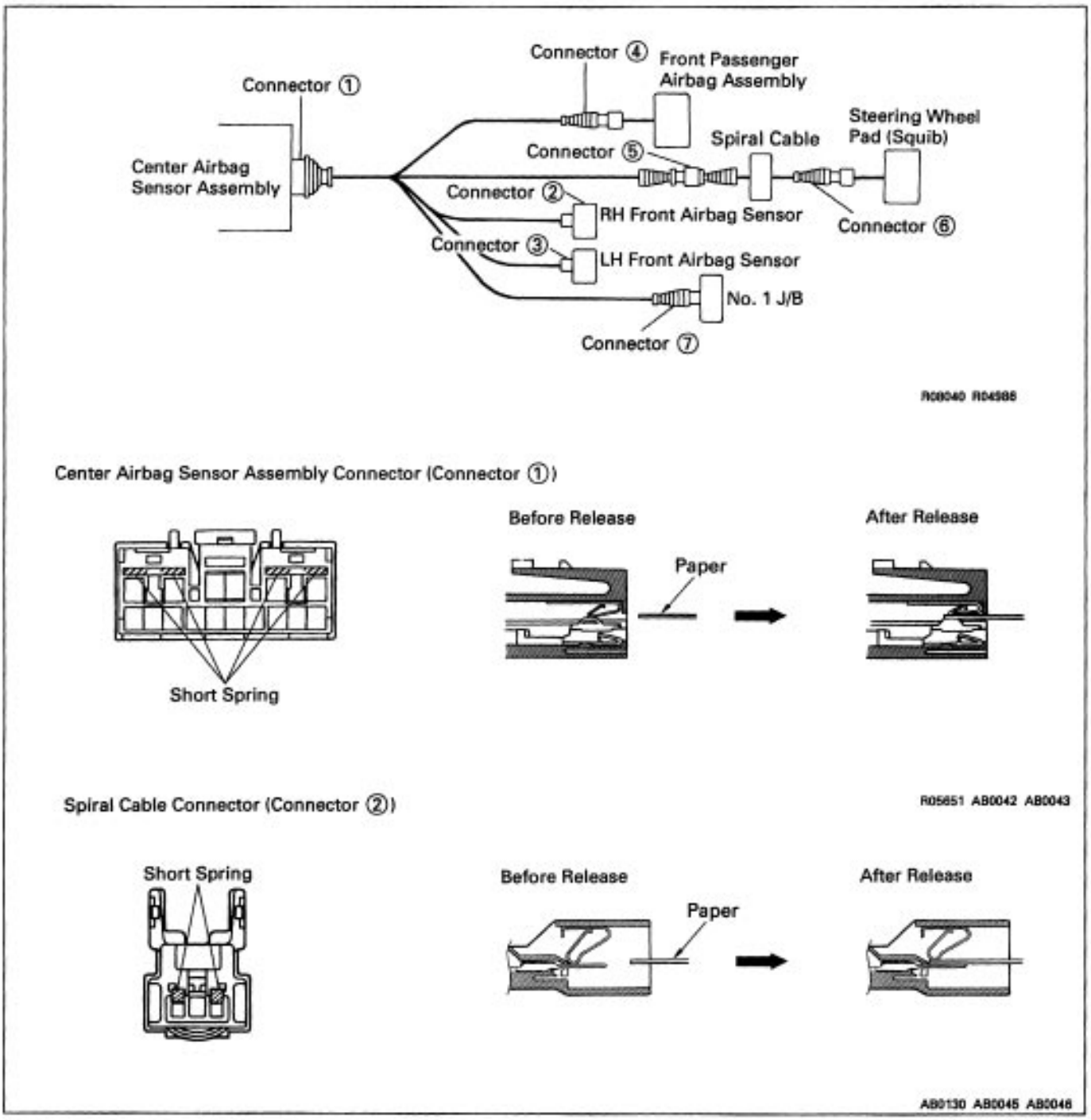
An airbag activation prevention mechanism is built into the connector for the squib circuit of the supplemental restraint system. When release of the airbag activation prevention mechanism is directed in the troubleshooting procedure, as shown in the illustration of the connector T and 0 below, insert paper which is the same thickness as the male terminal, between the terminal and the short spring

CAUTION:

- **NEVER RELEASE the airbag activation prevention mechanism on the steering wheel pad connector.**

NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **If the paper inserted is too thick the terminal and short spring may be damaged, so always use paper the same thickness as the male terminal.**



– MEMO –

DTC 14 Open in D Squib Circuit

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable and the steering wheel pad (squib). It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.
Diagnostic trouble code 14 is recorded when an open is detected in the squib circuit.

DTC No.	Diagnosis
14	• Open circuit in D+ wire harness or D‘ wire harness of squib. • Squib malfunction. • Spiral cable malfunction. • Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART

1 Preparation.

2 Check D squib circuit.
- OK → Go to step **5**
- NG → **3**

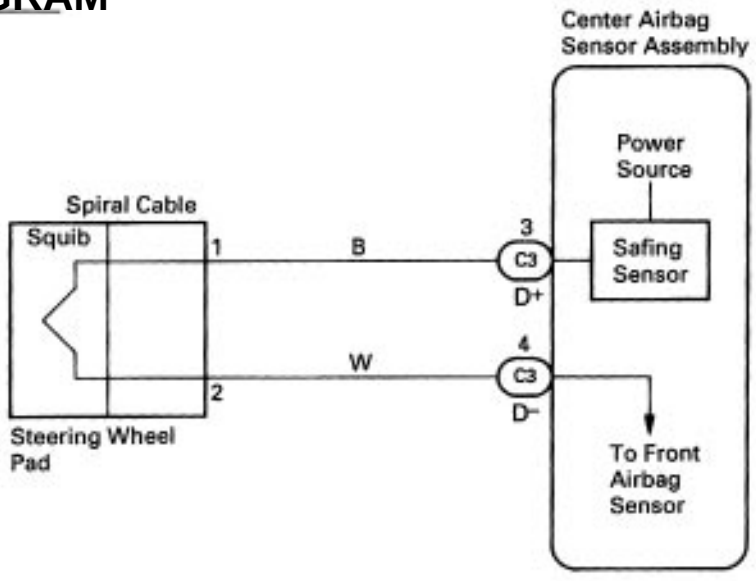
3 Check spiral cable.
- NG → Repair or replace spiral cable.
- OK → **4**

4 Check harness between center airbag sensor assembly and spiral cable.
- NG → Repair or replace harness or connector between center airbag sensor assembly and spiral cable.
- OK → **5**

5 Check center airbag sensor assembly.
- NG → Replace center airbag sensor assembly.
- OK → **6**

6 Check D squib.
- NG → Replace steering wheel pad.
- OK → From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

WIRING DIAGRAM

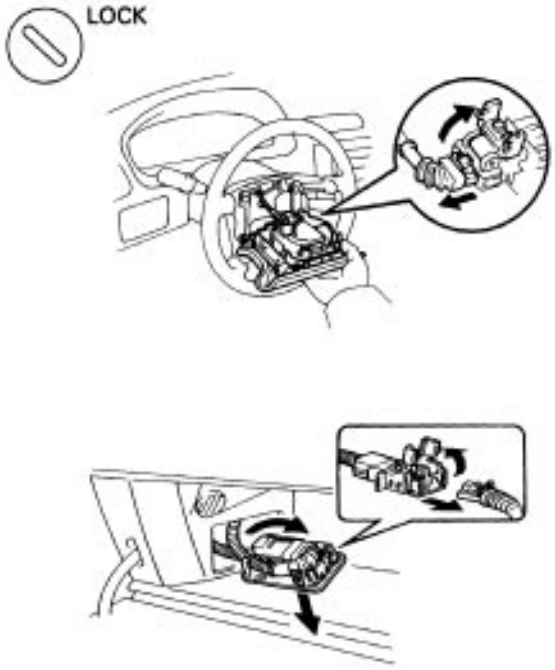


R06103

INSPECTION PROCEDURE

P Preparation C Check

1 Preparation.

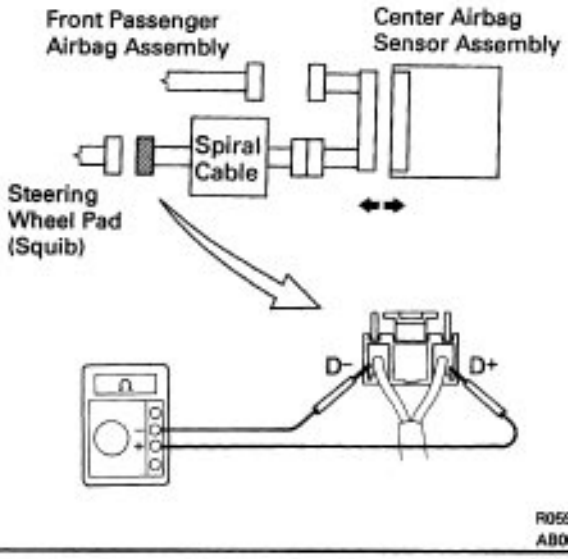


P (1) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(2) Remove steering wheel pad (See page RS–20).
(3) Disconnect connectors of front passenger airbag assembly. (See page RS–29)

Caution

Store the steering wheel pad with the front surface facing upward.

2 Check D squib circuit.



P Disconnect center airbag sensor assembly connectors.

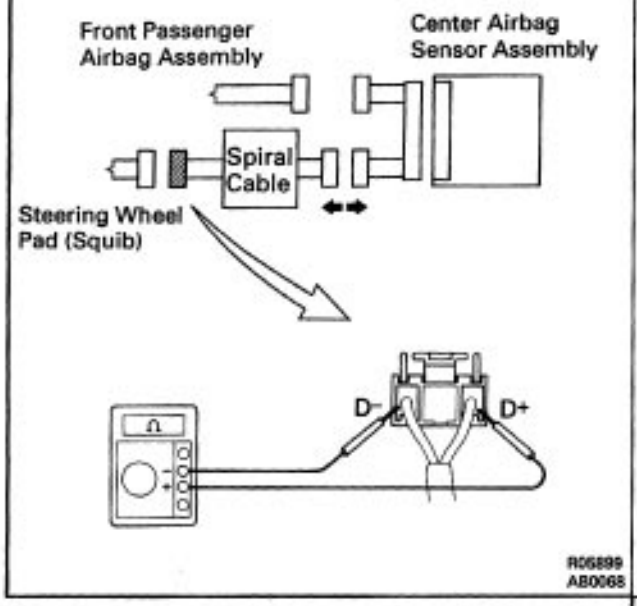
C Measure resistance between D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

OK **Resistance: Below 1Ω**

NG

OK Go to step 5.

3 **Check spiral cable.**



P Disconnect connector between center airbag sensor assembly and spiral cable.

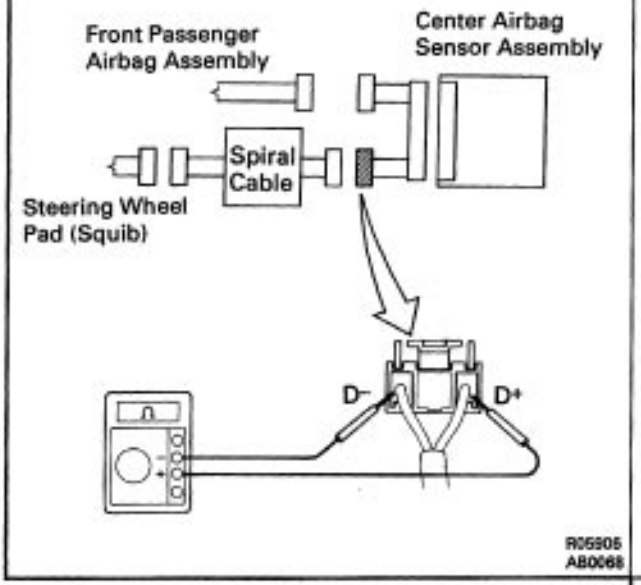
C Measure resistance between D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

OK **Resistance: Below 1 Ω**

OK

NG **Repair or replace spiral cable.**

4 **Check harness between center airbag sensor assembly and spiral cable.**



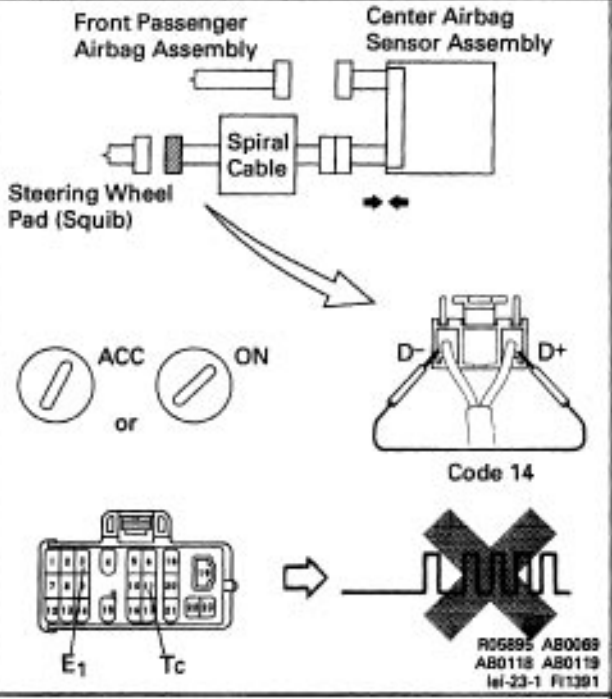
P Measure resistance between D+ and D– on center airbag sensor assembly side of connector between

OK center airbag sensor assembly and spiral cable.
Resistance: Below 1 Ω

OK

NG **Repair or replace harness or connector between center airbag sensor assembly and spiral cable.**

5 Check center airbag sensor assembly.



P
(1) Connect connector to center airbag sensor connector.
(2) Connect connector between center airbag sensor assembly and spiral cable.
(3) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(4) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(5) Turn ignition switch ACC on ON and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.

C
(1) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

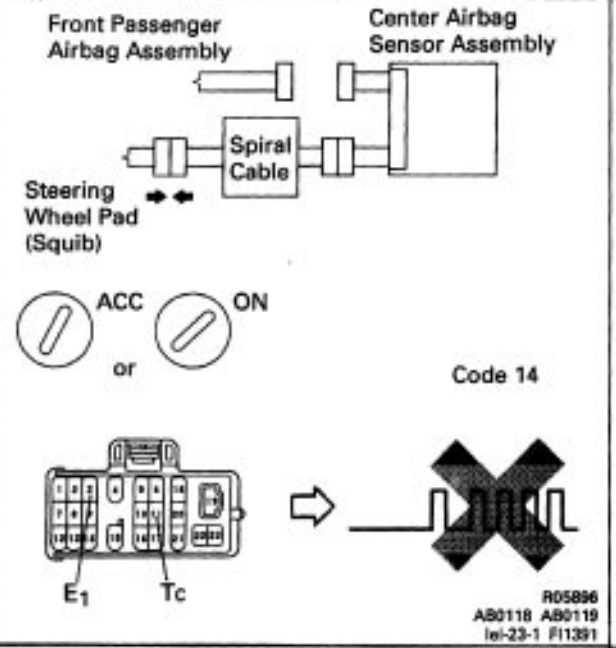
OK
Diagnostic trouble code 14 is not output.

Hint
Codes other than code 14 may be output at this time, but they are not relevant to this check.

OK

NG → **Replace center airbag sensor assembly.**

6 Check D squib.



P
(1) Turn ignition switch LOCK.
(2) Disconnect battery negative H terminal cable, and wait at least 90 seconds.
(3) Connect steering wheel pad (squib) con–nector.
(4) Connect negative (–y terminal cable to bat–tery, and wait at least 2 seconds.
(5) Turn ignition switch ACC or ON, and wait at least 20 seconds.

C
(6) Clear malfunction code. Turn ignition switch LOCK, and wait at least 20 seconds.
Turn ignition switch ACC or ON, and wait at least 20 seconds
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

OK
Diagnostic trouble code 14 is not output.

Hint
Code other than code 14 may be output at this time, but they are not relevant to this check.

OK

NG → **Replace steering wheel pad.**

From the results of the above inspection, the malfunctioning part can now be considered nor-mal. To make sure of this, use the simulation method to check.

– MEMO –

DTC 15 Open in Front Airbag Sensor Circuit

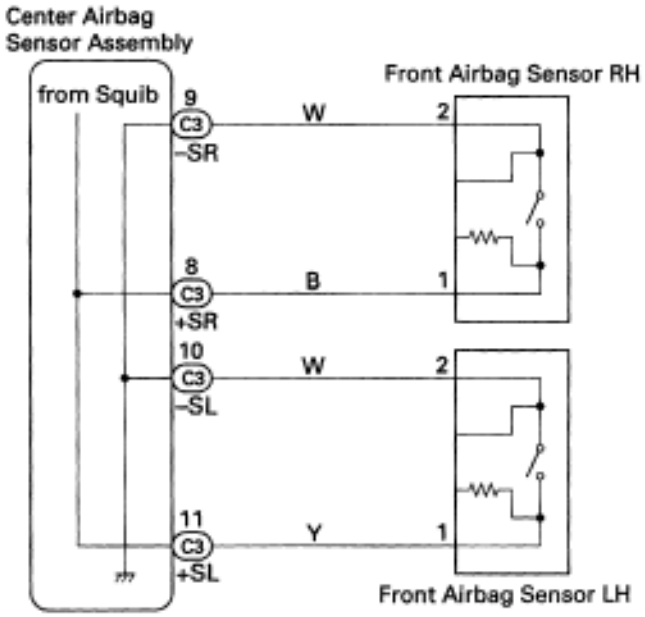
CIRCUIT DESCRIPTION

The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.
Diagnostic trouble code 15 is recorded when an open is detected in the front airbag sensor circuit.

NOTICE: The front airbag sensor connector is equipped with an electrical connection check mechanism for the purpose of detecting an open in the front airbag sensor (See page RS–13). This mechanism is constructed so that when the terminals of the front airbag sensor have been connected (when the connector housing lock is in the locked condition), the connection detection pin on the wire harness
side connects with the terminals for diagnosis use on the sensor side. If the connector is not properly connected, the diagnosis system, may detect only a malfunction code, even though the supplemental restraint system is functioning normally. When connecting the front airbag sensor connector, make sure it is connected properly. If diagnostic trouble code 15 is displayed after the front airbag sensor connector has been connected, check again that it is properly connected.

DTC No.	Diagnosis
15	• Open circuit in +S wire harness or –S wire harness of front airbag sensor. • Short circuit in front airbag sensor +S wire harness (to +B). • Front airbag sensor malfunction. • Malfunction of electrical connection check mechanism of front airbag sensor. • Center airbag sensor assembly malfunction.

WIRING DIAGRAM



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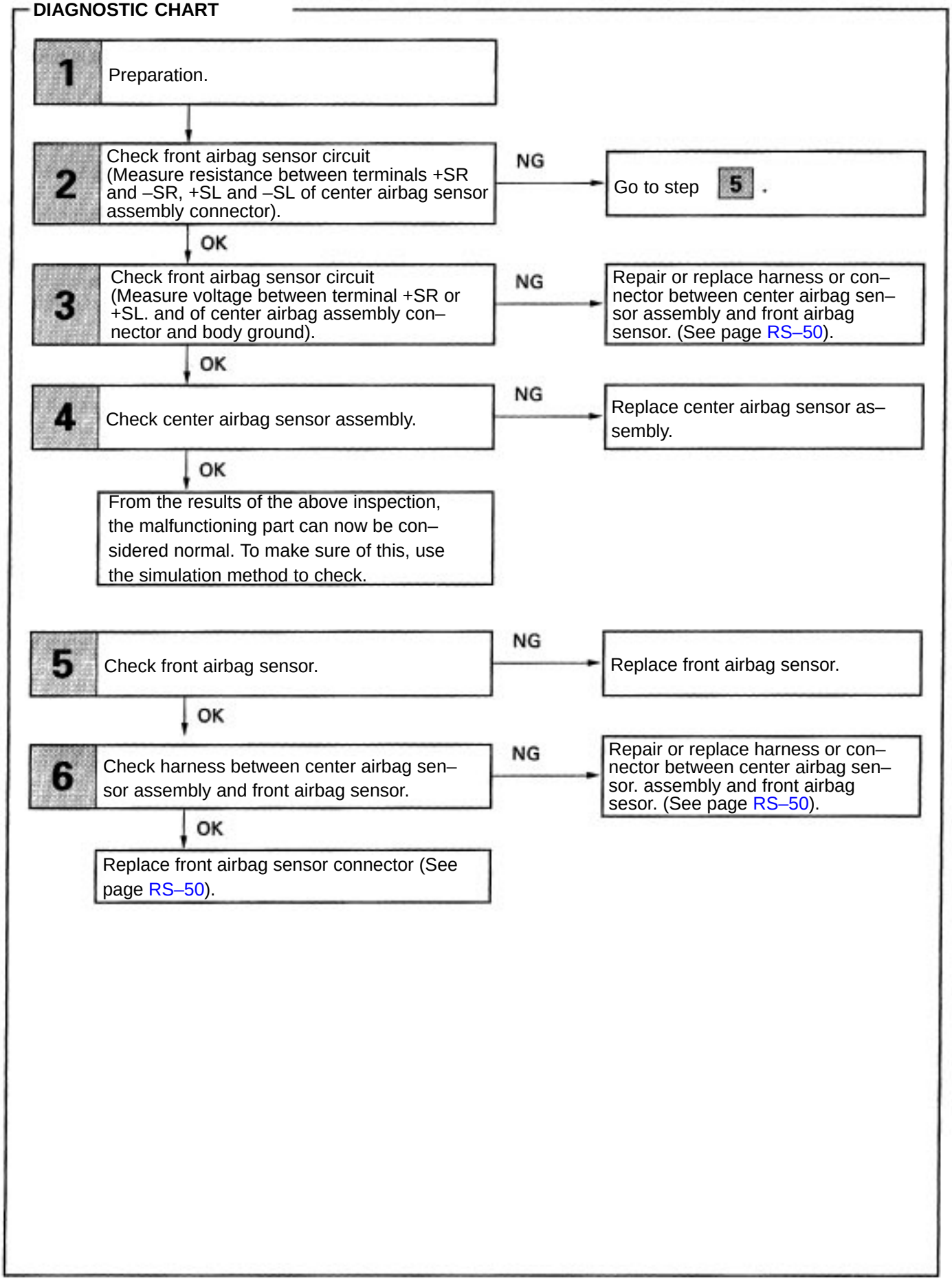
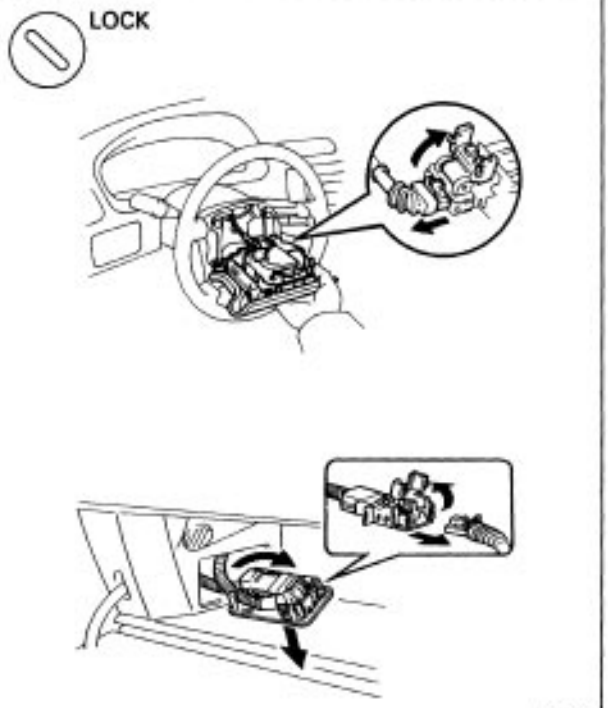
DIAGNOSTIC CHART



INSPECTION PROCEDURE

P Preparation C Check

1 Preparation.

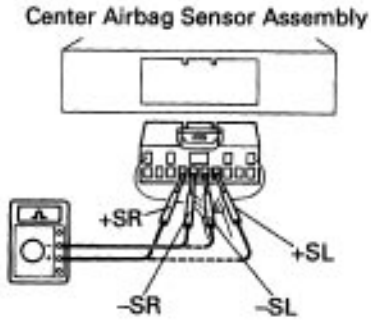


P (1) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.
(2) Remove steering wheel pad (See page RS–20).
(3) Disconnect connectors of front passenger airbag assembly. (See page RS–29)

Caution

Store the steering wheel pad with the front surface facing upward.

2 Check front airbag sensor circuit (Measure resistance between terminals +SR and –SR, +SL and –SL of center airbag sensor assembly connector.).



P Disconnect center airbag sensor assembly connectors.

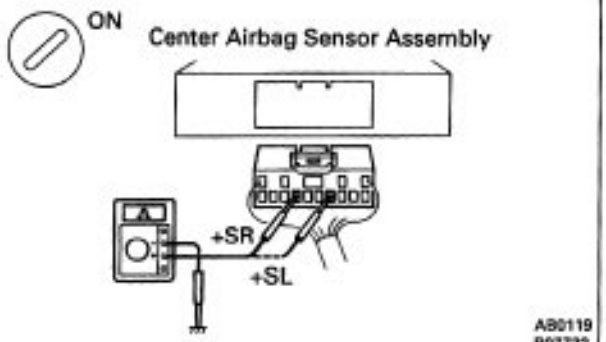
C Measure resistance between terminals +SR and –SR, +SL and –SL of harness side connector of center airbag sensor assembly.

OK **Resistance: 755 Ω – 885Ω**

OK

NG Go to step 5 .

3 Check front airbag sensor circuit. (Measure voltage between terminal +SR or +SL of center airbag sensor assembly connector and body ground.)



P (1) Connect negative H terminal cable to battery.
(2) Turn ignition SWitch ON.

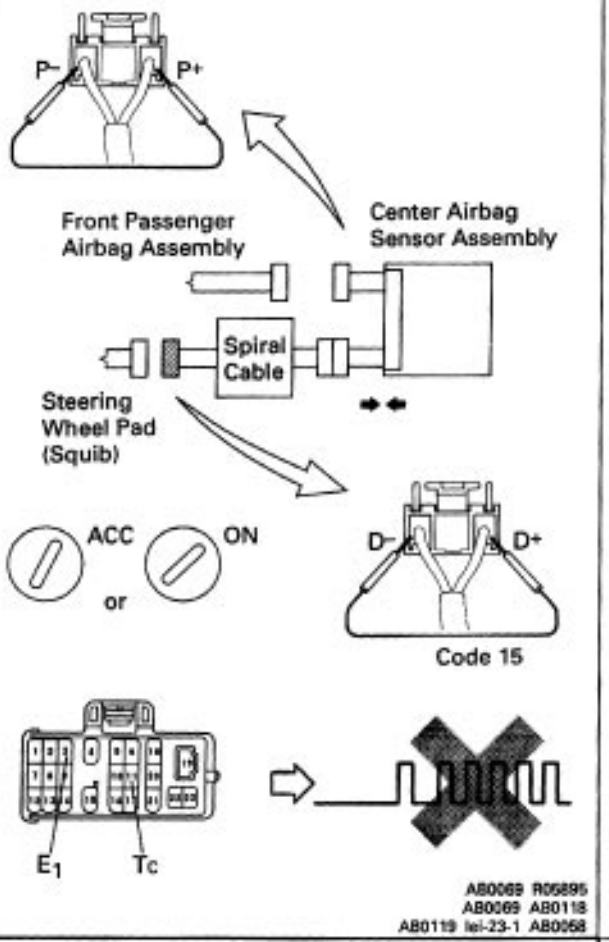
C Measure voltage between terminals +SR or +SL ofharness side connector of center airbag sensor assembly and body ground.

OK **Voltage: Below 1 V**

OK

NG **Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–50).**

4 Check center airbag sensor assembly.



P (1) Turn ignition switch LOCK.
(2) Disconnect negative (–) terminal cable from battery.
(3) Connect connector to center airbag sensor assembly.
(4) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(5) Using a service wire, connect P+ and P– on wire harness connector side of connector be–tween wire harness connector and front pas–senger airbag. .
(6) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(7) Turn ignition switch ACC or ON and wait at least 20 seconds.
Clear malfunction code. Turn ignition switch LOCK and wait at least 20 seconds.

C (1) Turn ignition switch ACC or ON and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

OK **Diagnostic trouble code 15 is not output.**

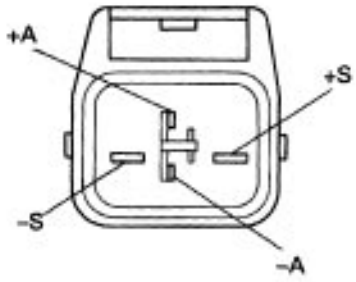
Hint Codes other than code 15 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5 Check front airbag sensor.



P Disconnect front airbag sensor connector.

C Measure resistance between each terminal of front airbag sensor.

OK

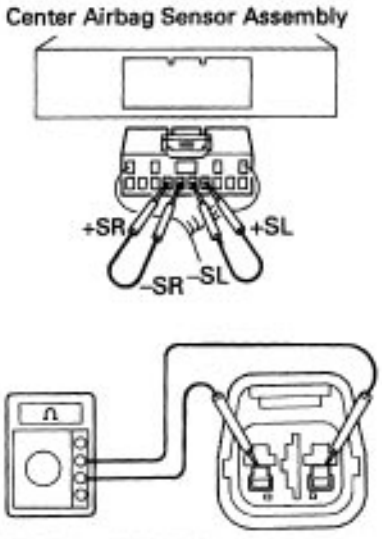
Terminal	Resistance
⊕ S – ⊕ A	Below 1 Ω
⊕ S – ⊖ S	1 MΩ or higher
⊖ S – ⊖ A	755 Ω – 885 Ω

Notice

- **Do not press ohmmeter probes too strongly against terminals of front airbag sensor.**
- **Make sure the front airbag sensor connector is properly connected.**

OK → NG: **Replace front airbag sensor.**

6 Check harness between center airbag sensor assembly and front airbag sensor.



P (1) Disconnect center airbag sensor assembly connectors.

(2) Using service wires, connect +SR and –SR, +SL and –SL on the wire harness side of the center airbag sensor assembly connectors.

C Measure resistance between terminals +SR and –SR, +SL and –SL of harness side connector of front airbag sensor.

Notice

- **Lightly touch ohmmeter probes at position shown in illustration.**
- **Make sure the front airbag sensor connector is properly connected.**

OK **Resistance: Below 1Ω**

OK → NG: **Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–50).**

Replace front airbag sensor connector (See page RS–50).

– MEMO –

DTC 22 SRS Warning Light System Malfunction

CIRCUIT DESCRIPTION

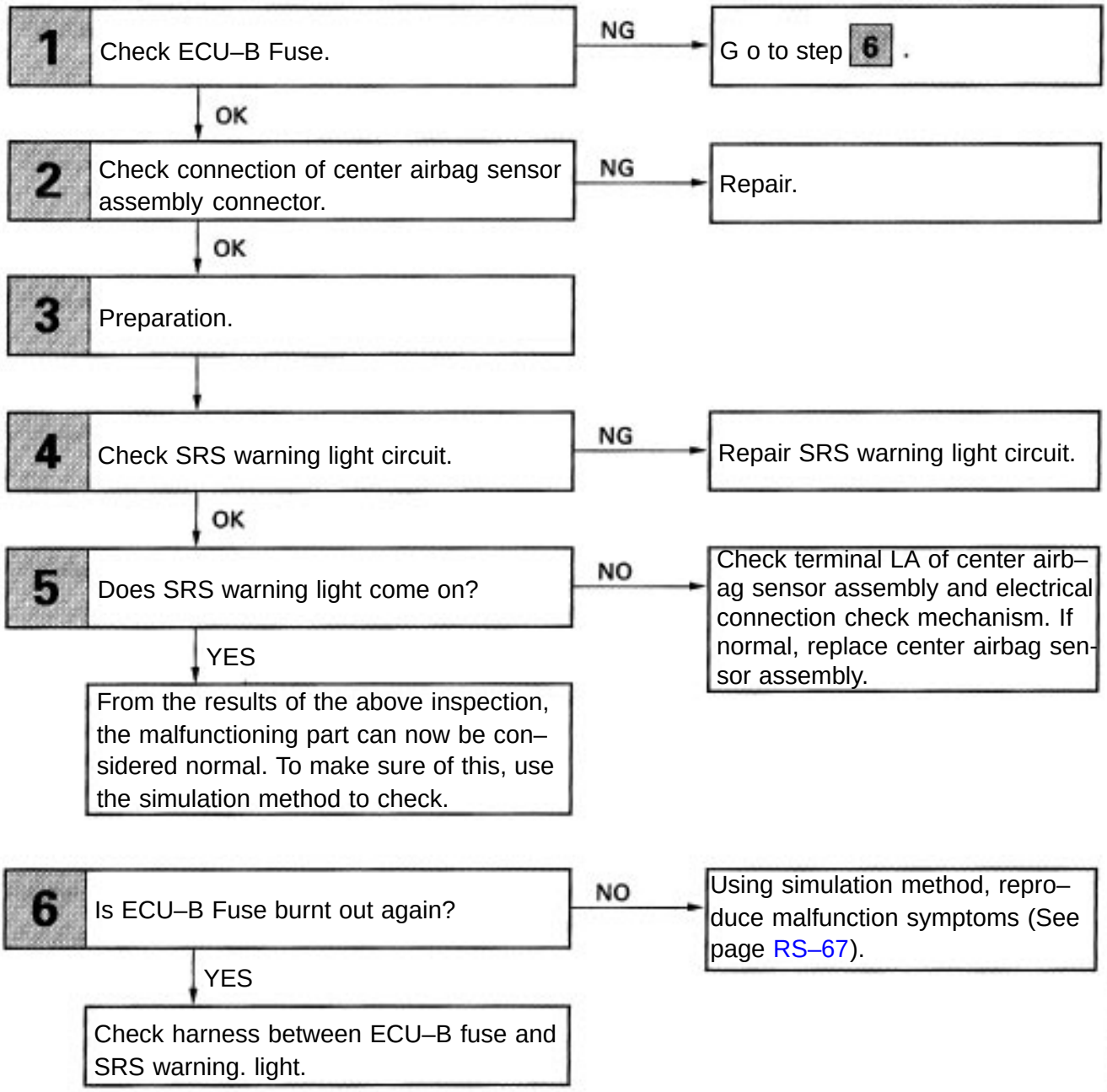
The SRS warning light is located on the cluster finish panel.
when the SRS is normal, the SRS warning light lights up for approx.6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and $E_1$of the DLC1 or DLC2 are connected, the diagnostic trouble code is displayed
by the blinking of the SRS warning light.
The SRS warning light circuit is equipped with an electrical connection check mechanism which detects
when the connector to the center airbag sensor assembly is not properly connected.
If the connector to the center airbag sensor assembly is not properly connected, the SRS warning light will not light up.
Diagnostic trouble code 22 is recorded when a malfunction occurs in the SRS warning light system. If an OPEN malfunction occurs in the SRS warning light system, the SRS warning light does not light up, so that until the malfunction is repaired, the diagnostic trouble codes (including code 22f cannot be confirmed.

DTC No.	Diagnosis
22	• Open circuit in SRS warning light system. • Center– airbag sensor assembly malfunction.

DIAGNOSTIC CHART

Troubleshooting for this system is different for when the SRS warning light does not light up and for when diagnostic trouble code 22 is output. Confirm the problem symptoms first before selecting the appropriate troubleshooting procedure.

HINT: If SRS warning light does not light up, perform the following troubleshooting:



DIAGNOSTIC CHART

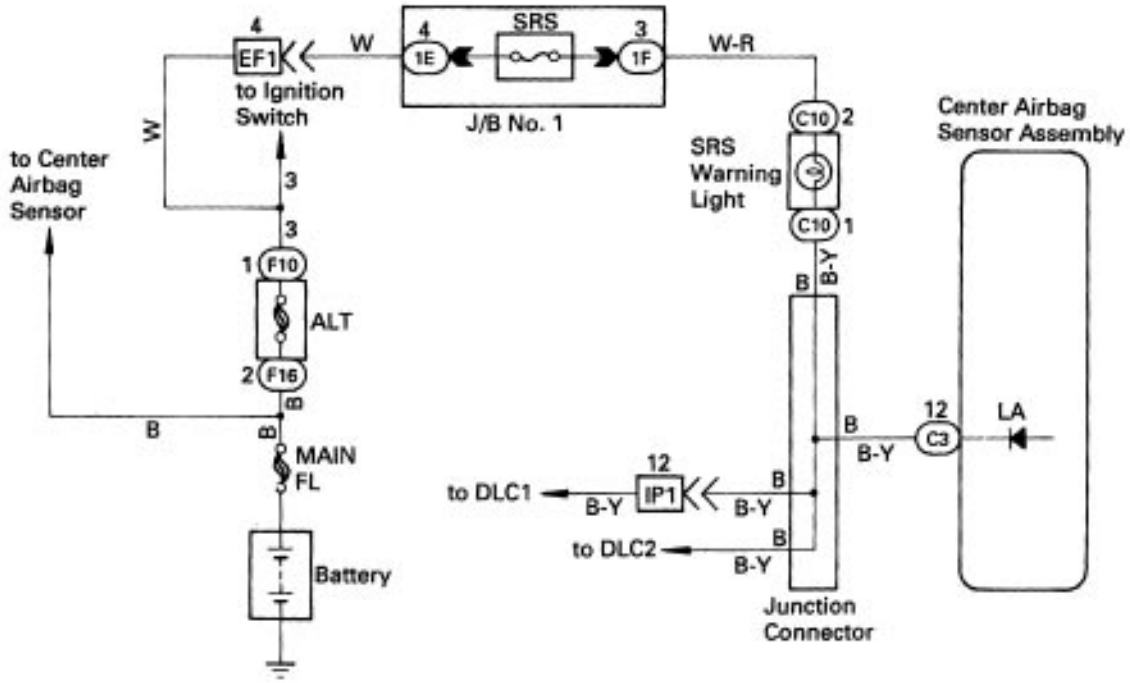
HINT: If diagnostic trouble code 22 is output, perform the following troubleshooting:
NO Using simulation m

1	Is diagnostic trouble code 22 output again?	Using simulation method, repro–duce malfunction symptoms (See page RS–67).

YES

Replace center airbag sensor assembly.

