



1996 Land Cruiser

Repair Manual

- Engine
- Chassis
- Body
- Electrical

Version 1.00

-original version released 12/21/2010

Version 1.11

-released 03/16/2011

-added cover page

-added 'Starter' section

FOR USA Pub. No. RM451U

HOW TO USE THIS MANUAL

GENERAL INFORMATION

IN00U-36

1. 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.

2. PRECAUTION

At the beginning of each section, a PRECAUTION is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

3. 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-18](#).

Be sure to read this before performing troubleshooting.

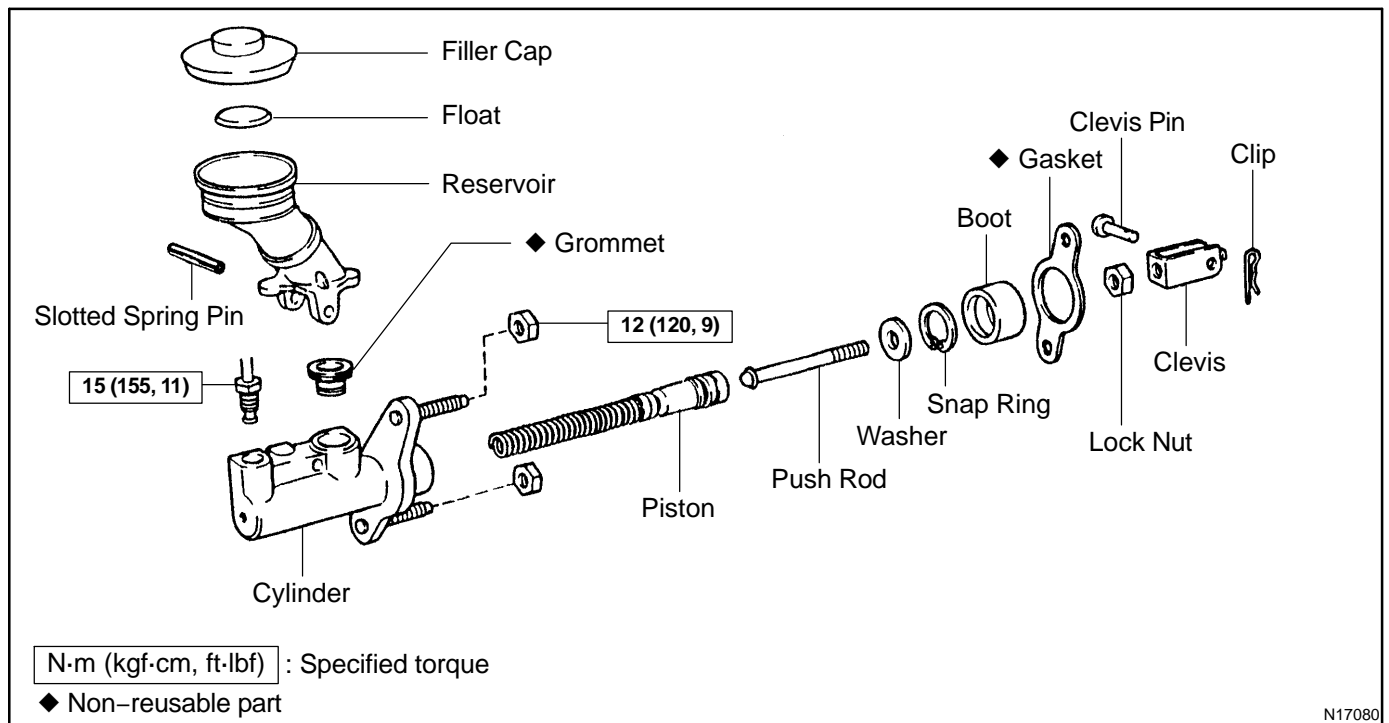
4. PREPARATION

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.

5. 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:

*Illustration:
what to do and where*

Task heading : what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350-30020 (09350-06120)

Set part No.

Component part No.

Detailed text : how to do task

(b) Measure the stroke applying and releasing the compressed air (392 — 785 kPa, 4 — 8 kgf/cm² or 57 — 114 psi) as shown in the illustration.

Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)

Specification

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.

6. REFERENCES

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

7. 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 in Service Specifications section for quick reference.

8. 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.

9. SI 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)

IN-2

INTRODUCTION – HOW TO USE THIS MANUAL

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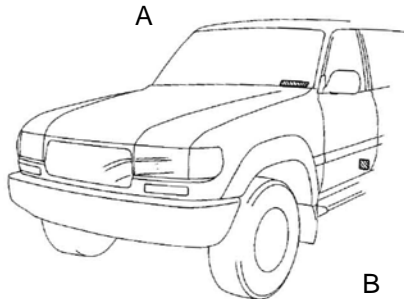
Example:

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IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER

IN04P-14



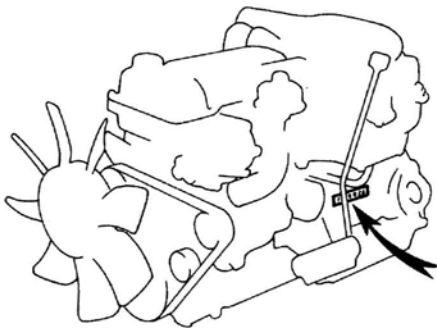
Z04707

1. VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and the certification label, as shown in the illustration.

A: Vehicle Identification Number Plate

B: Certification Label



P03780

2. ENGINE SERIAL NUMBER

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

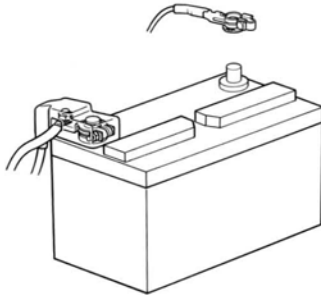
REPAIR INSTRUCTIONS

GENERAL INFORMATION

INOCO-12

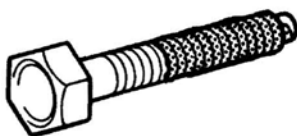
BASIC REPAIR HINT

- (a) Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
- (b) During disassembly, keep parts in the appropriate order to facilitate reassembly.



F11066

- (c) Installation and removal of battery terminal:
 - (1) Before performing electrical work, disconnect the negative (–) terminal cable from the battery.
 - (2) If it is necessary to disconnect the battery for inspection or repair, first disconnect the negative (–) terminal cable.
 - (3) When disconnecting the terminal cable, to prevent damage to battery terminal, loosen the cable nut and raise the cable straight up without twisting or prying it.
 - (4) Clean the battery terminals and cable ends with a clean shop rag. Do not scrape them with a file or other abrasive objects.
 - (5) Install the cable ends to the battery terminals after loosening the nut, and tighten the nut after installation. Do not use a hammer to tap the cable ends onto the terminals.
 - (6) Be sure the cover for the positive (+) terminal is properly in place.
- (d) Check hose and wiring connectors to make sure that they are connected securely and correctly.
- (e) Non-reusable parts
 - (1) Always replace cotter pins, gaskets, O-rings, oil seals, etc. with new ones.
 - (2) Non-reusable parts are indicated in the component illustrations by the "◆" symbol.



Seal Lock Adhesive

Z11554

- (f) Precoated parts

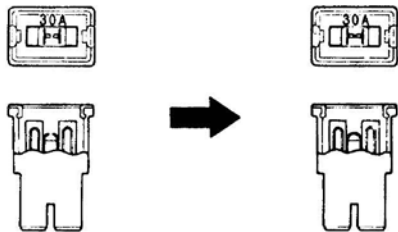
Precoated parts are bolts, nuts, etc. that are coated with a seal lock adhesive at the factory.

 - (1) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
 - (2) 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.

INTRODUCTION – REPAIR INSTRUCTIONS

- (3) Precoated parts are indicated in the component illustrations by the "★" symbol.
- (g) When necessary, use a sealer on gaskets to prevent leaks.
- (h) Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
- (i) 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 procedure. A list of SST and SSM can be found in Preparation section in this manual.

Medium Current Fuse and High Current Fuse
Equal Amperage Rating



BE1367

- (j) 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

V00076

IN-6

INTRODUCTION – REPAIR INSTRUCTIONS

- (k) 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-8](#)).
- Cancel the parking brake on the level place and shift the transmission in Neutral (or N position).
 - When jacking up the front wheels of the vehicle at first place stoppers behind the rear wheels.
 - When jacking up the rear wheels of the vehicle at first place stoppers before the front wheels.
 - When either the front or rear wheels only should be jacked up, set rigid racks and place stoppers in front and behind the other wheels on the ground.
 - After the vehicle is jacked up, be sure to support it on rigid racks . 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.
- (l) Observe the following precautions to avoid damage to the following parts:
- (1) Do not open the cover or case of the ECU unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

WRONG

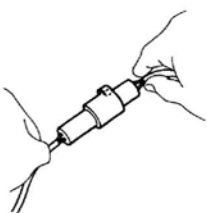


CORRECT



IN0253

WRONG



CORRECT

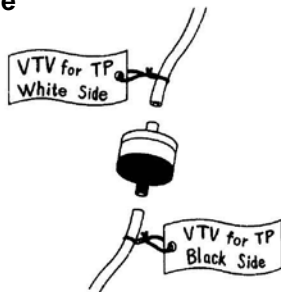


IN0252

- (2) To disconnect vacuum hoses, pull off the end, not the middle of the hose.
- (3) To pull apart electrical connectors, pull on the connector itself, not the wires.
- (4) 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.
- (5) When steam cleaning an engine, protect the electronic components, air filter and emission-related components from water.
- (6) Never use an impact wrench to remove or install temperature switches or temperature sensors.

INTRODUCTION – REPAIR INSTRUCTIONS

- (7) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
- (8) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter for adjustment. Once the hose has been stretched, it may leak air.

Example

IN0002

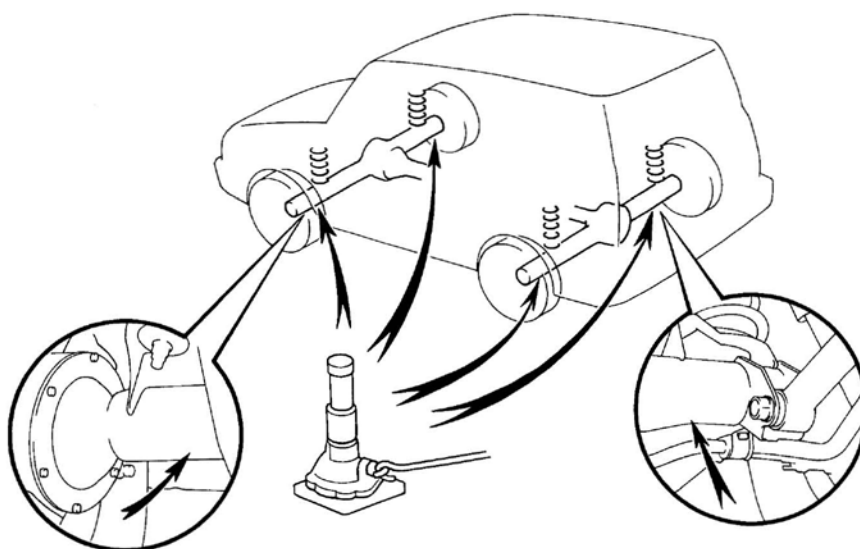
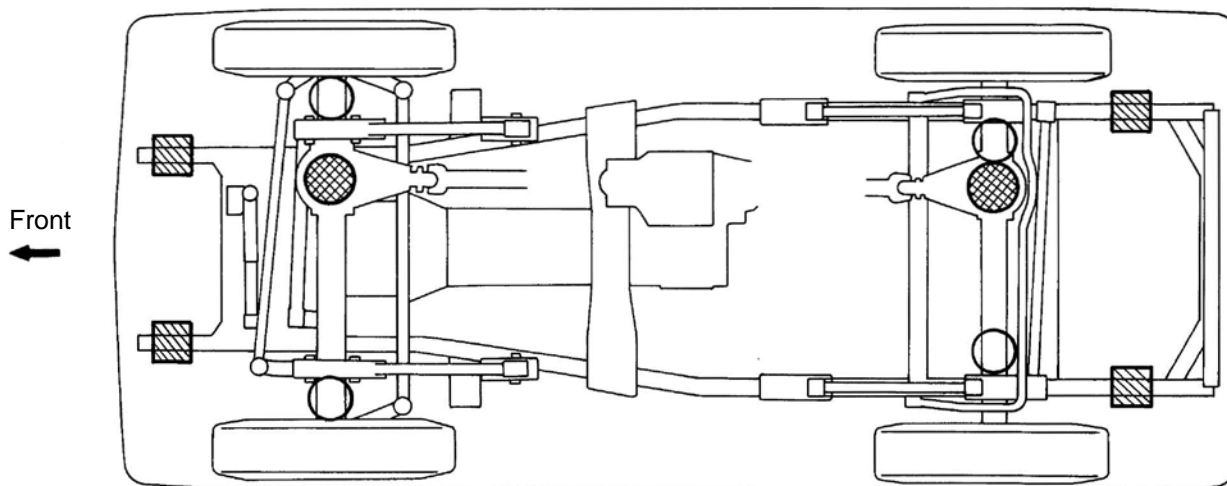
- (m) Installation and removal of vacuum hose:
 - (1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to.
 - (2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.
- (n) Unless otherwise stated, all resistance is measured at an ambient temperature of 20°C (68°F). Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurement should be made when the engine has cooled down.

IN-8

INTRODUCTION - REPAIR INSTRUCTIONS

IN0H2-01

VEHICLE LIFT AND SUPPORT LOCATIONS



JACK POSITION

Front Under front differential
Rear Under rear differential



SCREW TYPE JACK POSITION

SUPPORT POSITION

Safety stand



Z00796

FOR ALL OF VEHICLES PRECAUTION

IN010-01

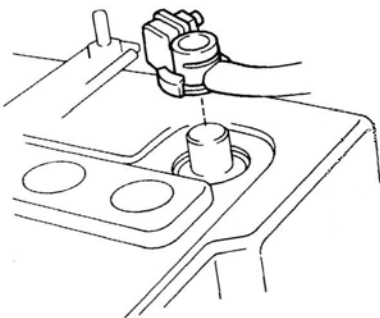
1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG AND SEAT BELT PRETENSIONER

- (a) The LAND CRUISER is equipped with an SRS (Supplemental Restraint System), such as the driver airbag and front passenger airbag assembly.

Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy 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 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 this manual.

Negative Cable



BO4111

(b) GENERAL NOTICE

- (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 troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page [DI-240](#)).

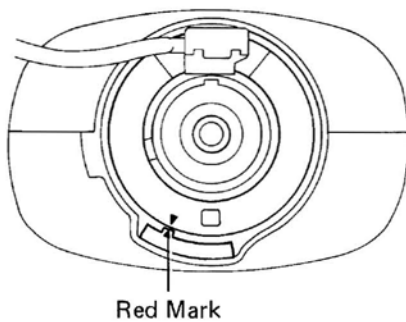
- (2) Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

(The supplemental 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 from the battery, the SRS may deploy.)

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 the 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 another battery.

INTRODUCTION – FOR ALL OF VEHICLES

- (3) Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad (See page [RS-9](#)) and front passenger airbag assembly (See page [RS-23](#)) should be inspected.
- (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 sensor during repairs.
- (6) Never disassemble and repair the airbag sensor assembly, steering wheel pad or front passenger airbag assembly in order to reuse them.
- (7) If the 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.
- (8) Do not directly expose the airbag sensor assembly, steering wheel pad or front passenger airbag assembly to hot air or flames.
- (9) Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for 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, check the SRS warning light (See page [DI-240](#)).



R00011

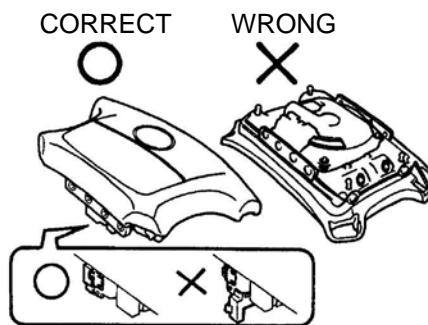
- (c) SPIRAL CABLE (in Combination Switch)
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result. Refer to [SR-19](#) of this manual concerning correct steering wheel installation.

INTRODUCTION - FOR ALL OF VEHICLES

(d) 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.
Storing the pad with its metallic surface facing upward may lead to a serious accident if the airbag inflates for some reason. In addition do not store a steering wheel pad on top of another one.
- (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 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 connector 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-11).
Perform the operation in a safe place away from electrical noise.

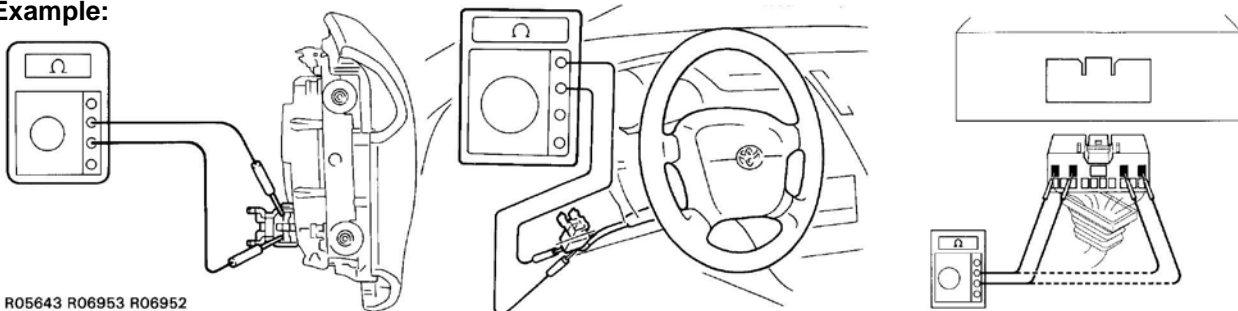
Example:



N01560

Z13953

Example:



R05643 R06953 R06952

Z13950

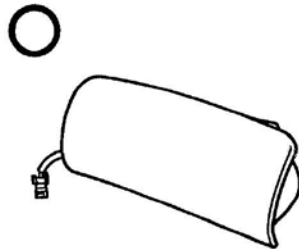
INTRODUCTION - FOR ALL OF VEHICLES

(e) FRONT PASSENGER AIRBAG ASSEMBLY

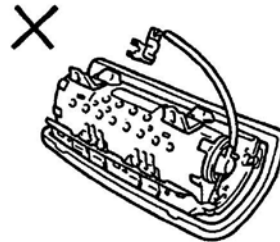
- (1) Always store a removed or new front passenger airbag assembly with the airbag deployment direction facing up.
Storing the airbag assembly with the airbag deployment direction facing down could cause a serious accident if the airbag inflates.
- (2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
- (3) Grease should not be applied to the front passenger airbag 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 assembly 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-25](#)).
Perform the operation in a safe place away from electrical noise.

Example:

CORRECT



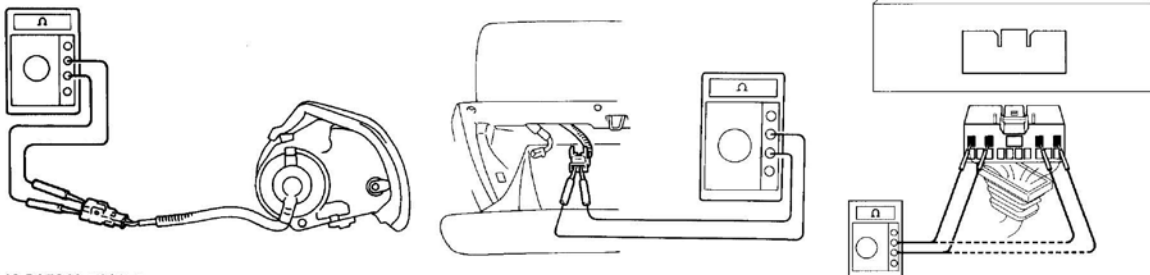
WRONG



R08766

Z13952

Example:



R05648 R05649 R06952

Z13951

(f) AIRBAG SENSOR ASSEMBLY

The connectors to the airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system.

(g) WIRE HARNESS AND CONNECTOR

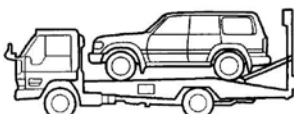


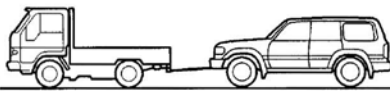
The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it as shown on page [RS-37](#).

IN-14

INTRODUCTION - FOR ALL OF VEHICLES

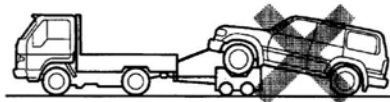
2. WHEN TOWING FULL-TIME 4WD VEHICLES

- Use one of the methods shown below to tow the vehicle.
- If the vehicle has trouble in the chassis and drive train, use method 1 (flat bed truck).

Towing Method \ Condition	Parking Brake	Transmission Shift Lever Position	Transfer Shift Lever Position	(w/o ABS) Center Differential Lock Switch	Center Differential
① Flat Bed Truck  <small>IN0309</small>	Applied	"P" Range	"H" Position	OFF	FREE (Normal) Driving
② Wheel Lift Type Truck with Dollies  					
③ Towing with Rope  <small>IN0312</small>	Released	"N" Range	"N" Position	OFF	↑

HINT : Do not use any towing methods other than those shown above.

For example, the towing method shown below is dangerous, so do not use it.

 <small>IN0313</small>	<p>During towing with this towing method, there is a danger of the drive train heating up and causing breakdown, or of the front wheels flying off the dolly.</p>
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V08127

V08127

3. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION:

If large amount of unburned gasoline flows into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

- (a) Use only unleaded gasoline.
- (b) Avoid prolonged idling.
Avoid running the engine at idle speed for more than 20 minutes.
- (c) Avoid spark jump test.
 - (1) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.
 - (2) While testing, never race the engine.
- (d) Avoid prolonged engine compression measurement.
Engine compression tests must be done as rapidly as possible.
- (e) 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.
- (f) Avoid coasting with ignition turned off.
- (g) Do not dispose of used catalyst along with parts contaminated with gasoline or oil.

4. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two-way radios and cellular telephones, observe the following precautions.

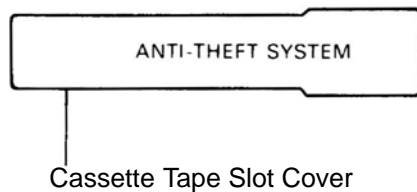
- (1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system.
- (2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronic systems. For details about ECU and sensors locations, refer to the section on the applicable component.
- (3) Avoid winding the antenna feeder together with other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses.
- (4) Check that the antenna and feeder are correctly adjusted.
- (5) Do not install powerful mobile communications system.

5. FOR USING OBD II SCAN TOOL OR TOYOTA HAND-HELD TESTER

CAUTION:

Observe the following items for safety reasons:

- Before using the OBD II scan tool or TOYOTA hand-held tester, the OBD II scan tool's instruction book or TOYOTA hand-held tester's operator manual should be read thoroughly.
- Be sure to route all cables securely when driving with the OBD II scan tool or TOYOTA hand-held tester connected to the vehicle. (i.e. Keep cables away from feet, pedals, steering wheel and shift lever.)
- Two persons are required when test driving with the OBD II scan tool or TOYOTA hand-held tester, one person to drive the vehicle and the other person to operate the OBD II scan tool or TOYOTA hand-held tester.



Cassette Tape Slot Cover

BE2826

6. 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 terminals or removing the audio system the customer should be asked for 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.

HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

GENERAL INFORMATION

IN04S-30

A large number of ECU controlled systems are used in the LAND CRUISER. 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. This manual 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: The troubleshooting procedure and how to make use of it are described on the following pages.

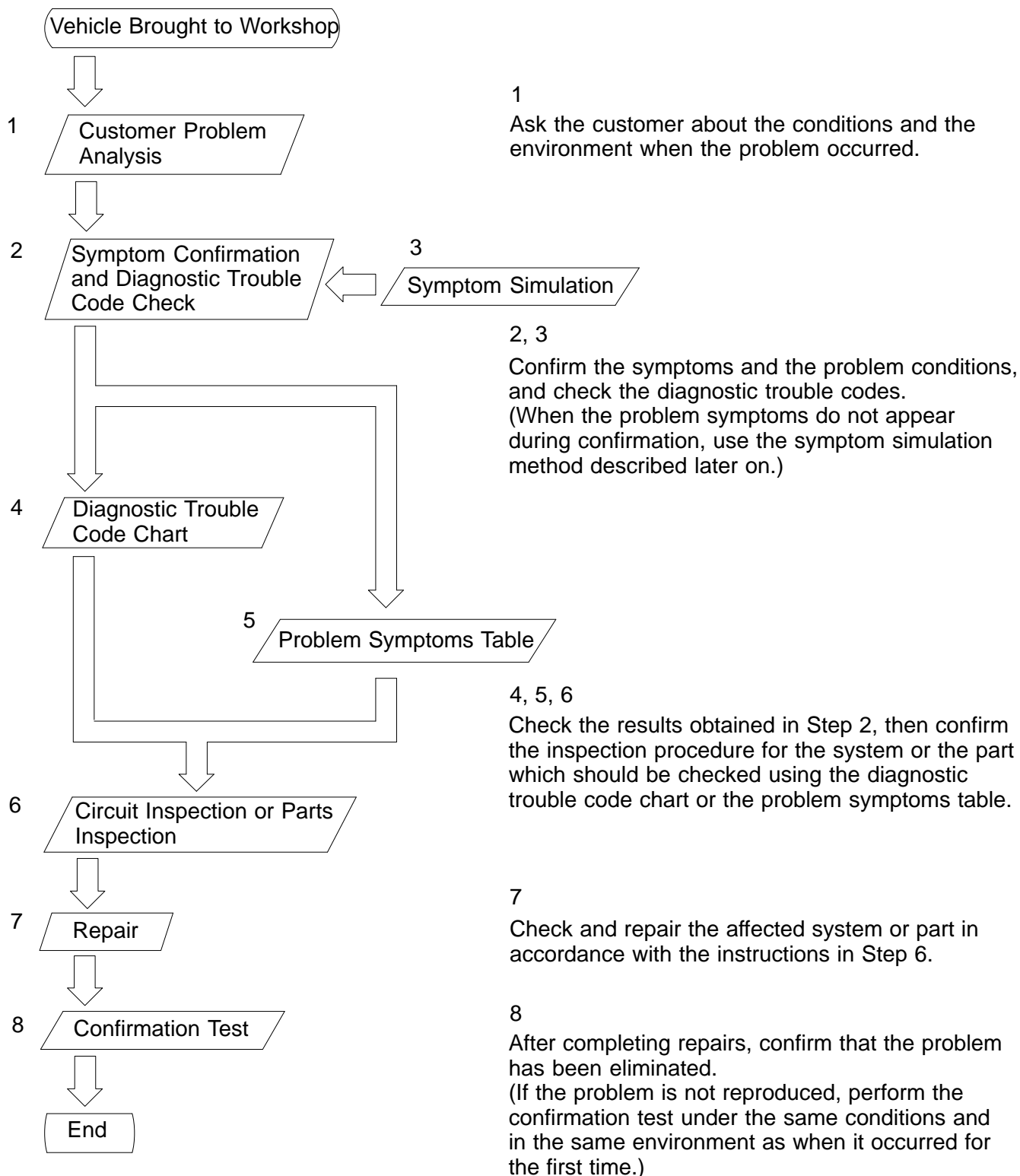
System	Page
1. Engine	DI-1
2. Automatic Transmission	DI-129
3. Anti-Lock Brake System	DI-188
4. Supplemental Restraint System	DI-238
5. Cruise Control System	DI-284

FOR USING OBD II SCAN TOOL OR TOYOTA HAND-HELD TESTER

- Before using the scan tool or tester, the scan tool's instruction book or tester's operator manual should be read thoroughly.
- If the scan tool or tester cannot communicate with ECU controlled systems when you have connected the cable of the scan tool or tester to DLC3, 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 the diagnosis data link line (Bus \oplus line) or ECU power circuit of the 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 perform the Self Test procedures outline in the Tester Operator's Manual.

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure on the following page. Here, only the basic procedure is shown. Details are provided in Diagnostics 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. 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 judgment. 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 Point 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 Diagnostics 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.

ENGINE CONTROL SYSTEM Check Sheet				Inspector's Name	
Customer's Name		Model and Model Year			
Driver's Name		Frame No.			
Data Vehicle Brought in		Engine Model			
License No.		Odometer Reading	km miles		
Problem Symptoms	<input type="checkbox"/> Engine does not Start	<input type="checkbox"/> Engine does not crank	<input type="checkbox"/> No initial combustion	<input type="checkbox"/> No complete combustion	
	<input type="checkbox"/> Difficult to Start	<input type="checkbox"/> Engine cranks slowly <input type="checkbox"/> Other _____			
	<input type="checkbox"/> Poor Idling	<input type="checkbox"/> Incorrect first idle <input type="checkbox"/> Idling rpm is abnormal <input type="checkbox"/> High (rpm) <input type="checkbox"/> Low (rpm) <input type="checkbox"/> Rough idling <input type="checkbox"/> Other _____			
	<input type="checkbox"/> Poor Drive ability	<input type="checkbox"/> Hesitation <input type="checkbox"/> Back fire <input type="checkbox"/> Muffler explosion (after-fire) <input type="checkbox"/> Surging <input type="checkbox"/> Knocking <input type="checkbox"/> Other _____			
	<input type="checkbox"/> Engine Stall	<input type="checkbox"/> Soon after starting <input type="checkbox"/> After accelerator pedal depressed <input type="checkbox"/> After accelerator pedal released <input type="checkbox"/> During A/C operation <input type="checkbox"/> Shifting from N to D <input type="checkbox"/> Other _____			
	<input type="checkbox"/> Others				
<input type="checkbox"/> constant <input type="checkbox"/> Sometimes (times per day/month)					



2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the LAND CRUISER 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 at the time of occurrence, to be output by the technician 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 LAND CRUISER.

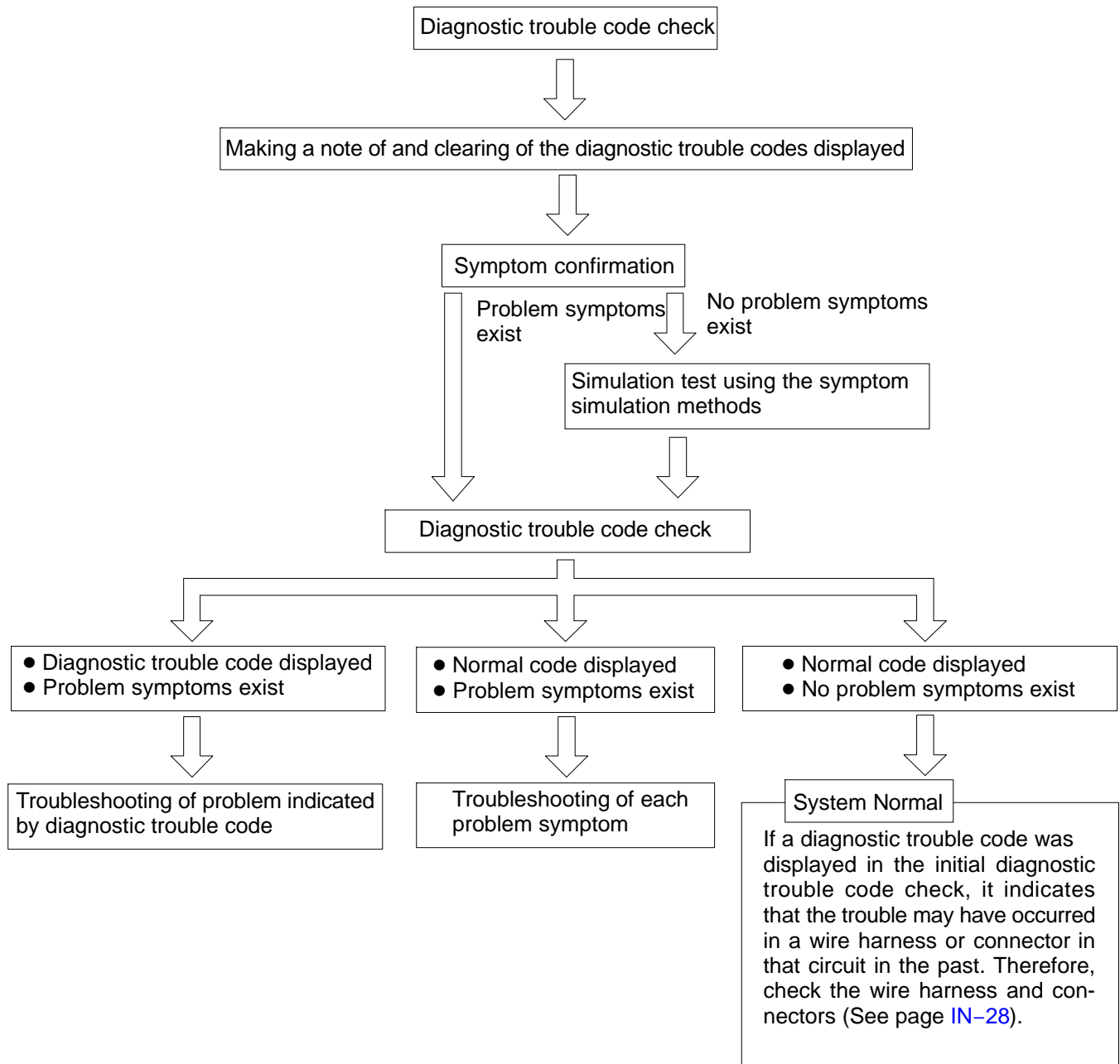
System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Diagnostic Test Mode (Active Test)
1. Engine	○ (with Check Mode)	○	○
2. Automatic Transmission	○ (with Check Mode)	○	○
3. Anti-Lock Brake System	○	○	○
4. Supplemental Restraint System	○	○	
5. Cruise Control System	○	○	

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)
			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 points on the previous page, 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 table.

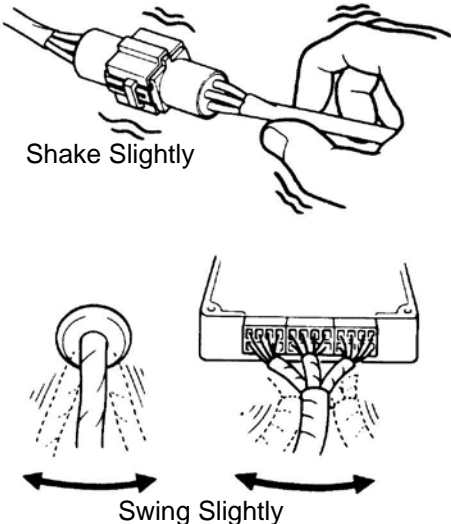
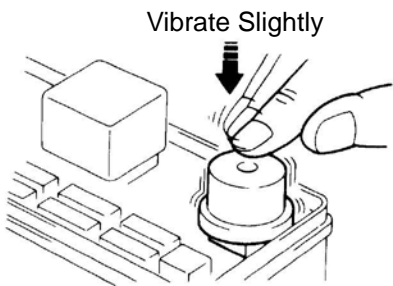


3. SYMPTOM SIMULATION

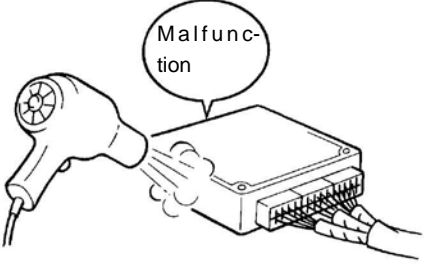

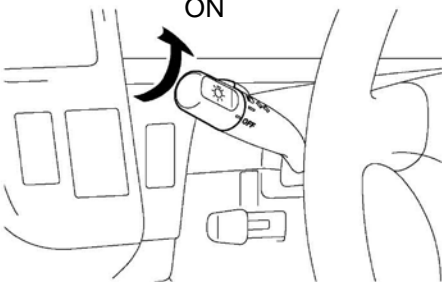
The most difficult case in troubleshooting is when there are no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out, then simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle. No matter how much 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) is likely cause for problem which is 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 problem symptoms table for each system to narrow down the possible causes of the symptom.

1	VIBRATION METHOD: When vibration seems to be the major cause.	
<p>CONNECTORS Slightly shake the connector vertically and horizontally.</p> <p>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.</p>		 <p>FI2331 FI2332</p>
<p>PARTS AND SENSOR Apply slight vibration with a finger to the part of the sensor considered to be the problem cause and check that the malfunction occurs.</p> <p>HINT: Applying strong vibration to relays may result in open relays.</p>		 <p>FI2330</p>

V07268

2	HEAT METHOD: When the problem seems to occur when the suspect area is heated.
<p>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.</p> <p>NOTICE:</p> <p>(1) Do not heat to more than 60°C (140°F). (Temperature is limited not to damage the components.)</p> <p>(2) Do not apply heat directly to parts in the ECU.</p>	 <p>FI2334</p>
3	WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high-humidity condition.
<p>Sprinkle water onto the vehicle and check to see if the malfunction occurs.</p> <p>NOTICE:</p> <p>(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.</p> <p>(2) Never apply water directly onto the electronic components.</p> <p>HINT:</p> <p>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 taken.</p>	 <p>FI6649</p>
4	OTHER: When a malfunction seems to occur when electrical load is excessive.
<p>Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.</p>	 <p>B02389</p>

B02390

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

- Trouble Area
Indicates the suspect area of the problem.

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

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

If a malfunction code is displayed during the DTC check mode, check the circuit for the code listed in the table below. For details of each code, turn to the page referred to under the "See page" for the respective "DTC No." in the DTC chart.

SAE CONTROLLED

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI-24)	Mass Air Flow Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM 	○	○
P0101 (DI-28)	Mass Air Flow Circuit Range/ Performance Problem	<ul style="list-style-type: none"> ● Mass air flow meter 	○	○
P0110 (DI-29)	Intake Air Temp. Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM 	○	○
P0115 (DI-33)	Engine Coolant Temp. Circuit Malfunction	<ul style="list-style-type: none"> ● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM 	○	○
P0116 (DI-37)	Engine Coolant Temp. Circuit Range/ Performance Problem	<ul style="list-style-type: none"> ● Engine coolant temp. sensor ● Cooling system 	○	○
	Throttle Position Sensor/Switch Malfunction	<ul style="list-style-type: none"> ● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM 		
	Throttle Position Sensor/ Switch Range/ Performance Problem	<ul style="list-style-type: none"> ● Throttle position sensor 		

5. PROBLEM SYMPTOMS TABLE

The suspected circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot 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.

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

● Problem Symptom

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

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST-2 ST-17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. ECM	DI-147 DI-151 IN-29
No complete combustion (Does not start)	1. Fuel pump control circuit	DI-151
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI-144 DI-151 EM-3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI-144 DI-151
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI-144 DI-151
Engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC-88
Engine idle speed (Poor idling)	1. A/C signal circuit 2. Fuel pump control circuit	
Engine idle speed (Poor idling)	1. Compression 2. Fuel pump control circuit	

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

CIRCUIT DESCRIPTION

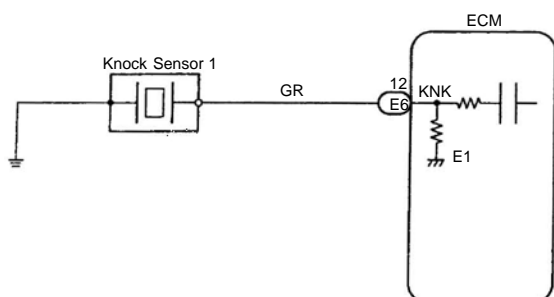
Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detection Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, 1,200 rpm or more.	<ul style="list-style-type: none"> • Open or short in knock sensor1 circuit • Knock sensor 1 (looseness) • ECM

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

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

WIRING DIAGRAM



- Wiring Diagram

This shows a wiring diagram of the circuit.

Use this diagram together with ELECTRICAL WIRING DIAGRAM to thoroughly understand the circuit.

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, SB = Sky Blue

The first letter indicates the basic wire color and the second letter indicates the color of the stripe.

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

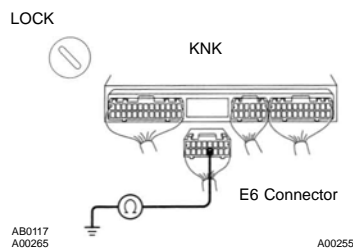


- Inspection Procedure

Use the inspection procedure 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.

INSPECTION PROCEDURE

- Check continuity between terminal KNK of ECM connector and body ground.



PREPARATION:

- Remove the glove compartment (See page SF-68).
- Disconnect the E6 connector from the ECM.

CHECK:

Measure the resistance between terminal KNK of the ECM connector and body ground.

OK:

Resistance: 1 M Ω or higher

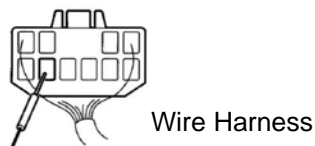
OK Go to step 3.

NG

- Check knock sensor (See page SF-61).

OK Replace knock sensor.

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

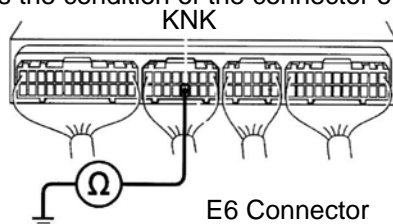


Check from the connector back side.
(with harness)

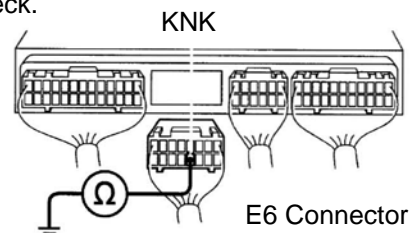


Check from the connector front side. (without harness)
In this case, care must be taken not to bend the terminals.

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



Connector being checked is connected.



Connector being checked is disconnected.

V08425

HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code charts or problem symptom table are provided for each circuit with detailed inspection procedures on the following pages. 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, refer to Step 8 to replace the ECU. So always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
- 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.

OPEN CIRCUIT:

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

HINT:

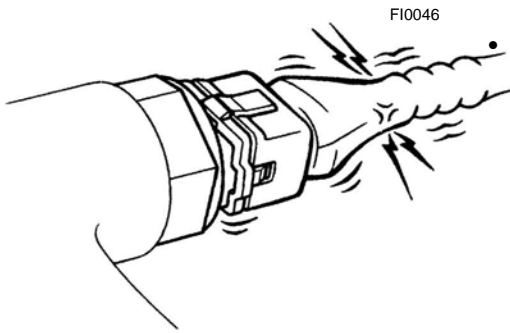
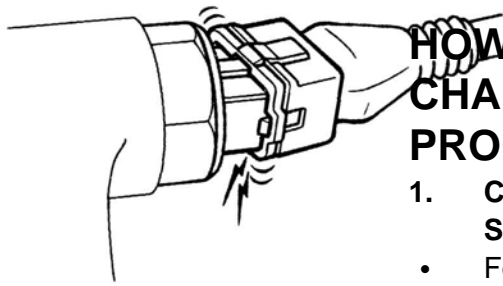
- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a deformation of connector terminals. 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:

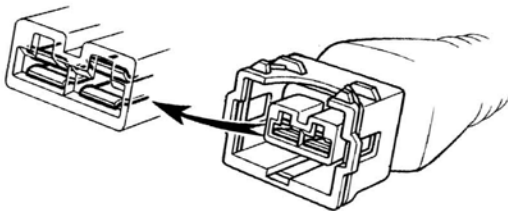
This could be due to a contact between wire harness and the body ground or to a short circuit occurred inside the switch, etc.

HINT:

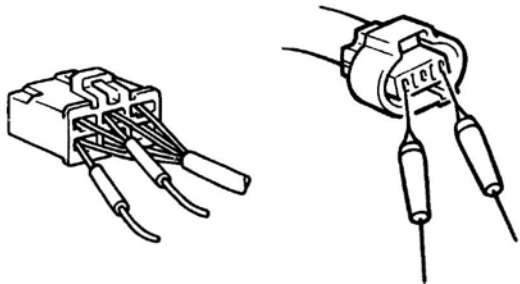
When there is a short circuit between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.



F10047



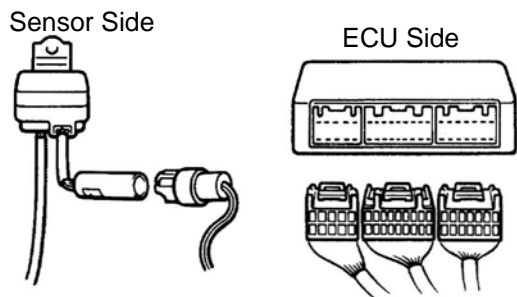
F10048



FI7187

2. CONNECTOR HANDLING

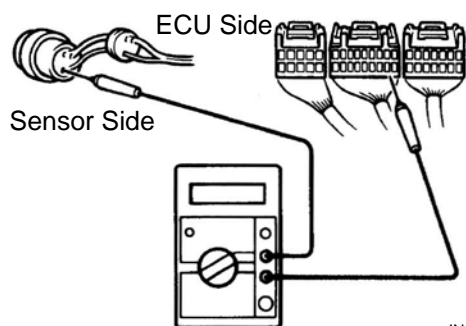
When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.



IN0379

3. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

- Disconnect the connectors at both ECU and sensor sides.



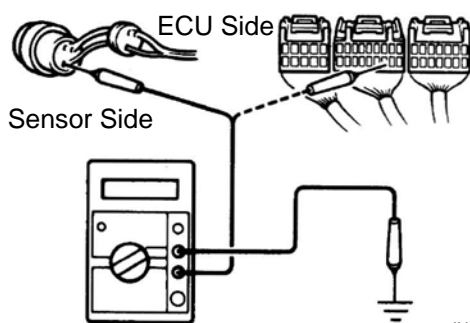
IN0378

- Measure the resistance between the applicable terminals of the connectors.

Resistance: 1 Ω or less

HINT:

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



IN0380

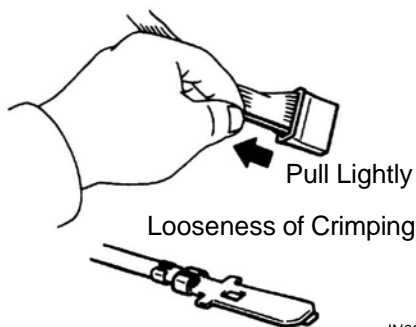
4. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

- Disconnect the connectors on both ends.
- Measure the resistance between the applicable terminals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 1 M Ω or higher

HINT:

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



IN0381

5. VISUAL CHECK AND CONTACT PRESSURE CHECK

- Disconnect the connectors at both ends.
- Check for rust or foreign material, etc. in the terminals of the connectors.
- Check crimped portions for looseness or damage and check that the terminals are secured in lock portion.

HINT:

The terminals should not come out when pulled lightly from the back.

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

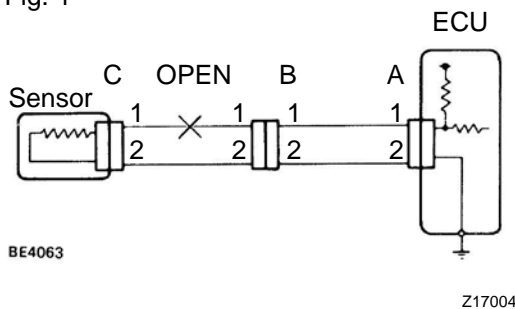
NOTICE:

When testing a gold-plated female terminal, always use a gold-plated male terminal.

HINT:

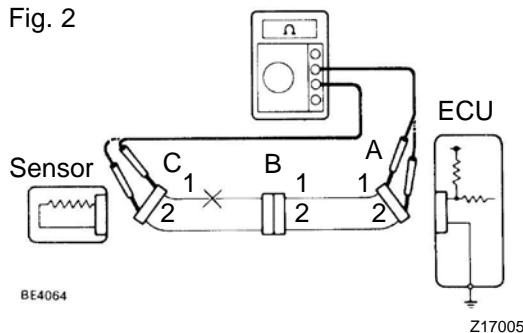
When the test terminal is pulled out more easily than others, there may be poor contact in that section.

Fig. 1

**6. CHECK OPEN CIRCUIT**

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

Fig. 2



- (a) Check the continuity.

- (1) Disconnect connectors "A" and "C" and measure the resistance between them.

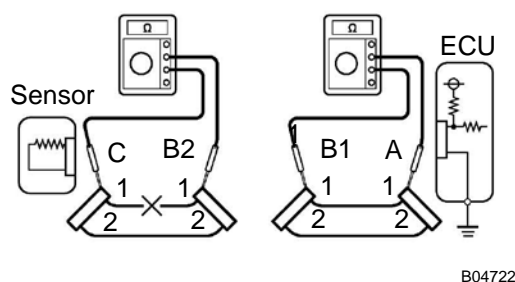
In the case of Fig. 2:

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. 3



- (2) Disconnect connector "B" and measure the resistance between the connectors.

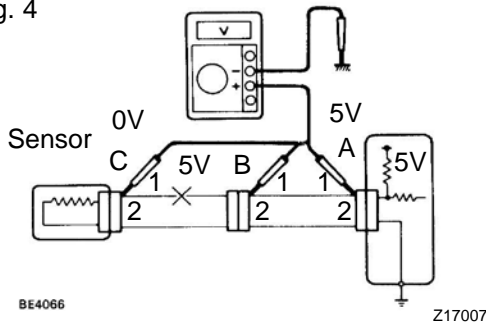
In the case of Fig. 3:

Between terminal 1 of connector "A" and terminal 1 of connector "B1" → Continuity

Between terminal 1 of connector "B2" 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 "B2" and terminal 1 of connector "C".

Fig. 4



(b) Check the voltage.

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.

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 5V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order.

If the results are:

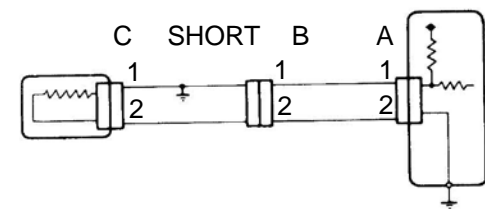
5V: Between Terminal 1 of connector "A" and Body Ground

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

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

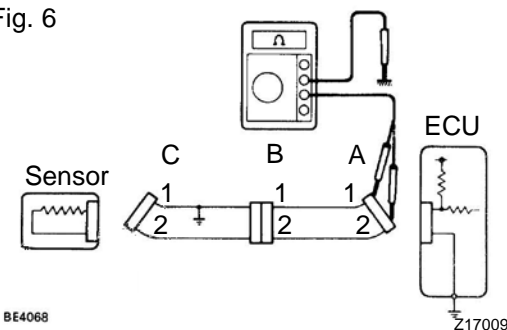
Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C".

Fig. 5

**7. CHECK SHORT CIRCUIT**

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

Fig. 6



Check the continuity with ground.

- (1) Disconnect connectors "A" and "C" and measure the resistance between terminal 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 (short)

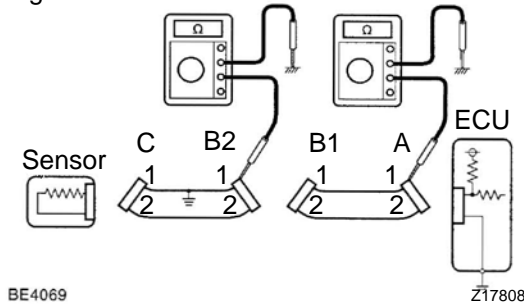
Between terminal 2 of connector "A" and body ground → No continuity

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

IN-32

INTRODUCTION – HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

Fig. 7



- (2) Disconnect connector "B" and measure the resistance between terminal 1 of connector "A" and body ground, and terminal 1 of connector "B2" and body ground.

In the case of Fig. 7:

Between terminal 1 of connector "A" and body ground → No continuity

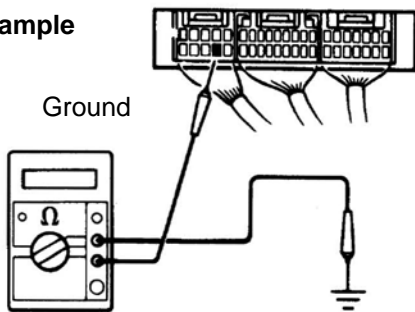
Between terminal 1 of connector "B2" and body ground → Continuity (short)

Therefore, it is found out that there is a short circuit between terminal 1 of connector "B2" and terminal 1 of connector "C".

8. 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 normal functioning one and check that the symptoms appear.

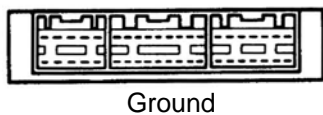
Example



- (1) Measure the resistance between the ECU ground terminal and the body ground.

Resistance: 1 Ω or less

ECU Side



W/H Side



TERMS

ABBREVIATIONS USED IN THIS MANUAL

IN04Q-07

Abbreviations	Meaning
ABS	Anti-Lock Brake System
AC	Alternating Current
ACC	Accessory
ACIS	Acoustic Control Induction System
ACSD	Automatic Cold Start Device
A.D.D.	Automatic Disconnecting Differential
A/F	Air-Fuel Ratio
AHC	Active Height Control Suspension
ALR	Automatic Locking Retractor
ALT	Alternator
AMP	Amplifier
ANT	Antenna
APPROX.	Approximately
A/T	Automatic Transmission (Transaxle)
ATF	Automatic Transmission Fluid
AUTO	Automatic
AUX	Auxiliary
AVG	Average
AVS	Adaptive Variable Suspension
BA	Brake Assist
BACS	Boost Altitude Compensation System
BAT	Battery
BDC	Bottom Dead Center
B/L	Bi-Level
B/S	Bore-Stroke Ratio
BTDC	Before Top Dead Center
BVSV	Bimetallic Vacuum Switching Valve
Calif.	California
CB	Circuit Breaker
CCo	Catalytic Converter For Oxidation
CD	Compact Disc
CF	Cornering Force
CG	Center Of Gravity
CH	Channel
COMB.	Combination
CPE	Coupe
CPS	Combustion Pressure Sensor
CPU	Central Processing Unit
CRS	Child Restraint System
CTR	Center
C/V	Check Valve
CV	Control Valve

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INTRODUCTION – TERMS

CW	Curb Weight
DC	Direct Current
DEF	Defogger
DFL	Deflector
DIFF.	Differential
DIFF. LOCK	Differential Lock
D/INJ	Direct Injection
DLI	Distributorless Ignition
DOHC	Double Over Head Cam
DP	Dash Pot
DS	Dead Soak
DSP	Digital Signal Processor
EBD	Electronic Brake Force Distribution
ECAM	Engine Control And Measurement System
ECD	Electronic Controlled Diesel
ECDY	Eddy Current Dynamometer
ECU	Electronic Control Unit
ED	Electro-Deposited Coating
EDIC	Electric Diesel Injection Control
EDU	Electronic Driving Unit
EFI	Electronic Fuel Injection
E/G	Engine
EGR-VM	Exhaust Gas Recirculation-Vacuum Modulator
ELR	Emergency Locking Retractor
ENG	Engine
ESA	Electronic Spark Advance
ETCS	Electronic Throttle Control System
EVP	Evaporator
E-VRV	Electric Vacuum Regulating Valve
EXH	Exhaust
FE	Fuel Economy
FF	Front-Engine Front-Wheel-Drive
F/G	Fuel Gage
FIPG	Formed In Place Gasket
FL	Fusible Link
F/P	Fuel Pump
FPU	Fuel Pressure Up
Fr	Front
FR	Front-Engine Rear-Wheel-Drive
F/W	Flywheel
FW/D	Flywheel Damper
FWD	Front-Wheel-Drive
GAS	Gasoline
GSA	Gear Shift Actuator
GND	Ground
HAC	High Altitude Compensator

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Author :

Date :

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INTRODUCTION – TERMS

H/B	Hatchback
H-FUSE	High Current Fuse
HI	High
HID	High Intensity Discharge (Head Lamp)
HPU	Hydraulic Power Unit
HSG	Housing
HT	Hard Top
HWS	Heated Windshield System
IAC	Idle Air Control
IC	Integrated circuit
IDI	Indirect Diesel Injection
IFS	Independent Front Suspension
IG	Ignition
IIA	Integrated Ignition Assembly
IN	Intake (Manifold, Valve)
INT	Intermittent
I/P	Instrument Panel
IRS	Independent Rear Suspension
J/B	Junction Block
J/C	Junction Connector
KD	Kick-Down
LAN	Local Area Network
LB	Liftback
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LH	Left-Hand
LHD	Left-Hand Drive
L/H/W	Length, Height, Width
LLC	Long-Life Coolant
LNG	Liquified Natural Gas
LO	Low
LPG	Liquified Petroleum Gas
LSD	Limited Slip Differential
LSP & PV	Load Sensing Proportioning And Bypass Valve
LSPV	Load Sensing Proportioning Valve
MAX.	Maximum
M-FUSE	Medium Current Fuse
MIC	Microphone
MIL	Malfunction Indicator Lamp
MIN.	Minimum
MP	Multipurpose
MPX	Multiplex Communication System
M/T	Manual Transmission (Transaxle)
MT	Mount
MTG	Mounting
N	Neutral

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INTRODUCTION – TERMS

NA	Natural Aspiration
No.	Number
O/D	Overdrive
OEM	Original Equipment Manufacturing
OHC	Overhead Camshaft
OHV	Overhead Valve
OPT	Option
O/S	Oversize
P & BV	Proportioning And Bypass Valve
PCS	Power Control System
PCV	Positive Crankcase Ventilation
PKB	Parking Brake
PPS	Progressive Power Steering
PS	Power Steering
PTO	Power Take-Off
R & P	Rack And Pinion
R/B	Relay Block
RBS	Recirculating Ball Type Steering
R/F	Reinforcement
RFS	Rigid Front Suspension
RH	Right-Hand
RHD	Right-Hand Drive
RLY	Relay
ROM	Read Only Memory
Rr	Rear
RR	Rear-Engine Rear-Wheel Drive
RRS	Rigid Rear Suspension
RWD	Rear-Wheel Drive
SDN	Sedan
SEN	Sensor
SICS	Starting Injection Control System
SMT	Sequential Manual Transmission
SOC	State Of Charge
SOHC	Single Overhead Camshaft
SPEC	Specification
SPI	Single Point Injection
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
STJ	Cold-Start Fuel Injection
SW	Switch
SYS	System
T/A	Transaxle
TACH	Tachometer
TBI	Throttle Body Electronic Fuel Injection

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INTRODUCTION – TERMS

TC	Turbocharger
TCCS	TOYOTA Computer-Controlled System
TCV	Timing Control Valve
TDC	Top Dead Center
TEMP.	Temperature
TEMS	TOYOTA Electronic Modulated Suspension
TIS	Total Information System For Vehicle Development
T/M	Transmission
TMC	TOYOTA Motor Corporation
TMMK	TOYOTA Motor Manufacturing Kentucky, Inc.
TRAC	Traction Control System
TURBO	Turbocharge
U/D	Underdrive
U/S	Undersize
VCV	Vacuum Control Valve
VENT	Ventilator
VIN	Vehicle Identification Number
VPS	Variable Power Steering
VSC	Vehicle Skid Control
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
WGN	Wagon
W/H	Wire Harness
w/o	Without
1st	First
2nd	Second
2WD	Two Wheel Drive Vehicle (4x2)
4WD	Four Wheel Drive Vehicle (4x4)

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 ABBREVIATIONS	SAE TERMS	TOYOTA TERMS ()--ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner, A/CL
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	HAC
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CTP	Closed Throttle Position	LL ON, Idle ON
DFI	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: Total Diagnosis Communication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	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)
EGR	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)

INTRODUCTION – TERMS

HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO ₂ S)
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 (IDL)
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	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Lamp
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non-Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, O ₂ Sensor (O ₂ S)
OBD	On-Board Diagnostic	On-Board Diagnostic System (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Convert (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	E-ABV
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
SRT	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

1996 LAND CRUISER (RM451U)

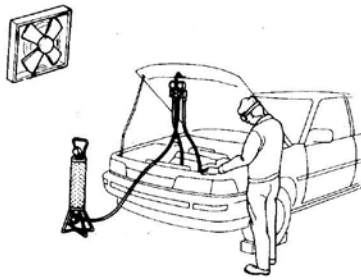
IN-40

INTRODUCTION – TERMS

TCM	Transmission Control Module	Transmission ECU, ECT ECU
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) Manifold Converter 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
WOT	Wide Open Throttle	Full Throttle
WU-OC	Warm Up Oxidation Catalytic Converter	–
WU-TWC	Warm Up Three-Way Catalytic Converter	–
3GR	Third Gear	–
4GR	Fourth Gear	–

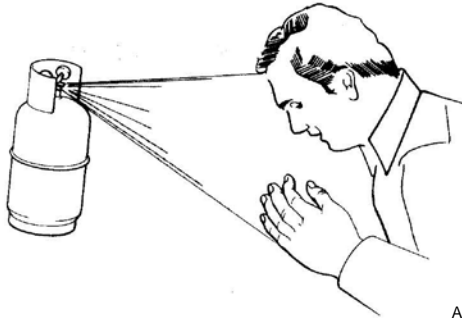
AIR CONDITIONING SYSTEM PRECAUTION

AC20A-01



AC2810

1. **DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME**
2. **ALWAYS WEAR EYE PROTECTION**



AC2811

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.

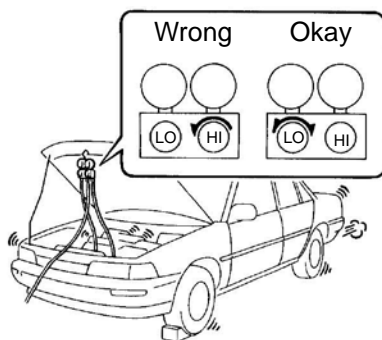
CAUTION:

Do not rub your eyes or skin.

- (b) Apply clean petroleum jelly to the skin.
- (c) Go immediately to a physician or hospital for professional treatment.

4. **NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME**

5. **BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT**



N11084

6. **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 compressor burnout may occur, so take care to avoid this.

7. **DO NOT OPEN HIGH PRESSURE MANIFOLD VALVE WHILE 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 only low pressure valve.

8. **BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT**

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating etc.

9. SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The LAND CRUISER is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and passenger air bag. 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 SRS, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following item carefully, then follow the correct procedure described in the repair manual.

PROBLEM SYMPTOMS TABLE

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.

Symptom	Suspect Area	See page
No blower operation	4. HTR Fuse 5. Heater main relay 6. Blower motor 7. Blower resistor 8. Blower speed control switch 9. Wire harness	– AC-64 AC-52 AC-57 AC-69 –
No air temperature control	1. Engine coolant volume 2. A/C control assembly 3. Water valve	– AC-69 AC-49
No compressor operation	1. Refrigerant volume 2. A.C Fuse 3. Magnetic clutch 4. Compressor 5. Pressure switch 6. Heater main relay 7. Blower speed control switch 8. A/C switch 9. A/C amplifier 10. Thermistor 11. Wire harness	AC-5 – AC-33 AC-33 AC-61 AC-64 AC-69 AC-69 AC-74 AC-60 –
Compressor operates intermittently	1. Refrigerant volume 2. Pressure switch 3. A/C amplifier 4. Thermistor 5. Wire harness	AC-5 AC-61 AC-74 AC-60 –
No cool air comes out	1. Refrigerant volume 2. Refrigerant pressure 3. Drive belt 4. Magnetic clutch 5. Compressor 6. Pressure switch 7. Thermistor 8. A/C switch 9. A/C amplifier 10. A/C control assembly 11. Wire harness	AC-5 AC-5 AC-15 AC-33 AC-33 AC-61 AC-60 AC-69 AC-74 AC-69 –
Cool air comes out only at high engine rpm	1. Refrigerant volume 2. Drive belt 3. Magnetic clutch 4. Compressor 5. Condenser 6. Receiver 7. Expansion valve 8. Evaporator 9. Thermistor 10. A/C amplifier 11. Wire harness	AC-5 AC-15 AC-33 AC-33 AC-42 AC-39 AC-47 AC-45 AC-60 AC-74 –

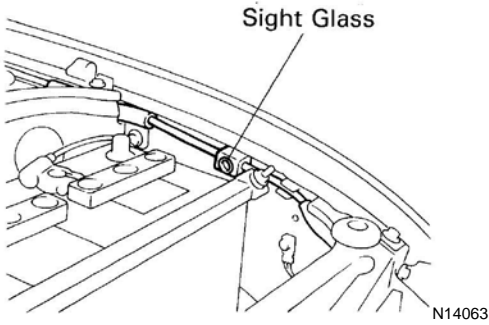
AC-4

AIR CONDITIONING – AIR CONDITIONING SYSTEM

Insufficient cooling	1. Refrigerant volume 2. Drive belt 3. Magnetic clutch 4. Compressor 5. Condenser 6. Receiver 7. Expansion valve 8. Evaporator 9. Refrigerant line 10. Pressure switch 11. A/C amplifier 12. A/C control assembly	AC-5 AC-15 AC-33 AC-33 AC-42 AC-39 AC-47 AC-45 AC-20 AC-61 AC-74 AC-69
No engine idle up when A/C switch ON	1. A/C amplifier 2. ECM 3. Wire harness	AC-74 – –
No warm air comes out	1. Engine coolant volume 2. A/C control assembly 3. Water valve 4. Heater radiator	– AC-69 AC-49 AC-46
A/C indicator does not light up when mode lever at DEF. position	1. Defroster mode switch 2. A/C switch 3. Wire harness	AC-69 AC-69 –

Rear heater:

Symptom	Suspect Area	See page
No blower operation	1. RR HTR Fuse 2. Rear heater relay 3. Rear heater switch 4. Rear blower motor 5. Rear blower resistor	– AC-65 AC-77 AC-55 AC-58
No warm air come out	1. Engine coolant volume 2. Rear heater radiator	– AC-46



ON-VEHICLE INSPECTION

1. INSPECT REFRIGERANT VOLUME

Observe the sight glass on the liquid tube.

Test conditions:

- Running engine at 1,500 rpm
- Blower speed control switch set at "HI"
- A/C switch ON
- Temperature control set at "MAX. COOL"
- Fully open doors

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient*	1. Check for gas leakage with gas leak tester and repair if necessary 2. Add refrigerant until bubbles disappear
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 leak tester and repair if necessary 2. Add refrigerant until bubbles disappear
4	Temperature between compressor inlet and outlet is noticeably different	Correct 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 refrigerant 2. Evacuate air and charge proper amount of purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stays clear	Correct	–

*: Bubbles in the sight glass with ambient temperatures higher than usual can be considered normal if cooling is sufficient.

2. INSPECT REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

This is a method in which the trouble is located by using a manifold gauge set. Read the manifold gauge pressure when the these conditions are established:

Test conditions:

- Temperature at the air inlet with the switch set at RECIRC is 30 – 35°C (86 – 95°F)
- Engine running at 1,500 rpm
- Blower speed control switch set at high
- 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.

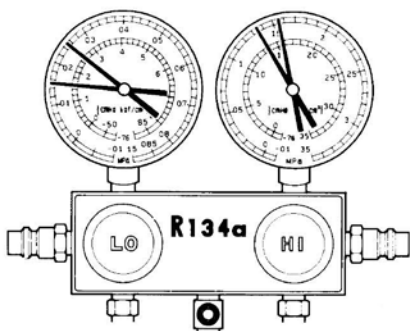
Gauge reading:

Low pressure side:

0.15 – 0.25 MPa (1.5 – 2.5 kgf/cm²)

High pressure side:

1.37 – 1.57 MPa (14 – 15 kgf/cm²)



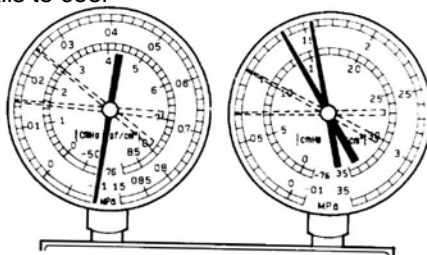
I01386

AC-6

AIR CONDITIONING – AIR CONDITIONING SYSTEM

(2) Moisture present in refrigeration system.

Condition: Periodically cools and then fails to cool

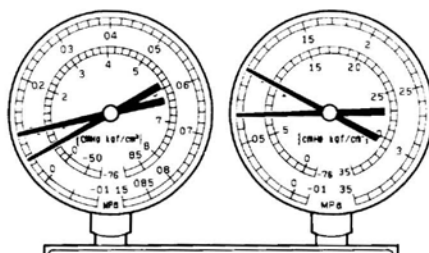


I01387

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
During operation, pressure on low pressure side sometimes become a vacuum and sometime normal	Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	<ul style="list-style-type: none"> • Drier in oversaturated state • Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant 	(1) Replace condenser (2) Remove moisture in cycle through repeatedly evacuating air (3) Charge proper amount of new refrigerant

(3) Insufficient cooling

Condition: Insufficient cooling



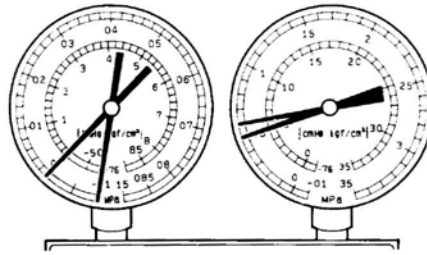
I01388

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> • Pressure low on both low and high pressure sides • Bubbles seen in sight glass continuously • Insufficient cooling performance 	Gas leakage at some place in refrigeration system	<ul style="list-style-type: none"> • Insufficient refrigerant in system • Refrigerant leaking 	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Charge proper amount of refrigerant (3) If indicated pressure value is near 0 when connected to gauge, create the vacuum after inspecting and repairing the location of the leak

AIR CONDITIONING – AIR CONDITIONING SYSTEM

(4) Poor circulation of refrigerant

Condition: Insufficient cooling

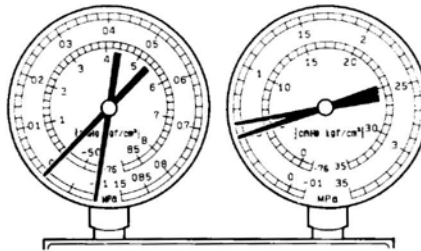


I01389

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> Pressure low in both low and high pressure sides Frost on tube from condenser to unit 	Refrigerant flow obstructed by dirt in condenser	condenser clogged	Replace condenser

(5) Refrigerant does not circulate

Condition: Does not cool (Cools from time to time in some cases)



I01449

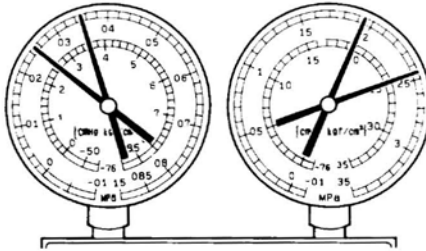
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> Vacuum indicated on low pressure side, very low pressure indicated on high pressure side Frost or dew seen on piping before and after condenser/ drier or expansion valve 	<ul style="list-style-type: none"> Refrigerant flow obstructed by moisture or dirt in refrigeration system Refrigerant flow obstructed by gas leakage from expansion valve 	Refrigerant does not circulate	<ol style="list-style-type: none"> (1) Check expansion valve (2) Clean out dirt in expansion valve by blowing with air (3) Replace condenser (4) Evacuate air and charge new refrigerant to proper amount (5) For gas leakage from expansion valve, replace expansion valve

AC-8

AIR CONDITIONING – AIR CONDITIONING SYSTEM

(6) Refrigerant overcharged or insufficient cooling of condenser

Condition: Insufficient cooling

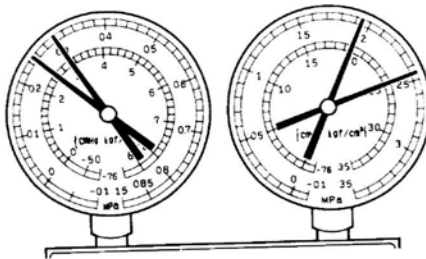


I01390

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Unable to develop sufficient performance due to excessive refrigeration system Insufficient cooling of condenser 	<ul style="list-style-type: none"> Excessive refrigerant in cycle → refrigerant over charged Condenser cooling → condenser fins clogged or cooling fan faulty 	<ul style="list-style-type: none"> (1) Clean condenser (2) Check cooling fan with fluid coupling operation (3) If (1) and (2) are in normal state, check amount of refrigerant Charge proper amount of refrigerant

(7) Air present in refrigeration system

Condition: Insufficient cooling



NOTE : These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

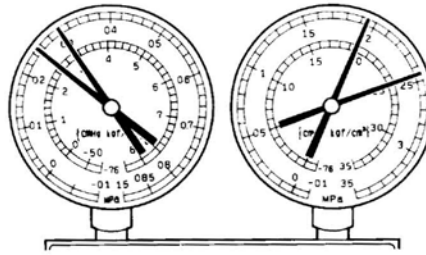
I01392

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> Pressure too high on both low and high pressure sides The low pressure piping hot to touch Bubbles seen in sight glass 	Air entered in refrigeration system	<ul style="list-style-type: none"> Air present in refrigeration system Insufficient vacuum purging 	<ul style="list-style-type: none"> (1) Check compressor oil to see if it is dirty or insufficient (2) Evacuate air and charge new refrigerant

AIR CONDITIONING – AIR CONDITIONING SYSTEM

(8) Expansion valve improperly

Condition: Insufficient cooling

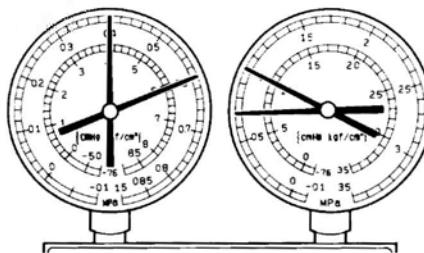


I01450

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Excessive refrigerant in low pressure piping • Expansion valve opened too wide 	<ul style="list-style-type: none"> Check expansion valve Replace if defective

(9) Defective compression compressor

Condition : Does not cool



I01393

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
<ul style="list-style-type: none"> • Pressure too high on low and high pressure sides • Pressure too low on high pressure side 	Internal leak in compressor	<ul style="list-style-type: none"> • Compression defective • Valve leaking or broken sliding parts 	Repair or replace compressor

3. INSPECT IDLE-UP SPEED

- (a) Warm up engine
- (b) Inspect idle-up speed when the these conditions are established:
 - Blower switch HI
 - Electrical load OFF
 - A/C switch ON
 - Put gear shift in neutral

Magnetic clutch condition	Idle speed
Magnetic clutch not engaged	650 ± 50 rpm
Magnetic clutch engaged	800 ± 50 rpm

If idle speed is not as specified, check the IAC valve and air intake system.

4. INSPECT FOR LEAKAGE OF REFRIGERANT

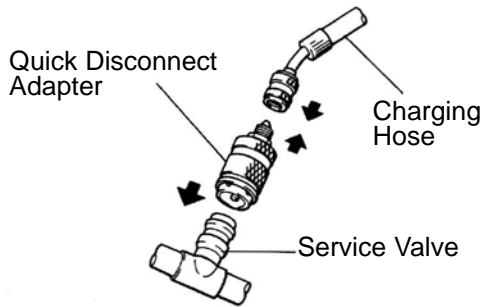
- (a) Perform in these conditions:
 - Stop engine.
 - Secure good ventilation (If not, the gas leak detector may react to volatile gases which are not refrigerant, such as evaporated gasoline and exhaust gas.)
 - Repeat the test 2 or 3 times.
 - Make sure that there is some refrigerant remaining in the refrigeration system.
When compressor is OFF: approximately 392 – 588 KPa (4 – 6 kgf/cm², 57 – 35 psi)
- (b) Bring the gas leak detector close to the drain hose before performing the test.

HINT:

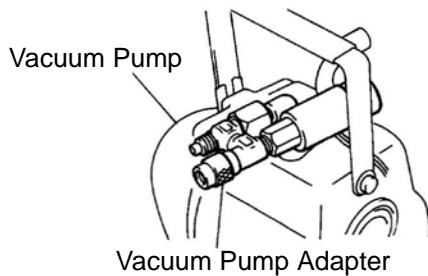
- After the blower motor is stopped, leave the cooling unit for more than 15 minutes.
- Expose the gas leak detector sensor the under the drain hose.
- When bring the gas leak detector close to the drain hose, make sure that the gas leak detector does not react to the volatile gases.

If such reaction is unavoidable, the vehicle must be lifted up.

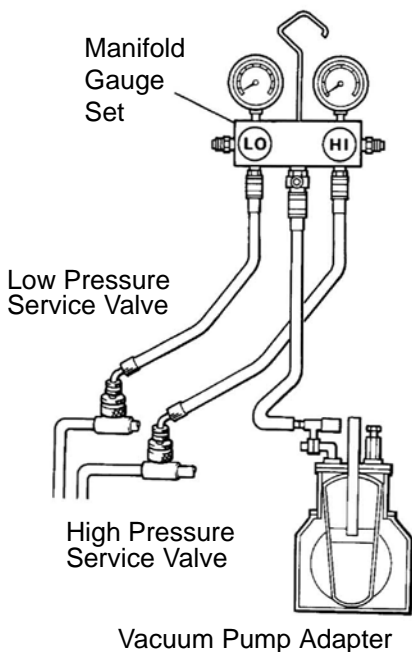
- (c) If gas leak is not detected on the drain hose, remove the power transistor from the cooling unit. Then insert the gas leak detector sensor into the unit and perform the test.
- (d) Disconnect the connector and leave the pressure switch for approximately 20 minutes. Then bring the gas leak detector close to the pressure switch and perform the test.
- (e) Bring the gas leak detector close to the refrigerant lines and perform the test.



N13795



N13794



N13791

EVACUATING

1. **CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES**
2. **REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINES**
3. **INSTALL MANIFOLD GAUGE SET**
 - (a) Close both hand valves of manifold gauge set.
 - (b) Connect the quick disconnect adapters to the service valves.
4. **EVACUATE AIR FROM REFRIGERATION SYSTEM**
 - (a) Connect the vacuum pump adapter to the vacuum pump.

- (b) Connect the center hose of the manifold gauge set to the vacuum pump adapter.
- (c) Open both the high and low hand valves and run the vacuum pump.
- (d) After 10 minutes or more, check that the low pressure gauge indicates 750 mmHg (30 in.Hg) or more.

HINT:

If the reading is not 750 mmHg (30 in.Hg) or more, close both hand valves of manifold gauge set and stop the vacuum pump. Check the system for leaks and repair as necessary.

- (e) Close both the high and low hand valves and stop the vacuum pump.
- (f) Leave the system in this condition for 5 minutes or more and check that there is no gauge indicator.

CHARGING

1. INSTALL CHARGING CYLINDER

HINT:

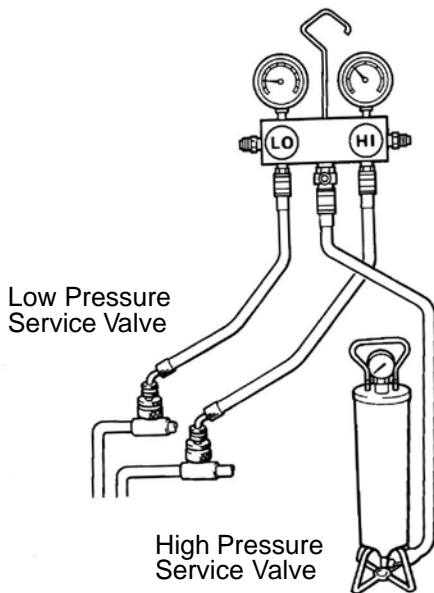
When handling the charging cylinder, always follow the direction given in the instruction manual.

- Charge the proper amount of refrigerant in charging cylinder.
- Connect the center hose to the charging cylinder.

CAUTION:

Do not open both high and low hand valves of manifold gauge set.

- Open the valve of charging cylinder.
- Press the valve core on the side of manifold gauge and expel the air inside of the center hose.



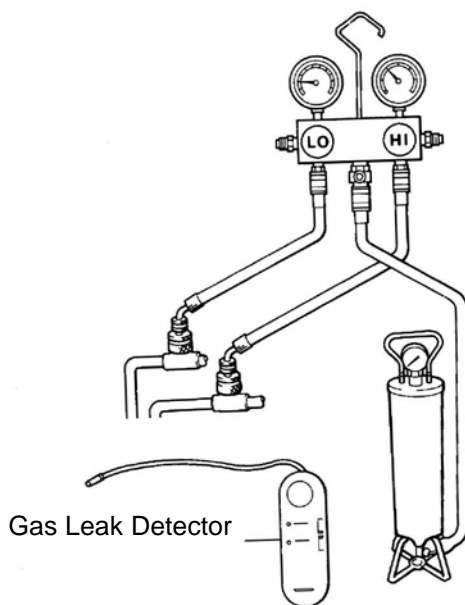
N13790

2. INSPECT REFRIGERATION SYSTEM FOR LEAKS

- Open the high pressure hand valve and charge refrigerant.
- When the low pressure gauge indicates 98 kPa (1 kgf/cm², 14 psi), close the high pressure hand valve.
- Using leak detector, check the system for leakage.
- If leak is found, repair the faulty component or connection. Add evacuate air from refrigeration system (Refer to 4).

CAUTION:

Use the refrigerant recovery/ recycling machine to recover the refrigerant whenever replacing parts.



N13792

AUTOMATIC TRANSMISSION SYSTEM

PRECAUTION

AT0SY-01

If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

3. CHARGE REFRIGERANT INTO REFRIGERANT SYSTEM

If there is no leak after refrigerant leak check charge, the proper amount of refrigerant into refrigeration system.

CAUTION:

Never run the engine when charging the system through the high pressure side. Do not open the low pressure hand valve when the system is being charged with liquid refrigerant.

- (a) Open the high pressure hand valve fully.
- (b) Charge specified amount of refrigerant, then close the high pressure hand valve.

HINT:

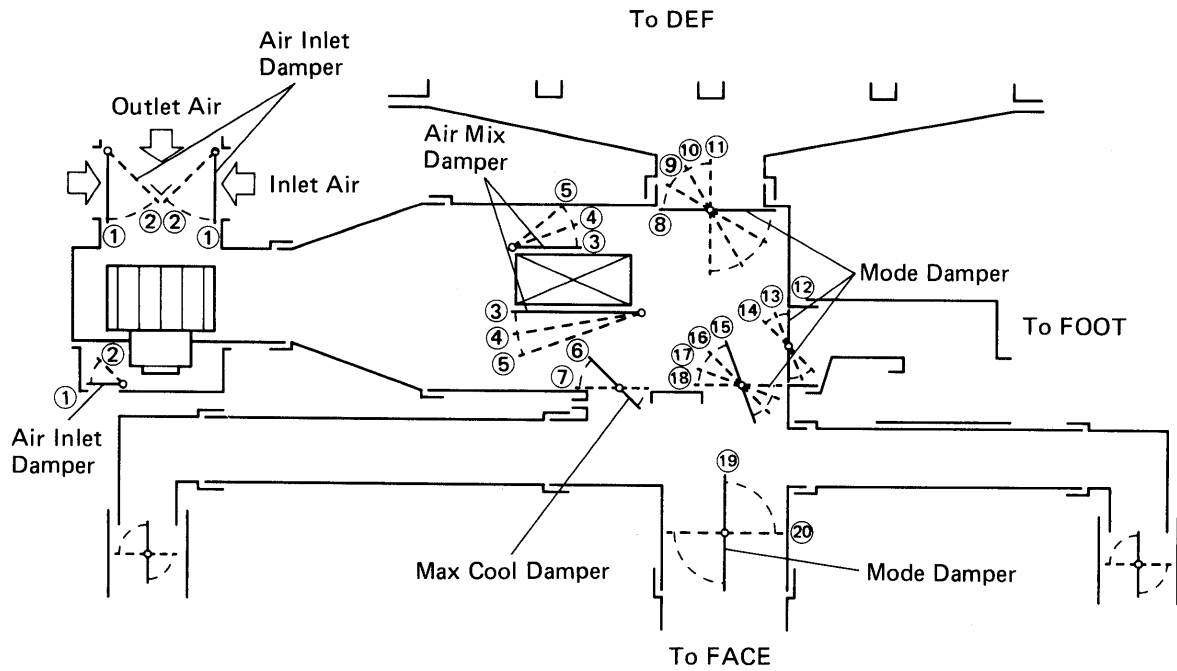
A fully charged system is indicated by the sight glass being free of any bubbles.










4. REMOVE MANIFOLD GAUGE SET

- (a) Close both hand valves of manifold gauge set.
- (b) Disconnect the quick disconnect adapters from the service valves.

5. INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINES

POSITIONING



A/C control lever	A/C control lever position	Dampers position	Air flow vents			
			FACE		FOOT	DEF
			Center	Side		
Air Inlet Control Lever	Fresh 	①				
	Recirc 	②				
Temperature Control Lever	Warm 	⑤ ④ ⑦ ③ ⑥				
	Cool 					
Mode Control Lever	Def. 	⑪ ⑫ ⑰ ⑳		○		○
	Foot/Def. 	⑩ ⑰ ⑳ ⑬		○	○	○
	Foot 	⑨ ⑭ ⑱ ⑳		○	○	○
	Bi-Level 	⑧ ⑬ ⑱ ⑲	○	○	○	
	Face 	⑧ ⑫ ⑮ ⑲	○	○		

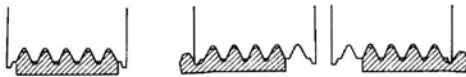
The size of circle (○) indicates the proportion of the air flow volume.

AC2662
0001BE

Z04523

DRIVE BELT ON-VEHICLE INSPECTION

AC2QG-01



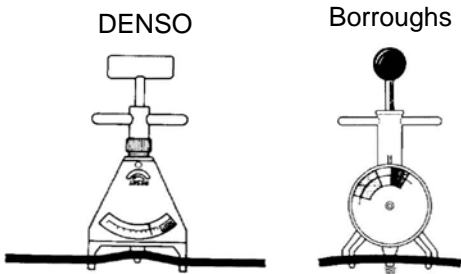
Correct

Wrong

CH0086

1. INSPECT DRIVE BELT'S INSTALLATION CONDITION

Check that drive belt fits properly in the ribbed grooves.



DENSO

Borroughs

N01881

2. INSPECT DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

DENSO BTG-20 (95506-00020) or

Borroughs No. BT-33-73F

Drive belt tension:

New belt 100-150 lbf

Used belt 60-100 lbf

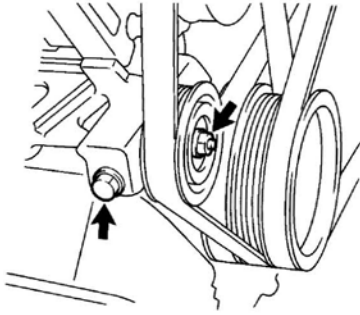
HINT:

- "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 been on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.

AC-16

AIR CONDITIONING – DRIVE BELT

AC2QH-01



N16451

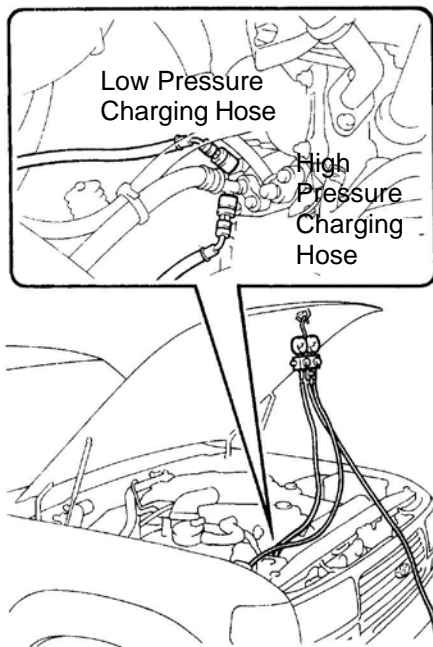
REMOVAL

1. **LOOSEN IDLE PULLEY LOCK NUT**
Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)
2. **REMOVE COMPRESSOR DRIVE BELT**

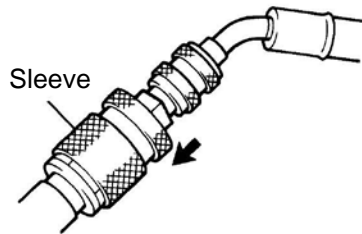
Loosen the adjusting bolt and remove the drive belt.

INSTALLATION

Installation is in the reverse order of removal (See page [AC-16](#)).



N14326



N04392

MANIFOLD GAUGE SET SET ON

AC20J-01

1. CONNECT CHARGING HOSES TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

Do not connect the wrong hoses.

2. CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES

Tighten the nuts by hand.

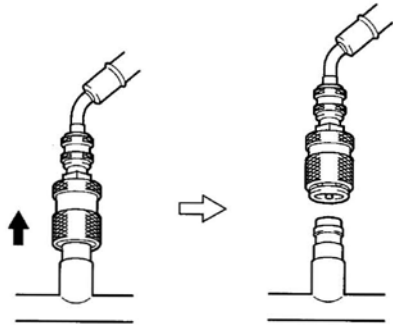
3. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE

5. CONNECT QUICK DISCONNECT ADAPTERS TO SERVICE VALVES

HINT:

Push the quick disconnect adapter onto the service valve, then slide the sleeve of the quick disconnect adapter downward to lock it.



N06553

SET OFF

1. **CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT:

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve.

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**

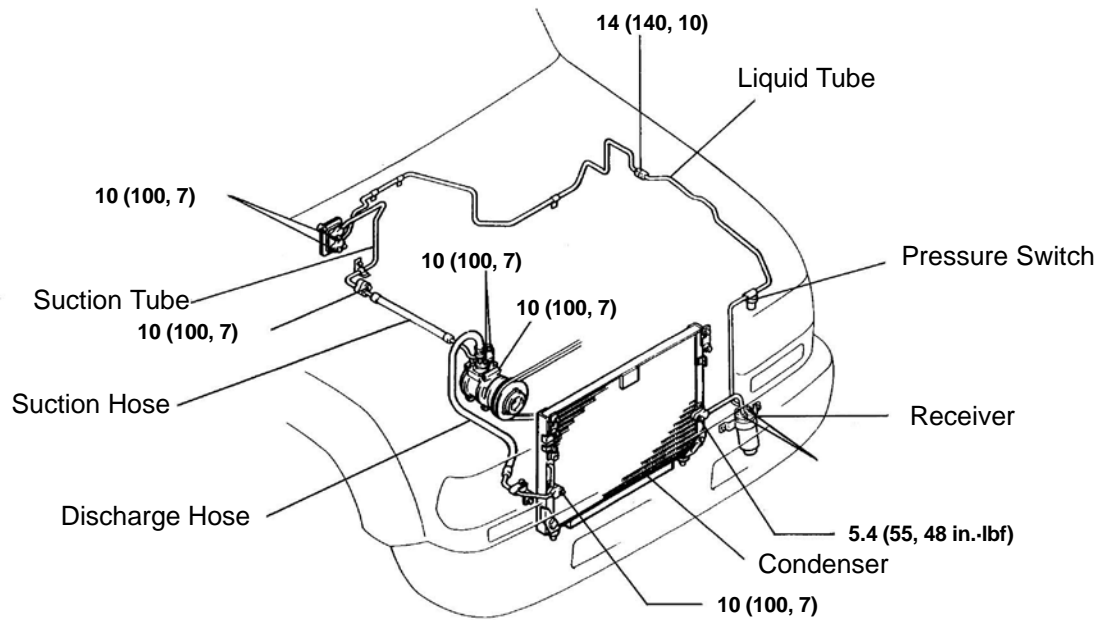
REFRIGERANT LINE ON-VEHICLE INSPECTION

AC2QM-01

1. INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS
2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

LOCATION



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

N14066

Z17947

REPLACEMENT

1. DISCHARGE REFRIGERANT IN REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TORQUE CONNECTIONS TO SPECIFIED TORQUE

NOTICE:

Connections should not be torqued tighter than the specified torque.

Part tightened	N·m	kgf·cm	ft·lbf
Compressor x Discharge hose	10	100	7
Compressor x Suction hose	10	100	7
Condenser x Discharge hose	10	100	7
Condenser x Liquid tube	10	100	7
Receiver x Liquid tube	5.4	55	48 in.·lbf
Pressure switch x Liquid tube	10	100	7
Cooling unit x Liquid tube	10	100	7
Expansion valve x Evaporator	5.4	55	48 in.·lbf
Cooling unit x Suction tube	10	100	7
Liquid tube (Piping joint)	14	140	10
Suction line (Block joint)	10	100	7

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

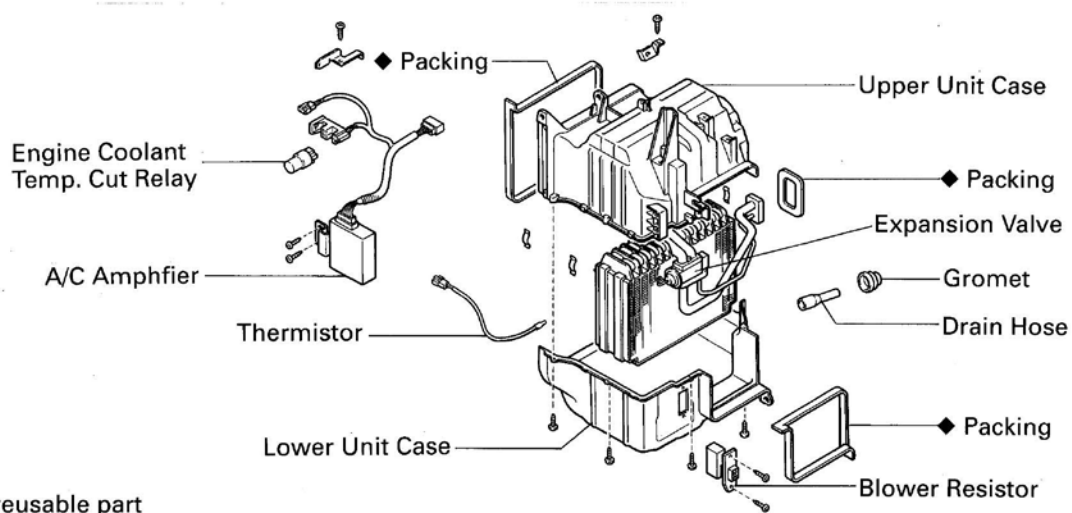
Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

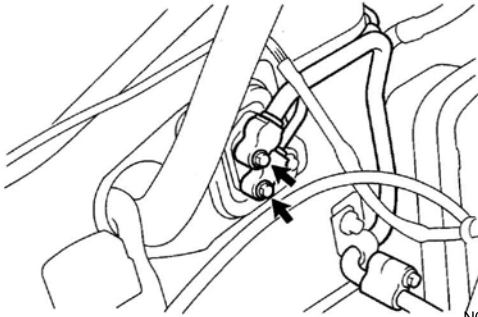
6. INSPECT AIR CONDITIONING OPERATION

COOLING UNIT COMPONENTS

AC3JL-01



N14361



N06172

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following procedure.

- Evacuate air from refrigeration system.
- Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

850 ± 50 g (29.98 ± 1.76 oz.)

2. DISCONNECT SUCTION TUBE AND LIQUID TUBE FROM COOLING UNIT FITTING

Remove the 2 bolts and both tubes.

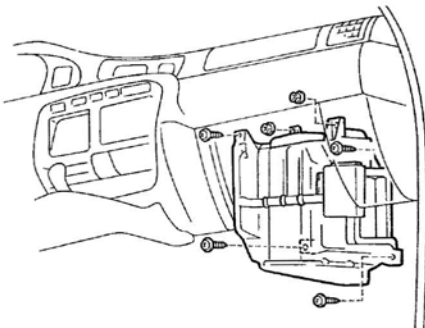
Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, lubricate 2 new O-rings with compressor oil and install the tubes.



N14293

3. REMOVE THESE PARTS:

- Glove compartment door (See page [BO-76](#))
- Glove compartment door reinforcement (See page [BO-76](#))

4. REMOVE COOLING UNIT

- Disconnect the connectors.
- Remove the 4 screws, 2 nuts and cooling unit.

DISASSEMBLY

1. REMOVE A/C AMPLIFIER
2. REMOVE RELAY
3. REMOVE WIRE HARNESS
4. REMOVE BLOWER RESISTOR

Remove the 2 screws and blower resistor.

5. **SEPARATE UPPER AND LOWER UNIT CASES**

- (a) Using a knife, cut off the each packing.
- (b) Remove 3 clips and 4 screws.
- (c) Separate the upper and lower unit cases.

6. **REMOVE EVAPORATOR FROM LOWER UNIT CASE**

HINT:

If the evaporator was replaced, add compressor oil to the compressor.

Add 40 cc (1.4 fl.oz.)

Compressor oil:

ND-OIL 8 or equivalent

7. **REMOVE THERMISTOR**

Pull out the thermistor from the evaporator.

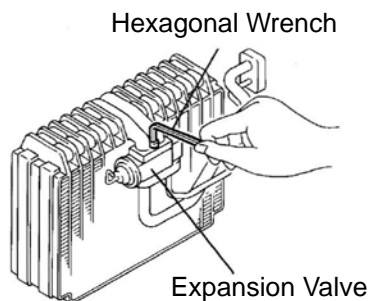
8. **REMOVE EXPANSION VALVE**

Using a hexagon wrench, remove the 2 bolts and separate the expansion valve and evaporator.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

HINT:

At the time of reassembly, lubricate 4 new O-rings with compressor oil and install the tubes.



N06174

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [AC-25](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [AC-24](#)).

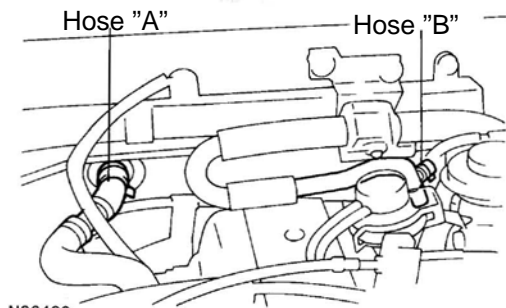
HEATER UNIT REMOVAL

AC20S-01

1. REMOVE COOLING UNIT (See page [AC-24](#))
2. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

It is not necessary to drain out all the coolant.

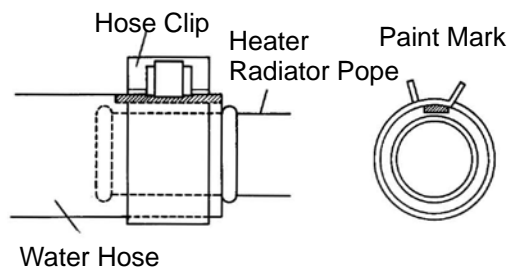


N06490

Z17942

3. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES

- (a) Grip the claws of the hose clip with pliers and slide the clip along the hose to a place where it does not clamp the hose to the pipe.
- (b) Disconnect the water hoses.



Water Hose

Hose "A"

Hose "B"

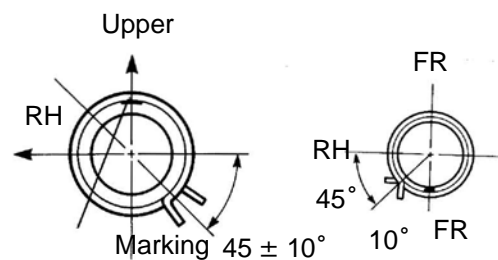
HINT:

- Push the water hose onto the heater radiator pipe as far as the ridge on the pipe.
- Install the hose clip in a position, as shown in the illustration.

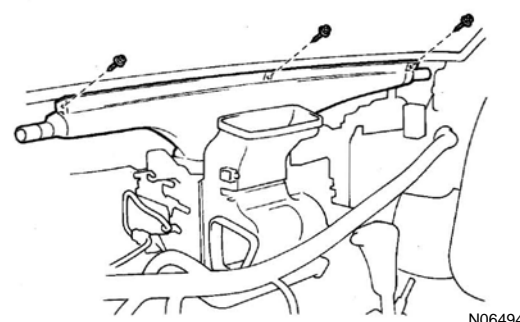
4. REMOVE PIPE GROMMETS

5. REMOVE INSTRUMENT PANEL SAFETY PAD (See page [BO-76](#))

6. REMOVE INSTRUMENT PANEL REINFORCEMENT (See page [BO-76](#))

N02485
N18179 N18181

Z17943



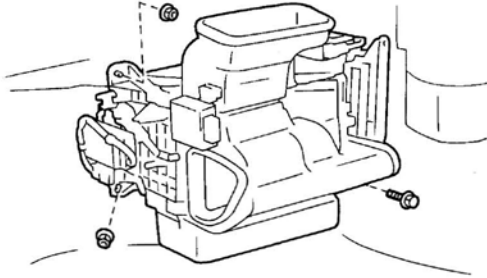
N06494

7. REMOVE HEATER UNIT

- (a) Remove the 3 screws and defroster nozzle.

AIR CONDITIONING - HEATER UNIT

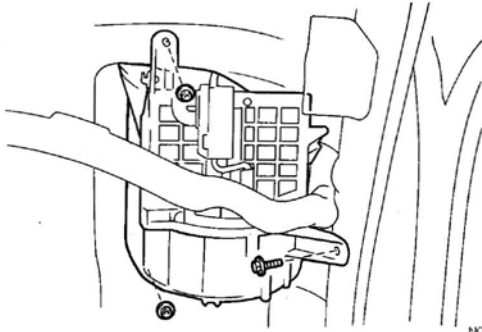
- (b) Remove the 2 nuts and a screw, then remove heater unit.



N06495

INSTALLATION

Installation is in the reverse order of removal (See page [AC-28](#)).



AC2R1-03

BLOWER UNIT REMOVAL

1. REMOVE INSTRUMENT PANEL AND REINFORCEMENT (See page [BO-76](#))
2. REMOVE COOLING UNIT (See page [AC-24](#))
3. REMOVE BLOWER UNIT
 - (a) Disconnect the connectors.
 - (b) Remove the bolt and 2 nuts, then remove the blower unit.

INSTALLATION

Installation is in the reverse order of removal (See page [AC-31](#)).

COMPRESSOR AND MAGNETIC CLUTCH

AC2R5-01

ON-VEHICLE INSPECTION

1. INSTALL MANIFOLD GAUGE SET (See page AC-18)

2. START ENGINE

Run the engine at 1,500 rpm.

3. INSPECT COMPRESSOR FOR METALLIC SOUND

Check if there is a metallic sound from the compressor when the A/C switch is on.

If metallic sound is heard, replace the compressor assembly.

4. INSPECT REFRIGERANT PRESSURE (See page AC-5)

5. STOP ENGINE

6. INSPECT VISUALLY FOR LEAKAGE OF REFRIGERANT FROM SAFETY SEAL

Using a gas leak detector, check for leakage of refrigerant.

If there is any leakage, replace the compressor assembly.

7. REMOVE MANIFOLD GAUGE SET (See page AC-19)

8. MAKE THESE VISUAL CHECKS:

(a) Leakage of grease from the clutch bearing.

(b) Signs of oil on the pressure plate or rotor.

Repair or replace, as necessary.

9. INSPECT MAGNETIC 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 magnetic clutch.

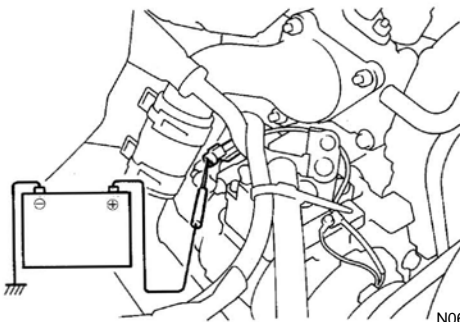
10. INSPECT MAGNETIC CLUTCH

(a) Disconnect the connector from the magnetic 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 magnetic clutch is energized.

If operation is not as specified, replace the magnetic clutch.



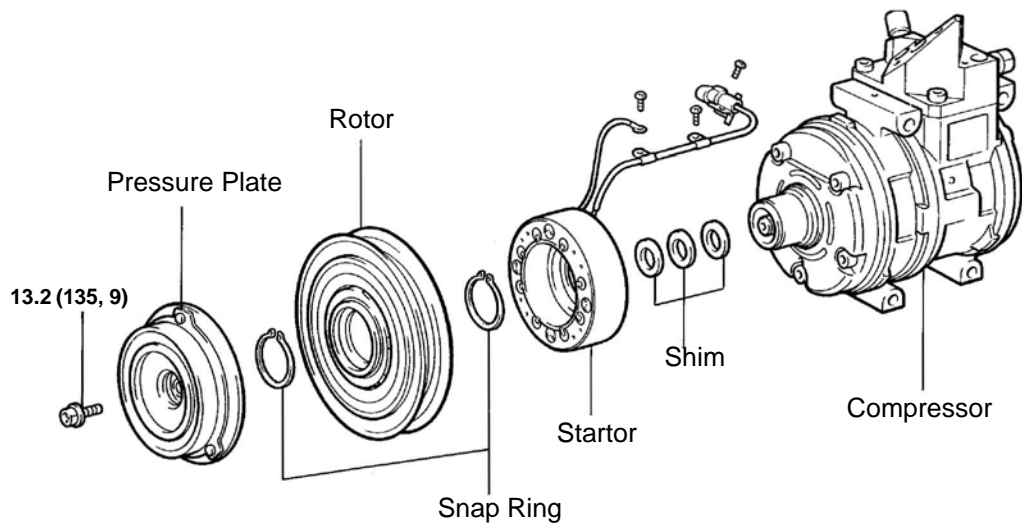
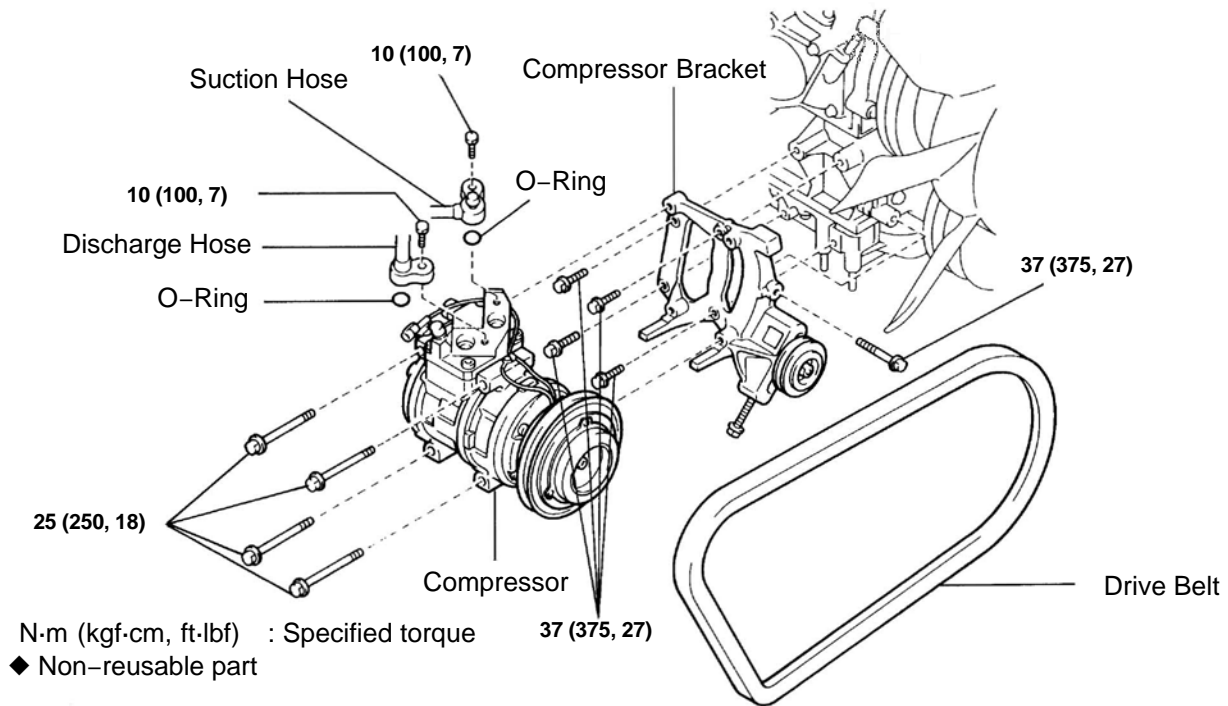
N06158

AC-34

AIR CONDITIONING - COMPRESSOR AND MAGNETIC CLUTCH

AC2R6-01

COMPONENTS



DISASSEMBLY

1. RUN ENGINE AT IDLE SPEED WITH A/C SWITCH ON FOR 10 MINUTES
2. STOP ENGINE
3. DISCONNECT NEGATIVE (-) TERMINAL CABLE FROM BATTERY
4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM
5. DISCONNECT DISCHARGE AND SUCTION HOSES

Remove the 2 bolts and disconnect the both hoses.

NOTICE:

Cap the open fittings immediately to keep the moisture or dirt out of the system.

6. REMOVE ENGINE UNDER COVER
7. REMOVE DRIVE BELT (See page [AC-16](#))
8. REMOVE COMPRESSOR
 - (a) Disconnect the connector.



AC0943

- (b) Remove the 4 bolts and pull the compressor upward.

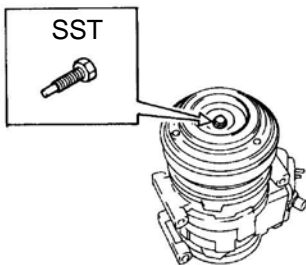
9. REMOVE COMPRESSOR (See page [AC-35](#))

10. REMOVE PRESSURE PLATE

- (a) Using SST and a socket wrench, remove the shaft bolt.

Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)

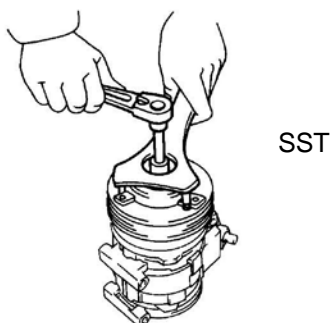
SST 07112-76060



AC0944

- (b) Install a SST on the pressure plate.

SST 07112-66040



AC0945

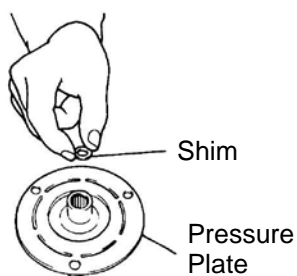
- (c) Using SST and a socket wrench, remove the pressure plate.

SST 07112-76060

AC-36

AIR CONDITIONING - COMPRESSOR AND MAGNETIC CLUTCH

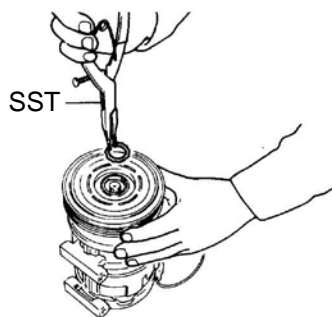
- (d) Remove the shims from the pressure plate.



AC0946

11. REMOVE ROTOR

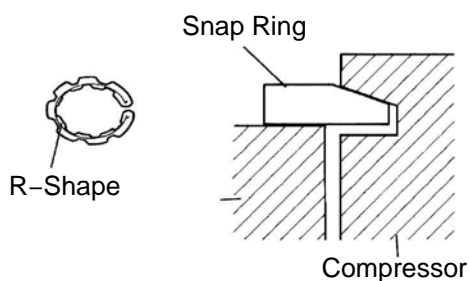
- (a) Using SST, remove the snap ring.
SST 07114-84020



AC0947

NOTICE:

The snap ring should be installed so that its beveled side faces up.

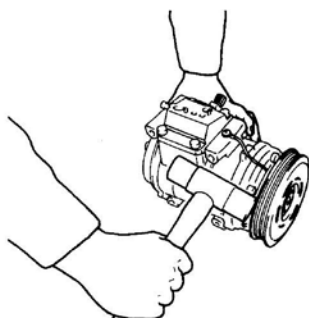


N20013

- (b) Using a plastic hammer, tap the rotor off the shaft.

NOTICE:

Be careful not to damage the pulley when tapping on the rotor.



AC1743

12. REMOVE STATOR

- (a) Disconnect the stator lead wire from the compressor housing.

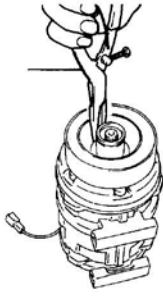


AC1744

AIR CONDITIONING - COMPRESSOR AND MAGNETIC CLUTCH

- (b) Using SST, remove the snap ring.
SST 07114-84020

SST

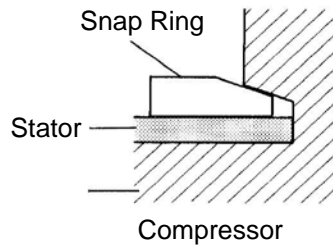


AC0950

NOTICE:

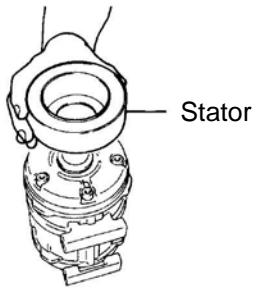
The snap ring should be installed so that its beveled side faces up.

R-Shape



N20012

- (c) Remove the stator.



AC0951

REASSEMBLY

1. INSTALL COMPRESSOR

- (a) Install the compressor with the 4 bolts.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

- (b) Connect the connector.

2. CONNECT DISCHARGE AND SUCTION HOSES

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

NOTICE:

Hoses should be connected immediately after the caps have been removed.

HINT:

Lubricate 2 new O-rings with compressor oil and install the hoses.

3. INSTALL AND INSPECT DRIVE BELT (See page [AC-17](#))

4. INSTALL ENGINE UNDER COVER

5. CONNECT NEGATIVE (-) TERMINAL CABLE TO BATTERY

6. EVACUATE AIR FROM REFRIGERATION SYSTEM

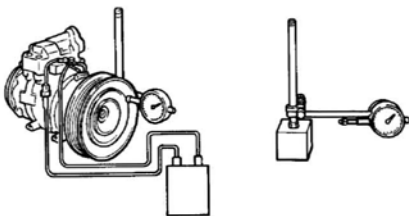
7. CHARGE SYSTEM WITH REFRIGERANT AND INSPECT FOR LEAKAGE OF REFRIGERANT

Specified amount:

850 ± 50 g (29.98 ± 1.76 oz.)

Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.



N04963

8. INSPECT A/C OPERATION

Reassembly is in the reverse order of disassembly (See page [AC-35](#)).

9. CHECK CLEARANCE OF MAGNETIC CLUTCH

- (a) Set the dial indicator to the pressure plate of the magnetic clutch.
- (b) Connect the magnetic clutch lead wire to the positive (+) terminal of the battery.
- (c) Check the clearance between the pressure plate and rotor when connecting the negative (-) terminal to the battery.

Standard clearance:

0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

If the clearance is not within the standard clearance, adjust the clearance using shims to obtain the standard clearance.

Shim Thickness:

0.1 mm (0.004 in.)

0.3 mm (0.012 in.)

0.5 mm (0.020 in.)

RECEIVER

ON-VEHICLE INSPECTION

AC2RB-01

INSPECT FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage.

If there is leakage, check the tightening torque at the joints.

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following procedure.

- Evacuate air from refrigeration system.
- Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

850 ± 50 g (29.98 ± 1.76 oz.)

2. DISCONNECT 2 LIQUID TUBES FROM RECEIVER

Remove the 2 bolts and both tubes.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, lubricate 2 new O-rings with compressor oil and install the tubes.

3. REMOVE RECEIVER FROM RECEIVER HOLDER

Remove the holder bolt and pull the receiver down ward.

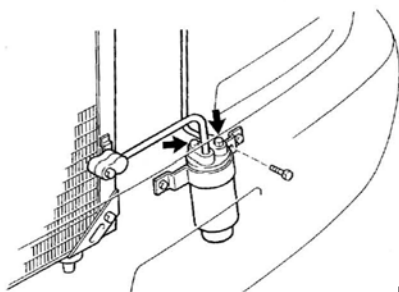
HINT:

If receiver was replaced, add compressor oil to compressor.

Add 10 cc (0.35 fl.oz.)

Compressor oil:

ND-OIL 8 or equivalent



N13975

INSTALLATION

Installation is in the reverse order of removal (See page [AC-40](#)).

CONDENSER

AC2RG-01

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 LEAKAGE

Repair as necessary.

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, refer to the following procedure.

- Evacuate air from refrigeration system.
- Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

850 ± 50 g (29.98 ± 1.76 oz.)

2. REMOVE THESE PARTS:

- Hood lock brace
- Center brace

3. DISCONNECT DISCHARGE HOSE AND LIQUID TUBE

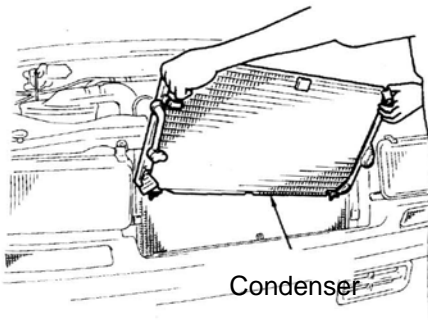
Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, lubricate 2 new O-rings with compressor oil to compressor.



AC2674

4. REMOVE CONDENSER

- Remove 2 condenser mounting bolts.
- Pull out the condenser between the radiator and the body.

HINT:

If condenser was replaced, add compressor oil to compressor.

Add 40 cc (1.4 fl.oz.)

Compressor oil:

ND-OIL 8 or equivalent

INSTALLATION

Installation is in the reverse order of removal (See page [AC-43](#)).

EVAPORATOR INSPECTION

AC2RJ-03

1. REMOVE EVAPORATOR (See page [AC-26](#))
2. CHECK EVAPORATOR FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

NOTICE:

Never use water to clean the evaporator.

3. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.

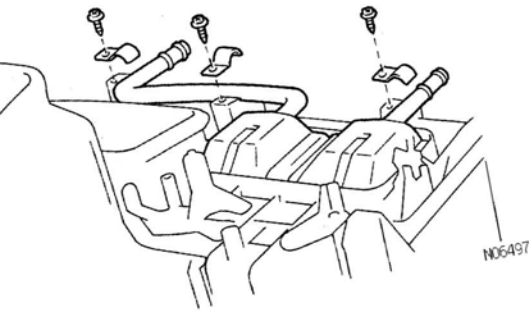
4. REINSTALL EVAPORATOR (See page [AC-26](#))

AC-46

AIR CONDITIONING – HEATER RADIATOR

HEATER RADIATOR INSPECTION

AC3JM-01



1. **REMOVE HEATER UNIT** (See page [AC-28](#))

2. **REMOVE HEATER RADIATOR**

(a) Remove the screws and plates.

(b) Pull the heater radiator out.

3. **INSPECT FINS FOR BLOCKAGE**

If the fins are clogged, clean them with compressed air.

4. **INSTALL HEATER RADIATOR**

EXPANSION VALVE

AC2RR-01

ON-VEHICLE INSPECTION

1. CHECK QUANTITY OF GAS DURING REFRIGERATION CYCLE
2. INSTALL MANIFOLD GAUGE SET
3. RUN ENGINE

- (a) Run the engine at 1,500 rpm for at least 5 minutes.
- (b) Then check that the high pressure reading is 1.37 – 1.57 MPa (14 – 16 kgf/cm², 199 – 228 psi).

4. CHECK EXPANSION VALVE

If the expansion valve is faulty, the low pressure reading will drop to 0 kPa (0 kgf/cm², 0 psi).

HINT:

When the low pressure drops to 0 kPa (0 kgf/cm², 0 psi), feel the receiver's IN and OUT sides for zero temperature difference.

WATER VALVE REMOVAL

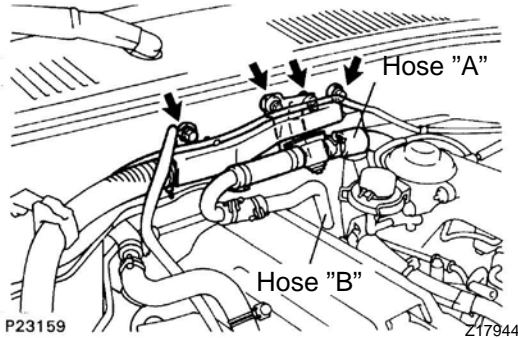
AC2RU-01

1. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

It is not necessary to drain out all the coolant.

2. DISCONNECT WATER VALVE CONTROL CABLE



3. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPE AND WATER VALVE

- Grip the claws of the hose clip with pliers and slide the clip along the hose to a place where it does not clamp the hose to the pipe.
- Disconnect the water hoses.

HINT:

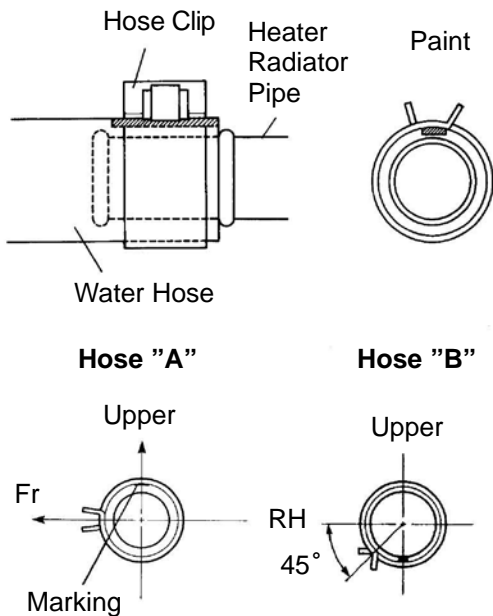
At the time of installation, refer to the following procedure.

- Push the water hose onto the heater radiator pipe as far as ridge on the pipe.
- Install the hose clip in a position, as shown in the illustration.

4. REMOVE WIRE HARNESS PROTECTOR

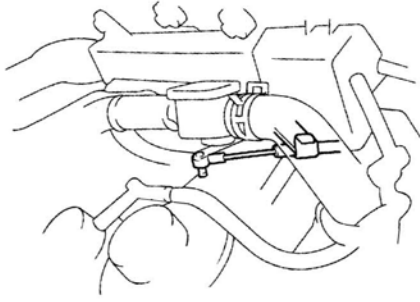
5. REMOVE WATER VALVE

Remove the 2 bolts and water valve.



AIR CONDITIONING – WATER VALVE

AC2RW-01



N14296

ADJUSTMENT**ADJUST WATER VALVE CONTROL CABLE**

- (a) Set the vehicle in these conditions.
 - Ignition switch on.
 - Blower speed control switch on.
 - Temperature control switch to "COOL" position.
- (b) Set the water valve to "COOL" position, install the control cable and lock the clamp.

AC-50

AIR CONDITIONING – WATER VALVE

AC2RV-01

INSTALLATION

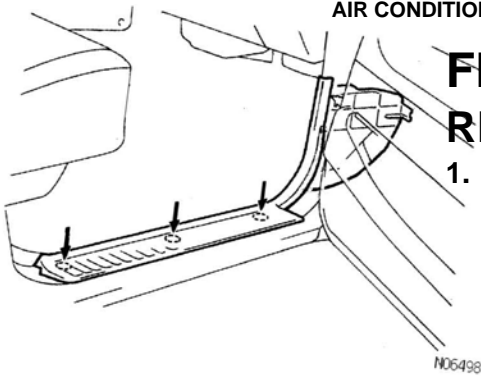
Installation is in the reverse order of removal (See page [AC-48](#)).

AIR CONDITIONING - FRONT BLOWER MOTOR

FRONT BLOWER MOTOR REMOVAL

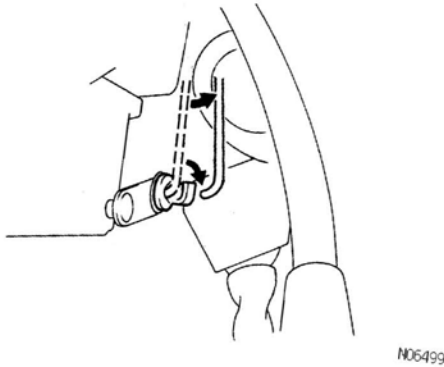
AC3JN-01

1. REMOVE RH SCUFF PLATE



2. REMOVE BLOWER MOTOR

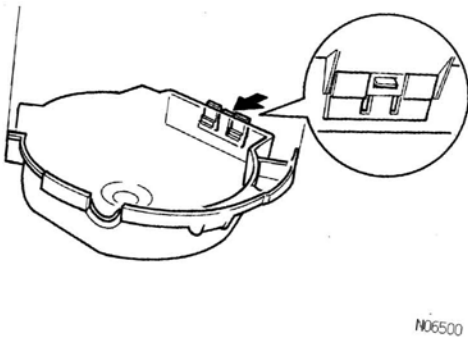
(a) Disconnect the link from the lower cover.



(b) Remove the 2 screws, then remove the lower cover while pushing the locking protrusion, as shown.

(c) Disconnect the connector from the blower motor.

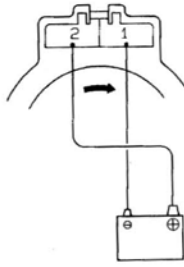
(d) Remove the 3 screws and blower motor.



AC-52

AIR CONDITIONING – FRONT BLOWER MOTOR

AC2RY-01



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.

If operation is not as specified, replace the blower motor.

AC2227

INSTALLATION

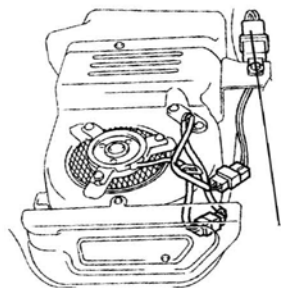
Installation is in the reverse order of removal (See page [AC-51](#)).

AC-54

AIR CONDITIONING – REAR BLOWER MOTOR

REAR BLOWER MOTOR REMOVAL

AC250-02



N14323

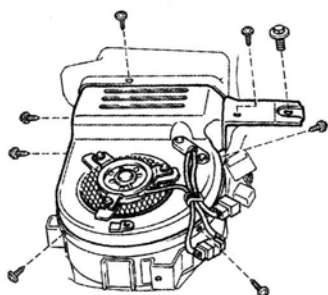
1. REMOVE FRONT RH SEAT
2. REMOVE BLOWER MOTOR

- (a) Disconnect the connectors from the blower motor and rear heater relay.
- (b) Remove the bolt and rear heater relay.



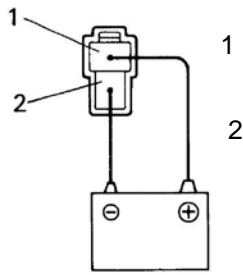
N14324

- (c) Remove the 2 screws and side cover.



N06504

- (d) Remove the bolt and 7 screws, then remove the upper cover with the blower motor.
- (e) Remove the 3 screws and the blower motor.



BE2611

INSPECTION

INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, then check that the motor operations smoothly.

If operation is not as specified, replace the motor.

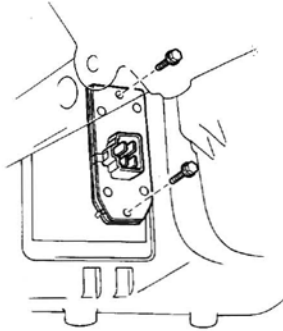
INSTALLATION

Installation is in the reverse order of removal (See page [AC-54](#)).

BLOWER RESISTOR INSPECTION

AC3JO-01

1. REMOVE GLOVE COMPARTMENT DOOR (See page [BO-76](#))



N06512

2. REMOVE BLOWER RESISTOR

Disconnect the connector and remove the 2 screws and blower resistor.

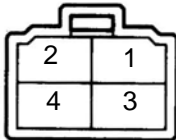
3. INSPECT BLOWER RESISTOR RESISTANCE

Measure resistance between terminals 1 and 4.

Standard resistance: 1.8 – 2.2 Ω

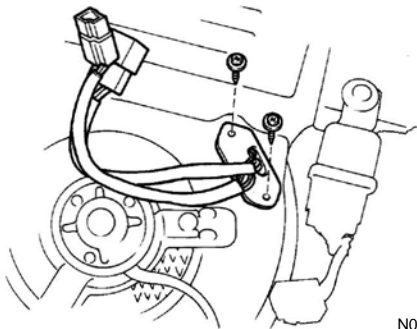
If resistance is not as specified, replace the blower resistor.

4. REINSTALL BLOWER RESISTOR



H-4-2

N09039



N06513

REAR BLOWER RESISTOR INSPECTION

AC3JP-01

- 1. REMOVE FRONT SEAT RH
- 2. REMOVE BLOWER RESISTOR
 - (a) Disconnect the connector.
 - (b) Remove the 2 screws and blower resistor.

Connector "A"



H-3-2 H-2-2

Connector "B"



Z09802

3. INSPECT REAR BLOWER RESISTOR CONTINUITY

Condition	Tester connection	Specified condition
Constant	A1 – B1 A2 – A3 – B2	Continuity

If continuity is not as specified, replace the blower resistor.

4. REINSTALL REAR BLOWER RESISTOR

AIR CONDITIONING – THERMISTOR



N14295

THERMISTOR ON-VEHICLE INSPECTION

AC2S9-01

1. REMOVE GLOVE COMPARTMENT PARTS
(See page [BO-76](#))

2. INSPECT THERMISTOR RESISTANCE

Measure the resistance between terminals.

Standard resistance:

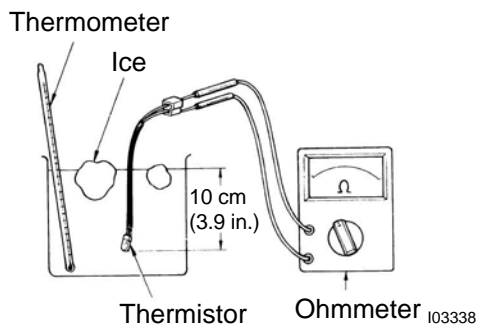
1,500 Ω at 25 °C (77 °F)

If resistance is not as specified, replace the sensor.

AC-60

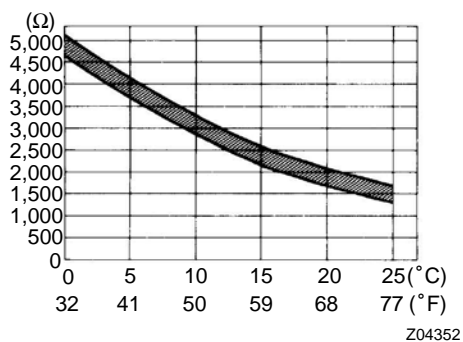
AIR CONDITIONING - THERMISTOR

AC2SA-01



INSPECTION

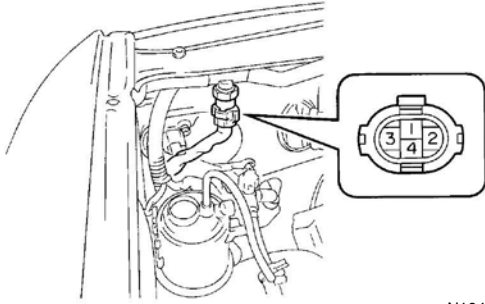
1. REMOVE THERMISTOR
2. INSPECT THERMISTOR RESISTANCE
 - (a) Place the thermistor in cold water, while varying temperature of the water, measure resistance at the connector and at the same time, measure temperature of the water with a thermometer.



- (b) Compare the 2 readings on the chart. If resistance is not as specified, replace the thermistor.
3. REINSTALL THERMISTOR

AIR CONDITIONING - PRESSURE SWITCH

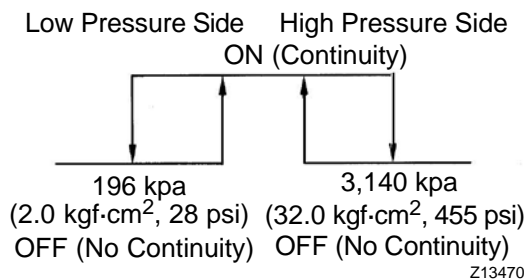
AC2SB-01



N16452

PRESSURE SWITCH ON-VEHICLE INSPECTION

1. INSTALL MANIFOLD GAUGE SET
2. DISCONNECT CONNECTOR FROM PRESSURE SWITCH
3. RUN ENGINE AT APPROX. 1,500 RPM



4. INSPECT PRESSURE SWITCH OPERATION

- (a) Connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (-) lead to terminal 1.
- (b) Check continuity between terminals when refrigerant pressure is changed, as shown in the illustration.

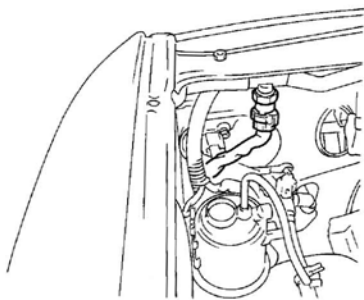
If operation is not as specified, replace the pressure switch.

5. STOP ENGINE AND REMOVE MANIFOLD GAUGE SET
6. CONNECT CONNECTOR TO PRESSURE SWITCH

AC-62

AIR CONDITIONING - PRESSURE SWITCH

AC2SC-01



N14163

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount:

850 ± 50 g (29.98 ± 1.76 oz.)

2. REMOVE PRESSURE SWITCH

- (a) Disconnect the connector.
- (b) Remove the pressure switch from the liquid tube.

Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

HINT:

At the time of installation, lubricate a new O-ring with compressor oil and install the switch.

HINT:

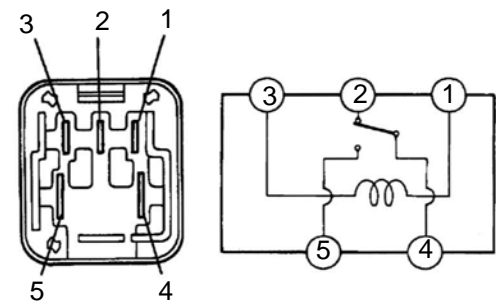
Lock the switch mount on the tube with an open end wrench, being careful not to deform the tube, and remove the switch.

INSTALLATION

Installation is in the reverse order of removal (See page [AC-62](#)).

AC-64

AIR CONDITIONING - HEATER MAIN RELAY



BE1850 BE1844

Z19533

HEATER MAIN RELAY INSPECTION

AC2SE-03

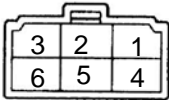
INSPECT HEATER MAIN RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 - 3	Continuity
	2 - 4	
Apply B+ between terminals 3 and 5.	4 - 5	Continuity

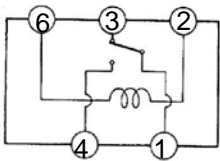
If continuity is not as specified, replace the relay.

REAR HEATER RELAY INSPECTION

INSPECT REAR HEATER RELAY CONTINUITY



H-6-2 BE1844



Z09804

Condition	Tester connection	Specified condition
Constant	2 - 6	Continuity
	1 - 3	
Apply B+ between terminals 2 and 6.	1 - 4	Continuity

If continuity is not as specified, replace the relay.

AC-66

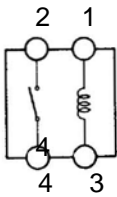
AIR CONDITIONING – MAGNETIC CLUTCH RELAY

MAGNETIC CLUTCH RELAY INSPECTION

AC2SG-01



BE1647 BE1841

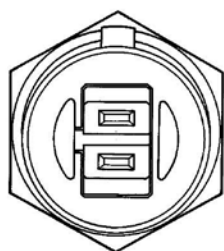


Z09507

INSPECT MAGNETIC CLUTCH RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 3	Continuity
Apply B+ between terminals 1 and 3.	2 – 4	Continuity

If continuity is not as specified, replace the relay.



ENGINE COOLANT TEMPERATURE (ECT) CUT RELAY INSPECTION

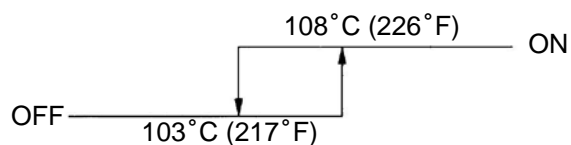
AC2SH-01

INSPECT SWITCH CONTINUITY

Check the continuity between terminals of the switch, as shown in the chart below.

If continuity is not as specified, replace the switch.

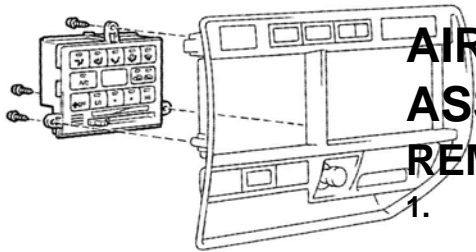
N06549



V02084

AC-68

AIR CONDITIONING - AIR CONDITIONING CONTROL ASSEMBLY



AIR CONDITIONING CONTROL ASSEMBLY REMOVAL

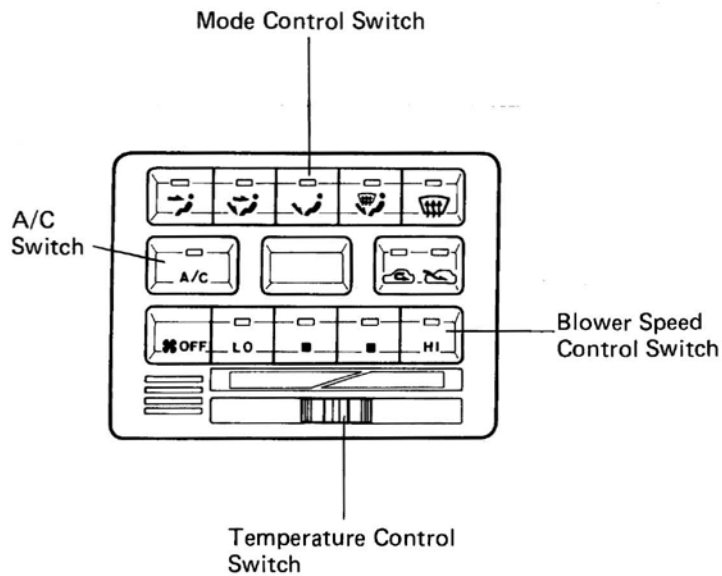
AC2SL-01

1. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL WITH A/C CONTROL ASSEMBLY
2. REMOVE A/C CONTROL ASSEMBLY

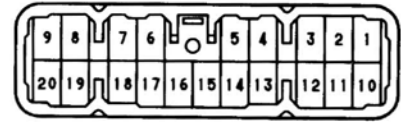
Remove the 3 screws and A/C control assembly from center panel.

N14164

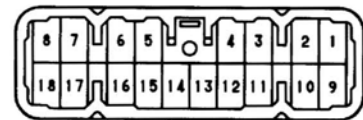
INSPECTION



Connector "A"

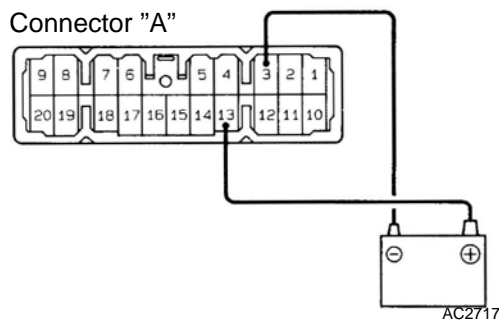


Connector "B"



e-20-2-C
N06571 e-18-2-B

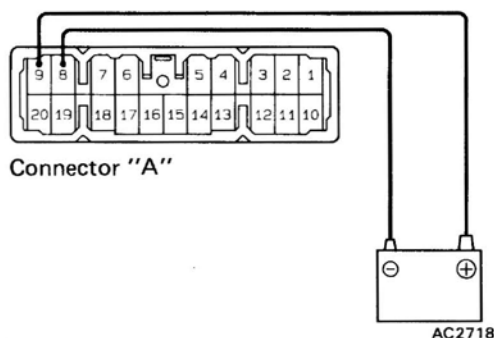
Z04530



1. INSPECT ILLUMINATION OPERATION

Connect the positive (+) lead from the battery to terminal A-13 and the negative (-) lead to terminal A-3, then check that the illuminations light up.

If illuminations do not light up, test the bulb.



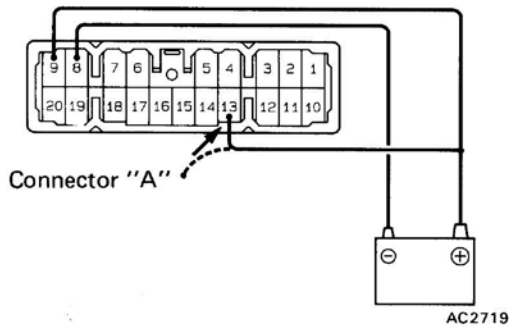
2. Air Inlet Control Switch:

INSPECT INDICATOR LIGHT OPERATION

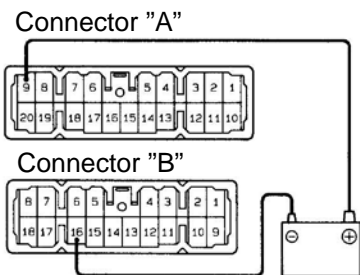
- Connect the positive (+) lead from the battery to terminal A-9 and the negative (-) lead to terminal A-8.
- With the air inlet control button pushed in, check that the FRESH or RECIRC indicator light lights up.
- Next, push in the button again, and check that the indicator light goes off and the other indicator light lights up.

AC-70

AIR CONDITIONING – AIR CONDITIONING CONTROL ASSEMBLY



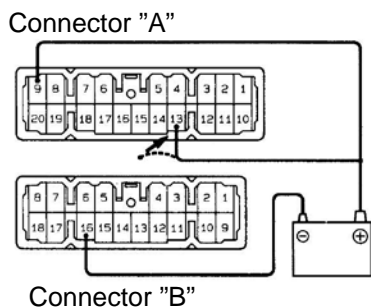
- (d) Then connect the positive (+) lead from the battery to terminal A-13 and check that the indicator dims. If operation is not as specified, replace the A/C control assembly.



AC2722

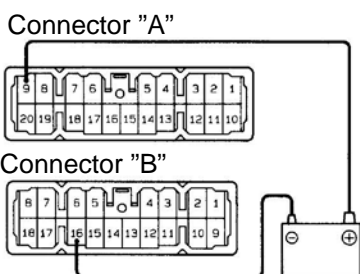
3. Mode Control Switch: INSPECT INDICATOR LIGHT OPERATION

- (a) Connect the positive (+) lead from the battery to terminal A-9 and the negative (-) lead to terminal B-16.
(b) Push each of the mode buttons in and check that their indicator light lights up.



AC2723

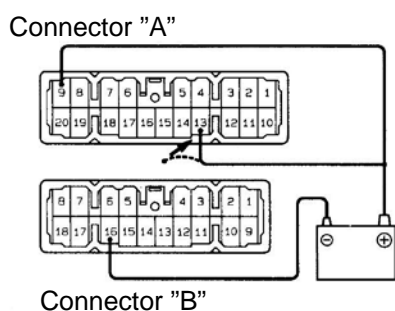
- (c) Then connect the positive (+) lead from the battery to terminal A-13 and check that the indicator dims. If operation is not as specified, replace the A/C control assembly.



AC2722

4. Blower Speed Control Switch: INSPECT INDICATOR LIGHT OPERATION

- (a) Connect the positive (+) lead from the battery to terminal A-9 and the negative (-) lead to terminal B-16.
(b) Push each of the blower speed control buttons in and check that their indicator light lights up.

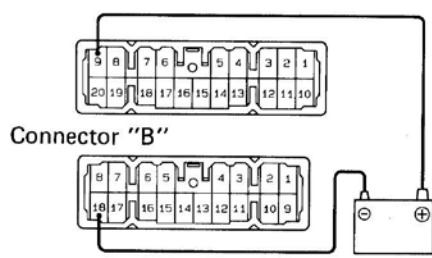


AC2723

- (c) Then connect the positive (+) lead from the battery to terminal A-13 and check that the indicator dims. If operation is not as specified, replace the A/C control assembly.

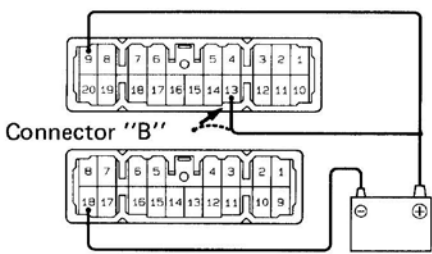
AIR CONDITIONING – AIR CONDITIONING CONTROL ASSEMBLY

Connector "A"



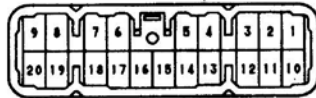
AC2726

Connector "A"



AC2727

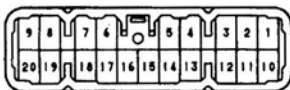
Connector "A"



e-20-2-C

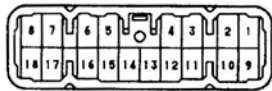
Z19129

Connector "A"

e-20-2-C
e-18-2-B

Z09805

Connector "B"

**5. A/C or DEF Switch:****INSPECT INDICATOR LIGHT OPERATION**

- Connect the positive (+) lead from the battery to terminal A-9 and the negative (-) lead to terminal B-18.
- Push the A/C or DEF switch button in and check that the indicator light lights up.

- Then, connect the positive (+) lead from the battery to terminal A-13 and check that the indicator dims.

If operation is not as specified, replace the A/C control assembly.

6. INSPECT AIR INLET CONTROL SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
FRESH	A8 – A19	Continuity
RECIRC	A8 – A18	Continuity

If continuity is not as specified, replace the A/C control assembly.

7. INSPECT MODE CONTROL SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
FACE	A14 – B16	Continuity
BI-LEVEL	A12 – B16	Continuity
FOOT	A7 – B16	Continuity
FOOT-DEF	B11 – B16	Continuity
DEF	B4 – B16	Continuity

If continuity is not as specified, replace the A/C control assembly.

8. INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY

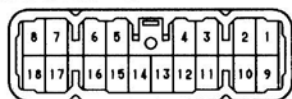
Switch position	Tester connection	Specified condition
OFF	A10 – B16	Continuity
LO	A1 – B16	Continuity
M1	B9 – B16	Continuity
M2	B10 – B16	Continuity
HI	B13 – B16	Continuity

AC-72

AIR CONDITIONING – AIR CONDITIONING CONTROL ASSEMBLY

If continuity is not as specified, replace the A/C control assembly.

Connector "B"



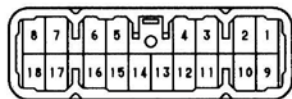
e-18-2-B

N06436

9. INSPECT A/C OR DEF SWITCH CONTINUITY

Check that there is continuity between terminals B-6 and B-17 intermittently each time the A/C or DEF switch button pressed. If continuity is not as specified, replace the A/C control assembly.

Connector "B"



e-18-2-B

N06436

10. INSPECT TEMPERATURE CONTROL SWITCH RESISTANCE

- (a) Measure resistance between terminals B-1 and B-2.

Standard resistance:

Approx. 3.0 k Ω

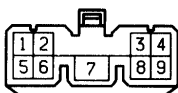
- (b) Check that the resistance between terminals B-1 and B-3 increases from 0 to approx. 3.0 k Ω when the switch knob is turned from COOL to HOT.

If operation is not as specified, replace the A/C control assembly.

INSTALLATION

Installation is the reverse order of removal (See page [AC-68](#)).

ON-WIRE HARNESS SIDE



S-9-1

N06435

AIR CONDITIONING AMPLIFIER

ON-VEHICLE INSPECTION

AC25I-01

INSPECT AMPLIFIER CIRCUIT

- (a) Disconnect the amplifier and inspect the connector on the wire harness side, as shown in the chart below.

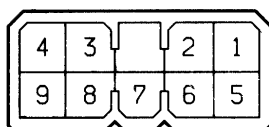
Test conditions:

- Ignition switch ON
- A/C switch ON
- Temperature control lever MAX COOL
- Blower control switch HI

Tester connection	Condition	Specifeid condition
6 – Ground	Constant	Continuity
8 – 9	Constant	Continuity
9 – 6	Constant	Approx. 1.5 kΩ at 25 °C (77 °F)
2 – Ground	A/C switch ON	Battery positive voltage
2 – Ground	A/C switch OFF	No voltage
5 – Ground	Start engine	Approx. 10 to 14 v
5 – Ground	Stop engine	No voltage

If circuit is as specified, try replacing the amplifier with a new one. If the circuit is not as specified, inspect the circuits connected to other parts.

From Back Side



g-9-2

Z12886

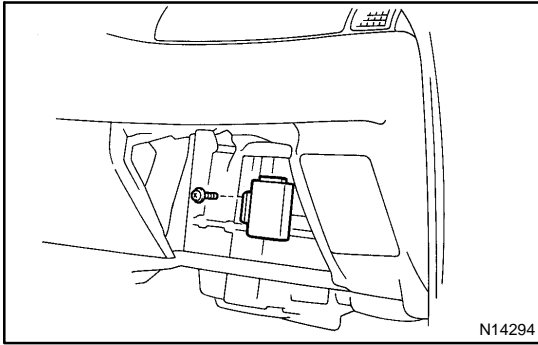
- (b) Connect the connector to A/C amplifier and inspect wire harness side connector from the back side, as shown in the chart below.

Test conditions:

- Ignition switch ON
- A/C switch ON
- Temperature control lever MAX COOL
- Blower control switch HI

Tester connection	Condition	Specified Condition
3 – Ground	Refrigeration pressure 2.0 – 32 kgf/cm ³	Battery positive voltage
3 – Ground	Refrigeration pressure less than 2.0 – 32 kgf/cm ³ or more	No voltage

If circuit is not as specified, replace the amplifier.



REMOVAL

1. **REMOVE GLOVE COMPARTMENT DOOR**
(See page [BO-76](#))
2. **REMOVE A/C AMPLIFIER**
 - (a) Disconnect the connector from the amplifier.
 - (b) Remove the screw and the amplifier.

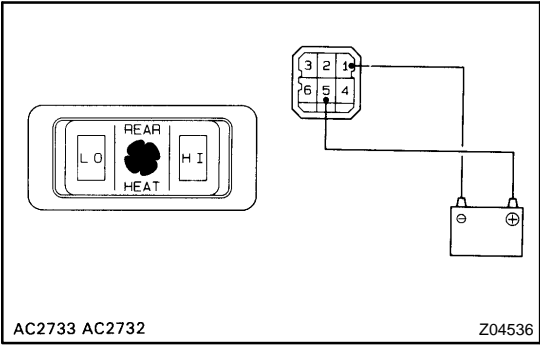
AC-76

AIR CONDITIONING – AIR CONDITIONING AMPLIFIER

AC2SK-01

INSTALLATION

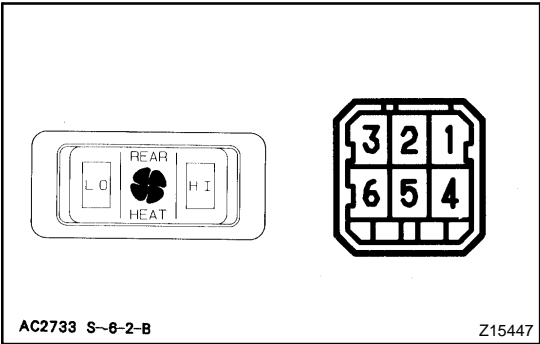
Installation is in the reverse order of removal See page [AC-75](#)).



REAR HEATER SWITCH INSPECTION

AC2SO-04

1. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL WITH A/C CONTROL ASSEMBLY
 2. REMOVE REAR HEATER SWITCH
 3. INSPECT INDICATOR OPERATION
 - (a) Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 1.
 - (b) Push each of the rear heater switch knob in and check that their indicators lights up.
- If operation is not as specified, replace the switch.

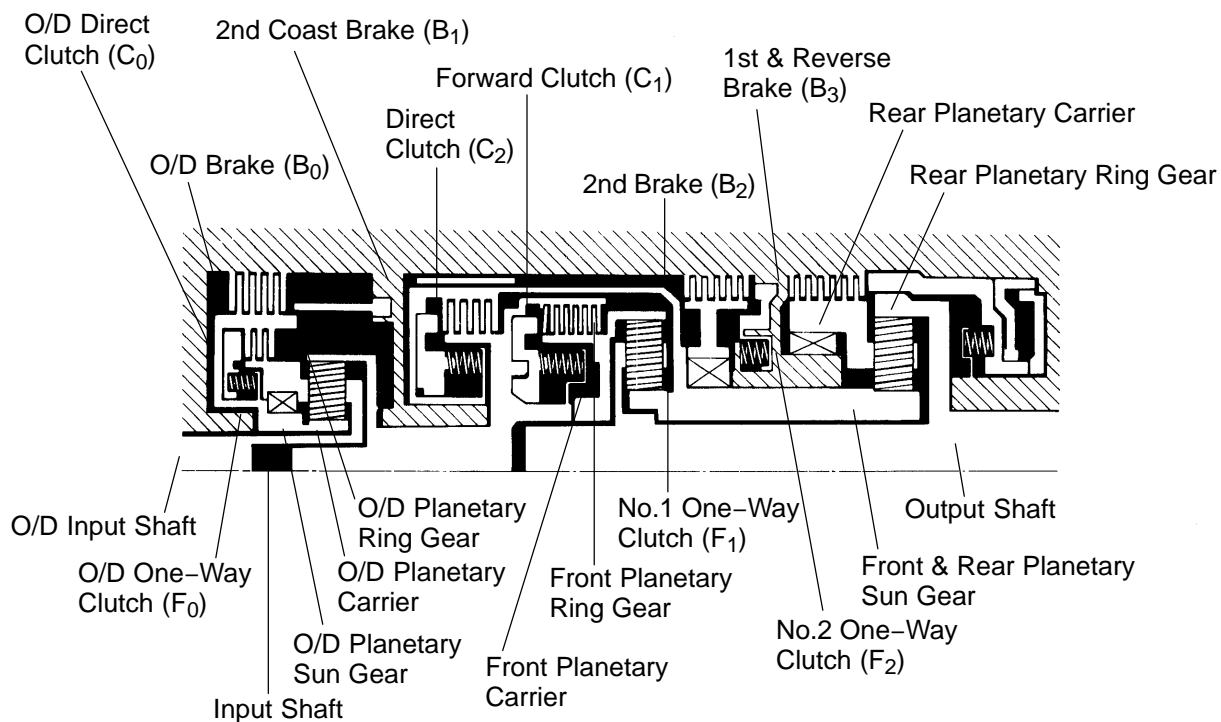


4. INSPECT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
HI	1 – 4	Continuity
OFF	–	No Continuity
LO	1 – 2	Continuity
Illumination circuit	3 – 6	Continuity

If continuity is not as specified, replace the switch.

OPERATION



AT2157

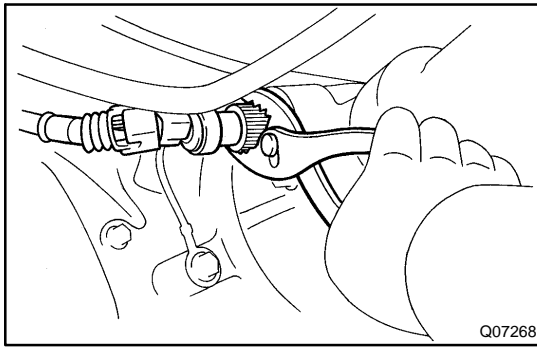
○ - - - - Operating

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	○	○			○	○		○	○	
	*1 3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	*2 2nd	○	○			○	○		○	○	

*1 Down-shift only in the 2 position and 3rd gear-no up-shift.

*2 Down-shift only in the L position and 2nd gear-no up-shift.

V07130

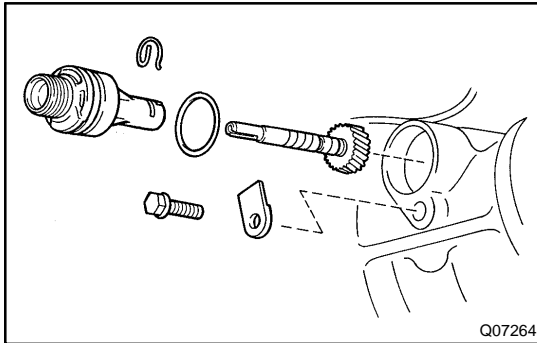


SPEEDOMETER DRIVEN GEAR ON-VEHICLE REPAIR

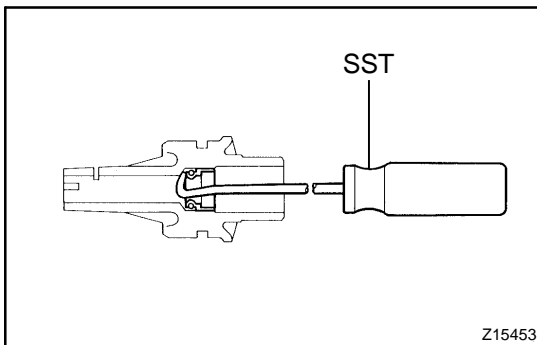
AT070-01

1. DISCONNECT SPEEDOMETER CABLE AND REMOVE SPEEDOMETER DRIVEN GEAR

- Loosen the serrated collar with pliers. Do not lose the felt dust protector and washer.
- Disconnect the speedometer cable.



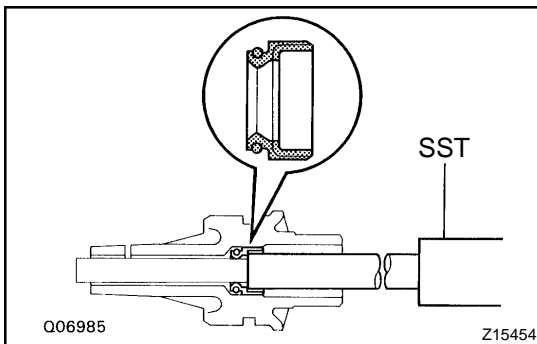
- Remove the bolt and locking plate. Pry out the speedometer driven gear assembly.
- Remove the O-ring from the speedometer driven gear assembly.
- Remove the clip and speedometer driven gear from the speedometer driven gear sleeve.



2. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, remove the oil seal.

SST 09921-00010

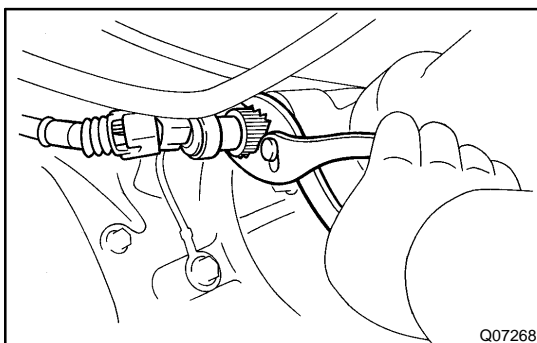


3. REINSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, install a new oil seal.

SST 09201-10000 (09201-01080)

Drive in depth: 20 mm (0.79 in.)



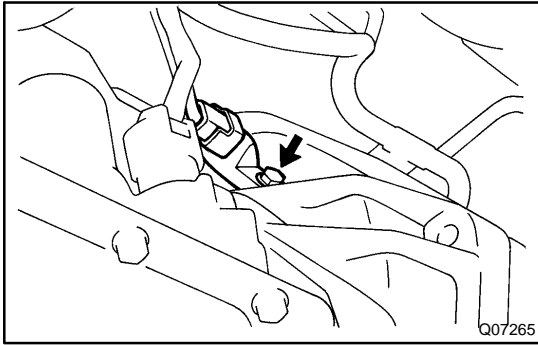
4. REINSTALL SPEEDOMETER DRIVEN GEAR AND CONNECT SPEEDOMETER CABLE

- Install the clip and speedometer driven gear to the speedometer driven gear sleeve.
 - Install a new O-ring to the speedometer driven gear assembly.
 - Install the speedometer driven gear.
 - Install the locking plate with the bolt.
- Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)**
- Connect the speedometer cable.

AT-4

AUTOMATIC TRANSMISSION – SPEEDOMETER DRIVEN GEAR

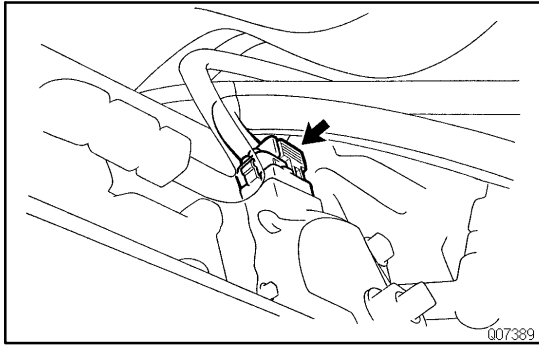
- (f) Tighten the serrated collar with pliers.



VEHICLE SPEED SENSOR ON-VEHICLE REPAIR

AT0T1-01

1. **DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR**
2. **REMOVE NO.2 VEHICLE SPEED SENSOR**
 - (a) Remove the bolt and No.2 vehicle speed sensor.
 - (b) Remove the O-ring from the No.2 vehicle speed sensor.
3. **REINSTALL NO.2 VEHICLE SPEED SENSOR**
 - (a) Coat a new O-ring with ATF and install it to the No.2 vehicle speed sensor.
 - (b) Install the No.2 vehicle speed sensor and torque the bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
4. **RECONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR**

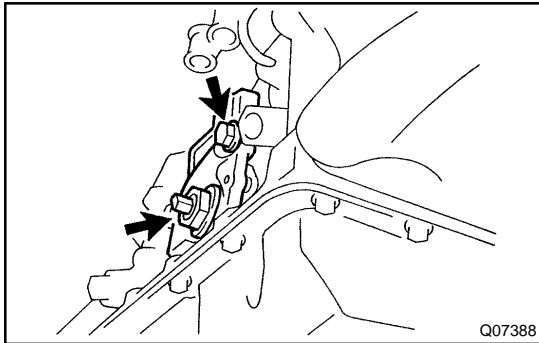


PARK/NEUTRAL POSITION (PNP) SWITCH

ATOT3-02

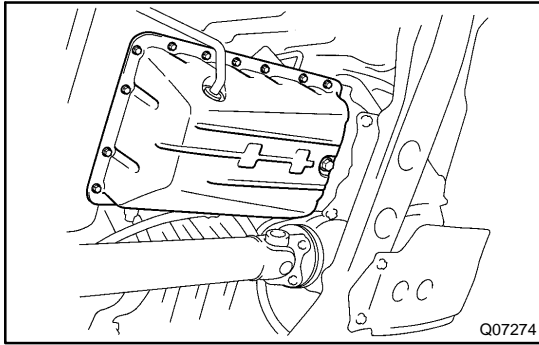
ON-VEHICLE REPAIR

1. **DISCONNECT 2 OIL COOLER PIPES** (See page [AT-16](#))
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**



3. **REMOVE PARK/NEUTRAL POSITION SWITCH**
 - (a) Pry off the lock washer and remove the nut.
 - (b) Remove the bolt and park/neutral position switch.
4. **REINSTALL PARK/NEUTRAL POSITION SWITCH**
 - (a) Install the park/neutral position switch and bolt.
 - (b) Install a new lock plate and the nut.
Torque: 6.9 N·m (70 kgf·cm, 61 in.-lbf)
 - (c) Stake the nut with the lock plate.
 - (d) Adjust the park/neutral position switch.
(See page [DI-131](#))
5. **RECONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
6. **RECONNECT 2 OIL COOLER PIPES** (See page [AT-17](#))

Adjust the shift lever position. (See page [DI-131](#))



VALVE BODY ASSEMBLY ON-VEHICLE REPAIR

AT074-01

1. DRAIN ATF

Torque: 20 N·m (205 kgf-cm, 15 ft-lbf)

2. REMOVE OIL PAN

NOTICE:

Some fluid will remain in the oil pan.

- (a) Remove the 19 bolts.

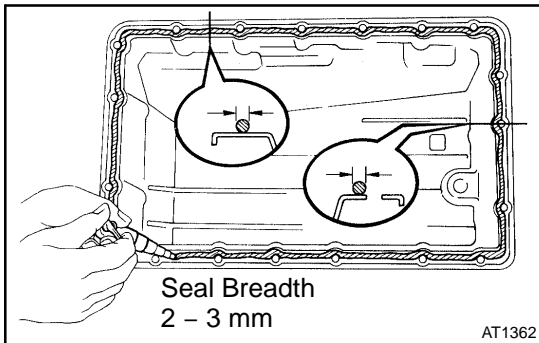
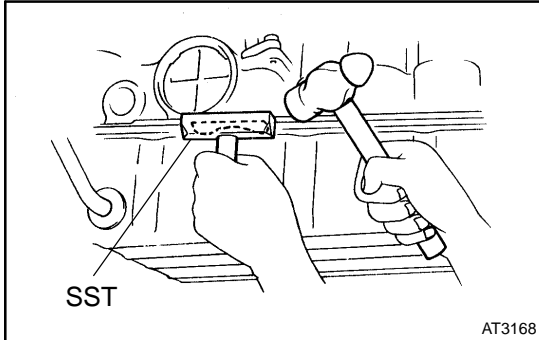
Torque: 7.4 N·m (75 kgf-cm, 65 in.-lbf)

- (b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then remove the oil pan.

SST 09032-00100

NOTICE:

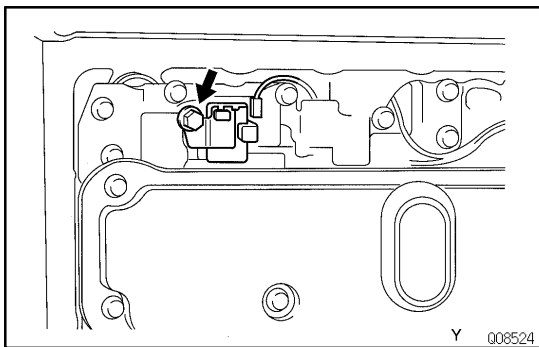
When removing the oil pan, be careful not to damage the oil pan flange.



HINT:

At the time of installation, after removing all the old FIPG on the contacting surface of the oil pan and transmission case, apply new FIPG to the oil pan. (See page [AT-1](#))

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent



3. WHEN REPLACING 3 SHIFT SOLENOID VALVES

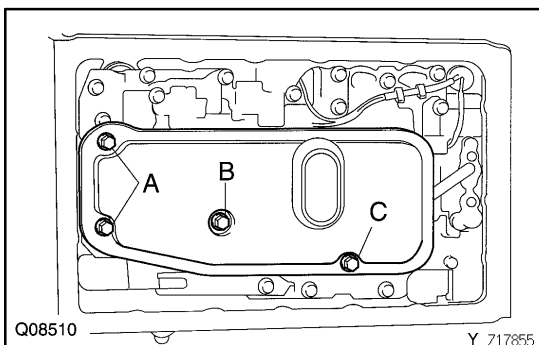
- (a) Disconnect the connectors from the solenoid valves.
(b) Remove the 3 solenoid valve mounting bolts.

Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

- (c) Remove the 3 solenoid valves.

HINT:

At the time of installation, replace the O-rings with new ones.



4. REMOVE OIL STRAINER

Remove the 4 bolts, and the oil strainer and gaskets.

Torque: 10 N·m (100 kgf-cm, 7 ft-lbf)

NOTICE:

Be careful as some fluid will come out with the oil strainer.

Bolt length:

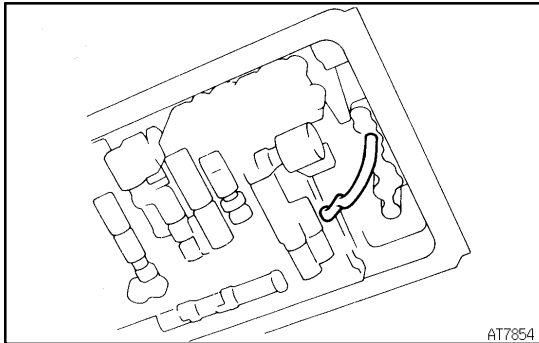
Bolt A: 16 mm (0.63 in.)

Bolt B: 20 mm (0.79 in.)

Bolt C: 28 mm (1.10 in.)

HINT:

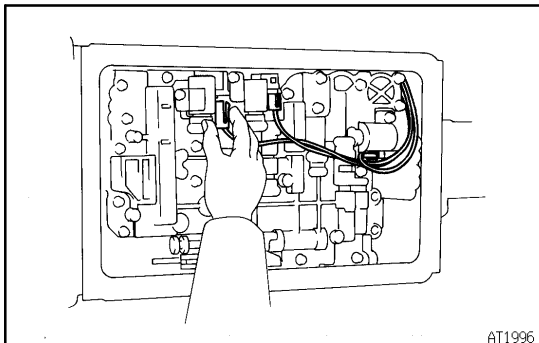
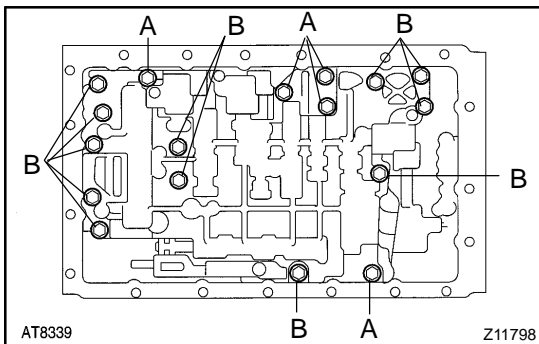
At the time of installation, replace the gaskets with new ones.

**5. REMOVE OIL PIPE**

Pry up both pipe ends with a large screwdriver and remove the pipe.

NOTICE:

At time of the installation, make sure that the oil pipe or the magnet do not interfere with the oil pan.

**6. DISCONNECT CONNECTOR FROM EACH SOLENOID VALVE****7. REMOVE VALVE BODY**

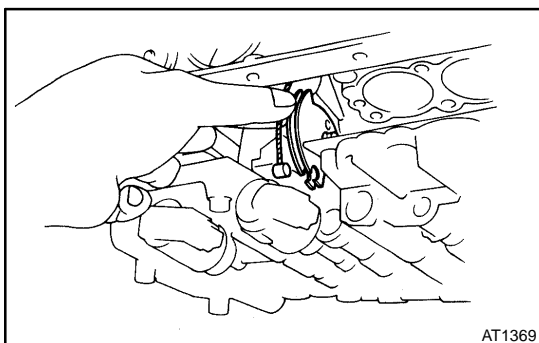
(a) Remove the 17 bolts.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

Bolt length:

Bolt A: 23 mm (0.91 in.)

Bolt B: 32 mm (1.26 in.)



(b) Disconnect the throttle cable from the cam.

(c) Remove the valve body.

NOTICE:

Be careful not to drop the check ball body and spring.

HINT:

At the time of installation, install the body together the check ball body and spring and Align the groove of the manual valve to the pin of the lever.

8. REINSTALL VALVE BODY ASSEMBLY

To install, follow the removal procedure in reverse.

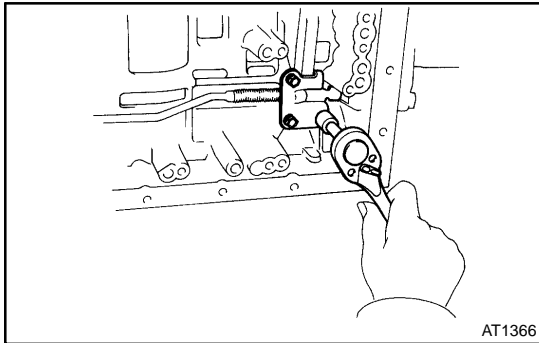
HINT:

After installation, fill ATF and check the fluid level. (See page [DI-131](#))

PARKING LOCK PAWL ON-VEHICLE REPAIR

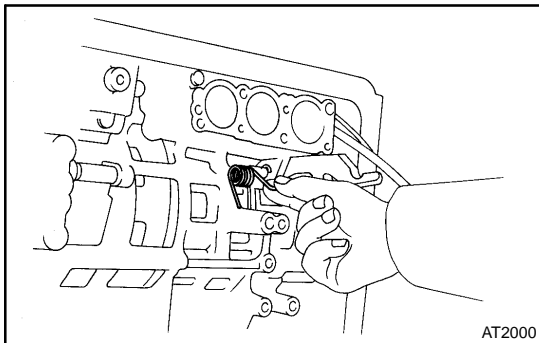
AT015-02

1. REMOVE VALVE BODY (See page [AT-7](#))



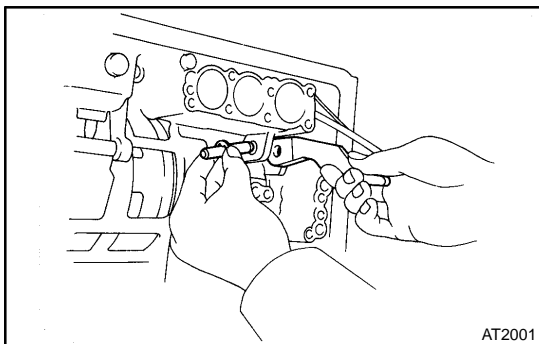
AT1366

2. REMOVE PARKING LOCK PAWL BRACKET



AT2000

3. REMOVE SPRING FROM PARKING LOCK PAWL SHAFT



AT2001

4. REMOVE PARKING LOCK PAWL AND SHAFT
5. REINSTALL PARKING LOCK PAWL AND SHAFT
6. REINSTALL SPRING
7. REINSTALL PARKING LOCK PAWL BRACKET

HINT:

- Push the lock rod fully forward.
- Check that the parking lock pawl operates smoothly.

Torque: 7.4 N·m (75 kgf·cm, 65 in.-lbf)

8. REINSTALL VALVE BODY (See page [AT-7](#))

THROTTLE CABLE ON-VEHICLE REPAIR

AT016-01

1. DISCONNECT THROTTLE CABLE

- (a) Disconnect the cable from the throttle linkage.
- (b) Disconnect the cable from the cable clamps in the engine compartment.
- (c) Remove the bolt and disconnect the cable clamp from the torque converter clutch housing.

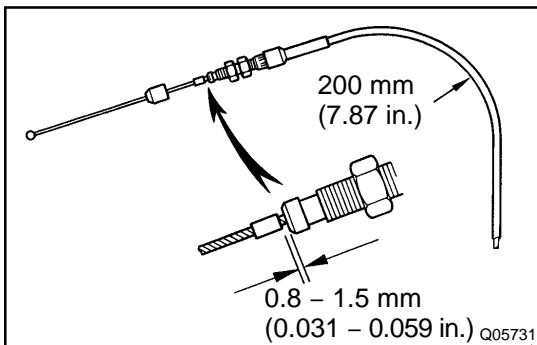
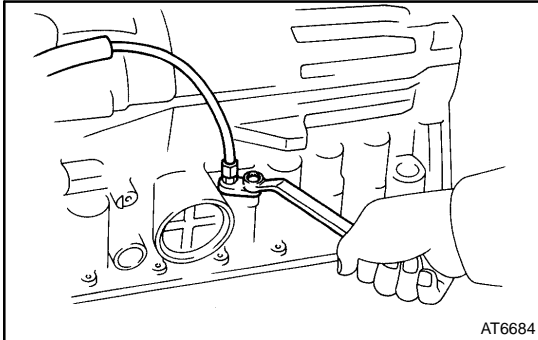
2. REMOVE VALVE BODY (See page AT-7)

3. REMOVE THROTTLE CABLE

Remove the retaining bolt and pull out the throttle cable.

4. REINSTALL THROTTLE CABLE

- (a) To install, follow the removal procedure in reverse.



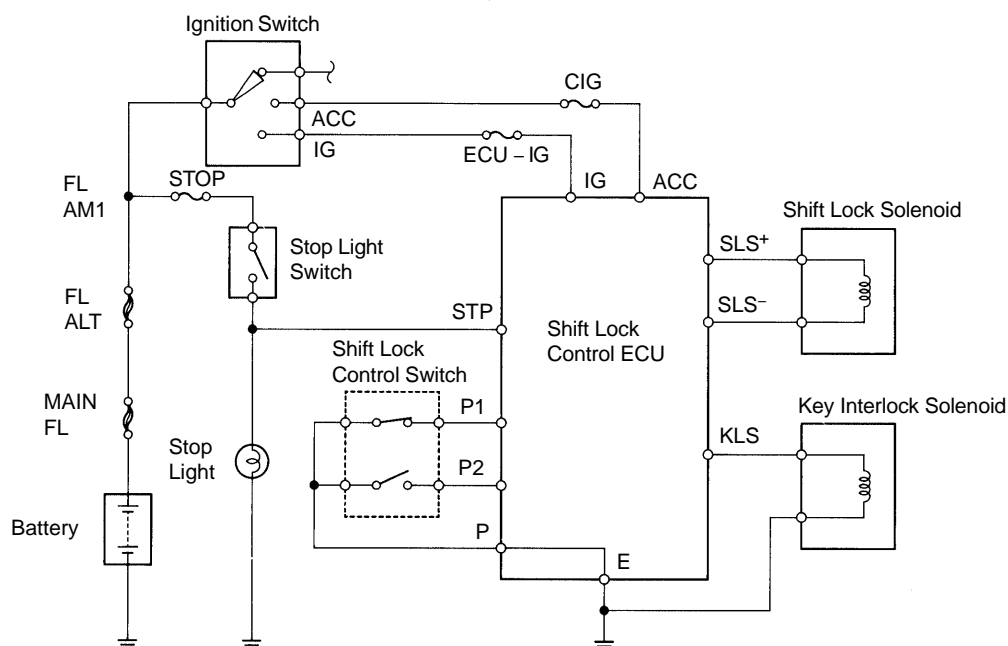
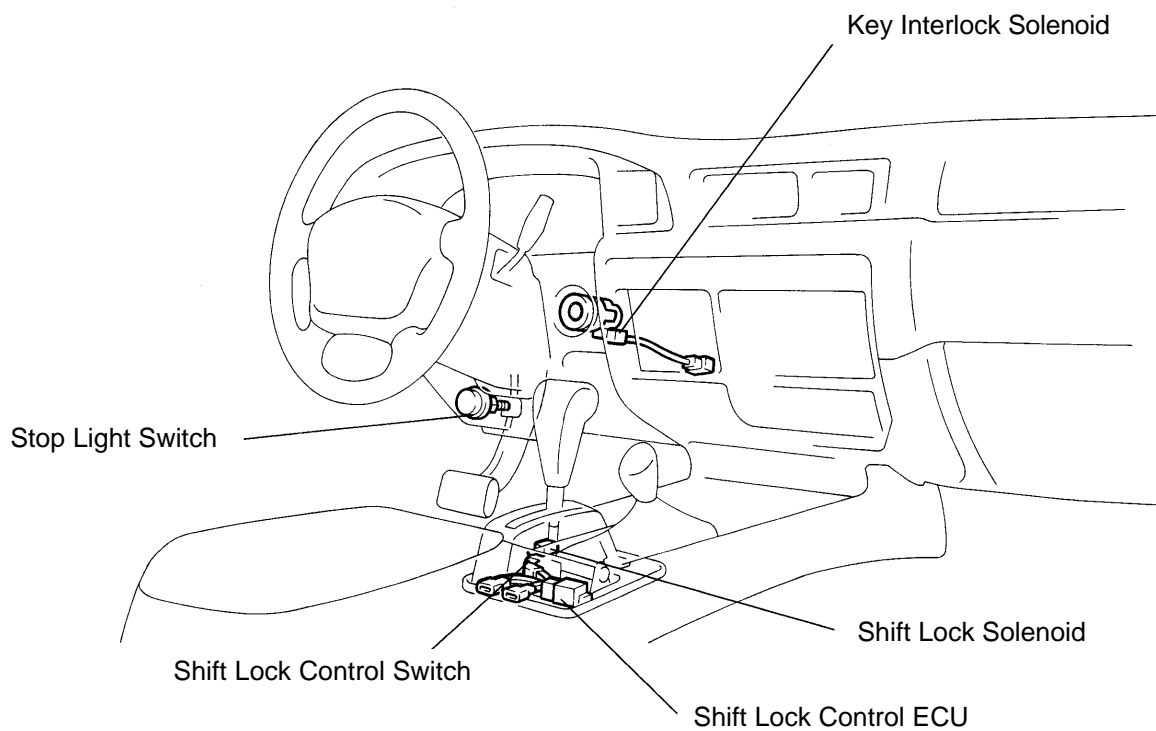
HINT:

If throttle cable is new, stake the stopper on the inner cable.

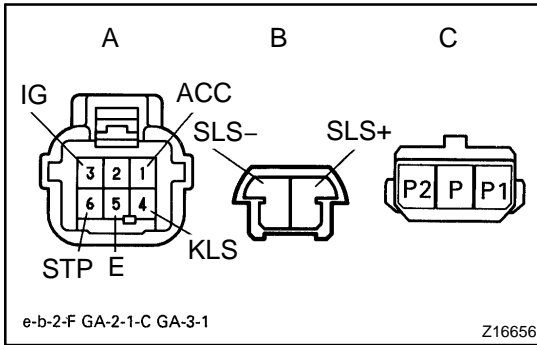
- (b) Bend the cable so there is a radius of about 200 mm (7.87 in.)
- (c) Pull the inner cable lightly until slight resistance is felt, and hold it there.
- (d) Stake the stopper, 0.8–1.5 mm (0.031–0.059 in.) from the end of outer cable.
 - After installation, fill ATF and check the fluid level (See page DI-131).
 - Adjust the throttle cable (See page DI-131).

SHIFT LOCK SYSTEM LOCATION

AT0YZ-01



Z16651



INSPECTION

1. INSPECT SHIFT LOCK CONTROL ECU

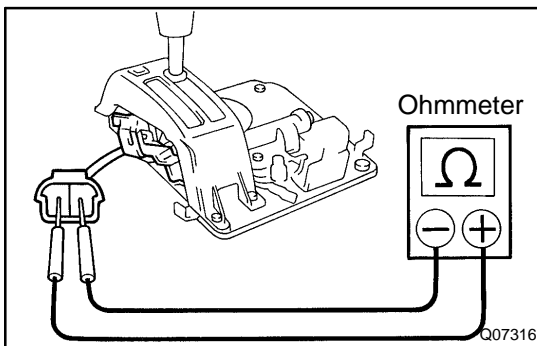
Using a voltmeter, measure the voltage at each terminal.

HINT:

Do not disconnect the ECU connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	IG SW ACC	10 – 14
	IG – E	IG SW ON	10 – 14
	STP – E	Depress brake pedal	10 – 14
	KLS – E	① IG SW ACC and shift lever P position	0
		② IG SW ACC and shift lever except P position	10 – 14
		③ ↑ (After - approx. 1 second)	6 – 9
B	SLS+ – SLS-	① IG SW ON and shift lever P position	0
		② Depress brake pedal	8.5 – 13.5
		③ ↑ (After - approx. 20 seconds)	5.5 – 9.5
		④ Shift lever except P position under condition above	0
C	P1 – P	① IG SW ON, shift lever P position and depress brake pedal	0
		② Shift lever except P position under condition above	9 – 13.5
	P2 – P	① IG SW ACC and shift lever at P position	9 – 13.5
		② Shift lever except P position under condition above	0

V07131

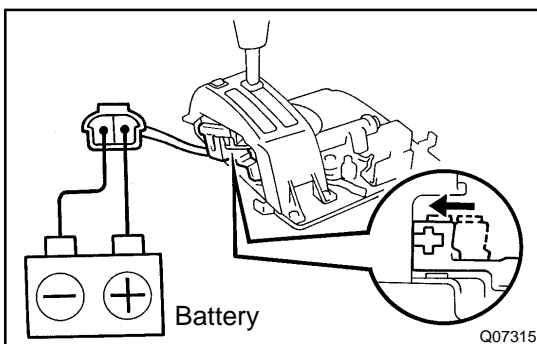


2. INSPECT SHIFT LOCK SOLENOID

- Disconnect the solenoid connector.
- Using an ohmmeter, measure the resistance between terminals.

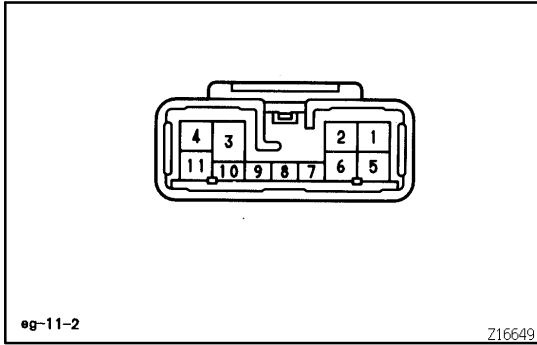
Standard resistance: 20 – 28 Ω

If the resistance is not as specified, replace the solenoid.



- Apply the battery positive voltage between terminals. At this time, confirm that solenoid operate.

If the operation is not as specified, replace the solenoid.

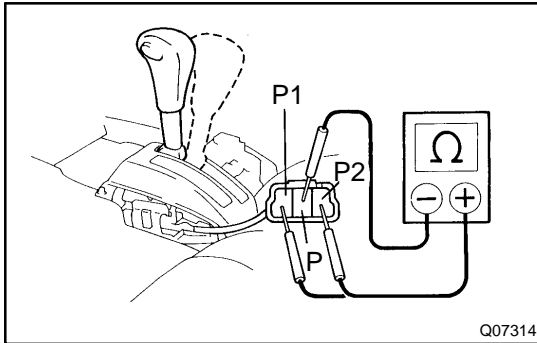


3. INSPECT KEY INTERLOCK SOLENOID

- Disconnect the solenoid connector.
- Using an ohmmeter, measure the resistance between terminals 7 and 8.

Standard resistance: 12 – 17 Ω

If the resistance is not as specified, replace the solenoid.



4. INSPECT SHIFT LOCK CONTROL SWITCH

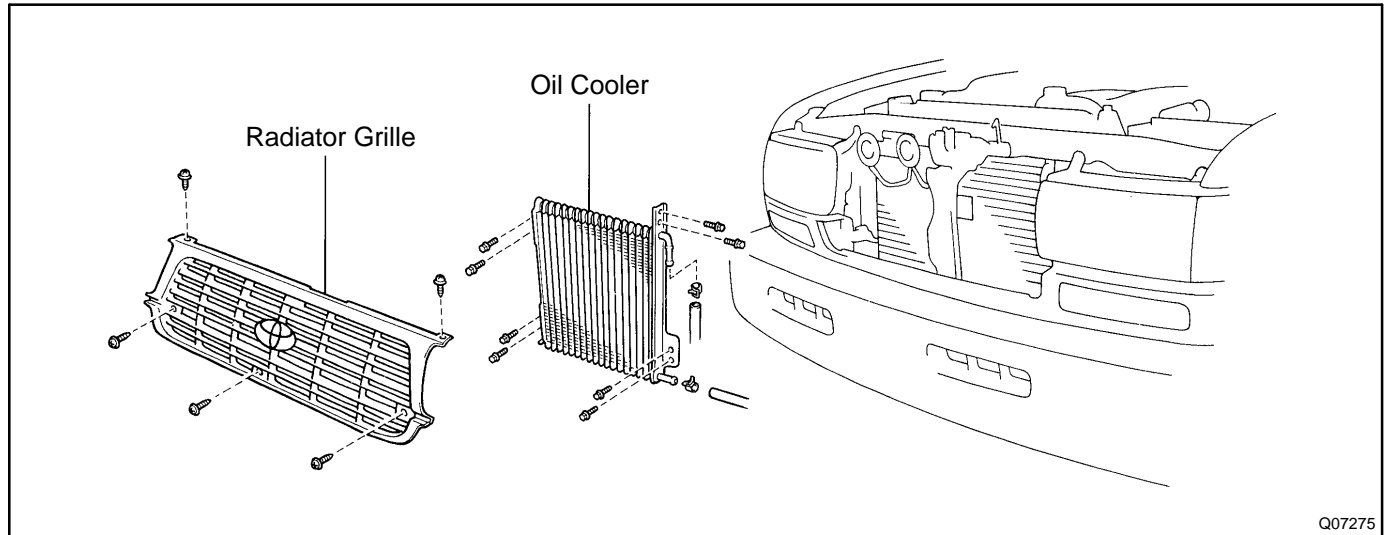
Inspect that there is continuity between each terminal.

Shift position	Tester condition to terminal number	Specified value
P position (Release button is not pushed)	P1 – P	Continuity
P position (Release button is pushed)	P1 – P P2 – P	Continuity
R, N, D, 2, L position	P2 – P	Continuity

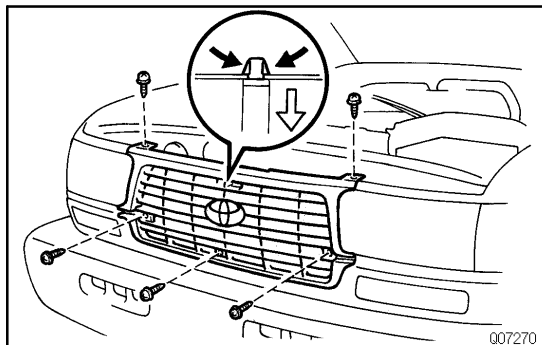
If the continuity is not as specified, replace the switch.

AIR COOLED OIL COOLER COMPONENTS

AT0TB-01



Q07275



REMOVAL

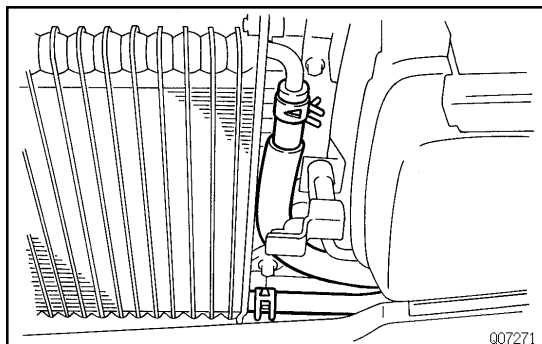
1. REMOVE RADIATOR GRILLE

- (a) Remove the 5 screws.
- (b) Using a screwdriver, disconnect the clip.

HINT:

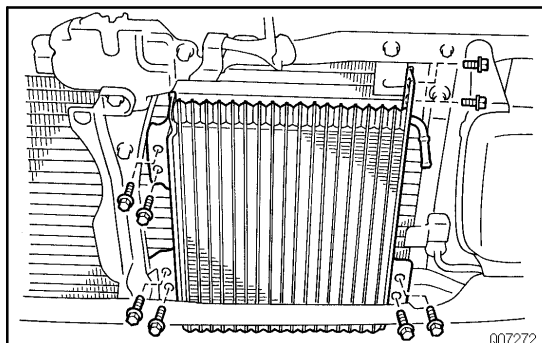
Tape a screwdriver tip before use.

- (c) Remove the radiator grille.



2. REMOVE OIL COOLER

- (a) Loosen the 2 clips and disconnect the 2 hoses.



- (b) Remove the 8 bolts and oil cooler.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

INSTALLATION

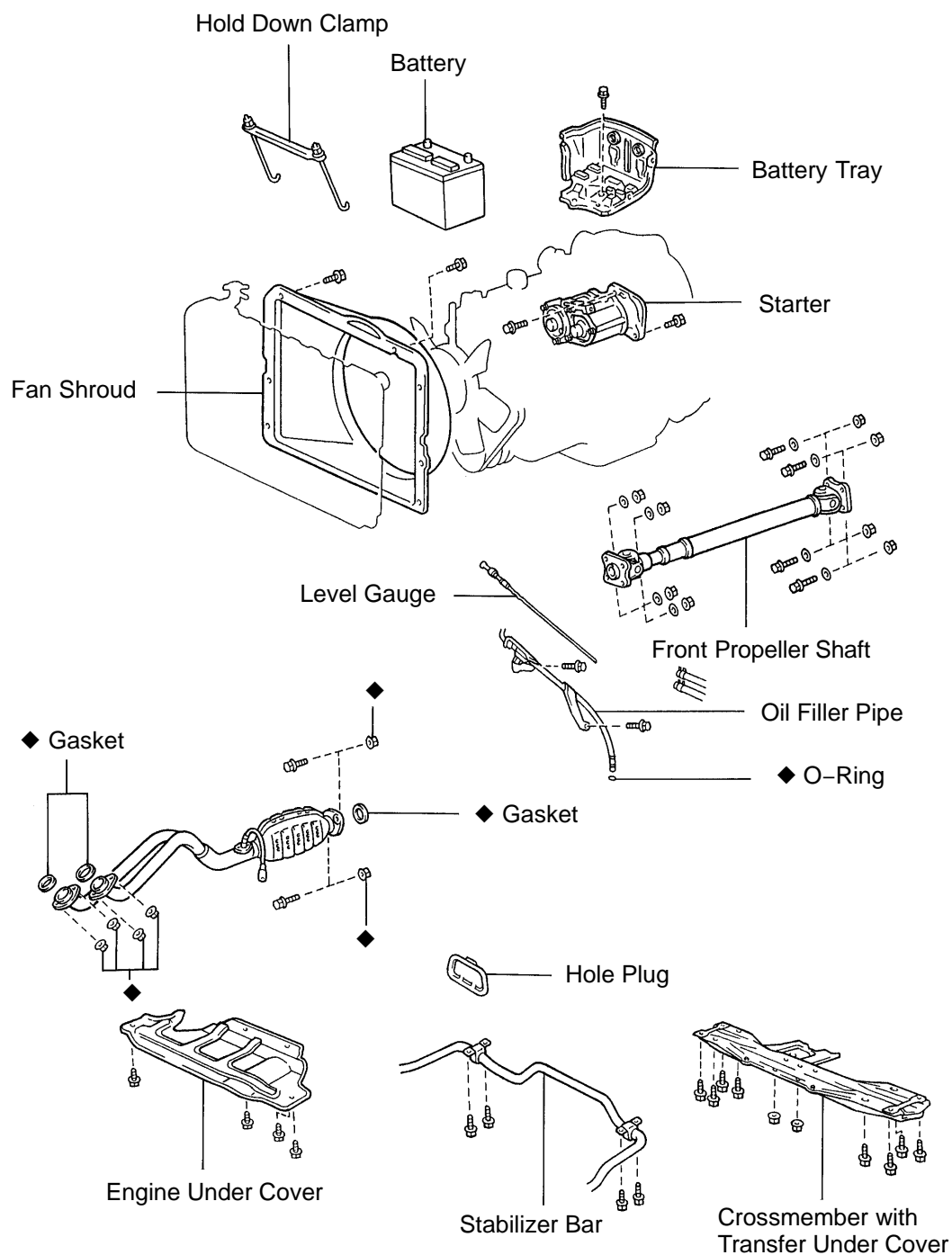
Installation is in the reverse order of removal (See page [AT-16](#)).

HINT:

After installation, check fluid level (See page [DI-131](#)).

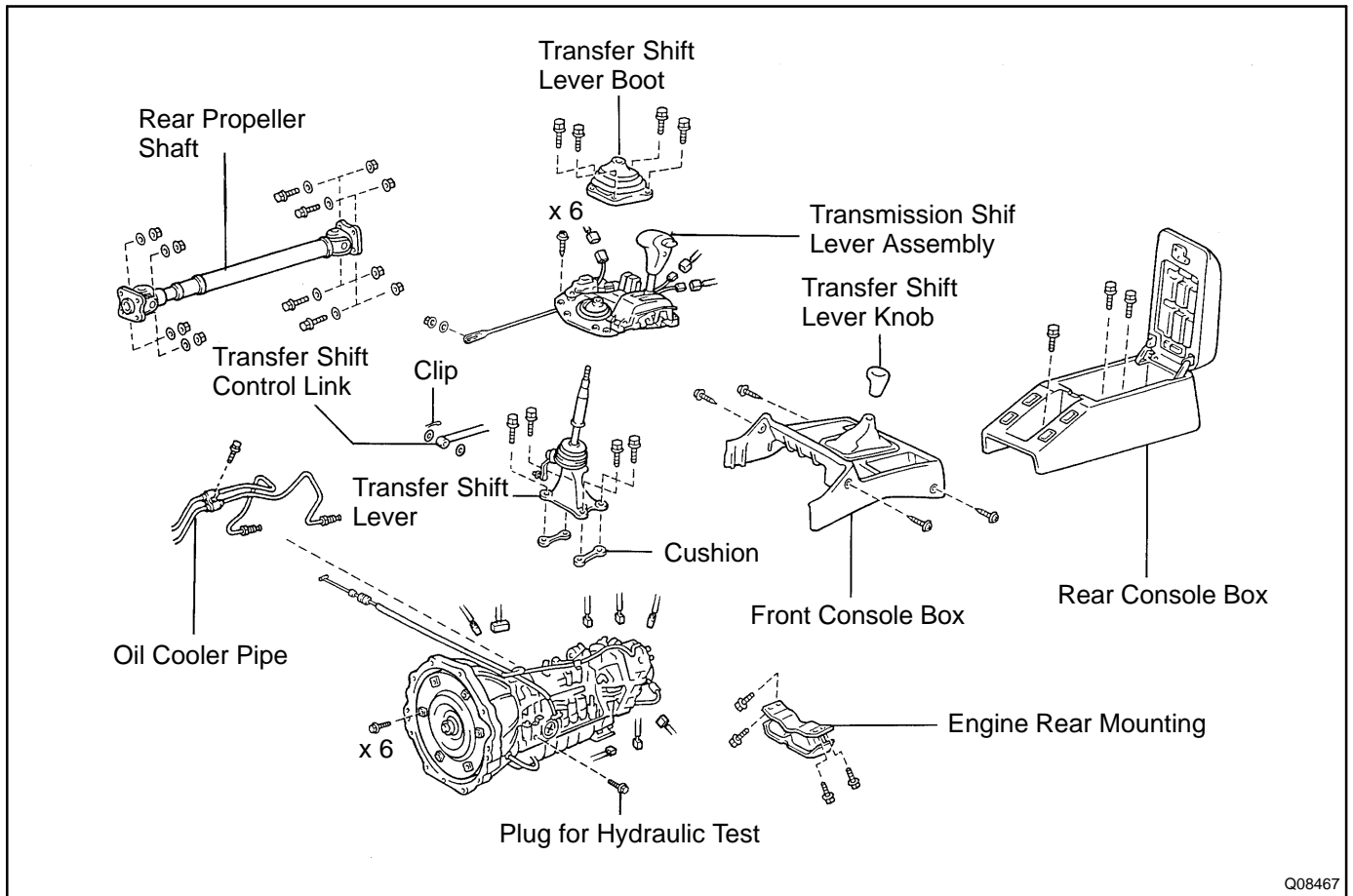
AUTOMATIC TRANSMISSION UNIT COMPONENTS

AT0TB-01

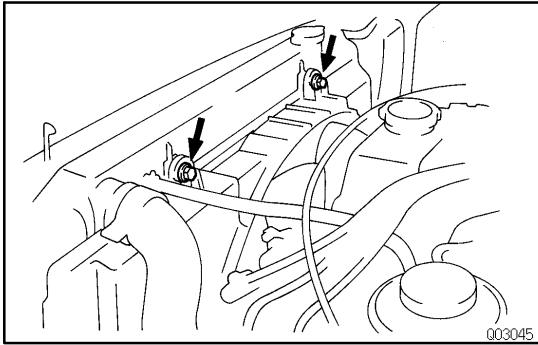


Q08463

AUTOMATIC TRANSMISSION – AUTOMATIC TRANSMISSION UNIT

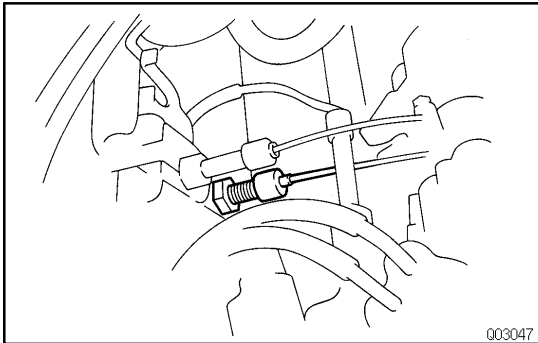


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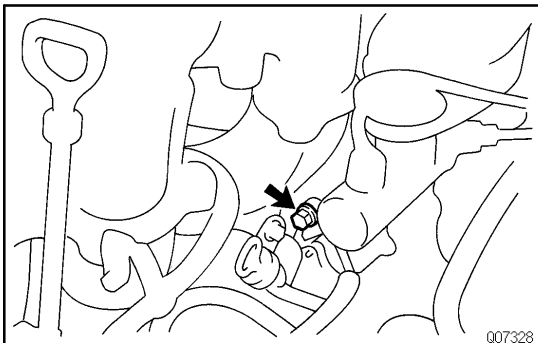


REMOVAL

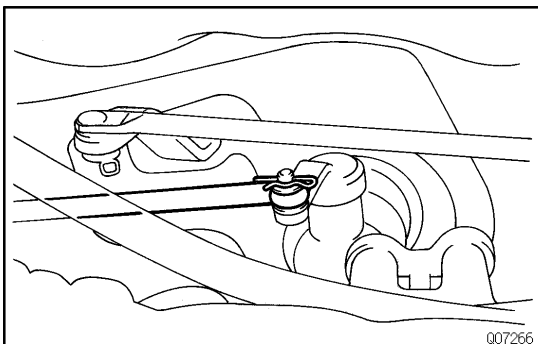
1. REMOVE BATTERY AND BATTERY TRAY
2. REMOVE 2 BOLTS AND LOOSEN FAN SHROUD OF COOLING FAN TO AVOID DAMAGE TO FAN
Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)



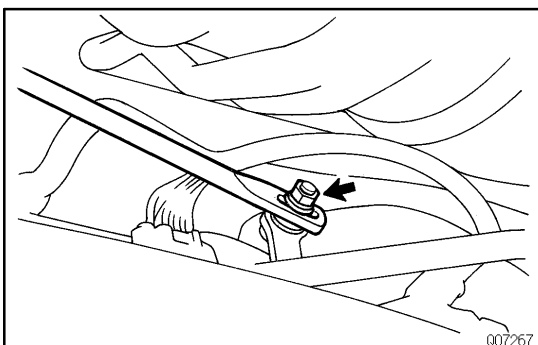
3. DISCONNECT THROTTLE CABLE
 - (a) Loosen the adjusting nut and disconnect the cable from the bracket.
 - (b) Disconnect the throttle cable from the linkage.



4. REMOVE UPPER SIDE STARTER MOUNTING BOLT
Torque: 39 N·m (400 kgf·cm, 29 ft-lbf)

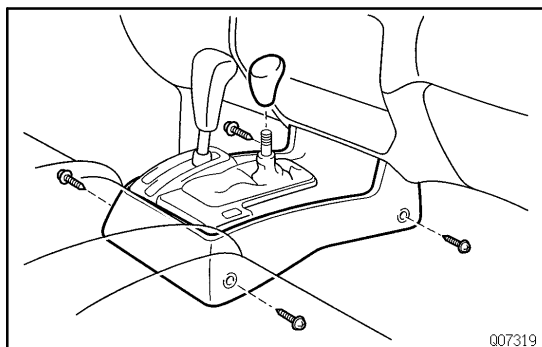


5. REMOVE TRANSMISSION SELECT LEVER AND TRANSFER SHIFT LEVER
 - (a) Remove the clip, washer and wave washer, and disconnect the transfer shift lever link.

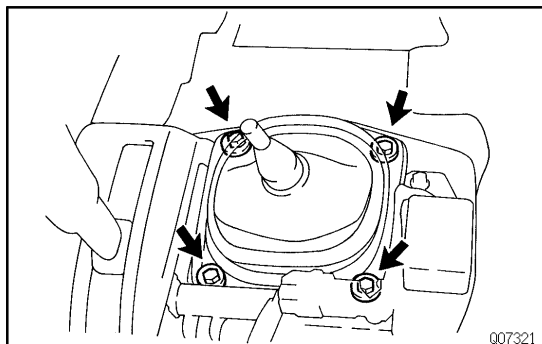


- (b) Remove the nut and washer, and disconnect the transmission select lever link.
Torque: 13 N·m (130 kgf·cm, 9 ft-lbf)

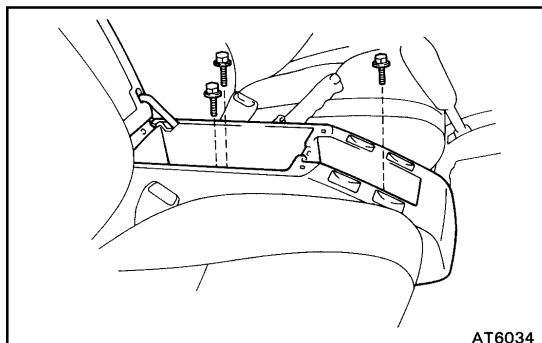
AUTOMATIC TRANSMISSION – AUTOMATIC TRANSMISSION UNIT



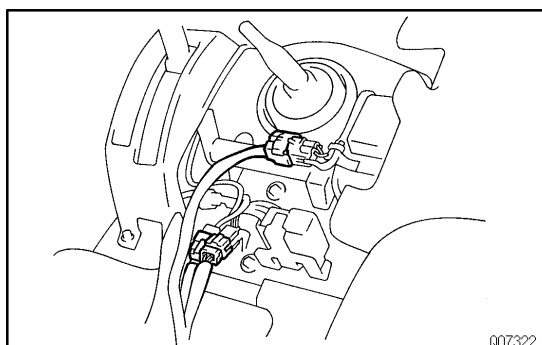
- (c) Remove the transfer shift lever knob.
- (d) Remove the 4 screws and console.



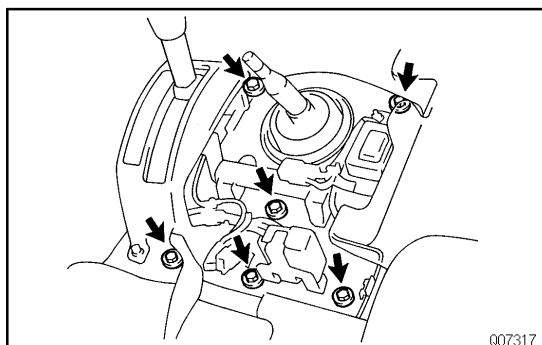
- (e) Remove the 4 screws and transfer shift lever boot.



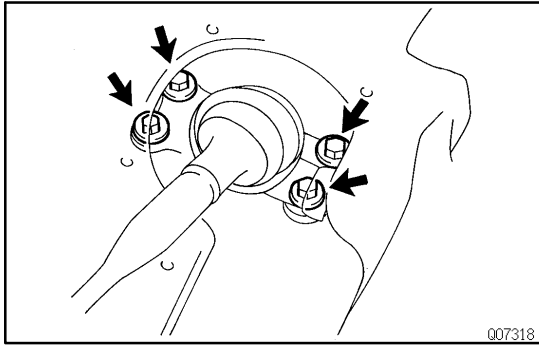
- (f) Remove the 3 bolts and console box.



- (g) Disconnect the 3 connectors.



- (h) Remove the 6 screws and transmission shift lever assembly.
Torque: 5.4 N-m (55 kgf-cm, 48 in.-lbf)



- (i) Remove the 4 bolts and transfer shift lever.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

- (j) Remove the 2 cushions.

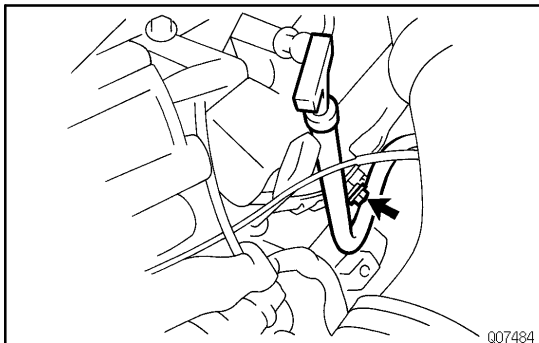
6. DISCONNECT THESE CONNECTORS:

- No.1 vehicle speed sensor
- No.2 vehicle speed sensor
- Park/neutral position switch
- Solenoid connector
- ATF temperature sensor
- Center differential lock indicator switch
- L4 position switch
- Neutral position switch

7. DISCONNECT BLEEDER HOSE FROM TRANSFER

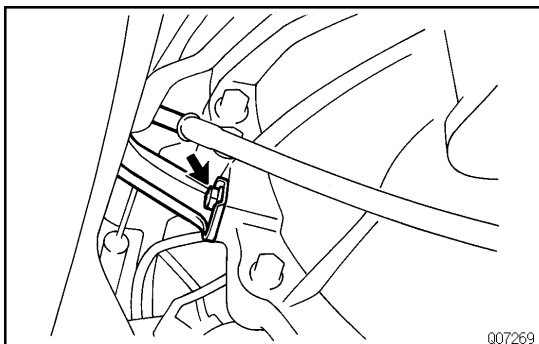
8. REMOVE FRONT AND REAR PROPELLER SHAFT

(See page [PR-3](#))



9. REMOVE OIL FILLER PIPE

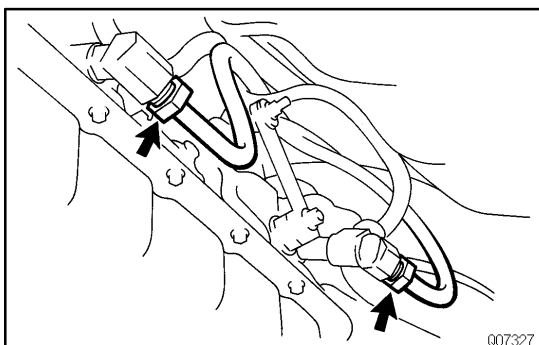
- (a) Remove the level gauge.
(b) Remove the upper side mounting bolt.



- (c) Remove the bolt and filler pipe.

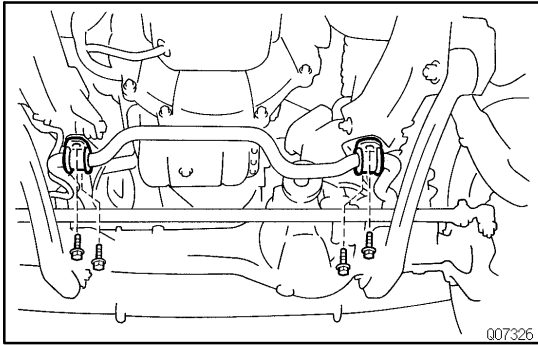
HINT:

At the time of installation, replace the used O-ring with a new one.



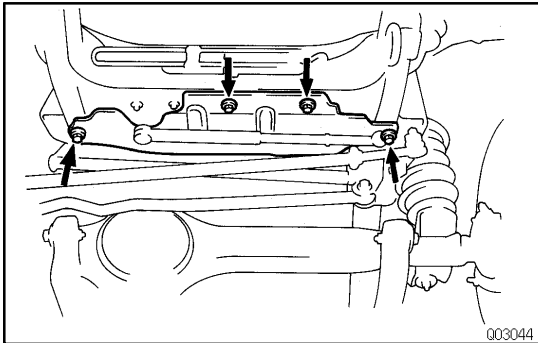
10. LOOSEN 2 OIL COOLER PIPE UNION NUTS

Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)



11. REMOVE 4 STABILIZER BAR BRACKET MOUNTING BOLTS

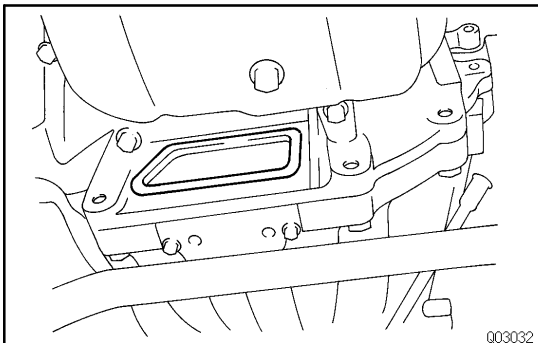
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



12. REMOVE ENGINE UNDER COVER

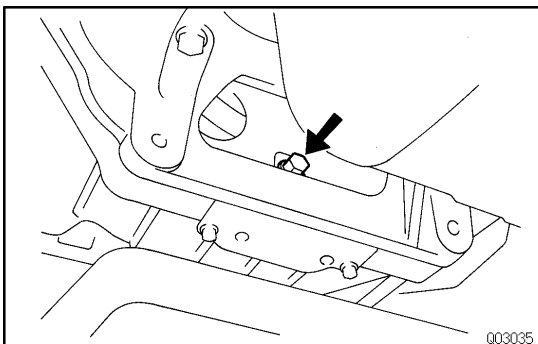
Remove the 4 bolts and engine under cover.

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



13. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLT

(a) Remove the converter hole plug.



(b) Turn the crankshaft to gain access to each bolt.
(c) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.

Torque: 55 N·m (550 kgf-cm, 40 ft-lbf)

HINT:

At the time of installation, first install gray colored bolt and then 5 other bolts.

14. REMOVE FRONT EXHAUST PIPE ASSEMBLY

(a) Remove the 2 nuts, bolts and gasket, and disconnect the front exhaust pipe assembly.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

HINT:

At the time of installation, replace the used nuts and gasket with new nuts and gasket.

(b) Loosen the clamp bolt and disconnect the clamp from the No.1 support bracket.

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

(c) Remove the 2 bolts and No.1 support bracket.

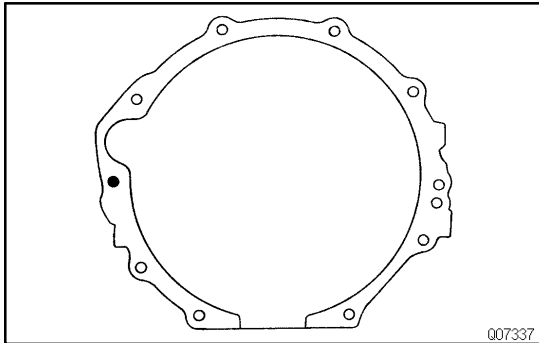
Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)

- (d) Remove the 4 nuts and 2 gaskets, shift the front exhaust pipe assembly to the vehicle's outside.

Torque: 62 N·m (630 kgf-cm, 46 ft-lbf)

HINT:

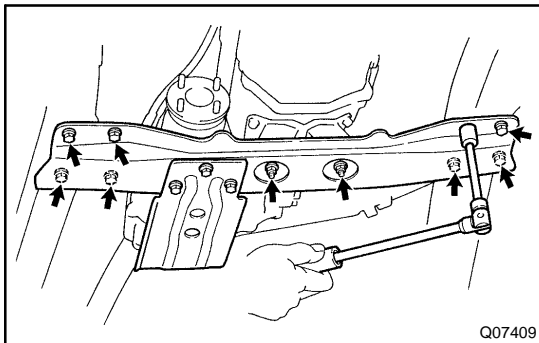
At the time of installation, replace the used gaskets and nuts with new gaskets and nuts.



15. REMOVE STARTER

- (a) Remove the nut and disconnect the terminal and connector.
(b) Remove the lower side mounting bolt and starter.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)



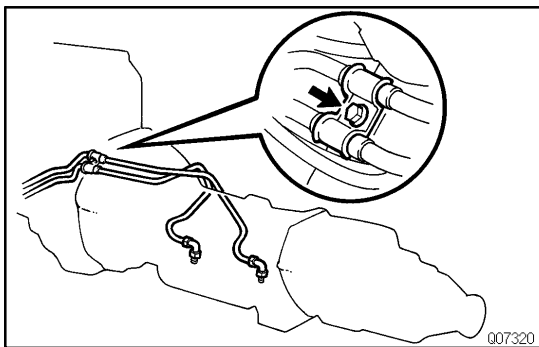
16. REMOVE CROSSMEMBER

- (a) Support the transmission with a transmission jack.
(b) Remove the 8 bolts and 2 nuts, and then remove the crossmember.

Torque:

Bolt: 61 N·m (620 kgf-cm, 45 ft-lbf)

Nut: 74 N·m (750 kgf-cm, 54 ft-lbf)



17. REMOVE TRANSMISSION

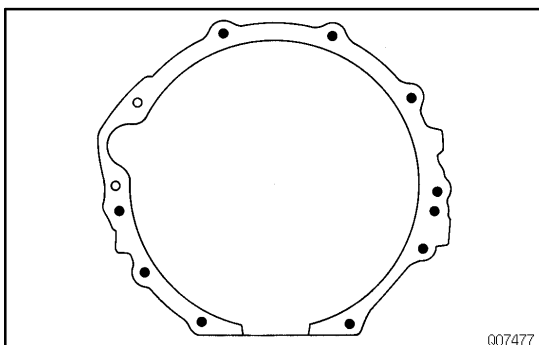
- (a) Lower the rear end of the transmission.

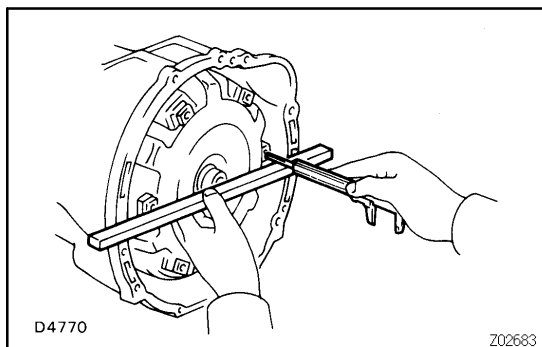
NOTICE:

Be careful not to damage the cooling fan, brake booster and brake line.

- (b) Separate the wire harness from the transmission and transfer.
(c) Remove the oil cooler pipe mounting bolts from the torque converter clutch housing, and then disconnect the 2 oil cooler pipes from the elbows.
(d) Remove the 10 bolts and transmission.

Torque: 72 N·m (730 kgf-cm, 53 ft-lbf)





INSTALLATION

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the transmission housing.

Correct distance: More than 15.7 mm (0.618 in.)

2. INSTALL TRANSMISSION

Installation is in the reverse order of removal (See page [AT-20](#)).

HINT:

- After installation, adjust the shift lever position and throttle cable (See page [DI-131](#)).
- Fill and check fluid level (See page [DI-131](#)).

BODY ELECTRICAL SYSTEM

BE1LS-01

PRECAUTION

Take care to observe the following precautions when performing inspections or removal and replacement of body electrical related parts.

1. HEADLIGHT SYSTEM

Halogen bulbs have pressurized gas inside and require special handling. They can burst 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.

2. SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

The LAND CRUISER is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

3. 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 negative (–) terminal cable is reconnected to the battery.

4. MOBILE COMMUNICATION SYSTEM

If the vehicle is equipped with a mobile communication system, refer to precautions in the IN section.

BE-2

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

BE1LT-01

PROBLEM SYMPTOMS TABLE

IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

Symptom	Suspect Area	See page
Ignition switch is not set to each position.	5. Ignition Switch	BE-11
"Key unlock warning system" does not operate.	1. GAUGE Fuse (I/P F/B) 2. Key Unlock Warning Switch 3. Door Courtesy Switch 4. Wire Harness	– BE-11 BE-21 –

HEADLIGHT AND TAILLIGHT SYSTEM

Symptom	Suspect Area	See page
Headlight does not light up. (Taillight is normal.)	1. Headlight Bulb 2. MAIN FL 3. HEAD (LH) Fuse (No.2 R/B) 4. HEAD (RH) Fuse (No.2 R/B) 5. Light Control Switch 6. Headlight Dimmer Switch 7. Wire Harness	– – – – BE-14 BE-14 –
Headlight does not light up. (Taillight does not light up.)	1. Headlight Bulb 2. Light Control Switch 3. Headlight Dimmer Switch 4. Wire Harness	– BE-14 BE-14 –
Only one light comes ON.	1. Headlight Bulb 2. HEAD (LH) Fuse (No.2 R/B) 3. HEAD (RH) Fuse (No.2 R/B) 4. Wire Harness	– – – –
"Lo-Beam" does not light up.	1. Headlight Bulb 2. Headlight Control Relay (No.2 R/B) 3. Headlight Dimmer Switch 4. Wire Harness	– – BE-14 –
"Hi-Beam" does not light up.	1. Headlight Bulb 2. Headlight Control Relay (No.2 R/B) 3. Headlight Dimmer Switch 4. Wire Harness	– – BE-14 –
"Flash" does not light up.	1. Headlight Bulb 2. Headlight Control Relay (No.2 R/B) 3. Headlight Dimmer Switch 4. Wire Harness	– – BE-14 –
Taillight does not light up. (Headlight is normal.)	1. Taillight Bulb 2. TAIL Fuse (I/P F/B) 3. Light Control Switch 4. Taillight Control Relay (No.2 R/B) 5. Wire Harness	– – BE-14 BE-14 –
Taillight does not light up. (Headlight does not light up.)	1. Taillight Bulb 2. MAIN FL 3. TAIL Fuse (I/P F/B) 4. Light Control Switch 5. Wire Harness	– – – BE-14 –
Headlight and Taillight does not light.	1. Light Control Switch 2. Wire Harness	BE-14 –

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

Only one side taillight does not light.	1. Taillight Bulb 2. Wire Harness	– –
Taillight does not light. (Headlight is normal.)	1. Taillight Bulb 2. TAIL Fuse (No.2 R/B) 3. Taillight Control Relay (No.2 R/B) 4. Light Control Switch 5. Wire Harness	– BE-14 BE-14 BE-14 –

TURN SIGNAL AND HAZARD WARNING SYSTEM

Symptom	Suspect Area	See page
"Hazard" and "Turn" do not light up.	1. Hazard Warning Switch 2. Turn Signal Flasher (No.1 R/B) 3. Wire Harness	BE-19 BE-19 –
None of blinks for hazard. (Turn is normal.)	1. Bulb 2. Turn Signal Flasher (No.1 R/B) 3. Wire Harness	– BE-19 –
Hazard warning light does not light up. (Turn is normal.)	1. HAZ – HORN Fuse (No.2 R/B) 2. Wire Harness	BE-19 –
Hazard warning light does not light up in one direction.	1. Hazard Warning Switch 2. Wire Harness	BE-19 –
The flashing frequency is abnormal.	1. Bulb 2. Turn Signal Flasher (No.1 R/B) 3. Wire Harness	– BE-19 –
Turn signal does not light up in one direction.	1. Turn Signal Switch 2. Wire Harness	BE-19 –
Only one bulb does not light up for hazard turn.	1. Bulb 2. Wire Harness	– –
Turn signal does not light up. (Combination meter, wiper and washer do not operate.)	1. Ignition Switch 2. TURN Fuse (I/P F/B) 3. Turn Signal Switch 4. Wire Harness	BE-11 BE-19 BE-19 –
Turn signal does not light up. (Combination meter, wiper and washer are normal.)	1. TURN Fuse (I/P F/B) 2. Turn Signal Switch 3. Wire Harness	BE-19 BE-19 –

INTERIOR LIGHT SYSTEM

Symptom	Suspect Area	See page
Room light does not light up.	1. DOME Fuse (No.2 R/B) 2. Door Courtesy Switch 3. Front Personal Light 4. Room Light Assembly 5. Bulb 6. Wire Harness	– BE-21 BE-21 BE-21 – –
Room light remains always on.	1. Door Courtesy Switch 2. Wire Harness	BE-21 –

BACK-UP LIGHT SYSTEM

Symptom	Suspect Area	See page
Back-Up light does not light up.	1. GAUGE Fuse (I/P F/B) 2. Ignition Switch 3. Park/Neutral Position Switch (A/T) 4. Bulb 5. Wire Harness	– BE-11 – – –

BE-4

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

Back-Up light remains on.	1. Park/Neutral Position Switch (A/T)	–
	2. Wire Harness	–
Only one light does not light up.	1. Bulb	–
	2. Wire Harness	–

STOP LIGHT SYSTEM

Symptom	Suspect Area	See page
Stop light does not light up.	1. STOP Fuse (I/P F/B)	–
	2. Stop Light Switch	BE-25
	3. Bulb	–
	4. Wire Harness	–
Stop light remains always on.	1. Stop Light Switch	BE-25
	2. Wire Harness	–
Only one light does not light up.	1. Wire Harness	–
	2. Bulb	–

WIPER AND WASHER SYSTEM

Symptom	Suspect Area	See page
Wipers do not operate or return to off position.	1. WIPER Fuse (I/P F/B)	BE-27
	2. Wiper Switch	BE-27
	3. Wiper Motor	BE-27
	4. Wiper Relay	BE-27
	5. Wire Harness	–
Wipers do not operate in MIST.	1. Wiper Switch	BE-27
	2. Wiper Motor	BE-27
	3. Wiper Relay	BE-27
	4. Wire Harness	–
Wipers do not operate in INT.	1. Wiper Switch	BE-27
	2. Wiper Motor	BE-27
	3. Wiper Relay	BE-27
	4. Wire Harness	–
Washer does not operate.	1. Washer Hose or Nozzle Clogged	–
	2. Washer Switch	BE-27
	3. Washer Motor	BE-27
	4. Wire Harness	–

**METER, GAUGES AND ILLUMINATION:
COMBINATION METER**

Symptom	Suspect Area	See page
Tachometer, speedometer, engine coolant temperature gauge and fuel gauge do not operate.	1. GAUGE Fuse (I/P F/B)	–
	2. Meter Circuit	BE-32
	3. Wire Harness	–
Speedometer does not operate.	1. No.1 Vehicle Speed Sensor	BE-34
	2. Speedometer Driven Gear and Drive Gear	–
	3. Meter Circuit	BE-32
	4. Wire Harness	–
Tachometer does not operate.	1. Meter Circuit	BE-32
	2. Igniter	–
	3. Wire Harness	–
Tachometer does not operate.	1. Meter Circuit	BE-32
	2. Igniter	–
	3. Wire Harness	–
Voltmeter does not operate.	1. Voltmeter Receiver Gauge	AT-6
	2. Wire Harness	–

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

Fuel gauge does not operate or abnormal operation.	1. Fuel Receiver Gauge 2. Fuel Sender Gauge 3. Meter Circuit 4. Wire Harness	BE-34 BE-34 BE-32 –
Engine coolant temperature gauge does not operation or abnormal operate.	1. Engine Coolant Temperature Receiver Gauge 2. Engine Coolant Temperature Sender Gauge 3. Meter Circuit 4. Wire Harness	BE-34 BE-34 BE-32 –
Oil pressure gauge does not operate or abnormal operation.	1. Oil Pressure Receiver Gauge 2. Oil Pressure Sender Gauge 3. Meter Circuit 4. Wire Harness	BE-34 BE-34 BE-34 –
All illumination lights do not light up.	1. TAIL Fuse (I/P F/B) 2. Light Control Rheostat 3. Wire Harness	– BE-34 –
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: COMBINATION METER

Symptom	Suspect Area	See page
Warning lights do not lights up. (Except discharge, SRS and door open)	1. GAUGE Fuse (I/P F/B) 2. Meter Circuit 3. Wire Harness	– BE-32 –
Brake warning light does not light up.	1. Bulb 2. Brake Fluid Level Switch 3. Parking Brake Switch 4. Meter Circuit 5. Wire Harness	– BE-34 BE-34 BE-32 –
Open door warning light does not light up.	1. Bulb 2. Door Courtesy Switch 3. DOME Fuse (No.2 R/B) 4. Meter Circuit 5. Wire Harness	– BE-21 BE-21 – – –
SRS warning light does not light up	1. Bulb 2. Airbag Sensor Assembly 3. ECU-B Fuse (I/P F/B) 4. Meter Circuit 5. Wire Harness	– – – BE-32 –
Discharge warning light does not light up.	1. Bulb 2. IGN Fuse (No.1 J/B) 3. Generator 4. Meter Circuit 5. Wire Harness	– – – BE-32 –
Seat belt warning light does not light up.	1. Bulb 2. Seat Belt Buckle Switch 3. Seat Belt Warning Relay (I/P F/B) 4. Meter Circuit 5. Wire Harness	– BE-34 – BE-32 –

BE-6

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

Engine oil level warning light does not light up.	1. Bulb 2. Meter Circuit 3. Engine Oil Level Warning Switch 4. Wire Harness	– BE-32 BE-34 –
Low oil pressure warning light does not light up.	1. Bulb 2. Low Oil Pressure Warning Switch 3. Meter Circuit 4. Wire Harness	– BE-32 BE-34 –
Fuel level warning light does not light up.	1. Bulb 2. Fuel Level Warning Switch 3. Meter Circuit 4. Wire Harness	– BE-34 BE-32 –

INDICATOR LIGHTS: COMBINATION METER

Symptom	Suspect Area	See page
High beam indicator light does not light up.	1. Bulb 2. Headlight and Taillight System 3. Meter Circuit 4. Wire Harness	– BE-19 BE-32 –
Shift indicator lights do not light up. (ALL)	1. Shift Position Indicator Wiring Circuit 2. Park/Neutral Position Switch 3. Wire Harness 4. Bulb	– BE-34 AT-6 –
Shift indicator lights do not light up. (L, 2, D)	1. Bulb 2. Shift Position Indicator Wiring Circuit 3. Park/Neutral Position Switch 4. Light Control Rheostat 5. Wire Harness	– BE-34 AT-6 BE-34 –
Shift indicator lights do not light up. (PWR)	1. Bulb 2. Shift Position Indicator Wiring Circuit 3. Pattern Select Switch 4. Wire Harness	– BE-34 AT-6 –
Shift indicator lights do not light up. (2nd START)	1. Bulb 2. Shift Position Indicator Wiring Circuit 3. ECM 4. Wire Harness	– AT-6 – –
Only one shift indicator does not light up.	1. Bulb 2. Shift Position Indicator Wiring Circuit	– BE-34
Indicator lights do not light up. (Except Turn, Hi-beam)	1. GAUGE Fuse (I/P F/B) 2. Wire Harness	– –
O/D OFF indicator light does not light up.	1. Bulb 2. O/D Main Switch 3. Meter Circuit 4. Wire Harness	– – BE-32 –
Malfunction indicator light does not light up.	1. Bulb 2. ECM 3. Wire Harness	– – –
Cruise control indicator light does not light up.	1. Bulb 2. Cruise Control ECU 3. Meter Circuit 4. Wire Harness	– – BE-32 –

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

DEFOGGER SYSTEM

Symptom	Suspect Area	See page
Defogger system does not operate.	1. DEFOG Fuse (I/P F/B) 2. GAUGE Fuse (I/P F/B) 3. Defogger Switch 4. Defogger Relay (No.1 R/B) 5. Defogger Wire 6. Wire Harness	– – BE-43 BE-43 – –

POWER WINDOW CONTROL SYSTEM

Symptom	Suspect Area	See page
Power window does not operate (ALL). (Power door lock does not operate.)	1. POWER Fuse (I/P F/B) 2. GAUGE Fuse (I/P F/B) 3. Power Main Relay (No.1 R/B) 4. Wire Harness	– – – –
Power window does not operate (ALL). (Power door lock is normal.)	1. Ignition Switch 2. Power Main Relay (No.1 R/B) 3. Power Window Master Switch 4. Wire Harness	BE-11 – BE-46 –
"One touch power window system" does not operate.	1. Power Window Master Switch	BE-46
Only one window glass does not operate.	1. Power Window Master Switch 2. Power Window Switch 3. Power Window Motor 4. Wire Harness	BE-46 BE-46 BE-46 –

POWER DOOR LOCK CONTROL SYSTEM

Symptom	Suspect Area	See page
Power door lock control system does not operate (ALL).	1. POWER Fuse (I/P F/B) 2. Power Main Relay (No.1 R/B) 3. Wire Harness	– – –
Power door lock control system does not operate by door lock control switch.	1. Door Lock Control Switch 2. Power Main Relay (No.1 R/B) 3. Wire Harness	BE-51 – –
Power door lock control system does not operate by door key.	1. Door Key Lock and Unlock Switch 2. Power Main Relay (No.1 R/B) 3. Wire Harness	BE-11 – –
Only one door does not operate.	1. Door Lock Motor 2. Door Lock Link Disconnected 3. Wire Harness	BE-51 – –
Fault in key confine prevention operation.	1. Power Main Relay (No.1 R/B) 2. Key Unlock Warning Switch 3. Door Courtesy Switch 4. Wire Harness	– BE-11 BE-21 –

SLIDING ROOF SYSTEM

Symptom	Suspect Area	See page
Sliding roof system does not operate. (Door lock does not operate.)	1. GAUGE Fuse (I/P F/B) 2. Ignition Switch 3. POWER Fuse (No.1 J/B) 4. Power Main Relay (No.1 R/B) 5. Sliding Roof Control Switch 6. Sliding Roof Control Relay 7. Sliding Roof Motor 8. Wire Harness	– BE-11 – – BE-58 BE-58 BE-58 –

BE-8

BODY ELECTRICAL – BODY ELECTRICAL SYSTEM

Sliding roof system operates abnormally.	1. Limit Switch 2. Sliding Roof Control Switch 3. Sliding Roof Control Relay	BE-58 BE-58 BE-58
Sliding roof system stops operation half way.	1. Sliding Roof Control Relay 2. Sliding Roof Limit Switch 3. Sliding Roof Control Switch 4. Sliding Roof Motor (Stones to foreign material trapped in motor assembly)	BE-58 BE-58 BE-58 BE-58
"Key-off sliding roof" operation does not operate.	1. POWER Fuse (I/P F/B) 2. Door Lock Control Relay 3. GAUGE Fuse (I/P F/B) 4. Ignition Switch 5. Door Courtesy Switch 6. Wire Harness	– BE-51 – BE-11 BE-21 –

POWER MIRROR SYSTEM

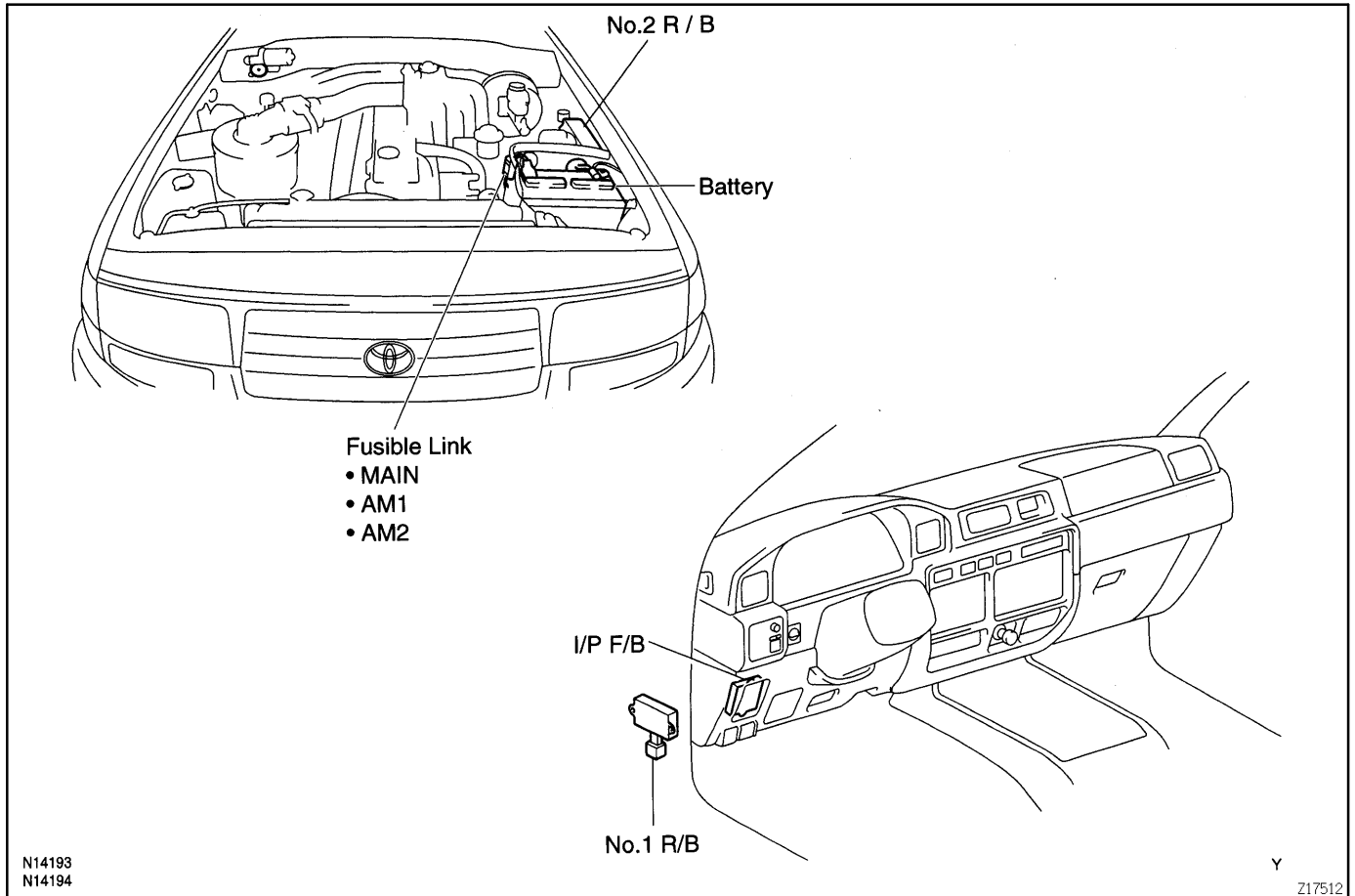
Symptom	Suspect Area	See page
Power mirror system does not operate.	1. CIG Fuse (I/P J/B) 2. Mirror Control Switch 3. Mirror Motor 4. Wire Harness	– BE-69 BE-69 –
Power mirror operate abnormally.	1. Mirror Control Switch 2. Mirror Motor 3. Wire Harness	BE-69 BE-69 –

POWER SEAT CONTROL SYSTEM

Symptom	Suspect Area	See page
Power seat does not operate.	1. POWER Fuse (I/P F/B) 2. Power Seat Switch 3. Wire Harness	– BE-62 –
"Sliding operation" does not operate.	1. Slide Motor 2. Power Seat Switch 3. Wire Harness	BE-62 BE-62 –
"Reclining operation" does not operate.	1. Reclining Motor 2. Power Seat Switch 3. Wire Harness	BE-62 BE-62 –
"Rear vertical operation" does not operate.	1. Rear Vertical Motor 2. Power Seat Switch 3. Wire Harness	BE-62 BE-62 –
"Lumber support operation" does not operate.	1. Lumber Support Motor 2. Lumber Support Switch 3. Wire Harness	BE-62 BE-62 –

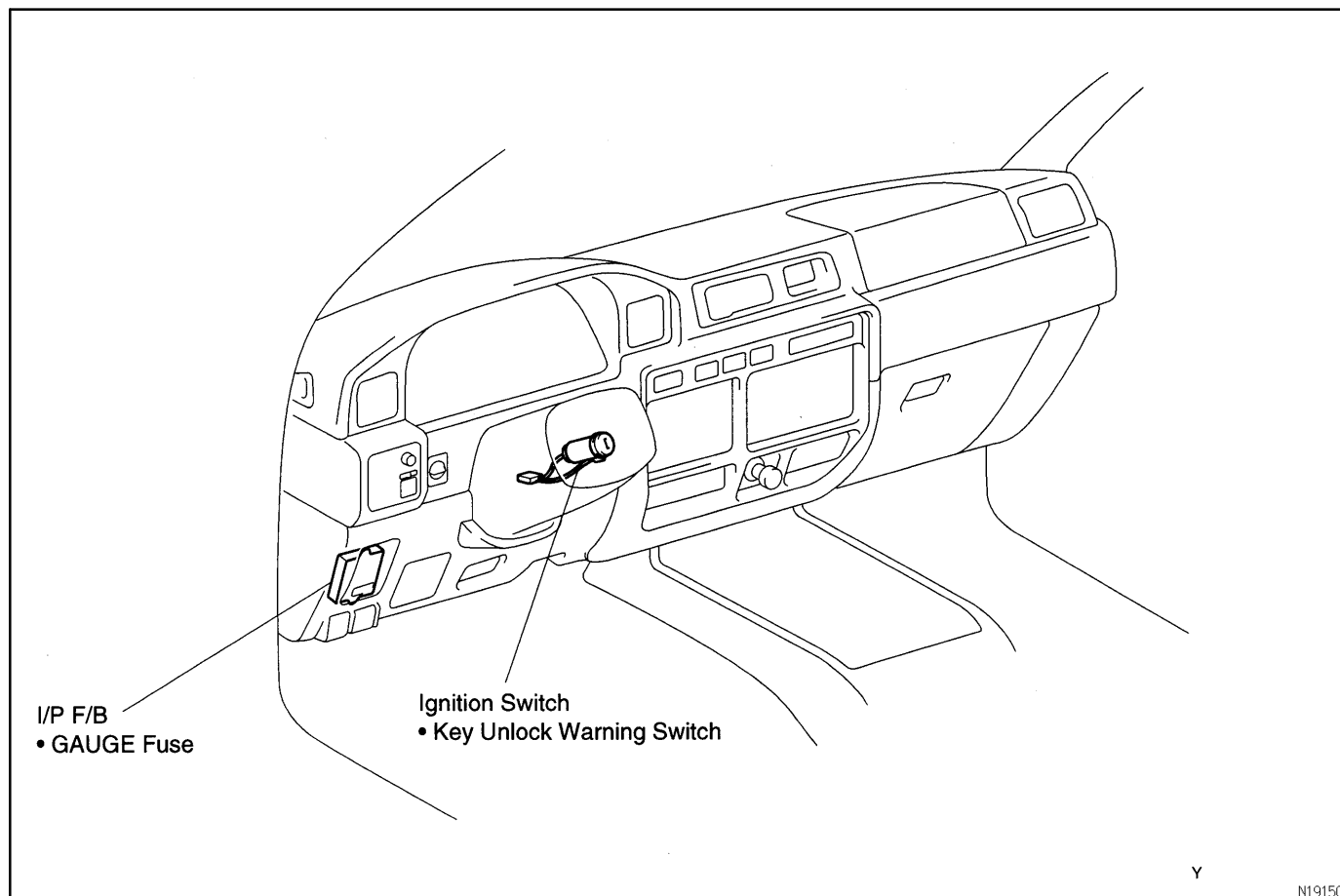
POWER SOURCE LOCATION

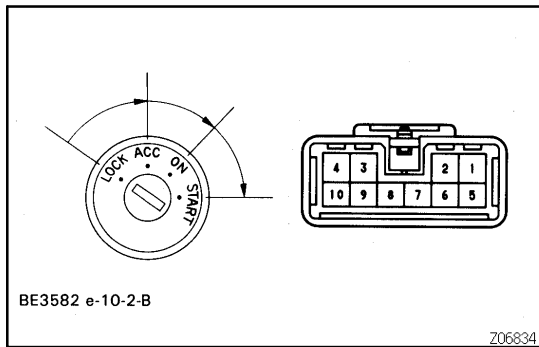
BE1LU-01



IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH LOCATION

BE1LV-01





INSPECTION

1. INSPECT IGNITION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	–	No continuity
ACC	7 – 9	Continuity
ON	3 – 4, 6 – 7 – 9	Continuity
START	2 – 3 – 4 6 – 9 – 10	Continuity

If continuity is not as specified, replace the switch.

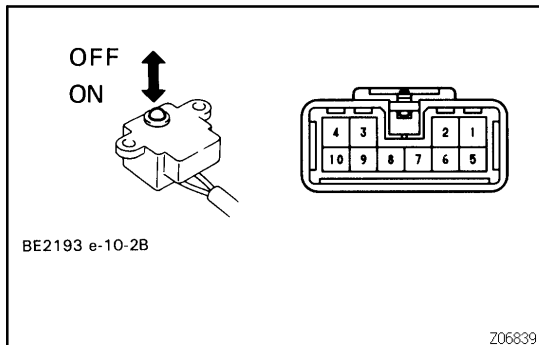
2. INSPECT SWITCH CONTINUITY

Condition	Tester connection	Specified condition
SW OFF (Key removed)	–	No continuity
SW ON (Key set)	1 – 5	Continuity

If continuity is not as specified, replace the switch.

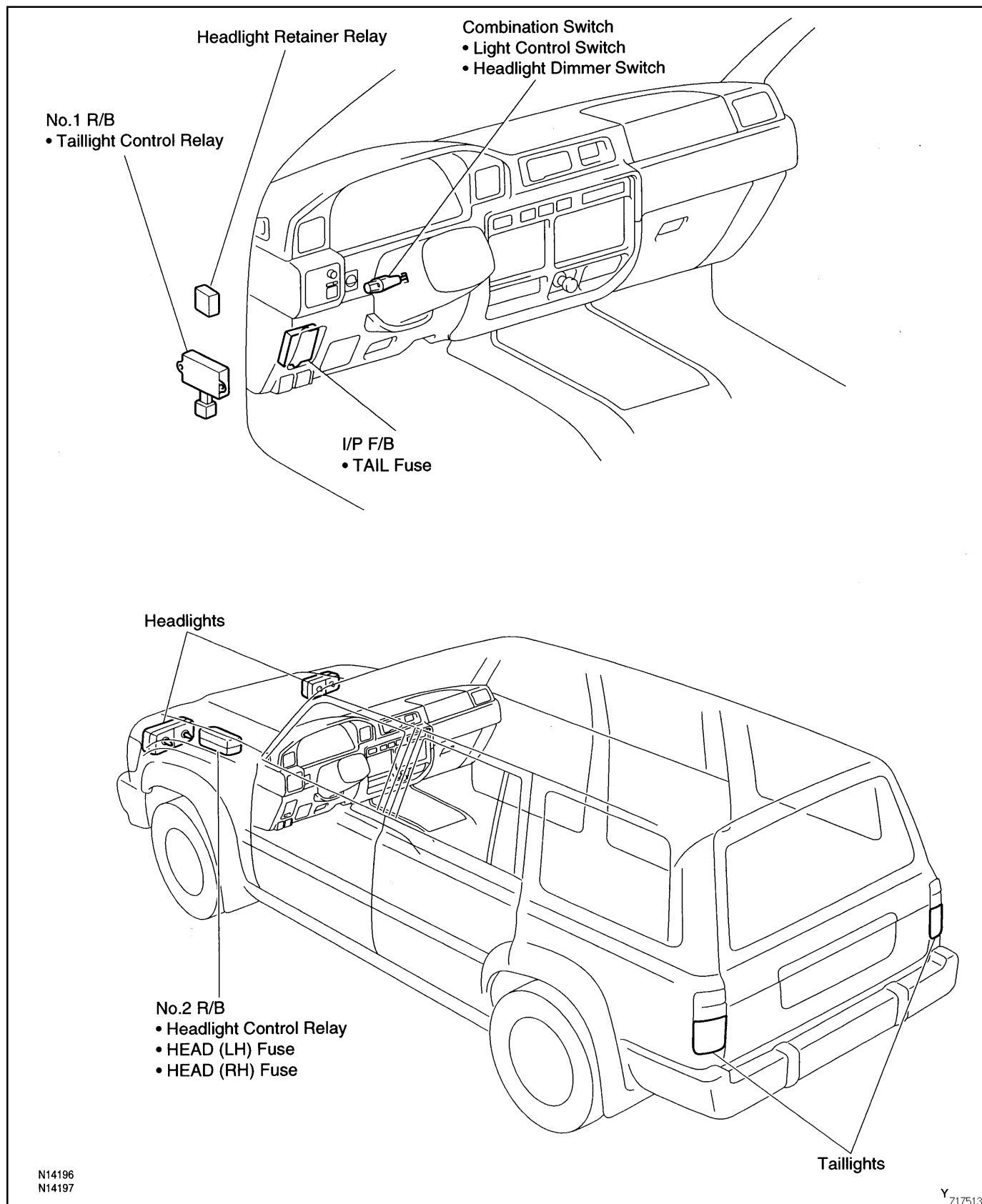
3. INSPECT DOOR COURTESY SWITCH CONTINUITY (See page [BE-21](#))

4. INSPECT SEAT BELT WARNING RELAY CIRCUIT (See page [BE-34](#))

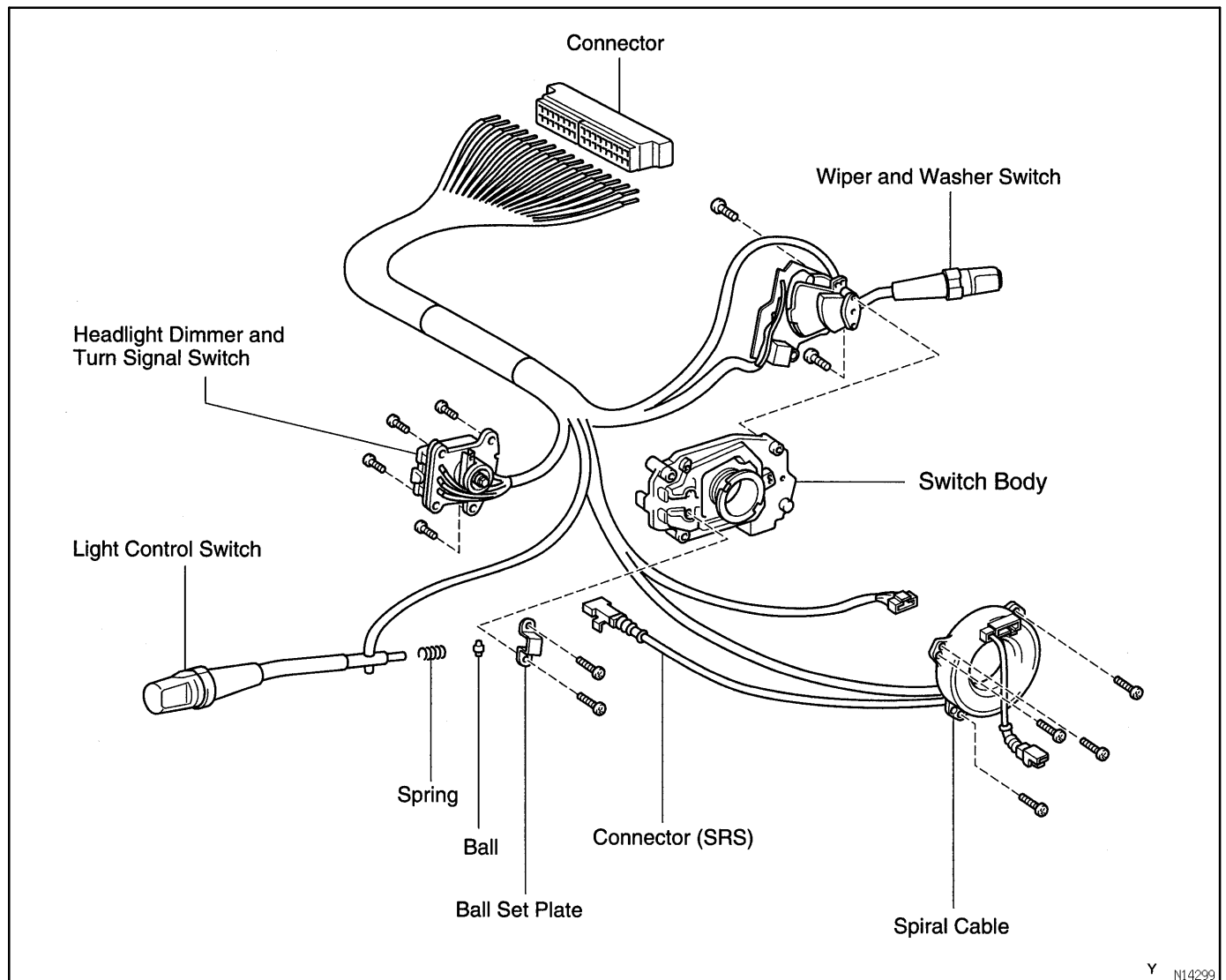


HEADLIGHT AND TAILLIGHT SYSTEM LOCATION

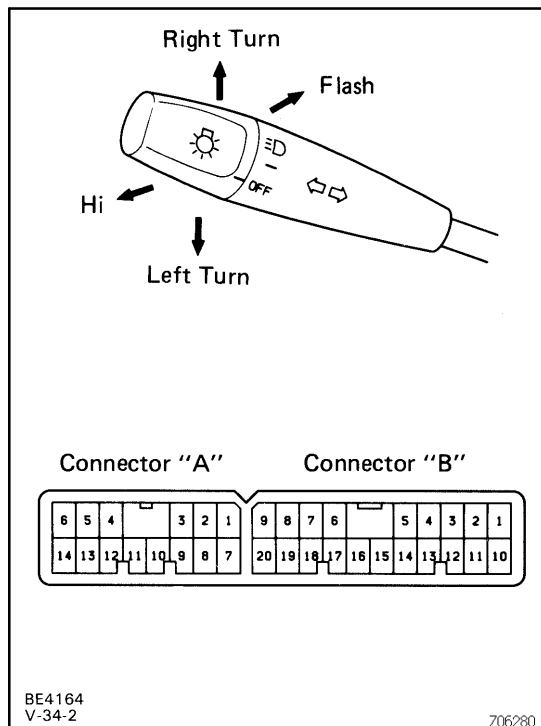
BE1LX-01



COMPONENTS



Y N14299



INSPECTION

1. INSPECT LIGHT CONTROL SWITCH CONTINUITY

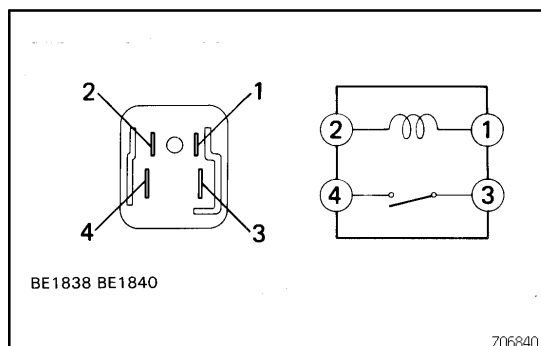
Switch position	Tester connection	Specified condition
OFF	–	No continuity
TAIL	A2 – A11	Continuity
HEAD	A2 – A11 – A13	Continuity

If continuity is not as specified, replace the switch.

2. INSPECT HEADLIGHT DIMMER SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Flash	A9 – A12 – A14	Continuity
Low beam	A3 – A9	Continuity
High beam	A9 – A12	Continuity

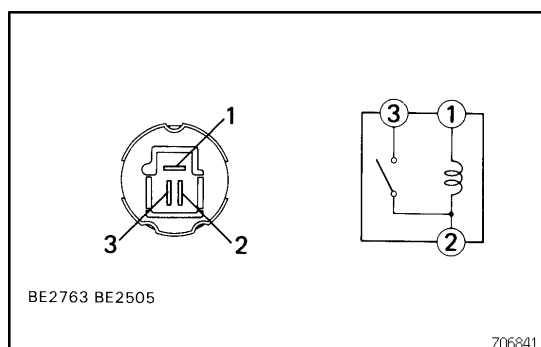
If continuity is not as specified, replace the switch.



3. INSPECT HEADLIGHT CONTROL RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 4	Continuity

If continuity is not as specified, replace the relay.

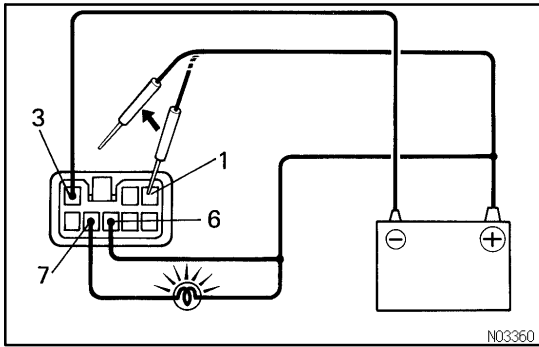


4. INSPECT TAILLIGHT CONTROL RELAY CONTINUITY

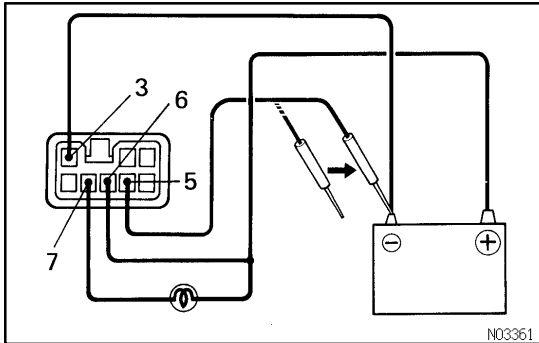
Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	2 – 3	Continuity

If continuity is not as specified, replace the relay.

BODY ELECTRICAL - HEADLIGHT AND TAILLIGHT SYSTEM

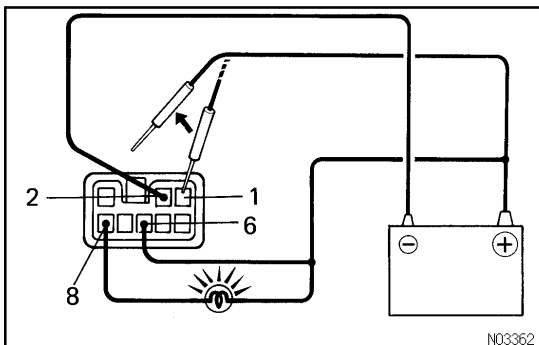
**5. INSPECT HEADLIGHT RETAINER CIRCUIT**

- (a) Connect the positive (+) leads from the battery to terminals 1 and 6, and the negative (-) lead to terminal 3.
- (b) Connect the 3.4 W test bulb between terminal 7 and the positive (+) lead from the battery.
- (c) Disconnect the positive (+) lead from terminal 1, and check that the test bulb is lighting.

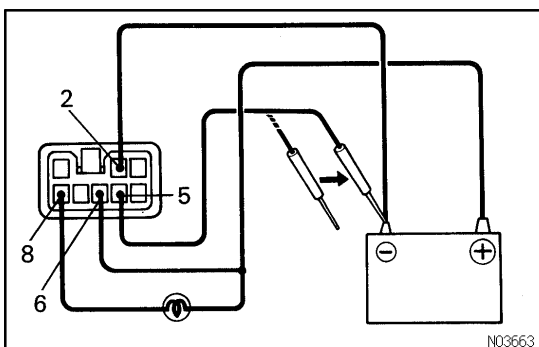


- (d) Connect the negative (-) lead to terminal 5, and check that the test bulb goes out.

If operation is not as specified, replace the relay.

**6. INSPECT TAILLIGHT CIRCUIT**

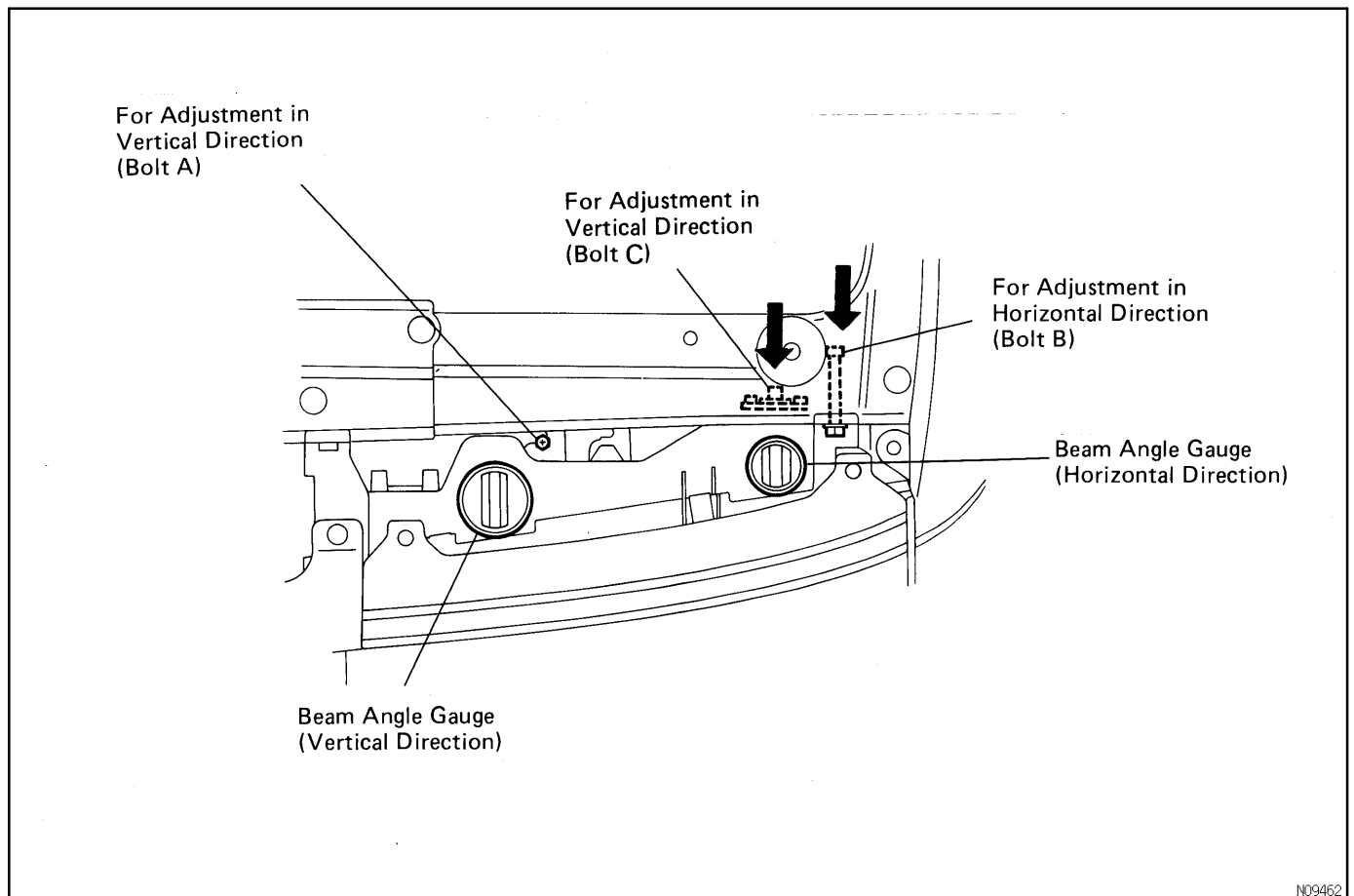
- (a) Connect the positive (+) leads from the battery to terminals 1 and 6, and the negative (-) lead to terminal 2.
- (b) Connect the 3.4 W test bulb between terminal 8 and the positive (+) lead from the battery.
- (c) Disconnect the positive (+) lead from terminal 1, and check that the test bulb is lighting.



- (d) Connect the negative (-) lead to terminal 5, and check that the test bulb goes out.

If operation is not as specified, replace the relay.

ADJUSTMENT

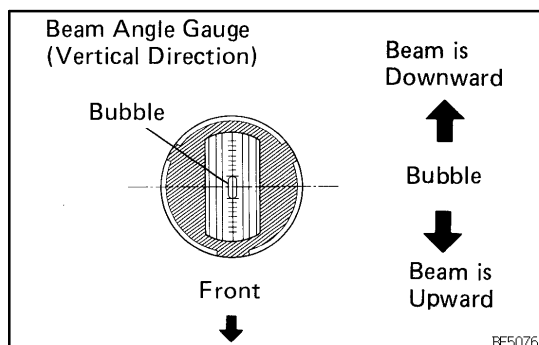


N09462

1. ADJUSTING HEADLIGHT AIM ONLY

(a) Put the vehicle in below conditions.

- Make sure the body around the headlight is not deformed.
- Park the vehicle on a level place.
- The driver gets into the driver's seat and puts the vehicle in a state ready for driving (with a full tank).
- Bounce the vehicle several times.



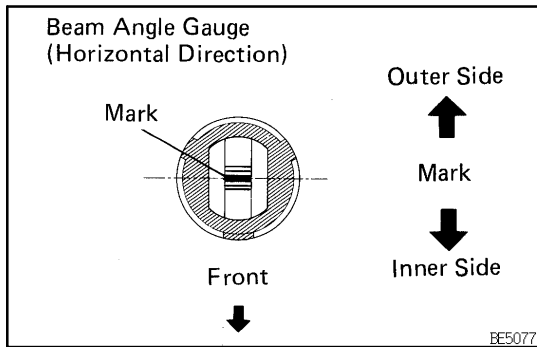
BE5076

(b) Adjust headlight in vertical alignment.

If the gauge bubble is outside the acceptable range of the beam angle gauge, adjust it using adjusting screw A.

HINT:

The beam angle will change about $0^{\circ}11'$ with one mark.



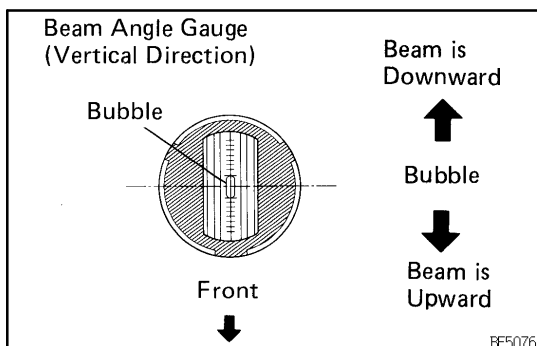
(c) Adjust headlight in horizontal alignment.

If the "0" moves away from the mark beyond the acceptable range, adjust the "0" back to the mark using adjusting screw B.
HINT:

The beam angle will change about $0^{\circ}23'$ with one mark.

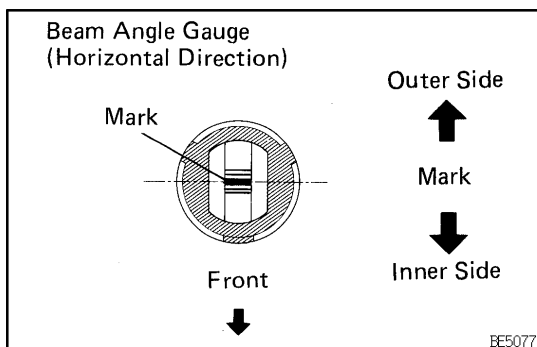
2. REPLACING HEADLIGHT

- (a) Replace the headlight.
- (b) Inspect the headlight aim. Do the following before inspection.
 - Make sure the body around the headlight is not deformed.
 - Park the vehicle on a level spot.
 - The driver gets into the driver's seat and puts the vehicle in a state ready for driving (with a full tank).
 - Bounce the vehicle several times.



(c) Adjust headlight in vertical alignment

- (1) Using adjusting screw A, adjust the headlight aim to within the specifications.



HINT:

The beam angle will change about $0^{\circ}11'$ with one mark.

- (2) Make sure the gauge bubble is within the acceptable range.

HINT:

If the gauge bubble is outside the acceptable range, check that the vehicle is parked on a level place.

- (d) Readjust the headlight aim after parking the vehicle on a level place.
- (e) Adjust the headlight in horizontal alignment.
 - (1) Using adjusting screw B, adjust the headlight aim to within the specifications.

HINT:

The beam angle will change about $0^{\circ}23'$ with one mark.

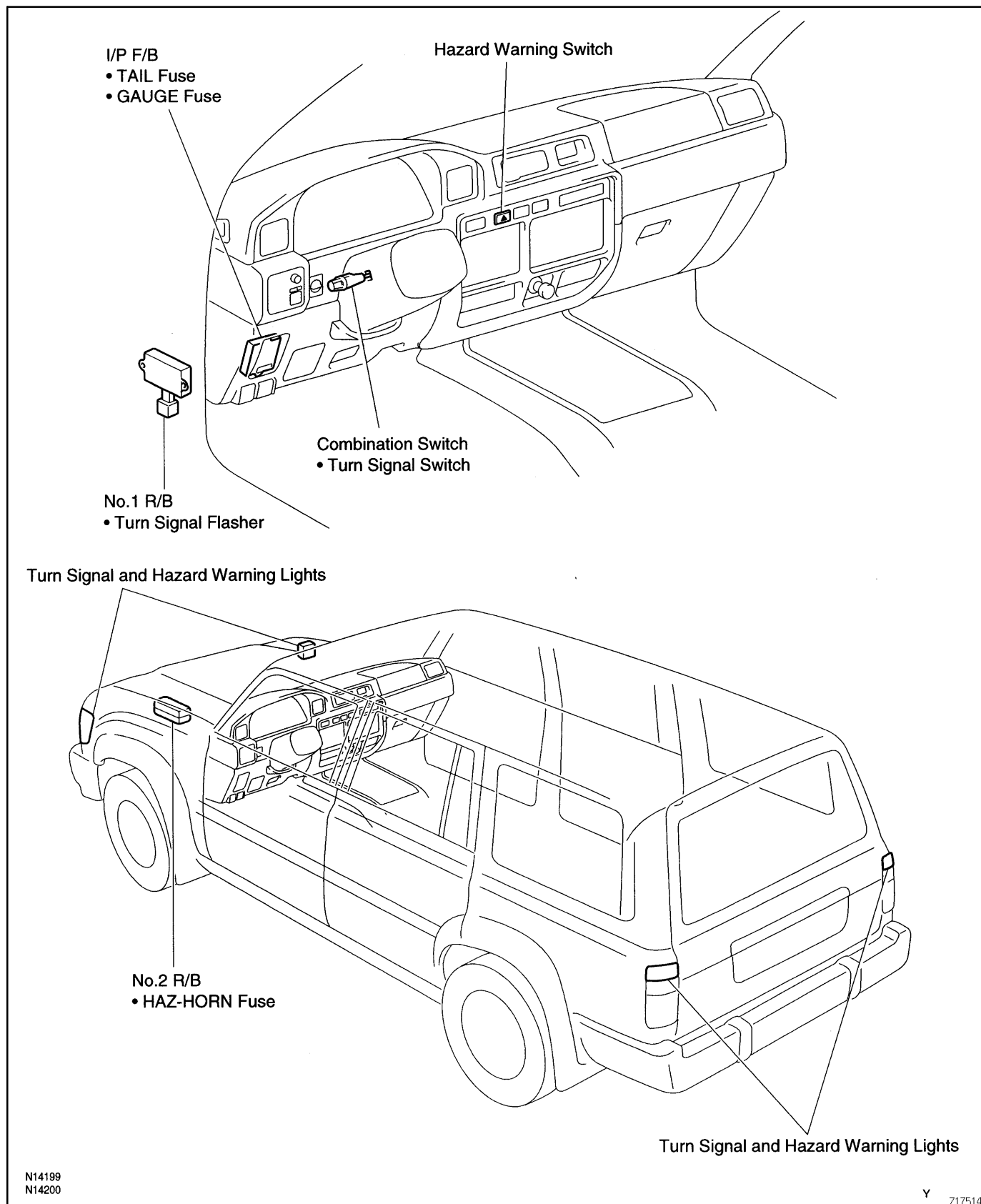
- (2) Using adjusting nut C, adjust the "0" back to the mark.

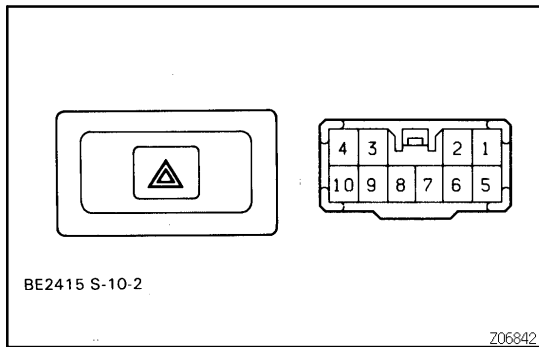
HINT:

For adjustment, pull nut C to the rear of the vehicle to free it. After adjustment, check that the nut C is locked in.

TURN SIGNAL AND HAZARD WARNING SYSTEM LOCATION

BE1M1-01



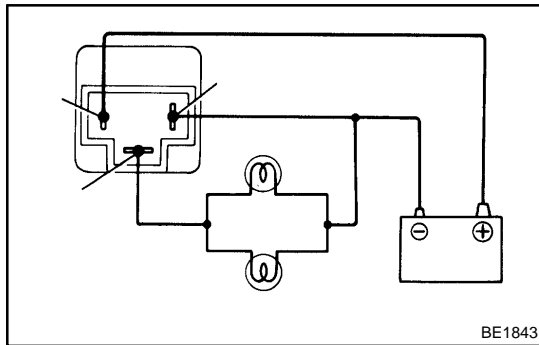


INSPECTION

1. INSPECT HAZARD WARNING SWITCH CONTINUITY

Condition	Tester connection	Specified condition
Switch OFF	7 – 10	Continuity
Switch ON	7 – 8 4 – 5 – 6 – 9	Continuity
Illumination circuit	2 – 3	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT TURN SIGNAL FLASHER OPERATION

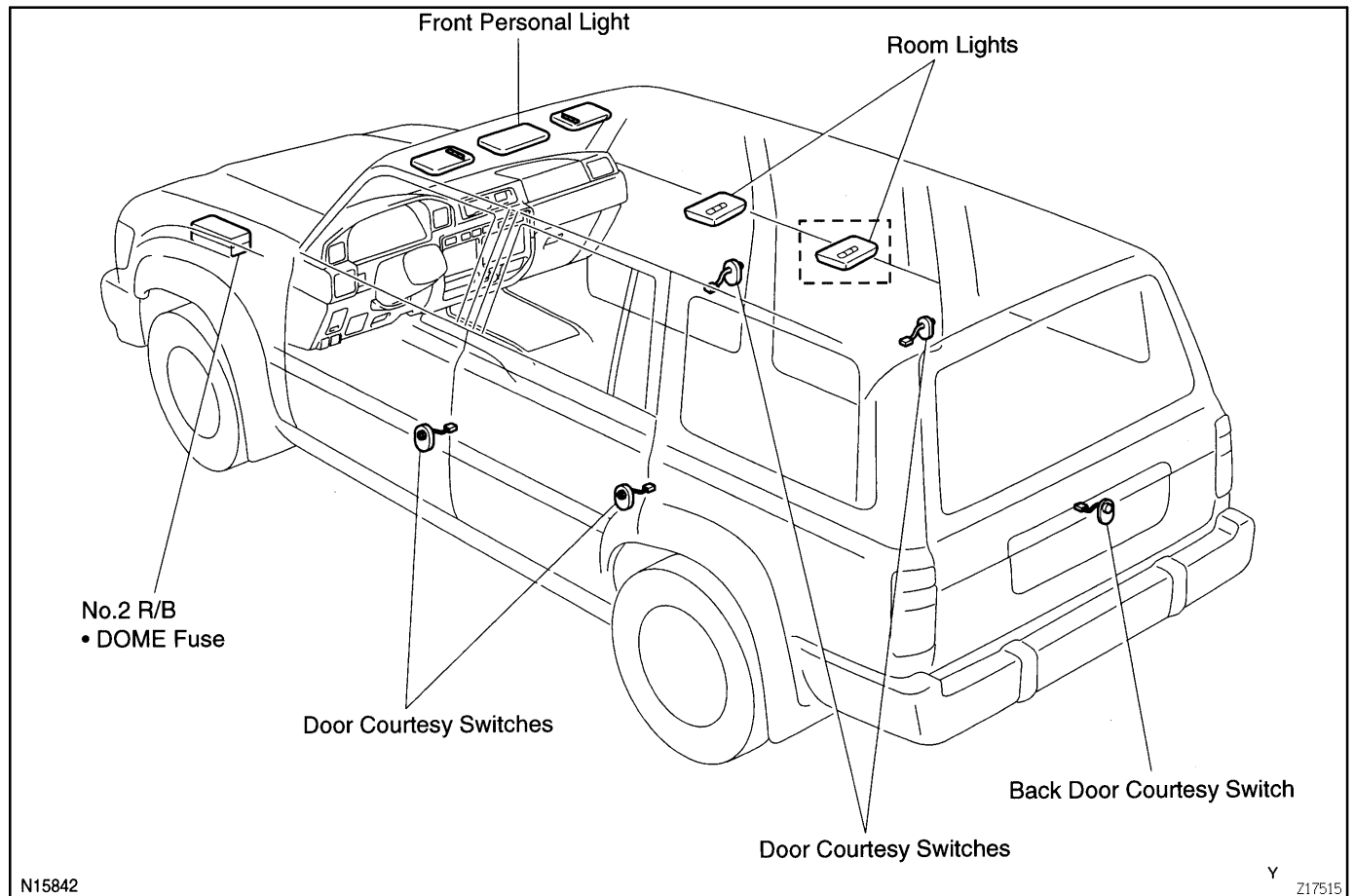
- Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.
- Connect the 2 turn signal light bulbs parallel to each other to terminals 1 and 3, and check that the bulbs flash.

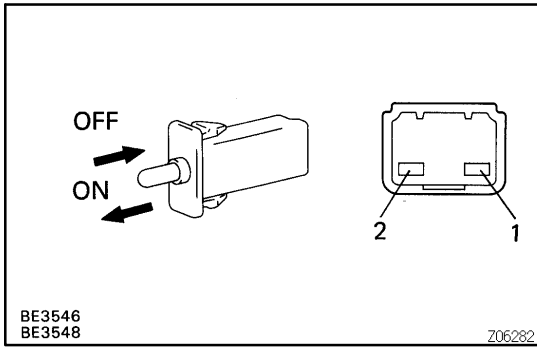
HINT:

The turn signal lights should flash 60 to 120 times per minute. If one of the front or rear turn signal lights has an open circuit, the number of flashes will be more than 140 per minute. If operation is not as specified, replace the flasher.

INTERIOR LIGHT SYSTEM LOCATION

BE1M3-01



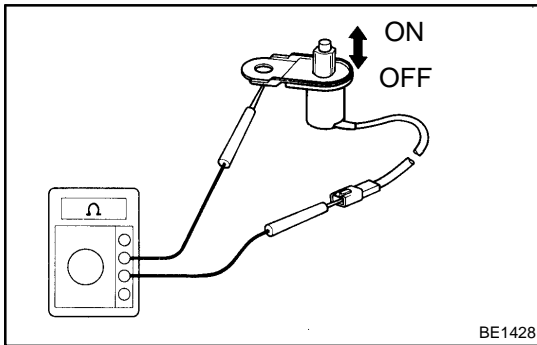


INSPECTION

1. INSPECT GLOVE BOX LIGHT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Closed)	–	No continuity
ON (Opened)	1 – 2	Continuity

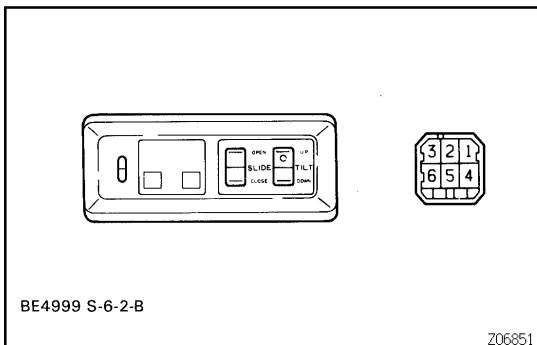
If continuity is not as specified, replace the switch.



2. INSPECT DOOR COURTESY SWITCH CONTINUITY

- Check that there is continuity between terminal and the switch body with the switch ON (switch pin released: opened door).
- Check that there is no continuity between terminal and the switch body with the switch OFF (switch pin pushed in: closed door).

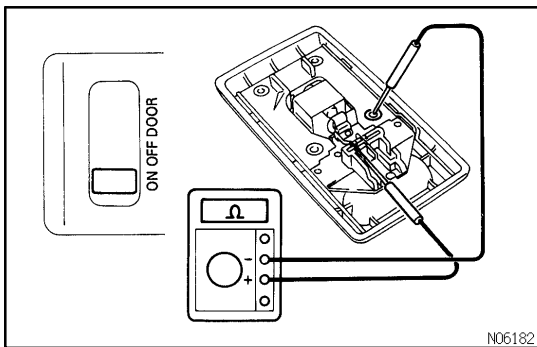
If operation is not as specified, replace the switch.



3. INSPECT FRONT PERSONAL LIGHT CONTINUITY

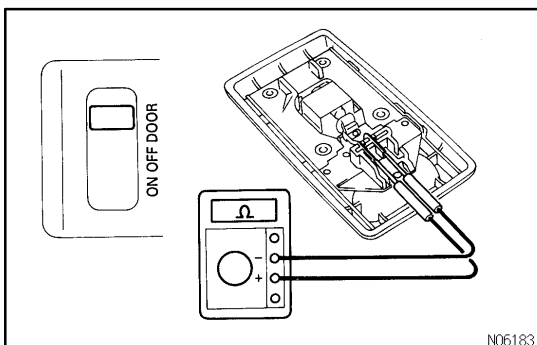
Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON	5 – 6	Continuity

If continuity is not as specified, replace the personal light.



4. INSPECT ROOM LIGHT ASSEMBLY

- Disconnect the connector from room light assembly.
- Turn the room light switch ON, check that there is continuity between terminal 2 and body ground.



- Turn the room light switch DOOR, and check that there is continuity between terminal 1 and 2.

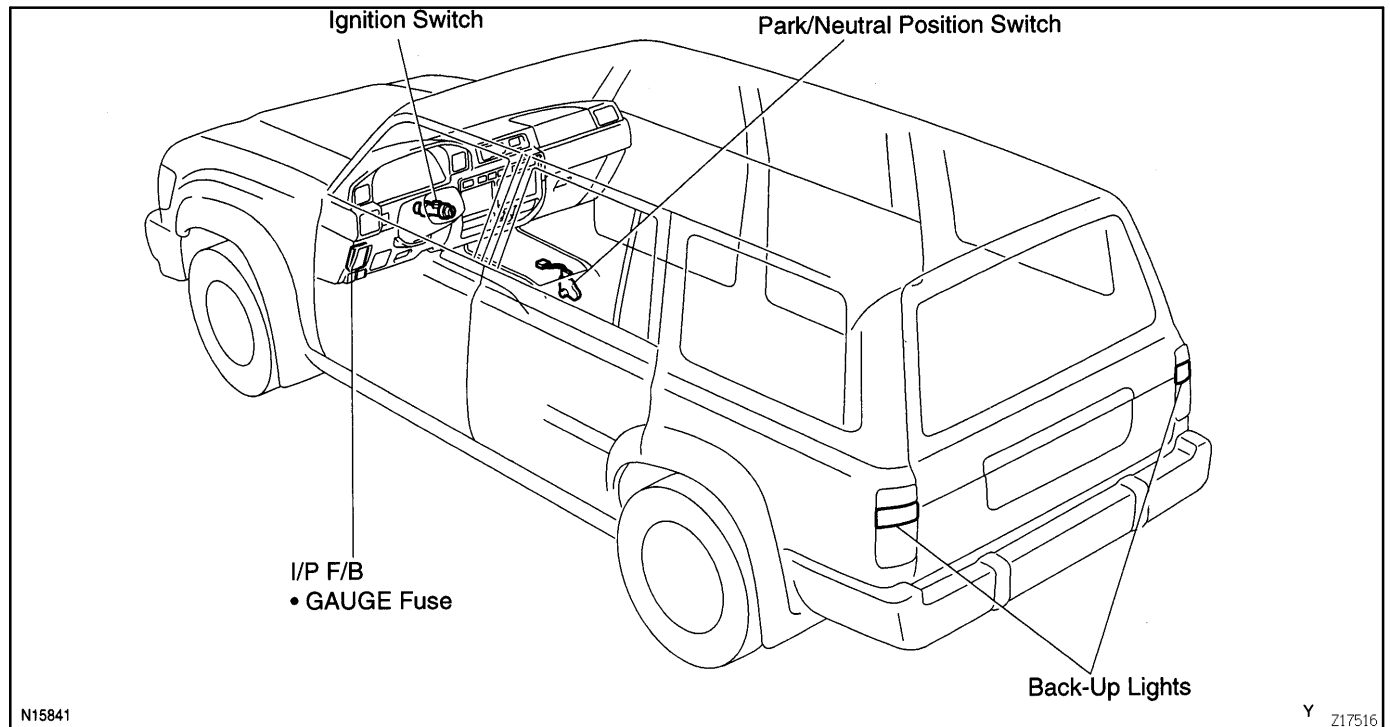
If operation is not as specified, replace the switch.

BE-22

BODY ELECTRICAL - BACK-UP LIGHT SYSTEM

BACK-UP LIGHT SYSTEM LOCATION

BE1M5-01



1996 LAND CRUISER (RM451U)

Author :

Date :

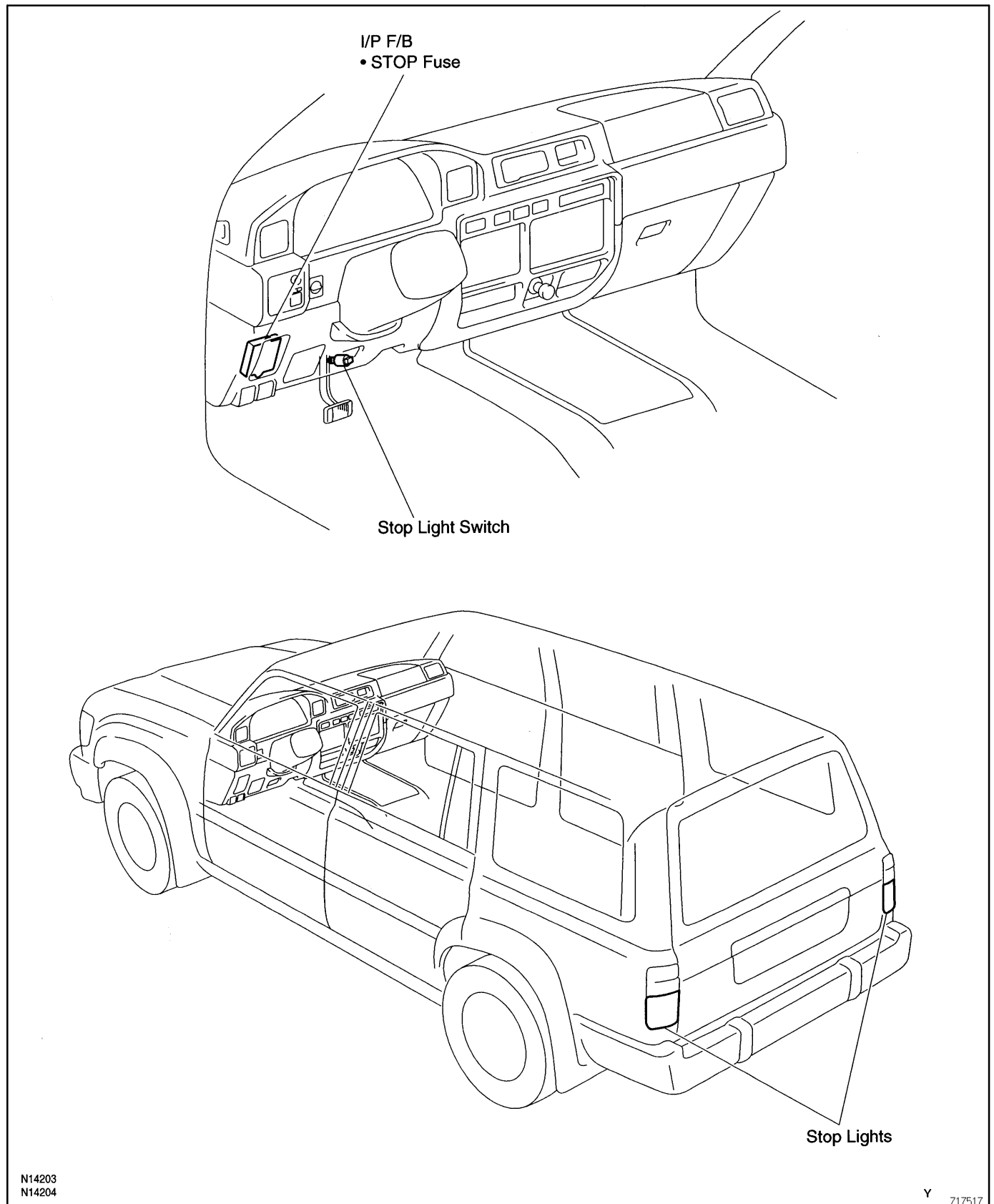
1160

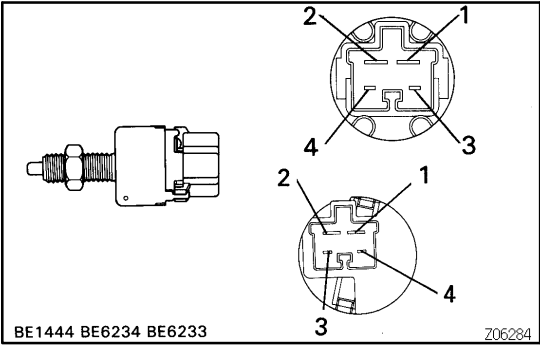
INSPECTION

INSPECT PARK/NEUTRAL POSITION SWITCH CONTINUITY (See page [AT-6](#))

STOP LIGHT SYSTEM LOCATION

BE1M7-01





INSPECTION

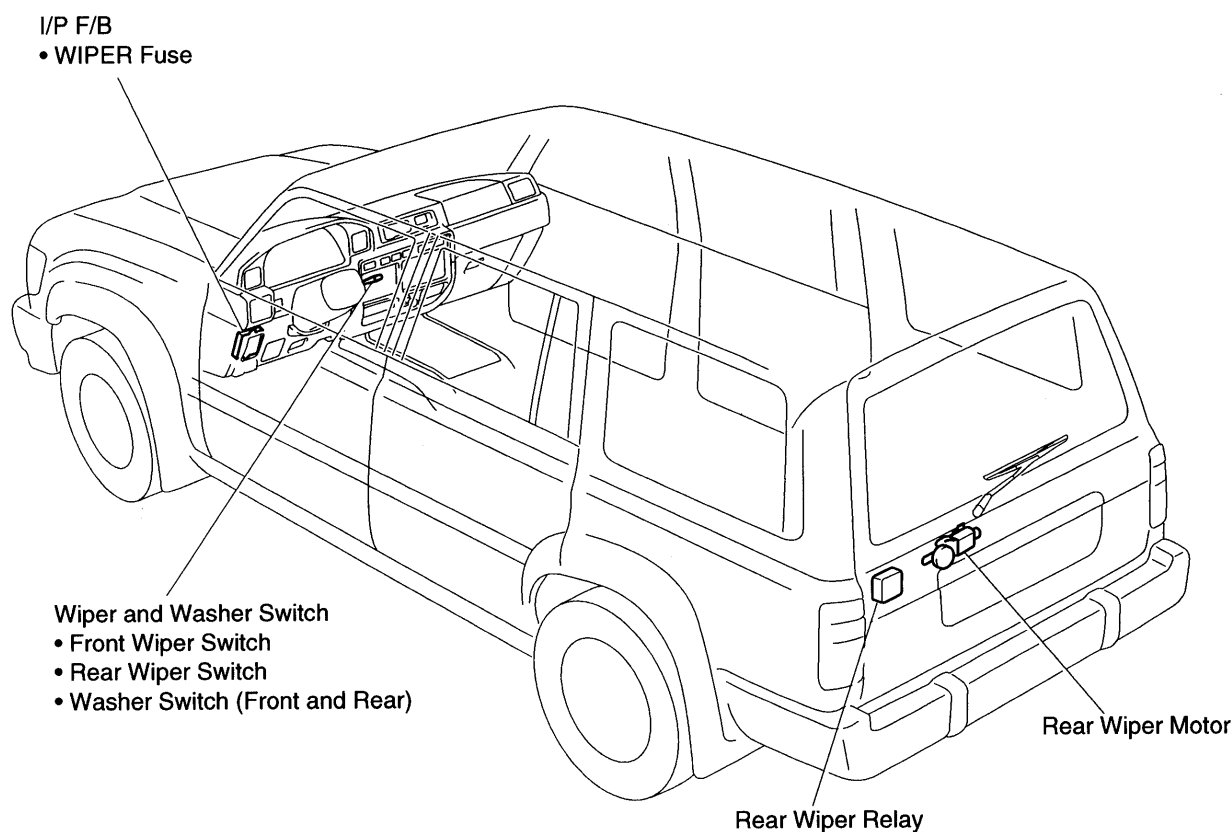
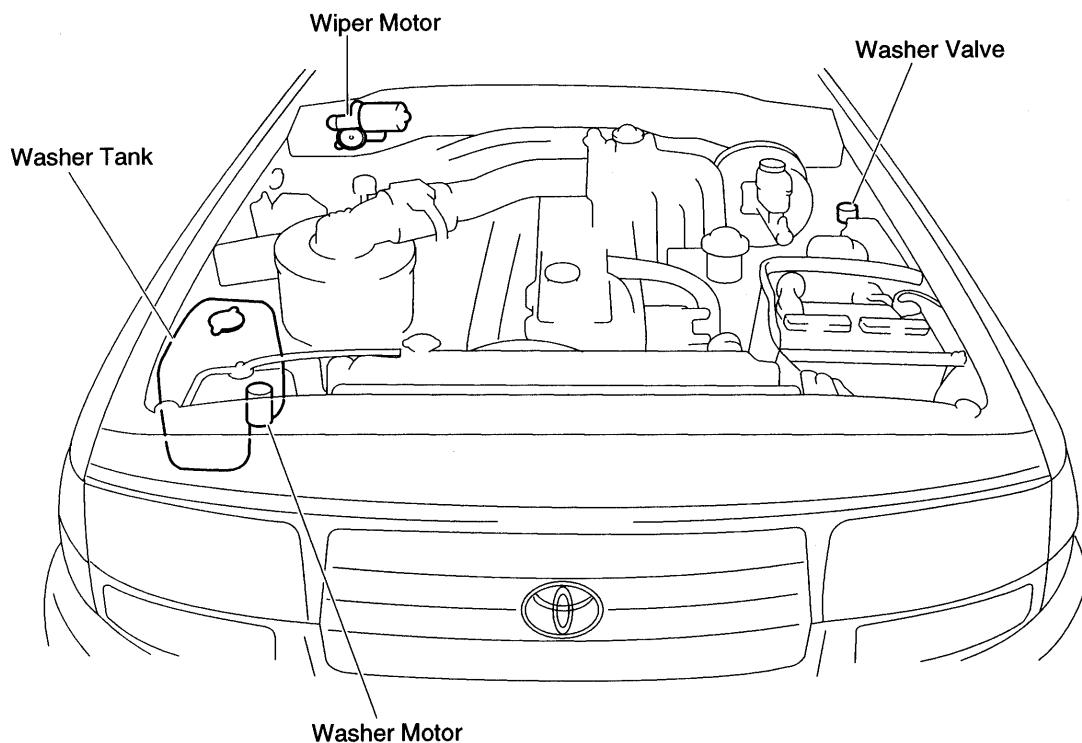
INSPECT STOP LIGHT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
SW pin free	1 – 2	Continuity
SW pin pushed in	–	No continuity

If continuity is not as specified, replace the switch.

WIPER AND WASHER SYSTEM LOCATION

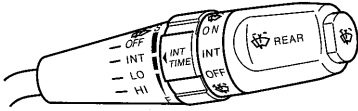
BE1M9-01

N14205
N14206

Y

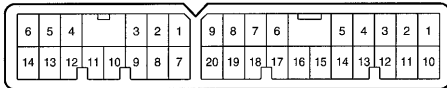
Z18154

Wiper with Intermittent time adjuster



Connector "A"

Connector "B"

N14307
V-34-2

Y Z15385

INSPECTION

1. INSPECT FRONT WIPER AND WASHER SWITCH CONTINUITY

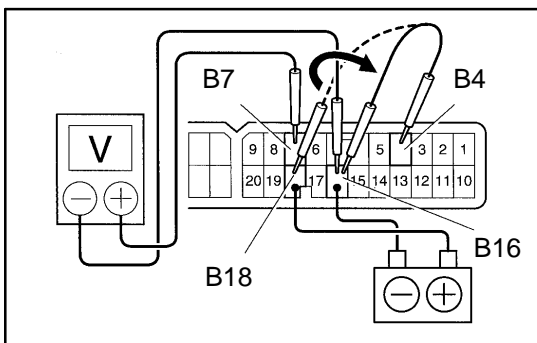
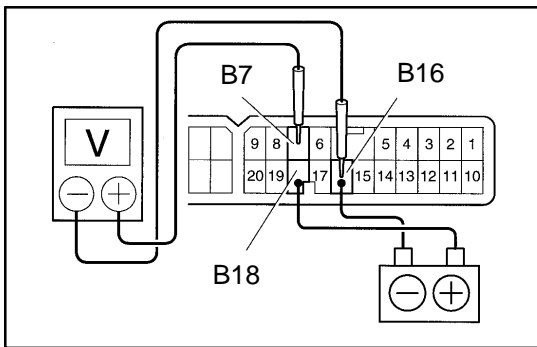
Switch position	Tester connection	Specified condition
Wiper OFF	B4 – B7	Continuity
Wiper INT	B4 – B7	Continuity
Wiper LO	B7 – B18	Continuity
Wiper HI	B13 – B18	Continuity
Washer OFF	–	No continuity
Washer ON	B8 – B16	Continuity

If continuity is not as specified, replace the switch.

2. INSPECT REAR WIPER AND WASHER SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Washer ON	B2 – B16	Continuity
Wiper OFF	–	No continuity
Wiper INT	B10 – B16	Continuity
Wiper ON	B1 – B16	Continuity
Washer ON	B1 – B2 – B16	Continuity

If continuity is not as specified, replace the switch.



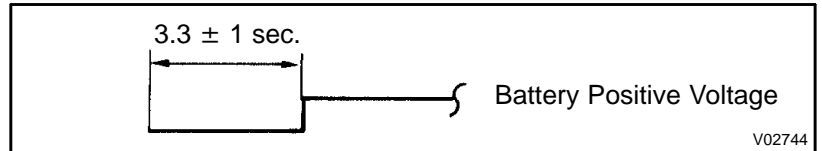
3. INSPECT INTERMITTENT WIPER OPERATION

- Turn the wiper switch to INT position.
- Turn the intermittent time control switch to FAST position.
- Connect the positive (+) lead from the battery to terminal B18 and the negative (–) lead to terminal B16.

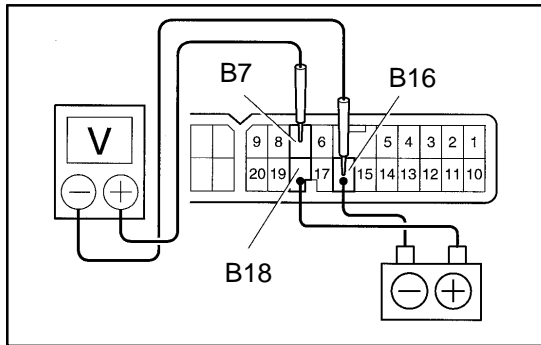
- Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (–) lead to terminal B16, and check that the meter needle indicates battery positive voltage.

- After connecting terminal B4 to terminal B18, connect B18 to terminal B16.

Then, check that the voltage rises from 0 volt to battery positive voltage within time as follows.

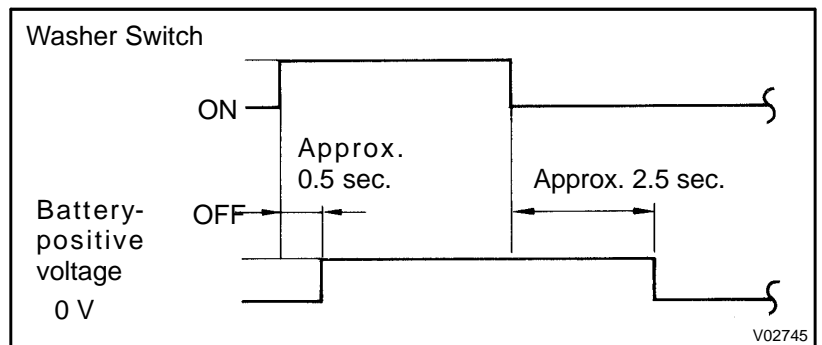


If operation is not as specified, replace the switch.

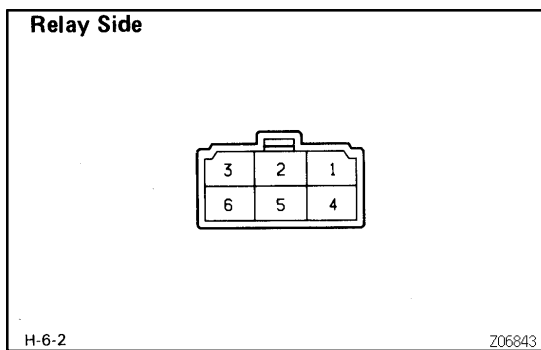


4. INSPECT WASHER LINKED OPERATION

- Connect the positive (+) lead from the battery to terminal B18 and the negative (-) lead to terminal B16.
- Connect the positive (+) lead from the voltmeter to terminal B7 and the negative (-) lead to terminal B16.
- Push in the washer switch. Check that the voltage changes, as shown in the table.

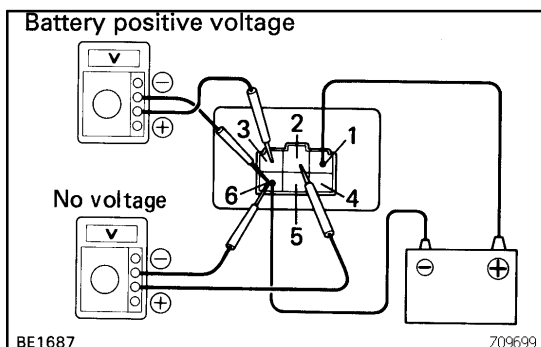


If operation is not as specified, replace the switch.



5. INSPECT REAR WIPER RELAY CONTINUITY

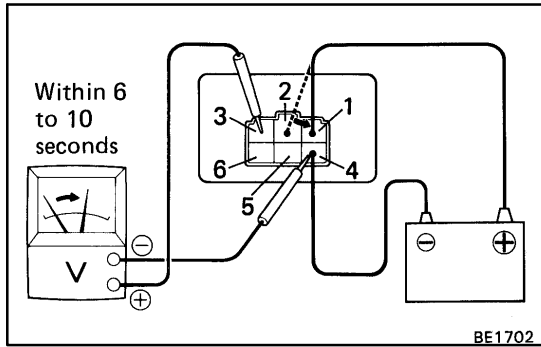
- Check that there is no continuity between terminals 1 and 3.
 - Check that there is continuity between terminals 2 and 3.
- If continuity is not as specified, replace the relay.



6. INSPECT REAR WIPER RELAY OPERATION

- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 6.
- Connect the positive (+) lead from the voltmeter to terminal 2 and the negative (-) lead to terminal 6, and check that the meter needle indicates to 0 V.
- Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (-) lead to terminal 6, and check that the meter needle indicates to battery positive voltage.

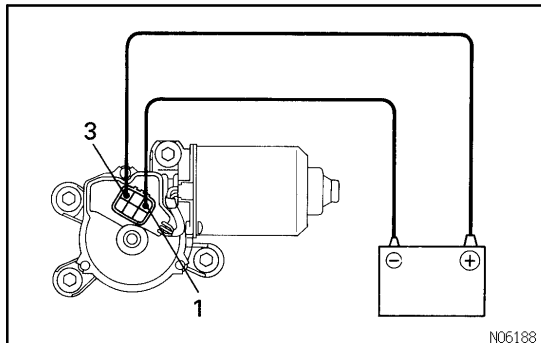
If operation is not as specified, replace the relay.



7. INSPECT REAR WIPER RELAY INTERMITTENT OPERATION

- Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 4.
- Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (-) lead to terminal 4.
- After disconnecting the positive (+) lead from terminal 2, connect it to terminal 1, and then, check that the meter needle rises from 0 V to battery positive voltage within 6 to 10 seconds.

If operation is not as specified, replace the relay.

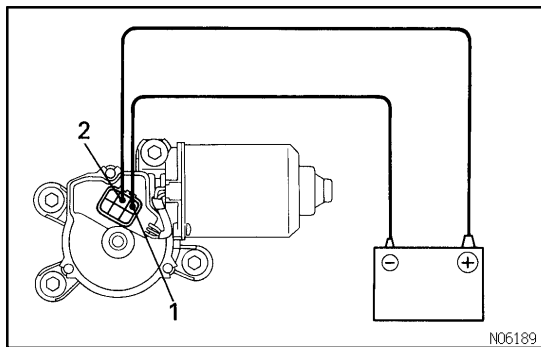


8. Low Speed:

INSPECT FRONT WIPER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 3 and negative (-) lead to terminal 1, and check that the motor operates at low speed.

If operation is not as specified, replace the motor.

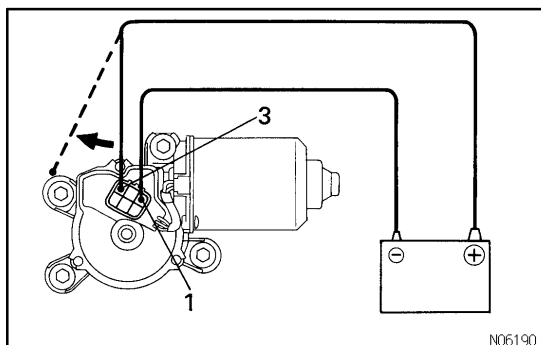


9. High Speed:

INSPECT FRONT WIPER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor operates at high speed.

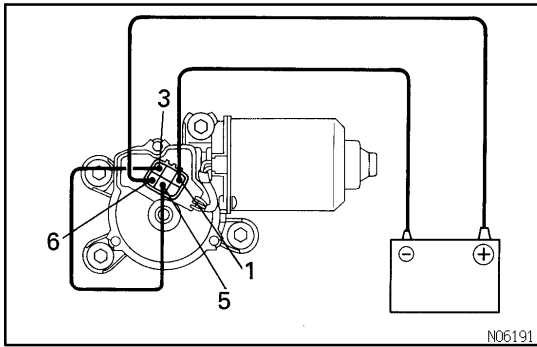
If operation is not as specified, replace the motor.



10. Stopping at Stop Position:

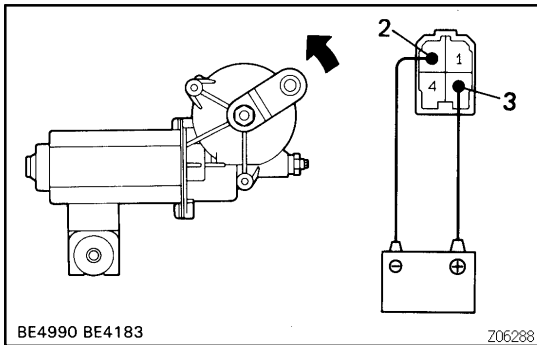
INSPECT FRONT WIPER MOTOR OPERATION

- 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 terminal 3 and 5.
- (c) Connect the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 1, and check that the motor stops running at the stop position after the motor operates again.

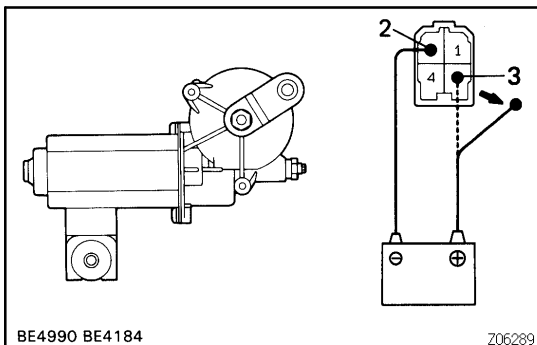
If operation is not as specified, replace the motor.



11. Low Speed: INSPECT REAR WIPER MOTOR OPERATION

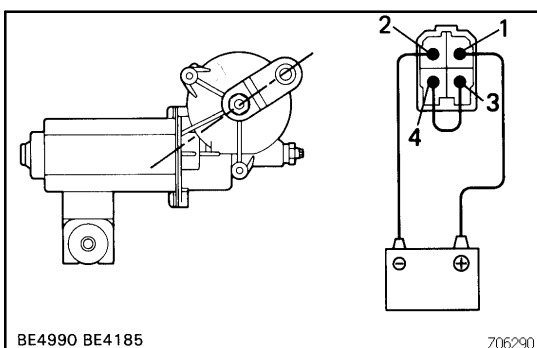
Connect the positive (+) lead from the battery to terminal 3 and negative (-) lead to terminal 2, and check that the motor operates at low speed.

If operation is not as specified, replace the motor.



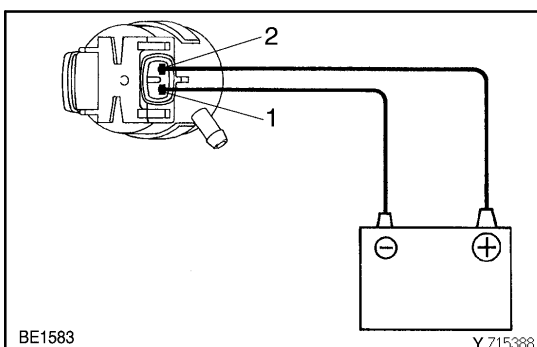
12. Stopping at Stop Position: INSPECT REAR WIPER MOTOR OPERATION

- (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 terminal 3 and 4.
- (c) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor stops running at the stop position after the motor operates again.

If operation is not as specified, replace the motor.



13. INSPECT WASHER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor operates.

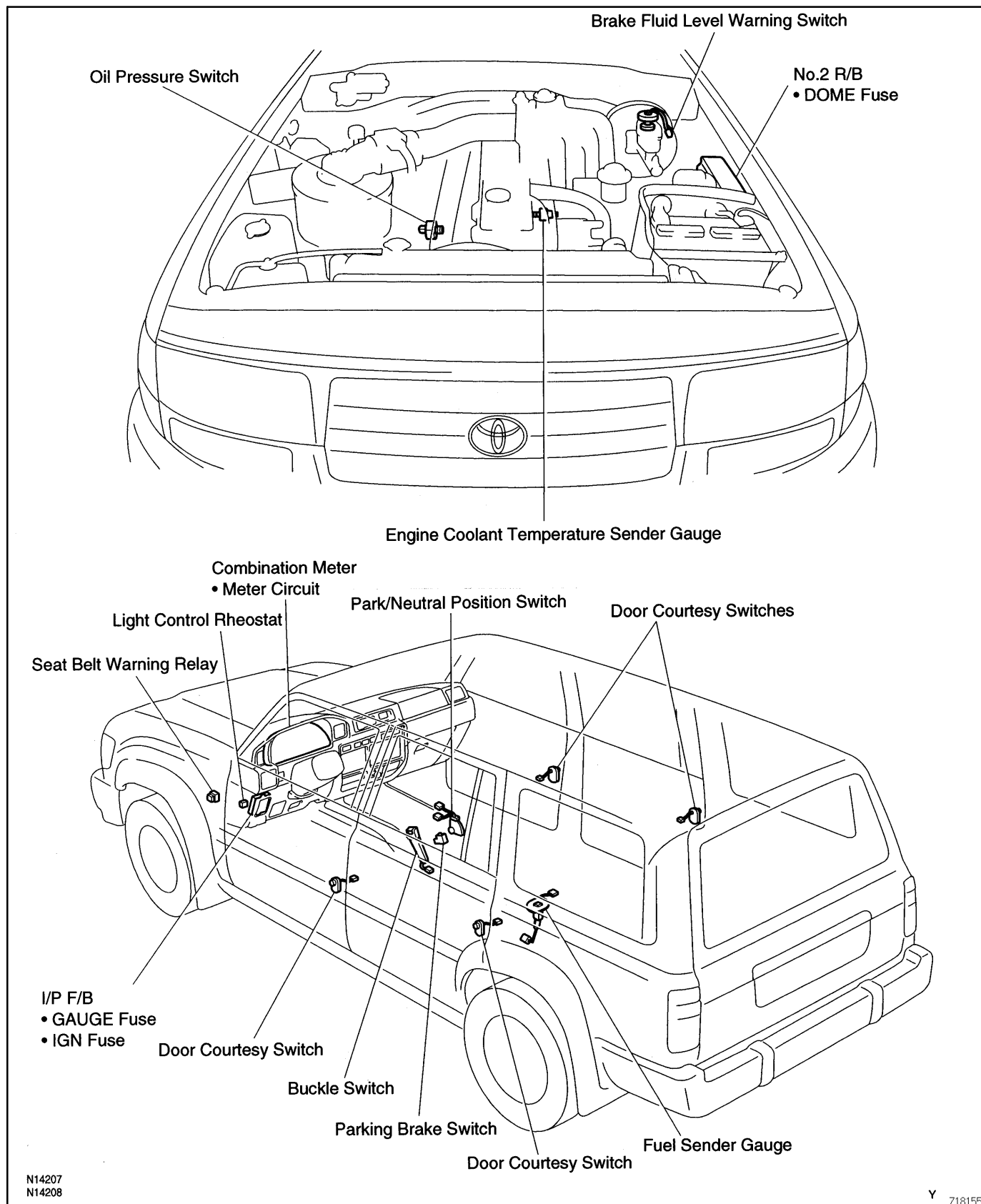
NOTICE:

These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

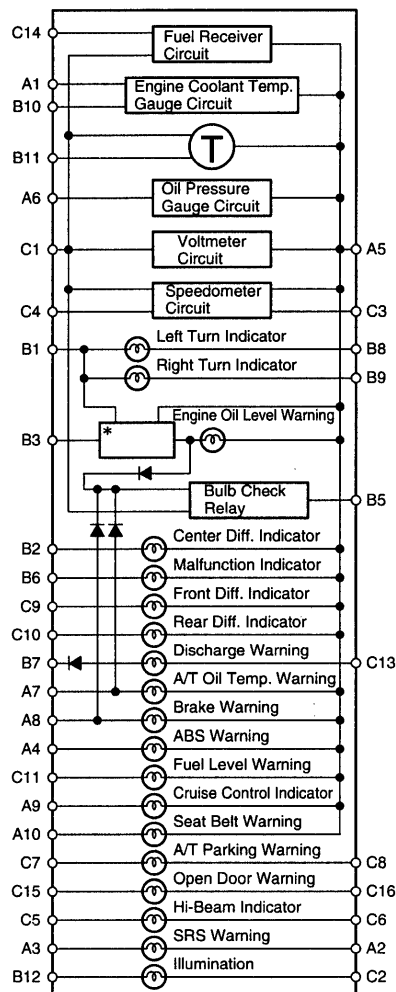
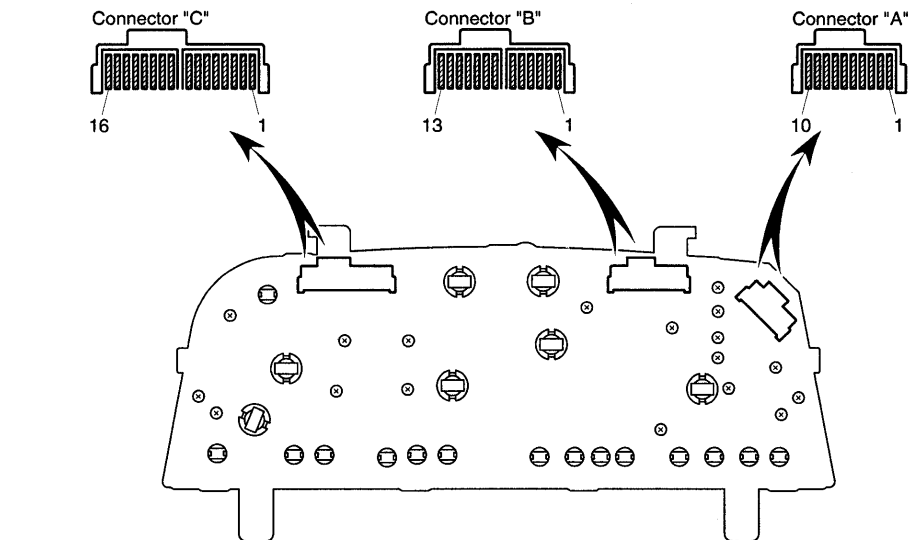
If operation is not as specified, replace the motor.

COMBINATION METER LOCATION

BE1MB-01



CIRCUIT



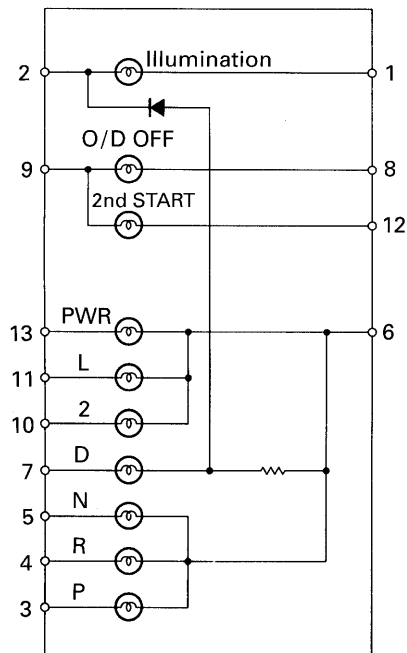
No.	Wiring connector side
A	1 Ground
	2 DOME Fuse
	3 Airbag ECU
	4 ABS ECU
	5 GAUGE Fuse
	6 Oil Pressure Sender Gauge
	7 A/T Fluid Temperature Sensor
	8 Brake Warning Switch
	9 Cruise Control ECU
	10 Seat Belt Warning Relay
B	1 Ground
	2 Center Diff. Lock Indicator Switch
	3 Engine Oil Level Sensor
	5 STARTER Relay
	6 ECM
	7 Charge Light Relay
	8 Light Control Switch (Left)
	9 Light Control Switch (Right)
	10 Engine Coolant Temperature Gauge
	11 Igniter
	12 Light Control Rheostat
C	1 Ground
	2 TAIL Fuse
	3 Speed Control Unit
	4 No.1 Vehicle Speed Sensor
	5 Headlight
	6 Headlight Dimmer Switch
	7 L4 Position Switch
	8 PNP Switch
	9 Front Diff. Lock Indicator Switch
	10 Rear Diff. Lock Indicator Switch
	11 Fuel Level Warning Switch
	13 IGN Fuse
	14 Fuel Sender Gauge
	15 Door Courtesy Switch
	16 DOME Fuse

T : Tacho Meter
 Diff. : Differential
 Temp : Temperature
 * : Engine Oil Level Circuit

N14318
 N14140

Z16425

SHIFT POSITION INDICATOR



Terminal	Wiring connector side
1	Light Control Rheostat-terminal A
2	TAIL Fuse
3	Park/Neutral Position Switch-terminal 6
4	Park/Neutral Position Switch-terminal 1
5	Park/Neutral Position Switch-terminal 5
6	Ground
7	Park/Neutral Position Switch-terminal 7
8	O/D OFF Switch
9	GAUGE Fuse
10	Park/Neutral Position Switch-terminal 3
11	Park/Neutral Position Switch-terminal 8
12	ECM
13	Pattern Select Switch

N14141

V06501

INSPECTION

1. INSPECT SPEEDOMETER

ON-VEHICLE:

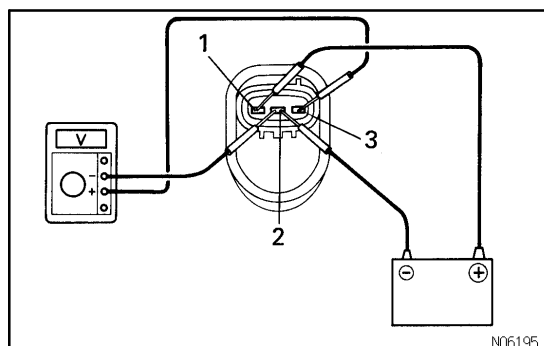
Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

HINT:

Tire wear and tire over or under inflation will increase the indication error.

If error is excessive, replace the speedometer.

Standard indication	Allowable range
20	18 – 24
40	38 – 44
60	58 – 66
80	78 – 88
100	98 – 110
120	118 – 132



2. INSPECT NO.1 VEHICLE SPEED SENSOR OPERATION

- Connect the positive (+) lead from battery to terminal 1 and negative (–) lead to terminal 2.
- Connect the positive (+) lead from tester to terminal 3 and the negative (–) lead to terminal 2.
- Revolve shaft.
- Check that there is voltage changer from approx. 0 V to 11 V or more between terminals 3 and 2.

HINT:

The voltage change should be 4 times per each revolution of the No.1 vehicle speed sensor shaft.

If operation is not as specified, replace the sensor.

3. INSPECT TACHOMETER

ON-VEHICLE:

- Connect a tune-up test tachometer, and start the engine.

NOTICE:

Reversing the connection of the tachometer will damage the transistors and diodes inside. When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.

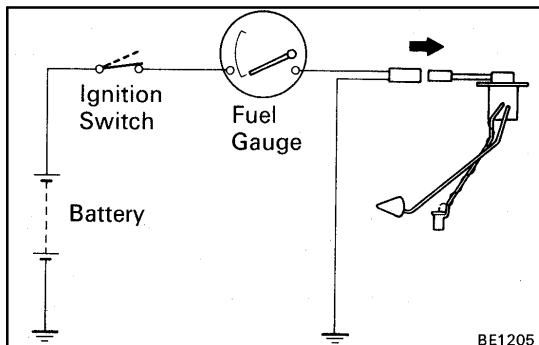
- Compare the tester and tachometer indications.
- If error is excessive, replace the tachometer.

RPM (DC 13.5 V, 25°C (77 °F))

Standard indication	Allowable range
700	630 – 770
1,000	900 – 1,100
2,000	1,875 – 2,125
3,000	2,850 – 3,150
4,000	3,850 – 4,150
5,000	4,850 – 5,150

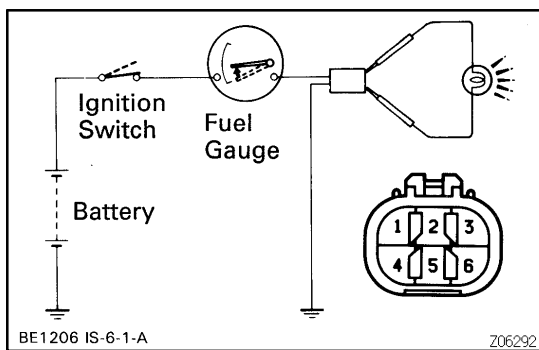
4. INSPECT VOLTMETER ON-VEHICLE:

Compare the tester and voltmeter indications.
If error is excessive, replace the voltmeter.



5. INSPECT FUEL RECEIVER GAUGE OPERATION

- Disconnect the connector from the sender gauge.
- Turn the ignition switch ON, and check that the receiver gauge needle indicates EMPTY.



- Connect terminals 4 and 5 on the wire harness side connector through a 3.4 W test bulb.
- Turn the ignition switch ON, and check that the bulb lights up and the receiver gauge needle moves towards the full side.

HINT:

Because of the silicon oil in the gauge, it will take a short time for needle to stabilize.

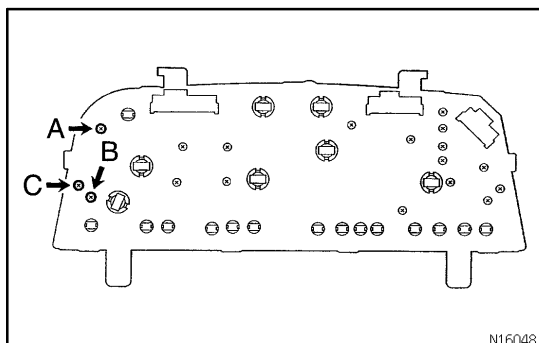
If operation is not as specified, inspect the receiver gauge resistance.

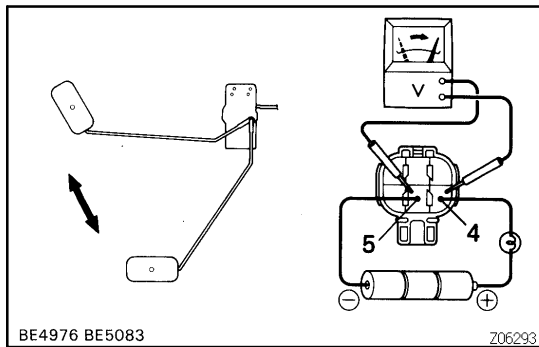
6. INSPECT FUEL RECEIVER GAUGE RESISTANCE

Between terminals	Resistance (Ω)
A – B	85.5 – 105.5
A – C	126 – 150
B – C	*90 – 110

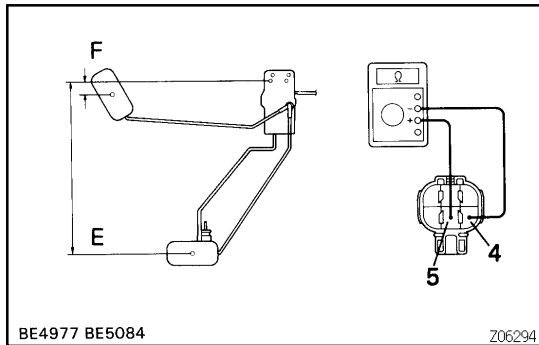
*: Include voltmeter resistance

If resistance value is not as specified, replace the fuel receiver gauge.



**7. INSPECT FUEL SENDER GAUGE OPERATION**

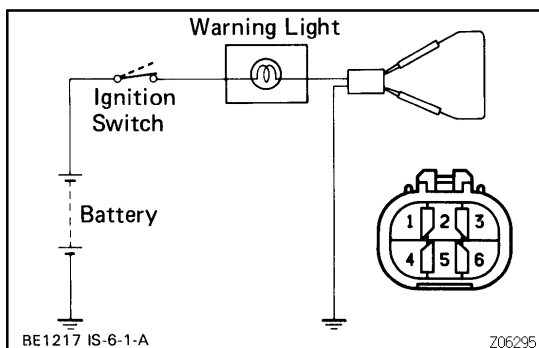
- Connect a series of three 1.5 V dry cell batteries.
- Connect the positive (+) lead from the dry cell batteries to terminal 4 through a 3.4 W test bulb and the negative (-) lead to terminal 5.
- Connect the positive (+) lead from the voltmeter to terminal 4 and the negative (-) lead to terminal 5.
- Check that the voltage rises as the float is moved from the full to empty position.

**8. INSPECT FUEL SENDER GAUGE RESISTANCE**

Measure the resistance between terminals 4 and 5.

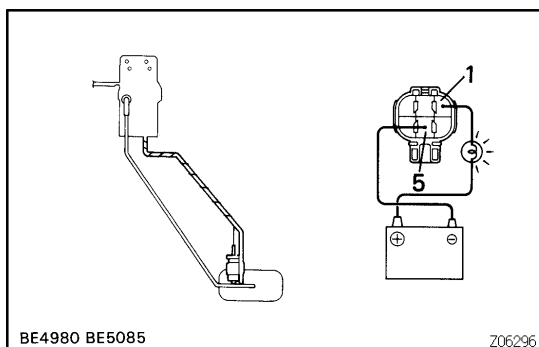
Float position: mm (in.)	Resistance (Ω)
F: Approx. 15.0 (0.591)	Approx. 3.0
E: Approx. 200.0 (7.874)	Approx. 110.0

If resistance value is not as specified, replace the sender gauge.

**9. INSPECT FUEL LEVEL WARNING LIGHT**

- Disconnect the connector from the sender gauge.
- Connect terminals 1 and 5 on the wire harness side connector.
- Turn the ignition switch ON, and check that the warning light lights up.

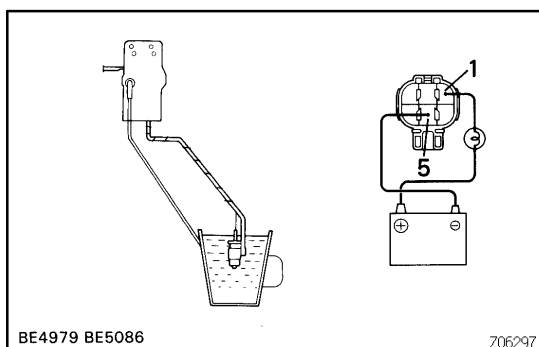
If the warning light does not light up, test the bulb.

**10. INSPECT FUEL LEVEL WARNING SWITCH**

- Apply battery positive voltage between terminals 1 and 5 through a 3.4 W test bulb, and check that the bulb lights up.

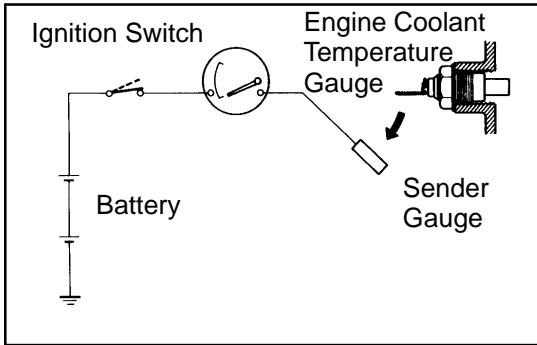
HINT:

It will take a short time for the bulb to light up.



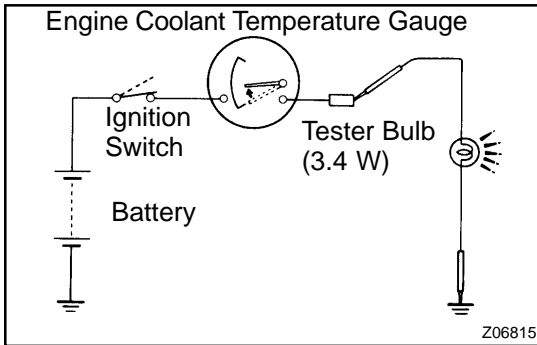
- Submerge the switch in fuel, and check that the bulb goes out.

If operation is not as specified, replace the sender gauge.



11. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE OPERATION

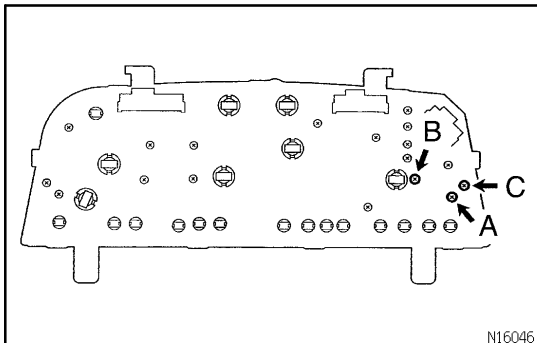
- Disconnect the connector from the sender gauge.
- Turn the ignition switch ON, and check that the receiver gauge needle indicates COOL.



- Ground terminal on the wire harness side connector through a 3.4 W test bulb.
- Turn the ignition switch ON, and check that the bulb lights up and the receiver gauge needle moves to the hot side.

If operation is as specified, replace the sender gauge. Then re-check the system.

If operation is not as specified, measure the receiver gauge resistance.



12. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE RESISTANCE

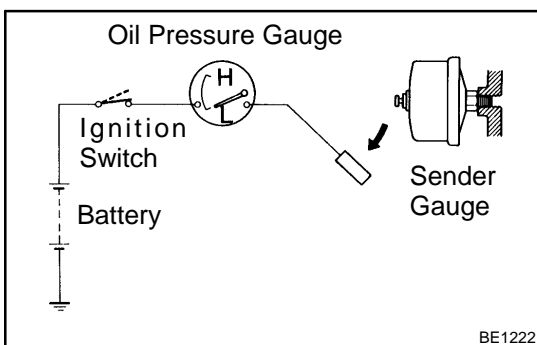
Measure the resistance between terminals.

Between terminals	Resistance (Ω)
A - B	71 - 79
A - C	117 - 141
B - C	185 - 215

HINT:

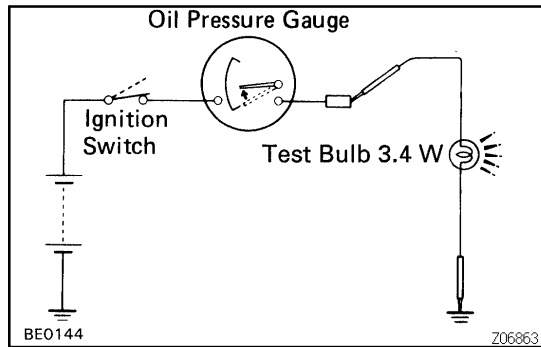
Connect the test leads so that the current from the ohmmeter can flow according to the above order. This circuit include the diode.

If resistance value is not as specified, replace the receiver gauge.



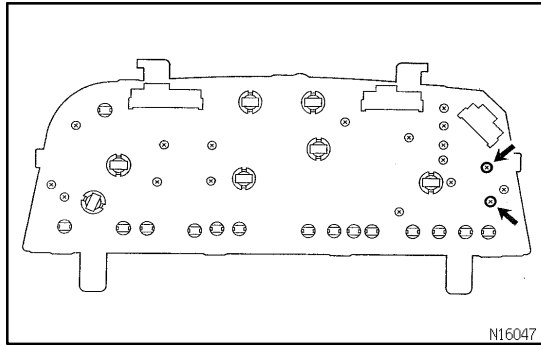
13. INSPECT OIL PRESSURE RECEIVER GAUGE OPERATION

- Disconnect the connector from the sender gauge.
- Turn the ignition switch ON, and check that the receiver gauge needle indicates LOW.



- (c) Ground terminal on the wire harness side through a 3.4 W test bulb.
- (d) Turn the ignition switch ON, and check that the bulb lights up and that the receiver gauge needle moves to the high side.

If operation is not as specified, measure the receiver gauge resistance.



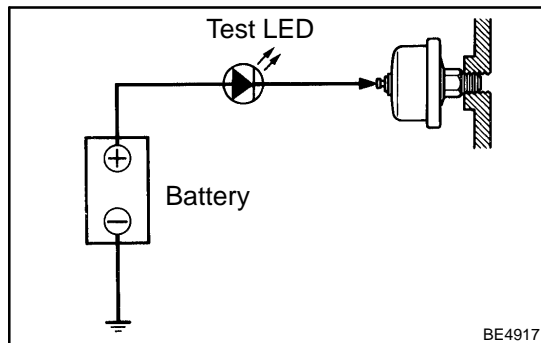
14. INSPECT OIL PRESSURE RECEIVER GAUGE RESISTANCE

Measure the receiver gauge resistance between terminals.

Resistance:

40 – 48 Ω

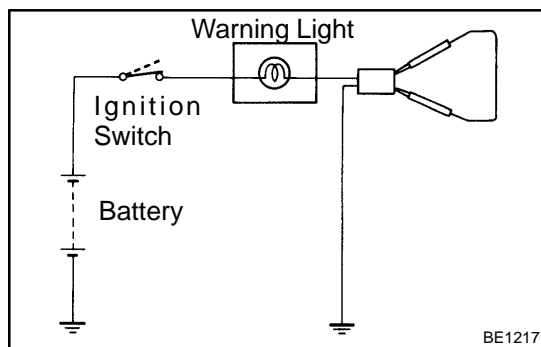
If resistance value is not as specified, replace the receiver gauge.



15. INSPECT OIL PRESSURE SENDER GAUGE OPERATION

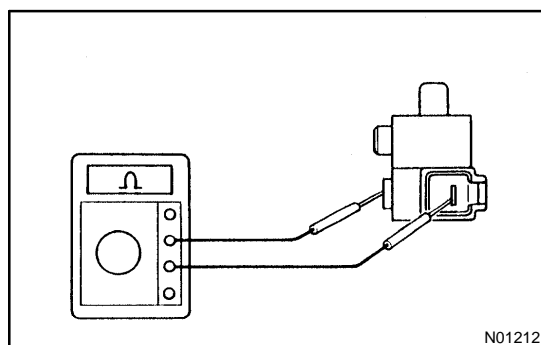
- (a) Disconnect the connector from the sender gauge.
- (b) Apply battery positive voltage to the sender gauge terminal through a test LED.
- (c) Check that the bulb does not light when the engine is stopped.
- (d) Check that the LED flashes when the engine is running. The number of flashed should vary with engine speed.

If operation is not as specified, replace the sender gauge.



16. INSPECT BRAKE WARNING LIGHT

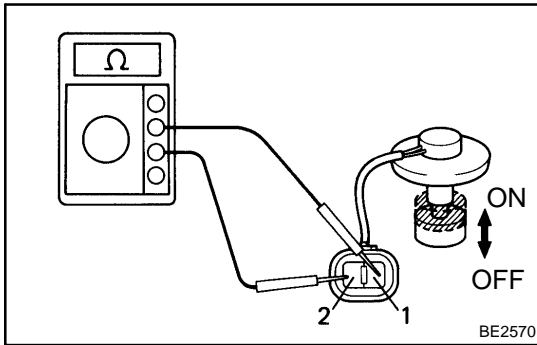
- (a) Disconnect the connectors from the level warning switch and parking brake switch.
- (b) Connect terminals on the wire harness side connector of the level warning switch connector.
- (c) Turn the ignition switch ON, and check that the warning light lights up.



17. INSPECT PARKING BRAKE SWITCH

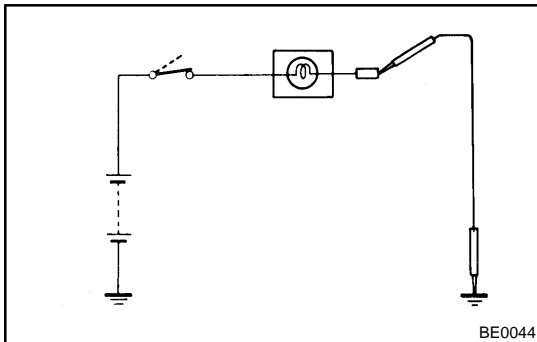
- (a) Check that there is continuity between terminal and the switch set nut with switch pin released (parking brake lever pulled up).
- (b) Check that there is no continuity between terminal and the switch set nut with switch pin pushed in. (parking brake lever released)

If operation is not as specified, replace the switch.

**18. INSPECT BRAKE FLUID LEVEL WARNING SWITCH**

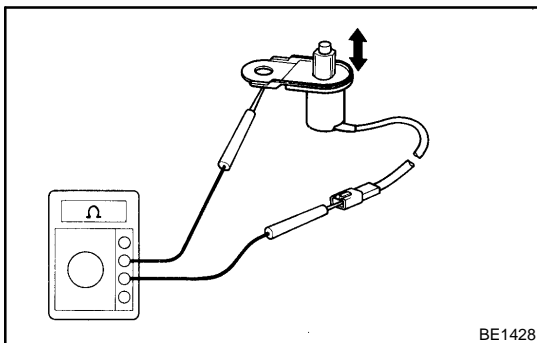
- Check that there is no continuity between terminals with the switch OFF (float up).
- Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.

**19. INSPECT OPEN DOOR WARNING LIGHT**

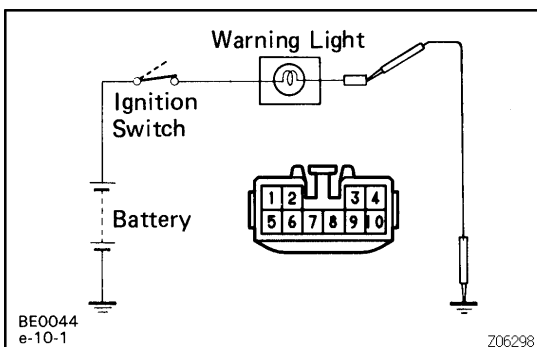
- Disconnect the connector from the door courtesy switch and ground terminal on the wire harness side connector.
- Turn the ignition switch ON, and check that the warning light lights up.

If the warning light does not light up, test the bulb.

**20. INSPECT DOOR COURTESY SWITCH**

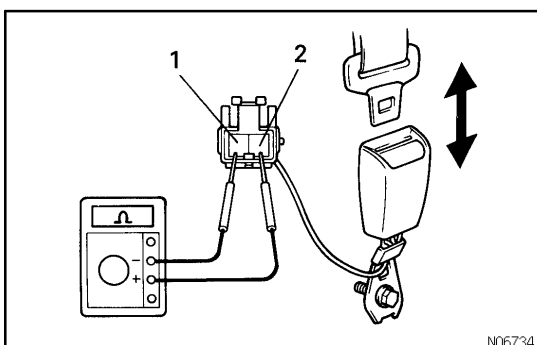
- Check that there is continuity between terminal and the switch body with the switch ON (switch pin released:opened door).
- Check that there is no continuity between terminal and the switch body with the switch OFF (switch pin pushed in:closed door).

If operation is not as specified, replace the switch.

**21. INSPECT SEAT BELT WARNING LIGHT**

- Disconnect the connector from the seat belt warning relay.
- Ground terminal 9 on the wire harness side connector.
- Turn the ignition switch ON, and check that the warning light lights up.

If the warning light does not light up, test the bulb.

**22. INSPECT SEAT BELT BUCKLE SWITCH CONTINUITY**

- Check that there is continuity between terminals with the switch ON (belt unfastened).
- Check that there is no continuity between terminals with the switch OFF (belt fastened).

If operation is not as specified, replace the seat belt inner.

Wire Harness Side



e-10-1

Z06844

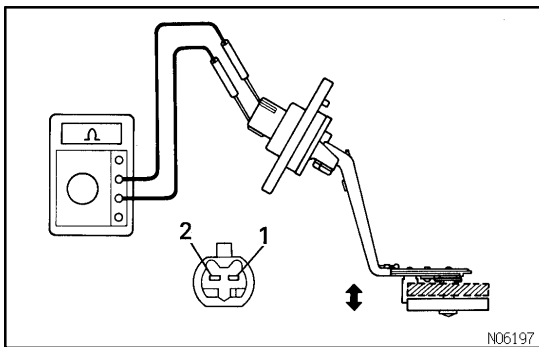
23. INSPECT SEAT BELT WARNING RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart.

Tester connection	Condition	Specified condition
1 – Ground	Constant	Continuity
4 – Ground	Driver's seat belt position UNFASTEN	Continuity
4 – Ground	Driver's seat belt position FASTEN	No continuity
7 – Ground	Ignition key SET	Continuity
7 – Ground	Ignition key Remove	No continuity
8 – Ground	Driver's door position OPEN	Continuity
8 – Ground	Driver's door position CLOSE	No continuity
5 – Ground	Ignition switch position ON	Battery positive voltage
5 – Ground	Ignition switch position LOCK or ACC	No voltage
9 – Ground	Constant	Battery positive voltage

If circuit is as specified, try another relay.

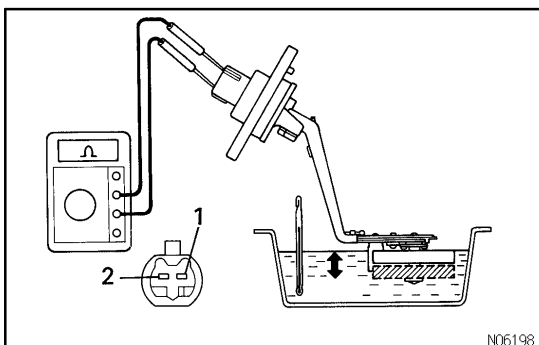
If the circuit is not as specified, check the circuits connected to other parts.



N06197

24. INSPECT ENGINE OIL LEVEL WARNING SWITCH

- Check that there is continuity between terminal with the switch each position.
- Heat the switch to above 60°C (140°F) in an oil bath.



N06198

- Check that there is continuity between terminals with the switch ON (float up).
- Check that there is no continuity between terminals with the switch OFF (float down).

If operation is not as specified, replace the switch.

Wire Harness Side

le-2-1-h

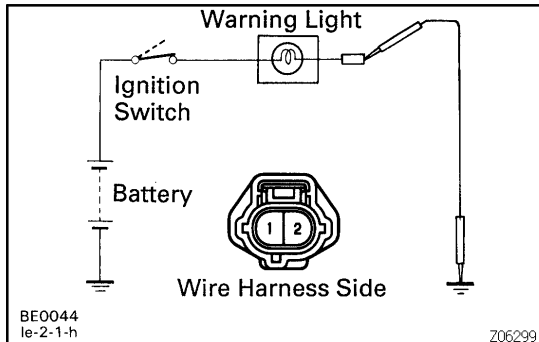
Z06845

25. INSPECT ENGINE OIL LEVEL WARNING CIRCUIT

Disconnect the switch connector and inspect the connector on wire harness side, as shown.

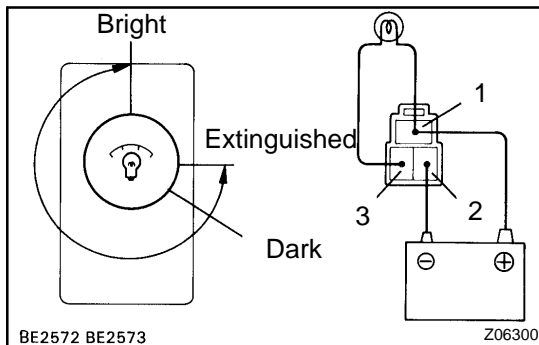
Tester connection	Condition	Specified condition
2 – Ground	Constant	Continuity

If continuity is not as specified, inspect the wire harness or ground point.

**26. INSPECT ENGINE OIL LEVEL WARNING LIGHT**

- Disconnect the connector from the switch.
- Ground terminal 1 on the wire harness connector.
- Turn the ignition switch ON, and check that the warning light lights up approximately 40 seconds later.

If the warning light does not light up, inspect bulb or wire harness.

**27. INSPECT LIGHT CONTROL RHEOSTAT**

- Connect terminals 1 and 3 through a 3.4 W test bulb.
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2.
- Turn the rheostat knob to fully counterclockwise, and check that the test bulb goes out.
- Gradually turn the rheostat knob to clockwise, and check that the test bulb brightness changes from dark to bright.

If operation is not as specified, replace the rheostat.

HINT:

Adjust the brightness of illumination lights by rheostat.

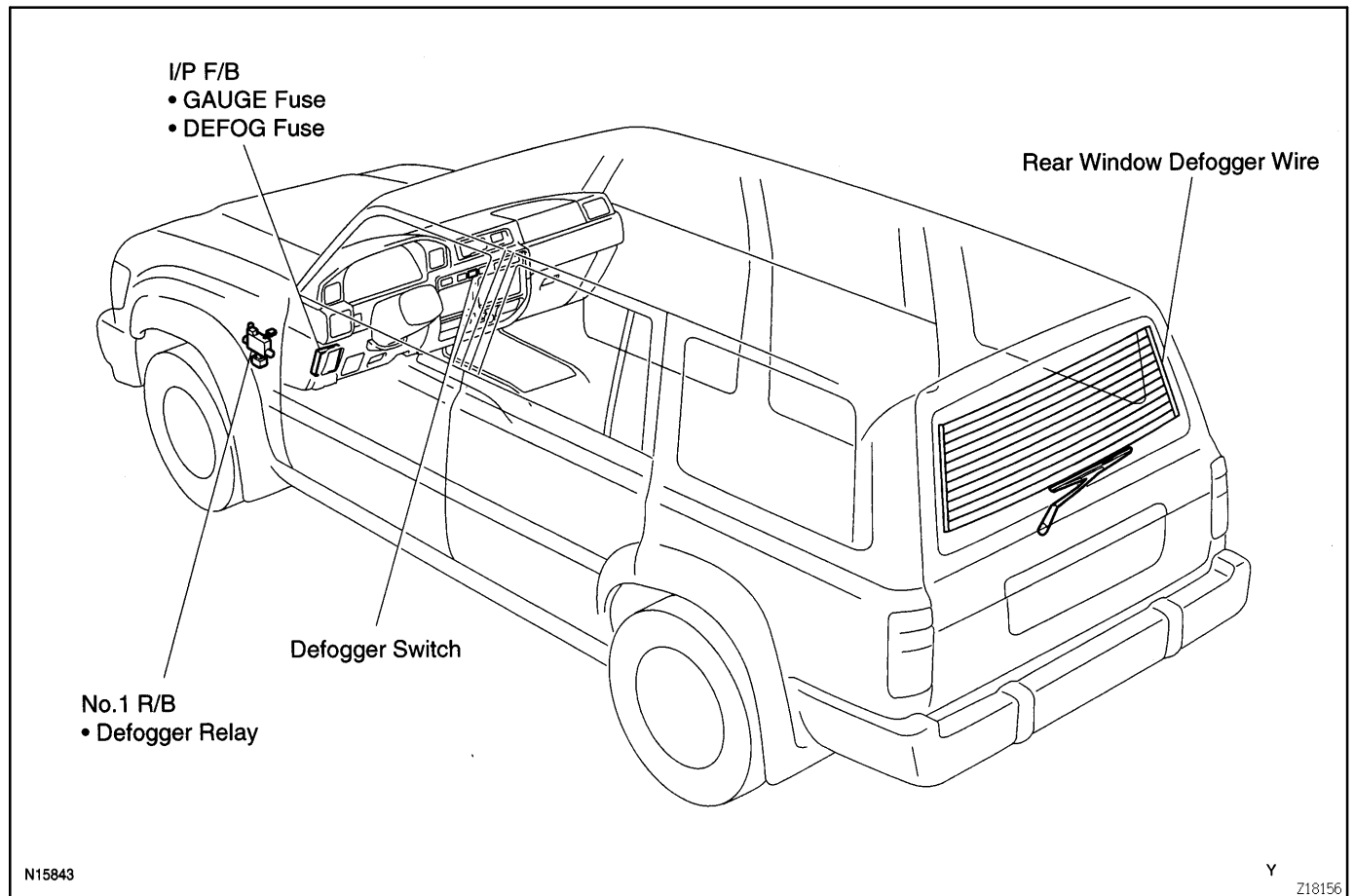
- A/C Control Assembly
- Antenna Switch
- Ash Receptacle
- Audio
- Center Diff. Lock Switch
- Cigarette Lighter
- Defogger Switch
- Hazard Warning Switch
- Shift Lever

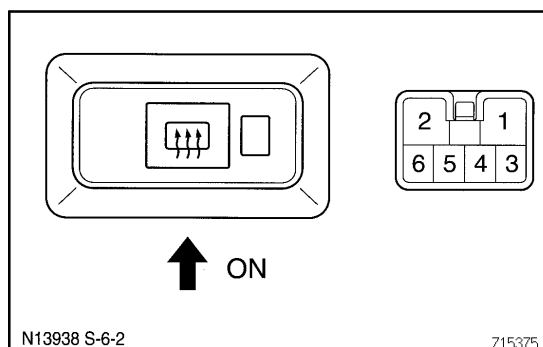
BE-42

BODY ELECTRICAL - DEFOGGER SYSTEM

DEFOGGER SYSTEM LOCATION

BE1ME-01





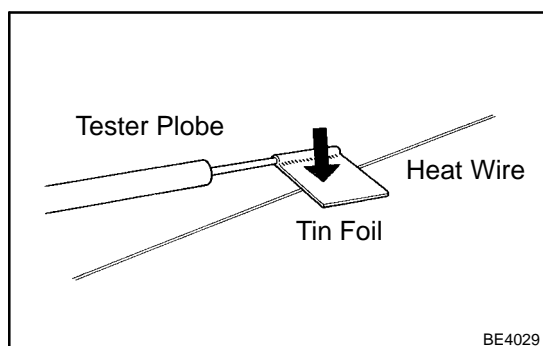
INSPECTION

1. INSPECT DEFOGGER SWITCH CONTINUITY

Condition	Tester connection	Specified condition
Switch OFF	-	No continuity
Switch ON	2 - 3 - 6	Continuity
Illumination circuit	1 - 4	Continuity

If continuity is not as specified, check the bulb or replace the switch.

2. INSPECT DEFOGGER RELAY CONTINUITY (See page BE-46.)

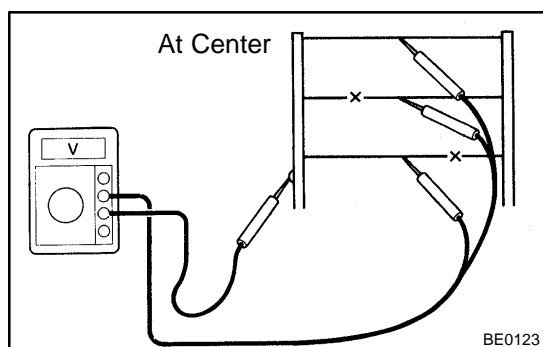


3. INSPECT DEFOGGER WIRES

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 abrasive 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.

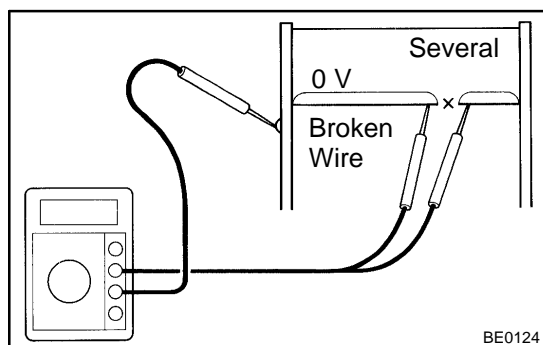
- Turn the ignition switch ON.
- Turn the defogger switch ON.
- Inspect the voltage at the center of each heat wire, as shown.



Voltage	Criteria
Approx. 5V	Okay (No break in wire)
Approx. 10V or 0V	Broken wire

HINT:

If there is 10 V, the wire is broken between the center of the wire and positive (+) end. If there is no voltage, the wire is broken between the center of the wire and ground.

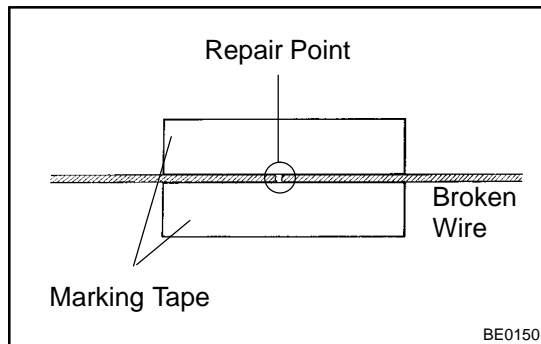


- Place the voltmeter positive (+) lead against the defogger positive (+) terminal.
- Place the voltmeter negative (-) lead with the foil strip against the heat wire at the positive (+) terminal end and slide it toward the negative (-) terminal end.

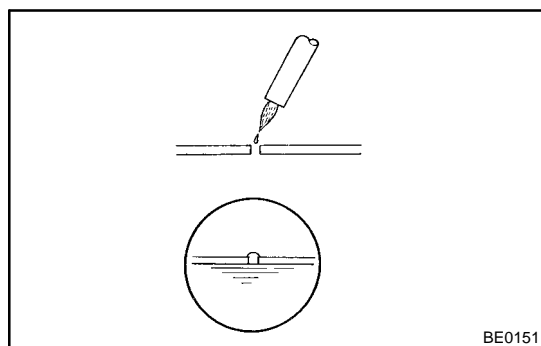
- (f) The point where the voltmeter deflects from zero to several V is the place where the heat wire is broken.

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.

**4. IF NECESSARY, REPAIR DEFOGGER WIRE**

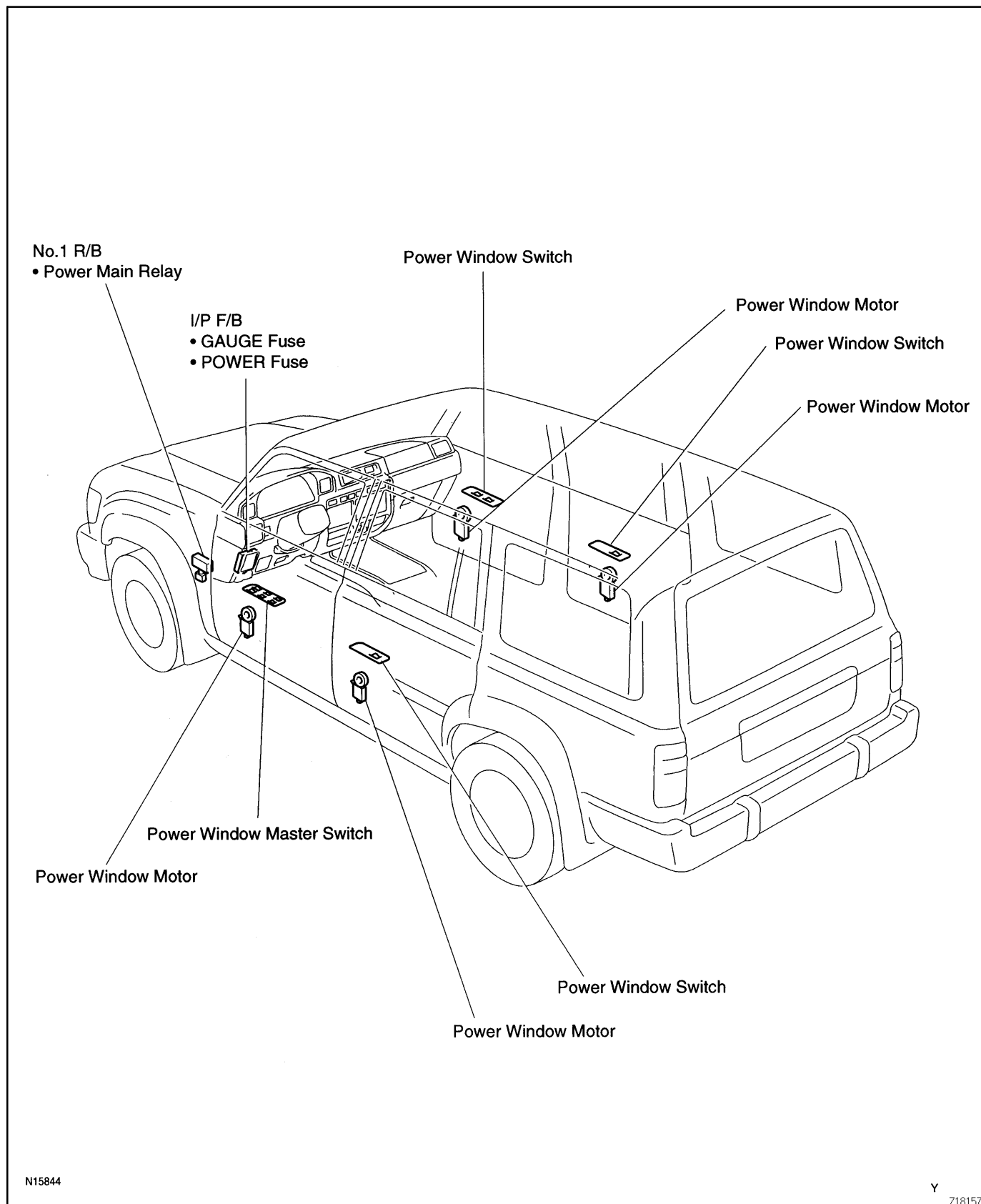
- (a) Clean the broken wire tips with a grease, wax and silicone remover.
 (b) Place the masking tape along both sides of the wire to be repaired.

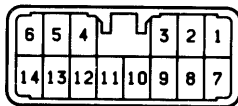
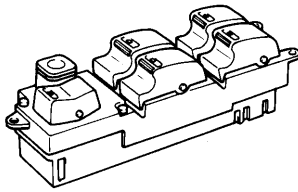


- (c) Thoroughly mix the repair agent (Dupont paste No. 4817 or equivalent).
 (d) Using a fine tip brush, apply a small amount to the wire.
 (e) After a few minutes, remove the masking tape.
 (f) Do not repair the defogger wire for at least 24 hours.

POWER WINDOW CONTROL SYSTEM LOCATION

BE1MG-01





Z06846

INSPECTION

1. INSPECT POWER WINDOW MASTER SWITCH CONTINUITY

Front Driver's Switch (Window unlock):

Switch position	Tester connection	Specified condition
UP	1 - 2 - 13 6 - 7 - 8	Continuity
OFF	1 - 2 - 6 - 13	Continuity
DOWN	1 - 2 - 6 7 - 8 - 13	Continuity

Front Driver's Switch (Window lock):

Switch position	Tester connection	Specified condition
UP	1 - 2 - 13 6 - 7 - 8	Continuity
OFF	1 - 2 - 6 - 13	Continuity
DOWN	1 - 2 - 6 7 - 8 - 13	Continuity

Front Passenger's Switch (Window unlock):

Switch position	Tester connection	Specified condition
UP	1 - 2 - 5 7 - 8 - 12	Continuity
OFF	1 - 2 - 5 - 12	Continuity
DOWN	1 - 2 - 12 5 - 7 - 8	Continuity

Front Passenger's Switch (Window lock):

Switch position	Tester connection	Specified condition
UP	7 - 8 - 12	Continuity
OFF	5 - 12	Continuity
DOWN	5 - 7 - 8	Continuity

Rear Left Switch (Window unlock):

Switch position	Tester connection	Specified condition
UP	1 - 2 - 9 7 - 8 - 10	Continuity
OFF	1 - 2 - 9 - 10	Continuity
DOWN	1 - 2 - 10 7 - 8 - 9	Continuity

Rear Left Switch (Window lock):

Switch position	Tester connection	Specified condition
UP	7 - 8 - 10	Continuity
OFF	9 - 10	Continuity
DOWN	7 - 8 - 9	Continuity

Rear Right Switch (Window unlock):

Switch position	Tester connection	Specified condition
UP	1 - 2 - 14 7 - 8 - 11	Continuity

BODY ELECTRICAL – POWER WINDOW CONTROL SYSTEM

OFF	1 – 2 – 11 – 14	Continuity
DOWN	1 – 2 – 11 7 – 8 – 14	Continuity

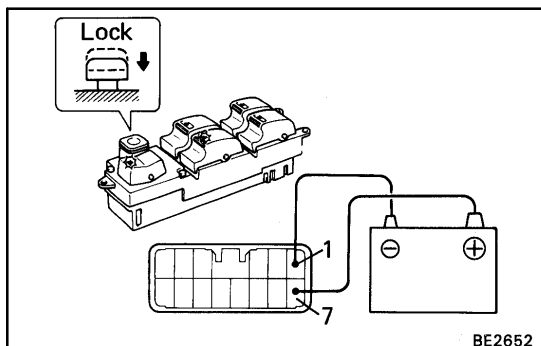
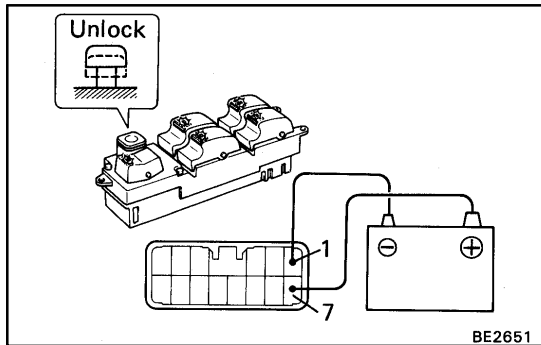
Rear Right Switch (Window lock):

Switch position	Tester connection	Specified condition
UP	7 – 8 – 11	Continuity
OFF	11 – 14	Continuity
DOWN	7 – 8 – 14	Continuity

If continuity is not as specified, replace the master switch.

2. INSPECT POWER WINDOW MASTER SWITCH ILLUMINATION

- Set the window lock switch to the unlock position.
- Connect the positive (+) lead from the battery to terminal 7 and the negative (–) lead to terminal 1, and check that all the illuminations light up.

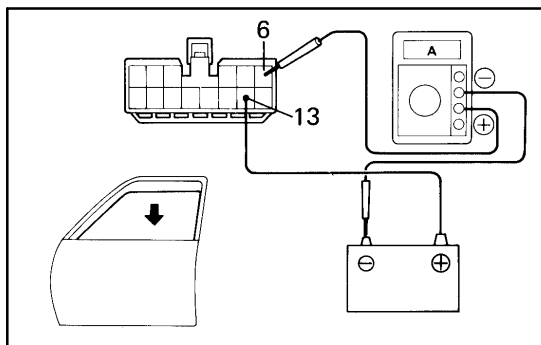


- Set the window lock switch to the lock position, and check that all the passenger's power window switch illuminations go out.

If operation is not as specified, replace the master switch.

3. Using an ammeter:**INSPECT ONE TOUCH POWER WINDOW SYSTEM**

- Disconnect the connector from the master switch.
- 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.
- Connect the positive (+) lead from the battery to terminal 13 on the wire harness side connector.

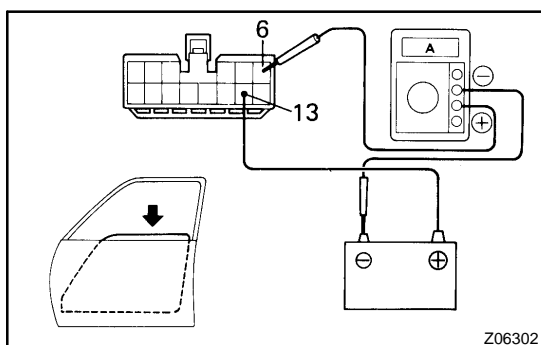


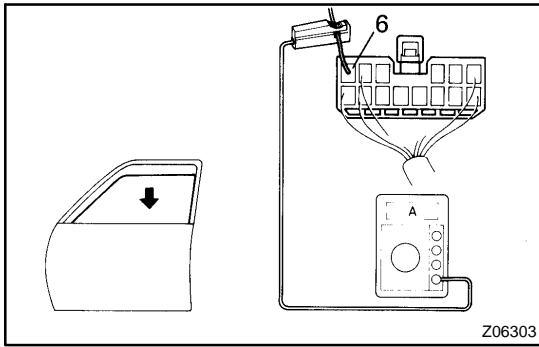
- As the window goes down, check that the current flow is up to approximately 7 A.
- Check that the current increases approximately 14.5 A or more when the window stops going down.

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.

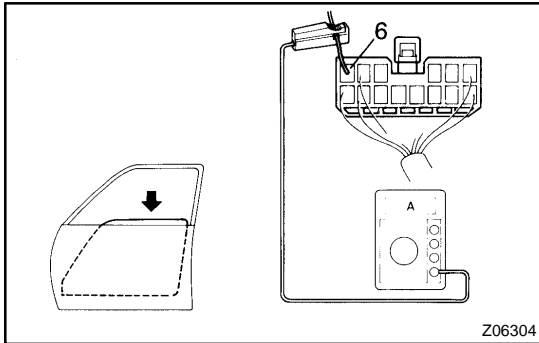
If the operation is as specified, replace the master switch.





4. Using an ammeter with a current – measuring probe: INSPECT ONE TOUCH POWER WINDOW SYSTEM

- Remove the master switch with connector connected.
- Attach a current-measuring probe to terminal 6 of the wire harness.
- Turn the ignition switch ON, and set the power window switch in the down position.
- As the window goes down, check that the current flow is up to approximately 7 A.

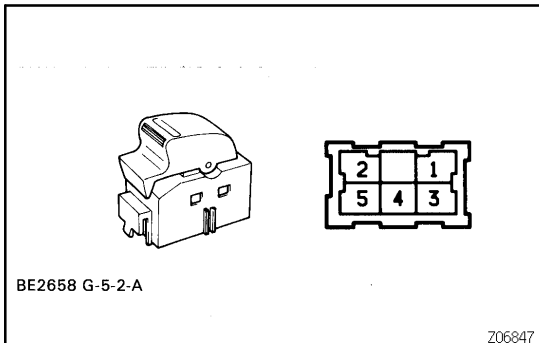


- Check that the current increases approximately 14.5 A or more when the window stops going down.

HINT:

The circuit breaker opens some 4 – 40 seconds after the window stops going down, so check must be made before the circuit breaker operates.

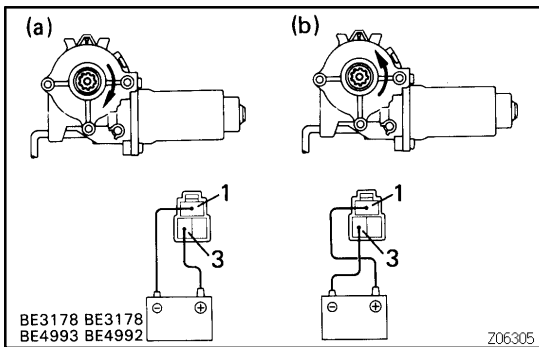
If operation is as specified, replace the master switch.



5. INSPECT POWER WINDOW SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
UP	1 – 5, 3 – 4	Continuity
OFF	1 – 2, 3 – 4	Continuity
DOWN	1 – 2, 4 – 5	Continuity

If continuity is not as specified, replace the switch.

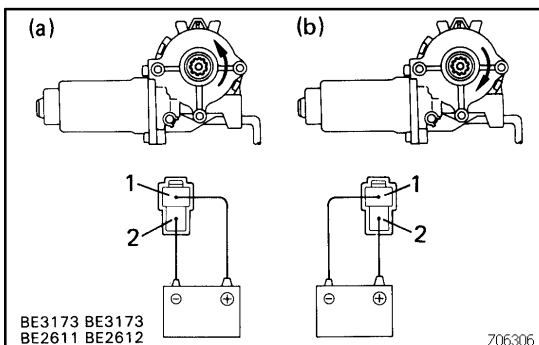


6. Front Door:

INSPECT LEFT SIDE DOOR POWER WINDOW MOTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1, and check that the motor turns clockwise.
- Reverse the polarity, and check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.



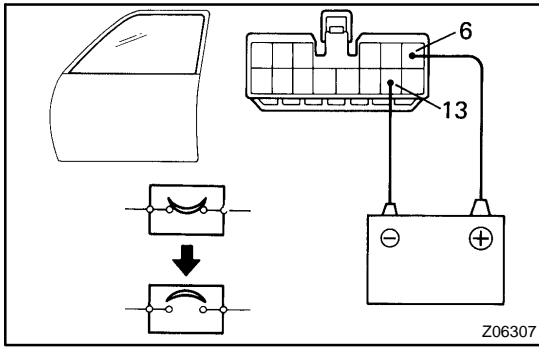
7. Rear Door:

INSPECT LEFT SIDE DOOR POWER WINDOW MOTOR OPERATION

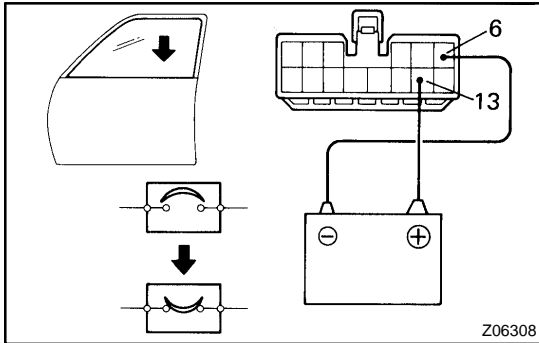
- Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns counterclockwise.
- Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.

BODY ELECTRICAL - POWER WINDOW CONTROL SYSTEM

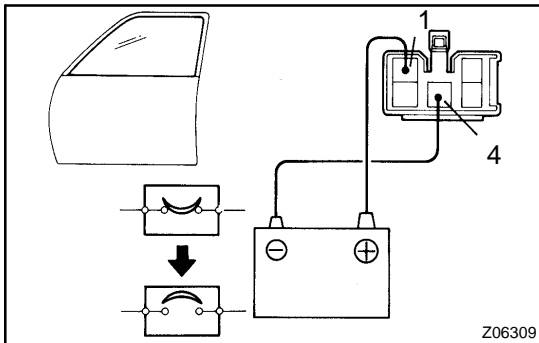
**8. INSPECT DRIVER'S DOOR PTC OPERATION**

- (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 the current changes from approximately 14 A to less than 1 A within 4 to 90 seconds.

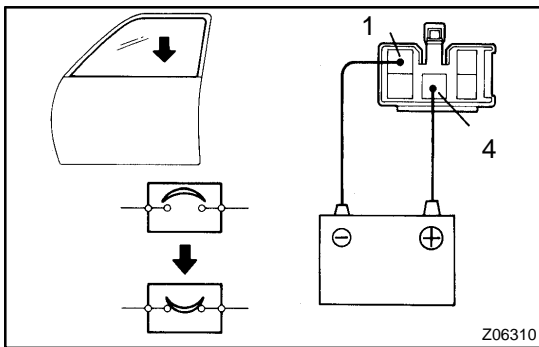


- (d) Disconnect the leads from terminals.
- (e) After approximately 90 seconds, connect the positive (+) lead from the battery to terminal 13 and negative (-) lead to terminal 6, check that the window begins to descend.

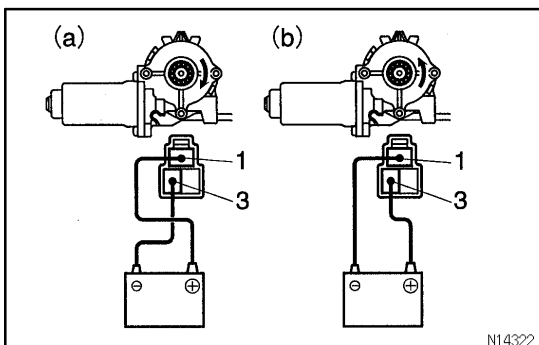
If operation is not as specified, replace the motor.

**9. INSPECT PASSENGER'S DOOR PTC OPERATION**

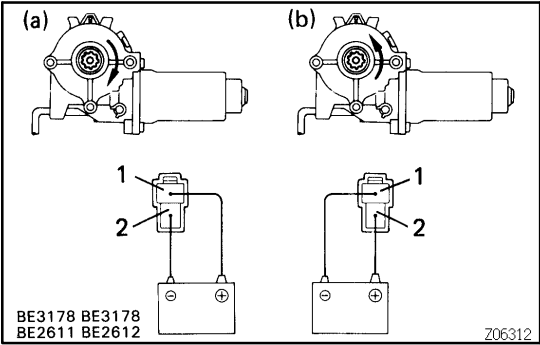
- (a) Disconnect the connector from the power window switch.
- (b) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position.
- (c) Connect the positive (+) lead from the battery to terminal 1 on the wire harness side connector.
- (d) Disconnect the leads from terminals.



- (e) After approximately 90 seconds, connect the positive (+) lead from the battery to terminal 4 and negative (-) lead to terminal 1, check that the window begins to descend.
- If operation is not as specified, replace the motor.

**10. INSPECT PASSENGER'S DOOR MOTOR OPERATION**

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3, and check that the motor turns clockwise.
- (b) Reverse the polarity, and check that the motor turns counterclockwise.

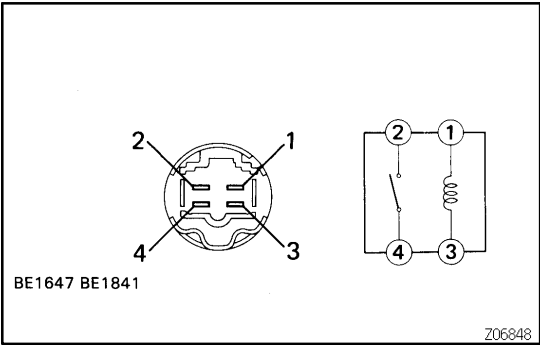


11. INSPECT REAR RIGHT SIDE DOOR MOTOR OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor turns counterclockwise.
- (b) Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.

12. INSPECT RIGHT SIDE PTC OPERATION



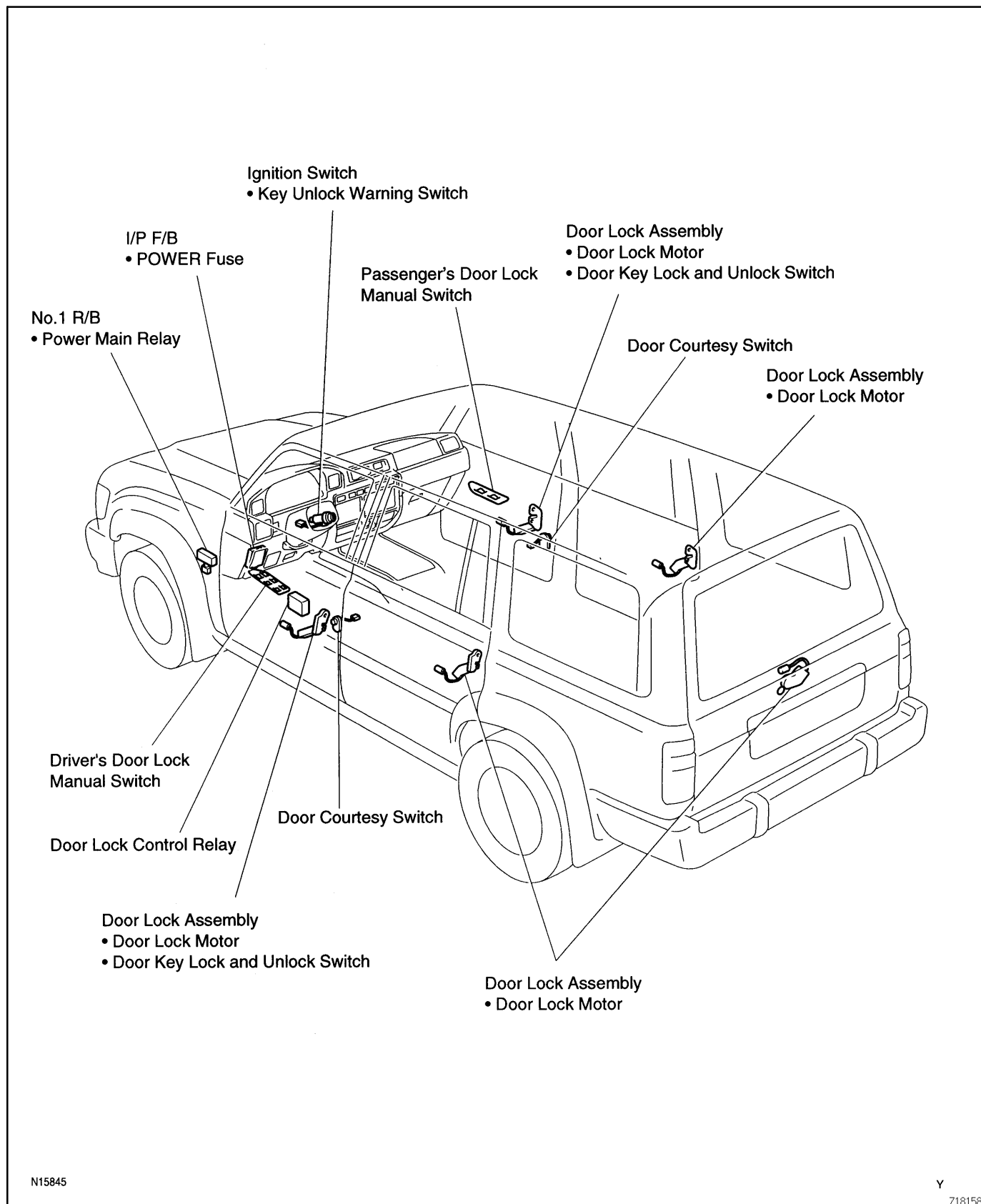
13. INSPECT POWER MAIN RELAY CONTINUITY

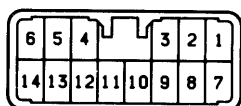
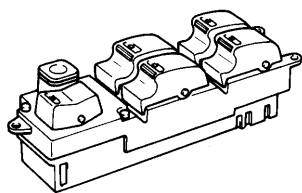
Condition	Tester connection	Specified condition
Constant	1 – 3	Continuity
Apply B+ between terminals 1 and 3.	2 – 4	Continuity

If continuity is not as specified, replace the relay.

POWER DOOR LOCK CONTROL SYSTEM LOCATION

BE1MI-01





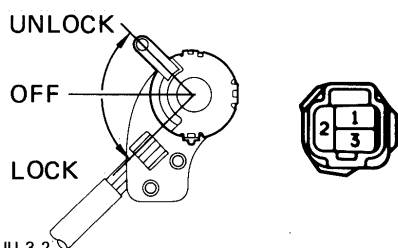
Z06846

INSPECTION

1. INSPECT DRIVER'S DOOR LOCK MANUAL SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	1 – 2 – 4	Continuity
OFF	–	No continuity
UNLOCK	1 – 2 – 3	Continuity

If continuity is not as specified, replace the switch.



BE2596 IU-3-2

Z06837

2. INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	1 – 3	Continuity
OFF	–	No continuity
UNLOCK	2 – 3	Continuity

If continuity is not as specified, replace the switch.

HINT:

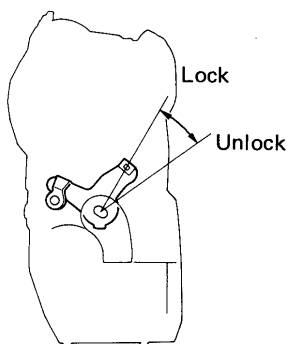
Door key lock and unlock switch is built into the front door lock assembly.

3. INSPECT KEY UNLOCK WARNING SWITCH CONTINUITY (See page [BE-11](#))

4. INSPECT DOOR COURTESY SWITCH CONTINUITY (See page [BE-21](#))

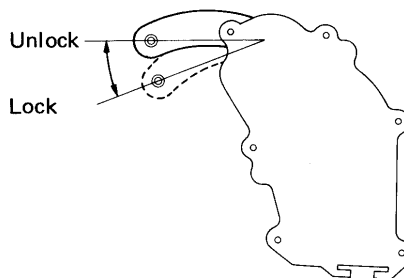
5. INSPECT DOOR LOCK MOTOR OPERATION

Front Door



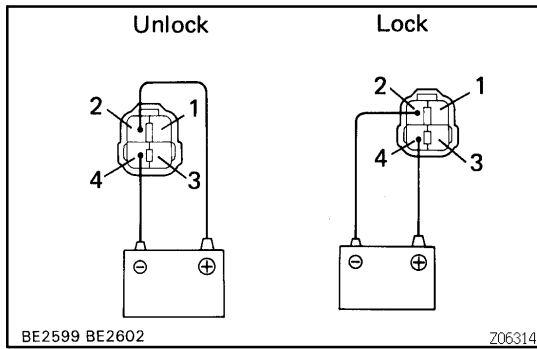
BE5090 BE5091

Rear Door and Back Door

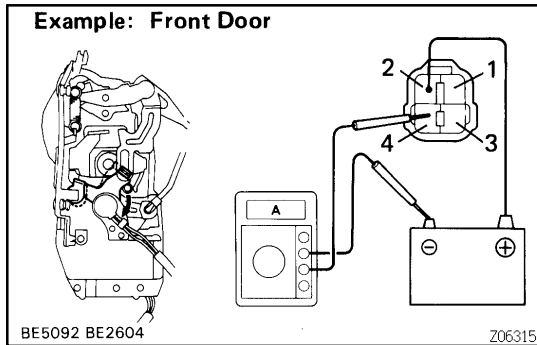


Z06313

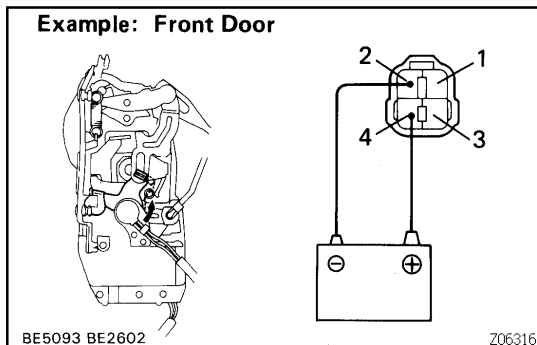
BODY ELECTRICAL - POWER DOOR LOCK CONTROL SYSTEM



- Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 4, and check that the door lock link moves to UNLOCK position.
 - Remove the polarity, and check that the door lock link move to LOCK position.
- If operation is not as specified, replace the door lock assembly.

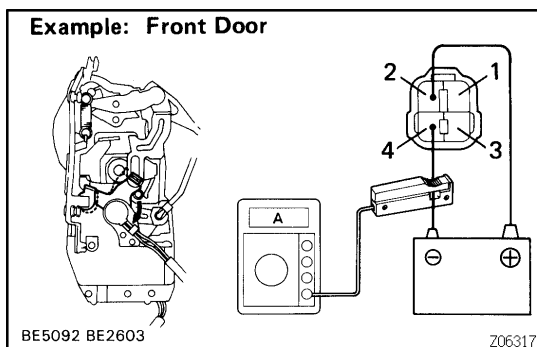
**6. Using an ammeter:****INSPECT PTC THERMISTOR OPERATION**

- Connect the positive (+) lead from the battery to terminal 2.
- Connect the positive (+) lead from the ammeter to terminal 4 and the negative (-) lead to battery negative (-) terminal, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.

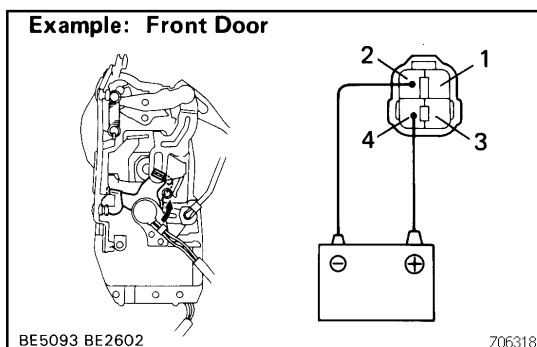


- Disconnect the leads from terminals.
- After approximately 60 seconds, connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 2, and check that the door lock moves to LOCK position.

If operation is not as specified, replace the door lock assembly.

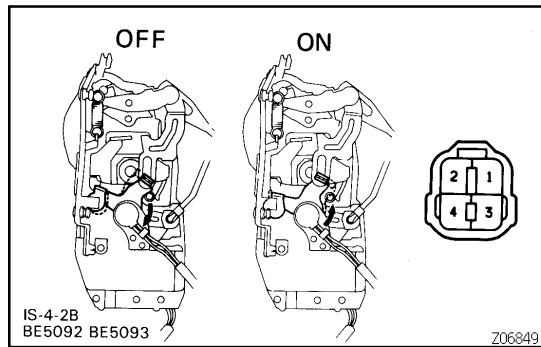
**7. Using an ammeter with a current-measuring probe:****INSPECT PTC THERMISTOR OPERATION**

- Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 4.
- Attach a current-measuring probe to either the positive (+) lead or the negative (-) lead, and check that the current changes from approximately 3.2 A to less than 0.5 A within 20 to 70 seconds.



- Disconnect the leads from terminals.
- After approximately 60 seconds, reverse the polarity, and check that the door lock moves to LOCK position.

If operation is not as specified, replace the door lock assembly.

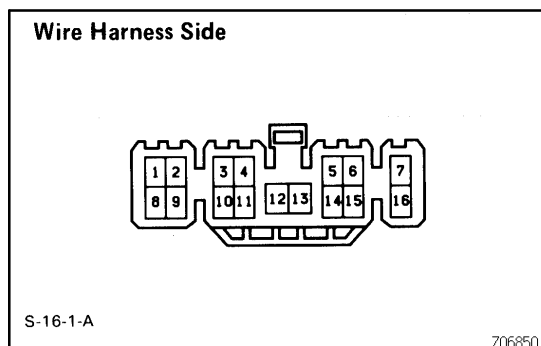


8. INSPECT DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
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.

9. INSPECT POWER MAIN RELAY CONTINUITY (See page BE-46)



10. INSPECT DOOR LOCK CONTROL RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart.

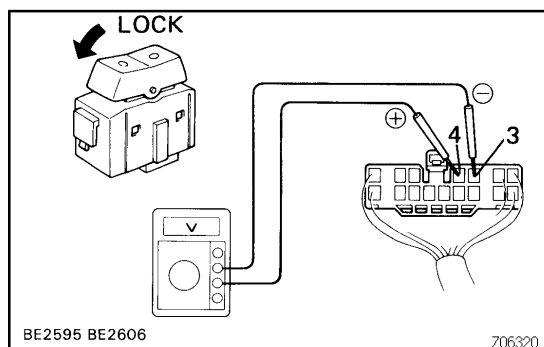
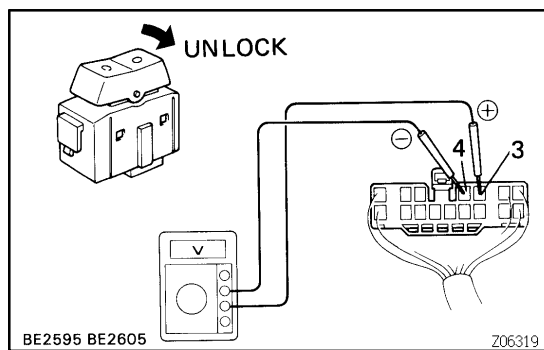
Tester connection	Condition	Specified condition
2 – Ground	Driver's door courtesy switch position OFF (Door closed)	No continuity
2 – Ground	Driver's door courtesy switch position ON (Door opened)	Continuity
5 – Ground	Passenger's door lock switch position OFF (Door locked)	No continuity
5 – Ground	Passenger's door lock switch position ON (Door unlocked)	Continuity
6 – Ground	Driver's door lock switch position OFF (Door locked)	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 of turned to lock)	No continuity

BODY ELECTRICAL – POWER DOOR LOCK CONTROL SYSTEM

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 and passenger's door key lock and unlock switch position OFF or UNLOCK	No continuity
11 – Ground	Door lock manual switch and passenger's door key lock and unlock switch position UNLOCK	Continuity
12 – Ground	Driver's and passenger's door key lock and unlock switch position OFF or UNLOCK (Door key free or turned to unlock)	No continuity
12 – Ground	Driver's or passenger's door key lock and unlock switch position LOCK (Door key turned to lock)	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
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.



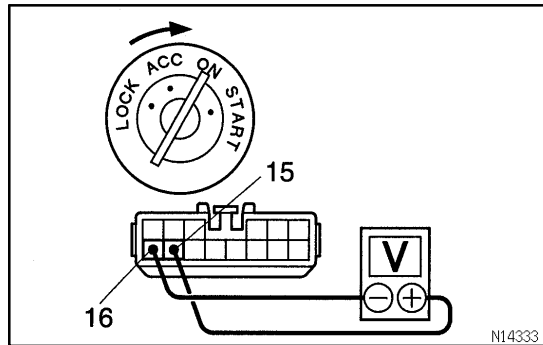
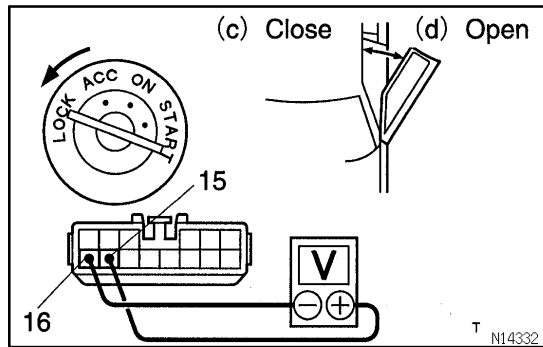
11. INSPECT DOOR LOCK SIGNAL

HINT:

When the relay circuit is as specified, inspect the door lock signal.