WIRING DIAGRAM



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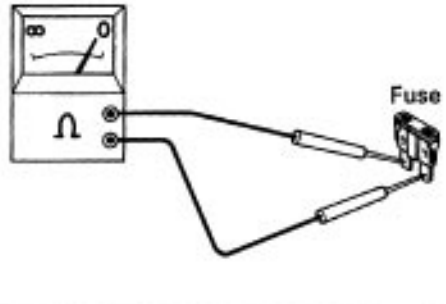
INSPECTION PROCEDURES

P Preparation C Check

HINT: IF SRS warning light does not light up, perform the following troubleshooting:

1 Check ECU–B fuse.



P Remove ECU–B fuse.

C Check continuity of ECU–13 fuse.

OK **Continuity**

Hint
- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, instal it.

OK

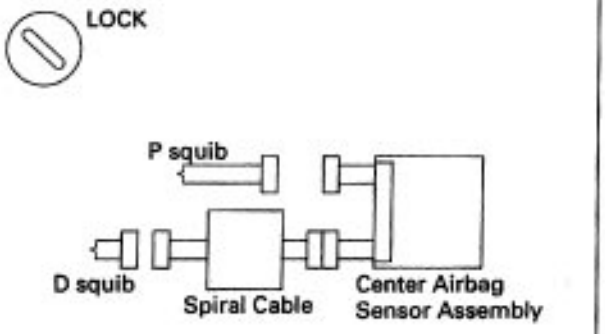
NG Go to step 6 .

2 Check connection of center airbag sensor assembly connector.

OK

NG Repair.

3 Preparation.



P (1) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.

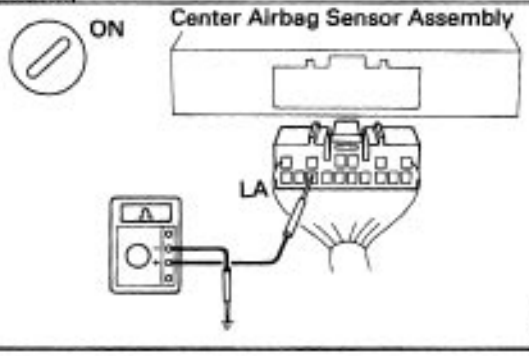
(2) Remove steering wheel pad (See page RS–20).

(3) Disconnect connector of front passenger airbag assembly. (See page RS–29).

Caution

Store the steering wheel pad with the front surface facing upward.

4 **Check SRS warning light circuit.**

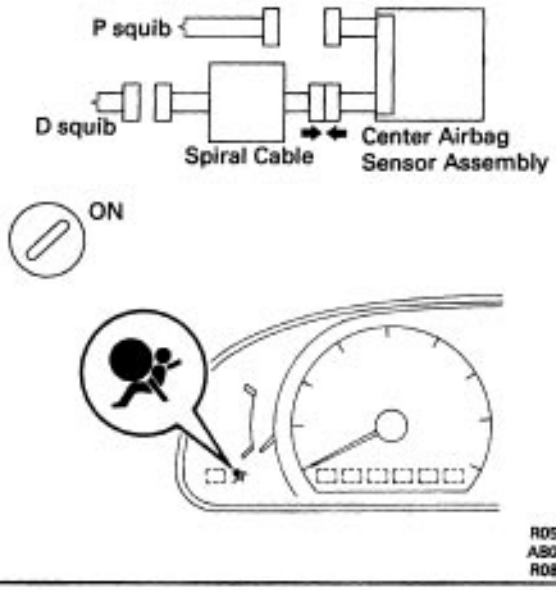


P (1) Disconnect center airbag sensor assembly connector.
(2) Connect negative (–) terminal cable to battery.
(3) Turn ignition switch ACC or ON.
C Measure voltage LA terminal of harness side connector of center airbag sensor assembly.
OK **Voltage: Battery positive voltage**

OK

NG **Repair SRS warning light circuit.**

5 **Does SRS warning light come on?**



P (1) Disconnect negative H terminal cable from the battery.
(2) Connect center airbag sensor assembly connector.
(3) Connect negative 1–y terminal cable to battery, and wait at least 2 seconds.
(4) Turn ignition switch ACC or ON.
C Check operation of SRS warning light.
OK **SRS warning light comes on.**

YES

NO **Check terminal LA of center airbag sensor assembly and electrical connection check mechanism. If normal, replace center airbag sensor assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

6 **Is new ECU–B fuse burnt out again?**

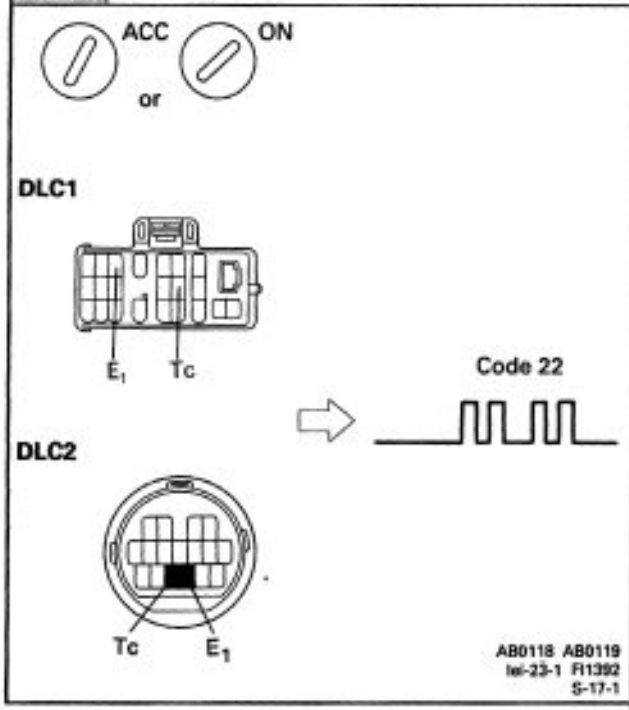
YES

NO **Using simulation method, reproduce malfunction symptoms (See page RS–67).**

Check harness between ECU–B fuse and SRS warning light.

HINT: If diagnostic trouble code 22 is output, perform the following troubleshooting:

1 **Is diagnostic trouble code 22 output again?**



C
(1) Turn ignition switch LOCK, and wait at least 2 seconds.
(2) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(3) Clear malfunction code stored in memory.
(See page RS–65)
(4) Turn ignition switch LOCK, and wait at least 20 seconds.
(5) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(6) Using SST, connect terminals Te and El of DLC1 or DLC2.
SST 09843–18020
(7) Check diagnostic trouble code.

YES

Replace center airbag sensor assembly.

NO **Using simulation method, reproduce malfunction symptoms (See page RS–67).**

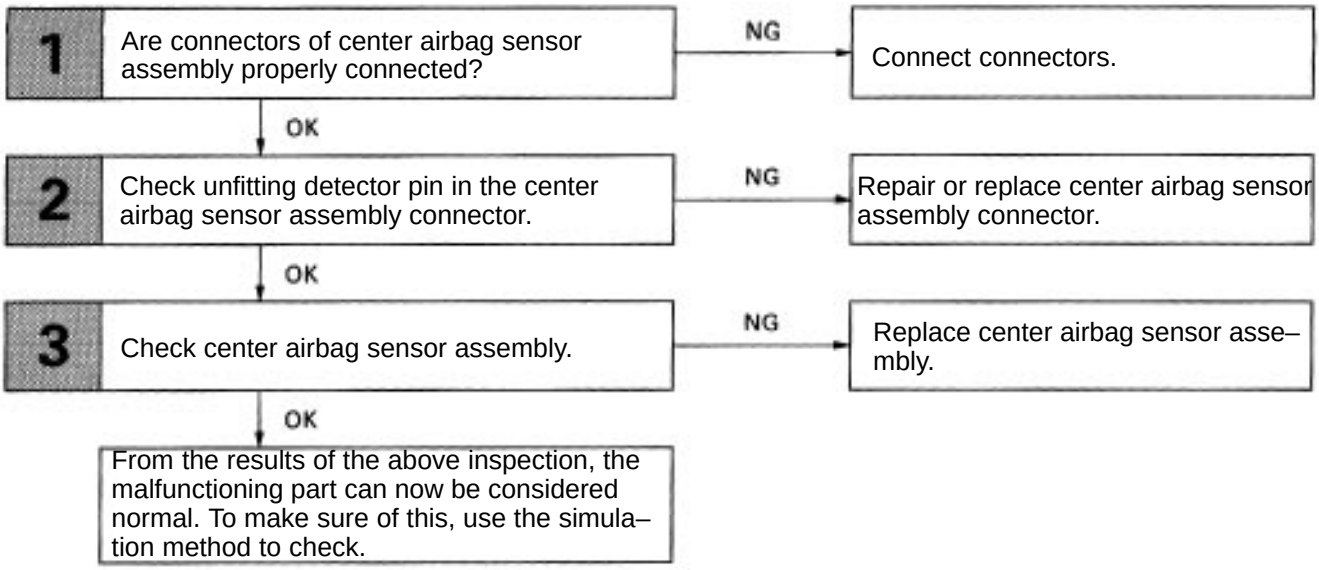
DTC 24 Open in Center Airbag Sensor Assembly Connectors Malfunction

CIRCUIT DESCRIPTION

The center airbag sensor assembly detects partial connection of connectors.
For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.
When the center airbag sensor assembly detects an open in the electrical connection check mechanism of the center airbag sensor connector or in the center airbag sensor circuit, trouble code 24 is recorded.

DTC No.	Diagnosis
24	• Malfunction of electrical connection check mechanism of center airbag sensor assembly connectors. • Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART



INSPECTION PROCEDURE

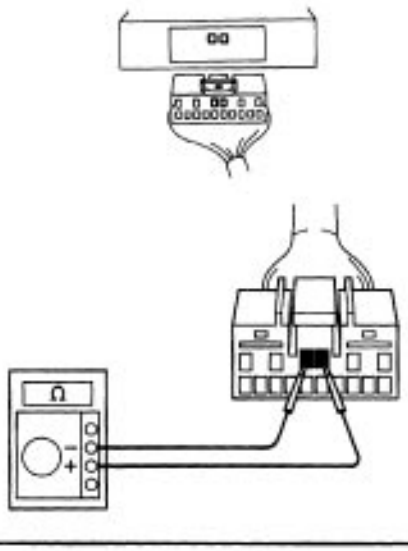
P Preparation C Check

1 **Are connector of center airbag sensor assembly properly connected?**

OK

NG **Connect connectors.**

2 **Check unfitting detector pin in the center airbag sensor assembly connector.**



P (1) Disconnect negative (–) terminal cable from battery.

(2) Disconnect center airbag sensor assembly.

C Test for continuity.

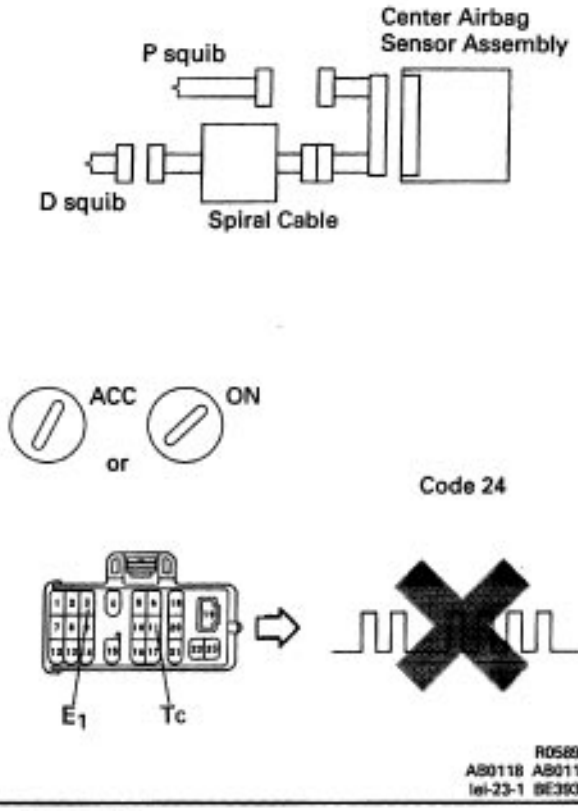
OK **Continuity exists.**

OK

NG **Repair or replace center airbag sensor assembly connector.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

3 Check center– airbag sensor assembly.



P (1) Disconnect negative (–y terminal cable from battery.
(2) Connect center airbag sensor assembly.
(3) Connect negative H terminal cable to battery.
(4) Turn ignition switch ACC or ON.

C Check diagnostic trouble code.

OK **Diagnostic trouble code 24 is not output.**

OK

NG **Replace center airbag sensor assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC 31 Center Airbag Sensor Assembly Malfunction

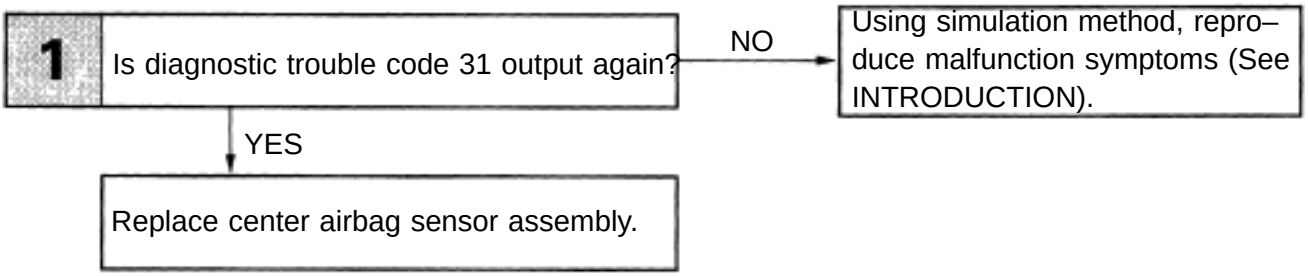
CIRCUIT DESCRIPTION

The center airbag sensor assembly consists of a center airbag sensor, safing sensor, ignition control and drive circuit, diagnosis circuit, etc.
It receives signals from the airbag sensors, judges whether or not the airbag must be deploy, and diagnosis system malfunction.
Diagnostic trouble code 31 is recorded with occurrence of a malfunction in the center airbag sensor assembly is detected.

DTC No.	Diagnosis
31	• Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART

HINT: When a malfunction code other than code 31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code 31.

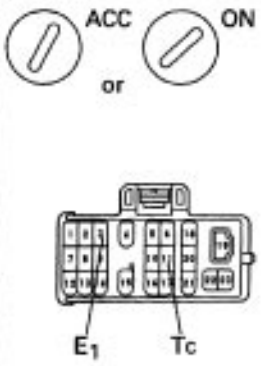


INSPECTION PROCEDURE

HINT: When a malfunction code other than code 31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code 31.

P Preparation C Check

1 Is diagnostic trouble code 31 output again?



AB0118 AB0119
Isi-23-1 FI1394

P Clear malfunction code.

C
(1) Turn ignition switch LOCK, and wait at least 20 seconds.
(2) Turn ignition switch ACC or ON, and wait at least 20 seconds.
(3) Repeat operation in step
(1) and
(2) at least 5 times.
(4) Using SST, connect terminals Tc and El of DLC1 or DLC2.
SST 09843–18020
(5) Check diagnostic trouble code.

NO → **Using simulation method, reproduce malfunction symptoms (See INTRODUCTION).**

YES

Replace center airbag sensor assembly.

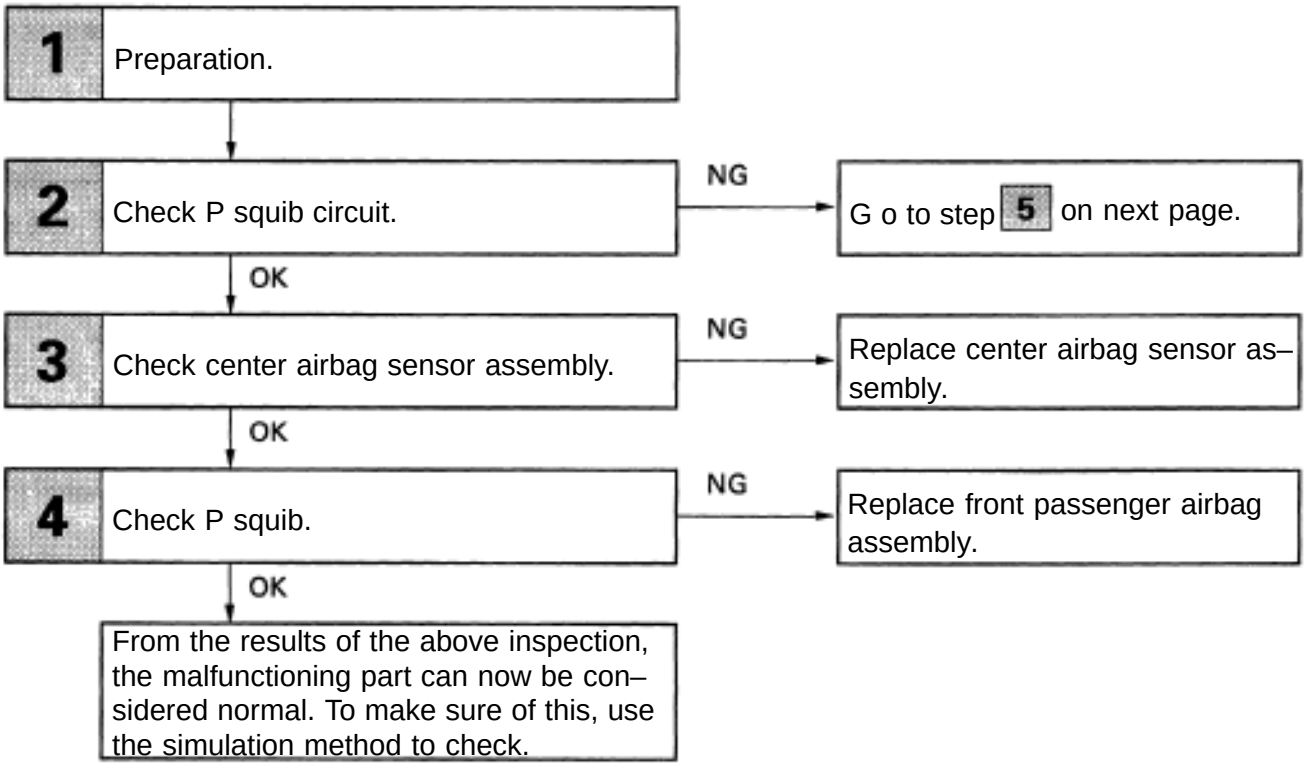
DTC 53 Short in P Squib Circuit (Between P+ Wire Harness and P– Wire Harness)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, (squib). It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each component, see FUNCTION OF COMPONENTS. on page RS–10–
Diagnostic trouble code 53 is recorded when a short is detected in the P+ wire harness and P– wire harness of the squib circuit.

DTC No.	Diagnosis
53	• Short circuit between P+ wire harness and P– wire harness of squib. • Squib malfunction. • Center airbag sensor assembly malfunction.

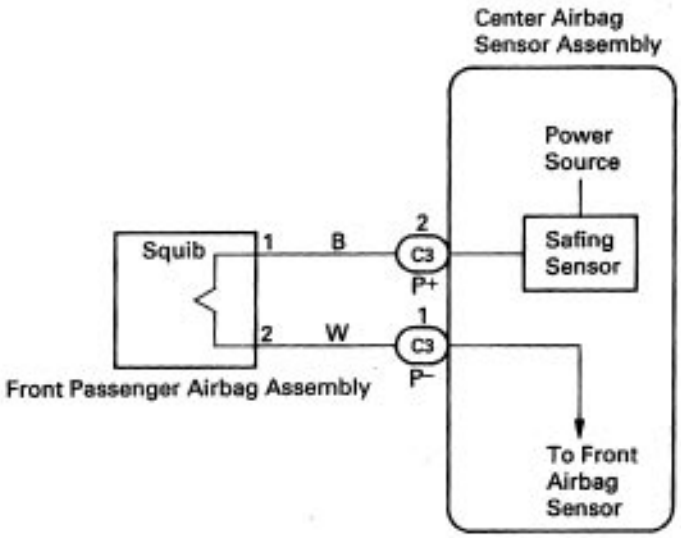
DIAGNOSTIC CHART



DIAGNOSTIC CHART (Cont'd)

5	Check P circuit.	NG	Repair or replace harness or connector between center airbag sensor assembly and front passenger airbag assembly.
OK ↓			
6	Check center airbag sensor assembly.	NG	Replace center airbag sensor assembly.
OK ↓			
From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.			

WIRING DIAGRAM



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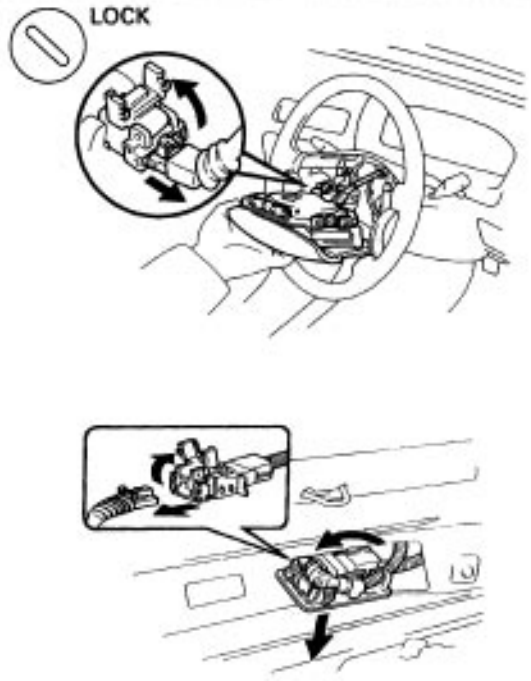
INSPECTION PROCEDURE

P Preparation C Check

1 Preparation.



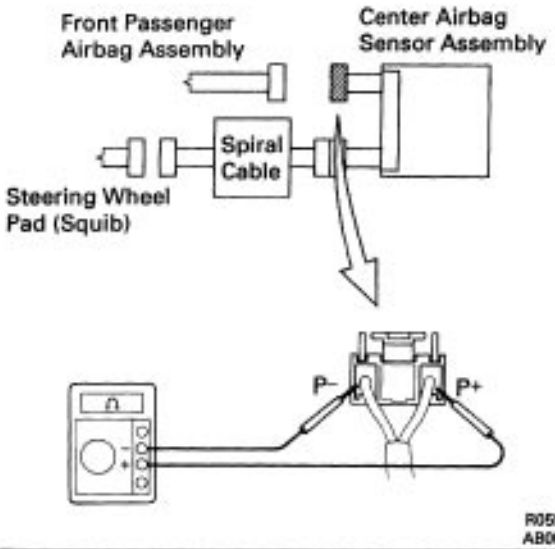
P (1) Disconnect battery negative H terminal cable, and wait at least 90 seconds.
t2y Remove steering wheel pad (See page RS–20).

(3) Disconnect connectors of front passenger airbag assembly (See page RS–29).

Caution

Store the steering wheel pad with the front surface facing upward.

2 Check Psquib circuit.



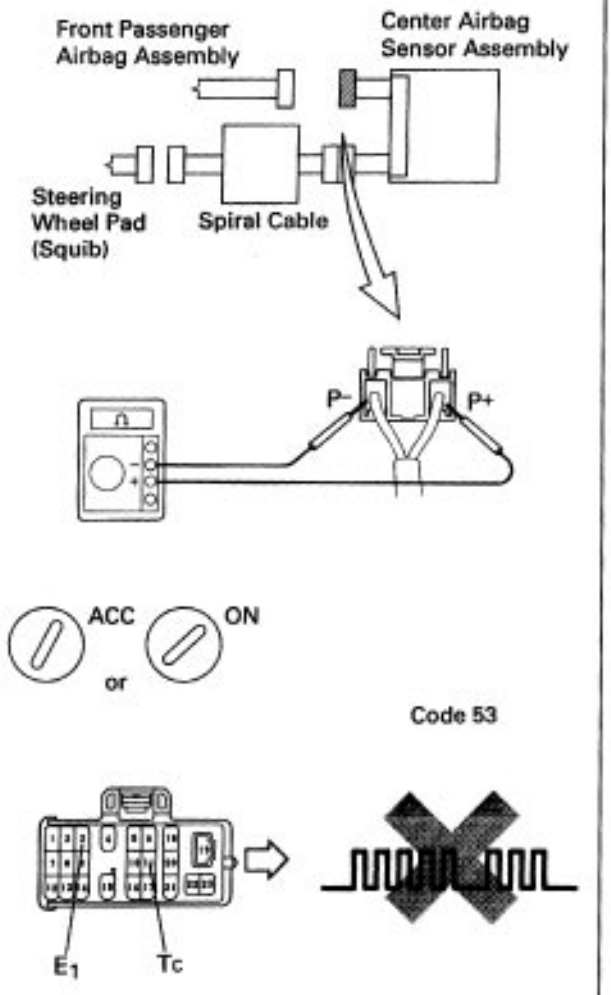
C For the connector (on the center airbag sensor assembly side) between the center airbag sensor assembly and front passenger airbag assembly, measure the resistance between P+ and P'.

OK **Resistance: 1 kΩ or higher**

OK

NG → Go to step 5

3 Check center airbag sensor assembly.



P

(1) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(2) Clear malfunction code stored in memory (See page RS–65).
(3) Turn ignition switch LOCK, and wait at least 20 seconds.

C

(1) Turn ignition switch ACC or ON and wait at least 20 seconds.
(2) Using SST, connect terminals Tc and El of D LC 1 or D LC2 .
SST 09843–18020
(3) Check diagnostic trouble code.

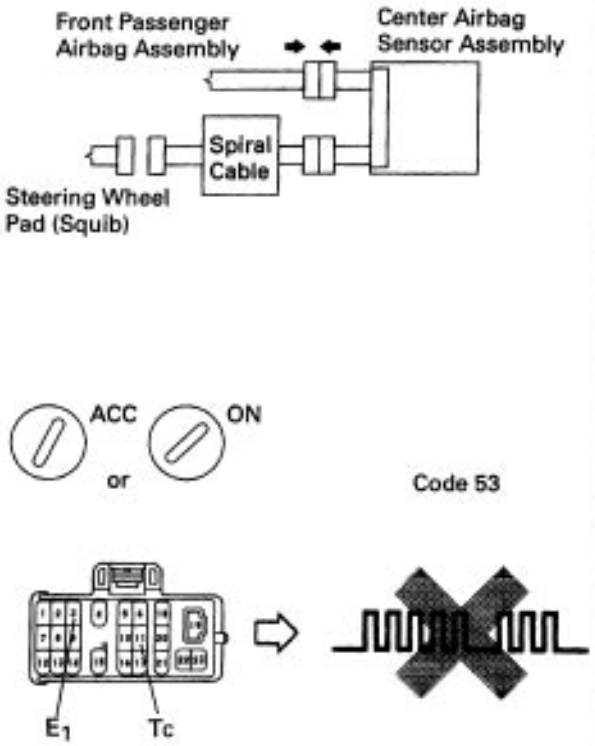
OK **Diagnostic trouble code 53 is not output.**

Hint Codes other than code 53 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

4 Check P squib.



P

(1)Turn ignition switch–LOCK.
(2) Disconnect battery negative (–) terminal cable and wait at least 90 seconds.
(3) Connect front passenger airbag assembly connector.
(4) Connect negative H terminal cable to battery, and wait at least 2 seconds.
(5)Clear malfunction code (See page RS–65).
(6) Turn ignition switch ACCor ON, and wait at least 20 seconds.

C

(1)Turn ignition switch ACC or ON and wait at least 20 seconds
(2)Using SSt, connect terminals Tc and E1 of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

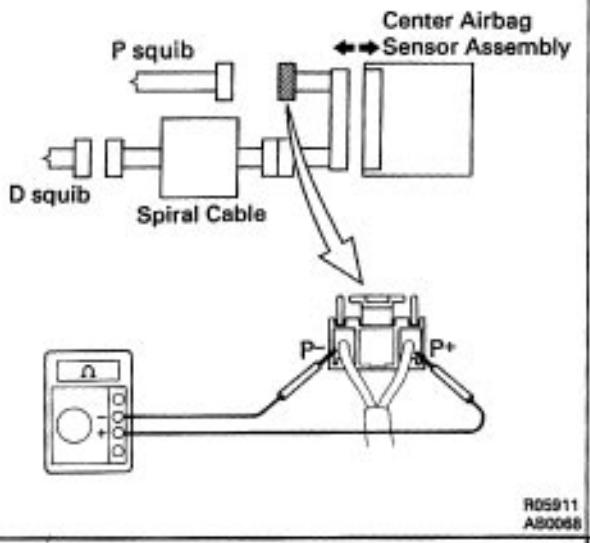
OK **Diagnostic trouble code 53 is not output.**

Hint Codes other than code 54 may be output at this time, but they are not relevant to this check.

OK → **From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.**

NG → **Replace front passenger airbag assembly.**

5 Check P circuit



P (1) Disconnect center airbag sensor assembly connector.

(2) Release airbag activation prevention mechanism on center airbag sensor assembly connector (See page RS–102).

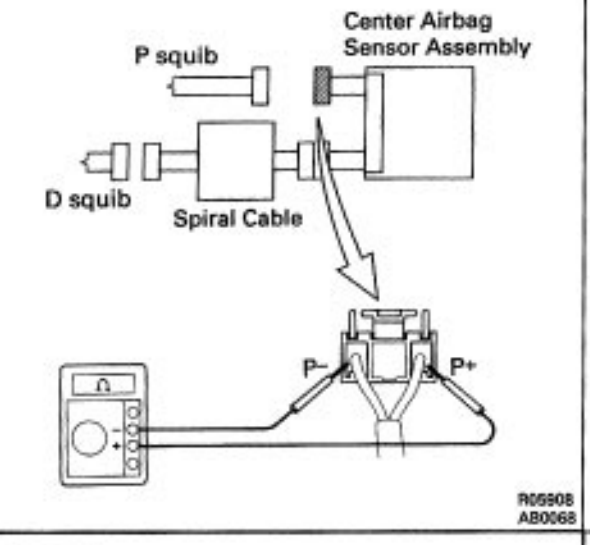
C For the connector (on the center airbag sensor assembly side) between the center airbag sensor assembly and front passenger airbag assembly, measure the resistance between P+ and P–.

OK **Resistance: 1 kΩ or higher**

NG **Repair or replace harness or connector between center airbag sensor assembly and front passenger airbag assembly.**

OK

6 Check center airbag sensor assembly.



P Connect center airbag sensor assembly connector.

C For the connector (on the center airbag sensor assembly side) between the center airbag sensor assembly and front passenger airbag assembly, measure the resistance between P+ and P–.

OK **Resistance: 1 kΩ or higher**

NG **Replace center airbag sensor assembly.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

DTC 54 Open in P Squib Circuit

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, wiring harness connector and front passenger airbag assembly. It causes the airbag to deploy when the airbag deployment conditions are satisfied. For details of the function of each component, see FUNCTION OF COMPONENTS on page RS–10.

Diagnostic trouble code 54 is recorded when an open is detected in the squib circuit.

DTC No.	Diagnosis
54	• Open circuit in P+ wire harness and P– wire harness of squib. • Squib malfunction. • Center airbag sensor assembly malfunction.

DIAGNOSTIC CHART

1 Preparation.

↓

2 Check P squib circuit. — NG → Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor (See page RS–13).

↓ OK

3 Check center airbag sensor assembly. — NG → Replace center airbag sensor assembly.

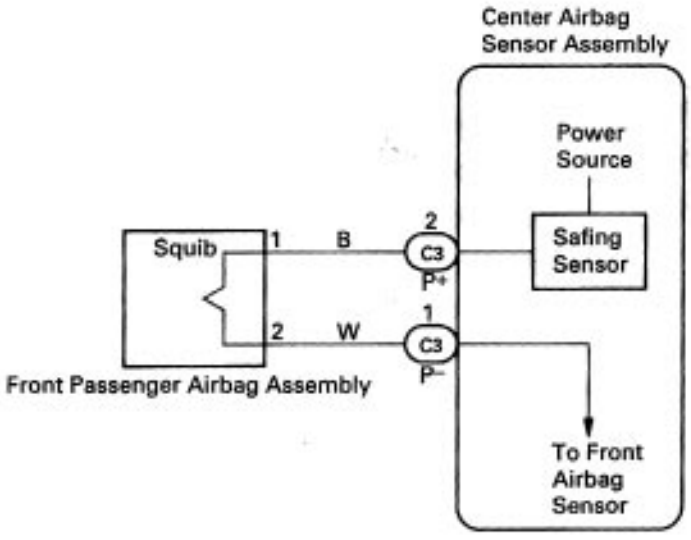
↓ OK

4 Check P squib. — NG → Replace front passenger airbag assembly.

↓ OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

WIRING DIAGRAM

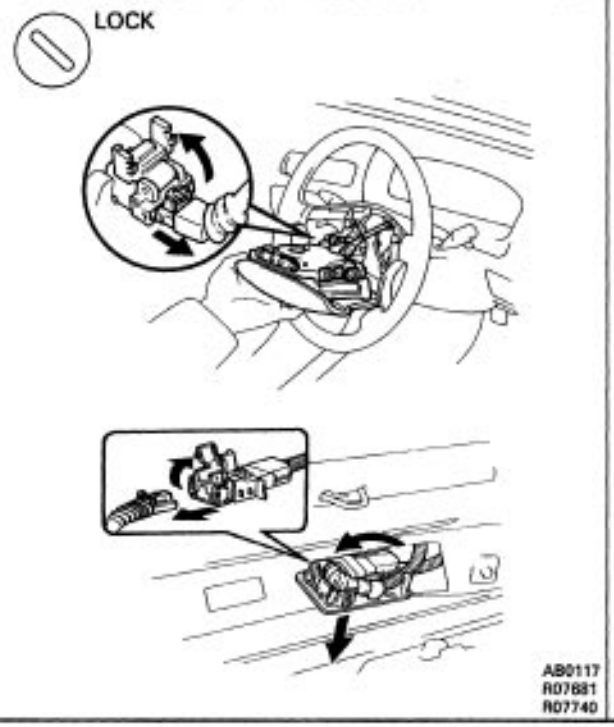


R06120

INSPECTION PROCEDURE

P Preparation C Check

1 Preparation.



P (1) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.

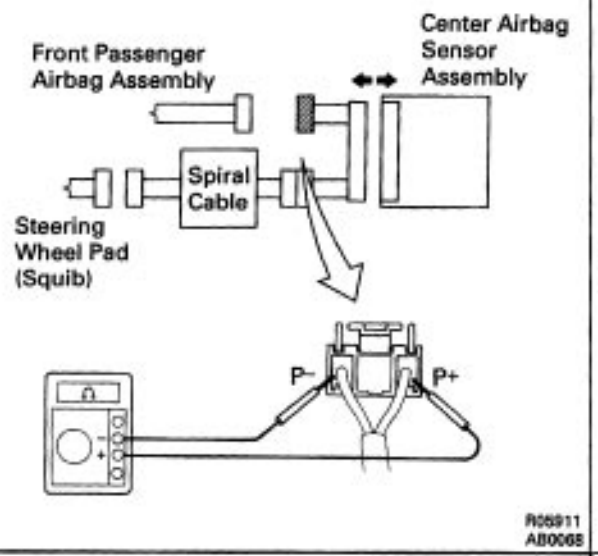
(2) Remove steering wheel pad (See page RS–20).

(3) Disconnect connectors of front passenger airbag assembly (See page RS–29).

Caution

Store the steering wheel pad with the front surface facing upward.

2 Check P squib circuit.



P Disconnect center airbag sensor assembly connector.

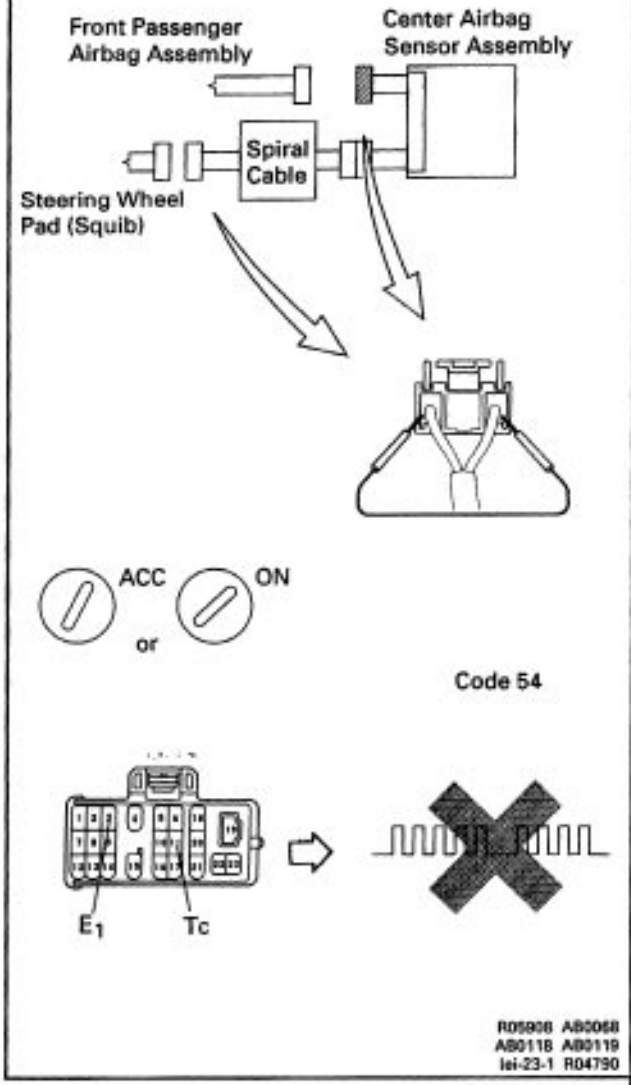
C For the connector (on the center airbag sensor assembly side) between the center airbag sensor assembly and front passenger airbag assembly, measure the resistance between P+ and P–.

OK **Resistance: Below 1Ω**

OK

NG **Repair or replace harness or connector between center airbag sensor assembly and front passenger airbag assembly.**

3 **Check center airbag sensor assembly.**



P (1) Connect connectors to center airbag sensor assembly.

(2) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.

(3) Using a service wire, connect P+ and P' on center airbag sensor assembly side of connec–tor between center airbag sensor assembly and front passenger airbag assembly.

(4) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(5)Turn ignition switch ACC or ON ON
(6)Clear malfunction code stored in memory

(see page RS–65)

(7)Turn ignition switch LOCK, and wait at least 20 seconds.

C

(1)Turn ignition switch ACC or ON and wait at least 20 seconds
(2)Using SSt, connect terminals Tc and E1 of DLC1 or DLC2.
SST 09843–18020
(3) Check diagnostic trouble code.

OK

Diagnostic trouble code 54 is not output.

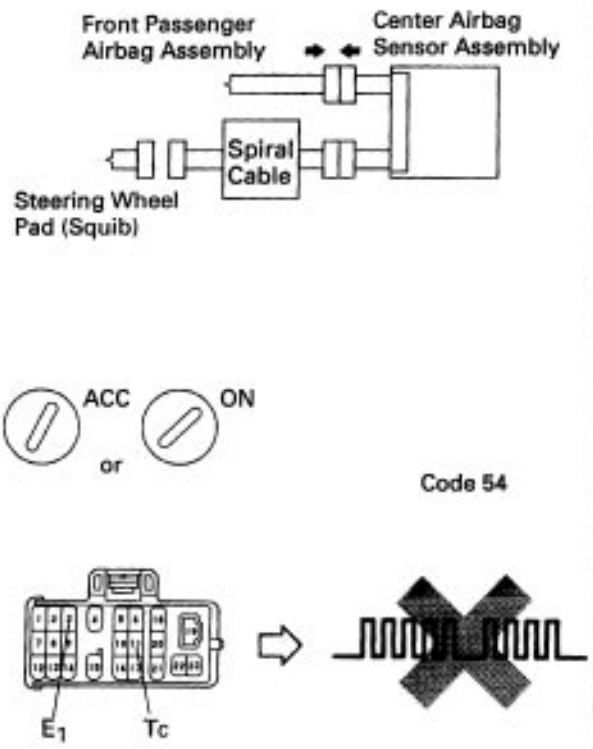
Hint

Codes other than code 54 may be output at this time, but they are not relevant to this check.

OK

NG **Replace center airbag sensor assembly.**

4 Check P squib.



P Turn ignition switch LOCK.

(2) Disconnect battery negative 1–y terminal cable and wait at least 90 seconds.

(3) Connect front passenger airbag assembly connector.

(4) Connect negative 1–y terminal cable to battery, and wait at least 2 seconds.

(5) Turn ignition switch ACC or ON and wait at least 20 seconds.

(6) Clear malfunction code stored in memory

(See page RS–65).

C (7) Turn ignition switch LOCK, and wait at least 20 seconds.

(1) Turn ignition switch ACC or ON, and wait at least 20 seconds.

(2) Using SST, connect terminals Tc and E, of DLC1.

SST 09843–18020

OK (3) Check diagnostic trouble code.

Diagnostic trouble code 54 is not output.

Hint Codes other than code 54 may be output at this time, but they are not relevant to this check.

OK

NG **Replace front passenger airbag assembly.**

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

– MEMO –

SRS Warning Light System Malfunction

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the supplemental restraint system is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically. If there is a malfunction in the supplemental restraint system, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and El of the check connector are connected, the diagnostic trouble code is displayed by the blinking of the SRS warning light.

DIAGNOSTIC CHART

Troubleshooting for this system is different for when the SRS warning light does not light up. Confirm the problem symptoms first before selecting the appropriate troubleshooting procedure.
HINT: If SRS warning light does not light up, perform the following troubleshooting:

1 Check SRS fuse.
- NG → Go to step **5**.
- OK ↓

2 Preparation.
- OK ↓

3 Check SRS warning light circuit.
- NG → Repair SRS warning light circuit (See page BE–61).
- OK ↓

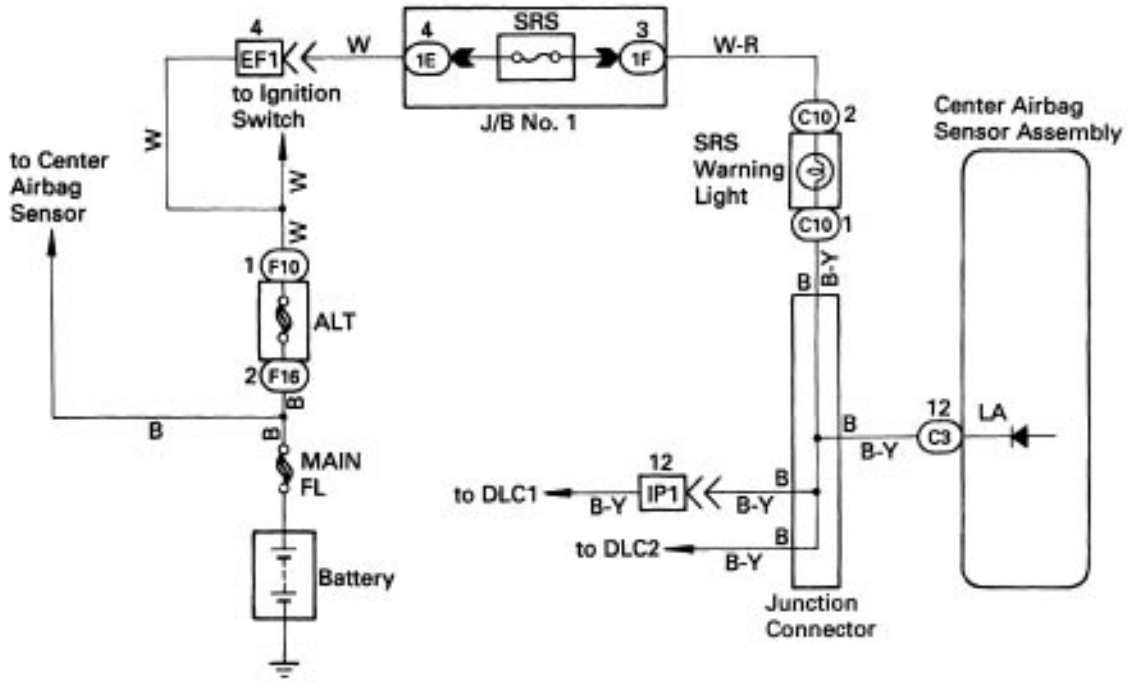
4 Does SRS warning light come on?
- NO → Check terminal LA of center airbag sensor assembly and electrical connection check mechanism. If normal, replace center airbag sensor assembly.
- YES ↓

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

5 Is new SRS fuse burnt out again?
- NO → Using simulation method, reproduce malfunction symptomes (See INTRODUCTION).
- YES ↓

Check harness between SRS fuse and SRS warning light, and SRS fuse and center airbag sensor assembly.

DIAGNOSTIC CHART
WIRING DIAGRAM



R08963

INSPECTION PROCEDURE

P Preparation C Check

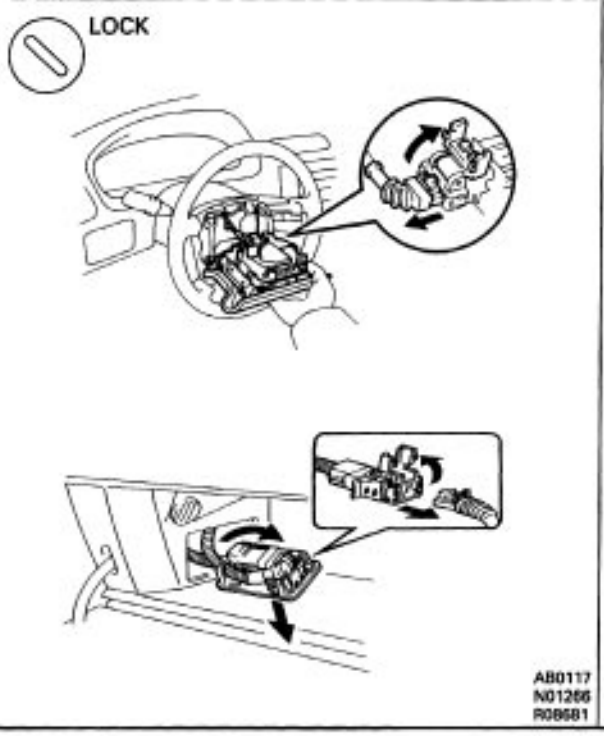
HINT: If SRS warning light does not light up, perform the following troubleshooting:

1 Check SRS fuse.

OK

NG > Go to step 5 .

2 Preparation.



P Disconnect battery negative H terminal cable, and wait at least 90 seconds.

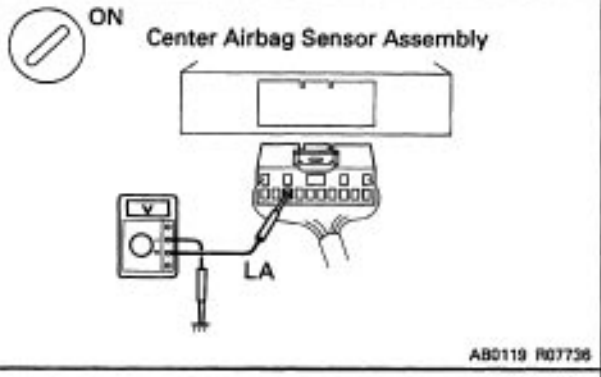
(2) Remove steering wheel pad (See page RS–20).

(3) Disconnect connectors of front passenger airbag assembly. (See page RS–29).

Caution

Store the steering wheel pad with the front surface facing upward.

3 **Check SRS warning light circuit.**



P (1) Disconnect center airbag sensor assembly.
(2) Connect negative (–) terminal cable to battery.
(3) Turn ignition switch ACC or ON.

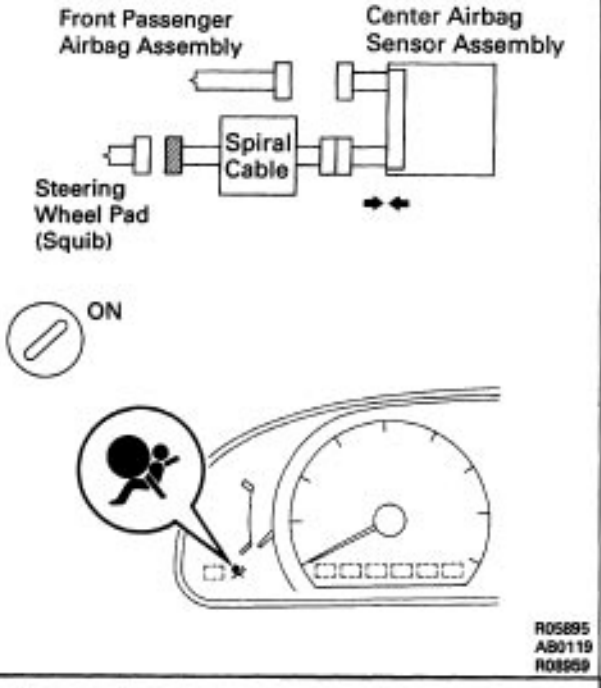
C Measure voltage LA terminal of harness side connector of center airbag sensor assembly.

OK **Battery Voltage: 10 – 14 V**

OK

NG **Repair SRS warning light circuit (See page BE–61).**

4 **Does SRS warning light come on?**



P (1) Disconnect negative (–) terminal cable from battery.
(2) Connect center airbag sensor assembly.
(3) Connect negative (–) terminal cable to battery.
(4) Turn ignition switch ACC or ON.

C (1) Turn ignition switch OFF, and wait at least 6 seconds.
(2) Turn ignition switch ON.

YES

NO **Check terminal LA of center airbag sensor assembly and electrical connection check mechanism. If normal, replace center airbag sensor assembly.**

5 **Is now SRS fuse burnt out again?**

YES

NO **Using simulation method, reproduce malfunction symptoms (See INTRODUCTION).**

Check harness between SRS fuse and SRS warning light, and SRS fuse and center airbag sensor assembly.

– MEMO –

SRS Warning Light System (Always Lit Up when ignition switch is LOCK position)

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the supplemental restraint system is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the supplemental restraint system, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and El of the DLC1 or DLC2 are connected, the diagnostic trouble code is displayed by the blinking of the SRS warning light.

DIAGNOSTIC CHART

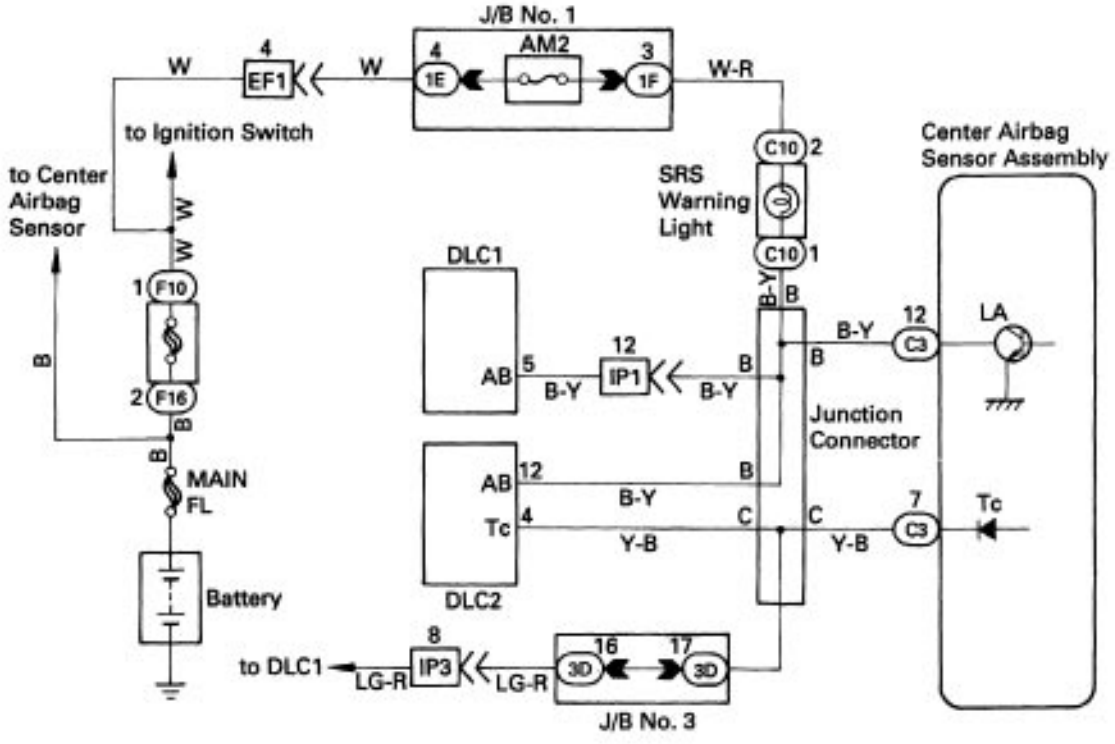
HINT: If the SRS warning light is always lit up by a DTC check procedure, perform Tc terminal circuit check procedure (See page RS–148).

1 Does SRS warning light turn off?

NO → Check SRS warning light circuit or terminal AB circuit of DLC1 or DLC2.

YES → Replace center airbag sensor assembly.

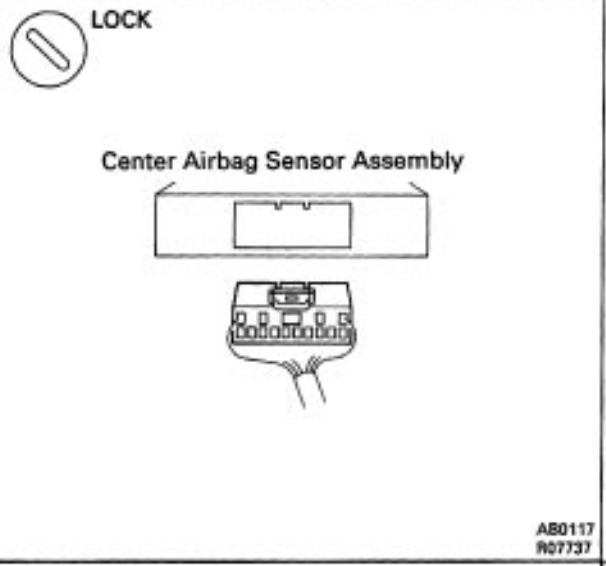
WIRING DIAGRAM



INSPECTION PROCEDURE

P Preparation C Check

1 Does SRS warning light turn off?



P Turn ignition switch LOCK.

(2) Disconnect negative H terminal cable from battery and wait at least 90 seconds.

(3) Remove steering wheel pad (See page RS–20).

(4) Disconnect connectors of front passenger airbag assembly. (See page RS–29)

(5) Disconnect center airbag sensor assembly connector.

C (6) Connect negative H terminal cable to battery. Check operation of SRS warning light.

Hint **Ignition Switch is LOCK position.**

YES

Replace center airbag sensor assembly.

NO

Check SRS warning light circuit or terminal AB circuit DLC1 or DLC2.

Tc Terminal Circuit

CIRCUIT DESCRIPTION

By connecting terminals Tc and El of the DLC1 or DLC2, the center airbag sensor assembly is set in the diagnostic trouble code output mode. The diagnostic trouble codes are displayed by the blinking of theSRS warning light.

DIAGNOSTIC CHART

Troubleshooting for this system is different depending on whether the diagnostic trouble code is not displayed SRS warning light is always lit up with a DTC check procedure, or is displayed without a DTC check procedure. Confirm the problem symptoms first before selecting the appropriate troubleshooting procedure.

HINT: If the diagnostic trouble code is not displayed or SRS warning light is always lit up with a DTC check procedure perform the following troubleshooting:

1. Check voltage between terminals Tc and E of DLC1 or DLC2.
   - OK → G o to step 3
   - NG ↓
2. Check voltage between terminal Tc of DLC1 or DLC2 and body ground.
   - OK → Check harness between terminal E1 of DLC1 or DLC2 and body ground.
   - NG ↓
3. Check center airbag sensor assembly.
   - OK → Check harness between center airbag sensor assembly and DLC1 or DLC2.
   - NG ↓

Replace center airbag sensor assembly.

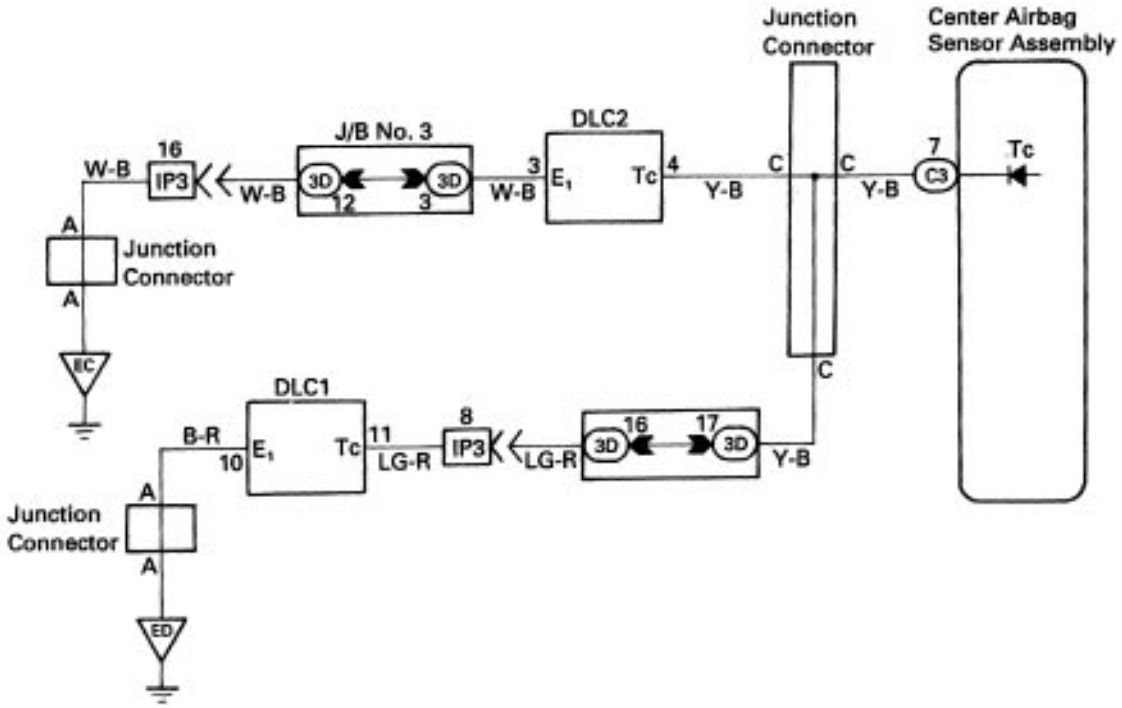
HINT: If the diagnostic trouble code is continuously displayed without a DTC check procedure, perform the following troubleshooting:

1. Check resistance between terminal Tc of center airbag sensor assembly and body ground.
   - OK → Replace center airbag sensor assembly.
   - NG ↓

Repair or replace harness or connector.

DIAGNOSTIC CHART

WIRING DIAGRAM



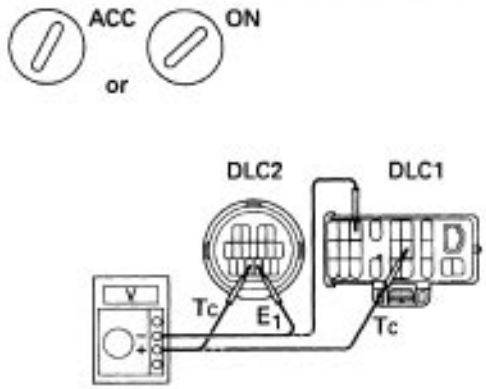
R08962

INSPECTION PROCEDURE

P Preparation C Check

HINT: If the diagnostic trouble code is not displayed, perform the following troubleshooting:

1 **Check voltage between terminals Te and El of DLC1 or DLC2.**



AB0118 AB0119 N01187

P Turn ignition switch ACC or ON.

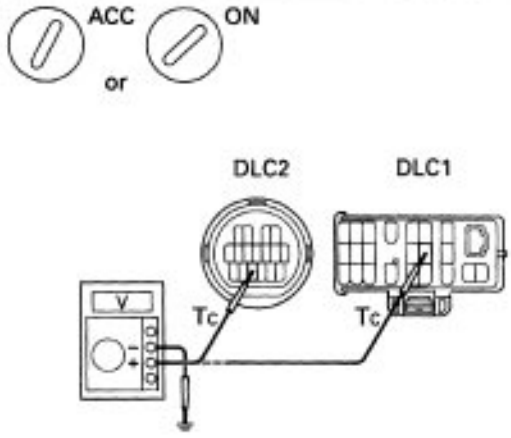
C Measure voltage between terminals Tc and El of DLC1 or DLC2.

OK **Battery Voltage: 10 – 14 V**

NG

OK → **Go to step 3 .**

2 **Check voltage between terminal Te of DLC1 or DLC2 and body ground.**



AB0118 AB0119 N01186

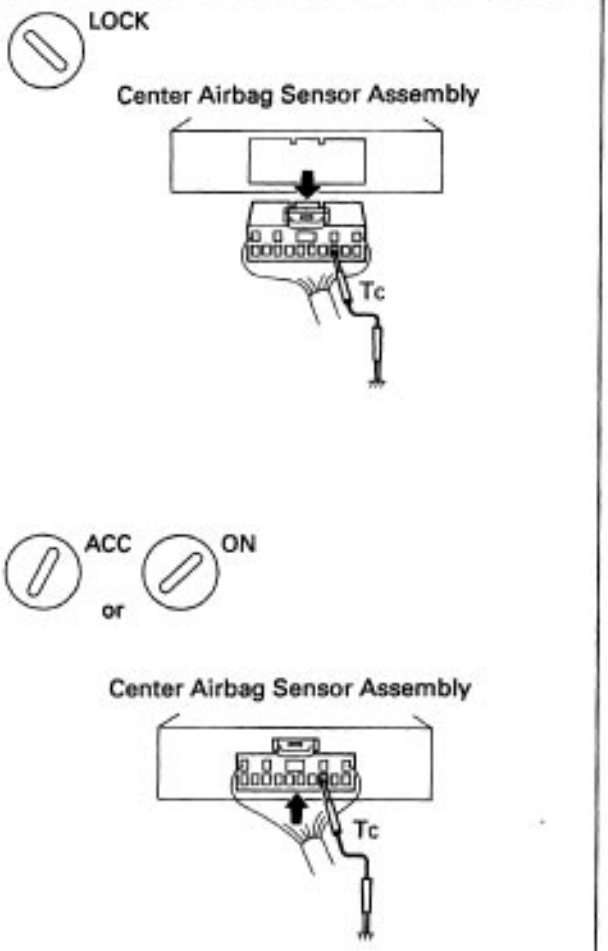
C Measure voltage between terminal Tc of DLC1 or DLC2 and body ground.

OK **Battery Voltage: 10 – 14 V**

NG

OK → **Check harness between terminal El of DLC1 or DLC2 and body ground.**

3 **Check center airbag sensor assembly.**



P (1) Turn ignition switch LOCK.

(2) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.

(3) Remove steering wheel pad (See page RS–20).

(4) Disconnect connectors of front passenger airbag assembly. (See page RS–29).

C Check operation of SRS warning light.

OK **SRS warning light comes on.**

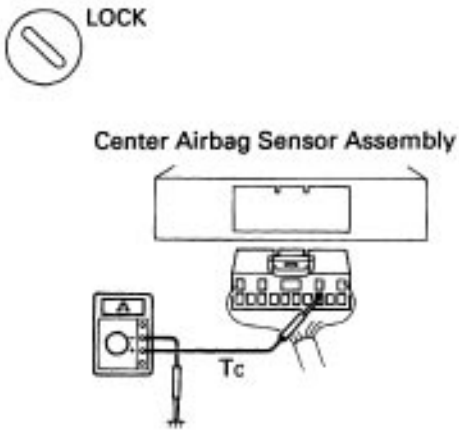
NG

OK **Check harness between center airbag sensor assembly and DLC1 or DLC2.**

Replace center airbag sensor assembly.

HINT: If the diagnostic trouble code is continuously displayed, perform the following troubleshooting.

1 **Check resistance between terminal Tc of center airbag sensor assembly and body ground.**



P Turn ignition switch LOCK.

(2) Disconnect center airbag sensor assembly connector.

(3) Disconnect battery negative (–) terminal cable, and wait at least 90 seconds.

(4) Remove steering wheel pad (See page RS–20).

(5) Disconnect connectors of front passenger airbag assembly. (See page RS–29).

C Check resistance between terminal Tc of center airbag sensor assembly and body ground.

OK **Resistance: 1 MΩ or higher**

NG

Repair or replace harness or connector.

OK **Replace center airbag sensor assembly.**

SERVICE SPECIFICATIONS

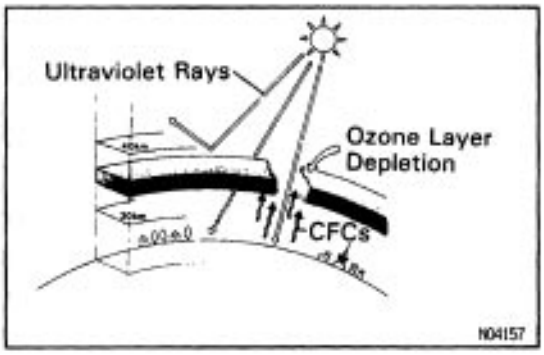
SERVICE DATA

Front airbag sensor resistance	Terminal	
	⊕ S – ⊕ A	Less than 1 Ω
	⊕ S – ⊖ S	∞
	⊖ S – ⊖ A	755 – 885 Ω

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Steering Wheel		35	360	26
Steering wheel pad		8.8	90	78 in.·lbf
Front passenger airbag assembly	to instrument panel reinforcement	21	210	15
	to instrument panel	8.0	80	69 in.·lbf
Seat belt shoulder anchor bolt		42	420	31
Front seat outer belt		42	420	31
Front airbag sensor		29	300	22
Center airbag sensor		20	200	15

AIR CONDITIONING SYSTEM

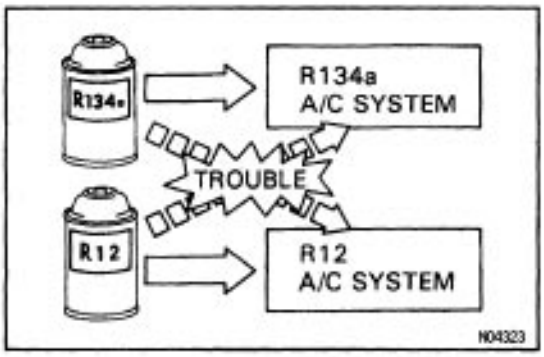


GENERAL DESCRIPTION

NEW AIR CONDITIONING SYSTEM WITH R134a

Refrigerant R12 (CFC12), previously used in automo–biles air conditioning systems is believed to contribute towards the depletion the earth's ozone layer. The ozone layer help to protect us against the harmful ultraviolet rays of the sun.

A newly developed refrigerant, R134 a (HFC 134 a), does not the destroy the ozone layer.



PRECAUTIONS FOR SERVICING R134a AIR CONDITIONERS

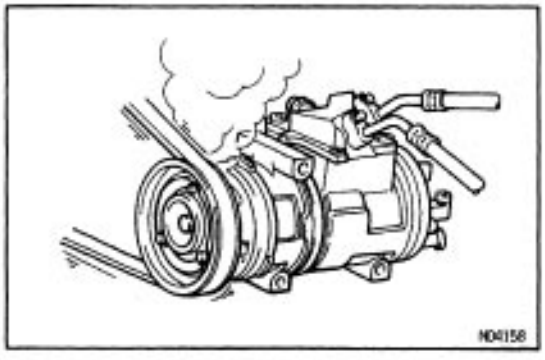
1. USE OF NEW REFRIGERANT R134a

The very different characteristics of refrigerants R134a and R12 have determined the design of their respective air conditioning systems. Under no circum–stances allow R12 to enter an R134a system, or vice versa, because serious damage could occur.

2. USE OF PROPER COMPRESSOR OIL

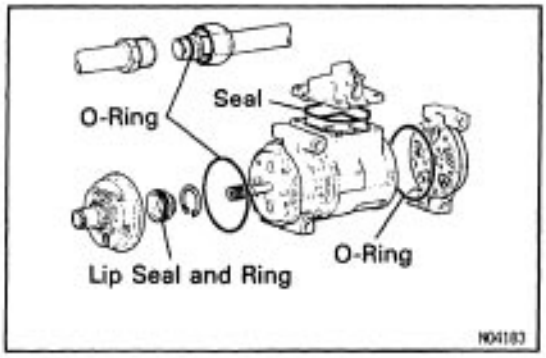
Compressor oil used in conventional R12 air condi–tioning systems cannot be used in R 134a air condi–tioning systems.

Always use genuine Toyota R1 34a air conditioning oil N D – OIL 8, made expressly for use with R 1 34a.



If even a small amount of the wrong oil is changed, it will result in clouding of the refrigerant.

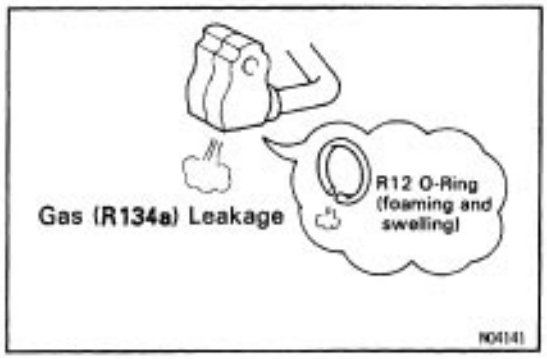
A large amount will cause the compressor to seize up.



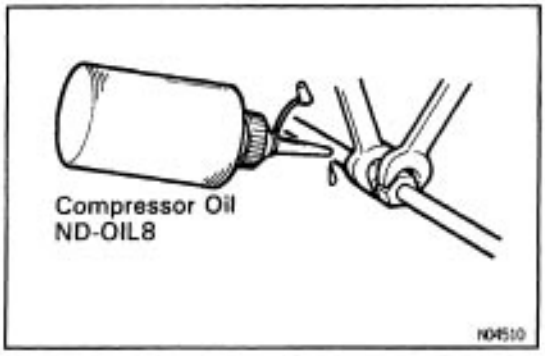
3. USE OF PROPER O – RINGS AND SEALS

0–rings and seals used for conventional R12 air conditioning systams cannot be used for R134a air conditioning systems.

Always use genuine Toyota R 134a system 0–rings and seals for R 1 34a air conditioning systems.



If O–rings and/or seals for R1 2 air conditioning sys–tems are used by mistake in the connections of an R 134a air conditioning system, the O–ring and seals will foam and swell resulting in leakage of refrigerant.



4. TIGHTEN CONNECTING PARTS SECURELY

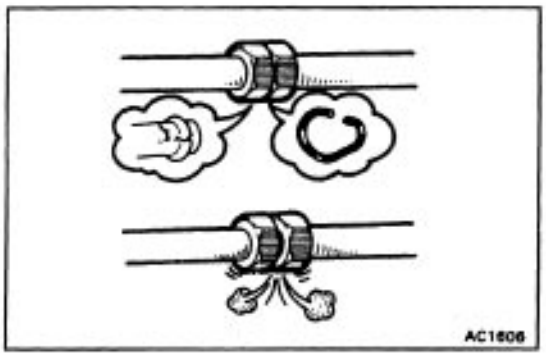
Securely tighten the connecting parts to prevent leak–ing of refrigerant gas.

Apply a few drops of compressor oil to 0–ring fittings for easy tightening and to prevent leaking of refrigerant gas.

CAUTION: Apply only ND–OIL 8 compressor oil

Tighten the nuts using 2 wrenches to avoid twist–ing the tube.

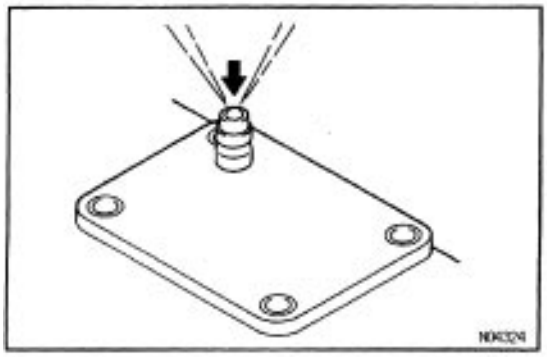
Tighten the 0–ring fittings or the bolted type fittings to the specified torque.



5. INSERT PLUG IMMEDIATELY IN DISCONNECTED PARTS

Insert a plug immediately in the disconnected parts to prevent the ingress of moisture and dust.

6. DO NOT REMOVE PLUG FROM NEW PARTS UNTIL IMMEDIATELY BEFORE INSTALLATION

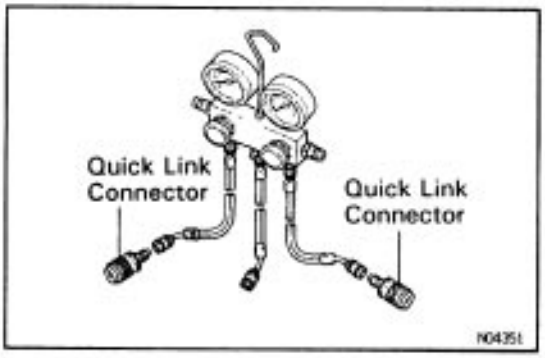


7. DISCHARGE GAS IN NEW COMPRESSOR FROM CHARGING VALVE BEFORE INSTALLING IT

If the gas in the new compressor is not discharged first, compressor oil will spray out with gas when the plug is removed.

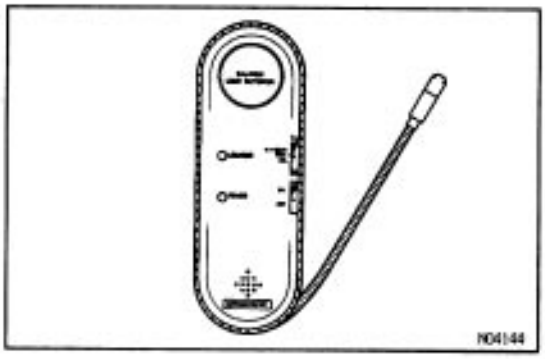
SERVICE TOOLS FOR R134a AIR CONDITIONER

When servicing R134a air conditioning systems always use the R134a dedicated manifold gauges, gas leak detector and vacuum pump adaptor.



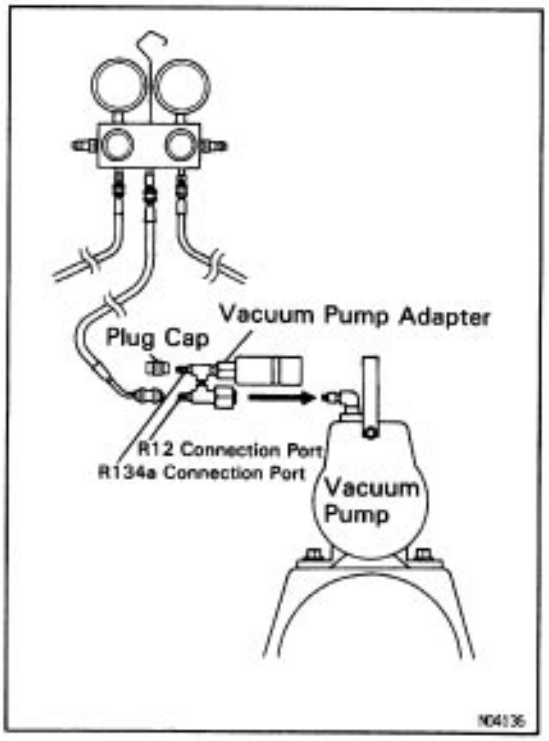
1. USE MANIFOLD GAUGES FOR R134a AIR CONDITI–ONER

Always use R134a dedicated manifold gauges to pre–vent R1 2 and RI 2 compressor oil contaminating the R 134a system.



2. USE R134a GAS LEAK DETECTOR

Similarly, always use an R 134a dedicated leak detec–tor. The R1 2 leak detector is not sufficiently sensitive.



3. USE VACUUM PUMP ADAPTER

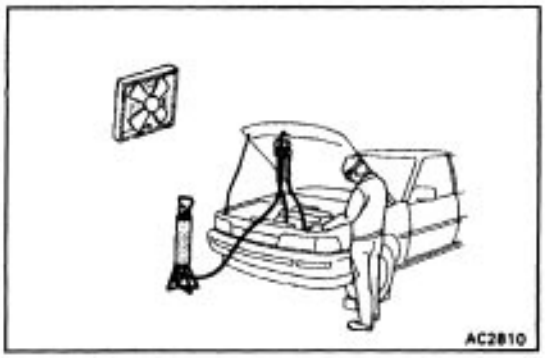
By connecting a vacuum pump adapter, the vacuum pump can be used for both R 134a and R 12 air condi–tioning systems.