- Connect the connector to the relay.
- Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to terminal 4.
- Set the door lock manual switch to UNLOCK, and check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.
- Reverse the polarity of the voltmeter leads.
- Set the door lock manual switch to LOCK, and check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

If operation is not as specified, replace the relay.

**12. INSPECT KEY-OFF POWER WINDOW SIGNAL****HINT:**

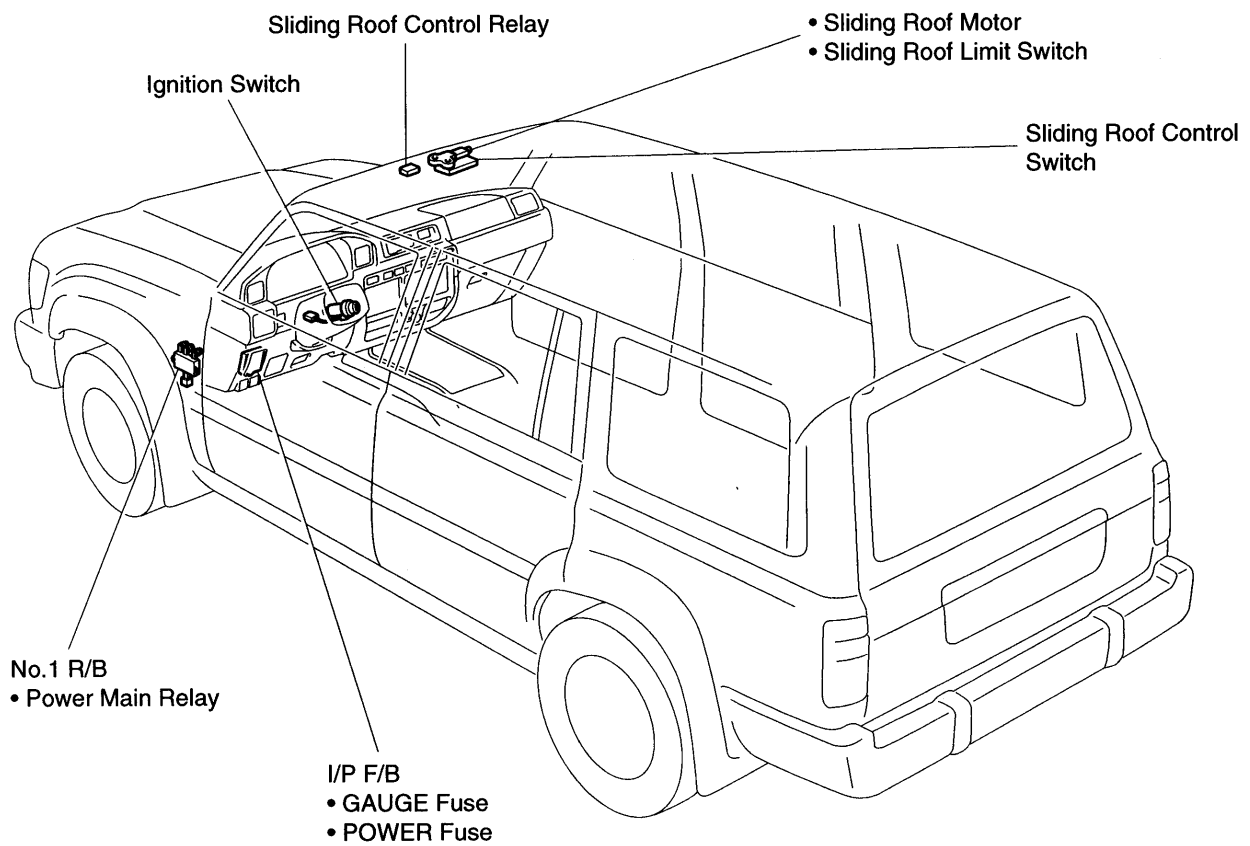
When the relay circuit is as specified, inspect the key-off power window signal.

- Connect the connector to the relay.
- Connect the positive (+) lead from the voltmeter to terminal 15 and the negative (-) lead to terminal 16.
- Close the door with ignition switch turned to LOCK or ACC, check that the meter needle indicates battery positive voltage.
- Open the door, check that the meter needle indicates 0 V.
- Turn the ignition switch ON, check that the meter needle indicate battery positive voltage again.

If operation is not as specified, replace the relay.

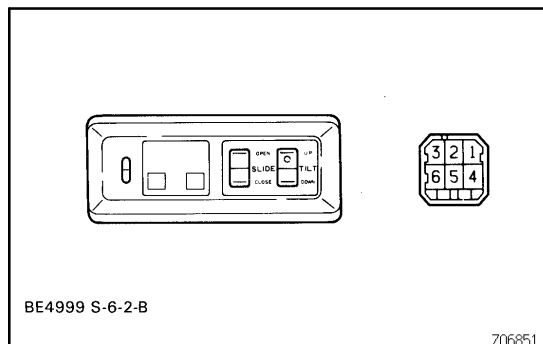
SLIDING ROOF SYSTEM LOCATION

BE1MK-01



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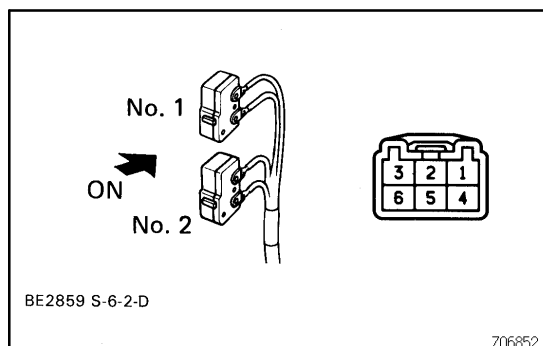


INSPECTION

1. INSPECT SLIDING ROOF SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
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	5 – 4	Continuity

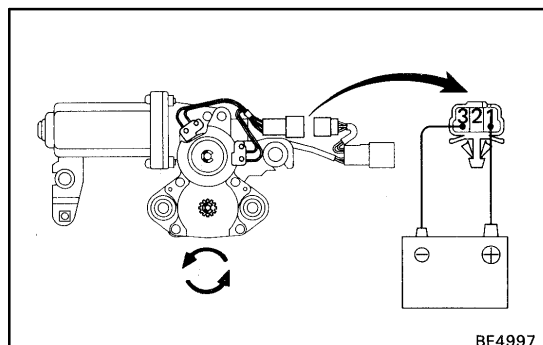
If continuity is not as specified, replace the switch.



2. INSPECT SLIDING ROOF LIMIT SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
No.1 limit switch OFF (SW pin released)	–	No continuity
No.1 limit switch ON (SW pin pushed in)	1 – 5	Continuity
No.2 limit switch OFF (SW pin released)	–	No continuity
No.2 limit switch ON (SW pin pushed in)	4 – 5	Continuity

If continuity is not as specified, replace the switch.

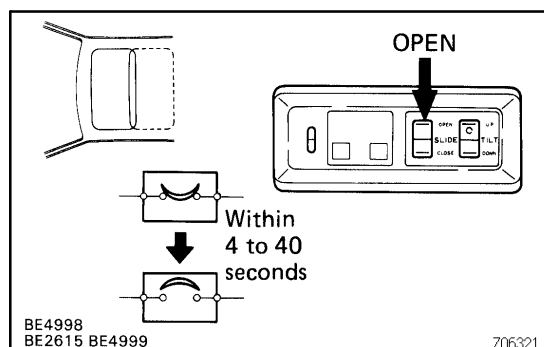


3. INSPECT SLIDING ROOF MOTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 3, and check that the motor turns clockwise.
- Reverse the polarity, and check that the motor turns to clockwise.

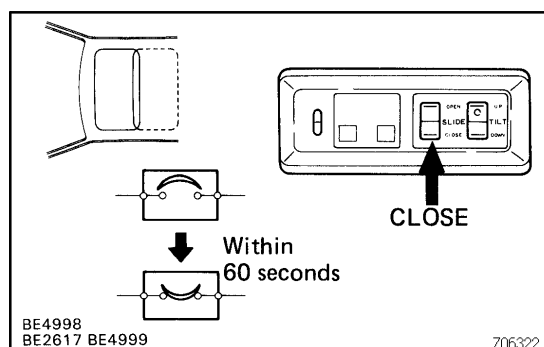
If operation is not as specified, replace the motor.

BODY ELECTRICAL - SLIDING ROOF SYSTEM



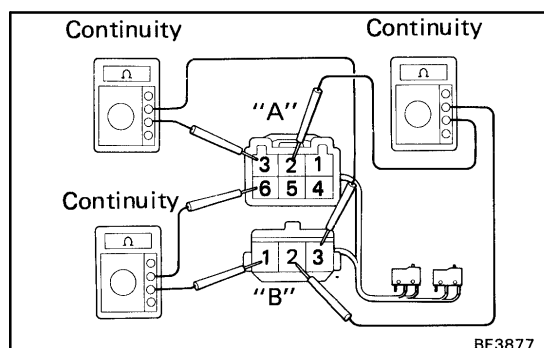
4. INSPECT SLIDING ROOF MOTOR CIRCUIT BREAKER OPERATION

- (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 4 to 40 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.

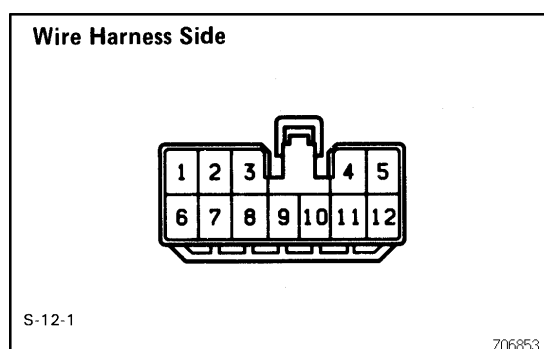
If operation is not as specified, replace the motor.



5. INSPECT SLIDING ROOF MOTOR WIRE CIRCUIT

- (a) Check that there is continuity between terminals A2 and B2.
- (b) Check that there is continuity between terminals A3 and B3.
- (c) Check that there is continuity between terminals A6 and B1.

If continuity is not as specified, replace the switch.



6. 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	Condition	Specified condition
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

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BODY ELECTRICAL – SLIDING ROOF SYSTEM

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	*1Continuity
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 (7.87 in.))	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
6 – Ground	Ignition switch position LOCK or ACC	*2No voltage
6 – Ground	Ignition switch position ON	Battery positive voltage
12 – Ground	Constant	Battery positive voltage

*1: There is resistance because this circuit is include motor.

*2: 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).

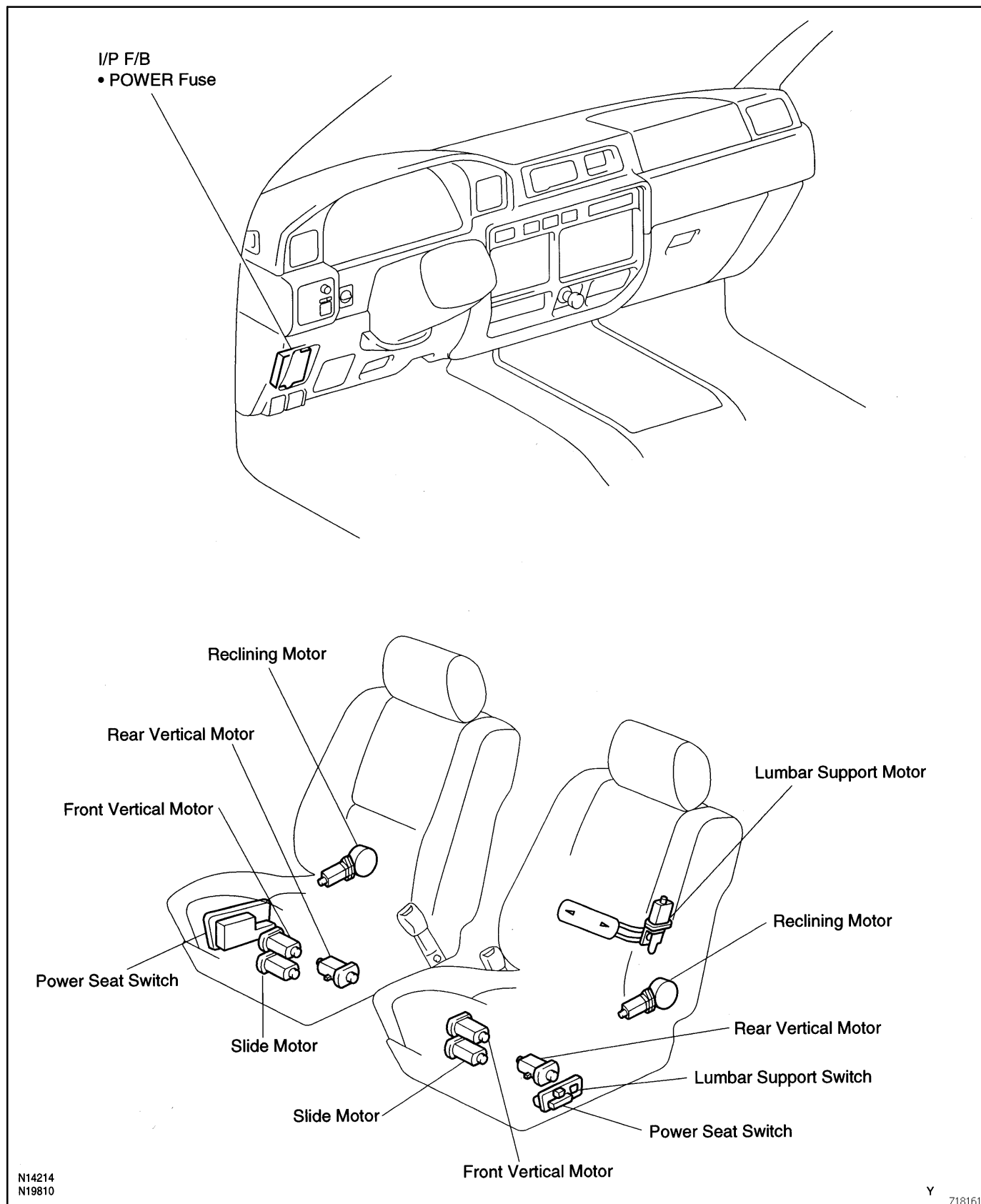
If circuit is as specified, replace the relay.

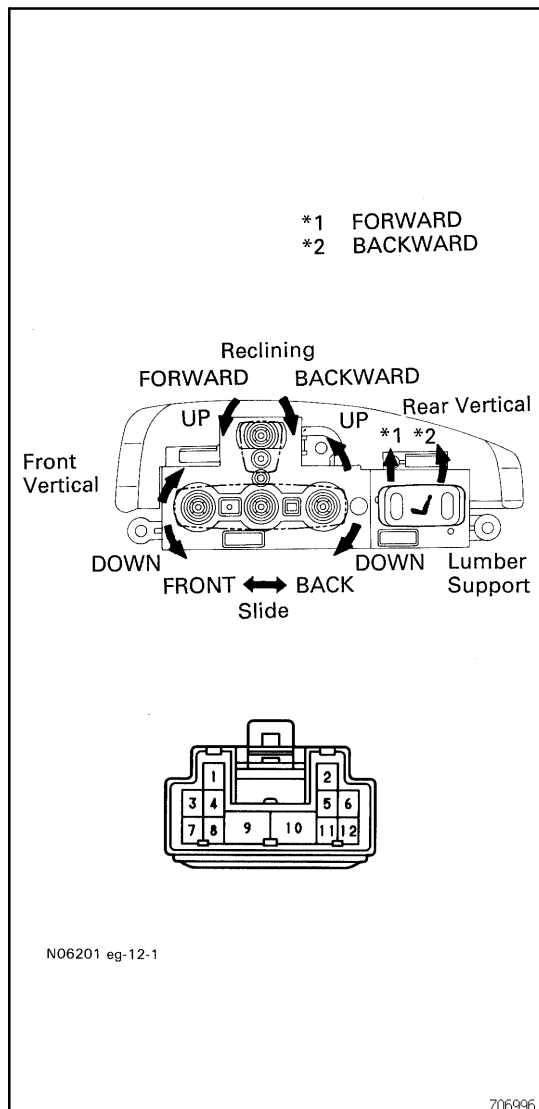
If circuit is not as specified, inspect the circuits connected to other parts.

7. INSPECT POWER MAIN RELAY CONTINUITY (See page [BE-46](#))

POWER SEAT CONTROL SYSTEM LOCATION

BE1MO-01





INSPECTION

1. INSPECT POWER SEAT SWITCH (DRIVER'S SIDE) CONTINUITY

Slide switch:

Switch position	Tester connection	Specified condition
FORWARD	5 – 10, 8 – 9	Continuity
OFF	5 – 8 – 9	Continuity
BACKWARD	5 – 9, 8 – 10	Continuity

Front vertical switch:

Switch position	Tester connection	Specified condition
UP	4 – 11, 10 – 12	Continuity
OFF	4 – 11 – 12	Continuity
DOWN	4 – 12, 10 – 11	Continuity

Rear vertical switch:

Switch position	Tester connection	Specified condition
UP	2 – 10, 6 – 7	Continuity
OFF	2 – 6 – 7	Continuity
DOWN	2 – 7, 6 – 10	Continuity

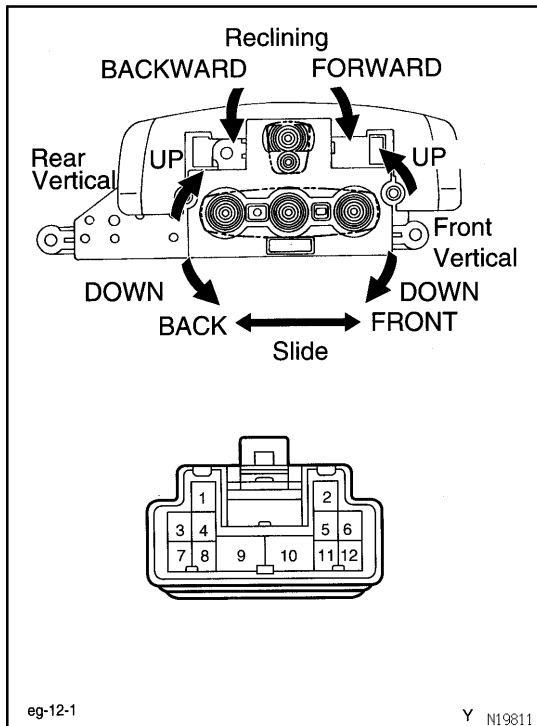
Reclining switch:

Switch position	Tester connection	Specified condition
FORWARD	4 – 10, 7 – 9	Continuity
OFF	4 – 7 – 9	Continuity
BACKWARD	4 – 9, 7 – 10	Continuity

Lumbar support switch:

Switch position	Tester connection	Specified condition
FORWARD	4 – 10, 7 – 9	Continuity
OFF	4 – 7 – 9	Continuity
BACKWARD	4 – 9, 7 – 10	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT POWER SEAT SWITCH (PASSENGER'S SIDE) CONTINUITY

Slide switch:

Switch position	Tester connection	Specified condition
FORWARD	5 - 10, 8 - 9	Continuity
OFF	5 - 8 - 9	Continuity
BACKWARD	5 - 9, 8 - 10	Continuity

Front vertical switch:

Switch position	Tester connection	Specified condition
UP	4 - 11, 10 - 12	Continuity
OFF	4 - 11 - 12	Continuity
DOWN	4 - 12, 10 - 11	Continuity

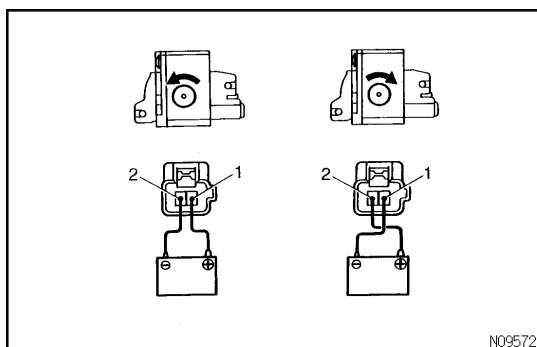
Rear vertical switch:

Switch position	Tester connection	Specified condition
UP	2 - 10, 6 - 7	Continuity
OFF	2 - 6 - 7	Continuity
DOWN	2 - 7, 6 - 10	Continuity

Reclining switch:

Switch position	Tester connection	Specified condition
FORWARD	4 - 10, 7 - 9	Continuity
OFF	4 - 7 - 9	Continuity
BACKWARD	4 - 9, 7 - 10	Continuity

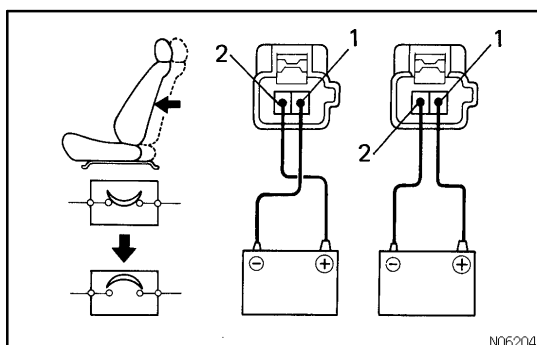
If continuity is not as specified, replace the switch.



3. INSPECT SLIDE MOTOR OPERATION

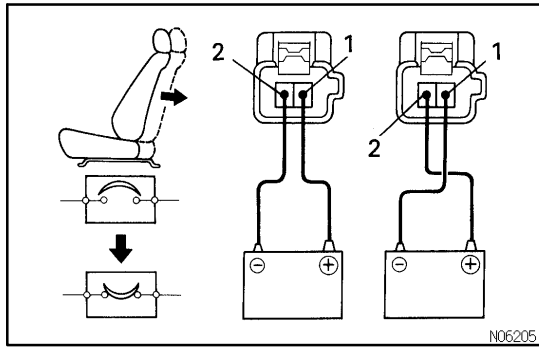
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns counterclockwise.
- Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.

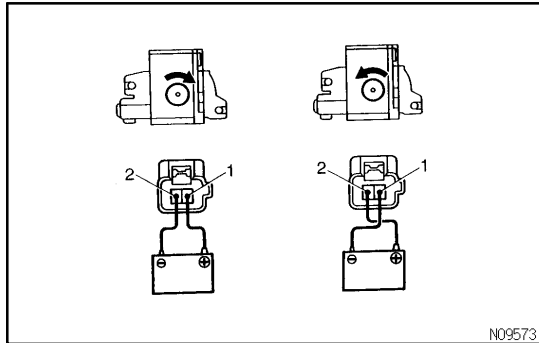


4. INSPECT SLIDE MOTOR CIRCUIT BREAKER OPERATION

- Connect the positive (+) lead and the negative (-) lead from the battery to slide motor connector (illustrated terminals), and slide the seat to front end position.
- Continue to apply voltage, check that there is a circuit breaker operation noise within 4 to 60 seconds.



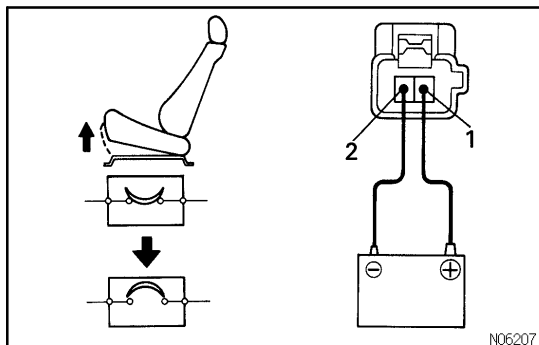
- (c) Reverse the polarity, and check that the seat begins to move backwards within approximately 60 seconds. If operation is not as specified, replace the motor.



5. INSPECT FRONT VERTICAL MOTOR OPERATION

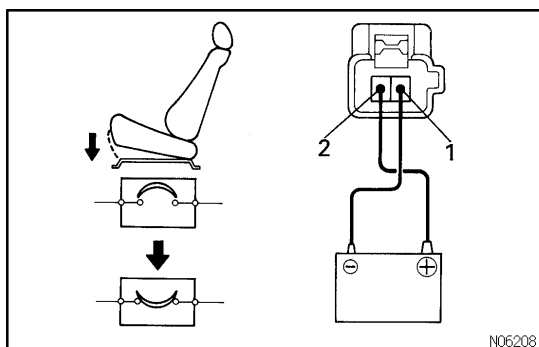
- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns clockwise.
- (b) Reverse the polarity, check that the motor turns counter-clockwise.

If operation is not as specified, replace the motor.

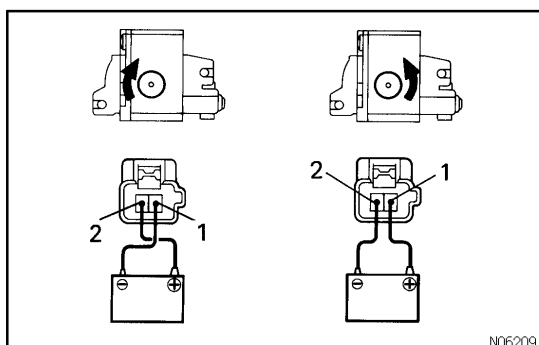


6. INSPECT FRONT VERTICAL MOTOR CIRCUIT BREAKER OPERATION

- (a) Connect the positive (+) lead and the negative (-) lead from the battery to the front vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position.
- (b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds.



- (c) Reverse the polarity, and check that the seat cushion begins to descend within approximately 60 seconds. If operation is not as specified, replace the motor.

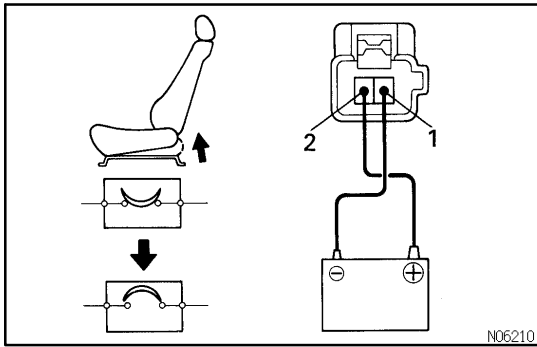


7. INSPECT REAR VERTICAL MOTOR OPERATION

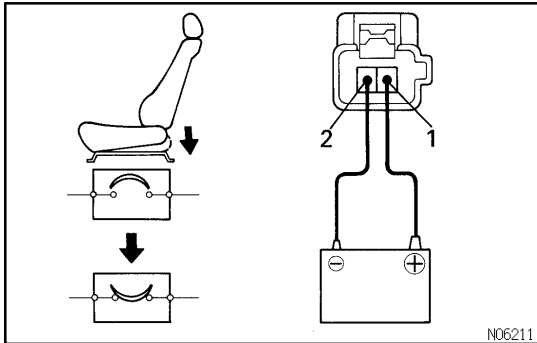
- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1, and check that the motor turns clockwise.
- (b) Reverse the polarity, and check that the motor turns counter-clockwise.

If operation is not as specified, replace the motor.

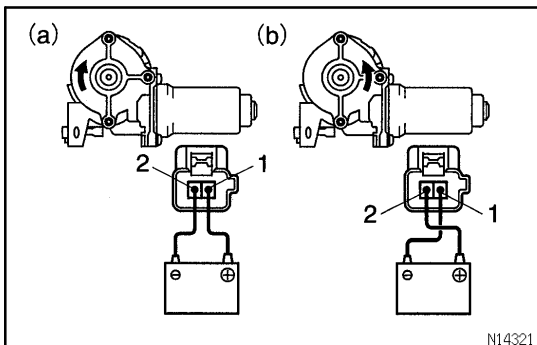
BODY ELECTRICAL - POWER SEAT CONTROL SYSTEM

**8. INSPECT REAR VERTICAL MOTOR CIRCUIT BREAKER OPERATION**

- (a) Connect the positive (+) lead and the negative (-) lead from the battery to the rear vertical motor connector (illustrated terminals), and move the front edge of seat cushion to the highest position.
- (b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds.

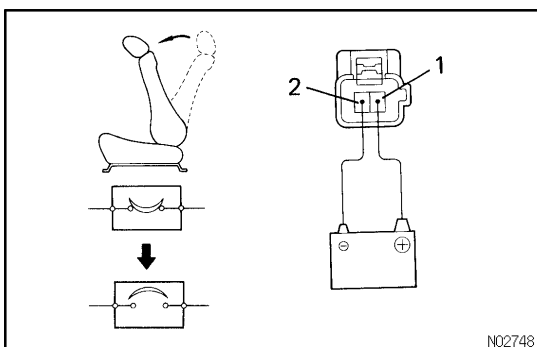


- (c) Reverse the polarity, check that the seat cushion begins to descend within approximately 60 seconds.
- If operation is not as specified, replace the motor.

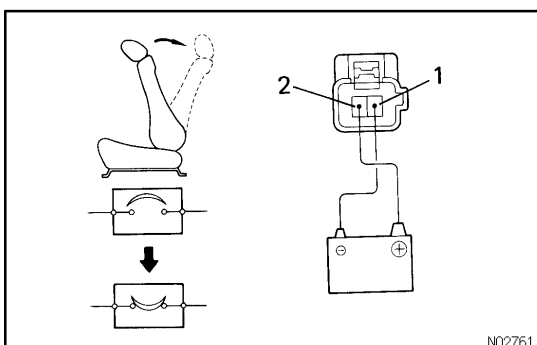
**9. INSPECT RECLINING MOTOR (DRIVER'S SIDE) OPERATION**

- (a) Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns clockwise.
- (b) Reverse the polarity, and check that the motor turns counterclockwise.

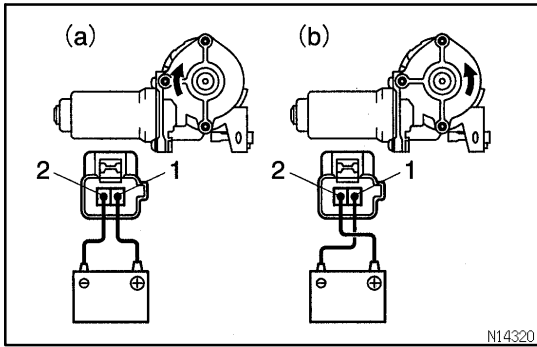
If operation is not as specified, replace the motor.

**10. INSPECT RECLINING MOTOR (DRIVER'S SIDE) CIRCUIT BREAKER OPERATION**

- (a) Connect the positive (+) lead from terminal 1 and negative (-) lead to terminal 2. Check that the seat back reclines to the most forward position.



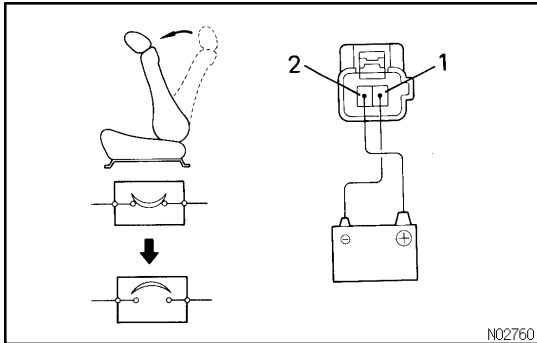
- (b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 40 seconds.
 - (c) Reverse the polarity, and check that the seat back starts to fall backwards within approximately 60 seconds.
- If operation is not as specified, replace the motor.



11. INSPECT RECLINING MOTOR (PASSENGER'S SIDE) OPERATION

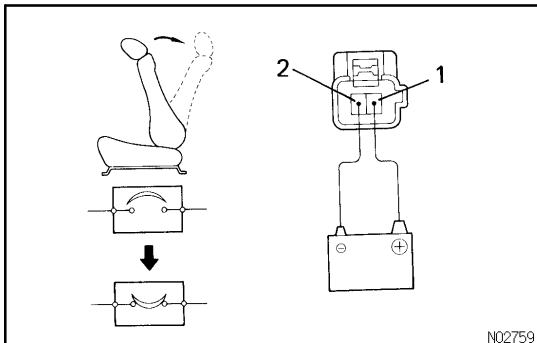
- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the motor turns counterclockwise.
- Reverse the polarity, and check that the motor turns clockwise.

If operation is not as specified, replace the motor.



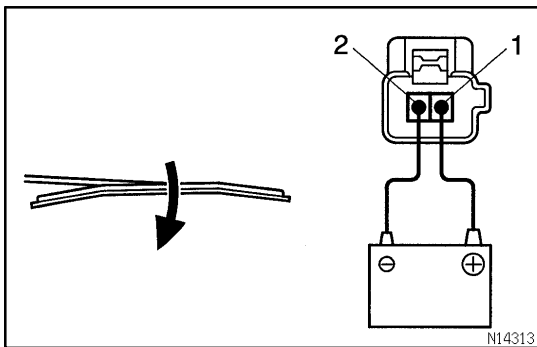
12. INSPECT RECLINING MOTOR (PASSENGER'S SIDE) CIRCUIT BREAKER OPERATION

- Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1 on the seat wire harness side connector, and recline the seat back to the most forward position.
- Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 40 seconds.



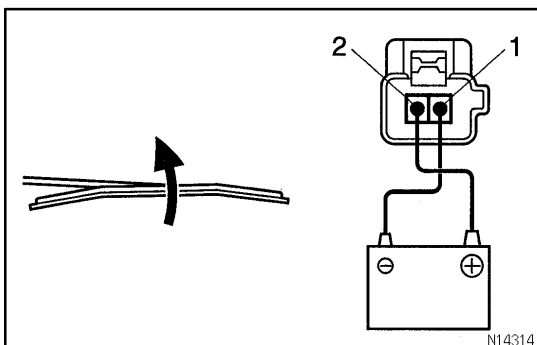
- Reverse the polarity, and check that the seat back starts to fall backwards within approximately 60 seconds.

If operation is not as specified, replace the motor.



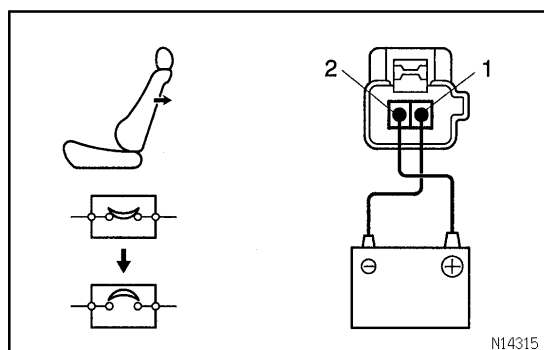
13. INSPECT LUMBAR SUPPORT MOTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 2, and check that the lumbar support moves release side.



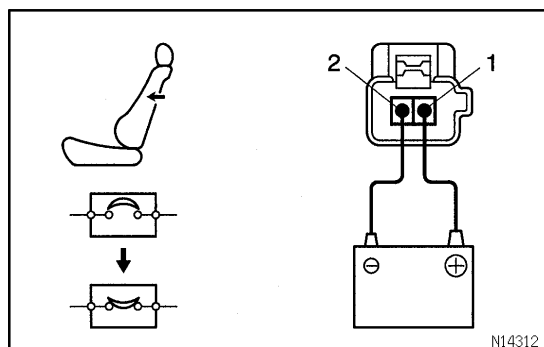
- Reverse the polarity, and check that the lumbar support moves forward.

If operation is not as specified, replace the motor.



14. INSPECT LUMBAR SUPPORT MOTOR CIRCUIT BREAKER OPERATION

- (a) Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 1 on the lumbar support motor connector and move the lumbar support to front end position.
- (b) Continue to apply voltage, and check that there is a circuit breaker operation noise within 4 to 60 seconds.



- (c) Reverse the polarity, and check that the lumbar support begins to move release side within approximately 60 seconds.

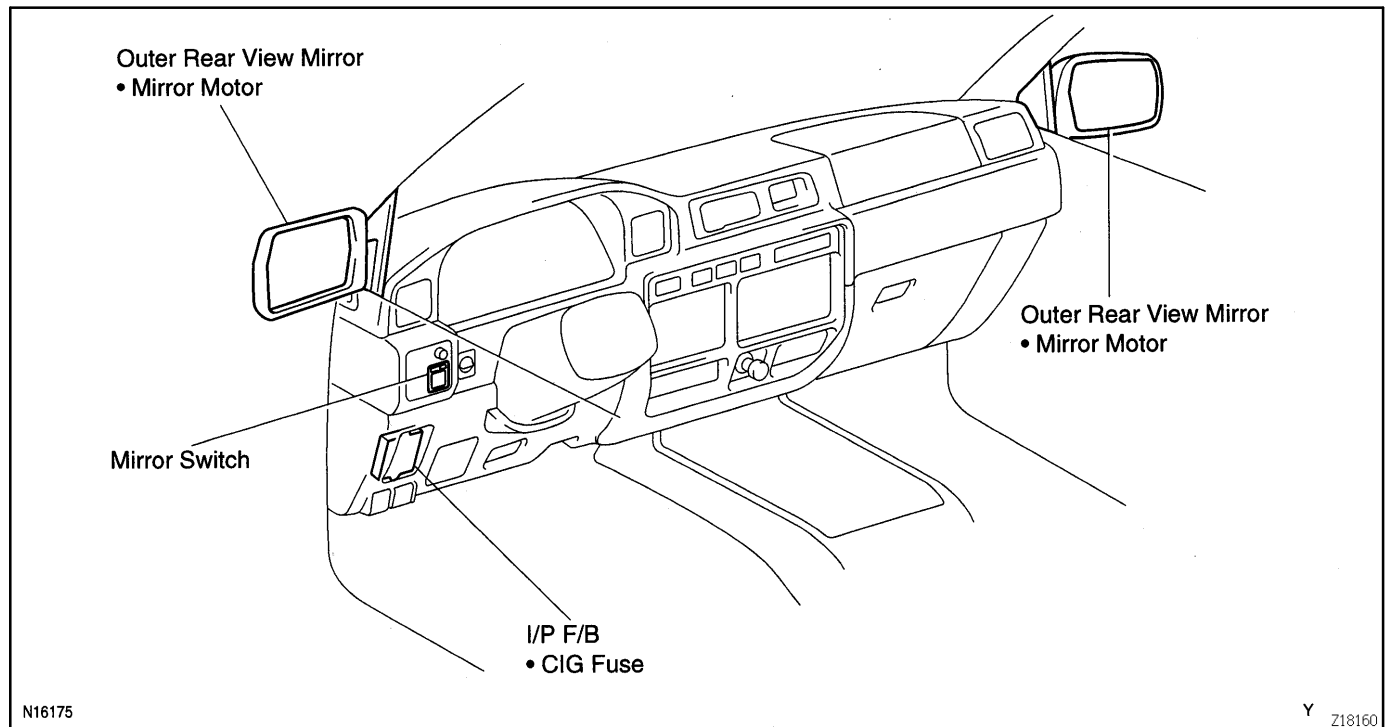
If operation is not as specified, replace the motor.

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BODY ELECTRICAL - POWER MIRROR CONTROL SYSTEM

POWER MIRROR CONTROL SYSTEM LOCATION

BE1MM-01

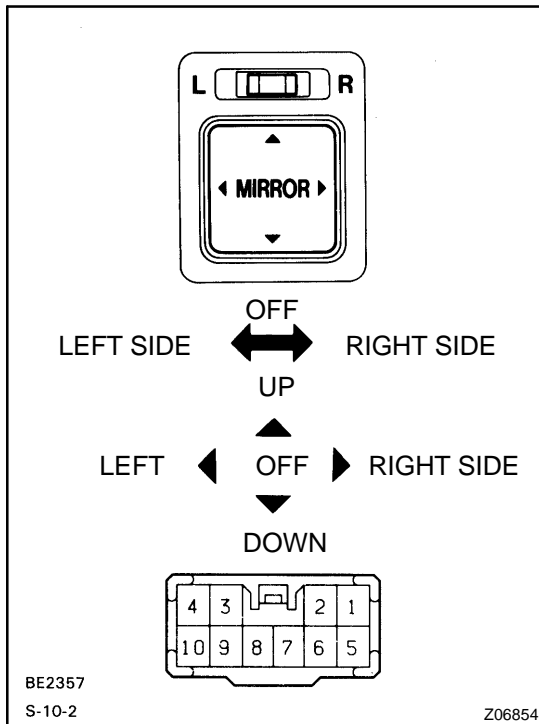


1996 LAND CRUISER (RM451U)

Author :

Date :

1206



INSPECTION

1. Left side: INSPECT MIRROR SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	–	No continuity
UP	1 – 10, 3 – 4	Continuity
DOWN	1 – 3, 4 – 10	Continuity
LEFT	1 – 9, 3 – 4	Continuity
RIGHT	1 – 3, 4 – 9	Continuity

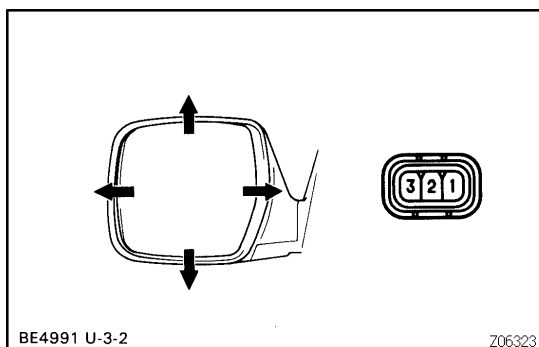
2. Off: INSPECT MIRROR SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	–	No continuity
UP	3 – 4	Continuity
DOWN	1 – 3	Continuity
LEFT	3 – 4	Continuity
RIGHT	1 – 3	Continuity

3. Right side: INSPECT MIRROR SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF	–	No continuity
UP	1 – 6, 3 – 4	Continuity
DOWN	1 – 3, 4 – 6	Continuity
LEFT	1 – 2, 3 – 4	Continuity
RIGHT	1 – 3, 2 – 4	Continuity

If continuity is not as specified, replace the switch.



4. INSPECT MIRROR MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal in column "A" and the negative (–) lead to terminal in column "B", check that the mirror operates in column "C".

Switch position	Tester connection	Specified condition
A (+)	B (–)	C (Operation)
2	3	Mirror turns upward
3	2	Mirror turns downward
1	3	Mirror turns to left side
3	1	Mirror turns to right side

If operation is not as specified, replace the mirror assembly.

AUDIO SYSTEM DESCRIPTION

BE0SA-01

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

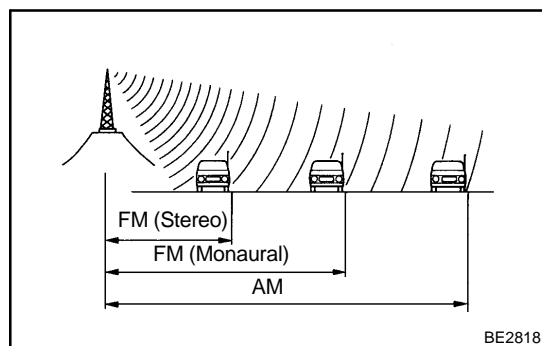
Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM		FM	
Modulation	Amplitude modulation			Frequency modulation	

LF: Low Frequency

MF: Medium Frequency

HF: High Frequency

VHF: Very High Frequency

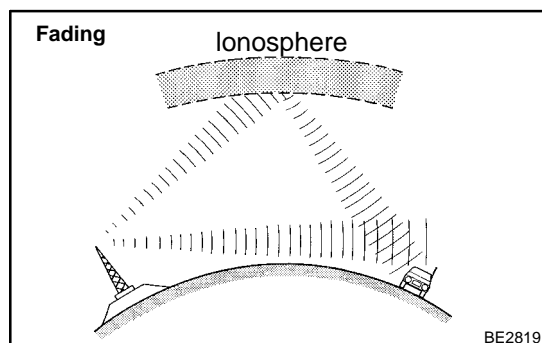


2. SERVICE AREA

There are great differences in the size of the service area for AM and FM monaural. Sometimes FM stereo broadcasts cannot be received even though AM can be received 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.

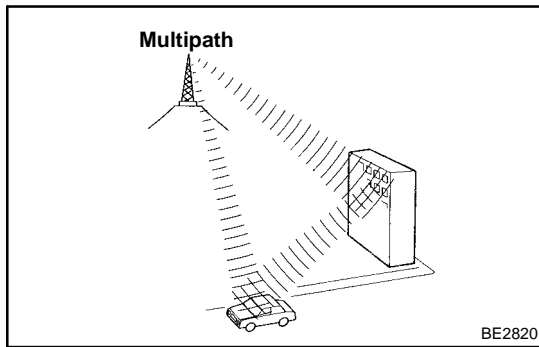
3. RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called "fading", "multipath" and "fade out". These problems are caused not by electrical noise but by the nature of the radio waves themselves.

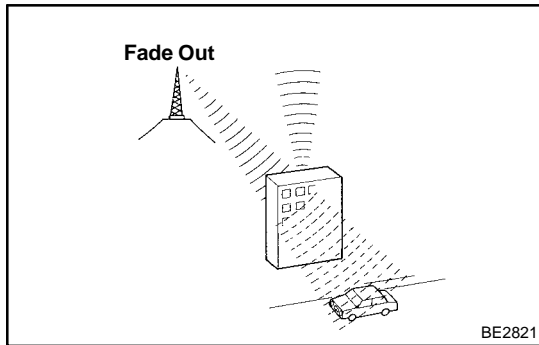


(1) Fading

Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially 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 transmitter that reach the vehicle's antenna directly. This type of interference is called "fading".



- (2) **Multipath**
One type of interference caused by the bounce of radio waves off of obstructions is called "multipath". Multipath occurs when a signal from the broadcast transmitter antenna bounces off buildings and mountains and interferes with the signal that is received directly.



- (3) **Fade Out**
Because FM radio waves are of higher frequencies than AM radio waves, they bounce off buildings, mountains, 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

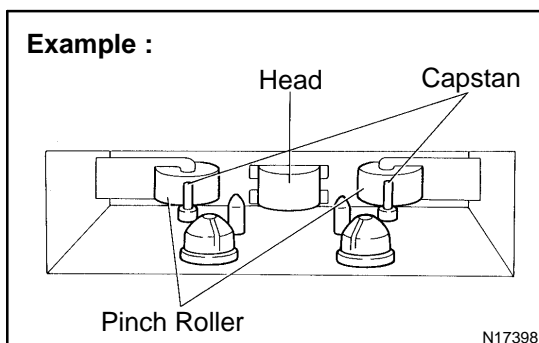
Compact Disc (hereafter called "CD") Players use a laser beam pick-up to read the digital signals recorded on the CD and reproduce analog signals of the music, etc. There are 4.7 in. (12 cm) and 3.2 in. (8 cm) discs in the CD player.

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.

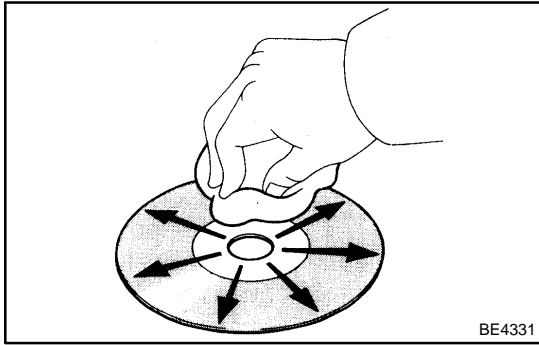
NOTICE:

CD players use an invisible laser beam which could cause hazardous radiation exposure. Be sure to operate the player correctly as instructed.



5. Tape Player/Head Cleaning: MAINTENANCE

- Raise the cassette door with your finger. Next, using a pencil or similar object, push in the guide.
- Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.



6. CD Player/Disc Cleaning: MAINTENANCE

If the disc gets dirty, clean the disc by wiping the surface from the center to outside in the radial directions with a soft cloth.

NOTICE:

Do not use a conventional record cleaner or anti-static preservative.

TROUBLESHOOTING

NOTICE:

When replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothes comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).

HINT:

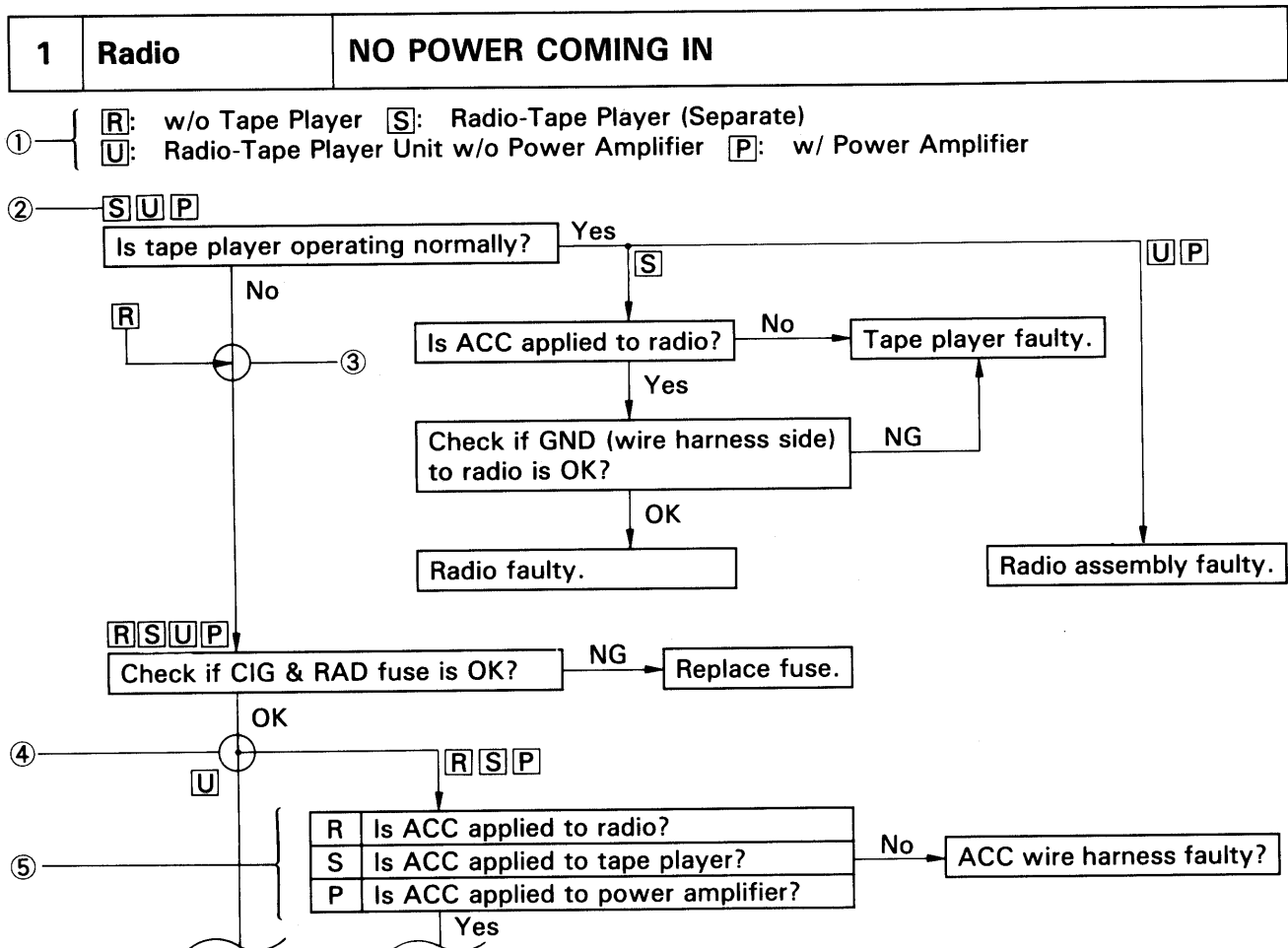
This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and is based on the assumption that the cause of trouble lies with the system components (except for the wires and connectors, etc.).

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	No power coming in.	1
	Power coming in, but radio not operating.	2
	Noise present, but AM – FM not operating.	3
	Either speaker does not work.	4
	Either AM or FM does not work.	5
	Reception poor (Volume faint).	5
	Few preset tuning bands.	5
	Sound quality poor.	6
	Cannot set station select button.	7
	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
	Either speaker does not work.	11
	Sound quality poor (Volume faint).	12
	Tape jammed, malfunction with tape speed or auto – reverse.	13
	APS, SKIP, RPT buttons not operating.	14
	Cassette tape will not eject.	15
CD Player	CD cannot be inserted.	16
	CD inserts, but no power.	17
	Power coming in, but CD player not operating.	18
	Sound jumps.	19
	Sound quality poor (Volume faint).	20
	Either speaker does not work.	21
Antenna	CD will not eject.	22
	Antenna does not fully extend or fully retract.	23
	Antenna – related.	24
Noise	Noise produced by vibration or shock while driving.	25
	Noise produced when engine starts.	26

HOW TO USE DIAGNOSTIC CHART



① Audio system type and symbol used.

HINT: Confirm the applicable type of audio system.

② Symbol for type of audio system the question applies to.

HINT: If the audio system type is not applicable, proceed to next question below.

③ Junction without black circle.

HINT: Proceed to next question below.

④ Junction with black circle.

HINT: Proceed to question for applicable audio system type.

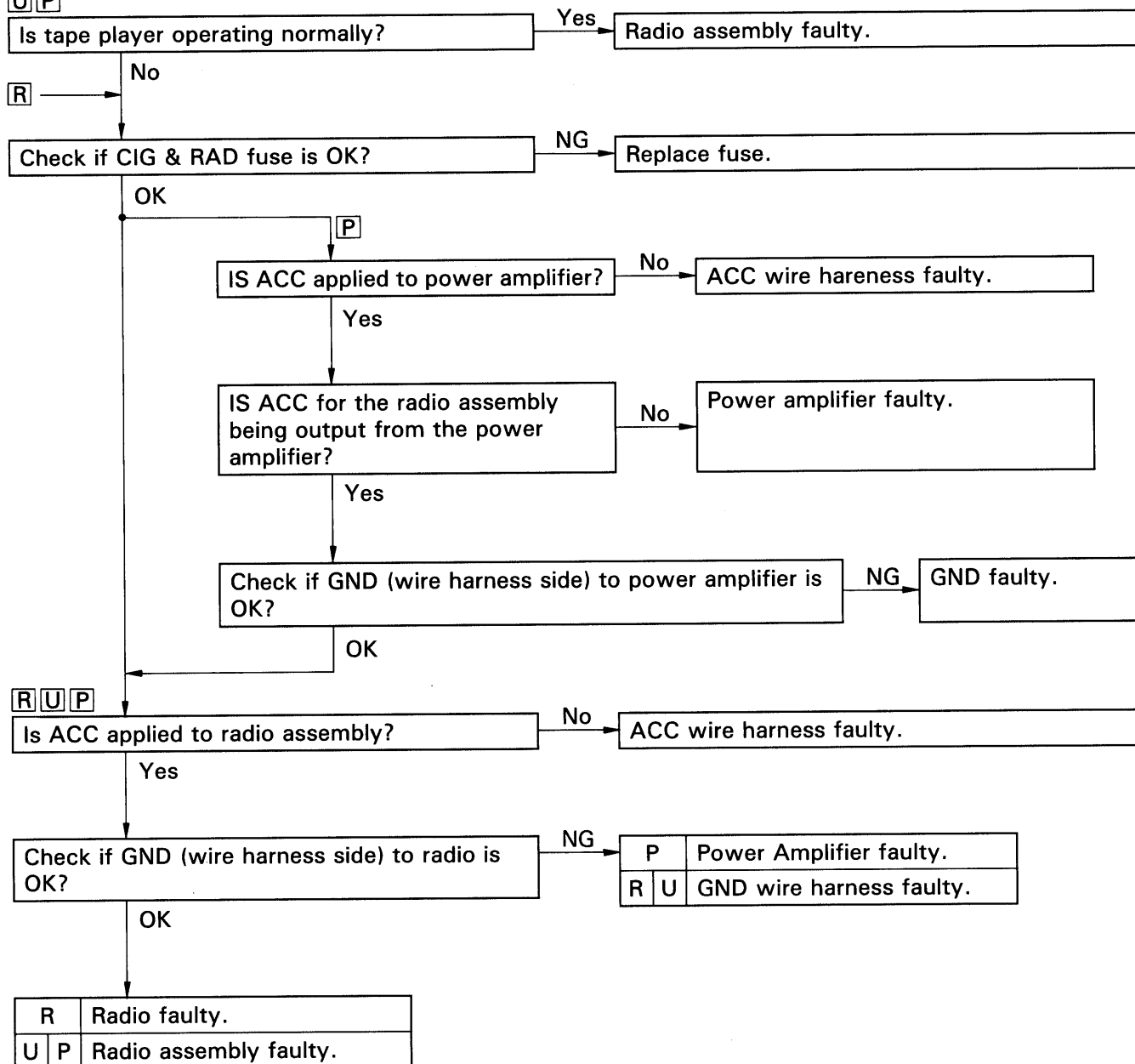
⑤ HINT: Select question for applicable audio system type.

1	Radio	NO POWER COMING IN
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R : Radio, 5 Speaker **U** : Radio – Tape Player, 5 Speaker

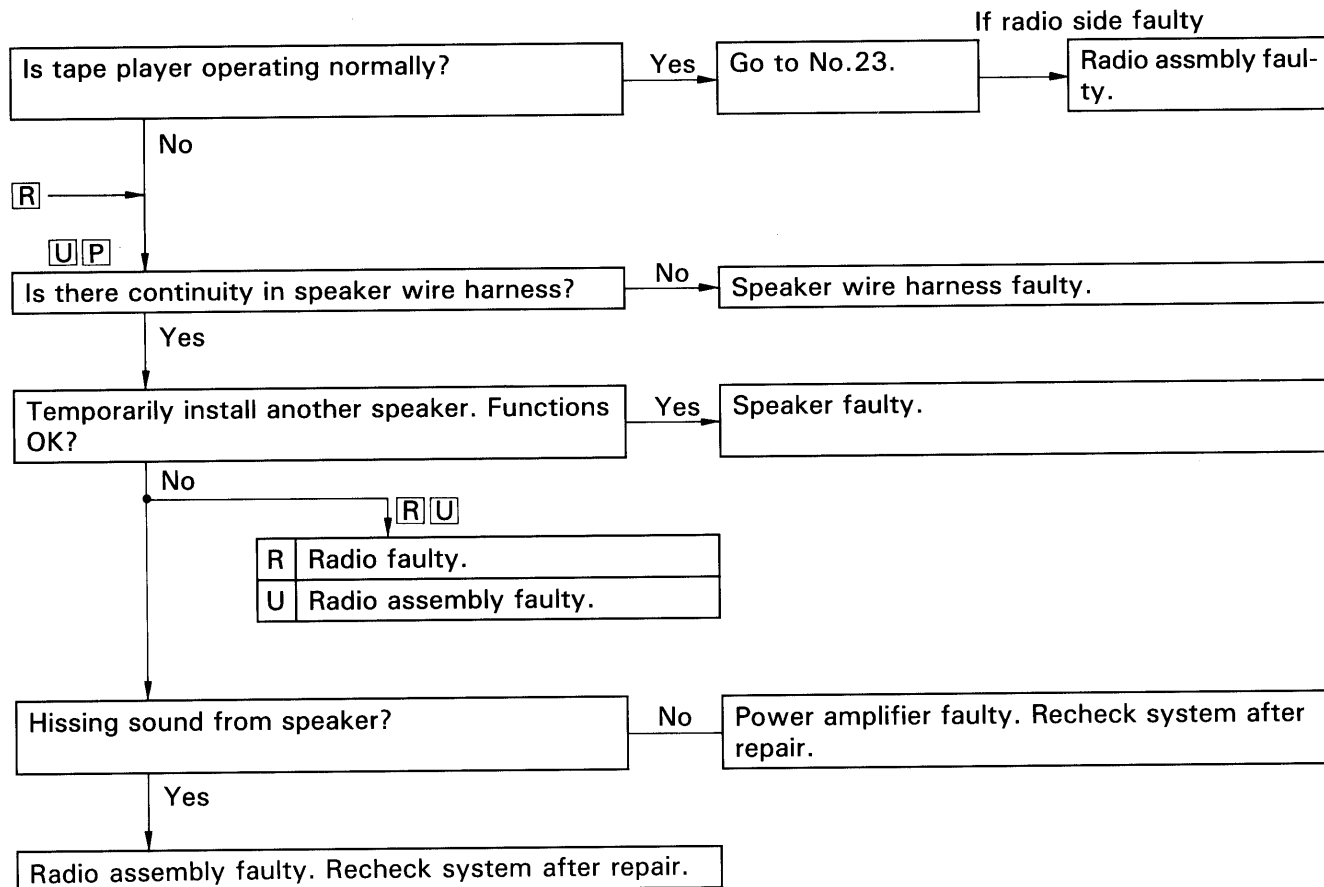
P : Radio – Tape Player, 9 Speaker

U P



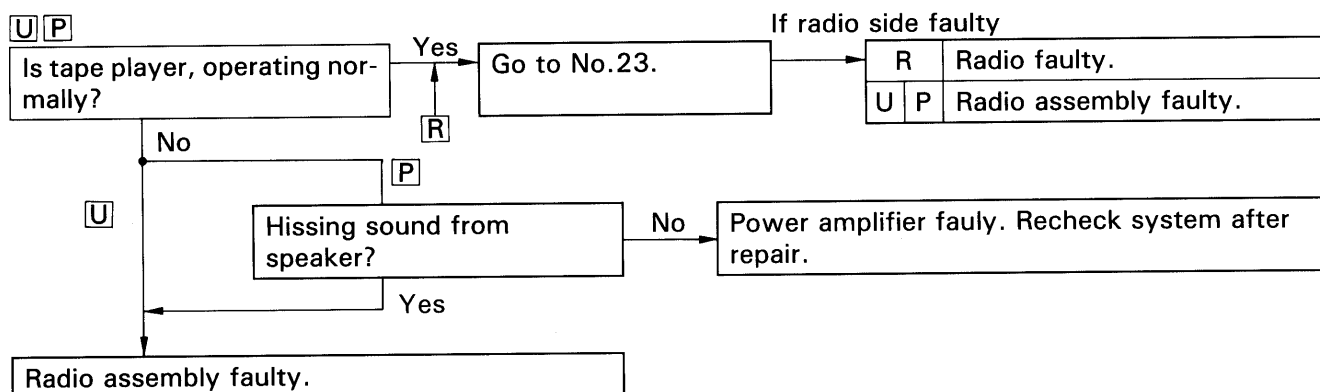
2	Radio	POWER COMING IN, BUT RADIO NOT OPERATING
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R : Radio, 5 Speaker **U** : Radio – Tape Player, 5 Speaker
P : Radio – Tape Player, 9 Speaker



3	Radio	NOISE PRESENT, BUT AM-FM NOT OPERATING
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R : Radio, 5 Speaker **U** : Radio – Tape Player, 5 Speaker
P : Radio – Tape Player, 9 Speaker

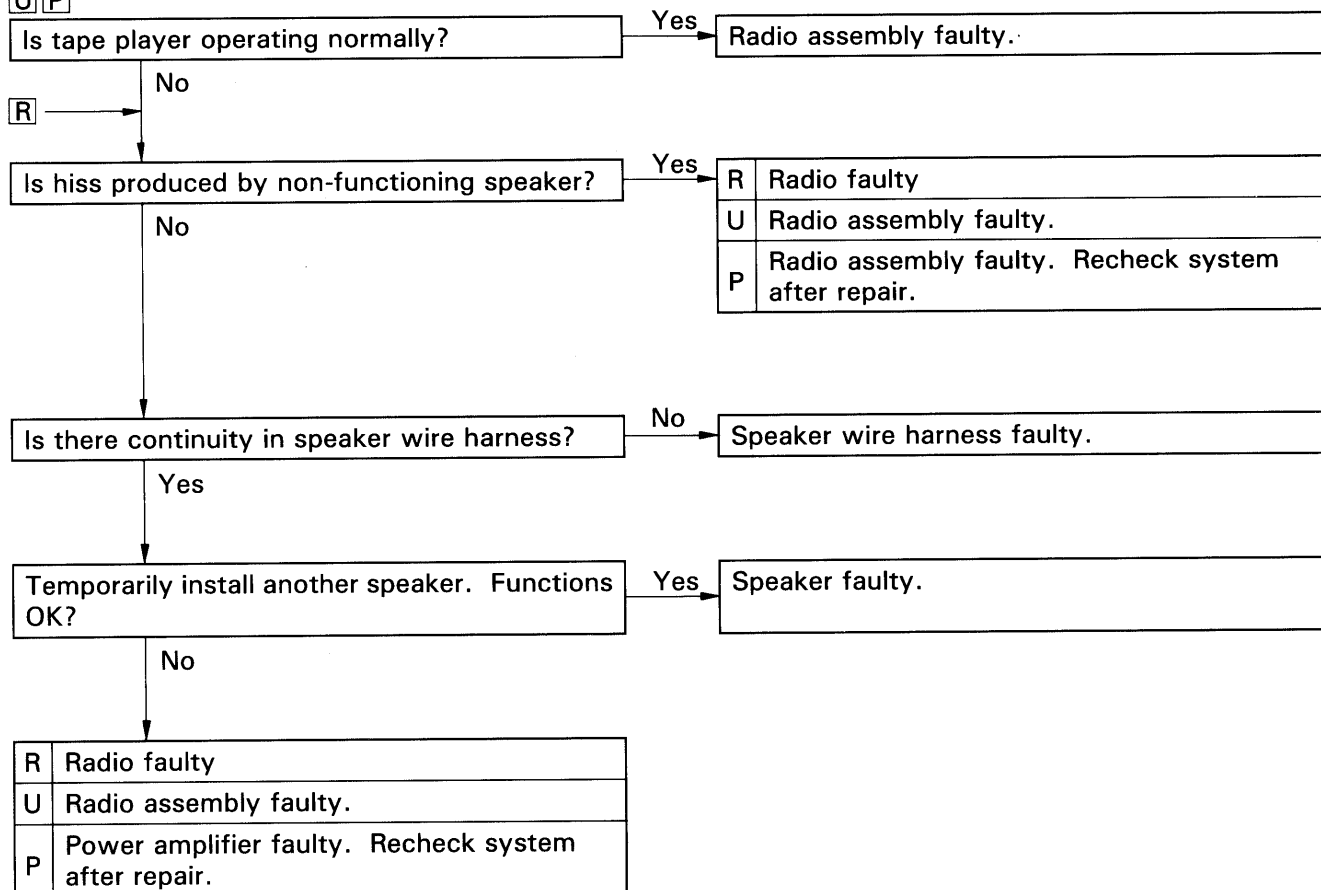


4	Radio	EITHER SPEAKER DOES NOT WORK
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R : Radio, 5 Speaker **U** : Radio – Tape Player, 5 Speaker

P : Radio – Tape Player, 9 Speaker

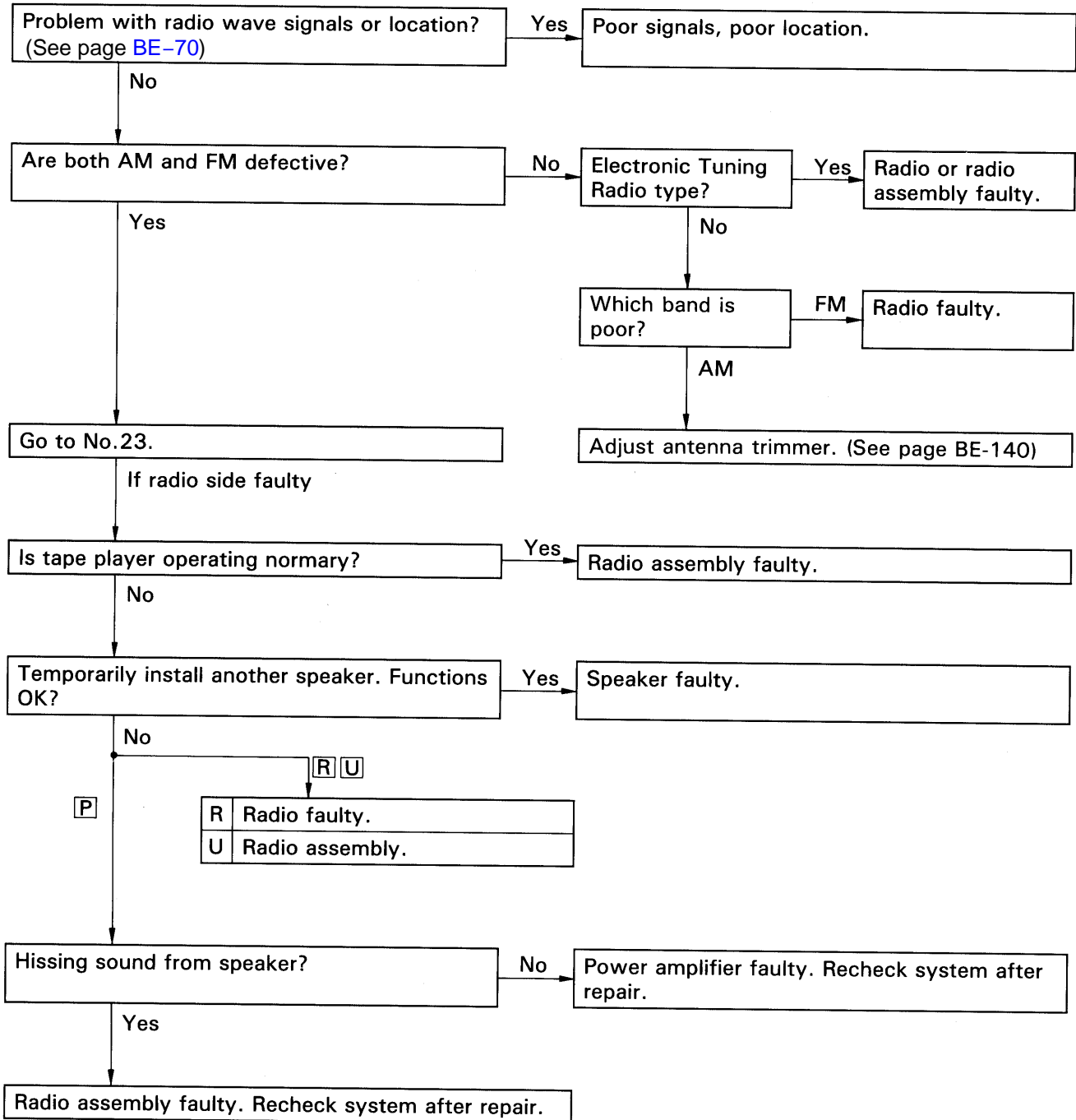
U P



BE-78

BODY ELECTRICAL - AUDIO SYSTEM

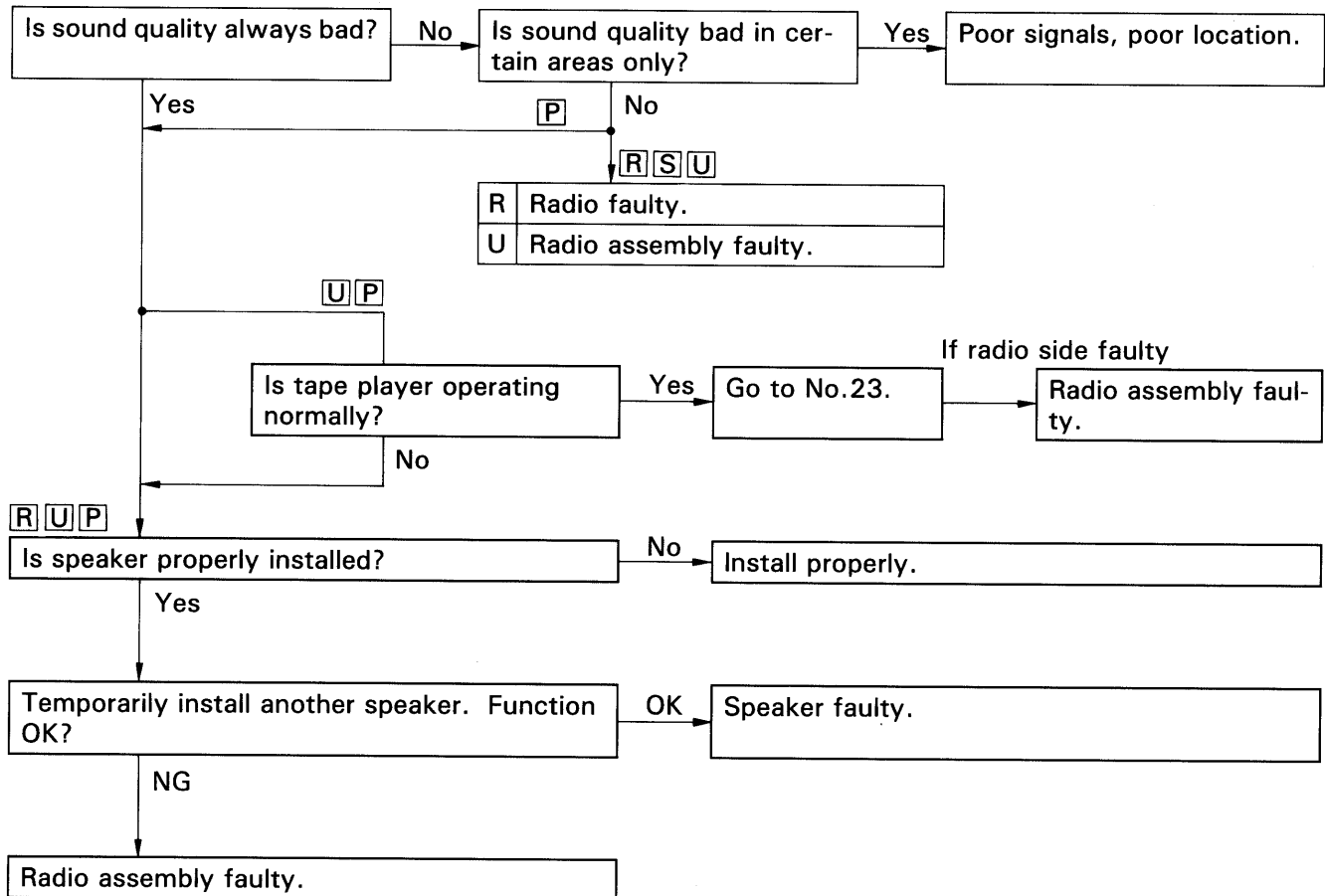
5	Radio	EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS
----------	--------------	--

R : Radio, 5 Speaker**U** : Radio-Tape Player, 5 Speaker**P** : Radio-Tape Player, 9 Speaker

V04332

6	Radio	SOUND QUALITY POOR
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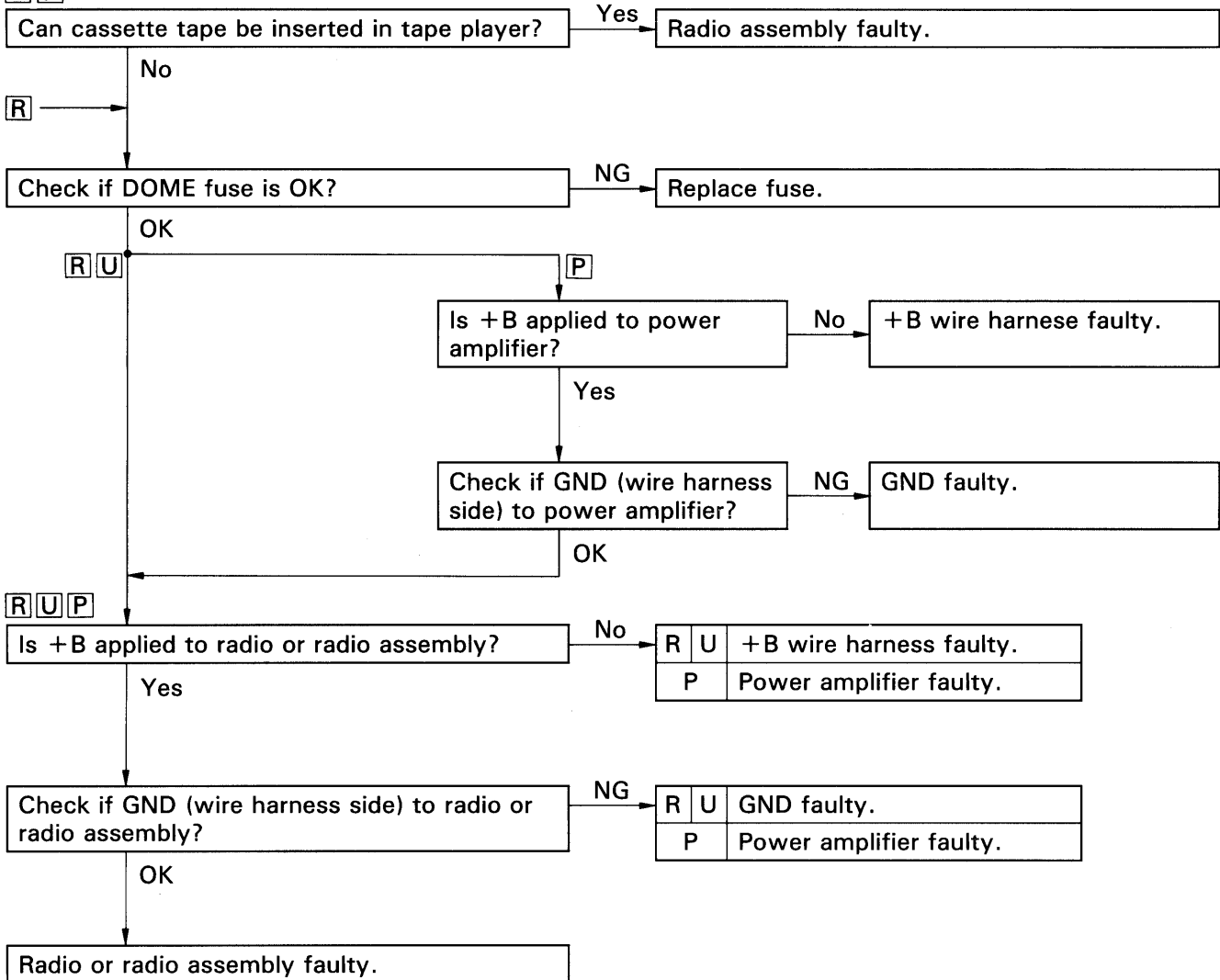
R : Radio, 5 Speaker **U** : Radio – Tape Player, 5 Speaker
P : Radio – Tape Player, 9 Speaker



7	Radio	CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS
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R : Radio, 5 Speaker **U** : Radio-Tape Player, 5 Speaker
P : Radio-Tape Player, 9 Speaker

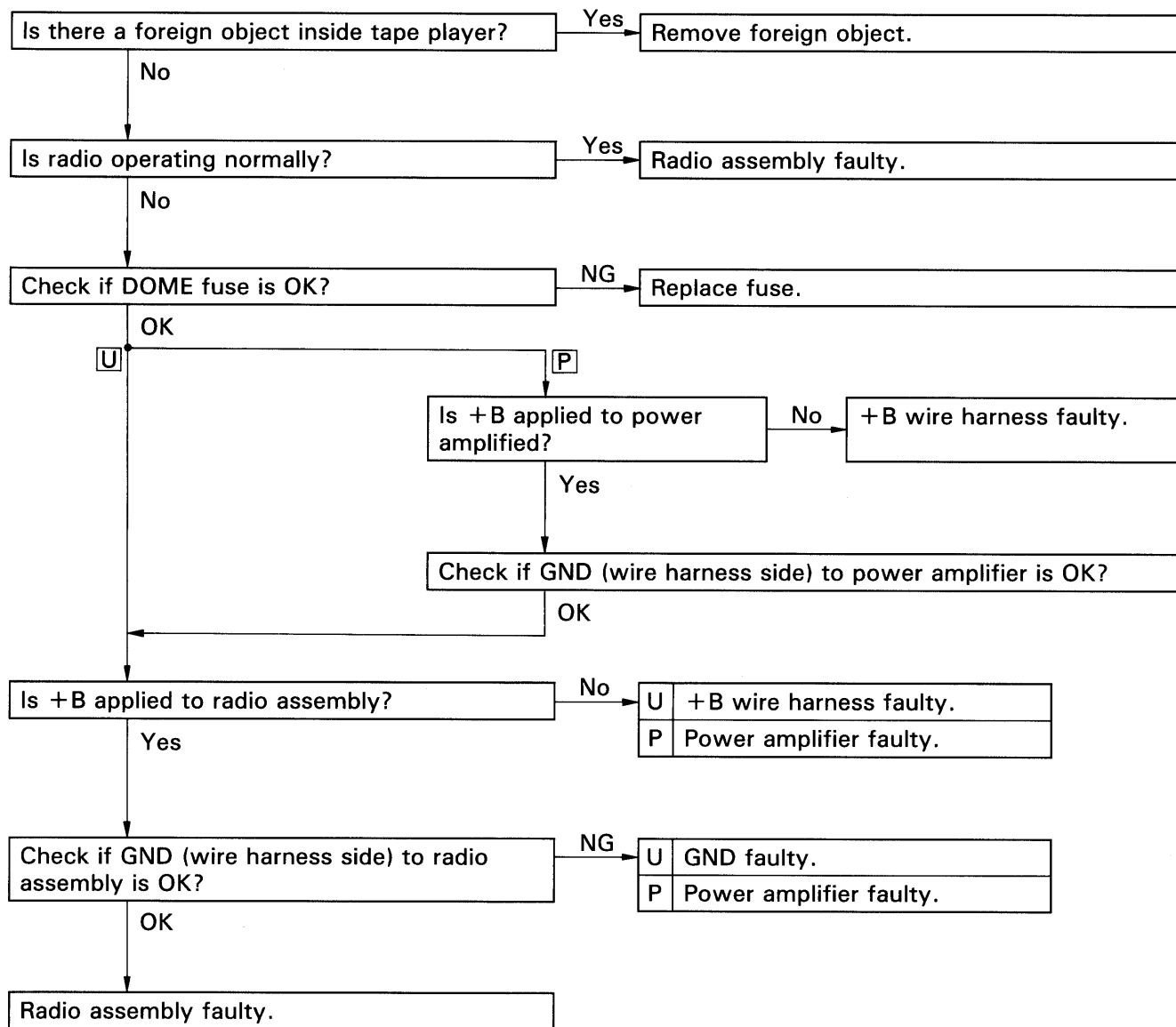
U P



8	Tape Player	CASSETTE TAPE CANNOT BE INSERTED
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U : Radio – Tape Player, 5 Speaker

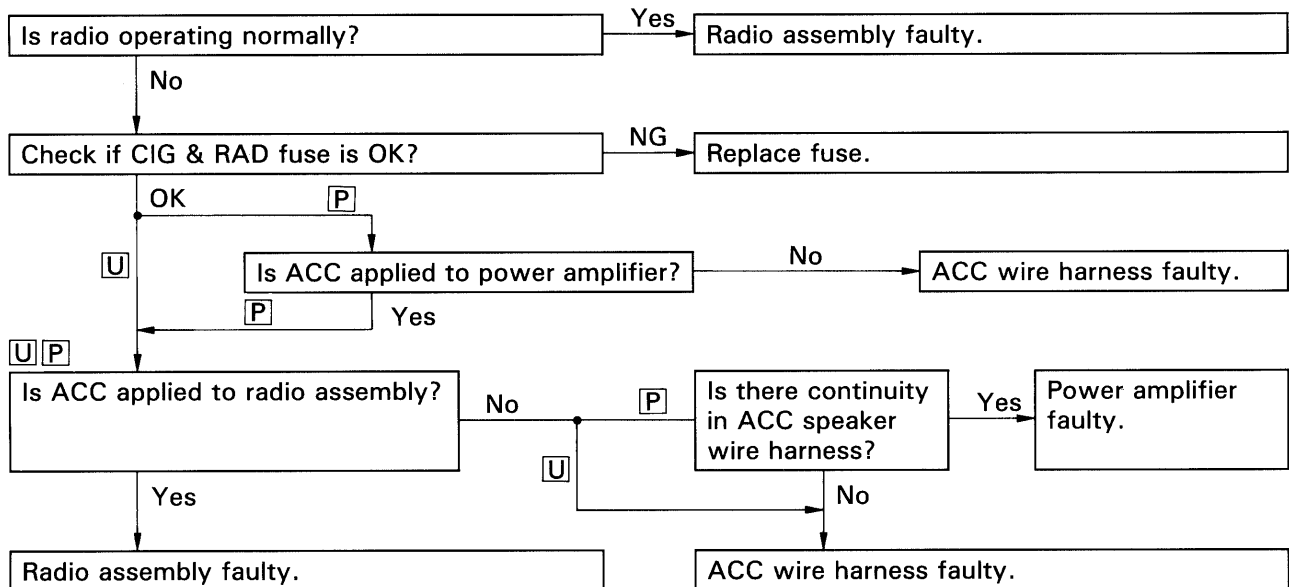
P : Radio – Tape Player, 9 Speaker



9 Tape Player CASSETTE TAPE INSERTS, BUT NO POWER

U : Radio – Tape Player, 5 Speaker

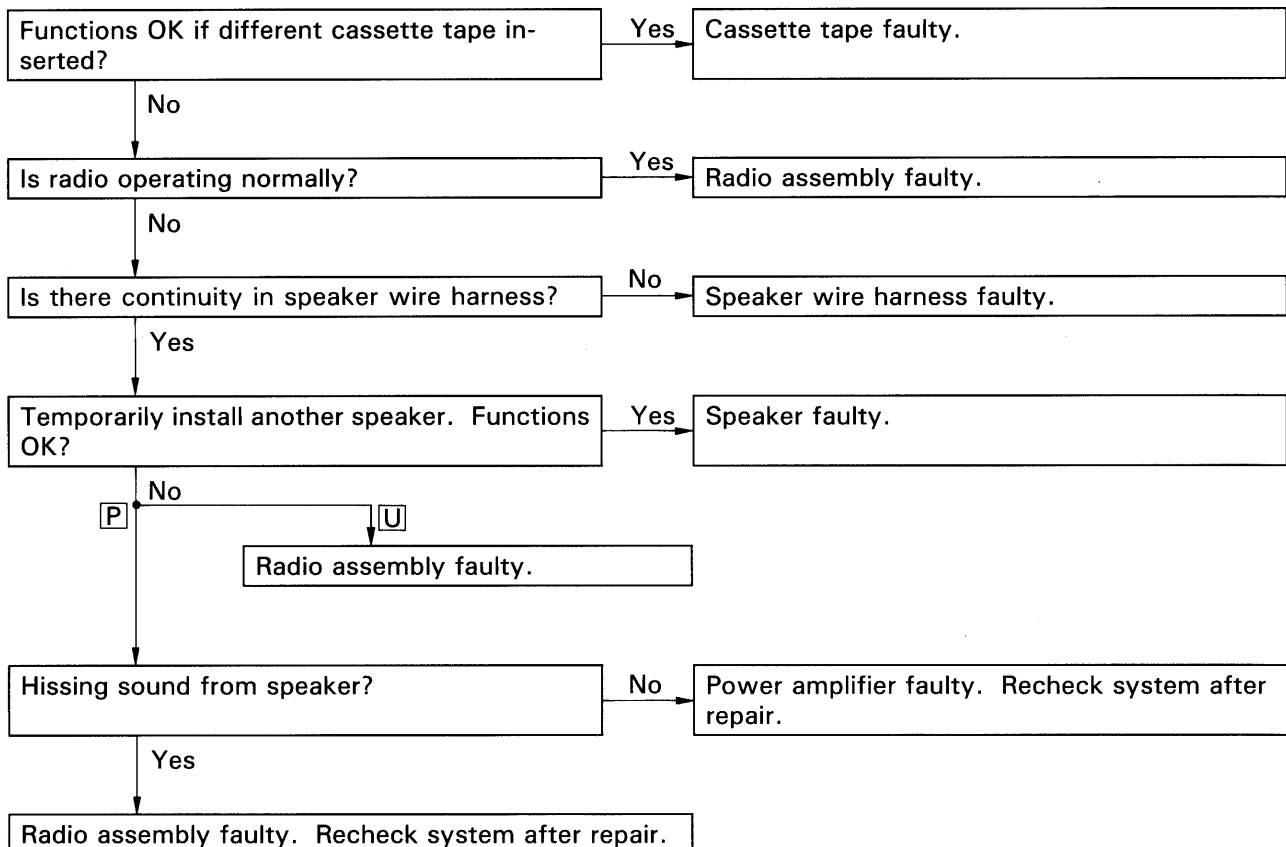
P : Radio – Tape Player, 9 Speaker



10 Tape Player POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

U : Radio – Tape Player, 5 Speaker

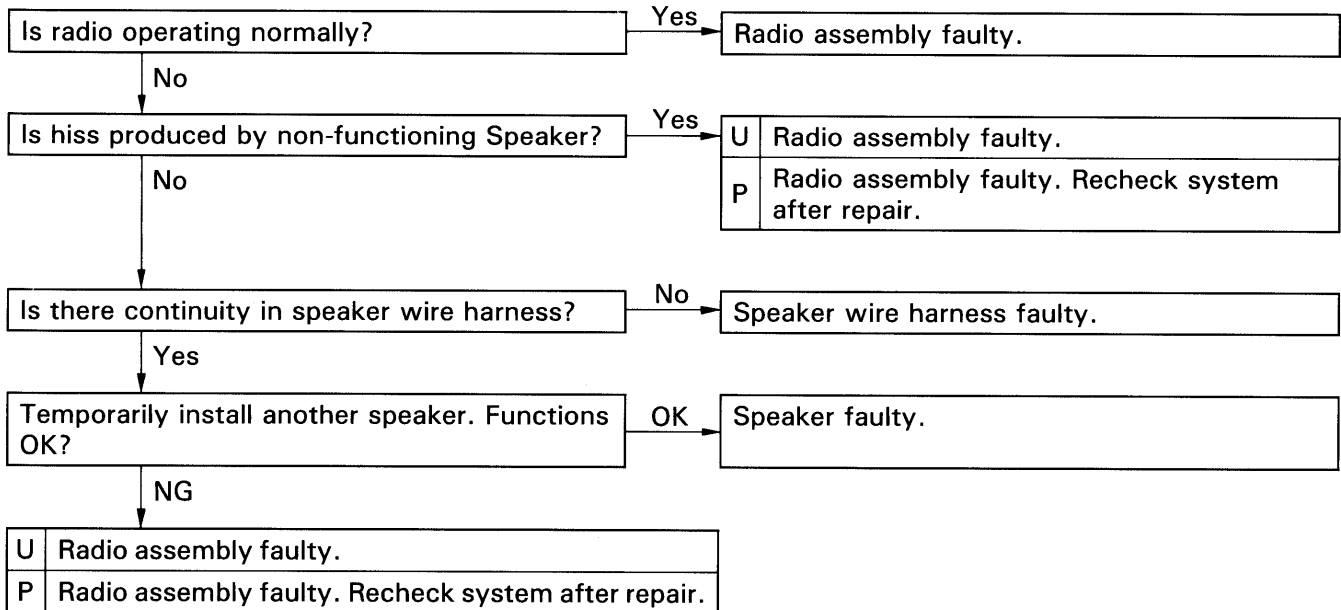
P : Radio – Tape Player, 9 Speaker



11	Tape Player	EITHER SPEAKER DOES NOT WORK
-----------	--------------------	-------------------------------------

U : Radio – Tape Player, 5 Speaker

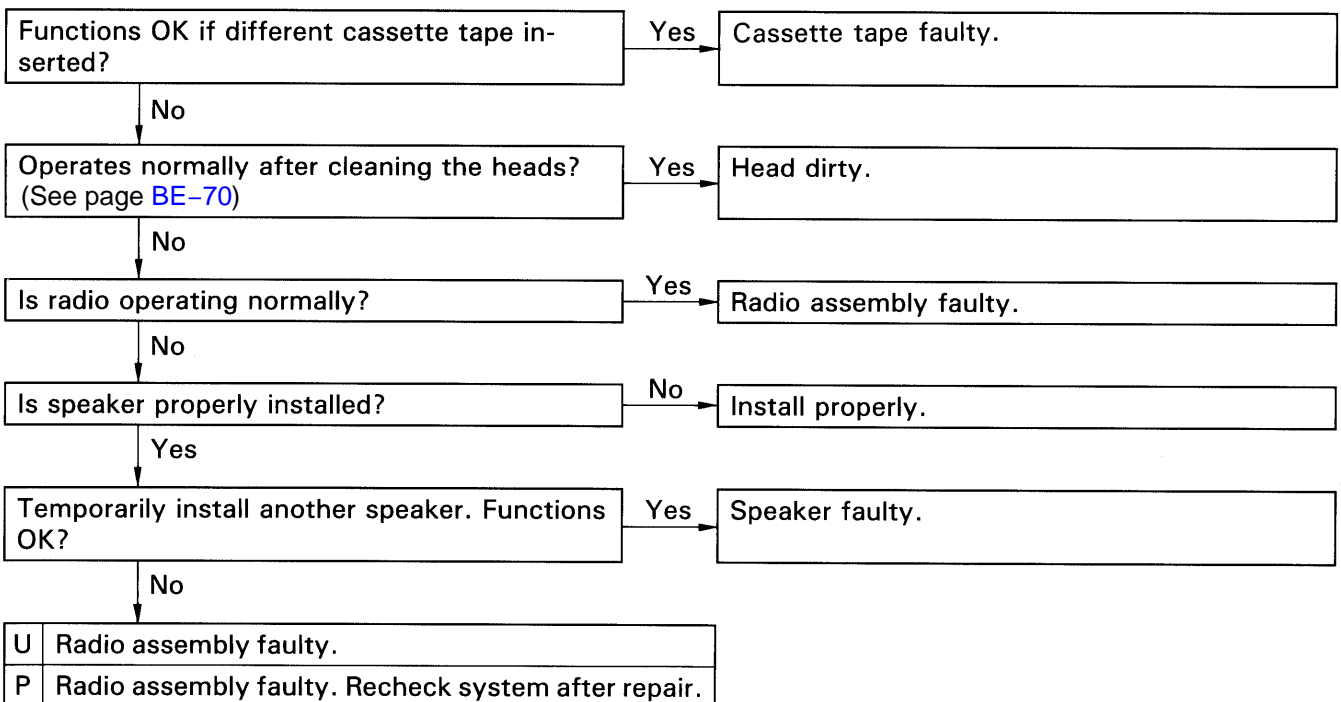
P : Radio – Tape Player, 9 Speaker



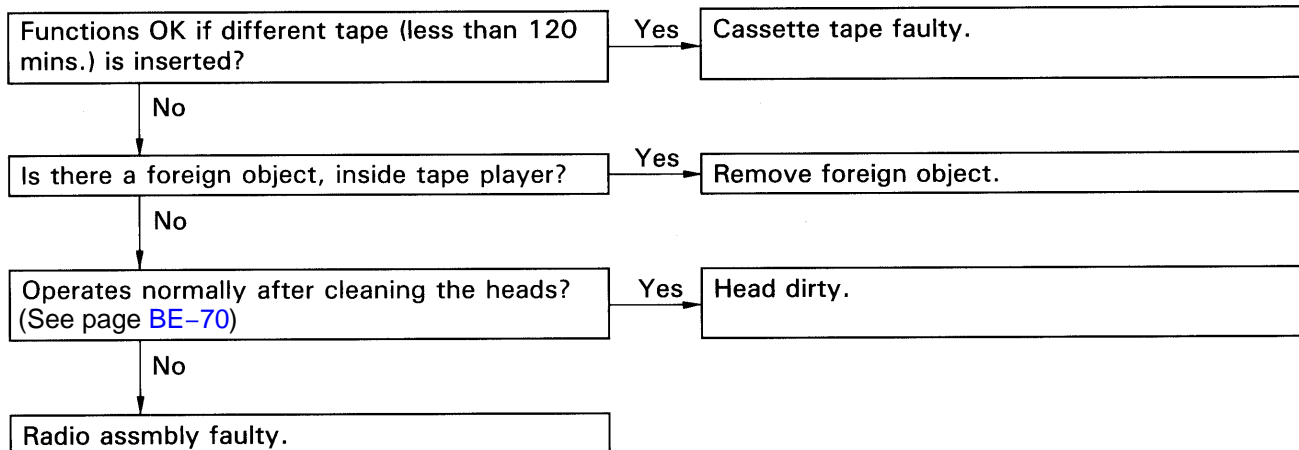
12	Tape Player	SOUND QUALITY POOR (VOLUME FAINT)
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U : Radio – Tape Player, 5 Speaker

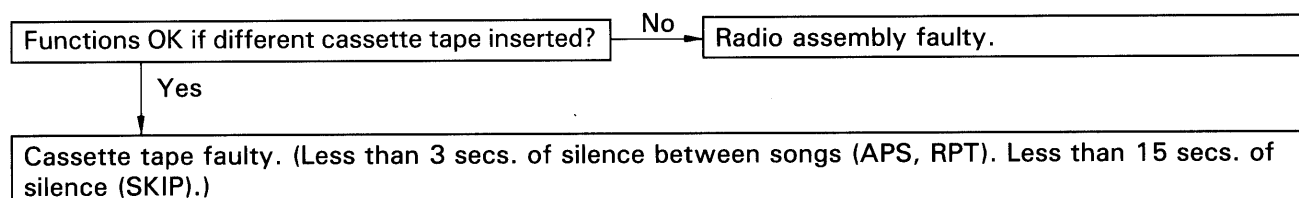
P : Radio – Tape Player, 9 Speaker



13	Tape Player	TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO-REVERSE
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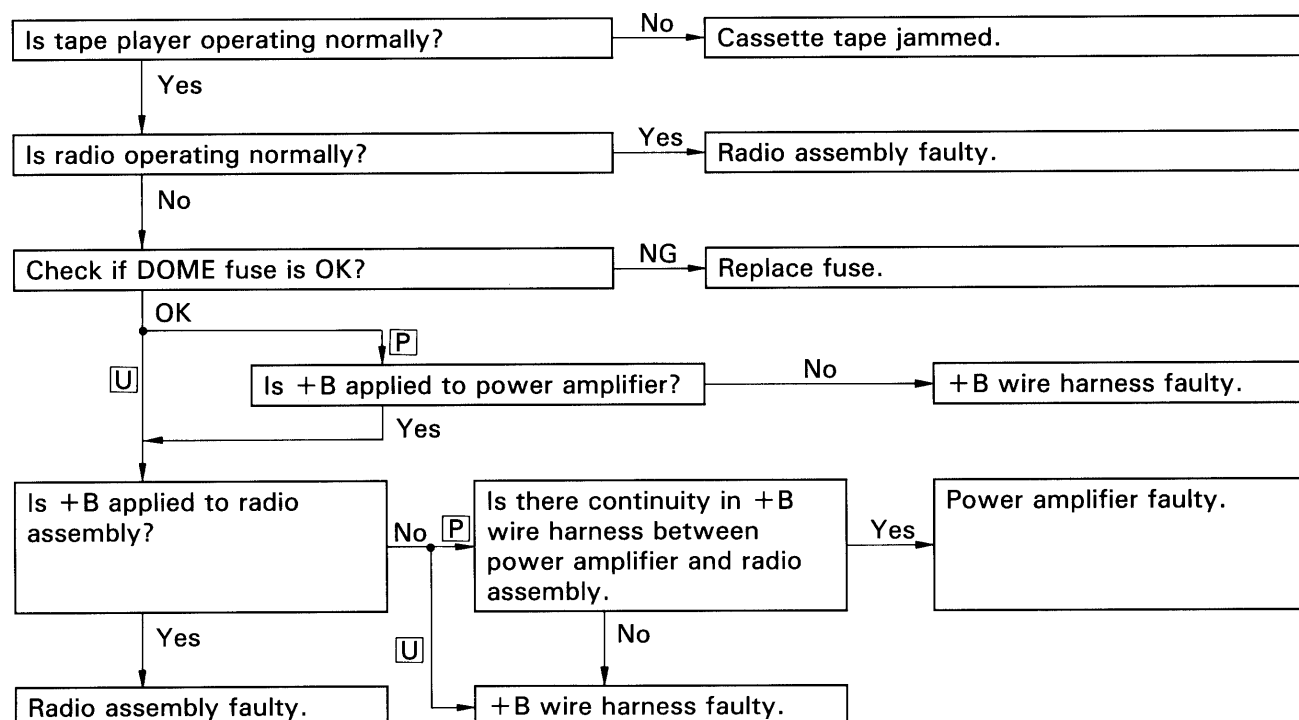


14	Tape Player	APS, SKIP, RPT BUTTONS NOT OPERATING
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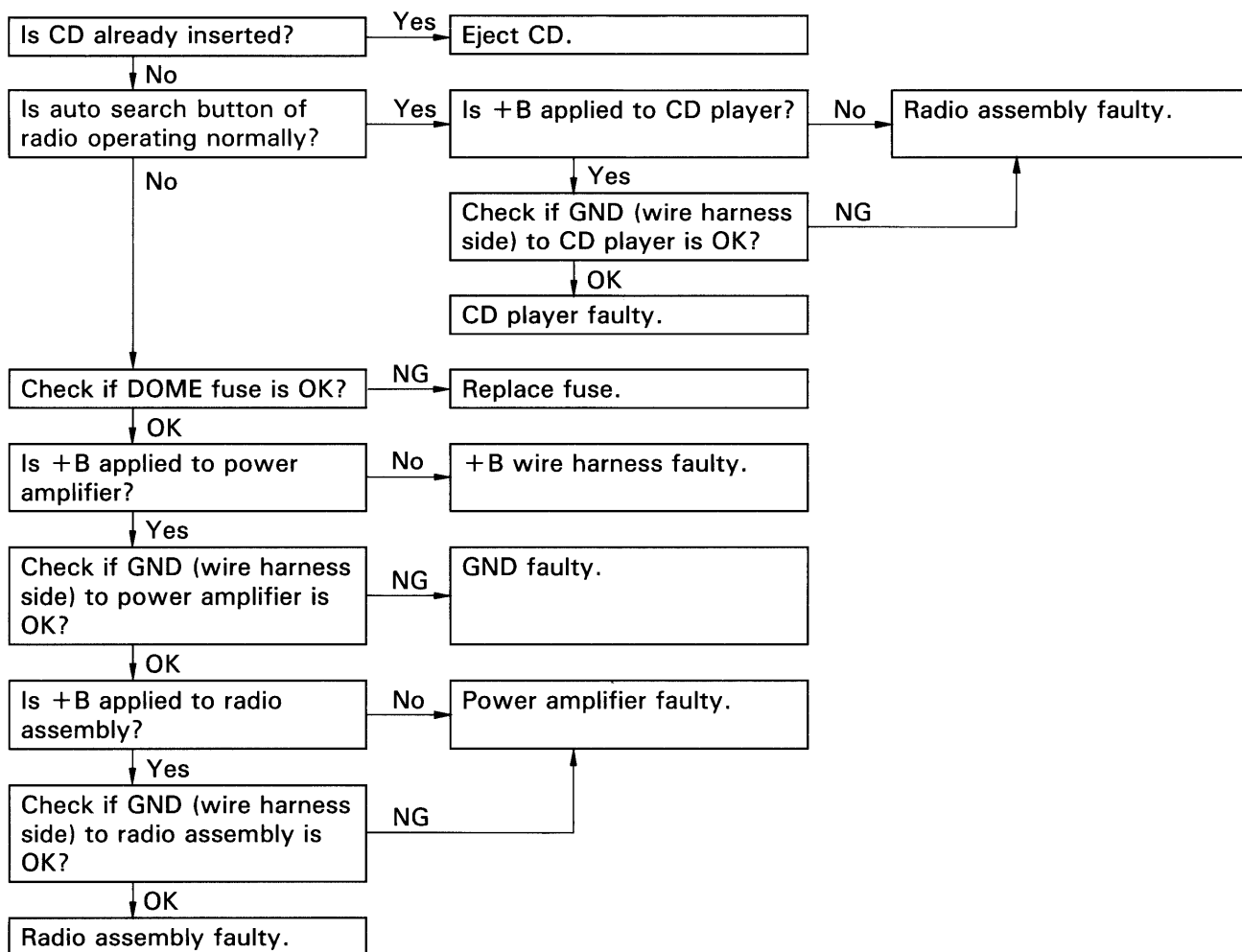


15	Tape Player	CASSETTE TAPE WILL NOT EJECT
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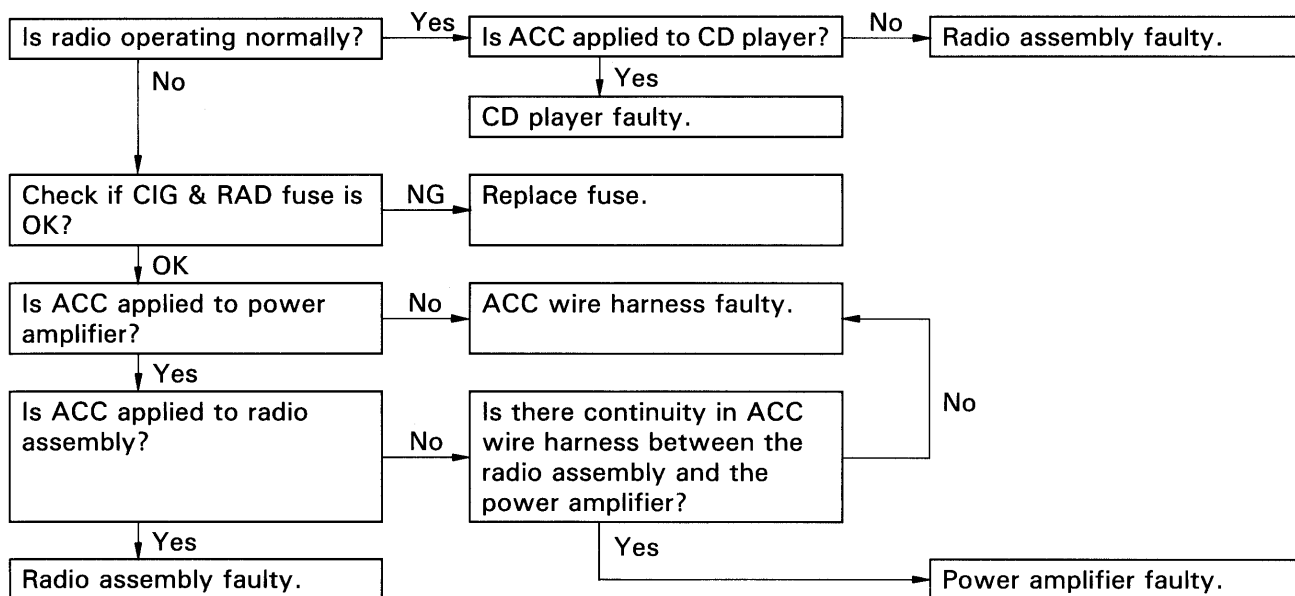
[R] : Radio, 5 Speaker [U] : Radio – Tape Player, 5 Speaker
 [P] : Radio – Tape Player, 9 Speaker



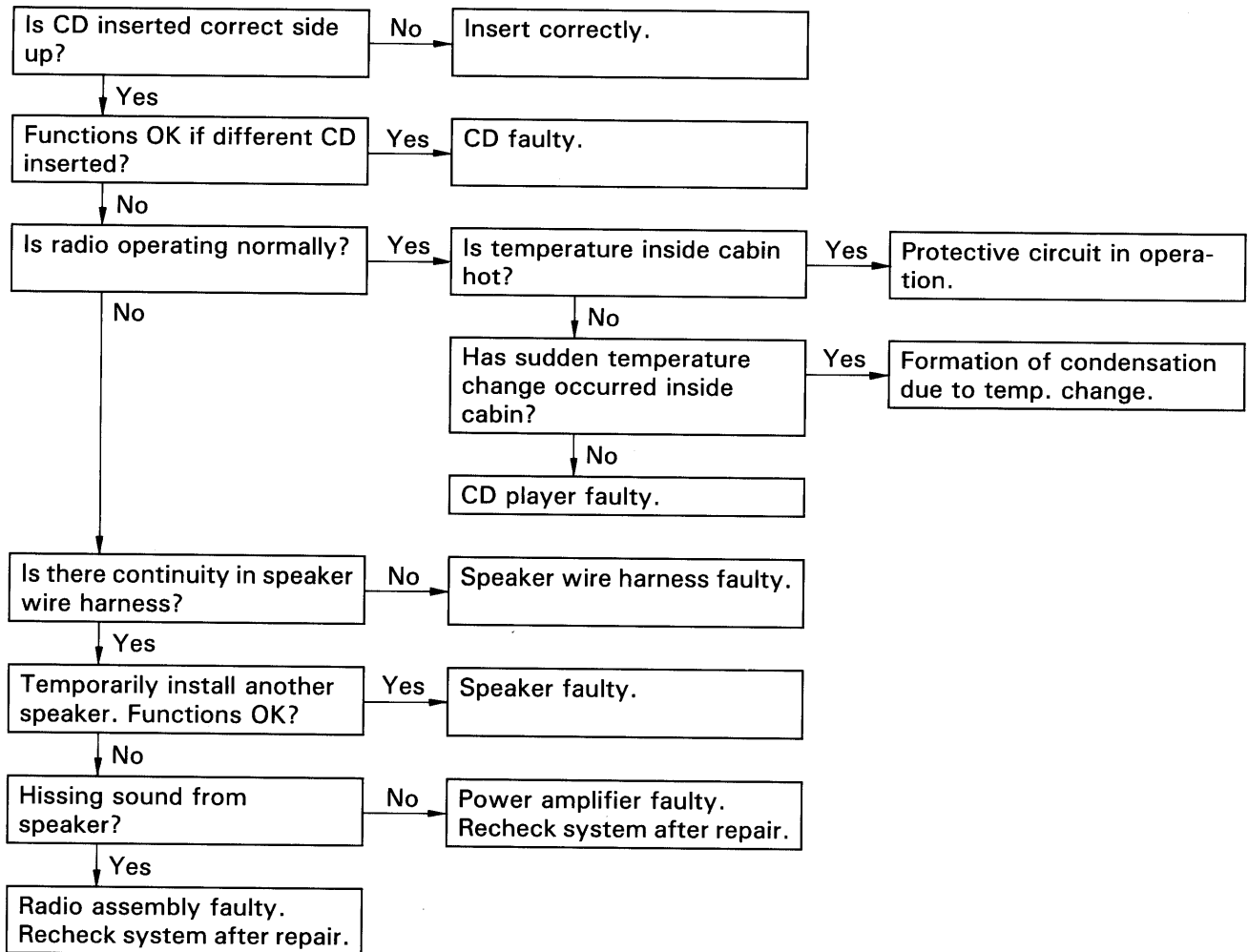
16	CD Player	CD CANNOT BE INSERTED
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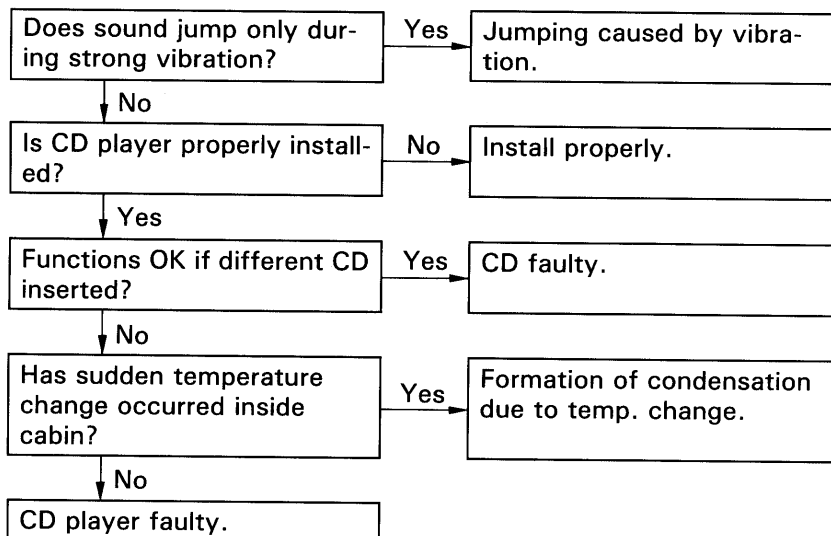
17	CD Player	CD INSERTS, BUT NO POWER
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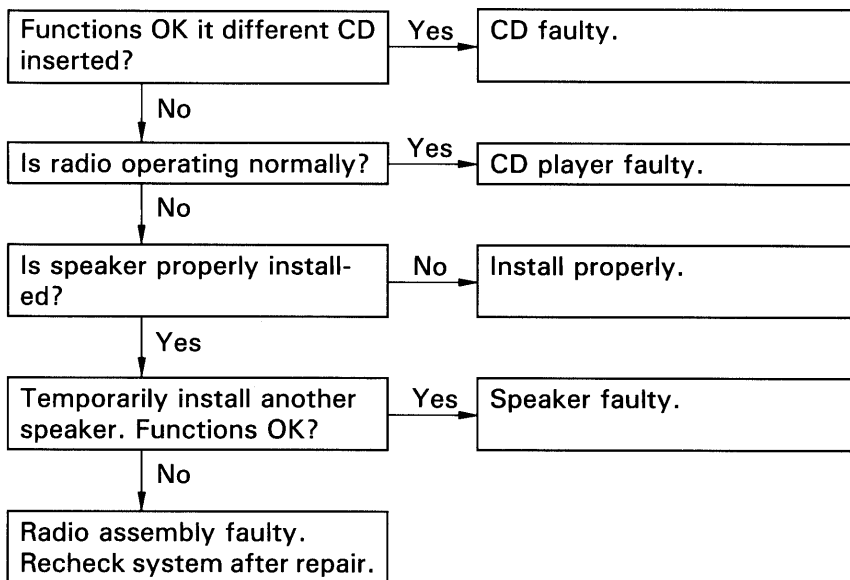
18	CD Player	POWER COMING IN, BUT CD PLAYER NOT OPERATING
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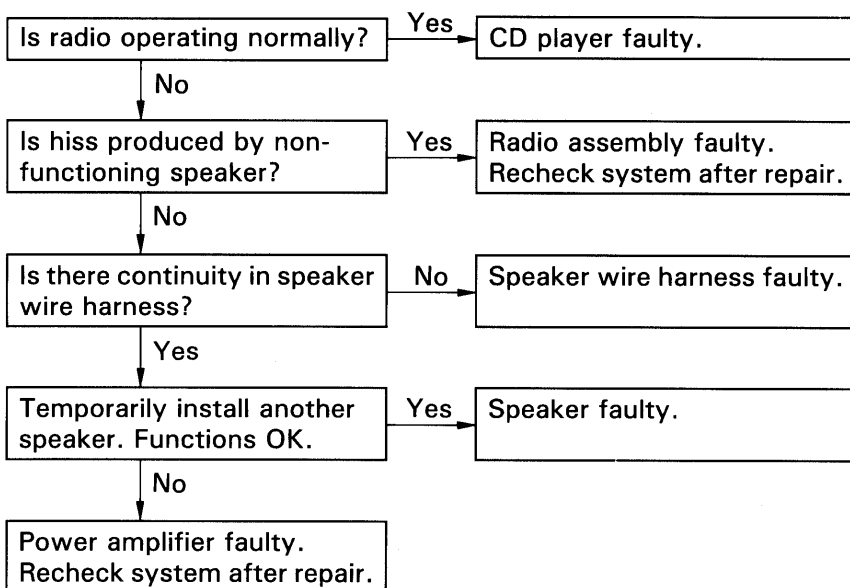
19	CD Player	SOUND JUMPS
-----------	------------------	--------------------

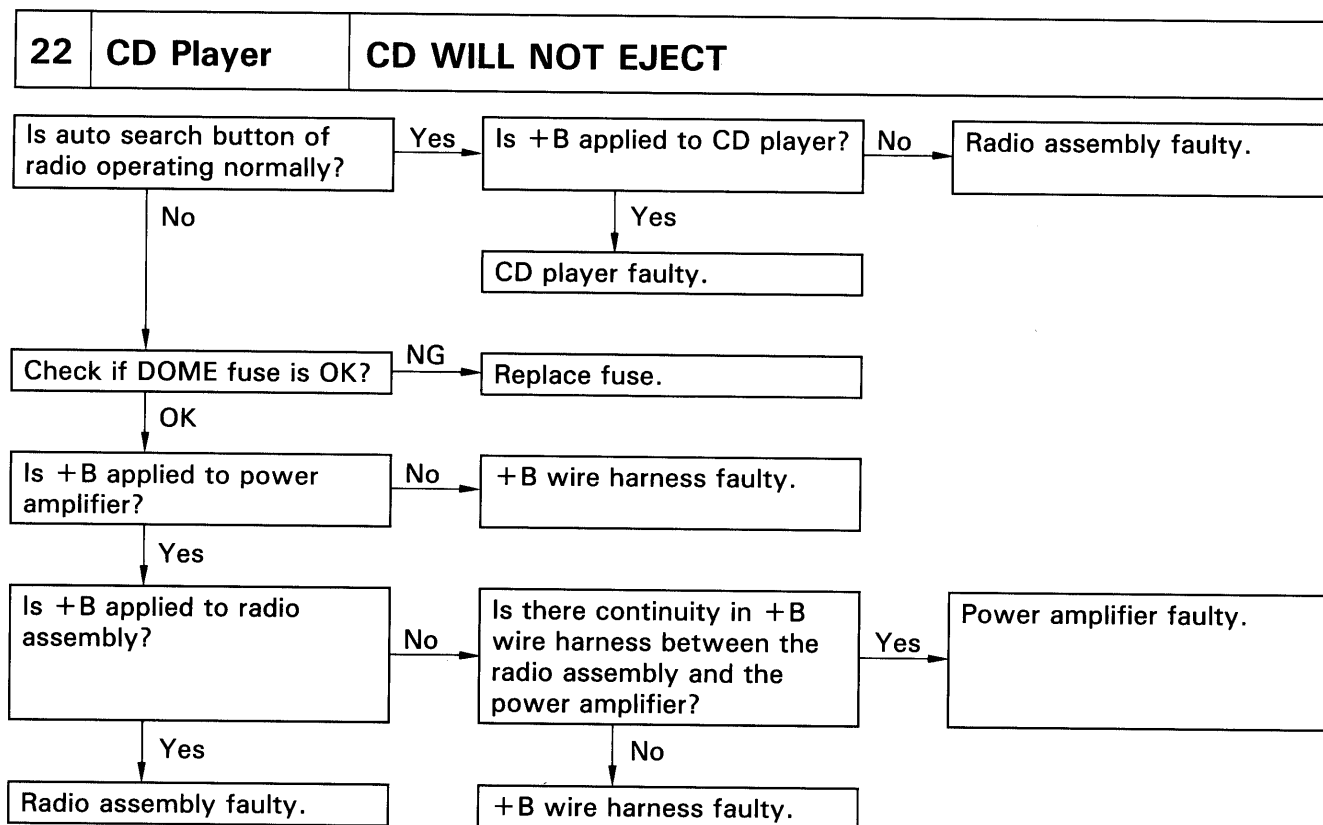


20	CD Player	SOUND QUALITY POOR (VOLUME FAINT)
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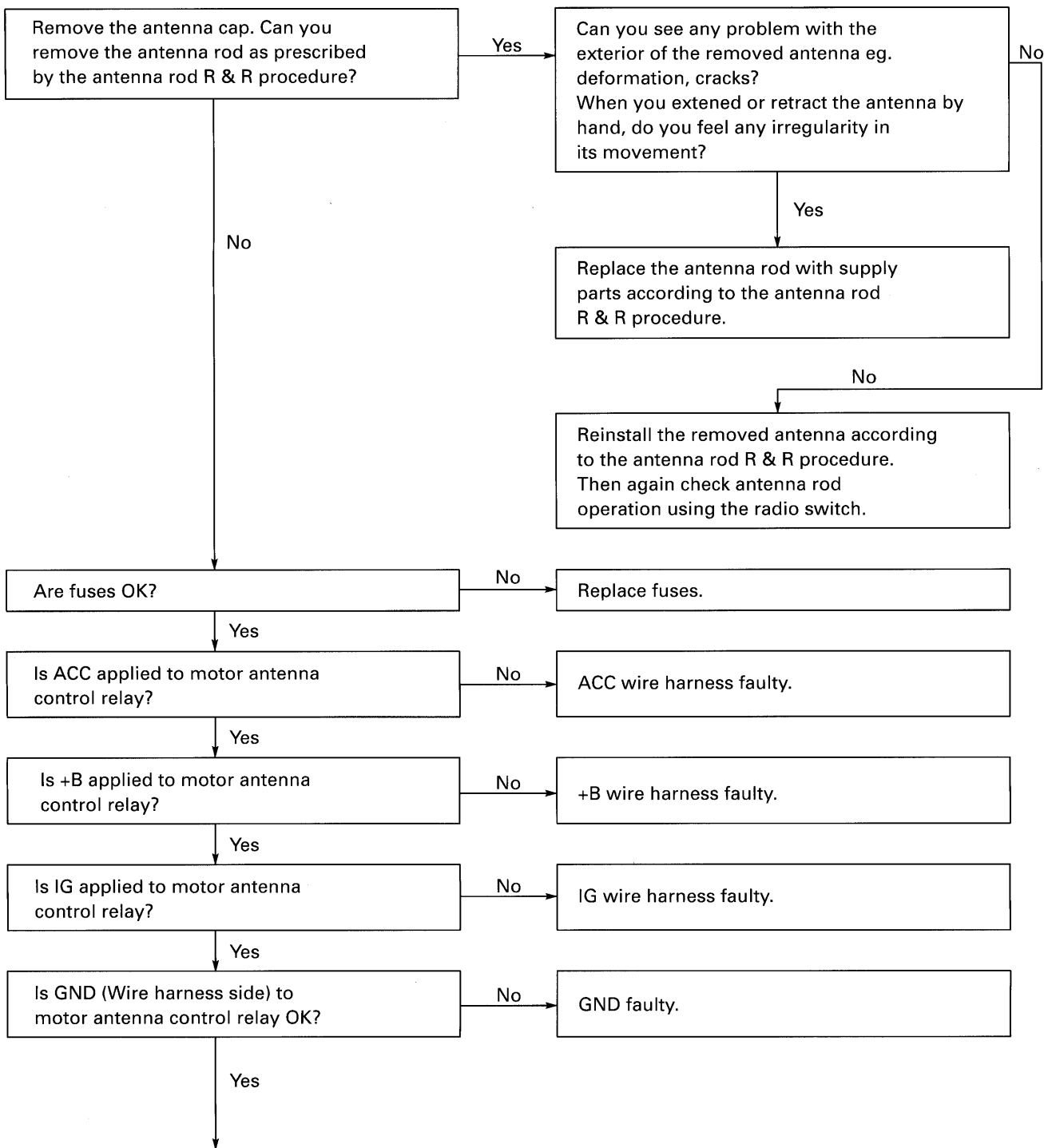


21	CD Player	EITHER SPEAKER DOES NOT WORK
-----------	------------------	-------------------------------------





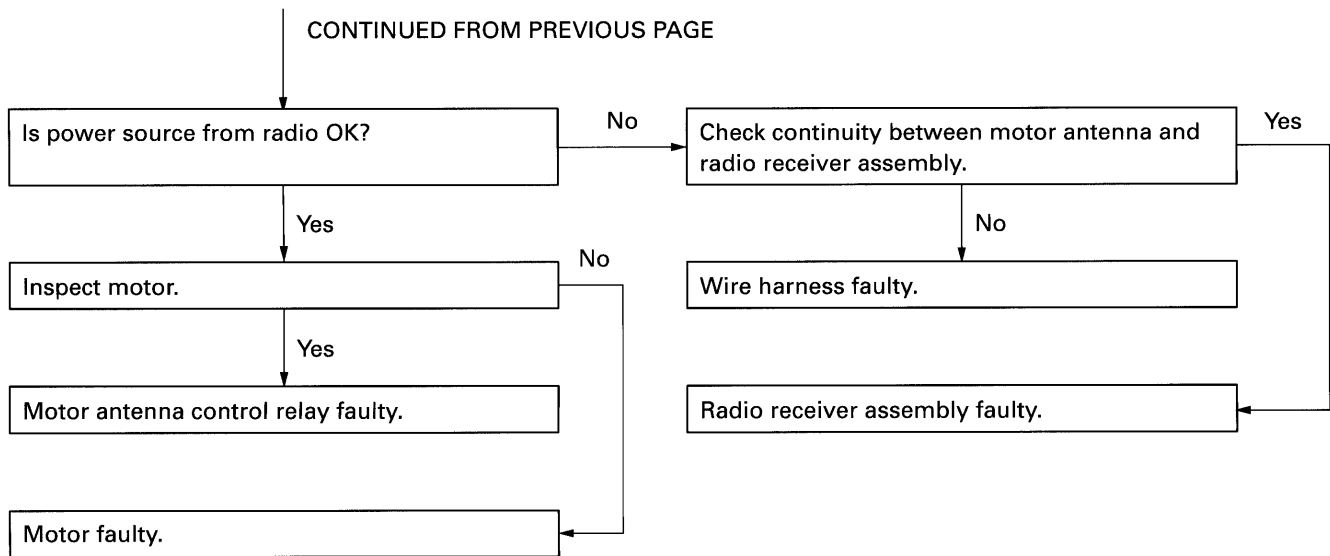
23	Antenna	ANTENNA DOES NOT FULLY EXTENDED OR FULLY RETRACT
-----------	----------------	---



CONTINUED ON NEXT PAGE

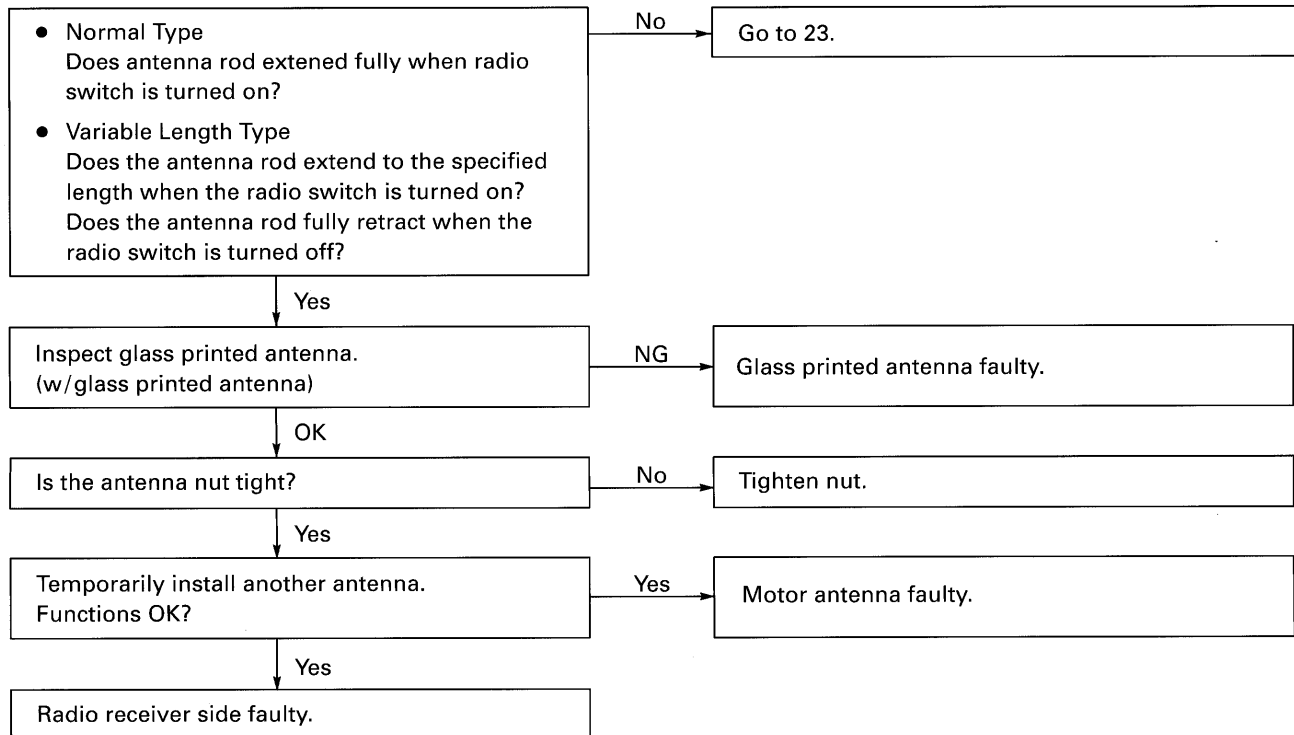
BE-90

BODY ELECTRICAL - AUDIO SYSTEM

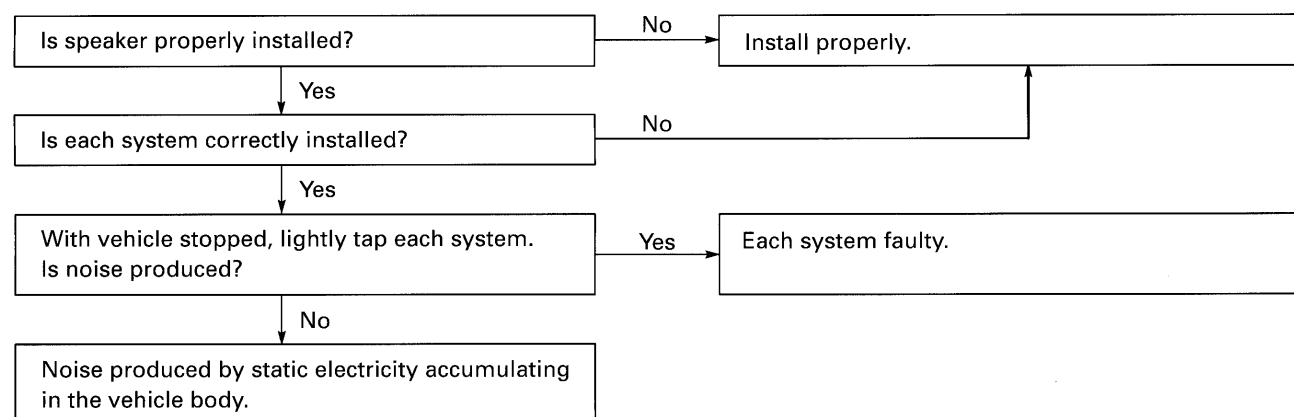


V06132

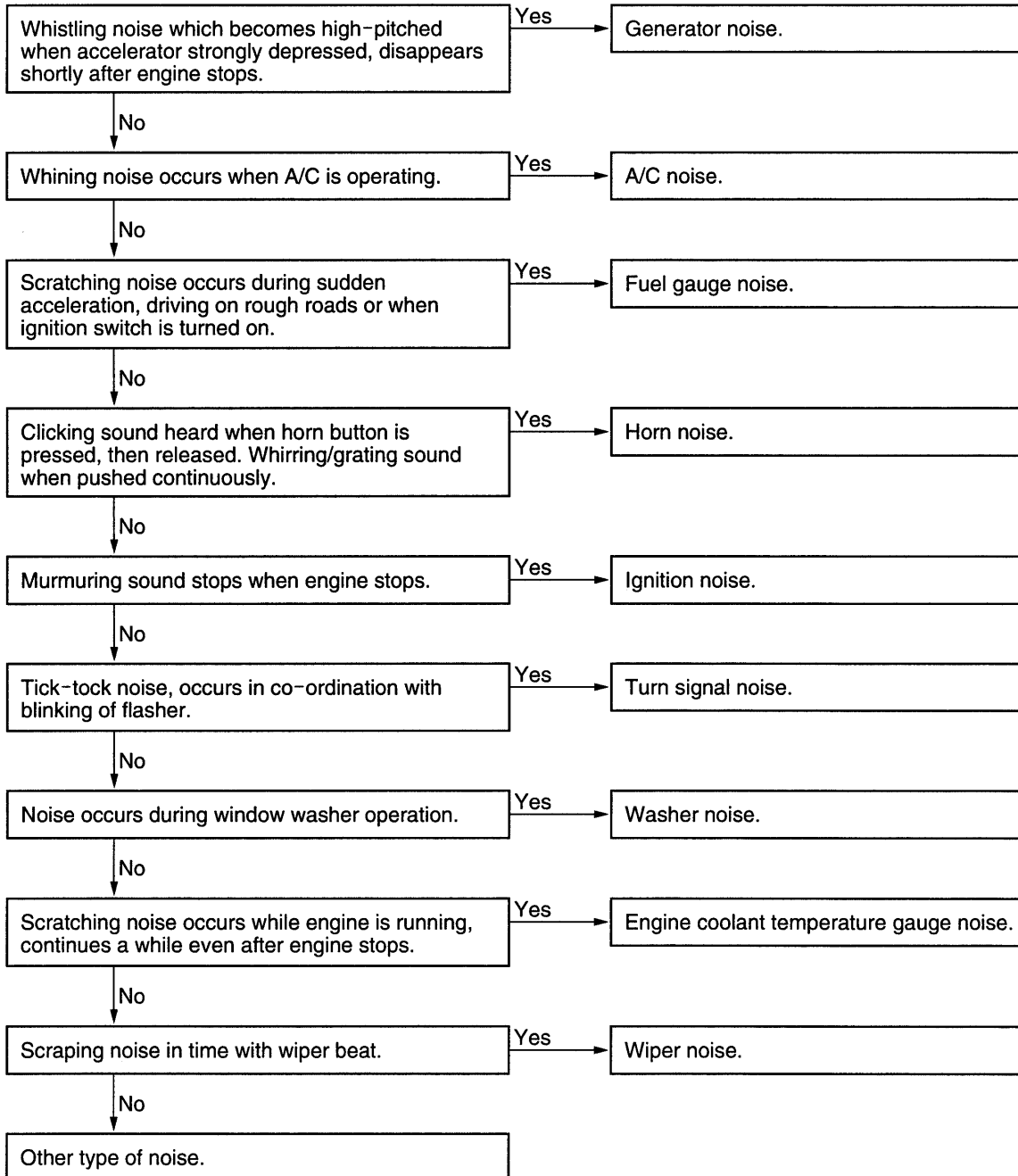
24	Antenna	ANTENNA-RELATED
-----------	----------------	------------------------



25	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING
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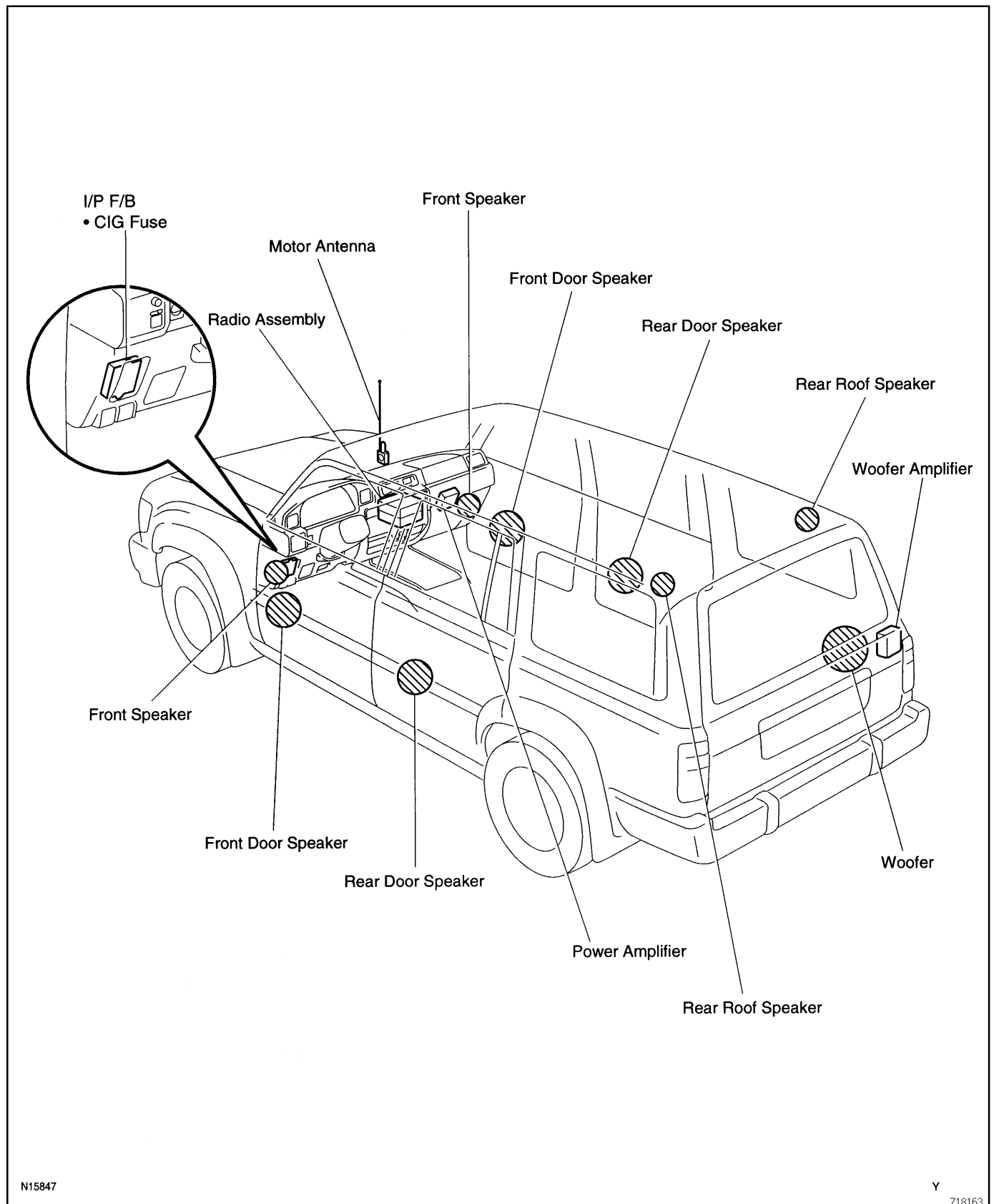
26	Noise	NOISE PRODUCED WHEN ENGINE STARTS
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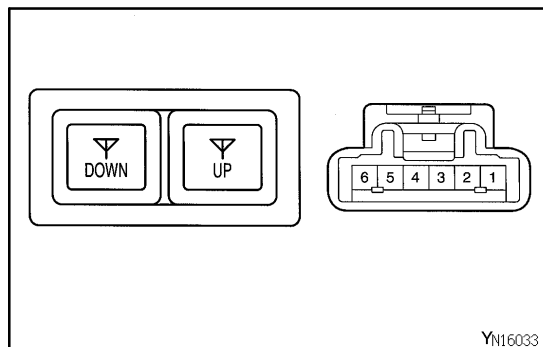


N20904

T V08466

LOCATION





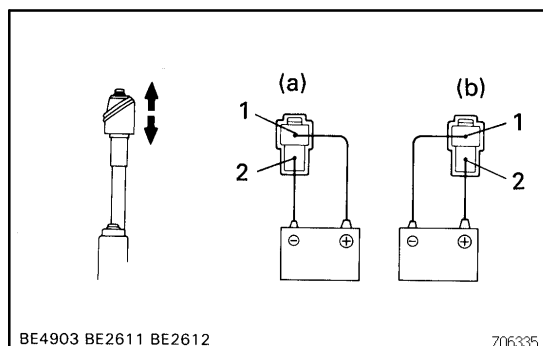
ANTENNA INSPECTION

BE1MS-01

1. w/ MOTOR ANTENNA: INSPECT ANTENNA SWITCH Except RADIO-LINKED TYPE

Condition	Tester connection	Specified condition
UP Button Position Free	2 – 5	Continuity
UP Button Position Pushed in	4 – 5	Continuity
DOWN Button Position Free	2 – 3	Continuity
DOWN Button Position Pushed in	3 – 4	Continuity
Illumination circuit	1 – 6	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT ANTENNA MOTOR OPERATION

- Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, and check that the motor turns (moves upward.)
- Then, reverse the polarity, check that the motor turns the opposite way (moves downward.)

If operation is not as specified, replace the motor.

CLOCK

TROUBLESHOOTING

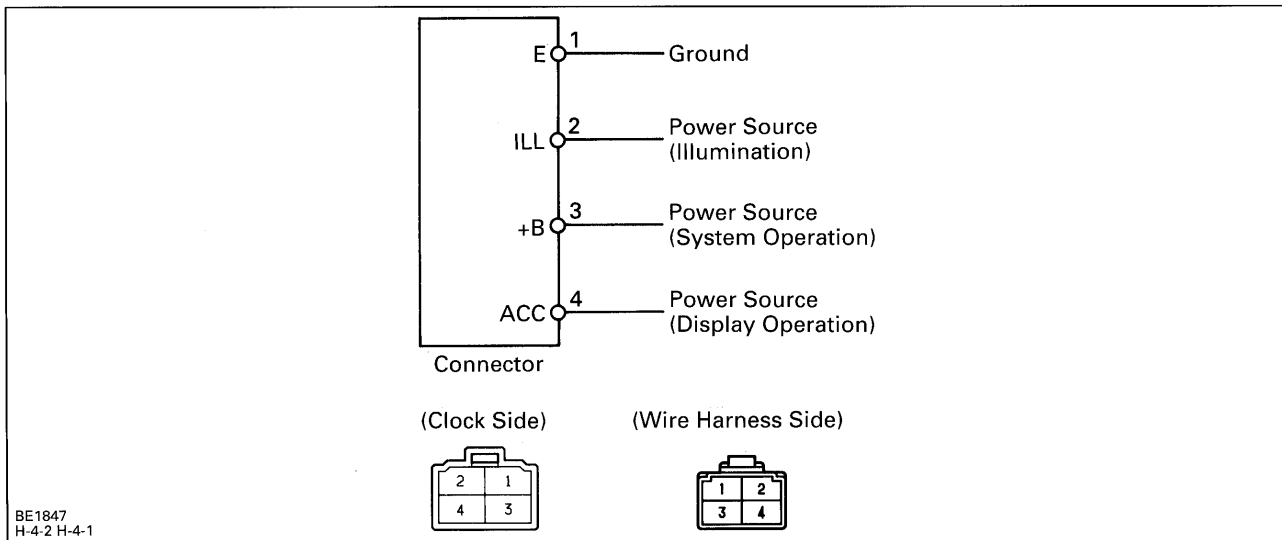
BE1MT-01

HINT:

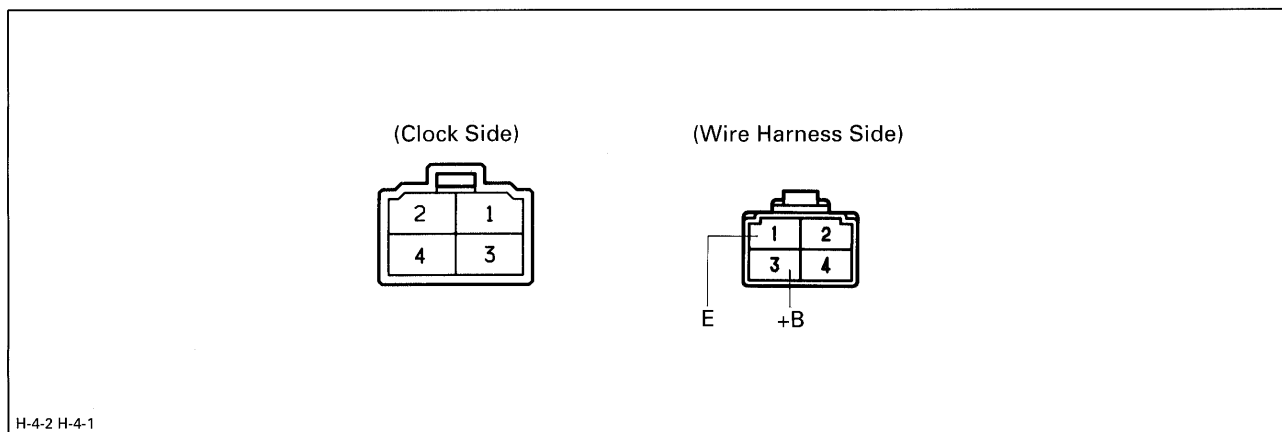
Troubleshoot the lock according to the table below.

Clock will not operate	1
Clock loses or gains time	2

1.5 seconds/day

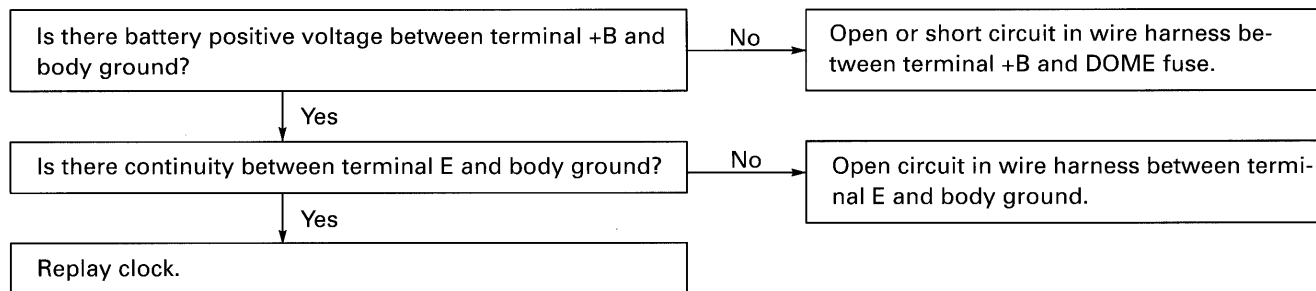


1 CLOCK WILL NOT OPERATE



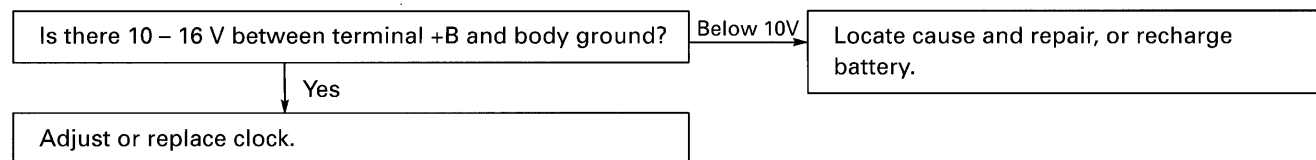
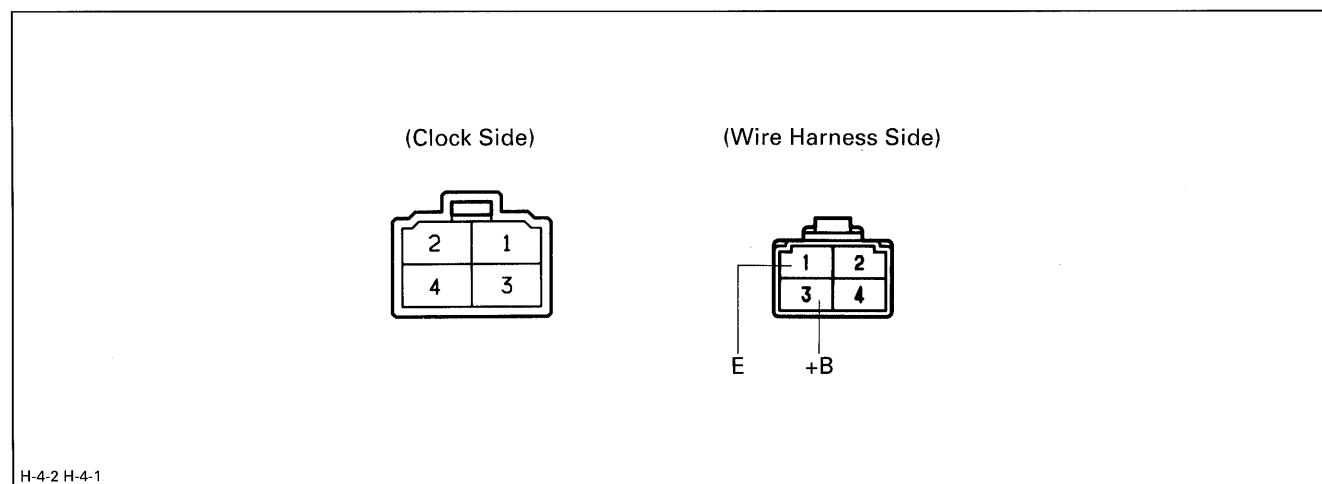
- Check that the battery positive voltage is 10 – 16 V. if voltage is not as specified, replace the battery.
- Check that the DOME fuse is not blown. If the fuse is blown, replace the fuse and check for short.
- Troubleshoot the clock as follows.
HINT: Inspect the connector on the wire harness side.

V06493



2 CLOCK LOSES OR GAINS TIME

- Check the the battery positive voltage is 10 – 16 V.
If voltage is not as specified, replace the battery.
- Inspect the error of the clock.
Allowable error (per day): ± 1.5 seconds
- 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.
- Troubleshoot the clock as follows.
HINT: Inspect the connector on the wire harness side.



CLIP

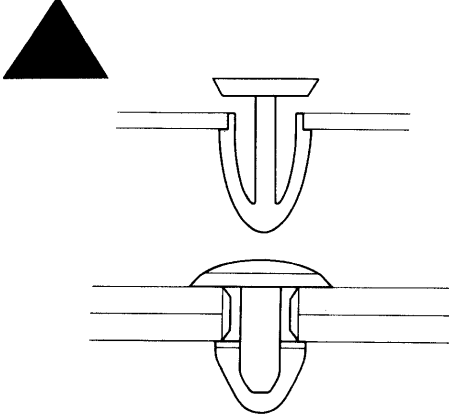
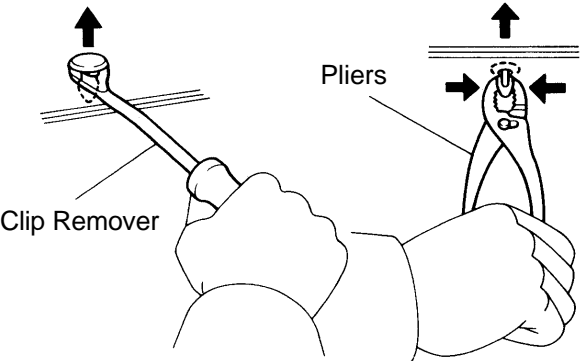
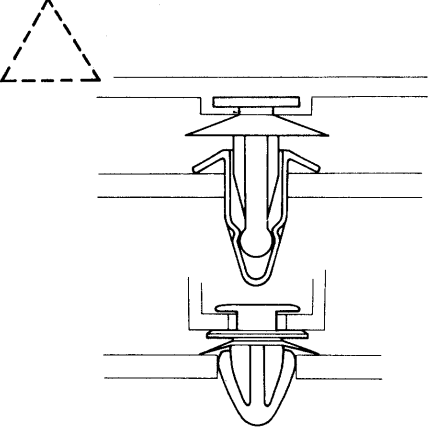
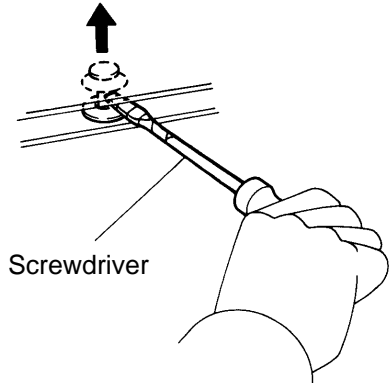
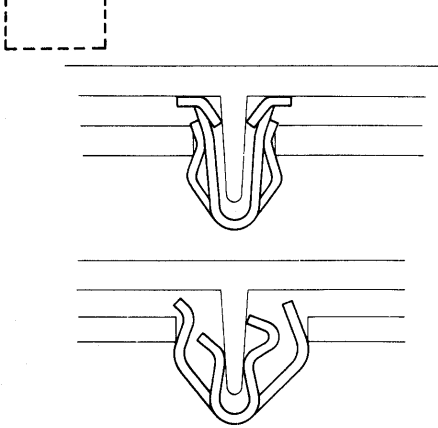
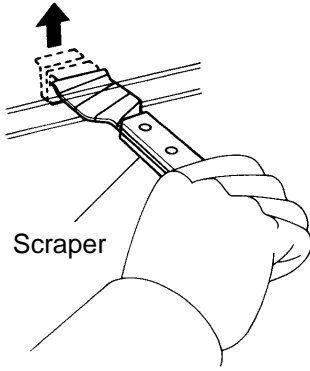
REPLACEMENT

B037F-01

The removal and installation methods of typical clips used in body parts are shown in the table below.

HINT:

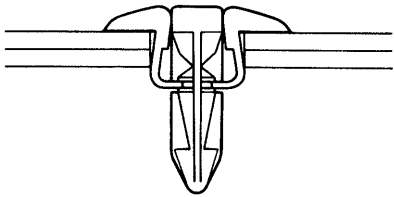
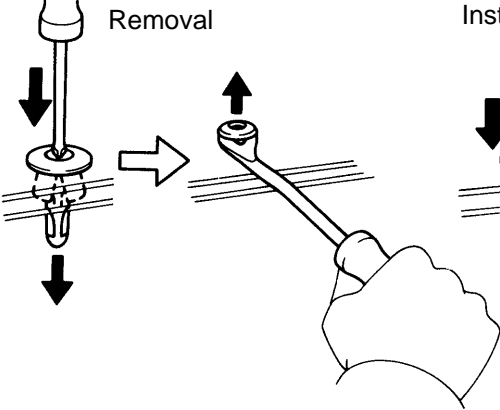
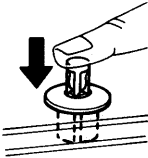
If the clip is damaged during the operation, always replace it with a new clip.

	 <p>Clip Remover</p> <p>Pliers</p>
	 <p>Screwdriver</p>
	 <p>Scraper</p>

V00005

BO-2

BODY - CLIP

Shape (Example)	Removal / Installation
	<div><div>Removal</div></div> <div><div>Installation</div></div>

V00012

SRS AIRBAG

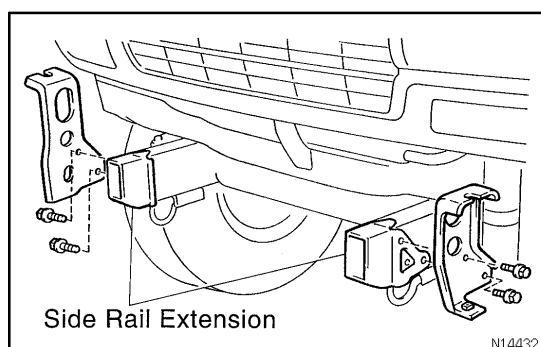
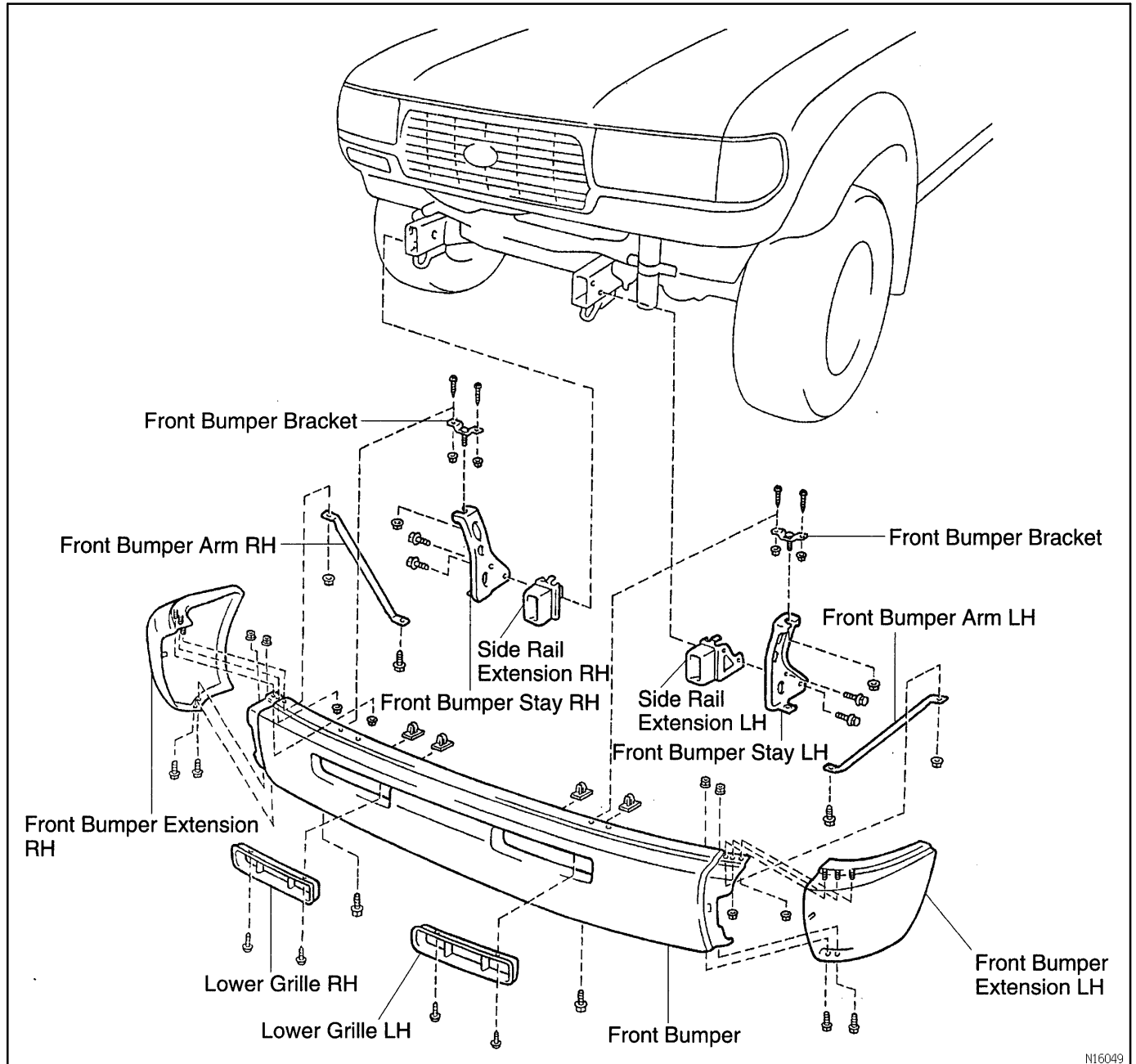
PRECAUTION

B037G-01

The LAND CRUISER is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

FRONT BUMPER COMPONENTS

BO37H-01



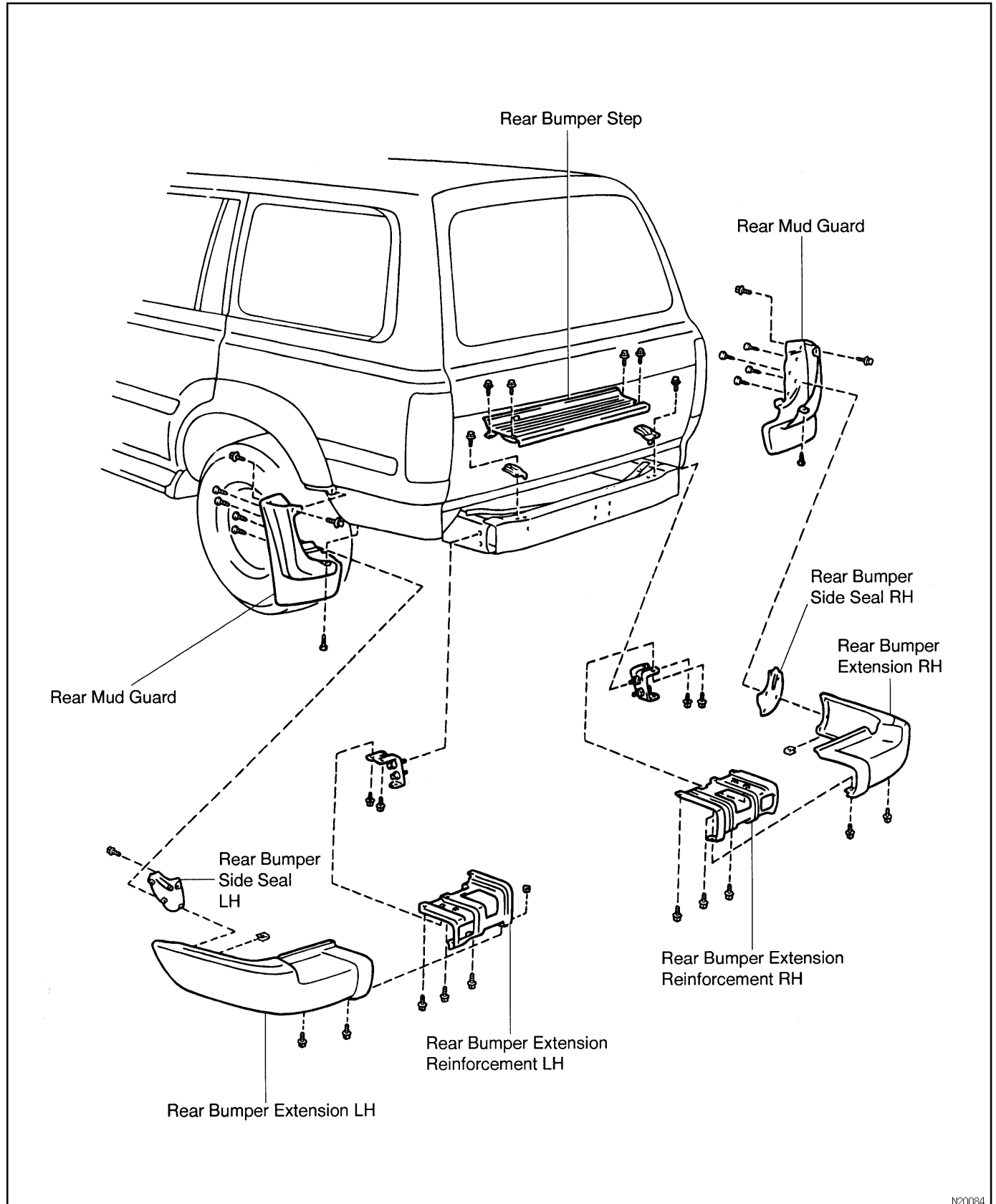
CAUTION:

The side rail extensions are necessary for normal functioning of the SRS airbag, so make sure that they are correctly installed. When replacing the bumper, always inspect the side rail extensions. If they are deformed or cracked, replace them.

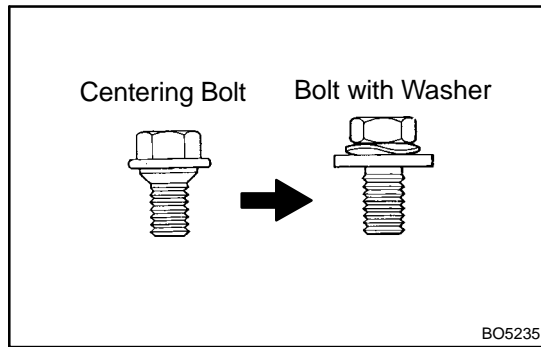
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

REAR BUMPER COMPONENTS

B0371-01



N20084

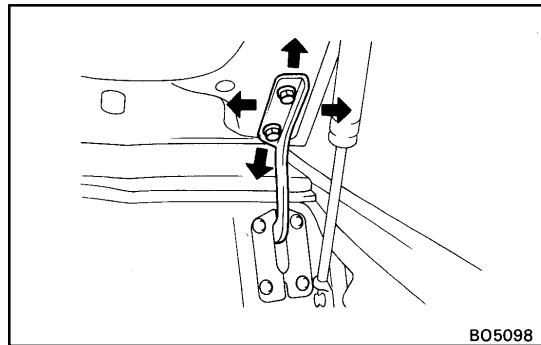


HOOD ADJUSTMENT

B037J-01

HINT:

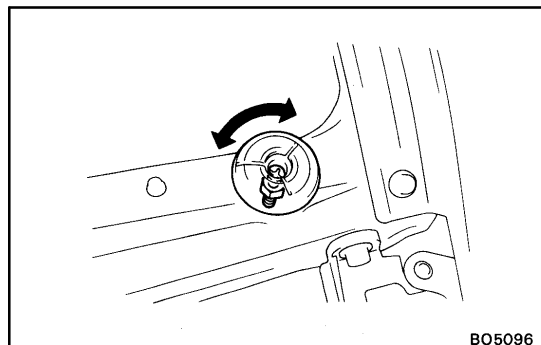
Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on. Substitute the bolt with washer for the centering bolt.



1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT /RIGHT DIRECTIONS

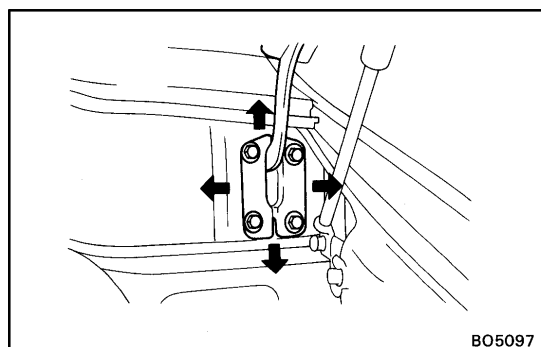
Adjust the hood by loosening the hood side hinge bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



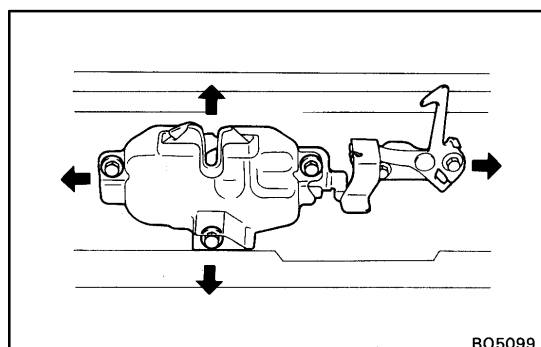
2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTIONS

- Loosen the lock nut.
- Adjust the hood by turning the cushions.



3. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTIONS

Adjust the hood by loosening the body side hinge bolts.



4. ADJUST HOOD LOCK

Adjust the hood lock by loosening the mounting bolts.

Torque: 8.0 N·m (80 kgf·cm, 69 in·lbf)

REPLACEMENT

1. REMOVE DAMPER STAY FROM HOOD

Remove the 2 bolts and support from the hood.

HINT:

While supporting the hood with your hand, remove the hood.

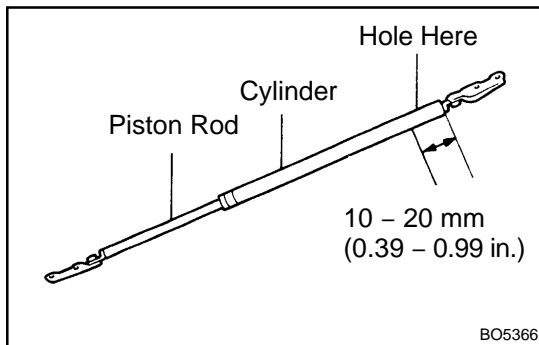
2. REMOVE DAMPER STAY FROM BODY

Remove the 2 bolts and support.

3. REPLACE DAMPER STAY

NOTICE:

- Do not disassemble the damper stay because the cylinder is filled with pressurized gas.



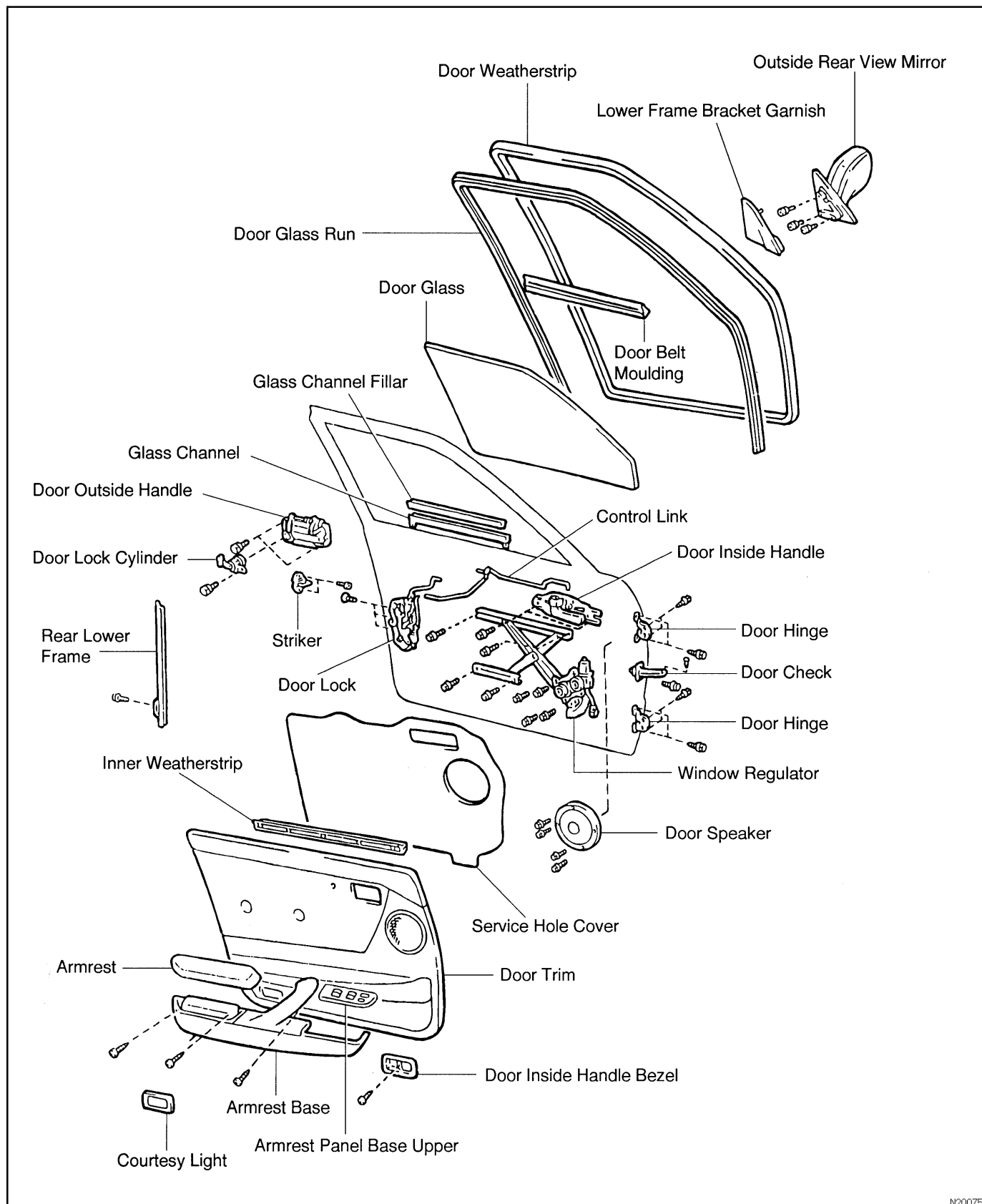
- If the damper stay is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole as shown in the illustration to completely release the high-pressure gas before disposing of it.
- When drilling, chips may fly out so work carefully.
- The gas is colorless, odorless and non-toxic.
- When working, handle the damper stay 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 stay fully extended.

4. INSTALL DAMPER STAY

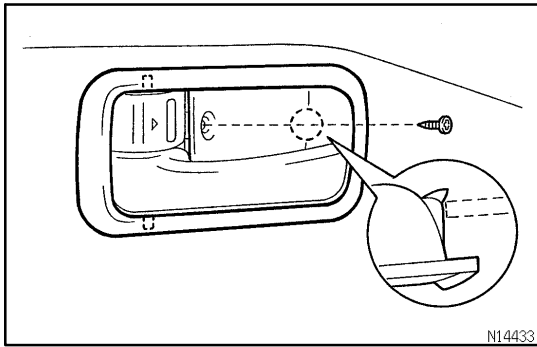
Install the damper stay.

FRONT DOOR COMPONENTS

B037L-01



N20075

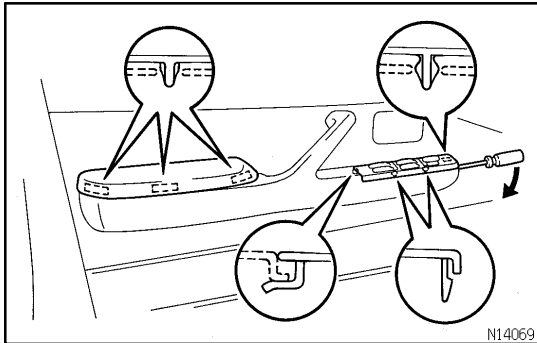


DISASSEMBLY

HINT:

Tape a screwdriver tip before using to pry parts.

1. REMOVE DOOR INSIDE HANDLE BEZEL

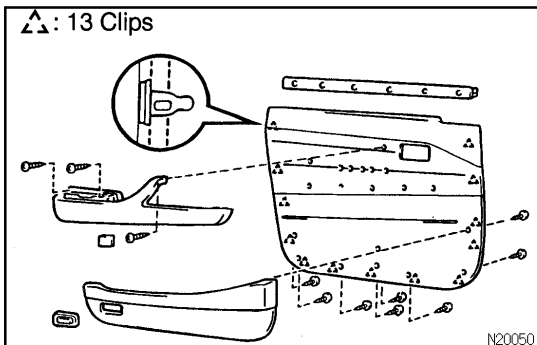


2. REMOVE ARMREST

3. REMOVE ARMREST PANEL BASE UPPER

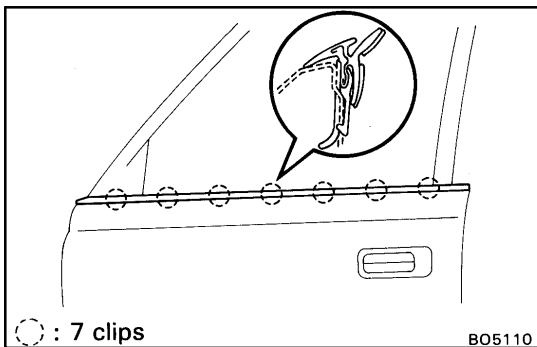
4. REMOVE COURTESY LIGHT

5. REMOVE LOWER FRAME BRACKET GARNISH



6. REMOVE DOOR TRIM

- Remove the 3 screws from the door trim.
- Using a screwdriver, remove the clip and remove the trim by pulling all of the trim up.
- Remove the 11 screws and armrest base from the door trim.
- Remove the inner weatherstrip from the door trim.
- Remove the 8 screws and door pocket from the door trim.



7. REMOVE DOOR BELT MOULDING

Pry out the clip from the edge of the panel, and remove the moulding .

8. REMOVE DOOR WEATHERSTRIP

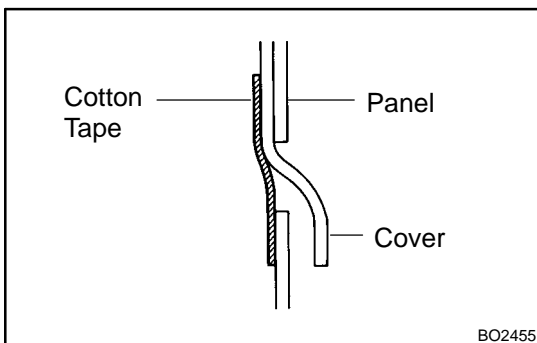
NOTICE:

Do not pull strongly on the weatherstrip as it may tear.

9. REMOVE DOOR INSIDE HANDLE

10. REMOVE DOOR LOCK CONTROL RELAY

11. REMOVE SERVICE HOLE COVER



NOTICE:

Do not block the trim clip sealing with the tape.

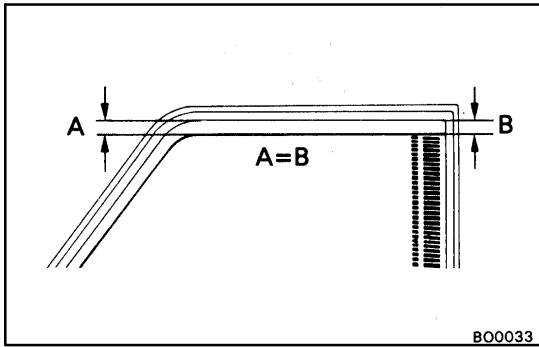
12. REMOVE OUTSIDE REAR VIEW MIRROR

13. REMOVE DOOR GLASS RUN

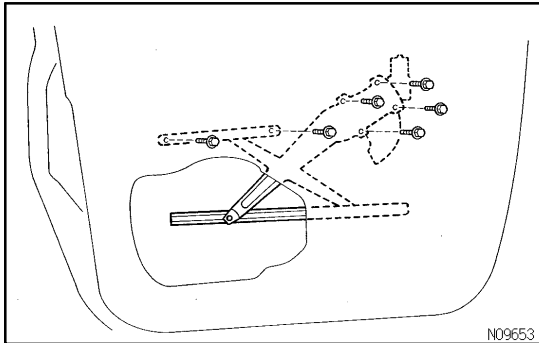
14. REMOVE REAR LOWER FRAME

BO-10

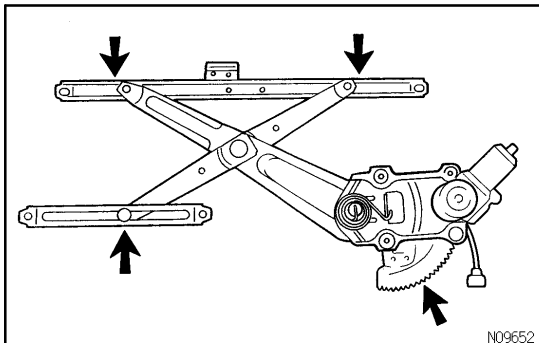
BODY - FRONT DOOR

**HINT:**

At the time of reassembly, adjust the equalizer arm up to down and tighten if where dimensions A and B, as shown are equal.

**15. REMOVE DOOR GLASS****16. REMOVE WINDOW REGULATOR**

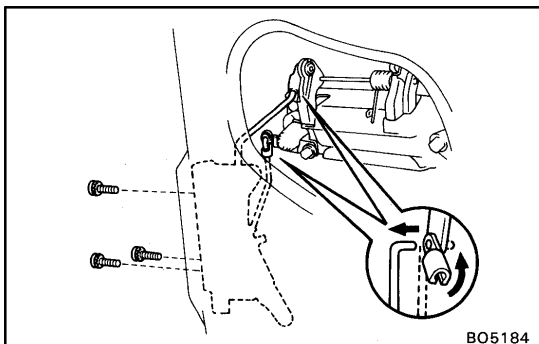
Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)

**HINT:**

At the time of reassembly, apply MP grease to the sliding surface and gears of the window regulator.

NOTICE:

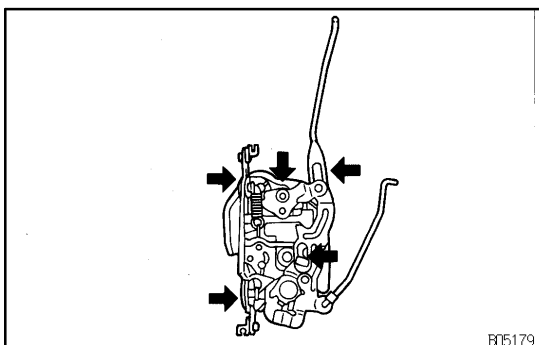
Do not apply grease to the spring.

17. REMOVE LOCKING AND OPENING CONTROL LINK**18. REMOVE DOOR LOCK****HINT:**

At the time of reassembly, apply adhesive to the 3 screws.

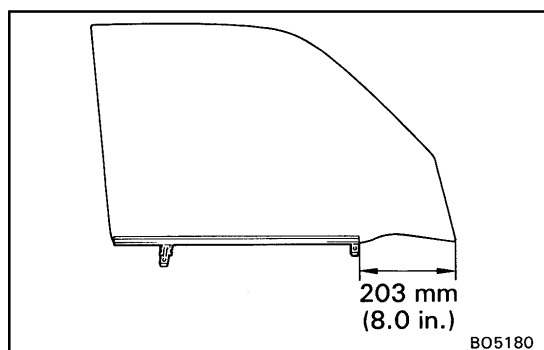
Part No.08833-00070, THREE BOND 1324 or equivalent

Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)

**HINT:**

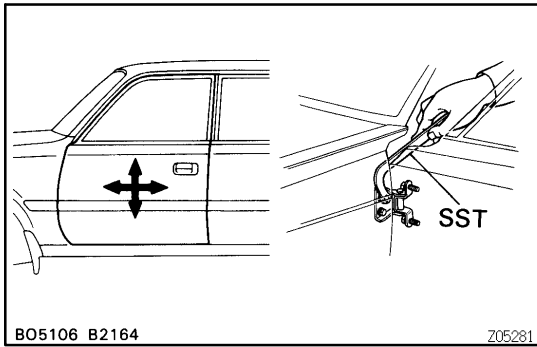
At the time of reassembly, apply MP grease to the sliding surface of the door lock.

19. REMOVE DOOR OUTSIDE HANDLE**20. REMOVE DOOR LOCK CYLINDER****21. REMOVE DOOR SPEAKER**



REPLACEMENT

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER



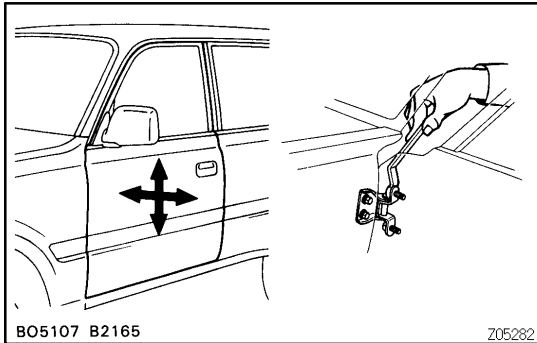
ADJUSTMENT

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812-00010

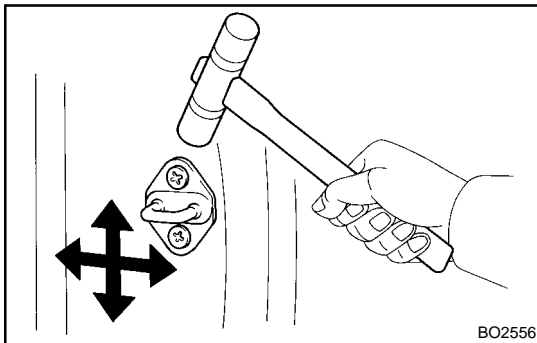
Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.

Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)



3. ADJUST DOOR LOCK STRIKER

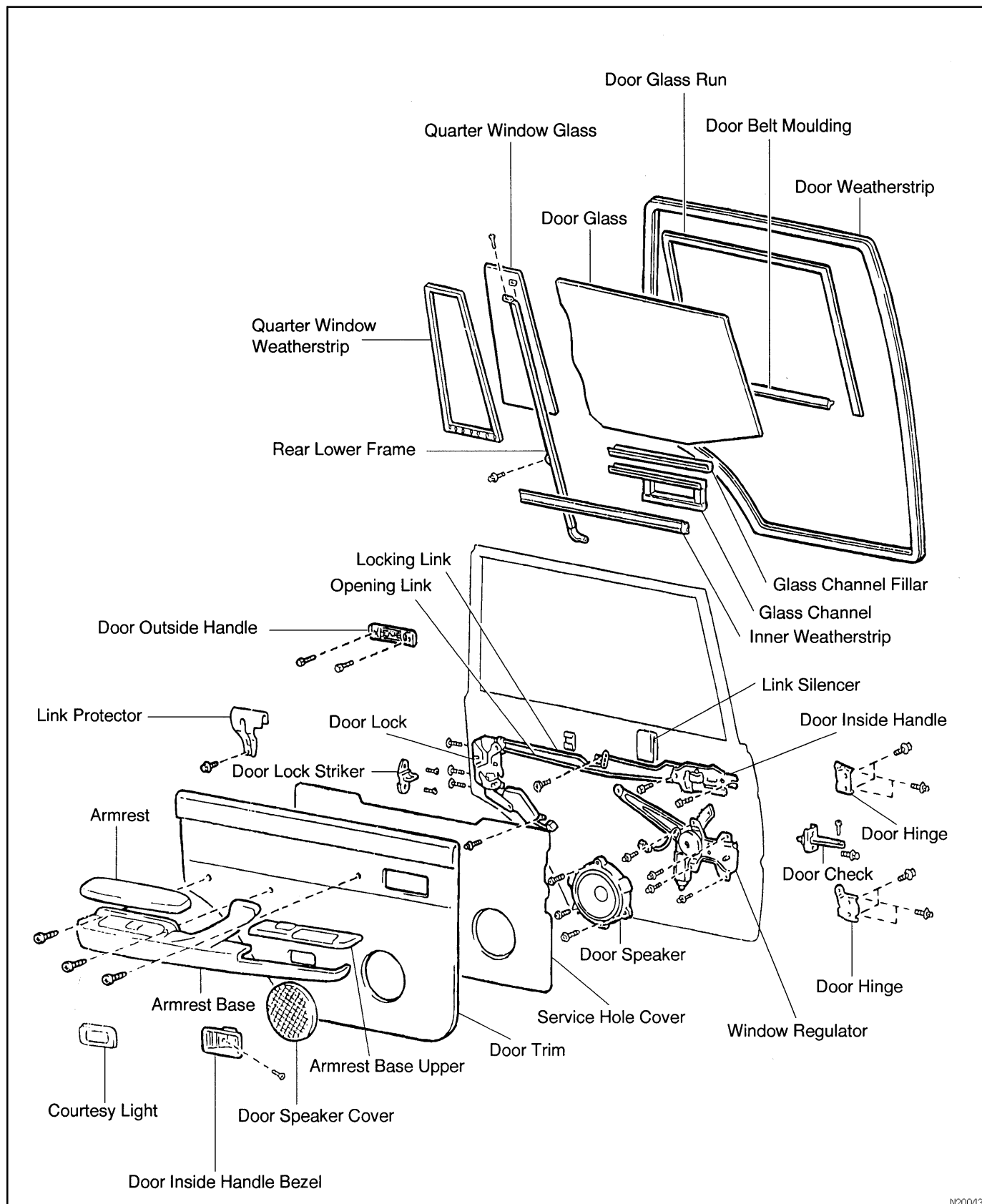
- Check that the door fit and door lock linkages are adjusted correctly.
- Loosen the striker mounting screws to adjust.
- Using a plastic hammer, tap the striker to adjust it.

REASSEMBLY

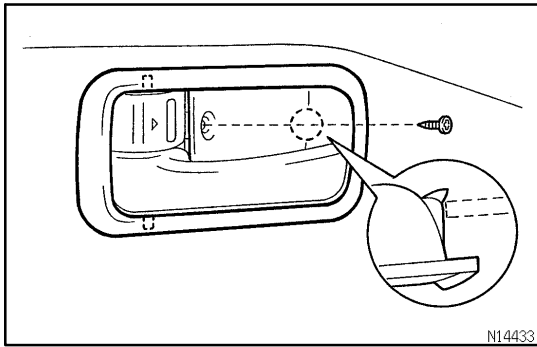
Reassembly is in the reverse order of disassembly (See page [BO-9](#).)

REAR DOOR COMPONENTS

B037Q-01



N20043

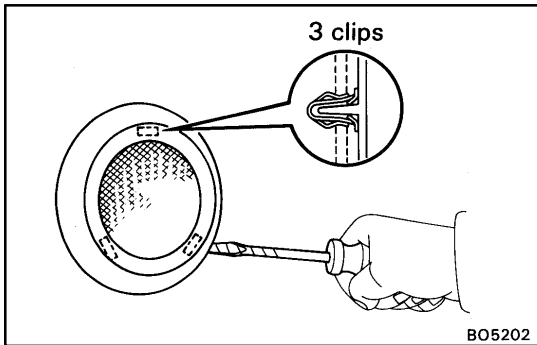


DISASSEMBLY

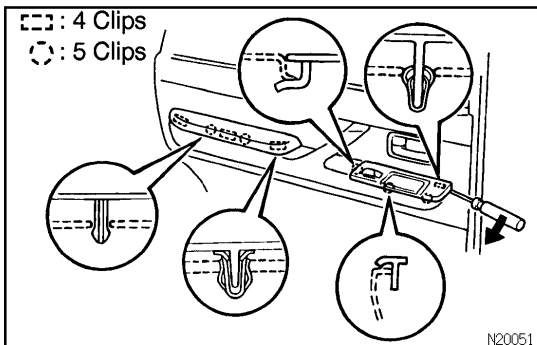
HINT:

Tap a screwdriver tip before using to pry parts.

1. REMOVE DOOR INSIDE HANDLE BEZEL



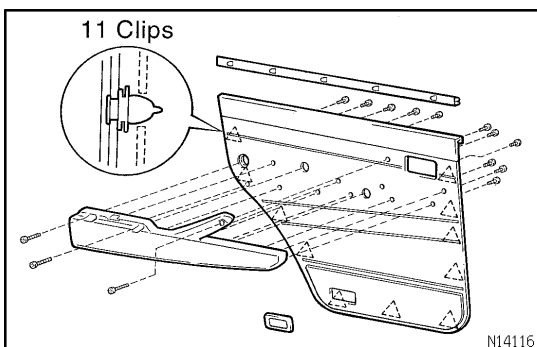
2. REMOVE DOOR SPEAKER COVER



3. REMOVE ASH TRAY

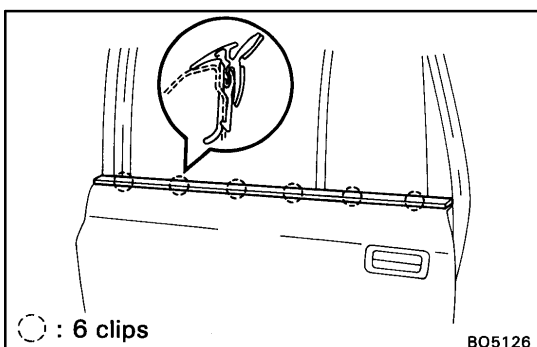
4. REMOVE ARMREST BASE UPPER

5. REMOVE ARMREST



6. REMOVE DOOR TRIM

- Remove the courtesy light.
- Remove the 3 screws from the door trim.
- Using a screwdriver, remove the clips and remove the trim by pulling all of the trim up.
- Remove the inner weatherstrip from the door trim.
- Remove the 11 screws and the armrest base from the door trim.



7. REMOVE DOOR BELT MOULDING

Pry out the clip from the edge of the panel, and remove the moulding.

8. REMOVE DOOR WEATHERSTRIP

NOTICE:

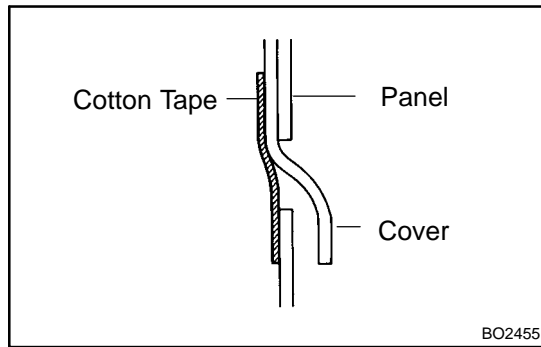
Do not pull strongly on the weatherstrip as it may tear.

9. REMOVE DOOR INSIDE HANDLE

10. REMOVE SERVICE HOLE COVER

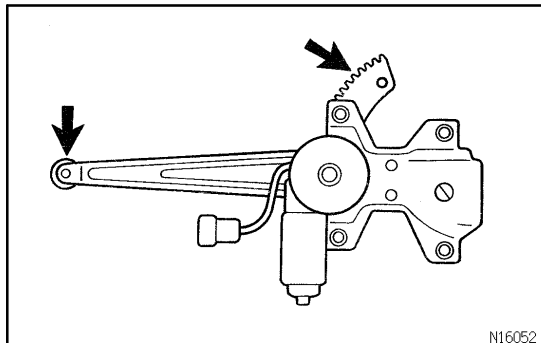
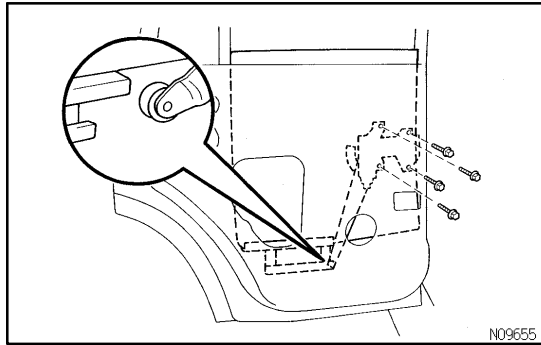
BO-16

BODY - REAR DOOR

**NOTICE:**

Do not block the clip sealing with the tape.

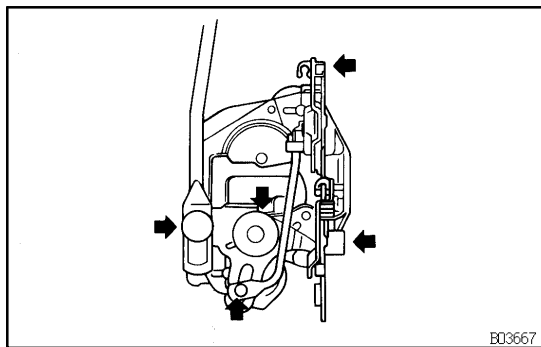
11. REMOVE DOOR SPEAKER
 12. REMOVE LINK PROTECTOR
 13. REMOVE LOCKING LINK AND DOOR OPENING LINK
 14. REMOVE DOOR GLASS RUN
 15. REMOVE REAR LOWER FRAME
 16. REMOVE QUARTER WINDOW GLASS WITH WEATHERSTRIP
 17. REMOVE DOOR GLASS
 18. REMOVE WINDOW REGULATOR
- Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)

**HINT:**

At the time of reassembly, apply MP grease to the sliding surface and gears of the regulator.

NOTICE:

Do not apply grease to the spring.

**19. REMOVE DOOR LOCK****HINT:**

At the time of reassembly, apply adhesive to the 3 screws.

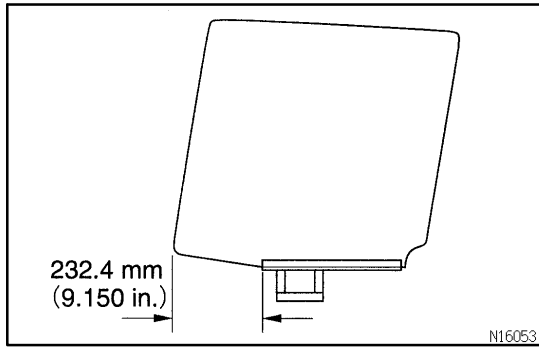
Part No.08833-00070, THREE BOND 1324 or equivalent

Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)

HINT:

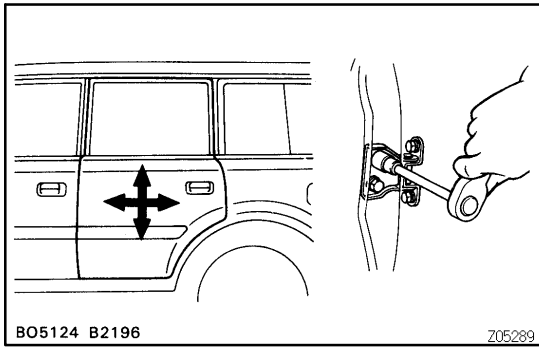
At the time of reassembly, apply MP grease to the sliding surface of the door lock.

20. REMOVE OUTSIDE HANDLE



REPLACEMENT

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT
2. APPLY SOAPY WATER TO INSIDE OF WEATHERSTRIP
3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER

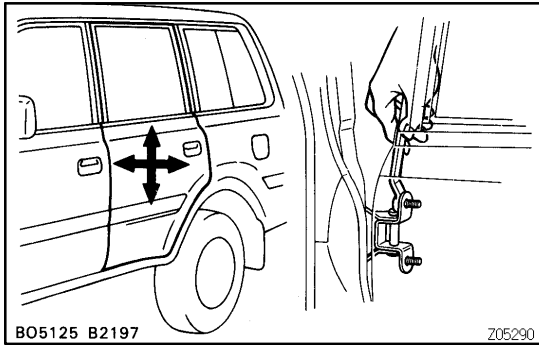


ADJUSTMENT

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Adjust the door by loosening the body side hinge bolts.

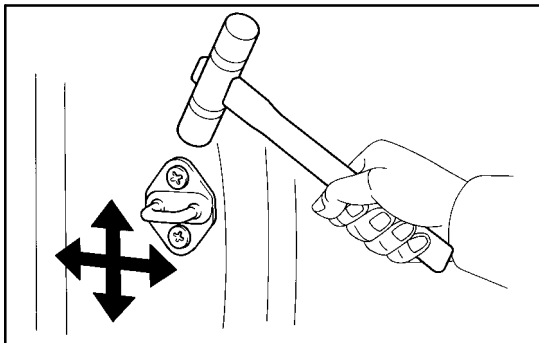
Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)



2. ADJUST DOOR IN LEFT /RIGHT AND VERTICAL DIRECTIONS

Adjust the door by loosening the door side hinge bolts.

Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)



3. ADJUST DOOR LOCK STRIKER

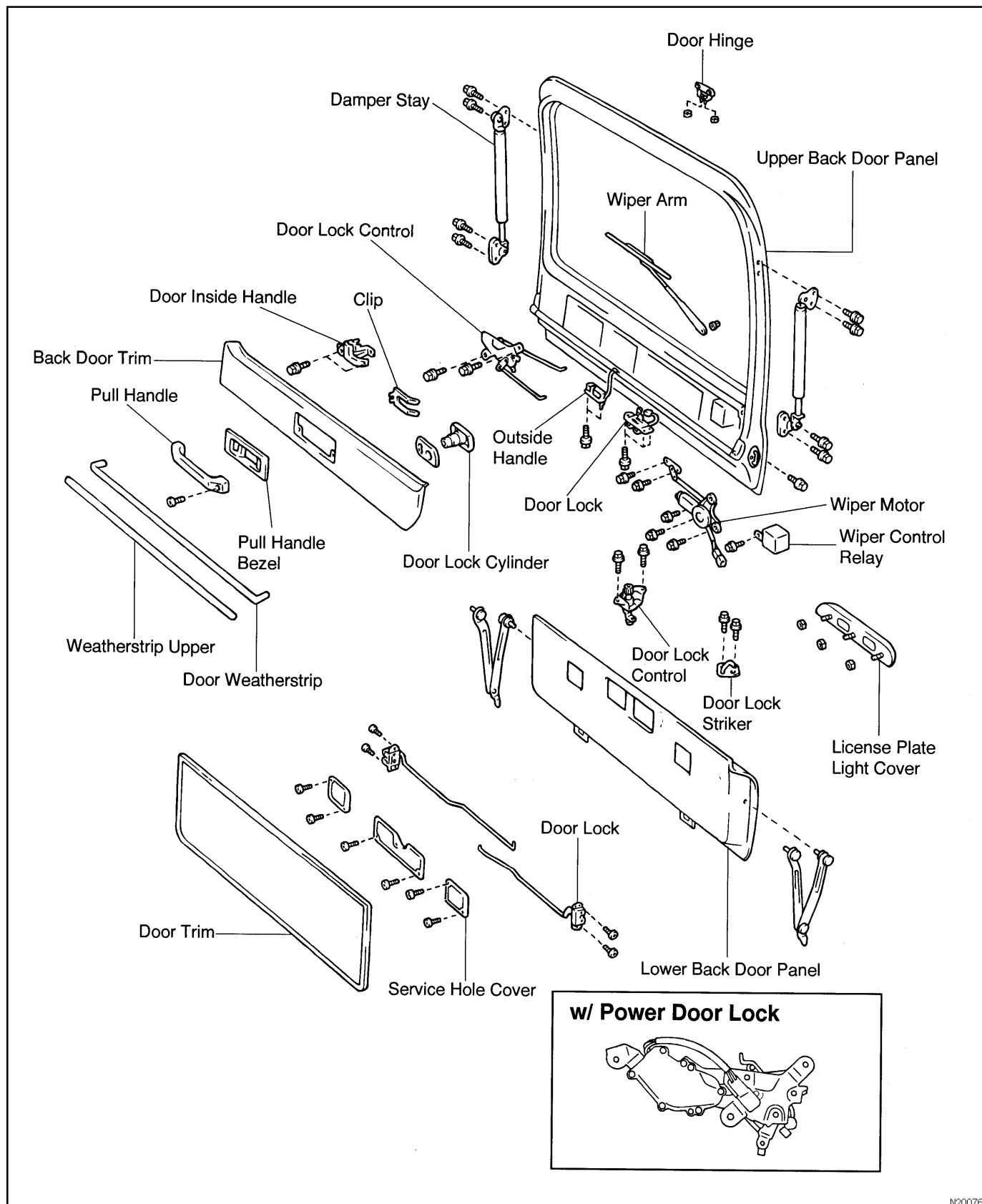
- Check that the door fit and door lock linkages are adjusted correctly.
- Loosen the striker mounting screws to adjust.
- Using a plastic hammer, tap the striker to adjust it.

REASSEMBLY

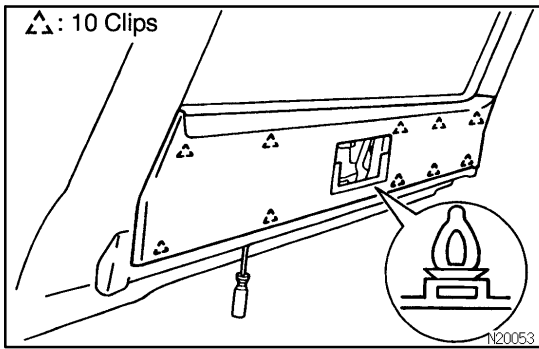
Reassembly is in the reverse order of disassembly (See page [BO-15](#)).

BACK DOOR COMPONENTS

B037V-01



N20076



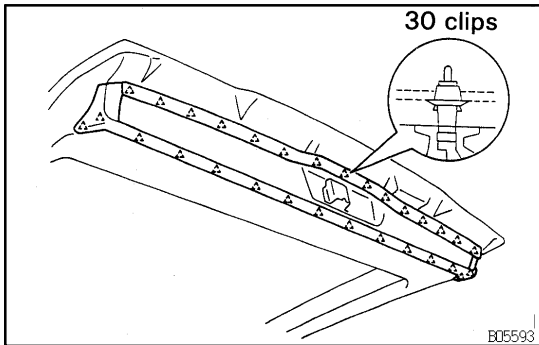
DISASSEMBLY

HINT:

Tape the screwdriver tip before using to pry parts.

1. REMOVE UPPER BACK DOOR

- (a) Remove the pull handle and pull handle bezel.
- (b) Remove the back door trim.
 - (1) Insert a screwdriver, between the retainers and trim to pry it loose.
 - (2) Remove the back door trim.



- (c) Remove the door weatherstrip.

NOTICE:

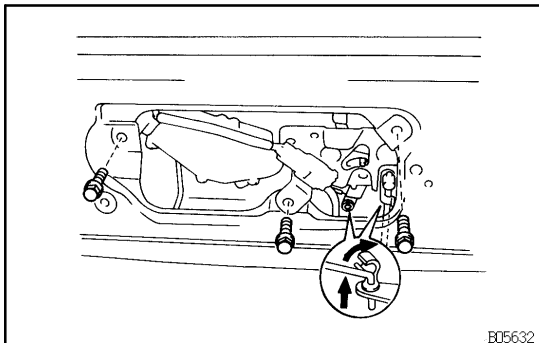
Do not pull strongly on the weatherstrip as it may tear.

- (d) Remove the weatherstrip upper.

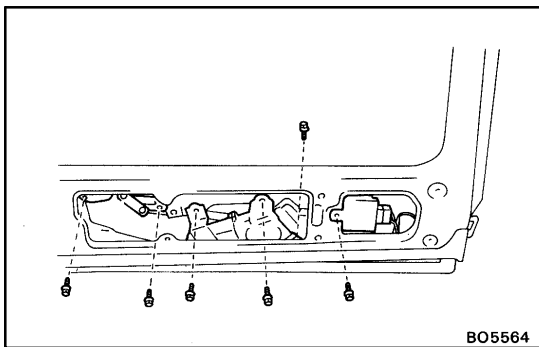
NOTICE:

Do not pull strongly off the weatherstrip as it may tear.

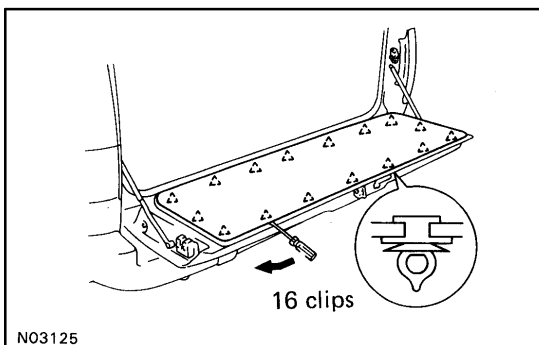
- (e) Remove the door inside handle.



- (f) Remove the door lock control.
- (g) Remove the outside handle.
- (h) Remove the door lock cylinder.
- (i) Remove the wiper arm.



- (j) Remove the wiper motor.
- (k) Remove the wiper control relay.
- (l) Remove the door lock.
- (m) Remove the damper stay.

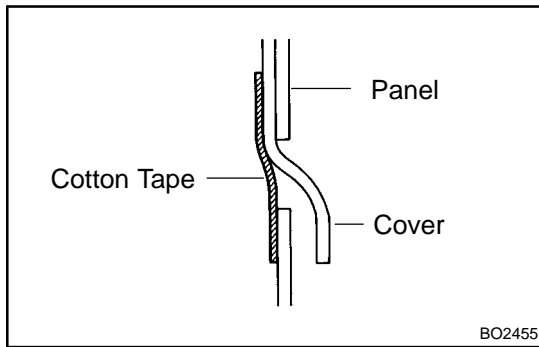


2. REMOVE LOWER BACK DOOR

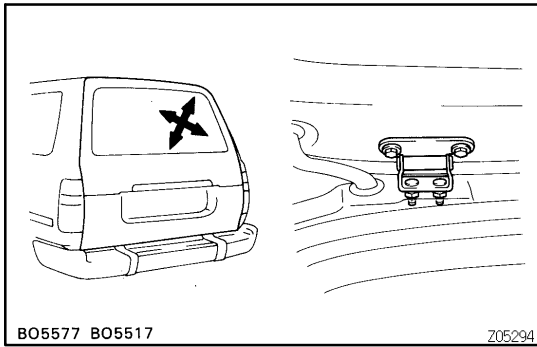
- (a) Remove the door trim.
 - (1) Insert a screwdriver, between the retainers and door trim to pry it loose.
 - (2) Remove the door trim.

BO-22

BODY - BACK DOOR



- (b) Remove the service hole cover.
- (c) Remove the door lock control.
- (d) Remove the door lock.
- (e) Remove the license plate light cover.

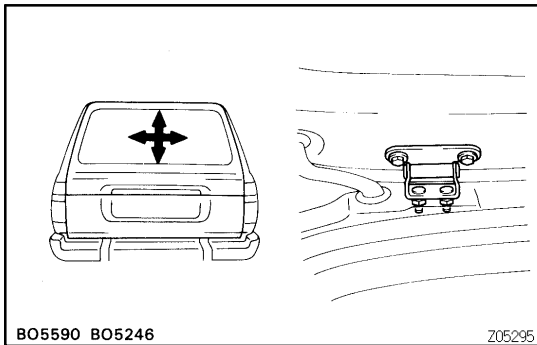


ADJUSTMENT

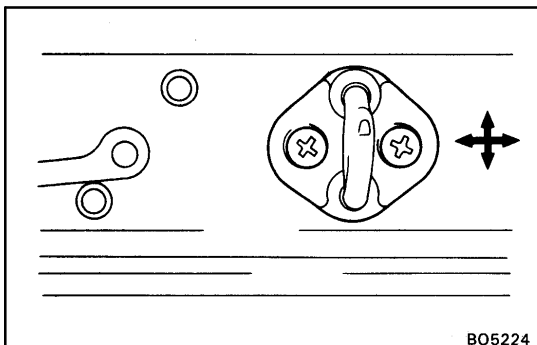
1. ADJUST UPPER BACK DOOR

- (a) Adjust the door in forward/rearward and left/right directions.

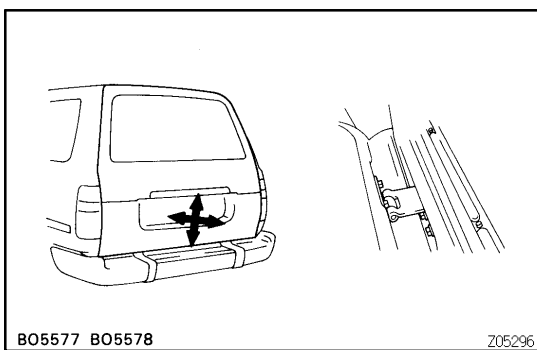
Adjust the door by loosening the door side hinge bolts.



- (b) Adjust the door in left/right and vertical directions.
Adjust the door by loosening the body side hinge bolts.



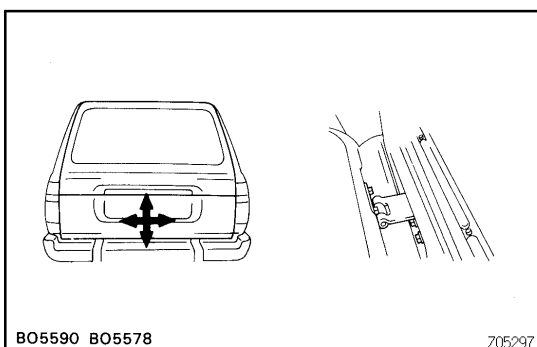
- (c) Adjust the door lock striker.
- (1) Check that the door fit and door lock linkage are adjusted correctly.
 - (2) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer. Tighten the striker mounting screw again.



2. ADJUST LOWER BACK DOOR

- (a) Adjust the door in forward/rearward and left/right directions.

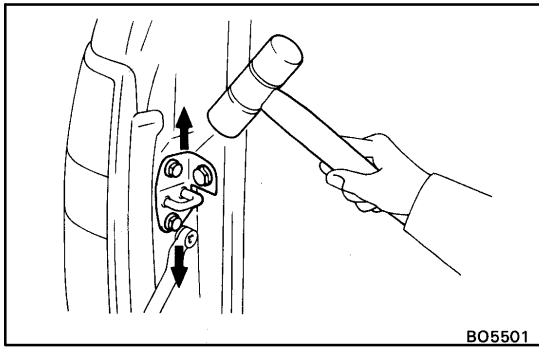
Adjust the door by loosening the door side hinge bolts.



- (b) Adjust the door in left/right and vertical directions.
Adjust the door by loosening the body side hinge bolts.

BO-24

BODY – BACK DOOR



- (c) Adjust the door lock striker.
- (1) Check that the door fit and door lock linkages are adjusted correctly.
 - (2) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.
 - (3) Tighten the striker mounting screws again.

REASSEMBLY

Reassembly is in the reverse order of disassembly(See page [BO-21](#)).

BACK DOOR STAY REPLACEMENT

B037Z-01

1. REMOVE DAMPER STAY FROM BACK DOOR

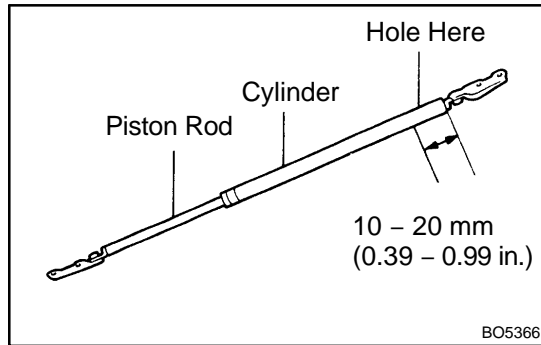
Remove the 2 bolts and support from the hood.

HINT:

While supporting the hood with your hand, remove the hood.

2. REMOVE DAMPER STAY FROM BODY

Remove the 2 bolts and support.



3. REPLACE DAMPER STAY

NOTICE:

- Do not disassemble the damper stay because the cylinder is filled with pressurized gas.
- If the damper stay is to be replaced, drill a 2.0 – 3.0 mm (0.079 – 0.118 in.) hole in the area shown in the illustration 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 stay 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 stay fully extended.

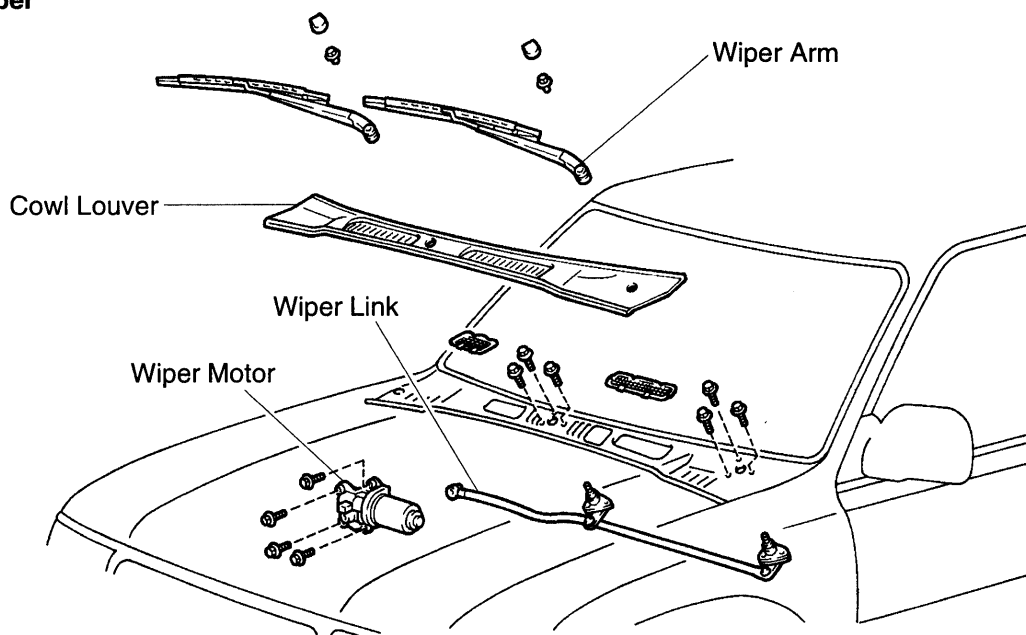
4. INSTALL DAMPER STAY

Install the damper stay.

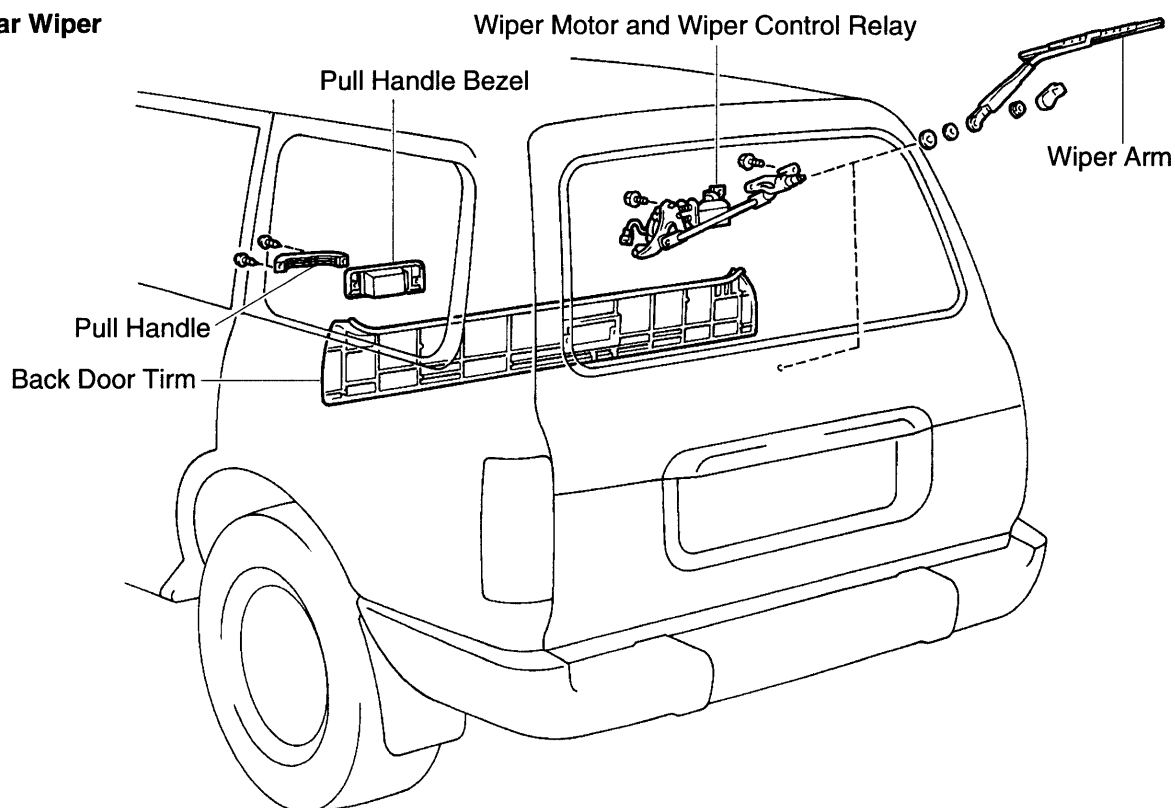
FRONT WIPER AND WASHER COMPONENTS

BO380-01

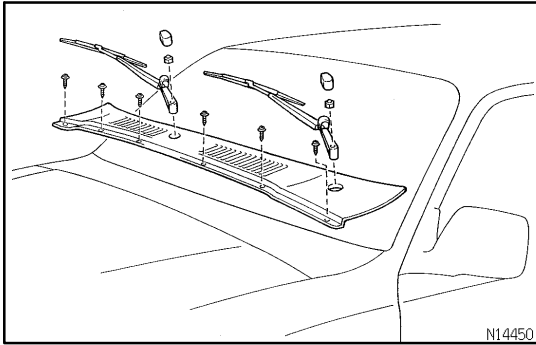
Front Wiper



Rear Wiper

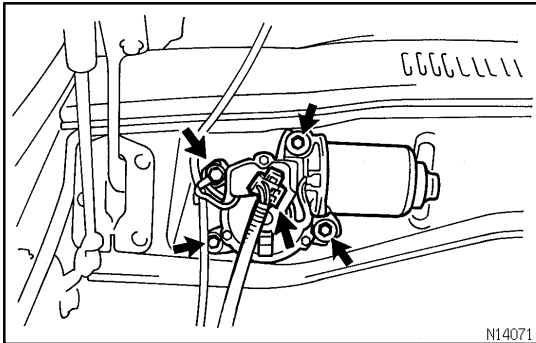


N16054



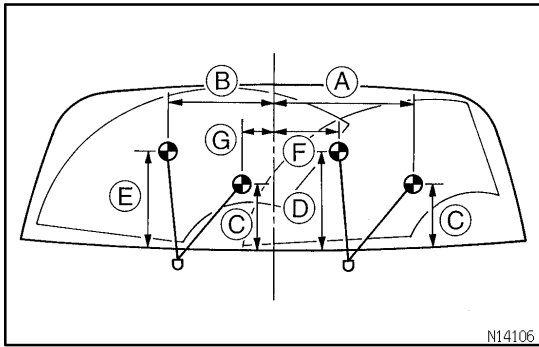
REMOVAL

1. REMOVE WIPER ARMS
2. REMOVE COWL LOUVER



3. REMOVE WIPER MOTOR AND WIPER LINK

- (a) Disconnect the connector, then unfasten 4 bolts and wiper motor.
- (b) Remove the wiper link.



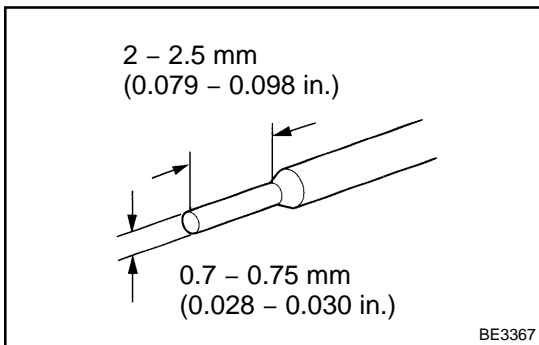
INSPECTION

1. INSPECT FRONT WASHER NOZZLE

- (a) While operating the washer, check that both the point where the washer fluid from the upper nozzles hits the windshield, and the upsurge area, are within the range indicated by the arrow.

A	Approx. 460 mm (18.1 in.)
B	Approx. 300 mm (11.8 in.)
C	Approx. 250 mm (9.84 in.)
D	Approx. 400 mm (15.7 in.)
E	Approx. 410 mm (16.1 in.)
F	Approx. 220 mm (8.66 in.)
G	Approx. 60 mm (2.36 in.)

- (b) Check if the lower point where the washer fluid hits the windshield is within the range of the wiping pattern (the area of the glass which is wiped by the wiper blades).

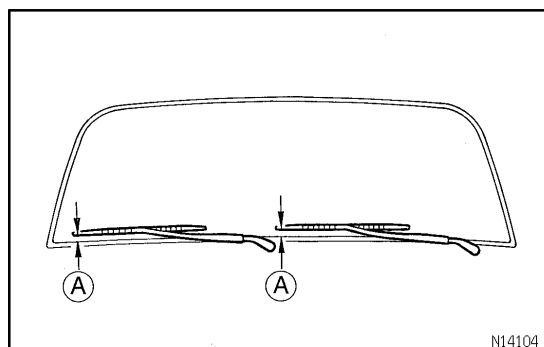


2. ADJUST FRONT WASHER NOZZLE

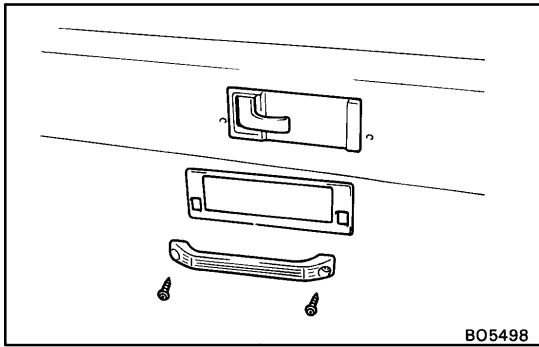
Using a tool like that shown in the illustration, change the direction of the nozzle hole to adjust the point where washer fluid strikes the windshield.

INSTALLATION

1. **INSTALL WIPER LINK**
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
2. **INSTALL WIPER MOTOR**
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
3. **INSTALL COWL LOUVER**



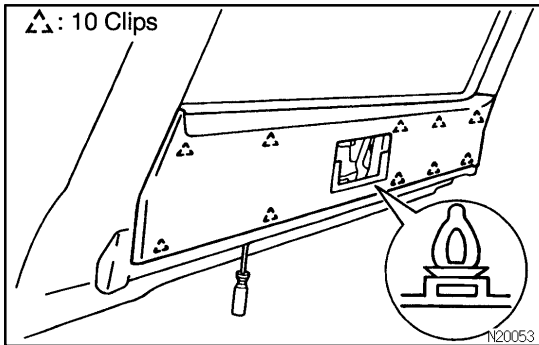
4. **INSTALL FRONT WIPER ARM**
 - (a) Install the wiper arms and operate the wipers once and turn the wiper switch OFF.
 - (b) Adjust the installation positions of the wiper arms to the positions as shown in the illustration.
A: Approx. 25 mm (0.98 in.)
 - (c) Tighten the nuts.
Torque: 20 N·m (210 kgf·cm, 15 ft-lbf)



REAR WIPER AND WASHER REMOVAL

BO385-01

1. REMOVE PULL HANDLE AND PULL HANDLE BEZEL



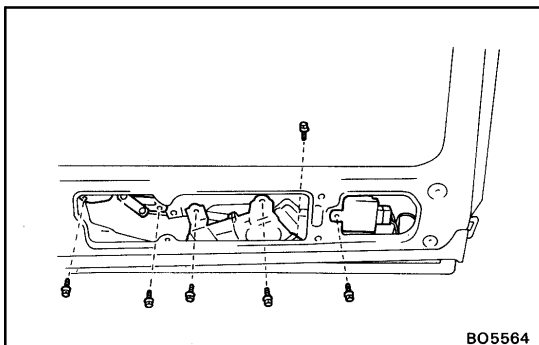
2. REMOVE BACK DOOR TRIM

- (a) Insert a screwdriver between the retainers and door trim to pry it loose.

HINT:

Tape the screwdriver tip before use.

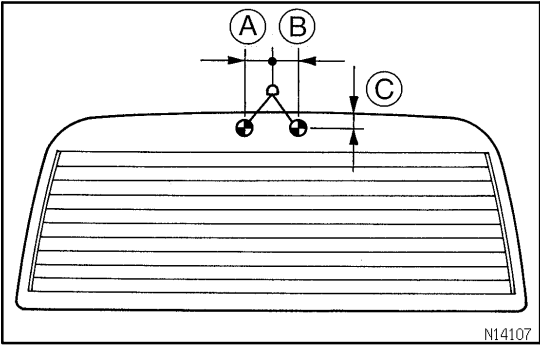
- (b) Remove the back door trim.



3. REMOVE WIPER ARM, MOTOR AND REAR WIPER CONTROL RELAY

- (a) Open the cap.
- (b) Remove the nut and wiper arm.
- (c) Remove the 5 bolts and motor, then disconnect the connector.
- (d) Remove the bolts and rear wiper control relay, then disconnect the connector.

4. ADJUST REAR WASHER NOZZLE



INSPECTION

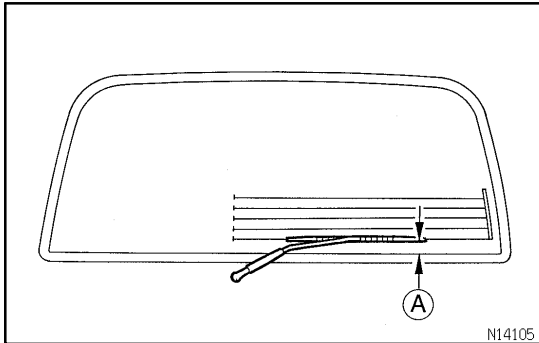
INSPECT REAR WASHER NOZZLE

While operating the washer, check whether the point where the washer fluid hits the back door glass and the upsurge area are within the range indicated by the hatched line.

A	Approx. 120 mm (4.72 in.)
B	Approx. 120 mm (4.72 in.)
C	Approx. 90 mm (3.54 in.)

INSTALLATION

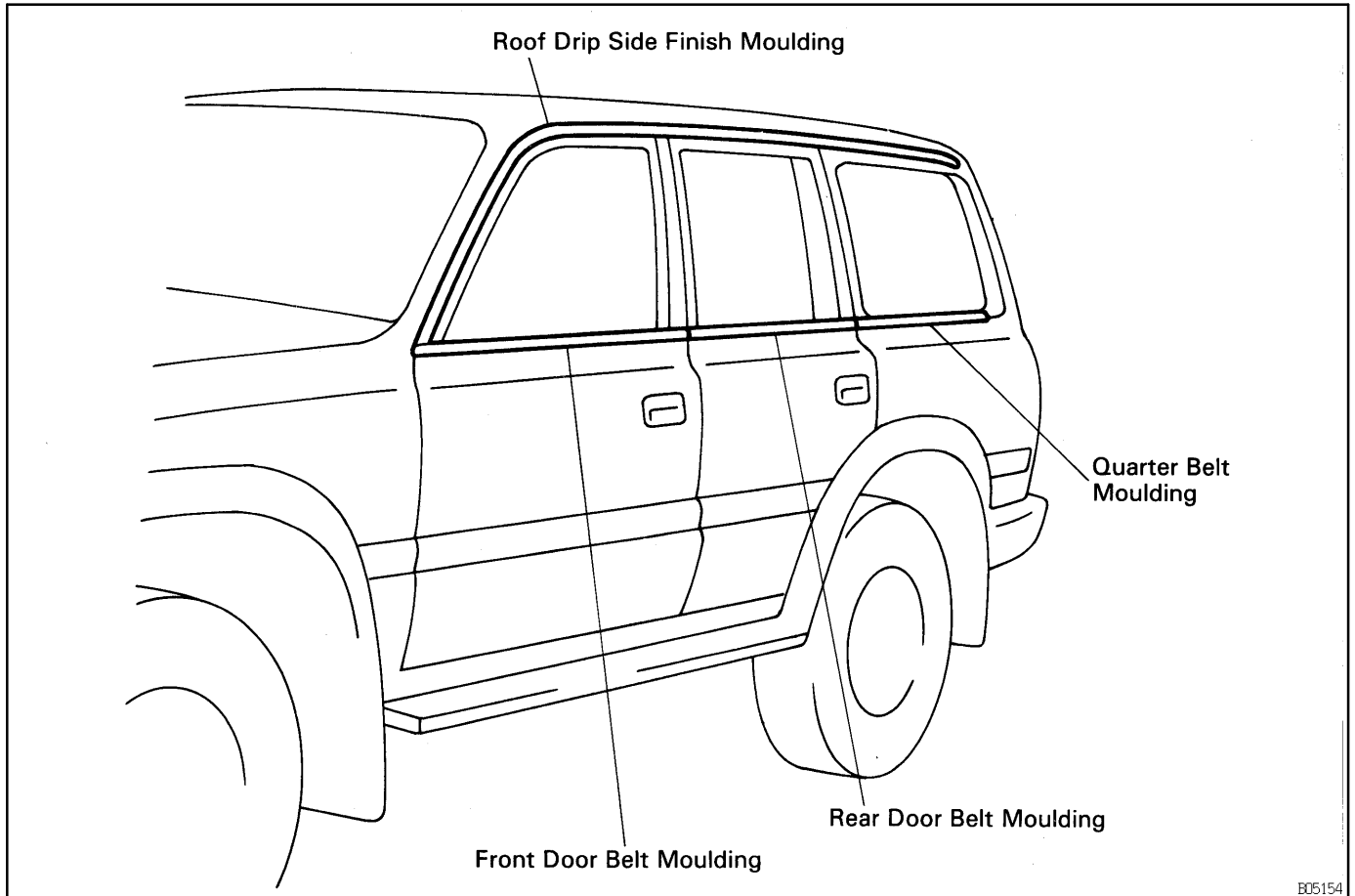
1. INSTALL WIPER CONTROL RELAY
2. INSTALL WIPER MOTOR
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)
3. INSTALL BACK DOOR TRIM
4. INSTALL PULL HANDLE BEZEL
5. INSTALL PULL HANDLE

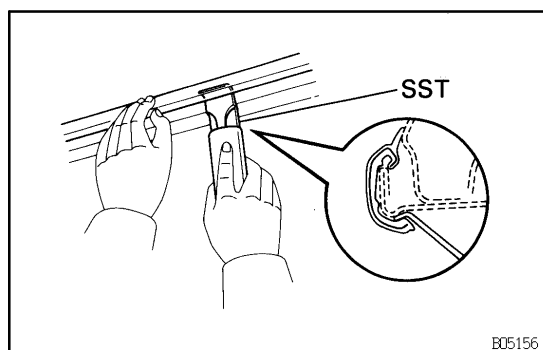


6. **INSTALL REAR WIPER ARM**
 - (a) Install the wiper arm and operate the wipers once and turn the wiper switch OFF.
 - (b) Adjust the installation positions of the wiper arm to the positions shown in the illustration.
A: Approx. 40 mm (1.57 in.)
 - (c) Tighten the nut.
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

BODY OUTSIDE MOULDING COMPONENTS

BO48L-01





REMOVAL

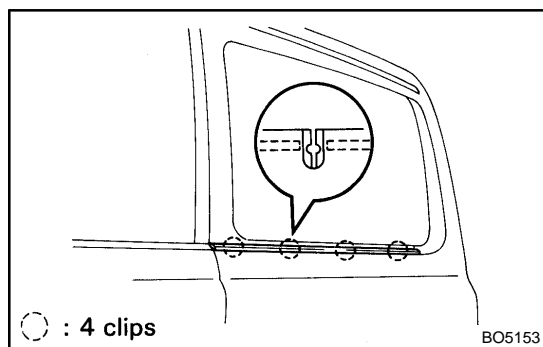
1. REMOVE ROOF DRIP MOULDING

Using SST, pull off the roof drip moulding from front ends.

SST 09806-30010

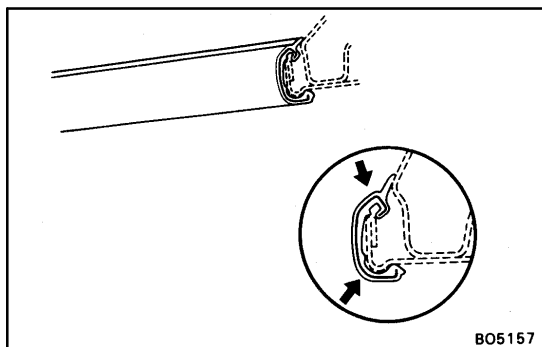
2. REMOVE FRONT DOOR BELT MOULDING (See page [BO-9](#))

3. REMOVE REAR DOOR BELT MOULDING (See page [BO-15](#))



4. REMOVE QUARTER BELT MOULDING

Pry out the clips from the edge of the panel, and remove the moulding.



INSTALLATION

1. INSTALL ROOF DRIP MOULDING

Attach the upper edge of the moulding to the body flange. Tap on the moulding by hand.

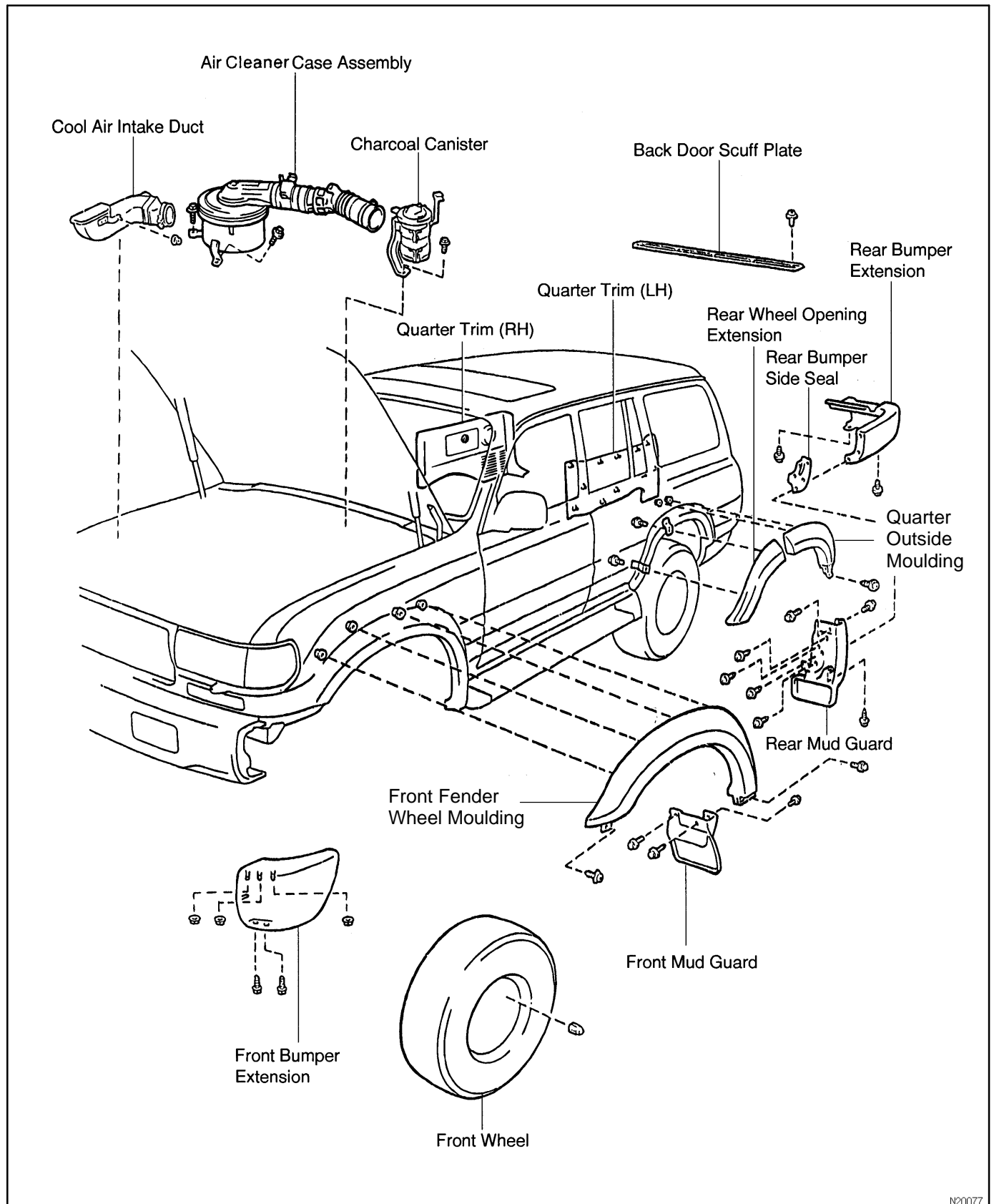
2. INSTALL FRONT DOOR BELT MOULDING

3. INSTALL REAR DOOR BELT MOULDING

4. INSTALL QUARTER BELT MOULDING

WHEEL OPENING MOULDING COMPONENTS

BO480-01

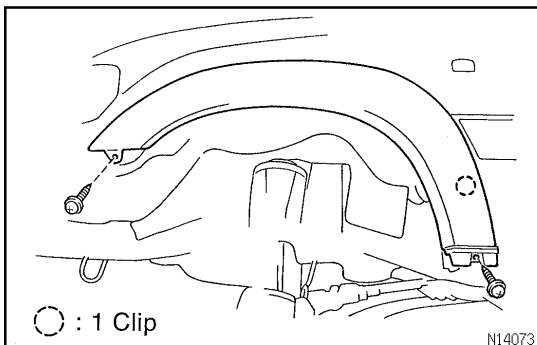
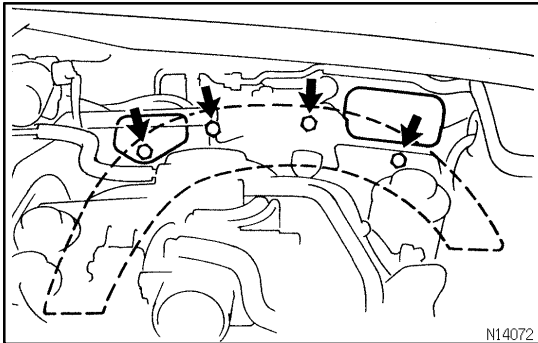


N20077

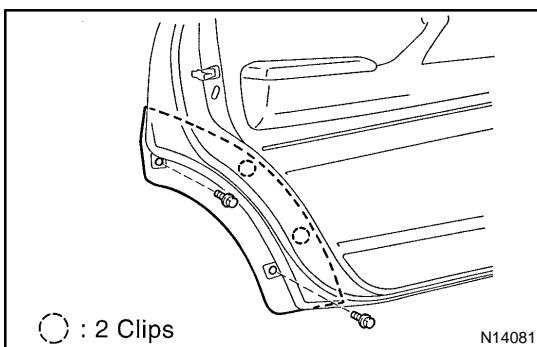
REMOVAL

1. REMOVE FRONT FENDER WHEEL OPENING MOULDING

- (a) Remove the charcoal canister.
- (b) Remove the air cleaner case assembly.
- (c) Remove the cool air intake duct.
- (d) Remove the front wheel.
- (e) Remove the front mudguard.
- (f) Remove the front bumper extension.
- (g) Remove the 4 nuts from engine room inside service hole.

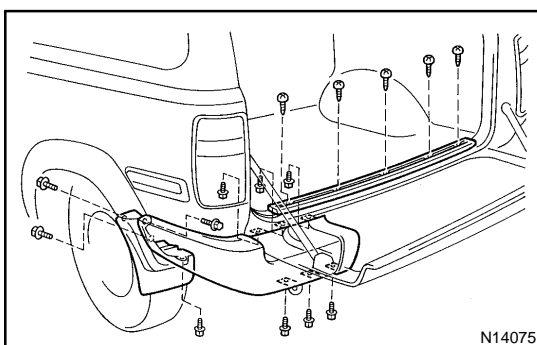


- (h) Remove the 2 screws.
- (i) Remove the front wheel opening extension.



2. REAR DOOR SIDE: REMOVE REAR WHEEL OPENING MOULDING

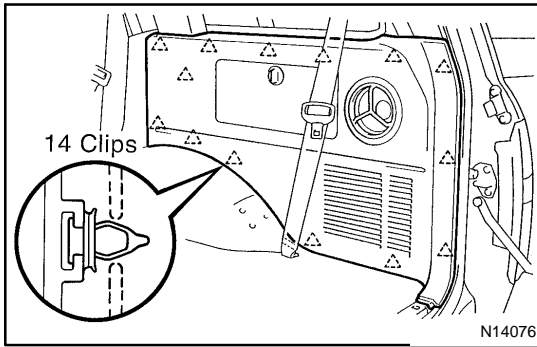
Remove the 2 bolts and moulding.



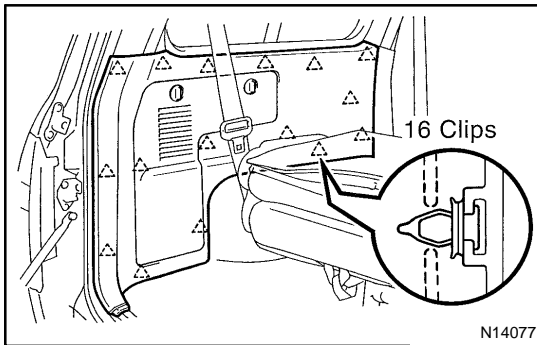
3. REMOVE REAR WHEEL OPENING MOULDING

- (a) Remove the mud guard, bumper extension and back door scuff plate.

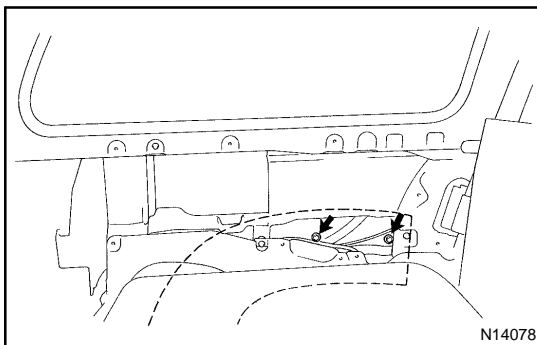
BODY - WHEEL OPENING MOULDING



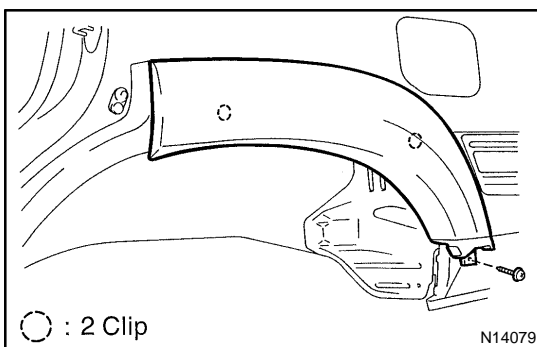
(b) Remove the quarter trim RH.



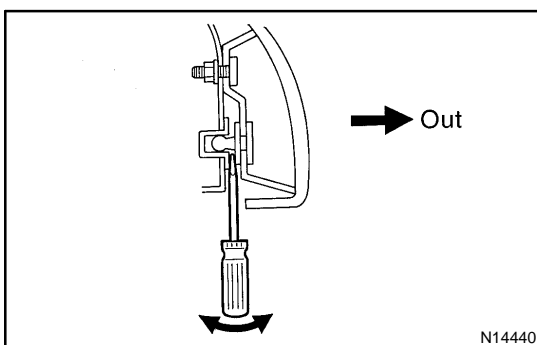
(c) Remove the quarter trim LH.

**4. REMOVE QUARTER OUTSIDE MOULDING**

(a) Remove the 2 nuts.



(b) Remove the screw.

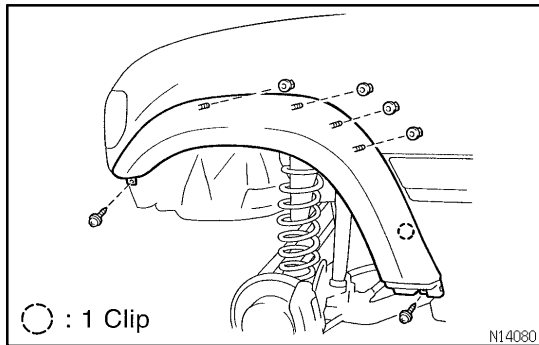


(c) Using a screwdriver, pry out the rearwheel moulding.

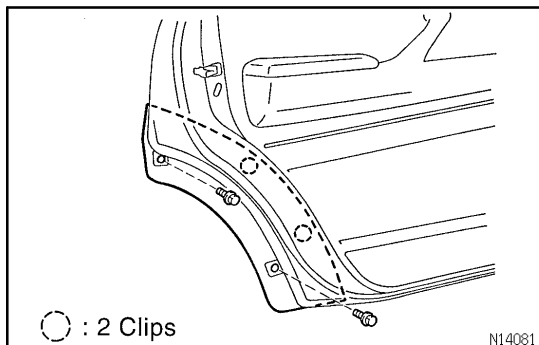
INSTALLATION

1. INSTALL FRONT WHEEL OPENING MOULDING

- (a) Install the front wheel opening moulding.

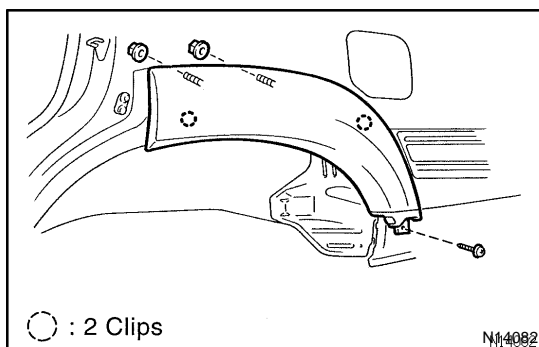


- (b) Install the 4 nuts from the service hole of the engine room inside.
- (c) Install the 2 screws.
- (d) Front bumper extension
- (e) Front mudguard
- (f) Front wheel
- (g) Cool air intake duct
- (h) Air cleaner case assembly
- (i) Charcoal canister



2. INSTALL QUARTER OUTSIDE MOULDING

Install the quarter outside moulding with the 2 bolts.

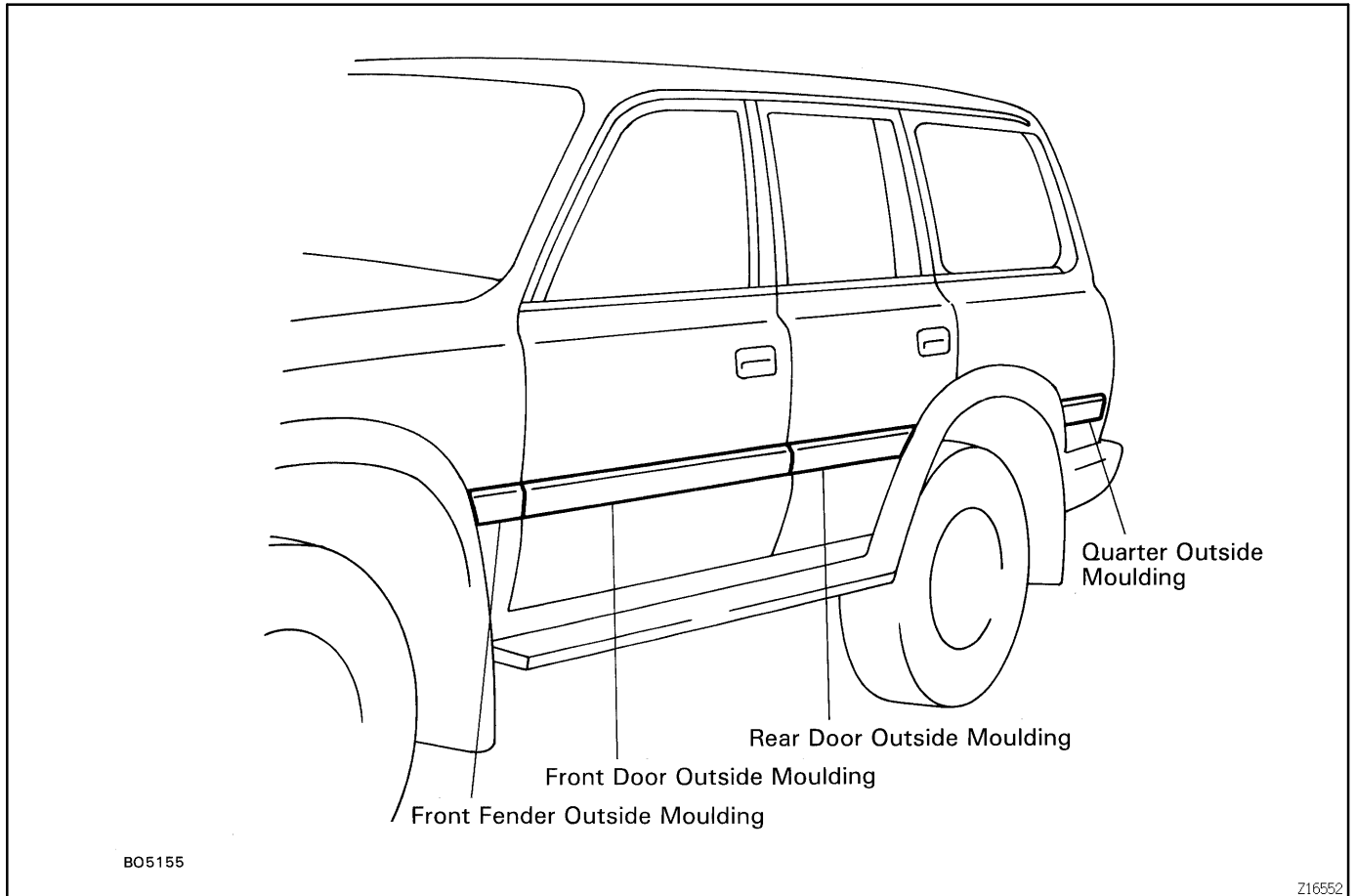


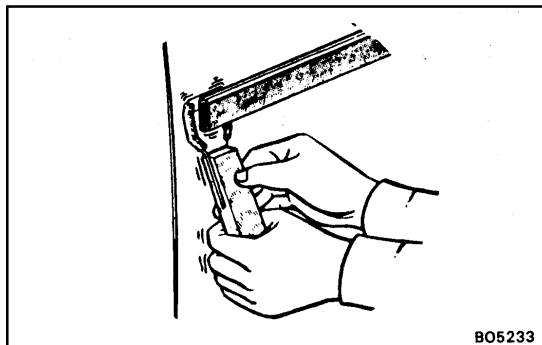
3. INSTALL REAR WHEEL OPENING MOULDING

- (a) Install the rear wheel opening moulding with the 2 nuts.
- (b) Install the screw.
- (c) Install the quarter trim LH.
- (d) Install the quarter trim RH.
- (e) Install the back door scuff plate.
- (f) Install the rear bumper extension.
- (g) Install the rear mudguard.

SIDE PROTECTION MOULDING COMPONENTS

BO38H-01





BO5233

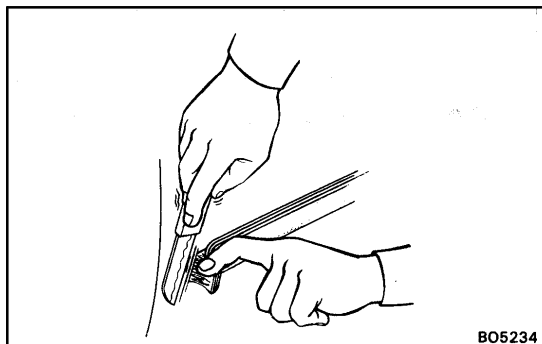
REMOVAL

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.



BO5234

2. REMOVE MOULDING AND ADHESIVE

- Pull off the moulding by cutting the adhesive with a knife.
- Scrape off adhesive from the body with a cutter or sandpaper.

NOTICE:

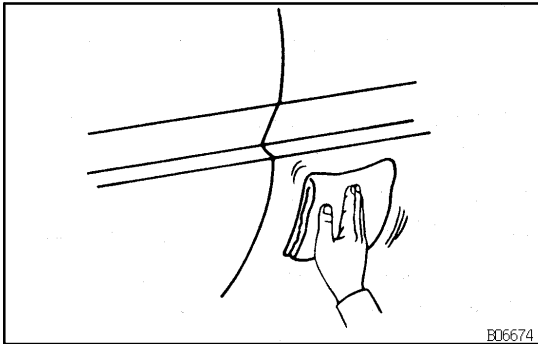
Remember that 30–80 mm (1.18–3.15 in.) of the ends of the moulding are glued tightly with a strong adhesive. Do not reuse moulding.

INSTALLATION

HINT:

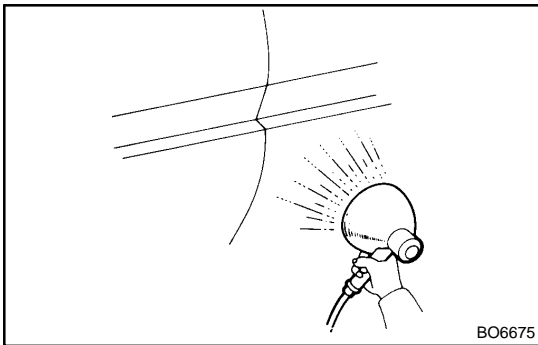
Precautions for storing moulding materials:

- Store in 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 solvent, open flame, or boiling water.
- The storage time for the moulding and adhesive are limited to about 9 months.



1. CLEAN MOULDING MOUNTING SURFACE

Wipe off stains with cleaner.

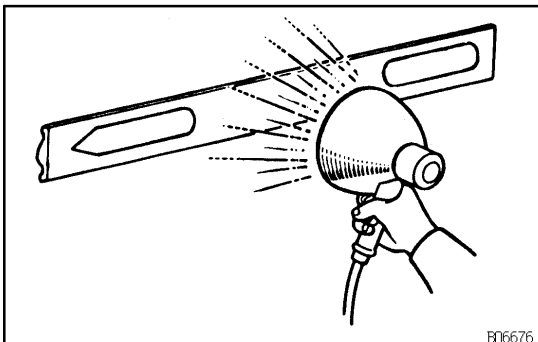


2. HEAT BODY MOUNTING SURFACE

Using a heat light, heat the body mounting surface to 30–50 °C (86–122 °F).

NOTICE:

When the moulding is installed, the temperature of the mounting surface should be 20 °C (68 °F) or higher.



3. HEAT MOULDING

- (a) Using a heat light, heat the moulding to 30–60 °C (86–140 °F).

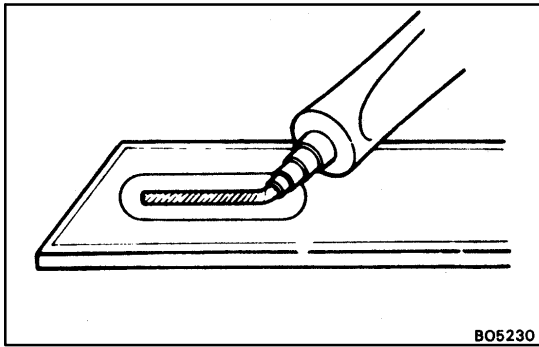
NOTICE:

Do not heat the moulding excessively.

- (b) The temperature should not be higher than 80 °C (176 °F).

BO-44

BODY - SIDE PROTECTION MOULDING



BO5230

4. APPLY ADHESIVE TO MOULDING

Apply adhesive to both punched out ends of the moulding.

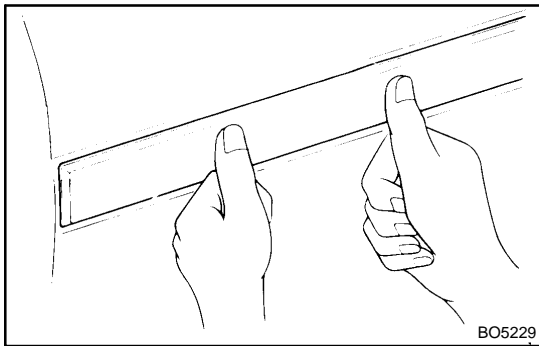
NOTICE:

Install the moulding within 7 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 uncovered area.



BO5229

6. INSTALL MOULDING

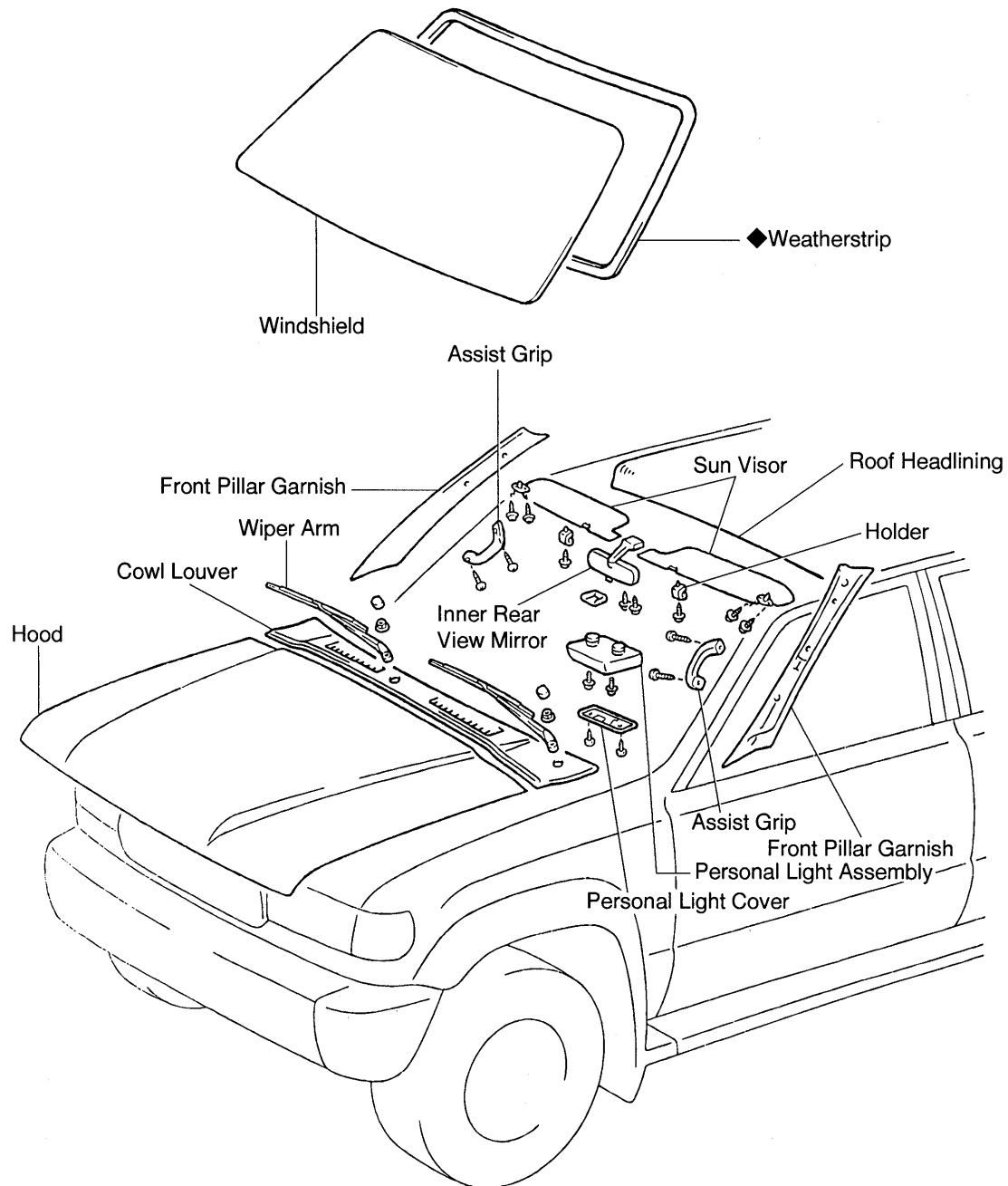
Push the moulding to the body, as shown in the illustration.

NOTICE:

- Be sure that the body and moulding are heated to the proper temperature.
- Do not depress the adhesive-coated parts excessively but 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.

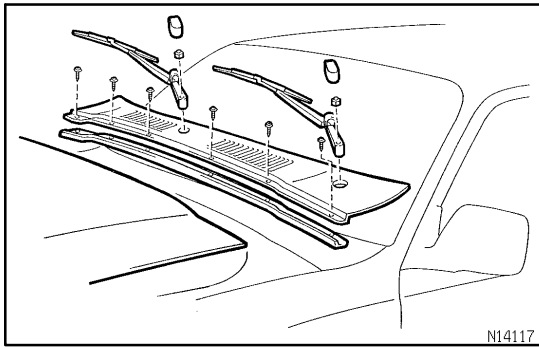
WINDSHIELD COMPONENTS

BO38P-01



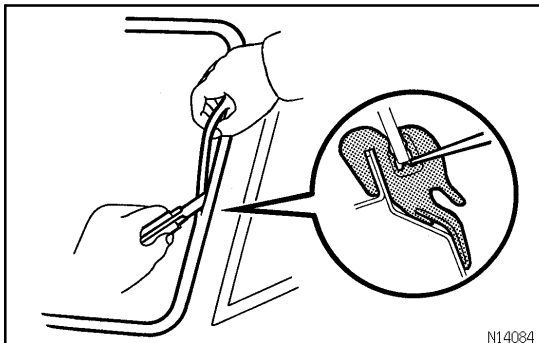
◆Non-reusable part

N20055



REMOVAL

1. REMOVE HOOD
2. REMOVE WIPER ARMS
3. REMOVE COWL LOUVER
4. REMOVE INNER REAR VIEW MIRROR
5. REMOVE PERSONAL LIGHT ASSEMBLY
6. REMOVE PERSONAL LIGHT COVER
7. REMOVE SUN VISORS AND HOLDERS
8. REMOVE ASSIST GRIPS
9. REMOVE FRONT PILLAR GARNISHES
10. LOOSEN ROOF HEADLINING



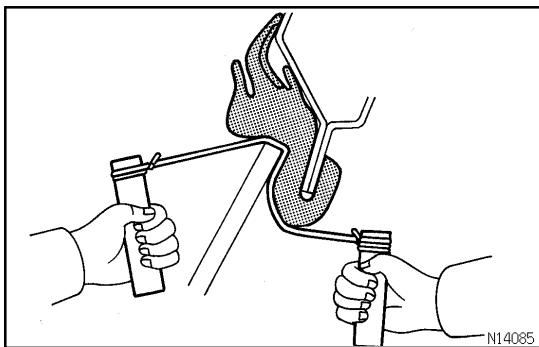
11. REMOVE WINDSHIELD GLASS

- (a) From the outside of the vehicle , cut off the weatherstrip.

NOTICE:

Do not damage the body and the glass.

- (b) Push piano wire through between the body and glass from the interior.

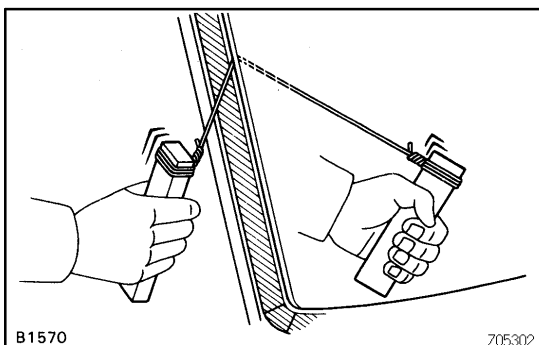


- (c) Tie both wire ends to the wooden blocks or equivalent.

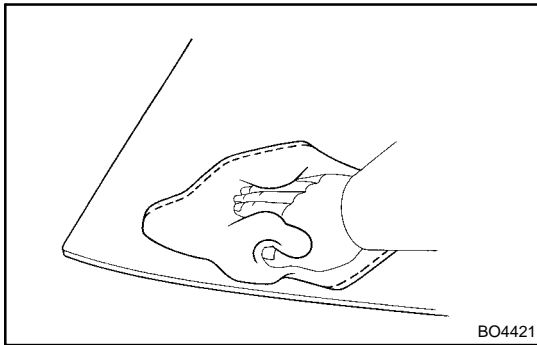
NOTICE:

When separating, take care not to damage the paint or interior ornaments.

To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.



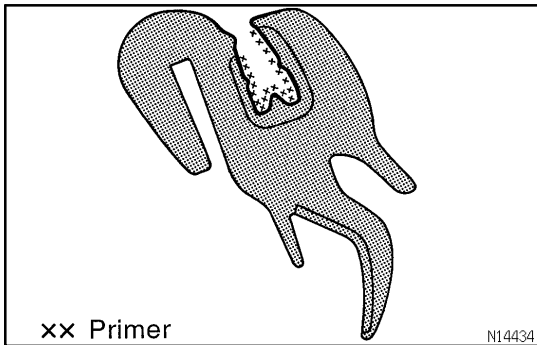
- (d) Cut the adhesive by pulling the piano wire around it.
(e) Remove the glass.



INSTALLATION

1. CLEAN BODY AND GLASS

Using a cleaner, clean the weatherstrip contacting surface of the body and the glass.



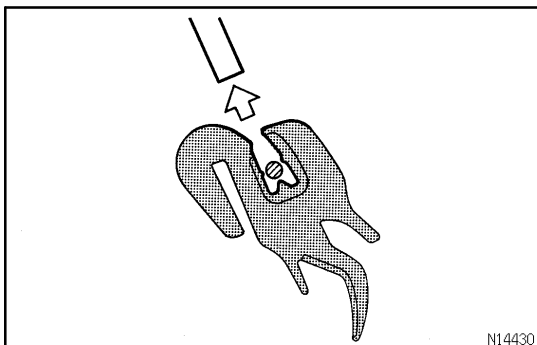
2. INSTALL WEATHERSTRIP

- (a) Apply primer to the weatherstrip on the contact surface with glass as shown in the illustration.

PRIMER: Sunstar-9002 T or equivalent

NOTICE:

Let the primer coating dry for 3 minutes or more.

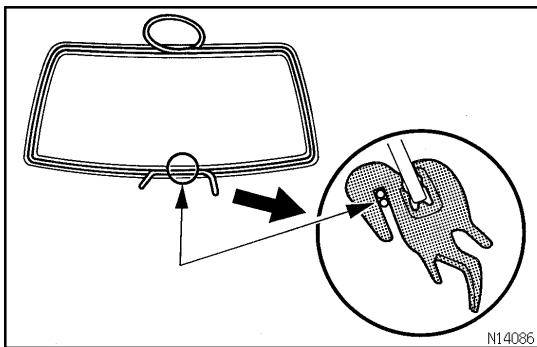


- (b) Cut off the tip of the cartridge nozzle. Fill the cartridge with adhesive.

- (c) Apply adhesive to the weatherstrip on the glass edge retaining surface as shown in the illustration.

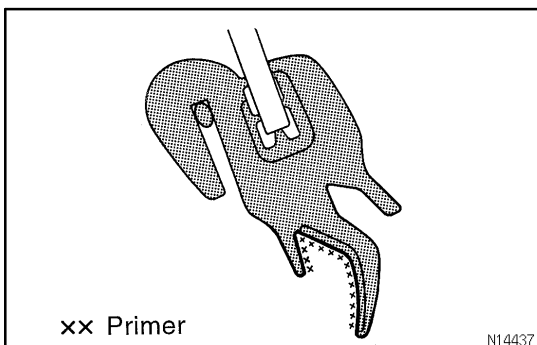
ADHESIVE: Sikaflex-256 HV or equivalent

- (d) Install the weatherstrip to the glass.
(e) Clean the weatherstrip.



3. INSTALL GLASS

- (a) Apply a working cord along the weatherstrip groove, as shown in the illustration.

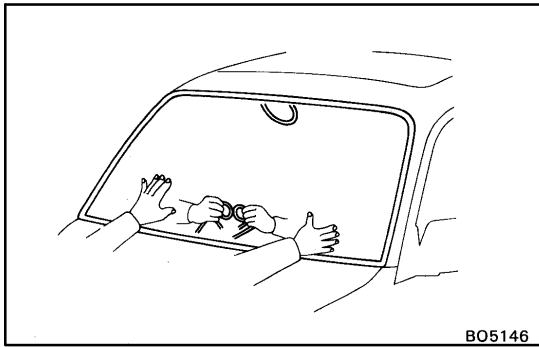


- (b) Apply primer to the weatherstrip on the surface with body as shown in the illustration.

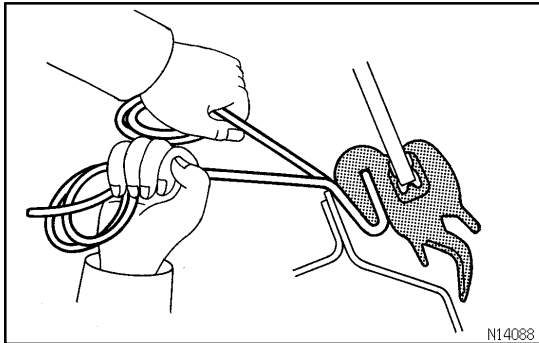
PRIMER: Sunstar-9002 T or equivalent

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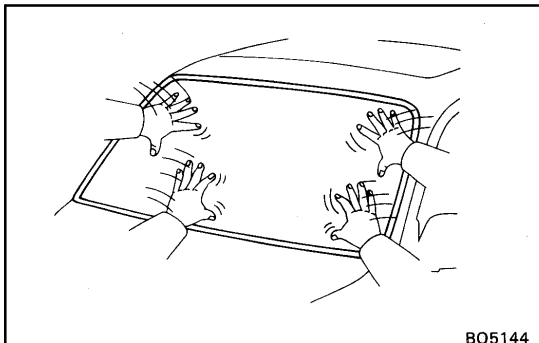
BODY - WINDSHIELD



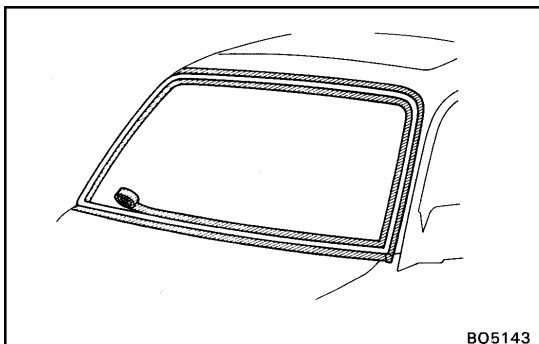
- (c) Begin installation in the middle of the lower part of the glass.
- (d) Hold the glass in position on the body.



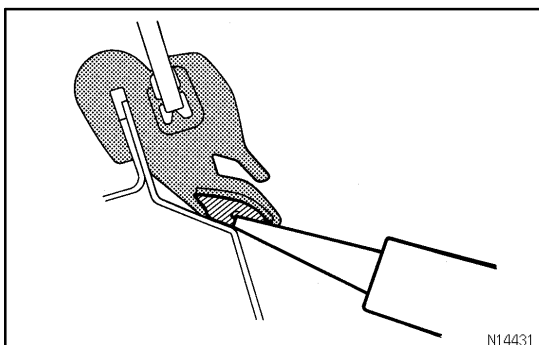
- (e) From the inside, pull off one cord at an angle so it pulls the lip over the flange. From the outside, press the glass along the weatherstrip until the glass is installed.



- (f) To make the glass fit snugly, tap from the outside with your open hand.

**4. APPLY ADHESIVE**

- (a) Put masking tape around the weatherstrip to protect the paint and the glass.



- (b) Cut off the tip of the cartridge nozzle. Fill the cartridge with adhesive.
- (c) Lift the lip of the weatherstrip (with hand) and fill adhesive into the clearance.

ADHESIVE: Sikaflex-256HV or equivalent**5. CLEANING SEALER SURFACE**

- (a) Apply auto glass sealer dry, remove the masking tape.

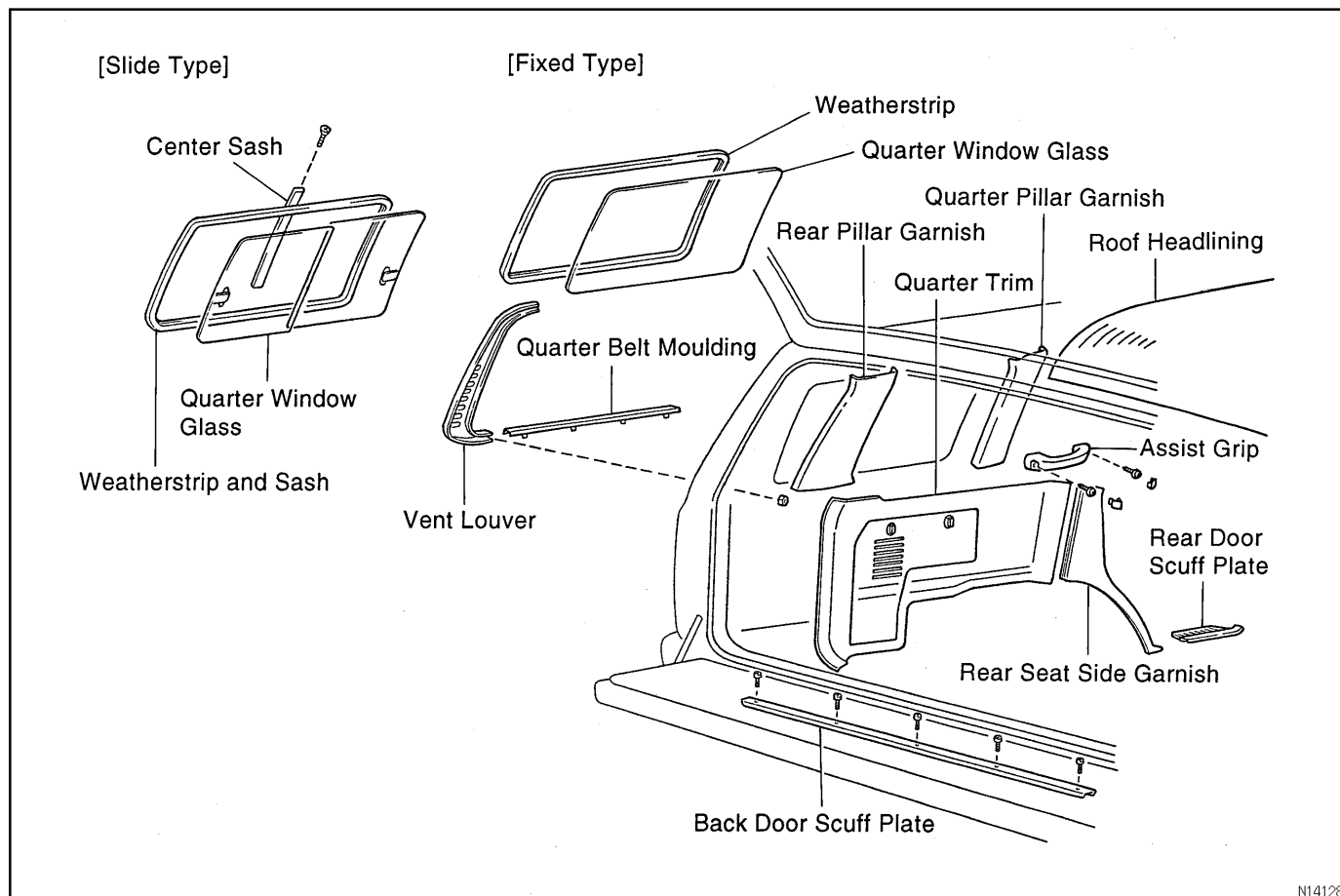
HINT:

The auto glass sealer will harden in about 15 hours.

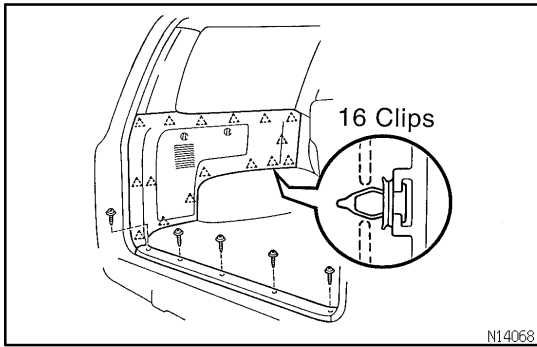
- (b) Clean off the sealer oozing out from the masking tape with a clean rag saturated in cleaner.
- 6. INSPECT FOR LEAKS AND REPAIR**
 - (a) Do a leak test.
 - (b) Seal any leaks with auto glass sealer.
Part No. 08833-00030 or equivalent
- 7. INSTALL ROOF HEADLINING**
- 8. INSTALL FRONT PILLAR GARNISHES**
- 9. INSTALL ASSIST GRIPS**
- 10. INSTALL SUN VISORS AND HOLDERS**
- 11. INSTALL PERSONAL LIGHT COVER**
- 12. INSTALL PERSONAL LIGHT ASSEMBLY**
- 13. INSTALL INNER REAR VIEW MIRROR**
- 14. INSTALL COWL LOUVER**
- 15. INSTALL WIPER ARMS**
Torque: 20 N·m(205 kgf·cm, 15 ft·lbf)
- 16. INSTALL HOOD**
Torque: 18 N·m(185 kgf·cm, 13 ft·lbf)
- 17. ADJUST HOOD (See page [BO-6](#))**

QUARTER WINDOW GLASS COMPONENTS

BO38S-01

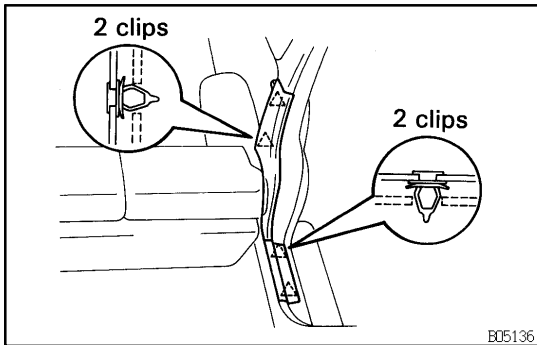


N14128

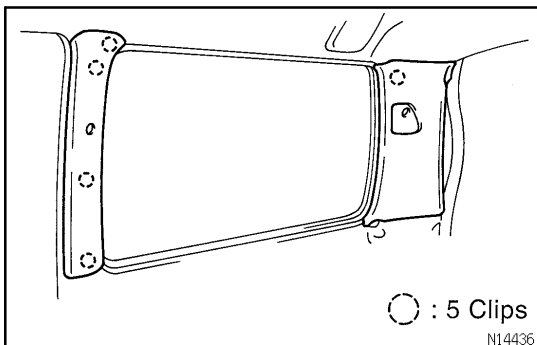


REMOVAL

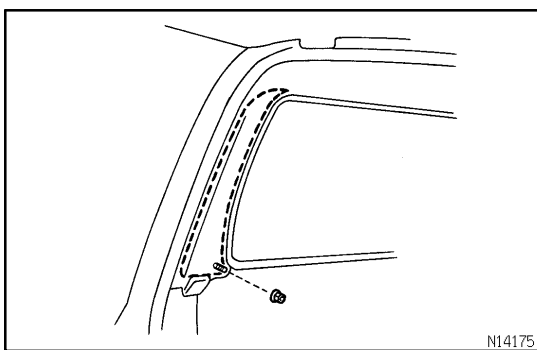
1. w/ No. 2 rear seat:
NO. 2 REAR SEAT
2. **REMOVE BACK DOOR SCUFF PLATE**
3. **REMOVE QUARTER TRIM**



4. **REMOVE REAR SEAT SIDE GARNISH**
5. **REMOVE REAR DOOR SCUFF PLATE**

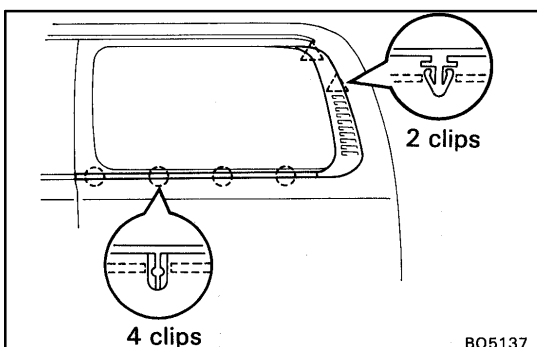


6. **REMOVE QUARTER PILLAR GARNISH**
7. **REMOVE REAR PILLAR GARNISH**
8. **REMOVE ASSIST GRIPS**
9. **LOOSEN ROOF HEADLINING**



10. REMOVE VENT LOUVER AND QUARTER BELT MOULDING

- (a) Remove the nut from the vent louver.

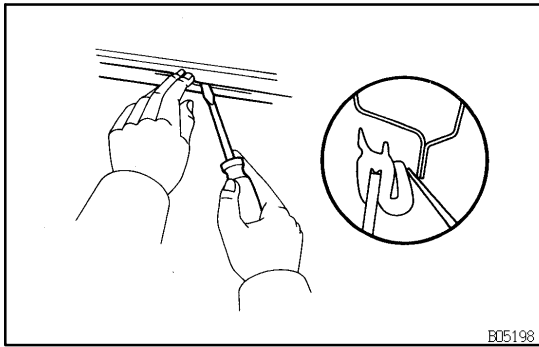


- (b) Insert a screwdriver between the retainers and body to pry it loose.

HINT:

Tape the screwdriver tip before use.

- (c) Pull out the vent louver.
- (d) Pull out the clips from the edge of the panel, and remove the moulding.



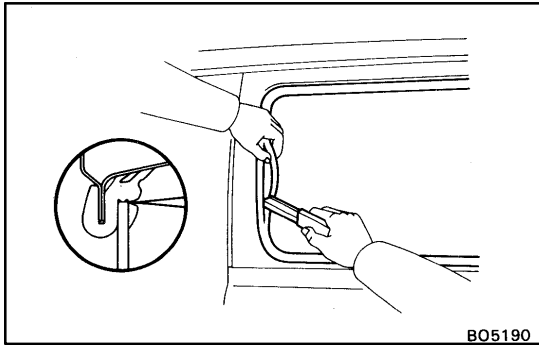
**11. If reusing the weatherstrip:
REMOVE QUARTER WINDOW GLASS**

- (a) Using a screwdriver loosen the weatherstrip from the body.

NOTICE:

Be careful not to damage the body.

- (b) Pry the lip of the weatherstrip outward from the interior part of the body flange.
- (c) Pull the glass outwards and remove it with the weatherstrip.



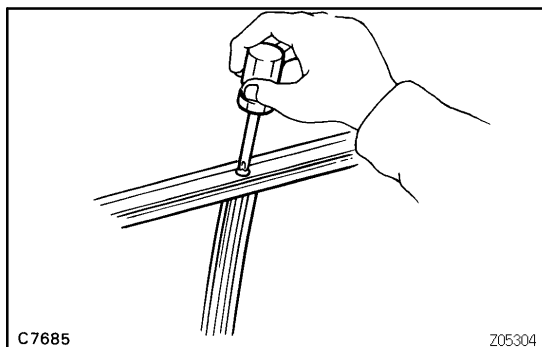
**12. If using a new weatherstrip:
REMOVE QUARTER WINDOW GLASS**

- (a) From outside of the vehicle, cut off the weatherstrip lip with a knife.

NOTICE:

Do not damage the body and the glass.

- (b) Push the glass outwards and remove the glass.
- (c) Remove the remaining weatherstrip.

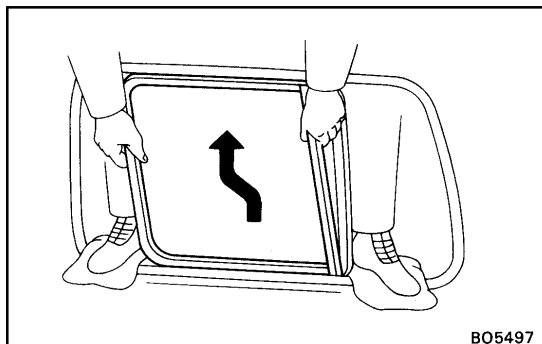


DISASSEMBLY

1. Slide Type:

REMOVE CENTER SASH

Remove the screw and weatherstrip.

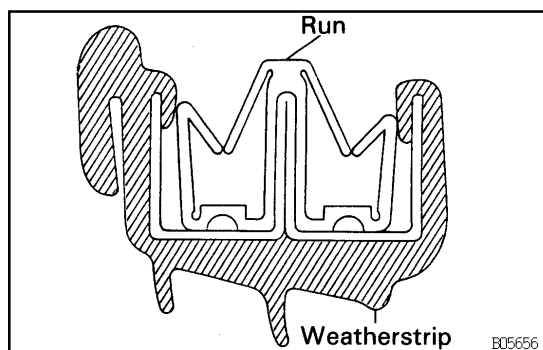


2. REMOVE QUARTER WINDOW GLASS

Pull up the sash and remove the 2 glasses.

3. REMOVE QUARTER WINDOW GLASS RUN FROM SASH

4. REMOVE QUARTER WINDOW WEATHERSTRIP FROM SASH



REASSEMBLY

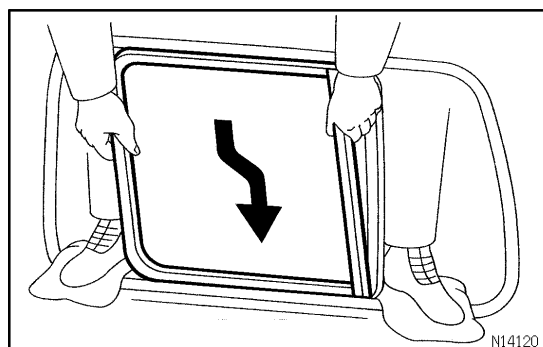
1. **Slide type:**
INSTALL QUARTER WINDOW WEATHERSTRIP ON SASH

NOTICE:

If the weatherstrip has hardened, it may develop leaks.

HINT:

Use a new one if possible.

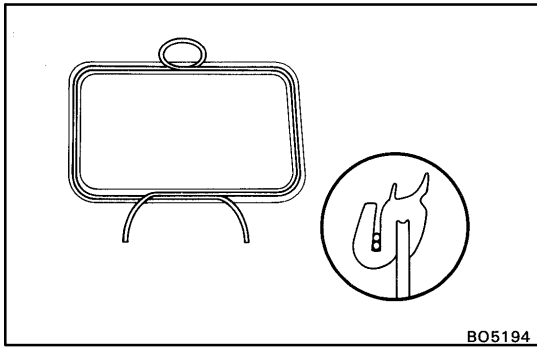


2. **INSTALL QUARTER WINDOW GLASS RUN**
3. **INSTALL QUARTER WINDOW GLASS**

Pull up on the sash and install 2 glasses.

4. **INSTALL CENTER SASH**

Install the weatherstrip with the screw.



INSTALLATION

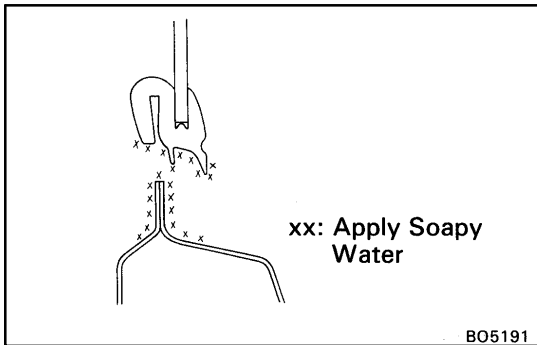
1. INSTALL WEATHERSTRIP ON GLASS

- (a) Attach the weatherstrip to the glass.

NOTICE:

If the weatherstrip has hardened, it may develop leaks. Use a new one if possible.

- (b) Insert a cord into the groove of the weatherstrip all the way around with the ends overlapping.

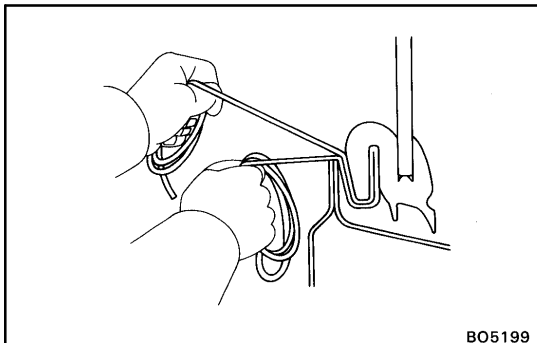


2. INSTALL QUARTER WINDOW GLASS

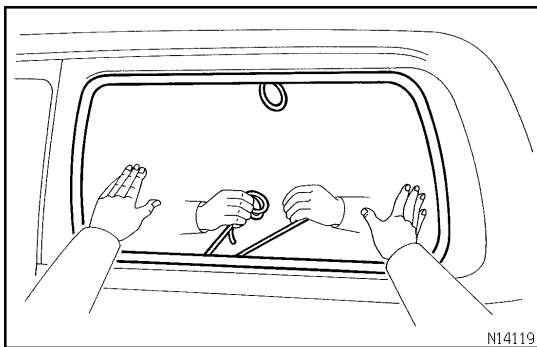
- (a) Apply soapy water to contact surface of the weatherstrip lip and to the body flange.

HINT:

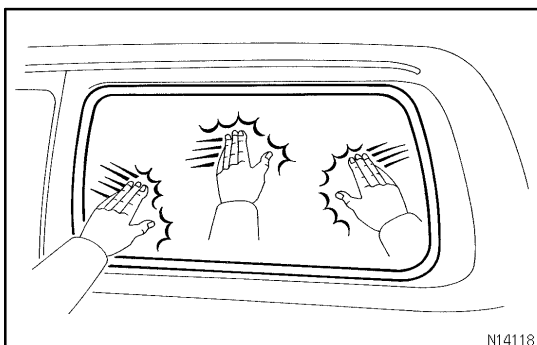
Begin installation in the middle of the lower part of the quarter window glass.



- (b) Hold the glass in position on the body.



- (c) From the inside, pull on one cord at an angle so it pulls the lip over the flange. From the outside, press the glass along the weatherstrip until the glass is installed.



3. FIX IN GLASS

To make the glass fix snugly, tap from the outside with your open hand.

4. INSPECT FOR LEAKS AND REPAIR

- (a) Do a leak test.
(b) Seal any leak with auto glass sealer.

5. INSTALL ROOF HEADLINING

6. INSTALL ASSIST GRIPS

7. INSTALL REAR PILLAR GARNISH

8. INSTALL QUARTER PILLAR GARNISH

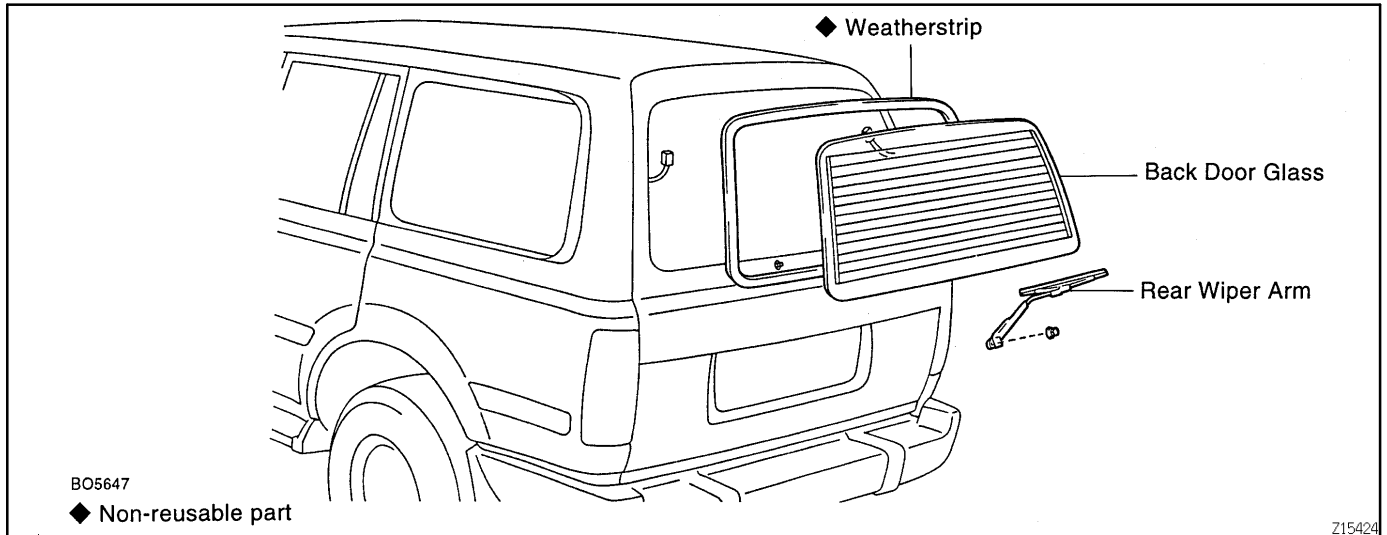
BO-56

BODY - QUARTER WINDOW GLASS

- 9. INSTALL REAR DOOR SCUFF PLATE**
- 10. INSTALL REAR SEAT SIDE GARNISH**
- 11. INSTALL QUARTER TRIM**
- 12. INSTALL BACK DOOR SCUFF PLATE**
- 13. w/ No. 2 Rear Seat:
INSTALL NO. 2 REAR SEAT**

BACK DOOR GLASS COMPONENTS

BO38X-01



REMOVAL

1. **REMOVE WIPER ARM**
2. **REMOVE DEFOGGER CONNECTOR**

Disconnect the connector from the glass.

3. **REMOVE BACK DOOR GLASS**

HINT:

Remove the glass in the same manner as the windshield.

INSTALLATION

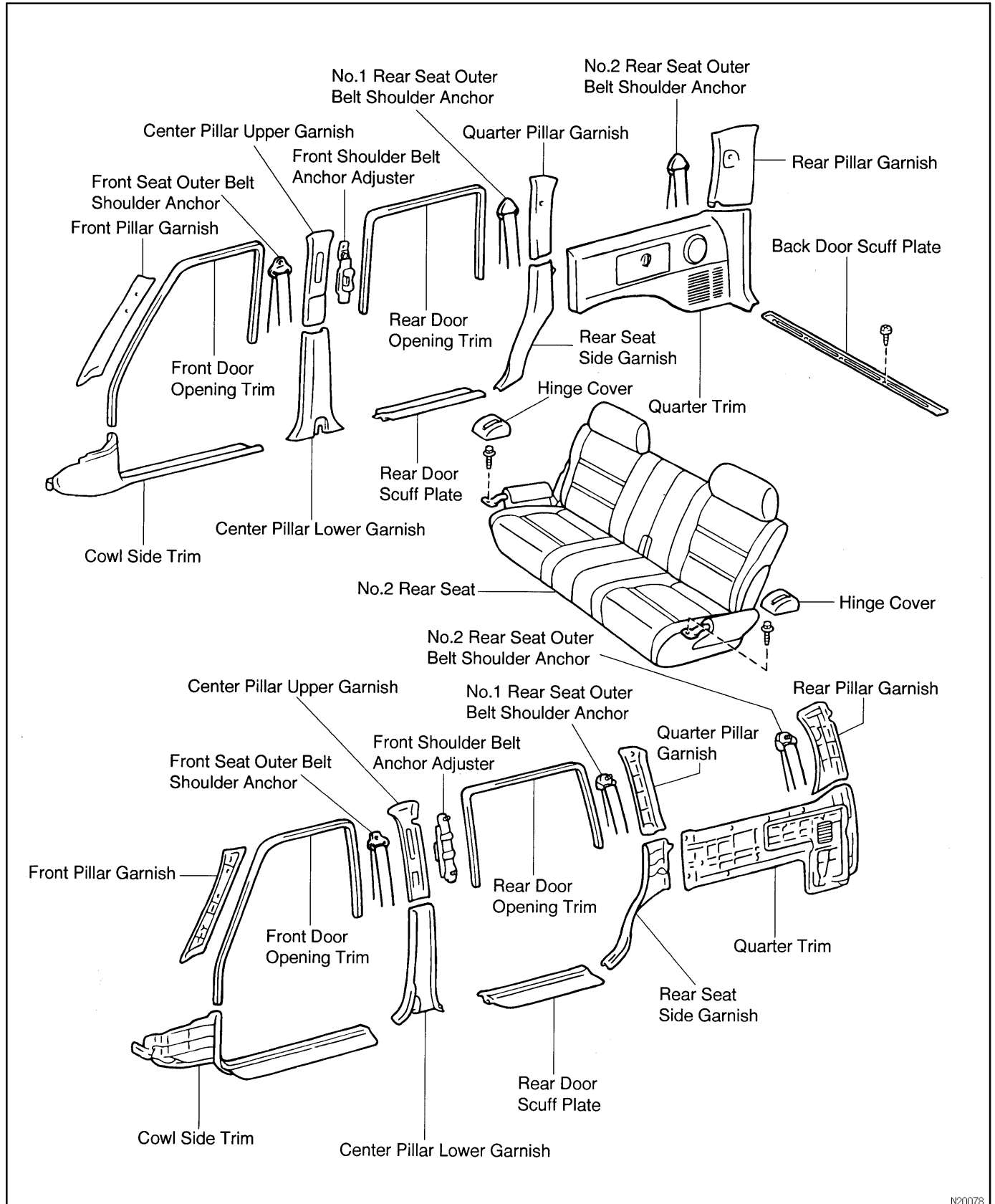
HINT:

Install the glass and weatherstrip in the same manner as the windshield.

1. **CLEAN BODY AND GLASS**
 2. **INSTALL WEATHERSTRIP ON GLASS**
 3. **INSTALL BACK DOOR GLASS**
 4. **FIX IN GLASS**
 5. **APPLY ADHESIVE**
Part No. 08833-00030 or equivalent
 6. **CLEAN SEALER SURFACE**
 7. **INSPECT FOR LEAKS AND REPAIR**
Part No. 08833-00030 or equivalent
 8. **CONNECT DEFOGGER WIRE CONNECTORS**
- Connect the connector to the glass.
9. **CONNECT WIPER ARM**
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

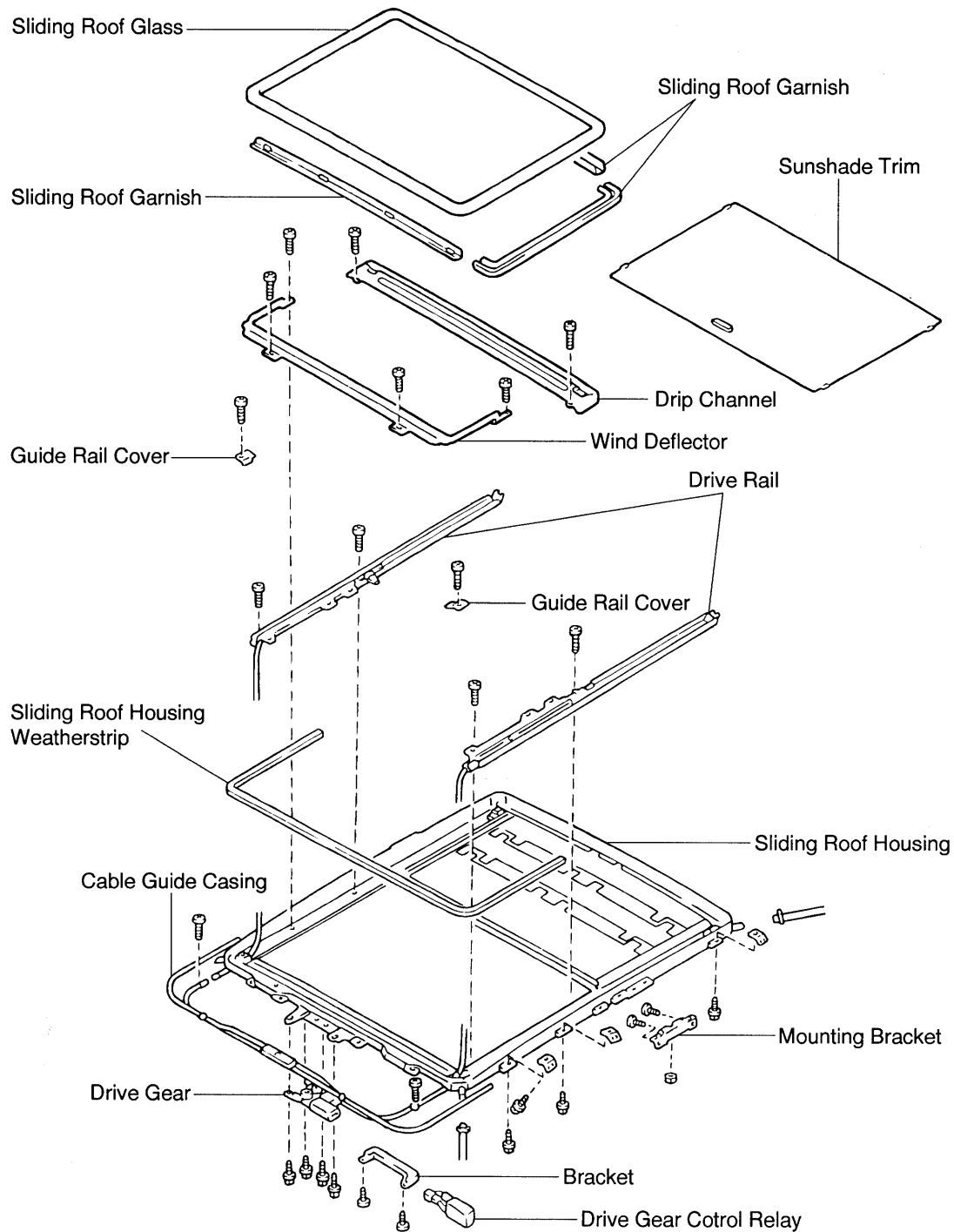
SLIDING ROOF COMPONENTS

BO390-01



N20078





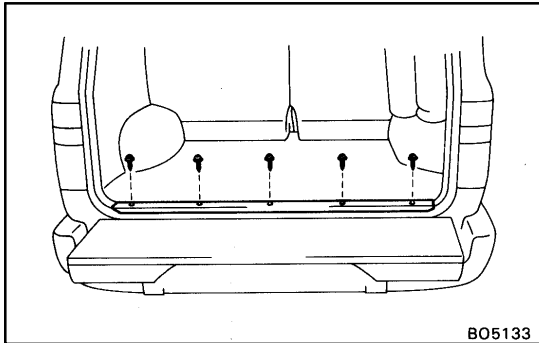
N20044

REMOVAL

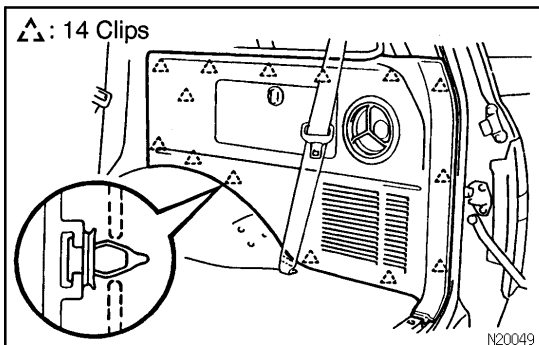
HINT:

Tape the screwdriver tip before using to pry parts.

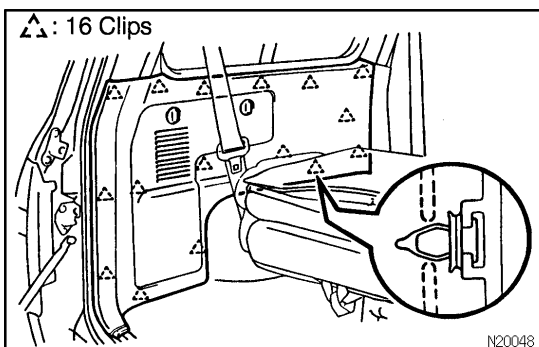
1. **CHECK OPERATION TO THE SLIDING ROOF**



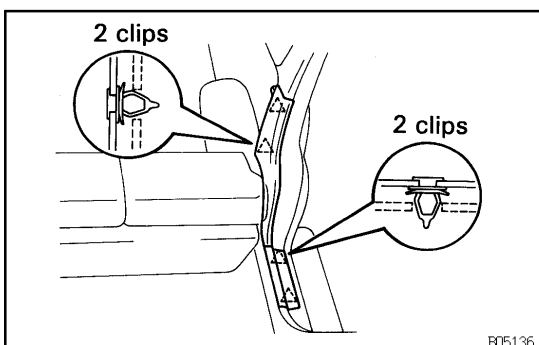
2. **REMOVE BACK DOOR SCUFF PLATE**
3. **w/ No. 2 Rear Seat**
REMOVE NO. 2 REAR SEAT



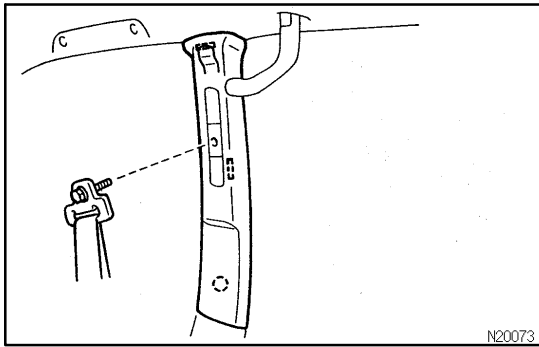
4. **REMOVE QUARTER TRIM RH**



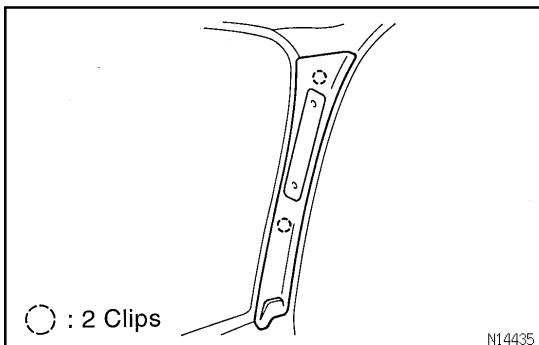
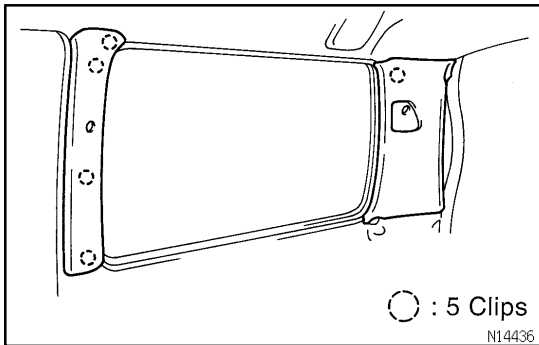
5. **REMOVE QUARTER TRIM LH**



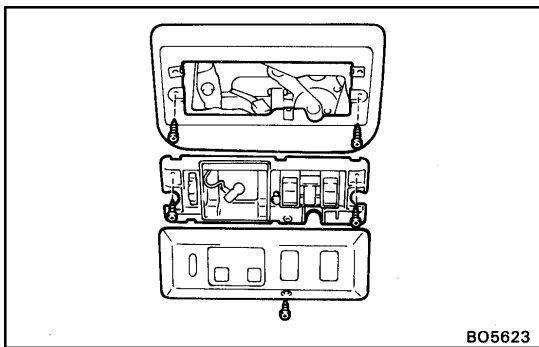
6. **REMOVE REAR SEAT SIDE GARNISH**
7. **REMOVE REAR DOOR SCUFF PLATE**
8. **REMOVE COWL SIDE TRIM**
9. **REMOVE FRONT AND REAR DOOR OPENING TRIM**
10. **REMOVE CENTER PILLAR LOWER GARNISH**



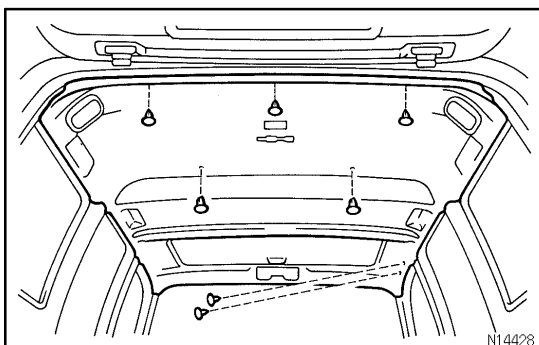
11. REMOVE FRONT SEAT OUTER BELT SHOULDER ANCHOR
12. REMOVE CENTER PILLAR UPPER GARNISH
13. REMOVE FRONT SHOULDER BELT ANCHOR ADJUSTER
14. REMOVE NO. 1 REAR SEAT OUTER BELT SHOULDER ANCHOR
15. w/ No. 2 Rear Seat
REMOVE NO. 2 REAR SEAT OUTER BELT SHOULDER ANCHOR
16. REMOVE QUARTER AND REAR PILLAR GARNISH
17. REMOVE ASSIST GRIPS



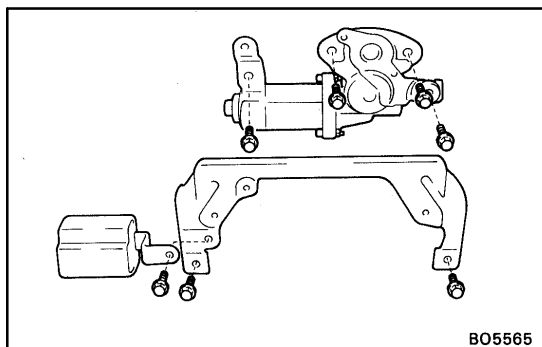
18. REMOVE FRONT PILLAR GARNISH
19. REMOVE SUN VISORS AND HOLDERS
20. REMOVE INNER REAR VIEW MIRROR
21. REMOVE PERSONAL LIGHT ASSEMBLY AND PERSONAL LIGHT COVER
22. REMOVE NO. 1 AND NO. 2 ROOM LIGHT
23. REMOVE BACK DOOR OPENING TRIM
24. REMOVE SLIDING ROOF OPENING MOULDING



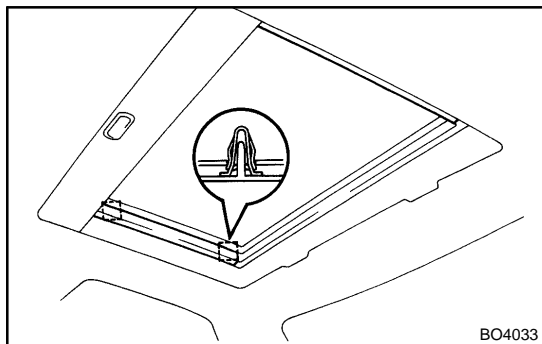
25. REMOVE CONTROL SWITCH
 - (a) Remove the screw.
 - (b) Using a screwdriver, remove the switch cover.
 - (c) Remove the 2 screws and switch body, then disconnect the connector.
 - (d) Remove the 2 screws and bracket.



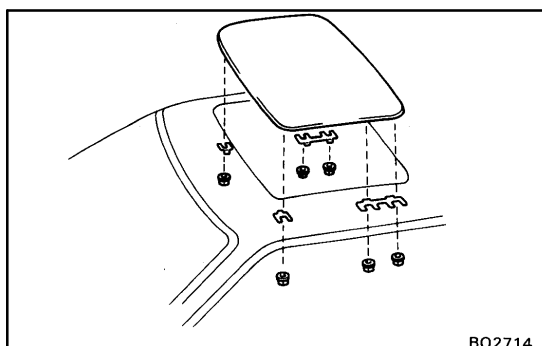
26. REMOVE ROOF HEADLINING
 - (a) Using the clip remover, remove the 7 clips.
 - (b) Remove the roof headlining.

**27. REMOVE DRIVE GEAR ASSEMBLY**

- (a) Remove the bolt and drive gear control relay, then disconnect the connector.
- (b) Remove the 2 bolts and bracket.
- (c) Remove the 4 bolts and drive gear assembly, then disconnect the connector.

**28. REMOVE SLIDING ROOF GARNISHES**

Using a screwdriver, pry loose the 2 clips and remove the inner side garnish.

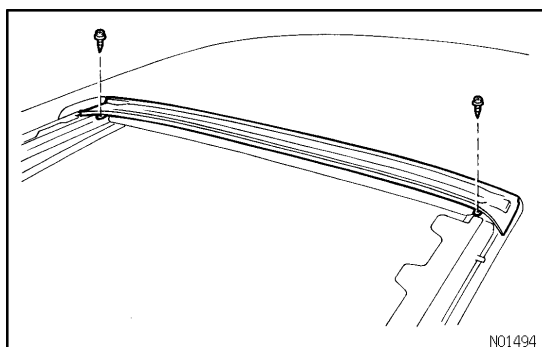
**29. REMOVE SLIDING ROOF GLASS**

- (a) Remove the 6 nuts and shims.

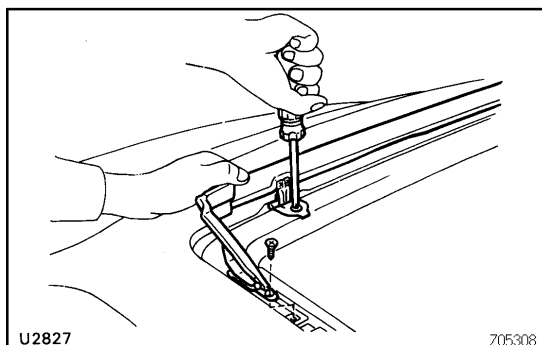
HINT:

Make sure of the number of shims.

- (b) Pull the glass upward to remove it.

**30. REMOVE DRIP CHANNEL**

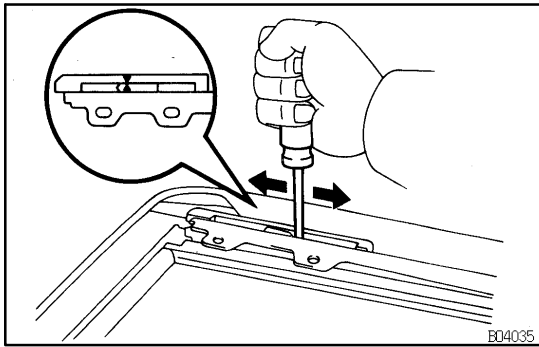
- (a) Remove the 2 screws.
- (b) Pull the channel forwards to remove it.

**31. REMOVE WIND DEFLECTOR**

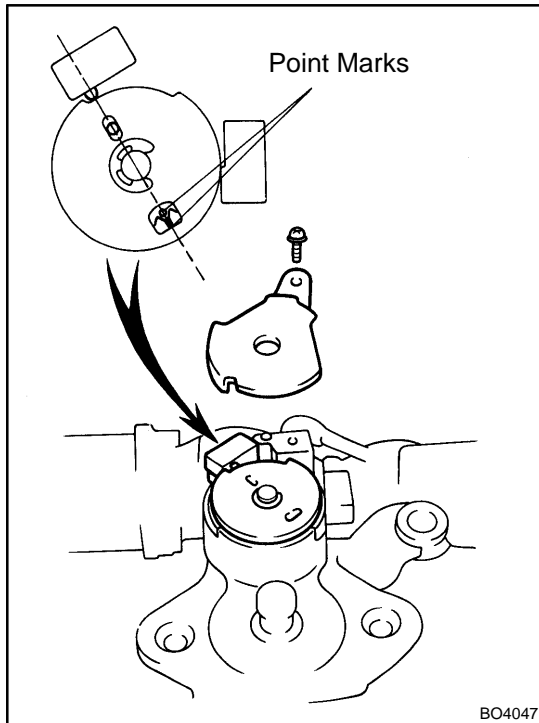
Remove the 4 screws and wind deflector.

32. REMOVE SLIDING ROOF HOUSING

- (a) Disconnect the drain hose.
- (b) Remove the 3 nuts, 12 screw and housing.

**33. ADJUST DRIVE RAIL****HINT:**

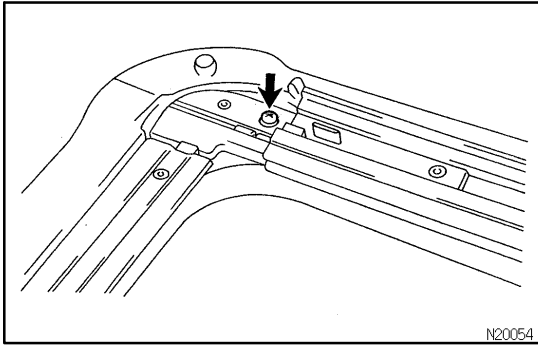
Adjust the drive rail to a closed and tilted down position.
Using a screwdriver, slide the link forward or backward to align the 2 marks, as shown.

**34. ADJUST AND INSTALL DRIVE GEAR ASSEMBLY**

- (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) Install the drive gear assembly with 4 bolts.
- (f) Connect the connector.

35. INSTALL DRIVE GEAR CONTROL RELAY AND BRACKET

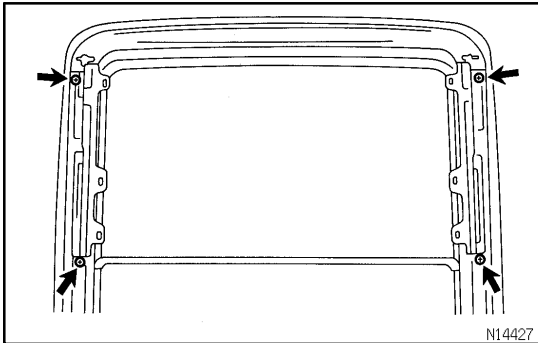
- (a) Install the bracket with 2 bolts.
- (b) Install the drive gear control relay with the bolt, then connect the connector.



DISASSEMBLY

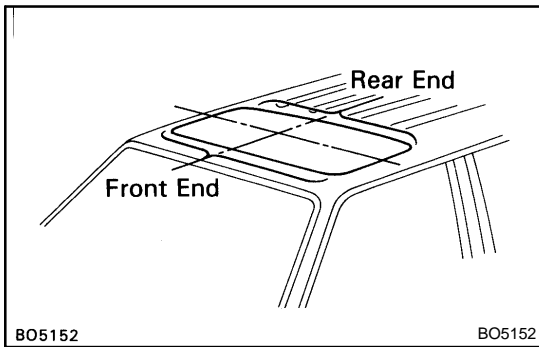
1. DISCONNECT SLIDING ROOF GUIDE RAIL AND CABLE GUIDE CASING

- Remove the screw and guide rail cover.
- Remove the screw.
- Pull out the cable guide casing.



2. REMOVE SLIDING GUIDE RAIL

- Make the drive cable to the front edge.
- Remove the 4 screws and both side drive rails.
- Remove the sunshade trim.



INSPECTION

1. INSPECT SLIDING ROOF GLASS ALIGNMENT

- (a) Start the engine and check the operation time of the sliding roof.

Operation time: Approx. 5 sec.

- (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	0.9 – 3.9 mm (0.035 – 0.154 in.)
Rear End	0.9 – 3.9 mm (0.035 – 0.154 in.)

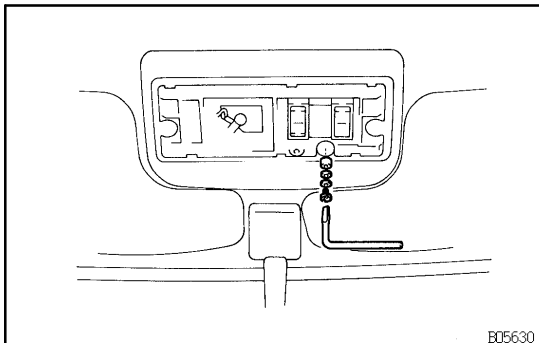
2. If the sliding roof does not operate:

ADJUST SLIDING ROOF GLASS ALIGNMENT

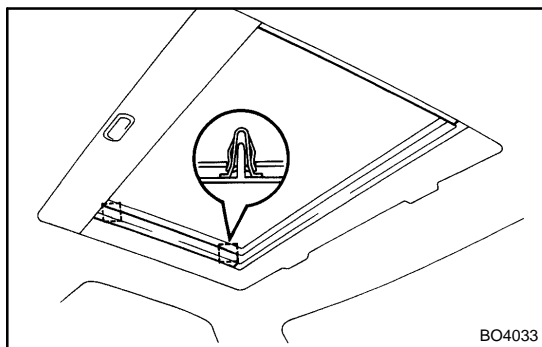
- (a) Remove the control switch cover.
 (b) Remove the large screw inside.

NOTICE:

Be careful not to lose the spring washer or shim.



- (c) Manually operate the moon roof by inserting a special crank-shaped screwdriver into the hole and turning the drive shaft.



BO4033

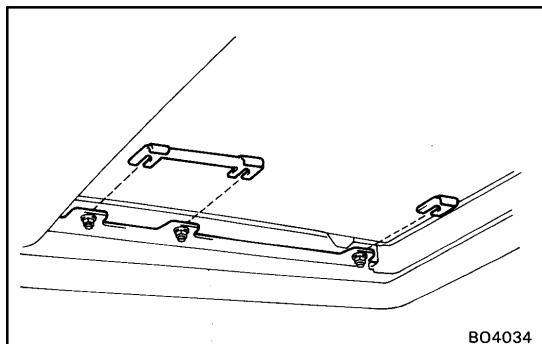
ADJUSTMENT

1. REMOVE SLIDING ROOF GARNISHES

Before making adjustments, remove the left and right sliding roof garnishes.

HINT:

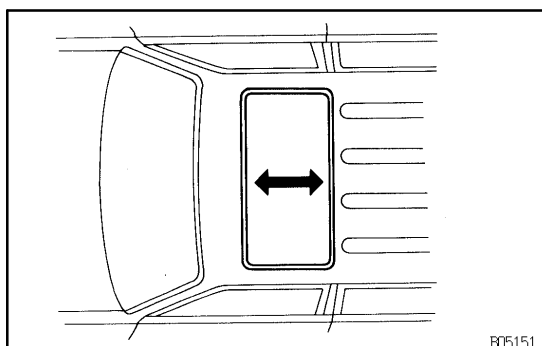
After adjustment, reinstall the sliding roof garnishes.



BO4034

2. ADJUST LEVEL DIFFERENCE

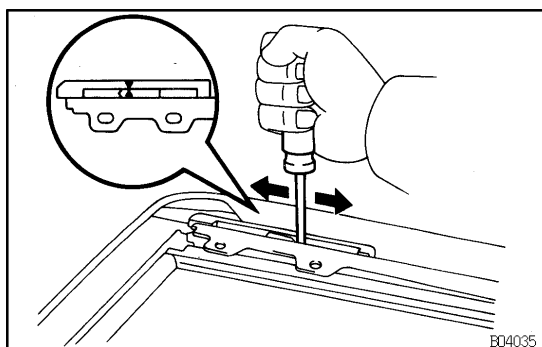
Adjust by increasing or decreasing the number of shims between the bracket and sliding roof.



BO5151

3. ADJUST FORWARD OR REARWARD

(a) Adjust by loosening the sliding roof installation nuts, and move the sliding roof bracket forwards and backwards.

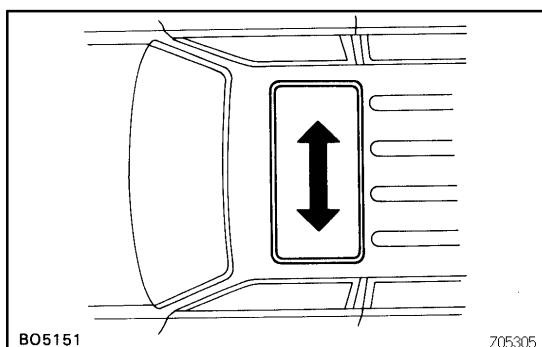


BO4035

(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 backwards to align the 2 marks, as shown in the illustration.

(d) Slide the bracket to the forefront with your hand.



BO5151

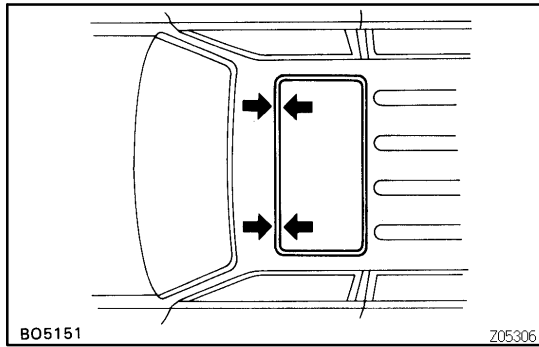
Z05305

4. ADJUST RIGHT OR LEFT

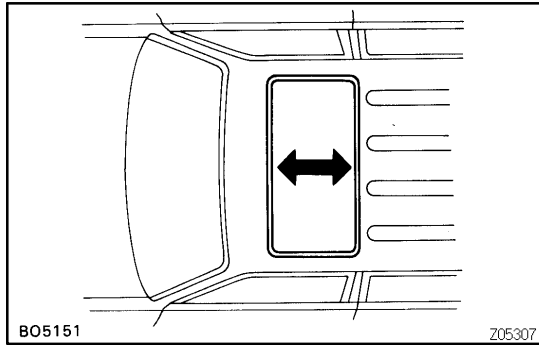
Adjust by loosening the sliding roof rear shoe installation nuts, and move the sliding roof to the right and left.

BO-70

BODY - SLIDING ROOF



5. ADJUST LEFT/RIGHT CLEARANCE



Adjust by loosening the sliding roof installation nuts and readjust the sliding roof to the proper position.

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BO-67](#)).

BO-72

BODY – SLIDING ROOF

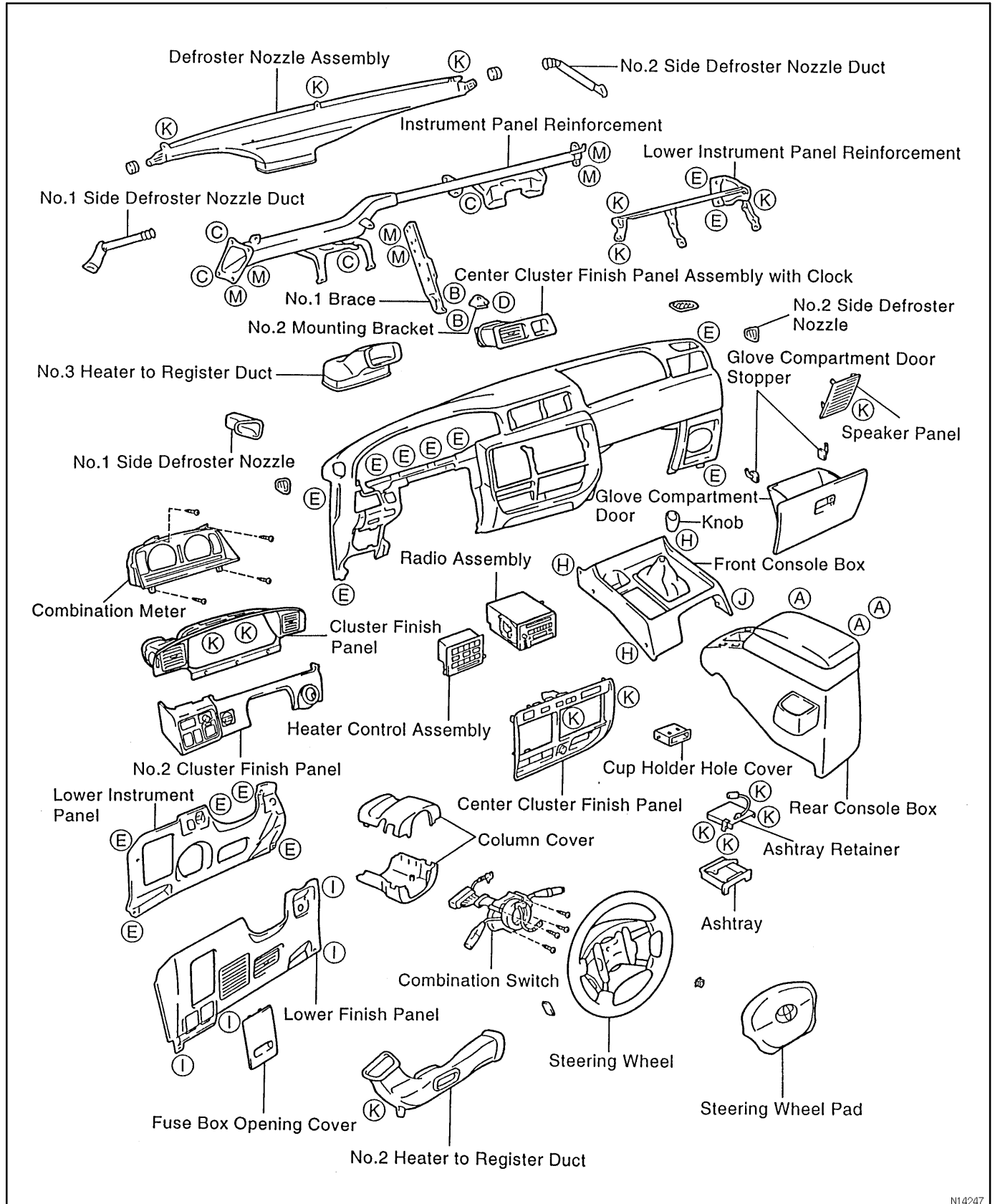
BO396-01

INSTALLATION

Installation is in the reverse order of removal (See page [BO-63](#)).

INSTRUMENT PANEL COMPONENTS

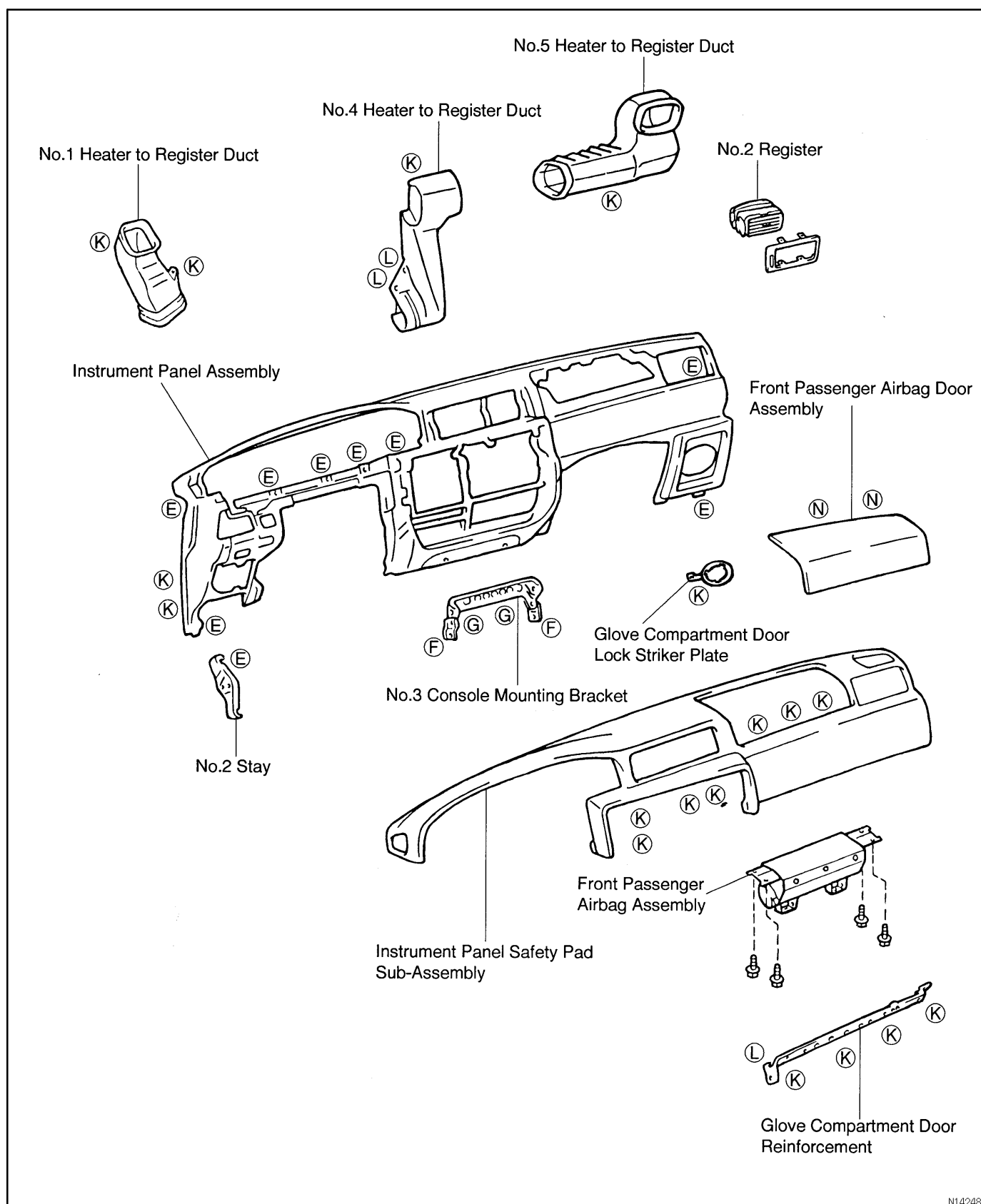
BO397-01



N14247

BO-74

BODY - INSTRUMENT PANEL

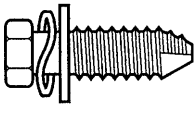
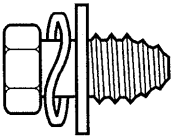
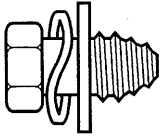
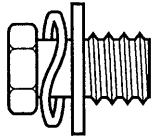
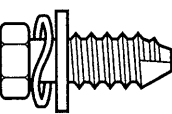
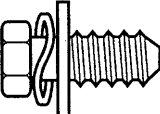

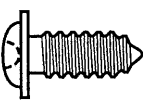
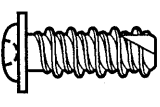

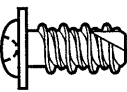
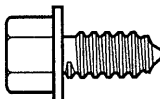




N14248

BODY - INSTRUMENT PANEL

HINT:

Screw shapes and size are indicated in the table below. The code (A - N) correspond to those indicated on the previous page.

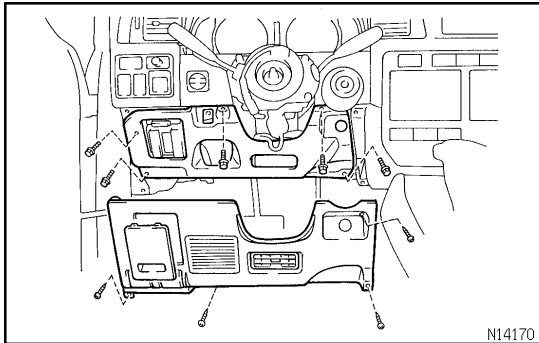
mm (in.)								
Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
Ⓐ		$\phi = 8$ (0.31) L = 30 (1.18)	Ⓑ		$\phi = 8$ (0.31) L = 18 (0.71)	Ⓒ		$\phi = 8$ (0.31) L = 16 (0.63)
Ⓓ		$\phi = 8$ (0.31) L = 16 (0.63)	Ⓔ		$\phi = 6$ (0.24) L = 20 (0.79)	Ⓕ		$\phi = 6$ (0.24) L = 18 (0.71)
Ⓖ		$\phi = 5$ (0.20) L = 18 (0.71)	Ⓗ		$\phi = 5$ (0.20) L = 16 (0.63)	Ⓘ		$\phi = 5$ (0.20) L = 18 (0.71)
Ⓙ		$\phi = 5$ (0.20) L = 25 (0.98)	Ⓚ		$\phi = 5$ (0.20) L = 14 (0.55)	Ⓛ		$\phi = 5$ (0.20) L = 14 (0.55)
Ⓜ		$\phi = 8$ (0.31)	Ⓝ		$\phi = 6$ (0.24)			

N14177

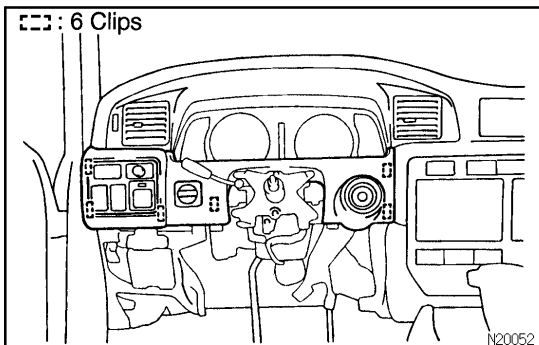
V06498

REMOVAL

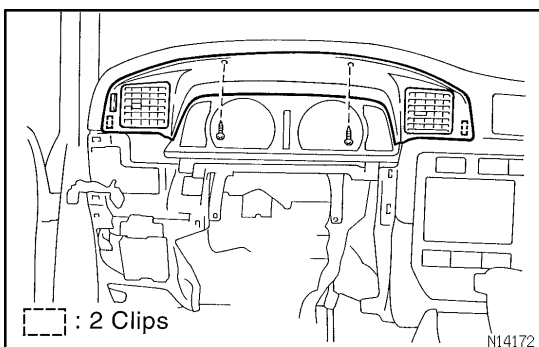
1. REMOVE STEERING WHEEL (See page [SR-11](#))
2. REMOVE COLUMN COVER
3. REMOVE HOOD LOCK RELEASE LEVER
4. REMOVE FUEL LID RELEASE LEVER



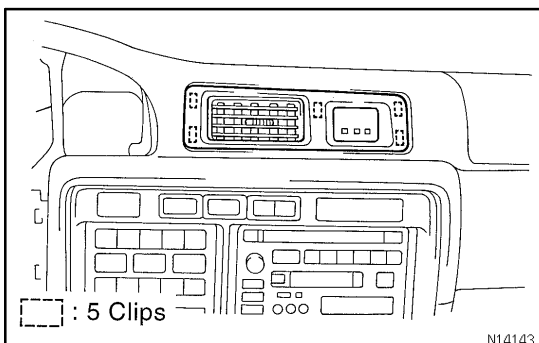
5. REMOVE FUSE BOX OPENING COVER
6. REMOVE LOWER FINISH PANEL
7. REMOVE LOWER INSTRUMENT PANEL
8. REMOVE NO. 2 HEATER TO REGISTER DUCT
9. LOOSEN DLC 3 AND FUSE BLOCK



10. REMOVE NO. 2 CENTER CLUSTER FINISH PANEL
11. REMOVE STEERING COLUMN (See page [SR-11](#))

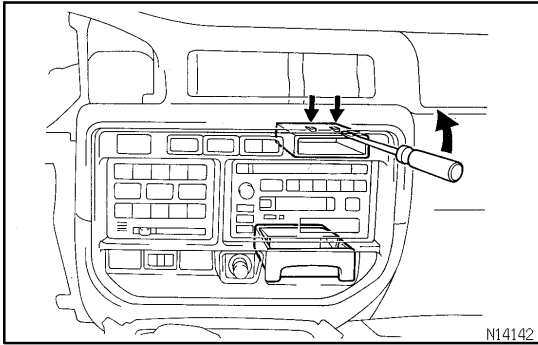


12. REMOVE CLUSTER FINISH PANEL
13. REMOVE COMBINATION METER



14. REMOVE CENTER CLUSTER FINISH PANEL WITH CLOCK

BODY - INSTRUMENT PANEL

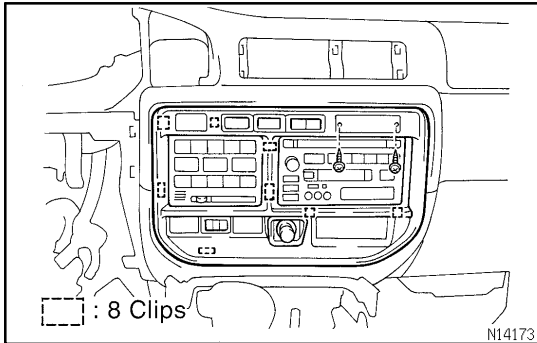
**15. REMOVE CENTER CLUSTER FINISH PANEL WITH HEATER CONTROL ASSEMBLY**

- (a) Using a screwdriver, take off the 2 claws, then remove the cup holder hole cover.

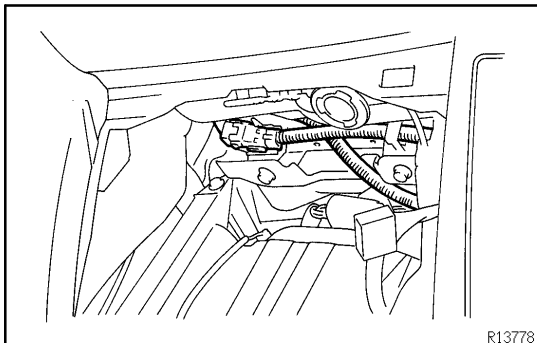
HINT:

Tape the screwdriver tip before use.

- (b) Take off the ashtray.
(c) Remove the center cluster finish panel with heater control assembly, then disconnect the connectors.



- (d) Remove the 2 screws and heater control assembly from the center cluster finish panel.

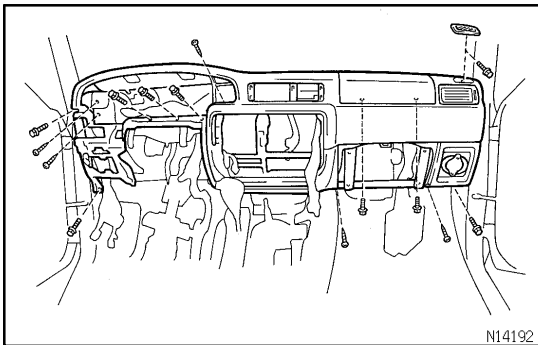
16. REMOVE RADIO**17. REMOVE GLOVE COMPARTMENT DOOR****18. REMOVE SPEAKER PANEL AND SPEAKER****19. REMOVE FRONT AND REAR CONSOLE BOX****20. DISCONNECT AIRBAG CONNECTOR**

- (a) Remove the airbag connector from the airbag bracket.

NOTICE:

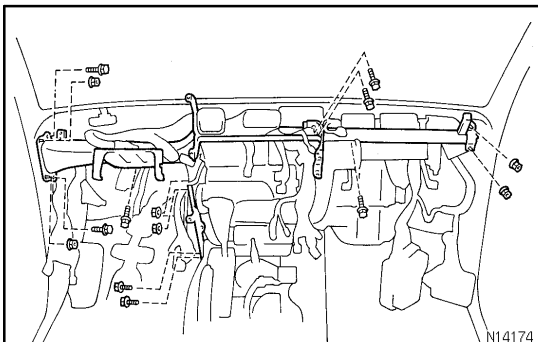
When handling the airbag connector, take care not to damage the airbag wire harness.

- (b) Disconnect the airbag connector.

**21. REMOVE INSTRUMENT PANEL**

- (a) Remove the 5 screws and 9 bolts.
(b) Remove the instrument panel.

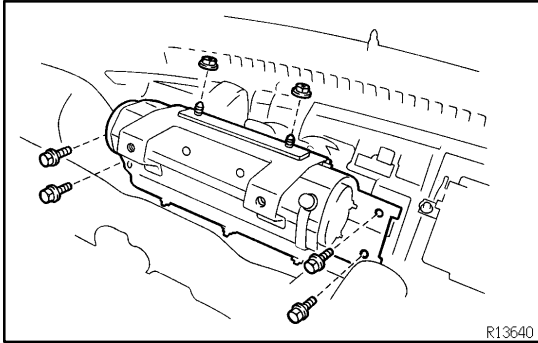
Torque: 20 N·m (210 kgf·cm, 15 ft·lbf) for passenger airbag bolts

**22. REMOVE INSTRUMENT PANEL REINFORCEMENT**

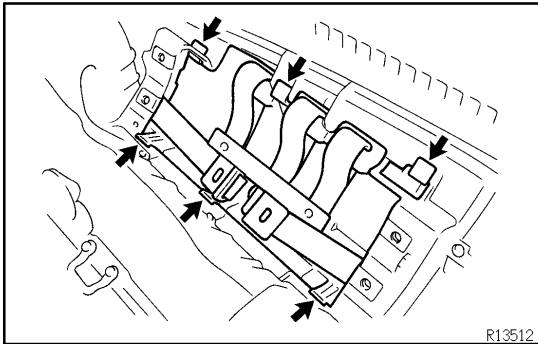
- (a) Remove the 2 bolts and lower instrument panel reinforcement.
(b) Remove the 2 bolts, 2 nuts and No. 1 brace.
(c) Remove the 4 bolts, 4 nuts and instrument panel reinforcement.

DISASSEMBLY

1. REMOVE GLOVE COMPARTMENT DOOR REINFORCEMENT
2. REMOVE NO. 4 HEATER TO REGISTER DUCT
3. REMOVE NO. 5 HEATER TO REGISTER DUCT
4. REMOVE NO. 2 REGISTER
5. REMOVE GLOVE COMPARTMENT DOOR LOCK STRIKER PLATE



6. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY
(See page [RS-22](#))
 - (a) Remove the 4 bolts and 2 nuts, and remove front passenger airbag assembly.



- (b) Pry up the 6 clips shown in the illustration and remove the airbag door.

CAUTION:

- Do not store the front passenger airbag assembly with the airbag deployment direction facing down.
- Never disassemble the front passenger airbag assembly.

7. REMOVE NO. 3 CONSOLE MOUNTING BRACKET
8. REMOVE NO. 1 HEATER TO REGISTER DUCT
9. REMOVE NO. 2 STAY

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BO-78](#)).

BO-80

BODY – INSTRUMENT PANEL

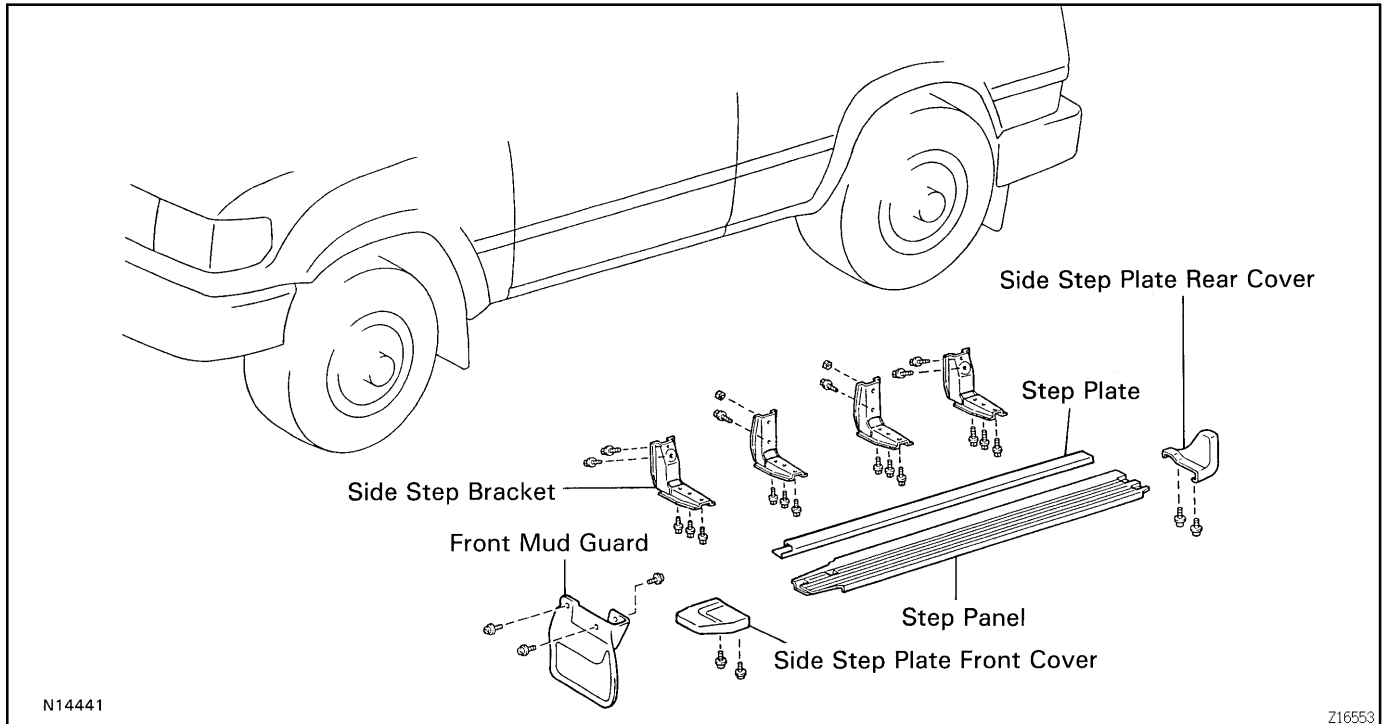
BO39B-01

INSTALLATION

Installation is in the reverse order of removal (See page [BO-76](#)).

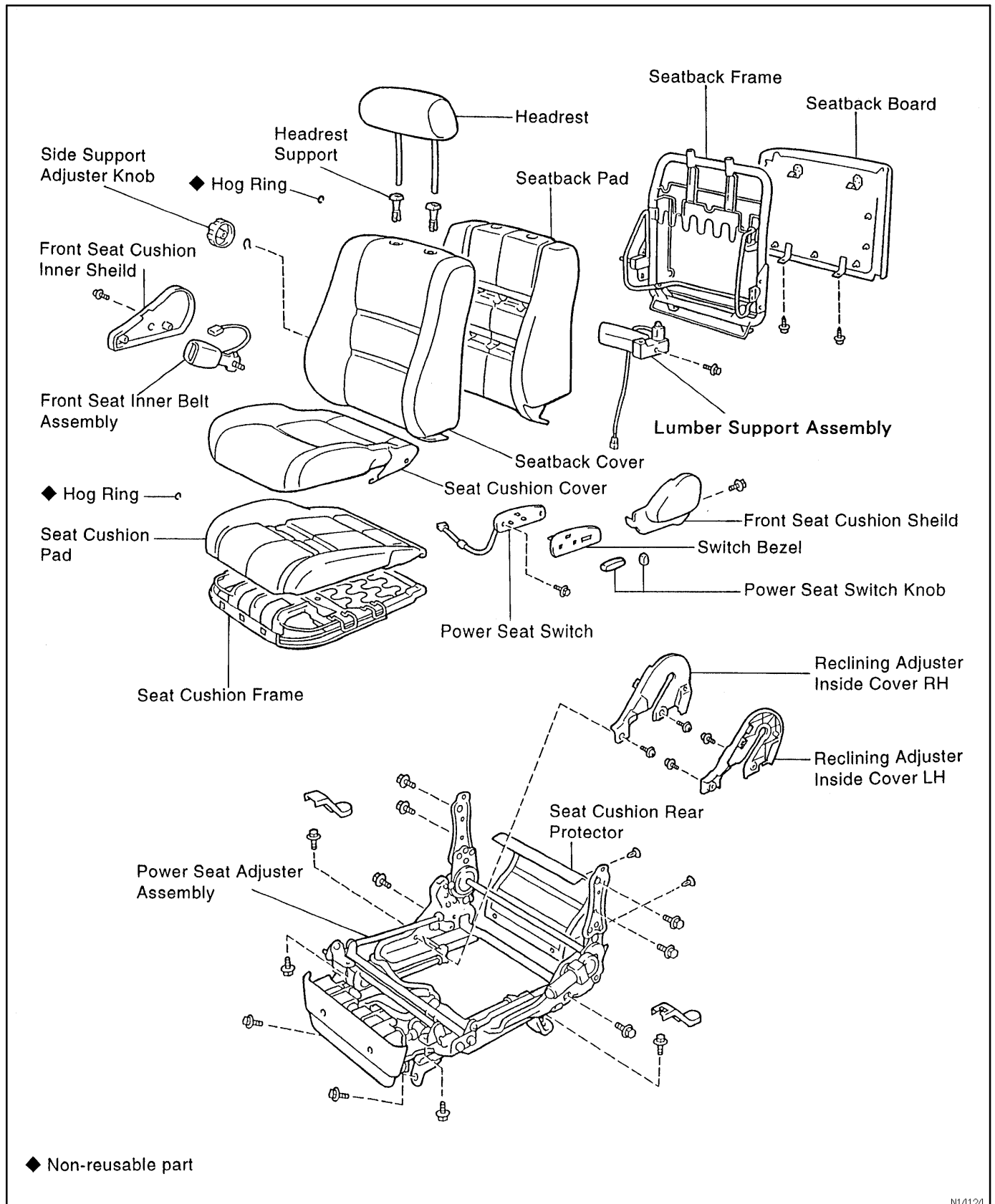
SIDE STEP COMPONENTS

B039C-01



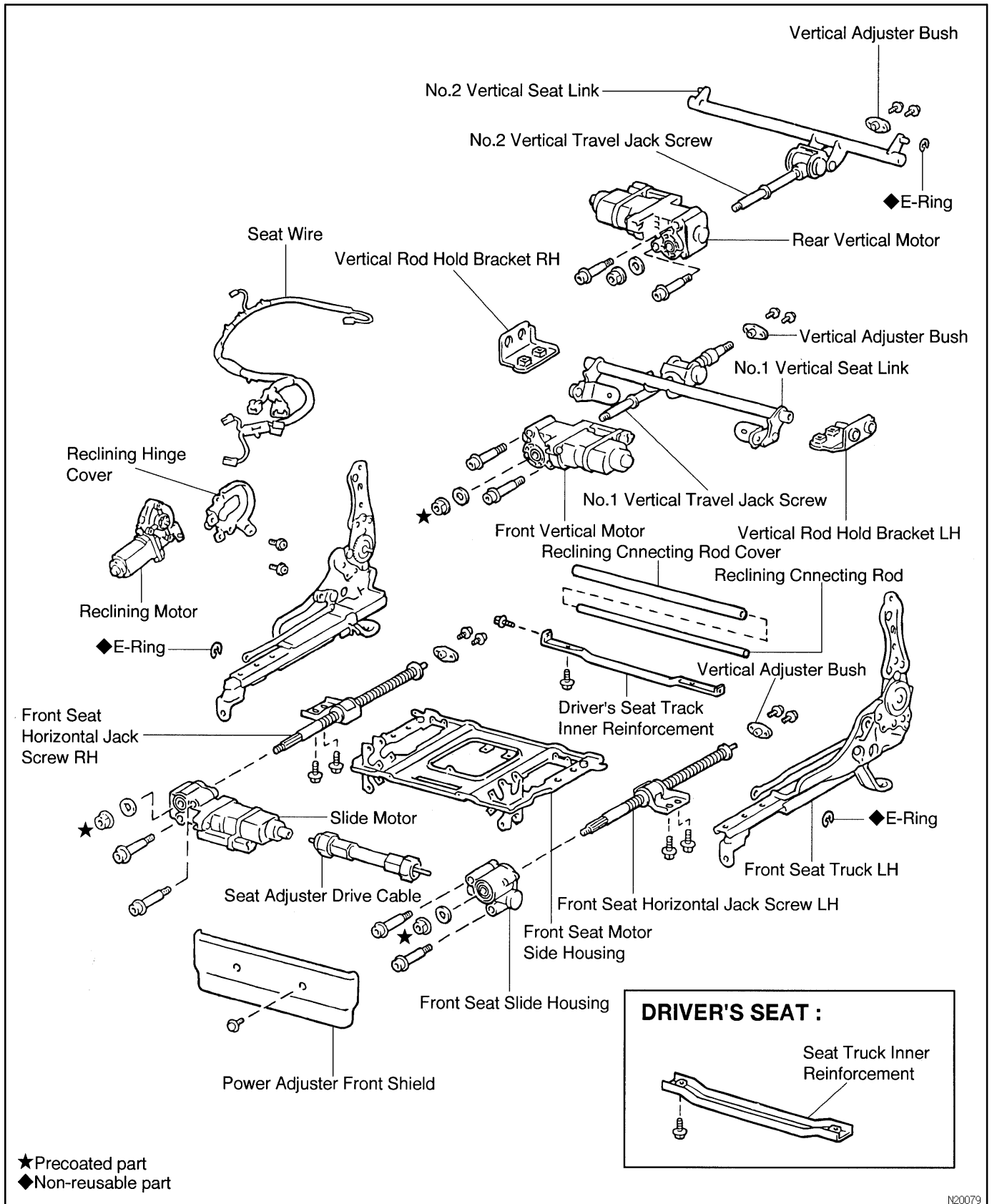
FRONT SEAT (Power Adjuster Type) COMPONENTS

BO39E-01

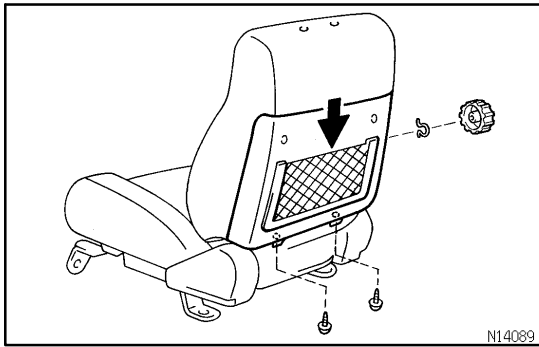


N14124

BODY - FRONT SEAT (Power Adjuster Type)



N20079



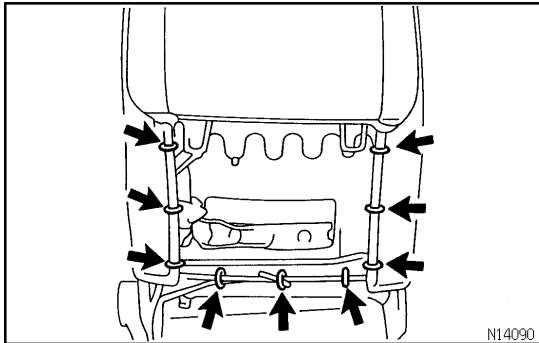
DISASSEMBLY

1. **REMOVE FRONT SEAT HEADREST**
2. **REMOVE SIDE SUPPORT ADJUSTER KNOB**

Using a screwdriver, remove the snap ring and side support adjuster knob.

3. **REMOVE SEATBACK BOARD**

- (a) Remove the 2 screws.
- (b) Slide the board downward to remove it.



4. **REMOVE FRONT SEATBACK ASSEMBLY**

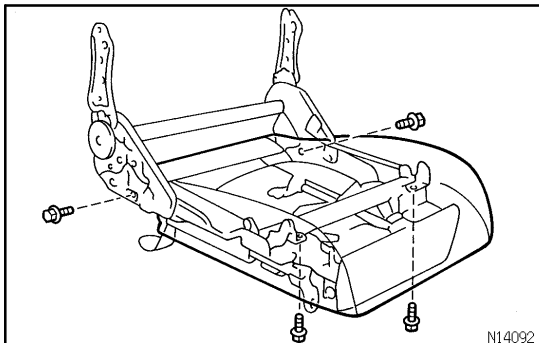
- (a) Using a hog ring pliers, remove the hog ring backward of seatback.
- (b) Remove the 4 bolts and front seatback assembly.

Torque: 30 N·m (300 kgf-cm, 22 ft-lbf)

5. **REMOVE FRONT SEAT CUSHION INNER SHIELD**

6. **REMOVE FRONT SEAT INNER BELT**

7. **REMOVE FRONT SEAT CUSHION SHIELD**



8. **REMOVE FRONT SEAT CUSHION**

- (a) Remove the 4 bolts.

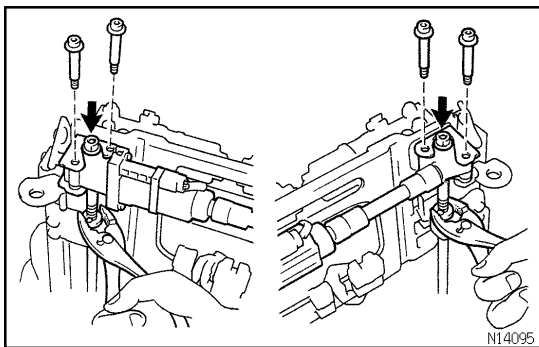
Torque: 30 N·m (300 kgf-cm, 22 ft-lbf)

- (b) Disconnect the connector, then remove the front seat cushion.

9. **REMOVE SEAT CUSHION REAR PROTECTOR**

10. **REMOVE RECLINING ADJUSTER INSIDE COVER**

Remove the 4 screws and reclining adjuster inside cover LH and RH.



11. **REMOVE POWER ADJUST FRONT SHIELD**

Remove the 2 screws and front shield.

12. **REMOVE SLIDE MOTOR**

- (a) Using the 5.0 mm (0.20 in.) hexagon wrench, remove the 4 housing bracket screws.

Torque: 10 N·m (100 kgf-cm, 7.0 ft-lbf)

- (b) Hold the front seat horizontal jack screw with a plier, and remove the 2 nuts and 2 washers.

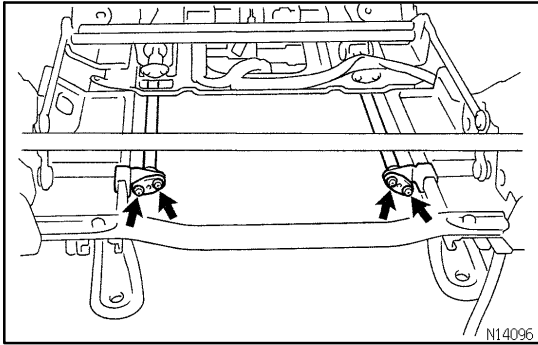
Torque: 2.0 N·m (20 kgf-cm, 17 in.-lbf)

HINT:

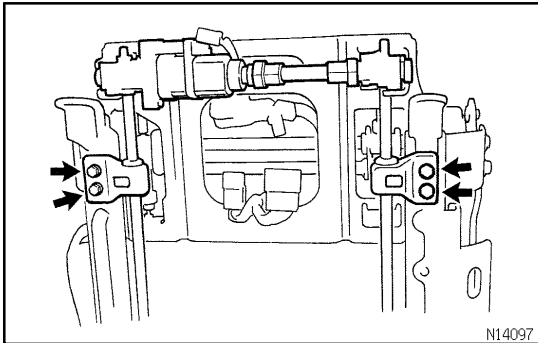
At the time of installation, apply adhesive to nut.

Part No. 08833 – 00070, THREE BOND 1324 or equivalent

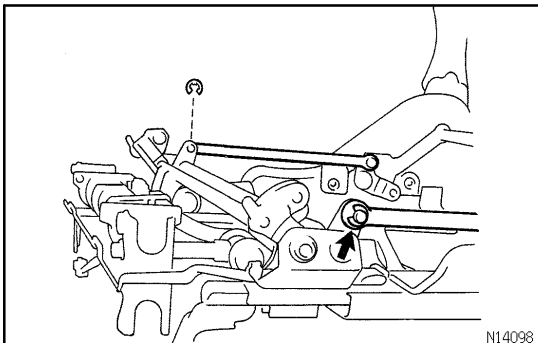
BODY – FRONT SEAT (Power Adjuster Type)



- (c) Remove the 4 screws and 2 vertical adjuster bushes.

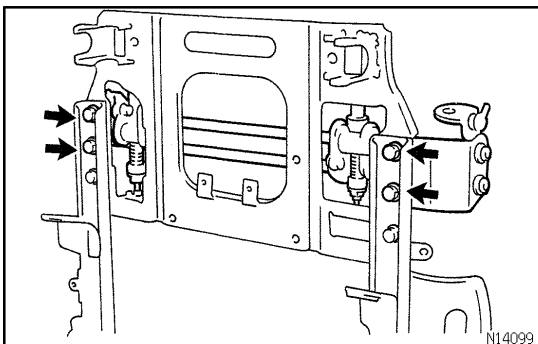


- (d) Remove the 4 bolts, slide motor, front seat slide housing and front seat horizontal jack screw.
Torque: 19 N·m (200 kgf-cm, 14 ft-lbf)
 (e) Loosen the seat adjuster nut, then remove the slide motor.

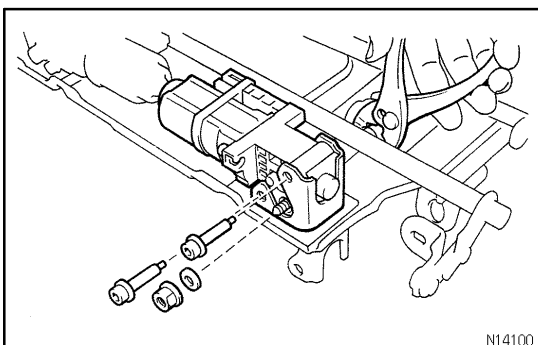


13. REMOVE REAR VERTICAL MOTOR

- (a) Remove the 2 E-rings, and disconnect the No. 1 vertical seat link.



- (b) Remove the 4 bolts, vertical rod hold bracket RH and vertical rod hold bracket LH.
Torque: 20 N·m (210 kgf-cm, 15 ft-lbf)

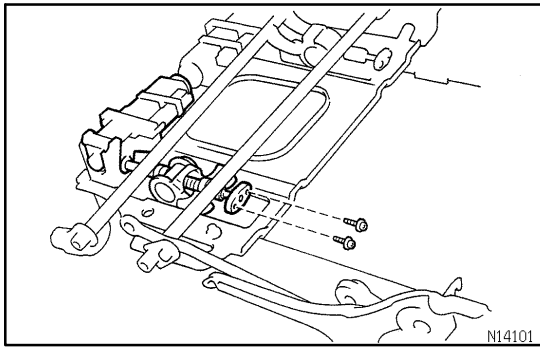


- (c) Using the 5.0 mm (0.20 in.) hexagon wrench, remove the 2 housing support bracket screws.
Torque: 10 N·m (100 kgf-cm, 7.0 ft-lbf)
 (d) Hold the No. 2 vertical travel jack screw with a plier, remove the nut and washer.
Torque: 2.0 N·m (20 kgf-cm, 17 in.-lbf)

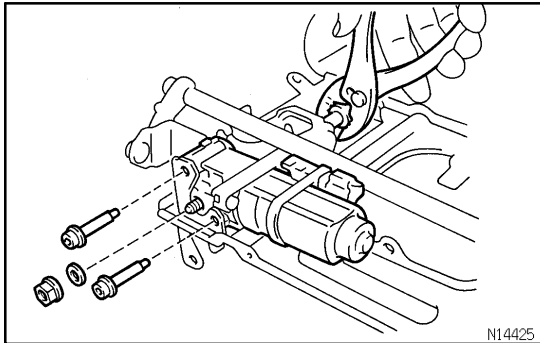
HINT:

At the time of reassembly, apply adhesive to nut.

Part No. 08833-00070, THREE BOND 1324 or equivalent



- (e) Remove the 2 screws, vertical adjuster bush, rear vertical motor and No. 2 vertical seat link.



14. REMOVE FRONT VERTICAL MOTOR

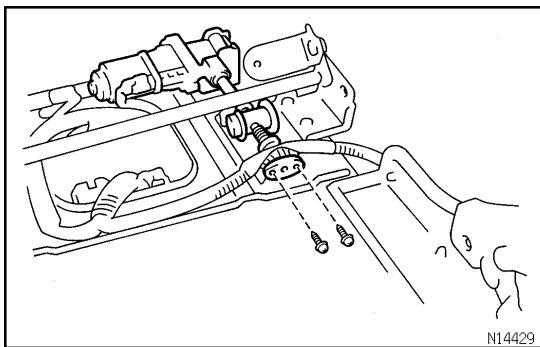
- (a) Using the 5.0 mm (0.20 in.) hexagon wrench, and remove the 2 housing support bracket screws.
Torque: 10 N·m (100 kgf·cm, 7.0 ft·lbf)
 (b) Hold the No. 1 vertical travel jack screw with a plier, remove the nut and washer.

HINT:

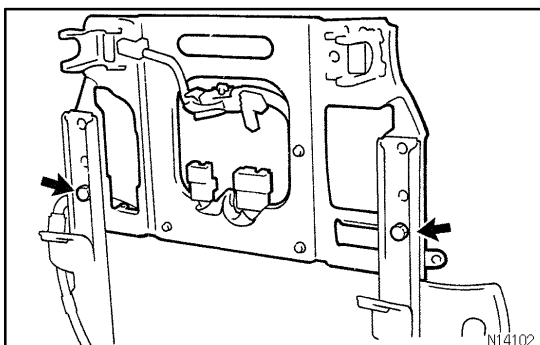
At the time of reassembly, apply adhesive to nut.

Part No. 08833-00070, THREE BOND 1324 or equivalent

Torque: 2.0 N·m (20 kgf·cm, 15 ft·lbf)



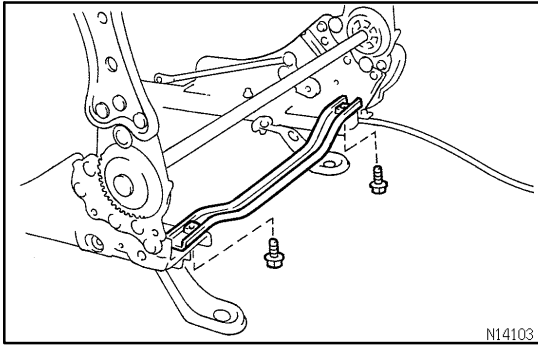
- (c) Remove the 2 screws, vertical adjuster bush, front vertical motor and No. 1 vertical seat link.



15. REMOVE FRONT SEAT TRACK

- (a) Remove the 2 bolts and front seat motor side housing.
Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)

BODY – FRONT SEAT (Power Adjuster Type)



- (b) Remove the 2 bolts, seat track inner reinforcement, then separate the seat track RH and LH.
Torque: 20 N·m (210 kgf-cm, 15 ft-lbf)
- (c) Remove the reclining connecting rod.
- 16. REMOVE SEAT WIRE**
- 17. REMOVE RECLINING MOTOR**
- 18. REMOVE RECLINING HINGE COVER**

BO-88

BODY – FRONT SEAT (Power Adjuster Type)

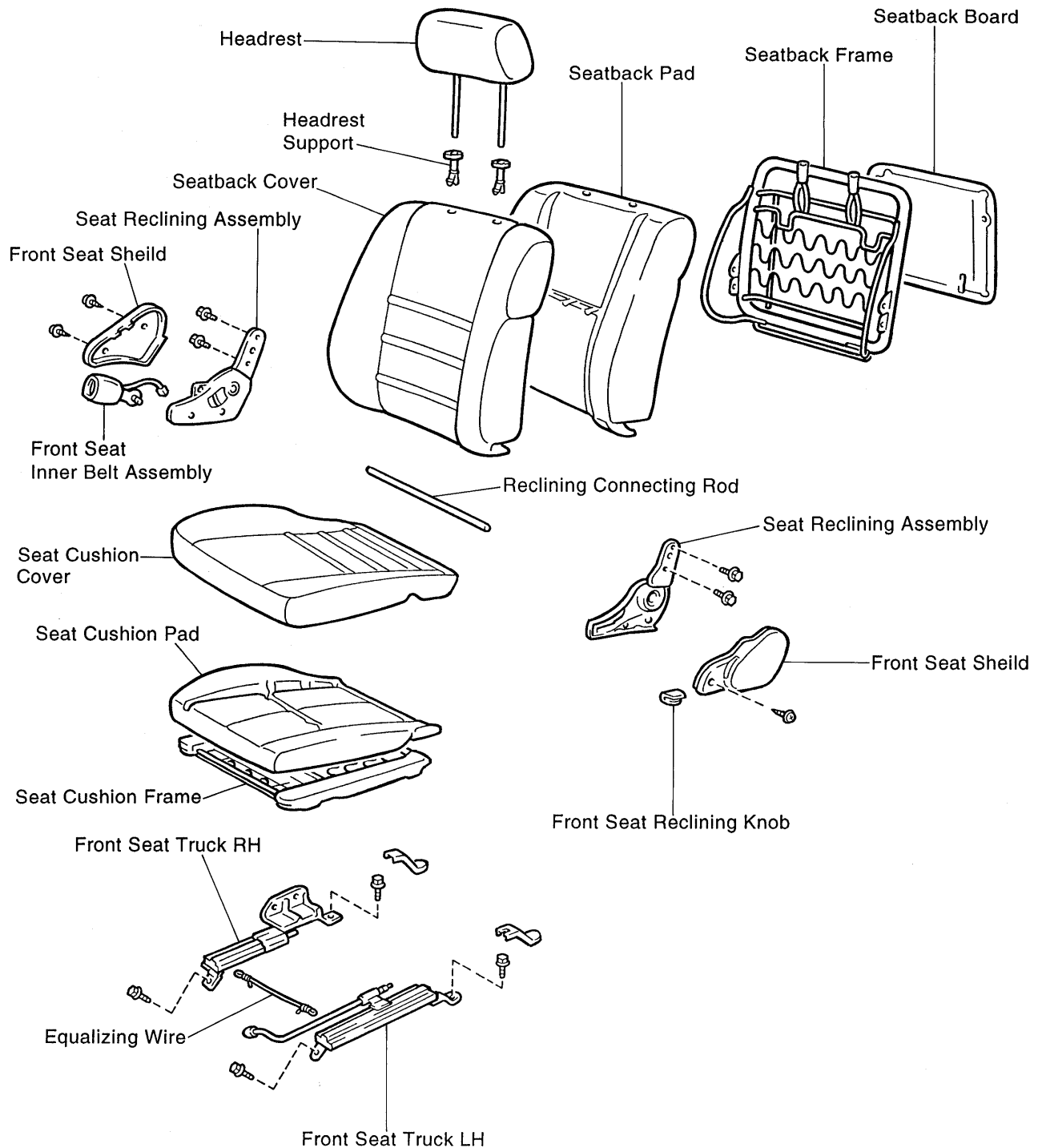
BO39H-01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BO-84](#)).

FRONT SEAT (Manual Adjuster Type) COMPONENTS

BO39D-01



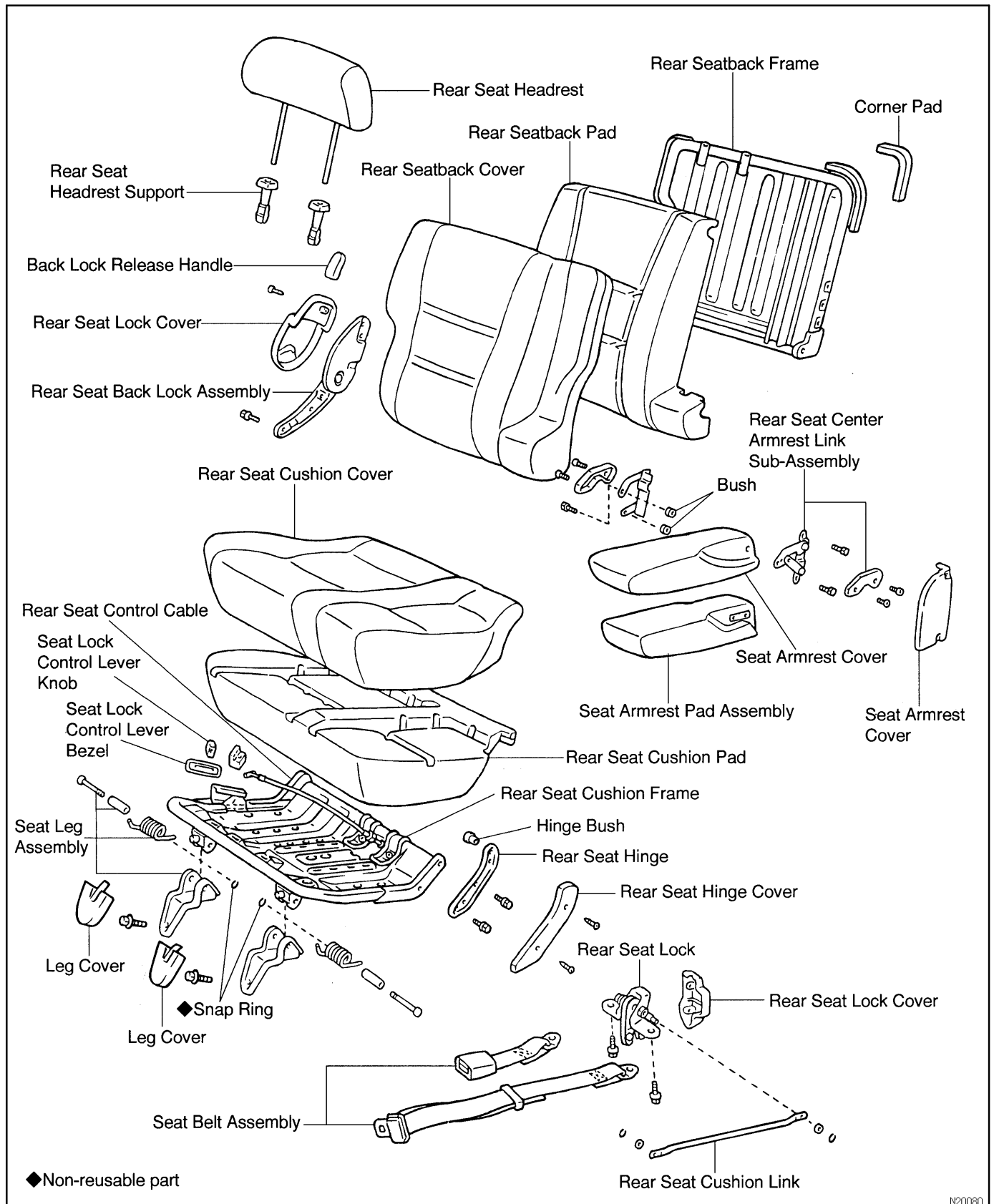
N14123

BO-90

BODY - REAR NO.1 SEAT

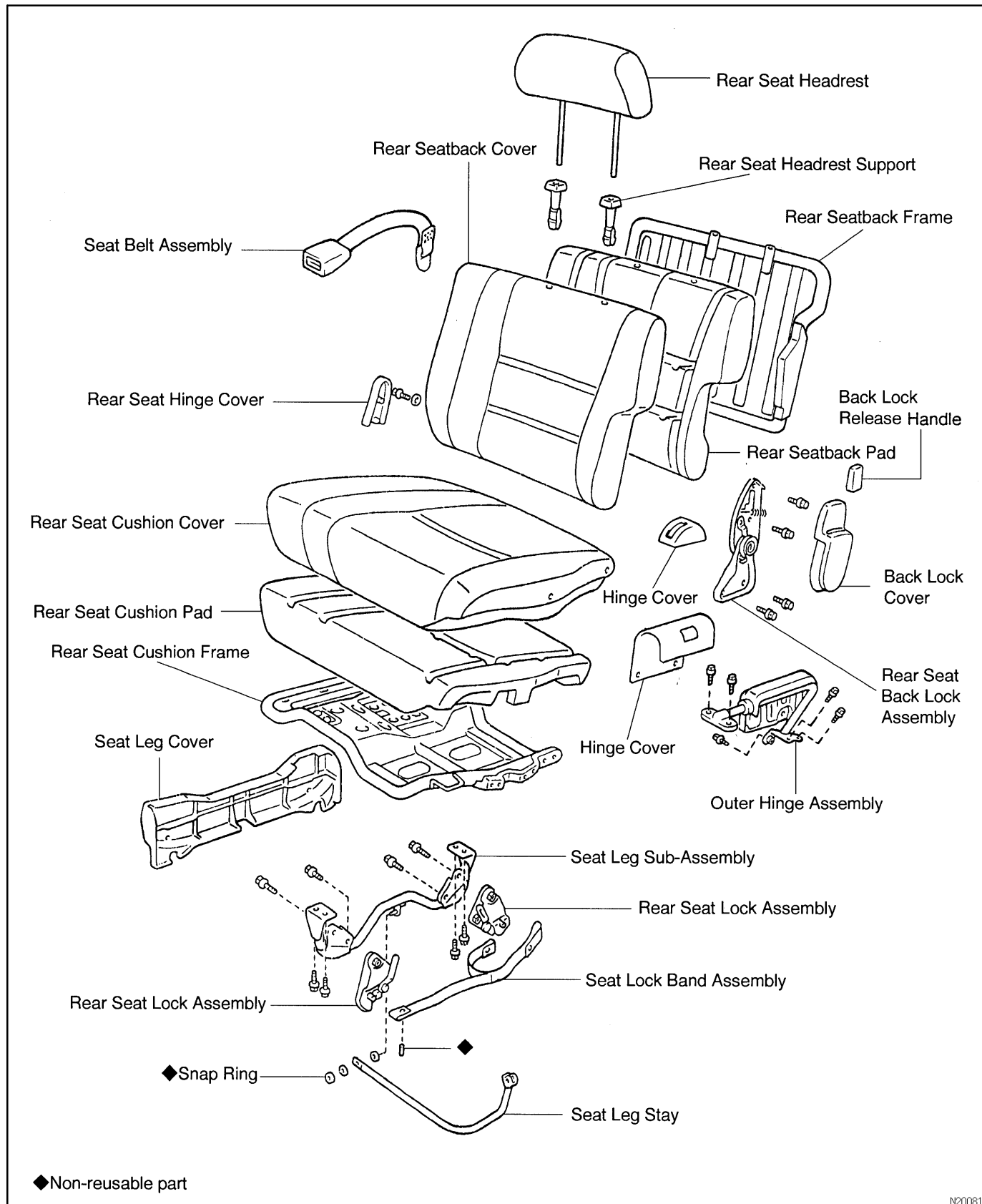
REAR NO.1 SEAT COMPONENTS

B039J-01



REAR NO.2 SEAT COMPONENTS

B039K-01

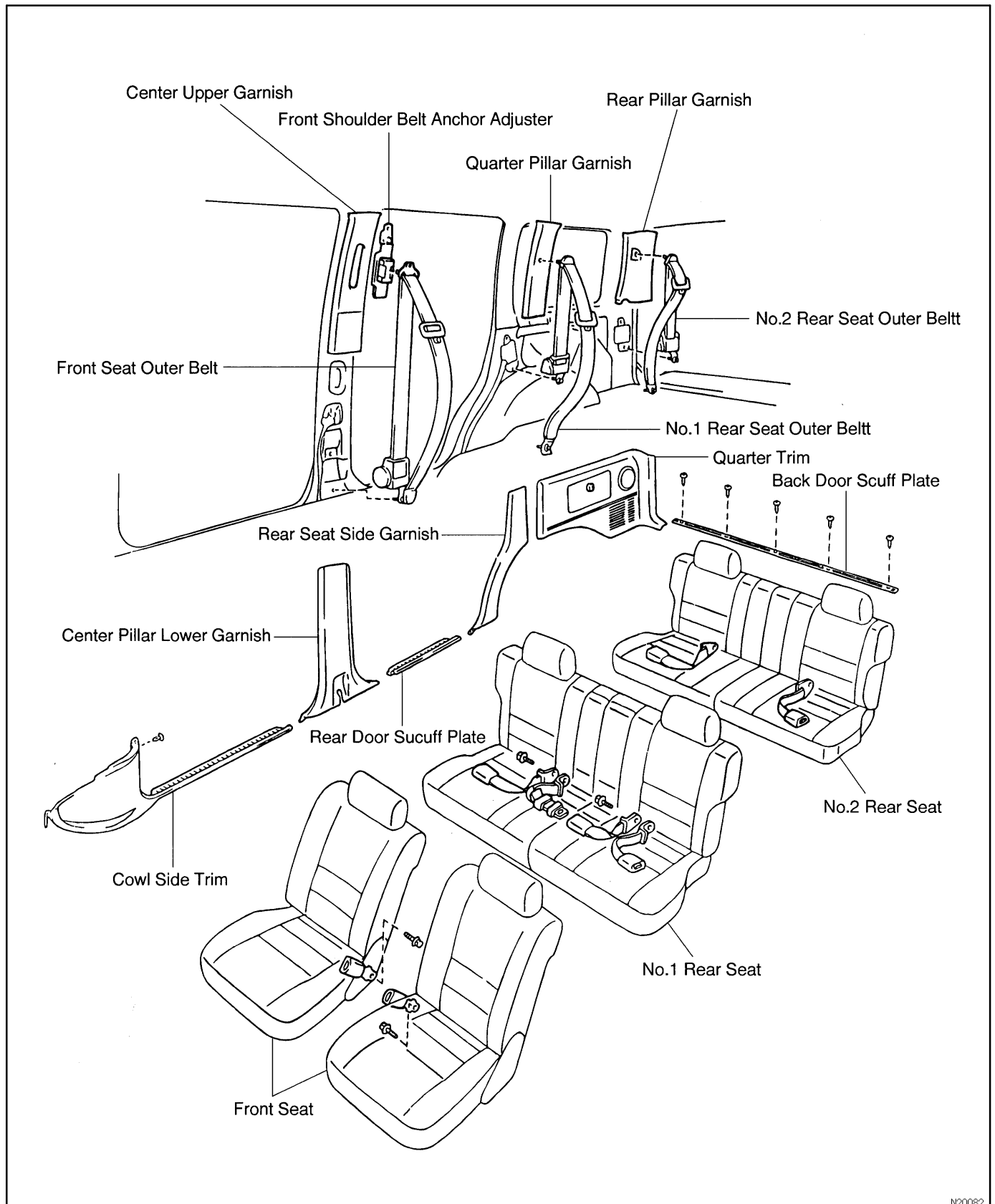


BO-92

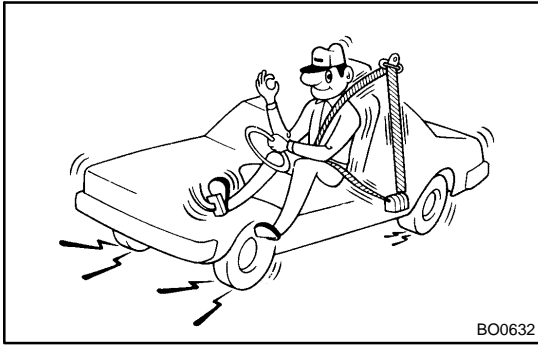
BODY - SEAT BELT

SEAT BELT COMPONENTS

B039L-01



N20082



SEAT BELT INSPECTION

BO39M-01

CAUTION:

Replace the seat belt assembly (outer belt, inner belt, bolts, nuts or sill-bar) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.

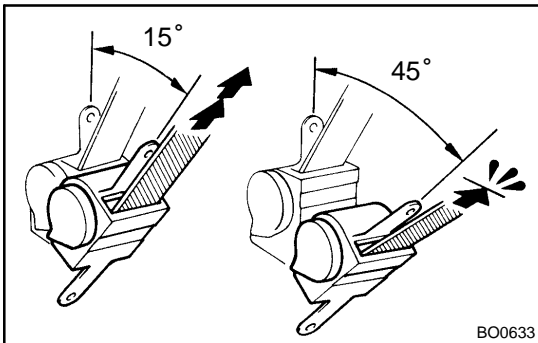
1. All seat belts:

RUNNING TEST (IN SAFE AREA)

- (a) Fasten the front seat belts.
- (b) Drive the car at 10 mph (16 km/h) and make a very hard stop.
Check that the belt locks 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 operation before installation.



2. Driver's seat belt (ELR):

STATIC TEST

- (a) Make sure that the belt locks when pulled out quickly.
- (b) Remove the locking retractor assembly.
- (c) Tilt the retractor slowly.
- (d) Make sure 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.

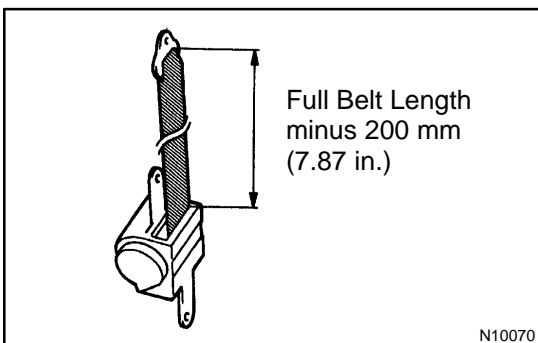
If a problem is found, replace the assembly.

3. Except driver's seat belt (ALR/ELR):

STATIC TEST

- (a) Make sure 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) Make sure that the belt cannot be extended further.

If a problem is found, replace the assembly.



- (e) Retract the whole belt, then pull it out to the full length minus 200 mm (7.87 in.).
- (f) Tilt the retractor slowly.
- (g) Make sure 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.

BRAKE SYSTEM

BR1CC-01

GENERAL DESCRIPTION

- 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.
- It is very important to keep parts and the area clean when repairing the brake system.
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

BR1CD-01

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.

Symptom	Suspect Area	See page
Low pedal or spongy pedal	4. Fluid leaks for brake system	–
	5. Air in brake system	–
	6. Piston seals: worn or damaged	BR-33
	7. Master cylinder: faulty	BR-33
	8. Booster push rod: out of adjustment	BR-9
Brake drag	4. Fluid leaks for brake system	BR-20
	1. Brake pedal freeplay: minimal	BR-6
	2. Parking brake lever travel: out of adjustment	BR-8
	3. Parking brake wire: sticking	–
	4. Pad: cracked or distorted	BR-21
		BR-30
	5. Piston: stuck	BR-33
		BR-33
	6. Piston: frozen	BR-33
		BR-33
Brake pull	7. Tension or return spring: faulty	BR-39
	8. Booster push rod: out of adjustment	BR-20
	9. . Vacuum leaks for booster system	BR-18
	10.. Master cylinder: faulty	BR-9
	1. Piston: stuck	BR-33
		BR-33
Brake pull	2. Pad: oily	BR-21
		BR-30
	3. Piston: frozen	BR-33
		BR-33
	4. Disc: Scored	BR-33
Brake pull		BR-33
	5. Pad: cracked or distorted	BR-21
		BR-30

BRAKE – TROUBLESHOOTING

Hard pedal but brake inefficient	1. Fluid leaks for brake system	–
	2. Air in brake system	–
	3. Pad: worn	BR-21
		BR-30
	4. Pad: cracked or distorted	BR-21
		BR-30
	5. Pad: oily	BR-21
		BR-30
	6. Pad: glazed	BR-21
Noise from brake		BR-30
	7. Disc: scored	BR-21
		BR-30
	8. Booster push rod: out of adjustment	BR-20
	9. Vacuum leaks for booster system	BR-18
	1. Pad: cracked or distorted	BR-21
		BR-30
	2. Installation bolt: loosen	BR-33
		BR-33
	3. Disc: scored	BR-33
		BR-33
	4. Pad support plate: loosen	BR-30
	5. Sliding pin: worn	BR-33
	6. Pad: dirty	BR-21
		BR-30
	7. Pad: glazed	BR-21
		BR-30
	8. Tension or return spring: faulty	BR-39
	9. Anti-squeal shim: damaged	BR-21
		BR-30
	10.. Hold-down spring: damaged	BR-39

BRAKE FLUID BLEEDING

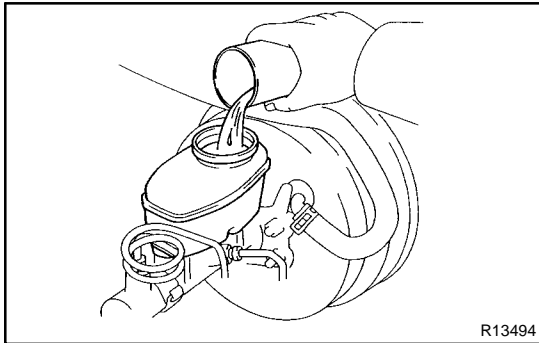
BR1CE-01

HINT:

If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE:

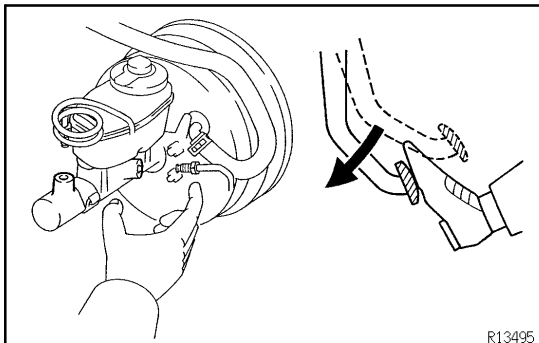
Do not let brake fluid remain on a painted surface. Wash it off immediately.



1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

Fluid: SAE J1703 or FMVSS No.116 DOT3

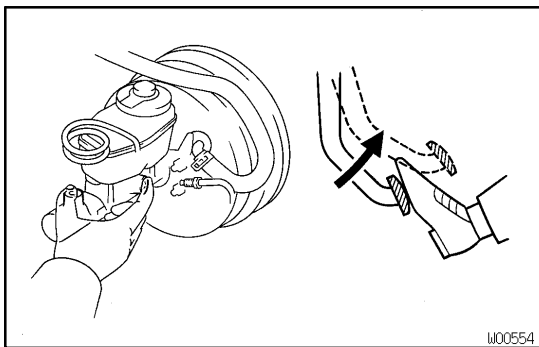


2. BLEED MASTER CYLINDER

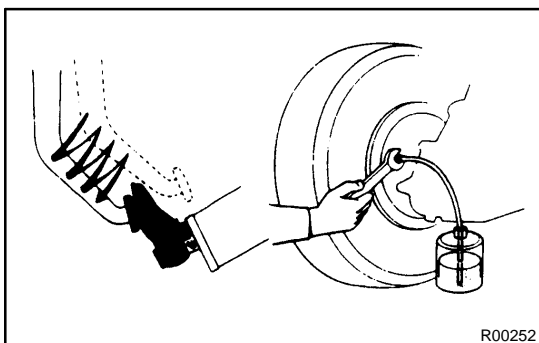
HINT:

If the master cylinder has been disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

- Disconnect the brake lines from the master cylinder.
- Slowly depress the brake pedal and hold it.



- Block off the outlet plugs with your fingers, and release the brake pedal.
- Repeat (b) and (c) 3 or 4 times.



3. CONNECT VINYL TUBE TO BRAKE CALIPER BLEEDER PLUG

Insert other end of the tube in a half-full container of brake fluid.

NOTICE:

Begin bleeding air from the brake caliper with the longest hydraulic line.

4. BLEED BRAKE LINE

- Slowly depress the brake pedal several times.

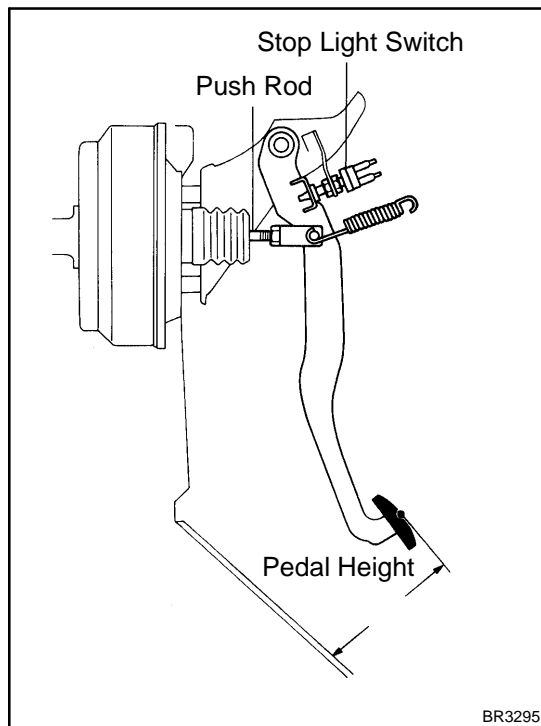
BRAKE - BRAKE FLUID

- (b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then tighten the bleeder plug.
- (c) Repeat this procedure until there are no more air bubbles in the fluid.

Bleeder plug tightening torque:

11 N·m (110 kgf·cm, 8 ft·lbf)

- 5. REPEAT PROCEDURE FOR EACH WHEEL**
- 6. BLEED LSP & BV**



BRAKE PEDAL ON-VEHICLE INSPECTION

BR1CF-04

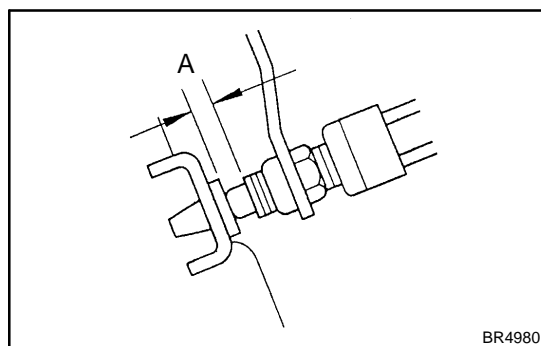
1. CHECK PEDAL HEIGHT

Pedal height from dash panel:

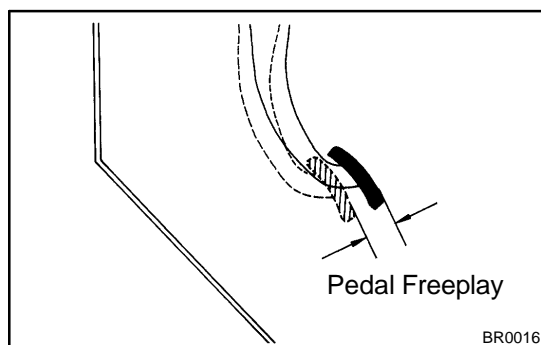
167.5 – 177.5 mm (6.594 – 6.988 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

- Disconnect the connector from the stop light switch.
 - Loosen the stop light switch lock nut and remove the stop light switch.
 - Loosen the push rod lock nut.
 - Adjust the pedal height by turning the pedal push rod.
 - Tighten the push rod lock nut.
- Torque: 25 N·m (260 kgf-cm, 19 ft-lbf)**
- Install the stop light switch and turn it until it lightly contacts the pedal stopper.
 - Turn the stop light switch back one turn.



- Check the clearance (A) between the stop light switch and pedal.
- Clearance: 0.5 – 2.4 mm (0.020 – 0.094 in.)**
- Tighten the stop light switch lock nut.
 - Connect the connector to the stop light switch.
 - Check that the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.
- (l) earance (A) between the stop light switch and the pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications.



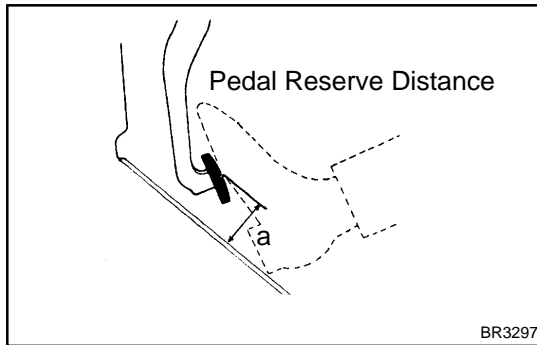
3. CHECK PEDAL FREEPLAY

- Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
 - Push in the pedal by hand until the beginning of the second resistance is felt. Measure the distance.
- Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)**

HINT:

The freeplay to the 1st resistance is due to the play between the clevis and pin. This is magnified up to 3 – 6 mm (0.12 – 0.24 in.) at the pedal.

If incorrect, check the stop light switch clearance.
If the clearance is OK, then troubleshoot the brake system.

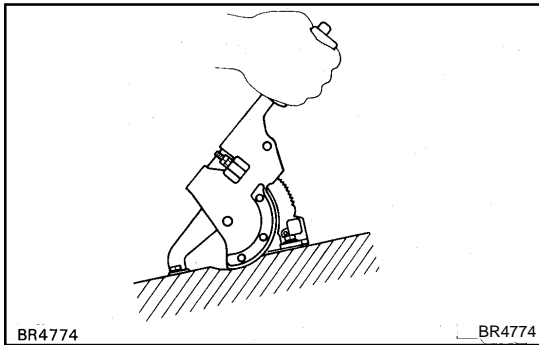


4. CHECK PEDAL RESERVE DISTANCE

- Release the parking brake.
- With the engine running, depress the pedal and measure the pedal reserve distance, as shown.

**Pedal reserve distance, 'a', at 490 N (50 kgf, 110.2lbf):
More than 68 mm (2.68 in.)**

If the reserve distance is incorrect, troubleshoot the brake system.



PARKING BRAKE LEVER ON-VEHICLE INSPECTION

BR1CG-01

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, 44.1 lbf):
7 – 9 clicks**

If incorrect, adjust the parking brake.

2. IF NECESSARY, ADJUST PARKING BRAKE

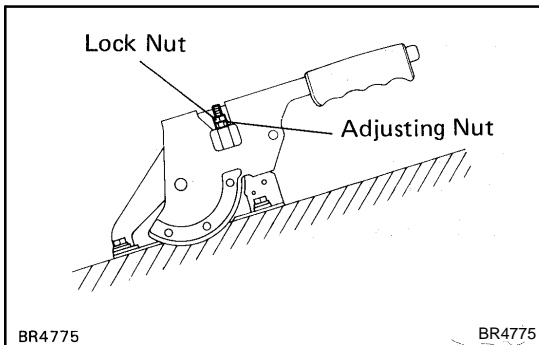
HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted. For shoe clearance adjustment (See page [BR-42](#)).

- Remove the rear console box.
- Loosen the lock nut and turn the adjusting nut until the lever travel is correct.
- Tighten the lock nut.

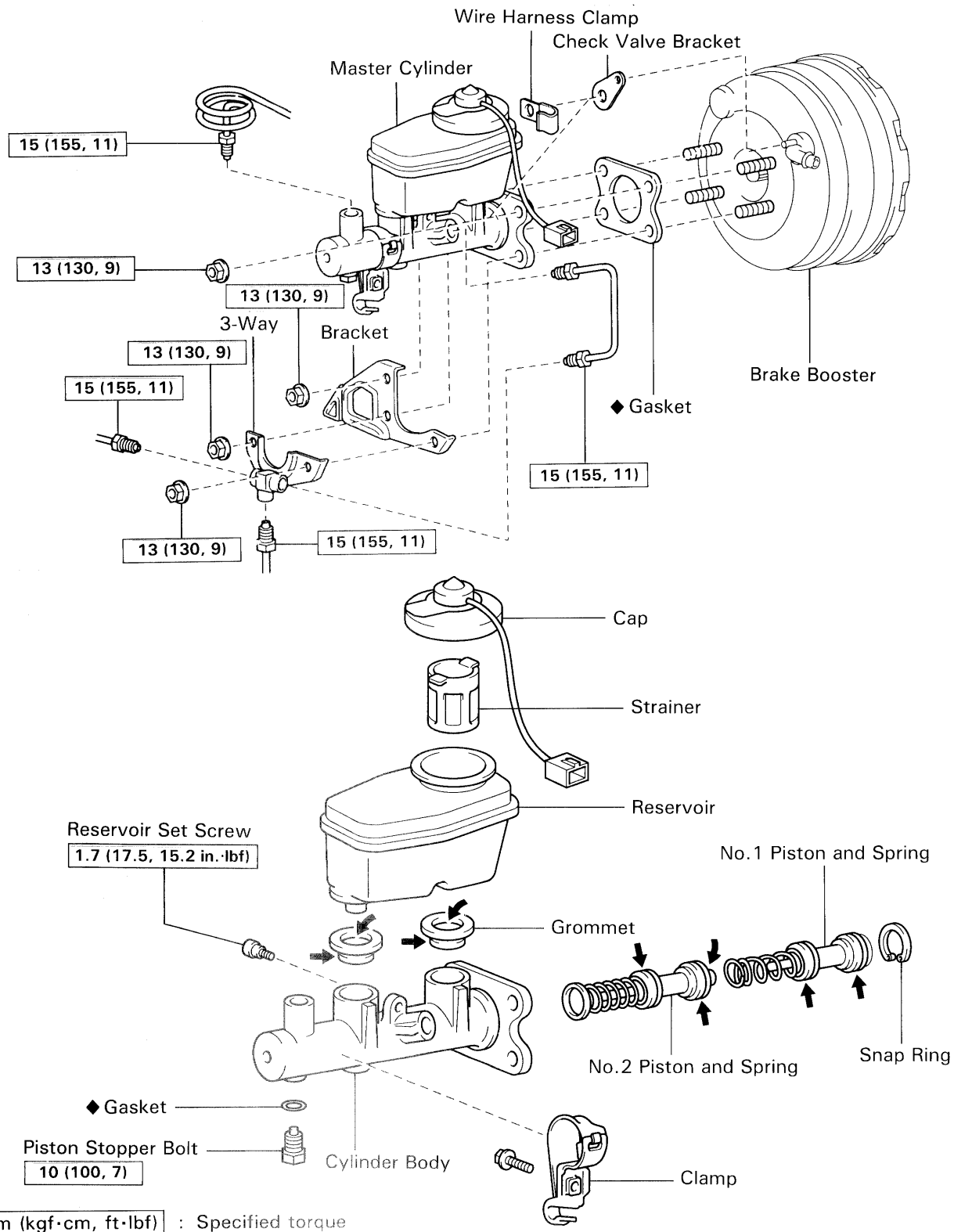
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

- Install the rear console box.



BRAKE MASTER CYLINDER COMPONENTS

BR1CH-01

W02212
W02213

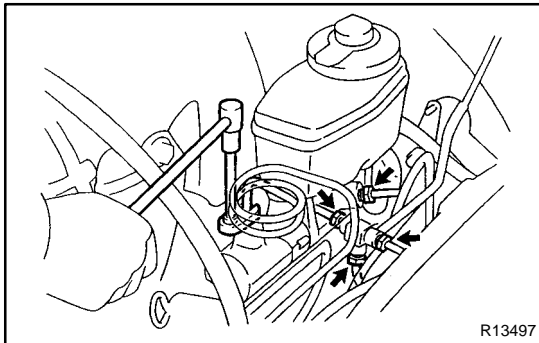
Z18608

REMOVAL

1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR
2. TAKE OUT FLUID WITH SYRINGE

NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

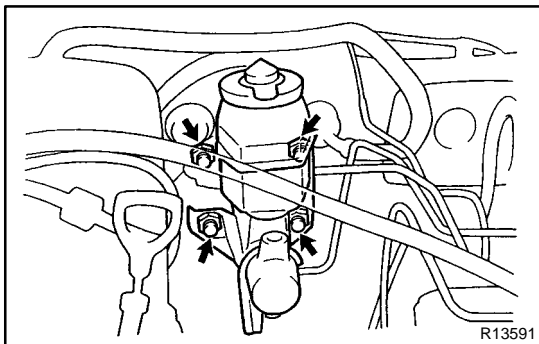


3. DISCONNECT BRAKE LINES

Using SST, disconnect the 4 brake lines from the master cylinder and 3-way.

SST 09023-00100

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)



4. REMOVE MASTER CYLINDER

- (a) Remove the 4 nuts.
Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)
- (b) Remove the 3-way, check valve bracket, wire harness clamp and bracket.
- (c) Pull out the master cylinder and gasket.

DISASSEMBLY

1. REMOVE RESERVOIR

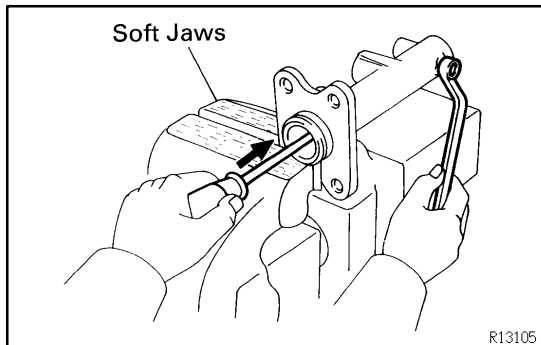
- (a) Remove the set screw and pull out the reservoir.

Torque: 1.7 N·m (17.5 kgf·cm, 15.2 in.-lbf)

- (b) Remove the cap and strainer from the reservoir.

2. REMOVE 2 GROMMETS

3. REMOVE BOLT AND CLAMP FROM CYLINDER BODY



4. PLACE CYLINDER IN VISE

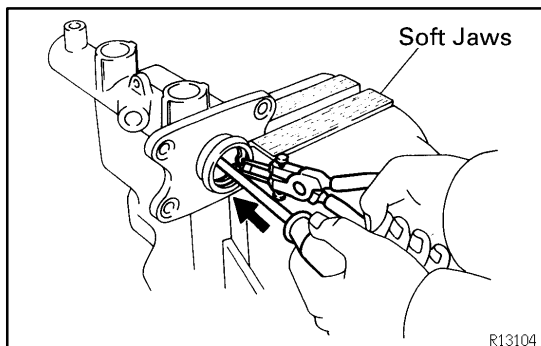
5. REMOVE PISTON STOPPER BOLT

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.

Torque: 10 N·m (100 kgf·cm, 7 ft-lbf)



6. REMOVE 2 PISTONS AND SPRINGS

- (a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

HINT:

Tape the screwdriver tip before use.

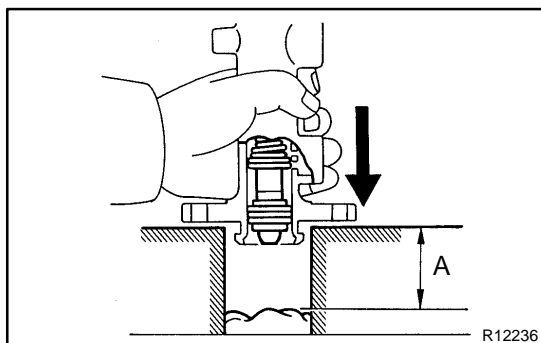
- (b) Remove the No.1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE:

If pulled out and installed at an angle, there is a possibility that the cylinder bore could be damaged.

NOTICE:

Be careful not to damage the rubber lips on the pistons.



- (c) Place a rag and 2 wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of the cylinder.

HINT:

Make sure that the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

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.

REASSEMBLY

Reassembly is in the reverse order of disassembly.

NOTICE:

Apply lithium soap base glycol grease to the rubber parts indicated by the arrows
(See page [BR-9](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [BR-9](#)).

HINT:

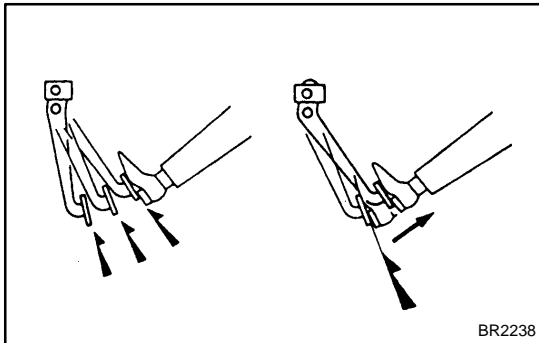
- Before installation, adjust length of brake booster push rod (See page [BR-18](#)).
- After installation, fill brake reservoir with brake fluid, bleed brake system (See page [BR-4](#)).
- Check for leaks, check and adjust brake pedal (See page [BR-6](#)).

BRAKE BOOSTER ASSEMBLY OPERATION

BR1CN-01

1. OPERATING CHECK

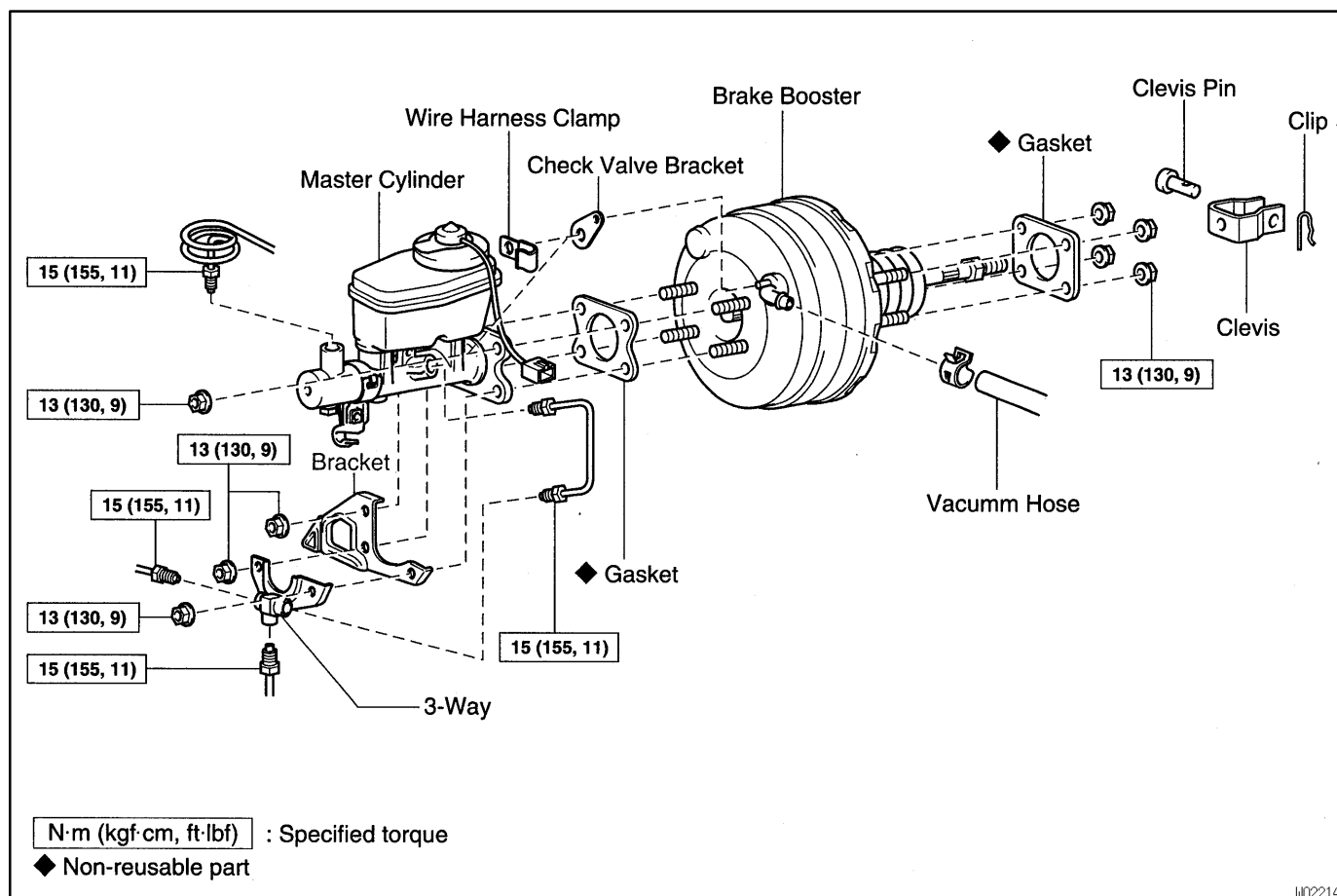
- (a) Depress the brake pedal several times with the engine off and check that there is no change in the pedal reserve distance.
- (b) Depress the brake pedal and start the engine. If the pedal goes down slightly, operation is normal.



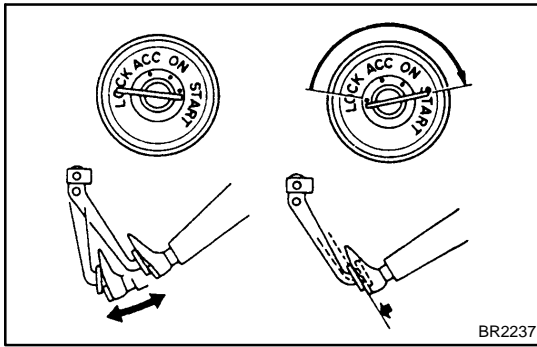
2. AIR TIGHTNESS CHECK

- (a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly. If the pedal goes down furthest the 1st 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 reserve travel after holding the pedal for 30 seconds, the booster is air tight.

COMPONENTS



W02214

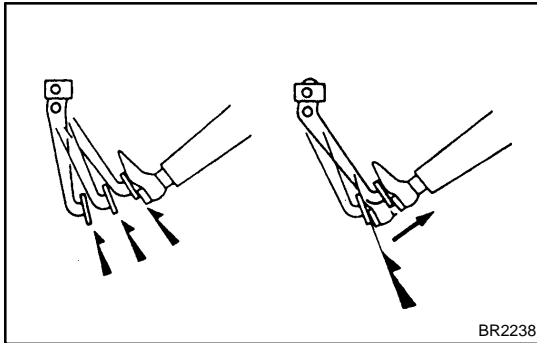


BRAKE BOOSTER ASSEMBLY OPERATION

BR1NM-01

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

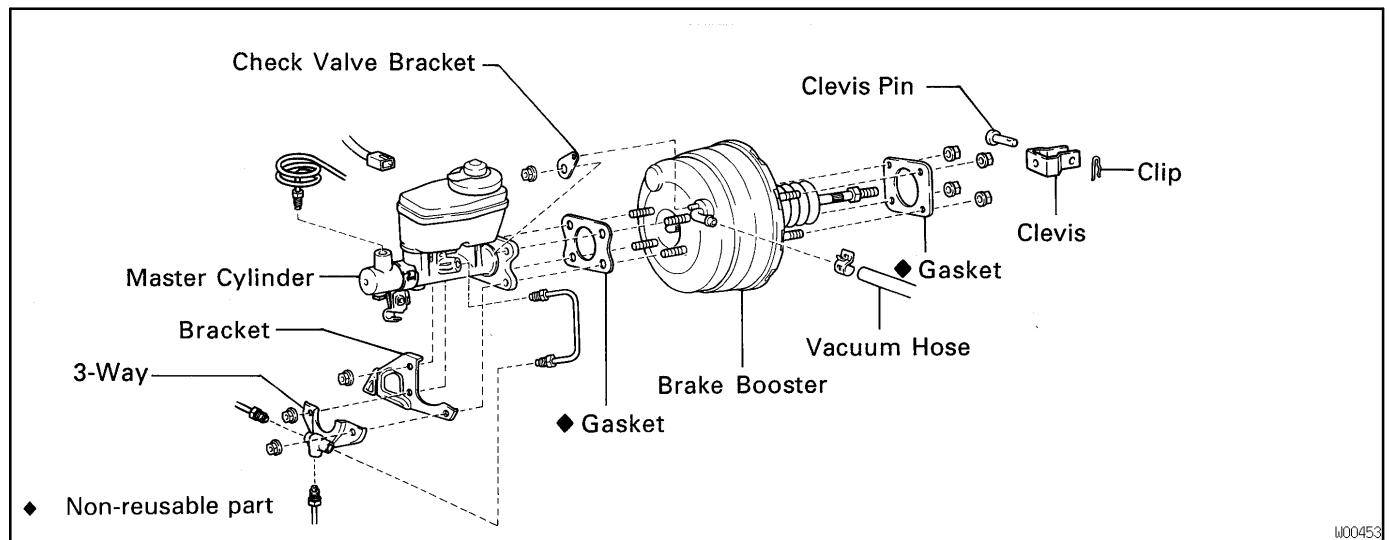
- (a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly. If the pedal goes down furthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.
- (b) Depress the brake pedal while the engine is running, and stop the engine with the pedal depressed. If there is no change in the pedal reserve travel after holding the pedal for 30 seconds, the booster is air tight.

BR-18

BRAKE - BRAKE BOOSTER ASSEMBLY

BR1CO-02

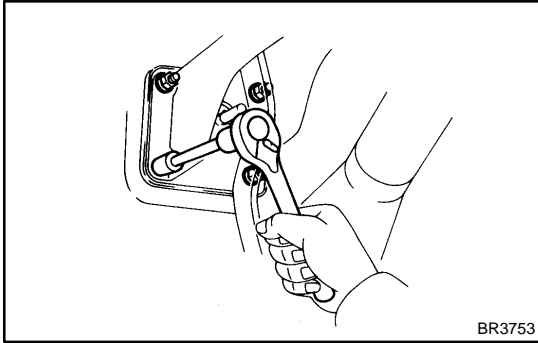
COMPONENTS



1996 LAND CRUISER (RM451U)

REMOVAL

1. **REMOVE MASTER CYLINDER** (See page [BR-9](#))
2. **REMOVE THESE PARTS:**
 - Return spring
 - Clip and clevis pin
 - Clevis
 - Vacuum hose

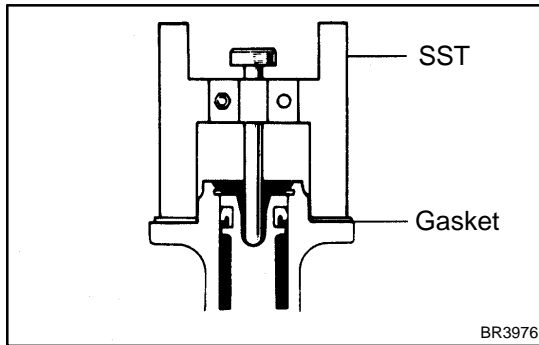


3. **REMOVE BRAKE BOOSTER**
 - (a) Remove the 4 booster installation nuts.
 - (b) Remove the booster and gasket.

INSTALLATION

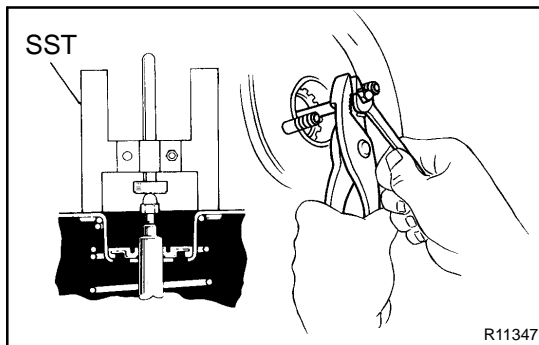
1. INSTALL BRAKE BOOSTER

- Install the booster and a new gasket.
- Install the clevis to the operating rod.
- Install and torque the booster installation nuts.
Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)
- Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.
- Install the pedal return spring.



2. ADJUST LENGTH OF BOOSTER PUSH ROD

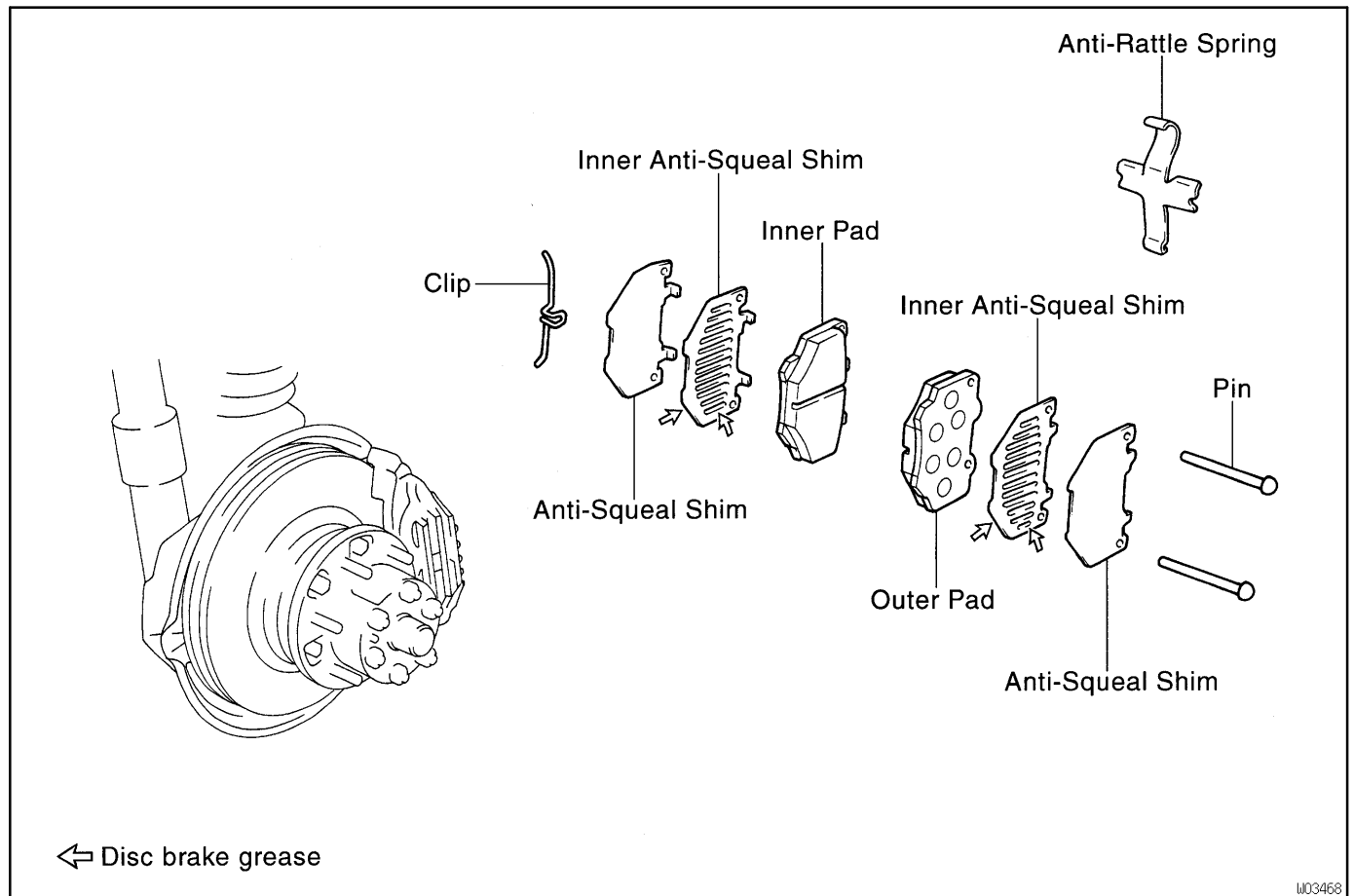
- Install a new gasket on the master cylinder.
- Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.
SST 09737-00010



- Turn the SST upside down, and set it on the booster.
SST 09737-00010
 - Measure the clearance between the booster push rod and pin head (SST).
Clearance: 0 mm (0 in.)
 - Adjust the booster push rod length until the push rod lightly touches the pin head.
- INSTALL MASTER CYLINDER** (See page [BR-9](#))
 - CONNECT VACUUM HOSE TO BRAKE BOOSTER**
 - FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM** (See page [BR-4](#))
 - CHECK FOR FLUID LEAKAGE**
 - CHECK AND ADJUST BRAKE PEDAL**
(See page [BR-6](#))
 - DO OPERATIONAL CHECK** (See page [BR-17](#))

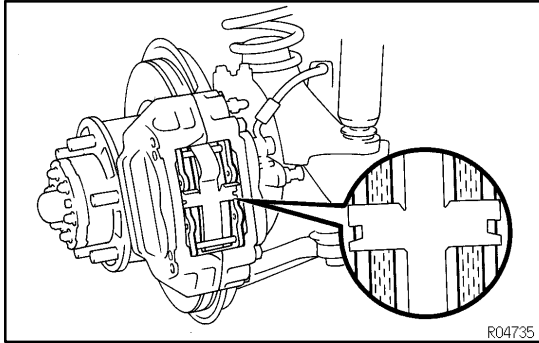
FRONT BRAKE PAD COMPONENTS

BR1CR-01



REPLACEMENT

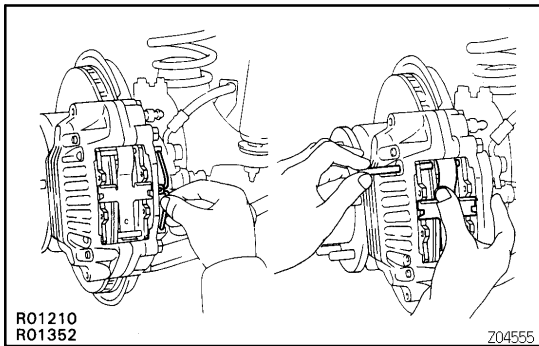
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within the specification.

Minimum thickness: 1.0 mm (0.039 in.)



3. REMOVE THESE PARTS:

- Clip
- 2 pins
- Anti-rattle spring
- 2 pads
- 4 anti-squeal shims

NOTICE:

The anti-rattle spring and clip can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

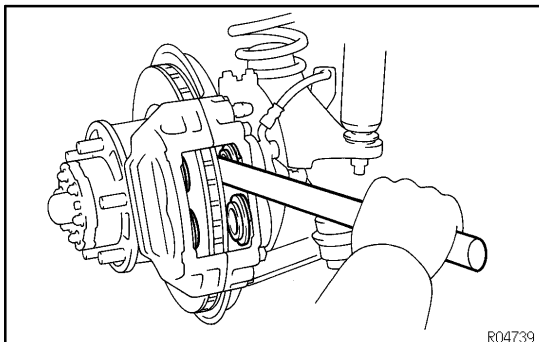
4. CHECK DISC THICKNESS AND RUNOUT (See page [BR-27](#))

5. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti-squeal shims must be replaced together with the pads.

(a) Draw out a small amount of brake fluid from the reservoir.



(b) Press in the pistons with a hammer handle or an equivalent.

HINT:

- Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.
- 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 2 anti-squeal shims to new pads.

HINT:

Apply disc brake grease to both sides of the inner anti-squeal shims (See page [BR-21](#)).

(d) Install the 2 pads.

HINT:

Apply disc brake grease to the caliper indicated by the arrows (See page [BR-33](#)).

NOTICE:

Do not allow oil or grease to get on the rubbing face.

6. INSTALL ANTI-RATTLE SPRING AND 2 PINS

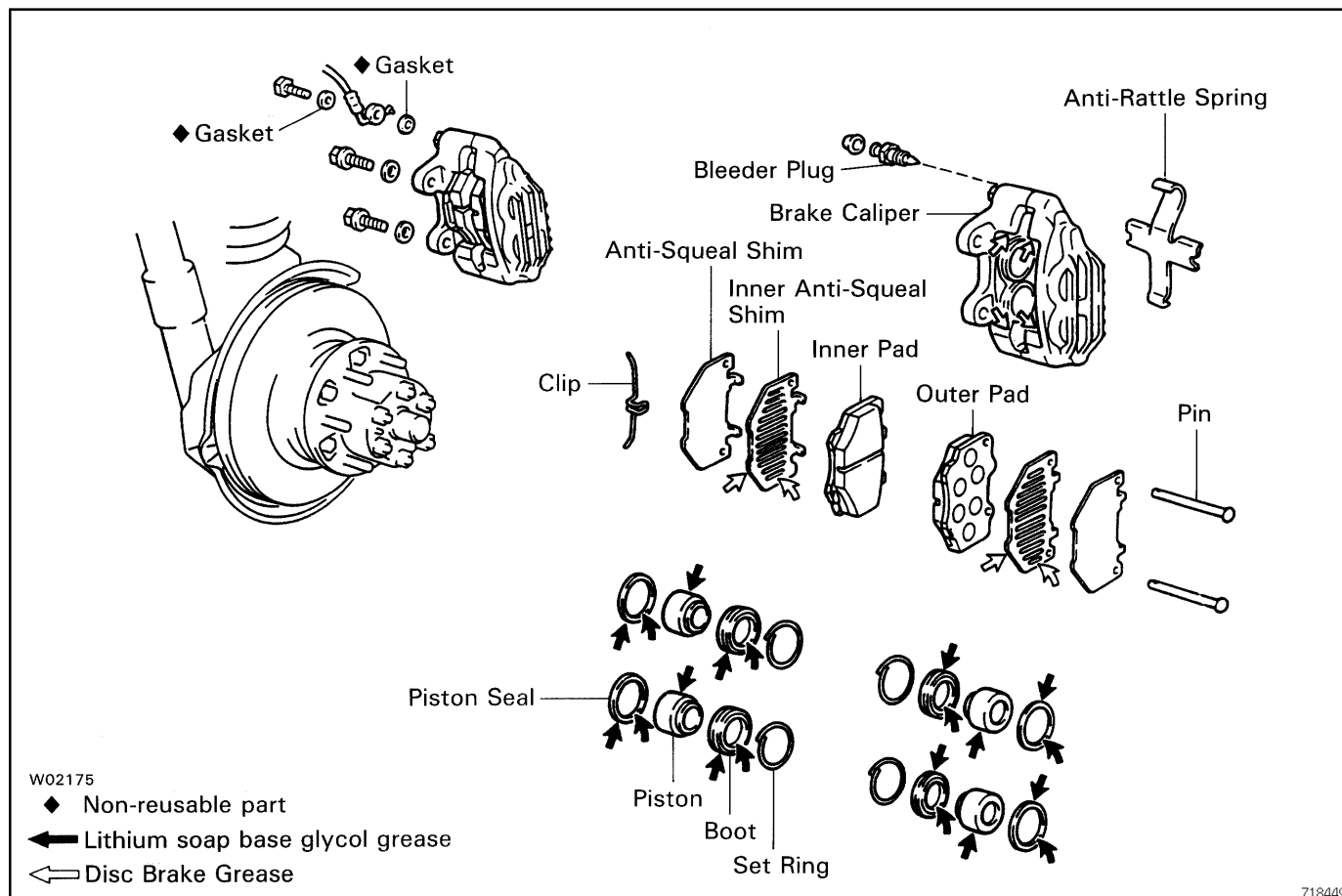
7. INSTALL CLIP

8. INSTALL FRONT WHEEL

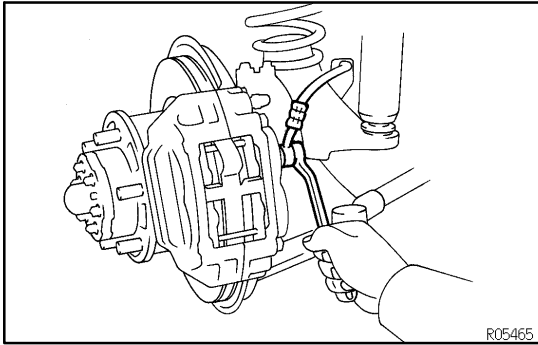
9. CHECK THAT FLUID LEVEL IS AT MAX LINE

FRONT BRAKE CALIPER COMPONENTS

BR1CT-01



Z18449



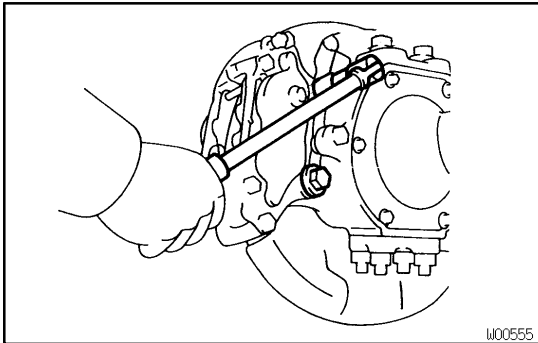
REMOVAL

1. DISCONNECT FLEXIBLE HOSE

- (a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.

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

- (b) Use a container to catch the brake fluid as it drains out.



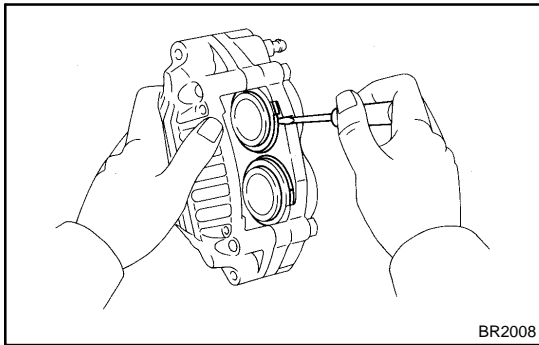
2. REMOVE CALIPER

Remove the 2 mounting bolts and caliper.

Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

3. REMOVE THESE PARTS:

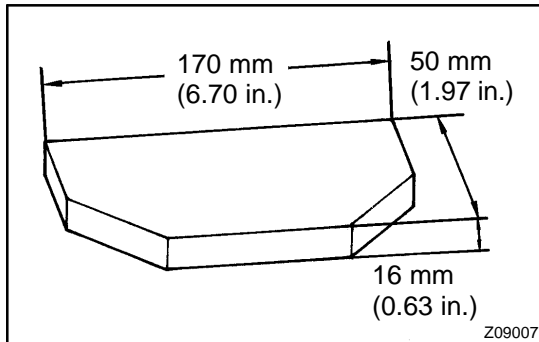
- Clip
- 2 pins
- Anti-rattle spring
- 2 pads
- 4 anti-squeal shims



DISASSEMBLY

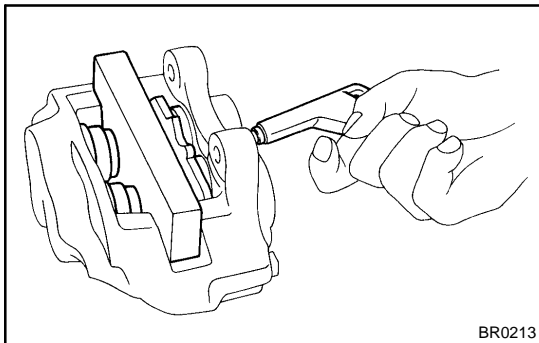
1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the 4 cylinder boot set rings and boots.



2. REMOVE PISTONS FROM CYLINDER

(a) Prepare the wooden plate to hold the pistons.

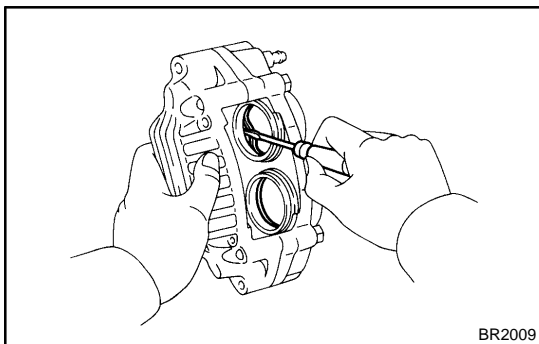


(b) Place the plate between the pistons and insert a pad at one side.

(c) Use compressed air to remove the pistons alternately from the cylinder.

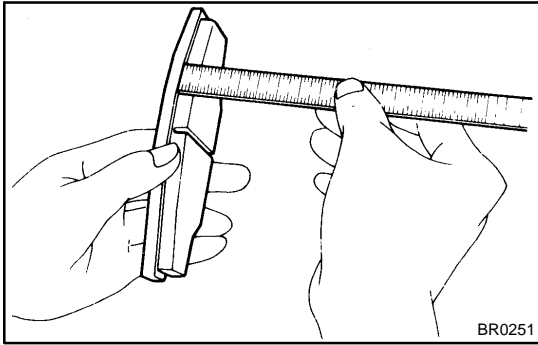
CAUTION:

Do not place your fingers in front of the pistons when using compressed air.



3. REMOVE PISTON SEALS

Using a screwdriver, remove the 4 piston seals from the cylinder.



INSPECTION

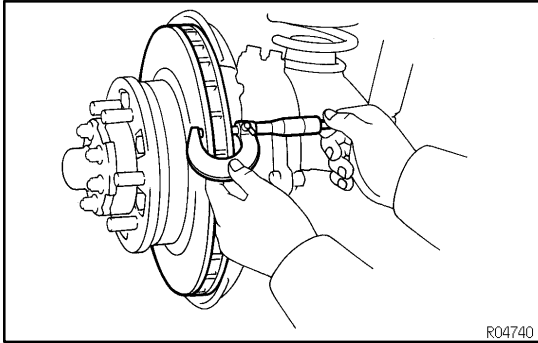
1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness: 9.5 mm (0.374 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows signs of uneven wear.



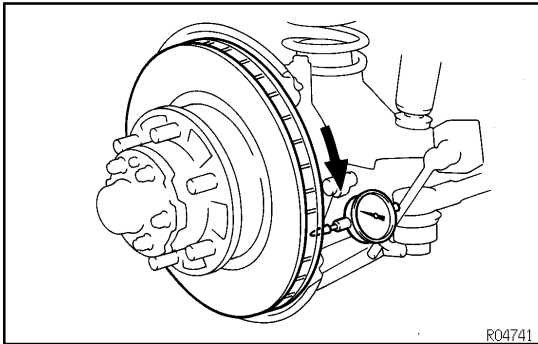
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 32.0 mm (1.260 in.)

Minimum thickness: 30.0 mm (1.181 in.)

If the disc is scored or worn, or if its thickness is less than the minimum, repair or replace the disc.



3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout at a position 10 mm (0.39 in.) from the outside edge.

Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, replace the disc or grind it on a "On-Car" brake lathe.

HINT:

Before measuring the runout, confirm that the front hub bearing play is within the specification.

4. IF NECESSARY, REPLACE DISC

- Remove the front axle hub (See page [SA-7](#)).
- Remove the disc from the axle hub.
- Install a new disc and torque the bolts.

Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)

- Install the axle hub and adjust the front bearing preload (See page [SA-9](#)).

BR-28

BRAKE – FRONT BRAKE CALIPER

BR1CW-01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-26](#)).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by the arrows (See page [BR-33](#)).

INSTALLATION

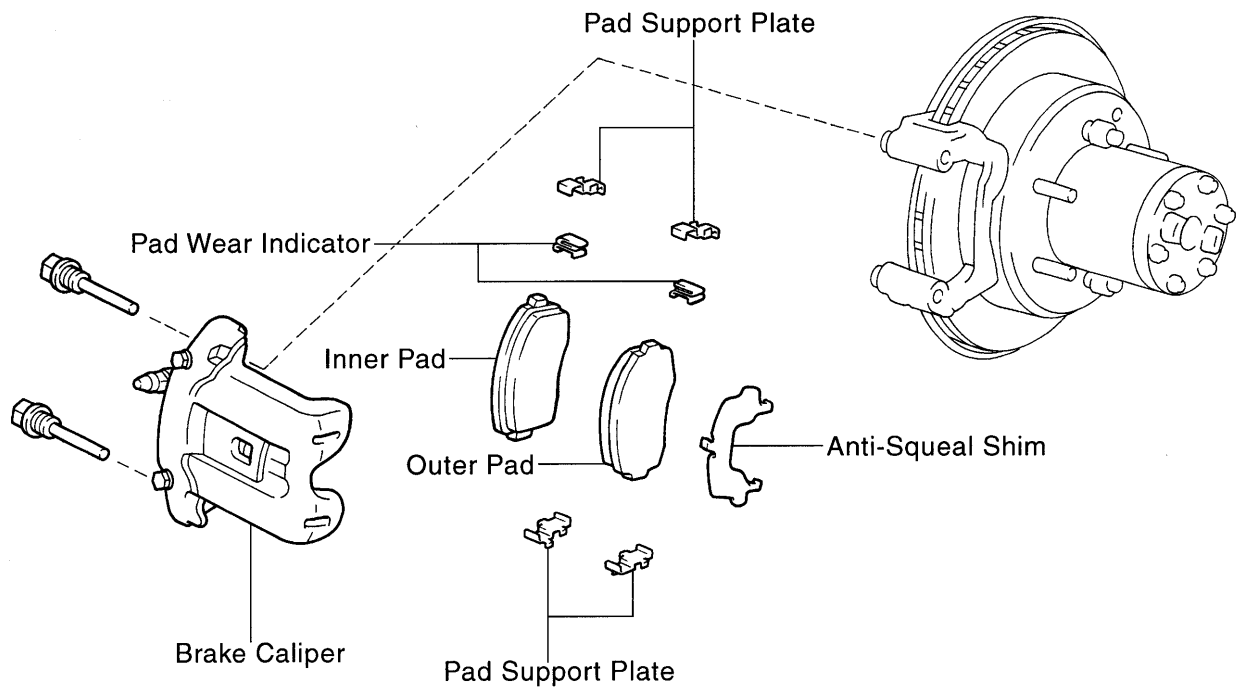
Installation is in the reverse order of removal (See page [BR-25](#)).

HINT:

After installation, fill the brake reservoir with brake fluid, bleed brake system (see page [BR-4](#)) and check for leaks.

REAR BRAKE PAD COMPONENTS

BR1CZ-02



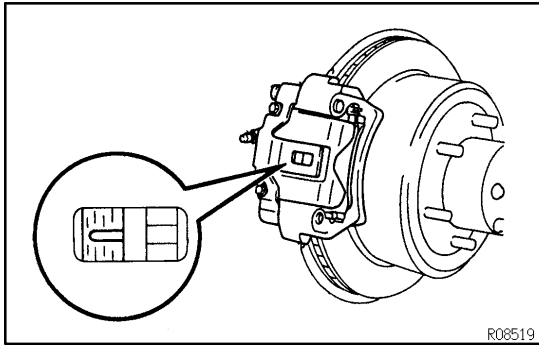
: Specified torque

W03469

REPLACEMENT

1. REMOVE REAR WHEEL

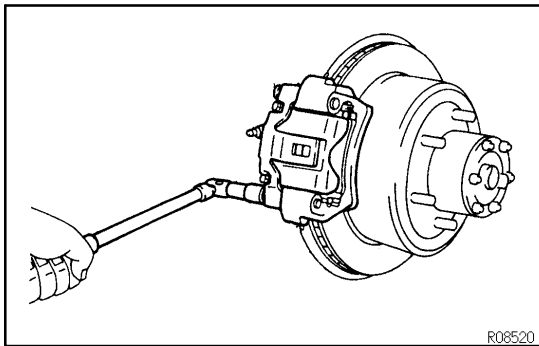
Remove the wheel and temporarily fasten the disc with the hub nuts.



2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspection hole and replace pads if the thickness is not within the specification.

Minimum thickness: 1.0 mm (0.039 in.)



3. REMOVE BRAKE CALIPER

- Remove the sliding main pin and sliding sub pin.
- Remove the caliper and suspend it so the hose is not stretched.

HINT:

Do not disconnect the flexible hose.

4. REMOVE THESE PARTS:

- 2 brake pads
- Anti-squeal shim
- 4 pad support plates
- 2 pad wear indicator plates

NOTICE:

The pad support plates can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

5. CHECK DISC THICKNESS AND RUNOUT

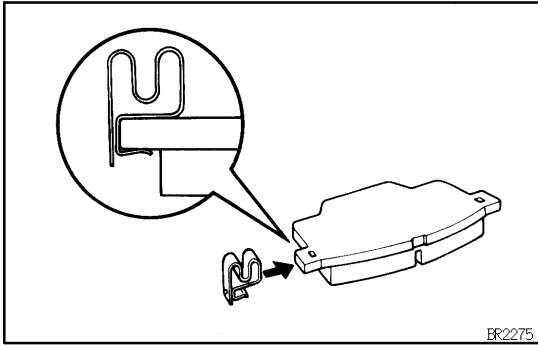
(See page [BR-36](#))

6. INSTALL PAD SUPPORT PLATES

7. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti-squeal shim and wear indicator plates must be replaced together with the pads.



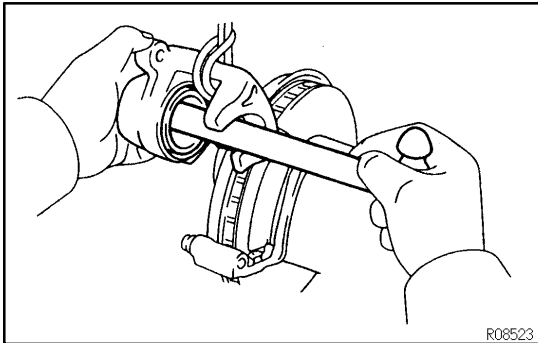
- (a) Install pad wear indicator plate to each pads.
- (b) Install the anti-squeal shim to the outer pad.
- (c) Install the 2 pads so the wear indicator plate is facing upward.

NOTICE:

Do not allow oil or grease to get on the rubbing face.

8. INSTALL CALIPER

- (a) Draw out a small amount of brake fluid from the reservoir.



- (b) Press in piston with a hammer handle or an equivalent.
- HINT:**

Always change the pads on one wheel at a time as there is a possibility of the opposite piston flying out.

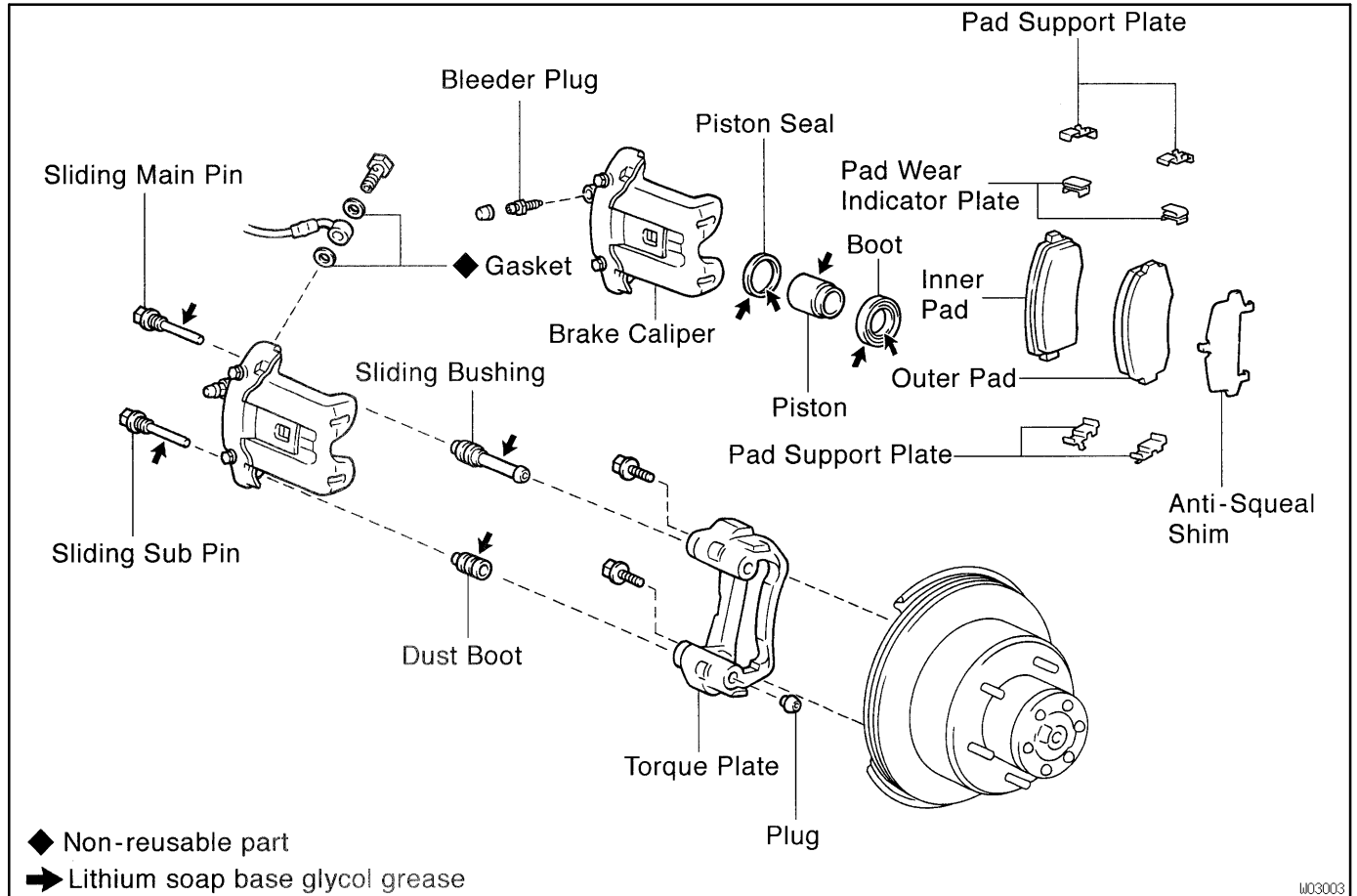
- (c) Install the caliper carefully so the boot is not wedged.
- (d) Install and torque the sliding main pin and sub pin.

Torque: 88 N·m (900 kgf-cm, 65 ft-lbf)

9. INSTALL REAR WHEEL**10. CHECK THAT FLUID LEVEL IS AT MAX LINE**

REAR BRAKE CALIPER COMPONENTS

BR1D1-01



W03003

REMOVAL

1. DISCONNECT FLEXIBLE HOSE

- (a) Remove the union bolt and 2 gaskets from the caliper, then disconnect the flexible hose from the caliper.

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

- (b) Use a container to catch the brake fluid as it drains out.

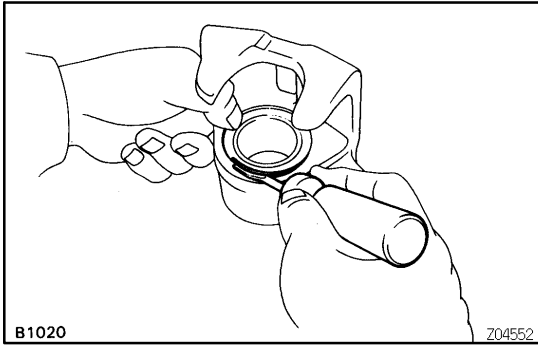
2. REMOVE CALIPER

Remove the 2 sliding pins and caliper.

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)

3. REMOVE THESE PARTS:

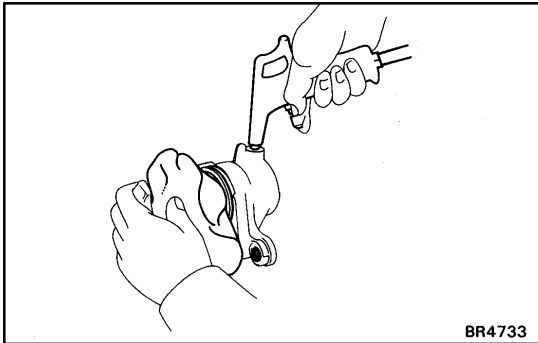
- (a) 2 pads with anti-squeal shim
- (b) 4 pad support plates



DISASSEMBLY

1. REMOVE CYLINDER BOOT

Using a screwdriver, remove the cylinder boot from the caliper.

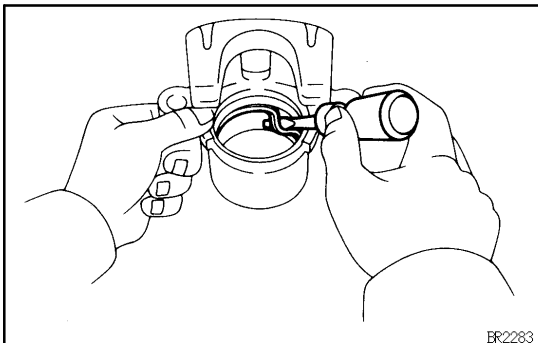


2. REMOVE PISTON

- (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 air.



3. REMOVE PISTON SEAL

Using a screwdriver, remove the piston seal from the cylinder.

4. REMOVE DUST BOOT AND SLIDING BUSHING

Using a screwdriver and hammer, tap out dust boot and sliding bushing.

HINT:

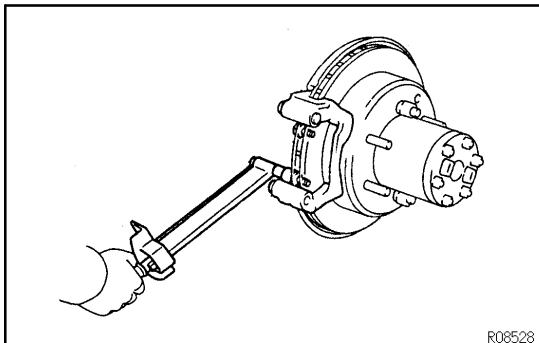
Tape the screwdriver tip before use.

INSPECTION

1. **MEASURE PAD LINING THICKNESS**
(See step 1. on page [BR-27](#))
Standard thickness: 10.0 mm (0.394 in.)
Minimum thickness: 1.0 mm (0.039 in.)
2. **MEASURE DISC THICKNESS** (See page [BR-27](#))
Standard thickness: 18.0 mm (0.709 in.)
Minimum thickness: 16.0 mm (0.630 in.)
3. **MEASURE DISC RUNOUT** (See page [BR-27](#))
Maximum disc runout: 0.15 mm (0.0059 in.)

If the runout is greater than the maximum, adjust the disc runout or grind it on a "On-Car" brake lathe.

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 and loosely install the hub nuts.



- (d) Install the torque plate and tighten the mounting bolts.
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [BR-35](#)).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by the arrows (See page [BR-33](#)).

INSTALLATION

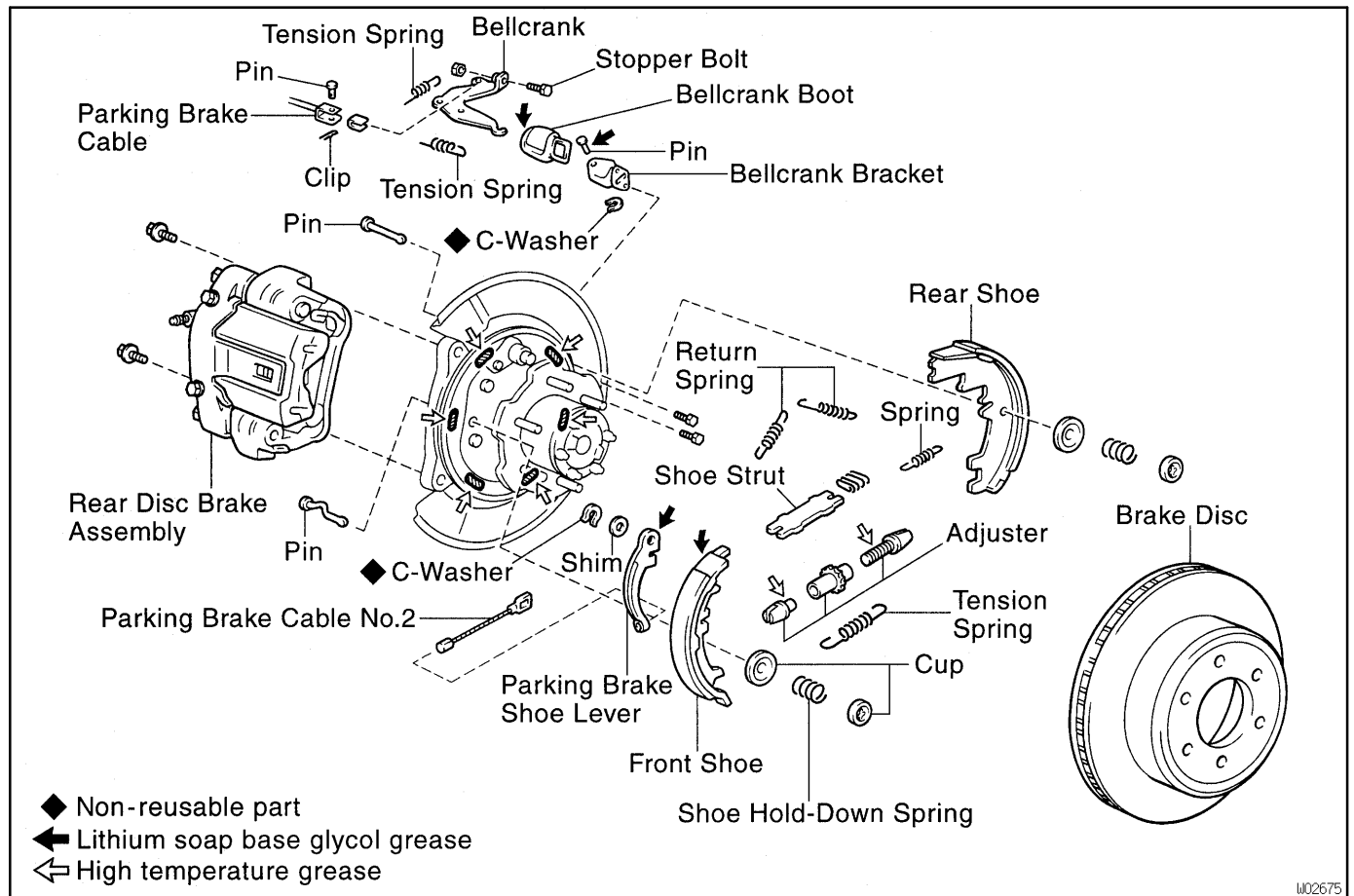
Installation is in the reverse order of removal (See page [BR-34](#)).

HINT:

After installation, fill brake reservoir with brake fluid, bleed brake system (See page [BR-4](#)) and check for leaks.

PARKING BRAKE COMPONENTS

BR1D7-01



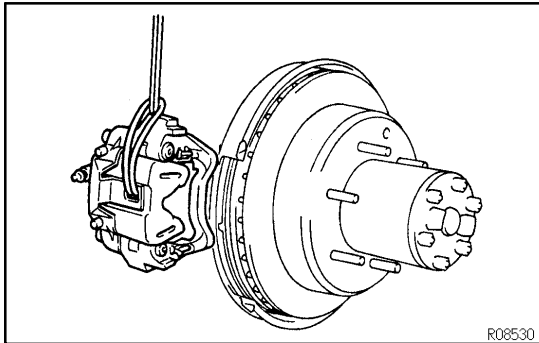
DISASSEMBLY

1. REMOVE REAR WHEEL

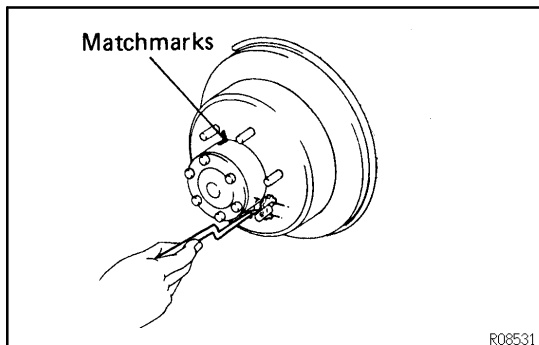
2. REMOVE REAR DISC BRAKE ASSEMBLY

- (a) Remove the 2 mounting bolts and remove the disc brake assembly.

Torque: 88 N·m (900 kgf-cm, 65 ft-lbf)



- (b) Suspend the disc brake assembly securely. Ensure that the hose is not stretched.

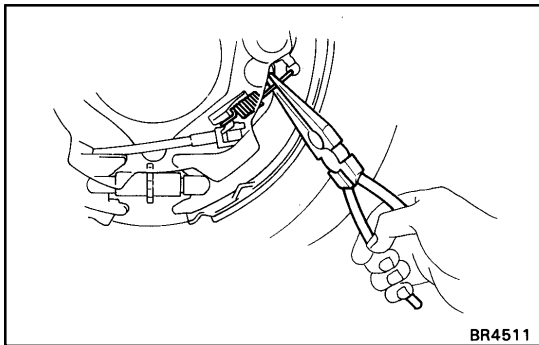


3. REMOVE DISC

Place the matchmarks on the disc and rear hub, and remove the disc.

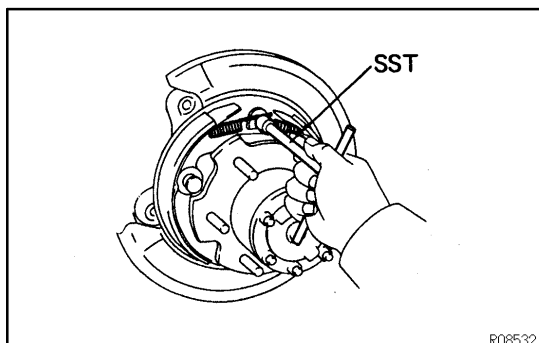
HINT:

If the disc cannot be removed easily, turn the shoe adjuster until the wheel turns freely.



4. REMOVE TENSION SPRING

Using needle-nose pliers, remove the tension spring.



5. REMOVE SHOE RETURN SPRINGS

Using SST, remove the shoe return springs.

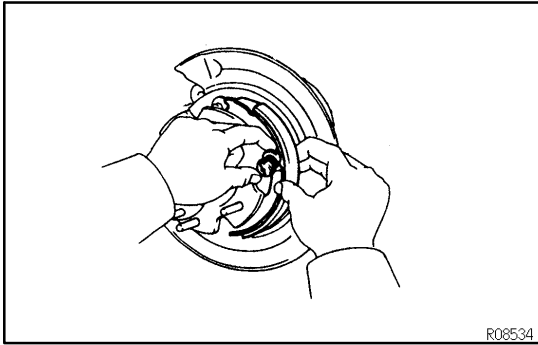
SST 09717-20010

HINT:

Using SST, install the front shoe return spring and then install the rear return spring.

SST 09718-20010

6. REMOVE SHOE STRUT WITH SPRING

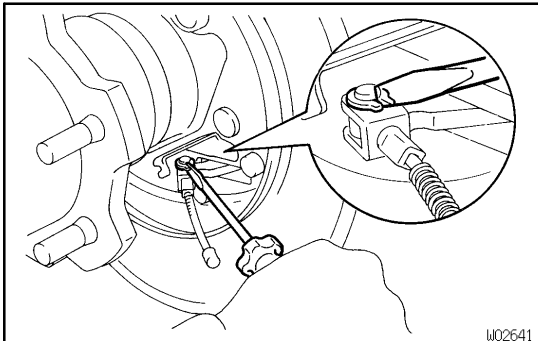


7. REMOVE REAR SHOE, ADJUSTER AND TENSION SPRING

- (a) Slide out the rear shoe, and remove the rear shoe and adjuster.
- (b) Remove the 2 shoe hold-down spring cups, spring and pin.
- (c) Remove the lower side tension spring.

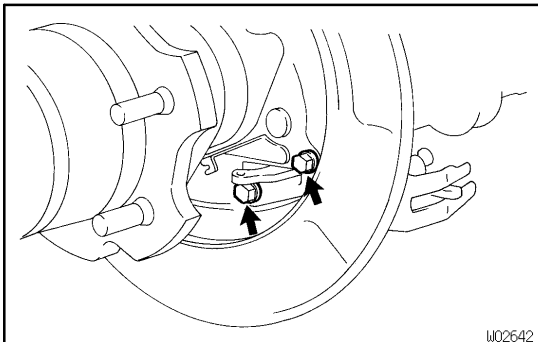
8. REMOVE FRONT SHOE

- (a) Slide out the front shoe.
- (b) Remove the shoe 2 hold-down spring cups, springs and pin.
- (c) Disconnect the parking brake cable from the parking brake shoe lever.



9. IF NECESSARY, REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK ASSEMBLY

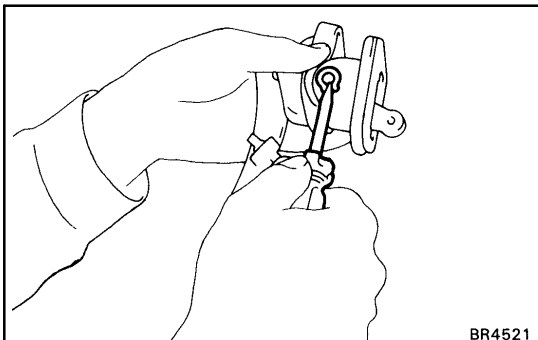
- (a) Using a screwdriver, remove the C-washer.
- (b) Remove the pin and disconnect the parking brake cable No.2 from the bellcrank.
- (c) Remove the clip.
- (d) Remove the pin and clip, then disconnect the parking brake cable.
- (e) Remove the 2 tension springs.



- (f) Remove the 2 bolts and parking brake bellcrank assembly.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (g) Remove the boot from parking brake bellcrank bracket.

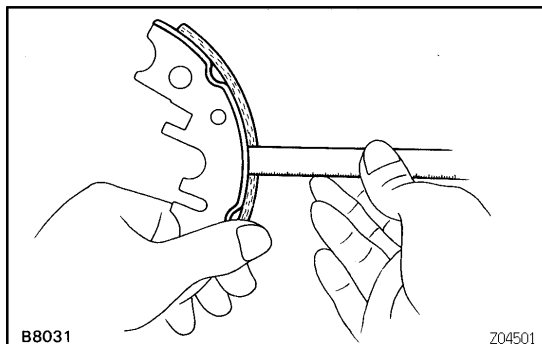


- (h) Using a screwdriver, remove the C-washer and pin.
- (i) Remove the parking brake bellcrank from the bell crank bracket.

INSPECTION

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



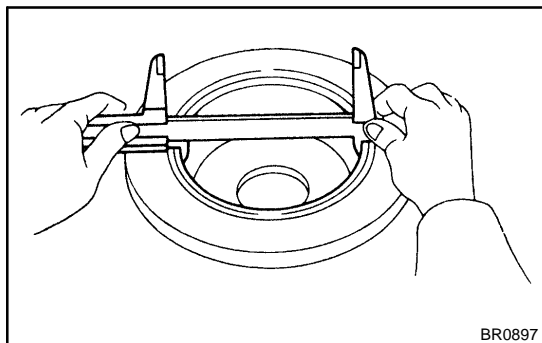
2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the thickness of the shoe lining.

Standard thickness: 4.0 mm (0.157 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the lining thickness is at the minimum thickness or less, or if there is extremely uneven wear, replace the brake shoe.



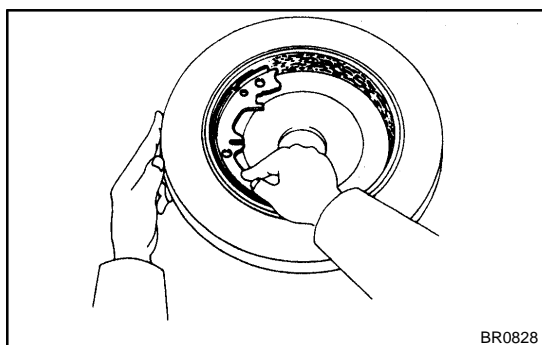
3. MEASURE BRAKE DISC INSIDE DIAMETER

Using a vernier calipers, measure the inside diameter of the disc.

Standard inside diameter: 230 mm (9.06 in.)

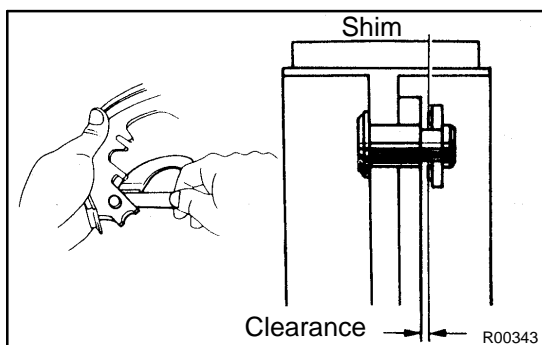
Maximum inside diameter: 231 mm (9.09 in.)

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 scored or is 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

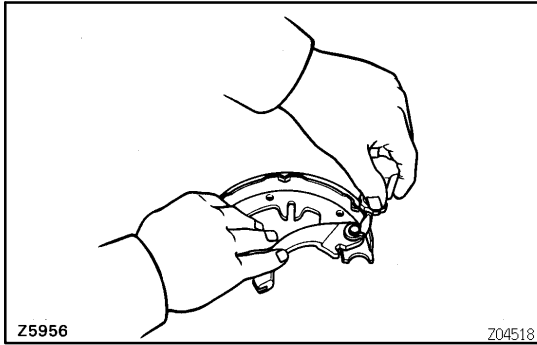
Using a feeler gauge, measure the clearance.

Standard clearance: Less than 0.35 mm (0.0138 in.)

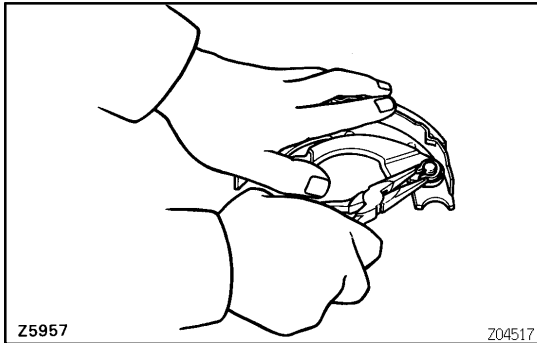
If the clearance is not within the specification, replace the shim with one of the correct size.

Shim Thickness	Shim Thickness
0.3 mm (0.012 in.)	0.9 mm (0.035 in.)
0.6 mm (0.024 in.)	

BRAKE – PARKING BRAKE

**6. IF NECESSARY, REPLACE SHIM**

- (a) Using a screwdriver, remove the C-washer.
- (b) Remove the parking brake shoe lever, and install the correct size shim.



- (c) Using needle-nose pliers, install the parking brake shoe lever with a new C-washer.
- (d) Remeasure the clearance.

REASSEMBLY

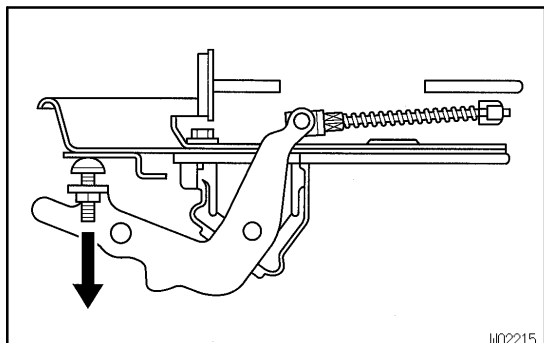
Reassembly is in the reverse order of disassembly (See page [BR-40](#)).

NOTICE:

Apply high temperature grease and lithium soap base glycol grease to the parts indicated by the arrows (See page [BR-39](#)).

1. ADJUST PARKING BRAKE SHOE CLEARANCE

- (a) Disconnect the PKB cable from bellcrank and remove the 2 tension springs.
- (b) Loosen the stopper bolt.
- (c) Temporarily install the hub nuts.
- (d) Remove the hole plug.
- (e) Turn the adjuster and expand the shoes until the disc locks.
- (f) Return the adjuster 8 notches.
- (g) Install the hole plug.



2. ADJUST BELLCRANK

- (a) Pull the bellcrank until all play in the interior linkage is taken up.
- (b) Screw in the bellcrank adjusting bolt to where it contacts on the dust seal.
- (c) Loosen it one turn, and lock it at that position with the lock nut.

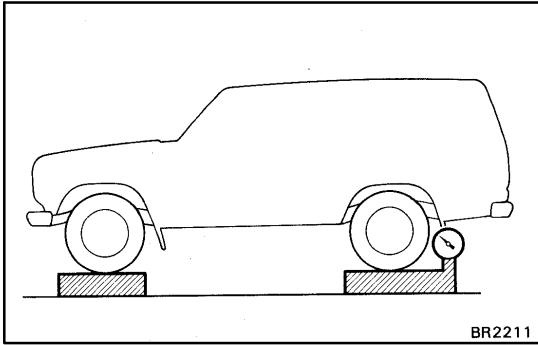
Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

- (d) Install the bellcrank spring.
- (e) Connect the PKB cable to the bellcrank.

3. BEDDING DOWN PARKING BRAKE SHOES AND DISC

- (a) Drive the vehicle at about 50 km/h (31 mph) on a safe, level and dry road.
- (b) With the parking brake release button pushed in, pull on the lever with 88 N (9 kgf, 19.8 lbf) of force.
- (c) Drive the vehicle for about 400 meters (0.25 mile) in this condition.
- (d) Repeat this procedure 2 or 3 times.

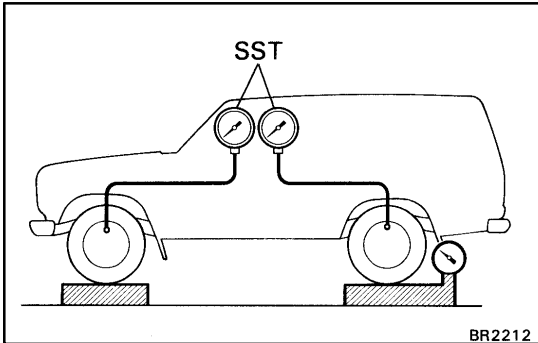
4. RECHECK AND ADJUST PARKING BRAKE LEVER TRAVEL



ON-VEHICLE INSPECTION

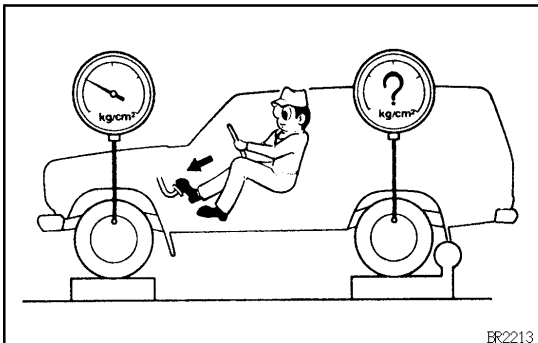
1. SET REAR AXLE LOAD

Rear axle load (include vehicle weight):
1,330 kg (2,932 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709-29018

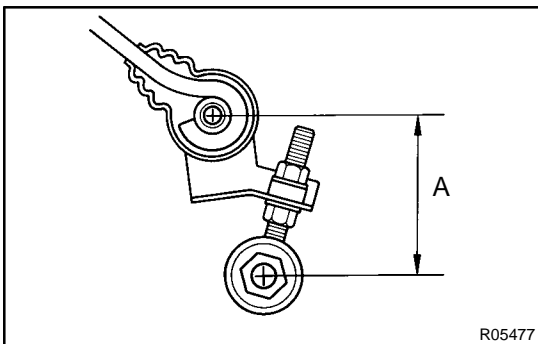


3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:
5,984 ± 589 kPa (61 ± 6 kgf/cm², 869 ± 86 psi)

HINT:

The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear pressure 2 seconds after adjusting the specified fluid pressure.



4. IF NECESSARY, ADJUST FLUID PRESSURE

- Disconnect the No.2 shackle from the shackle bracket.
- Adjust the length of the No.2 shackle turning it.

Low pressure – Lengthen A.

High pressure – Shorten A

Initial set: 90 mm (3.54 in.)

Adjusting range: 84 – 96 mm (3.31 – 3.78 in.)

HINT:

One turn of the No.2 shackle changes the fluid pressure by about 98.1 kPa (1.0 kgf/cm², 14.2 psi).

- In event the pressure cannot be adjusted by No.2 shackle, raise or lower the valve body.

Low pressure – Lower

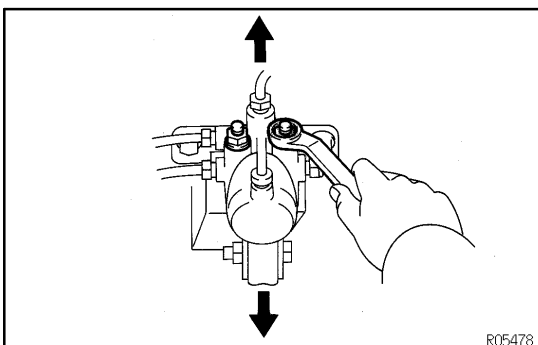
High pressure – Raise

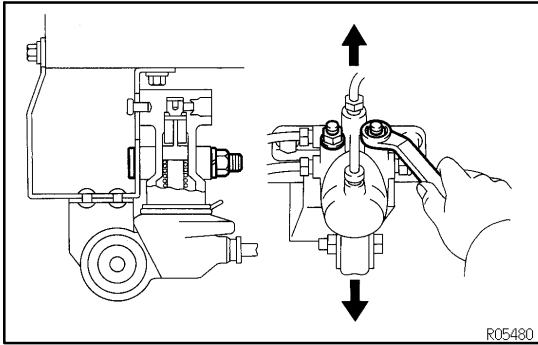
- Torque the 2 nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- Adjust the length of the No.2 shackle again.

If it cannot be adjusted, inspect the valve housing.

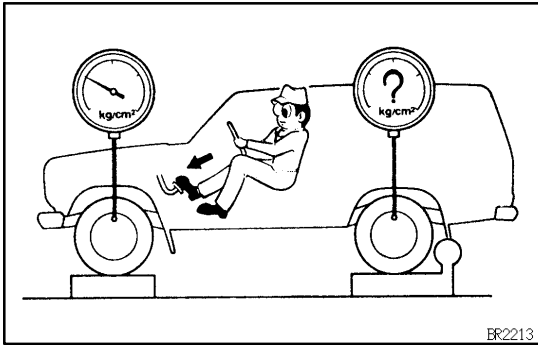


**5. IF NECESSARY, CHECK VALVE BODY**

(a) Assemble the valve body in the uppermost position.

HINT:

When the brakes are applied, the piston will move down about 1 mm (0.039 in.). Even at this time, the piston should not make contact with or move the load sensing spring.

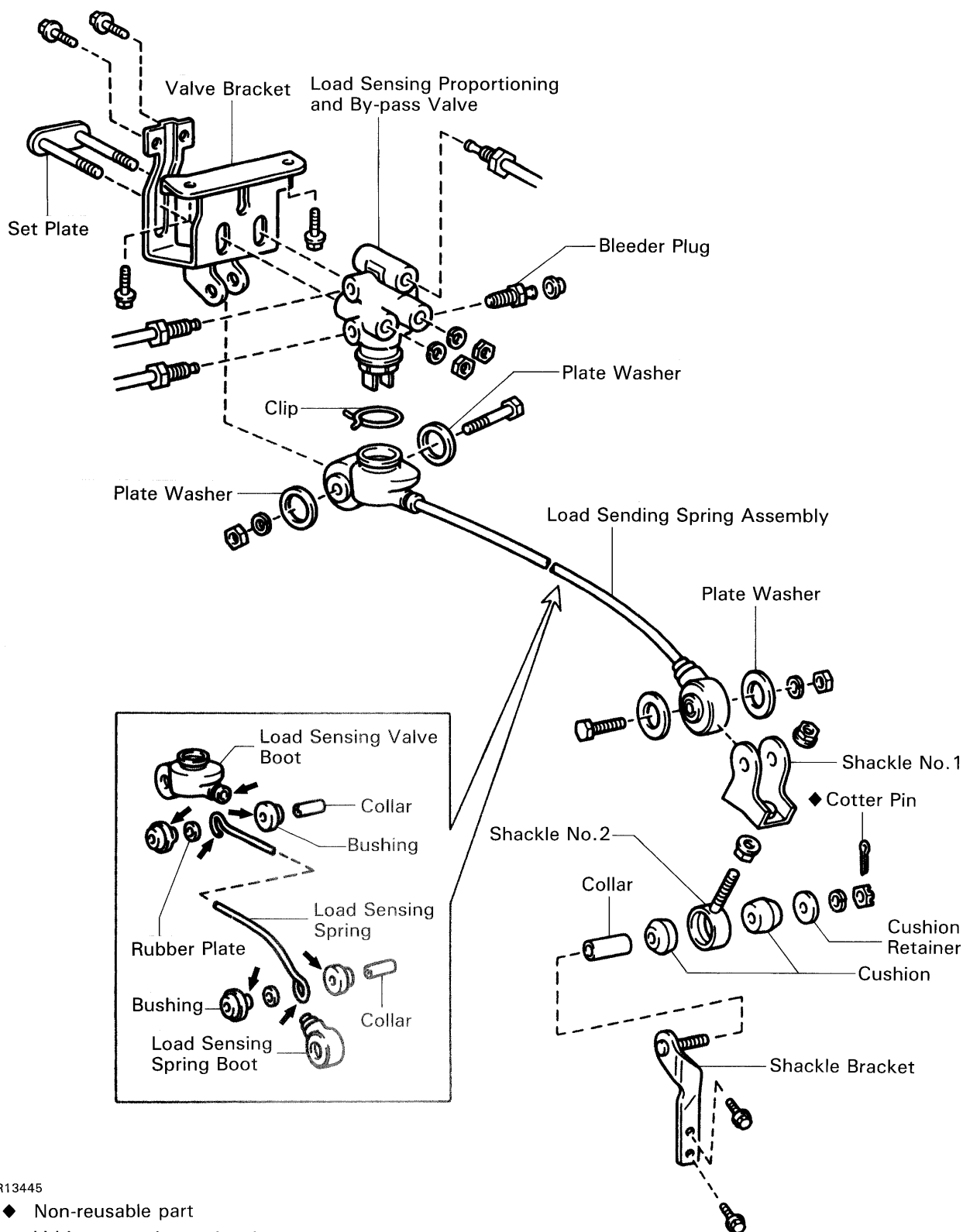


(b) In this position, check the rear brake pressure.

Front brake pressure kPa (kgf/cm ² , psi)	Rear brake pressure kPa (kgf/cm ² , psi)
3,434 (35, 498)	3,434 (35, 498)
5,396 (55, 783)	3,630 – 4,218 (37 – 43, 527 – 612)
9,810 (100, 1,424)	4,513 – 5,494 (46 – 56, 655 – 797)

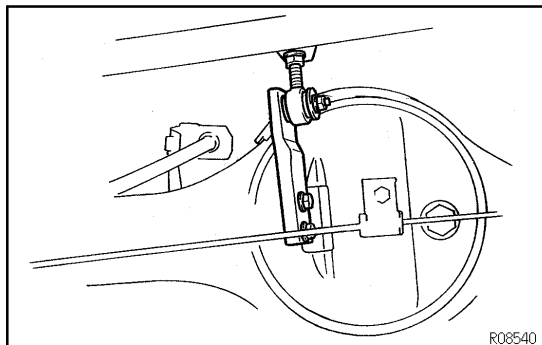
LOAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV) COMPONENTS

BR1DB-01



R13445

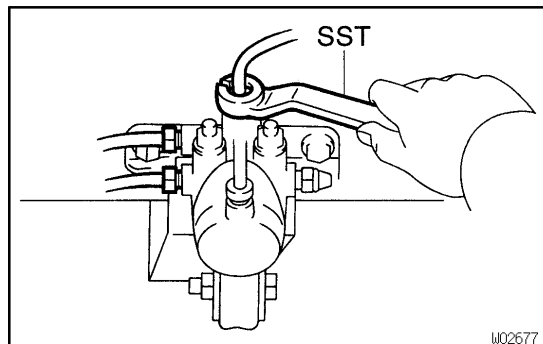
Z18450



REMOVAL

1. DISCONNECT SHACKLE NO.2 FROM BRACKET

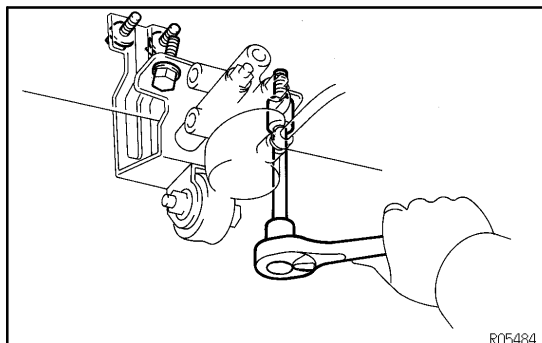
- Remove the cotter pin.
- Remove the nut and disconnect the shackle No.2 from the bracket.
- Remove the retainer, 2 cushions and collar.



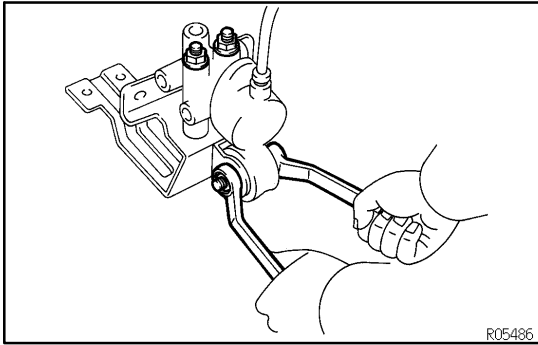
2. REMOVE LSP & BV ASSEMBLY

- Using SST, disconnect the 3 brake lines from the valve body.

SST 09751-36011



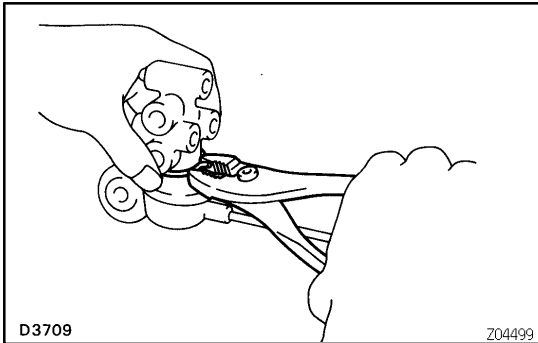
- Remove the valve bracket and 4 mounting bolts, then remove the LSP & BV assembly.



DISASSEMBLY

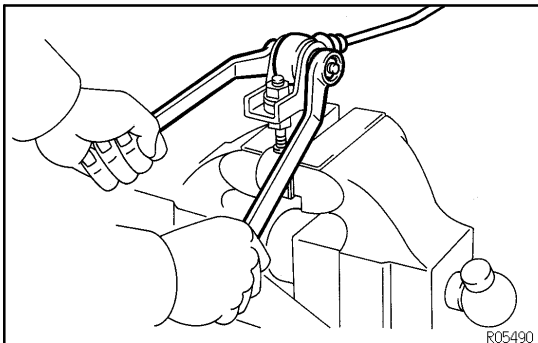
1. REMOVE VALVE BRACKET

- Remove the nut, bolt and 2 plate washers.
- Remove the 2 nuts, bracket and set plate from the valve body.



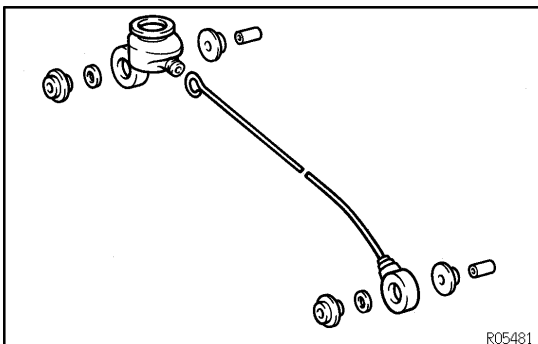
2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



3. REMOVE SHACKLE NO.1 AND NO.2

- Remove the bolt and nut, then remove the these parts:
 - Load sensing spring
 - 2 plate washers
- Loosen the 2 nuts, and remove the shackle No.1 from the shackle No.2.



4. DISASSEMBLE LOAD SENSING SPRING

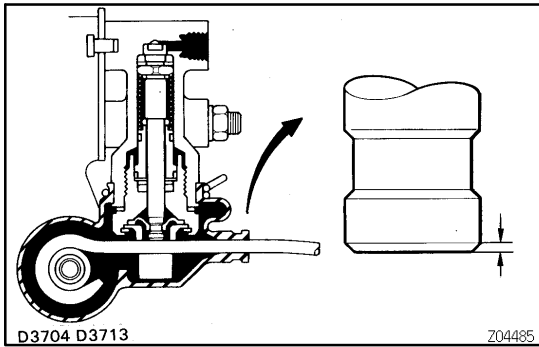
Disassembly the these parts:

- 4 bushings
- 2 collars
- 2 rubber plates
- Load sensing valve boot
- Load sensing spring boot

BR-50

BRAKE - LOAD SENSING PROPORTIONING AND BY-PASS
VALVE (LSP & BV)

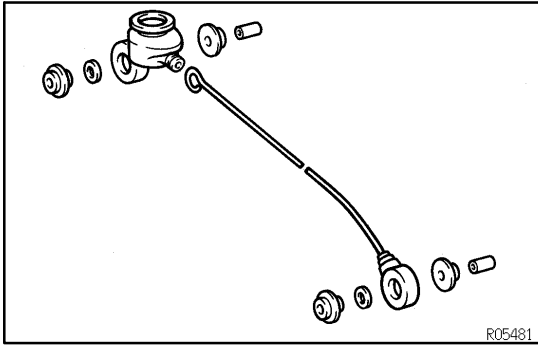
BR1DF-01



INSPECTION

**INSPECT VALVE PISTON PIN AND LOAD SENSING
SPRING CONTACT SURFACE FOR WEAR**

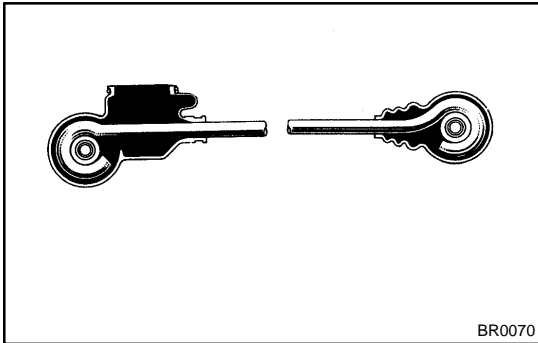
Wear limit: 0.7 mm (0.028 in.)



REASSEMBLY

1. ASSEMBLE THESE PARTS TO LOAD SENSING SPRING:

- Load sensing valve boot
- Load sensing spring boot
- 4 bushings
- 2 rubber plates
- 2 collars



HINT:

Apply lithium soap base glycol grease to the parts indicated by the arrows. Do not mistake the valve side for the shackle side of the load sensing spring.

2. INSTALL SHACKLE NO.1 AND NO.2 TO LOAD SENSING SPRING

- (a) Install the lock nut and shackle No. 1 to the shackle No. 2.
- (b) Torque the bolt and nut through the 2 plate washers.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

3. INSTALL LOAD SENSING SPRING TO VALVE BODY

Install the load sensing spring assembly to the load sensing valve with the clip.

4. INSTALL VALVE BRACKET

- (a) Install the set plate to the valve assembly through the valve bracket and temporarily tighten the 2 valve body mounting nuts.
- (b) Torque the bolt and nut through the 2 plate washers.

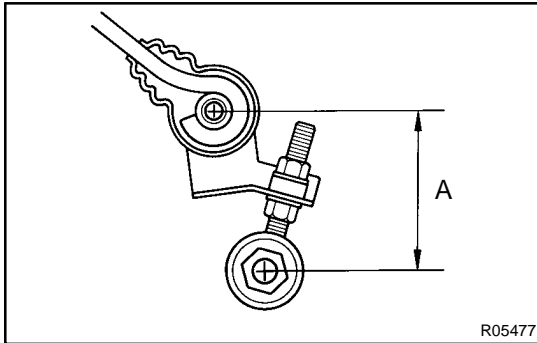
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

INSTALLATION

1. INSTALL LSP & BV ASSEMBLY

Install the LSP & BV assembly to the frame with the 4 bolts.

Torque: 25 N·m (260 kgf-cm, 19 ft-lbf)



2. CONNECT SHACKLE NO.2 TO BRACKET

(a) Set the dimension A by turning shackle No.2.

Initial set: 90 mm (3.54 in.)

(b) Tighten the lock nut.

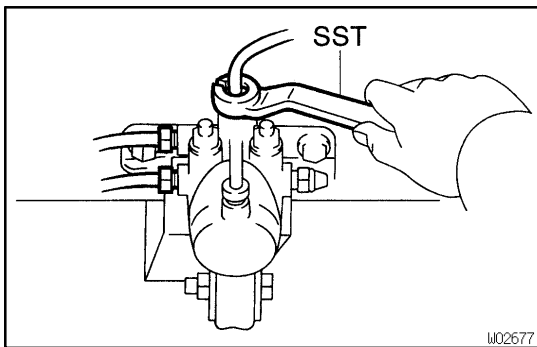
Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

(c) Install the 2 bushings and collar to the load sensing spring shackle.

(d) Install the load sensing spring shackle to the shackle bracket with a retainer and nut.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

(e) Install a new cotter pin.



3. CONNECT BRAKE LINES

Using SST, connect the 3 brake lines.

SST 09751-36011

Torque: 15 N·m (155 kgf-cm, 11 ft-lbf)

4. SET REAR AXLE LOAD (See page [BR-45](#))

5. SET VALVE BODY

(a) When pulling down the load sensing spring, confirm that the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts the load sensing spring.

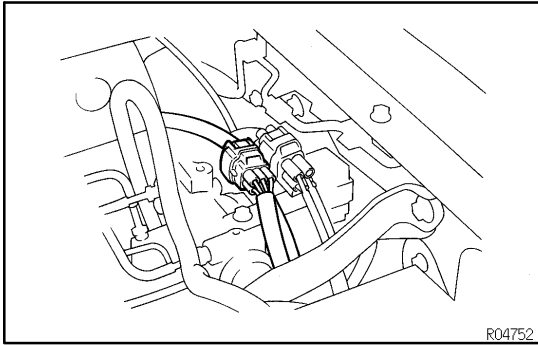
(c) Tighten the 2 valve body mounting nuts.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

6. BLEED BRAKE SYSTEM (See page [BR-4](#))

7. CHECK FLUID LEAKAGE

8. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page [BR-45](#))



ABS ACTUATOR ON-VEHICLE INSPECTION

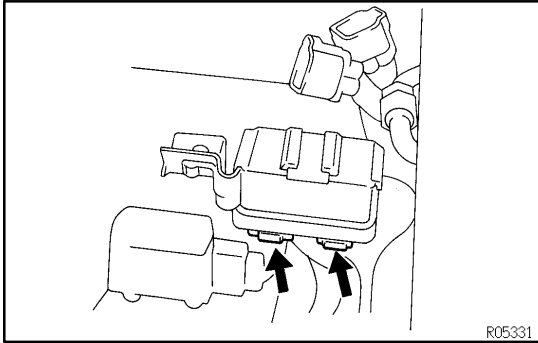
BR1DI-01

1. INSPECT BATTERY POSITIVE VOLTAGE

Battery positive voltage: 10 – 14 V

2. DISCONNECT CONNECTORS

- (a) Disconnect the connector from the actuator.



- (b) Remove the control relay from the actuator bracket.

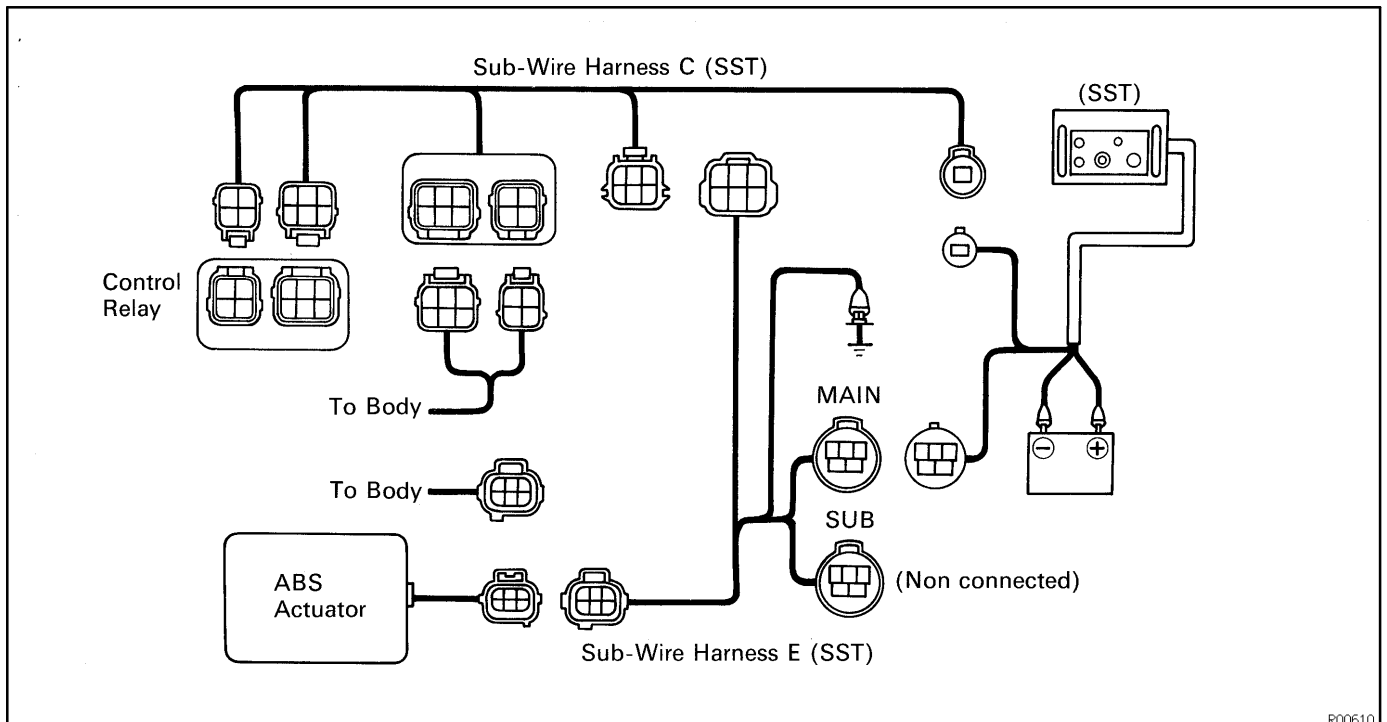
- (c) Disconnect the 2 connectors from the control relay.

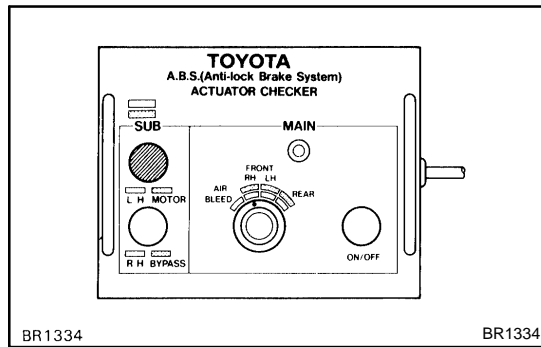
3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

- (a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub-wire harness C (SST) and E (SST), as shown.

SST 09990-00150, 09990-00200, 09990-00210

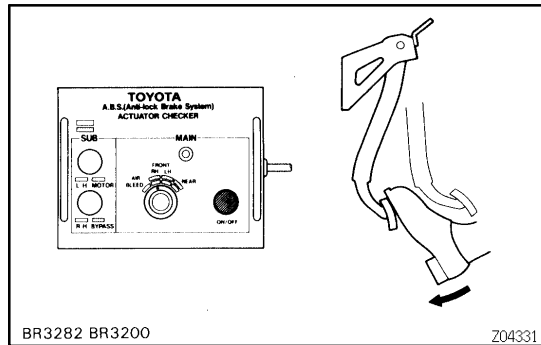
- (b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (-) terminal. Connect the black cable of the sub-wire harness to the battery negative (-) terminal or body ground.





4. INSPECT BRAKE ACTUATOR OPERATION

- Start the engine, and run it at idle.
- Turn the selector switch of the actuator checker to "FRONT RH" position.
- Push and hold in the SUB MOTOR switch for a few seconds.
- Depress the brake pedal and hold it until the step (g) is completed.

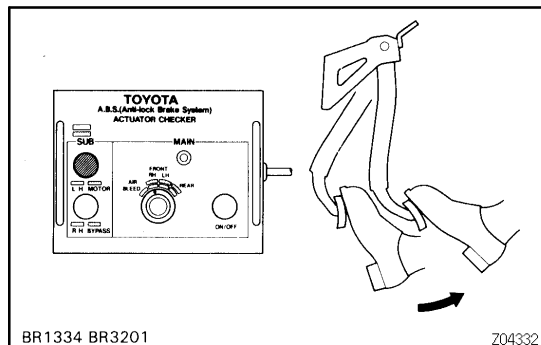


- Push the POWER switch, and check that the brake pedal does not go down.

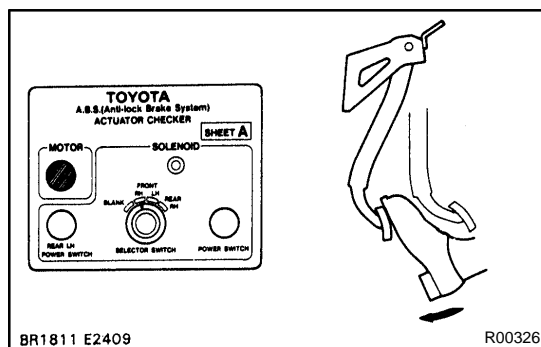
NOTICE:

Do not keep the POWER switch pushed down for more than 10 seconds.

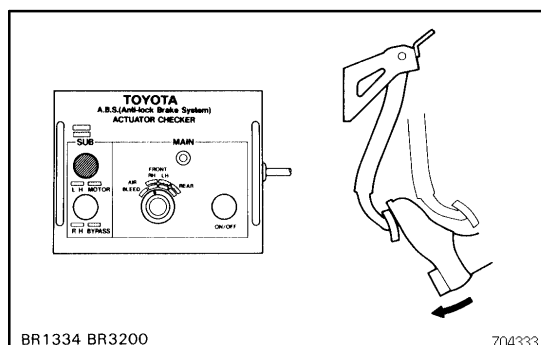
- Release the switch, and check that the pedal goes down.



- Push and hold in the SUB MOTOR switch for a few seconds, and check that the pedal returns.
- Release the brake pedal.



- Push and hold in the SUB MOTOR switch for a few seconds.
- Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the SUB MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.
- Release the brake pedal.



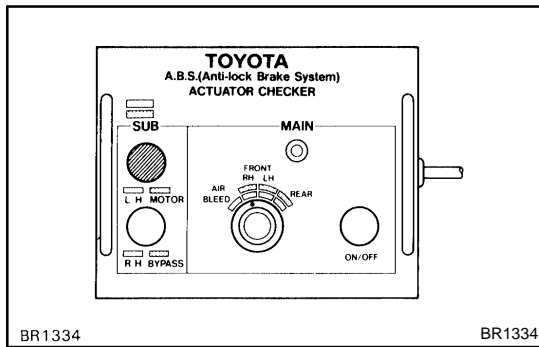
5. INSPECT FOR OTHER WHEELS

- Turn the selector switch to "FRONT LH" position.
- Repeating (c) to (j) of the step 4, check the actuator operation similarly.
- Similarly, inspect "REAR" position.

6. PUSH SUB MOTOR SWITCH

- Push and hold in the SUB MOTOR switch for a few seconds.
- Stop the engine.

BRAKE - ABS ACTUATOR

**7. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR**

Disconnect the actuator checker (SST) and sub-wire harness (SST) from the actuator, control relay and body side wire harness.

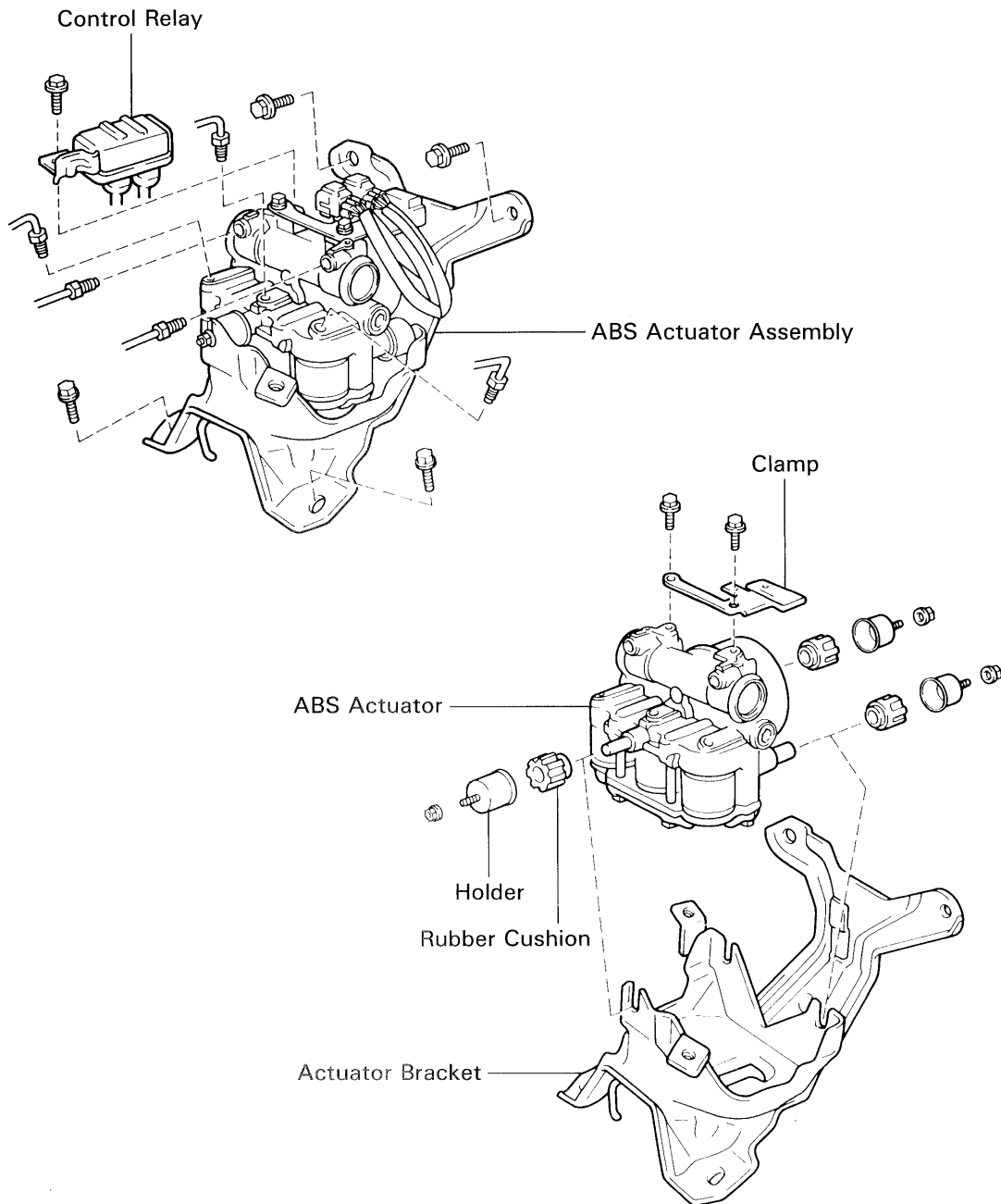
SST 09990-00150, 09990-00200, 09990-00210

8. CONNECT CONNECTORS

- (a) Connect the 2 connectors to the control relay.
- (b) Connect the connector to the actuator.
- (c) Install the control relay to the actuator bracket.

9. CLEAR DTC (See page [DI-190](#))

COMPONENTS



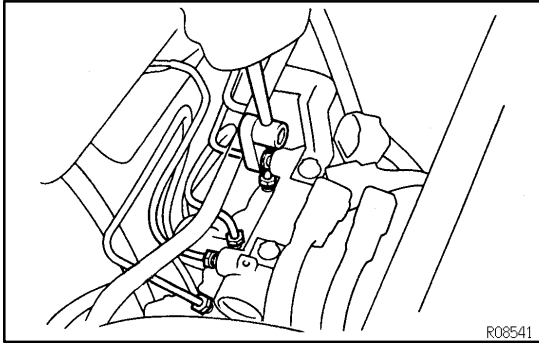
W02211

Z18451

REMOVAL

1. REMOVE CONTROL RELAY FROM ACTUATOR BRACKET

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



2. DISCONNECT BRAKE LINES

Using SST, disconnect the brake lines from the ABS actuator.

SST 09023-00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

3. REMOVE ABS ACTUATOR ASSEMBLY

(a) Disconnect the 2 connectors from the actuator.

(b) Remove the 4 bolts and actuator assembly.

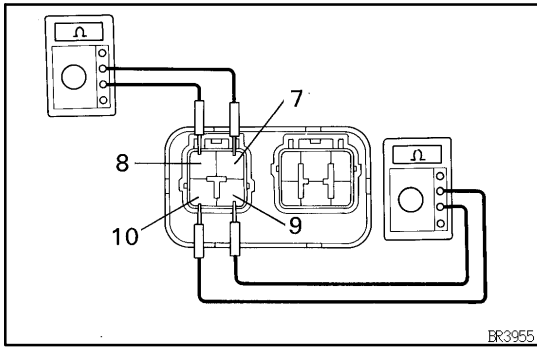
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

4. REMOVE ABS ACTUATOR

(a) Remove the 3 nuts and actuator from the actuator bracket.

Torque: 5.4 N·m (55 kgf·cm, 48 in·lbf)

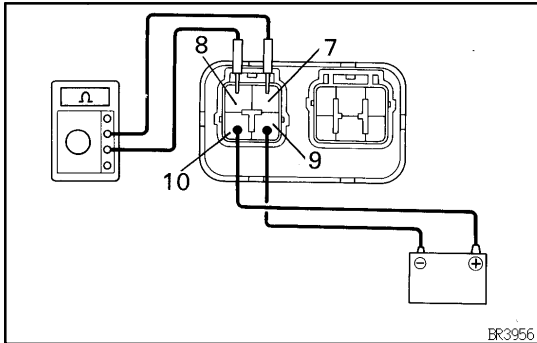
(b) Remove the 3 holders and cushions from the ABS actuator.



INSPECTION

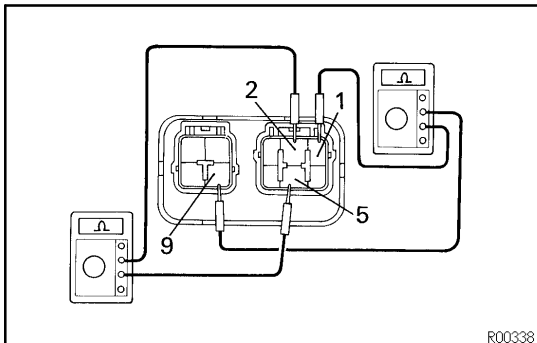
1. **INSPECT CONTINUITY OF MOTOR RELAY CIRCUIT**
 - (a) Check there is continuity between terminals 9 and 10.
 - (b) Check there is no continuity between terminals 7 and 8.

If continuity is not as specified, replace the relay.

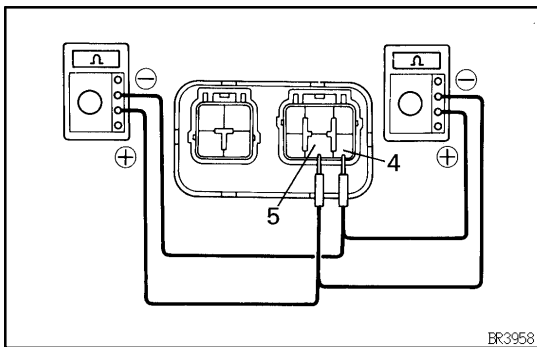


2. **INSPECT OPERATION OF MOTOR RELAY CIRCUIT**
 - (a) Connect the positive (+) lead from the battery to terminal 10 and negative (-) lead to terminal 9.
 - (b) Check there is continuity between terminals 7 and 8.

If operation is not as specified, replace the relay.



3. **INSPECT CONTINUITY OF SOLENOID RELAY CIRCUIT**
 - (a) Check there is continuity between terminals 1 and 9.
 - (b) Check there is no continuity between terminals 2 and 5.

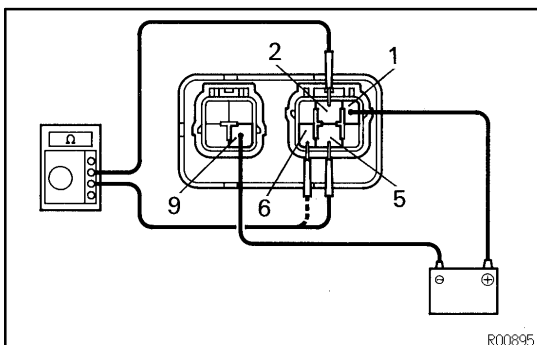


- (c) Connect the positive lead from the ohmmeter to terminal 5 and connect negative lead to terminal 4.
 - (d) Check there is continuity between terminals.
 - (e) Connect the 2 leads in reverse, and check that there is no continuity between terminals.

If continuity is not as specified, replace the relay.

HINT:

For the different type ohmmeter, there is no continuity for step (d), and there is continuity for step (e).



4. **INSPECT OPERATION OF SOLENOID RELAY CIRCUIT**
 - (a) Connect the positive (+) lead from the battery to terminal 1 and negative (-) lead to terminal 9.
 - (b) Check there is continuity between terminal 2 and 6.
 - (c) Check there is no continuity between terminals 2 and 6.

If operation is not as specified, replace the relay.

INSTALLATION

Installation is in the reverse order of removal (See page [BR-57](#)).

HINT:

After installation, fill the brake reservoir with brake fluid, bleed brake system (see page [BR-4](#)) and check for leaks.

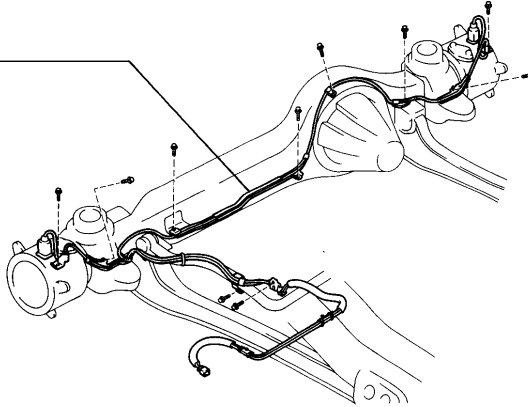
BR-60

BRAKE – FRONT SPEED SENSOR

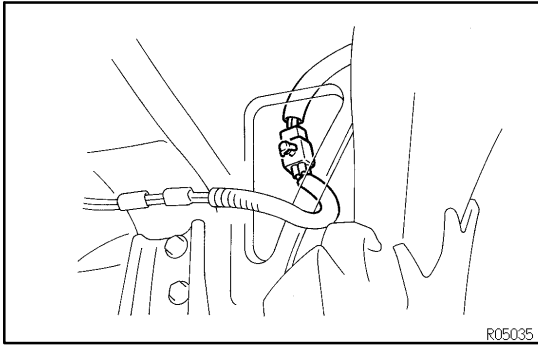
FRONT SPEED SENSOR COMPONENTS

BR1DM-02

Front Speed Sensor
with Wire Harness



W00451



REMOVAL

HINT:

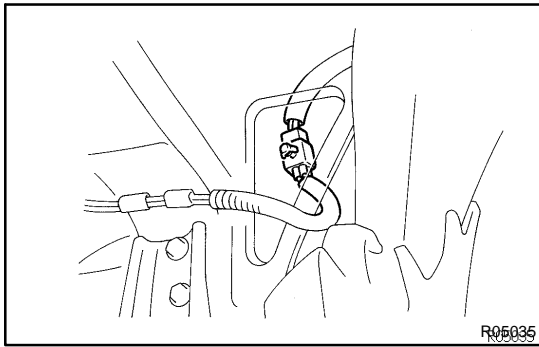
When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set.

1. DISCONNECT SPEED SENSOR CONNECTOR

2. REMOVE SPEED SENSOR

- (a) Remove the 8 clamp bolts holding the sensor harness from the axle housing.
- (b) Remove the bolt and wire tie holding the sensor harness from the stabilizer bar.
- (c) Remove the bolt and 2 clips holding the sensor harness from the frame and body.
- (d) Remove the 2 installation bolts and speed sensors from the steering knuckle.

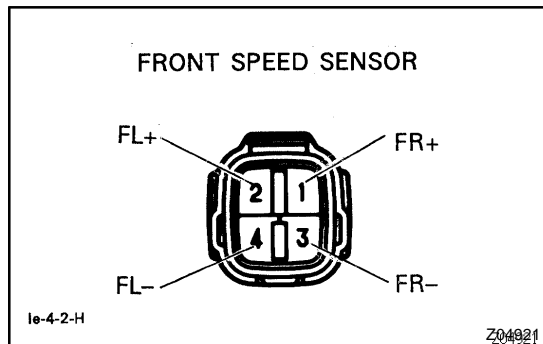
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



INSPECTION

1. INSPECT SPEED SENSOR

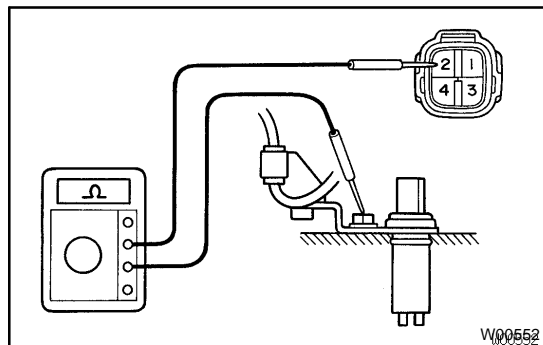
- (a) Disconnect the speed sensor connector.



- (b) Measure the resistance between terminals FR+ and FR-, and FL+ and FL-.

Resistance: 0.5 – 1.6 k Ω

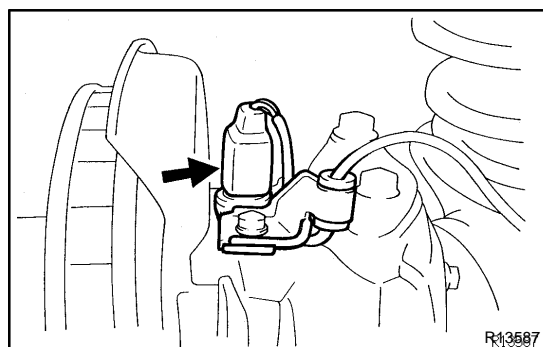
If resistance value is not specified, replace the sensor.



- (c) Check there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

- (d) Connect the speed sensor connector.

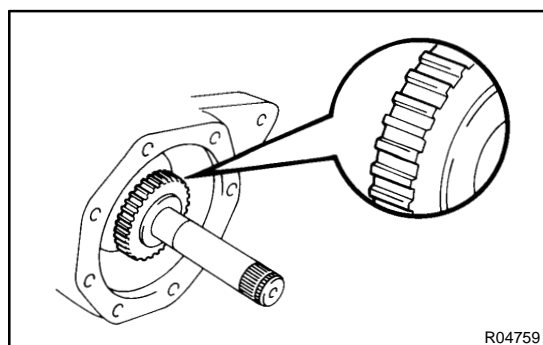


2. INSPECT SENSOR INSTALLATION

Check the sensor installation bolt is tightened properly and there is no clearance between the sensor and axle end.

If not, tighten the bolt.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- (a) Remove the axle hub with disc (See page [SA-67](#)).
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the axle hub with disc [SA-9](#)).

NOTICE:

To prevent damage to the serrations, do not strike the axle hub.

BRAKE – FRONT SPEED SENSOR

- 4. CHECK THAT THERE IS NO FOREIGN OBJECT ON SENSOR**
- 5. CHECK SPEED SENSOR SIGNAL (See page [DI-210](#))**

INSTALLATION

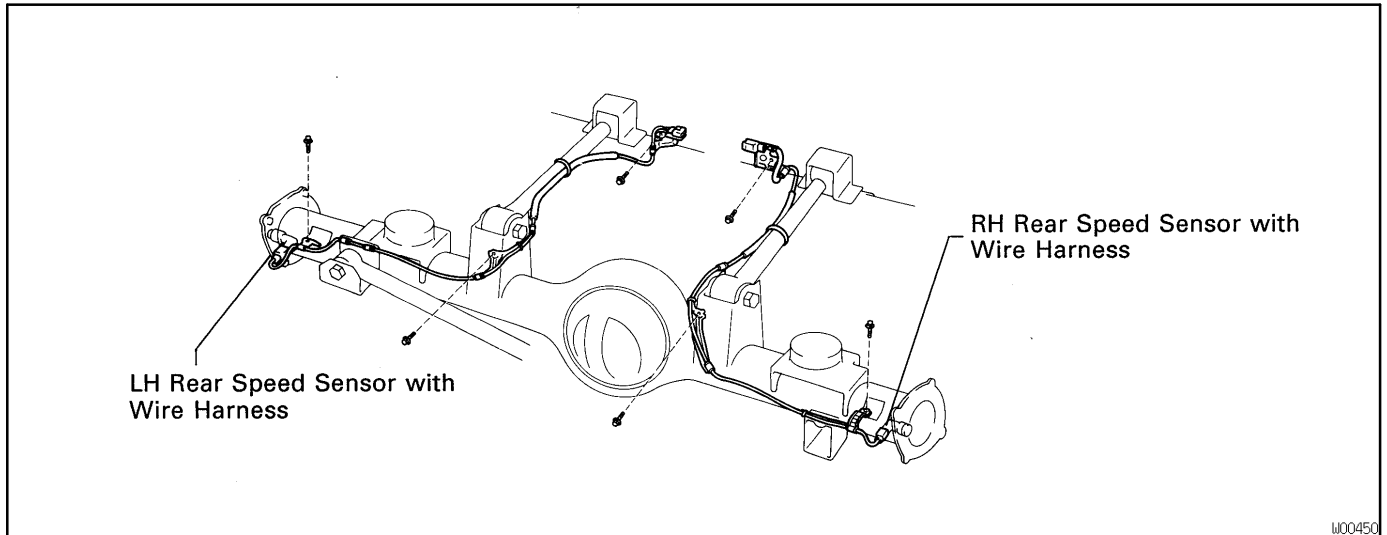
Installation is in the reverse order of removal (See page [BR-61](#)).

HINT:

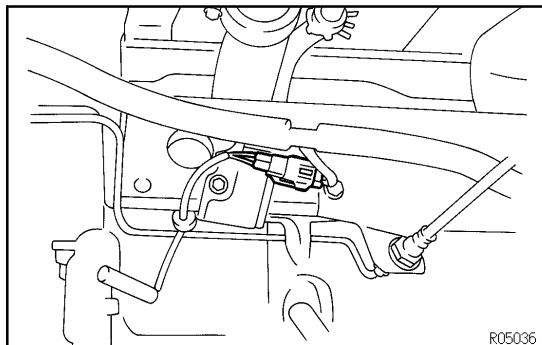
After installation, check the speed sensor signal (See page [DI-190](#)).

REAR SPEED SENSOR COMPONENTS

BR1DP-02



W00450



REMOVAL

HINT:

When replacing the sensor or sensor harness, replace the sensor and sensor harness together as a set.

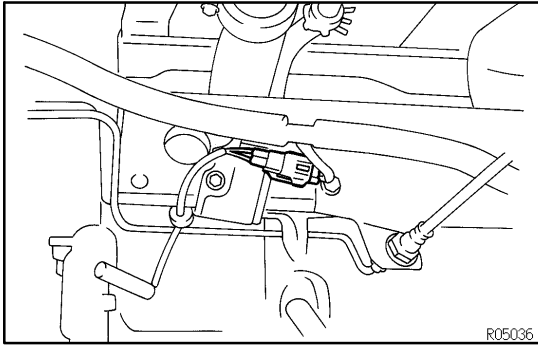
1. DISCONNECT SPEED SENSOR CONNECTOR

- (a) Disconnect the speed sensor connector.
- (b) Remove the 3 clamp bolts and 2 clips holding the sensor wire harness from the suspension arm and frame.

2. REMOVE SPEED SENSOR

Remove the installation bolt and speed sensor from the axle end.

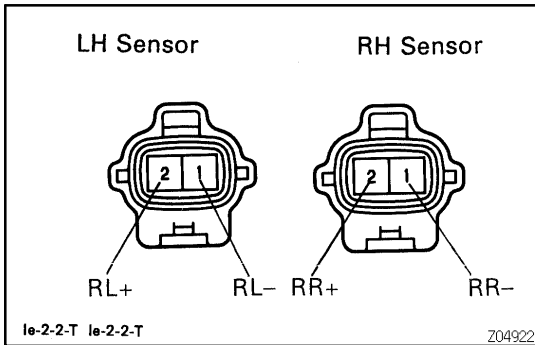
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



INSPECTION

1. INSPECT SPEED SENSOR

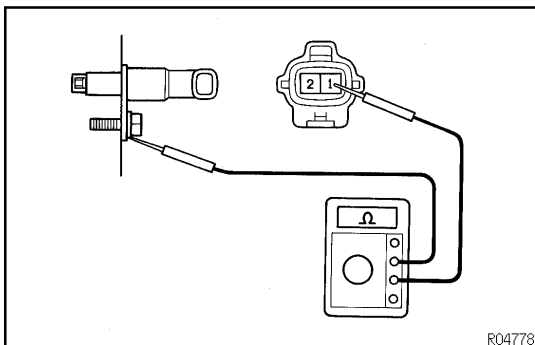
- (a) Disconnect the speed sensor connector.



- (b) Measure the resistance between terminals.

Resistance: 0.5 – 1.6 kΩ

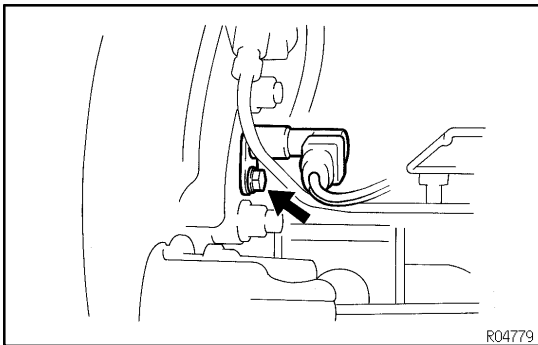
If resistance value is not specified, replace the sensor.



- (c) Check there is no continuity between each terminal and sensor body.

If there is continuity, replace the sensor.

- (d) Connect the speed sensor connector.

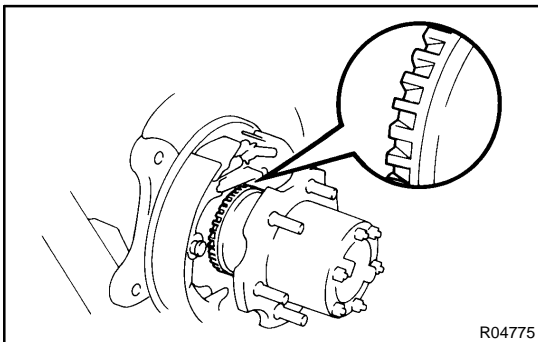


2. INSPECT SENSOR INSTALLATION

Check the sensor installation bolt is tightened properly and there is no clearance between the sensor and axle end.

If not, tighten the bolt.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



3. VISUALLY INSPECT SENSOR ROTOR SERRATIONS

- (a) Remove the brake disc (See page [BR-40](#)).
- (b) Inspect the sensor rotor serrations for scratches, cracks, warping or missing teeth.
- (c) Install the brake disc.

NOTICE:

To prevent damage to the serrations, do not strike the axle hub.

BR-68

BRAKE – REAR SPEED SENSOR

4. CHECK THAT THERE IS NO FOREIGN OBJECT ON SENSOR
5. CHECK SPEED SENSOR SIGNAL (See page [DI-210](#))

INSTALLATION

Installation is in the reverse order of removal (See page [BR-66](#)).

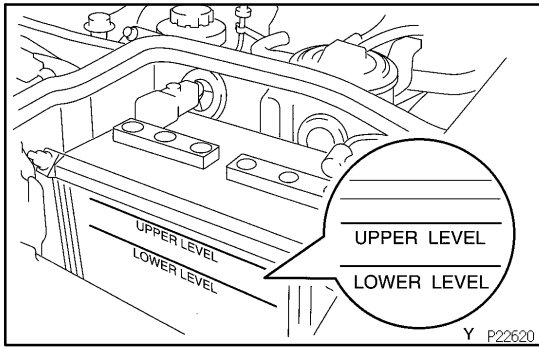
HINT:

After installation, check the speed sensor signal (see page [DI-190](#)).

PRECAUTION

CAUTION:

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.



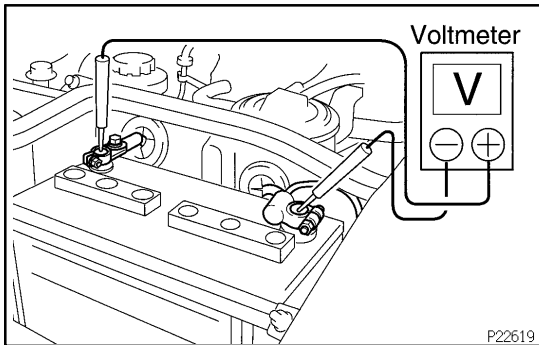
CHARGING SYSTEM ON-VEHICLE INSPECTION

CH0EO-02

1. CHECK BATTERY ELECTROLYTE LEVEL AND VOLT-AGE

- (a) Check the electrolyte quantity of each cell.

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



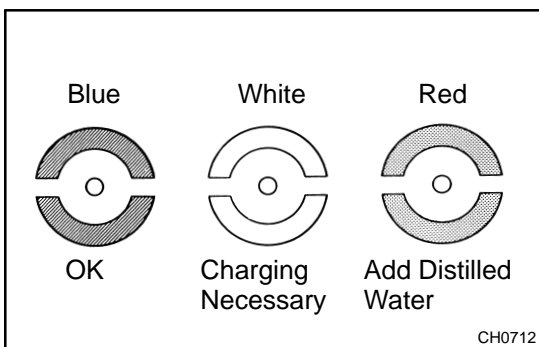
- (b) Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

Standard voltage: At 20°C (68°F): 12.7 – 12.9 V

HINT:

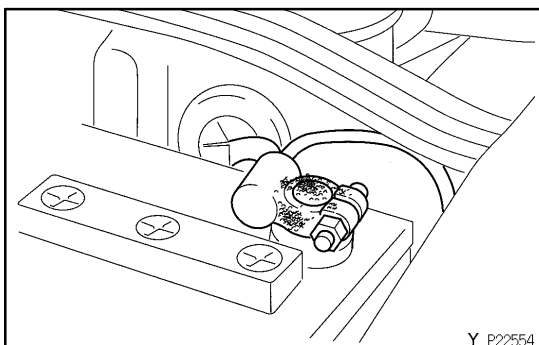
- Before measuring the voltage, turn the ignition switch OFF and turn off the electrical systems (headlight, blower motor, rear defogger etc.).
- If the vehicle has been running, wait 20 minutes or more after the vehicle stops before measuring the battery voltage.

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



HINT:

Check the indicator as shown in the illustration.



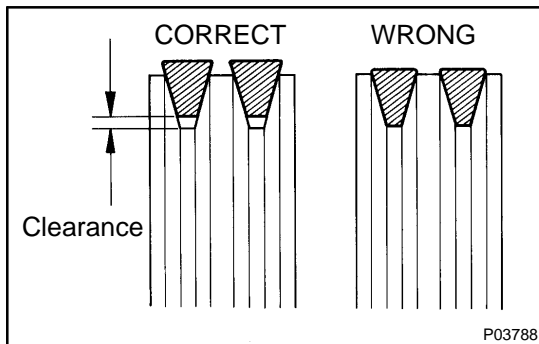
2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

- (a) Check that the battery terminals are not loose or corroded.

CHARGING – CHARGING SYSTEM

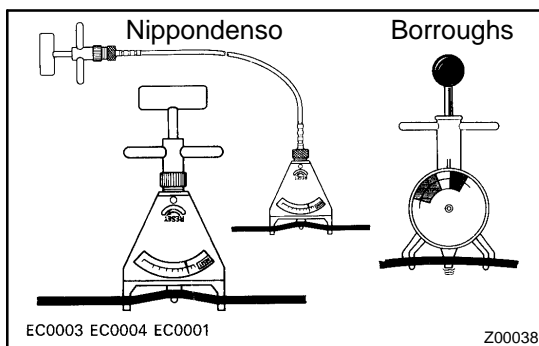
- (b) Check the fusible link and fuses for continuity.

Fusible link	MAIN 2.0 A
	AM1 1.25 B
	AM2 0.3 P
H-fuse	AM1 50 A
Fuse	IGN 7.5 A
	GAUGE 15 A

**3. INSPECT DRIVE BELTS**

- (a) Visually check the drive belt for cracks, oiliness or wear. Check that the belt does not touch the bottom of the pulley groove.

If necessary, replace the drive belts as a set.



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

Belt tension gauge:

Nippondenso BTG-20 (95506-00020)

Borroughs No. BT-33-73F

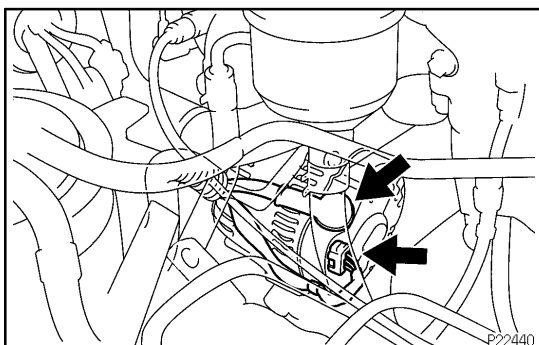
Drive belt tension:

New belt	400 – 580 N (41.0 – 59.1 kgf, 90.4 – 130.2 lbf)
Used belt	200 – 390 N (20.4 – 40.0 kgf, 45.0 – 88.2 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 new belt, run the engine for about 5 minutes and recheck the belt tension.

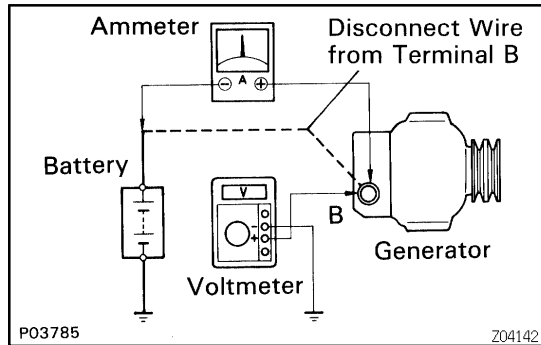
**4. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES**

- Check that the wiring is in good condition.
- Check that there is no abnormal noise from the generator while the engine is running.

5. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

- Turn the ignition switch "ON". Check that the discharge warning light comes on.
- Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the discharge warning light circuit.



6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT:

If a battery/generator tester is available, connect 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 generator and connect it to the negative (–) lead of the ammeter.
- Connect the positive (+) lead of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit as follows:

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

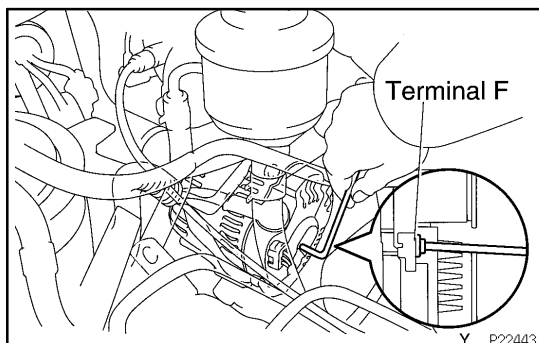
Standard amperage 10 A or less

Standard voltage:

at 25°C (77°F)	14.0 – 15.0 V
at 115°C (239°F)	13.5 – 14.3 V

If the voltmeter reading is more than standard voltage, replace the voltage regulator.

If the voltmeter reading is less than the 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.

7. 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

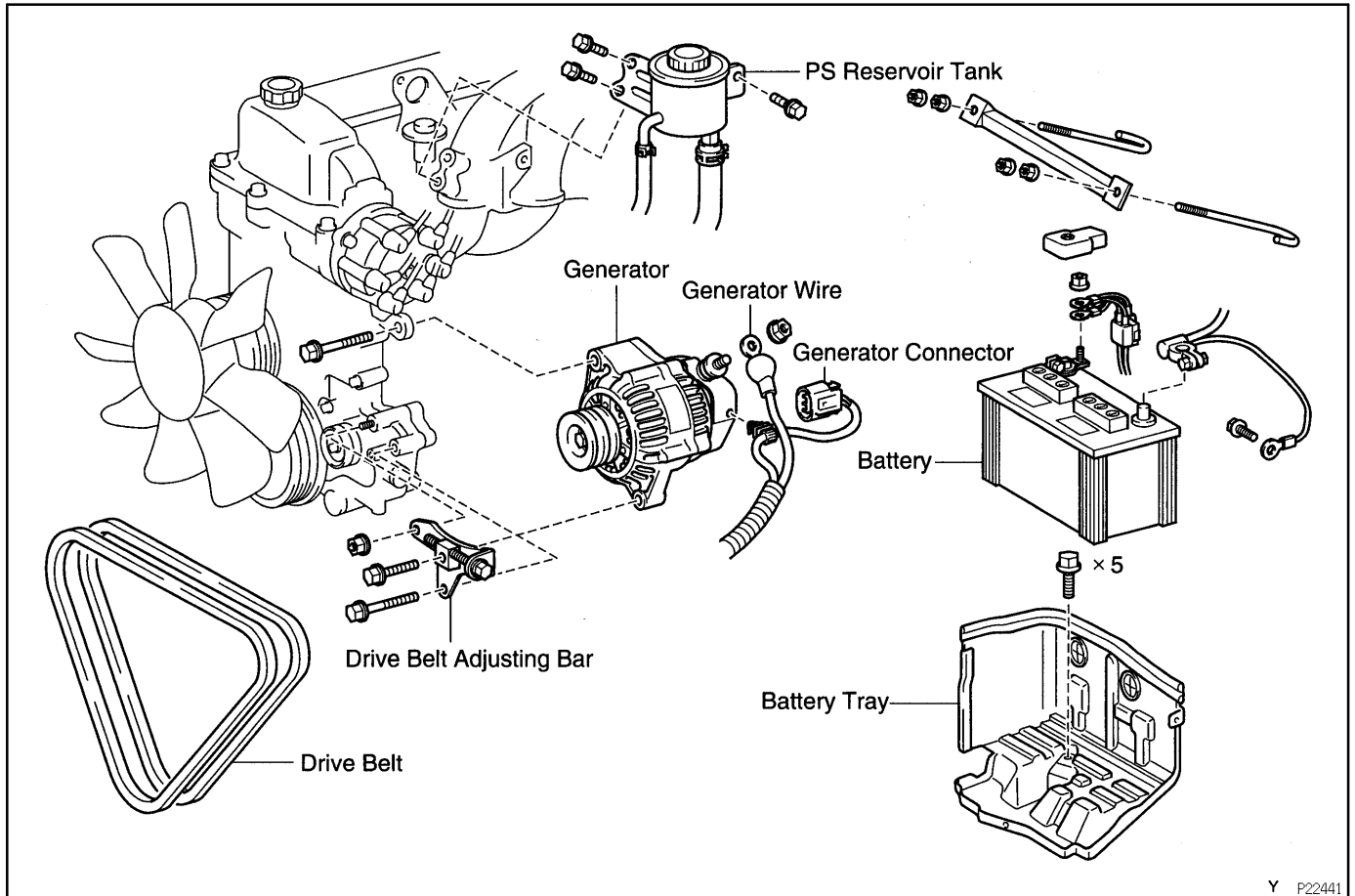
If the ammeter reading is less than standard amperage, repair the generator.

HINT:

If the battery is fully charged, the indication will sometimes be less than standard amperage.

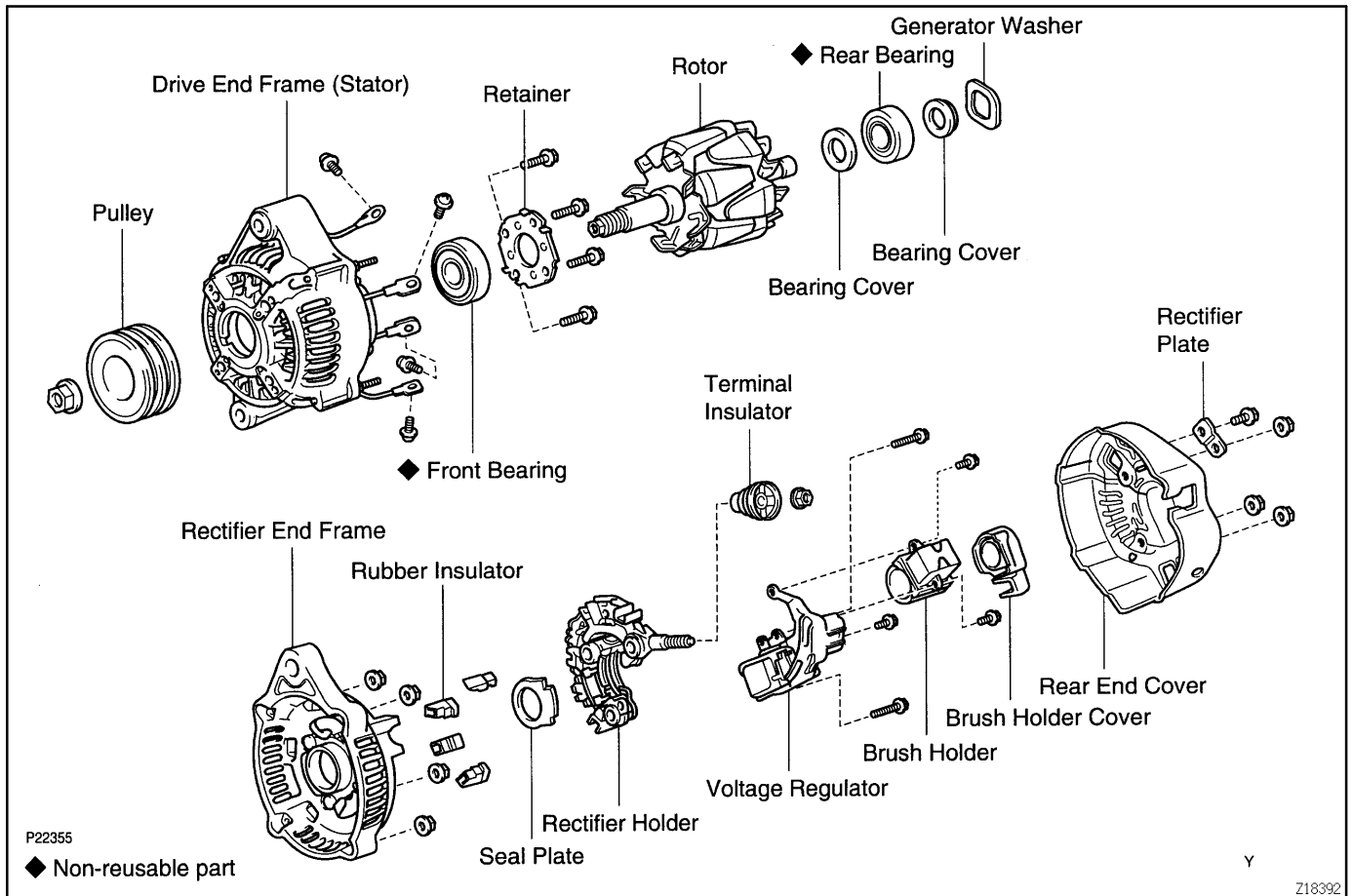
GENERATOR COMPONENTS

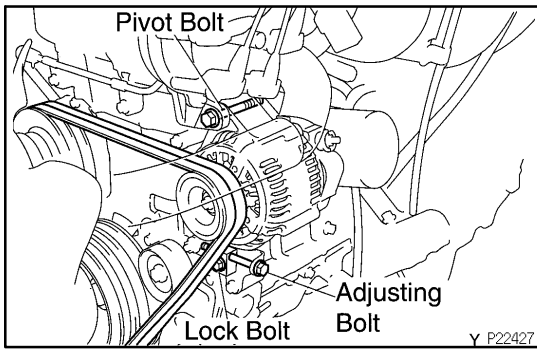
CH06H-05



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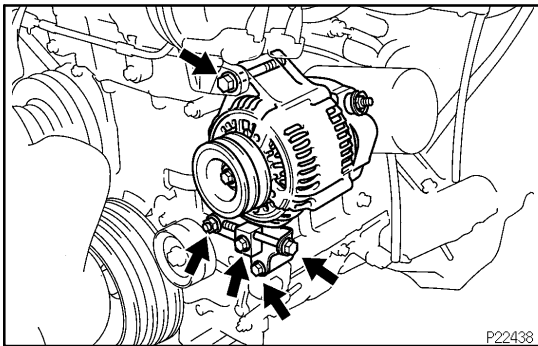
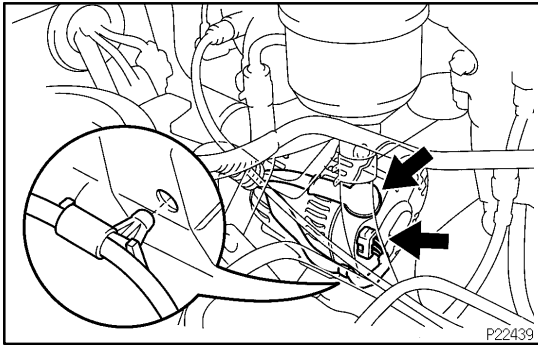
CHARGING - GENERATOR

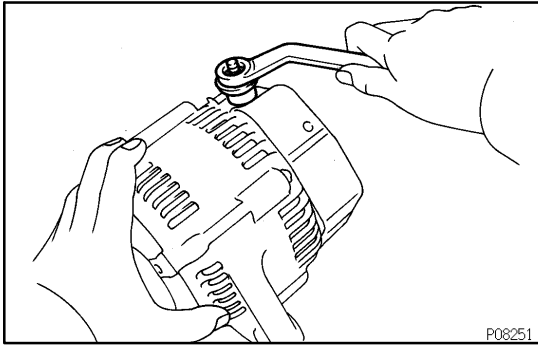




REMOVAL

1. **REMOVE BATTERY AND BATTERY TRAY**
2. **DISCONNECT POWER STEERING (PS) RESERVOIR TANK**
3. **REMOVE DRIVE BELTS**
 - (a) Loosen the lock bolt, pivot bolt and adjusting bolt.
 - (b) Remove the 2 drive belts.
4. **REMOVE GENERATOR**
 - (a) Disconnect the generator connector.
 - (b) Remove the rubber cap and nut, and disconnect the generator wire.
 - (c) Disconnect the generator wire clamp from the generator.
 - (d) Remove the lock bolt, bolt, nut and drive belt adjusting bar.
 - (e) Remove the pivot bolt and generator.

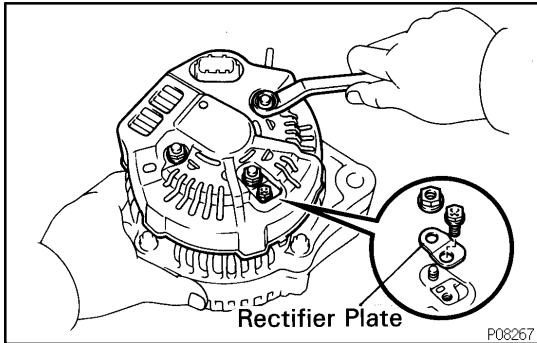




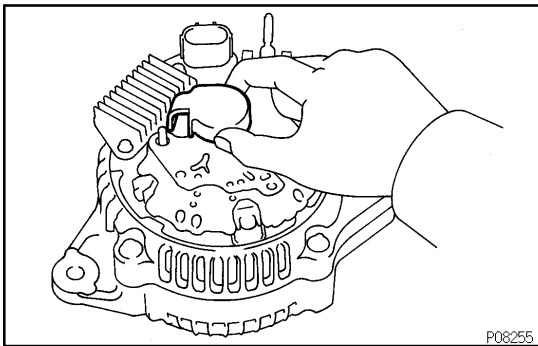
DISASSEMBLY

1. REMOVE REAR END COVER

- (a) Remove the nut and terminal insulator.

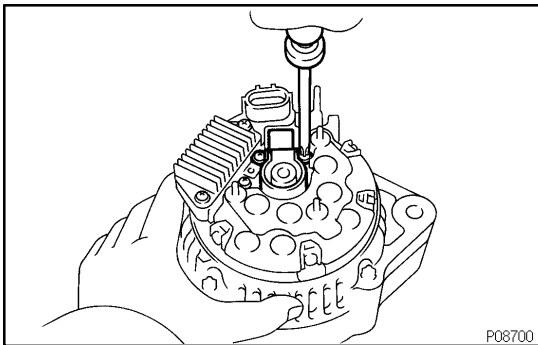


- (b) Remove the 3 nuts, bolt, rectifier plate and rear end cover.

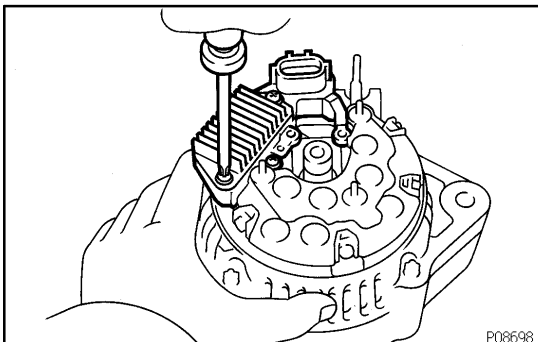


2. REMOVE BRUSH HOLDER

- (a) Remove the brush holder cover from the brush holder.

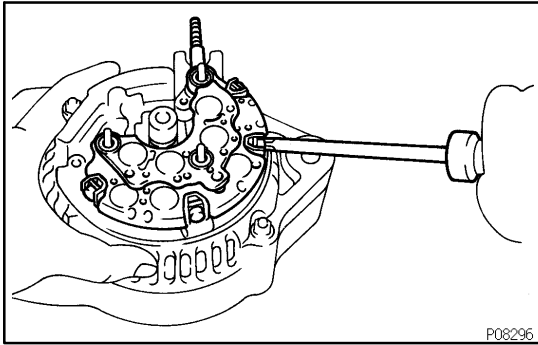


- (b) Remove the 2 screws and brush holder.



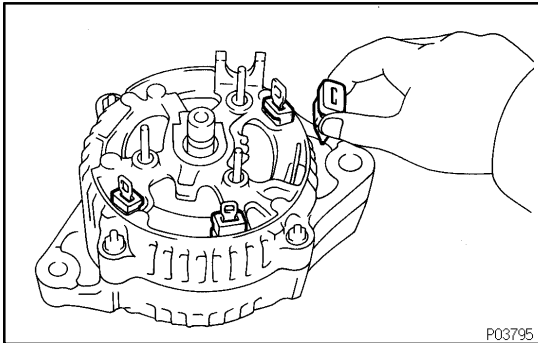
3. REMOVE VOLTAGE REGULATOR

- Remove the 3 screws and voltage regulator.

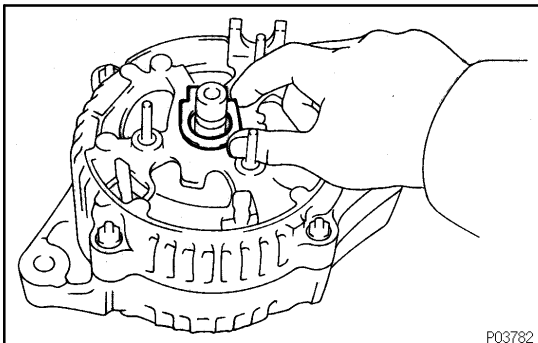


4. REMOVE RECTIFIER HOLDER

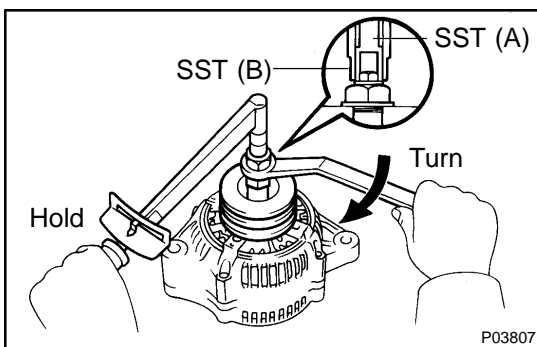
- (a) Remove the 4 screws and rectifier holder.



- (b) Remove the 4 rubber insulators.



- (c) Remove the seal plate.



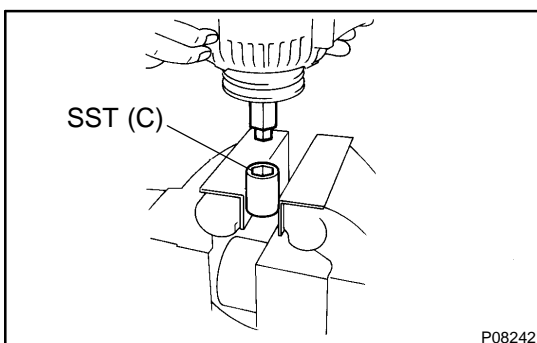
5. REMOVE PULLEY

- (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)

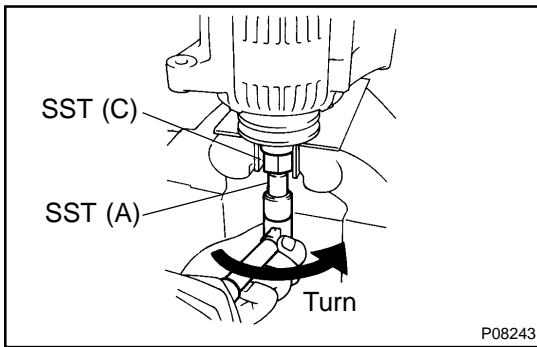
- (b) Check that SST (A) is secured to the rotor shaft.



- (c) Mount SST (C) in a vise.

- (d) Install the generator to SST (C).

CHARGING - GENERATOR

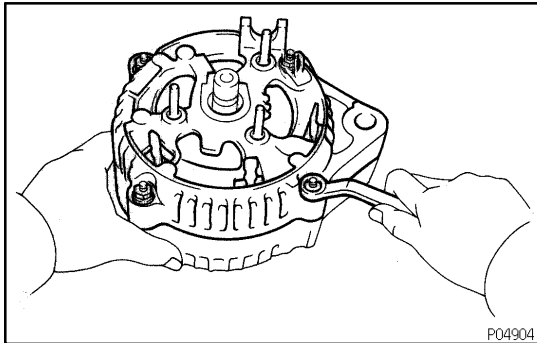


- (e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

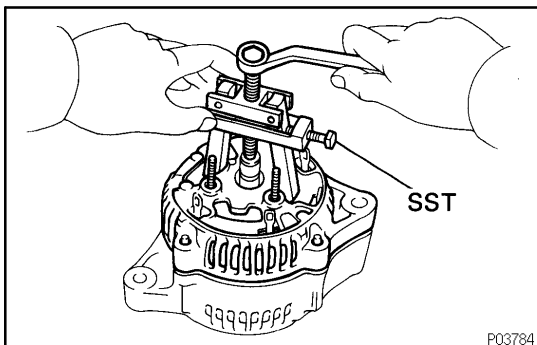
NOTICE:

To prevent damage to the rotor shaft, do not loosen the pulley nut more than one-half of a turn.

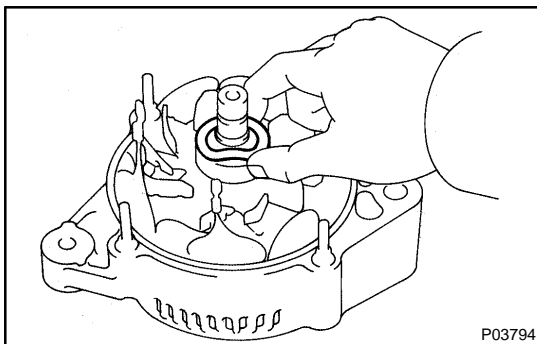
- (f) Remove the generator from SST (C).
 (g) Turn SST (B) and remove SST (A and B).
 (h) Remove the pulley nut and pulley.

**6. REMOVE RECTIFIER END FRAME**

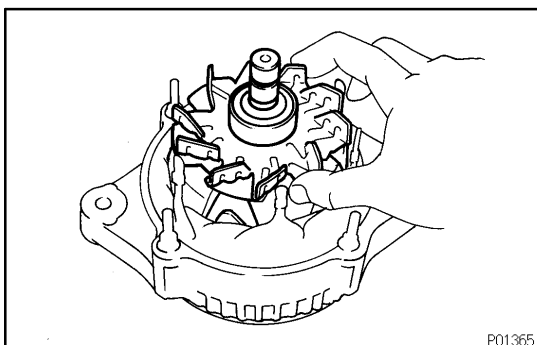
- (a) Remove the 4 nuts.

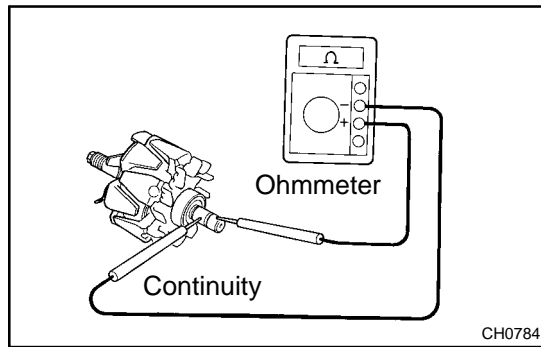


- (b) Using SST, remove the rectifier end frame.
 SST 09286-46011



- (c) Remove the generator washer.

**7. REMOVE ROTOR FROM DRIVE END FRAME**



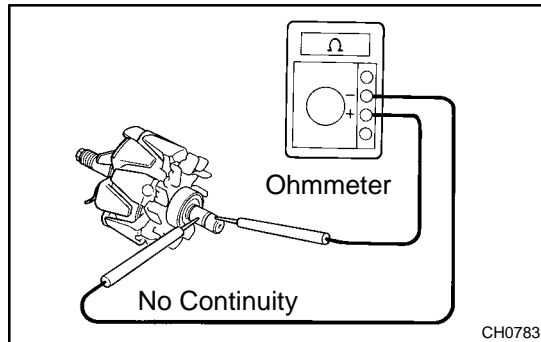
INSPECTION

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (At 20°C (68°F): 2.8 – 3.0 Ω

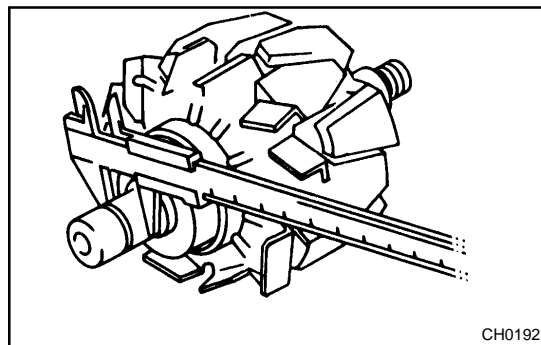
If there is no continuity, replace the rotor.



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.

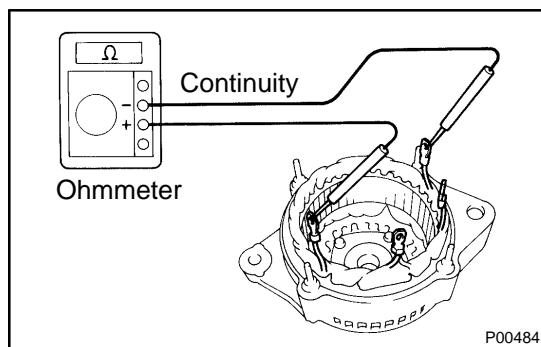
If rough or scored, replace the rotor.

(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.)

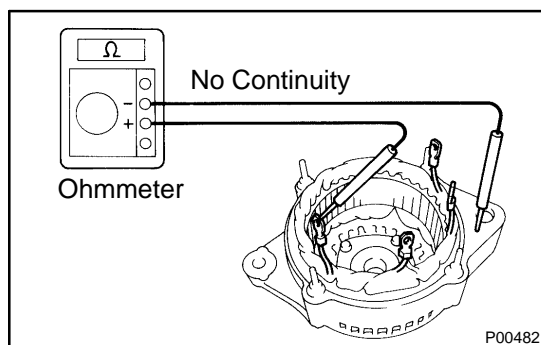
If the diameter is less than minimum, replace the rotor.



4. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

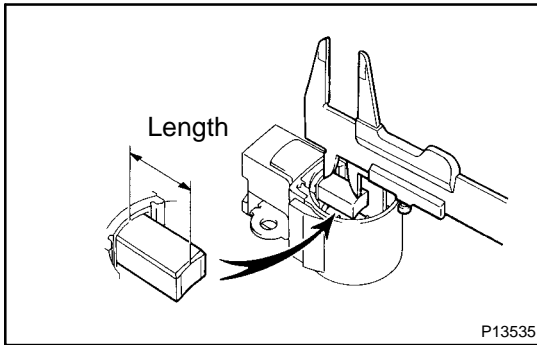
If there is no continuity, replace the drive end frame assembly.



5. 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.



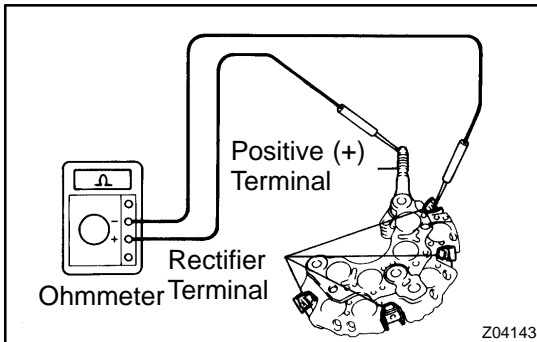
6. INSPECT EXPOSED BRUSH LENGTH

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.)

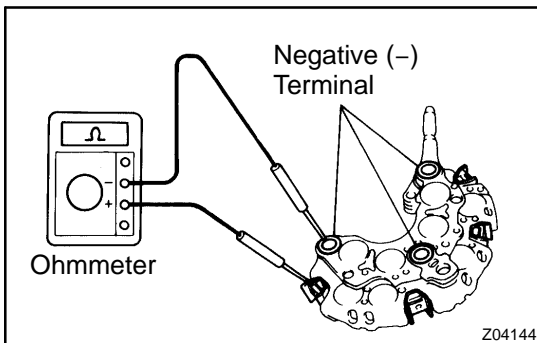
If the exposed length is less than minimum, replace the brushes and brush holder assembly.



7. INSPECT POSITIVE RECTIFIER

- Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
- Reverse the polarity of the tester probes and repeat step (a).
- Check that one shows continuity and the other shows no continuity.

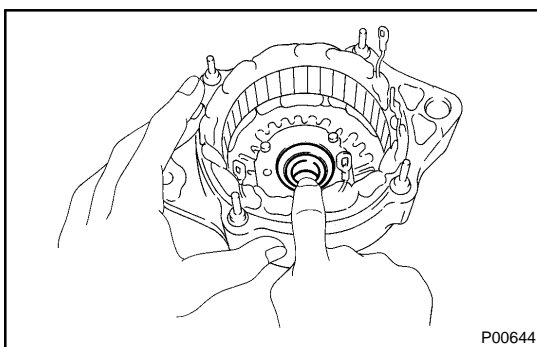
If continuity is not as specified, replace the rectifier holder.



8. INSPECT NEGATIVE RECTIFIER

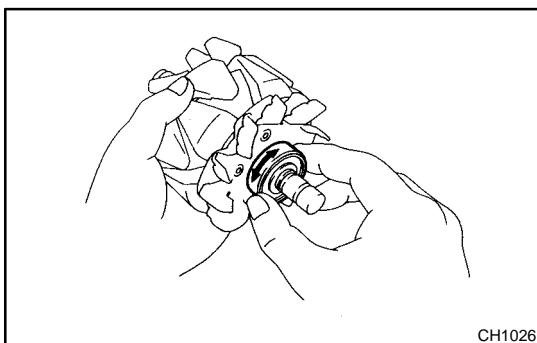
- Using an ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
- Reverse the polarity of the tester probes and repeat step (a).
- Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.



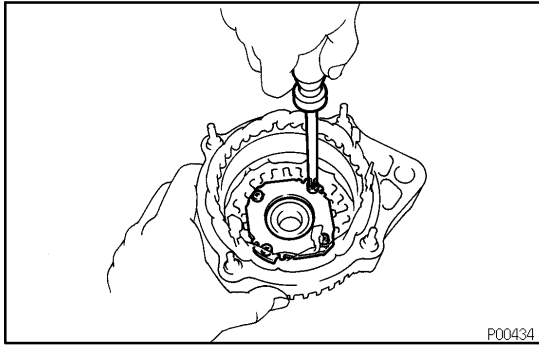
9. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.



10. INSPECT REAR BEARING

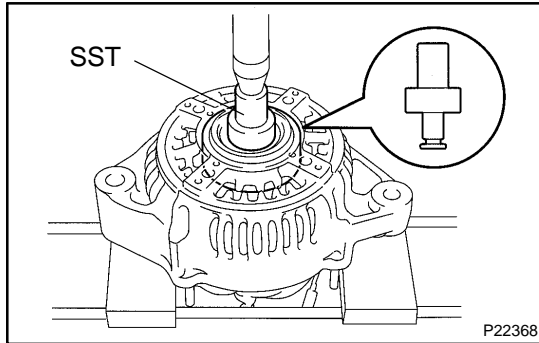
Check that the bearing is not rough or worn.



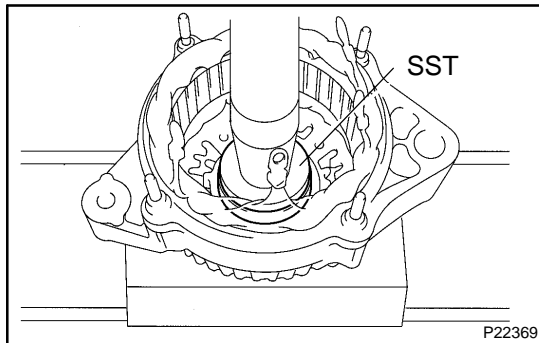
REPLACEMENT

1. REPLACE FRONT BEARING

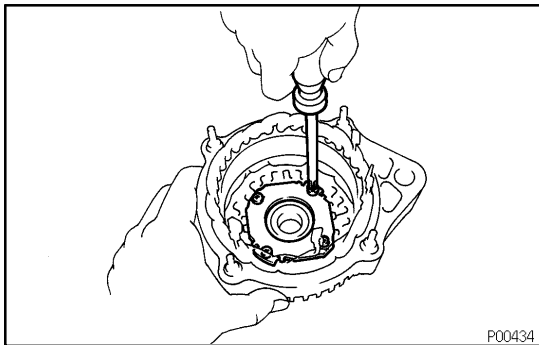
- (a) Remove the 4 screws and bearing retainer.



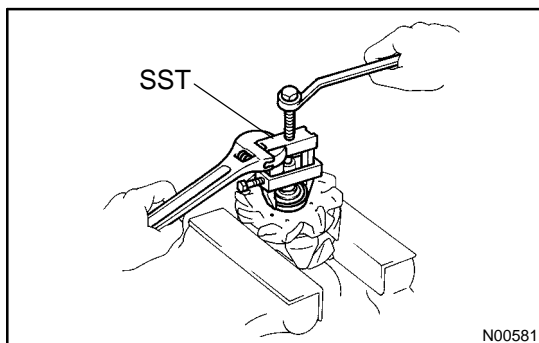
- (b) Using SST and a press, press out the bearing.
SST 09950-60010 (09951-00260, 09952-06010)



- (c) Using SST and a press, press in a new bearing.
SST 09950-60010 (09951-00500)



- (d) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.-lbf)



2. REPLACE REAR BEARING

- (a) Using SST, remove the bearing cover (outside) and bearing.

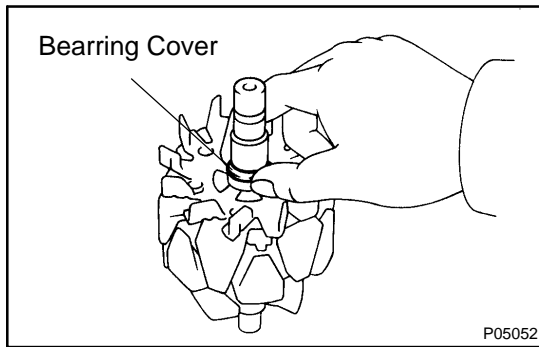
SST 09820-00021

NOTICE:

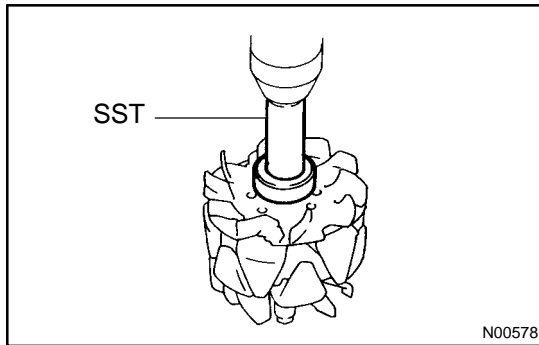
Be careful not to damage the fan.

- (b) Remove the bearing cover (inside).

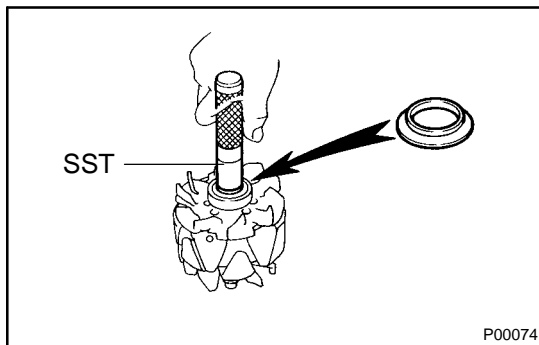
CHARGING - GENERATOR



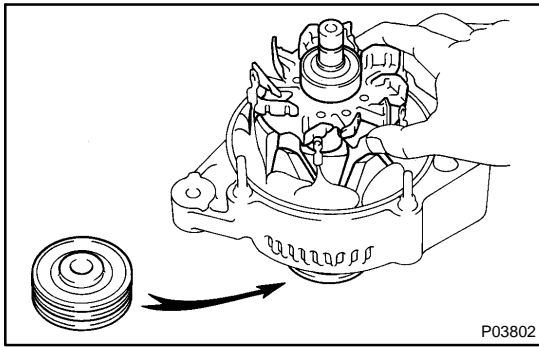
- (c) Place the bearing cover (inside) on the rotor.



- (d) Using SST and a press, press in a new bearing.
SST 09820-00030

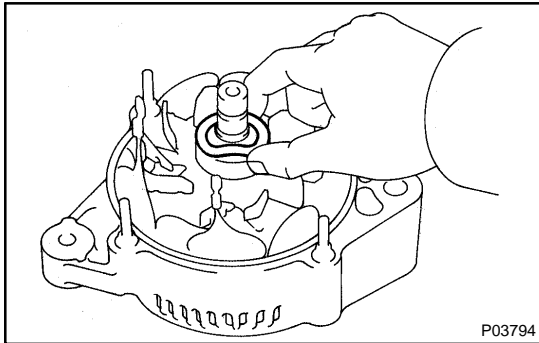


- (e) Using SST, push in the bearing cover (outside).
SST 09285-76010



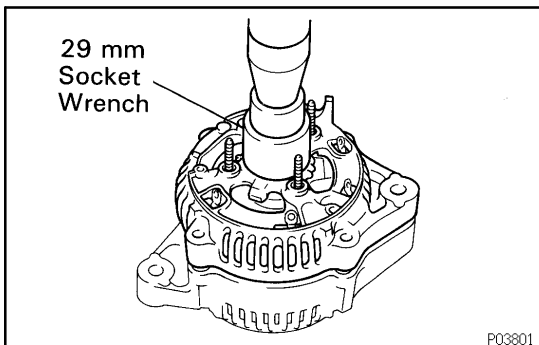
REASSEMBLY

1. PLACE RECTIFIER END FRAME ON PULLEY
2. INSTALL ROTOR TO DRIVE END FRAME



3. INSTALL RECTIFIER END FRAME

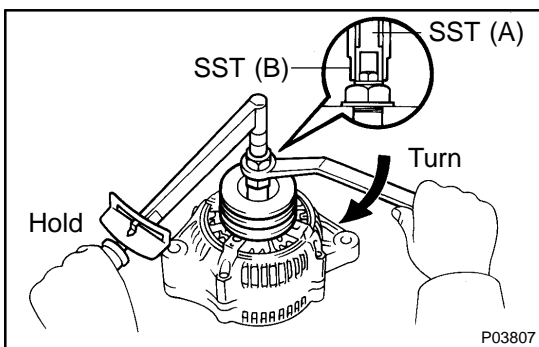
- (a) Place the generator washer on the rotor.



- (b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.

- (c) Install the 4 nuts.

Torque: 4.5 N·m (46 kgf·cm, 40 in.-lbf)



4. INSTALL PULLEY

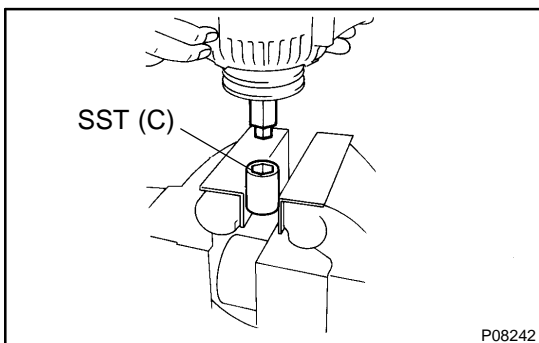
- (a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

- (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)

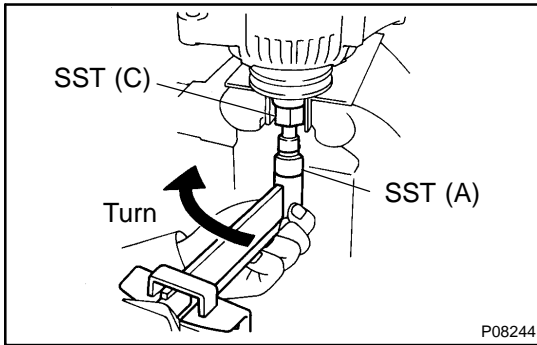
- (c) Check that SST (A) is secured to the pulley shaft.



- (d) Mount SST (C) in a vise.

- (e) Install the generator to SST (C).

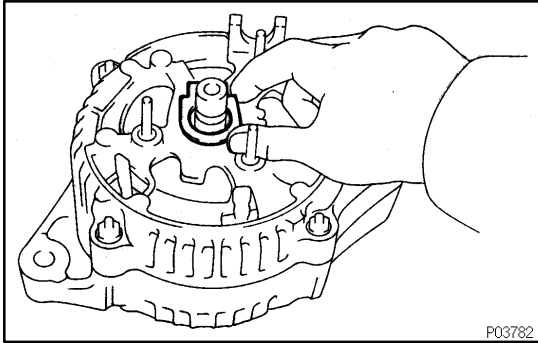
CHARGING - GENERATOR



- (f) To torque the pulley nut turn SST (A) in the direction shown in the illustration.

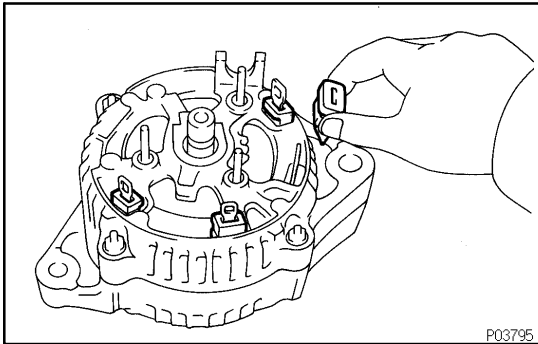
Torque: 110.5 N·m (1,128 kgf-cm, 81 ft-lbf)

- (g) Remove the generator from SST (C).
(h) Turn SST (B), and remove SST (A and B).

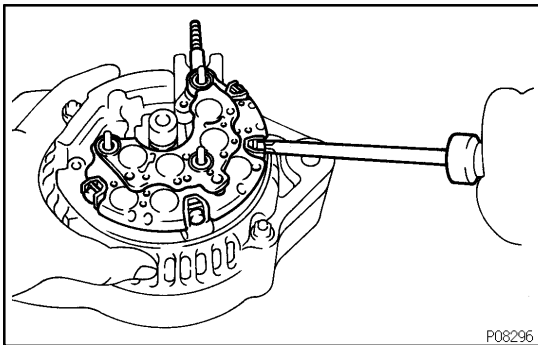


5. INSTALL RECTIFIER HOLDER

- (a) Place the seal plate on the rectifier end frame.

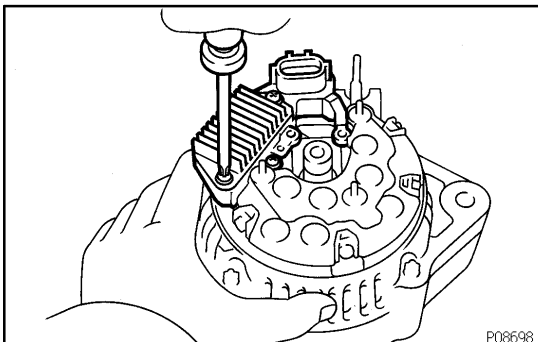


- (b) Install the 4 rubber insulators on the lead wires.



- (c) Install the rectifier holder with the 4 screws.

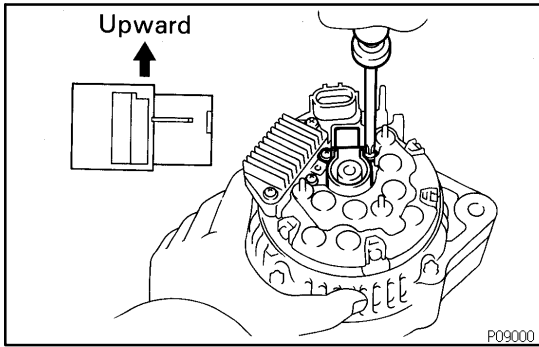
Torque: 2.9 N·m (30 kgf-cm, 25 in.-lbf)



6. INSTALL VOLTAGE REGULATOR

Install the voltage regulator on the rectifier end frame with the 3 screws.

Torque: 2.0 N·m (20 kgf-cm, 17 in.-lbf)



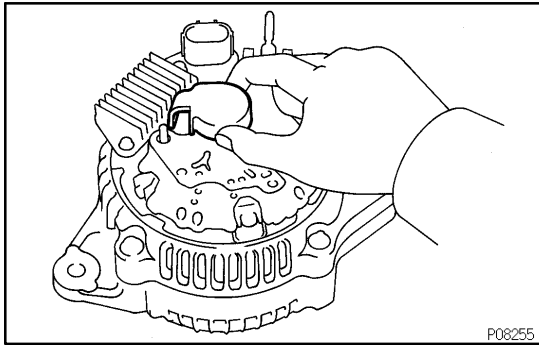
7. INSTALL BRUSH HOLDER

- (a) Install the brush holder on the rectifier end frame with the 2 screws.

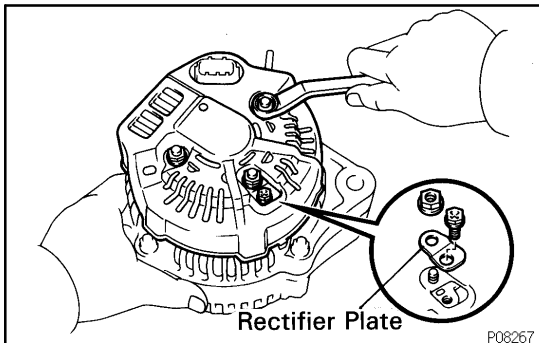
NOTICE:

Be careful of the holder installation direction.

Torque: 2.0 N·m (20 kgf·cm, 17 in.-lbf)



- (b) Place the brush holder cover on the brush holder.



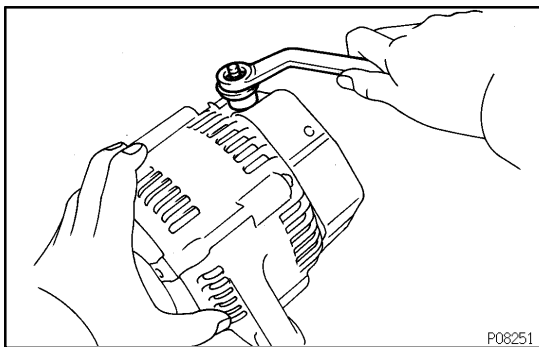
8. INSTALL REAR END COVER

- (a) Install the end cover together with the rectifier plate.
- (1) Hand tighten the bolt first for positioning the plate.
 - (2) Tighten the 3 nuts and bolt.

Torque:

Bolt: 3.8 N·m (39 kgf·cm, 34 in.-lbf)

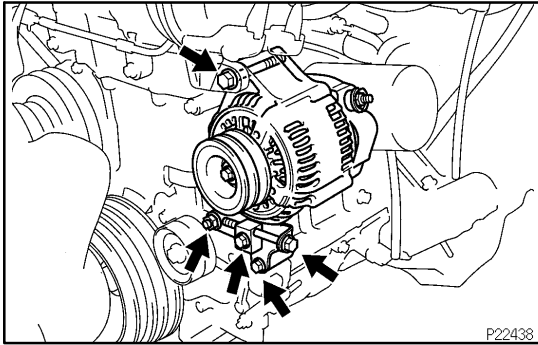
Nut: 4.4 N·m (45 kgf·cm, 39 in.-lbf)



- (b) Install the terminal insulator with the nut.

Torque: 4.1 N·m (42 kgf·cm, 36 in.-lbf)

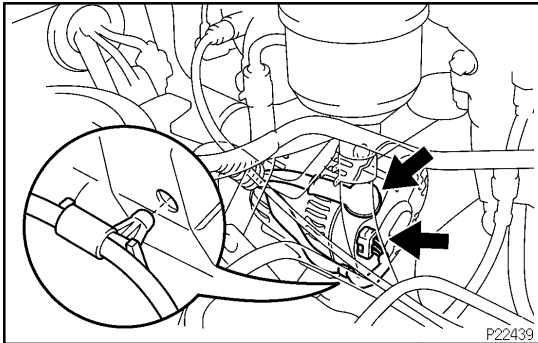
9. CHECK THAT ROTOR ROTATES SMOOTHLY



INSTALLATION

1. INSTALL GENERATOR

- (a) Mount generator on the generator bracket with the pivot bolt. Do not tighten the bolt yet.
- (b) Install the drive belt adjusting bar with the bolt and nut.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
- (c) Temporarily install the lock bolt.



- (d) Connect the generator connector.
- (e) Connect the generator wire with the nut and rubber cap.
- (f) Connect the generator wire clamp to the generator.

2. INSTALL DRIVE BELTS

- (a) Install the drive belts.
- (b) Adjust the drive belt with the adjusting bolt (See page [CH-2](#)).
- (c) Tighten the pivot and adjusting lock bolts.

Torque:

Pivot bolt: 59 N·m (600 kgf·cm, 43 ft·lbf)

Lock bolt: 21 N·m (210 kgf·cm, 15 ft·lbf)

3. CONNECT POWER STEERING (PS) RESERVOIR TANK

4. INSTALL BATTERY TRAY AND BATTERY

5. PERFORM ON-VEHICLE INSPECTION (See page [CH-2](#))

COOLANT INSPECTION

COOIO-04

HINT:

Check the coolant level when the engine is cold.

1. CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR

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.

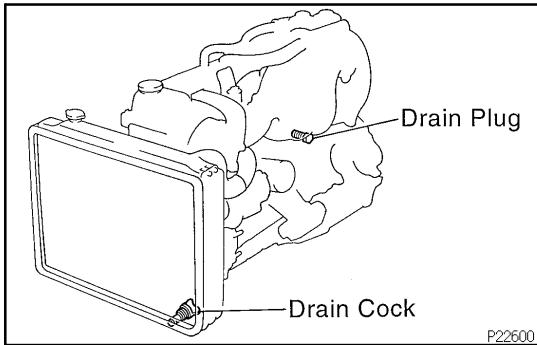
CAUTION:

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 radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

(c) Reinstall the radiator cap.



REPLACEMENT

REPLACE ENGINE COOLANT

- (a) Remove the radiator cap.

CAUTION:

See step 2. (a) above.

- (b) Drain the coolant from the radiator drain cock and engine drain plug (Engine drain plug at the left of engine block.).
- (c) Close the drain plugs.

Torque: Torque (Engine drain plug):

29 N·m (300 kgf·cm, 22 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 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.

Capacity:

w/ Front heater:

13.7 liters (14.4 US qts, 12.1 Imp. qts)

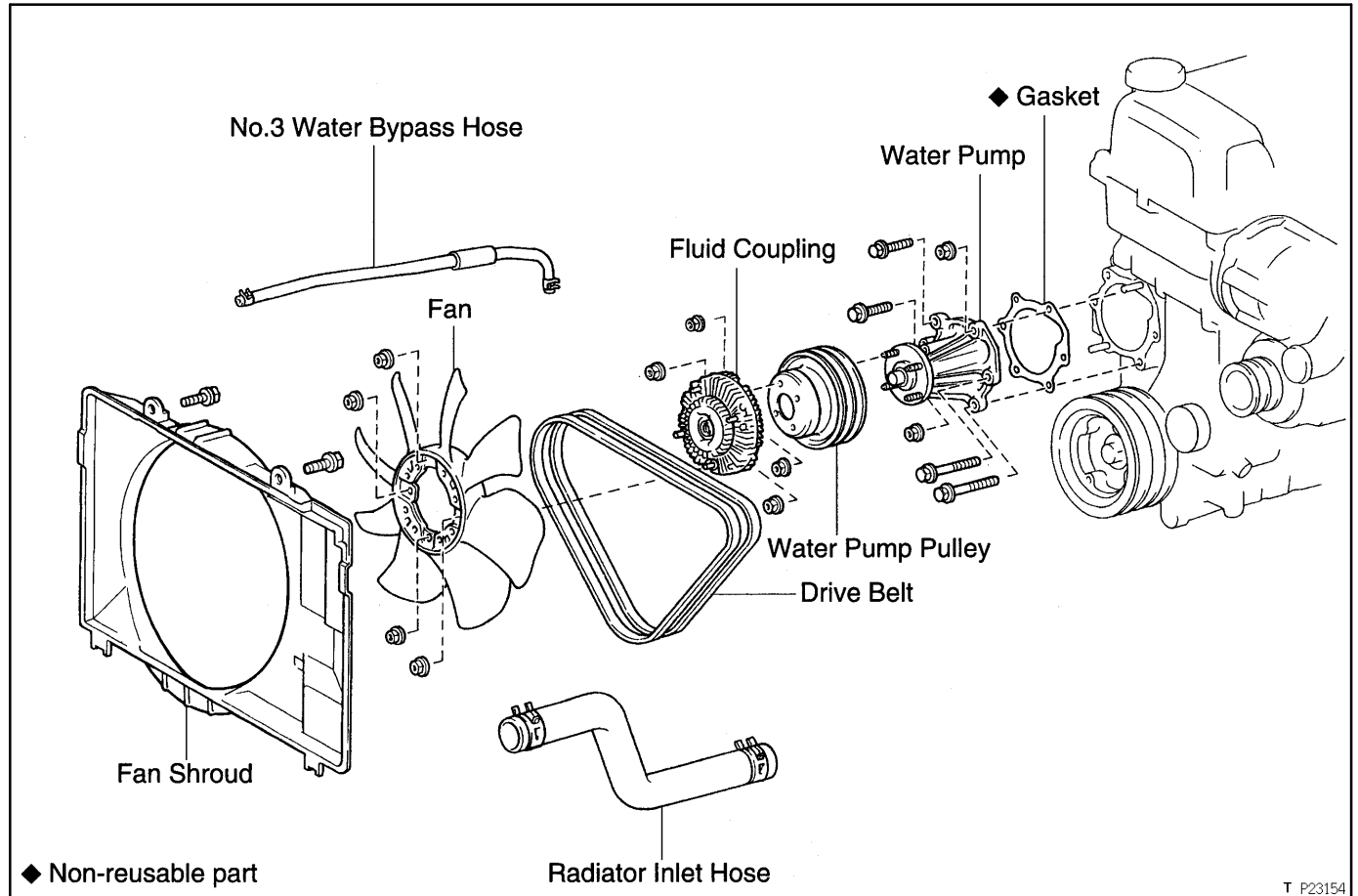
w/ Front and rear heaters:

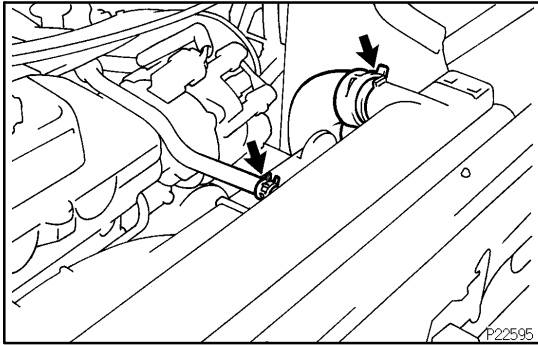
14.7 liters (15.5 US qts, 12.9 Imp. qts)

- (e) Reinstall the radiator cap.
- (f) Warm up the engine and check for leaks.
- (g) Recheck the coolant level and refill as necessary.

WATER PUMP COMPONENTS

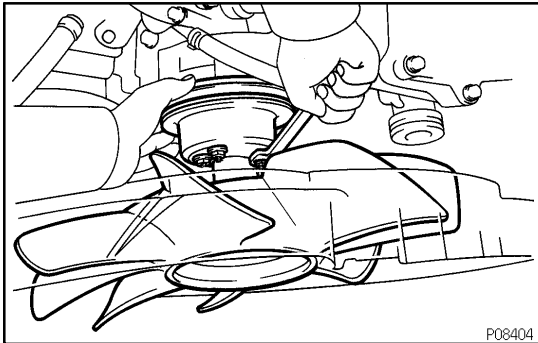
CO111-01





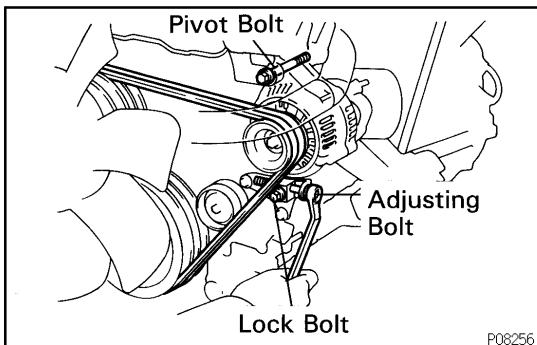
REMOVAL

1. DRAIN ENGINE COOLANT
2. DISCONNECT NO.3 WATER BYPASS HOSE
3. DISCONNECT RADIATOR INLET HOSE

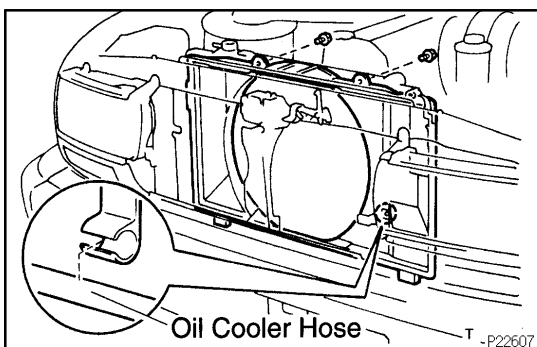


4. REMOVE DRIVE BELTS, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD

- (a) Stretch the belts and loosen the water pump pulley mounting nuts.



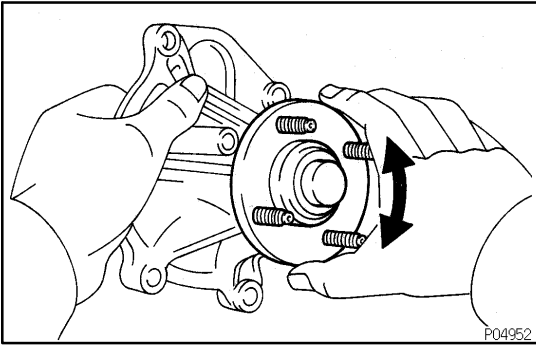
- (b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts.



- (c) Disconnect the oil cooler hose from the clamp on the fan shroud.
- (d) Remove the 2 bolts holding the fan shroud to the radiator.
- (e) Remove the 4 water pump pulley mounting nuts.
- (f) Pull out the fan with fluid coupling, water pump pulley and fan shroud.
- (g) Remove the fan from the fluid coupling.

5. REMOVE WATER PUMP

Remove the 4 bolts, 2 nuts, water pump and gasket.



INSPECTION

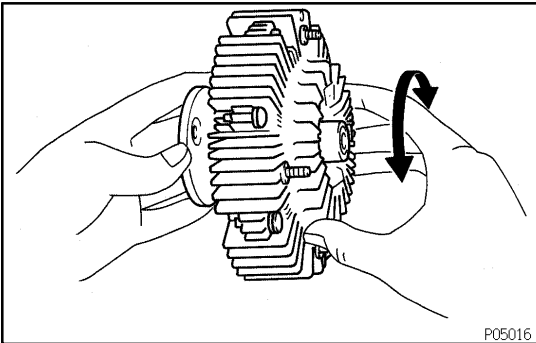
1. INSPECT WATER PUMP

- (a) Visually check the air hole and water hole for coolant leakage.

If leakage is found, replace the water pump.

- (b) Turn the pulley seat and check that the water pump bearing moves smoothly and quietly.

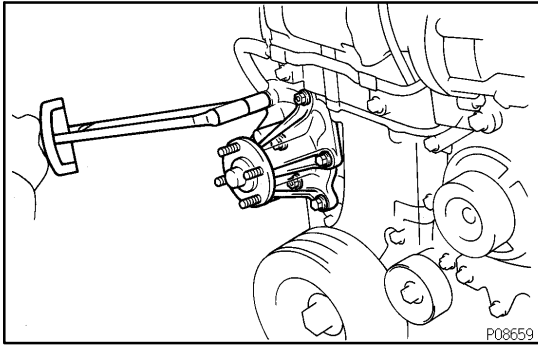
If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicon oil leakage.

If necessary, replace the fluid coupling.



INSTALLATION

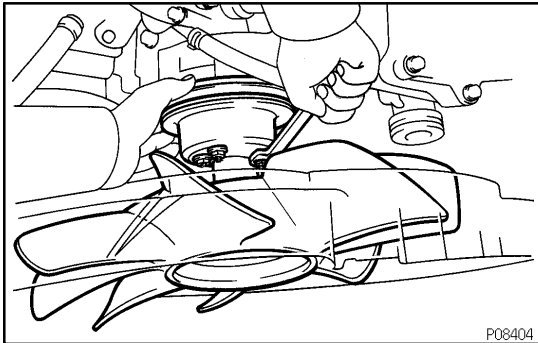
1. INSTALL WATER PUMP

Install a new gasket and the water pump with the 4 bolts and 2 nuts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

2. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS

(a) Install fan to the fluid coupling.



(b) Place the fan with fluid coupling, water pump pulley and fan shroud in position.

(c) Temporarily install the fan pulley mounting nuts.

(d) Install the fan shroud with the 2 bolts.

Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)

(e) Connect the oil cooler hose to the clamp on the fan shroud.

(f) Install the drive belts with the adjusting bolt and pivot bolt.

(g) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts.

(h) Adjust the drive belts (See page [CH-2](#)).

3. CONNECT NO.3 WATER BYPASS HOSE

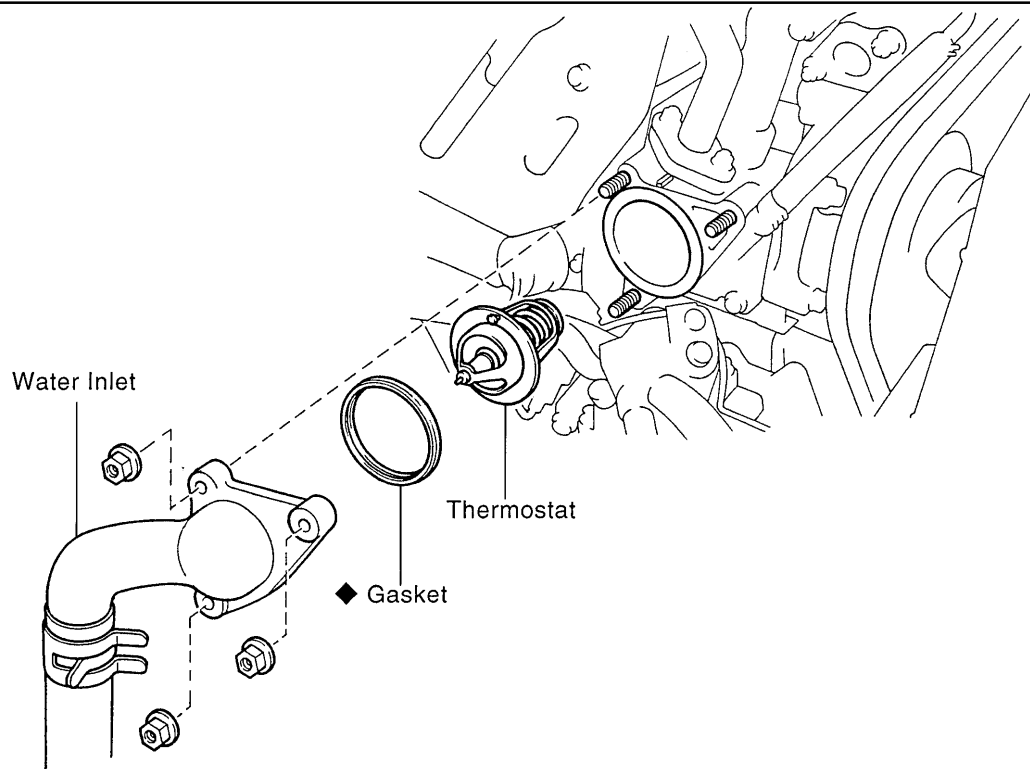
4. CONNECT RADIATOR INLET HOSE

5. FILL RADIATOR WITH ENGINE COOLANT

6. START ENGINE AND CHECK FOR LEAKS

THERMOSTAT COMPONENTS

CO0IU-03



◆ Non-reusable part

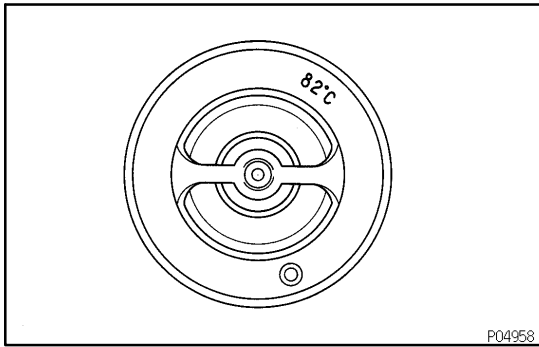
P22564

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**
2. **REMOVE WATER INLET AND THERMOSTAT**

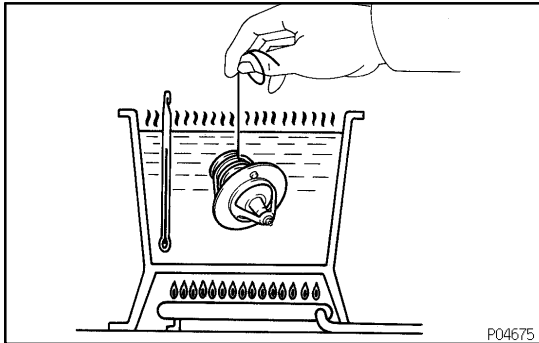


INSPECTION

INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.

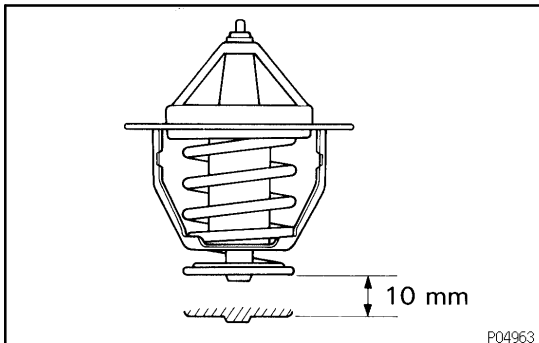


(a) Immerse the thermostat in water and gradually heat the water.

(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.



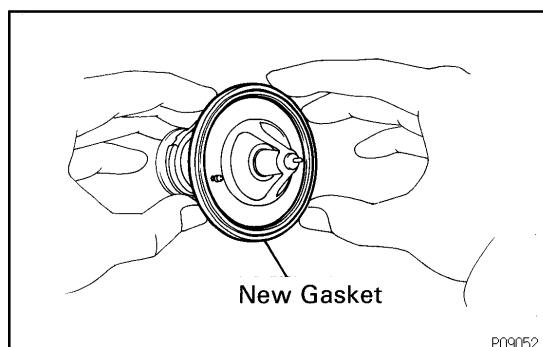
(c) Check the valve lift.

Valve lift: 10 mm (0.39 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

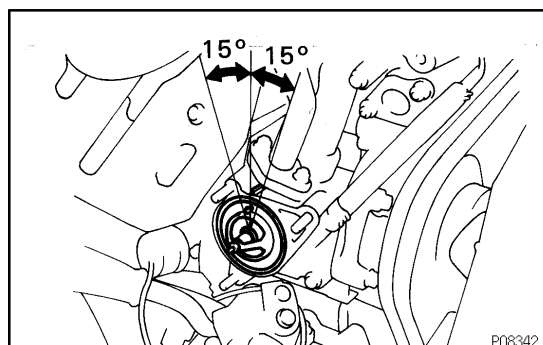
If not closed, replace the thermostat.



INSTALLATION

1. PLACE THERMOSTAT IN WATER PUMP

- (a) Install a new gasket on to the thermostat.
- (b) Align the thermostat jiggle valve with the protrusion of the water inlet housing, and insert the thermostat in the water inlet housing.



HINT:

The jiggle valve may be set within 15° of either side of the prescribed position.

2. INSTALL WATER INLET

Install the water inlet with the 3 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

3. **FILL RADIATOR WITH ENGINE COOLANT**
4. **START ENGINE AND CHECK FOR LEAKS**

RADIATOR

ON-VEHICLE CLEANING

CO01Y-02

NOTICE:

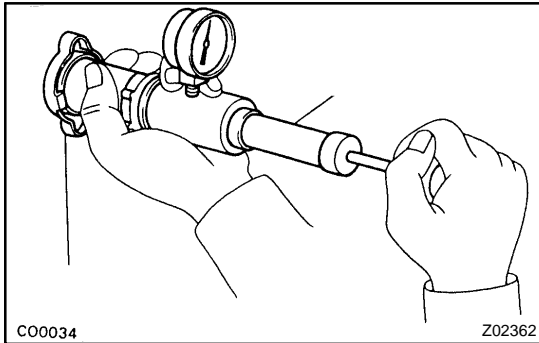
If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core)

ON-VEHICLE INSPECTION

1. REMOVE RADIATOR TANK CAP

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:

If the radiator cap has contaminations, always rinse it with water. Before using a radiator cap tester, wet the relief valve and pressure valve with coolant or water.

Using a radiator cap tester, pump the tester and measure the relief valve opening pressure.

Standard opening pressure:

74 – 103 kPa

(0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)

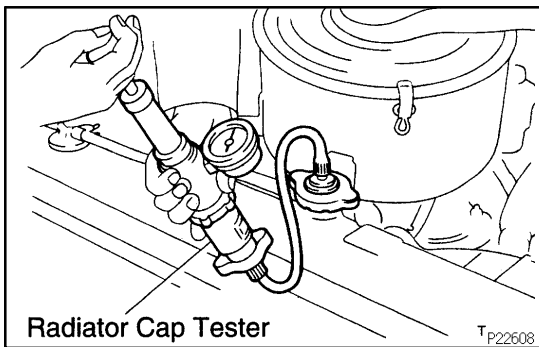
Minimum opening pressure:

59 kPa (0.6 kgf/cm², 8.5 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the radiator cap.



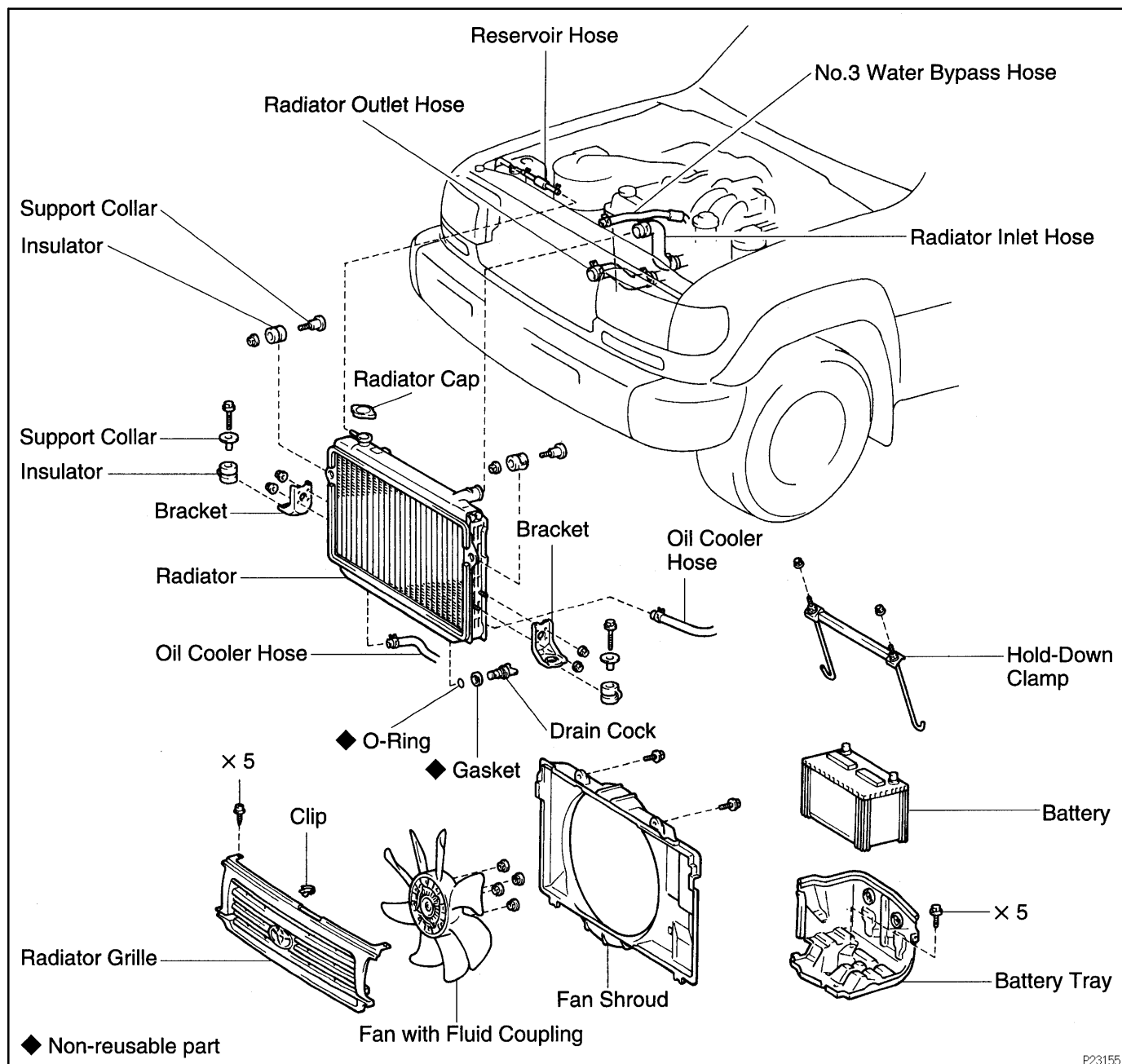
3. INSPECT COOLING SYSTEM FOR LEAKS

- Fill the radiator with coolant and attach a radiator cap tester.
- Warm up the engine.
- Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

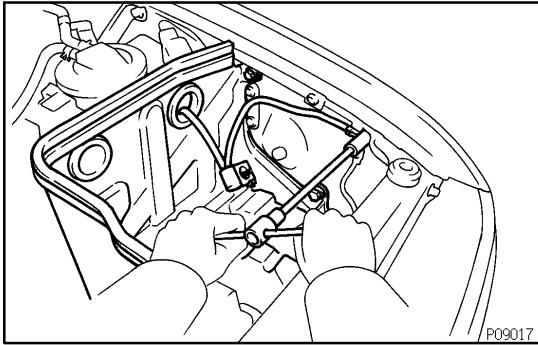
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

COMPONENTS



P23155



REMOVAL

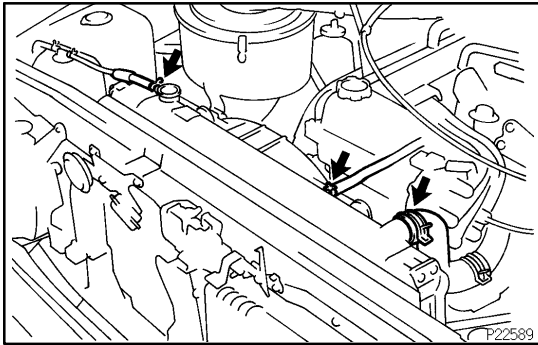
1. DRAIN ENGINE COOLANT

2. REMOVE BATTERY AND BATTERY TRAY

- Disconnect the battery cables.
- Remove the nuts, hold-down clamp and battery.
- Remove the bolt and disconnect the ground strap.
- Remove the 5 bolts and battery tray.

3. REMOVE RADIATOR GRILLE

Remove the 5 screws, clip and radiator grille.



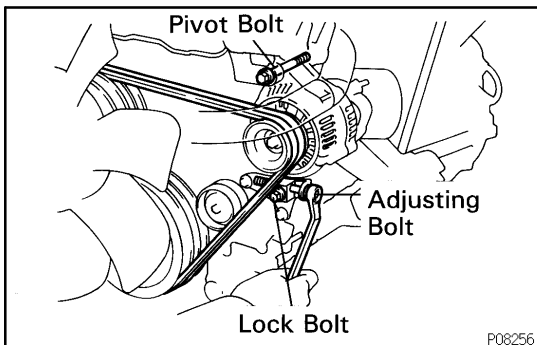
4. DISCONNECT NO.3 WATER BYPASS HOSE

5. DISCONNECT RADIATOR INLET HOSE

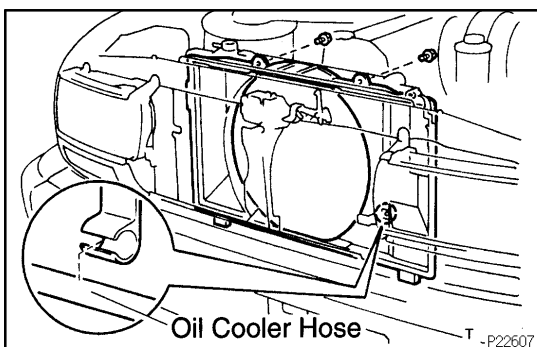
6. DISCONNECT RADIATOR RESERVOIR HOSE

7. REMOVE RADIATOR

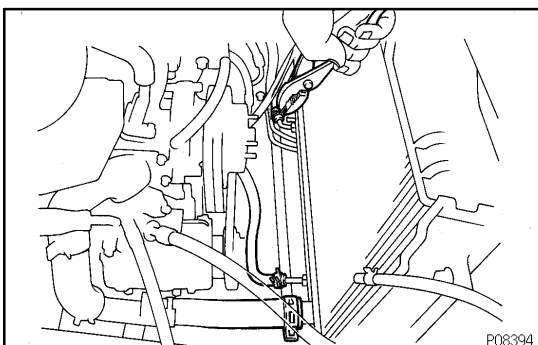
- Stretch the belts and loosen the water pump pulley mounting nuts.



- Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts.



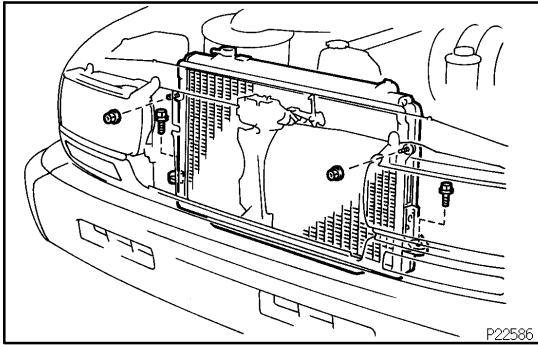
- Disconnect the oil cooler hose from the clamp on the fan shroud.
- Remove the 2 bolts holding the fan shroud to the radiator.
- Remove the 4 water pump pulley mounting nuts.
- Pull out the fan with fluid coupling, water pump pulley and fan shroud.



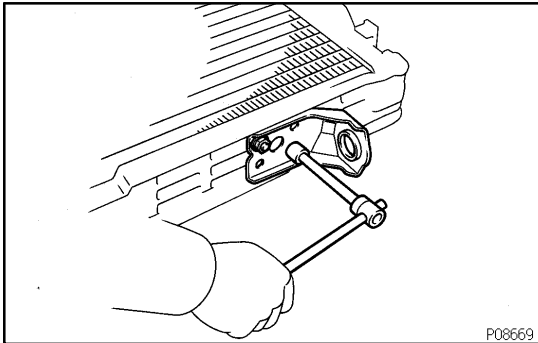
8. DISCONNECT A/T OIL COOLER HOSES

9. DISCONNECT RADIATOR OUTLET HOSE

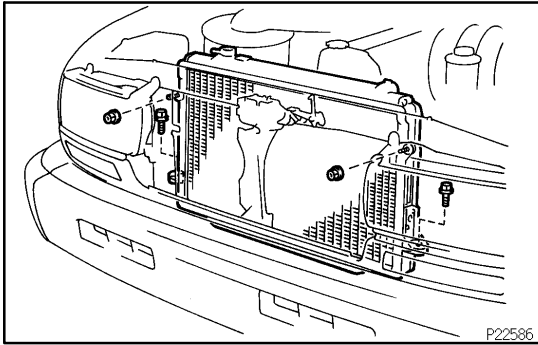
COOLING - RADIATOR

**10. REMOVE RADIATOR**

- (a) Remove the 2 bolts, 2 nuts and radiator.



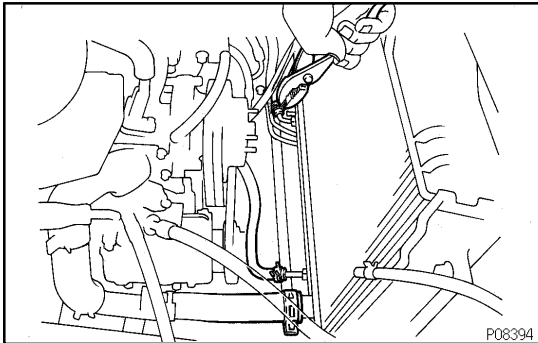
- (b) Remove the 4 nuts and 2 radiator brackets.



INSTALLATION

1. INSTALL RADIATOR

- (a) Install the 2 radiator brackets with the 4 nuts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
- (b) Install the radiator with the 2 bolts and 2 nuts.
Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 9 ft·lbf)

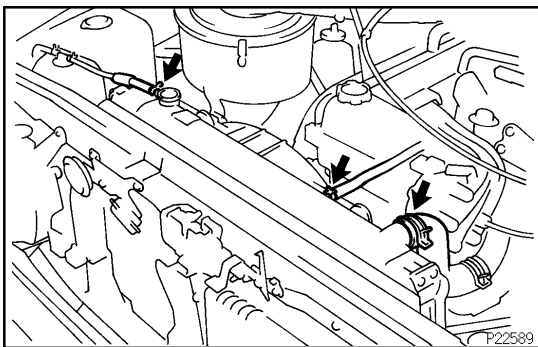
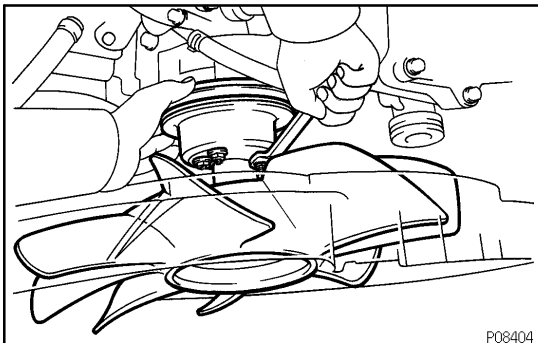


2. CONNECT A/T OIL COOLER HOSES

3. CONNECT RADIATOR OUTLET HOSE

4. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELTS

- (a) Place the fan with fluid coupling, water pump pulley and fan shroud in position.
- (b) Temporarily install the fan pulley mounting nuts.
- (c) Install the fan shroud with the 2 bolts.
Torque: 5.0 N·m (50 kgf·cm, 43 in.-lbf)
- (d) Connect the oil cooler hose to the clamp on the fan shroud.
- (e) Install the drive belts with the adjusting bolt and pivot bolt.
- (f) Stretch the belts tight and tighten the 4 water pump pulley mounting nuts.
- (g) Adjust the drive belts (See page [CH-2](#)).



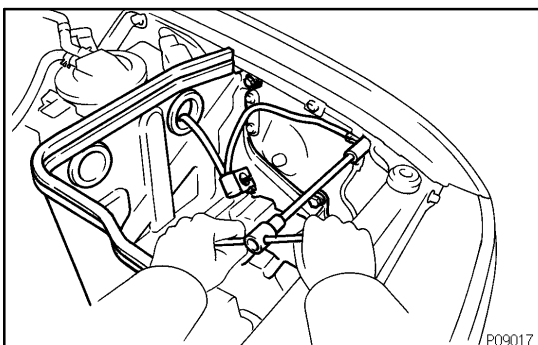
5. CONNECT RADIATOR RESERVOIR HOSE

6. CONNECT RADIATOR INLET HOSE

7. CONNECT NO.3 WATER BYPASS HOSE

8. INSTALL RADIATOR GRILLE

Install the radiator grille with the 5 screws and clip.



9. INSTALL BATTERY AND BATTERY TRAY

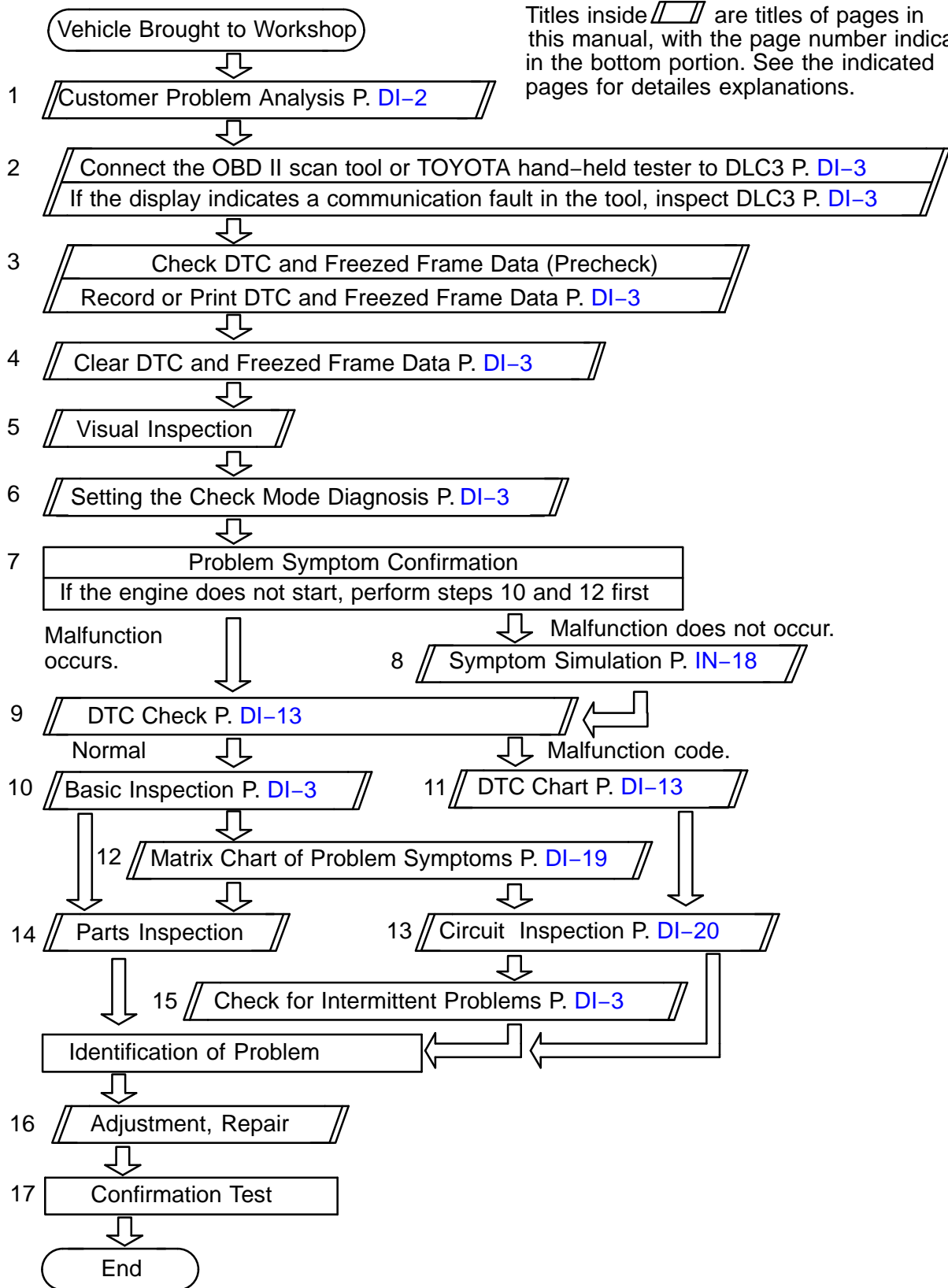
- (a) Install the battery tray with the 5 bolts.
 - (b) Connect the ground strap with the bolt.
 - (c) Install the battery with the hold-down clamp and nuts.
 - (d) Connect the battery cables.
- ### 10. FILL RADIATOR WITH ENGINE COOLANT
- ### 11. START ENGINE AND CHECK FOR LEAKS
- ### 12. CHECK AUTOMATIC TRANSMISSION FLUID LEVEL

ENGINE

HOW TO PROCEED WITH TROUBLESHOOTING

DISOS-02

Troubleshoot in accordance with the procedure on the following page.



CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

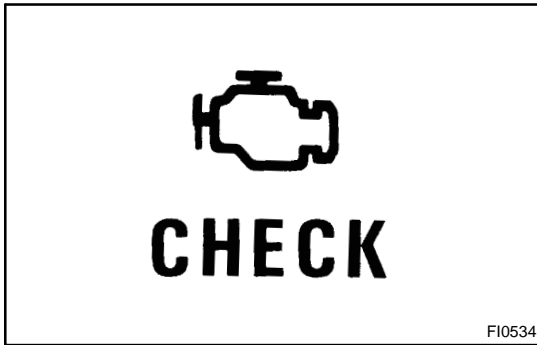
Inspector's
Name _____

Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

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

Dates Problem Occurred		_____			
Problem Frequency		<input type="checkbox"/> Constant <input type="checkbox"/> Sometimes (times per day/month) <input type="checkbox"/> Once only <input type="checkbox"/> Other _____			
Condition When Problem Occurs	Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Other _____			
	Outdoor Temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold (approx. ____ °F/ ____ °C)			
	Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner City <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Other _____			
	Engine Temp.	<input type="checkbox"/> Cold <input type="checkbox"/> Warming up <input type="checkbox"/> After Warming up <input type="checkbox"/> Any temp. <input type="checkbox"/> Other _____			
	Engine Operation	<input type="checkbox"/> Starting <input type="checkbox"/> Just after starting (min.) <input type="checkbox"/> Idling <input type="checkbox"/> Racing <input type="checkbox"/> Driving <input type="checkbox"/> Constant speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration <input type="checkbox"/> A/C switch ON/OFF <input type="checkbox"/> Other _____			

Condition of MIL		<input type="checkbox"/> Remains on <input type="checkbox"/> Sometimes light up <input type="checkbox"/> Does not light up	
DTC Inspection	Normal mode (Precheck)	<input type="checkbox"/> Normal	<input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freezed frame data ()
	Check Mode	<input type="checkbox"/> Normal	<input type="checkbox"/> Malfunction code(s) (code) <input type="checkbox"/> Freezed frame data ()



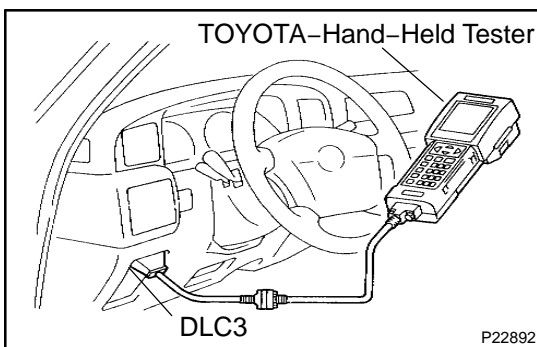
PRE-CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand-held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on-board computer 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 affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page [DI-13](#)).

If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTC remain recorded in the ECM memory.



- To check the DTC, connect the OBD II scan tool or TOYOTA hand-held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand-held tester also enables you to erase the DTCs and check frozen frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.).
- DTC 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 DTC chart on page [DI-13](#)).

- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous 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 step 2).
- *2 trip detection logic:
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second drive test, this second 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 1st 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 malfunction 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 malfunction 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.

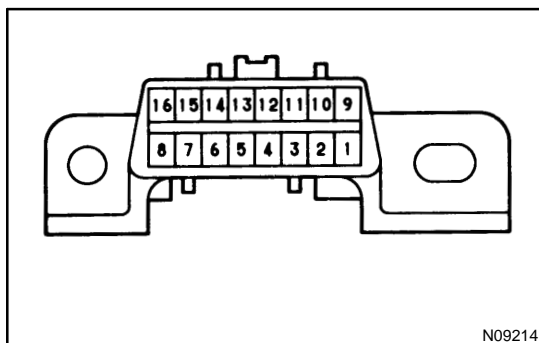
Priorities for troubleshooting:

If troubleshooting priorities for multiple DTCs are given in the applicable diagnostic chart, these should be followed.

If no instructions are given troubleshoot DTCs according to the following priorities.

- (1) DTC other than fuel trim malfunction (DTC P0171, P0172), 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).
- (b) Check the DLC3.

The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.



N09214

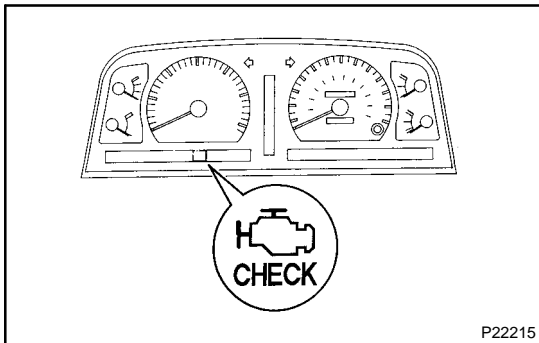
DIAGNOSTICS – ENGINE

Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground / ↔ Body Ground 1 Ω or less	Always
5	Signal Ground / ↔ Body Ground 1 Ω 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 OBD II scan tool or TOYOTA hand-held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- 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.



P22215

2. INSPECT DIAGNOSIS (NORMAL MODE)**(a) Check the MIL.**

- (1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page [BE-2](#)).

- (2) When the engine started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system

(b) Check the DTC.**NOTICE:**

TOYOTA hand-held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down

- (1) Prepare the OBD II scan tool (complying with SAE J 1978) or TOYOTA hand-held tester.
- (2) Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3 in the fuse box at the lower left of the instrument panel.
- (3) Turn the ignition switch ON and switch the OBD II scan tool or TOYOTA hand-held tester switch ON.
- (4) Use the OBD II scan tool or TOYOTA hand-held tester to check the DTC and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool's instruction book.)
- (5) See page [DI-13](#) to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand-held tester) to check the DTC, use normal mode. For codes on the DTC 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 DTCs are recorded in the ECM.

3. INSPECT DIAGNOSIS (CHECK MODE)**HINT:**

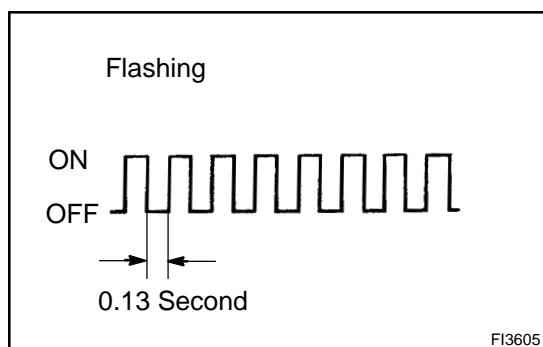
TOYOTA hand-held tester only:

Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

(a) Check the DTC.**(1) Initial conditions**

- Battery positive voltage 11 V or more.
- Throttle valve fully closed.
- Transmission in "park" or "neutral" position.
- Air conditioning switched OFF.

(2) Turn ignition switch OFF.**(3) Prepare the TOYOTA hand-held tester.**

- (4)** Connect the TOYOTA hand-held tester to DLC3 in the fuse box at the lower left of the instrument panel.
- (5)** Turn the ignition switch ON and push the TOYOTA hand-held tester ON.
- (6)** Switch the TOYOTA hand-held tester normal mode to check mode (Check that the MIL flashes.).
- (7)** Switch 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 DTC, etc.

- (9)** After simulating the malfunction conditions, use the TOYOTA hand-held tester diagnosis selector to check the DTCs and freeze 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 DTCs, etc. are erased.

DIAGNOSTICS – ENGINE

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

The following actions will erase the DTCs and freeze frame data.

(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester to erase the codes. (See the OBD II 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 LOCK during check mode, the DTCs and freeze frame data will be erased.

4. 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	<ul style="list-style-type: none"> Ignition timing fixed at 5° BTDC Injection method fixed at simultaneous injection 	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80° (176°F)	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: $0.1\text{ V} \leq \text{VTA} \leq 0.95\text{ V}$
P0135 P0141	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325 P0330	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 6 consecutive ignitions
P1605	Max. timing retardation	Returned to normal condition

5. 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.

- (1) Clear the DTC (See step 2).
- (2) Set the check mode (See step 3).
- (3) Perform a simulation test (See page [IN-18](#)).
- (4) Check the connector and terminal (See page [IN-28](#)).
- (5) Handle the connector (See page [IN-28](#)).
- (6) Visual check and contact pressure (See page [IN-28](#)).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC 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?
----------	---

NO

Charge or replace battery.

YES

2	Is engine cranked?
----------	---------------------------

NO

Proceed to page [ST-16](#), and continue to troubleshoot.

YES

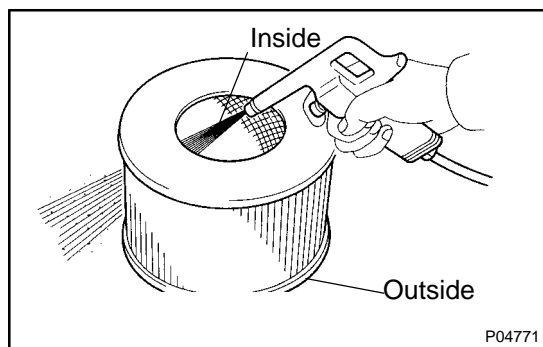
3	Does engine start?
----------	---------------------------

NO

Go to step 7.

YES

4	Check air filter.
----------	--------------------------



PREPARATION:

Remove air filter.

CHECK:

Visually check that the air cleaner element is not dirty or excessive oily.

HINT:

If necessary, clean the element with compressed air. First blow from inside thoroughly, then blow from outside of element.

NG

Repair or replace

OK

5 Check idle speed.**PREPARATION:**

- (a) Warm up engine to normal operating temperature.
- (b) Switch off all accessories.
- (c) Switch off air conditioning.
- (d) Shift transmission into "N" position.
- (e) Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3 on the vehicle.

CHECK:

Use CURRENT DATA to check the idle speed.

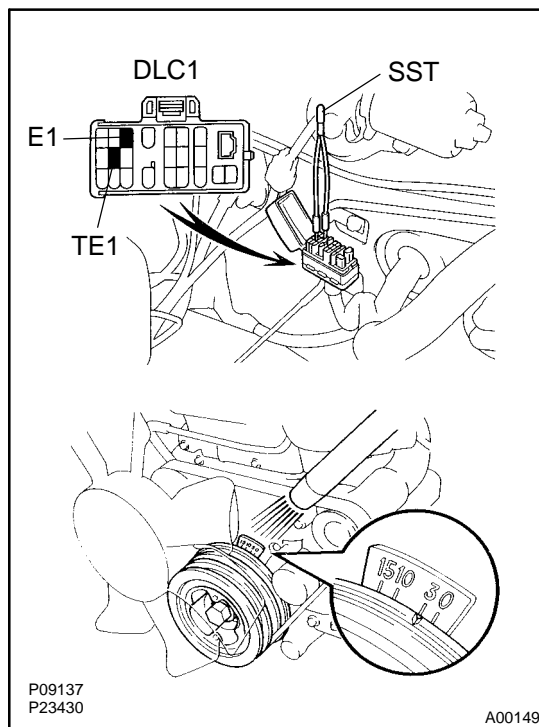
OK:

Idle speed: 650 ± 50 rpm

NG

Proceed to matrix chart of problem symptoms on page [DI-19](#).

OK

6 Check ignition timing.**PREPARATION:**

- (a) Warm up engine to normal operating temperature.
- (b) Shift transmission into "N" position.
- (c) Keep the engine speed at idle.
- (d) Using SST, connect terminals TE1 and E1 of DLC1.
SST 09843-18020
- (e) Connect a timing light probe to a high-tension cord.

CHECK:

Check ignition timing.

OK:

Ignition timing: 3° BTDC at idle

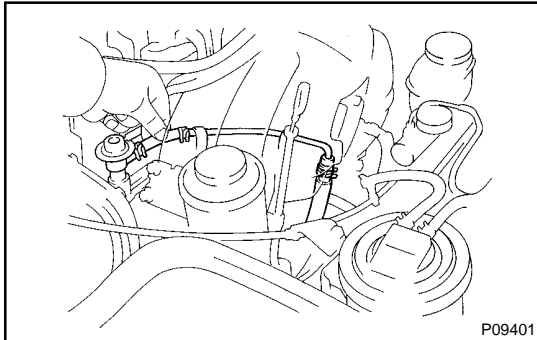
NG

Proceed to page [IG-1](#) and continue to trouble-shoot.

OK

Proceed to matrix chart of problem symptoms on page [DI-19](#).

7 Check fuel pressure.



PREPARATION:

- Be sure that enough fuel is in the tank.
- Connect the TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and push TOYOTA hand-held tester main switch ON.
- Use ACTIVE TEST mode to operate the fuel pump.
- If you have no TOYOTA hand-held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page [SF-6](#)).

CHECK:

Check for fuel pressure in the fuel return hose when it is pinched off.

HINT:

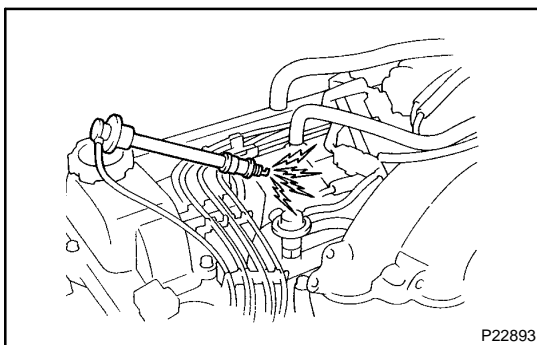
At this time, you will hear a fuel flowing noise.

NG

Proceed to page [SF-6](#) and continue to trouble-shoot.

OK

8 Check for spark.



PREPARATION:

- Remove No.2 and No.3 cylinder head cover.
- Disconnect high-tension cord from spark plug.
- Remove spark plug.
- Install the spark plug to the high-tension cord.
- Ground the spark plug.
- Disconnect injector connector.

CHECK:

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.

NG

Proceed to page **IG-1** and continue to troubleshoot.

OK

Proceed to matrix chart of problem symptoms on page **DI-19**.

7. 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.

(a) 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 warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 13.8 – 19.3% Racing without load (2,500 rpm): 17.6 – 25.2%
COOLANT TEMP.	Engine Coolant Temp. Sensor Value	After warming up: 80 – 95°C (176 – 203°F)
SHORT FT #1	Short-term Fuel Trim Bank 1	0 ± 20%
LONG FT #1	Long-term Fuel Trim Bank 1	0 ± 20%
ENGINE SPD	Engine Speed	Idling: 650 ± 50 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No. 1	Idling: BTDC 0 – 11°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 4.3 – 6.1 gm/sec. Racing without load (2,500 rpm): 21.2 – 30.4 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% Throttle Fully Open: 65 – 75%
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V
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

*: 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.

(b) 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: 2.0 – 3.5 ms
IAC STEP POS	Intake Air Control Valve step position Opening position step motor type IAC valve	Idling: 10 – 50 step
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
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 – CYL#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 rpm
EGRT GAS	EGR Gas Temp. Sensor Value	EGR not operating: Temp. between intake air temp. and engine coolant temp.
EGR SYSTEM	EGR System Operating Condition	Idling: OFF
FUEL PRES UP VSV	Fuel Pressure Up VSV Signal	High temp. restarting: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
O2 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 warmed up: 0 – 1,000 msec.
O2 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 warmed up: 0 – 1,000 msec.

*: 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.

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page referred to under the "See page" for the respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0100 (DI-20)	Mass Air Flow Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM 	○ *1	○
P0101 (DI-25)	Mass Air Flow Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Mass air flow meter 	○ *1	○
P0110 (DI-26)	Intake Air Temp. Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM 	○ *1	○
P0115 (DI-30)	Engine Coolant Temp. Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM 	○ *1	○
P0116 (DI-34)	Engine Coolant Temp. Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Engine coolant temp. sensor • Cooling system 	○ *1	○
P0120 (DI-35)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in throttle position sensor circuit • Throttle position sensor • ECM 	○ *1	○
P0121 (DI-39)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	<ul style="list-style-type: none"> • Throttle position sensor 	○ *1	○
P0125 (DI-40)	Insufficient Coolant Temp. for Closed Loop Fuel Control	<ul style="list-style-type: none"> • Open or short in heated oxygen sensor circuit • Heated oxygen sensor 	○ *1	○
P0130 (DI-43)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Heated oxygen sensor • Fuel trim malfunction 	○ *1	○
P0133 (DI-46)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Heated oxygen sensor 	○ *1	○
P0135 (DI-47)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	<ul style="list-style-type: none"> • Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM 	○ *1	○
P0136 (DI-49)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Heated oxygen sensor 	○ *1	○
P0141 (DI-47)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	<ul style="list-style-type: none"> • Same as DTC No. P0135 	○ *1	○

*1: MIL lights up

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DIAGNOSTICS – ENGINE

DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0171 (DI-51)	System too Lean (Fuel Trim)	<ul style="list-style-type: none"> • Air intake (hose loose) • Fuel line pressure, leak • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor 	○ *1	○
P0172 (DI-51)	System too Rich (Fuel Trim)	<ul style="list-style-type: none"> • Fuel line pressure • Injector leak, blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor 	○ *1	○
P0300 (DI-54)	Random/Multiple Cylinder Misfire Detected	<ul style="list-style-type: none"> • Ignition system • Injector 	○ *2	○
P0301	Misfire Detected	• Fuel line pressure		
P0302	– Cylinder 1	• EGR		
P0303	– Cylinder 2	• Compression pressure		
P0304	– Cylinder 3	• Valve clearance not to specification		
P0305	– Cylinder 4	• Valve timing		
P0306 (DI-54)	– Cylinder 5 – Cylinder 6	<ul style="list-style-type: none"> • Mass air flow meter • Engine coolant temp. sensor 		
P0325 (DI-59)	Knock Sensor 1 Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM 	○ *1	○
P0330 (DI-59)	Knock Sensor 2 Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • ECM 	○ *1	○
P0335 (DI-62)	Crankshaft Position Sensor "A" Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit for NE signal • Crankshaft position sensor for NE signal • Starter • ECM 	○ *1	○
P0340 (DI-65)	Camshaft Position Sensor Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in camshaft position sensor circuit • Camshaft position sensor • ECM 	○ *1	○
P0385 (DI-67)	Crankshaft Position Sensor "B" Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit for NE2 signal • Crankshaft position sensor for NE2 signal • ECM 	○ *1	○
P0401 (DI-69)	Exhaust Gas Recirculation Flow Insufficient Detected	<ul style="list-style-type: none"> • EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM 	○ *1	○
P0402 (DI-80)	Exhaust Gas Recirculation Flow Excessive Detected	<ul style="list-style-type: none"> • EGR valve stuck open • EGR VSV open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM 	○ *1	○

*1: MIL lights up

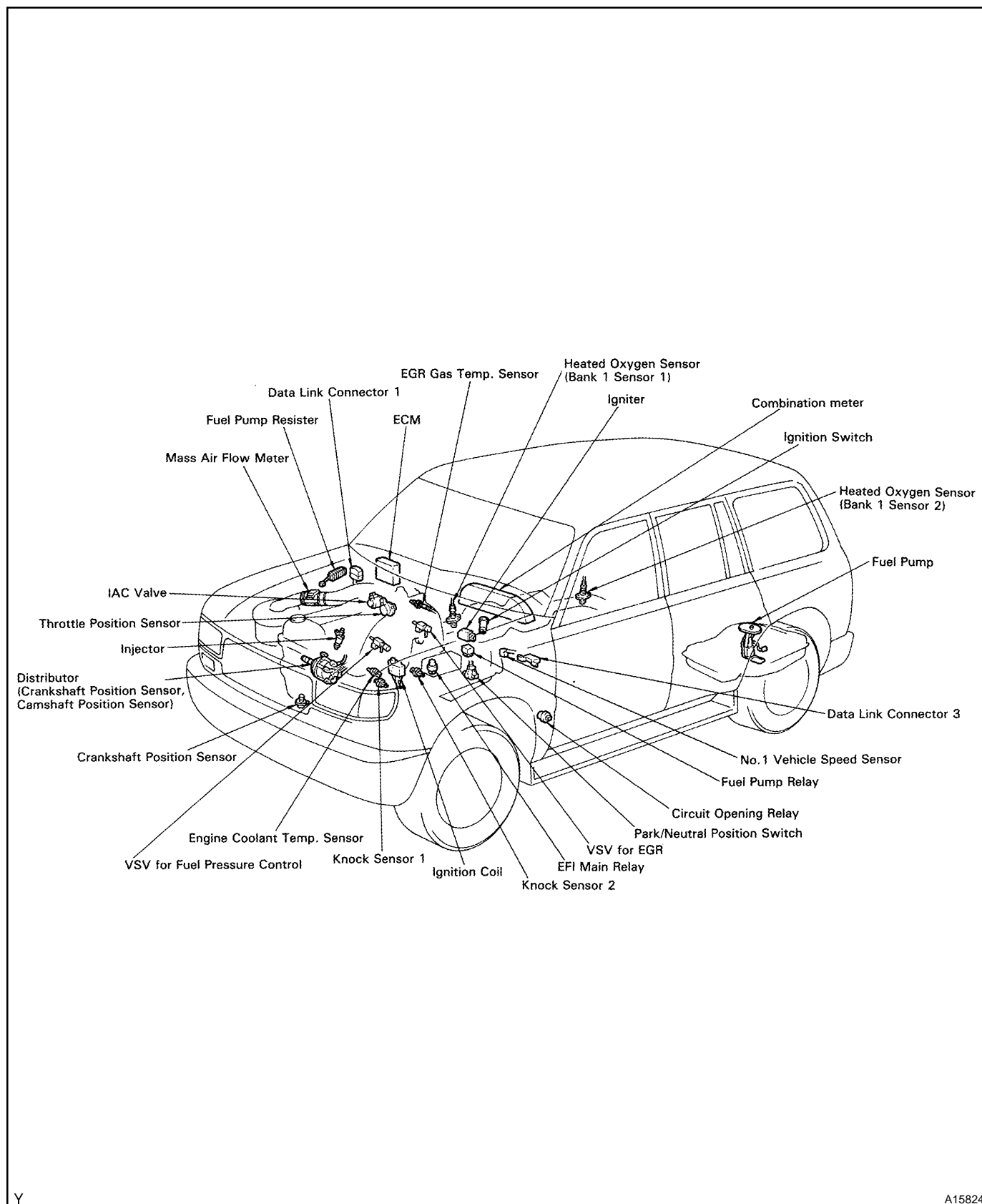
*2: MIL lights up or blinking

DIAGNOSTICS – ENGINE

DTC No. (See Page)	Detection Item	Trouble Area	*MIL	Memory
P0420 (DI-84)	Catalyst System Efficiency Below Threshold	<ul style="list-style-type: none"> • Three-way catalytic convertor • Open or short in heated oxygen sensor circuit • Heated oxygen sensor 	○	○
P0500 (DI-87)	Vehicle Speed Sensor Malfunction	<ul style="list-style-type: none"> • Combination meter • Open or short in speed sensor circuit • ECM • Vehicle speed sensor 	○	○
P0505 (DI-89)	Idle Control System Malfunction	<ul style="list-style-type: none"> • IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short A/C signal circuit • Air intake (hose loose) 	○	○
P0510 (DI-93)	Closed Throttle Position Switch Malfunction	<ul style="list-style-type: none"> • Open in closed throttle position switch circuit • Closed throttle position switch • ECM 	○	○
P1300 (DI-97)	Igniter Circuit Malfunction	<ul style="list-style-type: none"> • Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM 	○	○
P1335 (DI-102)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit for NE signal • Crankshaft position sensor for NE signal • Starter • ECM 	–	○
P1500 (DI-103)	Stater signal circuit Malfunction	<ul style="list-style-type: none"> • Open or short in starter signal circuit • ECM 	–	○
P1600 (DI-105)	ECM BATT Malfunction	<ul style="list-style-type: none"> • Open in back up power source circuit • ECM 	○	○
P1605 (DI-107)	Knock Control CPU Malfunction	<ul style="list-style-type: none"> • ECM 	○	○
P1780 (DI-108)	Park/Neutral Position Switch Malfunction	<ul style="list-style-type: none"> • Short in park/neutral position switch circuit • Park/neutral position switch • ECM 	○	○

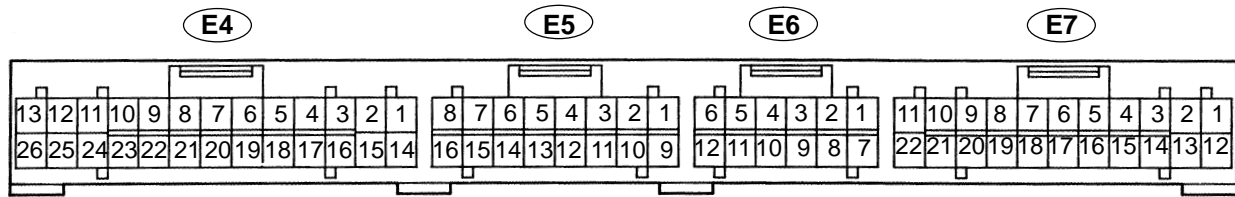
*: – . . . MIL does not light up, ○ . . . MIL lights up

PARTS LOCATION



TERMINALS OF ECM

ECM Terminals



F16526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E7 - 2) - E1 (E4 - 24)	R - Y ↔ BR - B	Always	9 - 14
+ B (E7 - 12) - E1 (E4 - 24)	Y ↔ BR - B	IG switch ON	9 - 14
VCC (E5 - 1) - E2 (E5 - 9)	R - G ↔ BR - B	IG switch ON	4.5 - 5.5
IDL (E5 - 11) - E2 (E5 - 9)	G - W ↔ BR - B	IG switch ON and apply vacuum to the throttle opener Throttle valve fully closed	0 - 3
		IG switch ON Throttle valve fully open	9 - 14
VTA (E5 - 10) - E2 (E5 - 9)	G - B ↔ BR - B	IG switch ON Throttle valve fully closed	0.3 - 0.8
		IG switch ON Throttle valve fully open	3.2 - 4.9
VG (E5 - 2) - E21 (E5 - 16)	G - BR	Idling, N position, A/C switch OFF	1.1 - 1.5
THA (E5 - 3) - E2 (E5 - 9)	L - Y ↔ BR - B	Idling, Intake air temp. 20°C (68°F)	0.5 - 3.4
THW (E5 - 4) - E2 (E5 - 9)	R - W ↔ BR - B	Idling, Engine coolant temp. 80°C (176°F)	0.2 - 1.0
STA (E7 - 11) - E1 (E4 - 24)	B - R ↔ BR - B	Cranking	6.0 or more
#10 (E4 - 12) - E01 (E4 - 13)	W - L ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)
#20 (E4 - 11) - E01 (E4 - 13)	W - R ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)
#30 (E4 - 25) - E01 (E4 - 13)	W - G ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)
#40 (E4 - 2) - E01 (E4 - 13)	Y ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)
#50 (E4 - 1) - E01 (E4 - 13)	Y - R ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)
#60 (E4 - 15) - E01 (E4 - 13)	Y - L ↔ BR	IG switch ON	9 - 14
		Idling	Pulse generation (See page DI-54)

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DIAGNOSTICS – ENGINE

IGT (E4 – 23) – E1 (E4 – 24)	B – G ↔ BR – B	Idling	Pulse generation (See page DI-97)
IGF (E4 – 17) – E1 (E4 – 24)	B – Y ↔ BR – B	IG switch ON Disconnect igniter connector	4.5 – 5.5
		Idling	Pulse generation (See page DI-97)
G1 (E6 – 11) – G – (E6 – 6)	R ↔ L	Idling	Pulse generation (See page DI-62)
G2 (E6 – 10) – G – (E6 – 6)	G ↔ L	Idling	Pulse generation (See page DI-62)
NE (E6 – 12) – G – (E6 – 6)	W ↔ L	Idling	Pulse generation (See page DI-62)
NE2 (E6 – 5) – G – (E6 – 6)	BR ↔ L	Idling	Pulse generation (See page DI-62)
W (E7 – 4) – E1 (E4 – 24)	Y – R ↔ BR – B	Idling	9 – 14
		IG switch ON	0 – 3
EGR (E4 – 22) – E1 (E4 – 24)	L – W ↔ BR – B	IG switch ON	9 – 14
ISC1 (E4 – 7) – E01 (E4 – 13)	R – G ↔ BR	IG switch ON	9 – 14
ISC2 (E4 – 6) – E01 (E4 – 13)	R – B ↔ BR	IG switch ON	9 – 14
ISC3 (E4 – 5) – E01 (E4 – 13)	G – Y ↔ BR	IG switch ON	9 – 14
ISC4 (E4 – 4) – E01 (E4 – 13)	L – Y ↔ BR	IG switch ON	9 – 14
OX1 (E5 – 5) – E1 (E4 – 24)	L ↔ BR – B	Maintain engine speed at 2,500 rpm for 2 mins. after warming up	Pulse generation
OX2 (E5 – 13) – E1 (E4 – 24)	W ↔ BR – B	Maintain engine speed at 2,500 rpm for 2 mins. after warming up	Pulse generation
HT1 (E6 – 1) – E03 (E6 – 16)	GR ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E6 – 7) – E03 (E6 – 16)	O ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E5 – 6) – E1 (E4 – 24)	W ↔ BR – B	Idling	Pulse generation (See page DI-62)
KNK2 (E5 – 14) – E1 (E4 – 24)	L – W ↔ BR – B	Idling	Pulse generation (See page DI-62)
SPD (E7 – 8) – E1 (E4 – 24)	L – W ↔ BR – B	IG switch ON Rotate driving wheel slowly.	Pulse generation
TE1 (E5 – 7) – E1 (E4 – 24)	L ↔ BR – B	IG switch ON	9 – 14
A/C (E7 – 7) – E1 (E4 – 24)	B – W ↔ BR – B	Idling, A/C switch ON	9 – 14
		Idling, A/C switch OFF	Below 2.0
THG (E4 – 19) – E2 (E5 – 9)	G – Y ↔ BR – B	IG switch ON	4.5 – 5.5
FC (E4 – 14) – E1 (E4 – 24)	R – W ↔ BR – B	IG switch ON	9 – 14
		Idling	0 – 3
FPU (E4 – 21) – E1 (E4 – 24)	L – R ↔ BR – B	IG switch ON	9 – 14
		Restarting at high engine coolant temp.	0 – 3
SDL (E7 – 6) – E1 (E4 – 24)	W ↔ BR – B	During transmission	Pulse generation

PROBLEM SYMPTOMS TABLE

When the malfunction code is not confirmed in the DTC 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
Engine does not crank (Does not start)	1. Starting system	ST-16
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit	DI-110 DI-115
No complete combustion (Does not start)	1. Fuel pump control circuit	DI-115
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI-103 DI-115 EM-3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI-103 DI-115
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pressure control circuit 3. Fuel pump control circuit	DI-103 DI-125 DI-115
High engine idle speed (Poor idling)	1. A/C signal circuit 2. ECM power source circuit	AC-5 DI-110
Low engine idle speed (Poor idling)	1. A/C signal circuit 2. Fuel pump control circuit	AC-5 DI-115
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM-3 DI-115
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI-110 DI-115
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI-115 DI-147
Surging (Poor driveability)	1. Fuel pump control circuit	DI-115
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI-115
During A/C operation (Engine stall)	1. A/C signal circuit 2. Engine control module (ECM)	AC-5 IN-18

CIRCUIT INSPECTION

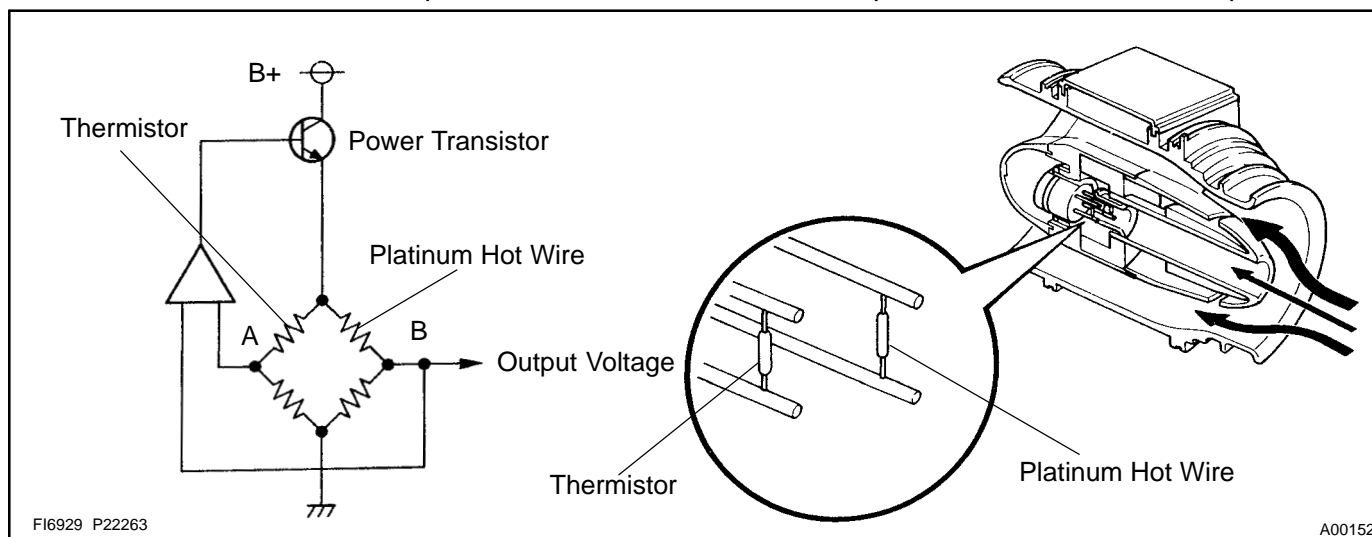
DTC	P0100	Mass Air Flow Circuit Malfunction
------------	--------------	--

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 temperature.



DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less.	<ul style="list-style-type: none"> • Open or short in mass air flow meter circuit • Mass air flow meter • ECM

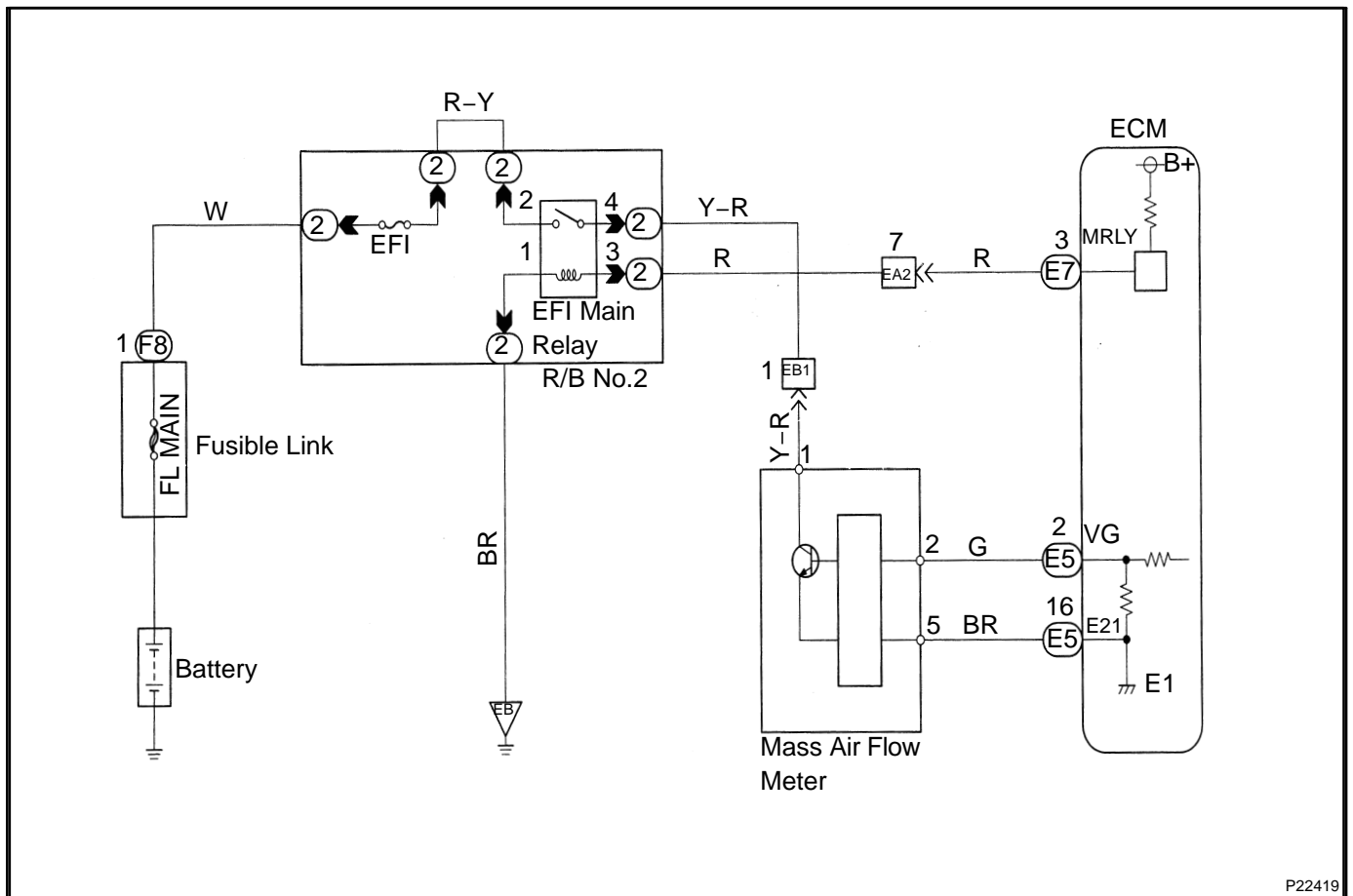
If the ECM detects DTC" P0100" it operates the fail safe function, keeping the ignition timing and injection volume constant and marking it possible to drive the vehicle.

HINT:

After confirming DTC P0100 use the OBD II scan tool or TOYOTA hand-held tester to confirm the mass air flow ratio from "CURRENT DATA".

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0	<ul style="list-style-type: none"> • Mass air flow meter power source open • VG circuit open or short
439.0 or more	<ul style="list-style-type: none"> • E21 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Connect the OBD II scan tool or TOYOTA hand-held tester, and read value of mass air flow rate.
----------	---

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (c) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.
- (d) Start the engine.

CHECK:

Read mass air flow rate on the OBD II scan tool or TOYOTA hand-held tester.

RESULT:

	Type I	Type II
Mass air flow rate (gm/sec.)	Approx. 0 gm/sec.	439.0 gm/sec. or more

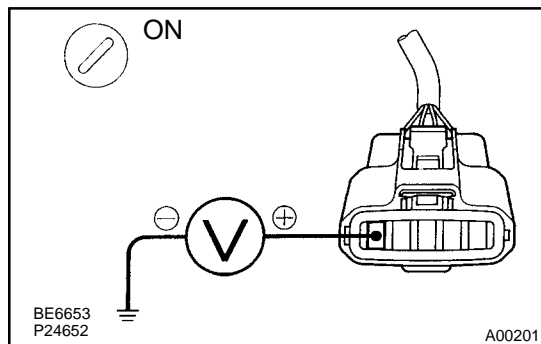
Type I

Go to step 2.

Type II

Go to step 5.

2	Check voltage of mass air flow meter power source.
----------	---



PREPARATION:

- (a) Disconnect the mass air flow meter connector.
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK:

Voltage: 9 – 14 V

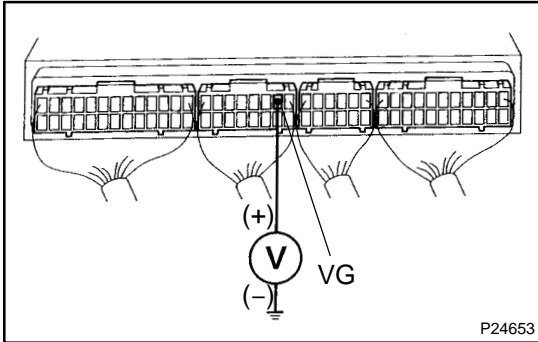
NG

Check for open in harness and connector between EFI main relay (Marking: EFI) and mass air flow meter (See page IN-28).

OK

DIAGNOSTICS - ENGINE

3 Check voltage between terminal VG of ECM and body ground.

**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Start the engine.

CHECK:

Measure voltage between terminal VG of ECM and body ground while engine is idling.

OK:**Voltage:**

1.1 – 1.5 V (P or N position and A/C switch OFF)

OK

Check and replace ECM (See page [IN-28](#)).

NG

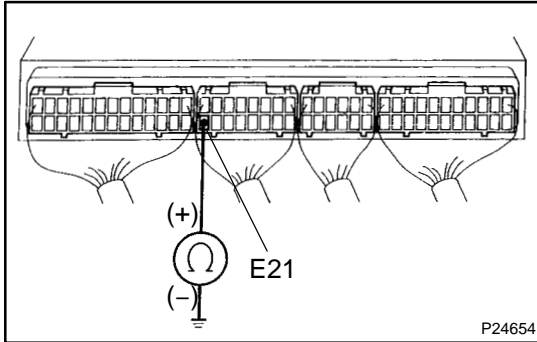
4 Check for open and short in harness and connector between mass air flow meter and ECM (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

Replace mass air flow meter.

5 Check continuity between terminal E21 of ECM and body ground.**PREPARATION:**

Remove instrument panel speaker No.1 panel
(See page [SF-65](#)).

CHECK:

Check continuity between terminal E21 of ECM and body ground.

OK:

Continuity (1 Ω or less)

NG

Check and replace ECM (See page [IN-28](#)).

OK**6 Check for open in harness and connector between mass air flow meter and ECM
(See page [IN-28](#)).****NG**

Repair or replace harness or connector.

OK

Replace mass air flow meter.

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0100 (Mass Air Flow Circuit Malfunction) on page [DI-20](#).

DTC No.	DTC 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
	Conditions (a) and (b) continue with engine speed 1500 rpm (2 trip detection logic): (a) Mass air flow meter output < 1 V (b) VTA \geq 0.72 V	

WIRING DIAGRAM

Refer to DTC P0100 (Mass Air Flow Circuit Malfunction) on page [DI-20](#) for the WIRING DIAGRAM.

INSPECTION PROCEDURE

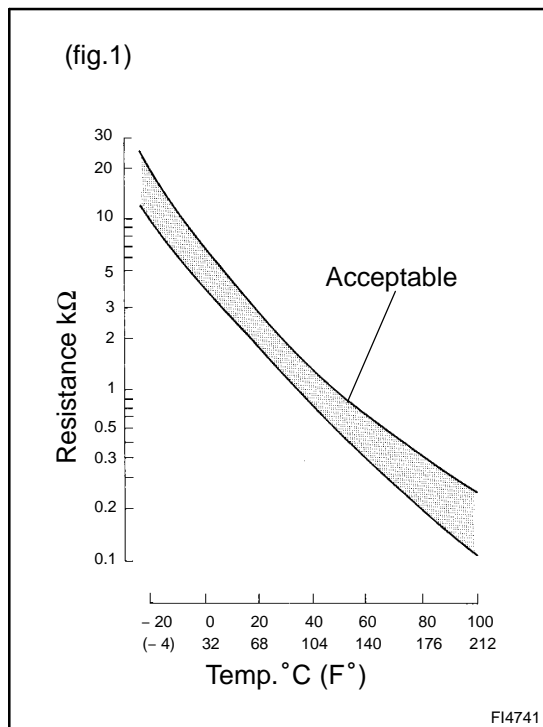
1	Are there any other codes (besides DTC P0101) being output?
----------	--

YES

Go to relevant DTC chart.

NO

Replace mass air flow meter.

DTC**P0110****Intake Air Temp. Circuit Malfunction****CIRCUIT DESCRIPTION**

The intake air temperature 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 5 V 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 detects the DTC "P0110", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

Intake Air Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
-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

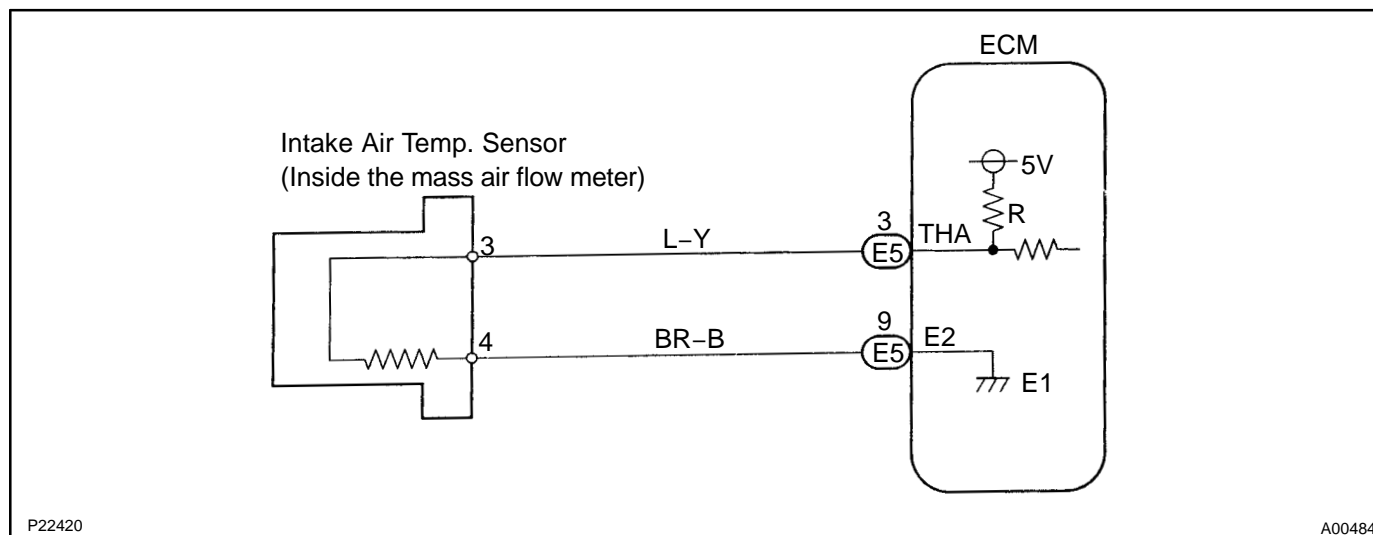
DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	<ul style="list-style-type: none"> • Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

HINT:

After confirming DTC P110 use the OBD II scan tool or TOYOTA hand-held tester to confirm the intake air temp. from "CURRENT DATA".

Temp. Displayed	Malfunction
- 40°C (- 40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Engine Coolant Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" 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 intake air temperature.
---	---

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3.
- Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Same as actual intake air temp.

HINT:

- If there is open circuit, push 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 140°C (284°F) or more.

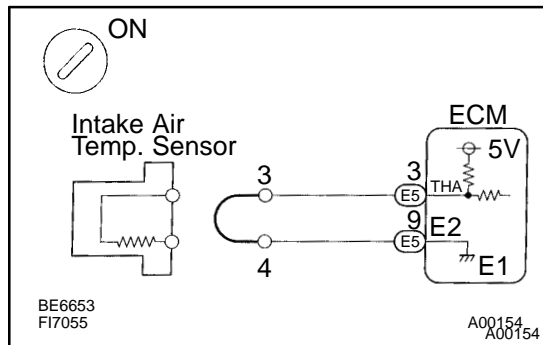
NG

**-40°C (-40°F)Go to step 2.
 140°C (284°F) or moreGo to step 4.**

OK

**Check for intermittent problems
(See page DI-3).**

2 Check for open in harness or ECM.



PREPARATION:

- Disconnect the mass air flow meter connector.
- Connect sensor wire harness terminals together.
- Turn ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

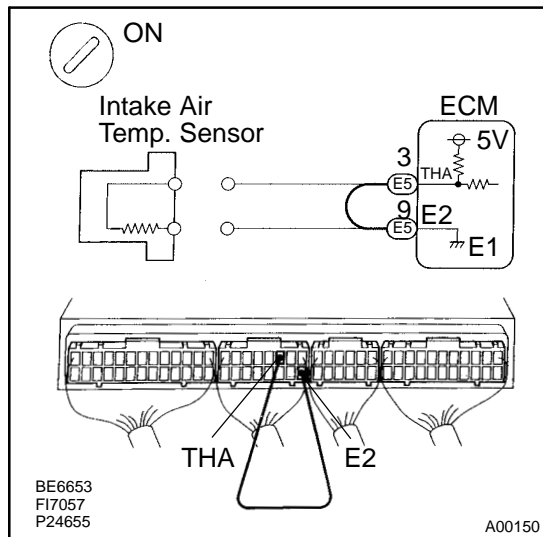
Temp. value: 140°C (284°F) or more

OK

Confirm good connection at sensor.
If OK, replace mass air flow meter.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Connect between terminals THA and E2 of ECM connector.

HINT:

Mass air flow meter connector is disconnected.

Before checking, do a visual and contact pressure check for the ECM connector (See page [IN-28](#)).

- Turn ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Temp. value: 140°C (284°F) or more

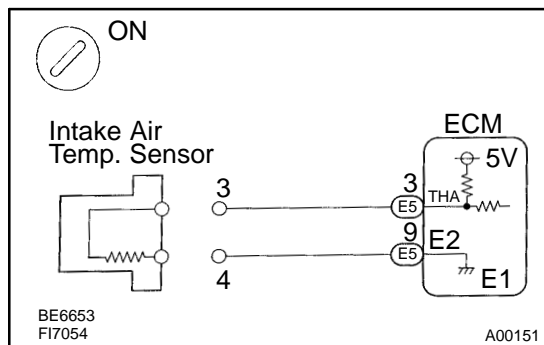
OK

Open in harness between terminals E2 or THA, repair or replace harness.

NG

Confirm good connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

DIAGNOSTICS - ENGINE

4 Check for short in harness and ECM.**PREPARATION:**

- Disconnect the mass air flow meter connector.
- Turn ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

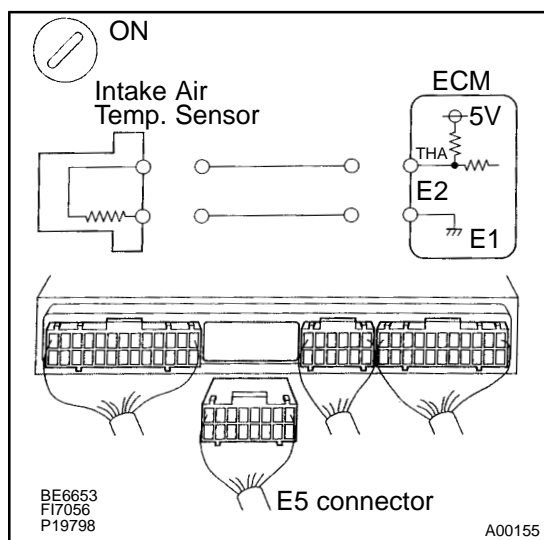
OK:

Temp. value: -40°C (-40°F)

OK

Replace mass air flow meter.

NG

5 Check for short in harness or ECM.**PREPARATION:**

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Disconnect the E5 connector of ECM.

HINT:

Mass air flow meter connector is disconnected.

- Turn ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Temp. value: -40°C (-40°F)

OK

Repair or replace harness or connector (See page [IN-28](#)).

NG

Check and replace ECM (See page [IN-28](#)).

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 engine 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 [DI-26](#).

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80°C (176 °F).

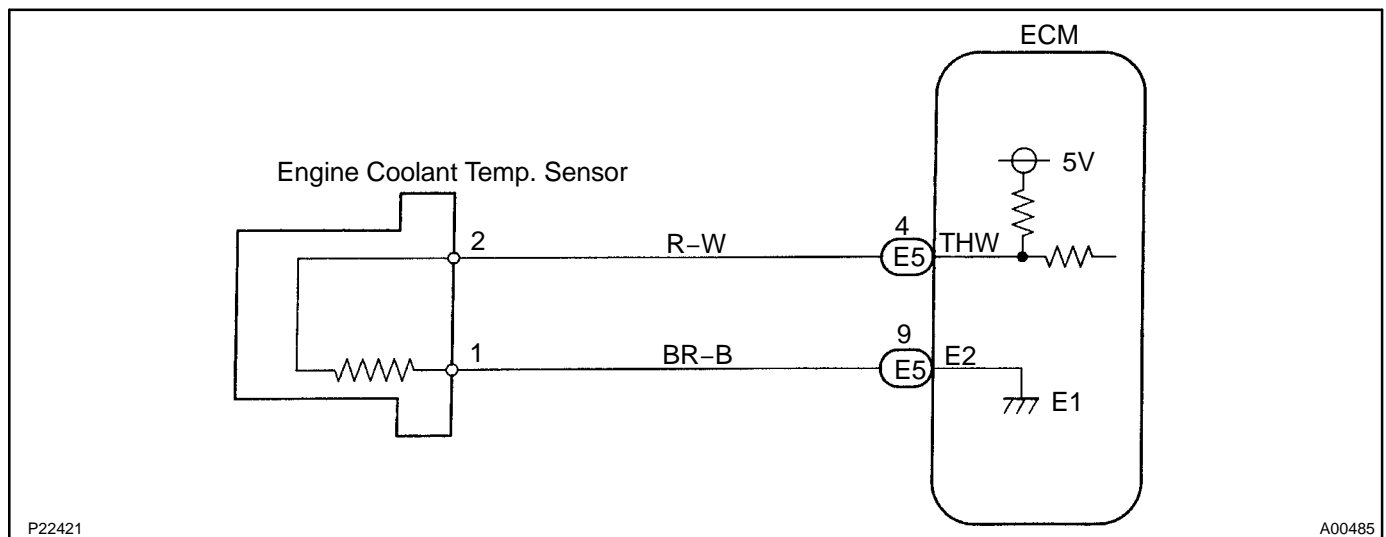
DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	<ul style="list-style-type: none"> • Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:

After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand-held tester to confirm the engine coolant temp. from CURRENT DATA.

Temp. Displayed	Malfunction
– 40°C (– 40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTC is P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Engine Coolant Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" 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. |
|---|---|

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and push the OBD II scan tool or TOYOTA hand-held tester main switch ON.

CHECK:

Read temperature value on the OBD II 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 140°C (284°F) or more.

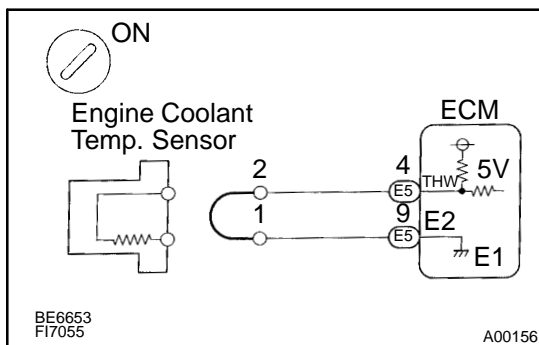
NG

-40°C (-40°F) ... Go to step 2.
 140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems
 (See page [DI-3](#)).

- | | |
|---|--|
| 2 | Check for open in harness or ECM. |
|---|--|



PREPARATION:

- Disconnect the engine coolant temp. sensor connector.
- Connect sensor wire harness terminals together.
- Turn ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Temp. value: 140°C (284°F) or more

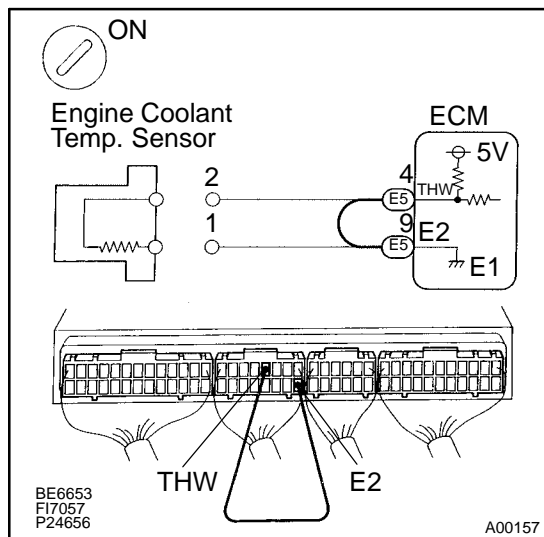
OK

Confirm good connection at sensor.
If OK, replace engine coolant temp. sensor.

NG

1998 LAND CRUISER (RM451U)

3 Check for open in harness or ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Connect between terminals THW and E2 of ECM connector.

HINT:

Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page [IN-28](#)).

- Turn ignition switch ON.

CHECK:

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Temperature value: 140°C (284°F) or more

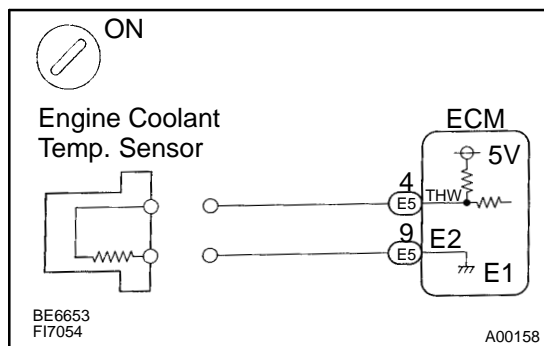
OK

Open in harness between terminals E2 or THW, repair or replace harness.

NG

Confirm good connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

4 Check for short in harness or ECM.



PREPARATION:

- Disconnect the engine coolant temp. sensor connector.
- Turn ignition switch ON.

CHECK:

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

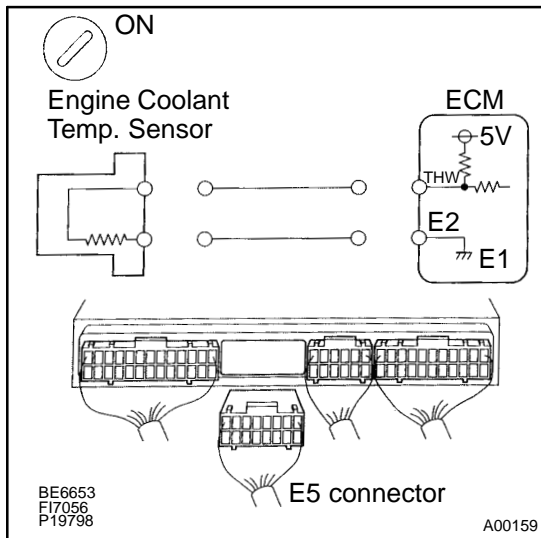
Temperature value: - 40°C (- 40°F)

OK

Replace engine coolant temp. sensor.

NG

5 Check for short in harness or ECM.



PREPARATION:

(a) Remove instrument panel speaker No.1 panel
(See page [SF-65](#)).

(b) Disconnect the E5 connector of ECM.

HINT:

Engine coolant temp. sensor connector is disconnected.

(c) Turn ignition switch ON.

CHECK:

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK:

Temperature value: - 40°C (- 40°F)

OK

Repair or replace harness or connector.

NG

Check and replace ECM (See page [IN-28](#)).

DTC	P0116	Engine Coolant Temp. Circuit Range/Performance Problem
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0115 (Engine Coolant Temp. Circuit Malfunction) on page [DI-30](#).

DTC No..	DTC Detecting Condition	Trouble Area
P0116	If THW $\geq 10^{\circ}\text{C}$ (50°F), 2 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	<ul style="list-style-type: none"> • Engine coolant temp. sensor • Cooling system
	If -7°C (19.4°F) \leq THW $< 10^{\circ}\text{C}$ (50°F), 5 min. or more after starting engine, engine coolant temp. sensor value 35°C (95°F) or less (2 trip detection logic)	
	If THW $< -7^{\circ}\text{C}$ (19.4°F), 20 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTC 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 DTC P0115 first.

1	Are there any other codes (besides DTC P0116) being output?
----------	--

YES

Go to relevant DTC chart.

NO

2	Check thermostat (See page CO-9).
----------	--

NG

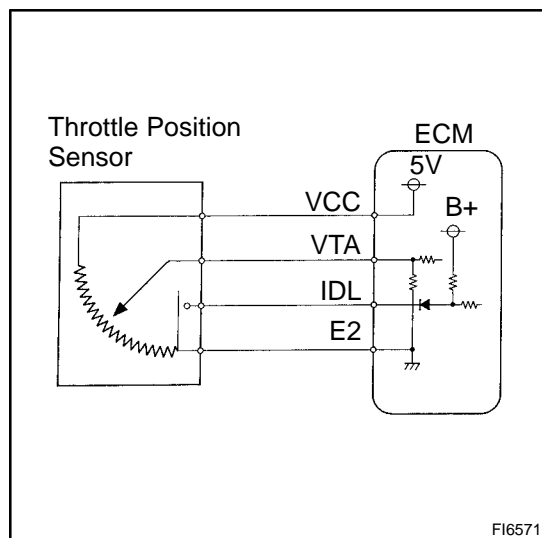
Replace the thermostat.

OK

Replace engine coolant temp. sensor.

DTC	P0120	Throttle/Pedal Position Sensor/Switch "A" 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 0 V. At this time, a voltage of approximately 0.3 – 0.8 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 3.2 – 4.9 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 increase correction and fuel–cut control etc.

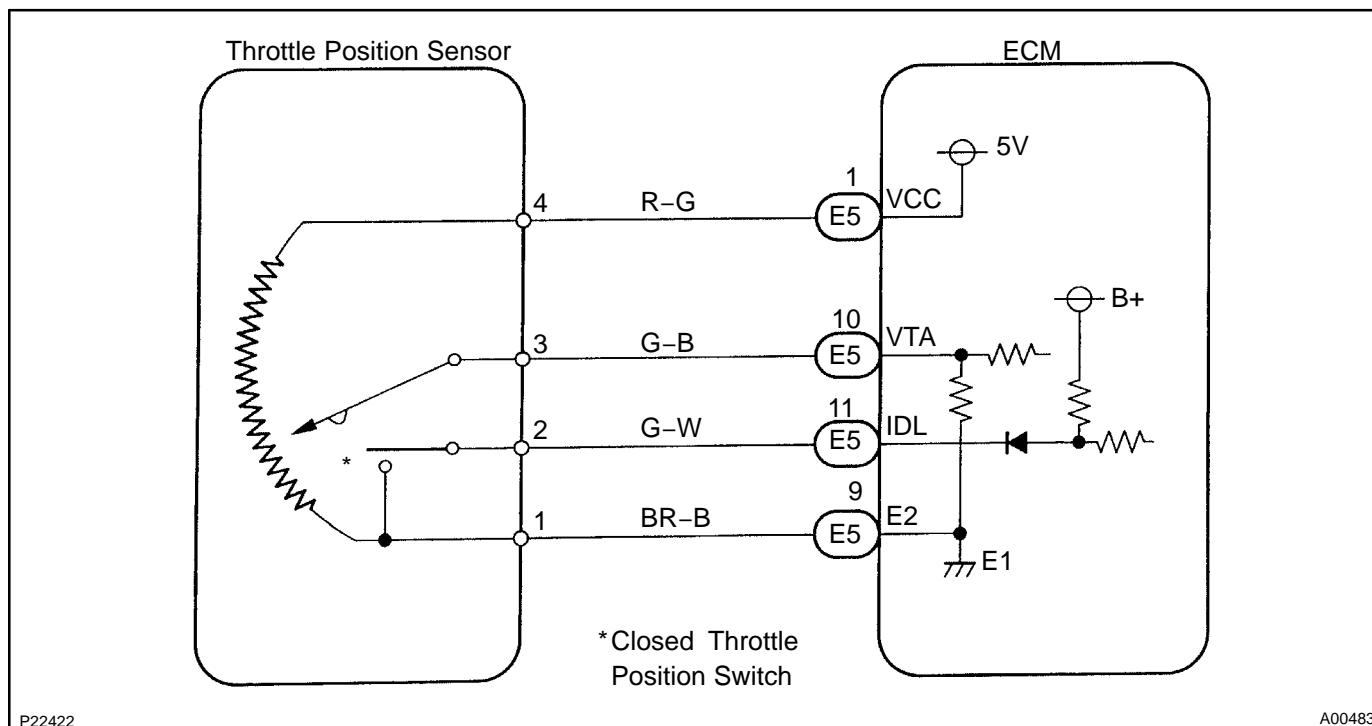
DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues (a) VTA < 0.1 V, and closed throttle position switch is OFF (b) VTA > 4.9 V	<ul style="list-style-type: none"> • Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

- If there is open circuit in IDL line, DTC P0120 does not indicate.
- After confirming DTC P0120 use the OBD II 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 %	VCC line open VTA line open or short
Approx. 99 %	Approx. 100 %	E2 line open

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Engine Coolant Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.

1

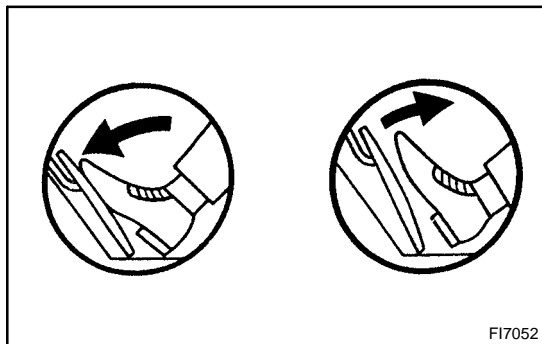
Connect the OBD II scan tool or TOYOTA hand-held tester and read the throttle valve opening percentage.

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3.
- Turn ignition switch ON and push the OBD II scan tool or TOYOTA hand-held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.



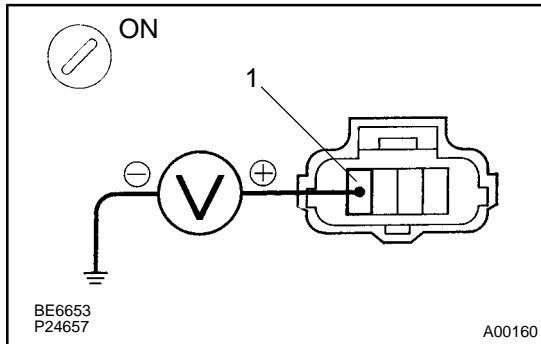
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

OK

Check for intermittent problems (See page DI-3).

NG

2 Check voltage between terminal 1 of wire harness side connector and body ground.**PREPARATION:**

- (a) Disconnect the throttle position sensor connector.
- (b) Turn ignition switch ON.

CHECK:

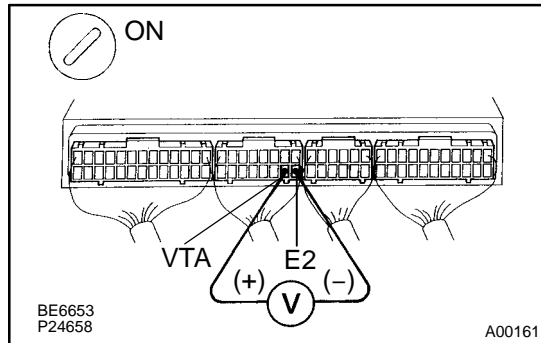
Measure voltage between terminal 1 of wire harness side connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

NG**Go to step 5.****OK****3 Check throttle position sensor (See page [SF-42](#)).****NG****Replace throttle position sensor.****OK**

4 Check voltage between terminals VTA and E2 of ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Measure voltage between terminals VTA and E2 of ECM.

OK:

Throttle valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	3.2 – 4.9 V

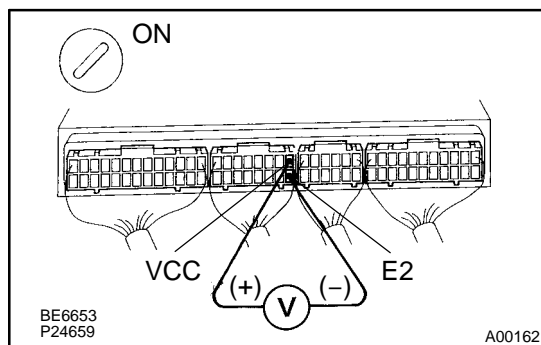
NG

Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page [IN-28](#)).

OK

Check and replace ECM (See page [IN-28](#)).

5 Check voltage between terminals VCC and E2 of ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Measure voltage between terminals VCC and E2 of ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG

Check and replace ECM (See page [IN-28](#)).

OK

Check for open in harness and connector between ECM and sensor (VCC line) (See page [IN-28](#)).

DTC	P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page [DI-35](#).

DTC No.	DTC Detection Condition	Trouble Area
P0121	After the vehicle speed has been exceeded 30 km/h (19 mph) even once, the output value of the throttle position sensor is out of the applicable range while the vehicle speed between 30 km/h (19 mph) and 0 km/h (0 mph).	<ul style="list-style-type: none"> Throttle position sensor

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0121) being output?
----------	--

YES

Go to relevant DTC chart.

NO

Replace throttle position sensor.

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control
------------	--------------	--

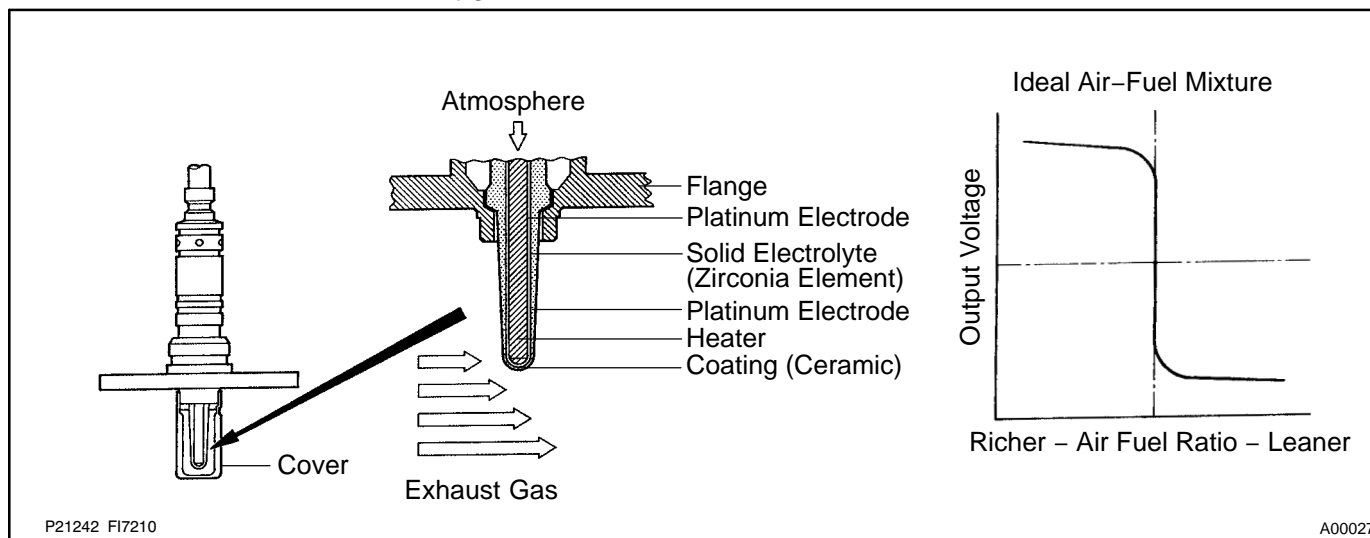
CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NO_x 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 where by 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. The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

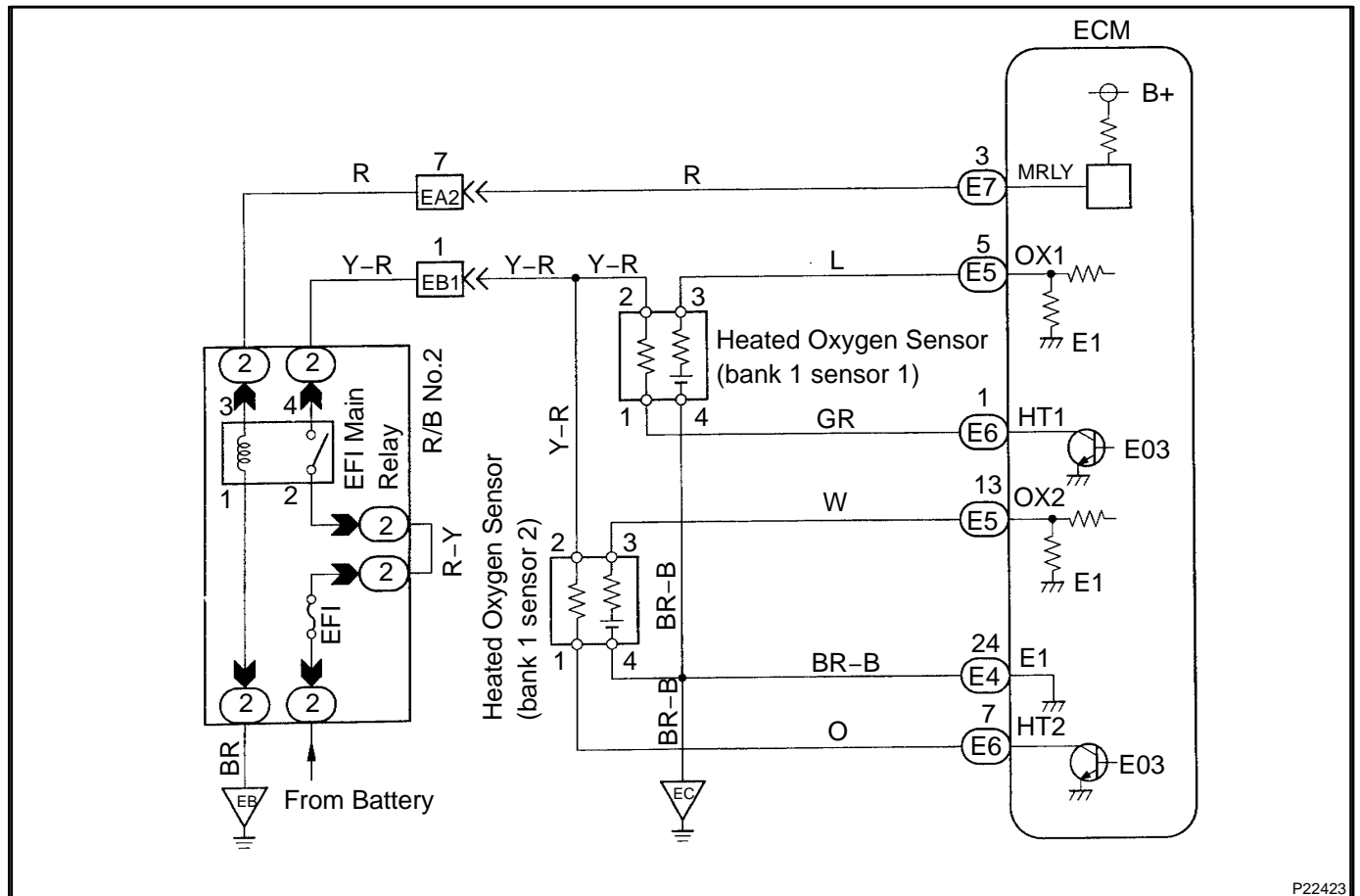


DTC No.	DTC Detecting Condition	Trouble Area
P0125	After the engine is warmed up, heated oxygen sensor (bank 1 sensor 2) output does not indicate RICH even once when conditions (a), (b) and (c) continue for at least 1.5 min. (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) Closed throttle position switch: OFF	<ul style="list-style-type: none"> • Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank1 sensor 1)

HINT:

After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand-held tester to confirm voltage output of heated oxygen sensor (bank 1 sensor 1) from CURRENT DATA.

If voltage output of heated oxygen sensor (bank 1 sensor 1) is 0 V, heated oxygen sensor (bank 1 sensor 1) circuit may be open or short.

WIRING DIAGRAM

P22423

INSPECTION PROCEDURE

1	Connect the OBD II scan tool or TOYOTA hand-held tester and read value for voltage output of heated oxygen sensor).
---	---

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (c) Warm up engine to normal operating temp.

CHECK:

Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 times using accelerator pedal.

OK:

Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once.

OK

Check and replace ECM (See page [IN-28](#)).

NG

2	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank1 sensor 1) (See page IN-28).
---	--

NG

Repair or replace harness or connector.

OK

Replace heated oxygen sensor
(bank 1 sensor 1).

DTC	P0130	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor (bank 1 sensor 1) 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)	<ul style="list-style-type: none"> • Heated oxygen sensor (bank 1 sensor 1) • Fuel trim malfunction

HINT:

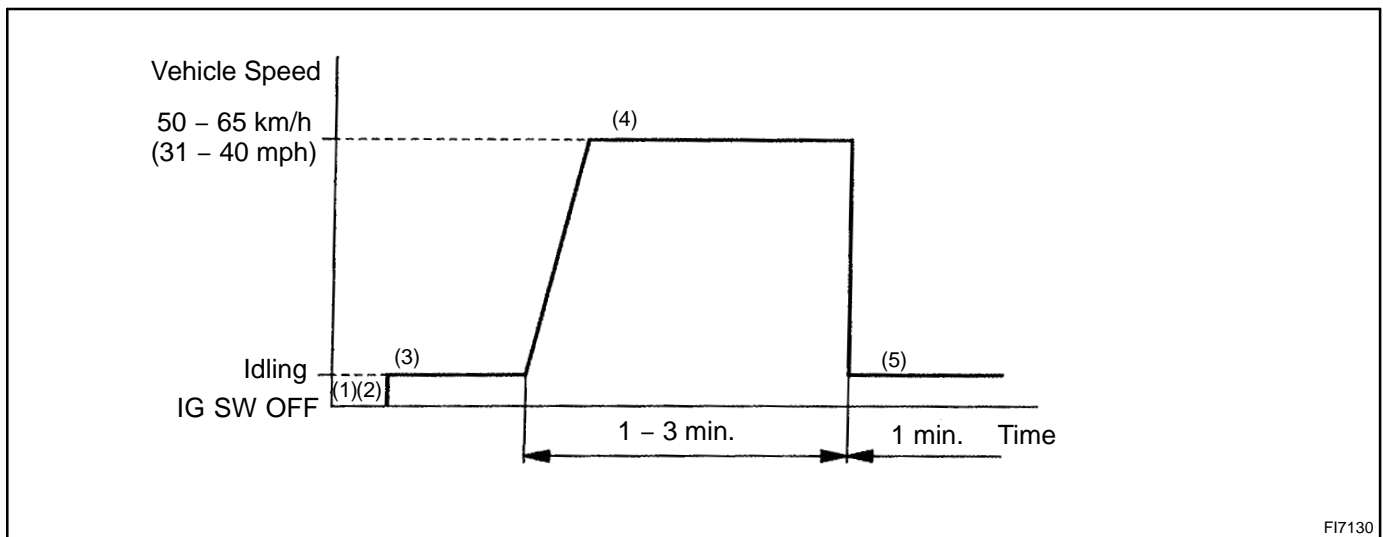
Sensor 1 refers to the sensor closer to the engine body.

The heated oxygen sensor's output voltage and the short-term fuel trim value can be read using the OBD II scan tool or TOYOTA hand-held tester.

WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-35](#) for WIRING DIAGRAM.

CONFIRMATION DRIVING PATTERN



- (1) Connect the TOYOTA hand-held tester to the DLC3.
- (2) Switch the TOYOTA hand-held tester from normal mode to check mode (See page [DI-3](#)).
- (3) Start the engine and warm it up with all accessory switches OFF.
- (4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min. to warm up the heated oxygen sensor.
- (5) Let the engine idle for 1 min.

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 have a TOYOTA hand-held tester, turn the ignition switch OFF after performing steps (3) to (5), then perform steps (3) to (5) again.

INSPECTION PROCEDURE

1	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN-28).
---	---

NG

Repair or replace harness or connector (See page [IN-28](#)).

OK

2	Check for heated oxygen sensor (bank 1 sensor 1) data.
---	--

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (c) Warm up engine to normal operating temp.

CHECK:

Read the heated oxygen sensor (bank 1 sensor 1) output voltage and short-term fuel trim.

RESULT:

Pattern	Heated oxygen sensor (bank 1 sensor 1) 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	

1, 2

Check fuel trim system (See page [DI-51](#)).

3

3 Check the output voltage of heated oxygen sensor (bank 1 sensor 1) during idling.

PREPARATION:

Warm up the heated oxygen sensor (bank 1 sensor 1) with the engine at 2,500 rpm for approx. 90 sec.

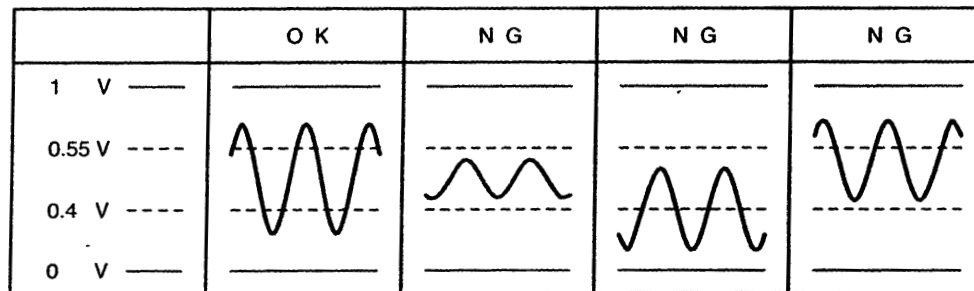
CHECK:

Use the OBD II scan tool or TOYOTA hand-held tester read the output voltage of the heated oxygen sensor (bank 1 sensor 1) during idling.

OK:

Heated oxygen sensor (bank 1 sensor 1) output voltage:

Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the Following table).



P18349

OK

**Perform confirmation driving pattern
(See page [DI-43](#)).**

NG

**Replace heated oxygen sensor
(bank 1 sensor 1).**

DTC	P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0133	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)	<ul style="list-style-type: none"> Heated oxygen sensor (bank 1 sensor 1)

HINT:

Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0133) being output?
----------	--

YES

Go to relevant DTC chart.

NO

Replace heated oxygen sensor (bank 1 sensor 1).

DTC	P0135	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)
------------	--------------	--

DTC	P0141	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0135	When the heater operates, heater current exceeds 2 A (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
P0141	Heater current of 0.25 A or less when the heater operates (2 trip detection logic)	

HINT:

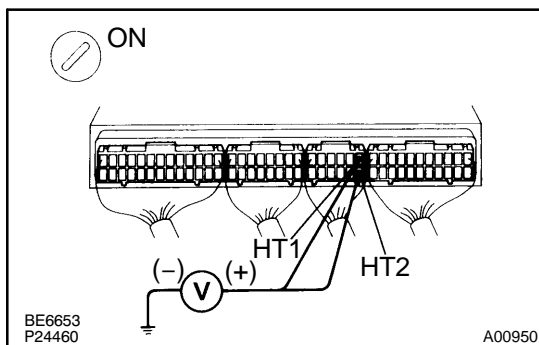
- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#) for WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Check voltage between terminals HT1, HT2 of ECM connector and body ground.
----------	---



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK

Check and replace ECM (See page [IN-28](#)).

NG

DI-48

DIAGNOSTICS – ENGINE

2	Check resistance of heated oxygen sensor heater (See page SF-64).
---	--

NG

Replace heated oxygen sensor.

OK

Check and repair harness or connector between EFI main relay (Marking: EFI) and heated oxygen sensor (bank 1 sensor 1, 2) and ECM (See page [IN-28](#)).

DTC	P0136	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0136	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 40 km/h (25 mph) or more after the engine is warmed up. (2 trip detection logic).	<ul style="list-style-type: none"> Heated oxygen sensor (bank 1 sensor 2)

HINT:

Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 (Insufficient Coolant Temp. for Closed Loop Fuel Control) on page [DI-40](#) for WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0136) being output?
----------	--

YES

Go to relevant DTC chart.

NO

2	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 2) (See page IN-28).
----------	---

NG

Repair or replace harness or connector.

OK

DI-50

DIAGNOSTICS – ENGINE

3	Check the output voltage of heated oxygen sensor (bank 1 sensor 2).
---	---

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (c) Warm up engine to normal operating temp.

CHECK:

Read voltage output of heated oxygen sensor (bank 1 sensor 2) when engine suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 min. using accelerator pedal.

OK:

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

OK

Check that each connector is properly connected.

NG

Replace heated oxygen sensor
(bank 1 sensor 2).

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, triggering 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.	DTC 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)	<ul style="list-style-type: none"> • Air intake (hose loose) • Fuel line pressure • Injector blockage, leak • Heated oxygen sensor (bank 1 sensor 1) 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)	<ul style="list-style-type: none"> • Fuel line pressure • Injector blockage, leak • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor

HINT:

- When the 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.
- If the total of the short-term fuel trim value and long-term fuel trim value is within + 30 – – 35 %, the system is functioning normally.
- If the vehicle runs out of fuel, the air-fuel ratio is LEAN and DTC P0171 is recorded. The MIL then come on.

INSPECTION PROCEDURE

1	Check air induction system (See page SF-1).
----------	--

NG

Repair or replace

OK

DI-52

DIAGNOSTICS – ENGINE

2	Check for heated oxygen sensor (bank 1 sensor 1) data.
----------	---

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (c) Warm up engine to normal operating temperature.

CHECK:

Read the heated oxygen sensor (bank 1 sensor 1) output voltage and short-term fuel trim.

RESULT:

Pattern	Heated oxygen sensor (bank 1 sensor 1) 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

Check for heated oxygen sensor (bank 1 sensor 1) (See page [SF-64](#)).

1, 2

3	Check fuel pressure (See page SF-6).
----------	---

NG

Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page [SF-1](#)).

OK

4	Check injector injection (See page SF-29).
----------	---

NG

Replace injector.

OK

DIAGNOSTICS – ENGINE

5	Check mass air flow meter and engine coolant temp. sensor (See page SF-40 , SF-61).
---	---

NG

Repair or replace.

OK

6	Check for spark and ignition (See page IG-1).
---	--

NG

Repair or replace.

OK

Check and replace ECM (See page [IN-28](#)).

DTC	P0300	Random/Multiple Cylinder Misfire Detected
DTC	P0301	Cylinder 1 Misfire Detected
DTC	P0302	Cylinder 2 Misfire Detected
DTC	P0303	Cylinder 3 Misfire Detected
DTC	P0304	Cylinder 4 Misfire Detected
DTC	P0305	Cylinder 5 Misfire Detected
DTC	P0306	Cylinder 6 Misfire Detected

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. When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

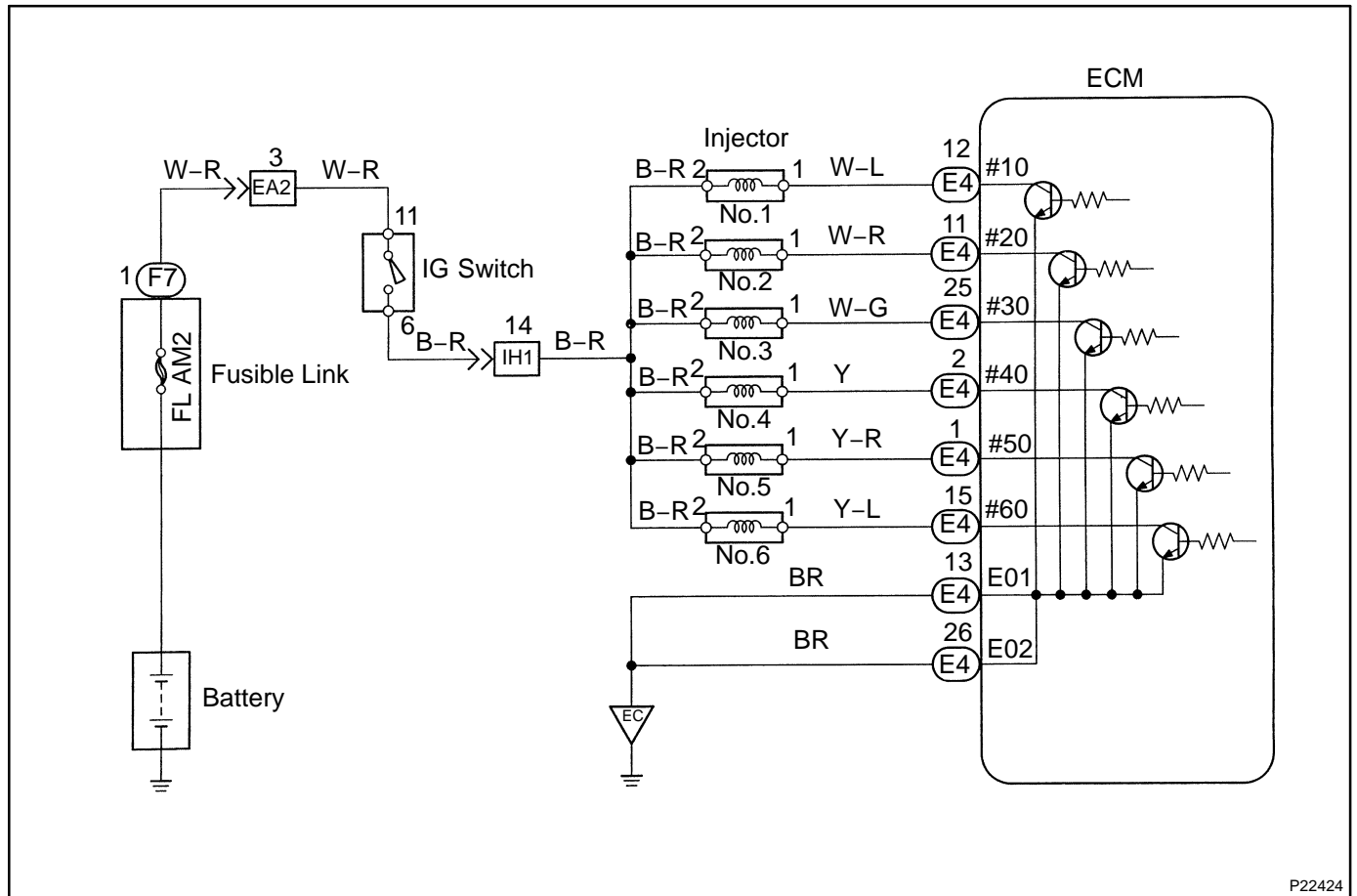
If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during the any particular 200 or 1,000 revolutions	<ul style="list-style-type: none">• Ignition system• Injector• Fuel line pressure• EGR• Compression pressure• Valve clearance not to specification• Valve timing• Mass air flow meter• Engine coolant temp. sensor
P0301	For any particular 200 revolutions of the engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
P0302		
P0303		
P0304	For any particular 1,000 revolutions of the engine, misfiring is detected which causes a deterioration in emission (2 trip detection logic)	
P0305		
P0306		

HINT:

When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM

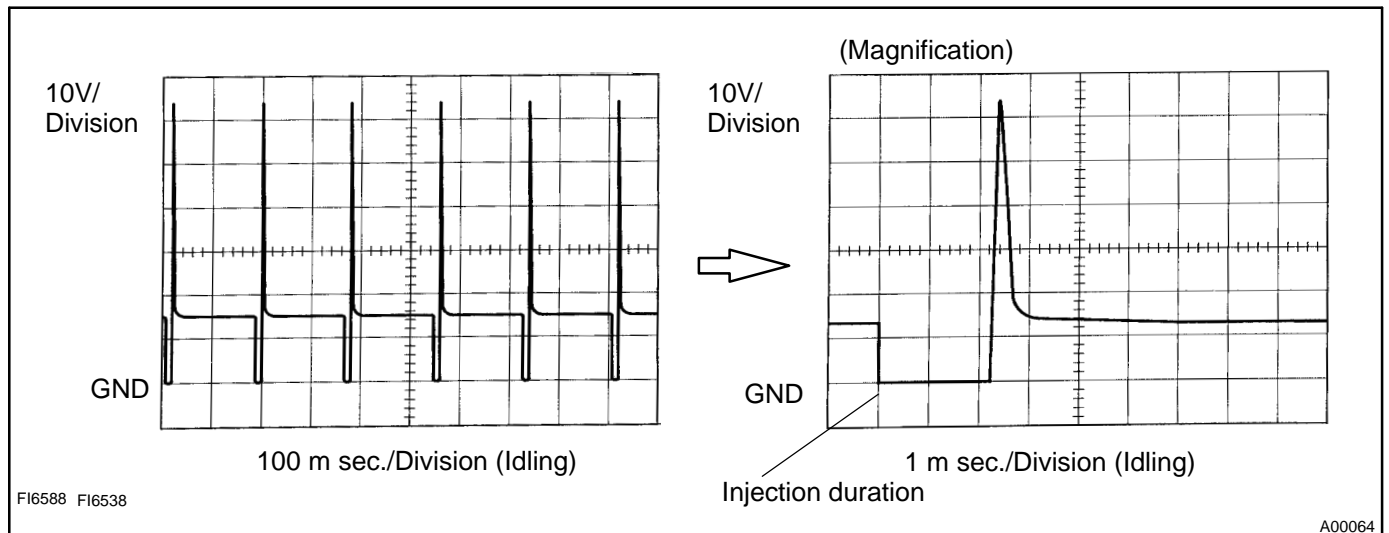


Reference INSPECTION USING OSCILLOSCOPE INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10 – #60 and E01 of ECM.

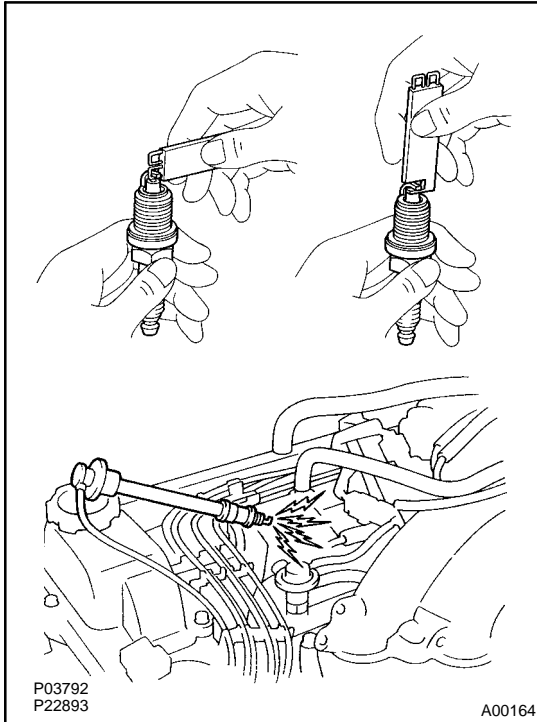
HINT:

The correct waveform is as shown.



INSPECTION PROCEDURE

1	Check spark plug and spark of misfiring cylinder.
---	--

**PREPARATION:**

- (a) Remove No.2 and No.3 cylinder head cover.
- (b) Disconnect the high-tension cord from spark plug.
- (c) Remove spark plug.

CHECK:

- (a) Check the carbon deposits on electrode.
- (b) Check electrode gap.

OK:

(1) No large carbon deposit present.

Not wet with gasoline or oil.

(2) Electrode gap: 0.8 mm (0.031 in.).

PREPARATION:

- (a) Install the spark plug to the high-tension cord.
- (b) Ground the spark plug.
- (c) Disconnect injector connector.

CHECK:

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:

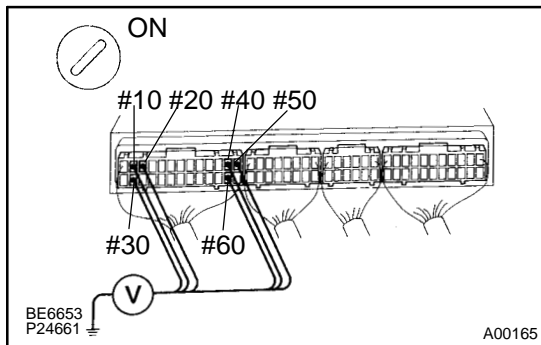
Spark jumps across electrode gap.

NG

Replace or check ignition system (See page [IG-1](#)).

OK

2 Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between applicable terminal of ECM connector and body ground.

OK:

Voltage: 9 - 14 V

OK

Go to step 4.

NG

3 Check injector of misfiring cylinder (See page [SF-29](#)).

NG

Replace injector.

OK

Check for open and short in harness and connector between injector and ECM (See page [IN-28](#)).

4 Check fuel pressure (See page [SF-6](#)).

NG

Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page [SF-1](#)).

OK

DI-58

DIAGNOSTICS - ENGINE

5 Check injector injection (See page [SF-29](#)).

NG

Replace injector.

OK

6 Check EGR system (See page [EC-11](#)).

NG

Repair EGR system.

OK

7 Check mass air flow meter and engine coolant temp. sensor (See page [SF-40](#), [SF-61](#)).

NG

Repair or replace.

OK

Check engine mechanical systems compression pressure (See page [EM-3](#)), valve clearance (See page [EM-4](#)) and valve timing (See page [EM-13](#)).

DTC	P0325	Knock Sensor 1 Circuit Malfunction
------------	--------------	---

DTC	P0330	Knock Sensor 2 Circuit Malfunction
------------	--------------	---

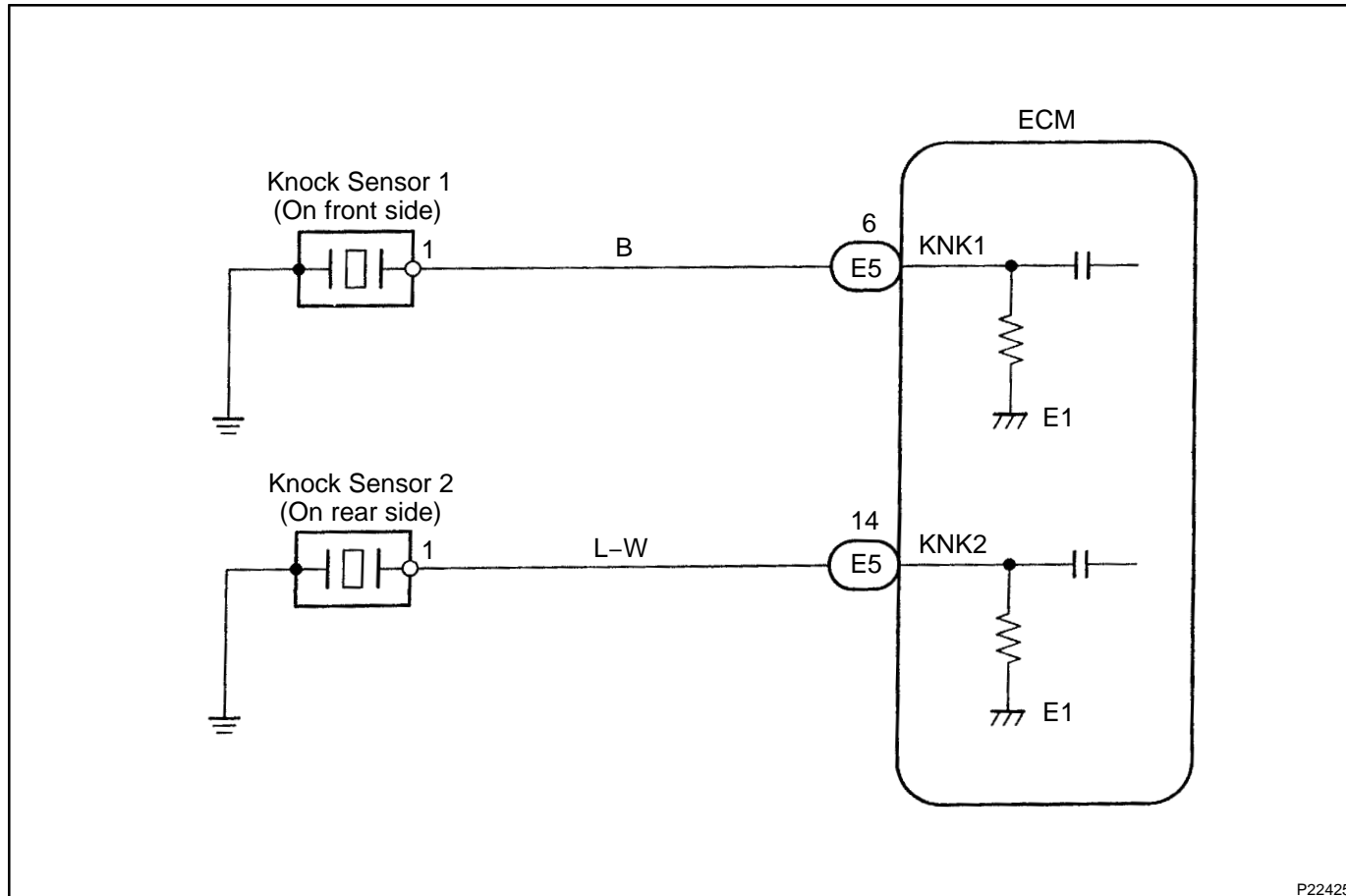
CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the front and rear of the left side 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.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed, between 1,800 rpm and 5,200 rpm	<ul style="list-style-type: none"> • Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM
P0330	No knock sensor 2 signal to ECM with engine speed, between 1,800 rpm and 5,200 rpm	<ul style="list-style-type: none"> • Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • ECM

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

WIRING DIAGRAM



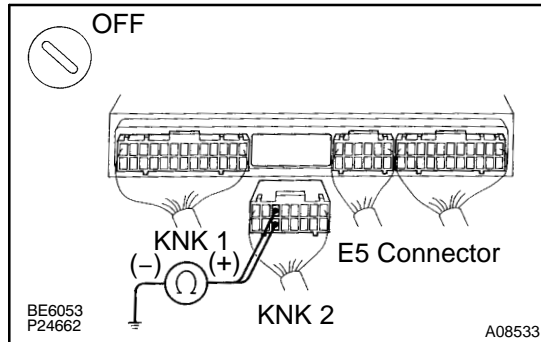
P22425

INSPECTION PROCEDURE

HINT:

- DTC P0325 is for the knock sensor circuit on the front side.
- DTC P0330 is for the knock sensor circuit on the rear side.

- | | |
|----------|---|
| 1 | Check continuity between terminal KNK1, KNK2 of ECM connector and body ground. |
|----------|---|



PREPARATION:

- Remove the instrument panel speaker No.1 panel (See page [SF-65](#)).
- Disconnect the E5 connector of ECM.

CHECK:

Measure resistance between terminal KNK1, KNK2 of ECM connector and body ground.

HINT:

- Connect terminal KNK1 to knock sensor 1.
- Connect terminal KNK2 to knock sensor 2.

OK:

Resistance: 1 MΩ or higher

OK

Go to step 3.

NG

- | | |
|----------|---|
| 2 | Check knock sensor (See page SF-62). |
|----------|---|

NG

Replace knock sensor.

OK

- | | |
|----------|---|
| 3 | Check for open and short in harness and connector between ECM and knock sensor (See page IN-28). |
|----------|---|

NG

Repair or replace harness or connector.

OK

4

Does malfunction disappear when a good knock sensor is installed?

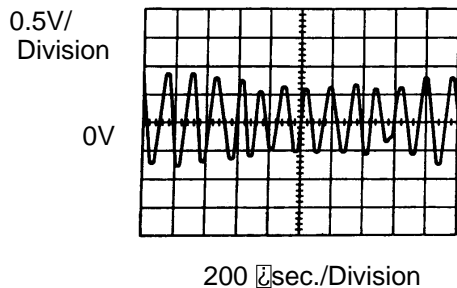
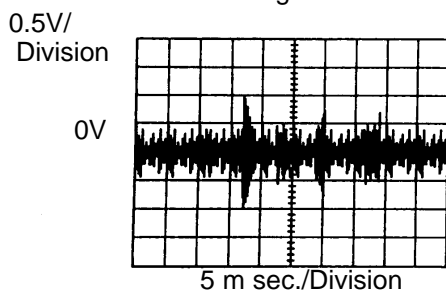
YES

Replace knock sensor.

NO

Check and replace ECM (See page [IN-28](#)).

Knock signal waveform



A00068

Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm) measure between terminals KNK1, KNK2 of ECM and body ground.

HINT:

The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 164 μ sec. (Normal mode vibration frequency of knock sensor: 6.1 kHz).

HINT:

If normal mode vibration frequency is not 6.1 kHz the sensor is malfunctioning.

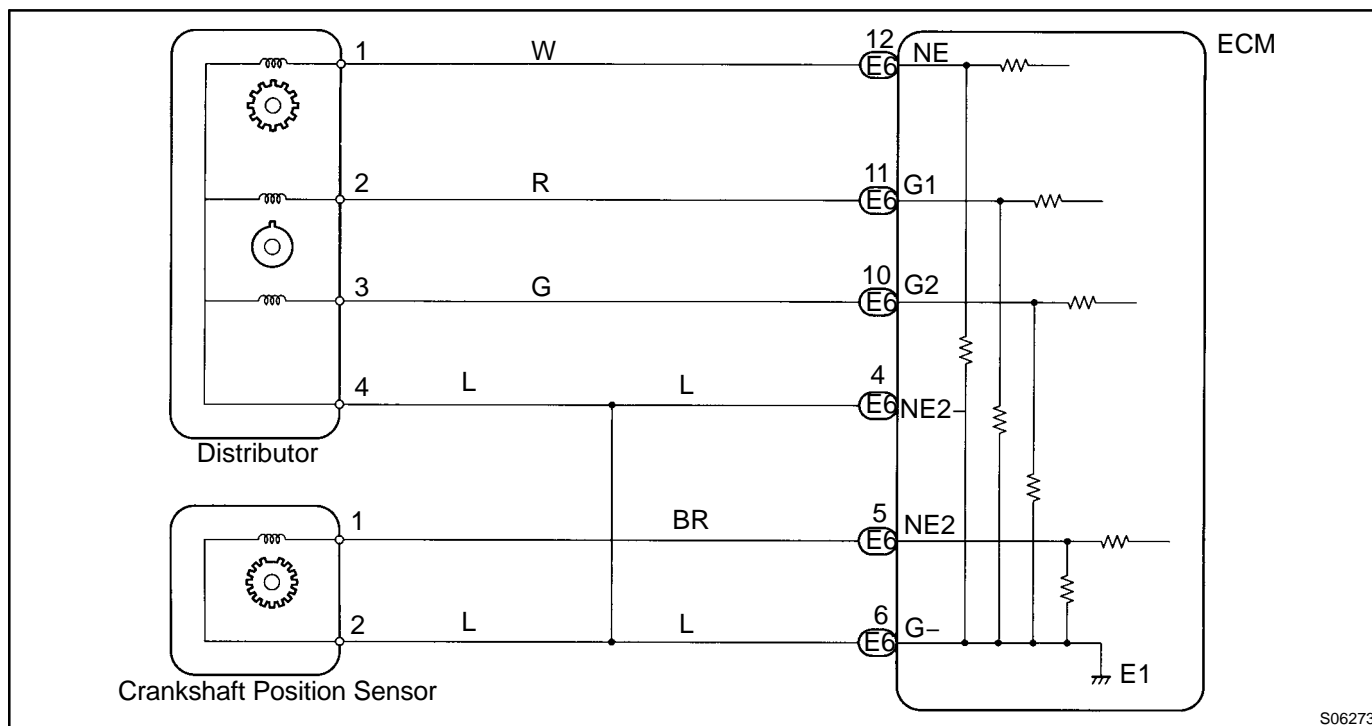
DTC	P0335	Crankshaft Position Sensor "A" Circuit Malfunction
------------	--------------	---

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE signal) consists of a signal plate and pick up coil. The NE signal plate has 24 teeth and is built into the distributor. When the camshaft rotates, 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 sensor generates 24 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and the engine speed by the NE signals, and detects misfire by NE2 signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal (NE signal) to ECM during cranking. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor circuit for NE signal. • Crankshaft position sensor for NE signal
	No crankshaft position sensor signal (NE signal) to ECM with engine speed 550 rpm or more (2 trip detection logic)	<ul style="list-style-type: none"> • Starter • ECM

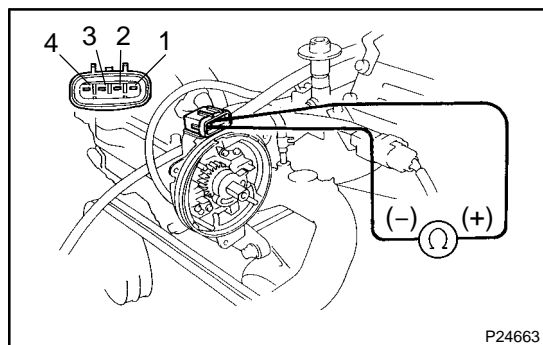
WIRING DIAGRAM



S06273

INSPECTION PROCEDURE

1 Check resistance of crankshaft position sensor for NE signal.

**PREPARATION:**

Remove the distributor cap and disconnect distributor connector.

CHECK:

Measure resistance between terminals 1 and 4 of distributor connector.

OK:

	Resistance
Cold	185 – 275 Ω
Hot	240 – 325 Ω

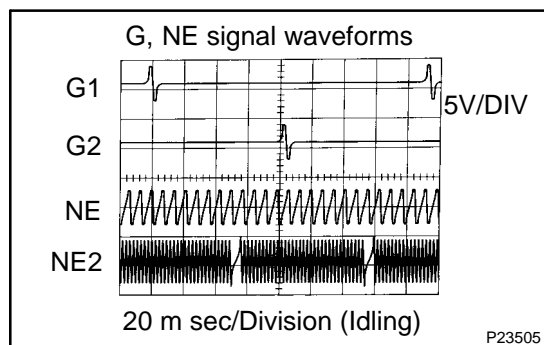
"Cold" is from -10°C (14°F) to 50°C (122°F) of engine coolant temperature sensor and "Hot" is from 50°C (122°F) to 100°C (212°F).

Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G1, G2, NE, NE2 and G- of ECM.

HINT:

The correct waveforms are as shown.



NG

Replace distributor housing assembly.

OK

2 Check for open and short in harness and connector between ECM and crankshaft position sensor for NE signal (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

DI-64

DIAGNOSTICS - ENGINE

3	Check air gap (See page IG-1).
---	---

NG

Replace distributor housing assembly.

OK

Check and replace ECM (See page [IN-28](#)).

DTC	P0340	Camshaft Position Sensor Circuit Malfunction
------------	--------------	---

CIRCUIT DESCRIPTION

The camshaft position sensors (G1 and G2 signals) consist of a signal plate and a pick up coil. The G1, G2, signal plates each have one tooth on the outer circumference and are built into the distributor. When the camshaft rotates, 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 ECM detects the standard crankshaft angle based on the G1, G2 signals, detects the actual crankshaft angle and engine speed by the NE signals, and detects misfire by NE2 signals.

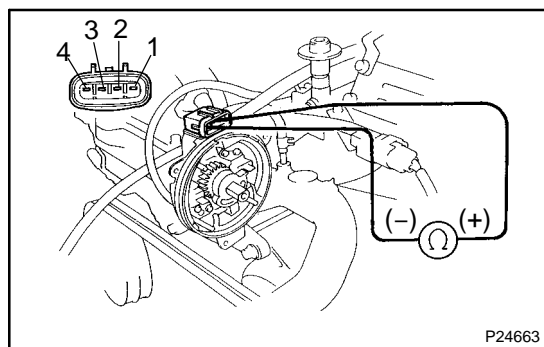
DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal (G signal) to ECM with engine speed 550 rpm or more.	<ul style="list-style-type: none">• Open or short in camshaft position sensor circuit• Camshaft position sensor• ECM

WIRING DIAGRAM

Refer to DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page [DI-62](#) for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Check resistance of camshaft position sensor.
----------	--



PREPARATION:

Disconnect camshaft position sensor connector.

CHECK:

Measure resistance between terminals 2, 3 and 4 of distributor connector.

OK:

	Resistance
Cold	185 – 275 Ω
Hot	240 – 325 Ω

"Cold" is from -10°C (14°F) to 50°C (122°F) of engine coolant temperature and "Hot" is from 50°C (122°F) to 100°C (212°F).

Reference: INSPECTION USING OSCILLOSCOPE

Refer to page [DI-62](#) for Reference INSPECTION USING OSCILLOSCOPE.

NG**Replace distributor housing assembly.****OK**

DI-66

DIAGNOSTICS - ENGINE

2	Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN-28).
---	---

NG

Repair or replace harness or connector.

OK

3	Check air gap (See page IG-1).
---	---

NG

Replace distributor housing assembly.

OK

Check and replace ECM (See page [IN-28](#)).

DTC	P0385	Crankshaft Position Sensor "B" Circuit Malfunction
------------	--------------	---

CIRCUIT DESCRIPTION

The crankshaft position sensor (NE2 signal) consists of a signal plate and a pick up coil. The NE2 signal plate has 34 teeth and is mounted on the crankshaft. When the crankshaft rotates, 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 NE2 signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on G1, G2 signals detects the actual crankshaft angle and the engine speed by NE signals, and detects misfire by NE2 signals.

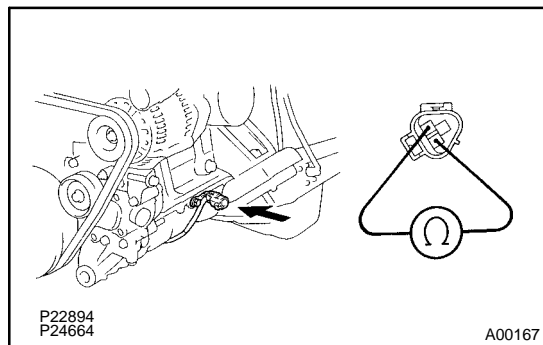
DTC No.	DTC Detecting Condition	Trouble Area
P0385	No crankshaft position sensor signal (NE 2 signal) to ECM during cranking. (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in crankshaft position sensor for NE2 signals. • Crankshaft position sensor for NE2 signal. • ECM
	No crankshaft position sensor signal (NE 2 signal) to ECM with engine speed 550 rpm or more. (2trip detection logic)	

WIRING DIAGRAM

Refer to DTC 0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page [DI-62](#) for WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Check resistance of crankshaft position sensor for NE2 signal.
----------	---



PREPARATION:

Disconnect crankshaft position sensor connector.

CHECK:

Measure resistance between terminals 1 and 2 of crankshaft position sensor connector.

OK:

	Resistance
Cold	1630 – 2740 Ω
Hot	2065 – 3225 Ω

"Cold" is from -10°C (14°F) to 50°C (122°F) of engine coolant temperature and "Hot" is from 50°C (122°F) to 100°C (212°F).

Reference: INSPECTION USING OSCILLOSCOPE

Refer to page [DI-62](#) for Reference INSPECTION USING OSCILLOSCOPE.

NG

Replace crankshaft position sensor.

OK

DI-68

DIAGNOSTICS – ENGINE

2	Check for open and short in harness and connector between ECM and crankshaft position sensor for NE2 signal (See page IN-28).
---	--

NG

Repair or replace harness or connector.

OK

3	Inspect sensor installation and teeth of signal plate.
---	--

NG

Tighten the sensor.
Replace signal plate.

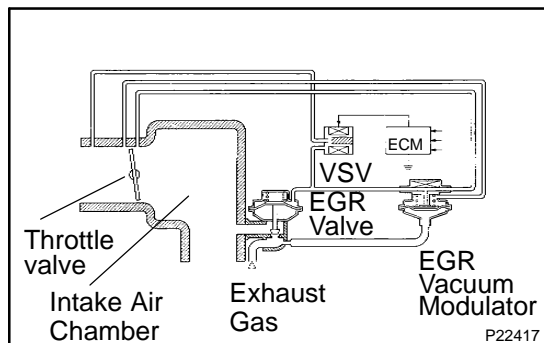
OK

Check and replace ECM (See page [IN-28](#)).

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 temp. and reduce NOX emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.



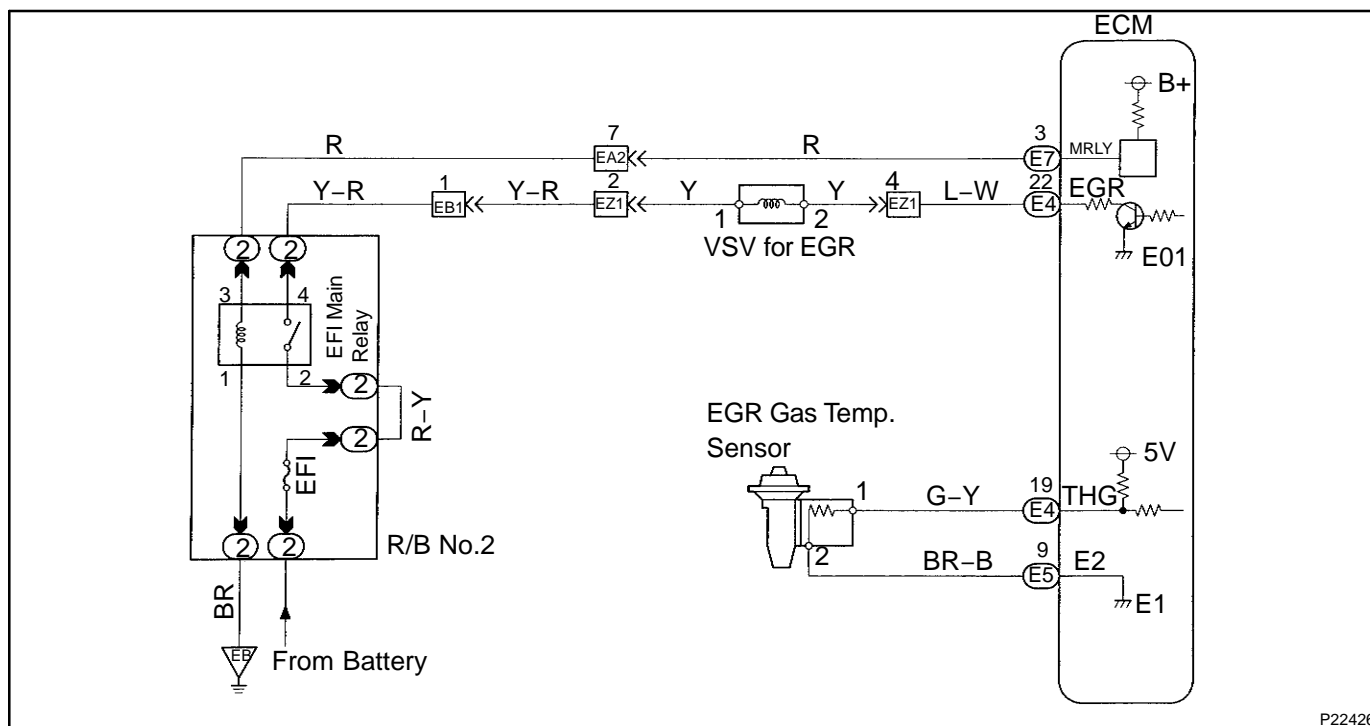
If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM.

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.

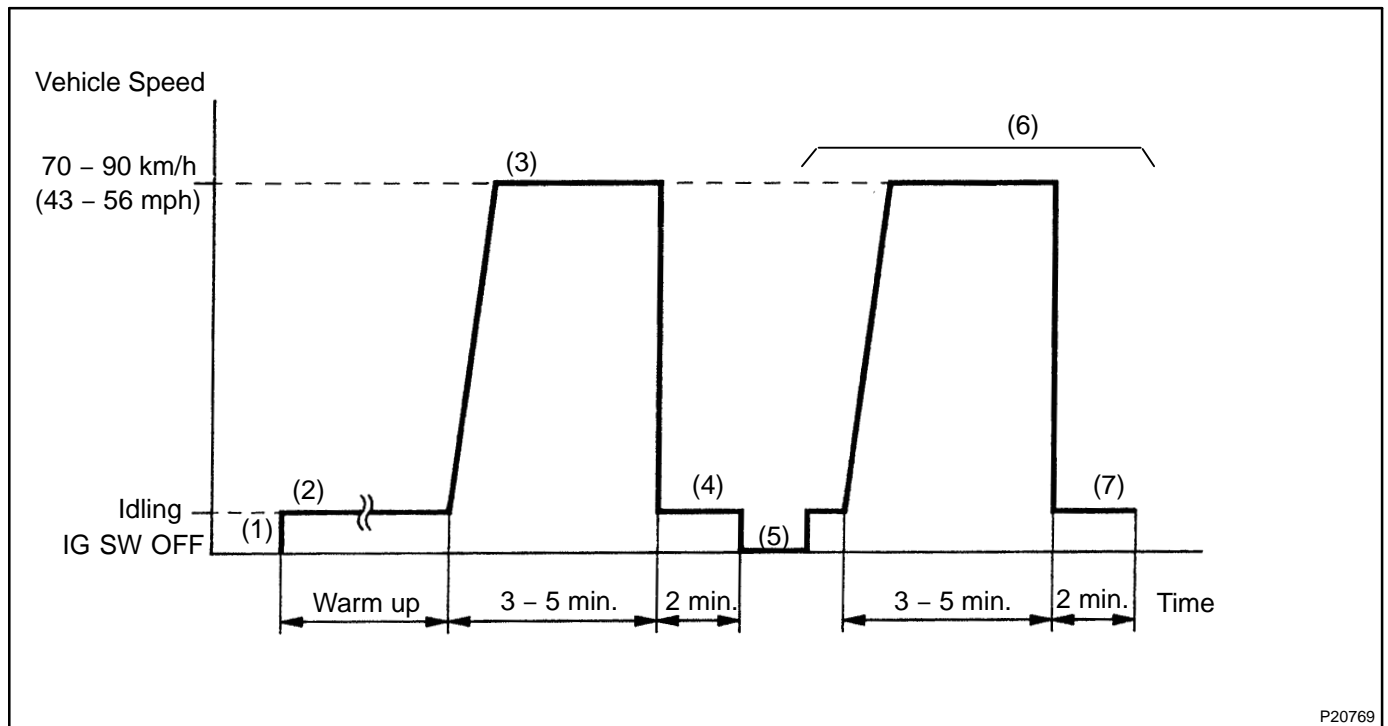
- Before the engine is warmed up.
- During deceleration (throttle valve closed).
- Light engine load (amount of intake air very small).
- Engine racing.

DTC No.	DTC 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 38°C (100.4°F) above the ambient air temperature. (2 trip detection logic)	<ul style="list-style-type: none"> • EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM

WIRING DIAGRAM



SYSTEM CHECK DRIVING PATTERN



P20769

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
 - (2) Start and warm up the engine with all accessories switched OFF.
 - (3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min. or more.
 - (4) Idle the engine for about 2 min.
 - (5) Stop at safe place and turn the ignition switch OFF.
 - (6) Start the engine and do steps (3) and (4) again.
 - (7) Check the "READINESS TESTS" mode on the OBD II scan tool or TOYOTA hand-held tester.
- If "COMPL" is displayed and the MIL does not light up, the system is normal.
 If "INCMPL" is displayed and the MIL does not light up, run the vehicle again and check it.

HINT:

"INCMPL" is displayed when either condition (a) or (b) exists.

- (a) The system check is incomplete.
- (b) There is a malfunction in the system.

If there is a malfunction in the system, the MIL will light up after steps (2) to (6) above are done.

INSPECTION PROCEDURE

TOYOTA hand-held tester

1	Connect the TOYOTA hand-held tester and read value of EGR gas temp. value.
---	--

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the TOYOTA hand-held tester to the DLC3.
- (c) Turn ignition switch ON and push the TOYOTA hand-held tester main switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

EGR gas temp.: 10°C (50°F) or more

HINT:

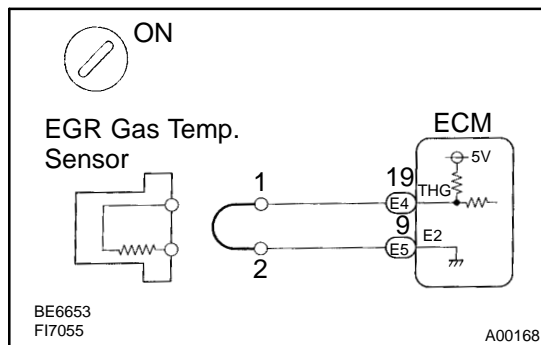
If there is an open circuit, the TOYOTA hand-held tester indicates 3.1°C (37.6°F).

OK

Go to step 4.

NG

2	Check for open in harness or ECM.
---	-----------------------------------



PREPARATION:

- (a) Disconnect the EGR gas temp. sensor connector.
- (b) Connect sensor wire harness terminals together.
- (c) Turn ignition switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

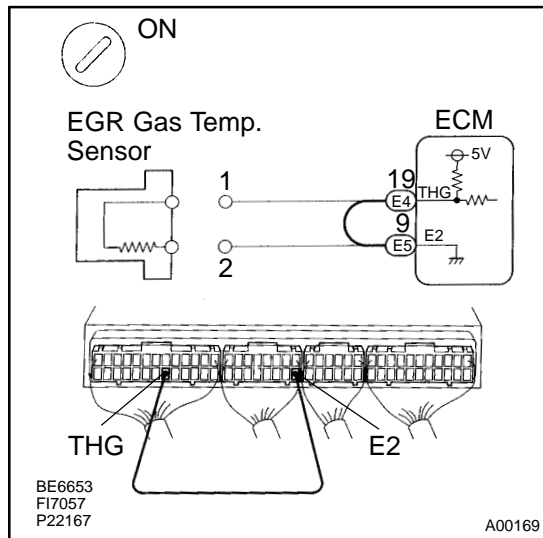
EGR gas temp.: Approx. 157.5°C (315.5°F)

OK

Confirm good connection at sensor.
If OK, replace EGR gas temp. sensor.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Remove the instrument panel speaker No.1 panel (See page [SF-65](#)).
- Connect between terminals THG and E2 of ECM connector.

HINT:

EGR gas temp. sensor connector is disconnected.

Before checking, do a visual check and contact pressure check for the ECM connector (See page [IN-28](#)).

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

EGR gas temp.: Approx. 157.5°C (315.5°F)

OK

Open in harness between terminals E2 or THG.
Repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

4 Check the connection of the vacuum hose, EGR hose (See page [EC-11](#)).

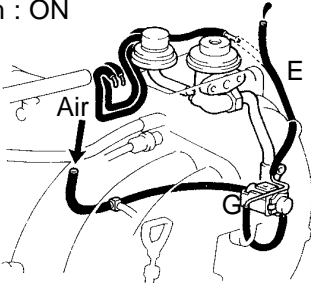
NG

Repair or replace.

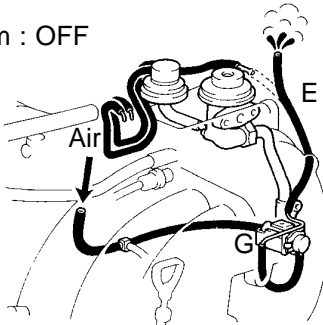
OK

5 Check the VSV for EGR.

System : ON



System : OFF



P22963
P22964

A00170

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect the TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check operation of VSV, when it is operated by the TOYOTA hand-held tester.

OK:

EGR system is ON:

Air does not flow from pipe G to pipe E.

EGR system is OFF:

Air from pipe G is flowing out through pipe E.

OK

Go to step 7.

NG

6 Check operation of the VSV for EGR (See page [SF-60](#)).

NG

Replace VSV for EGR.

OK

Check for open in harness and connector between VSV and ECM (See page [IN-28](#)).

7 Check EGR vacuum modulator (See page [EC-11](#)).

NG

Repair or replace.

OK

DI-74

DIAGNOSTICS - ENGINE

8	Check EGR valve (See page EC-11).
---	--

NG

Repair or replace.

OK

9	Check value of EGR gas temp. sensor.
---	--------------------------------------

PREPARATION:

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the TOYOTA hand-held tester to the DLC3.
- (c) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- (d) Select the ACTIVE TEST mode on the TOYOTA hand-held tester. (EGR system ON)
- (e) Race the engine at 4,000 rpm for 3 mins.

CHECK:

Measure the EGR gas temp. while racing engine at 4,000 rpm.

OK:

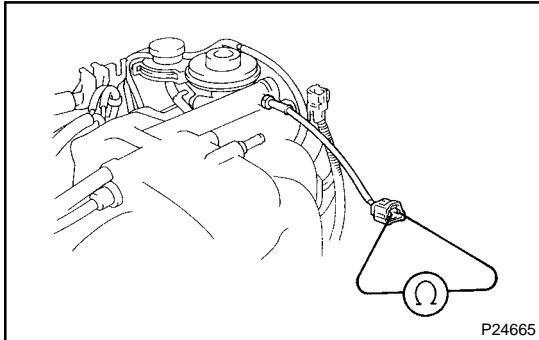
EGR gas temp. after 3 mins.: 140°C (284°F) or more

NG

Replace EGR gas temp. sensor.

OK

Check and replace ECM (See page [IN-28](#)).

OBD II scan tool (excluding TOYOTA hand-held tester)**1 Check resistance of EGR gas temp. sensor.****PREPARATION:**

Disconnect EGR gas temp. sensor connector.

CHECK:

Measure resistance between terminals of EGR gas temp. sensor connector.

OK:

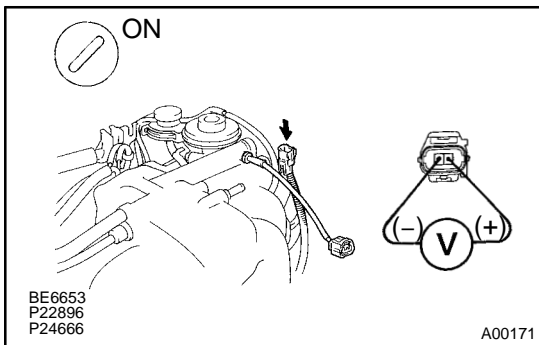
Resistance: 600 kΩ or less

HINT:

If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG

Check and replace EGR gas temp. sensor (See page SF-63).

OK**2 Check for open in harness or ECM.****PREPARATION:**

(a) Disconnect EGR gas temp. sensor connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.

OK:

Voltage: 4.5 – 5.5 V

OK

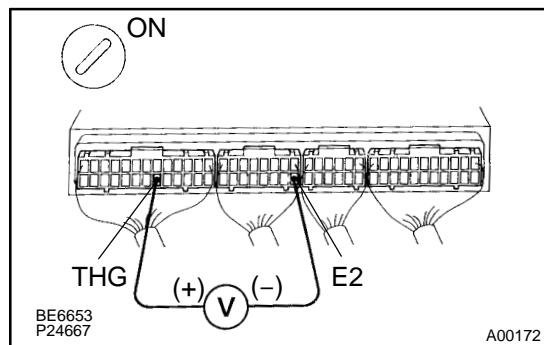
Go to step 4.

NG

DI-76

DIAGNOSTICS - ENGINE

3 Check for open in harness or ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Measure voltage between terminals of THG and E2 of ECM connector.

HINT:

EGR gas temp. sensor connector is disconnected.

OK:

Voltage: 4.5 – 5.5 V

OK

Open in harness between terminals E2 or THG.
Repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

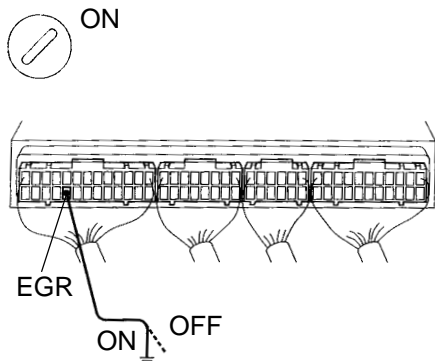
4 Check connection of vacuum hose, EGR hose (See page [EC-11](#)).

NG

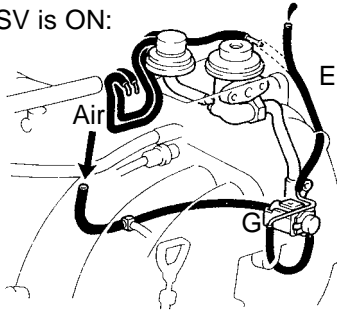
Repair or replace.

OK

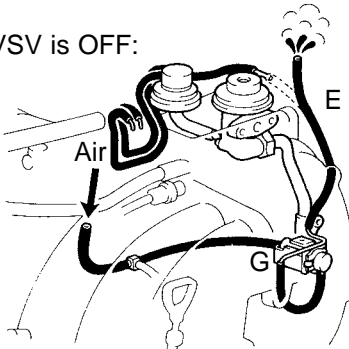
5 Check the VSV for EGR.



(1) VSV is ON:



(2) VSV is OFF:



BE6653
P22905
P22963
P22964

A00173

PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Check VSV function.

- Connect between terminal EGR of ECM and body ground (ON).
- Disconnect between terminal EGR of ECM and body ground (OFF).

OK:

- VSV is ON:**
Air does not flow from pipe G to pipe E.
- VSV is OFF:**
Air from pipe G is flows out through pipe E.

OK

Go to step 7.

NG

DI-78

DIAGNOSTICS - ENGINE

6	Check operation for the VSV for EGR (See page SF-60).
---	--

NG

Replace VSV for EGR.

OK

Check for open in harness and connector between R/B No.2 and ECM (See page [IN-28](#)).

7	Check EGR vacuum modulator (See page EC-11).
---	---

NG

Repair or replace.

OK

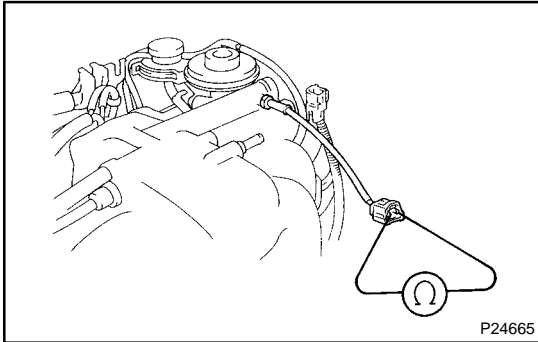
8	Check EGR valve (See page EC-11).
---	--

NG

Repair or replace.

OK

9

Check resistance of EGR gas temp. sensor (See page [SF-63](#)).**PREPARATION:**

- (a) Disconnect EGR gas temp. sensor connector.
- (b) Start the engine and warm it up.
- (c) Disconnect VSV connector for EGR.
- (d) Race the engine at 4,000 rpm or 3 mins.

CHECK:

Measure the resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

OK:

**Resistance of EGR gas temp. sensor after 3 mins.:
4.3 k Ω or less**

HINT:

At 20°C (68°F): 188.6 – 439.0 k Ω for resistance.

NG**Replace EGR gas temp. sensor.****OK****Check and replace ECM (See page [IN-28](#)).**

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0401 (Exhaust Gas Recirculation Flow Insufficient Detected) on page [DI-69](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0402	EGR 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)	<ul style="list-style-type: none"> • EGR valve stuck open • EGR VSV open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit
	EGR valve is always open (2 trip detection logic)	<ul style="list-style-type: none"> • ECM

Refer to DTC P0401 (Exhaust Gas Recirculation Flow Insufficient Detected) for the System Check Driving Pattern and Wiring Diagram.

INSPECTION PROCEDURE

TOYOTA hand-held tester

1	Connect the TOYOTA hand-held tester and read EGR gas temp. value.
----------	--

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect the TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and push the TOYOTA hand-held tester main switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

EGR gas temp.: 150°C (302°F) or less (Not immediately after driving)

HINT:

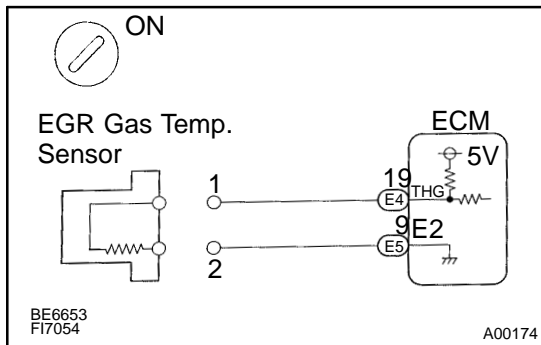
If there is a short circuit, the TOYOTA hand-held tester indicates Approx. 157.5°C (315.5°F).

OK

Go to step 4.

NG

2 Check for short in harness and ECM.



PREPARATION:

Disconnect the EGR gas temp. sensor connector.

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

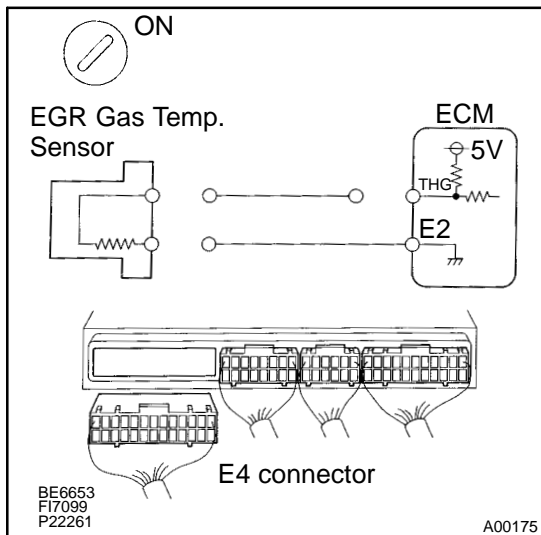
EGR gas temp.: 3.1°C (37.6°F)

OK

Replace EGR gas temp. sensor.

NG

3 Check for short in harness or ECM.



PREPARATION:

(a) Remove the instrument panel speaker No.1 panel.

(See page [SF-65](#)).

(b) Disconnect the E4 connector of ECM.

HINT:

EGR gas temp. sensor is disconnected.

CHECK:

Read EGR gas temp. on the TOYOTA hand-held tester.

OK:

EGR gas temp.: 3.1°C (37.6°F)

OK

Repair or replace harness or connector.

NG

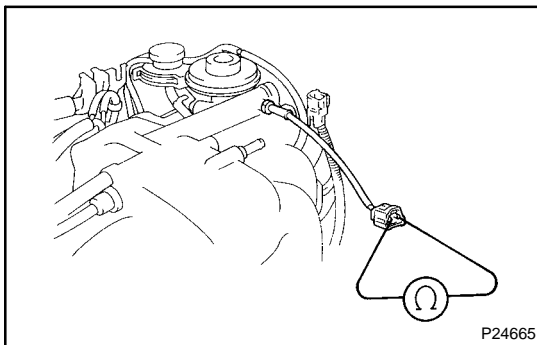
Check and replace ECM (See page [IN-28](#)).

DI-82

DIAGNOSTICS – ENGINE

4 Check the VSV for EGR (See page [DI-69](#)).**OK**Check EGR valve (See page [EC-11](#)).**NG****5** Check operation of the VSV for EGR (See page [SF-60](#)).**NG**

Replace VSV for EGR.

OKCheck for short in harness and connector between VSV and ECM (See page [IN-28](#)).**OBD II scan tool (excluding TOYOTA hand-held tester)****1** Check resistance of EGR gas temp. sensor (See page [DI-105](#)).**PREPARATION:**

Disconnect EGR gas temp. sensor connector.

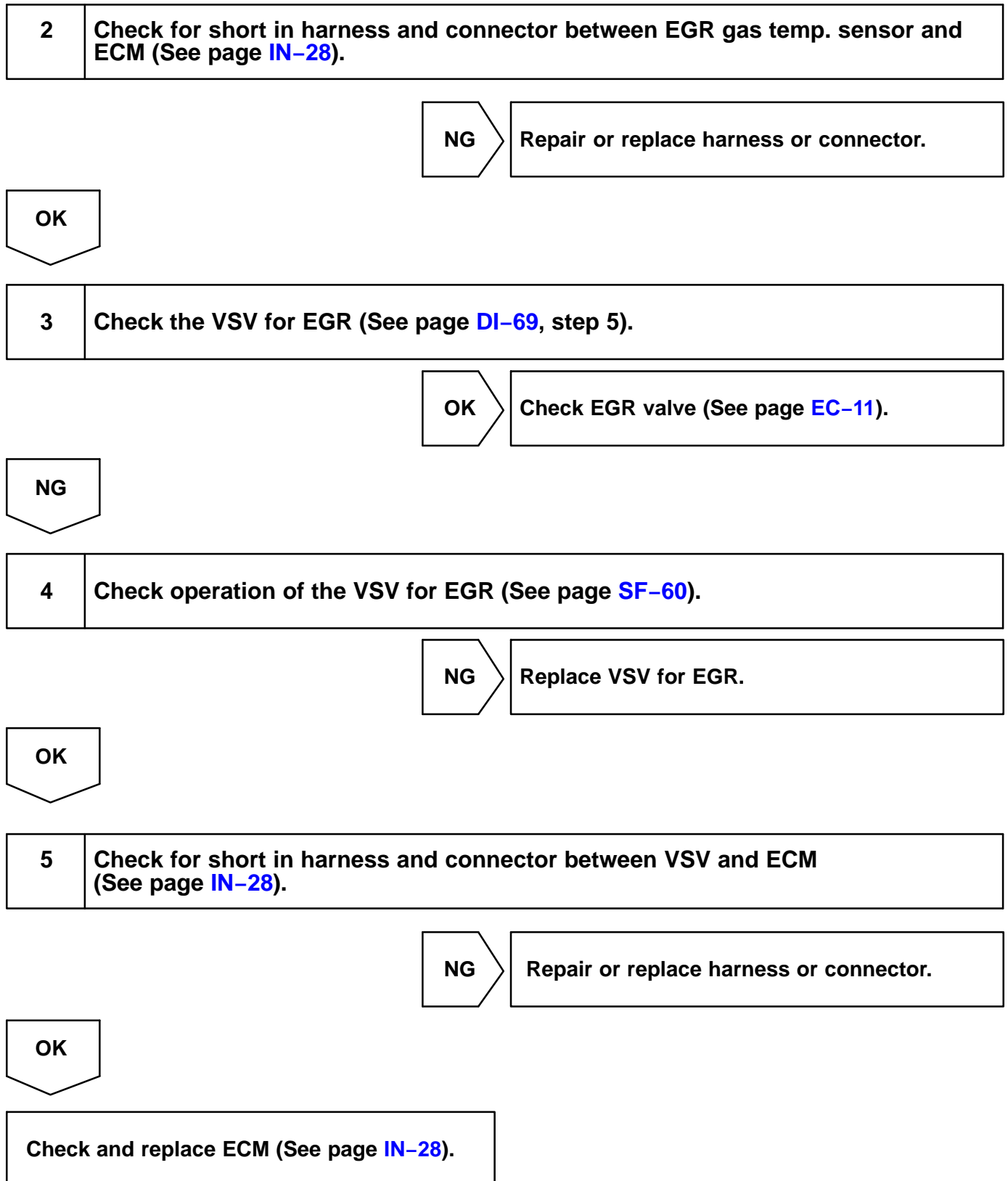
CHECK:

Measure resistance between terminals of EGR gas temp. sensor connector.

OK:**Resistance: 2.5 k Ω or more
(Not immediately after driving)****HINT:**If there is short circuit, ohmmeter indicates 200 Ω or less.**NG**

Replace EGR gas temp. sensor.

OK



DTC	P0420	Catalyst System Efficiency Below Threshold
------------	--------------	---

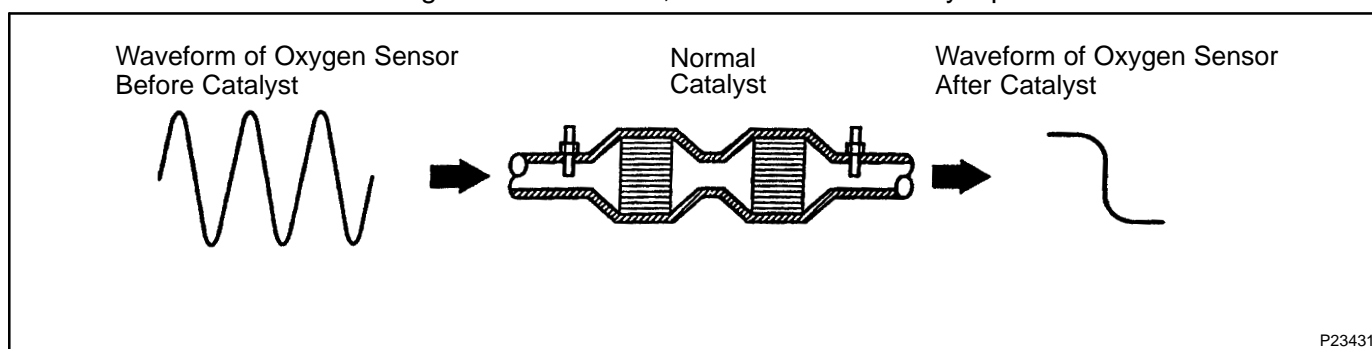
CIRCUIT DESCRIPTION

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 deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

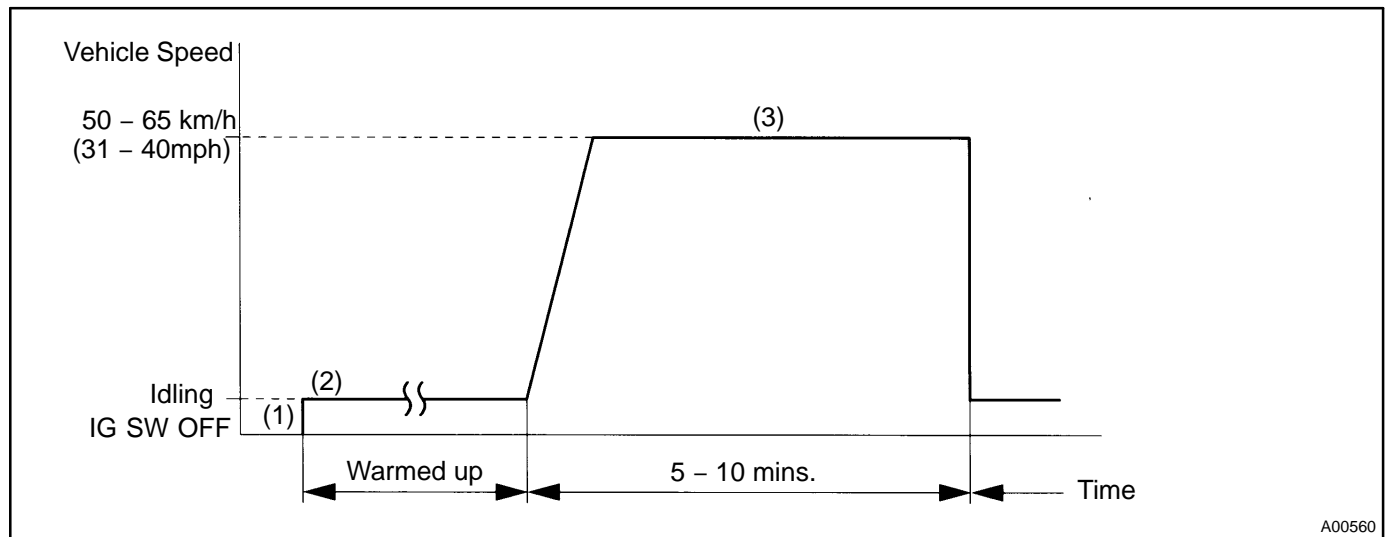
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



DTC No.	DTC Detecting Condition	Trouble Area
P0420	After the engine is warmed up and the vehicle driven for 6 mins. at 30 – 83 km/h (19 – 52 mph), the waveforms of the heated oxygen sensors, bank 1 sensor 1 and bank1 sensor 2, have the same amplitude	<ul style="list-style-type: none"> • Front exhaust pipe (front catalyst) and rear TWC (rear catalyst) • Heated oxygen sensor

CONFIRMATION ENGINE RACING PATTERN



A00560

- (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) Run the vehicle at 50 - 65 km/h (31 - 40 mph) for 5 - 10 mins.

HINT:

If a malfunction exists, the MIL will light up during step (3).

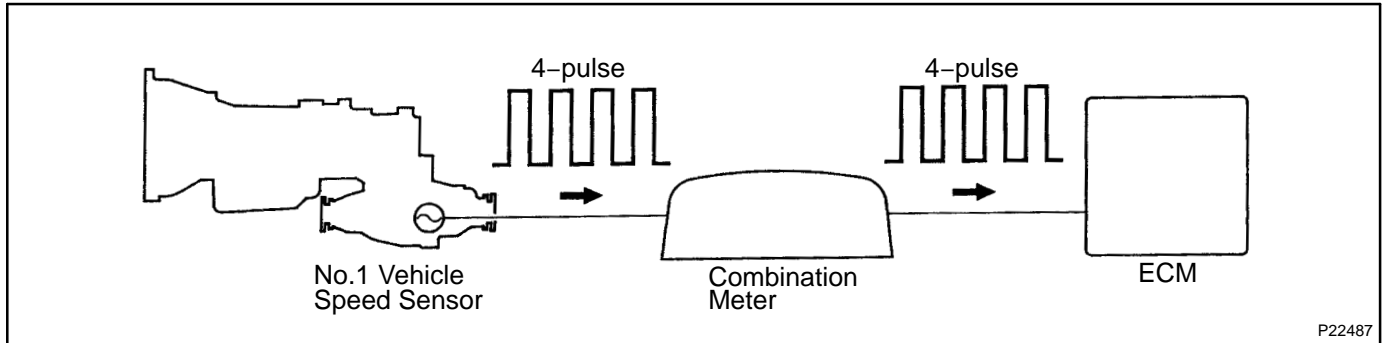
INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0420) being output?
YES	Go to relevant DTC chart.
NO	
2	Check heated oxygen sensor (bank 1 sensor 1) (See page SF-64).
NG	Repair or replace.
OK	
3	Check heated oxygen sensor (bank 1 sensor 2) (See page SF-64).
NG	Repair or replace.
OK	
Replace front exhaust pipe (front catalyst) and rear TWC (rear catalyst) (See page EM-110).	

DTC	P0500	Vehicle Speed Sensor Malfunction
------------	--------------	---

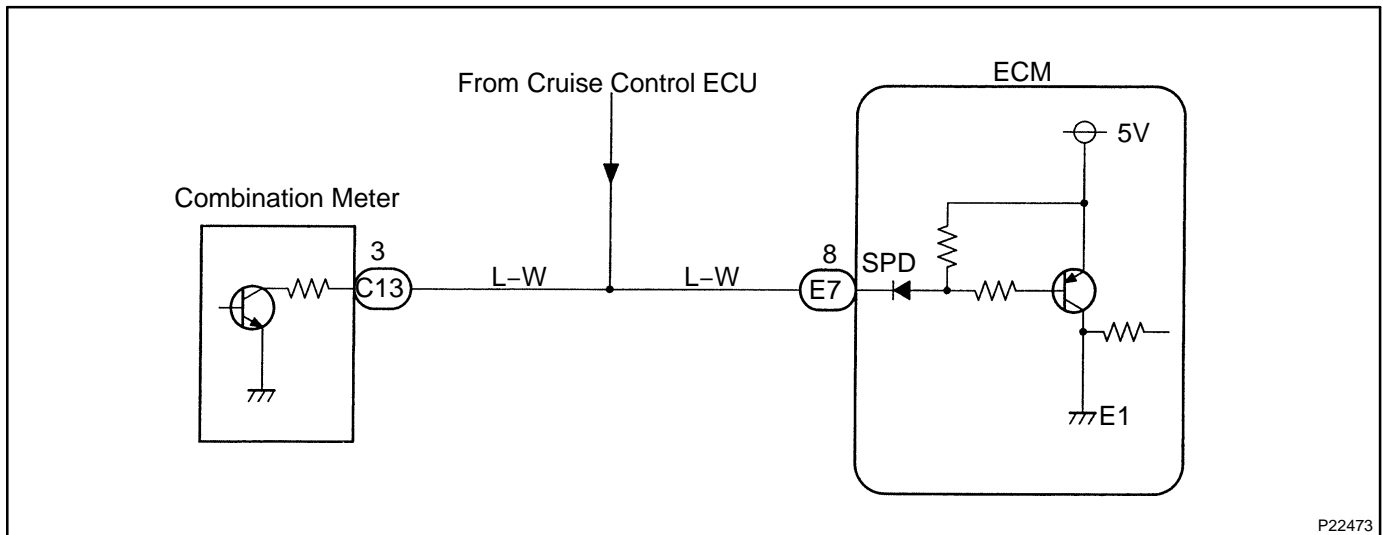
CIRCUIT DESCRIPTION

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.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under conditions (a) and (b): (2 trip detection logic) (a) Park/neutral position switch is OFF. (b) Vehicle is being driven.	<ul style="list-style-type: none"> • Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Combination meter • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check operation of speedometer.

CHECK:

Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

HINT:

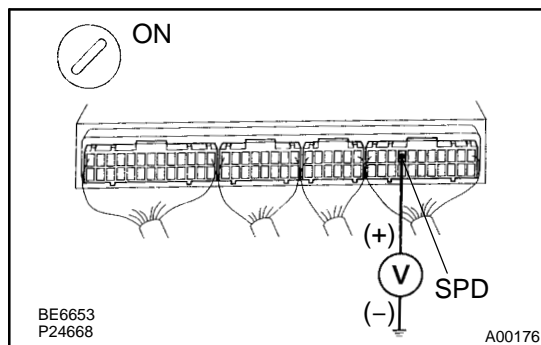
The vehicle speed sensor is operating normally if the speedometer display is normal.

NG

Check speedometer circuit (See page [BE-2](#)).

OK

2 Check voltage between terminal SPD of ECM connector and body ground.



PREPARATION:

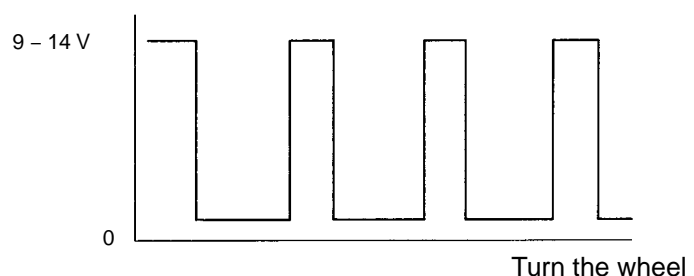
- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Disconnect cruise control ECU connector.
- Shift the shift lever to neutral.
- Jack up a rear wheels on one side.
- Turn ignition switch ON.

CHECK:

Measure voltage between terminal SPD of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.