The vacuum pump adaptor has an internal magnetic valve.

When evacuation is completed and the vacuum pump switch is turned off, the magnetic valve opens allow–ing the introduction atmospheric air into the manifold gauges to prevent the back flow of oil from the vacuum pump into the gauge hose.

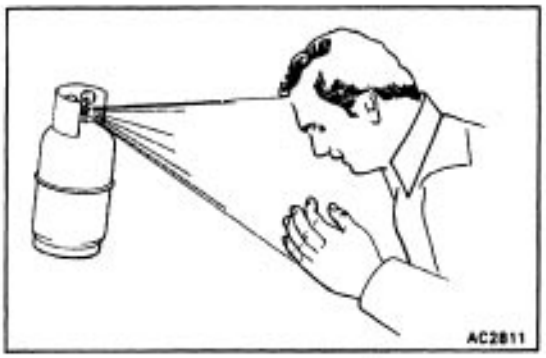
CAUTION:

Be sure to turn off the manifold gauge valve immediately after evacuating the system. Then you may switch off the vacuum pump. If this order is reversed, the line will be temporarily open to atmosphere.



HANDLING PRECAUTIONS FOR REFRIGERANT

1. **DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME**
2. **ALWAYS WEAR EYE PROTECTION**



3. **BE CAREFUL THAT LIQUID REFRIGERANT DOES NOT GET IN YOUR EYES OR ON YOUR SKIN**

   If liquid refrigerant gets in your eyes or on your skin:

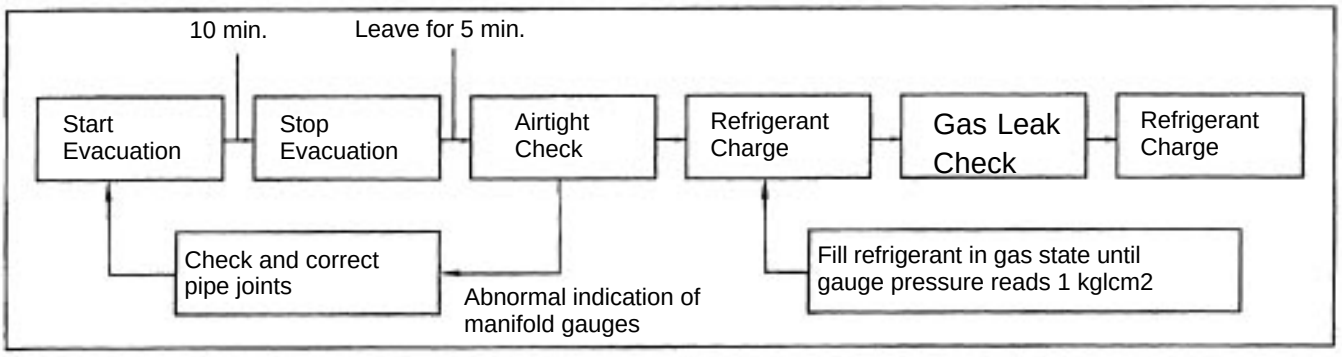
(a) Wash the area with lots of cool water.
   CAUTION: Do not rub your eyes or skin.
(b) Apply clean petroleum jelly to the skin.
(c) GO immediately to a physician or hospital for profes–sional treatment.

HANDLING PRECAUTIONS FOR REFRIGERANT CONTAINER

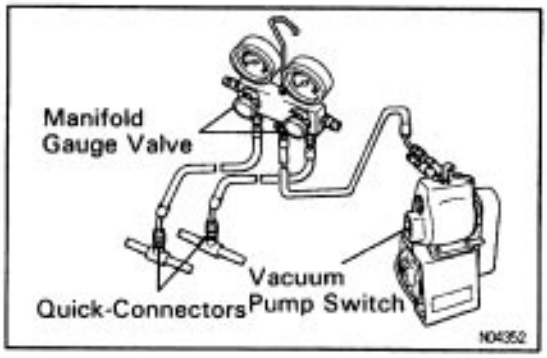
1. **NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME**
2. **BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT**

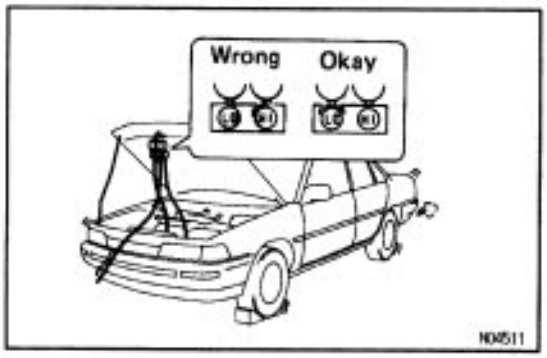
CHARGING AND LEAK–CHECK METHODS

Evacuate the refrigeration system according to the following procedures.



V00970





CAUTION:

- **Be sure to connect both the high and low pressure quick–connectors onto the A/C system when eva–cuating. If only one side is connected, the system would be open to atmosphere through the other connector, making it impossible to maintain vacuum.**
- **Be sure to turn off the manifold gauge valve imme–diately after evacuating the system. Then you may switch off the vacuum pump.**

AC0N6–06

PRECAUTIONS WHEN CHARGING REFRIGERANT

1. **DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERANT SYSTEM**
   If there is not enough refrigerant in the refrigerant system oil lubrication will be insufficient and compres–sor burnout may occur, so take care to avoid this.
2. **DO NOT OPEN HIGH PRESSURE MANIFOLD VALVE WHILST COMPRESSOR IS OPERATING**
   If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylinder to rupture, so open and close the low pres–sure valve only.
3. **BE CAREFUL NOT TO OVERCHARGE WITH RE–FRIGERANT IN SYSTEM**
   If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating etc.

AC0N7–08

ELECTRICAL PARTS

Before removing and inspecting the electrical parts, set the ignition switch to the LOCK position and disconnect the negative (–) terminal cable from bat–tery.

CAUTION: Work must be started after 90 seconds from the time the Ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is discon–nected from the battery.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

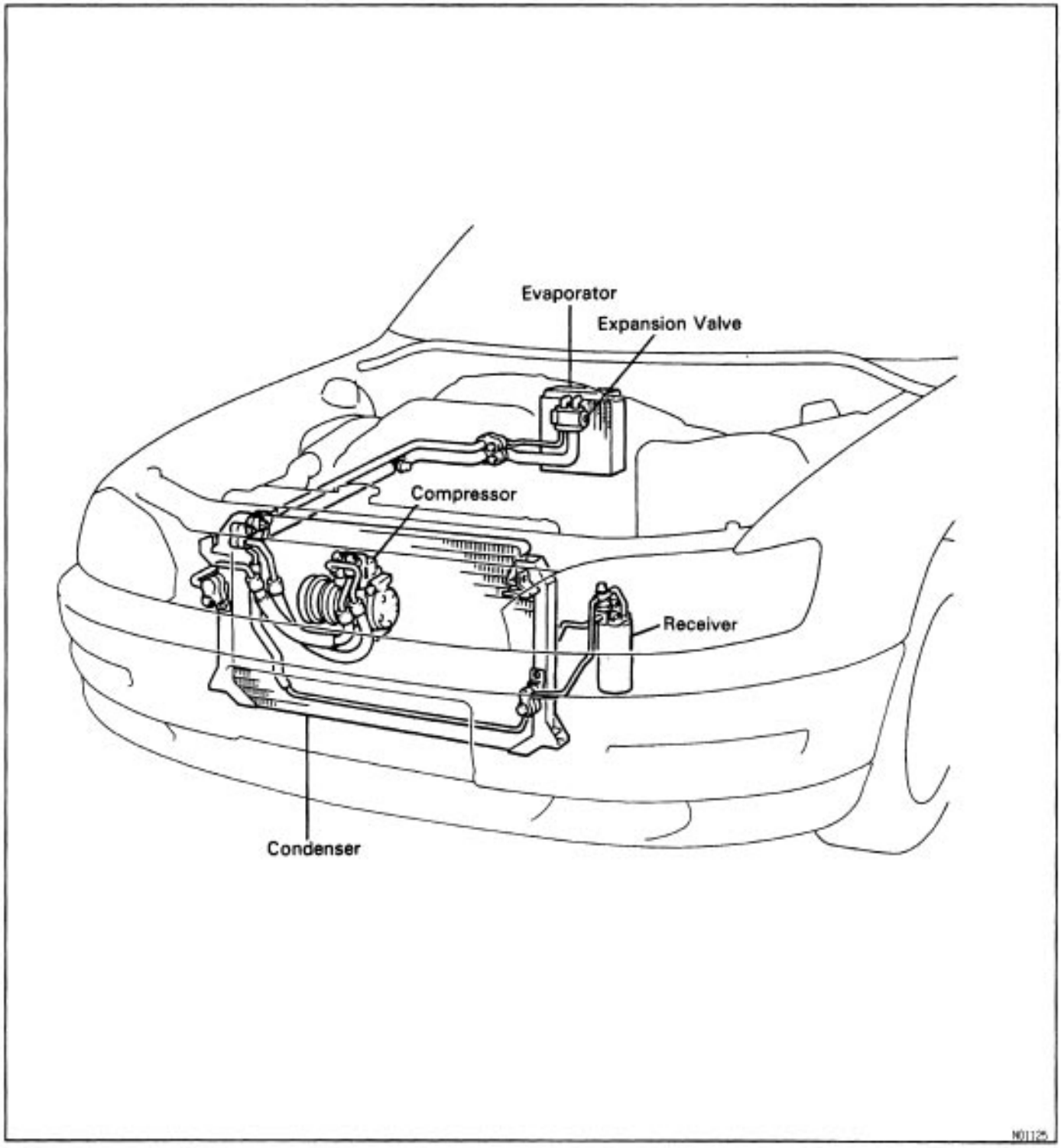
Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to deploy, possibly leading to a serious acci–dent.

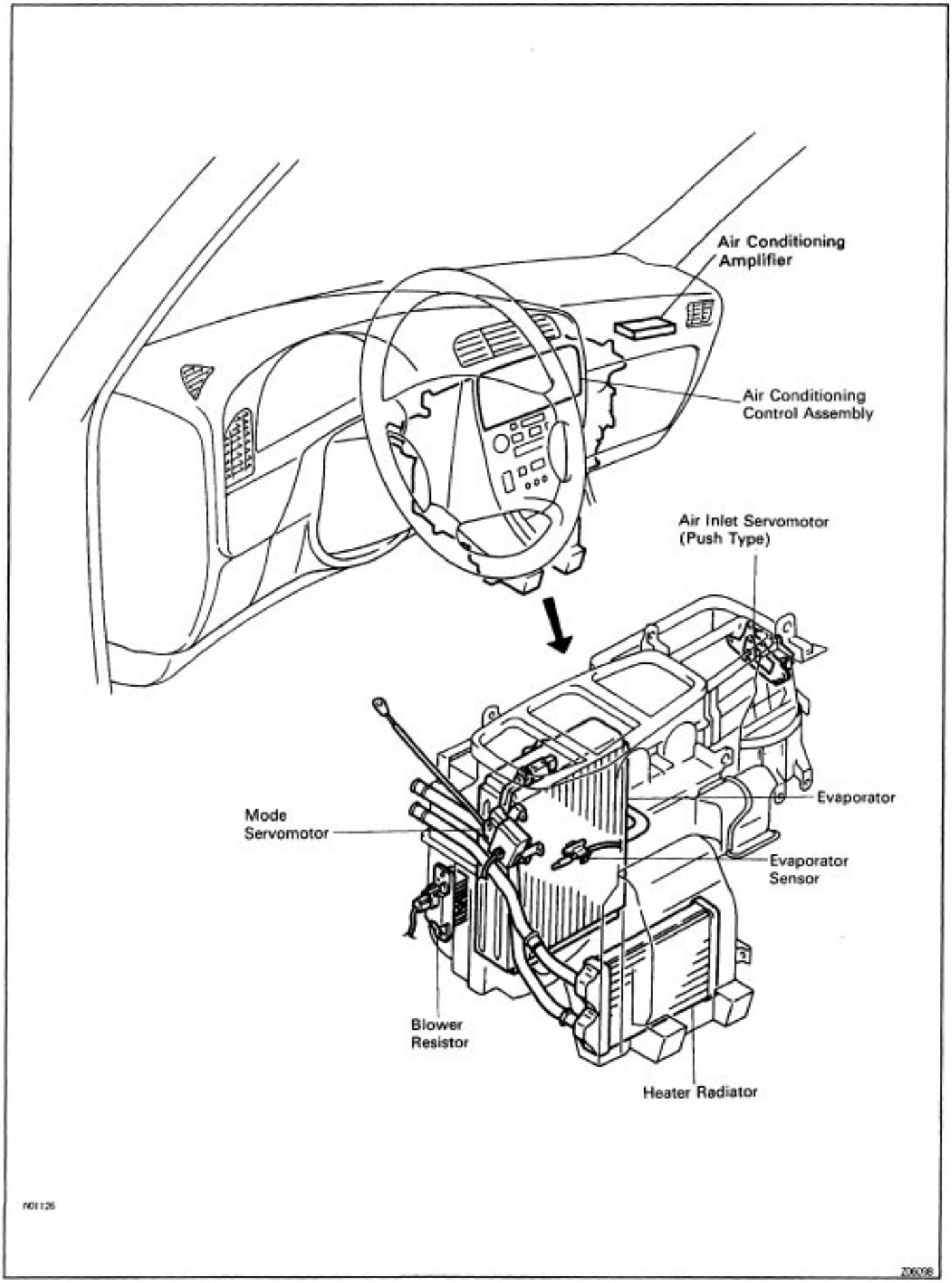
During removal or installation of the parts and the yellow wire harness and connector for the airbag is necessary, refer to the precautionary notices in the RS section before performing the operation.

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is discon–nected from the battery.

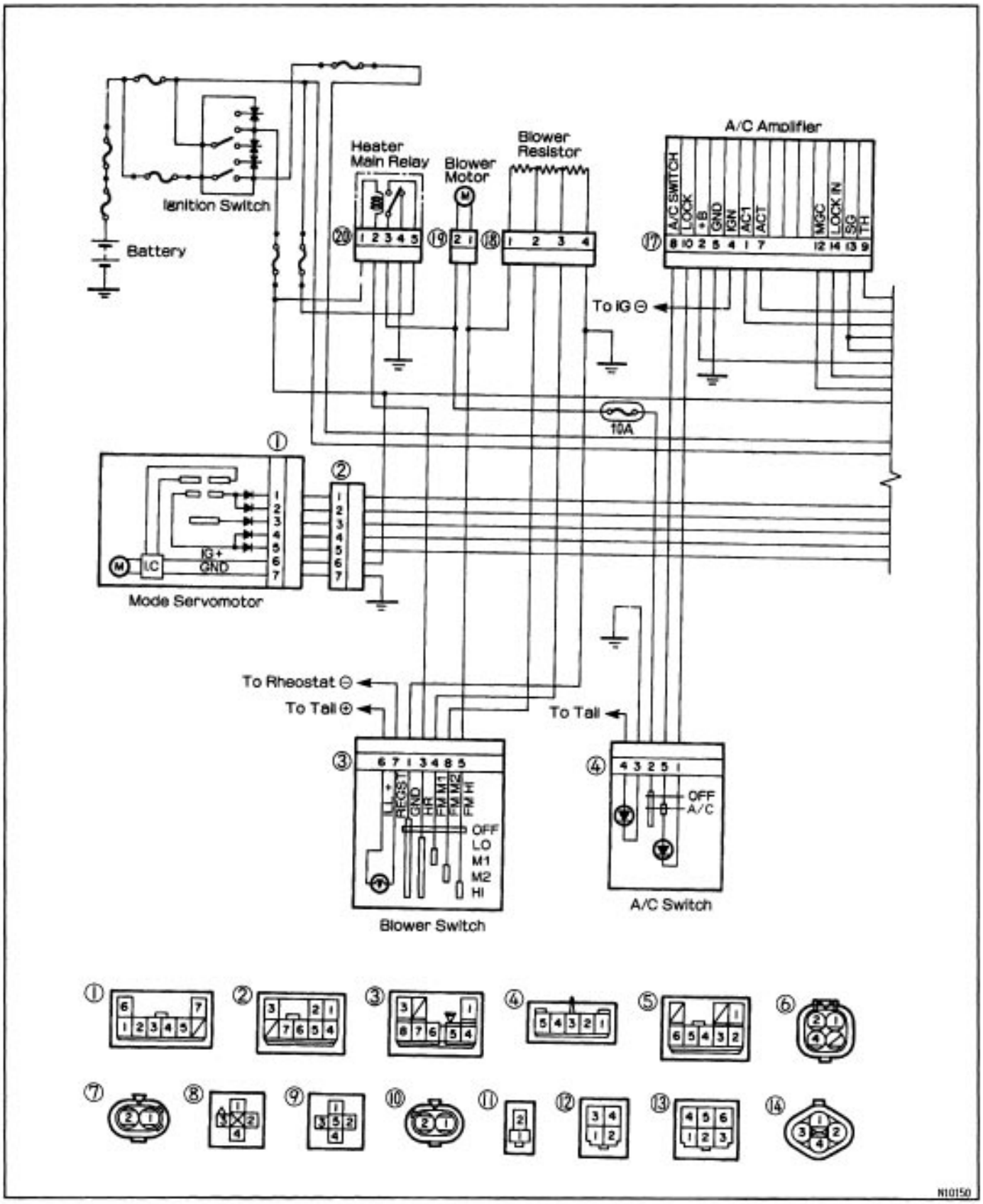
DESCRIPTION

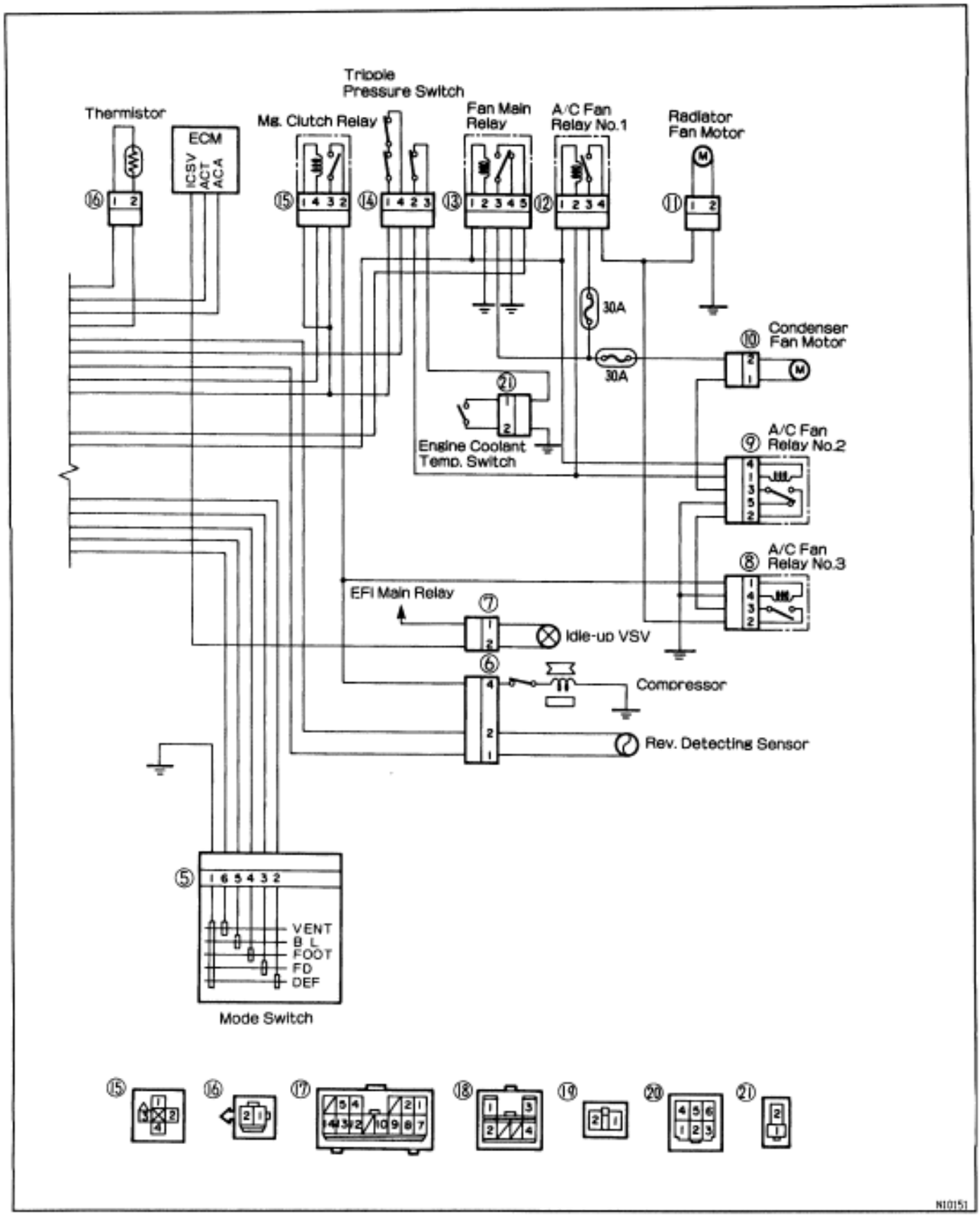
PARTS LOCATION



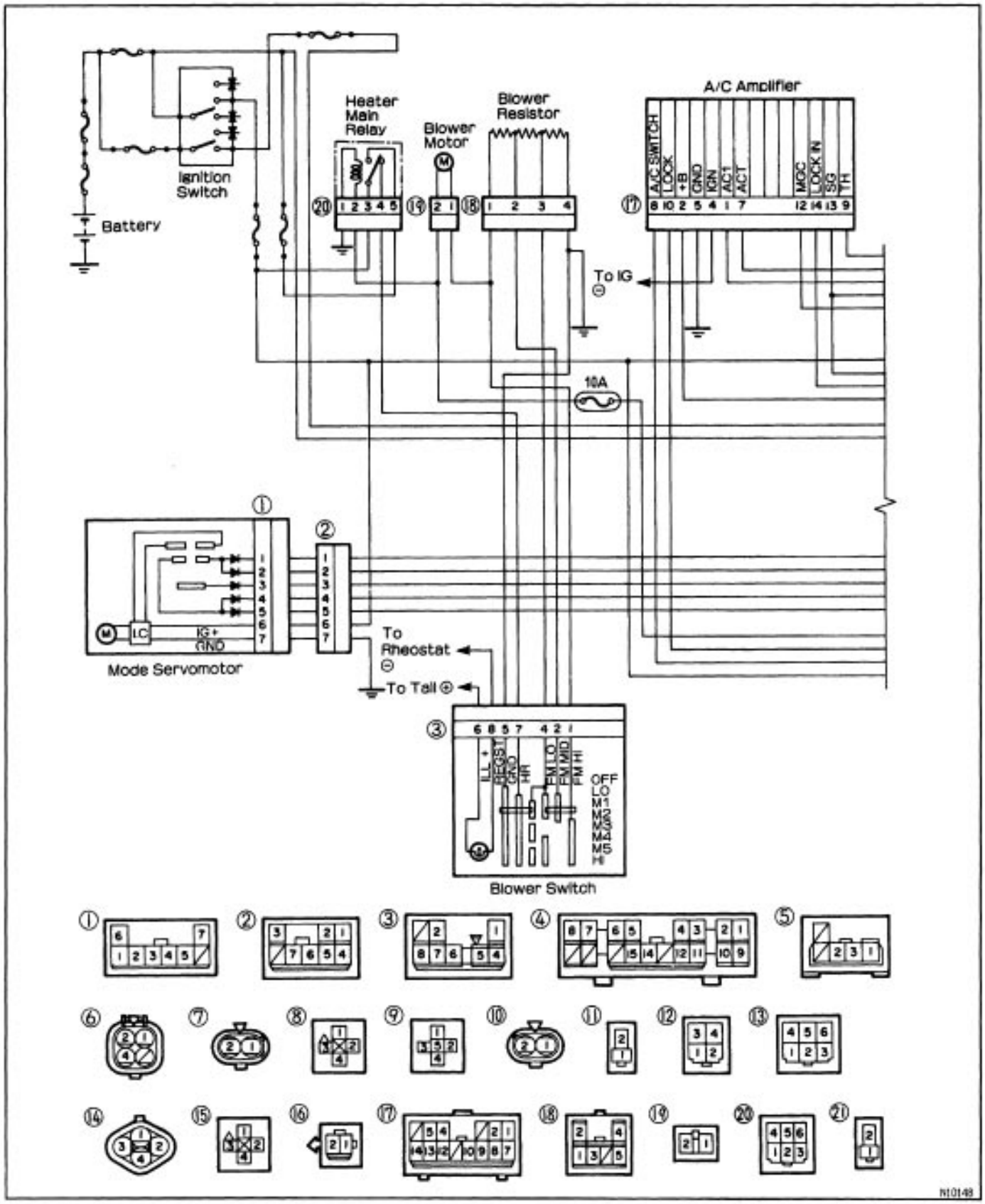

Air Conditioning Amplifier
Air Conditioning Control Assembly
Air Inlet Servomotor (Push Type)
Evaporator
Mode Servomotor
Evaporator Sensor
Blower Resistor
Heater Radiator
N01126
Z06098

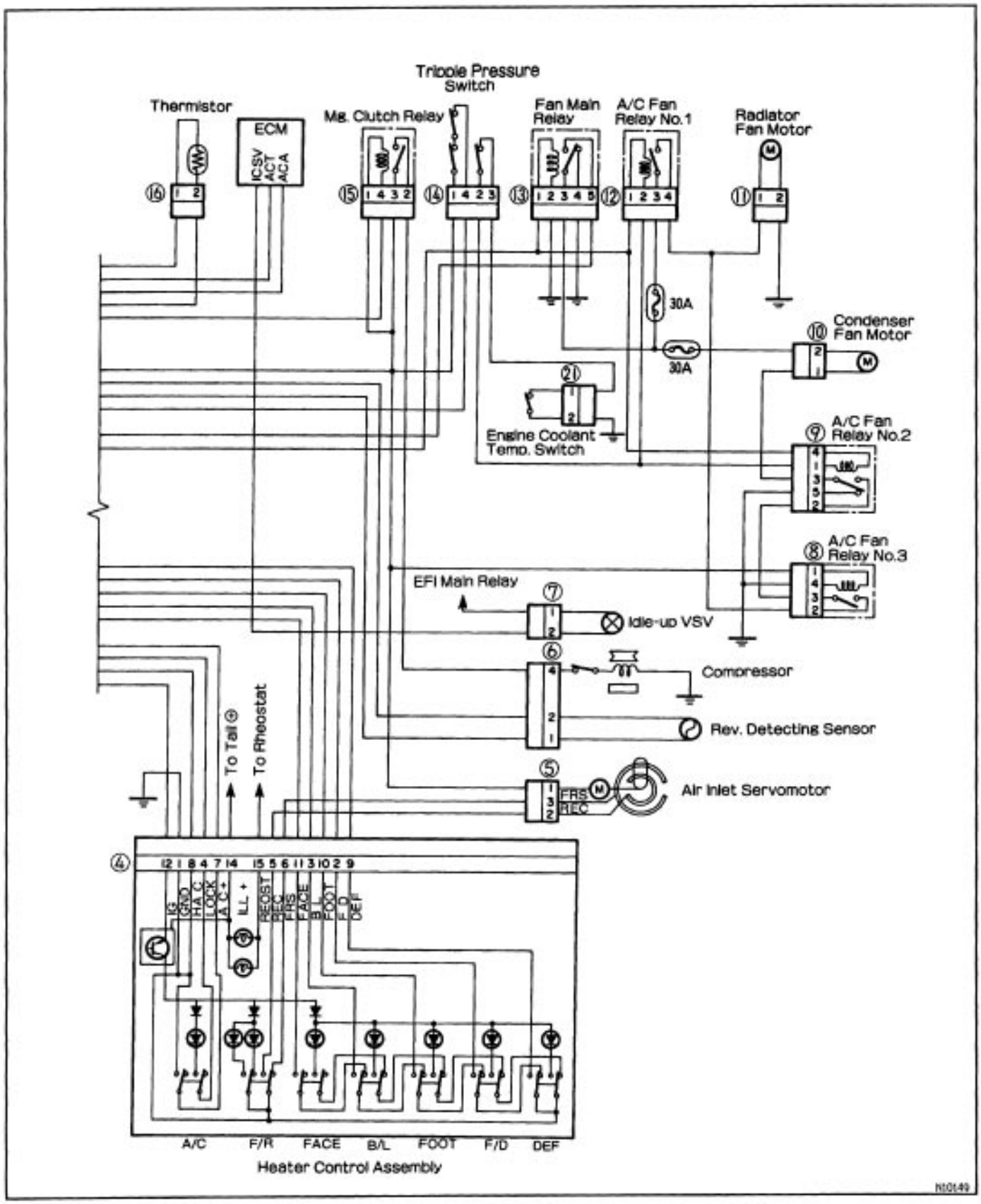
ELECTRICAL WIRING DIAGRAM
(Lever Type On 5S–FE Engine Model)



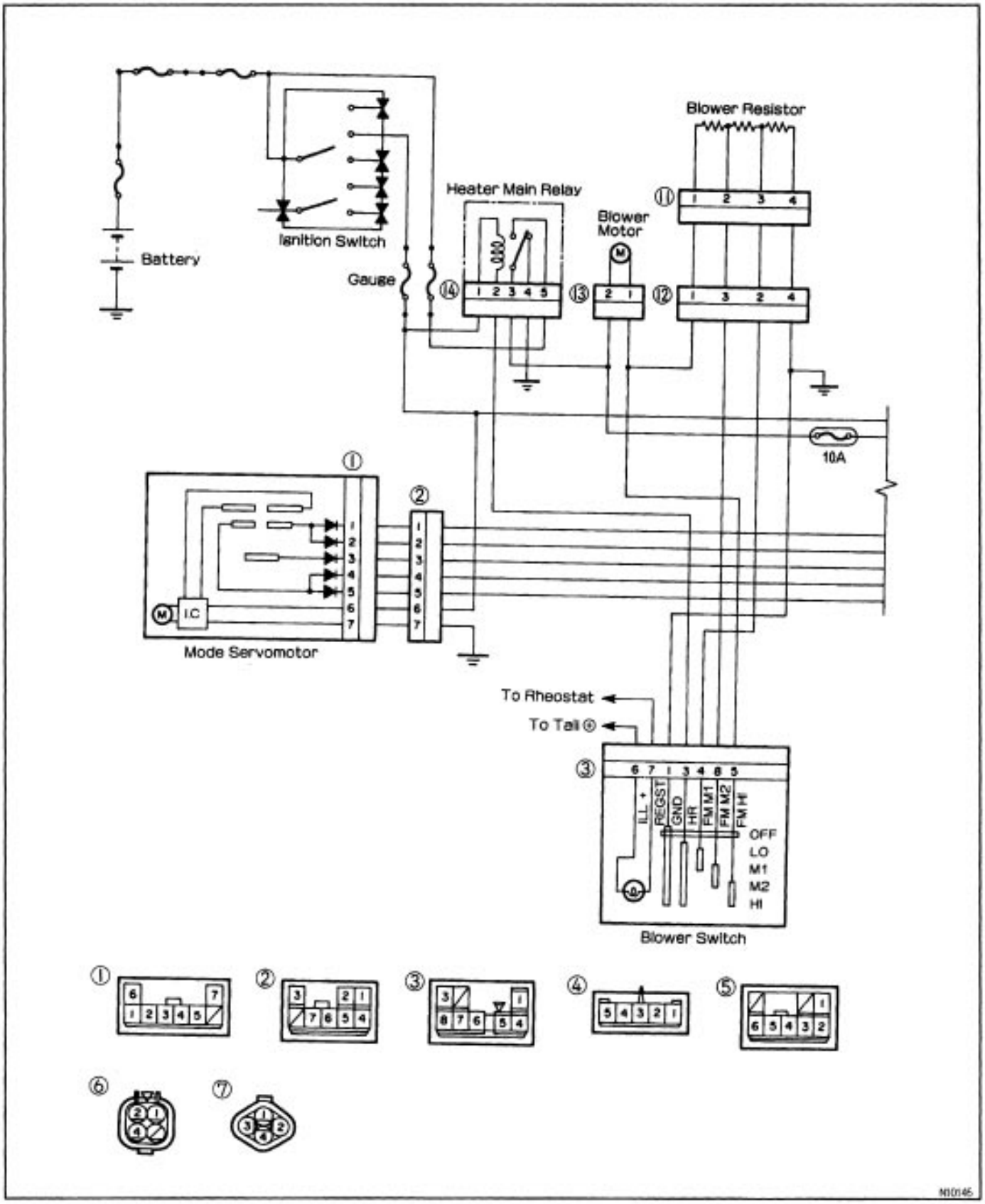

Trinple
Pressure Switch
Thermistor
ECM
ICSV
ACT
A/C A
Mg. Clutch Relay
Fan Main
Relay
A/C Fan
Relay No.1
Radiator
Fan Motor
30A
30A
Condenser
Fan Motor
Engine Coolant
Temp. Switch
A/C Fan
Relay No.2
A/C Fan
Relay No.3
EFI Main Relay
Idle-up VSV
Compressor
Rev. Detecting Sensor
VENT
B L
FOOT
FD
DEF
Mode Switch
N10151

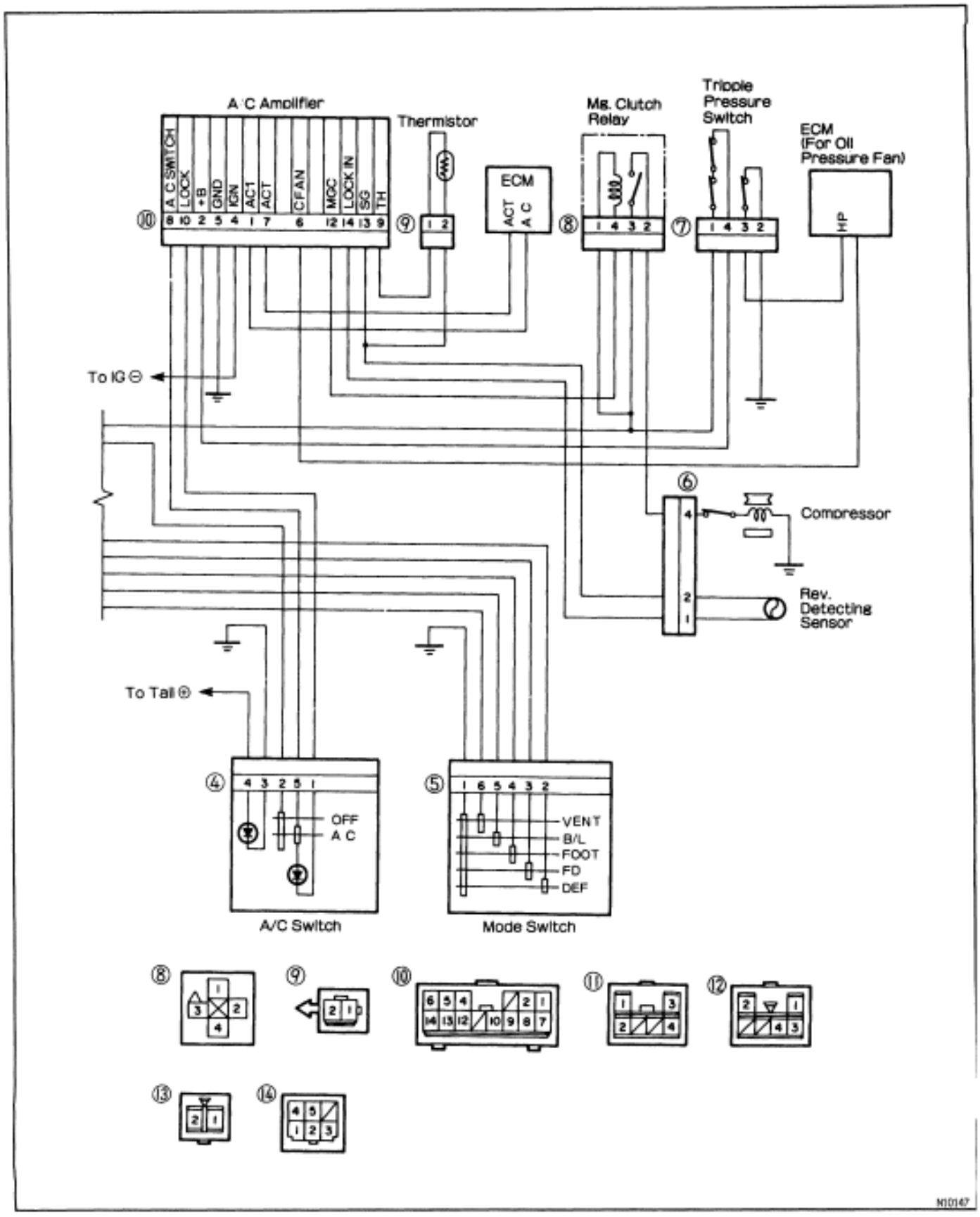
(Push Button Type On 5S–FE Engine Model)