AT7809

NG

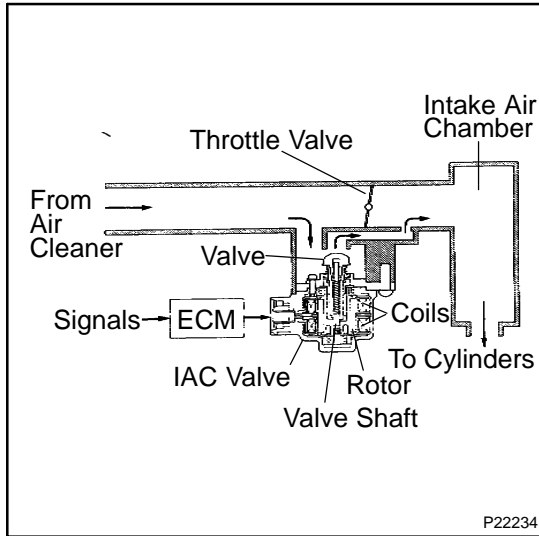
Check and repair harness and connector between combination meter and ECM.

OK

Check and replace ECM (See page [IN-28](#)).

DTC	P0505	Idle Control System Malfunction
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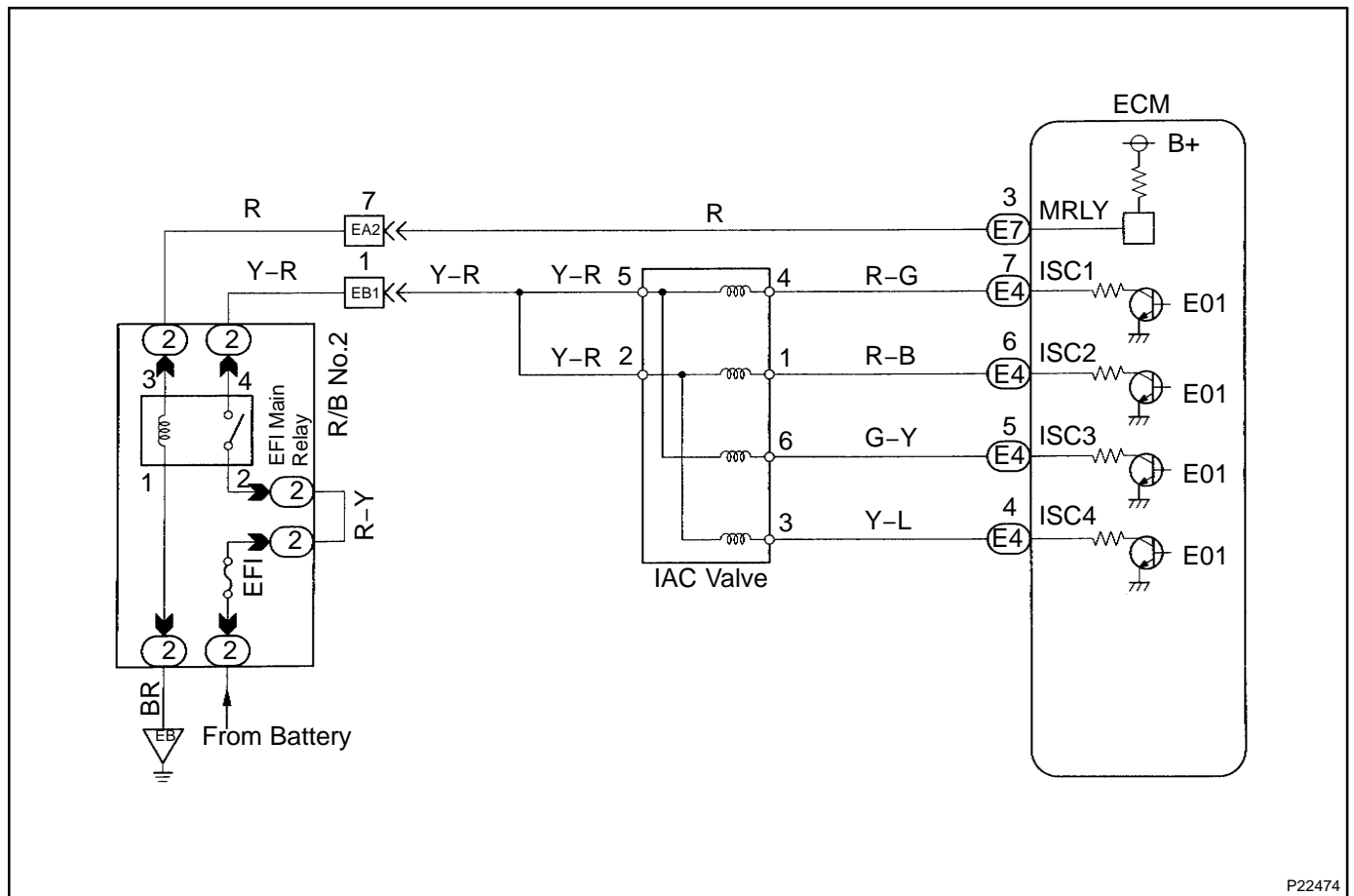
CIRCUIT DESCRIPTION



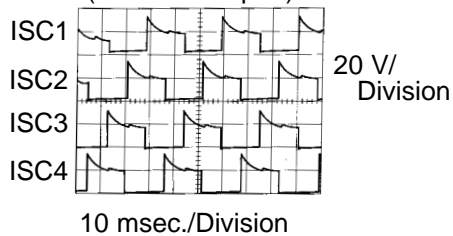
The step motor type IAC valve is located in front of the intake air chamber. Intake air bypassing the throttle valve is directed to the IAC valve through a passage. A step motor is built into the IAC valve. It consists of four coils, a magnetic rotor, valve shaft and valve. When current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and the valve seat. In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed. There are 125 possible positions to which the valve can be opened.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from the target speed (2 trip detection logic)	<ul style="list-style-type: none"> • IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short in A /C signal circuit • Air intake (hose loose)

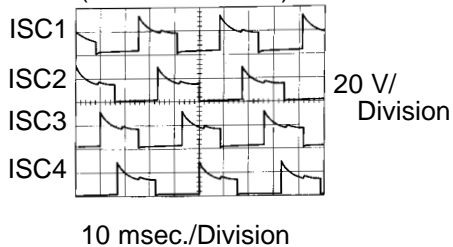
WIRING DIAGRAM



A/C Switch OFF → ON
(IAC Valve Open)



A/C Switch ON → OFF
(IAC Valve Close)



F16536
F16537

A00202

Reference: INSPECTION USING OSCILLOSCOPE

With the engine idling measure waveforms between terminals ISC1, ISC2, ISC3, ISC4 and E01 of ECM when A/C switch ON or OFF.

HINT:

The correct waveforms are as shown.

INSPECTION PROCEDURE

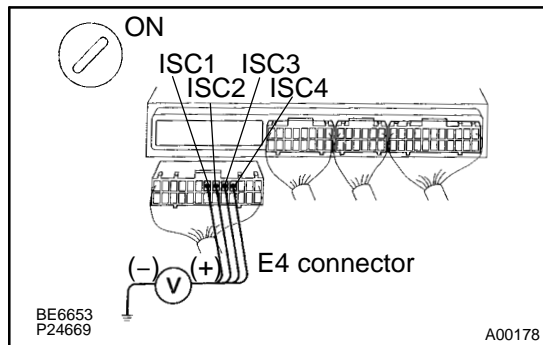
1 Check air induction system (See page [SF-1](#)).

NG

Repair or replace.

OK

2 Check voltage terminals ISC1, ISC2, ISC3, ISC4, of ECM connector and body ground.

**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Disconnect the E4 connector of ECM.
- (c) Turn ignition switch ON.

CHECK:

Measure voltage between terminals ISC1, ISC2, ISC3, ISC4 of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK

Go to step 4.

NG

3 Check IAC valve (See page [SF-49](#)).

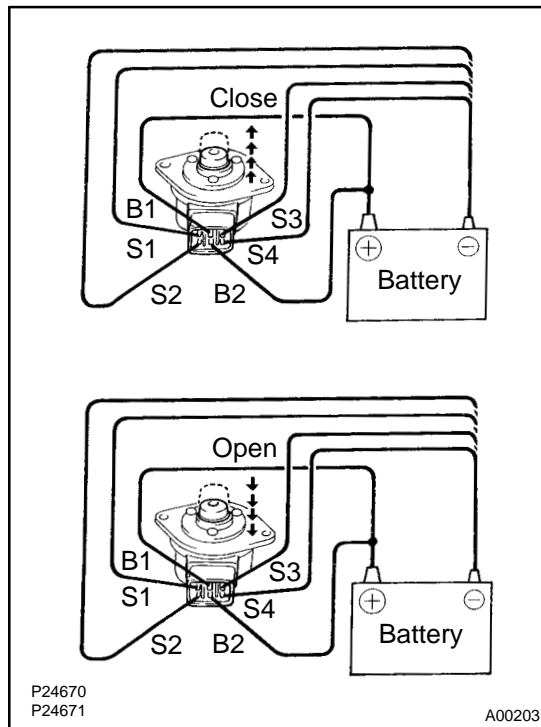
NG

Replace IAC valve.

OK

Check for open and short in harness and co-nnector between EFI main relay (Marking:EFI) and IAC valve and ECM (See page [IN-28](#)).

4 Check operation of the IAC valve .

**PREPARATION:**

Remove IAC valve (See page [SF-51](#)).

CHECK:

- Connect the positive (+) lead from the battery to terminals 5 (B1) and 2 (B2), and the negative (-) lead to terminals 4 (S1), -1 (S2), -6 (S3), -3 (S4) in that order.
- Connect the positive (+) lead from the battery to terminals 5 (B1) and 2 (B2), and the negative (-) lead to terminals 3 (S4), -6 (S3), -1 (S2), -4 (S1) in that order.

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 step of the IAC valve as desired.

NG

Repair or replace IAC valve.

OK

Check and replace ECM (See page [IN-28](#)).

DTC	P0510	Closed Throttle Position Switch Malfunction
------------	--------------	--

CIRCUIT DESCRIPTION

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page [DI-35](#).

DTC No.	DTC Detecting Condition	Trouble Area
P0510	The closed throttle position switch does not turn ON or OFF even once when the vehicle is driven (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short 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

Refer to DTC P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) on page [DI-35](#) for WIRING DIAGRAM.

INSPECTION PROCEDURE

HINT:

If DTCs P0110 (Intake Air Temp. Circuit Malfunction), P0115 (Engine Coolant Temp. Circuit Malfunction), P0120 (Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction) are output simultaneously, E2 (Sensor Ground) may be open.

TOYOTA hand-held tester

1	Connect the TOYOTA hand-held tester and read CTP switch signal.
----------	--

PREPARATION:

- Remove the fuse cover on the instrument panel.
- Connect OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

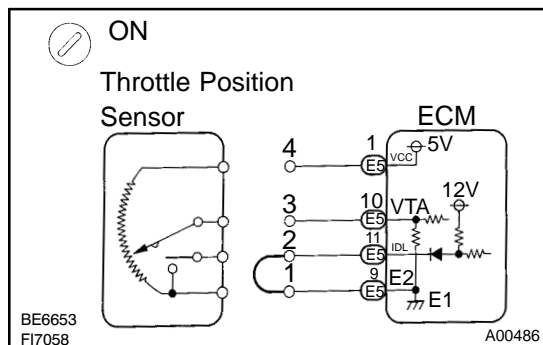
CHECK:

Read CTP switch signal on TOYOTA hand-held tester.

RESULT:

Throttle Valve	Closed Throttle Position Switch Signal	Malfunction
Fully closed	OFF	Open circuit: Go to step 2
Fully open	ON	Short circuit: Go to step 4

2 Check for open in harness or ECM.



PREPARATION:

- Disconnect throttle position sensor connector.
- Connect sensor wire harness terminals between terminals 1 and 2.
- Turn ignition switch ON.

CHECK:

Read CTP switch signal on TOYOTA hand-held tester.

OK:

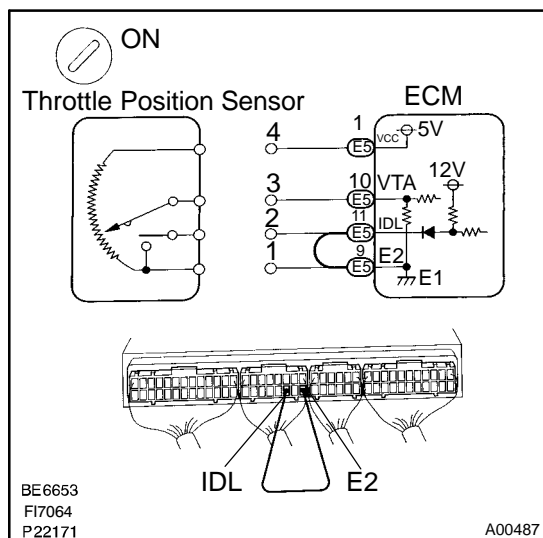
CTP switch signal: ON

OK

Confirm good connection at sensor.
If OK, replace throttle position sensor.

NG

3 Check for open in harness or ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Connect between terminals IDL and E2 of ECM.

HINT:

Throttle position sensor connector is disconnected.
Before checking, do a visual check and contact pressure check for connector (See page [IN-28](#)).

- Turn ignition switch ON.

CHECK:

Read CTP switch signal on TOYOTA hand-held tester.

OK:

CTP switch signal: ON

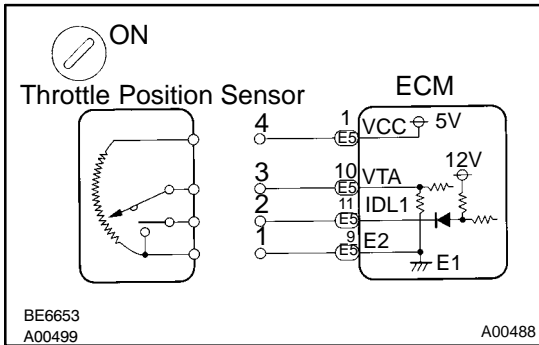
OK

Open in harness between ECM and throttle position sensor, repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

4 Check for short in harness or ECM.



PREPARATION:

- Disconnect throttle position sensor connector.
- Turn ignition switch ON.

CHECK:

Read CTP switch signal on TOYOTA hand-held tester.

OK:

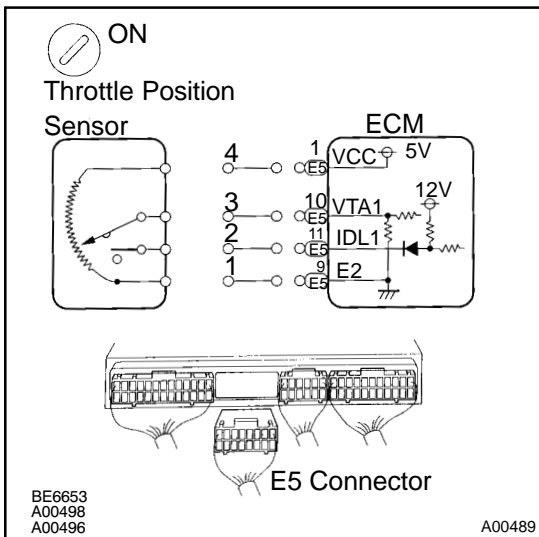
CTP switch signal: OFF

OK

Confirm good connection at sensor.
If OK, replace throttle position sensor.

NG

5 Check for short in harness or ECM.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Disconnect E5 connector of ECM.

HINT:

Throttle position sensor connector is disconnected.

- Turn ignition switch ON.

CHECK:

Read CTP switch signal on TOYOTA hand-held tester.

OK:

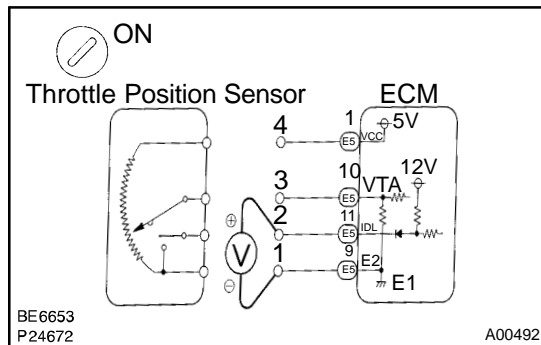
CTP switch signal: OFF

OK

Short in harness between ECM and throttle position sensor, repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM (See page [IN-28](#)).

OBD II scan tool (excluding TOYOTA hand-held tester)**1 Check for open and short in harness or ECM.****PREPARATION:**

- (a) Disconnect throttle position sensor connector.
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals 1 and 2 of throttle position sensor connector.

OK:

Voltage: 9 – 14 V

OK

**Confirm good connection at sensor.
If OK, replace throttle position sensor.**

NG

2 Check for open and short in harness and connector between throttle position sensor and ECM (See page [IN-28](#)).

NG

Open or short in harness between ECM and throttle position sensor.

OK

**Confirm connection at ECM.
If OK, replace ECM (See page [IN-28](#)).**

DTC	P1300	Igniter Circuit Malfunction
------------	--------------	------------------------------------

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr1 at a predetermined angle ($^{\circ}$ CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.

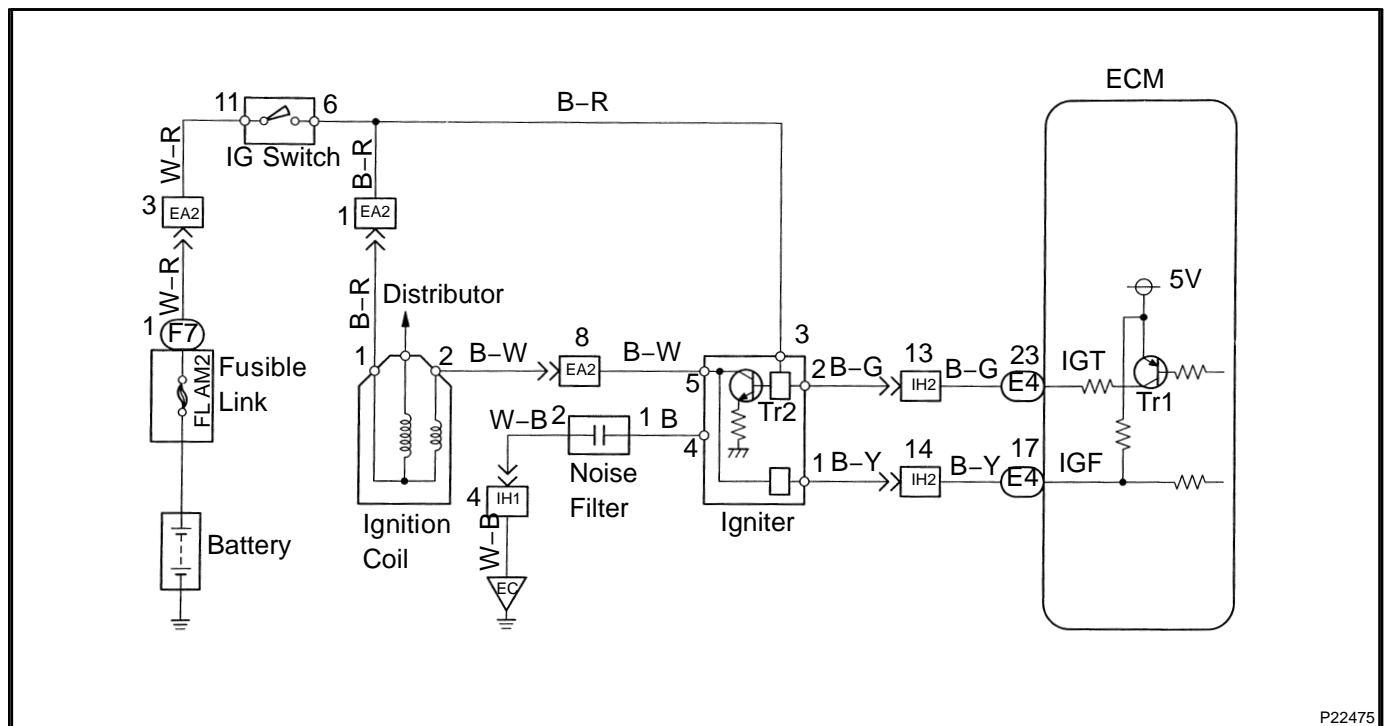
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr2 turns on.

When it reaches the ignition timing, the ECM turns Tr1 off and outputs the IGT signal "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 IGF signal is not input to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 6 consecutive IGT signals during engine running	<ul style="list-style-type: none"> • Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

WIRING DIAGRAM



DI-98

DIAGNOSTICS - ENGINE

INSPECTION PROCEDURE

1 Check for spark (See page [IG-1](#)).

NG

Go to step 4.

OK

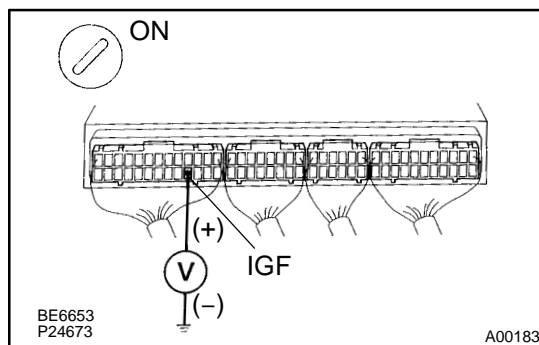
2 Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

3 Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.

**PREPARATION:**

- (a) Disconnect igniter connector.
- (b) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (c) Turn ignition switch ON.

CHECK:

Measure voltage between terminal IGF of ECM connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK

Replace igniter.

NG

Check and replace ECM (See page [IN-28](#)).

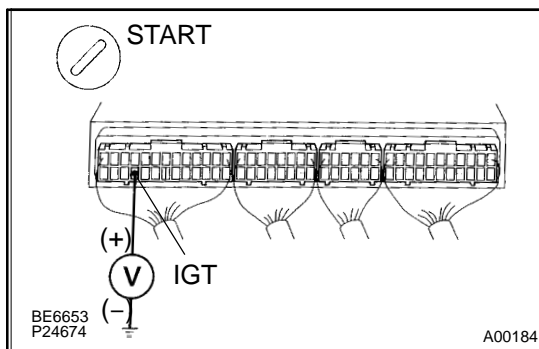
- 4 Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page [IN-28](#)).**

NG

Repair or replace harness or connector.

OK

- 5 Check voltage between terminals IGT of ECM connector and body ground.**



PREPARATION:

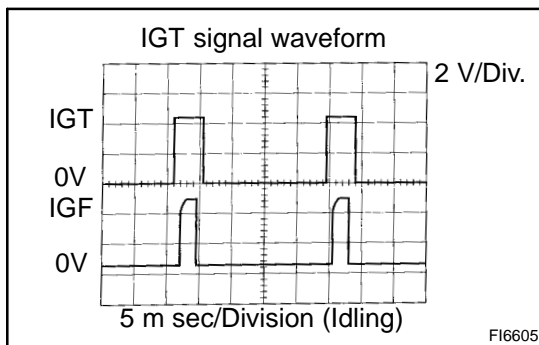
Remove instrument panel speaker No.1 panel (See page [SF-65](#)).

CHECK:

Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK:

Voltage: More than 0.1 V and less than 4.5 V



Reference: INSPECTION USING OSCILLOSCOPE

During cranking or idling, check waveforms between terminals IGT and E1 of engine control module.

HINT:

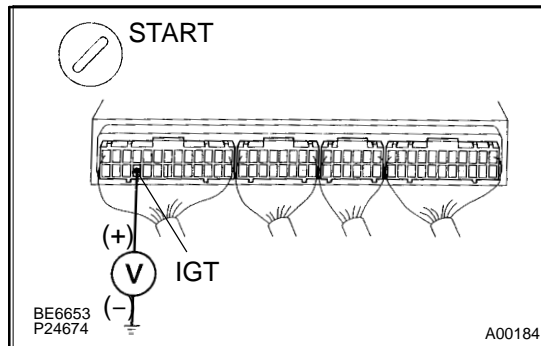
The correct regulator waveforms are as shown.

NG

Check and replace ECM (See page [IN-28](#)).

NG

6 Disconnect igniter connector and check voltage between terminals IGT of ECM connector and body ground.



PREPARATION:

- (a) Disconnect igniter connector.
- (b) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).

CHECK:

Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK:

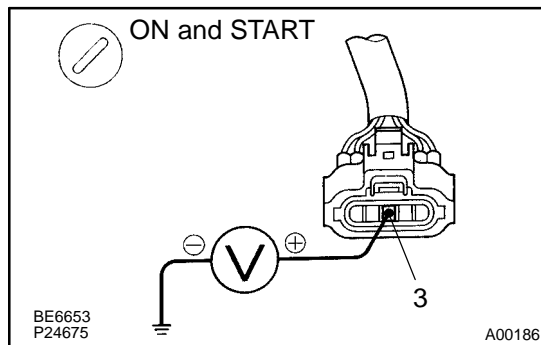
Voltage: More than 0.1 V and less than 4.5 V

OK

Check and replace ECM (See page [IN-28](#)).

NG

7 Check voltage between terminal 3 of igniter connector and body ground.



PREPARATION:

Disconnect igniter connector.

CHECK:

Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to "ON" and "START" position.

OK:

Voltage: 9 – 14 V

NG

Check and repair igniter power source circuit.

OK

8 Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

DIAGNOSTICS – ENGINE

9	Check ignition coil (See page IG-1).
---	---

NG

Replace ignition coil.

OK

Replace igniter.

DTC	P1335	Crankshaft Position Sensor Circuit Malfunction (during engine running)
------------	--------------	---

CIRCUIT DESCRIPTION

Refer to DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) on page [DI-62](#).

DTC No.	DTC Detecting Condition	Trouble Area
P1335	No crankshaft position sensor signal (NE signal) to ECM with engine speed 1,000 rpm or more	<ul style="list-style-type: none">• Open or short in crankshaft position sensor circuit for NE signal• Crankshaft position sensor for NE signal• Starter• ECM

WIRING DIAGRAM

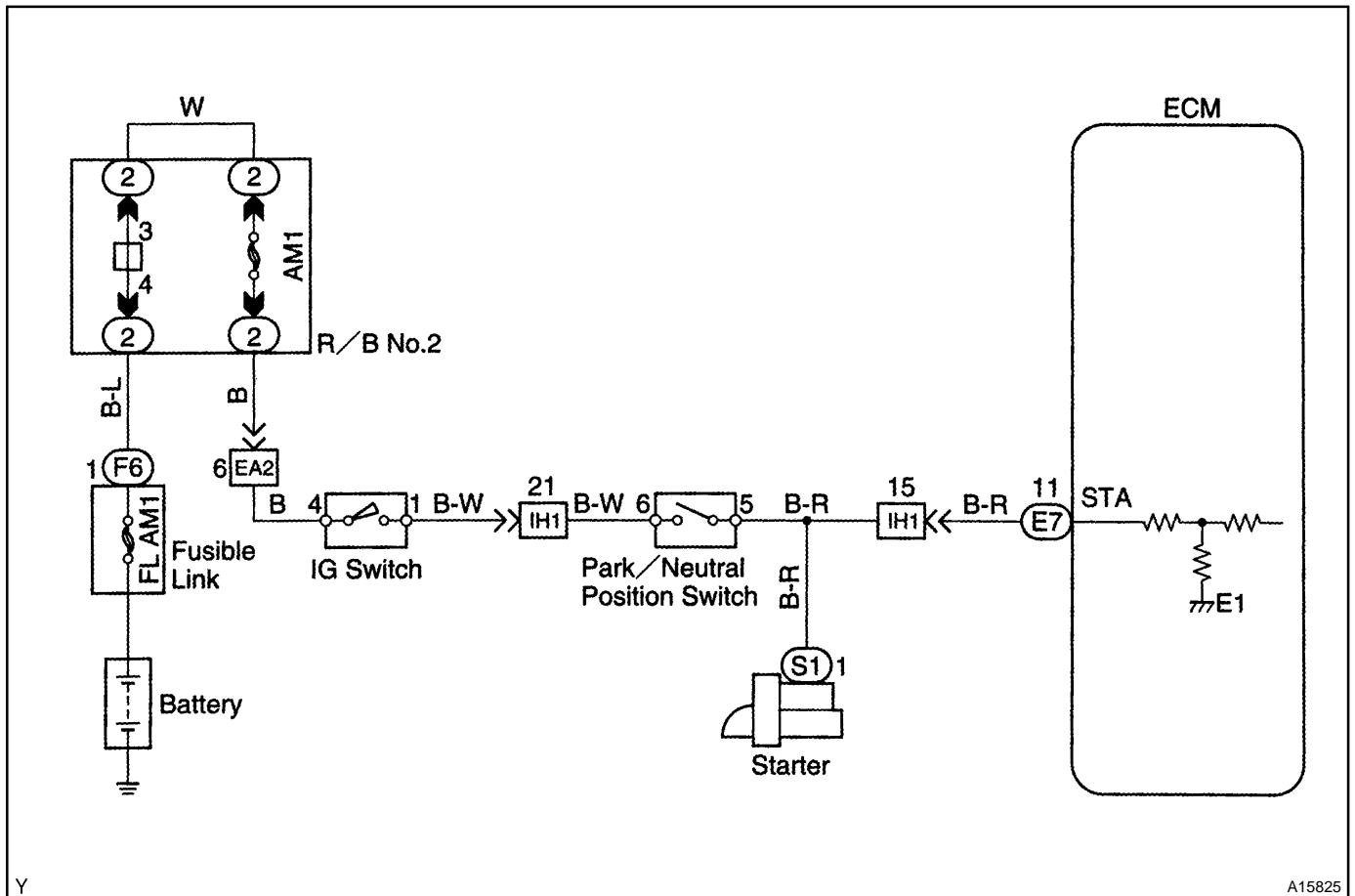
See DTC P0335 (Crankshaft Position Sensor "A" Circuit Malfunction) for WIRING DIAGRAM and INSPECTION PROCEDURE.

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 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.

WIRING DIAGRAM



INSPECTION PROCEDURE

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 [DI-19](#).

1	Connect TOYOTA hand-held tester and check STA signal.
---	---

PREPARATION:

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Turn ignition switch ON and push TOYOTA hand-held tester main switch ON.

CHECK:

Read STA signal on the TOYOTA hand-held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK

Proceed to next circuit inspection shown on matrix chart (See page [DI-19](#)).

NG

2	Check for open in harness and connector between ECM and starter relay (See page IN-28).
---	--

NG

Repair or replace harness or connector.

OK

Check and replace ECM
(See page [IN-28](#)).

DTC	P1600	ECM BATT Malfunction
------------	--------------	-----------------------------

CIRCUIT DESCRIPTION

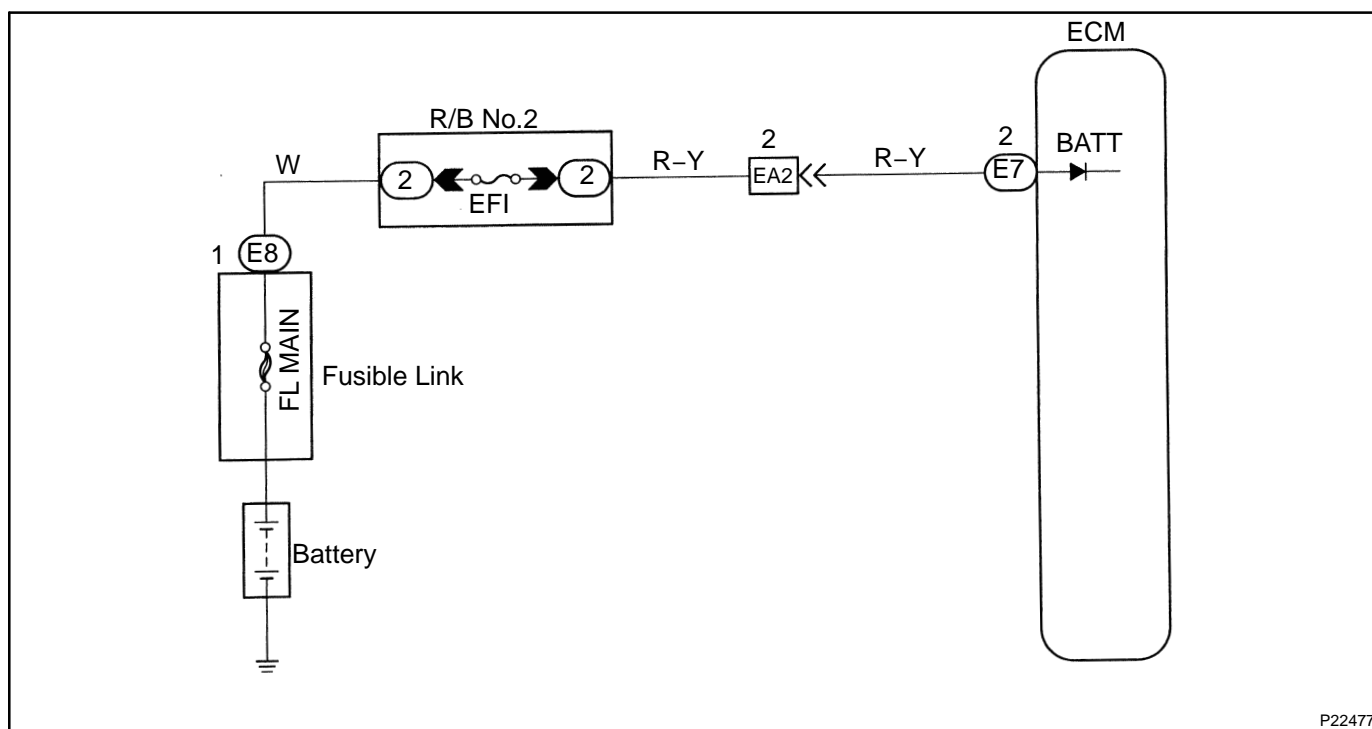
Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air-fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	<ul style="list-style-type: none"> • Open in back up power source circuit • ECM

HINT:

If DTC P1600 appear, the ECM does not store another DTC.

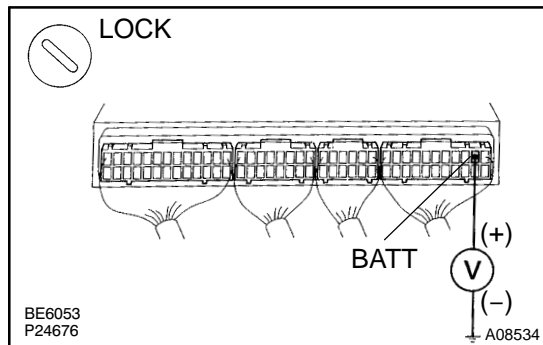
WIRING DIAGRAM



P22477

INSPECTION PROCEDURE

1	Check voltage between terminal BATT of ECM connector and body ground.
---	--

**PREPARATION:**

Remove the instrument panel speaker No.1 panel
(See page [SF-65](#)).

CHECK:

Measure voltage between terminal BATT of ECM connector and body ground.

OK:

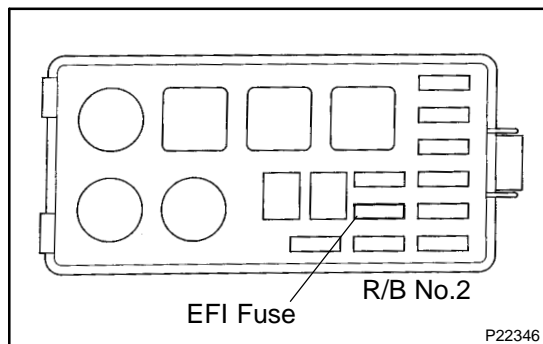
Voltage 9 – 14 V

OK

Check and replace ECM (See page [IN-28](#)).

NG

2	Check EFI fuse.
---	------------------------

**PREPARATION:**

Remove EFI fuse from R/B No.2.

CHECK:

Check continuity of EFI fuse.

OK:

Continuity

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.

DTC	P1605	Knock Control CPU Malfunction
------------	--------------	--------------------------------------

CIRCUIT DESCRIPTION

Refer to DTC P0325, P0330 (Knock Sensor 1, 2 Circuit Malfunction) on page [DI-59](#).

DTC No.	DTC Detecting Condition	Trouble Area
P1605	Engine control computer malfunction (for knock control)	• ECM

WIRING DIAGRAM

Refer to P0325, P0330 (Knock Sensor 1, 2 Circuit Malfunction) on page [DI-59](#).

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P1605) being output?
----------	--

YES

Go to relevant DTC chart.

NO

Check and replace ECM (See page [IN-28](#)).

DTC	P1780	Park/Neutral Position Switch Malfunction
------------	--------------	---

CIRCUIT DESCRIPTION

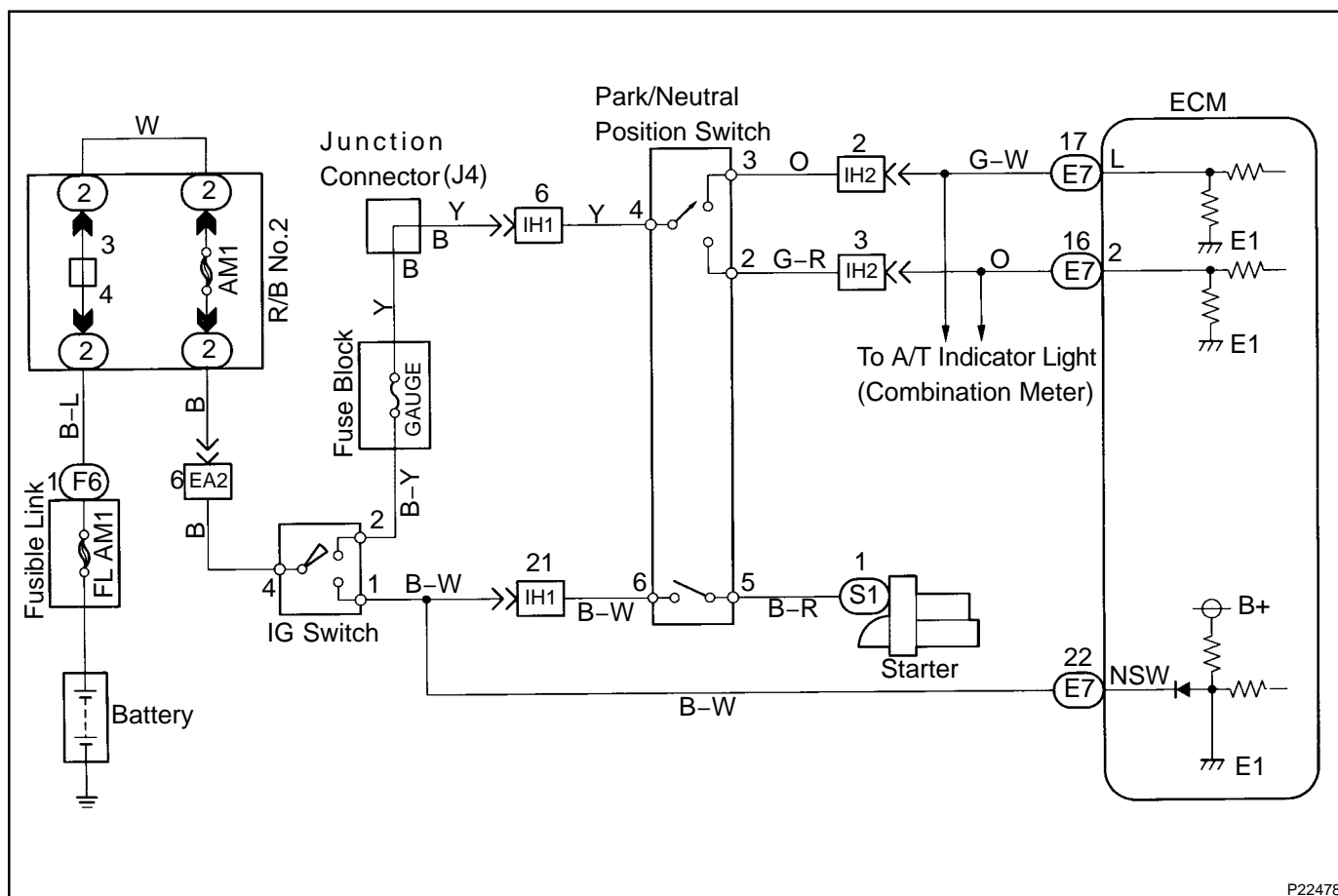
The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L or R position, the park/neutral position 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.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for "N", "2" and "L" position (2 trip detection logic)	<ul style="list-style-type: none"> • 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".

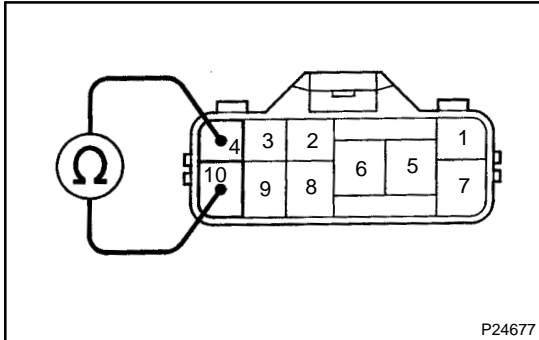
WIRING DIAGRAM



P22478

INSPECTION PROCEDURE

1 Check park/neutral position switch.

**PREPARATION:**

Disconnect park/neutral position switch connector.

CHECK:

Check continuity between each terminal shown below when the shift lever is positioned to each range.

OK:

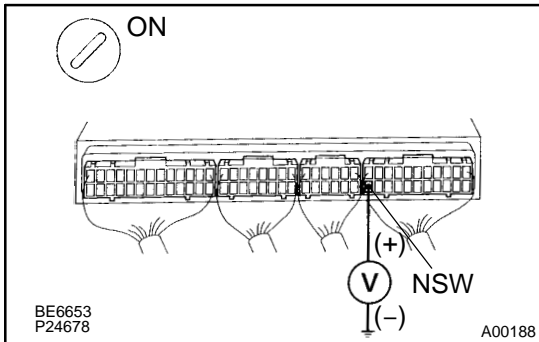
Shift Position	Terminal No. to continuity	Terminal No. to continuity
P	4 – 7	5 – 6
R	4 – 8	–
N	4 – 10	5 – 6
D	4 – 9	–
2	2 – 4	–
L	3 – 4	–

NG

Replace park/neutral position switch.

OK

2 Check voltage between terminal NSW of ECM connector and body ground.

**PREPARATION:**

Remove instrument panel speaker No.1 panel
(See page [SF-65](#)).

CHECK:

- Turn ignition switch ON.
- 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 – 14 V

OK

Check and replace ECM (See page [IN-28](#)).

NG

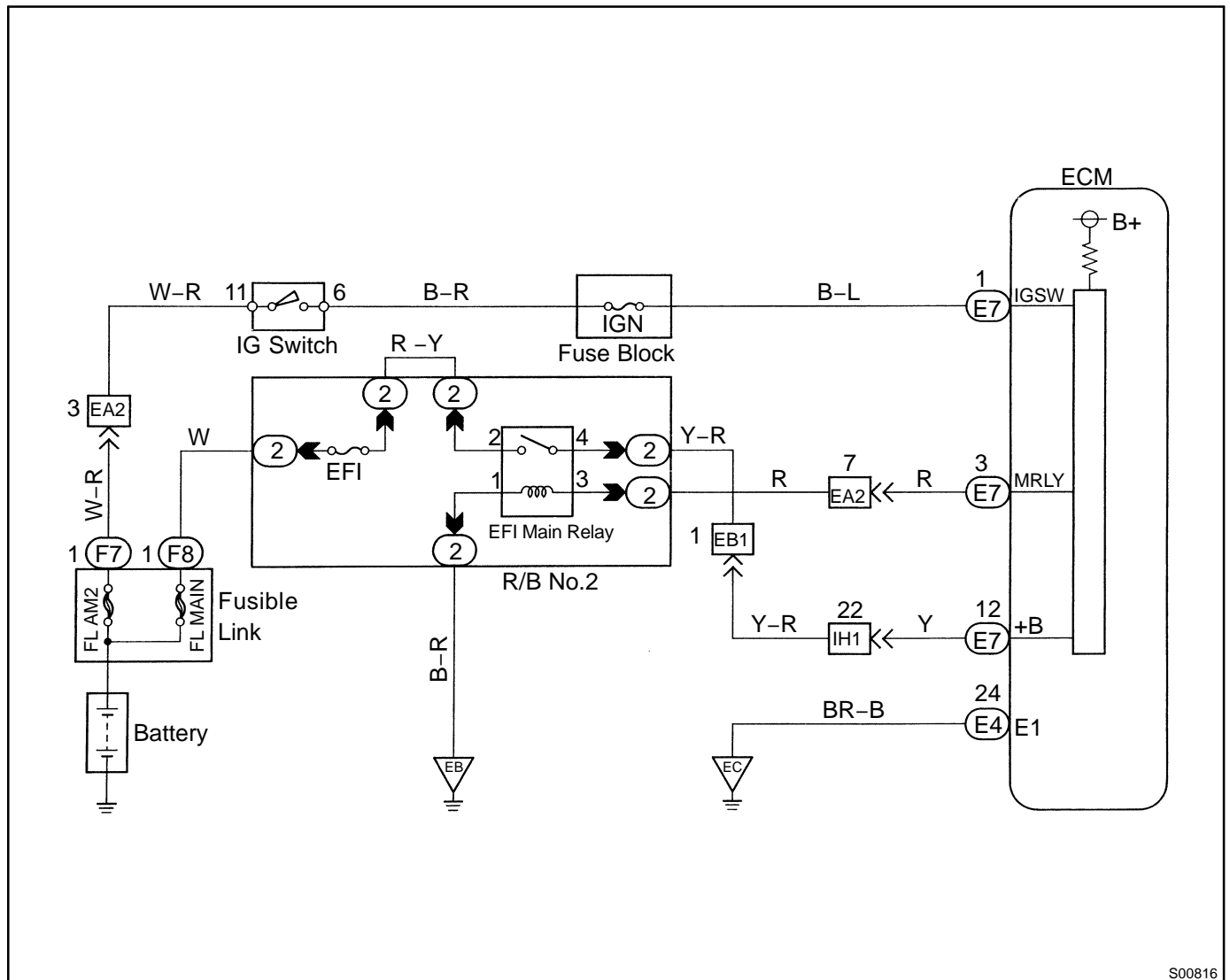
Check for open and short in harness and connector between ECM and park/neutral position switch (See page [IN-28](#)).

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 (Marking: EFI) and supplying power to the terminals +B of the ECM.

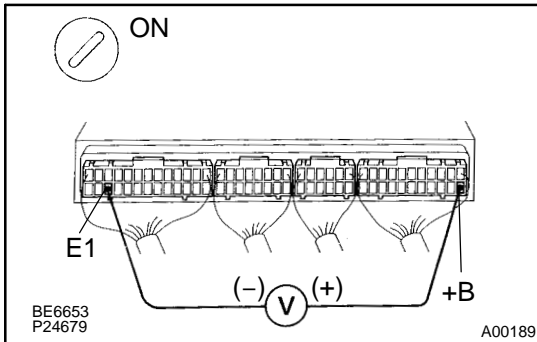
WIRING DIAGRAM



S00816

INSPECTION PROCEDURE

- 1 Check voltage between terminals +B and E1 of the ECM connector.**

**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals +B and E1 of the ECM connector.

OK:

Voltage: 9 – 14 V

OK

Proceed to next circuit inspection shown on matrix chart (See page [DI-19](#)).

NG

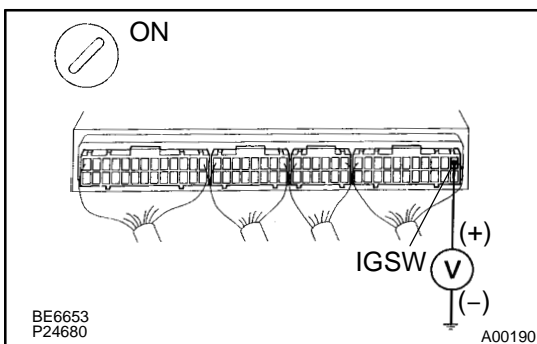
- 2 Check for open in harness and connector between terminal E1 of ECM connector and body ground (See page [IN-28](#)).**

NG

Repair or replace harness or connector.

OK

- 3 Check voltage between terminal IGSW of ECM connector and body ground.**

**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals IGSW of ECM and body ground.

OK:

Voltage: 9 – 14 V

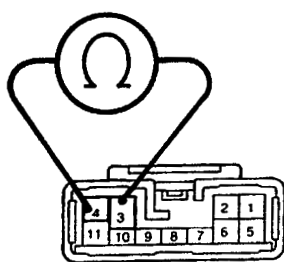
OK

Go to step 6.

NG

DI-112

DIAGNOSTICS – ENGINE

4 Check IGN fuse from fuse block.**NG****Check for short in all the harness and components connected to IGN fuse.****OK****5 Check ignition switch.**

P24681

PREPARATION:

- (a) Remove instrument lower finish panel.
- (b) Remove instrument cluster finish center panel No.2.

CHECK:

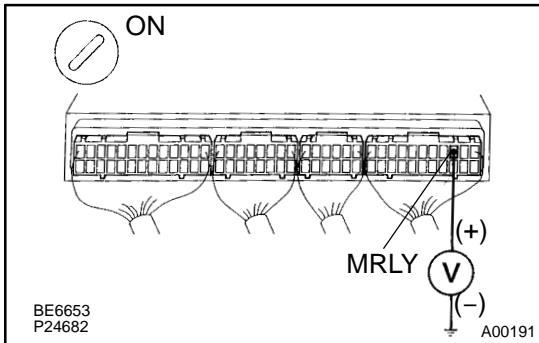
Check continuity between terminals.

OK:

Shift Position	Terminal No. to continuity	Terminal No. to continuity
LOCK	–	–
ACC	3 – 4	–
ON	2 – 3 – 4	6 – 11
START	1 – 2 – 4	5 – 6 – 11

NG**Replace ignition switch.****OK**

Check for open and short in harness and connector between battery and ignition switch and ECM.

6 Check voltage between terminal MREL of ECM connector and body ground.**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal MREL of ECM and body ground.

OK:

Voltage: 9 – 14 V

NG**Check and replace ECM.****OK****7 Check EFI fuse (Marking: EFI) (See page [DI-105](#)).****NG****Check for short in all the harness and components connected to EFI fuse.****OK****8 Check EFI main relay (Marking: EFI) (See page [SF-54](#)).****NG****Replace EFI main relay (Marking: EFI).****OK**

DI-114

DIAGNOSTICS - ENGINE

9	Check for open and short in harness and connector between terminal MREL of ECM connector and body ground (See page IN-28).
---	---

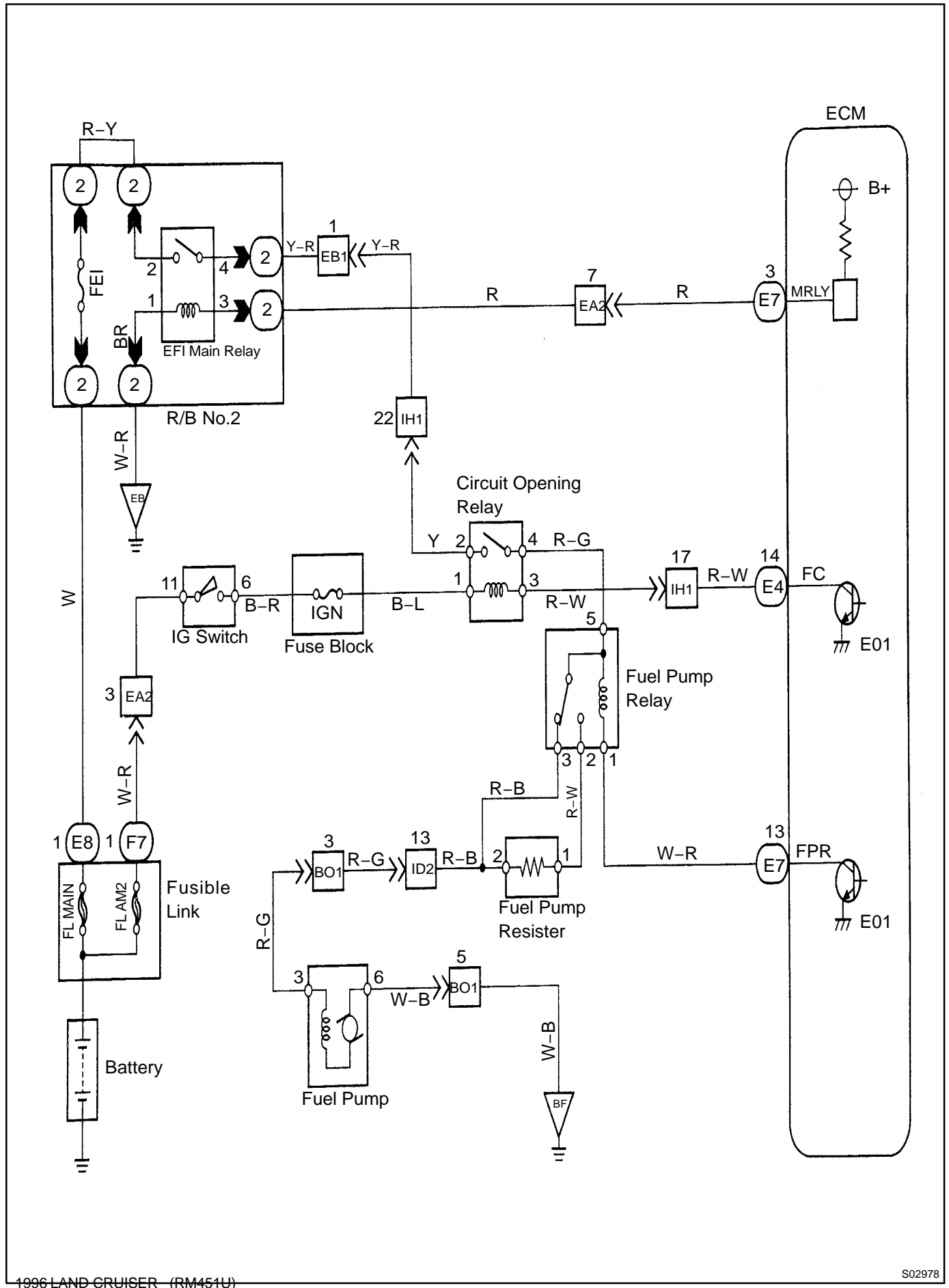
NG

Repair or replace harness or connector.

OK

Check for open and short in harness and connector between terminal +B of ECM connector and battery (See page [IN-28](#)).

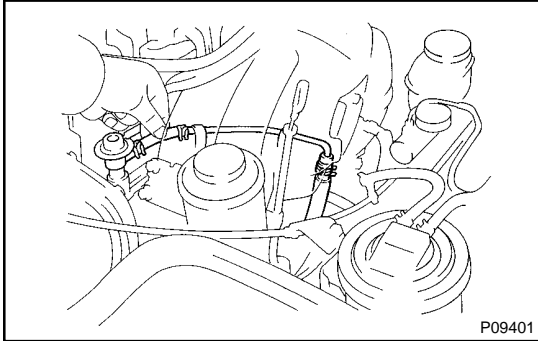
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

- | | |
|---|---|
| 1 | Connect the TOYOTA hand-held tester and check operation of fuel pump. |
|---|---|

**PREPARATION:**

- (a) Remove the fuse cover on the instrument panel.
- (b) Connect the TOYOTA hand-held tester to the DLC3.
- (c) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- (d) Use ACTIVE TEST mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel return hose when it is pinched off.

OK:

There is pressure in the fuel return hose.

HINT:

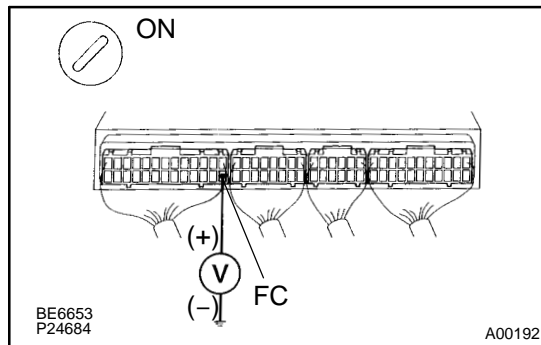
At this time, you will hear a fuel flowing noise.

OK**Go to step 4.****NG**

- | | |
|---|--|
| 2 | Check circuit opening relay (See page SF-56). |
|---|--|

NG**Replace circuit opening relay.****OK**

3 Check voltage between terminal FC of ECM connector and body ground.

**PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal FC of ECM and body ground.

OK:

Voltage: 9 – 14 V

OK

Go to step 5.

NG

Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page [IN-28](#)).

4 Connect the TOYOTA hand-held tester and check operation of fuel pump relay.

PREPARATION:

- (a) Connect the TOYOTA hand-held tester to the DLC3.
- (b) Start the engine.
- (c) Turn TOYOTA hand-held tester main switch ON.
- (d) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check operation of fuel pump relay when it is switched ON and OFF by the TOYOTA hand-held tester.

OK:

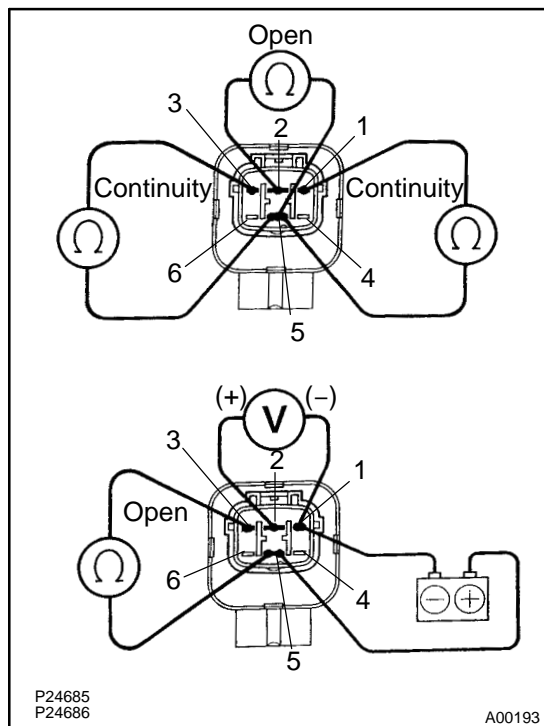
Operating noise can be heard from the relay.

OK

Go to step 8.

NG

DIAGNOSTICS - ENGINE

5 Check operation of fuel pump relay.**PREPARATION:**

- (a) Disconnect fuel pump relay connector.
- (b) Remove fuel pump relay.

CHECK:

Check continuity between terminals of fuel pump relay.

OK:

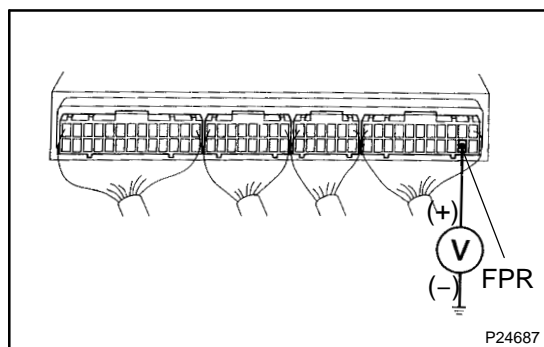
Terminals 3 and 5	Continuity
Terminals 2 and 5	Open
Terminals 1 and 5	Continuity (Reference value 80 Ω)

CHECK:

- (a) Apply battery voltage between terminals 1 and 5.
- (b) Measure voltage between terminals 1 and 2.

OK:

Terminals 1 and 2	Battery voltage
-------------------	-----------------

NG**Replace fuel pump relay.****OK****6 Check voltage between terminal FPR of ECM connector and body ground.****PREPARATION:**

- (a) Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- (b) Start the engine.

CHECK:

Measure voltage between terminal FPR of ECM and body ground while racing the engine.

OK:

Time after engine started	Voltage
60 seconds or more	0 - 3 V
Less than 60 seconds	9 - 14 V

OK**Check and replace ECM (See page [IN-28](#)).****NG**

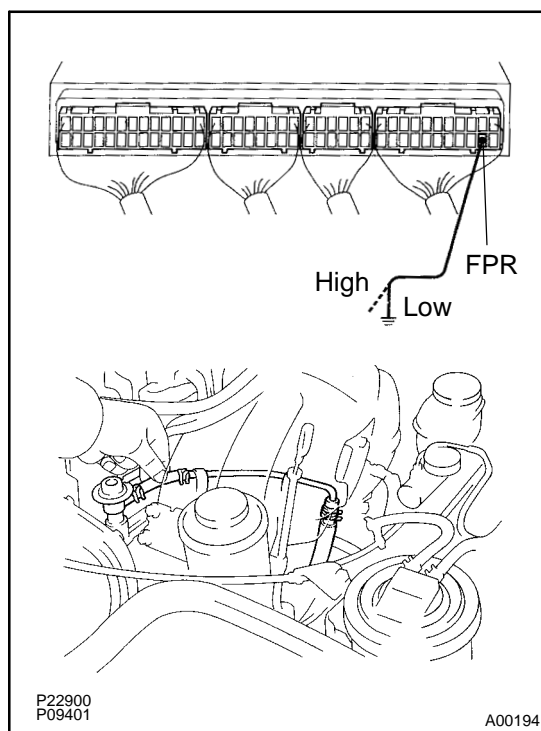
- 7** Check for open and short in harness and connector between terminal FPR of ECM connector and fuel pump relay (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

- 8** Check operation of fuel pump.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Connect the TOYOTA hand – held tester to the DLC3.
- Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- Use ACTIVE TEST mode to operate the fuel pump.

CHECK:

Check operation of fuel pump, when it is operated by the TOYOTA hand-held tester and terminal FPR of ECM is grounded and is not grounded.

OK:

There is pressure in the inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

FPR is grounded (Low speed)	FPR is not grounded (High speed)	
NG	NG	Go to step 9
NG	OK	Go to step 10
OK	NG	Repair or replace harness or connector between fuel pump relay and fuel pump.

- 9** Check fuel pump (See page [SF-6](#)).

NG

Repair or replace fuel pump.

OK

Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page [IN-28](#)).

10 Check fuel pump resistor. (See page [SF-58](#)).

NG

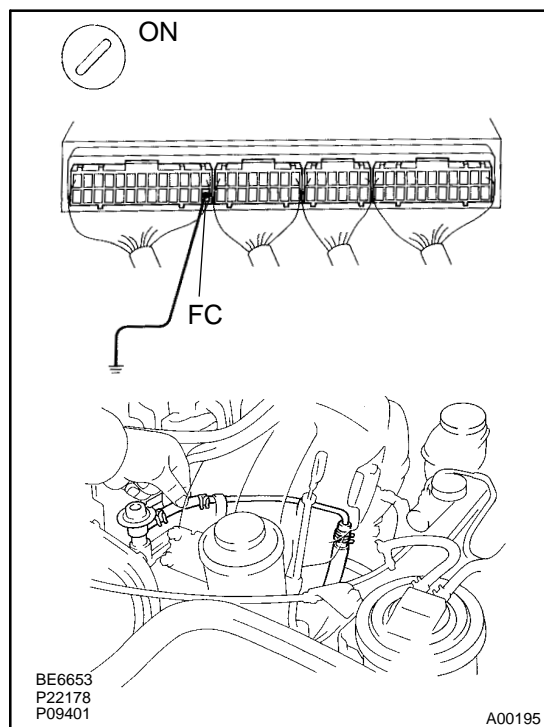
Replace fuel pump resistor.

OK

Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page [IN-28](#)).

OBD II scan tool (excluding TOYOTA hand-held tester)

1 Check fuel pump operation.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

- Connect between terminal FC of ECM and body ground.
- Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK

Go to step 4.

OK

DI-122

DIAGNOSTICS – ENGINE

2 Check circuit opening relay (See page [DI-84](#)).

NG

Replace circuit opening relay.

OK

3 Check voltage between terminal FC of ECM connector and body ground (See step 3 of TOYOTA hand-held tester).

OK

Go to step 4.

NG

Check for open and short in harness and connector between terminal FC of ECM and circuit opening relay and fuse block (See page [IN-28](#)).

4 Check operation of fuel pump relay (See step 5 of TOYOTA hand-held tester).

NG

Replace fuel pump relay.

OK

5 Check voltage between terminal FPR of ECM connector and body ground (See step 6 of TOYOTA hand-held tester).

NG

Check and replace ECM (See page [IN-28](#)).

6 Check for open and short in harness and connector between terminal FC of ECM connector and fuel pump relay (See page [IN-28](#)).

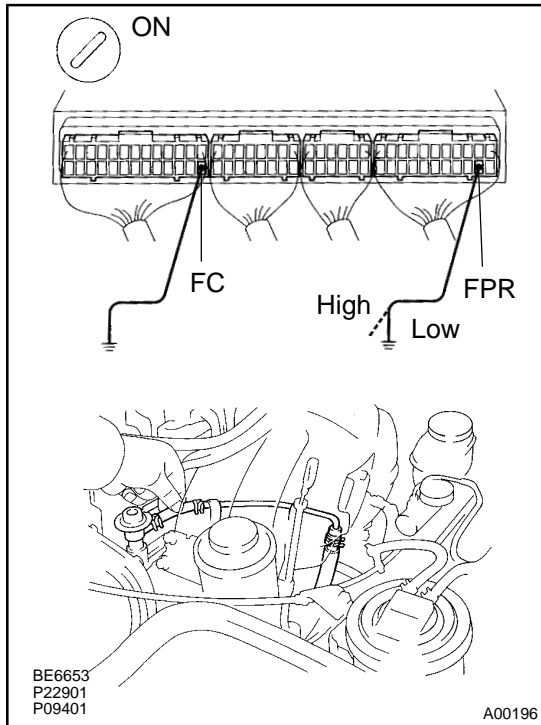
NG

Repair or replace harness or connector.

OK

1996 LAND CRUISER (RM451U)

7 Check operation of fuel pump.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

- Connect terminal FC of ECM and body ground.
- Check operation of fuel pump when terminal FPR of ECM is grounded and is not grounded.

OK:

There is pressure in the inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

FPR is grounded (Low speed)	FPR is not grounded (High speed)	
NG	NG	Go to step 8
NG	OK	Go to step 9
OK	NG	Repair or replace harness or connector between fuel pump relay and fuel pump.

8 Check fuel pump (See page [SF-6](#)).

NG

Repair or replace fuel pump.

OK

Check for open or short in harness and connector between EFI main relay (Marking: EFI) and circuit opening relay and fuel pump relay and fuel pump and body ground (See page [IN-28](#)).

DI-124

DIAGNOSTICS - ENGINE

9	Check fuel pump resistor (See page SF-58).
---	---

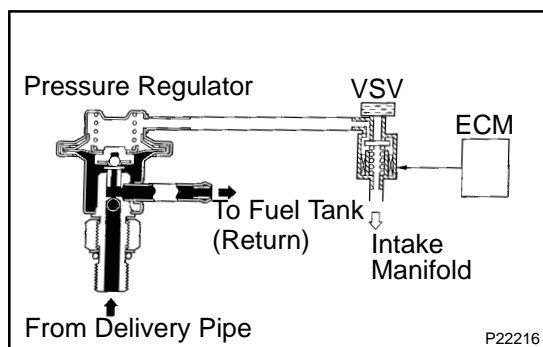
NG

Replace fuel pump resistor.

OK

Check for open and short in harness and connector between fuel pump relay and fuel pump resistor and fuel pump (See page [IN-28](#)).

Fuel Pressure Control Circuit



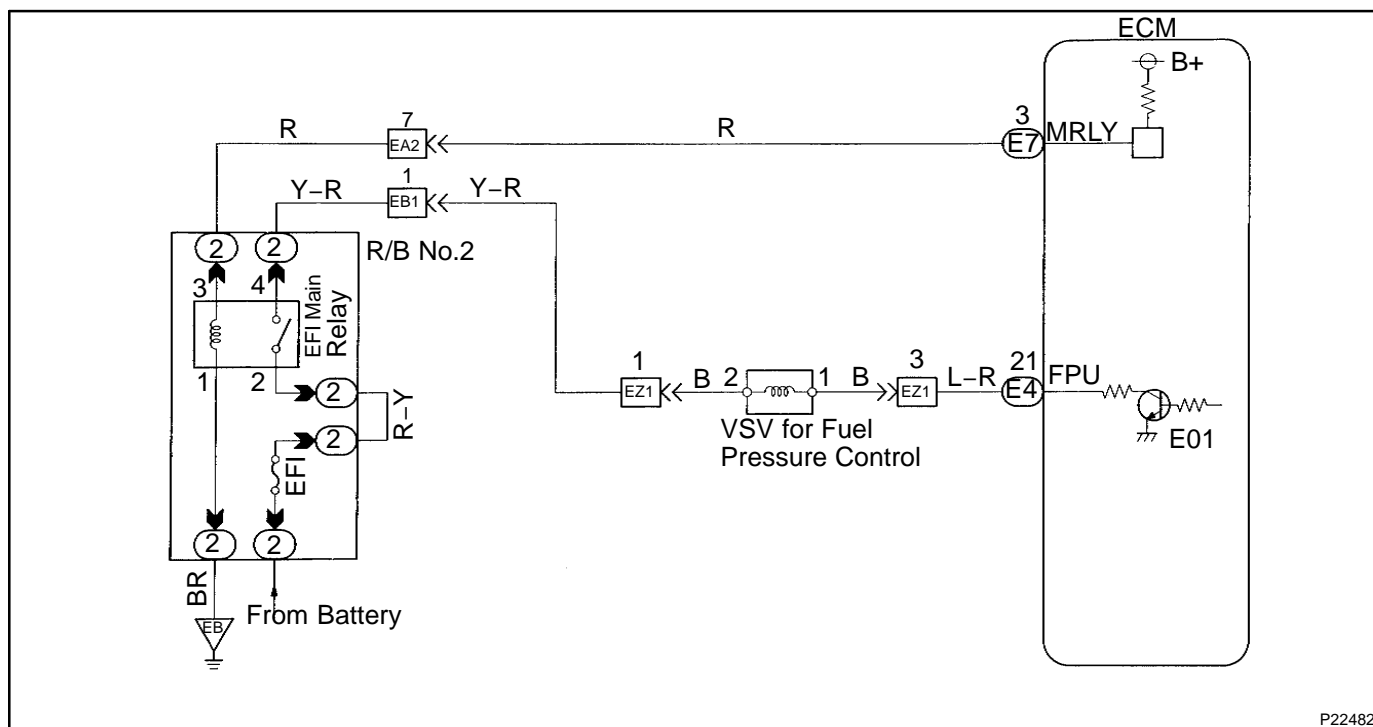
CIRCUIT DESCRIPTION

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 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. 120 sec. after the engine is started.

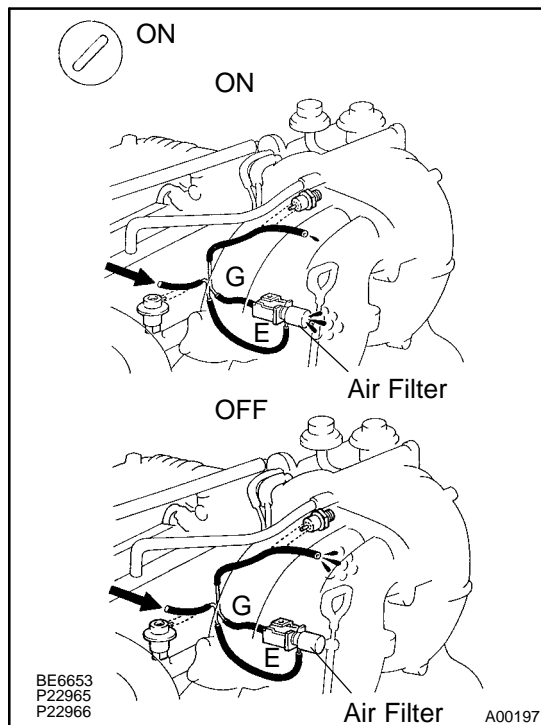
WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

- | | |
|---|--|
| 1 | Connect the TOYOTA hand-held tester and check operation of VSV for fuel pressure control. |
|---|--|

**PREPARATION:**

- Remove the fuse cover on the instrument panel.
- Connect the TOYOTA hand-held tester to the DLC3.
- Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

CHECK:

Check operation of VSV when VSV is operated by the TOYOTA hand-held tester.

OK:

VSV is ON:

Air from pipe E is flowing out through the air filter.

VSV is OFF:

Air from pipe E is flowing out through pipe G.

OK

Check and repair fuel pressure regulator (See page [SF-19](#)).

NG

- | | |
|---|--|
| 2 | Check VSV for fuel pressure control (See page SF-59). |
|---|--|

NG

Replace VSV for fuel pressure control.

OK

- 3** Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

Check and replace ECM (See page [IN-28](#)).

OBD II scan tool (excluding TOYOTA hand-held tester)

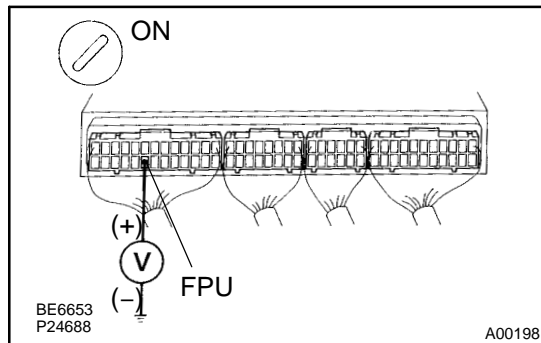
- 1** Check VSV for fuel pressure control (See page [SF-59](#)).

NG

Replace VSV for fuel pressure control.

OK

- 2** Check voltage between terminal FPU of ECM connector and body ground.



PREPARATION:

- Remove instrument panel speaker No.1 panel (See page [SF-65](#)).
- Turn ignition switch ON.

CHECK:

Measure voltage between terminal FPU of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG

Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page [IN-28](#)).

OK

DI-128

DIAGNOSTICS – ENGINE

3	Check fuel pressure regulator (See page SF-19).
---	--

NG

Repair or replace fuel pressure regulator.

OK

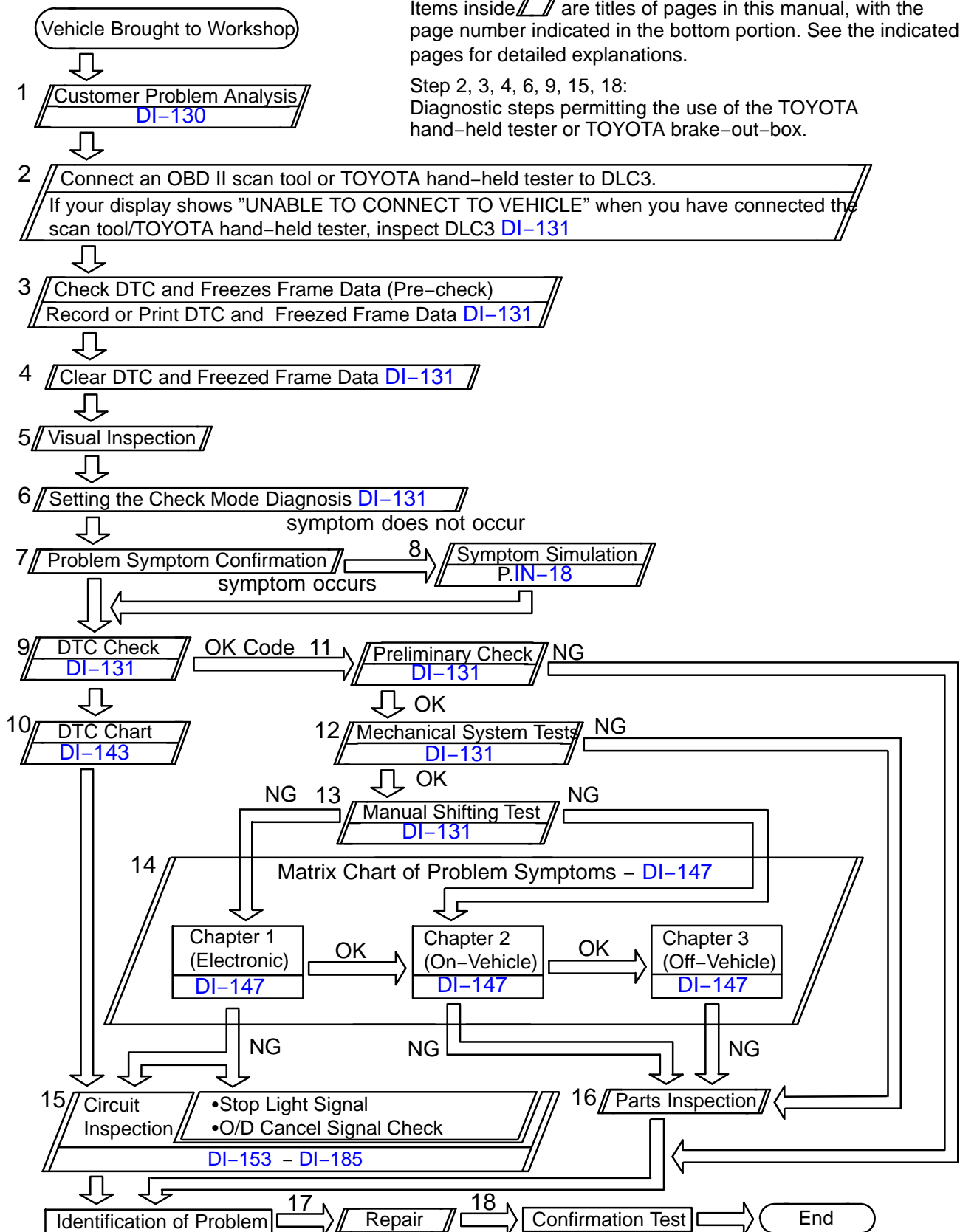
Check and replace ECM (See page [IN-28](#)).

AUTOMATIC TRANSMISSION

HOW TO PROCEED WITH TROUBLESHOOTING

DISK4-03

Troubleshoot in accordance with the procedure on the following page.



DI-130

DIAGNOSTICS - AUTOMATIC TRANSMISSION

DISK6-01

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control
System Check SheetInspector'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?	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)

Symptoms	<input type="checkbox"/> Vehicle does not move (<input type="checkbox"/> Any position <input type="checkbox"/> Particular position)
	<input type="checkbox"/> No up-shift (<input type="checkbox"/> 1st → 2nd <input type="checkbox"/> 2nd → 3rd <input type="checkbox"/> 3rd → O/D)
	<input type="checkbox"/> No down-shift (<input type="checkbox"/> O/D → 3rd <input type="checkbox"/> 3rd → 2nd <input type="checkbox"/> 2nd → 1st)
	<input type="checkbox"/> Lock-up malfunction
	<input type="checkbox"/> Shift point too high or too low
	<input type="checkbox"/> Harsh engagement (<input type="checkbox"/> N → D <input type="checkbox"/> Lock-up <input type="checkbox"/> Any drive position)
	<input type="checkbox"/> Slip or shudder
	<input type="checkbox"/> No kick-down
	<input type="checkbox"/> Others ()

Check Item	Malfunction Indicator Lamp	<input type="checkbox"/> Normal <input type="checkbox"/> Remains ON
------------	----------------------------	---

DTC Check	1st Time	<input type="checkbox"/> Normal code <input type="checkbox"/> Malfunction code (Code)
	2nd Time	<input type="checkbox"/> Normal code <input type="checkbox"/> Malfunction code (Code)

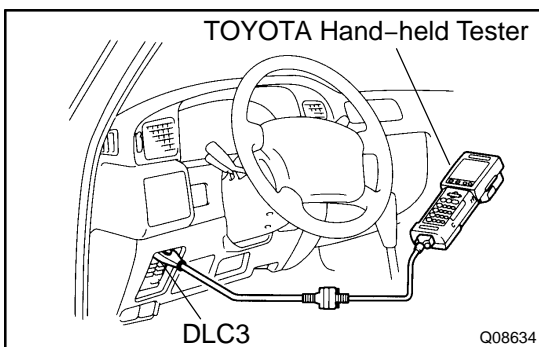
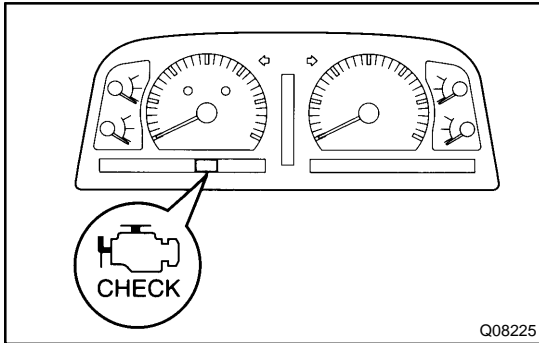
PRE-CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand-held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on-board computer 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 affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page [DI-13](#)).

If the malfunction does not occurs in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.

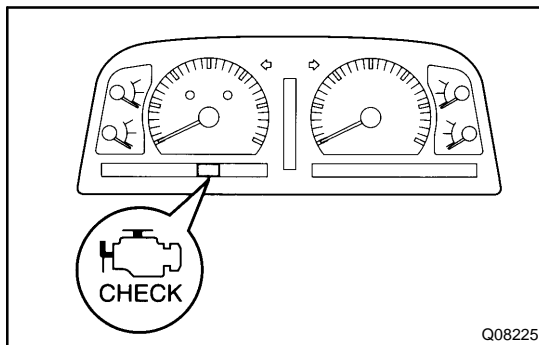


- To check the DTCs, connect an OBD II scan tool or TOYOTA hand-held tester to the DLC3 on the vehicle. The OBD II scan tool or TOYOTA hand-held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the OBDII scan tool's instruction book).
- DTCs 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 page [DI-143](#)).

- 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 DTCs use 2 trip detection logic(*) to prevent erroneous 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) (See step 3).

- *2 trip detection logic:
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory.

If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up.



2. Normal Mode: INSPECT DIAGNOSIS

- (a) Check the MIL.
- (1) The MIL lights up when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page [BE-2](#)).

- (2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

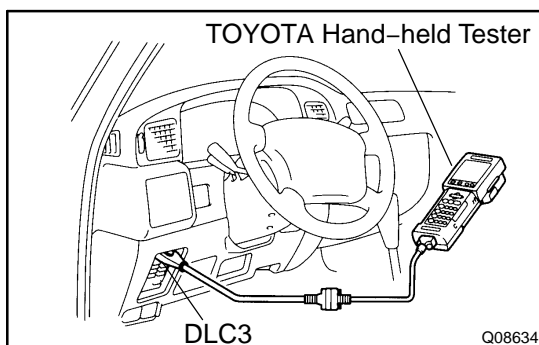
- (b) Check the DTC.

NOTICE:

TOYOTA hand-held tester only:

When the diagnostic system is switched from the normal mode to the check mode, it erases all DTCs and freeze frame data recorded in the normal mode. So before switching modes, always check the DTCs and freeze frame data, and note them down.

- (1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester.
- (2) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3 in the fuse box at the lower left of the instrument panel.
- (3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand-held tester switch ON.



- (4) Use the OBD II scan tool or TOYOTA hand-held tester to check the DTCs and freeze frame data. Note them down (For operating instructions, see the OBD II scan tool's instruction book).
- (5) See page [DI-143](#) to confirm the details of the DTCs.

NOTICE:

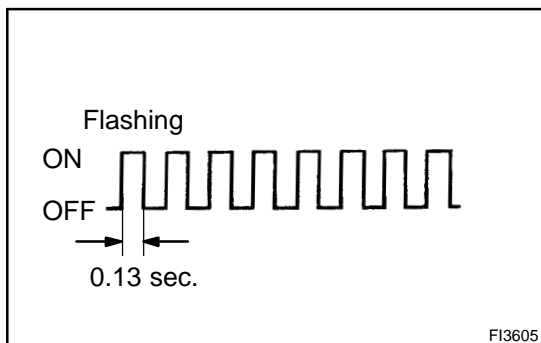
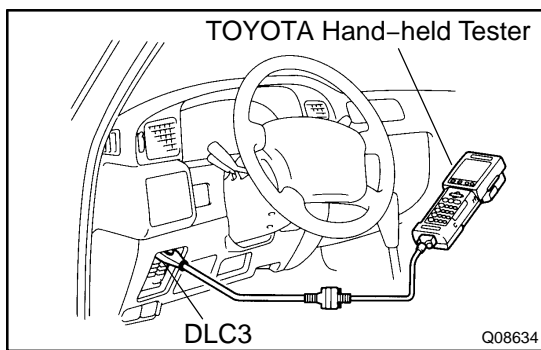
When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand-held tester) to check the DTCs, use the normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated for the 1st time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. Check Mode:**INSPECT DIAGNOSIS****HINT:**

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 check mode.

- (a) Check the DTC.
 - (1) Check the initial conditions.
 - Battery positive voltage 11 V or more.
 - Throttle valve fully closed.
 - Transmission in P position.
 - Air conditioning switched off.
 - (2) Turn the ignition switch OFF.
 - (3) Prepare the TOYOTA hand-held tester.
 - (4) Connect the TOYOTA hand-held tester to the DLC3 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 from the normal mode to the check mode (Check that the MIL flashes).
 - (7) Start the engine (The MIL goes).
 - (8) Simulate the conditions of the malfunction described by the customer.

**NOTICE:**

Leave the ignition switch ON until you have checked the DTCs etc.

- (9) After simulating the malfunction conditions, use the TOYOTA hand-held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

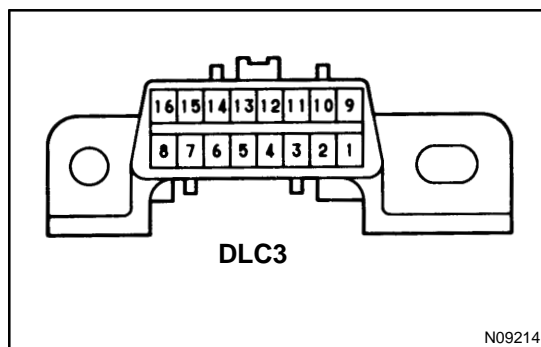
Take care not to turn the ignition switch OFF. Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all DTCs, etc. are erased.

- (10) After checking the DTC, inspect the applicable circuit.
- (b) Clear the DTC.
- The following actions will erase the DTCs and freeze frame data.

Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions.).

NOTICE:

If the TOYOTA hand-held tester switches the ECM from the normal mode to the check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during the check mode, the DTCs and freezed frame data will be erased.



- (c) Check the DLC3.
- The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection/Voltage or Resistance	Condition
2	Bus ⊕ Line/Pulse generation	During communication
4	Chassis Ground – Body/1 Ω or less	Always
5	Signal Ground – Body/1 Ω or less	Always
16	Battery Positive – Body/9 – 14 V or 1 Ω or less	Always

HINT:

If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA hand-held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect the DLC3 on the original vehicle.
- 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.

4. CHECK FOR INTERMITTENT PROBLEMS

TOYOTA hand-held tester only:

By putting the vehicle's ECM in the 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.

- (1) Clear the DTC (See step 3).
- (2) Set the check mode (See step 3).
- (3) Do a simulation test (See page [IN-18](#)).
- (4) Check the connector connection and terminal (See page [IN-28](#)).
- (5) Visual check and contact pressure (See page [IN-28](#)).
- (6) Handle the connector (See page [IN-28](#)).

5. ROAD TEST**NOTICE:**

Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).

- (a) D position test in NORM and PWR pattern positions.

Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position and check the following:

HINT:

When the 2nd start switch is on, there is no 1 → 2 up-shift and 2 → 1 down-shift.

- (1) 1 → 2, 2 → 3 and 3 → O/D up-shift takes place, and shift point should conform to those shown in the automatic shift schedule. Conduct a test under both Normal and Power patterns.

HINT:

There is no O/D up-shift or lock-up when the coolant temperature is below 55°C (131°F).

Evaluation:

- If there is no 1 → 2 up-shift:
Shift solenoid valve No. 2 is stuck.
1-2 shift valve is stuck.
- If there is no 2 → 3 up-shift:
Shift solenoid valve No. 1 is stuck.
2-3 shift valve is stuck.
- If there is no 3 → O/D up-shift:
3-4 shift valve is stuck.
- If the shift point is defective:
Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve etc., are defective.

- If the lock-up is defective:
 Lock-up solenoid is stuck.
 Lock-up control valve is stuck.
 Lock-up signal value is stuck.
- (2) In the same way, check the shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up-shift.

Evaluation:

If the shock is excessive:

Line pressure is too high.

Accumulator is defective.

Check ball is defective.

- (3) 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 noises and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc.

- (4) 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.
- (5) Check for abnormal shock and slip at kick-down.
- (6) Check for the lock-up mechanism.
 - Drive in D position, O/D gear, at a steady speed (lock-up ON) of about 95 km/h (59 mph).
 - 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.

- (b) 2 position test.

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check the following points:

HINT:

When the 2nd start switch is on, there is no 1 → 2 up-shift and 2 → 1 down-shift.

- (1) Check to see that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule.

HINT:

There is no O/D up-shift and lock-up in the 2 position.

- (2) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

Evaluation:

If there is no engine braking effect:

2nd coast brake is defective.

- (3) Check for abnormal noise at acceleration and deceleration, and for shock at up-shift and down-shift.
- (c) L position test.
 - (1) While running in the L position, check to see that there is no up-shift to 2nd gear.
 - (2) While running in the L position, release the accelerator pedal and check the engine braking effect.

Evaluation:

If there is no engine braking effect:

1st and reverse brake is defective.

- (3) Check for abnormal noise during acceleration and deceleration.
- (d) R position test.
 Shift into the R position and fully depress the accelerator pedal and check for slipping.

(e) P position test.

Stop the vehicle on a grade (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.

6. BASIC INSPECTION

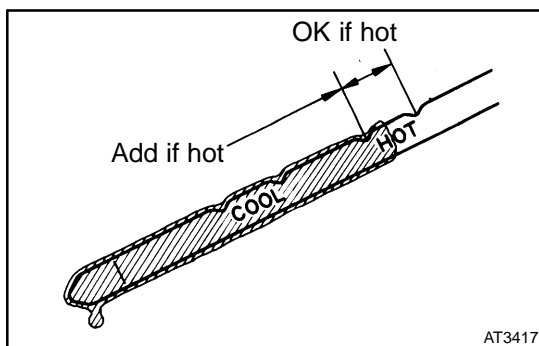
(a) Check the fluid level.

HINT:

- Drive the vehicle so that the engine and transmission are at normal operating temperature.

Fluid temp.: 70 – 80°C (158 – 176°F)

- Only use the COOL range on the dipstick as a rough reference when the ATF is replaced or the engine does not run.



- (1) Park the vehicle on a level surface and set the parking brake.
- (2) 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.
- (3) Pull out the dipstick and wipe it clean.
- (4) Push it back fully into the pipe.
- (5) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add new fluid.

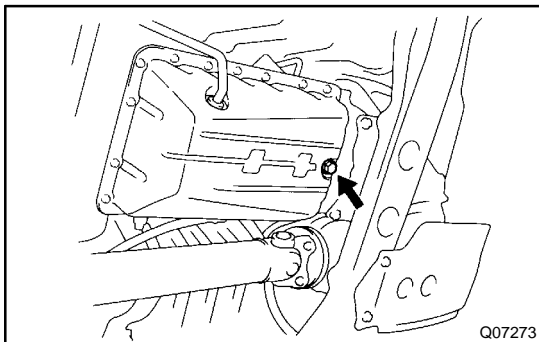
Fluid type: ATF DEXRON®II

NOTICE:

Do not overfill.

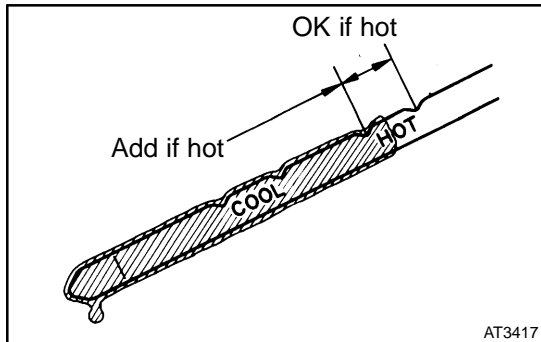
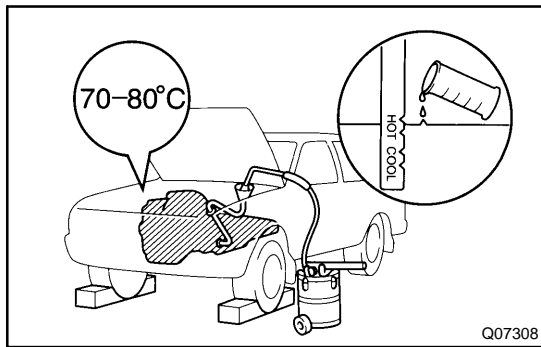
(b) Check the fluid condition.

If the fluid smells burnt or is black, replace it.



(c) Replace the ATF.

- (1) Remove the drain plug and drain the ATF.
- (2) Reinstall the drain plug securely.



- (3) With the engine OFF, add new fluid through the oil filler pipe.

Fluid type: ATF DEXRON®II

Capacity:

Dry fill: 11.0 liters (11.6 US qts, 9.7 Imp. qts)

Drain and refill: 1.9 liters (2.0 US qts, 1.7 Imp. qts)

- (4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

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

- (6) Check the fluid level at the normal operating temperature 70 – 80°C (158 – 176°F) and add as necessary.

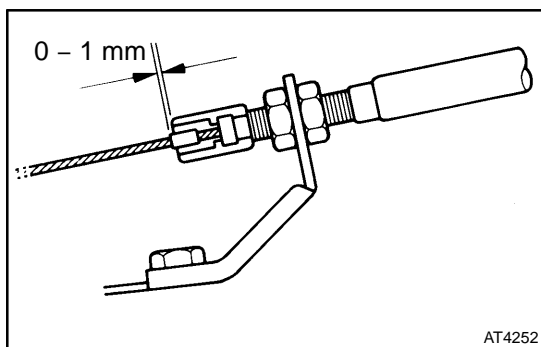
NOTICE:

Do not overfill.

- (d) Check the fluid leaks.

Check for leaks in the transmission.

If there are leaks, it is necessary to repair or replace O-rings, Seal packings, oil seals, plugs or other parts.

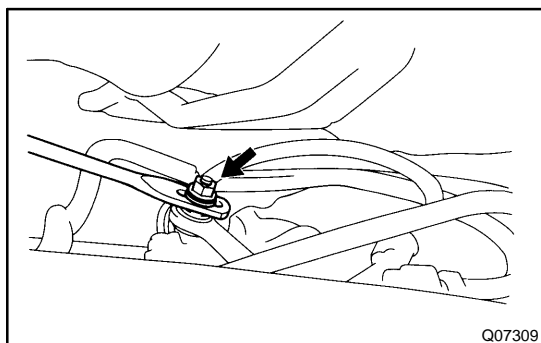


- (e) Inspect and adjust the throttle cable.

- (1) Check that the throttle valve is fully closed.
- (2) Check that the inner cable is not slack.
- (3) 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.

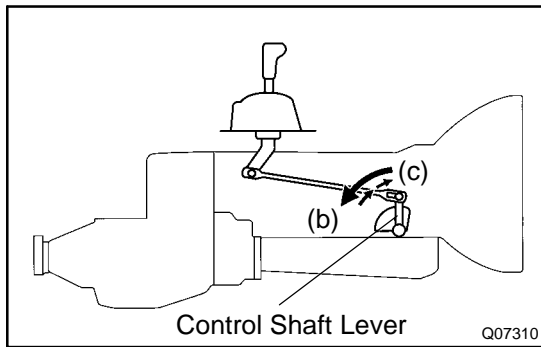


- (f) Inspect and adjust the shift lever position.

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.

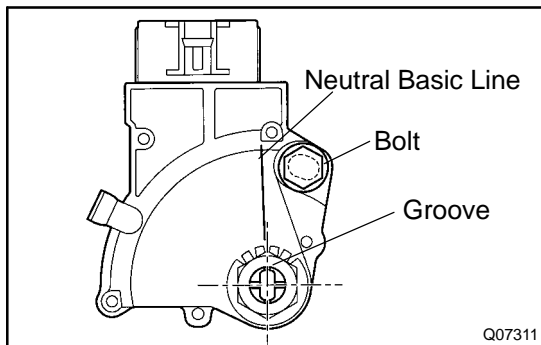
- (1) Loosen the nut on the control rod.
- (2) Push the control rod fully rearward.



- (3) Return the control shaft lever 2 notches to N position.
- (4) Set the shift lever to N position.
- (5) While holding the shift lever lightly toward the R position side, adjust the control rod nut.
- (6) Tighten the control rod nut.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

- (7) 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 position.



- (g) 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 stated above, carry out the following adjustment procedure.

- (1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
- (2) Align the groove and neutral basic line.
- (3) Hold in position and tighten the bolt.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

For continuity inspect of the park/neutral position switch, see page [DI-169](#).

- (h) Check the idle speed.

Idle speed:

650 ± 50 rpm (In N position and air conditioner OFF)

7. MECHANICAL SYSTEM TESTS

- (a) Measure the stall speed.

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- Do the that at normal operating ATF 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 doing the test.
- (1) Chock the 4 wheels.
 - (2) Connect an OBD II scan tool or TOYOTA hand-held tester to the DLC3.
 - (3) Fully apply the parking brake.
 - (4) Keep your left foot pressed firmly on the brake pedal.
 - (5) Start the engine.

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

- (6) 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: 1,950 ± 150 rpm

- (7) Do the same test in R position.

Stall speed: 1,950 ± 150 rpm

Evaluation:

Problem	Possible cause
Stall speed low in D and R positions	<ul style="list-style-type: none"> • Engine output may be insufficient • Stator one-way clutch is operating properly <p>HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty.</p>
Stall speed high in D position	<ul style="list-style-type: none"> • Line pressure too low • Forward clutch slipping • No. 2 one-way clutch not operating properly • O/D one-way clutch not operating properly
Stall speed high in R position	<ul style="list-style-type: none"> • Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • O/D clutch slipping
Stall speed high in D and R positions	<ul style="list-style-type: none"> • Line pressure too low • Improper fluid level • O/D one-way clutch not operating properly

- (b) Measure the time lag.

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 O/D direct clutch, forward clutch, direct clutch and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

- (1) Fully apply the parking brake.

- (2) Start the engine and check idle speed.

Idle speed: 650 ± 50 rpm (In N position and air conditioner OFF)

- (3) 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 the same manner, measure the time lag for N → R.

Time lag: N → D Less than 1.2 seconds

In the same way, measure the time lag for N → R.

Time lag: N → R Less than 1.5 seconds

If N → D time or N → R time lag is longer than specified:

Evaluation:

Problem	Possible cause
N → D time lag is longer	<ul style="list-style-type: none"> • Line pressure too low • Forward clutch worn • O/D one-way clutch not operating properly
N → R time lag is longer	<ul style="list-style-type: none"> • Line pressure too low • Direct clutch worn • 1st and reverse brake worn • O/D one-way clutch not operating properly

8. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- Do the test at normal operation ATF 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 doing the test.
- Be careful to prevent SST's hose from interfering with the exhaust pipe.

(1) Warm up the ATF.

(2) Remove the test plug on the transmission case right side and connect SST (See page [AT-18](#) for the location to connect SST).

SST 09992-00094 (09992-00150, 09992-00270)

(3) Fully apply the parking brake and chock the 4 wheels.

(4) Start the engine and check idling speed.

(5) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(6) Measure the line pressure when the engine is idling.

(7) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE:

Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches the specified stall speed.

(8) In the same manner, do the test in R position.

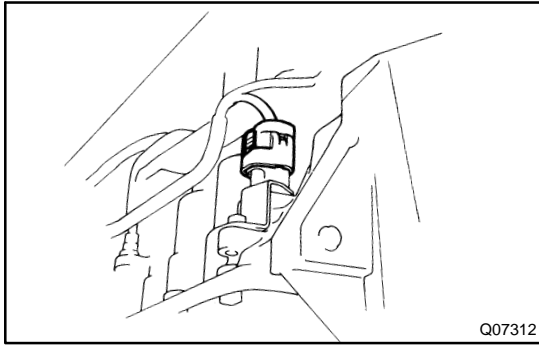
Specified line pressure:

Condition	D position kPa (kgf/cm ² , psi)	R position kPa (kgf/cm ² , psi)
Idling	422 – 481 (4.3 – 4.9, 61 – 70)	510 – 608 (5.2 – 6.2, 74 – 88)
Stall	1,285 – 1,530 (13.1 – 15.6, 128 – 153)	1,579 – 1,932 (16.1 – 19.7, 158 – 193)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

Evaluation:

Problem	Possible cause
If the measured value at all positions are higher	<ul style="list-style-type: none"> • Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured value at all positions are lower	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	<ul style="list-style-type: none"> • R position circuit fluid leakage • Direct clutch defective • 1st and reverse brake defective



Q07312

9. MANUAL SHIFTING TEST

The purpose of this manual shifting test is to determine whether a problem is caused by either mechanical or electrical factors. Disconnecting the solenoid wire disables electrically-controlled automatic gear shifting. In this case, operating the shift lever is the only way to shift the transmission gear. If the gear is not changed by shift lever operation, it is assumed that there is a mechanical problem.

- (a) Turn the ignition switch OFF.
- (b) Disconnect the solenoid wire connector.
- (c) Warm up the engine.
- (d) Drive the vehicle.
- (e) Check the transmission operation when the shift lever is moved into L, 2 and D positions.

Standard:

Shift Lever	Operation
L to 2	Shift up
2 to D	Shift up
D to 2	Shift down
2 to L	Shift down

- (f) Turn the ignition switch OFF.
- (g) Connect the solenoid wire connector.
- (h) Clear DTCs.

HINT:

When the solenoid wire is disconnected, the transmission gear will be set as listed below:

Shift Lever	Gear
P	Parking
R	Reverse
N	Neutral
D	O/D (4th)
2	3rd
L	1st

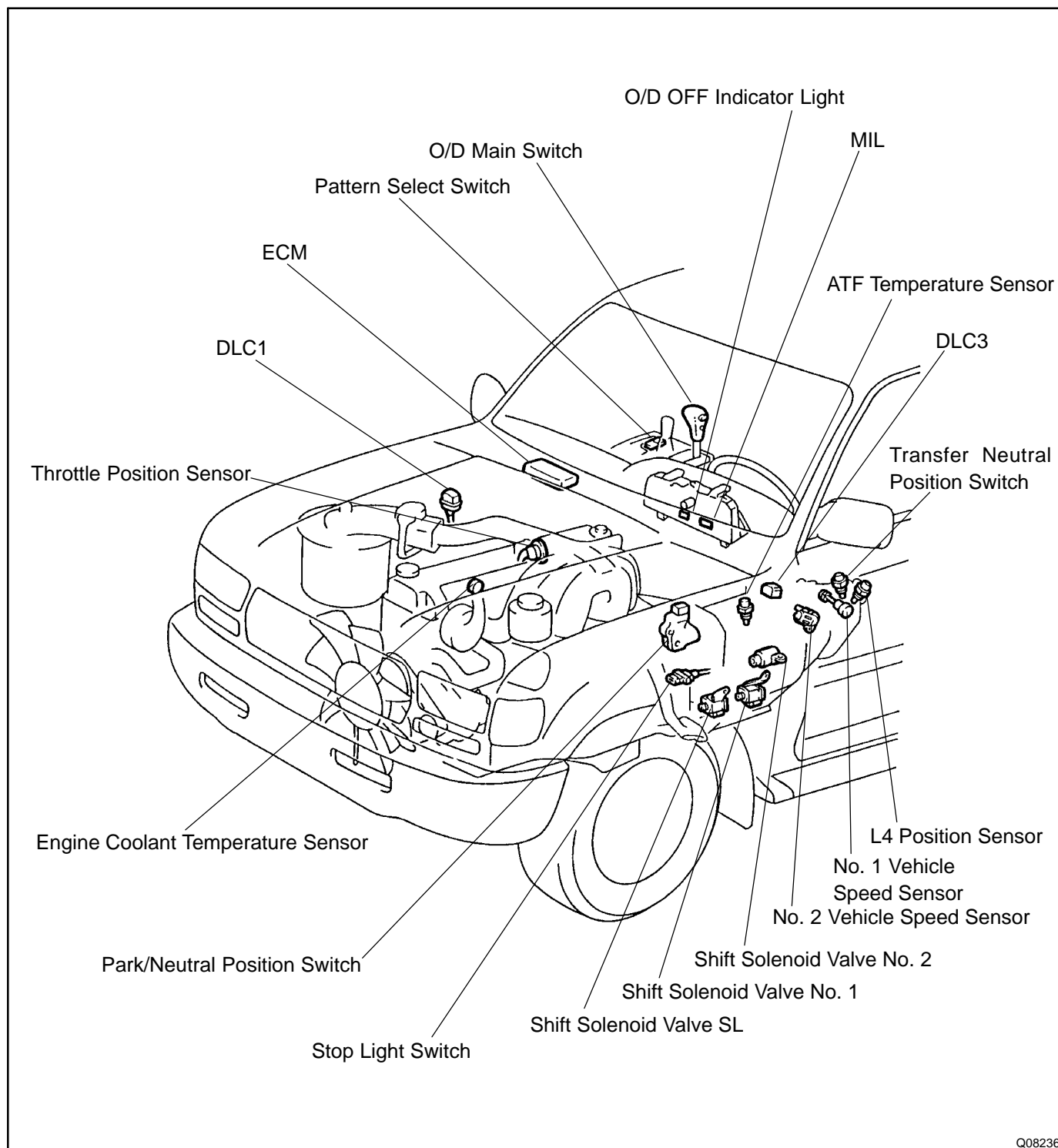
DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0500 (DI-153)	Vehicle Speed Sensor Malfunction (No. 1 Vehicle Speed Sensor)	<ul style="list-style-type: none"> • Open or short in No. 1 vehicle speed sensor circuit • No. 1 vehicle speed sensor • ECM 	●	○
P0710 (DI-154)	Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor)	<ul style="list-style-type: none"> • Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM 	●	○
P0750 (DI-156)	Shift Solenoid A Malfunction (Shift Solenoid Valve No. 1)	<ul style="list-style-type: none"> • Shift solenoid valve No. 1 is stuck open or closed • Valve body is blocked up or stuck 	●	○
P0753 (DI-157)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No. 1)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve No. 1 circuit • Shift solenoid valve No. 1 • ECM 	●	○
P0755 (DI-156)	Shift Solenoid B Malfunction (Shift Solenoid Valve No. 2)	<ul style="list-style-type: none"> • Shift solenoid valve No. 2 is stuck open or closed • Valve body is blocked up or stuck 	●	○
P0758 (DI-157)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No. 2)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve No. 2 circuit • Shift solenoid valve No. 2 • ECM 	●	○
P0770 (DI-161)	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	<ul style="list-style-type: none"> • Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock-up clutch 	●	○
P0773 (DI-163)	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM 	●	○
P1700 (DI-166)	Speed Sensor No. 2 Circuit Malfunction (No. 2 Vehicle Speed Sensor)	<ul style="list-style-type: none"> • Open or short in No. 2 vehicle speed sensor circuit • No. 2 vehicle speed sensor • ECM 	●	○
P1780 (DI-169)	Park/Neutral Position Switch Malfunction	<ul style="list-style-type: none"> • Short in park/neutral position switch circuit • Park/neutral position switch • ECM 	●	○

*: ● ...MIL light up

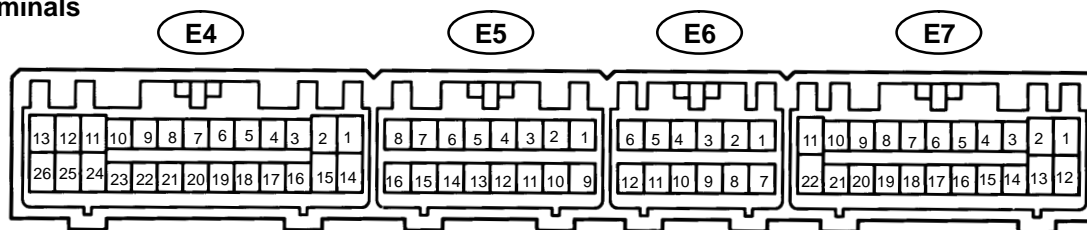
PARTS LOCATION



Q08236

TERMINALS OF ECM

ECM Terminals



Vd-76-2

D00115

Symbols (Terminal No.)	Wiring Color	Condition	STD Voltage (V)
SPD (E7-8) – E1 (E4-24)	L-W – BR-B	Disconnect cruise control connector and IG ON Stationary	Below 1.5
		Disconnect cruise control connector and IG ON Turn one rear wheel slowly	Pulse signal is output Below 1.5 ↔ 4 – 6
S1 (E4-10) – E1 (E4-24)	R – BR-B	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
S2 (E4-9) – E1 (E4-24)	R-Y – BR-B	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
SL (E4-8) – E1 (E4-24)	R-L – BR-B	IG OFF Disconnect ECM connector	11 – 15 Ω
		IG ON	Below 1.5
		Vehicle driving under lock-up position	9 – 14
SP2 ⁺ (E6-2) – SP ⁻ (E6-8)	V – V-G	IG OFF Disconnect ECM connector	560 – 680 Ω
		Engine is running	Pulse signal is output Below 1.5 ↔ 4 – 6
OD1 (E7-18) – E1 (E4-24)	G-O – BR-B	IG ON	9 – 14
OD2 (E7-19) – E1 (E4-24)	P-L – BR-B	O/D main switch ON (O/D OFF)	Below 3
		O/D main switch OFF (O/D ON)	9 – 14
OIL (E5-12) – E2 (E5-9)	R-W – BR-B	ATF temperature: 110°C (230°F)	Below 1.5
L (E7-17) – E1 (E4-24)	G-W – BR-B	IG ON Shift lever L position	7.5 – 14
		IG ON Shift lever other than L position	Below 1.5
2 (E7-16) – E1 (E4-24)	O – BR-B	IG ON Shift lever 2 position	7.5 – 14
		IG ON Shift lever other than 2 position	Below 1.5
R (E7-15) – E1 (E4-24)	R-B – BR-B	IG ON Shift lever R position	7.5 – 14
		IG ON Shift lever other than R position	Below 1.5
NSW (E7-22) – E1 (E4-24)	B-W – BR-B	IG ON Shift lever P or N position	Below 3
		IG ON Shift lever other than P and N position	9 – 14
STP (E7-14) – E1 (E4-24)	G-W – BR-B	IG ON Brake pedal is depressed	7.5 – 14
		IG ON Brake pedal is released	Below 1.5
THW (E5-4) – E2 (E5-9)	R-W – BR-B	IG ON Engine coolant temperature 80°C (176°F)	Below 1.5
IDL (E5-11) – E2 (E5-9)	G-W – BR-B	IG ON Accel. pedal is released	Below 1.5
		IG ON Accel. pedal is depressed	9 – 14

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

VTA (E5-10) – E2 (E5-9)	G-B – BR-B	IG ON Accel. pedal is released	Below 0.3 – 0.8
		IG ON Accel. pedal is depressed	3.2 – 4.9
PWR (E7-20)– E1 (E4-24)	P-B – BR-B	IG ON Pattern select switch "NORM"	Below 1.5
		IG ON Pattern select switch "PWR"	7.5 – 14
TFN (E7-21)– E1 (E4-24)	Y-L – BR-B	IG ON Transfer N position	Below 3
		IG ON Transfer other than N position	9 – 14
L4SW (E7-9)– E1 (E4-24)	B-L – BR-B	IG ON Transfer L4 position	7.5 – 14
		IG ON Transfer other than L4 position	Below 1.5
HOLD (E4-3) – E1 (E4-24)	O – BR-B	IG ON 2nd start switch ON	9 – 14
		IG ON 2nd start switch OFF	Below 1.5
HI (E4-18) – E1 (E4-24)	R-W – BR-B	IG ON	7.5 – 14

PROBLEM SYMPTOMS TABLE

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 and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	6. On-vehicle repair matrix chart 7. Off-vehicle repair matrix chart	– –
Vehicle does not move in a particular position or positions	1. On-vehicle repair matrix chart 2. Off-vehicle repair matrix chart	– –
No up-shift (1st → 2nd)	1. Shift solenoid valve No. 1 and No. 2 circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. Park/neutral position switch circuit 7. Off-vehicle repair matrix chart 8. ECM	DI-157 DI-35 DI-87 DI-166 – DI-169 – DI-145
No up-shift (2nd → 3rd)	1. Shift solenoid valve No. 1 and No. 2 circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. Park/neutral position switch circuit 7. Off-vehicle repair matrix chart 8. ECM	DI-157 DI-35 DI-87 DI-166 – DI-169 – DI-145
No up-shift (3rd → O/D)	1. O/D main switch & O/D OFF indicator light circuit 2. Shift solenoid valve No. 1 and No. 2 circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. Throttle position sensor circuit 6. Park/neutral position switch circuit 7. O/D cancel signal circuit 8. Engine coolant temp. sensor circuit 9. On-vehicle repair matrix chart 10. Off-vehicle repair matrix chart 11. ECM	DI-174 DI-157 DI-87 DI-166 DI-35 DI-169 DI-172 DI-30 – – DI-145

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

No down-shift (O/D → 3rd)	1. Shift solenoid valve No. 1 and No. 2 circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. ECM	DI-157 DI-35 DI-87 DI-166 – DI-145
No down-shift (3rd → 2nd)	1. Shift solenoid valve No. 1 and No. 2 circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. ECM	DI-157 DI-35 DI-87 DI-166 – DI-145
No down-shift (2nd → 1st)	1. Shift solenoid valve No. 1 and No. 2 circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. Off-vehicle repair matrix chart 7. ECM	DI-157 DI-35 DI-87 DI-166 – – DI-145
Lock-up does not engage	1. Shift solenoid valve SL circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. Stop light switch circuit 6. Park/neutral position switch circuit 7. Engine coolant temp. sensor circuit 8. On-vehicle repair matrix chart 9. Off-vehicle repair matrix chart 10. ECM	DI-163 DI-35 DI-87 DI-166 DI-185 DI-169 DI-30 – – DI-145
Lock-up does not disengage	1. Shift solenoid valve SL circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. Stop light switch circuit 6. On-vehicle repair matrix chart 7. Off-vehicle repair matrix chart 8. ECM	DI-163 DI-35 DI-87 DI-166 DI-185 – – DI-145
Shift point too high or too low	1. Throttle position sensor circuit 2. Pattern select switch circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. ECM	DI-35 DI-179 DI-87 DI-166 DI-145
Up-shifts to 2nd while in L position Up-shifts to 3rd while in L position	1. Park/neutral position switch circuit 2. ECM	DI-169 DI-145
Up-shifts to O/D from 3rd while O/D main switch is OFF	1. O/D main switch & O/D OFF indicator light circuit 2. ECM	DI-174 DI-145
Up-shift to O/D from 3rd while engine is cold	1. Engine coolant temp. sensor circuit 2. On-vehicle repair matrix chart 3. Off-vehicle repair matrix chart 4. ECM	DI-30 – – DI-145

DIAGNOSTICS – AUTOMATIC TRANSMISSION

Harsh engagement (N → D)	<ol style="list-style-type: none"> 1. Shift solenoid valve SL circuit 2. ATF temp. sensor circuit 3. Throttle position sensor circuit 4. Park/neutral position switch circuit 5. On-vehicle repair matrix chart 6. Off-vehicle repair matrix chart 7. ECM 	DI-163 DI-154 DI-35 DI-169 – – DI-145
Harsh engagement (Lock-up)	<ol style="list-style-type: none"> 1. Shift solenoid valve SL circuit 2. Throttle position sensor circuit 3. No. 1 vehicle speed sensor circuit 4. No. 2 vehicle speed sensor circuit 5. On-vehicle repair matrix chart 6. Off-vehicle repair matrix chart 7. ECM 	DI-163 DI-35 DI-87 DI-166 – – DI-145
Harsh engagement (Any driving position)	<ol style="list-style-type: none"> 1. Shift solenoid valve SL circuit 2. ATF temp. sensor circuit 3. Throttle position sensor circuit 4. No. 1 vehicle speed sensor circuit 5. No. 2 vehicle speed sensor circuit 6. On-vehicle repair matrix chart 7. Off-vehicle repair matrix chart 8. ECM 	DI-163 DI-154 DI-35 DI-87 DI-166 – – DI-145
Slip or shudder (Forward and reverse)	<ol style="list-style-type: none"> 1. On-vehicle repair matrix chart 2. Off-vehicle repair matrix chart 	– –
Slip or shudder (A particular position)	<ol style="list-style-type: none"> 1. On-vehicle repair matrix chart 2. Off-vehicle repair matrix chart 	– –
No engine braking	<ol style="list-style-type: none"> 1. On-vehicle repair matrix chart 2. Off-vehicle repair matrix chart 	– –
Poor acceleration	<ol style="list-style-type: none"> 1. Throttle position sensor circuit 2. No. 1 vehicle speed sensor circuit 3. No. 2 vehicle speed sensor circuit 4. Shift solenoid valve No. 1 and No. 2 circuit 5. Shift solenoid valve SL circuit 6. On-vehicle repair matrix chart 7. Off-vehicle repair matrix chart 	DI-35 DI-87 DI-166 DI-157 DI-163 – –
No kick-down	<ol style="list-style-type: none"> 1. Throttle position sensor circuit 2. Shift solenoid valve No. 1 and No. 2 circuit 3. No. 1 vehicle speed sensor circuit 4. On-vehicle repair matrix chart 5. ECM 	DI-35 DI-157 DI-87 – DI-145
No pattern select	<ol style="list-style-type: none"> 1. Pattern select switch circuit 2. ECM 	DI-179 DI-145
No 2nd start	<ol style="list-style-type: none"> 1. Pattern select switch circuit 2. Shift solenoid valve No. 1 and No. 2 circuit 3. ECM 	DI-179 DI-157 DI-145
Large shift shock or engine stalls when starting off or stopping	<ol style="list-style-type: none"> 1. Shift solenoid valve SL circuit 2. Stop light switch circuit 3. Off-vehicle repair matrix chart 4. ECM 	DI-163 DI-185 – DI-145

Chapter 2: On-Vehicle Repair**(★: A340F, A343F Automatic Transmission Repair Manual Pub. No. RM479U)**

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. Throttle cable 2. Transmission control rod 3. Manual valve 4. Primary regulator valve 5. Parking lock pawl 6. Off-vehicle repair matrix chart	DI-131 DI-131 ★ ★ ★ –
Vehicle does not move in R position	1. Off-vehicle repair matrix chart	–
Vehicle does not move in a particular position or positions (Except R position)	1. Off-vehicle repair matrix chart	–
No up-shift (1st → 2nd)	1. 1-2 shift valve 2. Off-vehicle repair matrix chart	★ –
No up-shift (2nd → 3rd)	1. 2-3 shift valve 2. Off-vehicle repair matrix chart	★ –
No up-shift (3rd → O/D)	1. 3-4 shift valve 2. Off-vehicle repair matrix chart	★ –
No down-shift (O/D → 3rd)	1. 3-4 shift valve	★
No down-shift (3rd → 2nd)	1. 2-3 shift valve	★
No down-shift (2nd → 1st)	1. 1-2 shift valve 2. Off-vehicle repair matrix chart	★ –
Lock-up does not engage or lock-up does not disengage	1. Lock-up relay valve 2. Off-vehicle repair matrix chart	★ –
Harsh engagement (N → D)	1. Accumulator control valve 2. Off-vehicle repair matrix chart	★ –
Harsh engagement (Lock-up)	1. Lock-up control valve 2. Off-vehicle repair matrix chart	★ –
Harsh engagement (N → R)	1. Accumulator control valve 2. C ₂ accumulator 3. Off-vehicle repair matrix chart	★ ★ –
Harsh engagement (N → L)	1. Low coast modulator valve	★
Harsh engagement (1st → 2nd (D position))	1. Accumulator control valve 2. B ₂ accumulator	★ ★
Harsh engagement (1st → 2nd (2 position))	1. Accumulator control valve 2. B ₂ accumulator	★ ★
Harsh engagement (2nd → 3rd → O/D)	1. Cut-back valve	★
Harsh engagement (1st → 2nd → 3rd → O/D)	1. Throttle valve 2. Accumulator control valve	★ ★
Harsh engagement (2nd → 3rd)	3. Accumulator control valve 1. C ₂ accumulator 2. Off-vehicle repair matrix chart	★ ★ –
Harsh engagement (3rd → O/D)	1. Accumulator control valve 2. B ₀ accumulator 3. Off-vehicle repair matrix chart	★ ★ –
Harsh engagement (O/D → 3rd)	1. Accumulator control valve 2. C ₀ accumulator 3. Off-vehicle repair matrix chart	★ ★ –

DIAGNOSTICS – AUTOMATIC TRANSMISSION

Slip or shudder (Forward and reverse)	1. Throttle cable 2. Transmission control rod 3. Oil strainer 4. Pressure relief valve 5. Off-vehicle repair matrix chart	DI-131 DI-131 ★ ★ –
Slip or shudder (Particular position)	1. Throttle cable 2. Transmission control rod 3. Off-vehicle repair matrix chart	DI-131 DI-131 –
No engine braking (1st (L position))	1. Low coast modulator 2. Off-vehicle repair matrix chart	★ –
No engine braking (2nd (2 position))	1. 2nd coast modulator 2. Off-vehicle repair matrix chart	★ –
No kick-down	1. 1-2 shift valve 2. 2-3 shift valve	★ ★

Chapter 3: Off-Vehicle Repair**(★: A340F, A343F Automatic Transmission Repair Manual Pub. No. RM479U)**

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. O/D one-way clutch (F ₀) 2. O/D planetary gear unit 3. Torque converter clutch	★ ★ AT-26
Vehicle does not move in R position	1. 2nd coast brake (B ₁) 2. Front and rear planetary gear unit 3. Direct clutch (C ₂) 4. 1st and reverse brake (B ₃)	★ ★ ★ ★
Vehicle does not move in D, 2 and L positions	1. Forward clutch (C ₁)	★
Vehicle does not move in D and 2 positions	1. No. 2 one-way clutch (F ₂)	★
Vehicle does not move in 2 position	1. 1st and reverse brake (B ₃)	★
Vehicle does not move in L position	1. 2nd brake (B ₂) 2. 2nd coast brake (B ₁) 3. Direct clutch (C ₂)	★ ★ ★
No up-shift (1st → 2nd)	1. 2nd brake (B ₂) 2. No. 1 one-way clutch (F ₁)	★ ★
No up-shift (2nd → 3rd)	1. Direct clutch (C ₂)	★
No up-shift (3rd → O/D)	1. O/D brake (B ₀)	★
No down-shift (2nd → 1st)	1. 2nd brake (B ₂)	★
Lock-up does not engage or lock-up does not disengage	1. Torque converter clutch	AT-26
Harsh engagement (N → D)	1. Forward clutch (C ₁) 2. O/D one-way clutch (F ₀) 3. No. 2 one-way clutch (F ₂)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C ₂) 2. 1st and reverse brake (B ₃) 3. O/D one-way clutch (F ₀)	★ ★ ★
Harsh engagement (2nd → 3rd)	1. Direct clutch (C ₂)	★
Harsh engagement (3rd → O/D)	1. O/D brake (B ₀) 2. O/D planetary gear unit	★ ★
Harsh engagement (O/D → 3rd)	1. O/D one-way clutch (F ₀)	★
Harsh engagement (Lock-up)	1. Torque converter clutch	AT-26
Slip or shudder (Forward and reverse (After warm-up))	1. Torque converter clutch 2. O/D one-way clutch (F ₀) 3. O/D direct clutch (C ₀)	AT-26 ★ ★
Slip or shudder (Forward and reverse (Just after engine starts))	1. Torque converter clutch	AT-26

1996 LAND CRUISER (RM451U)

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

Slip or shudder (R position)	1. Direct clutch (C ₂) 2. 1st and reverse brake (B ₃) 3. O/D one-way clutch (F ₀)	★ ★ ★
Slip or shudder (1st)	1. Forward clutch (C ₁) 2. No. 2 one-way clutch (F ₂) 3. O/D one-way clutch (F ₀)	★ ★ ★
Slip or shudder (2nd)	1. 2nd brake (B ₂) 2. 2nd coast brake (B ₁) 3. No. 1 one-way clutch (F ₁)	★ ★ ★
Slip or shudder (3rd)	1. Direct clutch (C ₂)	★
Slip or shudder (O/D)	1. O/D brake (B ₀)	★
No engine braking (1st – 3rd)	1. O/D direct clutch (C ₀)	★
No engine braking (1st)	1. 1st and reverse brake (B ₃)	★
No engine braking (2nd)	1. 2nd coast brake (B ₁)	★
Poor acceleration (All positions)	1. Torque converter clutch	AT-26
Poor acceleration (O/D)	1. O/D brake (B ₀) 2. O/D planetary gear unit	★ ★
Poor acceleration (Other than O/D)	1. O/D brake (B ₀)	★
Poor acceleration (Other than 2nd)	1. 2nd coast brake (B ₁) 2. No. 1 one-way clutch (F ₁)	★ ★
Poor acceleration (1st and 2nd)	1. O/D one-way clutch (F ₀)	★
Poor acceleration (L and R positions)	1. 1st and reverse brake (B ₃)	★
Poor acceleration (R position)	1. Forward clutch (C ₁)	★
Engine stalls when starting off or stopping	1. Torque converter clutch	AT-26

CIRCUIT INSPECTION

DTC	P0500	Vehicle Speed Sensor Malfunction (No. 1 Vehicle Speed Sensor)
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See page [DI-87](#).

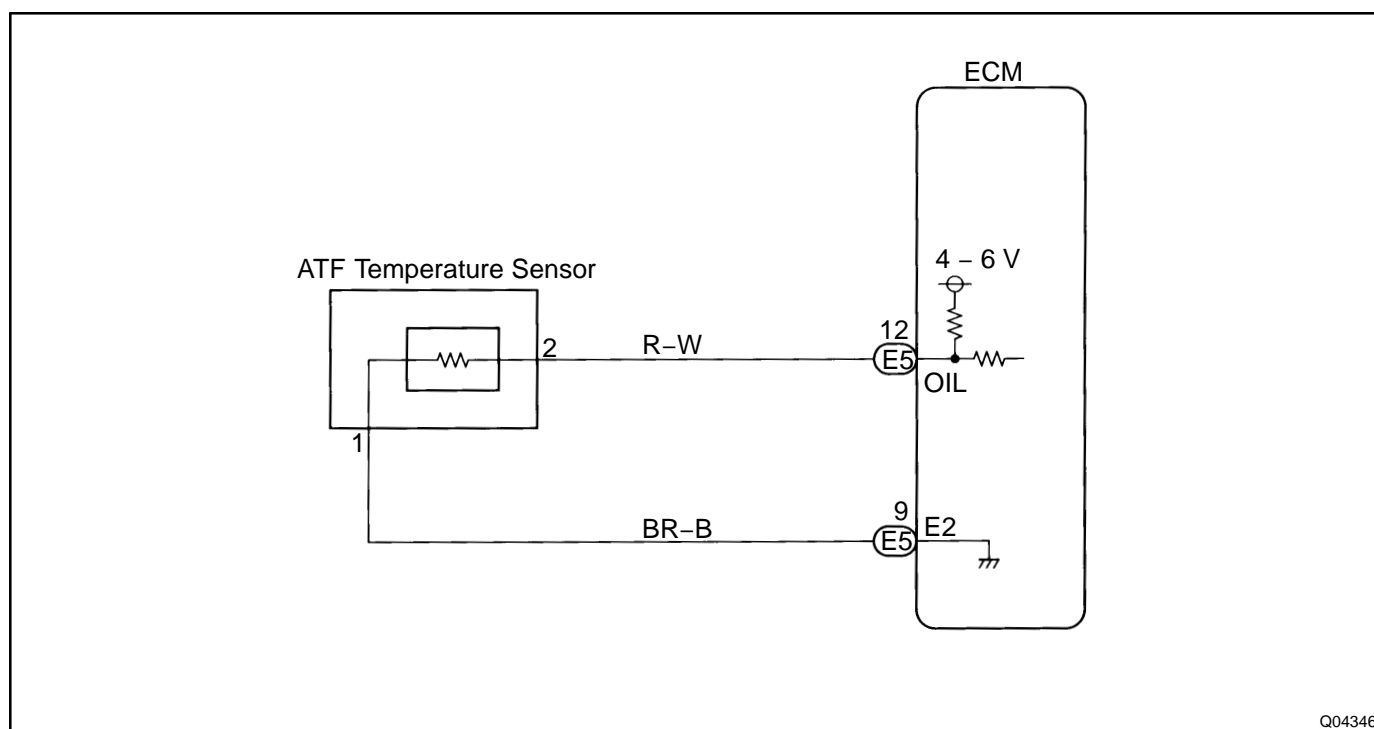
DTC	P0710	Transmission Fluid Temperature Sensor Circuit Malfunction (ATF Temperature Sensor)
------------	--------------	---

CIRCUIT DESCRIPTION

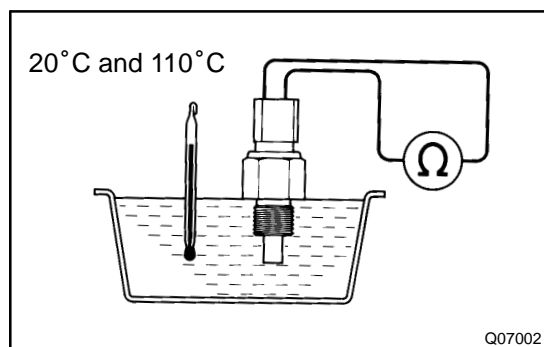
The ATF temperature sensor converts fluid temperature into resistance value which is input into the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more (a) Temp. sensor resistance is less than 79 Ω (b) After the engine has been operating for 15 min. or more, the resistance at the temp. sensor is more than 156 k Ω	<ul style="list-style-type: none"> • Open or short in ATF temp. sensor circuit • ATF temp. sensor • ECM

WIRING DIAGRAM



Q04346

INSPECTION PROCEDURE**1 Check ATF temperature Sensor.****PREPARATION:**

Remove the ATF temperature sensor.

CHECK:

Measure the resistance between terminals of the ATF temperature sensor at 20°C (68°F) and 110°C (230°F).

OK:

Resistance :

20°C (68°F): Approx. 12.2 kΩ

110°C (230°F): Approx. 770 Ω

NG**Replace ATF temperature sensor.****OK****2 Check harness and connector between ATF temperature sensor and ECM (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK****Check and replace ECM.**

DTC	P0750, P0755	Shift Solenoid A/B Malfunction (Shift Solenoid Valve No. 1/No. 2)
------------	---------------------	--

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 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.

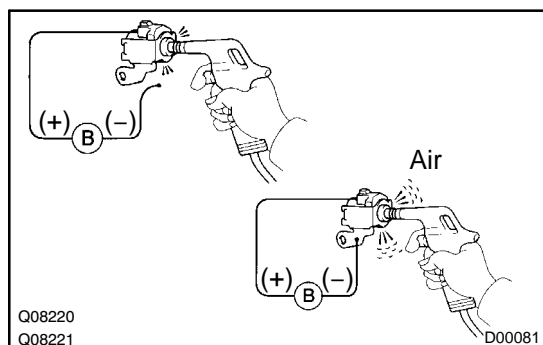
DTC No.	DTC Detecting Condition	Trouble Area
P0750 P0755	During normal driving, the gear required by the ECM does not match the actual gear (2 trip detection logic)	<ul style="list-style-type: none"> Shift solenoid valve No. 1/No. 2 is stuck open or closed Valve body is blocked up or stuck

HINT:

Check the shift solenoid valve No. 1 when DTC P0750 is output and check shift solenoid valve No. 2 when DTC P0755 is output.

INSPECTION PROCEDURE

1	Check shift solenoid valve No. 1 or No. 2 operation.
----------	---



PREPARATION:

- Remove the oil pan.
- Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

- Applying 490 kPa (5 kgf/cm², 71 psi) of compressed air, check that the shift solenoid valve does not leak air.
- When battery positive voltage is supplied to the shift solenoid valves, check they opens.

NG

Replace shift solenoid valve No. 1 or No. 2.

OK

2	Check valve body (See page DI-147).
----------	--

NG

Repair or replace valve body.

OK

Repair transmission (See page [AT-18](#)).

DTC	P0753, P0758	Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No. 1/No. 2)
------------	---------------------	---

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the shift solenoid valves No. 1 and No. 2 controlled by ECM. 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 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 are malfunction, hydraulic control cannot be done 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			SHIFT SOLENOID NO. 1 MALFUNCTIONING			SHIFT SOLENOID NO. 2 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	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

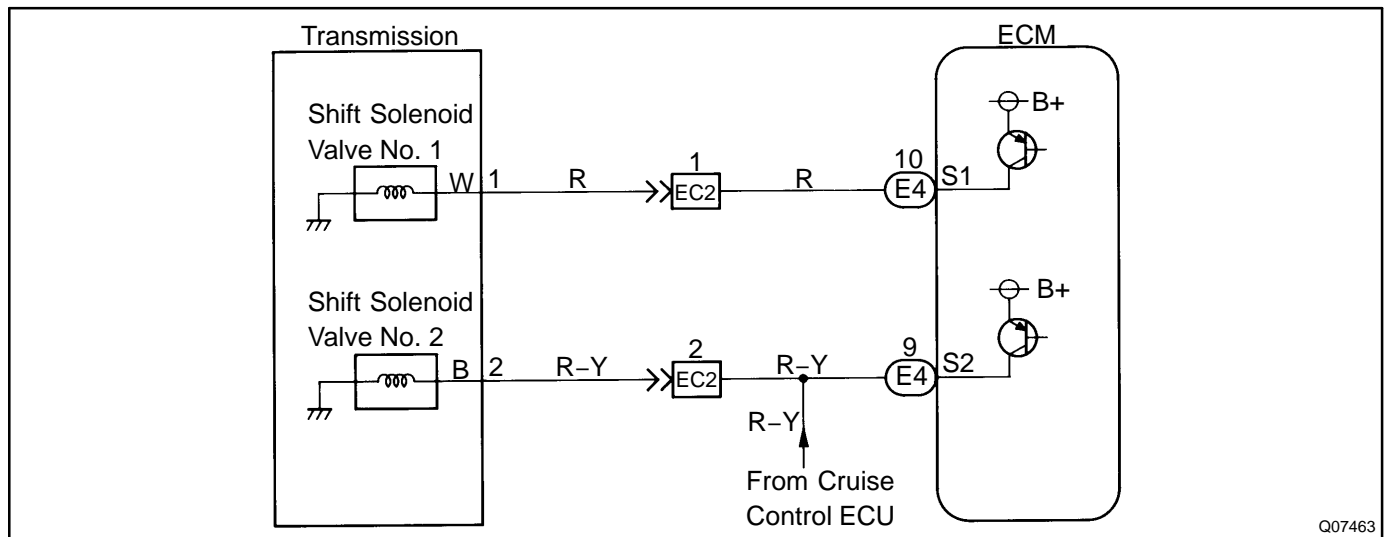
X: Malfunctions

HINT:

Check the shift solenoid valve No. 1 when DTC P0753 is output and check the shift solenoid valve No. 2 when DTC P0758 is output.

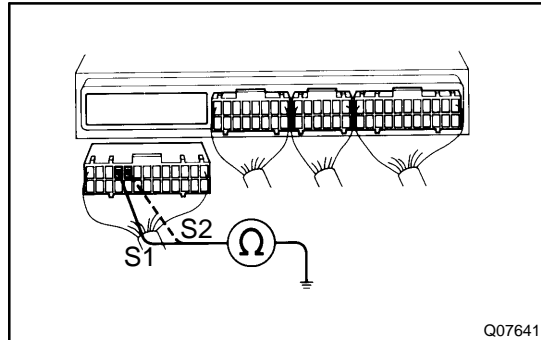
DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	<p>The ECM checks for an open or short circuit in the shift solenoid valves No. 1 and No. 2 circuit when it changes</p> <p>The ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not light up MIL</p> <p>After ECM detects condition (a) or (b) continuously 8 times or more in one-trip, it causes the MIL light up until condition (a) or (b) disappears</p> <p>After that, if the ECM detects condition (a) or (b) once, it starts lighting up MIL again</p> <p>(a) Solenoid resistance is 8 Ω or less (short circuit) when the solenoid is energized</p> <p>(b) Solenoid resistance is 100 kΩ or more (open circuit) when the solenoid is not energized</p>	<ul style="list-style-type: none"> • Open or short in shift solenoid valve No. 1/No. 2 circuit • Shift solenoid valve No. 1/No. 2 • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Measure resistance between terminal S1 or S2 of ECM and body ground.



PREPARATION:

Disconnect the connector from the ECM.

CHECK:

Measure the resistance between terminal S1 or S2 of the ECM and body ground.

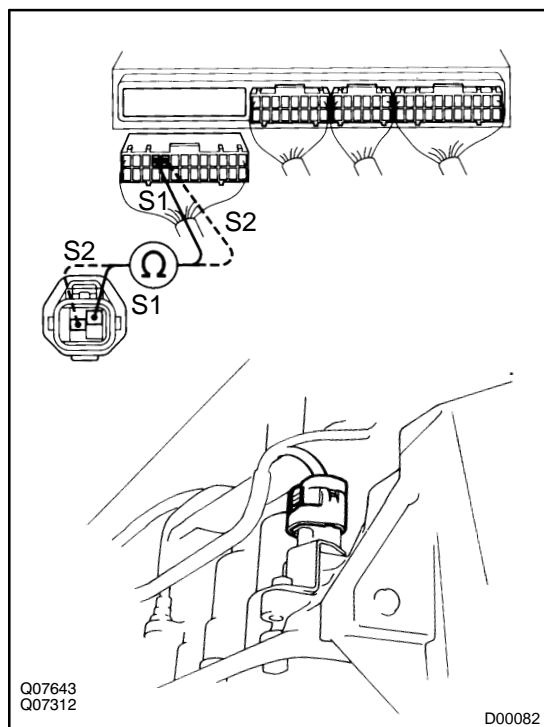
OK:

Resistance: 11 – 15 Ω

OK

Check and replace ECM.

NG

2 Check harness and connector between ECM and automatic transmission solenoid connector.**PREPARATION:**

Disconnect the solenoid connector from the automatic transmission.

CHECK:

Check the harness and connector between terminals S1 or S2 of the ECM and S1 or S2 terminals of the solenoid connector.

OK:

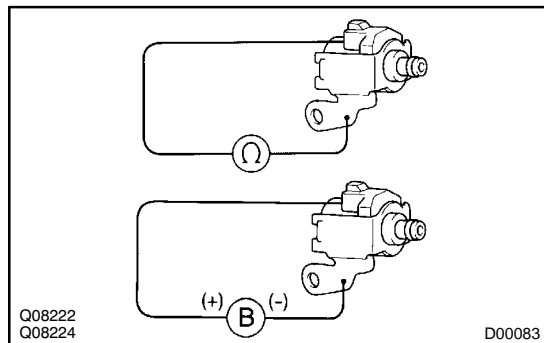
There is no open and no short circuit.

NG**Repair or replace harness or connector.****OK**

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

3 Check shift solenoid valve No. 1 or No. 2.

**PREPARATION:**

- (a) Jack up the vehicle.
- (b) Remove the oil pan.
- (c) Disconnect the solenoid connector.
- (d) Remove the shift solenoid valve No. 1 or No. 2.

CHECK:

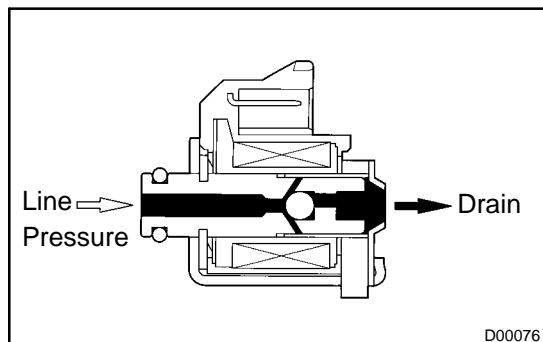
- (a) Measure the resistance between solenoid connector and body ground.
- (b) Connect positive \oplus lead to terminal of the solenoid connector, negative \ominus lead to the solenoid body.

OK:

- (a) Resistance: 11 – 15 Ω
- (b) The shift solenoid valve No. 1 or No. 2 makes an operating noise.

NG**Replace shift solenoid valve No. 1 or No. 2.****OK****Repair or replace solenoid wire.**

DTC	P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)
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SYSTEM DESCRIPTION

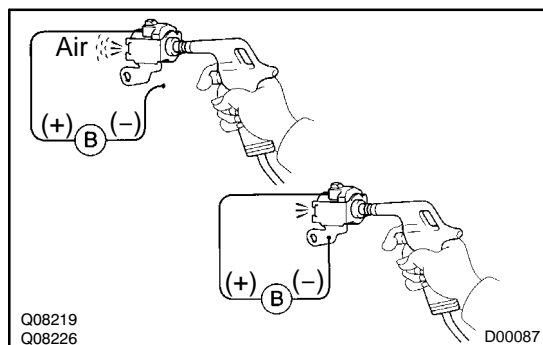
The ECM uses the signals from the throttle position sensor, air-flow meter and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.

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 clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0770	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)	<ul style="list-style-type: none"> • Shift solenoid valve SL is stuck open or closed • Valve body blocked up or stuck • Lock-up clutch

INSPECTION PROCEDURE

1	Check shift solenoid valve SL operation.
----------	---



PREPARATION:

Remove the shift solenoid valve SL from the valve body.

CHECK:

- Applying 490 kPa (5 kgf/cm², 71 psi) of compressed air, check that the solenoid valve opens.
- When battery voltage is supplied to the shift solenoid valve, check it does not leak air.

NG

Replace shift solenoid valve SL.

OK

DI-162

DIAGNOSTICS – AUTOMATIC TRANSMISSION

2	Check valve body (See page DI-147).
---	--

NG

Repair or replace valve body.

OK

Replace torque converter clutch (See page [AT-26](#)).

DTC	P0773	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)
------------	--------------	--

CIRCUIT DESCRIPTION

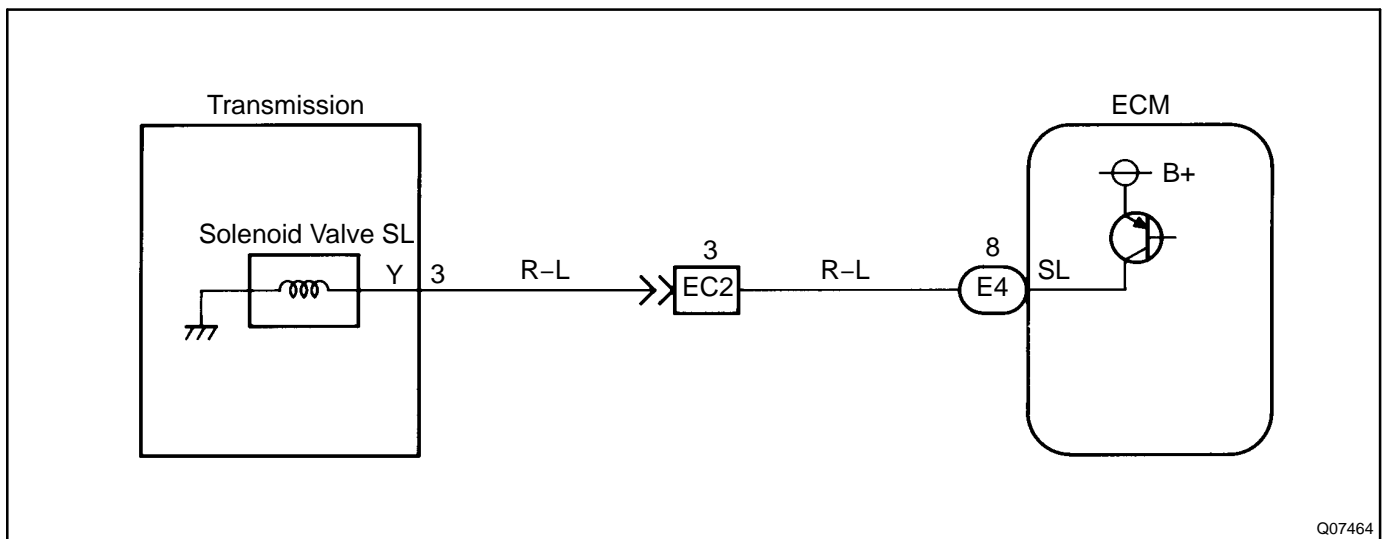
The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock-up relay valve, which then controls operation of the lock-up clutch.

Fail Safe Function:

If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

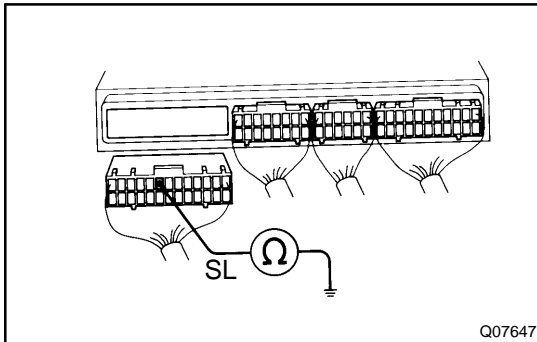
DTC No.	DTC Detecting Condition	Trouble Area
P0773	Open or short in shift solenoid valve SL circuit for 1 time (2 trip detection logic)	<ul style="list-style-type: none"> • Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Measure resistance between terminal SL of ECM and body ground.**

**PREPARATION:**

Disconnect the connector from the ECM.

CHECK:

Measure the resistance between terminal SL of the ECM and body ground.

OK:

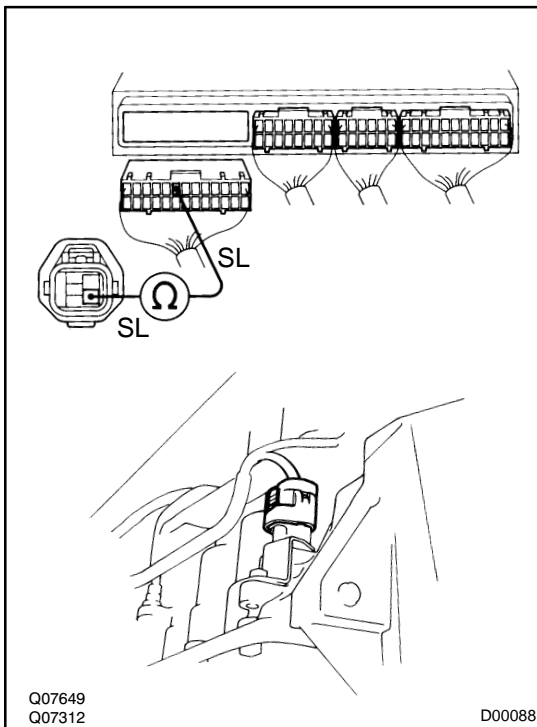
Resistance: 11 – 15 Ω

OK

Check and replace ECM.

NG

- 2 Check harness and connector between ECM and automatic transmission solenoid connector.**

**PREPARATION:**

Disconnect the solenoid connector from the transmission.

CHECK:

Check the harness between terminal SL of the ECM and terminal SL of the automatic transmission solenoid connector.

OK:

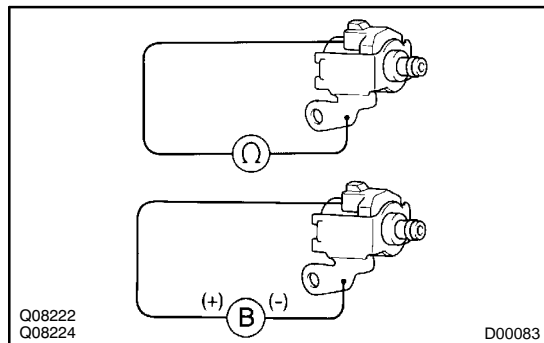
There is no open or short circuit.

NG

Repair or replace harness or connector.

OK

3 Check shift solenoid valve SL.



PREPARATION:

- (a) Jack-up the vehicle.
- (b) Remove the oil pan.
- (c) Disconnect the shift solenoid valve SL connector.
- (d) Remove the shift solenoid valve SL.

CHECK:

- (a) Measure the resistance between the shift solenoid valve SL connector terminal and its body ground.
- (b) Connect positive \oplus lead to terminal of the solenoid connector, negative \ominus lead to the solenoid body.

OK:

- (a) Resistance: 11 – 15 Ω
- (b) Shift solenoid valve SL makes operation noise.

NG

Replace shift solenoid valve SL.

OK

Check and replace or repair solenoid wire.

DTC	P1700	Speed Sensor No. 2 Circuit Malfunction (No. 2 Vehicle Speed Sensor)
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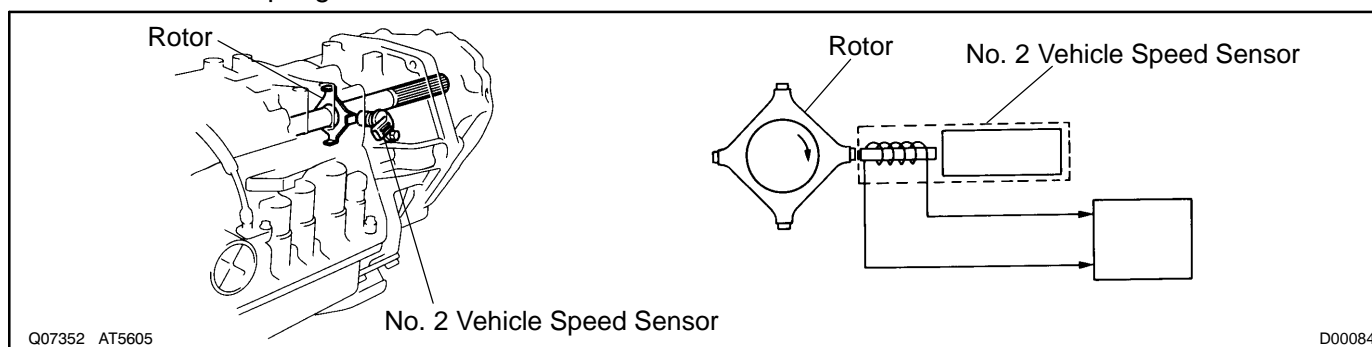
CIRCUIT DESCRIPTION

The No. 2 vehicle speed sensor detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals.

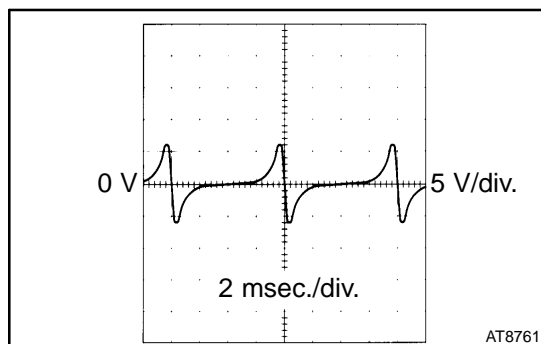
An AC voltage is generated in the No. 2 vehicle speed sensor coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.

The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

If the No. 2 vehicle speed sensor malfunctions, the ECM uses input signals from the No. 1 vehicle speed sensor as a back-up signal.



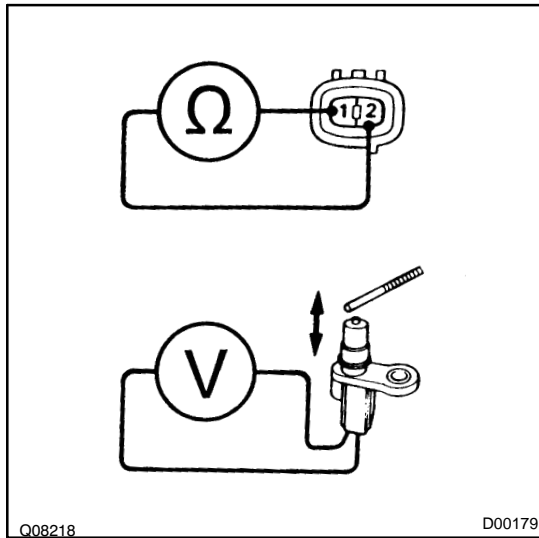
DTC No.	DTC Detecting Condition	Trouble Area
P1700	<p>All conditions below are detected 500 times or more continuously (2 trip detection logic)</p> <p>(a) No signal from No. 2 vehicle speed sensor is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal is sent</p> <p>(b) Vehicle speed: 9 km/h (5.6 mph) or more for as least 4 sec.</p> <p>(c) Park/neutral position switch: OFF (Other than P or N position)</p> <p>(d) Transfer position: Other than N position</p>	<ul style="list-style-type: none"> • Open or short in No. 2 vehicle speed sensor circuit • No. 2 vehicle speed sensor • ECM



Reference:

Waveform between terminals SP2⁺ and SP2⁻ when the vehicle speed is approx. 60 km/h (37 mph).

2	Check No. 2 vehicle speed sensor.
----------	--

**PREPARATION:**

Remove the No. 2 vehicle speed sensor from the transmission.

CHECK:

- (a) Measure the resistance between terminals 1 and 2 of the vehicle speed sensor.
- (b) Check the voltage between terminals 1 and 2 of the vehicle speed sensor when a magnet is put close to the front end of the vehicle speed sensor then taken away quickly.

OK:

(a) **Resistance: 560 – 680 Ω**

(b) **Voltage is generated intermittently.**

HINT:

The generated voltage is extremely low.

NG

Replace No. 2 vehicle speed sensor.

OK

Check and repair harness and connector between ECM and No. 2 vehicle speed sensor (See page [IN-28](#)).

DTC	P1780	Park/Neutral Position Switch Malfunction
------------	--------------	---

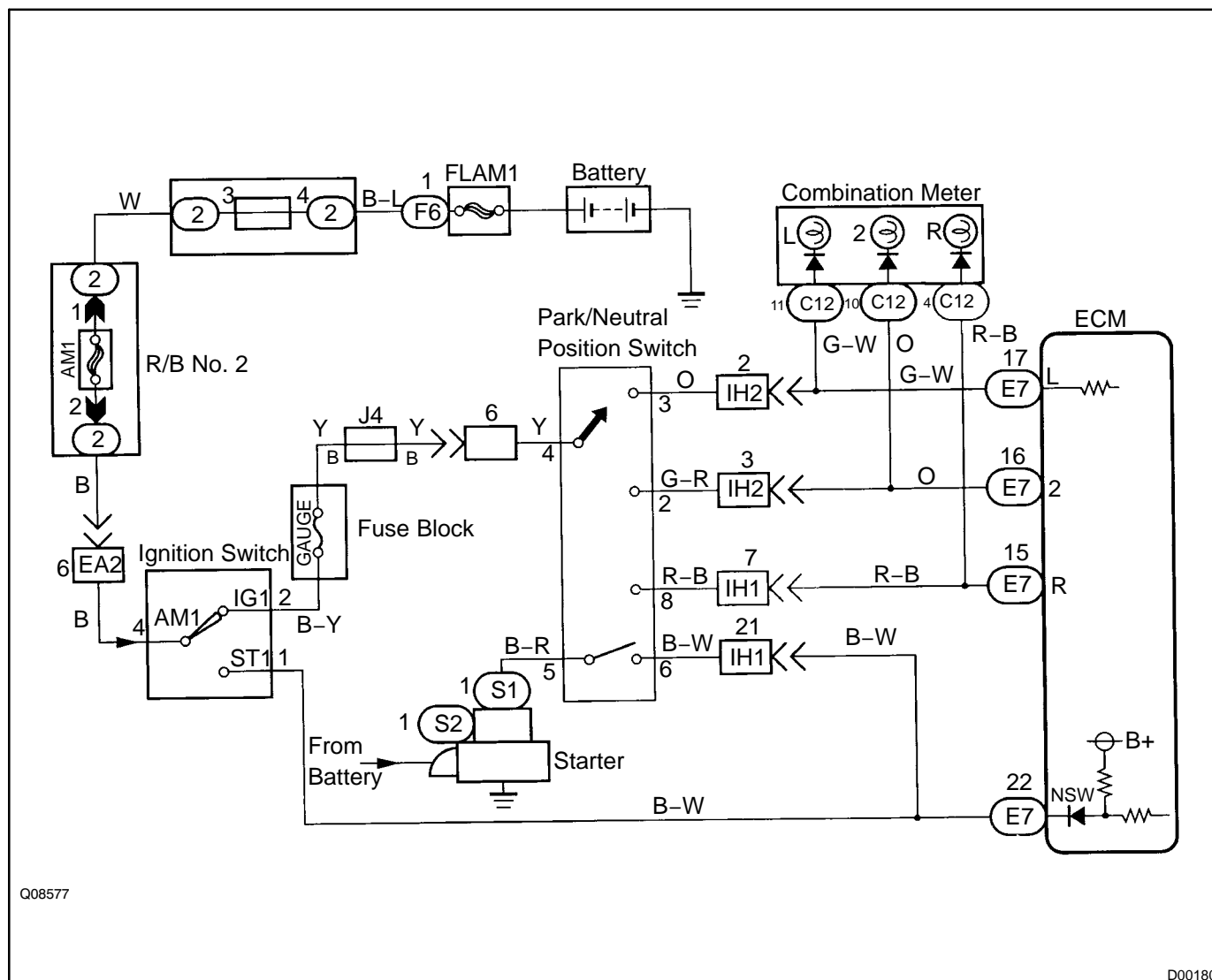
CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

The ECM receives signals (NSW, R, 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 D position.

DTC No.	DTC Detection Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for N, 2 and L positions (2 trip detection logic)	<ul style="list-style-type: none"> • Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a), (b) and (c) 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 (c) Engine load: 0.6 g/rev. or more	

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Read PNP, REVERSE, 2ND and LOW signals.
---	---

When using TOYOTA hand-held tester:

PREPARATION:

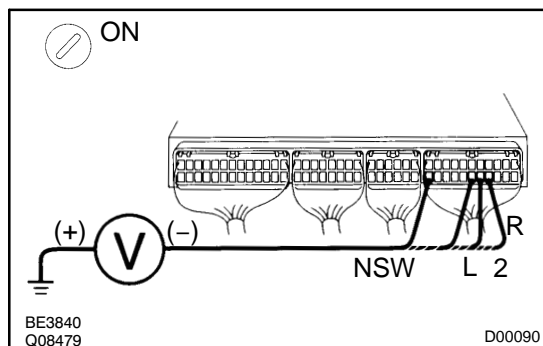
- Remove the fuse box cover.
- Connect a TOYOTA hand-held tester to the DLC3.
- Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

Shift lever into the P, R, N, 2 and L positions, and read the PNP, REVERSE, 2 and L signals on the TOYOTA hand-held tester.

OK:

Shift position	Signal
2	2ND OFF → ON
L	LOW OFF → ON
R	REVERSE OFF → ON
P, N	PNP SW OFF → ON



When not using TOYOTA hand-held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals NSW, 2 and L of ECM and body ground when the shift lever is shifted to the following positions.

OK:

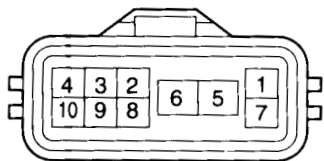
Position	NSW – Body ground	R – Body ground	2 – Body ground	L – Body ground
P, N	Below 1.5 V	Below 1.5 V	Below 1.5 V	Below 1.5 V
R	9 – 14 V	7.5 – 14 V*	Below 1.5 V	Below 1.5 V
D	9 – 14 V	Below 1.5 V	Below 1.5 V	Below 1.5 V
2	9 – 14 V	Below 1.5 V	7.5 – 14 V	Below 1.5 V
L	9 – 14 V	Below 1.5 V	Below 1.5 V	7.5 – 14 V

*: The voltage will drop slightly due to lighting up of the back up light.

OK	Check and replace ECM.
----	------------------------

NG

2 Check park/neutral position switch.



Q07657

D00109

PREPARATION:

- (a) Jack up the vehicle.
- (b) Remove the park/neutral position switch connector.

CHECK:

Check the continuity between each terminal shown below when the shift lever is moved to each position.

OK:

Shift Position	Terminal No. to continuity	Terminal No. to continuity
P	4 – 7	5 – 6
R	4 – 8	–
N	4 – 10	5 – 6
D	4 – 9	–
2	2 – 4	–
L	3 – 4	–

NG
Replace park/neutral position switch.
OK

Repair or replace harness and connector between battery and park/neutral position switch, and park/neutral position switch and ECM (See page [IN-28](#)).

O/D Cancel Signal Circuit

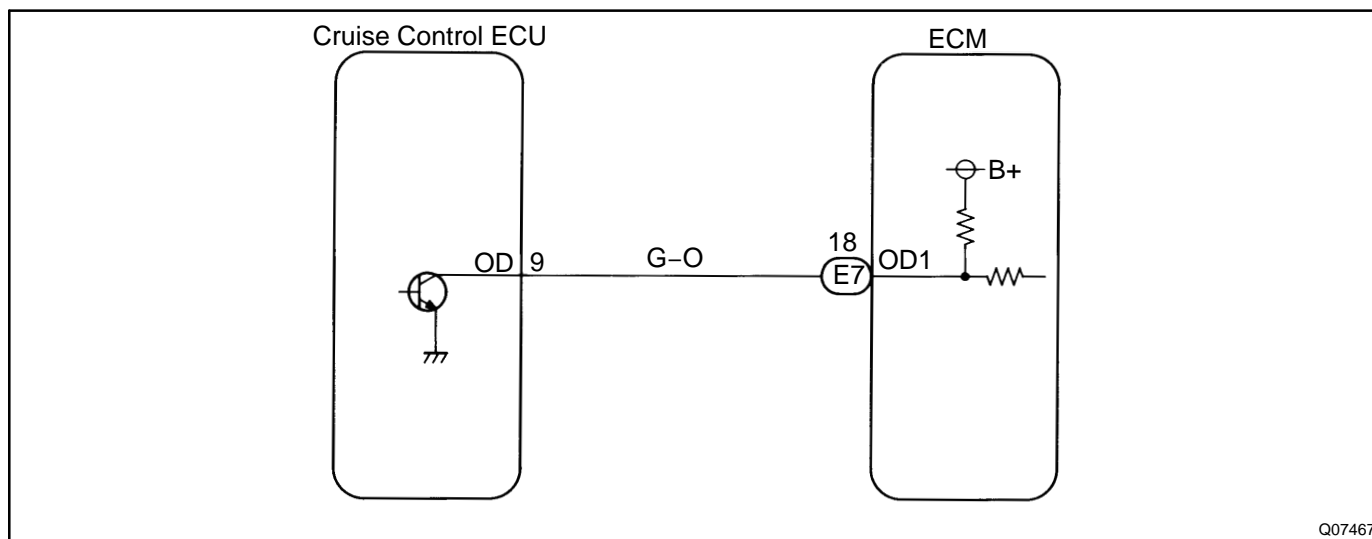
CIRCUIT DESCRIPTION

While driving with cruise control activated, in order to minimize gear shifting and provide smooth cruising on an uphill, 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 shifting until these signals are discontinued.

(For details, see the Cruise Control section, page [DI-292](#))

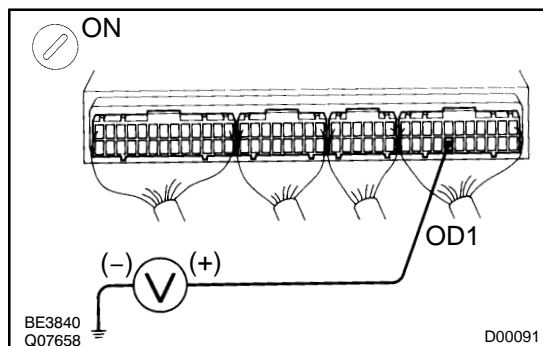
WIRING DIAGRAM



Q07467

INSPECTION PROCEDURE

- 1 Check voltage between terminal OD1 of ECM and body ground.



PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal OD1 of the ECM and body ground.

OK:

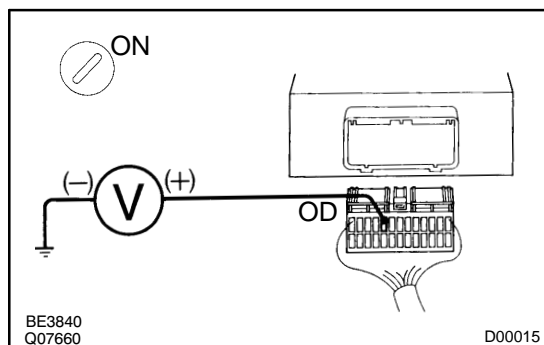
Voltage: 9 – 14 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-147](#)).

NG

- 2 Check voltage between terminal OD of cruise control ECU harness side connector and body ground.**

**PREPARATION:**

- (a) Disconnect the cruise control ECU connector.
- (b) Turn ignition switch ON.

CHECK:

Measure the voltage between terminal OD of the cruise control ECU harness side connector and body ground.

OK:

Voltage: 9 – 14 V

OK

Check and replace cruise control ECU.

NG

- 3 Check harness and connector between cruise control ECU and ECM (See page [IN-28](#)).**

NG

Repair or replace wire harness or connector.

OK

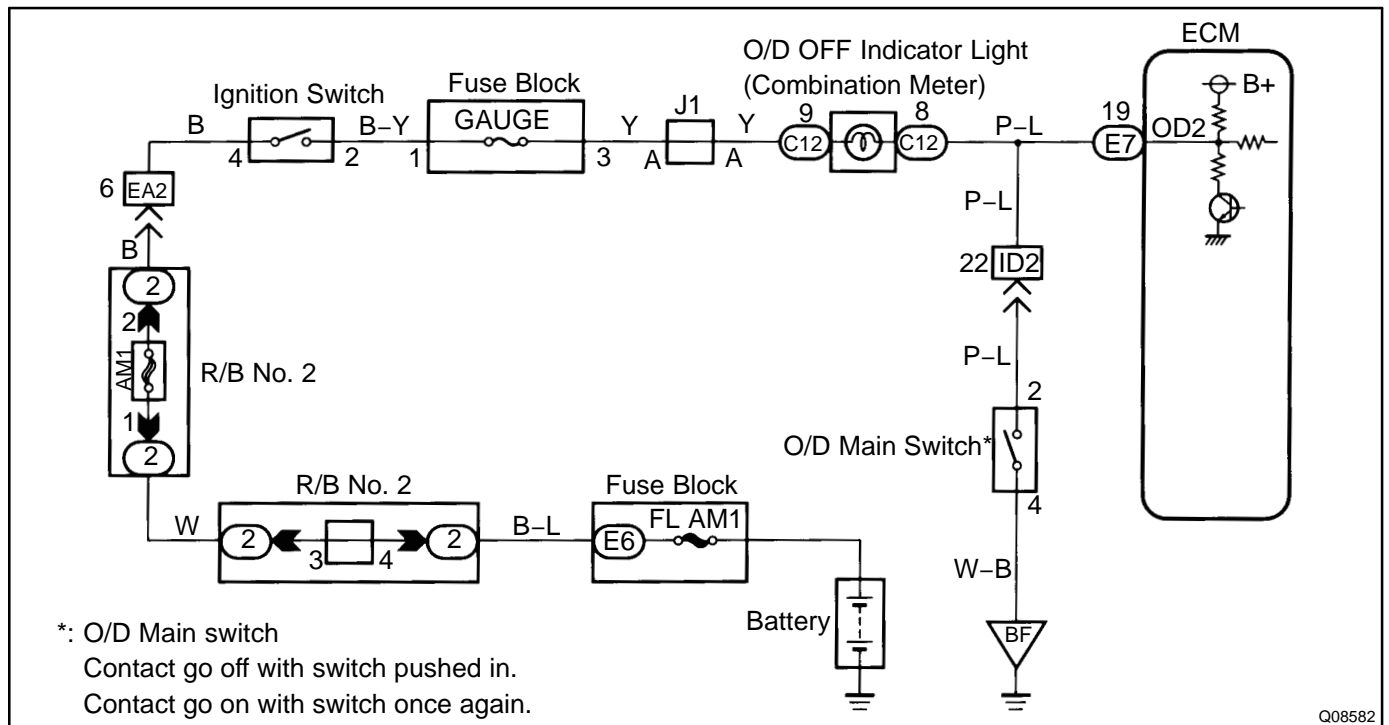
Check and replace ECM.

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

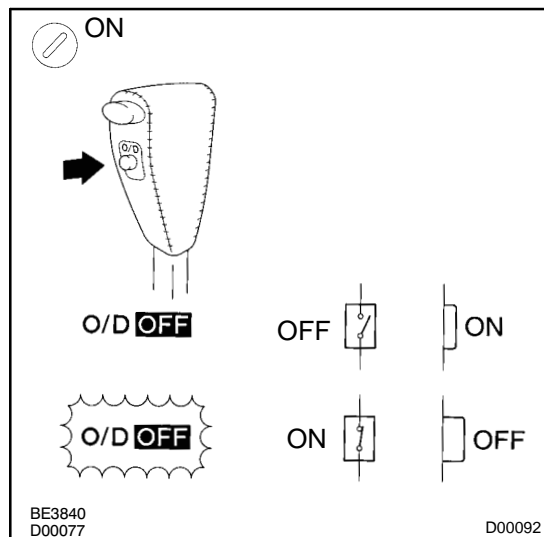
The O/D main switch contacts go off when the switch is pushed in and come on when it is pushed once again. In O/D main switch OFF position, the O/D OFF indicator lights up, and the ECM prohibits shifting to O/D.

WIRING DIAGRAM



INSPECTION PROCEDURE**O/D OFF indicator light does not light up:**

- | | |
|----------|--|
| 1 | Check operation of O/D main switch. |
|----------|--|

**CHECK:**

- (a) Turn the ignition switch ON.
- (b) Check the O/D OFF indicator light when the O/D main switch is pushed in to ON.

OK:**O/D OFF indicator light goes off****CHECK:**

Check the O/D OFF indicator light when the O/D main switch is pushed again to OFF.

OK:**O/D OFF indicator light lights up****NG****Go to step 4.****OK**

2

Check OVRDRIVE CUT SW2 signal.**When using TOYOTA hand-held tester:****PREPARATION:**

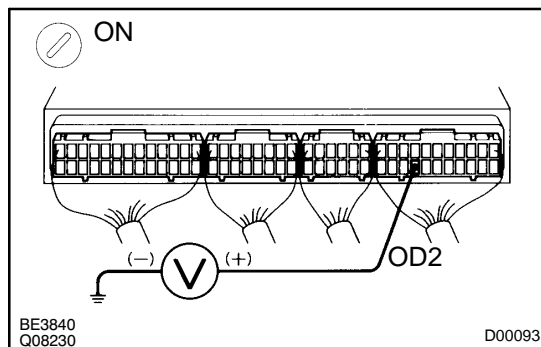
- (a) Remove the fuse box cover.
- (b) Connect a TOYOTA hand-held tester to the DLC3.
- (c) Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

Read the OVRDRIVE CUT SW2 signal on the TOYOTA hand-held tester.

OK:

O/D Main Switch	OVRDRIVE CUT SW2 Signal
O/D ON (pushed in)	OFF
O/D OFF (pushed out)	ON

**When not using TOYOTA hand-held tester:****PREPARATION:**

Turn the ignition switch ON.

CHECK:

Check the voltage between terminal OD2 of the ECM and body ground.

OK:

O/D Main Switch	Voltage
O/D ON	9 – 14 V
O/D OFF	Below 3 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-147](#)).

NG

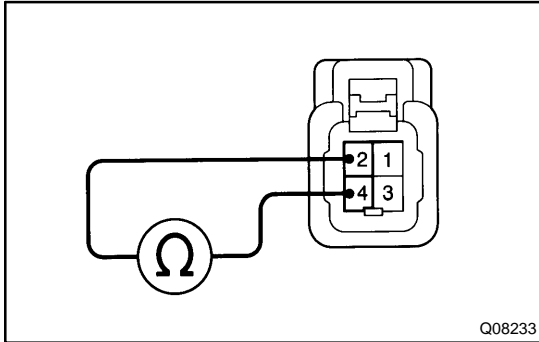
3

Check harness and connector between O/D OFF indicator light and ECM (See page [IN-28](#)).**NG**

Repair or replace harness or connector.

OK

Check and replace ECM.

4 Check O/D main switch.**CHECK:**

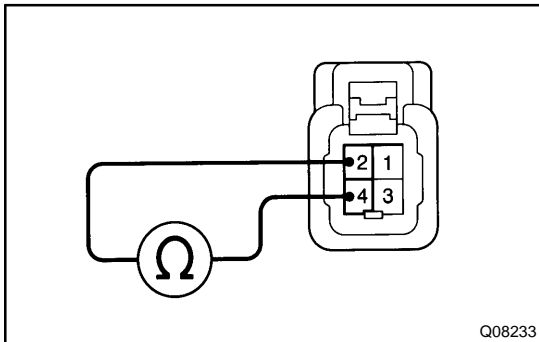
- (a) Disconnect the O/D main switch connector.
- (b) Measure the resistance between terminals 2 and 4 of the O/D main switch connector.

OK:

O/D Main Switch	Resistance
ON	$\infty \Omega$ (open)
OFF	0 Ω (continuity)

NG**Replace O/D main switch.****OK**

Check and replace the combination meter
(See page [BE-32](#)).

O/D OFF indicator light remains ON:**1 Check O/D main switch.****CHECK:**

- (a) Disconnect the O/D main switch connector.
- (b) Measure the resistance between terminals 2 and 4 of the O/D main switch connector.

OK:

O/D Main Switch	Resistance
ON	$\infty \Omega$ (open)
OFF	0 Ω (continuity)

NG**Replace O/D main switch.****OK**

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DIAGNOSTICS – AUTOMATIC TRANSMISSION

2	Check harness and connector between O/D OFF indicator light and O/D main switch, and O/D OFF indicator light and ECM (See page IN-28).
---	---

NG

Repair or replace harness or connector.

OK

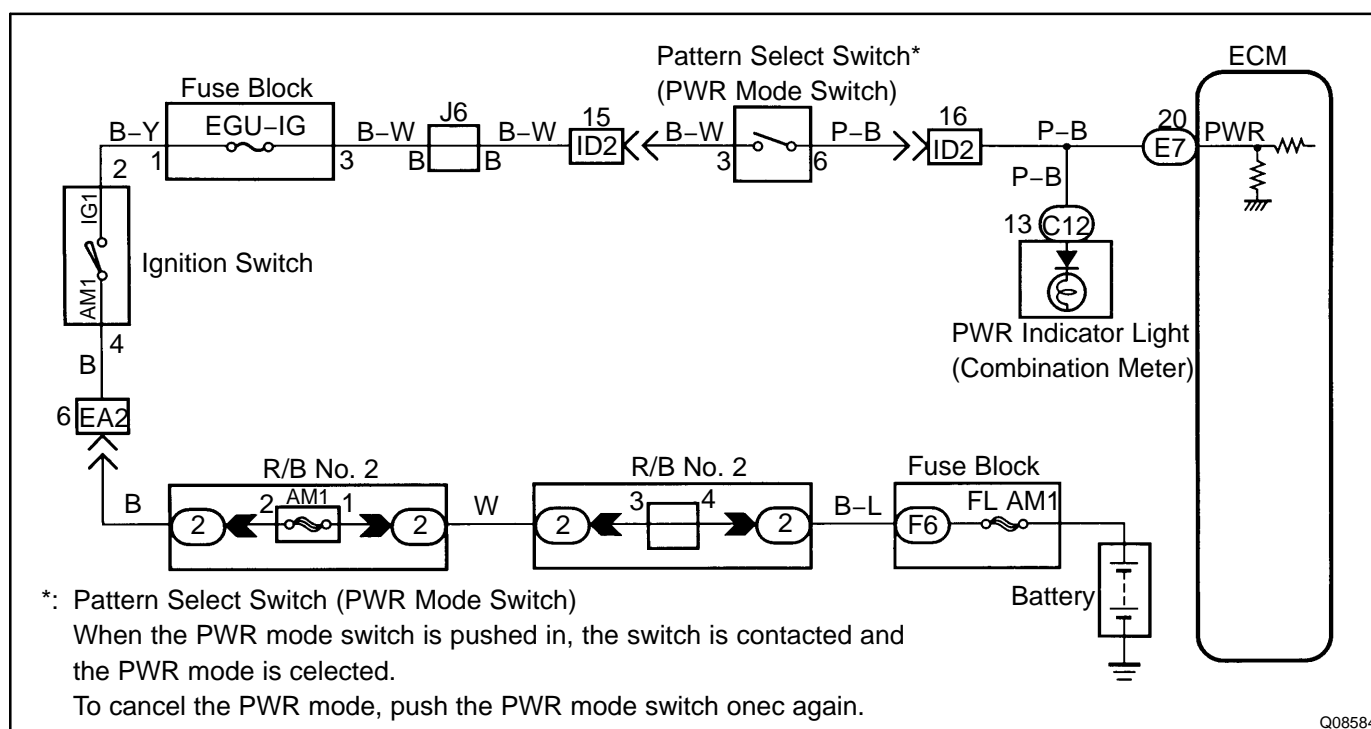
Check and replace ECM.

Pattern Select Switch Circuit (PWR Mode Switch)

CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 position, L position and the lock-up 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, and control the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Check operation of PWR indicator light.

PREPARATION:

Check if the PWR indicator light normally when the PWR mode switch is set to NORM and PWR position.

NG

Check and repair PWR indicator light.

OK

2 Check PATTERN SEL SW signal.

When using TOYOTA hand-held tester:

PREPARATION:

- Remove the fuse box cover.
- Connect a TOYOTA hand-held tester to the DLC3.
- Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

CHECK:

Read the PWR signal on the TOYOTA hand-held tester.

OK:

PWR Mode Switch	PATTERN SEL SW Signal
PWR	ON
NORM	OFF

When not using TOYOTA hand-held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Measure the voltage between terminal PWR of the ECM connector and body ground when the PWR mode switch is set to the PWR (POWER) position and NORM (NORMAL) position.

OK:

PWR Mode Switch	Voltage
PWR	7.5 – 14 V
NORM	Below 1.5 V

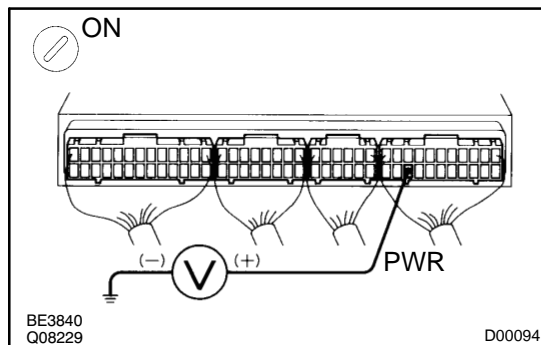
HINT:

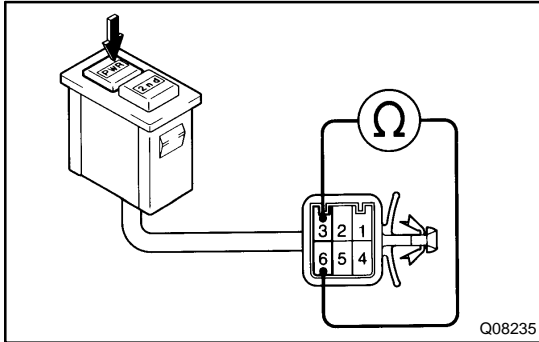
The ECM uses the normal pattern signal if the power signal is not input.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-147](#)).

NG



3 Check PWR mode switch.**PREPARATION:**

Disconnect the pattern select switch connector.

CHECK:

Check the resistance between terminals of the pattern select switch connector when the PWR mode switch is set to PWR and NORM positions.

OK:

PWR Mode Switch	Resistance
PWR	0 Ω (continuity)
NORM	∞ Ω (open)

NG**Replace pattern select switch.****OK****4 Check harness and connector between battery and pattern select switch, and pattern select switch and ECM (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK****Check and replace ECM.**

Pattern Select Switch Circuit (2nd Start Switch) & 2nd Start Switch Indicator Light Circuit

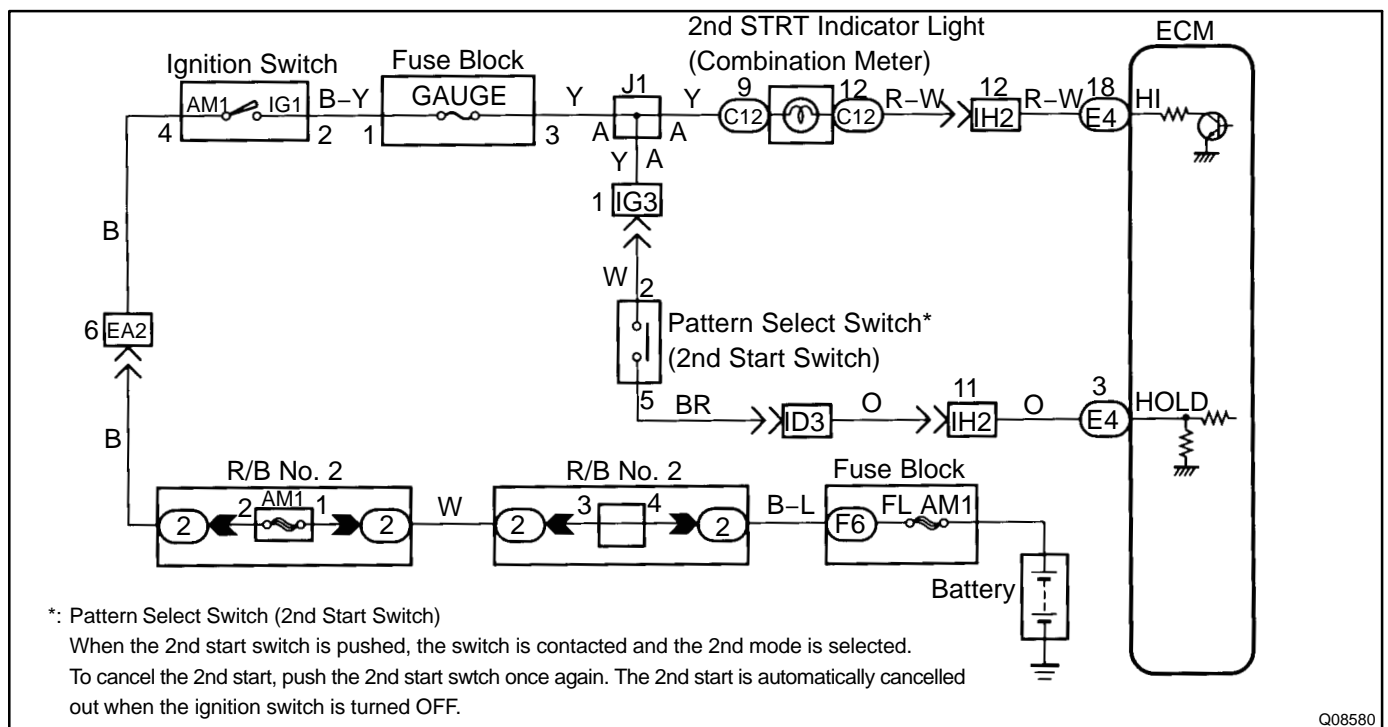
CIRCUIT DESCRIPTION

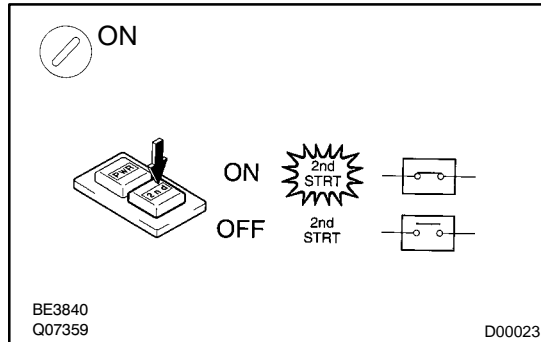
When 2nd start mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear.

In D position, the transmission automatically shifts up through 3rd to O/D as usual.

In 2nd position, the transmission is held in 2nd gear.

WIRING DIAGRAM



INSPECTION PROCEDURE**1 Check operation of 2nd start switch.****CHECK:**

- (a) Turn the ignition switch ON.
- (b) Check the "2nd STRT" indicator light when the 2nd start switch is pushed in to ON.

OK:

"2nd STRT" indicator light lights up.

CHECK:

Check the "2nd STRT" indicator light when the 2nd start switch is pushed again, or PWR mode switch is pushed into OFF.

OK:

"2nd STRT" indicator light goes off. When PWR mode switch is pushed in to ON, "2nd STRT" indicator light goes off, and "PWR" indicator light lights up.

OK

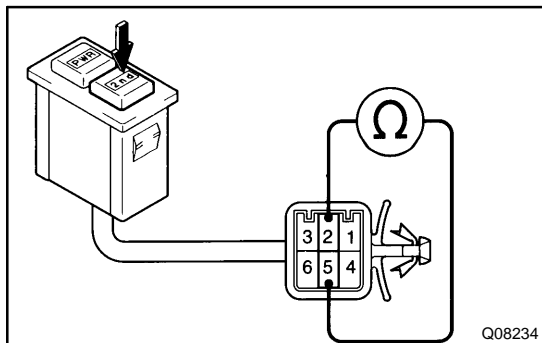
Proceed to next circuit inspection shown on problem symptoms table (See page [DI-147](#)).

NG**2 Check 2nd start indicator bulb.****NG**

Replace 2nd start indicator bulb.

OK

3 Check 2nd start switch.

**PREPARATION:**

Disconnect the pattern select switch connector.

CHECK:

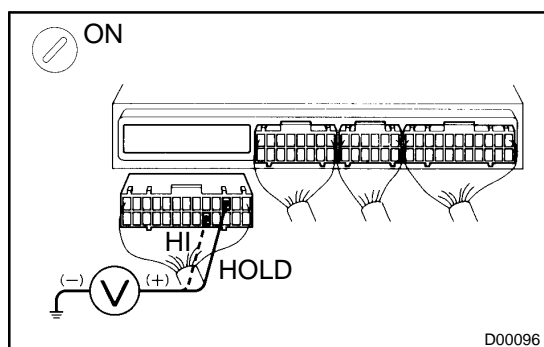
Check the resistance between terminals 2 and 5 of the pattern select switch connector when the pattern select switch is set to 2nd start switch ON and OFF.

OK:

2nd Start Switch	Resistance
ON	0 Ω (continuity)
OFF	∞ Ω (open)

NG**Replace pattern select switch.****OK**

4 Check voltage between terminals HOLD and HI of ECM and body ground.

**PREPARATION:**

- (a) Turn ignition switch ON.
- (b) Disconnect the connector from the ECM.

CHECK:

Check the voltage between terminal HOLD of the ECM and body ground when the select switch is set to 2nd start switch ON and OFF.

OK:

2nd Start Switch	Voltage
ON	9 – 14 V
OFF	Below 1.5 V

CHECK:

Check the voltage between terminal HI of the ECM and body ground.

OK:

Voltage: 7.5 – 14 V

OK**Check and replace ECM.****NG**

Check and replace harness and connector between battery and patten select switch, pattern select switch and ECM, battery and 2nd start indicator light, and 2nd start indicator light and ECM (See page IN-28).

Pattern Select Switch Circuit (2nd Start Switch) & 2nd Start Switch Indicator Light Circuit

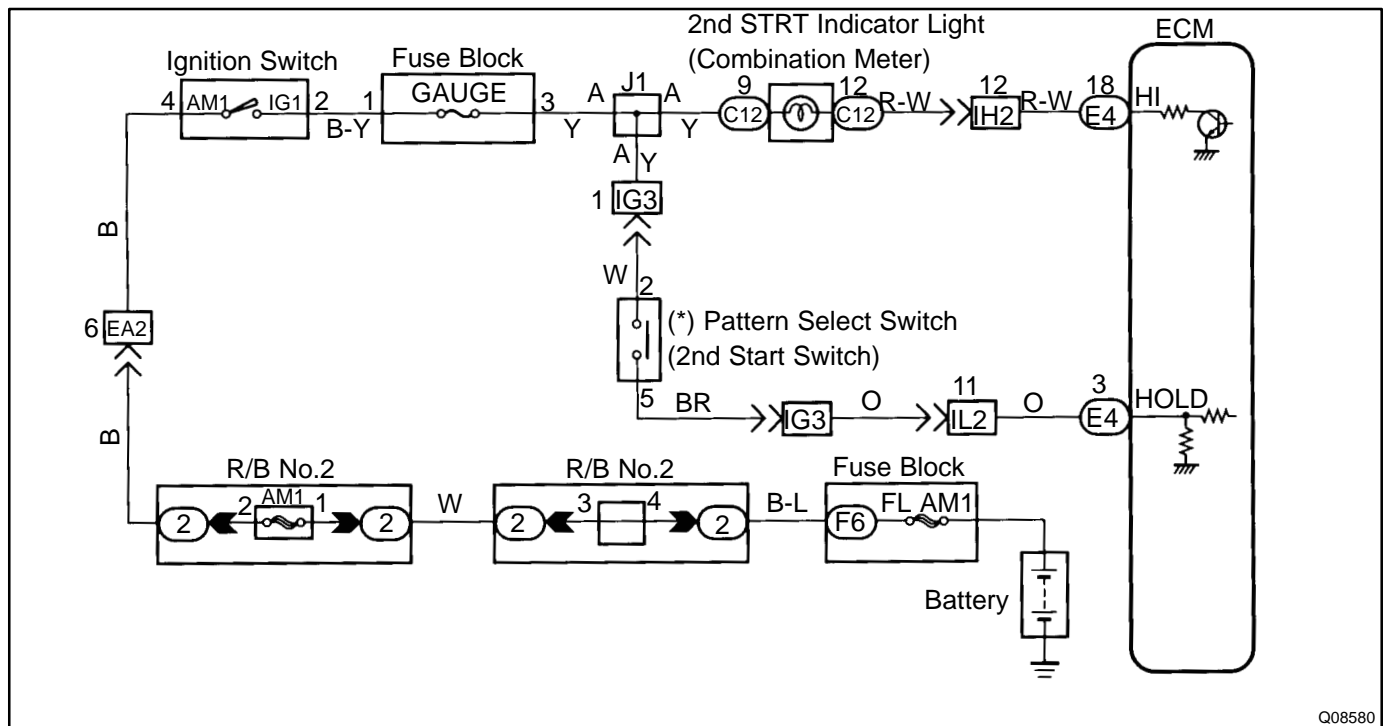
CIRCUIT DESCRIPTION

When 2nd start mode is selected with the pattern select switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear.

In D position, the transmission automatically shifts up through 3rd to O/D as usual.

In 2nd position, the transmission is held in 2nd gear.

WIRING DIAGRAM



Q08580

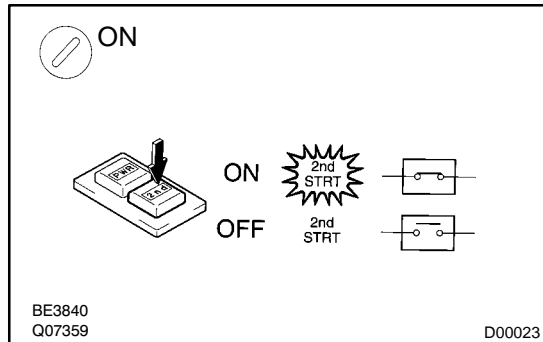
(*) Pattern Select Switch (2nd Start Switch)

When the 2nd start switch is pushed, the switch is contacted and the 2nd mode is selected.

To cancel the 2nd start, push the 2nd start switch once again. The 2nd start is automatically cancelled out when the ignition switch is turned OFF.

INSPECTION PROCEDURE

1 Check operation of 2nd start switch.

**CHECK:**

- (a) Turn the ignition switch ON.
- (b) Check "2nd STRT" indicator light when 2nd start switch is pushed in to ON.

OK:

"2nd STRT" indicator light lights up.

CHECK:

Check "2nd STRT" indicator light when 2nd start switch is pushed again, or PWR mode switch is pushed into OFF.

OK:

"2nd STRT" indicator light goes off. When PWR mode switch is pushed in to ON, "2nd STRT" indicator light goes off, and "PWR" indicator light lights up.

OK

Proceed to next circuit inspection shown on matrix chart (See page [DI-150](#)).

NG

2 Check 2nd start indicator bulb.

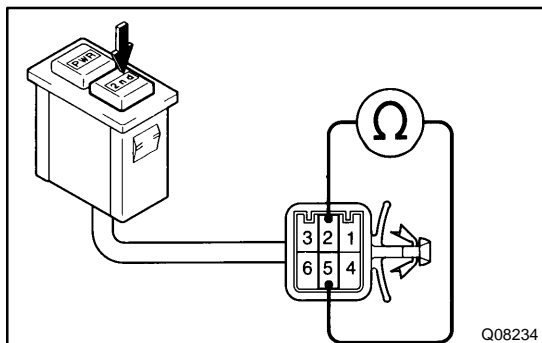
NG

Replace 2nd start indicator bulb.

OK

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DIAGNOSTICS - AUTOMATIC TRANSMISSION

3 Check 2nd start switch.**PREPARATION:**

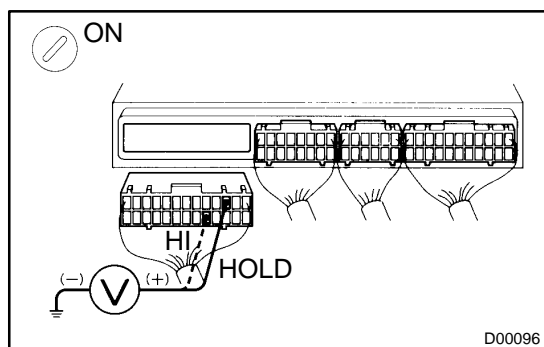
Disconnect the pattern select switch connector.

CHECK:

Check continuity between terminals 2 and 5 of pattern select switch connector when pattern select switch is set to 2nd start switch ON and OFF.

OK:

2nd start switch	Specified condition
Press continuously "2nd" switch	0 Ω (Continuity)
Release "2nd" switch	∞ Ω (open)

NG**Replace pattern select switch.****OK****4 Check voltage between terminals HOLD and HI of ECM and body ground.****PREPARATION:**

- (a) Turn ignition switch ON.
- (b) Disconnect the connector of ECM.

CHECK:

Check voltage between terminal HOLD of ECM and body ground when the select switch is set to 2nd start switch ON and OFF.

OK:

2nd start switch	Voltage
ON	9 - 14 V
OFF	Below 1.5 V

CHECK:

Check voltage between terminal HI of ECM and body ground.

OK:**Voltage: 7.5 - 14 V****OK****Check and replace the ECM.****NG**

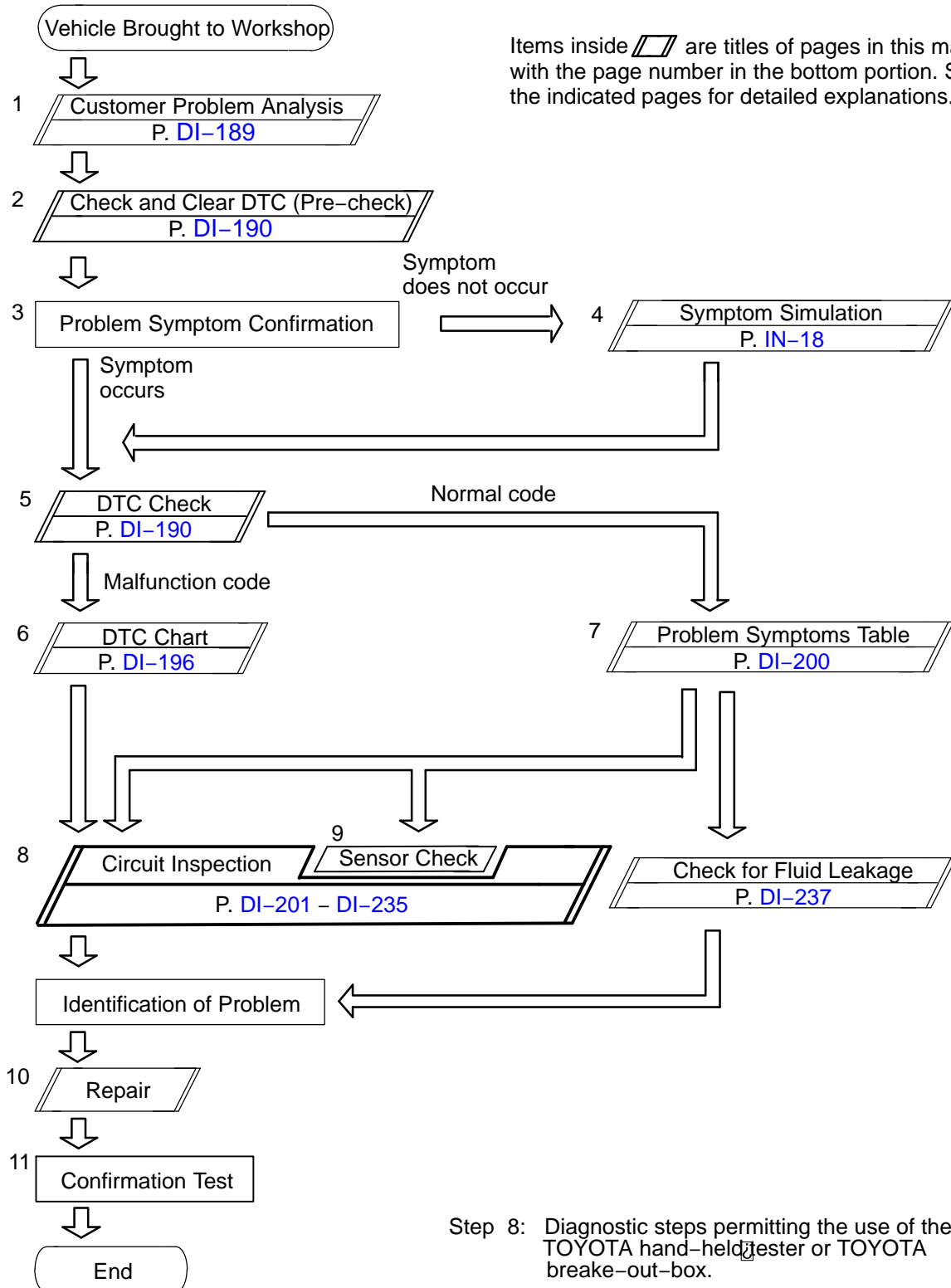
Check and replace harness and connector between battery and patten select switch, pattern select switch and ECM, battery and 2nd start indicator light , 2nd start indicator light and ECM (See page IN-27).

ANTI-LOCK BRAKE SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DISLT-02

Troubleshooting in accordance with the procedure on the following pages.



CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

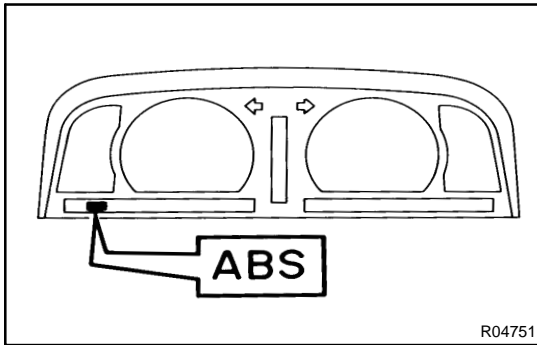
 Inspector's :
 Name _____

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date Problem First Occurred	/ /
Frequency Problem Occurs	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)

Symptoms	<input type="checkbox"/> ABS does not operate.	
	<input type="checkbox"/> ABS does not operate efficiently.	
	ABS Warning Light Abnormal	<input type="checkbox"/> Remains ON <input type="checkbox"/> Does not Light Up

DTC Check	1st Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)
	2nd Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)



PRE-CHECK

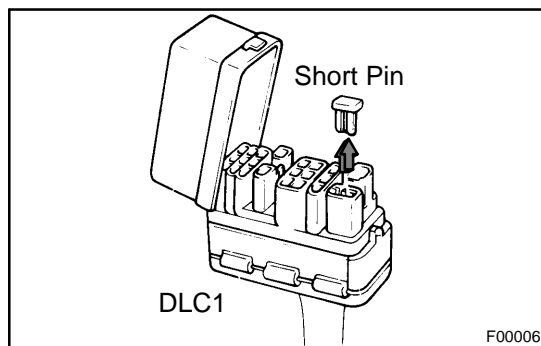
1. DIAGNOSIS SYSTEM

(a) Check the indicator.

When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

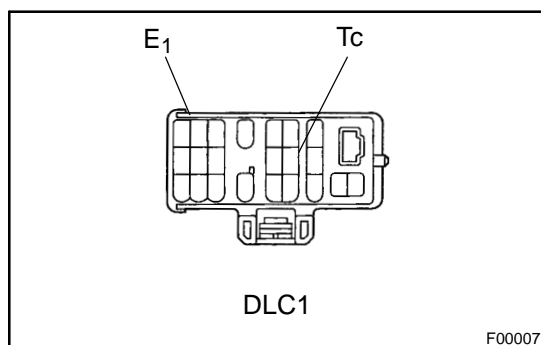
HINT:

- If the indicator check result is not normal, proceed to troubleshooting for the ABS warning light circuit (See page [DI-230](#)).
- When the transfer is in L position (center differential lock), the ABS does not operate and the ABS warning light stays ON.



(b) Check the DTC.

- (1) Confirm that the center differential is free.
- (2) Disconnect the short pin from the DLC1.



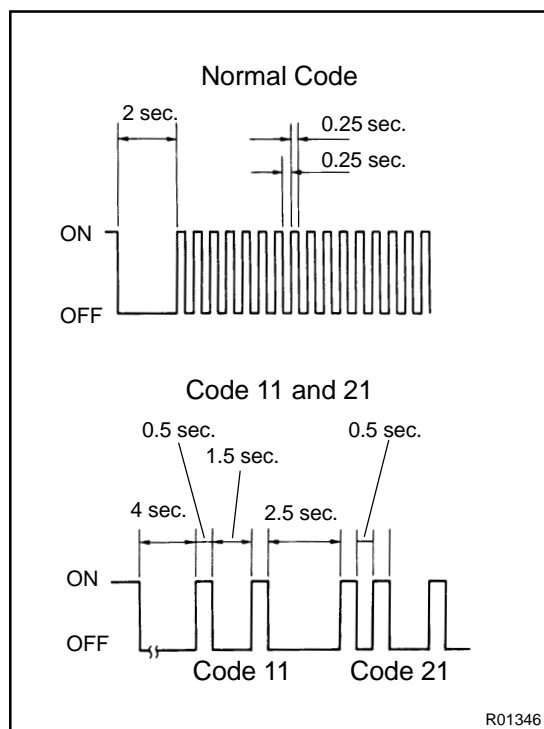
- (3) Using SST, connect terminals Tc and E₁ of the DLC1.

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- (4) Turn the ignition switch ON.
- (5) Read the DTC 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 [DI-233](#) or [DI-230](#)).

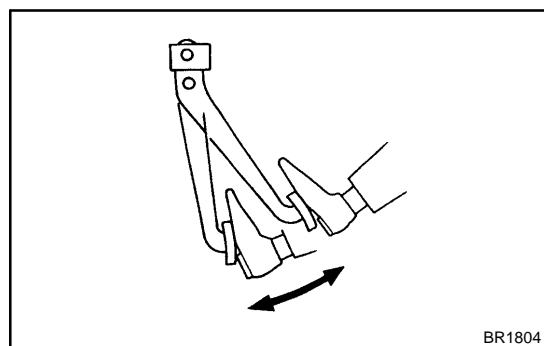


- As an example, the blinking patterns for normal code and codes 11 and 21 are shown in the illustration.

(6) Code are explained in the code table on page [DI-196](#).

(7) 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 DTC will be displayed 1st.



(c) Clear the DTC.

(1) Confirm that the center differential is free.

(2) Using SST, connect terminals Tc and E₁ of the DLC1 and remove the short pin from the DLC1.

SST 09843-18020

(3) Turn the ignition switch ON.

(4) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.

(5) Check that the warning light shows the normal code.

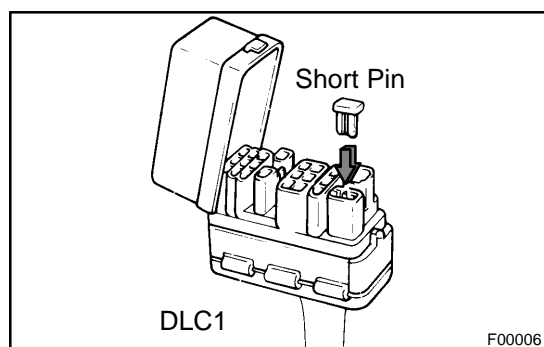
(6) Remove the SST from the terminals of the DLC1.

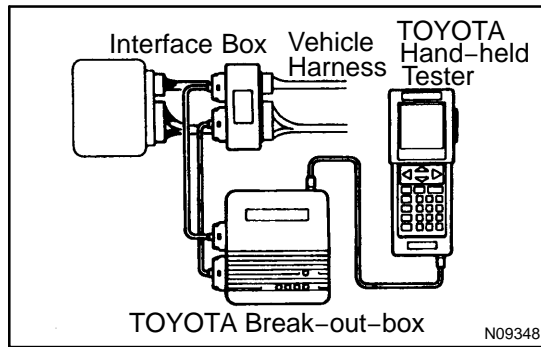
SST 09843-18020

(7) Connect the short pin to the DLC1.

HINT:

Cancellation can also be done by removing the ECU-B fuse, but in this case, other memory systems will also be cancelled out.



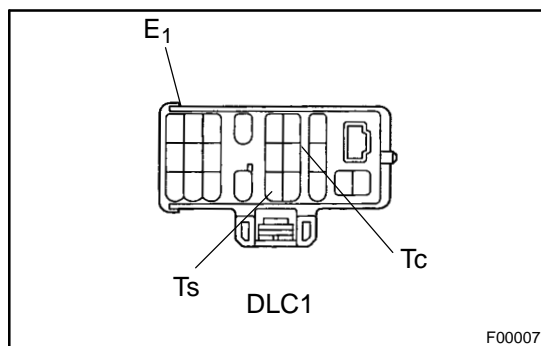


- (d) Using TOYOTA break-out-box and TOYOTA hand-held tester, measure the ECU terminal values.
- (1) Hook up the TOYOTA hand-held tester and TOYOTA break-out-box to the vehicle.
 - (2) Read the ECU input/output values by following the prompts on the tester screen.

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.



2. SPEED SENSOR SIGNAL AND DECELERATION SENSOR CHECK

- (a) Check the speed sensor signal.
- (1) Confirm that the center differential is free.
 - (2) Turn the ignition switch OFF.
 - (3) Using SST, connect terminals Ts and E₁ of the 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 [DI-230](#)).

- (6) Drive vehicle straight forward.

HINT:

Drive vehicle faster than 45 km/h (28 mph) for several seconds.

- (7) Stop the vehicle.
- (8) Using SST, connect terminals Tc and E₁ of the DLC1.

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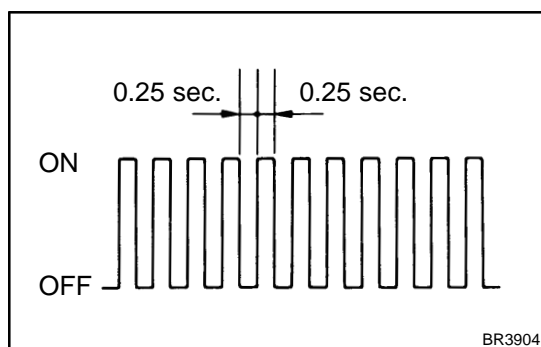
- (9) Read the number of blinks of the ABS warning light.

HINT:

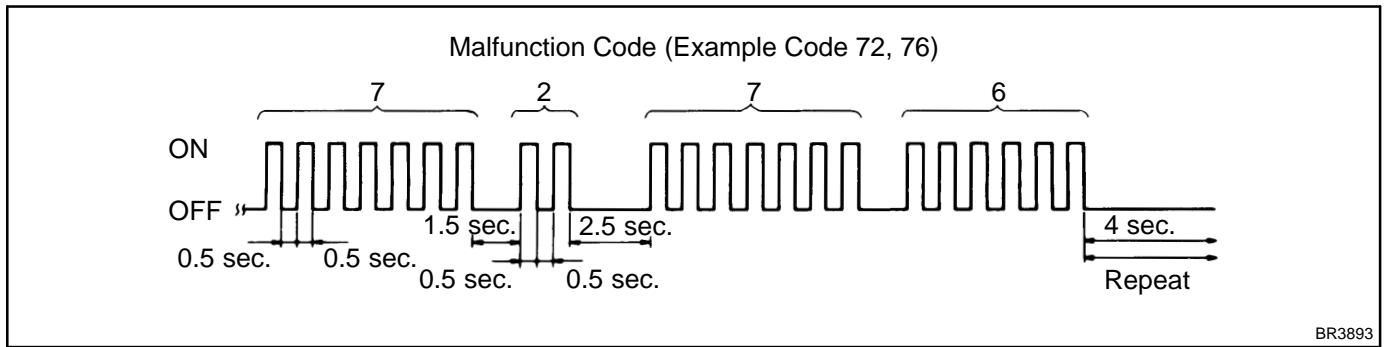
See the list of DTC on page [DI-190](#).

If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).

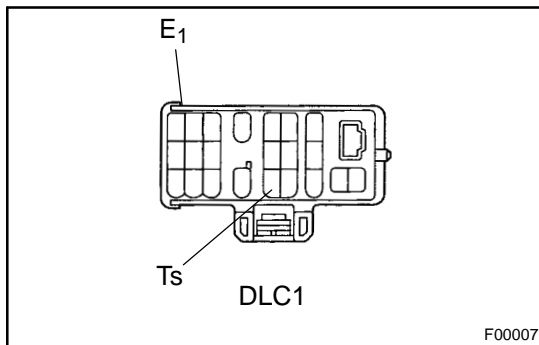
If 2 or more malfunction are indicated at the same time, the lowest numbered code will be displayed 1st.



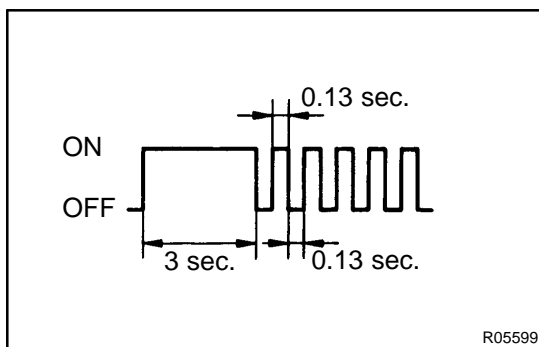
DIAGNOSTICS - ANTI-LOCK BRAKE SYSTEM



- (10) After doing the check, disconnect terminals Ts and E₁, Tc and E₁ of the DLC1, and turn the ignition switch OFF.



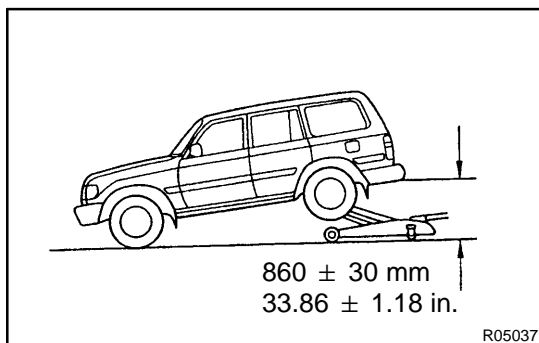
- (b) Deceleration sensor detection point check.
- (1) Confirm that the center differential is free.
 - (2) Turn the ignition switch OFF.
 - (3) Using SST, connect terminals Ts and E₁ of the DLC1.
- SST 09843-18020
- (4) Start the engine.



- (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 [DI-230](#)).



- (6) Jack up the rear side of the vehicle slowly.

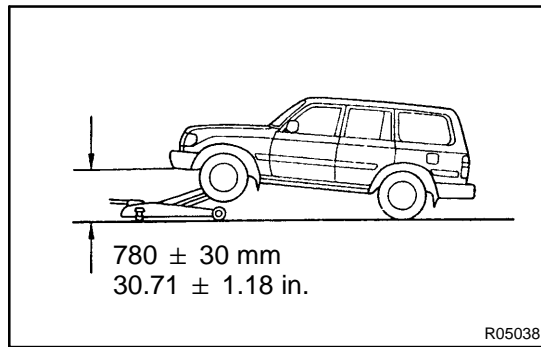
HINT:

When measuring the height, measure at the center of the lower body of the vehicle.

- (7) Check that the warning light blinks.

If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

- (8) Jack down the vehicle slowly.



- (9) Jack up the front side of the vehicle slowly, as shown.

HINT:

When measuring the height, measure at the center of the lower body of the vehicle.

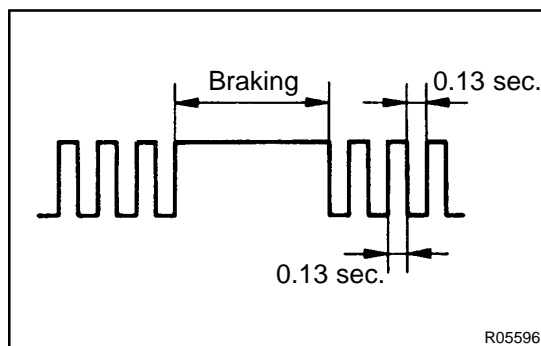
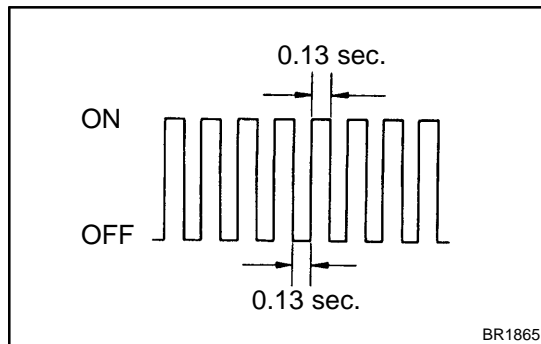
- (10) Check that the warning light blinks.

If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

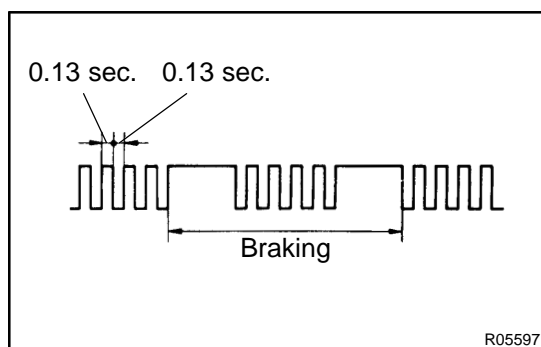
- (11) Jack down the vehicle slowly.

- (c) Deceleration sensor operation check.

- (1) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, lightly depress the brake pedal.
- (2) Check that there is no change in the warning light pattern.



- (3) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal moderately.
- (4) Check that the warning light turns on while braking.
- (5) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal strongly.



- (6) Check that the warning light pattern changes while braking, as shown.

If the operation is not as specified, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

- (7) Stop the vehicle and turn the ignition switch OFF.
- (8) Remove SST from the terminals Ts and E₁ of the DLC1.

SST 09843-18020

DIAGNOSTICS – ANTI-LOCK BRAKE SYSTEM

(d) Check the DTC of speed sensor function.

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	<ul style="list-style-type: none"> • Right front speed sensor • Sensor installation • Sensor rotor • Sensor wire harness
72	Low output voltage of left front speed sensor	<ul style="list-style-type: none"> • Left front speed sensor • Sensor installation • Sensor rotor • Sensor wire harness
73	Low output voltage of right rear speed sensor	<ul style="list-style-type: none"> • Right rear speed sensor • Sensor installation • Sensor rotor • Sensor wire harness
74	Low output voltage of left rear speed sensor	<ul style="list-style-type: none"> • Left rear speed sensor • Sensor installation • Sensor rotor • Sensor wire harness
75	Abnormal change in output voltage of right front speed sensor	<ul style="list-style-type: none"> • Right front speed sensor rotor • Sensor wire harness
76	Abnormal change in output voltage of left front speed sensor	<ul style="list-style-type: none"> • Left front speed sensor rotor • Sensor wire harness
77	Abnormal change in output voltage of right rear speed sensor	<ul style="list-style-type: none"> • Right rear speed sensor rotor • Sensor wire harness
78	Abnormal change in output voltage of left rear speed sensor	<ul style="list-style-type: none"> • Left rear speed sensor rotor • Sensor wire harness
79	Deceleration sensor is faulty	<ul style="list-style-type: none"> • Deceleration sensor • Sensor installation

DIAGNOSTIC TROUBLE CODE CHART

NOTICE:

When removing the part, turn the ignition switch OFF.

HINT:

- Using SST 09843-18020, connect the terminals Tc and E₁, and remove the short pin.
- If any abnormality is not found when inspection parts, inspect the ECU.

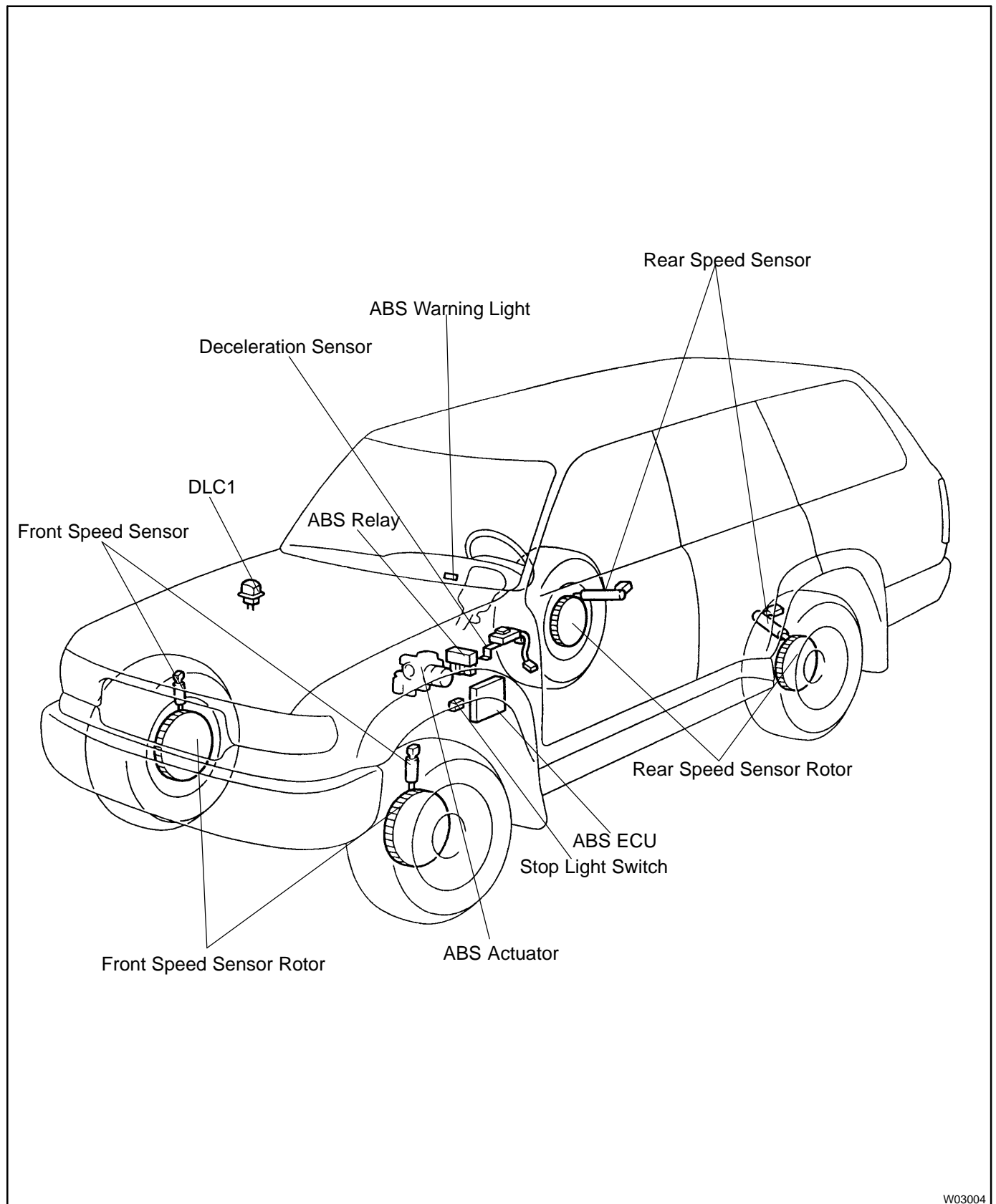
If a malfunction code is displayed during the DTC check, check the circuit listed that the code. For details of each code, turn to the page referred to under the "See page" for respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area
11 (DI-201)	Open circuit in ABS control (solenoid) relay circuit	<ul style="list-style-type: none"> • ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit
12 (DI-201)	Short circuit in ABS control (solenoid) relay circuit	<ul style="list-style-type: none"> • ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit
13 (DI-204)	Open circuit in ABS control (motor) relay circuit	<ul style="list-style-type: none"> • ABS control (motor) relay • Open or short in ABS control (motor) relay circuit
14 (DI-204)	Short circuit in ABS control (motor) relay circuit	<ul style="list-style-type: none"> • ABS control (motor) relay • B+ short in ABS control (motor) relay circuit
21 (DI-207)	Open or short circuit in 3-position solenoid circuit for right front wheel	<ul style="list-style-type: none"> • ABS actuator • Open or short in SFR circuit
22 (DI-207)	Open or short circuit in 3-position solenoid circuit for left front wheel	<ul style="list-style-type: none"> • ABS actuator • Open or short in SFL circuit
23 (DI-207)	Open or short circuit in 3-position solenoid circuit for rear wheel	<ul style="list-style-type: none"> • ABS actuator • Open or short in SRR circuit
31 (DI-210)	Right front wheel speed sensor signal malfunction	<ul style="list-style-type: none"> • Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit • Sensor rotor
32 (DI-210)	Left front wheel speed sensor signal malfunction	
33 (DI-210)	Right rear wheel speed sensor signal malfunction	
34 (DI-210)	Left rear wheel speed sensor signal malfunction	
35 (DI-210)	Open circuit in left front or right rear speed sensor circuit	<ul style="list-style-type: none"> • Open in left front or right rear speed sensor circuit
36 (DI-210)	Open circuit in right front or left rear speed sensor circuit	<ul style="list-style-type: none"> • Open in right front or left rear speed sensor circuit
41 (DI-215)	Low battery positive voltage or abnormally high battery positive voltage	<ul style="list-style-type: none"> • Battery • IC regulator • Open or short in power source circuit
43 (DI-218)	Malfunction in deceleration sensor	<ul style="list-style-type: none"> • Deceleration sensor • Wire harness for deceleration sensor circuit
44 (DI-219)	Open or short in deceleration sensor circuit	<ul style="list-style-type: none"> • Deceleration sensor • Open or short in deceleration sensor circuit
48 (DI-221)	Open or short circuit in center differential lock circuit Center differential is locking	<ul style="list-style-type: none"> • Center differential lock • Center differential lock circuit

DIAGNOSTICS – ANTI-LOCK BRAKE SYSTEM

51 (DI-224)	Pump motor is locked Open in pump motor ground	<ul style="list-style-type: none"> • ABS pump motor
Always ON (DI-225)	Malfunction in ECU IG power source circuit	<ul style="list-style-type: none"> • Battery • IC regulator • Open or short in power source circuit • ECU

PARTS LOCATION



W03004

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC 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	Suspected Area	See page
ABS does not operate	<p>Only when 1 – 4 are all normal and the problem is still occurring, replace the ABS ECU</p> <ol style="list-style-type: none"> 2. Check the DTC reconfirming that the normal code is output 3. IG power source circuit 4. Speed sensor circuit 5. Check the ABS actuator with a checker <p>If abnormal, check the hydraulic circuit for leakage (See page DI-237)</p>	DI-190 DI-215 DI-210 BR-53
ABS does not operate efficiently	<p>Only when 1 – 4 are all normal and the problem is still occurring, replace the ABS ECU</p> <ol style="list-style-type: none"> 1. Check the DTC reconfirming that the normal code is output 2. Speed sensor circuit 3. Stop light switch circuit 4. Check the ABS actuator with a checker <p>If abnormal, check the hydraulic circuit for leakage (See page DI-237)</p>	DI-190 DI-210 DI-228 BR-53
ABS warning light abnormal	<ol style="list-style-type: none"> 1. ABS warning light circuit 2. ABS ECU 	DI-230 –
DTC check cannot be done	<p>Only when 1 and 2 are all normal and the problem is still occurring, replace the ABS ECU</p> <ol style="list-style-type: none"> 1. ABS warning light circuit 2. Tc terminal circuit 	DI-230 DI-233
Speed sensor signal check cannot be done	<ol style="list-style-type: none"> 1. Ts terminal circuit 2. ABS ECU 	DI-235 –

CIRCUIT INSPECTION

DTC	11, 12	ABS Control (Solenoid) Relay Circuit
-----	--------	--------------------------------------

CIRCUIT DESCRIPTION

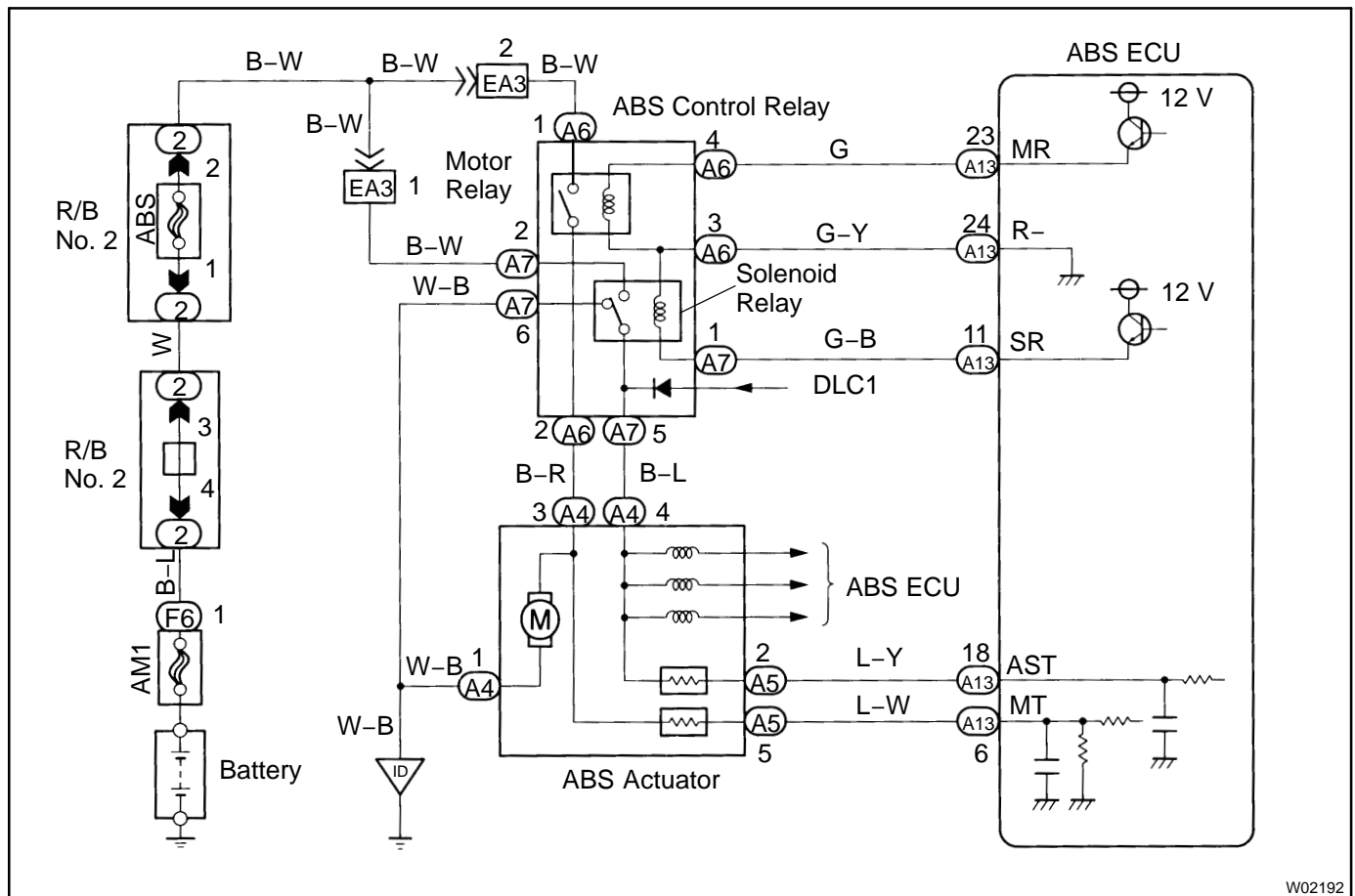
This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC 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. (2) ABS control (solenoid) relay monitor terminal (AST) voltage: 0 V	<ul style="list-style-type: none"> • ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit
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	<ul style="list-style-type: none"> • ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit

Fail safe function:

If trouble in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

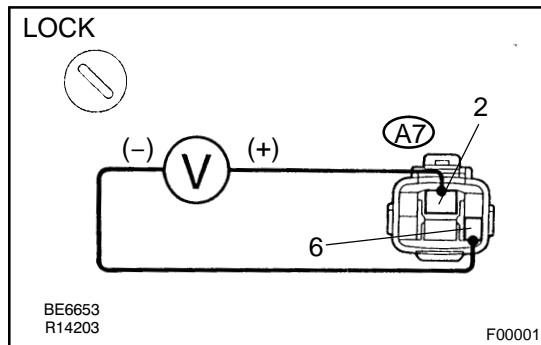
WIRING DIAGRAM



W02192

INSPECTION PROCEDURE

- 1 Check voltage between terminals A7-2 and A7-6 of ABS control relay connector.**

**PREPARATION:**

Disconnect the ABS control relay connector.

CHECK:

Measure the voltage between terminals A7-2 and A7-6 of the ABS control relay harness side connector.

OK:

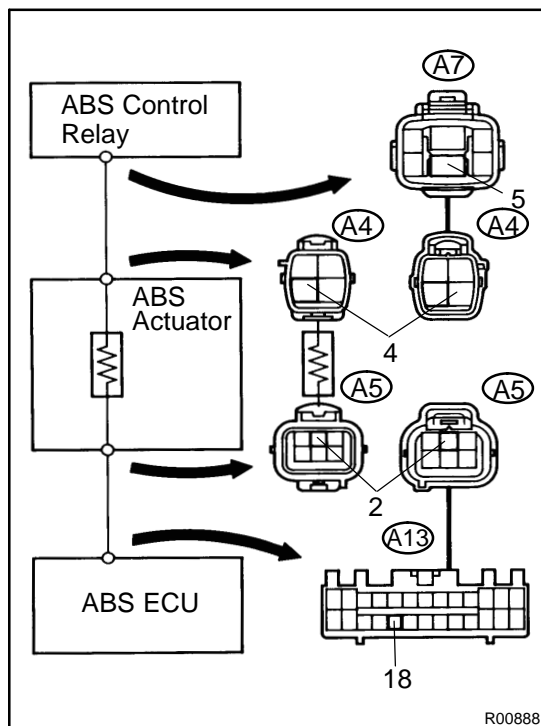
Voltage: 10 – 14 V

NG

Check and repair harness or connector.

OK

- 2 Check continuity between terminals A7-5 and A4-4, A4-4 and A5-2, and A5-2 and A13-18.**

**PREPARATION:**

Disconnect the 2 connectors from the ABS actuator.

CHECK:

Check the continuity between terminals A7-5 and A4-4, A4-4 and A5-2, and A5-2 and A13-18.

OK:

Continuity

HINT:

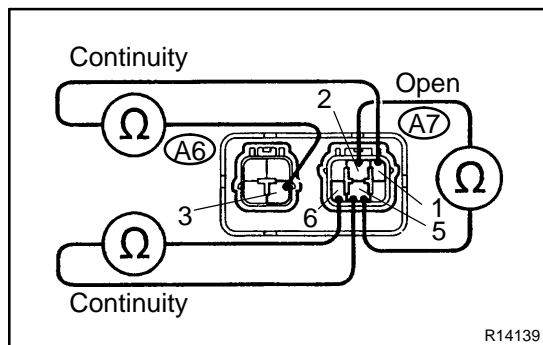
There is a resistance of 4 ~ 6 Ω between terminals A4-4 and A5-2.

NG

Repair or replace harness or ABS actuator.

OK

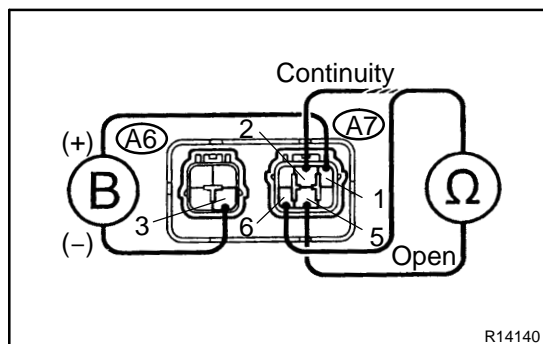
3 Check ABS control (solenoid) relay.

**CHECK:**

Check the continuity between each terminal of the ABS control (solenoid) relay.

OK:

Terminals A7-1 and A6-3	Continuity (Reference value aprox. 80 Ω)
Terminals A7-5 and A7-6	Continuity
Terminals A7-2 and A7-5	Open

**CHECK:**

- Apply battery positive voltage between terminals A7-1 and A6-3.
- Check the continuity between each terminal of the ABS control (solenoid) relay.

OK:

Terminals A7-5 and A7-6	Open
Terminals A7-2 and A7-5	Continuity

NG

Replace ABS control relay.

OK

4 Check for open and short in harness and connector between ABS control (solenoid) relay and ABS ECU (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

DTC	21, 22, 23	ABS Actuator Solenoid Circuit
------------	-------------------	--------------------------------------

CIRCUIT DESCRIPTION

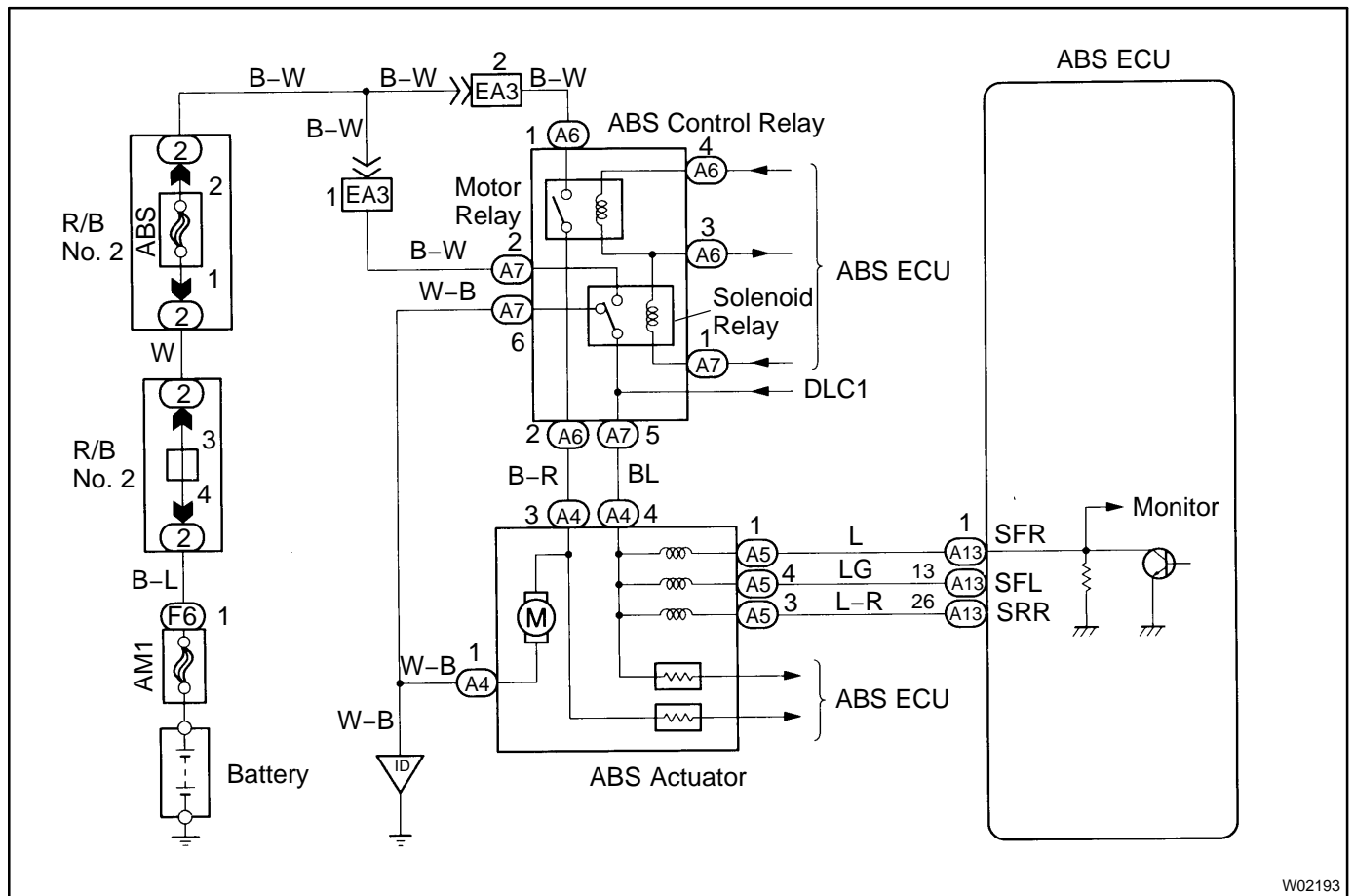
This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force.

DTC No.	DTC 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	<ul style="list-style-type: none"> •ABS actuator •Open or short in SFR circuit
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	<ul style="list-style-type: none"> •ABS actuator •Open or short in SFL circuit
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	<ul style="list-style-type: none"> •ABS actuator •Open or short in SRR circuit

Fail safe function:

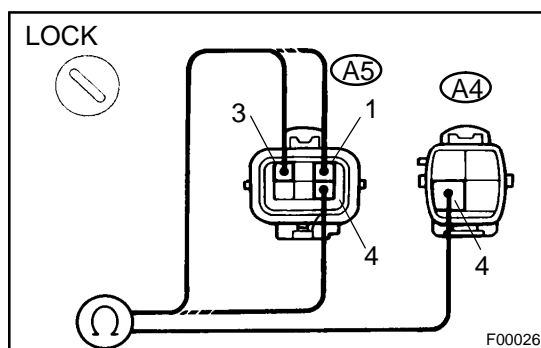
If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check ABS actuator solenoid.
---	------------------------------



PREPARATION:

Disconnect the 2 connectors from the ABS actuator.

CHECK:

Check the continuity between terminals A4 – 4 and A5-1, 3, 4 of the ABS actuator connector.

OK:

Continuity

HINT:

Resistance of each solenoid coil is $0.8 - 1.6 \, \Omega$

NG

Replace ABS actuator.

OK

2	Check for open and short in harness and connector between ABS ECU and actuator (See page IN-28).
---	---

NG

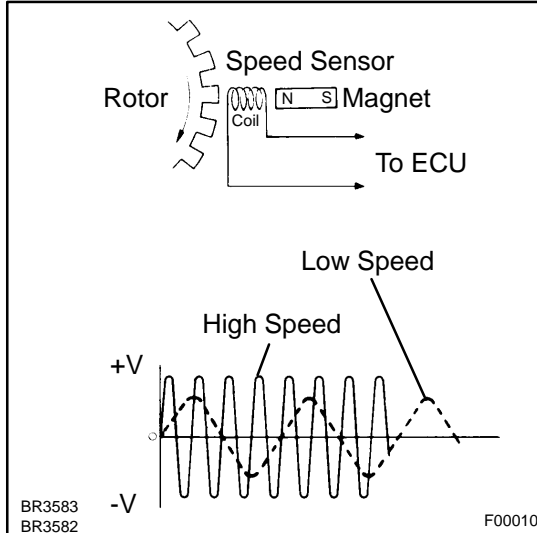
Repair or replace harness or connector.

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connector are normal, ECU may be defective.

DTC	31, 32, 33, 34, 35, 36	Speed Sensor Circuit
------------	-------------------------------	-----------------------------

CIRCUIT DESCRIPTION



The speed sensor detects 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.

DTC No.	DTC 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.	<ul style="list-style-type: none"> • Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit • Sensor rotor
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.	<ul style="list-style-type: none"> • Open in left front or right rear speed sensor circuit
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.	<ul style="list-style-type: none"> • Open in right front or left rear speed sensor circuit

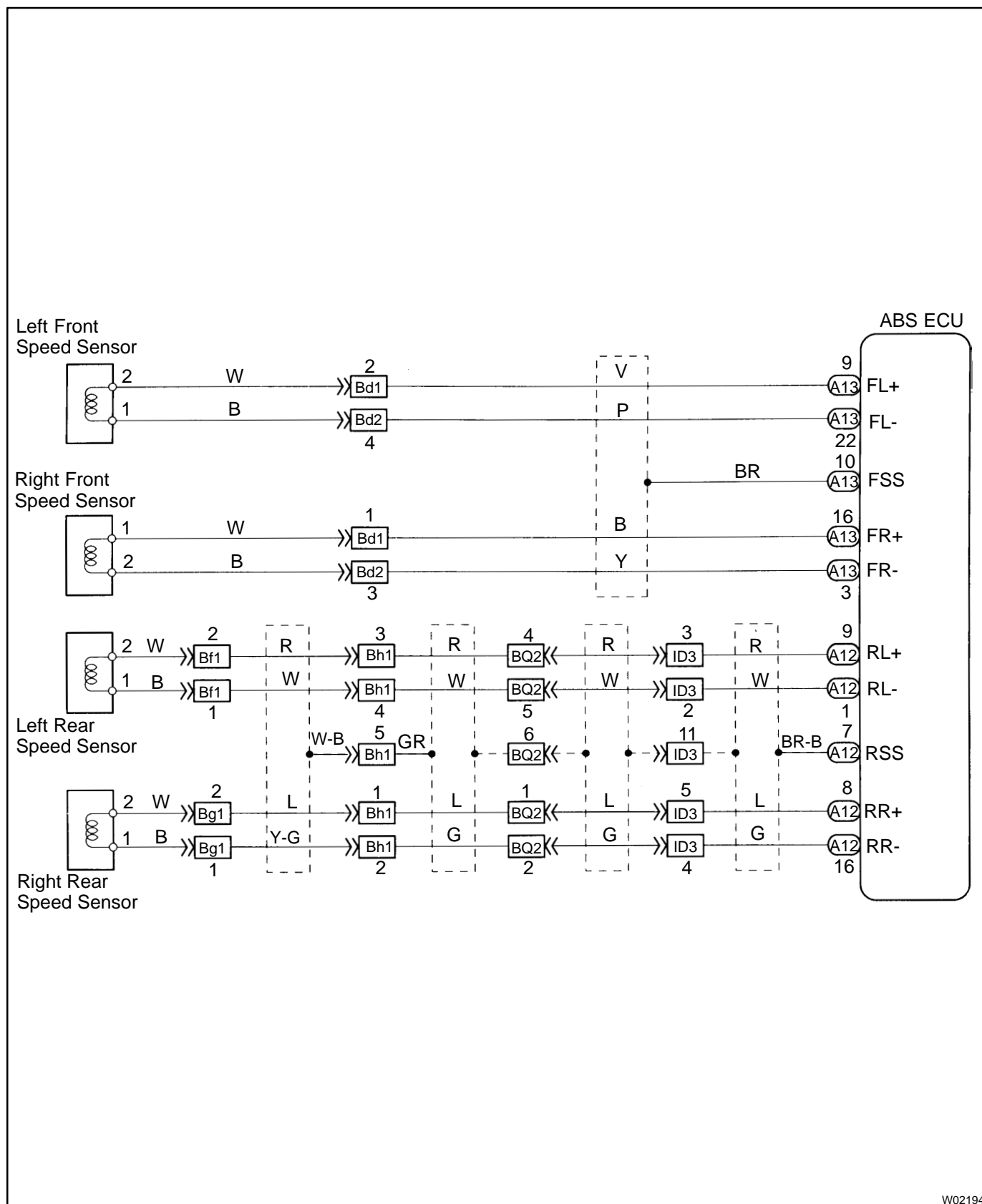
HINT:

- 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:

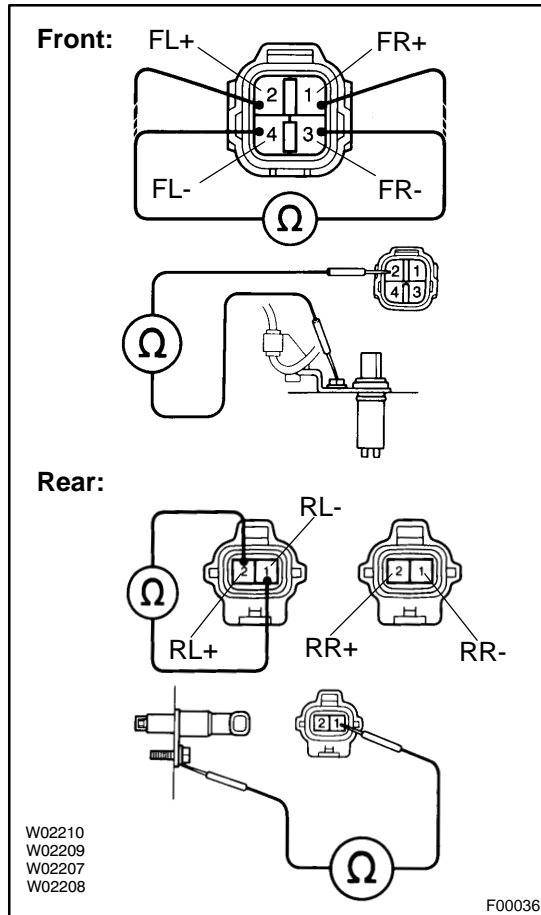
If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check speed sensor.

**Front****PREPARATION:**

Disconnect speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector.

OK:

Resistance: 0.6 - 2.0 kΩ

CHECK:

Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

Rear**PREPARATION:**

Disconnect speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2 of speed sensor connector.

OK:

Resistance: 0.5 - 1.6 kΩ

CHECK:

Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG

Replace speed sensor.

NOTICE:

Check the speed sensor signal last (See page [DI-189](#)).

OK

DI-213

DIAGNOSTICS - ANTI-LOCK BRAKE SYSTEM

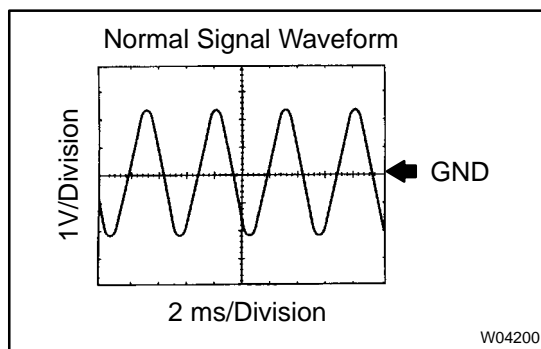
- 2** Check for open and short in harness and connector between each speed sensor and ECU (See page [IN-27](#)).

NG

Repair or replace harness or connector.

OK

- 3** Check speed sensor and rotor serrations.

**Reference: INSPECTION USING OSCILLOSCOPE****PREPARATION:**

- (a) Remove the ABS ECU with connector still connected.
- (b) Connect the oscilloscope to the terminals FR+, FL+, RR+ or RL+ and GND of the ABS ECU.

CHECK:

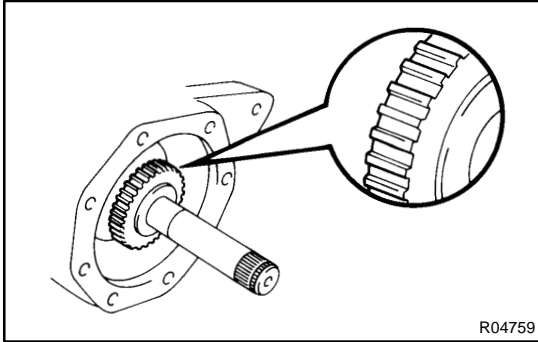
Drive the vehicle at 30 km/h (19 mph), and check the signal waveform.

OK

Turn the IG switch OFF, check and replace ABS ECU.

NG

4 Check sensor rotor and sensor installation.



Front

PREPARATION:

Remove front axle hub and knuckle spindle (See page [SA-8](#)).

CHECK:

Check the sensor rotor serrations.

OK:

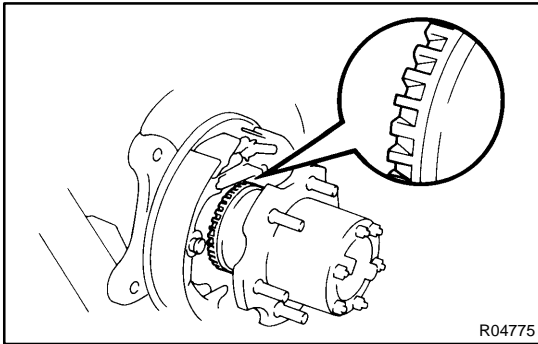
No scratches or missing teeth.

CHECK:

Check the sensor tip and grease.

OK:

No scratches or foreign objects on the sensor tip and grease.



Rear

PREPARATION:

Remove the rear brake caliper and disc.

CHECK:

Check the sensor rotor serrations.

OK:

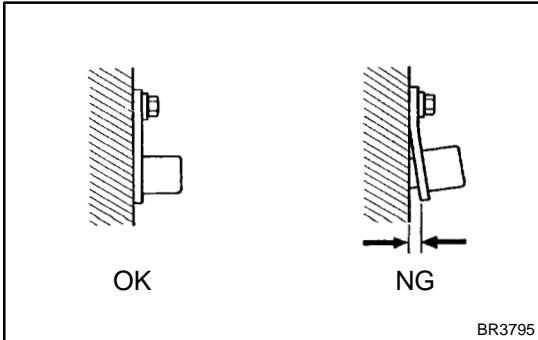
No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



CHECK:

Check the speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.

NG

Replace speed sensor or rotor.

NOTICE:

Check the speed sensor signal last (See page [DI-189](#)).

OK

Check and replace ABS ECU.

DTC	41	IG Power Source Circuit
------------	-----------	--------------------------------

CIRCUIT DESCRIPTION

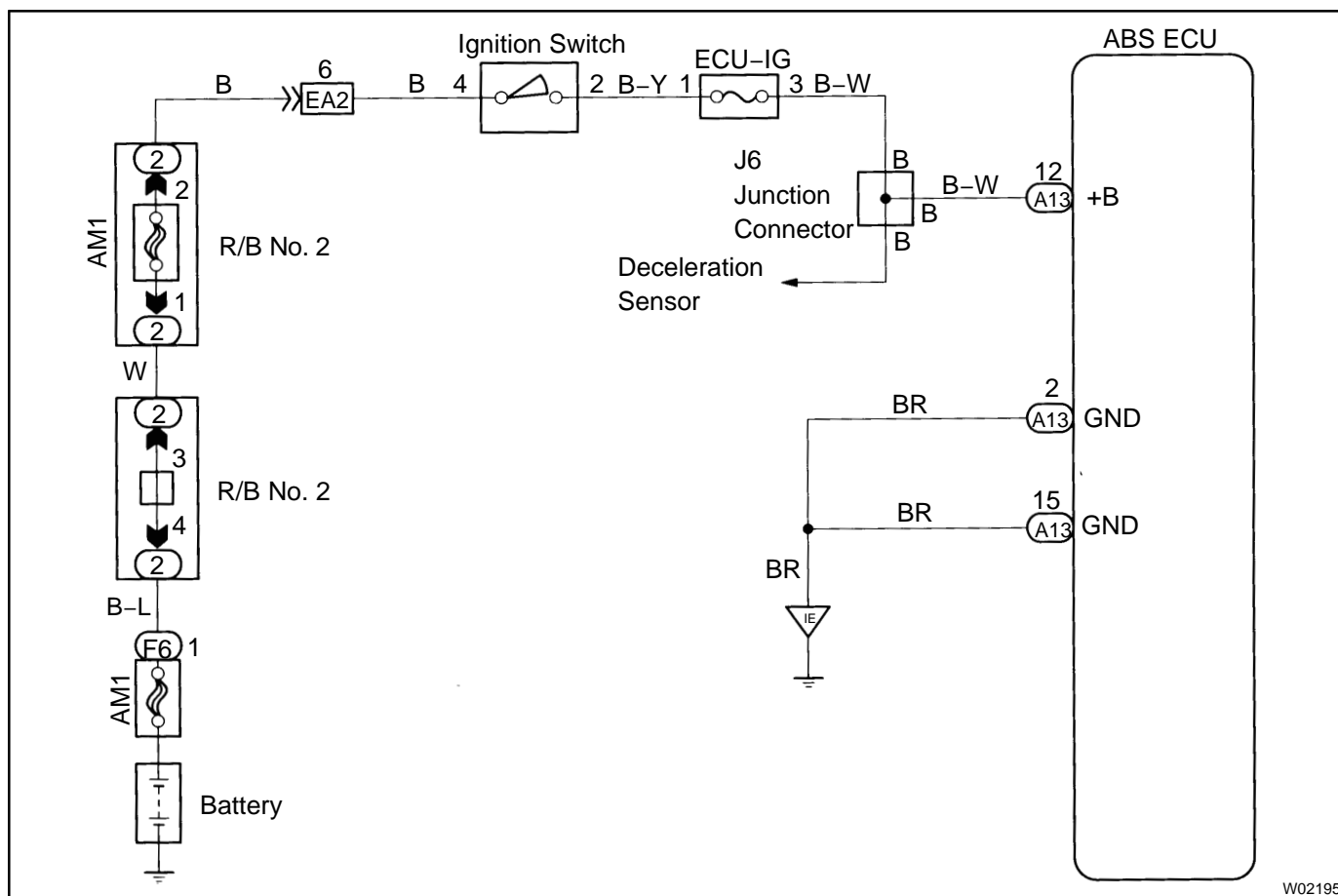
This is the power source for the ECU, hence the CPU and actuators.

DTC No.	DTC 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.	<ul style="list-style-type: none"> • Battery • IC regulator • Open or short in power source circuit

Fail safe function:

If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



W02195

INSPECTION PROCEDURE

1 Check battery positive voltage.

OK:

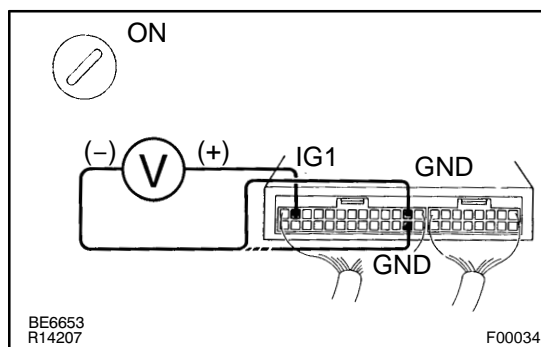
Voltage: 10 – 14 V

NG

Check and repair charging system.

OK

2 Check voltage between terminals IG1 and GND of ABS ECU connector.



PREPARATION:

Remove the ABS ECU with connectors still connected.

CHECK:

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals IG1 and GND of the ABS ECU connector.

OK:

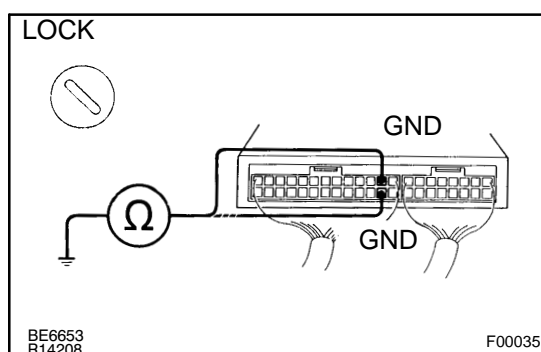
Voltage: 10 – 14 V

OK

Check and replace ABS ECU.

NG

3 Check continuity between terminals GND of ABS ECU connector and body ground.



CHECK:

Measure the resistance between terminal GND of the ABS ECU connector and body ground.

OK:

Resistance: 1 Ω or less

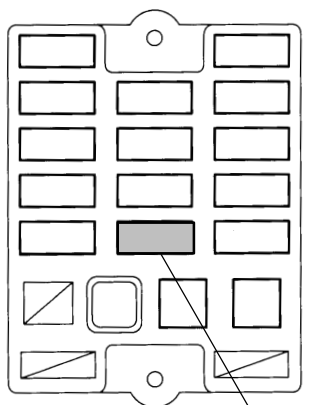
NG

Repair or replace harness or connector.

OK

4 Check ECU-IG fuse.

Fuse Block



ECU-IG

W02206

PREPARATION:

Remove the ECU-IG fuse from the Fuse block.

CHECK:

Check the continuity of the ECU-IG fuse.

OK:**Continuity****NG****Check for short in all harness and components connected to ECU-IG fuse (See attached wiring diagram).****OK****Check for open in harness and connector between ABS ECU and battery (See page [IN-28](#)).**

DTC	43	Malfunction in Deceleration Sensor
------------	-----------	---

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
43	<p>Either of the following 1 or 2 is detected:</p> <ol style="list-style-type: none"> After the battery terminal is connected, input from the deceleration sensor does not change at one cycle (0 km/h → more than 30 km/h → 0 km/h) for 16 times continuously When the brake pedal is not depressed at vehicle speed of 5 km/h or more, forward and backward G (more than 0.4 G) is detected for 30 seconds or more 	<ul style="list-style-type: none"> Deceleration sensor Wire harness for deceleration sensor system

INSPECTION PROCEDURE

1	Check deceleration sensor (See page DI-190).
----------	---

NG

Replace deceleration sensor.

OK

2	Check for open or short in harness and connector between sensor and ECU (See page IN-28).
----------	--

NG

Repair or replace harness and connector.

OK

Check and replace ABS ECU.

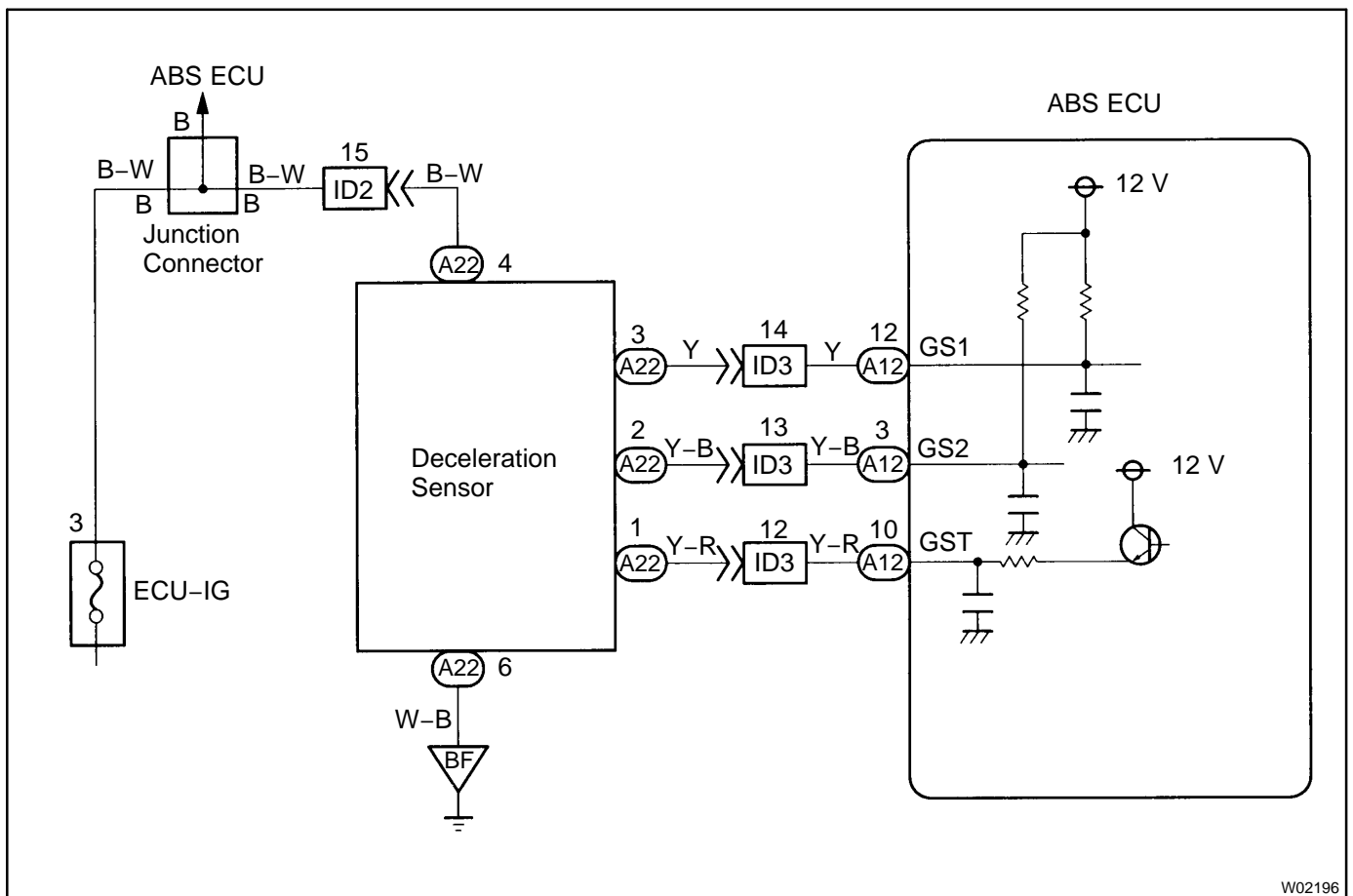
DTC	44	Deceleration Sensor Circuit
------------	-----------	------------------------------------

CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control. If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates.

DTC No.	DTC Detecting Condition	Trouble Area
44	<p>Either of the following 1 or 2 is detected:</p> <ol style="list-style-type: none"> 1. An open or short is detected in circuit GS1 or GS2 for 1 sec. 2. After the ignition is turned ON, the test signal is output by GST <p>During this time, a trouble signal is detected for 0.5 sec.</p>	<ul style="list-style-type: none"> • Deceleration sensor • Open or short in deceleration sensor circuit

WIRING DIAGRAM



W02196

INSPECTION PROCEDURE

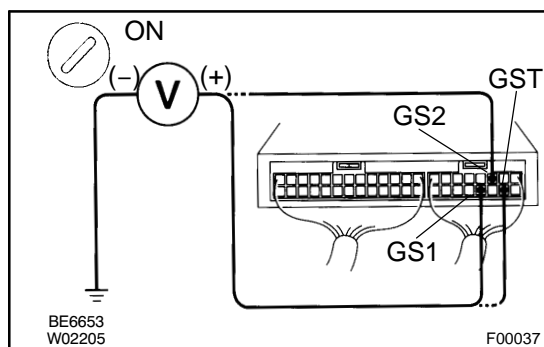
- | | |
|----------|--|
| 1 | Check for open and short in harness and connector between Deceleration sensor and ECU (See page IN-28). |
|----------|--|

NG

Repair or replace harness or connector.

OK

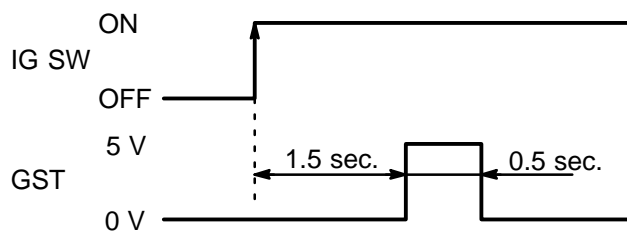
- | | |
|----------|--|
| 2 | Check voltage between terminals GS1, GS2, GST of ABS ECU and body ground. |
|----------|--|

**PREPARATION:**

- Remove the ABS ECU with connectors still connected.
- Disconnect the deceleration sensor connector.
- Turn the ignition switch ON.

CHECK:

Measure the voltage between terminals GS1, GS2, GST of the ECU and Body ground.

OK:**Voltage:****GS1, GS2: 4 – 14 V****GST: As shown below**

NG

Check and replace ABS ECU.

OK

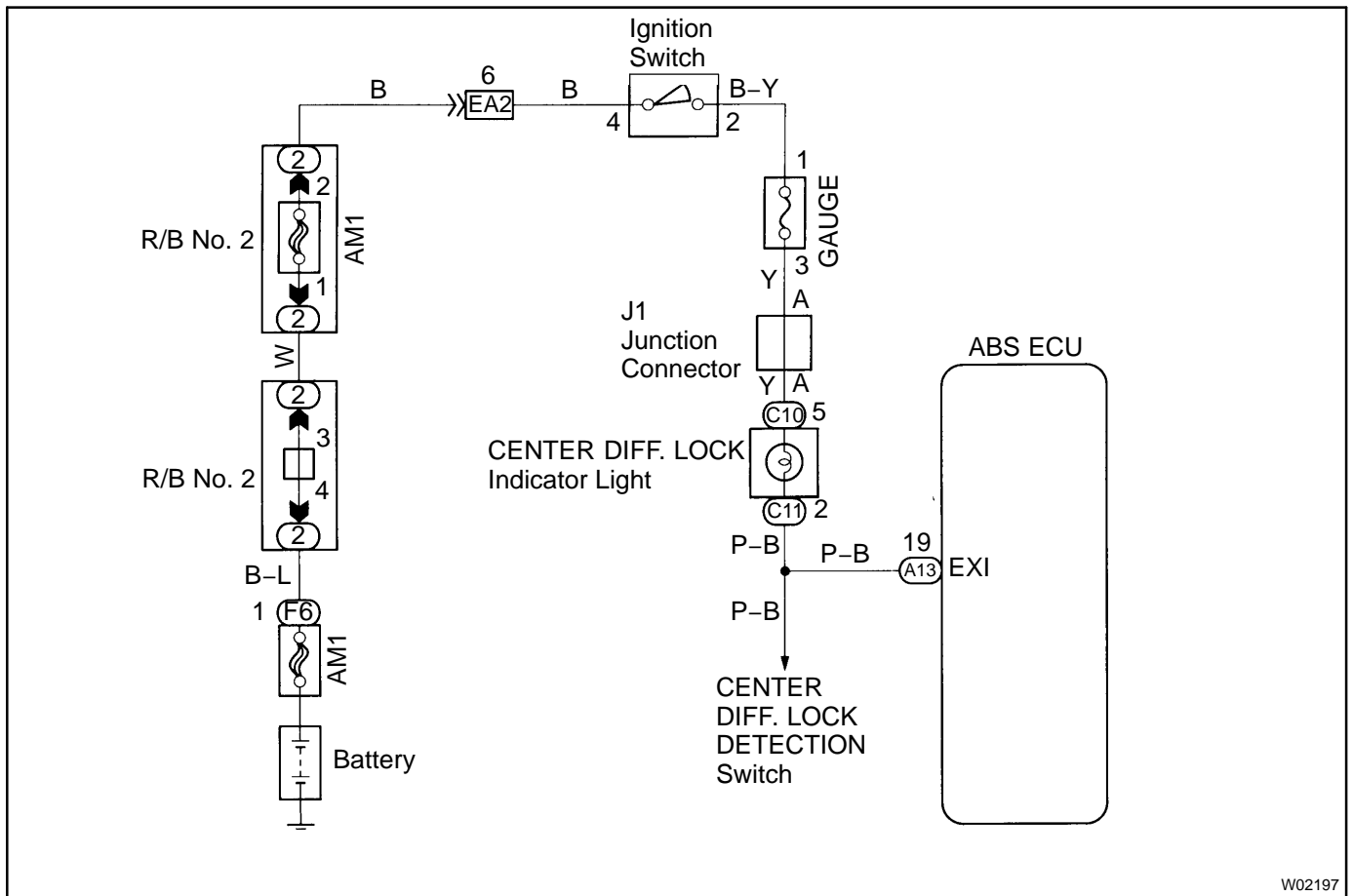
Check and replace deceleration sensor.

DTC	48	Center Differential Lock Circuit
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CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
48	Open or short circuit in center differential lock circuit Center differential is locking	<ul style="list-style-type: none"> Center differential lock Center differential lock circuit

WIRING DIAGRAM



W02197

INSPECTION PROCEDURE

1	Check the center differential is free (Transfer is in H position).
----------	---

NG

Repair the center differential lock system.

OK

DI-222

DIAGNOSTICS – ANTI-LOCK BRAKE SYSTEM

2	Is DTC output?
----------	-----------------------

Check DTC on page [DI-190](#).

NO	Normal.
-----------	----------------

YES

3	Check that CENTER DIFF. LOCK indicator light does not go off.
----------	--

NO	Go to step 6.
-----------	----------------------

YES

4	Check that bulb for CENTER DIFF. LOCK indicator light is not burnt out.
----------	--

YES	Replace indicator light.
------------	---------------------------------

NO

5	Check for open in harness and connector between battery and CENTER DIFF. LOCK indicator light, and CENTER DIFF. LOCK indicator light and ABS ECU (See page IN-28).
----------	---

NG	Repair or replace harness or connector.
-----------	--

OK

6	Check for short in harness and connector between CENTER DIFF. LOCK indicator light and ABS ECU (See page IN-28).
---	---

NG

Repair or replace harness or connector.

OK

Check and replace ABS ECU.

DTC	51	ABS Pump Motor Lock
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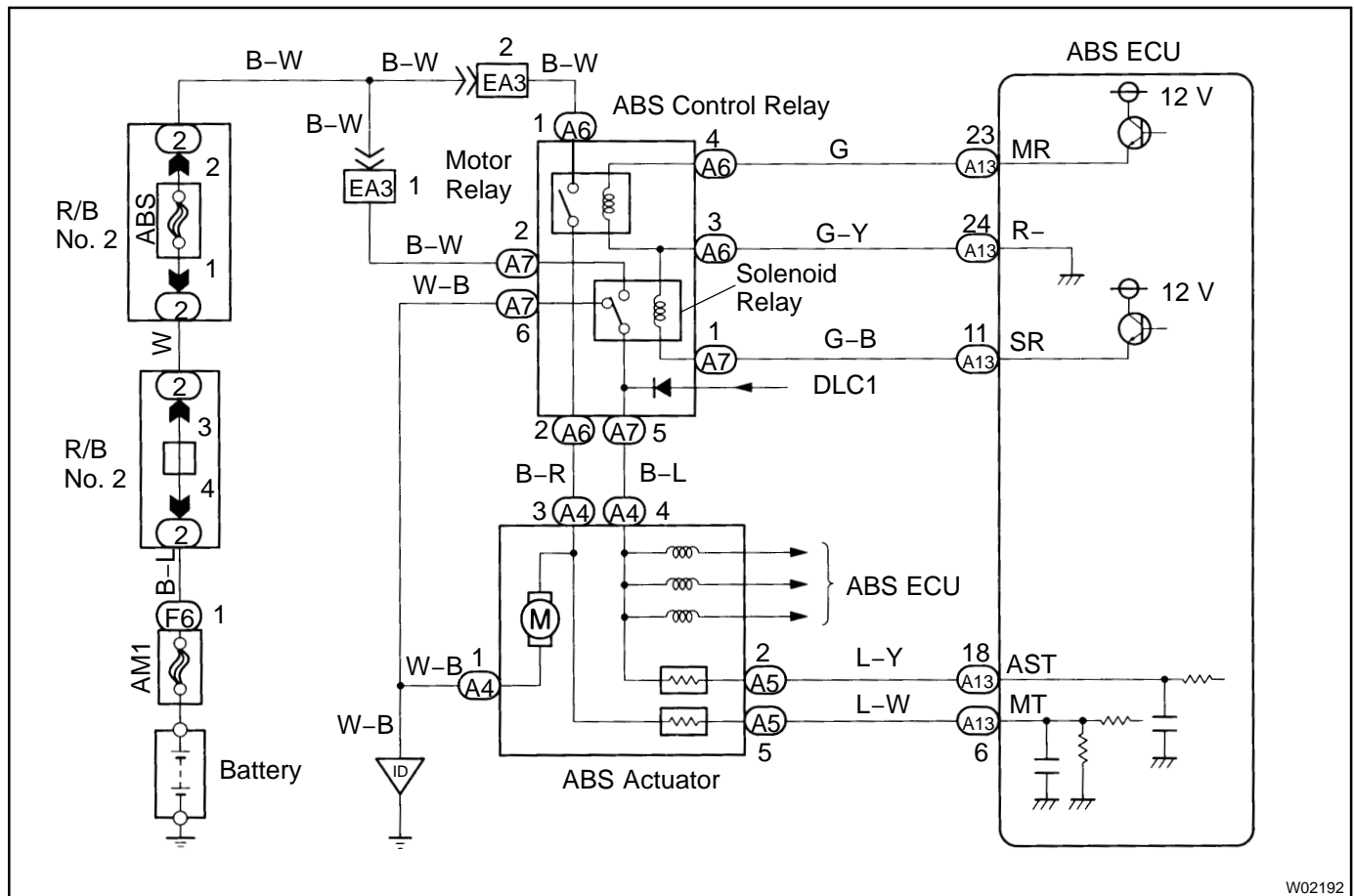
CIRCUIT DESCRIPTION

DTC No.	DTC 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 ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



W02192

DTC	Always ON	Malfunction in ECU IG Power Source Circuit
------------	------------------	---

CIRCUIT DESCRIPTION

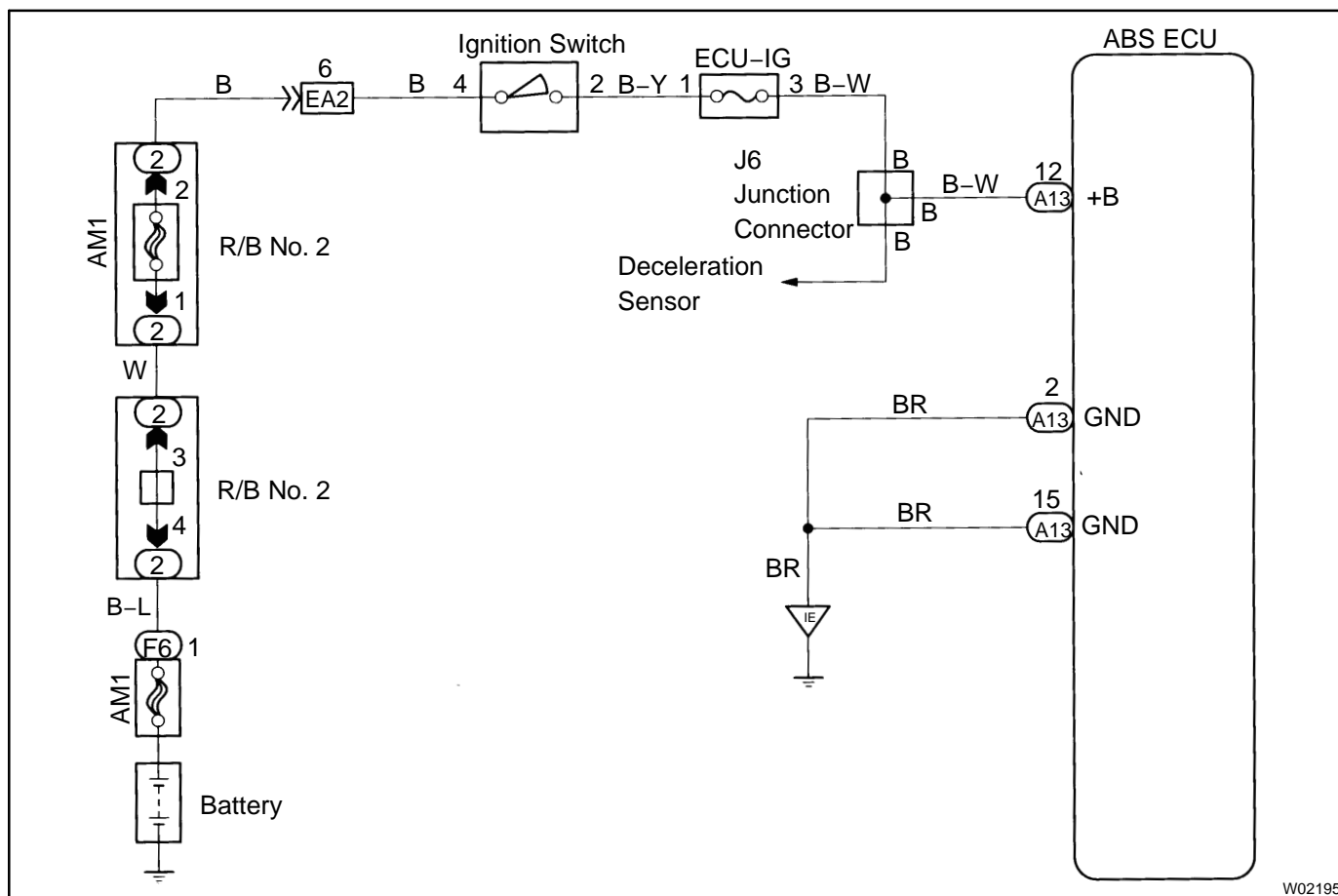
This is the power source for the ECU, hence the CPU, and the actuator.

DTC No.	DTC Detecting Condition	Trouble Area
Always ON	Voltage of ECU terminal +B remains at more than 17 V or below 9.5 V	<ul style="list-style-type: none"> • 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 control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



W02195

INSPECTION PROCEDURE

1	Is DTC output?
----------	-----------------------

Check DTC on page [DI-190](#).

YES

Repair circuit indicated by code output.

NO

2	Is normal code displayed?
----------	----------------------------------

YES

Check ABS solenoid relay. Check for short in harness and connector between ABS solenoid relay and DLC1 (See page [IN-28](#)).

NO

3	Is ABS warning light go off?
----------	-------------------------------------

YES

Check for open or short in harness and connector between ECU-IG fuse and ECU (See page [IN-28](#)).

NO

4	Check battery positive voltage.
----------	--

PREPARATION:

Start the engine.

CHECK:

Check the battery positive voltage.

OK:

Voltage: 10 – 16 V

NG

Check and repair charging system.

OK

5	Check ABS warning light.
---	--------------------------

PREPARATION:

- (a) Turn the ignition switch OFF.
- (b) Disconnect the connector from the ABS ECU.
- (c) Turn the ignition switch ON.

CHECK:

Check the ABS warning light goes off.

OK**Check and replace ABS ECU.****NG**

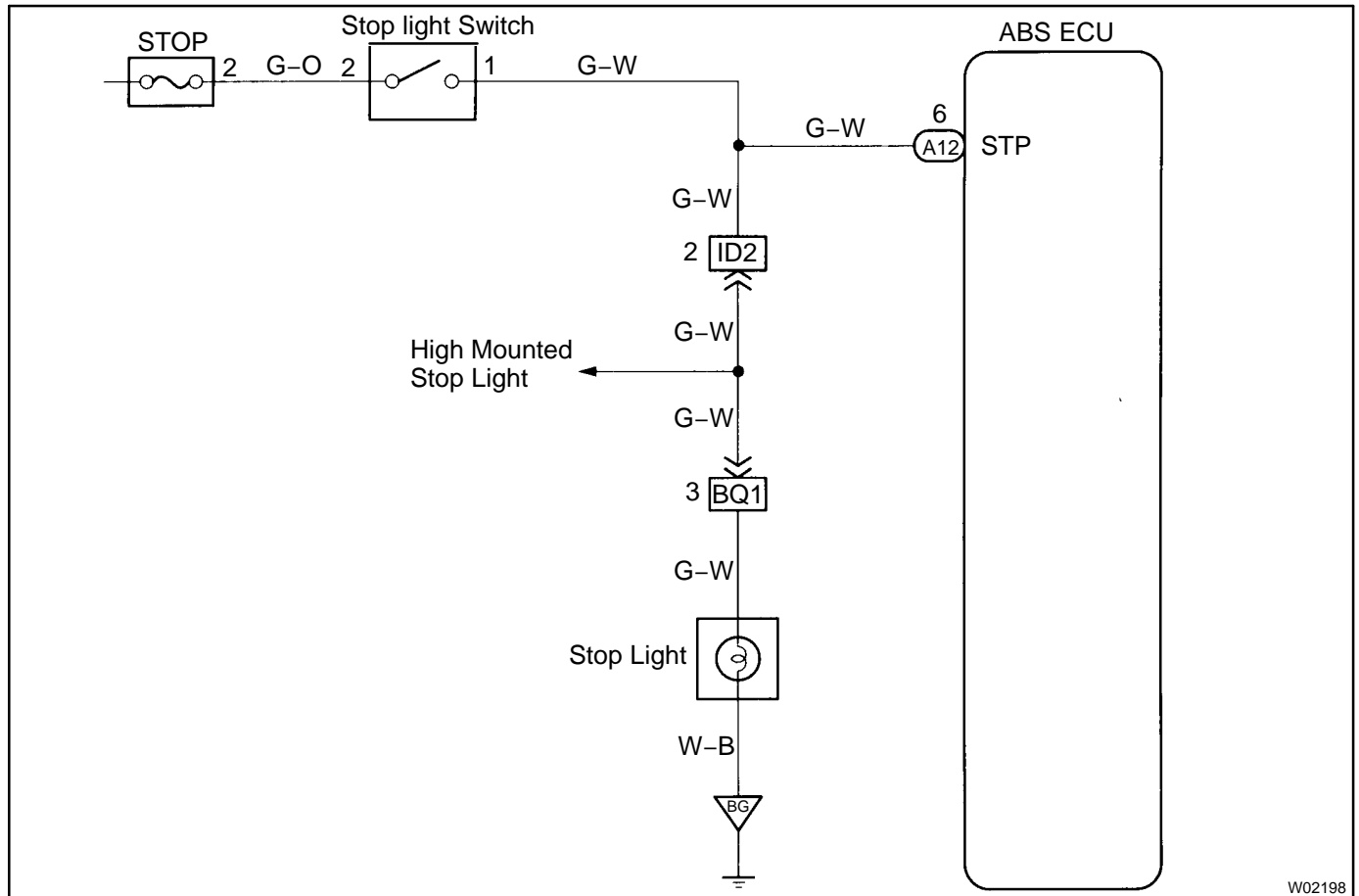
Check for short in harness and connector between combination meter and ABS ECU, and combination meter and DLC1 (See page [IN-28](#)).

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.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	Check operation of stop light.
---	--------------------------------

CHECK:

Check that stop light lights up when brake pedal is depressed and turns off when brake pedal is released.

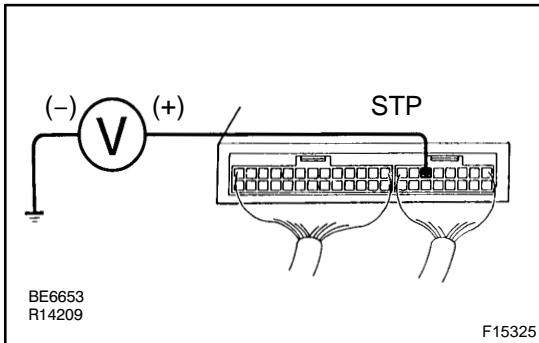
NG

Repair stop light circuit (See page [BE-24](#)).

OK

2

Check voltage between terminal STP of ABS ECU and body ground.

**PREPARATION:**

Remove the ABS ECU with connectors still connected.

CHECK:

Measure the voltage between terminal STP of the ABS ECU and body ground when the brake pedal is depressed.

OK:

Voltage: 8 – 14 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-200](#)).

NG

3

Check for open in harness and connector between ABS ECU and stop light switch (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

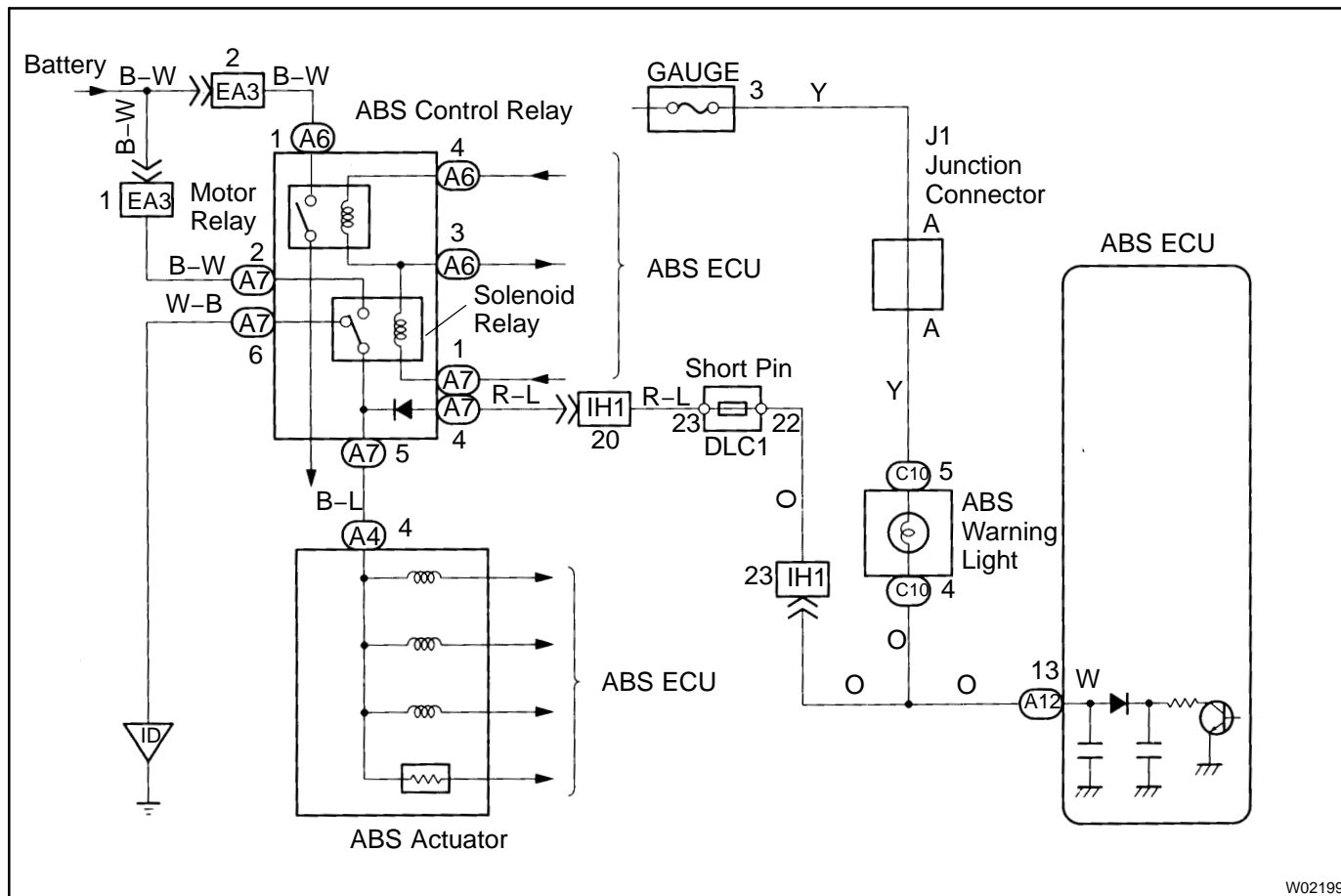
Check and replace ABS ECU.

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 DTC in memory. After removing the short pin of the DLC1, connect terminals Tc and E₁ of the DLC1 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

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 3

1	Check ABS warning light.
---	--------------------------

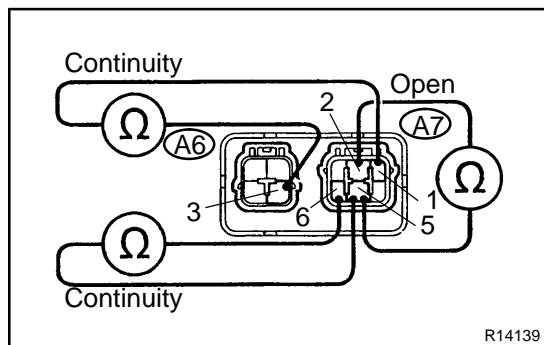
See Combination Meter Troubleshooting on page [BE-2](#).

NG

Repair bulb or combination meter assembly.

OK

2 Check ABS control relay.



PREPARATION:

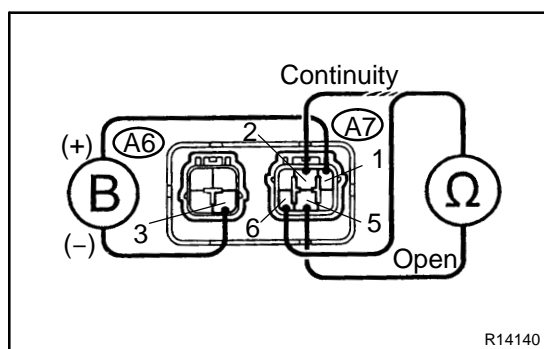
- Turn the ignition switch OFF.
- Disconnect the connectors from the control relay.

CHECK:

Check the continuity between each terminal of the ABS control relay.

OK:

Terminals A7-1 and A6-3	Continuity (Reference value 80 Ω)
Terminals A7-5 and A7-6	Continuity
Terminals A7-2 and A7-5	Open

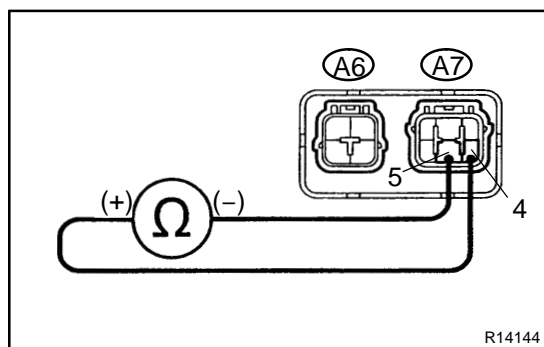


CHECK:

- Apply battery positive voltage between terminals A7-1 and A6-3.
- Check the continuity between each terminal of the ABS control relay.

OK:

Terminals A7-5 and A7-6	Open
Terminals A7-2 and A7-5	Continuity



CHECK:

Connect the ⊕ test lead to terminal A7-4 and the ⊖ test lead to terminal A7-5. Check continuity between the terminals.

OK:

Continuity

If there is no continuity, connect the ⊖ test lead to terminal A7-4 and the ⊕ lead to terminal A7-5. Recheck continuity between terminals.

NG

Replace ABS control relay.

OK

Check for open in harness and connector between DLC1 and ABS control relay and body ground (See page IN-28).

DI-232

DIAGNOSTICS – ANTI-LOCK BRAKE SYSTEM

3	Is DTC output?
---	----------------

Check DTC on page [DI-190](#).

YES

Repair circuit indicated by code output.

NO

4	Does ABS warning light go off if short pin is removed?
---	--

NO

Check for short in harness and connector between warning light and DLC1 and ECU (See page [IN-28](#)).

YES

5	Check ABS control relay (See step 2).
---	---------------------------------------

NG

Replace ABS control relay.

OK

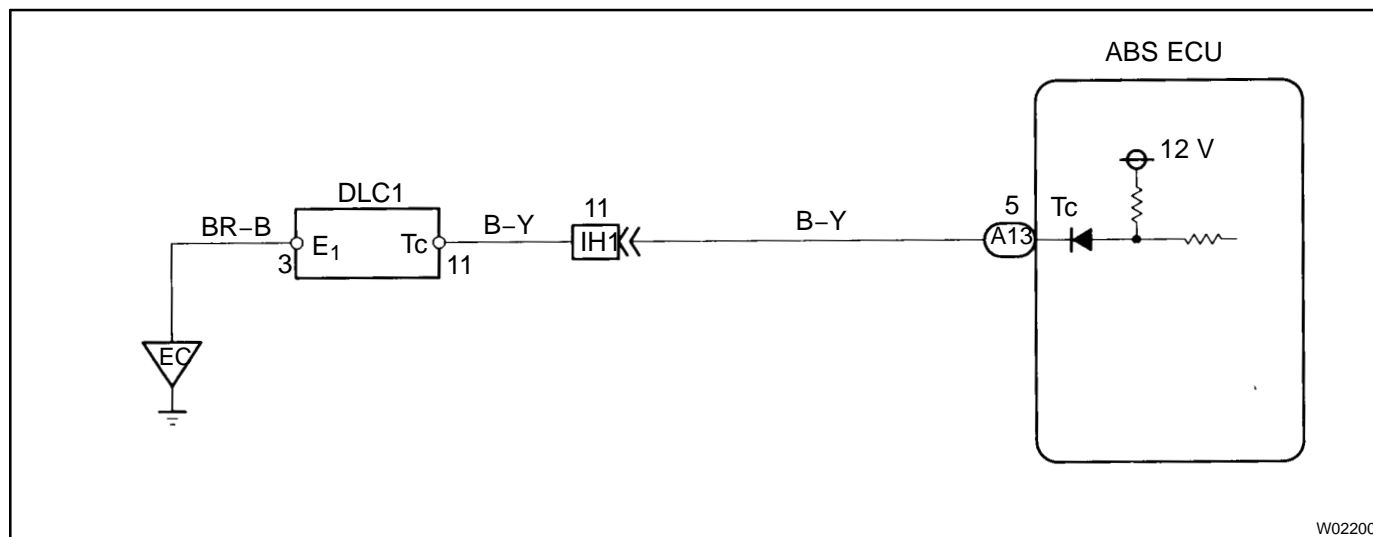
Check for short in harness and connector between DLC1 and ABS control relay (See page [IN-28](#)).

Tc Terminal Circuit

CIRCUIT DESCRIPTION

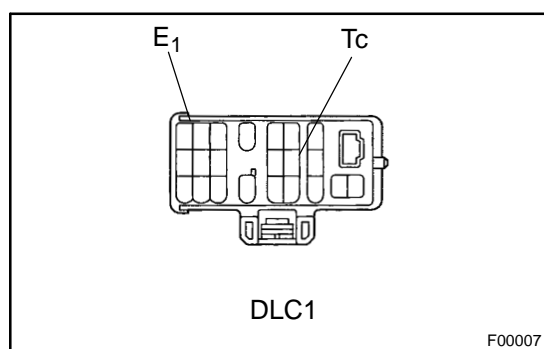
Connecting terminals Tc and E₁ of the DLC1 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

- | | |
|---|--|
| 1 | Check voltage between terminals Tc and E ₁ of DLC1. |
|---|--|



CHECK:

- Turn the ignition switch ON.
- Measure the voltage between terminals Tc and E₁ of the DLC1.

OK:

Voltage: 10 – 14 V

OK

If ABS warning light does not blink even after Tc and E₁ are connected, ECU may be defective.

NG

DI-234

DIAGNOSTICS – ANTI-LOCK BRAKE SYSTEM

2	Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN-28).
---	---

NG

Repair or replace harness or connector.

OK

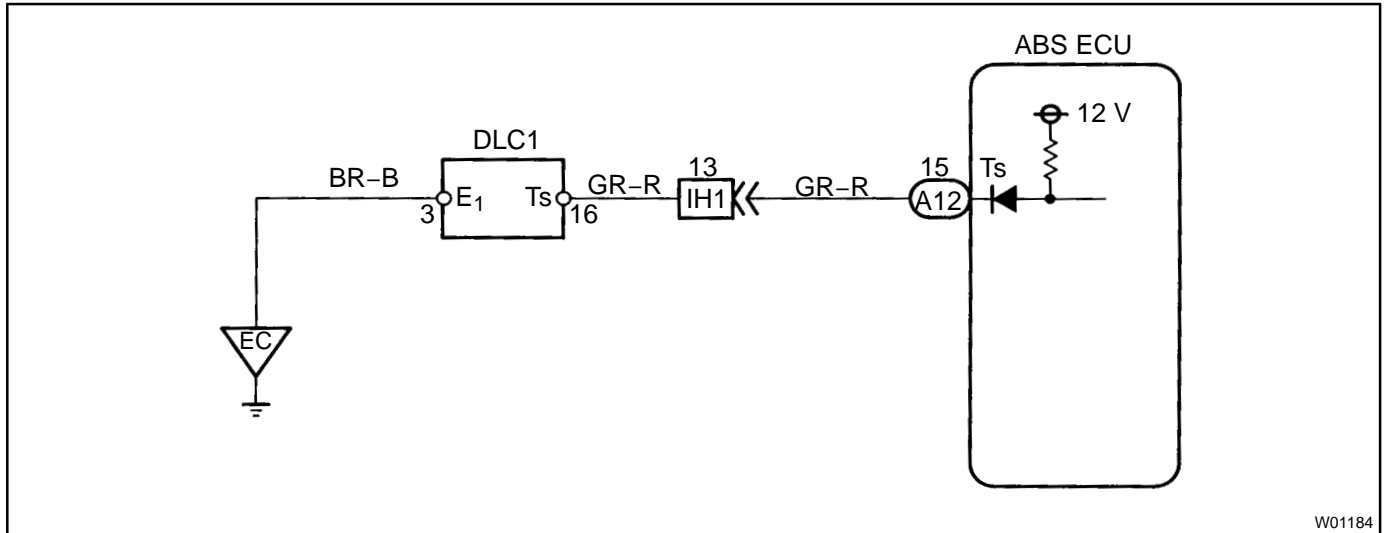
Check and replace ABS ECU.

Ts Terminal Circuit

CIRCUIT DESCRIPTION

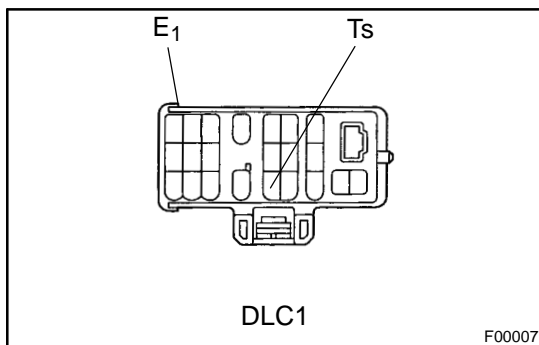
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check. Connecting terminals Ts and E₁ of the DLC1 in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Check voltage between terminals Ts and E₁ of DLC1.



CHECK:

- (a) Turn the ignition switch ON.
- (b) Measure the voltage between terminals Ts and E₁ of the DLC1.

OK:

Voltage: 10 – 14 V

OK

If ABS warning light does not blink even after Ts and E₁ are connected, ECU may be defective.

NG

DI-236

DIAGNOSTICS - ANTI-LOCK BRAKE SYSTEM

2	Check for open and short in harness and connector between ABS ECU and DLC1, and DLC1 and body ground (See page IN-28).
---	---

NG

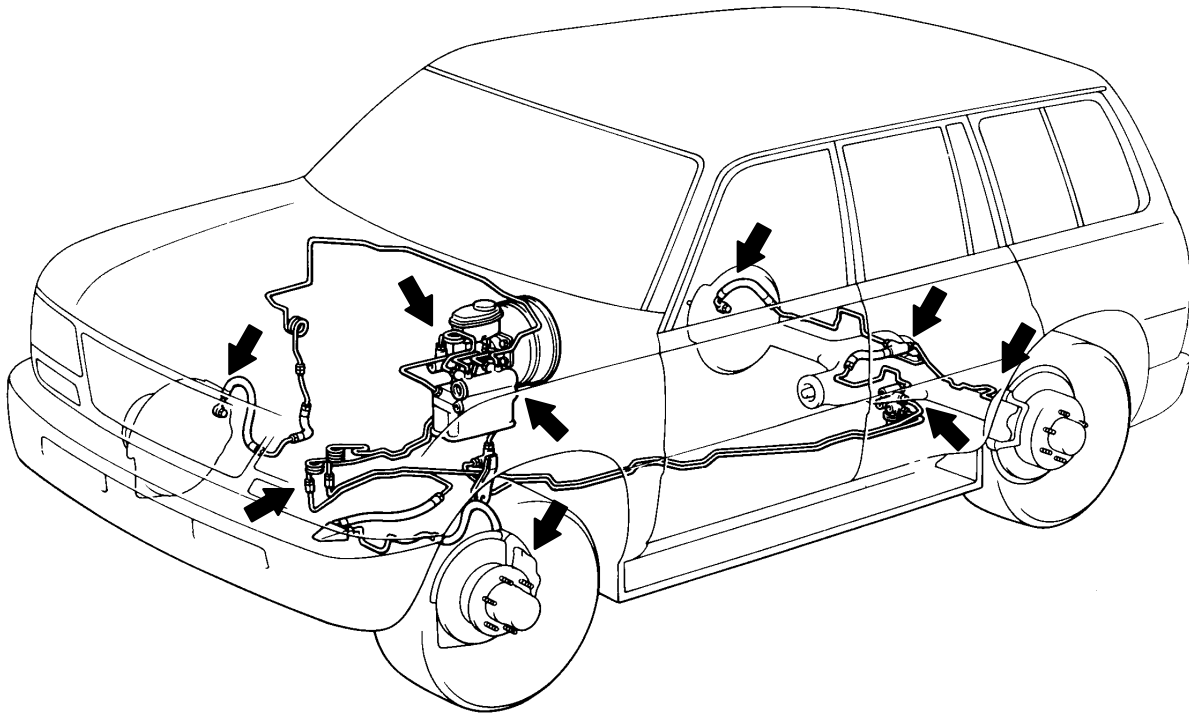
Repair or replace harness or connector.

OK

Check and replace ABS ECU.

Check for Fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



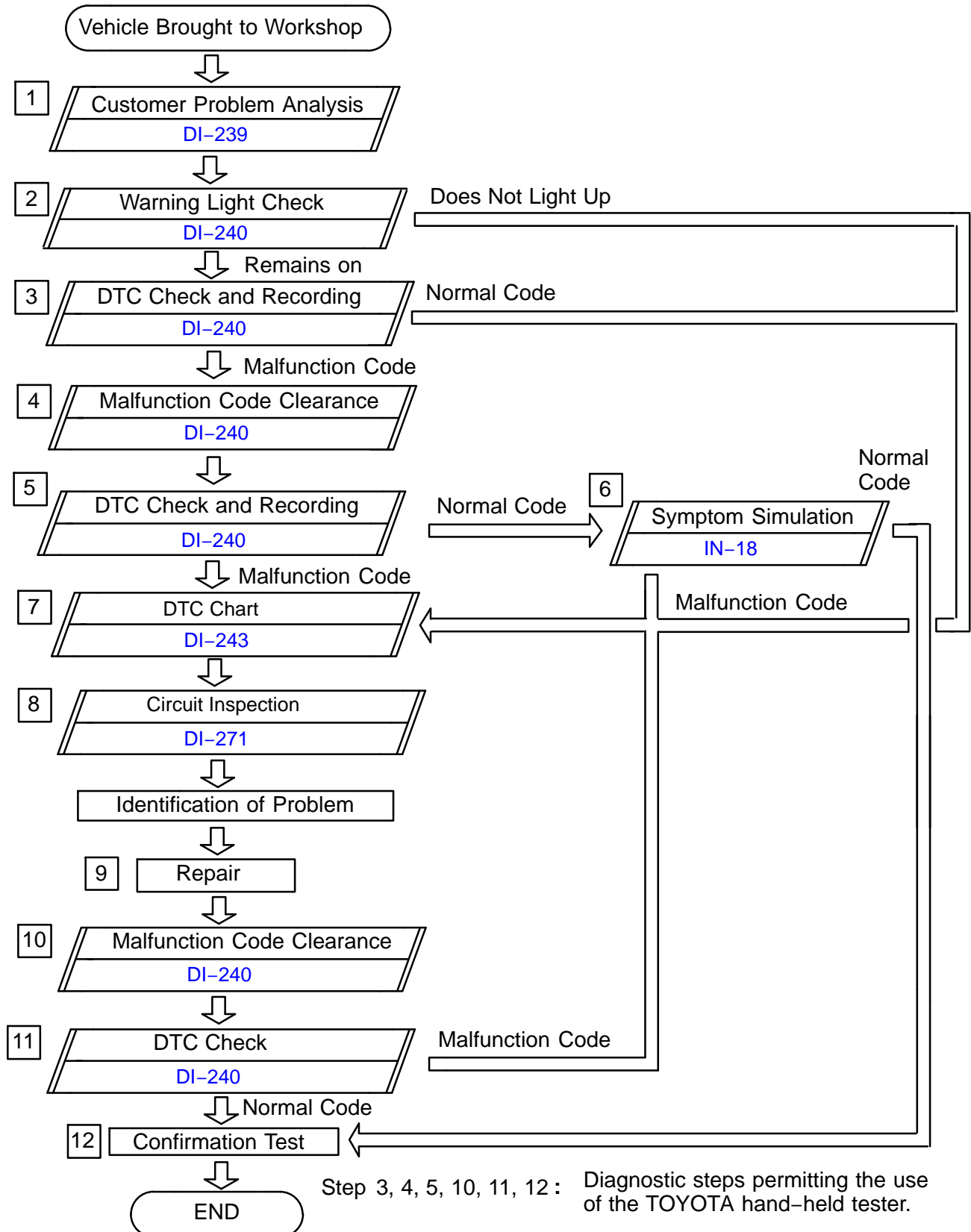
W02202

SUPPLEMENTAL RESTRAINT SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DISQ0-02

Perform troubleshoot in accordance with the procedure on the following page.



CUSTOMER PROBLEM ANALYSIS CHECK

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

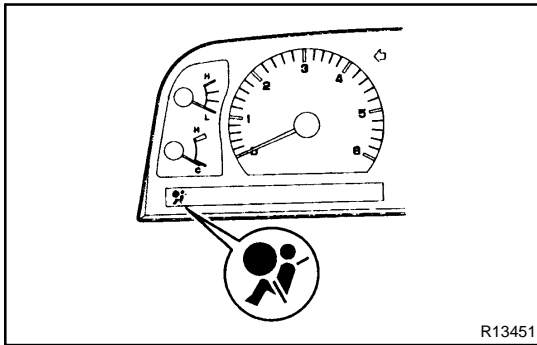
Date Problem Dist Occurred	/ /
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Other
Temperature	Approx.

Vehicle Operation	<input type="checkbox"/> Starting <input type="checkbox"/> Idling <input type="checkbox"/> Driving [<input type="checkbox"/> Constant speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration <input type="checkbox"/> Other]
Road Conditions	
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	<input type="checkbox"/> Remains ON <input type="checkbox"/> Sometimes Light Up <input type="checkbox"/> Does Not Light Up
	2nd Time	<input type="checkbox"/> Remains ON <input type="checkbox"/> Sometimes Light Up <input type="checkbox"/> Does Not Light Up
DTC Inspection	1st Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code [Code.]
	2nd Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code [Code.]



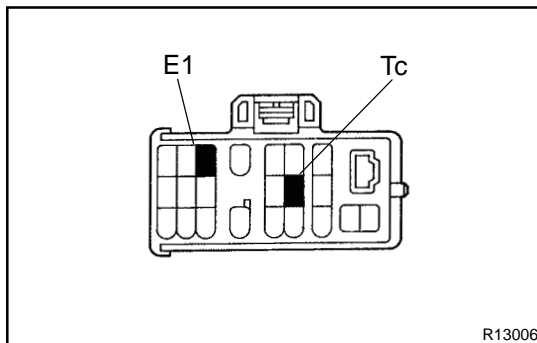
PRE-CHECK

1. SRS WARNING LIGHT CHECK

- Turn the ignition switch to ACC or ON and check that the SRS warning light lights up.
- Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

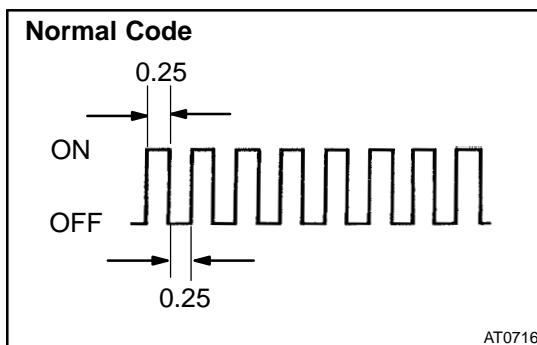
- When the ignition switch is at ACC or ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely. Proceed to "SRS warning light system malfunction" on page [DI-274](#), [DI-276](#).



2. DTC CHECK (Using diagnosis check wire)

- Output the DTC.
 - Turn the ignition switch to ACC or ON position and wait approx. 20 seconds.
 - Using SST, connect terminals Tc and E1 of the DLC1.

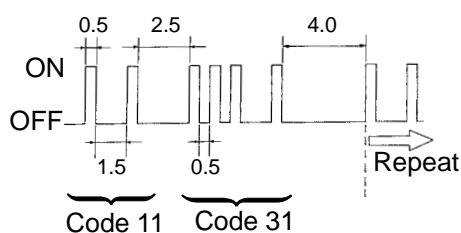
SST 09843-18020



- Read the DTC.

Read the 2-digit DTC 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
The first blinking output indicates the first digit of a 2-digit DTC. After a 1.5 second pause, the second blinking output will indicate the second digit.

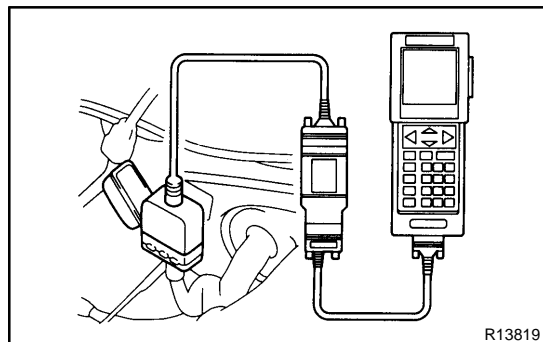
Code 11 and 31

AB0056

If there are 2 or more codes, there will be a 2.5 second pause between each codes. 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 start from the smallest numbered code tot he larger.
- If it does not output a DTC or outputs a DTC without terminal connection, proceed to the Tc terminal circuit inspection on page [DI-279](#).



R13819

3. DTC CHECK (Using TOYOTA hand-held tester)

- Hook up the TOYOTA hand-held tester to the DLC1.
- Read the DTCs by following the prompts on the tester screen.

HINT:

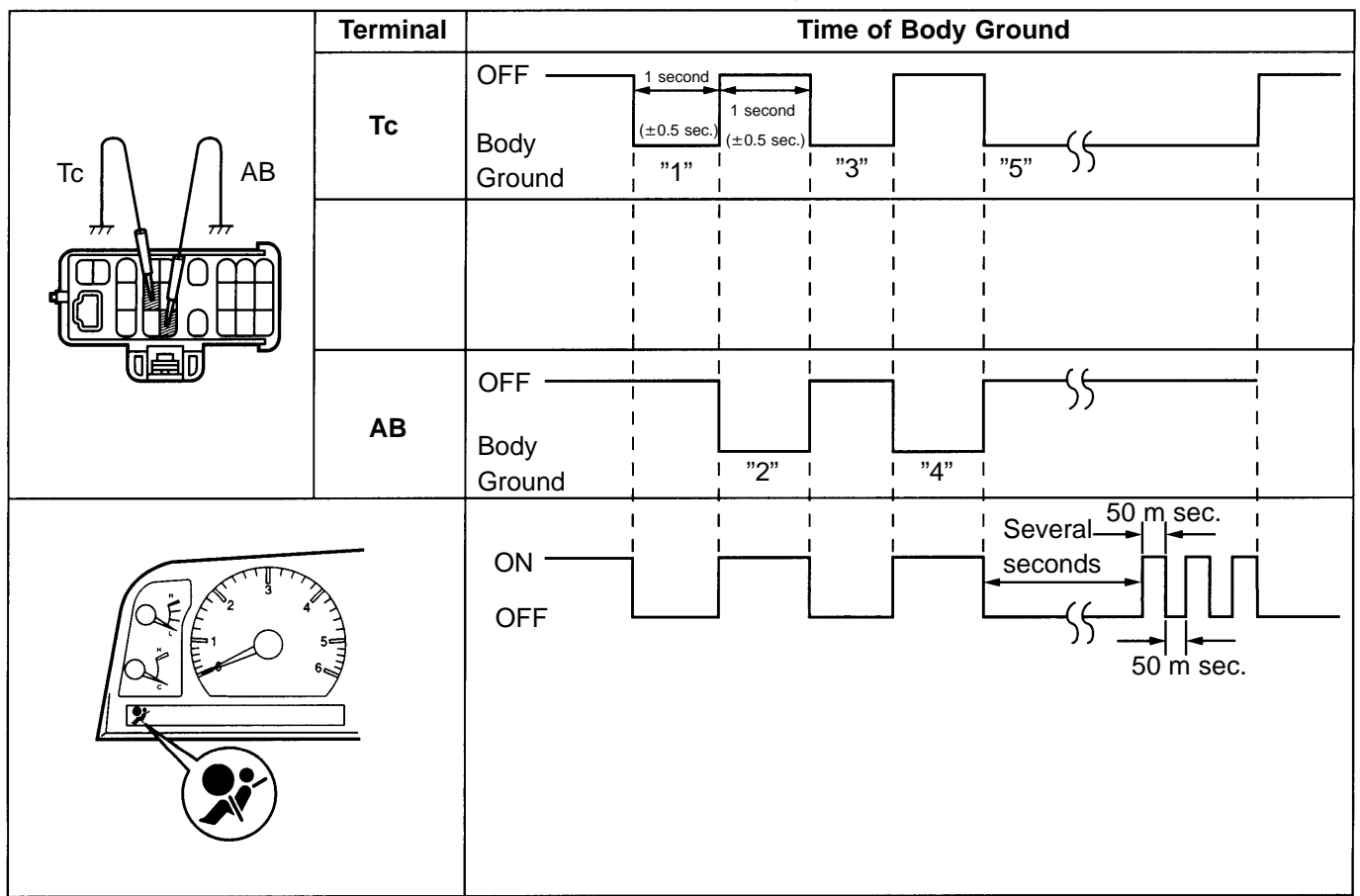
Please refer to the TOYOTA hand-held tester operator's manual, for further details.

4. DTC CLEARANCE (Using diagnosis check wire)

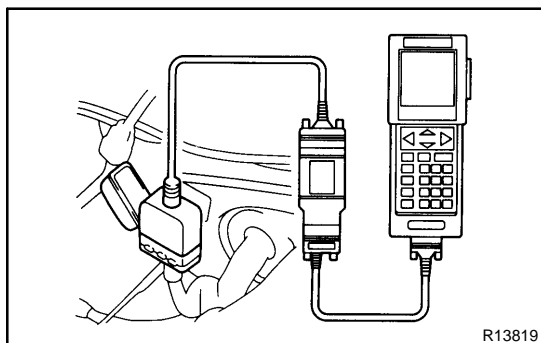
- Connect the 2 service wires to terminals Tc and AB of DLC1.
- Turn the ignition switch to ACC or ON and wait approx. 6 seconds.
- Starting with the Tc terminal, apply body ground alternately to terminal Tc and terminal AB twice each in cycles of 1.0 seconds. Confirm that body ground is absolute. Finally, 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 within an interval of 0.2 second. If DTCs do not clear, repeat the above procedure until the codes are cleared.



H00059



R13819

- Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 m sec. cycle to indicate the codes have been cleared.

5. USING TOYOTA HAND-HELD TESTER

- Hook up the TOYOTA hand-held tester to the DLC1.
- Clear the DTC 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 CODE CHART

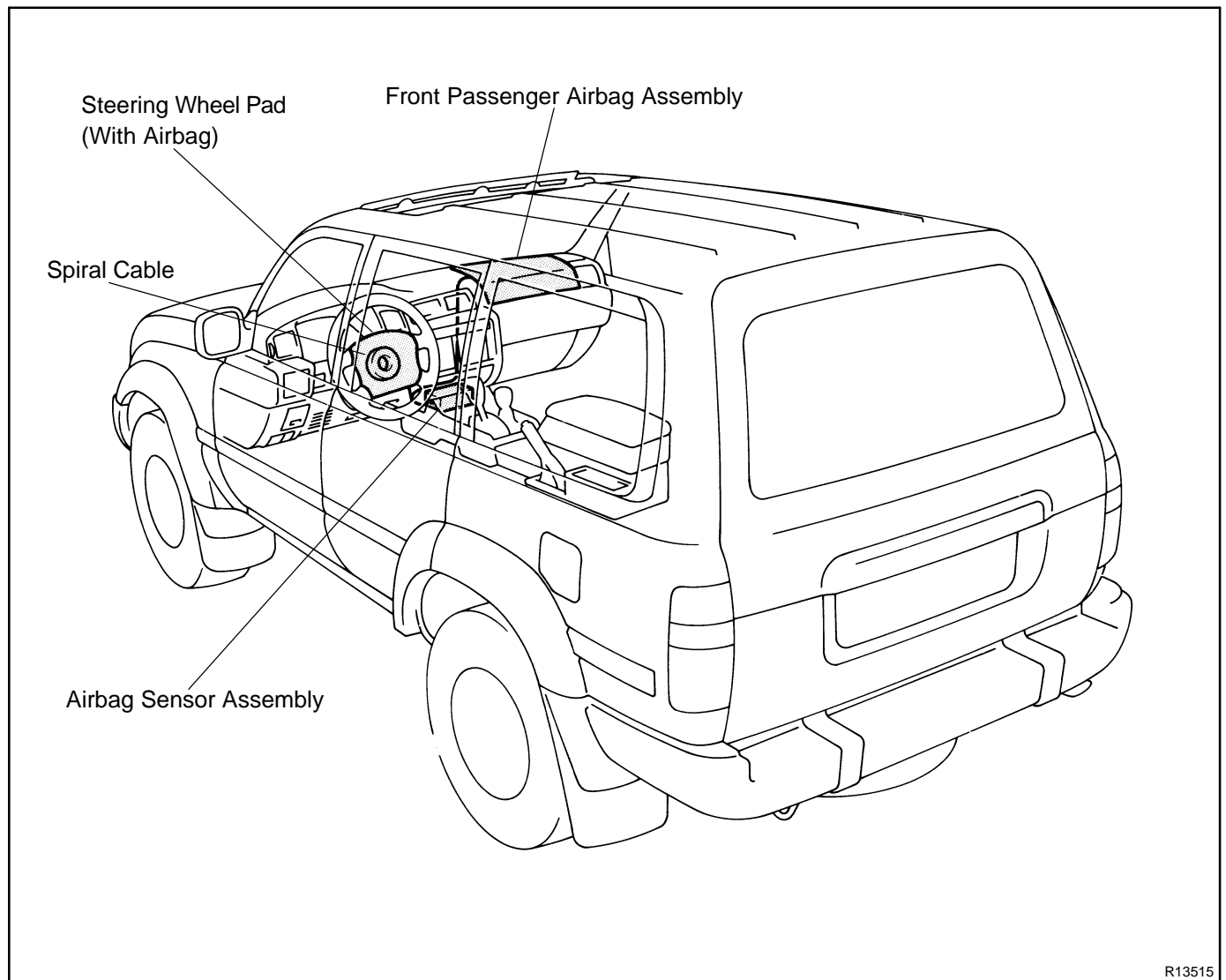
If a malfunction code is displayed during the DTC check, the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
Normal (DI-271)	• System normal	–	OFF
	• Source voltage drop	• Battery • Airbag sensor assembly	ON
11 (DI-247)	• Short in squib circuit (to ground)	• Steering wheel pad (D squib) • Front passenger airbag assembly (P squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
12 (DI-254)	• Short in squib circuit (to B+)	• Steering wheel pad (D squib) • Front passenger airbag assembly (P squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
14 (DI-260)	• Open in D squib circuit	• Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Wire harness	ON
31 (DI-265)	• Airbag sensor assembly malfunction	• Airbag sensor assembly	ON
54 (DI-267)	• Open in P squib circuit	• Front passenger airbag assembly (P squib) • Airbag sensor assembly • Wire harness	ON

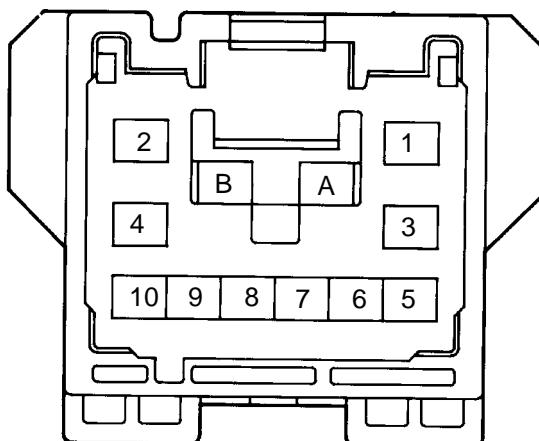
HINT:

- When the SRS warning light remains lit up and the DTC is the normal code, this means a source drop voltage.
This malfunction is not stored in memory by the airbag sensor assembly and if the power source voltage returns to normal, the SRS warning light will automatically go out.
- When 2 or more codes are indicated, the codes will be displayed in numeral order starting from the lowest numbered code.
- If a code not listed on the chart is displayed, the airbag sensor assembly is faulty.

PARTS LOCATION



TERMINALS OF ECM



W02056

No.	Symbol	Terminal Name
A	–	Electrical Connection Check Mechanism
B	–	Electrical Connection Check Mechanism
1	P ⁻	Squib ⊖ (Passenger)
2	P ⁺	Squib ⊕ (Passenger)
3	D ⁻	Squib ⊖ (Driver)
4	D ⁺	Squib ⊕ (Driver)
5	E ₁	Ground
6	E ₂	Ground
7	T _c	Diagnosis
8	LA	SRS Warning Light
9	IG ₂	Power Source (IGN Fuse)
10	ACC	Power Source (CIG Fuse)

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • SRS warning light system malfunction (Always lit up when ignition switch is in LOCK position.) 	DI-274
<ul style="list-style-type: none"> • With the ignition switch at ACC or ON, the SRS warning lights does not light up. 	<ul style="list-style-type: none"> • SRS warning light system malfunction (Does not light up when ignition switch is turned to ACC or ON.) 	DI-276
<ul style="list-style-type: none"> • DTC not displayed. • SRS warning light is always lit up with a DTC check procedure. • DTC displayed without Tc and E1 terminal connection. 	<ul style="list-style-type: none"> • Tc terminal circuit 	DI-279

CIRCUIT INSPECTION

DTC	11	Short in Squib Circuit (to Ground)
------------	-----------	---

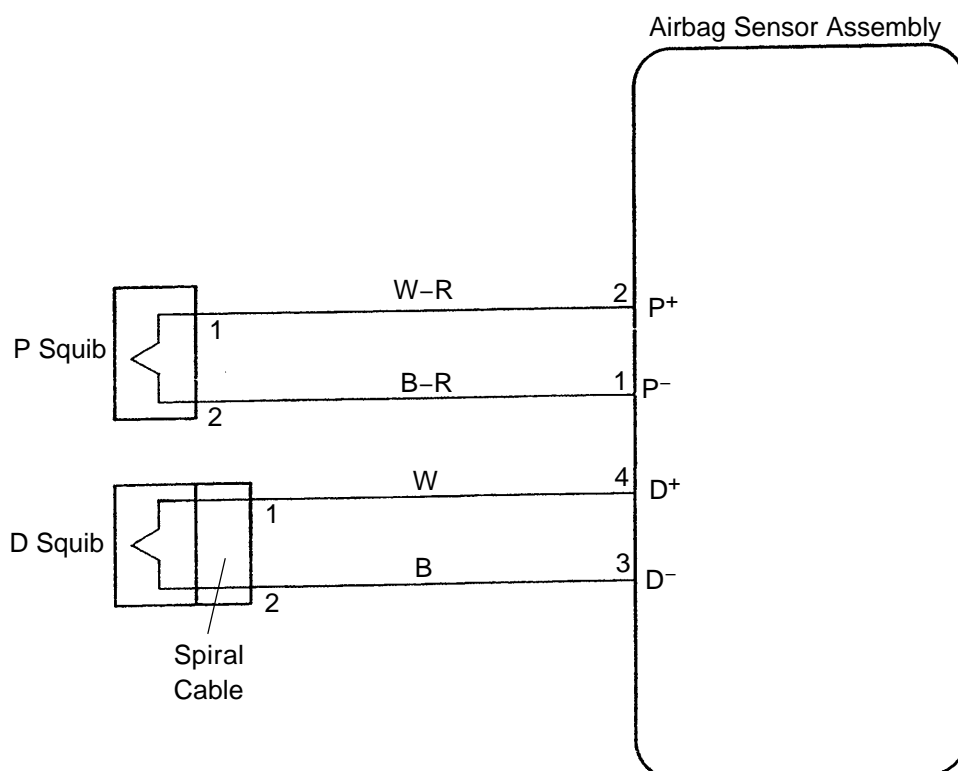
CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly. If causes the SRS to deploy when the SRS deployment conditions are satisfied. For details of the function of each component, see FUNCTION OF COMPONENTS on page [RS-2](#).

DTC 11 is recorded when ground short is detected in the squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
11	<ul style="list-style-type: none"> • Short circuit in squib wire harness (to ground) • Squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction 	<ul style="list-style-type: none"> • Steering wheel pad (D squib) • Front passenger airbag assembly (P squib) • Spiral cable • Airbag sensor assembly • Wire harness

WIRING DIAGRAM



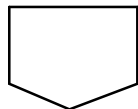
R16017

DI-248

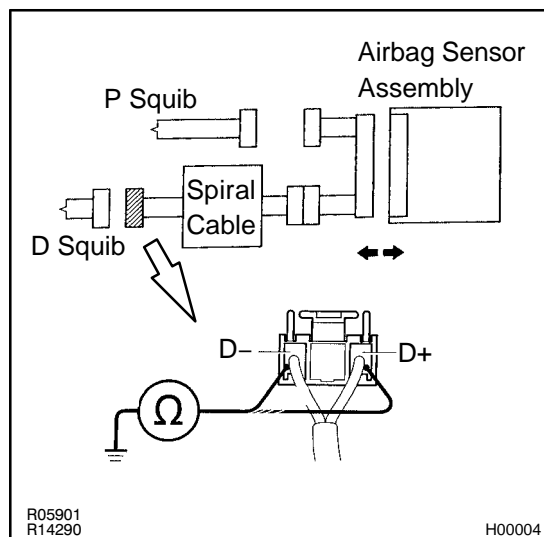
DIAGNOSTICS - SUPPLEMENTAL RESTRAINT SYSTEM

INSPECTION PROCEDURE

1	Preparation. (See step 1 on page DI-271)
---	---



2	Check D squib circuit.
---	------------------------

**CHECK:**

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.

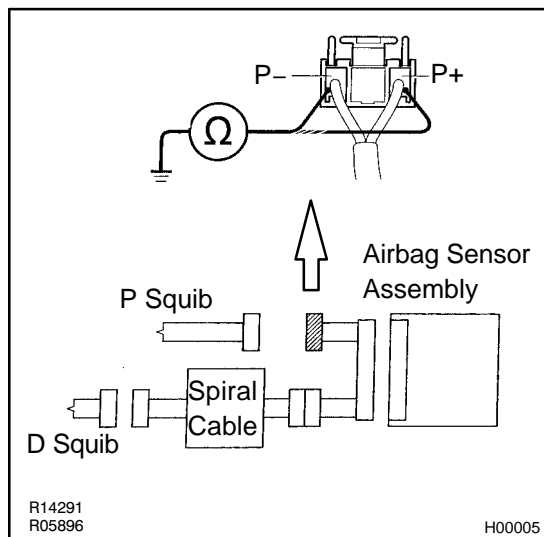
OK:

Resistance: 1 MΩ or Higher

NG	Go to step 7.
----	---------------

OK

3 Check P squib circuit.



CHECK:

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and front passenger airbag assembly, measure the resistance between P⁺, P⁻ and body ground.

OK:

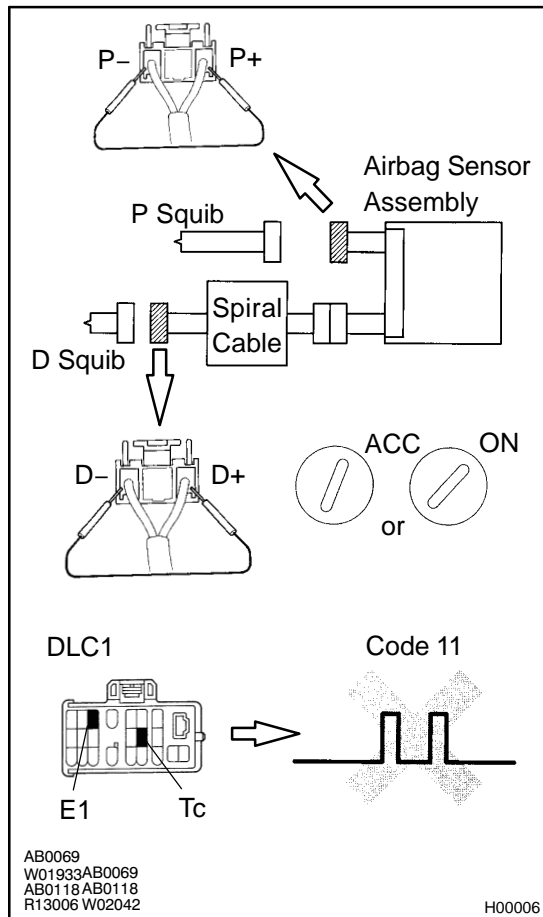
Resistance: 1 MΩ or Higher

NG

Repair or replace harness or connector between the airbag sensor assembly and front passenger airbag assembly.

OK

4 Check airbag sensor assembly.



PREPARATION:

- Connect connector to airbag sensor assembly.
- Using service wire, connect D⁺ and D⁻ on spiral cable side of connector between spiral cable and steering wheel pad.
- Using a service wire, connect P⁺ and P⁻ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC

OK:

DTC 11 is not output.

HINT:

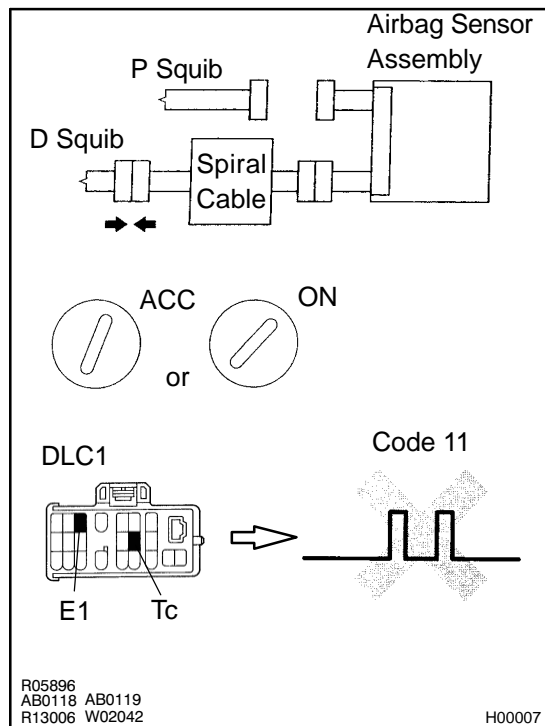
Codes other than code 11 may be output at this time, but they are not relevant to this check.

NG

Replace airbag sensor assembly.

OK

5 Check D squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect steering wheel pad connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 11 is not output.

HINT:

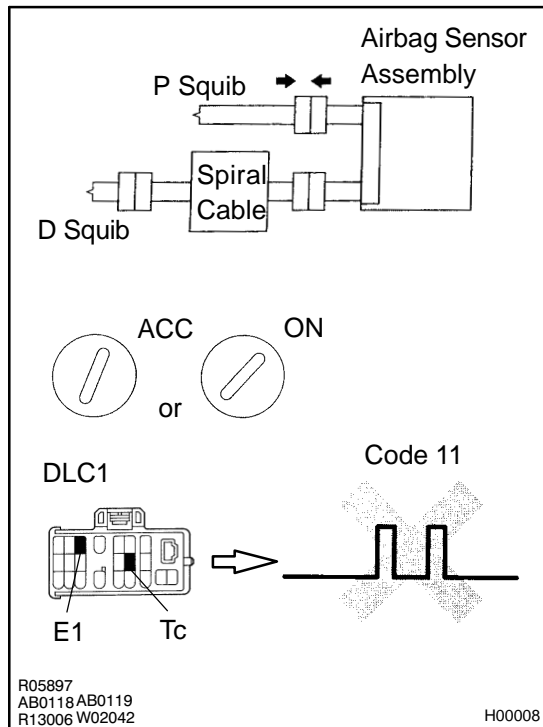
Codes other than code 11 may be output at this time, but they are not relevant to this check.

NG

Replace steering wheel pad.

OK

6 Check P squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect front passenger airbag assembly connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 11 is not output.

HINT:

Codes other than code 11 may be output at this time, but they are not relevant to this check.

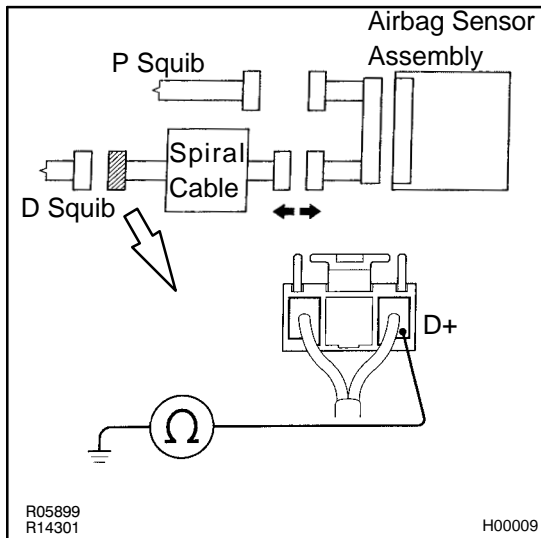
NG

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.

7

Check spiral cable.**PREPARATION:**

Disconnect connector between airbag sensor assembly and spiral cable.

CHECK:

Measure resistance between D⁺ on spiral cable side of connector between spiral cable and steering wheel pad and body ground.

OK:

Resistance: 1 MΩ or Higher

NG**Repair or replace spiral cable.****OK**

Repair or replace harness or connector between airbag sensor assembly and spiral cable.

DTC	12	Short in Squib Circuit (to B+)
------------	-----------	---------------------------------------

CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly. It causes the SRS to deploy when the SRS deployment conditions are satisfied. For details of the function of each component, see page FUNCTION OF COMPONENTS on page RS-2. DTC 12 is recorded when a B+ short is detected in the squib circuit.

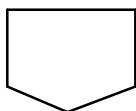
DTC No.	DTC Detection Condition	Trouble Area
12	<ul style="list-style-type: none"> • Short circuit in squib wire harness (to B+) • Squib malfunction • Spiral cable malfunction • Airbag sensor assembly malfunction 	<ul style="list-style-type: none"> • Steering wheel pad (D squib) • Front passenger airbag assembly (P squib) • Spiral cable • Airbag sensor assembly • Wire harness

WIRING DIAGRAM

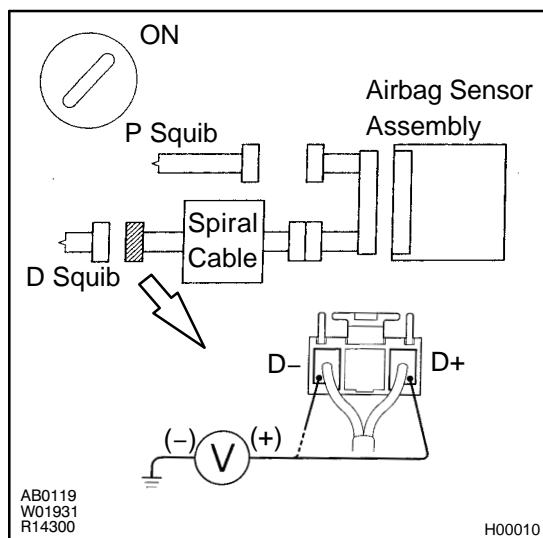
Refer to page DI-247 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Preparation. (See step 1 on page DI-271)
----------	---



2	Check D squib circuit.
----------	-------------------------------



CHECK:

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the voltage between D⁺, D⁻ and body ground.

OK:

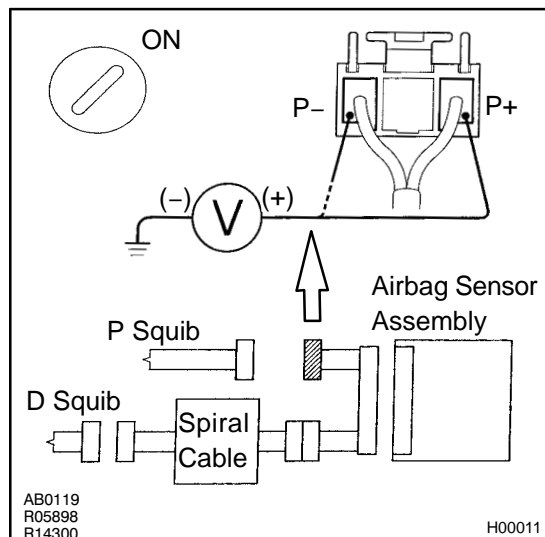
Voltage: 0 V

NG

Go to step 7.

OK

3 Check P squib circuit.

**CHECK:**

For the connector (on the airbag sensor assembly side) between airbag sensor assembly and front passenger airbag assembly, measure the voltage between P⁺, P⁻ and body ground.

OK:

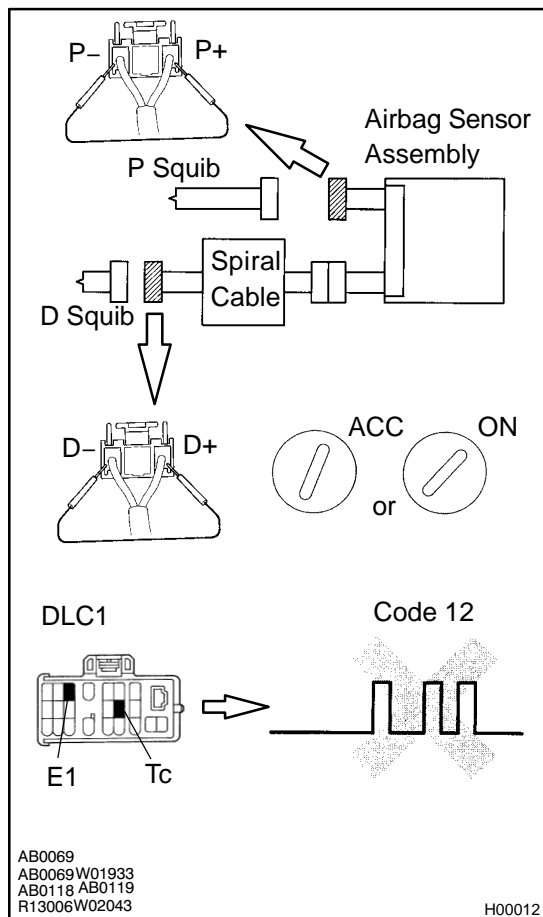
Voltage: 0 V

NG

Repair or replace harness or connector between the airbag sensor assembly and front passenger airbag assembly.

OK

4 Check airbag sensor assembly.



PREPARATION:

- Connect connector to airbag sensor assembly.
- Using a service wire, connect D⁺ and D⁻ on spiral cable side of connector between spiral cable and steering wheel pad.
- Using a service wire, connect P⁺ and P⁻ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory. (See page DI-240)
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 12 is not output.

HINT:

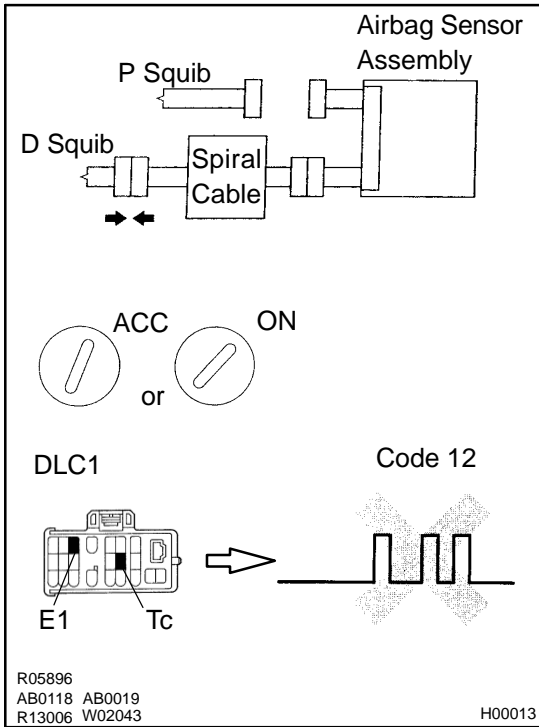
Codes other than code 12 may be output at this time, but they are not relevant to this check.

NG

Replace airbag sensor assembly.

OK

5 Check D squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect steering wheel pad connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 12 is not output.

HINT:

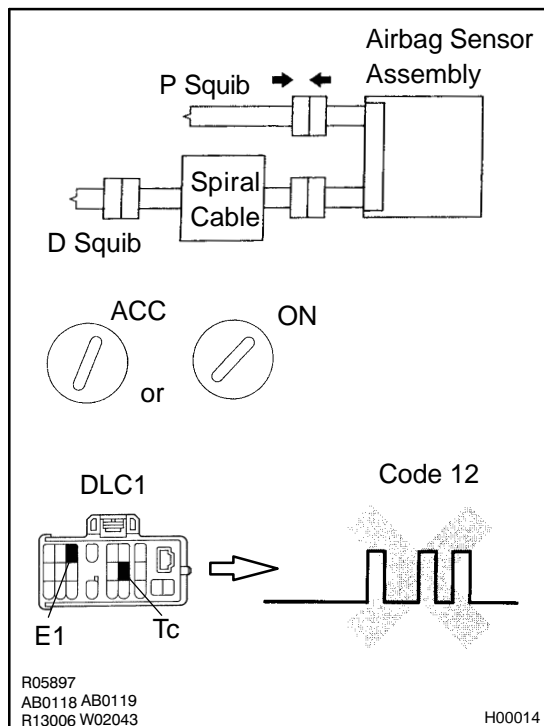
Codes other than code 12 may be output at this time, but they are not relevant to this check.

NG

Replace steering wheel pad.

OK

6 Check P squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect front passenger airbag assembly connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory. (See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1. SST 09843-18020
- Check DTC.

OK:

DTC 12 is not output.

HINT:

Codes other than code 12 may be output at this time, but they are not relevant to this check.

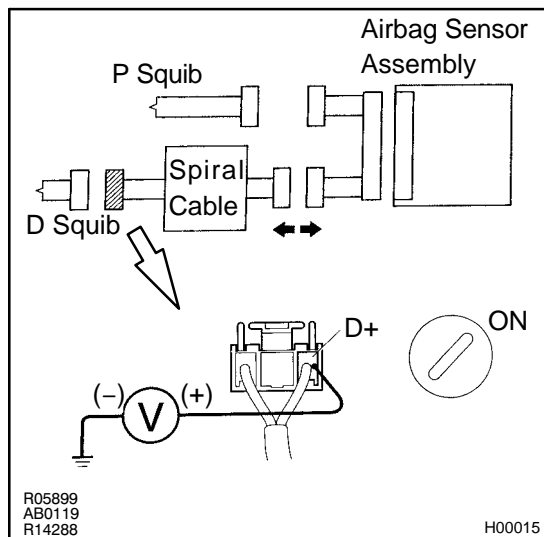
NG

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.

7

Check spiral cable.**PREPARATION:**

- Turn ignition switch to LOCK.
- Disconnect connector between airbag sensor assembly and spiral cable.
- Turn ignition switch ON.

CHECK:

Measure voltage at D+ on spiral cable side of connector between spiral cable and steering wheel pad and body ground.

OK:

Voltage: 0 V

NG**Repair or replace spiral cable.****OK****Repair or replace harness or connector between airbag sensor assembly and spiral cable.**

DTC	14	Open in D Squib Circuit
------------	-----------	--------------------------------

CIRCUIT DESCRIPTION

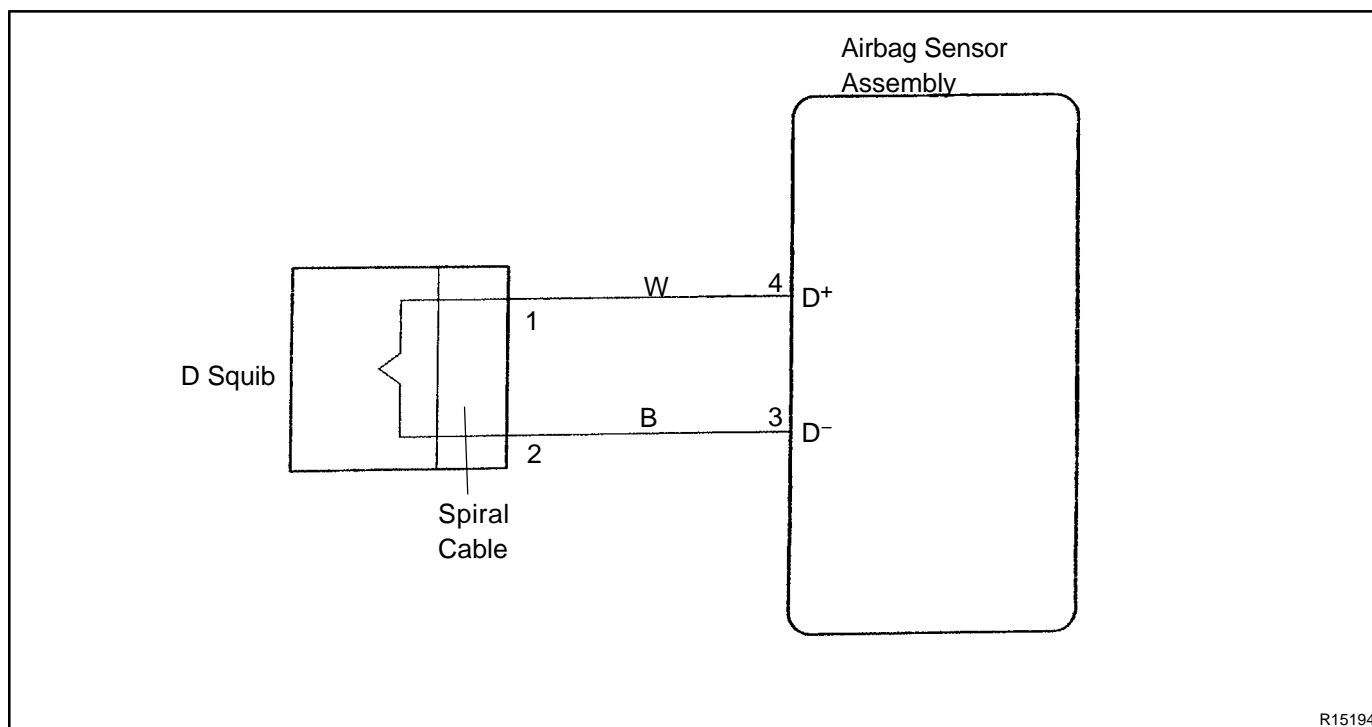
The D squib circuit consists of the airbag sensor assembly, spiral cable and the steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.

For details of the function of each component, see FUNCTION OF COMPONENTS on page [RS-2](#).

DTC 14 is recorded when an open is detected in the squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
14	<ul style="list-style-type: none"> • Open circuit in D⁺ wire harness or D⁻ wire harness of squib • D squib malfunction • Spiral cable malfunction • Center airbag sensor assembly malfunction 	<ul style="list-style-type: none"> • Steering wheel pad (D squib) • Spiral cable • Airbag sensor assembly • Wire harness

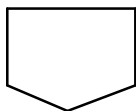
WIRING DIAGRAM



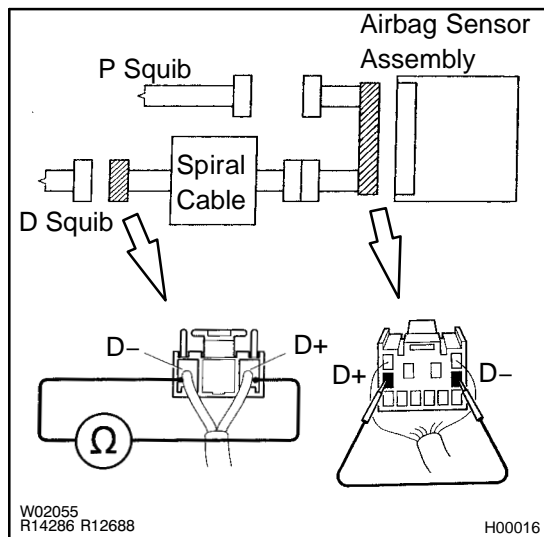
R15194

INSPECTION PROCEDURE

1	Preparation. (See step 1 on page DI-271)
----------	---



2 Check D squib circuit.



PREPARATION:

Using service wire, connect D⁺ and D⁻ on airbag sensor assembly connector.

CHECK:

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between D⁺ and D⁻.

OK:

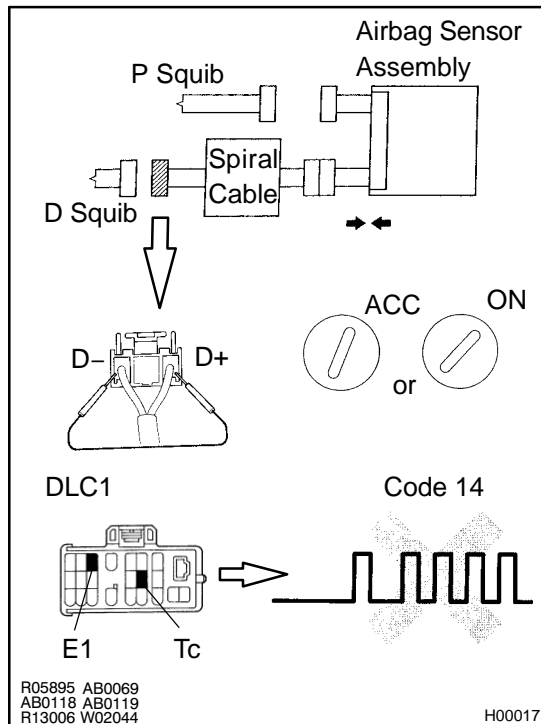
Resistance: Below 1 Ω

NG

Go to step 5.

OK

3 Check airbag sensor assembly.



PREPARATION:

- Connect connector to airbag sensor assembly.
- Using a service wire, connect D+ and D- on spiral cable side of connector between spiral cable and steering wheel pad.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 14 is not output.

HINT:

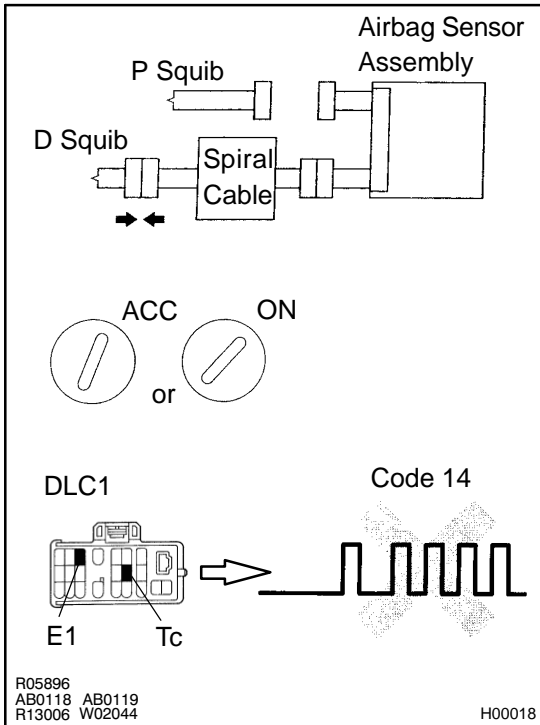
Codes other than code 14 may be output at this time, but they are not relevant to this check.

NG

Replace airbag sensor assembly.

OK

4 Check D squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect steering wheel pad (squib) connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory. (See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1. SST 09843-18020
- Check DTC.

OK:

DTC 14 is not output.

HINT:

Codes other than code 14 may be output at this time, but they are not relevant to this check.

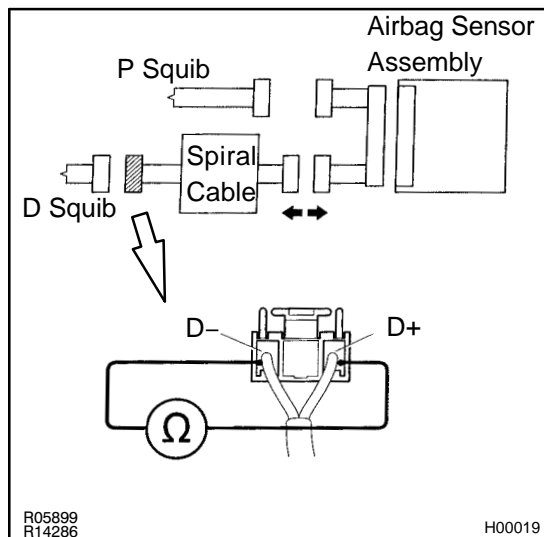
NG

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.

5 Check spiral cable.



PREPARATION:

Disconnect connector between airbag sensor assembly and spiral cable.

CHECK:

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance D⁺ and D⁻.

OK:

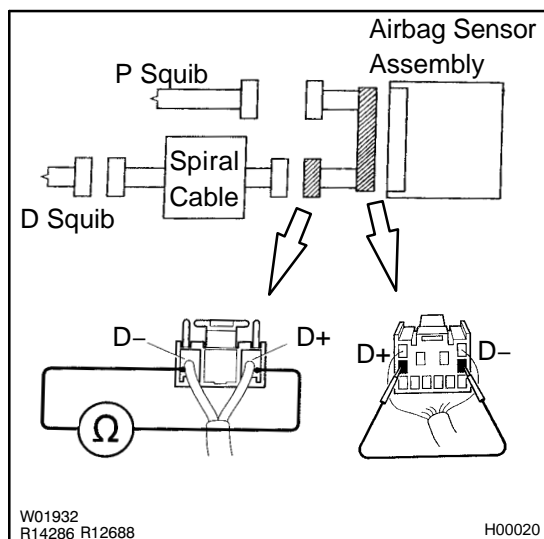
Resistance: Below 1 Ω

NG

Repair or replace spiral cable.

OK

6 Check harness between airbag sensor assembly and spiral cable.



PREPARATION:

Using service wire, connect D⁺ and D⁻ on airbag sensor assembly connector.

CHECK:

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and spiral cable, measure the resistance between D⁺ and D⁻.

OK:

Resistance: Below 1 Ω

NG

Repair or replace harness or connector between airbag sensor assembly and spiral cable.

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	31	Airbag Sensor Assembly Malfunction
------------	-----------	---

CIRCUIT DESCRIPTION

The airbag sensor assembly consists of a airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.

It receives signals from the airbag sensors, judges whether or not the SRS must be activated, and diagnosis system malfunction.

DTC 31 is recorded when occurrence of a malfunction in the airbag sensor assembly is detected.

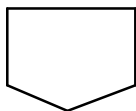
DTC No.	DTC Detection Condition	Trouble Area
31	• Airbag sensor assembly malfunction	• Airbag sensor assembly

INSPECTION PROCEDURE

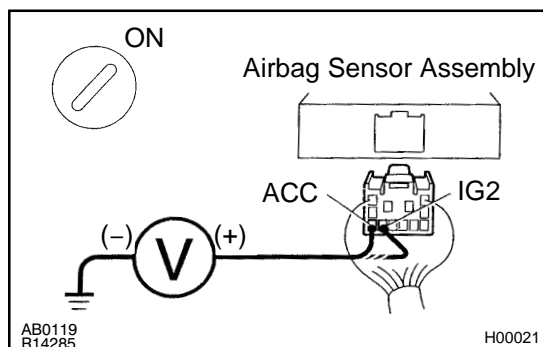
HINT:

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.

1	Preparation (See step 1 on page DI-271).
----------	---



2	Check voltage at IG2 and ACC of airbag sensor assembly.
----------	--



PREPARATION:

Turn ignition switch ON.

CHECK:

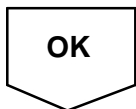
Measure voltage between terminals IG2 and ACC of airbag sensor assembly and body ground.

OK:

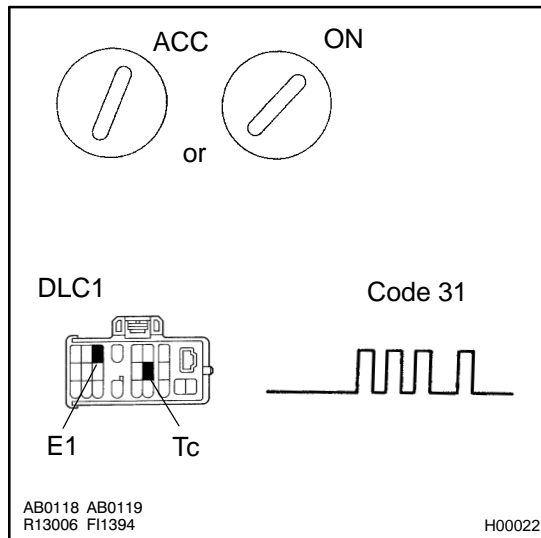
Voltage: Below 16 V



Check battery and charging system (See page [CH-2](#)).



3 Is DTC 31 output again?

**PREPARATION:**

Clear malfunction code.

CHECK:

- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Repeat operation in step (a) and (b) at least 5 times.
- Using SST, connect terminals Tc and E1 of DLC 1.
SST 09843-18020
- Check the DTC.

NO

Using simulation method, reproduce malfunction symptoms (See page [IN-18](#)).

YES

Replace airbag sensor assembly.

DTC	54	Open in P Squib Circuit
------------	-----------	--------------------------------

CIRCUIT DESCRIPTION

The P squib circuit consists of the airbag sensor assembly and front passenger airbag assembly.

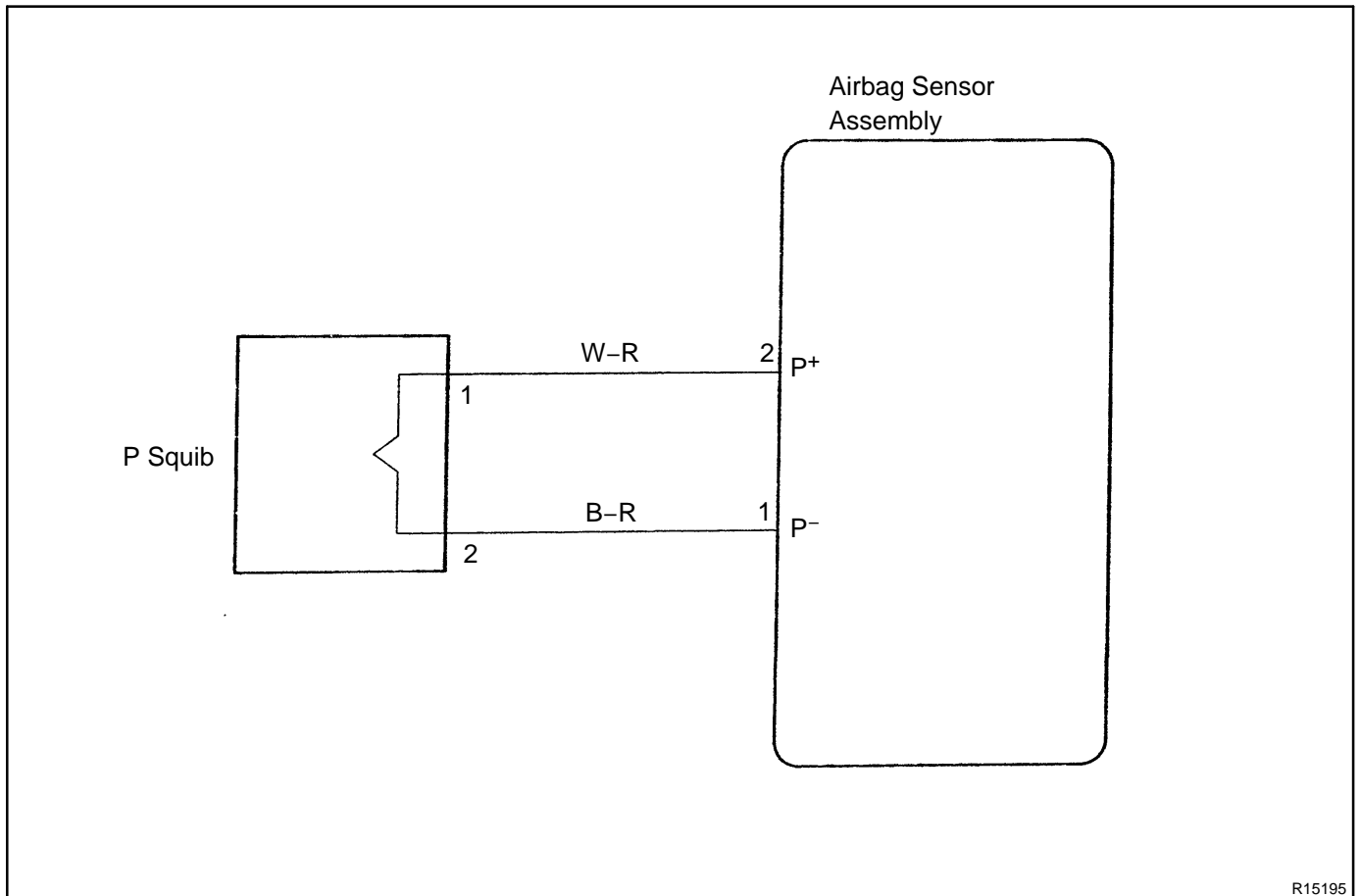
It causes the airbag to deploy when the airbag deployment conditions are satisfied.

For details of the function of each component, see FUNCTION OF COMPONENTS on page [RS-2](#).

DTC 54 is recorded when an open is detected in the P squib circuit.

DTC No.	DTC Detection Condition	Trouble Area
54	<ul style="list-style-type: none"> • Open circuit in P⁺ wire harness or P⁻ wire harness of squib • Squib malfunction • Airbag sensor assembly malfunction 	<ul style="list-style-type: none"> • Front passenger airbag assembly (P squib) • Airbag sensor assembly • Wire harness

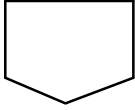
WIRING DIAGRAM



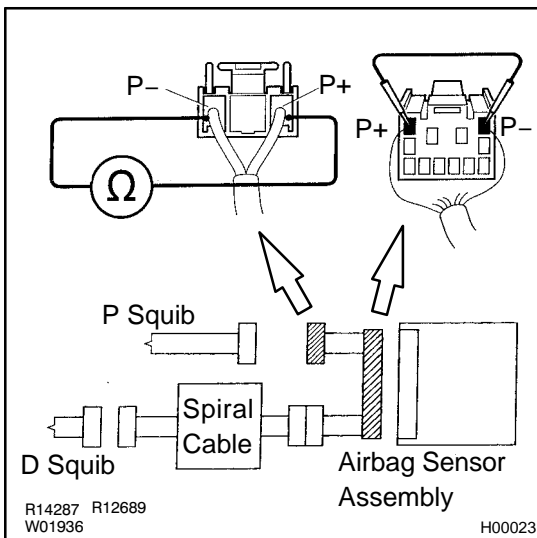
R15195

INSPECTION PROCEDURE

1 Preparation. (See step 1 on page [DI-271](#))



2 Check P squib circuit.

**PREPARATION:**

Using service wire, connect P+ and P- on airbag sensor assembly connector.

CHECK:

For the connector (on the airbag sensor assembly side) between the airbag sensor assembly and front passenger airbag assembly measure the resistance between P+ and P-.

OK:

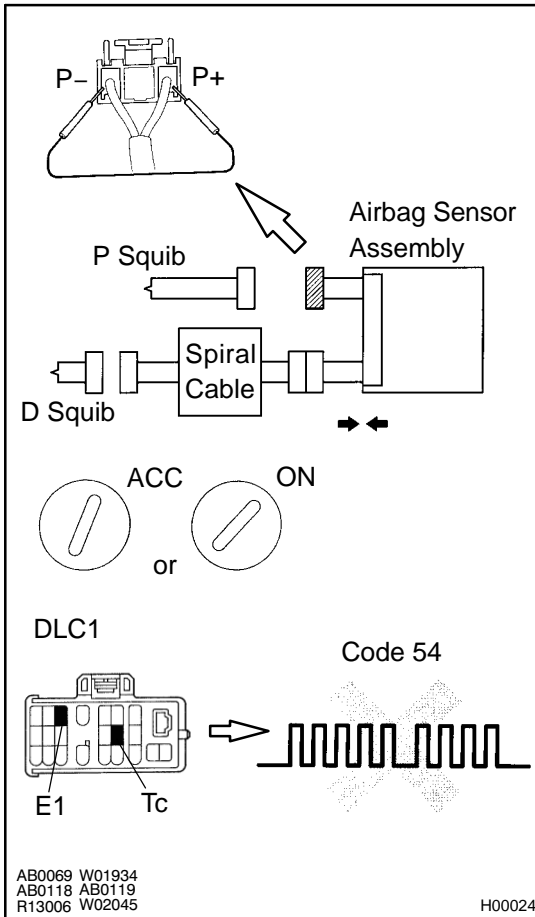
Resistance: Below 1 Ω

NG

Repair or replace harness or connector between airbag sensor assembly and front passenger airbag assembly.

OK

3 Check airbag sensor assembly.



PREPARATION:

- Connect connector to airbag sensor assembly.
- Using service wire, connect P⁺ and P⁻ on airbag sensor assembly side of connector between airbag sensor assembly and front passenger airbag assembly.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 54 is not output.

HINT:

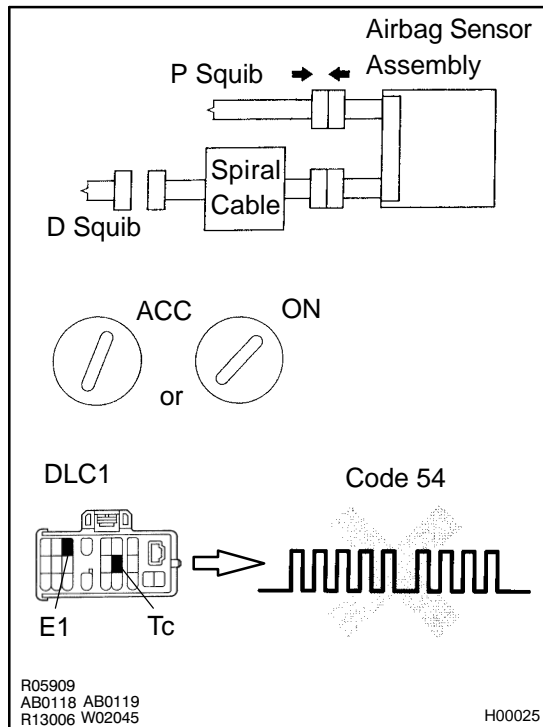
Codes other than code 54 may be output at this time, but they are not relevant to this check.

NG

Replace airbag sensor assembly.

OK

4 Check P squib.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Connect front passenger airbag assembly connector.
- Connect negative (-) terminal cable to battery, and wait at least 2 seconds.

CHECK:

- Turn ignition switch to ACC or ON and wait at least 20 seconds.
- Clear malfunction code stored in memory.
(See page [DI-240](#))
- Turn ignition switch to LOCK, and wait at least 20 seconds.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Using SST, connect terminals Tc and E1 of DLC1.
SST 09843-18020
- Check DTC.

OK:

DTC 54 is not output.

HINT:

Codes other than code 54 may be output at this time, but they are not relevant to this check.

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.

DTC	Normal	Source Voltage Drop
------------	---------------	----------------------------

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage-increase circuit (DC-DC converter) in the airbag sensor assembly in case the source voltage drops.

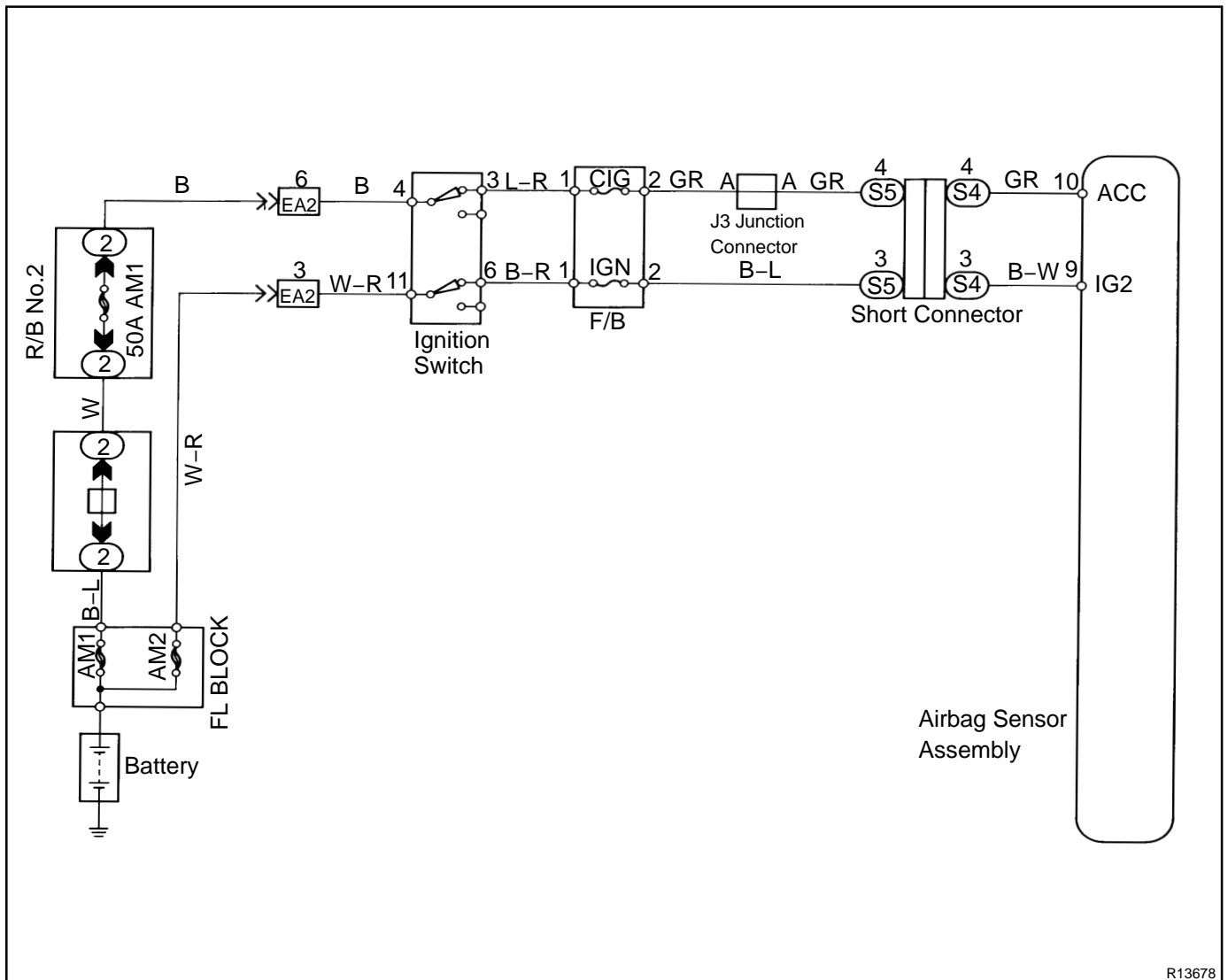
When the battery voltage drops, the voltage-increase circuit (DC-DC converter) functions to increase the voltage of the SRS to normal voltage.

The diagnosis system malfunction display for this circuit is different to other circuits—when the SRS warning light remains lit up and the DTC is a normal code, source voltage drop is indicated.

Malfunction in this circuit is not recorded in the airbag sensor assembly, and the source voltage returns to normal, the SRS warning light automatically goes off.

DTC No.	DTC Detection Condition	Trouble Area
Normal	Source voltage drop	<ul style="list-style-type: none"> • Battery • Airbag sensor assembly

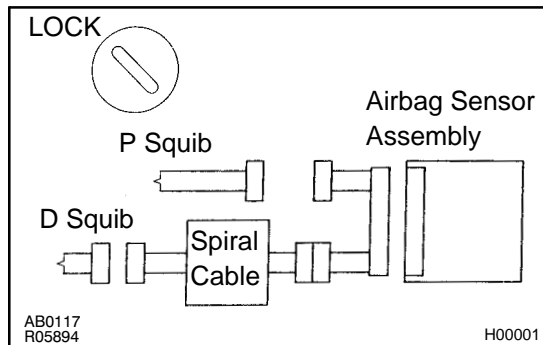
WIRING DIAGRAM



R13678

INSPECTION PROCEDURE

1 Preparation.

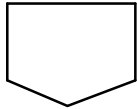


PREPARATION:

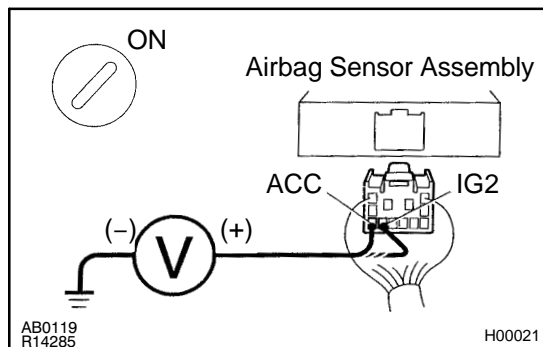
- Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
- Remove steering wheel pad (See page [SR-11](#)).
- Disconnect connector of front passenger airbag assembly (See page [RS-22](#)).
- Disconnect connector of airbag sensor assembly (See page [RS-33](#)).

CAUTION:

Store the steering wheel pad with the front surface facing upward.



2 Check source voltage.



PREPARATION:

- Connect negative (–) terminal cable to battery.
- Turn ignition switch ON.

CHECK:

Measure voltage at IG2 or ACC on sensor and operate electric system. (defogger, wiper, headlight, heater blower, etc.)

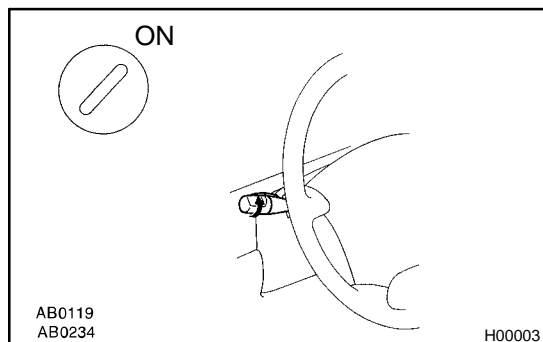
OK:

Voltage: 10 – 14 V

NG

Check the harness between battery and airbag sensor assembly, and check the battery and charging system.

OK

3 Does SRS warning light turn off?**PREPARATION:**

- (a) Turn ignition switch to LOCK.
- (b) Connect steering wheel pad connector.
- (c) Connect front passenger airbag assembly connector.
- (d) Connect airbag sensor assembly connector.
- (e) Turn ignition switch ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.) and check that SRS warning light goes off.

NO

Check DTC, if a DTC is output, perform trouble-shooting according to DTC, if a normal code is output, replace 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.

SRS Warning Light System Malfunction (Always lit up, when ignition switch is in LOCK position.)

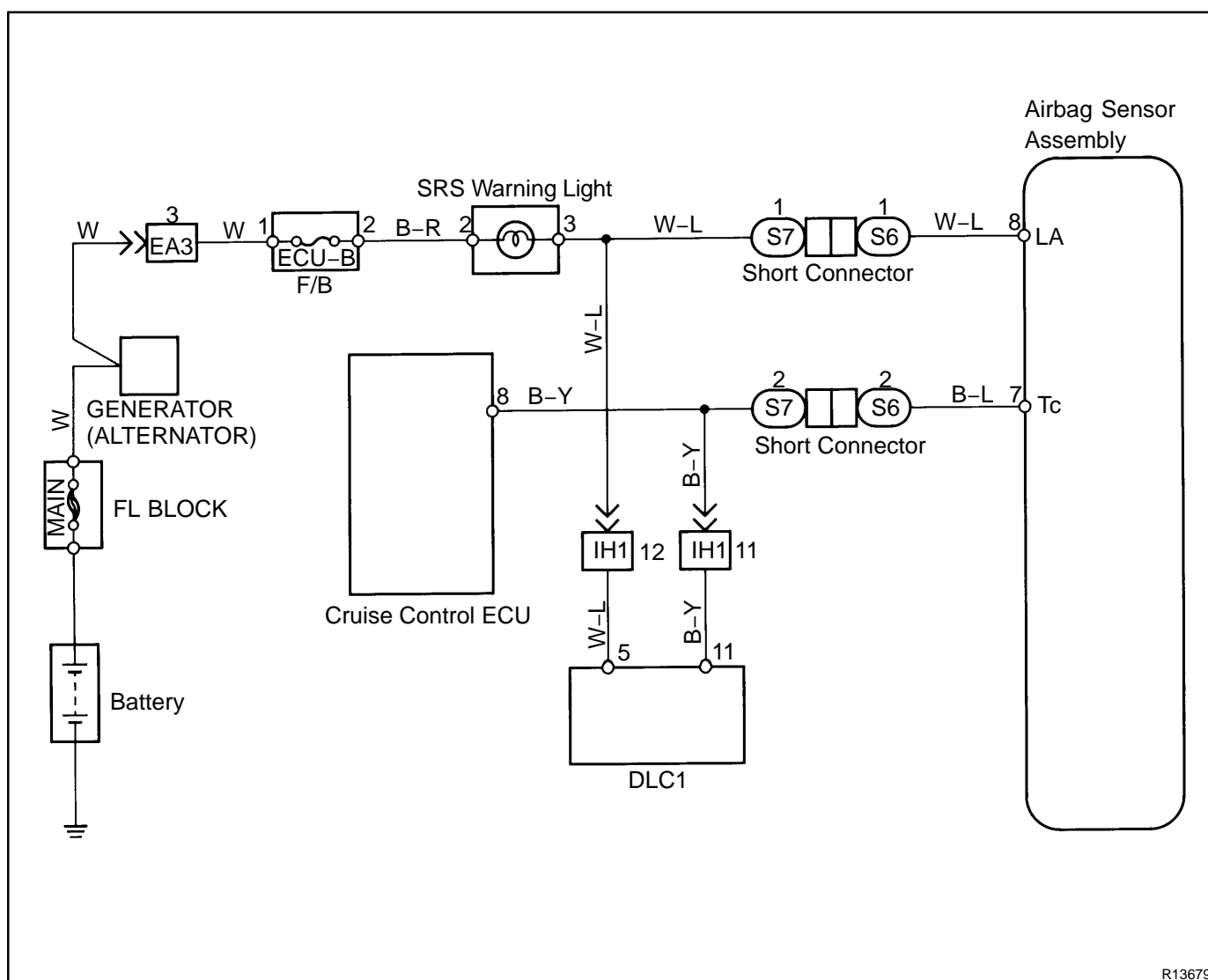
CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.

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 E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

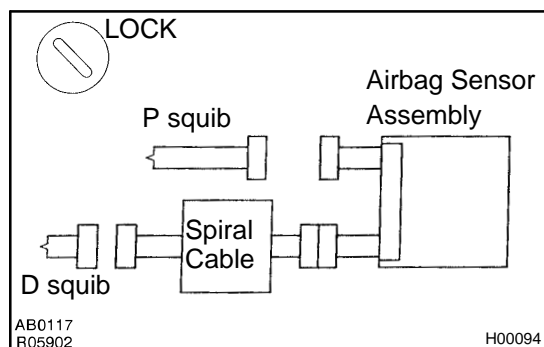
WIRING DIAGRAM



R13679

INSPECTION PROCEDURE

1 Preparation.

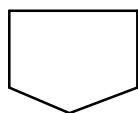


PREPARATION:

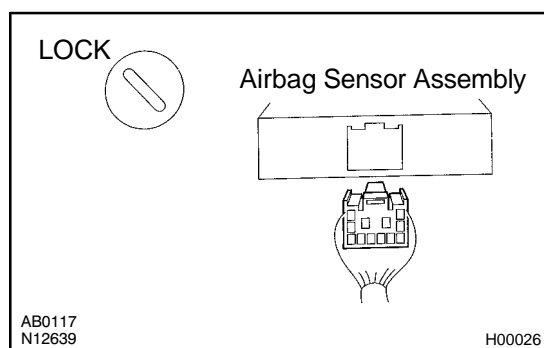
- Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
- Remove steering wheel pad. (See SR section)
- Disconnect connector of front passenger airbag assembly. (See page [RS-22](#))

CAUTION:

Store the steering wheel pad with the front surface facing upward.



2 Does SRS warning light turn off?



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
- Disconnect airbag sensor assembly connector.
- Connect negative (–) terminal cable to battery.

CHECK:

Check operation of SRS warning light.

NO

Check SRS warning light circuit or terminal AB circuit of DLC1.

YES

Replace airbag sensor assembly.

SRS Warning Light System Malfunction (Does not light up, when ignition switch is turned to ACC or ON.)

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.

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.

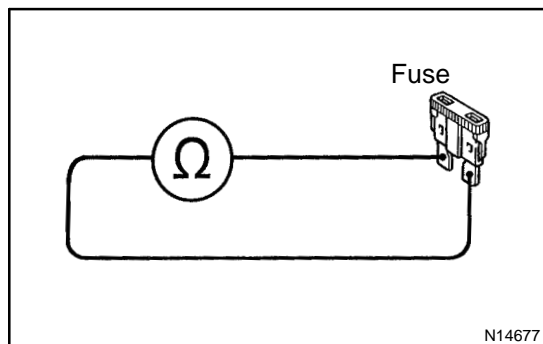
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality. When terminals Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

WIRING DIAGRAM

Refer to page [DI-274](#) for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1 Check ECU-B Fuse.



PREPARATION:

Remove ECU-B fuse.

CHECK:

Check continuity of ECU-B fuse.

OK:

Continuity

HINT:

- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

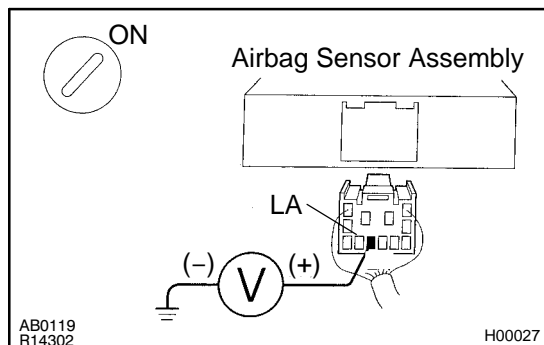
NG

Go to step 5.

OK

2 Preparation. (See step 1 on page [DI-271](#))

3 Check SRS warning light circuit.



PREPARATION:

- (a) Connect negative (-) terminal cable to battery.
- (b) Turn ignition switch to ACC or ON.

CHECK:

Measure voltage LA terminal of harness side connector of air-bag sensor assembly.

OK:

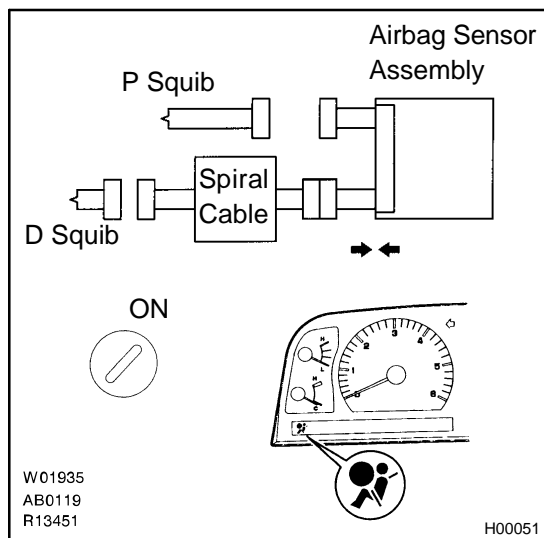
Voltage: 10 – 14 V

NG

Check SRS warning light bulb/repair SRS warning light circuit.

OK

4 Does SRS warning light come on?



PREPARATION:

- (a) Disconnect negative (-) terminal cable from the battery.
- (b) Connect airbag sensor assembly connector.
- (c) Connect negative (-) terminal cable to battery, and wait at least 2 seconds.
- (d) Turn ignition switch to ACC or ON.

CHECK:

Check operation of SRS warning light.

NO

Check terminal LA of airbag sensor assembly. If normal, replace 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.

DI-278

DIAGNOSTICS – SUPPLEMENTAL RESTRAINT SYSTEM

5	Is new ECU-B fuse burnt out again?
---	------------------------------------

NO

Using simulation method, reproduce malfunction symptoms (See page [IN-18](#)).

YES

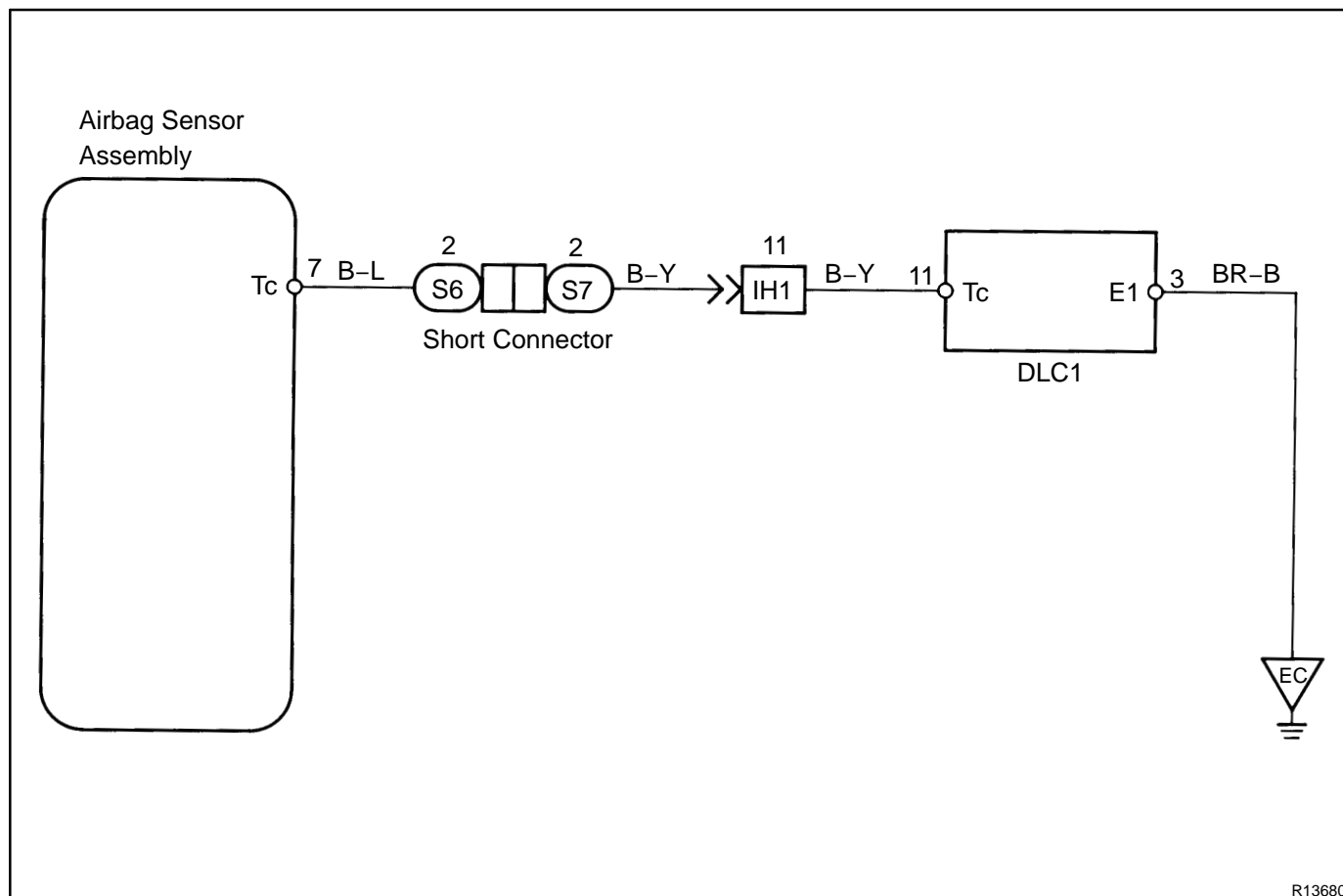
Check harness between ECU-B fuse and SRS warning light.

Tc Terminal Circuit

CIRCUIT DESCRIPTION

By connecting terminals Tc and E1 of the DLC1 the airbag sensor assembly is set in the DTC output mode. The DTCs are displayed by the blinking of the SRS warning light.