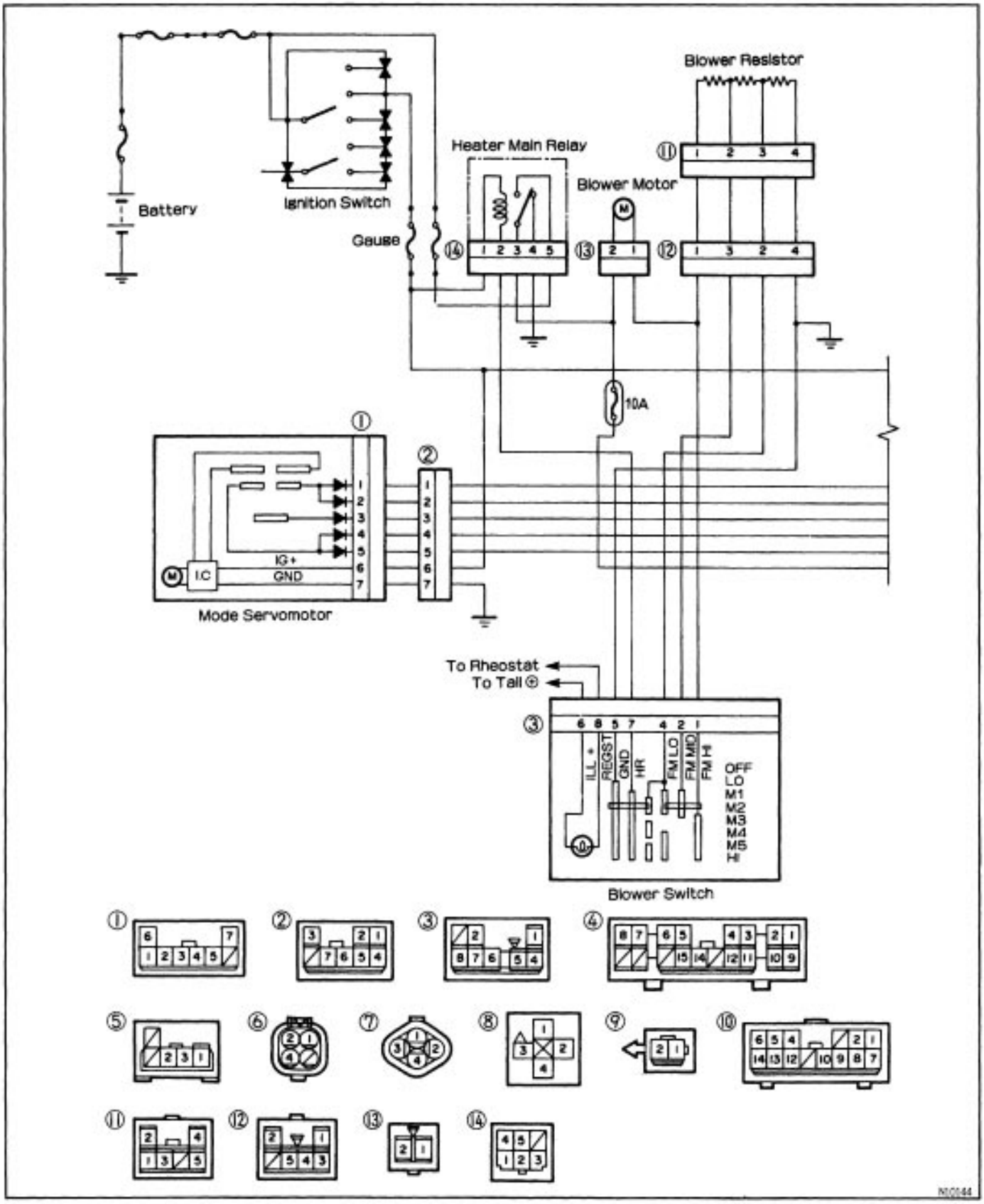

Trinple Pressure Switch
Thermistor
ECM
IGSW
ACT
ACA
Mg. Clutch Relay
Fan Main Relay
A/C Fan Relay No.1
Radiator Fan Motor
30A
30A
Condenser Fan Motor
Engine Coolant Temp. Switch
A/C Fan Relay No.2
A/C Fan Relay No.3
EFI Main Relay
Idle-up VSV
Compressor
Rev. Detecting Sensor
Air Inlet Servomotor
FRS
REC
To Tail
To Rheostat
IG
GND
HA C
LOCK
A C+
ILL +
DEFOST
REC
FRS
FACE
B/L
FOOT
F/D
DEF
A/C
F/R
FACE
B/L
FOOT
F/D
DEF
Heater Control Assembly
N10149

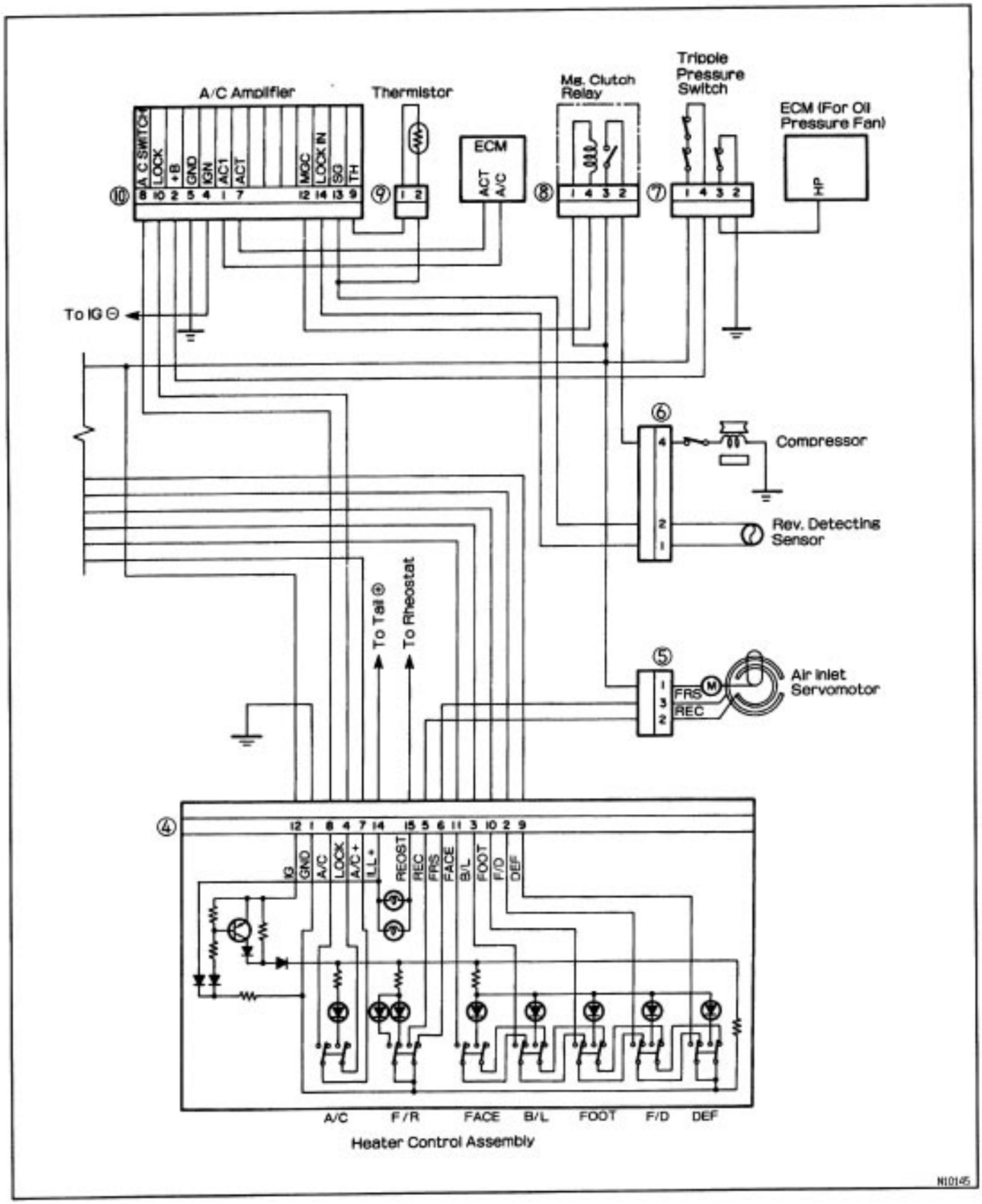
(Lever Type On 1 MZ–FE Engine Model)




A/C Amplifier
A/C SWITCH
LOCK
+B
GND
IGN
AC1
ACT
CFAN
MGC
LOCK IN
SG
TH
Thermistor
ECM
ACT
A/C
Mg. Clutch Relay
Tripple Pressure Switch
ECM (For Oil Pressure Fan)
HP
To IG ⊖
Comoressor
Rev. Detecting Sensor
To Tail ⊕
OFF
A/C
A/C Switch
VENT
B/L
FOOT
FD
DEF
Mode Switch
N10147

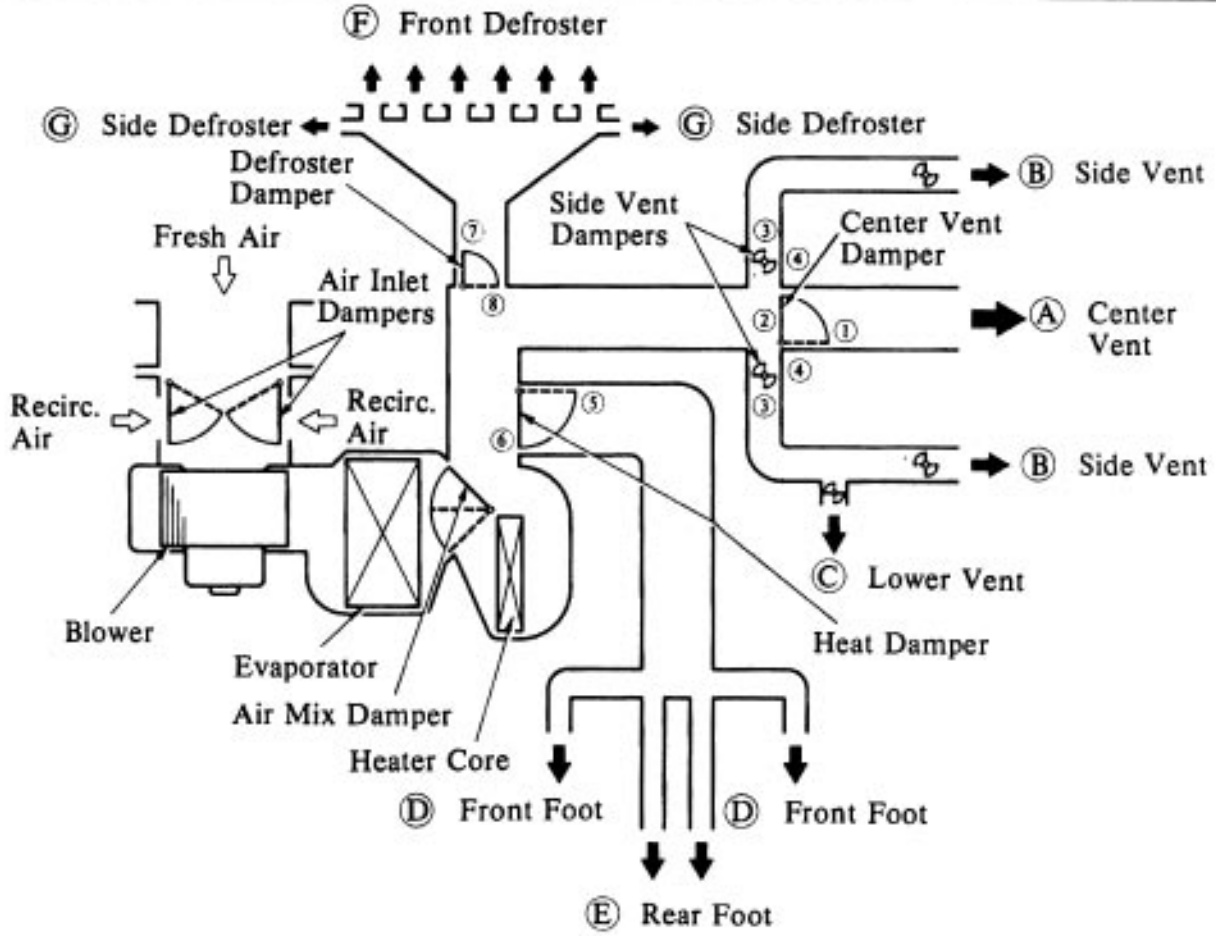
(Push Button Type On 1 MZ–FE Engine Model)




A/C Amplifier
Thermistor
Ms. Clutch Relay
Tripple Pressure Switch
ECM (For Oil Pressure Fan)
ECM
A C SWITCH
LOCK
+B
GND
IGN
AC1
ACT
MGC
LOCK IN
SG
TH
ACT
A/C
HP
To IG ⊖
Compressor
Rev. Detecting Sensor
To Tail ⊕
To Rheostat
Air Inlet Servomotor
FRS
REC
IG
GND
A/C
LOCK
A/C+
IL+
REOST
REC
FRS
FACE
B/L
FOOT
F/D
DEF
A/C
F/R
FACE
B/L
FOOT
F/D
DEF
Heater Control Assembly
N10145

DAMPERS POSITION

AC007–01



Air Outlet Mode		Mode Control Damper Position	Vent			Foot		Defroster	
			Ⓐ Center	Ⓑ Side	Ⓒ Lower	Ⓓ Front	Ⓔ Rear	Ⓕ Front	Ⓖ Side
Face		① ③ ⑥ ⑧	◯	◯	○				
Bi-level		① ③ ⑤ ⑧	○	○	○	○	○		
Foot		② ④ ⑤ ⑧		○	○	◯	○	○	○
Foot/ Defroster		② ④ ⑤ ⑦		○	○	○	○	○	○
Defroster		② ④ ⑥ ⑦		○	○			◯	○

The size of the circle ○ indicates the proportion of air flow volume.

N01883

PREPARATION

SST (SPECIAL SERVICE TOOLS)

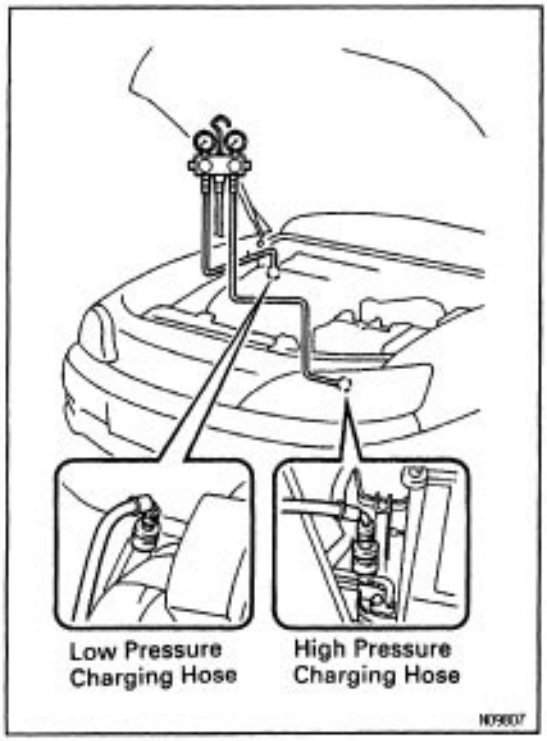
	07110–58060 Air Conditioner Service Tool Set	
	(07117–58060) Refrigerant Drain Service Valve	
	(07117–58070) T–Joint	
	(07117–58080) Quick Coupler	Discharge (diam. 16 mm)
	(07117–58090) Quick Coupler	Suction (diam. 13 mm)
	(07117–78050) Refrigerant Charging Gauge	
	(07117–88060) Refrigerant Charging Hose	Discharge (Red)
	(07117–88070) Refrigerant Charging Hose	Suction (Blue)
	(07117–88080) Refrigerant Charging Nose	Utility (Green)
	07112–66040 Magnetic Clutch Remover	
	07112–76060 Magnetic Clutch Stopper	
	07114–84020 Snap Ring Pliers	
	07116–38360 Gas Leak Detector Assembly	

RECOMMENDED TOOL

	09082–00050 TOYOTA Electrical Tester Set	

LUBRICANT

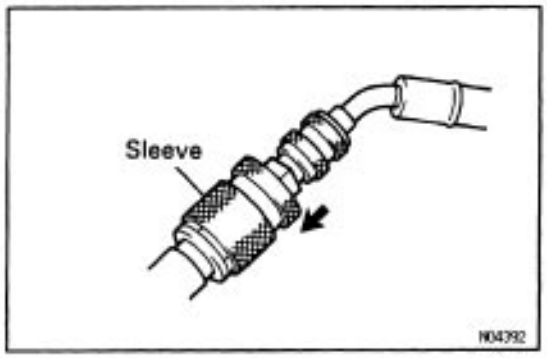
Item	Capacity	Classification
Compressor oil	–	ND–OIL 8 or equivalent
When replacing receiver	10 cc (0.34 fl.oz.)	
When replacing condenser	40 cc (1.4 f l.oz.)	
When replacing evaporator	40 cc (1.4 fl.oz.)	
When replacing compressor	140 cc (4.9 fl.oz.)	



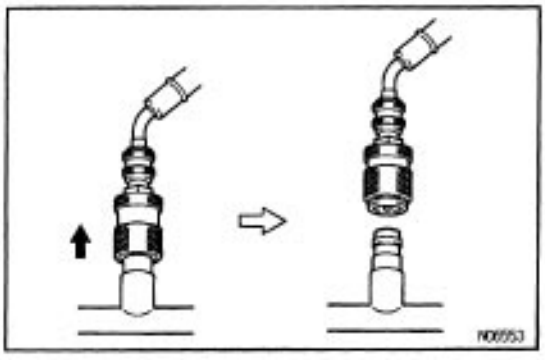
USE OF MANIFOLD GAUGE SET

MANIFOLD GAUGE SET INSTALLATION

1. **CONNECT CHARGING HOSES TO MANIFOLD GAUGE SET**
   Tighten the nuts by hand.
   CAUTION: Do not connect the wrong hoses.
2. **CONNECT QUICK CONNECTORS TO CHARGING HOSES**
   Tighten the nuts by hand.
3. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
4. **REMOVE CAPS FROM SERVICE VALVES ON RE–FRIGERANT LINE**



5. **CONNECT QUICK CONNECTORS TO SERVICE VALVES**
   HINT: Push the quick connector onto the service valve, then slide the sleeve of the quick connector downward to lock it.



MANIFOLD GAUGE SET REMOVAL

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK CONNECTORS FROM SER–VICE VALVES ON REFRIGERANT LINE**
   HINT: Slide the sleeve of the quick connector upward to unlock the connector and remove it from the ser–vice valve.
3. **INSTALL CAPS TO SERVICE VALVES ON REFRIG–ERANT LINE**

TROUBLESHOOTING

Use the table below to help you find the cause of problem. The numbers indicate the priority of the likely cause of the problem. Check each rt in order. If necessary, replace these parts.

See page / Parts Name / Trouble	Inspect Volume of Refrigerant	Inspect Refrigeration System with Manifold Gauge Set	Inspect Drive Belt Tension	Fusible Link	Fuse (A/C)	Pressure Switch	Evaporator Temp. Sensor	Revolution Detecting Sensor	Magnet Clutch Relay	A/C Fan Relays
See page	AC–29	AC–24	AC–30	–	–	AC–60	AC–62	AC–63	AC–63	AC–64
No blower operation				1						
No blower control										
No air flow mode control										
No air inlet control										
Insufficient flow of cool air										
Insufficient flow of warm air										
No cool air comes out	3	4	5		1	6	13	9	2	
Cool air comes out intermittently	1	2	3				6	4		
Cool air comes out only at high engine speed	2	3	1							
Insufficient cooling	1	2	3			7	12			6
No warm air comes out										
Air temp. control not functioning										
No engine idle up when A/C switch on										

V02703

AC–59 Blower Resistor	AC–57 Air Inlet Servomotor	AC–58 Air out let Servomotor	AC–55 Blower Motor	AC–56 Condenser Fan Motor	AC–67 A/C Control Assembly	AC–66 A/C Amplifier	AC–36 Compressor	AC–47 Condenser	AC–49 Evaporator	AC–36 Magnet Clutch	AC–45 Receiver	AC–53 Expansion Valve (Replace)	– Wiring or Wiring Connection
4			3		2								5
					1								2
		2			1								3
	2				1								3
2			1						3				4
2			1										3
					10	12	8			7			14
						5						7	8
							5	4					
				8		11	10	4	13	9	5	14	
					1								2
					1								2
						1							2

V02704

REFRIGERANT SYSTEM INSPECTION WITH MANIFOLD GAUGE SET

This is a method in which the trouble is located by using a manifold gauge set.
(See ”USE OF MANIFOLD GAUGE SET” on page AC–21)
Read the manifold gauge pressure when the following conditions are established:

(a) Temperature at the air inlet with the switch set at RECIRC is 30 – 35 ®C (86 – 95 ®F)
(b) Engine running at 1,500 rpm
(c) Blower speed control switch set at high
(d) Temperature control set at max. cool

HINT: It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.

1. NORMALLY FUNCTIONING REFRIGERATION SYSTEM

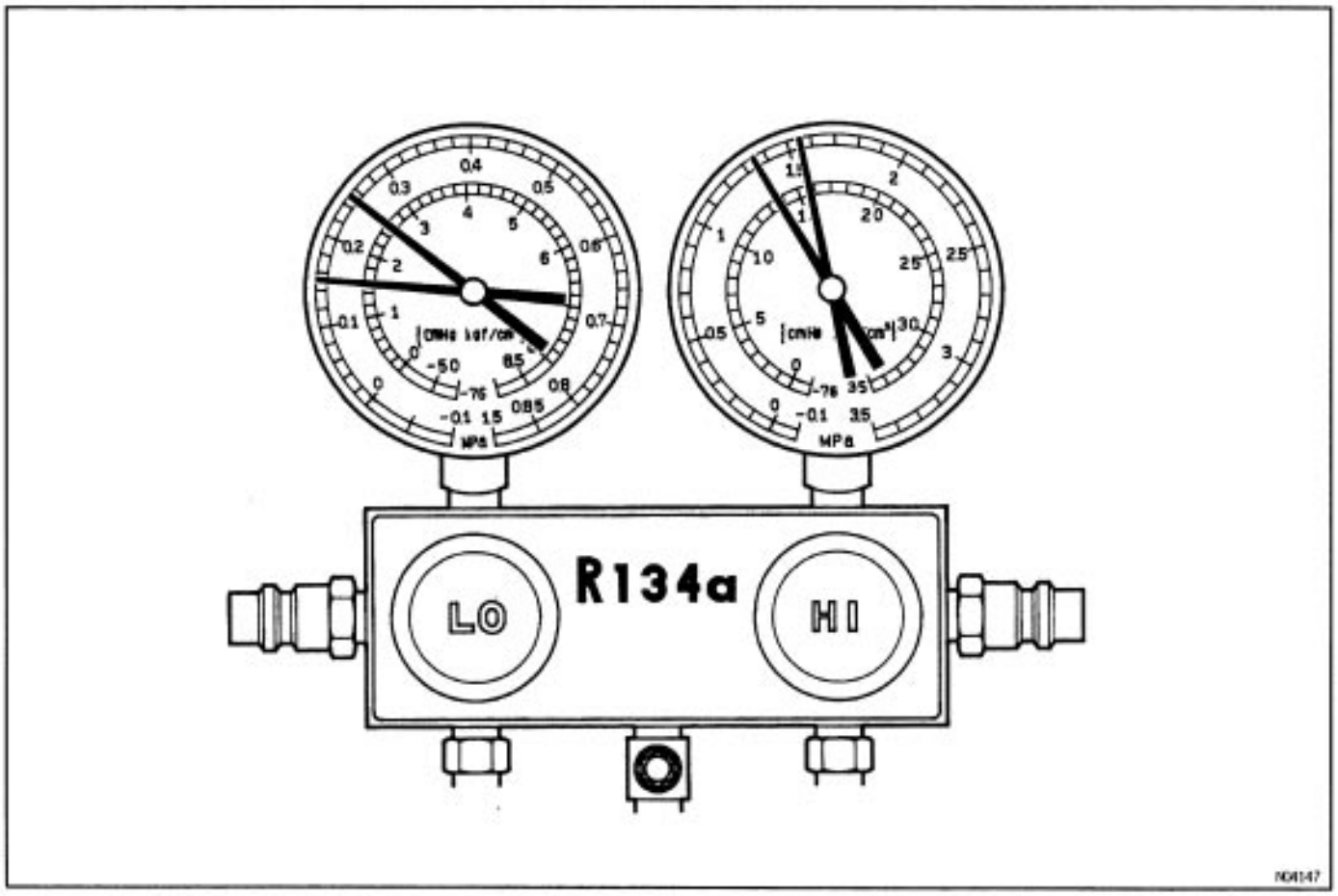
Gauge reading:

Low pressure side:

0.15 – 0.25 MPa (1.5 – 2.5 kgf/cm’)

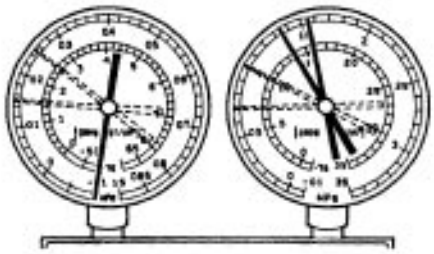
High pressure side:

1.37 – 1.57 MPa (14 – 16 kgf/emt)



2. MOISTURE PRESENT IN REFRIGERATION SYSTEM

Condition: Periodically cools and then fails to cool



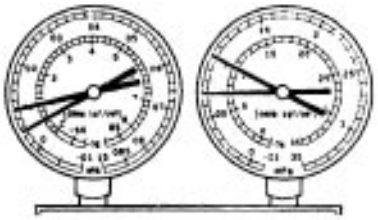
ND4148

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• During operation, prea–sure on low pressure side sometimes becomes a vacuum and sometimes normal	• Moisture entered in re–frigeration system freezes at expansion valve orifice and tempo–rarily stops cycle, but normal state is restored after a time when the ice melts	• Drier in oversaturated state • Moisture in refrigeration system freezes at expan–sion valve orifice and blocks circulation of re–frigerant	(1) Replace receiver/drier (2) Remove moisture in cycle through repeat–edly evacuating air (3) Charge new refrigerant to proper amount

V01034

3. INSUFFICIENT REFRIGERANT

Condition: Insufficient cooling



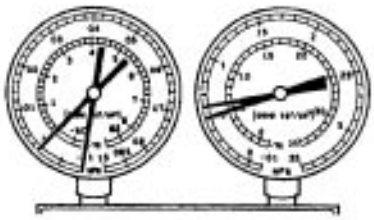
ND4149

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low on both low and high pressure sides • Bubbles seen in sight glass continuously • Insufficient cooling per–formance	• Gas leakage at some place in refrigeration sys–tem	• Insufficient refrigerant in system 1 • Refrigerant leaking	(1) Check for gas leakage with leak detector and repair if necessary (2) Charge refrigerant to proper arhount (3) If pressure indicated value is near 0 when connected to gauge, create the vacuum af–ter inspecting and re–pairing the location of the leak

V01035

4. POOR CIRCULATION OF REFRIGERANT

Condition: Insufficient cooling



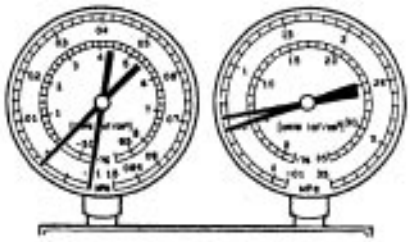
N04150

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low on both low and high pressure sides • Frost on tubes from receiver to unit	• Refrigerant flow obstructed by dirt in receiver	• Receiver clogged	• Replace receiver

W00030

5. REFRIGERANT DOES NOT CIRCULATE

Condition: Does not cool (Cools from time to time in some cases)



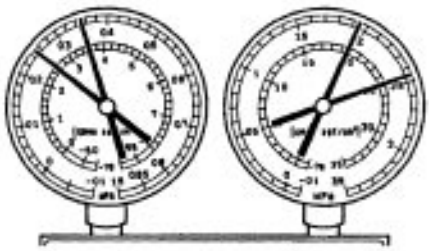
N04150

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Vacuum indicated on low pressure side, very low pressure indicated on high pressure side • Frost or dew seen on piping before and after receiver/drier or expansion valve	• Refrigerant flow obstructed by moisture or dirt in refrigeration system • Refrigerant flow obstructed by gas leakage from expansion valve heat sensing tube	• Refrigerant does not circulate	(1) Check heat sensing tube, expansion valve and EPR (2) Clean out dirt in expansion valve by blowing with air If not able to remove dirt, replace expansion valve (3) Replace receiver (4) Evacuate air and charge new refrigerant to proper amount. For gas leakage from heat sensing tube, replace expansion valve.

W00041

6. REFRIGERANT OVERCHARGE OR INSUFFICIENT COOLING OF CONDENSER

Condition: Does not cool sufficiently



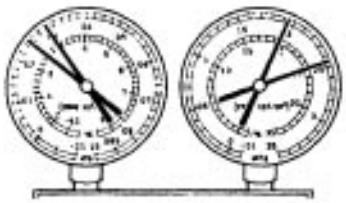
N04151

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • No air bubbles seen through the sight glass even when the engine rpm is lowered.	• Unable to develop sufficient performance due to excessive refrigerant in system • .Insufficient cooling of condenser	• Excessive refrigerant in cycle – refrigerant overcharged: • Condenser cooling insufficient – condenser fins clogged or fan motor faulty	(1) Clean condenser (2) Check fan motor operation (3) If (1) and (2) are in normal state, check amount of refrigerant Charge proper amount of refrigerant

V01032

7. AIR PRESENT IN REFRIGERATION SYSTEM

Condition: Does not cool down sufficiently



NOTE: These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

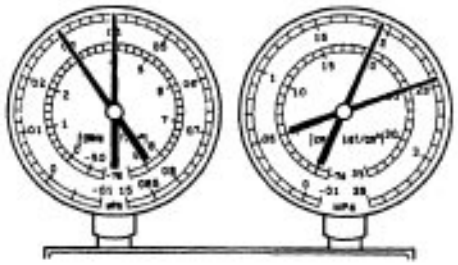
N04153

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • The low pressure piping is hot to the touch • Bubbles seen in sight glass	• Air entered in refrigeration system	• Air present in refrigeration system • Insufficient vacuum purging	(1) Check compressor oil to see if dirty or insufficient (2) Evacuate air and charge new refrigerant

V01033

8. EXPANSION VALVE IMPROPERLY MOUNTED/HEAT SENSING TUBE DEFECTIVE (OPENS TOO WIDE)

Condition: Insufficient cooling



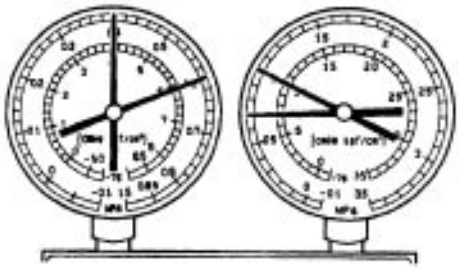
N04152

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • Frost or large amount of dew on piping on low pressure side	• Trouble in expansion valve or heat sensing tube not installed cor–rectly	• Excessive refrigerant in low pressure piping • Expansion valve opened too wide	(1) Check heat sensing tube installed condition (2) If (1) is normal, check expansion valve Replace if' defective

V01031

9. DEFECTIVE COMPRESSION COMPRESSOR

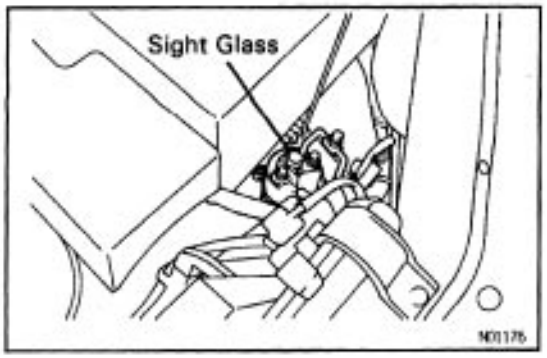
Condition: Does not cool



N04148

Symptom seen in ref rigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on low pressure side • Pressure too low on high pressure side	• Internal leak in compres–sor	• Compression defective • Valve leaking or broken, sliding parts	• Repair or replace com–pressor

V01029



REFRIGERANT VOLUME

AC000–SJ

REFRIGERANT VOLUME INSPECTION

1. **RUN ENGINE AT IDLE SPEED**
2. **OPERATE A/C AT MAXIMUM COOLING FOR A FEW MINUTES**
3. **INSPECT AMOUNT OF REFRIGERANT OBSERVE THE SIGHT GLASS ON THE LIQUID TUBE.**

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present insight glass	Insufficient'	(1) Check for gas lakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles dis–apear
2	No bubbles present in sight glass	None, sufficient or too much	Refer to items 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas lea–ktester and repair if necessary (2) Add refrigerant until bubbles disap–pear
4	Temperature between compressor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after air conditioning is turned off, refrigerant in sight glass stays clear	Too much	(1) Discharge refrigrant (2)Evacuate air and charge proper amo–unto of purified refrigerant
6	When air conditioning is turned off, re–frigerant foams and then stay clear	Proper	–

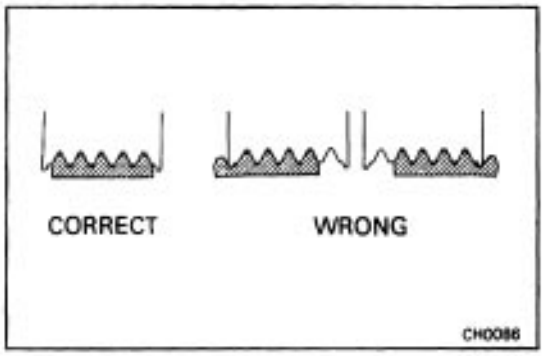
*: Bubbles in the sight glass with ambient temperatu–ers higher can be considered normal if cooling is suff icient.

AC00H–0E

REFRIGERANT CHARGE VOLUME

Specified amount:

850 ± 50 g (29.98 ±1.76 oz)

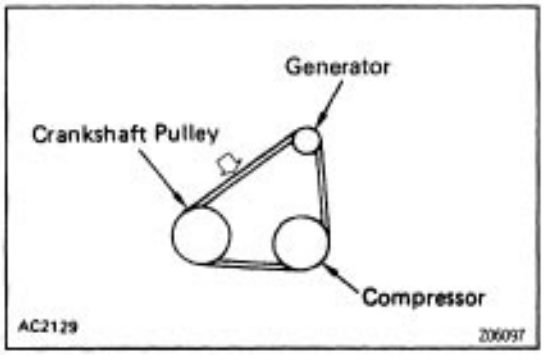


DRIVE BELT TENSION

DRIVE BELT TENSION INSPECTION

1. INSPECT DRIVE BELT'S INSTALLATION CONDI–TION

Check that the drive belt fits properly in the ribbed grooves.



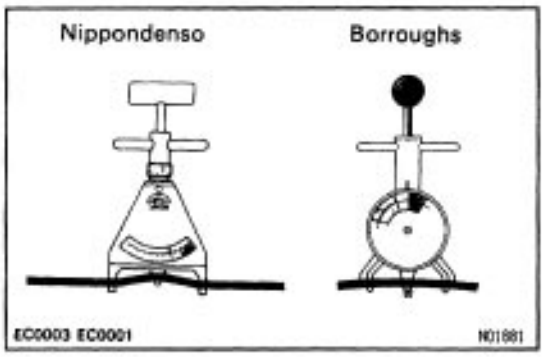
2. INSPECT DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt ten–sion.

Belt tension gauge:
Nippondenso BTG–20 (95506–00020) or
Borroughs No. BT–33–73F
Drive belt tension:
5S– FE:
New belt 165 ± 26 lbf
Used belt 110 ± 11 lbf
1 MZ–FE:
New belt 165 ± 26 lbf
Used belt 88 ± 22 lbf

HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has beenused on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.



IDLE–UP SPEED

IDLE UP SPEED INSPECTION

1. WARM UP ENGINE

2. INSPECT IDLE SPEED

5S– FE:

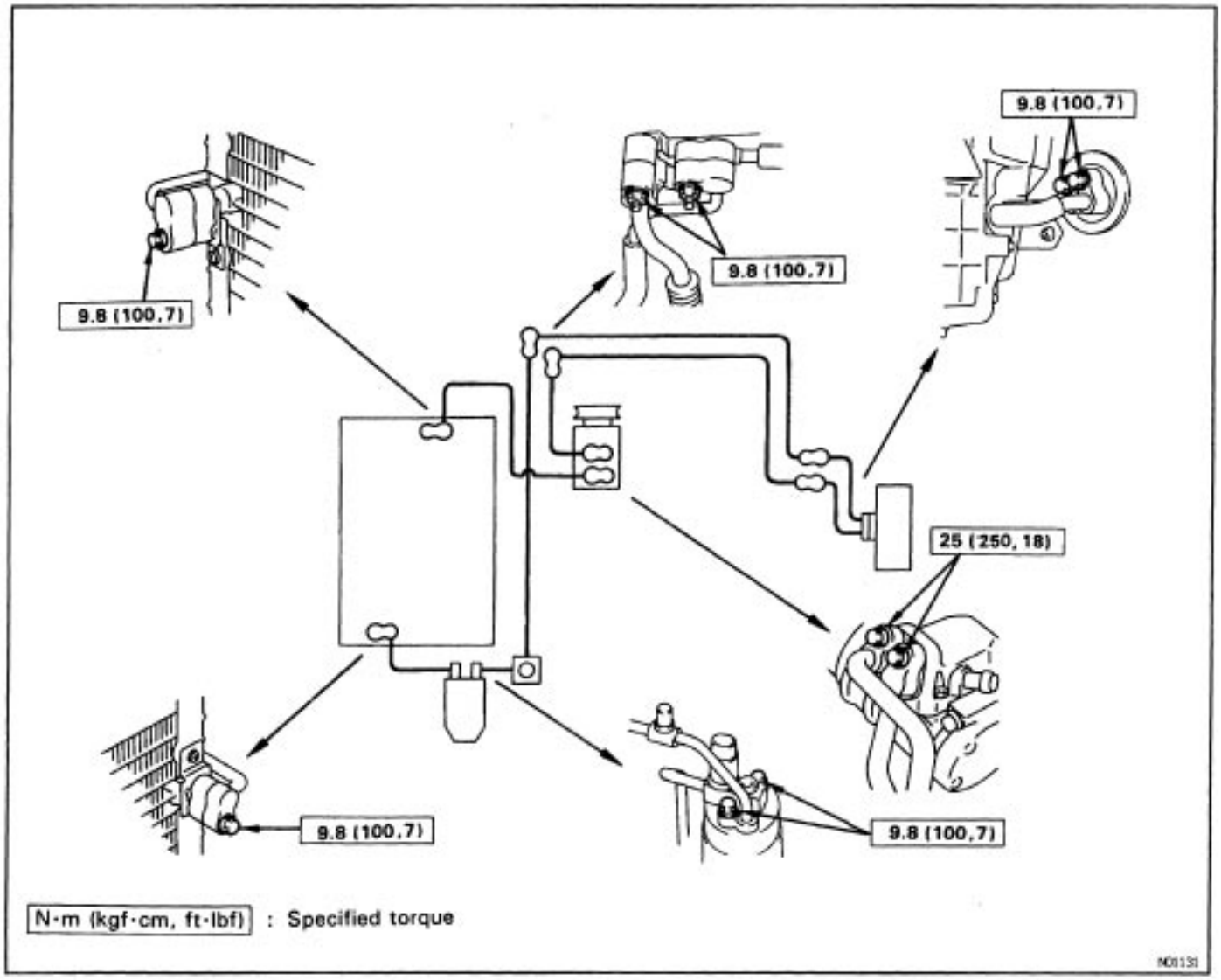
Magnet clutch condition	Standard idle speed (rpm)
No engaged	Approx. 750
Engaged	Approx. 850

1 MZ – FE:

Magnet clutch condition	Standard idle speed (rpm)
No engaged	Approx. 700
Engaged	Approx. 700

REFRIGERANT LINES

TIGHTENING TORQUE OF REFRIGERATION LINES



ON–VEHICLE INSPECTION

1. **INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS**
2. **INSPECT HOSES AND TUBES FOR LEAKAGE**
   Using a gas leak tester, check for leakage of refriger–ant.