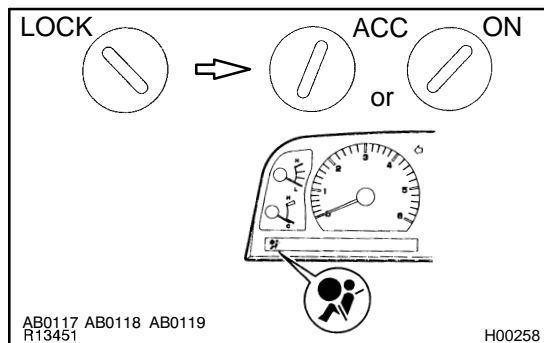
WIRING DIAGRAM



R13680

INSPECTION PROCEDURE**If the DTC is not displayed, perform the following troubleshooting.**

1	Does SRS warning light light up for approx. 6 seconds?
----------	---

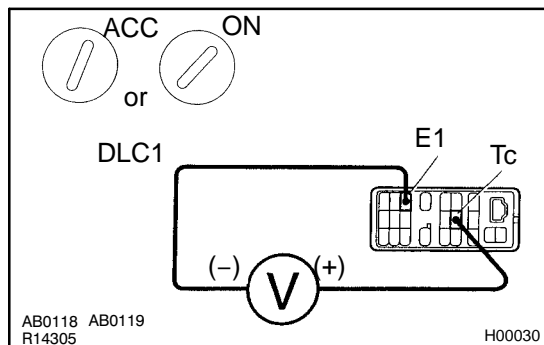
**PREPARATION:**

Check operation of SRS warning light after ignition switch is turned from LOCK position to ACC or ON position.

NO	Check SRS warning light system. (See page DI-240)
-----------	--

YES	
------------	--

2	Check voltage between terminals Tc and E1 of DLC1.
----------	---

**PREPARATION:**

Turn ignition switch to ACC or ON.

CHECK:

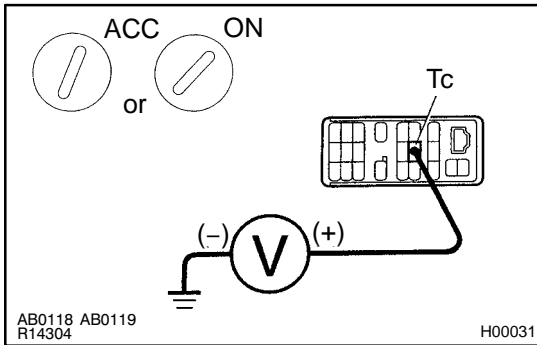
Measure voltage between terminals Tc and E1 of DLC1.

OK:

Voltage: 10 – 14 V

OK	Go to step 4.
-----------	----------------------

NG	
-----------	--

3**Check voltage between terminals Tc of DLC1 and body ground****CHECK:**

Measure voltage between terminals Tc of DLC1 and body ground.

OK:

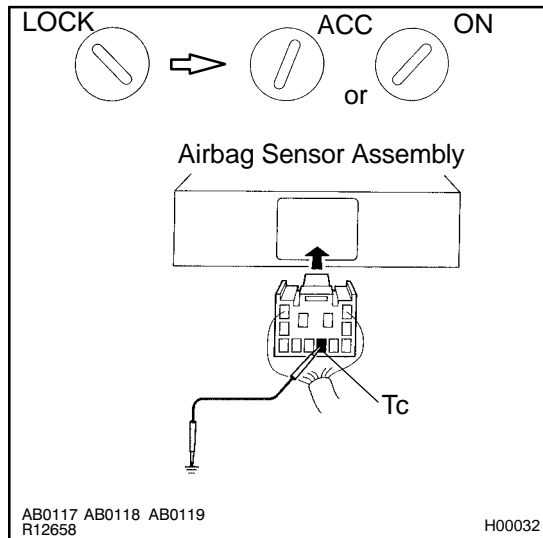
Voltage: 10 – 14 V

OK

Check harness between terminal E1 of DLC1 and body ground.

NG

4 Check airbag sensor assembly.



PREPARATION:

- Turn ignition switch to LOCK.
- Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- Disconnect airbag sensor assembly connector.
- Insert service wire into terminal Tc from back side as shown.
- Connect airbag sensor assembly connector with service wire.
- Connect negative (-) terminal cable to battery.
- Turn ignition switch to ACC or ON, and wait at least 20 seconds.
- Connect service wire of terminal Tc to body ground.

CHECK:

Check operation of SRS warning light.

OK:

SRS warning light comes on.

NOTICE:

Never make a mistake with the terminal connection position as this will cause a malfunction.

OK

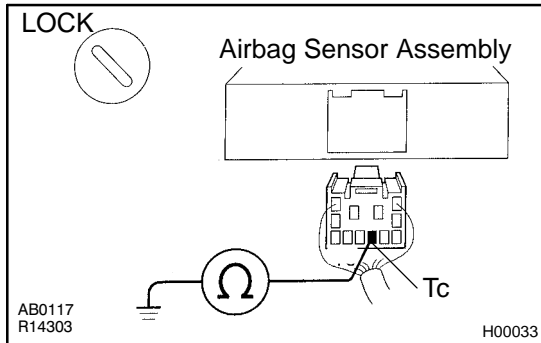
Check harness between airbag sensor assembly and DLC1.

NG

Replace airbag sensor assembly.

If the DTC is displayed without a DTC check procedure, perform the following troubleshooting.

- | | |
|----------|--|
| 1 | Check resistance between terminal Tc of airbag sensor assembly and body ground. |
|----------|--|

**PREPARATION:**

- (a) Turn ignition switch to LOCK.
- (b) Disconnect negative (-) terminal cable from the battery, and wait at least 90 seconds.
- (c) Disconnect airbag sensor assembly connector.

CHECK:

Check resistance between terminal Tc of airbag sensor assembly connector and body ground.

OK:

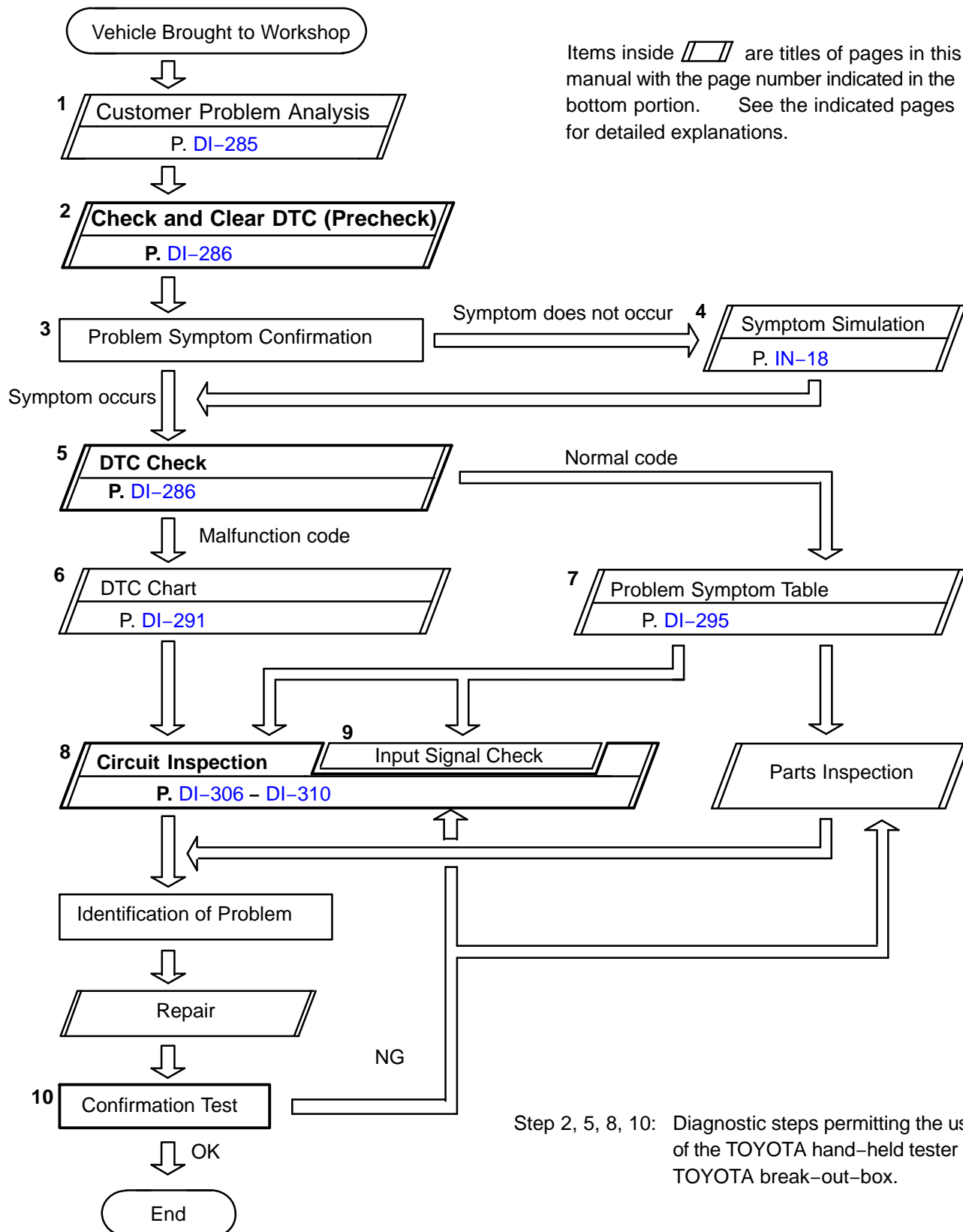
Resistance: 1 MΩ or Higher

NG**Repair or replace harness or connector.****OK****Replace airbag sensor assembly.**

CRUISE CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DIS04-02



CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		Registration No.	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	Odometer Reading	km Mile

Condition of Problem Occurrence	Date of Problem Occurrence	/ /
	How Often does Problem Occur?	<input checked="" type="checkbox"/> Continuous <input checked="" type="checkbox"/> Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	km Mile

Symptoms	<input checked="" type="checkbox"/> Auto cancel occurs	<ul style="list-style-type: none"> Driving condition <input type="checkbox"/> City driving <input type="checkbox"/> Freeway <input type="checkbox"/> Up hill <input type="checkbox"/> Down hill After cancel occurred, did the driver activate cruise control again? <input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Cancel does not occur	<input type="checkbox"/> With brake ON <input type="checkbox"/> Except D position shift <input type="checkbox"/> At 40 km/h (25 mph) or less <input type="checkbox"/> When control SW turns to CANCEL position
	<input type="checkbox"/> Cruise control malfunction	<input type="checkbox"/> Slip to acceleration side <input type="checkbox"/> Slip to deceleration side <input type="checkbox"/> Hunting occurs <input type="checkbox"/> O/D cut off does not occur <input type="checkbox"/> O/D does not return
	<input type="checkbox"/> Switch malfunction	<input type="checkbox"/> SET <input type="checkbox"/> ACCEL <input type="checkbox"/> COAST <input type="checkbox"/> RESUME <input type="checkbox"/> CANCEL
	<input type="checkbox"/> Cruise MAIN indicator light	<input type="checkbox"/> Remains ON <input type="checkbox"/> Does not light up <input type="checkbox"/> Blinking

DTC Check	1st Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)
	2nd Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

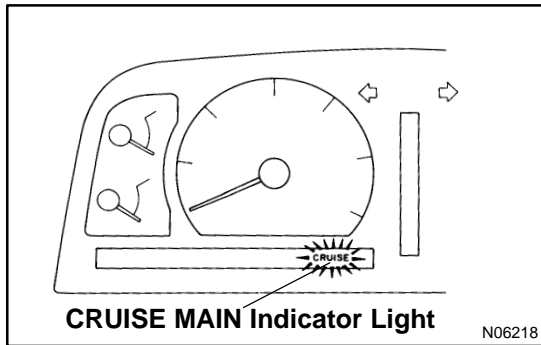
Inspector's name: _____

Customer's Name		Registration No.	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	Odometer Reading	km Mile

Condition of Problem Occurrence	Date of Problem Occurrence	/ /
	How Often does Problem Occur?	<input checked="" type="checkbox"/> Continuous <input checked="" type="checkbox"/> Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	km Mile

Symptoms	<input checked="" type="checkbox"/> Auto cancel occurs	<ul style="list-style-type: none"> Driving condition <input type="checkbox"/> City driving <input type="checkbox"/> Freeway <input type="checkbox"/> Up hill <input type="checkbox"/> Down hill After cancel occurred, did the driver activate cruise control again? <input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Cancel does not occur	<input type="checkbox"/> With brake ON <input type="checkbox"/> Except D position shift <input type="checkbox"/> At 40 km/h (25 mph) or less <input type="checkbox"/> When control SW turns to CANCEL position
	<input type="checkbox"/> Cruise control malfunction	<input type="checkbox"/> Slip to acceleration side <input type="checkbox"/> Slip to deceleration side <input type="checkbox"/> Hunting occurs <input type="checkbox"/> O/D cut off does not occur <input type="checkbox"/> O/D does not return
	<input type="checkbox"/> Switch malfunction	<input type="checkbox"/> SET <input type="checkbox"/> ACCEL <input type="checkbox"/> COAST <input type="checkbox"/> RESUME <input type="checkbox"/> CANCEL
	<input type="checkbox"/> Cruise MAIN indicator light	<input type="checkbox"/> Remains ON <input type="checkbox"/> Does not light up <input type="checkbox"/> Blinking

DTC Check	1st Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)
	2nd Time	<input type="checkbox"/> Normal Code <input type="checkbox"/> Malfunction Code (Code)



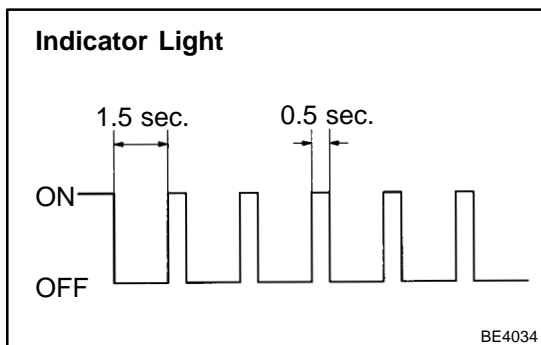
PRE-CHECK

1. DIAGNOSIS SYSTEM

- (a) Check the indicator.
 - (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 off when the main switch is turned OFF.

HINT:

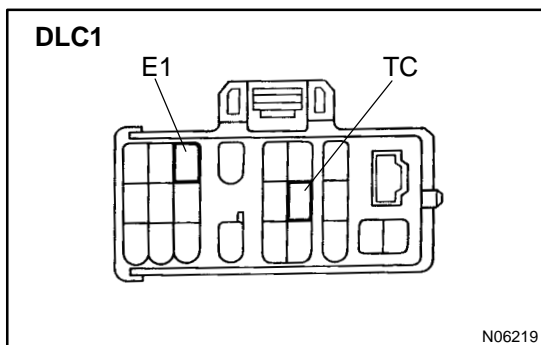
If the indicator check result is not normal, proceed to troubleshooting (See page [BE-34](#)) for the combination meter section.



- (b) Check the DTC.

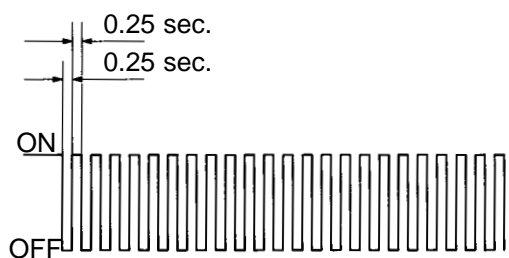
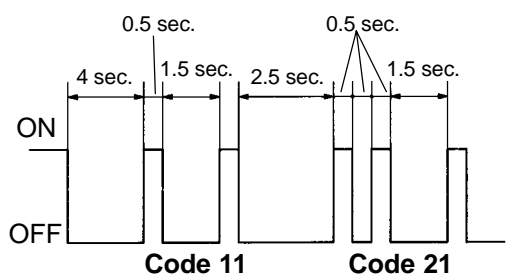
HINT:

If a malfunction occurs in the No. 1 vehicle speed sensors or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stopped in memory as a diagnostic trouble code.



- (c) Output of DTC using diagnosis check wire.

- (1) Turn the ignition switch ON.
- (2) Using SST, connect terminals Tc and E₁ of DLC1.
SST 09843-18020
- (3) Read the DTC on the CRUISE MAIN indicator light.

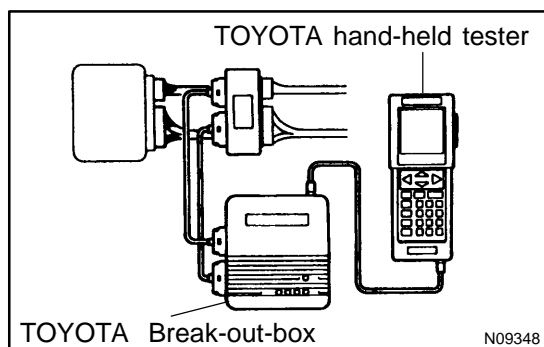
Normal Code**Malfunction codes 11 and 21**BE4032
BE4033

I00021

HINT:

If the DTC is not output, inspect the diagnosis circuit (See page [DI-333](#))

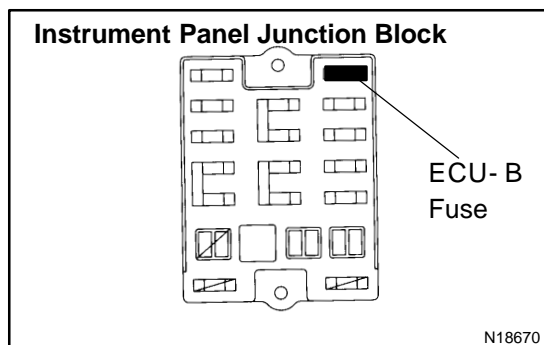
As an example, the blinking patterns for codes; normal, 11 and 21 are shown in the illustration.



N09348

2. ECU TERMINAL VALUES MEASUREMENT BY USING TOYOTA BREAK-OUT-BOX AND TOYOTA HAND-HELD TESTER

- Hook up the TOYOTA break-out-box and TOYOTA hand-held tester to the vehicle.
- Read the ECU input/output values by following the prompts on the tester screen.
- Please refer to the TOYOTA hand-held tester has a "Snapshot" function. This records the measured data and is effective in the diagnosis of intermittent problems.

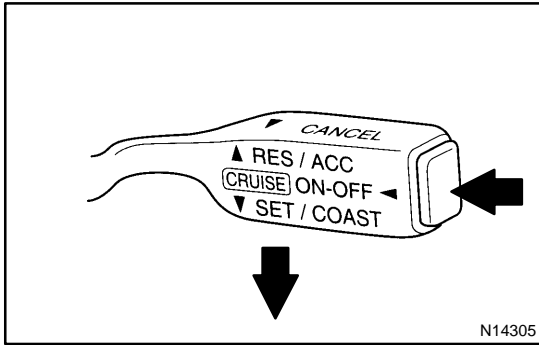


N18670

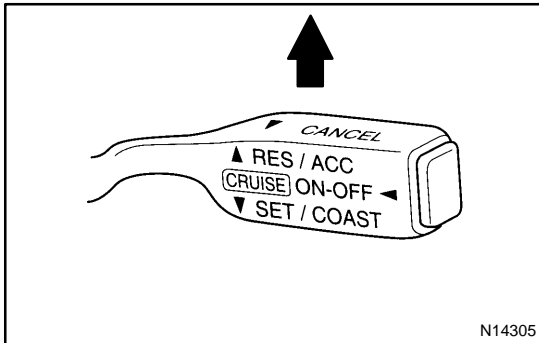
3. DTC CLEARANCE

- After completing repairs, the diagnostic trouble code retained in memory can be cleared by removing the ECU-B fuse for 10 seconds or more, with the ignition switch off.
- Check that the normal code is displayed after connecting the fuse.

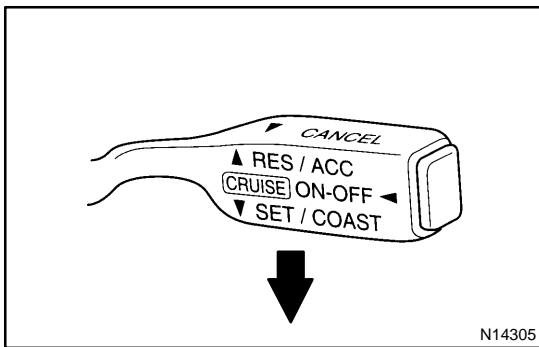
DIAGNOSTICS - CRUISE CONTROL SYSTEM

**4. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)****(a) Inspect the SET switch.**

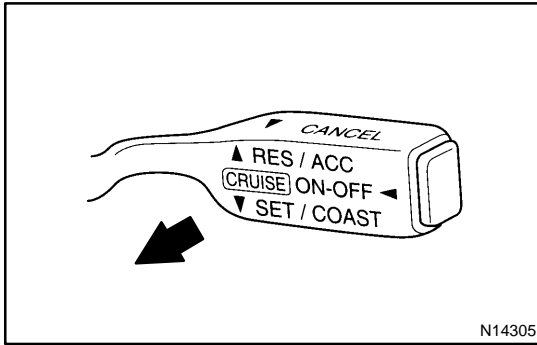
- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Press the control switch to the SET/COAST.
- (4) After releasing the switch, check that the vehicle cruises at the desired speed.

**(b) Inspect the ACCEL switch.**

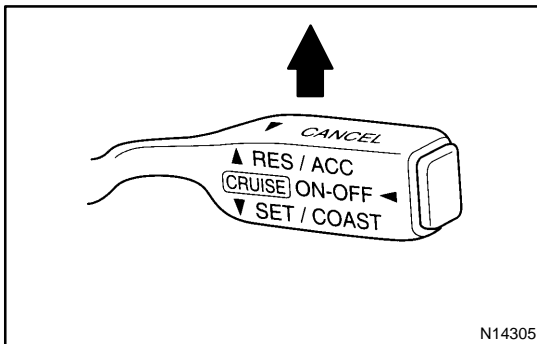
- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Check that the vehicle speed is increased while the control switch turned to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily press the control switch upward in the RES/ACC and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap-up function).

**(c) Inspect the COAST switch.**

- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Check that the vehicle speed is decreased while the control switch is turned to SET/COAST, and the vehicle cruise at the set speed when the switch is released.
- (4) Momentarily press the control switch is turned to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap-down function).

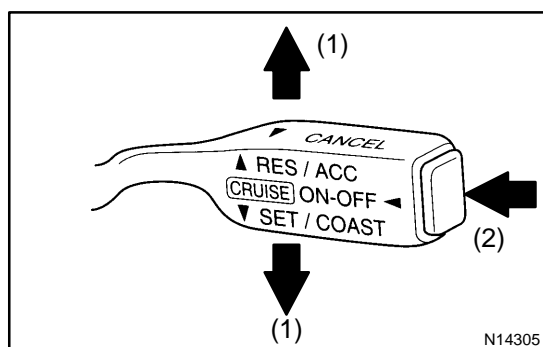


- (d) Inspect the CANCEL switch.
- (1) Push the main switch ON.
 - (2) Drive at a desired speed (40 km/h (25 mph) or higher).
 - (3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
 - Depress the brake pedal
 - Shift to except D position
 - Push the main switch OFF
 - Pull the cruise control switch to CANCEL



- (e) Inspect the RESUME switch.
- (1) Push the main switch ON.
 - (2) Drive at a desired speed (40 km/h (25 mph) or higher).
 - (3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
 - Depress the brake pedal
 - Shift to except D position
 - Pull the cruise control switch to CANCEL
 - (4) After the control switch is turned to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation.

DIAGNOSTICS - CRUISE CONTROL SYSTEM

**5. INPUT SIGNAL CHECK**

HINT:

- (1) For check No.1 - No.3
 - Turn ignition switch ON.
- (2) For check No.4
 - Jack up the vehicle.
 - Start the engine.
 - Shift to D position.
- (a) Press the control switch to SET/COAST or RES/ACC position and hold it down or hold it up "1".
- (b) Push the main switch ON "2".
- (c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.
- (d) Turn the SET/COAST or RES/ACC switch OFF.
- (e) Operate each switch as listed in the table below.
- (f) Read the blinking pattern of the CRUISE MAIN indicator light.
- (g) After performing the check, turn the main switch OFF.

HINT:

When 2 or more signals are input to the ECU, the lowest numbered code will be displayed first.

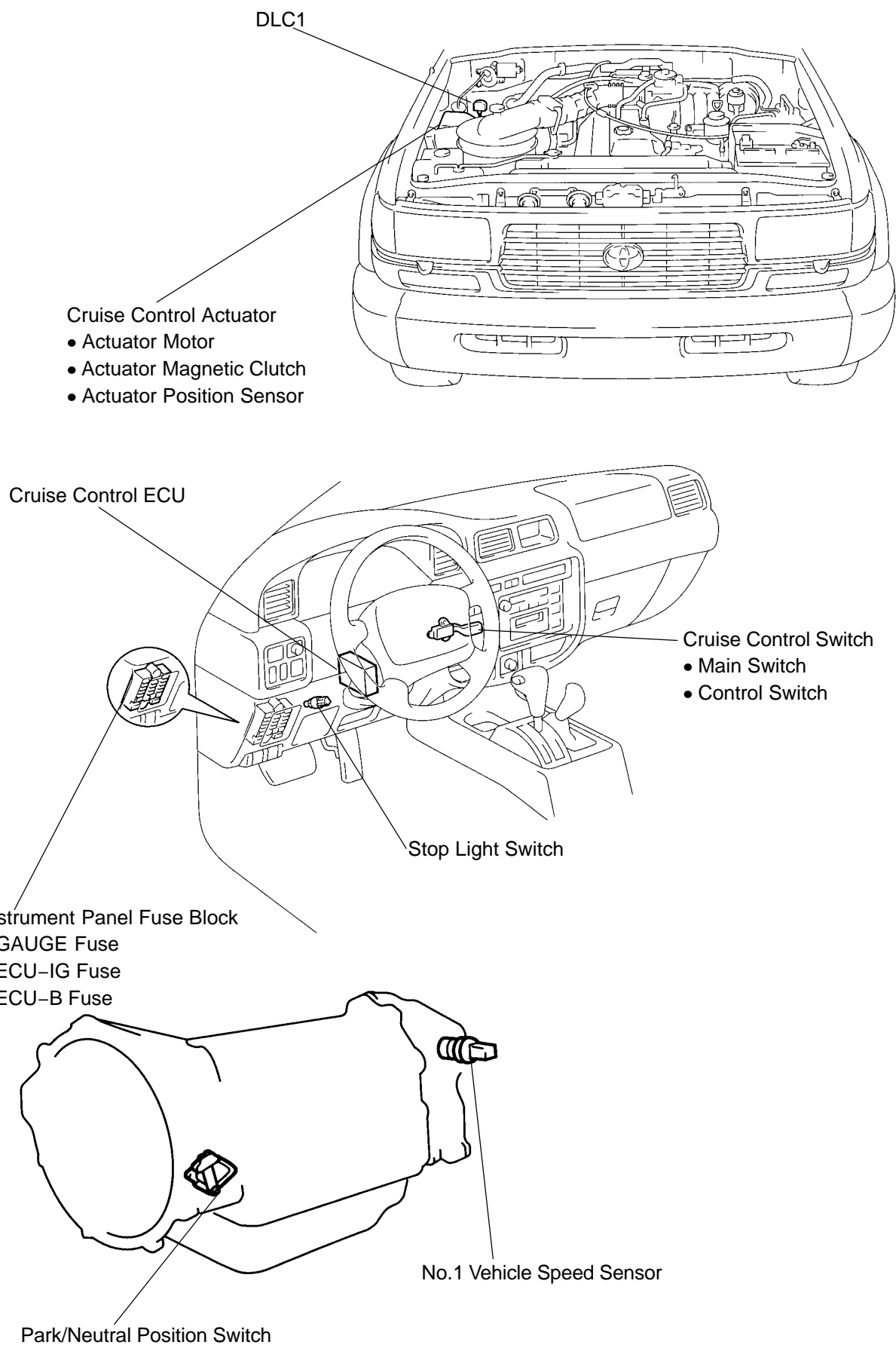
No.	Operation Method	CRUISE MAIN Indicator Light Blinking Pattern	Diagnosis
1	Turn SET/COAST switch ON		SET/COAST switch circuit is normal
2	Turn RES/ACC switch ON		RES/ACC switch circuit is normal
3	Turn CANCEL switch ON		CANCEL switch circuit is normal
	Turn stop light switch ON Depress brake pedal		Stop light switch circuit is normal
	Turn PNP switch OFF (Shift to except D position)		PNP switch circuit is normal
4	Drive at about 40 km/h (25 mph) or higher		Vehicle Speed Sensor is normal
	Drive at about 40 km/h (25 mph) or below		

DIAGNOSTIC TROUBLE CODE CHART

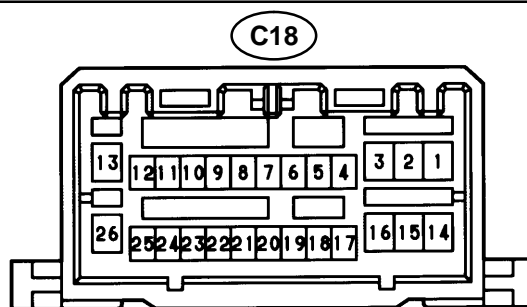
If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No. (See Page)	Circuit inspection	Trouble Area
11 (DI-296)	• Actuator Motor Circuit	<ul style="list-style-type: none"> • Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
12 (DI-298)	• Actuator Magnetic Clutch Circuit	<ul style="list-style-type: none"> • STOP Fuse • Stop light switch • Actuator magnetic clutch • Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground • Cruise control ECU
13 (DI-301)	• Actuator Position Sensor Circuit	<ul style="list-style-type: none"> • Actuator position sensor • Harness or connector between cruise control ECU and actuator position sensor • Cruise control ECU
14 (DI-304)	• Actuator Mechanical Malfunction	<ul style="list-style-type: none"> • Actuator motor (actuator lock: motor, arm) • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU
21 (DI-306)	• Open in Vehicle Speed Sensor Circuit	<ul style="list-style-type: none"> • Combination meter • Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor • Vehicle speed sensor • Cruise control ECU
23 (DI-310)	• Vehicle Speed Signal Abnormal	<ul style="list-style-type: none"> • Vehicle speed sensor • Cruise control ECU
32 (DI-311)	• Control Switch Circuit	<ul style="list-style-type: none"> • Cruise control switch • Harness or connector between cruise control ECU and cruise control switch, cruise control switch and body ground • Cruise control ECU

PARTS LOCATION



TERMINALS OF ECM



Vd-26-2-E

I00410

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
D ↔ GND (C18-2 ↔ C18-13)	B-W ↔ BR	Shift to except D position	Below 1 V
		Shift to D position	10 – 16 V
PI ↔ GND (C18-7 ↔ C18-13)	G-Y ↔ BR	Ignition switch ON Cruise control main switch ON	Below 1.2 V
		Ignition switch ON Cruise control main switch OFF	10 – 16 V
TC ↔ GND (C18-8 ↔ C18-13)	B-Y ↔ BR	Ignition switch ON	10 – 16 V
		Ignition switch ON Connect terminals TC and E1 of diagnostic check connector	Below 1 V
OD ↔ GND (C18-9 ↔ C18-13)	G-O ↔ BR	During cruise control driving OD switch ON.	10 – 16 V
		During cruise control driving OD switch OFF (3rd driving)	Below 1 V
L ↔ GND (C18-10 ↔ C18-13)	R ↔ BR	During cruise control driving	9 – 15 V
		Except during cruise control driving	Below 1 V
MC ↔ GND (C18-11 ↔ C18-13)	L-R ↔ BR	During cruise control driving COAST switch hold ON	9 – 15 V
		During cruise control driving ACC switch hold ON	Below 1 V
MO ↔ GND (C18-12 ↔ C18-13)	L ↔ BR	During cruise control driving ACC switch hold ON	9 – 15 V
		During cruise control driving COAST switch hold ON	Below 1 V
GND ↔ Body Ground (C18-13 ↔ Body Ground)	BR ↔ Body Ground	Constant	Below 1 V
B ↔ GND (C18-14 ↔ C18-13)	B-W ↔ BR	Ignition switch ON	10 – 16 V
BATT ↔ GND (C18-15 ↔ C18-13)	B-R ↔ BR	Constant	10 – 16 V
STP- ↔ GND (C18-16 ↔ C18-13)	G-W ↔ BR	Depress brake pedal	10 – 16 V
		Release brake pedal	Below 1 V

DI-294

DIAGNOSTICS – CRUISE CONTROL SYSTEM

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
CCS ↔ GND (C18-18 ↔ C18-13)	B-G ↔ BR	Ignition switch ON	10 – 16 V
		Ignition switch ON CANCEL switch hold ON	5.1 – 8.3 V
		Ignition switch ON SET/COAST switch hold ON	2.4 – 4.0 V
		Ignition switch ON RES/ACC switch hold ON	0.8 – 1.4 V
CMS ↔ GND (C18-19 ↔ C18-13)	Y-R ↔ BR	Ignition switch ON Main switch ON	Below 1 V
		Ignition switch ON Main switch OFF	10 – 16 V
SPD ↔ GND (C18-20 ↔ C18-13)	L-W ↔ BR	Ignition switch ON	4.7 – 5.2 V
		During driving	3 – 7 V
IDL ↔ GND (C18-21 ↔ C18-13)	G-W ↔ BR	Ignition switch ON Throttle valve fully closed	Below 1 V
		Ignition switch ON Throttle valve fully opened	10 – 16 V
ECT ↔ GND (C18-22 ↔ C18-13) ECT ↔ GND (C18-22 ↔ C18-13)	G-R ↔ BR	During driving Gear position O/D	Below 1 V
		During driving Gear position 3rd	10 – 16 V
VR1 ↔ GND (C18-23 ↔ C18-13)	Y ↔ BR	Ignition switch ON	4.7 – 5.2 V
VR2 ↔ VR3 (C18-24 ↔ C18-25)	Y-G ↔ Y-L	During cruise control driving	1.0 – 4.7 V
		Ignition switch ON Actuator control plate fully opened	4.2 – 4.7 V
		Ignition switch ON Actuator control plate fully closed	1.0 – 1.2 V
VR3 ↔ GND (C18-25 ↔ C18-13)	Y-L ↔ BR	Constant	Below 1 V
L- ↔ GND (C18-26 ↔ C18-13)	↔ BR	Constant	Below 1 V

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring. (DTC is Normal)	1. Main Switch Circuit (Cruise control switch) 2. Vehicle Speed Sensor 3. Control Switch Circuit (Cruise control switch) 4. Stop Light Switch Circuit 5. Park/Neutral Position Switch Circuit 6. Actuator Motor Circuit 7. Cruise Control Cable 8. Cruise Control ECU	DI-330 DI-306 DI-311 DI-314 DI-322 DI-296 DI-336 IN-28
SET not occurring or CANCEL occurring. (DTC does not output)	1. ECU Power Source Circuit 2. Cruise Control ECU	DI-325 IN-28
Actual vehicle speed deviates above or below the set speed.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Electronically Controlled Transmission Communication Circuit 4. Actuator Motor Circuit 5. Idle Signal Circuit (main throttle position sensor) 6. Cruise Control ECU	DI-336 DI-310 DI-319 DI-296 DI-316 IN-28
Gear shifting frequent between 3rd O/D when driving on uphill road. (Hurting)	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI-319 IN-28
Cruise control not cancelled, even when brake pedal is depressed.	1. Cruise Control Cable 2. Stop Light Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI-336 DI-314 DI-296 IN-28
Cruise control not cancelled, even when transmission is shifted to "N" position.	1. Cruise Control Cable 2. Park/Neutral Position Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI-336 DI-322 DI-296 IN-28
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Cruise Control Cable 2. Control Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI-336 DI-311 DI-296 IN-28
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Actuator Motor Circuit 4. Cruise Control ECU	DI-336 DI-310 DI-296 IN-28
Poor response is ACCEL and RESUME modes.	1. Cruise Control Cable 2. Electronically Controlled Transmission Communication Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI-336 DI-319 DI-296 IN-28
O/D does not RESUME, even though the road is not uphill.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI-319 IN-28
DTC memory is erased.	1. Back-up Power Source Circuit 2. Cruise Control ECU	DI-328 IN-28
DTC is not output, or is output when it should not be.	1. Diagnosis Circuit 2. Cruise Control ECU	DI-319 IN-28
Cruise MAIN indicator light remains ON or fails to light up.	1. Cruise MAIN Indicator Light Switch Circuit	DI-332

CIRCUIT INSPECTION

DTC	11	Actuator Motor Circuit
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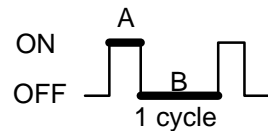
CIRCUIT DESCRIPTION

The actuator motor is operated by signals from the ECU. Acceleration and deceleration signals are transmitted by changes in the Duty Ratio (See note below).

Duty Ratio

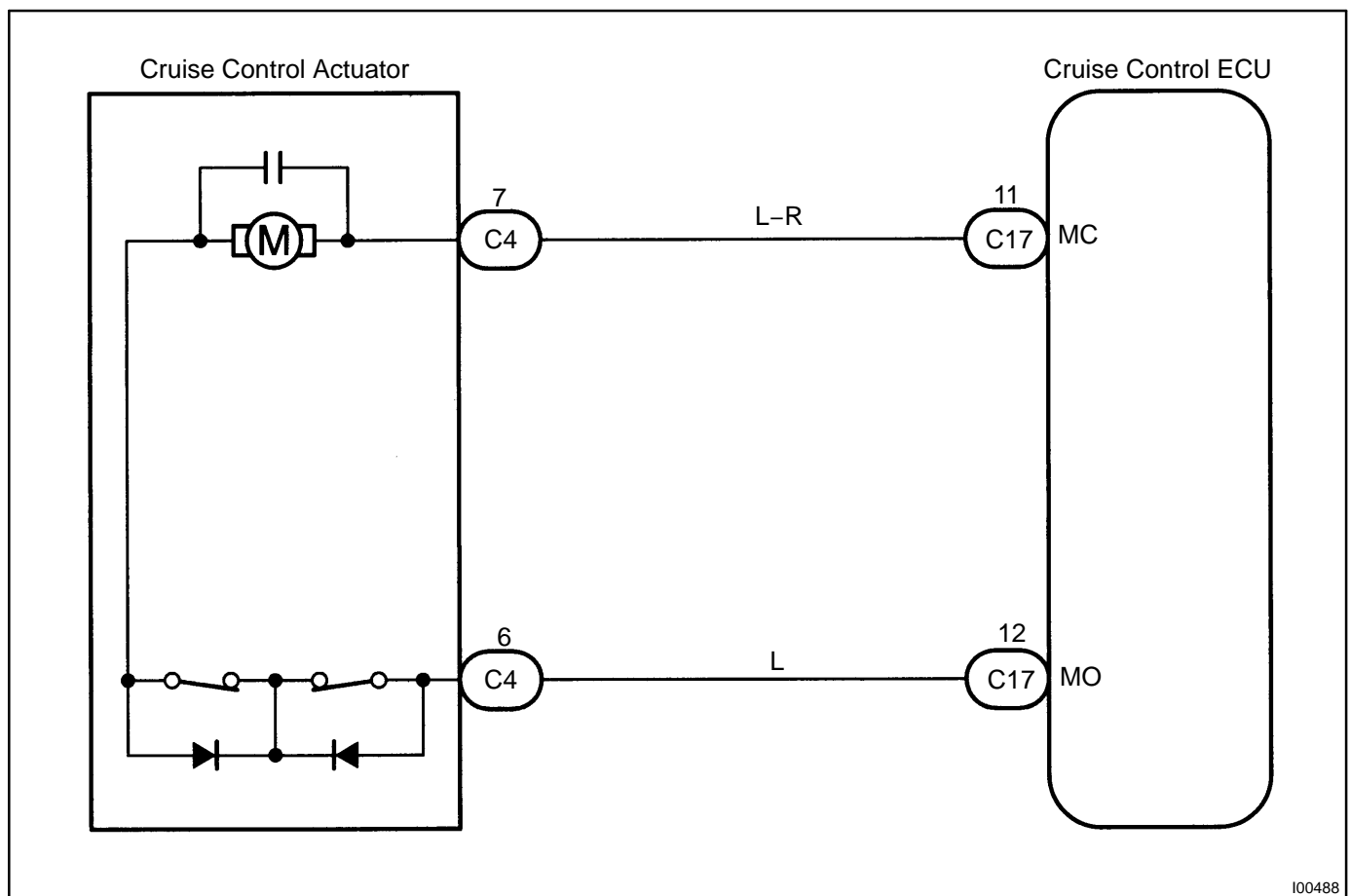
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then.

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100 (\%)$$



DTC No.	Detection Item	Trouble Area
11	Short in actuator motor circuit.	<ul style="list-style-type: none"> • Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU

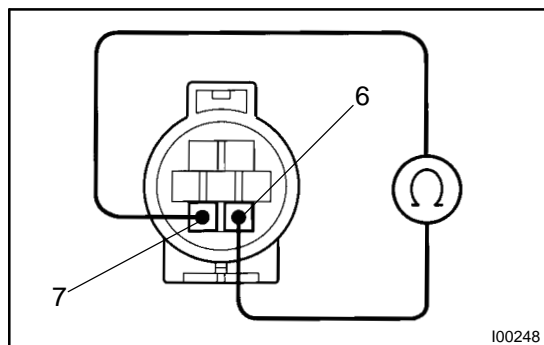
WIRING DIAGRAM



I00488

INSPECTION PROCEDURE

- | | |
|----------|--|
| 1 | Check resistance between terminals MO and MC of actuator motor. |
|----------|--|

**PREPARATION:**

- (a) Turn ignition switch OFF.
- (b) Disconnect the actuator connector.

CHECK:

Measure resistance between terminals 6 and 7.

HINT:

If control plate position is fully opened or fully closed, resistance can not measure.

OK:

Resistance: more than 4.2 Ω

NG**Replace cruise control actuator.****OK**

- | | |
|----------|---|
| 2 | Check for open and short in harness and connectors between cruise control ECU and actuator motor (See page IN-28). |
|----------|---|

NG**Repair or replace harness or connector.****OK**

Check and replace cruise control ECU.
(See page [IN-28](#)).

DTC	12	Actuator Magnetic Clutch Circuit
------------	-----------	---

CIRCUIT DESCRIPTION

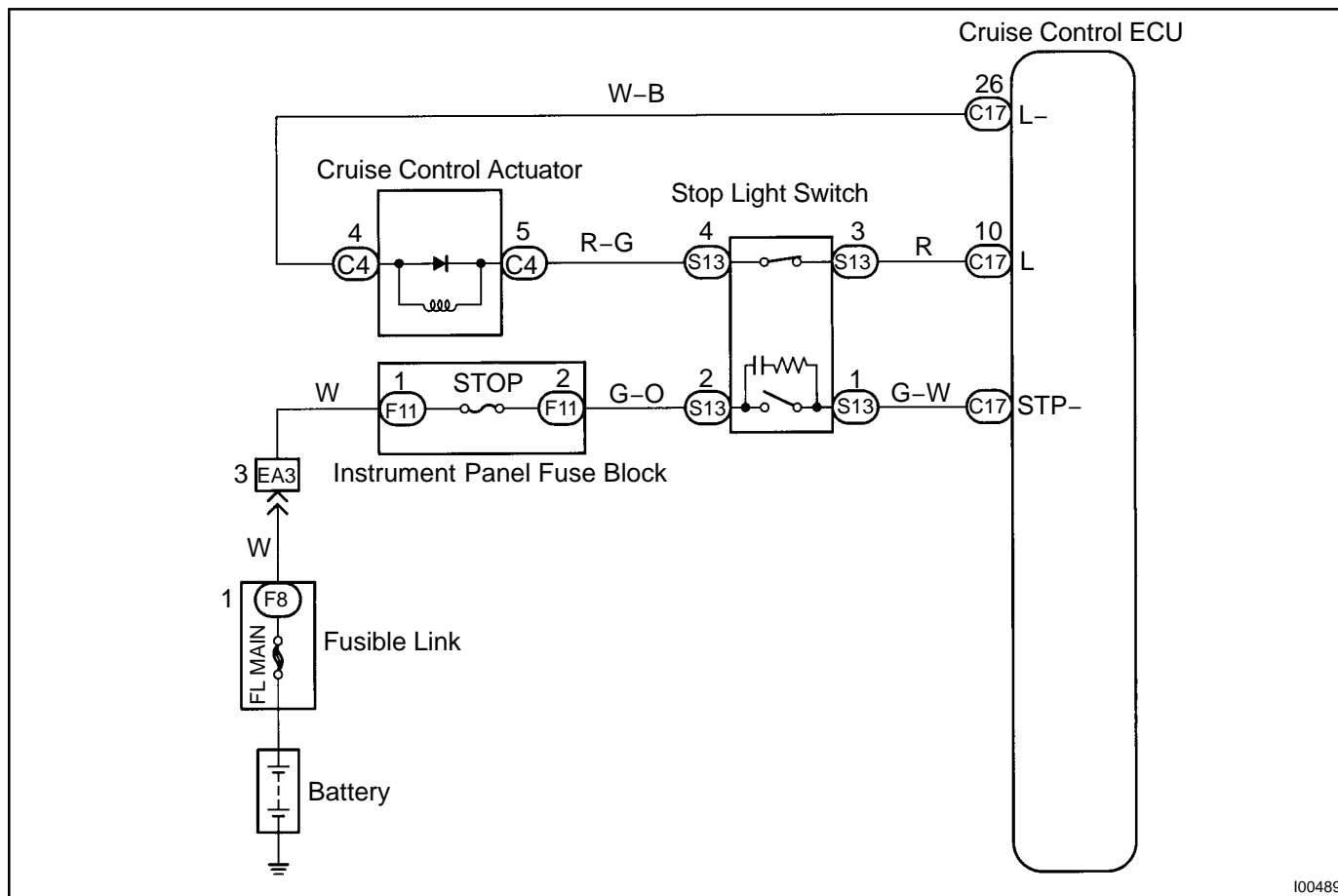
This circuit turns on the magnetic clutch inside the actuator during cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during cruise control operation, the rotor shaft between the motor and control plate is released.

When the brake pedal is depressed, the stop light switch turns on, supplying electrical power to the stop light. Power supply to the magnetic clutch is mechanically cut and the magnetic 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 safety 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.

DTC No.	Detection Item	Trouble Area
12	<ul style="list-style-type: none"> Short in actuator magnetic clutch circuit. Open (0.8 sec.) in actuator magnetic clutch circuit. 	<ul style="list-style-type: none"> STOP Fuse Stop light switch Actuator magnetic clutch Harness or connector between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground Cruise control ECU

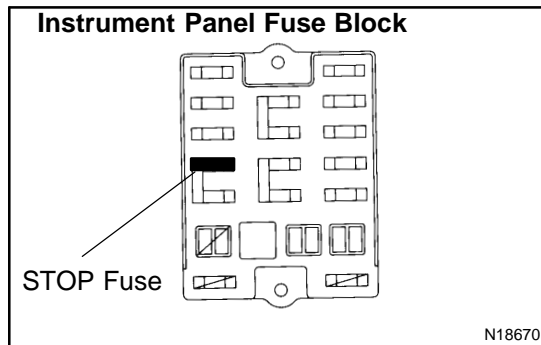
WIRING DIAGRAM



100489

INSPECTION PROCEDURE

1 Check STOP fuse.



PREPARATION:

- (a) Turn ignition switch OFF.
- (b) Remove the STOP fuse from instrument panel fuse block.

CHECK:

Check fuse continuity.

OK:

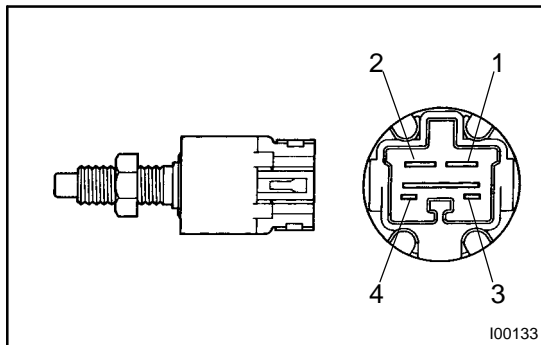
There is continuity.

NG

Replace STOP fuse.

OK

2 Check stop light switch.



PREPARATION:

Disconnect the stop light switch connector.

CHECK:

Check continuity between terminals.

Switch position	Continuity
Switch pin free (Brake pedal depressed)	1 – 2
Switch pin pushed in (Brake pedal released)	3 – 4

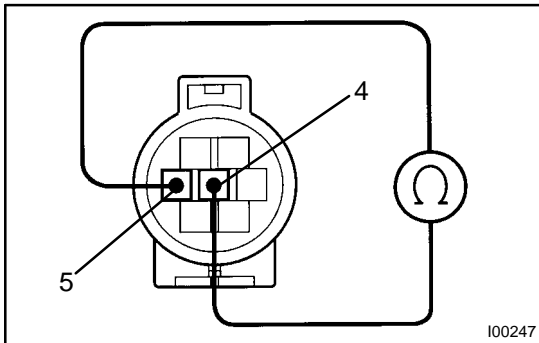
NG

Replace stop light switch.

OK

DI-300

DIAGNOSTICS – CRUISE CONTROL SYSTEM

3 Check resistance between terminals L and GND of actuator magnetic clutch.**PREPARATION:**

- (a) Turn ignition switch OFF.
- (b) Disconnect the actuator connector.

CHECK:

Measure resistance between terminals 4 and 5.

OK:

Resistance: 34.65 – 42.35 Ω

NG**Replace cruise control actuator.****OK****4 Check for open and short in harness and connectors between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK**

Check and replace cruise control ECU
(See page [IN-28](#)).

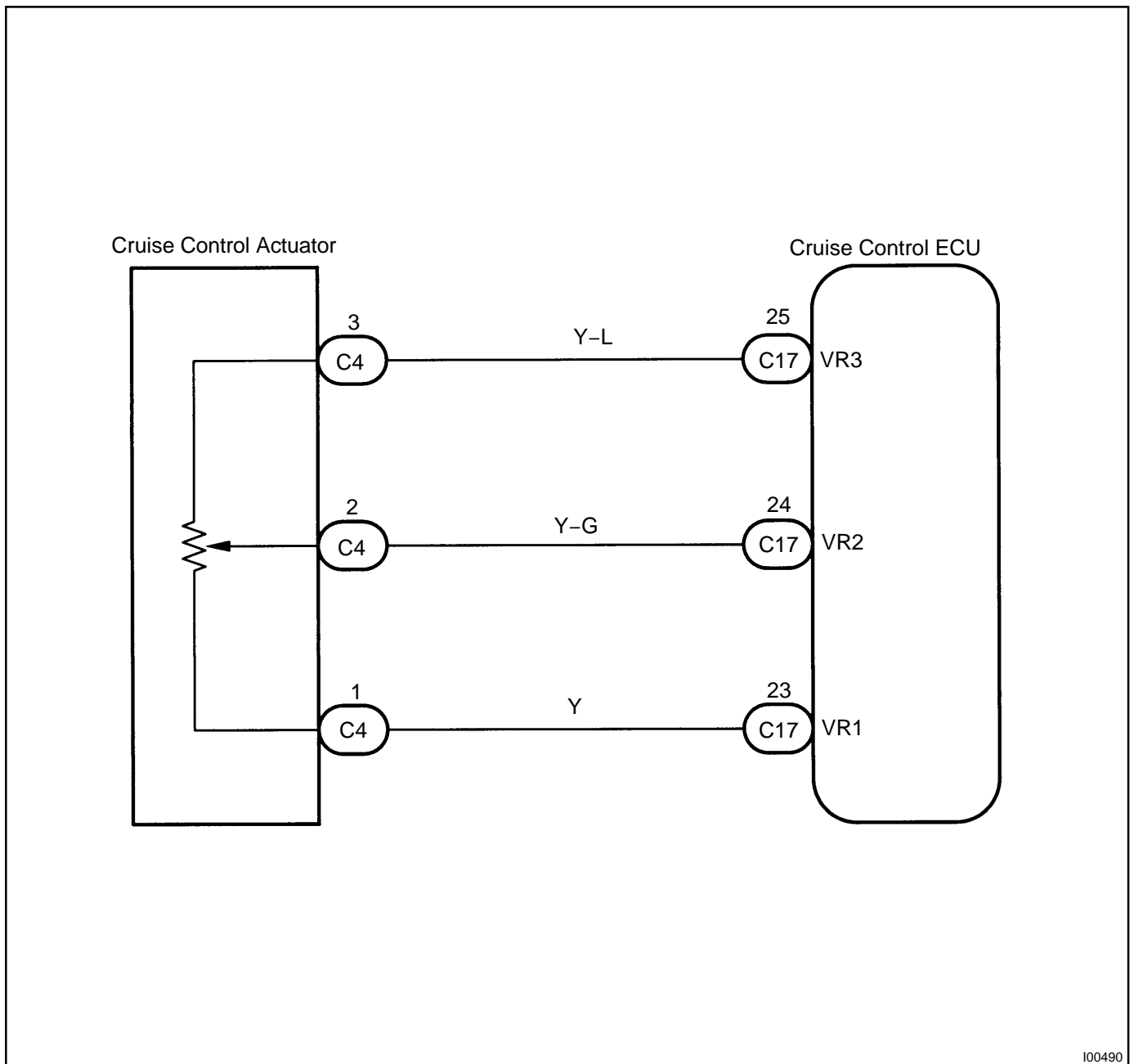
DTC	13	Actuator Position Sensor Circuit
------------	-----------	---

CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU.

DTC No.	Detection Item	Trouble Area
• 13	• Position sensor detects abnormal voltage.	<ul style="list-style-type: none"> • Actuator position sensor • Harness or connector between cruise control ECU and actuator position sensor • Cruise control ECU

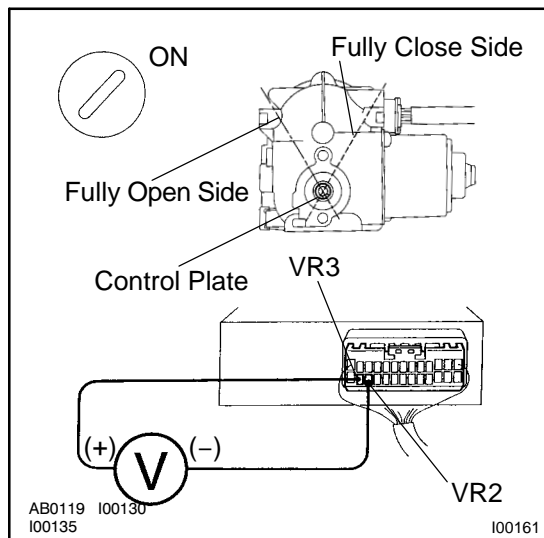
WIRING DIAGRAM



I00490

INSPECTION PROCEDURE

- | | |
|---|--|
| 1 | Check resistance between terminals VR2 and VR3 of cruise control ECU connector. |
|---|--|

**PREPARATION:**

- Remove the ECU with connectors still connected.
- Turn ignition switch OFF.

CHECK:

Measure voltage between terminals VR2 and VR3 of ECU connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

OK:**Voltage:**

Fully closed: Approx. 1.3 V

Fully opened: Approx. 4.1 V

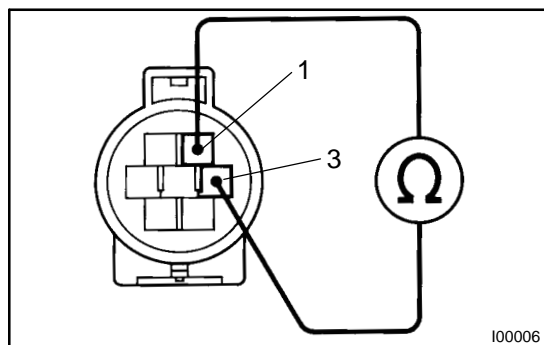
In addition, as the control plate is turned, the voltage should increase gradually without interruption.

NG

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

OK

- | | |
|---|--|
| 2 | Check resistance between terminals VR1 and VR3 of actuator position sensor. |
|---|--|

**PREPARATION:**

- Turn ignition switch OFF.
- Disconnect the actuator connector.

CHECK:

Measure resistance between actuator terminal 1 and 3 of actuator connector.

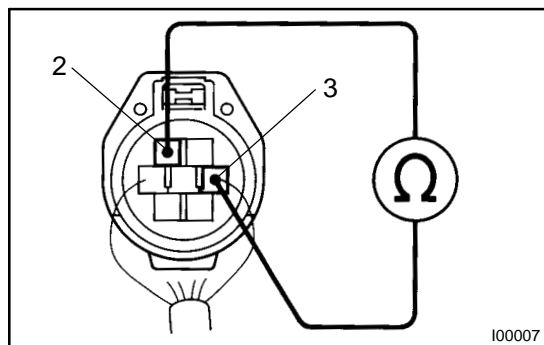
OK:

Resistance: 1.8 – 2.2 kΩ (25 °C)

NG

Replace cruise control actuator.

OK

3 Check voltage between terminals VR2 and VR3 of actuator position sensor.**PREPARATION:**

- (a) Turn ignition switch ON.
- (b) Connect the actuator connector.

CHECK:

Measure voltage between terminals 2 and 3 of actuator connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

OK:

Voltage: 1.3 – 4.0 V

HINT:

As the control plate is turned, the voltage should increase gradually without interruption.

NG**Replace cruise control actuator.****OK****4 Check for open and short in harness and connector between cruise control ECU and actuator position sensor (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK****Check and replace cruise control ECU
(See page [IN-28](#)).**

DTC	14	Actuator Mechanical Malfunction
------------	-----------	--

CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU.

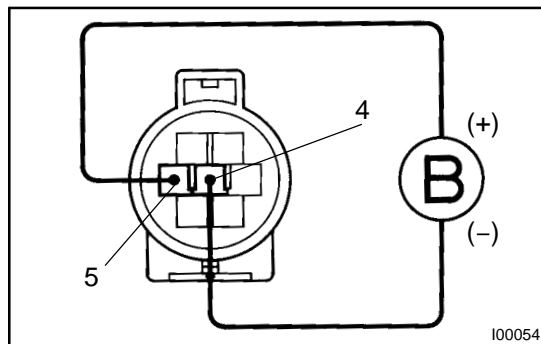
DTC No.	Detection Item	Trouble Area
14	<ul style="list-style-type: none"> • Open in actuator motor circuit. • Position sensor signal valve does not change when the motor operates. 	<ul style="list-style-type: none"> • Actuator lock: (motor, arm) • Actuator motor • Harness or connector between cruise control ECU and actuator motor • Cruise control ECU

WIRING DIAGRAM

See page [DI-296](#).

INSPECTION PROCEDURE

1	Check cruise control actuator arm locking operation
----------	--



PREPARATION:

- Turn ignition switch OFF.
- Disconnect the actuator connector.

CHECK:

- Connect the positive (+) lead from the battery to the terminal 5 of actuator and the negative (-) lead to terminal 4.

NOTICE:

Do not connect the high tension cables to the wrong battery terminal. You will damage the cruise control actuator.

- Move the control plate by hand.

OK:

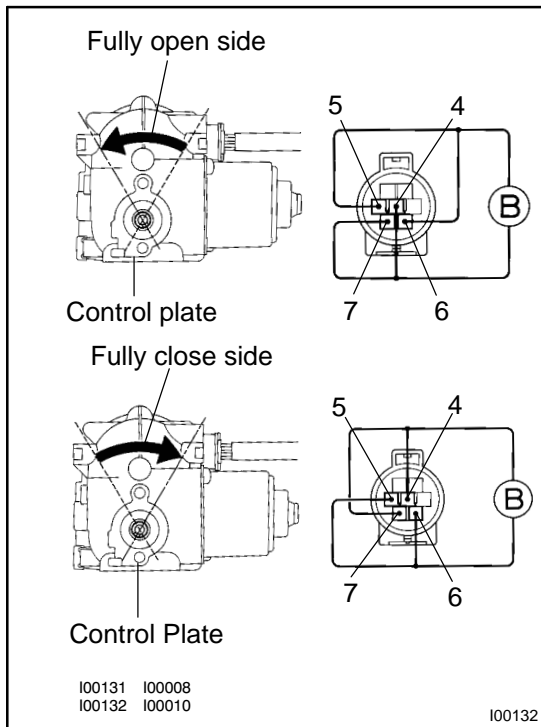
Control plate does not move.

NG

Replace cruise control actuator.

OK

2 Check cruise control actuator operation.



PREPARATION:

- Turn ignition switch OFF.
- Disconnect the actuator connector.

CHECK:

Connect the positive (+) lead from the battery to terminals 5 and 6 of actuator, connect the negative (-) lead to terminals 4 and 7 of actuator.

OK:

Control arm moves to full open side

CHECK:

Connect the positive (+) lead from the battery to terminals 4 and 7 of actuator, connect the negative (-) lead to terminals 5 and 6 of actuator.

OK:

Control arm moves to full close side

NG

Replace cruise control actuator.

OK

3 Check harness and connector between cruise control ECU and cruise control actuator (See page IN-28).

NG

Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN-28).

DTC	21	Open in Vehicle Speed Sensor Circuit
------------	-----------	---

CIRCUIT DESCRIPTION

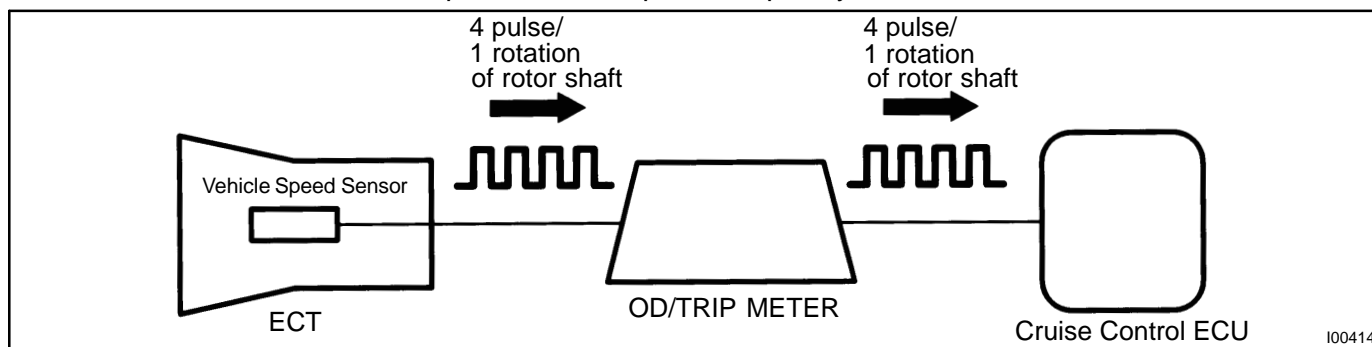
The vehicle speed sensor circuit is sent to cruise control ECU as vehicle speed signal.

The rotor shaft is driven by the gear of the transmission.

For each rotation of the shaft, the vehicle speed sensor sends a 4 pulse signal through the combination meter to the cruise control ECU (See the following).

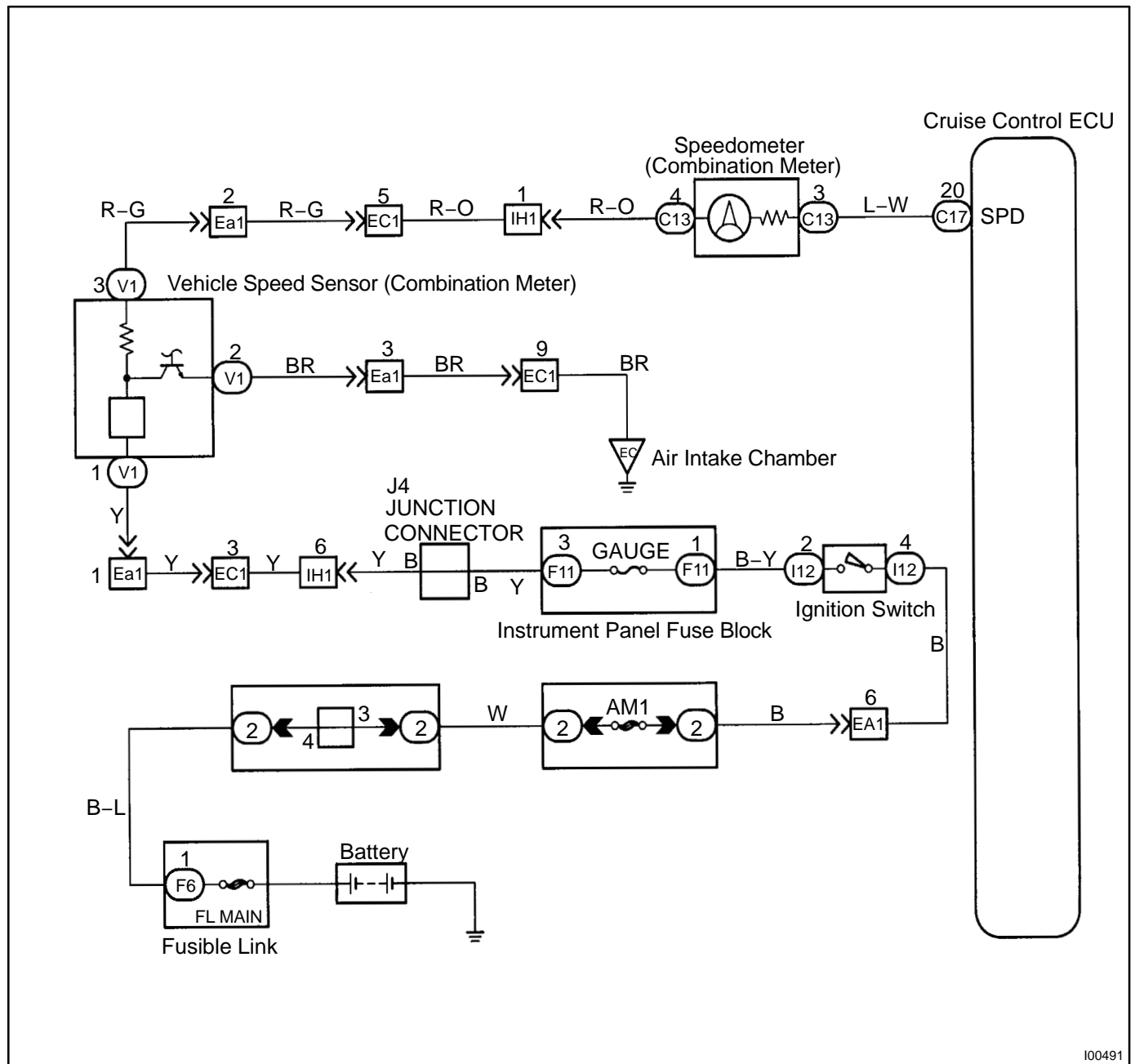
This signal is converted inside the combination meter and sent as a 4-pulse signal to the cruise control ECU.

The ECU calculates the vehicle speed from this pulse frequency.



DTC No.	Detection Item	Trouble Area
21	<ul style="list-style-type: none"> Speed signal is not input to the cruise control ECU while cruise control is set. 	<ul style="list-style-type: none"> Combination meter Harness or connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor Vehicle speed sensor Cruise control ECU





WIRING DIAGRAM



I00491

INSPECTION PROCEDURE

1	Input signal check.
---	---------------------

Input Signal	Indicator Light Blinking Pattern
Drive at about 40 km/h (25 mph) or below	Light ON  OFF 
Drive at about 40 km/h (25 mph) or higher	Light ON  OFF 

CHECK:

- (a) See input signal check on page [DI-286](#).
 (b) 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

OK

Check and replace cruise control ECU
(See page [IN-28](#)).

NG

2	Check speedometer circuit (See Combination meter troubleshooting on page BE-34).
---	---

NG

Repair or replace harness, connector or combination meter assembly.

OK

3	Check harness and connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor (See page IN-28).
---	---

NG

Repair or replace harness or connector.

OK

4	Check vehicle speed sensor (See page BE-34).
---	---

NG

Replace vehicle speed sensor.

OK

Check and replace cruise control ECU
(See page [IN-28](#)).

DTC	23	Vehicle Speed Signal Abnormal
------------	-----------	--------------------------------------

CIRCUIT DESCRIPTION

See page [DI-306](#).

DTC No.	Detection Item	Trouble Area
23	<ul style="list-style-type: none"> Vehicle speed sensor pulse is abnormal. (When speed signal is not input to the ECU below 0.2 sec., code will be displayed.) 	<ul style="list-style-type: none"> Vehicle speed sensor Cruise control ECU

WIRING DIAGRAM

See page [DI-306](#).

INSPECTION PROCEDURE

1	Check vehicle speed sensor (See page BE-34).
----------	---

NG

Replace vehicle speed sensor.

OK

Check and replace cruise control ECU (See page [IN-28](#)).

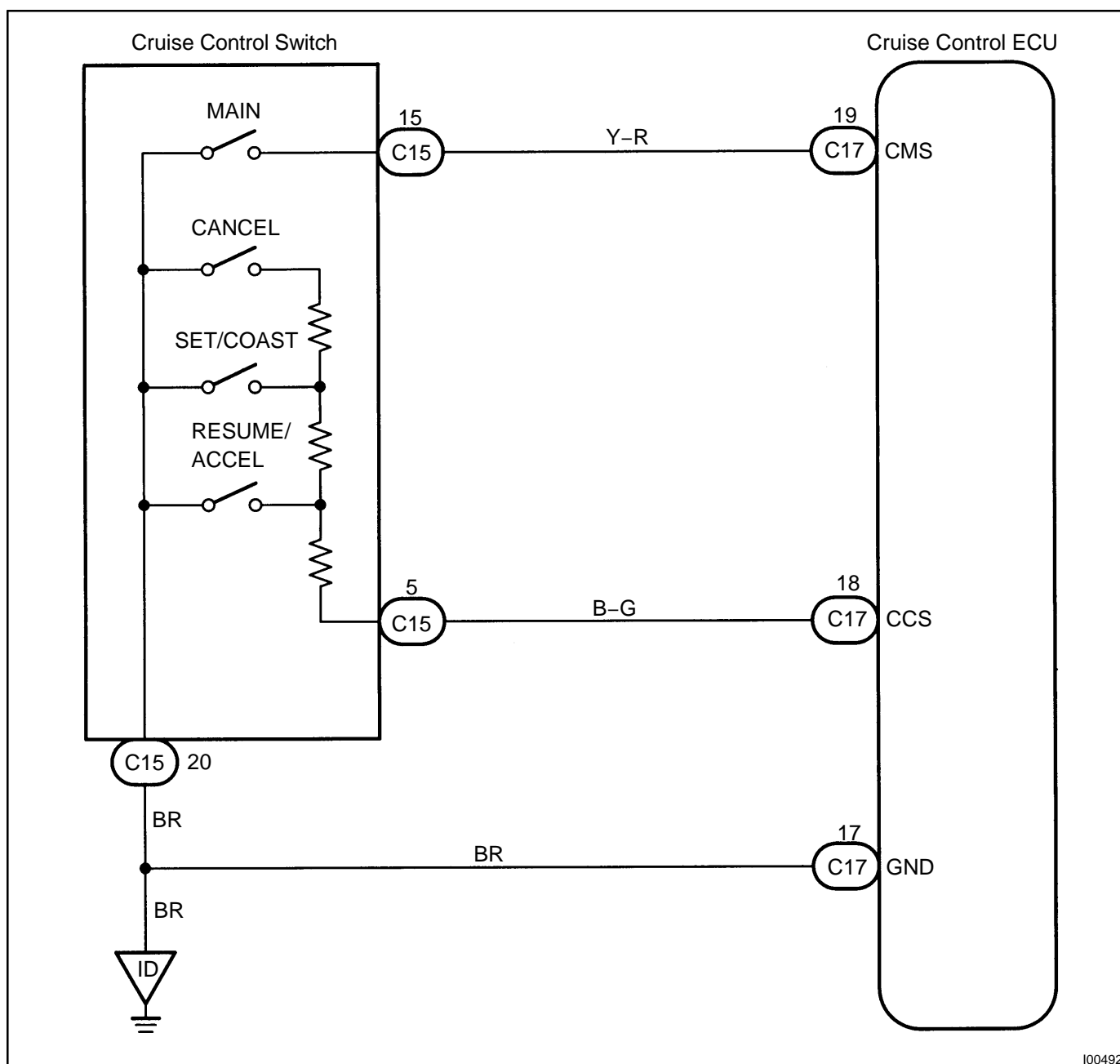
DTC	32	Control Switch Circuit (Cruise Control Switch)
------------	-----------	---

CIRCUIT DESCRIPTION

This circuit carries the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU.

DTC No.	Detection Item	Trouble Area
32	<ul style="list-style-type: none"> Short in control switch circuit. 	<ul style="list-style-type: none"> Cruise control switch Harness or connector between cruise control ECU and cruise control switch, cruise control switch and body ground Cruise control ECU

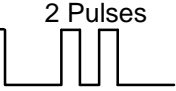
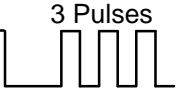
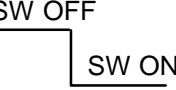

WIRING DIAGRAM



I00492

INSPECTION PROCEDURE

1	Input signal check.
---	---------------------

Input Signal	Indicator Light Blinking Pattern
SET/COAST switch	ON  OFF
RESUME/ACCEL switch	ON  OFF
CANCEL switch	ON  OFF 

PREPARATION:

See input signal check on page [DI-286](#).

CHECK:

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

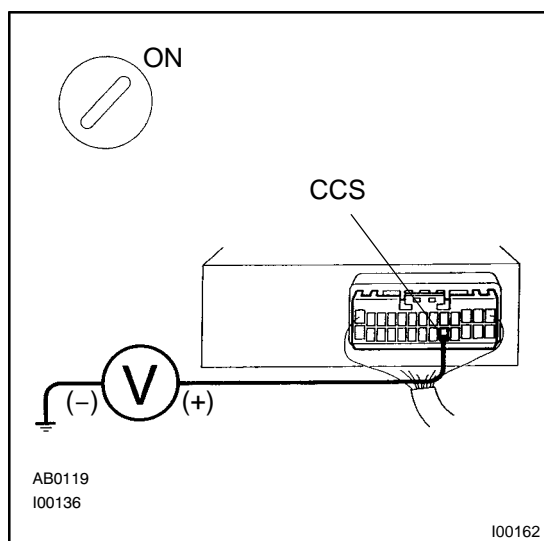
The indicator light goes off when the cancel switch is turned ON.

OK

Wait and see.

NG

2	Check voltage between terminals CCS of cruise control ECU connector and body ground.
---	--

**PREPARATION:**

- Remove the ECU with connector still connected.
- Turn ignition switch ON.

CHECK:

Measure voltage between terminals CCS of ECU connector and body ground, when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

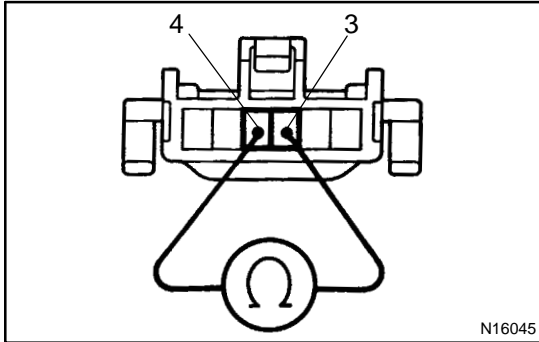
Switch position	Resistance (Ω)
Neutral	10 – 14 V
RES/ACC	0.7 – 2.5 V
SET/COAST	2.3 – 4.6 V
CANCEL	4.1 – 7.2 V

NG

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#))

OK

DIAGNOSTICS - CRUISE CONTROL SYSTEM

3 Check control switch.**PREPARATION:**

- (a) Remove steering wheel center pad.
- (b) Disconnect the control switch connector.

CHECK:

Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated.

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	50 – 80
SET/COAST	180 – 220
CANCEL	400 – 440

NG**Replace control switch.****OK****4 Check harness and connector between cruise control ECU and cruise control switch, cruise control switch and body ground (See page IN-28).****NG****Repair or replace harness or connector.****OK****5 Input signal check (See step 1).****OK****Wait and see.****NG**

**Check and replace cruise control ECU
(See page IN-28).**

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to the ECU. When the ECU receives this signal, it cancels the cruise control.

A fail-safe function is provided so that the cancel functions normally, even if there is a malfunction in the stop light signal circuit.

The cancel conditions are: Battery positive voltage at terminal STP-

When the brake is on, battery positive voltage normally applies through the STOP fuse and stop light switch to terminal STP- of the ECU, and the ECU turns the cruise control off.

If the harness connected to terminal STP- has an open circuit, terminal STP- will have battery positive voltage and the cruise control will be turned off.

Also, when the brake is on, the magnetic clutch circuit is cut mechanically by the stop light switch, turning the cruise control off (See page [DI-298](#) for operation of the magnetic clutch).

WIRING DIAGRAM

See page [DI-298](#).

INSPECTION PROCEDURE

1 Check operation of stop light.

CHECK:

Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released.

NG

Check stop light system (See page [BE-24](#)).

OK

2 Input signal check.

Input Signal	Indicator Light Blinking Pattern
Stop Light switch ON	

CHECK:

- (a) See input signal check on [DI-286](#).
- (b) Check the indicator light when the brake pedal is depressed.

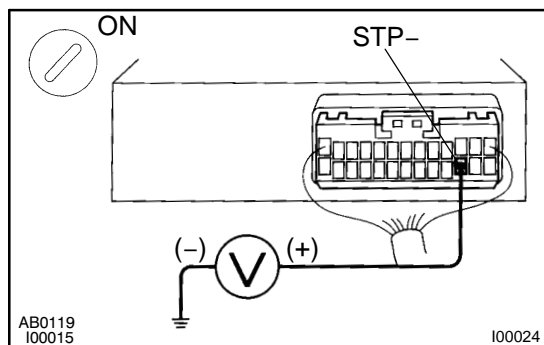
OK:

The indicator light goes off when the brake pedal is depressed.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

3 Check voltage between terminal STP- of cruise control ECU connector and body ground.**PREPARATION:**

- (a) Remove the ECU with connectors still connected.
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal STP- of cruise control ECU connector and body ground, when the brake pedal is depressed and released.

OK:

Depressed	10 - 14 V
Released	Below 1 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG**4 Check for open in harness and connectors between terminal STP- of cruise control ECU and stop light switch (See page [IN-28](#)).****NG**

Repair or replace harness or connector.

OK

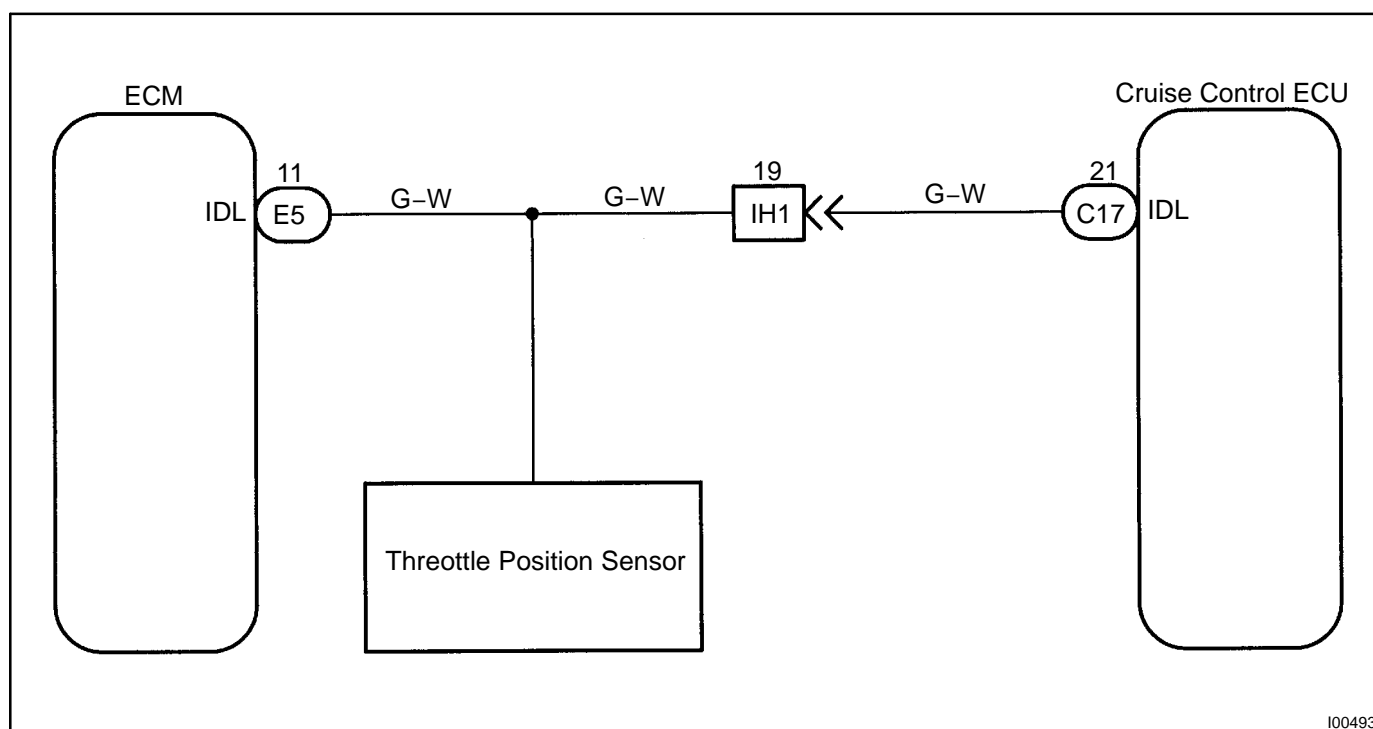
Check and replace cruise control ECU (See page [IN-28](#)).

Idle Switch Circuit

CIRCUIT DESCRIPTION

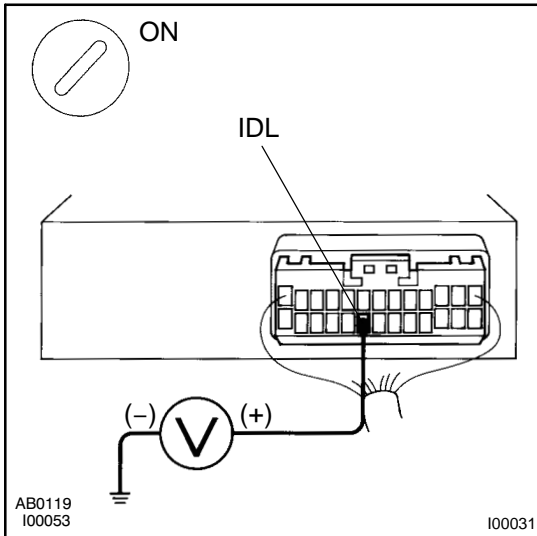
When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed. If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect the engine.

WIRING DIAGRAM



INSPECTION PROCEDURE

- 1 Check voltage between terminal IDL of cruise control ECU connector and body ground.**

**PREPARATION:**

- (a) Remove the ECU with connector still connected.
- (b) Disconnect the ECM and ABS ECU connectors.
- (c) Turn ignition switch ON.

CHECK:

Measure voltage between terminal IDL of ECU connector and body ground when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Voltage
Fully opened	10 – 14 V
Fully closed	Below 2 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

- 2 Check harness and connector between ECM and throttle position sensor (See page [IN-28](#)).**

NG

Repair or replace harness or connector.

OK

- 3 Check throttle position sensor circuit (See page [DI-35](#)).**

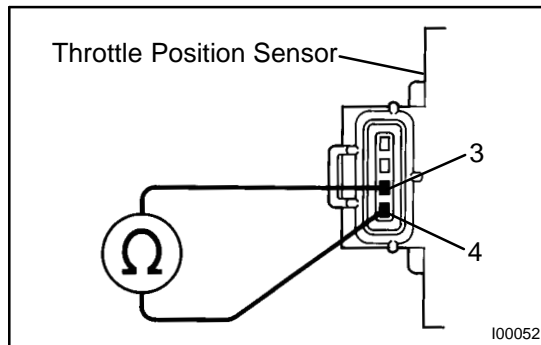
NG

Replace throttle position sensor.

OK

DI-318

DIAGNOSTICS – CRUISE CONTROL SYSTEM

4 Check throttle position sensor.**PREPARATION:**

Disconnect the throttle position sensor connector.

CHECK:

Measure resistance between terminals 3 and 4 of throttle position sensor connector when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Resistance
Fully opened	1 MΩ or higher
Fully closed	Below 2.3 kΩ

NG**Replace throttle position sensor.****OK****5 Check for open and short in harness and connector between cruise control ECU and throttle position sensor, throttle position sensor and body ground (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK****Check and replace cruise control ECU
(See page [IN-28](#)).**

Electronically Controlled Transmission Communication Circuit

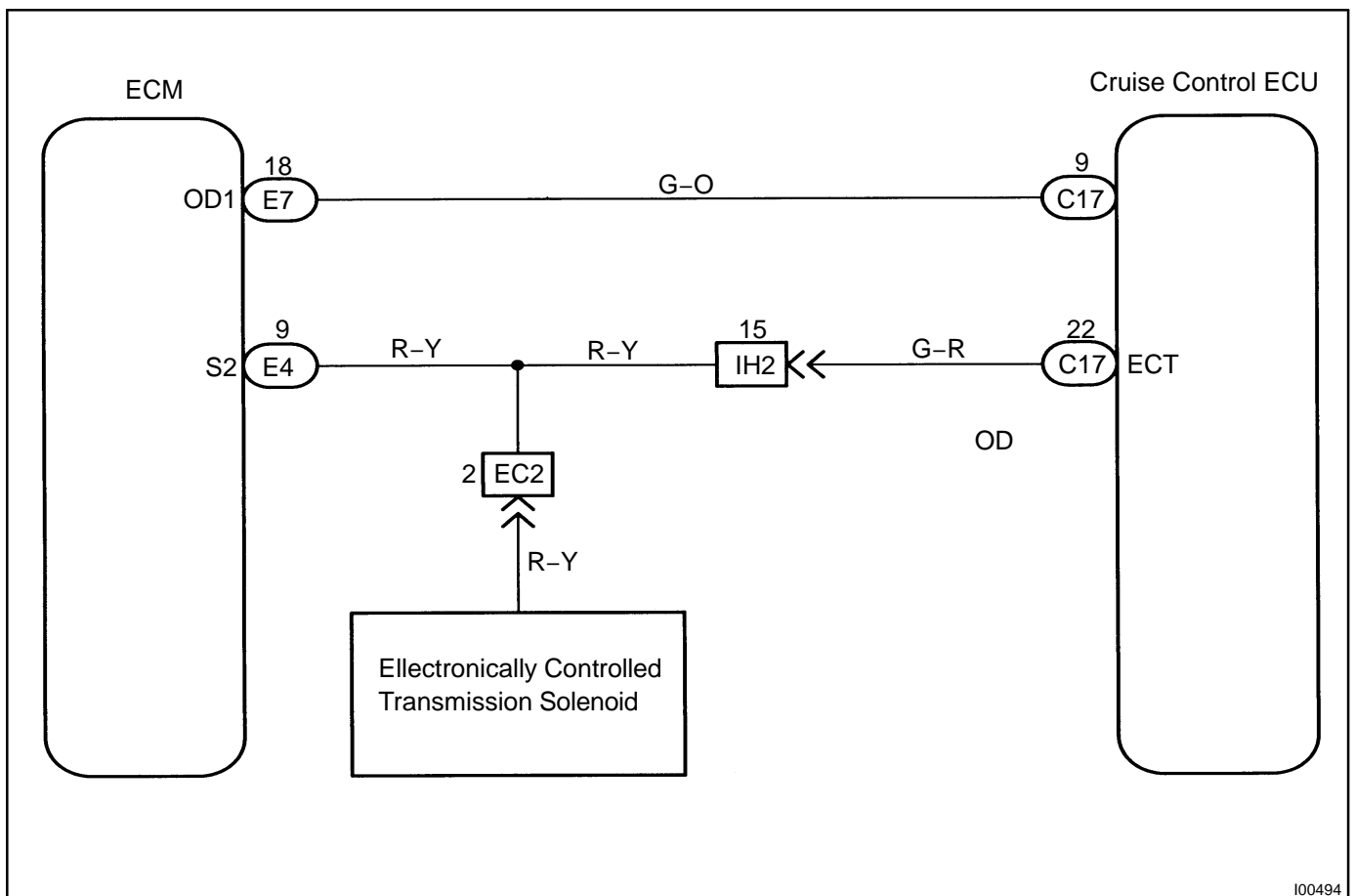
CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON-OFF overdrive operation and to provide smooth driving, when down shifting in the electronically controlled transmission occurs, a signal to prevent upshift until the end of the up hill slope is sent from the cruise control ECU to the electronically controlled transmission.

Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No. 2 solenoid) from the ECM.

If vehicle speed down, also when terminal ECT of the cruise control ECU receives down shifting signal, it sends a signal from terminal OD to ECM to cut overdrive until the end of the uphill slope, and the gear shifts are reduced and gear shift points in the electronically controlled transmission are changed.

WIRING DIAGRAM



I00494

INSPECTION PROCEDURE

1	Check operation of overdrive.
----------	--------------------------------------

PREPARATION:

Test drive after engine warms up.

CHECK:

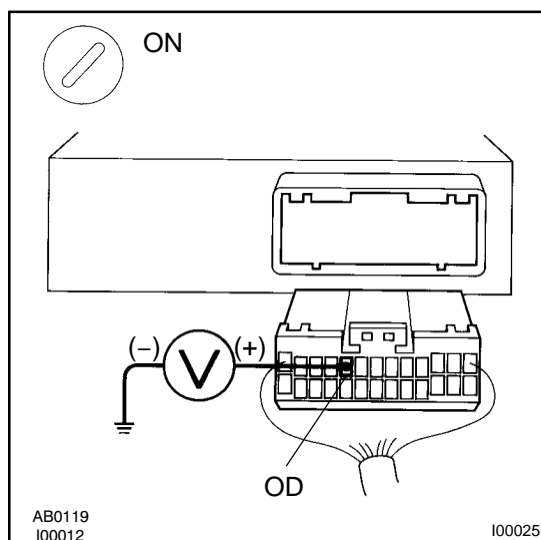
Check that overdrive ON ↔ OFF occurs with operation of OD switch ON–OFF.

NG

Check and repair electronically controlled transmission (See page [DI-129](#)).

OK

2	Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.
----------	---



PREPARATION:

- (a) Remove the ECU with connector still connected.
- (b) Turn ignition switch ON.
- (c) Disconnect the ECU connector.

CHECK:

Measure voltage between terminal OD of harness side connector of ECU and body ground.

OK:

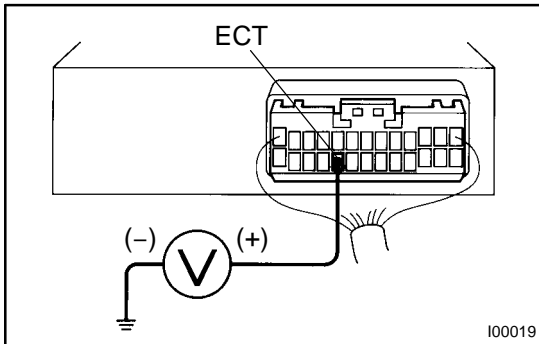
Voltage: 10 – 14 V

NG

Go to step 5.

OK

3 Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive).



PREPARATION:

- (a) Connect the ECU connector.
- (b) Test drive after engine warms up.

CHECK:

Check voltage between terminal ECT of ECU connector and body ground when OD switch is ON and OFF.

OK:

OD switch position	Voltage
ON	8 – 14 V
OFF	Below 0.5 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

4 Check harness and connector between terminal ECT of cruise control ECU and electronically controlled transmission solenoid (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

Check and replace cruise control ECU.

5 Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM (See page [IN-28](#)).

NG

Repair or replace harness or connector.

OK

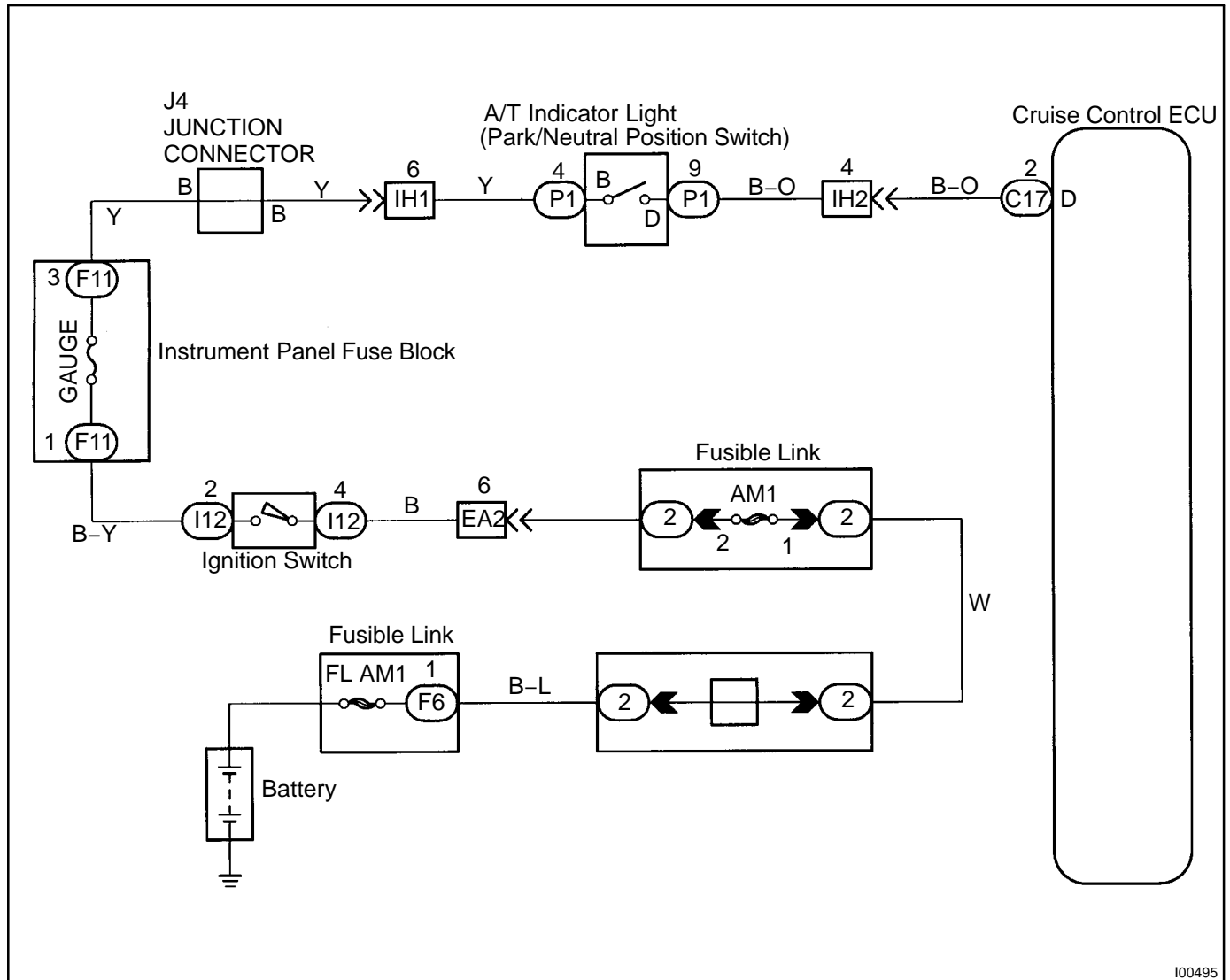
Check and replace cruise control ECU (See page [IN-28](#)).

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is put in except D position, 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.

WIRING DIAGRAM



I00495

INSPECTION PROCEDURE

1	Check starter operation.
---	--------------------------

CHECK:

Check that the starter operates normally and that the engine starts.

NG

Proceed to engine troubleshooting (See page [DI-1](#)).

OK

2	Input signal check.
---	---------------------

Input Signal	Indicator Light Blinking Pattern
Turn PNP switch OFF (Shift to except D position)	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">Light</div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 5px;">ON SW ON</div> <div style="margin-top: 5px;">OFF SW OFF</div> </div> </div>

PREPARATION:

See input signal check on page [DI-286](#).

CHECK:

Check the indicator light when shifting into except D position.

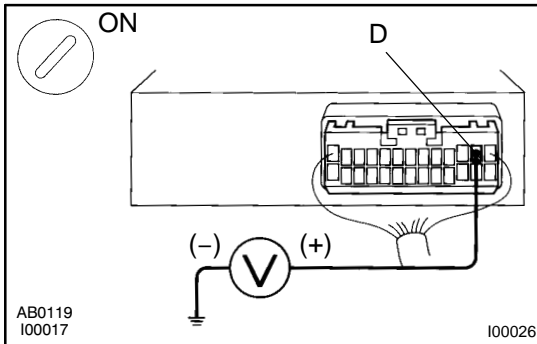
OK:

The indicator light goes off when shifting into except D position.

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

3 Check voltage between terminal D of cruise control ECU connector and body ground.**PREPARATION:**

Turn ignition switch ON.

CHECK:

Measure voltage between terminal D of ECU connector and body ground when shifting into D position and other positions.

OK:

Shift Position	Voltage
D position	10 – 14 V
Other positions	Below 1 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG**4 Check harness and connector between cruise control ECU and park/neutral position switch (See page [IN-28](#)).****NG**

Repair or replace harness or connector.

OK

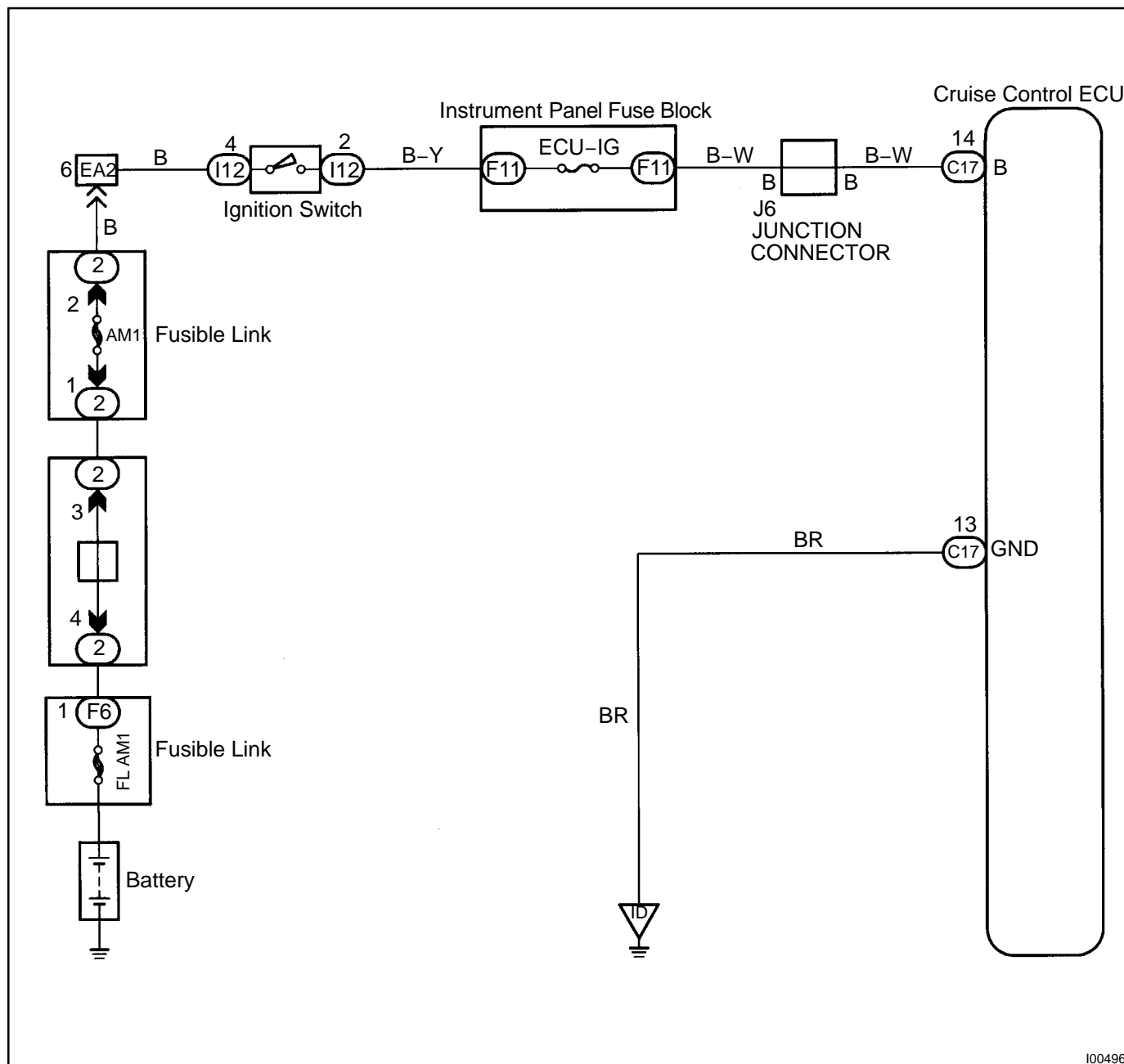
Check and replace cruise control ECU (See page [IN-28](#)).

ECU Power Source Circuit

CIRCUIT DESCRIPTION

The ECU power source supplies power to the actuator and sensors, etc.. When terminal GND and the cruise control ECU case are grounded.

WIRING DIAGRAM

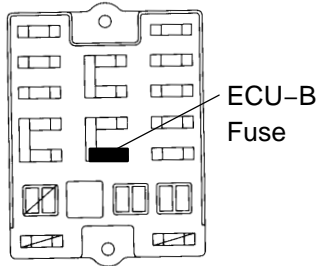


I00496

INSPECTION PROCEDURE

1 Check ECU-B fuse.

Junction Block No.1



N18670

PREPARATION:

Remove the ECU-B fuse from instrument panel fuse block.

CHECK:

Check continuity of ECU-B fuse.

OK:

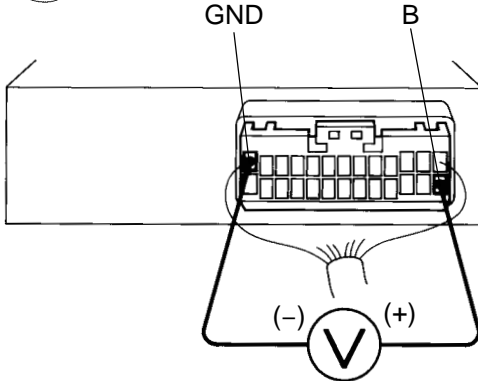
Continuity

NG

Check for short in all the harness and components connected to ECU-B fuse.

OK

2 Check voltage between terminals B and GND of cruise control ECU connector.

AB0119
I00014

I00027

PREPARATION:

- (a) Remove the ECU with connector still connected.
- (b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals B and GND of ECU connector.

OK:

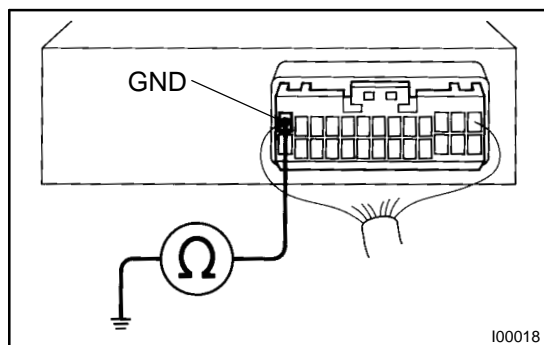
10 – 14 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

- 3** Check resistance between terminal GND of cruise control ECU connector and body ground (See page [IN-28](#)).

**CHECK:**

Measure resistance between terminal GND of ECU connector and body ground.

OK:

Resistance: Below 1 Ω

NG

Repair or replace harness or connector.

OK

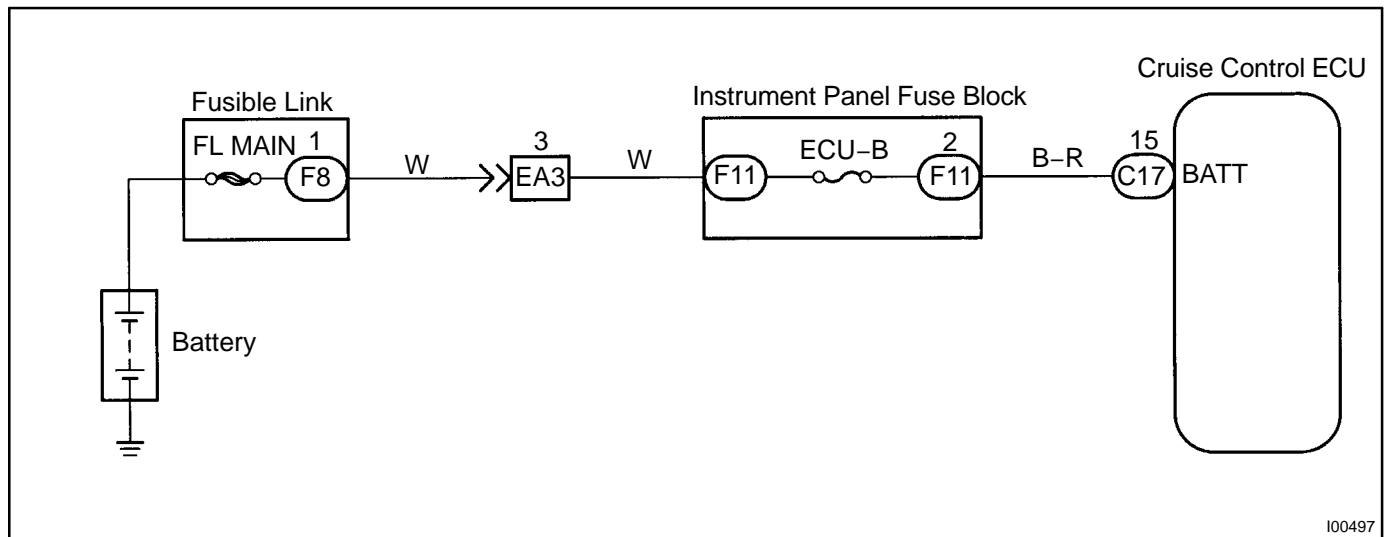
Check and repair harness and connector between cruise control ECU and battery (See page [IN-28](#)).

Back-up Power Source Circuit

CIRCUIT DESCRIPTION

The ECU back-up power source provides power even when the ignition is off and is used for DTC memory, etc..

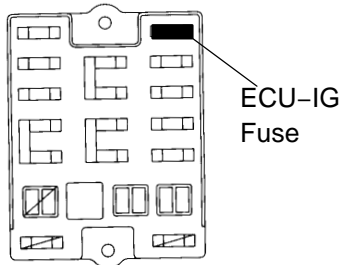
WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check ECU-IG fuse.

Junction Block No.1



N18670

PREPARATION:

Remove the ECU-IG fuse from relay block No.2.

CHECK:

Check continuity of ECU-IG fuse.

OK:

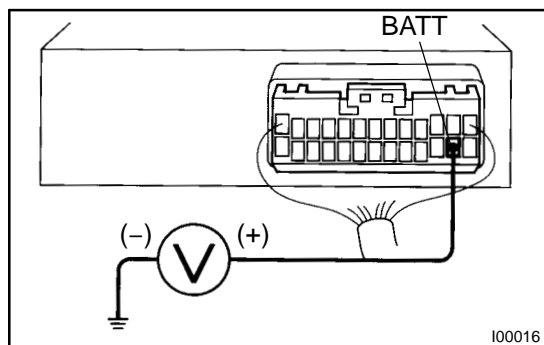
Continuity

NG

Check for short in all the harness and components connected to the ECU-IG fuse.

OK

- 2** Check voltage between terminal BATT of cruise control ECU connector and body ground (See page [IN-28](#)).

**PREPARATION:**

Remove the ECU with connector still connected.

CHECK:

Measure voltage between terminal BATT of ECU connector and body ground.

OK:

Voltage: 10 – 14 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

Check and repair harness and connector between battery and cruise control ECU (See page [IN-28](#)).

Main Switch Circuit (Cruise Control Switch)

CIRCUIT DESCRIPTION

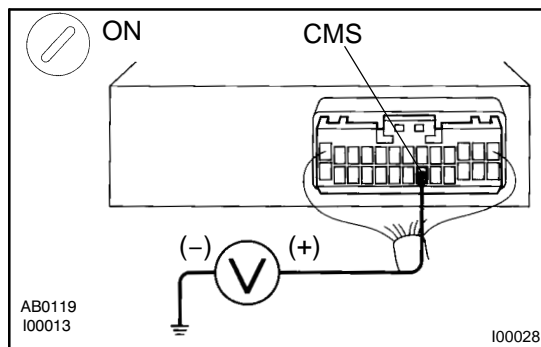
When the cruise control main switch is turned off, the cruise control does not operate.

WIRING DIAGRAM

See page [DI-311](#).

INSPECTION PROCEDURE

- | | |
|---|--|
| 1 | Check voltage between terminal CMS of cruise control ECU connector and body ground. |
|---|--|



PREPARATION:

- Remove the ECU with connector still connected.
- Turn ignition switch ON.

CHECK:

Measure voltage between terminal CMS of cruise control ECU connector when main switch is held on and off.

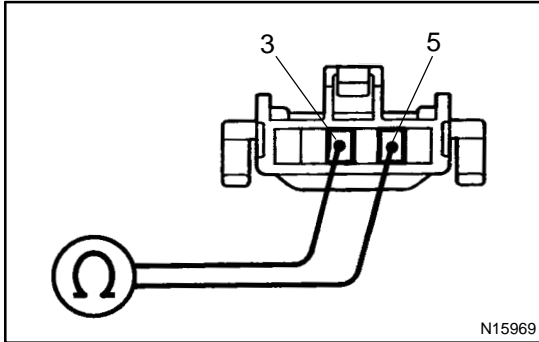
OK:

Main switch	Voltage
OFF	10 – 14 V
ON	Below 2 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

2 Check main switch continuity.**PREPARATION:**

- (a) Remove steering wheel center pad (See page [SR-11](#)).
- (b) Disconnect the control switch connector.

CHECK:

Check continuity between terminals 3 and 5 of control switch connector when main switch is held on and off.

OK:

Switch position	Tester connection	Specified condition
OFF	3 - 5	No continuity
Hold ON	3 - 5	Continuity

NG**Replace control switch.****OK****3 Check harness and connector between cruise control ECU and main switch (See page [IN-28](#)).****NG****Repair or replace harness or connector.****OK**

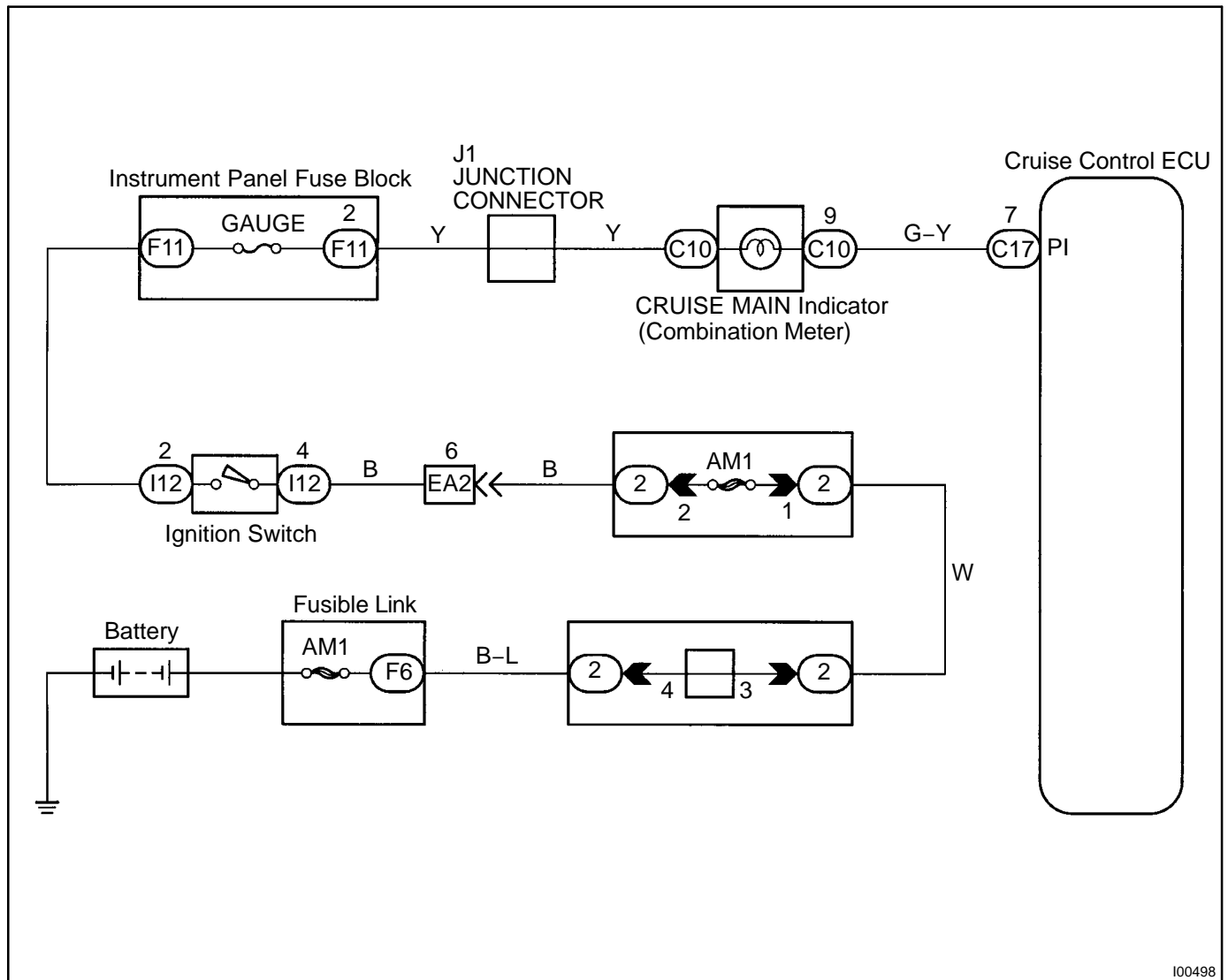
Check and replace cruise control ECU (See page [IN-28](#)).

CRUISE MAIN Indicator Light Circuit

CIRCUIT DESCRIPTION

When the cruise control main switch is turned ON, CRUISE MAIN indicator light lights up.

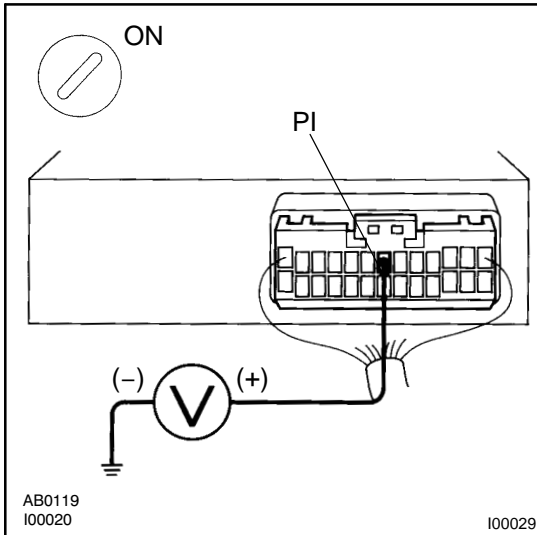
WIRING DIAGRAM



I00498

INSPECTION PROCEDURE

- 1** Check voltage between terminals PI and GND of cruise control ECU connector.

**PREPARATION:**

Turn ignition switch ON.

CHECK:

Measure voltage between terminals PI and GND of ECU connector when main switch on and off.

OK:

Switch position	Voltage
OFF	10 – 16 V
ON	Below 1.2 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

- 2** Check combination meter (See page [BE-34](#)).

NG

Replace combination meter.

OK

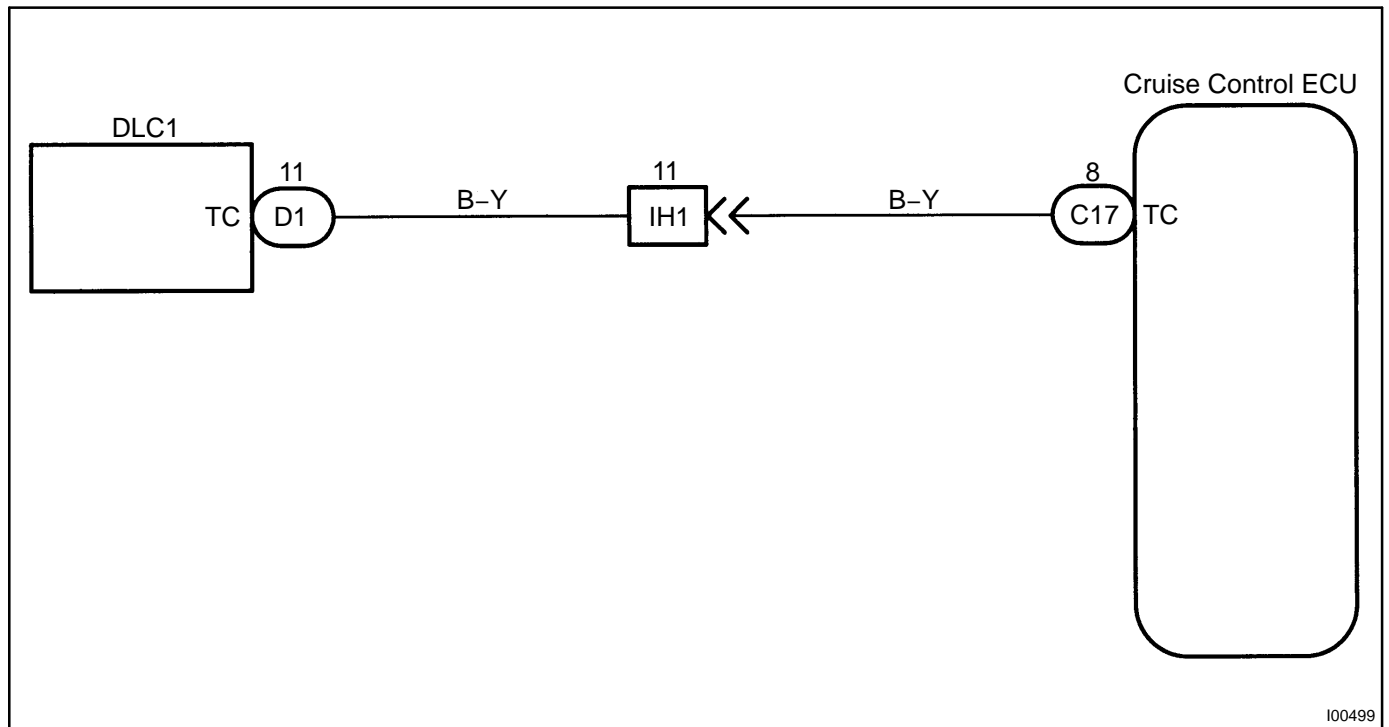
Check and replace cruise control ECU (See page [IN-28](#)).

Diagnosis Circuit

CIRCUIT DESCRIPTION

This circuit sends a signal to the ECU that DTC output is required.

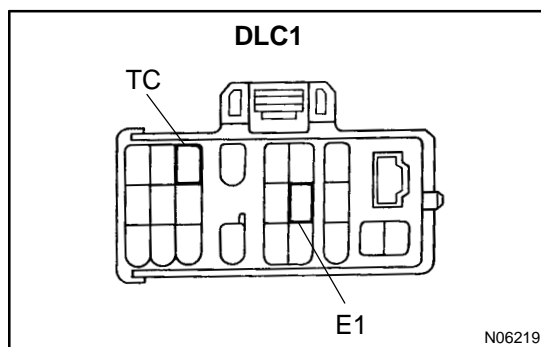
WIRING DIAGRAM



I00499

INSPECTION PROCEDURE

- 1 Check voltage between terminals Tc and E₁ of DLC1.



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminals Tc and E₁ of DLC1.

OK:

Voltage: 10 – 14 V

OK

Proceed to next circuit inspection shown on problem symptoms table (See page [DI-295](#)).

NG

1996 LAND CRUISER (RM451U)

2	Check harness and connector between cruise control ECU and DLC1, DLC1 and body ground (See page IN-28).
---	--

NG

Repair or replace harness or connector.

OK

Check and replace cruise control ECU
(See page [IN-28](#)).

Actuator Control Cable

INSPECTION PROCEDURE

1	Actuator control cable inspection
---	-----------------------------------

CHECK:

- (a) Check that the actuator, control cable throttle link are properly installed and that the cable and link are connected correctly.
- (b) Check that the actuator and bell crank are operating smoothly.
- (c) Check that the cable is not loose or too tight.

OK:

Freeplay: less than 10 mm

HINT:

- If the control cable is very loose, the vehicle's loss of speed going uphill will be large.
- If the control cable is too tight, the idle RPM will become high.

EMISSION CONTROL SYSTEM

EC07H-06

PURPOSE

The emission control systems are installed to reduce the amount of HC, CO and NOx exhausted from the engine ((3), (4) and (5)), to prevent the atmospheric release of blow-by gas-containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).

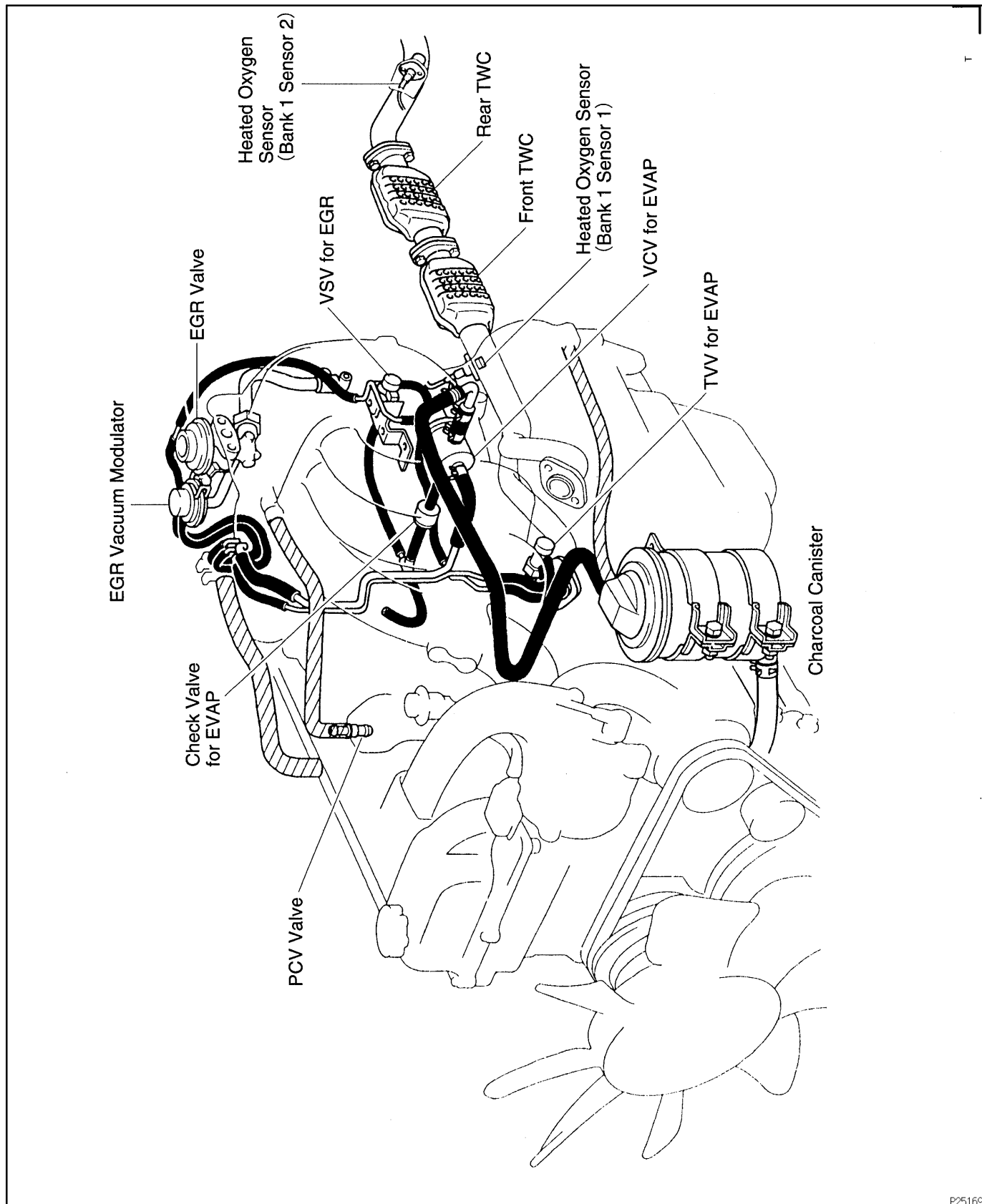
The function of each system is shown in the following table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NOx
(4) Three-Way Catalytic Converter	TWC	Reduces HC, CO and NOx
(5) Sequential Multiport Fuel Injection*	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

Remark: * For inspection and repair of the SFI system, refer to the SF section in this manual.

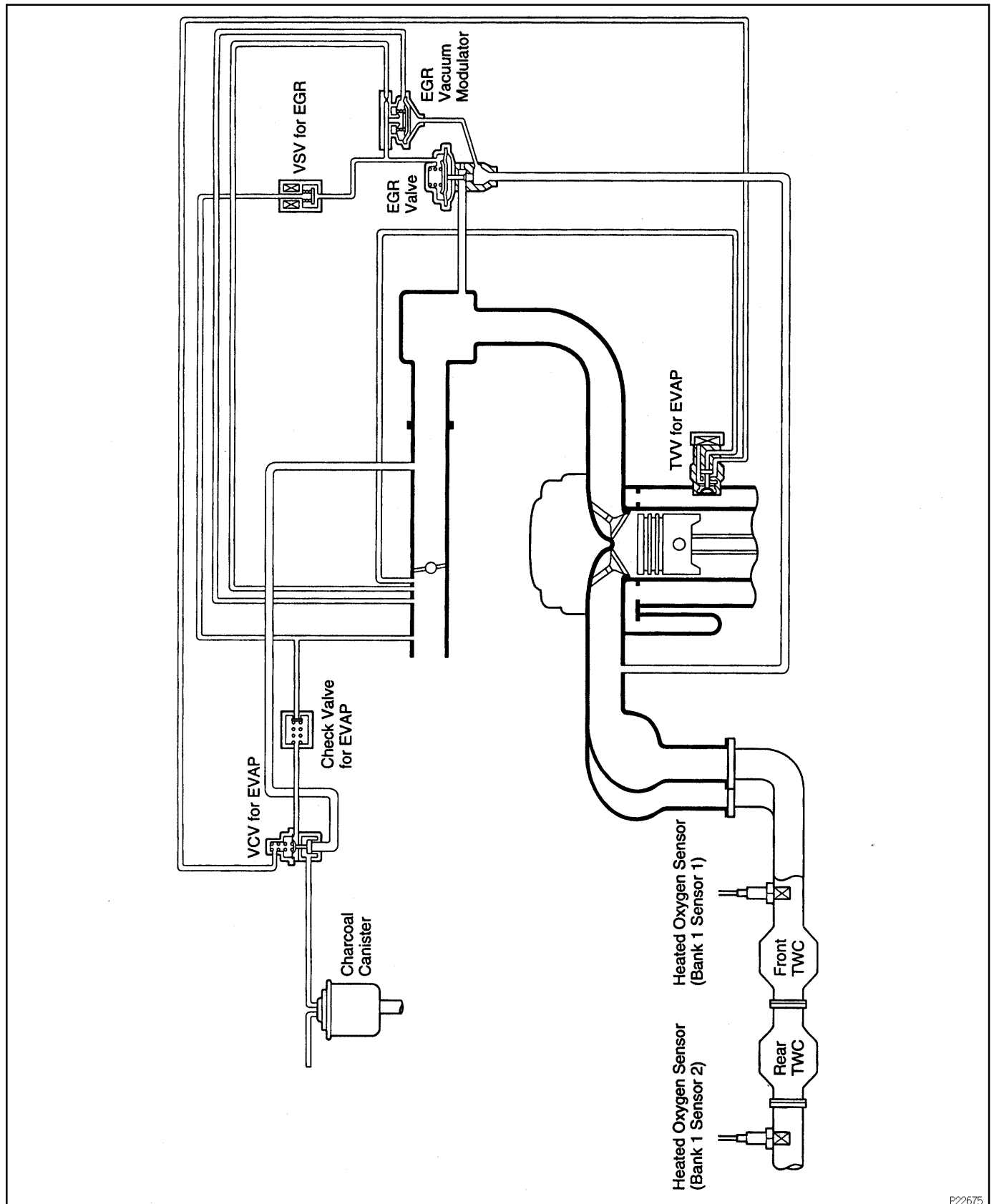
PARTS LAYOUT AND SCHEMATIC DRAWING LOCATION

EC071-06

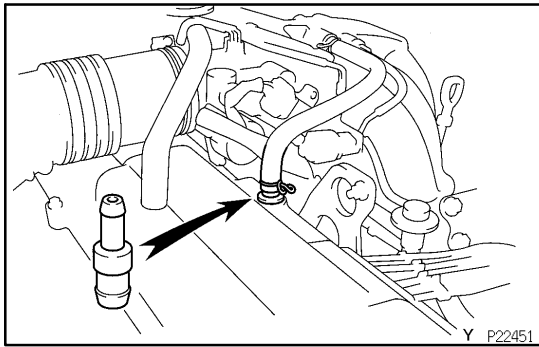


P25169

DRAWING



P22675



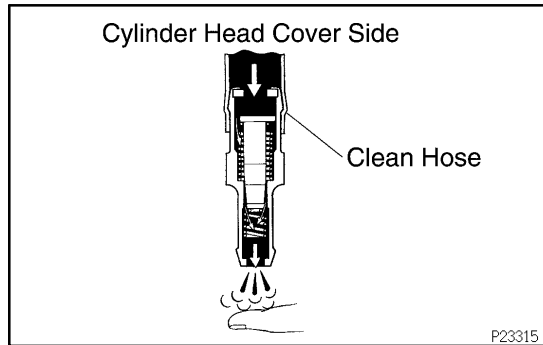
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM INSPECTION

EC0G9-01

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



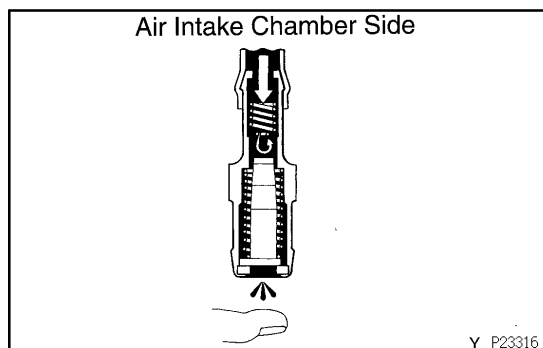
3. INSPECT PCV VALVE OPERATION

- (a) Blow air into the cylinder head side, and check that air passes through easily.

CAUTION:

Do not suck air through the valve.

Petroleum substances inside the valve are harmful.

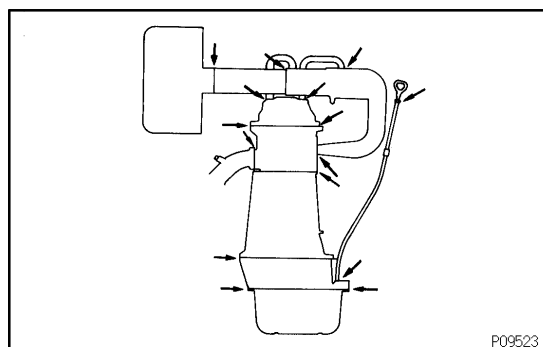


- (b) Blow air into the air intake chamber side, and check that air passes through with difficulty.

If operation is not as specified, replace the PCV valve.

4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE

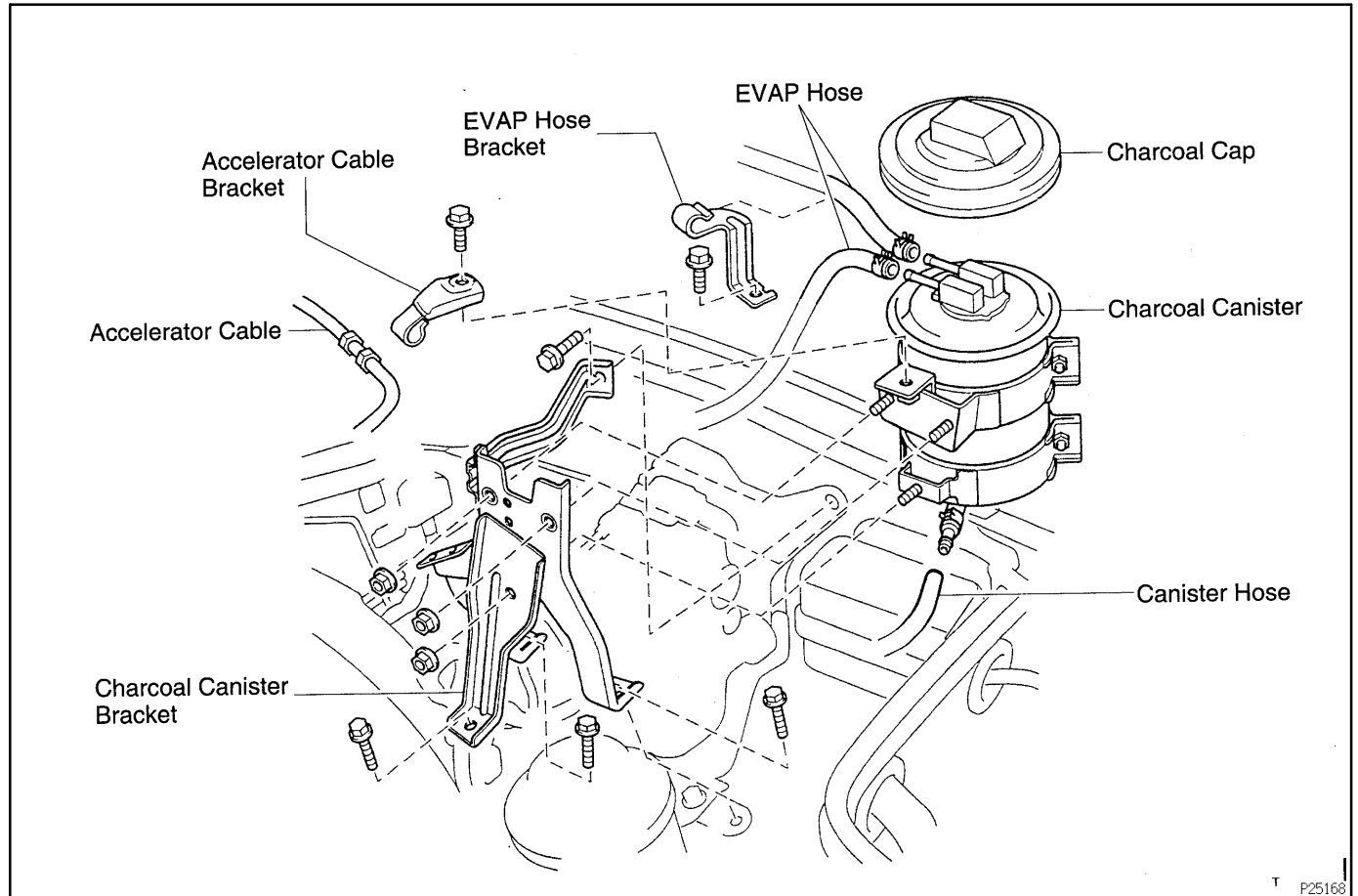


6. VISUALLY INSPECT HOSE, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM COMPONENTS

EC0GA-01



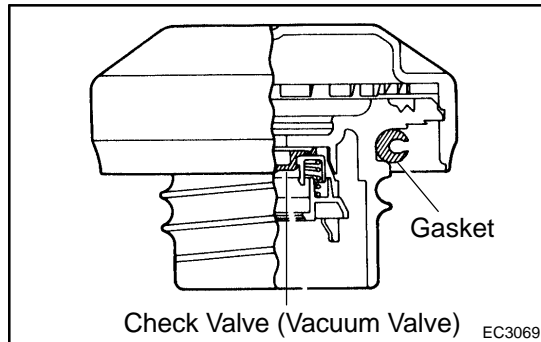
INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

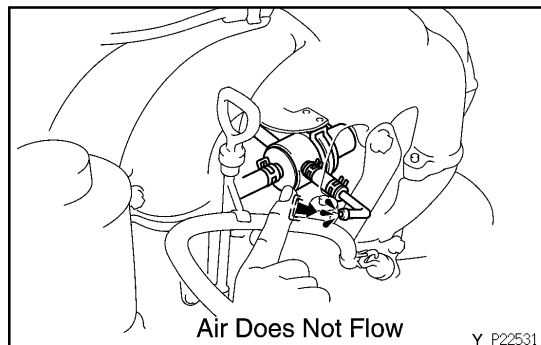
Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

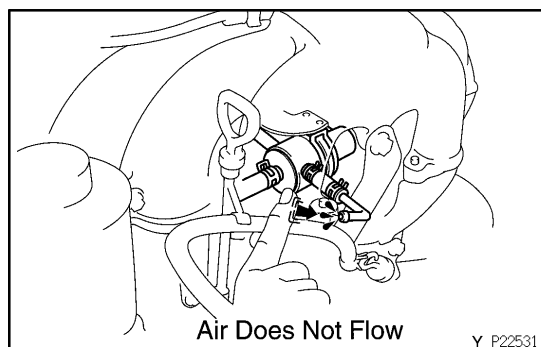
Check if the cap and/or gasket are deformed or damaged.

If necessary, repair or replace the cap.



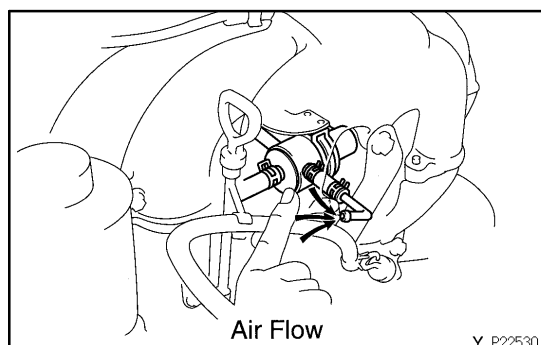
4. INSPECT TVV OPERATION WITH COLD ENGINE

- The engine coolant temperature should be below 45°C (113°F).
- Disconnect the EVAP hose from the union pipe.
- Start the engine.
- Gradually increase the engine speed from idle to 3,000 rpm and check that air suction is not felt at the union pipe.



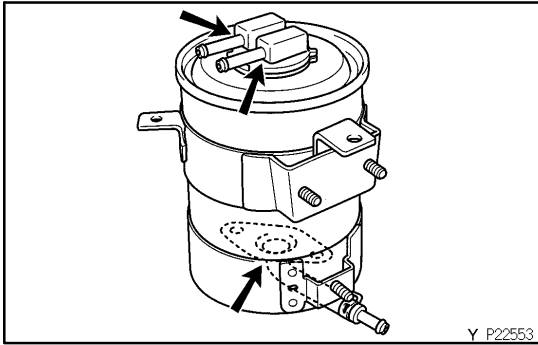
5. INSPECT OPERATION OF VCV WITH HOT ENGINE

- Warm up the engine.
- With the engine idling, check that air suction is not felt at union pipe.



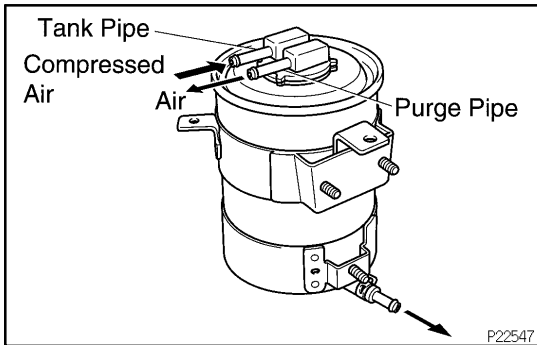
- Gradually increase the engine speed to 3,000 rpm and check that there is air suction at the union pipe.
 - Reconnect the EVAP hose to the union pipe.
- If no problem is found with this inspection, system is normal; otherwise inspect each part.

- REMOVE CHARCOAL CANISTER WITH BRACKET
- REMOVE CHARCOAL CANISTER FROM BRACKET
- REMOVE CAP FROM CHARCOAL CANISTER



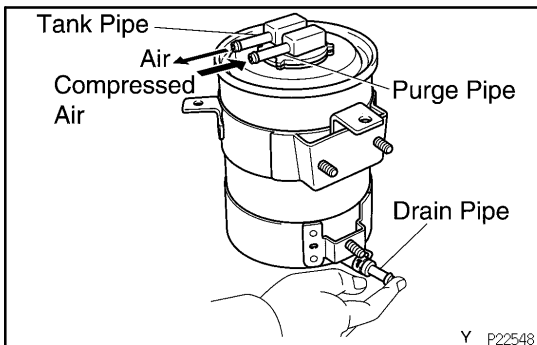
9. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



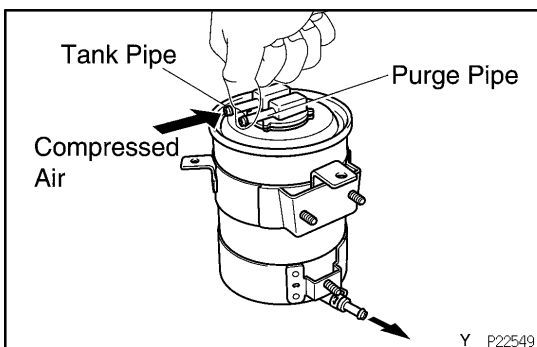
10. INSPECT FOR CLOGGED FILTER AND STUCK VALVE

(a) Using low pressure compressed air (7.26 kPa, 74 gf/cm², 1.05 psi), blow into tank pipe and check that air flows without resistance from the other pipes.



(b) While holding drain pipe closed, blow air (1.96 kPa, 20 gf/cm², 0.28 psi) into purge pipe and check that air flow without resistance from tank pipe.

If a problem is found, replace the charcoal canister.



11. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into tank pipe while holding purge pipe closed.

NOTICE:

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

12. REINSTALL CAP TO CHARCOAL CANISTER

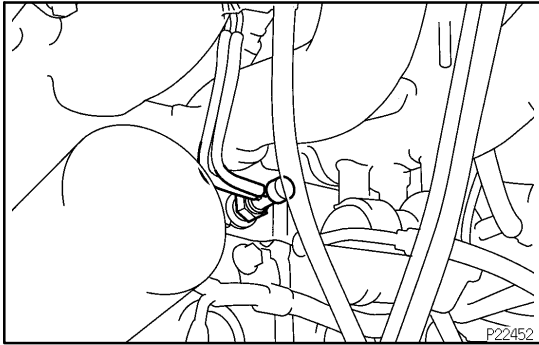
13. REINSTALL CHARCOAL CANISTER TO BRACKET

Torque: 14 N·m (145 kgf·cm, 10 ft·lbf)

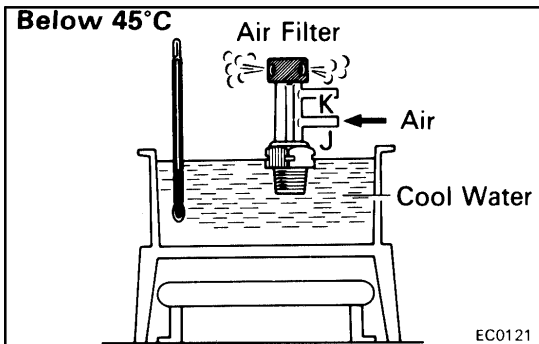
14. REINSTALL CHARCOAL CANISTER WITH BRACKET

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

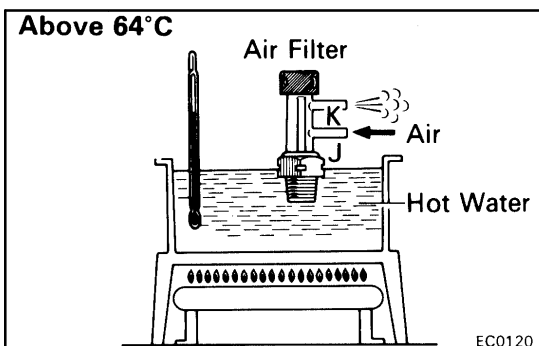
15. DRAIN ENGINE COOLANT

**16. REMOVE TVV FROM CYLINDER HEAD**

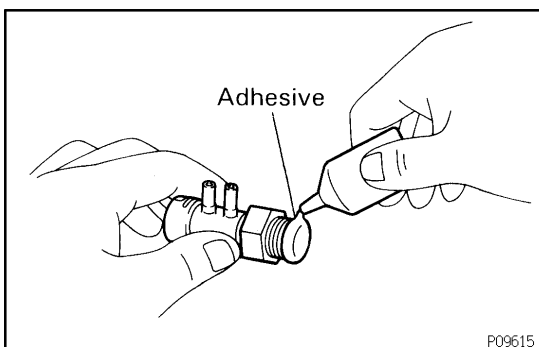
- (a) Disconnect the 2 vacuum hoses.
- (b) Remove the TVV.

**17. INSPECT TVV OPERATION**

- (a) Cool the TVV to below 45°C (113°F) with cool water.
- (b) Check that air flows from pipe J to the air filter.



- (c) Heat the TVV to above 64°C (147°F) with hot water.
 - (d) Check that air flows from pipe J to pipe K.
- If operation is not as specified, replace the TVV.

**18. REINSTALL TVV**

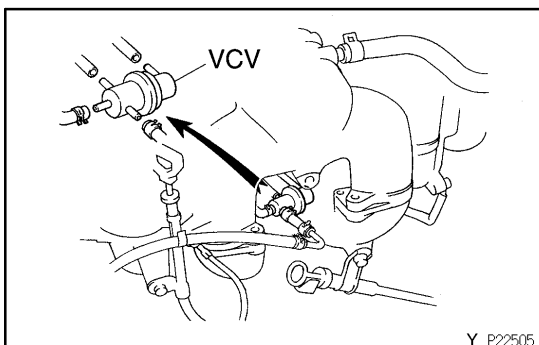
- (a) Apply adhesive to 2 or 3 threads of the TVV, and install it.

Adhesive:

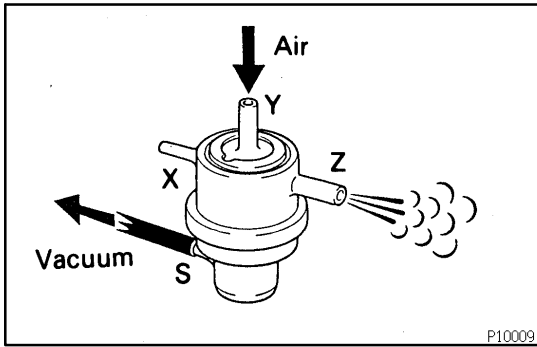
Part No. 08833-00070, THREE BOND 1324 or equivalent

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

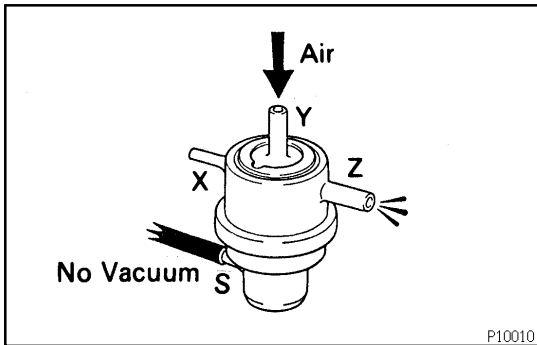
- (b) Reconnect 2 vacuum hoses.

19. REFILL WITH ENGINE COOLANT**20. REMOVE INTAKE MANIFOLD STAY****21. REMOVE VCV**

EMISSION CONTROL – EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

**22. INSPECT VCV**

- Apply vacuum above 9.3 kPa (70 mmHg, 2.76 in.Hg) to pipe S.
- Blow air into pipe Y and check that air comes out of pipe Z.

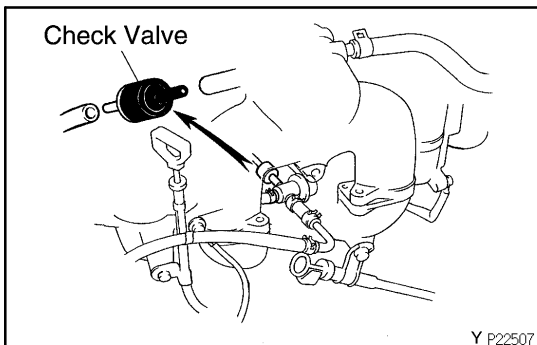
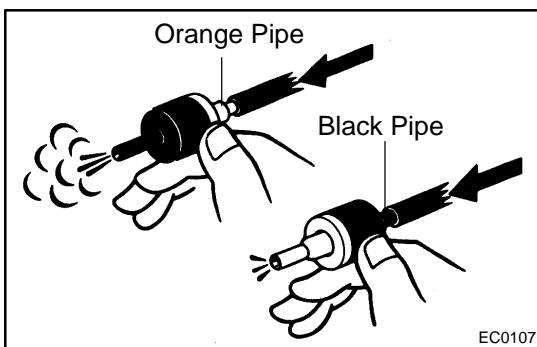


- Stop the applied vacuum.
- Blow air into pipe Y and check that air does not come out of pipe Z.

If operation is not as specified, replace the VCV.

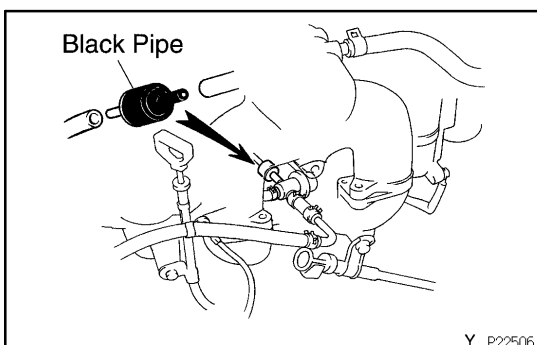
23. REINSTALL VCV**24. INSTALL INTAKE MANIFOLD STAY**

Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)

**25. REMOVE INTAKE MANIFOLD STAY****26. REMOVE CHECK VALVE****27. INSPECT CHECK VALVE**

- Check that air flows from the orange pipe to the black pipe.
- Check that air does not flow from the black pipe to the orange pipe.

If operation is not as specified, replace the check valve.

**28. REINSTALL CHECK VALVE****HINT:**

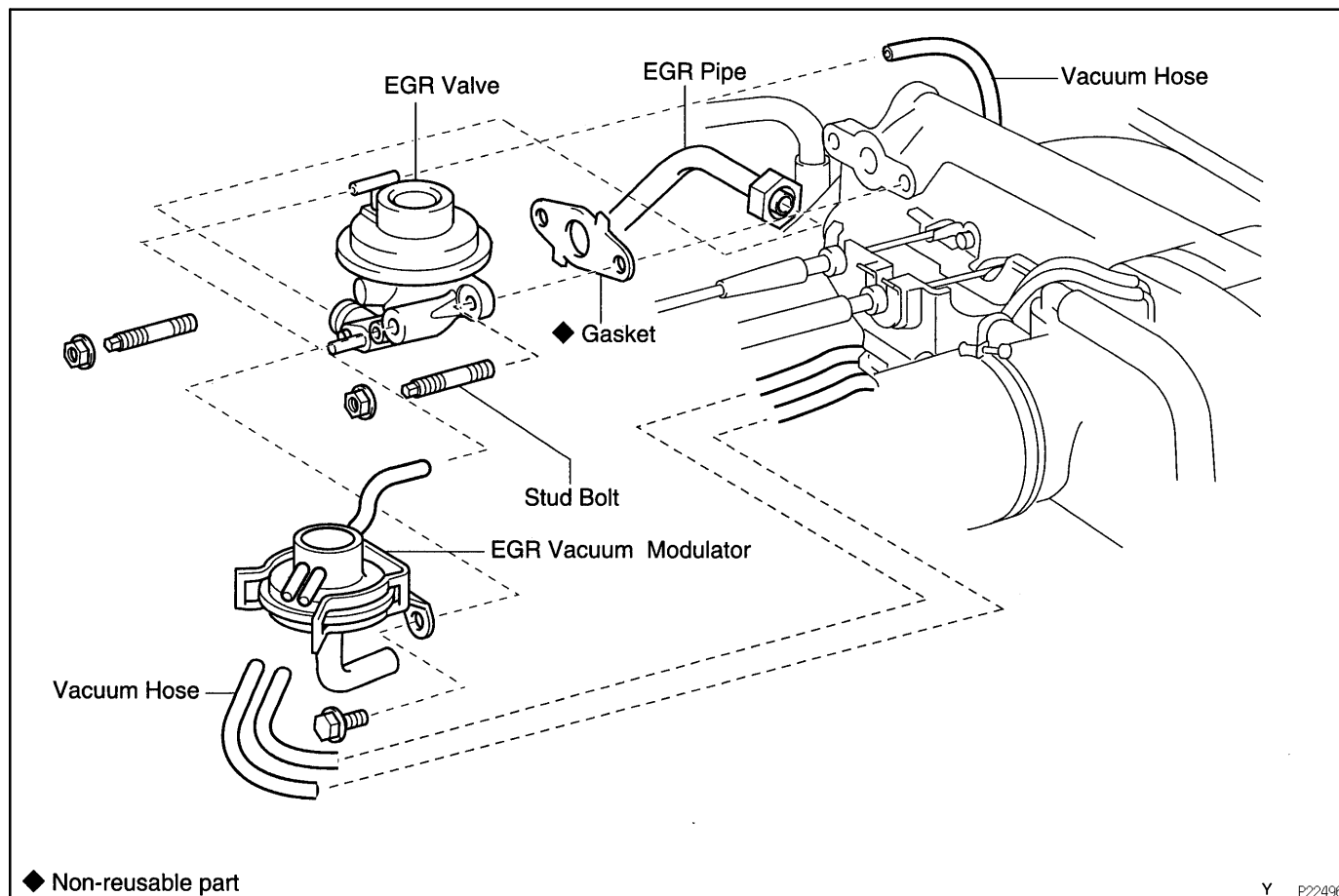
Reinstall the check valve with the black pipe facing the VCV side.

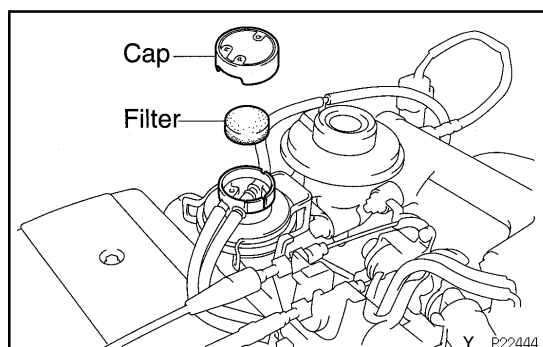
29. INSTALL INTAKE MANIFOLD STAY

Torque: 36 N·m (360 kgf·cm, 26 ft·lbf)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM COMPONENTS

EC0GC-01





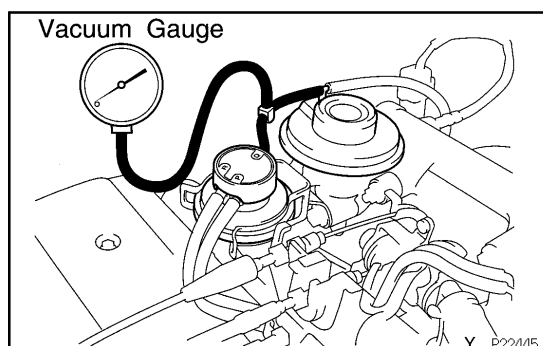
INSPECTION

1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR

- Remove the cap and filter.
- Check the filter for contamination or damage.
- Using compressed air, clean the filter.
- Reinstall the filter and cap.

HINT:

Install the filter with the coarser surface facing the atmospheric side (outward).



2. INSTALL VACUUM GAUGE

Using a 3-way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

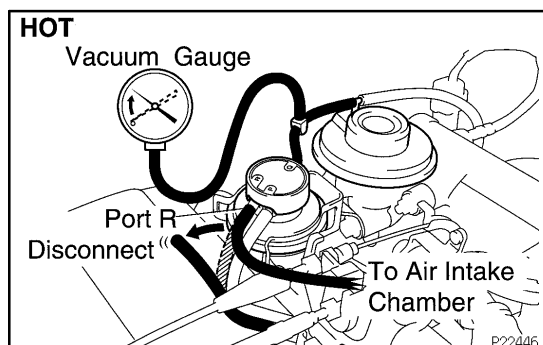
3. INSPECT SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.

4. CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL (See page EM-10)

5. INSPECT VSV OPERATION WITH COLD ENGINE

- The engine coolant temperature should be below 47°C (117°F).
- Check that the vacuum gauge indicates zero at 2,500 rpm.
- Check that the EGR pipe is not hot.



6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

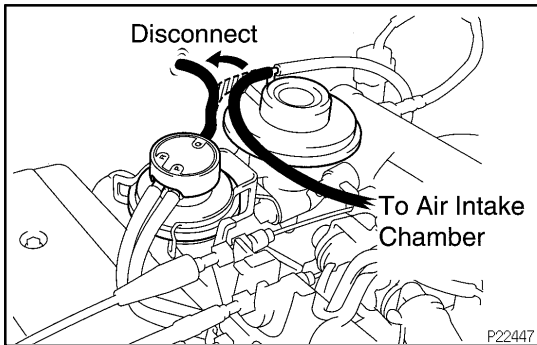
- Warm up the engine to above 53°C (127°F).
- Check that the vacuum gauge indicates low vacuum at 2,500 rpm.
- Disconnect the vacuum hose port R of the EGR vacuum modulator and connect port R directly to the air intake chamber with another hose.
- Check that the vacuum gauge indicates high vacuum at 2,500 rpm.

HINT:

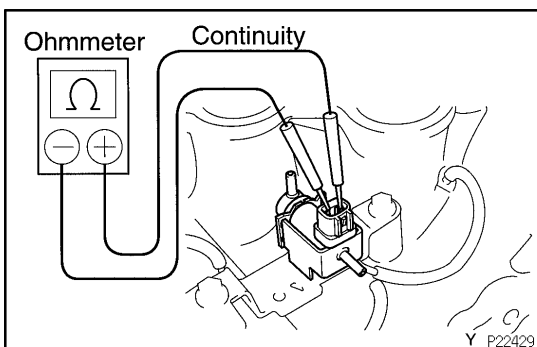
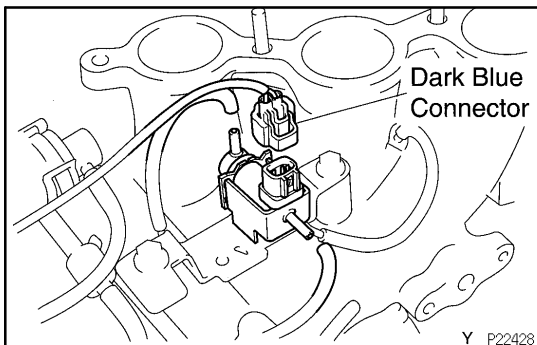
As a large amount of exhaust gas enters, the engine will misfire slightly.

7. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL**8. REMOVE VACUUM GAUGE**

Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.

**9. INSPECT EGR VALVE**

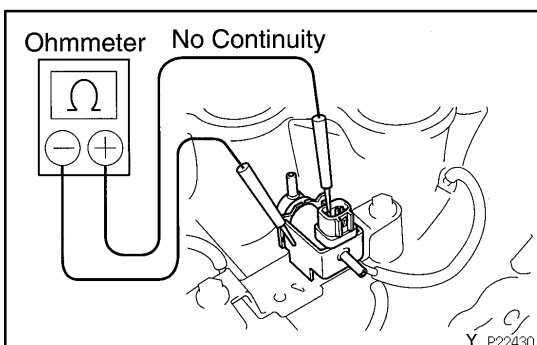
- (a) Apply vacuum directly to the EGR valve with the engine idle.
 - (b) Check that the engine runs rough or dies.
 - (c) Reconnect the vacuum hoses to the proper locations.
- If no problem is found with this inspection, system is normal; otherwise inspect each part.

10. CANCEL DIAGNOSTIC TROUBLE CODE**11. REMOVE AIR INTAKE CHAMBER (See page [EM-28](#))****12. DISCONNECT VACUUM HOSES AND CONNECTOR****13. INSPECT VSV FOR OPEN CIRCUIT**

Using an ohmmeter, check that there is continuity between the terminals.

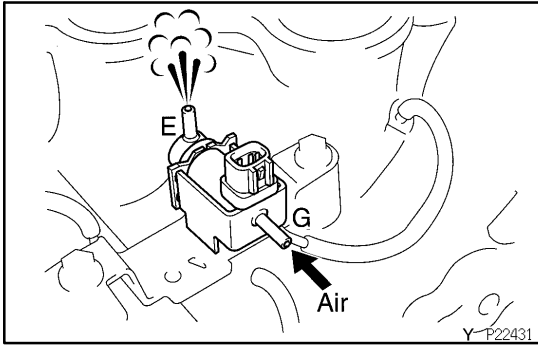
Resistance: 30 – 34 Ω at 20°C (68°F)

If there is no continuity, replace the VSV.

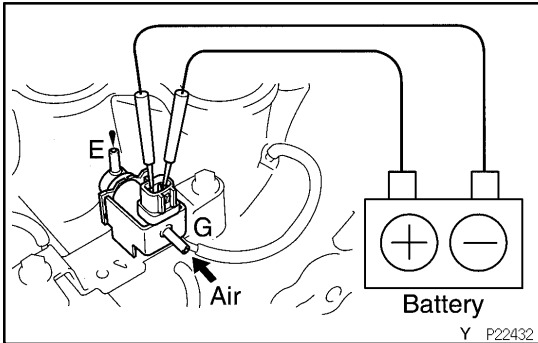
**14. INSPECT VSV FOR GROUND**

Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.

**15. INSPECT VSV OPERATION**

- (a) Check that the air flows from pipe G to pipe E.

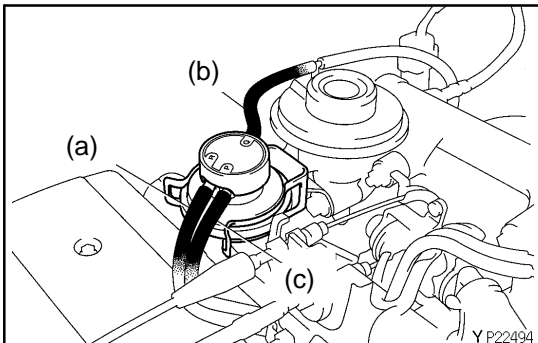


- (b) Apply battery voltage across the terminals.

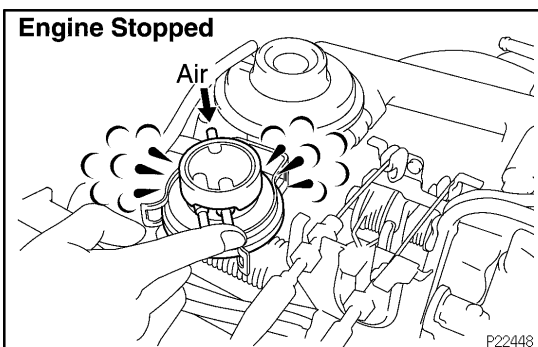
- (c) Check that the air does not flow from pipe G to pipe E. If operation is not as specified, replace the VSV.

16. RECONNECT VACUUM HOSES AND CONNECTOR

- 17. REINSTALL AIR INTAKE CHAMBER (See page EM-54)**

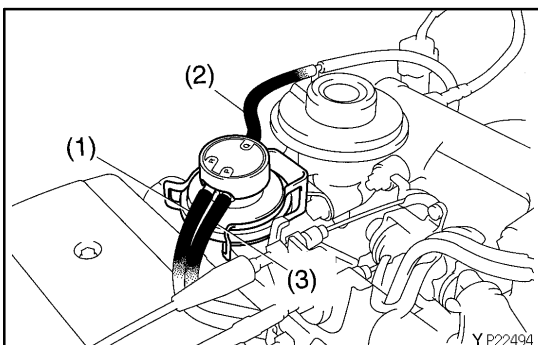
**18. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR**

- (a) Disconnect the vacuum hose from R port.
(b) Disconnect the vacuum hose from Q port.
(c) Disconnect the vacuum hose from P port.

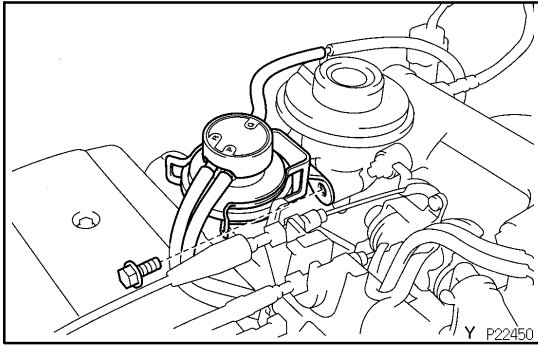
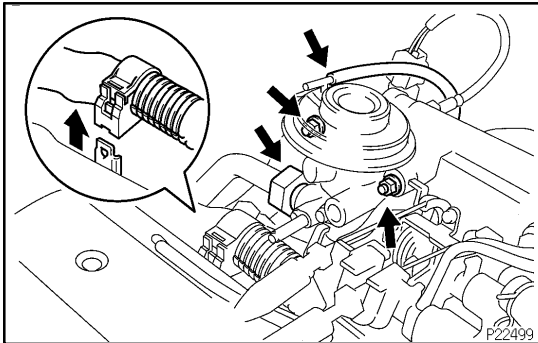
**19. INSPECT EGR VACUUM MODULATOR OPERATION**

- (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 2,500 rpm.
(d) Repeat the above test. Check that there is a strong resistance to air flow.

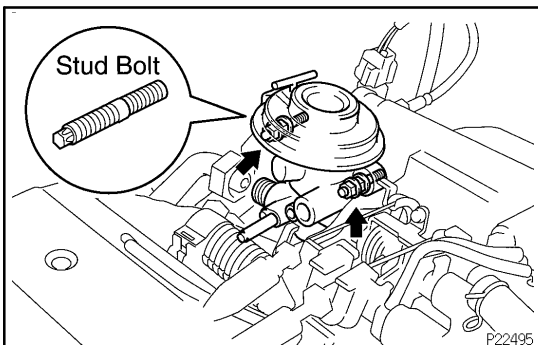
If operation is not as specified, replace the EGR vacuum modulator.

**20. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR**

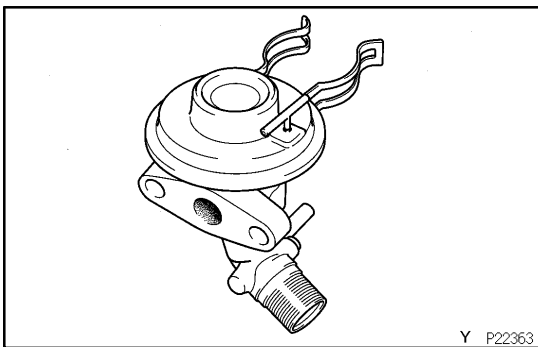
- (a) Connect the vacuum hose to R port.
(b) Connect the vacuum hose to Q port.
(c) Connect the vacuum hose to P port.

**21. REMOVE EGR VACUUM MODULATOR****22. REMOVE EGR VALVE**

- (a) Disconnect the vacuum hose from the EGR valve.
- (b) Disconnect the engine wire from the clamp.
- (c) Loosen the EGR pipe union nut.
- (d) Remove the 2 nuts holding the EGR valve to the air intake chamber.



- (e) Using 2 nuts, remove the 2 stud bolts, EGR valve and gasket.

**23. INSPECT EGR VALVE**

Check for sticking and heavy carbon deposits.
If a problem is found, replace the valve.

24. REINSTALL EGR VALVE

- (a) Using 2 nuts, temporarily install a new gasket, and EGR valve with the 2 stud bolts.

Torque: 9 N·m (90 kgf-cm, 78 in.-lbf)

- (b) Install the 2 nuts holding the EGR valve to the air intake chamber.

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

- (c) Tighten the union nut of the EGR pipe.

Torque: 64 N·m (650 kgf-cm, 47 ft-lbf)

- (d) Connect the engine wire to the clamp.

- (e) Connect the vacuum hose to the EGR valve.

25. REINSTALL EGR VACUUM MODULATOR

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM INSPECTION

EC0H3-02

1. EXHAUST PIPE ASSEMBLY INSPECTION

- (a) Check connection for looseness or damage
- (b) Check clamps for weakness, cracks or damage

2. TWC INSPECTION

Check for dents or damage

If any part of the protector is damaged or dented to the extent that it touches the TWC, repair or replace it.

3. HEAT INSULATOR INSPECTION

- (a) Check heat insulator for damage
- (b) Check for adequate clearance between TWC and heat insulator.

4. FRONT TWC AND REAR TWC REPLACEMENT (See page [EM-110](#))

CO/HC INSPECTION

EM1E0-04

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

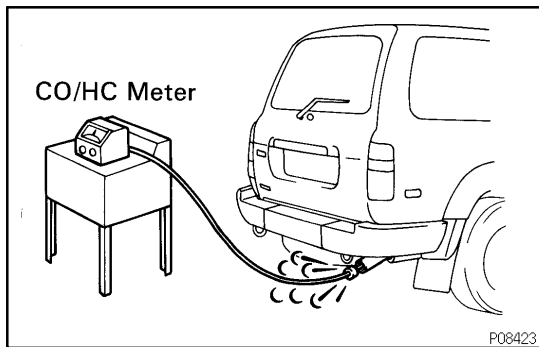
HINT:

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. 4.INSERT CO/HC 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 doing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

6. TROUBLESHOOTING

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

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

CO	HC	Problems	Causes
Normal	High	Rough idle	3. Faulty ignitions: <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high-tension cords • Cracked distributor cap 4. Incorrect valve clearance 5. Leaky EGR valve 6. Leaky intake and exhaust valves 7. Leaky cylinders
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line • Defective ECT sensor • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty MAF meter

COMPRESSION INSPECTION

EMOKR-04

HINT:

If there is lack of power, excessive oil consumption 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

3. REMOVE SPARK PLUGS (See page IG-1)

4. CHECK CYLINDER COMPRESSION PRESSURE

- Insert a compression gauge into the spark plug hole.
- Fully open the throttle.
- While cranking the engine, measure the compression pressure.

HINT:

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

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

NOTICE:

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

Compression pressure:

1,176 kPa (12.0 kgf/cm², 171 psi) or more

Minimum pressure: 883 kPa (9.0 kgf/cm², 128 psi)

Difference between each cylinder:

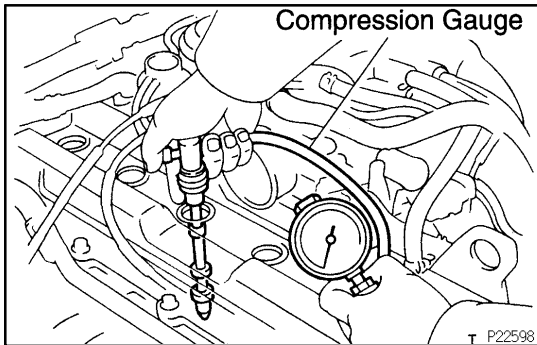
98 kPa (1.0 kgf/cm², 14 psi) or less

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, 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.

5. REINSTALL SPARK PLUGS (See page IG-1)

6. RECONNECT DISTRIBUTOR CONNECTOR



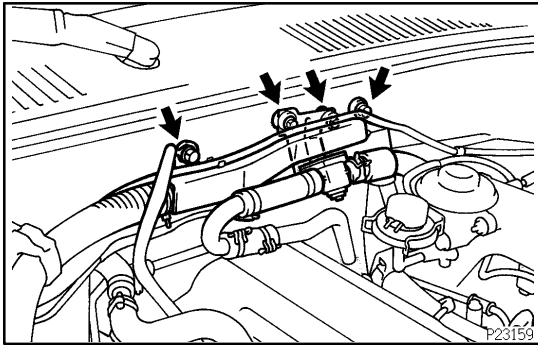
VALVE CLEARANCE INSPECTION

EM1Q4-01

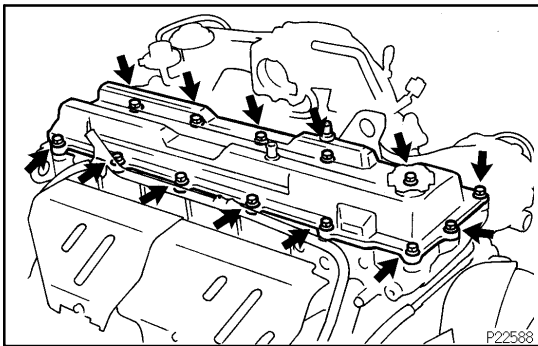
HINT:

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

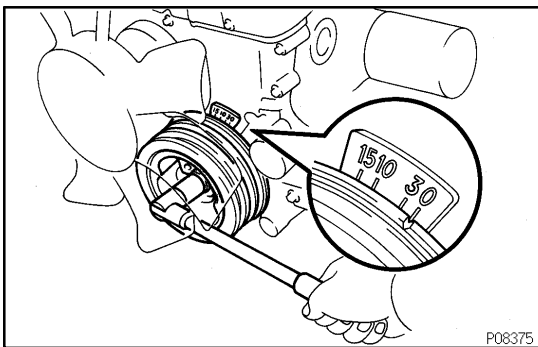
1. **DRAIN ENGINE COOLANT**
2. **REMOVE THROTTLE BODY** (See page [SF-45](#))



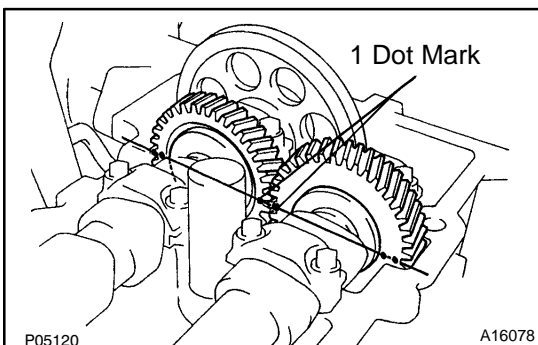
3. **DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL**
 - (a) Remove the 2 bolts and disconnect the ground strap and engine wire.
 - (b) Remove the 2 bolts and disconnect the heater valve.
4. **DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS** (See page [IG-1](#))



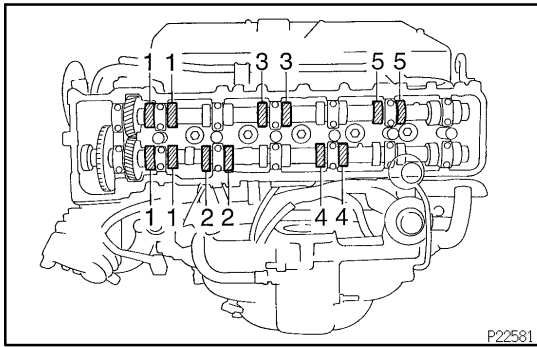
5. **REMOVE CYLINDER HEAD COVER**
Remove the 13 bolts, cylinder head cover and gasket.



6. **SET NO. 1 CYLINDER TO TDC/COMPRESSION**
 - (a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.



- (b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



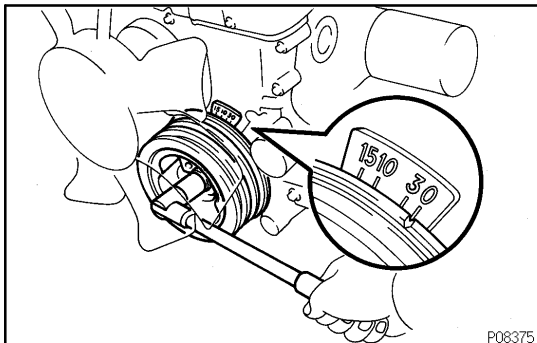
7. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

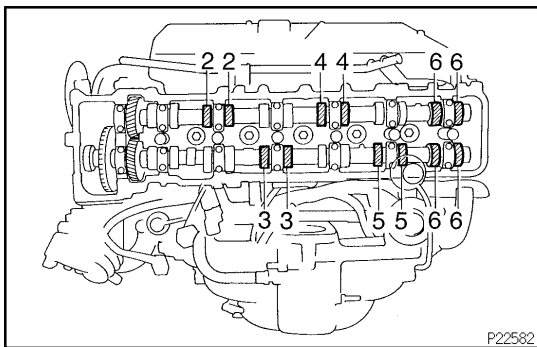
- Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
- Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

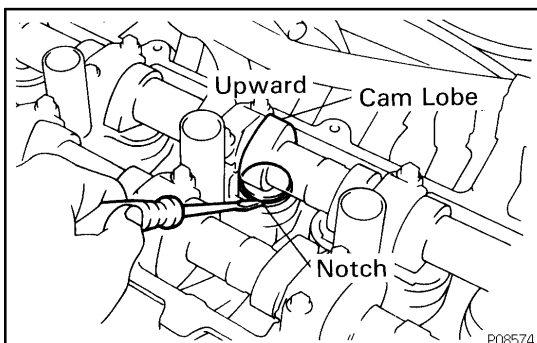
Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust	0.25 – 0.35 mm (0.010 – 0.041 in.)



- ### (b) Turn the crankshaft pulley 1 revolution (360°) and align the its groove with timing mark "0" of the timing chain cover.



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



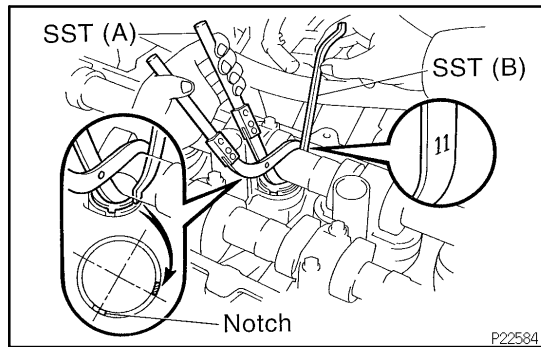
8. Except for rear valves of No. 6 cylinder ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Position the notch of the valve lifter toward the spark plug side.

EM-6

ENGINE MECHANICAL – VALVE CLEARANCE

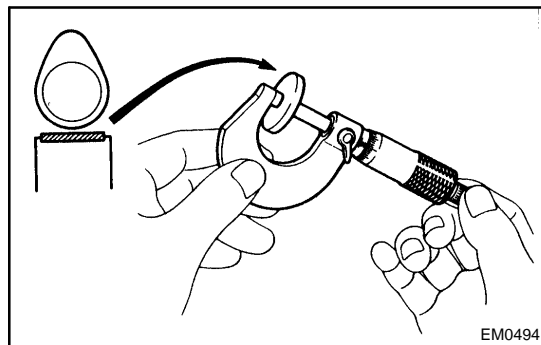
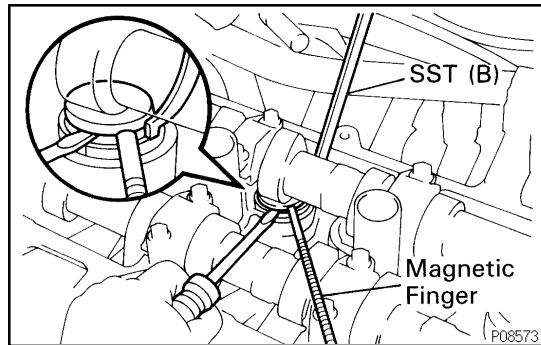


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter flange. Remove SST (A).

SST 09248-06020, 09248-55050 (09248-05510)

HINT:

- Apply SST (B) at slight angle on the side marked with "11", 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 shallowly from the outside of the cylinder head, at a slight angle.
- Remove the adjusting shim with a small screwdriver and magnetic finger.



- (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

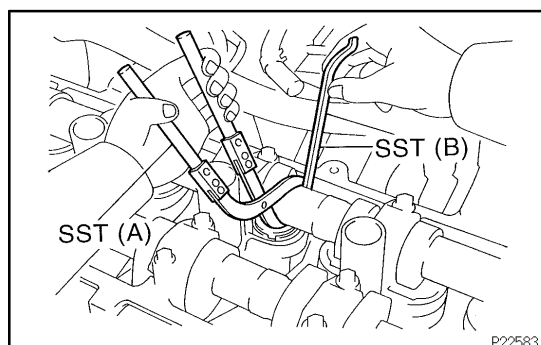
Intake: $N = T + (A - 0.20 \text{ mm (0.008 in.)})$

Exhaust: $N = T + (A - 0.30 \text{ mm (0.012 in.)})$

- Select a new shim with a thickness as close as possible to the calculated value.

HINT:

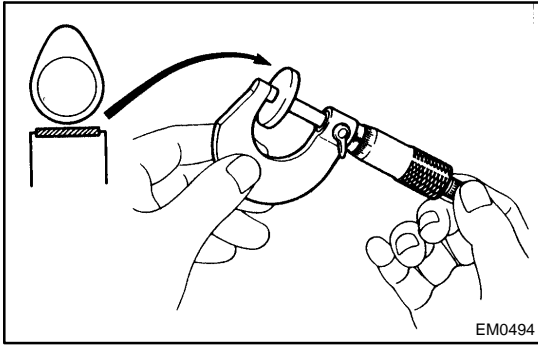
Shims are available in 17 sized in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



- (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 09248-06020, 09248-55050 (09248-05510)

- (d) Recheck the valve clearance.



9. Rear valves of No. 6 cylinder ADJUST VALVE CLEARANCE

- (a) Remove the distributor (See page [IG-10](#)).
 - (b) Remove the camshafts (See page [EM-28](#)).
 - (c) Remove the adjusting shim with a small screwdriver.
 - (d) 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: $N = T + (A - 0.20 \text{ mm (0.008 in.)})$**
Exhaust: $N = T + (A - 0.30 \text{ mm (0.012 in.)})$
- Select a new shim with a thickness as close as possible to the calculated value.

HINT:

Shims are available in 17 sized in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).

- (e) Place a new adjusting shim on the valve lifters.
 - (f) Install the camshafts (See page [EM-54](#)).
 - (g) Recheck the valve clearance.
 - (h) Install the distributor (See page [IG-11](#)).
- ### 10. REINSTALL CYLINDER HEAD COVER
- (a) Install the gasket to the cylinder head cover.
 - (b) Install the cylinder head cover with the 13 bolts.
- ### 11. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS (See page [IG-1](#))
- ### 12. RECONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL
- (a) Connect the heater valve with the 2 bolts.
 - (b) Connect the ground strap and engine wire with the 2 bolts.
- ### 13. REINSTALL THROTTLE BODY (See page [SF-48](#))
- ### 14. REFILL RADIATOR WITH ENGINE COOLANT
- ### 15. CHECK AND ADJUST IGNITION TIMING (See page [EM-10](#))

Adjusting Shim Selection Chart (Intake)

Installed shim thickness mm (in.)		Measured clearance mm (in.)	
0.000 – 0.030 (0.0000 – 0.0012)	2.500 (0.0984)	2.500 (0.0984)	2.500 (0.0984)
0.031 – 0.050 (0.0012 – 0.0020)	2.520 (0.0992)	2.520 (0.0992)	2.520 (0.0992)
0.051 – 0.070 (0.0020 – 0.0028)	2.540 (0.1000)	2.540 (0.1000)	2.540 (0.1000)
0.071 – 0.090 (0.0028 – 0.0035)	2.560 (0.1008)	2.560 (0.1008)	2.560 (0.1008)
0.091 – 0.110 (0.0036 – 0.0043)	2.580 (0.1016)	2.580 (0.1016)	2.580 (0.1016)
0.111 – 0.130 (0.0044 – 0.0051)	2.600 (0.1024)	2.600 (0.1024)	2.600 (0.1024)
0.131 – 0.149 (0.0052 – 0.0059)	2.620 (0.1032)	2.620 (0.1032)	2.620 (0.1032)
0.150 – 0.250 (0.0059 – 0.0098)	2.640 (0.1040)	2.640 (0.1040)	2.640 (0.1040)
0.251 – 0.270 (0.0099 – 0.0106)	2.660 (0.1048)	2.660 (0.1048)	2.660 (0.1048)
0.271 – 0.290 (0.0107 – 0.0114)	2.680 (0.1056)	2.680 (0.1056)	2.680 (0.1056)
0.291 – 0.310 (0.0115 – 0.0122)	2.700 (0.1064)	2.700 (0.1064)	2.700 (0.1064)
0.311 – 0.330 (0.0122 – 0.0130)	2.720 (0.1072)	2.720 (0.1072)	2.720 (0.1072)
0.331 – 0.350 (0.0130 – 0.0138)	2.740 (0.1080)	2.740 (0.1080)	2.740 (0.1080)
0.351 – 0.370 (0.0138 – 0.0146)	2.760 (0.1088)	2.760 (0.1088)	2.760 (0.1088)
0.371 – 0.390 (0.0146 – 0.0154)	2.780 (0.1096)	2.780 (0.1096)	2.780 (0.1096)
0.391 – 0.410 (0.0154 – 0.0161)	2.800 (0.1104)	2.800 (0.1104)	2.800 (0.1104)
0.411 – 0.430 (0.0162 – 0.0169)	2.820 (0.1112)	2.820 (0.1112)	2.820 (0.1112)
0.431 – 0.450 (0.0170 – 0.0177)	2.840 (0.1120)	2.840 (0.1120)	2.840 (0.1120)
0.451 – 0.470 (0.0178 – 0.0185)	2.860 (0.1128)	2.860 (0.1128)	2.860 (0.1128)
0.471 – 0.490 (0.0185 – 0.0193)	2.880 (0.1136)	2.880 (0.1136)	2.880 (0.1136)
0.491 – 0.510 (0.0193 – 0.0201)	2.900 (0.1144)	2.900 (0.1144)	2.900 (0.1144)
0.511 – 0.530 (0.0201 – 0.0209)	2.920 (0.1152)	2.920 (0.1152)	2.920 (0.1152)
0.531 – 0.550 (0.0209 – 0.0217)	2.940 (0.1160)	2.940 (0.1160)	2.940 (0.1160)
0.551 – 0.570 (0.0217 – 0.0224)	2.960 (0.1168)	2.960 (0.1168)	2.960 (0.1168)
0.571 – 0.590 (0.0225 – 0.0232)	2.980 (0.1176)	2.980 (0.1176)	2.980 (0.1176)
0.591 – 0.610 (0.0233 – 0.0240)	3.000 (0.1184)	3.000 (0.1184)	3.000 (0.1184)
0.611 – 0.630 (0.0241 – 0.0248)	3.020 (0.1192)	3.020 (0.1192)	3.020 (0.1192)
0.631 – 0.650 (0.0248 – 0.0256)	3.040 (0.1200)	3.040 (0.1200)	3.040 (0.1200)
0.651 – 0.670 (0.0256 – 0.0264)	3.060 (0.1208)	3.060 (0.1208)	3.060 (0.1208)
0.671 – 0.690 (0.0264 – 0.0272)	3.080 (0.1216)	3.080 (0.1216)	3.080 (0.1216)
0.691 – 0.710 (0.0272 – 0.0280)	3.100 (0.1224)	3.100 (0.1224)	3.100 (0.1224)
0.711 – 0.730 (0.0280 – 0.0287)	3.120 (0.1232)	3.120 (0.1232)	3.120 (0.1232)
0.731 – 0.750 (0.0288 – 0.0295)	3.140 (0.1240)	3.140 (0.1240)	3.140 (0.1240)
0.751 – 0.770 (0.0296 – 0.0303)	3.160 (0.1248)	3.160 (0.1248)	3.160 (0.1248)
0.771 – 0.790 (0.0304 – 0.0311)	3.180 (0.1256)	3.180 (0.1256)	3.180 (0.1256)
0.791 – 0.810 (0.0311 – 0.0319)	3.200 (0.1264)	3.200 (0.1264)	3.200 (0.1264)
0.811 – 0.830 (0.0319 – 0.0327)	3.220 (0.1272)	3.220 (0.1272)	3.220 (0.1272)
0.831 – 0.850 (0.0327 – 0.0335)	3.240 (0.1280)	3.240 (0.1280)	3.240 (0.1280)
0.851 – 0.870 (0.0335 – 0.0343)	3.260 (0.1288)	3.260 (0.1288)	3.260 (0.1288)
0.871 – 0.890 (0.0343 – 0.0350)	3.280 (0.1296)	3.280 (0.1296)	3.280 (0.1296)
0.891 – 0.910 (0.0351 – 0.0358)	3.300 (0.1304)	3.300 (0.1304)	3.300 (0.1304)
0.911 – 0.930 (0.0359 – 0.0366)	3.320 (0.1312)	3.320 (0.1312)	3.320 (0.1312)
0.931 – 0.950 (0.0367 – 0.0374)	3.340 (0.1320)	3.340 (0.1320)	3.340 (0.1320)
0.951 – 0.970 (0.0374 – 0.0382)	3.360 (0.1328)	3.360 (0.1328)	3.360 (0.1328)
0.971 – 0.990 (0.0382 – 0.0390)	3.380 (0.1336)	3.380 (0.1336)	3.380 (0.1336)
0.991 – 1.010 (0.0390 – 0.0398)	3.400 (0.1344)	3.400 (0.1344)	3.400 (0.

Intake valve clearance (Cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)
EXAMPLE:

ENGINE MECHANICAL – VALVE CLEARANCE

Adjusting Shim Selection Chart (Exhaust)

Installed shim thickness mm (in.)		Measured clearance mm (in.)		New shim thickness mm (in.)		Shim No.		Thickness		Shim No.		Thickness			
0.000 – 0.030 (0.000 – 0.012)		2.500 (0.0984)		0.000 – 0.030 (0.000 – 0.012)		2.500 (0.0984)		1		2.500 (0.0984)		10		2.950 (0.1161)	
0.031 – 0.050 (0.012 – 0.020)		2.550 (0.1004)		0.031 – 0.050 (0.012 – 0.020)		2.550 (0.1004)		2		2.550 (0.1004)		11		3.000 (0.1181)	
0.051 – 0.070 (0.020 – 0.028)		2.600 (0.1024)		0.051 – 0.070 (0.020 – 0.028)		2.600 (0.1024)		3		2.600 (0.1024)		12		3.050 (0.1201)	
0.071 – 0.090 (0.028 – 0.035)		2.650 (0.1043)		0.071 – 0.090 (0.028 – 0.035)		2.650 (0.1043)		4		2.650 (0.1043)		13		3.100 (0.1220)	
0.091 – 0.110 (0.036 – 0.043)		2.700 (0.1063)		0.091 – 0.110 (0.036 – 0.043)		2.700 (0.1063)		5		2.700 (0.1063)		14		3.150 (0.1240)	
0.111 – 0.130 (0.044 – 0.051)		2.750 (0.1083)		0.111 – 0.130 (0.044 – 0.051)		2.750 (0.1083)		6		2.750 (0.1083)		15		3.200 (0.1260)	
0.131 – 0.150 (0.052 – 0.059)		2.800 (0.1103)		0.131 – 0.150 (0.052 – 0.059)		2.800 (0.1103)		7		2.800 (0.1102)		16		3.250 (0.1280)	
0.151 – 0.170 (0.059 – 0.067)		2.850 (0.1123)		0.151 – 0.170 (0.059 – 0.067)		2.850 (0.1122)		8		2.850 (0.1122)		17		3.300 (0.1299)	
0.171 – 0.190 (0.067 – 0.075)		2.900 (0.1143)		0.171 – 0.190 (0.067 – 0.075)		2.900 (0.1142)		9		2.900 (0.1142)					
0.191 – 0.210 (0.075 – 0.083)		2.950 (0.1163)		0.191 – 0.210 (0.075 – 0.083)											
0.211 – 0.230 (0.083 – 0.091)		3.000 (0.1183)		0.211 – 0.230 (0.083 – 0.091)											
0.231 – 0.249 (0.091 – 0.098)		3.050 (0.1203)		0.231 – 0.249 (0.091 – 0.098)											
0.250 – 0.350 (0.098 – 0.0138)		3.100 (0.1223)		0.250 – 0.350 (0.098 – 0.0138)											
0.351 – 0.370 (0.138 – 0.0146)		3.150 (0.1243)		0.351 – 0.370 (0.138 – 0.0146)											
0.371 – 0.390 (0.146 – 0.0154)		3.200 (0.1263)		0.371 – 0.390 (0.146 – 0.0154)											
0.391 – 0.410 (0.154 – 0.0161)		3.250 (0.1283)		0.391 – 0.410 (0.154 – 0.0161)											
0.411 – 0.430 (0.162 – 0.0169)		3.300 (0.1303)		0.411 – 0.430 (0.162 – 0.0169)											
0.431 – 0.450 (0.170 – 0.0177)		3.350 (0.1323)		0.431 – 0.450 (0.170 – 0.0177)											
0.451 – 0.470 (0.178 – 0.0185)		3.400 (0.1343)		0.451 – 0.470 (0.178 – 0.0185)											
0.471 – 0.490 (0.185 – 0.0193)		3.450 (0.1363)		0.471 – 0.490 (0.185 – 0.0193)											
0.491 – 0.510 (0.193 – 0.0201)		3.500 (0.1383)		0.491 – 0.510 (0.193 – 0.0201)											
0.511 – 0.530 (0.201 – 0.0209)		3.550 (0.1403)		0.511 – 0.530 (0.201 – 0.0209)											
0.531 – 0.550 (0.209 – 0.0217)		3.600 (0.1423)		0.531 – 0.550 (0.209 – 0.0217)											
0.551 – 0.570 (0.217 – 0.0224)		3.650 (0.1443)		0.551 – 0.570 (0.217 – 0.0224)											
0.571 – 0.590 (0.225 – 0.0232)		3.700 (0.1463)		0.571 – 0.590 (0.225 – 0.0232)											
0.591 – 0.610 (0.233 – 0.0240)		3.750 (0.1483)		0.591 – 0.610 (0.233 – 0.0240)											
0.611 – 0.630 (0.241 – 0.0248)		3.800 (0.1503)		0.611 – 0.630 (0.241 – 0.0248)											
0.631 – 0.650 (0.248 – 0.0256)		3.850 (0.1523)		0.631 – 0.650 (0.248 – 0.0256)											
0.651 – 0.670 (0.256 – 0.0264)		3.900 (0.1543)		0.651 – 0.670 (0.256 – 0.0264)											
0.671 – 0.690 (0.264 – 0.0272)		3.950 (0.1563)		0.671 – 0.690 (0.264 – 0.0272)											
0.691 – 0.710 (0.272 – 0.0280)		4.000 (0.1583)		0.691 – 0.710 (0.272 – 0.0280)											
0.711 – 0.730 (0.280 – 0.0287)		4.050 (0.1603)		0.711 – 0.730 (0.280 – 0.0287)											
0.731 – 0.750 (0.288 – 0.0295)		4.100 (0.1623)		0.731 – 0.750 (0.288 – 0.0295)											
0.751 – 0.770 (0.296 – 0.0303)		4.150 (0.1643)		0.751 – 0.770 (0.296 – 0.0303)											
0.771 – 0.790 (0.304 – 0.0311)		4.200 (0.1663)		0.771 – 0.790 (0.304 – 0.0311)											
0.791 – 0.810 (0.311 – 0.0319)		4.250 (0.1683)		0.791 – 0.810 (0.311 – 0.0319)											
0.811 – 0.830 (0.319 – 0.0327)		4.300 (0.1703)		0.811 – 0.830 (0.319 – 0.0327)											
0.831 – 0.850 (0.327 – 0.0335)		4.350 (0.1723)		0.831 – 0.850 (0.327 – 0.0335)											
0.851 – 0.870 (0.335 – 0.0343)		4.400 (0.1743)		0.851 – 0.870 (0.335 – 0.0343)											
0.871 – 0.890 (0.343 – 0.0350)		4.450 (0.1763)		0.871 – 0.890 (0.343 – 0.0350)											
0.891 – 0.910 (0.351 – 0.0358)		4.500 (0.1783)		0.891 – 0.910 (0.351 – 0.0358)											
0.911 – 0.930 (0.359 – 0.0366)		4.550 (0.1803)		0.911 – 0.930 (0.359 – 0.0366)											
0.931 – 0.950 (0.367 – 0.0374)		4.600 (0.1823)		0.931 – 0.950 (0.367 – 0.0374)											
0.951 – 0.970 (0.374 – 0.0382)		4.650 (0.1843)		0.951 – 0.970 (0.374 – 0.0382)											
0.971 – 0.990 (0.382 – 0.0390)		4.700 (0.1863)		0.971 – 0.990 (0.382 – 0.0390)											
0.991 – 1.010 (0.390 – 0.0398)		4.750 (0.1883)		0.991 – 1.010 (0.390 – 0.0398)											
1.011 – 1.030 (0.398 – 0.0406)		4.800 (0.1903)		1.011 – 1.030 (0.398 – 0.0406)											
1.031 – 1.050 (0.406 – 0.0413)		4.850 (0.1923)		1.031 – 1.050 (0.406 – 0.0413)											
1.051 – 1.070 (0.414 – 0.0421)		4.900 (0.1943)		1.051 – 1.070 (0.414 – 0.0421)											
1.071 – 1.090 (0.422 – 0.0429)		4.950 (0.1963)		1.071 – 1.090 (0.422 – 0.0429)											
1.091 – 1.110 (0.430 – 0.0437)		5.000 (0.1983)		1.091 – 1.110 (0.430 – 0.0437)											
1.111 – 1.130 (0.437 – 0.0445)		5.050 (0.2003)		1.111 – 1.130 (0.437 – 0.0445)											
1.131 – 1.150 (0.445 – 0.0453)		5.100 (0.2023)		1.131 – 1.150 (0.445 – 0.0453)											

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 0.440 mm
(0.0173 in.). Replace the 2.800 mm (0.1102
in.) shim with a No. 10 shim

HINT: New shims have the thickness in
millimeter imprinted on the face

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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 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

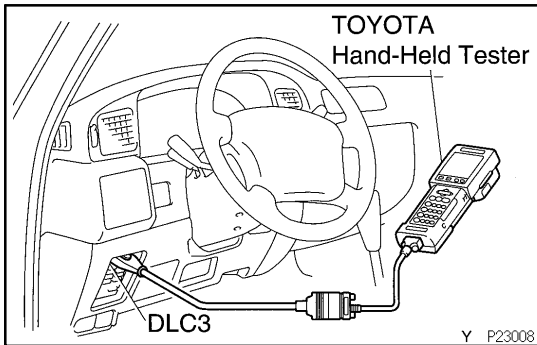
IGNITION TIMING INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

- (a) Remove the fuse cover on the instrument panel.



- (b) Connect the TOYOTA hand-held tester or OBD II scan tool to the DLC3.

- (c) Please refer to the TOYOTA hand-held tester or OBD II scan tool operator's manual for further details.

3. CONNECT TIMING LIGHT TO ENGINE

4. CHECK IDLE SPEED

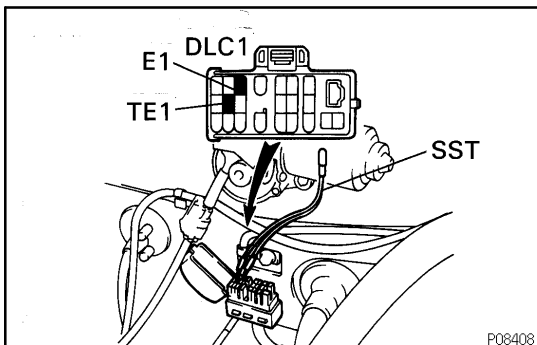
- (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.

- (b) Check the idle speed.

Idle speed: 650 ± 50 rpm

5. INSPECT AND ADJUST IGNITION TIMING

- (a) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843-18020



- (b) Using a timing light, check the ignition timing.

Ignition timing: 3° BTDC @ idle

(Transmission in neutral position and A/C OFF)

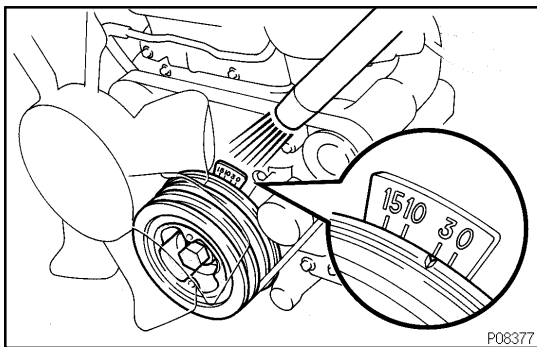
- (c) Loosen the hold-down bolt, and adjust by turning the distributor.

- (d) Tighten the hold-down bolt, and recheck the ignition timing.

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

- (e) Remove the SST from the DLC1.

SST 09843-18020



6. FURTHER CHECK IGNITION TIMING

Ignition timing: 2 – 13° BTDC @ idle

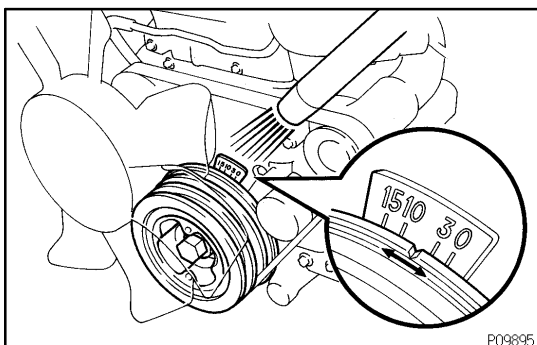
(Transmission in neutral position and A/C OFF)

HINT:

The timing mark moves in a range between 2° and 13°.

7. DISCONNECT TIMING LIGHT FROM ENGINE

8. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL



IDLE SPEED INSPECTION

EMOKU-05

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.
- (i) Air conditioning switched OFF.

2. CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL (See page [EM-10](#))

3. INSPECT IDLE SPEED

- (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
- (b) Check the idle speed.

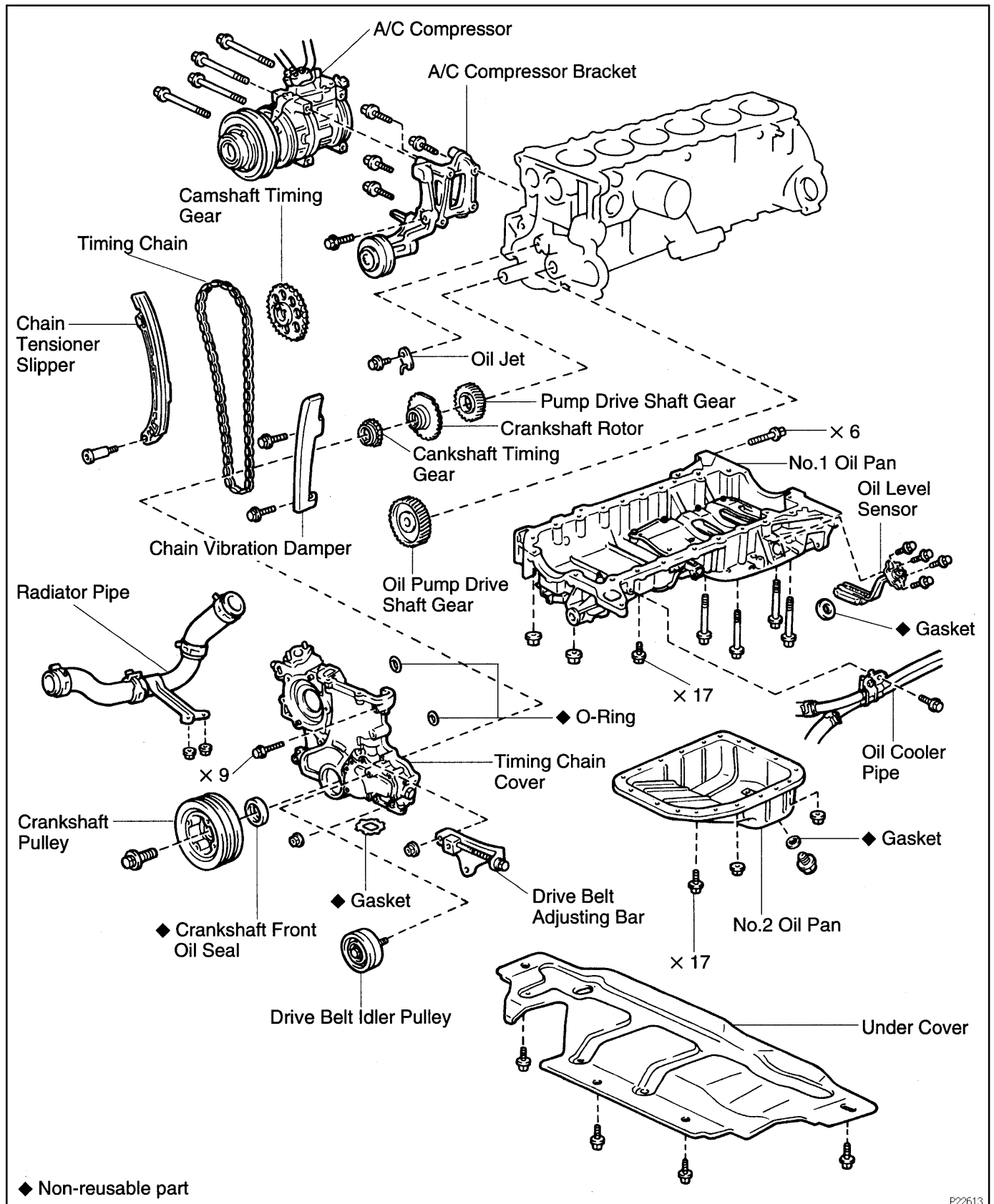
Idle speed: 650 ± 50 rpm

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

4. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

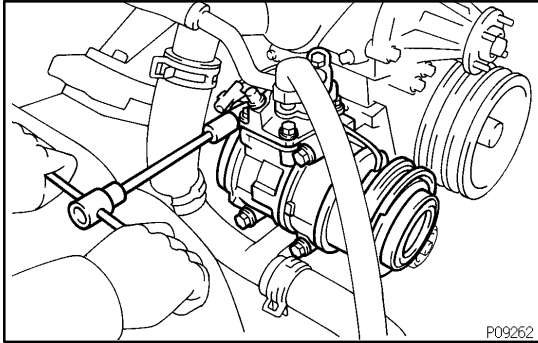
TIMING CHAIN COMPONENTS

EM1E8-01



REMOVAL

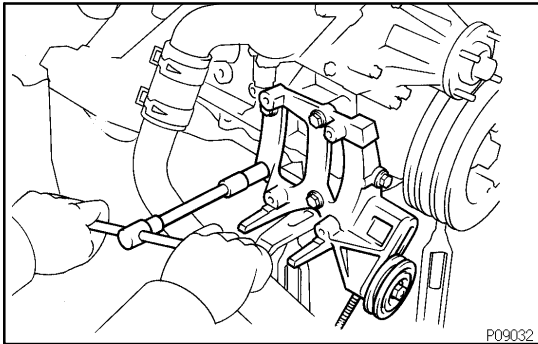
1. DRAIN ENGINE OIL
2. DRAIN ENGINE COOLANT
3. REMOVE ENGINE UNDER COVER
4. REMOVE RADIATOR (See page [CO-14](#))



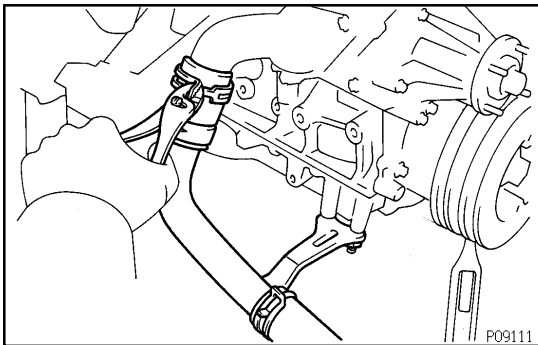
5. **DISCONNECT A/C COMPRESSOR AND BRACKET**
 - (a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
 - (b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket.

HINT:

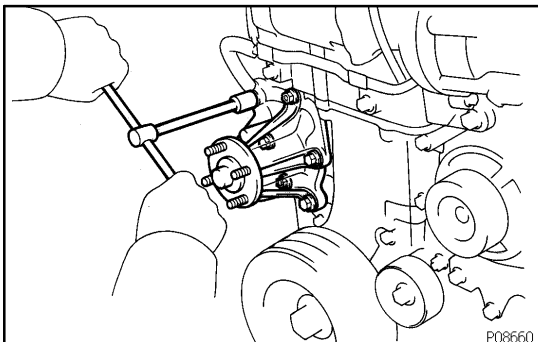
Put aside the compressor, and suspend it.



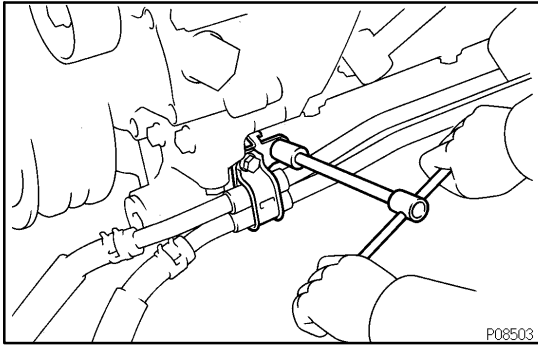
- (c) Remove the 5 bolts and A/C compressor bracket.



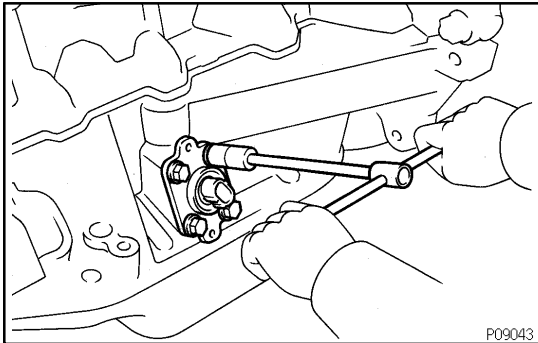
6. **REMOVE RADIATOR PIPE**
 - (a) Disconnect the No. 2 radiator hose from the water inlet.
 - (b) Remove the 2 nuts and radiator pipe.



7. **REMOVE WATER PUMP**
Remove the 4 bolts, 2 nuts, water pump and gasket.
8. **REMOVE CYLINDER HEAD** (See page [EM-28](#))

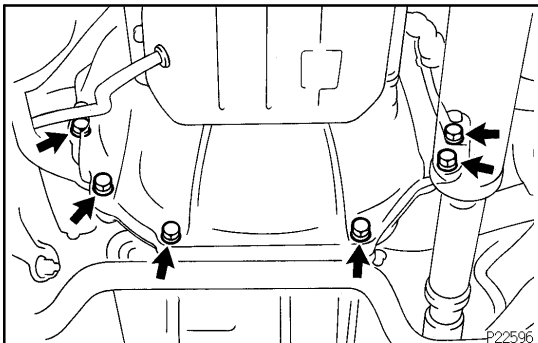


9. DISCONNECT OIL COOLER PIPE BRACKET FROM NO. 1 OIL PAN



10. REMOVE OIL LEVEL SENSOR

- (a) Remove the 4 bolts and level sensor.
- (b) Remove the gasket from the level sensor.

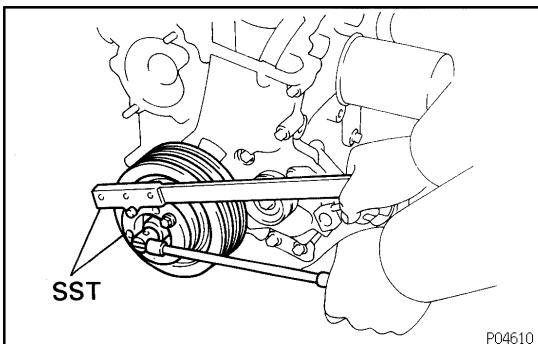


11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING

Remove the 6 bolts.

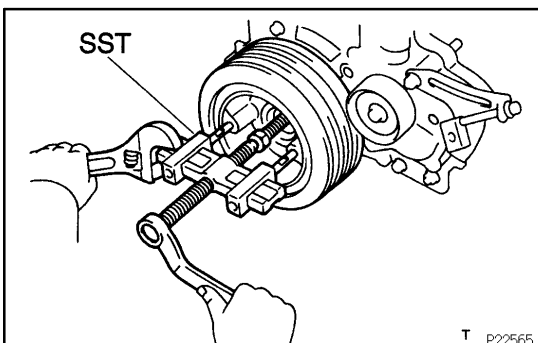
12. REMOVE NO. 2 OIL PAN (See page LU-5)

13. REMOVE NO. 1 OIL PAN (See page LU-5)



14. REMOVE CRANKSHAFT PULLEY

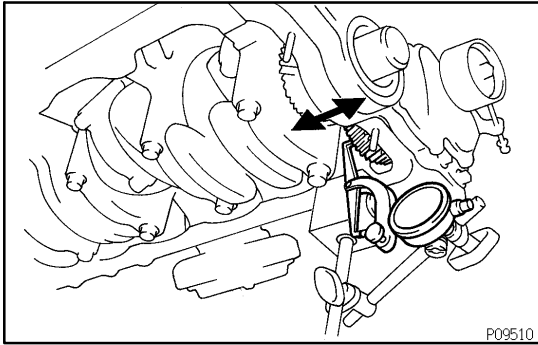
- (a) Using SST, remove the pulley bolt.
SST 09213-58012, 09330-00021
- (b) Remove the crankshaft pulley.



HINT:

If necessary, remove the pulley with SST.

SST 09950-50010 (09951-05010, 09952-05010, 09953-05010, 09953-05020, 09954-05020)



15. CHECK THRUST CLEARANCE OF OIL PUMP DRIVE SHAFT GEAR

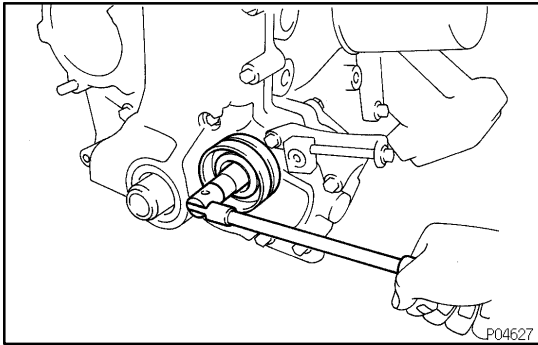
Using a dial indicator with lever type attachment, measure the thrust clearance.

Standard thrust clearance:

0.040 – 0.160 mm (0.0016 – 0.0063 in.)

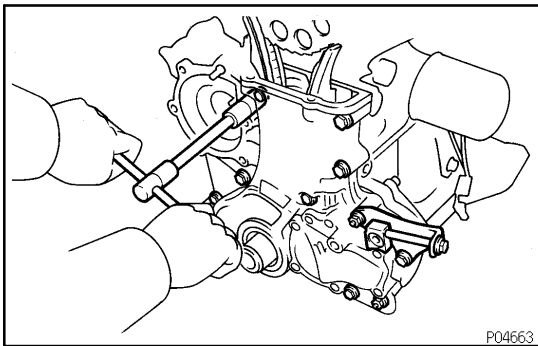
Maximum thrust clearance: 0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the oil pump drive shaft gear and/or timing chain cover.



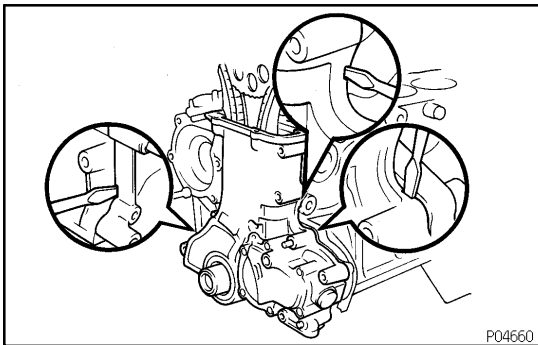
16. REMOVE DRIVE BELT IDLER PULLEY

Remove the bolt and idler pulley.



17. REMOVE TIMING CHAIN COVER

- (a) Remove the 9 mounting bolts, 2 mounting nuts and drive belt adjusting bar.

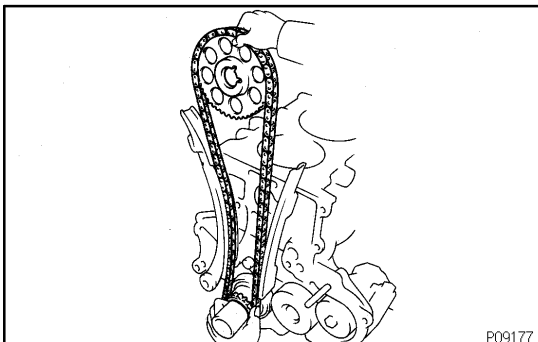


- (b) Remove the oil pump by prying the portions between the cylinder block and oil pump with a screwdriver.

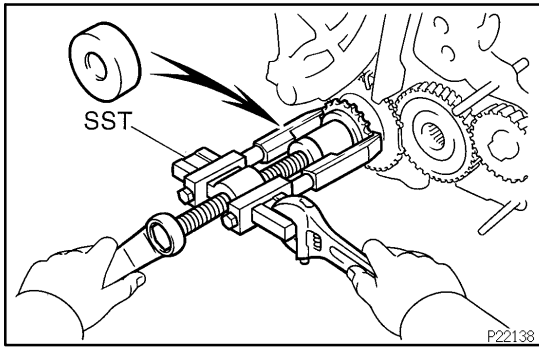
NOTICE:

Be careful not to damage the contact surfaces of the cylinder block and oil pump.

- (c) Remove the O-rings from the oil pump.
- (d) Remove the gasket from the oil pump.

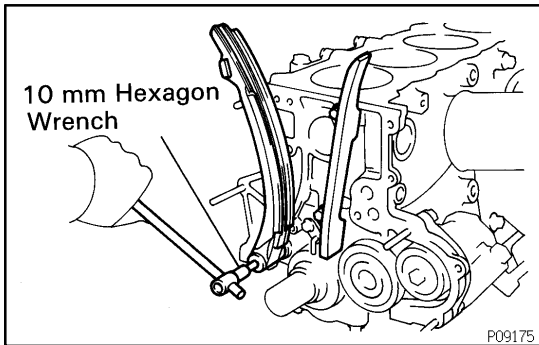


18. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR

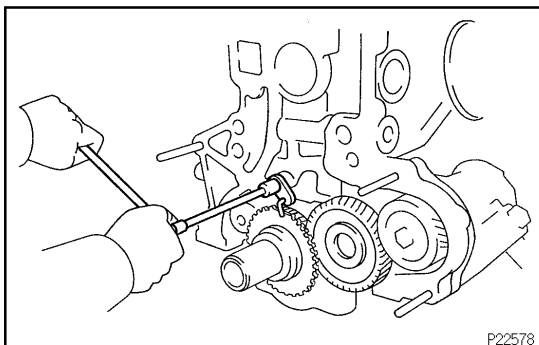
**19. REMOVE CRANKSHAFT TIMING GEAR****HINT:**

If necessary, remove the gear with SST.

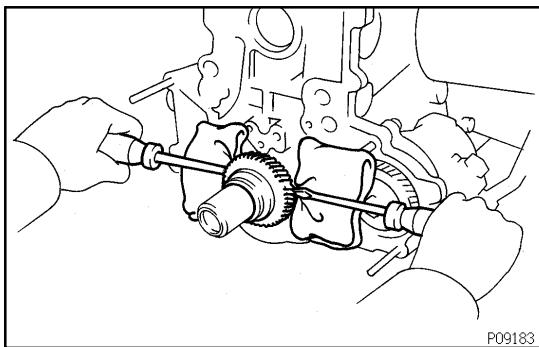
SST 09950-40010 (09951-04010, 09952-04010, 09953-04020, 09954-04010, 09955-04060), 09950-60010 (09951-00350)

**20. REMOVE CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER**

- (a) Using a 10 mm hexagon wrench, remove the bolt and slipper.
- (b) Remove the 2 bolts and damper.

**21. REMOVE OIL JET**

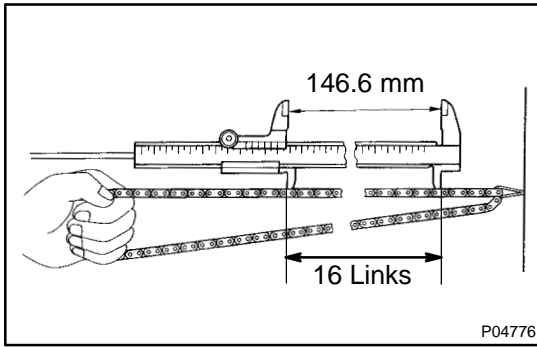
Remove the bolt and oil jet.

22. REMOVE CRANKSHAFT ROTOR**23. REMOVE OIL PUMP DRIVE SHAFT GEAR****24. REMOVE PUMP DRIVE SHAFT GEAR**

If the pump drive shaft gear cannot be removed by hand, use 2 screwdrivers.

NOTICE:

Position shop rags as shown to prevent damage.



INSPECTION

1. INSPECT TIMING CHAIN AND TIMING GEARS

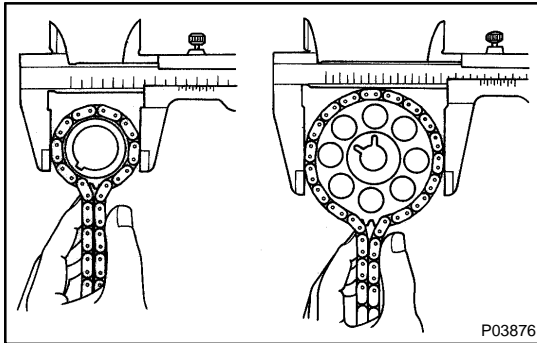
- (a) Measure the length of 16 links with the chain fully stretched.

Maximum chain elongation: 146.6 mm (5.772 in.)

If the elongation is greater than maximum, replace the chain.

HINT:

Make the same measurements pulling at 3 or more places selected at random.



- (b) Wrap the chain around the timing gear.

- (c) Using vernier calipers, measure the timing gear diameter with the chain.

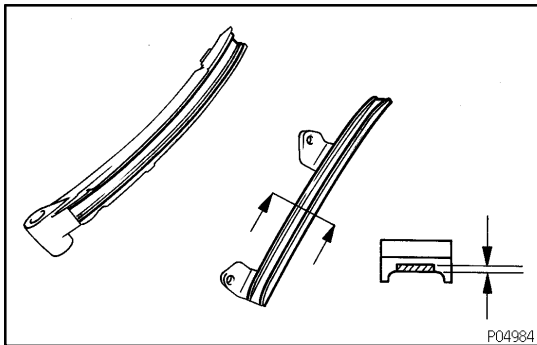
NOTICE:

Vernier calipers must contact the chain rollers for measuring.

Minimum gear diameter (w/Chain):

Camshaft	126.0 mm (4.961 in.)
Crankshaft	65.4 mm (2.575 in.)

If the diameter is less than minimum, replace the chain and gears.

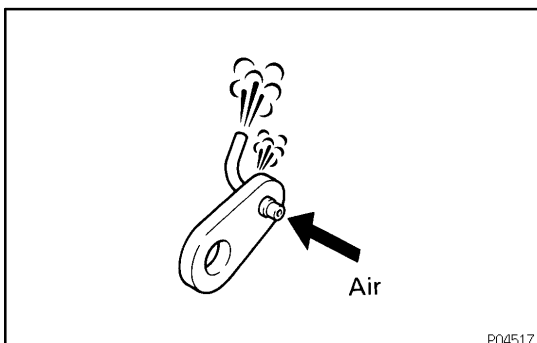


2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

Measure the chain tensioner slipper and vibration damper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper and/or damper.



3. INSPECT OIL JET

Check the oil jet for damage or clogging.

If necessary, replace the oil jet.

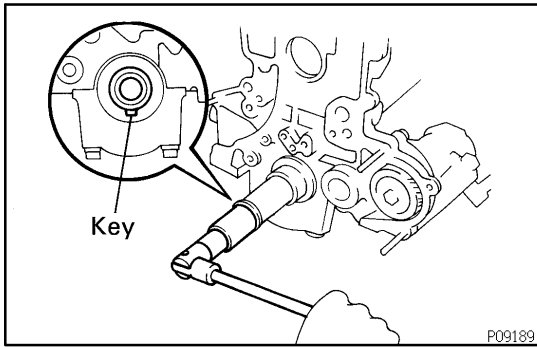
EM-18

ENGINE MECHANICAL – TIMING CHAIN

EM1QS-01

REPLACEMENT

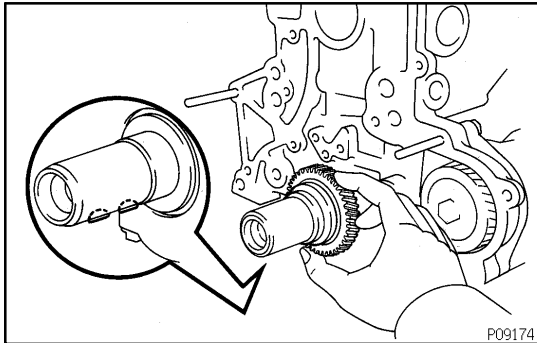
REPLACE CRANKSHAFT FRONT OIL SEAL (See page [EM-99](#))



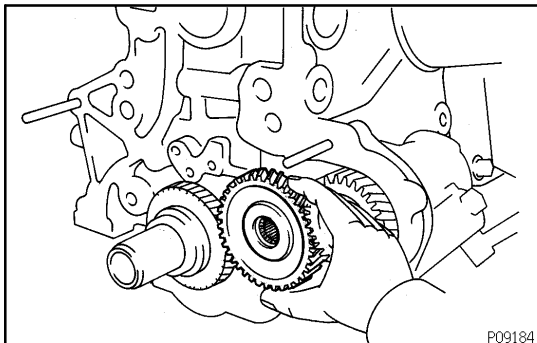
INSTALLATION

1. SET CRANKSHAFT

Turn the crankshaft until the set key on crankshaft facing downward.

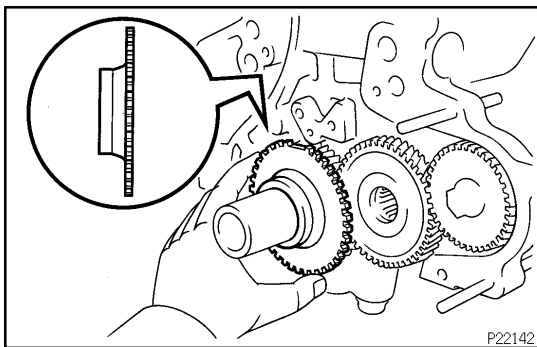


2. INSTALL PUMP DRIVE SHAFT GEAR



3. INSTALL OIL PUMP DRIVE SHAFT GEAR

- (a) Apply a light coat of engine oil on the shaft portion of the gear.
- (b) Install the gear.

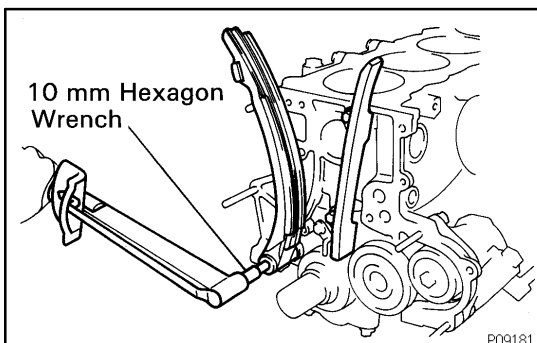


4. INSTALL CRANKSHAFT ROTOR

5. INSTALL OIL JET

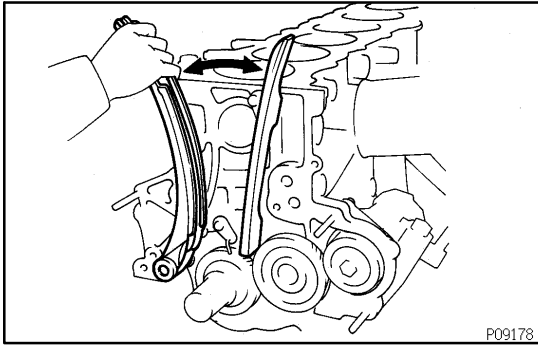
Install the oil jet with the bolt.

Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)

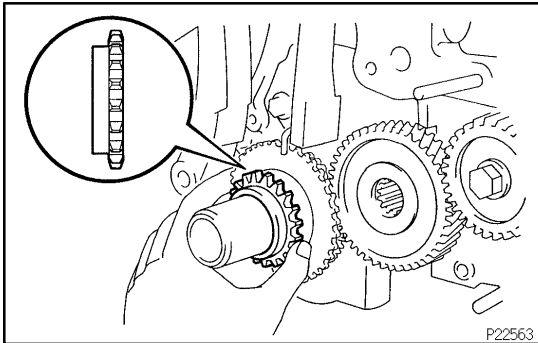


6. INSTALL CHAIN TENSIONER SLIPPER AND VIBRATION DAMPER

- (a) Install the damper with the 2 bolts.
Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)
- (b) Using a 10 mm hexagon wrench, install the slipper with the bolt.
Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)



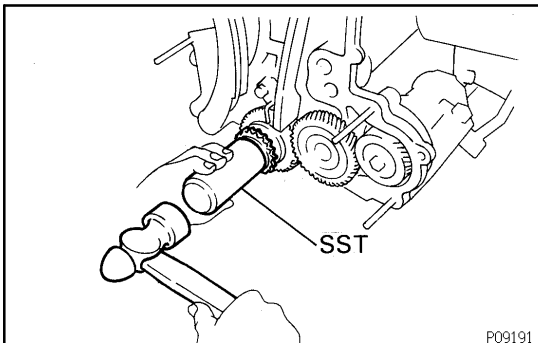
- (c) Check that the slider moves smoothly.



7. INSTALL CRANKSHAFT TIMING GEAR

NOTICE:

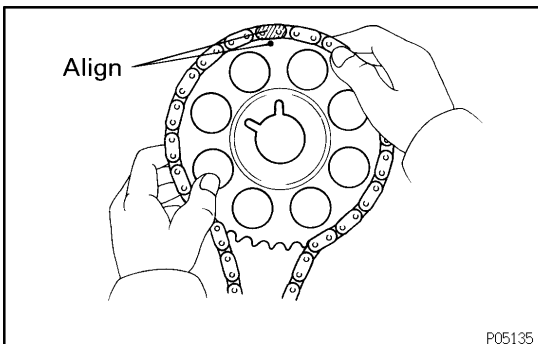
Be careful of the installation direction.



HINT:

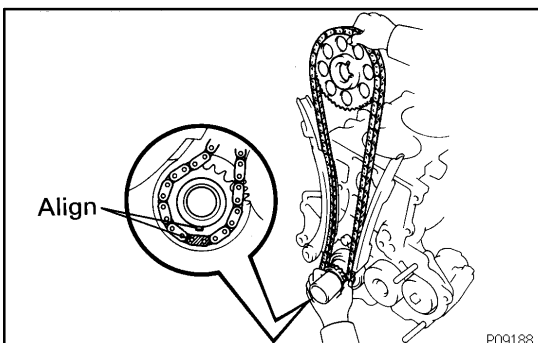
If necessary, install the gear with SST.

SST 09636-20010

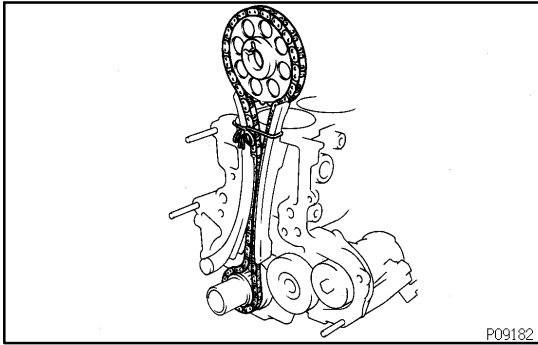


8. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR

- (a) Install the timing chain on the camshaft timing gear with the bright link aligned with the timing mark on the camshaft timing gear.



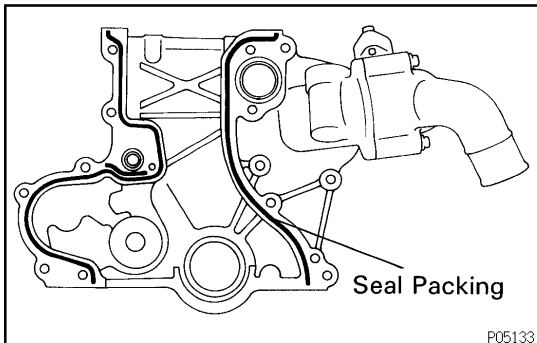
- (b) Install the timing chain on the crankshaft timing gear with the other bright link aligned with the timing mark on the crankshaft timing gear.



- (c) Tie the timing chain with a cord as shown in the illustration and make sure it doesn't come loose.

9. INSTALL TIMING CHAIN COVER

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the timing chain cover 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 timing chain cover as shown in the illustration.

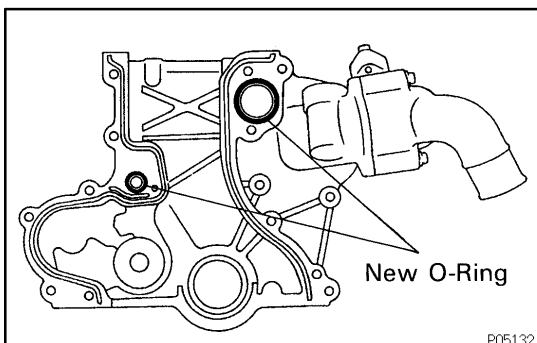
Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

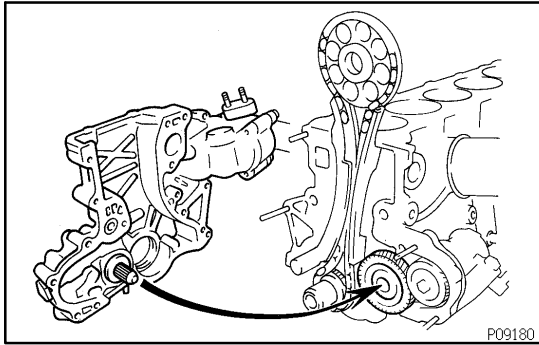
HINT:

Avoid applying an excessive amount to the surface.

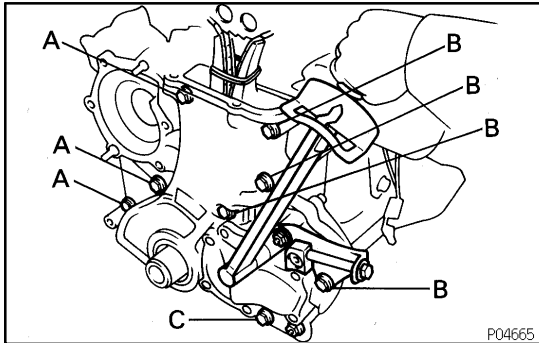
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



- (c) Place 2 new O-rings in position on the timing chain cover.



- (d) Engage the gear of the oil pump drive rotor with the gear of the oil pump drive gear, and install the oil pump.



- (e) Install the oil pump and drive belt adjusting bar with the 9 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

HINT:

Each bolt length is indicated in the illustration.

Bolt A: 30 mm (1.18 in.)

Bolt B: 50 mm (1.97 in.)

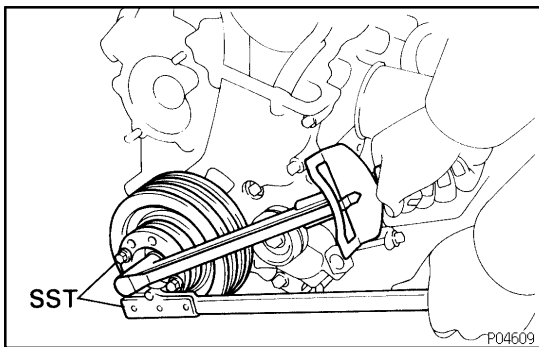
Bolt C: 60 mm (2.38 in.)

- (f) Remove the cord from the chain.

10. INSTALL DRIVE BELT IDLER PULLEY

Install the pulley with the bolt.

Torque: 43 N·m (440 kgf-cm, 32 ft-lbf)



11. 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 and torque the pulley bolt.

SST 09213-58012, 09330-00021

Torque: 412 N·m (4,200 kgf-cm, 304 ft-lbf)

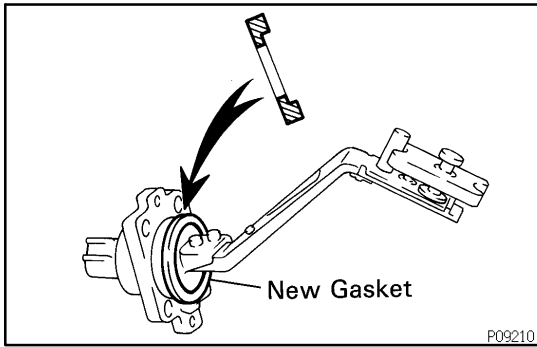
12. INSTALL NO. 1 OIL PAN (See page LU-12)

13. INSTALL NO. 2 OIL PAN (See page LU-12)

14. INSTALL BOLTS HOLDING NO. 1 OIL PAN TO TRANSMISSION HOUSING

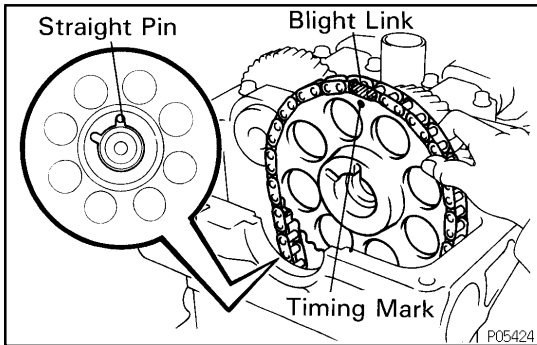
Install the 6 bolts.

Torque: 72 N·m (730 kgf-cm, 53 ft-lbf)

**15. INSTALL OIL LEVEL SENSOR**

- (a) Install a new gasket to the level sensor.
- (b) Install the level sensor with the 4 bolts.

Torque: 5.4 N·m (55 kgf-cm, 48 in.-lbf)

16. CONNECT OIL COOLER PIPE BRACKET TO NO. 1 OIL PAN**17. INSTALL CYLINDER HEAD (See page [EM-54](#))****NOTICE:**

However, for the installation of the camshaft timing gear and timing chain, follow the below procedure. Align the blight link of the timing chain and camshaft timing gear mark, and install them to the camshaft.

18. INSTALL WATER PUMP

Install a new gasket and water pump with the 4 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

19. INSTALL RADIATOR PIPE

- (a) Connect the No.2 radiator hose to the water inlet.
- (b) Install the 2 nuts holding the radiator pipe to the No.1 oil pan.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

20. INSTALL A/C COMPRESSOR AND BRACKET

- (a) Install the A/C compressor bracket with the 5 bolts.

Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

- (b) Install the A/C compressor with the 4 bolts.

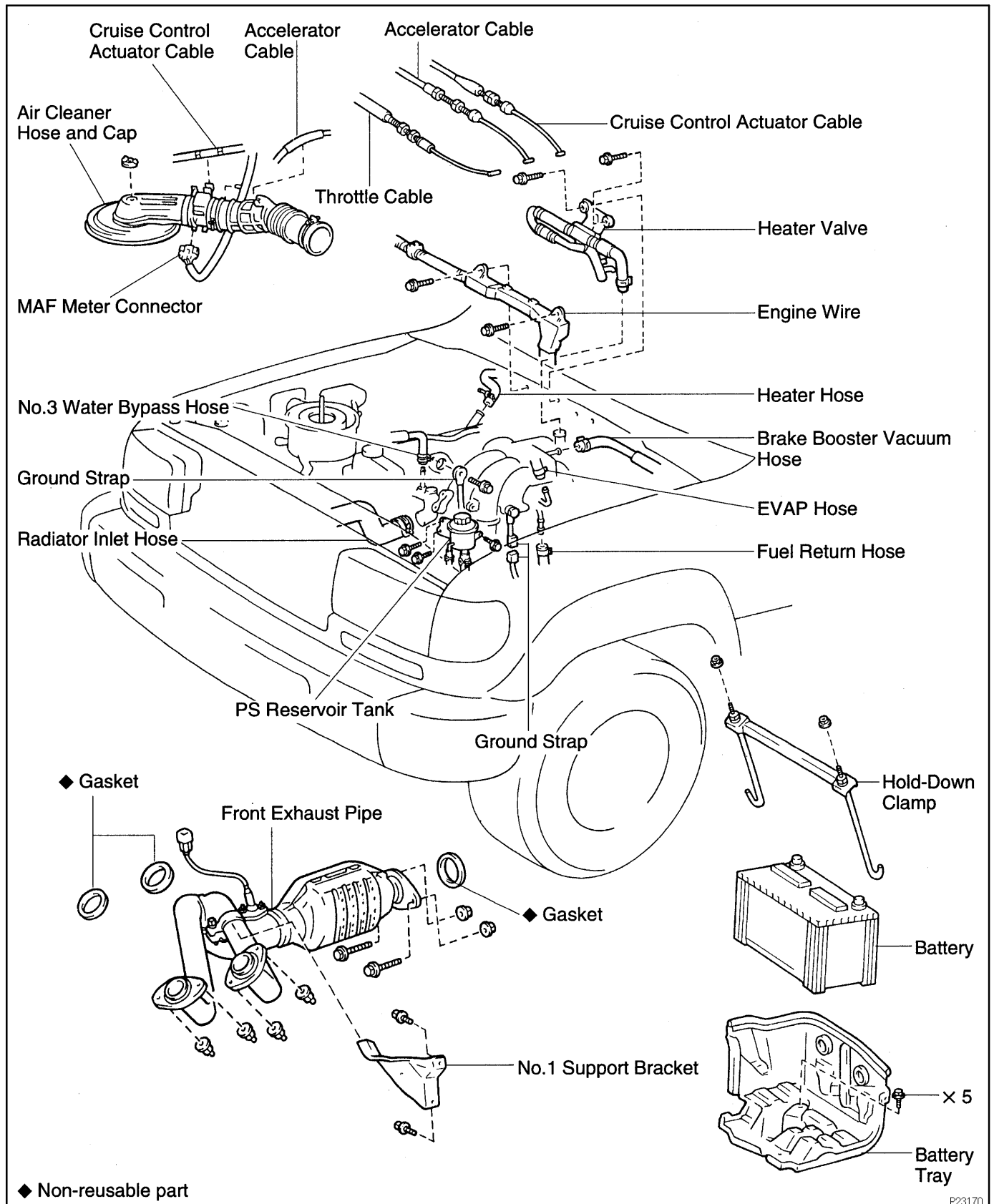
Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

- (c) Install and adjust the drive belt (See page [CH-2](#)).

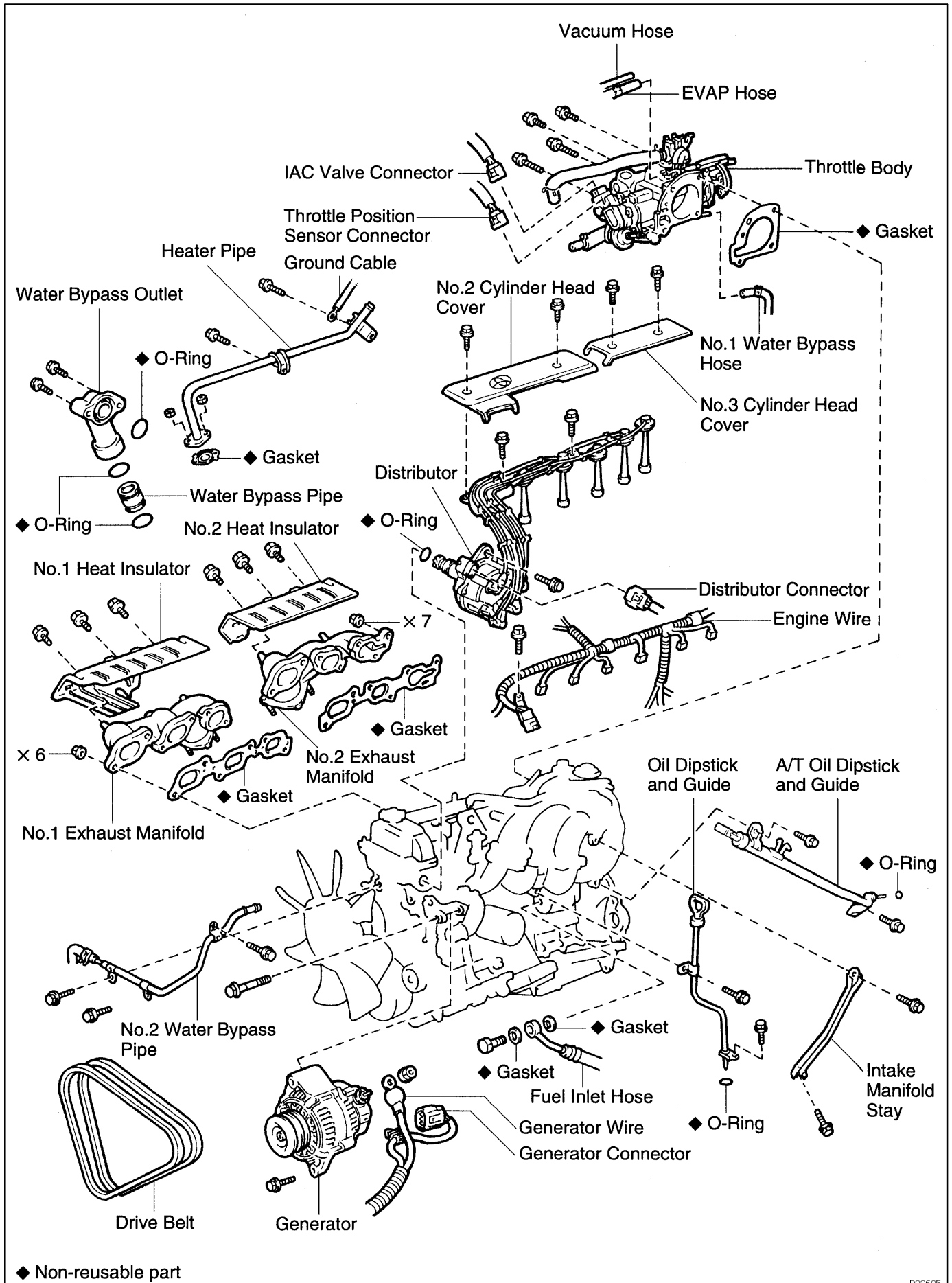
21. INSTALL RADIATOR (See page [CO-16](#))**22. FILL ENGINE WITH OIL****23. INSTALL ENGINE UNDER COVER****24. START ENGINE AND CHECK FOR LEAKS**

CYLINDER HEAD COMPONENTS

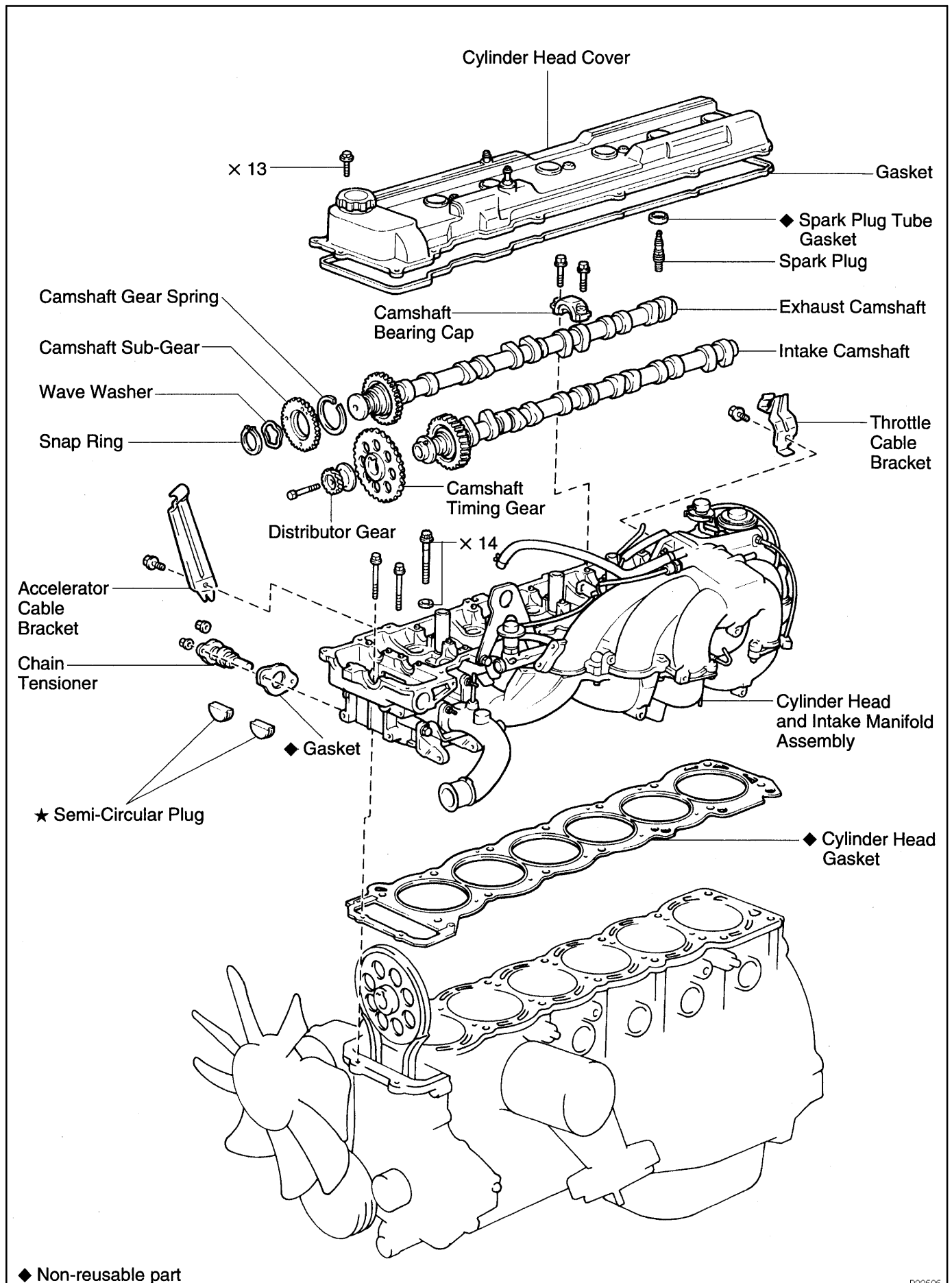
EM1E2-01



ENGINE MECHANICAL - CYLINDER HEAD

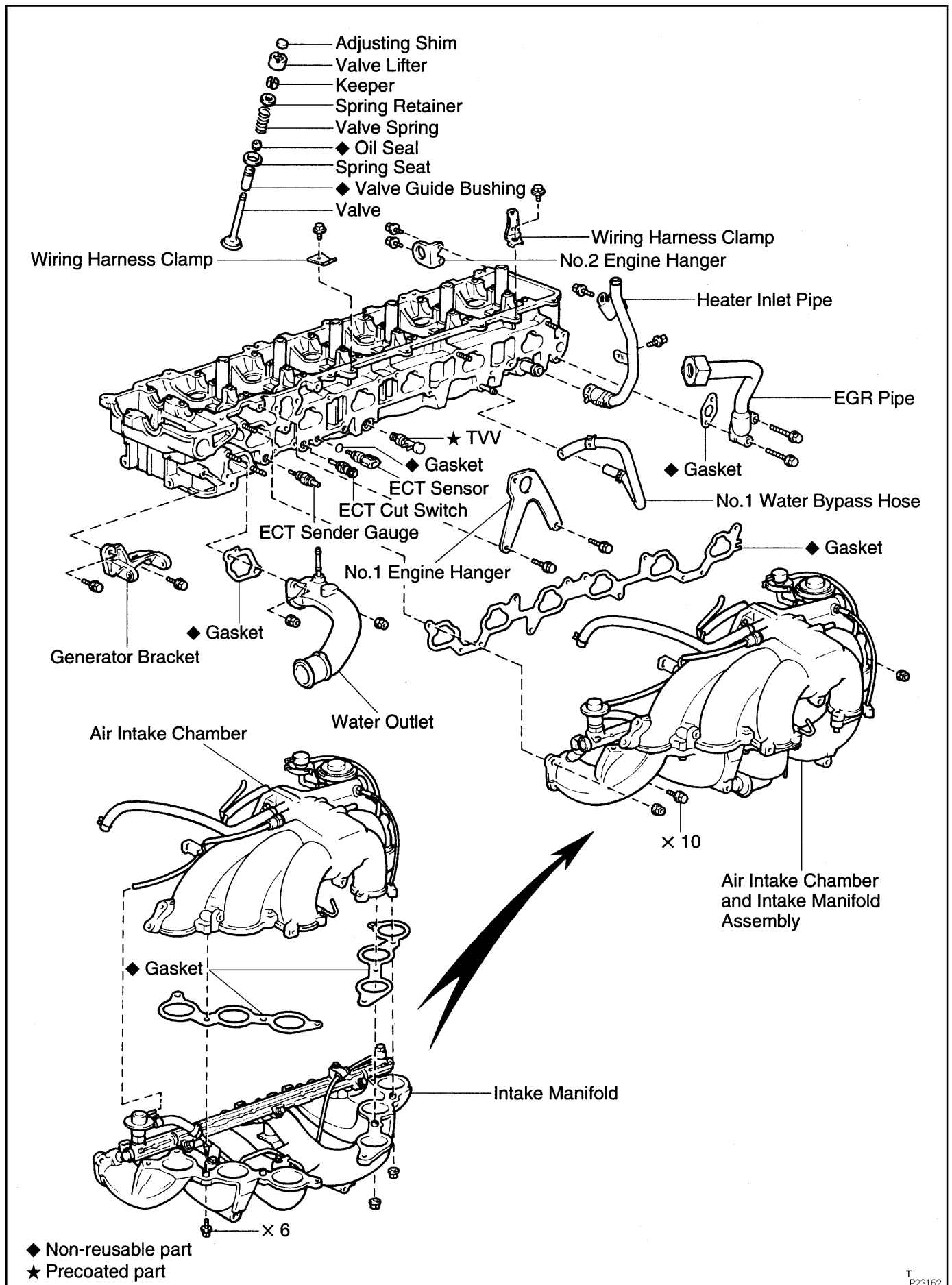


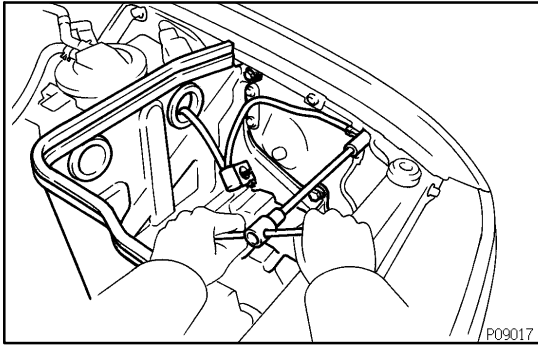
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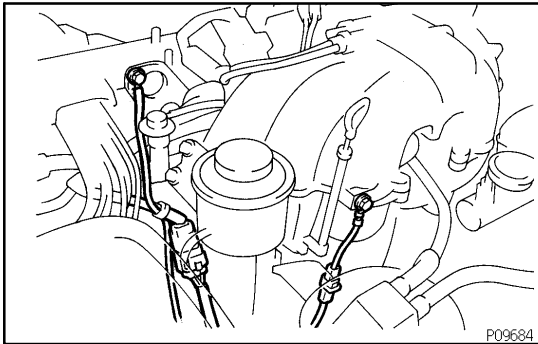
ENGINE MECHANICAL - CYLINDER HEAD

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P23162

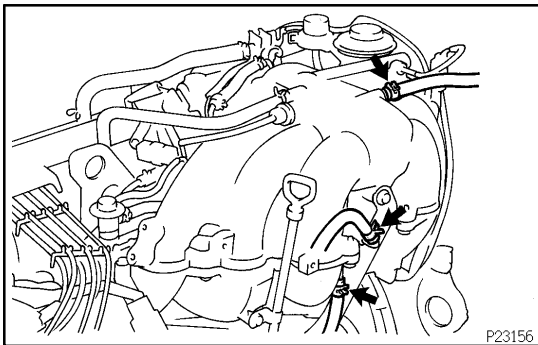


REMOVAL

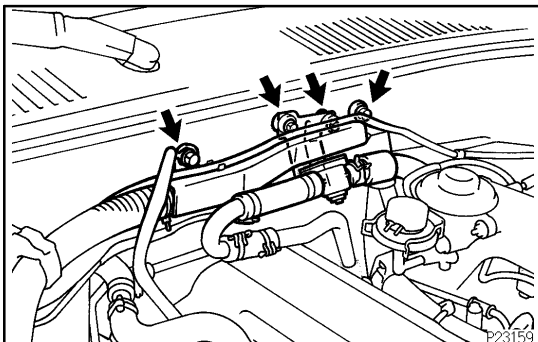
1. **DRAIN ENGINE COOLANT**
2. **REMOVE BATTERY AND BATTERY TRAY**
 - (a) Disconnect the battery cables.
 - (b) Remove the nuts, hold-down clamp and battery.
 - (c) Remove the bolt and disconnect the ground strap.
 - (d) Remove the 5 bolts and battery tray.
3. **REMOVE AIR CLEANER HOSE AND CAP**
4. **DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY**
5. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY**
6. **DISCONNECT THROTTLE CABLE FROM THROTTLE BODY**



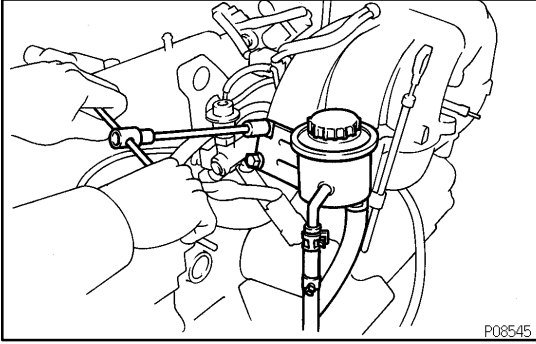
7. **DISCONNECT ENGINE GROUND STRAPS**
 - (a) Disconnect the ground strap from the No. 1 engine hangar.
 - (b) Disconnect the ground strap from the air intake chamber.
8. **DISCONNECT CONNECTOR ON INTAKE MANIFOLD FROM LH FENDER APRON**



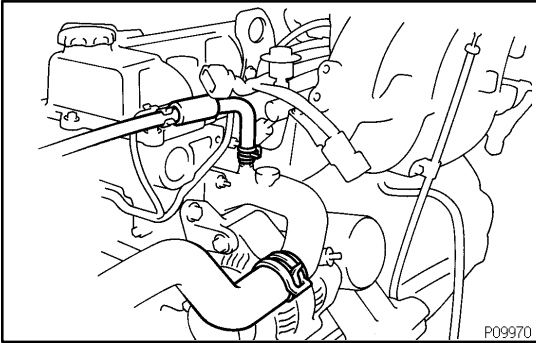
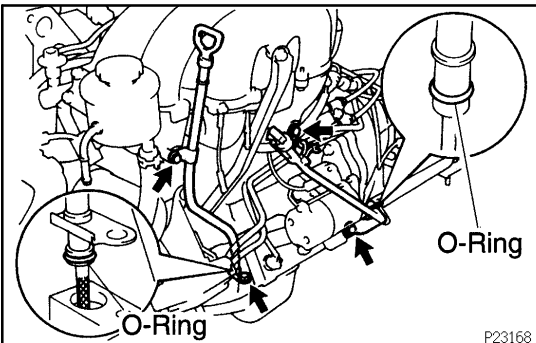
9. **DISCONNECT BRAKE BOOSTER VACUUM HOSE**
10. **DISCONNECT EVAP HOSE**
11. **DISCONNECT FUEL RETURN HOSE**
12. **DISCONNECT HEATER HOSES**



13. **DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL**
 - (a) Remove the 2 bolts and disconnect the engine wire and ground strap.
 - (b) Remove the 2 bolts and disconnect the heater valve.
14. **REMOVE NO. 2 AND NO. 3 CYLINDER HEAD COVERS**
Remove the 4 bolts and head covers.
15. **REMOVE DISTRIBUTOR (See page IG-10)**

**16. DISCONNECT PS RESERVOIR TANK**

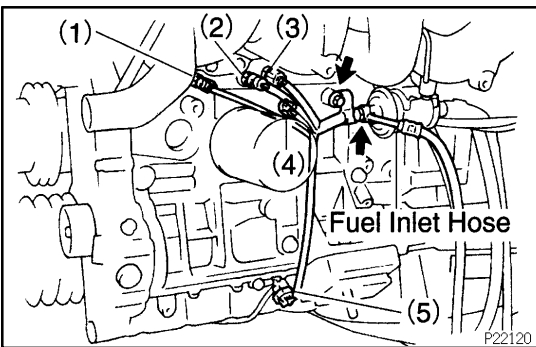
Remove the 3 bolts and disconnect the reservoir tank.

**17. DISCONNECT RADIATOR INLET HOSE****18. DISCONNECT NO. 3 WATER BYPASS HOSE****19. REMOVE GENERATOR (See page CH-8)****20. REMOVE THROTTLE BODY (See page SF-45)****21. REMOVE OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION**

- (a) Remove the 2 mounting bolts.
- (b) Pull out the dipstick together with dipstick guide.
- (c) Remove the O-ring from the dipstick guide.

22. REMOVE INTAKE MANIFOLD STAY

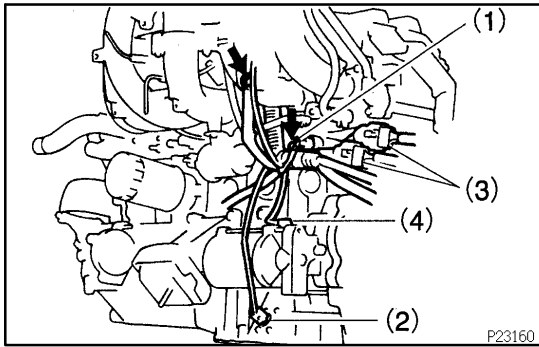
Remove the 2 bolts and intake manifold stay.

**23. DISCONNECT FUEL INLET HOSE**

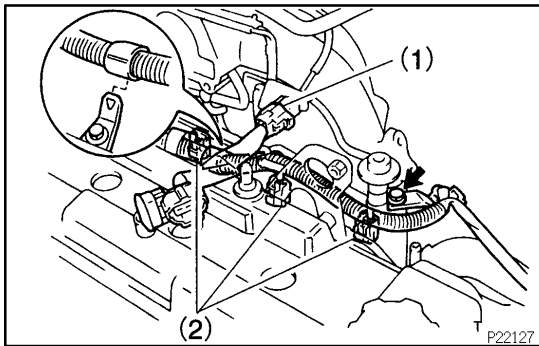
Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter.

24. DISCONNECT ENGINE WIRE

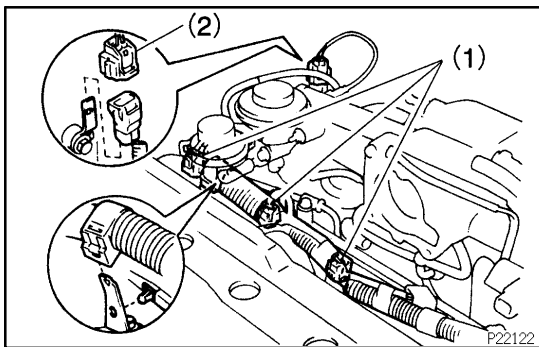
- (a) Disconnect the connectors.
 - (1) Disconnect the ECT sender gauge connector.
 - (2) Disconnect the ECT cut switch connector.
 - (3) Disconnect the ECT sensor connector.
 - (4) Disconnect the knock sensor connector.
 - (5) Disconnect the crankshaft position sensor connector.
- (6) Remove the bolt and disconnect the engine wire from the cylinder block.



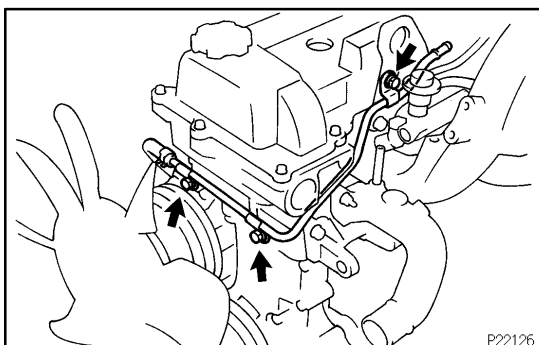
- (b) Disconnect the connectors.
 - (1) Disconnect the knock sensor connector.
 - (2) Disconnect the oil level sensor connector.
 - (3) Disconnect the 2 connectors from the transmission.
 - (4) Disconnect the starter connector.
- (c) Disconnect the 2 heated oxygen sensor connectors.
- (d) Disconnect the PNP switch connector.
- (e) Remove the 2 bolts and disconnect the engine wire from the intake manifold and cylinder block.
- (f) Disconnect the PCV hose from the PCV valve.
- (g) Remove the bolt holding the engine wire to the intake manifold.



- (h) Disconnect the connectors.
 - (1) Disconnect the connector for the emission control valve set assembly.
 - (2) Disconnect the 3 injector connectors.
- (i) Disconnect the engine wire clamp.

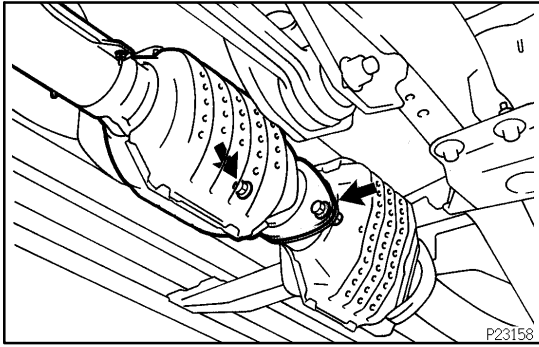


- (j) Disconnect the engine wire clamp.
- (k) Disconnect the connectors.
 - (1) Disconnect the 3 injector connectors.
 - (2) Disconnect the EGR gas temp. sensor connector.
- (l) Disconnect the clamp of the No. 6 injector wire from the bracket.
- (m) Disconnect the engine wire from the cylinder head and intake manifold.

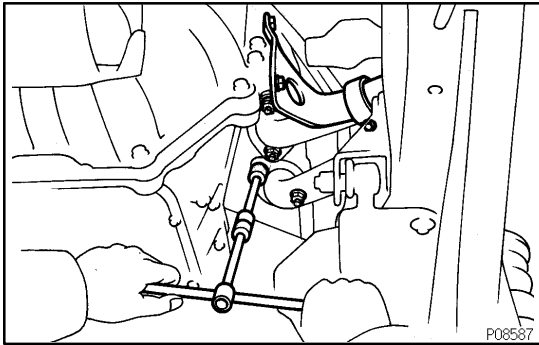


25. DISCONNECT NO. 2 WATER BYPASS PIPE

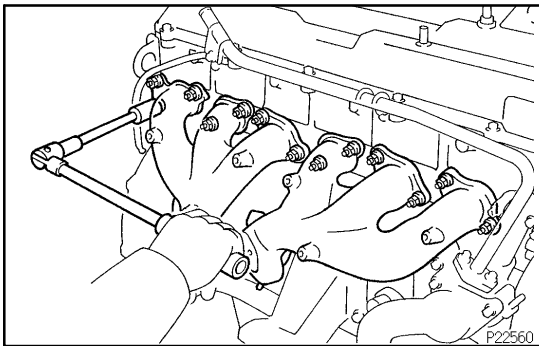
Remove the 3 bolts, and disconnect the bypass pipe from the cylinder head.

**26. REMOVE FRONT EXHAUST PIPE**

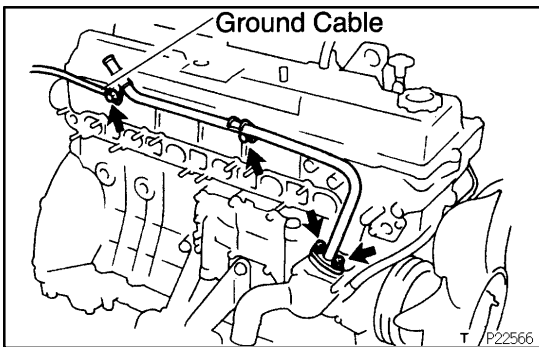
- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC.
- (c) Disconnect the front exhaust pipe, and remove the gasket.



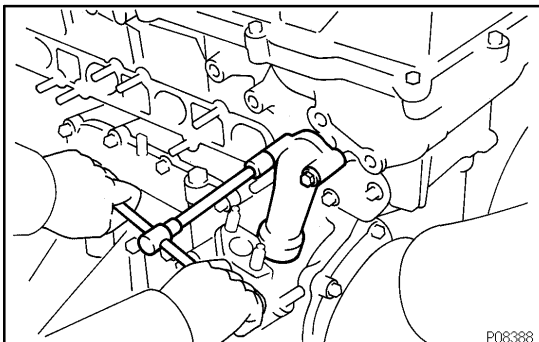
- (d) Loosen the clamp bolt and disconnect the clamp from the No. 1 support bracket.
- (e) Remove the 2 bolts and No. 1 support bracket.
- (f) Remove the 4 nuts, front exhaust pipe and 2 gaskets.

**27. REMOVE NO. 1 AND NO. 2 EXHAUST MANIFOLDS**

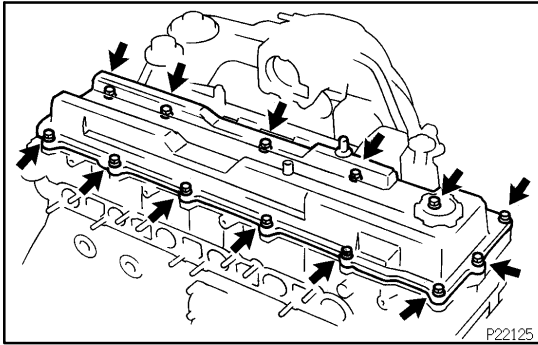
- (a) Remove the 6 bolts, No. 1 heat insulator and No. 2 heat insulator.
- (b) Remove the 13 nuts, No. 1 exhaust manifold, No. 2 exhaust manifold and 2 gaskets.

**28. REMOVE HEATER PIPE**

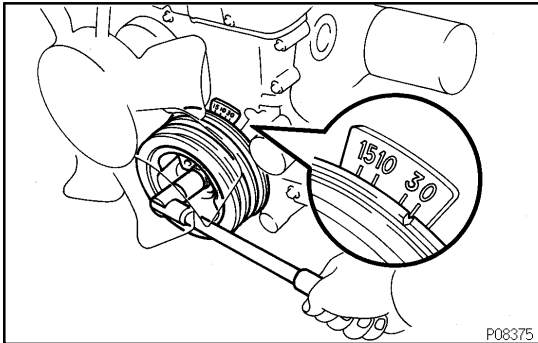
Remove the 2 bolts, 2 nuts, ground cable, heater pipe and gasket.

**29. REMOVE WATER BYPASS OUTLET AND PIPE**

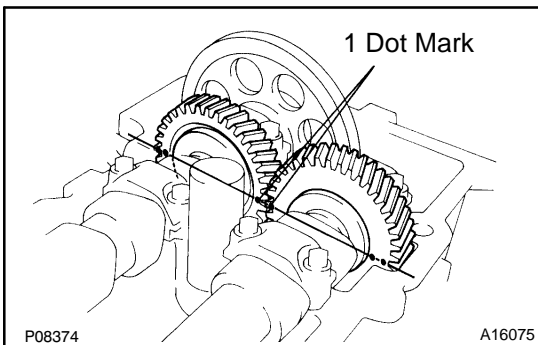
- (a) Remove the 2 bolts and water bypass outlet and pipe.
- (b) Remove the 3 O-rings from the water bypass outlet and pipe.

**30. REMOVE CYLINDER HEAD COVER**

Remove the 13 bolts, cylinder head cover and gasket.

31. REMOVE SPARK PLUGS**32. SET NO. 1 CYLINDER TO TDC/COMPRESSION**

- (a) Turn the crankshaft pulley and align its groove with the "0" mark on the timing chain cover.

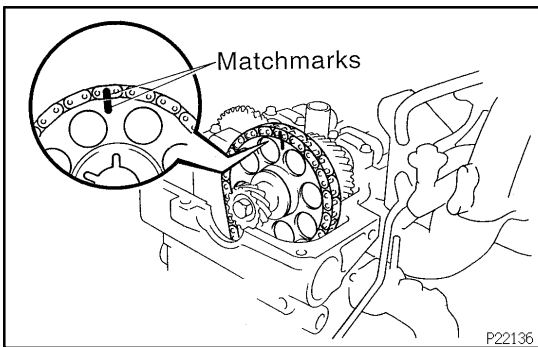


- (b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration.

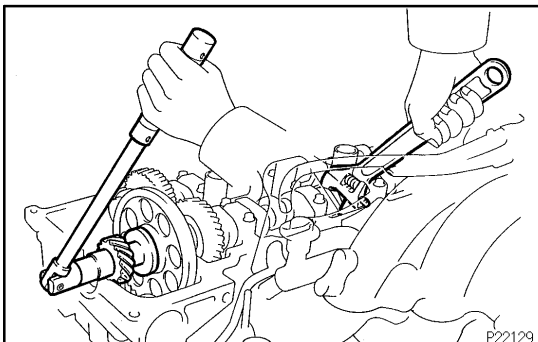
If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

33. REMOVE CHAIN TENSIONER

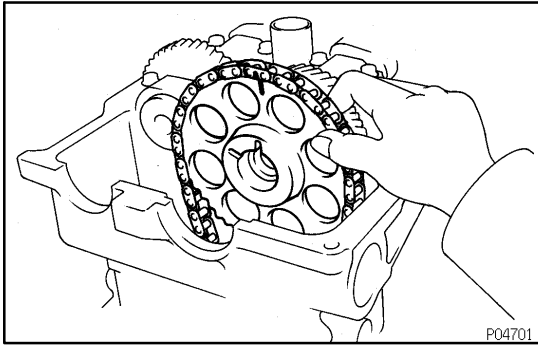
Remove the 2 nuts, chain tensioner and gasket.

**34. REMOVE CAMSHAFT TIMING GEAR**

- (a) Remove the semi-circular plug.
- (b) Place the matchmarks on the camshaft timing gear and timing chain.



- (c) Hold the intake camshaft with a wrench, remove the bolt and distributor gear.

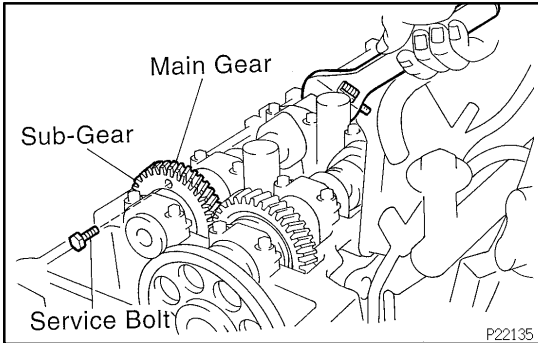


- (d) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper.

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.



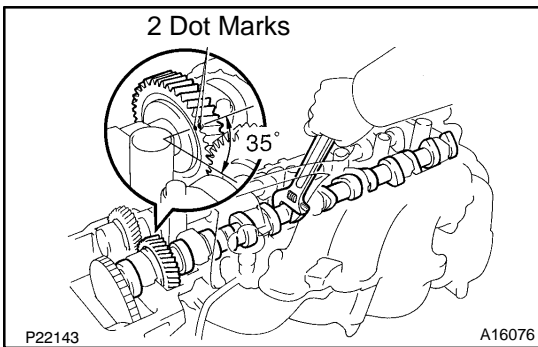
- (a) Remove the exhaust camshaft.
- (1) Bring the service bolt hole of the driven sub-gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.
 - (2) Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

Recommended service bolt:

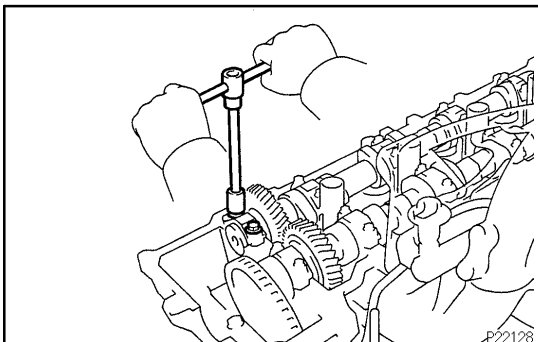
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

HINT:

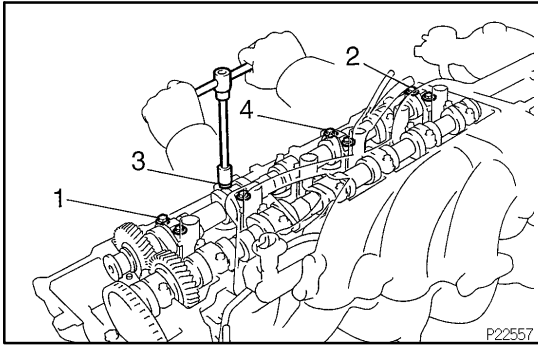
When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.



- (3) Set the timing mark (2 dot marks) of the camshaft driven gear at approx. 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.



- (4) Lightly push the camshaft towards the rear without applying excessive force.
- (5) Loosen and remove the No. 1 bearing cap bolts, alternately loosening the left and right bolts uniformly.

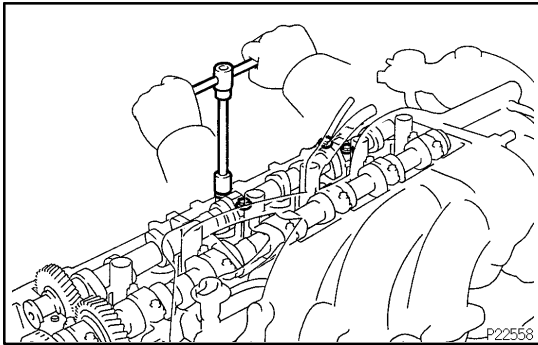


- (6) Loosen and remove the No. 2, No. 3, No. 5 and No. 7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown.

NOTICE:

Do not remove the No. 4 and No. 6 bearing cap bolts at this stage.

- (7) Remove the 4 bearing caps.



- (8) Alternately and uniformly loosen and remove the No. 4 and No. 6 bearing cap bolts.

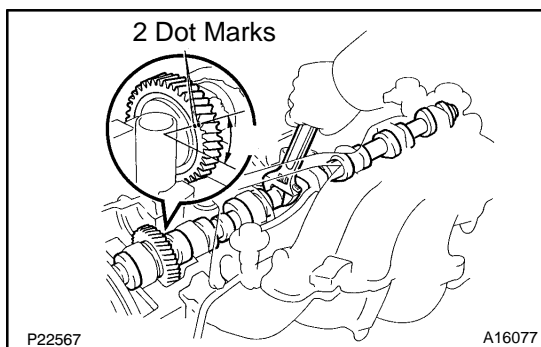
HINT:

- As the 4 No. 4 and No. 6 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 4 No. 4 and No. 6 bearing cap bolts. Then reverse the order of above steps from (g) to (e) and repeat steps from (c) to (h) once again.

NOTICE:

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

- (9) Remove the 2 bearing caps and exhaust camshaft.

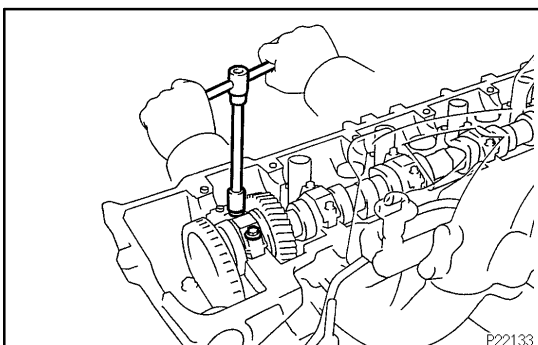


- (b) Remove the intake camshaft.

- (1) Set the timing mark (2 dot marks) of the camshaft drive gear at approx. 25° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.

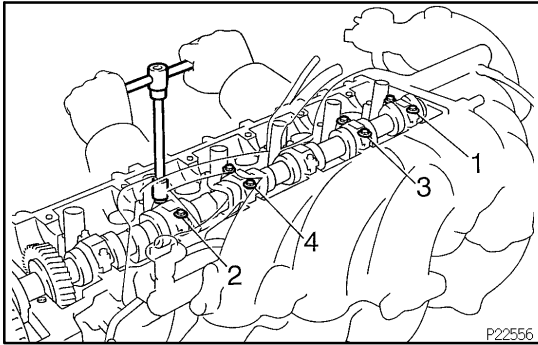
HINT:

The above angle arrows the No. 1 and No. 4 cylinder cam lobes of the intake camshaft to push their valve lifters evenly.



- (2) Lightly push the intake camshaft towards the front without applying excessive force.
- (3) Loosen and remove the No. 1 bearing cap bolts, alternately loosening the left and right bolts uniformly.

ENGINE MECHANICAL – CYLINDER HEAD

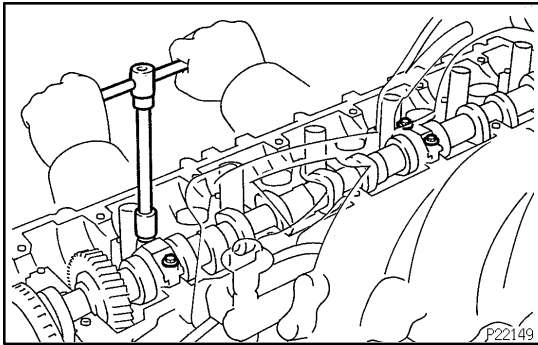


- (4) Loosen and remove the No. 3, No. 4, No. 6 and No. 7 bearing cap bolts, alternately loosening the left and right bolts uniformly in several passes, in the sequence shown.

NOTICE:

Do not remove the No. 2 and No. 5 bearing cap bolts at this stage.

- (5) Remove the 4 bearing caps.



- (6) Alternately and uniformly loosen and remove the No. 2 and No. 5 bearing cap bolts.

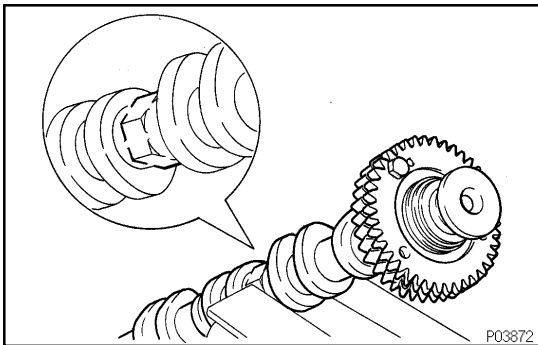
HINT:

- As the 4 No. 2 and No. 5 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, re-tighten the 4 No. 2 and No. 5 bearing cap bolts. Then reverse the order of above steps from (e) to (c) and repeat steps from (a) to (f) once again.

NOTICE:

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

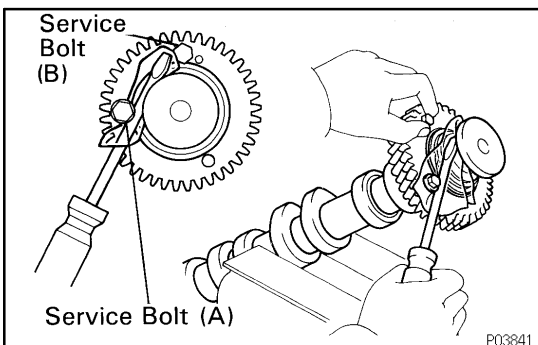
- (7) Remove the 2 bearing caps and exhaust camshaft.

**36. DISASSEMBLE EXHAUST CAMSHAFT**

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

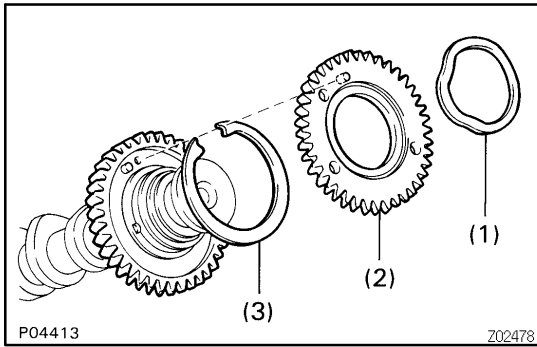


- (b) Insert a service bolt (A) into the service hole of the camshaft sub-gear.
- (c) Using a screwdriver, turn the sub-gear clockwise, and remove the service bolt (B).

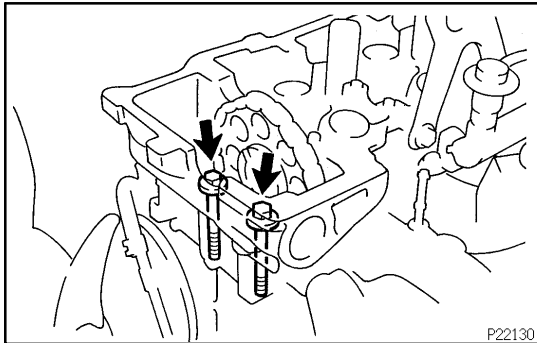
NOTICE:

Be careful not to damage the camshaft.

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

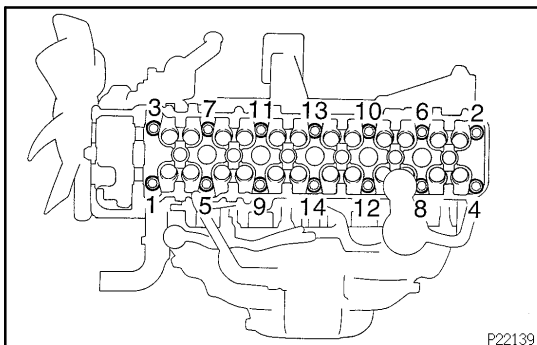


- (e) Remove the wave washer (1), camshaft sub-gear (2) and camshaft gear spring (3).



37. REMOVE CYLINDER HEAD AND INTAKE MANIFOLD ASSEMBLY

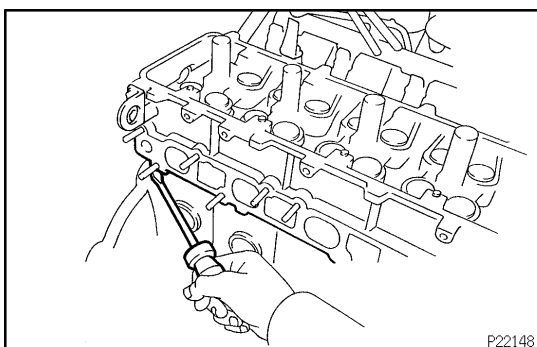
- (a) Remove the 2 bolts in front of the head before the other head bolts are removed.



- (b) Uniformly loosen and remove the 14 cylinder head bolts, in several passes, in the sequence shown.

NOTICE:

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



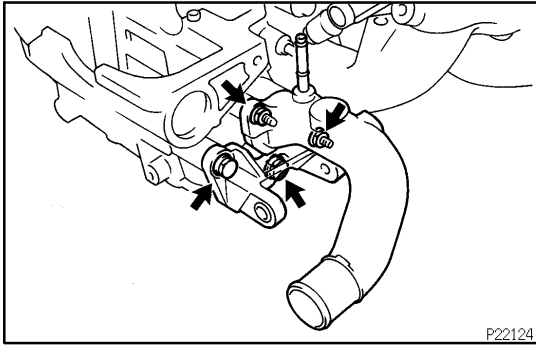
- (c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.

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.



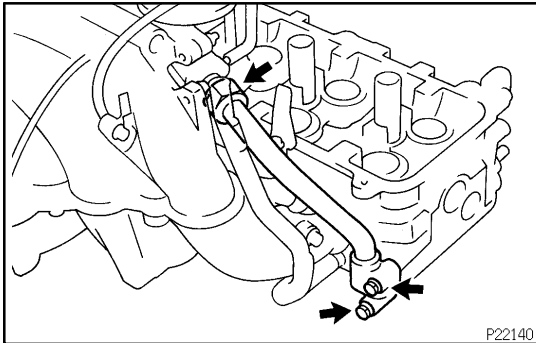
DISASSEMBLY

1. REMOVE GENERATOR BRACKET

Remove the 2 bolts and generator bracket.

2. REMOVE WATER OUTLET

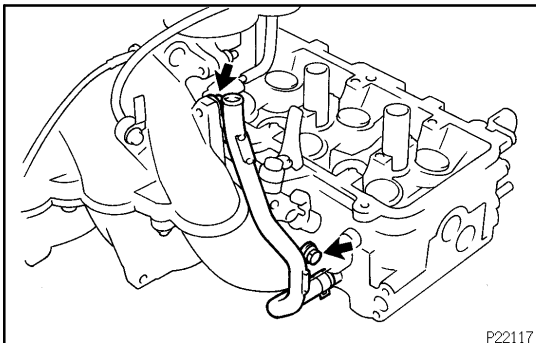
Remove the 2 nuts, water outlet and gasket.



3. REMOVE EGR PIPE

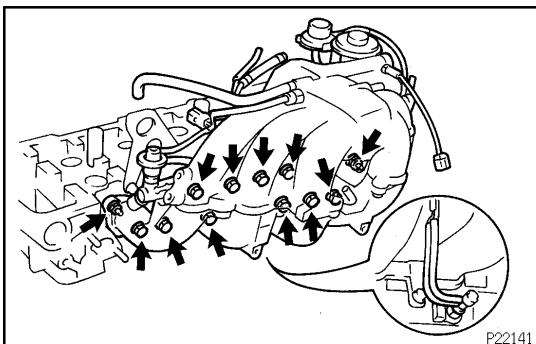
(a) Loosen the union nut.

(b) Remove the 2 bolts, EGR pipe and gasket.



4. REMOVE HEATER INLET PIPE AND HOSE

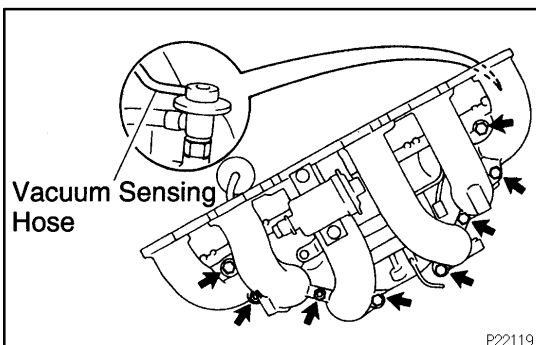
Remove the 2 bolts, and disconnect the pipe and hose.



5. REMOVE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the 2 vacuum hoses from the TVV.

(b) Remove the 10 bolts, 2 nuts, intake manifold and gasket.

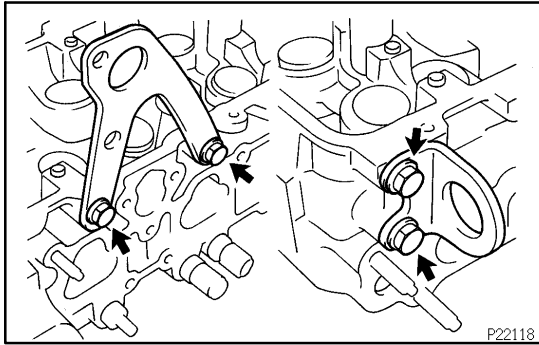


6. DISASSEMBLE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY

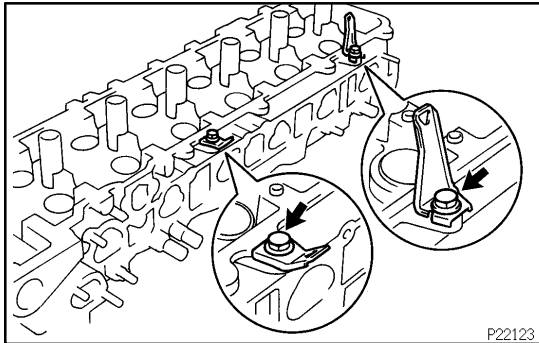
(a) Disconnect the vacuum sensing hose from the fuel pressure regulator.

(b) Remove the 6 bolts, 2 nuts, air intake chamber and 2 gaskets from the intake manifold.

7. REMOVE NO. 1 WATER BYPASS HOSE



8. REMOVE NO. 1 AND NO. 2 ENGINE HANGERS

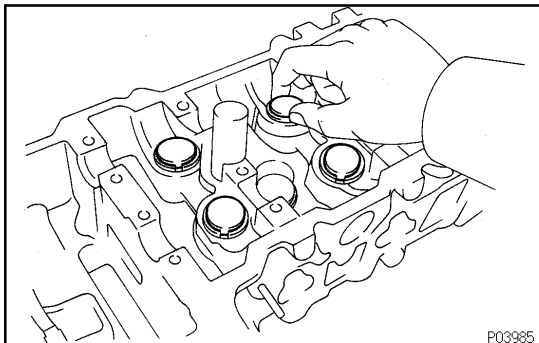


9. REMOVE 2 ENGINE WIRE CLAMP BRACKETS

Remove the 2 bolts and 2 wire clamp brackets.

10. REMOVE ACCELERATOR CABLE BRACKET AND THROTTLE CABLE BRACKET

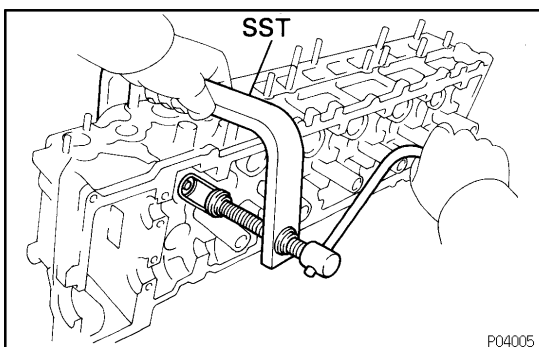
Remove the 2 bolts and 2 cable brackets.



11. REMOVE VALVE LIFTERS AND SHIMS

HINT:

Arrange the valve lifters and shims in correct order.

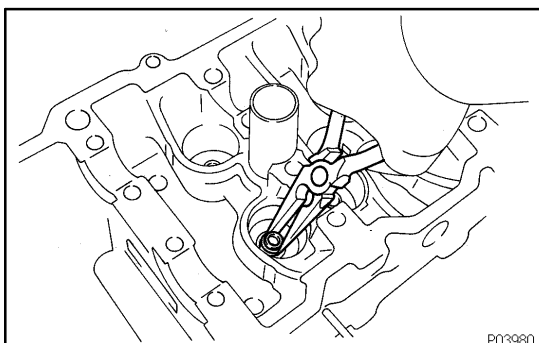


12. REMOVE VALVES

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

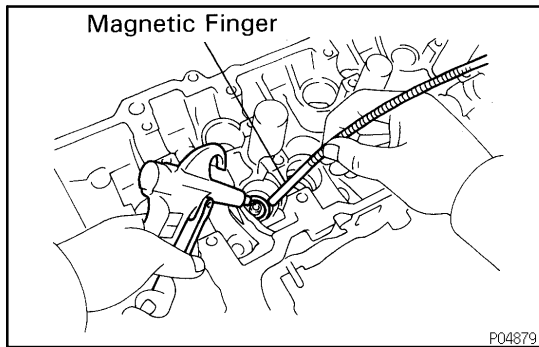
SST 09202-70020 (09202-00010)

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



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

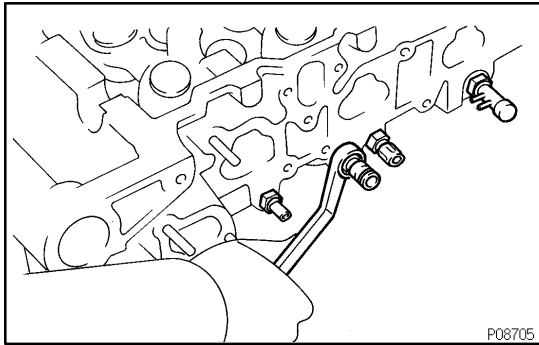
ENGINE MECHANICAL - CYLINDER HEAD



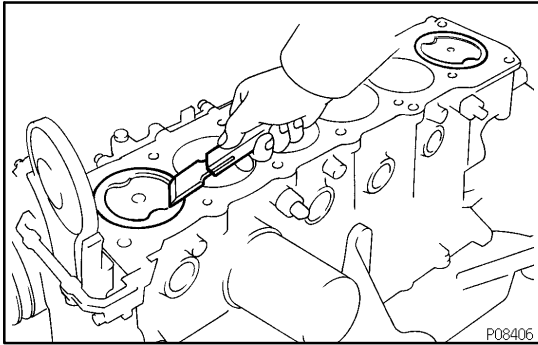
- (d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

HINT:

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



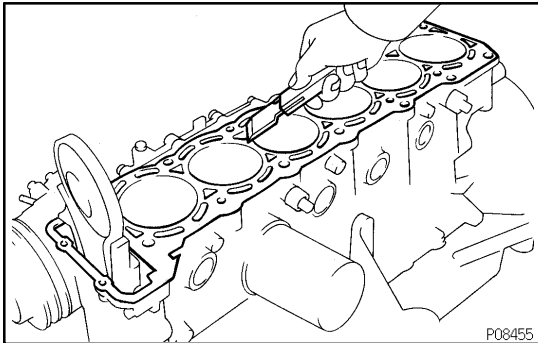
13. REMOVE ECT SENDER GAUGE
14. REMOVE ECT CUT SWITCH
15. REMOVE ECT SENSOR
16. REMOVE TVV



INSPECTION

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

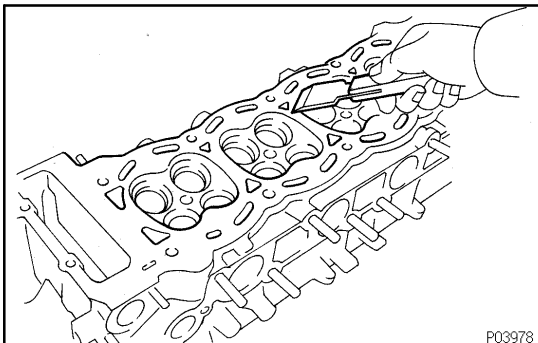
- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



- (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-compressed air.

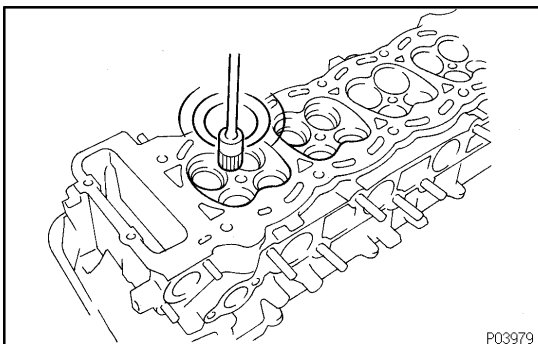


2. CLEAN CYLINDER HEAD

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

NOTICE:

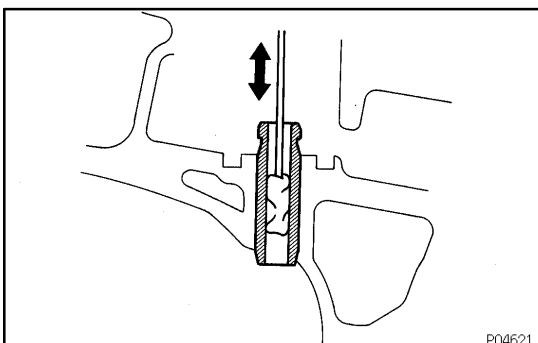
Be careful not to scratch the cylinder block contact surface.



- (b) Using a wire brush, remove all the carbon from the combustion chambers.

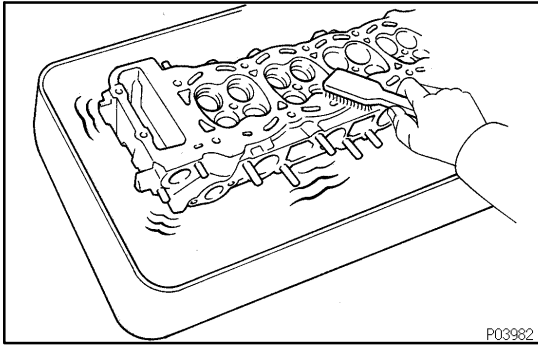
NOTICE:

Be careful not to scratch the cylinder block contact surface.

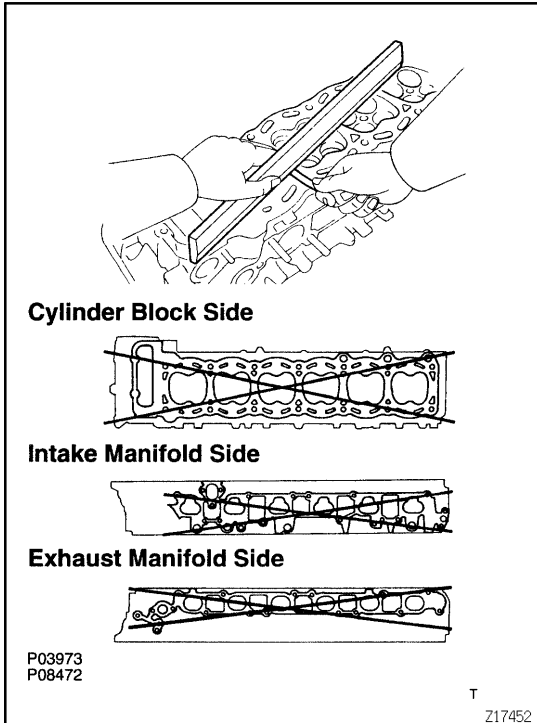


- (c) Using a valve guide bushing brush and solvent, clean all the guide bushings.

ENGINE MECHANICAL – CYLINDER HEAD



- (d) Using a soft brush and solvent, thoroughly clean the cylinder head.



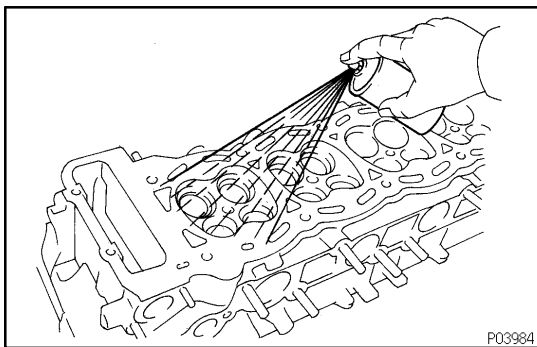
3. INSPECT CYLINDER HEAD

- (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:

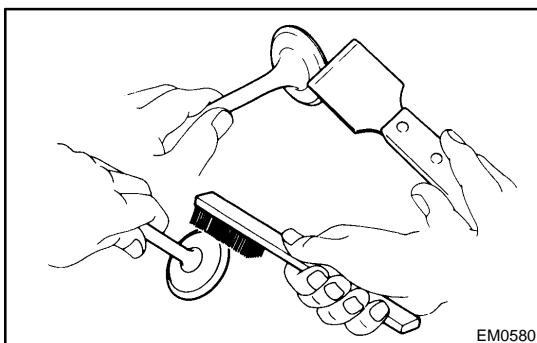
Cylinder block side	0.15 mm (0.0059 in)
Manifold side	0.10 mm (0.0039 in)

If warpage is greater than maximum, replace the cylinder head.



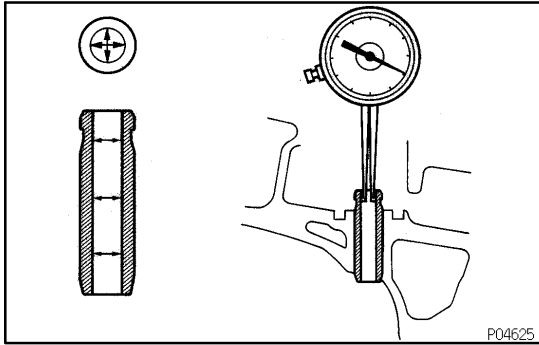
- (b) Inspect for cracks.
Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



4. CLEAN VALVES

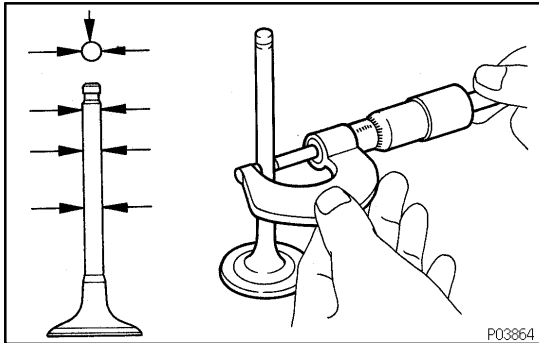
- (a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

**5. INSPECT VALVE STEMS AND GUIDE BUSHINGS**

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

Bushing inside diameter:

7.010 – 7.030 mm (0.2760 – 0.2768 in.)



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

Valve stem diameter:

Intake	6.970 – 6.985 mm (0.2744 – 0.2750 in.)
Exhaust	6.965 – 6.980 mm (0.2742 – 0.2748 in.)

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

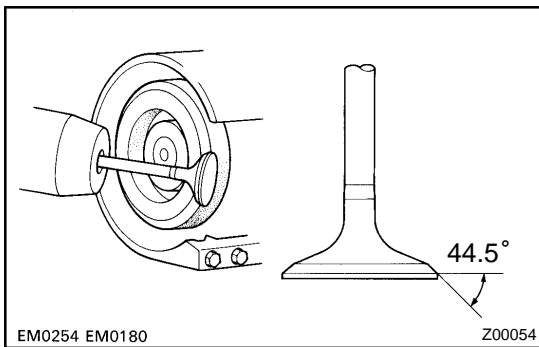
Standard oil clearance:

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:

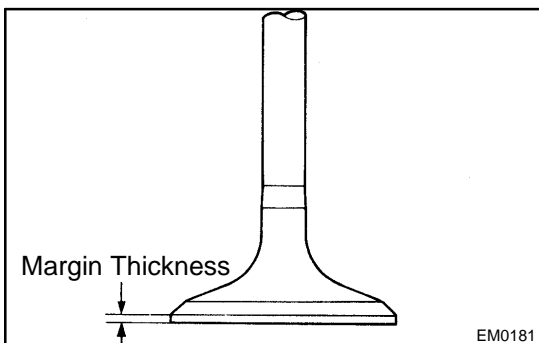
Intake	0.08 mm (0.0031 in.)
Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing (See page [EM-49](#)).

**6. 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°



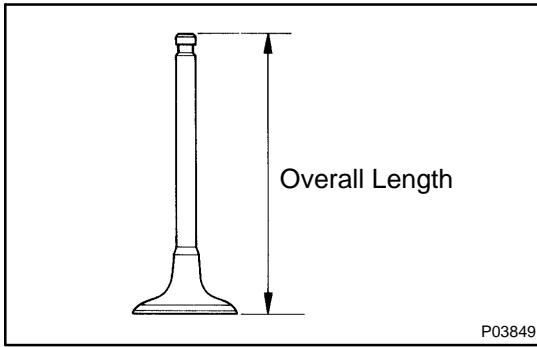
- (c) Check the valve head margin thickness.

Margin thickness:

Standard	1.2 mm (0.047 in.)
Minimum	1.0 mm (0.039 in.)

If the margin thickness is less than minimum, replace the valve.

ENGINE MECHANICAL – CYLINDER HEAD



- (d) Check the valve overall length.

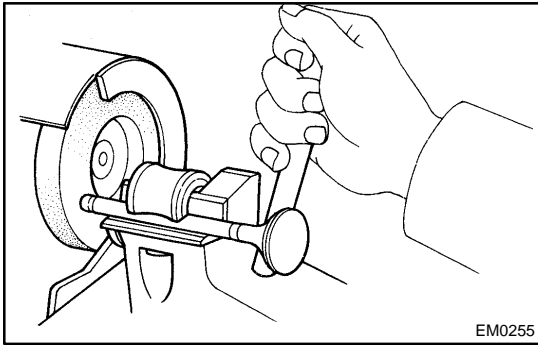
Standard overall length:

Intake	98.4 mm (3.874 in.)
Exhaust	97.4 mm (3.854 in.)

Minimum overall length:

Intake	97.9 mm (3.854 in.)
Exhaust	97.4 mm (3.835 in.)

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

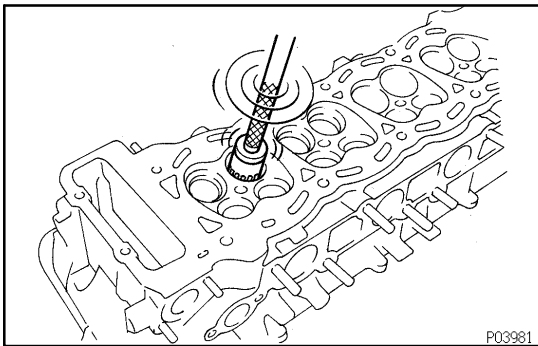


- (e) Check the surface of the valve stem tip for wear.

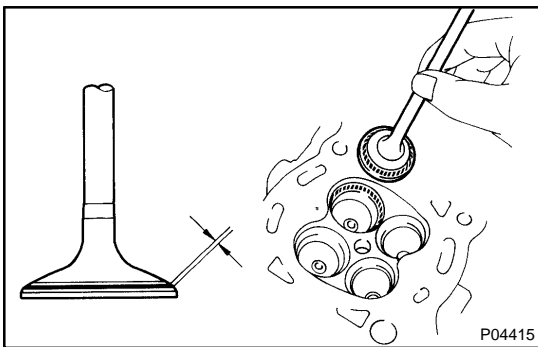
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE:

Do not grind off more than minimum.

**7. 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.



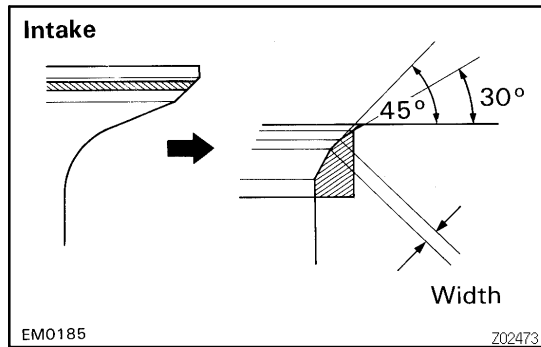
- (c) Check the valve face and seat for the following:

- 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 these width:

Intake	1.2 – 1.6 mm (0.047 – 0.063 in.)
Exhaust	1.0 – 1.4 mm (0.039 – 0.055 in.)

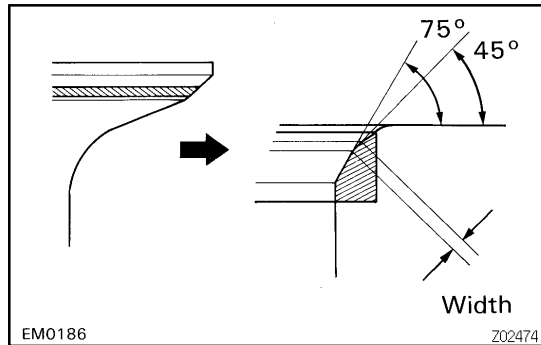
EM-44

ENGINE MECHANICAL – CYLINDER HEAD

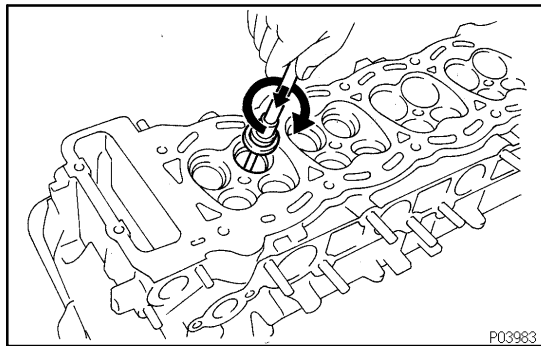


If not, correct the valve seats as follows:

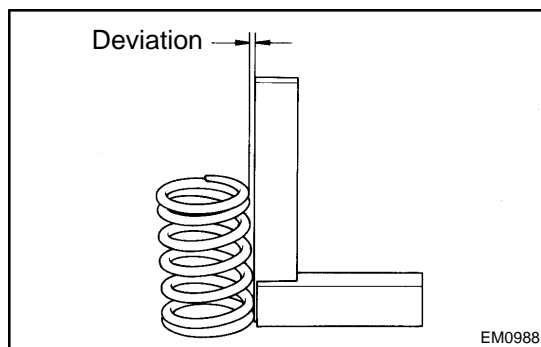
- (1) Intake:
If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



- (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.

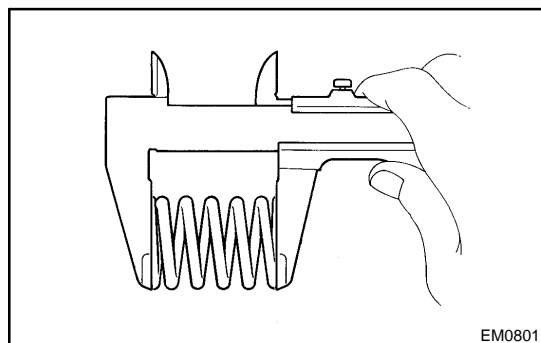


8. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation: 2.0 mm (0.079 in.)

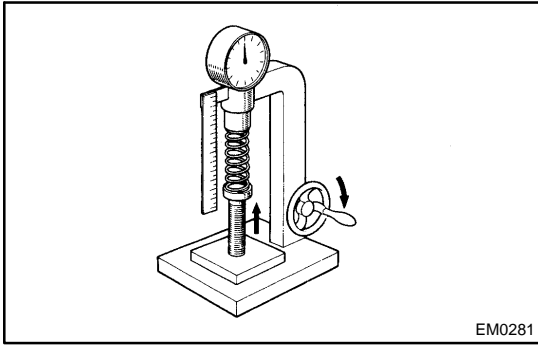
If the deviation is greater than maximum, replace the valve spring.



- (b) Using vernier calipers, measure the free length of the valve spring.

Free length: 43.94 – 45.06 mm (1.7299 – 1.7740 in.)

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



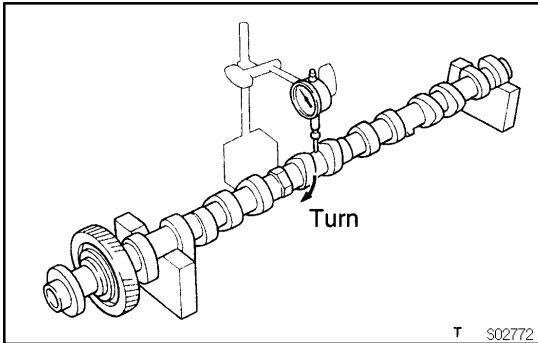
- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

214 – 238 N (21.8 – 24.2 kgf, 48.1 – 53.4 lbf)

at 36.5 mm (1.437 in.)

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



9. INSPECT CAMSHAFTS

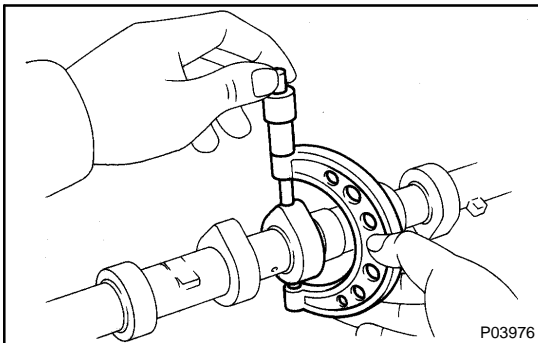
- (a) Inspect for runout.

(1) Place the camshaft on V-blocks.

(2) 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 the cam lobes.

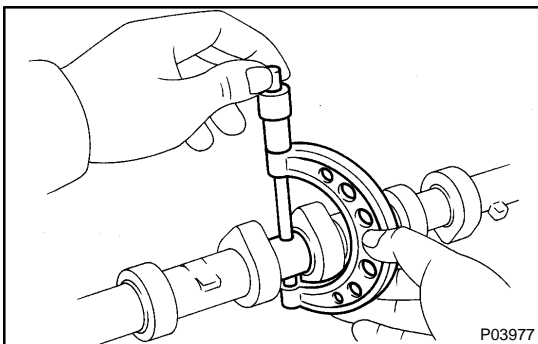
Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

50.61 – 50.71 mm (1.9925 – 1.9965 in.)

Minimum cam lobe height: 50.51 mm (1.9886 in.)

If the cam lobe height is less than minimum, replace the camshaft.



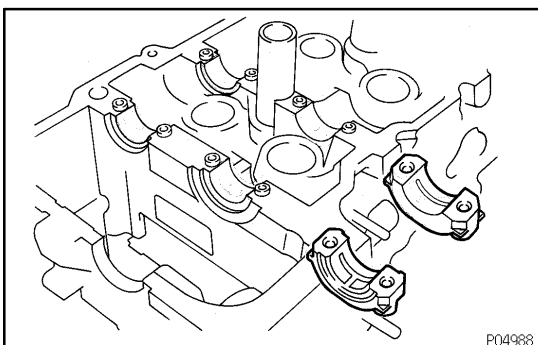
- (c) Inspect the journals.

Using a micrometer, measure the journal diameter.

Journal diameter:

26.959 – 26.975 mm (1.0614 – 1.0620 in.)

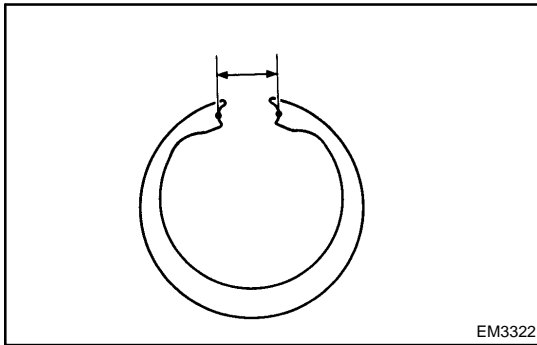
If the journal diameter is not as specified, check the oil clearance.



- (d) Inspect the camshaft bearings.

Check that bearings for flaking and scoring.

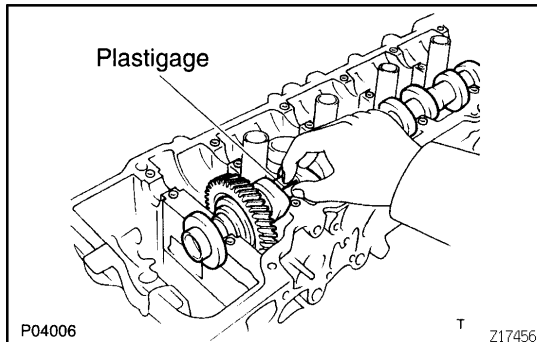
If the bearings are damaged, replace the bearing caps and cylinder head as a set.



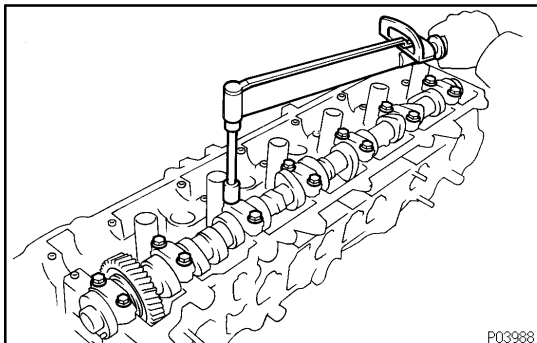
- (e) Inspect the gear spring
Using vernier calipers, measure the free distance between the spring ends.

Free distance: 18.2 – 18.8 mm (0.717 – 0.740 in.)

If the free distance is not as specified, replace the gear spring.



- (f) Inspect the journal oil clearance.
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on the cylinder head.
(3) Lay a strip of Plastigage across each of the camshaft journals.

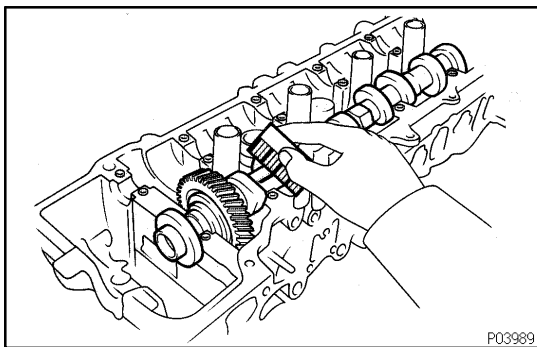


- (4) Install the bearing caps (See page [EM-54](#)).

NOTICE:

Do not turn the camshaft.

- (5) Remove the bearing caps.



- (6) Measure the Plastigage at its widest point.

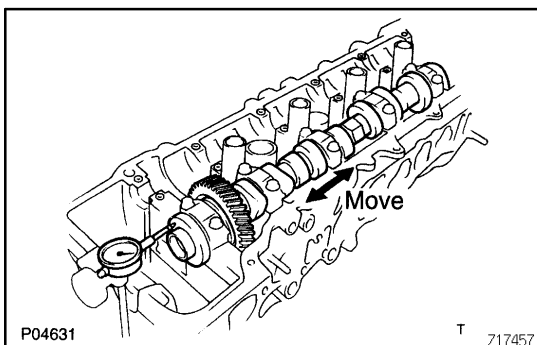
Standard oil clearance:

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.

- (7) Completely remove the Plastigage.



- (g) Inspect the thrust clearance.
(1) Install the camshaft (See page [EM-54](#)).
(2) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

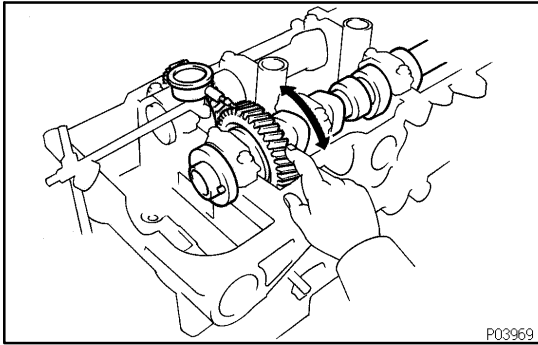
Standard thrust clearance:

0.030 – 0.080 mm (0.0012 – 0.0031 in.)

Maximum thrust clearance: 0.10 mm (0.0039 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

ENGINE MECHANICAL - CYLINDER HEAD



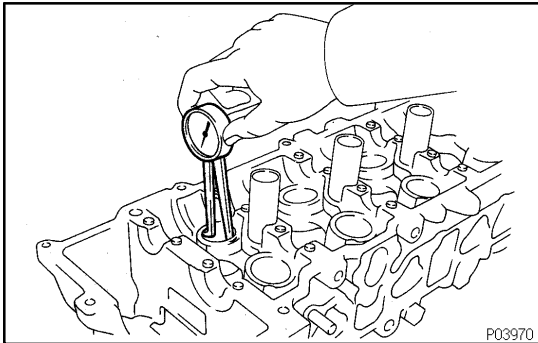
- (h) Inspect the gear backlash.
- (1) Install the camshafts without installing the exhaust cam sub-gear (See page [EM-54](#)).
 - (2) Using a dial indicator, measure the backlash.

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 than maximum, replace the camshafts.

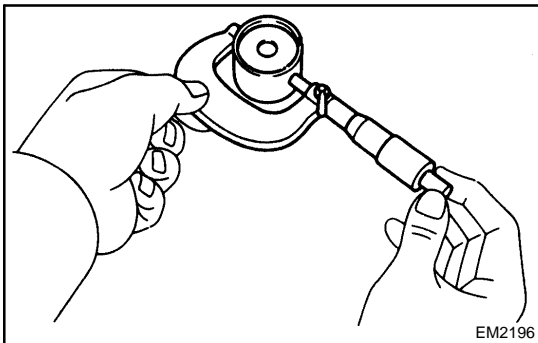


10. INSPECT VALVE LIFTER OIL CLEARANCE

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:

34.000 – 34.021 mm (1.3386 – 1.3394 in.)



- (b) Using a micrometer, measure the lifter diameter.

Lifter diameter:

33.966 – 33.976 mm (1.3372 – 1.3376 in.)

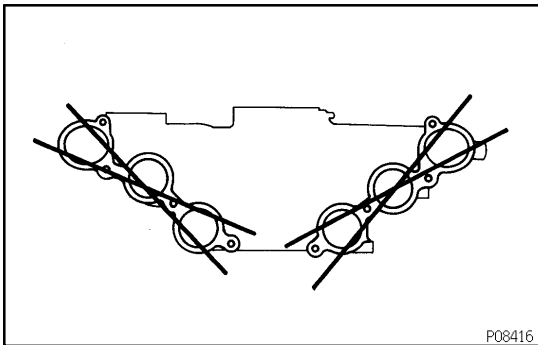
- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:

0.024 – 0.055 mm (0.0009 – 0.0022 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.



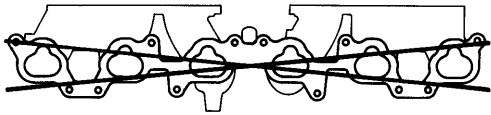
11. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, measure the surface contacting the intake manifold for warpage.

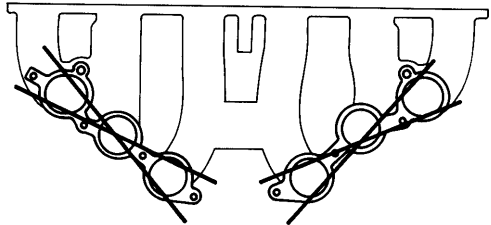
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the air intake chamber.

Cylinder Head Side



Air Intake Chamber Side

P08414
P08415

Z04171

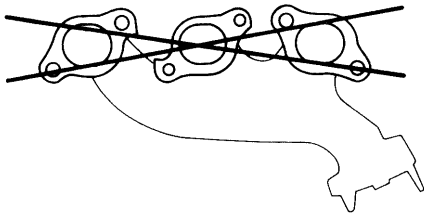
12. INSPECT INTAKE MANIFOLD

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

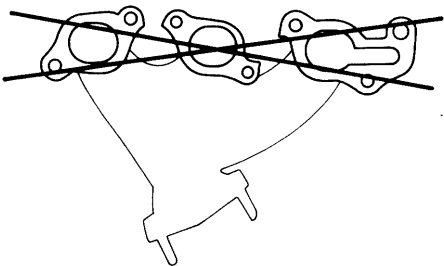
Maximum warpage: 0.30 mm (0.0118 in.)

If warpage is greater than maximum, replace the manifold.

No.1 Exhaust Manifold



No.2 Exhaust Manifold



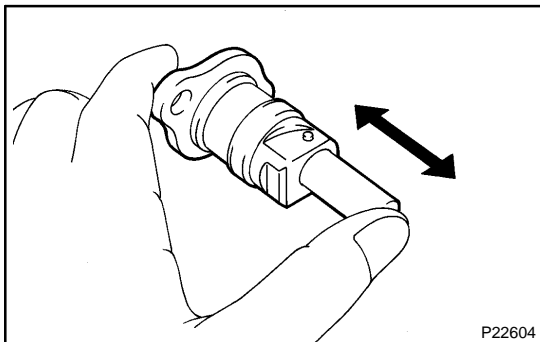
P08250

13. INSPECT EXHAUST MANIFOLDS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head for warpage.

Maximum warpage: 0.30 mm (0.0118 in.)

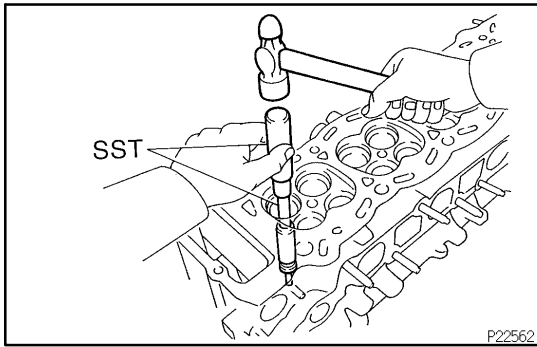
If warpage is greater than maximum, replace the manifold.



P22604

14. INSPECT CHAIN TENSIONER

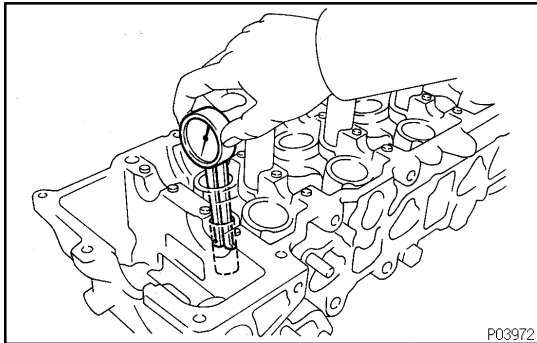
Check that the plunger moves smoothly.



REPLACEMENT

1. REPLACE VALVE GUIDE BUSHINGS

- Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).
- Using SST and a hammer, tap out the guide bushing.
SST 09201-10000 (09201-01070), 09950-70010 (09951-07100)
- Using a caliper gauge, measure the bushing bore diameter of the cylinder head.



Both intake and exhaust

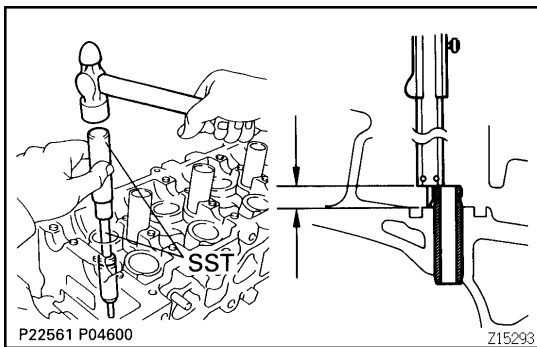
Bushing bore diameter mm (in.)	Bushing size
11.492 – 11.513 (0.4524 – 0.4533)	Use STD
11.542 – 11.563 (0.4544 – 0.4552)	Use O/S 0.05

- Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.513 mm (0.4533 in.), machine the bushing bore to the following dimension:

11.542 – 11.563 mm (0.4544 – 0.4552 in.)

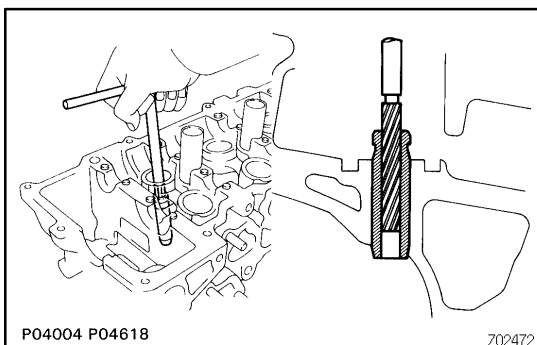
- If the bushing bore diameter of the cylinder head is greater than 11.563 mm (0.4552 in.), replace the cylinder head.

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

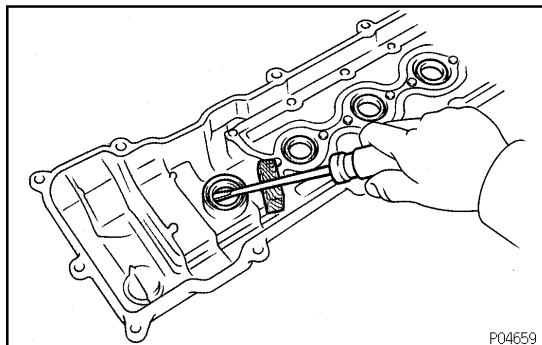


- Using SST and a hammer, tap in a new guide bushing until it protrudes 8.2 – 8.6 mm (0.323 – 0.339 in.) from the cylinder head.

SST 09201-10000 (09201-01070), 09950-70010 (09951-07100)

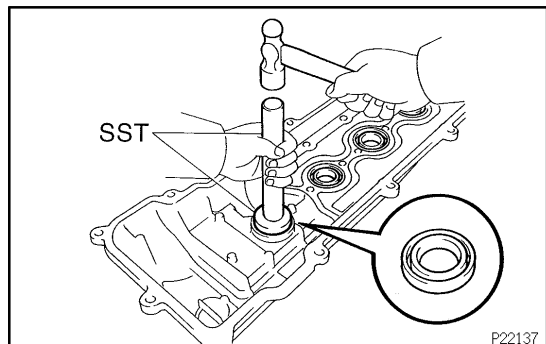


- Using a sharp 7 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page [EM-40](#)) between the guide bushing and valve stem.



2. REPLACE SPARK PLUG TUBE GASKETS

- (a) Using a screwdriver, pry out the tube gasket.



- (b) Using SST and a hammer, tap in a new tube gasket as shown in the illustration.

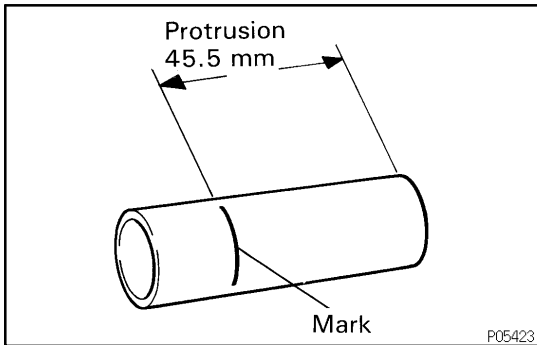
SST 09950-60010 (09951-00480), 09950-70010 (09951-07150)

- (c) Apply a light coat of MP grease to the gasket lip.

REASSEMBLY

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.



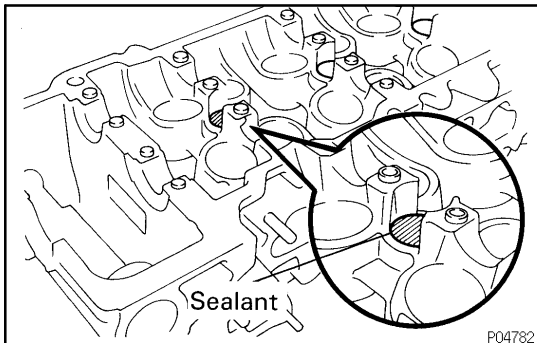
1. INSTALL SPARK PLUG TUBES

HINT:

When using a new cylinder head, spark plug tubes must be installed.

- (a) Mark the standard position away from the edge, onto the spark plug tube.

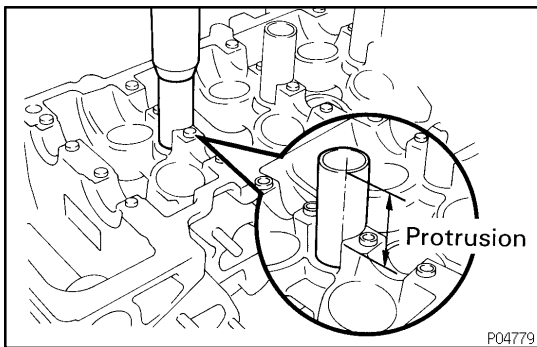
Standard protrusion: 45.5 mm (1.791 in.)



- (b) Apply adhesive to the spark plug tube hole of the cylinder head.

Sealant:

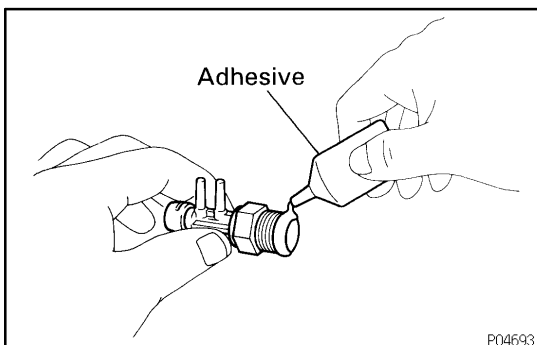
Part No. 08833-00070, Adhesive 1324, THREE BOND 1324 or equivalent



- (c) Using a press, press in a new spark plug tube until there is 45.5 mm (1.791 in.) 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 protrusion while pressing.

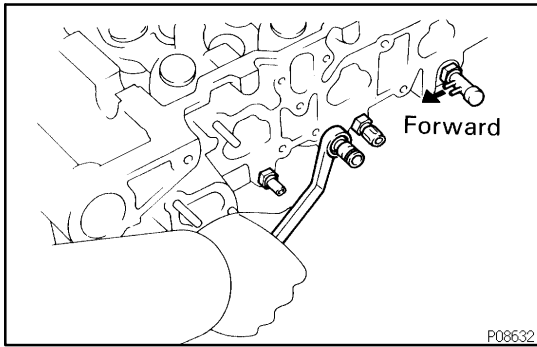


2. INSTALL TVV

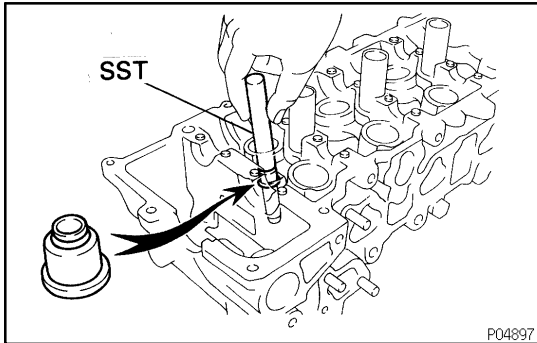
- (a) Apply adhesive to 2 or 3 threads of the TVV.

Adhesive:

Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

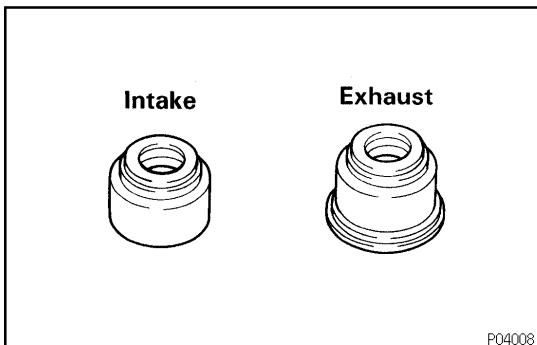


- (b) Install the TVV.
3. **INSTALL ECT SENDER GAUGE**
 4. **INSTALL ECT CUT SWITCH**
 5. **INSTALL ECT SENSOR**



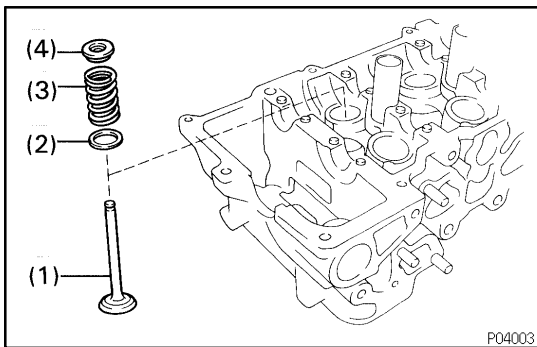
6. INSTALL VALVES

- (a) Using SST, push in a new oil seal.
SST 09236-00101 (09236-15010)

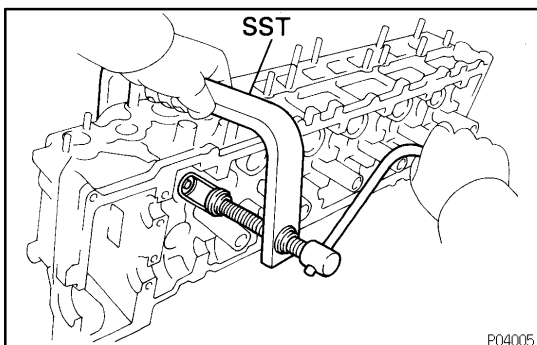


HINT:

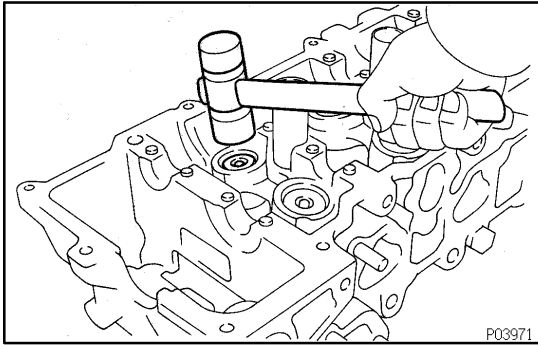
Different oil seals are used for the intake and exhaust.



- (b) Install the valve (1), spring seat (2), valve spring (3) and spring retainer (4).



- (c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202-70020 (09202-00010)



- (d) Using a plastic-faced hammer, lightly tap the valve stem tip to ensure a proper fit.

7. INSTALL VALVE LIFTERS AND SHIMS

- (a) Install the valve lifter and shim.
 (b) Check that the valve lifter rotates smoothly by hand.

8. INSTALL ACCELERATOR CABLE BRACKET AND THROTTLE CABLE BRACKET

9. INSTALL 2 ENGINE WIRE CLAMP BRACKETS

10. INSTALL NO. 1 AND NO. 2 ENGINE HANGERS

Torque: 41 N·m (420 kgf-cm, 30 ft-lbf)

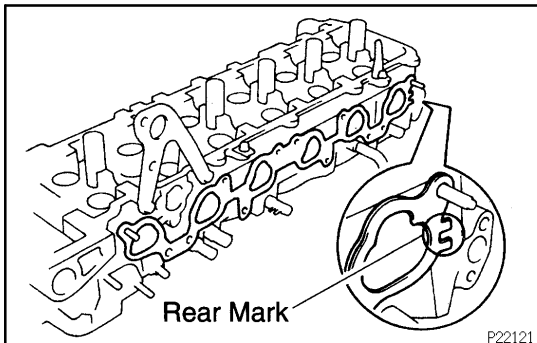
11. INSTALL NO. 1 WATER BYPASS HOSE

12. ASSEMBLE AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY

- (a) Install 2 new gaskets and the air intake chamber with the 6 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

- (b) Connect the vacuum sensing hose to the fuel pressure regulator.



13. INSTALL AIR INTAKE CHAMBER AND INTAKE MANIFOLD ASSEMBLY

- (a) Place a new gasket so that the rear mark is toward the rear side.
 (b) Install the intake manifold with the 10 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

- (c) Connect the 2 vacuum hoses to the TVV.

14. INSTALL HEATER INLET PIPE AND HOSE

Install the heater hose to the cylinder head, and connect the pipe to the intake manifold with the 2 bolts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

15. INSTALL EGR PIPE

- (a) Temporarily install the union nut to the EGR valve.
 (b) Install a new gasket and the EGR pipe to the cylinder head with the 2 bolts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

- (c) Tighten the union nut.

Torque: 78 N·m (800 kgf-cm, 58 ft-lbf)

16. INSTALL WATER OUTLET

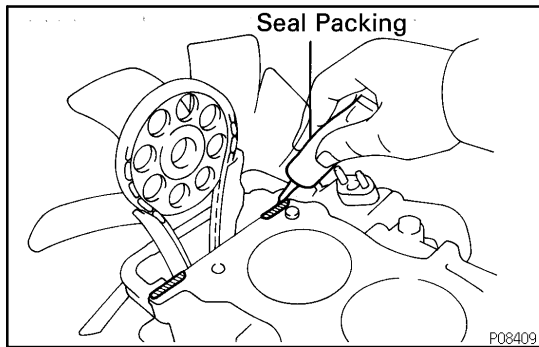
Install a new gasket and the water outlet with the 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

17. INSTALL GENERATOR BRACKET

Install the generator bracket with the 2 bolts.

Torque: 43 N·m (440 kgf-cm, 32 ft-lbf)



INSTALLATION

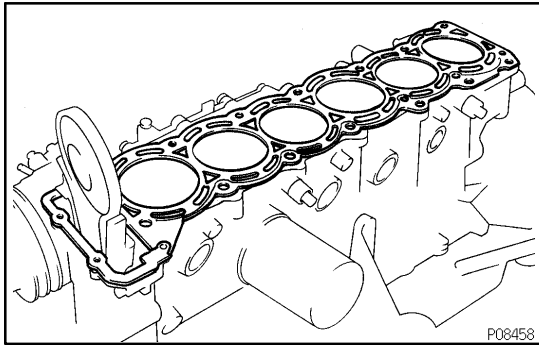
1. INSTALL CYLINDER HEAD AND INTAKE MANIFOLD ASSEMBLY

- (a) Place the cylinder head on the cylinder head.
 - (1) Apply seal packing to the 2 locations as shown.

Seal packing: Part No. 08826-00080 or equivalent

NOTICE:

Do not apply too much seal packing

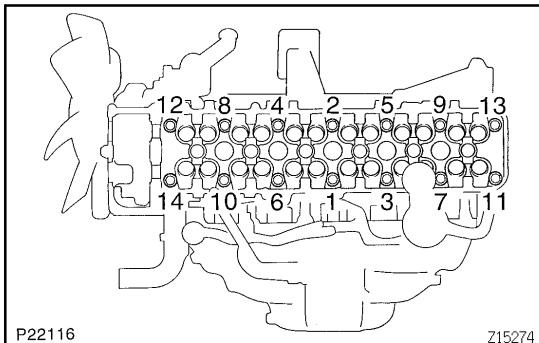


- (2) Place a new cylinder head gasket in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

- (3) Place the cylinder head in position on the cylinder head gasket.



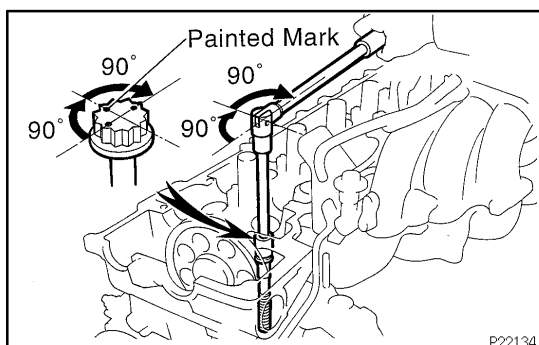
- (b) Install the cylinder head bolts.

HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e)).
 - If any cylinder head bolt is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
 - (2) Install and uniformly tighten the 14 cylinder head bolts and plate washers in several passes, in the sequence shown.

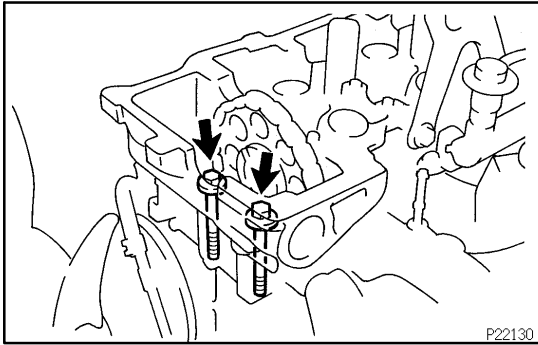
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

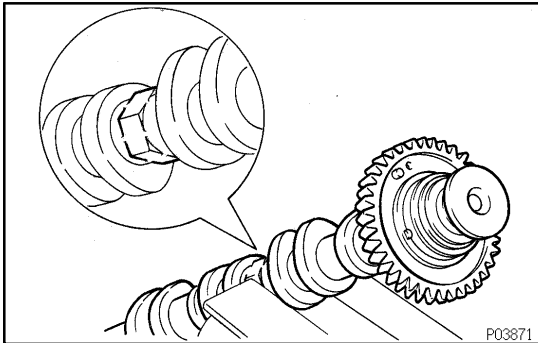


- (3) Mark the front of the cylinder head bolt head with paint.
- (4) Retighten the cylinder head bolts by 90° in the numerical order shown.
- (5) Retighten the cylinder head bolts by an additional 90°.
- (6) Check that the painted mark is now facing rearward.

ENGINE MECHANICAL - CYLINDER HEAD



- (7) Install and torque the 2 mounting bolts.
Torque: 21N·m (210 kgf·cm, 15 ft·lbf)

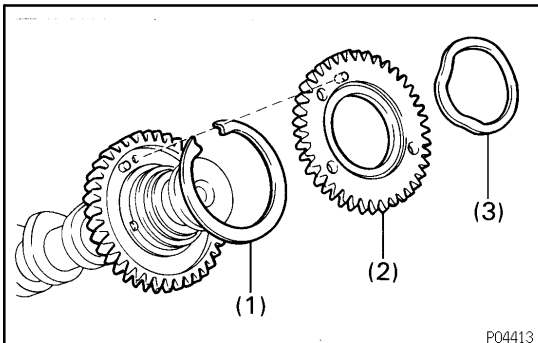


2. ASSEMBLE EXHAUST CAMSHAFT

- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

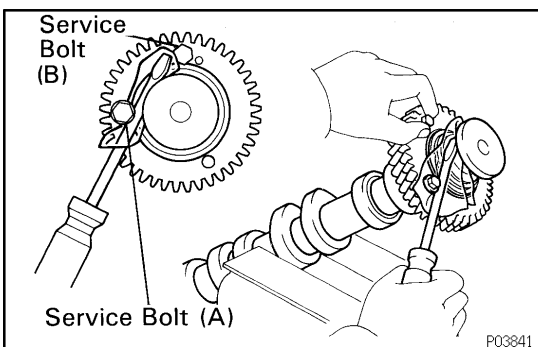


- (b) Install the camshaft gear spring (1), camshaft sub-gear (2) and wave washer (3).

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 (B).

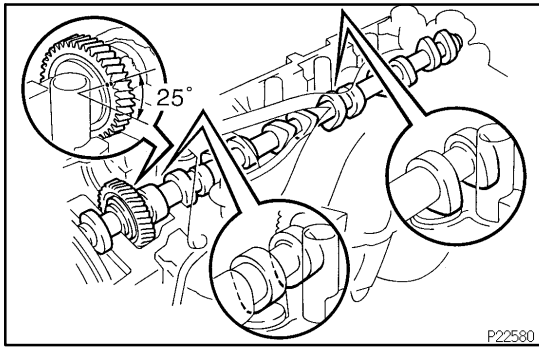
NOTICE:

Be careful not to damage the camshaft.

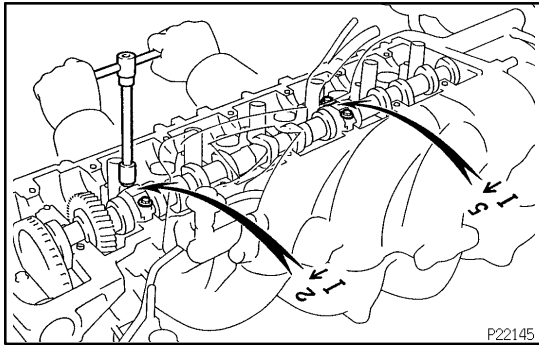
3. INSTALL CAMSHAFTS

NOTICE:

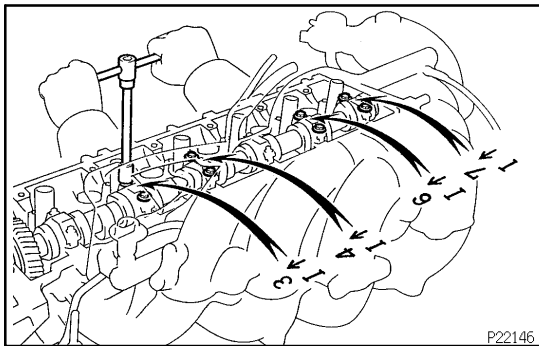
Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following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



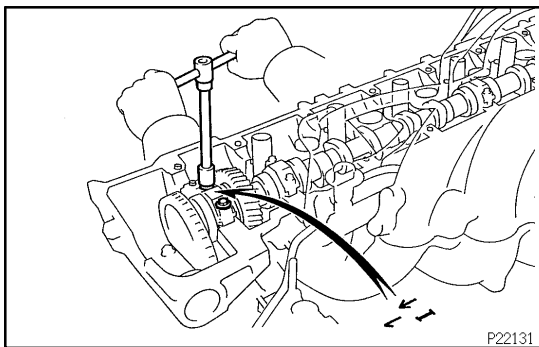
- (a) Install the intake camshaft.
- (1) Apply engine oil to the thrust portion of the intake camshaft.
 - (2) Lightly place the intake camshaft on top of the cylinder head as shown in the illustration so that the No. 1 and No. 4 cylinder cam lobes face downward.
 - (3) Lightly push the camshaft towards the front without applying excessive force.



- (4) Place the No. 2 and No. 5 bearing caps in their proper location.
- (5) Temporarily tighten these bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.

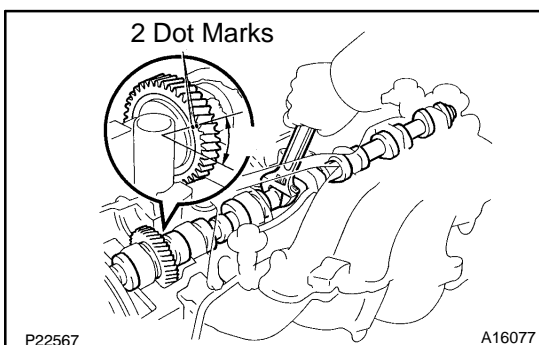


- (6) Place the No. 3, No. 4, No. 6 and No. 7 bearing caps in their proper location.
- (7) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly.



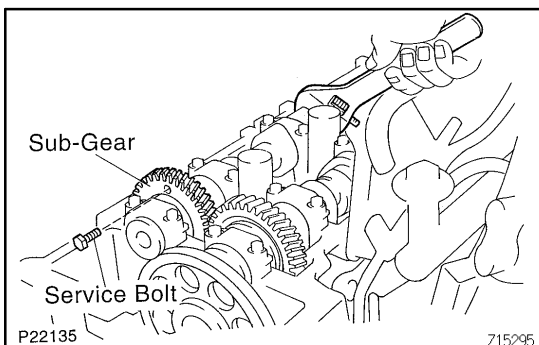
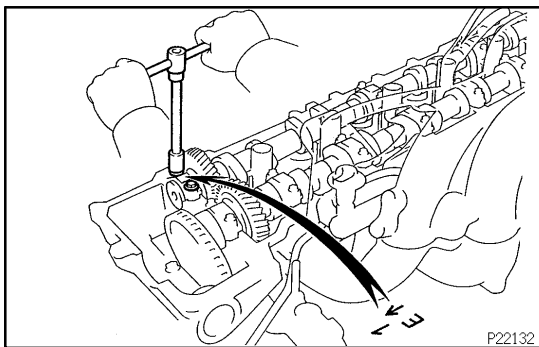
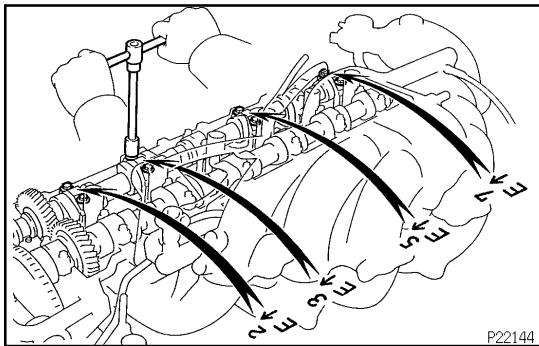
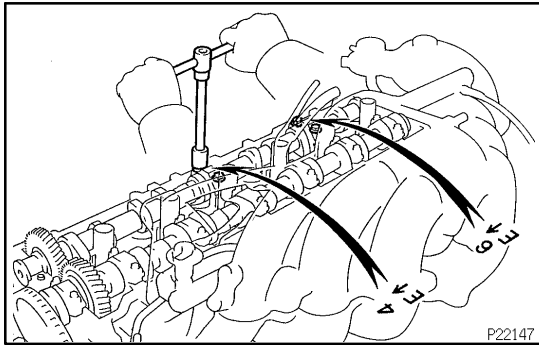
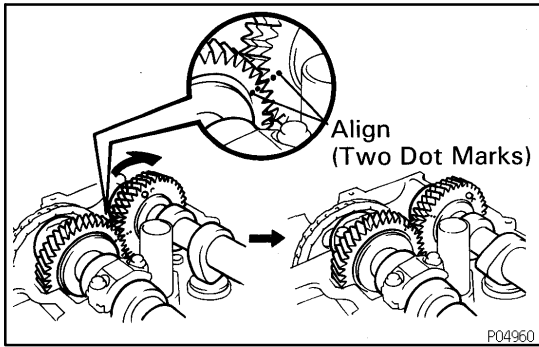
- (8) Place the No. 1 bearing cap in its proper location. When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap.
- (9) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly.
- (10) Uniformly tighten the 14 bearing cap bolts in several passes.

Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)

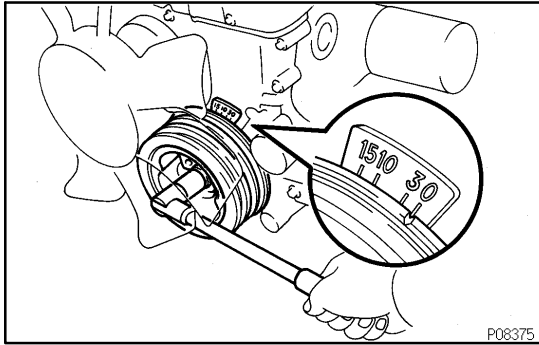


- (b) Install the exhaust camshaft.
- (1) Set the timing mark (2 dot marks) of the camshaft drive gear at approx. 35° angle by turning the hexagon wrench head portion of the intake camshaft with a wrench.

ENGINE MECHANICAL – CYLINDER HEAD

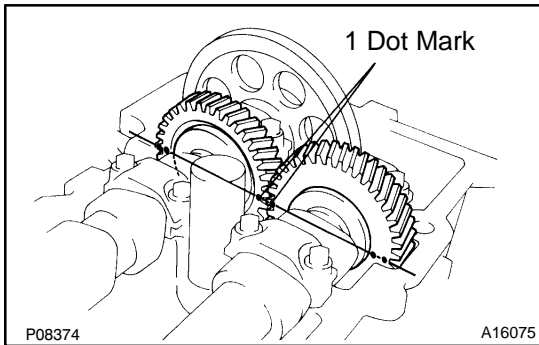


- (2) Apply engine oil to thrust portion of the exhaust camshaft.
 - (3) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (two dot marks) on each gear.
 - (4) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.
 - (5) Lightly push the intake camshaft towards the front without applying excessive force.
 - (6) Install the No. 4 and No. 6 bearing caps in their proper location.
 - (7) Temporarily tighten the bearing cap bolts uniformly and alternately in several passes until the bearing caps are snug with the cylinder head.
 - (8) Place the No. 2, No. 3, No. 5 and No. 7 bearing caps in their proper location.
 - (9) Temporarily tighten these bearing cap bolts, alternately tightening the left and right bolts uniformly.
 - (10) Place the No. 1 bearing cap in its proper location. When doing this, check that there is no gap between the cylinder head and the contact surface of bearing cap.
 - (11) Temporarily tighten the bearing cap bolts, alternately tightening the left and right bolts uniformly.
 - (12) Uniformly tighten the 14 bearing cap bolts in several passes.
- Torque: 16 N·m (160 kgf-cm, 12 ft-lbf)**
- (13) Bring the service bolt installed in the driven sub-gear upward by turning the hexagon wrench head portion of the camshaft with a wrench.
 - (14) Remove the service bolt.
 - (15) Check that the intake and exhaust camshafts turn smoothly.

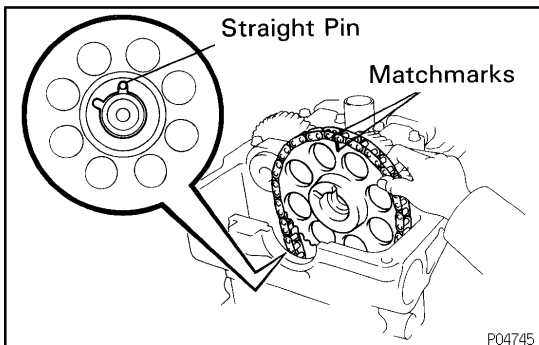


4. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.



- (b) Turn the camshafts so that the timing marks with 1 and 2 dots will be in straight line on the cylinder head surface as shown in the illustration.

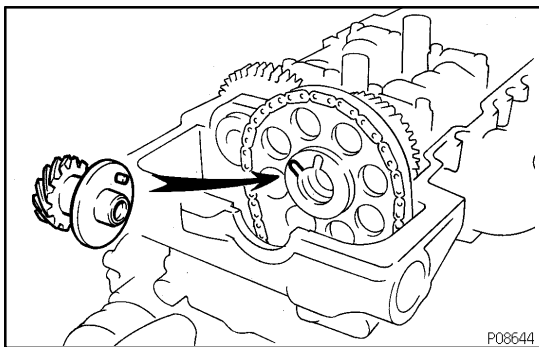


5. INSTALL CAMSHAFT TIMING GEAR

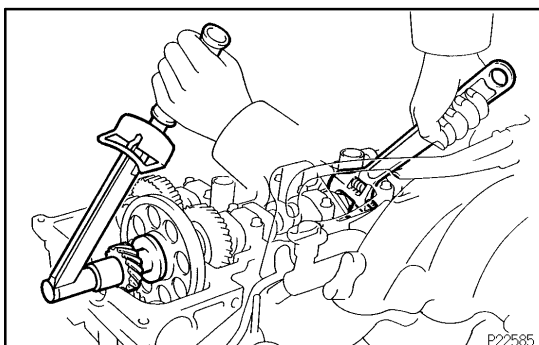
HINT:

Check that the matchmarks on the camshaft timing gear and timing chain are aligned.

- (a) Place the gear over the straight pin of the intake camshaft.



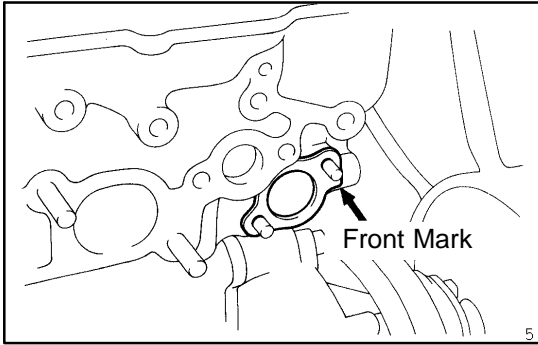
- (b) Align the straight pin of distributor gear with the straight pin groove of the intake camshaft gear as shown.



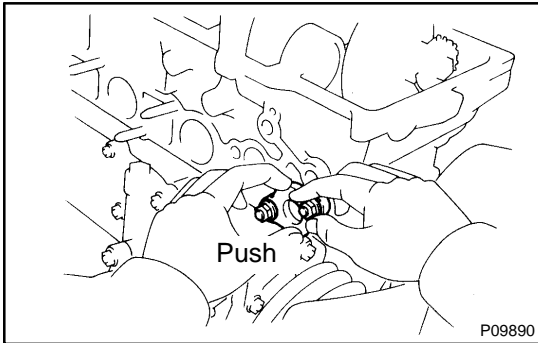
- (c) Hold the intake camshaft with a wrench, install and torque the bolt.

Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)

ENGINE MECHANICAL – CYLINDER HEAD

**6. INSTALL CHAIN TENSIONER**

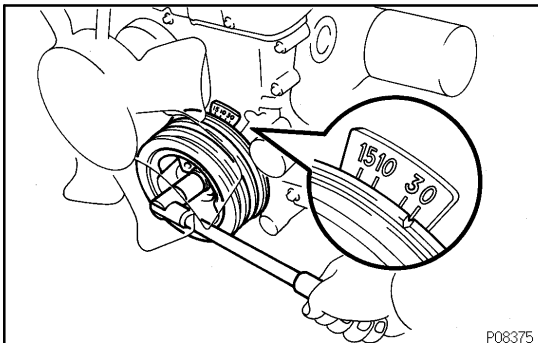
- (a) Place a new gasket so that the front mark is toward the front side.



- (b) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts.

- (c) Tighten the 2 nuts.

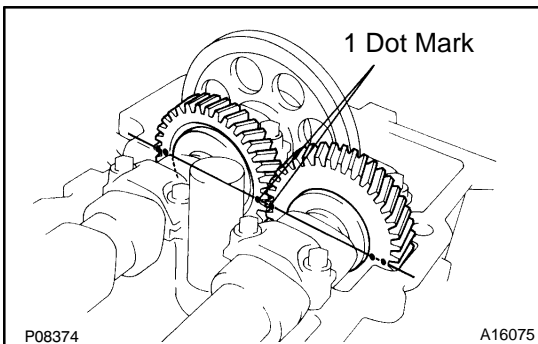
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

**7. CHECK VALVE TIMING**

- (a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.

NOTICE:

Always turn the crankshaft clockwise.



- (b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

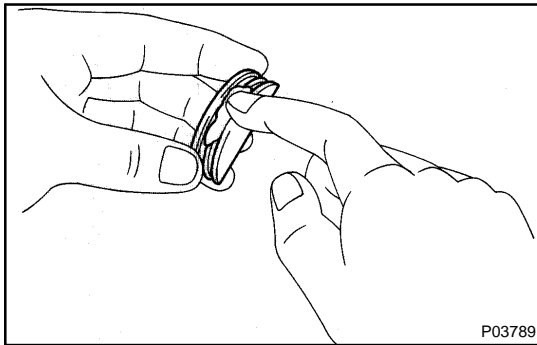
8. CHECK AND ADJUST VALVE CLEARANCE (See page EM-4)

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 – 0.35 mm (0.010 – 0.041 in.)

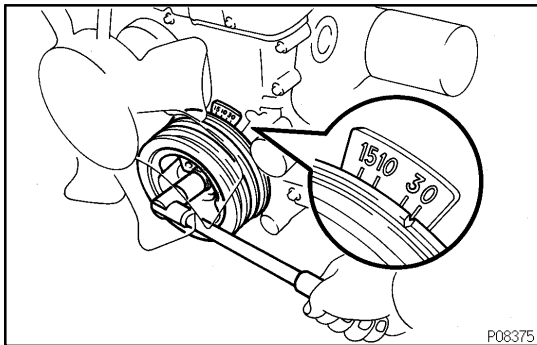
9. INSTALL SPARK PLUGS

**10. INSTALL SEMI-CIRCULAR PLUG**

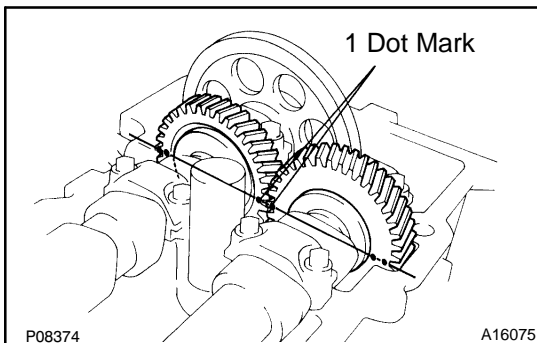
- (a) Remove any old packing (FIPG) material.
- (b) Apply seal packing to the cylinder head installation surface of the semi-circular plug.

Seal packing: Part No. 08826-00080 or equivalent

- (c) Install the semi-circular plug to the cylinder head.

**11. SET NO. 1 CYLINDER TO TDC/COMPRESSION**

- (a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.

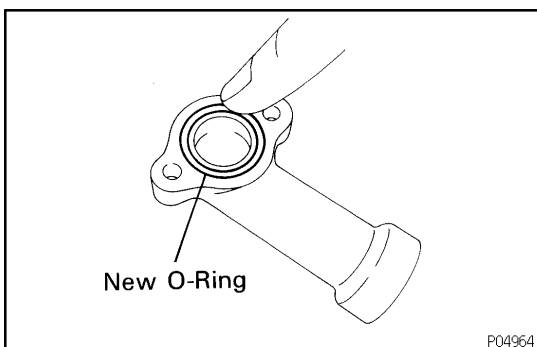


- (b) Check that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration.

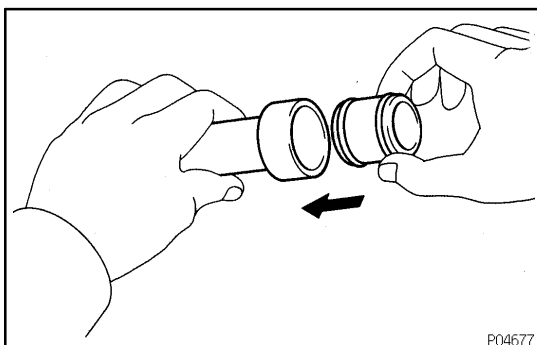
If not, turn the crankshaft 1 revolution (360°) and align the mark as above.

12. INSTALL CYLINDER HEAD COVER

- (a) Install the gasket to the cylinder head cover.
- (b) Install the cylinder head cover with the 13 bolts.

**13. INSTALL WATER BYPASS OUTLET AND PIPE**

- (a) Install a new O-ring to the water bypass outlet.



- (b) Install 2 new O-rings to the water bypass pipe.
- (c) Apply soapy water to the O-rings.
- (d) Assemble the water bypass outlet and pipe.
- (e) Install the water bypass outlet and pipe with the 2 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

14. INSTALL HEATER PIPE

Install a new gasket, the heater pipe and ground cable with the 2 bolts and 2 nuts.

Torque:

20 N·m (200 kgf·cm, 14 ft·lbf) for bolt:

21 N·m (210 kgf·cm, 15 ft·lbf) for nut

15. INSTALL NO. 1 AND NO. 2 EXHAUST MANIFOLDS

(a) Install 2 new gaskets, No. 1 exhaust manifold and No. 2 exhaust manifold with the 13 nuts.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Install the No. 1 heat insulator and No. 2 heat insulator with the 6 bolts.

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

16. INSTALL FRONT EXHAUST PIPE

(a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts.

Torque: 63 N·m (630 kgf·cm, 46 ft·lbf)

(b) Install the No. 1 support bracket with the 2 bolts.

Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)

(c) Connect the clamp and tighten the clamp bolt.

Torque: 19.5 N·m (195 kgf·cm, 14 ft·lbf)

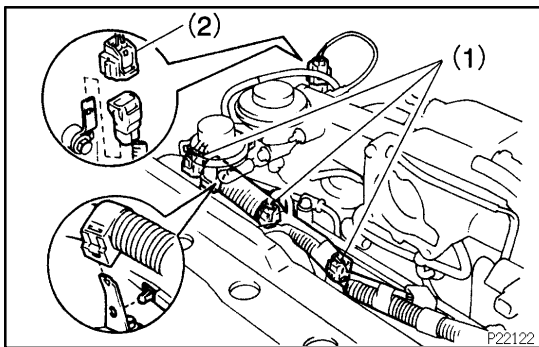
(d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts.

Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)

17. CONNECT NO. 2 WATER BYPASS PIPE

Connect the bypass pipe to the cylinder head with the 3 bolts.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

**18. CONNECT ENGINE WIRE**

(a) Place the engine wire on the intake manifold.

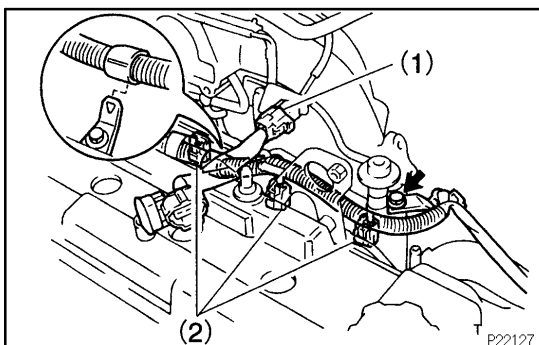
(b) Connect the connectors.

(1) Connect the 3 injector connectors.

(2) Connect the EGR gas temp. sensor connector.

(c) Connect the clamp of the No.6 injector wire to the bracket.

(d) Connect the engine wire clamp.



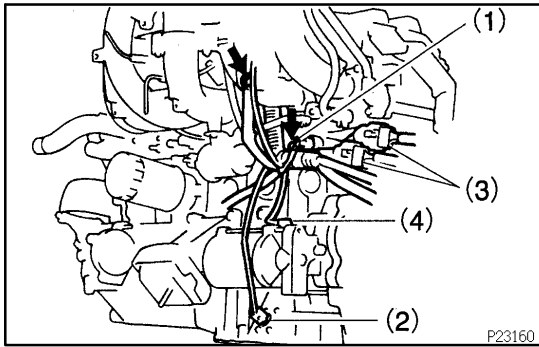
(e) Connect the engine wire clamp.

(f) Connect the connectors.

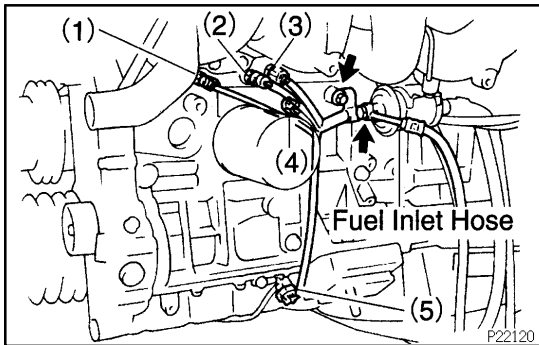
(1) Connect the connector for the emission control valve set assembly.

(2) Connect the 3 injector connectors.

(g) Install the bolt holding the engine wire to the intake manifold.



- (h) Connect the engine wire to the intake manifold and cylinder block with the 2 bolts.
- (i) Connect the PNP switch connector.
- (j) Connect the 2 heated oxygen sensor connectors.
- (k) Connect the connectors.
 - (1) Connect the Knock sensor connector.
 - (2) Connect the oil level sensor connector.
 - (3) Connect the 2 connectors to the transmission.
 - (4) Connect the starter connector.



- (l) Connect the engine wire to the cylinder block with the bolt.
- (m) Connect the connectors.
 - (1) Connect the ECT sender gauge connector.
 - (2) Connect the ECT cut switch connector.
 - (3) Connect the ECT sensor connector.
 - (4) Connect the knock sensor connector.
 - (5) Connect the crankshaft position sensor connector.

19. CONNECT FUEL INLET HOSE

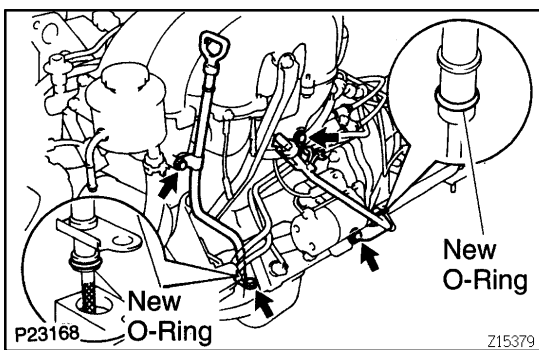
Connect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf-cm, 22 ft-lbf)

20. INSTALL INTAKE MANIFOLD STAY

Install the intake manifold stay with the 2 bolts.

Torque: 36 N·m (360 kgf-cm, 26 ft-lbf)



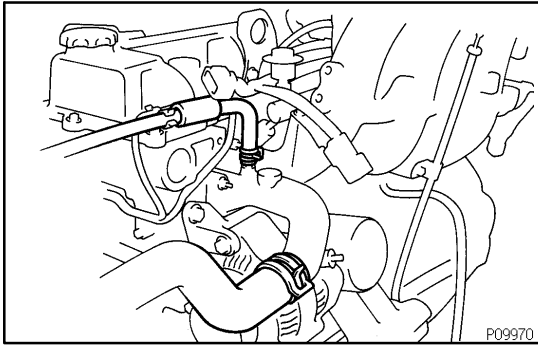
21. INSTALL OIL DIPSTICKS AND GUIDES FOR ENGINE AND TRANSMISSION

- (a) Install a new O-ring to the dipstick guide.
- (b) Apply a light coat of engine oil on the O-ring.
- (c) Push in the dipstick guide into the guide hole of the oil pan.
- (d) Install the dipstick guide with the 2 bolts.

Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)

22. INSTALL THROTTLE BODY (See page [SF-48](#))

23. INSTALL GENERATOR AND DRIVE BELTS (See page [CH-19](#))

**24. CONNECT NO. 3 WATER BYPASS HOSE****25. CONNECT RADIATOR INLET HOSE****26. CONNECT PS RESERVOIR TANK**

Connect the reservoir tank with the 3 bolts.

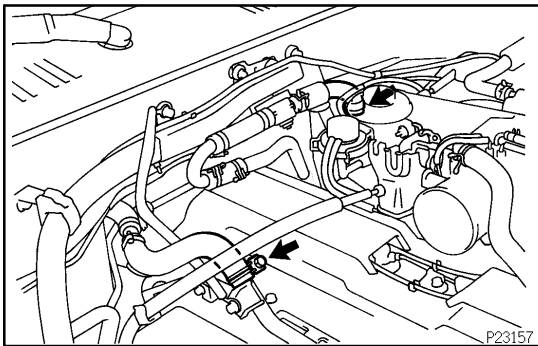
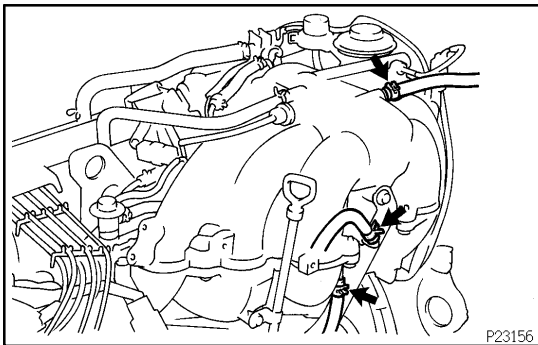
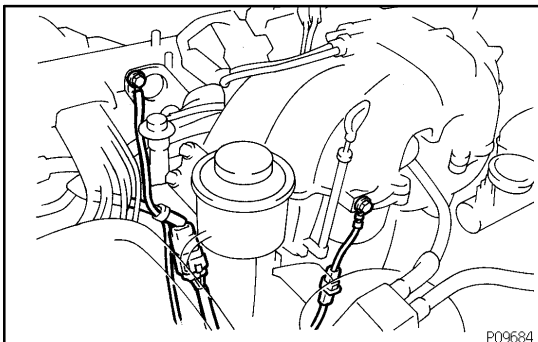
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

27. INSTALL DISTRIBUTOR (See page IG-11)**28. INSTALL NO. 2 AND NO. 3 CYLINDER HEAD COVERS**

Install the head covers with the 4 bolts.

29. CONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL

- (a) Connect the heater valve with the 2 bolts.
- (b) Connect the engine wire and ground strap with the 2 bolts.

**30. CONNECT HEATER HOSES****31. CONNECT FUEL RETURN HOSE****32. CONNECT EVAP HOSE****33. CONNECT BRAKE BOOSTER VACUUM HOSE****34. CONNECT CONNECTOR ON INTAKE MANIFOLD TO LH FENDER APRON****35. CONNECT ENGINE GROUND STRAPS**

- (a) Connect the ground strap to the No. 1 engine hanger.
- (b) Connect the ground strap to the air intake chamber.

36. CONNECT THROTTLE CABLE TO THROTTLE BODY**37. CONNECT ACCELERATOR CABLE TO THROTTLE BODY****38. CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY**

39. INSTALL AIR CLEANER HOSE AND CAP**40. INSTALL BATTERY TRAY AND BATTERY**

- (a) Install the battery tray with the 5 bolts.
- (b) Connect the ground strap with the bolt.
- (c) Install the battery and hold-down clamp with the nuts.
- (d) Connect the battery cables.

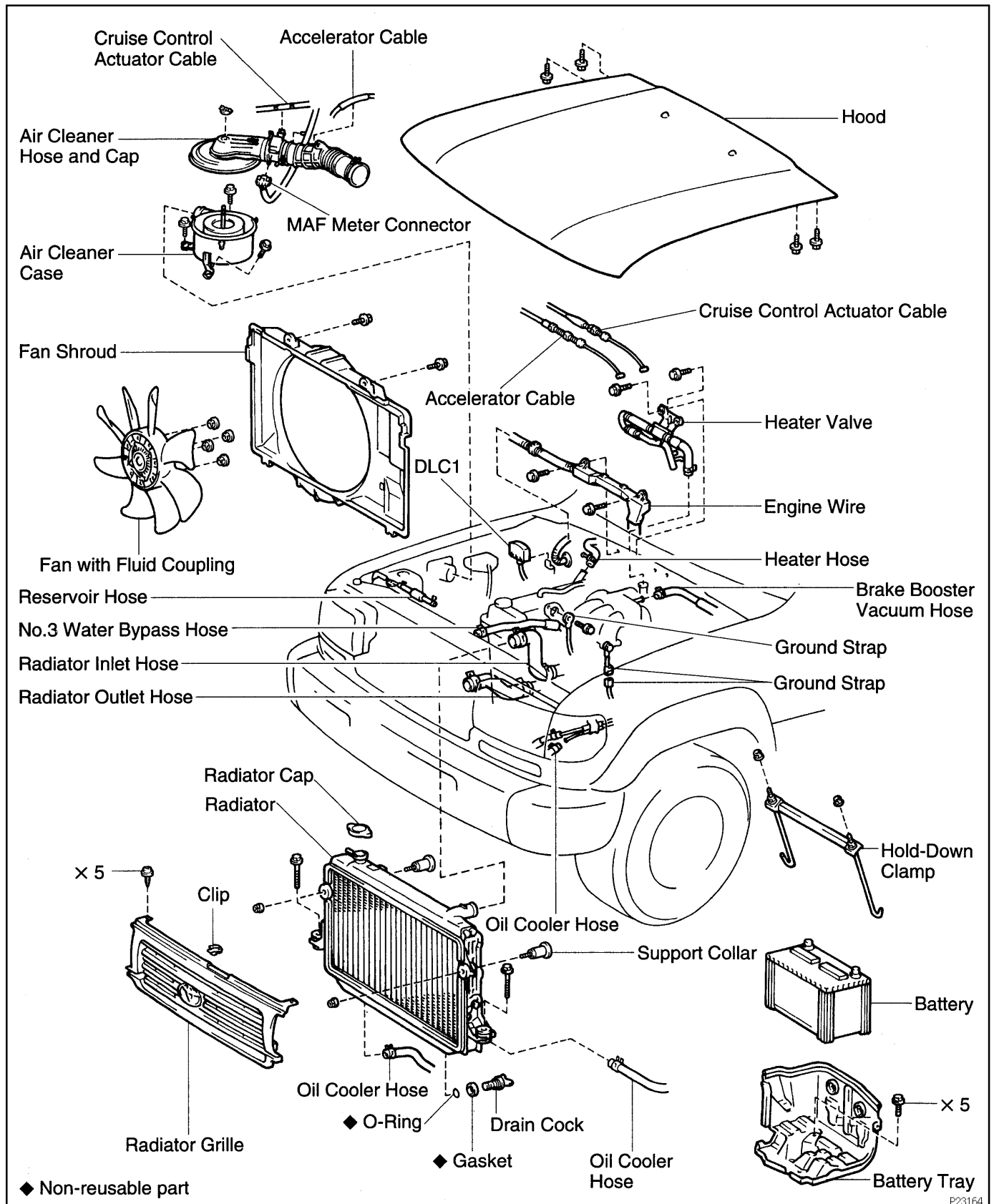
41. FILL RADIATOR WITH ENGINE COOLANT**42. START ENGINE AND CHECK FOR LEAKS****43. ADJUST IGNITION TIMING (See page [EM-10](#))****44. PERFORM ROAD TEST**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

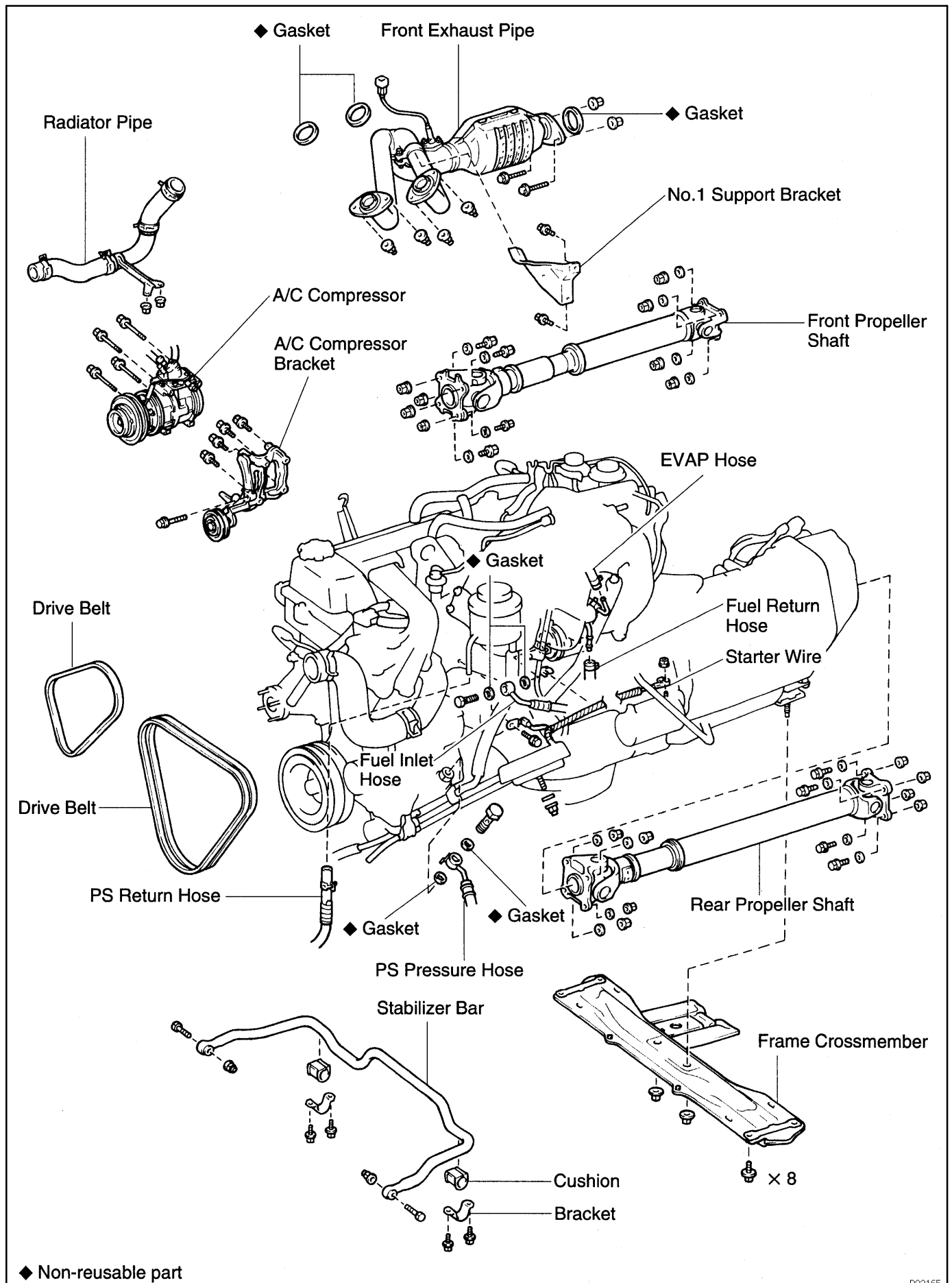
45. RECHECK ENGINE COOLANT LEVEL

ENGINE UNIT COMPONENTS

EM1EC-01

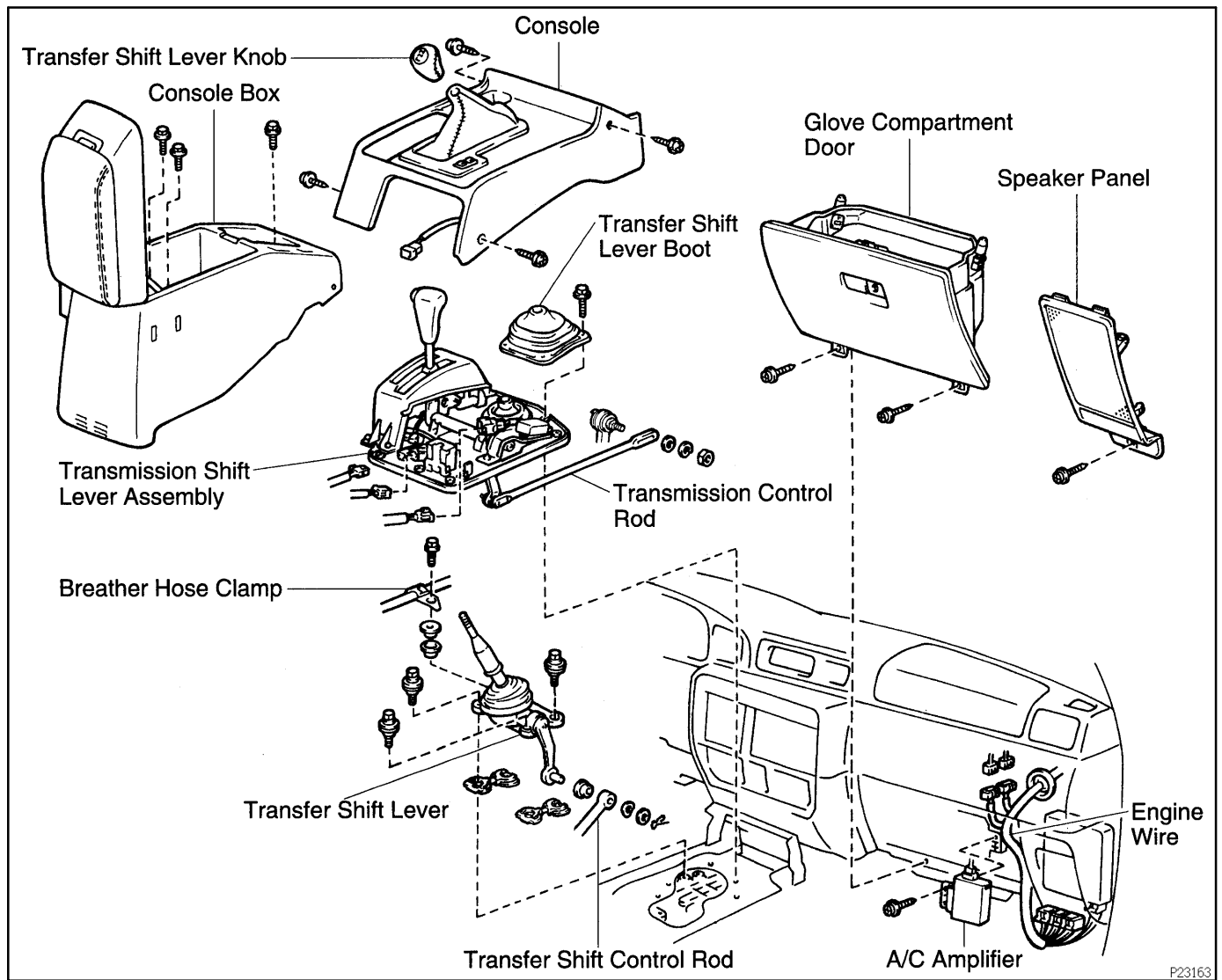


P23164

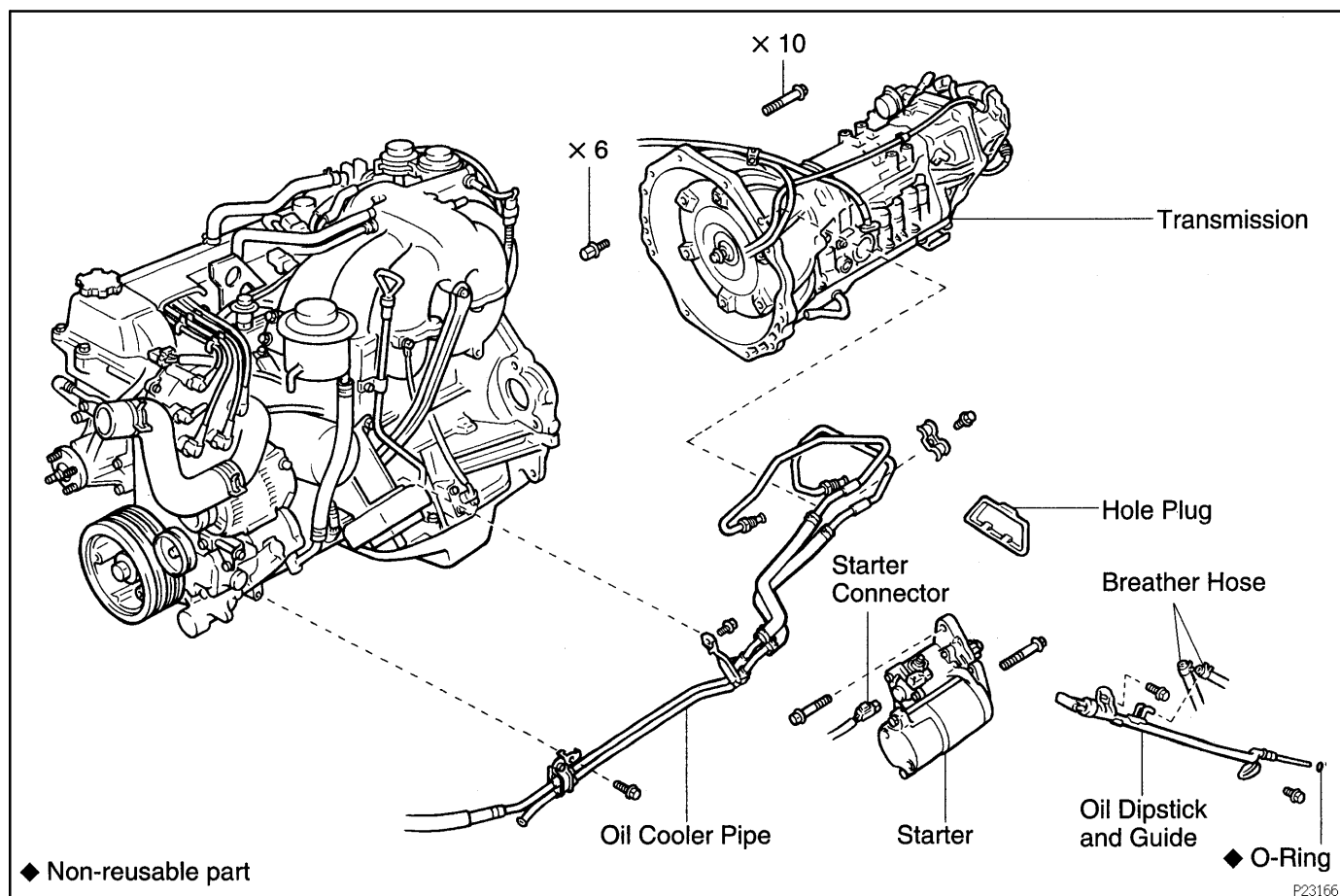


P23165

ENGINE MECHANICAL - ENGINE UNIT

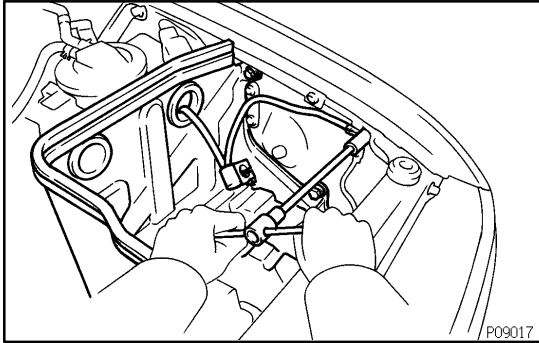


P23163



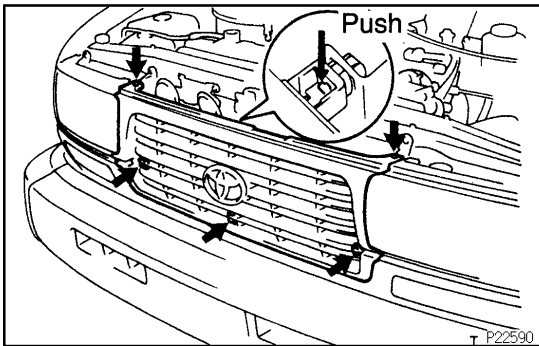
REMOVAL

1. DRAIN ENGINE COOLANT
2. DRAIN ENGINE OIL
3. REMOVE HOOD



4. REMOVE BATTERY AND BATTERY TRAY

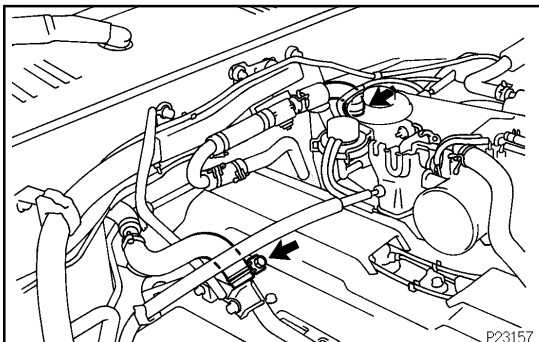
- (a) Disconnect the battery cables.
- (b) Remove the nuts, hold-down clamp and battery.
- (c) Remove the bolt and disconnect the ground strap.
- (d) Remove the 5 bolts and battery tray.