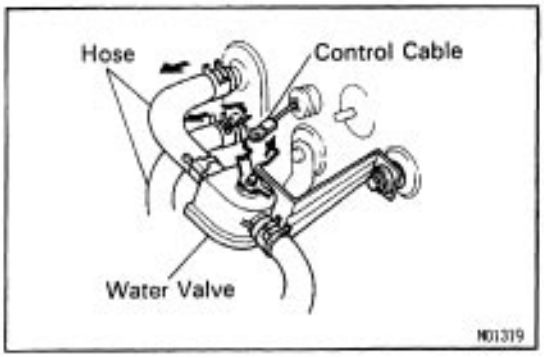
REFRIGERANT LINES REPLACEMENT

1. **DISCHARGE REFRIGERANT IN REFRIGERATION SYSTEM**
   (See page AC–21**)**
2. **REPLACE FAULTY TUBE OR HOSE**
   HINT: Cap the open fittings immediately to keep mois–ture or dirt out of the system.
3. **TORQUE CONNECTIONS TO SPECIFIED TORQUE**
   NOTICE: Connections should not be torque tighter than the specified torque.
4. **EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT**
   Specified amount:
   850 ±50g (29.98 ±1.76 oz)
5. **INSPECT FOR LEAKAGE OF REFRIGERANT**
   Using a gas leak tester, check for leakage of refriger–ant.
6. **INSPECT AIR CONDITIONING OPERATION**

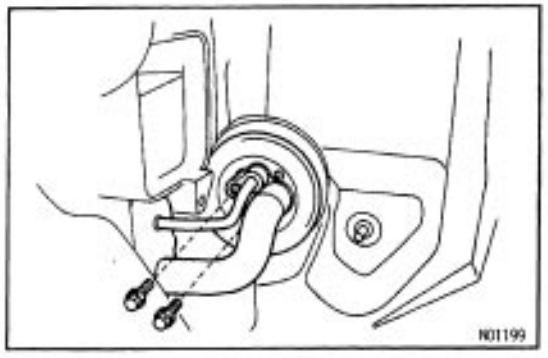
AIR CONDITIONING UNIT

A/C UNIT REMOVAL

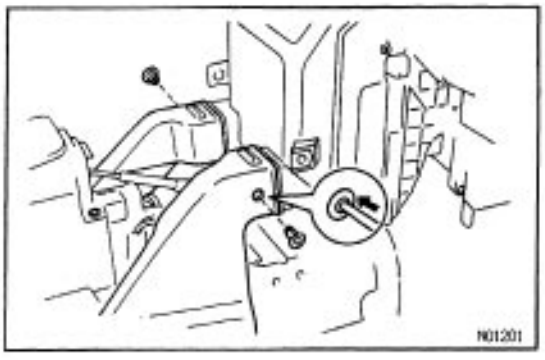
1. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**
   (See page AC–21)
2. **DRAIN ENGINE COOLANT FROM RADIATOR**
   HINT: It is not necessary to drain out all the coolant.



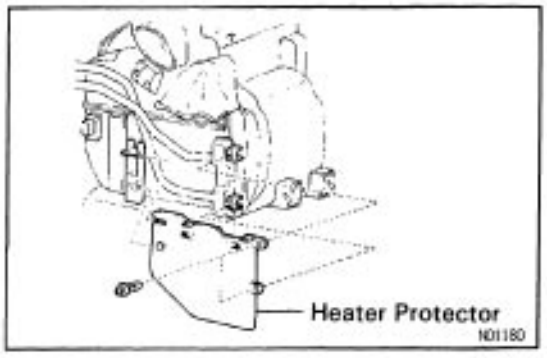
3. **DISCONNECT WATER VALVE CONTROL CABLE FROM WATER VALVE**
4. **DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES**
5. **REMOVE INSTRUMENT PANEL AND REINFORCEMENT**
   (See page BO–108)
6. **REMOVE BLOWER UNIT**
   (See page AC–35)



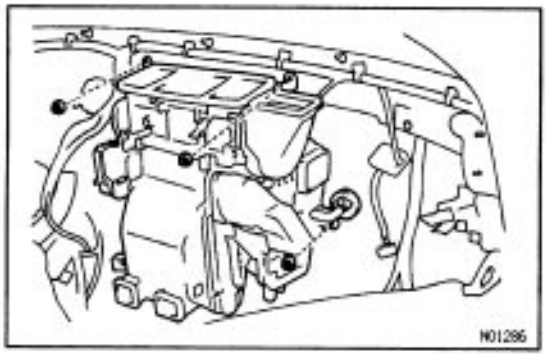
7. **DISCONNECT LIQUID AND SUCTION TUBE FROM BLOCK JOINT**
   Remove 2 bolts and both tubes.



8. **REMOVE REAR AIR DUCTS**
   Remove the clip and the air duct.



9. **REMOVE HEATER PROTECTOR**
   Remove the 2 clips and the heater protector.



10. REMOVE A/C UNIT

(a) Disconnect connectors from the unit.

(b) Remove the 3 nuts and the A/C unit.

A/C UNIT INSTALLATION

1. INSTALL A/C UNIT

(a) Install the A/C unit with the 3 nuts.

(b) Connect connectors.

2. INSTALL HEATER PROTECTOR

3. INSTALL REAR AIR DUSTS

4. CONNECT LIQUID AND SUCTION TUBE TO BLOCK JOINT

5. INSTALL BLOWER UNIT

6. INSTALL INSTRUMENT PANEL AND REINFORCEMENT

7. CONNECT WATER HOSES TO HEATER RADIATOR PIPES

8. CONNECT WATER VALVE CONTROL CABLE TO WATER VALVE

(See step 3 on page AC–33)

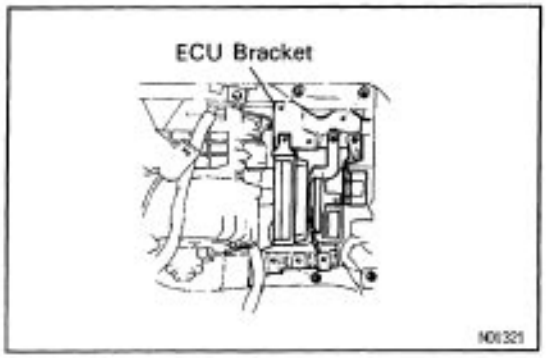
9. REFILL WITH ENGINE COOLANT

10. EVACUATE AIR FROM REFRIGERATION SYSTEM

11. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT

Specified amount:

850 ±50 g (29.98 ±1.76 oz)



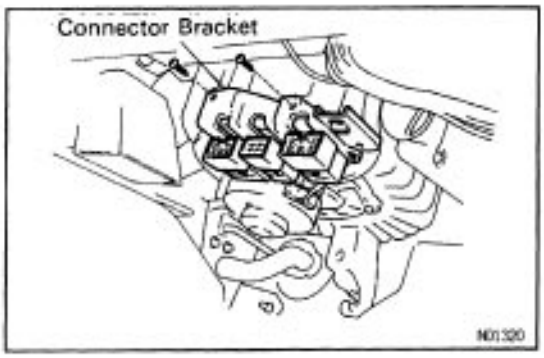
BLOWER UNIT

AC0GO–02

BLOWER UNIT REMOVAL

1. REMOVE GLOVE COMPARTMENT
(See page BO–108**)**

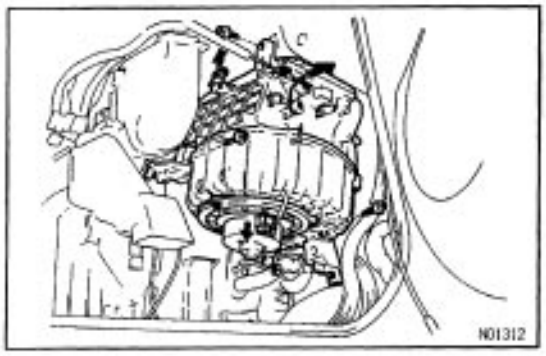
2. REMOVE ECU AND ECU BRACKET



3. REMOVE CONNECTOR BRACKET

(a) Disconnect the connector from the connector brack–et.

(b) Remove the 2 screws and the bracket.



4. REMOVE BLOWER UNIT

(a) Disconnect the connector from the blower unit.

(b) Disconnect the air inlet damper control cable.

(c) Remove the 3 screws, nut and the blower unit.

AC14S–01

BLOWER UNIT INSTALLATION

1. INSTALL BLOWER UNIT

(a) Install the blower unit with the 3 screws and the nut.

(b) Connect the air inlet damper control cable to the blower unit.

(c) Connect the connector.

2. INSTALL CONNECTOR BRACKET

3. INSTALL ECU BRACKET AND ECU

4. INSTALL GLOVE COMPARTMENT

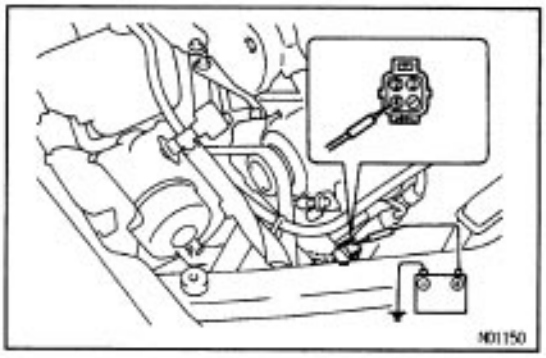
COMPRESSOR

ON–VEHICLE INSPECTION

Magnet Clutch:

1. **MAKE THE FOLLOWING VISUAL CHECKS:**
   Leakage of grease from the clutch bearing.
   Signs of oil on the pressure plate or rotor.
   Repair or replace, as necessary.
2. **INSPECT MAGNET CLUTCH BEARING FOR NOISE**

(a) Start engine.
(b) Check for abnormal noise from near the compressor when the A/C switch is OFF.
If abnormal noise is being emitted, replace the mag–netic clutch.



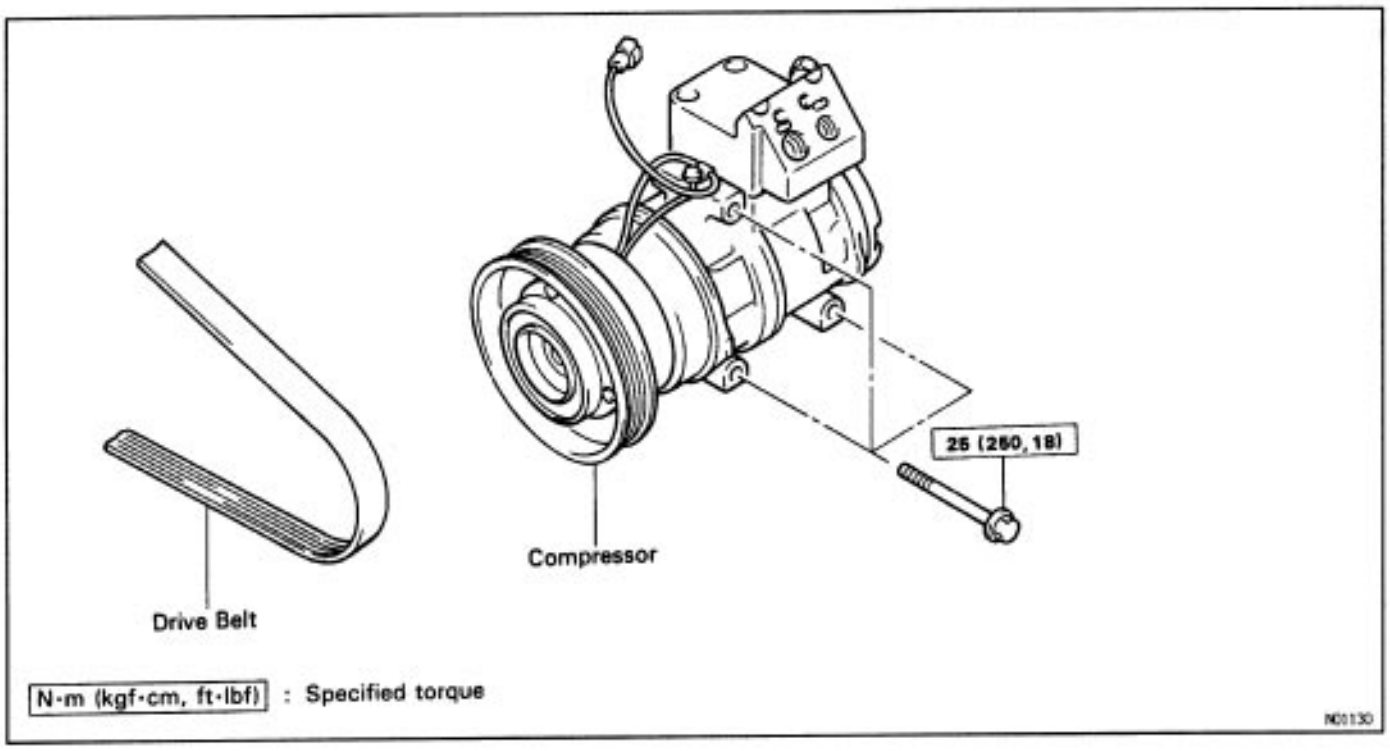
3. **INSPECT MAGNET CLUTCH**

(a) Disconnect the connector from the magnet clutch.
(b) Connect the positive (+) lead from the battery to the terminal on the magnetic clutch connector and the negative (–) lead to the body ground.
(c) Check that the magnet clutch is energized.
If operation is not as specified, replace the magnet clutch.

Compressor:

1. **INSTALL MANIFOLD GAUGE SET**
   (See page AC–21)
2. **START ENGINE**
3. **INSPECT COMPRESSOR FOR METALLIC SOUND**
   Check that there is a metallic sound from the com–pressor when the A/C switch is turn on.
   If metallic sound is heard, replace the compressor assembly.
4. **INSPECT PRESSURE OF REFRIGERATION SYSTEM**
   See “Refrigerant System Inspection with Manifold Gauge Set” on page AC–24.
5. **STOP ENGINE**
6. **INSPECT VISUALLY FOR LEAKAGE OF REFRIGER–ANT FROM SAFETY SEAL**
   If there is any leakage, replace the compressor assem–bly.

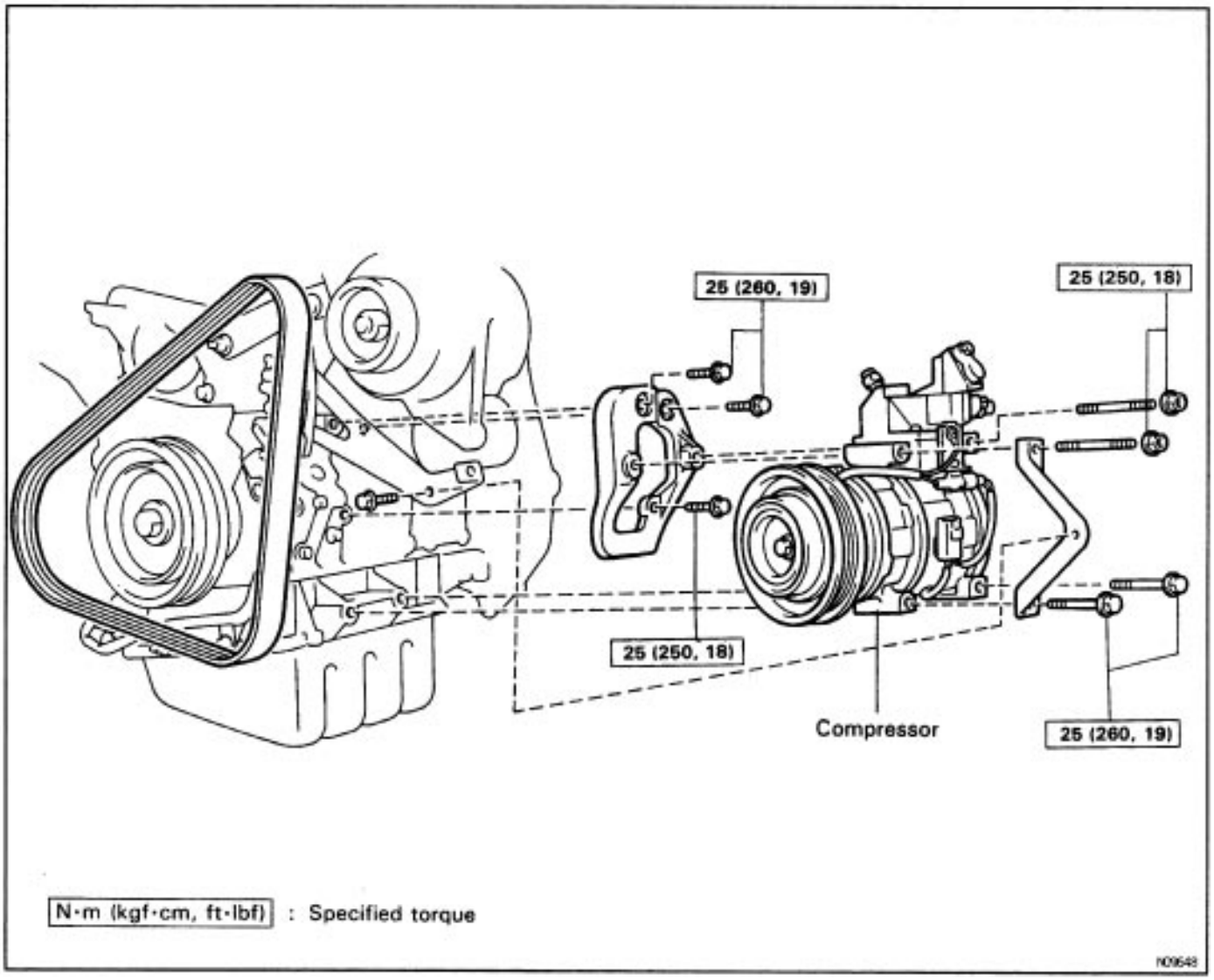
COMPRESSOR REMOVAL
5S–FE Engine Model:



1. **RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX 10 MINUTES**
2. **STOP ENGINE**
3. **DISCONNECT NEGATIVE (–) CABLE FROM BAT–TERY**
   CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the “LOCK” position and the negative (–) terminal cable is discon–nected from the battery.
4. **DISCHARGE REFRIGERANT FROM REFRIGERA–TION SYSTEM**
   (See page AC–21)
6. **DISCONNECT DISCHARGE HOSE AND SUCTION HOSE FROM COMPRESSOR**
7. **DISCONNECT CONNECTOR FROM MAGNET CLUTCH**
8. **REMOVE COMPRESSOR**

(a) Loosen the drive belt.
(b) Remove 3 bolts and compressor.

COMPRESSOR REMOVAL
1 MZ–FE Engine Model:



1. **RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX 10 MINUTES**
2. **STOP ENGINE**
3. **DISCONNECT NEGATIVE (–) CABLE FROM BAT–TERY**

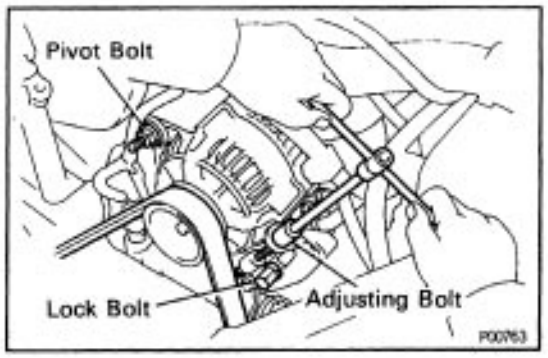
   CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is discon–nected from the battery.

4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

(See page AC–21)

5. DISCONNECT DISCHARGE HOSE AND SUCTION HOSE FROM COMPRESSOR

6. DISCONNECT CONNECTOR FROM MAGNET CLUTCH



7. REMOVE DRIVE BELT

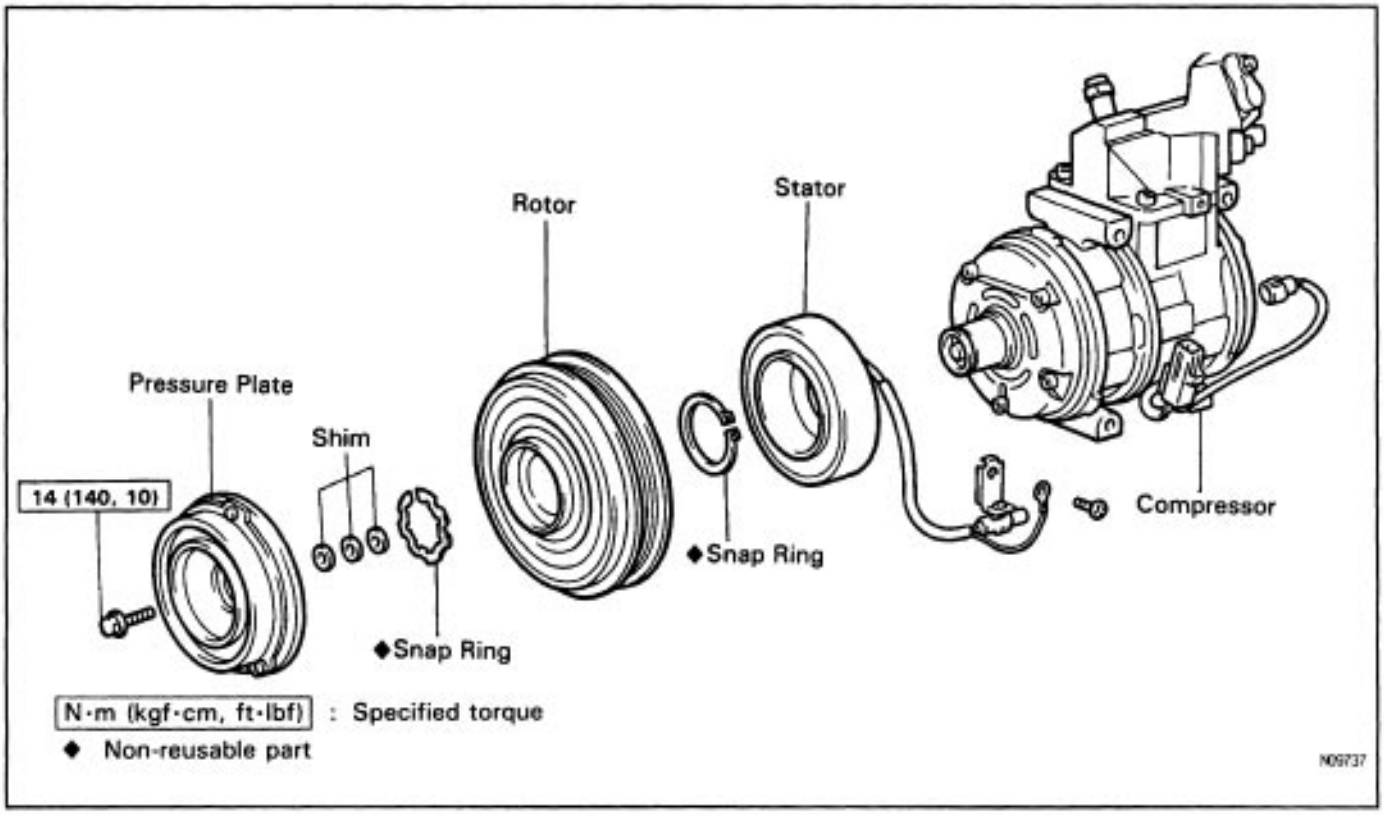
Loosen the pivot bolt and adjusting lock bolt and remove the drive belt.

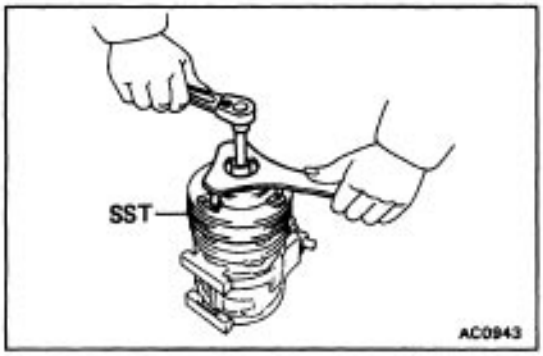
8. REMOVE COMPRESSOR

(a) Remove 2 nuts and 2 bolts.

(b) Remove the compressor.

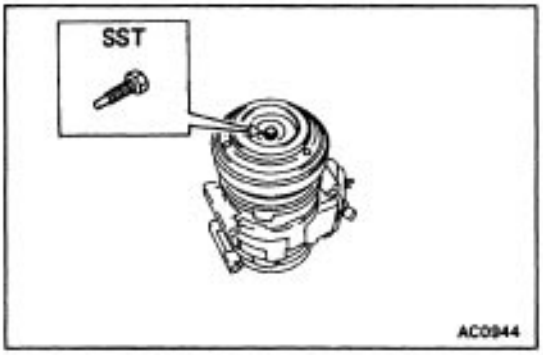
MAGNET CLUTCH DISASSEMBLY



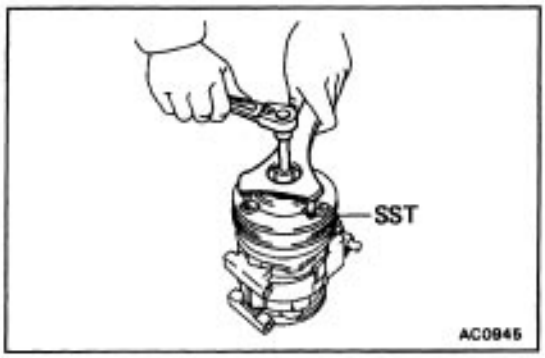


1. REMOVE PRESSURE PLATE

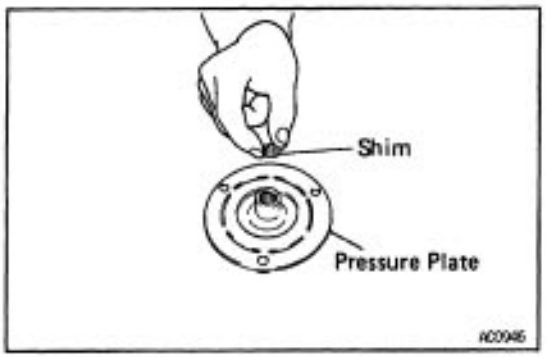
(a) Using SST and socket wrench, remove the shaft bolt.
SST 07112 – 76060



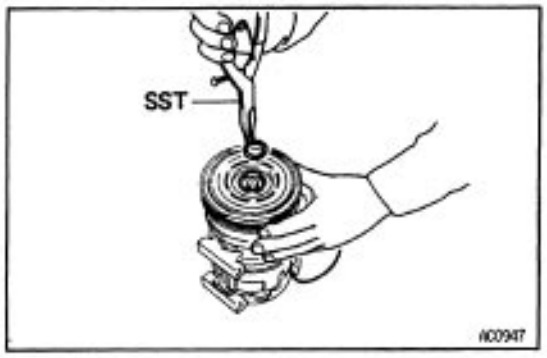
(b) Install a SST on the pressure plate.
SST 07112–66040



(c) Using SST and socket wrench, remove the pressure plate.
SST 07112–76060

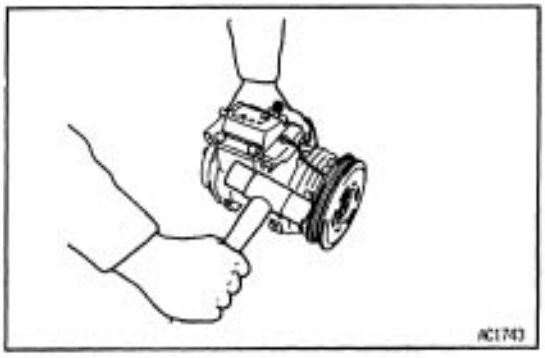


(d) Remove the shims from the pressure plate.

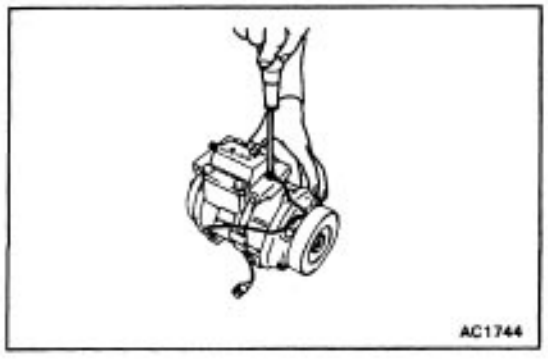


2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114–84020
CAUTION: Do not spread the point of SST widely.
Max width:
23.1 mm

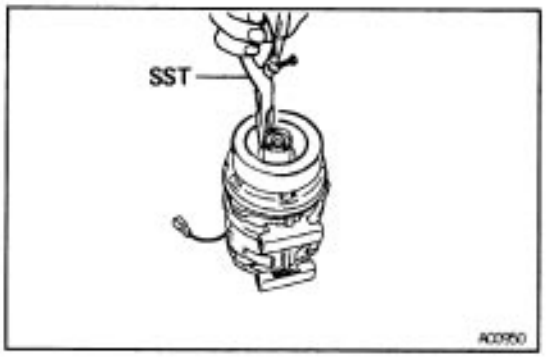


(b) Using a plastic hammer, tap the rotor off the shaft.
NOTICE: Be careful not to damage the pulley when tapping on the rotor.

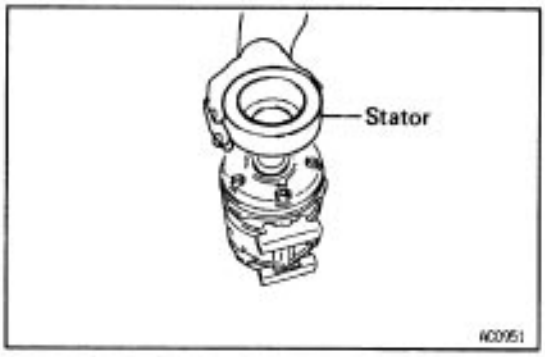


3. REMOVE STARTER

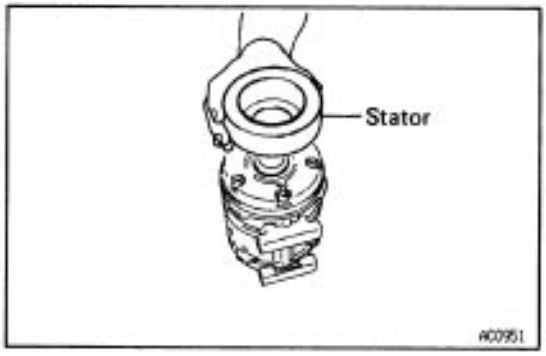
(a) Disconnect the stator lead wire from the compressor housing.



(b) Using a SST, remove the snap ring.
SST 07114–84020



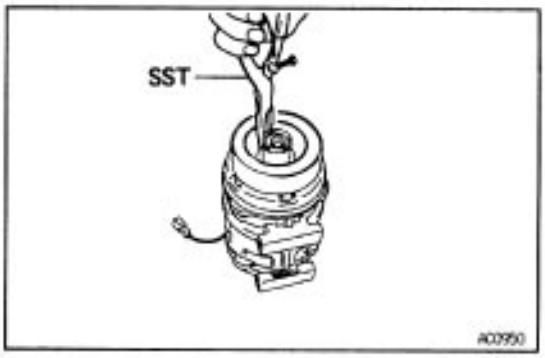
(c) Remove the stator.



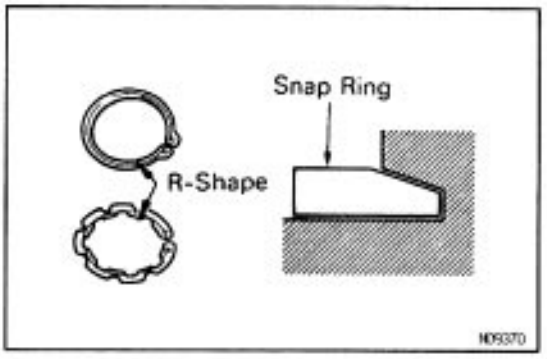
MAGNET CLUTCH ASSEMBLY

1. INSTALL STATOR

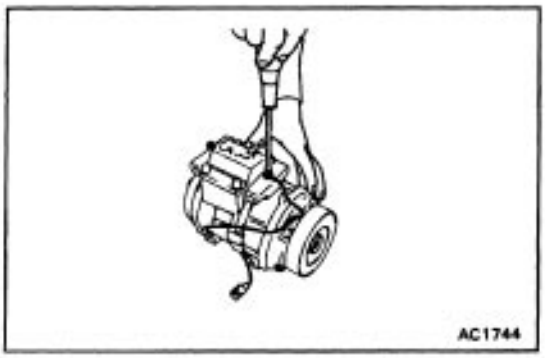
(a) Install the stator on the compressor.



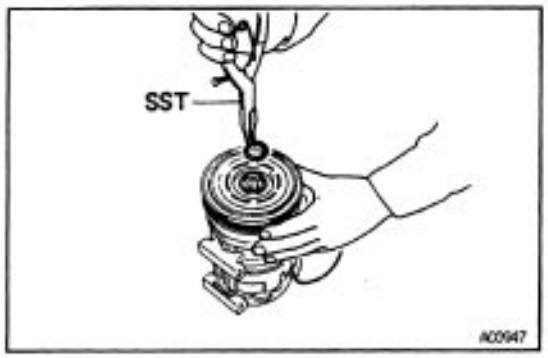
(b) Using SST, install the new snap ring.
SST 07114 –84020



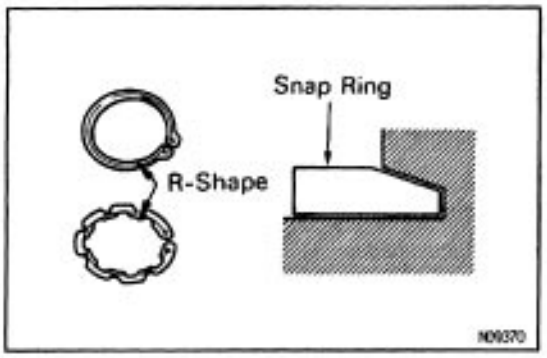
NOTICE: The snap ring should be installed so that its beveled side faces up.



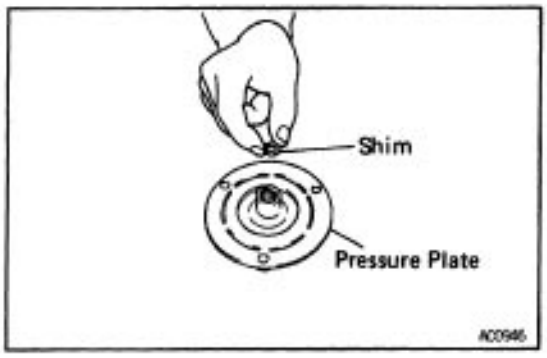
(c) Using SST and torque wrench, fasten the magnet clutch lead wire to the cylinder block.
Torque: 3.4 N–m (35 kgf.cm, 30 in.–lbf)
SST 07110–61050



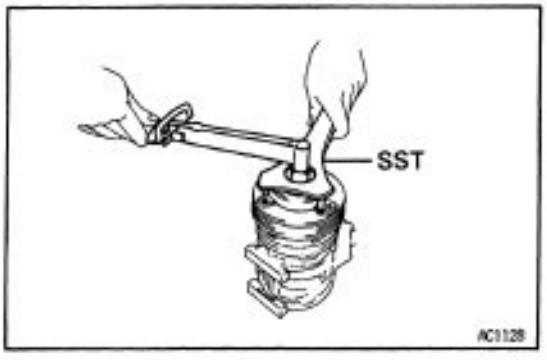
2. INSTALL ROTOR
(a) Install the rotor on the compressor shaft.
(b) Using SST, install the new snap ring.
SST 07114–84020
CAUTION:Do not spread the point of SST widely.
Max width:
23.1 mm



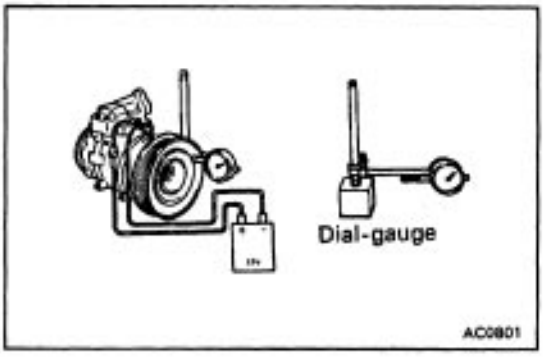
NOTICE: The snap ring should be installed so that its beveled side faces up.



3. INSTALL PRESSURE PLATE
(a) Put the shims on the pressure plate.



(b) Using SST and torque wrench, install the shaft bolt.
SST 07112–76060
Torque: 13 N–m (135 kgf–cm, 10 ft–lbf)



4. CHECK CLEARANCE OF MAGNET CLUTCH

(a) Set the dial – gauge to the pressure plate of the magnet clutch.

(b) Connect the magnet clutch lead wire to the positive (+) terminal of the battery.

(c) Check the clearance between the pressure plate and rotor, whenconnect the negative (–) terminal of the battery.

Standard clearance:

0.5 ± 0.15 mm (0.020 ± 0.059 in.)

If the clearance is not within standard clearance, adjust the clearance using shims to obtain the stand–ard clearance.

AC146-01

COMPRESSOR INSTALLATION

1. INSTALL COMPRESSOR

(a) Install compressor with 4 bolts.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

(b) Install drive belt.

(c) Inspect drive belt tension.

2. CONNECT CONNECTOR TO MAGNET CLUTCH

3. CONNECT DISCHARGE HOSE AND SUCTION HOSE TO COMPRESSOR

NOTICE: Hoses should be connected immediately after the caps have been removed.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount:

850 ±50 g (29.98 ±1.76 oz)

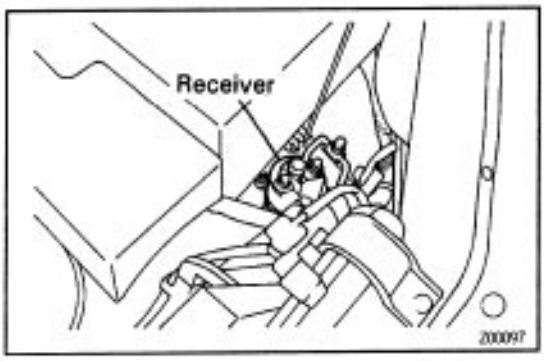
5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak tester, check for leakage of refriger–ant.

If there is leakage, check the tightening torque at the joints.

6. CONNECT NEGATIVE (–) CABLE TO BATTERY

7. INSPECT A/C OPERATION



RECEIVER

ON–VEHICLE INSPECTION

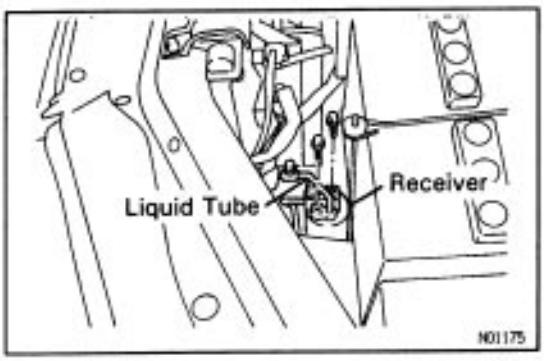
INSPECT FITTINGS FOR LEAKAGE

Using a gas leak tester, check for leakage.

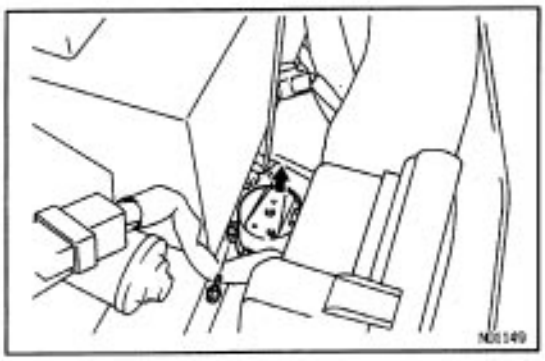
If there is leakage, check the tightening torque at the joints.

RECEIVER REMOVAL

1. **DICHARGER REFRIGERANT FROM REFRIGERA–TION SYSTEM**
   (See page AC–21**)**



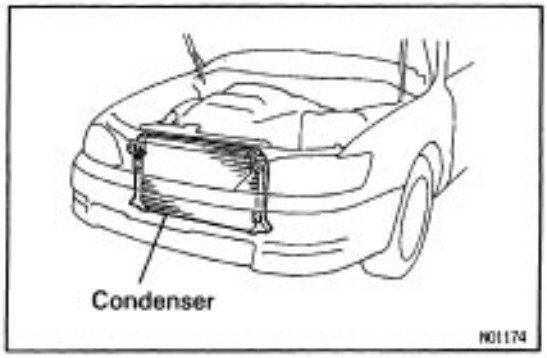
2. **REMOVE 2 LIQUID TUBES FROM RECEIVER**
   Remove the 2 bolts and the both tubes from the receiver.



3. **REMOVE RECEIVER FROM RECEIVER HOLDER**
   Remove the bolt, then remove the receiver from re–ceiver holder.
   NOTICE: Cap the open fittings immediately to keeps moi–sture out of the system.

RECEIVER INSTALLATION

1. **INSTALL RECEIVER INTO RECEIVER HOLDER**
   Install the receiver into the receiver, holder with the bolt.
2. **INSTALL 2 LIQUID TUBES TO RECEIVER**
   Install 2 liquid tubes to the receiver with 2 bolts.
   Torque: 5.5 N–m (55 kgf–cm, 48 in.–lbf)
   NOTICE: Do not remove the caps until the tubes are connected.
3. **REPLENISH COMPRESSOR OIL IF RECEIVER HAS BEEN REPLACED**
   Add 15 cc (0.5 fl.oz.)
   Compressor oil:
   ND OIL 8 or equivalent
4. **EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT**
   Specified amount:
   850 ±50 g (29.98 ±1.76 oz)
5. **INSPECT FOR LEAKAGE OF REFRIGERANT**
6. **INSPECT A/C OPERATION**



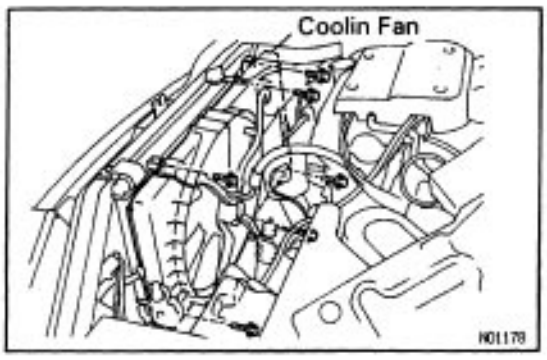
CONDENSER

ON–VEHICLE INSPECTION

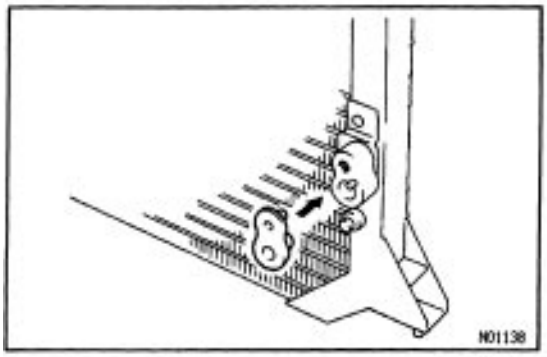
1. **INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE**
   If the fins are clogged, wash them with water and dry with compressed air.
   NOTICE: Be careful not to damage the fins.
   If the fins are bent, straighten them with a screwdriver or pliers.
2. **INSPECT CONDENSER AND FITTINGS FOR LEAK–AGE**
   Using a gas leak tester, check for leakage.
   If there is leakage, check the tightening torque at the joints.

CONDENSER REMOVAL

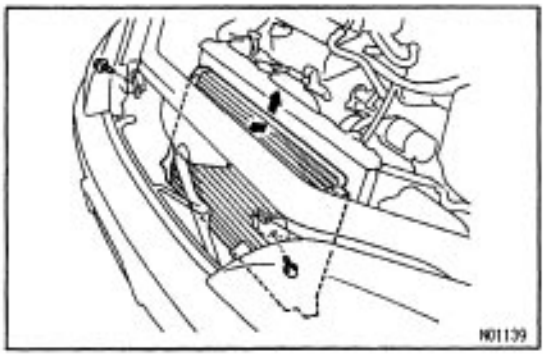
1. **DISCHAGE REFRIGERANT FROM REFRIGERATION SYSTEM**
   (See page AC–21)
2. **REMOVE UPPER COVER**



3. **REMOVE COOLING FAN**
   (See page EG–351)
4. **REMOVE UPPER SUPPORT**
   Remove the 2 bolts and 2 upper supports.

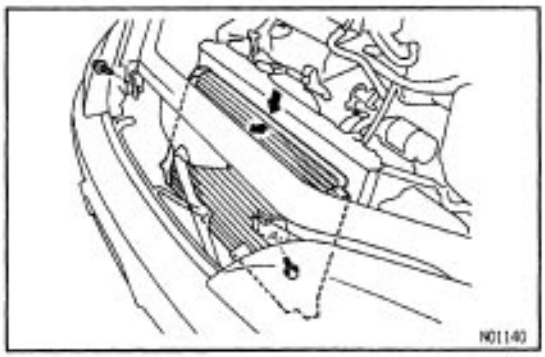


5. **REMOVE LIQUID TUBES**
   Remove the 2 bolts and 2 tubes.
   NOTICE: Cap the open fittings immediately to keep mois–ture out of the system.
6. **REMOVE HEADLIGHTS ON THE BOTH SIDES**



7. REMOVE CONDENSER

Remove the 2 bolts and lean the radiator backward, then remove the cond enser.



AC011–08

CONDENSER INSTALLATION

1. INSTALL CONDENSER

Install the condenser with the 2 bolt.

2. INSTALL LIQUID TUBES

Install both tubes with the 2 bolts.

Specified torque: 9.8 N–m (100 kgf–cm, 7 ft–lbf)

NOTICE: Do not remove caps until the tube is installed.

3. INSTALL COOLING FAN

4. REPLENISH COMPRESSOR OIL IF CONDENSER HAS BEEN REPLACED

Add 40 cc (1.4 fl.oz.)

Compressor Oil:

ND OIL 8 or equivalent

5. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount:

850 ±50g (33.51 ±1.76 oz)

6. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak tester, check for leakage of refriger–ant.

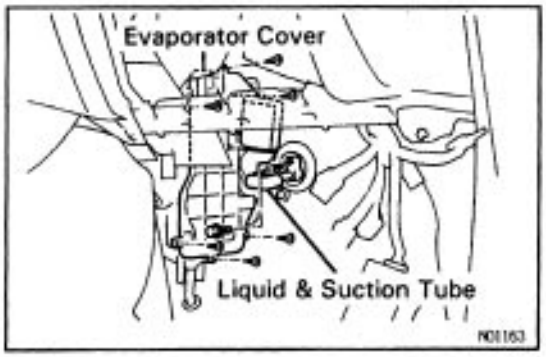
7. INSTALL REMOVAL PARTS

Install the removal parts in reverse order of removal procedure.

EVAPORATOR

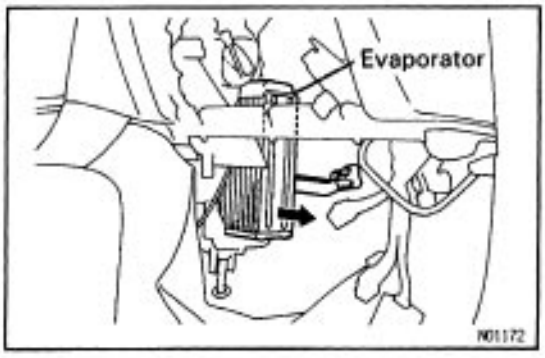
EVAPORATOR REMOVAL

1. **DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM**
   (See page AC–21)
2. **REMOVE BLOWER UNIT**
   (See page AC–35)



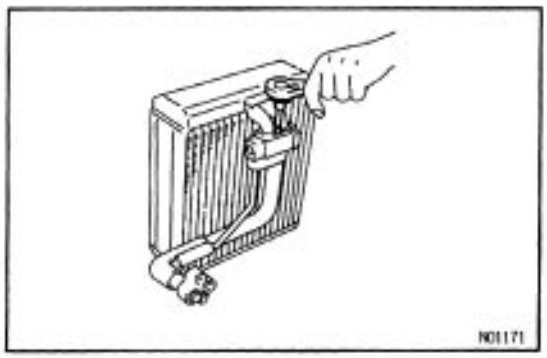
3. **REMOVE EVAPORATOR COVER**

(a) Remove 2 bolts for the liquid and suction tube.
(b) Remove 8 screws and evaporator cover.



4. **REMOVE EVAPORATOR**

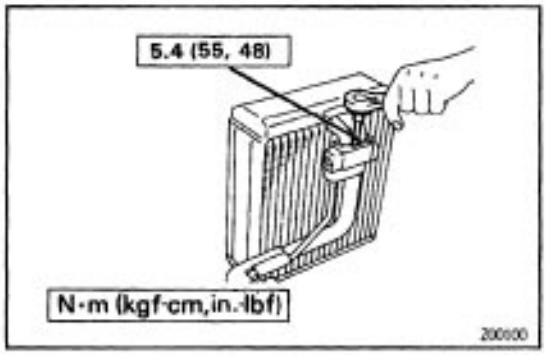
(a) Pull and remove the evaporator.

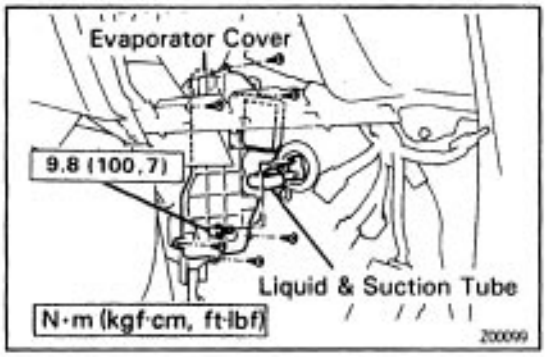


(b) Remove 2 bolts using a hexagon wrench and separate the evaporator and expansion valve.

EVAPORATOR INSPECTION

1. **INSPECT FINS FOR BLOCKAGE**
   If the fins are clogged, clean them with compressed air.
   NOTICE: Never use water to clean the evaporator.
2. **INSPECT FITTINGS FOR CRACKS OR SCRATCHES**
   Repair as necessary.





EVAPORATOR INSTALLATION

1. INSTALL REMOVAL PARTS

Install the removal parts in reverse order of removal procedure.

HINT:

The tightening torque for the bolt used to install the expantion valve on the evaporator is shown below.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

The tightening torque for the bolts used to install the liquid and suction tube is shown below.

Torque: 9.8 N–m (100 kgf–cm, 7 ft–lbf)

2. REPLENISH COMPRESSOR OIL IF EVAPORATOR HAS BEEN REPLACED

Add 40 cc (1.4 fl.oz)

Compressor oil:

ND OIL 8 or equivalent

3. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT

Specified amount:

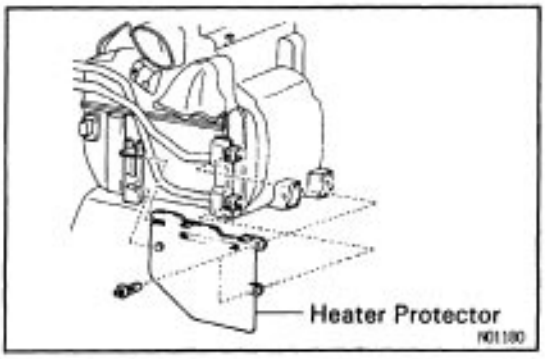
850 ± 50g (29.98 ±1.76 oz)

4. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak tester, check for leakage of refriger–ant.

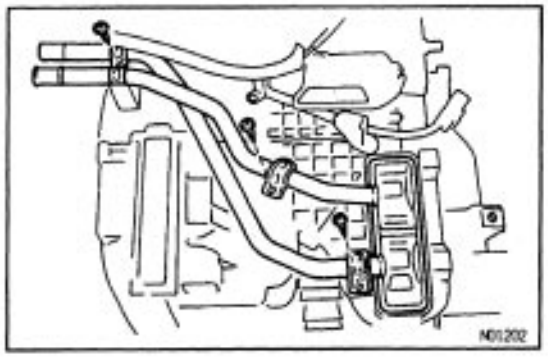
HEATER RADIATOR

HEATER RADIATOR REMOVAL



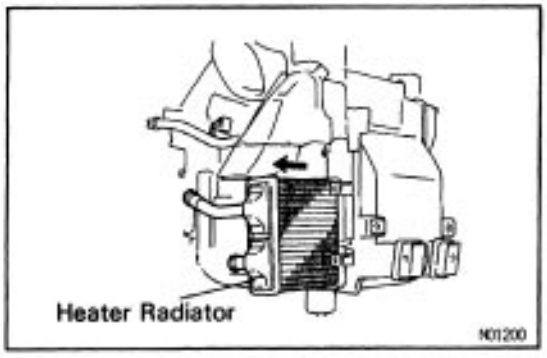
1. REMOVE HEATER PROTECTOR

Remove the 2 clips and the heater protector.



2. REMOVE HEATER RADIATOR

(a) Remove the 3 screws and the 3 clamps.



(b) Disconnect the heater pipes.
(c) Pull the heater radiator out.

HEATER RADIATOR INSPECTION

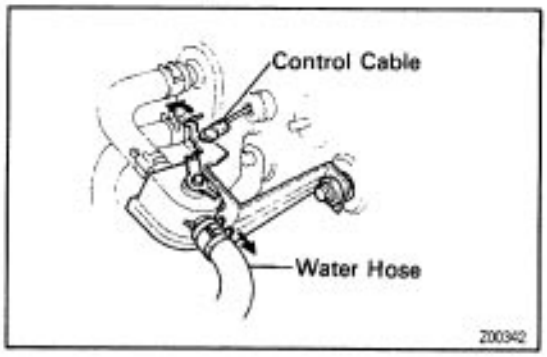
If the fin are clogged, clean them with commpressed air.

HEATER RADIATOR INSTALLATION

1. INSTALL HEATER RADIATOR TO A/C UNIT

(a) Put the radiator in the A/C unit.
(b) Connect teh heater pipes.
(c) Install the 3 clamps with 3 screws.

2. INSTALL HEATER PROTECTOR



WATER VALVE

AC019-03

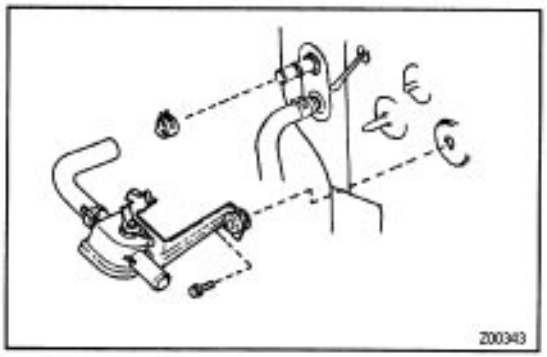
WATER VALVE REMOVAL

1. DRAIN ENGINE COOLANT FROM RADIATOR

HINT: It is not necessary to drain out all the coolant.

2. DISCONNECT WATER VALVE CONTROL CABLE FROM WATER VALVE

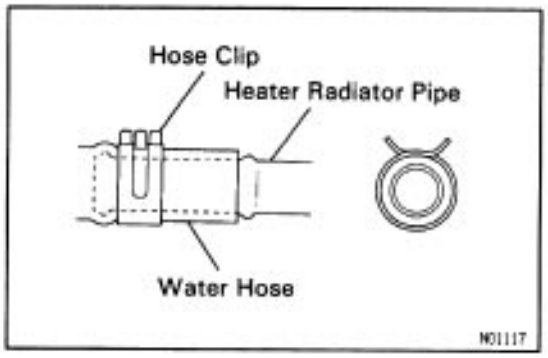
3. DISCONNECT WATER HOSE FROM WATER VALVE



4. REMOVE WATER VALVE

(a) Disconnect the water hose from the heater radiator pipe.

(b) Remove the bolt and the water valve



AC017-03

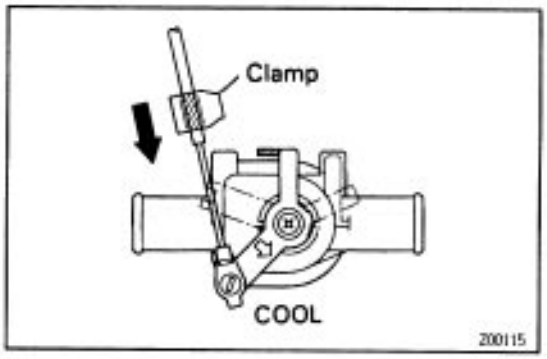
WATER VALVE INSTALLATION

1. INSTALL WATER VALVE

(a) Push the water hose onto the heater radiator pipe as far as rigs on the pipe and install the hose clip.

(b) Install water valve with the bolt.

2. CONNECT HEATER HOSE TO WATER VALVE



3. CONNECT WATER VALVE CONTROL CABLE TO WATER VALVE

(a) Set the temperature control switch to ”COOL”.

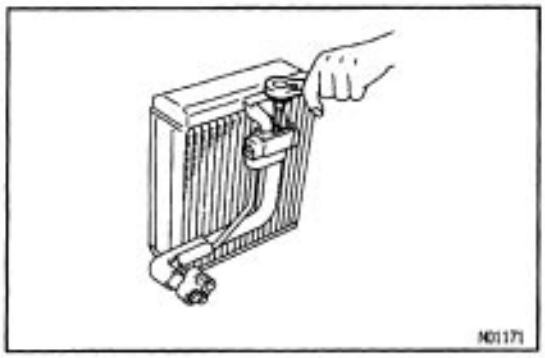
(b) Set the water valve lever to ”COOL”, install the control cable and lock the clamp.

HINT: Lock the clamp while lightly pushing the outer cable in the direction shown by the arrow.

EXPANSION VALVE

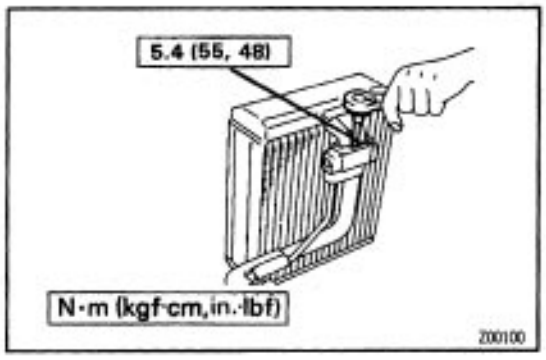
ON–VEHICLE INSPECTION

1. **CHECK QUANTITY OF GAS DURING REFRIGERATION CYCLE**
2. **INSTALL MANIFOLD GAUGE SET**
3. **RUN ENGINE**
   Run the engine at 1,500 rpm for at least 5 minutes. Then check that the high pressure reading is 1.37 – 1.53 MPa (14 – 16 kgf/cm^2, 199 – 228 psi).
4. **CHECK EXPANSION VALVE**
   If the expansion valve is faulty, the low pressure reading will drop to 0 kPa (0 kgf/cm^2, 0 psi).
   HINT: When the low pressure drops to 0 kPa (0 kgf/cm^2, 0 psi), feel the receiver's IN and OUT sides for no temperature difference.



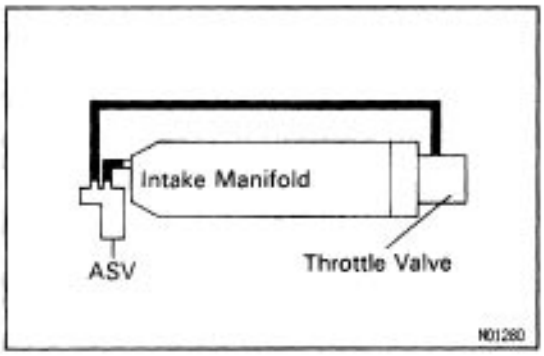
EXPANSION VALVE REMOVAL

1. **REMOVE EVAPORATOR**
   (See page AC–50**)**
2. **REMOVE EXPANSION VALVE**
   (See page AC–51**)**



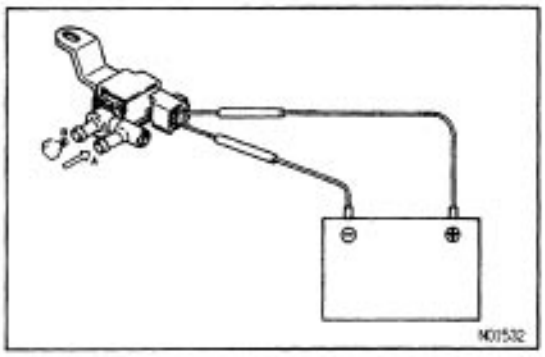
EXPANTION VALVE INSTALLSION

1. **INSTALL EXPANSION VALVE**
   (See page AC–51**)**
2. **INSTALL EVAPORATOR**
   (See page AC–51**)**



AIR SWITCHING VALVE (ASV)

VACUUM HOSE CIRCUIT (5S–FE ENGINE MODEL)

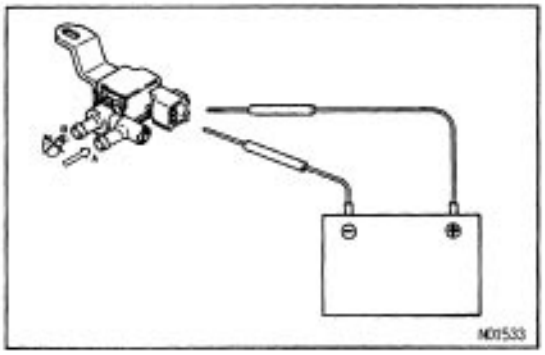


ASV INSPECTION (5S–FE ENGINE MODEL)

1. CHECK VACUUM CIRCUIT CONTINUITY IN ASV BY BLOWING AIR INTO PIPES

(a) Connect the ASV terminals to the battery terminals as illustrated.

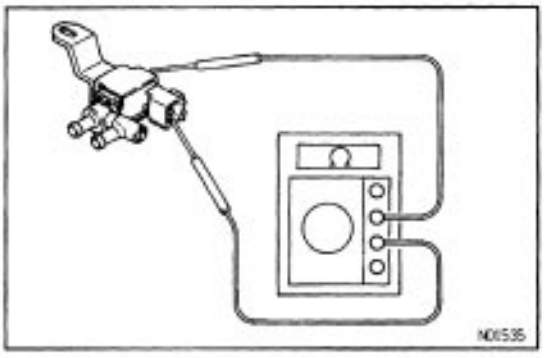
(b) Blow into pipe ”A” and’ check that air comes out of pipe ”B”.



(c) Disconnect the battery.

(b) Blow into pipe ”A” and check that air does not come out of pipe ”B”.

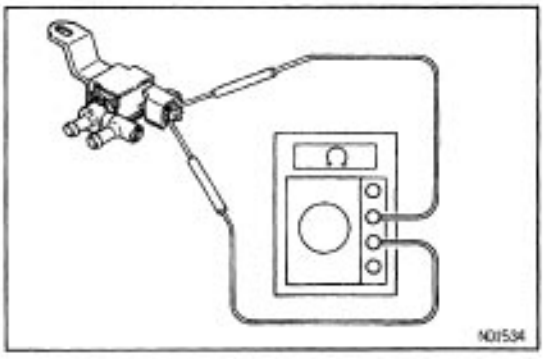
If a problem is bound, replace the ASV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between each terminal and the ASV.

If there is continuity, replace the ASV.



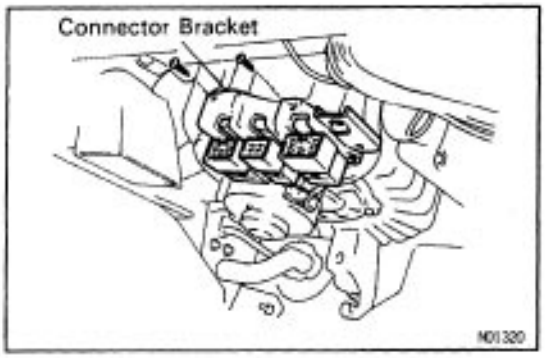
3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the 2 terminals.

Resistance:

30 – 34 0 at 20˚ C (68˚ F)

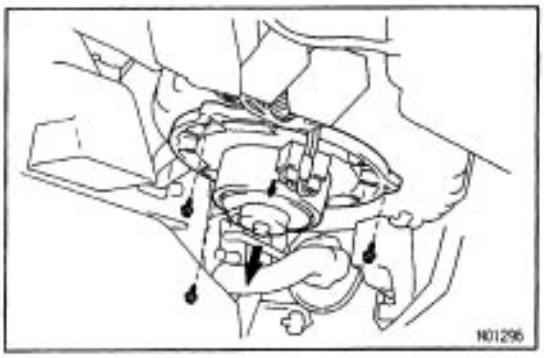
If resistance value is not as specified, replace the ASV.



BLOWER MOTOR

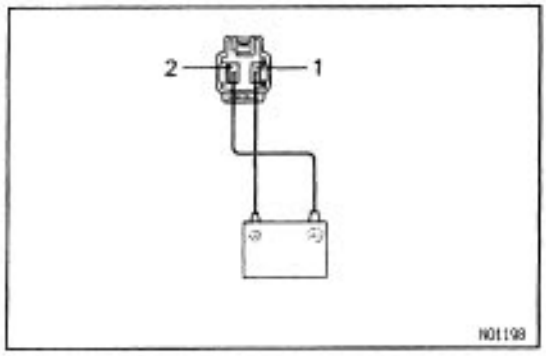
BLOWER MOTOR REMOVAL

1. **REMOVE INSTRUMENT LOWER PANEL AND UNDER COVER NO. 2**
   (See page BO–108**)**
2. **REMOVE CONNECTOR BRACKET**
   Remove the 2 screws and the bracket



3. **REMOVE MOTOR**

(a) Disconnect the connector.
(b) Remove the 3 screws and the motor.



BLOWER MOTOR INSPECTION

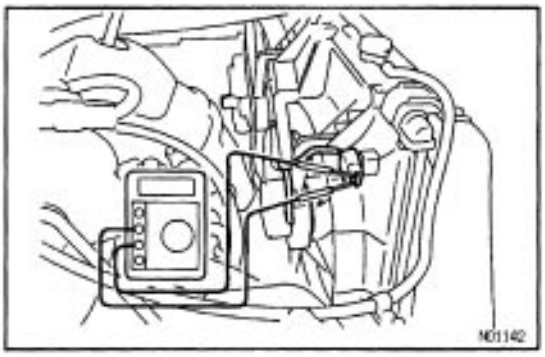
INSPECT BLOWER MOTOR OPERATION
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, then check that the motor operation is smooth.

BLOWER MOTOR INSTALLATION

1. **INSTALL MOTOR**

(a) Install the motor with the 3 screws.
(b) Connect the connector.

2. **INSTALL CONNECTOR BRACKET**
3. **INSTALL INSTRUMENT LOWER PANEL AND UNDER COVER NO. 2**



CONDENSER FAN MOTOR

CONDENSER FAN MOTOR INSPECTION 5S–FE ENGINE MODEL:

1. DISCONNECT CONNECTOR

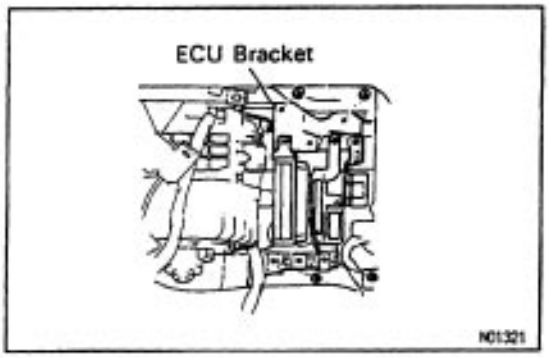
2. INSPECT CONDENSER FAN MOTOR

Connect positive (+) lead from battery and negative (–) lead to terminals, then check that the condenser fan motor operates smoothly.

Standard current:

6.7±1 (A)

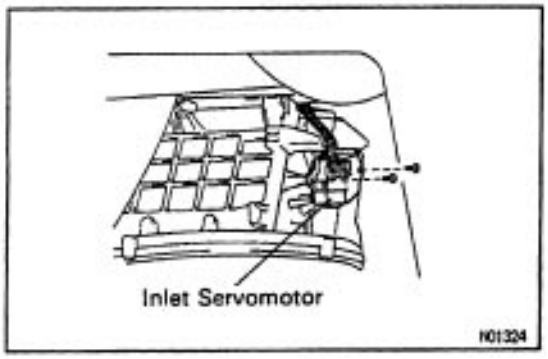
If current value is not as specified, replace the con–denser fan motor.



AIR INLET SERVOMOTOR

AIR INLET SERVOMOTOR REMOVAL

1. **REMOVE GLOVE COMPARTMENT**
   (See page BO–108**)**
2. **REMOVE ECU AND ECU BRACKET**

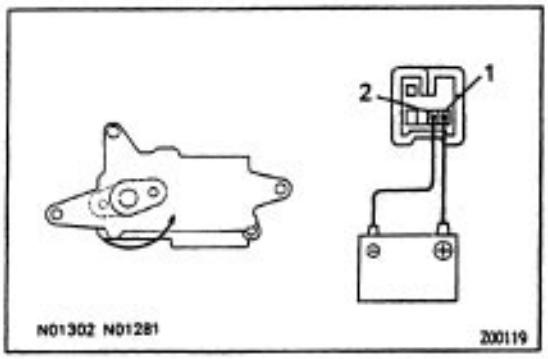


3. **REMOVE SERVOMOTOR**

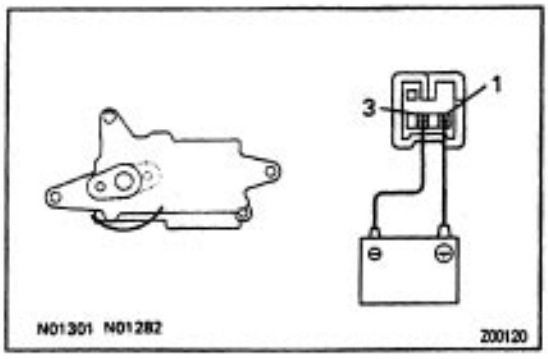
(a) Disconnect the connector.
(b) Remove the 2 screws and the servomotor.

AIR INLET SERVOMOTOR INSPECTION

INSPECT SERVOMOTOR OPERATION



(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the arm rotates to the ”FRESH” side smoothly.



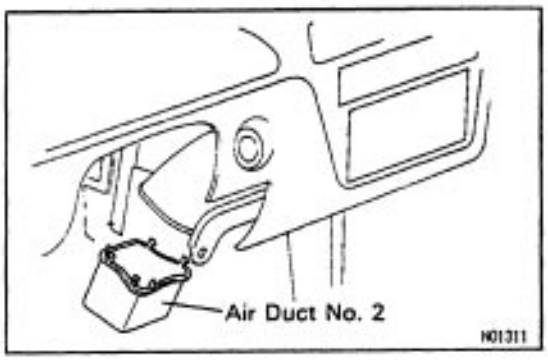
(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3, check that the arm rotates to the ”RECI RC” side smoothly.
If operation is not as specified, replace the servo motor.

AIR INLET SERVOMOTOR INSTALLATION

1. **INSTALL SERVOMOTOR**

(a) Install the servomotor with the 2 screws.
(b) Connect the connector.

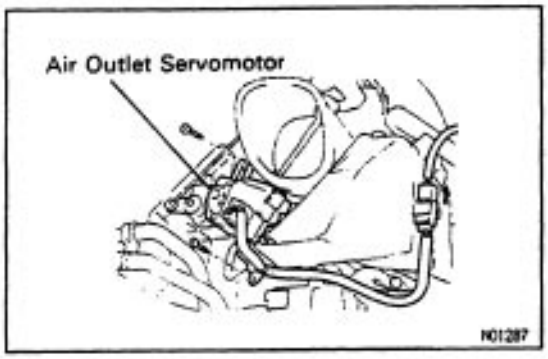
2. **INSTALL ECU AND ECU BRACKET**
3. **INSTALL GLOVE COMPARTMENT**



AIR OUTLET SERVOMOTOR

AIR OUTLET SERVOMOTOR REMOVAL

1. **REMOVE INSTRUMENT LOWER FINISH PANEL AND AIR DUCT**
   (See page BO–108)
2. **REMOVE AIR DUCT NO. 2**



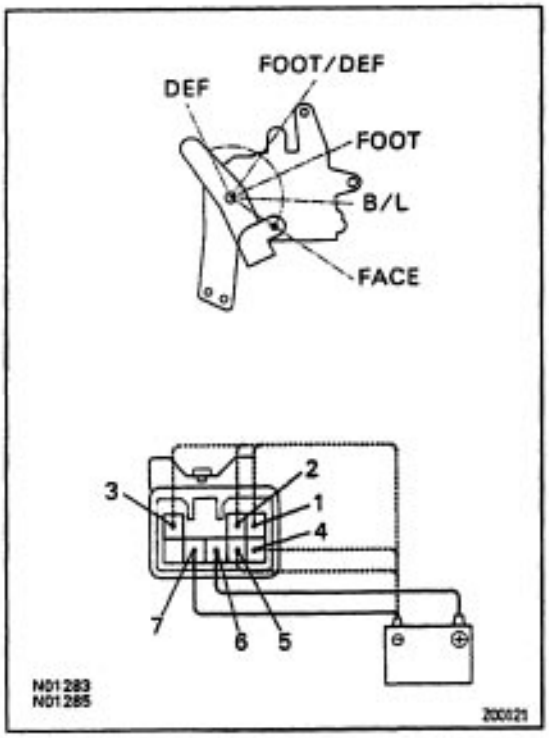
3. **REMOVE SERVOMOTOR**

(a) Disconnect the connector.
(b) Remove the 2 screws and the servomotor.

AIR OUTLET SERVOMOTOR INSPECTION

INSPECT SERVOMOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 7.
(b) Connect the negative (–) lead from the battery to each terminal and check that the arm rotates to each position as shown below.



Connected terminal	Position
1	D EF
2	FOOT/DEF
3	FOOT
4	B/L
5	FACE

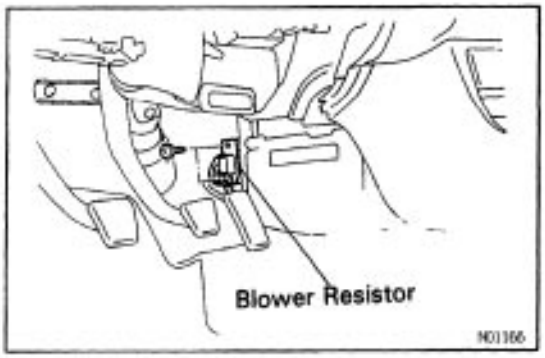
If operation is not as specified, replace the servomo–tor.