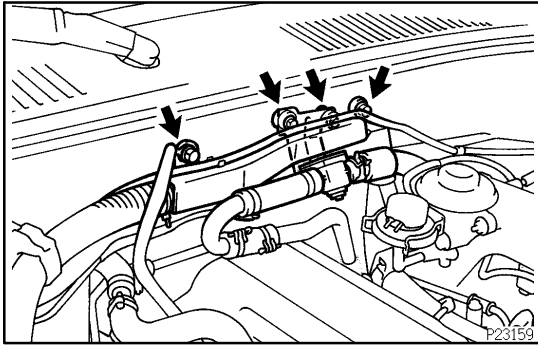
5. REMOVE RADIATOR GRILLE

Remove the 5 screws, clip and radiator grille.

6. REMOVE RADIATOR (See page [CO-14](#))
7. DISCONNECT OIL COOLER HOSE FROM OIL COOLER PIPE
8. REMOVE AIR CLEANER HOSE AND CAP
9. REMOVE AIR CLEANER CASE
10. DISCONNECT CRUISE CONTROL ACTUATOR CABLE FROM THROTTLE BODY
11. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

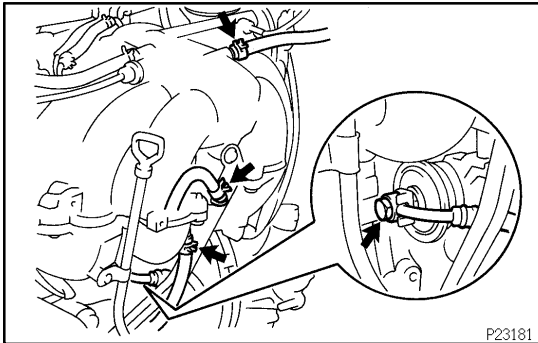


12. DISCONNECT HEATER HOSES



13. DISCONNECT ENGINE WIRE AND HEATER VALVE FROM COWL PANEL

- (a) Remove the 2 bolts and disconnect the engine wire and ground strap.
- (b) Remove the 2 bolts and disconnect the heater valve.



14. DISCONNECT BRAKE BOOSTER VACUUM HOSE

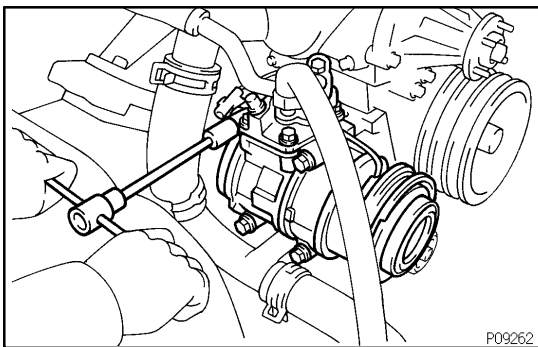
15. DISCONNECT EVAP HOSE

16. DISCONNECT FUEL HOSES

- (a) Disconnect the fuel return hose.
- (b) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter.

17. DISCONNECT WIRES AND CONNECTORS

- (a) Disconnect the 2 heated oxygen sensor connectors.
- (b) Disconnect the DLC1 clamp.
- (c) Disconnect the 2 oil pressure gauge connectors.
- (d) Disconnect the generator wire and connector.
- (e) Disconnect the connector on the intake manifold from the fender apron.
- (f) Disconnect the high-tension cord from the ignition coil.
- (g) Disconnect the ground strap from the No. 1 engine hanger.
- (h) Disconnect the ground strap from the air intake chamber.
- (i) Disconnect the starter wire.
- (j) Disconnect the ground cable from the cylinder block.



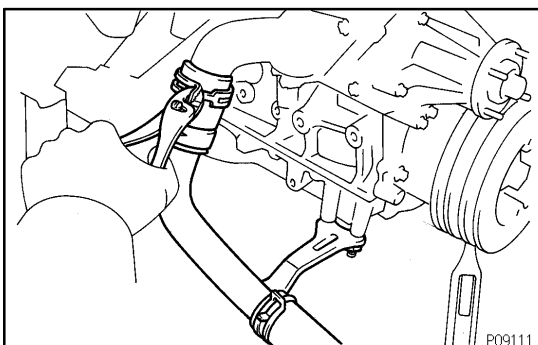
18. DISCONNECT A/C COMPRESSOR AND BRACKET

- (a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
- (b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket.

HINT:

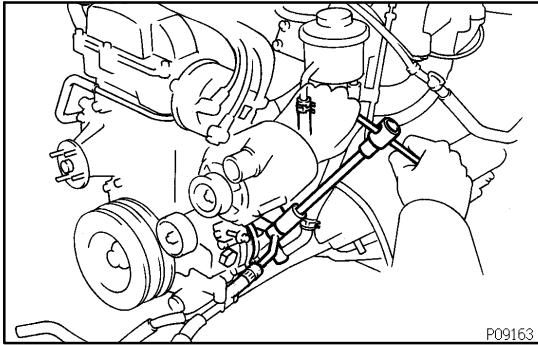
Put aside the compressor, and suspend it.

- (c) Remove the 5 bolts and A/C compressor bracket.



19. REMOVE RADIATOR PIPE

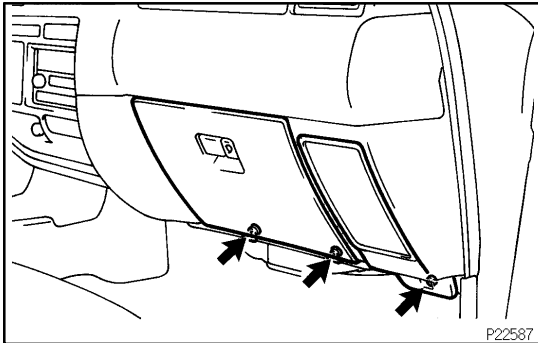
- (a) Remove the 2 nuts holding the radiator pipe to the No. 1 oil pan.
- (b) Disconnect the No. 2 radiator hose from the water inlet and remove the radiator pipe.

**20. DISCONNECT PS PRESSURE HOSE**

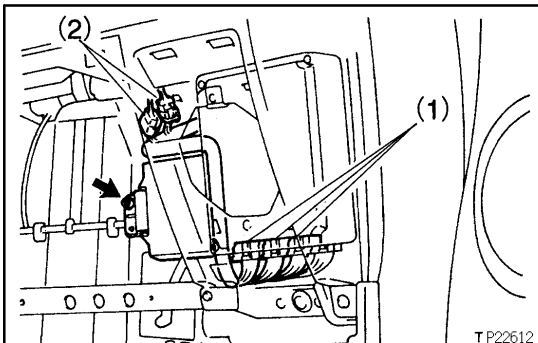
Remove the union bolt and 2 gaskets, and disconnect the pressure hose from the PS pump.

21. DISCONNECT PS RETURN HOSE

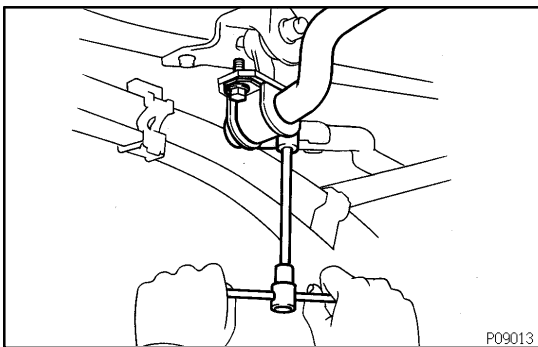
Disconnect the return hose from the PS reservoir tank.

**22. DISCONNECT ENGINE WIRE FROM CABIN**

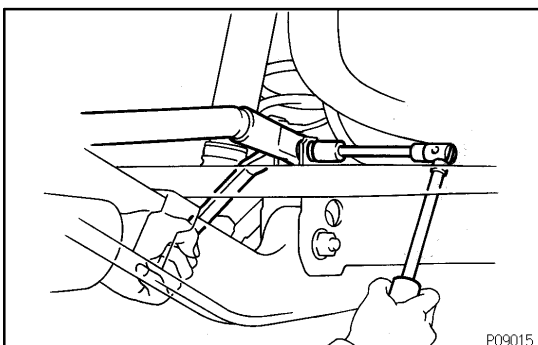
- (a) Remove the 2 screws and glove compartment door.
- (b) Remove the screw and speaker panel.



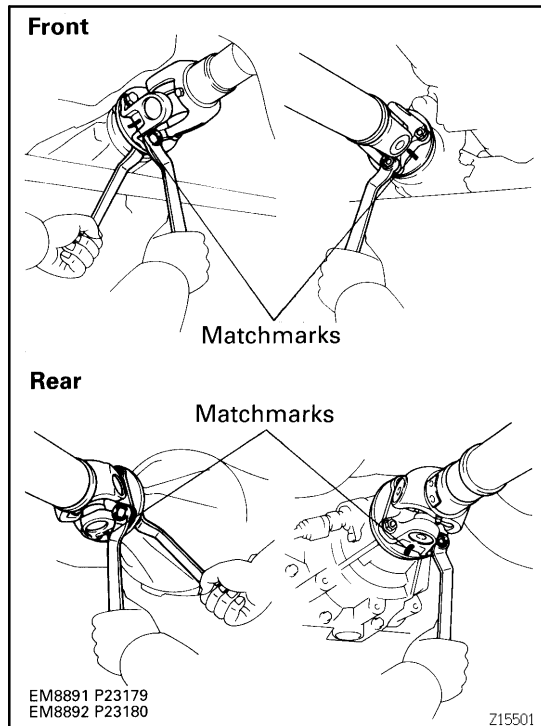
- (c) Remove the screw, and disconnect the A/C amplifier.
- (d) Disconnect the connectors.
 - (1) Disconnect the 3 connectors from the ECM.
 - (2) Disconnect the 2 connectors from the cowl wire.
- (e) Pull out the engine wire from the cabin.

**23. REMOVE STABILIZER BAR**

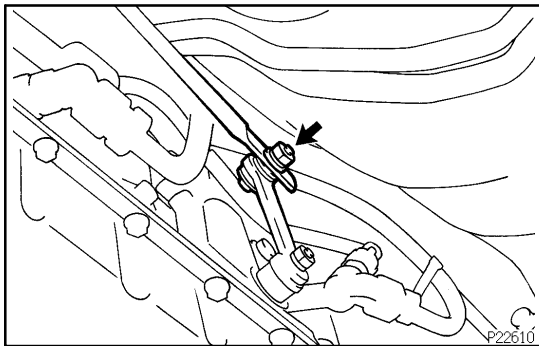
- (a) Remove the 2 bolts and disconnect stabilizer bar from the bracket.



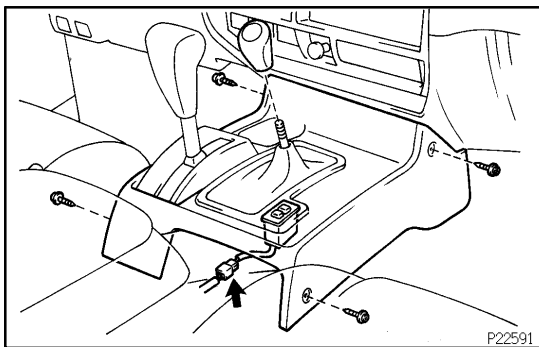
- (b) Remove the bolt and nut, and remove the stabilizer bar from the axle housing.

**24. REMOVE FRONT AND REAR PROPELLER SHAFTS**

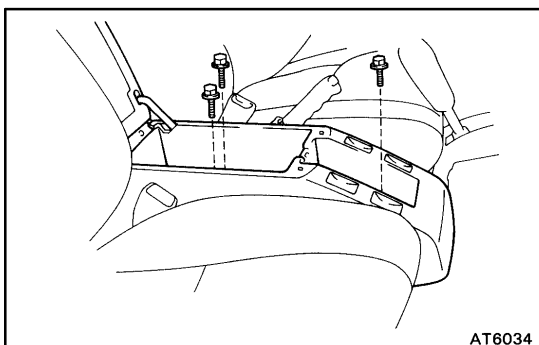
- Put matchmarks on the flanges.
- Remove the 4 bolts and nuts.
- Remove the 4 nuts.
- Remove the propeller shaft.

**25. REMOVE TRANSFER SHIFT LEVER**

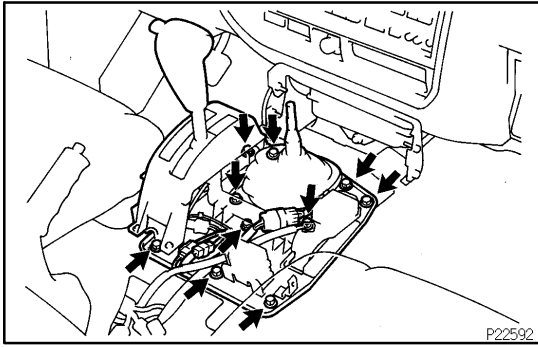
- Remove the nut and transmission control rod.



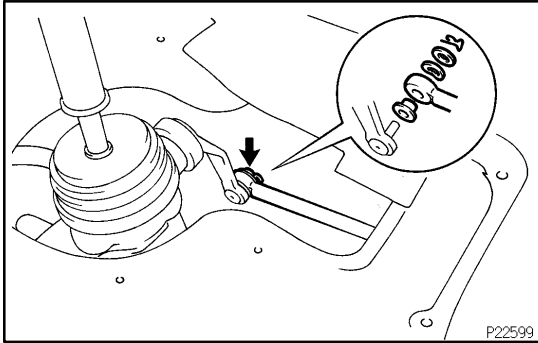
- Remove the transfer shift lever knob.
- Remove 4 screws.
- Lift up the console slightly in order to disconnect the connector.
- Remove the console.



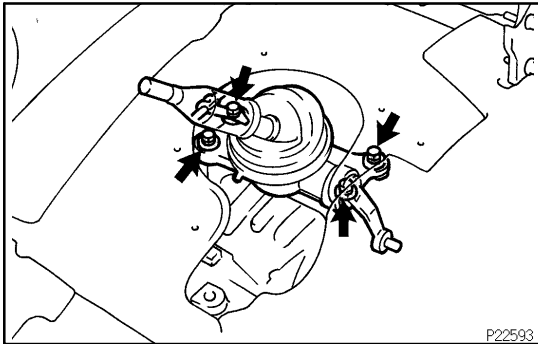
- Remove the 3 bolts and console box.



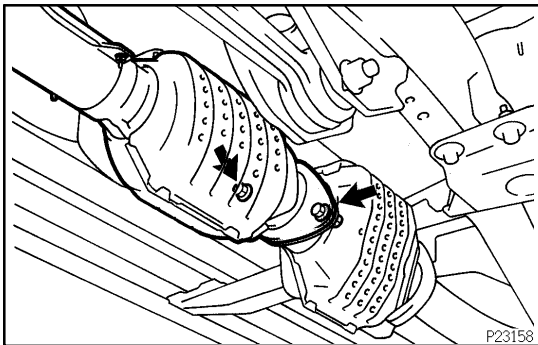
- (g) Disconnect the 3 connectors.
- (h) Remove the 10 bolts and the transfer shift lever boot and transmission shift lever assembly.



- (i) Pull out the pin and disconnect the shift rod.

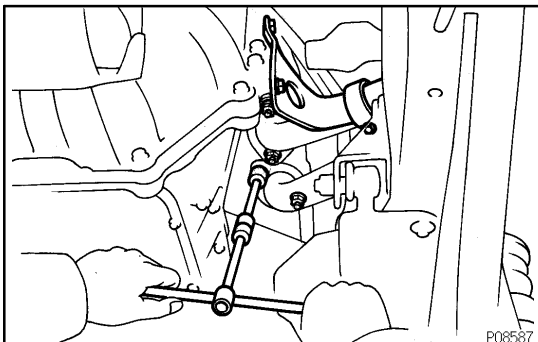


- (j) Remove the 4 bolts, hose clamp and the transfer shift lever.



26. REMOVE FRONT EXHAUST PIPE

- (a) Disconnect the heated oxygen sensor connector.
- (b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC.
- (c) Disconnect the front exhaust pipe, and remove the gasket.

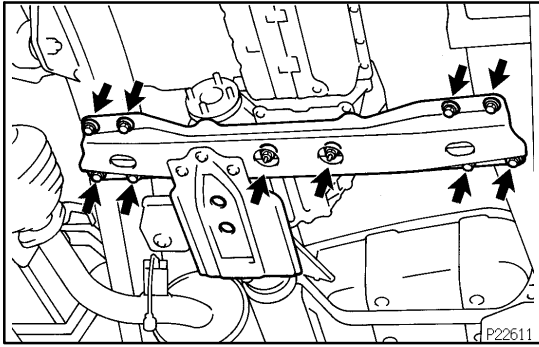


- (d) Loosen the clamp bolt and disconnect the clamp from the No.1 support bracket.
- (e) Remove the 2 bolts and No. 1 support bracket.
- (f) Remove the 4 nuts, front exhaust pipe and 2 gaskets.

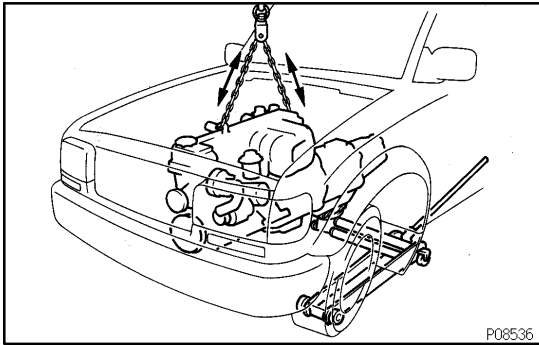
27. DISCONNECT GROUND STRAP FROM HEAT INSULATOR

28. PLACE JACK UNDER TRANSMISSION

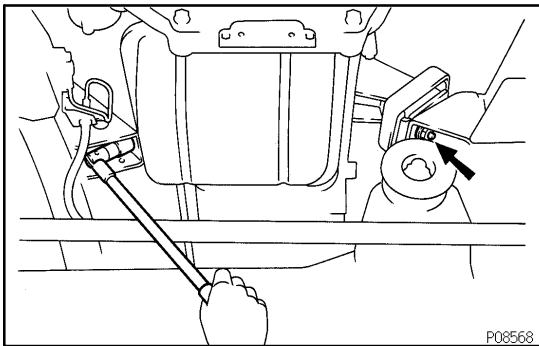
Be sure to put a wooden block between the jack and the transmission oil pan to prevent damage.

**29. REMOVE FRAME CROSSMEMBER**

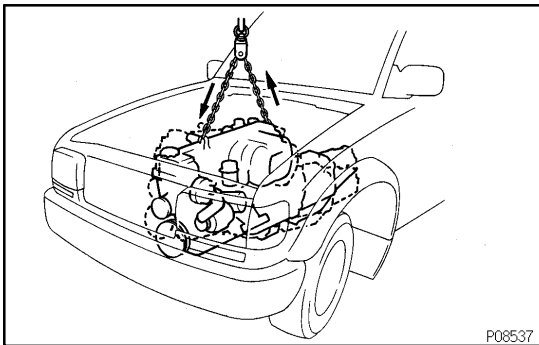
- (a) Remove the 2 nuts holding the crossmember to the engine rear mounting insulator.
- (b) Remove the 8 bolts and crossmember.

**30. REMOVE ENGINE WITH TRANSMISSION**

- (a) Attach the engine hoist chain to the 2 engine hangers.



- (b) Remove the 2 nuts holding the engine front mounting insulators to the frame.

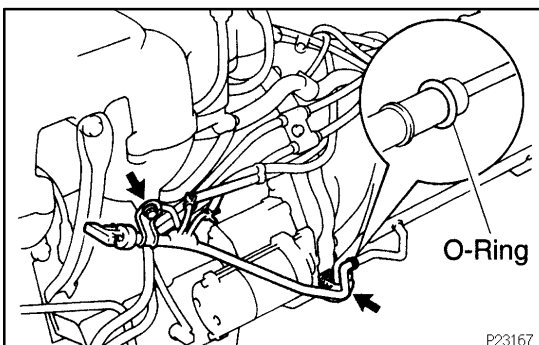


- (c) Lift the engine with transmission out of the vehicle slowly and carefully.

NOTICE:

Make sure that the engine is clear of all wiring and hoses.

- (d) Place the engine and transmission assembly onto the stand.

**31. REMOVE OIL DIPSTICK GUIDE FOR TRANSMISSION**

- (a) Disconnect the 2 breather hoses.
- (b) Remove the 2 mounting bolts.
- (c) Pull out the dipstick guide and dipstick from the transmission.
- (d) Remove the O-ring from the dipstick guide.

32. DISCONNECT ENGINE WIRE FROM TRANSMISSION

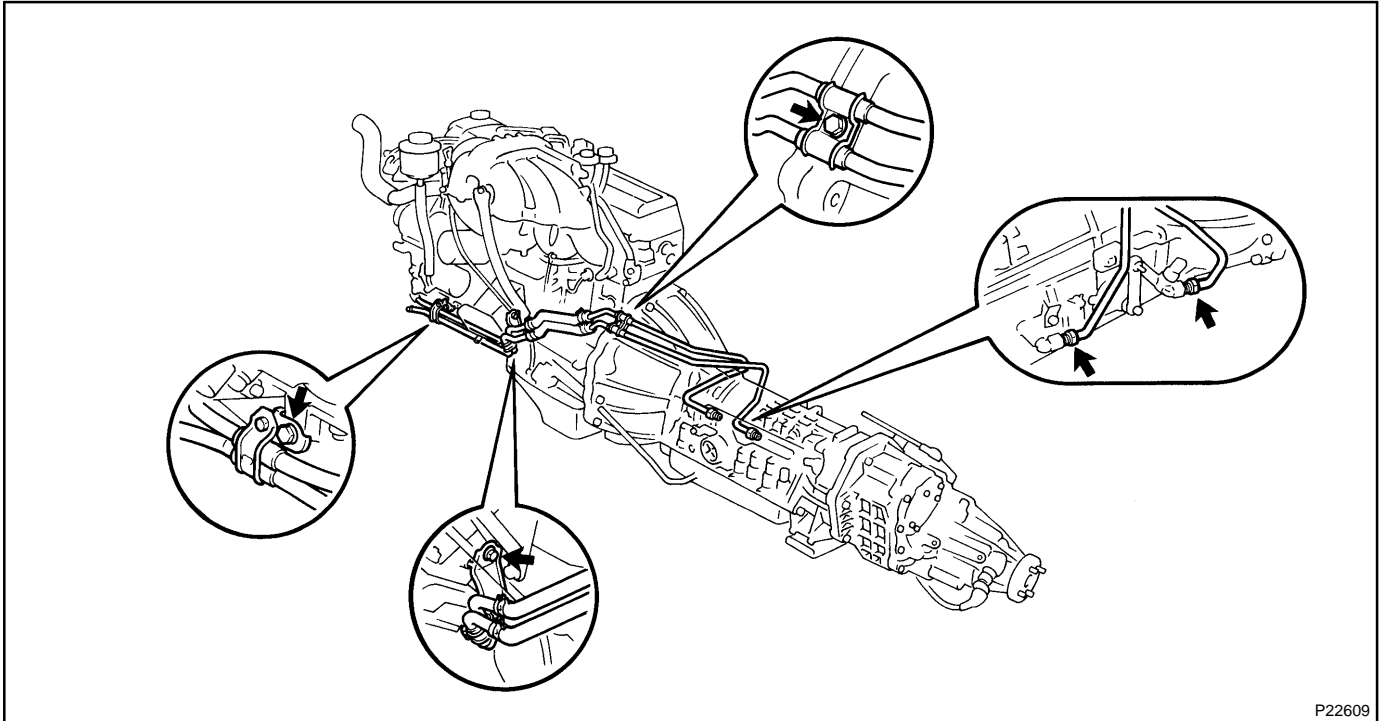
- (a) Disconnect the PNP switch connector.
- (b) Disconnect the 2 connectors from the transmission.

33. REMOVE STARTER

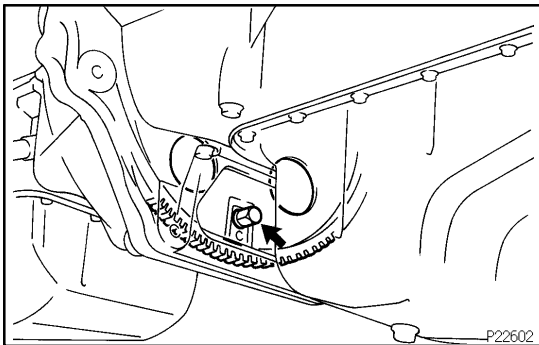
- (a) Disconnect the starter connector.
- (b) Remove the 2 bolts and starter.

34. REMOVE A/T OIL COOLER PIPES FOR TRANSMISSION

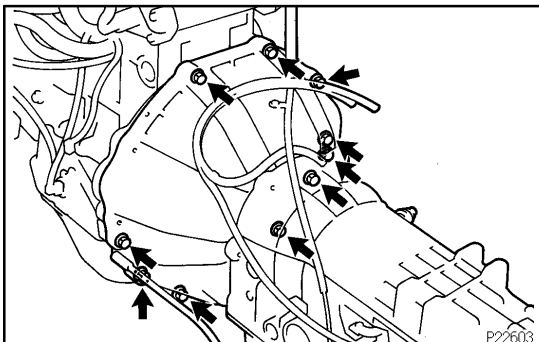
- (a) Remove the 3 clamp mounting bolts.
- (b) Loosen the 2 union nuts, and remove the oil cooler pipes.

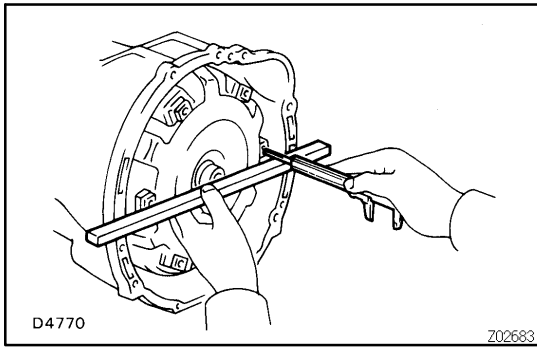
**35. DISCONNECT THROTTLE CABLE FROM THROTTLE BODY****36. REMOVE HOLE PLUG****37. REMOVE 6 TORQUE CONVERTER CLUTCH MOUNTING BOLT**

Turn the crankshaft to gain access to each bolt. Remove the 6 bolts.

**38. REMOVE TRANSMISSION FROM ENGINE**

Remove the 10 bolts and transmission.





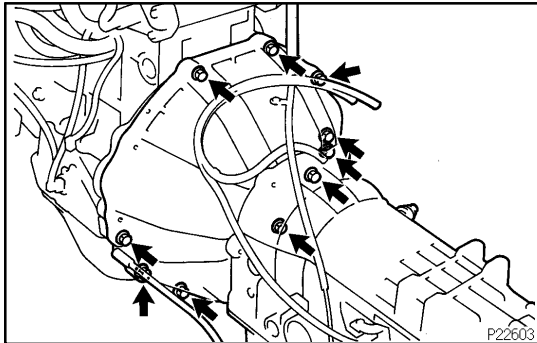
INSTALLATION

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission.

Correct distance: 15.7 mm (0.618 in.) or more

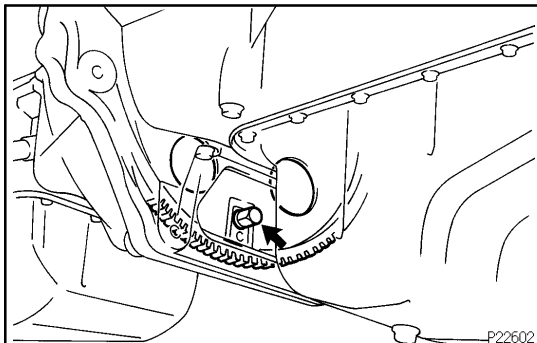
If the distance is less than the specifications, check for an improper installation.



2. INSTALL TRANSMISSION TO ENGINE

Install the transmission with the 7 bolts.

Torque: 72 N·m (730 kgf-cm, 53 ft-lbf)



3. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS

Install the 6 bolts by turning the crankshaft.

Torque: 55 N·m (550 kgf-cm, 41 ft-lbf)

HINT:

First install the green colored bolt and then the remaining 5 bolts.

4. INSTALL HOLE PLUG

5. CONNECT THROTTLE CABLE TO THROTTLE BODY

6. INSTALL A/T OIL COOLER PIPES FOR TRANSMISSION

- Temporarily install the 3 mounting bolts.
- Connect the 2 oil cooler pipes to the unions on the transmission. Tighten the union nuts.

Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)

- Tighten the 3 clamp mounting bolts.

7. INSTALL STARTER

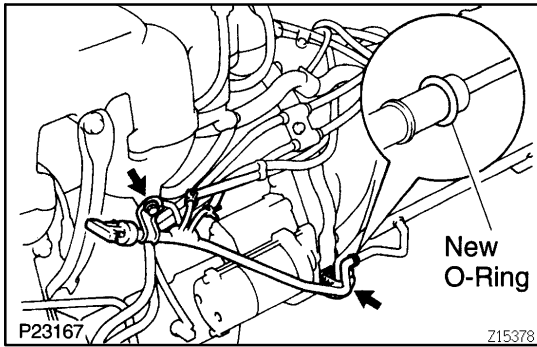
- Install the starter with the 2 bolts.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

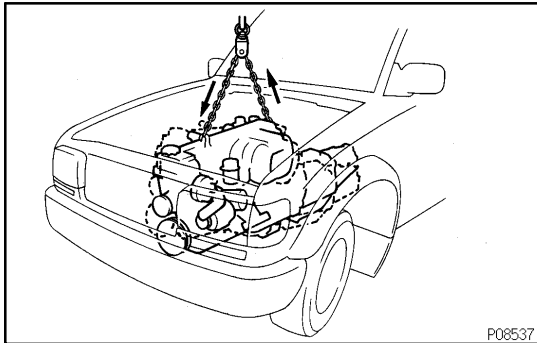
- Connect the starter connector.

8. CONNECT ENGINE WIRE TO TRANSMISSION

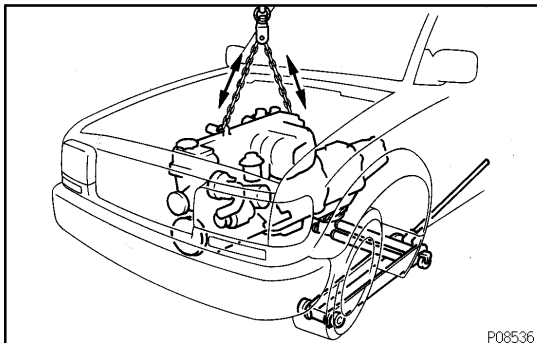
- Connect the 2 connectors from the transmission.
- Connect the PNP switch connector.

**9. INSTALL OIL DIPSTICK GUIDE FOR TRANSMISSION**

- (a) Install a new O-ring to the dipstick guide.
- (b) Apply a light coat of ATF to the O-ring.
- (c) Connect the dipstick guide end to the tube of the oil pan, and install the dipstick guide with the 2 bolts.
- (d) Install the dipstick.
- (e) Connect the 2 breather hoses.

**10. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE**

- (a) Attach the engine hoist chain to the engine hangers.
- (b) Lower the engine and transmission assembly into the engine compartment.



- (c) Insert the stud bolts of the front engine mounting insulators into the stud bolt holes of the frame.
- (d) Temporarily install the 2 nuts holding the engine front mounting insulators to the frame crossmember.
- (e) Keep the engine level with a jack.
- (f) Remove the hoist chain.

11. INSTALL FRAME CROSSMEMBER

- (a) Temporarily install the crossmember to the engine rear mounting insulator with the 2 nuts.
- (b) Install the 8 bolts holding the crossmember to the frame.
- (c) Tighten the 2 nuts holding the crossmember to the engine rear mounting insulator.

Torque: 61 N·m (620 kgf-cm, 45 ft-lbf)**Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)****12. TIGHTEN NUTS HOLDING ENGINE FRONT MOUNTING INSULATORS TO FRAME****Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)****13. CONNECT GROUND STRAP TO HEAT INSULATOR****14. INSTALL FRONT EXHAUST PIPE**

- (a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts.

Torque: 63 N·m (630 kgf-cm, 46 ft-lbf)

- (b) Install the No.1 support bracket with the 2 bolts.

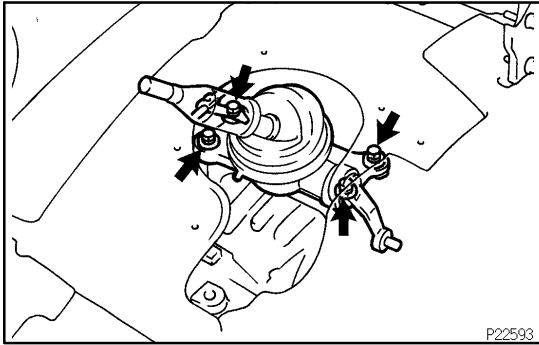
Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)

- (c) Connect the clamp and tighten the clamp bolt.

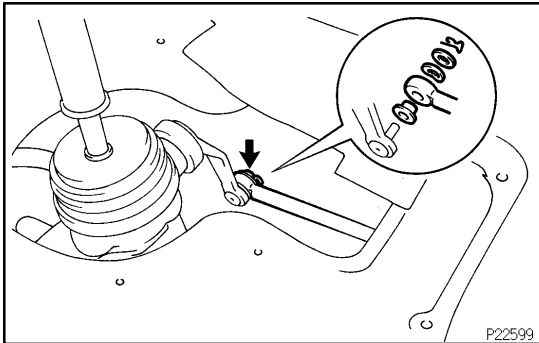
Torque: 19.5 N·m (195 kgf-cm, 14 ft-lbf)

- (d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts.

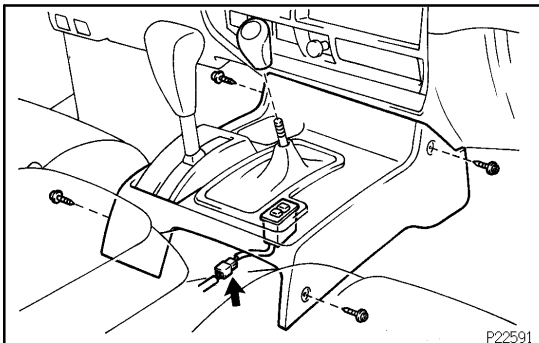
Torque: 46 N·m (470 kgf-cm, 34 ft-lbf)

**15. INSTALL TRANSFER SHIFT LEVER**

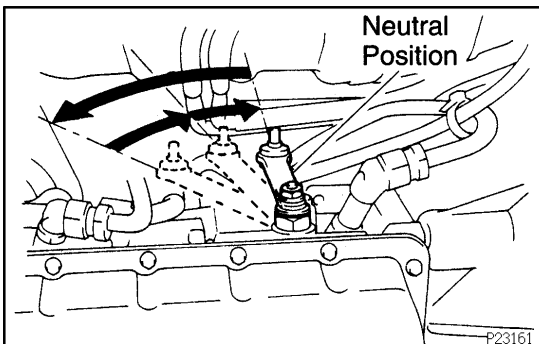
- (a) Install the shift lever and hose clamp with the 4 bolts.
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



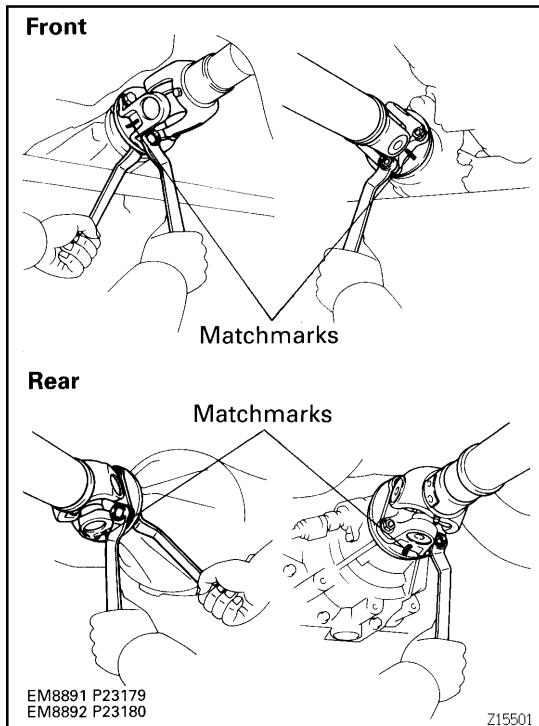
- (b) Connect the shift rod and install the pin.
 (c) Install the transfer shift lever boot and transmission shift lever assembly with the 10 bolts.
Torque: 5.4 N·m (55 kgf-cm, 48 in.-lbf)
 (d) Connect the 3 connectors to the transmission shift lever assembly.
 (e) Install the console box with the 3 bolts.



- (f) Connect the pattern select switch connector.
 (g) Install the console with the 4 screws.
 (h) Install the transfer shift lever knob.



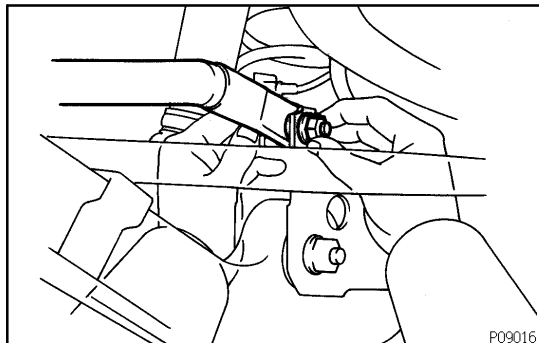
- (i) Shift the shift lever to N position.
 (j) Fully turn the control shaft lever back and return 2 notches. It is now in neutral position.
 (k) Connect the transmission control rod with the nut.
Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

**16. Differential Side:****INSTALL FRONT AND REAR PROPELLER SHAFTS**

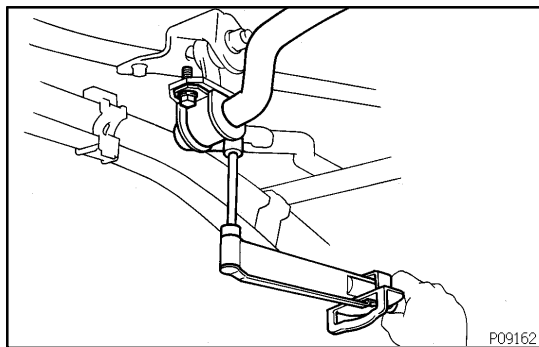
- (a) Align the matchmarks on the flanges and connect the flanges with the 4 bolts and nuts.
- (b) Torque the bolts and nuts.

Torque:**74 N·m (750 kgf-cm, 54 ft-lbf) for front shaft****88 N·m (900 kgf-cm, 65 ft-lbf) for rear shaft****17. Transfer Side:****INSTALL FRONT AND REAR PROPELLER SHAFTS**

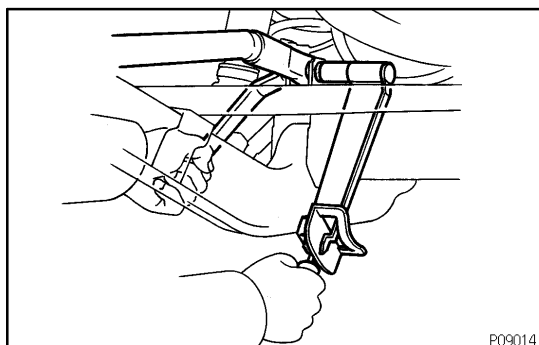
- (a) Align the matchmarks on the flanges and connect the flanges with the 4 nuts.
- (b) Torque the nuts.

Torque:**74 N·m (750 kgf-cm, 54 ft-lbf) for front shaft****88 N·m (900 kgf-cm, 65 ft-lbf) for rear shaft****18. INSTALL STABILIZER BAR**

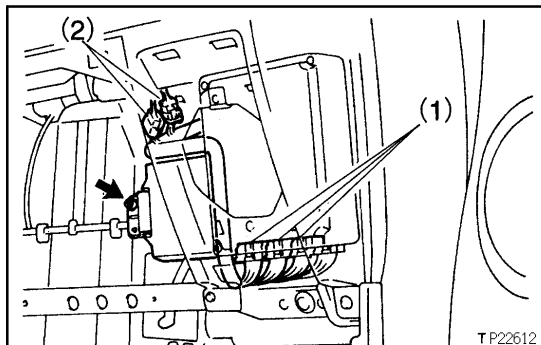
- (a) Temporarily install the stabilizer bar to the axle housing with the bolt and nut.



- (b) Connect the stabilizer bar with the 2 bolts.
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)
- (c) Bounce the vehicle up and down to stabilize the suspension.



- (d) Torque the bolt and nut holding the stabilizer bar to the axle housing.
Torque: 25 N·m (260 kgf-cm, 19 ft-lbf)

**19. CONNECT ENGINE WIRE TO CABIN**

- (a) Push in the engine wire through the cowl panel.
- (b) Connect the connectors.
 - (1) Connect the 3 connectors to the ECM.
 - (2) Connect the 2 connectors to the cowl wire.
- (c) Connect the A/C amplifier with the screw.
- (d) Install the speaker panel with the screw.
- (e) Install the glove compartment door with the 2 screws.

20. CONNECT PS RETURN HOSE

Connect the return hose to the PS reservoir tank.

21. CONNECT PS PRESSURE HOSE

Connect the PS pressure hose with 2 new gaskets and the union bolt.

Torque: 56 N·m (575 kgf·cm, 42 ft·lbf)

22. INSTALL RADIATOR PIPE

- (a) Connect the No. 2 radiator hose to the water inlet.
- (b) Install the 2 nuts holding the radiator pipe to the No. 1 oil pan.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

23. INSTALL A/C COMPRESSOR AND BRACKET

- (a) Install the A/C compressor bracket with the 5 bolts.

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

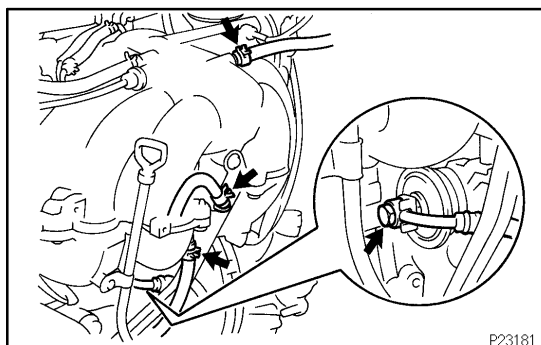
- (b) Install the A/C compressor with the 4 bolts.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

- (c) Install and adjust the drive belt (See page [CH-2](#)).

24. CONNECT WIRES AND CONNECTORS

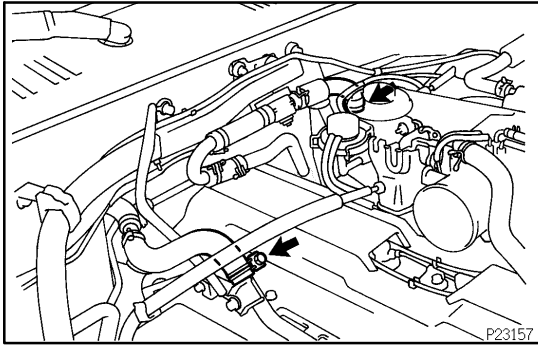
- (a) Connect the 2 heated oxygen sensor connectors.
- (b) Connect the DLC1 clamp.
- (c) Connect the 2 oil pressure gauge connectors.
- (d) Connect the generator wire and connector.
- (e) Connect the connector on the intake manifold to the fender apron.
- (f) Connect the high-tension cord to the ignition coil.
- (g) Connect the ground strap to the No. 1 engine hanger.
- (h) Connect the ground strap to the air intake chamber.
- (i) Connect the starter wire.
- (j) Connect the ground cable to the cylinder block.

**25. CONNECT FUEL HOSES**

- (a) Connect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt.

Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

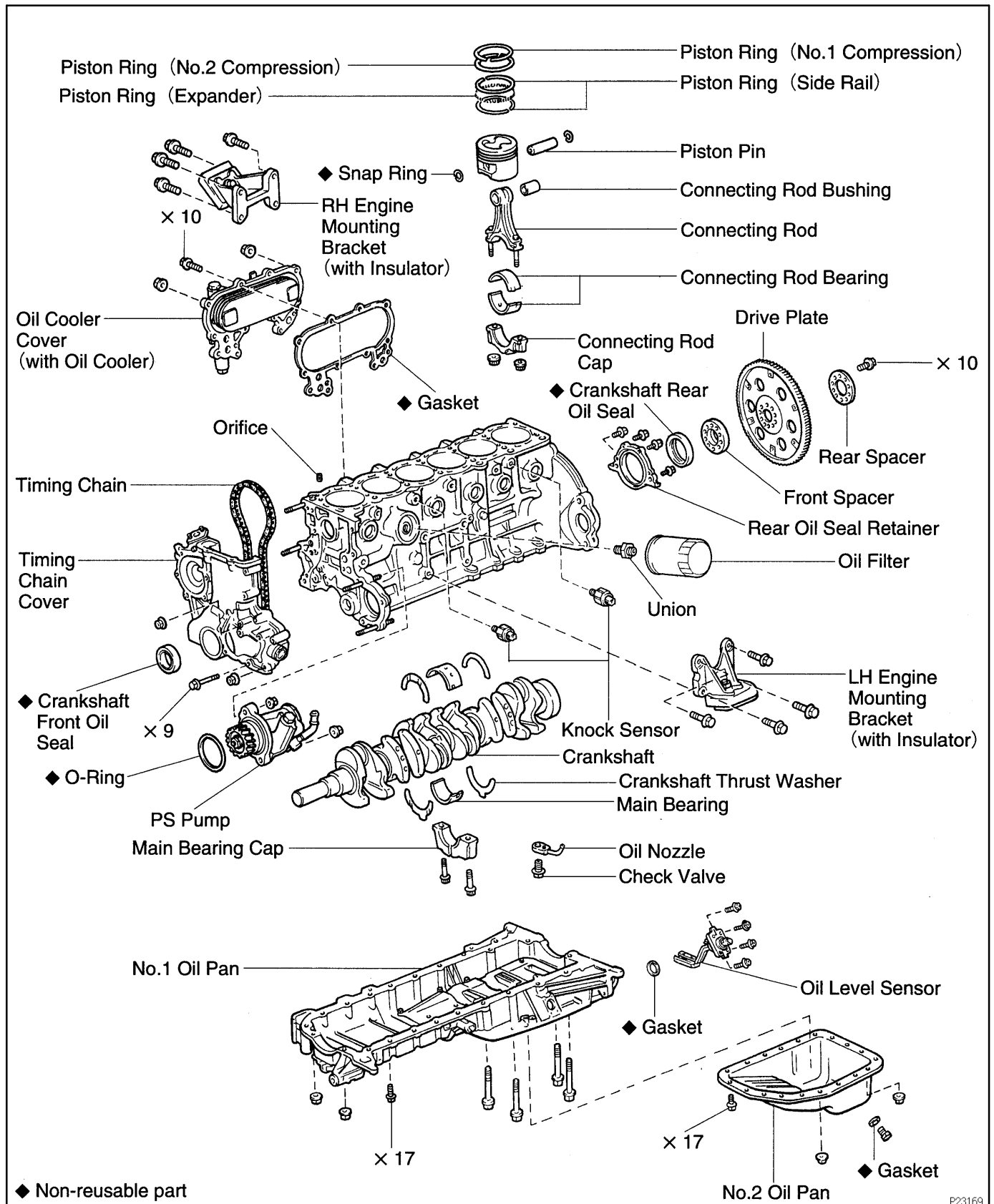
- (b) Connect the fuel return hose.



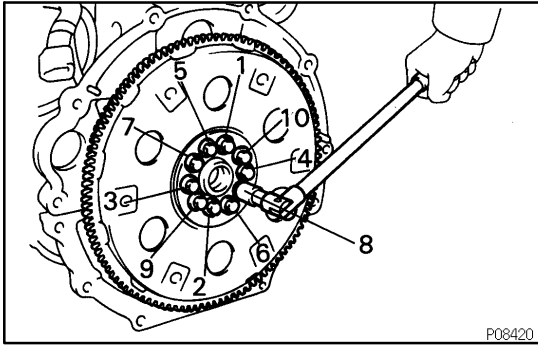
26. **CONNECT EVAP HOSE**
27. **CONNECT BRAKE BOOSTER VACUUM HOSE**
28. **CONNECT HEATER VALVE AND ENGINE WIRE TO COWL PANEL**
 - (a) Connect the heater valve with the 2 bolts.
 - (b) Connect the engine wire and ground strap with the 2 bolts.
29. **CONNECT HEATER HOSES**
30. **CONNECT ACCELERATOR CABLE TO THROTTLE BODY**
31. **CONNECT CRUISE CONTROL ACTUATOR CABLE TO THROTTLE BODY**
32. **INSTALL AIR CLEANER CASE**
33. **INSTALL AIR CLEANER HOSE AND CAP**
34. **CONNECT OIL COOLER HOSE TO OIL COOLER PIPE**
35. **INSTALL RADIATOR (See page [CO-16](#))**
36. **INSTALL RADIATOR GRILLE**
Install the radiator grille with the 5 screws and clip.
37. **INSTALL BATTERY TRAY AND BATTERY**
 - (a) Install the battery tray with the 5 bolts.
 - (b) Connect the ground strap with the bolt.
 - (c) Install the battery and hold-down clamp with the nuts.
 - (d) Connect the battery cables.
38. **FILL WITH ENGINE OIL**
39. **FILL RADIATOR WITH ENGINE COOLANT**
40. **START ENGINE AND CHECK FOR LEAKS**
41. **CHECK AUTOMATIC TRANSMISSION FLUID LEVEL**
42. **CHECK IGNITION TIMING (See page [EM-10](#))**
43. **INSTALL HOOD**
44. **PERFORM ROAD TEST**
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
45. **RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS**

CYLINDER BLOCK COMPONENTS

EM1EF-01



P23169



DISASSEMBLY

1. REMOVE DRIVE PLATE

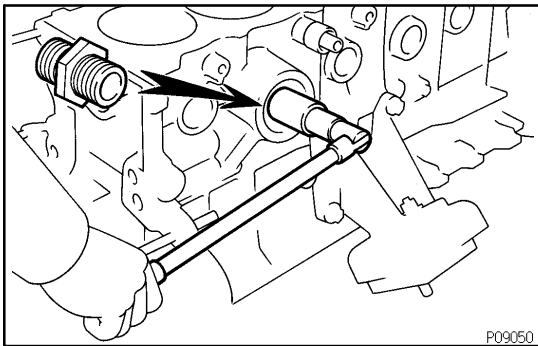
Uniformly loosen and remove the drive plate bolts, in several passes, in the sequence shown.

2. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

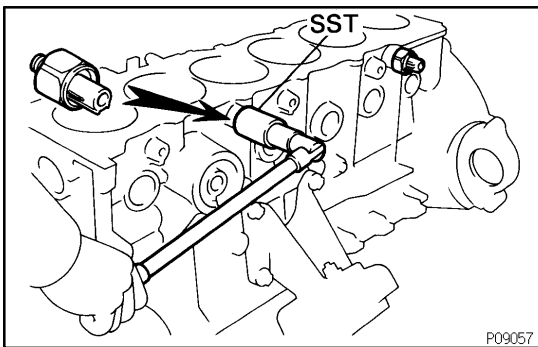
3. REMOVE CYLINDER HEAD (See page [EM-28](#))

4. REMOVE TIMING CHAIN AND GEARS (See page [EM-13](#))

5. REMOVE OIL FILTER (See page [LU-2](#))



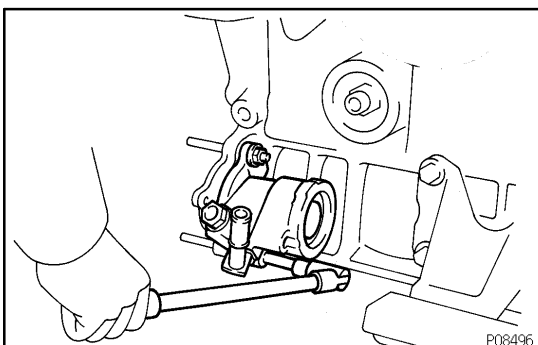
6. REMOVE OIL FILTER UNION



7. REMOVE KNOCK SENSORS

Using SST, remove the 2 knock sensors.

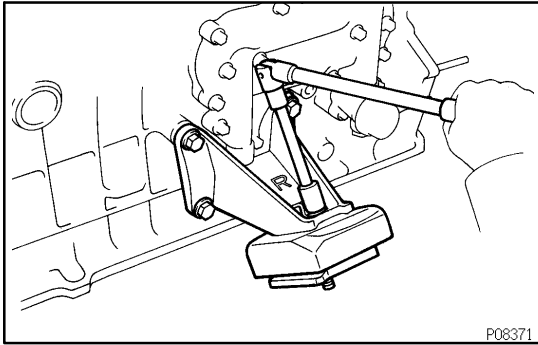
SST 09816-30010



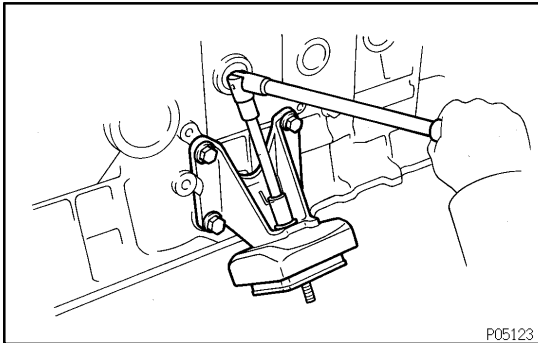
8. REMOVE PS PUMP

(a) Remove the 2 nuts and pump.

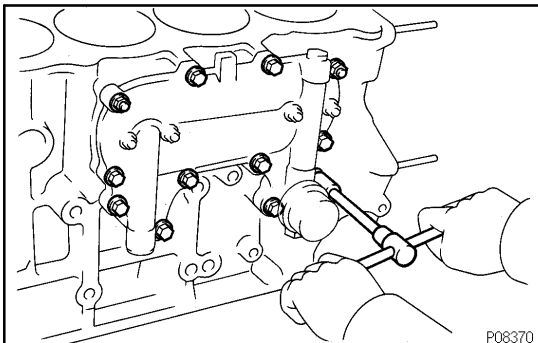
(b) Remove the O-ring from the pump.

**9. REMOVE RH ENGINE MOUNTING BRACKET**

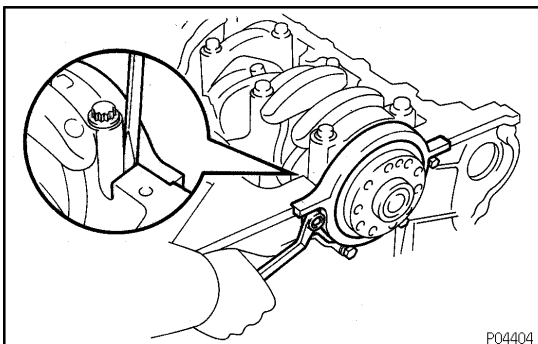
- (a) Remove the nut and insulator.
- (b) Remove the 4 bolts and bracket.

**10. REMOVE LH ENGINE MOUNTING BRACKET**

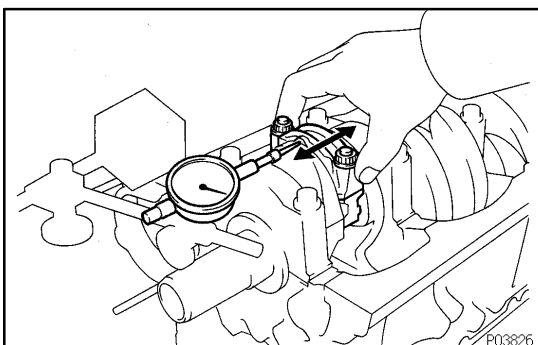
- (a) Remove the nut and insulator.
- (b) Remove the 4 bolts and bracket.

**11. REMOVE OIL COOLER COVER AND OIL COOLER**

Remove the 10 bolts, 2 nuts, oil cooler cover with the oil cooler and gasket.

**12. REMOVE REAR OIL SEAL RETAINER**

Remove the 4 bolts and retainer.

**13. CHECK CONNECTING ROD THRUST CLEARANCE**

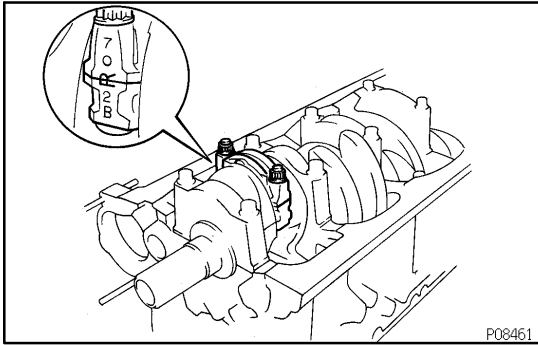
Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.160 – 0.262 mm (0.0063 – 0.0103 in.)

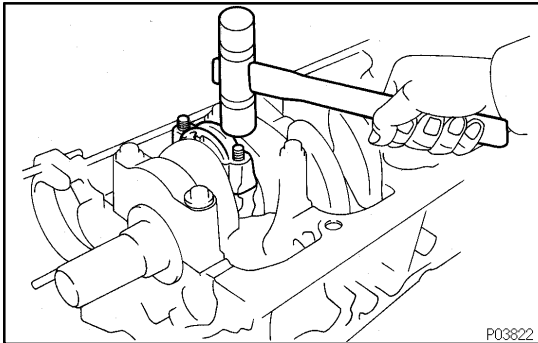
Maximum thrust clearance: 0.362 mm (0.0143 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



14. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

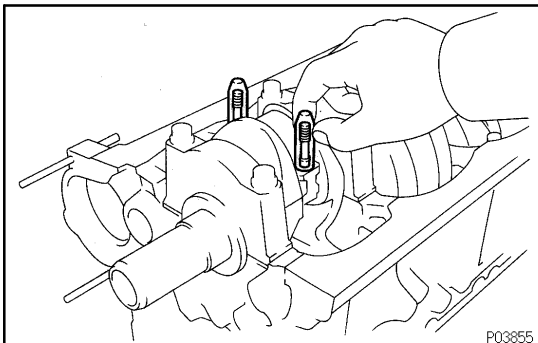
- (a) Check the matchmarks on the connecting rod cap and connecting rod to ensure correct reassembly.
- (b) Remove the connecting rod cap nuts.



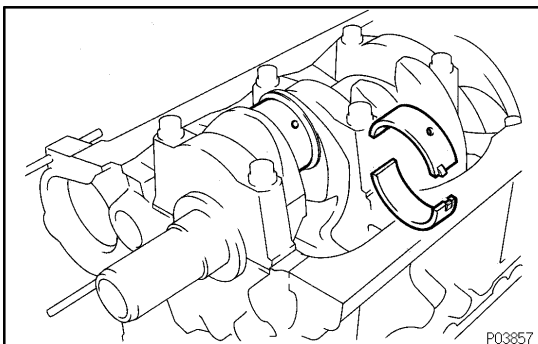
- (c) Using a plastic-faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT:

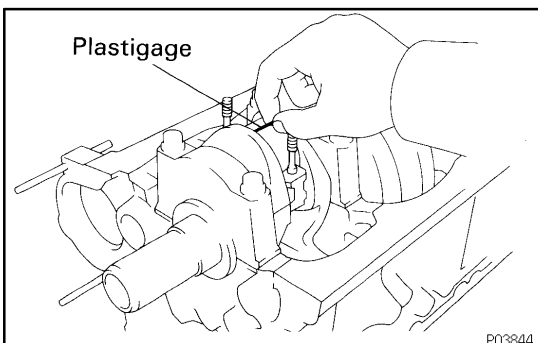
Keep the lower bearing inserted with the connecting rod cap.



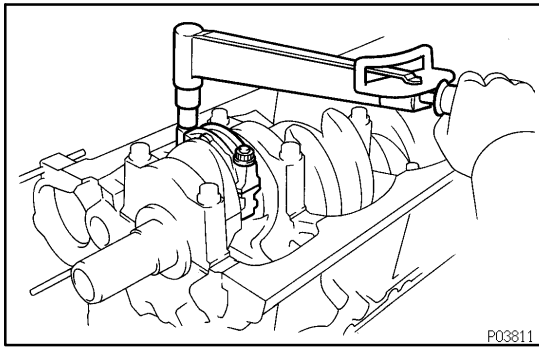
- (d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



- (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.

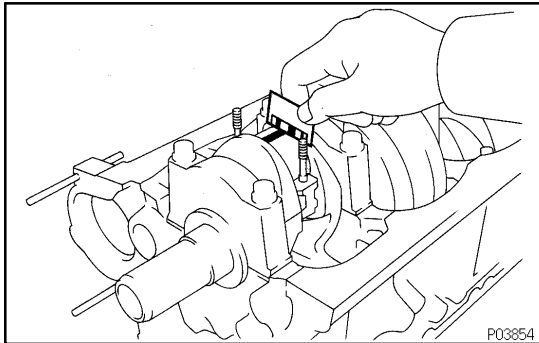


- (h) Install the connecting rod cap with the 2 nuts (See page [EM-103](#)).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the 2 nuts and connecting rod cap (See procedure (b) and (c) above).



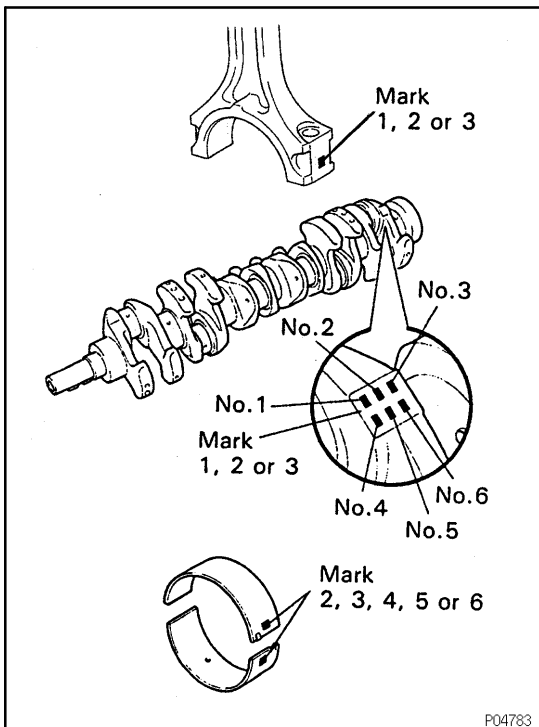
- (j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD	0.032 – 0.050 mm (0.0013 – 0.0020 in.)
U/S 0.25	0.033 – 0.073 mm (0.0013 – 0.0029 in.)

Maximum oil clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

**HINT:**

If using a standard bearing, replace 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 connecting rod and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

	Number marked								
Connecting rod	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

EXAMPLE: Connecting rod "3" + Crankshaft "1"
= Total number 4 (Use bearing "4")

Reference**Connecting rod big end inside diameter:**

Mark "1"	60.526 – 60.532 mm (2.3829 – 2.3831 in.)
Mark "2"	60.532 – 60.538 mm (2.3831 – 2.3834 in.)
Mark "3"	60.538 – 60.544 mm (2.3834 – 2.3836 in.)

Crankshaft crank pin diameter:

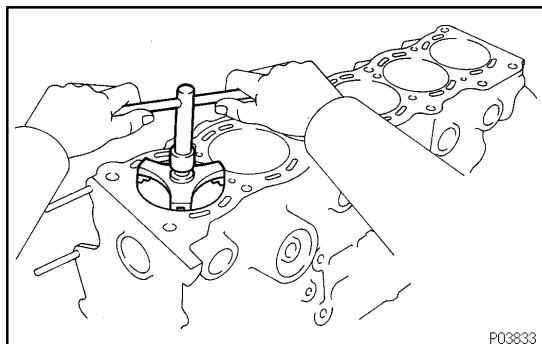
Mark "1"	56.994 – 57.000 mm (2.2439 – 2.2441 in.)
Mark "2"	56.988 – 56.994 mm (2.2436 – 2.2439 in.)
Mark "3"	56.982 – 56.988 mm (2.2434 – 2.2436 in.)

ENGINE MECHANICAL – CYLINDER BLOCK

Standard sized bearing center wall thickness:

Mark "2"	1.744 – 1.747 mm (0.0687 – 0.0688 in.)
Mark "3"	1.747 – 1.750 mm (0.0688 – 0.0689 in.)
Mark "4"	1.750 – 1.753 mm (0.0689 – 0.0690 in.)
Mark "5"	1.753 – 1.756 mm (0.0690 – 0.0691 in.)
Mark "6"	1.756 – 1.759 mm (0.0691 – 0.0693 in.)

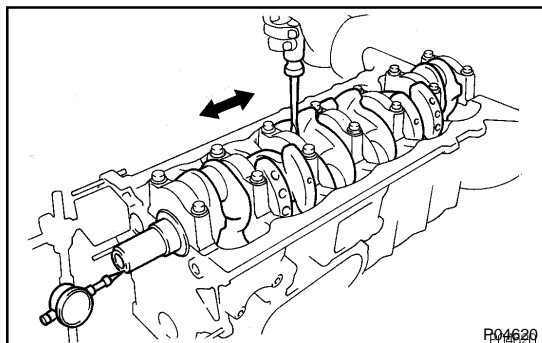
- (k) Completely remove the Plastigage.

**15. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES**

- (a) Using a ridge reamer, remove the all 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.

**16. 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:

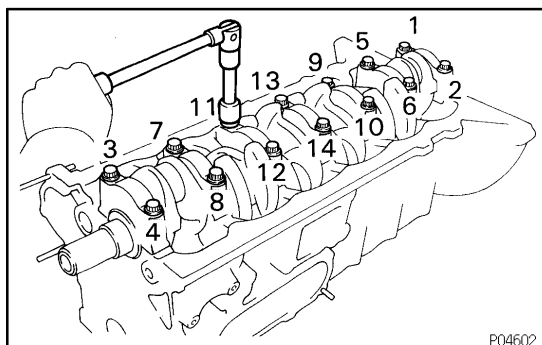
0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance: 0.30 mm (0.0118 in.)

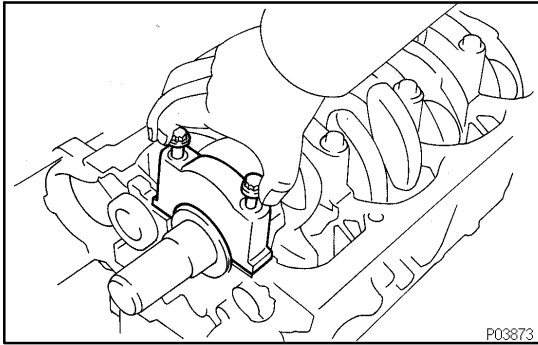
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:

STD	2.440 – 2.490 mm (0.0961 – 0.0980 in.)
O/S 0.125	2.503 – 2.553 mm (0.0985 – 0.1005 in.)
O/S 0.250	2.565 – 2.615 mm (0.1010 – 0.1030 in.)

**17. 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 (No.4 main bearing cap only) lower thrust washers.

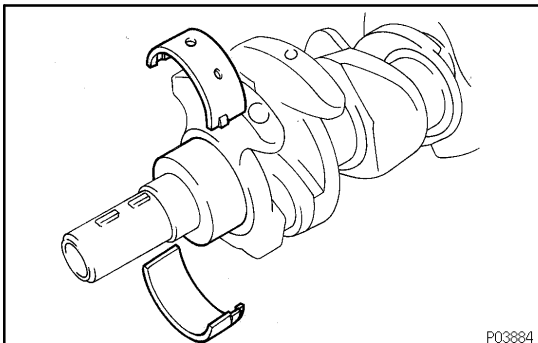
HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

- (c) Lift out the crankshaft.

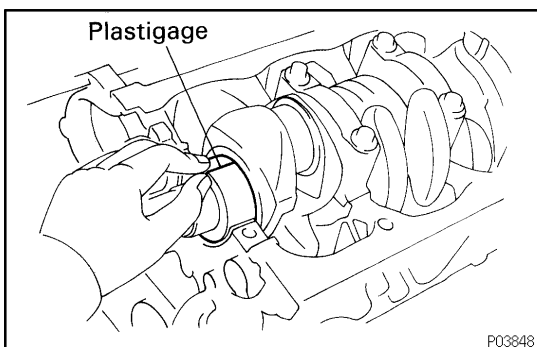
HINT:

Keep the upper bearing and upper thrust washers together with the cylinder block.

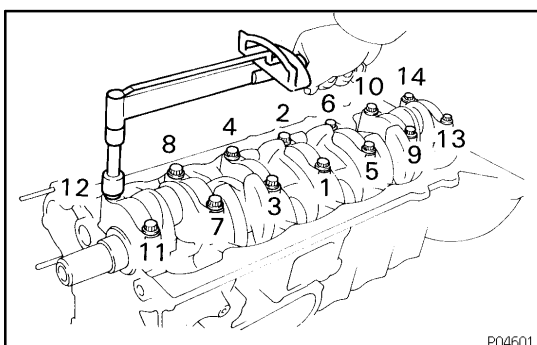


- (d) Clean each main journal and bearing.
 (e) Check each main journal and bearing for pitting and scratches.

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.



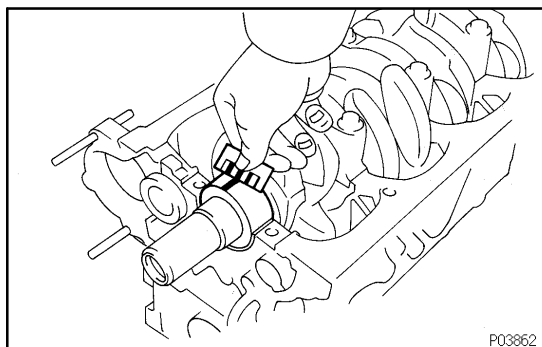
- (h) Install the main bearing caps (See page [EM-103](#)).

NOTICE:

Do not turn the crankshaft.

- (i) Remove the main bearing caps (See procedure (a) and (b) above).

ENGINE MECHANICAL – CYLINDER BLOCK



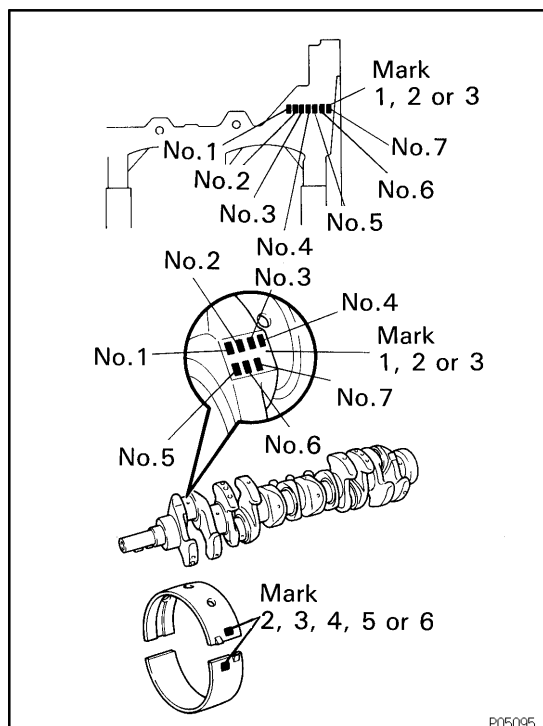
- (j) Measure the Plastigage at its widest point.

Standard clearance:

STD	0.042 – 0.060 mm (0.0017 – 0.0024 in.)
U/S 0.25	0.041 – 0.081 mm (0.0016 – 0.0032 in.)

Maximum clearance: 0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

**HINT:**

If using a standard bearing, replace 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 cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "2", "3", "4", "5" and "6" accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	1	2	3	1	2	3	1	2	3
Use bearing	2	3	4	3	4	5	4	5	6

EXAMPLE: Cylinder block "2" + Crankshaft "1"
= Total number 3 (Use bearing "3")

Reference**Cylinder block main journal bore diameter:**

Mark "1"	74.026 – 74.032 mm (2.9144 – 2.9146 in.)
Mark "2"	74.032 – 74.038 mm (2.9146 – 2.9149 in.)
Mark "3"	74.038 – 74.044 mm (2.9149 – 2.9151 in.)

Crankshaft main journal diameter:

Mark "1"	68.994 – 69.000 mm (2.7163 – 2.7165 in.)
Mark "2"	68.988 – 68.994 mm (2.7161 – 2.7163 in.)
Mark "3"	68.982 – 68.988 mm (2.7158 – 2.7161 in.)

Standard bearing center wall thickness:

Mark "2"	2.489 – 2.492 mm (0.0980 – 0.0981 in.)
Mark "2"	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
Mark "3"	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
Mark "4"	2.498 – 2.501 mm (0.0983 – 0.0985 in.)
Mark "5"	2.501 – 2.504 mm (0.0985 – 0.0986 in.)

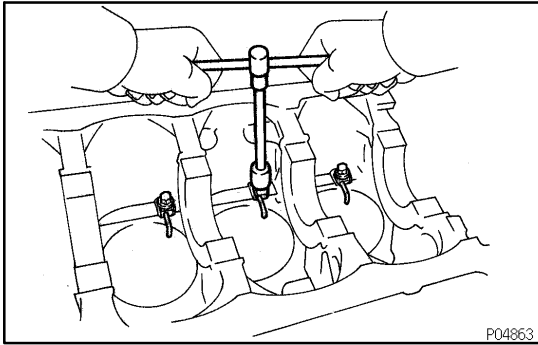
- (k) Completely remove the Plastigage.

18. REMOVE CRANKSHAFT

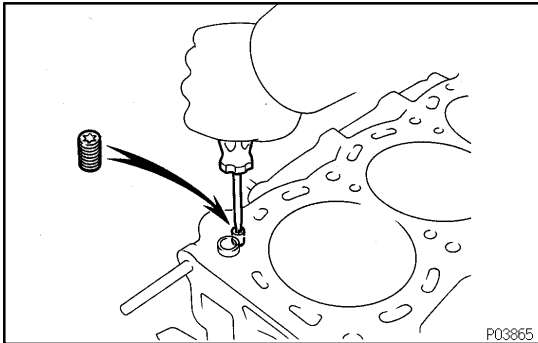
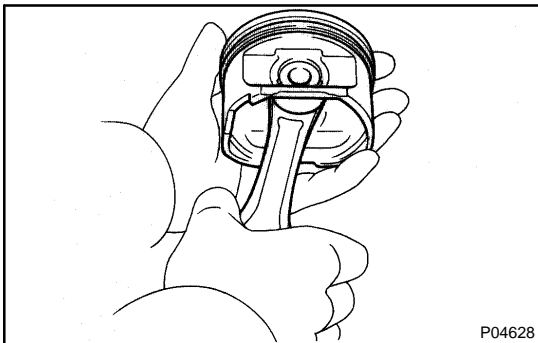
- (a) Lift out the crankshaft.
(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

HINT:

Arrange the main bearings and thrust washers in correct order.

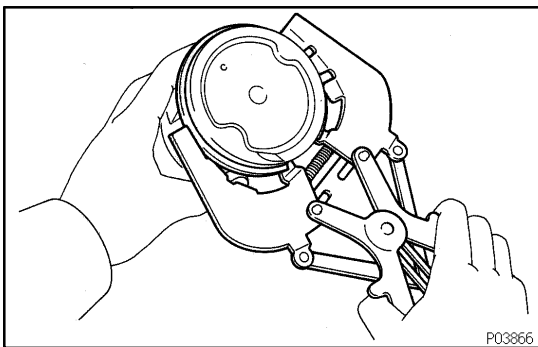
**19. REMOVE CHECK VALVES AND OIL NOZZLES**

Remove the 6 check valves and oil nozzles.

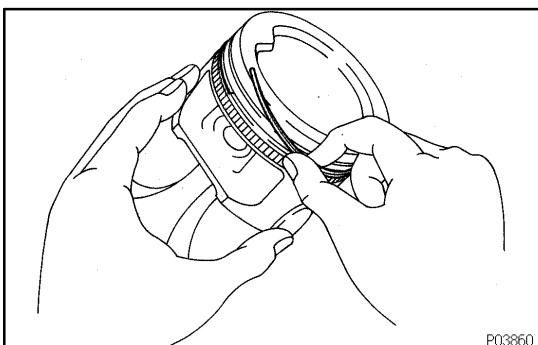
**20. REMOVE CYLINDER BLOCK ORIFICE****21. CHECK FIT BETWEEN PISTON AND PISTON PIN**

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.

**22. REMOVE PISTON RINGS**

- (a) Using a piston ring expander, remove the 2 compression rings.

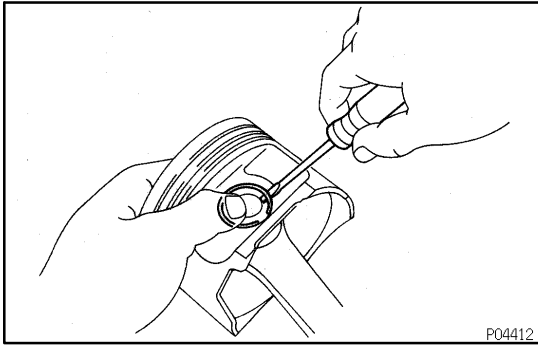


- (b) Remove the 2 side rails and oil ring by hand.

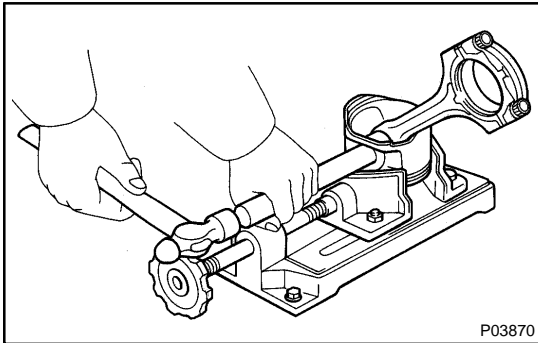
HINT:

Arrange the rings in correct order only.

ENGINE MECHANICAL – CYLINDER BLOCK

**23. DISCONNECT CONNECTING ROD FROM PISTON**

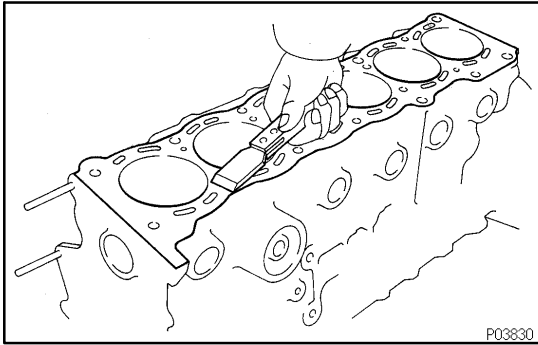
- (a) Using a small screwdriver, pry out the 2 snap rings.
- (b) Gradually heat the piston to 80 – 90°C (176 – 194°F).



- (c) Using plastic-faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

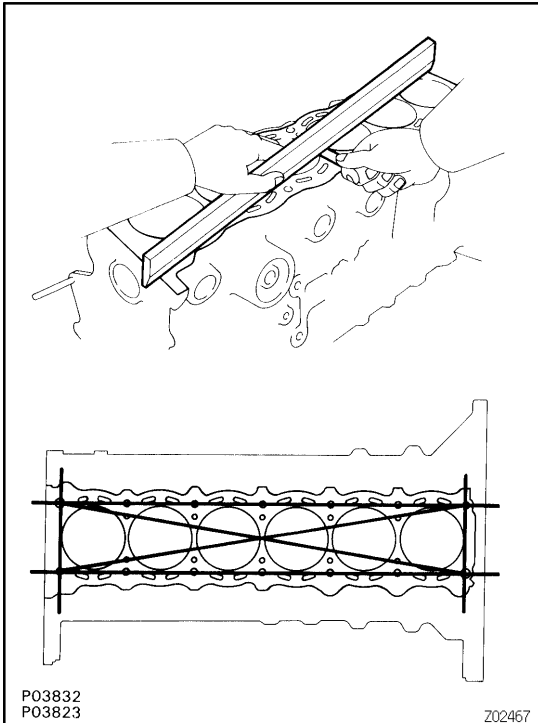
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.



INSPECTION

1. CLEAN CYLINDER BLOCK

- (a) Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
- (b) Using a soft brush and solvent, thoroughly clean the cylinder block.

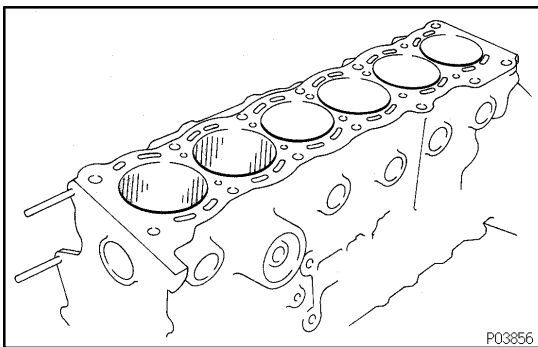


2. INSPECT CYLINDER BLOCK

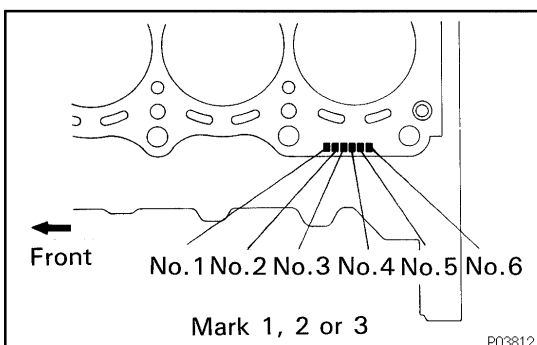
- (a) Inspect for flatness.
Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage: 0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.



- (b) Visually check the cylinder for vertical scratches.
If deep scratches are present, rebore all the 6 cylinders. If necessary, replace the cylinder block.

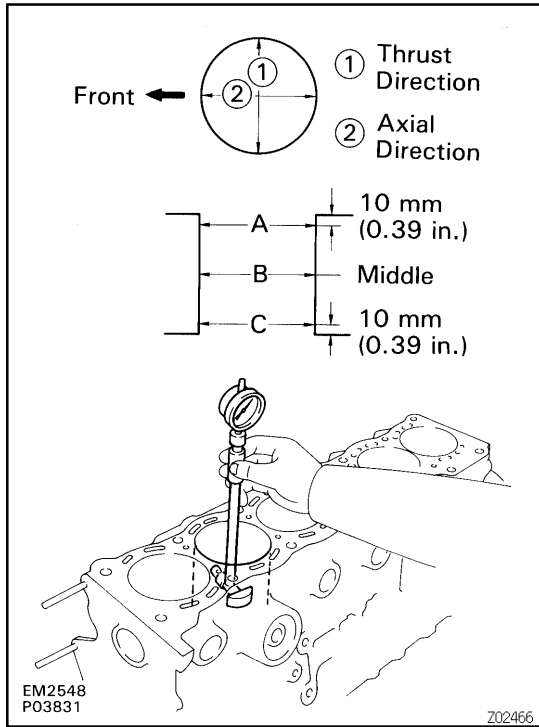


- (c) Inspect the cylinder bore diameter.

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.

ENGINE MECHANICAL – CYLINDER BLOCK



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

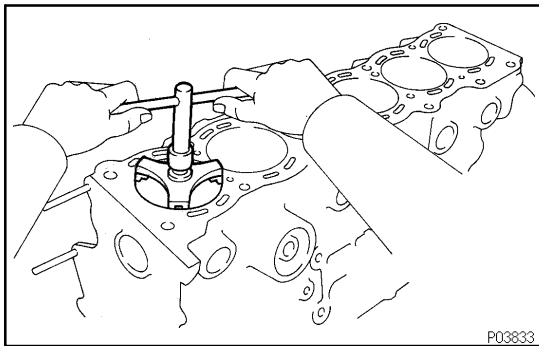
Standard diameter:**STD**

Mark "1"	100.000 – 100.010 mm (3.9370 – 3.9374 in.)
Mark "2"	100.010 – 100.020 mm (3.9374 – 3.9378 in.)
Mark "3"	100.020 – 100.030 mm (3.9378 – 3.9382 in.)

Maximum diameter:

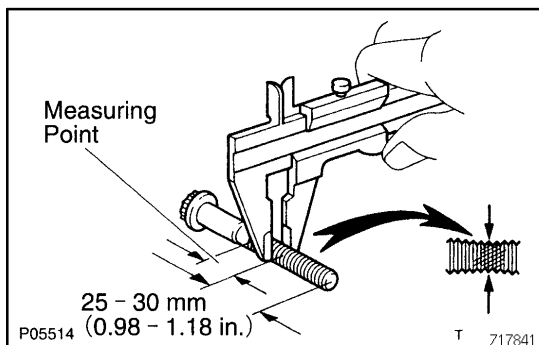
STD	100.23 mm (3.9461 in.)
O/S 0.50	100.73 mm (3.9658 in.)
O/S 1.00	101.23 mm (3.9854 in.)

If the diameter is greater than maximum, rebore all the 6 cylinders. If necessary, replace the cylinder block.



(d) Remove the cylinder ridge.

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



(e) Inspect the main bearing cap bolts.

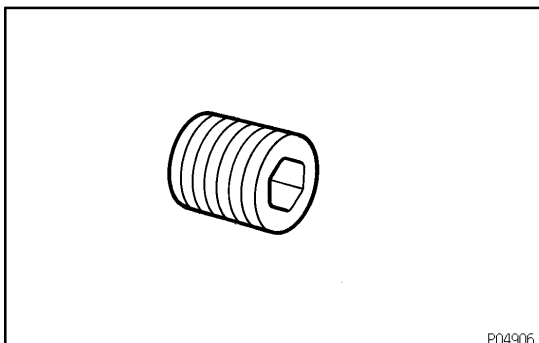
Using vernier calipers, measure the thread outside diameter of the bolt.

Standard outside diameter:

10.85 – 11.00 mm (0.4271 – 0.4331 in.)

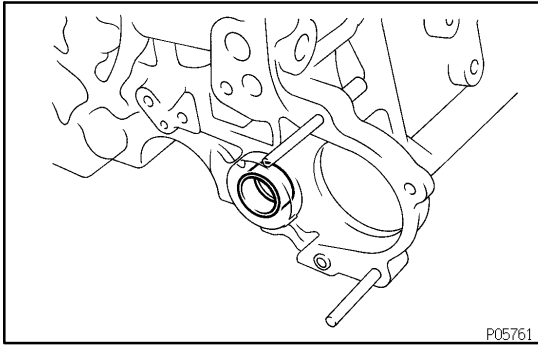
Minimum outside diameter: 10.6 mm (0.417 in.)

If the diameter is less than minimum, replace the bolt.



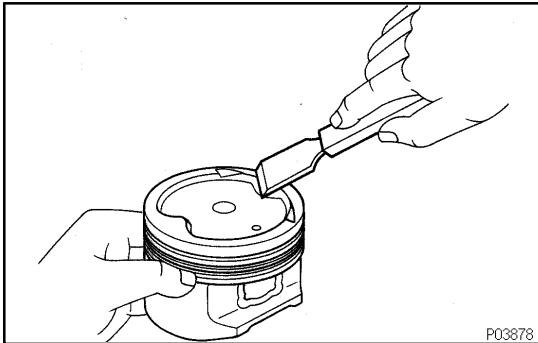
(f) Inspect the cylinder block oil orifice for clogging.

If necessary, replace the orifice.



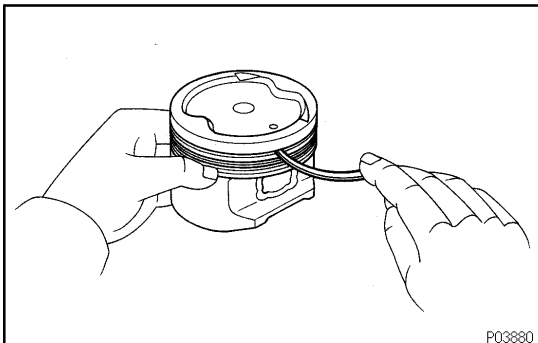
3. INSPECT BEARING OF OIL PUMP DRIVE SHAFT GEAR

Check the bearing for pitting and scratches.
If the bearing is damaged, replace the cylinder block.

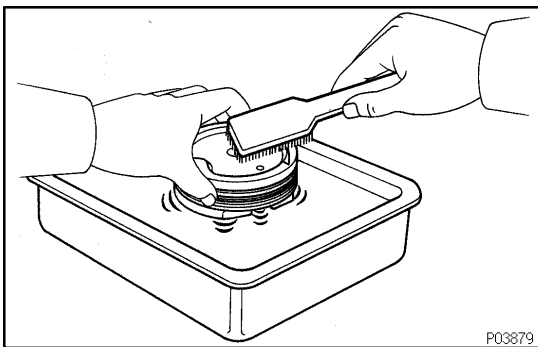


4. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



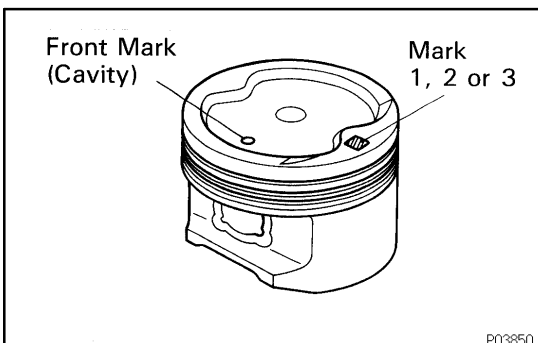
(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



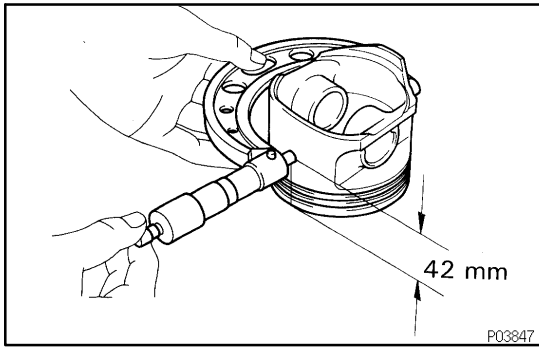
5. INSPECT PISTON AND CONNECTING ROD

(a) Inspect the piston oil clearance.

HINT:

There are 3 sizes of the standard piston diameter, marked "1", "2" and "3". The mark is stamped on the piston top.

ENGINE MECHANICAL – CYLINDER BLOCK



- (1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 42 mm (1.65 in.) from the piston head.

Piston diameter:

STD	Mark "1"	99.950 – 99.960 mm (3.9350 – 3.9354 in.)
	Mark "2"	99.960 – 99.970 mm (3.9354 – 3.9358 in.)
	Mark "3"	99.970 – 99.980 mm (3.9358 – 3.9362 in.)
O/S 0.50		100.450 – 100.480 mm (3.9547 – 3.9559 in.)
O/S 1.00		100.950 – 100.980 mm (3.9744 – 3.9756 in.)

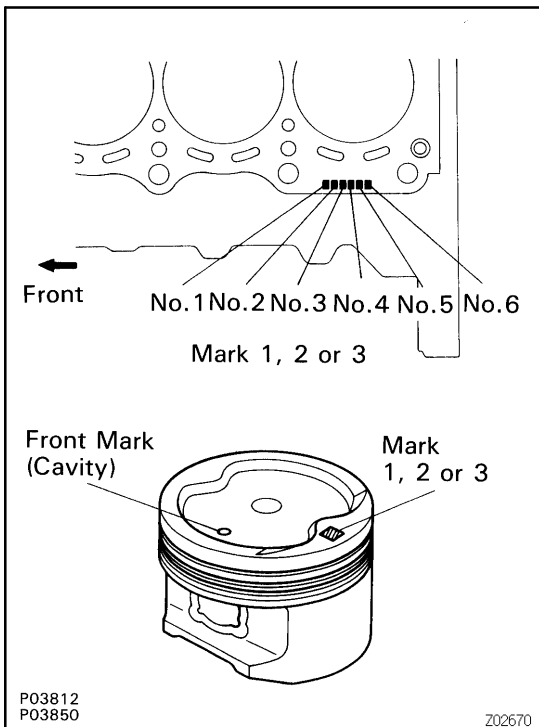
- (2) Measure the cylinder bore diameter in the thrust directions (See step 2).
 (3) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.040 – 0.060 mm (0.0016 – 0.0024 in.)

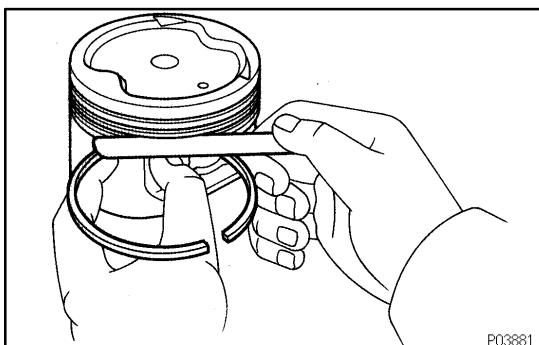
Maximum oil clearance: 0.080 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace all the 6 pistons and rebore all the 6 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.

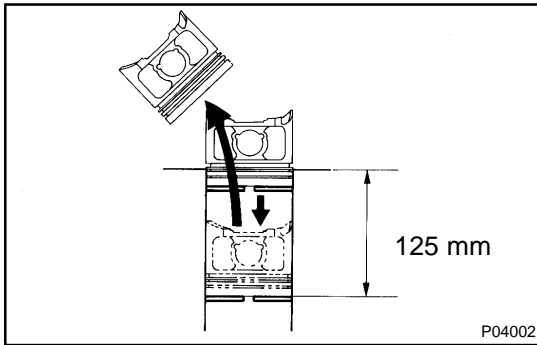


- (b) Inspect the piston ring groove clearance.
 Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

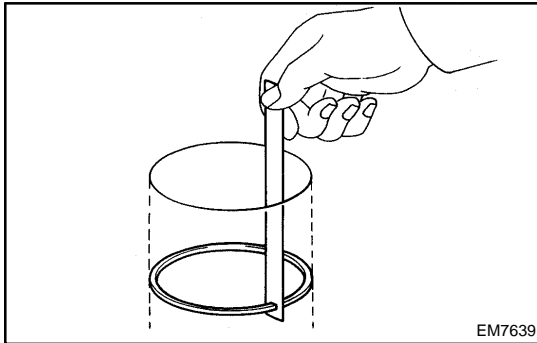
Ring groove clearance:

No. 1	0.040 – 0.080 (0.0016 – 0.0031 in.)
No. 2	0.030 – 0.070 (0.0012 – 0.0028 in.)

If the clearance is greater than maximum, replace the piston.



- (c) Inspect the piston ring end gap.
- (1) Insert the piston ring into the cylinder bore.
 - (2) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 125 mm (4.92 in.) from the top of the cylinder block.



- (3) Using a feeler gauge, measure the end gap.

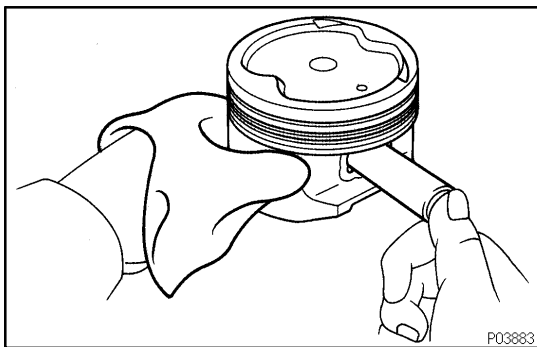
Standard end gap:

No. 1	0.300 – 0.520 mm (0.0118 – 0.0205 in.)
No. 2	0.450 – 0.670 mm (0.0177 – 0.0264 in.)
Oil (Side rail)	0.150 – 0.520 mm (0.0059 – 0.0205 in.)

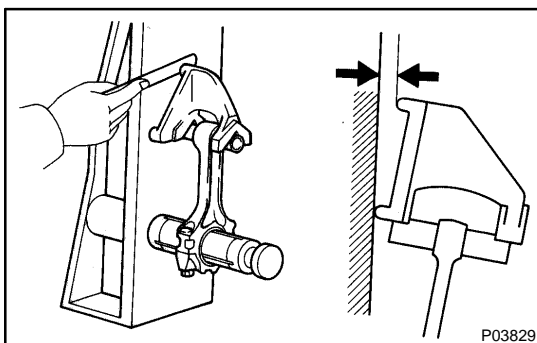
Maximum end gap:

No. 1	1.12 mm (0.0441 in.)
No. 2	1.17 mm (0.0461 in.)
Oil (Side rail)	1.12 mm (0.0441 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 6 cylinders or replace the cylinder block.

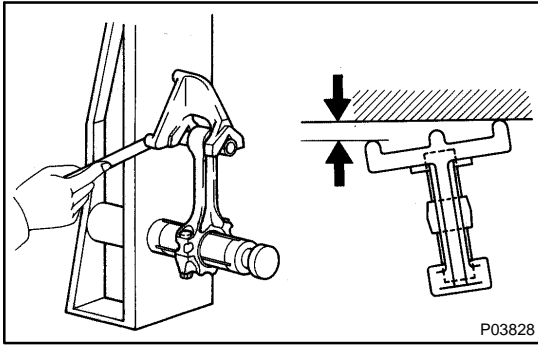


- (d) Inspect the piston pin fit.
At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.



- (e) Using a rod aligner and feeler gauge, check the connecting rod alignment.
- (1) 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, replace the connecting rod assembly.

ENGINE MECHANICAL – CYLINDER BLOCK

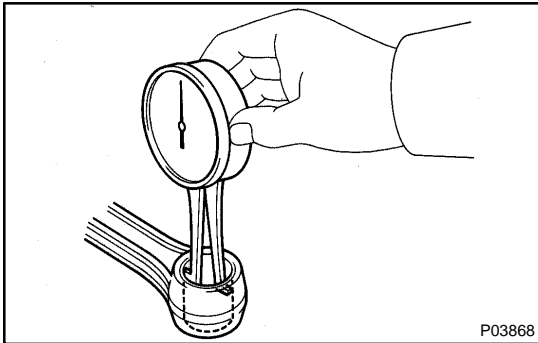


(2) Check for twist

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.

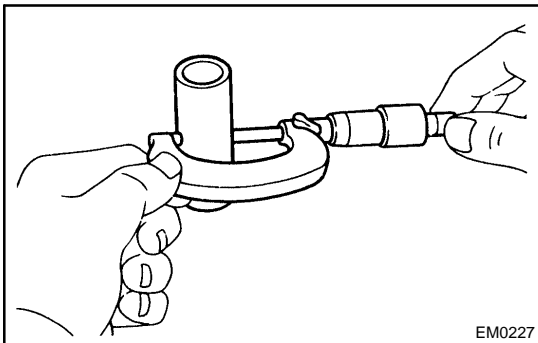


(f) Inspect the piston pin oil clearance.

(1) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

26.008 – 26.020 mm (1.0239 – 1.0244 in.)



(2) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

26.000 – 26.012 mm (1.0236 – 1.0241 in.)

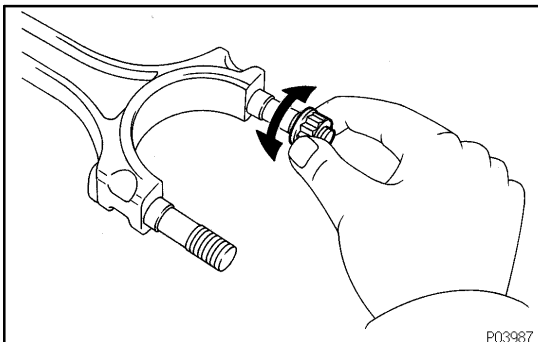
(3) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

Standard oil clearance:

0.004 – 0.012 mm (0.0002 – 0.0005 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 (See page [EM-99](#)).



(g) Inspect the connecting rod bolts.

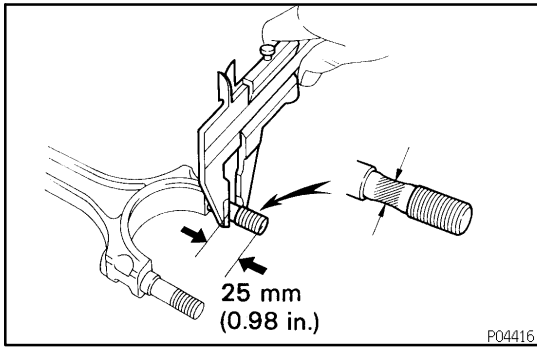
Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.

If the cap nut cannot be turned easily, measure the outside diameter of the connecting rod bolt with vernier calipers.

Standard outside diameter:

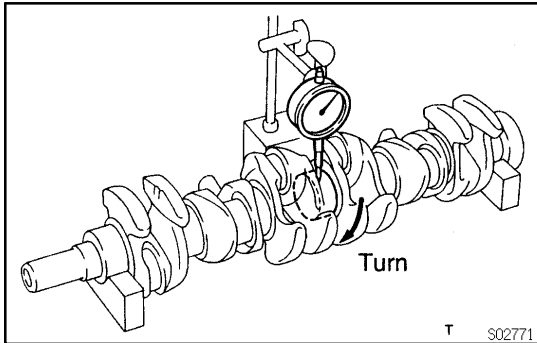
8.40 – 8.60 mm (0.3307 – 0.3386 in.)

Minimum outside diameter: 8.00 mm (0.3150 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.

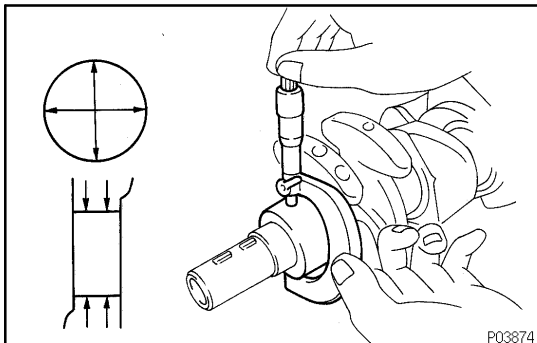
If the outside diameter is less than minimum, replace the connecting rod bolt and nut as a set.

**6. INSPECT CRANKSHAFT****(a) Inspect for circle runout.**

- (1) Place the crankshaft on V-blocks.
- (2) 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.

**(b) Inspect the main journals and crank pins.**

- (1) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD	68.982 – 69.000 mm (2.7158 – 2.7165 in.)
U/S 0.25	68.745 – 68.755 mm (2.7065 – 2.7069 in.)

Crank pin diameter:

STD	56.982 – 57.000 mm (2.2434 – 2.2441 in.)
U/S 0.25	56.745 – 56.755 mm (2.2341 – 2.2344 in.)

If the diameter is not as specified, check the oil clearance (See page [EM-83](#)). If necessary, grind or replace the crankshaft.

- (2) Check each main journal and crank pin for taper and out-of-round as shown.

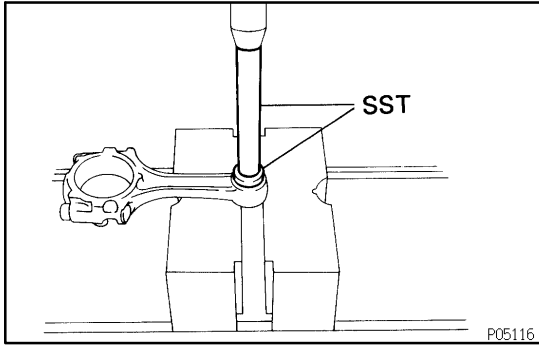
Maximum taper and out-of-round:

0.02 mm (0.0008 in.)

If the taper and out-of-round is greater than maximum, replace the crankshaft.

7. 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. Install new main journal and/or crankshaft pin undersized bearings.

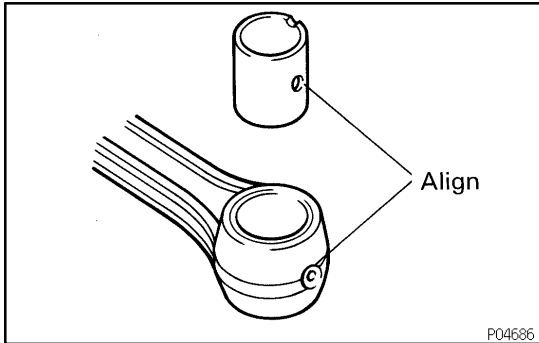


REPLACEMENT

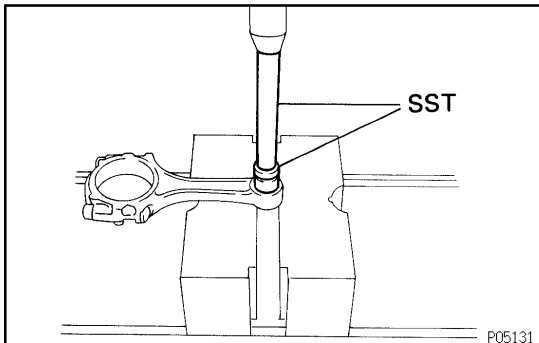
1. REPLACE CONNECTING ROD BUSHING

- (a) Using SST and a press, press out the bushing.

SST 09950-60010 (09951-00280), 09950-70010 (09951-07100)

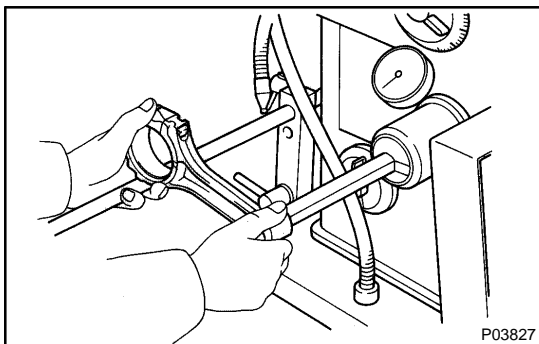


- (b) Align the oil holes of a new bushing and the connecting rod.

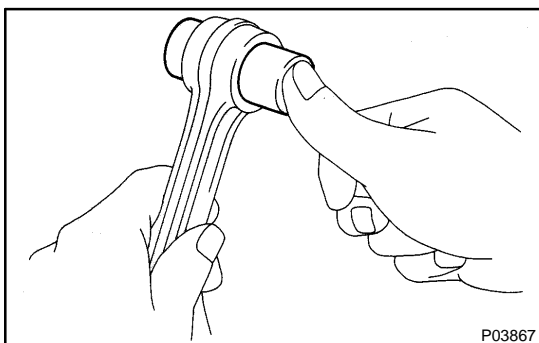


- (c) Using SST and a press, press in the bushing.

SST 09950-60010 (09951-00280), 09950-70010 (09951-07100)



- (d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (See page [EM-92](#)) between the bushing and piston pin.

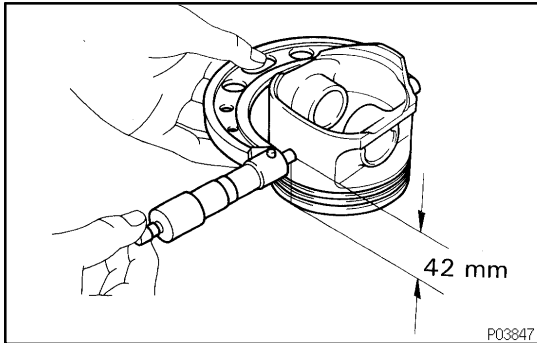


- (e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

2. REPLACE OVERSIZED (O/S) PISTONS FOR CYLINDER BORING

HINT:

- Bore all the 6 cylinders for the O/S piston outside diameter.
- Replace all the piston rings with ones to match the O/S pistons.



- (a) Keep 6 new O/S pistons.

O/S piston diameter:

O/S 0.50	100.450 – 100.480 mm (3.9547 – 3.9559 in.)
O/S 1.00	100.950 – 100.980 mm (3.9744 – 3.9756 in.)

- (b) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 42 mm (1.65 in.) from the piston head.
- (c) Calculate the amount of each cylinder is to be rebored as follows:

$$\text{Size to be rebored} = P + C - H$$

P = Piston diameter

C = Piston oil clearance

0.040 – 0.060 mm (0.0016 – 0.0024 in.)

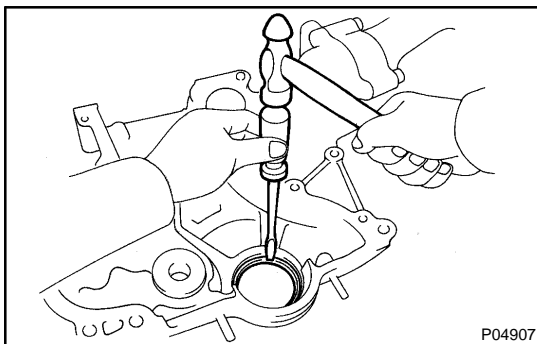
H = Allowance for honing

0.02 mm (0.0008 in.) or less

- (d) Bore and hone the cylinders to calculated dimensions.
Maximum honing: 0.02 mm (0.0008 in.)

NOTICE:

Excess honing will destroy the finished roundness.



3. REPLACE CRANKSHAFT FRONT OIL SEAL

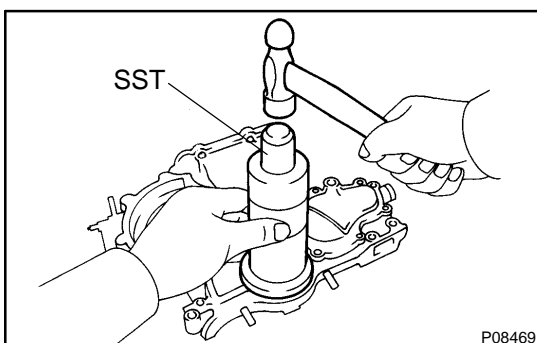
HINT:

There are 2 methods ((a) and (b)) to replace the oil seal.

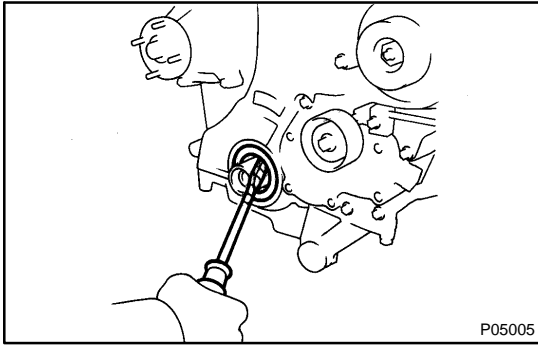
- (a) If the timing chain cover is removed from the cylinder block:
- (1) Using a screwdriver and a hammer, tap out the oil seal.
 - (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the timing chain cover edge.
SST 09316-60011 (09316-00011, 09316-00051)
 - (3) Apply MP grease to the oil seal lip.

NOTICE:

Do not let foreign matter get onto the lip of the oil seal.



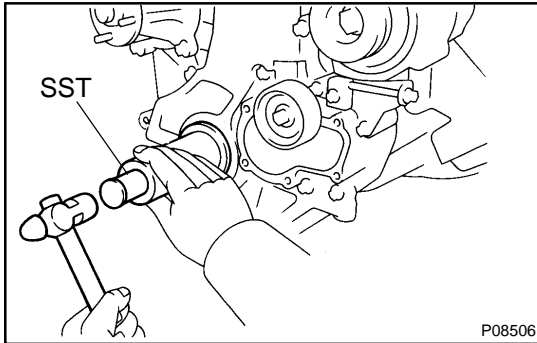
ENGINE MECHANICAL - CYLINDER BLOCK



- (b) If the timing chain cover is installed to the cylinder block:
 (1) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.



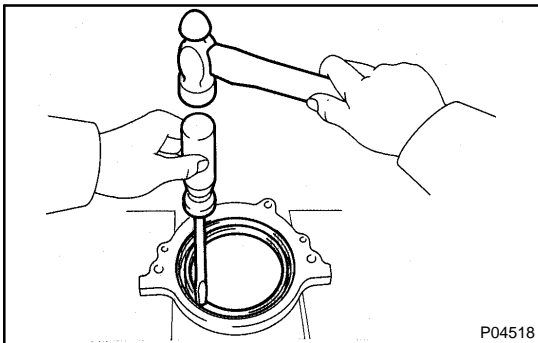
- (2) Apply MP grease to a new oil seal lip.

NOTICE:

Do not let foreign matter get onto the lip of the oil seal.

- (3) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.

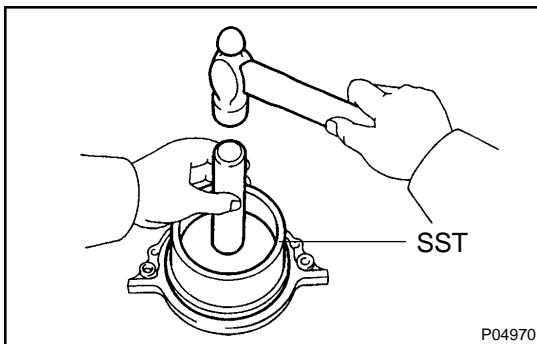
SST 09316-60011 (09316-00011, 09316-00051)

**4. REPLACE CRANKSHAFT REAR OIL SEAL****HINT:**

There are 2 methods ((a) and (b)) to replace the oil seal.

- (a) If the rear oil seal retainer is removed from the cylinder block:

- (1) Using a screwdriver and a hammer, tap out the oil seal.

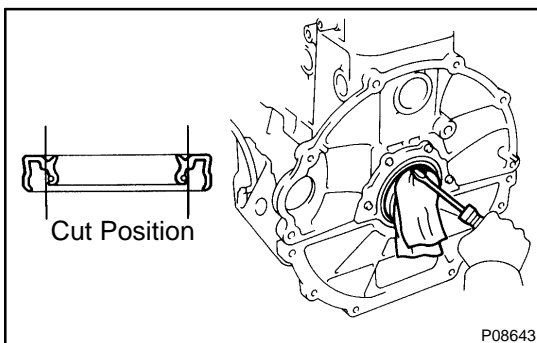


- (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.

SST 09223-15030, 09950-70010 (09951-07150)

NOTICE:

Do not let foreign matter get onto the lip of the oil seal.



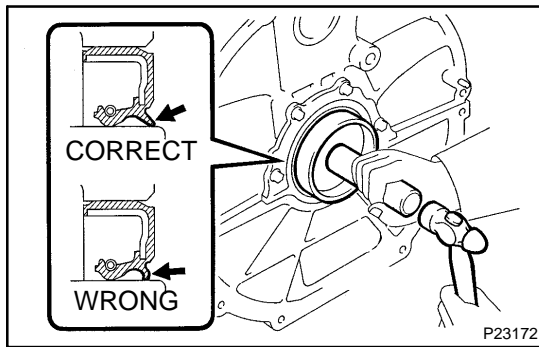
- (b) If the rear oil seal retainer is installed to the cylinder block:

- (1) Using a knife, cut off the oil seal lip.

- (2) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft. Tape the screwdriver tip.



- (3) 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, 09950-70010 (09951-07150)

NOTICE:

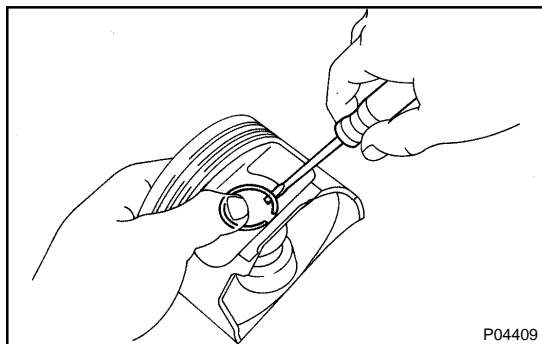
Do not let foreign matter get onto the lip of the oil seal.

- (4) Check that the lip of the oil seal is not bent inward.

REASSEMBLY

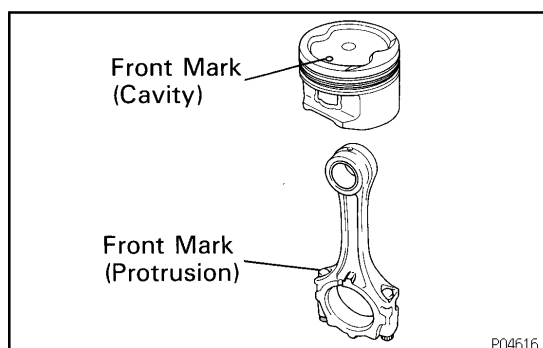
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

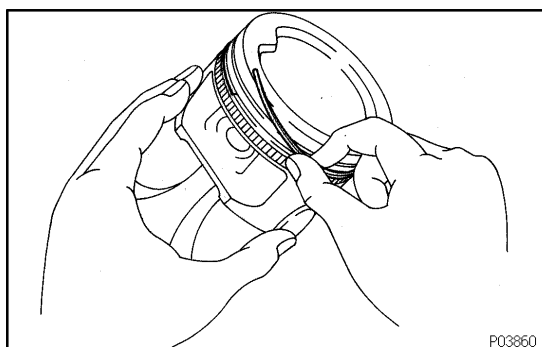


1. ASSEMBLE PISTON AND CONNECTING ROD

- Install a new snap ring on one side of the piston pin hole.
- Gradually heat the piston to 80 – 90°C (176 – 194°F).

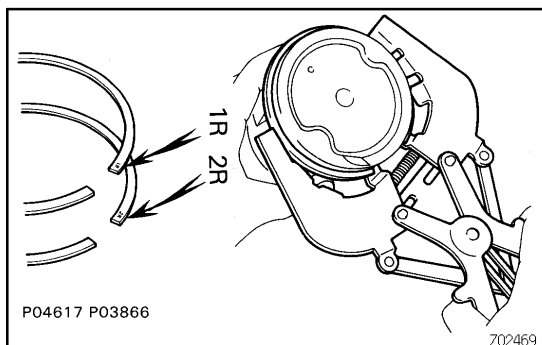


- Coat the piston pin with engine oil.
- Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.
- Install a new snap ring on the other side of the piston pin hole.



2. INSTALL PISTON RINGS

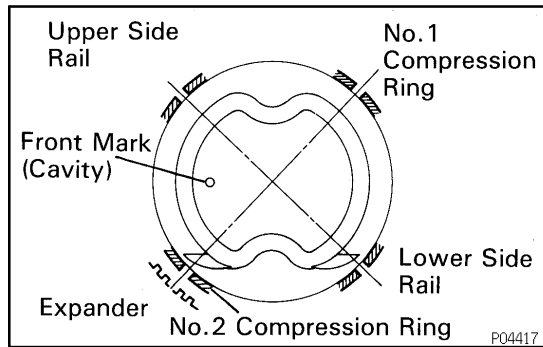
- Install the oil ring expander and 2 side rails by hand.



- Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark:

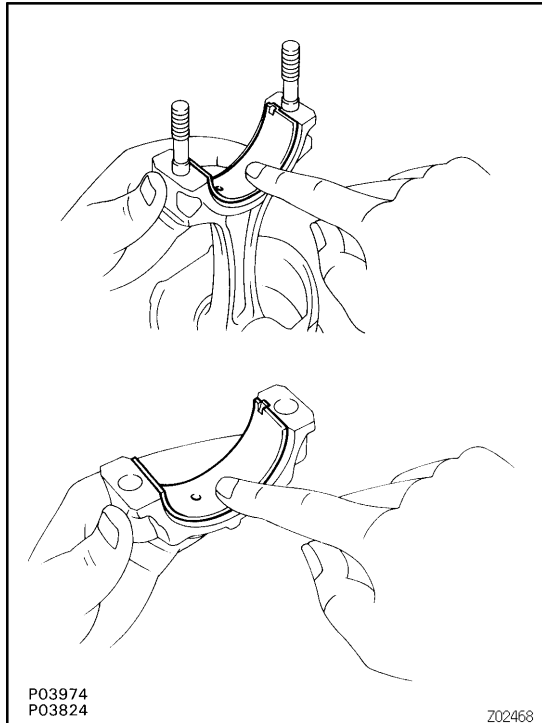
No. 1	1R
No. 2	2R



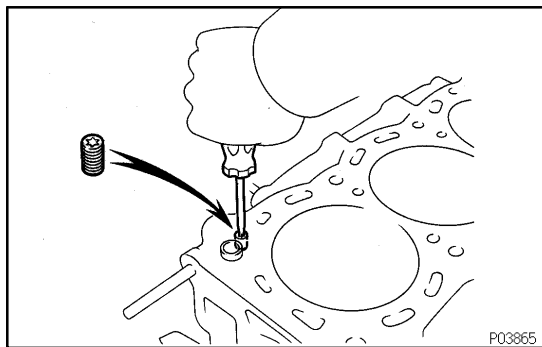
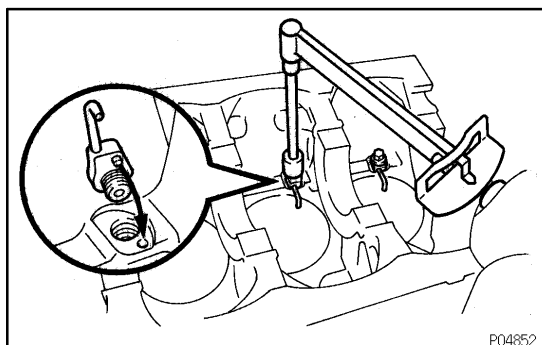
- (c) Position the piston rings so that the ring ends are as shown.

NOTICE:

Do not align the ring ends.

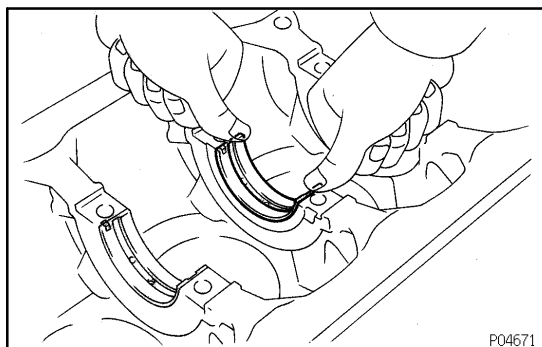
**3. INSTALL BEARINGS**

- (a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
- (b) Install the bearings in the connecting rod and connecting rod cap.

**4. INSTALL CYLINDER BLOCK ORIFICE****5. INSTALL OIL NOZZLES AND CHECK VALVES**

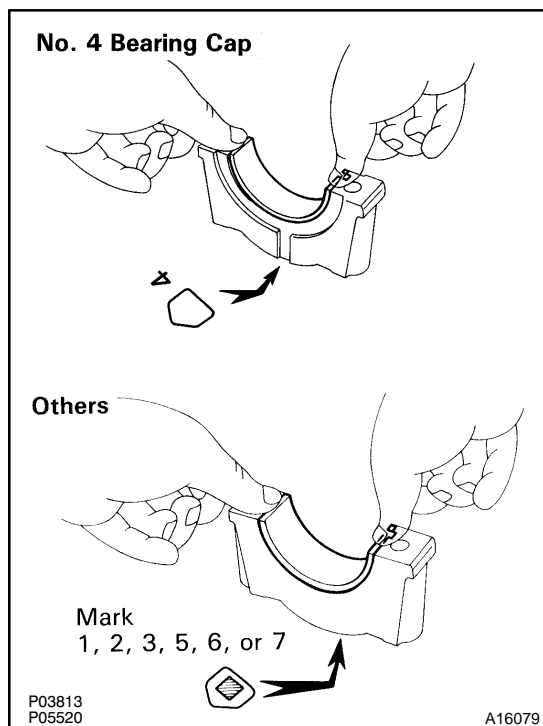
- (a) Align the pin of the oil nozzle with the pin hole of the cylinder block.
- (b) Install the oil nozzle with the check valve. Install the 6 oil nozzles and check valves.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



6. INSTALL MAIN BEARINGS

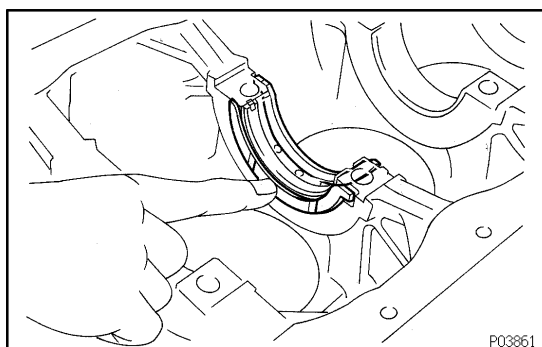
- (a) Align the bearing claw with the claw groove of the cylinder block, and push in the 7 upper bearings.



- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 7 lower bearings.

HINT:

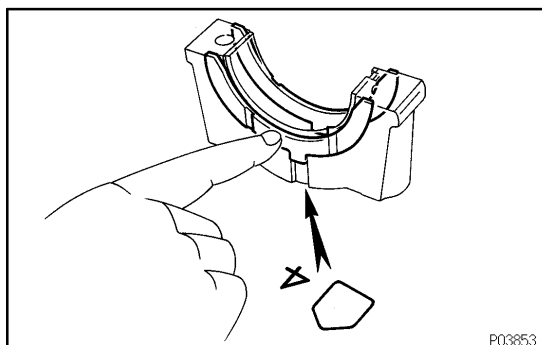
A number is marked on each main bearing cap to indicate the installation position.



7. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.4 journal position of the cylinder block with the oil grooves facing outward.

8. PLACE CRANKSHAFT ON CYLINDER BLOCK

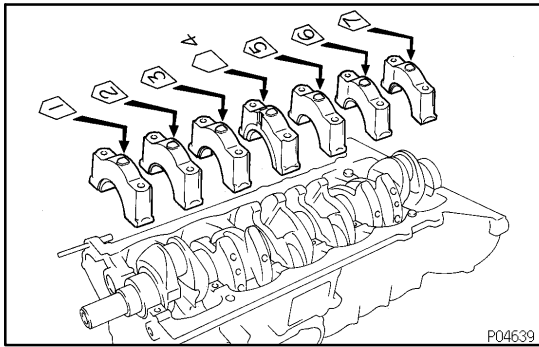


9. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

- (a) Place the main bearing caps and lower thrust washers on the cylinder block.
- (1) Install the 2 thrust washers on the No.4 bearing cap with the grooves facing outward.

EM-106

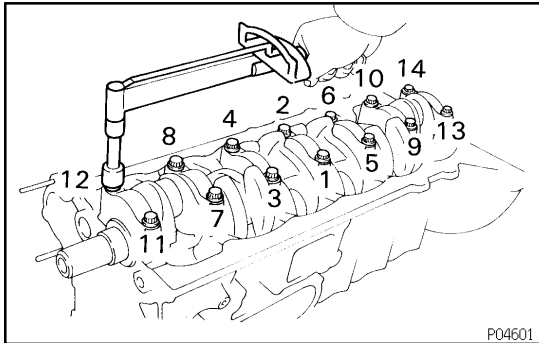
ENGINE MECHANICAL – CYLINDER BLOCK



- (2) Install the 7 main bearing caps in their proper locations.

HINT:

Each bearing cap has a number and front mark.



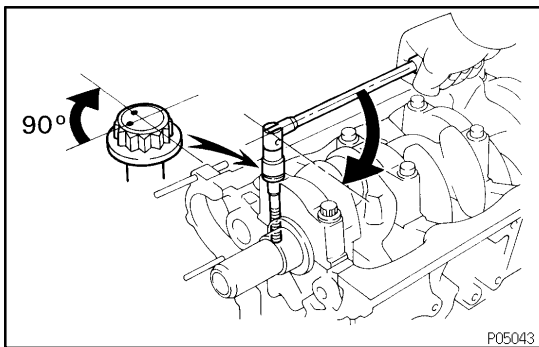
- (b) Install the main bearing cap bolts.

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.
- (1) Apply a light coat of engine oil on the threads and under the heads of the main bearings cap bolts.
- (2) Install and uniformly tighten the 14 bolts of the main bearing caps, in several passes, in the sequence shown.

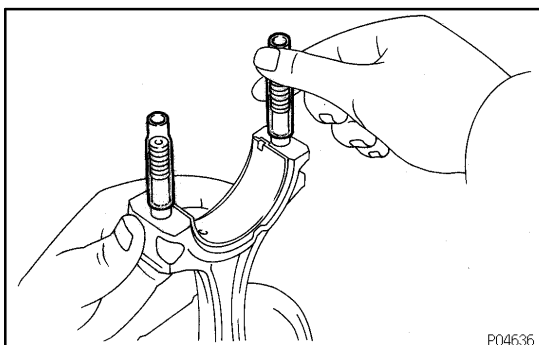
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.



- (3) Mark the front of the main bearing cap bolt with paint.
- (4) Retighten the main bearing cap bolts by 90° in the numerical order shown above.
- (5) Check that the painted mark is now at a 90° angle to the front.

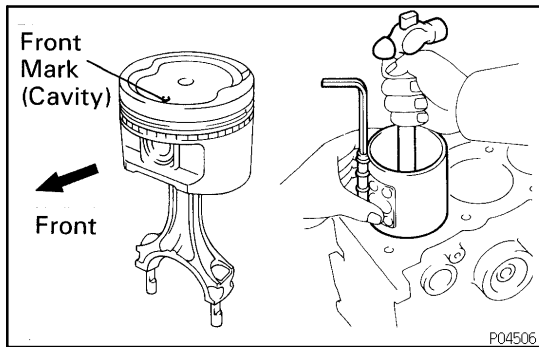
- (c) Check that the crankshaft turns smoothly.
- (d) Check that the crankshaft thrust clearance (See page [EM-83](#)).



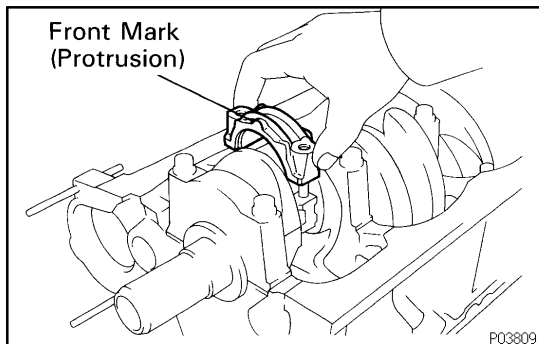
10. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

- (a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

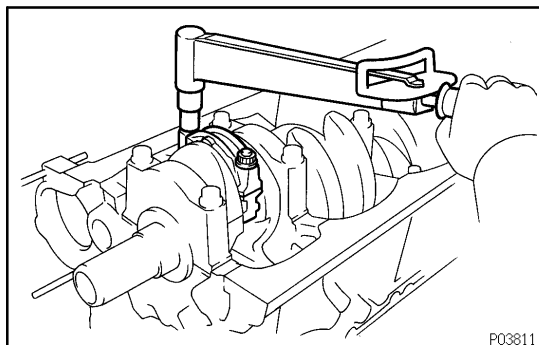
ENGINE MECHANICAL – CYLINDER BLOCK



- (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.

**11. INSTALL CONNECTING ROD CAP**

- (a) Place the connecting rod cap on the connecting rod.
- (1) Match the numbered connecting rod cap with the connecting rod.
 - (2) Install the connecting rod cap with the front mark facing forward.



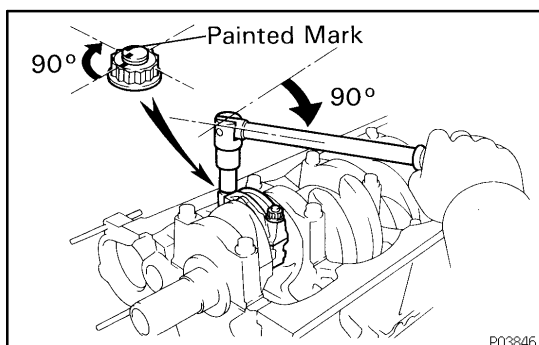
- (b) Install the connecting rod cap nuts.

HINT:

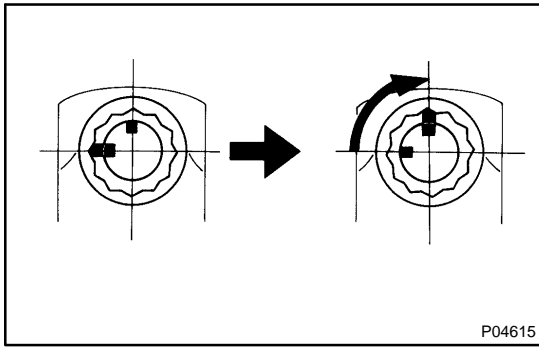
- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
 - If any connecting rod bolt is broken or deformed, replace it.
- (1) Apply a light coat of engine oil on the threads and under the nuts of the connecting rod cap.
 - (2) Install and alternately tighten the nuts of the connecting rod cap in several passes.

Torque: 48 N·m (490 kgf-cm, 35 ft-lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.



- (3) Mark the front of the connecting rod cap nut and bolt with paint.
- (4) Retighten the connecting rod cap nuts 90° as shown.

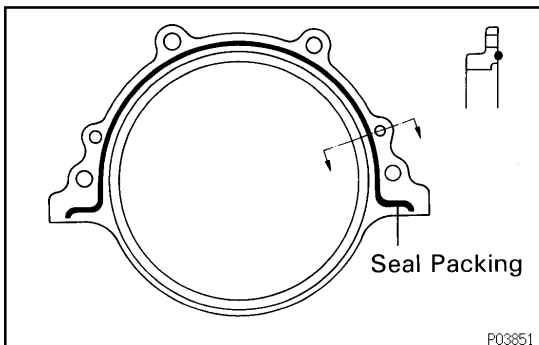


(5) Check that the painted mark on the nut is at 90° angle in relation to the mark on the bolt.

- (c) Check that the crankshaft turns smoothly.
- (d) Check that the connecting rod thrust clearance (See page EM-83).

12. INSTALL REAR OIL SEAL RETAINER

- (a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer 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 retainer as shown in the illustration.

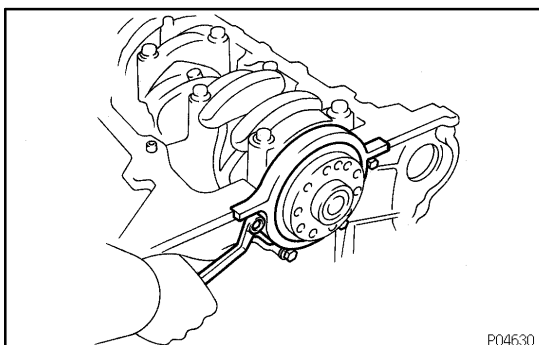
Seal packing: Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- 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.



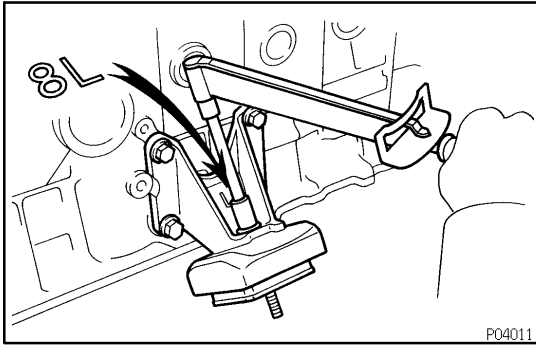
- (c) Install the retainer with the 4 bolts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

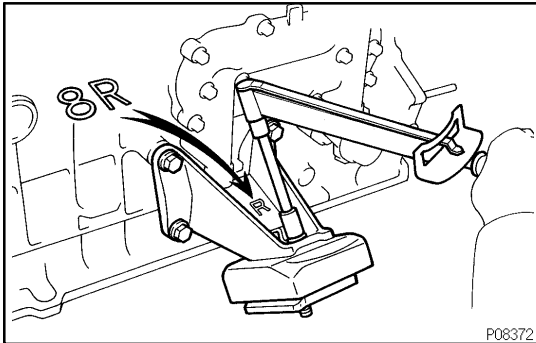
13. INSTALL OIL COOLER COVER AND OIL COOLER

Install a new gasket, the oil cooler cover and oil cooler with the 10 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

**14. INSTALL LH ENGINE MOUNTING BRACKET**

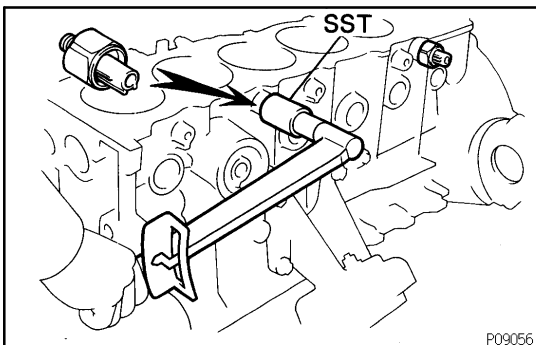
- (a) Install the bracket with the 4 bolts.
Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)
- (b) Install the insulator with the nut.
Torque: 72 N·m (730 kgf-cm, 43 ft-lbf)

**15. INSTALL RH ENGINE MOUNTING BRACKET**

- (a) Install the bracket with the 4 bolts.
Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)
- (b) Install the insulator with the nut.
Torque: 72 N·m (730 kgf-cm, 43 ft-lbf)

16. INSTALL PS PUMP

- (a) Place a new O-ring to the pump.
- (b) Install the pump with the 2 nuts.
Torque: 36 N·m (370 kgf-cm, 27 ft-lbf)

**17. INSTALL KNOCK SENSORS**

Using SST, install the 2 knock sensors.

SST 09816-30010

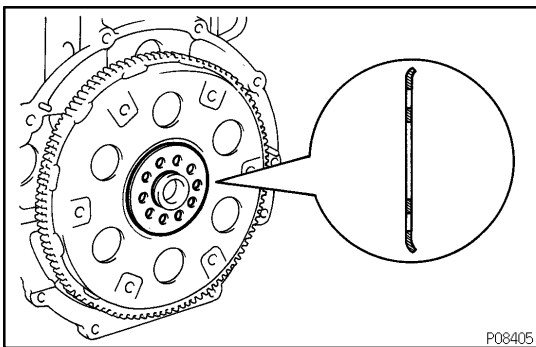
Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

18. INSTALL OIL FILTER UNION

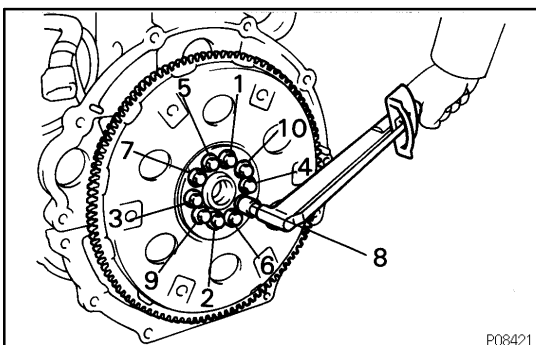
Torque: 44 N·m (450 kgf-cm, 33 ft-lbf)

19. INSTALL OIL FILTER (See page [LU-2](#))**20. INSTALL TIMING CHAIN (See page [EM-19](#))****21. INSTALL CYLINDER HEAD (See page [EM-54](#))****22. REMOVE ENGINE STAND****23. INSTALL DRIVE PLATE**

- (a) Install the front spacer, drive plate and rear plate on the crankshaft.

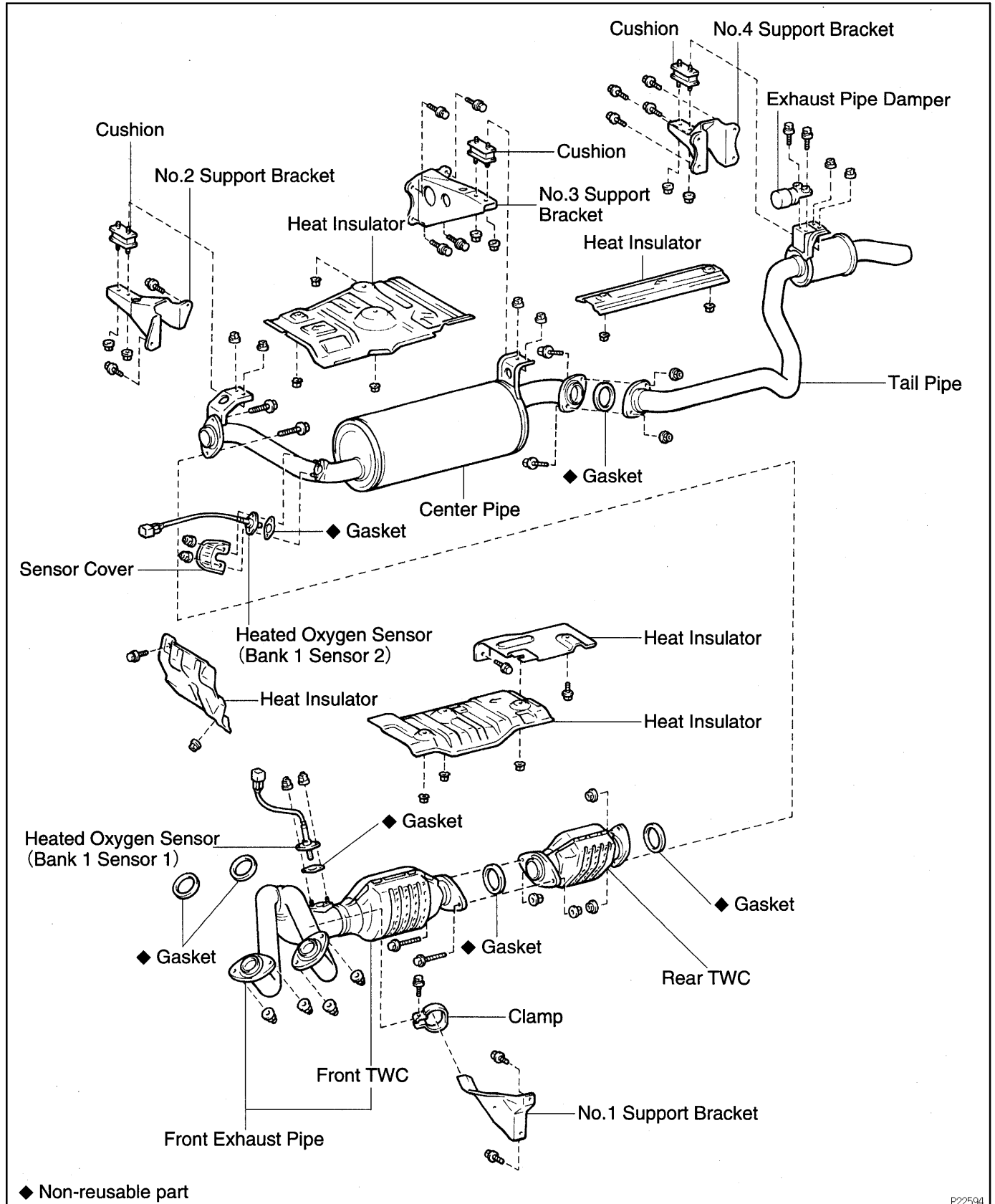


- (b) Install and uniformly tighten the 10 drive plate bolts, in several passes, in the sequence shown.
Torque: 100 N·m (1,000 kgf-cm, 74 ft-lbf)

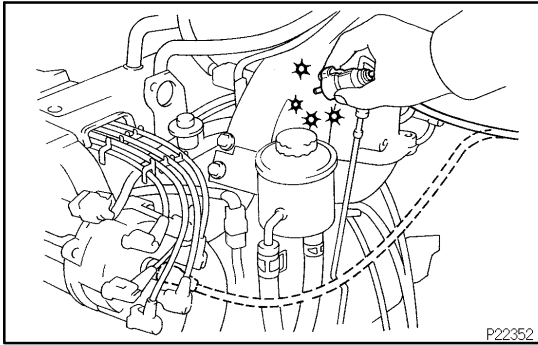


EXHAUST SYSTEM COMPONENTS

EM0EE-10



P22594



IGNITION SYSTEM ON-VEHICLE INSPECTION

IG01B-02

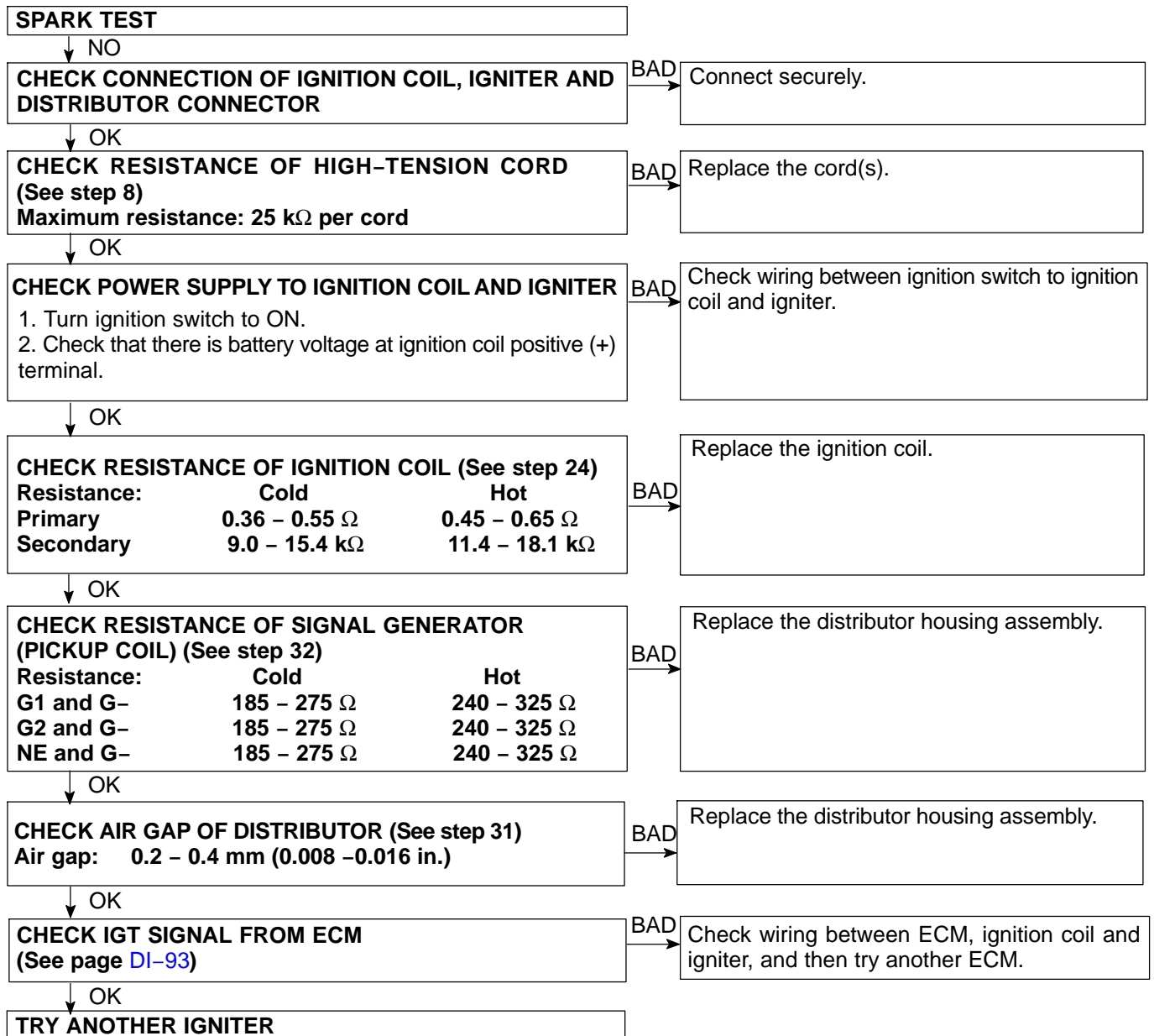
1. CHECK THAT SPARK OCCURS

- Disconnect the high-tension cords (from the ignition coil) from the distributor cap.
- Hold the end approx. 12.5 mm (0.50 in.) from the body ground.
- Check if spark occurs while engine is being cranked.

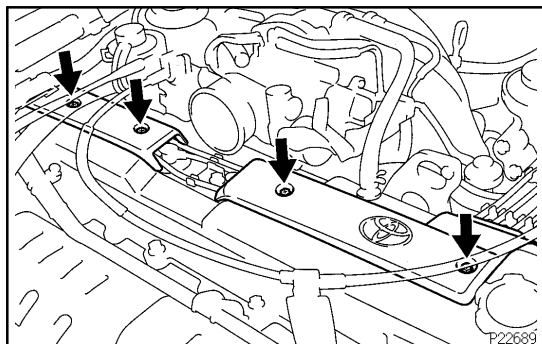
HINT:

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

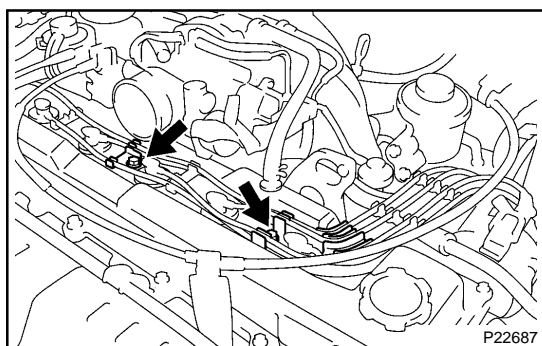
If the spark does not occur, do the test as follows:



2. REMOVE NO.2 PCV HOSE
3. REMOVE AIR CLEANER HOSE
4. DISCONNECT THROTTLE CABLE

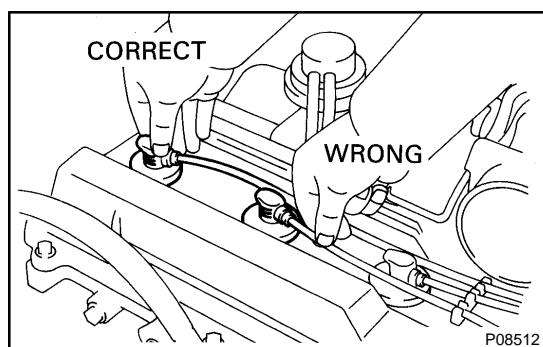


5. REMOVE NO.2 AND NO.3 CYLINDER HEAD COVERS
Remove the 4 bolts and head covers.



6. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

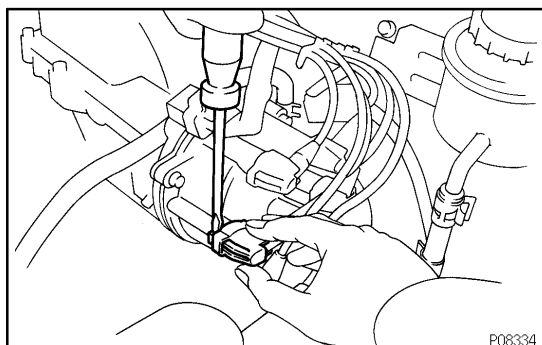
- (a) Remove the 2 mounting bolts of the No.1 and No.2 cord clamps.



- (b) Disconnect the high-tension cords at the rubber boot.
Do not pull on the cords.

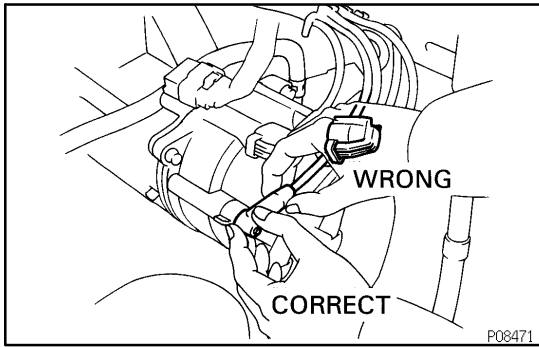
NOTICE:

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



7. DISCONNECT HIGH-TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

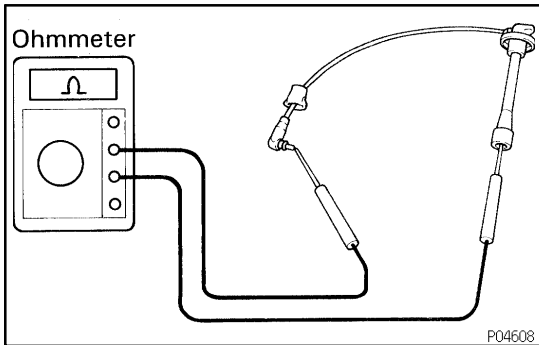
- (a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil).



- (b) Disconnect the high-tension cord at the grommet.
Do not pull on the cord.

NOTICE:

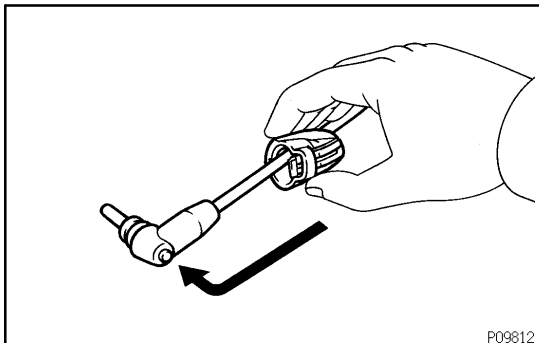
Pulling on or bending the cords may damage the conductor inside. Do not wipe any of the oil from the grommet after the high-tension cord is disconnected.

**8. INSPECT HIGH-TENSION CORD RESISTANCE**

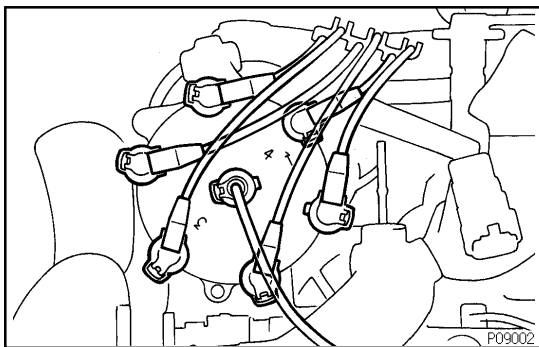
Using an ohmmeter, measure the resistance.

Maximum resistance: 25 kΩ per cord

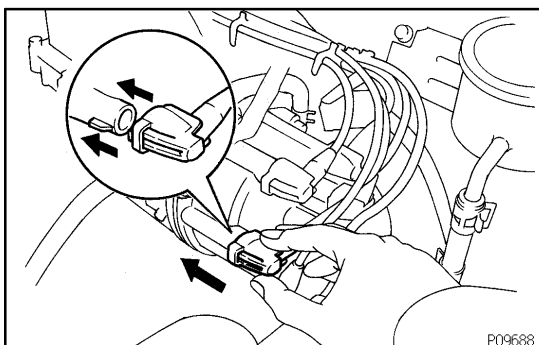
If the resistance is greater than maximum, check the terminals.
If necessary, replace the high-tension cord.

**9. RECONNECT HIGH-TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL**

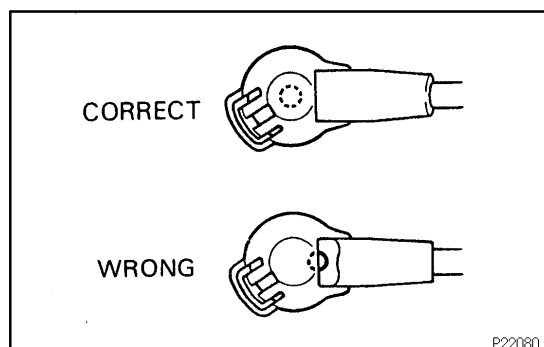
- (a) Assemble the holder and grommet.

**HINT:**

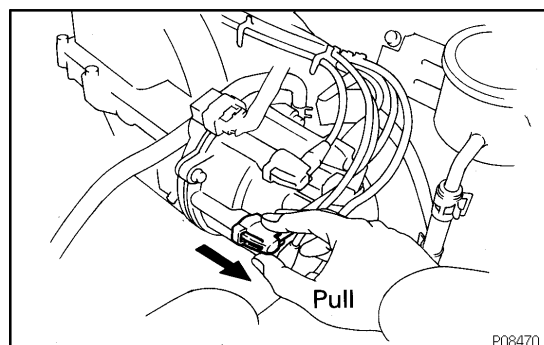
Connect the high-tension cords to the distributor cap as shown in the illustration.



- (b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord.

**NOTICE:**

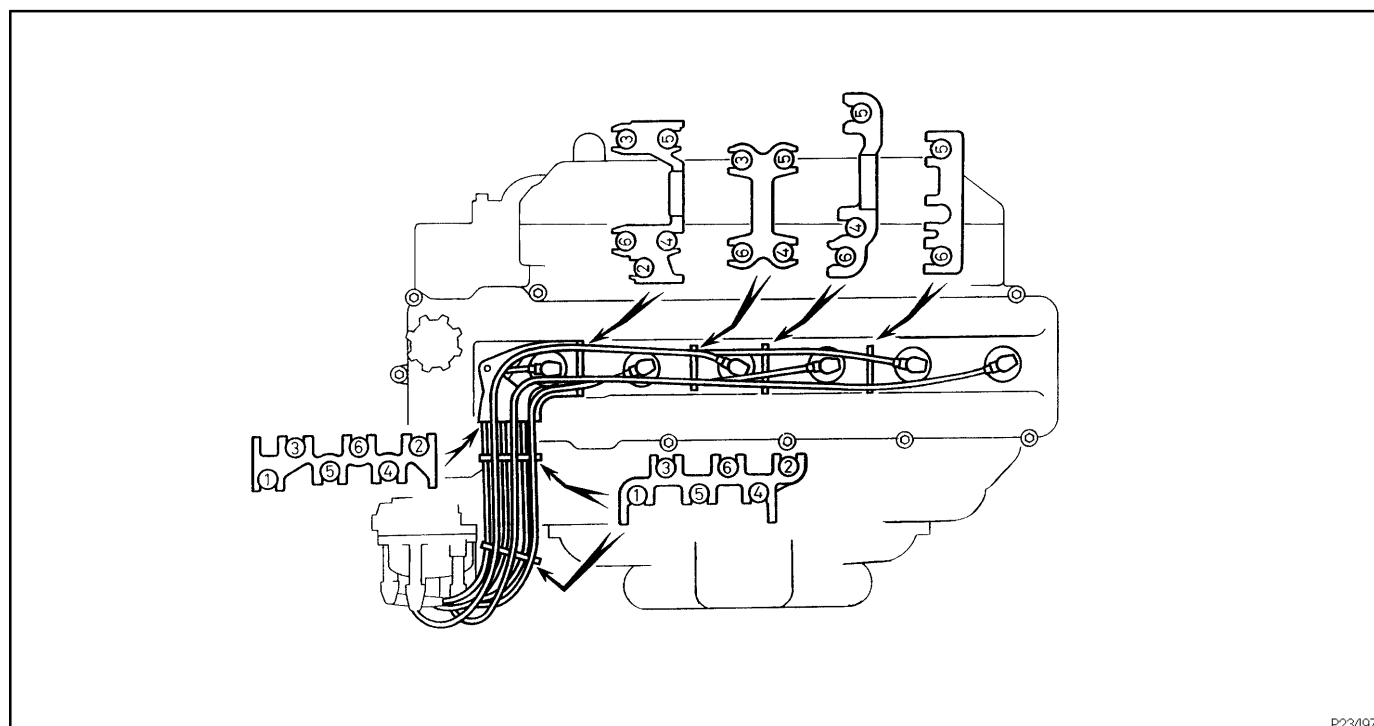
Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.

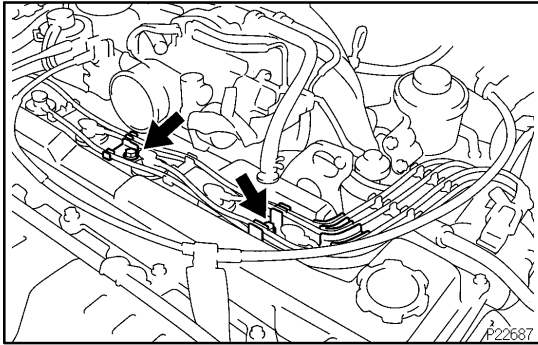


- (c) Check that the lock claw of the holder is engaged by lightly pulling the holder.

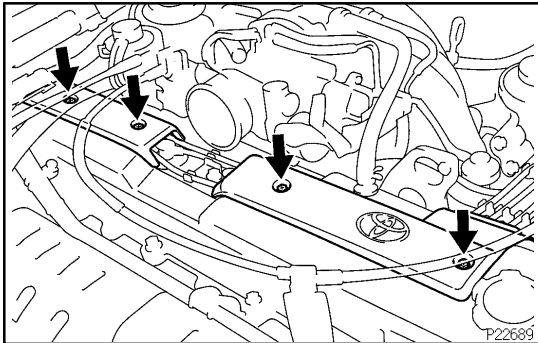
10. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

- (a) Secure the high-tension cords with the cord clamps as shown in the illustration.





- (b) Install the No.1 and No.2 cord clamps with the 2 bolts.



11. INSTALL NO.2 AND NO.3 CYLINDER HEAD COVERS

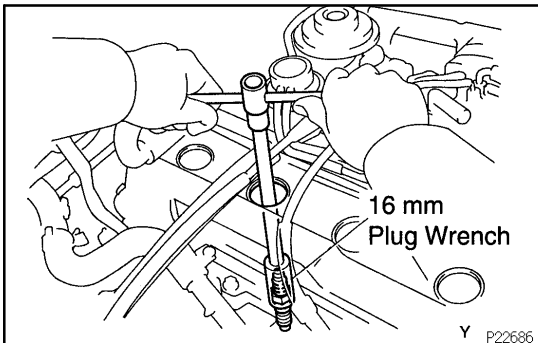
Install the head covers with the 4 bolts.

12. CONNECT THROTTLE CABLE

13. INSTALL AIR CLEANER HOSE

Install the air cleaner hose with the 2 clamp bolts.

14. INSTALL NO.2 PCV HOSE



15. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

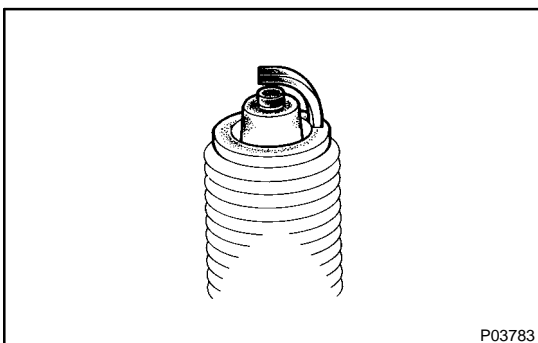
16. REMOVE SPARK PLUGS

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



17. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug.



18. VISUALLY INSPECT SPARK PLUGS

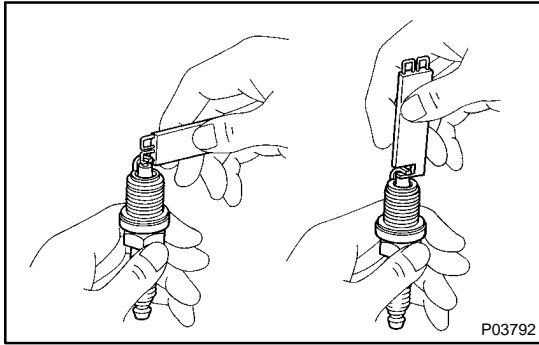
Check the spark plug for electrode wear, threads damage and insulator damage.

If abnormal, replace the plugs.

Recommended spark plugs:

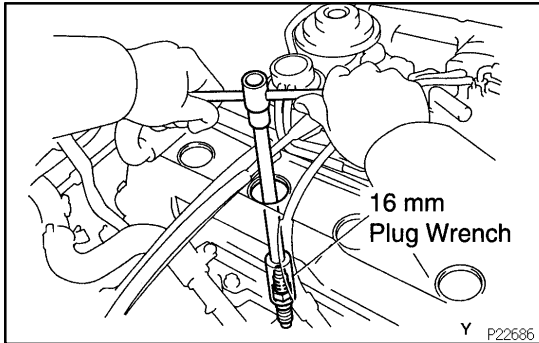
ND: K16R-U

NGK: BKR5EYA

**19. ADJUST ELECTRODE GAP**

Carefully bend the outer electrode to obtain the correct electrode gap.

Correct electrode gap: 0.8 mm (0.031 in.)

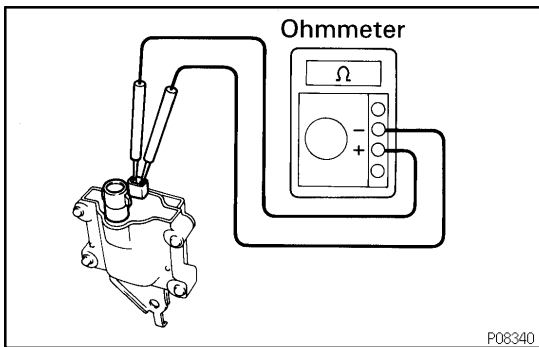
**20. INSTALL SPARK PLUGS**

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

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

21. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS**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).

22. DISCONNECT IGNITION COIL CONNECTOR**23. DISCONNECT HIGH-TENSION CORD****24. INSPECT PRIMARY COIL RESISTANCE**

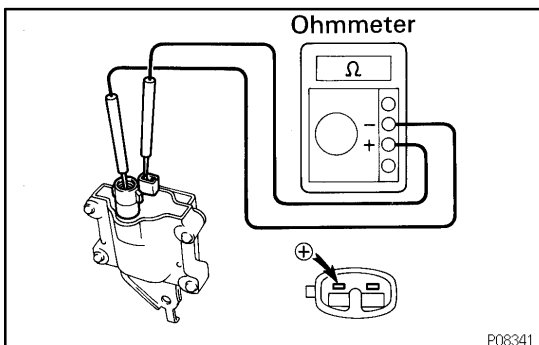
Using an ohmmeter, measure the resistance between the positive (+) and negative (-) terminals.

Primary coil resistance:

Cold: 0.36 – 0.55 Ω

Hot: 0.45 – 0.65 Ω

If the resistance is not as specified, replace the ignition coil.

**25. 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 k Ω

Hot: 11.4 – 18.1 k Ω

If the resistance is not as specified, replace the ignition coil.

26. RECONNECT HIGH-TENSION CORD**27. RECONNECT IGNITION COIL CONNECTOR**

NOTICE:

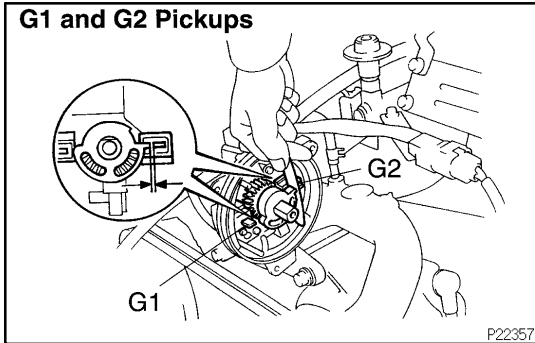
"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

28. DISCONNECT DISTRIBUTOR CONNECTOR

29. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS

30. REMOVE ROTOR

G1 and G2 Pickups

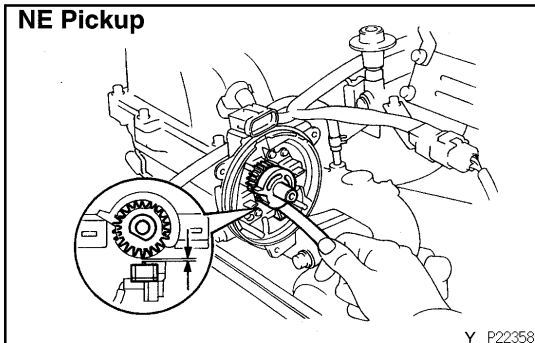


31. INSPECT AIR GAPS

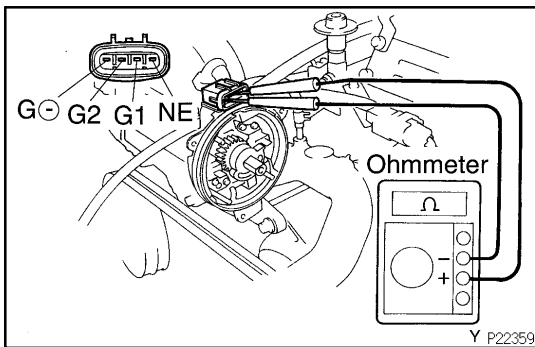
Using a thickness gauge, measure the gap between the signal rotor and the pickup coil projection.

Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)

NE Pickup



If the gap is not as specified, replace the distributor housing.



32. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, check that the resistance of the pickup coil.

Pickup coil resistance:

Cold	G1 and G \ominus	185 – 275 Ω
	G2 and G \ominus	185 – 275 Ω
	NE and G \ominus	185 – 275 Ω
Hot	G1 and G \ominus	240 – 325 Ω
	G2 and G \ominus	240 – 325 Ω
	NE and G \ominus	240 – 325 Ω

If the resistance is not as specified, replace the distributor housing.

33. REINSTALL ROTOR

34. REINSTALL DISTRIBUTOR CAP

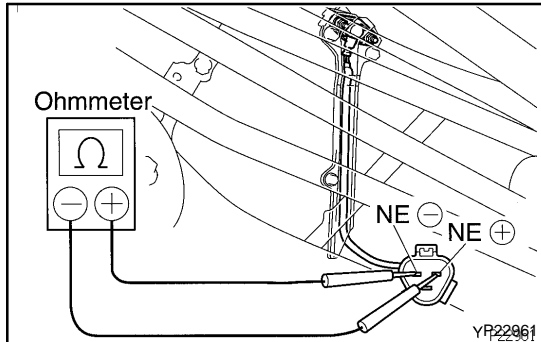
35. RECONNECT DISTRIBUTOR CONNECTOR

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the sensor itself.

"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).

36. DISCONNECT CRANKSHAFT POSITION SENSOR CONNECTOR AND BRACKET



37. INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance (NE \oplus – NE \ominus):

Cold: 1,630 – 2,740 Ω

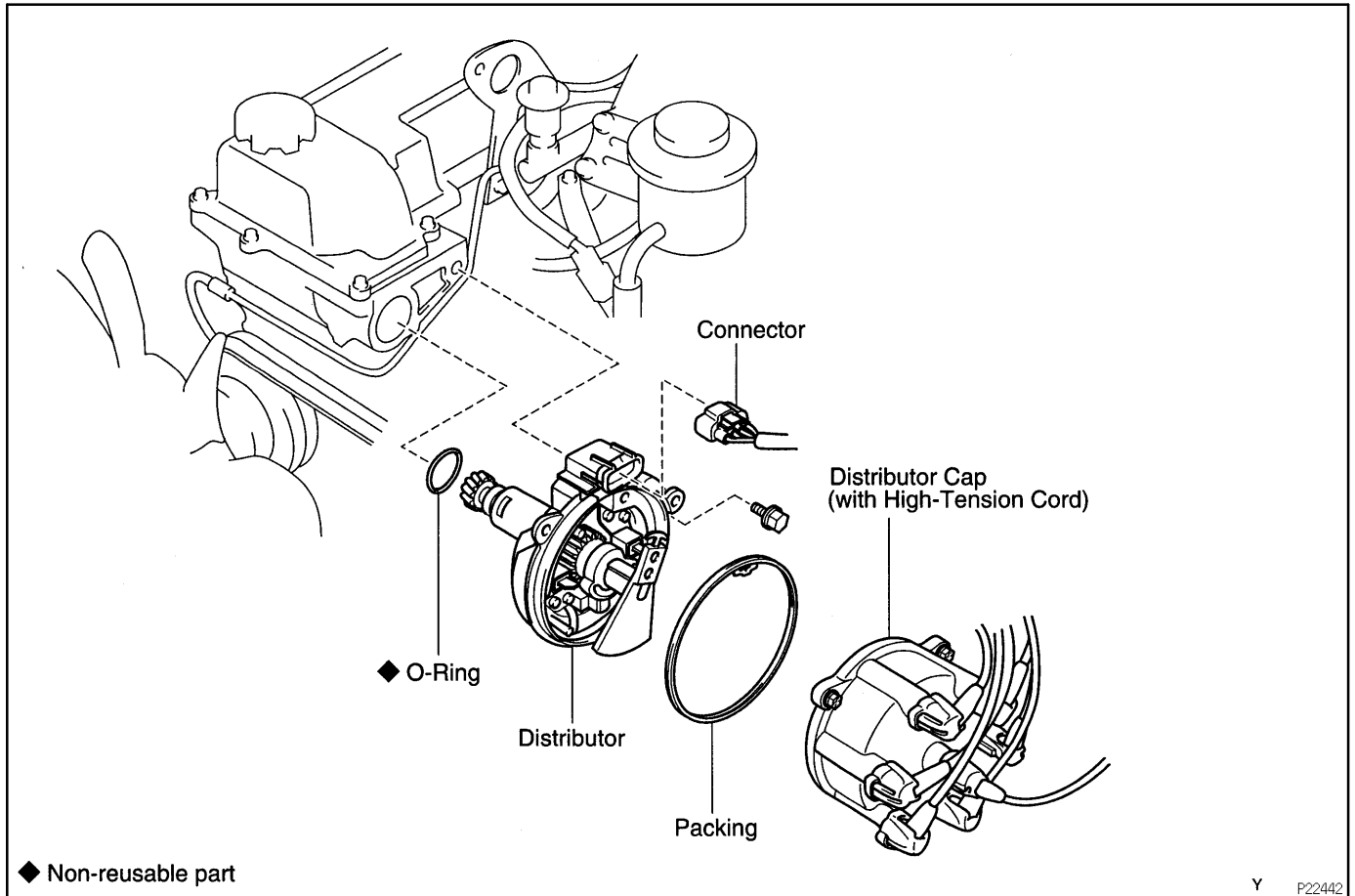
Hot: 2,065 – 3,225 Ω

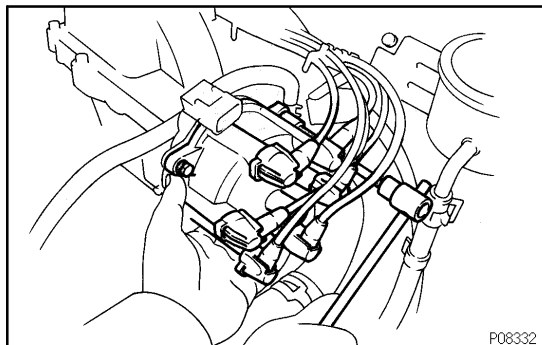
If the resistance is not as specified, replace the crankshaft position sensor.

38. RECONNECT CRANKSHAFT POSITION SENSOR BRACKET AND CONNECTOR

DISTRIBUTOR COMPONENTS

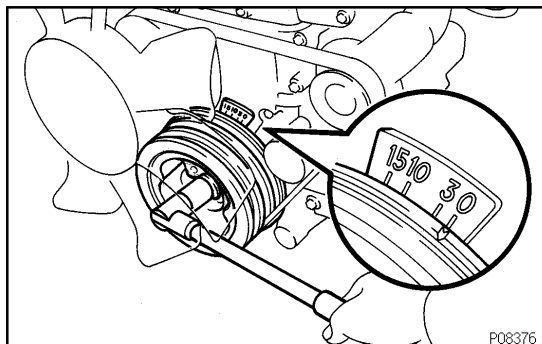
IG01C-01





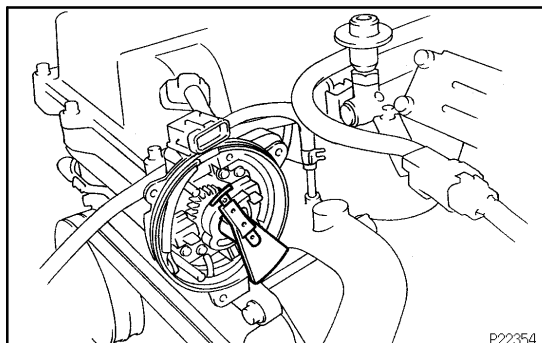
REMOVAL

1. **DISCONNECT DISTRIBUTOR CONNECTOR**
2. **REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS**



3. SET NO.1 CYLINDER TO TDC/COMPRESSION

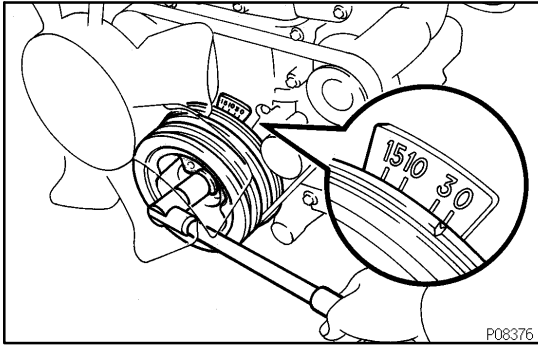
- (a) Turn the crankshaft pulley until the timing mark is aligned with "0" mark on the timing chain cover.



- (b) Check that the distributor rotor direction is as shown. If not, turn the crankshaft pulley one complete revolution.

4. REMOVE DISTRIBUTOR

- (a) Remove the hold-down bolt and pull out the distributor.
- (b) Remove the O-ring from the distributor housing.

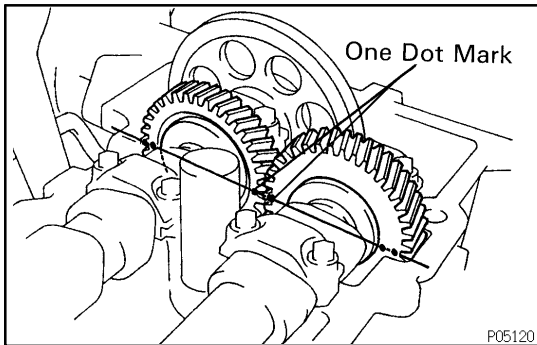


INSTALLATION

1. CHECK NO.1 CYLINDER TO TDC/COMPRESSION

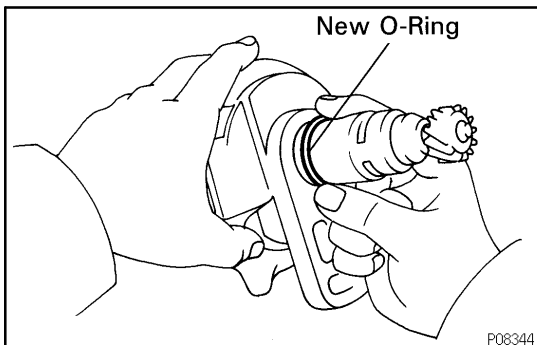
If necessary, remove the cylinder head cover, and check these conditions:

- Turn the crankshaft pulley and align its groove with the timing mark "0" of the timing chain cover.



- Verify that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the mark as above.

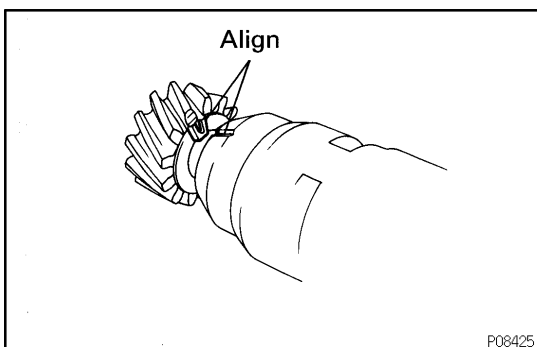


2. INSTALL DISTRIBUTOR

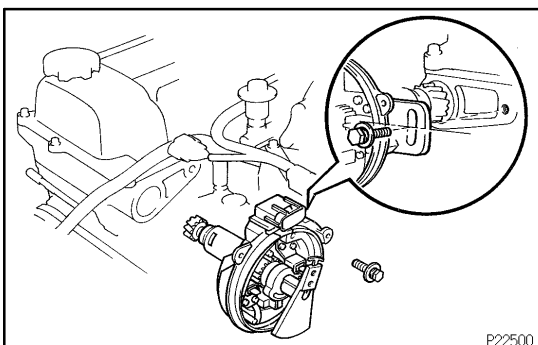
- (a) Install a new O-ring to the distributor.

HINT:

Always use a new O-ring when installing the distributor.



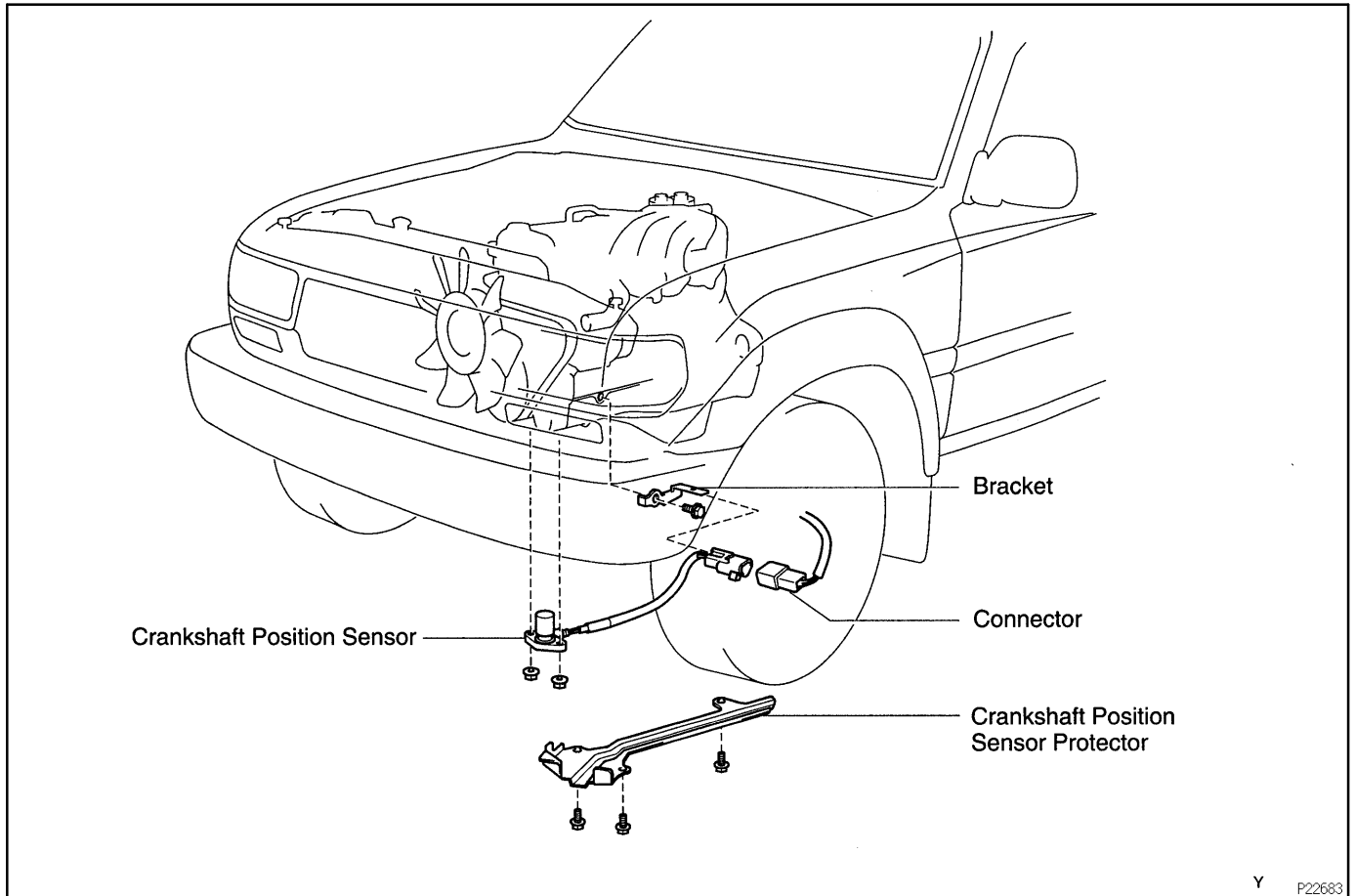
- (b) Align the groove of the distributor housing with the protrusion on the driven gear.
- (c) Apply a light coat of engine oil on the O-ring.



- (d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.
- (e) Lightly tighten the hold-down bolt.
3. INSTALL DISTRIBUTOR CAP
4. CONNECT DISTRIBUTOR CONNECTOR
5. CHECK IGNITION TIMING (See page [EM-10](#))

CRANKSHAFT POSITION SENSOR COMPONENTS

IG0JW-01

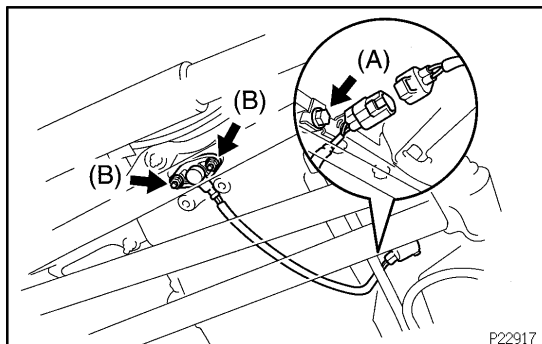


REMOVAL

1. REMOVE ENGINE UNDER COVER
2. REMOVE CRANKSHAFT POSITION SENSOR PROTECTOR

Remove the 3 bolts and crankshaft position sensor protector.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



3. DISCONNECT CRANKSHAFT POSITION SENSOR BRACKET AND CONNECTOR
4. REMOVE CRANKSHAFT POSITION SENSOR

Remove the bolt, 2 nuts and crankshaft position sensor.

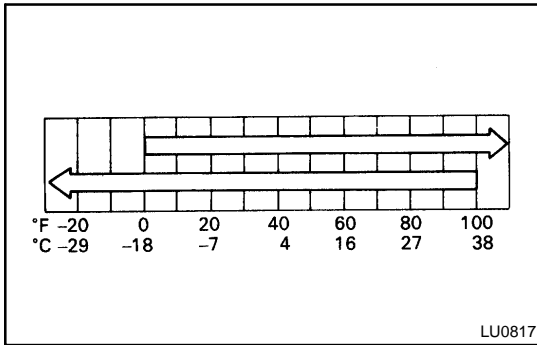
Torque:

Bolt A: 20 N·m (200 kgf·cm, 14 ft·lbf)

Nut B: 9 N·m (90 kgf·cm, 78 in·lbf)

INSTALLATION

Installation is in the reverse order of removal (See page [IG-13](#)).



OIL AND FILTER INSPECTION

LU08N-03

1. CHECK ENGINE OIL QUALITY

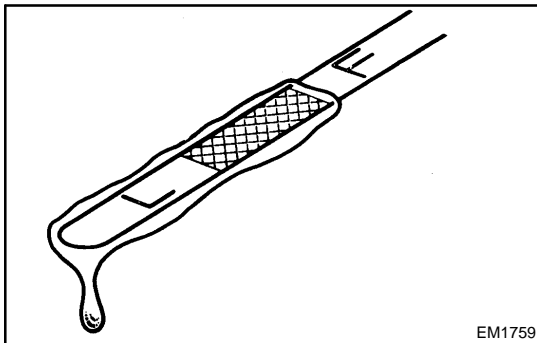
Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade SH Energy-Conserving II multigrade engine oil or ILSAC multigrade engine oil.

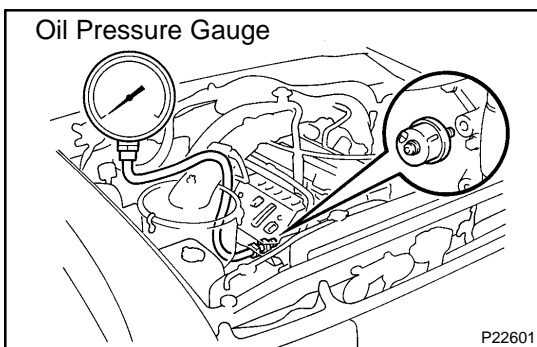
Recommended viscosity is as shown in the illustration, with SAE 5W-30 being the preferred engine oil.



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 "F" mark.



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 kgf/cm², 36 – 71 psi)

6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

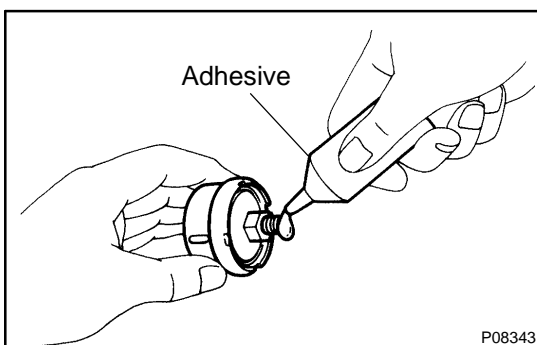
(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

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



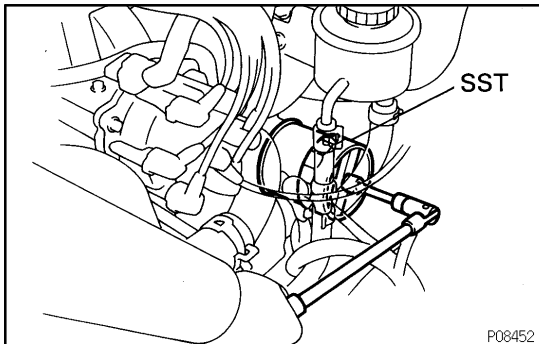
REPLACEMENT

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 filters must be disposed of only at designated disposal sites.

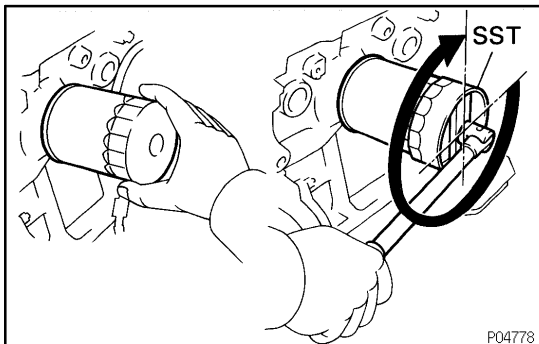
1. DRAIN ENGINE OIL

- (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 09228-44011
- (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 09228-44011

3. FILL WITH ENGINE OIL

- (a) Clean and install the oil drain plug with a new gasket.
Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

- (b) Fill with new engine oil.

Oil grade:

See step 1 in oil pressure check

Capacity:

Drain and refill

w/ Oil filter change

7.2 liters (7.5 US qts, 6.3 Imp. qts)

w/o Oil filter change

6.9 liters (7.3 US qts, 6.1 Imp. qts)

Dry fill

8.0 liters (8.5 US qts, 7.0 Imp. qts)

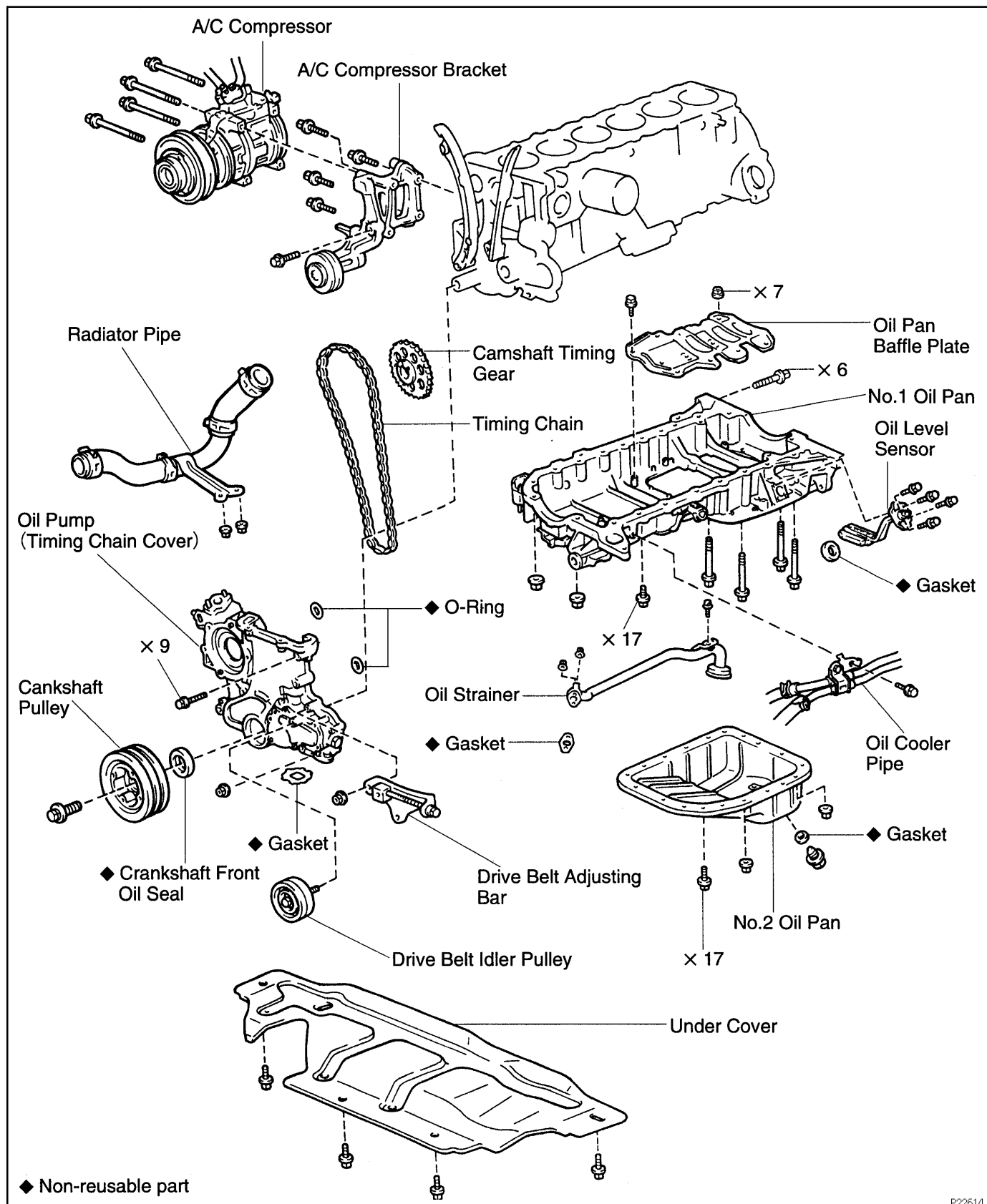
- (c) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

OIL PUMP COMPONENTS

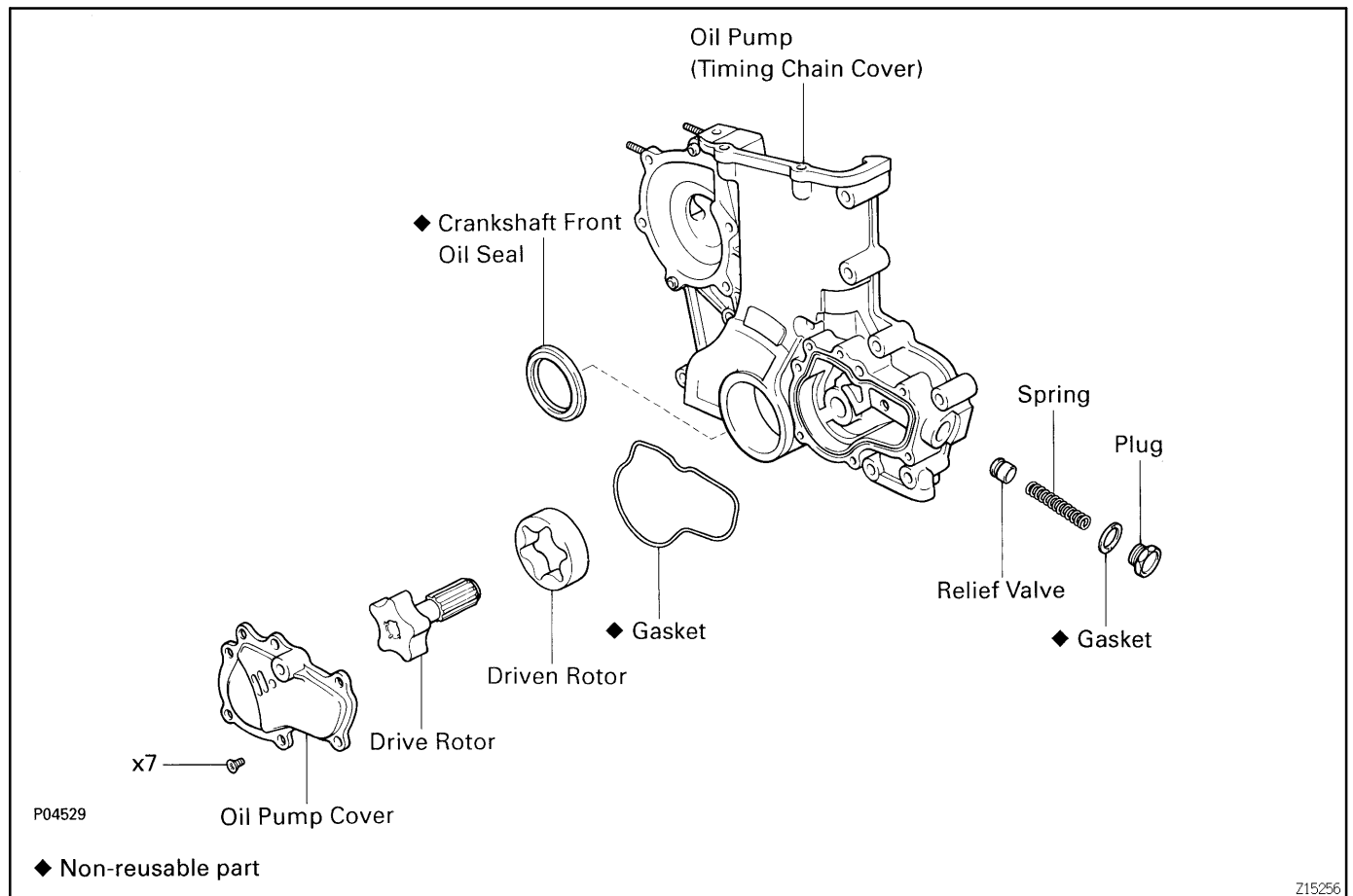
LU0KF-04



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LU-4

LUBRICATION - OIL PUMP

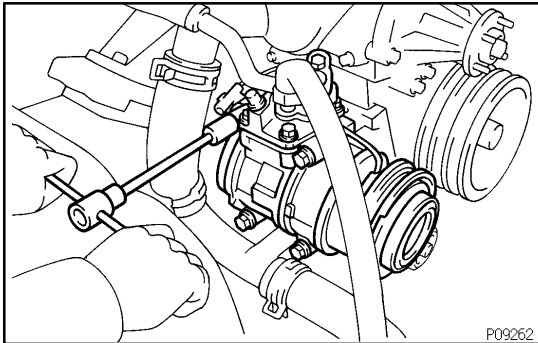


REMOVAL

HINT:

When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **DRAIN ENGINE OIL**
2. **REMOVE ENGINE UNDER COVER**
3. **DRAIN ENGINE COOLANT**
4. **REMOVE RADIATOR (See page [CO-14](#))**

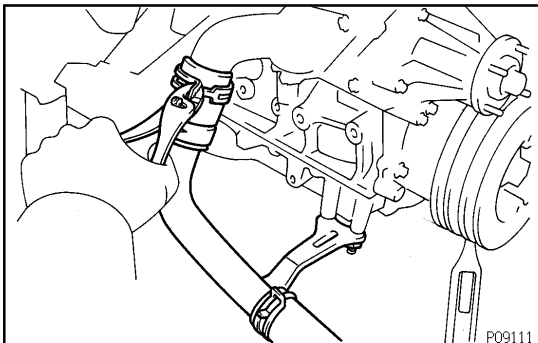


5. **DISCONNECT A/C COMPRESSOR AND BRACKET**
 - (a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
 - (b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket.

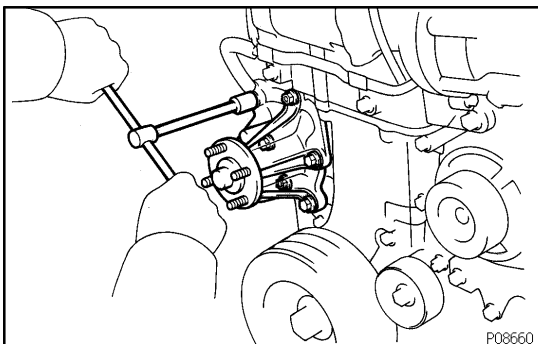
HINT:

Put aside the compressor, and suspend it.

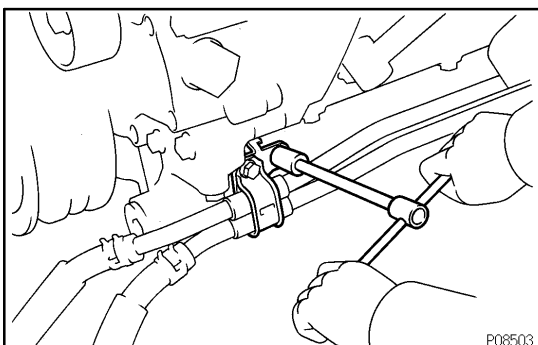
- (c) Remove the 5 bolts and A/C compressor bracket.



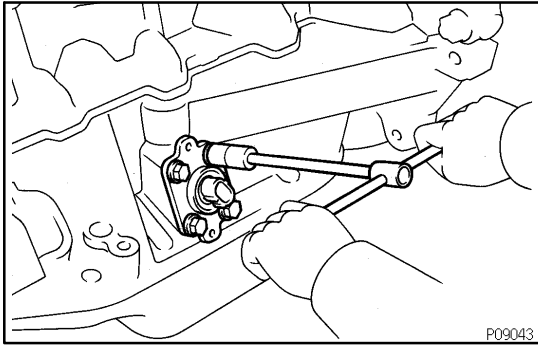
6. **REMOVE RADIATOR PIPE**
 - (a) Disconnect the No.2 radiator hose from the water inlet.
 - (b) Remove the 2 nuts and radiator pipe.



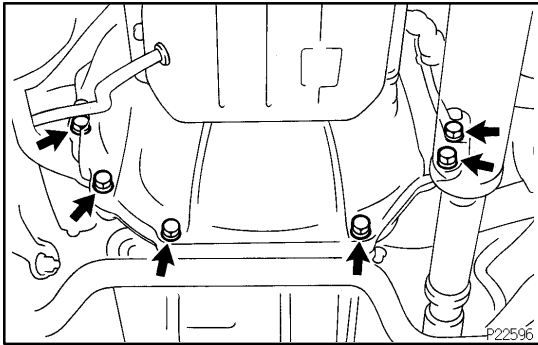
7. **REMOVE WATER PUMP**
Remove the 4 bolts, 2 nuts, water pump and gasket.
8. **REMOVE CYLINDER HEAD (See page [EM-28](#))**



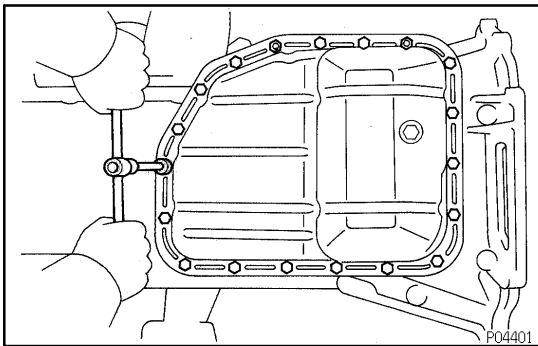
9. **DISCONNECT OIL COOLER PIPE BRACKET FROM NO.1 OIL PAN**

**10. REMOVE OIL LEVEL SENSOR**

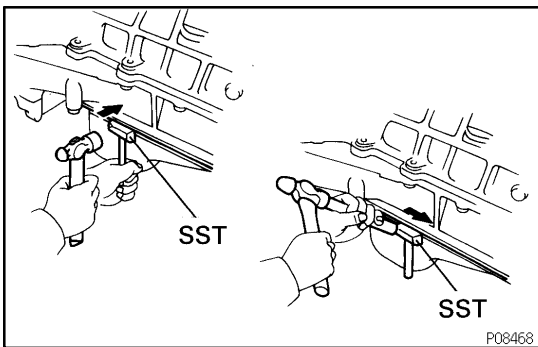
- (a) Remove the 4 bolts and level sensor.
- (b) Remove the gasket from the level sensor.

**11. REMOVE BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING**

Remove the 6 bolts.

**12. REMOVE NO.2 OIL PAN**

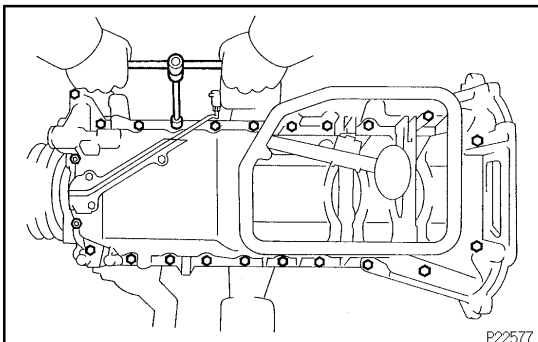
- (a) Remove the 17 mounting bolts and 2 nuts.



- (b) Insert the blade of SST between the No.1 and No.2 oil pans, cut off applied sealer and remove the No.2 oil pan.
SST 09032-00100

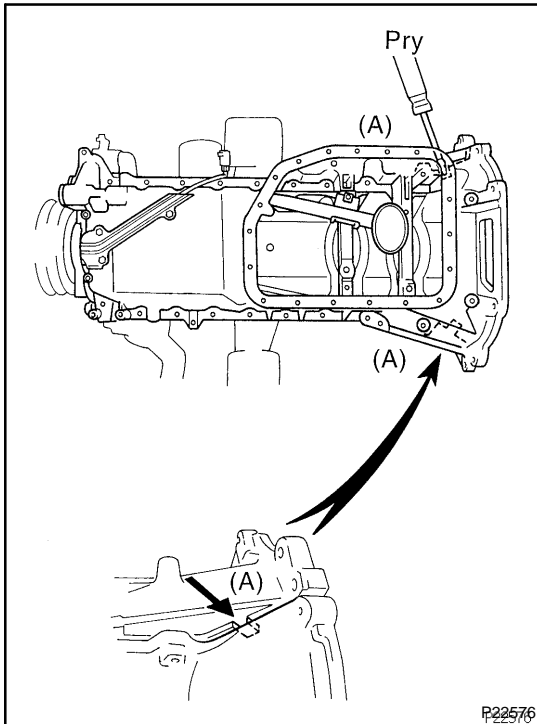
NOTICE:

Be careful not to damage the No.2 oil pan contact surface of the No.1 oil pan. Be careful not to damage the oil pan flange.

**13. REMOVE NO.1 OIL PAN**

- (a) Remove the 21 mounting bolts and 2 nuts.

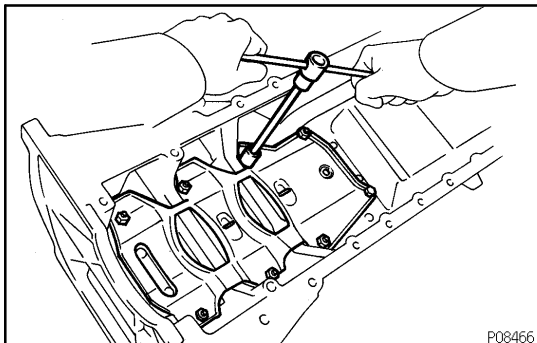
LUBRICATION - OIL PUMP



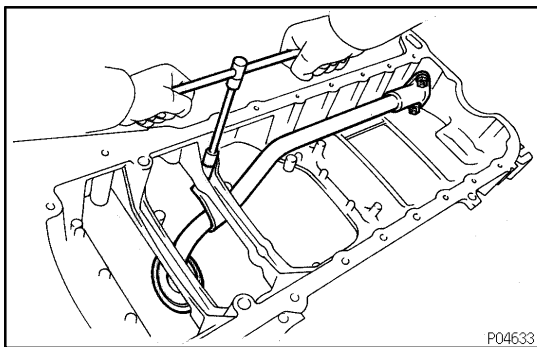
- (b) Remove the No.1 oil pan by prying the portions (A) between the cylinder block and No.1 oil pan with a screwdriver.

NOTICE:

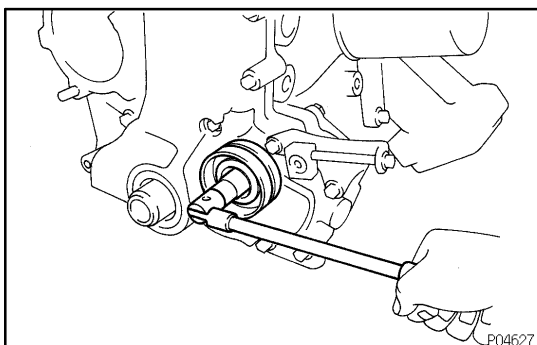
Be careful not to damage the contact surfaces of the cylinder block and No.1 oil pan.

**14. REMOVE OIL PAN BAFFLE PLATE**

Remove the bolt, 7 nuts and baffle plate.

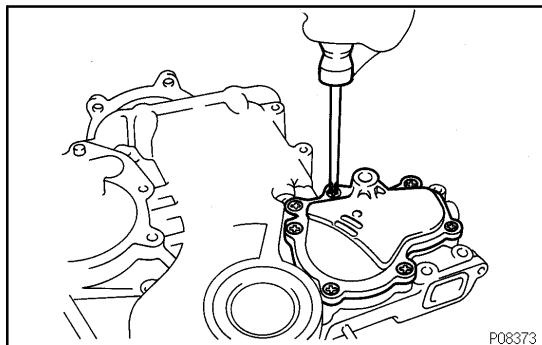
**15. REMOVE OIL STRAINER**

Remove the bolt, 2 nuts, oil strainer and gasket.

16. REMOVE CRANKSHAFT PULLEY (See page [EM-13](#))**17. REMOVE DRIVE BELT IDLER PULLEY**

Remove the bolt and idler pulley.

18. REMOVE OIL PUMP (TIMING CHAIN COVER) (See page [EM-13](#))**19. REMOVE TIMING CHAIN AND CAMSHAFT TIMING GEAR**



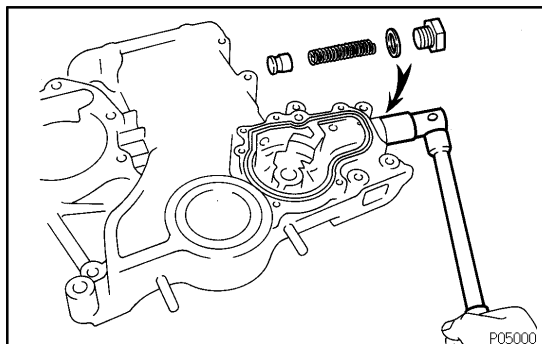
DISASSEMBLY

1. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 7 screws, pump cover, drive rotor, driven rotor and gasket.

HINT:

At the time of installation, place a new gasket on the pump body.



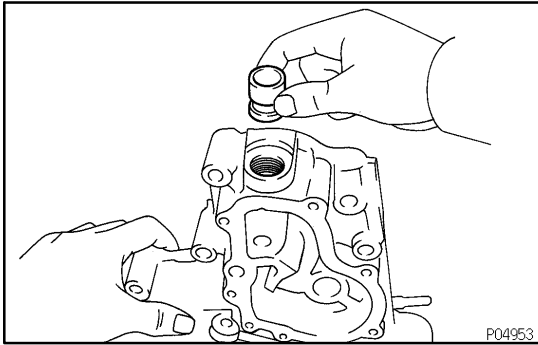
2. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve.

Torque: 49 N·m (500 kgf-cm, 36 ft-lbf)

HINT:

At the time of installation, install a new gasket to the plug.

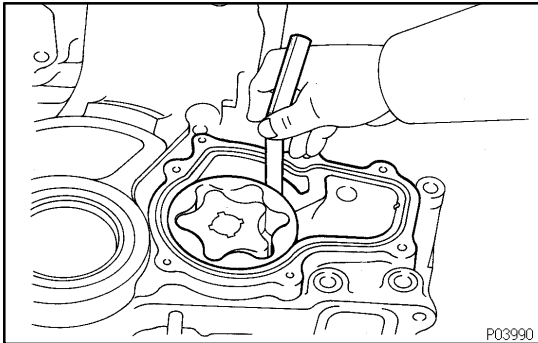


INSPECTION

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 ROTOR BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven rotor and body.

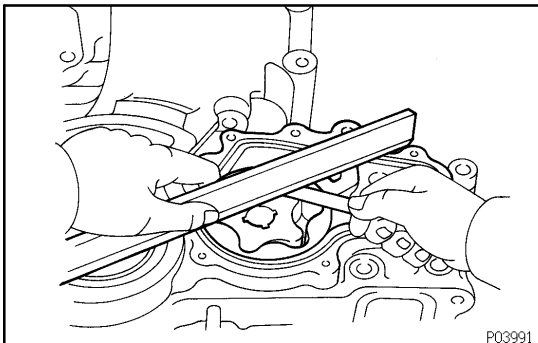
Standard body clearance:

0.100 - 0.170 mm (0.0039 - 0.0067 in.)

Maximum body clearance:

0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



3. INSPECT ROTOR SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

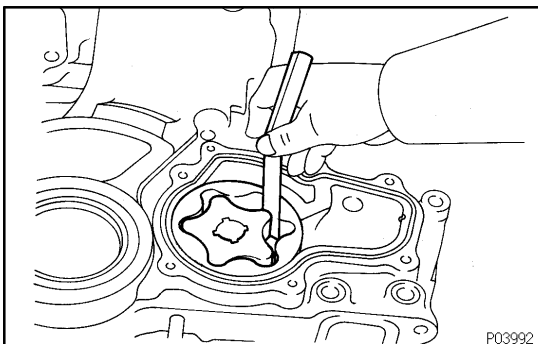
Standard side clearance:

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.



4. INSPECT ROTOR TIP CLEARANCE

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:

0.030 - 0.160 mm (0.0012 - 0.0063 in.)

Maximum tip clearance:

0.25 mm (0.0098 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

LU-10

LUBRICATION – OIL PUMP

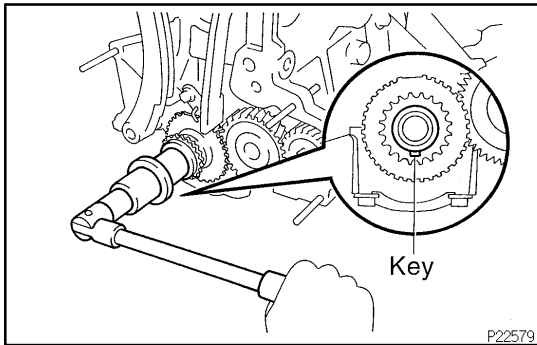
LU08T-03

REPLACEMENT

REPLACE CRANKSHAFT FRONT OIL SEAL (See page [EM-99](#))

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [LU-8](#)).



INSTALLATION

1. SET CRANKSHAFT

Turn the crankshaft until the set key on the crankshaft facing downward.

2. INSTALL TIMING CHAIN AND CAMSHAFT TIMING GEAR (See page EM-19)

3. INSTALL OIL PUMP (TIMING CHAIN COVER)(See page EM-19)

4. INSTALL DRIVE BELT IDLER PULLEY

Install the pulley with the bolt.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

5. INSTALL CRANKSHAFT PULLEY (See page EM-19)

6. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

7. INSTALL OIL PAN BAFFLE PLATE

Install the baffle plate with the bolt and 7 nuts.

Torque: 9.0 N·m (90 kgf·cm, 78 in.-lbf)

8. INSTALL NO.1 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, 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 No.1 oil pan as shown in the illustration.

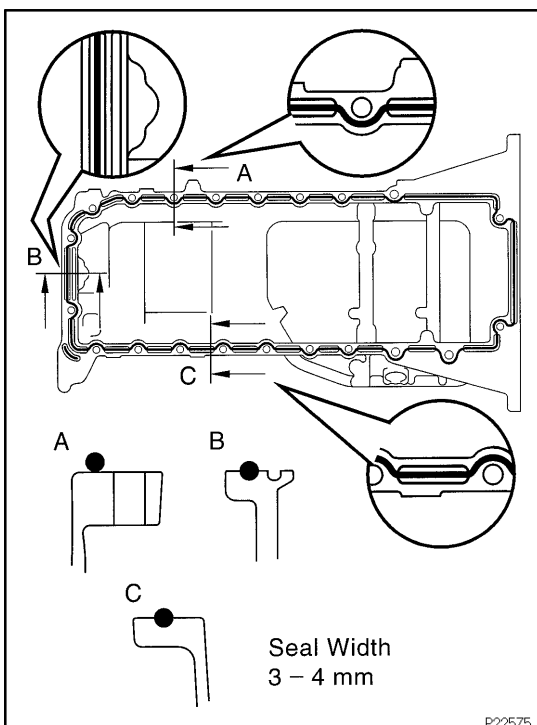
Seal packing: Part No. 08826-00080 or equivalent

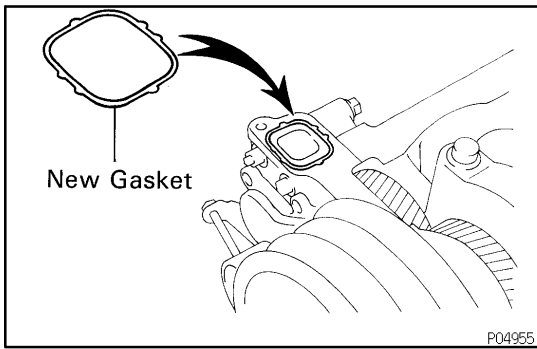
- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

HINT:

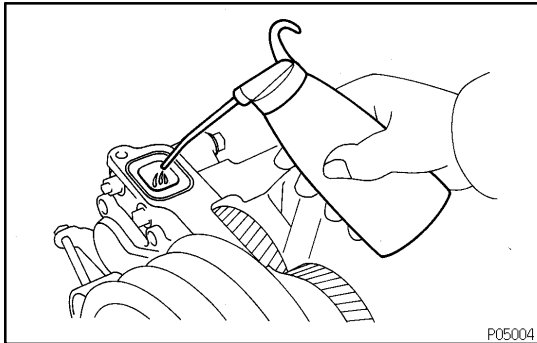
Avoid applying an excessive amount to the surface.

- 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 a new gasket in position.



- (d) Pour in approximately 15 cm³ (0.9 cu in.) of engine oil into oil pump hole.
- (e) Install the No.1 oil pan with the 21 bolts and 2 nuts.

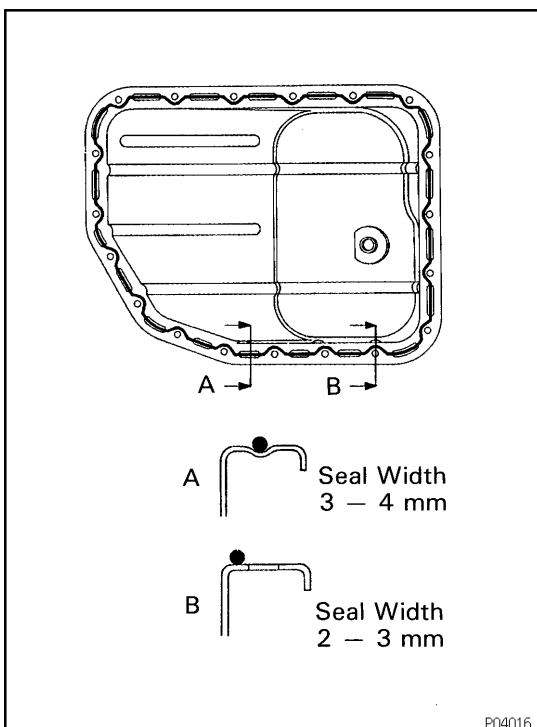
Torque:

14 mm head: 44 N·m (440 kgf·cm, 32 ft·lbf)

12 mm head: 20 N·m (200 kgf·cm, 14 ft·lbf)

9. 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 oil pan.
- 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 No.2 oil pan as shown in the illustration.

NOTICE:

Do not use a solvent which will affect the painted surfaces.

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 or 3 – 4 mm (0.012 – 0.016 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.

- 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 No.2 oil pan with the 17 bolts and 2 nuts.

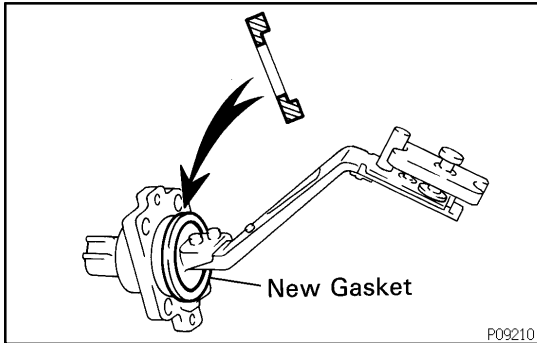
Torque: 7.8 N·m (80 kgf·cm, 69 in.-lbf)

Torque: 8.8 N·m (90 kgf·cm, 78 in.-lbf)

10. INSTALL BOLTS HOLDING NO.1 OIL PAN TO TRANSMISSION HOUSING

Install the 6 bolts.

Torque: 72 N·m (730 kgf-cm, 53 ft-lbf)



11. INSTALL OIL LEVEL SENSOR

(a) Install a new gasket to the level sensor.

(b) Install the level sensor with the 4 bolts.

Torque: 5.4 N·m (55 kgf-cm, 48 in.-lbf)

12. CONNECT OIL COOLER PIPE BRACKET TO NO.1 OIL PAN

13. INSTALL CYLINDER HEAD(See page [EM-54](#))

14. INSTALL WATER PUMP

Install a new gasket and water pump with the 4 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

15. INSTALL RADIATOR PIPE

(a) Connect the No.2 radiator hose to the water inlet.

(b) Install the 2 nuts holding the radiator pipe to the No.1 oil pan.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

16. INSTALL A/C COMPRESSOR AND BRACKET

(a) Install the A/C compressor bracket with the 5 bolts.

Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

(b) Install the A/C compressor with the 4 bolts.

Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

(c) Install and adjust the drive belt (See page [CH-2](#)).

17. INSTALL RADIATOR (See page [CO-16](#))

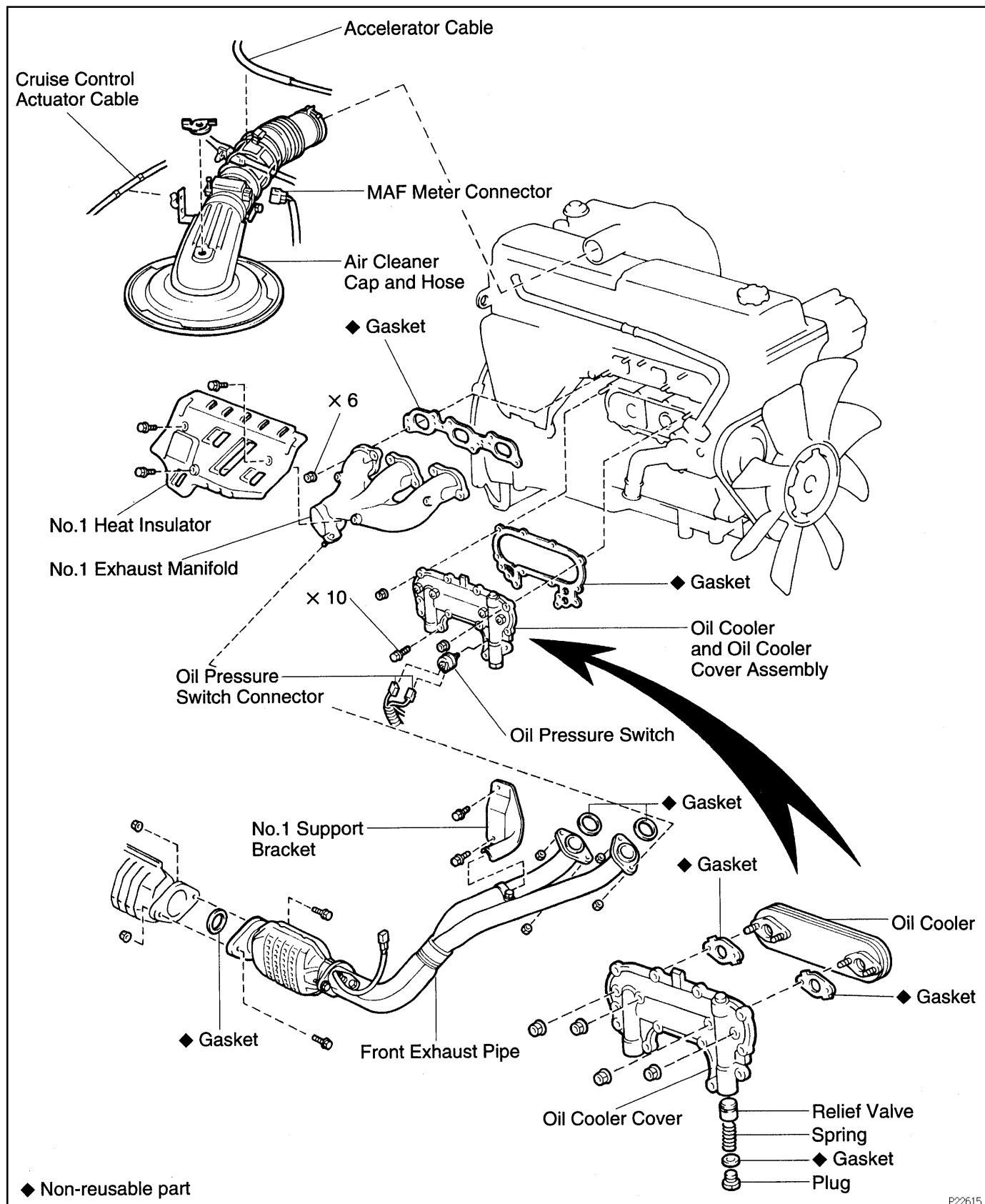
18. INSTALL ENGINE UNDER COVER

19. FILL WITH ENGINE OIL

20. START ENGINE AND CHECK FOR LEAKS

OIL COOLER COMPONENTS

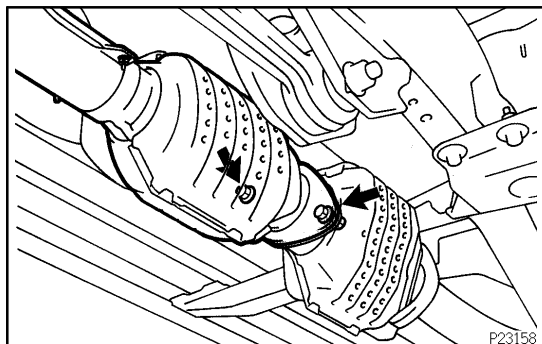
LU08W-03



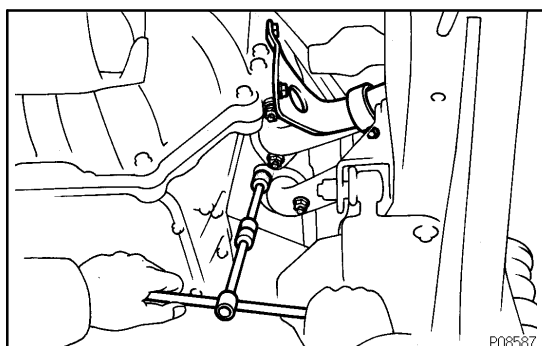
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REMOVAL

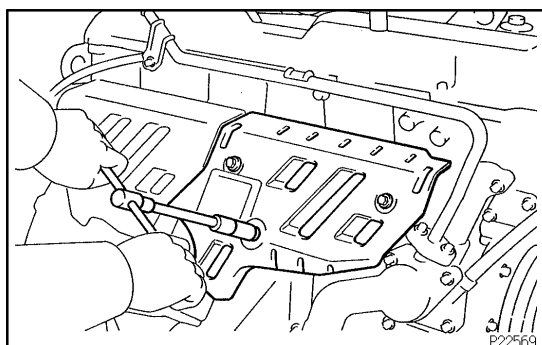
1. DRAIN ENGINE COOLANT
2. REMOVE AIR CLEANER CAP AND HOSE



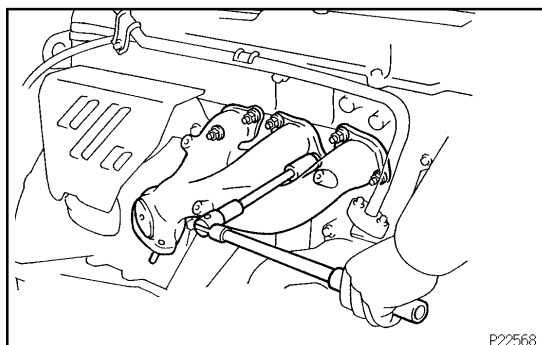
3. REMOVE FRONT EXHAUST PIPE
 - (a) Disconnect the heated oxygen sensor connector.
 - (b) Remove the 2 nuts and 2 bolts holding the front exhaust pipe to the rear TWC.
 - (c) Disconnect the front exhaust pipe, and remove the gasket.



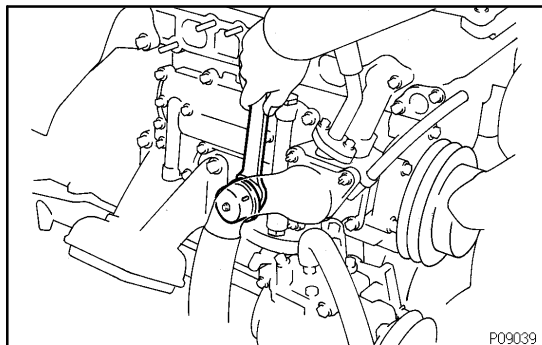
- (d) Loosen the clamp bolt and disconnect the clamp from the No.1 support bracket.
- (e) Remove the 2 bolts and No.1 support bracket.
- (f) Remove the 4 nuts, front exhaust pipe and 2 gaskets.



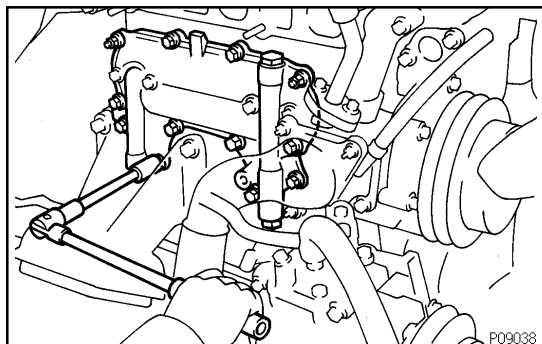
4. REMOVE NO.1 EXHAUST MANIFOLD
 - (a) Remove the 3 bolts and No.1 heat insulator.



- (b) Remove the 6 nuts, exhaust manifold and gasket.

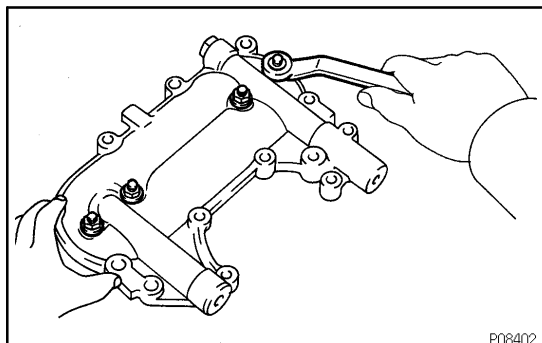


5. REMOVE OIL PRESSURE SWITCH



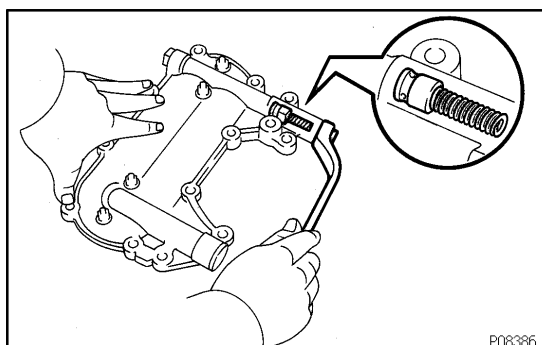
6. REMOVE OIL COOLER AND OIL COOLER COVER ASSEMBLY

Remove the 10 bolts, 2 nuts, oil cooler and oil cooler cover assembly and gasket.



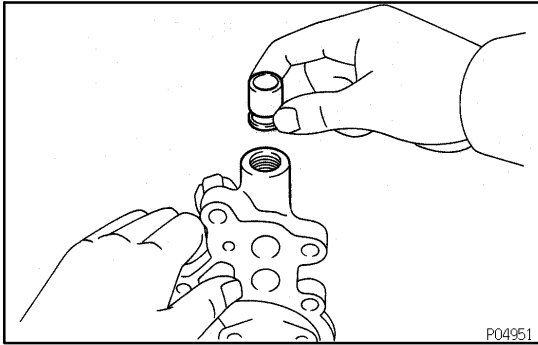
7. SEPARATE OIL COOLER AND OIL COOLER COVER

Remove the 4 nuts, oil cooler and 2 gaskets from the oil cooler cover.



8. REMOVE RELIEF VALVE

Remove the plug, gasket, spring and relief valve.



INSPECTION

1. INSPECT RELIEF VALVE

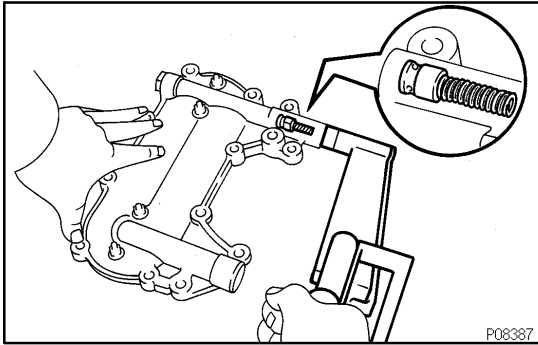
Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it doesn't, replace the relief valve. If necessary, replace the oil cooler cover.

2. INSPECT OIL COOLER

Check the oil cooler for damage or clogging.

If necessary, replace the oil cooler.



INSTALLATION

1. INSTALL RELIEF VALVE

Install the relief valve, spring and a new gasket with the plug.

Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

2. ASSEMBLE OIL COOLER AND OIL COOLER COVER

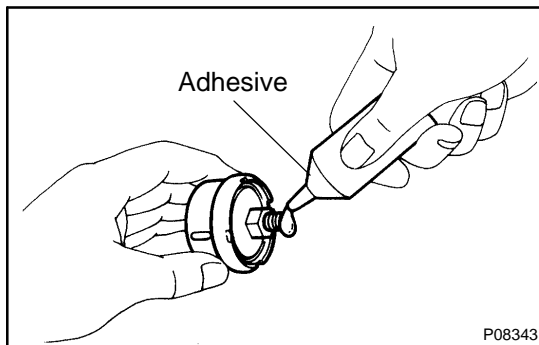
Install 2 new gaskets and the oil cooler to the oil cooler cover with the 4 nuts.

Torque: 17 N·m (170 kgf-cm, 12 ft-lbf)

3. INSTALL OIL COOLER AND OIL COOLER COVER ASSEMBLY

Install a new gasket, the oil cooler and oil cooler cover assembly with the 10 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)



4. INSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:

Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the oil pressure switch.

5. INSTALL NO.1 EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with the 6 nuts.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

(b) Install the heat insulator with the 3 bolts.

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

6. INSTALL FRONT EXHAUST PIPE

(a) Install 2 new gaskets and the front exhaust pipe with the 4 nuts.

Torque: 63 N·m (630 kgf-cm, 46 ft-lbf)

(b) Install the No.1 support bracket with the 2 bolts.

Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)

(c) Connect the clamp and tighten the clamp bolt.

Torque: 19.5 N·m (195 kgf-cm, 14 ft-lbf)

(d) Connect the front exhaust pipe to the rear TWC with a new gasket, 2 bolts and 2 nuts.

Torque: 46 N·m (470 kgf-cm, 34 ft-lbf)

7. INSTALL AIR CLEANER CAP AND HOSE

8. FILL RADIATOR WITH ENGINE COOLANT

9. START ENGINE AND CHECK FOR LEAKS

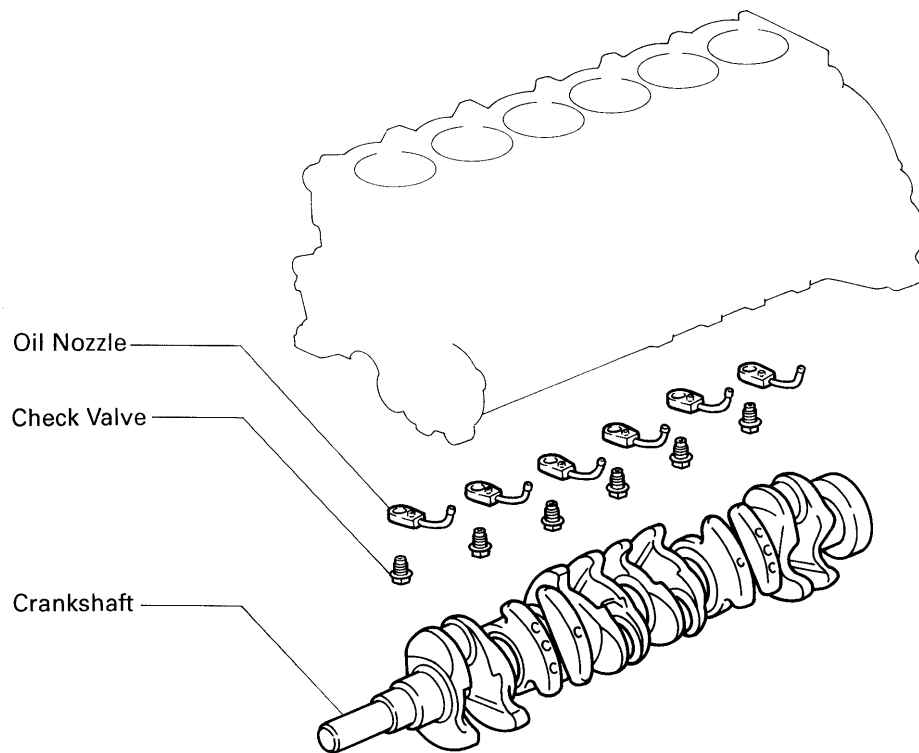
10. CHECK ENGINE OIL

LU-20

LUBRICATION - OIL NOZZLE

OIL NOZZLE COMPONENTS

LUOKL-01



P04786

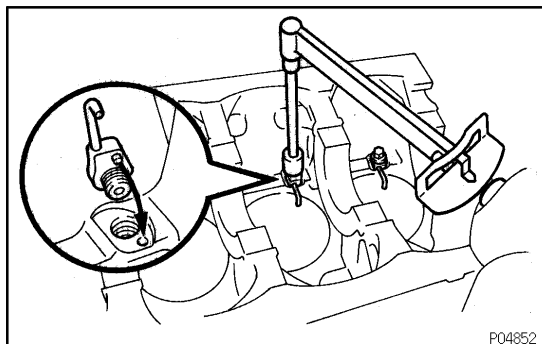
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REMOVAL

1. REMOVE CYLINDER HEAD (See page [EM-28](#))
2. REMOVE TIMING CHAIN AND GEARS (See page [EM-13](#))
3. REMOVE CRANKSHAFT (See page [EM-83](#))
4. REMOVE OIL NOZZLES

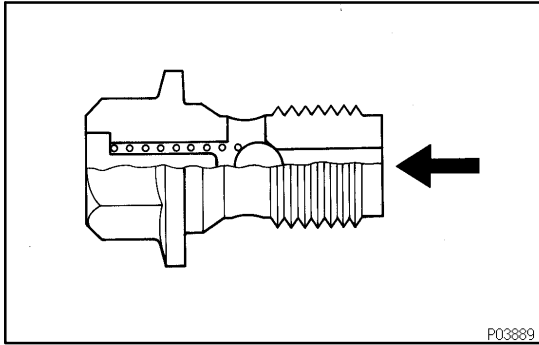
Remove the 6 check valves and oil nozzles.

Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)



HINT:

At the time of installation, align the pin of the nozzle with the pin hole of the cylinder block.



INSPECTION

1. INSPECT CHECK VALVES

Push the valve with a wooden stick to check if it is stuck.

If stuck, replace the check valve.

2. INSPECT OIL NOZZLES

Check the oil nozzles for damage or clogging.

If necessary, replace the oil nozzle.

INSTALLATION

Installation is in the reverse order of removal (See page [LU-21](#)).

OUTSIDE VEHICLE

GENERAL MAINTENANCE

MA02P-04

The owners are responsible for these maintenance and inspection items.

They can be done by the owner or they can have them done at a service shop.

These items include 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 do.

Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. TIRES

- (a) Check the pressure with a gauge.

If necessary, adjust.

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

3. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts.

If necessary, tighten them.

4. TIRE ROTATION

Check the owner's manual supplement in which the maintenance schedule is shown.

5. WINDSHIELD WIPER BLADES

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

If necessary, replace.

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.

7. DOORS AND ENGINE HOOD

- (a) Check that all doors and the tailgate 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

GENERAL MAINTENANCE

MA02Q-04

The owners are responsible for these maintenance and inspection items.

They can be done by the owner or they can have them done at a service shop.

These items include 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 do.

Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
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- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. LIGHTS

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

3. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

4. HORN

Check that it is working.

5. WINDSHIELD

Check for scratches, pits or abrasions.

6. WINDSHIELD WIPER AND WASHER

- (a) Check operation of the wipers and washer.
- (b) Check that the wipers do not streak.

7. WINDSHIELD DEFROSTER

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

8. REAR VIEW MIRROR

Check that it is mounted securely.

9. SUN VISORS

Check that they move freely and mounted securely.

10. 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.

11. SEATS

- (a) Check that all front seat controls such as seat adjusters, seatback recliner, etc. operate smoothly.
- (b) Check that all latches lock securely in any position.
- (c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latch position.
- (d) For folding-down rear seat backs, check that the latches lock securely.

12. 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.

13. ACCELERATOR PEDAL

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

14. BRAKE PEDAL (See page BR-6)

- (a) Check that pedal for smoothly operation.
- (b) Check that the pedal has the proper reserve distance and freeplay.
- (c) Check the brake booster function.

15. BRAKES

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

16. PARKING BRAKE (See page BR-8)

- (a) Check that the lever has the proper travel.
- (b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

17. AUTOMATIC TRANSMISSION "PARK" MECHANISM

- (a) Check the lock release button of the selector level for proper and smooth operation.
- (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

MA02R-04

GENERAL MAINTENANCE

1. GENERAL NOTICE

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

3. ENGINE COOLANT LEVEL

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

4. RADIATOR AND HOSES

- Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
- Check the hoses for cracks, kinks, rot or loose connections.

5. BATTERY ELECTROLYTE LEVEL

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

6. BRAKE FLUID LEVELS

Check that the brake fluid level is near the upper level line on the see-through reservoir.

7. ENGINE DRIVE BELTS

Check drive belt for fraying, cracks, wear or oiliness.

8. ENGINE OIL LEVEL

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

9. POWER STEERING FLUID LEVEL

- Check the level on the dipstick.
- The level should be in the HOT or COLD range depending on the fluid temperature.

10. AUTOMATIC TRANSMISSION FLUID LEVEL

- Park the vehicle on a level surface.
- With the engine idling and the parking and foot brake applied, shift the selector into all positions from the P to L, and then shift into the P.
- Pull out the dipstick and wipe off the fluid with a clean rag. Re-insert the dipstick fully and check that the fluid level is in the HOT range.
- Do this check with the fluid at normal driving temperature (70 – 80°C (158 – 176°F)).

HINT:

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

11. 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.

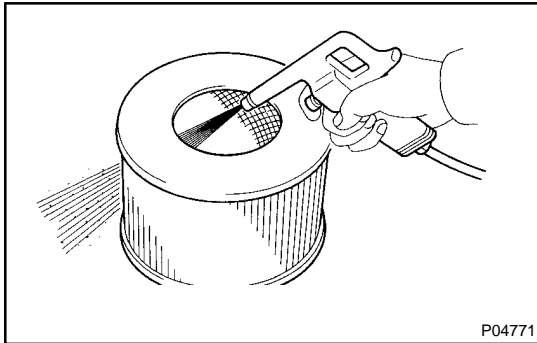
ENGINE INSPECTION

MA04U-01

HINT:

Inspect these items when the engine is cold.

1. INSPECT DRIVE BELT (See page [CH-2](#))



2. INSPECT AIR FILTER

- (a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

If necessary, replace the air cleaner element.

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

3. REPLACE AIR FILTER

Replace the air cleaner element with a new one.

4. REPLACE SPARK PLUGS (See page [IG-1](#))

5. REPLACE ENGINE OIL AND OIL FILTER (See page [LU-2](#))

6. REPLACE ENGINE COOLANT (See page [CO-2](#))

7. INSPECT CHARCOAL CANISTER (See page [EC-6](#))

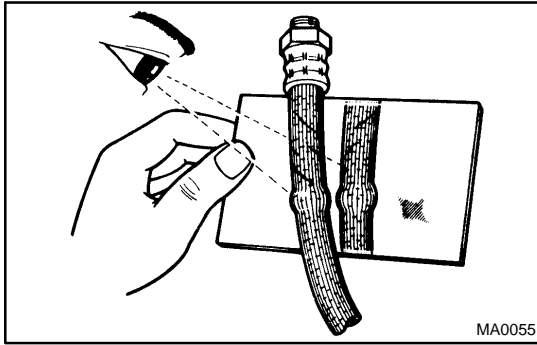
8. REPLACE GASKET IN FUEL TANK CAP (See page [EC-6](#))

9. INSPECT FUEL LINES AND CONNECTIONS (See page [EC-6](#))

10. INSPECT EXHAUST PIPES AND MOUNTINGS

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

11. ADJUST VALVE CLEARANCE (See page [EM-4](#))



BRAKE INSPECTION

MA02T-03

1. 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.
 - Check for damage.
 - Check for wear.
 - Check for deformation.
 - Check for cracks.
 - Check for corrosion.
 - Check for leaks.
 - Check for bends.
 - Check for 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.
2. **INSPECT FRONT BRAKE PADS AND DISCS** (See page [BR-27](#))
3. **INSPECT REAR BRAKE PADS AND DISCS** (See page [BR-36](#))
4. **INSPECT PARKING BRAKE LININGS AND DRUMS** (See page [BR-42](#))

CHASSIS INSPECTION

MA04V-01

1. INSPECT STEERING LINKAGE

- (a) Check the steering linkage for looseness or damage.
 - Check that the tie rod ends do not have excessive play.
 - Check that the boot clamps are not loose.
- (b) Inspect the dust cover for damage.

2. INSPECT SRS AIRBAG

(Driver airbag: See page [RS-9](#))

(Front passenger airbag: See page [RS-23](#))

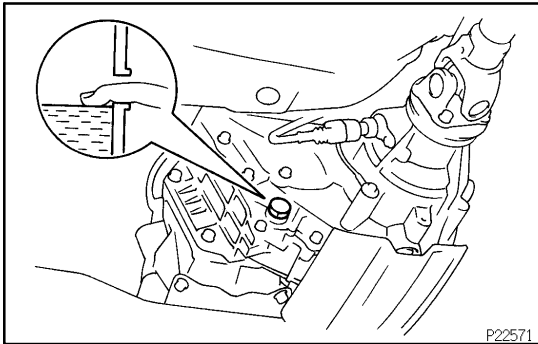
3. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leakage.

If leakage is found, check for cause and repair.

4. INSPECT OIL LEVEL IN AUTOMATIC TRANSMISSION

(See page [DI-131](#))



5. INSPECT OIL LEVEL IN TRANSFER AND DIFFERENTIAL

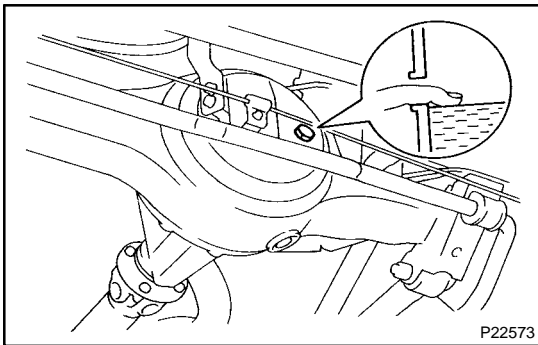
(a) Transfer:

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole.

If the level is low, add oil until it begins to run out of the filler hole.

Oil grade: API GL-4 or GL-5

Viscosity: 75W-90



(b) Differential:

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole.

If the level is low, add oil until it begins to run out of the filler hole.

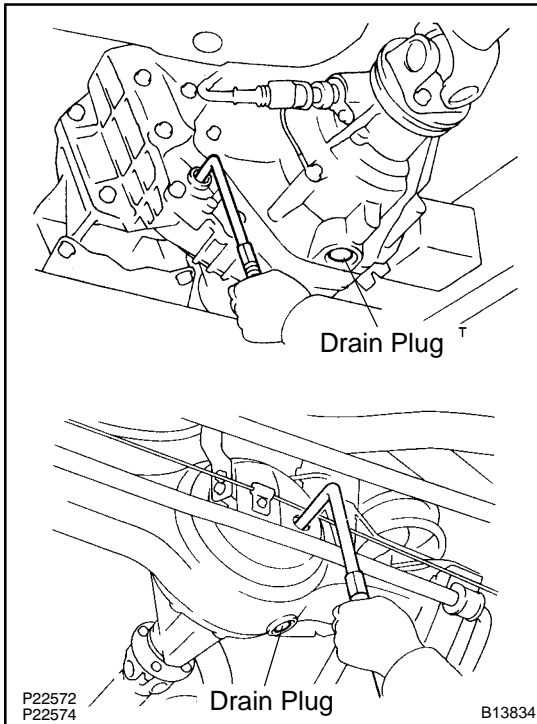
Oil grade: Hypoid gear oil API GL-5

Viscosity:

Above -18°C (0°F) SAE 90

Below -18°C (0°F) SAE 80W-90 or 80W

6. REPLACE AUTOMATIC TRANSMISSION FLUID (See page [DI-3](#))

**7. REPLACE TRANSFER AND DIFFERENTIAL OIL**

- Remove the drain plug and drain the oil.
- Reinstall the drain plug securely.
- Add new oil until it begins to run out of the filler hole.

Oil grade and viscosity: See step 5.

Oil capacity:

Transfer oil

1.7 liters (1.8 US qts, 1.5 Imp. qts)

Front differential oil (w/o Differential lock)

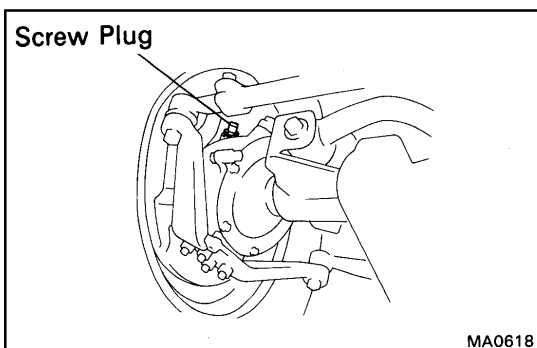
2.8 liters (3.0 US qts, 2.5 Imp. qts)

Front differential oil (w/ Differential lock)

2.65 liters (2.8 US qts, 2.3 Imp. qts)

Rear differential oil

3.25 liters (3.4 US qts, 2.9 Imp. qts)

8. REPACK FRONT WHEEL BEARINGS (See pages SA-7 and SA-9)**9. LUBE STEERING KNUCKLE CHASSIS AND PROPELLER SHAFT**

- Remove the screw plug from each steering knuckle and repack with lubricant.

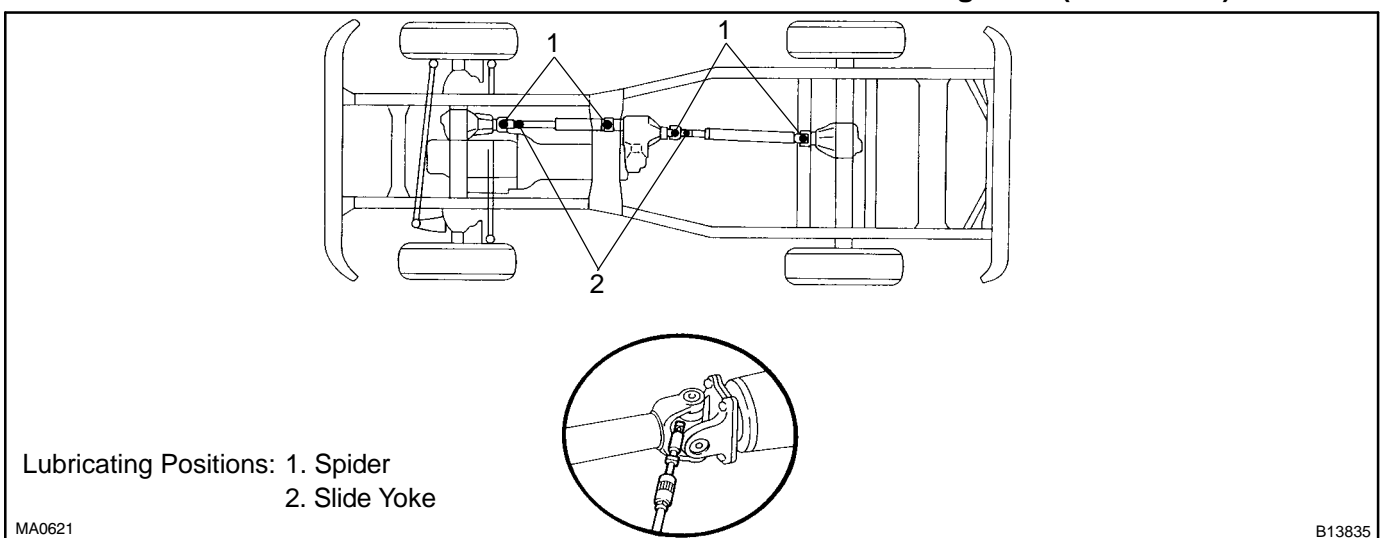
Steering knuckle grease:

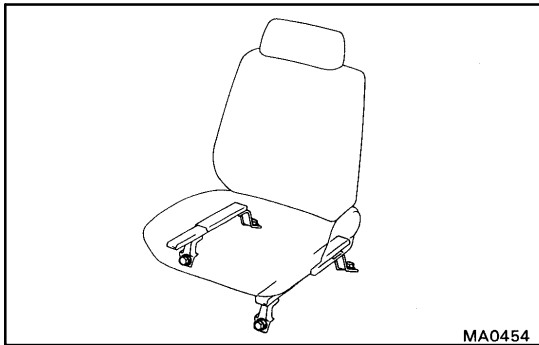
Molybdenum disulfide lithium base chassis grease (NLGI No. 2)

- Reinstall the 2 screw plugs.
- Lubricate chassis components, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:

Lithium base chassis grease (NLGI No. 2)





MA04W-01

BODY INSPECTION

1. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

- (a) Tighten the front seat-to-body mounting bolts.

Torque: 39 N·m (400 kgf-cm, 29 ft-lbf)

- (b) Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing nuts and bolts on the steering system, drive train, suspension system, fuel tank mounts, engine mounts, etc.

2. 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 locks operate properly
Doors close properly
- 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.

- (c) Be sure to deliver a clean car.

Especially check the steering wheel, shift lever knob, all switch knobs, door handles and seats.

MAINTENANCE EQUIPMENT

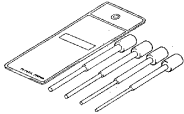
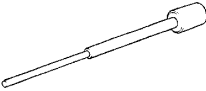
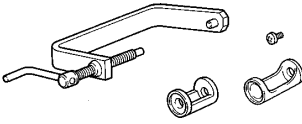
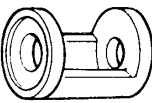
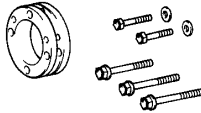



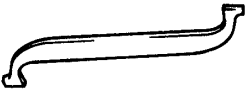
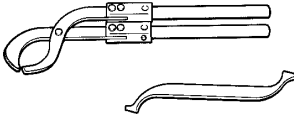
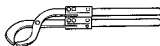
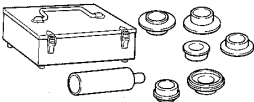
PP2ZZ-01

Mirror	Brake hose
Torque wrench	

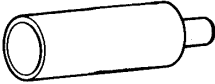


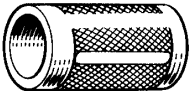



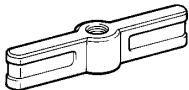
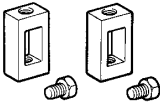
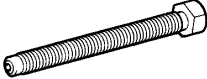
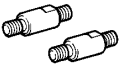
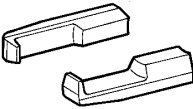
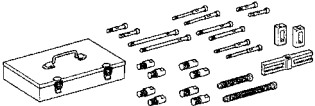
ENGINE MECHANICAL

SST (Special Service Tools)

PP300-01

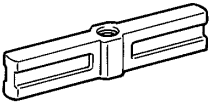
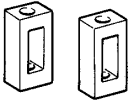


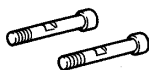
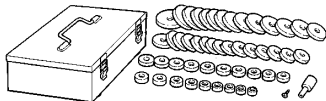



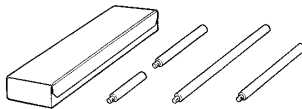


	09201-10000 Valve Guide Bushing Remover & Replacer Set	
	(09201-01070) Valve Guide Bushing Remover & Replacer 7	
	09202-70020 Valve Spring Compressor	
	(09202-00010) Attachment	
	09213-58012 Crankshaft Pulley Holding Tool	
	09223-15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09236-00101 Water Pump Overhaul Tool Set	
	(09236-15010) Bearing Stay	Valve stem oil seal
	09248-06020 Valve Lifter Stopper	
	09248-55050 Valve Clearance Adjust Tool Set	
	(09248-05510) Valve Lifter Press	
	09316-60011 Transmission & Transfer Bearing Replacer	

PREPARATION - ENGINE MECHANICAL


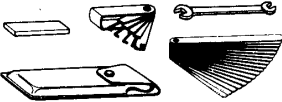
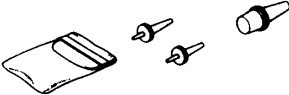
	(09316-00011) Replacer Pipe	Crankshaft front oil seal
	(09316-00051) Replacer "D"	Crankshaft front oil seal
	09330-00021 Companion Flange Holding Tool	Crankshaft pulley
	09636-20010 Upper Ball Joint Dust Cover Replacer	Crankshaft timing gear
	09816-30010 Oil Pressure Switch Socket	Knock sensor
	09843-18020 Diagnosis Check Wire	
	09950-40011 Puller B Set	Crankshaft timing gear
	(09951-04010) Hanger 150	
	(09952-04010) Slide Arm	
	(09953-04020) Center Bolt 150	
	(09954-04010) Arm 25	
	(09955-04061) Claw No.6	
	09950-50012 Puller C Set	Crankshaft pulley

PP-4

PREPARATION – ENGINE MECHANICAL

	(09951-05010) Hanger 150	
	(09952-05010) Slide Arm	
	(09953-05010) Center Bolt 100	
	(09953-05020) Center Bolt 150	
	(09954-05020) Claw No.2	
	09950-60010 Replacer Set	
	(09951-00280) Replacer 28	Connecting rod bushing
	(09951-00350) Replacer 35	Crankshaft timing gear
	(09951-00480) Replacer 48	Spark plug tube gasket
	09950-70010 Handle Set	
	(09951-07100) Handle 100	
	(09951-07150) Handle 150	

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
	09200-00010 Engine Adjust Kit .	
	09258-00030 Hose Plug Set .	Plug for the vacuum hose, fuel hose etc.

PP-6

PREPARATION - ENGINE MECHANICAL

PP302-01

EQUIPMENT

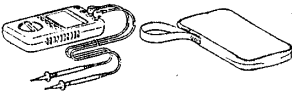
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune-up tester	
Heater	
Magnetic finger	
Micrometer	
OBD II scan tool	Engine speed
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

SSM (Special Service Materials)

08826-00080	Seal Packing Black or equivalent (FIPG)	Over space between cylinder block and timing chain case Timing chain cover Semi-circular plug Oil pan Rear oil seal retainer
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Plug tube
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	TVV

EMISSION CONTROL
RECOMMENDED TOOLS

PP305-02

	09082-00040 TOYOTA Electrical Tester.	
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EQUIPMENT

Heater	TVV
OBD II scan tool	Engine speed
Thermometer	TVV
Torque wrench	
Vacuum gauge	

PP-10

PREPARATION – EMISSION CONTROL

PP307-01

SSM (Special Service Materials)

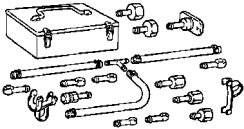
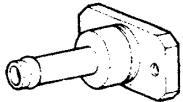
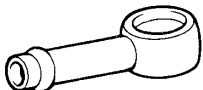
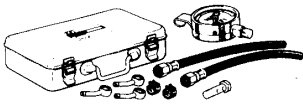
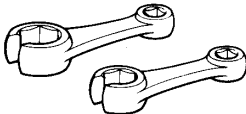


08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	TVV
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1996 LAND CRUISER (RM451U)


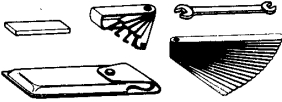
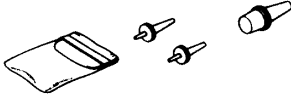
SFI

SST (Special Service Tools)

PP3KU-01

	09268-41047 Injection Measuring Tool Set	
	(09268-41091) 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
	09816-30010 Oil Pressure Switch Socket	Knock sensor
	09842-30070 Wiring "F" EFI Inspection	

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
	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
OBD II scan tool	Engine speed
Soft brush	Throttle body
Sound scope	Injector
Torque wrench	

COOLING EQUIPMENT

PP30B-01

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

COOLANT


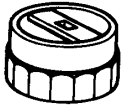
PP30C-03

Item	Capacity	Classification
Engine coolant w/ Front heater	12.5 liters (13.2 US qts, 11.1 Imp. qts)	Ethylene-glycol base
w/ Front heater and rear heaters	13.4 liters (14.2 US qts, 11.8 Imp. qts)	

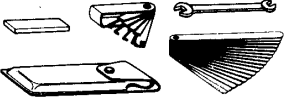
LUBRICATION

SST (Special Service Tools)

PP30D-04

	09032-00100 Oil Pan Seal Cutter	
	09228-44011 Oil Filter Wrench	

RECOMMENDED TOOLS

	09200-00010 Engine Adjust Kit .	
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PP-18

PREPARATION – LUBRICATION

PP30F-01

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

PREPARATION – LUBRICATION

PP30G-03

LUBRICANT

Item	Capacity	Classification
Engine oil		API grade SH, Energy-Conserving II multigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil, with SAE 5W-30 being preferred engine oil
Dry fill	8.0 liters (8.5 US qts, 7.0 Imp. qts)	
Drain and refill w/ Oil filter change	7.4 liters (7.8 US qts, 6.5 Imp. qts)	
w/o Oil filter change	6.9 liters (7.3 US qts, 6.1 Imp qts)	

PP-20

PREPARATION – LUBRICATION

PP30H-01


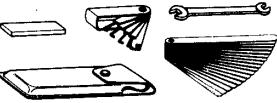
SSM (Special Service Materials)

08826-00080	Seal Packing Black or equivalent (FIPG)	Oil pump Oil pan (Timing chain cover)
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Oil pressure switch

IGNITION

RECOMMENDED TOOLS

PP30I-01

	09082-00040 TOYOTA Electrical Tester.	
	09200-00010 Engine Adjust Kit .	

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PREPARATION – IGNITION

PP30J-01

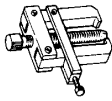
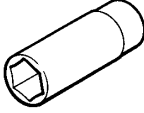

EQUIPMENT

Spark plug cleaner	
Torque wrench	

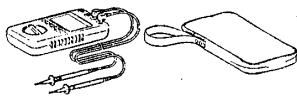
STARTING

SST (Special Service Tools)

PP30K-03

	09286-46011	Injection Pump Spline Shaft Puller	Armature bearing
	09810-38140	Starter Magnet Switch Nut Wrench 14	Terminal nut
	09820-00030	Alternator Rear Bearing Replacer	Armature rear bearing

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
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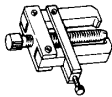
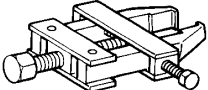

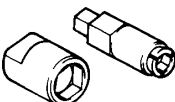
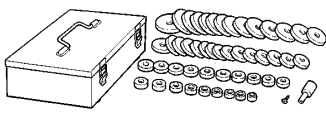


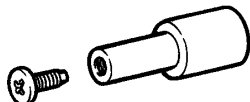
EQUIPMENT

Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Magnetic switch terminal kit
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V-block	Commutator
Vernier calipers	Commutator, Brush

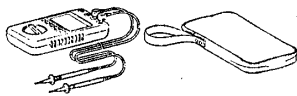
CHARGING

SST (Special Service Tools)

PP30N-01

	09285-76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286-46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09820-00021	Alternator Rear Bearing Puller	
	09820-00030	Alternator Rear Bearing Replacer	
	09820-63010	Alternator Pulley Set Nut Wrench Set	
	09950-60010	Replacer Set	
	(09951-00260)	Replacer 26	Rotor front bearing
	(09951-00500)	Replacer 50	Rotor front bearing
	(09952-06010)	Adapter	Rotor front bearing

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
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PP-28

PREPARATION – CHARGING

PP30P-01


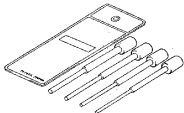
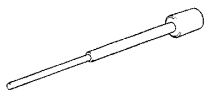
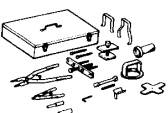
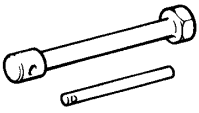
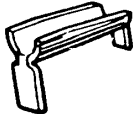
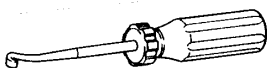
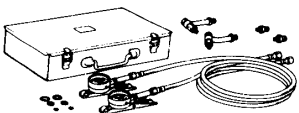
EQUIPMENT

Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

AUTOMATIC TRANSMISSION

SST (Special Service Tools)

PP3KT-01

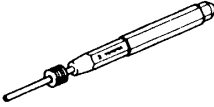
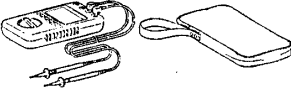
	09032-00100 Oil Pan Seal Cutter	
	09201-10000 Valve Guide Bushing Remover & Replacer Set	Speedometer driven gear oil seal
	(09201-01080) Valve Guide Bushing Remover & Replacer 8	
	09350-30020 TOYOTA Automatic Transmission Tool Set	
	(09351-32010) One-way Clutch Test Tool	
	(09351-32020) Stator Stopper	
	09921-00010 Spring Tension Tool	Speedometer driven gear oil seal
	09992-00095 Automatic Transmission Oil Pressure Gauge Set	

PP-30

PREPARATION – AUTOMATIC TRANSMISSION

PP3KS-01

RECOMMENDED TOOLS

	09031-00030 Pin Punch .	
	09082-00040 TOYOTA Electrical Tester.	

EQUIPMENT

Dial indicator with magnetic base	Check drive plate runout
OBD II scan tool	
Straight edge	Torque converter clutch
Torque wrench	
Vernier Calipers	Torque converter clutch

PP-32

PREPARATION – AUTOMATIC TRANSMISSION

PP2XT-02

LUBRICANT

Item	Capacity	Classification
Automatic transmission fluid		ATF DEXRON®II
Dry fill	11.0 liters (11.6 US qts, 9.7 Imp. qts)	
Drain and refill	1.9 liters (2.0 US qts, 1.7 Imp. qts)	

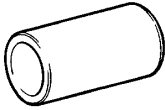


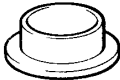
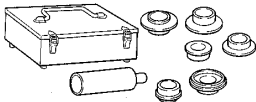
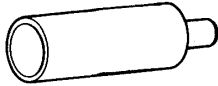
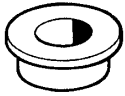

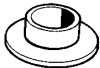



SSM (Special Service Materials)

08826-00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Oil pan
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Extension housing

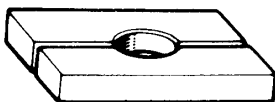

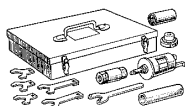

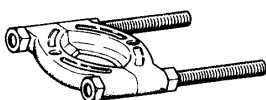
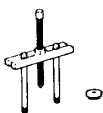
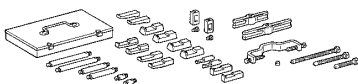
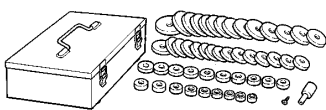


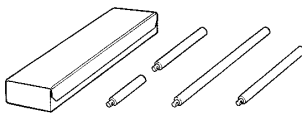

TRANSFER

SST (Special Service Tools)

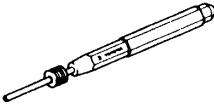
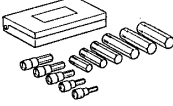
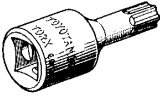
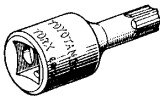
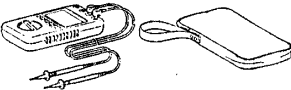
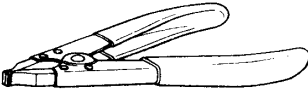
PP3KQ-01

	09223-00010 Cover & Seal Replacer	Center differential
	09223-15020 Oil Seal & Bearing Replacer	Front extension housing
	09316-12010 Transfer Bearing Replacer	Center differential
	09316-20011 Transfer Bearing Replacer	Front extension housing Rear extension housing Component parts removal and installation
	09316-60011 Transmission & Transfer Bearing Replacer	
	(09316-00011) Replacer Pipe	Front extension housing Rear extension housing Idler gear Component parts removal and installation Center differential
	(09316-00021) Replacer "A"	Rear extension housing
	(09316-00031) Replacer "B"	Front extension housing Rear extension housing Idler gear Component parts removal and installation Input shaft
	(09316-00041) Replacer "C"	Component parts removal and installation Front extension housing Rear extension housing
	(09316-00061) Replacer "E"	Front extension housing
	(09316-00071) Replacer "F"	Idler gear Front extension housing
	09325-12010 Transmission Oil Plug	Rear extension housing

PREPARATION – TRANSFER

	09527-30010	Rear Axle Shaft Bearing Remover	Input shaft
	09608-00081	Differential Side Bearing Cone Replacer	Component parts removal and installation
	09612-24014	Steering Gear Housing Overhaul Tool Set	Center differential
	(09612-10050)	Steering Rack Shaft Bushing Replacer	
	09950-00020	Bearing Remover	Idler gear Center differential Front extension housing
	09950-00030	Bearing Remover Attachment	Center differential
	09950-40011	Puller B Set	Component parts removal and installation Front extension housing
	09950-60010	Replacer Set	
	(09951-00320)	Replacer 32	Component parts removal and installation Center differential
	(09951-00400)	Replacer 40	Center differential
	09950-70010	Handle Set	Component parts removal and installation Front extension housing Center differential
	(09951-07150)	Handle 150	

RECOMMENDED TOOLS

	09031-00030 Pin Punch .	
	09040-00010 Hexagon Wrench Set .	
	09042-00010 Torx Socket T30 .	
	09042-00020 Torx Socket T40 .	
	09082-00040 TOYOTA Electrical Tester.	
	09905-00012 Snap Ring No.1 Expander .	

EQUIPMENT

Dial indicator	
Feeler gauge	
Magnetic finger	
Straight edge	
Torque wrench	
Vernier calipers	

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PREPARATION – TRANSFER

PP2XX-01

LUBRICANT

Item	Capacity	Classification
Transfer oil	1.7 liters (1.8 US qts, 1.5 Imp. qts)	API GL-4 or GL-5 SAE 75W-90

SSM (Special Service Materials)

08826-00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Front case x Rear case Rear case x Case cover Case x Extension housing
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Dynamic damper set bolt
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Straight screw plug Case cover set bolt

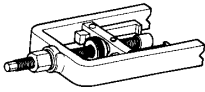
PP-40

PREPARATION – PROPELLER SHAFT

PROPELLER SHAFT

SST (Special Service Tools)

PP2Y8-01

	09332-25010 Universal Joint Bearing Remover & Replacer	Spider bearing
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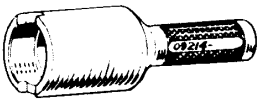

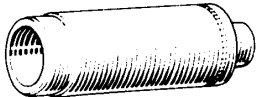
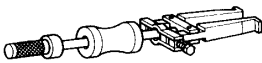
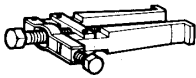
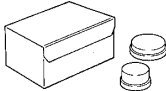
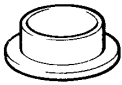
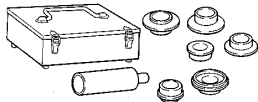
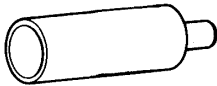
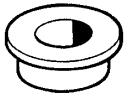


EQUIPMENT

Dial indicator	
Torque wrench	

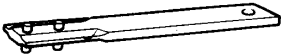
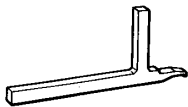


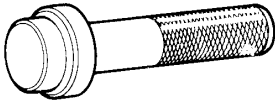



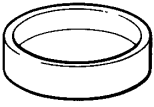
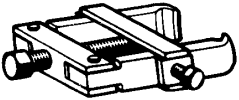
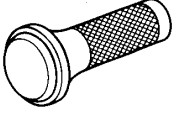
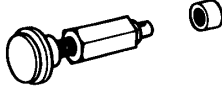
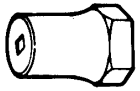
SUSPENSION AND AXLE


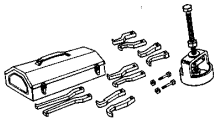

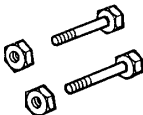

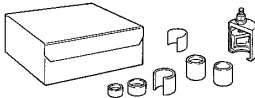

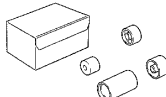
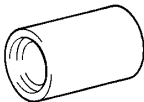




SST (Special Service Tools)

PP3KP-01

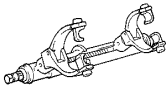
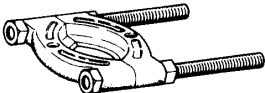
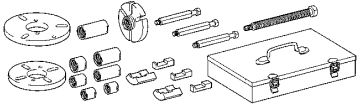






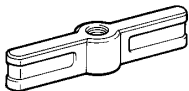
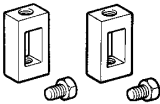
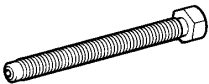
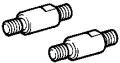
	09214-76011 Crankshaft Pulley Replacer	Front differential Rear differential
	09223-15020 Oil Seal & Bearing Replacer	Front differential Rear axle
	09226-10010 Crankshaft Front & Rear Bearing Replacer	Rear suspension
	09308-00010 Oil Seal Puller	Front axle Front differential Rear axle Rear differential
	09308-10010 Oil Seal Puller	Front differential Rear differential
	09315-00022 Clutch Release Bearing Remover & Replacer	Rear differential
	09316-20011 Transfer Bearing Replacer	Rear suspension
	09316-60011 Transmission & Transfer Bearing Replacer	Front differential Rear differential
	(09316-00011) Replacer Pipe	
	(09316-00021) Replacer "A"	
	(09316-00051) Replacer "D"	
	09330-00021 Companion Flange Holding Tool	Front differential Rear differential

PREPARATION – SUSPENSION AND AXLE

	09504-00011 Differential Side Bearing Adjusting Nut Wrench	Front differential Rear differential
	09504-22011 Differential Side Bearing Replacer	Rear differential
	09506-35010 Differential Drive Pinion Rear Bearing Replacer	Rear differential Rear suspension
	09509-25011 Rear Axle Bearing Lock Nut Wrench	Rear axle
	09517-36010 Rear Axle Shaft Oil Seal Replacer-	Rear axle
	09550-10013 Replacer Set "B"	Rear differential Rear suspension
	(09553-10010) Differential Side Bearing Replacer	
	(09557-10011) Differential Drive Pinion Front Bearing Replacer	
	09550-60010 Differential Side Bearing Replacer	Rear differential
	09556-22010 Drive Pinion Front Bearing Remover	Front differential Rear differential
	09605-60010 Steering Knuckle Bearing Cup Replacer-	Front axle
	09606-60020 Steering Knuckle Bearing Remover	Front axle
	09607-60020 Front Wheel Adjusting Nut Wrench	Front axle

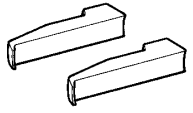
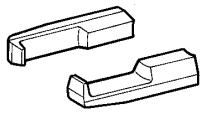

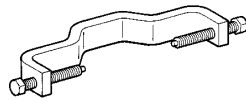
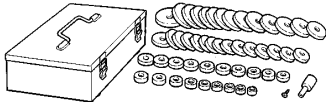
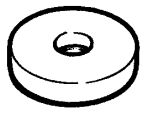
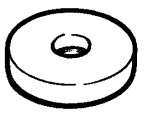
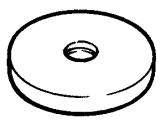
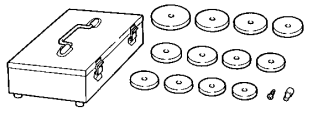
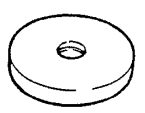
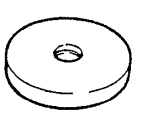
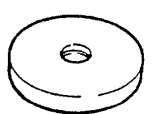
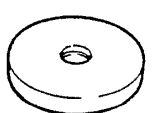
	09611-22012 Tie Rod End Puller	Front axle
	09612-65014 Steering Worm Bearing Puller	Front axle
	(09612-01010) Claw "A"	
	(09612-01050) Hanger Pin with Nut	
	09618-60010 Front Axle & Drive Shaft Bearing Replacer	Front axle
	09710-22021 Front Suspension Bushing Tool Set	Rear suspension
	(09710-01071) Lower Arm Bushing Remover	
	09710-22042 Rear Suspension Bushing Tool Set	Front suspension
	(09710-02051) Base	
	(09710-02061) Replacer	
	(09710-02071) Bushing Remover & Replacer	
	09710-30050 Suspension Arm Bushing Replacer	Front suspension
	09726-40010 Lower Control Shaft Bearing Replacer	Front differential Rear differential

PREPARATION – SUSPENSION AND AXLE

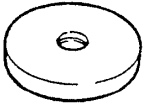
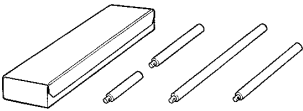


	09727-30021 Coil Spring Compressor	
	09950-00020 Bearing Remover	Front differential Rear differential
	09950-30011 Puller A Set	Front differential Rear differential
	(09951-03010) Upper Plate	
	(09953-03010) Center Bolt	
	(09954-03010) Arm	
	(09955-03030) Lower Plate 130	
	(09956-03020) Adapter 18	
	09950-40011 Puller B Set	Front differential Rear differential
	(09951-04010) Hanger 150	
	(09952-04010) Slide Arm	
	(09953-04020) Center Bolt 150	
	(09954-04010) Arm 25	

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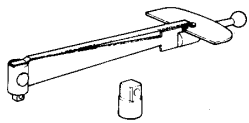
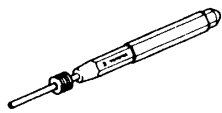
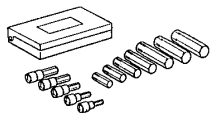
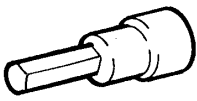
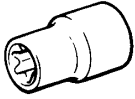
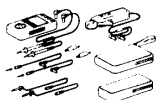
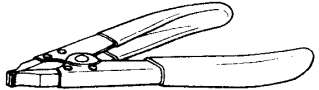
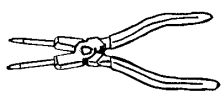
PREPARATION – SUSPENSION AND AXLE

	(09955-04011) Claw No.1	
	(09955-04061) Claw No.6	
	(09957-04010) Attachment	
	(09958-04011) Holder	
	09950-60010 Replacer Set	Front differential Rear differential Rear suspension
	(09951-00480) Replacer 48	
	(09951-00490) Replacer 49	
	(09951-00540) Replacer 54	
	09950-60020 Replacer Set No.2	Front axle Rear axle Rear differential
	(09951-00710) Replacer 71	
	(09951-00720) Replacer 72	
	(09951-00810) Replacer 81	
	(09951-00890) Replacer 89	

PREPARATION – SUSPENSION AND AXLE

	(09951-00910) Replacer 91	
	09950-70010 Handle Set	Front axle Front suspension Rear axle Rear differential Rear suspension
	(09951-07100) Handle 100	
	(09951-07150) Handle 150	

RECOMMENDED TOOLS

	09025-00010 Small Torque Wrench (30 kgf-cm)	Front differential Rear differential
	09031-00030 Pin Punch .	Front differential
	09040-00011 Hexagon Wrench Set .	Front differential
	(09043-20060) Socket Hexagon Wrench 6.	
	09044-00020 Torx Socket E10 .	Rear differential
	09082-00050 TOYOTA Electrical Tester Set.	Differential locking system
	09905-00012 Snap Ring No.1 Expander .	Front axle Front differential
	09905-00013 Snap Ring Pliers .	Front axle Front differential

EQUIPMENT

Dial indicator or dial indicator with magnetic base	
Feeler gauge	
Micrometer	
Spring tension gauge	
Torque wrench	

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PREPARATION – SUSPENSION AND AXLE

PP2YE-01

LUBRICANT

Item		Capacity	Classification
Differential oil Front	w/o Dfferential lock	2.80 liters (2.9 US qts, 2.5 Imp. qts)	Hypoid gear oil API GL-5 Above –18°C (0°F) SAE 90
	w/ Dfferential lock	2.65 liters (2.8 US qts, 2.3 Imp. qts)	Below –18°C (0°F) SAE 80W-90 or 80W
Rear		3.25 liters (3.4 US qts, 2.9 Imp. qts)	



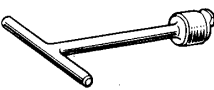

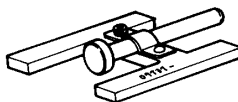
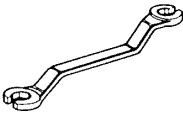

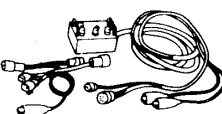

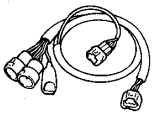
SSM (Special Service Materials)

08826-00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Front differential Rear differential Differential locking system
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Front differential Rear differential Differential locking system


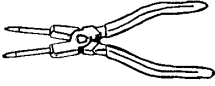
BRAKE

SST (Special Service Tools)

PP3KN-01

	09023-00100 Union Nut Wrench 10 mm	
	09709-29018 LSPV Gauge Set	
	09717-20010 Brake Shoe Return Spring Remover	
	09718-20010 Brake Shoe Return Spring Replacer	
	09737-00010 Brake Booster Push Rod Gauge	
	09751-36011 Brake Line Union Nut 10 x 12 mm Wrench	
	09843-18020 Diagnosis Check Wire	
	09990-00150 ABS Actuator Checker and Sub-harness	
	09990-00200 ABS Actuator Checker Sub-harness "C"	
	09990-00210 ABS Actuator Checker Sub-harness "E"	

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
	09905-00013 Snap Ring Pliers .	

PP-54

PREPARATION – BRAKE

PP2YI-01

EQUIPMENT

Dial indicator	Brake disc
Micrometer	Brake disc
Torque wrench	
Vernier calipers	Brake disc

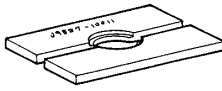


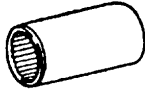
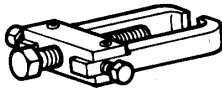
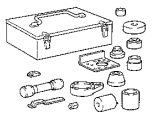

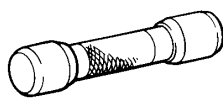
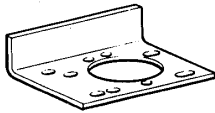
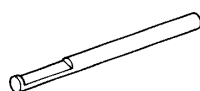
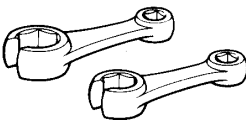
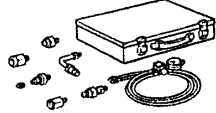
LUBRICANT

Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No. 116 DOT 3

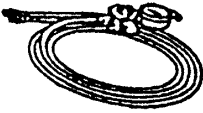

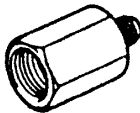
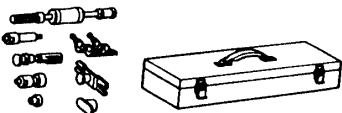

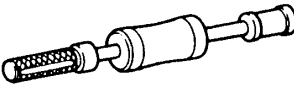


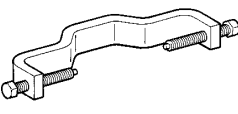
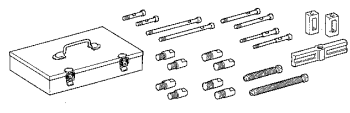
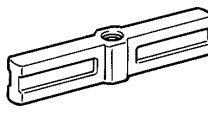
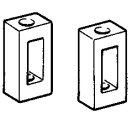
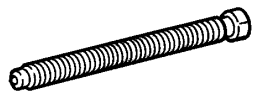
STEERING

SST (Special Service Tools)

PP3KM-01

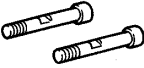
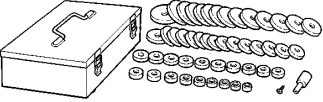


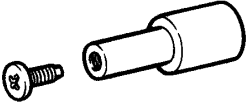
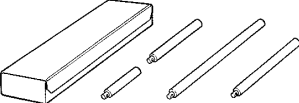

	09527-10011	Rear Axle Shaft Bearing Remover	PS vane pump
	09610-55012	Pitman Arm Puller	Steering linkage
	09611-22012	Tie Rod End Puller	Steering linkage
	09616-00011	Steering Worm Bearing Adjusting Socket	PS gear
	09628-62011	Ball Joint Puller	Steering linkage
	09630-00014	Power Steering Gear Housing Overhaul Tool Set	
	(09631-00051)	No.3 Wrench	PS gear
	(09631-00121)	Teflon Ring Former	PS gear
	(09631-00142)	Overhaul Stand	PS gear
	09631-10030	Oil Seal Remover	PS vane pump
	09631-22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	PS gear
	09640-10010	Power Steering Pressure Gauge Set	

PREPARATION - STEERING

	(09641-01010) Gauge Assy	On-vehicle inspection
	(09641-01030) Attachment B	On-vehicle inspection
	(09641-01060) Attachment E	On-vehicle inspection
	09910-00015 Puller Set	
	(09911-00011) Puller Clamp	Tilt steering column
	(09912-00010) Puller Slide Hammer	Tilt steering column
	09950-40011 Puller B Set	
	(09957-04010) Attachment	Tilt steering column
	(09958-04011) Holder	Tilt steering column
	09950-50010 Puller C Set	
	(09951-05010) Hanger 150	Tilt steering column
	(09952-05010) Slide Arm	Tilt steering column
	(09953-05020) Center Bolt 150	Tilt steering column

PP-58

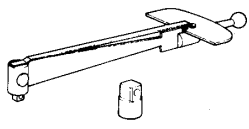
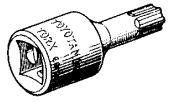
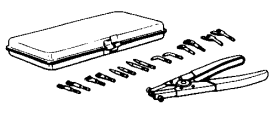
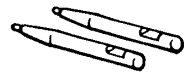
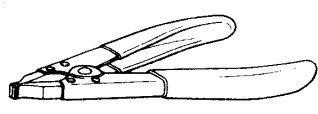
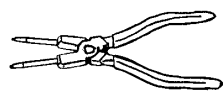
PREPARATION - STEERING

	(09954-05020) Claw No.2	Tilt steering column
	09950-60010 Replacer Set	
	(09951-00360) Replacer 36	PS gear
	(09951-00410) Replacer 41	PS gear
	(09952-06010) Adapter	PS gear
	09950-70010 Handle Set	
	(09951-07200) Handle 200	PS gear

PREPARATION – STEERING

PP3KL-01

RECOMMENDED TOOLS

	09025-00010 Torque Wrench (30 kgf-cm)	PS vane pump PS gear
	09042-00010 Torx Socket T30 .	Tilt steering column
	09904-00010 Expander Set .	
	(09904-00050) No. 4 Claw	
	09905-00012 Snap Ring No.1 Expander .	
	09905-00013 Snap Ring Pliers .	

PP-60

PREPARATION – STEERING

PP2YM-01

EQUIPMENT

Caliper gauge	PS vane pump
Calipers	PS vane pump
Dial indicator	PS gear
Feeler gauge	PS vane pump
Micrometer	PS vane pump
Torque wrench	

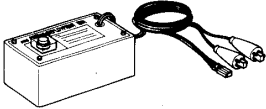

LUBRICANT

Item		Capacity	Classification
Power steering fluid	Total	0.8 liters (0.9 US qts, 0.7 Imp. qts)	ATF DEXRON®II or III

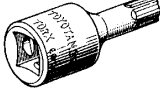

SUPPLEMENTAL RESTRAINT SYSTEM

SST (Special Service Tools)

PP2YO-02

	09082-00700 SRS Airbag Deployment Tool	
	09843-18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

	09042-00020 Torx Socket T40 .	Airbag sensor assembly
	09082-00040 TOYOTA Electrical Tester.	


EQUIPMENT

Bolt Length: 35 mm (1.38 in.) Pitch: 1.0 mm (0.039 in.) Diam: 6.0 mm (0.236 in.)	Airbag disposal
Rope (no projections, difficult to break)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam: 360 mm (14.17 in.)	Airbag disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam: 360 mm (14.17 in.)	Airbag disposal
Torque wrench	Steering wheel pad
Vinyl bag	Airbag disposal

BODY ELECTRICAL

RECOMMENDED TOOLS

PP2YS-02

	09082-00040 TOYOTA Electrical Tester.	
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PP-66

PREPARATION – BODY ELECTRICAL

PP2YT-01

EQUIPMENT

Bulb (3.4 W)	Fuel sender gauge Seat belt warning relay
Bulb (21 W)	Turn signal flasher relay
Clip remover	For removing cowl louver
Dry cell battery	Fuel sender gauge
Masking tape	Rear window defogger wire
Oil bath	Engine oil level warning switch
Test lead	
Thermometer	Engine coolant temperature sender gauge Engine oil level warning switch
Tin foil	Rear window defogger wire
Torque wrench	

SSM (Special Service Materials)

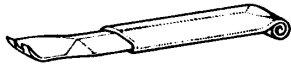

08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Power seat housing set nut Power seat slide and vertical motor set screw
08833-00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	Low oil pressure warning switch Engine coolant temperature sender gauge
08888-88888	DuPont Paste No. 4817 or equivalent	Rear window defogger

PP-68

PREPARATION – BODY

BODY**SST (Special Service Tools)**

PP2YV-01

	09806-30010 Windshield Moulding Remover	
	09812-00010 Door Hinge Set Bolt Wrench	

LUBRICANT

PP2YW-01

Item	Capacity	Classification
MP grease	–	–

PP-70

PREPARATION – BODY

PP2YX-02


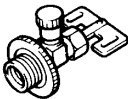








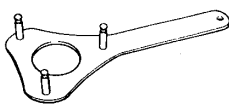

SSM (Special Service Materials)

08833-00030	Three cement black or equivalent	Back door glass
08833-00070	Adhesive 1324, THREE BOND 1324 or equivalent	Front door Rear door Power seat regulator

AIR CONDITIONING



SST (Special Service Tools)

PP3KJ-01

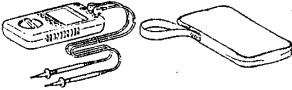
	07110-58060 Air Conditioner Service Tool Set	
	(07117-58060) Refrigerant Drain Service Valve	
	(07117-58070) T-Joint	
	(07117-58080) Quick Disconnect Adapter	Discharge (Diam.: 16 mm)
	(07117-58090) Quick Disconnect Adapter	Suction (Diam.: 13 mm)
	(07117-78050) Refrigerant Charging Gauge	
	(07117-88060) Refrigerant Charging Hose	Discharge (Color: Red)
	(07117-88070) Refrigerant Charging Hose	Suction (Color: Blue)
	(07117-88080) Refrigerant Charging Hose	Utility (Color: Green)
	07112-66040 Magnetic Clutch Remover	
	07112-76060 Magnetic Clutch Stopper	
	07114-84010 Snap Ring Pliers	

PP-72

PREPARATION – AIR CONDITIONING

	07114-84020 Snap Ring Pliers	
	07116-38360 Gas Leak Detector Assembly	

RECOMMENDED TOOLS

	09082-00040 TOYOTA Electrical Tester.	
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PP-74

PREPARATION – AIR CONDITIONING

PP2Z1-01

LUBRICANT

Item	Capacity	Classification
Compressor oil		ND-OIL 8 or equivalent
When replacing receiver	10 cc (0.35 fl.oz.)	
When replacing condenser	40 cc (1.4 fl.oz.)	
When replacing evaporator	40 cc (1.4 fl.oz.)	
When replacing compressor	120 cc (4.1 fl.oz.)	

TROUBLESHOOTING

PRO6N-01

PROBLEM SYMPTOMS TABLE

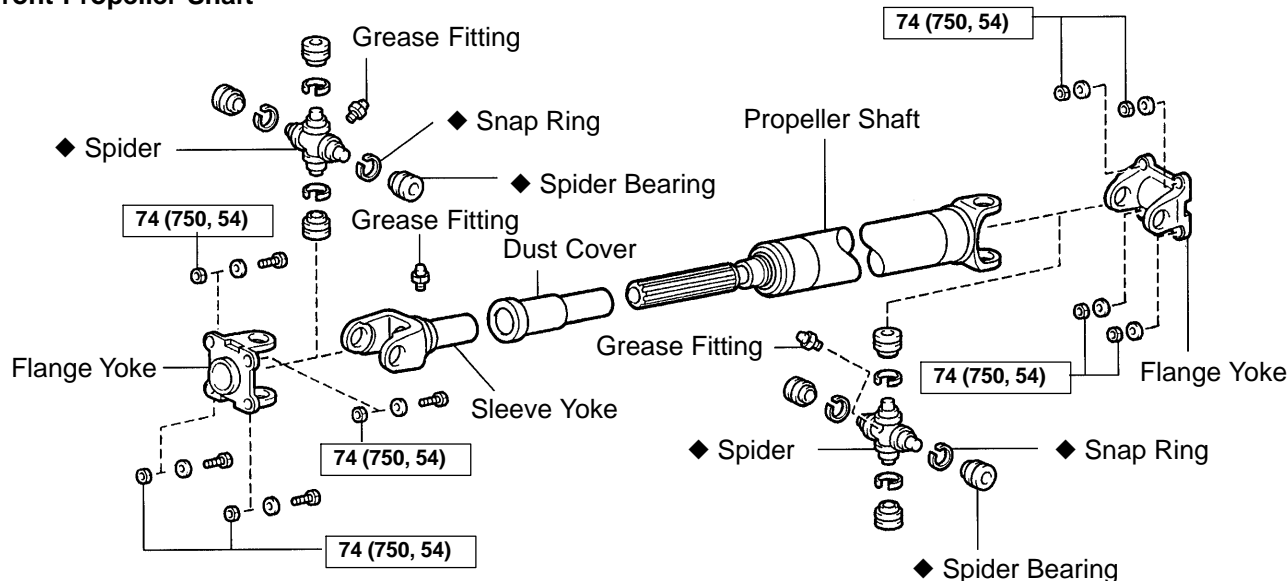
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Noise	3. Seeve yoke spline: worn 4. Spider bearing: worn or stuck	PR-4 PR-4
Vibration	1. Sleeve yoke spline: stuck 2. Propeller shaft: runout 3. Propeller shaft: imbalance	PR-4 PR-4 –

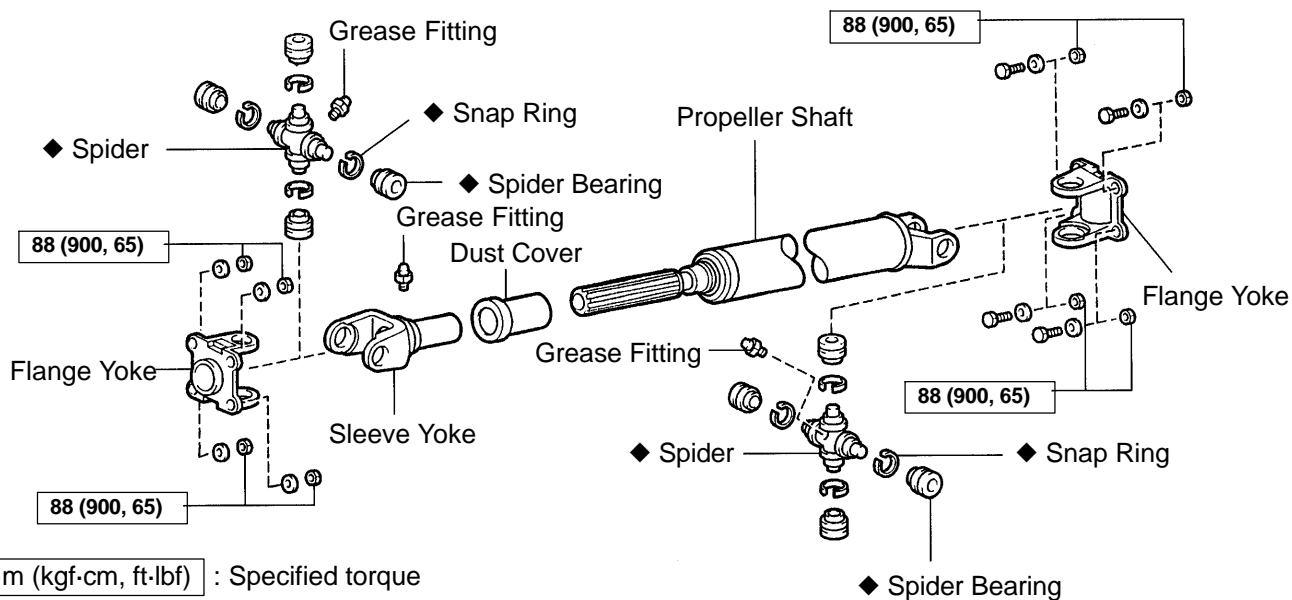
PROPELLER SHAFT ASSEMBLY COMPONENTS

PR060-02

Front Propeller Shaft



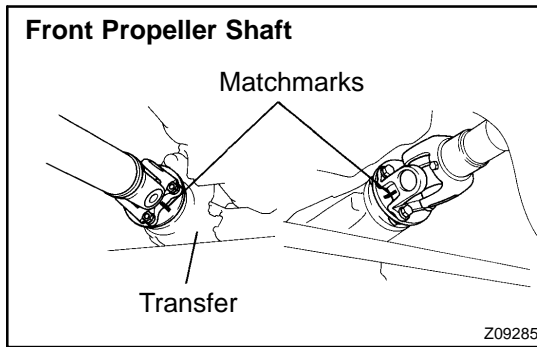
Rear propeller Shaft



N-m (kgf-cm, ft-lbf) : Specified torque

◆ Non-reusable part

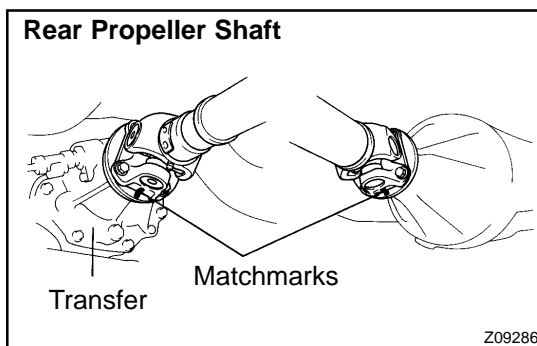
Q10862



REMOVAL

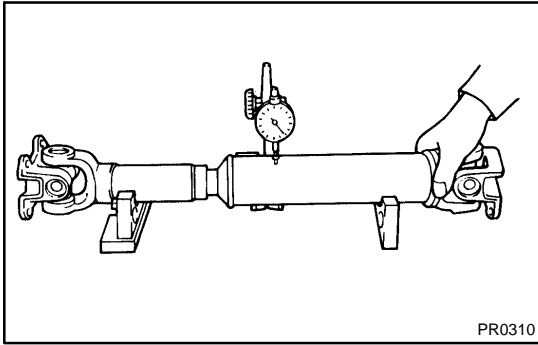
1. REMOVE FRONT PROPELLER SHAFT

- Place matchmarks on the propeller shaft flange and transfer.
- Remove the 4 nuts and washers.
Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)
- Place matchmarks on the propeller shaft flange and differential.
- Remove the 4 nuts, bolts and washers.
Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)
- Remove the front propeller shaft.



2. REMOVE REAR PROPELLER SHAFT

- Place matchmarks on the propeller shaft flange and transfer.
- Remove the 4 nuts and washers.
Torque: 88 N·m (900 kgf-cm, 65 ft-lbf)
- Place matchmarks on the propeller shaft flange and differential.
- Remove the 4 nuts, bolts and washers.
Torque: 88 N·m (900 kgf-cm, 65 ft-lbf)
- Remove the rear propeller shaft.



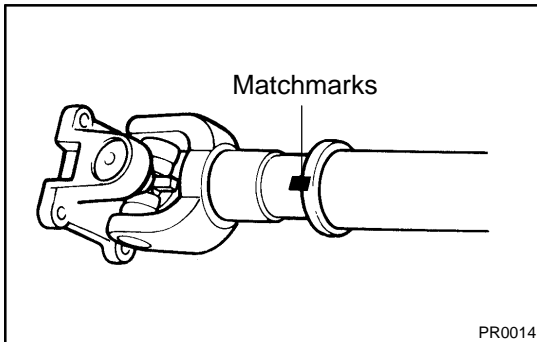
INSPECTION

1. INSPECT FRONT AND REAR PROPELLER SHAFTS FOR DAMAGE OR RUNOUT

Using a dial indicator, check the runout of shafts.

Maximum runout: 0.8 mm (0.031 in.)

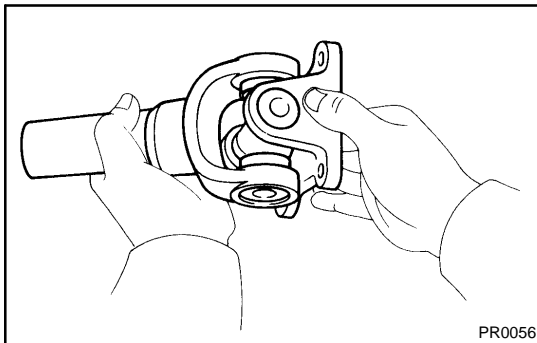
If shaft runout is greater than maximum, replace the shaft.



2. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT

Place matchmarks on the sleeve yoke and shaft.

- (1) Pull out the sleeve yoke from the shaft.
- (2) Remove the dust cover from the shaft.



3. INSPECT SPIDER BEARING

- Check the spider bearings for wear or damage.
- Check the spider bearing axial play by turning the yoke with holding the shaft tightly.

Bearing axial play: Maximum 0.05 mm (0.0020 in.)

If necessary, replace the spider bearing.

4. INSERT SLEEVE YOKE INTO PROPELLER SHAFT

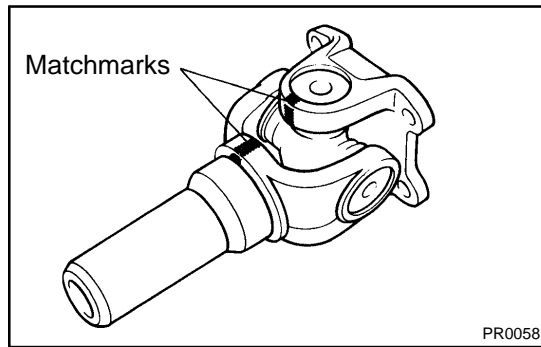
- (a) Apply MP grease to the propeller shaft spline and sleeve yoke sliding surface.
- (b) Align the matchmarks on the sleeve yoke propeller shaft.
- (c) Install the propeller shaft into the sleeve yoke.

INSTALLATION

Installation is in the reverse order of removal (See page [PR-3](#)).

HINT:

After installation, pump MP grease into each fitting with a grease gun until the grease begins to flow around the oil seal.



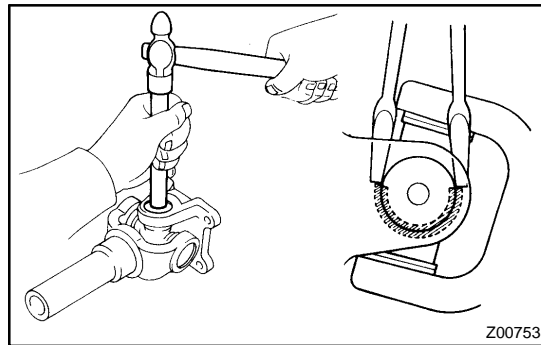
SPIDER BEARING REPLACEMENT

PR06S-03

NOTICE:

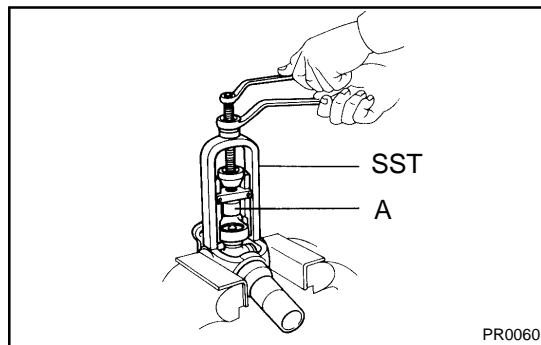
Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

1. REMOVE PROPELLER SHAFT (See page [PR-3](#))
2. PLACE MATCHMARKS ON SHAFT AND YOKE



3. REMOVE SNAP RINGS

- (a) Using a brass bar and hammer, slightly tap in the bearing outer races.
- (b) Using 2 screwdrivers, remove the 4 snap rings from the grooves.

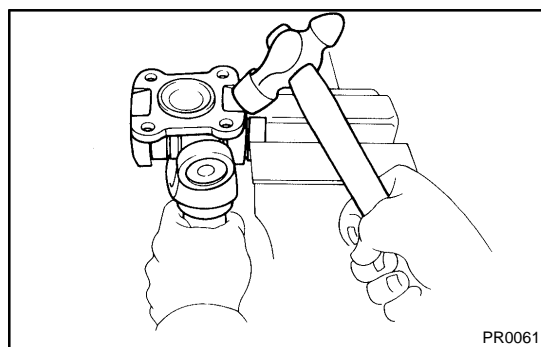


4. REMOVE SPIDER BEARINGS

- (a) Using SST, push out the bearing from the flange.
SST 09332-25010

HINT:

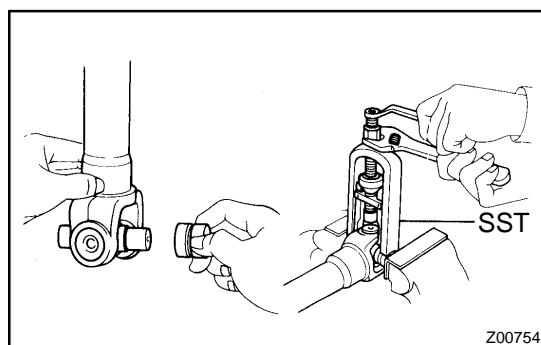
Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.



- (b) Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT:

Remove the bearing on the opposite side by the same procedure.

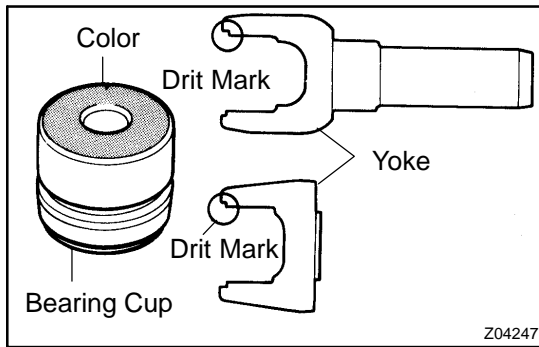


- (c) Install the 2 removed bearing outer races to the spider.
- (d) Using SST, push out the bearing from the yoke.
SST 09332-25010
- (e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

HINT:

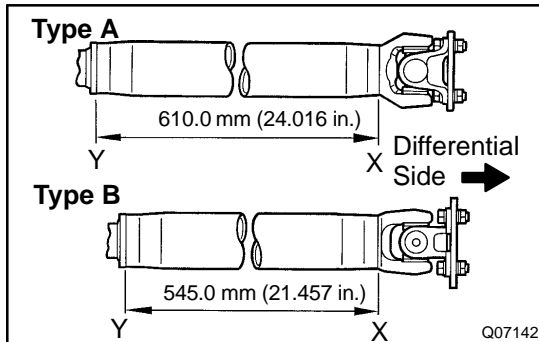
Remove the bearing on the opposite side in the same procedure.

PROPELLER SHAFT – SPIDER BEARING

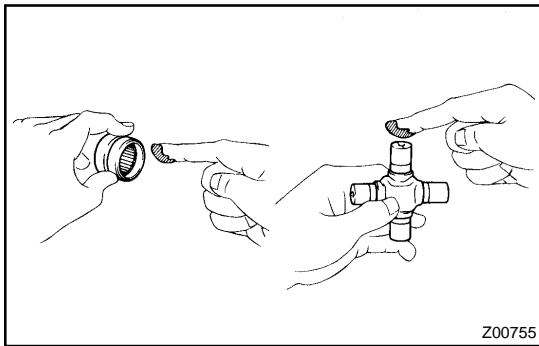
**5. SELECT SPIDER BEARING**

Select the bearing according to whether or not there is a drill mark on the yoke section.

Yoke	Bearing (Type A)	Bearing (Type B)
w/ drill mark	w/ color mark (White)	w/ color mark (Red)
No drill mark	No color mark	No color mark

**HINT:**

At time of the reassemble, there are 2 types of rear propeller shafts, type A and type B. Referring to the illustration, measure the distance between the welding points X and Y to identify which of the 2 types is used for the vehicle.

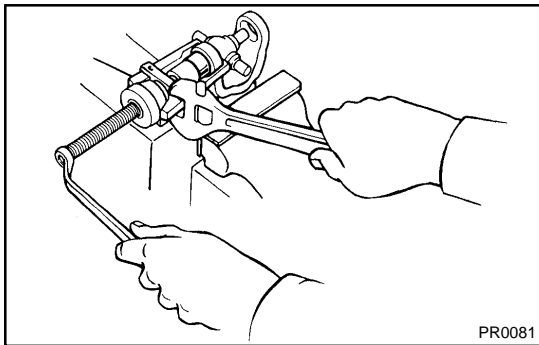
**6. INSTALL SPIDER BEARING**

- (a) Apply MP grease to a new spider and bearings.

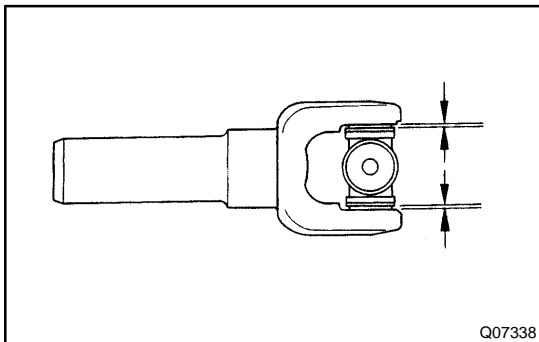
NOTICE:

Be careful not to apply too much grease.

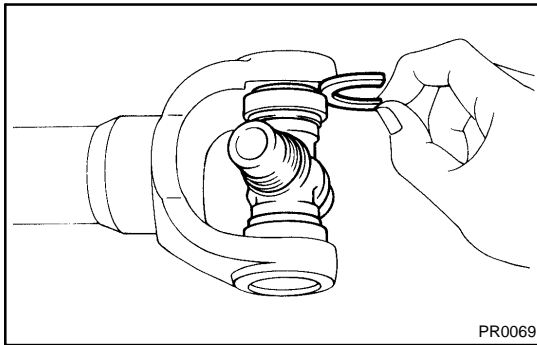
- (b) Align the matchmarks on the yoke and flange.



- (c) Fit the spider into the yoke.
 (d) Using SST, install the bearings on the spider.
 SST 09332-25010



- (e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths.



7. INSTALL SNAP RINGS

- (a) Install 2 new snap rings of equal thickness which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

HINT:

Do not reuse the snap rings.

Thickness of snap ring:

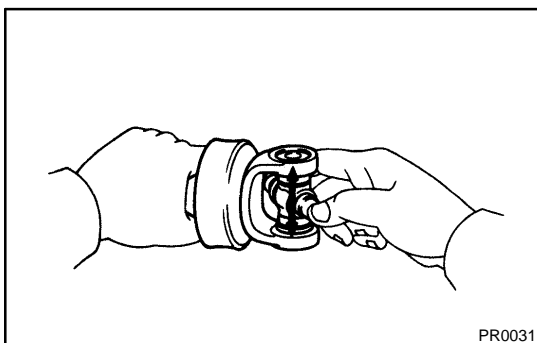
Front Propeller Shaft and Rear Propeller Shaft (Type B)

Color	Mark	Thickness mm (in.)
–	1	2.100 – 2.150 (0.0827 – 0.0846)
–	2	2.150 – 2.200 (0.0846 – 0.0866)
–	3	2.200 – 2.250 (0.0866 – 0.0886)
Brown	–	2.250 – 2.300 (0.0886 – 0.0906)
Blue	–	2.300 – 2.350 (0.0906 – 0.0925)
–	6	2.350 – 2.400 (0.0925 – 0.0945)
–	7	2.400 – 2.450 (0.0945 – 0.0965)
–	8	2.450 – 2.500 (0.0965 – 0.0984)

Rear Propeller Shaft (Type A)

Color	Thickness mm (in.)
–	2.00 (0.0787)
Brown	2.03 (0.0799)
Blue	2.06 (0.0811)
–	2.09 (0.0823)

- (b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.



8. CHECK SPIDER BEARING (See page [PR-4](#))

- Check that the spider bearing moves smoothly.
- Check the spider bearing axial play.

Bearing axial play: Maximum 0.05 mm (0.0020 in.)

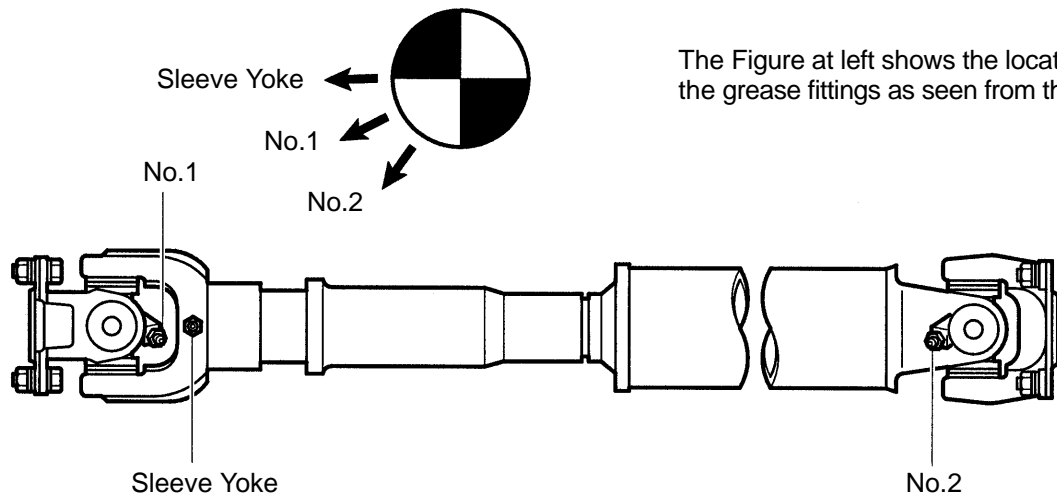
HINT:

- Install a new spider bearing on the flange side in the procedure described above.
- When replacing the spider bearing, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration.

PROPELLER SHAFT – SPIDER BEARING

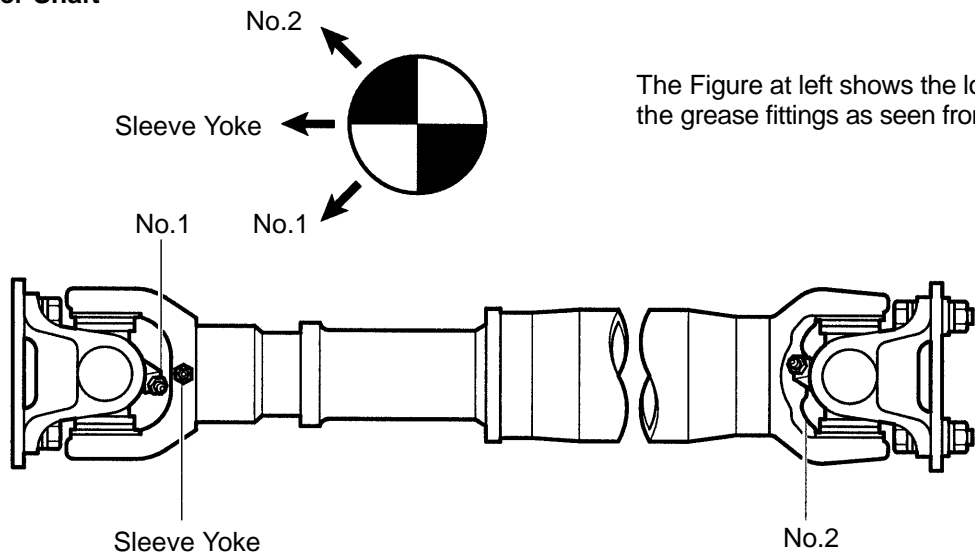
SPIDER GREASE FITTING ASSEMBLY DIRECTION

Front Propeller Shaft



SPIDER GREASE FITTING ASSEMBLY DIRECTION

Rear Propeller Shaft



Q09100

SRS AIRBAG

PRECAUTION

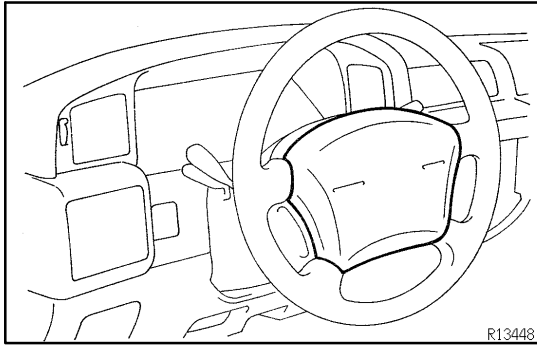
RS00Z-02

NOTICE:

- The LAND CRUISER is equipped with an SRS , which comprises a driver airbag and a front passenger airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the SRS, 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.
- Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.
- Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad, front passenger airbag assembly, and airbag sensor assembly should be inspected (See pages [RS-9](#), [RS-23](#) and [RS-34](#))
- Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
- Never disassemble and repair the steering wheel pad, front passenger airbag assembly, or airbag sensor assembly in order to reuse it.
- If the steering wheel pad, front passenger airbag assembly or airbag sensor assembly have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
- Use a volt/ohmmeter with high impedance (10 k Ω /V minimum) for troubleshooting the system's electrical circuits.
- Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
- After work on the SRS is completed, check the SRS warning light (See page [DI-240](#)).
- If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

CAUTION:

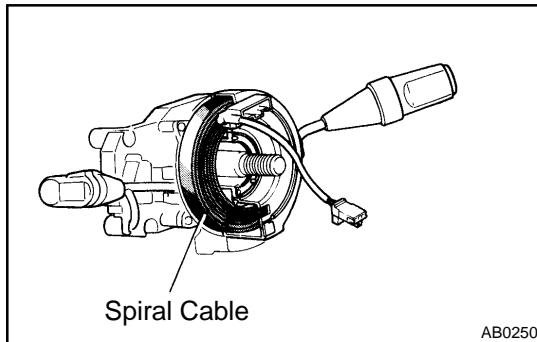
- Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
(The SRS is equipped with a back-up power source so that if work is started within 90 seconds of disconnecting the negative (-) terminal cable of the battery, the SRS may be deployed.)
- When the negative (-) terminal cable is disconnected from the battery, the memory of the clock and audio system will be canceled. So before starting work, make a record of the contents memorized in the audio memory system. When work is finished, reset the audio systems as they were 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.
- Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.
- Do not expose the steering wheel pad, front passenger airbag assembly, or airbag sensor assembly directly to hot air or flames.



OPERATION

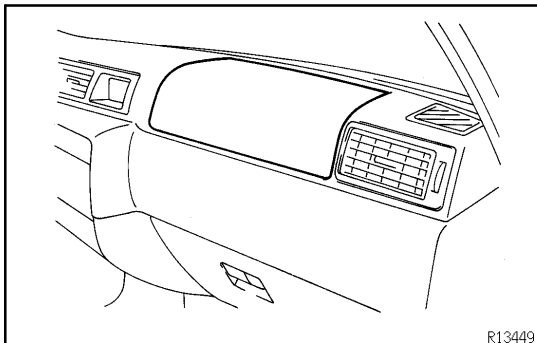
1. STEERING WHEEL PAD (with AIRBAG)

The inflator and bag of the SRS are stored in the steering wheel pad and cannot be disassembled. The inflator contains a squib, igniter charge, gas generant, etc., and inflates the bag when instructed by the airbag sensor assembly.



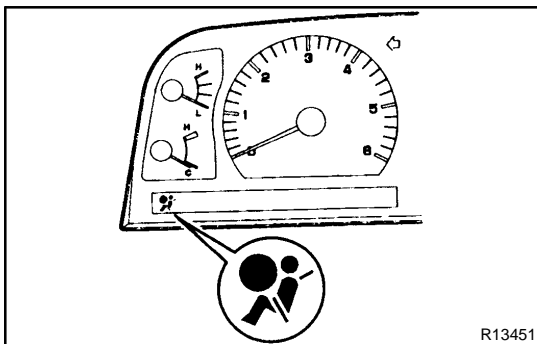
2. SPIRAL CABLE (in COMBINATION SWITCH)

A spiral cable is used as an electrical joint from the vehicle body side to the steering wheel.



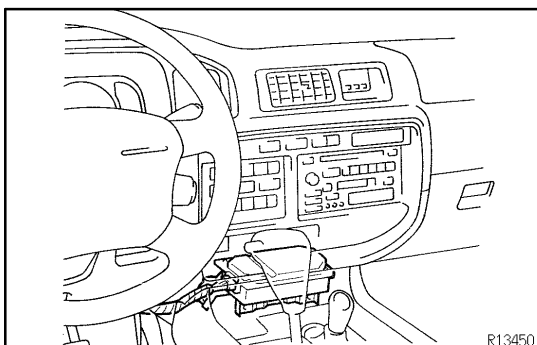
3. FRONT PASSENGER AIRBAG ASSEMBLY

The inflator and bag of the SRS are stored in the front passenger airbag assembly and cannot be disassembled. The inflator contains a squib, igniter charge, gas generant, etc., and inflates the bag when instructed by the airbag sensor assembly.



4. SRS WARNING LIGHT

The SRS warning light is located on the combination meter. It goes on to alert the driver of trouble in the system when a malfunction is detected in the airbag sensor assembly. 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.

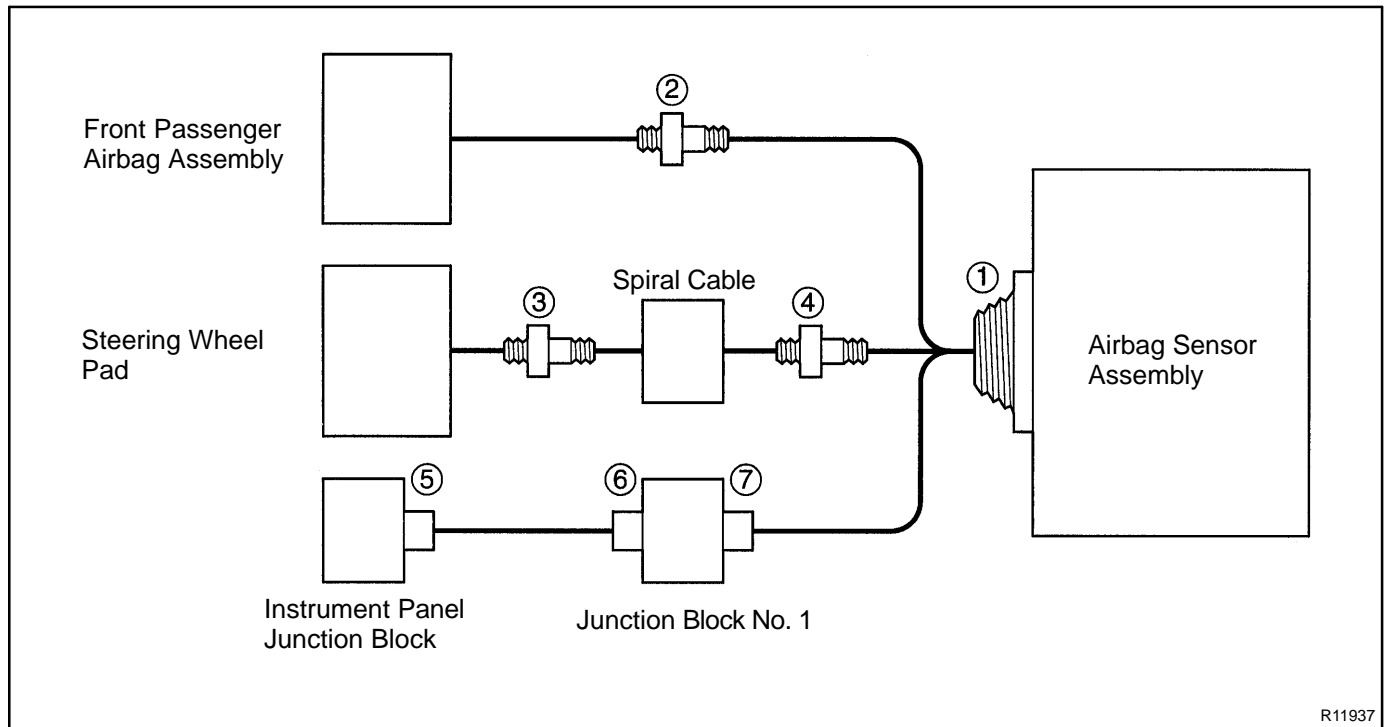


5. AIRBAG SENSOR ASSEMBLY

The airbag sensor assembly is mounted on the floor inside the console box. The airbag sensor assembly consists of an airbag sensor, safing sensor, diagnosis circuit and ignition control, drive circuit, etc.

It receives signals from the airbag sensors and judges whether the SRS must be activated or not.

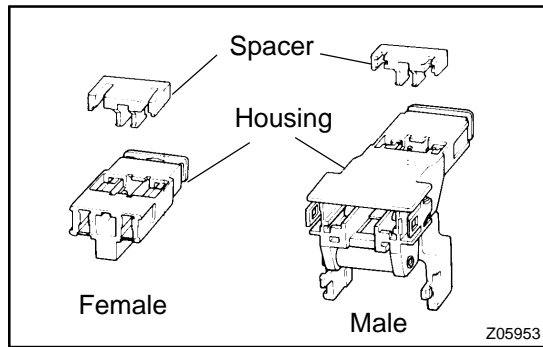
6. SRS CONNECTORS



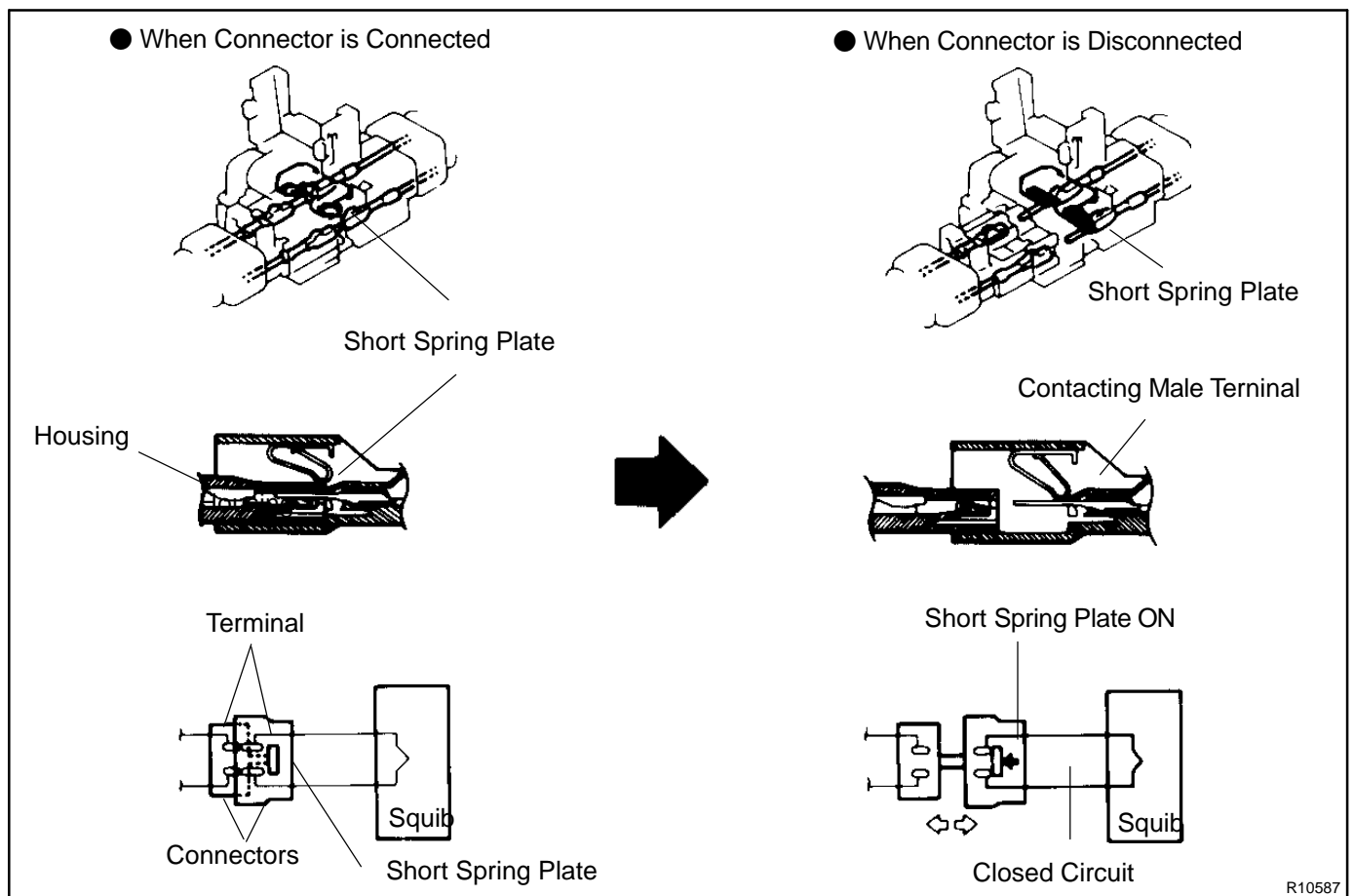
R11937

No.	Item	Application
(1)	Terminal Twin-Lock Mechanism	Connectors 1, 2, 3, 4, 5, 6, 7
(2)	Airbag Activation Prevention Mechanism	Connectors 2, 3, 4
(3)	Electrical Connection Check Mechanism	Connectors 1
(4)	Connector Twin-Lock Mechanism	Connectors 2, 3, 4

- (a) All connectors in the SRS are colored yellow to distinguish them from other connectors. Connectors having special functions and specifically designed for the SRS are used in the locations shown above to ensure high reliability. These connectors use durable gold-plated terminals.

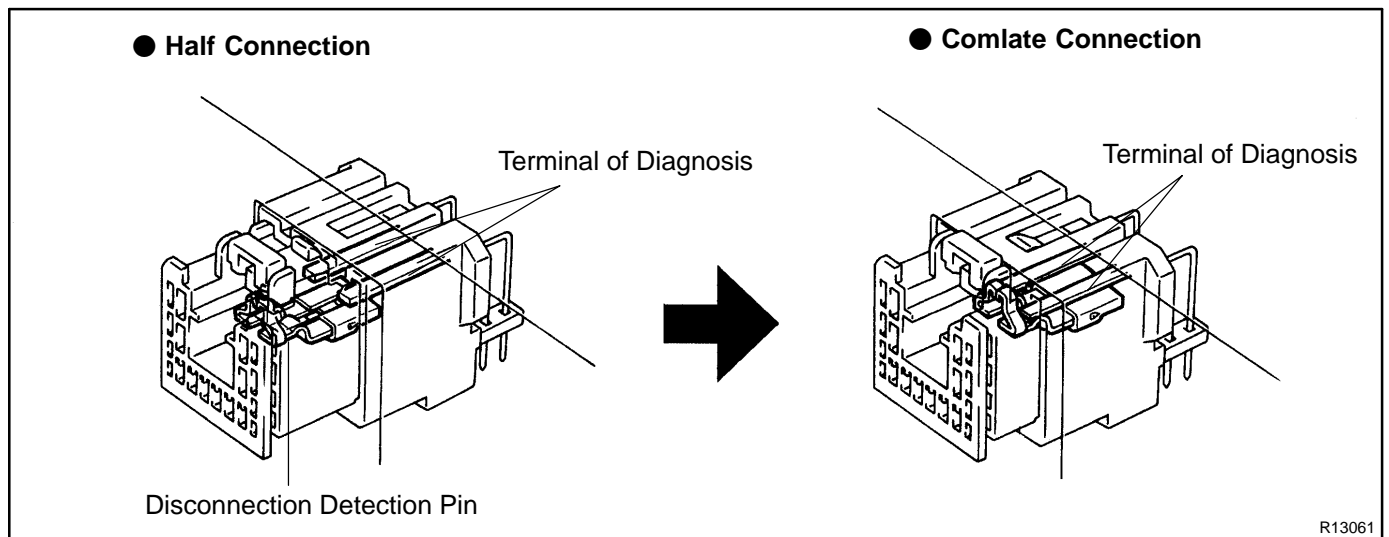


- (1) **Terminal Twin-Lock Mechanism**
Each connector has a two-piece construction consisting of a housing and a spacer. This design secures the locking of the terminal by two locking devices (the retainer and the lance) to prevent terminals from coming out.
- (2) **Airbag Activation Prevention Mechanism**
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 type of connector shown above is used for connectors 2, 3 and 4 in the diagram on the preceding page.

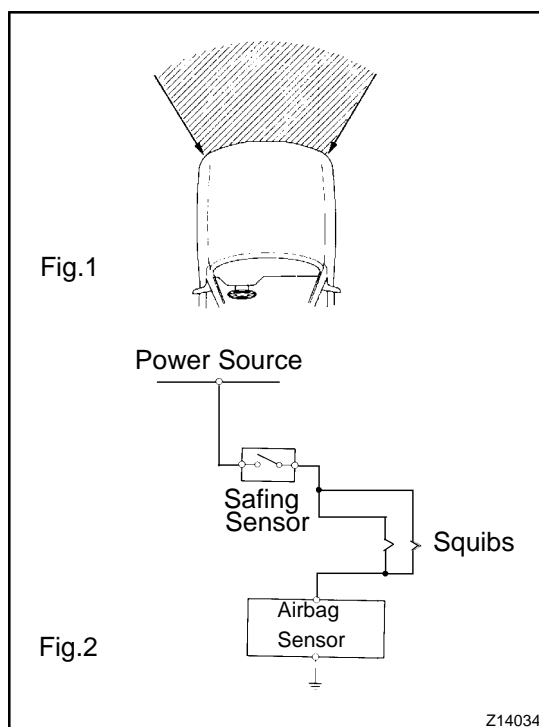
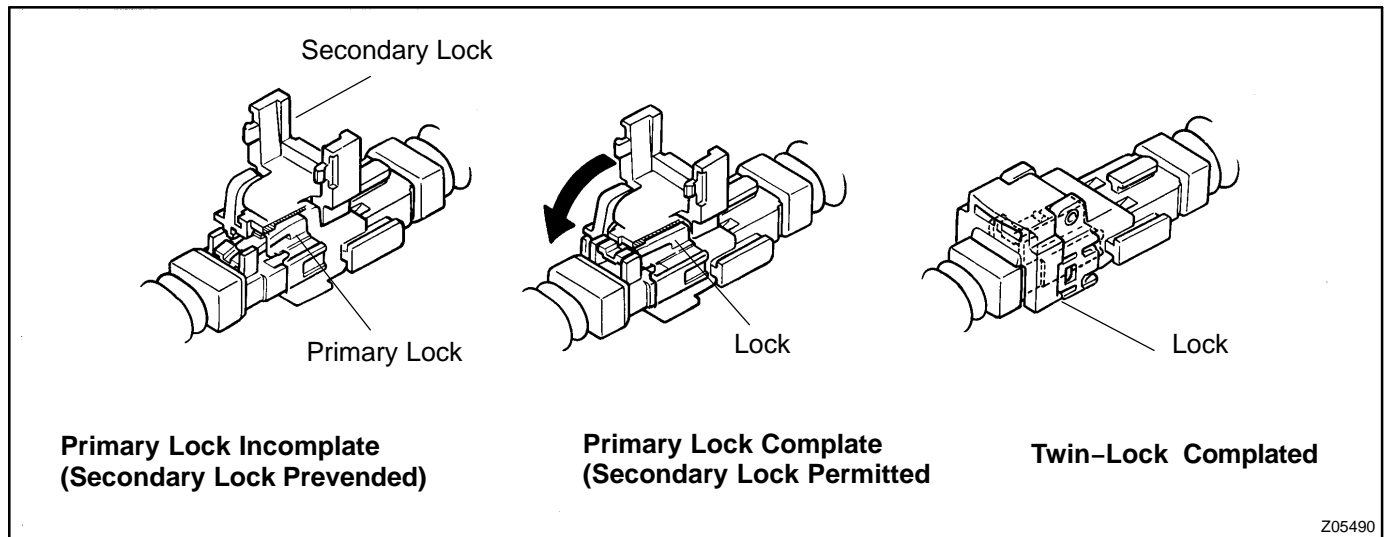
- (3) **Electrical Connection Check Mechanism**
This mechanism electrically checks if connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the disconnection detection pin connects with the diagnosis terminals when the connector housing lock is locked.



HINT:

The illustration shows connector 1.

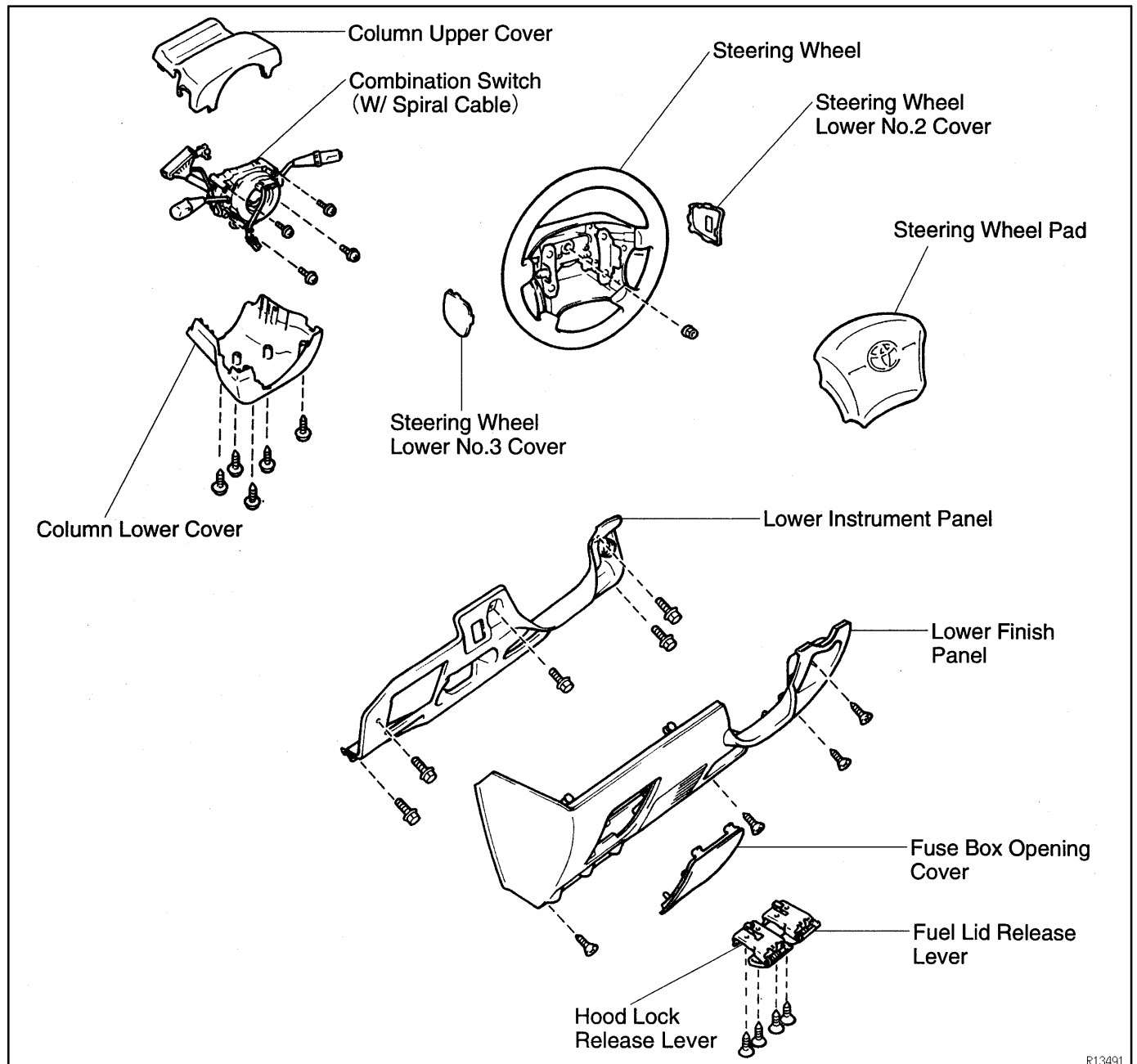
- (4) **Connector Twin-Lock Mechanism**
 With this mechanism connectors (male and female connectors) are locked by 2 locking devices to increase connection reliability. If the primary lock is incomplete, ribs interfere and prevent the secondary lock.



- (b) When the vehicle is involved in a frontal collision in the hatched area (Fig. 1) and the shock is larger than the predetermined level, the SRS is activated automatically. A safing sensor is designed to go on at a smaller deceleration rate than the airbag sensor. As illustrated in Fig. 2, ignition is caused when current flows to the squib, which happens when a safing sensor and the airbag sensor go on simultaneously. When a deceleration force acts on the sensors, two squibs in the driver airbag and front passenger airbag ignite and generate gas. The gas discharging into the driver airbag and front passenger airbag rapidly increases the pressure inside the bags, breaking open the steering wheel pad and instrument panel door. Bag inflation then ends, and the bags deflate as the gas is discharged through discharge holes at the bag's rear or side.

STEERING WHEEL PAD AND SPIRAL CABLE COMPONENTS

RS0P1-01



RS-8

SUPPLEMENTAL RESTRAINT SYSTEM – STEERING WHEEL PAD AND SPIRAL CABLE

RS0P2-01

REMOVAL

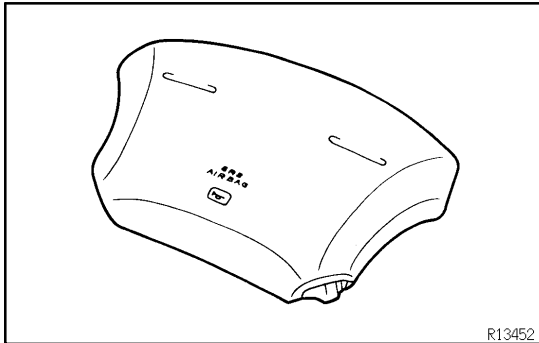
REMOVE STEERING WHEEL AND SPIRAL CABLE (See page [SR-11](#))

INSPECTION

1. VEHICLES NOT INVOLVED IN A COLLISION

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) With the steering wheel pad (with airbag) installed in the vehicle, do a visual check with includes the following items.

Check for cuts, minute cracks or marked discoloration of the steering wheel pad top surface and grooved portion.

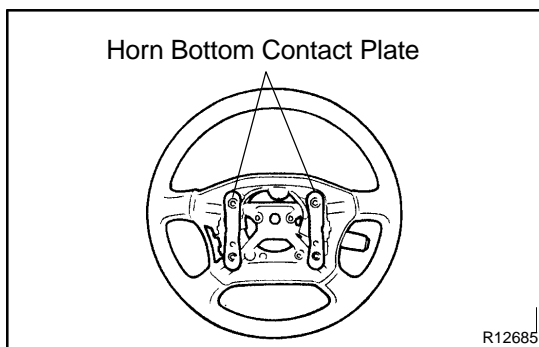


2. VEHICLES INVOLVED IN A COLLISION

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) Do a visual check.

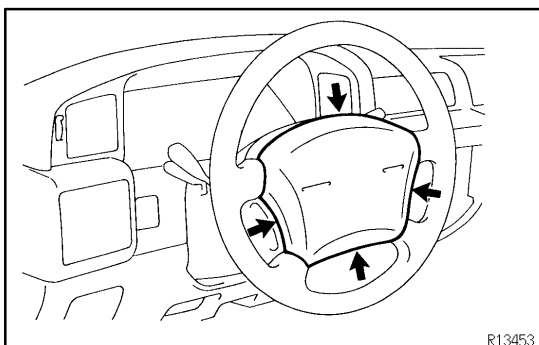
With the steering wheel pad removed from the vehicle, do a visual check with includes the following items.

- Check for cuts and cracks in, or marked discoloration of, the steering wheel pad top surface and its grooved portion.
- Check for cuts and cracks in wire harnesses, and for chipping in connectors.
- 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 pages [SR-11](#) and [SR-19](#) and be sure to follow the correct procedure.

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Do a visual check with includes the following items with the steering wheel pad removed from the 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:

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.

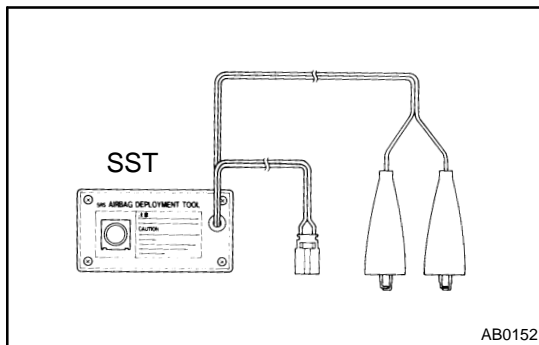
DISPOSAL

HINT:

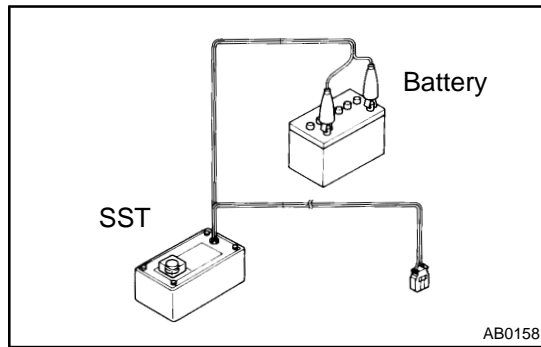
When scrapping vehicle equipped with an SRS or disposing of a steering wheel pad (with airbag), always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of the TOYOTA MOTOR SALES, U.S.A., INC. When disposing of a steering wheel pad with an airbag deployed in a collision, follow the same procedure given in step 1-(d) in "DISPOSAL".

CAUTION:

- Never dispose of a steering wheel pad which has an undeployed airbag.
- 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.



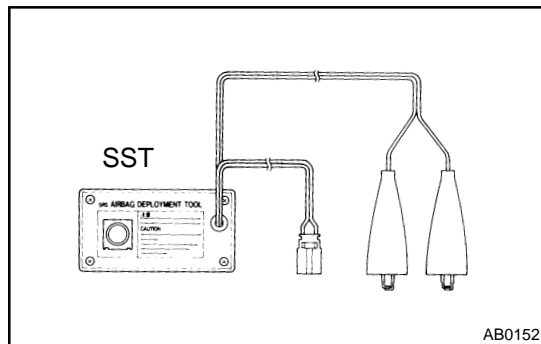
- When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.
SST 09082-00700
- When deploying an airbag, perform the operation at least 10 m (33 ft) away from the steering wheel pad.
- The steering wheel pad is very 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 the deployed airbag.
- Always wash your hands with water after completing the operation.
- Do not apply water, etc. to a steering wheel pad with the deployed airbag.



1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to deploy the airbag.

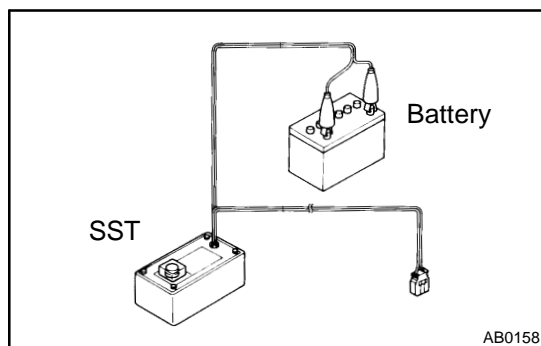


(a) Check functioning of the SST.

CAUTION:

When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.

SST 09082-00700

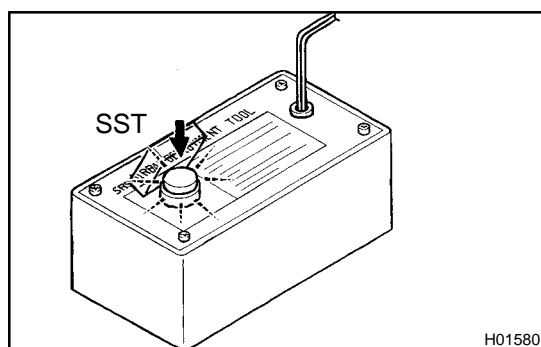


(1) Connect the SST to the battery.

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 will be connected with the supplemental restraint system.



(2) Check functioning of the SST.

Press the SST activation switch, and check that 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.

(b) Install the SST.

CAUTION:

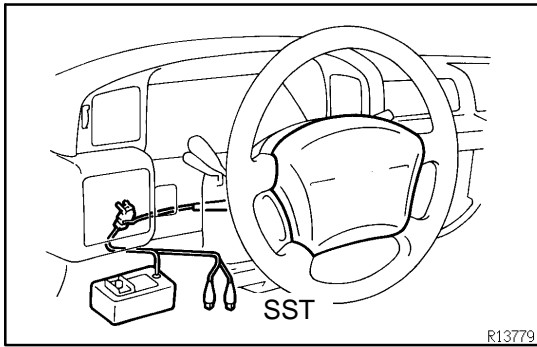
Check that there is no looseness in the steering wheel and steering wheel pad.

(1) Remove the steering column lower cover.

Remove the 3 screws and steering column lower cover as shown in the illustration.

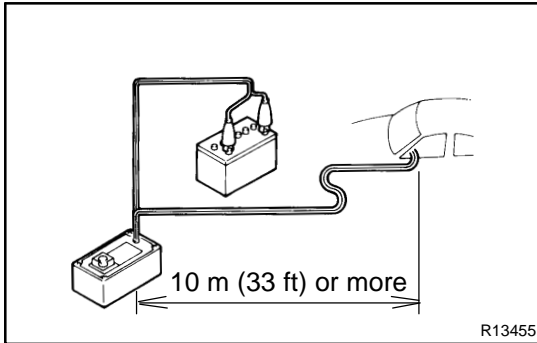
(2) Disconnect the airbag connector of the spiral cable.

SUPPLEMENTAL RESTRAINT SYSTEM – STEERING WHEEL PAD AND SPIRAL CABLE



- (3) Connect the SST connector to the airbag connector of the spiral cable.

SST 09082-00700



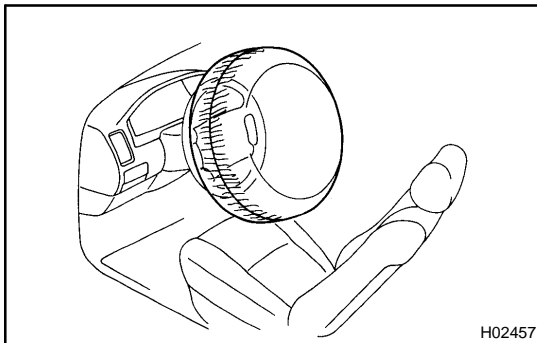
- (4) Move the SST at least 10 m (33 ft) away from the front of the vehicle.

- (5) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (6) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal.



- (c) Deploy the airbag.

- (1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.

- (2) Press the SST activation switch and deploy the airbag.

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.

- (d) Dispose 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 steering wheel pad with the deployed airbag.
- Always wash your hands with water after completing the operation.
- Do not apply water, etc. to a steering wheel pad with the deployed airbag.

- (1) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the steering wheel pad still installed.

- (2) When moving a vehicle for scrapping which has a steering wheel pad with deployed airbag, use gloves and safety glasses.

2. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD ONLY

NOTICE:

- When disposing of the steering wheel pad (with airbag) only, never use the customers vehicle to deploy the airbag.
- Be sure to follow the procedure given below when deploying the airbag.

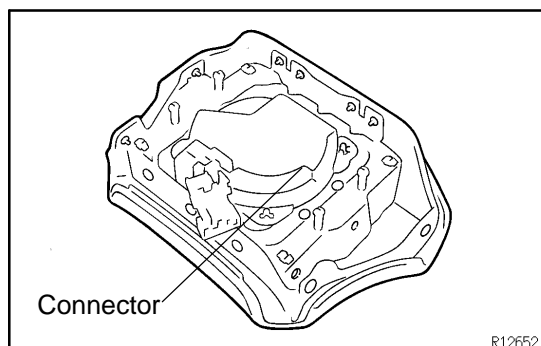
HINT:

Have a battery ready as the power source to deploy the airbag.

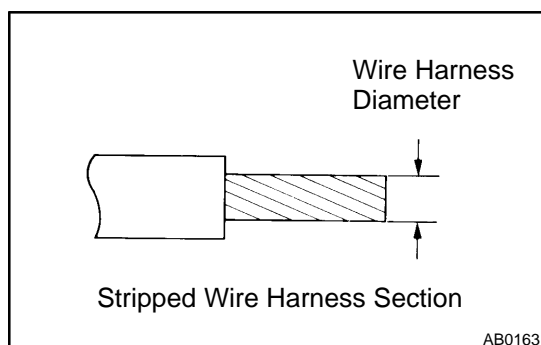
(a) Remove the steering wheel pad (See page [SR-11](#)).

CAUTION:

When storing the steering wheel pad, keep the upper surface of the pad facing upward.



(b) Remove the connector on the rear surface of the steering wheel pad from the bracket.



(c) Using a service-purpose wire harness, tie down the steering wheel pad to the disc wheel.

Wire harness: Stripped wire harness section 1.25 mm² or more (0.0019 in² or more).

HINT:

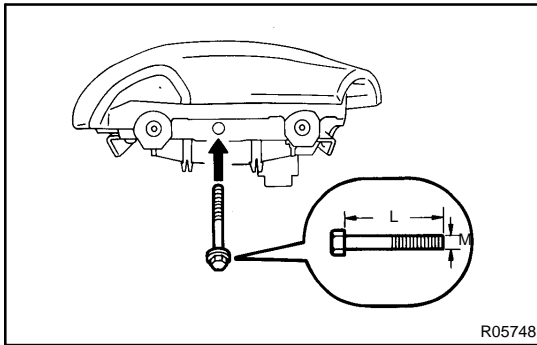
To calculate the square of the stripped wire harness section:

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 shock when the airbag is deployed. This is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 mm² (0.0019 in²).

SUPPLEMENTAL RESTRAINT SYSTEM – STEERING WHEEL PAD AND SPIRAL CABLE



- (1) Install the 2 bolts with washers in the 2 bolt holes in the steering wheel pad.

Bolt:

L: 35. mm (1.387 in.)

M: 6.0 mm (0.236 in.)

Pitch: 1.0 mm (0.039 in.)

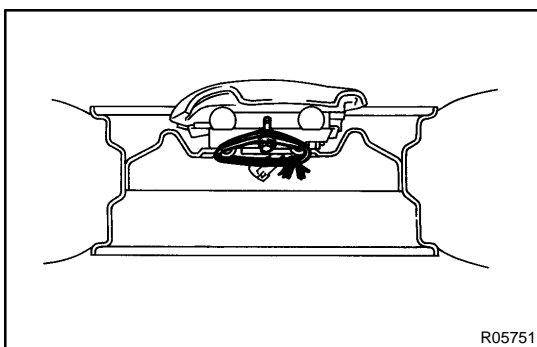
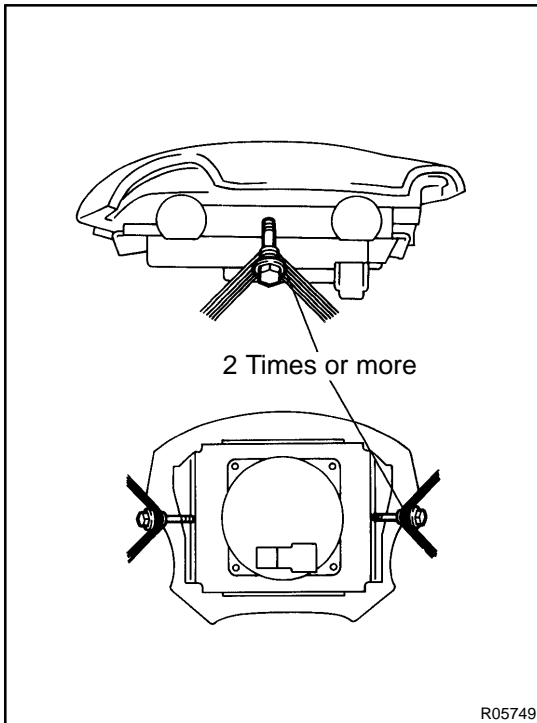
NOTICE:

- Tighten the bolts by hand until the bolts become difficult to turn.
- Do not tighten the bolts too much.

- (2) Using 3 wire harnesses, wind the wire harness 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 slack in the wire harness, the steering wheel pad may come loose due to the shock when the airbag is deployed. This is highly dangerous.



- (3) 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:

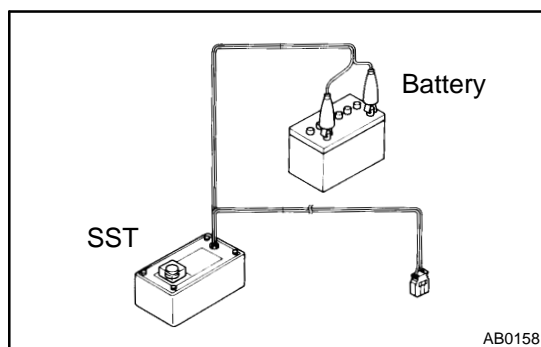
- Make sure that the wire harness is tight. It is very dangerous when looseness in the wire harness results in the steering wheel pad coming free through the shock from the airbag deploying.
- Always tie down the steering wheel pad with the pad side facing upward. It is very dangerous if the steering wheel pad is tied down with the metal surface facing upward as the wire harness will be cut by the shock from the airbag deploying and the steering wheel pad will be thrown into the air.

NOTICE:

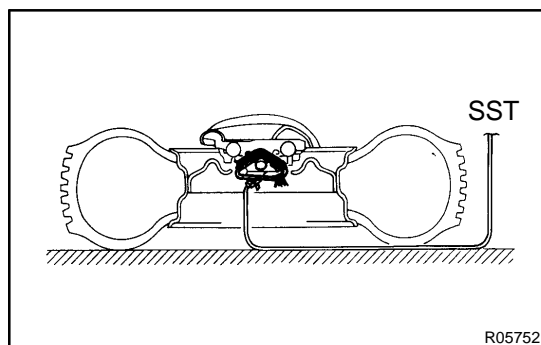
The disc wheel will be marked by airbag deployment, so when disposing of the airbag use a redundant disc wheel.

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SUPPLEMENTAL RESTRAINT SYSTEM - STEERING WHEEL PAD AND SPIRAL CABLE



- (d) Check functioning of the SST.
SST 09082-00700



- (e) Install the SST.

CAUTION:

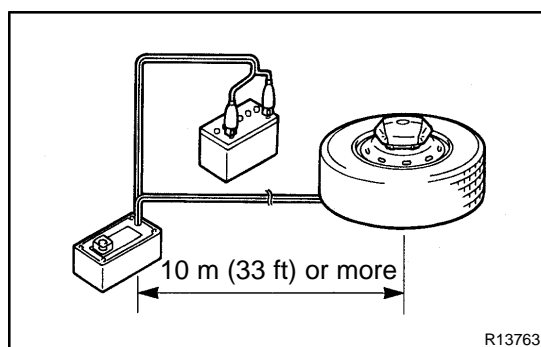
Place the disc wheel on the level ground.

- (1) Connect the connector of 2 SST to the steering wheel pad connector.

SST 09082-00700, 09082-00760

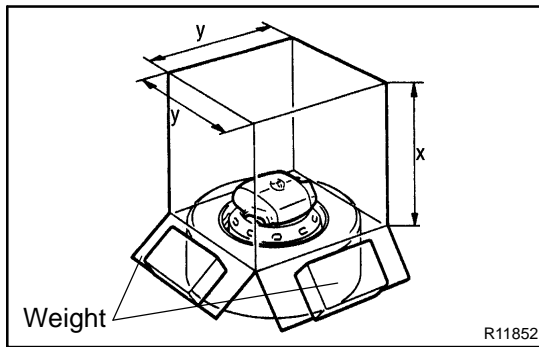
NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the disc wheel.



- (2) Move the SST to at least 10 m (33 ft) away from the steering wheel pad tied down on the disc wheel.

SUPPLEMENTAL RESTRAINT SYSTEM – STEERING WHEEL PAD AND SPIRAL CABLE



- (f) Cover the steering wheel pad with a cardboard box or tires.

- Covering method using a cardboard box:
Cover the steering wheel pad with the cardboard box and weight the cardboard box down in 4 places with at least 190 N (20 kg, 44 lb).

Size of cardboard box:

Must exceed the following dimensions:

x=460 mm (18.11 in.)

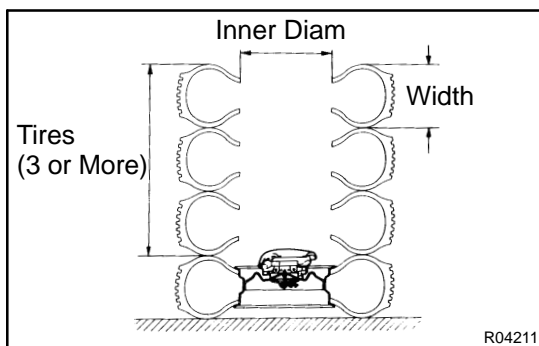
When dimension of the cardboard box exceeds the diameter of the disc wheel with tire to which the steering wheel pad is tied

x=460 mm (18.11 in.) + width of tire

y= 650 mm (25.59 in.)

NOTICE:

If a cardboard box smaller than the specified size is used, the cardboard box will be broken by the shock from the air-bag deployment.



- Covering method using tires:
Place at least 3 tires without disc wheel on top of the disc wheel with tire to which the steering wheel pad is tied.

Tire size: Must exceed the following dimensions–

Width: 185 mm (7.87 in.)

Inner diameter: 360 mm (14.17 in.)

CAUTION:

Do not use tires with disc wheels.

NOTICE:

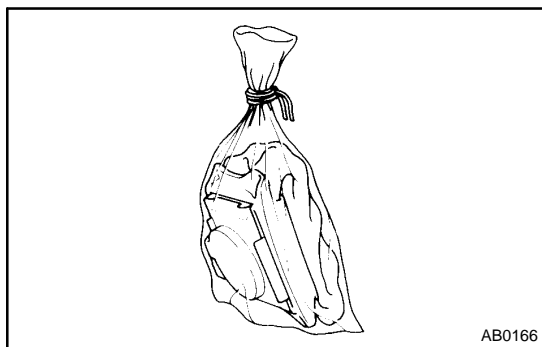
The tires may be marked by the airbag deployment, so use the redundant tires.

- (g) Deploy the airbag.

- (1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
- (2) Check that no one is within 10 m (33 ft) area around the disc wheel which the steering wheel pad is tied to.
- (3) Press the SST activation switch and deploy the air-bag.

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.



(h) Dispose of the 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 steering wheel pad with deployed airbag.
 - Always wash your hands with water after completing the operation.
 - Do not apply water, etc. to a steering wheel pad with deployed airbag.
- (1) Remove the steering wheel pad from the disc wheel.
 - (2) Place the steering wheel pad in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the steering wheel pad, steering wheel or spiral cable.

Case	Replacing part
If the airbag has been deployed.	Steering wheel pad
If the steering wheel pad has been found to be faulty in troubleshooting.	Steering wheel pad
If the spiral cable has been found to be faulty in troubleshooting.	Spiral cable
If the steering wheel pad has been found to be faulty during checking items. (See page RS-9)	Steering wheel pad
If the steering wheel has been found to be faulty during checking items. (See page RS-9)	Steering wheel
If the spiral cable has been found to be faulty during checking items. (See page RS-9)	Spiral cable
If the steering wheel pad has been dropped.	Steering wheel pad

CAUTION:

For removal and installation of the steering wheel pad, see pages [SR-11](#) and [SR-19](#), and be sure to follow the correct procedure.

RS-20

SUPPLEMENTAL RESTRAINT SYSTEM – STEERING WHEEL PAD AND SPIRAL CABLE

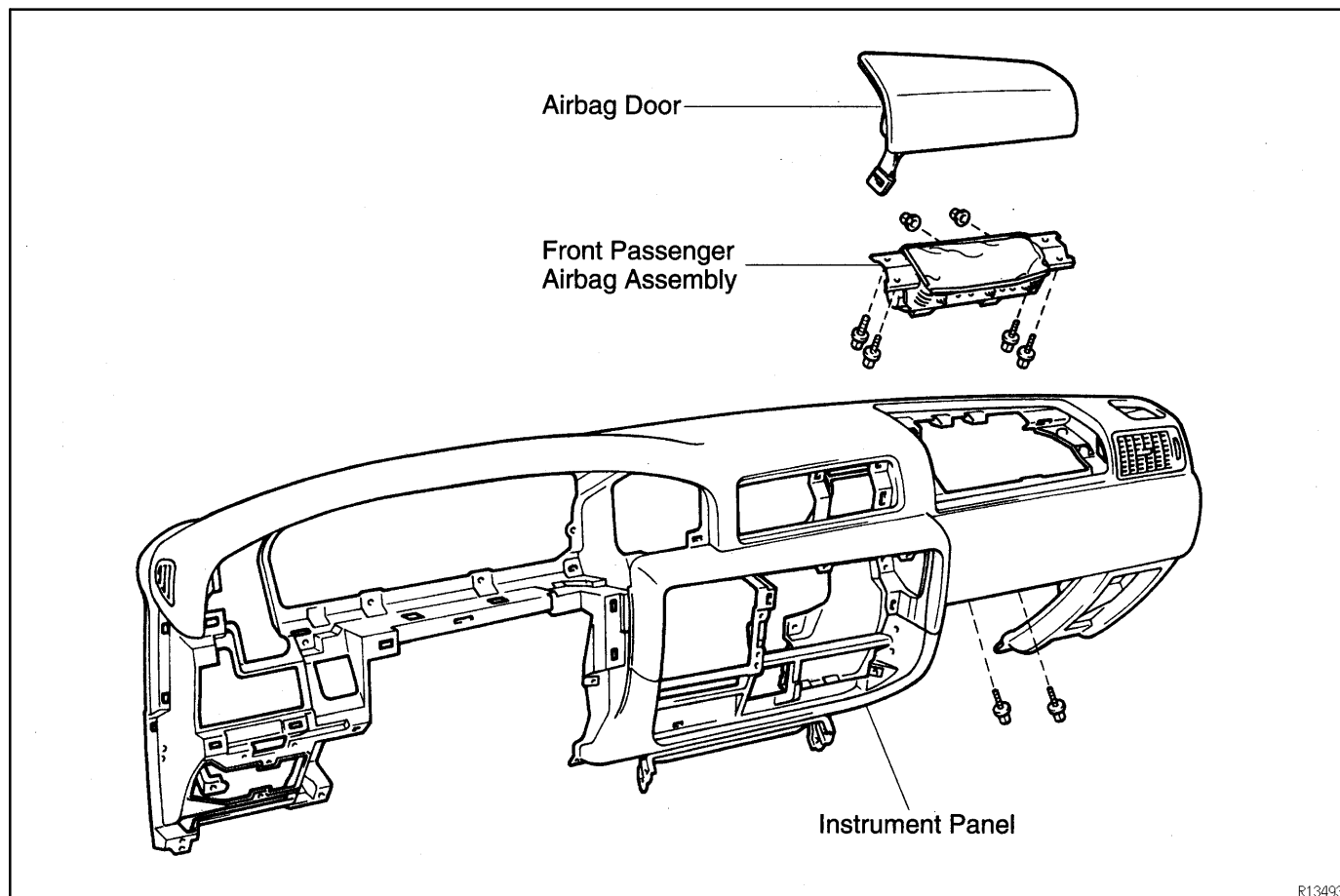
RS0P6-01

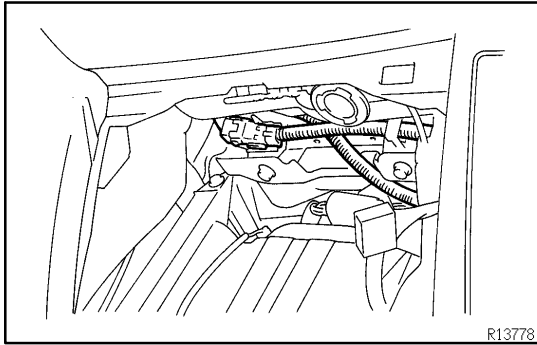
INSTALLATION

INSTALL STEERING WHEEL AND SPIRAL CABLE (See page [RS-7](#))

FRONT PASSENGER AIRBAG ASSEMBLY COMPONENTS

RS0P7-01





REMOVAL

NOTICE:

If the wiring connector of the SRS is disconnected with the ignition switch at ON or ACC, DTCs will be recorded.

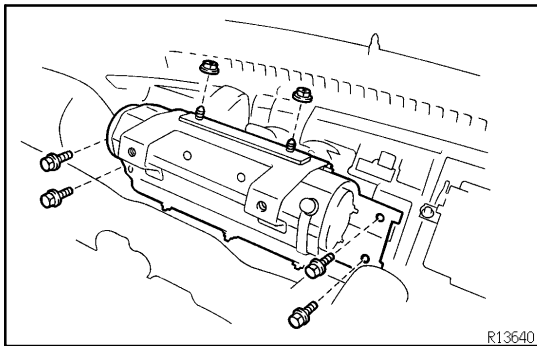
1. DISCONNECT AIRBAG CONNECTOR

- (a) Remove the glove compartment door
(See page [BO-76](#)).
- (b) Remove the airbag connector from the airbag bracket.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

- (c) Disconnect the airbag connector.

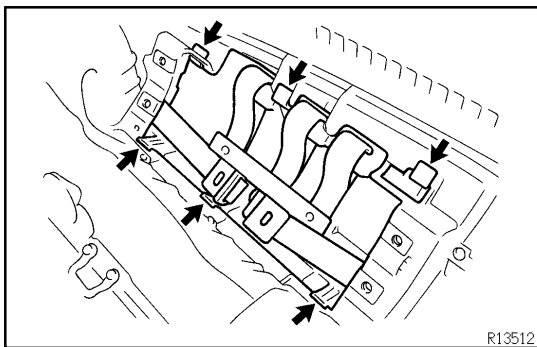


2. REMOVE INSTRUMENT PANEL

(See pages [BO-76](#))

3. REMOVE FRONT PASSENGER AIRBAG ASSEMBLY

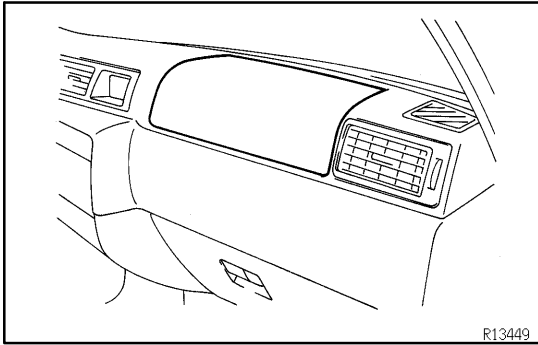
- (a) Remove the 4 bolts and 2 nuts, and remove front passenger airbag assembly.



- (b) Pry up the 6 clips shown in the illustration and remove the airbag door.

CAUTION:

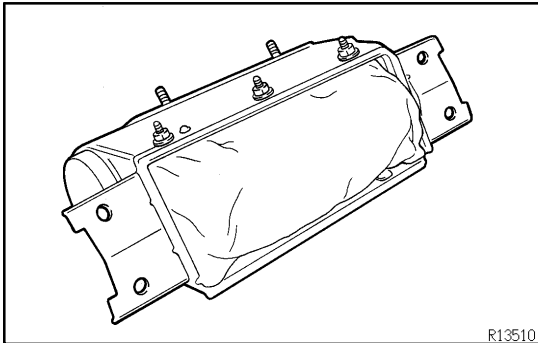
Do not store the front passenger airbag assembly with the airbag deployment direction facing down. Never disassemble the front passenger airbag assembly.



INSPECTION

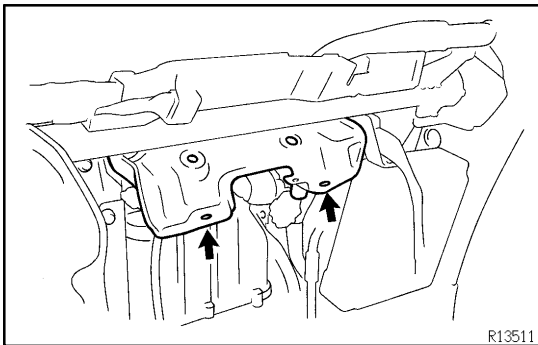
1. VEHICLES NOT INVOLVED IN COLLISION

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) Do a visual check which includes the following items with the front passenger airbag assembly installed in the vehicle.
Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly and instrument panel.



2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle.
 - Check cuts, minute cracks or marked discoloration on the front passenger airbag assembly.
 - Check cuts and cracks in wire harnesses, and for chipping in connectors.
 - Check the deformation or cracks on the instrument panel and instrument panel reinforcement.



HINT:

If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it. Always replace it with a new one.

CAUTION:

For removal and installation of the front passenger airbag assembly, see page [RS-22](#) and [RS-31](#) and be sure to follow the correct procedure.

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) Do a visual check which includes the following items with the front passenger airbag assembly removed from the vehicle.
 - Check the deformation or cracks on the instrument panel and instrument panel reinforcement.
 - Check the damage on the connector and wire harness.

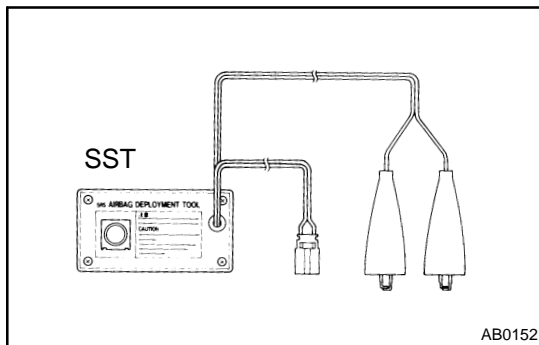
HINT:

If the instrument panel or instrument panel reinforcement is deformed or cracked, never repair it. Always replace it with a new one.

DISPOSAL

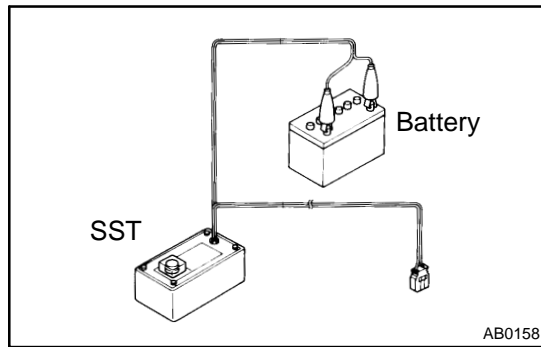
HINT:

When scrapping vehicle equipped with an SRS or disposing of a front passenger 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. When disposing of a front passenger airbag assembly with an airbag deployed in a collision, follow the same procedure given in step 1–(e) in "DISPOSAL".



CAUTION:

- Never dispose of a front passenger airbag assembly which has an undeployed airbag.
- 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 specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.
SST 09082-00700
- When deploying an airbag, perform the operation 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 completing the operation.
- Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.

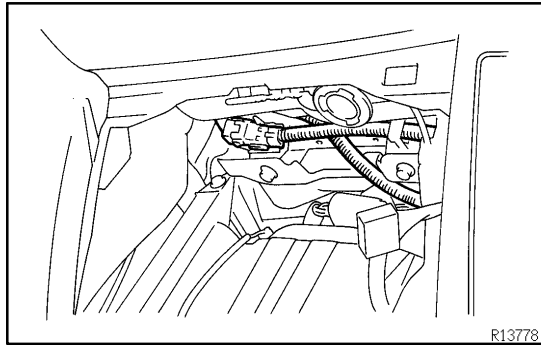


1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

HINT:

Have a battery ready as the power source to deploy the airbag.

- (a) Check functioning of the SST.
(See page RS-11)

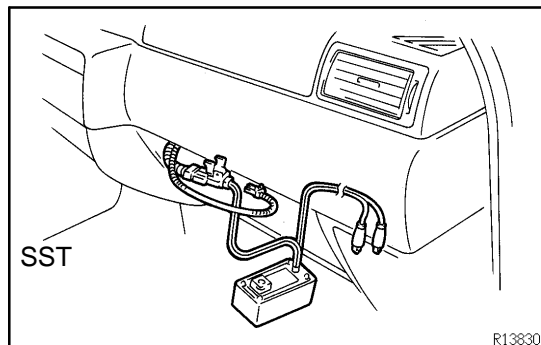


- (b) Disconnect the airbag connector.
 - (1) Remove the glove compartment door.
 - (2) Remove the No.1 under cover.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

- (3) Pull up the connector.
- (4) Disconnect the airbag connector.

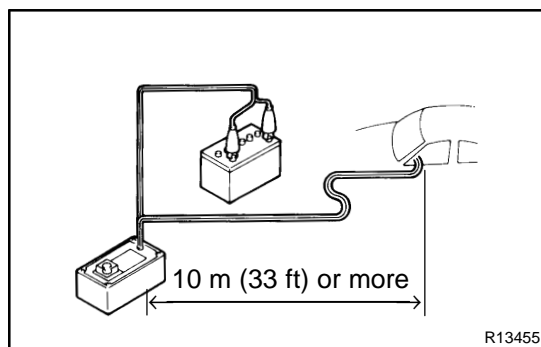


- (c) Install the SST.
 - (1) Connect the SST connector to the front passenger airbag assembly connector.

SST 09082-00700

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.

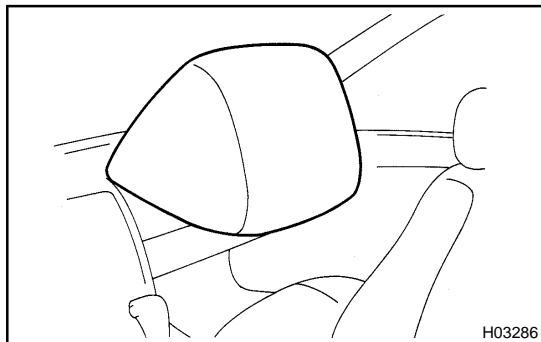


- (2) Move the SST to at least 10 m (33 ft) away from the front of the vehicle.
- (3) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

- (4) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (-) terminal.



- (d) Deploy the airbag.
 - (1) Confirm that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.
 - (2) Press the SST activation switch and deploy the airbag.

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.

- (e) Dispose of the front passenger airbag assembly.

CAUTION:

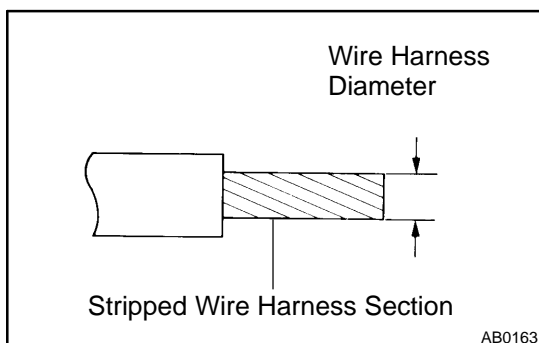
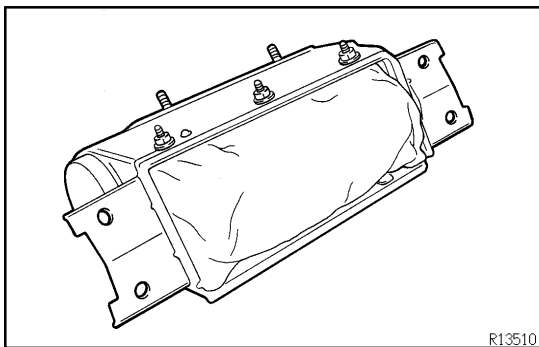
- The front passenger airbag assembly is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.
 - Use gloves and safety glasses when handling a front passenger airbag assembly with deployed airbag.
 - Always wash your hands with water after completing the operation.
 - Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.
- (1) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the front passenger airbag assembly still installed.
 - (2) When moving a vehicle for scrapping which has a front passenger airbag assembly with deployed airbag, use gloves and safety glasses.