AIR OUTLET SERVOMOTOR INSTALLATION

1. **INSTALL SERVOMOTOR**

(a) Install the servomotor with 2 screws.
(b) Connect the connector

2. **INSTALL HEATER DUCT**
3. **INSTALL LOWER FINISH PANEL**



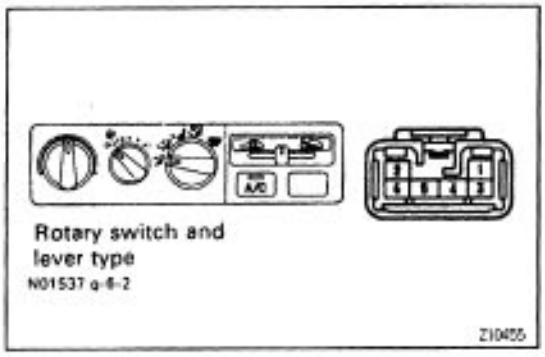
BLOWER RESISTOR

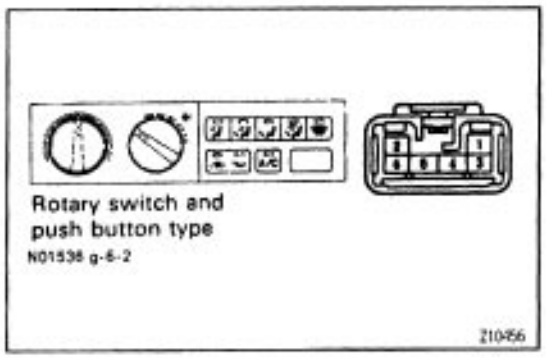
BLOWER RESISTOR REMOVAL

1. **REMOVE INSTRUMENT LOWER FINISH PANEL (See page BO–108)**
2. **REMOVE BLOWER RESISTOR**

(a) Disconnect the connector from the resistor.
(b) Remove the 2 screws and the resistor.

BLOWER RESISTOR INSPECTION





INSPECT BLOWER RESISTOR CONTINUITY
Continuity

Condition	Tester connectoin to terminal number	Specified value
Constant	1–2–3–6	Continuity

If continuity is not as specified, replace the blower resistor.

Condition	Tester connectoin to terminal number	Specified value
Constant	t –2–3–5–6	Continuity

If continuity is not as specified, replace the blower resistor.

BLOWER RESISTOR INSTALLATION

1. **INSTALL BLOWER RESISTOR**

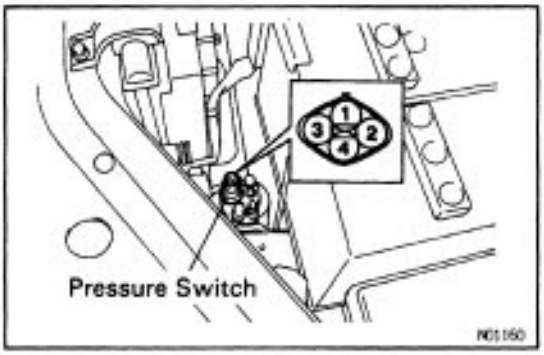
(a) Install the resistor with the 2 screws.
(b) Connect the connector to the resistor.

2. **INSTALL INSTRUMENT LOWER FINISH PANEL**

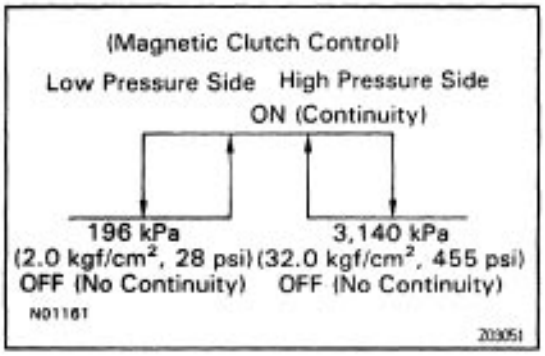
PRESSURE SWITCH

ON–VEHICLE INSPECTION

1. **INSTALL MANIFOLD GAUGE SET**
   (See page AC–21)
2. **DISCONNECT CONNECTOR FROM PRESSURE SWITCH**
3. **RUN ENGINE AT APPROX. 2000 RPM**



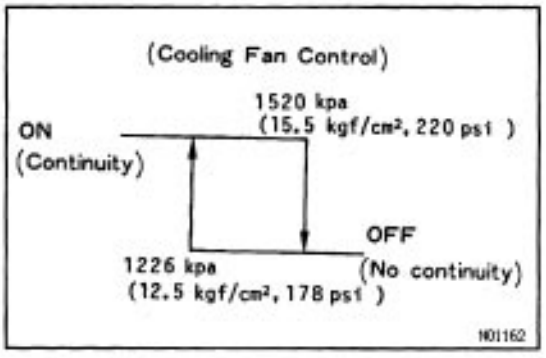
4. **INSPECT PRESSURE SWITCH OPERATION**



Magnet Clutch Control:

(a) Connect the positive (+) lead from the ohmmeter to terminal 4 and negative (–) lead to terminal 1.

(b) Check continuity between terminals when refrigerant pressure is changed, as shown.
If operation is not as specified, replace the pressure switch.

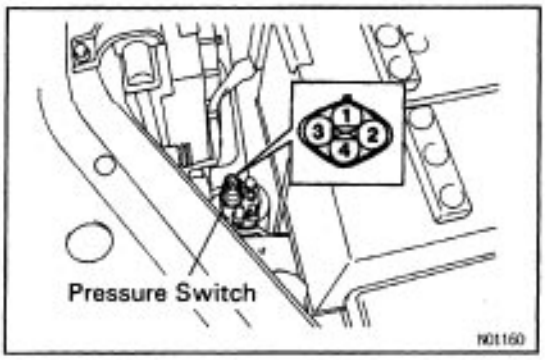


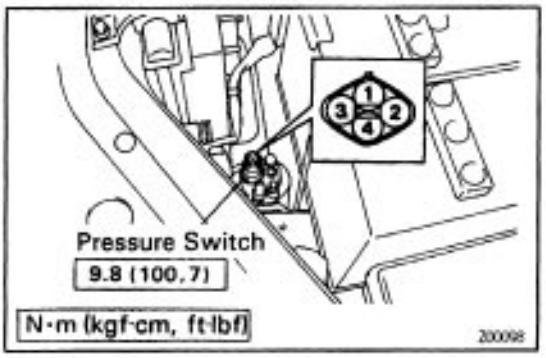
Cooling Fan Control:

(a) Connect the positive (+) lead from the ohmmeter to terminal 2 and negative (–) lead to terminal 3.

(b) Check continuity between terminals when refrigerant pressure is changed, as shown.
If operation is not as specified, replace the pressure switch.

5. **STOP ENGINE AND REMOVE MANIFOLD GAUGE SET**
6. **CONNECT CONNECTOR TO PRESSURE SWITCH**





PRESSURE SWITCH REMOVAL

1. DISCHARGE REFRIGERANT IN REFRIGERATION SYSTEM

2. REMOVE PRESSURE SWITCH

(a) Disconnect the connector.

(b) Remove the pressure switch from the liquid tube.
HINT: Lock the switch mount on the tube with an open end wrench, being careful not to deform the tube, and remove the switch.

PRESSURE SWITCH INSTALLATION

1. INSTALL PRESSURE SWITCH

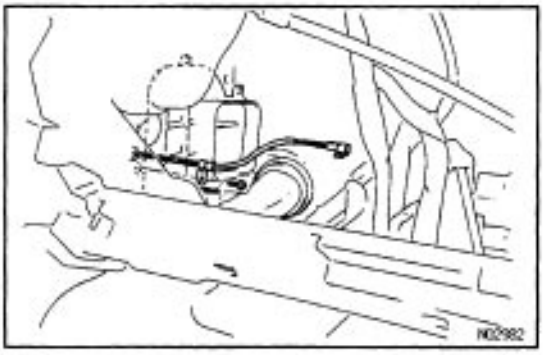
(a) Install the pressure switch to the liquid tube.
Torque: 9.8 N–m (100 kgf–cm, 7 ft–lbf)
HINT: Lock the switch mount on the tube with an open end wrench, being careful not to deform the tube, and install the switch.

(b) Connect the connector.

2. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE WITH REFRIGERANT
Specified amount:
850 ±50 g (29.98 ±1.76 oz)

3. INSPECT FOR LEAKAGE OF REFRIGERANT
Using a gas leak tester, check for leakage of refriger–ant from the pressure switch mount.

4. INSPECT A/C OPERATION

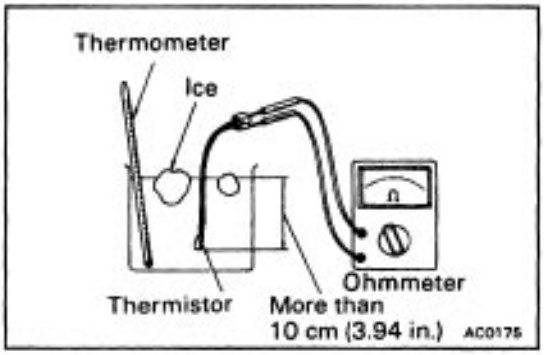


EVAPORATOR TEMPERATURE SENSOR

EVAPORATOR TEMPERATURE SENSOR REMOVAL

REMOVE EVAPORATOR TEMPERATURE SENSOR

Remove the screw and the evaporator temperature sensor (thermistor).



EVAPORATOR TEMPERATURE SENSOR INSPECTION

Check resistance between terminals of evaporator temperature sensor (thermistor) connector at each temperature.

Resistance:

at 0°C (32°F): 4.6 – 5.1 kΩ

at 15°C (59°F): 2.1 – 2.6 kΩ

In addition as temperature increases, the resistance decreases gradually.

EVAPORATOR TEMPERATURE SENSOR INSTALLATION

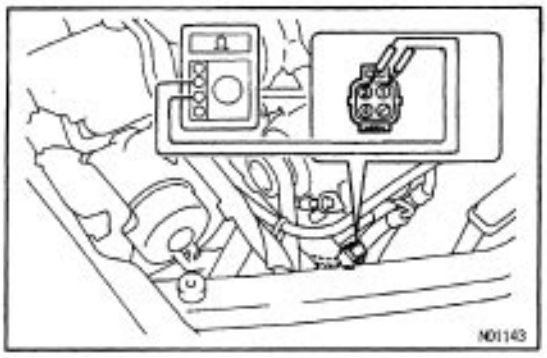
INSTALL EVAPORATOR TEMPERATURE SENSOR

Install evaporator temperature sensor in reverse order of removal procedure.

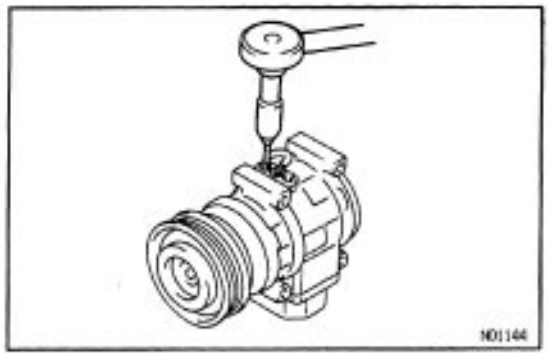
REVOLUTION DETECTING SENSOR

ON–VEHICLE INSPECTION

1. **DISCONNECT NEGATIVE (–) CABLE FROM BAT–TERY**
   CAUTION: Work must be started after 90 seconds from the time the ignition swithch is turned “LOCK” position and the negative (–) terminal cable is disconnected from the battery.
2. **DISCONNECT CONNECTOR OF REVOLUTION DET–ECTING SENSOR**



3. **INSPECT REVOLUTION DETECTING SENSOR**
   Check the resistance between terminals 1 and 2 of the sensor.
   Specified resistance:
   5S–FE:
   165 – 205Ω at 20 °C (68 °F)
   1 MZ– FE:
   65 – 125Ω at 20 °C (68 °F)
   If the resistance value is not as specified, replace the revolution detecting sensor.



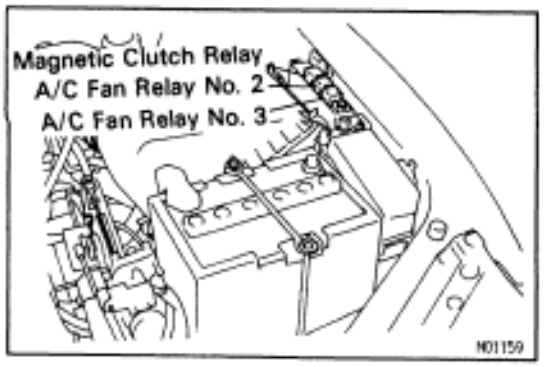
REVOLUTION DETECTING SENSOR REMOVAL

1. **REMOVE COMPRESSOR**
   (See page AC–37)
2. **REMOVE REVOLUTION DETECTING SENSOR**

(a) Remove 2 bolts.
(b) Remove the revolution detecting sensor.

REVOLUTION DETECTING SENSOR INSTALLATION

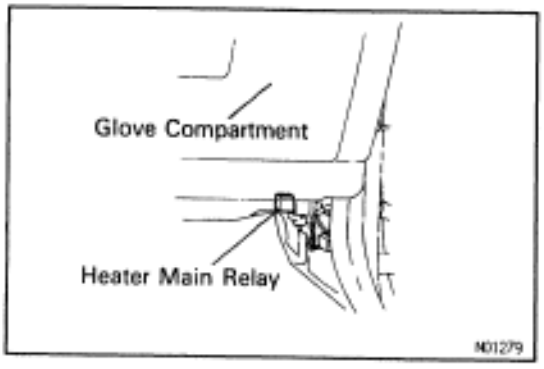
1. **INSTALL REVOLUTION DETECTING SENSOR**
   Using a torque wrench, tighten the bolts.
   Torque:6 N–m (60 kgf–cm, 4 ft–lbf)
2. **INSTALL COMPRESSOR**
   (See page AC–46)



RELAY

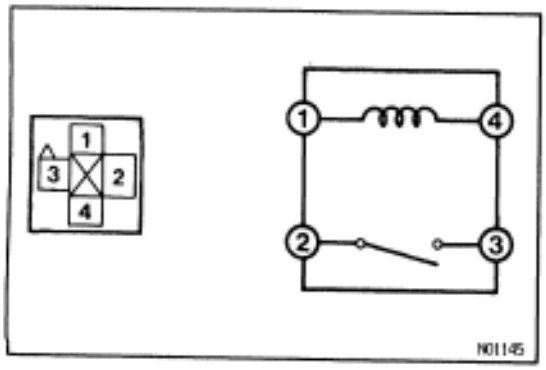
RELAYS REMOVAL

1. **DISCONNECT NEGATIVE (–) CABLE FROM BAT–TERY**
   CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the 'LOCK' position and the negative (–) terminal cable is discon–nected from the battery.
2. **REMOVE RELAYS**



RELAYS INSPECTION

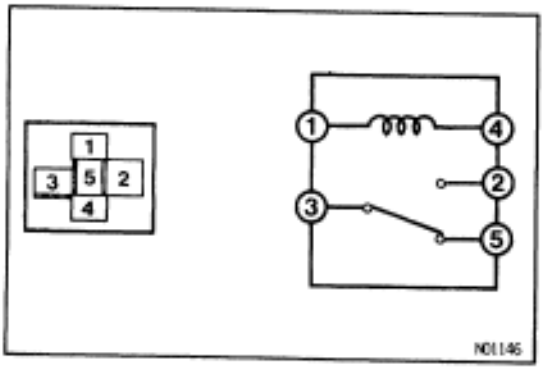
1. **INSPECT MAGNET CLUTCH RELAY CONTINUITY**



Condition	Tester connection to terminal number	Specified value
Constant	1 – 4	Continuity
Apply B + between terminals 1 and 4.	2 –3	Continuity

If continuity is not as specified, replace the relay.

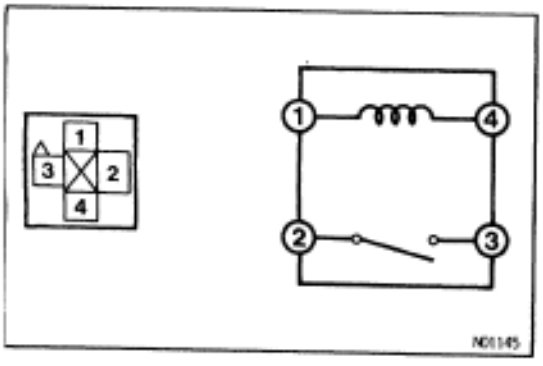
2. **INSPECT A/C FAN RELAY NO. 2 CONTINUITY**
   5S–FE Engine Model:



Condition	Tester connection to terminal number	Specified value
Constant	1 –4 3 – 5	Continuity
Apply6 + between terminals 1 and 4.	2 – 3	Continuity

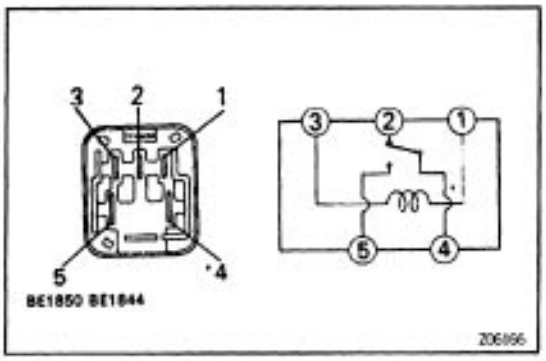
If continuity is not as specified, replace the relay.

3. **INSPECT A/C FAN RELAY NO. 3 CONTINUITY**
   5S–FE Engine Model:



Condition	Tester connection to terminal number	Specified value
Constant	1 – 4	Continuity
Apply B + between terminals 1 and 4.	2 – 3	Continuity

If continuity is not as specified, replace the relay.



4. INSPECT HEATER MAIN RELAY CONTINUITY

Condition	Tester connection to terminal number	Specified value
Constant	1–3 2–4	Continuity
Apply B + between terminals 1 and 3.	4–5	Continuity

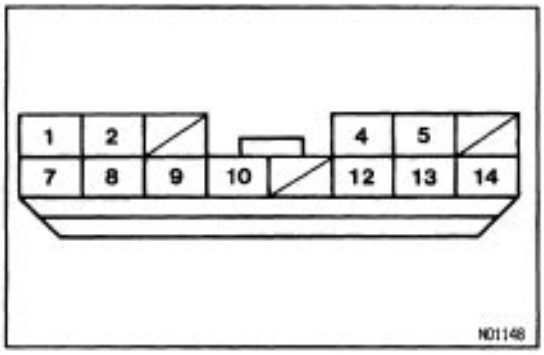
If continuity is not as specified, replace the relay.

A0082–01

RELAYS INSTALLATION

1. INSTALL RELAYS

2. CONNECT NEGATIVE (–) CABLE TO BATTERY



AIR CONDITIONING AMPLIFIER

A/C AMPLIFIER INSPECTION

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side, as shown in the chart below.

Test conditions

- Ignition switch : ON
- Temperature control dial : MAX COOL
- Blower dial: HI

Tester connection	Condition	Specified condition
5 – Ground	Constant	Continuity
9–13	Constant	1.5 kΩ at 20 °C (68 °F)
14–13	Constant	Approx. 115Ω at 20 °C (68 °F)
12 – Ground	Turn A/C switch ON	Battery voltage
12– Ground	Turn A/C switch OFF	No voltage
2 – Ground	Refrigerant pressure: 196 – 3140 kPa	Battery voltage
2 – Ground	Refrigerant pressure: less than 196 kPa or more than 3140 kPa	No voltage
10 – Ground	Turn A/C switch ON	Battery voltage
10 – Ground	Turn A/C switch OFF	No voltage
8 – Ground	Turn A/C switch ON	Battery voltage
8 – Ground	Turn A/C switch OFF	No voltage

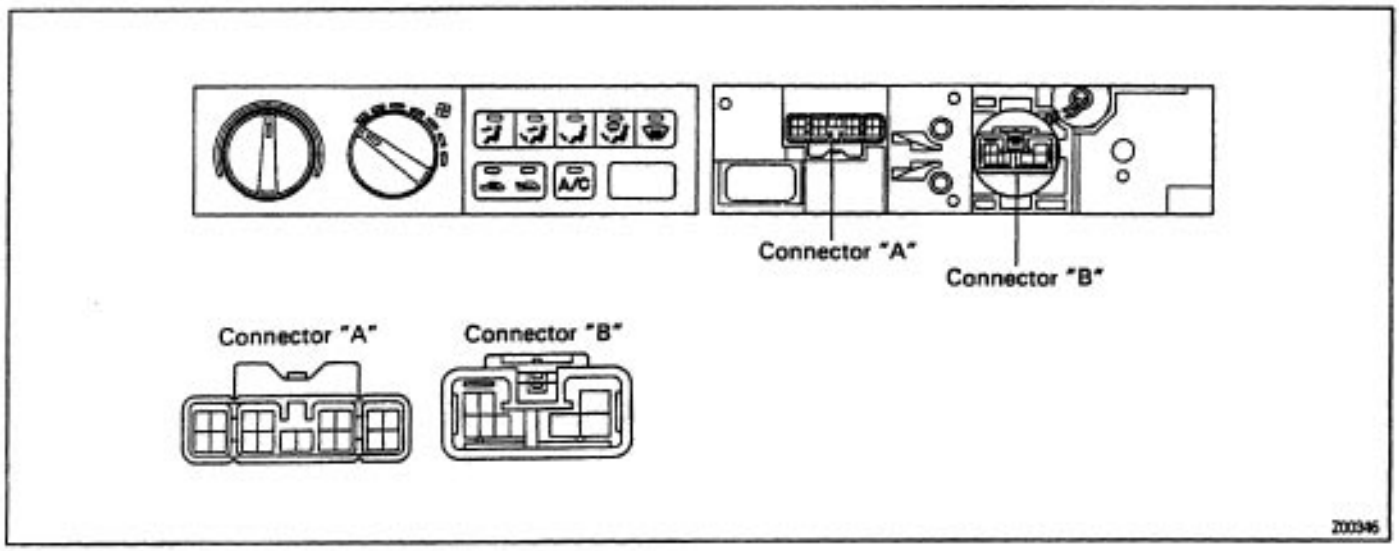
If circuit is not as specified, replace the amplifier.

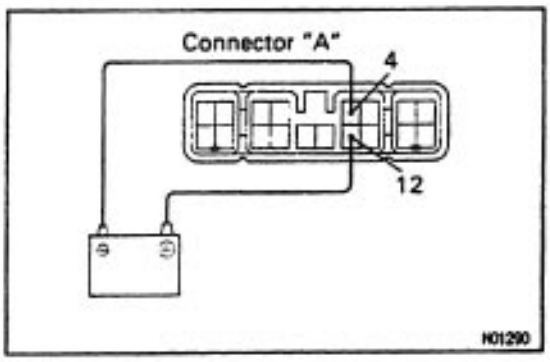
AIR CONDITIONING CONTROL ASSEMBLY

A/C CONTROL ASSEMBLY REMOVAL

(See page BO–108)

A/C CONTROL ASSEMBLY INSPECTION (ROTARY SWITCH AND PUSH BUTTON TYPE)



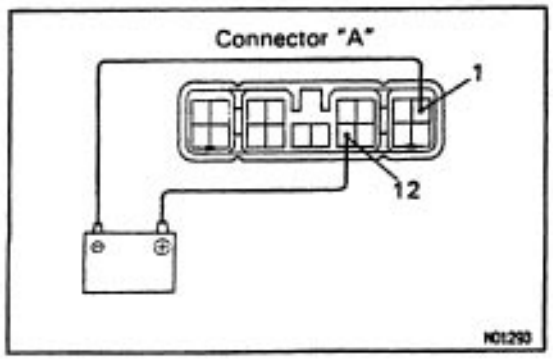


1. INSPECT A/C INDICATOR

(a) Connect the positive (+) lead from the battery to terminal A–12 and the negative (–) lead to terminal A–4.

(b) Push the A/C button in and check that the indicator light up.

If operation is not as specified, replace the A/C control assembly.

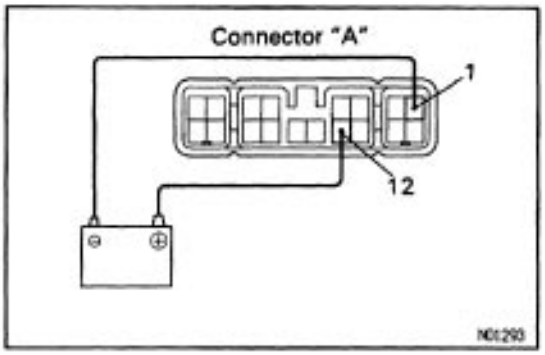


2. INSPECT MODE INDICATOR

(a) Connect the positive (+) lead from the battery to terminal A–12 and the negative (–) lead to terminal A–1.

(b) Push each of the mode bottons in and check that their indicators light up.

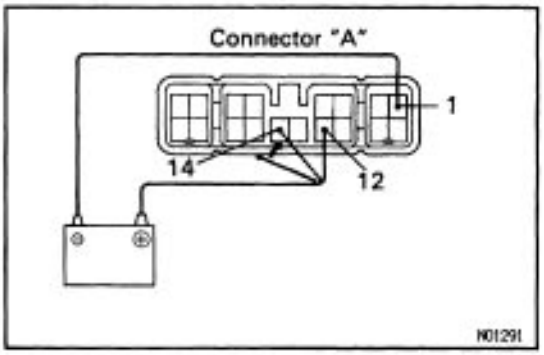
If operation is not as specified, replace the A/C control assembly.



3. INSPECT AIR INLET INDICATOR

(a) Connect the positive (+) lead from the battery to terminal A– 12 and the negative (–) lead to terminal A–1.

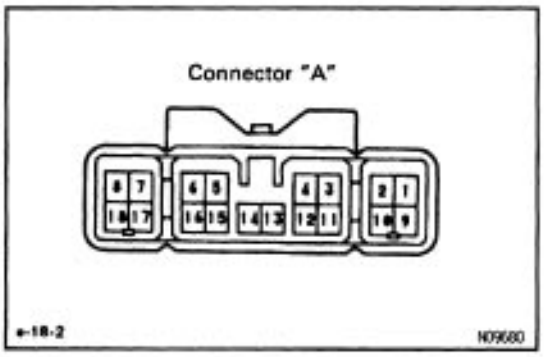
(b) Check that the FRESH and RECIRC indicators light up alternately each time the air inlet control switch button is pressed.
If operation is not as specified, replace the A/C con–trol assembly.



4. INSPECT INDICATOR DIMMING OPERATION

(a) Connect the positive (+) lead from the battery to terminal A– 12 and the negative (–) lead to terminal A –1.

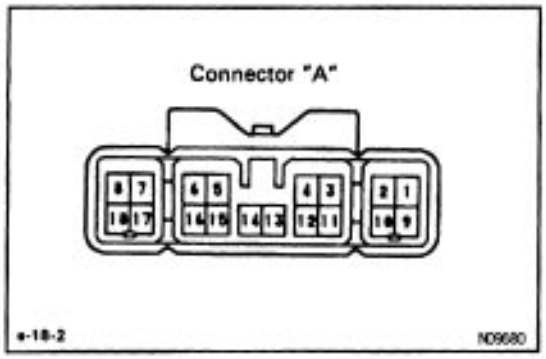
(b) Connect the positive (+) lead from the battery to terminal A–14 and check that the mode indicator dims.
If operation is not as specified, replace the A/C con–trol assembly.



5. INSPECT A/C SWITCH CONTINUITY

Switch position	Tester connection to terminal number	Specified value
OFF	–	No continuity
ON	A7 – A8	Continuity

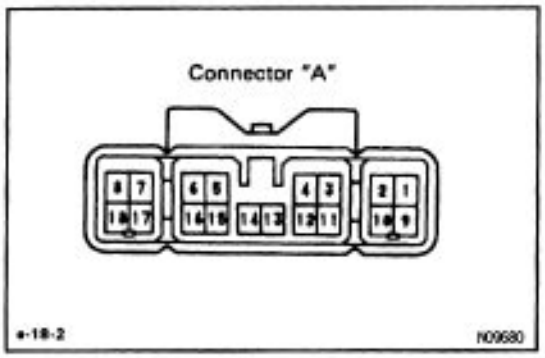
If continuity is not as specified, replace the A/C con–trol assembly.



6. INSPECT MODE CONTROL SWITCH CONTINUITY

Switch position	Tester connection to terminal number	Specified value
FACE	A11 –Al	Continuity
B/L	A3 – A 1	Continuity
FOOT	A10 – A1	Continuity
FOOT/ oeF	A2 – A 1	Continuity
D EF	A9 – A 1	Continuity

If continuity is not as specified, replace the A/C con–trol assembly.

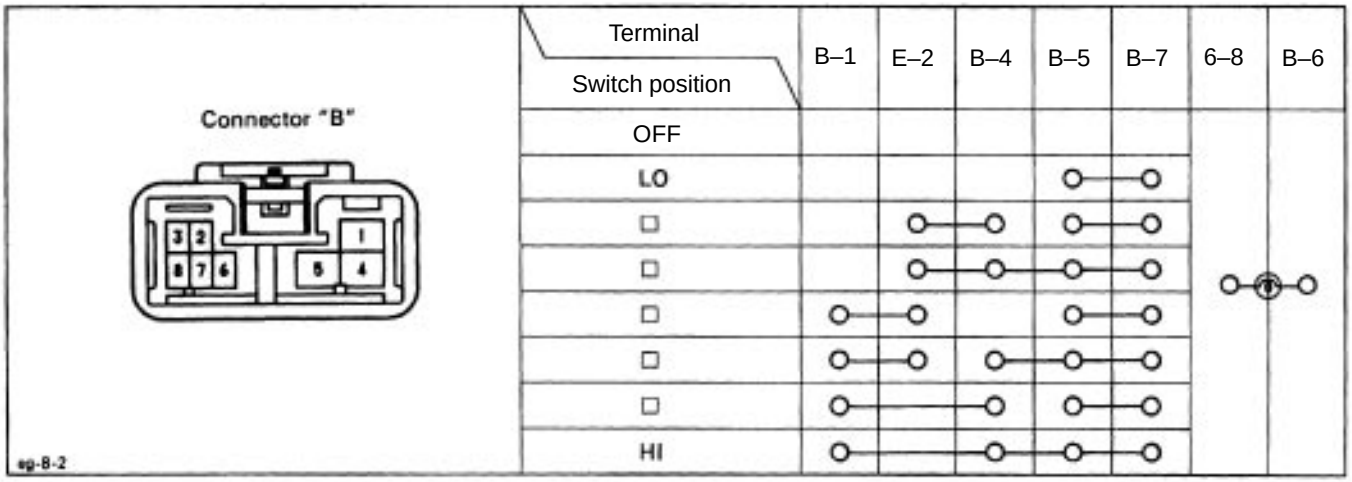


7. INSPECT AIR INLET CONTROL SWITCH CONTINUITY

Switch position	Tester connectoin to terminal number	Specified value
RECIRC	A5 – A 1	Continuity
FRESH	A6–A1	Continuity

If continuity is not as specified, replace the A/C con–trol assembly.

8. INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY

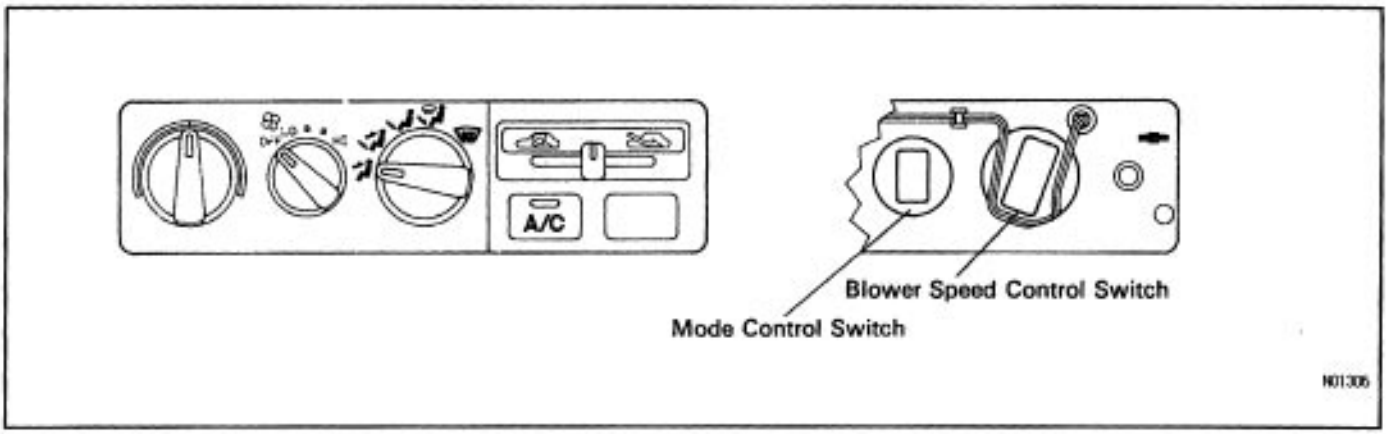


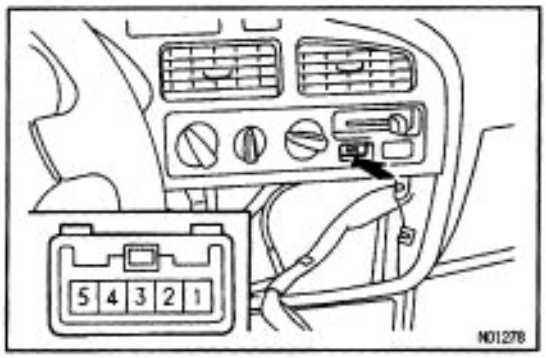
Terminal / Switch position	B–1	E–2	B–4	B–5	B–7	6–8	B–6
OFF						●	●
LO				●	●		
□		●	●	●	●		
□		●	●	●	●		
□	●	●		●	●		
□	●	●	●	●	●		
□	●		●	●	●		
HI	●		●	●	●		

V00113

If continuity is not as specified, replace the switch.

ROTARY SWITCH AND LEVER TYPE:

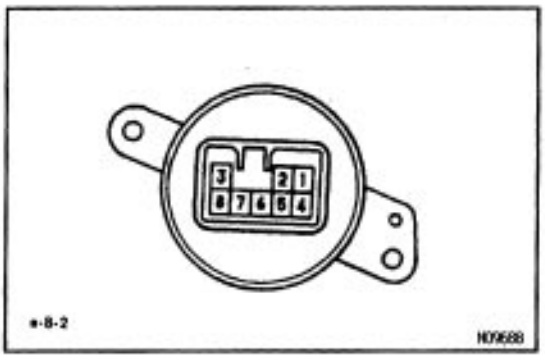




1. INSPECT A/C SWITCH CONTINUITY

Switch position	Tester connection to terminal number	Specified value
OFF.	–	No continuity
ON	2 – 5	Continuity

If continuity is not as specified, replace the switch.

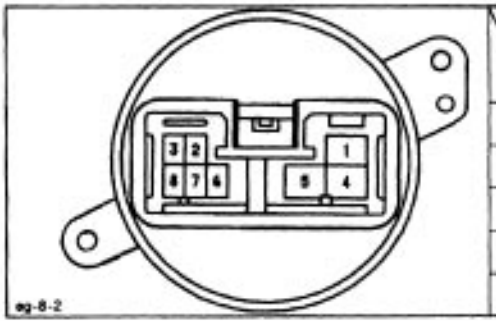


2. INSPECT MODE CONTROL SWITCH CONTINUITY

Switch position	Tester connection to terminal number	Specified value
FACE	1–8	Continuity
B/ L	1 – 7	Continuity
FOOT	1 –6	Continuity
FOOT/ DEF	1–5	Continuity
DEF	1–4	Continuity

If continuity is not as specified, replace the switch.

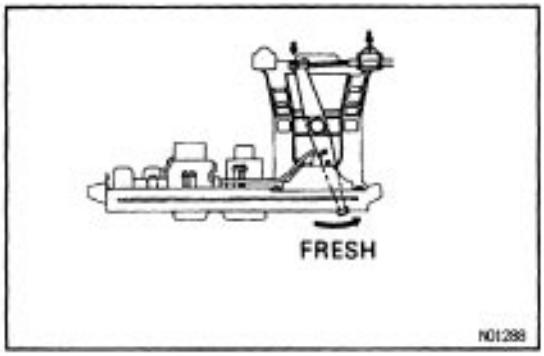
3. INSPECT BLOWER SPEED CONTROL SWITCH CON–TINUITY



Terminal / Switch position	1	3	4	5	8	6	7
OFF	○						
LO	○	○					
■	○	○	○			○	○
■	○	○			○		
HI	○	○		○			

V00105

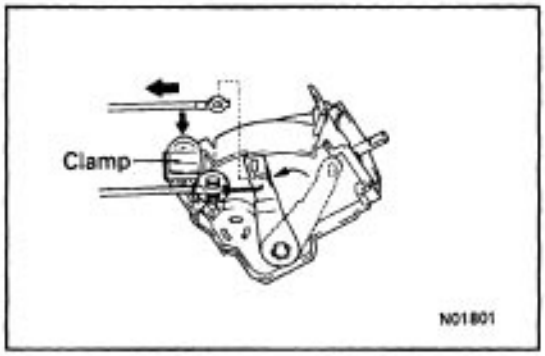
If continuity is not as specified, replace the switch.



A/C CONTROL CABLES ADJUSTMENT

1. ADJUST AIR INLET DAMPER CONTROL CABLE

Set the air inlet damper and the control lever to ” FRESH” position, install the control cable and lock the clamp.



2. ADJUST AIR MIX DAMPER CONTROL CABLE

Set the air mix damper and control switch to ”COOL” position, install the control cable and lock the clamp while lightly pushing the outer cable in the direction shown by the arrow.

A/C CONTROL ASSEMBLY INSTALLATION

(See page BO–108**)**

SERVICE SPECIFICATIONS

SERVICE DATA

Refrigerant charge volume		850 ± 50 g (29.98 ± 1.76 oz)
Drive belt tention		
5S–FE:	New belt	165 ± 26 lb
Used belt		110 ± 11 lb
1 MZ– FE:	New belt	165 ± 26 lb
	Used belt	88 ± 22 lb
Idle speed		
5S–FE:	Magnetic clutch no engaged	Approx. 750 rpm
	Magnetic clutch engaged	Approx. 850 rpm
1 MZ– FE:	Magnetic clutch noT engaged	Approx. 700 rpm
	Magnetic clutch engaged	Approx. 700 rpm
	Magnetic clutch clearance	0.5 ± 0.15 mm (0.020 ± 0.006 in.)

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Suction hose x Compressor	9.8	100	7
Discharge hose x Compressor	9.8	100	7
Compressor x Engine	25	250	18
Liquid x Receiver	5.4	55	48 in.·lbf
Lequid x Condensor	9.8	100	7
Expansion valve x Evaporator	5.4	55	48 in.·lbf
Suction tube x A/C unit	9.8	100	7
Liquid tube x A/C unit	9.8	100	7
Pressure switch x Liquired tube	9.8	100	7