2. DEPLOYMENT WHEN DISPOSING OF FRONT PASSENGER AIRBAG ASSEMBLY ONLY**NOTICE:**

- When disposing of the front passenger airbag assembly only, never use the customer's vehicle to deploy the airbag.
- Be sure to follow the procedure given below when deploying the airbag.

HINT:

Have a battery ready as the power source to deploy the airbag.



- (a) Remove the front passenger airbag assembly.
(See page [RS-22](#))

CAUTION:

- When removing the front passenger airbag assembly, work must be started 90 seconds after the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.
 - Store the front passenger airbag assembly with the airbag deployment side facing upward.
- (b) Using a service-purpose wire harness for the vehicle, tie down the front passenger airbag assembly to the tire.
Wire harness: Stripped wire harness section 1.25 mm² or more (0.0019 in.² or more)

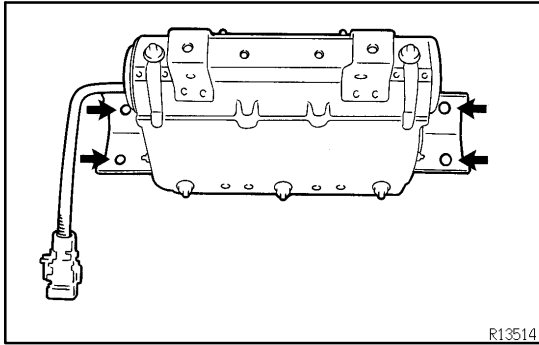
HINT:

To calculate the square of the stripped wire harness section:

$$\text{Square} = 3.14 \times (\text{Diameter})^2 \text{ divided by } 4$$

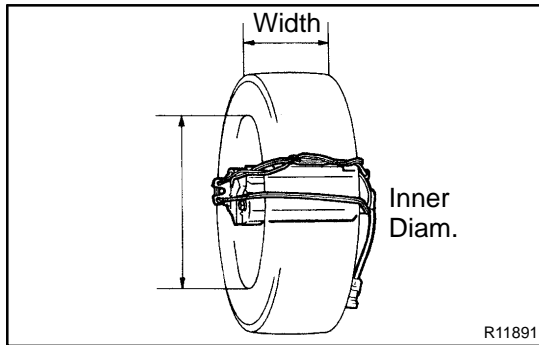
RS-28

SUPPLEMENTAL RESTRAINT SYSTEM – FRONT PASSENGER AIRBAG ASSEMBLY

**CAUTION:**

If the front passenger airbag assembly is tied down with too thin wire harness, it may snap. This is highly dangerous. Always use a wire harness which is at least 1.25 mm² (0.0019 in.²)

- (1) Wind the wire harness around the tire, passing the wire harness through the installation holes indicated by arrows in the illustration.



- (2) Position the front passenger airbag assembly inside the tire with the airbag deployment side facing inside.

Tire size: Must exceed the following dimensions–

Width: 185 mm (7.28 in.)

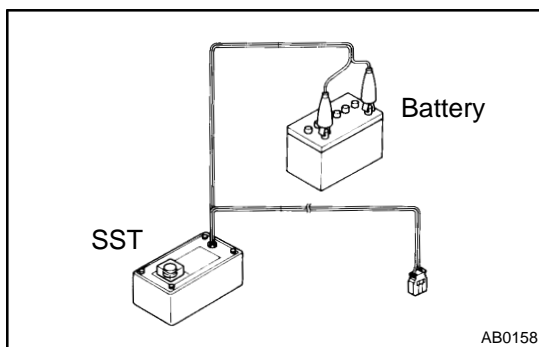
Inner diameter: 360 mm (14.17 in.)

CAUTION:

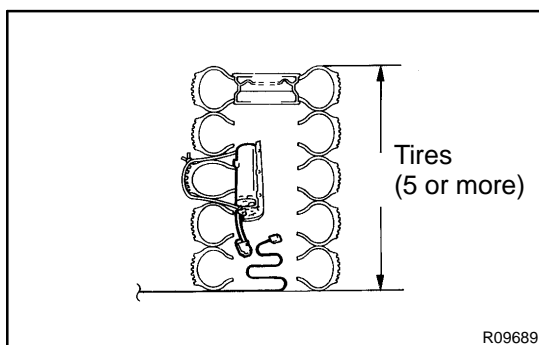
- Make sure that the wire harness is tight. It is very dangerous if looseness in the wire harness results in the front passenger airbag assembly coming free due to the shock from the airbag deploying.
- Always tie down the front passenger airbag assembly with the airbag deployment side facing inside.

NOTICE:

The tire will be marked by the airbag deployment, so use a redundant tire.



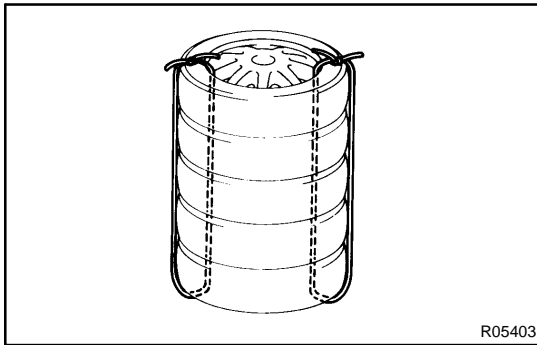
- (c) Check functioning of the SST.
SST 09082-00700



- (d) Place tires.
 - (1) Place at least 2 tires under the tire to which the front passenger airbag assembly is tied.
 - (2) 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.

1996 LAND CRUISER (RM451U)

SUPPLEMENTAL RESTRAINT SYSTEM – FRONT PASSENGER AIRBAG ASSEMBLY



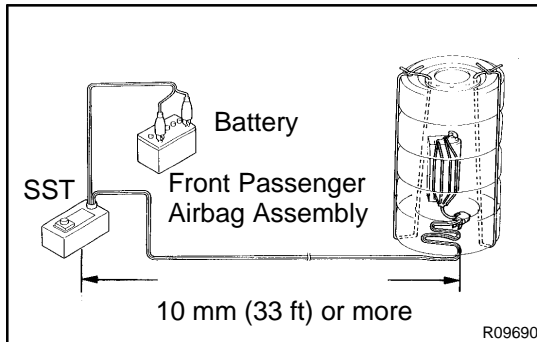
- (3) Tie the tires together with 2 wire harnesses.

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 from the airbag deploying.

HINT:

Place the SST connector and wire harness inside tires. Provide at least 1 m (3 ft) of slack for the wire harness.



- (e) Install the SST.
Connect the SST connector to the front passenger airbag assembly connector.
SST 09082-00700

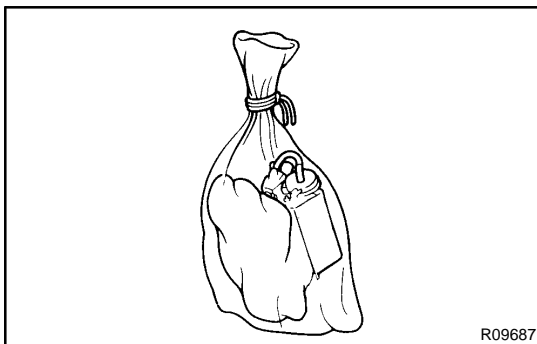
NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock.

- (f) Deploy the airbag
- (1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (-) terminal.
 - (2) Confirm that no one is within 10 m (33 ft) area around the tire which the front passenger airbag assembly is tied to.
 - (3) Press the SST activation switch and deploy the airbag.

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.



- (g) Dispose of the 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 assembly with deployed airbag.**
 - **Always wash your hands with water after completing the operation.**
 - **Do not apply water, etc. to a front passenger airbag assembly with deployed airbag.**
- (1) Remove the front passenger airbag assembly from the tire.
 - (2) Place the front passenger airbag assembly in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the front passenger airbag assembly, instrument panel or instrument panel reinforcement.

Case	Replacing part
If the airbag has been deployed.	Front passenger airbag assembly
If the front passenger airbag assembly has been found to be faulty in trouble-shooting.	Front passenger airbag assembly
If the front passenger airbag assembly has been found to be faulty during checking items. (See page RS-23)	Front passenger airbag assembly
If the instrument panel has been found to be faulty during checking items. (See page RS-23)	Instrument panel
If the instrument panel reinforcement has been found to be faulty during checking items. (See page RS-23)	Instrument panel reinforcement
If the front passenger airbag assembly has been dropped.	Front passenger airbag assembly

CAUTION:

For replacement of the front passenger airbag assembly, see page [RS-22](#) and [RS-31](#).

Be sure to follow the correct procedure.

INSTALLATION

NOTICE:

Never use airbag parts from another vehicle. When replacing parts, replace with new parts.

1. INSTALL FRONT PASSENGER AIRBAG ASSEMBLY

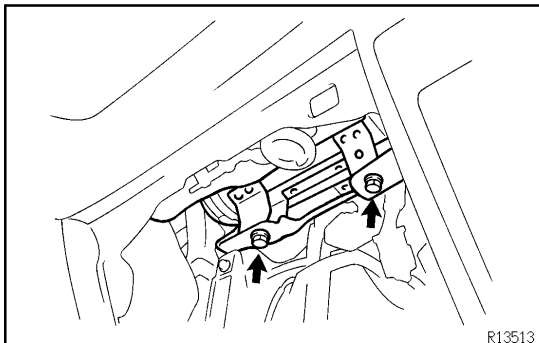
Install the airbag door and front passenger airbag assembly to the instrument panel.

CAUTION:

- Make sure that no foreign objects are trapped between the airbag and the module.
- Do not damage the strap when installing the module. If the airbag door is cracked or its surface is peeling, always replace it with a new airbag door.

NOTICE:

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.



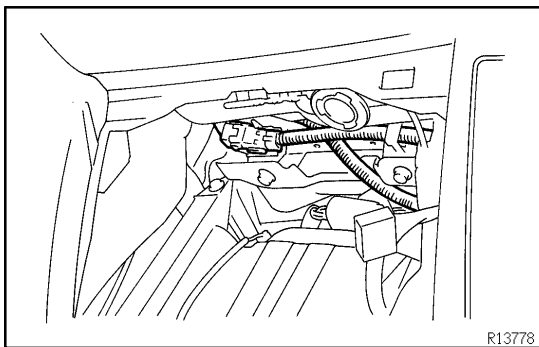
2. INSTALL INSTRUMENT PANEL (See page [BO-80](#))

Install the 2 bolts to instrument panel reinforcement.

Torque: 20 N·m (210 kgf·cm, 15 ft·lbf)

NOTICE:

Make sure the front passenger airbag assembly is installed to the specified torque. When installing the instrument panel, take care that the airbag wire harness does not interfere with other parts and is not pinched between other parts.

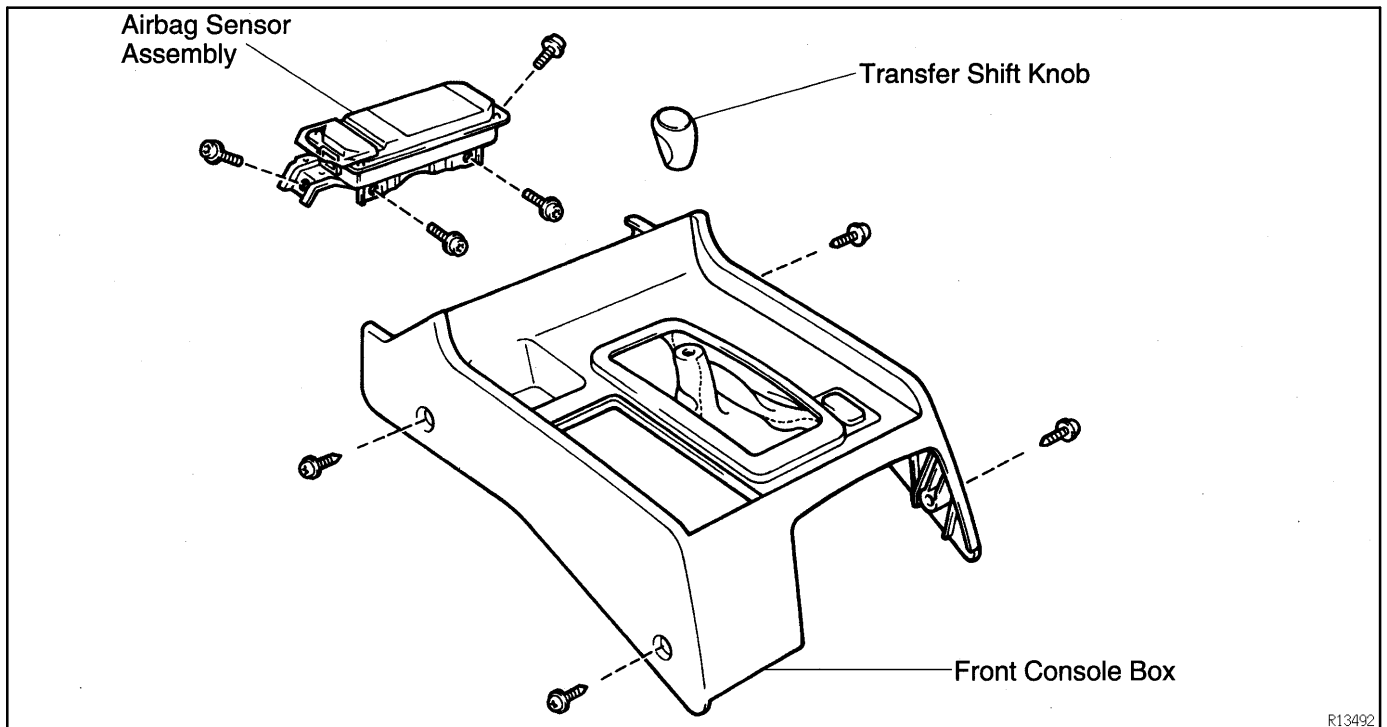


3. CONNECT AIRBAG CONNECTOR

- Connect the airbag connector.
- Install the airbag connector to the airbag bracket.
- Install the glove compartment door.

AIRBAG SENSOR ASSEMBLY COMPONENTS

RS0PD-01



R13492

REMOVAL

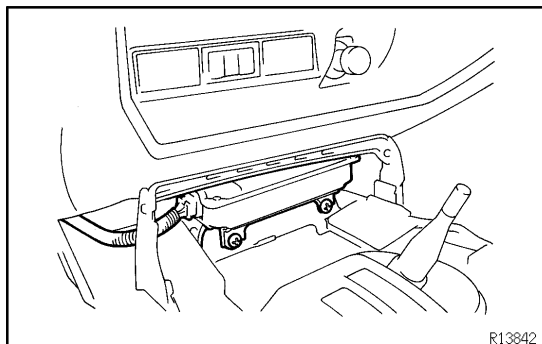
NOTICE:

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 destroyed by static electricity.)

1. REMOVE THESE PARTS:

- (a) Transfer shirt knob
- (b) Front console box



2. REMOVE AIRBAG SENSOR ASSEMBLY

- (a) Disconnect the connector.

NOTICE:

Remove the connector with the sensor assembly installed.

- (b) Using a torx wrench remove the 4 screws and the airbag sensor assembly.

Torx wrench: T40 (Part No. 09042-00020 or locally manufactured tool)

INSPECTION

1. VEHICLE NOT INVOLVED IN COLLISION

Do a diagnostic system check. (See page [DI-240](#))

2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

Do a diagnostic system check. (See page [DI-240](#))

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Replace the airbag sensor assembly. (See page [RS-32](#))

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the airbag sensor assembly.

- If the SRS has been deployed in a collision.
- If the airbag sensor assembly has been found to be faulty in troubleshooting.
- If the airbag sensor assembly has been dropped.

CAUTION:

For removal and installation of the airbag sensor assembly, see page [RS-33](#) and [RS-36](#). Be sure to follow the correct procedure.

INSTALLATION

NOTICE:

- **Never use SRS parts from another vehicle. When replacing parts, replace with new parts.**
- **Never reuse the airbag sensor assembly involved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**

1. INSTALL AIRBAG SENSOR ASSEMBLY

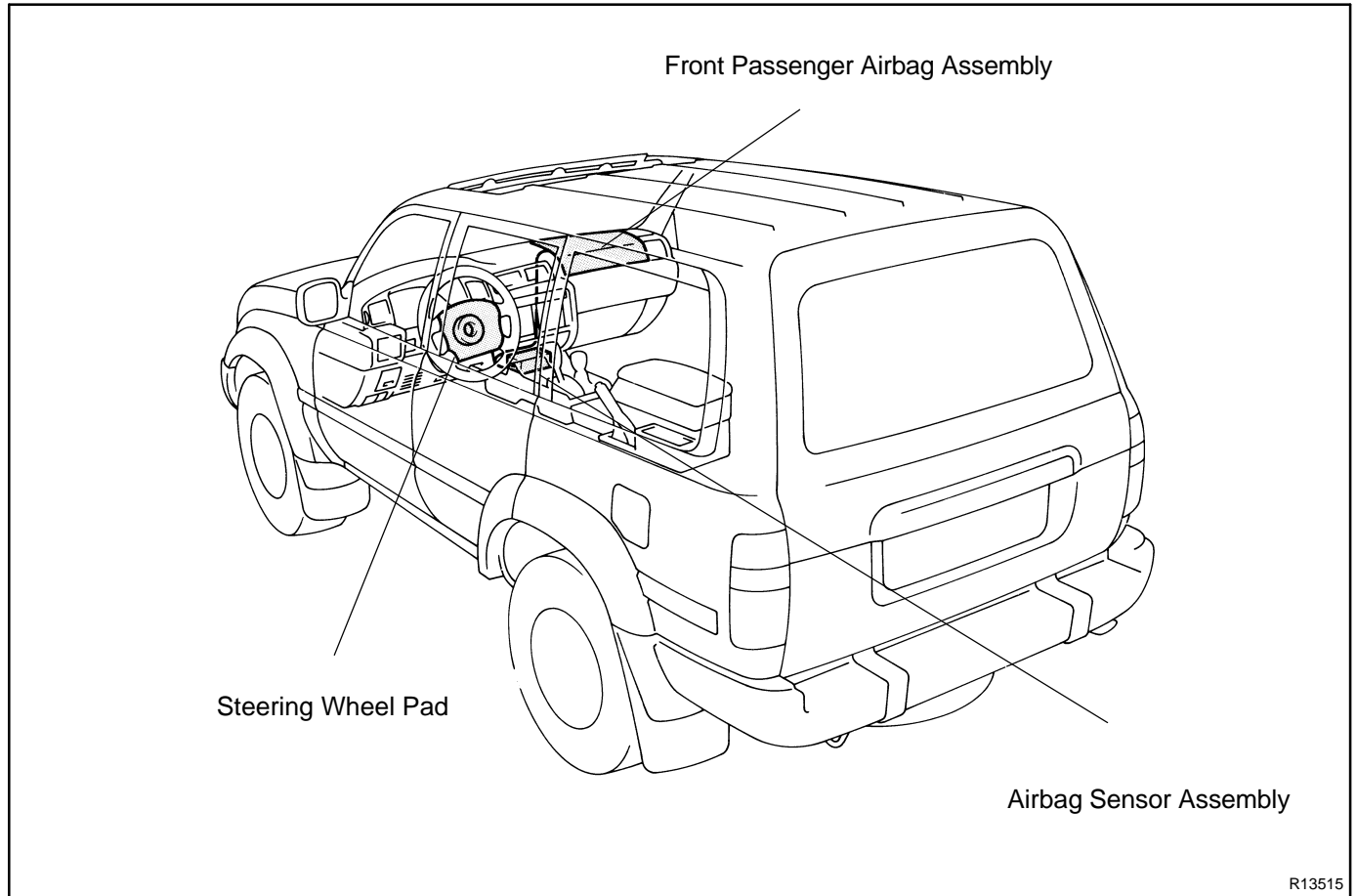
- (a) Using a torx wrench, install the airbag sensor assembly with the 4 screws.
Torx wrench: T40 (Part No. 09042-00020 or locally manufactured tool)
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
- (b) Connect the connector.

NOTICE:

- **Installation of the connector is done with the sensor assembly installed.**
 - **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, bracket or connector, replace the sensor assembly with a new one.**
 - **When installing the sensor assembly, take care that the SRS 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.**
- ### 2. INSTALL THE REMOVED PARTS

WIRE HARNESS AND CONNECTOR LOCATION

RS0PK-01



R13515

INSPECTION

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 black corrugated tube and all the connectors in the system are a standard yellow color.

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check (See page [DI-240](#)).

2. VEHICLES INVOLVED IN COLLISION

- (a) Do a diagnostic system check (See page [DI-240](#)).
- (b) Check for breaks in all wires of the SRS wire harness, and for exposed conductors.
- (c) Check to see if the SRS wire harness connectors are cracked or chipped.

REPLACEMENT

In the following cases, replace the wire harness or connector.

- If any part of the SRS wire harness or any connector has been found to be faulty in troubleshooting.
- If any part of the SRS wire harness or any connector has been found to be faulty during the check in items 2–(b) or (c).

NOTICE:

If the wire harness used in the SRS is damaged, replace the whole wire harness assembly.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SA1U7-01

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.

(w/ Differential locking system):

- Check that center differential lock mode is set.
- When switching differential Free↔Lock, the indicator lamp will blink if the gears of the differential lock sleeve are not meshed. If this occurs, when the tires are rotated to apply differential power to the differential, the differential locks and the indicator lamp light up.

Symptom	Suspect Area	See page
Wander/ pulls	1. Tires: worn or improperly inflated 2. Wheel alignment: incorrect 3. Steering linkage: loosen or worn 4. Hub bearings: loosen or worn 5. Steering gear: out of adjustment or broken	SA-3 SA-4 SR-47 SA-8 SR-41
Bottoming	1. Vehicle: overloaded 2. Spring weak 3. Shock absorber: worn out	– SA-49 SA-49
Sways/ pitches	1. Tires: worn or improperly inflated 2. Stabilizer bar: bent or broken 3. Shock absorber: worn out	SA-3 SA-60 SA-49
Front wheel shimmy	1. Tires: worn or improperly inflated 2. Wheels: out of balance 3. Shock absorber: worn out 4. Wheel alignment: incorrect 5. Hub bearings: loosen or worn 6. Steering linkage: loosen or worn 7. Steering gear: out of adjustment or broken	SA-3 SA-3 SA-49 SA-3 SA-7 SR-45 SR-38
Abnormal tire wear	1. Tires: worn or improperly inflated 2. Wheel alignment: incorrect 3. Suspension parts: worn out 4. Shock absorber: worn out	SA-3 SA-3 – SA-49
Noise in front differential	1. Oil level: low or wrong grade 2. Excessive backlash between pinion and ring gear 3. Ring, pinion to side gears: worn or chipped 4. Pinion shaft bearing: worn 5. Side bearing: worn 6. Differential bearing: loosen or worn	SA-21 SA-29 SA-29 SA-29 SA-29 SA-29
Oil leak from front differential	1. Oil level: too high or wrong grade 2. Drive pinion oil seal: worn or damaged 3. Side gear oil seal: worn or damaged 4. Companion flange: loosen or damaged 5. Side gear shaft: damaged	SA-21 SA-29 SA-29 SA-29 SA-29
Noise in rear axle	1. Oil level: low or wrong grade 2. Excessive backlash between pinion and ring gear 3. Ring, pinion to side gears: worn or chipped 4. Pinion shaft bearing: worn 5. Axle shaft bearing: worn 6. Differential bearing: loosen or worn	SA-73 SA-87 SA-87 SA-87 SA-87 SA-87
Oil leak from rear axle	1. Oil seal: worn or damaged 2. Rear axle housing: cracked	SA-73 –

SA-2

SUSPENSION AND AXLE – TROUBLESHOOTING

Oil leak from rear differential	1. Oil level: too high or wrong grade 2. Oil seal: worn or damaged 3. Companion flange: loosen or damaged	SA-73 SA-73 SA-87
Indicator lights do not light up	1. Fusible link: blown 2. GAUGE fuse: blown 3. Bulb: burned out 4. Wiring or ground: faulty	BE-9 BE-9 BE-32 –
Indicator lights do not light up (Diff. lock control switch RR or FR RR position)	1. DIFF fuse: blown 2. Diff. lock control switch: faulty 3. Diff. lock ECU: faulty 4. Wiring or ground: faulty	BE-9 SA-101 SA-101 –
Differential lock does not operate	1. Diff. lock position switch: faulty 2. Diff. lock actuator: faulty 3. Diff. lock ECU: faulty 4. Differential carrier (Diff. lock): faulty 5. Wiring or ground: faulty	SA-101 SA-101 SA-101 SA-101 –
After differential lock, lock not release When vehicle speed is higher than approx. 8 km/h (5mph)	1. Speed sensor: faulty 2. Diff. lock ECU: faulty 3. Wiring or ground: faulty	BE-32 SA-101 –

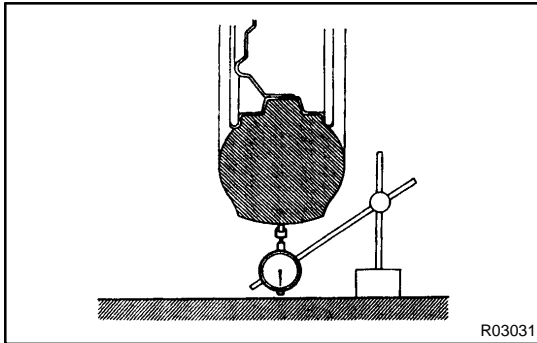
TIRE AND WHEEL INSPECTION

SA1U8-02

1. INSPECT TIRE

- (a) Check the tires for wear and for the proper inflation pressure.

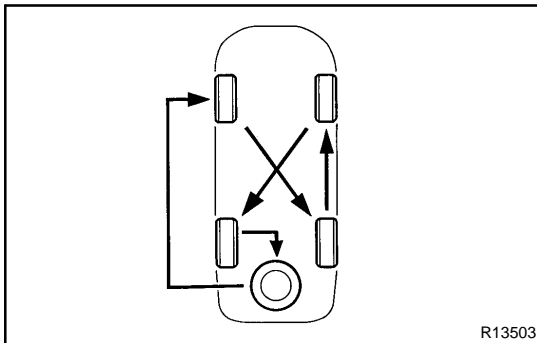
Cold tire inflation pressure: See page [SS-30](#)



R03031

- (b) Check the tire runout.

Tire runout: 3.0 mm (0.118 in.) or less

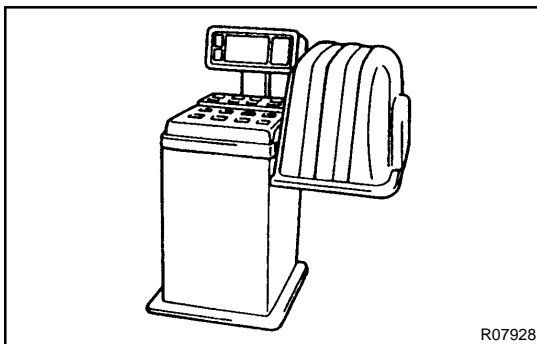


R13503

2. ROTATE TIRES

HINT:

See the illustration for where to rotate each tire.



R07928

3. 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: 13.0 g (0.029 lb) or less

4. CHECK WHEEL BEARING LOOSENESS

Check the no backlash in the bearing shaft direction.

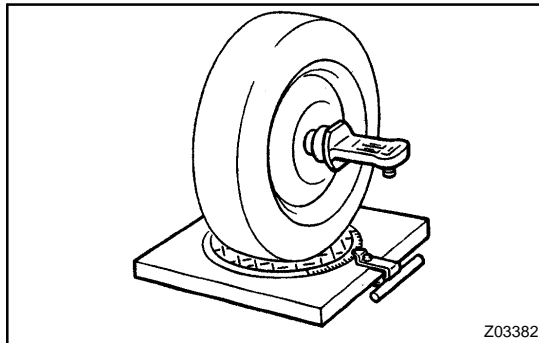
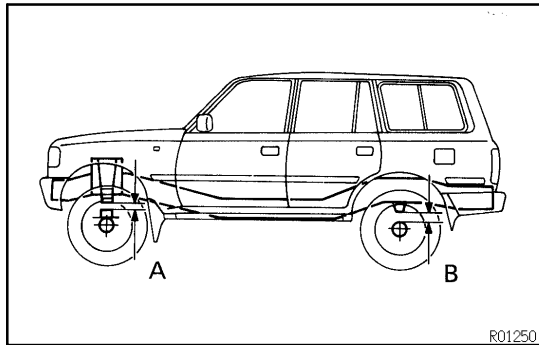
5. CHECK FRONT SUSPENSION FOR LOOSENESS

6. CHECK STEERING LINKAGE FOR LOOSENESS

7. CHECK BALL JOINT FOR LOOSENESS

8. CHECK SHOCK ABSORBER WORKS PROPERLY

- Check for oil leaks
- Check mounting bushings for wear
- Bounce front and rear of the vehicle



FRONT WHEEL ALIGNMENT INSPECTION

SA1U9-02

1. MEASURE VEHICLE HEIGHT

Clearance:

A (Follow spring clearance): 36 mm (1.42 in.)

B (Bumper stopper clearance): 104 mm (4.09 in.)

If the clearance of the vehicle is not standard, try to level the vehicle by rocking it down.

If still not correct, check for bad springs or suspension parts.

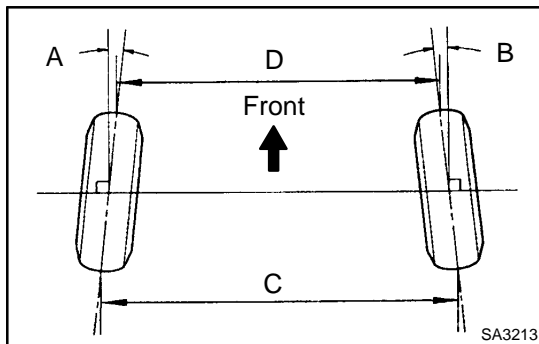
2. INSTALL CAMBER-CASTER-KINGPIN GAUGE OR ONTO WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION

Camber	$1^{\circ}00' \pm 45'$
Left-right error	45' or less
Caster	$3^{\circ}00' \pm 1^{\circ}$
Left-right error	45' or less
Steering axis inclination	$13^{\circ}00' \pm 45'$

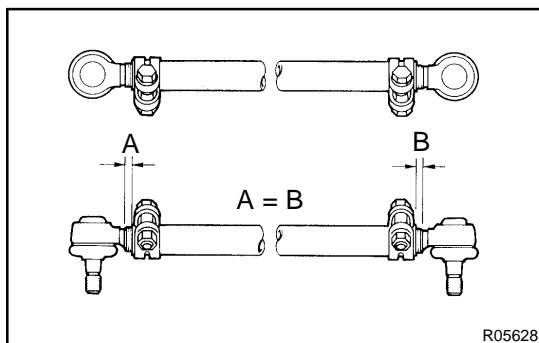
Camber, caster and steering axis inclination are not adjustable. If measurements are not within the specification, inspect the suspension parts for damaged and/or worn out parts and replace them as necessary.



4. INSPECT TOE-IN

Toe-in (total)	$A+B: 0.2^{\circ} \pm 0.2^{\circ}$ $C-D: 2 \pm 2 \text{ mm } (0.08 \pm 0.08 \text{ in.})$
----------------	--

If toe-in is not within the specification, adjust by the tie rod end.



5. ADJUST TOE-IN

(a) Loosen the clamp bolts and nuts.

(b) Adjust toe-in to the correct value by turning the tie rod.

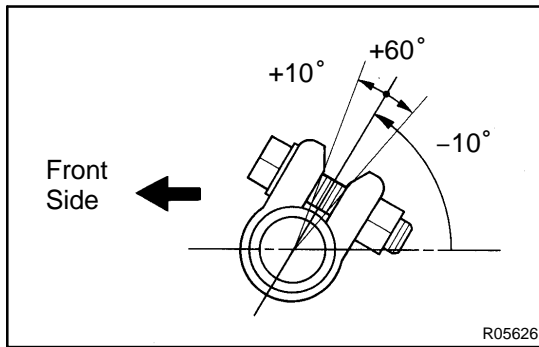
HINT:

Make sure that the lengths of the left and right tie rod ends are the same.

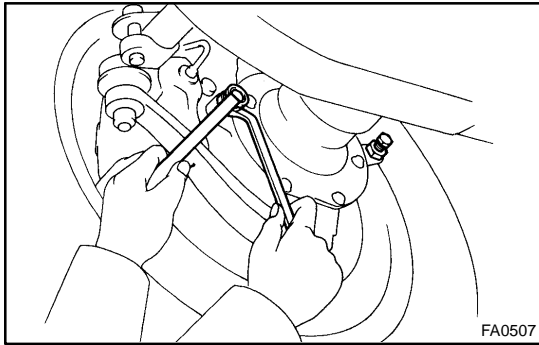
(c) Torque the clamp bolts and nuts.

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

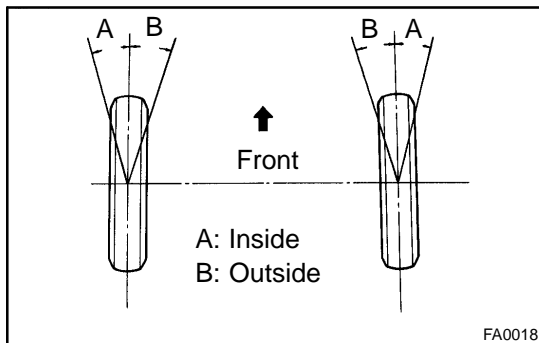
SUSPENSION AND AXLE – FRONT WHEEL ALIGNMENT

**HINT:**

The clamps opening must be positioned at the rear of the tie rod end face within $60^\circ \pm 10^\circ$ from the vehicle axis.

**6. INSPECT WHEEL ANGLE**

- (a) Remove the caps of the knuckle stopper bolts and check the steering angles.



- (b) Turn the steering wheel fully, and measure the turning angle.

Inside wheel	$32^\circ 00' - 35^\circ 00'$
Outside wheel	$31^\circ 00'$ (Reference)

HINT:

When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

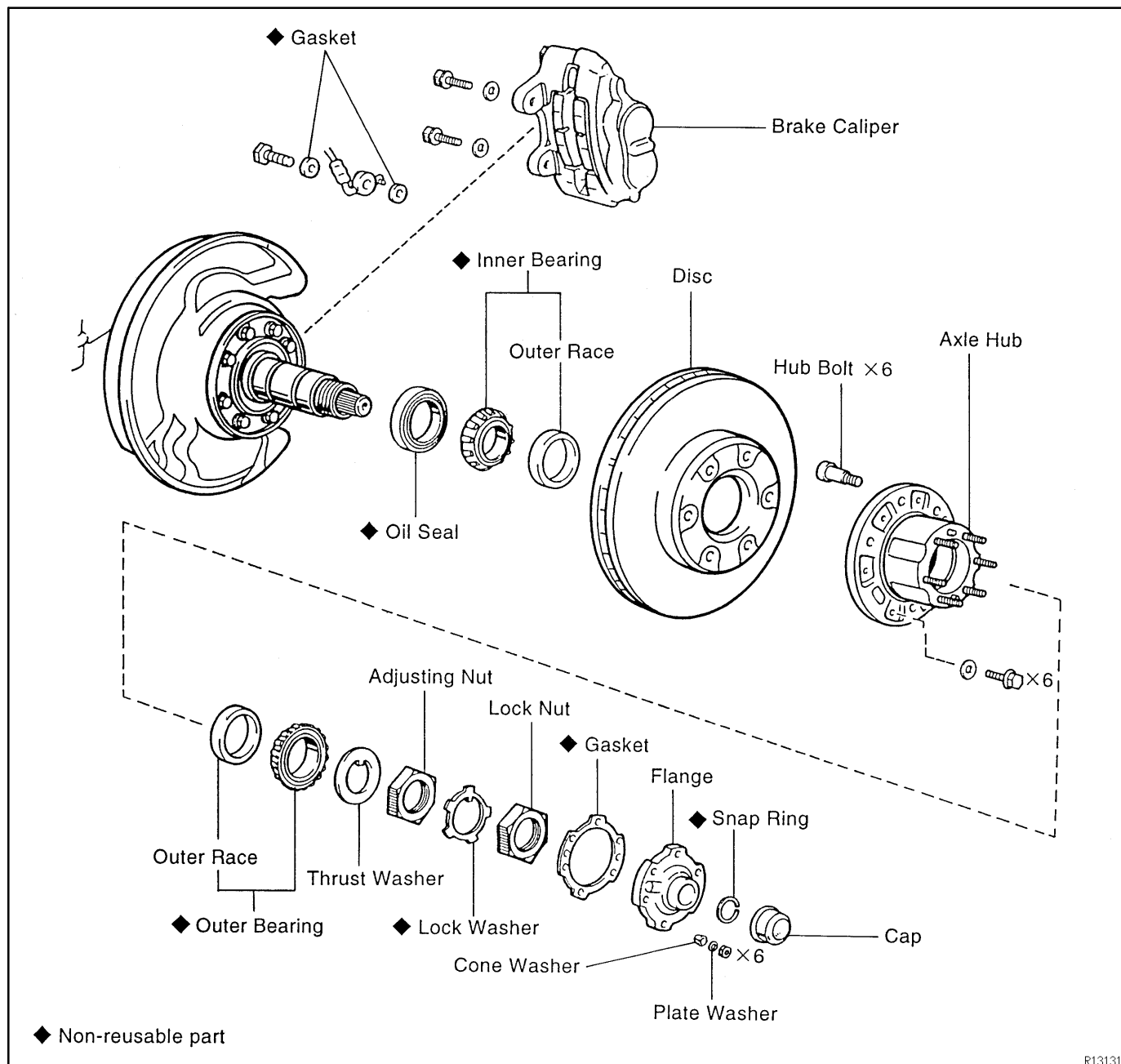
If maximum steering angles differ from the standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

FRONT AXLE HUB COMPONENTS

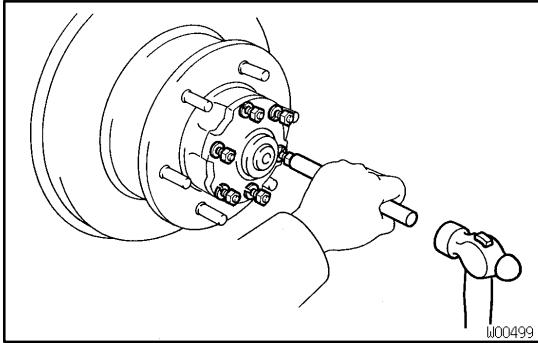
SA1UA-01



R13131

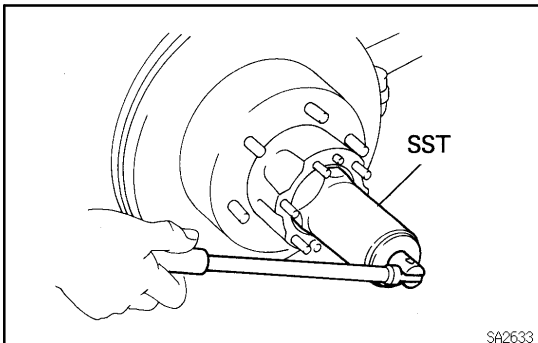
REMOVAL

1. REMOVE FRONT WHEEL
2. REMOVE BRAKE CALIPER (See page [BR-25](#))



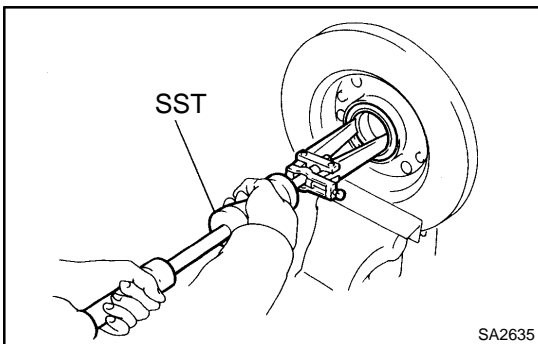
3. REMOVE FLANGE

- (a) Using a screwdriver and hammer, remove the grease cap from the flange.
- (b) Using a snap ring expander, remove the snap ring.
- (c) Loosen the 6 mounting nuts.
- (d) Using a brass bar and hammer, tap on the 6 bolts heads and remove the 6 cone washers, plate washers and nuts.
- (e) Remove the flange.
- (f) Remove the gasket.



4. REMOVE AXLE HUB WITH DISC

- (a) Using a screwdriver, release the lock washer.
- (b) Using SST, remove the lock nut.
SST 09607-60020
- (c) Remove the lock washer.
- (d) Using SST, remove the adjusting nut and thrust washer.
SST 09607-60020
- (e) Remove the hub and disc together with the outer bearing.

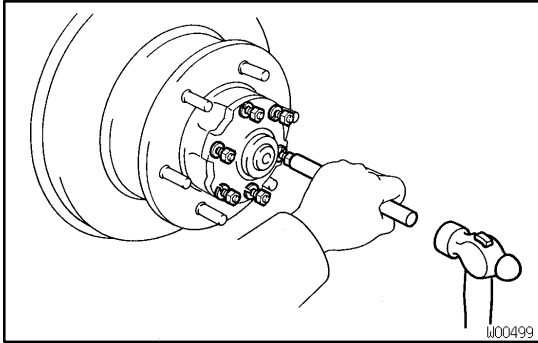


5. REMOVE OIL SEAL AND INNER BEARING

- (a) Using SST, remove the oil seal.
SST 09308-00010
- (b) Remove the inner bearing from the hub.

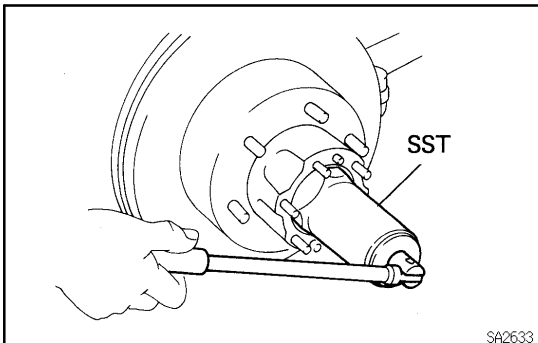
REMOVAL

1. REMOVE FRONT WHEEL
2. REMOVE BRAKE CALIPER (See page [BR-25](#))



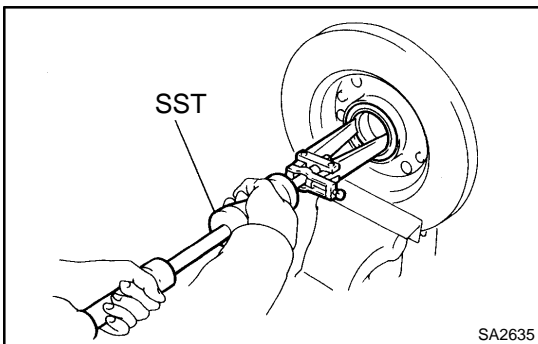
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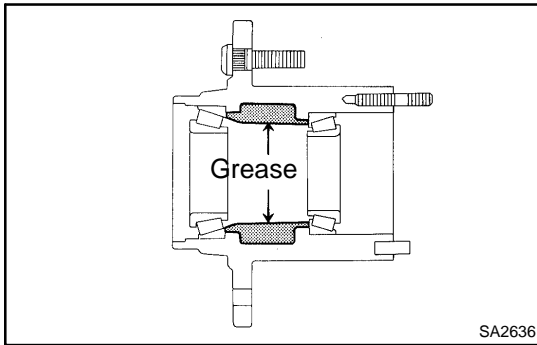
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SST 09607-60020
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SST 09607-60020
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SST 09308-00010
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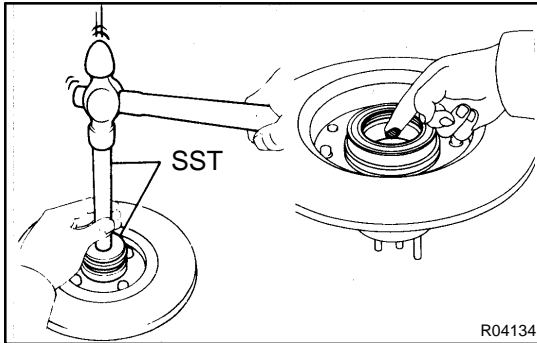


INSTALLATION

1. PACK BEARINGS WITH MP GREASE

- Place MP grease on the palm of your hand.
- Pack grease into the bearing until the grease oozes out from the other side.
- Do the same around the bearing circumference.

2. COAT INSIDE OF HUB WITH MP GREASE



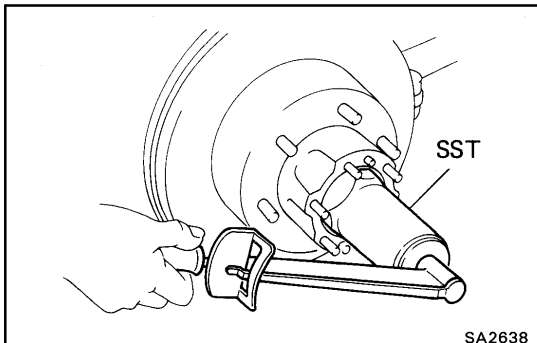
3. INSTALL INNER BEARING AND OIL SEAL

- Place the inner bearing into the hub.
- Using SST, install a new oil seal into the hub.
SST 09950-60020 (09951-00910),
09950-70010 (09951-07150)

- Coat the oil seal lip with MP grease.

4. INSTALL AXLE HUB WITH DISC TO SPINDLE

- Place the axle hub with disc to the spindle.
- Install the outer bearing.
- Install the thrust washer.



5. ADJUST PRELOAD

- Using SST, torque the adjusting nut.
SST 09607-60020

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

- Turn the hub right and left 2 or 3 times.

- Using SST, torque the adjusting nut.
SST 09607-60020

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

- Loosen the nut until it can be turned by hand.

- Using SST, torque the adjusting nut again.
SST 09607-60020

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

NOTICE:

Check that the bearing has no play.

- Using a spring tension gauge, measure the preload.

Preload (at starting):

28 – 56 N (2.9 – 5.7 kgf, 6.4 – 12.6 lbf)

6. INSTALL LOCK WASHER AND LOCK NUT

- Install a new lock washer and lock nut.

- Using SST, torque the lock nut.

SST 09607-60020

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

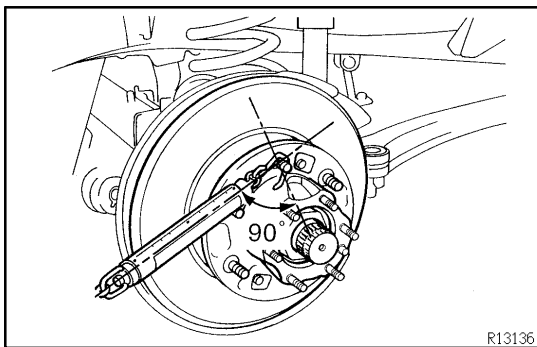
- Check that axle hub turns smoothly and that the bearing has no play.

- Using a spring tension gauge, check the preload.

Preload (at starting):

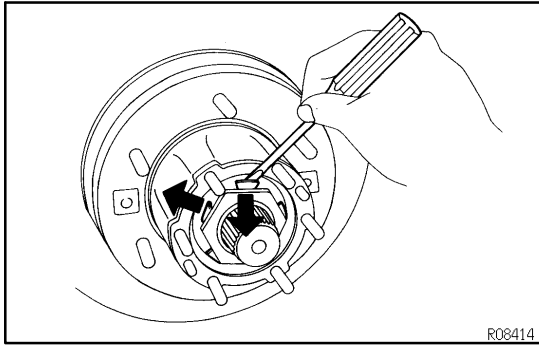
28–56 N (2.9–5.7 kgf, 6.4–12.6 lbf)

If it is not within the specification, adjust it with the adjusting nut after removing the lock washer and lock nut.



SA-10

SUSPENSION AND AXLE – FRONT AXLE HUB

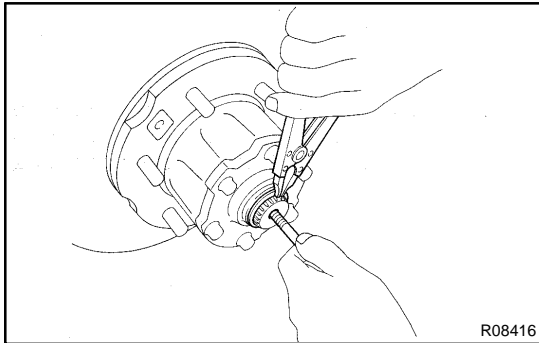


- (e) Secure the lock nut by bending one of the lock washer teeth inward and the other lock washer teeth outward.

7. INSTALL FLANGE

- (a) Place a new gasket in position on the axle hub.
 (b) Apply MP grease to the inner flange splines.
 (c) Install the flange to the axle hub.
 (d) Install the 6 cone washers, plate washers and nuts.
 (e) Torque the 6 nuts.

Torque: 35 N·m (360 kgf-cm, 26 ft-lbf)



- (f) Install the bolt in the axle shaft and pull it out.
 (g) Using a snap ring expander, install a new snap ring.
 (h) Remove the bolt.
 (i) Coat inside of the cap with MP grease.
 (j) Install the cap to the flange.

8. INSTALL BRAKE CALIPER (See page [BR-29](#))**9. INSTALL FRONT WHEEL**

Torque:

Steel wheel: 147 N·m (1,500 kgf-cm, 109 ft-lbf)

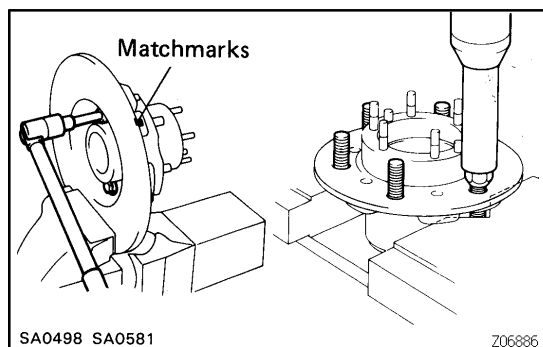
Alumimum wheel: 103 N·m (1,050 kgf-cm, 76 ft-lbf)

10. BLEED BRAKE LINE

FRONT WHEEL HUB BOLT REPLACEMENT

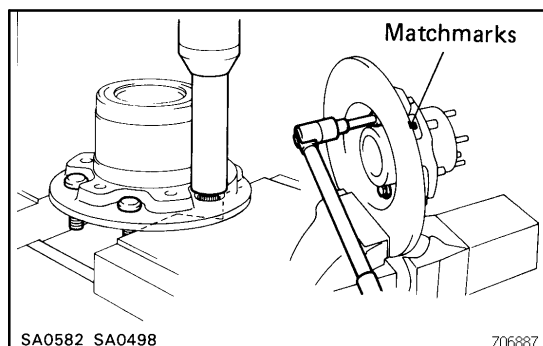
SA1UE-01

1. REMOVE FRONT AXLE HUB (See page SA-7)



2. REPLACE HUB BOLTS

- Place matchmarks on the axle hub and disc.
- Remove the 6 bolts and disc from the axle hub.
- Install the nut to the hub bolt.
- Using an extension bar and a press, remove the hub bolt.



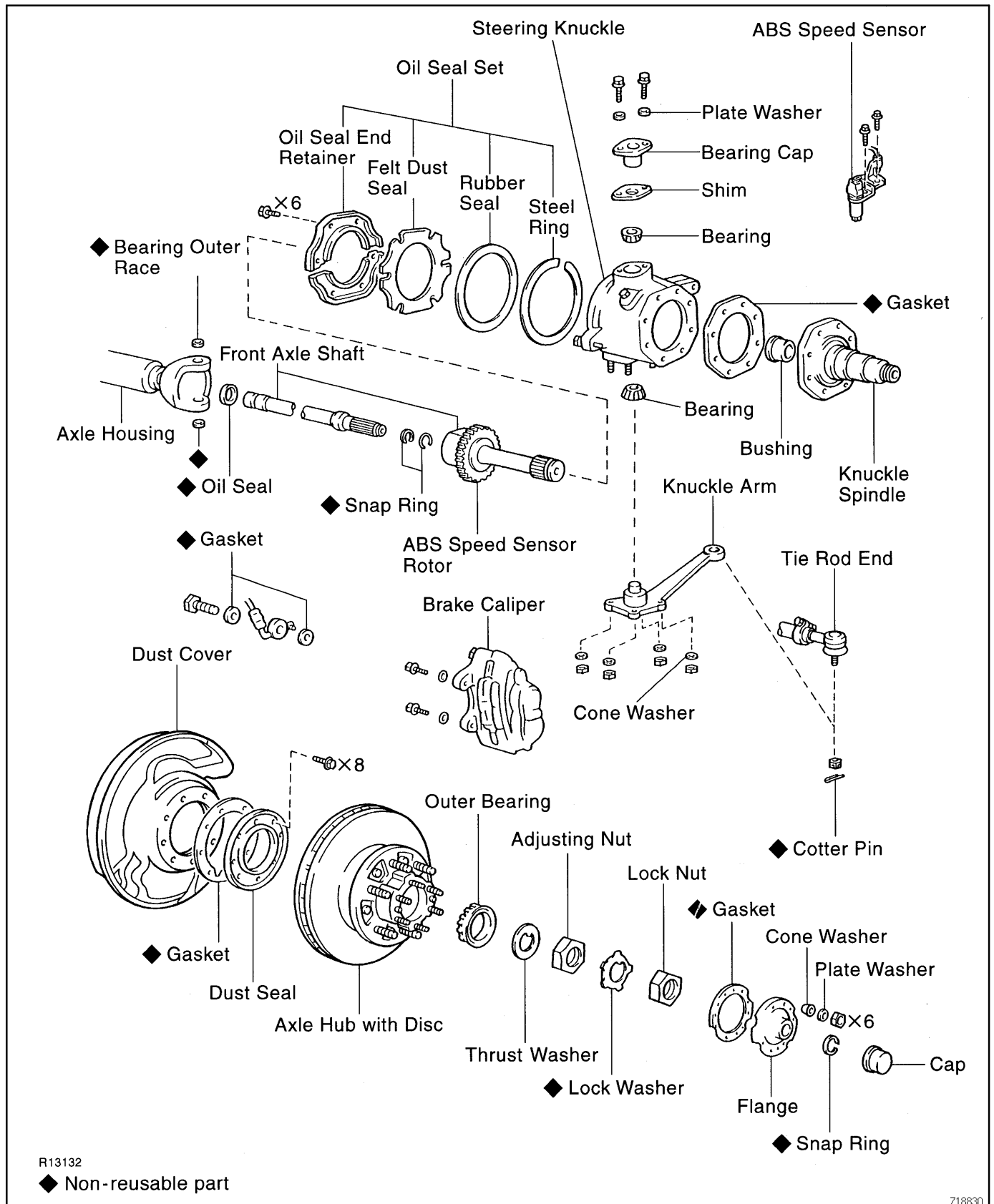
- Using an extension bar and press, install a new hub bolt.
- Align the matchmarks on the axle hub and disc.
- Install and torque the 6 bolts.

Torque: 64 N·m (650 kgf-cm, 47 ft-lbf)

3. INSTALL FRONT AXLE HUB (See page SA-9)

STEERING KNUCKLE AND AXLE SHAFT COMPONENTS

SA1UF-01

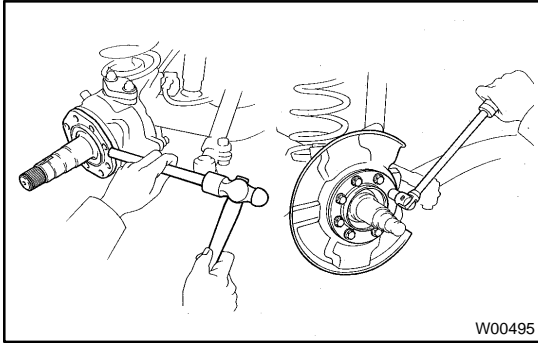


REMOVAL

1. REMOVE FRONT AXLE HUB (See page SA-7)

2. REMOVE ABS SPEED SENSOR

Remove the 2 bolts and disconnect the speed sensor from the steering knuckle.



W00495

3. REMOVE DUST SEAL AND DUST COVER

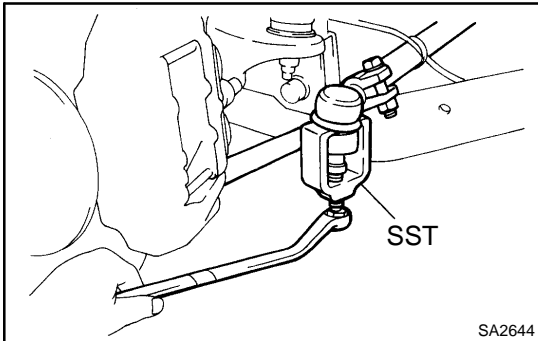
Remove the 8 bolts, dust seal, dust cover and gasket.

4. REMOVE KNUCKLE SPINDLE

- Using a brass bar and hammer, tap the knuckle spindle of the steering knuckle.
- Remove the knuckle spindle and gasket.

5. REMOVE AXLE SHAFT

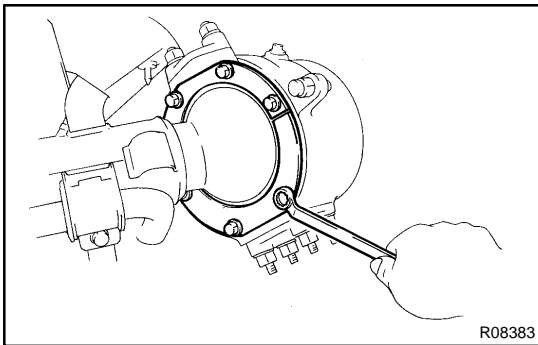
Position one flat part of the outer shaft upward and remove the axle shaft.



SA2644

6. DISCONNECT TIE ROD FROM KNUCKLE ARM

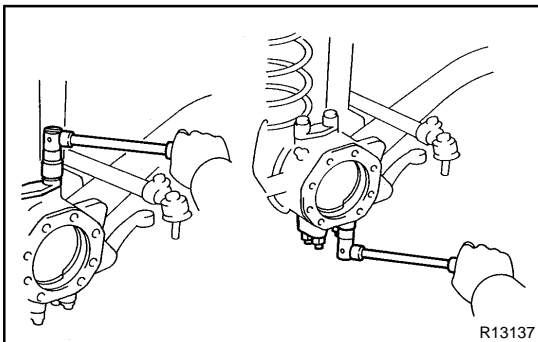
- Remove the cotter pin and nut.
- Using SST, disconnect the tie rod from the knuckle arm.
SST 09611-22012



R08383

7. REMOVE OIL SEAL SET

- Remove the 6 bolts from the end retainer.
- Remove these parts from the steering knuckle:
 - Oil seal end retainer
 - Felt dust seal
 - Rubber seal
 - Steel ring



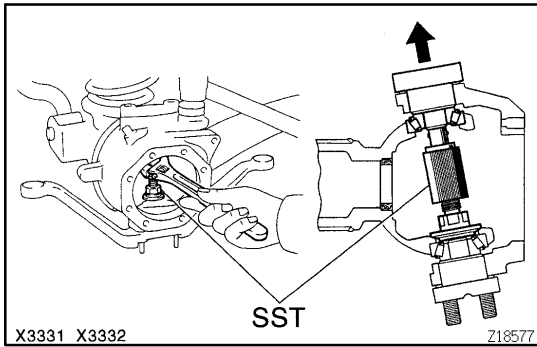
R13137

8. REMOVE KNUCKLE ARM AND BEARING CAP

- Remove the 2 bolts and plate washers from the bearing cap.
- Remove the 4 nuts from the knuckle arm.
- Using a brass bar and hammer, tap on the 4 bolts heads and remove the 4 cone washers.

SA-14

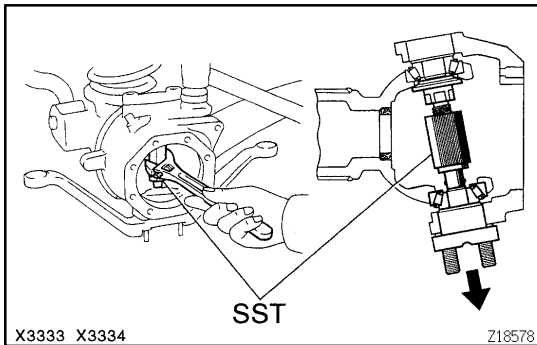
SUSPENSION AND AXLE - STEERING KNUCKLE AND AXLE SHAFT



- (d) Using SST, remove the bearing cap and shim from the steering knuckle.
SST 09606-60020

HINT:

- Use the SST without a collar.
- In some cases, to satisfy the standard value of preload, more than one shims are used.



- (e) Using SST, remove the knuckle arm and shim from the steering knuckle.
SST 09606-60020

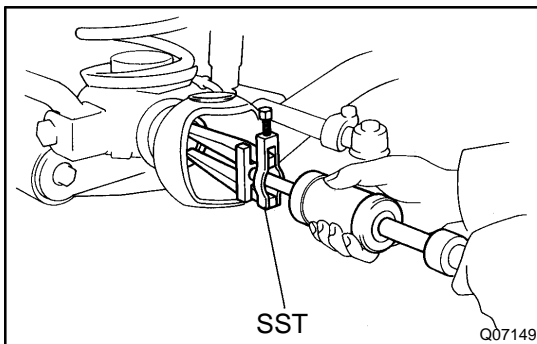
HINT:

- Use the SST without a collar.
- In some cases, to satisfy the standard value of preload, more than one shims are used.

9. REMOVE STEERING KNUCKLE AND BEARING

HINT:

Mark the removed adjusting shim and bearings so as to enable reassembling them to their proper positions.

**10. REMOVE OIL SEAL TO AXLE HOUSING**

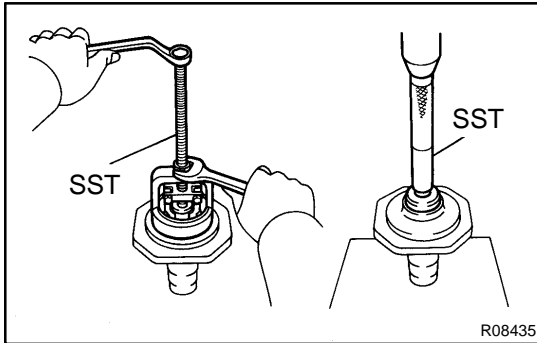
Using SST, remove the oil seal.

SST 09308-00010

REPLACEMENT

1. INSPECT KNUCKLE SPINDLE

Clean the knuckle spindle and inspect the bushing for wear or damage.

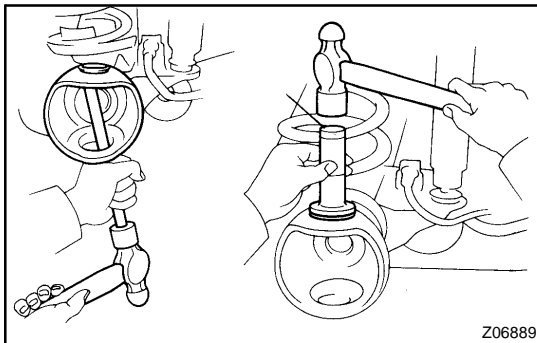


2. REPLACE BUSHING

- Using SST, remove the bushing.
SST 09612-65014 (09612-01010, 09612-01050)
- Using SST and a press, install a new bushing into the spindle.
SST 09618-60010

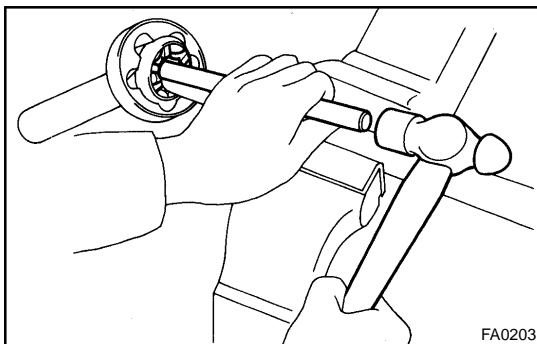
3. INSPECT BEARING

Clean the bearing and 2 outer races and inspect them for wear or damage.



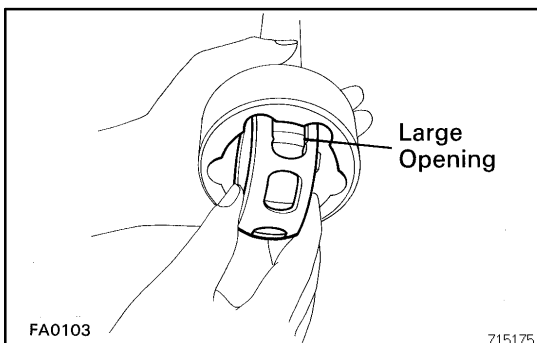
4. IF NECESSARY, REPLACE BEARING OUTER RACE

- Using a brass bar and hammer, remove the bearing outer race.
- Using SST and a hammer, carefully install a new bearing outer race.
SST 09605-60010

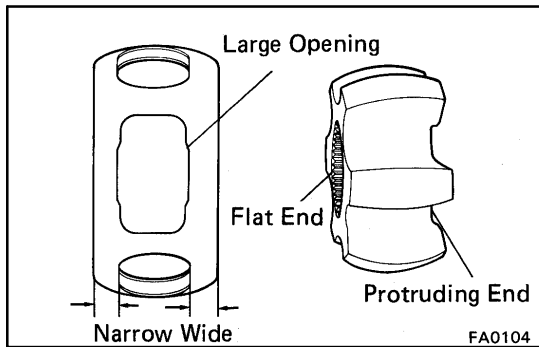


5. INSPECT BIRFIELD JOINT INNER PARTS

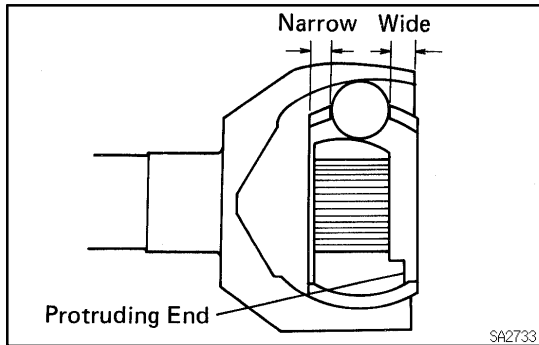
- Hold the inner shaft in a vise.
- Place a brass bar against the joint inner race and remove the outer shaft.
- Tilt the inner race and cage and take out the bearing balls one by one.



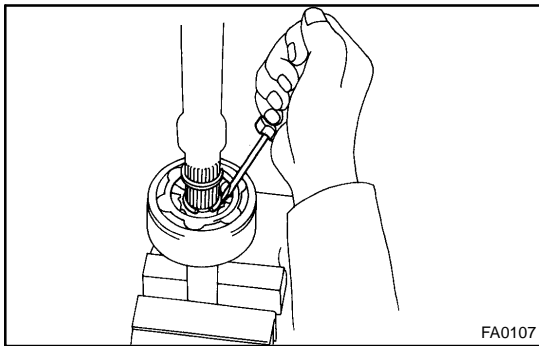
- Fit the 2 large openings in the cage against the protruding parts of the outer shaft and remove the cage and inner race.
- Remove the inner race from the cage through the large opening.
- Clean and inspect the joint parts for wear or damage.



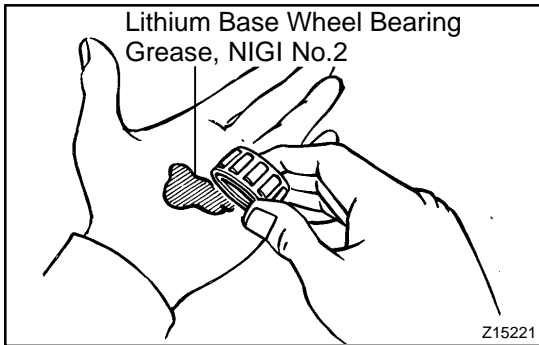
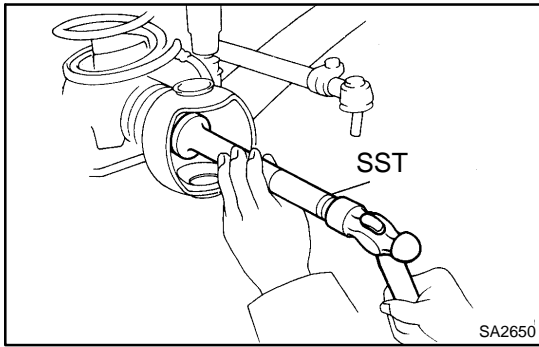
- (g) Coat the joint inner parts and outer shaft inside with molybdenum disulfide lithium base grease, NLGI No.2.
- (h) Install the inner race in the cage through the large opening.
- (i) Position the protruding end of the inner race toward the wide side of the cage.
- (j) Assemble the cage and inner race to the outer shaft by fitting the 2 large openings in the cage against the protruding parts of the outer shaft.



- (k) Make sure to position the wide side of the cage and the inner race protruding end outward.
- (l) Fit in the inner race and cage and install the 6 bearing balls in the outer shaft (See step (c)).
- (m) Pack molybdenum disulfide lithium base grease, NLGI No.2 in the outer shaft.
- (n) Install a new snap ring on the inner shaft.



- (o) Hold the outer shaft in a vise and while compressing the snap ring, install the inner shaft to the outer shaft.
- (p) Make sure that the inner shaft cannot be pulled out.



INSTALLATION

1. INSTALL OIL SEAL TO AXLE HOUSING

Using SST and a hammer, install a new oil seal into the axle housing.

SST 09618-60010

2. INSTALL OIL SEAL SET

Install these parts to the steering knuckle:

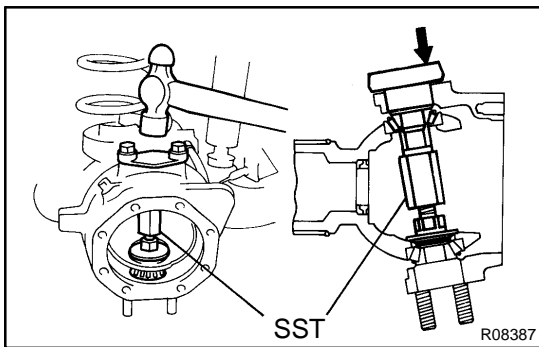
- Oil seal and retainer
- Felt dust seal
- Rubber seal and steel ring

3. PACK BEARINGS WITH LITHIUM BASE WHEEL BEARING GREASE, NLGI NO.2

- (a) Place lithium base wheel bearing grease, NLGI No.2 on your hand.
- (b) Pack grease into the bearing until the grease oozes out from the outer side.
- (c) Do the same around the bearing circumference.

4. INSTALL STEERING KNUCKLE AND BEARINGS

- (a) Place the bearings in positions on the knuckle and axle housing.
- (b) Install the knuckle on the axle housing.



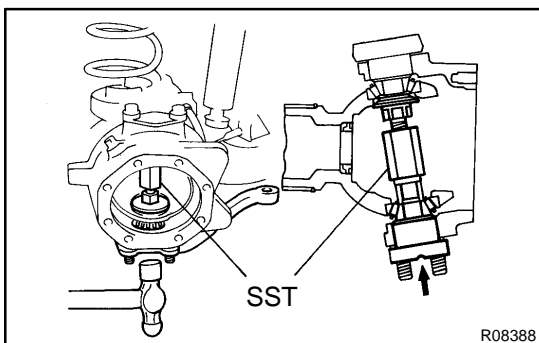
5. INSTALL KNUCKLE ARM AND BEARING CAP

- (a) Using SST, support the upper bearing inner race.
SST 09606-60020

HINT:

Use the SST with a collar.

- (b) Install the bearing cap over the shim that were originally used.
- (c) Using a hammer, install the bearing cap into the bearing inner race.



- (d) Using SST, support the lower bearing inner race.
SST 09606-60020

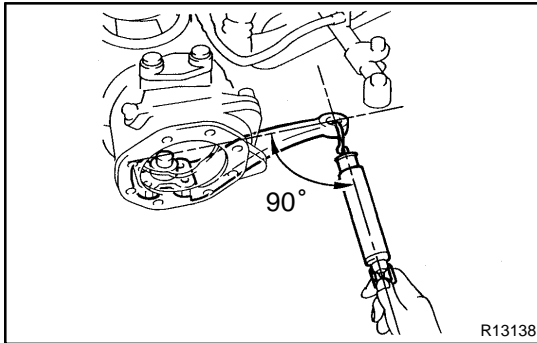
HINT:

Use the SST with a collar.

- (e) Using a hammer, tap the knuckle arm and shim into the bearing inner race.
- (f) Remove the SST from the knuckle.
- (g) Install the 4 cone washers and nuts.

Torque: 96 N·m (980 kgf-cm, 71 ft-lbf)

- (h) Install the 2 plate washers and bolts.
Torque: 96 N·m (980 kgf-cm, 71 ft-lbf)



6. MEASURE BEARINGS PRELOAD

Using a spring tension gauge, measure the preload.

Preload (at starting):

25 – 44 N (2.5 – 4.5 kgf, 5.6 – 9.9 lbf)

7. ADJUST BEARING PRELOAD

- (a) Remove the bearing cap and knuckle arm
 (See page [SA-13](#)).
 (b) Select the adjusting shim.

Adjusting shim thickness

Thickness mm (in.)	Thickness mm (in.)
0.1 (0.004)	0.5 (0.020)
0.2 (0.008)	1.0 (0.039)

- (c) Install the bearing cap and knuckle arm
 (See page [SA-17](#)).

8. CONNECT TIE ROD TO KNUCKLE ARM

Torque the nut and secure it with a new cotter pin.

Torque: 91 N·m (925 kgf-cm, 67 ft-lbf)

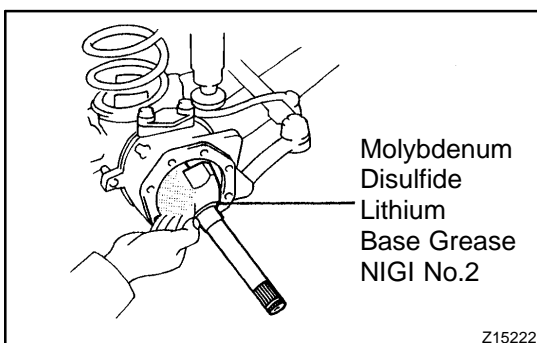
9. INSTALL OIL SEAL END RETAINER TO KNUCKLE ARM

Install the oil seal end retainer to steering knuckle with the 6 bolts.

Torque: 5.4 N·m (55 kgf-cm, 48 in.-lbf)

10. INSTALL AXLE SHAFT

Position one flat part of the outer shaft upward and install the shaft.



11. PACK MOLYBDENUM DISULFIDE LITHIUM BASE GREASE, NLGI NO.2

Pack molybdenum disulfide lithium base grease, NLGI No.2 into the knuckle to about 3 fourths of the knuckle.

12. INSTALL KNUCKLE SPINDLE, DUST COVER WITH GASKETS AND DUST SEAL

- (a) Place a new gasket in the position on the knuckle and install the spindle.
 (b) Place the dust cover, dust seal and a new gasket on the spindle.

- (c) Torque the 8 bolts.

Torque: 47 N·m (475 kgf-cm, 34 ft-lbf)

13. CONNECT ABS SPEED SENSOR

Connect the speed sensor and 2 bolts to the steering knuckle.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

14. INSTALL AXLE HUB (See page [SA-9](#))

15. CHECK FRONT WHEEL ALIGNMENT

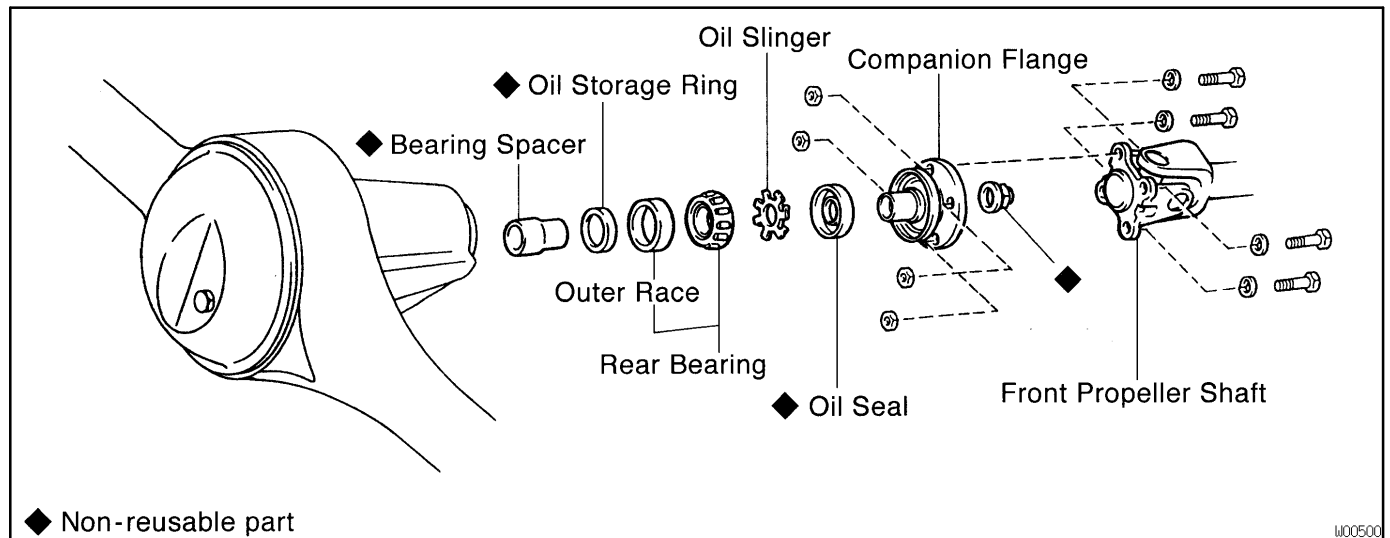
(See page [SA-4](#))

16. CHECK ABS SPEED SENSOR SIGNAL

(See page [DI-190](#))

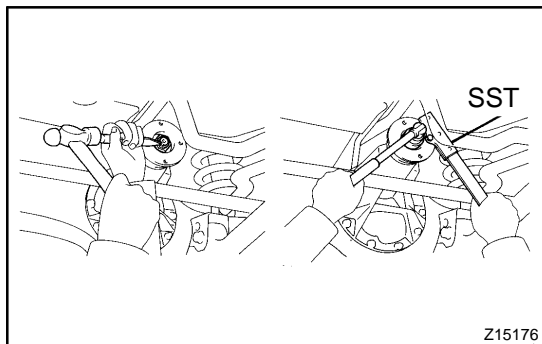
FRONT DIFFERENTIAL REAR OIL SEAL COMPONENTS

SA1UJ-01



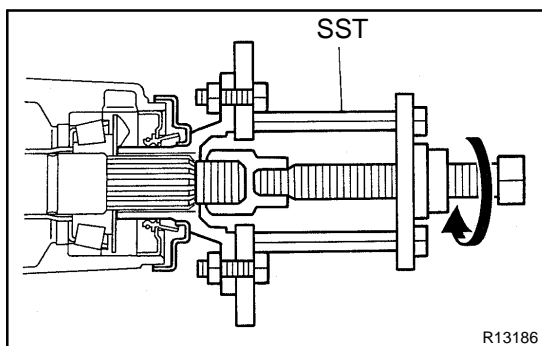
REPLACEMENT

1. DRAIN DIFFERENTIAL OIL
2. REMOVE FRONT PROPELLER SHAFT
(See page [PR-3](#))

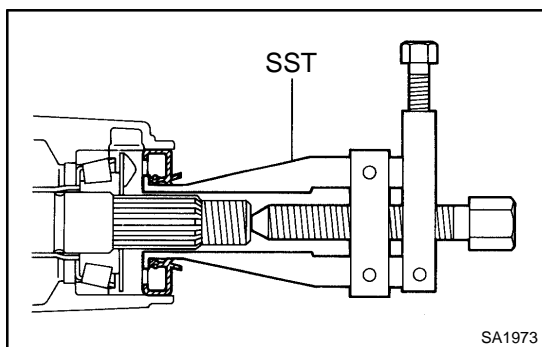


3. REMOVE COMPANION FLANGE

- (a) Using a chisel and hammer, loosen the staked part of the nut.
- (b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330-00021

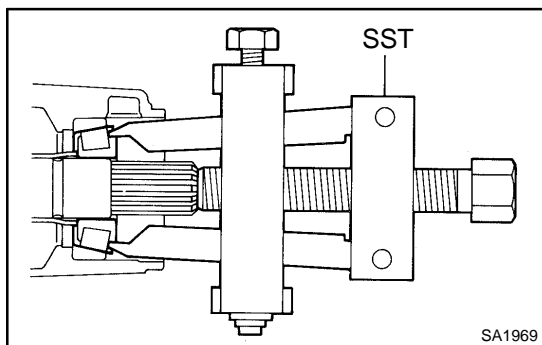


- (c) Using SST, remove the companion flange.
SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



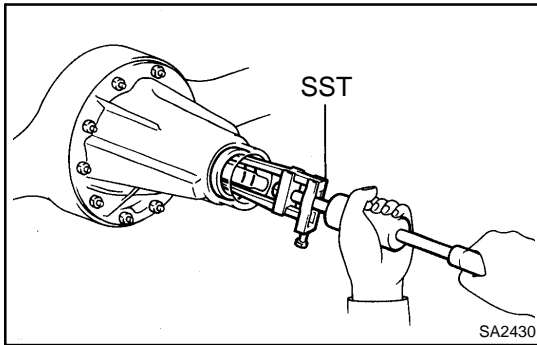
4. REMOVE OIL SEAL AND OIL SLINGER

- (a) Using SST, remove the oil seal.
SST 09308-10010
- (b) Remove the oil slinger.



5. REMOVE REAR BEARING

- Using SST, remove the rear bearing from the drive pinion.
SST 09556-22010

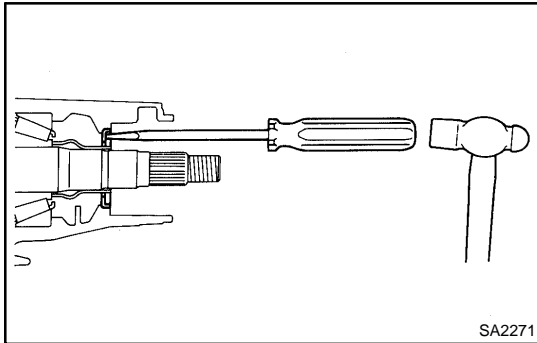
**6. REMOVE REAR BEARING OUTER RACE**

Using SST, remove the bearing outer race.

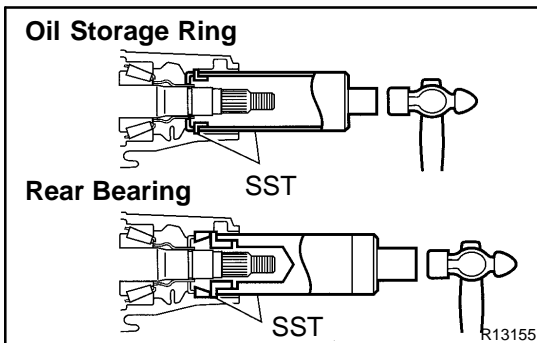
SST 09308-00010

NOTICE:

Do not scratch the taper surface of the outer race.

**7. REMOVE OIL STORAGE RING**

Using a screwdriver, bend the oil storage ring and drive it out.

8. REMOVE BEARING SPACER**9. INSTALL BEARING SPACER****10. INSTALL OIL STORAGE RING**

Using SST, install a new oil storage ring.

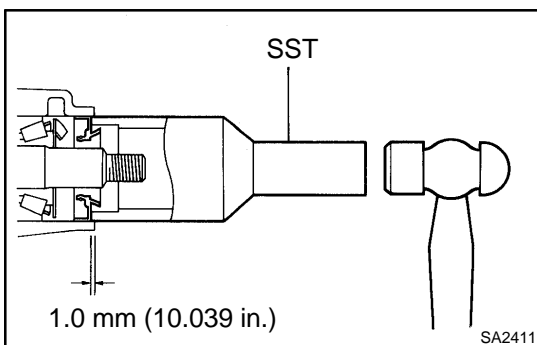
SST 09316-60011 (09316-00011, 09316-00021)

11. INSTALL REAR BEARING

(a) Using SST, install the bearing outer race.

SST 09316-60011 (09316-00011, 09316-00021)

(b) Install the rear bearing.

**12. INSTALL OIL SLINGER AND OIL SEAL**

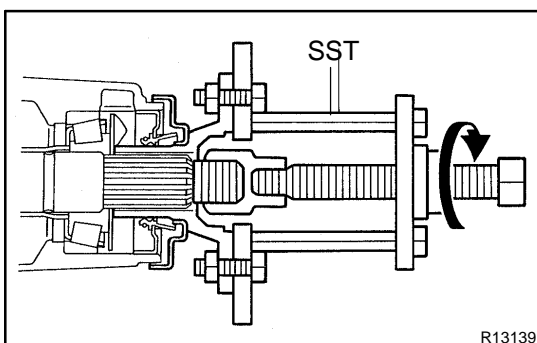
(a) Install the oil slinger.

(b) Using SST, install a new oil seal, as shown.

SST 09214-76011

Oil seal drive in depth: 1.0 mm (0.039 in.)

(c) Coat the lip of the oil seal with MP grease.

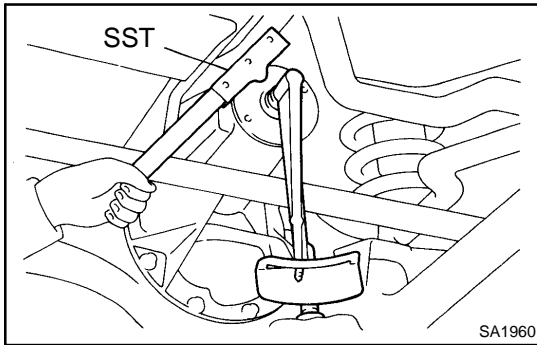
**13. INSTALL COMPANION FLANGE**

(a) Using SST, install the companion flange on the drive pinion.

SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

(b) Place the plate washer on the companion flange.

SUSPENSION AND AXLE – FRONT DIFFERENTIAL REAR OIL SEAL



- (c) Apply light coat of gear oil on threads of a new companion flange nut.

- (d) Using SST to hold the flange, torque the nut.

SST 09330-00021

Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)

14. ADJUST DRIVE PINION PRELOAD

(See page [SA-36](#))

15. STAKE DRIVE PINION NUT

16. INSTALL FRONT PROPELLER SHAFT
(See page [PR-5](#))

17. FILL DIFFERENTIAL WITH GEAR OIL

Torque: 49 N·m (500 kgf·cm, 39 ft·lbf)

Oil type: Hypoid gear oil API GL-5

Recommended oil viscosity:

Above -18°C (0°F) SAE 90

Below -18°C (0°F) SAE 80W-90 or 80W

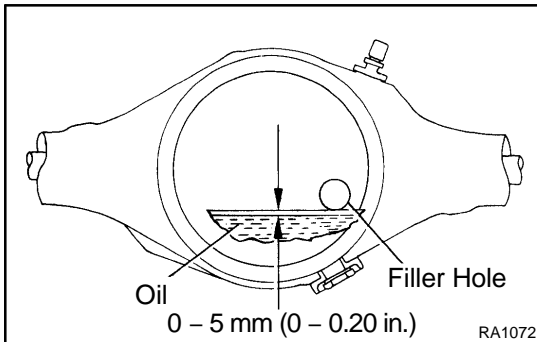
Capacity:

w/o Differential lock:

2.80 liters (2.9 US qts, 2.5 Imp. qts)

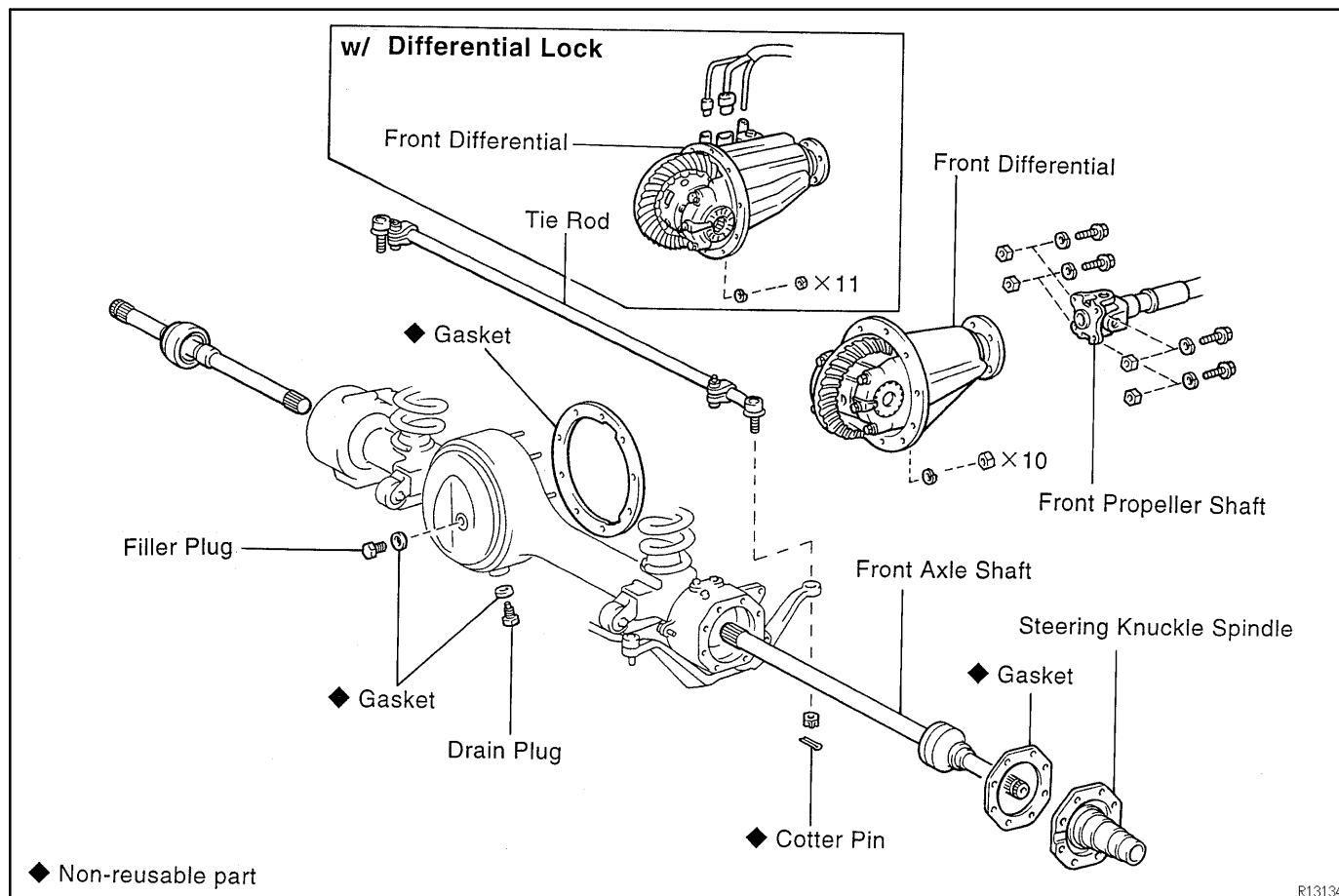
w/ Differential lock:

2.65 liters (2.8 US qts, 2.3 Imp. qts)



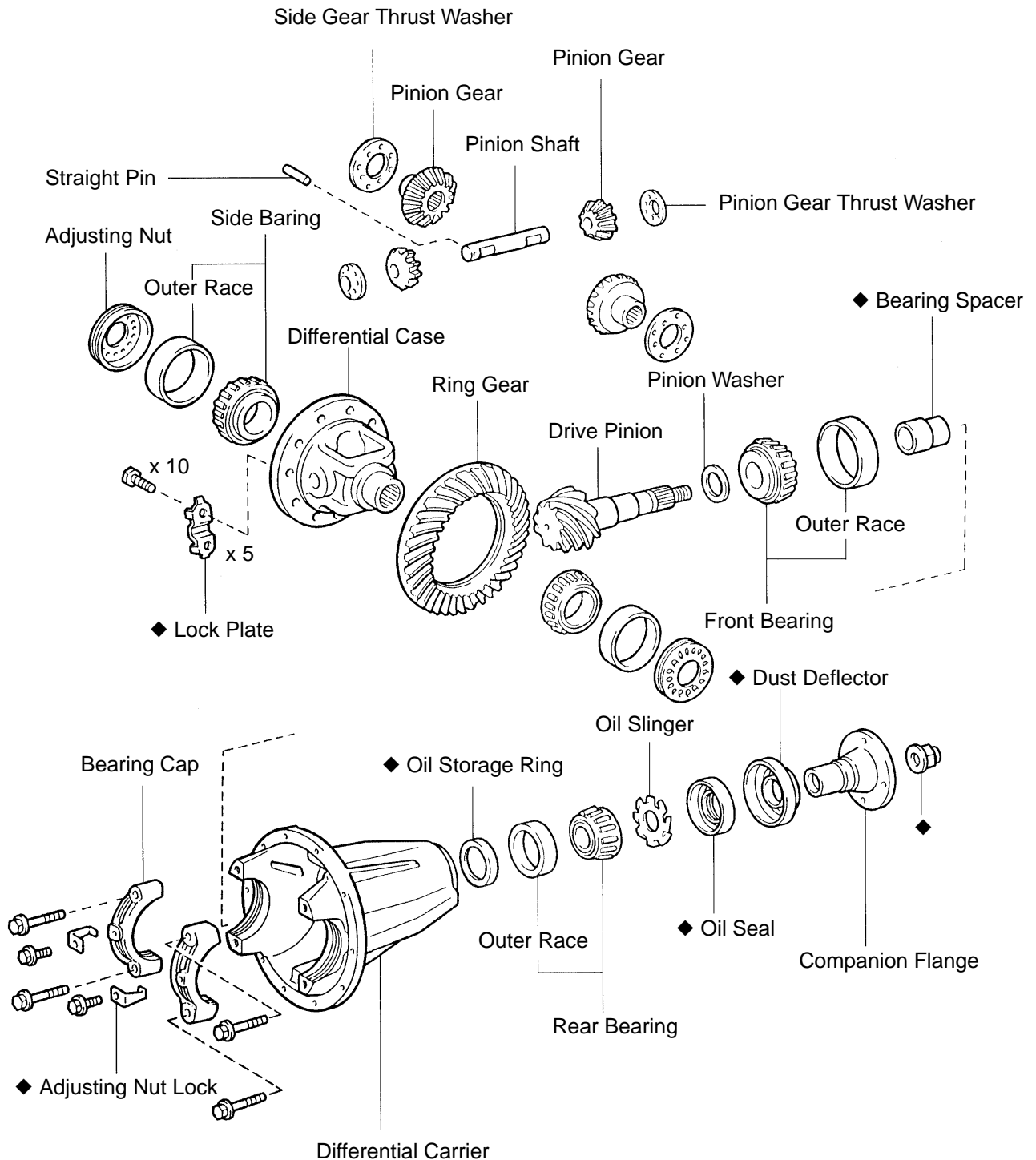
FRONT DIFFERENTIAL CARRIER COMPONENTS

SA1UL-01



SUSPENSION AND AXLE - FRONT DIFFERENTIAL CARRIER

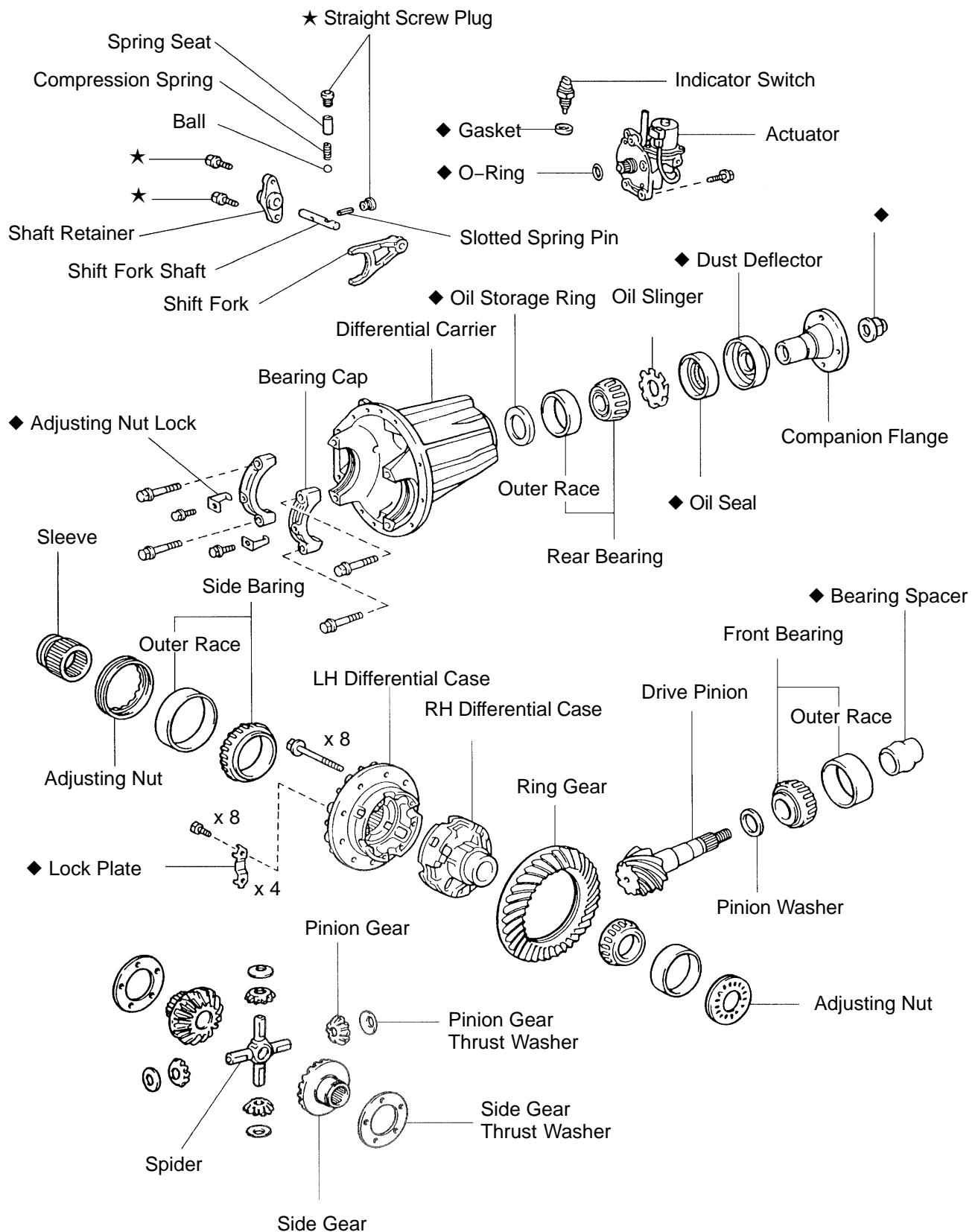
w/o Differential Lock



◆ Non-reusable part

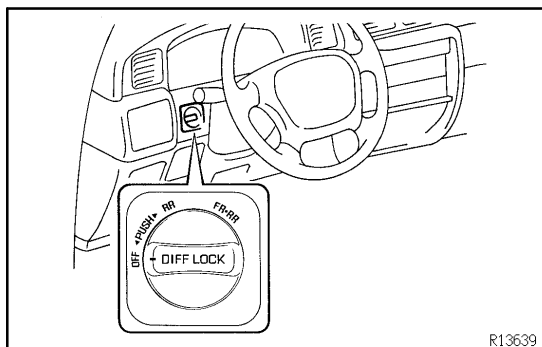
W00530

w/ Differential Lock



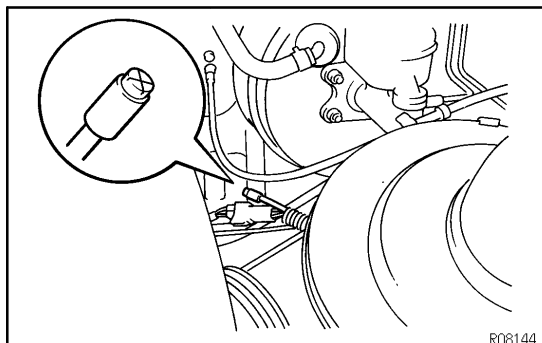
◆ Non-reusable part
 ★ Precoated part

W00531



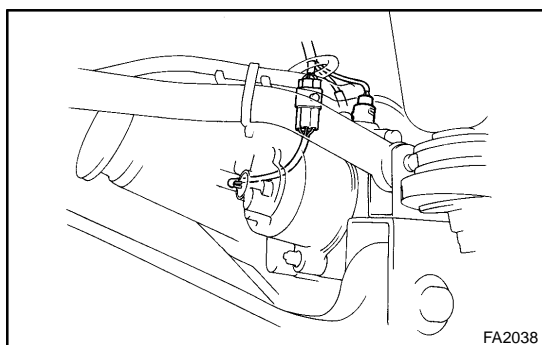
REMOVAL

1. **w/ DIFFERENTIAL LOCK:**
BEFORE REMOVAL, SHIFT FRONT DIFFERENTIAL TO LOCK
 - (a) Turn the ignition switch to the ON position.
 - (b) Keep the center differential lock condition.
 - (c) Turn the differential lock control switch to the FR/RR position and lock the front differential.
 - (d) Rotating the tires, check they are in the differential lock condition.



- (e) Disconnect the cable from the negative terminal of the battery.

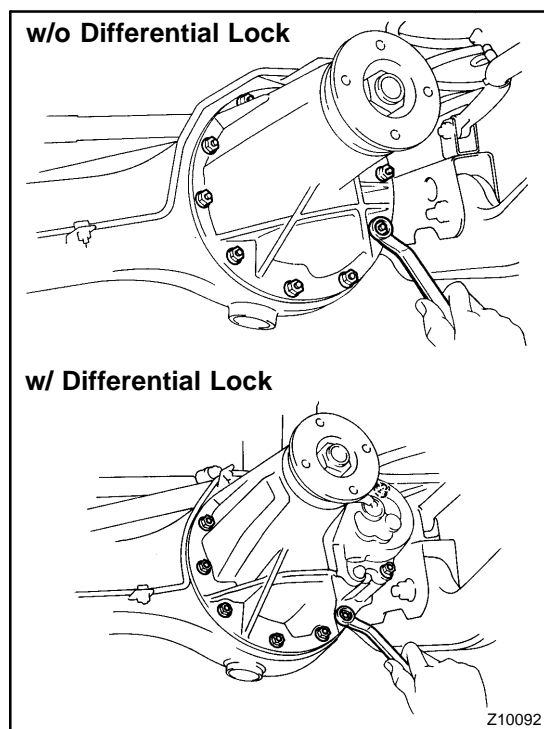
2. **DRAIN DIFFERENTIAL OIL**
3. **REMOVE FRONT AXLE SHAFTS** (See page [SA-13](#))



4. **REMOVE TIE ROD FROM KNUCKLE ARM**
(See page [SA-13](#))
5. **REMOVE FRONT PROPELLER SHAFT**
(See page [PR-3](#))
6. **w/ DIFFERENTIAL LOCK:**
DISCONNECT CONNECTORS AND TUBE

HINT:

- When connecting the tube of the harness side to the hose of the actuator side, its depth of insertion is 15 mm (0.59 in.).
- Take care that water or equivalent does not adhere to the connector and hose.

**7. REMOVE DIFFERENTIAL CARRIER ASSEMBLY**

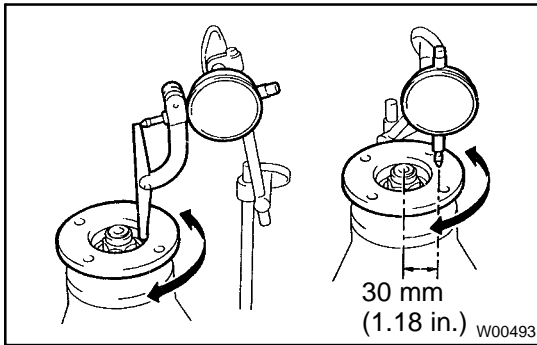
- (a) Remove the 10 nuts, washers and differential carrier assembly.

NOTICE:

Be careful not to damage the installation surface.

Torque: 27 N·m (280 kgf-cm, 20 ft-lbf)

- (b) Remove the gasket.

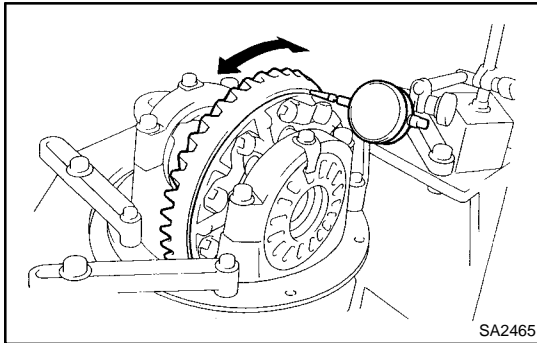


DISASSEMBLY

1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum runout: 0.10 mm (0.0039 in.)

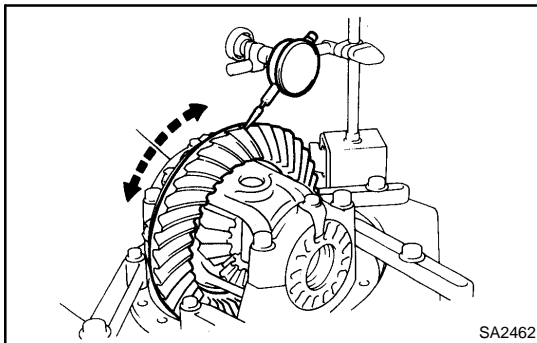


2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.10 mm (0.0039 in.)

If the runout is greater than the maximum, replace the ring gear and driven pinion as a set.

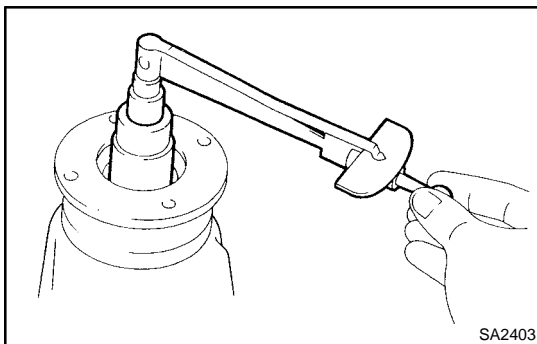


3. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13–0.18 mm (0.0051–0.0071 in.)

If the backlash is not within the specification, adjust the side bearing preload or repair as necessary.



4. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of backlash between the drive pinion and ring gear.

Preload (at starting):

0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)

5. CHECK TOTAL PRELOAD

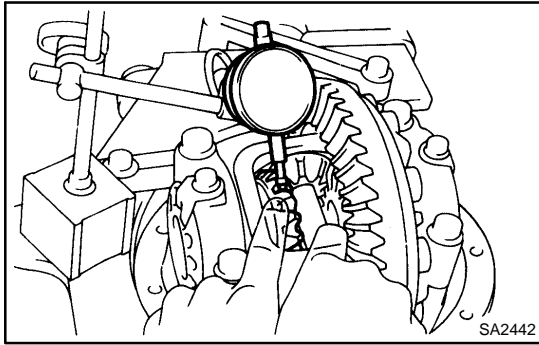
Using a torque wrench, measure the preload.

Total preload (at starting):

Drive pinion preload plus

0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

If necessary, disassemble and inspect the differential.



**6. w/o DIFFERENTIAL LOCK:
CHECK SIDE GEAR BACKLASH**

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install the correct thrust washers (See page [SA-35](#)).

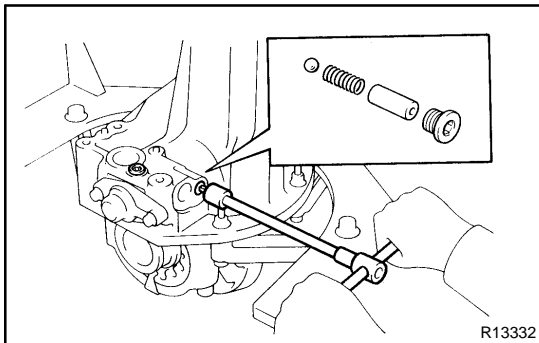
**7. CHECK TOOTH CONTACT BETWEEN RING GEAR
AND DRIVE PINION (See page [SA-35](#))**

**8. w/ DIFFERENTIAL LOCK:
REMOVE ACTUATOR**

- (a) Remove the bolt and actuator from the differential carrier.
- (b) Remove the O-ring.

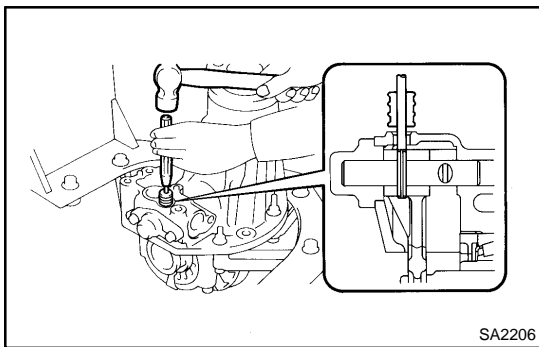
**9. w/ DIFFERENTIAL LOCK:
REMOVE INDICATOR SWITCH**

Remove the indicator switch and gasket.

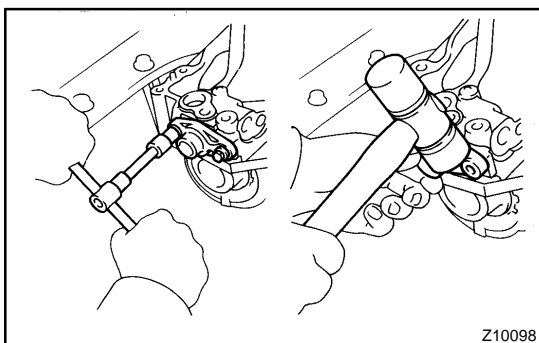


**10. w/ DIFFERENTIAL LOCK:
REMOVE SHIFT FORK SHAFT**

- (a) Using a hexagon wrench, remove the 2 straight screw plugs.
- (b) Remove the spring seat, compression spring and ball.



- (c) Using a pin punch and hammer, remove the slotted spring pin.

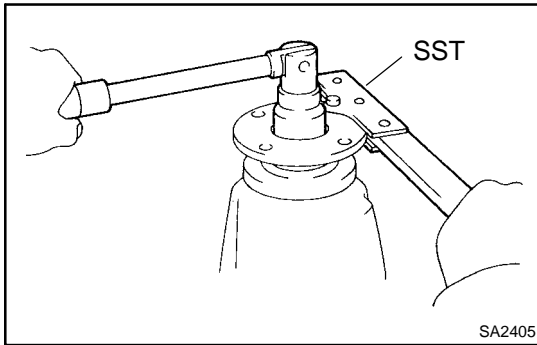


- (d) Remove the 2 bolts from the shaft retainer.
- (e) Using a plastic hammer, tap out the shaft retainer.
- (f) Remove the shift fork shaft.

HINT:

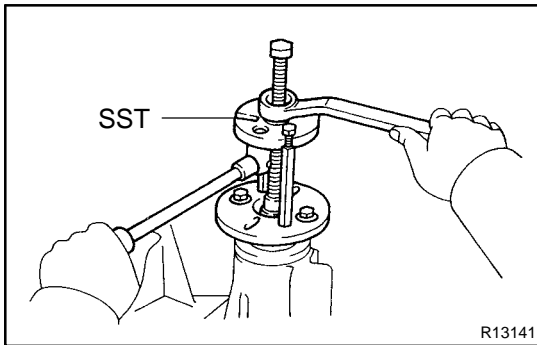
Pull out the shift fork shaft with a screwdriver turned round.

SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER

**11. REMOVE COMPANION FLANGE**

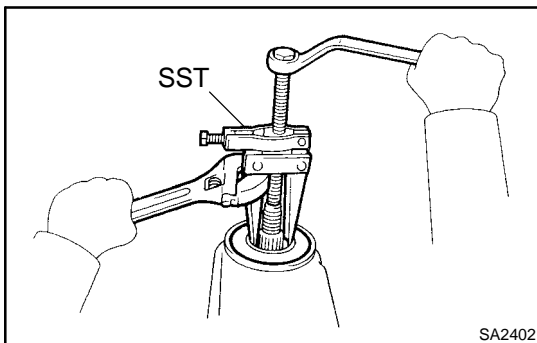
- (a) Using a chisel and hammer, unstake the nut.
- (b) Using SST to hold the flange, remove the nut and plate washer.

SST 09330-00021



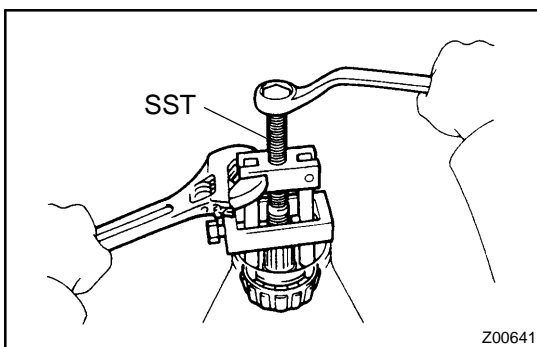
- (c) Using SST, remove the companion flange.

SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

**12. REMOVE OIL SEAL AND OIL SLINGER**

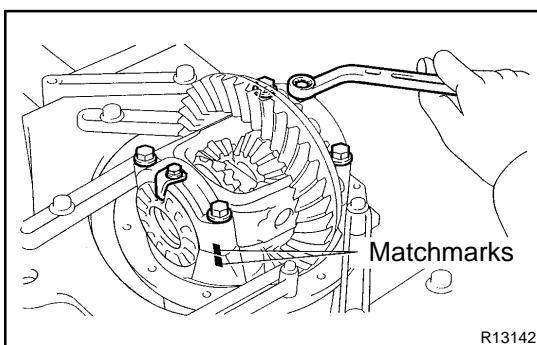
- (a) Using SST, remove the oil seal from the differential carrier.
- (b) Remove the oil slinger.

SST 09308-10010

**13. REMOVE REAR BEARING**

Using SST, remove the rear bearing from the drive pinion.

SST 09556-22010

**14. REMOVE DIFFERENTIAL CASE**

- (a) Place matchmarks on the bearing cap and differential carrier.
- (b) Remove the 2 adjusting nut locks.
- (c) Remove the 4 bolts and 2 bearing caps.
- (d) w/o Differential lock:
Remove the 2 adjusting nuts.
- (e) w/o Differential lock:
Remove the differential case with the side bearing outer races from the carrier.

HINT:

Tag the disassembled parts to show the location for reassembly.

- (f) w/ Differential lock:

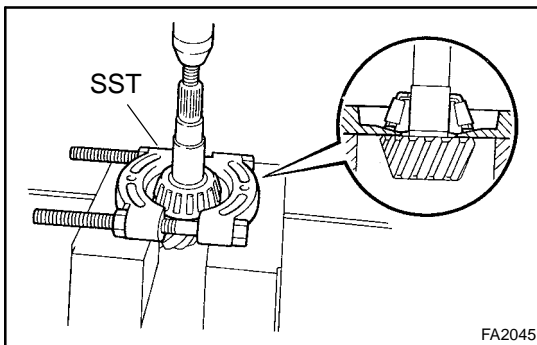
Remove the differential case with the side bearing outer race, adjusting nuts and sleeve from the differential carrier.

- (g) w/ Differential lock:

Remove the shift fork.

15. REMOVE DRIVE PINION AND BEARING SPACER

- (a) Remove the drive pinion with the front bearing.
(b) Remove the bearing spacer.

**16. REMOVE DRIVE PINION FRONT BEARING**

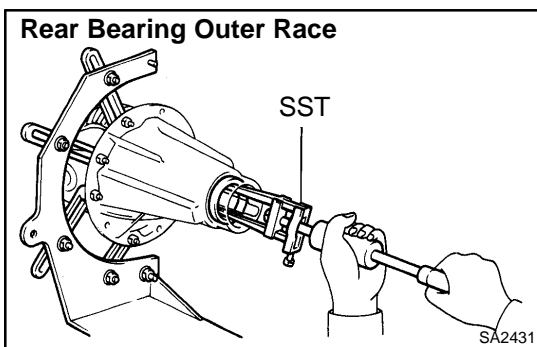
- (a) Using SST and a press, remove the bearing from the drive pinion.

SST 09950-00020

HINT:

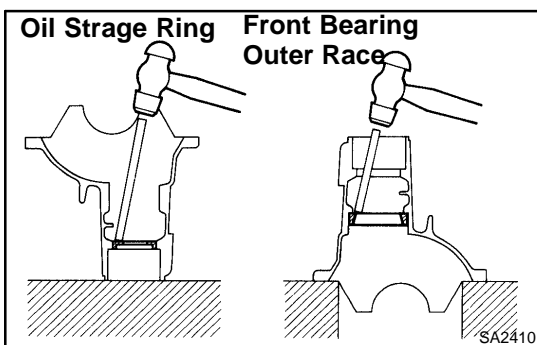
If the drive pinion or ring gear are damaged, replace them as a set.

- (b) Remove the plate washer from the drive pinion.

**17. REMOVE FRONT AND REAR BEARING OUTER RACES AND OIL STORAGE RING**

- (a) Using SST, remove the rear bearing outer race.

SST 09308-00010

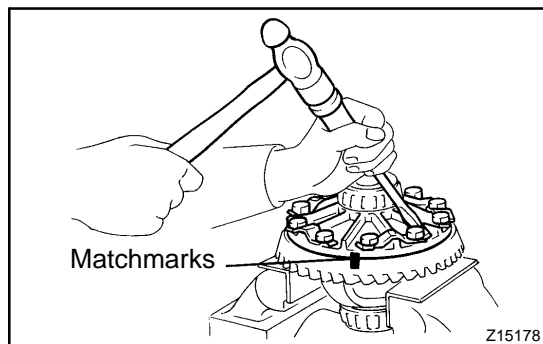


- (b) Using a brass bar and hammer, remove the oil storage ring and front bearing outer race.

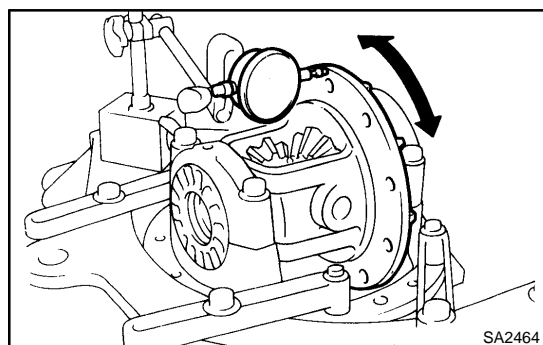
HINT:

Do not remove the oil storage ring unless replacing it with a new one.

SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER

**18. REMOVE RING GEAR**

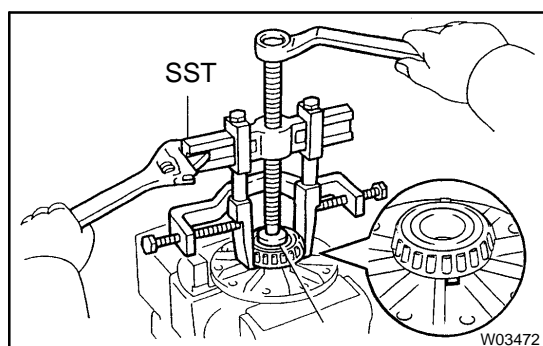
- Using a screwdriver and hammer, unstake the lock plate.
- Place matchmarks on the ring gear and differential case.
- Remove the ring gear 10 set bolts and 5 lock plates.
- Using a plastic hammer, tap on the ring gear to separate it from the differential case.

**19. CHECK DIFFERENTIAL CASE RUNOUT**

- Install the differential case in the differential carrier and tighten the adjusting nut just to where there is no play in the bearing.
- Using a dial indicator, measure the differential case run-out.

Maximum case runout: 0.07 mm (0.0028 in.)

- Remove the differential case.

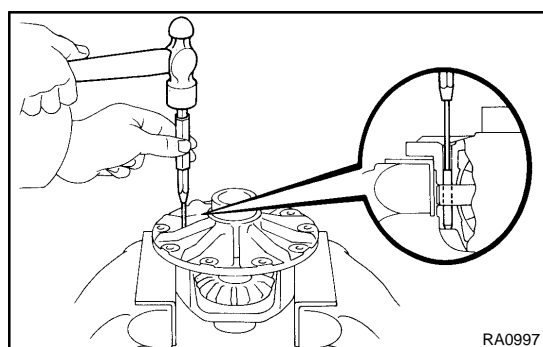
**20. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE**

Using SST, pull the side bearing from the differential case.

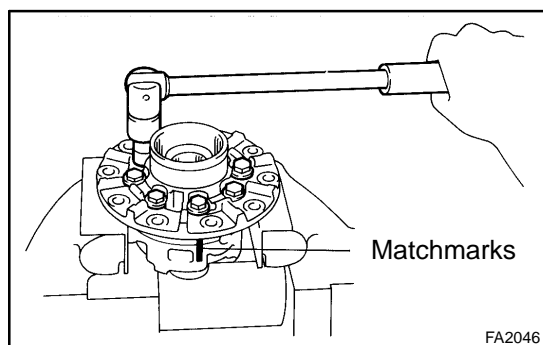
SST 09950-40010 (09951-04010, 09952-04020, 09953-04020, 09954-04010, 09955-04010, 09957-04010, 09958-04010), 09950-60010 (09951-00480)

HINT:

Fix the claws of SST to the notches in the differential case.

**21. w/o DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

- Using a pin punch and hammer, remove the straight pin.
- Remove these parts from the differential case:
 - Pinion shaft
 - 2 Pinion gears
 - 2 Pinion gear thrust washers
 - 2 Side gears
 - 2 Side gear thrust washers

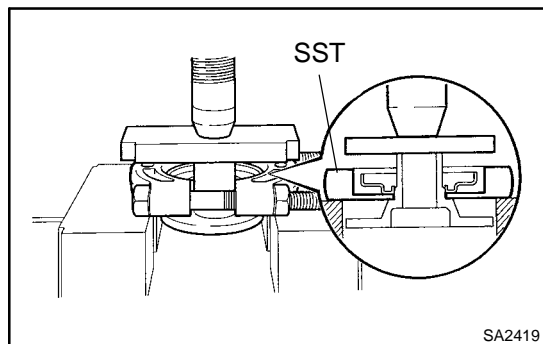
**22. w/ DIFFERENTIAL LOCK: DISASSEMBLE DIFFERENTIAL CASE**

- Place matchmarks on the LH and RH cases.
- Remove the 8 bolts uniformly, a little at a time.
- Using a plastic hammer, separate the LH and RH cases.
- Remove these parts from the RH differential case:
 - 2 Side gears
 - 2 Side gear thrust washers
 - Spider

SA-34

SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER

- 4 Pinion gears
- 4 Pinion gear thrust washers

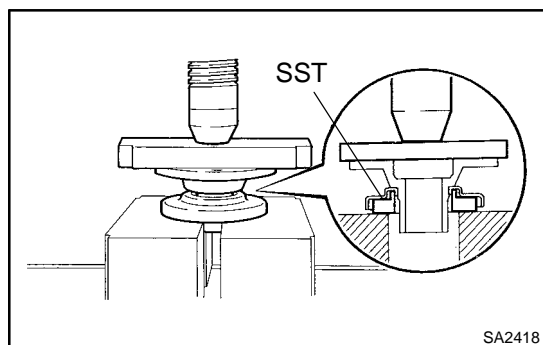


REPLACEMENT

1. REMOVE DUST DEFLECTOR TO COMPANION FLANGE

Using SST and a press, remove the dust deflector.

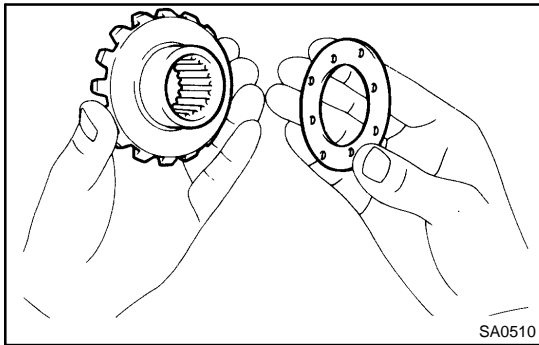
SST 09950-00020



2. INSTALL DUST DEFLECTOR TO COMPANION FLANGE

Using SST and a press, install a new dust deflector.

SST 09726-40010



REASSEMBLY

1. w/o DIFFERENTIAL LOCK:

ASSEMBLE DIFFERENTIAL CASE

- (a) Apply all of the sliding and rotating surfaces with gear oil.
- (b) Install the 2 thrust washers and side gears.
Using the table below, select the thrust washers which will ensure that the backlash is within the specification.
Try to select washers of the same size for both sides.

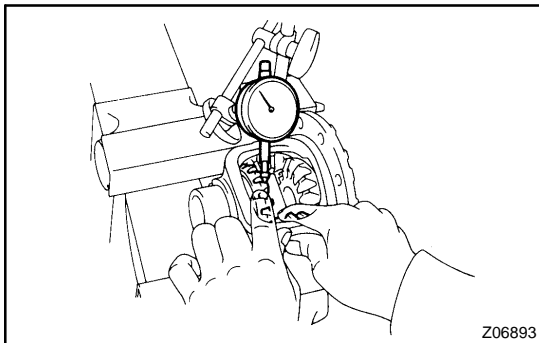
Thrust washer thickness

Thickness mm (in.)	Thickness mm (in.)
1.60 (0.063)	.80 (0.071)
1.70 (0.067) ¹	–

- (c) Install the 2 side gears with the side gears thrust washers, 4 pinion gears, pinion gear thrust washers and pinion shaft.

HINT:

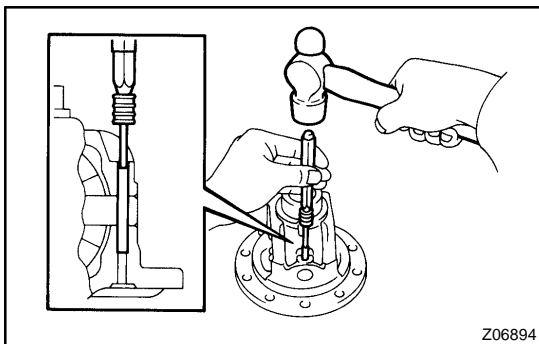
Align the hole for the pinion shaft with the case hole.



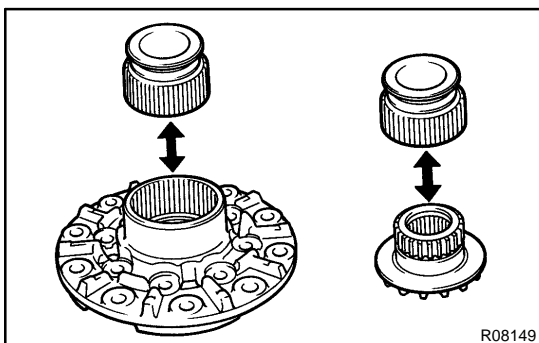
- (d) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install a thrust washer of different thickness.



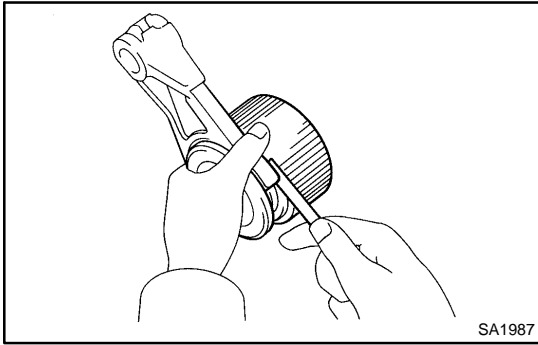
- (e) Using a pin punch and hammer, install the straight pin through the holes in the differential case and pinion shaft.
- (f) Using a chisel and hammer, stake the out side of the differential case pin hole.



2. w/ DIFFERENTIAL LOCK:

INSPECT SLEEVE

- (a) Install the sleeve to the differential case (LH) and check it moves smoothly.
- (b) Install the sleeve to the side gear check it moves smoothly.

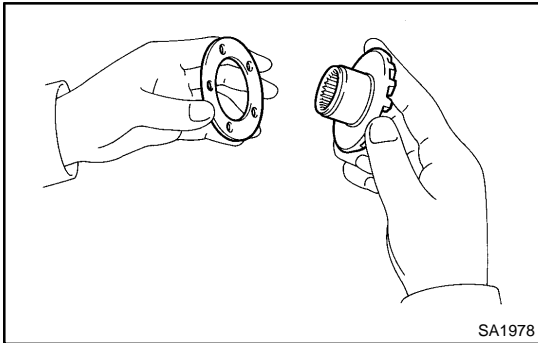


**3. w/ DIFFERENTIAL LOCK:
MEASURE CLEARANCE OF SHIFT FORK AND SLEEVE**

Using a feeler gauge, measure the clearance between the shift fork and sleeve.

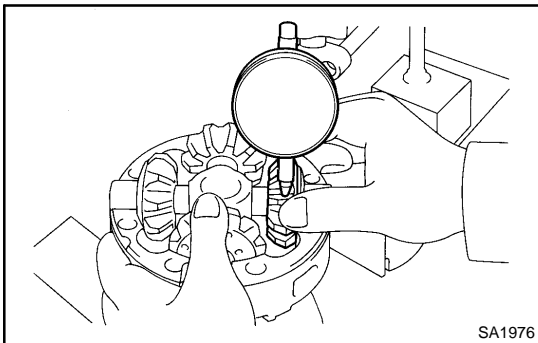
Clearance:

0.15 – 0.35 mm (0.006 – 0.014 in.)



**4. w/ DIFFERENTIAL LOCK:
ASSEMBLE DIFFERENTIAL CASE**

- (a) Apply all of the sliding and rotating surfaces with gear oil.
- (b) Install the side gear thrust washer to the side gear.
- (c) Install the side gear to the RH case.
- (d) Install the 4 pinion gears and pinion gear thrust washers to the spider.
- (e) Install the pinion gear with the spider to the RH case.



- (f) Using a dial indicator, holding the side gear and spider and measure the side gear backlash.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

HINT:

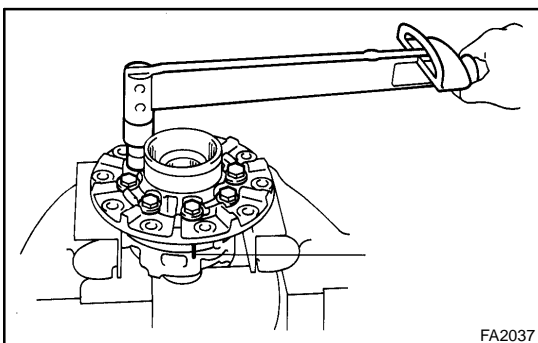
- Measure at all 4 locations.
- Measure the backlash at the RH case and at the LH case.

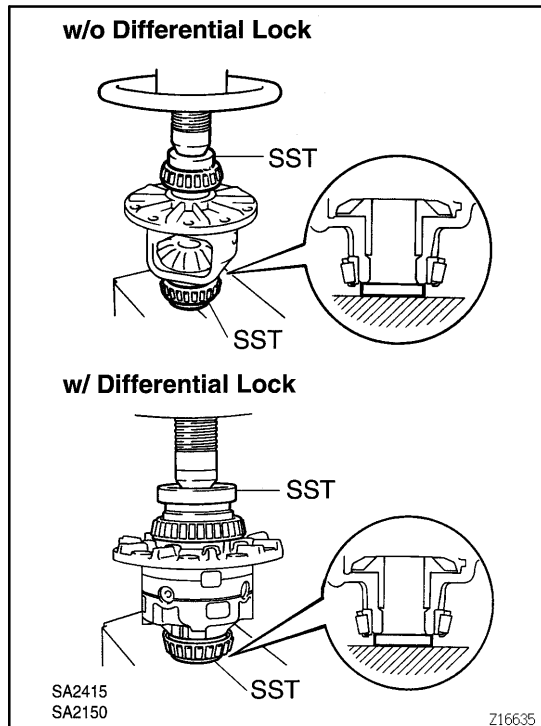
If the backlash is not within the specification, install a thrust washer of a different thickness.

Thrust washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.9 (0.035)	1.2 (0.047)
1.0 (0.039)	1.3 (0.051)
1.1 (0.043)	–

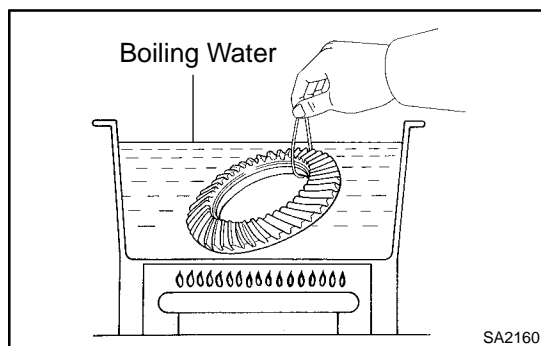
- (g) Install the side gear and side gear thrust washer to the RH case.
- (h) Install the pinion gears and spider to the RH case.
- (i) Install the side gear and side gear thrust washer to the RH case.
- (j) Align the matchmarks on the LH and RH cases.
- (k) Torque the 8 bolts uniformly, a little at a time.
Torque: 47 N·m (480 kgf-cm, 35 ft-lbf)





5. INSTALL SIDE BEARINGS

- w/o Differential lock:
Using SST and a press, install the 2 side bearings on the differential case.
SST 09950-60010 (09951-00480)
- w/ Differential lock:
Using SST and a press, install the 2 side bearings on the differential case.
SST 09223-15020, 09950-60010 (09951-00480)



6. INSTALL RING GEAR ON DIFFERENTIAL CASE

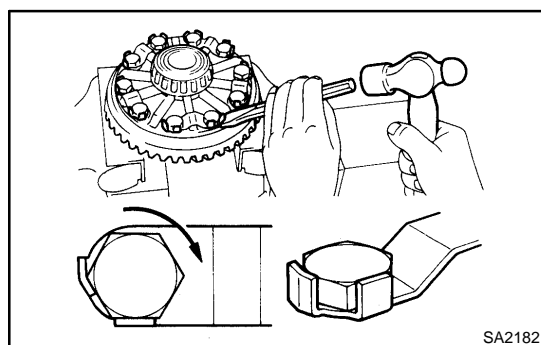
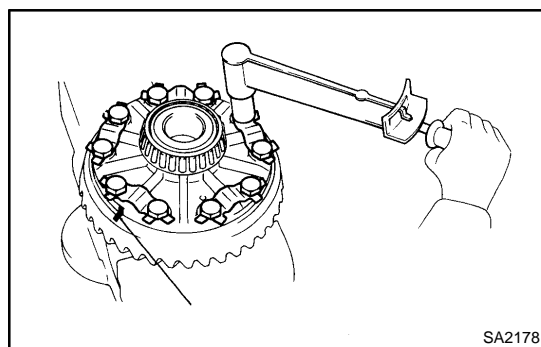
- Clean the contact surfaces of the differential case and ring gear.
- Heat the ring gear to about 100°C (212°F) in boiling water.
- Carefully remove the ring gear from the water.
- After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.
- Align the matchmarks on the ring gear and differential case.
- Temporarily install new 5 lock plates and 10 set bolts.

NOTICE:

The ring gear set bolts should not tighten until the ring gear has cooled sufficiently.

- After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.

Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)

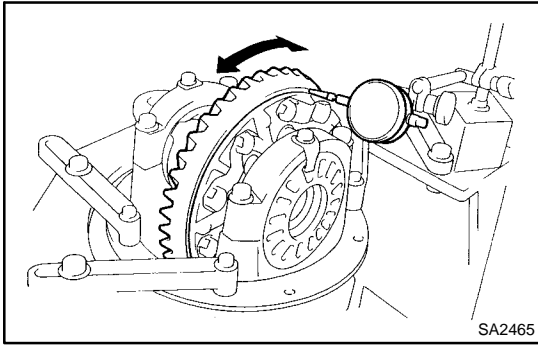


- Using a drift punch and hammer, stake the lock plates.

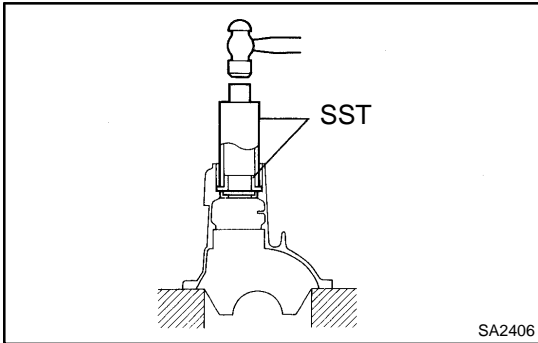
HINT:

Stake one claw flush with the flat surface of the bolt. For the claw contacting the protruding portion of the bolt, stake only the half on the tightening side.

SUSPENSION AND AXLE - FRONT DIFFERENTIAL CARRIER

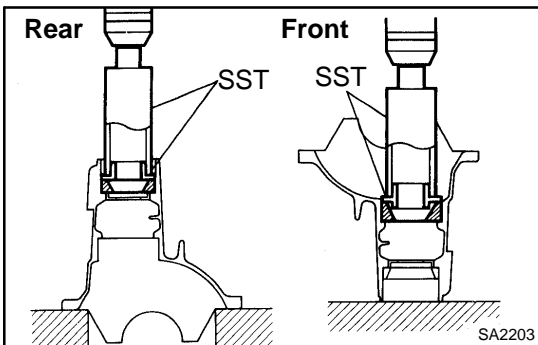
**7. CHECK RING GEAR RUNOUT**

- (a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings.
- (b) Using a dial indicator, check the ring gear runout.
Maximum runout: 0.10 mm (0.0039 in.)
- (c) Remove the differential case.

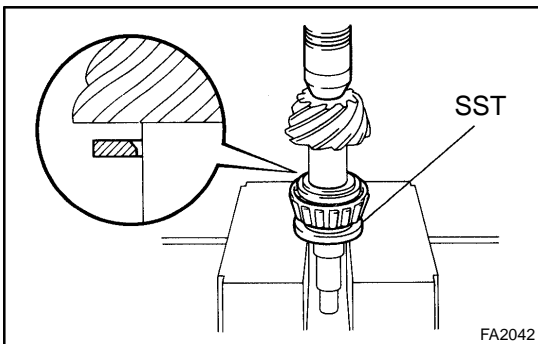
**8. INSTALL OIL STORAGE RING**

Using SST and a hammer, install a new oil storage ring.

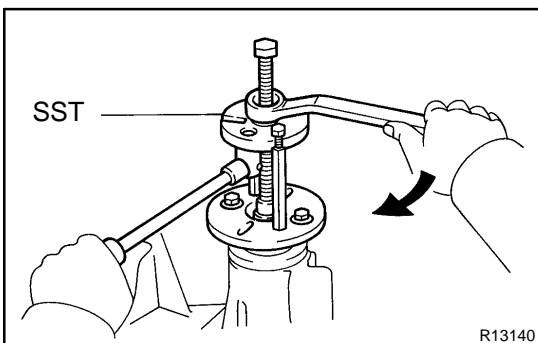
SST 09316-60011 (09316-00011, 09316-00021)

**9. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES**

- Front side:
Using SST and a press, install the 2 outer races.
SST 09316-60011 (09316-00011, 09316-00051)
- Rear side:
Using SST and a press, install the 2 outer races.
SST 09316-60011 (09316-00011, 09316-00021)

**10. INSTALL DRIVE PINION FRONT BEARING**

- (a) Install the plate washer on the drive pinion with the chamfered end facing the pinion gear.
- (b) Using SST and a press, install the front bearing onto the drive pinion.
SST 09506-30012

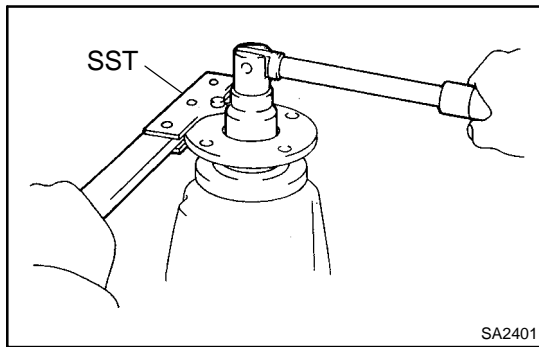
**11. TEMPORARILY ADJUST DRIVE PINION PRELOAD**

- (a) Install the drive pinion, rear bearing and oil slinger.

HINT:

Assemble the spacer and oil seal after adjusting the gear contact pattern.

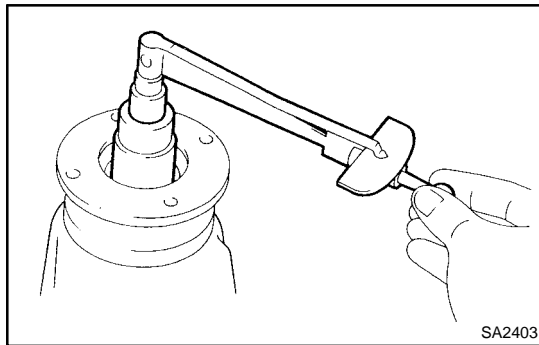
- (b) Install the companion flange with SST.
SST 09550-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



- (c) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330-00021

NOTICE:

As there is no spacer, tighten a little at a time, being careful not to overtighten.



- (d) Using a torque wrench, measure the preload.
Preload (at starting):
New bearing
0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.-lbf)
Reused bearing
0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)

HINT:

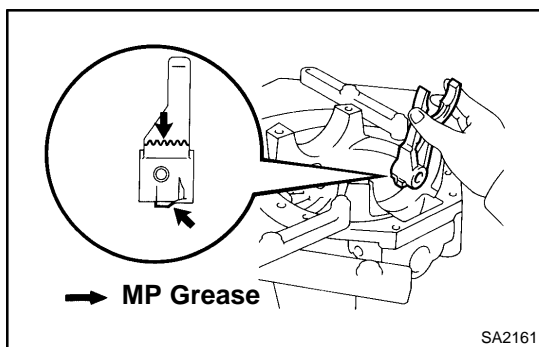
Measure the total preload after first turning the bearing clockwise and counterclockwise several times to mark the bearing smooth.

12. w/o DIFFERENTIAL LOCK:**INSTALL DIFFERENTIAL CASE IN CARRIER**

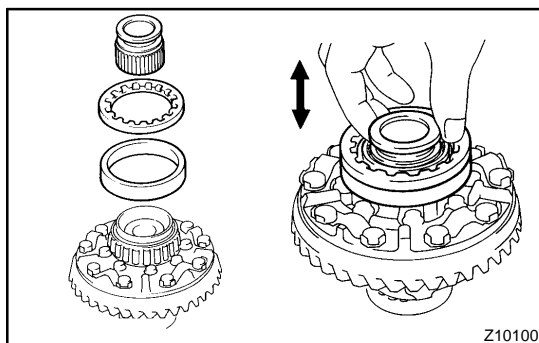
- (a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.
(b) Install the case in the carrier.

HINT:

Make sure that there is backlash between the ring gear and drive pinion.

**13. w/ DIFFERENTIAL LOCK:****INSTALL DIFFERENTIAL CASE IN CARRIER**

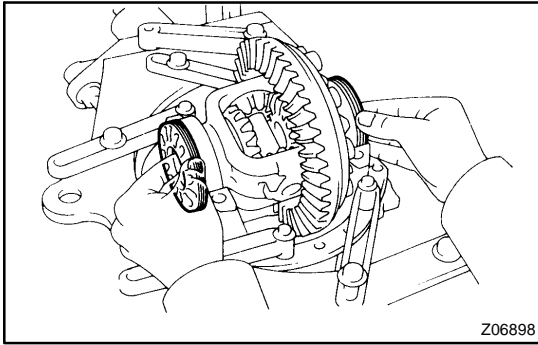
- (a) Apply MP grease on the rack of the shift fork and connecting part of the indicator switch.
(b) Insert the shift fork into the differential carrier, as shown.



- (c) Install outer races, adjusting nuts and left side to sleeve.
HINT:
Check that the sleeve moves smoothly.
(d) Install the shift fork in the groove of the sleeve holding it by hand and install the case in the carrier.

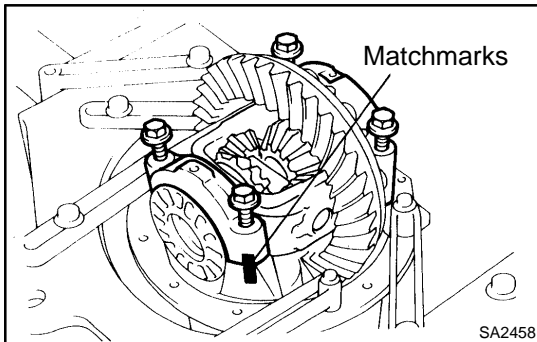
HINT:

Make sure that there is backlash between the ring gear and drive pinion.



14. w/o DIFFERENTIAL LOCK: INSTALL ADJUSTING NUTS

Install the adjusting nuts on the carrier, making sure the nuts are threaded properly.



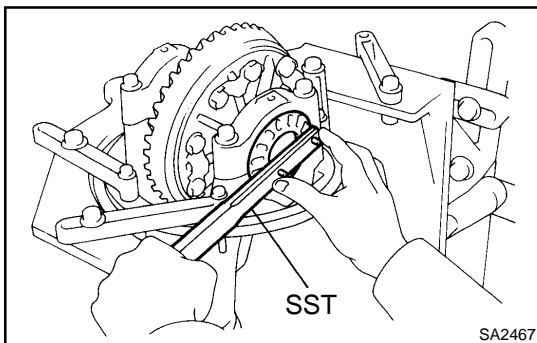
15. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the 2 bearing cap bolts 2 or 3 turns and press down the bearing cap by hand.

HINT:

If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly.

Reinstall the adjusting nuts if necessary.



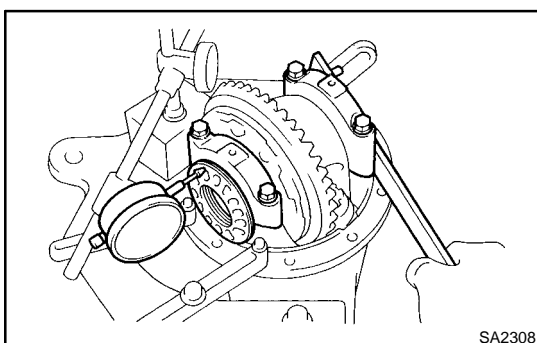
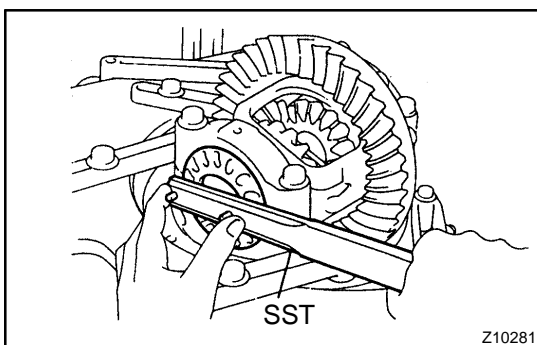
16. ADJUST SIDE BEARING PRELOAD

- (a) Torque the 4 bearing cap bolts to the specified torque, and loosen them to the point where the adjusting nuts can be turned by SST.

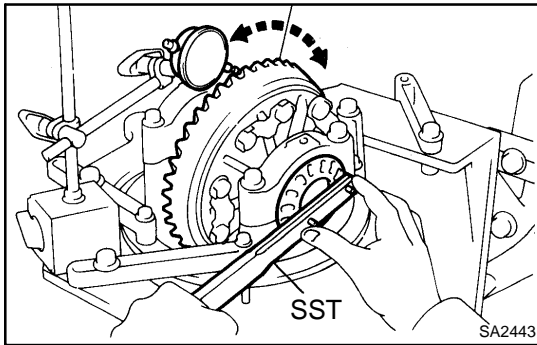
SST 09504-00011

Torque: 78 N·m (800 kgf-cm, 58 ft-lbf)

- (b) Fully tighten the 4 bearing cap bolts by hand.
(c) Using the SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0.2 mm (0.008 in.).
(d) With turning the ring gear, use the SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.



- (e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.
(g) Torque the adjusting nut 1 – 1.5 notches from the zero preload position.



- (h) Using a dial indicator, adjust the ring gear backlash until it is within the specification.

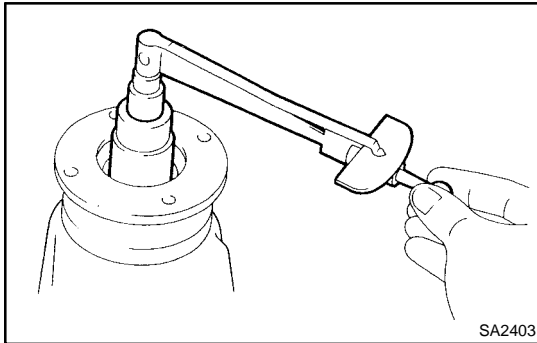
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT:

The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and torque the nut on the right side one notch.

- (i) Torque the 4 bearing cap bolts.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)



- (j) Recheck the ring gear backlash.

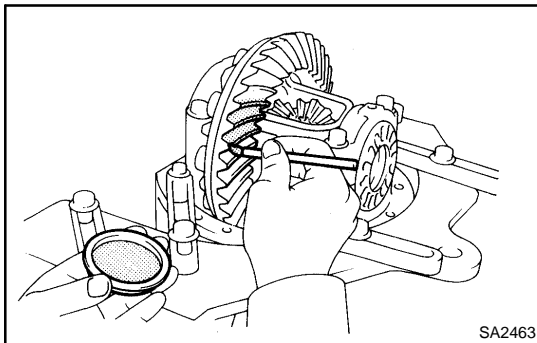
Backlash: 0.13–0.18 mm (0.0051–0.0071 in.)

- (k) Using a torque wrench, measure the preload.

Total preload (at starting):

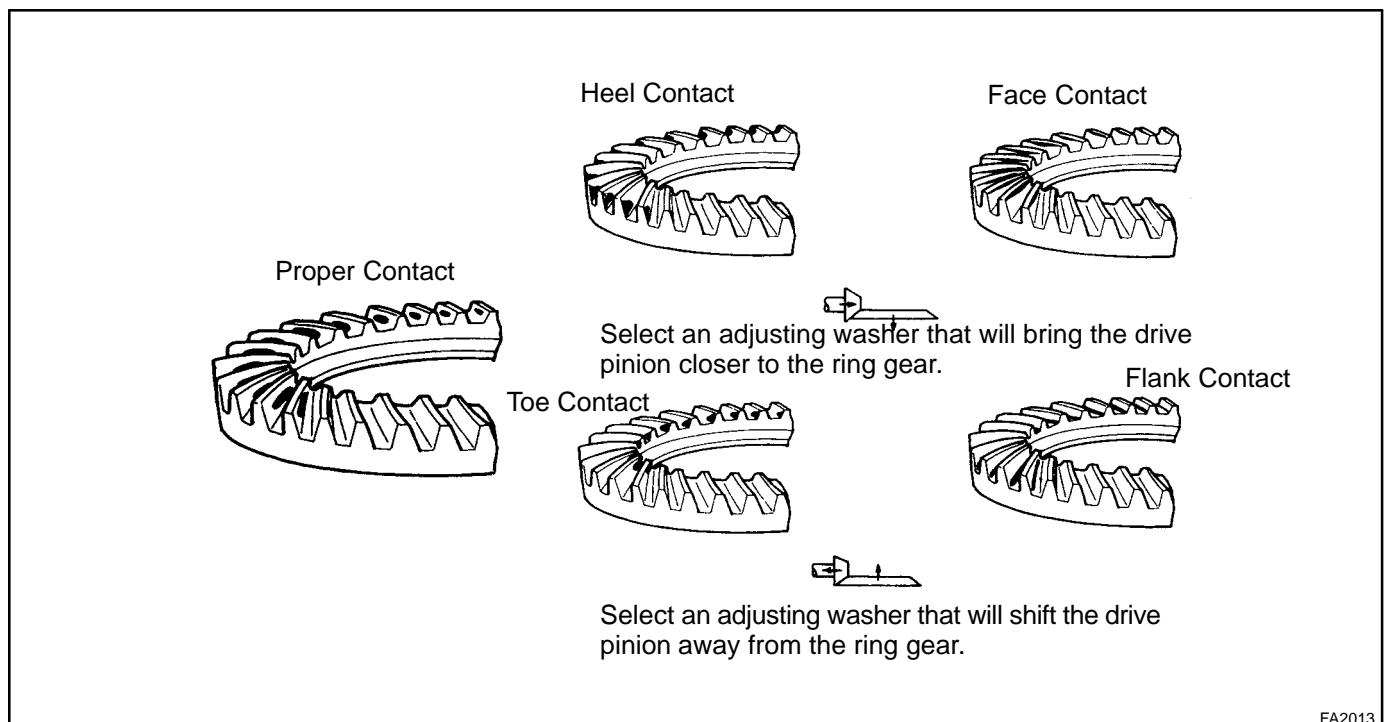
Drive pinion preload plus

0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)



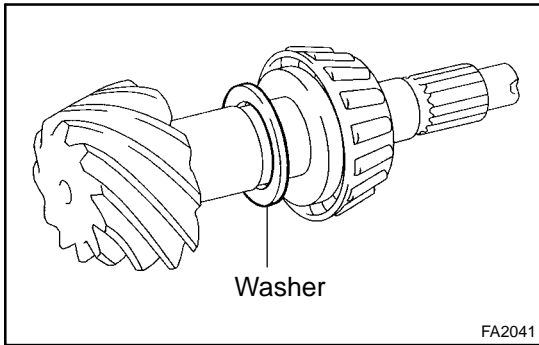
17. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

- (a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead.
- (b) Hold the companion flange firmly and rotate the ring gear in both directions.
- (c) Inspect the tooth pattern.



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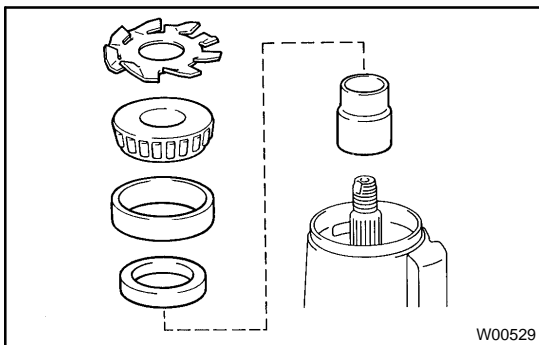
SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER



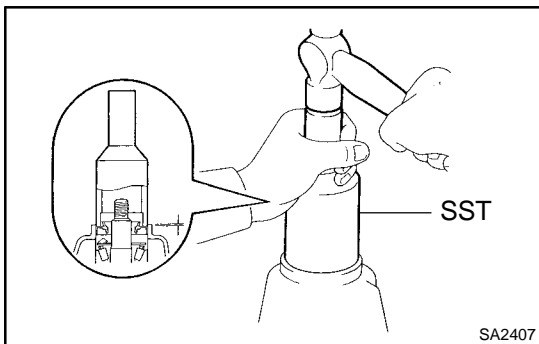
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

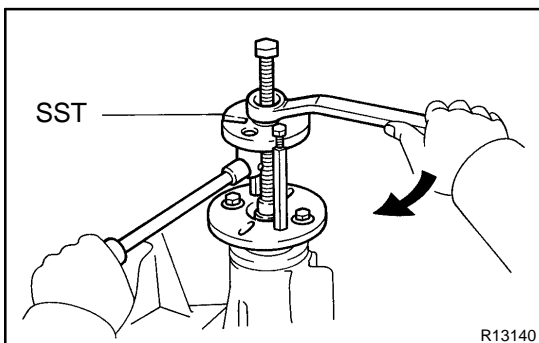
Thickness mm (in.)	Thickness mm (in.)
1.70 (0.0669)	2.03 (0.0799)
1.73 (0.0681)	2.06 (0.0811)
1.76 (0.0693)	2.09 (0.0823)
1.79 (0.0705)	2.12 (0.0835)
1.82 (0.0717)	2.15 (0.0846)
1.85 (0.0728)	2.18 (0.0858)
1.88 (0.0740)	2.21 (0.0870)
1.91 (0.0752)	2.24 (0.0882)
1.94 (0.0764)	2.27 (0.0894)
1.97 (0.0776)	2.30 (0.0906)
2.00 (0.0787)	2.33 (0.0917)

18. REMOVE COMPANION FLANGE (See page SA-29)**19. REMOVE OIL SLINGER AND REAR BEARING****20. REMOVE REAR BEARING OUTER RACE AND OIL STORAGE RING (See page SA-29)****21. INSTALL BEARING SPACER AND REAR BEARING**

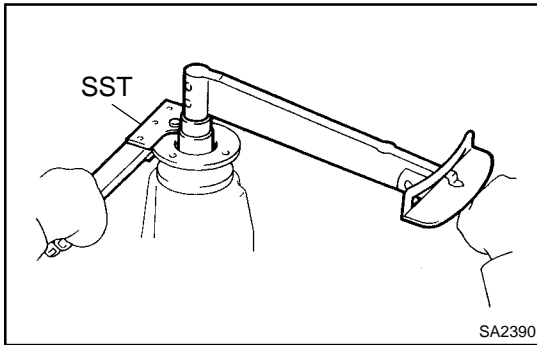
- Install a new bearing spacer on the shaft.
- Install a new oil storage ring and rear bearing outer race (See page SA-29).
- Install the rear bearing and oil slinger.

**22. INSTALL OIL SEAL**

- Using SST, install a new oil seal, as shown.
SST 09214-76011
Oil seal drive in depth: 1.0 mm (0.039 in.)
- Apply MP grease to the oil seal lip.

**23. INSTALL COMPANION FLANGE**

- Install the companion flange with SST.
SST 09550-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



(b) Install the plate washer and a new nut.

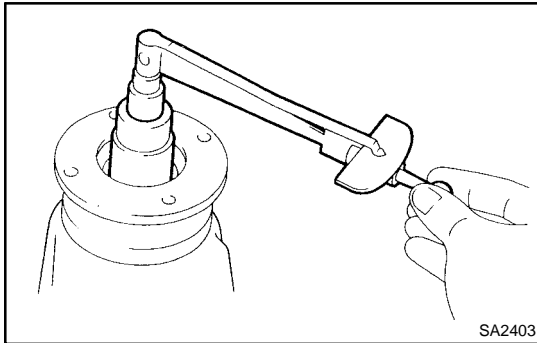
HINT:

Coat the threads of a new nut with gear oil.

(c) Using SST to hold the flange, tighten the nut.

SST 09330-00021

Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)



24. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):

New bearing:

0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.-lbf)

Reused bearing:

0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)

If the preload is greater than the specification, replace the bearing spacer.

If the preload is less than the specification, retighten the nut a little at a time with a torque of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

Maximum torque: 343 N·m (3,500 kgf·cm, 253 ft·lbf)

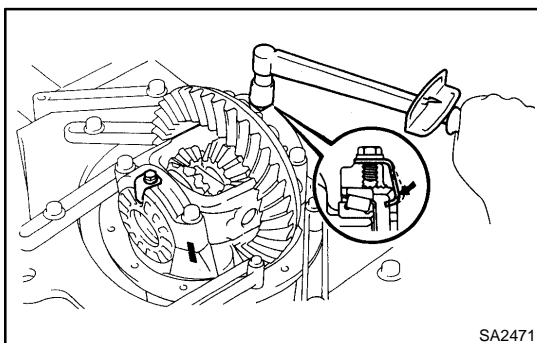
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

25. RECHECK RING GEAR BACKLASH

26. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

27. CHECK RUNOUT OF COMPANION FLANGE

28. STAKE DRIVE PINION NUT



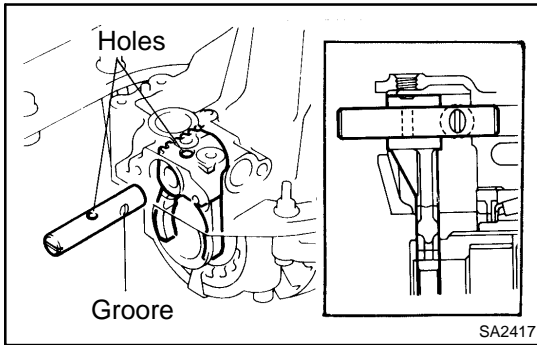
29. INSTALL ADJUSTING NUT LOCKS

(a) Install 2 new nut locks on the bearing caps.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

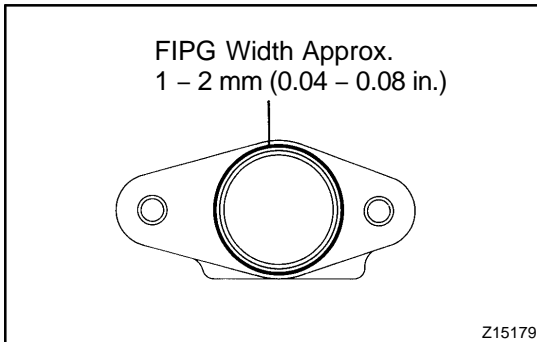
(b) After tightening bolts, bend the nut locks.

SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER



30. w/ DIFFERENTIAL LOCK: INSTALL SHIFT FORK SHAFT

- (a) Apply MP grease onto the outer circuit of the fork shaft.
- (b) Install the fork shaft to match the hole of the shift fork and that of the shift fork shaft.



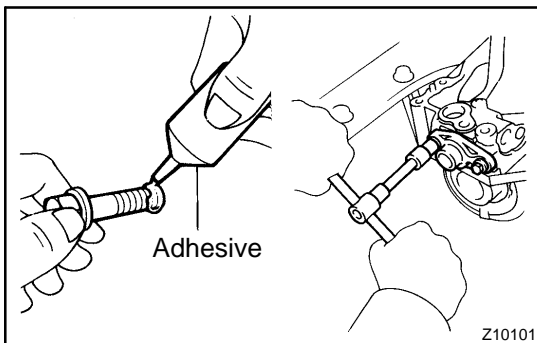
- (c) Remove any FIPG material and be careful not to drop oil on the contacting surface of the differential carrier and shaft retainer.

- (d) Apply FIPG to the carrier, as shown.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the shaft retainer within 10 minutes after applying FIPG.

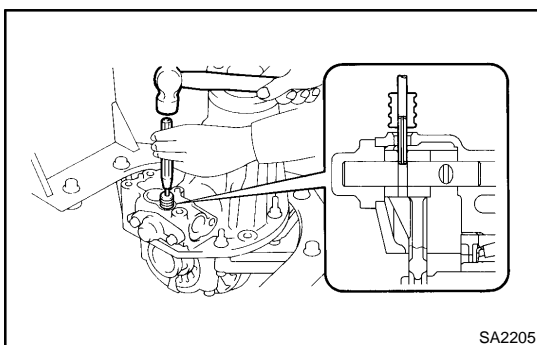


- (e) Clean the threads of the bolts and retainer bolts holes with toluene or trichlorethylene.

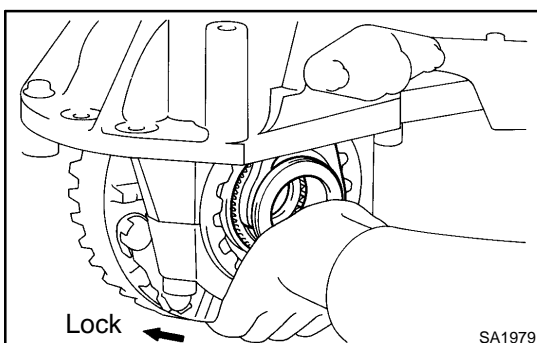
- (f) Apply adhesive to 2 or 3 threads of the mount bolt end.
Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

- (g) Tighten the shaft retainer with the 2 bolts.

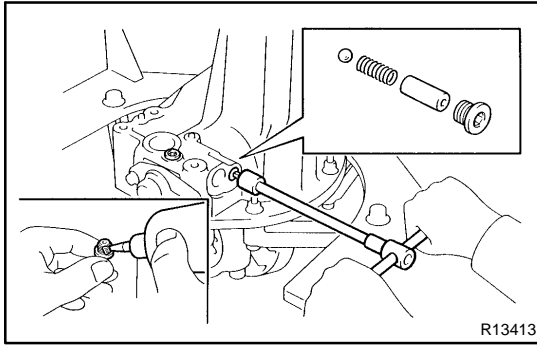
Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)



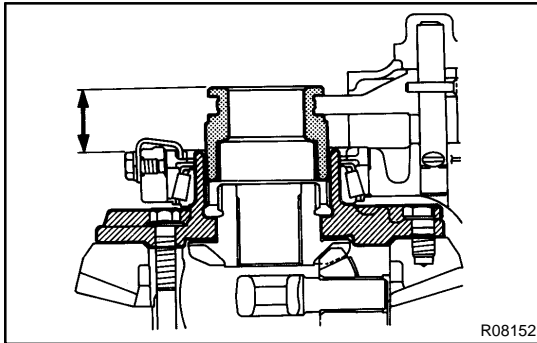
- (h) Using a pin punch and hammer, install the slotted spring pin to the shift fork.



- (i) Shift the fork deeply and keep the differential lock condition.



- (j) Install the ball, compression spring and spring seat.
- (k) Clean the threads of 2 plugs and plug holes with toluene or trichloroethylene.
- (l) Apply adhesive to the plug threads.
Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
- (m) Using a hexagon wrench, install and tighten the screw plugs.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)



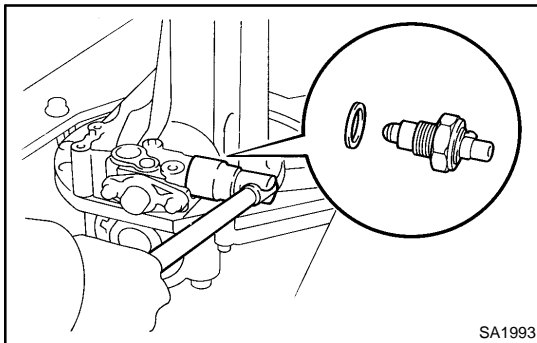
**31. w/ DIFFERENTIAL LOCK:
MEASURE DISTANCE BETWEEN SLEEVE AND DIFFERENTIAL CASE END SIDE**

Measure distance between the sleeve and tip of the differential case when differential is free and locked.

Standard distance:

LOCK: 17.44 – 18.86 mm (0.6866 – 0.7425 in.)

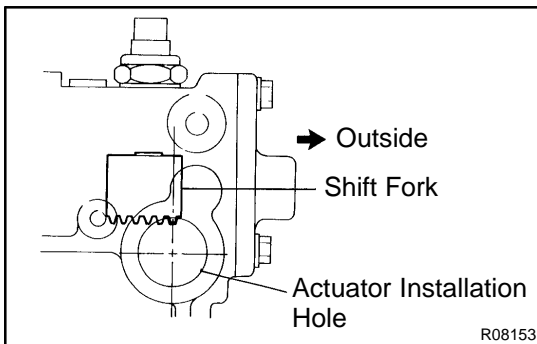
FREE: 32.40 – 33.90 mm (1.2756 – 1.3346 in.)



**32. w/ DIFFERENTIAL LOCK:
INSTALL INDICATOR SWITCH**

Install the indicator switch with a new gasket.

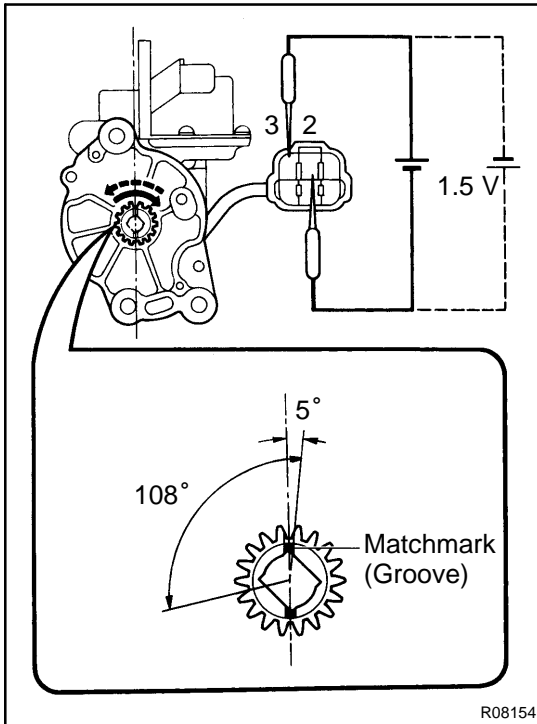
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)



**33. w/ DIFFERENTIAL LOCK:
INSTALL ACTUATOR**

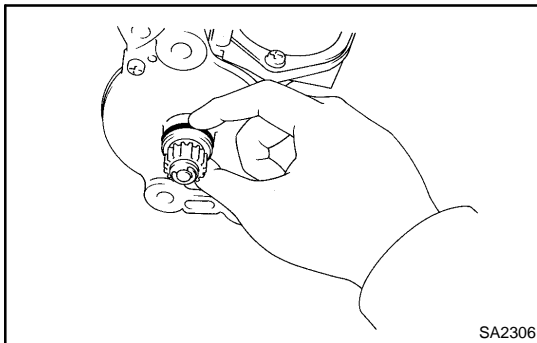
- (a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole.

SUSPENSION AND AXLE – FRONT DIFFERENTIAL CARRIER

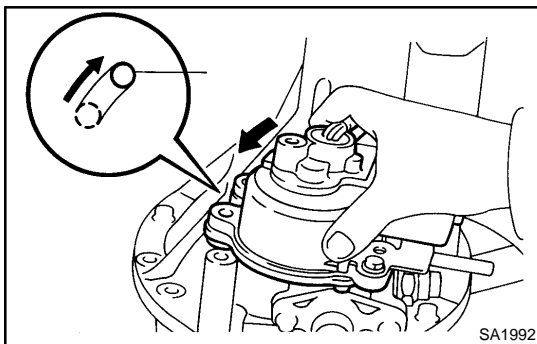


- (b) Ensure that the matchmarks of the pinion of the actuator is in the extent between zero and 5 degrees clockwise above the center line of the actuator.

If the matchmarks is not in this extent, rotate the pinion to be matched. Do not supply the battery positive voltage directly between terminals. If the matchmarks come to the extension limit of the rotation, do not electrify moreover.



- (c) Install a new O-ring to the actuator.
 (d) Apply a light coat of gear oil on the O-ring.
 (e) Apply MP grease to the gear part.

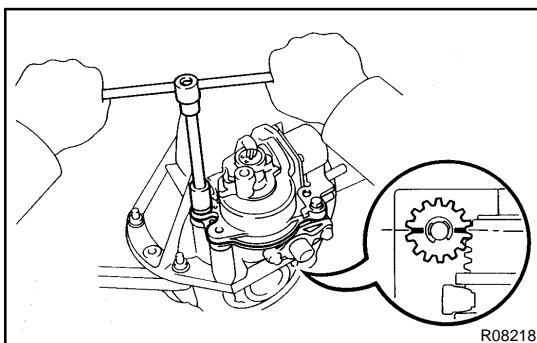


- (f) Insert the actuator so that the long hole on the actuator side fits with the knock pin on the carrier side.

HINT:

Do not damage the O-ring of the actuator.

- (g) Align the actuator with the long hole and rotate the actuator counterclockwise when the knock pin reaches the right-hand side.



- (h) Install the actuator to the differential carrier with the bolt so that the outermost rack tooth of the shift fork will fit the matchmarks of the pinion of the actuator.

Torque: 26 N·m (270 kgf-cm, 20 ft-lbf)

INSTALLATION

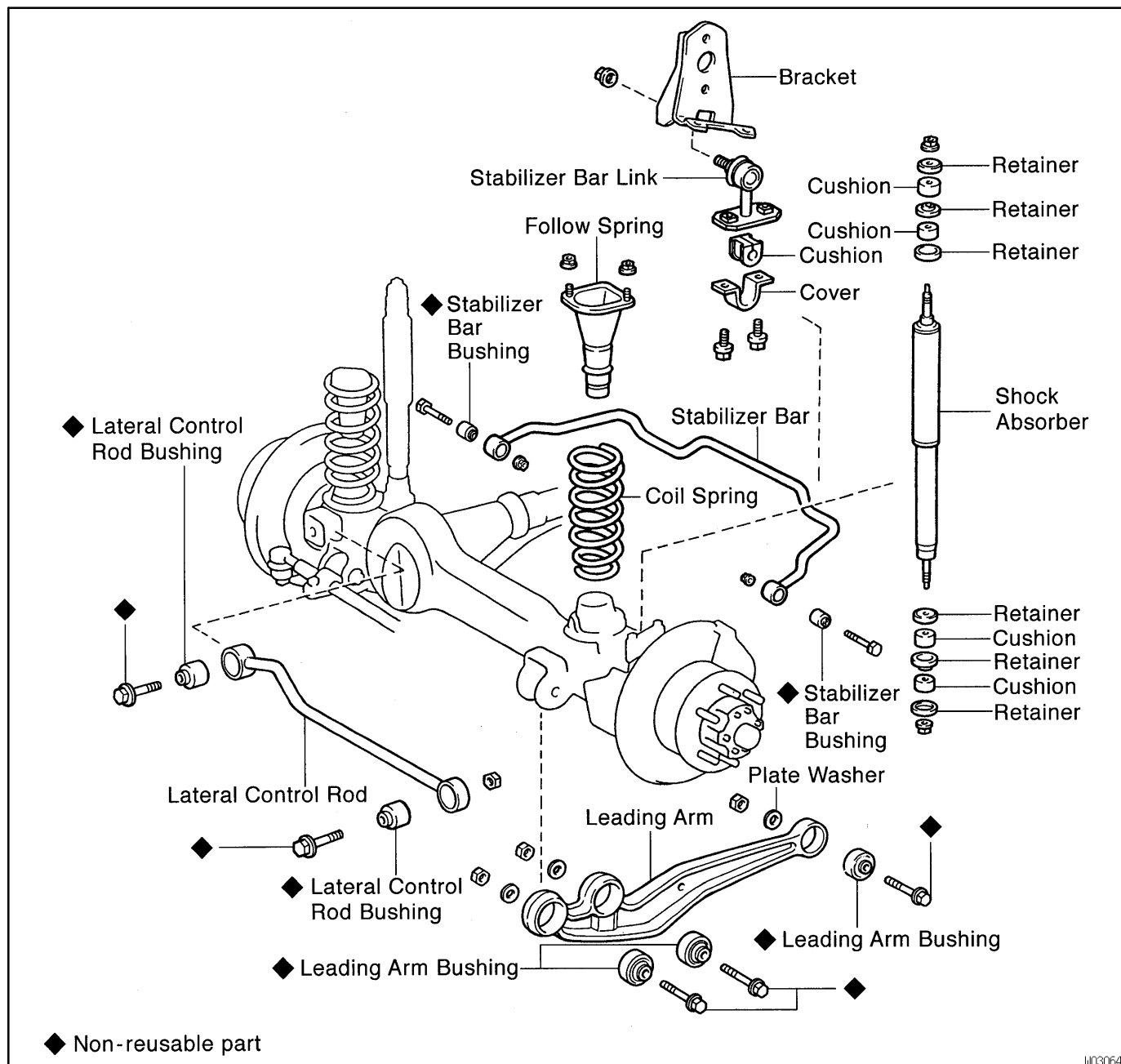
Installation is in the reverse order of removal (see page [SA-27](#)).

HINT:

- w/ differential lock:
Before installation, check differential lock operation connecting the connector of the actuator to the connector of the vehicle side.
- w/ differential lock:
Before installation, check that the sleeves on work with switching over the differential lock control switch.
After checking, lock the front differential.
- After installation, fill the differential with gear oil (See page [SA-27](#)).
- w/ differential lock:
After installation, check that the bleeder plug at the point of the bleeder tube (inside of the engine room) is not damaged or worn.

COIL SPRING AND FRONT SHOCK ABSORBER COMPONENTS

SA1UR-01



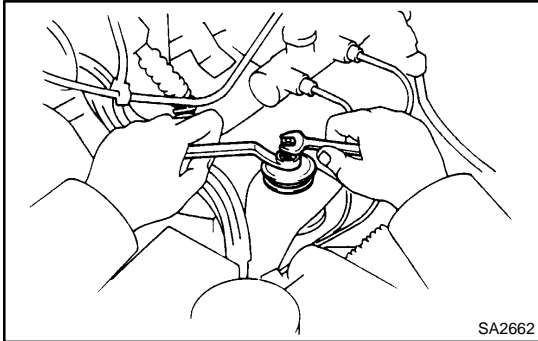
REMOVAL

1. REMOVE FRONT WHEEL

Torque:

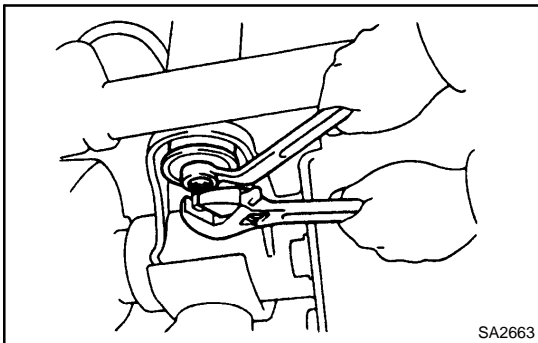
Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



2. REMOVE FRONT SHOCK ABSORBER

- (a) Jack up and support the axle housing.
- (b) Hold the piston rod and remove the upper mounting nut.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)



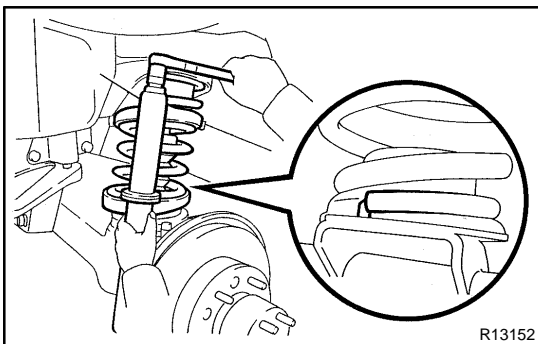
- (c) Hold the shock absorber and remove the lower mounting nut, shock absorber, cushions and retainers.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

3. DISCONNECT STABILIZER BAR FROM AXLE HOUSING (See page SA-60)

4. REMOVE COIL SPRING

- (a) Jack down and support axle housing.



- (b) Using SST, compress the coil spring.
SST 09727-30021

NOTICE:

Do not use an impact wrench. It will damage the SST.

- (c) Remove the coil spring.

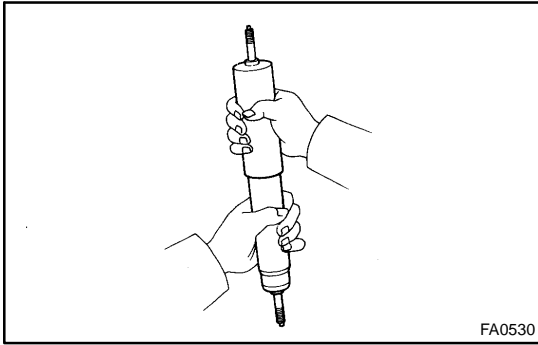
HINT:

Align the coil spring end with the lower seat and install the coil spring.

5. REMOVE FOLLOW SPRING

Remove the 2 nuts and follow spring.

Torque: 9.2 N·m (94 kgf·cm, 82 in.-lbf)



INSPECTION

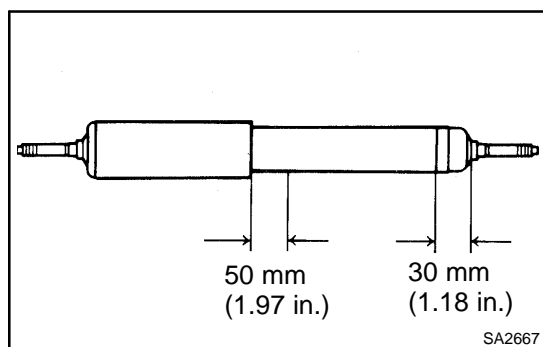
INSPECT SHOCK ABSORBER

Compress and extend the shock absorber rod and check that there is 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.



DISPOSAL

DISCARD SHOCK ABSORBER

Before discarding the shock absorber, drill a hole 2 – 3 mm (0.079 – 0.118 in.) in diameter at the location shown in the illustration to release the gas inside.

NOTICE:

When drilling, chips may fly out, work carefully. The gas is colorless, odorless and non-poisonous.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-50](#)).

FRONT LATERAL CONTROL ROD REMOVAL

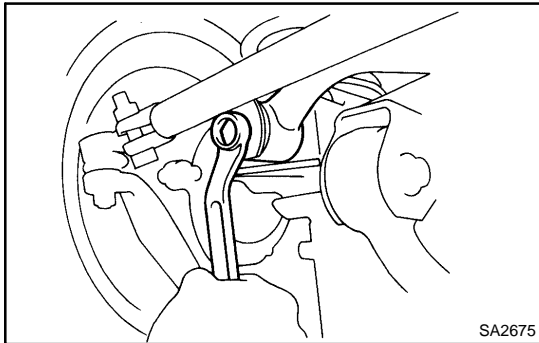
SA1UW-01

1. REMOVE FRONT WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



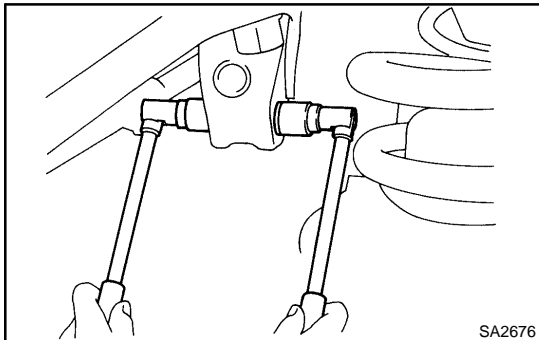
2. DISCONNECT LATERAL CONTROL ROD FROM AXLE HOUSING

Remove the bolt and disconnect the lateral control rod from the axle housing.

Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.



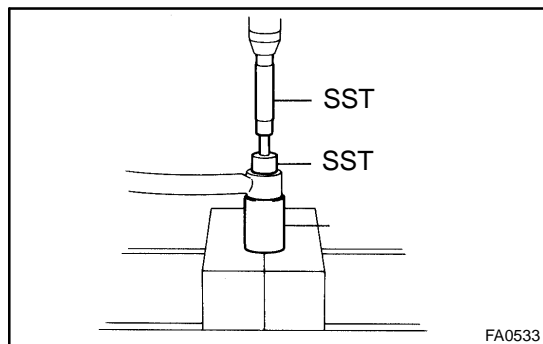
3. REMOVE LATERAL CONTROL ROD FROM FRAME

Remove the nut, bolt and lateral control rod.

Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.

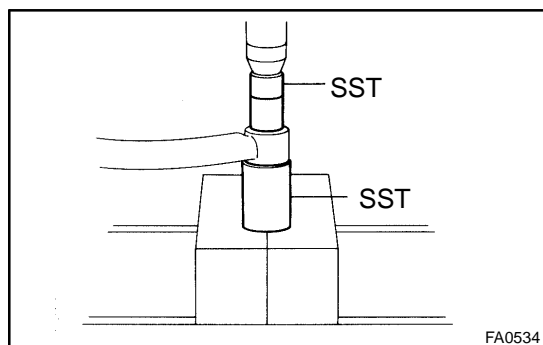


REPLACEMENT

1. REMOVE BUSHING

Using SST, remove the bushing from the lateral control rod.

SST 09710-22042 (09710-02051, 09710-02071),
09950-70010 (09951-07150)



2. INSTALL BUSHING

Using SST, install a new bushing into the lateral control rod.

SST 09710-22042 (09710-02051, 09710-02071)

HINT:

Do not use a lubricant when pressing in the bushing.

SA-56

SUSPENSION AND AXLE – FRONT LATERAL CONTROL ROD

SA1UY-01

INSTALLATION

Installation is in the reverse order of removal (See page [SA-54](#)).

FRONT LEADING ARM REMOVAL

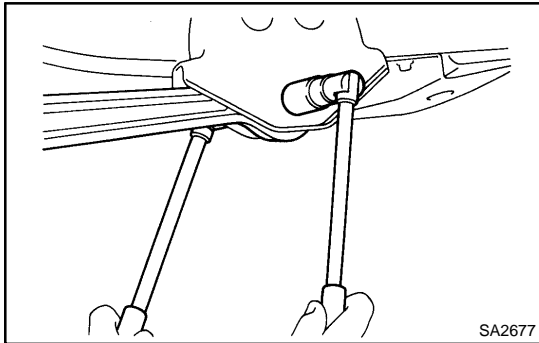
SA1UZ-01

1. REMOVE FRONT WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



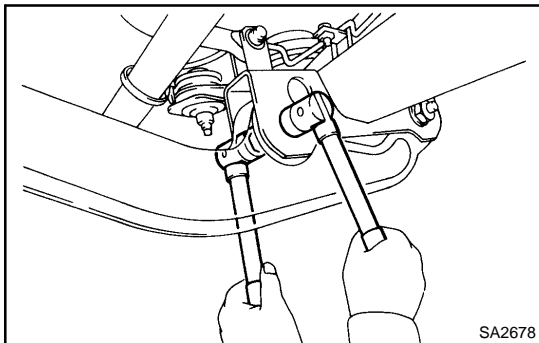
2. REMOVE LEADING ARM

- (a) Remove the bolt, plate washer and nut from the leading arm to the frame side.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.



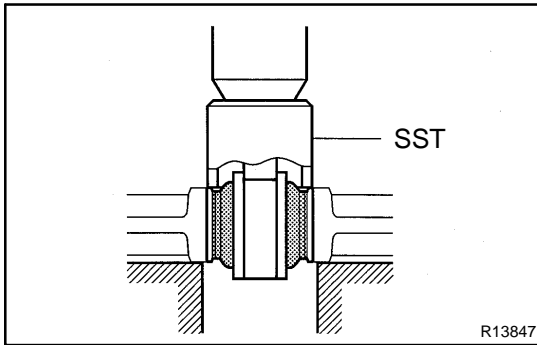
- (b) Remove the 2 bolts and nuts from the leading arm to the axle housing side.

Torque: 171 N·m (1,750 kgf·cm, 127 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolts.

- (c) Remove the leading arm.



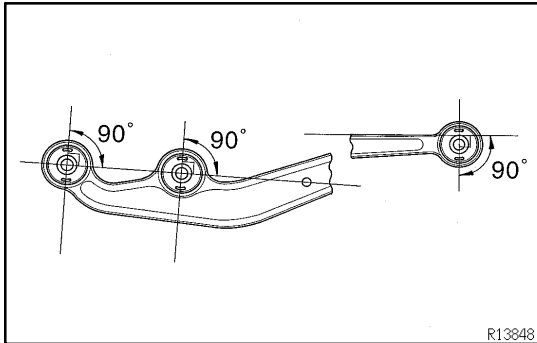
REPLACEMENT

REPLACE BUSHINGS

Using SST and a press, replace the bushing from the leading arm.

SST Front side: 09710-30050

SST Rear side: 09710-22042 (09710-02061)



HINT:

When assembling a new bushing, as shown in the illustration.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-57](#)).

FRONT STABILIZER BAR REMOVAL

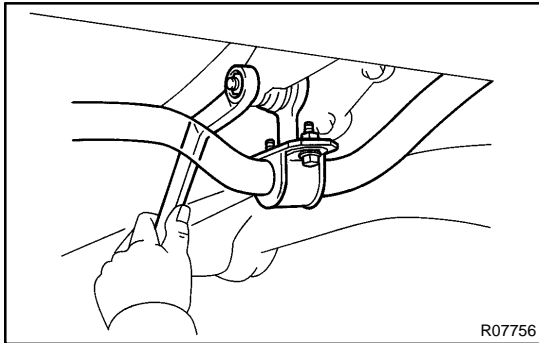
SA1V2-01

1. REMOVE FRONT WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf-cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf-cm, 76 ft·lbf)



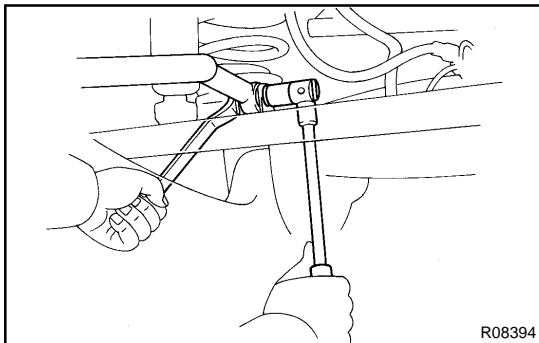
2. REMOVE STABILIZER BAR

- (a) Remove the nut and disconnect the stabilizer bar with the link from the bracket.

Torque: 103 N·m (1,050 kgf-cm, 76 ft·lbf)

HINT:

After stabilizing the suspension, torque the nut.

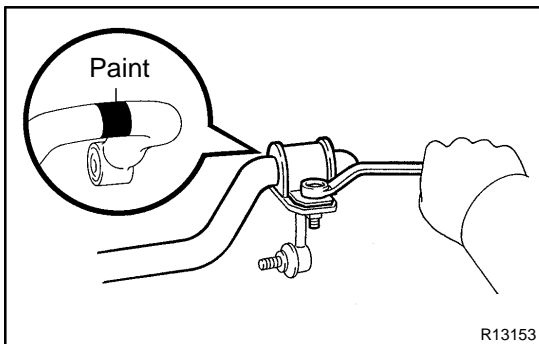


- (b) Remove the bolt and nut and remove the stabilizer bar from the axle housing.

Torque: 25 N·m (260 kgf-cm, 19 ft·lbf)

HINT:

After stabilizing the suspension, torque the nut.



- (c) Remove the 2 bolts, cover and cushion from the stabilizer bar.

Torque: 18 N·m (185 kgf-cm, 13 ft·lbf)

HINT:

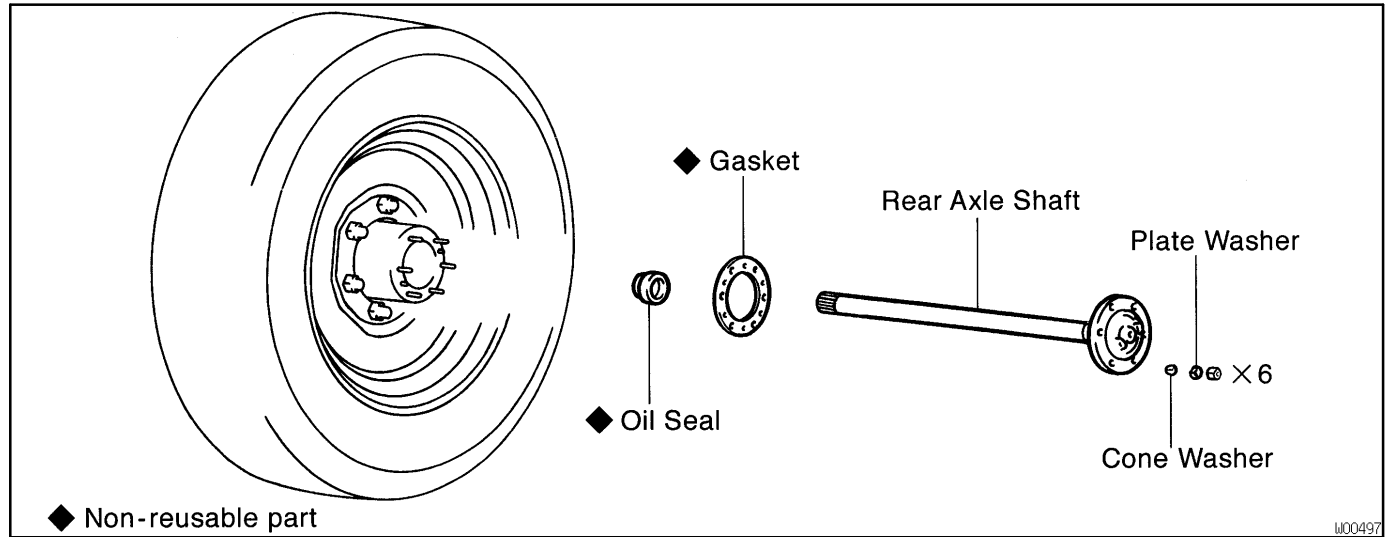
Install the cushions on the lines painted on the stabilizer bar and install the covers onto cushions.

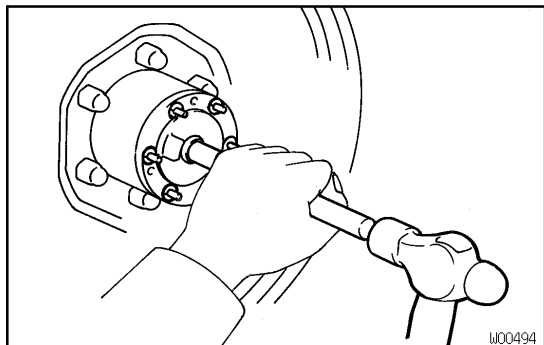
INSTALLATION

Installation is in the reverse order of removal (See page [SA-60](#)).

REAR AXLE SHAFT COMPONENTS

SA1V4-01

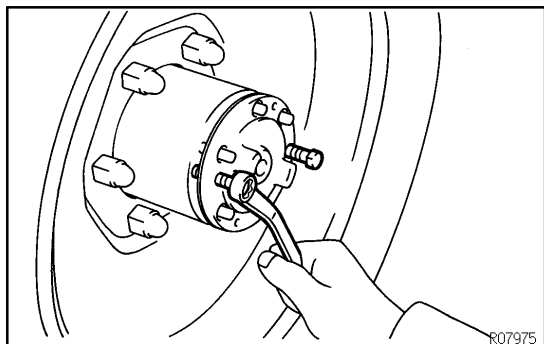




REMOVAL

REMOVE REAR AXLE SHAFT

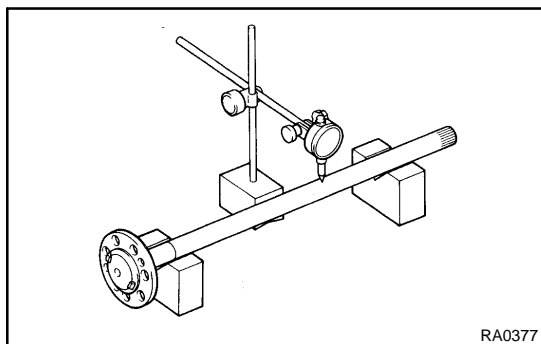
- (a) Remove the 6 set nuts and plate washers.
Torque: 34 N·m (340 kgf·cm, 25 ft·lbf)
- (b) Using a brass bar and hammer, strike the center part of the axle shaft to remove the 6 cone washers.



- (c) Install and gradually tighten 2 bolts evenly and pull the axle shaft.
- (d) Remove the 2 bolts from the rear axle shaft.
- (e) Remove the rear axle shaft and gasket.

NOTICE:

Be careful not to damage the oil seal.



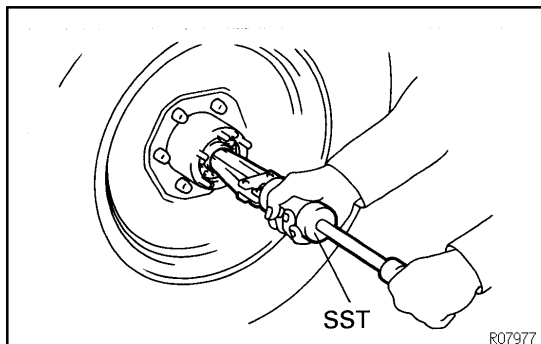
INSPECTION

1. INSPECT REAR AXLE SHAFT

- (a) Check for wear or damage.
- (b) Using a dial indicator, check the runout of axle shaft.

Maximum runout: 0.8 mm (0.031 in.)

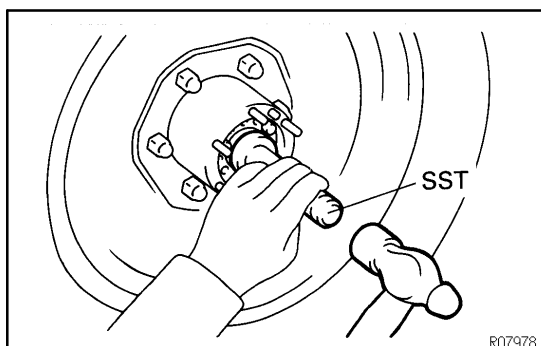
If the runout is greater than the maximum, replace the axle shaft.



2. REPLACE OIL SEAL

- (a) Using SST, remove the oil seal.

SST 09308-00010



- (b) Using SST and a hammer, install a new oil seal into the hub.

SST 09517-36010

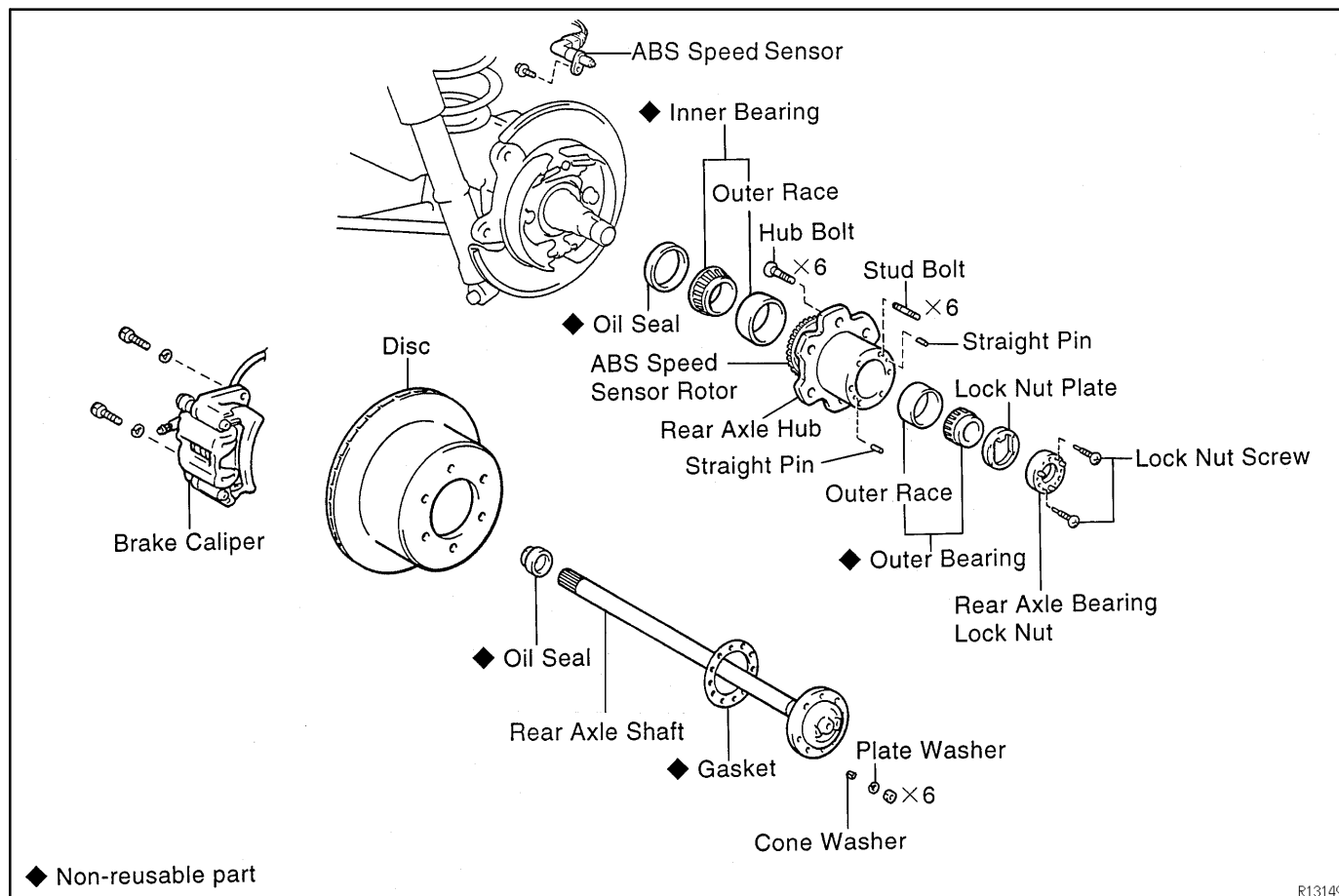
- (c) Apply MP grease to the oil seal lip.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-63](#)).

REAR AXLE HUB COMPONENTS

SA1VB-01



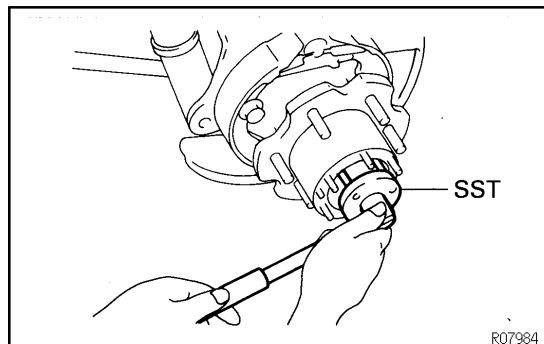
R13149

REMOVAL

1. REMOVE REAR WHEEL
2. REMOVE REAR AXLE SHAFT (See page [SA-63](#))
3. REMOVE BRAKE CALIPER AND DISC
(See page [BR-34](#))

4. DISCONNECT ABS SPEED SENSOR

Remove the bolt and disconnect the ABS speed sensor.

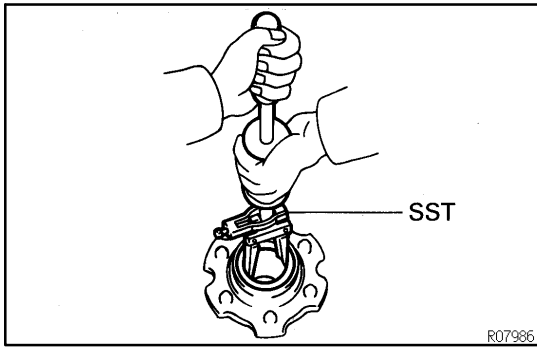


5. REMOVE REAR AXLE BEARING LOCK NUT

- (a) Remove the 2 screws from the lock nut.
- (b) Using SST, remove the lock nut.
SST 09509-25011

6. REMOVE REAR AXLE HUB

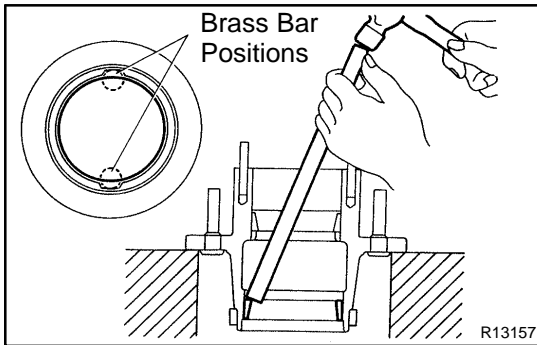
- (a) Pull out the axle hub, remove the lock nut plate and outer bearing.
- (b) Remove the axle hub.



REPLACEMENT

1. REMOVE OIL SEAL AND INNER BEARING

- (a) Using SST, remove the oil seal.
SST 09308-00010
- (b) Remove the inner bearing from the hub.

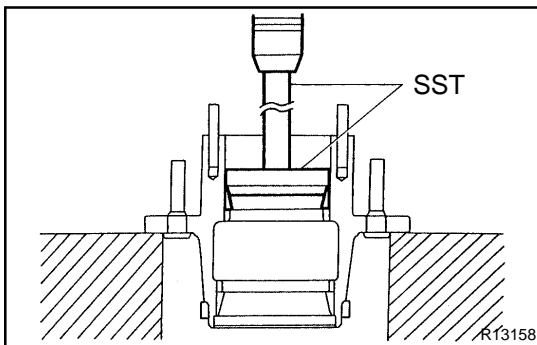


2. REMOVE BEARING OUTER RACE

Using a brass bar and hammer, remove the bearing outer races.

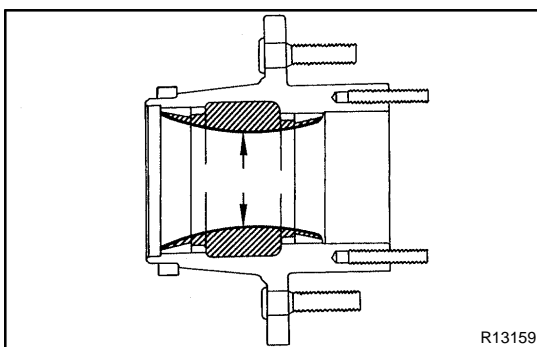
NOTICE:

Be careful not to damage the ABS speed sensor rotor.



3. INSTALL BEARING OUTER RACE

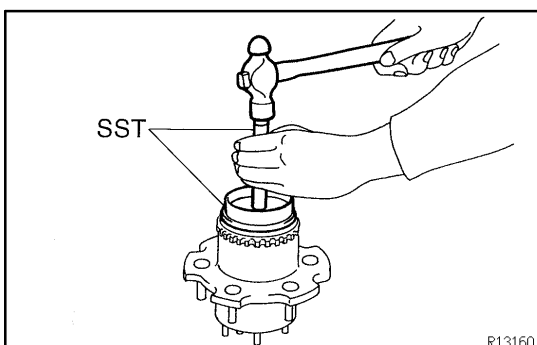
- Outside race:
Using SST and a press, install new bearing outer races.
SST 09950-60020 (09951-00710),
09950-70010 (09951-07150)
- Inside race:
Using SST and a press, install new bearing outer races.
SST 09950-60020 (09951-00810),
09950-70010 (09951-07150)



4. PACK BEARINGS WITH MP GREASE

- (a) Place MP grease on the palm of your hand.
- (b) Pack grease into the bearing until the grease ooze out from the other side.
- (c) Do the same around the bearing circumference.

5. COAT INSIDE OF HUB WITH MP GREASE



6. INSTALL INNER BEARING AND OIL SEAL

- (a) Place inner bearing into the hub.
- (b) Using SST, install a new oil seal into the hub.
SST 09223-15020, 09950-70010 (09951-07150)
- (c) Apply MP grease to the oil seal lip.

INSTALLATION

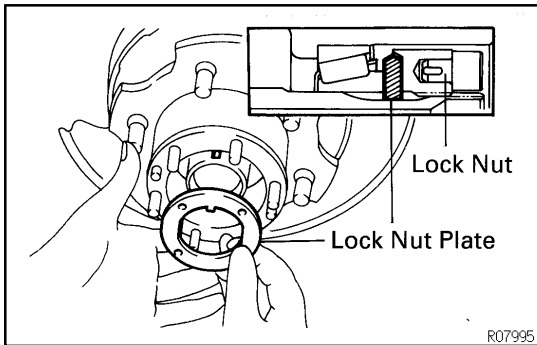
1. INSTALL REAR AXLE HUB

- Clean the hub installation position of the axle housing and apply MP grease thinly.
- Place the axle hub to the axle housing.

NOTICE:

Be careful not to damage the oil seal.

- Install the outer bearing.

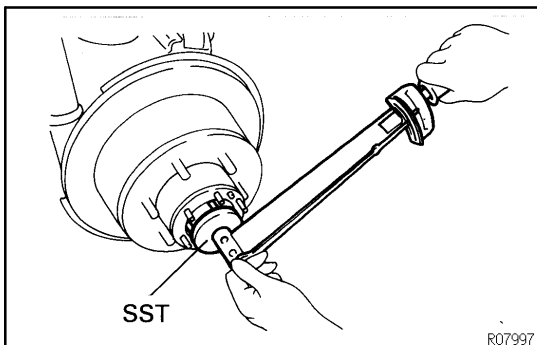


2. INSTALL LOCK NUT PLATE AND REAR AXLE BEARING LOCK NUT

- Place the lock nut plate on the axle housing, making sure the tongue lines up with the key groove.
- Temporarily install the lock nut.

3. INSTALL DISC

Install the disc to the rear axle hub and temporarily install the 2 hub nuts.

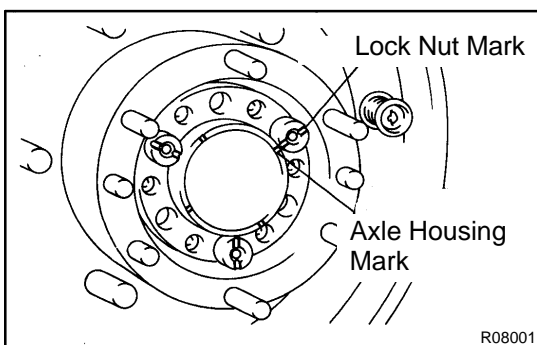
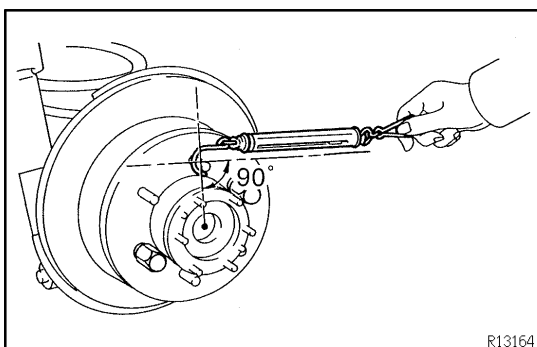


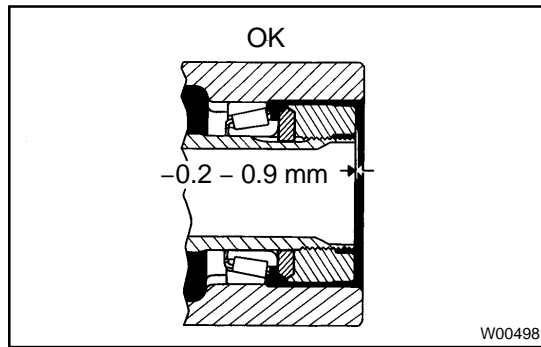
4. ADJUST PRELOAD

- Using SST, torque the bearing lock nut.
SST 09509-25011
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)
- Make the bearing smooth by turning the hub several times.
- Using the SST, retighten the bearing lock nut.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)
- Using the SST, loosen the nut until it can be turned by hand.
- Using a spring tension gauge, check the preload and tighten the nut until the preload is within the specification.
Preload (at starting):
26-57 N (2.6-5.8 kgf, 5.7-12.8 lbf)

NOTICE:

Make sure that there is no contact with the parking brake shoe.





- (g) Check the distance between top surface of axle housing and the lock nut.

Standard distance:

-0.2 - 0.9 mm (-0.0079 - 0.0354 in.)

If the distance is greater than the specification, reassemble the lock nut plate.

- (h) Check that the hub with disc rotates smoothly and hub has no axial play.

5. INSTALL BEARING LOCK NUT SCREW

Tighten the 2 lock nut screws.

Torque: 5.4 N·m (55 kgf·cm, 48 in.-lbf)

6. CONNECT ABS SPEED SENSOR

Connect the ABS speed sensor install the bolt.

Torque: 18 N·m (185 kgf·cm, 13 ft-lbf)

7. INSTALL BRAKE CALIPER (See page [BR-38](#))

8. INSTALL REAR AXLE SHAFT (See page [SA-65](#))

9. INSTALL REAR WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft-lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft-lbf)

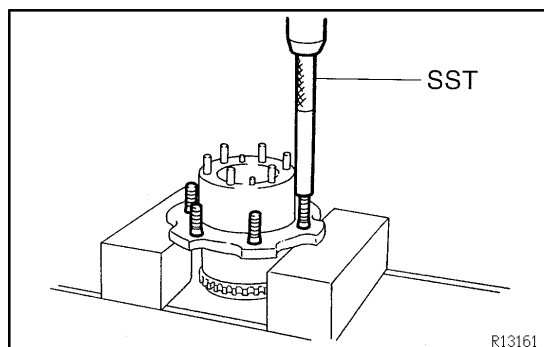
10. CHECK ABS SPEED SENSOR SIGNAL

(See page [DI-190](#))

REAR WHEEL HUB BOLT REPLACEMENT

SA1VC-01

1. REMOVE REAR AXLE HUB (See page [SA-67](#))



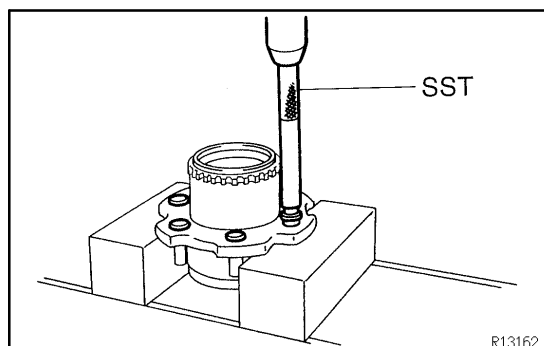
2. REMOVE HUB BOLT

Using SST and a press, remove hub bolt from the axle hub.

SST 09950-70010 (09951-07150)

NOTICE:

Be careful not to damage the ABS speed sensor rotor.



3. INSTALL HUB BOLT

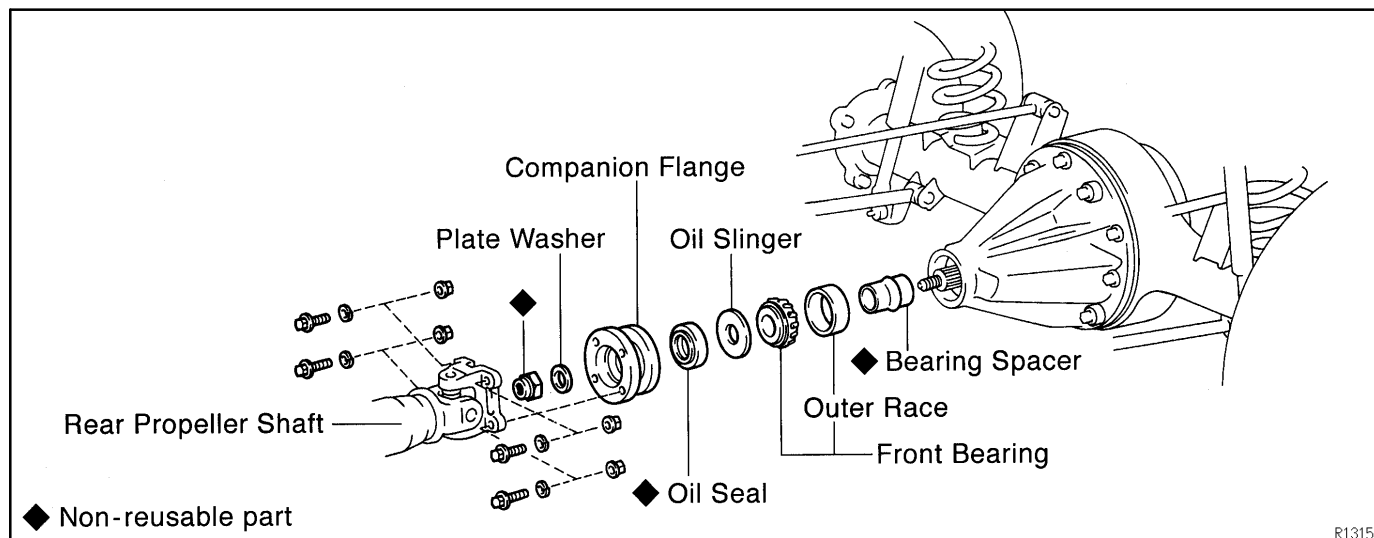
Using SST and a press, install the hub bolt.

SST 09950-70010 (09951-07150)

4. INSTALL REAR AXLE HUB (See page [SA-69](#))

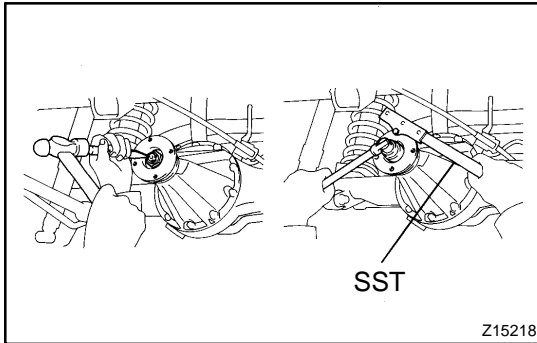
REAR DIFFERENTIAL FRONT OIL SEAL COMPONENTS

SA1VD-01

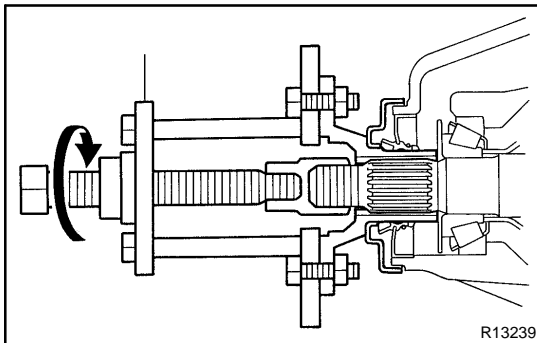


REPLACEMENT

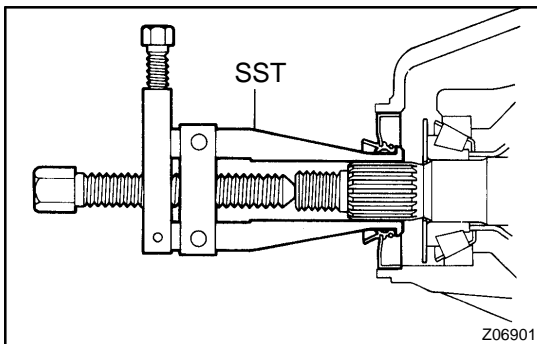
1. DRAIN DIFFERENTIAL OIL
2. DISCONNECT REAR PROPELLER SHAFT
(See page [PR-3](#))



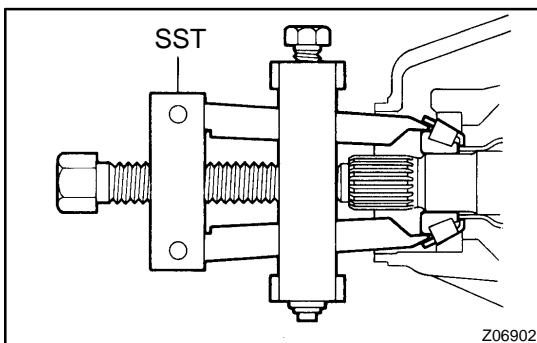
3. REMOVE COMPANION FLANGE
 - (a) Using a chisel and hammer, loosen the staked part of the nut.
 - (b) Using SST to hold the flange, remove the nut and plate washer.
SST 09330-00021



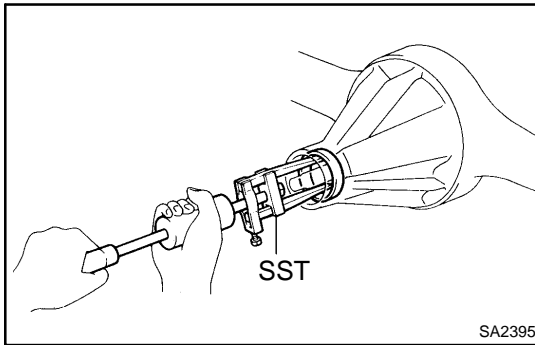
- (c) Using SST, remove the companion flange.
SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



4. REMOVE OIL SEAL AND OIL SLINGER
 - (a) Using SST, remove the oil seal.
SST 09308-10010
 - (b) Remove the oil slinger.



5. REMOVE FRONT BEARING
Using SST, remove the front bearing from the drive pinion.
SST 09556-22010

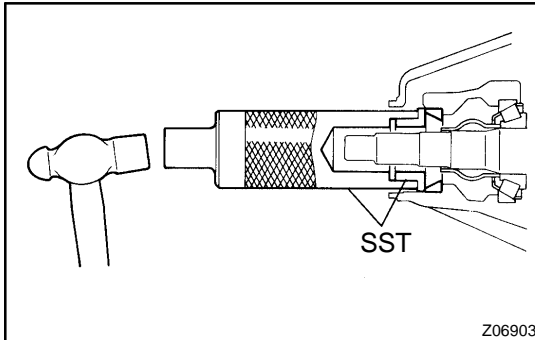
**6. REMOVE BEARING OUTER RACE**

Using SST, remove the bearing outer race.

SST 09308-00010

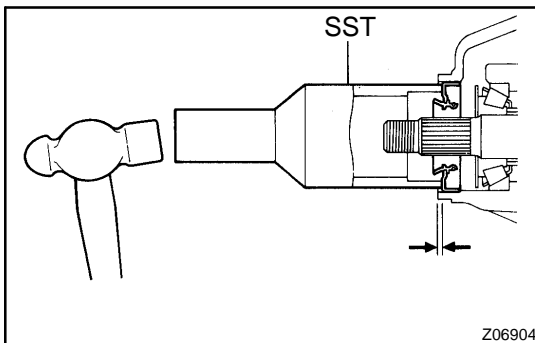
NOTICE:

Do not scratch the taper surface of the outer race.

7. REMOVE BEARING SPACER**8. INSTALL NEW BEARING SPACER****9. INSTALL BEARING OUTER RACE**

Using SST, install the bearing outer race.

SST 09316-60011 (09316-00011, 09316-00021)

10. INSTALL FRONT BEARING**11. INSTALL OIL SLINGER AND OIL SEAL**

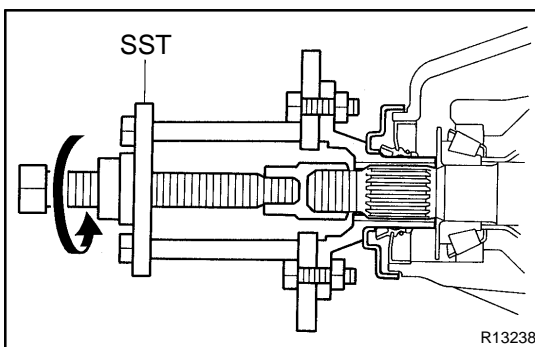
(a) Install the oil slinger.

(b) Using SST, install a new oil seal, as shown.

SST 09214-76011

Oil seal drive in depth: 1.0 mm (0.039 in.)

(c) Apply MP grease to the oil seal lip.

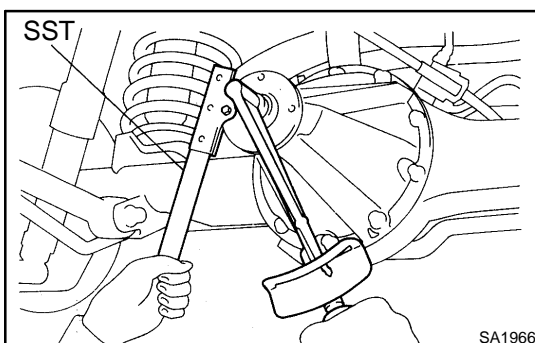
**12. INSTALL COMPANION FLANGE**

(a) Using SST, install the companion flange on the drive pinion.

SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

(b) Place the plate washer on the companion flange.

(c) Apply light coat of gear oil on threads of a new companion flange nut.



(d) Using SST to hold the flange, torque the nut.

SST 09330-00021

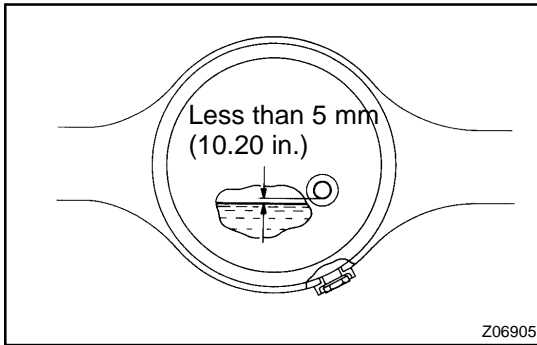
Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)

13. ADJUST DRIVE PINION PRELOAD

(See page [SA-73](#))

14. STAKE DRIVE PINION NUT**15. CONNECT REAR PROPELLER SHAFT**

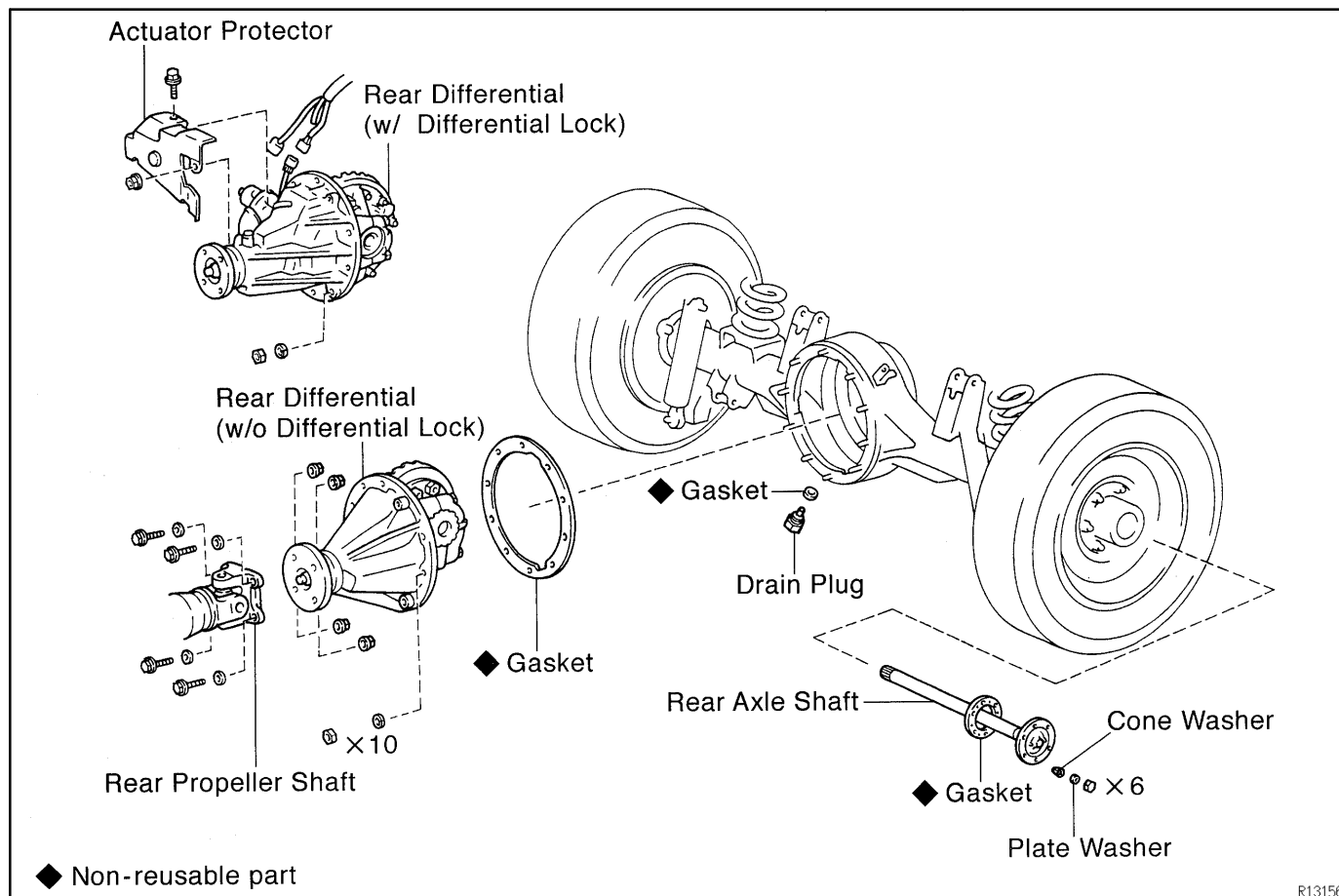
(See page [PR-5](#))



- 16. FILL DIFFERENTIAL WITH GEAR OIL**
Torque: 49 N·m (500 kgf·cm, 39 ft·lbf)
Oil type: Hypoid gear oil API GL-5
Recommended oil viscosity:
Above -18°C (0°F) SAE 90
Below -18°C (0°F) SAE 80W-90 or 80W
Capacity:
3.25 liters (3.4 US qts, 2.9 Imp. qts)

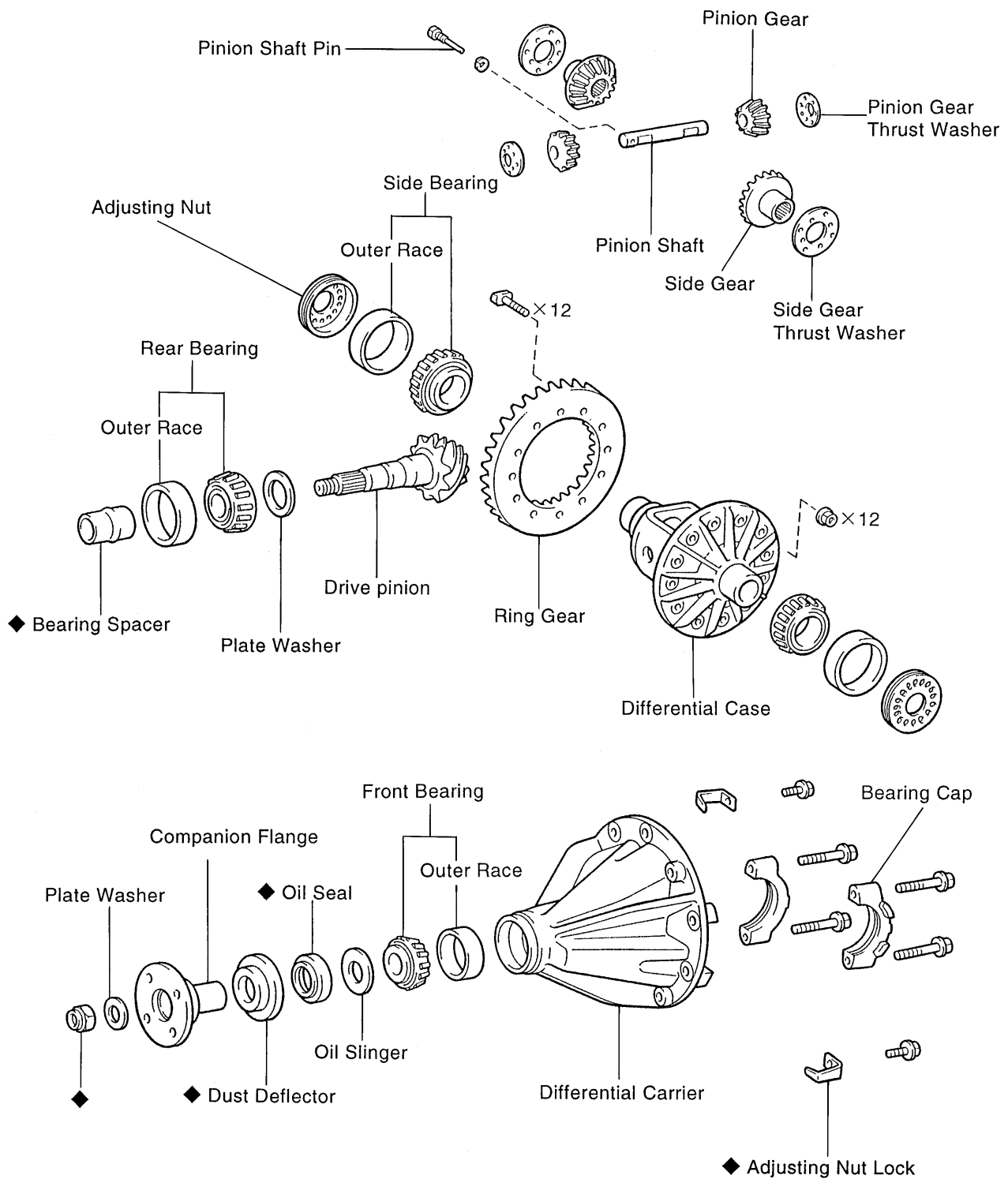
REAR DIFFERENTIAL CARRIER COMPONENTS

SA1VF-03



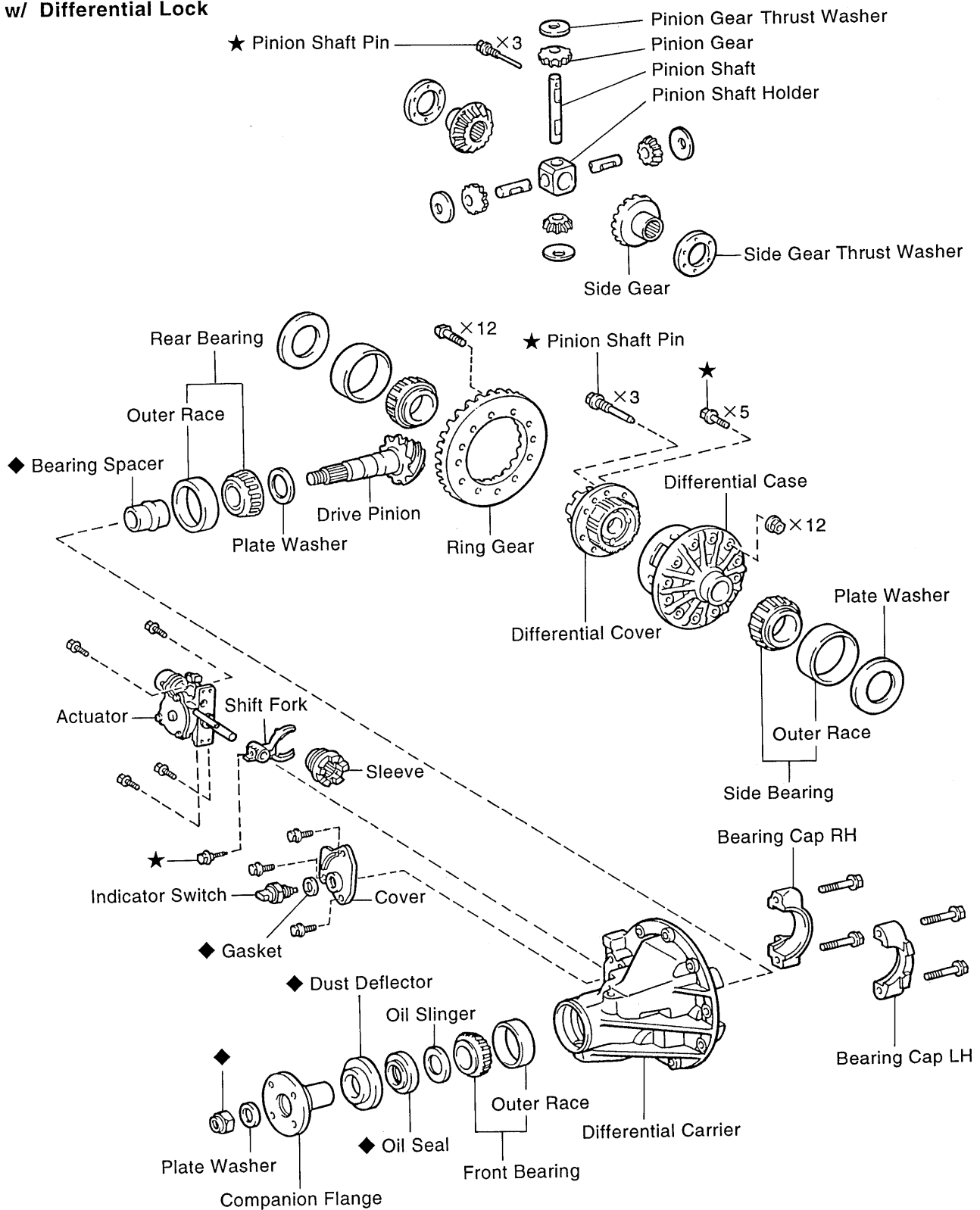
SUSPENSION AND AXLE - REAR DIFFERENTIAL CARRIER

w/o Differential Lock



R13150

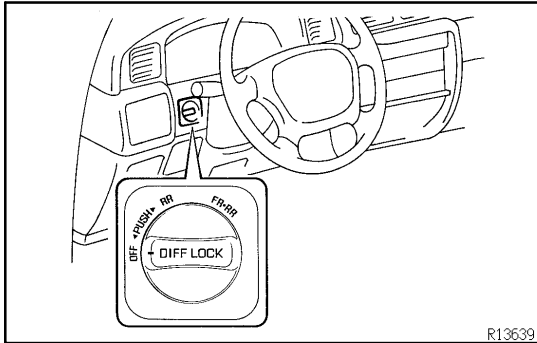
w/ Differential Lock



◆ Non-reusable part

★ Precoated part

R13216



REMOVAL

1. w/ Differential lock:

SHIFT REAR DIFFERENTIAL TO LOCK

- (a) Turn the ignition switch to the ON position.
- (b) Keep the center differential lock condition.
- (c) Turn the differential lock control switch to the RR or FR/RR position and lock the rear differential.

HINT:

Rotating the tires, check they are in the differential lock condition.

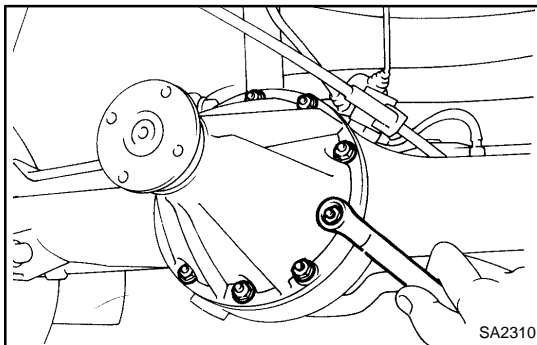
- (d) Disconnect the cable from the negative terminal of the battery.

2. DRAIN DIFFERENTIAL OIL

3. REMOVE REAR AXLE SHAFTS (See page [SA-63](#))

4. DISCONNECT PROPELLER SHAFT

(See page [PR-3](#))



5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

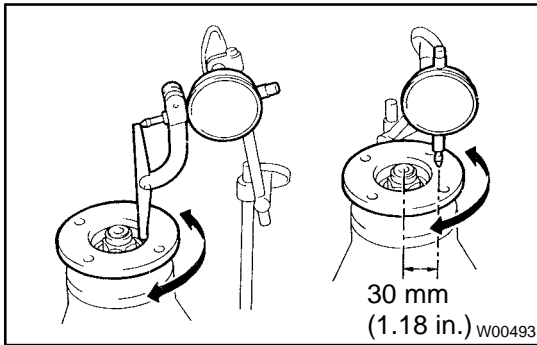
- (a) Remove the 10 nuts, washers and differential carrier assembly.

NOTICE:

Be careful not to damage the installation surface.

Torque: 73 N·m (740 kgf-cm, 54 ft-lbf)

- (b) Remove the gasket.

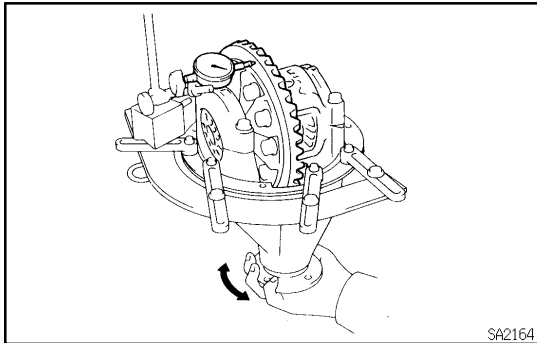


DISASSEMBLY

1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum runout: 0.10 mm (0.0039 in.)

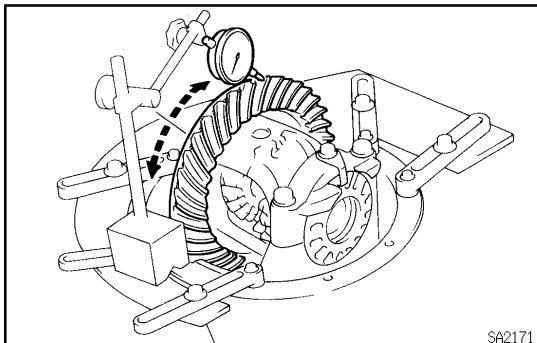


2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.10 mm (0.0039 in.)

If the runout is greater than the maximum, replace the ring gear.



3. CHECK RING GEAR BACKLASH

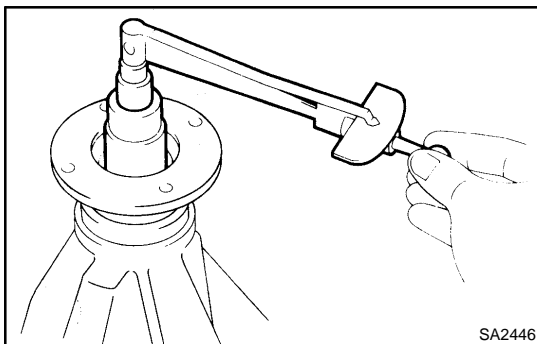
Using a dial indicator, measure the ring gear backlash.

Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)

HINT:

Perform the measurements at 3 or more positions around the circumference of the ring gear.

If the backlash is not within the specification, adjust the side bearing preload or repair as necessary.



4. MEASURE DRIVE PINION PRELOAD

(a) Using a torque wrench, measure the preload of backlash between the drive pinion and ring gear.

Preload (at starting):

0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.-lbf)

(b) Using a torque wrench, measure the preload.

Total preload (at starting):

Drive pinion preload plus

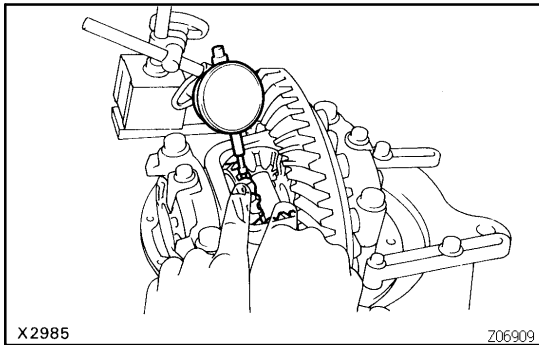
w/o Differential lock

0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)

w/ differential lock

0.3 – 0.7 N·m (3 – 7 kgf·cm, 2.6 – 6.1 in.-lbf)

If necessary, disassemble and inspect the differential.



X2985

Z06909

5. CHECK SIDE GEAR BACKLASH

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case.

Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)

If the backlash is not within the specification, install the correct thrust washers (See page [SA-87](#)).

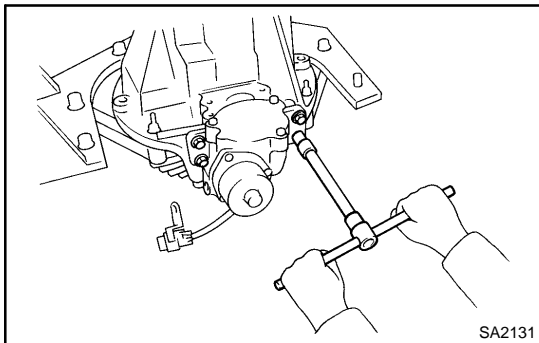
6. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page [SA-35](#))**7. w/ DIFFERENTIAL LOCK:****REMOVE INDICATOR SWITCH**

Remove the indicator switch and gasket.

8. w/ DIFFERENTIAL LOCK:**REMOVE COVER**

(a) Remove the 3 bolts.

(b) Using a brass bar and hammer, tap on the cover to remove it.



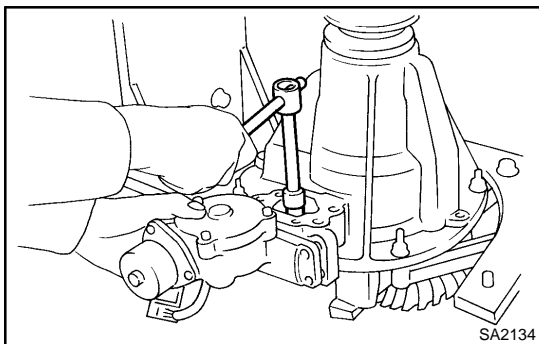
SA2131

9. w/ DIFFERENTIAL LOCK:**REMOVE SLEEVE**

(a) Remove the 4 bolts.

(b) Using a plastic hammer, tap the actuator.

(c) Remove the actuator and sleeve.

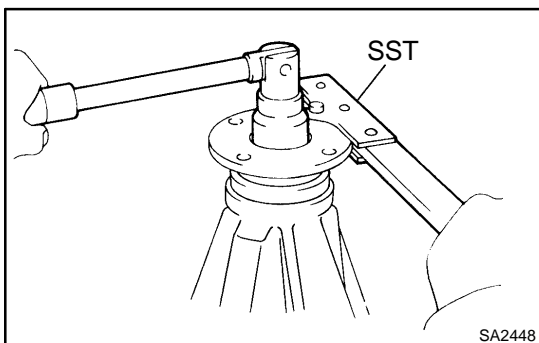


SA2134

10. w/ DIFFERENTIAL LOCK:**REMOVE ACTUATOR AND SHIFT FORK AND SHAFT**

(a) Remove the shift fork shaft bolt.

(b) Pull out the actuator and remove the shift fork.



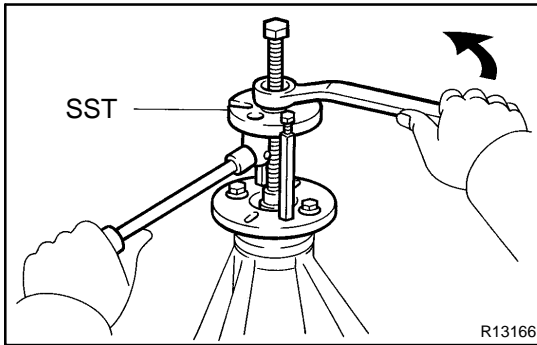
SA2448

11. REMOVE COMPANION FLANGE

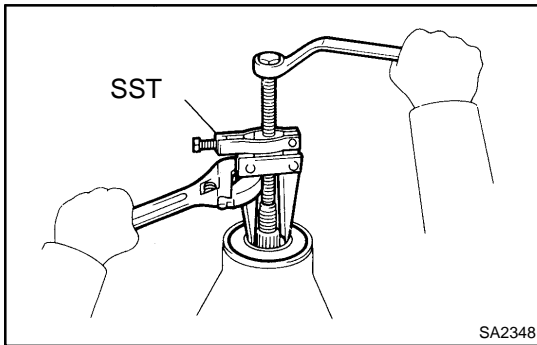
(a) Using a chisel and hammer, unstick the nut.

(b) Using SST to hold the flange, remove the nut and plate washer.

SST 09330-00021

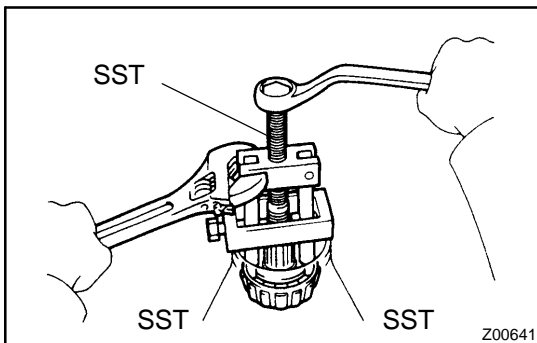


- (c) Using SST, remove the companion flange.
SST 09950-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



12. REMOVE OIL SEAL AND OIL SLINGER

- (a) Using SST, remove the oil seal from the differential carrier.
SST 09308-10010
(b) Remove the oil slinger.

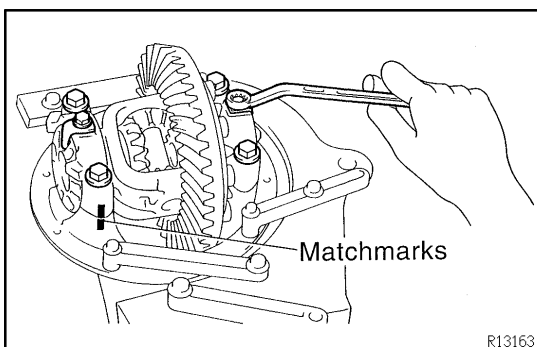


13. REMOVE FRONT BEARING

Using SST, remove the front bearing from the drive pinion.

SST 09556-22010

If the front bearing is damaged or worn, replace the bearing.



14. w/o DIFFERENTIAL LOCK:

REMOVE DIFFERENTIAL CASE ASSEMBLY

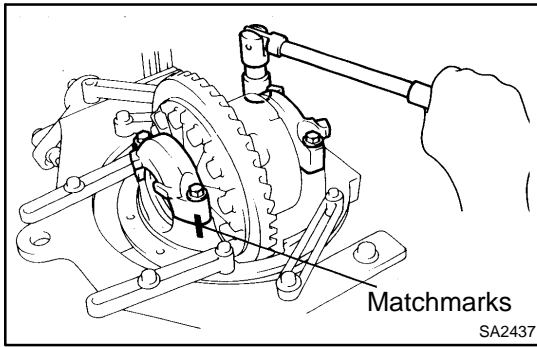
- (a) Place matchmarks on the bearing cap and differential carrier.
(b) Remove the 2 adjusting nut locks.

HINT:

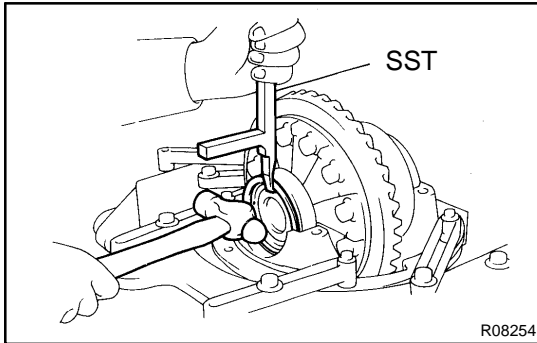
Tag the disassembled parts to show the location for reassembly.

- (c) Remove the 2 bearing caps and adjusting nuts.
(d) Remove the differential case with the bearing outer races from the carrier.

SUSPENSION AND AXLE – REAR DIFFERENTIAL CARRIER

**15. w/ DIFFERENTIAL LOCK:****REMOVE DIFFERENTIAL CASE ASSEMBLY**

- (a) Place matchmarks on the bearing cap and differential carrier.
- (b) Remove the 4 bolts and 2 bearing caps.



- (c) Using SST, remove the plate washers.
SST 09504-22011

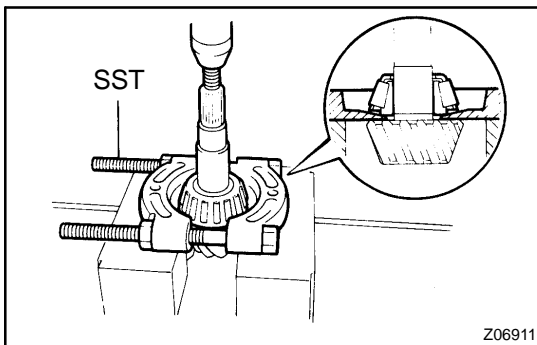
HINT:

Measure the plate washer thickness and note it.

- (d) Remove the differential case with the side bearing outer races from the differential carrier.

HINT:

Tag the bearing outer races to show the location for reassembly.

**16. REMOVE DRIVE PINION AND BEARING SPACER FROM DIFFERENTIAL CARRIER**

- (a) Remove the drive pinion with the rear bearing.
- (b) Remove the bearing spacer.

17. REMOVE DRIVE PINION REAR BEARING

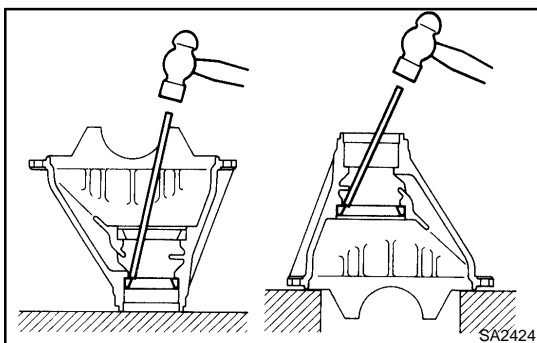
- (a) Using SST and a press, remove the rear bearing from the drive pinion.

SST 09950-00020

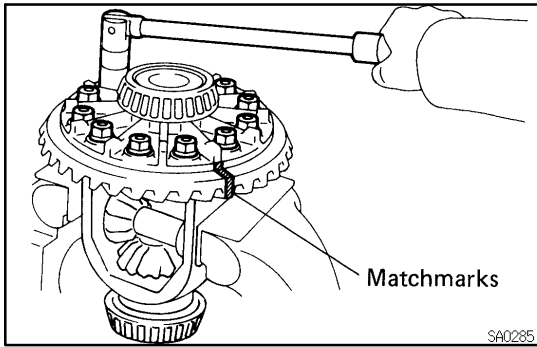
HINT:

If the drive pinion or ring gear are damaged, replace them as a set.

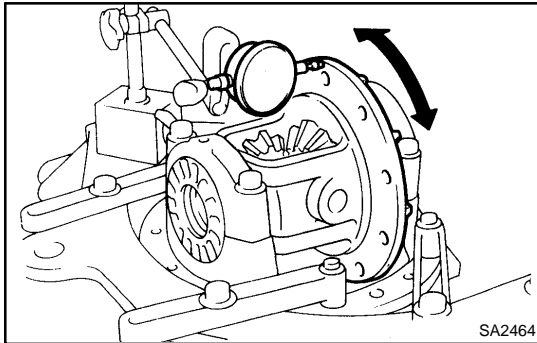
- (b) Remove the plate washer from the drive pinion.

**18. REMOVE FRONT AND REAR BEARING OUTER RACES**

Using a brass bar and hammer, remove the outer races.

**19. REMOVE RING GEAR**

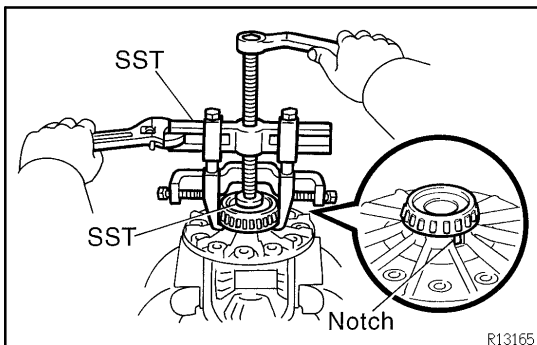
- Place matchmarks on the ring gear and differential case.
- Remove the 12 ring gear set nuts and bolts.
- Using a plastic hammer, tap on the ring gear to remove it from the differential case.

**20. CHECK DIFFERENTIAL CASE RUNOUT**

- Install the differential case in the differential carrier and tighten the adjusting nut just to where there is no play in the bearing.
- Using a dial indicator, measure the differential case runout.

Maximum case runout: 0.07 mm (0.0028 in.)

- Remove the differential case.

**21. w/o DIFFERENTIAL LOCK:****REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE**

Using SST, remove the 2 side bearings from the differential case.

SST 09950-40010 (09951-04010, 09952-04010, 09953-04020, 09955-04060, 09957-04010, 09958-04010), 09950-60010 (09951-00480)

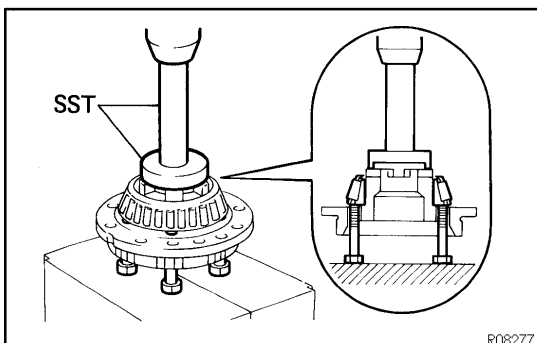
22. w/ DIFFERENTIAL LOCK:**REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE**

- Using SST, remove the side bearing (ring gear side).

SST 09950-40010 (09951-04010, 09952-04010, 09953-04020, 09955-04060, 09957-04010, 09958-04010), 09950-60010 (09951-00480)

HINT:

Fix the claws of SST to the notches in the differential case.



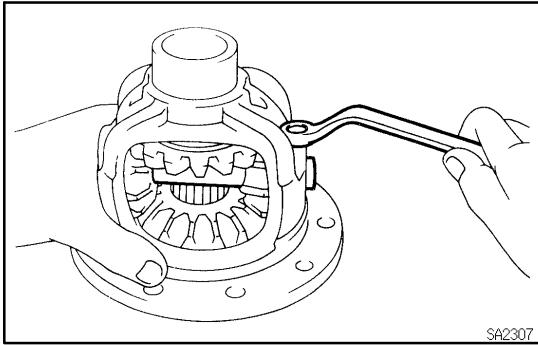
- Using SST, 4 bolts and a press, remove the side bearing (cover side).

SST 09550-10012 (09557-10010), 09950-70010 (09951-07150)

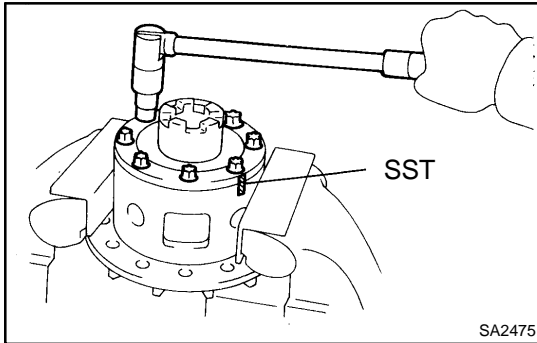
HINT:

Fix the claws of SST to the notches in the differential case.

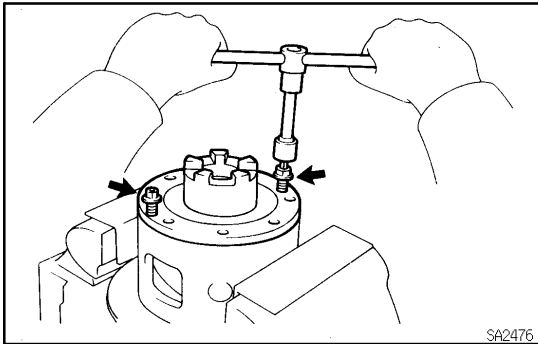
SUSPENSION AND AXLE – REAR DIFFERENTIAL CARRIER

**23. w/o DIFFERENTIAL LOCK:****DISASSEMBLE DIFFERENTIAL CASE**

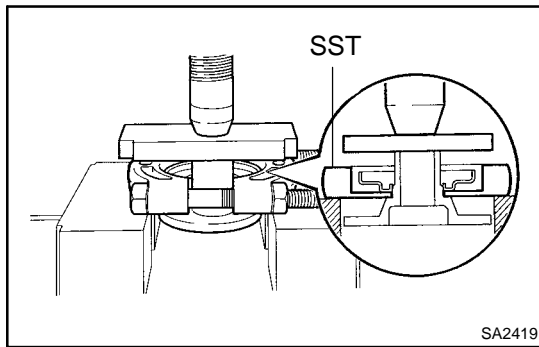
- (a) Remove the pinion shaft pin and washer.
- (b) Remove these parts from the differential case:
 - Pinion shaft
 - 2 Pinion gears
 - 2 Pinion gear thrust washers
 - 2 Side gears
 - 2 Side gear thrust washers

**24. w/ DIFFERENTIAL LOCK:****DISASSEMBLE DIFFERENTIAL CASE**

- (a) Place matchmarks on the case and cover.
- (b) Using a torx socket wrench, remove the 5 set bolts and 3 pinion shaft pins.



- (c) Using the 2 cover installation bolts, separate the cover and case.
- (d) Remove these parts from the differential case:
 - 2 Side gears
 - 2 Side gear thrust washers
 - 4 Pinion gears
 - 4 Pinion thrust washers
 - 3 Pinion shafts
 - Pinion shaft holder

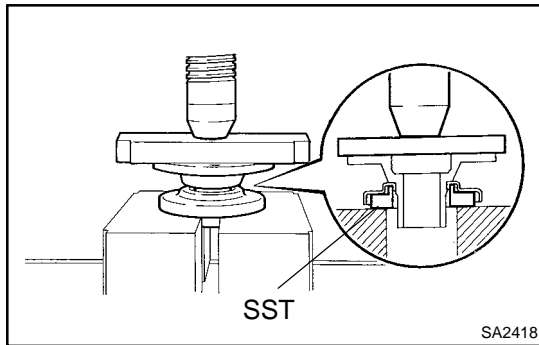


REPLACEMENT

1. REMOVE DUST DEFLECTOR

Using SST and a press, remove the dust deflector.

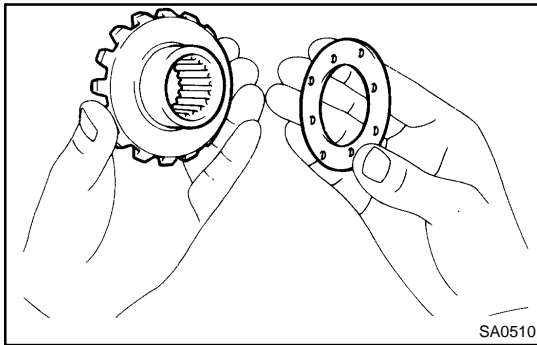
SST 09950-00020



2. INSTALL DUST DEFLECTOR

Using SST and a press, install a new dust deflector.

SST 09726-40010



REASSEMBLY

1. w/o DIFFERENTIAL LOCK:

ASSEMBLE DIFFERENTIAL CASE

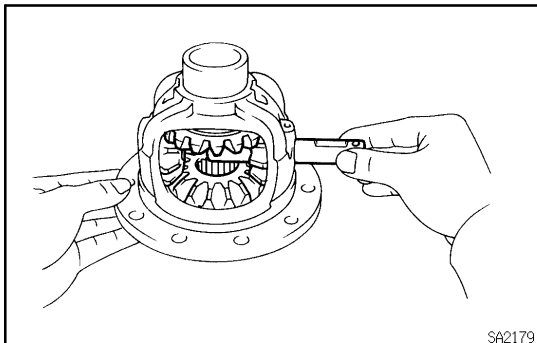
- (a) Apply all of the sliding and rotating surfaces with gear oil.
- (b) Install the 2 thrust washers and side gears.

Using the table below, select the thrust washers which will ensure that the backlash is within the specification. Try to select washers of the same size for both sides.

Backlash: 0.02 – 0.20 mm (0.0008–0.0079 in.)

Thrust washer thickness

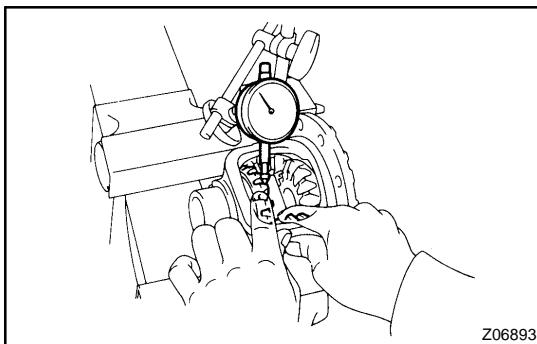
Thickness mm (in.)	Thickness mm (in.)
1.60 (0.063)	1.90 (0.075)
1.75 (0.069)	2.05 (0.081)



- (c) Install the side gears with the side gear thrust washers, pinion gears, pinion gear thrust washers and pinion shaft.

HINT:

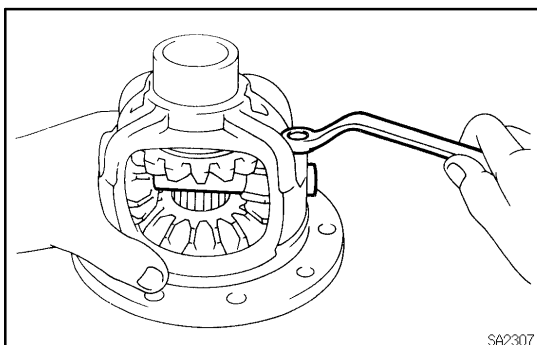
Align the hole for the pinion shaft and differential case hole.



- (d) Using a dial indicator, measure the side gear backlash with holding the one pinion gear toward the case.

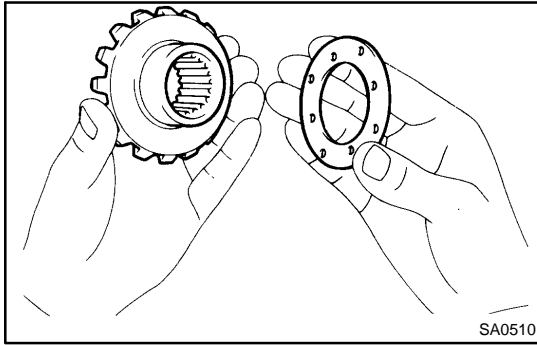
Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)

If the backlash is not within the specification, install a thrust washer of different thickness.



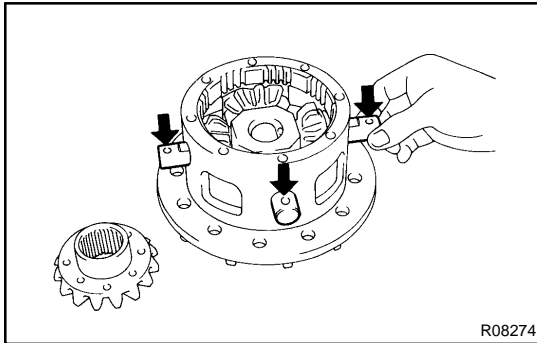
- (e) Install the pinion shaft pin and washer.

Torque: 27 N·m (275 kgf-cm, 20 ft-lbf)



2. w/ DIFFERENTIAL LOCK: MEASURE SIDE GEAR BACKLASH

- (a) Apply all of the sliding and rotating surfaces with gear oil.
- (b) Install the thrust washer to the side gear.
- (c) Install the thrust washer to the pinion gear.



- (d) Install the side gear into the case.
- (e) Install the holder into the case.
- (f) Install the 4 pinion gears with the thrust washers.
- (g) Align the pinion shaft hole and case pinion shaft pin hole, and install the pinion shaft.
- (h) Install the side gear to the cover.
- (i) Align the matchmarks and install the case and cover.
- (j) Using a torx socket wrench, torque the 5 bolts and 3 pinion shaft pins.

Torque: 58 N·m (590 kgf-cm, 43 ft-lbf)

- (k) Using a dial indicator, with holding the side gear and measure the backlash.

Backlash: 0.02 – 0.20 mm (0.0008 – 0.0079 in.)

HINT:

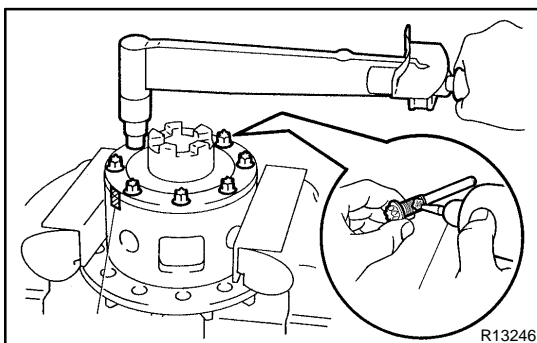
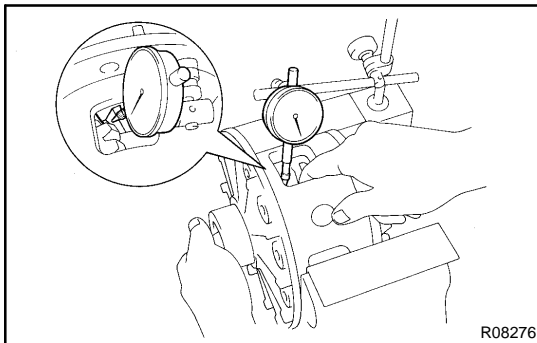
Measure at all 4 locations.

If the backlash is not within the specification, install the thrust washer of a different thickness.

Thrust washer thickness

Thickness mm (in.)	Thickness mm (in.)
1.60 (0.063)	1.90 (0.075)
1.75 (0.069)	2.05 (0.081)

- (l) After measuring backlash, remove the 5 set bolts and 3 pinion shaft pins.



3. w/ DIFFERENTIAL LOCK: ASSEMBLE DIFFERENTIAL CASE

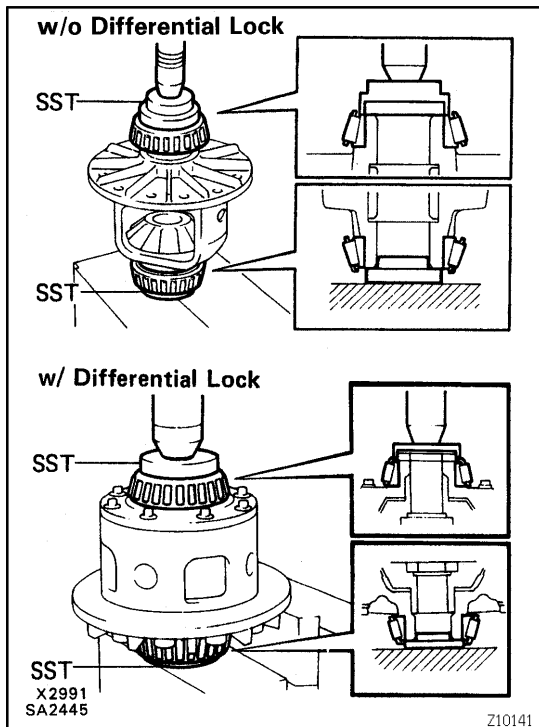
- (a) Clean the thread of the bolts, pinion shaft pins, case and cover with the white gasoline.
- (b) Coat the threads of the bolts and pinion shaft pins with adhesive.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (c) Align the matchmarks, install the case and cover.

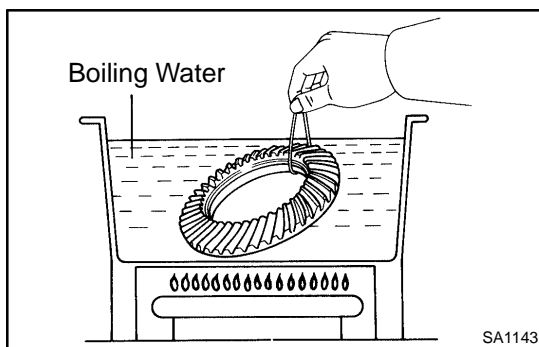
- (d) Using a torx socket wrench, torque the 5 bolts and 3 pinion shaft pins.

Torque: 58 N·m (590 kgf-cm, 43 ft-lbf)



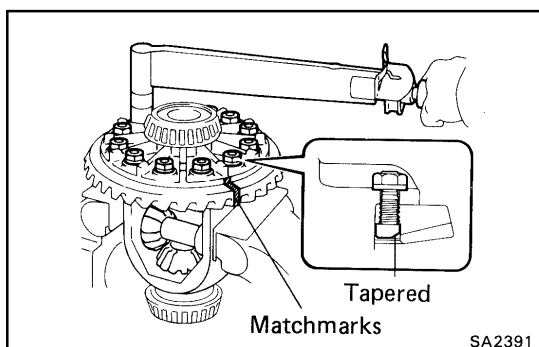
4. INSTALL SIDE BEARINGS

- (a) w/o Differential lock:
Using SST and a press, install the 2 side bearings on the differential case.
SST 09315-00022, 09550-10012 (09558-10010)
- (b) w/ Differential lock:
Using SST and a press, install the 2 side bearings on the differential case.
SST 09550-60010, 09550-10012 (09558-10010)



5. INSTALL RING GEAR ON DIFFERENTIAL CASE

- (a) Clean the contact surfaces of the differential case and ring gear.
- (b) Heat the ring gear to about 100°C (212°F) in boiling water.
- (c) Carefully remove the ring gear from the boiling water.
- (d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.



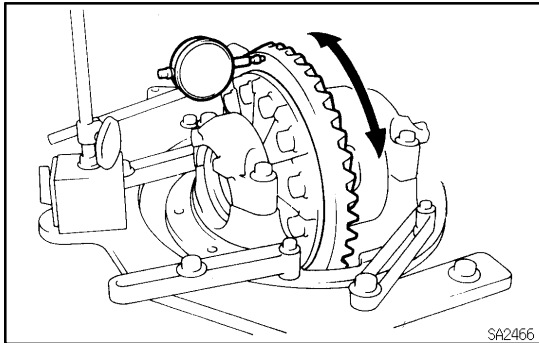
- (e) Align the matchmarks on the ring gear and differential case.
- (f) Temporarily install the set bolts and nuts so that the bolt holes in the ring gear and differential case are not misaligned.

NOTICE:

Install the bolts so that the tapered part of the bolt is on the ring gear side. The ring gear set nuts should not tighten until the ring gear has cooled sufficiently.

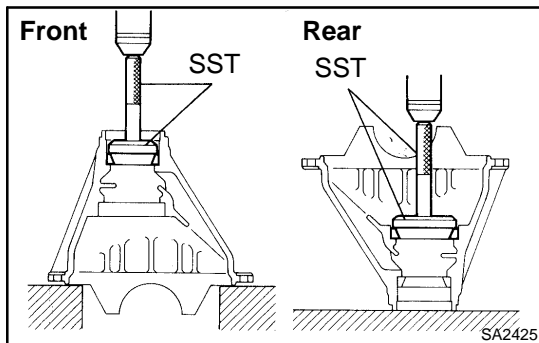
- (g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.

Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)



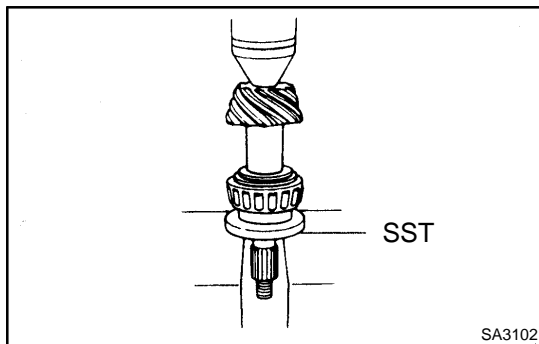
6. CHECK RING GEAR RUNOUT

- (a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings.
- (b) Using a dial indicator, check the ring gear runout.
Maximum runout: 0.10 mm (0.0039 in.)
- (c) Remove the differential case.



7. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

- (a) Front side:
Using SST and a press, install the 2 outer races.
SST 09950-60020 (09951-00710),
09950-70010 (09951-07150)
- (b) Rear side:
Using SST and a press, install the 2 outer races.
SST 09950-60020 (09951-00890),
09950-70010 (09951-07150)



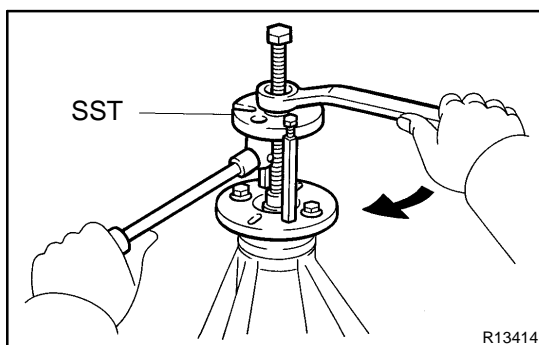
8. INSTALL DRIVE PINION REAR BEARING

- (a) Install the washer on the drive pinion.

HINT:

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.

- (b) Using SST and a press, install the rear bearing onto the drive pinion.
SST 09506-35010



9. TEMPORARILY ADJUST DRIVE PINION PRELOAD

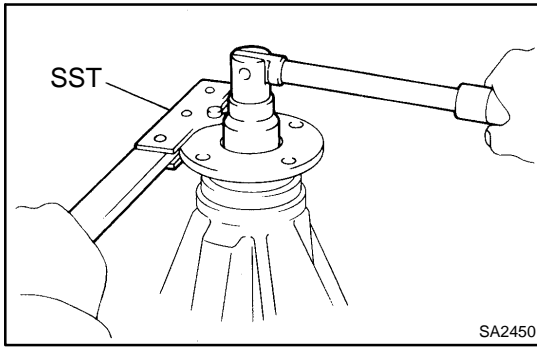
- (a) Install the drive pinion and front bearing.

HINT:

Assemble the spacer and oil seal after adjusting the gear contact pattern.

- (b) Install the oil slinger.
- (c) Install the companion flange with SST.
SST 09550-30010 (09951-03010, 09953-03010,
09954-03010, 09955-03030, 09956-03020)

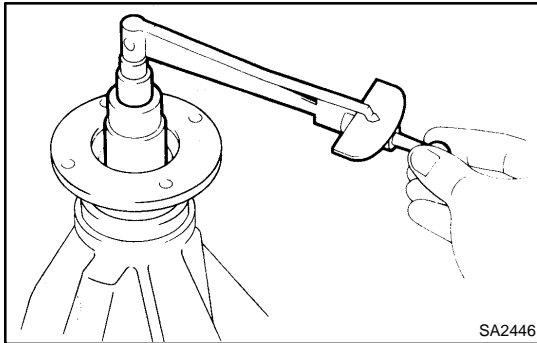
SUSPENSION AND AXLE – REAR DIFFERENTIAL CARRIER



- (d) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330-00021

NOTICE:

Coat the nut and screw of the drive pinion with gear oil. As there is no spacer, tighten a little at a time, being careful not to overtighten.



- (e) Using a torque wrench, measure the preload.
Preload (at starting):
New bearing
1.3 – 2.0 N·m (13 – 20 kgf·cm, 11.3 – 17.4 in.-lbf)
Reused bearing
0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.-lbf)

HINT:

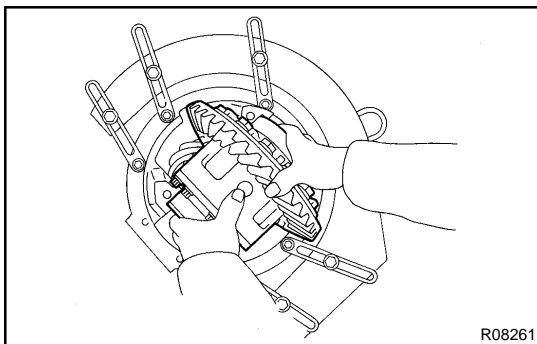
Measure the total preload after first turning the bearing clockwise and counterclockwise several times to make the bearing smooth.

10. w/o DIFFERENTIAL LOCK:**INSTALL DIFFERENTIAL CASE IN CARRIER**

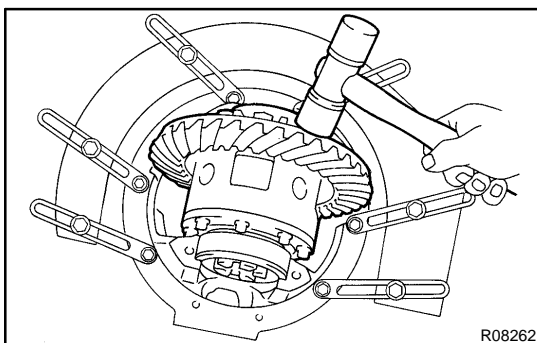
- (a) Place the 2 bearing outer races on their respective bearings. Make sure that the left and right outer races are not interchanged.
(b) Install the case in the carrier.

HINT:

Make sure that there is backlash between the ring gear and drive pinion.

**11. w/ DIFFERENTIAL LOCK:****INSTALL DIFFERENTIAL CASE IN CARRIER**

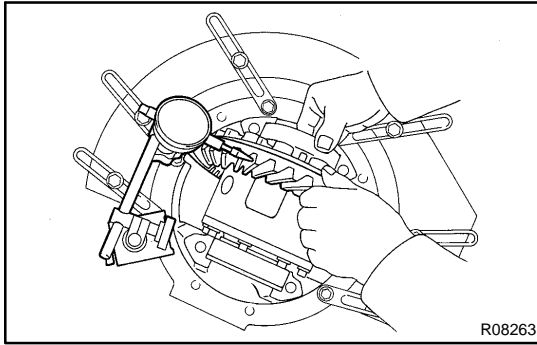
- (a) Place the 2 bearing outer races on their respective bearings. Make sure that the left and right races are not interchanged.
(b) Install the assembled plate washer onto the side bearing.
(c) Install the differential case in the carrier.



- (d) Make the plate washer and bearing smooth by tapping on the ring gear with a plastic hammer.

HINT:

If it is difficult to install the differential case into the carrier, replace the plate washer with a thinner one. However, select a plate washer that allows no clearance between it and the carrier.



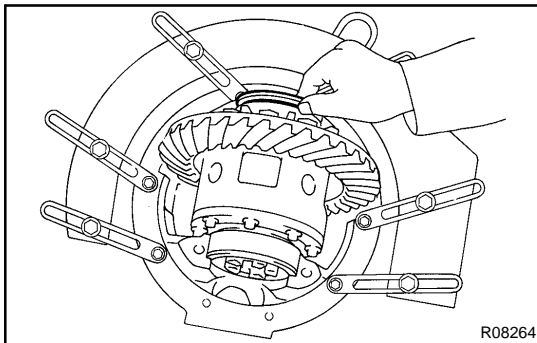
12. w/ DIFFERENTIAL LOCK: ADJUST RING GEAR BACKLASH

- (a) Using a dial indicator, with holding the side bearing of the ring gear side and measure the backlash.
Backlash (reference): 0.15 mm (0.0059 in.)
- (b) Select a case cover side plate washer using the backlash as reference.

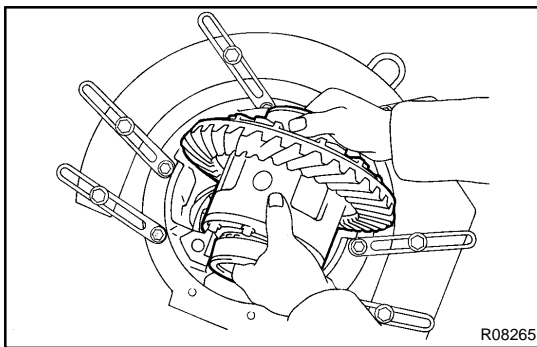
Side plate washer thickness

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
1	2.67 (0.1051)	7	2.85 (0.1122)	13	3.03 (0.1193)	19	3.21 (0.1264)
2	2.70 (0.1063)	8	2.88 (0.1134)	14	3.06 (0.1205)	20	3.24 (0.1276)
3	2.73 (0.1075)	9	2.91 (0.1146)	15	3.09 (0.1217)	21	3.27 (0.1287)
4	2.76 (0.1087)	10	2.94 (0.1157)	16	3.12 (0.1228)	22	3.30 (0.1299)
5	2.79 (0.1098)	11	2.97 (0.1169)	17	3.15 (0.1240)	23	3.33 (0.1311)
6	2.82 (0.1110)	12	3.00 (0.1181)	18	3.18 (0.1252)		

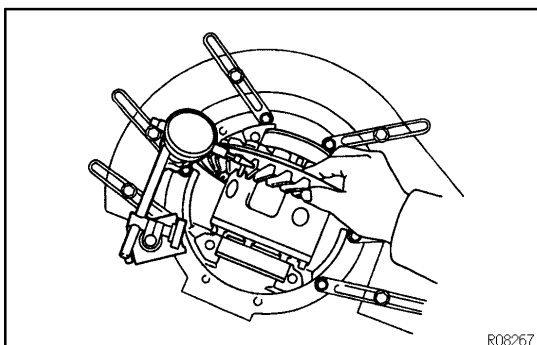
V04434



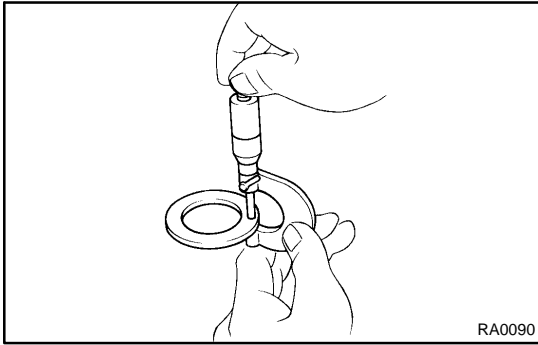
- (c) Select a ring gear side plate washer of a thickness which eliminates any clearance between the plate washer and carrier.



- (d) Remove the 2 plate washers and differential carrier.
- (e) Install the plate washer into the lower part of the carrier.
- (f) Place the plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.
- (g) Using a plastic hammer, make the washer and bearing smooth by tapping the ring gear.



- (h) Using a dial indicator, measure the ring gear backlash.
Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)
If it is not within the specification, adjust it by either increasing or decreasing the number of washers on both sides by an equal amount.
HINT:
There should be no clearance between the plate washer and case.
Ensure that there is ring gear backlash.

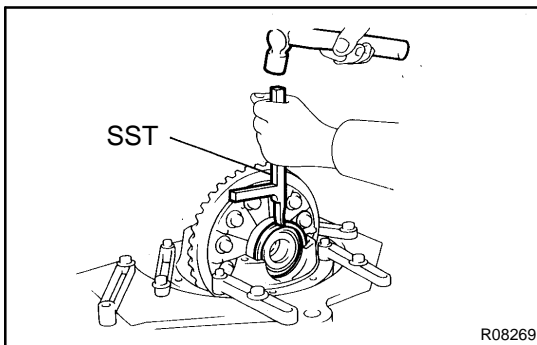


**13. w/ DIFFERENTIAL LOCK:
ADJUST SIDE BEARING PRELOAD**

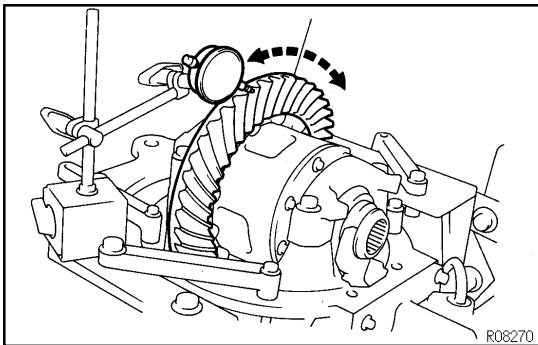
- (a) After adjustment with the backlash as reference, remove the ring gear side plate washer.
- (b) Using a micrometer, measure the thickness of the removed plate washer.
- (c) Install a new thicker washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) than the washer removed.

HINT:

Select a washer which can be pressed in 2/3 of the way with finger.



- (d) Using SST, tap in the plate washer.
SST 09504-22010
- (e) Align the matchmarks on the cap and carrier.
- (f) Tighten the 4 bearing cap bolts to the specified torque.
Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)



- (g) Using a dial indicator, adjust the ring gear backlash until it is within the specification.

Backlash: 0.15 – 0.20 mm (0.0059 – 0.0079 in.)

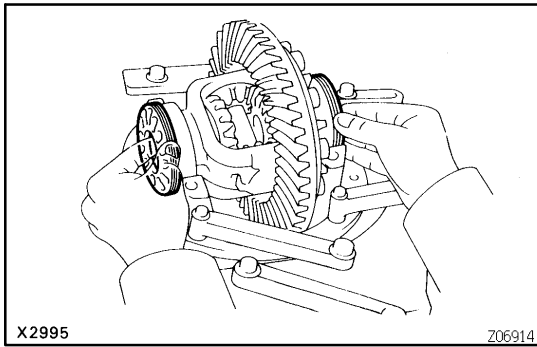
If it is not within the specification, follow the procedure listed below.

If backlash is greater than the specification:

Replace the cover side washer with a thicker washer. When doing so replace the ring gear side plate washer with one having a thickness equalling the amount the cover side plate washer thickness was decreased.

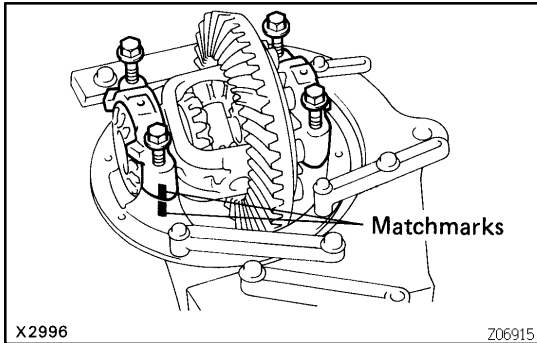
If backlash is less than specification:

Replace the cover side washer with a thicker washer. When doing so, replace the ring gear side plate washer with one having a thickness equalling the amount the cover side plate washer thickness was increased.



14. w/o DIFFERENTIAL LOCK: INSTALL ADJUSTING NUTS

Install the 2 adjusting nuts on the carrier, making sure the nuts are threaded properly.



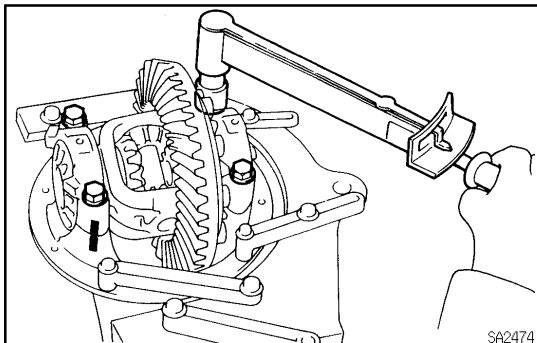
15. w/o DIFFERENTIAL LOCK: INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the 2 bearing cap bolts 2 or 3 turns and press down the bearing cap by hand.

HINT:

If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly.

Reinstall the adjusting nuts if necessary.



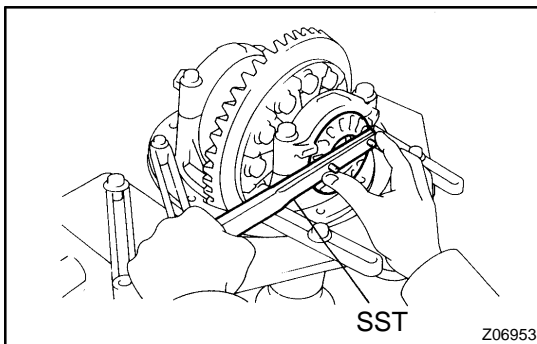
16. w/o DIFFERENTIAL LOCK: ADJUST SIDE BEARING PRELOAD

- (a) Torque the 4 bearing cap bolts to the specified torque, then loosen them to the point where the adjusting nuts can be turned by SST.

SST 09504-00011

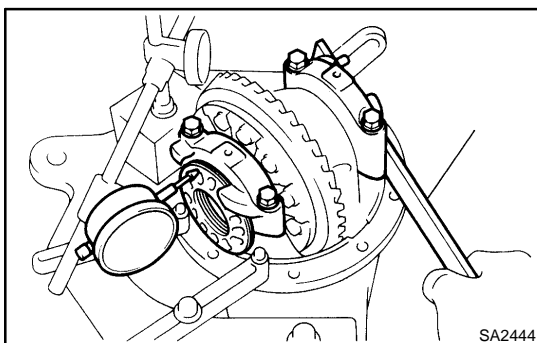
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

- (b) Fully tighten the 4 bearing cap bolts by hand.



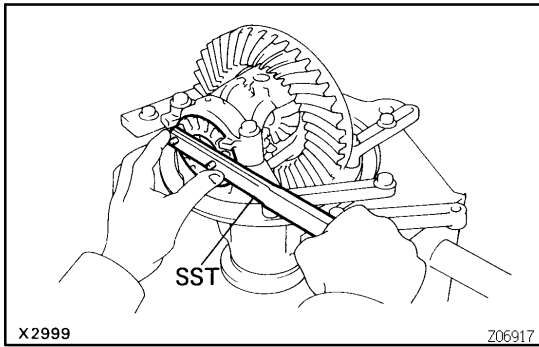
- (c) Using the SST, torque the adjusting nut on the ring gear side until the ring has a backlash of about 0.2 mm (0.008 in.).

- (d) With turning the ring gear, use the SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.

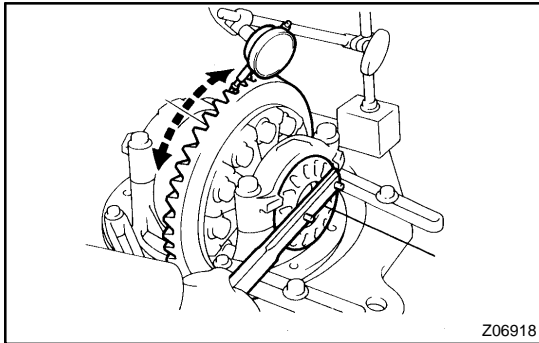


- (e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
- (f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.

SUSPENSION AND AXLE – REAR DIFFERENTIAL CARRIER



- (g) Using the SST, torque the adjusting nut 1–1.5 notches from the zero preload position.

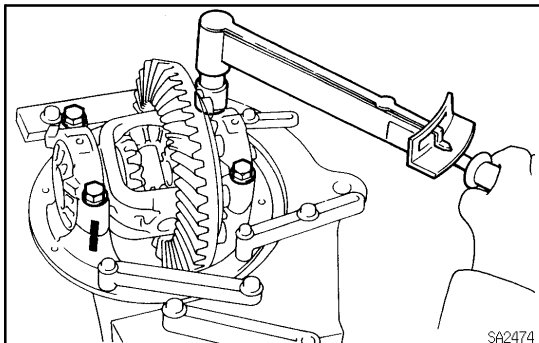


- (h) Using a dial indicator, adjust the ring gear backlash until it is within the specification.

Backlash: 0.15 – 0.20 mm (0.0059–0.0079 in.)

HINT:

The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and torque the nut on the right side one notch.



- (i) Torque the 4 bearing cap bolts.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)
(j) Recheck the ring gear backlash.
Backlash: 0.15 – 0.20 mm (0.0059–0.0079 in.)

17. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the preload.

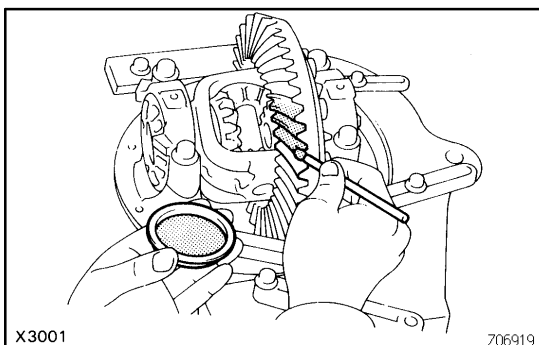
Total preload (at starting):

**Drive pinion preload plus
w/o Differential lock**

0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)

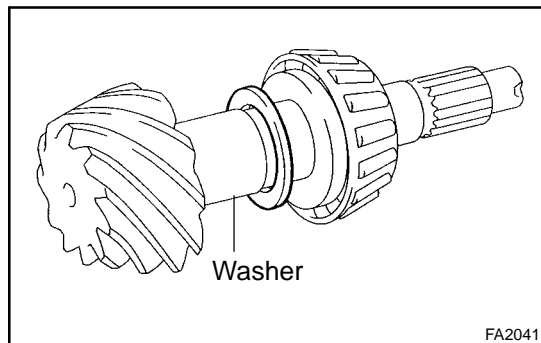
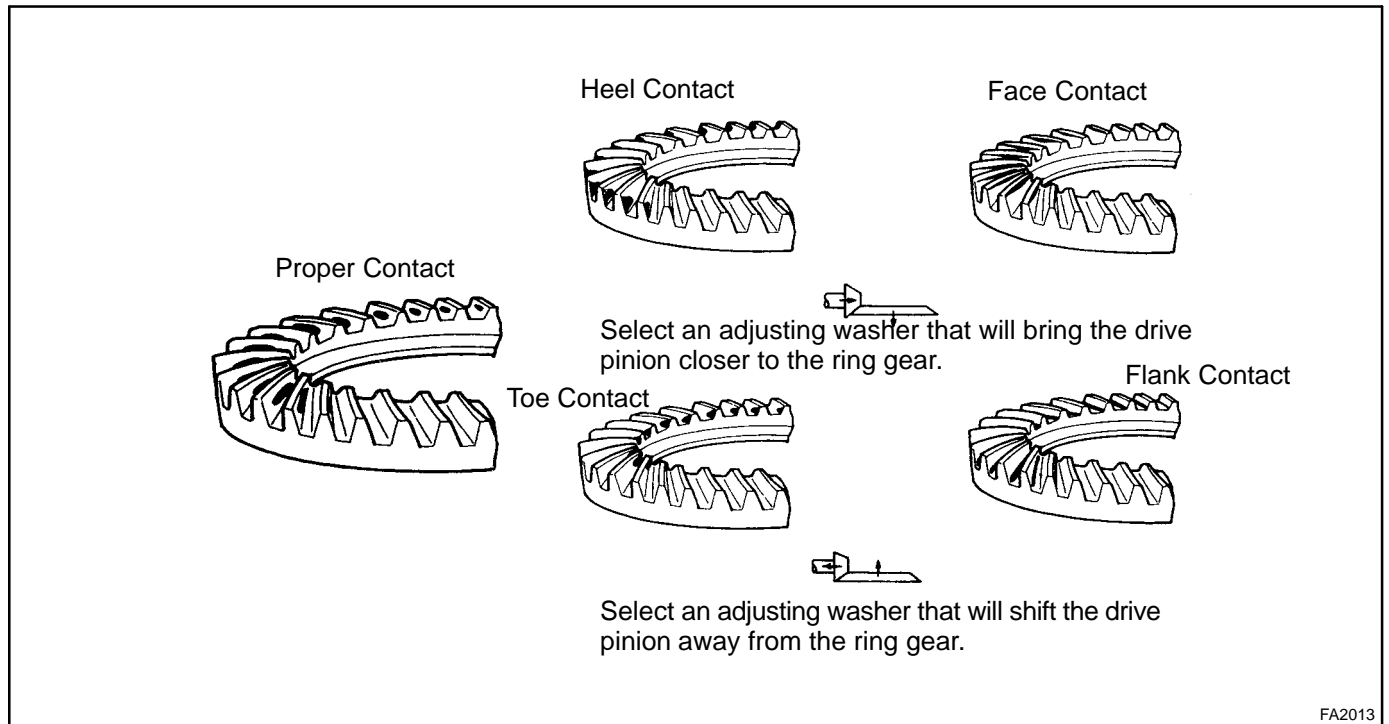
w/ Differential lock

0.3– 0.7 N·m (3 – 7 kgf·cm, 2.6 – 6.1 in.·lbf)



18. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

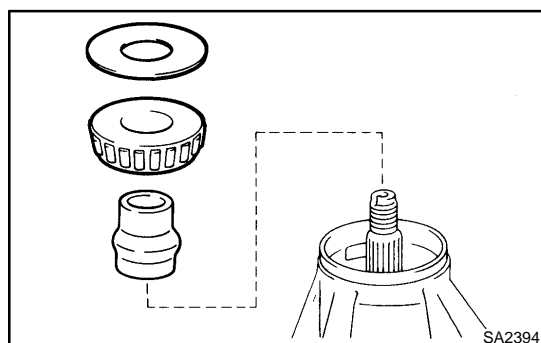
- (a) Coat 3 or 4 teeth at 3 different positions on the ring gear with red lead.
(b) Turn the companion flange, pin both directions to inspect the ring gear for proper tooth contact.



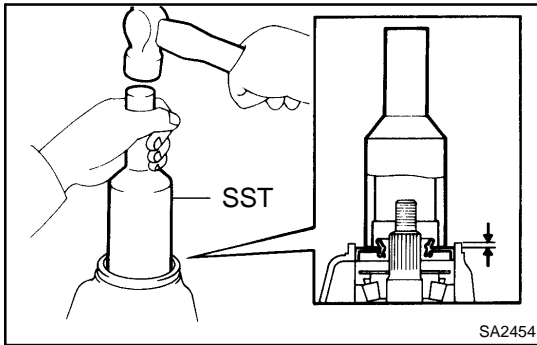
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Thickness mm (in.)	Thickness mm (in.)
1.05 (0.0413)	1.35 (0.0531)
1.10 (0.0433)	1.40 (0.0551)
1.15 (0.0453)	1.45 (0.0571)
1.20 (0.0472)	1.50 (0.0591)
1.25 (0.0492)	1.55 (0.0610)
1.30 (0.0512)	–

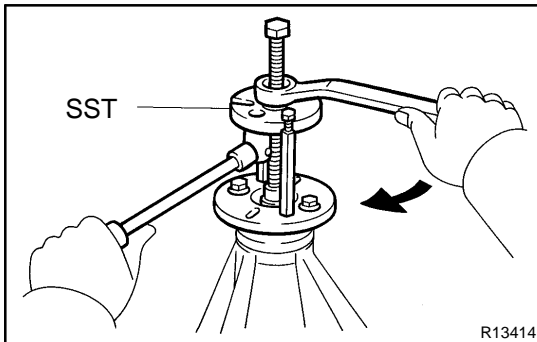
19. **REMOVE COMPANION FLANGE** (See page [SA-29](#))
20. **REMOVE OIL SLINGER AND FRONT BEARING** (See page [SA-29](#))



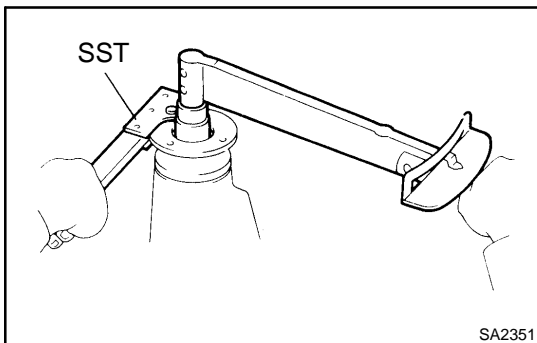
21. **INSTALL BEARING SPACER AND FRONT BEARING**
 - (a) Install a new bearing spacer on the shaft.
 - (b) Install the front bearing and oil slinger.

**22. INSTALL OIL SEAL**

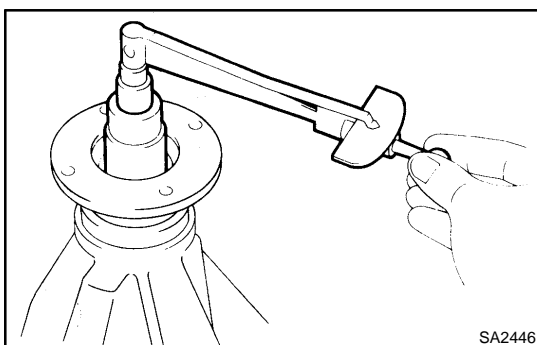
- (a) Using SST and a hammer, install a new oil seal, as shown.
SST 09214-76011
Oil seal drive in depth: 1.0 mm (0.039 in.)
- (b) Apply MP grease to the oil seal lip.

**23. INSTALL COMPANION FLANGE**

- (a) Install the companion flange with SST.
SST 09550-30010 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)
- (b) Install the plate washer and a new nut.
HINT:
Coat the threads of a new nut with gear oil.



- (c) Using SST to hold the flange, tighten the nut.
SST 09330-00021
Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)

**24. ADJUST DRIVE PINION PRELOAD**

Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):**New bearing**

1.3 – 2.0 N·m (13 – 20 kgf·cm, 11.3 – 17.4 in.-lbf)

Reused bearing

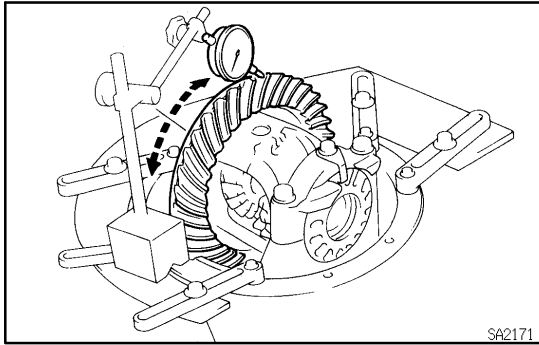
0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.-lbf)

If the preload is greater than the specification, replace the bearing spacer.

If the preload is less than the specification, retighten the nut a little at a time 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

Maximum torque: 441 N·m (4,500 kgf·cm, 326 ft·lbf)

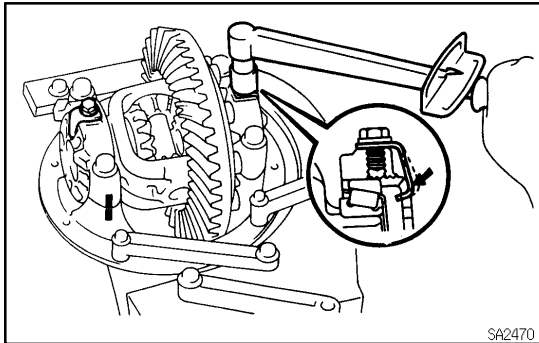
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

**25. RECHECK RING GEAR BACKLASH**

Using a dial indicator, measure the ring gear backlash.

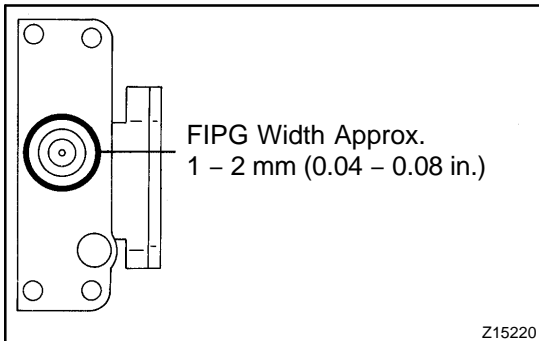
Ring gear backlash:

0.15 – 0.20 mm (0.0059 – 0.0079 in.)

26. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION**27. CHECK RUNOUT OF COMPANION FLANGE (See page SA-80)****28. w/o DIFFERENTIAL LOCK:
INSTALL ADJUSTING NUT LOCKS**

- (a) Install 2 new nut locks on the bearing caps.
- (b) Tightening 2 bolts, bend the nut locks.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

**29. w/ DIFFERENTIAL LOCK:
INSTALL ACTUATOR, SHIFT FORK AND SLEEVE**

- (a) Clean contacting surfaces of any FIPG material using gasoline or alcohol.
- (b) Apply FIPG to the actuator.

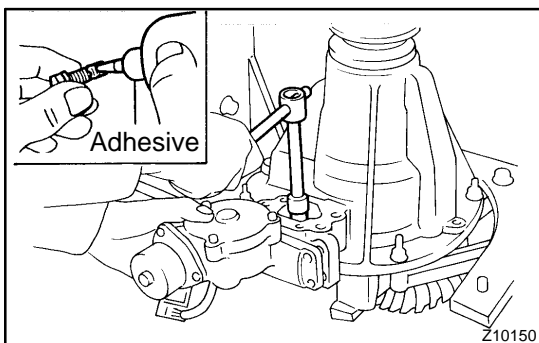
FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the actuator within 10 minutes after applying FIPG.

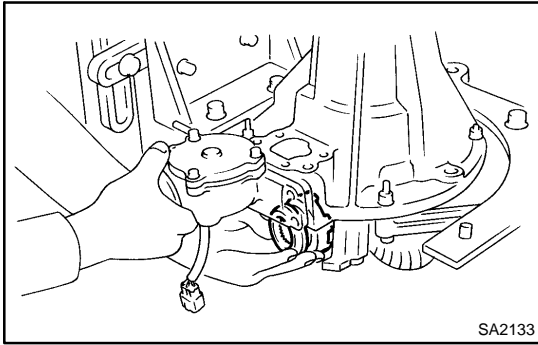


- (c) Install the actuator to the differential and match the shift fork hole.

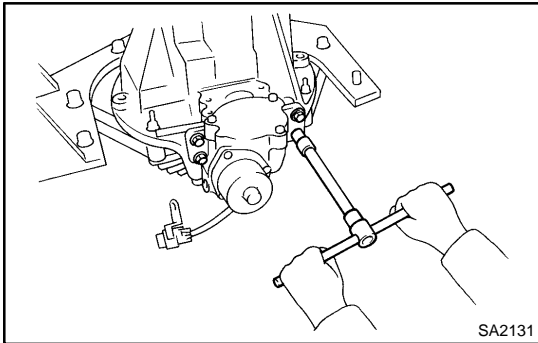


- (d) Clean the threads of set bolt and fork shaft with the white gasoline.
- (e) Coat the threads of the set bolt with adhesive.
Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent
- (f) Tighten the shift fork shaft set bolt.
Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)

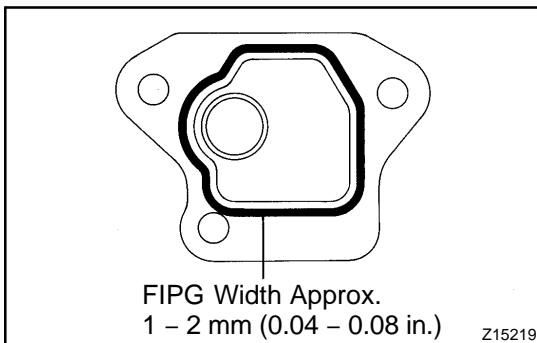
SUSPENSION AND AXLE – REAR DIFFERENTIAL CARRIER



- (g) Engage the sleeve with the dog clutch of the differential case.



- (h) Tighten the 4 bolts.
Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)



**30. w/ DIFFERENTIAL LOCK:
 INSTALL COVER**

- (a) Clean contacting surfaces of any FIPG material using gasoline or alcohol.
 (b) Apply FIPG to the cover.
FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the cover within 10 minutes after applying FIPG.

- (c) Tighten the 3 bolts.
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

**31. w/ DIFFERENTIAL LOCK:
 INSTALL INDICATOR SWITCH**

Install the indicator switch with a new gasket.

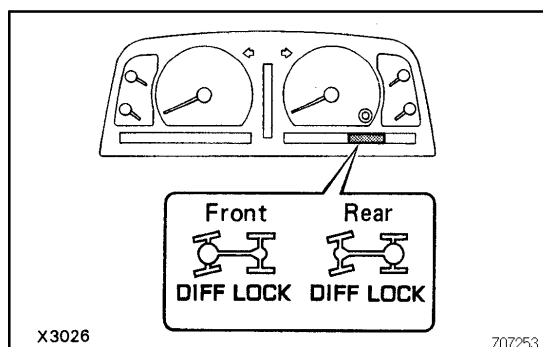
Torque: 40 N·m (410 kgf-cm, 30 ft-lbf)

INSTALLATION

Installation is in the reverse order of removal (See page [SA-79](#)).

HINT:

After installation, fill the differential with gear oil (See page [SA-27](#)).

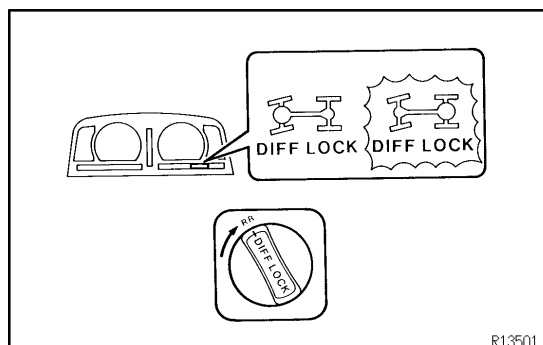


DIFFERENTIAL LOCK SYSTEM ON-VEHICLE INSPECTION

SA1VL-03

1. INSPECT DIFFERENTIAL LOCK SYSTEM

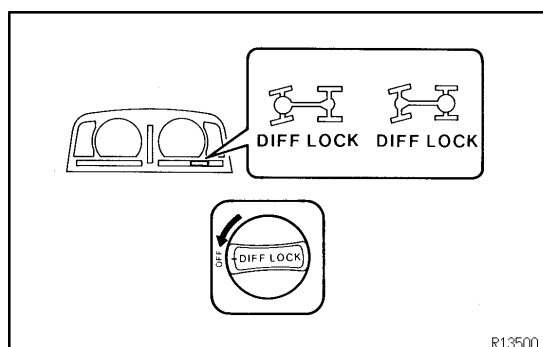
- (a) Inspect the indicator lights.
Check that the indicator lights (front side and rear side) light up for approx. 1 second when the ignition switch is turned ON.



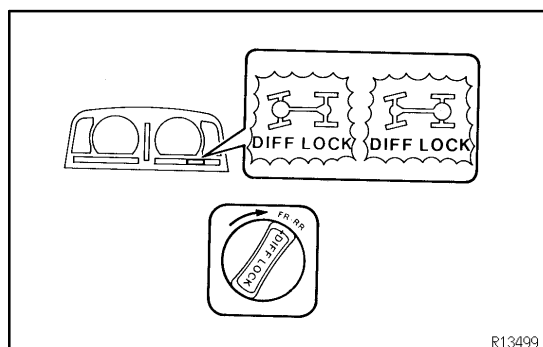
- (b) Inspect the differential lock operation.
- (1) Jack up the vehicle then start the engine.
 - (2) Put the transfer shift lever on the L position.
 - (3) When the Diff. lock control switch is set to the RR position, the indicator light (rear side) is turned on. Differential lock is applied to the rear wheel at this time.

HINT:

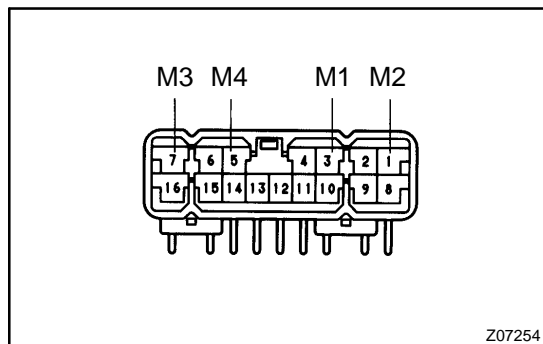
If the gears of the differential lock system are not meshed, the indicator light remains blinking, so rotate the tires to mesh the gear.



- (4) When the Diff. lock control switch is at the OFF position, the indicator light goes off. Differential lock is released for the rear wheel at this time.



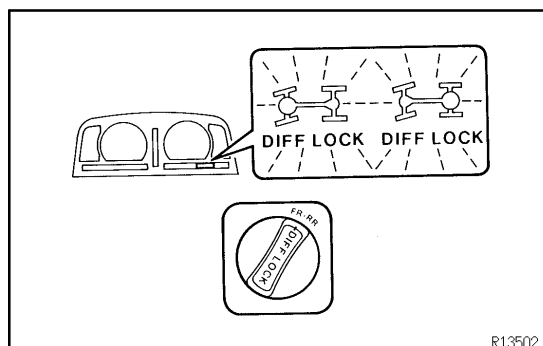
- (5) When the Diff. lock control switch is set to the FR/RR position, the indicator lights (front side and rear side) are turned on. Differential lock is applied to both the front wheels and rear wheels at this time.



- (6) Check the voltage between the terminals of the Diff. lock ECU when switching the Diff. lock control switch with the speedometer, registering approx. 8 km/h (5 mph) or more.

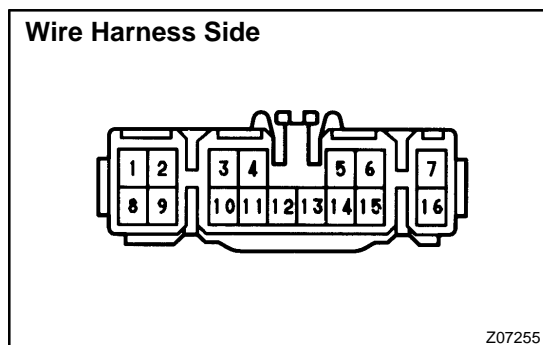
Diff. lock control switch	Terminal	Specified value
OFF → RR	3 (M1) – 1 (M2)	0.5 V or less (on change)
RR → FR-RR	7 (M3) – 5 (M4)	0.5 V or less (on change)

V03070



- (7) Check that the indicator lights blink when center Diff. lock release mode is set.
Diff. lock is released for both the front wheels and rear wheels at this time.
- (8) Return the Diff. lock control switch to OFF.
- (9) Stop the engine and lower the vehicle.

Wire Harness Side



2. INSPECT DIFF. LOCK SYSTEM CIRCUIT

- (a) Inspect the system circuit with connector disconnected. Disconnect the connector from the Diff. lock ECU and inspect the connector on the wire harness side, as shown in the chart.

Trouble Part/ Terminals (Symbols)	Condition	Specified Value
Rear diff. lock actuator/ 1 (M2) – 3 (M1)	–	Less than 100 Ω
Front diff. lock actuator/ 5 (M4) – 7 (M1)	–	Less than 100 Ω
Body ground/ 13 (GND) – Body ground	–	Continuity
Vehicle speed sensor/ 4 (SPD) – Body ground	Vehicle moving slowly	1 pulse each 40 cm (15.75 in.)

SUSPENSION AND AXLE – DIFFERENTIAL LOCKING SYSTEM

DIFF. fuse/ 8 (IG) – Body ground	Ignition switch ON	Battery positive voltage
Rear diff. lock position switch/ 2 (RLP) – Body ground	Ignition switch ON, Indicator light (Rear) ON	About 0 V
	Ignition switch ON, Indicator light (Rear) OFF	Battery positive voltage
Front diff. lock position switch/ 9 (FLP) – Body ground	Ignition switch ON, Indicator light (front) ON.	About 0 V
	Ignition switch ON, Indicator light (front) OFF	Battery positive voltage
Center diff. indicator switch/ 15 (4WD) – Body ground	Ignition switch ON, Indicator light (Center diff. lock) ON	About 0 V
	Ignition switch ON, Indicator light (Center diff. lock) OFF	Battery positive voltage
Differential lock control switch/ 12 (R) – Body ground	Ignition switch ON, Diff. lock control switch RR or FR RR	Battery positive voltage
	Ignition switch ON, Diff. lock control switch OFF	About 0 V
Differential lock control switch/ 6 (RF) – Body ground	Ignition switch ON, Diff. lock control switch FR RR	Battery positive voltage
	Ignition switch ON, Diff. lock control switch OFF or RR	About 0 V

HINT:

When a signal enters the ECU to LOCK the front differential and set the rear differential to FREE (when battery positive voltage is inputted to terminal 6 (RF) of ECU and about 0 V is inputted to terminal 12 (R)), or a signal to FREE both the front and rear differentials, the indicator lights keep blinking until the ignition switch is turned off (Fail-safe function).

If the circuit is not as specified, check and repair or replace the trouble part shown in the table above.

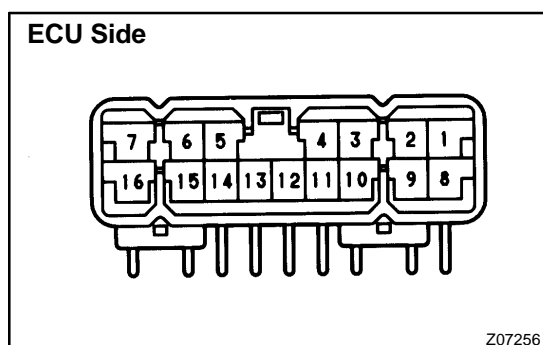
- (b) Inspect the battery positive voltage

Battery positive voltage: 10 – 14.5 V

- (c) Inspect the system circuit with connector connected
- (1) Turn the ignition switch to the ON position.
 - (2) Keep the center Diff. lock condition.
 - (3) Remove the Diff. lock ECU.

- (4) Using a voltmeter, measure the voltage when the differential lock control switch is in the position, as shown below.

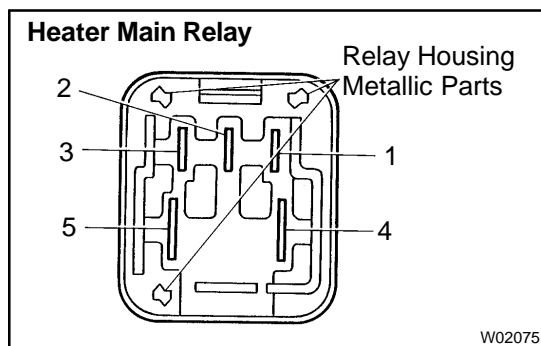
Terminals (Symbols)	Switch Position	STD Voltage (V)
15 (4WD) – 13 (GND)	–	0.5 or less
9 (FLP) – 13 (GND)	FR RR	0.5 or less
2 (RLP) – 13 (GND)	RR or FR RR	0.5 or less



3 (M1) – 1 (M2)	OFF – RR	0.5 or less → 10 – 14.5 (Approx. 1 sec) → 0.5 or less
1 (M2) – 3 (M1)	RR – OFF	0.5 or less → 10 – 14.5 (Approx. 1 sec) → 0.5 or less
7 (M3) – 5 (M4)	OFF or RR – FR RR	0.5 or less → 10 – 14.5 (Approx. 1 sec) → 0.5 or less
5 (M4) – 7 (M3)	FR RR – RR or OFF	0.5 or less → 10 – 14.5 (Approx. 1 sec) → 0.5 or less

If the circuit is not as specified, replace the ECU.

(d) Install the ECU in place.



3. INSPECT DIFF. LOCK ACTUATOR

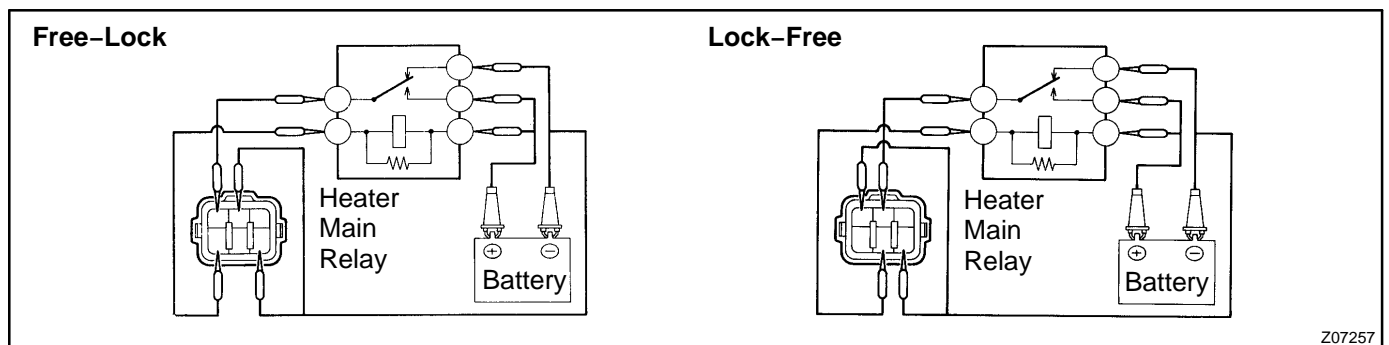
- Jack up the vehicle.
- Use the heater main relay and connect it, as shown below.

NOTICE:

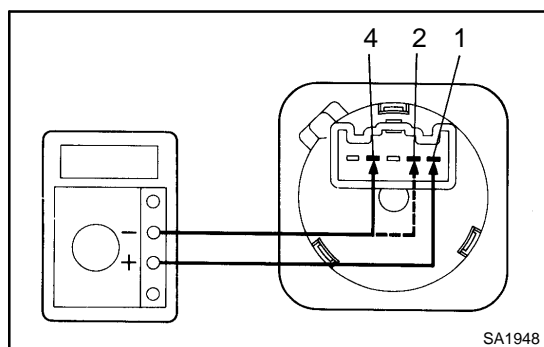
Connect the terminals being careful not to touch the neighboring terminals or metallic parts of relay housing.

- Rotate the tire and check that differential lock has occurred.

If operation is not as specified, replace the actuator.



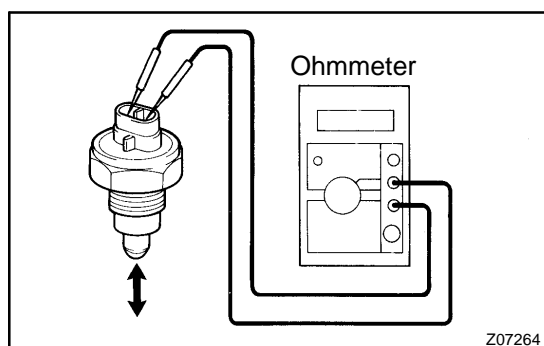
SUSPENSION AND AXLE – DIFFERENTIAL LOCKING SYSTEM

**4. INSPECT DIFF. LOCK CONTROL SWITCH**

Inspect the switch continuity between terminals, as shown.

Switch Position	Terminals	Specified Condition
OFF	1 – 2	No continuity
	1 – 4	No continuity
RR	1 – 2	No continuity
	1 – 4	Continuity
FR RR	1 – 2	Continuity
	1 – 4	Continuity

If continuity is not as specified, replace the switch.

**5. INSPECT DIFF. LOCK POSITION SWITCH****(a) Front and Rear:**

Inspect the diff. lock position switch.

- (1) Check that there is continuity between terminals when the switch is pushed (differential connected position).
- (2) Check that there is no continuity when the switch is free (differential disconnected position).

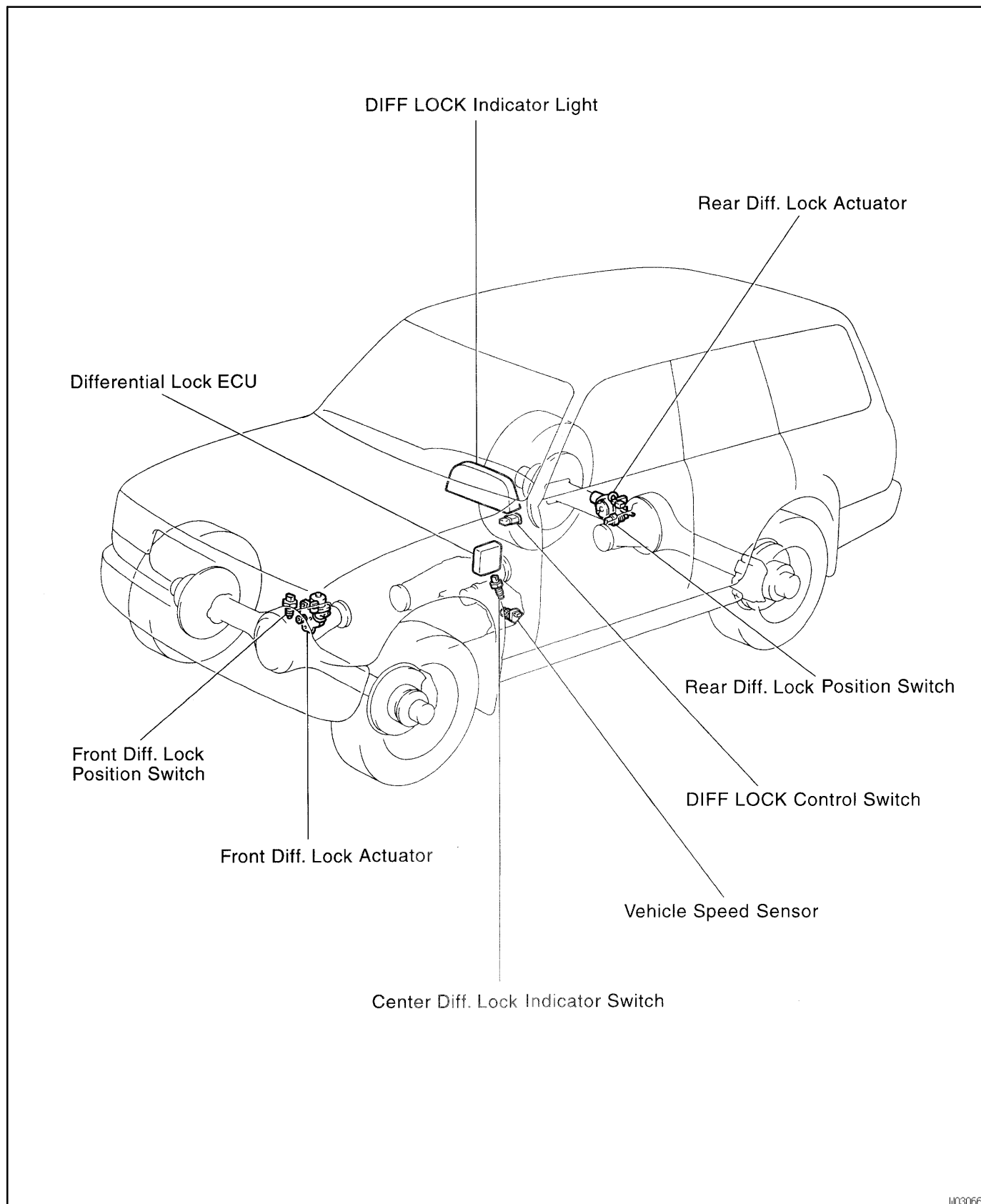
If operation is not as specified, replace the switch.

(b) Inspect the center diff. indicator switch.**6. INSPECT VEHICLE SPEED SENSOR AND INDICATOR LIGHT**

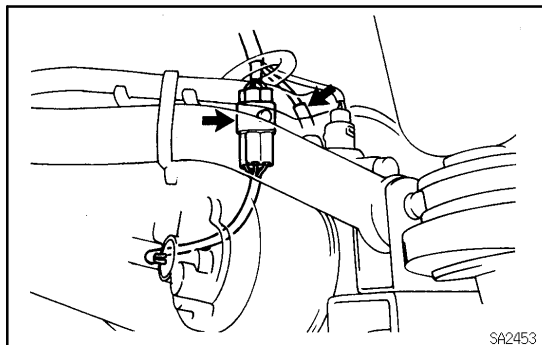
- (a) Inspect the vehicle speed sensor (See page [BE-34](#)).
- (b) Inspect the indicator light.

DIFFERENTIAL LOCKING SYSTEM LOCATION

SA1VM-01



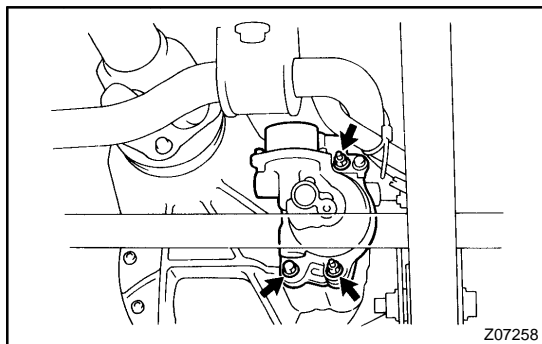
W03066



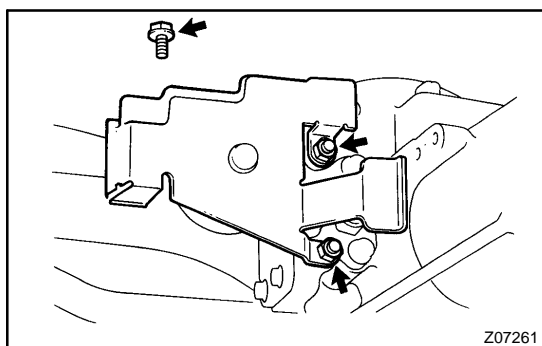
REMOVAL

1. REMOVE FRONT ACTUATOR

- (a) Shifting the front differential lock.
- (b) Disconnect the connector and tube.

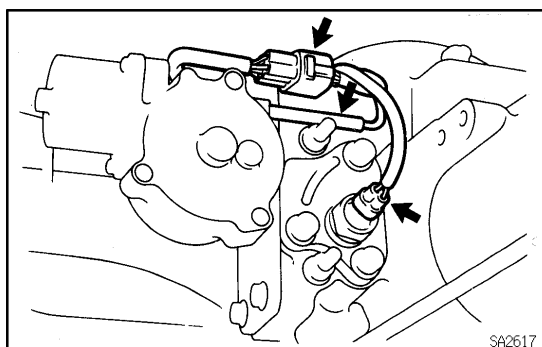


- (c) Remove the 2 nuts, bolt and actuator.
- (d) Remove the O-ring from the actuator.

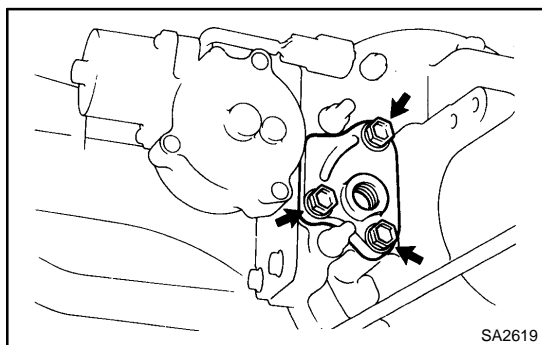


2. REMOVE REAR ACTUATOR

- (a) Shifting the gear differential lock.
- (b) Remove the actuator protector.
Remove the 2 nuts, bolt and protector.



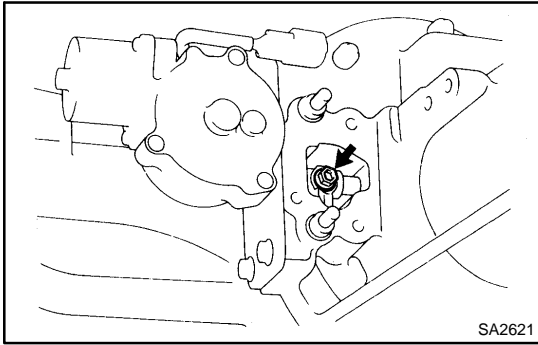
- (c) Disconnect the connectors and tube.
- (d) Remove the rear Diff. lock position switch.



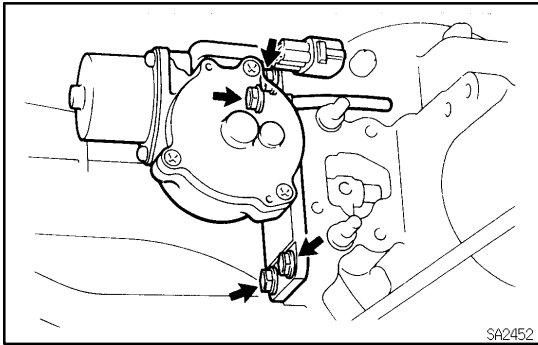
- (e) Remove the cover.
 - (1) Remove the 3 bolts.
 - (2) Using a brass bar and hammer, remove the cover.

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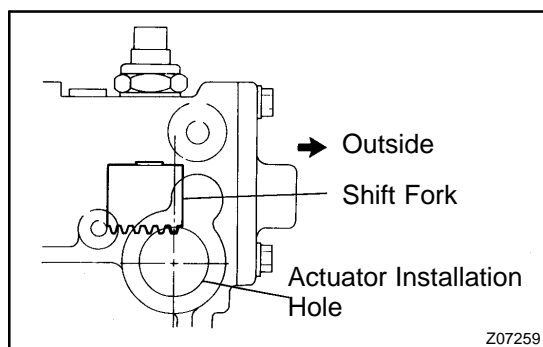
SUSPENSION AND AXLE – DIFFERENTIAL LOCKING SYSTEM



- (f) Remove the shift fork set bolt.



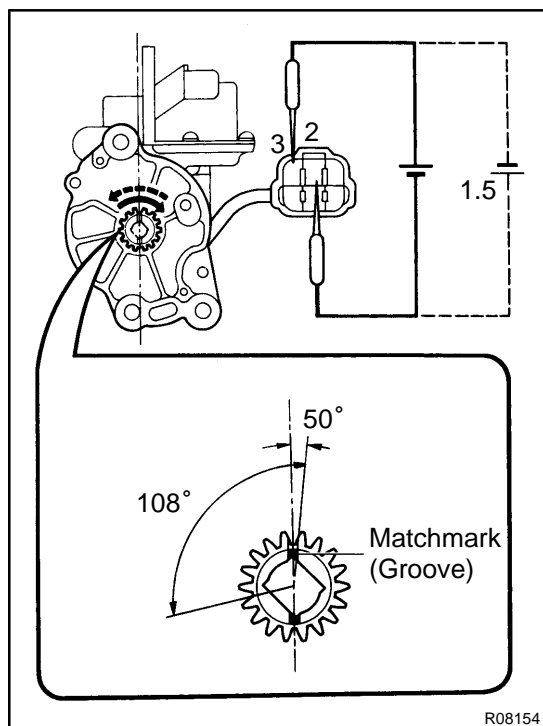
- (g) Remove the 4 bolts.
(h) Using a screwdriver, pry out the actuator.



INSTALLATION

1. INSTALL FRONT ACTUATOR

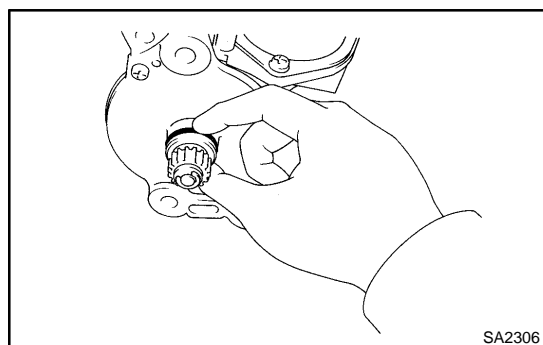
- (a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole.



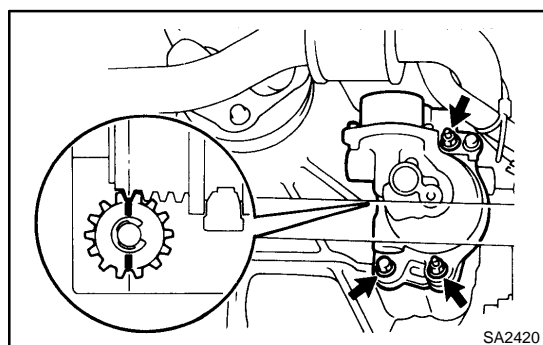
- (b) Using a dry cell battery, align the matchmark on the pinion with the center line of the actuator.

NOTICE:

- If the pinion of the actuator is not in the specified place, the actuator is difficult to be installed.
- Do not supply the battery positive voltage between terminals.
- If the matchmark comes to the extension limit of the rotation, do not electrify moreover.



- (c) Install a new O-ring to the actuator.
 (d) Apply a light coat of gear oil on the O-ring.
 (e) Apply MP grease to the gear part of the actuator.



- (f) Install the actuator to the differential with the 2 nuts and bolt, so that the outermost rack tooth of the shift fork will fit matchmark of the pinion of the actuator.

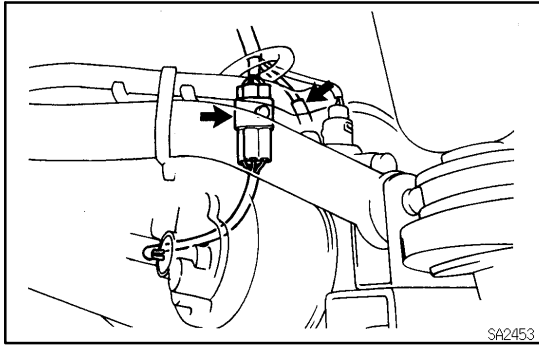
HINT:

Do not damage the O-ring of the actuator.

Torque: 26 N·m (270 kgf-cm, 20 ft-lbf)

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SUSPENSION AND AXLE – DIFFERENTIAL LOCKING SYSTEM



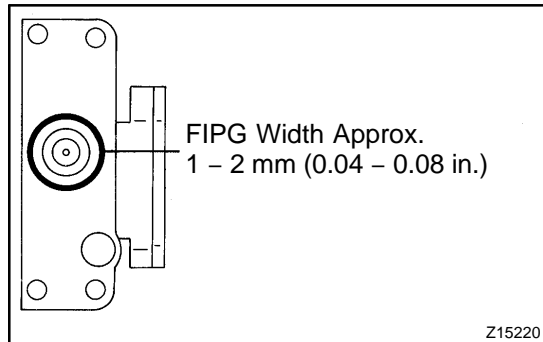
(g) Connect the connector and tube.

HINT:

- The depth of the insertion of the bleeder tube into the hose is approx. 15 mm (0.59 in.).
- Take care that water or the equivalent will not adhere to the connector and hose.

(h) Cancel the front differential lock.

With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock.



2. INSTALL REAR ACTUATOR

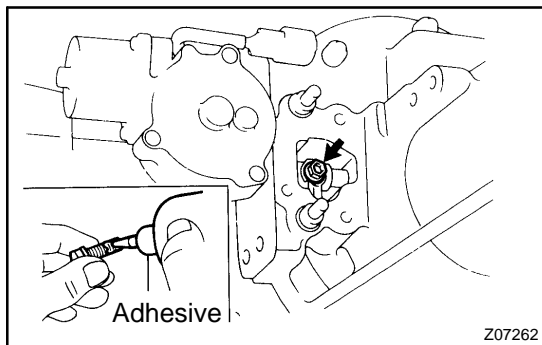
(a) Clean contacting surfaces of any FIPG material using gasoline or alcohol.

(b) Apply FIPG to the actuator.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

Install the actuator within 10 minutes after applying FIPG.



(c) Install the actuator to the differential and match the shaft with the shaft fork hole.

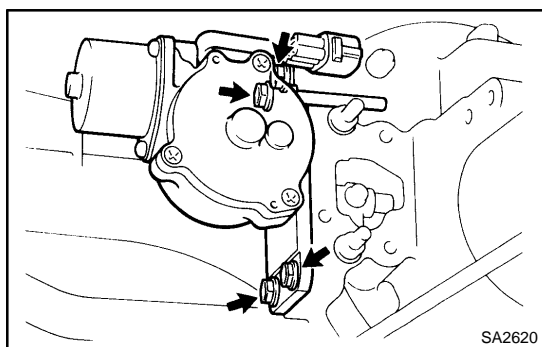
(d) Clean the threads of the set bolt and shaft fork with the white gasoline.

(e) Coat the threads of the set bolt with adhesive.

Adhesive: Part No. 08833-00070, THREE BOND 1324 or equivalent

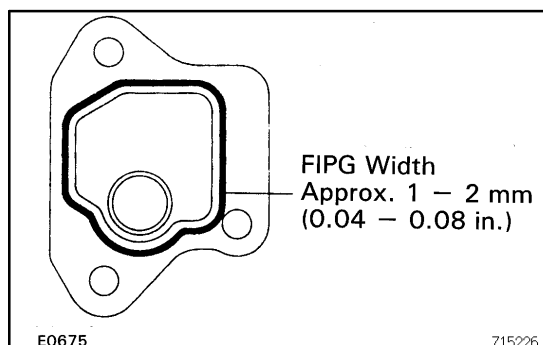
(f) Tighten the shift fork set bolt.

Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)



(g) Tighten the 4 bolts uniformly, a little at a time.

Torque: 24 N·m (240 kgf-cm, 17 ft-lbf)



(h) Install the cover.

(1) Clean the contacting surfaces of any FIPG material using gasoline or alcohol.

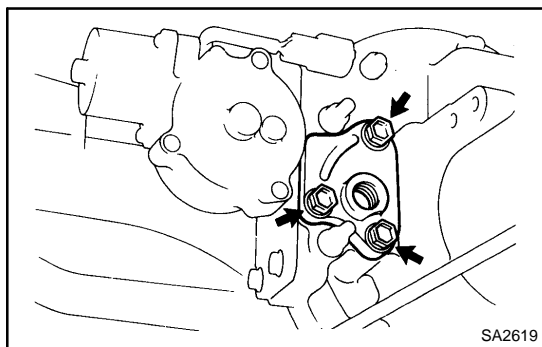
(2) Apply FIPG to the cover.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

HINT:

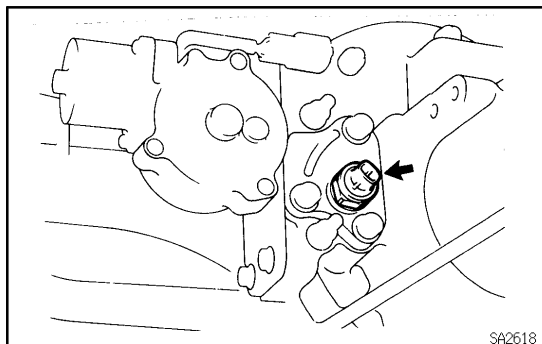
Install the cover within 10 minutes after applying FIPG.

SUSPENSION AND AXLE – DIFFERENTIAL LOCKING SYSTEM



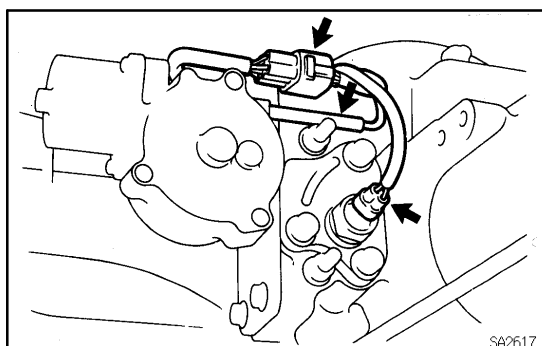
(3) Tighten the 3 bolts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



- (i) Install the rear Diff. position switch.
Install the position switch with a new gasket.

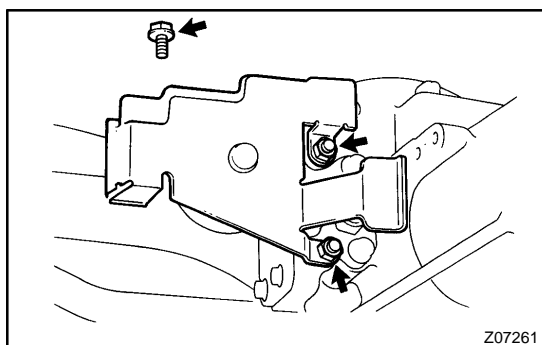
Torque: 40 N·m (410 kgf-cm, 30 ft-lbf)



- (j) Connect the connectors and tube.

HINT:

- The depth of the insertion of the bleeder tube into the hose is approx. 15 mm (0.59 in.).
- Take care that the water or the equivalent will not adhere to the connectors and hose.



- (k) Install the actuator protector.
Install the protector with the 2 nuts and bolt.

Torque:

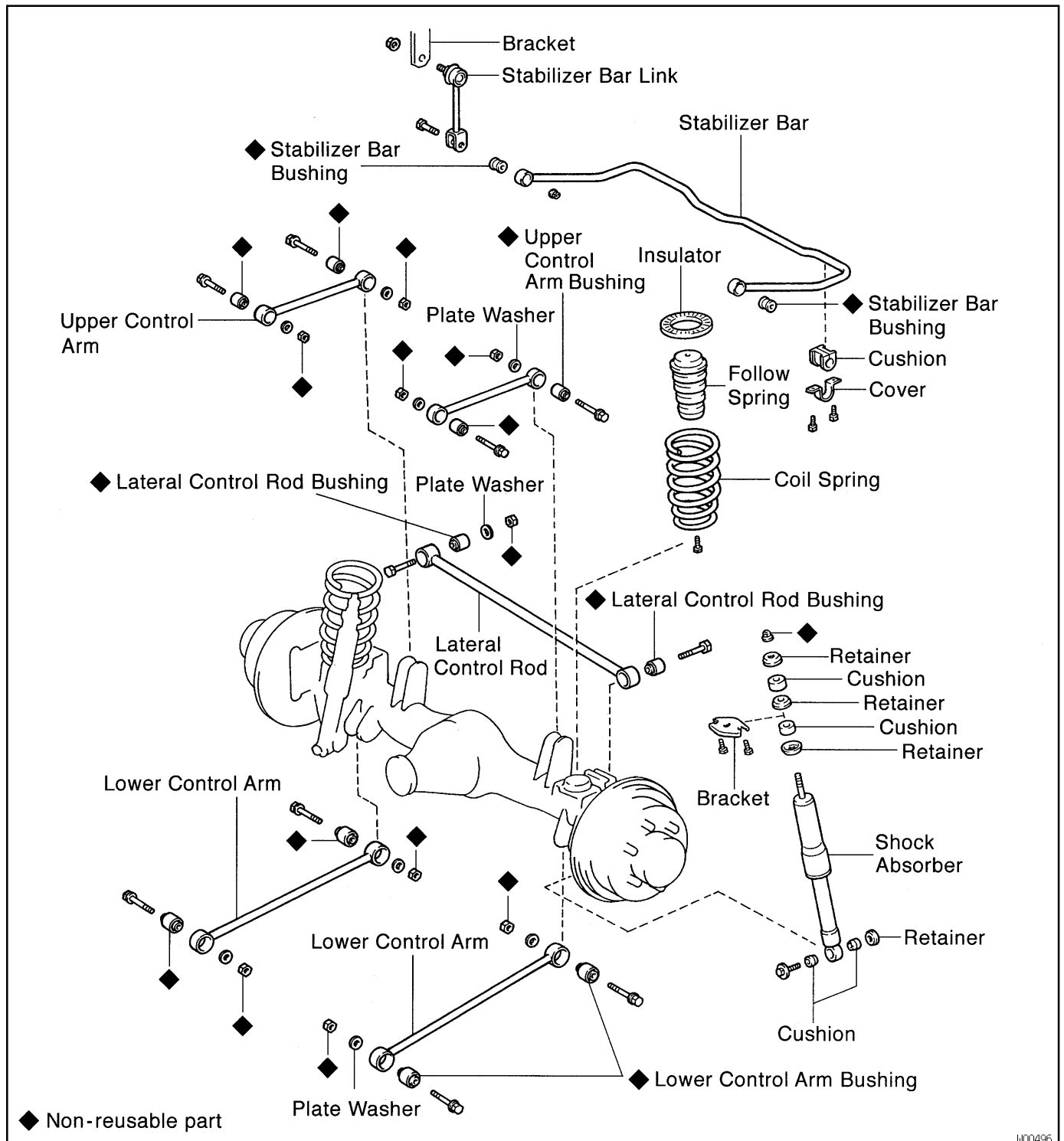
Nut: 35 N·m (360 kgf-cm, 26 ft-lbf)

Bolt: 20 N·m (200 kgf-cm, 14 ft-lbf)

- (l) Cancel the rear differential lock.
With the ignition switch ON, turn the differential lock control switch to OFF to cancel the differential lock.

COIL SPRING AND REAR SHOCK ABSORBER COMPONENTS

SA1VR-03



REMOVAL

1. REMOVE REAR WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf-cm, 109 ft-lbf)

Aluminum wheel: 103 N·m (1,050 kgf-cm, 76 ft-lbf)

2. REMOVE REAR SHOCK ABSORBER

- (a) Remove the lower bolt holding the shock absorber from the rear axle housing.

Torque: 64 N·m (650 kgf-cm, 47 ft-lbf)

- (b) Remove the retainer and 2 cushions, disconnect the shock absorber.

- (c) Remove the 2 upper bolts and shock absorber.

Torque: 50 N·m (510 kgf-cm, 37 ft-lbf)

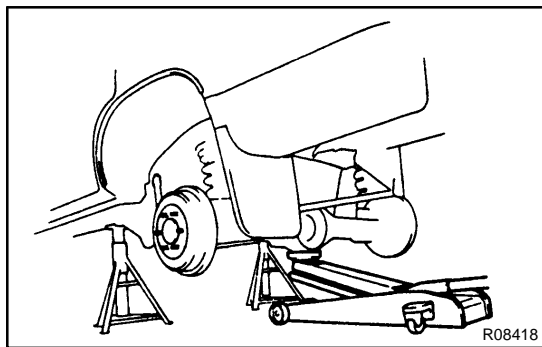
- (d) Remove these parts from the shock absorber:

- Nut
- 3 Retainers
- 2 Cushions
- Bracket

Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)

3. DISCONNECT STABILIZER BAR BRACKETS FROM REAR AXLE HOUSING (See page SA-124)

4. DISCONNECT LATERAL CONTROL ROD FROM REAR AXLE HOUSING (See page SA-118)

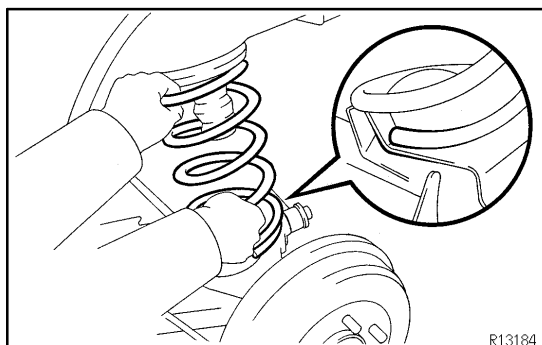


5. REMOVE COIL SPRING

- (a) Begin to lower the axle housing.

HINT:

Be careful not to snap the brake line and parking brake cable.



- (b) With lowering the rear axle housing, remove the coil spring and insulator.

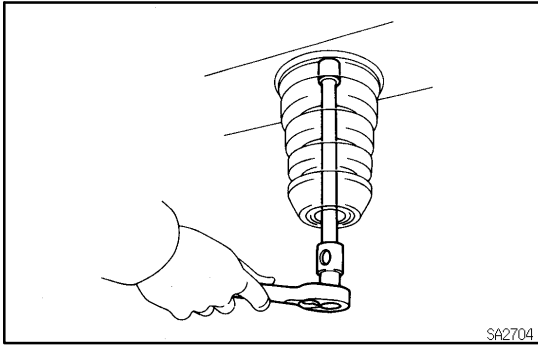
HINT:

Check that the coil spring end is installed correctly.

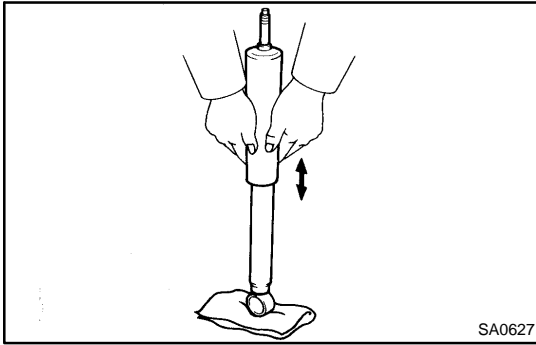
If the coil spring end is not in the correct position, reinstall the coil spring.

SA-114

SUSPENSION AND AXLE – COIL SPRING AND REAR SHOCK ABSORBER



- (c) Remove the bolt and follow spring from the frame.
Torque: 28 N·m (290 kgf-cm, 21 ft-lbf)



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.

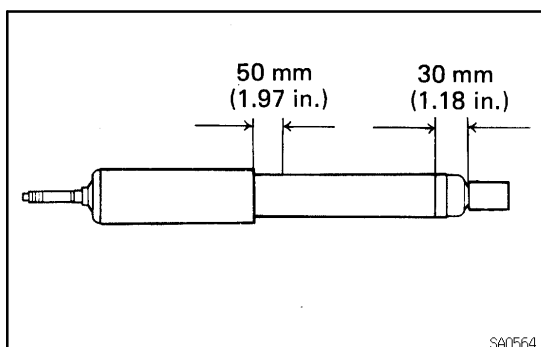
NOTICE:

When discarding the shock absorber, use the following procedure.

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SUSPENSION AND AXLE – COIL SPRING AND REAR SHOCK ABSORBER

SA1VS-01

**DISPOSAL****DISCARD SHOCK ABSORBER**

Before discarding the shock absorber, drill a hole 2 – 3 mm (0.079 – 0.118 in.) in diameter at the location shown in the illustration to release the gas inside.

NOTICE:

When drilling, chips may fly out, work carefully. The gas is colorless, odorless and non-poisonous.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-113](#)).

REAR LATERAL CONTROL ROD REMOVAL

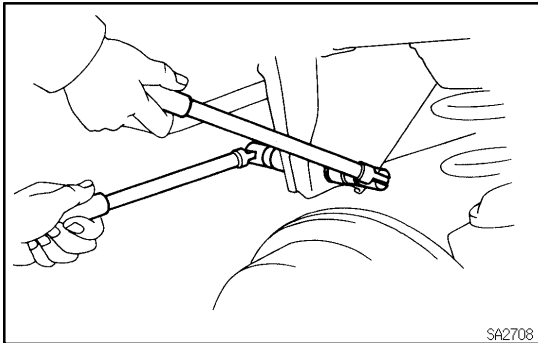
SA1VU-01

1. REMOVE REAR WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



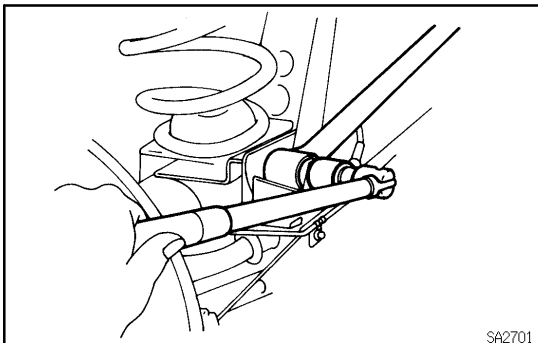
2. REMOVE LATERAL CONTROL ROD

- (a) Remove the bolt, nut and plate washer, and disconnect the lateral control rod.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.

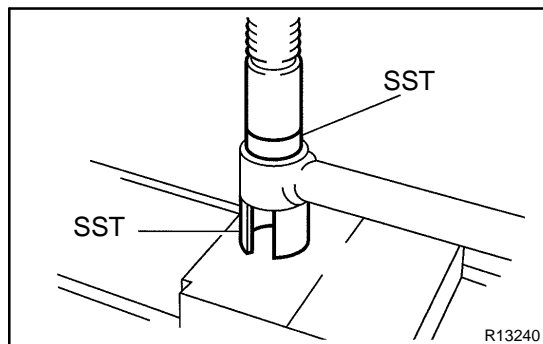


- (b) Remove the bolt and lateral control rod from the axle housing.

Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.

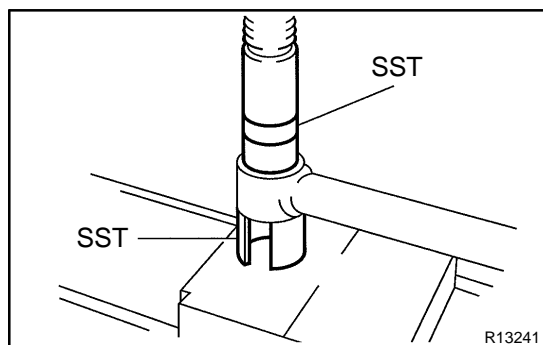


REPLACEMENT

REPLACE LATERAL CONTROL ROD BUSHING

- (a) Using SST and a press, remove the bushing.

SST 09550-10012 (09553-10010),
09710-22021 (09710-01071)



- (b) Using SST and a press, install a new bushing.

SST 09550-10012 (09553-10010),
09710-22021 (09710-01071)

SA-120

SUSPENSION AND AXLE – REAR LATERAL CONTROL ROD

SA1VW-01

INSTALLATION

Installation is in the reverse order of removal (See page [SA-118](#)).

REAR UPPER AND LOWER CONTROL ARM REMOVAL

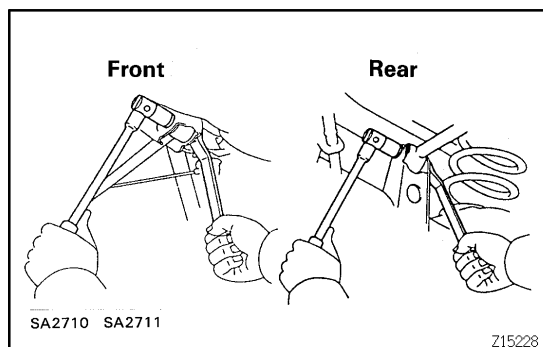
SA1VX-01

1. REMOVE REAR WHEEL

Torque:

Steel wheel: 147 N·m (1,500 kgf·cm, 109 ft·lbf)

Aluminum wheel: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



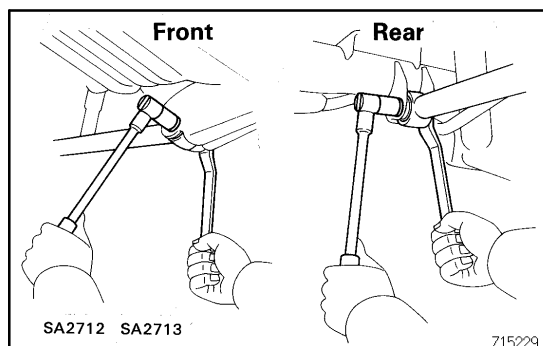
2. REMOVE UPPER CONTROL ARM

Remove the 2 bolts, plate washers, nuts and upper control arm from the frame.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

HINT:

After stabilizing the suspension, torque the bolt.



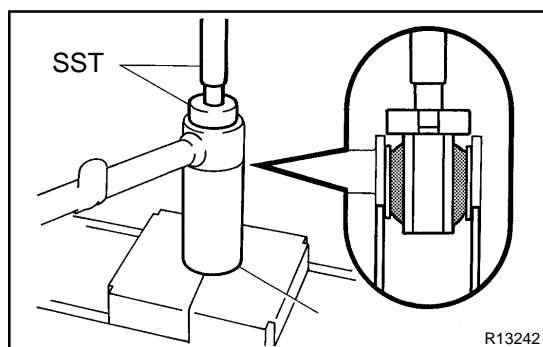
3. REMOVE LOWER CONTROL ARM

Remove the 2 bolts, plate washers, nuts and lower control arm from the frame.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

HINT:

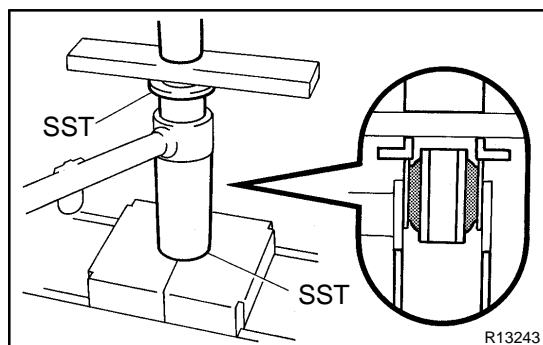
After stabilizing the suspension, torque the bolt.



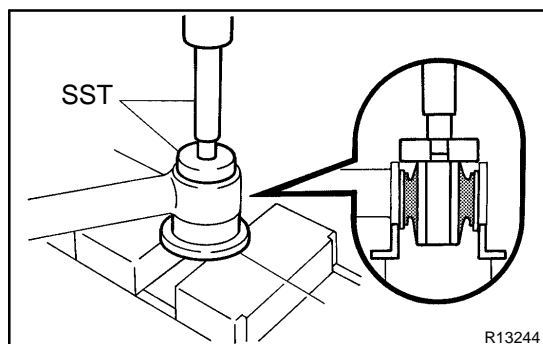
REPLACEMENT

1. REPLACE UPPER CONTROL ARM BUSHING

- (a) Using SST and a press, remove the bushing.
 SST 09226-10010, 09950-60010 (09951-00490),
 09950-70010 (09951-07100)

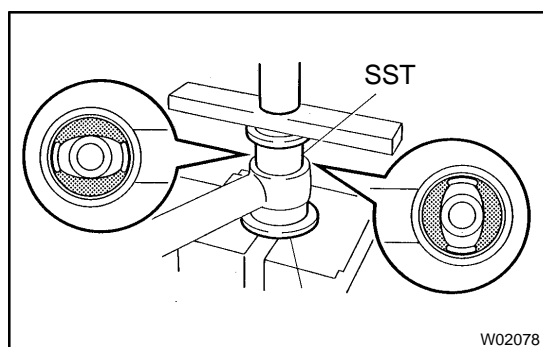


- (b) Using SST and a press, install a new bushing.
 SST 09226-10010, 09506-35010



2. REPLACE LOWER CONTROL ARM BUSHING

- (a) Using SST and a press, remove the bushing.
 SST 09506-35010, 09950-60010 (09951-00540),
 09950-70010 (09951-07100)



- (b) Using SST and a press, install a new bushing, as shown.
 SST 09316-20011, 09506-35010

INSTALLATION

Installation is in the reverse order of removal (See page [SA-121](#)).

REMOVAL

REMOVE STABILIZER BAR

- (a) Loosen the 2 bolts and nuts.

Torque: 25 N·m (260 kgf-cm, 19 ft-lbf)

HINT:

After stabilizing the suspension, torque the nut.

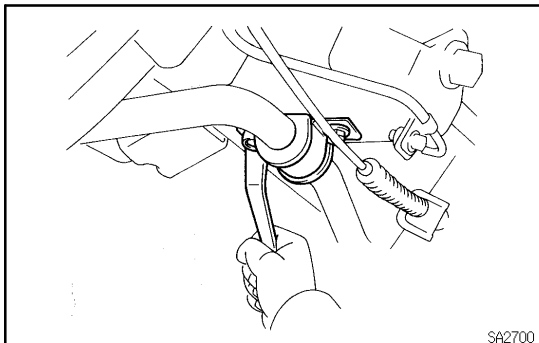
- (b) Remove the nuts and disconnect the stabilizer bar with the links from the bracket.

Torque: 15 N·m (153 kgf-cm, 11 ft-lbf)

HINT:

After stabilizing the suspension, torque the nut.

- (c) Remove the 2 bolts, nuts and links from the stabilizer bar.

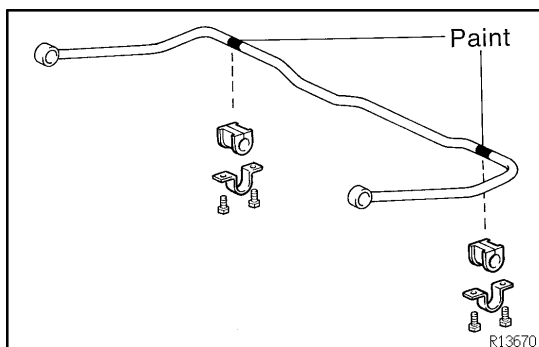


- (d) Remove the 4 bolts and stabilizer bar from the axle housing with the covers.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

HINT:

After stabilizing the suspension, torque the bolt.



- (e) Remove the 2 covers and cushions from the stabilizer bar.

HINT:

Install the cushions and brackets touching the line painted on the stabilizer bar.

INSTALLATION

Installation is in the reverse order of removal (See page [SA-124](#)).

SFI SYSTEM PRECAUTION

SF1ED-04

1. **BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM THE BATTERY.**

HINT:

Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is disconnected. Therefore, if necessary, read the diagnosis before disconnecting the negative (–) terminal cable from the battery.

2. **DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM.**
3. **KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS**
4. **MAINTENANCE PRECAUTIONS**

- (a) In event of engine misfire, these precautions should be taken.
 - (1) Check proper connection of battery terminals, etc.
 - (2) Handle high-tension cords carefully.
 - (3) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
 - (4) When cleaning the engine compartment, be especially careful to protect the electrical system from water.
- (b) Precautions when handling the oxygen sensor.
 - (1) Do not allow the oxygen sensor to drop or hit against an object.
 - (2) Do not allow the sensor to come in contact with water.

5. **IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)**

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

6. **AIR INDUCTION SYSTEM**

- (a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
- (b) 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.

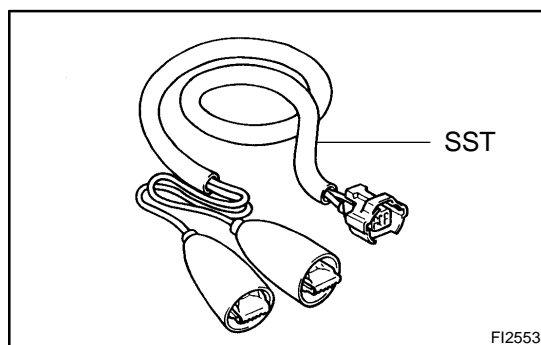
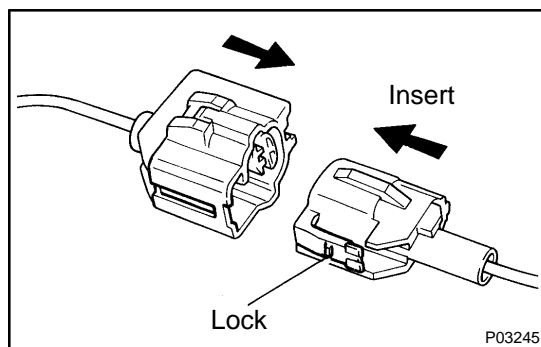
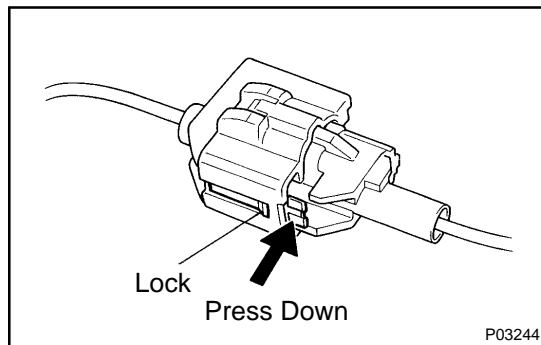
7. **ELECTRONIC CONTROL SYSTEM**

- (a) Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the negative (–) terminal cable from the battery.

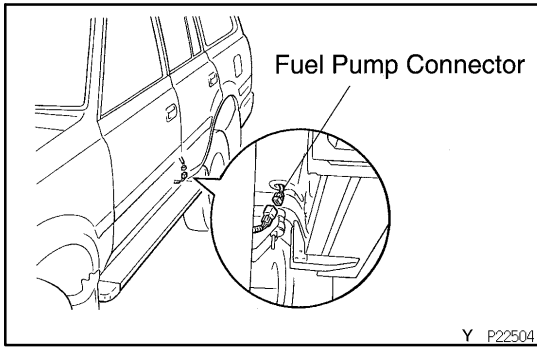
HINT:

Always check the diagnostic trouble code before disconnecting the negative (-) terminal cable from the battery.

- (b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (-) cables.
- (c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
- (d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.
- (e) Do not open the ECM cover.



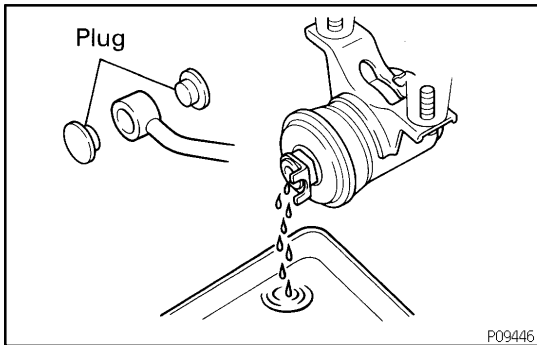
- (f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
- (g) Parts should be replaced as an assembly.
- (h) Care is required when pulling out and inserting wiring connectors.
 - (1) Release the lock and pull out the connector, pulling on the connectors.
 - (2) Fully insert the connector and check that it is locked.
- (i) When inspecting a connector with a volt/ohmmeter
 - (1) Carefully take out the water-proofing rubber if it is a water-proof type connector.
 - (2) Insert the test probe into the connector from the wiring side when checking the continuity, amperage or voltage.
 - (3) Do not apply unnecessary force to the terminal.
 - (4) After checking, install the water-proofing rubber on the connector securely.
- (j) Use SST for inspection or test of the injector or its wiring connector.
SST 09842-30070



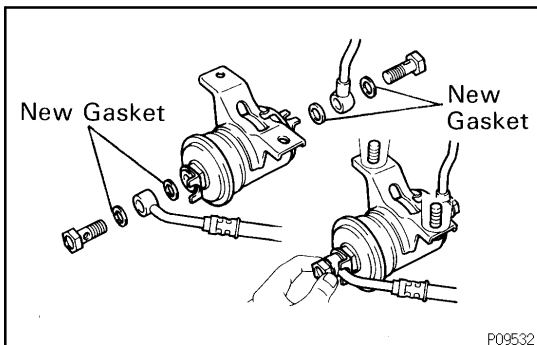
8. FUEL SYSTEM

(a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedures:

- (1) Disconnect the fuel pump connector.
- (2) Start the engine. After the engine has stopped on its own, turn off the ignition switch.



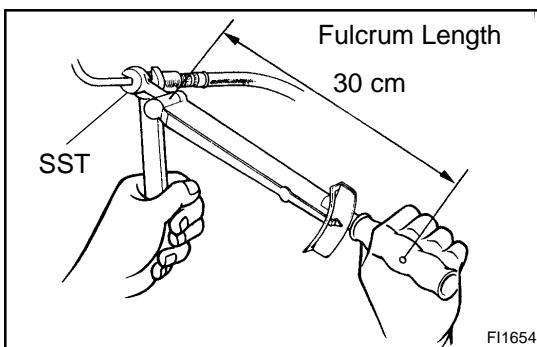
- (3) Put a container under the connection.
- (4) Slowly loosen the connection.
- (5) Disconnect the connection.
- (6) Plug the connection with 2 rubber plugs.
- (7) Reconnect the fuel pump connector.



(b) When connecting the union bolt on the high pressure pipe union, observe the following procedures:

- (1) Always use a new gasket.
- (2) Tighten the union bolt by hand.
- (3) Tighten the union bolt to the specified torque.

Torque: 29 N·m (300 kgf-cm, 21 ft-lbf)



(c) When connecting the flare nut on the high pressure pipe union, observe the following procedures:

- (1) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
- (2) Using SST, tighten the flare nut to the specified torque.

SST 09631-22020

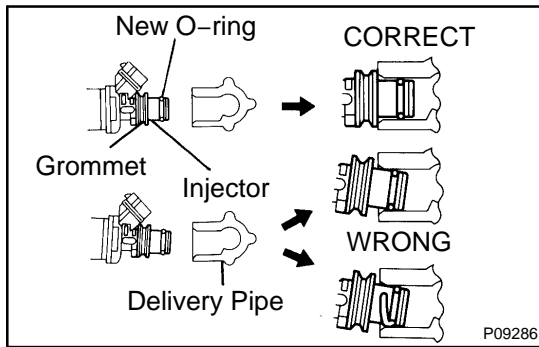
NOTICE:

Do not rotate the fuel pipe, when tightening the flare nut.

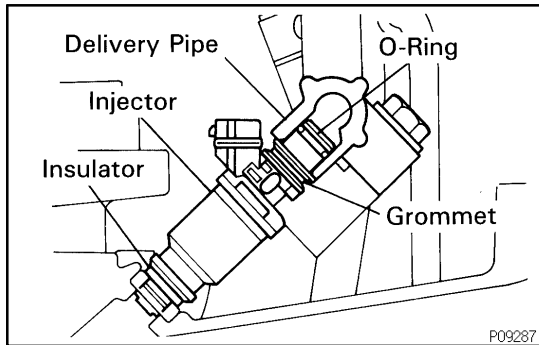
Torque: 30 N·m (310 kgf-cm, 22 ft-lbf)

HINT:

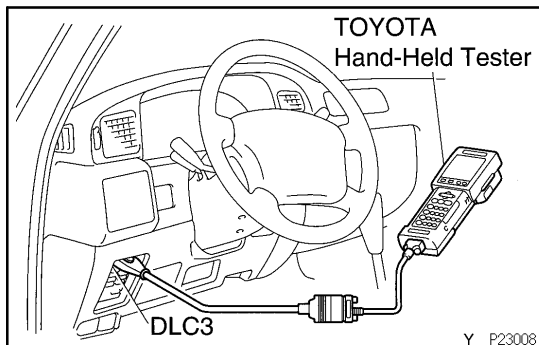
Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).



- (d) Observe the following precautions when removing and installing the injectors.
- (1) Never reuse the O-ring.
 - (2) When placing a new O-ring on the injector, take care not to damage it in any way.
 - (3) Coat a new O-ring with spindle oil or gasoline before installing—never use engine, gear or brake oil.



- (e) Install the injector to the delivery pipe and intake manifold as shown in the illustration.

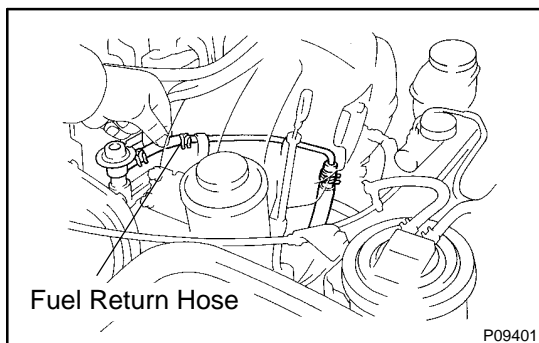


- (f) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
- (1) Remove the fuse cover on the instrument panel.
 - (2) Connect the TOYOTA hand-held tester to the DLC3.
 - (3) Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

NOTICE:**Do not start the engine.**

- (4) Select the active test mode on the TOYOTA hand-held tester.
- (5) Please refer to the TOYOTA hand-held tester operator's manual for further details.

If you have no TOYOTA hand-held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page [SF-14](#)).



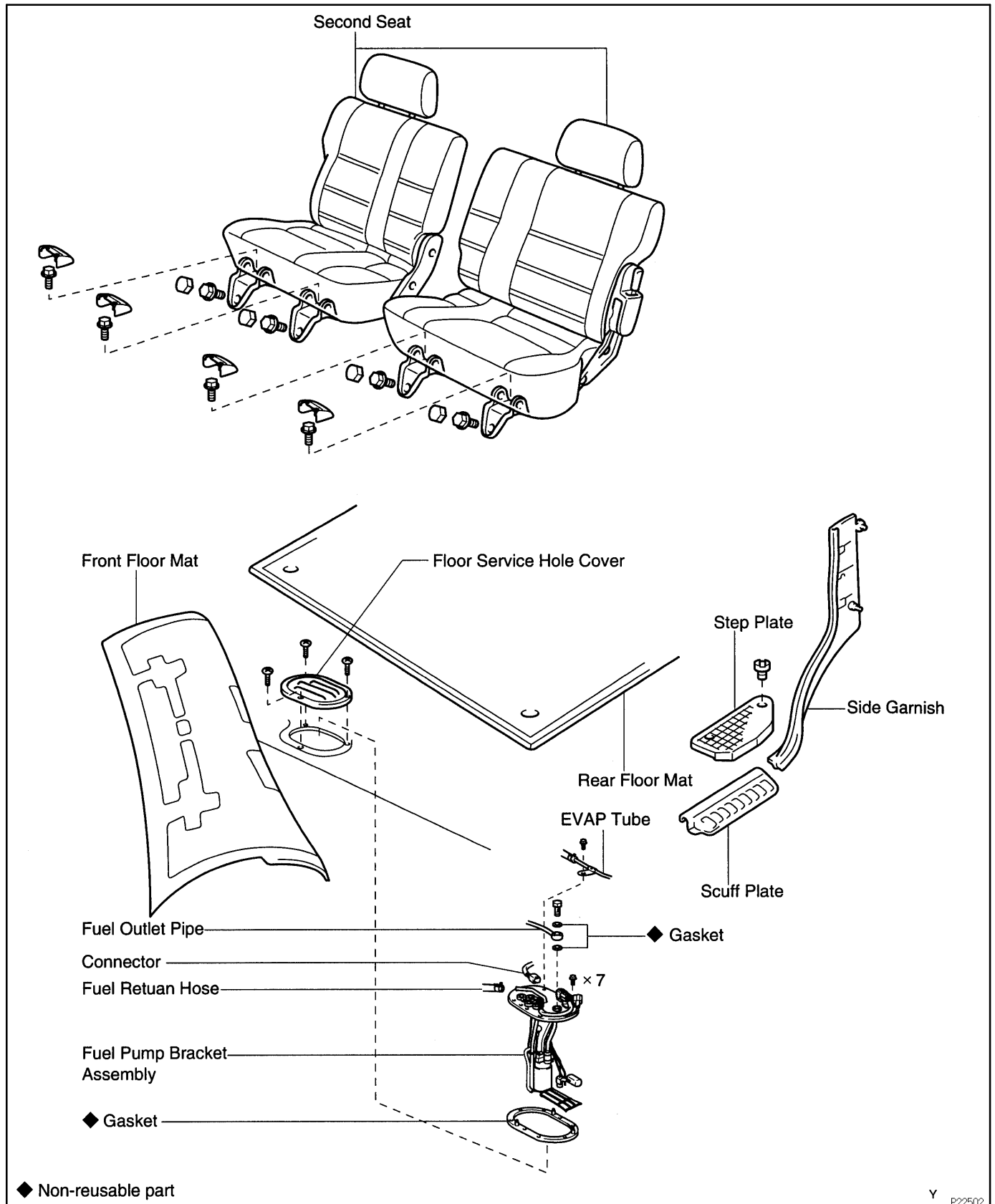
- (6) Pinch the fuel return hose. The pressure in the high pressure line will rise to approx. 392 kPa (4 kgf/cm², 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

NOTICE:**Always pinch the hose. Avoid bending as it may cause the hose to crack.**

- (7) Turn the ignition switch to LOCK.
- (8) Disconnect the TOYOTA hand-held tester from the DLC3.

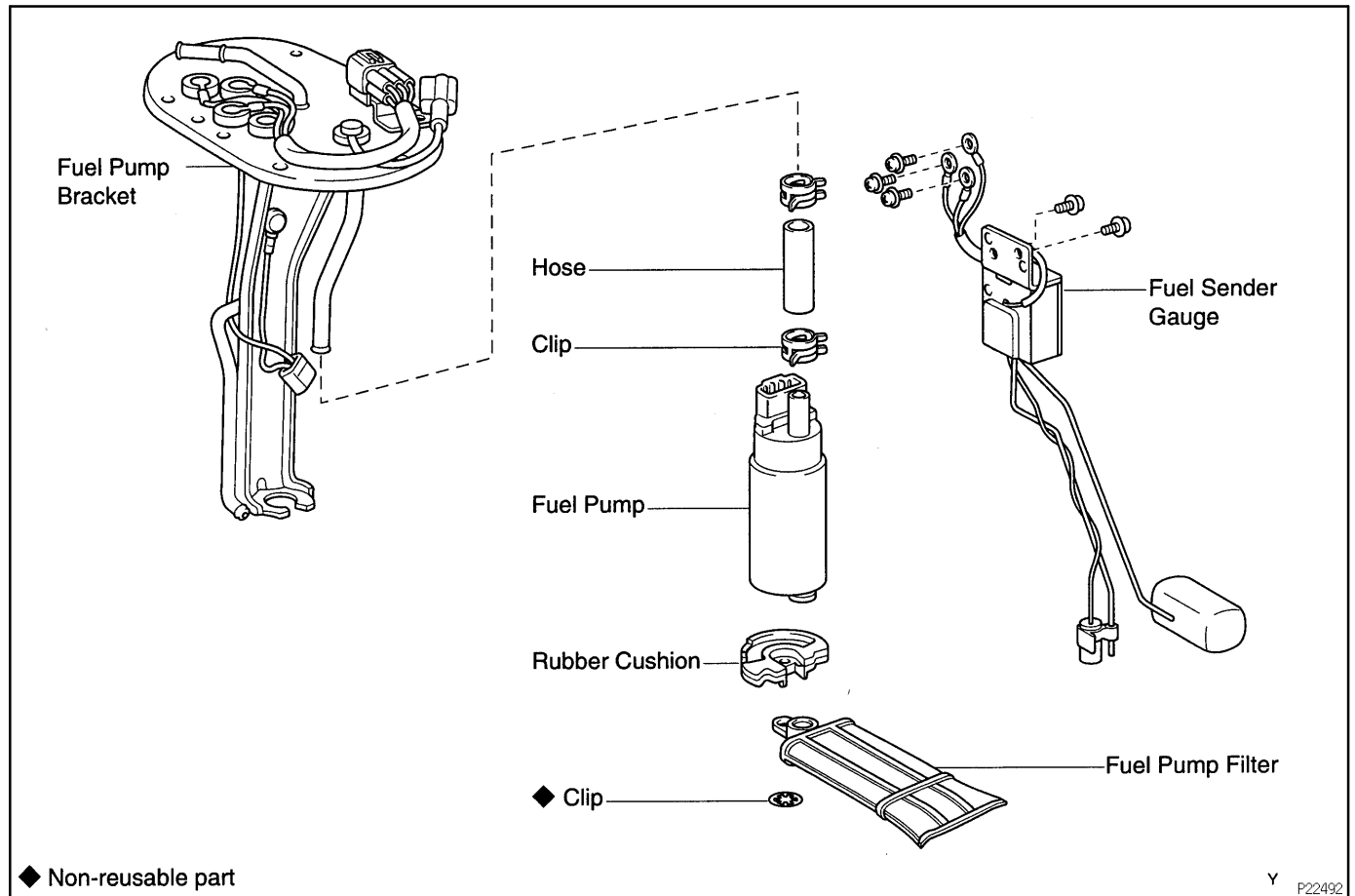
- (g) Install the fuse cover on the instrument panel.

COMPONENTS



SF-10

SFI - FUEL PUMP



REMOVAL

CAUTION:

Do not smoke or work near an open flame when working on the fuel pump.

1. REMOVE SECOND SEATS
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
2. REMOVE SCUFF PLATE
3. REMOVE SIDE GARNISH
4. REMOVE STEP PLATE
5. DISCONNECT FLOOR MATS
6. REMOVE FLOOR SERVICE HOLE COVER

Remove the 3 screws and service hole cover.

7. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET

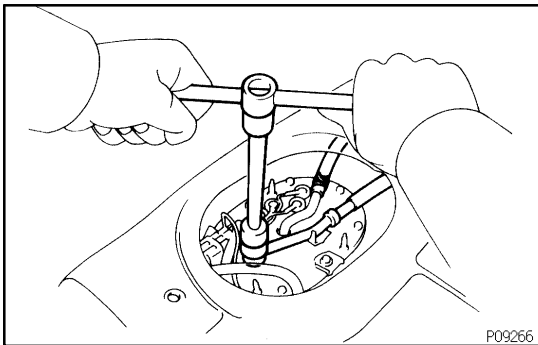
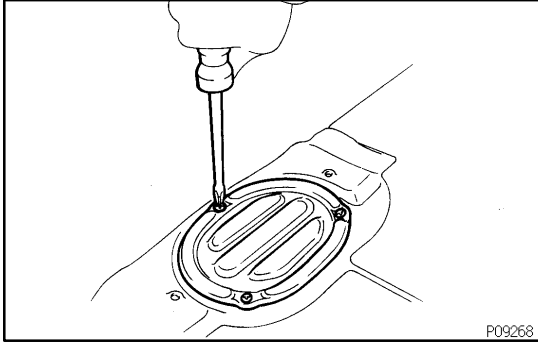
CAUTION:

Remove the fuel filter cap to prevent the fuel from flowing out.

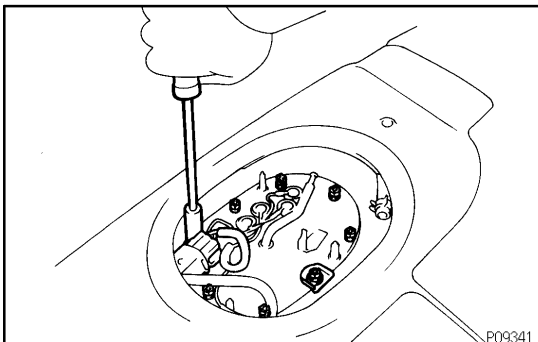
- (a) Disconnect the fuel pump and sender gauge connector.

HINT:

At the time of installation, please refer to the following items.
Check for fuel leakage.



- (b) Remove the union bolt and gaskets, and disconnect the outlet pipe from the pump bracket.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
- (c) Disconnect the return hose from the pump bracket.



8. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

- (a) Remove the 8 bolts.
Torque: 3.9 N·m (40 kgf·cm, 35 in.-lbf)
- (b) Pull out the pump bracket assembly.

NOTICE:

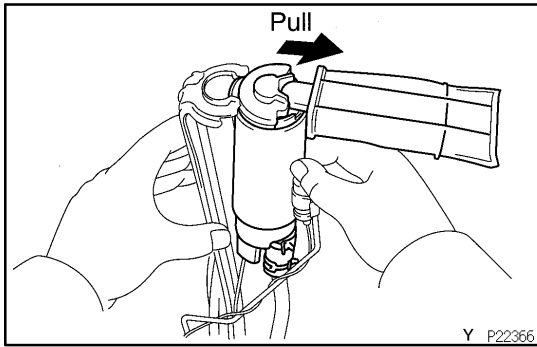
- Do not damage the fuel pump filter.
 - Be careful that the arm of the sender gauge should not bent.
- (c) Remove the gasket from the pump bracket.

SF-12

SFI - FUEL PUMP

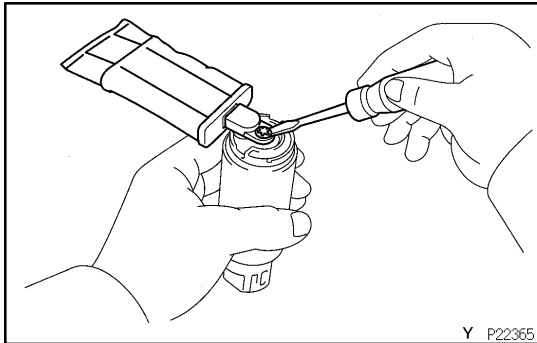
HINT:

At the time of installation, please refer to the following items.
install a new gasket to the pump bracket.



DISASSEMBLY

1. **REMOVE FUEL PUMP FROM FUEL PUMP BRACKET**
 - (a) Pull off the lower side of the fuel pump from the pump bracket.
 - (b) Disconnect the fuel pump connector.
 - (c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
 - (d) Remove the rubber cushion from the fuel pump.



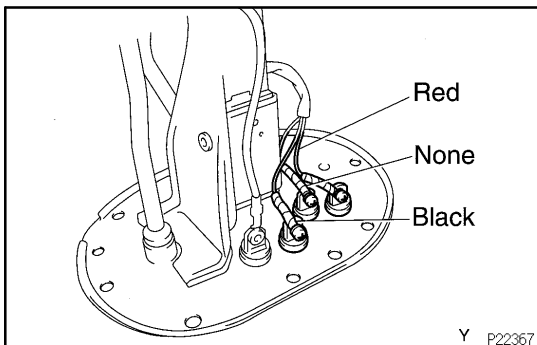
2. **REMOVE FUEL PUMP FILTER FROM FUEL PUMP**

- (a) Using a small screwdriver, remove the clip.

HINT:

At the time of installation, please refer to the following items.
install the pump filter with a new clip.

- (b) Pull out the pump filter.

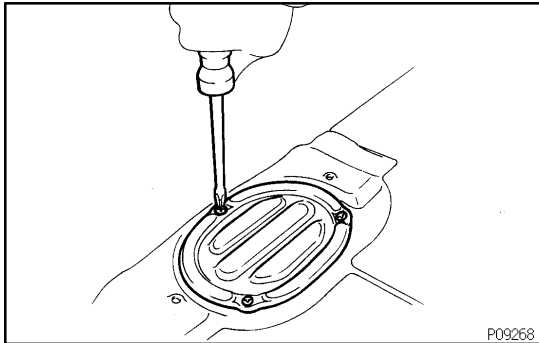


3. **REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET**

- (a) Remove the 3 screws and disconnect the lead wires from the pump bracket.
- (b) Remove the 2 screws and sender gauge.

INSPECTION

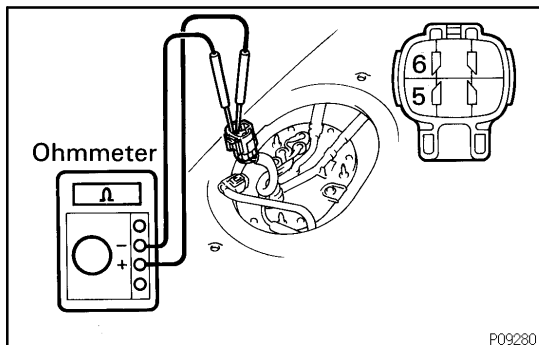
1. REMOVE SECOND SEATS
2. REMOVE SCUFF PLATE
3. REMOVE SIDE GARNISH
4. REMOVE STEP PLATE
5. DISCONNECT FLOOR MATS



6. REMOVE FLOOR SERVICE HOLE COVER

Remove the 3 screws and service hole cover.

7. DISCONNECT FUEL PUMP AND SENDER GAUGE CONNECTOR

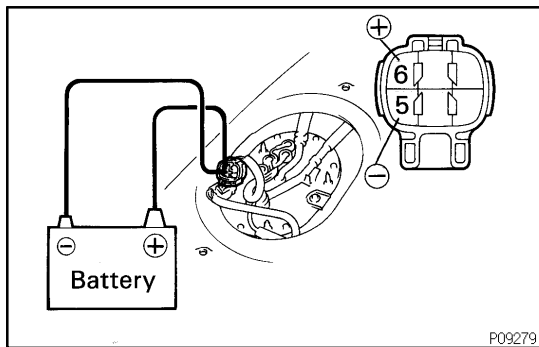


8. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals 5 and 6.

Resistance: 0.2 – 3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump.



9. INSPECT FUEL PUMP OPERATION

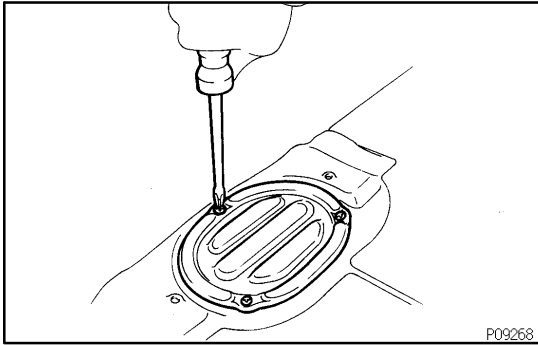
Connect the positive (+) lead from the battery to terminal 6 of the connector, and the negative (-) lead to terminal 5. Check that the fuel pump operates.

NOTICE:

- These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.
- Keep the fuel pump 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.

10. RECONNECT FUEL PUMP AND SENDER GAUGE CONNECTOR

**11. REINSTALL FLOOR SERVICE HOLE COVER**

Install the service hole cover with the 3 screws.

12. REINSTALL FLOOR MATS**13. REINSTALL STEP PLATE****14. REINSTALL SIDE GARNISH****15. REINSTALL SCUFF PLATE****16. REINSTALL SECOND SEATS**

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

REASSEMBLY

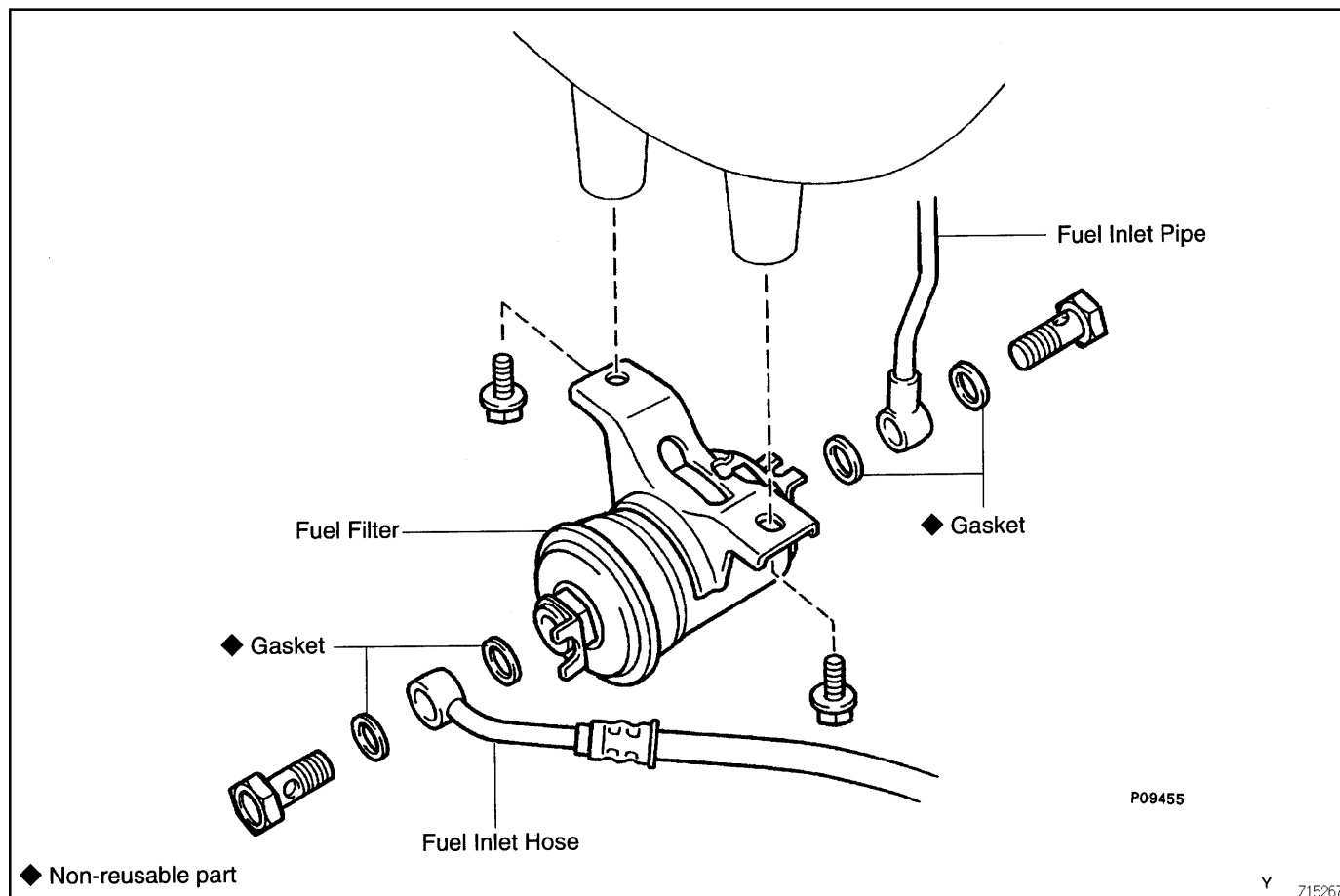
Reassembly is in the reverse order of disassembly (See page [SF-13](#)).

INSTALLATION

Installation is in the reverse order of removal (See page [SF-11](#)).

FUEL FILTER COMPONENTS

SF1EL-01



FUEL PRESSURE REGULATOR ON-VEHICLE INSPECTION

SF1EM-01

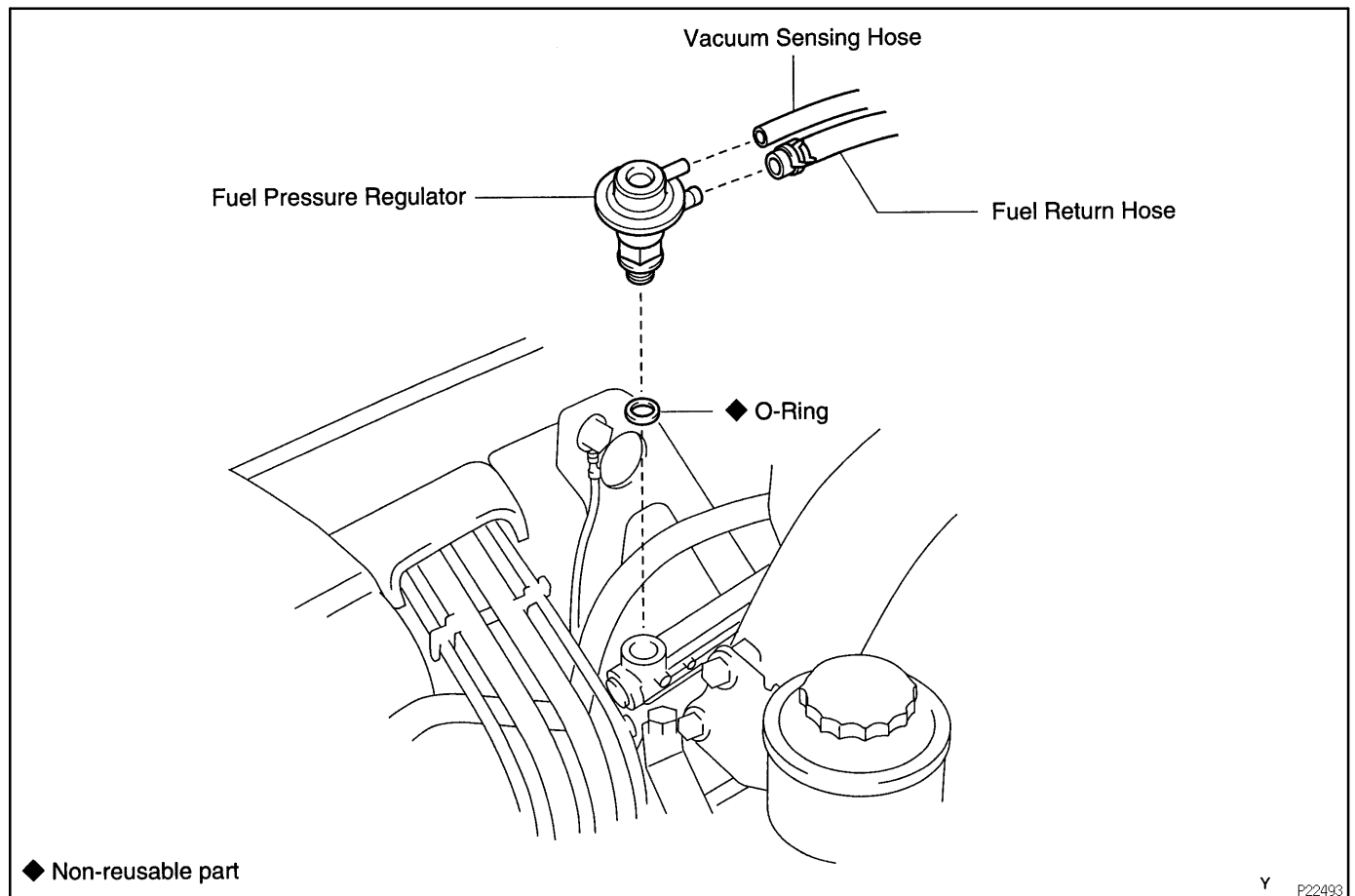
INSPECT FUEL PRESSURE (See page [SF-1](#))

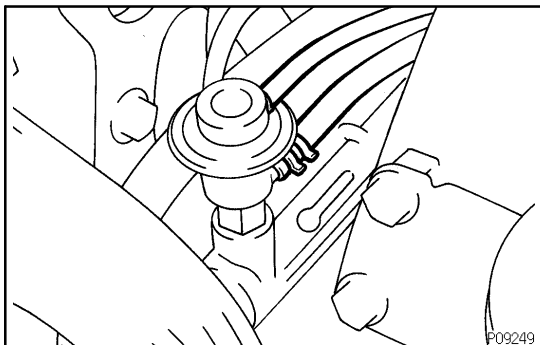
SF-20

SFI - FUEL PRESSURE REGULATOR

SF0XZ-04

COMPONENTS



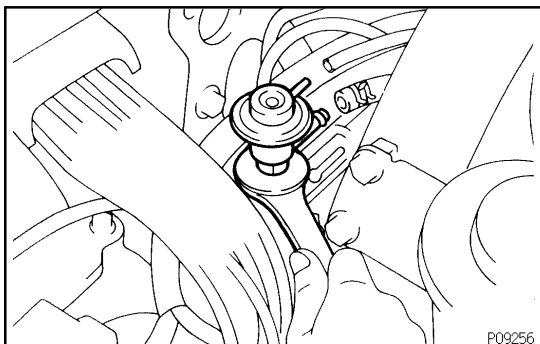


REMOVAL

1. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR
2. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR

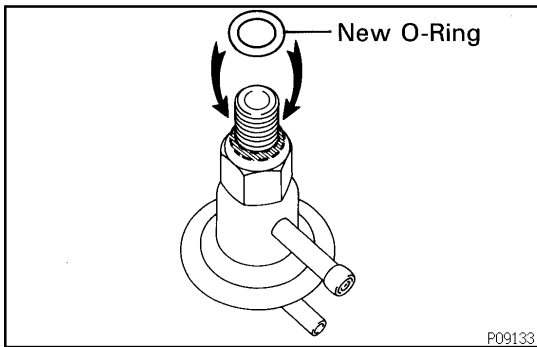
CAUTION:

Put a shop towel under the pressure regulator.



3. REMOVE FUEL PRESSURE REGULATOR

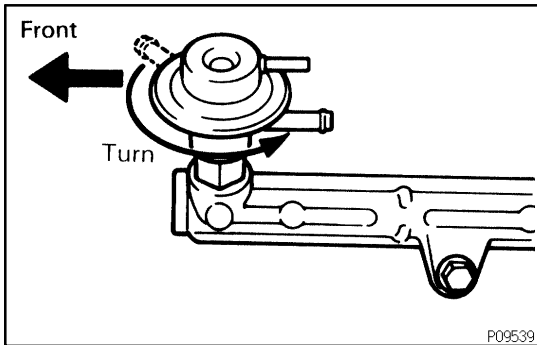
- (a) Loosen the lock nut, and remove the pressure regulator.
- (b) Remove the O-ring from the pressure regulator.



INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Fully loosen the lock nut on the pressure regulator.
- (b) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.
- (c) Insert the pressure regulator into the delivery pipe by hand completely.

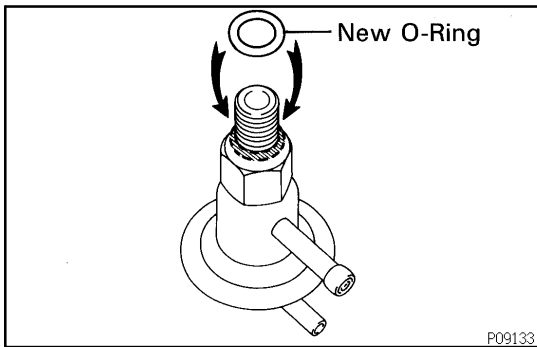


- (d) Turn the pressure regulator counterclockwise until the fuel outlet port faces in the direction indicated in the illustration.

- (e) Tighten the lock nut.

Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

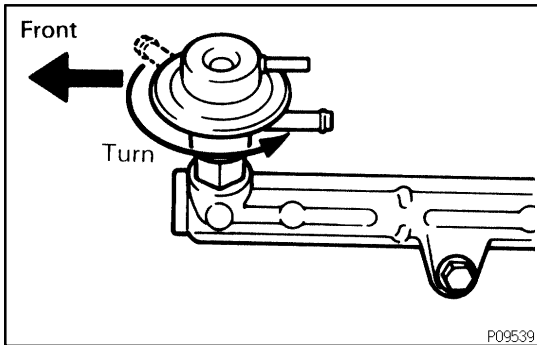
2. **CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR**
3. **CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR**
4. **START ENGINE AND CHECK FOR FUEL LEAKAGE**



INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

- (a) Fully loosen the lock nut on the pressure regulator.
- (b) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.
- (c) Insert the pressure regulator into the delivery pipe by hand completely.

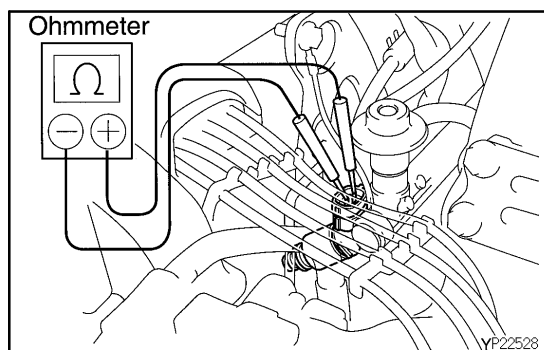


- (d) Turn the pressure regulator counterclockwise until the fuel outlet port faces in the direction indicated in the illustration.

- (e) Tighten the lock nut.

Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)

2. **CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR**
3. **CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR**
4. **START ENGINE AND CHECK FOR FUEL LEAKAGE**

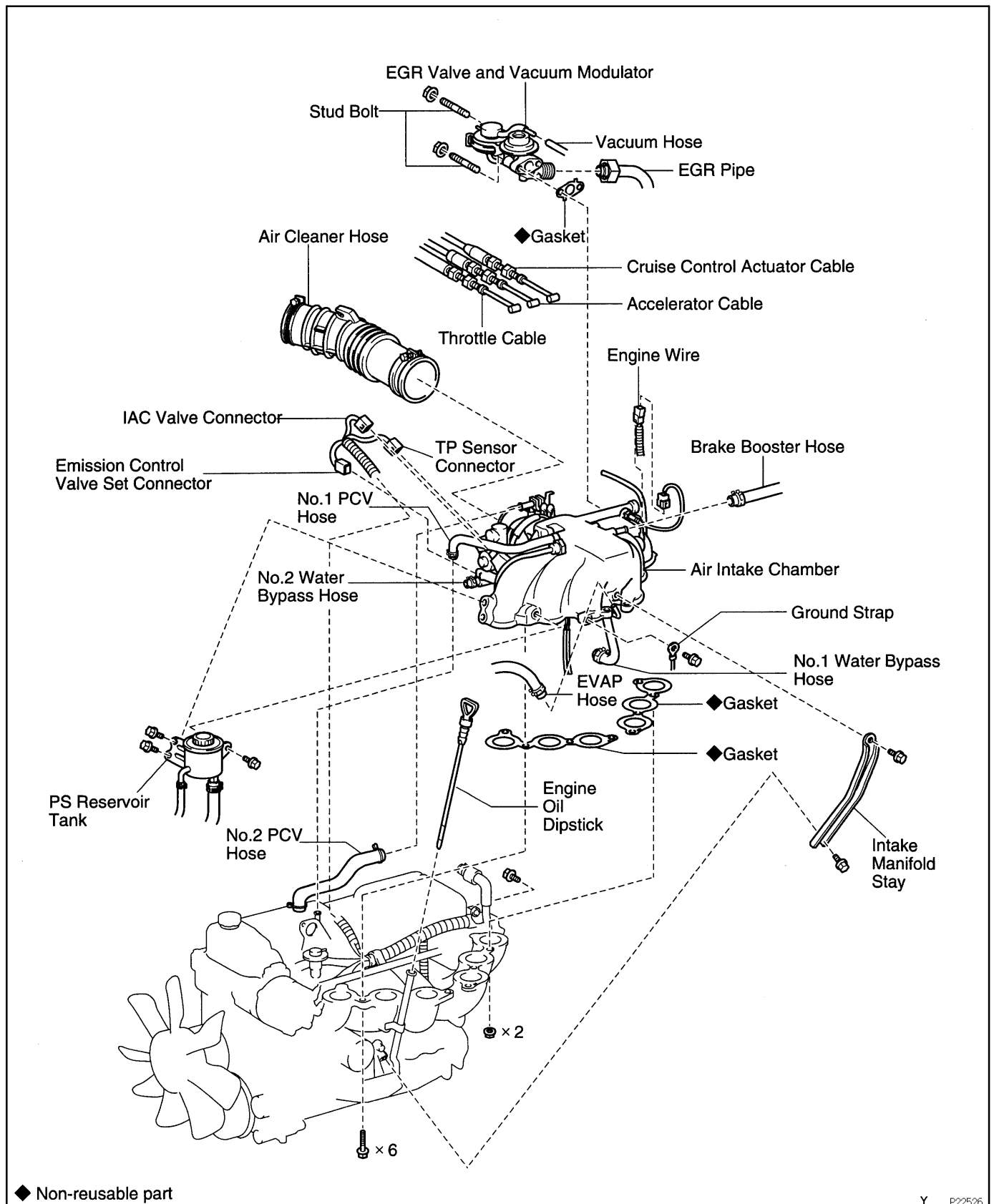


SF00R-05

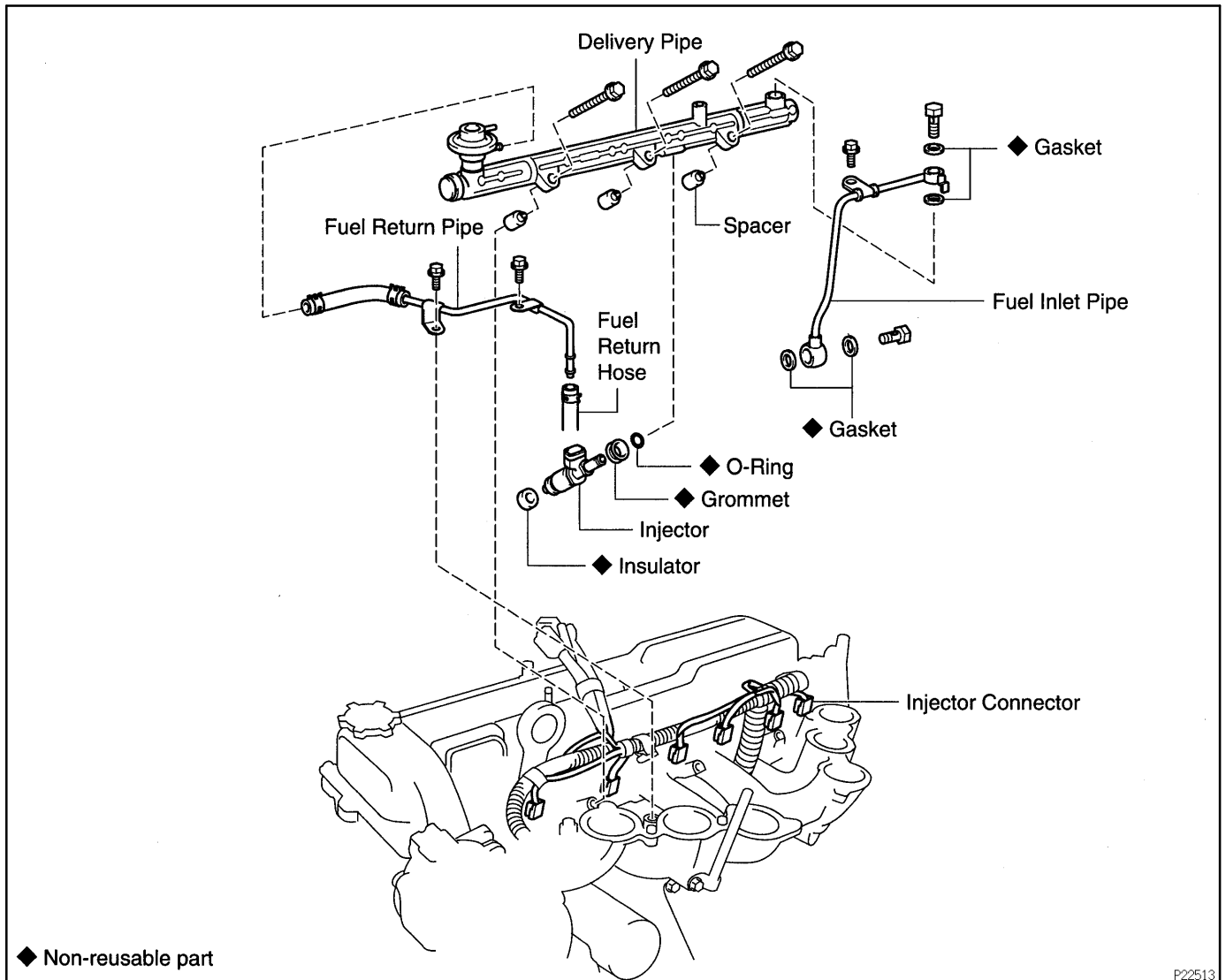
INJECTOR ON-VEHICLE INSPECTION

1. REMOVE THROTTLE BODY (See page [SF-45](#))
2. INSPECT INJECTOR RESISTANCE
 - (a) Disconnect the 6 injector connectors.
 - (b) Using an ohmmeter, measure the resistance between the terminals.
Resistance: 13.4 – 14.2 Ω at 20°C (68°F)
- If the resistance is not as specified, replace the injector.
- (c) Reconnect the 6 injector connectors.
3. REINSTALL THROTTLE BODY (See page [SF-48](#))

COMPONENTS



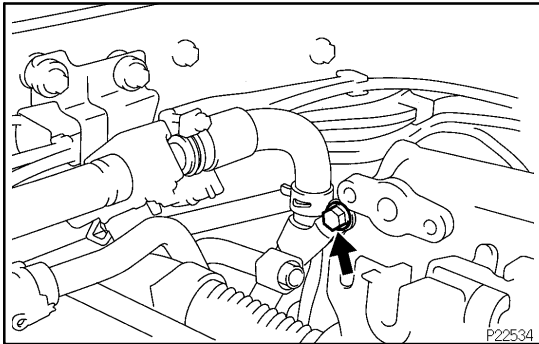
SFI - INJECTOR



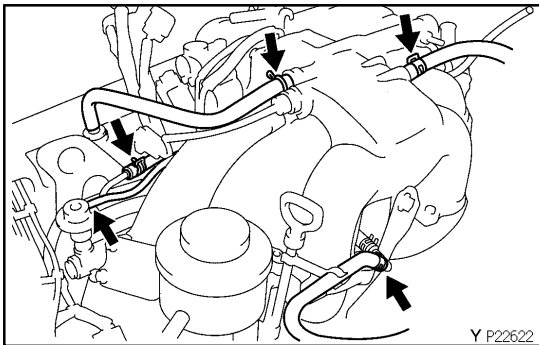
P22513

REMOVAL

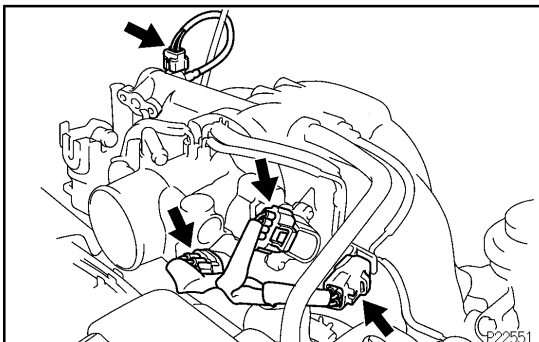
1. DRAIN ENGINE COOLANT
2. DISCONNECT CRUISE CONTROL ACTUATOR CABLE
3. DISCONNECT ACCELERATOR CABLE
4. DISCONNECT THROTTLE CABLE
5. DISCONNECT NO.2 PCV HOSE
6. DISCONNECT AIR CLEANER HOSE
7. REMOVE EGR VACUUM MODULATOR AND VALVE
(See page [EC-10](#))



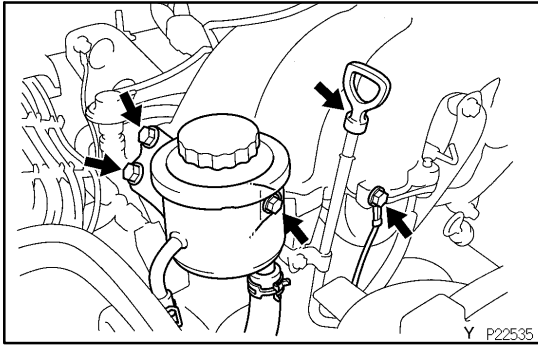
8. REMOVE BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER



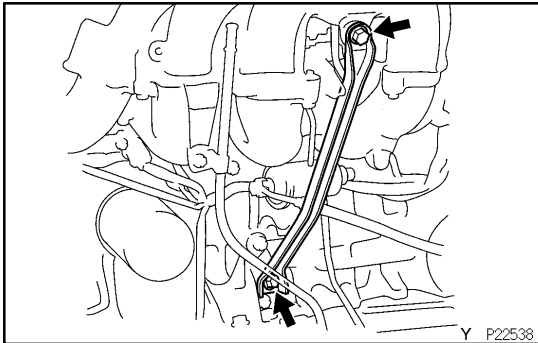
9. DISCONNECT NO.1 PCV HOSE
10. DISCONNECT VACUUM SENSING HOSE
11. DISCONNECT NO.2 WATER BYPASS HOSE
12. DISCONNECT EVAP HOSE
13. DISCONNECT BRAKE BOOSTER HOSE



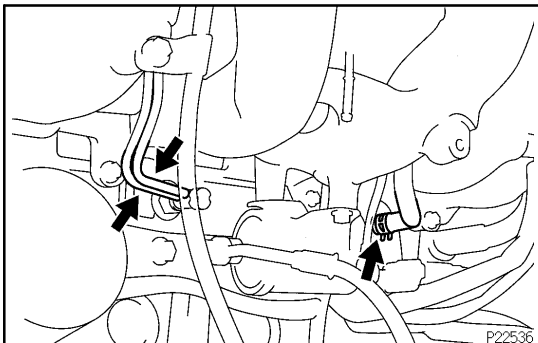
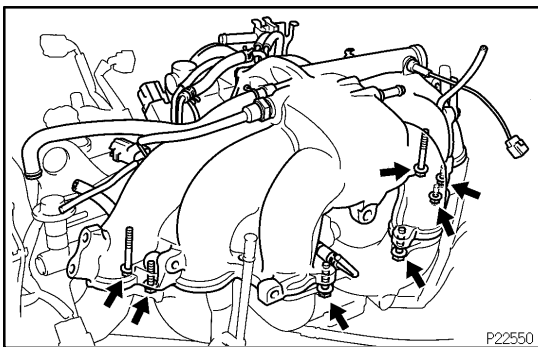
14. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
15. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR
16. DISCONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY
17. DISCONNECT EGR GAS TEMP. SENSOR CONNECTOR

**18. DISCONNECT PS RESERVOIR TANK**

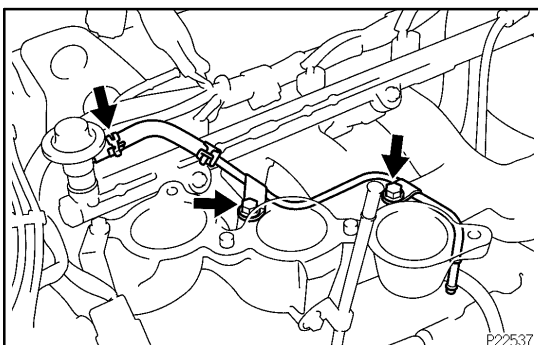
Remove the 3 bolts and disconnect the reservoir tank.

19. REMOVE ENGINE OIL DIPSTICK**20. DISCONNECT GROUND STRAP****21. REMOVE INTAKE MANIFOLD STAY**

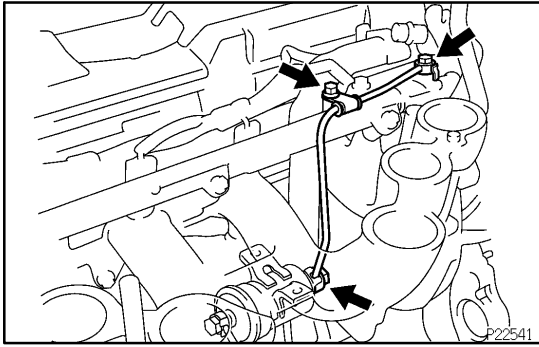
Remove the 2 bolts and intake manifold stay.

**22. DISCONNECT VACUUM HOSES FROM TVV****23. DISCONNECT NO.1 WATER BYPASS HOSE FROM CYLINDER HEAD****24. REMOVE AIR INTAKE CHAMBER**

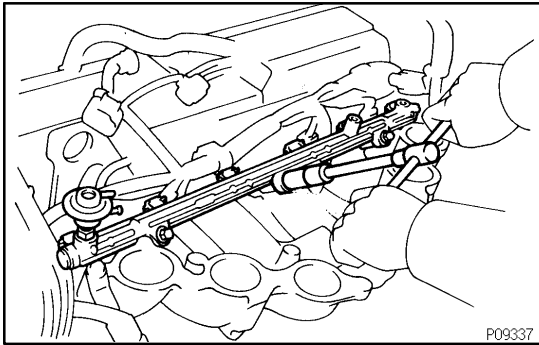
Remove the 6 bolts, 2 nuts, air intake chamber and 2 gaskets.

**25. REMOVE FUEL RETURN PIPE**

- (a) Disconnect the fuel hose from the fuel pressure regulator.
- (b) Remove the 2 bolts and fuel return pipe.

**26. REMOVE FUEL INLET PIPE**

Remove the 2 union bolts, bolt, 4 gaskets and fuel pipe.

**27. REMOVE DELIVERY PIPE AND INJECTORS**

- (a) Disconnect the 6 injector connectors.
- (b) Remove the 3 bolts and delivery pipe together with the 6 injectors.

NOTICE:

Be careful not to drop the injectors when removing the delivery pipe.

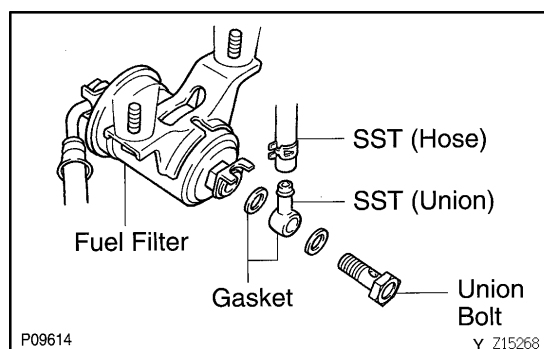
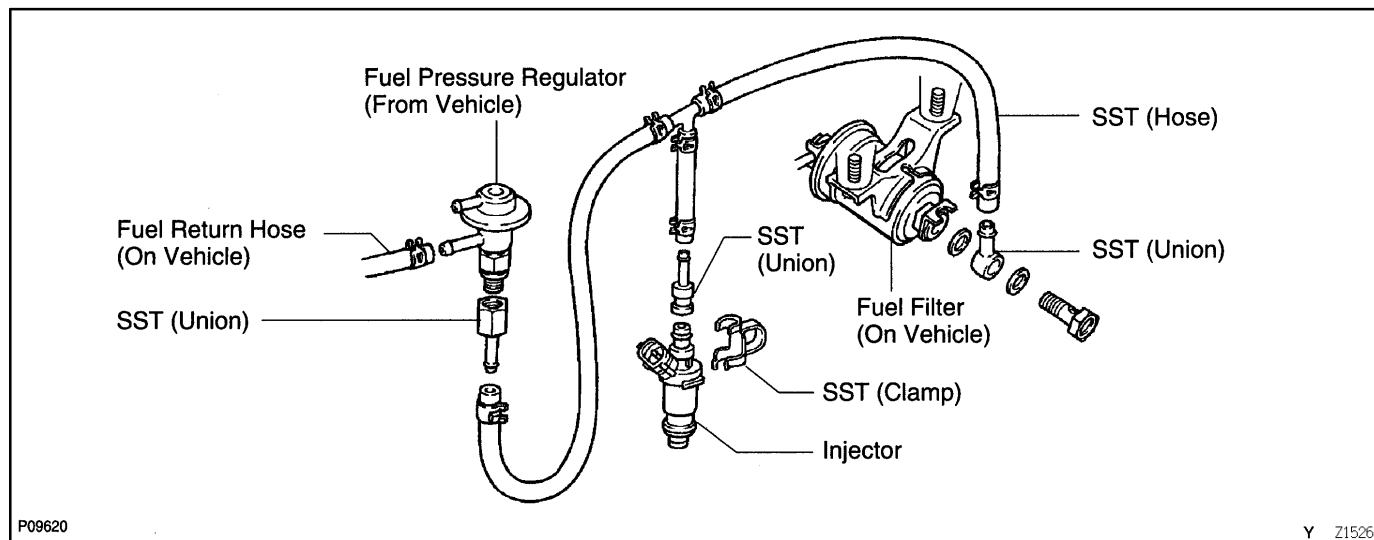
- (c) Remove the 6 insulators and 3 spacers from the intake manifold.
- (d) Pull out the 6 injectors from the delivery pipe.
- (e) Remove the O-ring and grommet from each injector.

INSPECTION

1. INSPECT INJECTOR INJECTION

CAUTION:

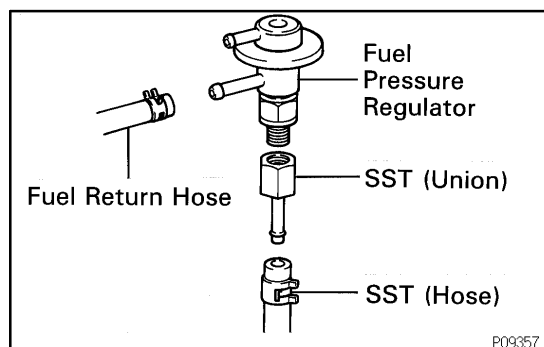
Keep injector clean of sparks during the test.



- (a) Connect SST (union and hose) to the fuel filter outlet with the 2 gaskets and union bolt.

SST 09268-41046 (90405-09015)

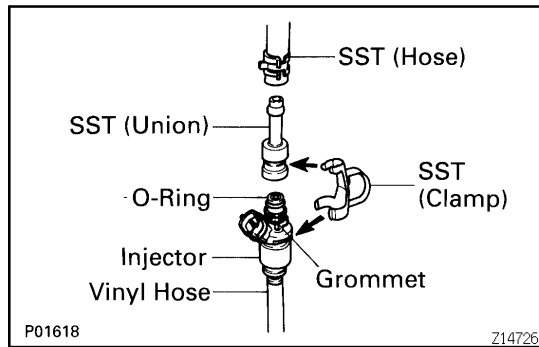
Torque: 29 N·m (300 kgf-cm, 22 ft-lbf)



- (b) Remove the fuel pressure regulator (See page [SF-21](#)).
 (c) Install the O-ring to the fuel inlet of pressure regulator.
 (d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union).
 SST 09268-41046 (09268-41091)
Torque: 25 N·m (250 kgf-cm, 18 ft-lbf)
 (e) Connect the fuel return hose to the fuel outlet of the pressure regulator.

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SFI - INJECTOR



- (f) Install the grommet and O-ring to the injector.
- (g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).

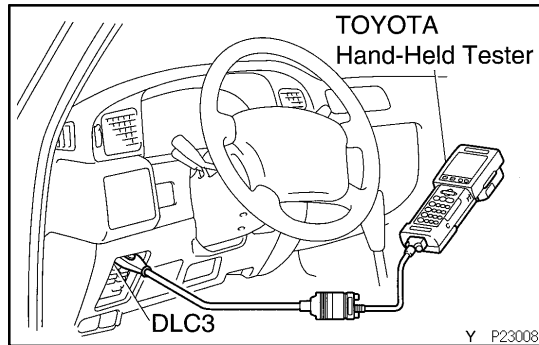
SST 09268-41046

- (h) Put the injector into the graduated cylinder.

HINT:

Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

- (i) Remove the fuse cover on the instrument panel.

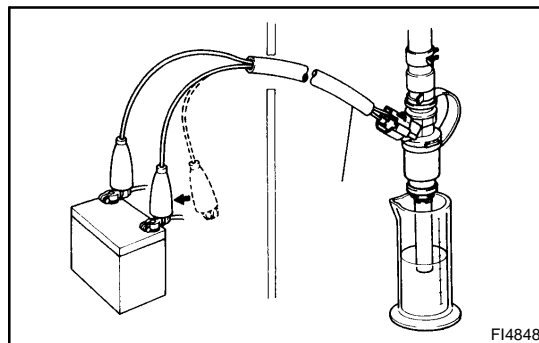


- (j) Connect the TOYOTA hand-held tester to the DLC3.
- (k) Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

NOTICE:

Do not start the engine.

- (l) Select the active test mode on the TOYOTA hand-held tester.
- (m) Please refer to the TOYOTA hand-held tester operator's manual for further details.



- (n) If you have no TOYOTA hand-held tester, connect the positive (+) and negative (-) leads from the battery to the fuel pump connector (See page [SF-14](#))
- (o) 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.

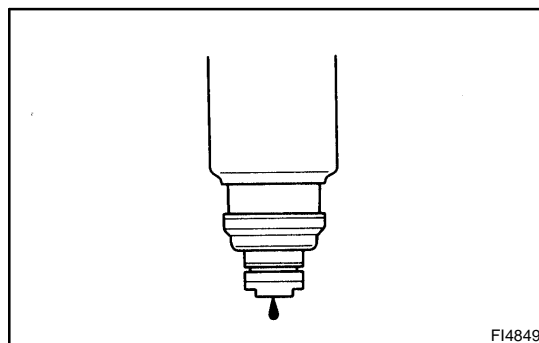
SST 09842-30070

Volume:

69 - 88 cm³ (4.2 - 5.4 cu in.) per 15 seconds

Difference between each injector:

5 cm³ (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.

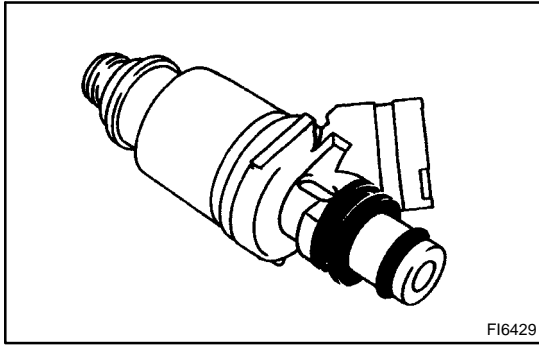
SST 09842-30070

Fuel drop: One drop or less per minute

- (b) Turn the ignition switch to LOCK.
- (c) Disconnect the negative (-) terminal cable from the battery.

SFI - INJECTOR

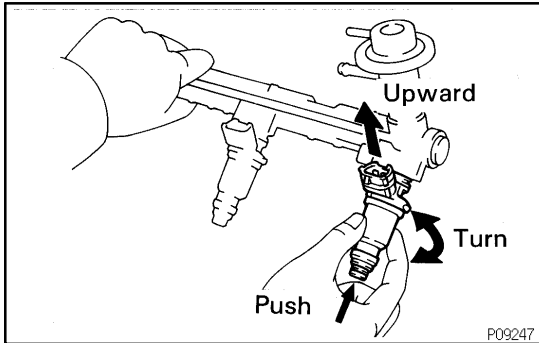
- (d) Remove SST.
SST 09268-41045
- (e) Reinstall the fuel pressure regulator to the delivery pipe
(See page [SF-22](#)).
- (f) Disconnect the TOYOTA hand-held tester from the
DLC3.
- (g) Reinstall the fuse cover on the instrument panel.



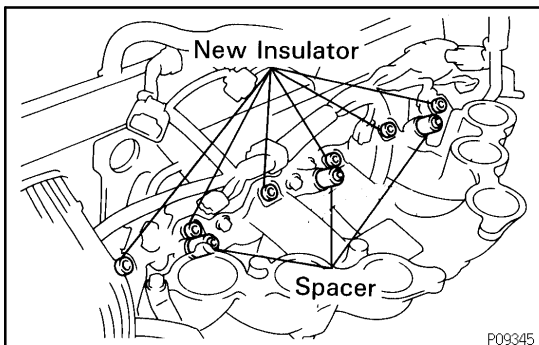
INSTALLATION

1. INSTALL INJECTORS AND DELIVERY PIPE

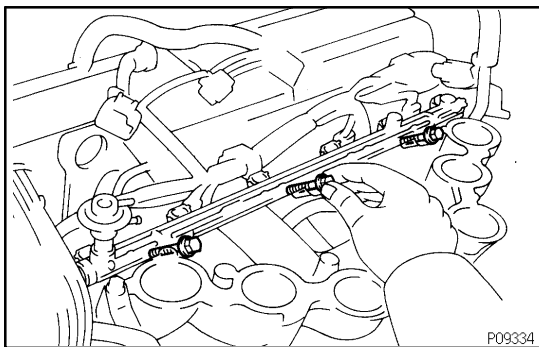
- (a) Install a new grommet to the injector.
- (b) Apply a light coat of gasoline to a new O-ring and install it to the injector.



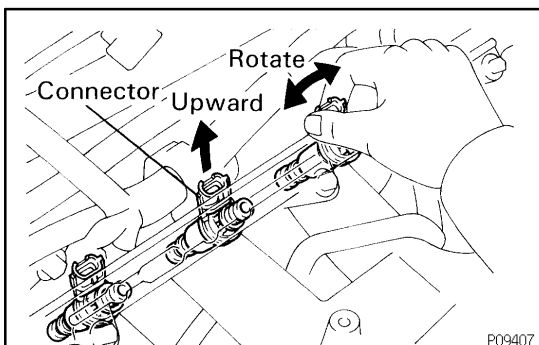
- (c) While turning the injector left and right, install it to the delivery pipe. Install the 6 injectors.
- (d) Position the injector connector upward.



- (e) Place 6 new insulators and the 3 spacers in position on the intake manifold.
- (f) Place the 6 injectors together with the delivery pipe in position on the intake manifold.



- (g) Temporarily install the 3 bolts holding the delivery pipe to the intake manifold.



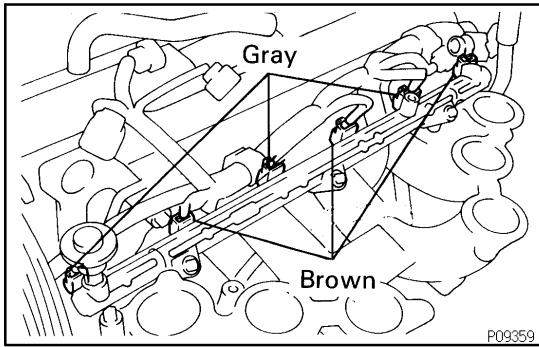
- (h) Check that the injectors rotate smoothly.

HINT:

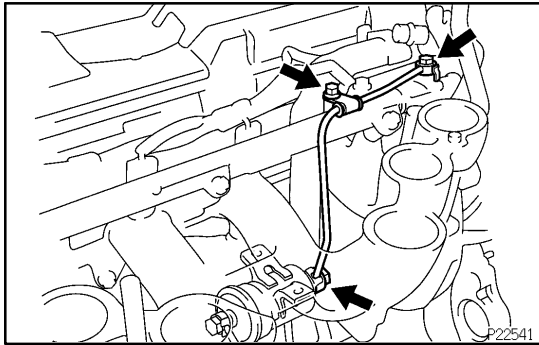
If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings. Replace the O-rings.

- (i) Position the injector connector upward.
- (j) Tighten the 3 bolts holding the delivery pipe to the intake manifold.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



- (k) Connect the 6 injector connectors as shown.



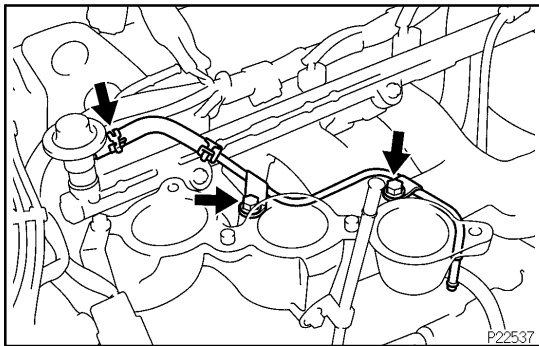
2. INSTALL FUEL INLET PIPE

Install the fuel inlet pipe with 4 new gaskets, the 2 union bolts and bolt.

Torque:

Union bolt: 29 N·m (300 kgf-cm, 22 ft-lbf)

Bolt: 20 N·m (200 kgf-cm, 14 ft-lbf)

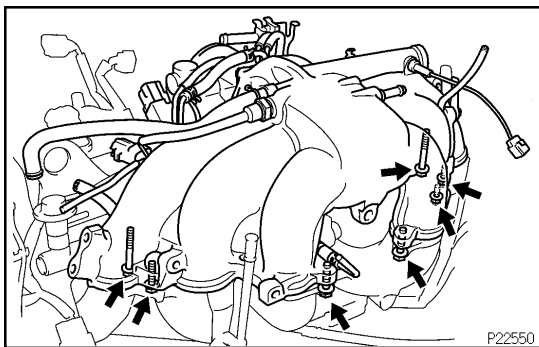


3. INSTALL FUEL RETURN PIPE

- (a) Install the fuel return pipe with the 2 bolts.

Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)

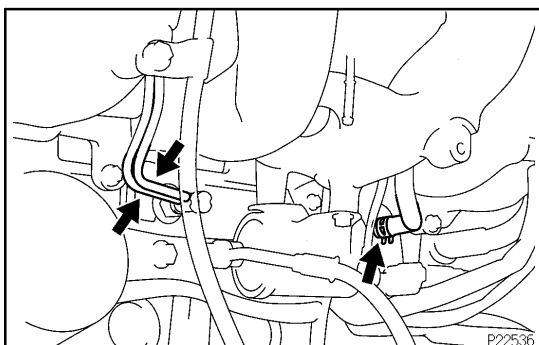
- (b) Connect the fuel hose to the fuel pressure regulator.



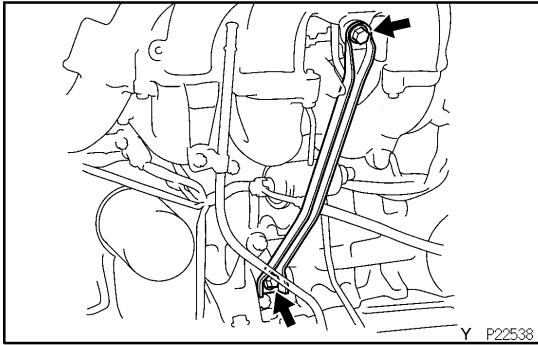
4. INSTALL AIR INTAKE CHAMBER

Install 2 new gaskets and the air intake chamber with the 6 bolts and 2 nuts.

Torque: 21 N·m (210 kgf-cm, 15 ft-lbf)

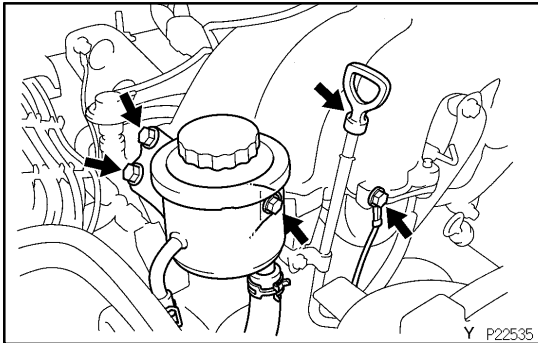


5. CONNECT NO.1 WATER BYPASS HOSE TO CYLINDER HEAD
6. CONNECT VACUUM HOSES TO TVV

**7. INSTALL INTAKE MANIFOLD STAY**

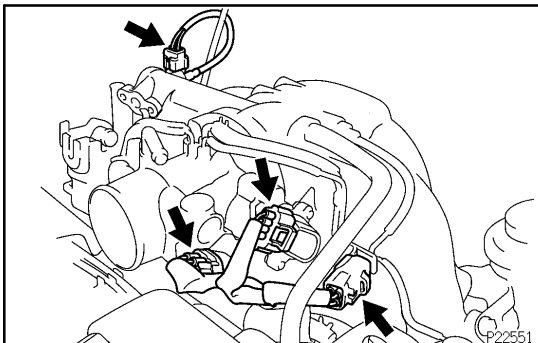
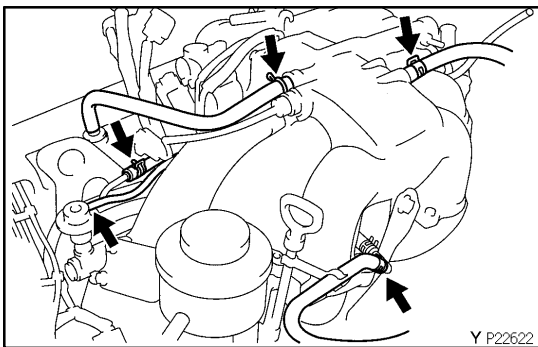
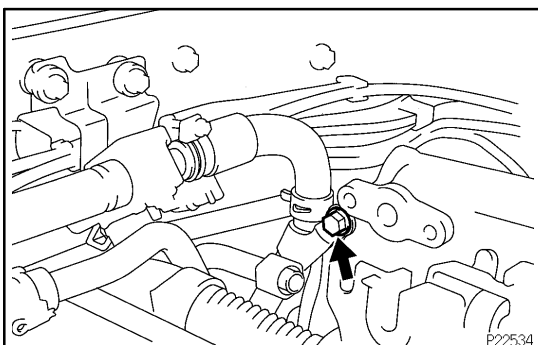
Install the intake manifold stay with the 2 bolts.

Torque: 36 N·m (360 kgf-cm, 26 ft-lbf)

**8. CONNECT GROUND STRAP****9. INSTALL ENGINE OIL DIPSTICK****10. CONNECT PS RESERVOIR TANK**

Connect the reservoir tank with the 3 bolts.

Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)

**11. CONNECT EGR GAS TEMP. SENSOR CONNECTOR****12. CONNECT CONNECTOR FOR EMISSION CONTROL VALVE SET ASSEMBLY****13. CONNECT IDLE AIR CONTROL VALVE CONNECTOR****14. CONNECT THROTTLE POSITION SENSOR CONNECTOR****15. CONNECT BRAKE BOOSTER HOSE****16. CONNECT EVAP HOSE****17. CONNECT NO.2 WATER BYPASS HOSE****18. CONNECT VACUUM SENSING HOSE****19. CONNECT NO.1 PCV HOSE****20. INSTALL BOLT HOLDING HEATER INLET PIPE AND AIR INTAKE CHAMBER**

Torque: 20 N·m (200 kgf-cm, 14 ft-lbf)

21. INSTALL EGR VALVE AND VACUUM MODULATOR (See page [EC-10](#))**22. CONNECT THROTTLE CABLE****23. CONNECT ACCELERATOR CABLE****24. CONNECT CRUISE CONTROL ACTUATOR CABLE****25. CONNECT AIR CLEANER HOSE****26. CONNECT NO.2 PCV HOSE**

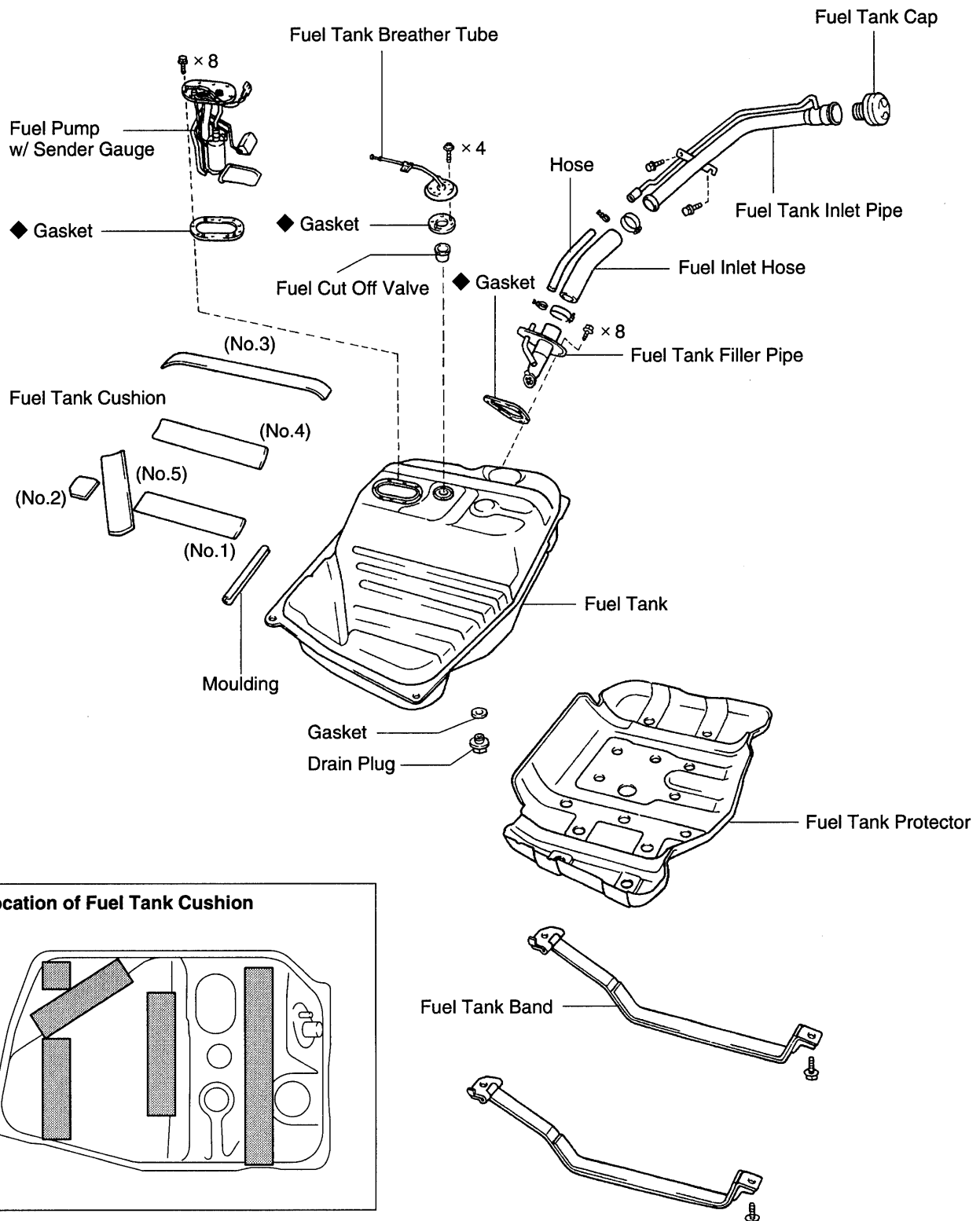
27. FILL WITH ENGINE COOLANT

FUEL TANK AND LINE COMPONENTS

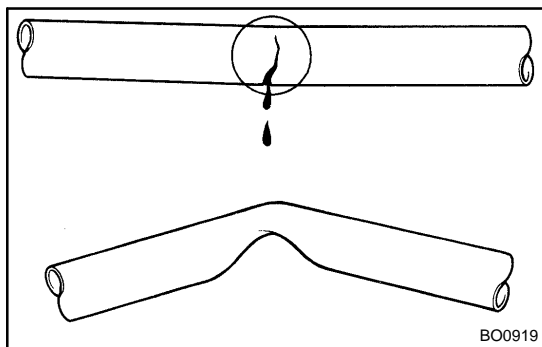
SF00Z-12

CAUTION:

- Always use new gaskets when replacing the fuel tank or component parts.
- Apply the proper torque to all parts tightened.



P22503

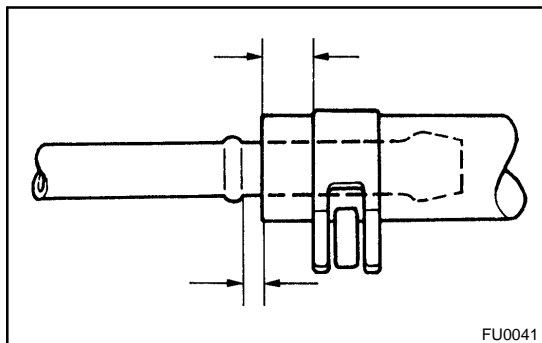
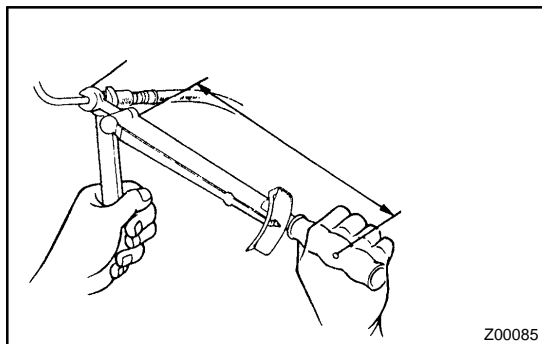


INSPECTION

INSPECT FUEL TANK AND LINE

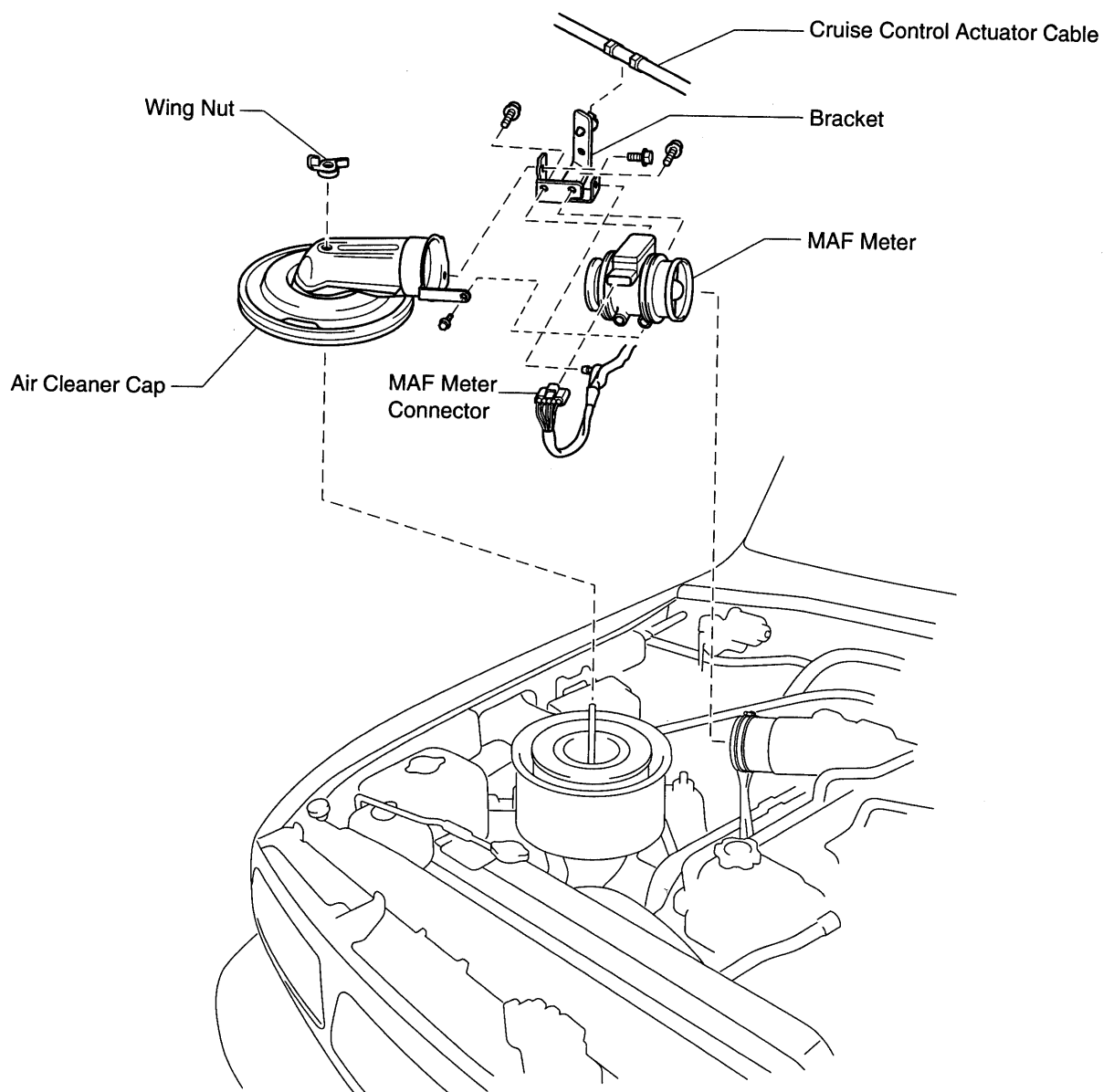
- Check the fuel lines for cracks or leakage, and all connections for deformation.
- Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
- Check the fuel tank for deformation, cracks fuel leakage or tank band looseness.
- Check the filler neck for damage or fuel leakage.
- Hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the part as necessary.

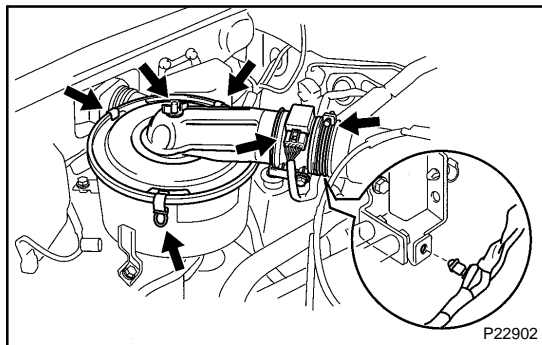


MASS AIR FLOW (MAF) METER COMPONENTS

SF0P1-06



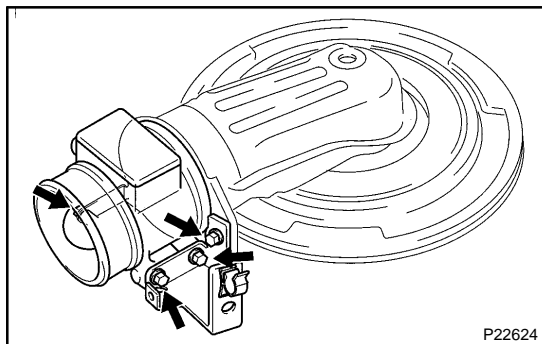
P22621



REMOVAL

1. REMOVE AIR CLEANER CAP AND MAF METER

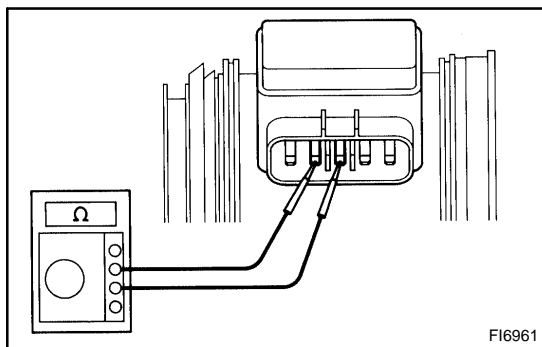
- Disconnect the MAF meter connector and wire clamp.
- Disconnect the cruise control actuator cable.
- Loosen the air cleaner hose clamp.
- Disconnect the 3 clips, and remove the wing nut, air cleaner cap and MAF meter.



2. REMOVE MAF METER

Remove the 4 bolts, bracket and MAF meter.

Torque: 6.9 N·m (70 kgf·cm, 61 in.-lbf)



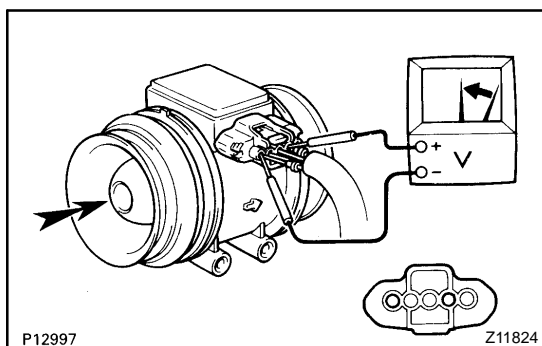
INSPECTION

1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Between terminals	Resistance	Temperature
THA - E2	10 - 20 kΩ	-20°C (-4°F)
THA - E2	4 - 7 kΩ	0°C (32°F)
THA - E2	2 - 3 kΩ	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)
THA - E2	0.2 - 0.4 kΩ	80°C (176°F)

If the resistance is not as specified, replace the MAF meter.



2. INSPECT MAF METER OPERATION

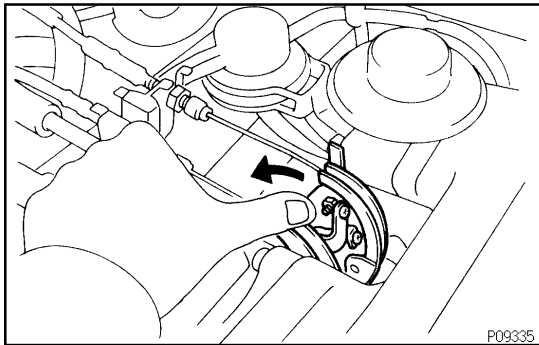
- Connect the MAF meter connector.
- Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (-) tester probe to terminal E3.
- Blow air into the MAF meter, and check that the voltage fluctuates.

If operation is not as specified, replace the MAF meter.

- Disconnect the MAF meter connector.

INSTALLATION

Installation is in the reverse order of removal (See page [SF-39](#)).

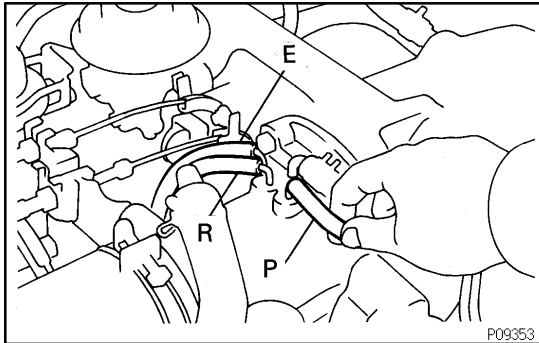


THROTTLE BODY ON-VEHICLE INSPECTION

SF1EU-01

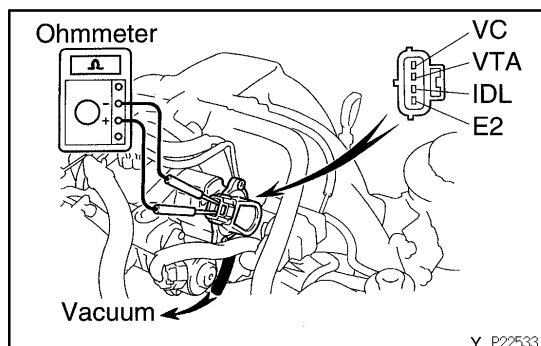
1. INSPECT THROTTLE BODY

- (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	At 3,500 rpm
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum



2. INSPECT THROTTLE POSITION (TP) SENSOR

- (a) Disconnect the TP sensor connector.
 (b) Apply vacuum to the throttle opener.
 (c) Using an ohmmeter, measure the resistance between each terminal.

Throttle valve condition	Between terminals	Resistance
Fully closed	VTA - E2	0.2 - 5.7 kΩ
Fully closed	IDL - E2	2.3 kΩ or less
Open	IDL - E2	Infinity
Fully open	VTA - E2	2.0 - 10.2 kΩ
-	VC - E2	2.5 - 5.9 kΩ

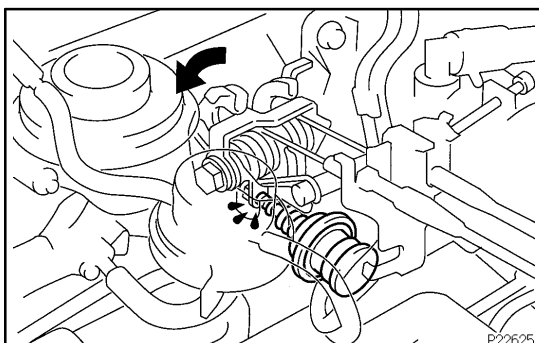
- (d) Reconnect the TP sensor connector.

3. INSPECT AND ADJUST DASHPOT

- (a) Allow the engine to warm up to normal operating temperature.

- (b) Check the idle speed.

Idle speed: 650 ± 50 rpm (N position)

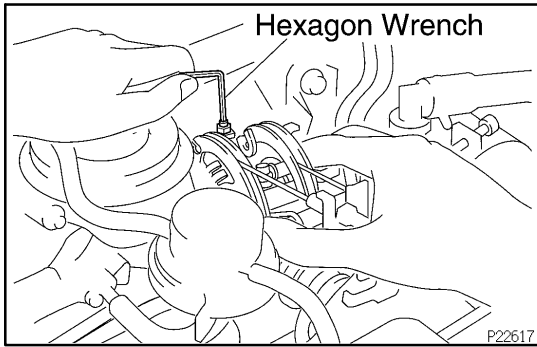


- (c) Open the throttle valve until the throttle lever separates from the dashpot end.

- (d) Release the throttle valve gradually, and check the dashpot setting speed when the throttle lever touched the dashpot end.

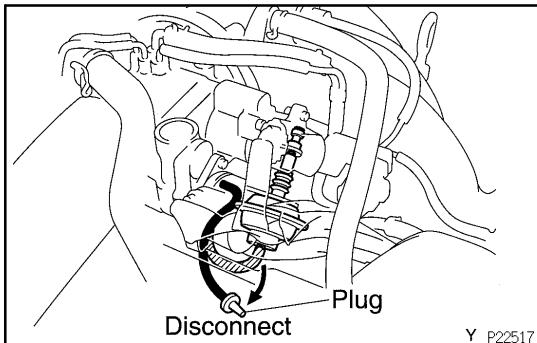
Dashpot setting speed: 2,200 ± 300 rpm

SFI - THROTTLE BODY



If not as specified, adjust using the following procedure:

- (1) Stop the engine.
- (2) Loosen the lock nut of the stopper bolt.
- (3) Adjust the dashpot setting speed by turning the stopper bolt.
- (4) Start the engine and check the dashpot setting speed.
- (5) Retighten the lock nut.
- (e) Maintain the engine at 3,500 rpm.
- (f) Release the throttle valve, and check that the engine returns to idle in a few seconds.



4. CHECK THROTTLE OPENER

- (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: 700 – 1,000 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.

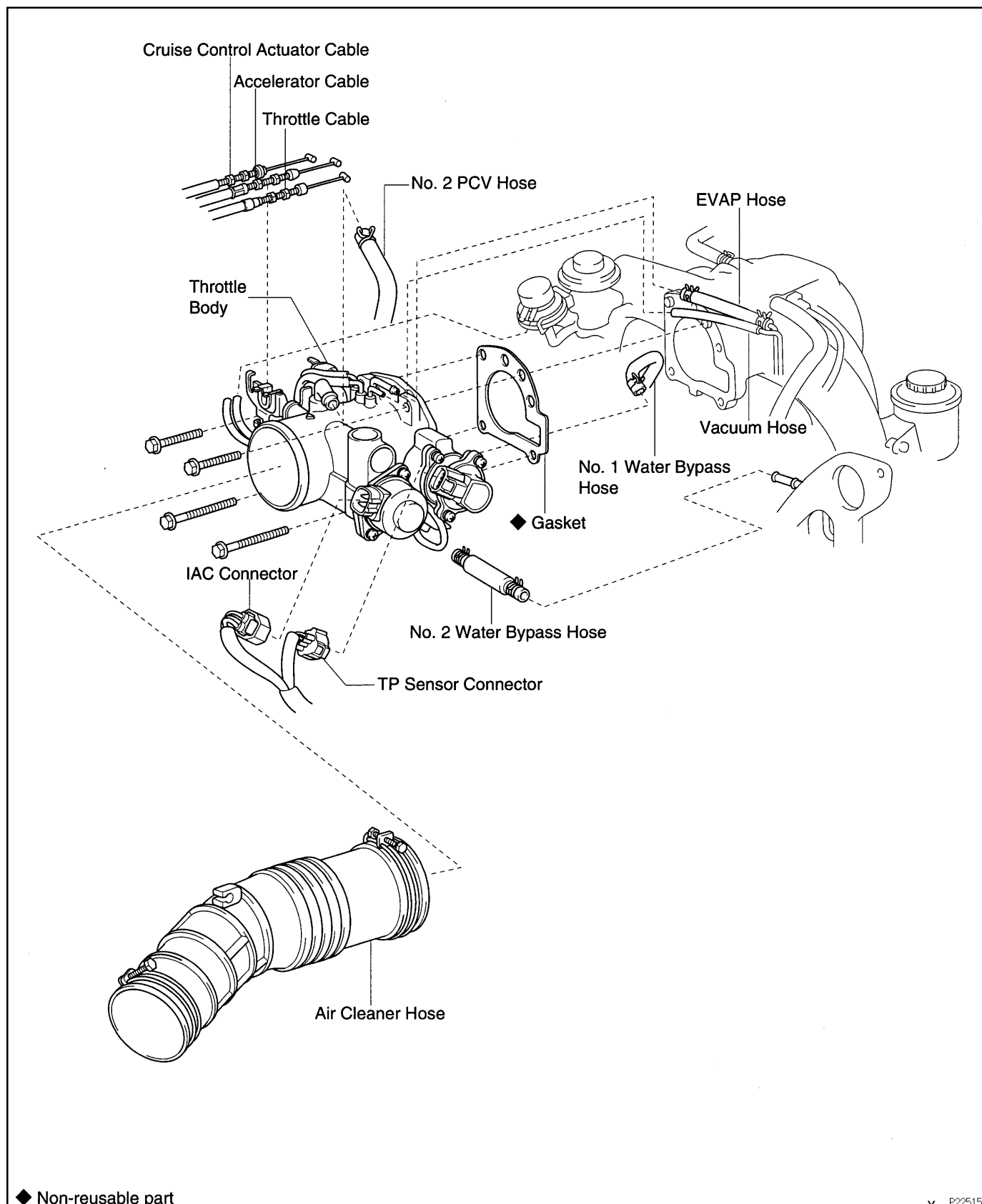
Idle speed: 650 ± 50 rpm (N position)

SF-44

SFI - THROTTLE BODY

SF1EV-01

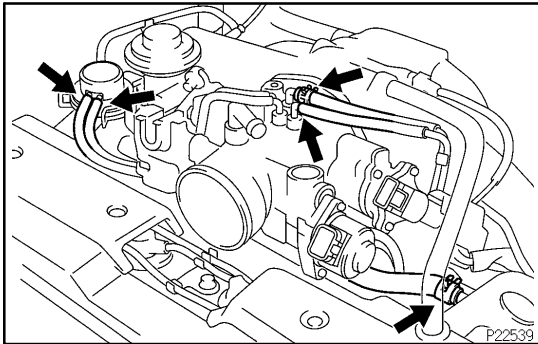
COMPONENTS



P22515

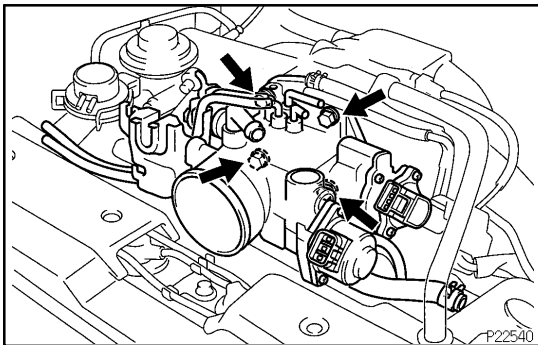
REMOVAL

1. DRAIN ENGINE COOLANT
2. DISCONNECT NO.2 PCV HOSE
3. DISCONNECT AIR CLEANER HOSE
4. DISCONNECT CONTROL CABLES FROM THROTTLE BODY
5. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR
6. DISCONNECT IDLE AIR CONTROL VALVE CONNECTOR



7. REMOVE THROTTLE BODY

- (a) Disconnect the EVAP hose.
- (b) Disconnect the 3 vacuum hoses.
- (c) Disconnect the No.2 water bypass hose.



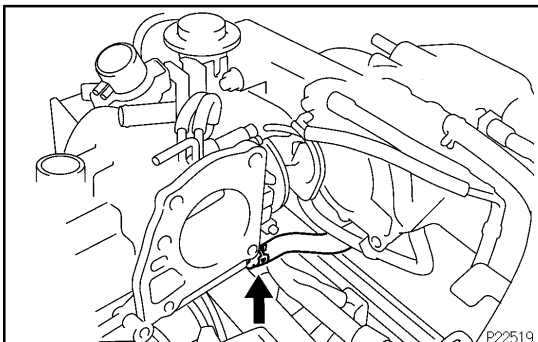
- (d) Remove the 4 bolts, and disconnect the throttle body from the air intake chamber.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

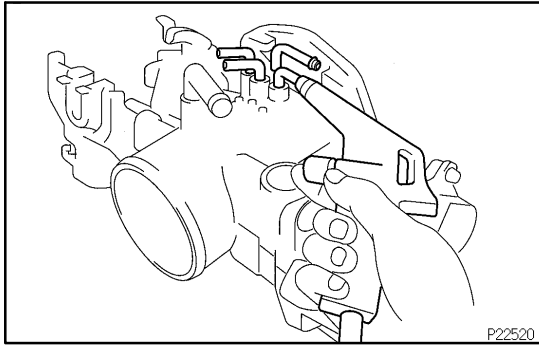
- (e) Remove the throttle body gasket.

HINT:

At the time of installation, please refer to the following items.
install a new gasket on the air intake chamber.



- (f) Disconnect the No.1 water bypass hose from the throttle body, and remove the throttle body.
- (g) Disconnect the No.2 water bypass hose from the throttle body.



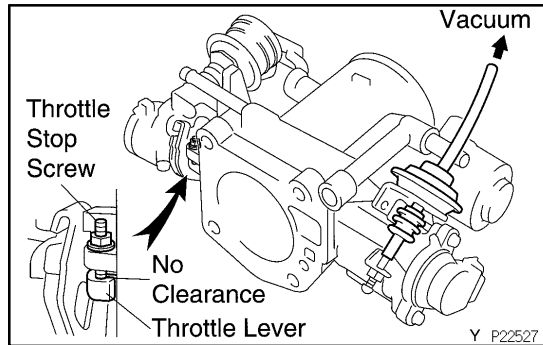
INSPECTION

1. CLEAN THROTTLE BODY

- Using a soft brush and carburetor cleaner, clean the cast parts.
- Using compressed air, clean all the passages and apertures.

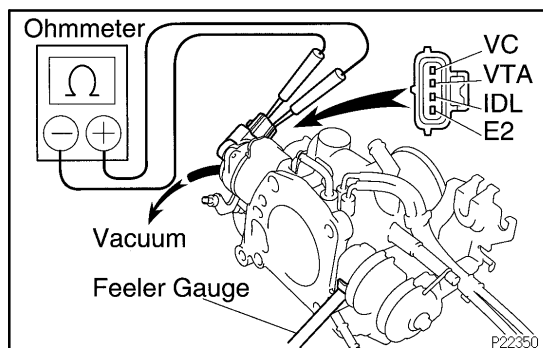
NOTICE:

To prevent deterioration, do not clean the throttle position sensor, dashpot and IAC valve.



2. INSPECT THROTTLE VALVE

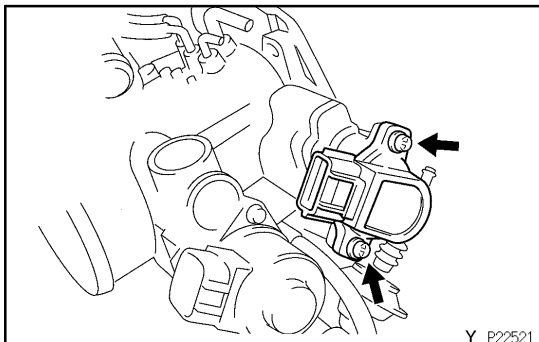
- Apply vacuum to the throttle opener.
- Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. INSPECT THROTTLE POSITION SENSOR

- Apply vacuum to the throttle opener.
- Insert a 0.50 mm (0.020 in.) or 0.75 mm (0.030 in.) feeler gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, measure the resistance between each terminal.

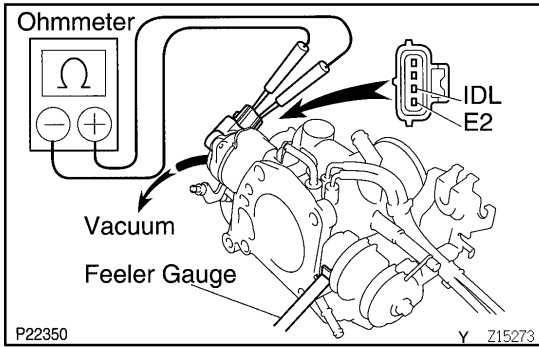
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA - E2	0.2 - 5.7 kΩ
0.50 mm (0.020 in.)	IDL - E2	2.3 kΩ or less
0.75 mm (0.030 in.)	IDL - E2	Infinity
Throttle valve fully open	VTA - E2	2.0 - 10.2 kΩ
-	VC - E2	2.5 - 5.9 kΩ



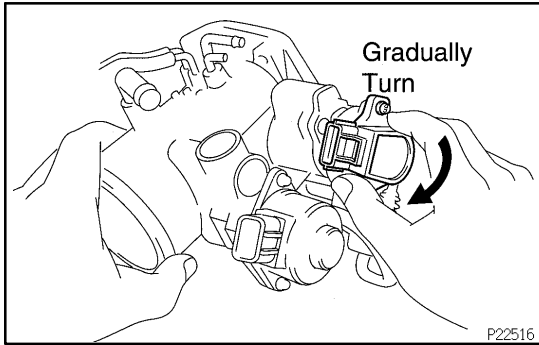
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

- Loosen the 2 set screws of the sensor.

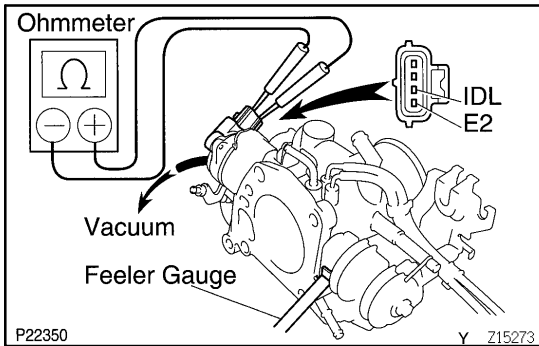
SFI - THROTTLE BODY



- (b) Apply vacuum to the throttle opener.
- (c) Insert a 0.62 mm (0.024 in.) feeler 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.

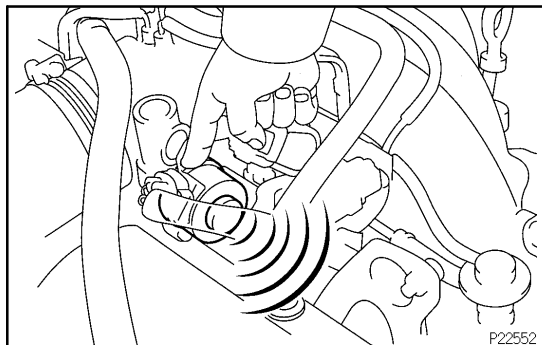


- (f) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL - E2)
0.50 mm (0.020 in.)	Continuity
0.75 mm (0.030 in.)	No continuity

INSTALLATION

Installation is in the reverse order of removal (See page [SF-45](#)).



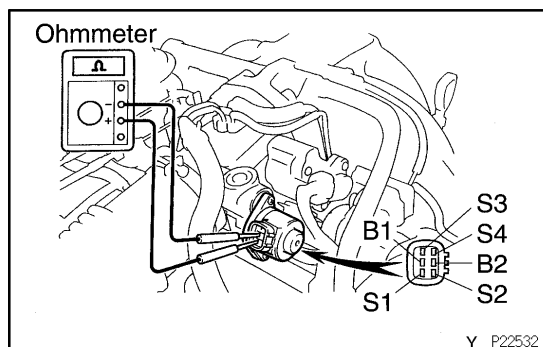
IDLE AIR CONTROL (IAC) VALVE ON-VEHICLE INSPECTION

SF1EZ-01

1. INSPECT IAC VALVE FOR OPERATING SOUND

Check that there is a clicking sound immediately after stopping the engine.

If the operation is not as specified, check the IAC valve, wiring and ECM.



2. INSPECT IAC VALVE RESISTANCE

- Disconnect the IAC valve connector.
- Using an ohmmeter, measure the resistance between the terminals (B1-S1 and S3, B2-S2 and S4).

Resistance:

At Cold: $-10 - 50^{\circ}\text{C}$ ($-50 - 122^{\circ}\text{F}$): $15 - 25\ \Omega$

At Hot: $50 - 100^{\circ}\text{C}$ ($122 - 212^{\circ}\text{F}$): $20 - 30\ \Omega$

If resistance is not as specified, replace the IAC valve.

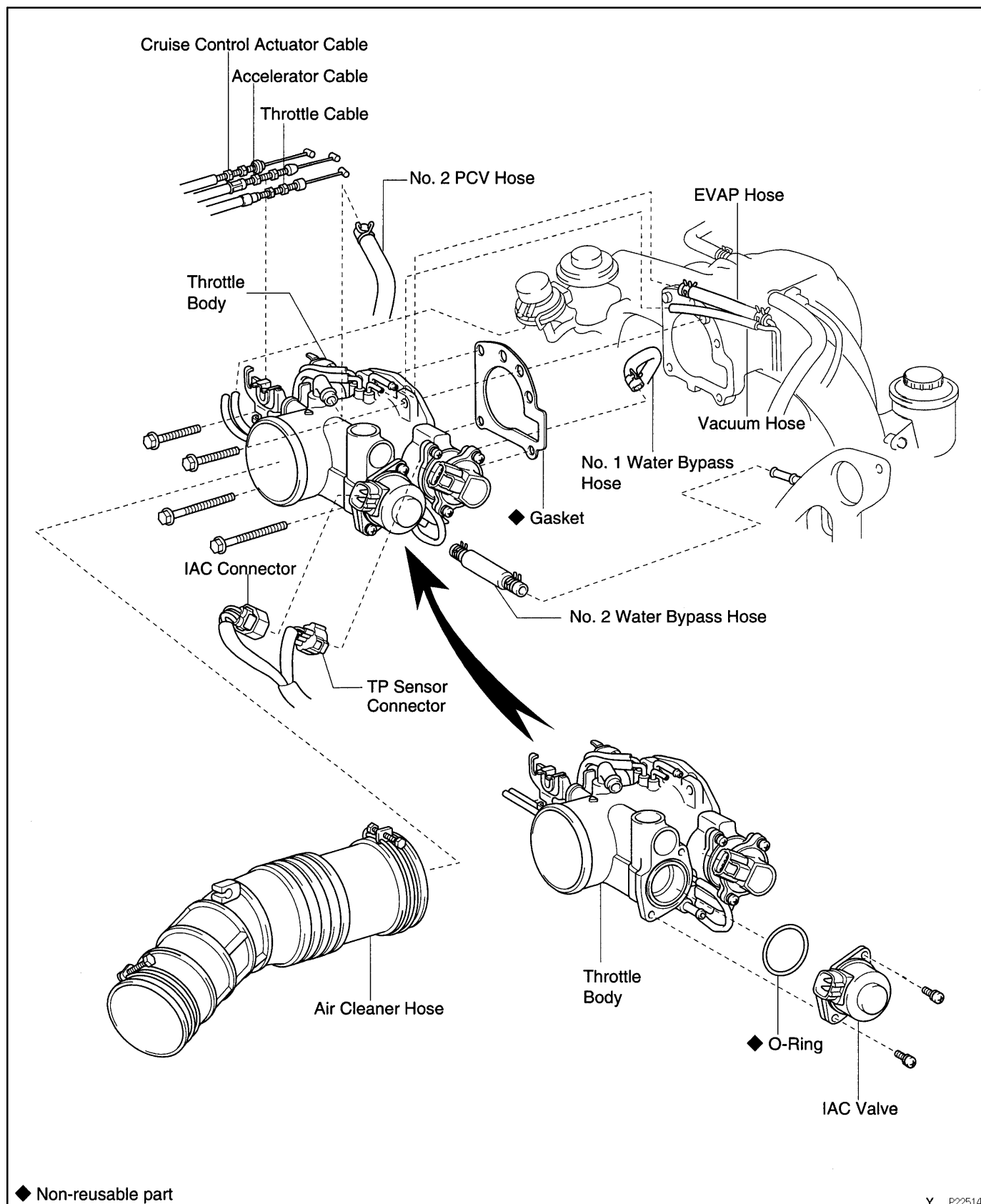
- Reconnect the IAC valve connector.

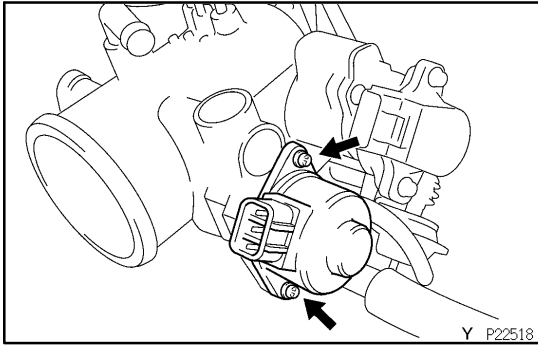
SF-50

SFI - IDLE AIR CONTROL (IAC) VALVE

SF1F0-01

COMPONENTS





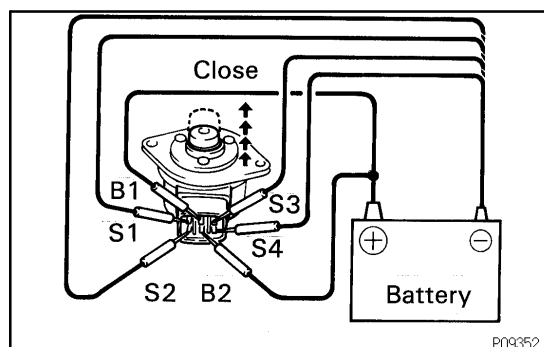
REMOVAL

1. REMOVE THROTTLE BODY (See page [SF-45](#))
2. REMOVE IAC VALVE

Remove the 2 screws, IAC valve and O-ring.

HINT:

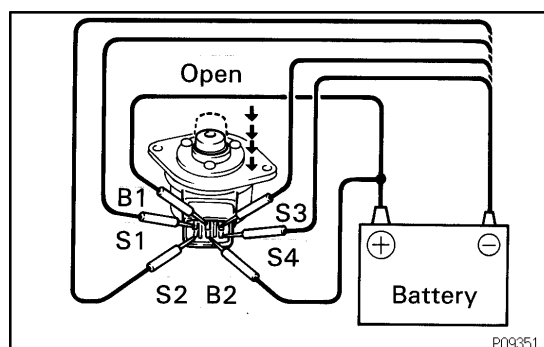
At the time of installation, install the IAC valve with a new O-ring.



INSPECTION

INSPECT IDLE AIR CONTROL VALVE OPERATION

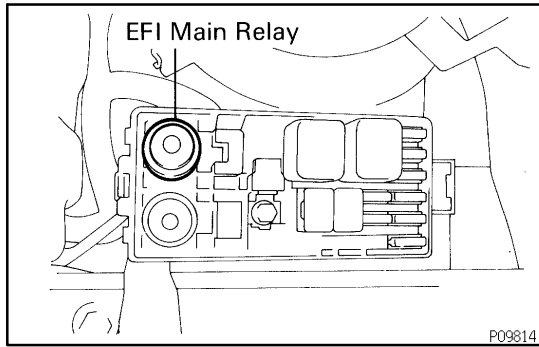
- (a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1-S2-S3-S4-S1 in sequence, and check that the valve moves toward the closed position.



- (b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4-S3-S2-S1-S4 in sequence, and check that the valve moves toward the open position. If operation is not as specified, replace the IAC valve.

INSTALLATION

Installation is in the reverse order of removal (See page [SF-51](#)).

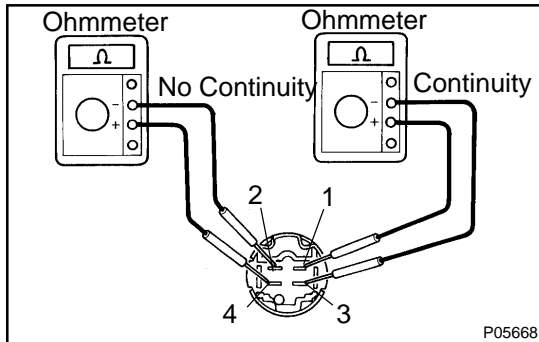


EFI MAIN RELAY INSPECTION

SF06G-11

1. REMOVE EFI MAIN RELAY

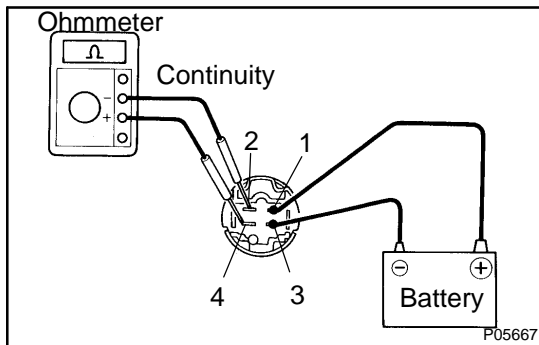
LOCATION: In the engine compartment relay box.



2. INSPECT EFI MAIN RELAY CONTINUITY

- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



3. INSPECT EFI MAIN RELAY OPERATION

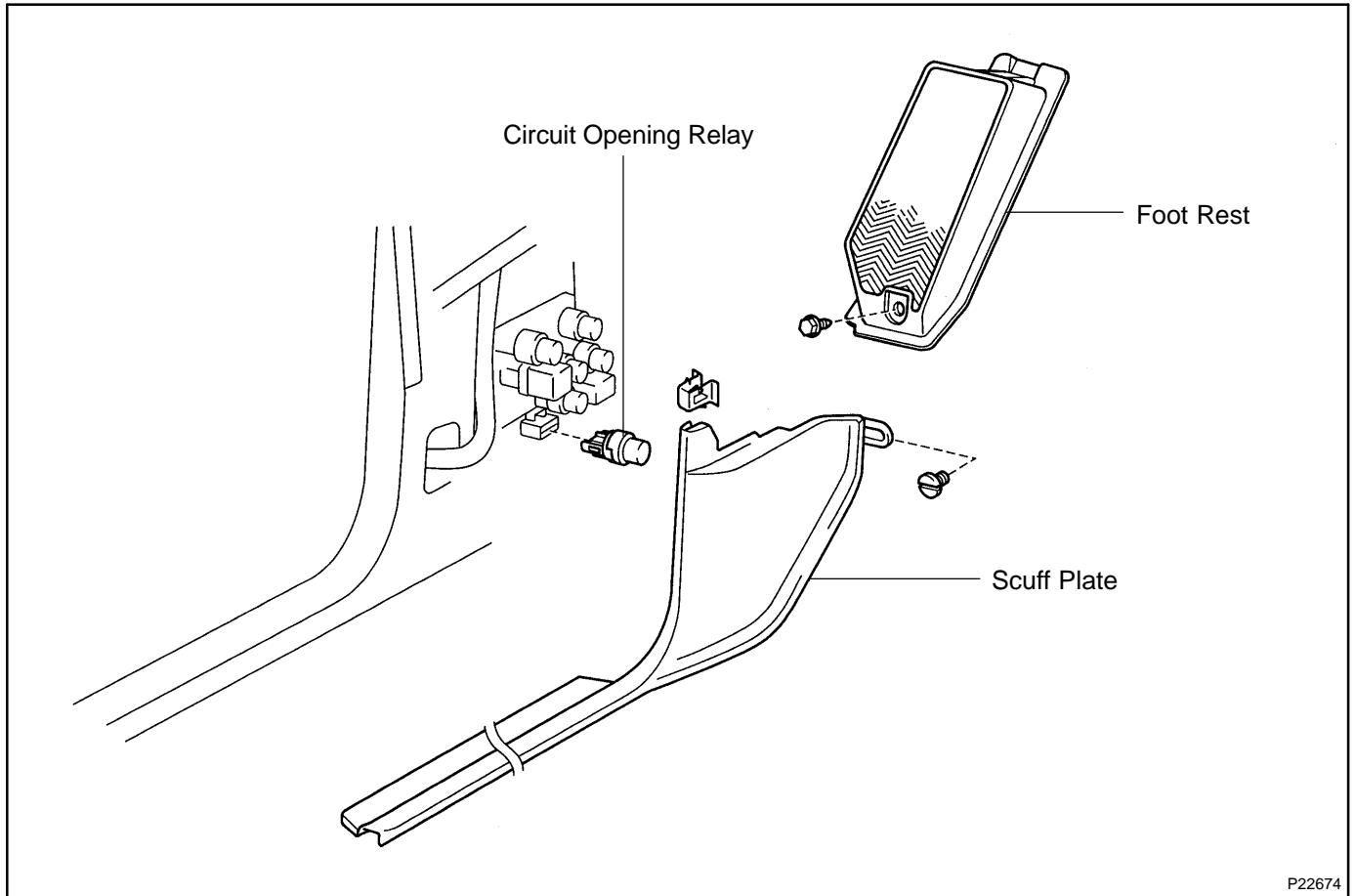
- Apply battery voltage across terminals 1 and 3.
- Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

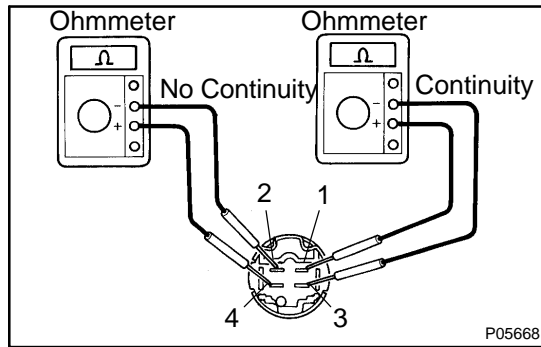
4. REINSTALL EFI MAIN RELAY

CIRCUIT OPENING RELAY COMPONENTS

SF1F4-01



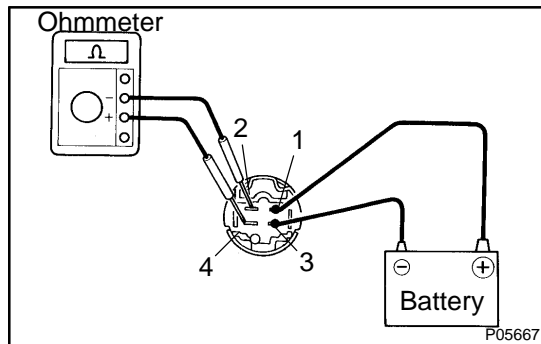
P22674



INSPECTION

1. **REMOVE CIRCUIT OPENING RELAY**
2. **INSPECT CIRCUIT OPENING RELAY CONTINUITY**
 - (a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.
 - (b) Check that there is no continuity between terminals 2 and 4.

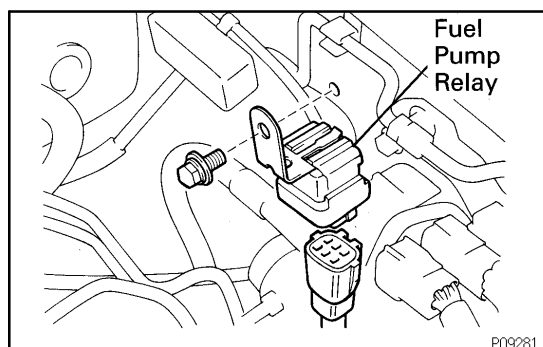
If continuity is not as specified, replace the relay.



3. **INSPECT CIRCUIT OPENING RELAY OPERATION**
 - (a) Apply battery voltage across terminals 1 and 3.
 - (b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

4. **REINSTALL CIRCUIT OPENING RELAY**

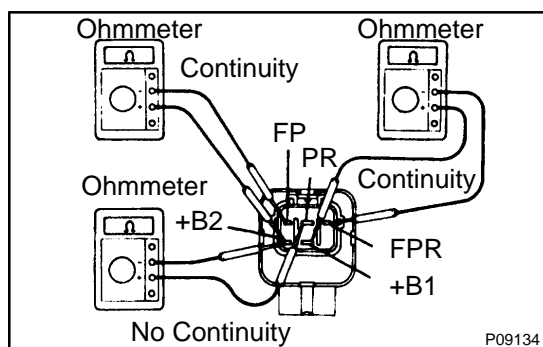


FUEL PUMP RELAY INSPECTION

SF1F7-01

1. REMOVE FUEL PUMP RELAY

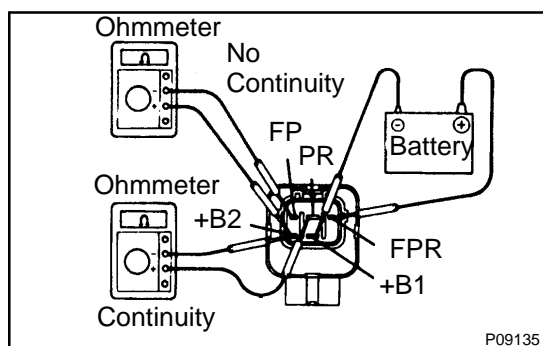
- Disconnect the fuel pump relay connector.
- Remove the bolt and fuel pump relay.



2. INSPECT FUEL PUMP RELAY CONTINUITY

- Using an ohmmeter, check that there is continuity between terminals +B1 and FPR.
- Check that there is continuity between terminals +B2 and FP.
- Check that there is no continuity between terminals +B2 and PR.

If continuity is not as specified, replace the relay.

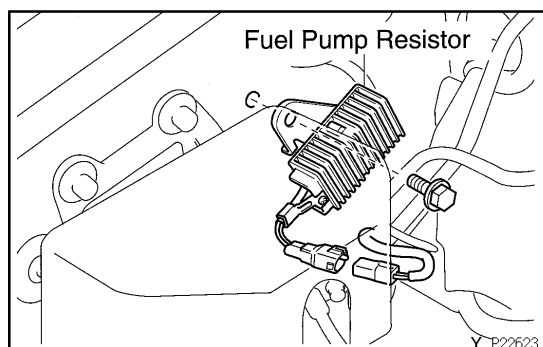


3. INSPECT FUEL PUMP RELAY OPERATION

- Apply battery voltage across terminals +B1 and FPR.
- Using an ohmmeter, check that there is no continuity between the +B2 and FP.
- Check that there is continuity between terminals +B2 and PR.

If operation is not as specified, replace the relay.

4. REINSTALL FUEL PUMP RELAY

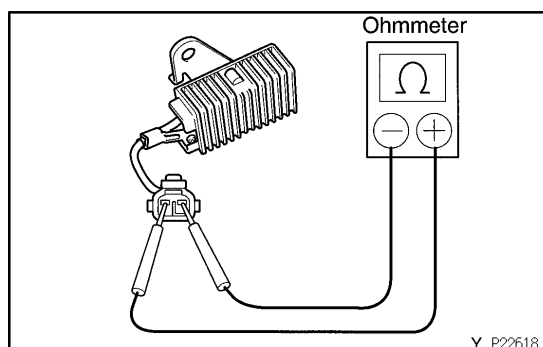


FUEL PUMP RESISTOR INSPECTION

SF1F8-01

1. REMOVE FUEL PUMP RESISTOR

- (a) Disconnect the fuel pump resistor connector.
- (b) Remove the bolt and fuel pump resistor.



2. INSPECT FUEL PUMP RESISTOR

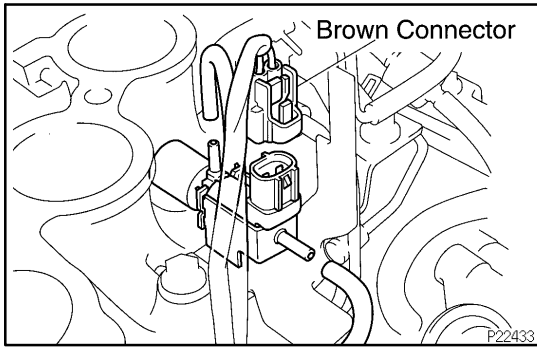
Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.70 – 0.76 Ω at 20°C (68°F)

If there is no continuity, replace the resistor.

3. REINSTALL FUEL PUMP RESISTOR

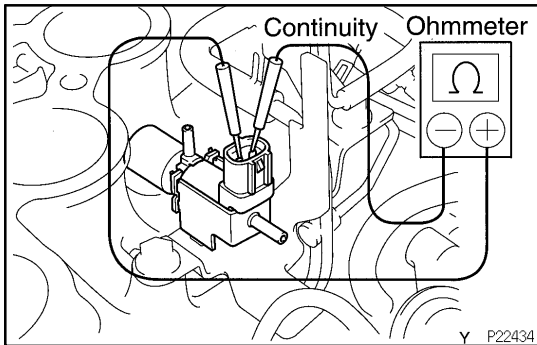
Torque: 18 N·m (185 kgf-cm, 13 ft-lbf)



VSV FOR FUEL PRESSURE CONTROL INSPECTION

SF1F9-01

1. REMOVE AIR INTAKE CHAMBER (See page [EM-28](#))
2. DISCONNECT VACUUM HOSES AND CONNECTOR

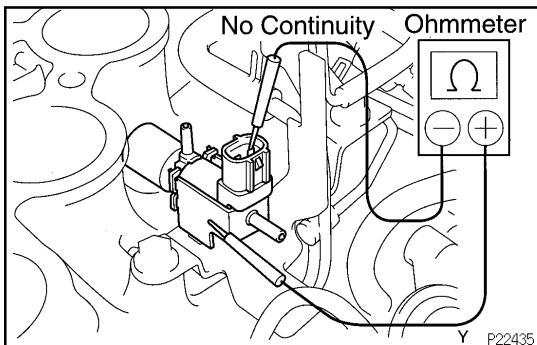


3. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 37 – 44 Ω at 20°C (68°F)

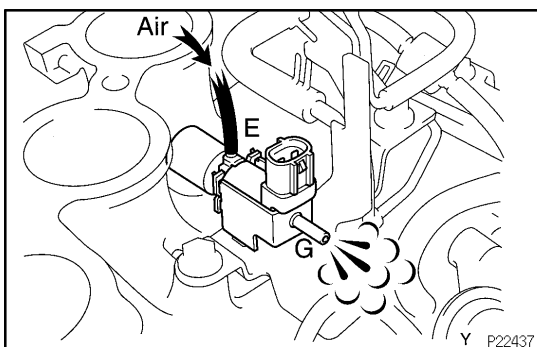
If there is no continuity, replace the VSV.



4. INSPECT VSV FOR GROUND

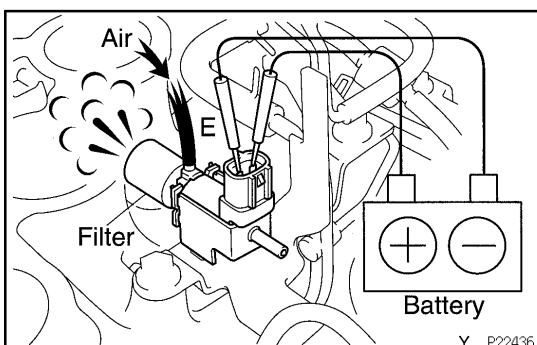
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



5. INSPECT VSV OPERATION

- (a) Check that the air flows from pipe E to pipe G.



- (b) Apply battery voltage across the terminals.
 - (c) Check that the air does not flows from pipe E to the filter.
- If operation is not as specified, replace the VSV.

6. RECONNECT VACUUM HOSES AND CONNECTOR
7. REINSTALL AIR INTAKE CHAMBER (See page [EM-54](#))

SF-60

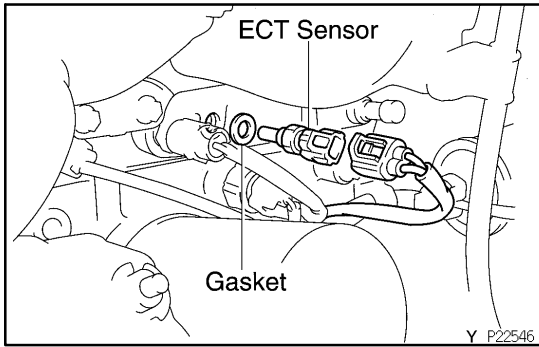
SFI – VSV FOR EXHAUST GAS RECIRCULATION (EGR)

VSV FOR EXHAUST GAS RECIRCULATION (EGR)

INSPECTION

(See page [EC-11](#))

SF1F6-01



ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

SF0PO-09

1. DRAIN ENGINE COOLANT

2. REMOVE ECT SENSOR

- Disconnect the ECT sensor connector.
- Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.

3. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the ECT sensor.

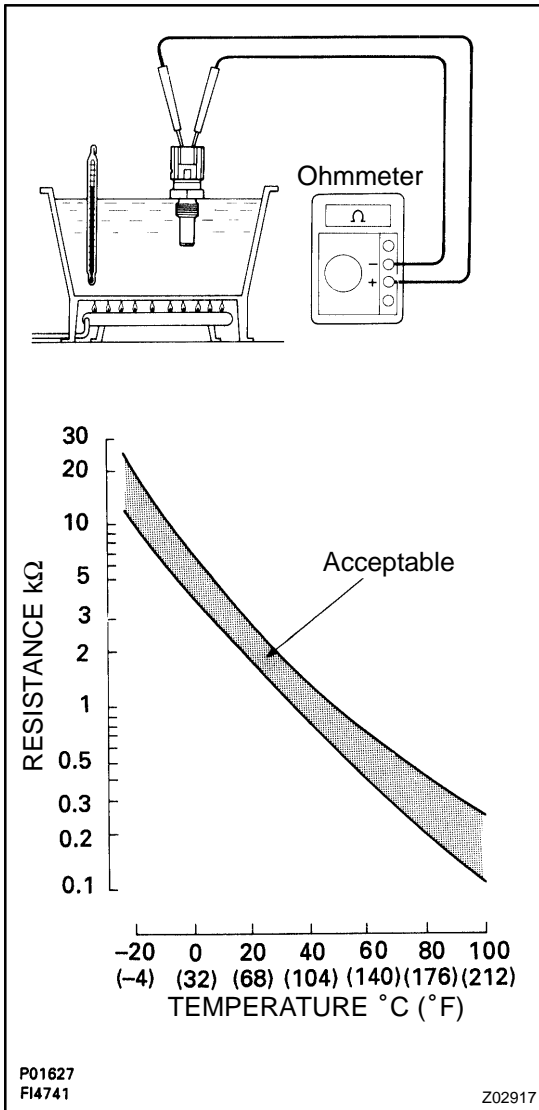
4. REINSTALL ECT SENSOR

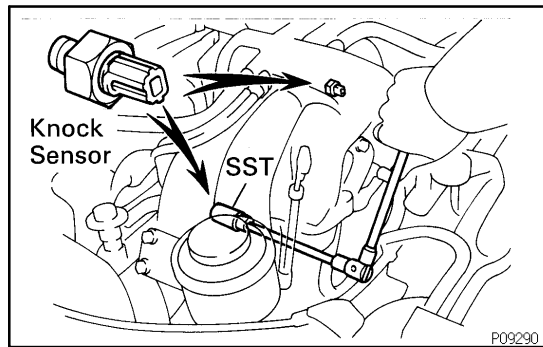
- Using a 19 mm deep socket wrench, install the ECT sensor and gasket.

Torque: 24.5 N·m (250 kgf·cm, 17.5 ft·lbf)

- Connect the ECT sensor connector.

5. REFILL ENGINE COOLANT





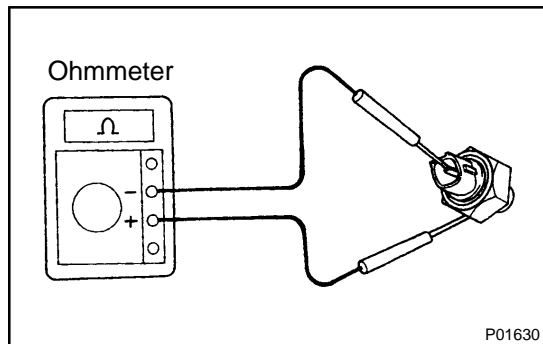
KNOCK SENSOR INSPECTION

SF1FB-01

1. REMOVE KNOCK SENSOR

- (a) Disconnect the knock sensor connector.
- (b) Using SST, remove the knock sensor.

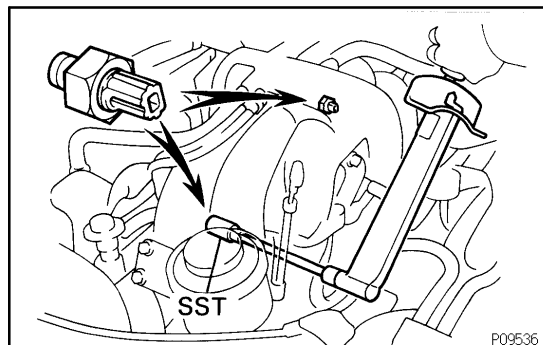
SST 09816-30010



2. INSPECT KNOCK SENSOR

Using an ohmmeter, check that there is no continuity between the terminal and body.

If there is continuity, replace the sensor.



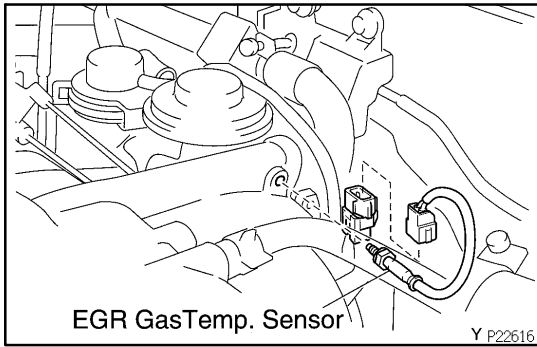
3. REINSTALL KNOCK SENSOR

- (a) Using SST, install the knock sensor.

SST 09816-30010

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

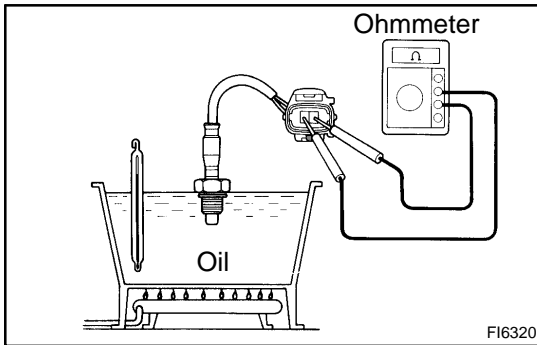
- (b) Connect the knock sensor connector.



EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR INSPECTION

SF1FA-01

1. REMOVE EGR GAS TEMPERATURE SENSOR



2. INSPECT EGR GAS TEMPERATURE SENSOR

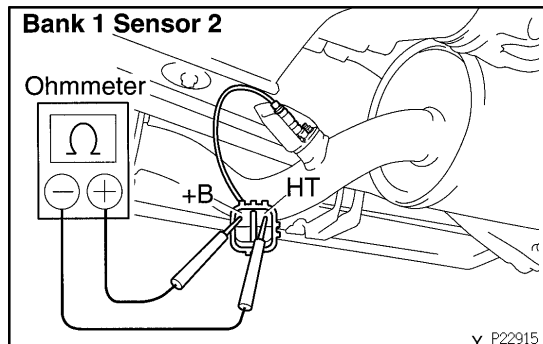
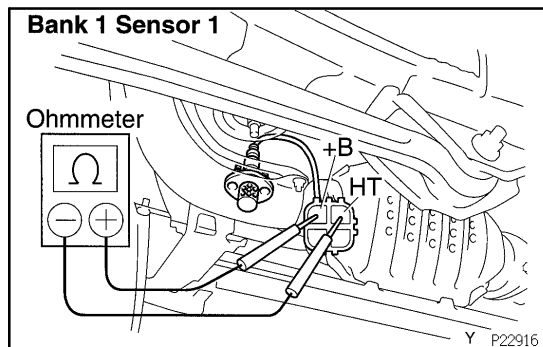
Using an ohmmeter, measure the resistance between the terminals.

Temperature	Resistance
50°C (122°F)	64 – 97 kΩ
100°C (212°F)	11 – 16 kΩ
150°C (302°F)	2 – 4 kΩ

If the resistance is not as specified, replace the sensor.

3. REINSTALL EGR GAS TEMPERATURE SENSOR

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



HEATED OXYGEN SENSOR INSPECTION

SF1FC-01

INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

- Disconnect the heated oxygen sensor connector.
- Using an ohmmeter, measure the resistance between terminals +B and HT.

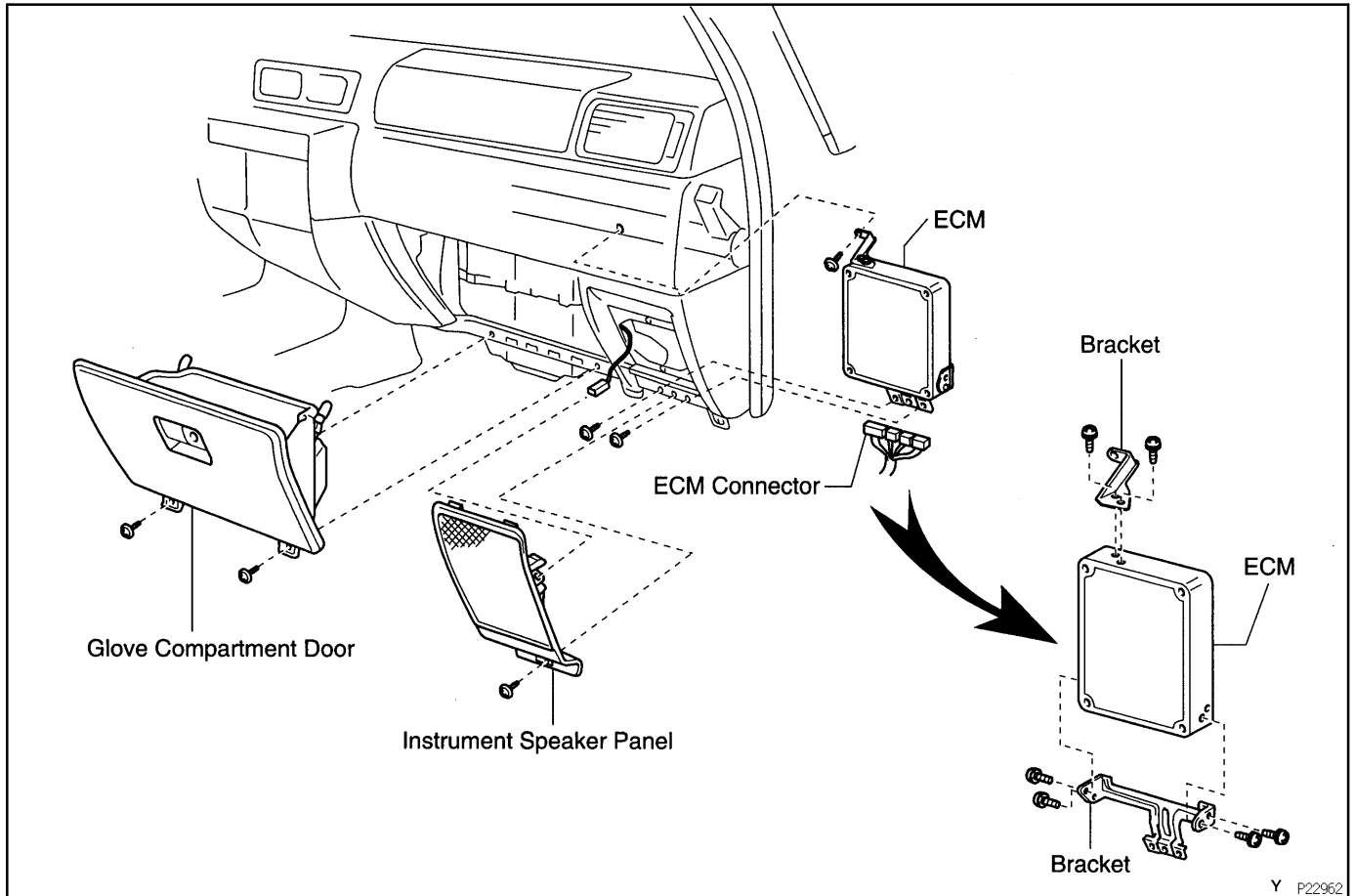
Resistance: 11 – 16 Ω at 20°C (68°F)

If resistance is not as specified, replace the heated oxygen sensor.

- Reconnect the heated oxygen sensor connector.

ENGINE CONTROL MODULE (ECM) COMPONENTS

SF000-07



INSPECTION

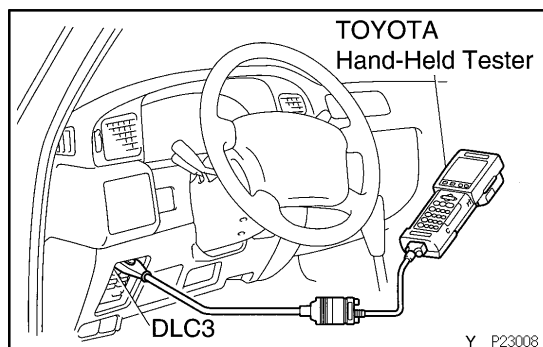
1. REMOVE ECM
2. INSPECT ECM (See page [DI-17](#))
3. REINSTALL ECM

FUEL CUT RPM INSPECTION

SF002-08

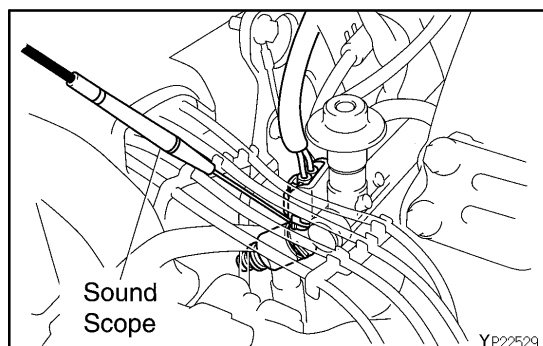
1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

- Remove the fuse cover on the instrument panel.
- Connect the TOYOTA hand-held tester or OBD II scan tool to the DLC3.
- Please refer to the TOYOTA hand-held tester or OBD II scan tool operator's manual for further details.



3. INSPECT FUEL CUTOFF PRM

- Increase the engine speed to at least 3,500 rpm.
- Use a sound scope to check for injector operating noise.
- 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

4. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

STEERING SYSTEM

SR164-01

PRECAUTION

- 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 LAND CRUISER is equipped with SRS (Supplemental Restraint System) such as the driver airbag and front passenger airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SR165-01

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 the order shown. If necessary, repair or replace these parts.

Symptom	Suspect Area	See page
Hard steering	11. Tires (Improperly inflated) 12. Power steering fluid level (Low) 13. Front wheel alignment (Incorrect) 14. Steering system joints (Worn) 15. Suspension arm ball joints (Worn) 16. Steering column (Binding) 17. Power steering vane pump 18. Power steering gear	SA-3 SR-4 SA-4 – – – SR-21 SR-33
Poor return	1. Tires (Improperly inflated) 2. Front wheel alignment (Incorrect) 3. Steering column (Binding) 4. Power steering gear	SA-3 SA-4 – SR-33
Excessive play	1. Steering system joints (Worn) 2. Suspension arm ball joints (Worn) 3. Intermediate shaft, Universal joint, Sliding yoke (Worn) 4. Front wheel bearing (Worn) 5. Power steering gear	– – – SR-7 SR-33
Abnormal noise	1. Power steering fluid level (Low) 2. Steering system joints (Worn) 3. Power steering vane pump 4. Power steering gear	SR-4 – SR-21 SR-33

POWER STEERING FLUID BLEEDING

SR167-01

1. **CHECK FLUID LEVEL** (See page [SR-4](#))
2. **JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS**

3. **TURN STEERING WHEEL**

With the engine stopped, turn the wheel slowly from lock to lock several times.

4. **LOWER VEHICLE**

5. **START ENGINE**

Run the engine at idle for a few minutes.

6. **TURN STEERING WHEEL**

- (a) With the engine idling, turn the 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.

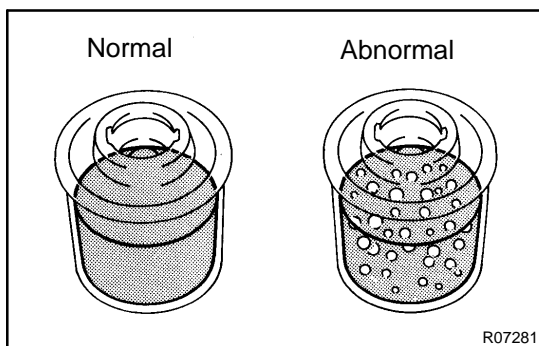
- (b) Repeat (a) several times.

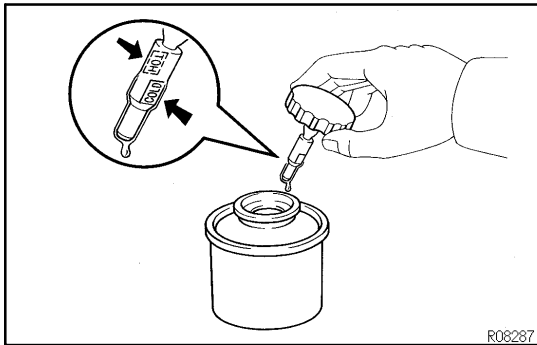
7. **STOP ENGINE**

8. **CHECK FOR FOAMING OR EMULSIFICATION**

If the system has to be bled twice specifically because of foaming or emulsification, check for fluid leaks in the system.

9. **CHECK FLUID LEVEL** (See page [SR-4](#))





R08287

INSPECTION

1. CHECK FLUID LEVEL

- Keep the vehicle level.
- With the engine stopped, check the fluid level in the oil reservoir.

If necessary, add fluid.

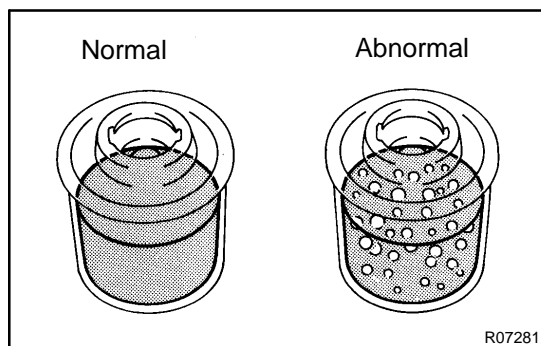
Fluid: ATF DEXRON® II or III

HINT:

Check that the fluid level is within the HOT LEVEL range on the reservoir cap dipstick. If the fluid is cold, check that it is within the COLD LEVEL range.

- Start the engine and run it at idle.
- Turn the steering wheel from lock to lock several times to boost fluid temperature.

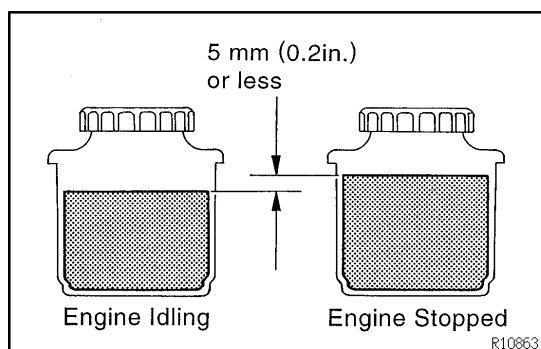
Fluid temperature: 80°C (176°F)



R07281

- Check for foaming or emulsification.

If there is foaming or emulsification, bleed power steering system. (See page [SR-3](#)).



R10863

- With the engine idling, measure the fluid level in the oil reservoir.
- Stop the engine.
- Wait a few minutes and remeasure the fluid level in the oil reservoir.

Maximum fluid level rise: 5 mm (0.20 in.)

If a problem is found, bleed power steering system (See page [SR-3](#)).

- Check the fluid level.

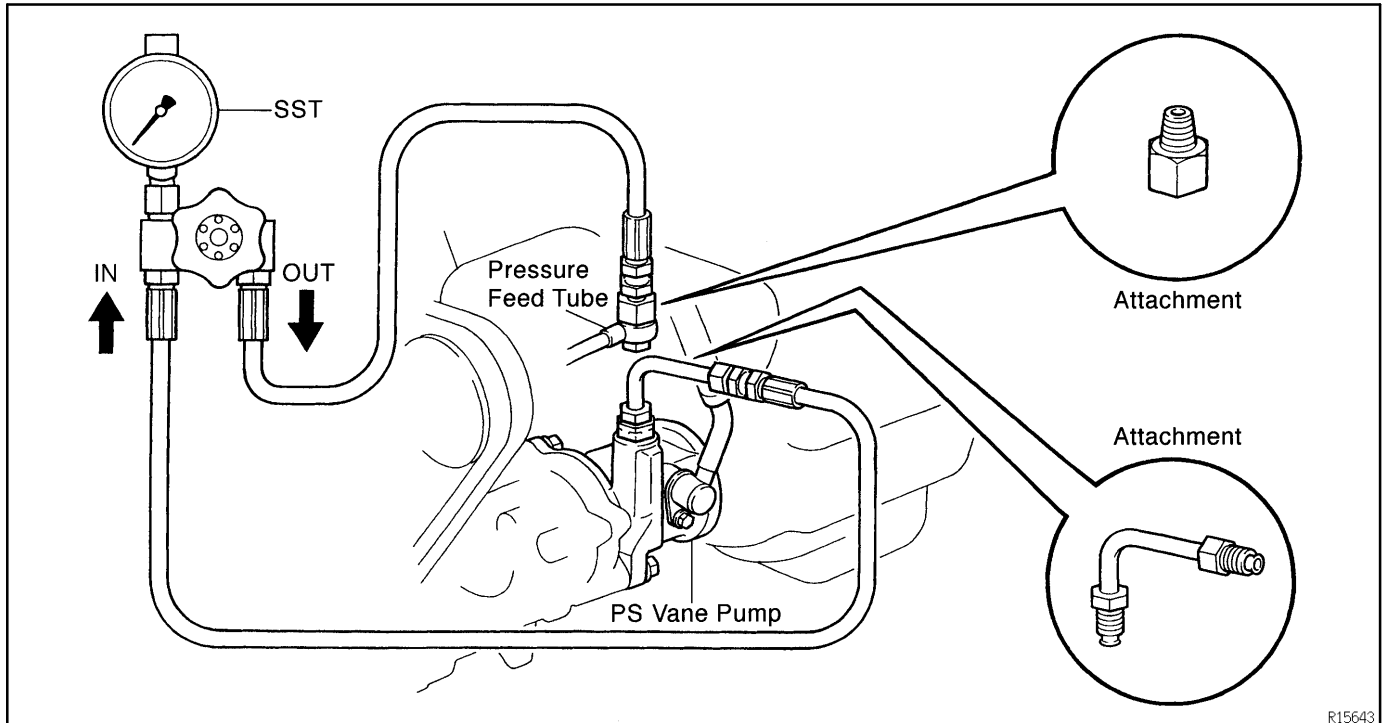
STEERING - POWER STEERING FLUID

2. CHECK STEERING FLUID PRESSURE

- (a) Disconnect the pressure feed tube from the PS vane pump (See page [SR-23](#)).
- (b) Connect SST over 2 new gaskets, as shown below.
SST 09640-10010 (09641-01010, 09641-01030, 09641-01060)

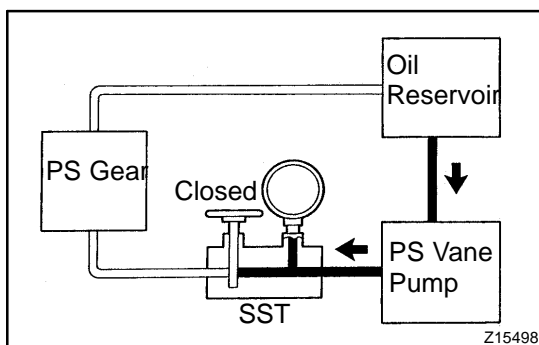
NOTICE:

Check that the valve of the SST is in the open position.



- (c) Bleed the power steering system (See page [SR-3](#)).
- (d) Start the engine and run it at idle.
- (e) Turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80°C (176°F)

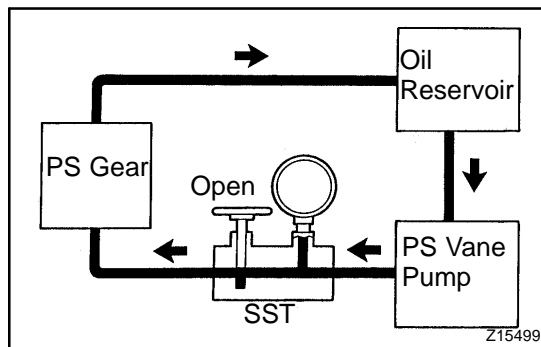


- (f) With the engine idling, close the valve of the SST and observe the reading on the SST.

**Minimum fluid pressure:
9,316kPa (95 kgf/cm², 1,351 psi)**

NOTICE:

- Do not keep the valve closed for more than 10 seconds.
- Do not let the fluid temperature become too high.

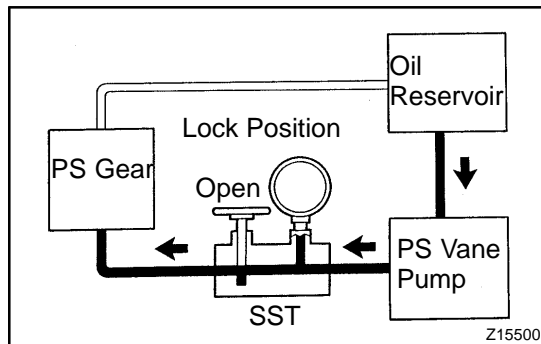


- (g) With the engine idling, open the valve fully.
 (h) Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm.

Difference fluid pressure:
490 kPa (5 kgf/cm², 71 psi) or less

NOTICE:

Do not turn the steering wheel.



- (i) With the engine idling and valve fully opened, turn the steering wheel to full lock.

Minimum fluid pressure:
9,316 kPa (95 kgf/cm², 1,351 psi)

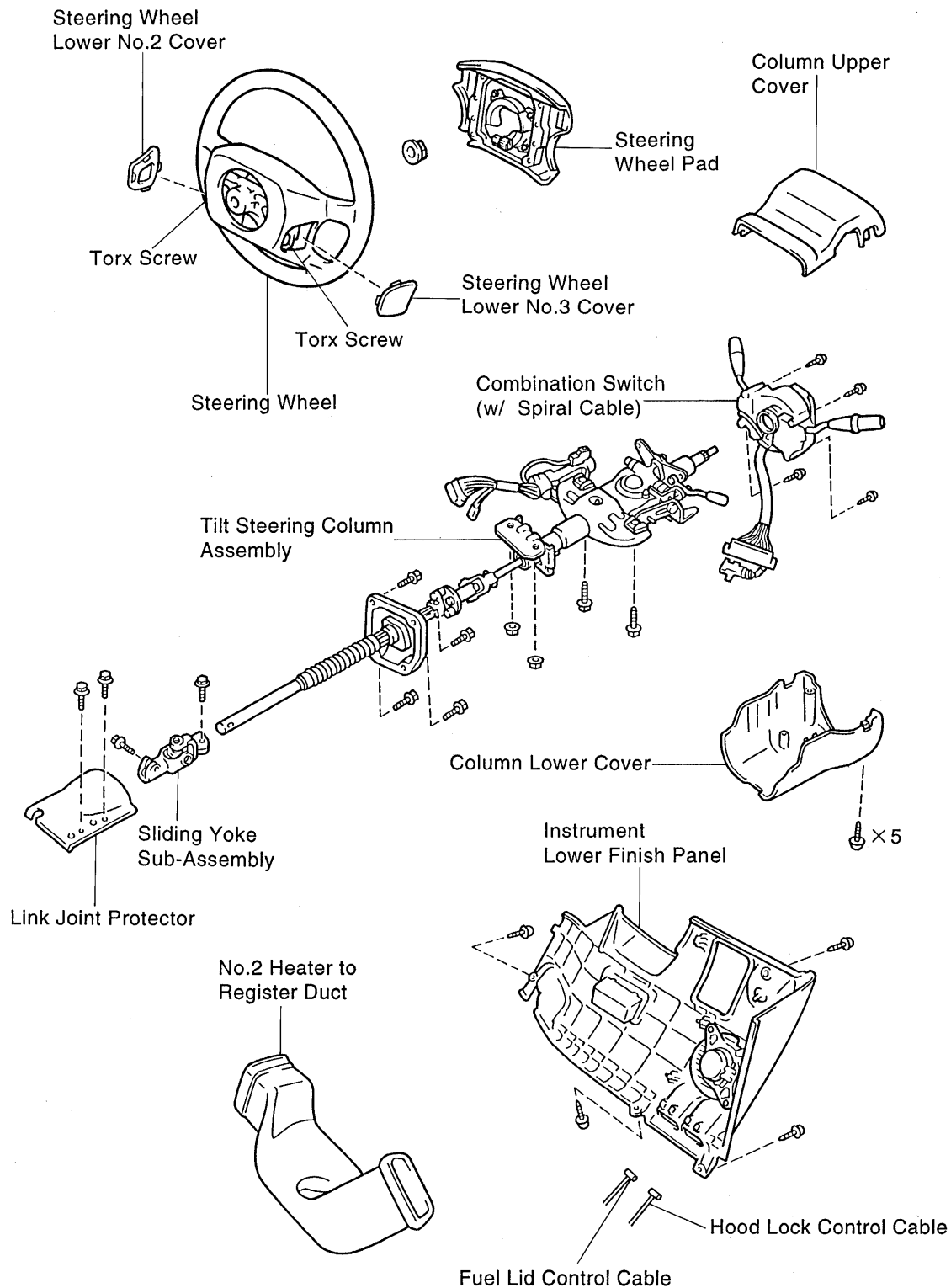
NOTICE:

- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

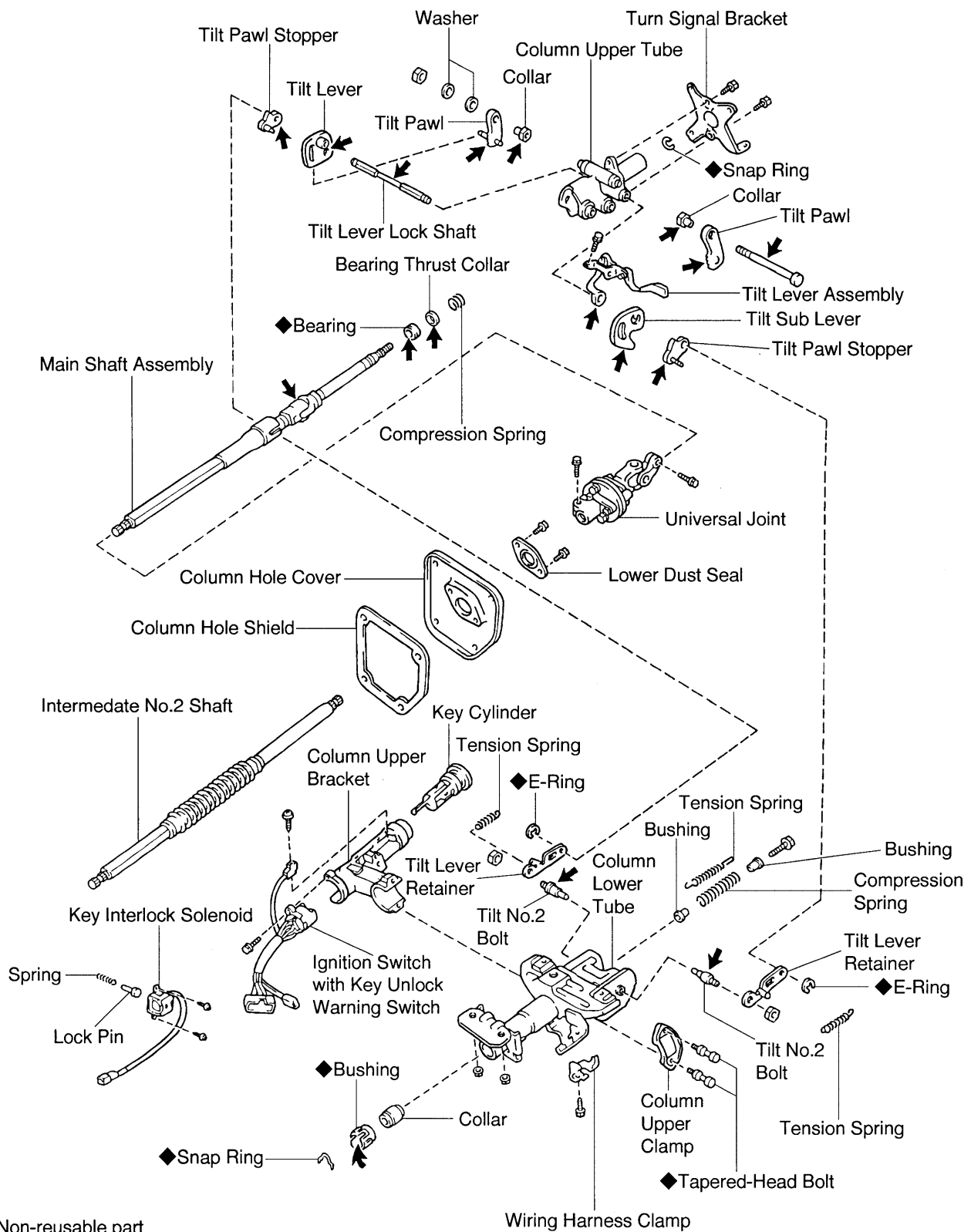
- (j) Disconnect the SST.
 (k) Connect the pressure feed tube (See page [SR-32](#)).
 (l) Bleed the power steering system (See page [SR-3](#)).

TILT STEERING COLUMN COMPONENTS

SR169-01



R13247



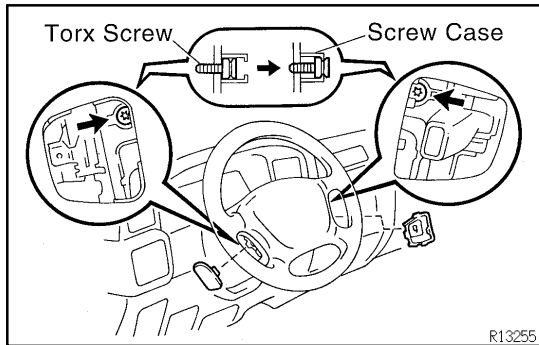
R13251

REMOVAL

1. REMOVE STEERING WHEEL PAD

NOTICE:

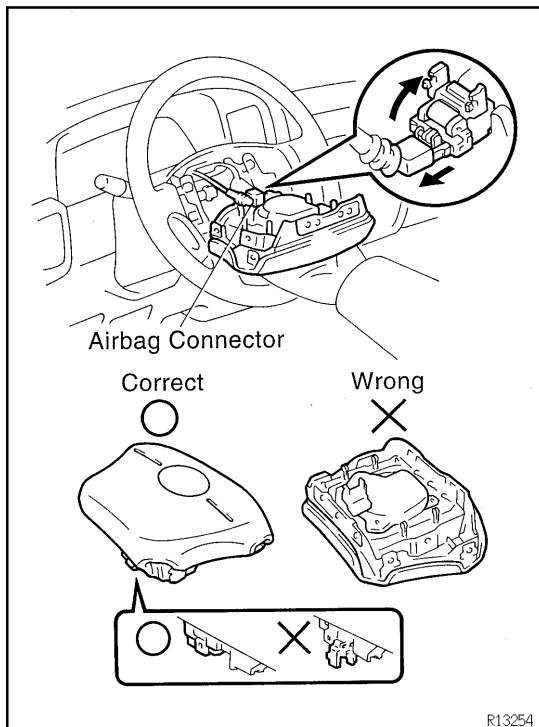
If the airbag connector is disconnected with the ignition switch at ON or ACC, DTCs will be recorded. Never use airbag parts from another vehicle. When replacing parts, replace with new parts.



- Place the front wheels facing straight ahead.
- Remove the steering wheel lower No.2 and No.3 cover from the steering wheel.
- Using a torx socket wrench, loosen the 2 torx screws.

HINT:

Loosen the 2 screws until the groove along the screw circumference catches on the screw case.



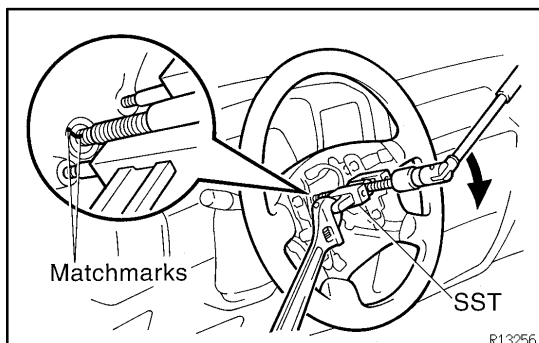
- Pull out the wheel pad from the steering wheel and disconnect the airbag connector.

CAUTION:

When storing the wheel pad, keep the upper surface of the pad facing upward. Never disassemble the wheel pad.

NOTICE:

When removing the wheel pad, take care not to pull the airbag wire harness.



2. REMOVE STEERING WHEEL

- Disconnect the connector.
- Remove the steering wheel set nut.
- Place matchmarks on the steering wheel and main shaft assembly.
- Using SST, remove the wheel.

SST 09950-50010 (09951-05010, 09952-05010, 09953-05020, 09954-05020)

3. REMOVE INSTRUMENT LOWER FINISH PANEL

- (a) Disconnect the hood lock control cable and fuel lid control cable.
- (b) Remove the 4 panel set screws.

4. REMOVE NO.2 HEATER TO REGISTER DUCT**5. REMOVE UPPER AND LOWER COLUMN COVERS**

Remove the 5 screws.

6. REMOVE COMBINATION SWITCH WITH SPIRAL CABLE

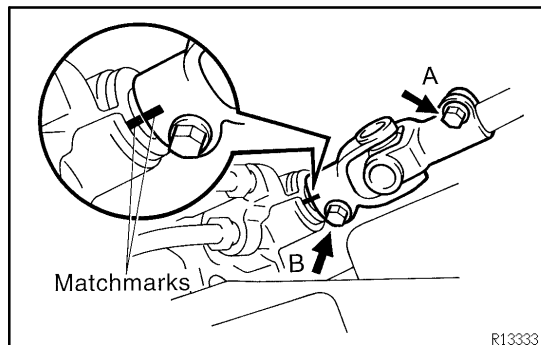
- (a) Disconnect the 2 connectors.
- (b) Disconnect the airbag connector.
- (c) Remove the 4 screws.

NOTICE:

Do not disassemble the cable or apply oil to it.

7. REMOVE 4 COLUMN HOLE COVER SET BOLTS**8. REMOVE LINK JOINT PROTECTOR**

Remove the 2 bolts.

**9. DISCONNECT SLIDING YOKE SUB-ASSEMBLY**

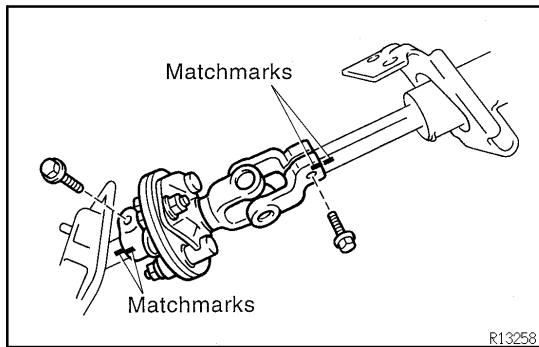
- (a) Place matchmarks on the yoke sub-assembly and worm gear valve body shaft.
- (b) Loosen bolt A and remove bolt B.

10. REMOVE SLIDING YOKE SUB-ASSEMBLY

Remove the bolt A.

11. REMOVE TILT STEERING COLUMN ASSEMBLY

- (a) Disconnect the 3 connectors.
- (b) Remove the 2 column assembly set nuts and 2 set bolts.



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. DISCONNECT UNIVERSAL JOINT

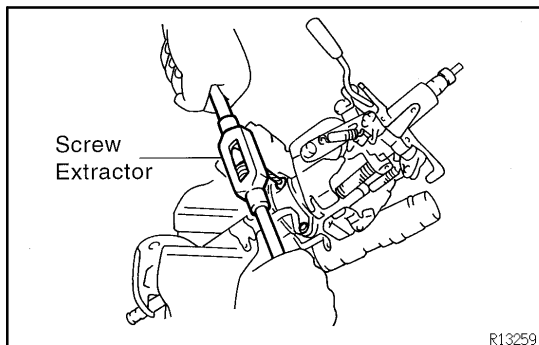
- (a) Place matchmarks on the universal joint, intermediate No.2 shaft and main shaft.
- (b) Remove the 2 bolts.

2. REMOVE LOWER DUST SEAL, COLUMN HOLE COVER AND COLUMN HOLE SHIELD

- (a) Remove the 2 bolts from the dust seal.
- (b) Remove the hole shield from the hole cover.

3. REMOVE WIRING HARNESS CLAMP

Remove the bolt.



4. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

- (a) Using a 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 bolts.
- (c) Using a screw extractor, remove the 2 bolts.

5. REMOVE COMPRESSION SPRING

- (a) Remove the bolt.
- (b) Remove the 2 bushings from the spring.

6. REMOVE 3 TENSION SPRINGS

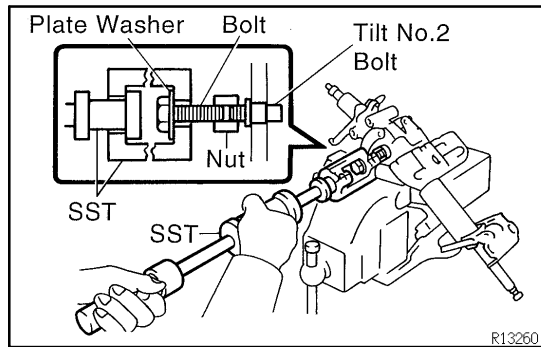
7. REMOVE 2 TILT LEVER RETAINERS AND TILT PAWL STOPPERS

- (a) Remove the E-ring from the tilt lever lock shaft.
- (b) Remove the nut from the tilt No.2 bolt.

8. REMOVE 2 TILT PAWLS

- (a) Remove the nut and 2 washers from the bolt.
- (b) Pull out the bolt.
- (c) Remove the tilt lever assembly set bolt.
- (d) Remove the collar from the tilt pawl.

9. REMOVE TILT LEVER, TILT SUB LEVER, TILT LEVER ASSEMBLY AND TILT LEVER LOCK SHAFT



10. REMOVE COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

- (a) Set SST, the nut (10 mm nominal diameter, 1.25 mm pitch), plate washer (36 mm outer diameter) and bolt (10 mm nominal diameter, 1.25 mm pitch, 50 mm length), as shown.

SST 09910-00015 (09911-00011, 09912-00010)

Reference

Nut: 90170-10004

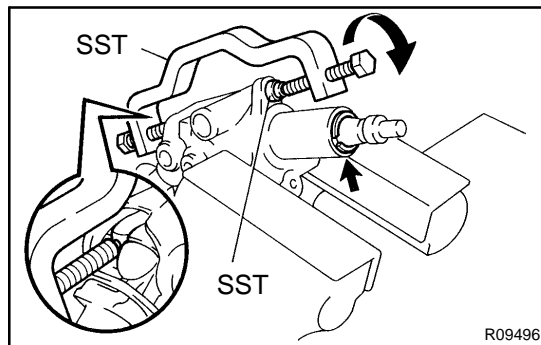
Plate washer: 90201-10201

Bolt: 91111-51050

- (b) Remove the 2 tilt No.2 bolts by using the sliding hammer on SST.
- (c) Remove the upper tube with the shaft assembly from the column lower tube.

11. REMOVE TURN SIGNAL BRACKET

Remove the 2 bolts.



12. REMOVE MAIN SHAFT ASSEMBLY

- (a) Using SST, compress the compression spring.

SST 09950-40010 (09957-04010, 09958-04010)

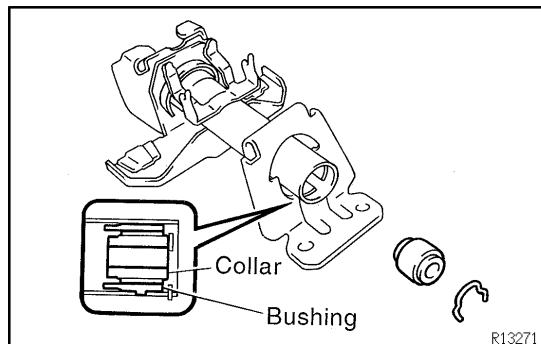
NOTICE:

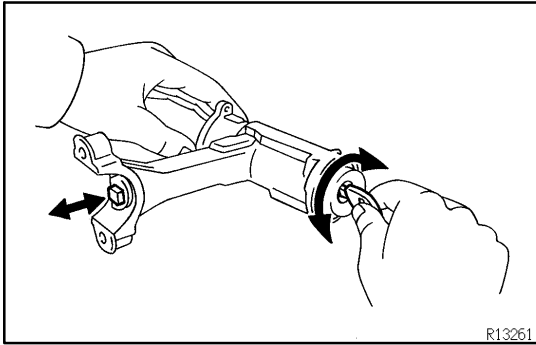
Do not bend the sliding yoke of the main shaft assembly more than 20°.

- (b) Using snap ring pliers, remove the snap ring.
- (c) Remove the shaft assembly from the column upper tube.
- (d) Remove the compression spring, bearing thrust collar and bearing from the shaft assembly.

13. REMOVE COLLAR

Remove the snap ring and collar from the column lower tube.

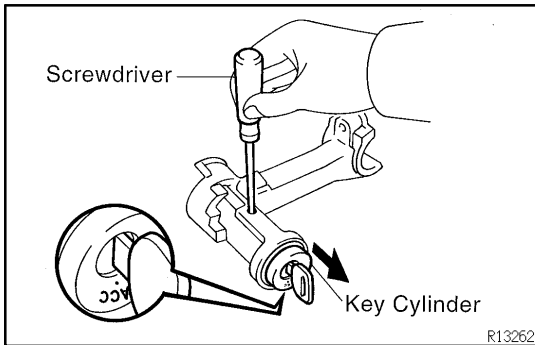




INSPECTION

1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

- Place the ignition key at the ACC position.
- Push down the stop pin with a screwdriver, and pull out the cylinder.
- Install a new cylinder.

HINT:

Make sure the key is at the ACC position.

3. INSPECT IGNITION SWITCH (See page BE-11)

4. INSPECT KEY UNLOCK WARNING SWITCH (See page BE-11)

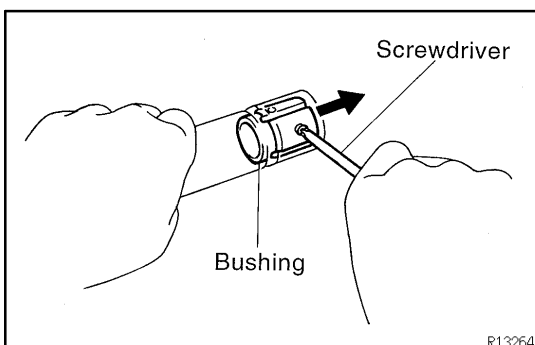
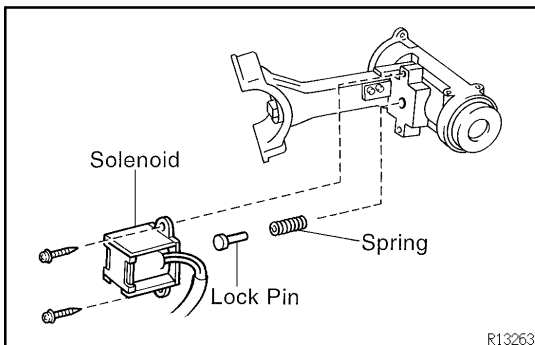
5. IF NECESSARY, REPLACE IGNITION SWITCH WITH KEY UNLOCK WARNING SWITCH

- Remove the 2 screws.
- Install a new switches with the 2 screws.

6. INSPECT KEY INTERLOCK SOLENOID (See page SR-9)

7. IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID

- Remove the 2 screws.
- Remove the solenoid, spring and lock pin.
- Install a new solenoid with the spring and lock pin, with the 2 screws.



8. IF NECESSARY, REPLACE BUSHING

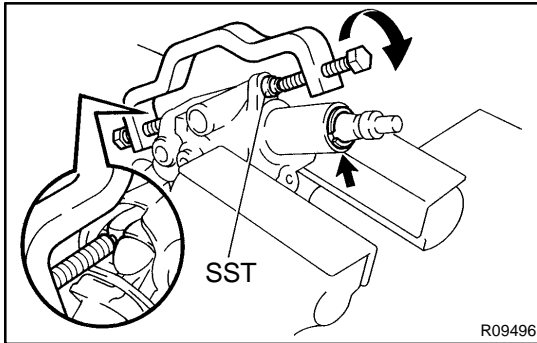
- Using a screwdriver, remove the bushing from the column lower tube.
- Coat a new bushing with molybdenum disulfide lithium base grease.
- Align the holes of the tube and projections of the bushing.

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. **COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR-9)**
2. **INSTALL MAIN SHAFT ASSEMBLY**
 - (a) Install a new bearing, bearing thrust collar and compression spring to the shaft assembly.



- (b) Install the shaft assembly into the column upper tube.
- (c) Using SST, compress the compression spring.
SST 09950-40010 (09957-04010, 09958-04010)

NOTICE:

Do not bend the universal joint of the main shaft more than 20°.

- (d) Using snap ring pliers, install a new snap ring.

3. INSTALL TURN SIGNAL BRACKET

Torque the 2 bolts.

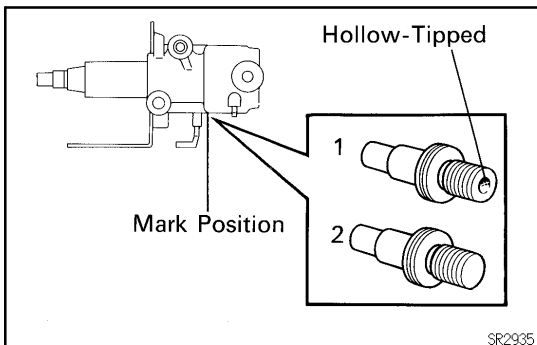
Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)

4. SELECT TILT NO.2 BOLTS

Select the bolt with plain thread end when the column upper tube mark is 2, and the bolt with the hollow-tipped thread end when the mark is 1.

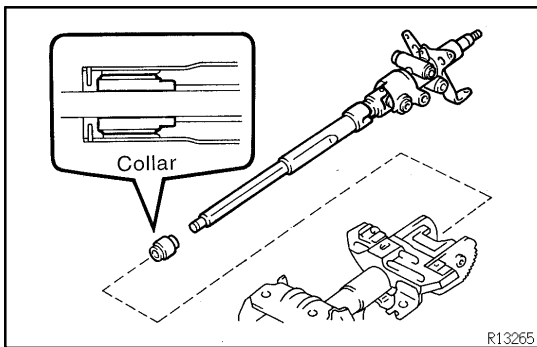
NOTICE:

Select the bolt type to match each number marked in the squares on the upper tube.

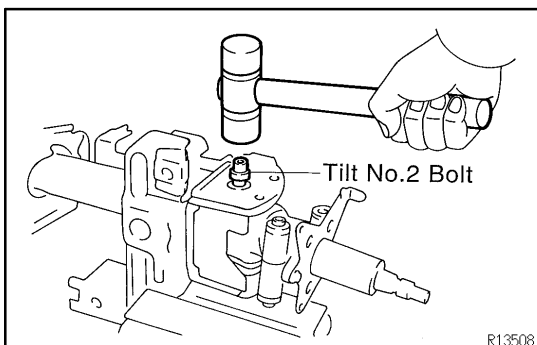


5. INSTALL COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

- (a) Install the collar to the shaft assembly.
- (b) Install a new snap ring.
- (c) Install the upper tube with the shaft assembly into the column lower tube.



- (d) Using a plastic hammer, drive in the 2 tilt No.2 bolts.
- ### 6. INSTALL TILT LEVER LOCK SHAFT, TILT LEVER ASSEMBLY, TILT SUB LEVER AND TILT LEVER



7. INSTALL 2 TILT PAWLS

- (a) Coat the collar with molybdenum disulfide lithium base grease and install it to the tilt pawl.
- (b) Install the pawl.

HINT:

Install the pawl pin into the long hole of the tilt lever/ tilt sub lever.

- (c) Install the bolt through the pawls and tilt lever assembly.
- (d) Temporarily install the 2 washers and nut.
- (e) Torque the tilt lever assembly set bolt.

Torque: 2.9 N·m (30 kgf·cm, 26 in.-lbf)

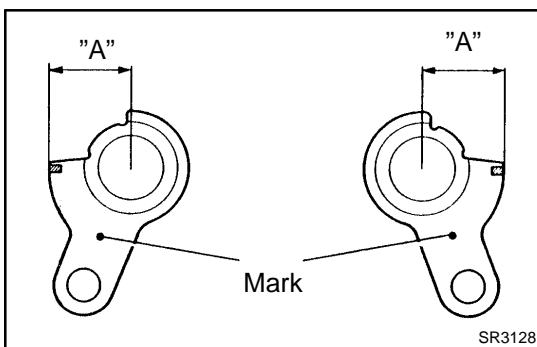
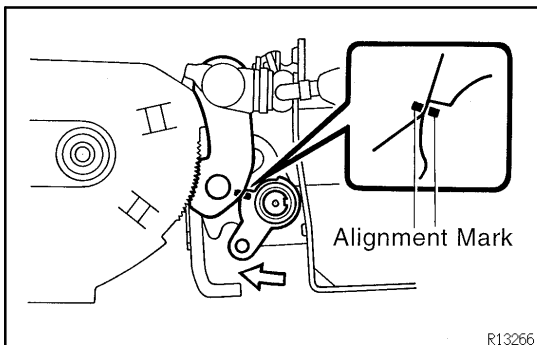
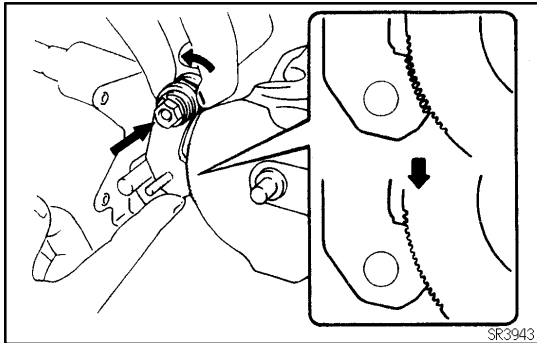
8. ENGAGE AND ADJUST 2 TILT PAWLS

- (a) Engage the tilt sub lever side pawl to the center of the ratchet.
- (b) While turning the tilt lever side tilt pawl collar, completely engage the tilt lever side pawl to the ratchet.
- (c) Torque the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

9. SELECT AND INSTALL 2 TILT PAWL STOPPERS

- (a) With the tilt pawl and ratchet engaged, install the stopper.
- (b) Check that the alignment marks on the stopper and pawl align when the stopper is rotated to the pawl side.



- (c) If the alignment marks do not align, select stopper according to the following table.

Tilt lever side	Tilt sub lever side	Dimension "A" mm (in.)
1	A	12.65 – 12.75 (0.4980 – 0.5020)
2	B	12.55 – 12.65 (0.4941 – 0.4980)
3	C	12.45 – 12.55 (0.4902 – 0.4941)
4	D	12.35 – 12.45 (0.4862 – 0.4902)
5	E	12.25 – 12.35 (0.4823 – 0.4862)

- (d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged.

10. INSTALL 2 TILT LEVER RETAINERS

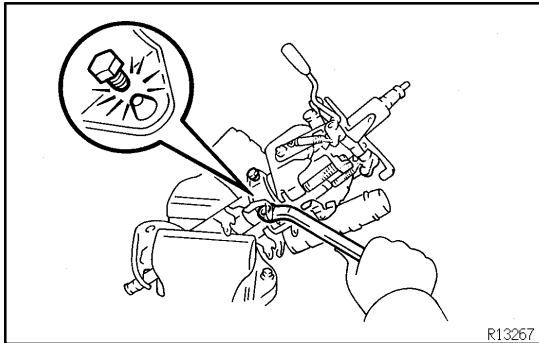
- (a) Install a new E-ring.
- (b) Torque the nut.

Torque: 15 N·m (150 kgf·cm, 11 ft-lbf)

11. INSTALL 3 TENSION SPRINGS**12. INSTALL COMPRESSION SPRING**

- (a) Install the 2 bushings to the spring.
- (b) Torque the bolt.

Torque: 7.8 N·m (80 kgf-cm, 69 in.-lbf)

**13. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP**

Tighten 2 new tapered-head bolts until the bolt head brakes off.

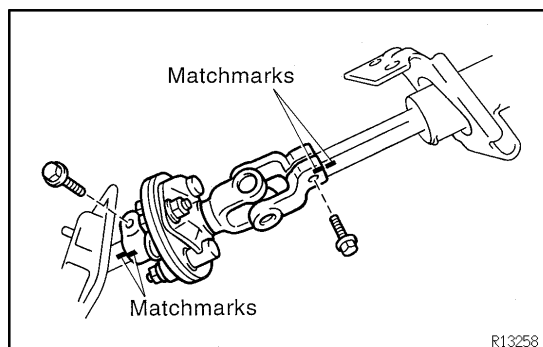
14. INSTALL WIRING HARNESS CLAMP

Tighten the bolt.

15. INSTALL COLUMN HOLE SHIELD, COLUMN HOLE COVER AND LOWER DUST SEAL

- (a) Install the hole shield to the hole cover.
- (b) Install the dust seal to the hole cover.
- (c) Torque 2 bolts.

Torque: 5.9 N·m (60 kgf-cm, 52 in.-lbf)

**16. CONNECT UNIVERSAL JOINT**

- (a) Align the matchmarks on the intermediate No.2 shaft and universal joint then torque the bolt.

Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)

- (b) Align the matchmarks on the universal joint and the main shaft then torque the bolt.

Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)

17. CHECK TILT STEERING COLUMN OPERATION

- (a) Check that there is no axial play at the end of the main shaft.
- (b) With the main shaft in the neutral position, raise the tilt lever and check that the main shaft rises to the uppermost position.
- (c) Lower the main shaft, and check that it locks in the lowermost position.

INSTALLATION

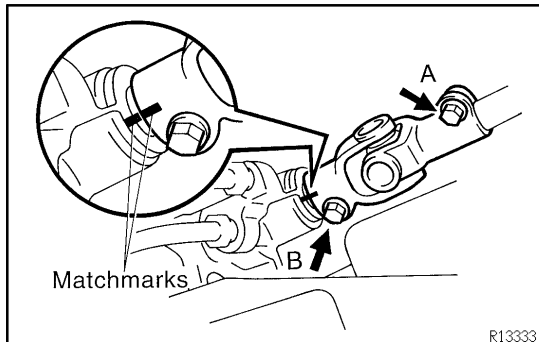
1. INSTALL STEERING COLUMN ASSEMBLY

- (a) Torque the 2 column assembly set nuts and 2 set bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

- (b) Connect the 3 connectors.

2. INSTALL SLIDING YOKE SUB-ASSEMBLY

Temporarily tighten the bolt A.



3. CONNECT SLIDING YOKE SUB-ASSEMBLY

- (a) Align the matchmarks on the yoke sub-assembly and worm gear valve body shaft.

- (b) Torque the bolt B.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

- (c) Torque the bolt A.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

4. INSTALL LINK JOINT PROTECTOR

Torque the 2 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

5. TORQUE 4 COLUMN HOLE COVER SET BOLTS

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

6. INSTALL COMBINATION SWITCH WITH SPIRAL CABLE

- (a) Tighten the 4 screws.

- (b) Connect the airbag connector.

- (c) Connect the 2 connectors.

7. INSTALL UPPER AND LOWER COLUMN COVERS

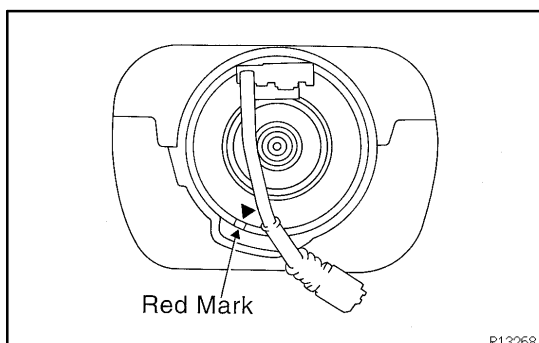
Tighten the 5 screws.

8. INSTALL NO.2 HEATER TO REGISTER DUCT

9. INSTALL INSTRUMENT LOWER FINISH PANEL

- (a) Tighten the 4 panel set screws.

- (b) Connect the hood lock control cable and fuel lid control cable.



10. CENTER SPIRAL CABLE

- (a) Check that the front wheels are facing straight ahead.

- (b) Turn the cable counterclockwise by hand until it becomes harder to turn the cable.

- (c) Then rotate the cable clockwise about 3 turns to align the red mark.

HINT:

The cable will rotate about 3 turns to either left or right of the center.

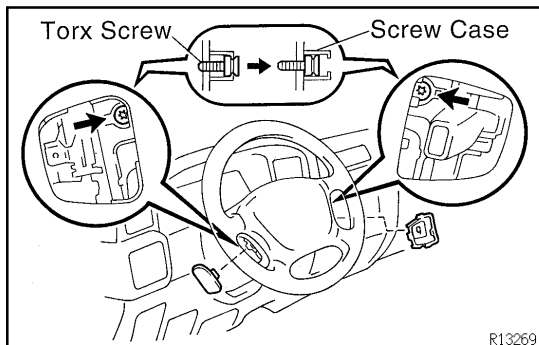
11. INSTALL STEERING WHEEL

- (a) Align the matchmarks on the wheel and main shaft assembly.
- (b) Torque the wheel set nut.
Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)
- (c) Connect the connector.

12. INSTALL STEERING WHEEL PAD**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 connector, 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.

- (a) Connect the airbag connector.
- (b) Install the wheel pad after confirming that the circumference groove of the torx screws is caught on the screw case.

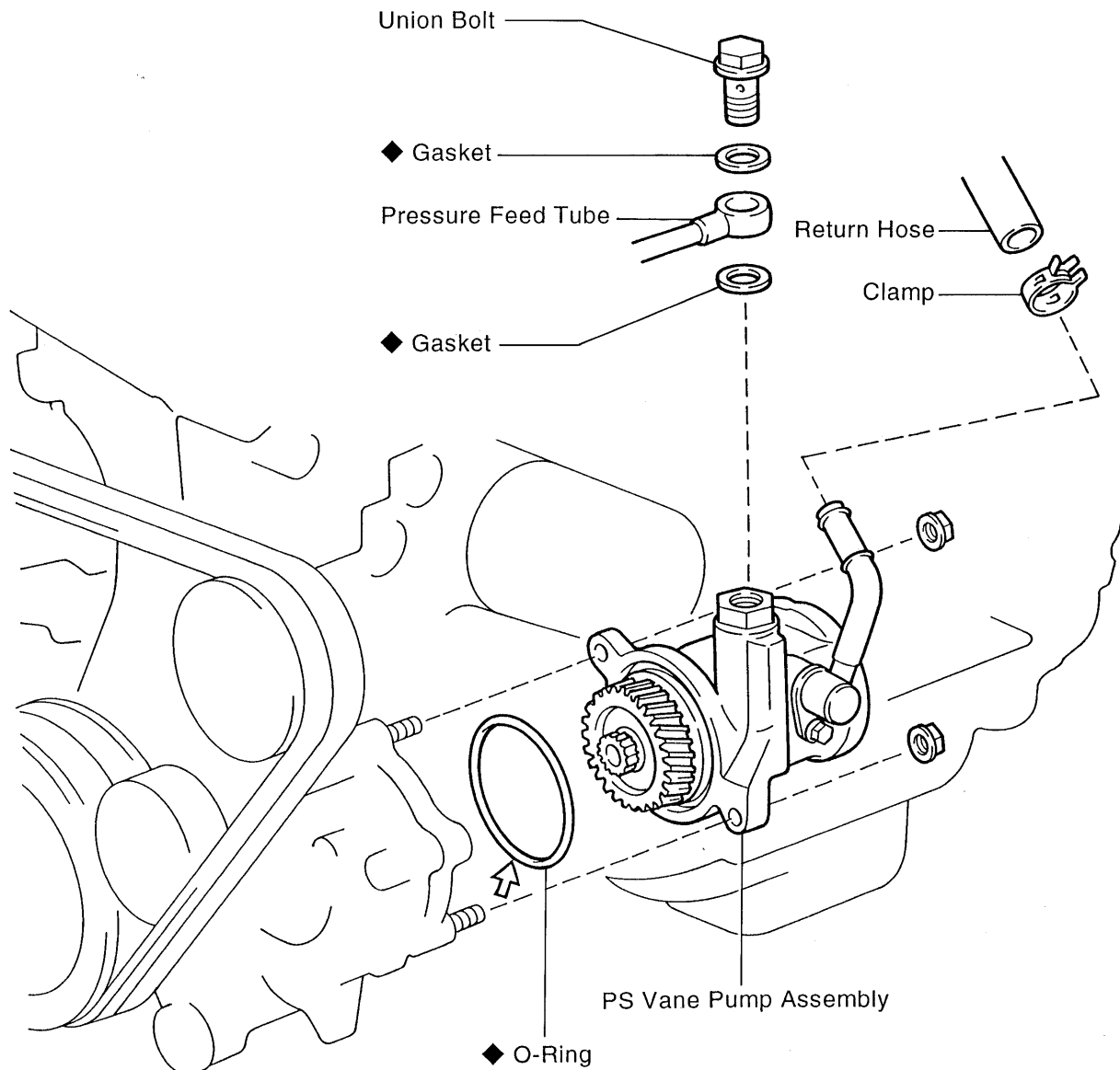


- (c) Using a torx socket wrench, torque the 2 screws.
Torque: 9.0 N·m (90 kgf-cm, 78 in.-lbf)
- (d) Install the steering wheel lower No.2 and No.3 cover.

13. CHECK STEERING WHEEL CENTER POINT

POWER STEERING VANE PUMP COMPONENTS

SR16F-01

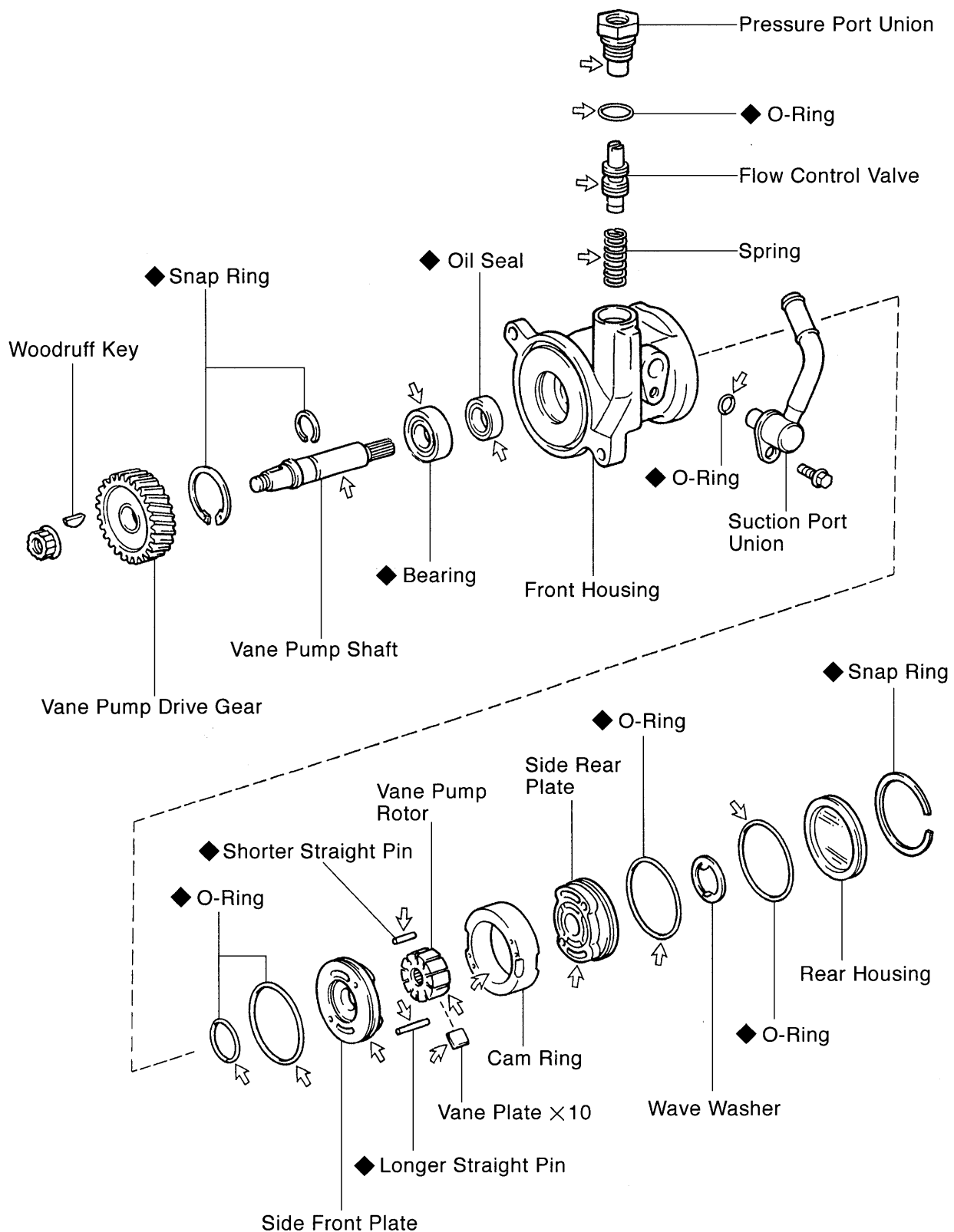


◆ Non-reusable part
 ⇐ Power steering fluid

R13248

SR-22

STEERING - POWER STEERING VANE PUMP



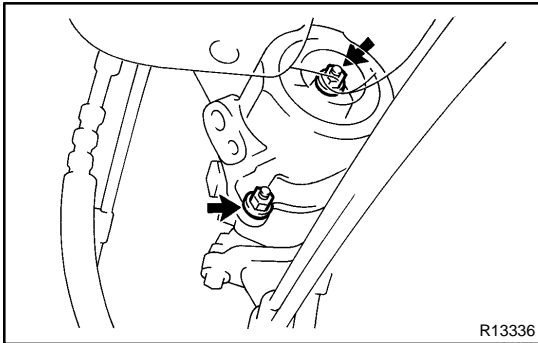
◆ Non-reusable part
 ⇐ Power steering fluid

R13252

REMOVAL

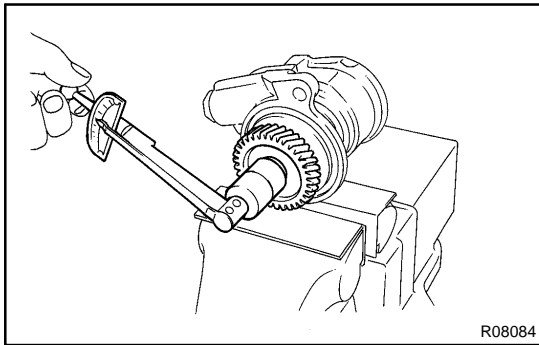
1. **DISCONNECT RETURN HOSE**
2. **DISCONNECT PRESSURE FEED TUBE**

Remove the union bolt and 2 gaskets.



3. **REMOVE PS VANE PUMP ASSEMBLY**

- (a) Remove the 2 nuts.
- (b) Remove the O-ring from the vane pump assembly.



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. MEASURE POWER STEERING VANE PUMP ROTATING TORQUE

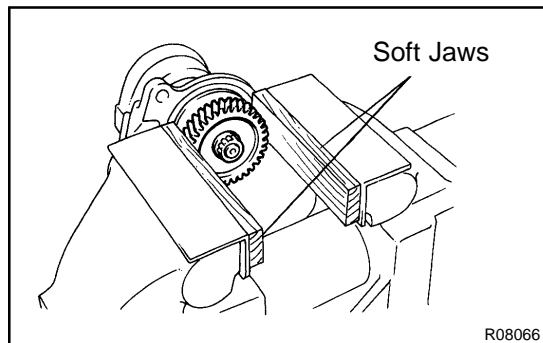
- Check that the pump rotates smoothly without abnormal noise.
- Using a torque wrench, check the pump rotating torque.

Rotation torque:

0.3 N·m (2.8 kgf·cm, 2.4 in.-lbf) or less

2. REMOVE SUCTION PORT UNION

- Remove the bolt.
- Remove the O-ring from the union.



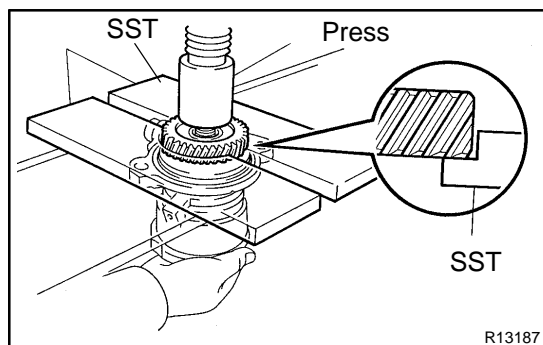
3. REMOVE VANE PUMP DRIVE GEAR

- Using soft jaws on a vise, clamp the gear in the vise.

NOTICE:

Be careful not to damage the gear.

- Remove the gear set nut.



- Using SST, press out the gear.

SST 09527-10011

NOTICE:

Be careful not to damage the gear. To avoid dropping the PS pump assembly, support the pump assembly with your hand.

- Remove the woodruff key from the vane pump shaft.

4. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

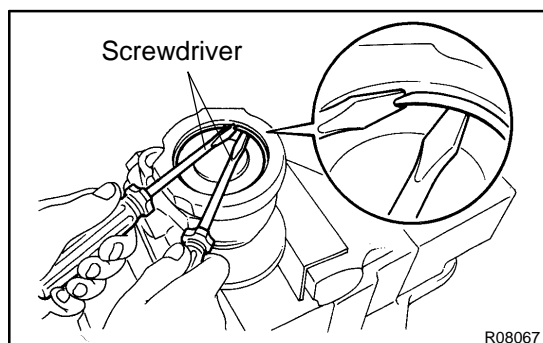
Remove the O-ring from the union.

5. REMOVE REAR HOUSING AND WAVE WASHER

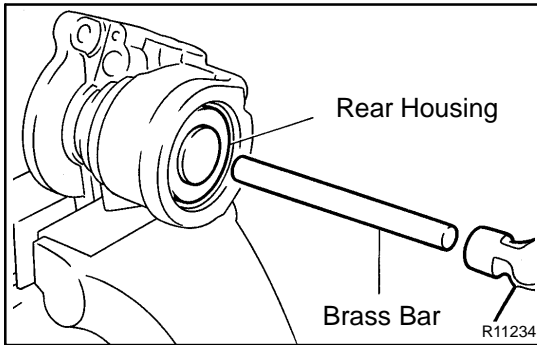
- Using 2 screwdrivers, remove the snap ring.

NOTICE:

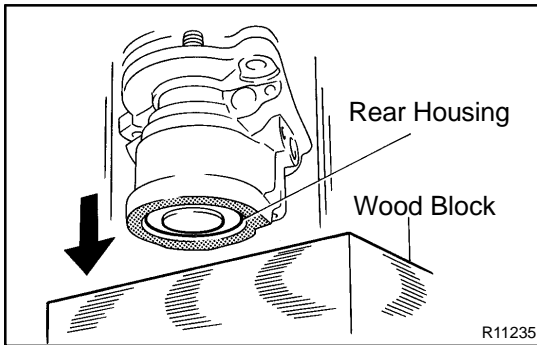
Take care not to damage the housing.



STEERING – POWER STEERING VANE PUMP



- (b) Using a brass bar and hammer, tap the housing so that the spring force of the wave washer pushes the housing forward.



- (c) Gently tap the PS pump assembly on a wood block and remove the housing and washer.

- (d) Remove the O-ring from the housing.

6. REMOVE SIDE REAR PLATE

- (a) Gently tap the PS pump assembly on a wood block and remove the plate.

- (b) Remove the O-ring from the plate.

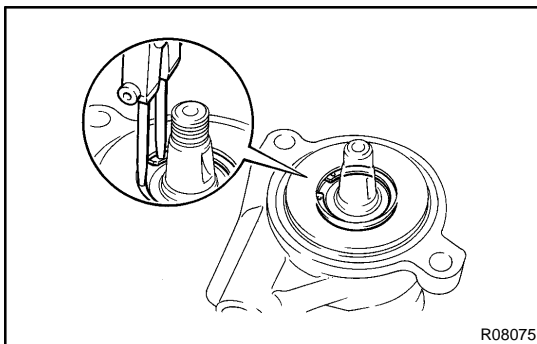
7. REMOVE CAM RING, VANE PUMP ROTOR AND 10 VANE PLATES

NOTICE:

Be careful not to scratch the cam ring, rotor or vane plates.

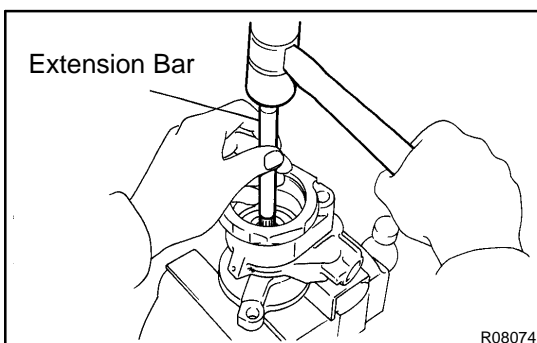
8. REMOVE SHORTER STRAIGHT PIN

Remove the pin from the side front plate.

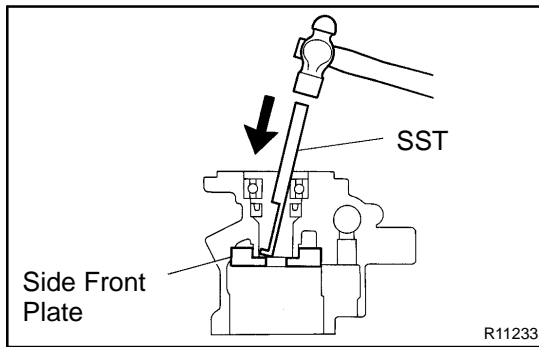


9. REMOVE VANE PUMP SHAFT WITH BEARING

- (a) Using snap ring pliers, remove the snap ring.



- (b) Using an extension bar and hammer, tap out the shaft with the bearing.

**10. REMOVE SIDE FRONT PLATE**

- (a) Using SST, tap out the plate from the front housing.
SST 09631-10030

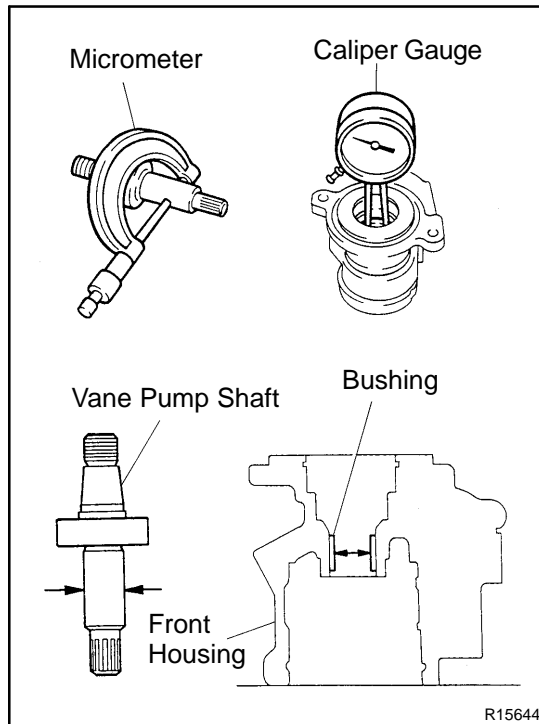
NOTICE:

Be careful not to damage the front housing.

- (b) Remove the 2 O-rings from the plate.

11. REMOVE LONGER STRAIGHT PIN

Using pliers, remove the pin from the front housing.



INSPECTION

1. CHECK OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

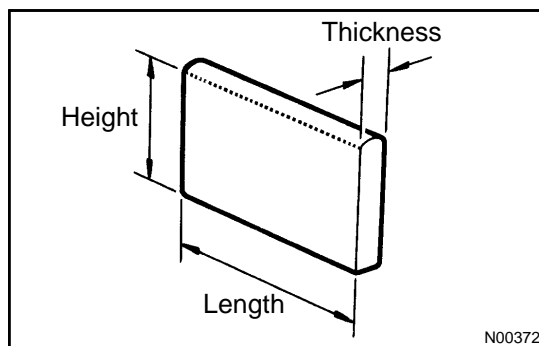
Using a micrometer and caliper gauge, measure the oil clearance.

Standard clearance:

0.03 – 0.05 mm (0.0012 – 0.0020 in.)

Maximum clearance: 0.07 mm (0.0028 in.)

If it is more than maximum, replace the front housing and vane pump shaft.



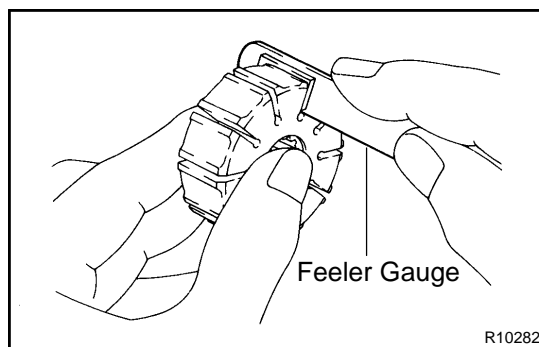
2. INSPECT VANE PUMP ROTOR AND 10 VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the plate.

Minimum height: 8.6 mm (0.339 in.)

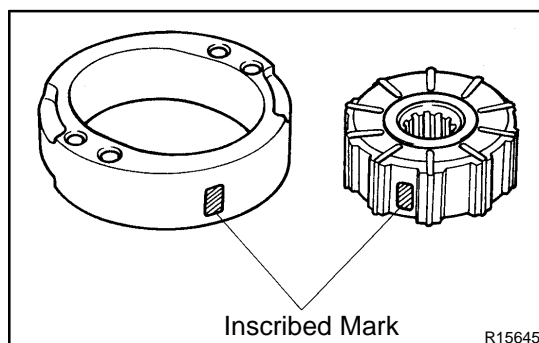
Minimum thickness: 1.397 mm (0.0550 in.)

Minimum length: 14.991 mm (0.5902 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and plate.

Maximum clearance: 0.033 mm (0.0013 in.)



If more than maximum, replace the plate and/or rotor with one having the mark equivalent to the mark stamped on the cam ring.

Inscribed mark

Vane pump rotor: 1, 2, or None

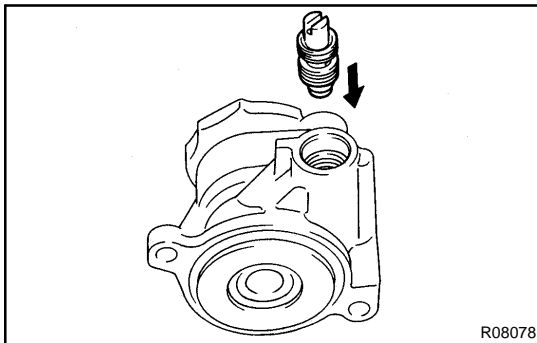
Cam ring: 2, 3, or 4

HINT:

There are 3 vane plate lengths for the following rotor and cam ring marks.

Rotor mark	Cam ring mark	Vane plate part number	Vane plate length mm (in.)
None	2	44345-60030	14.995 – 14.997 (0.59035 – 0.59043)
1	3	44345-60040	14.993 – 14.995 (0.59027 – 0.59035)
2	4	44345-60050	14.991 – 14.993 (0.59020 – 0.59027)

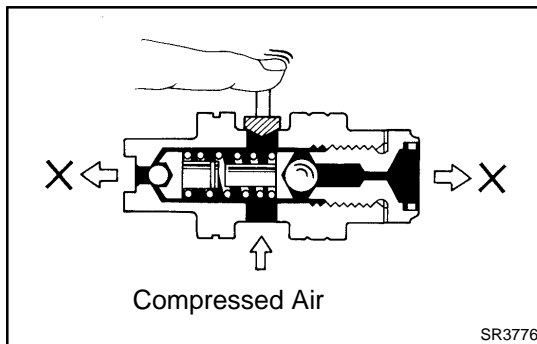
V08067



R08078

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.

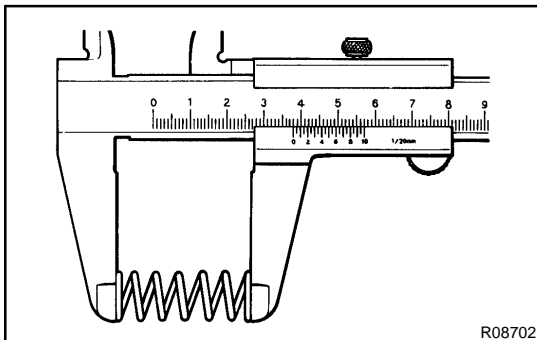


SR3776

- (b) Check the valve for leakage. Close one of the holes and apply 392 – 490 kPa (4 – 5 kgf/cm², 57 – 71 psi) of compressed air into the opposite side, and confirm that air does not come out from the end holes.

Inscribed mark:

A, B, C, D, E or F



R08702

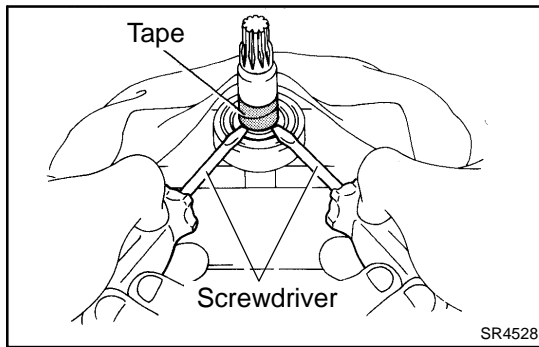
4. INSPECT SPRING

Using calipers, measure the free length of the spring.

Minimum free length: 35 – 37 mm (1.38 – 1.46 in.)

If it is not within the specification, replace the spring.

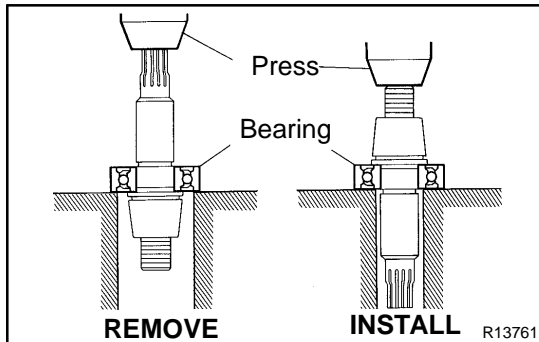
STEERING – POWER STEERING VANE PUMP

**5. IF NECESSARY, REPLACE BEARING**

- (a) Using 2 screwdrivers, remove the snap ring from the vane pump shaft.

NOTICE:

To prevent vane pump shaft damage, wind tape on the shaft.

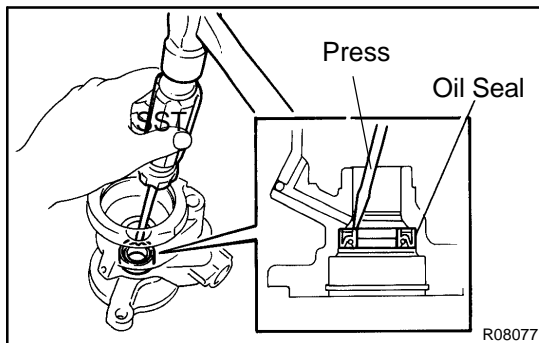


- (b) Using a press, press out the bearing.
 (c) Coat a new bearing with power steering fluid.
 (d) Using a press, press in the bearing.

NOTICE:

Be careful not to damage the shaft.

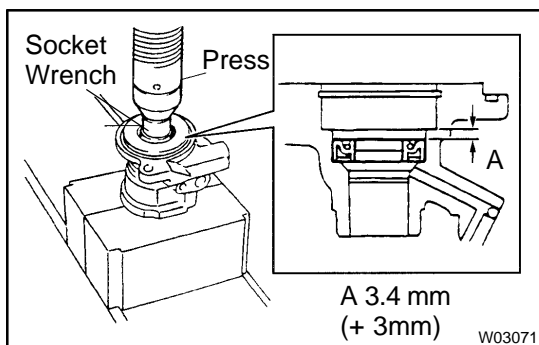
- (e) Install a new snap ring to the shaft.

**6. IF NECESSARY, REPLACE OIL SEAL**

- (a) Using a screwdriver and hammer, tap out the oil seal from the front housing.

NOTICE:

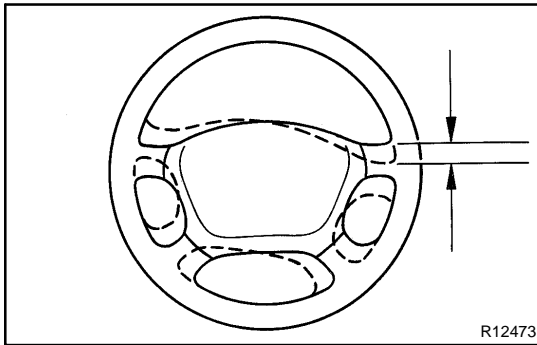
Be careful not to damage the housing.



- (b) Coat a new oil seal lip with power steering fluid.
 (c) Using a socket wrench (23 mm), press in the oil seal as shown in the illustration.

NOTICE:

- **Make sure you install the oil seal facing the correct direction.**
- **Be careful not to damage the front housing.**



STEERING WHEEL INSPECTION

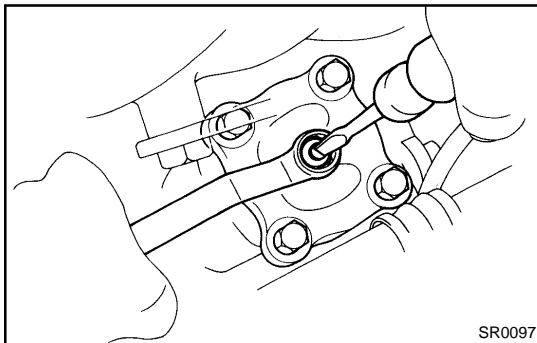
SR168-01

1. CHECK STEERING WHEEL FREEPLAY

- 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: 40 mm (1.58 in.)

If the freeplay exceeds the maximum, adjust it in the following procedure.



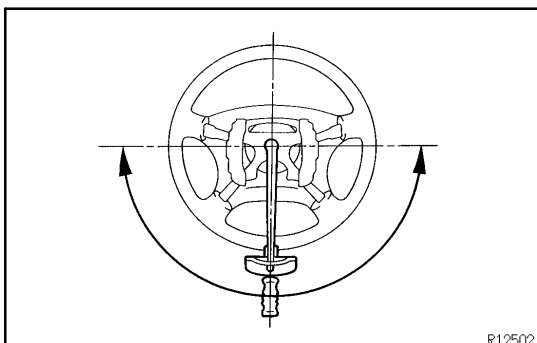
2. ADJUST STEERING GEAR

- Point the front wheels straight ahead.
- Loosen the adjusting screw lock nut.
- Turn the cross shaft adjusting screw clockwise to decrease steering wheel freeplay and counterclockwise to increase it.

HINT:

Turn the adjusting screw in small increments and check the freeplay between each adjustment.

- Turn the steering wheel half way around in both directions.
- Check that the freeplay is correct and steering is smooth and without rough spots.
- Torque the adjusting screw lock nut (See page [SR-41](#)).



3. CHECK STEERING EFFORT

- Center the steering wheel.
- Remove the steering wheel pad (See page [SR-11](#)).
- Start the engine and run it at idle.
- Measure the steering effort in both directions.

Reference: 8.3 N·m (85 kgf·cm, 73 in.-lbf)

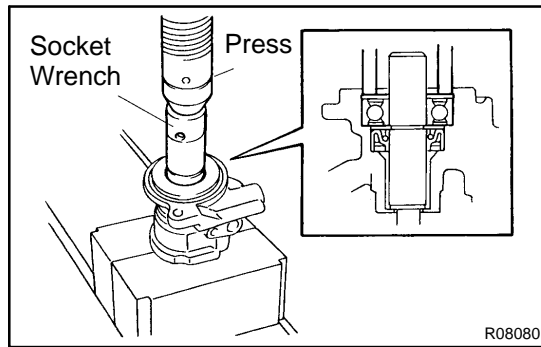
HINT:

Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

- (e) Torque the steering wheel set nut.

Torque: 34 N·m (350 kgf-cm, 25 ft-lbf)

- (f) Install the steering wheel pad (See page [SR-19](#)).



REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH POWER STEERING FLUID

(See page [SR-21](#))

2. INSTALL VANE PUMP SHAFT WITH BEARING

- Using a socket wrench (29 mm), press in the shaft with the bearing to the front housing.

NOTICE:

Be careful not to damage the oil seal lip.

- Using snap ring pliers, install a new snap ring to the front housing.

3. INSTALL LONGER STRAIGHT PIN

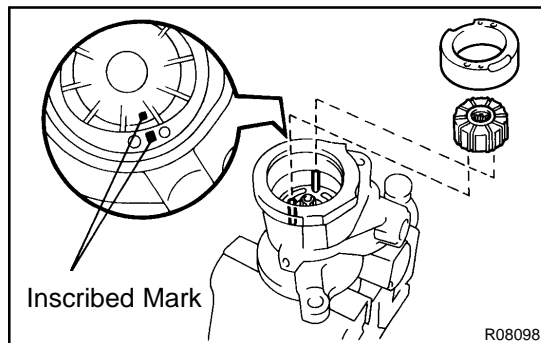
Install a new pin to the front housing.

NOTICE:

Be careful not to damage the pin.

4. INSTALL SIDE FRONT PLATE

- Coat 2 new O-rings with power steering fluid and install them to the plate.



- Align the hole of the plate and longer straight pin.

NOTICE:

Make sure you install the plate facing the correct direction.

(See page [SR-21](#))

5. INSTALL SHORTER STRAIGHT PIN

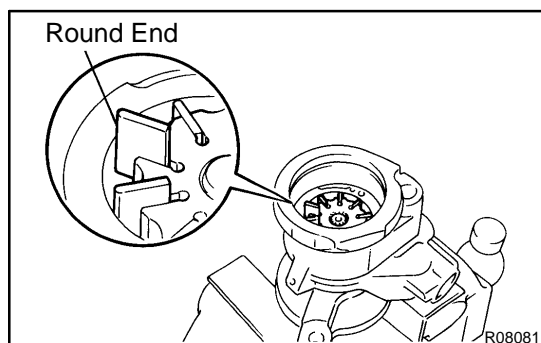
Install a new pin to the side front plate.

NOTICE:

Be careful not to damage the pin.

6. INSTALL CAM RING AND VANE PUMP ROTOR

Install the ring and rotor with the inscribed marks facing outward.

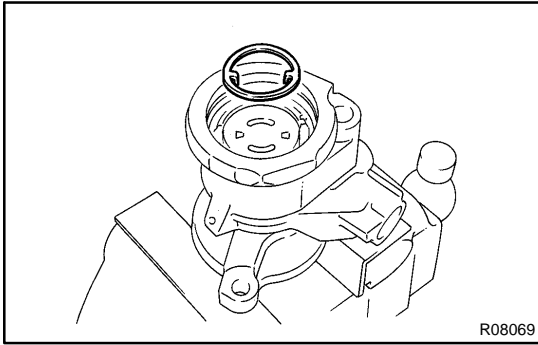


7. INSTALL VANE PLATES

Install the 10 plates with the round end facing outward.

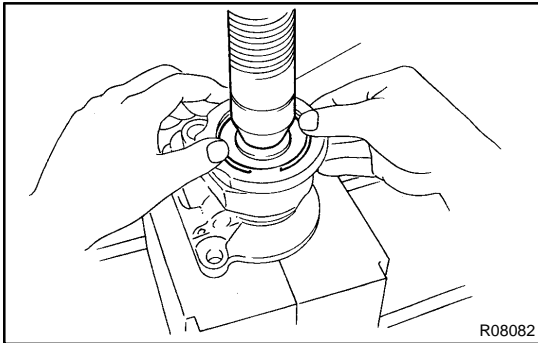
8. INSTALL SIDE REAR PLATE

- Coat a new O-ring with power steering fluid and install it to the plate.
- Align the holes of the plate with the straight pins.



9. INSTALL WAVE WASHER

Install the washer so that its protrusions fit into the slots in the side rear plate.



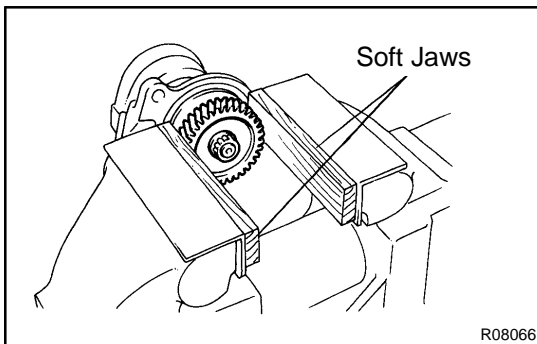
10. INSTALL REAR HOUSING

- Coat a new O-ring with power steering fluid and install it to the housing.
- Using a press, apply just enough pressure to compress the wave washer, and install a new snap ring to the front housing.

11. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

- Install the valve facing the correct direction. (See page [SR-21](#))
- Coat a new O-ring with power steering fluid and install it to the union.
- Torque the union.

Torque: 69 N·m (700 kgf-cm, 51 ft-lbf)



12. INSTALL VANE PUMP DRIVE GEAR

- Install the woodruff key and gear.
- Using soft jaws on a vise, clamp the gear in the vise.

NOTICE:

Be careful not to damage the gear.

- Torque the gear set nut.

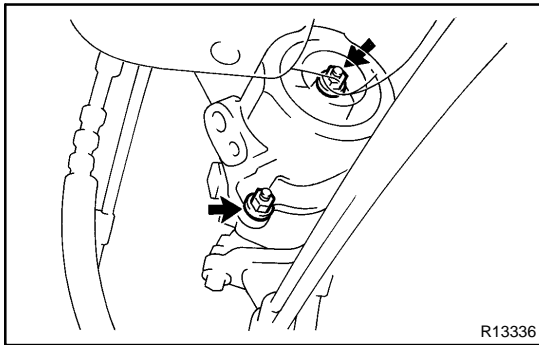
Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)

13. MEASURE POWER STEERING PUMP ROTATING TORQUE (See page [SR-24](#))

14. INSTALL SUCTION PORT UNION

- Coat a new O-ring with power steering fluid and install it to the union.
- Torque the bolt.

Torque: 13 N·m (130 kgf-cm, 9 ft-lbf)

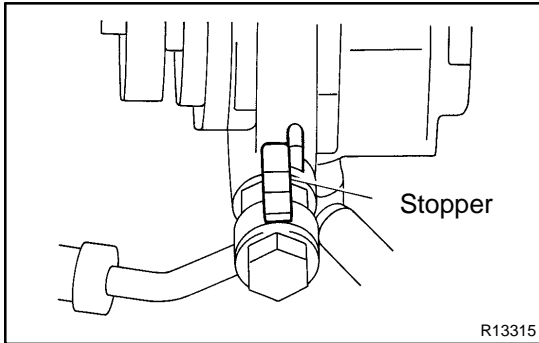


INSTALLATION

1. INSTALL PS VANE PUMP ASSEMBLY

- (a) Coat a new O-ring with power steering fluid and install it to the vane pump assembly.
- (b) Torque the 2 nuts.

Torque: 36 N·m (370 kgf-cm, 27 ft-lbf)



2. CONNECT PRESSURE FEED TUBE

Torque the union bolt with 2 new gaskets.

Torque: 56 N·m (575 kgf-cm, 42 ft-lbf)

HINT:

Make sure the stopper of the tube is touching the PS pump body, as shown then torque the union bolt.

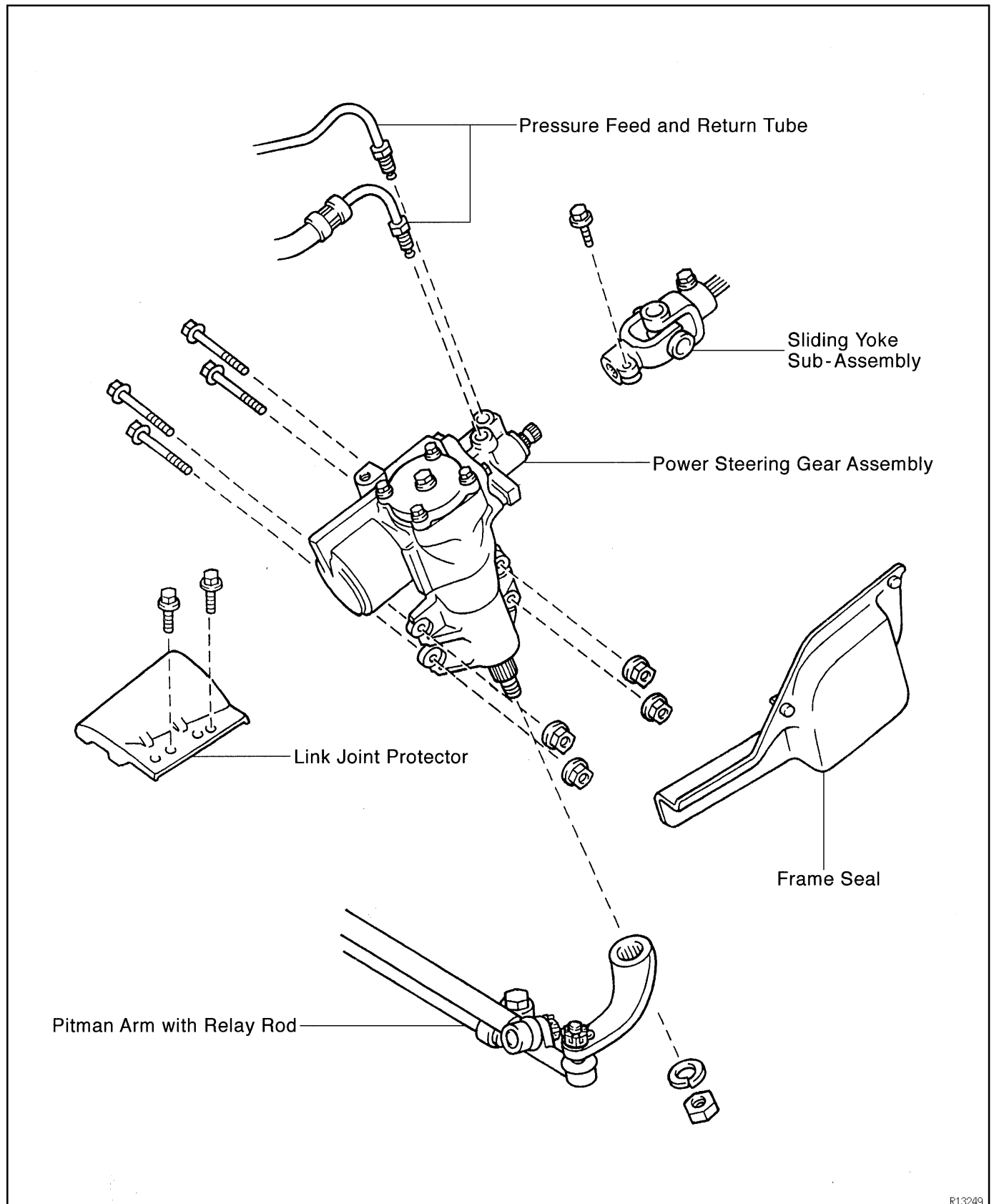
3. CONNECT RETURN HOSE

4. BLEED POWER STEERING SYSTEM

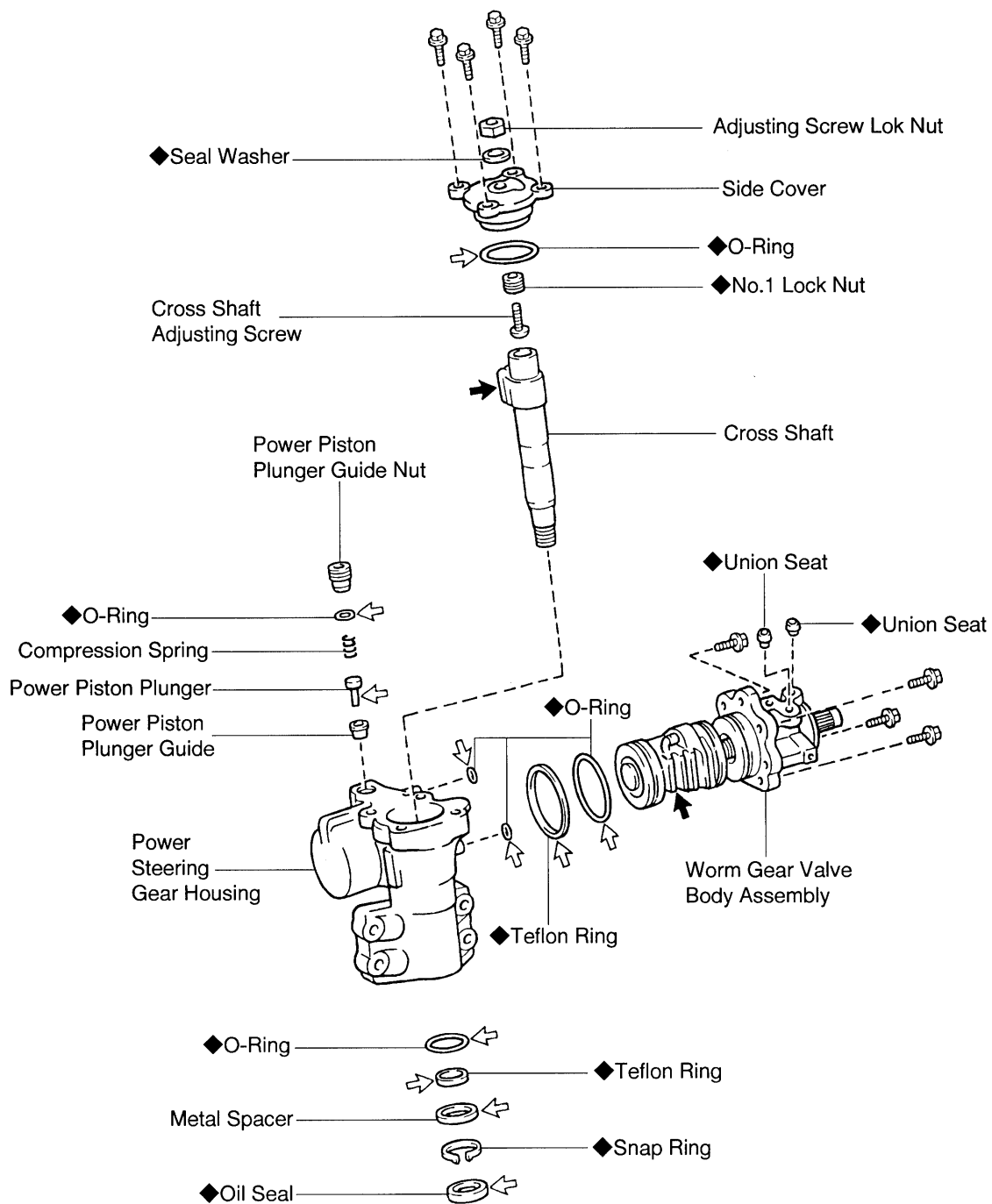
(See page [SR-3](#))

POWER STEERING GEAR COMPONENTS

SR16L-01



R13249



◆ Non-reusable part

↔ Apply Power steering fluid

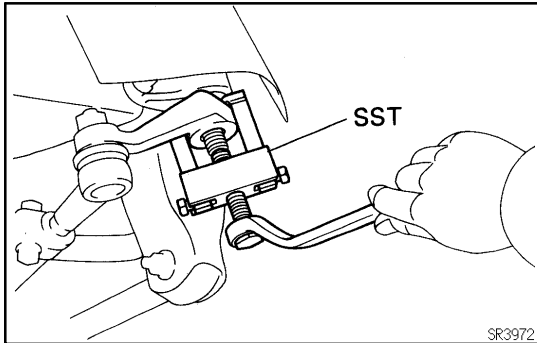
← Molybdenum disulfide lithium base grease

R13253

REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
2. REMOVE STEERING WHEEL PAD (See page [SR-11](#))
3. REMOVE STEERING WHEEL (See page [SR-11](#))
4. REMOVE FRAME SEAL
5. REMOVE LINK JOINT PROTECTOR

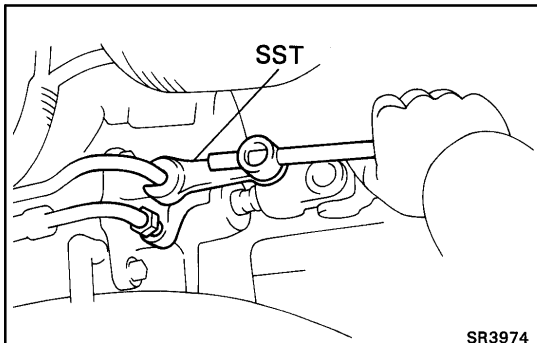
Remove the 2 bolts.



6. DISCONNECT PITMAN ARM WITH RELAY ROD

- (a) Remove the pitman arm set nut and spring washer.
- (b) Using SST, disconnect the pitman arm from the gear assembly.

SST 09628-62011



7. DISCONNECT PRESSURE FEED AND RETURN TUBES

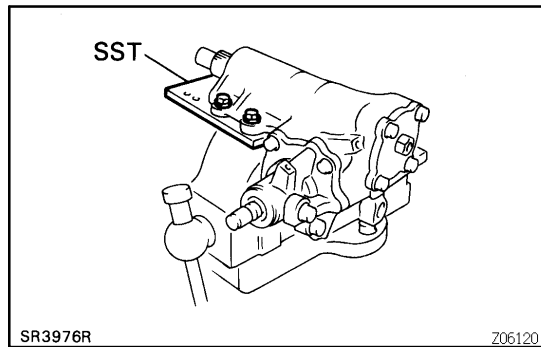
Using SST, disconnect the pressure feed and return tubes.

SST 09631-22020

8. DISCONNECT SLIDING YOKE SUB-ASSEMBLY (See page [SR-13](#))

9. REMOVE PS GEAR ASSEMBLY

Remove the 4 installation bolts and nuts.



DISASSEMBLY

NOTICE:

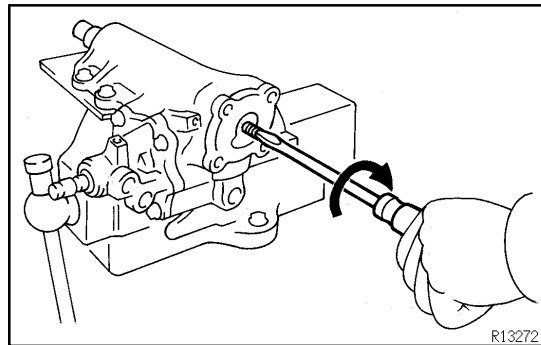
When using a vise, do not overtighten it.

1. SECURE PS GEAR ASSEMBLY IN VISE

Secure the gear assembly on SST and clamp SST in a vise.

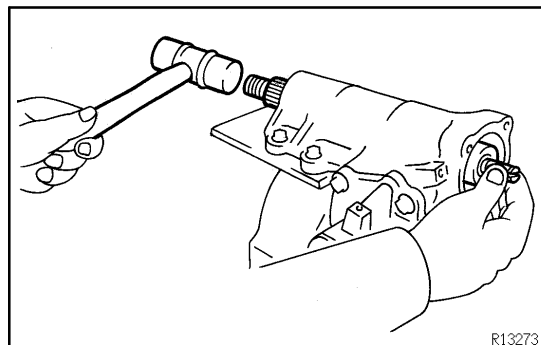
SST 09630-00014 (09631-00142)

2. REMOVE ADJUSTING SCREW LOCK NUT AND SEAL WASHER



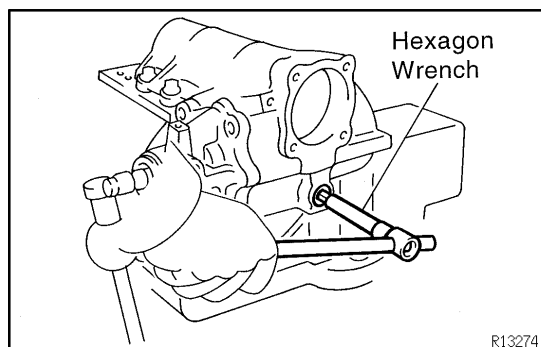
3. REMOVE SIDE COVER

- Remove the 4 bolts.
- Turn the cross shaft adjusting screw clockwise until the cover comes off.
- Remove the O-ring from the cover.



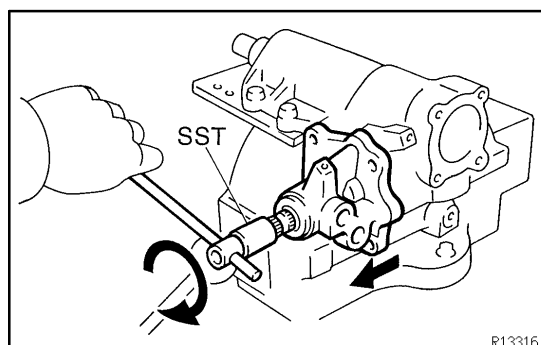
4. REMOVE CROSS SHAFT

Using a plastic hammer, tap on the cross shaft end and pull out the shaft.



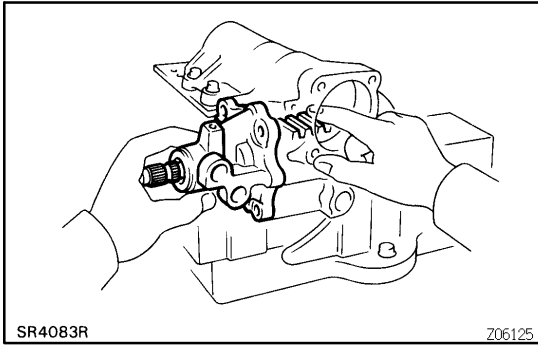
5. REMOVE POWER PISTON PLUNGER GUIDE NUT, COMPRESSION SPRING, POWER PISTON PLUNGER AND POWER PISTON PLUNGER GUIDE

- Using a hexagon wrench (10 mm), remove the plunger guide nut.
- Remove the O-ring from the plunger guide nut.



6. REMOVE WORM GEAR VALVE BODY ASSEMBLY

- Remove the 4 bolts.
 - Using SST, turn the valve body shaft clockwise with holding the worm gear by your finger so it cannot move.
- SST 09616-00010

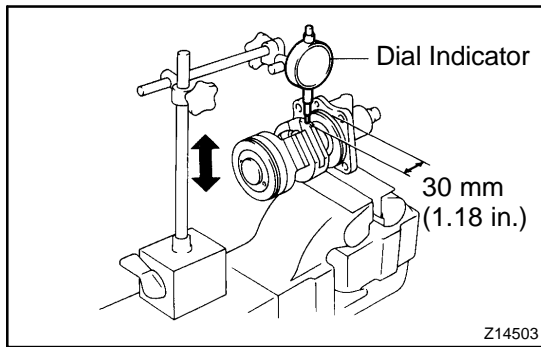


(c) Pull out the valve body assembly.

NOTICE:

Ensure that the worm gear does not come off the worm shaft.

(d) Remove the 2 O-rings from the gear housing.



INSPECTION

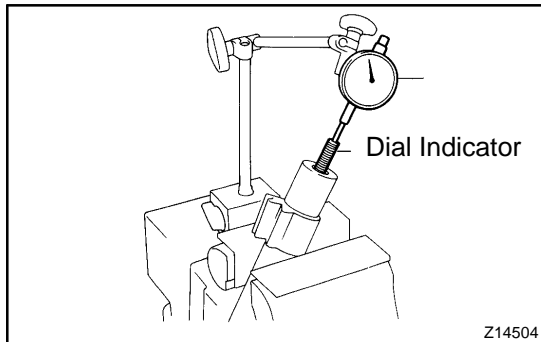
NOTICE:

When using a vise, do not overtighten it.

1. INSPECT BALL CLEARANCE

Using a dial indicator, check the ball clearance. Move the worm gear up and down.

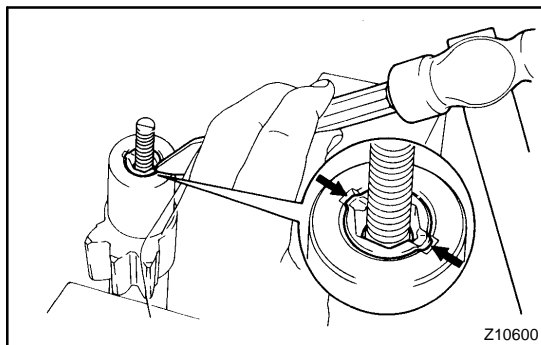
Maximum clearance: 0.15 mm (0.0059 in.)



2. INSPECT CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

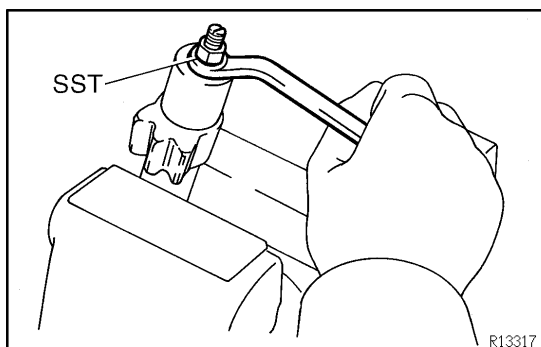
Using a dial indicator, measure the thrust clearance.

Standard clearance: 0.03 – 0.05 (0.0012 – 0.0020 in.)



3. IF NECESSARY, ADJUST CROSS SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Using a chisel and hammer, unstake the No.1 lock nut.



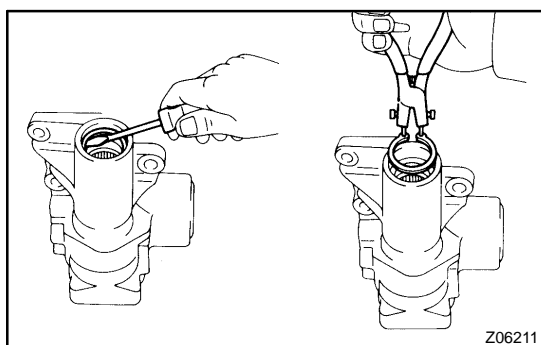
(b) Using SST, remove the No.1 lock nut.

SST 09630-00014 (09631-00051)

(c) Using a screwdriver, adjust the adjusting screw for correct thrust clearance.

(d) Using the SST, tighten a new lock nut.

(e) Using a chisel and hammer, stake the lock nut.



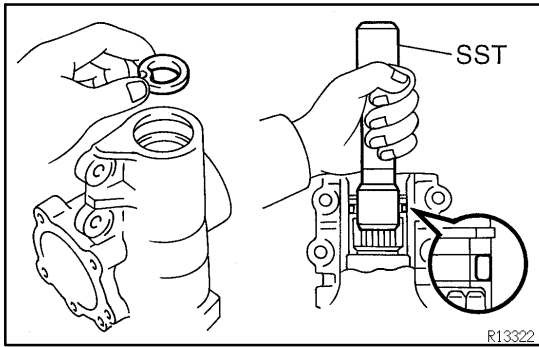
4. IF NECESSARY, REPLACE OIL SEAL, METAL SPACER AND TEFLON RING

(a) Using a screwdriver, pry out the oil seal from the gear housing.

(b) Using snap ring pliers, remove the snap ring from the gear housing.

(c) Remove the metal spacer, teflon ring and O-ring from the gear housing.

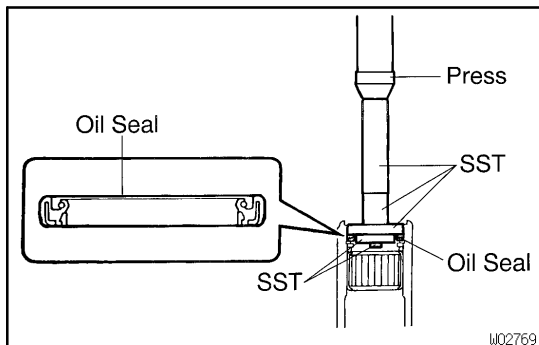
STEERING - POWER STEERING GEAR



- (d) Coat a new O-ring and metal spacer with power steering fluid and install them.
- (e) Using snap ring pliers, install a new snap ring.
- (f) Coat a new teflon ring with power steering fluid.
- (g) Form a teflon ring into a heart shape and install it with hand.
- (h) Using SST, form the teflon ring.
SST 09630-00014 (09631-00121)

NOTICE:

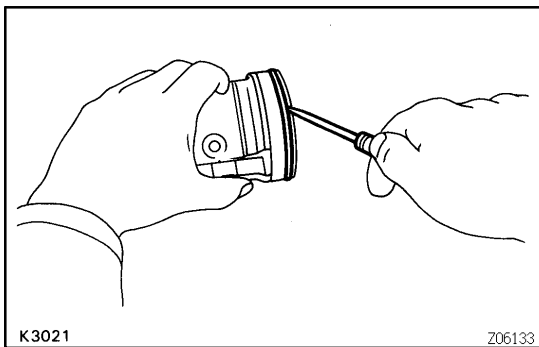
The teflon ring must be squeezed before inserting the cross shaft or damage will result.



- (i) Coat a new oil seal with power steering fluid.
- (j) Using SST, press in the oil seal to the gear housing.
SST 09950-60010 (09951-00340, 09951-00450)
09950-70010 (09951-07200)

NOTICE:

Make sure you install the oil seal facing the correct direction.



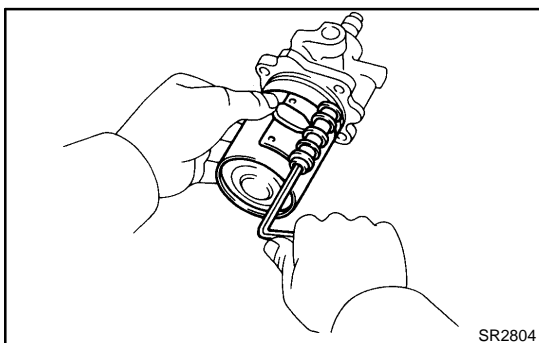
5. IF NECESSARY, REPLACE TEFLON RING AND O-RING

- (a) Using a screwdriver, remove the teflon ring and O-ring from the worm gear valve body assembly.

NOTICE:

Be careful not to damage the worm gear valve body assembly.

- (b) Coat a new O-ring with power steering fluid and install it.

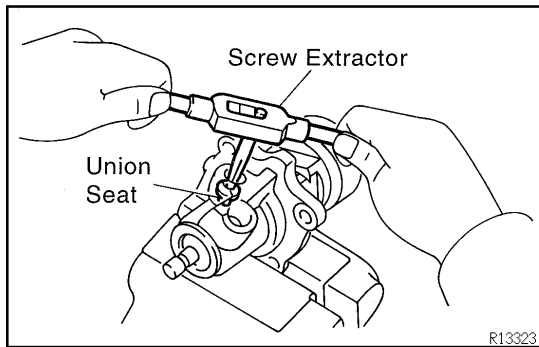


- (c) Expand a new teflon ring with your fingers.

NOTICE:

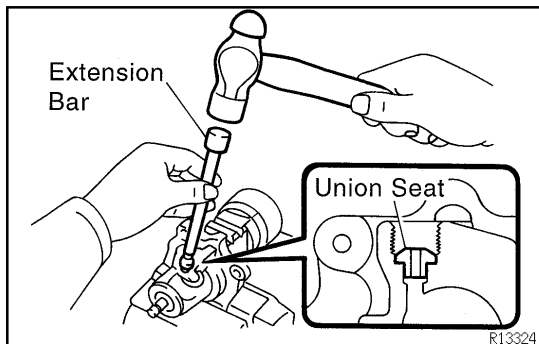
Be careful not to overexpand the teflon ring.

- (d) Install the teflon ring.
- (e) Coat the teflon ring with power steering fluid and snug it down with piston ring compressor for 5 - 7 minutes.



6. IF NECESSARY, REPLACE UNION SEATS

- (a) Using a screw extractor, remove the 2 union seats from the worm gear valve body assembly.



- (b) Using a hammer and extension bar, tap in 2 new union seats.

NOTICE:

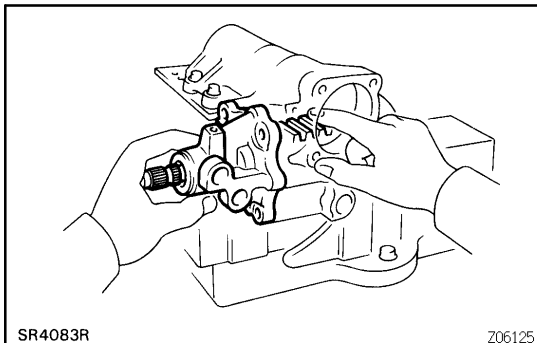
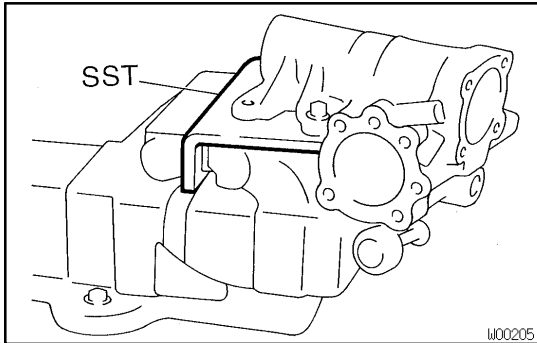
Before installing the union seat, remove dust sticking to the worm gear valve body assembly.

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

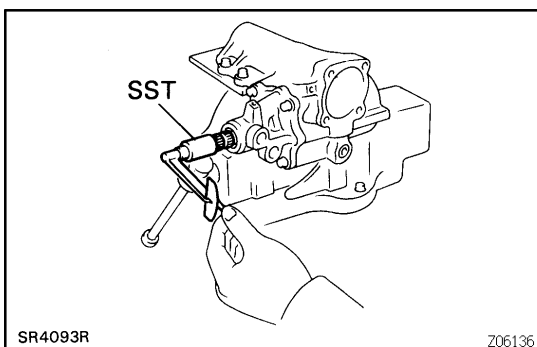
1. **COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE** (See page [SR-33](#))
2. **INSTALL WORM GEAR VALVE BODY ASSEMBLY**
 - (a) Coat 2 new O-rings with power steering fluid and install them to the gear housing.
 - (b) Secure the gear housing on SST and clamp SST in vise.
SST 09630-00014 (09631-00142)



- (c) Install the valve body assembly while supporting the worm gear with your fingers so that it does not rotate.
- (d) Torque the 4 bolts.
Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)

NOTICE:

Be careful not to damage the teflon ring.

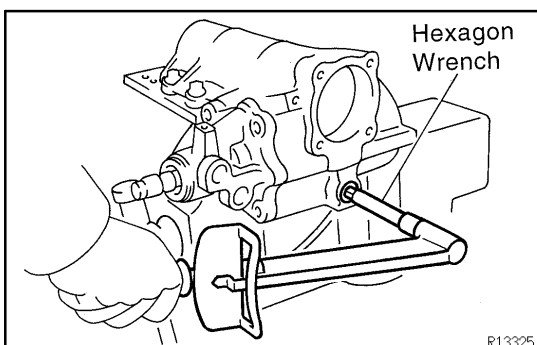


- (e) Using SST and a torque wrench, check the valve body assembly rotating torque.
SST 09616-00010
Rotating torque:
0.3 – 0.5 N·m (3 – 5.5 kgf·cm, 2.6 – 4.8 in.-lbf)

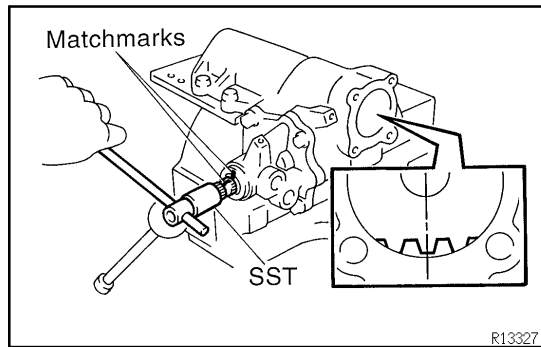
HINT:

Hold the worm gear to prevent it from turning.

If rotating torque is not correct, replace the worm gear valve body assembly.

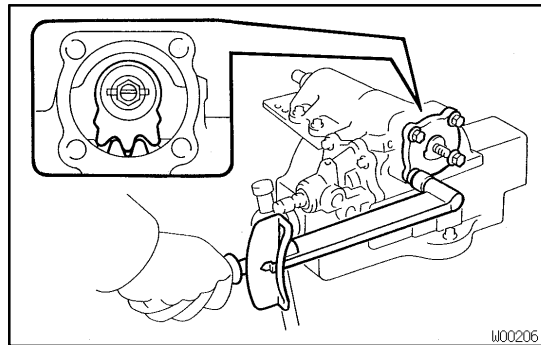


3. **INSTALL POWER PISTON PLUNGER GUIDE, POWER PISTON PLUNGER, COMPRESSION SPRING AND POWER PISTON PLUNGER GUIDE NUT**
 - (a) Coat a new O-ring with power steering fluid.
 - (b) Install the O-ring to the plunger guide nut and install the plunger guide nut with a hexagon wrench (10 mm).
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)



4. DETERMINE CENTER POSITION

- Using SST, turn the worm gear valve body shaft so full lock in both directions and determine the exact center.
SST 09616-00010
- Place matchmarks on the worm gear valve body shaft and worm gear valve body housing to show neutral position.



5. INSTALL CROSS SHAFT AND SIDE COVER

- Coat a new O-ring with power steering fluid and install it on the side cover.
- Assemble the cross shaft to the side cover.

HINT:

Fully loosen the cross shaft adjusting screw.

- Install and push the cross shaft into the gear housing so that the center teeth mesh together.
- Torque the 4 bolts in a diagonal pattern.

Torque: 61 N·m (620 kgf-cm, 45 ft-lbf)

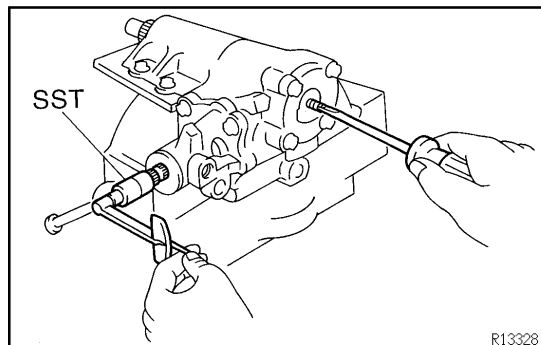
6. ADJUST TOTAL PRELOAD

- Install SST with a torque wrench on the worm gear valve body shaft.
SST 09616-00010
- Turn the cross shaft adjusting screw until the preload is within specification.

Preload (Turning):

0.74 – 10.8 N·m (7.5 – 11.0 kgf-cm, 6.5 – 9.6 in.-lbf)

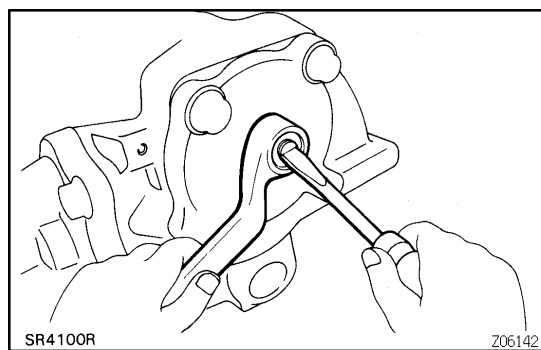
7. INSTALL NEW SEAL WASHER



8. INSTALL ADJUSTING SCREW LOCK NUT

Torque the lock nut while holding the cross shaft adjusting screw.

Torque: 46 N·m (470 kgf-cm, 34 ft-lbf)



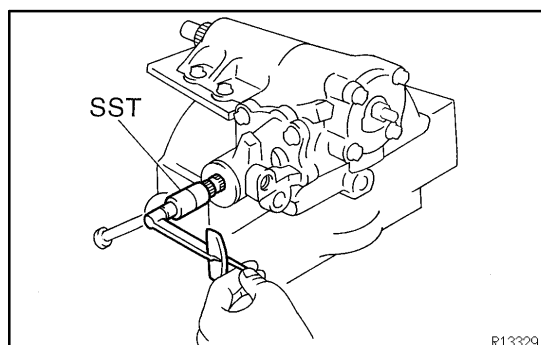
9. CHECK TOTAL PRELOAD

Using SST and a torque wrench, check total preload.

SST 09616-00010

Total preload (Turning):

0.74 – 1.08 N·m (7.5 – 11.0 kgf-cm, 6.5 – 9.6 in.-lbf)



INSTALLATION

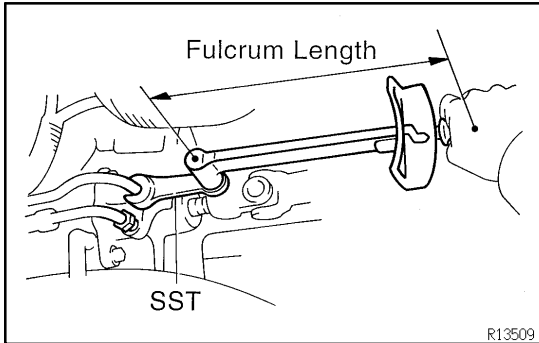
1. INSTALL PS GEAR ASSEMBLY

Torque the 4 installation bolts and nuts.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

2. CONNECT SLIDING YOKE SUB-ASSEMBLY

(See page [SR-19](#))



3. CONNECT PRESSURE FEED AND RETURN TUBES

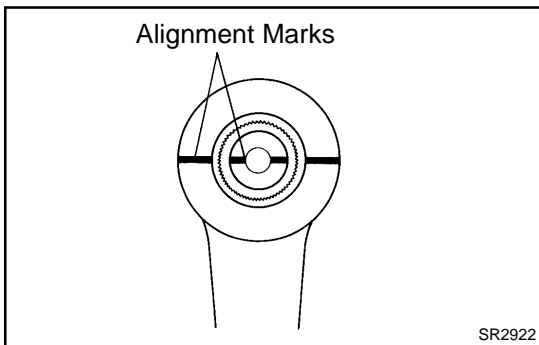
Using SST, connect the pressure feed and return tubes.

SST 09631-22020

Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.



4. CONNECT PITMAN ARM WITH RELAY ROD

(a) Align the alignment marks on the cross shaft and pitman arm and connect the pitman arm.

(b) Install the spring washer and pitman arm set nut.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

5. POSITION FRONT WHEELS FACING STRAIGHT AHEAD

HINT:

Do it with the front of the vehicle jacked up.

6. CENTER SPIRAL CABLE (See page [SR-19](#))

7. INSTALL STEERING WHEEL

(a) Align the matchmarks on the wheel and steering column main shaft.

(b) Temporarily tighten the wheel set nut.

(c) Connect the connector.

8. BLEED POWER STEERING SYSTEM

(See page [SR-3](#))

9. CHECK STEERING WHEEL CENTER POINT

10. TORQUE STEERING WHEEL SET NUT

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

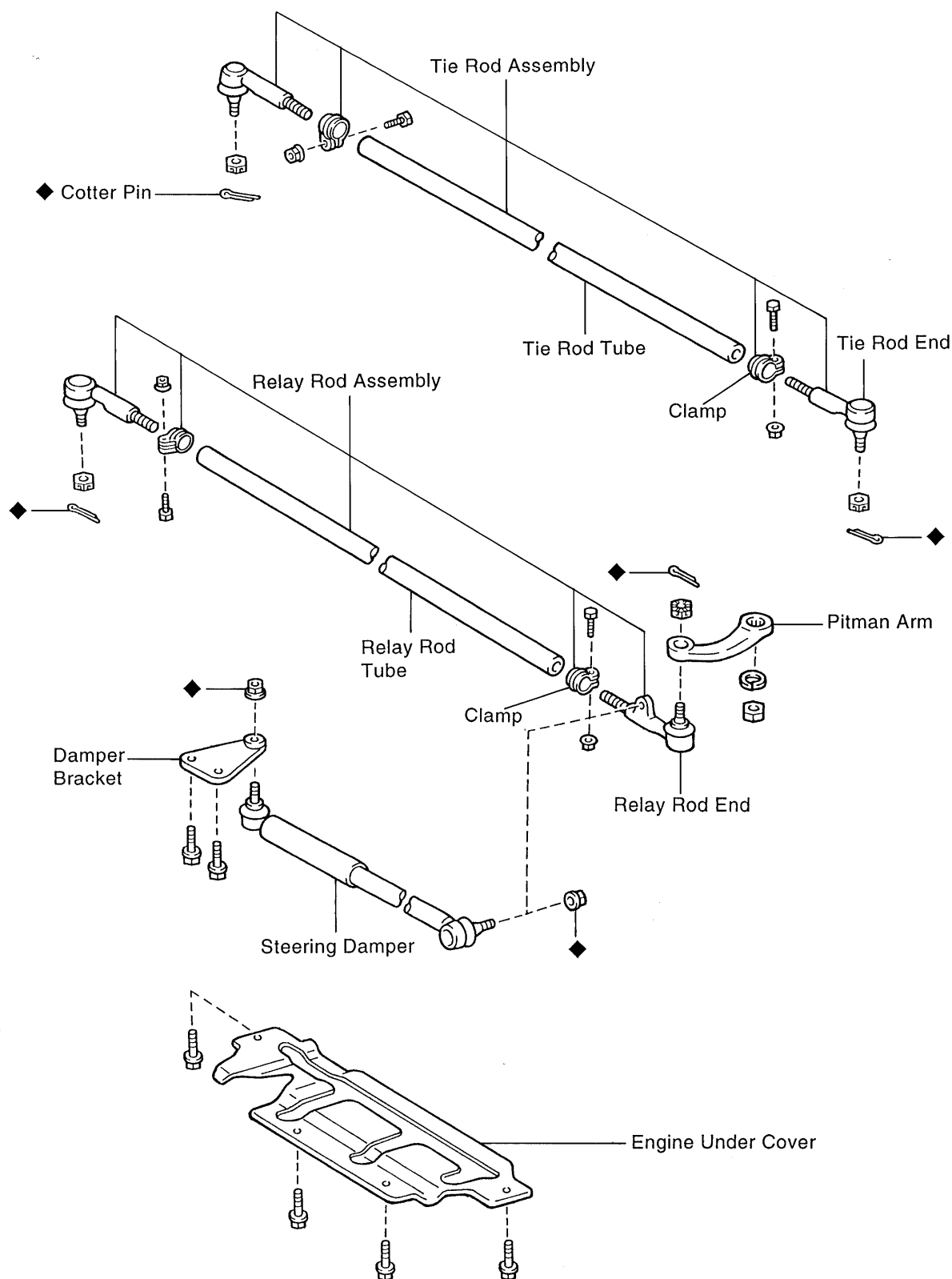
11. INSTALL STEERING WHEEL PAD (See page [SR-19](#))

12. CHECK FRONT WHEEL ALIGNMENT

(See page [SR-4](#))

STEERING LINKAGE COMPONENTS

SR16R-01



R13250

REMOVAL

NOTICE:

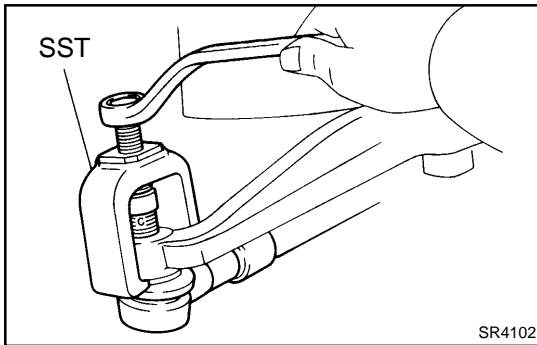
When using a vise, do not overtighten it.

1. REMOVE ENGINE UNDER COVER

Remove the 4 bolts.

2. REMOVE PITMAN ARM

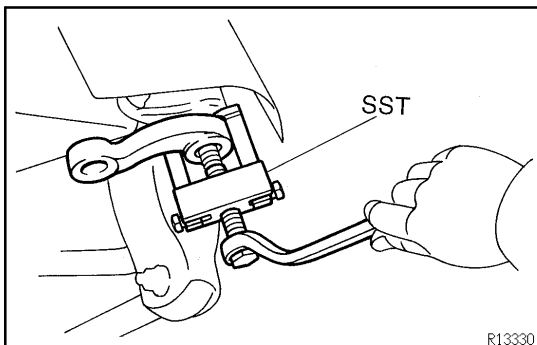
- (a) Remove the cotter pin and nut.



- (b) Using SST, disconnect the pitman arm from the relay rod assembly.

SST 09611-22012

- (c) Remove the pitman arm set nut and spring washer.

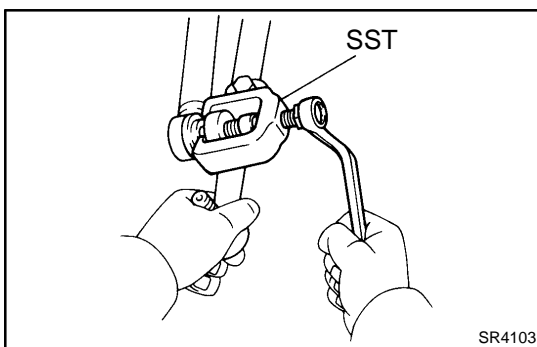


- (d) Using SST, disconnect the pitman arm from the PS gear assembly.

SST 09628-62011

3. REMOVE STEERING DAMPER WITH STEERING DAMPER BRACKET

- (a) Remove the nut and 2 damper bracket set bolts.

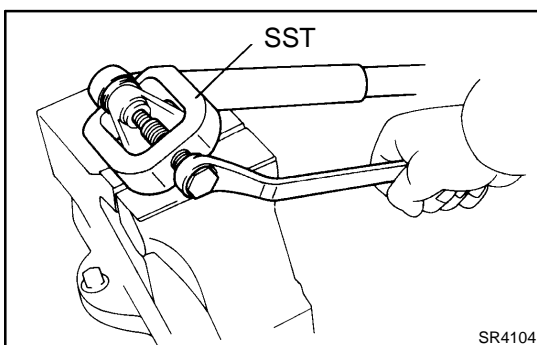


- (b) Using SST, disconnect the damper with damper bracket from the relay rod assembly.

SST 09611-22012

4. REMOVE STEERING DAMPER

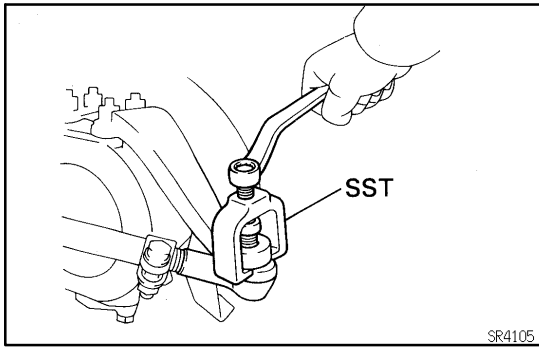
- (a) Secure the damper bracket in a vise.
(b) Remove the nut.



- (c) Using SST, remove the damper from the damper bracket.
SST 09610-55012

5. REMOVE RELAY ROD ASSEMBLY

- (a) Remove the cotter pin and nut.

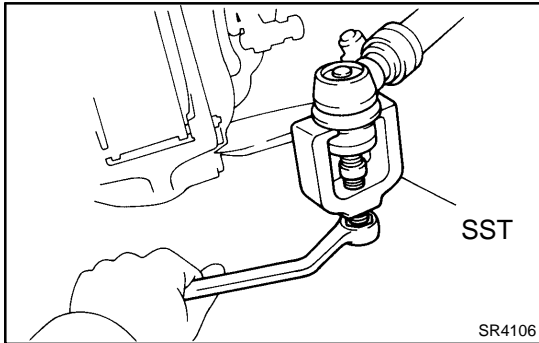


- (b) Using SST, disconnect the relay rod assembly from the knuckle arm.

SST 09611-22012

6. REMOVE TIE ROD ASSEMBLY

- (a) Remove the 2 cotter pins and nuts.

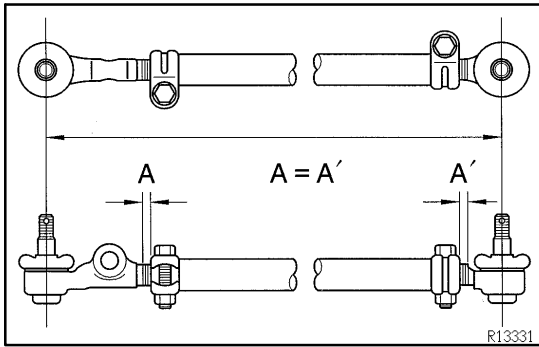


- (b) Using SST, disconnect the tie rod assembly from the RH and LH knuckle arms.

SST 09611-22012

7. REMOVE TIE ROD ENDS AND RELAY ROD ENDS

Loosen the tie rod end or relay rod end clamp and remove the tie rod end or relay rod end.



INSTALLATION

HINT:

When connecting the ball stud to the arm or rod, remove the grease on the joint surfaces.

1. INSTALL TIE ROD ENDS AND RELAY ROD ENDS

- Turn the tie rod ends or relay rod ends equal amounts into the rod tube. Tie rod assembly should be approximately 1,233 mm (48.54 in.). Relay rod assembly should be approximately 1,090 mm (42.91 in.).
- The remaining length of threads on both tie rod ends or relay rod ends should be equal.
- Temporarily tighten the tie rod end or relay rod end clamps.

2. INSTALL TIE ROD ASSEMBLY

- Connect the tie rod assembly to the RH and LH knuckle arms.
- Torque the 2 nuts.
Torque: 91 N·m (925 kgf-cm, 67 ft-lbf)
- Install 2 new cotter pins.
- After adjusting toe-in, torque the clamp bolts and nuts.
Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

3. INSTALL RELAY ROD ASSEMBLY

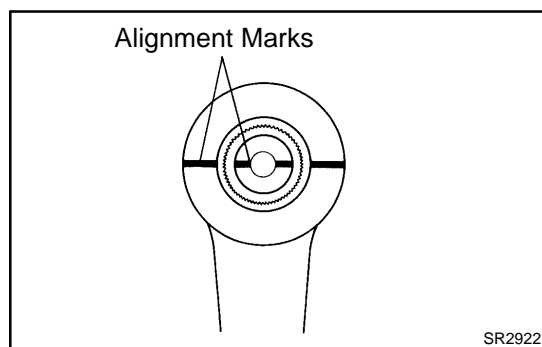
- Connect the relay rod assembly to the knuckle arm.
- Torque the nut.
Torque: 91 N·m (925 kgf-cm, 67 ft-lbf)
- Install a new cotter pin.
- Torque the clamp bolts and nuts.
Torque: 37 N·m (375 kgf-cm, 27 ft-lbf)

4. INSTALL STEERING DAMPER

- Secure the damper bracket in a vise.
- Connect the damper to the damper bracket.
- Torque a new nut.
Torque: 74 N·m (750 kgf-cm, 54 ft-lbf)

5. INSTALL STEERING DAMPER WITH STEERING DAMPER BRACKET

- Connect the damper with damper bracket to the relay rod assembly.
- Torque a new nut and 2 damper bracket set bolts.
Torque:
Nut: 74 N·m (750 kgf-cm, 54 ft-lbf)
Bolt: 39 N·m (400 kgf-cm, 29 ft-lbf)

**6. INSTALL PITMAN ARM**

- (a) Align the alignment marks on the pitman arm and the cross shaft, and install the spring washer and set nut.

Torque: 177 N·m (1,800 kgf-cm, 130 ft-lbf)

- (b) Connect the pitman arm to the relay rod assembly.
(c) Torque the nut.

Torque: 91 N·m (925 kgf-cm, 67 ft-lbf)

- (d) Install a new cotter pin.

7. INSTALL ENGINE UNDER COVER














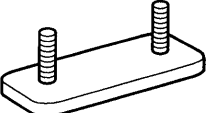

Tighten the 4 bolts.

8. CHECK FRONT WHEEL ALIGNMENT
(See page [SA-4](#))

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS00F-01

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4- 5- 6- 7- 8- 9- 10- 11-	4T	Hexagon flange bolt	 4 Protruding lines	9T
		5T	w/ washer hexagon bolt		
		6T	Hexagon flange bolt	 5 Protruding lines	10T
		7T	w/ washer hexagon bolt		
Hexagon head bolt	 8- 9- 10- 11-	8T	Hexagon flange bolt	 6 Protruding lines	11T
		9T	w/ washer hexagon bolt		
		10T	Hexagon flange bolt	 6 Protruding lines	11T
		11T	w/ washer hexagon bolt		
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T	Hexagon flange bolt w/ washer hexagon bolt	 6 Protruding lines	11T
Hexagon head bolt	 2 Protruding lines	5T	Stud bolt	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 2 Protruding lines	6T		 Grooved	
Hexagon head bolt	 3 Protruding lines	7T	Welded bolt		4T
Hexagon head bolt	 4 Protruding lines	8T			

V06821

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
10T	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

TORQUE SPECIFICATION

SS1EN-01

Part tightened	N·m	kgf·cm	ft·lbf
Front seat mounting bolt	39	400	29

ENGINE MECHANICAL

SERVICE DATA

SS1EO-04

Compression pressure	at 250 rpm STD Minimum Difference of pressure between each cylinder	1,176 kPa (12.0 kgf/cm ² , 171 psi) or more 883 kPa (9.0 kgf/cm ² , 128 psi) 98 kPa (1.0 kgf/cm ² , 14 psi) or less
Valve clearance	at cold Intake Exhaust	0.15 – 0.25 mm (0.006 – 0.010 in.) 0.25 – 0.35 mm (0.010 – 0.014 in.)
Ignition timing	w/ Terminals TE1 and E1 connected	3° BTDC @ idle
Idle speed	–	650 ± 50 rpm
Cylinder head	Warpage Cylinder block side Manifold side Valve seat Refacing angle Contacting angle Contacting width Cylinder head bolt outside diameter	Maximum Maximum Intake Exhaust Intake Exhaust STD Minimum 0.15 mm (0.0059 in.) 0.10 mm (0.0039 in.) 30°, 45°, 75° 45°, 75° 45° 1.2 – 1.6 mm (0.047 – 0.063 in.) 1.0 – 1.4 mm (0.039 – 0.055 in.) 10.85 – 11.00 mm (0.4272 – 0.4331 in.) 10.6 mm (0.417 in.)
Valve guide bushing	Inside diameter Outside diameter (for repair part) Protrusion height	STD O/S 0.05 7.010 – 7.030 mm (0.2760 – 0.2768 in.) 11.492 – 11.513 mm (0.4524 – 0.4533 in.) 11.542 – 11.563 mm (0.4544 – 0.4522 in.) 8.2 – 8.6 mm (0.323 – 0.339 in.)
Valve	Valve overall length Valve face angle Stem diameter Stem oil clearance Margin thickness	STD Intake Exhaust Minimum Intake Exhaust 44.5° Intake Exhaust STD Intake Exhaust Maximum Intake Exhaust STD Minimum 98.4 mm (3.874 in.) 97.9 mm (3.854 in.) 97.9 mm (3.854 in.) 97.4 mm (3.835 in.) 6.970 – 6.985 mm (0.2744 – 0.2750 in.) 6.965 – 6.980 mm (0.2742 – 0.2748 in.) 0.025 – 0.060 mm (0.0010 – 0.0024 in.) 0.030 – 0.065 mm (0.0012 – 0.0026 in.) 0.08 mm (0.0031 in.) 0.10 mm (0.0039 in.) 1.2 mm (0.047 in.) 1.0 mm (0.039 in.)
Valve spring	Deviation Free length Installed tension at 36.5 mm (1.437 in.)	Maximum 43.94 – 45.06 mm (1.7299 – 1.7740 in.) 214 – 238 N (21.8 – 24.2 kgf, 48.1 – 53.4 lbf)
Valve lifter	Lifter diameter Lifter bore diameter Oil clearance	STD Maximum 33.966 – 33.976 mm (1.3372 – 1.3376 in.) 34.000 – 34.021 mm (1.3386 – 1.3394 in.) 0.024 – 0.055 mm (0.0009 – 0.0022 in.) 0.07 mm (0.0028 in.)
Manifold	Warpage	Maximum 0.30 mm (0.0118 in.)
Air intake chamber	Warpage	Maximum 0.30 mm (0.0118 in.)

SERVICE SPECIFICATIONS – ENGINE MECHANICAL

Camshaft	Thrust clearance	STD	0.030 – 0.080 mm (0.0012 – 0.0031 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	STD	50.61 – 50.71 mm (1.9925 – 1.9965 in.)
Camshaft gear backlash		Minimum	50.51 mm (1.9886 in.)
		STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
Camshaft gear spring end free distance			18.2 – 18.8 mm (0.712 – 0.740 in.)
Spark plug tube	Protrusion		45.5 mm (1.791 in.)
Oil pump drive shaft gear	Thrust clearance	STD	0.040 – 0.160 mm (0.0016 – 0.0063 in.)
		Maximum	0.30 mm (0.0188 in.)
Chain and timing gear	Chain length at 16 links	Maximum	146.6 mm (5.772 in.)
	Camshaft timing gear wear (w/ Chain)	Minimum	126.0 mm (4.961 in.)
	Crankshaft timing gear wear (w/ Chain)	Minimum	65.4 mm (2.575 in.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD Mark 1	100.000 – 100.010 mm (3.9370 – 3.9374 in.)
		2	100.010 – 100.020 mm (3.9374 – 3.9378 in.)
		3	100.020 – 100.030 mm (3.9378 – 3.9382 in.)
		Maximum STD	100.23 mm (3.9461 in.)
		O/S 0.50	100.73 mm (3.9658 in.)
		O/S 1.00	101.23 mm (3.9854 in.)
Main bearing bolt outside diameter		STD	10.85 – 11.00 mm (0.4271 – 0.4331 in.)
		Minimum	10.6 mm (0.417 in.)
Piston and piston ring	Piston diameter	STD Mark 1	99.950 – 99.960 mm (3.9350 – 3.9354 in.)
		2	99.960 – 99.970 mm (3.9354 – 3.9358 in.)
		3	99.970 – 99.980 mm (3.9358 – 3.9362 in.)
		O/S 0.50	100.450 – 100.480 mm (3.9547 – 3.9559 in.)
		O/S 1.00	100.950 – 100.980 mm (3.9744 – 3.9756 in.)
	Piston oil clearance	STD	0.040 – 0.060 mm (0.0016 – 0.0024 in.)
	Piston ring groove clearance	No. 1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
		No. 2	0.300 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD No. 1	0.300 – 0.520 mm (0.0118 – 0.0205 in.)
		No. 2	0.450 – 0.670 mm (0.0177 – 0.0264 in.)
		Oil	0.150 – 0.520 mm (0.0059 – 0.0205 in.)
		Maximum No. 1	1.12 mm (0.0441 in.)
		No. 2	1.17 mm (0.0461 in.)
		Oil	1.12 mm (0.0441 in.)

SS-6

SERVICE SPECIFICATIONS – ENGINE MECHANICAL

Connecting rod	Thrust clearance	STD	0.160 – 0.262 mm (0.0063 – 0.0103 in.)
		Maximum	0.362 mm (0.0143 in.)
	Connecting rod bearing center wall thickness (Reference)		
		Mark 2	1.744 – 1.747 mm (0.0687 – 0.0688 in.)
		3	1.747 – 1.750 mm (0.0688 – 0.0689 in.)
		4	1.750 – 1.753 mm (0.0689 – 0.0690 in.)
		5	1.753 – 1.756 mm (0.0690 – 0.0691 in.)
		6	1.756 – 1.759 mm (0.0691 – 0.0693 in.)
	Connecting rod oil clearance	STD	0.032 – 0.050 mm (0.0013 – 0.0020 in.)
		U/S 0.25	0.033 – 0.073 mm (0.0013 – 0.0029 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod bend	Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.015 mm (0.0059 in.)
	Bushing inside diameter		26.008 – 26.020 mm (1.0239 – 1.0244 in.)
	Piston pin diameter		26.000 – 22.012 mm (1.0236 – 1.0241 in.)
Crankshaft	Piston pin oil clearance	STD	0.004 – 0.012 mm (0.0002 – 0.0005 in.)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt outside diameter	STD	8.40 – 8.60 mm (0.3307 – 0.3386 in.)
		Minimum	8.00 mm (0.3150 in.)
	Thrust clearance	STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness	STD	2.440 – 2.490 mm (0.0961 – 0.0980 in.)
		O/S 0.125	2.503 – 2.553 mm (0.0985 – 0.1005 in.)
		O/S 0.250	2.565 – 2.615 mm (0.1010 – 0.1030 in.)
	Main journal oil clearance	STD	0.042 – 0.060 mm (0.0017 – 0.0024 in.)
		U/S 0.25	0.041 – 0.081 mm (0.0016 – 0.0032 in.)
		Maximum	0.10 mm (0.0039 in.)
	Main journal diameter	STD	68.982 – 69.000 mm (2.7158 – 2.7165 in.)
		U/S 0.25	68.745 – 68.755 mm (2.7065 – 2.7069 in.)
	Main bearing center wall thickness (Reference)	Mark 2	2.489 – 2.492 mm (0.0980 – 0.0981 in.)
		3	2.492 – 2.495 mm (0.0981 – 0.0982 in.)
		4	2.495 – 2.498 mm (0.0982 – 0.0983 in.)
		5	2.498 – 2.501 mm (0.0983 – 0.0985 in.)
		6	2.501 – 2.504 mm (0.0985 – 0.0986 in.)
	Crank pin diameter	STD	56.982 – 57.000 mm (2.2434 – 2.2441 in.)
		U/S 0.25	56.745 – 56.755 mm (2.2341 – 2.2344 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out-of-round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out-of-round	Maximum	0.02 mm (0.0008 in.)

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
Distributor x Cylinder head	18	180	13
No. 1 engine hanger x Cylinder head	41	420	30
No. 2 engine hanger x Cylinder head	41	420	30
Air intake chamber x Intake manifold	21	210	15
Intake manifold x Cylinder head	21	210	15
Heater inlet pipe x Intake manifold	21	210	15
EGR pipe x Cylinder head	21	210	15
EGR pipe x EGR valve Union nut	78	800	58
Water outlet x Cylinder head	21	210	15
Generator bracket x Cylinder head	43	440	32
Cylinder head x Cylinder block	1st 2nd 3rd	39 Turn 90° Turn 90°	400 Turn 90° Turn 90°
Cylinder head x Timing chain cover	21	210	15
Camshaft bearing cap x Cylinder head	16	160	12
Camshaft timing gear x Camshaft	74	750	54
Chain tensioner x Cylinder head	21	210	15
Water bypass outlet x Cylinder head	21	210	15
Heater pipe x Timing chain cover	21	210	15
Heater pipe x Cylinder head	20	200	14
Exhaust manifold x Cylinder head	39	400	29
Heat insulator x Exhaust manifold	19	195	14
Front exhaust pipe x Exhaust manifold	63	630	46
No. 1 support bracket x Transmission	24	240	17
No. 1 support bracket clamp bolt	19.5	195	14
Front exhaust pipe x Rear TWC	46	470	34
No. 2 water bypass pipe x Cylinder head	20	200	14
No. 2 water bypass pipe x No. 1 engine hanger	20	200	14
Fuel inlet hose x Fuel filter	29	300	22
Intake manifold stay x Air intake chamber	36	360	26
Intake manifold stay x Cylinder block	36	360	26
Oil dipstick guide x Intake manifold	20	200	14
Oil dipstick guide x No. 1 oil pan	20	200	14
PS reservoir tank x Air intake chamber	20	200	14
Oil jet x Cylinder block	20	200	14
Vibration damper x Cylinder block	20	200	14
Chain tensioner slipper x Cylinder block	69	700	51
Timing chain cover x Cylinder block	21	210	15
Drive belt idler pulley x Timing chain cover	43	440	32
Crankshaft pulley x Crankshaft	412	4,200	304
Transmission housing x No. 1 oil pan	72	730	53
Oil level sensor x No. 1 oil pan	5.4	55	48 in.-lbf
Water pump x Cylinder block	21	210	15
Radiator pipe x No. 1 oil pan	21	210	15

1996 LAND CRUISER (RM451U)

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SERVICE SPECIFICATIONS – ENGINE MECHANICAL

A/C compressor bracket x No. 1 oil pan		37	375	27
A/C compressor bracket x Cylinder block		37	375	27
A/C compressor x A/C compressor bracket		25	250	18
Oil check valve x Cylinder block		25	250	18
Main bearing cap x Cylinder block	1st	74	750	54
	2nd	Turn 90°	Turn 90°	Turn 90°
Connecting rod cap x Connecting rod	1st	48	490	35
	2nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		21	210	15
Oil cooler cover x Cylinder block		21	210	15
LH engine mounting bracket x Cylinder block		69	700	51
LH insulator x LH engine mounting bracket		72	730	43
RH engine mounting bracket x Cylinder block		69	700	51
RH insulator x RH engine mounting bracket		72	730	43
PS pump x Cylinder block		36	370	27
Knock sensor x Cylinder block		44	450	33
Oil filter union x Cylinder block		44	450	33
Drive plate x Crankshaft		100	1,000	74
Transmission x Cylinder block		72	730	53
Transmission x No. 1 oil pan		72	730	53
Torque converter clutch x Drive plate		55	550	41
A/T oil cooler pipe x Union (Transmission)		34	350	25
Starter x Transmission		39	400	29
Frame crossmember x Frame		61	620	45
Frame crossmember x Engine rear mounting insulator		74	750	54
Engine front mounting insulator x Frame		74	750	54
Transfer shift lever x Transmission		18	185	13
Transmission shift lever assembly x Body		5.4	55	48 in.-lbf
Transmission control rod x Control shaft lever		13	130	9
Front propeller shaft x Front differential		74	750	54
Front propeller shaft x Transfer		74	750	54
Rear propeller shaft x Rear differential		88	900	65
Rear propeller shaft x Transfer		88	900	65
Stabilizer bar bracket mounting bolt		18	185	13
Stabilizer bar x Axle carrier		25	260	19
PS pressure hose x PS pump		56	575	42
Rear TWC x Center pipe		40	400	29
Center pipe x Tailpipe		40	400	29
Heated oxygen sensor (Bank 1 sensor 1) x Front exhaust pipe		20	200	14
Heated oxygen sensor (Bank 1 sensor 2) x Center pipe		20	200	14
No. 2 support bracket x Frame		18.5	185	13
No. 3 support bracket x Frame		18.5	185	13
No. 4 support bracket x Frame		18.5	185	13
Exhaust pipe damper x Tailpipe		19.5	195	14

EMISSION CONTROL

SERVICE DATA

SS1EQ-01

VSV for EVAP	Resistance	at 20°C (68°F)	30 – 34 Ω
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SS-10

SERVICE SPECIFICATIONS – EMISSION CONTROL

SS1ER-01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Charcoal canister x Charcoal canister bracket	14	145	10
Charcoal canister bracket x Body	18	185	13
TVV x Cylinder head	29	300	22
Intake manifold stay x Air intake chamber	36	360	26
Intake manifold stay x Cylinder block	36	360	26
EGR valve x Air intake chamber	for stud bolt	9	78 in.·lbf
	for nut	18	13
EGR valve x EGR pipe	64	650	47
EGR valve x EGR vacuum modulator	18	185	13

SERVICE SPECIFICATIONS – SFI

SFI

SERVICE DATA

SS1ES-01

Fuel pressure regulator	Fuel pressure at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm ² , 38 – 44 psi)
Fuel pump	Resistance at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance at 20°C (68°F) Injection volume Difference between each cylinder Fuel leakage	13.4 – 14.2 Ω 69 – 88 cm ³ (4.2 – 5.4 cu in.) per 15 sec. 5 cm ³ (0.3 cu in.) or less 1 drop or less per 12 min.
MAF meter	Resistance (THA – E2) at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
Throttle body	Throttle body fully closed angle Dashpot setting speed Throttle opener setting speed	6° 2,200 ± 300 rpm 700 – 1,000 rpm
Throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) VTA – E2 0.50 mm (0.020 in.) IDL – E2 0.75 mm (0.030 in.) IDL – E2 Throttle valve fully open VTA – E2 – VC – E2	0.2 – 5.7 kΩ 2.3 kΩ or less Infinity 2.0 – 10.2 kΩ 2.5 – 5.9 kΩ
IAC valve	Resistance (B1 – S1 and S3, B2 – S2 and S4) at cold (–10 – 50 °C (–50 – 122°F)) at hot (50 – 100°C (122 – 212°F))	15 – 25 Ω 20 – 30 Ω
Fuel pump resistor	Resistance at 20°C (68°F)	0.70 – 0.76 Ω
VSV for fuel pressure control	Resistance at 20°C (68°F)	37 – 44 Ω
ECT sensor	Resistance at –20°C (–4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F) 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
EGR gas temp sensor	Resistance at 50°C (122°F) at 100°C (212°F) 150°C (302°F)	64 – 97 kΩ 11 – 16 kΩ 2 – 4 kΩ
Heated oxygen sensor	Heater coil resistance at 20°C (68°F)	11 – 16 Ω
Fuel cut rpm	Fuel return rpm	1,200 rpm

TORQUE SPECIFICATION

Part tightened		N-m	kgf-cm	ft-lbf
Fuel line	for union bolt	29	300	22
	for flare nut	30	310	22
Second seat x Body		39	400	29
Fuel pump bracket assembly x Fuel tank		3.9	40	35 in.-lbf
Fuel inlet hose x Fuel filter		29	300	22
Fuel inlet pipe x Fuel filter		29	300	22
Fuel filter x Intake manifold		21	210	15
Fuel pressure regulator x Delivery pipe		25	250	18
Delivery pipe x Intake manifold		21	210	15
Fuel inlet pipe x Delivery pipe	Union bolt	29	300	22
	Bolt	20	200	14
Fuel inlet pipe x Fuel filter		29	300	22
Fuel return pipe x Intake manifold		20	200	14
Air intake chamber x Intake manifold		21	210	15
Intake manifold stay x Air intake chamber		36	360	26
Intake manifold stay x Cylinder block		36	360	26
PS reservoir tank x Air intake chamber		18	185	13
Heater inlet pipe x Air intake chamber		20	200	14
Drain plug x Fuel tank		6.5	65	57 in.-lbf
Fuel tank breather tube x Fuel tank		1.5	15	13 in.-lbf
Fuel tank filler pipe x Fuel tank		3.5	35	31 in.-lbf
Fuel tank band x Body		39	400	29
MAF meter x Bracket		6.9	70	61 in.-lbf
MAF meter x Air cleaner cap		6.9	70	61 in.-lbf
Throttle body x Air intake chamber		21	210	15
Fuel pump resistor x Body		18	185	13
ECT sensor x Cylinder head		24.5	250	17.5
EGR gas temperature sensor x Air intake chamber		20	200	14
Knock sensor x Cylinder block		44	450	33

COOLING

SERVICE DATA

SS1EU-01

Thermostat	Valve opening temperature	80 – 84 °C (176 – 183 °F)
	Valve lift at 95 °C (203 °F)	10 mm (0.39 in.) or more
Radiator cap	Relief valve opening pressure	74 – 103 kPa (0.75 – 1.05 kgf/cm ² , 10.7 – 14.9 psi)
	STD Minimum	59 kPa (0.6 kgf/cm ² , 8.5 psi)

COOLING

SERVICE DATA

SS1EU-01

Thermostat	Valve opening temperature	80 – 84 °C (176 – 183 °F)
	Valve lift at 95 °C (203 °F)	10 mm (0.39 in.) or more
Radiator cap	Relief valve opening pressure	74 – 103 kPa (0.75 – 1.05 kgf/cm ² , 10.7 – 14.9 psi)
	STD Minimum	59 kPa (0.6 kgf/cm ² , 8.5 psi)

LUBRICATION

SERVICE DATA

SS1EW-01

Oil pressure		at idle speed at 3,000 rpm	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more 245 – 490 kPa (2.5 – 5.0 kgf/cm ² , 36 – 71 psi)
Oil pump	Body clearance	STD Maximum	0.100 – 0.170 mm (0.0039 – 0.0067 in.) 0.30 mm (0.0118 in.)
	Side clearance	STD Maximum	0.030 – 0.090 mm (0.0012 – 0.0035 in.) 0.15 mm (0.0059 in.)
	Tip clearance	STD Maximum	0.030 – 0.160 mm (0.0012 – 0.0063 in.) 0.25 mm (0.0098 in.)

TORQUE SPECIFICATION

Part tightened		N-m	kgf-cm	ft-lbf
Oil pan x Drain plug		25	250	18
Oil pump x Relief valve plug		49	500	36
Drive belt idler pulley x Oil pump		43	440	32
Oil strainer x No. 1 oil pan		20	200	14
Baffle plate x No. 1 oil pan		9.0	90	78 in.-lbf
No. 1 oil pan x Cylinder block	14 mm head bolt	44	440	32
	12 mm head bolt	20	200	14
No. 1 oil pan x Oil pump (Timing chain cover)		20	200	14
No. 2 oil pan x No. 1 oil pan	Bolt	7.8	80	69 in.-lbf
	Nut	8.8	90	78 in.-lbf
No. 1 oil pan x Transmission housing		72	730	53
Oil level sensor x No. 1 oil pan		5.4	55	48 in.-lbf
Water pump x Cylinder block		21	210	15
Radiator pipe x No. 1 oil pan		21	210	15
A/C compressor bracket x No. 1 oil pan		37	375	27
A/C compressor bracket x Cylinder block		37	375	27
A/C compressor x A/C compressor bracket		25	250	18
Oil cooler cover x Relief valve plug		37	375	27
Oil cooler x Oil cooler cover		17	170	12
Oil cooler cover x Cylinder block		21	210	15
No. 1 exhaust manifold x Cylinder head		39	400	29
No. 1 exhaust manifold x Heat insulator		19	195	14
Front exhaust pipe x Exhaust manifold		63	630	46
No. 1 support bracket x Transmission housing		24	240	17
Front exhaust pipe x No. 1 support bracket	Clamp bolt	19.5	195	14
Front exhaust pipe x Rear TWC		46	470	34
Oil check valve x Cylinder block		25	250	18

IGNITION

SERVICE DATA

SS1EY-03

Firing order	–	1 – 5 – 3 – 6 – 2 – 4
High-tension cord	Resistance Maximum	25 k Ω per cord
Spark plug	Recommended spark plug Correct electrode gap	ND NGK K16R-U BKR5EYA 0.8 mm (0.031 in.)
Ignition coil	Primary coil resistance Secondary coil resistance	at cold at hot at cold at hot 0.36 – 0.55 Ω 0.45 – 0.65 Ω 9.0 – 15.4 k Ω 11.4 – 18.1 k Ω
Distributor	Air gap Pickup coil resistance	0.2 – 0.4 mm (0.008 – 0.016 in.) at cold (G1 – G \ominus) (G2 – G \ominus) (NE – G \ominus) at hot (G1 – G \ominus) (G2 – G \ominus) (NE – G \ominus) 185 – 275 Ω 185 – 275 Ω 185 – 275 Ω 240 – 325 Ω 240 – 325 Ω 240 – 325 Ω
Crankshaft position sensor	Resistance	at cold (NE \oplus – NE \ominus) at hot (NE \oplus – NE \ominus) 1,630 – 2,740 Ω 2,065 – 3,225 Ω

SS-18

SERVICE SPECIFICATIONS – IGNITION

SS1EZ-01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	20	200	14
Distributor x Cylinder head	18	180	13
Crankshaft position sensor protector x No. 1 oil pan	20	200	14
Crankshaft position sensor x No. 1 oil pan	9	90	78 in.·lbf

STARTING

SERVICE DATA

SS1F0-04

Starter (1.4 kW)	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 less
	Brush length	STD	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load	STD	17.6 – 23.5 N (1.79 – 2.41 kgf, 4.0 – 5.3 lbf)
		Minimum	11.8 N (1.20 kgf, 2.7 lbf)
	Commutator		
	Diameter	STD	30.0 mm (1.18 in.)
		Minimum	29.0 mm (1.14 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
Starter (2.0 kW)	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)
	Rated voltage and output power		12 V 2.0 kW
	No-load characteristics	Current	100 A or less at 11.5 V
		rpm	2,500 rpm or less
	Brush length	STD	15.0 mm (0.591 in.)
		Minimum	9.0 mm (0.354 in.)
	Spring installed load	STD	21.5 – 27.5 N (2.19 – 2.80 kgf, 4.8 – 6.2 lbf)
		Minimum	12.7 N (1.29 kgf, 2.9 lbf)
	Commutator		
	Diameter	STD	35.0 mm (1.38 in.)
		Minimum	34.0 mm (1.34 in.)
	Undercut depth	STD	0.7 mm (0.028 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)

SS-20

SERVICE SPECIFICATIONS – STARTING

SS1F1-04

TORQUE SPECIFICATION

Part tightened		N-m	kgf-cm	ft-lbf
Starter mounting bolt		39	400	29
Starter wire mounting nut		8.8	90	78 in.-lbf
Terminal bolt x Terminal C		17	173	12.5
Terminal bolt x Terminal 30		17	173	12.5
End cover x Magnetic housing	1.4 kW	2.5	25	22 in.-lbf
	2.0 kW	3.6	37	32 in.-lbf
End cover x Field frame	1.4 kW	1.5	15	13 in.-lbf
	2.0 kW	3.8	40	35 in.-lbf
Starter housing x Magnetic switch	1.4 kW	5.9	60	52 in.-lbf
	2.0 kW	9.3	95	82 in.-lbf
Field frame x Armature assembly	1.4 kW	5.9	60	52 in.-lbf
	2.0 kW	9.3	95	82 in.-lbf
Lead wire x Terminal C of starter		5.9	60	52 in.-lbf

CHARGING

SERVICE DATA

SS1F2-04

Battery	Voltage	at 20° C (68° F)	12.7 – 12.9
Drive belt	Tension	New belt Used belt	400 – 580 N (41.0 – 59.1 kgf, 90.4 – 130.2 lbf) 200 – 390 N (20.4 – 40.0 kgf, 45.0 – 88.2 lbf)
Generator	Rated output		12 V 80 A
	Rotor coil resistance	at 20° C (68° F)	2.8 – 3.0 Ω
	Slip ring diameter	STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Minimum	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage	at 25° C (77° F) at 115° C (239° F)	14.0 – 15.1 V 13.5 – 14.3 V

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Bearing retainer 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 x Rectifier holder	2.9	30	25 in·lbf
Rear end cover x Rectifier holder	4.4	45	39 in·lbf
Rectifier plate x Rectifier holder	3.8	39	34 in·lbf
Terminal insulator x Rectifier holder	4.1	42	36 in·lbf
Drive belt adjusting bar x Timing chain cover	21	210	15
Generator x Generator bracket	59	600	43
Drive belt adjusting bar x Generator	21	210	15

AUTOMATIC TRANSMISSION

SERVICE DATA

SS1E6-02

Line pressure (Wheel locked)		
Engine idling	D position	422 – 481 kPa (4.3 – 4.9 kgf/cm ² , 61 – 70 psi)
	R position	510 – 608 kPa (5.2 – 6.2 kgf/cm ² , 74 – 88 psi)
AT stall (Throttle valve fully opened)	D position	1,285 – 1,530 kPa (13.1 – 15.6 kgf/cm ² , 128 – 153 psi)
	R position	1,579 – 1,932 kPa (16.1 – 19.7 kgf/cm ² , 158 – 193 psi)
Engine stall revolution	D and R position	1,950 ± 150 rpm
Time lag	N → D position	Less than 1.2 seconds
	N → R position	Less than 1.5 seconds
Engine idle speed (A/C OFF)	N position	650 ± 50 rpm
Throttle cable adjustment (throttle valve fully closed) Between boot and face and inner cable stopper		0 – 1 mm (0 – 0.04 in.)
Torque converter clutch installation distance		More than 15.7 mm (0.618 in.)
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter clutch runout	Max.	0.30 mm (0.0118 in.)
Shift point		
D position Throttle valve fully opened	1 → 2	56 – 62 km/h (35 – 39 mph)
	2 → 3	103 – 114 km/h (64 – 71 mph)
	3 → O/D	152 – 163 km/h (94 – 101 mph)
	O/D → 3	145 – 156 km/h (90 – 97 mph)
	3 → 2	95 – 101 km/h (59 – 63 mph)
	2 → 1	42 – 47 km/h (26 – 29 mph)
2 position Throttle valve fully opened	3 → 2	116 – 127 km/h (72 – 79 mph)
L position Throttle valve fully opened	2 → 1	56 – 62 km/h (38 – 39 mph)
Lock-up point		Throttle valve opening 5 %
D position	Lock-up ON	77 – 83 km/h (48 – 52 mph)
	Lock-up OFF	68 – 74 km/h (42 – 46 mph)

TORQUE SPECIFICATION

Part tightened		N-m	kgf-cm	ft-lbf
Valve body x Transmission case		10	100	7
Oil stainer x Valve body		10	100	7
Oil pan		7.4	75	65 in.-lbf
Drain plug x Oil pan		20	205	15
Parking lock pawl bracket x Transmission case		7.4	75	65 in.-lbf
Front propeller shaft x Front differential		74	750	54
Front propeller shaft x Transfer		74	750	54
Rear propeller shaft x Transfer		88	900	65
Rear propeller shaft x Rear differential		88	900	65
Drive plate x Crankshaft		98	1,000	72
Torque converter clutch x Drive plate		55	550	40
Front exhaust pipe x Exhaust manifold		62	630	46
Front exhaust pipe x TWC		39	400	29
Oil cooler pipe		34	350	25
Transmission x Engine		71	730	53
Exhaust pipe clamp		19	195	14
Park/neutral position switch	Nut	6.9	70	61 in.-lbf
	Bolt	13	130	9
No. 2 vehicle speed sensor		5.4	55	48 in.-lbf
Speedometer driven gear sleeve x Locking plate		16	160	12
Starter mounting bolt		39	400	29
Transfer shift lever		18	185	13
Stabilizer bar bracket mounting bolt		18	185	13
Engine under cover mounting bolt		28	290	21
Exhaust pipe No. 1 support bracket x Torque converter clutch housing		24	240	17
Crossmember x Frame		61	620	45
Engine rear mounting x Crossmember		74	750	54
Transmission shift lever assembly x Body		5.4	55	48 in.-lbf
Oil cooler mounting bolt		11	115	8

SERVICE SPECIFICATIONS – TRANSFER

TRANSFER

SERVICE DATA

SS1E8-02

Idler gear rear bearing adjusting shim thickness	Mark 2	0.30 mm (0.0118 in.)
	3	0.45 mm (0.0177 in.)
	4	2.40 mm (0.0945 in.)
	5	2.60 mm (0.1024 in.)
	6	2.80 mm (0.1102 in.)
	7	3.00 mm (0.1181 in.)
	8	3.20 mm (0.1260 in.)
	9	3.40 mm (0.1339 in.)
	10	3.60 mm (0.1417 in.)
	11	3.80 mm (0.1496 in.)
	12	4.00 mm (0.1575 in.)
	13	0.55 mm (0.0216 in.)
Output shaft rear bearing adjusting shim thickness	Mark B	0.30 mm (0.0118 in.)
	C	0.45 mm (0.0177 in.)
	D	1.00 mm (0.0394 in.)
	E	1.20 mm (0.0472 in.)
	F	1.40 mm (0.0551 in.)
	G	1.60 mm (0.0630 in.)
	H	1.80 mm (0.0709 in.)
	J	2.00 mm (0.0787 in.)
	K	2.20 mm (0.0866 in.)
	L	2.40 mm (0.0945 in.)
	M	2.60 mm (0.1024 in.)
	N	0.55 mm (0.0216 in.)
Input gear snap ring thickness	Mark A	2.00 mm (0.0787 in.)
	B	2.10 mm (0.0827 in.)
	C	2.20 mm (0.0866 in.)
	D	2.30 mm (0.0906 in.)
	E	2.40 mm (0.0945 in.)
	F	2.50 mm (0.0984 in.)
	G	2.60 mm (0.1024 in.)
	H	2.70 mm (0.1063 in.)
	J	2.80 mm (0.1102 in.)
Input shaft rear ball bearing snap ring thickness	Mark A	2.00 mm (0.0787 in.)
	B	2.10 mm (0.0827 in.)
	C	2.20 mm (0.0866 in.)
	D	2.30 mm (0.0906 in.)
	E	2.40 mm (0.0945 in.)
Idler low gear thrust clearance	STD	0.125 – 0.275 mm (0.0049 – 0.0108 in.)
	Max.	0.275 mm (0.0108 in.)
Idler low gear radial clearance	STD	0.015 – 0.068 mm (0.0006 – 0.0027 in.)
	Max.	0.068 mm (0.0027 in.)
High speed output gear thrust clearance	STD	0.10 – 0.25 mm (0.0039 – 0.0098 in.)
	Max.	0.25 mm (0.0098 in.)
High speed output gear radial clearance	STD	0.015 – 0.071 mm (0.0006 – 0.0028 in.)
	Max.	0.071 mm (0.0028 in.)
Center differential backlash	Min.	0.05 mm (0.0020 in.)

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SERVICE SPECIFICATIONS – TRANSFER

Center differential side gear thrust washer thickness		1.70 mm (0.0669 in.) 1.85 mm (0.0728 in.) 2.00 mm (0.0787 in.) 2.15 mm (0.0846 in.) 2.30 mm (0.0906 in.) 2.45 mm (0.0965 in.) 2.60 mm (0.1024 in.) 2.75 mm (0.1083 in.) 2.90 mm (0.1142 in.) 3.05 mm (0.1201 in.)
Front drive gear piece snap ring thickness	Mark A B C D E F G H J K L	2.00 mm (0.0787 in.) 2.10 mm (0.0827 in.) 2.20 mm (0.0866 in.) 2.30 mm (0.0906 in.) 2.40 mm (0.0945 in.) 2.50 mm (0.0984 in.) 2.60 mm (0.1024 in.) 2.70 mm (0.1063 in.) 2.80 mm (0.1102 in.) 1.80 mm (0.0709 in.) 1.90 mm (0.0748 in.)
Front extension housing ball bearing snap ring thickness	Mark A B	1.7 mm (0.0669 in.) 1.8 mm (0.0709 in.)
Front output shaft hub snap ring thickness	Mark A B C D E	1.8 mm (0.0709 in.) 1.9 mm (0.0748 in.) 2.0 mm (0.0787 in.) 2.1 mm (0.0827 in.) 2.2 mm (0.0866 in.)
Oil pump driven rotor body clearance	STD Max.	0.08 – 0.17 mm (0.0031 – 0.0067 in.) 0.17 mm (0.0067 in.)
Oil pump driven rotor body tip clearance	STD Max.	0.05 – 0.15 mm (0.0020 – 0.0059 in.) 0.15 mm (0.0059 in.)
Oil pump side clearance	STD Max.	0.03 – 0.10 mm (0.0012 – 0.0039 in.) 0.10 mm (0.0039 in.)
Rear extension housing ball bearing snap ring thickness	Mark A B	1.7 mm (0.0669 in.) 1.8 mm (0.0709 in.)
Rear output shaft ball bearing snap ring thickness	Mark 1 2 3 4	1.95 mm (0.0768 in.) 2.05 mm (0.0807 in.) 2.15 mm (0.0847 in.) 2.25 mm (0.0886 in.)
Motor actuator		
Terminal 2 – Terminal 3	STD resistance	0.3 – 100 Ω
Terminal 2 or 3 – Body ground	STD resistance	More than 0.5 M Ω

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
Oil pump plate and separator x Rear extension housing	4.9	50	43 in.-lbf
Oil pump cover x Rear extension housing	4.9	50	43 in.-lbf
Lever lock pin	12	120	9
Oil strainer x Rear case	4.9	50	43 in.-lbf
Oil receiver x Front case	12	120	9
Case cover x Rear case	37	380	27
Rear extension housing x Rear case	37	380	27
Front extension housing x Front case	37	380	27
Center differential lock Indicator switch	37	380	14
L4 position switch	37	380	27
Neutral position switch	37	380	27
Screw plug x Front case	19	190	14
Screw plug x Rear extension housing	29	300	22
Motor actuator x Front case	18	185	13
Differential front case x Differential rear case	98	1,000	72
Temporarily tighten	88	900	65
Front case x Rear case	37	380	27
Rear case x Retainer	39	400	28
Dynamic damper x Rear extension housing	37	380	27

PROPELLER SHAFT

SERVICE DATA

SS1EA-02

Propeller shaft runout	Max.	0.8 mm (0.031 in.)
Spider bearing axial play		Less than 0.05 mm (0.0020 in.)
Snap ring thickness		
Font propeller shaft and rear propeller shaft (Type B)	Mark Color	
	1 –	2.100 – 2.150 mm (0.0827 – 0.0846 in.)
	2 –	2.150 – 2.200 mm (0.0846 – 0.0866 in.)
	3 –	2.200 – 2.250 mm (0.0866 – 0.0886 in.)
	– Brown	2.250 – 2.300 mm (0.0886 – 0.0906 in.)
	– Blue	2.300 – 2.350 mm (0.0906 – 0.0925 in.)
	6 –	2.350 – 2.400 mm (0.0925 – 0.0945 in.)
	7 –	2.400 – 2.450 mm (0.0945 – 0.0965 in.)
	8 –	2.450 – 2.500 mm (0.0965 – 0.0984 in.)
Rear propeller shaft (Type A)	Color	
	–	2.00 mm (0.0787 in.)
	Brown	2.03 mm (0.0799 in.)
	Blue	2.06 mm (0.0811 in.)
	–	2.09 mm (0.0823 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Front propeller shaft x Front differential	74	750	54
Front propeller shaft x Transfer	74	750	54
Rear propeller shaft x Rear differential	88	900	65
Rear propeller shaft x Transfer	88	900	65

SUSPENSION AND AXLE

SERVICE DATA

SS1EC-02

Cold tire inflation pressure	Tire size P275/70R 16	220 kPa (2.2 kgf/cm ² , 32 psi)
Follow spring and bumper stopper clearance	Follow spring clearance (Front) Bumper stopper clearance (Rear)	36 mm (1.42 in.) 104 mm (4.09 in.)
Front wheel alignment	Camber Left-right error	1°00' ± 45' 45' or less
	Caster Left-right error	3°00' ± 60' 45' or less
	Steering axis inclination	13°00' ± 45'
	Toe-in (Total) Inspection STD Adjustment STD	0.2° ± 0.2° (2 ± 2 mm, 0.08 ± 0.08 in.) 0.2° ± 0.1° (2 ± 1 mm, 0.08 ± 0.04 in.)
	Wheel angle (Max.) Inside wheel Outside wheel	32°00' – 35°00' 31°00'
Tire and wheel	Tire runout	3.0 mm (0.118 in.) or less
	Wheel balance (Unbalance after adjustment)	13.0 g (0.029 lb) or less
	Wheel bearing preload (at starting) Front	28 – 56 N (2.9 – 5.7 kgf, 6.4 – 12.6 lbf)
	(Rotating load at hub bolt) Rear	26 – 57 N (2.6 – 5.8 kgf, 5.7 – 12.8 lbf)
Front axle	Steering knuckle bearing preload (Rotating load at knuckle end, before installing dust seal)	25 – 44 N (2.5 – 4.5 kgf, 5.5 – 9.9 lbf)
Front differential	Drive pinion preload (at starting) New bearing Reused bearing	0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.-lbf) 0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.-lbf)
	Total preload (at starting)	Drive pinion preload plus 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)
	Drive pinion to ring gear backlash	0.13 – 0.18 mm (0.0051 – 0.0071 in.)
	Pinion gear to side gear backlash	0.05 – 0.20 mm (0.0020 – 0.0079 in.)
	Ring gear runout Max.	0.10 mm (0.0039 in.)
	Companion flange runout Max. Radial Lateral	0.10 mm (0.0039 in.) 0.10 mm (0.0039 in.)
	Oil seal drive in depth	1.0 mm (0.039 in.)
	Side gear thrust washer thickness w/o Differential lock	1.6 mm (0.063 in.) 1.7 mm (0.067 in.) 1.8 mm (0.071 in.) 0.9 mm (0.035 in.)
	w/ Differential lock	1.0 mm (0.039 in.) 1.1 mm (0.043 in.) 1.2 mm (0.047 in.) 1.3 mm (0.051 in.)

SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Front differential (cont'd)	Drive pinion adjusting plate washer thickness	1.70 mm (0.0669 in.)
		1.73 mm (0.0681 in.)
		1.76 mm (0.0693 in.)
		1.79 mm (0.0705 in.)
		1.82 mm (0.0717 in.)
		1.85 mm (0.0728 in.)
		1.88 mm (0.0740 in.)
		1.91 mm (0.0752 in.)
		1.94 mm (0.0764 in.)
		1.97 mm (0.0776 in.)
		2.00 mm (0.0787 in.)
		2.03 mm (0.0799 in.)
		2.06 mm (0.0811 in.)
		2.09 mm (0.0823 in.)
		2.12 mm (0.0835 in.)
		2.15 mm (0.0846 in.)
		2.18 mm (0.0858 in.)
		2.21 mm (0.0870 in.)
		2.24 mm (0.0882 in.)
		2.27 mm (0.0894 in.)
		2.30 mm (0.0906 in.)
		2.33 mm (0.0917 in.)
Rear differential	Drive pinion preload (at starting)	New bearing Reused bearing
		1.3 – 2.0 N·m (13 – 20 kgf·cm, 11.3 – 17.4 in.-lbf) 0.7 – 1.0 N·m (7 – 10 kgf·cm, 6.1 – 8.7 in.-lbf)
	Total preload (at starting)	Drive pinion preload plus
	w/o Differential lock	0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.-lbf)
	w/ Differential lock	0.3 – 0.7 N·m (3 – 7 kgf·cm, 2.6 – 6.1 in.-lbf)
	Drive pinion to ring gear backlash	0.15 – 0.20 mm (0.0059 – 0.0079 in.)
	Pinion gear to side gear backlash	0.02 – 0.20 mm (0.0008 – 0.0079 in.)
	Ring gear runout	Max. 0.10 mm (0.0039 in.)
	Companion flange runout	Max. Radial Lateral
		0.10 mm (0.0039 in.) 0.10 mm (0.0039 in.)
	Oil seal drive in depth	1.0 mm (0.039 in.)
	Side gear thrust washer thickness	1.60 mm (0.0630 in.) 1.75 mm (0.0689 in.) 1.90 mm (0.0748 in.) 2.05 mm (0.0807 in.)
	Drive pinion adjusting plate washer thickness	1.05 mm (0.0413 in.) 1.10 mm (0.0433 in.) 1.15 mm (0.0453 in.) 1.20 mm (0.0472 in.) 1.25 mm (0.0492 in.) 1.30 mm (0.0512 in.) 1.35 mm (0.0531 in.) 1.40 mm (0.0551 in.) 1.45 mm (0.0571 in.) 1.50 mm (0.0591 in.) 1.55 mm (0.0610 in.)

Rear differential (cont'd)	Side bearing adjusting plate thickness (w/ Differential lock only)	2.67 mm (0.1051 in.)
		2.70 mm (0.1063 in.)
		2.73 mm (0.1075 in.)
		2.76 mm (0.1087 in.)
		2.79 mm (0.1098 in.)
		2.82 mm (0.1110 in.)
		2.85 mm (0.1122 in.)
		2.88 mm (0.1134 in.)
		2.91 mm (0.1146 in.)
		2.94 mm (0.1157 in.)
		2.97 mm (0.1169 in.)
		3.00 mm (0.1181 in.)
		3.03 mm (0.1193 in.)
		3.06 mm (0.1205 in.)
		3.09 mm (0.1217 in.)
		3.12 mm (0.1228 in.)
		3.15 mm (0.1240 in.)
		3.18 mm (0.1252 in.)
		3.21 mm (0.1264 in.)
		3.24 mm (0.1276 in.)
		3.27 mm (0.1287 in.)
		3.30 mm (0.1299 in.)
		3.33 mm (0.1311 in.)
Rear axle	Rear axle shaft runout Max. Distance between top surface of axle housing and lock nut	0.8 mm (0.031 in.) -0.2 – 0.9 mm (-0.0079 – 0.0354 in.)

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf
FRONT			
Axle hub x Disc	64	650	47
Axle hub bearing lock nut	64	650	47
Flange x Axle hub	35	360	26
Brake caliper x Axle carrier	123	1,250	90
Brake caliper x Flexible hose	30	310	22
Steering knuckle x Knuckle arm	96	980	71
Bearing cap x Steering knuckle	96	980	71
Knuckle arm x Tie rod	91	925	67
Steering knuckle x Knuckle spindle	47	475	34
Oil seal end retainer x Knuckle arm	5.4	55	48 in.-lbf
ABS speed sensor set bolt x Steering knuckle	18	185	13
Hub nut	Steel wheel	147	1,500
	Aluminum wheel	103	1,050
Drain plug	49	500	36
Filler plug	49	500	36
Propeller shaft x Companion flange	88	900	65
Side bearing cap x Differential carrier	78	800	58
Ring gear x Differential case	97	985	71
Drive pinion x Companion flange	196 – 343	2,000 – 3,500	145 – 253
Differential LH case x RH case	47	480	35
Differential lock shift retainer	24	240	17
Differential lock screw plug	22	220	16
Differential lock indicator switch	40	410	30
Differential lock actuator	26	270	20
Differential carrier x Axle housing	27	280	20
Adjusting nut lock x Bearing cap	13	130	9
Follow spring x Frame	9.2	94	82 in.-lbf
Stabilizer bar x Axle housing	25	260	19
Shock absorber x Axle housing	69	700	51
Shock absorber x Frame	69	700	51
Stabilizer bar link x Cover	18	185	13
Stabilizer bar link x Link bracket	103	1,050	76
Lateral control rod x Frame	171	1,750	127
Lateral control rod x Axle housing	171	1,750	127
Leading arm x Frame	177	1,800	130
Leading arm x Axle housing	171	1,750	127
REAR			
Rear axle shaft x Axle hub	34	340	25
Rear axle bearing lock nut	59	600	43
Rear axle bearing lock nut screw	5.4	55	48 in.-lbf
Brake caliper x Axle carrier	103	1,050	76
ABS speed sensor set bolt	18	185	13

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SERVICE SPECIFICATIONS – SUSPENSION AND AXLE

Hub nut	Steel wheel	147	1,500	109
	Aluminum wheel	103	1,050	76
Drain plug		49	500	36
Filler plug		49	500	36
Pinion shaft pin	w/o Differential lock	27	275	20
	w/ Differential lock	58	590	43
Propeller shaft x Companion flange		74	750	54
Side bearing cap x Differential carrier	w/o Differential lock	78	800	58
	w/ Differential lock	113	1,150	83
Ring gear x Differential case		110	1,125	81
Companion flange x Drive pinion (Maximum torque)		441	4,500	325
Differential carrier x Axle housing		73	740	54
Adjusting nut lock x Bearing cap		13	130	9
Differential case x Differential cover		58	590	43
Differential lock shift fork set bolt		20	200	14
Differential lock actuator		24	240	17
Differential lock cover		18	185	13
Differential lock indicator switch		40	410	30
Actuator protector	Nut	35	360	26
	Bolt	20	200	14
Follow spring x Frame		28	290	21
Shock absorber x Bracket		69	700	51
Shock absorber bracket x Frame		50	510	37
Shock absorber x Axle housing		64	650	47
Lateral control rod x Frame		177	1,800	130
Lateral control rod x Axle housing		245	2,500	181
Upper control rod x Frame		177	1,800	130
Upper control rod x Axle housing		177	1,800	130
Lower control arm x Frame		177	1,800	130
Lower control arm x Axle housing		177	1,800	130
Stabilizer bar x Link		25	260	19
Stabilizer bar link x Link bracket		103	1,050	76
Cover x Axle housing		18	185	13

BRAKE

SERVICE DATA

SS1EE-02

Brake pedal height from asphalt sheet		167.5 – 177.5 mm (6.59 – 6.99 in.)
Brake pedal freeplay		3 – 6 mm (0.12 – 0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		More than 68 mm (2.68 in.)
Brake booster push rod to piston clearance	w/ SST	0 mm (0 in.)
Front brake pad thickness	STD	9.5 mm (0.374 in.)
	Minimum	1.0 mm (0.039 in.)
Front brake disc thickness	STD	32.0 mm (1.260 in.)
	Minimum	30.0 mm (1.181 in.)
Front brake disc runout	Maximum	0.15 mm (0.0059 in.)
Rear brake pad thickness	STD	10.0 mm (0.394 in.)
	Minimum	1.0 mm (0.039 in.)
Rear brake disc thickness	STD	18.0 mm (0.709 in.)
	Minimum	16.0 mm (0.630 in.)
Rear brake disc runout	Maximum	0.15 mm (0.0059 in.)
Rear brake disc inside diameter	STD	230 mm (9.06 in.)
	Maximum	231 mm (9.09 in.)
Parking brake shoe lining thickness	STD	4.0 mm (0.157 in.)
	Minimum	1.0 mm (0.039 in.)
Parking brake lever travel at 196 N (20 kgf, 44.1 lbf)		7 – 9 clicks
Parking brake clearance between rear shoe and lever		Less than 0.35 mm (0.0138 in.)
Parking brake shoe and lever clearance adjusting shim thickness		0.3 mm (0.012 in.)
		0.6 mm (0.024 in.)
		0.9 mm (0.035 in.)

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt	10	100	7
Master cylinder x Reservoir	1.7	17.5	15.2 in·lbf
Master cylinder x Brake booster	13	130	9
Brake line union nut	15	155	11
Brake booster clevis lock nut	25	260	19
Brake booster x Pedal bracket	13	130	9
Bleeder plug	11	110	8
Front disc brake caliper installation bolt	123	1,250	90
Front disc brake caliper x Flexible hose	30	310	22
Parking brake bellcrank x Backing plate	13	130	9
Rear disc brake cliper x Spindle pin	88	900	65
Rear disc brake caliper x Flexible hose	30	310	22
Rear disc brake torque plate x Knuckle	103	1,050	76
LSP & BV bracket x Frame	25	260	19
LSP & BV x LSP & BV bracket	13	130	9
LSP & BV spring x LSP & BV bracket	18	185	13
LSP & BV spring x Shackle No. 1	18	185	13
LSP & BV shackle lock nut	25	250	18
LSP & BV shackle x Shackle bracket	13	130	9
LSP & BV shackle bracket x Rear axle housing	19	195	14
ABS actuator assembly x Body	19	195	14
ABS actuator x Actuator bracket	5.4	55	48 in·lbf
ABS control relay x Actuator bracket	13	130	9
Front speed sensor installation bolt	18	185	13
Rear speed sensor installation bolt	18	185	13

SERVICE SPECIFICATIONS – STEERING

STEERING

SERVICE DATA

SS1EG-02

ON-VEHICLE INSPECTION		
Steering wheel freeplay	Maximum	40 mm (1.57 in.)
Fluid level rise	Maximum	Below 5 mm (020 in.)
Fluid pressure at idle speed with valve closed	Minimum	9,316 kPa (95 kgf/cm ² , 1,351 psi)
Steering effort at idle speed	Maximum	8.3 N·m (85 kgf·cm, 73 in.-lbf)
TILT STEERING COLUMN		
Pawl stopper alignment mark	1 or A	12.65 – 12.75 mm (0.4980 – 0.5020 in.)
	2 or B	12.55 – 12.65 mm (0.4941 – 0.4980 in.)
	3 or C	12.45 – 12.55 mm (0.4902 – 0.4941 in.)
	4 or D	12.35 – 12.45 mm (0.4962 – 0.4902 in.)
	5 or E	12.25 – 12.35 mm (0.4823 – 0.4862 in.)
PS VANE PUMP		
Oil clearance between pump shaft and bushing	STD	0.03 – 0.05 mm (0.0012 – 0.0020 in.)
	Maximum	0.07 mm (0.0028 in.)
Vane plate height	Minimum	8.6 mm (0.339 in.)
Vane plate thickness	Minimum	1.397 mm (0.05500 in.)
Vane plate length	Minimum	14.991 mm (0.59016 in.)
Vane plate and pump rotor groove clearance	Maximum	0.033 mm (0.00130 in.)
	Vane plate length	Pump rotor mark
		None
	1	14.995 – 14.997 mm (0.59035 – 0.59043 in.)
		14.993 – 14.995 mm (0.59027 – 0.59035 in.)
	2	14.991 – 14.993 mm (0.59020 – 0.59027 in.)
	Cam ring mark	2
		14.995 – 14.997 mm (0.59035 – 0.59043 in.)
	3	14.993 – 14.995 mm (0.59027 – 0.59035 in.)
		14.991 – 14.993 mm (0.59020 – 0.59027 in.)
	4	
Spring free length	STD	35 – 37 mm (1.38 – 1.46 in.)
Vane pump rotating torque	Maximum	0.3 N·m (2.8 kgf·cm, 2.4 in.-lbf)
PS GEAR		
Worm gear valve body ball clearance	Maximum	0.15 mm (0.059 in.)
Cross shaft adjusting screw thrust clearance	STD	0.03 – 0.05 mm (0.0012 – 0.0020 in.)
Worm gear preload		0.3 – 0.5 N·m (3 – 5.5 kgf·cm, 2.6 – 4.8 in.-lbf)
Total preload		0.74 – 1.08 N·m (7.5 – 11.0 kgf·cm, 6.5 – 9.6 in.-lbf)
STEERING LINKAGE		
Tie rod length	Approximately	1.207 mm (47.51 in.)
Relay rod length	Approximately	1.085 mm (42.72 in.)

TORQUE SPECIFICATION

Part tightened	N-m	kgf-cm	ft-lbf	
TILT STEERING COLUMN				
Steering wheel set nut	34	350	25	
Steering wheel pad set screw (Torx screw)	9.0	90	78 in.-lbf	
Steering column assembly set nut and bolt	25	250	18	
Sliding yoke sub-assembly x Worm gear valve body shaft	34	350	25	
Sliding yoke sub-assembly x Intermediate No. 2 shaft	34	350	25	
Universal joint x Intermediate No. 2 shaft	34	350	25	
Main shaft assembly x Universal joint	34	350	25	
Turn signal bracket set bolt	4.9	50	43 in.-lbf	
Tilt sub lever side pawl set bolt x Nut	5.9	60	52 in.-lbf	
Tilt lever retainer set nut	15	150	11	
Tilt lever assembly set bolt	2.9	30	26 in.-lbf	
Compression spring set bolt	7.8	80	69 in.-lbf	
Column hole cover x Lower dust seal	5.9	60	52 in.-lbf	
Column hole cover x Body	13	130	9	
Link joint protector set bolt	12	120	9	
PS VANE PUMP				
Pressure feed tube set union bolt	56	575	42	
PS vane pump assembly set nut	36	370	27	
Suction port union set bolt	13	130	9	
Vane pump drive gear set nut	74	750	54	
Pressure port union	69	700	51	
PS GEAR				
Pressure tube x Gear housing assembly	for use with SST	36	365	26
	for use without SST	44	450	33
Return tube x Gear housing assembly	for use with SST	36	365	26
	for use without SST	44	450	33
Gear housing assembly x Body	142	1,450	105	
Pitman arm x Cross shaft	177	1,800	130	
Cross shaft adjusting screw set nut	46	470	34	
Side cover x Gear housing	61	620	45	
Plunger guide nut	20	205	15	
Worm gear valve body assembly x Gear housing	61	620	45	
Control valve shaft x Sliding york sub-assembly	34	350	25	
STEERING LINKAGE				
Pitman arm x Cross shaft	177	1,800	130	
Pitman arm x Relay rod	91	925	67	
Tie rod clamp bolt	37	375	27	
Tie rod x Knuckle arm	91	925	67	
Relay rod x Steering damper	74	750	54	
Steering damper x Steering damper bracket	74	750	54	
Steering damper bracket x Body	74	750	54	
Relay rod clamp bolt	37	375	27	

SUPPLEMENTAL RESTRAINT SYSTEM

TORQUE SPECIFICATION

SS1EI-01

Part tightened	N·m	kgf·cm	ft·lbf
Steering wheel set nut	34	350	25
Steering wheel pad	9.0	90	80 in·lbf
Front passenger airbag assembly x Instrument panel reinforcement	20	205	15
Airbag sensor assembly	20	205	15

BODY ELECTRICAL

SERVICE DATA

SS1EJ-02

TURN SIGNAL FLASHER	
Flashes/Minute	60 – 120
SPEEDOMETER (USING A SPEEDOMETER)	
Standard indication (mph)	Allowable range (mph)
20	18 – 24
40	38 – 44
60	58 – 66
80	78 – 88
100	98 – 110
120	118 – 132
TACHOMETER (ON-VEHICLE)	
DC 13.5 V 25°C (77°F)	
Standard indication (RPM)	Allowable range (RPM)
700	630 – 770
1,000	900 – 1,100
2,000	1,875 – 2,125
3,000	2,850 – 3,150
4,000	3,850 – 4,150
5,000	4,850 – 5,150
FUEL RECEIVER GAUGE	
A – B	85.5 – 105.5 Ω
A – C	126 – 150 Ω
B – C	90 – 110 Ω
FUEL SENDER GAUGE	
Float position F: Approx. 15 mm ((0.59 in.)	Approx. 3 Ω
Float position E: Approx. 200 (7.87 in.)	Approx. 110 Ω
ENGINE COOLANT TEMPERATURE RECEIVER GAUGE	
A – B	71 – 79 Ω
A – C	117 – 141 Ω
B – C	185 – 215 Ω
OIL PRESSURE RECEIVER GAUGE	
Resistance	40 – 48 Ω
CRUISE CONTROL SWITCH	
Switch position OFF	No continuity
Switch position RESUME/ACCEL	Approx. 68 Ω
Switch position SET/COAST	Approx. 198 Ω
Switch position CANCEL	Approx. 418 Ω
CRUISE CONTROL ACTUATOR	
1 – 3	Approx. 2 k Ω
2 – 3	Approx. 0.5 – 1.7 k Ω
Actuator control arm free play	0 mm (0 in.)

BODY

TORQUE SPECIFICATION

SS1EK-02

Part tightened	N-m	kgf-cm	ft-lbf
FRONT BUMPER			
Front bumper arm x Front bumper bracket	39	400	29
Front bumper arm x Body	39	400	29
Front bumper extension x Front bumper	5.4	55	48 in.-lbf
REAR BUMPER			
Rear bumper extension x Rear bumper reinforcement	13	130	9
Rear bumper extension reinforcement x Body	5.4	55	48 in.-lbf
HOOD			
Hood hinge x Body	18	185	13
Hood lock x Body	8	80	69 in.-lbf
FRONT DOOR			
Door hinge x Body	24	240	17
Door hinge x Door panel	24	240	17
Door lock x Door panel	5	50	43 in.-lbf
Window regulator x Door panel	5	50	43 in.-lbf
REAR DOOR			
Door hinge x Body	24	240	17
Door hinge x Door panel	24	240	17
Door lock x Door panel	5	50	43 in.-lbf
Window regulator x Door panel	5	50	43 in.-lbf
WIPER AND WASHER			
Front wiper arm x Wiper link	20	210	15
Wiper link x Body	5.4	55	48 in.-lbf
Wiper motor x Body	5.4	55	48 in.-lbf
Rear wiper arm x Wiper motor	5.4	55	48 in.-lbf
WHEEL OPENING EXTENSION			
Front wheel opening extension x Body	5.4	55	48 in.-lbf
Rear wheel opening extension x Body	5.4	55	48 in.-lbf
INSTRUMENT PANEL			
Front passenger airbag assembly x Instrument panel reinforcement	20	210	15
FRONT MANUAL SEAT			
Seat truck x Body	39	400	29
Seat reclining assembly x Seatback frame	52	530	38
Lumber support x Seatback frame	18	185	13
FRONT POWER SEAT			
Seat truck x Body	39	400	29
Power seat adjuster x Seatback frame	37	375	27
Power seat adjuster x Seatback cushion frame	18	185	13
Lumber support x Seatback frame	18	185	13
NO. 1 REAR SEAT			
Seat cushion hinge x Body	39	400	29
Seat cushion hinge x Seat cushion frame	39	400	29

1996 LAND CRUISER (RM451U)

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SERVICE SPECIFICATIONS – BODY

Seat lock x Seat cushion frame		41	420	30
NO. 2 REAR SEAT				
Reclining adjuster x Seatback frame		52	530	38
Seat leg x Body		18	185	13
POWER SEAT ADJUSTER				
No. 2 vertical seat link x Rear vertical motor	Bolt	10	100	7
	Nut	2	20	17 in.-lbf
No. 1 vertical seat link x Front vertical motor		10	100	7
Seat truck x Seat truck inner reinforcement		20	210	15
Front seat horizontal seat screw x Front seat motor slide housing		19	200	14
Slide motor x Front seat horizontal jack screw	Bolt	10	100	7
	Nut	2	20	17 in.-lbf
Front seat horizontal jack screw x Front seat truck		19	200	14
SEAT BELT				
Adjustable anchor x Body		43	440	32
ELR x Body		5	50	43 in.-lbf
Outer belt anchor x Body		43	440	32
Inner belt x Seat		43	440	32
SIDE STEP				
Side step bracket x Body		13	130	9
Side step bracket x Side panel		5.4	55	48 in.-lbf

AIR CONDITIONING

SERVICE DATA

SS1EL-01

Refrigerant charge volume		850 ± 50 g (59.98 ± 1.76 oz.)
Drive belt tension	New belt	100 – 150 lbf
	Used belt	60 – 100 lbf
Idle-up speed		800 rpm
Magnetic clutch clearance		0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

SS-44

SERVICE SPECIFICATIONS – AIR CONDITIONING

SS1EM-02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Compressor x Suction hose	10	100	7
Compressor x Discharge hose	10	100	7
Condensser x Compressor bracket	25	250	18
Compressor bracket x Engine	37	375	27
Receiver x Liquid tube	5.4	55	48 in.·lbf
Condenser x Discharge hose	10	100	7
Cooling unit x Liqied tube	10	100	7
Cooling unit x Suction tube	10	100	7
Pressure switch x Liquid tube	10	100	7
Expansion valve x Evaporetor	5.4	55	48 in.·lbf
Liquid line (Union nut)	14	140	10
Suction line (bolt)	10	140	7

STARTING SYSTEM

ON-VEHICLE INSPECTION

ST08A-02

NOTICE:

Before changing the starter, check these items again:

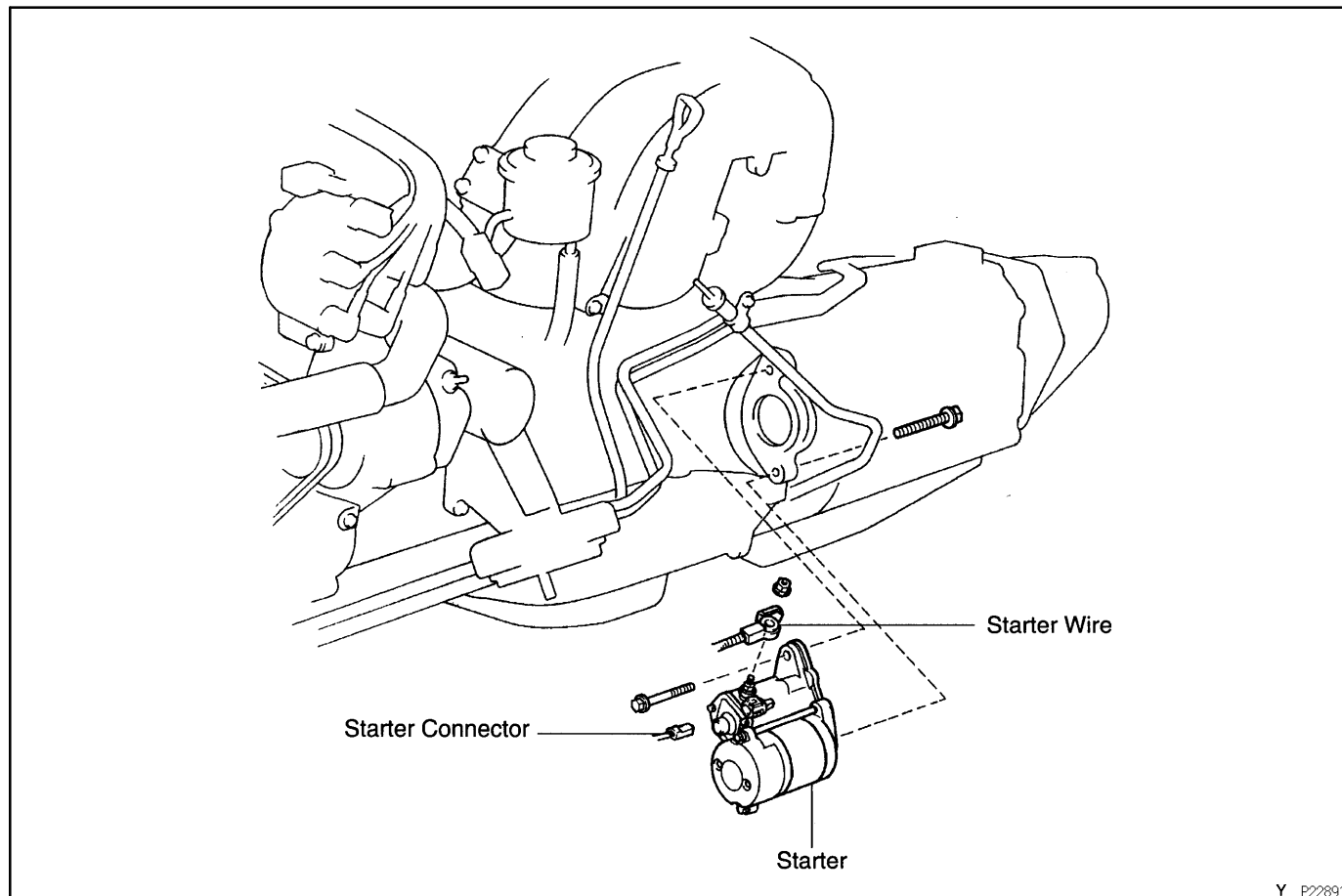
- Connector connection
- Accessory installation, e.g.: theft deterrent system

ST-2

STARTING - STARTER

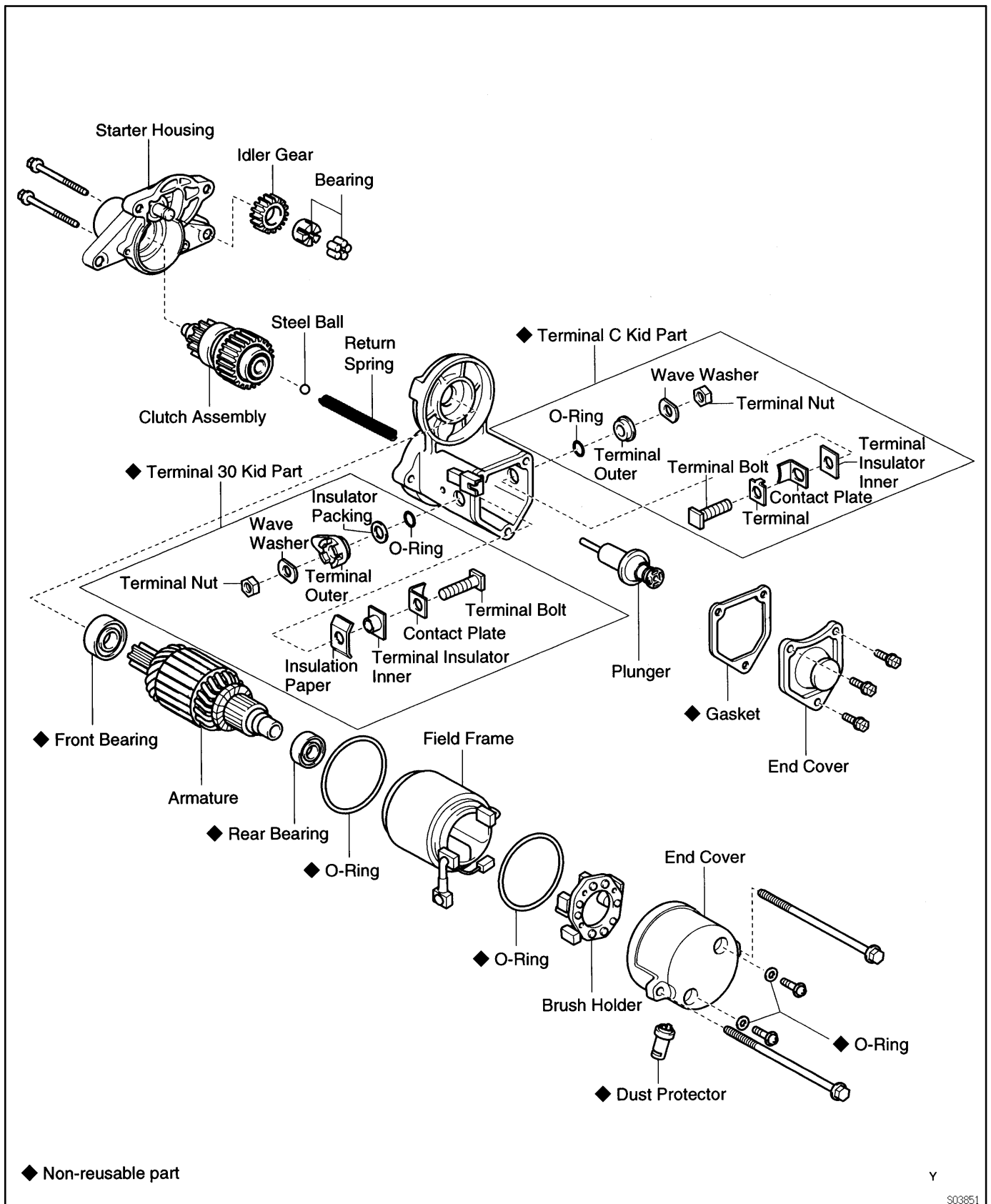
STARTER COMPONENTS

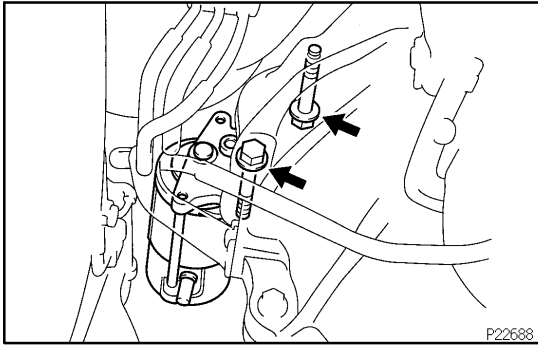
STOKO-01



Y P22891

STARTING - STARTER





REMOVAL

REMOVE STARTER

- (a) Disconnect the starter connector.
- (b) Remove the nut, and disconnect the starter wire.
- (c) Remove the 2 bolts and starter.

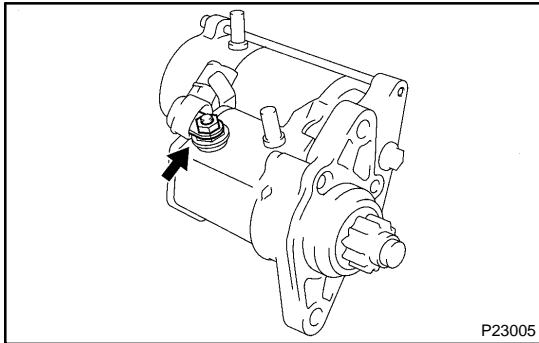
Torque: 8.8 N·m (90 kgf·cm, 70 in.-lbf)

Torque: 39 N·m (400 kgf·cm, 29 ft-lbf)

DISASSEMBLY

HINT:

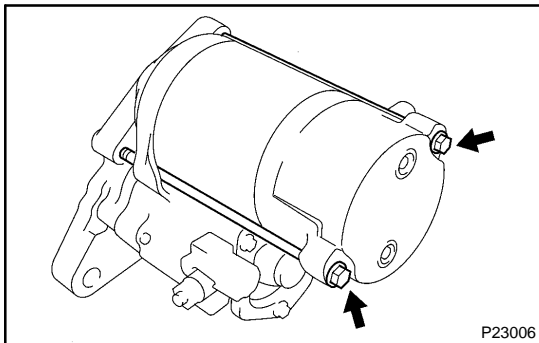
At the time of reassembly, use high-temperature grease to lubricate the bearings, gears, return spring and steel ball when assembling the starter.



1. REMOVE FIELD FRAME AND ARMATURE

- (a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

Torque: 5.9 N·m (60 kgf·cm, 52 in.-lbf)



- (b) Remove the 2 through bolts.

Torque:

1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

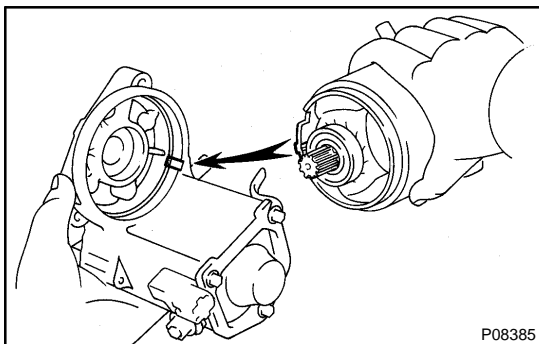
2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

- (c) Pull out the field frame with the armature from the magnetic switch assembly.

- (d) Remove the O-ring.

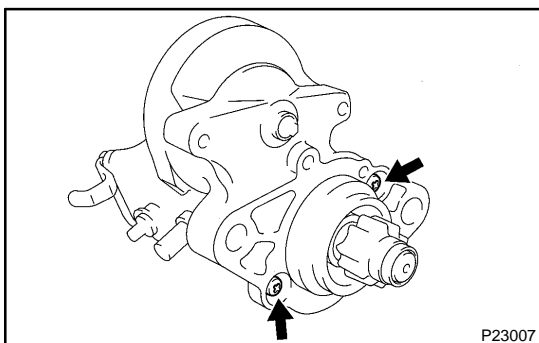
HINT:

At the time of reassembly, use a new O-ring.



HINT:

At the time of reassembly, align the protrusion of the field frame with cutout of the magnetic switch.



2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

- (a) Remove the 2 screws.

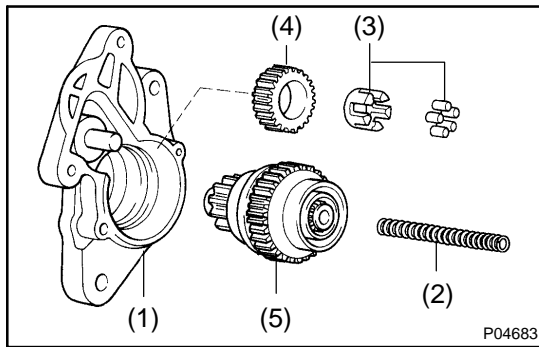
Torque:

1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.-lbf)

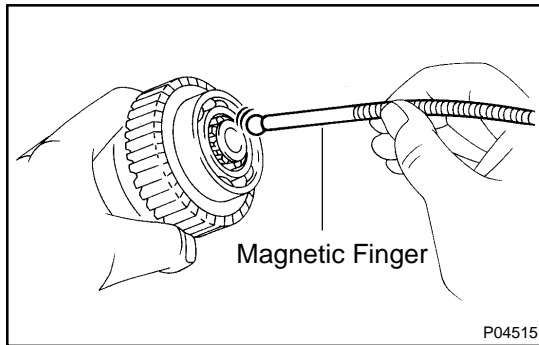
2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.-lbf)

ST-6

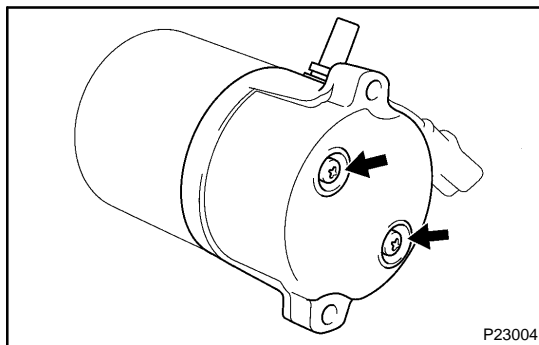
STARTING - STARTER



- (b) Remove these parts from the magnetic switch assembly:
- (1) Starter housing
 - (2) Return spring
 - (3) Bearing
 - (4) Idler gear
 - (5) Starter clutch assembly

**3. REMOVE STEEL BALL**

Using a magnetic finger, remove the steel ball from the clutch shaft hole.

**4. REMOVE BRUSH HOLDER**

- (a) Remove the 2 screws, 2 O-rings and end cover from the field frame.

Torque:

1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.-lbf)

2.0 kW type: 3.8 N·m (40 kgf·cm, 35 in.-lbf)

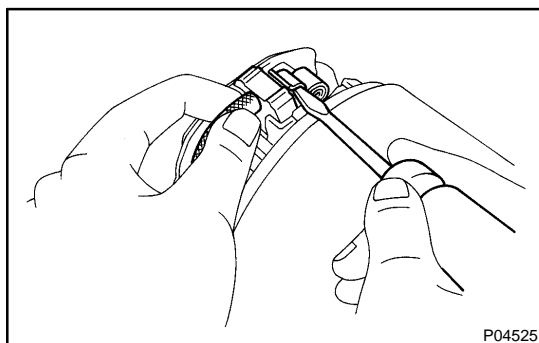
HINT:

At the time of reassembly, use new O-rings.

- (b) Remove the O-ring from the field frame.

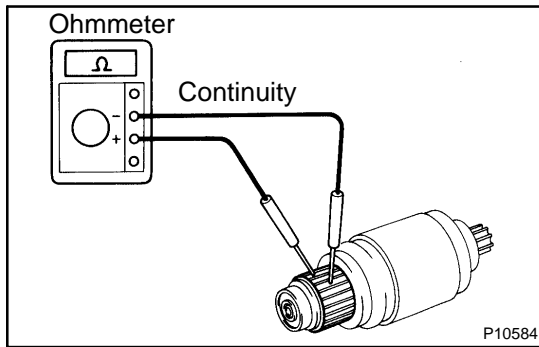
HINT:

At the time of reassembly, use a new O-ring.



- (c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME

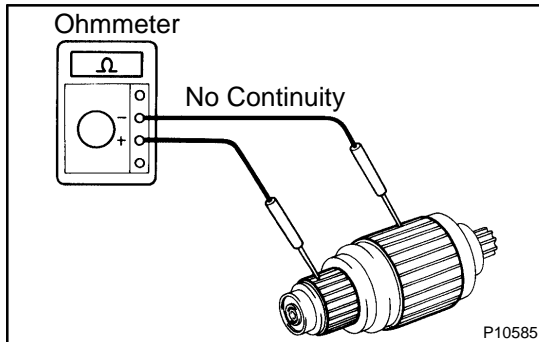


INSPECTION

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.



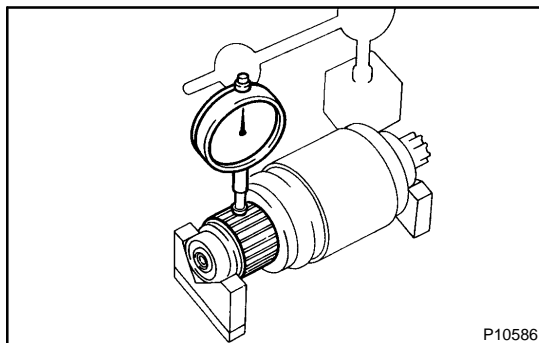
2. INSPECT COMMUTATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No. 400) or on a lathe.



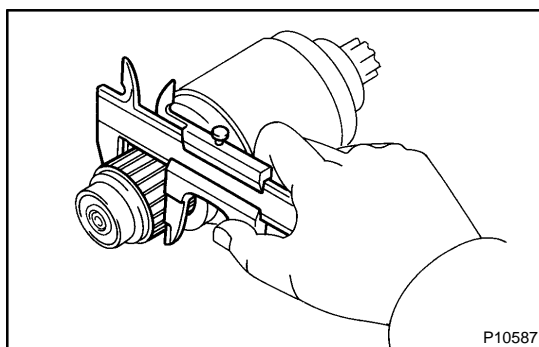
4. INSPECT COMMUTATOR CIRCLE RUNOUT

(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.



5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

Standard diameter:

1.4 kW type: 30 mm (1.18 in.)

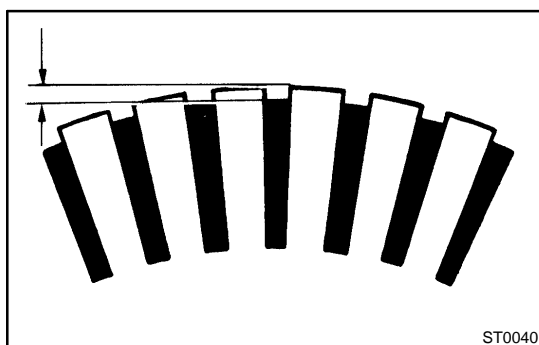
2.0 kW type: 35 mm (1.38 in.)

Minimum diameter:

1.4 kW type: 29 mm (1.14 in.)

2.0 KW type: 34 mm (1.34 in.)

If the diameter is less than minimum, replace the armature.



6. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

Standard undercut depth:

1.4 kW type: 0.6 mm (0.024 in.)

2.0 kW type: 0.7 mm (0.028 in.)

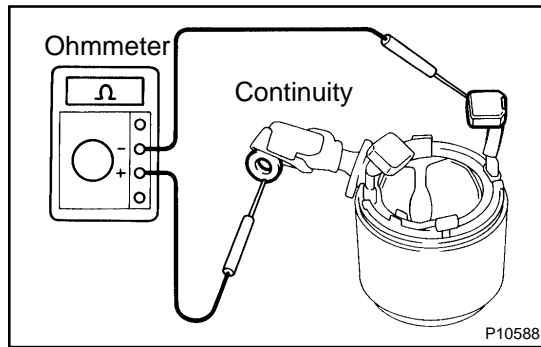
Minimum undercut depth:

0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

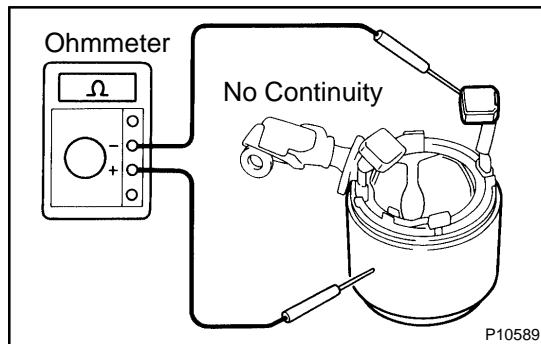
ST-8

STARTING - STARTER

**7. INSPECT FIELD COIL FOR OPEN CIRCUIT**

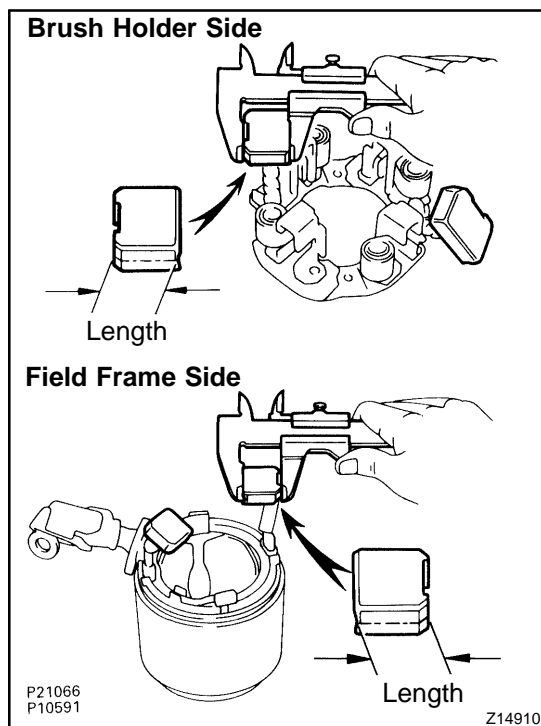
Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

If there is no continuity, replace the field frame.

**8. 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.

**9. INSPECT BRUSH LENGTH**

Using vernier calipers, measure the brush length.

Standard length:

1.4 kW type: 15.5 mm (0.610 in.)

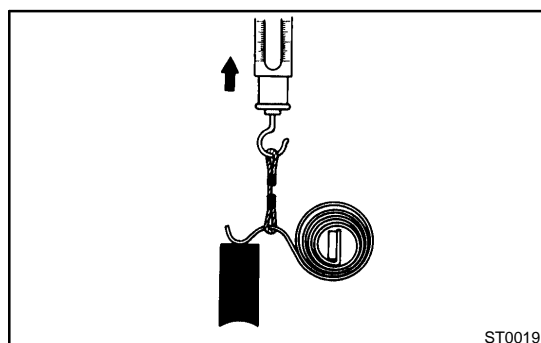
2.0 kW type: 15.0 mm (0.591 in.)

Minimum length:

1.4 kW type: 10.0 mm (0.394 in.)

2.0 KW type: 9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush holder and field frame.

**10. INSPECT BRUSH SPRING LOAD**

Take the pull scale reading the instant the brush spring separates from the brush.

Standard spring installed load:

1.4 kW type:

17.6 – 23.5 N (1.79 – 2.41 kgf, 4.0 – 5.3 lbf)

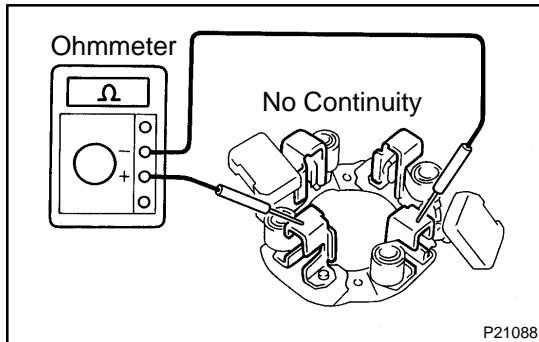
2.0 kW type:

21.5 – 27.5 N (2.19 – 2.80 kgf, 4.8 – 6.2 lbf)

STARTING - STARTER

Minimum spring installed load:**1.4 kW type: 11.8 N (1.20 kgf, 2.7 lbf)****2.0 kW type: 12.7 N (1.29 kgf, 2.9 lbf)**

If the installed load is less than minimum replace the brush springs.

**11. INSPECT BRUSH HOLDER INSULATION**

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (-) brush holders.

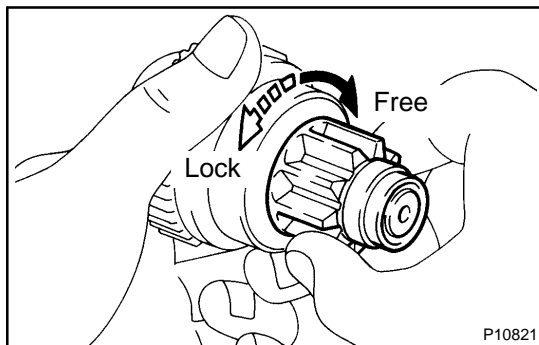
If there is continuity, repair or replace the brush holder.

12. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

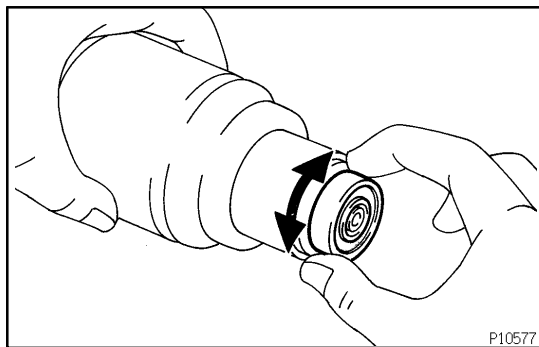
If damaged, replace the gear or clutch assembly.

If damaged, also check the drive plate ring gear for wear or damage.

**13. INSPECT CLUTCH PINION GEAR**

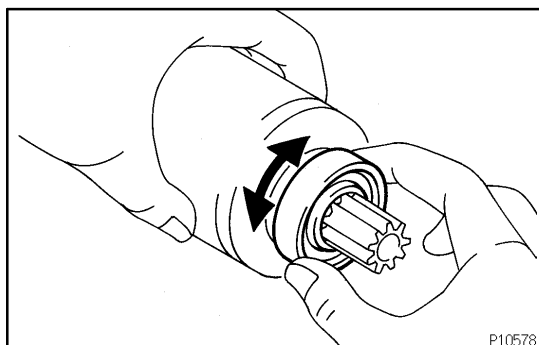
Hold the starter clutch and rotate the pinion gear clockwise, and check that it turns freely. Try to rotate the pinion gear counter-clockwise and check that it locks.

If necessary, replace the clutch assembly.

**14. INSPECT REAR BEARING**

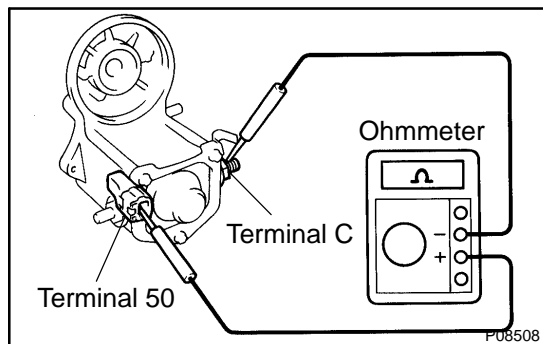
Turn each bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing.

**15. INSPECT FRONT BEARING**

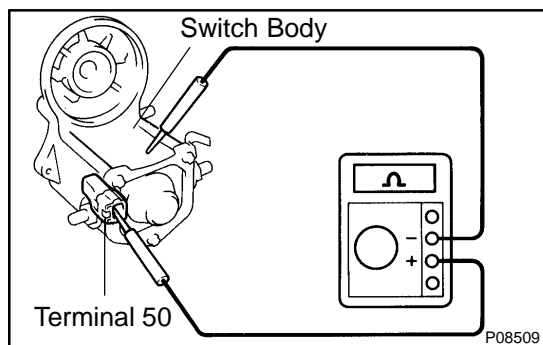
Turn each bearing by hand while applying inward force.

If resistance is felt or the bearing sticks, replace the bearing.

**16. DO PULL-IN COIL OPEN CIRCUIT TEST**

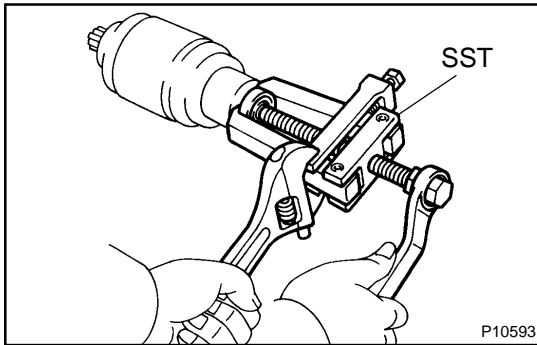
Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.

**17. DO HOLD-IN COIL OPEN CIRCUIT TEST**

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

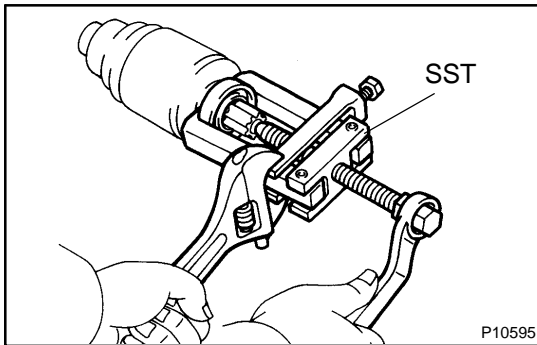
If there is no continuity, replace the magnetic switch.



REPLACEMENT

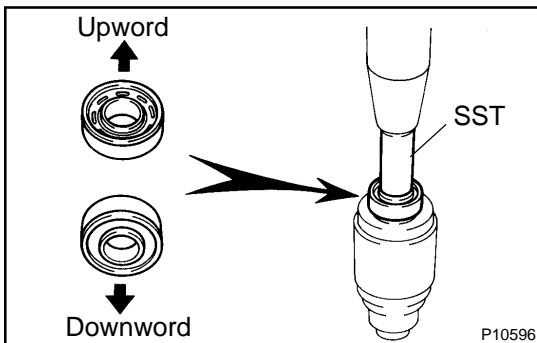
1. REPLACE REAR BEARING

- (a) Using SST, remove the bearing.
SST 09286-46011
- (b) Using a press, press in a new rear bearing.



2. REPLACE FRONT BEARING

- (a) Using SST, remove the bearing.
SST 09286-46011

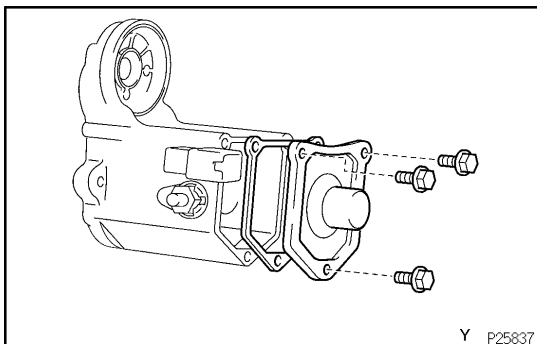


- (b) Using a press, press in a new front bearing.

NOTICE:

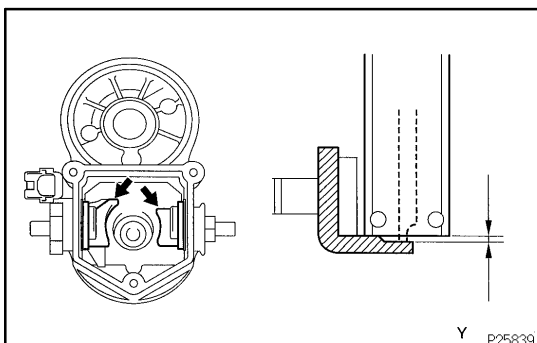
Be careful of the bearing installation direction.

SST 09820-00030



3. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp, end cover, gasket and plunger.

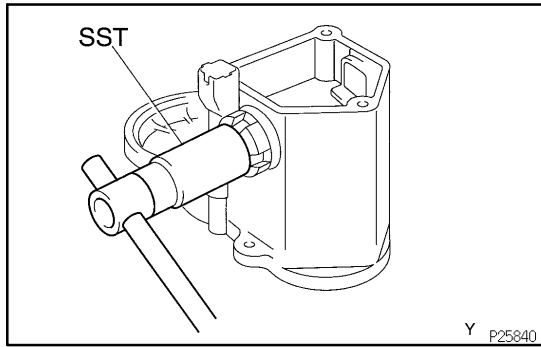


4. INSPECT CONTACT PLATE FOR WEAR

Using vernier calipers, measure the contact plate for depth of wear.

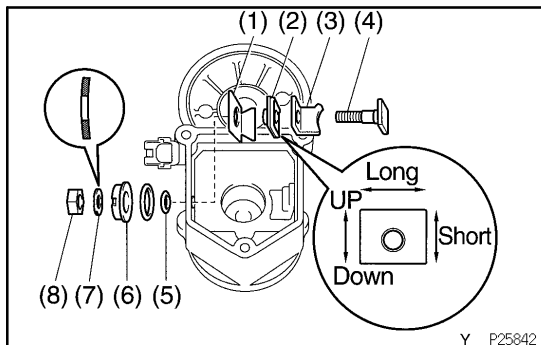
Maximum wear: 0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



5. REMOVE TERMINAL KIT PARTS

- (a) Using SST, loosen the terminal nuts.
SST 09810-38140
- (b) Terminal C:
Remove the terminal nut, wave washer, terminal insulator (outside), O-ring, terminal bolt, contact plate and terminal insulator (inside).
- (c) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O-ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.



6. REINSTALL TERMINAL KIT PARTS

- (a) Terminal 30:
Install these new parts:
 - (1) Insulation paper
 - (2) Terminal insulator (inside)
 - (3) Contact plate
 - (4) Terminal bolt
 - (5) O-ring
 - (6) Packing and terminal insulator (outside)
 Install the packing to the terminal insulator, and install them.

HINT:

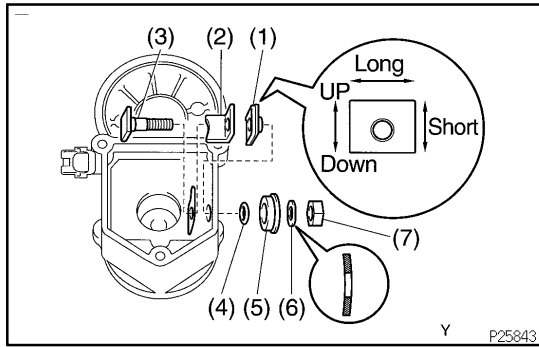
Match the protrusion of the insulator with the indentation of the housing.

- (7) Wave washer
- (8) Terminal nut

NOTICE:

Be careful to install the terminal insulators (inside) and wave washers in the correct direction.

STARTING - STARTER



(b) Terminal C:

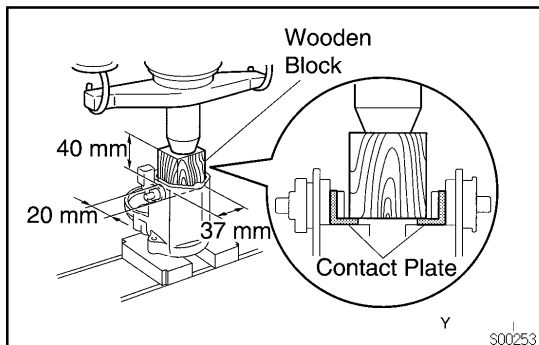
Install these new parts:

- (1) Terminal insulator (inside)
- (2) Contact plate
- (3) Terminal bolt
- (4) O-ring
- (5) Terminal insulator (outside)
- (6) Wave washer
- (7) Terminal nut

NOTICE:

Be careful to install the terminal insulators (inside) and wave washers in the correct direction.

- (c) Temporarily tighten the terminal nuts.

**7. TIGHTEN TERMINAL NUT**

- (a) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:

20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)

Press force:

981 N (100 kgf, 221 lbf)

NOTICE:

Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.

Gauge pressure:

$$(\text{kgf/cm}^2) = \frac{100 \text{ kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2} \right)^2 \times 3.14 (\pi)}$$

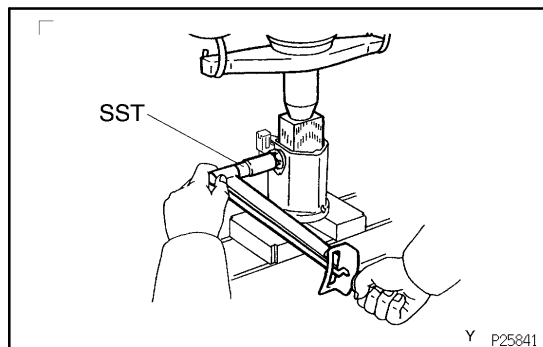
$$(\text{psi}) = \frac{221 \text{ lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2} \right)^2 \times 3.14 (\pi)}$$

$$(\text{kPa}) = (\text{kgf/cm}^2) \times 98.1$$

$$(\text{kPa}) = (\text{psi}) \times 6.9$$

V06796

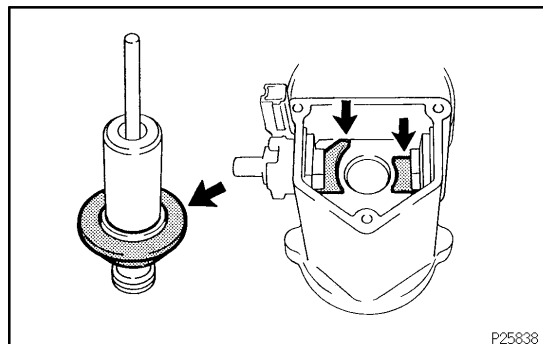
If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.



- (b) Using SST, tighten the nuts to the specified torque.
 SST 09810-38140
 Torque: 17 N·m (173 kgf-cm, 12 ft-lbf)

NOTICE:

If the nut is over tightened, it may cause cracks on the inside of the insulator.



8. CLEAN CONTACT SURFACES OF CONTACT PLATE AND PLUNGER

Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

9. REINSTALL MAGNETIC SWITCH END COVER

Install the plunger, new gasket, end cover and lead clamp with the 3 bolts.

Torque:

1.4 kW type: 2.5 N·m (25 kgf-cm, 22 in.-lbf)

2.0 kW type: 3.6 N·m (37 kgf-cm, 32 in.-lbf)

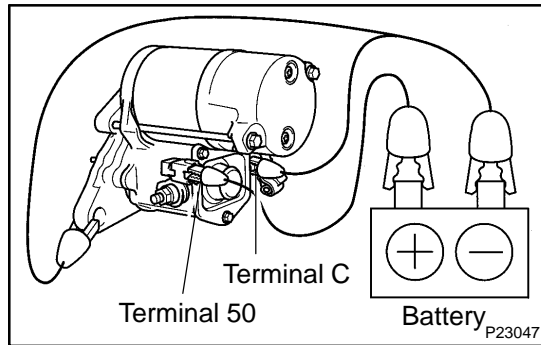
REASSEMBLY

Reassembly is in the reverse order of disassembly (See page [ST-5](#)).

TEST

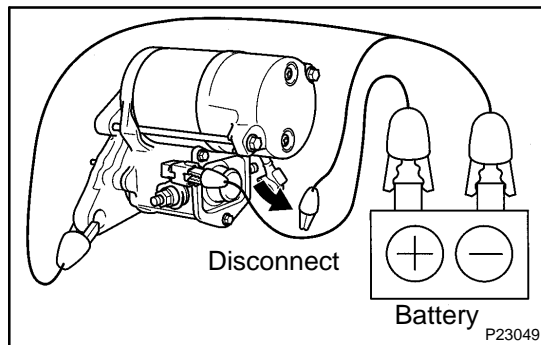
NOTICE:

These tests must be performed within 3 to 5 seconds to avoid burning out the coil.



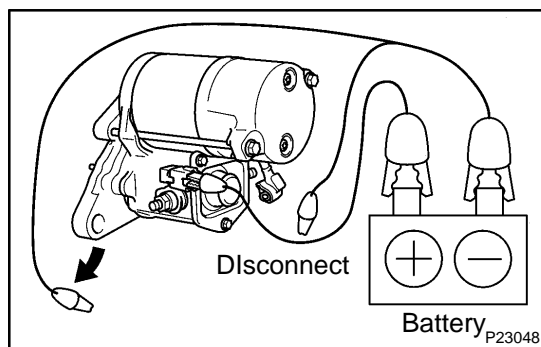
1. DO PULL-IN TEST

- Disconnect the field coil lead wire from terminal C.
- Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



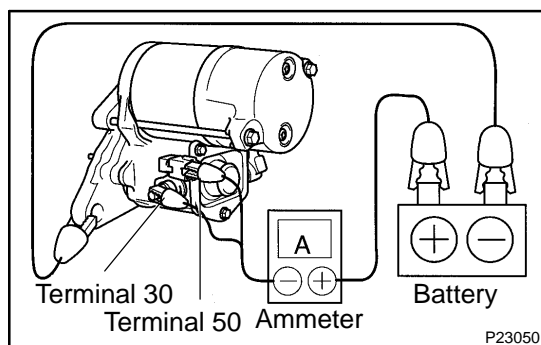
2. DO HOLD-IN TEST

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.



3. INSPECT CLUTCH PINION GEAR RETURN

- Disconnect the negative (-) lead from the switch body.
- Check that the clutch pinion gear returns inward.



4. DO NO-LOAD PERFORMANCE TEST

- Connect the battery and ammeter to the starter as shown.
- Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current:

1.4 kW type

At 11.5V: 90 A or less

2.0 kW type

At 11.5V: 100 A or less

INSTALLATION

Installation is in the reverse order of removal (See page [ST-4](#)).

TRANSFER SYSTEM

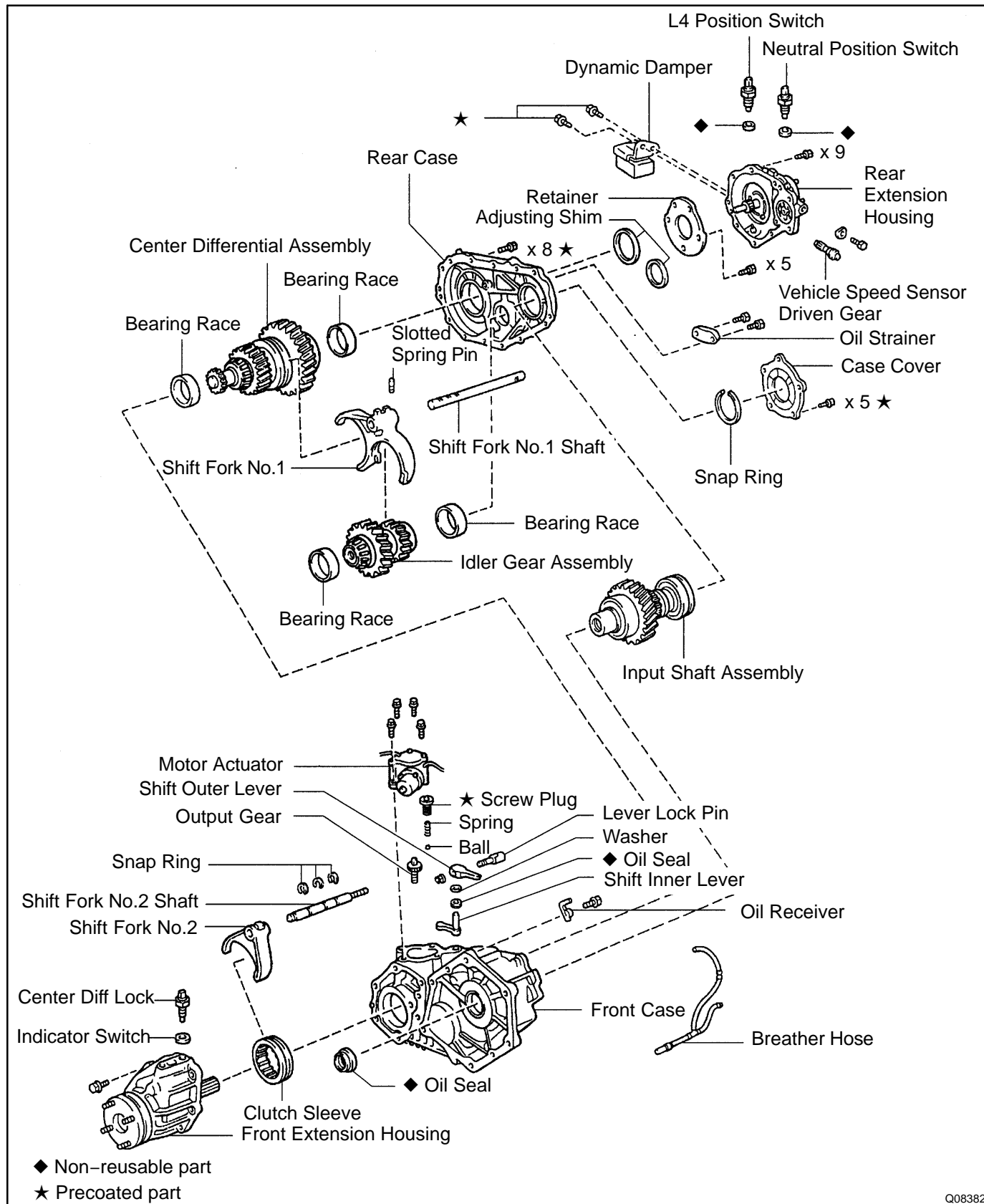
TROAX-01

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 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.

TRANSFER ASSEMBLY COMPONENTS

TR0B2-01



Q08382

DISASSEMBLY

1. REMOVE BREATHER HOSE
2. REMOVE DYNAMIC DAMPER

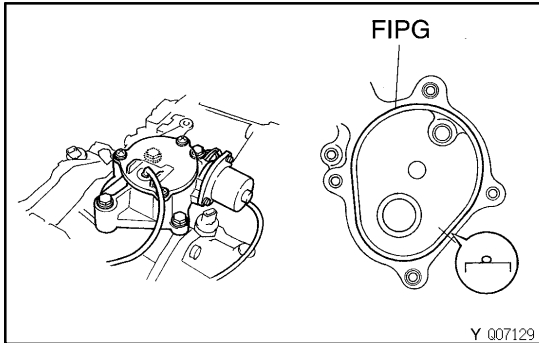
Remove the 2 bolts and dynamic damper.

HINT:

At the time of reassembly, apply adhesive to the bolt threads.

Adhesive: Part No.08833-00070, THREE BOND 1324 or equivalent

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



3. REMOVE MOTOR ACTUATOR

Remove the 4 bolts and motor actuator.

HINT:

At the time of reassembly, please refer to the following items.

- Set the motor actuator in differential lock condition.
- Apply FIPG to the front case.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

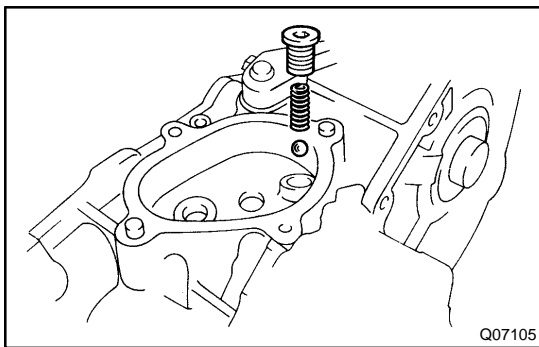
4. REMOVE OUTPUT GEAR FROM FRONT CASE

HINT:

At the time of reassembly apply gear oil to the output gear.

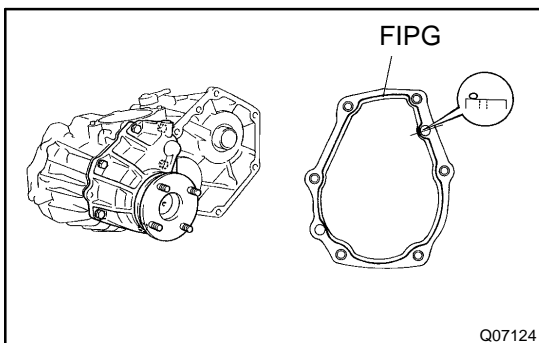
NOTICE:

At the time of reassembly, do not turn the output gear.



5. REMOVE SCREW PLUG, SPRING AND BALL

- (a) Using a torx socket wrench (T40), remove the screw plug.



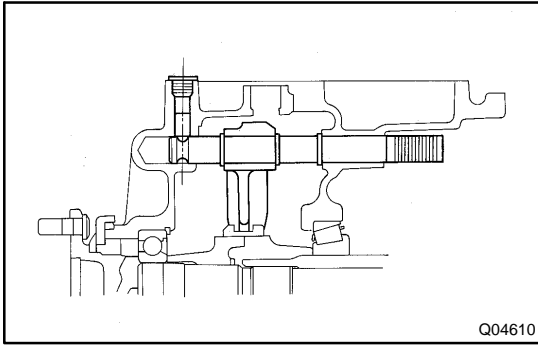
HINT:

At the time of reassembly, apply liquid sealer to the screw plug.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 19 N·m (190 kgf·cm, 14 ft·lbf)

- (b) Using a magnetic finger, remove the spring and ball.



6. REMOVE TRANSFER INDICATOR SWITCH

Remove the Center Diff Lock indicator switch, L4 position switch, Neutral position switch and 3 gaskets.

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

7. REMOVE FRONT EXTENSION HOUSING

Remove the 6 bolts and front extension housing.

HINT:

If necessary, tap the front extension housing with a plastic hammer.

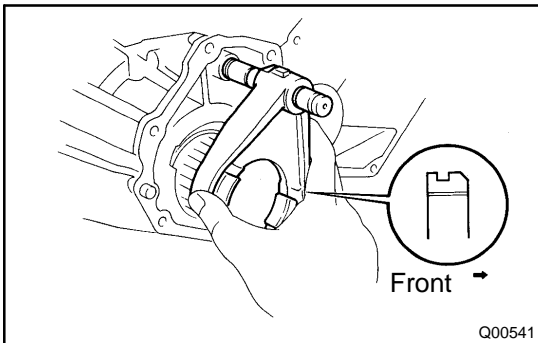
HINT:

At the time of reassembly, please refer to the following items.

- Set the clutch sleeve in differential lock condition.
- Apply FIPG to the front case.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

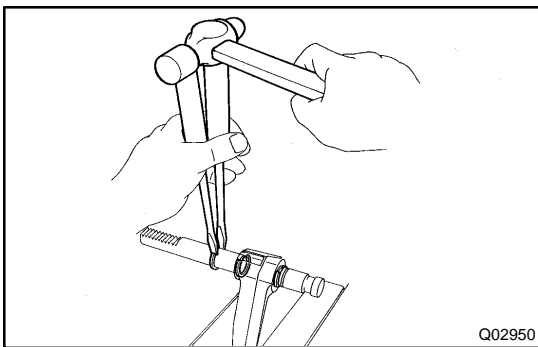
Torque: 37 N·m (380 kgf-cm, 27 ft-lbf)



8. REMOVE CLUTCH SLEEVE, SHIFT FORK NO.2 SHAFT AND SHIFT FORK NO.2

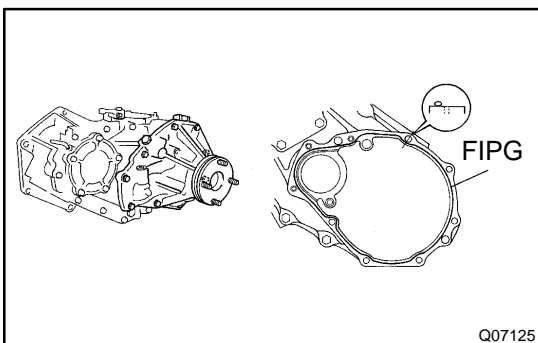
HINT:

At the time of reassembly, make sure to install the clutch sleeve in the correct direction.



9. SEPARATE SHIFT FORK NO.2 SHAFT AND SHIFT FORK NO.2

- Using 2 screwdrivers and a hammer, tap out the 3 snap rings from the shift fork No.2 shaft.
- Separate the shift fork No.2 shaft and shift fork No.2.



10. REMOVE REAR EXTENSION HOUSING

Remove the 9 bolts and rear extension housing.

HINT:

If necessary, tap the rear extension housing with a plastic hammer.

HINT:

At the time of reassembly, apply FIPG to the rear case.

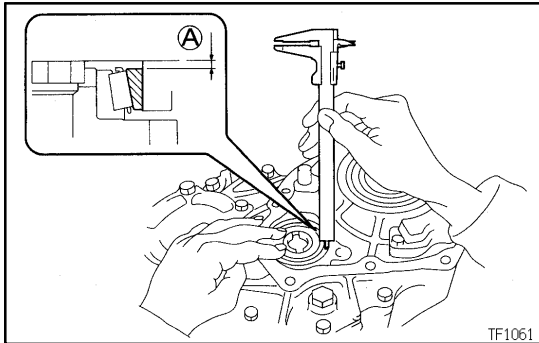
FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

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

11. REMOVE RETAINER FROM REAR CASE

Remove the 5 bolts and retainer.

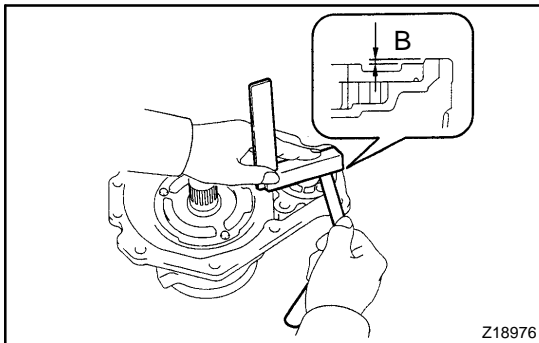
Torque: 39 N·m (400 kgf·cm, 28 ft·lbf)

**12. REMOVE ADJUSTING SHIM**

HINT:

At the time of assembly, select adjusting shims for the idler gear rear taper roller bearing.

- (a) Using vernier calipers, measure dimension A.
- (b) Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement.



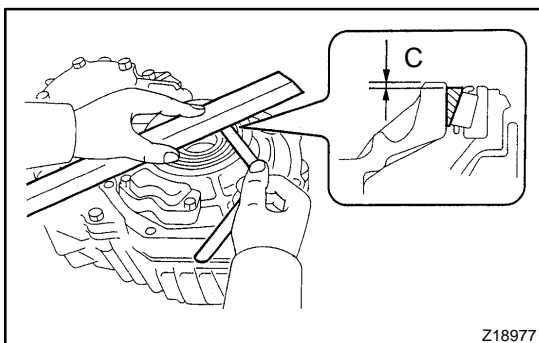
- (c) Using a steel straight edge and feeler gauge, measure the clearance of dimension B.
- (d) Calculate the required thickness of the adjusting shim.

Thickness:

Dimension A + Dimension B + (0.022 – 0.049 mm, 0.0009 – 0.0019 in.)

- (e) From the following table, select a shim so that its thickness is within the range of the calculation.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
2	0.30 (0.0118)	8	3.20 (0.1260)
3	0.45 (0.0177)	9	3.40 (0.1339)
4	2.40 (0.0945)	10	3.60 (0.1417)
5	2.60 (0.1024)	11	3.80 (0.1496)
6	2.80 (0.1102)	12	4.00 (0.1575)
7	3.00 (0.1181)	13	0.55 (0.0216)



HINT:

At the time of reassembly, select adjusting shims for the output shaft taper roller bearing.

- (f) Using a steel straight edge and feeler gauge, measure the clearance of dimension C.
- (g) Lightly hold down the bearing outer race in the thrust direction to eliminate any looseness before making the measurement.
- (h) Calculate the required thickness of the adjusting shim.

Thickness:**Dimension C + (0.014 – 0.039 mm, 0.0006 – 0.0015 in.)**

- (i) From the following table, select a shim so that its thickness is within the range of the calculation.

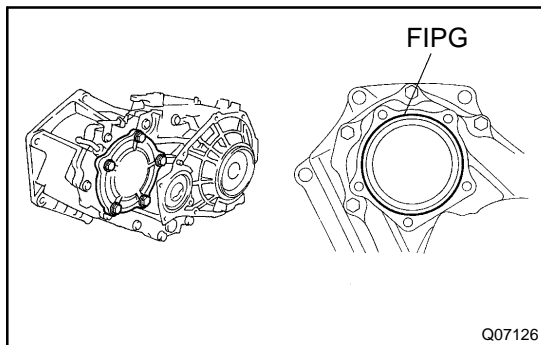
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
B	0.30 (0.0118)	H	1.80 (0.0709)
C	0.45 (0.0177)	J	2.00 (0.0787)
D	1.00 (0.0394)	K	2.20 (0.0866)
E	1.20 (0.0472)	L	2.40 (0.0945)
F	1.40 (0.0551)	M	2.60 (0.1024)
G	1.60 (0.0630)	N	0.55 (0.0216)

13. REMOVE OIL STRAINER FROM REAR CASE

Remove the 2 set bolts and oil strainer.

Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)**14. REMOVE CASE COVER**

- (a) Remove the 5 bolts.

**HINT:**

At the time of reassembly, apply liquid sealer to the bolt threads.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent**Torque: 37 N·m (380 kgf·cm, 27 ft-lbf)**

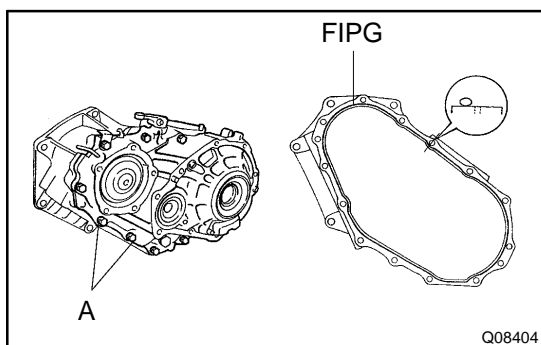
- (b) Using a brass bar and hammer, tap the case cover and remove it.

HINT:

At the time of reassembly, apply FIPG to the rear case.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent**15. SEPARATE FRONT CASE AND REAR CASE**

- (a) Using a snap ring expander, remove the snap ring from the rear case.
- (b) Remove the 8 bolts.

**HINT:**

At the time of reassembly, apply liquid sealer to the "A" bolt threads.

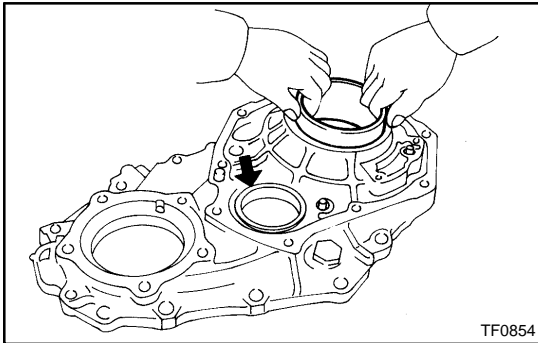
Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent**Torque: 37 N·m (380 kgf·cm, 27 ft-lbf)**

- (c) Using a brass bar and hammer, tap the rear case and separate it.

HINT:

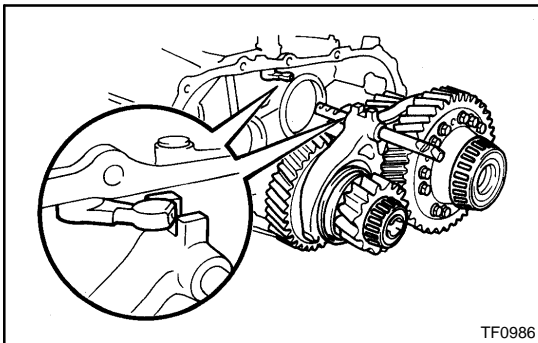
At the time of reassembly, apply FIPG to the front case.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

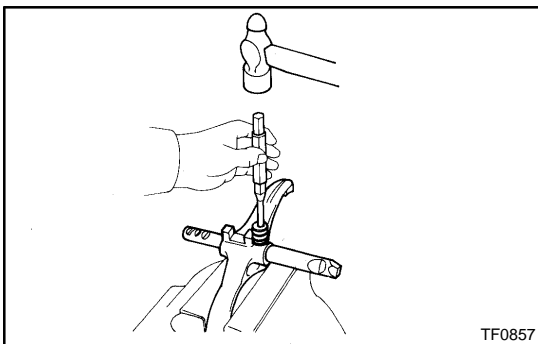


- 16. REMOVE 2 BEARING RACES FROM REAR CASE**
17. REMOVE INPUT SHAFT ASSEMBLY

Using a plastic hammer, remove the input shaft assembly.

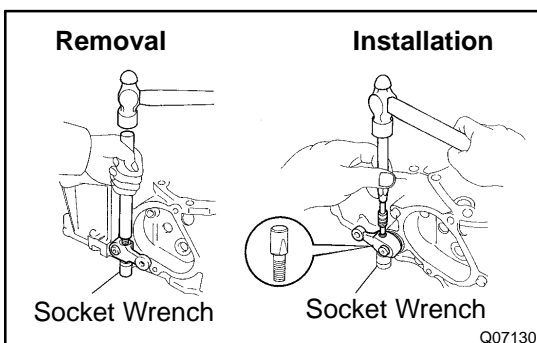


- 18. REMOVE IDLER GEAR ASSEMBLY, CENTER DIFFERENTIAL ASSEMBLY, SHIFT FORK NO.1 AND SHIFT FORK NO.1 SHAFT FROM FRONT CASE**



- 19. SEPARATE SHIFT FORK NO.1 AND SHIFT FORK NO.1 SHAFT**

- (a) Using a pin punch and hammer, drive out the slotted spring pin.
 (b) Separate the shift fork No.1 and shift fork No.1 shaft.



- 20. REMOVE SHIFT OUTER LEVER AND INNER LEVER**

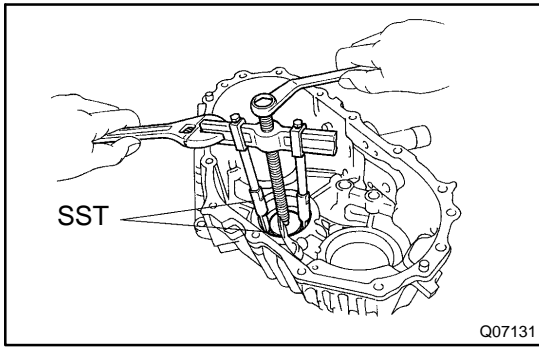
- (a) Remove the nut and washer from the shift outer lever.
Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)
 (b) Using a brass bar, hammer and socket wrench, tap out the lever lock pin.
 (c) Remove the shift outer lever, washer and inner lever from the front case.

- 21. REMOVE OIL RECEIVER FROM FRONT CASE**

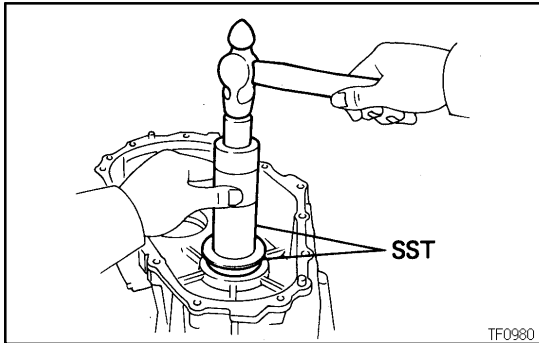
Remove the bolt and oil receiver.

Torque: 12 N·m (120 kgf-cm, 9 ft-lbf)

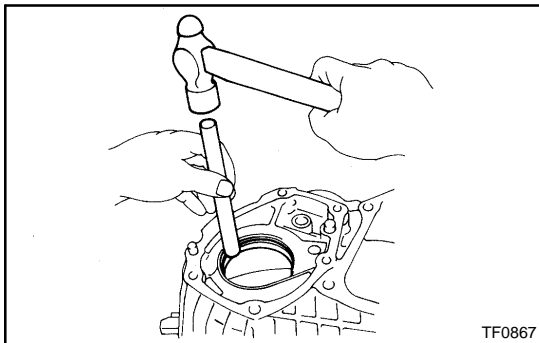
TRANSFER – TRANSFER ASSEMBLY

**22. REMOVE 2 BEARING RACES FROM FRONT CASE**

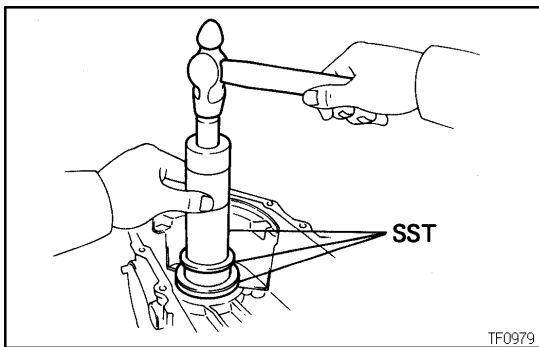
- (a) Using SST, remove the bearing race (for idler gear).
SST 09950-40010, 09950-60010 (09951-00320)

**HINT:**

At the time of reassembly, please refer to the following item.
Using SST and a press, install the bearing race (for idler gear).
SST 09316-60011 (09316-00011, 09316-00041)

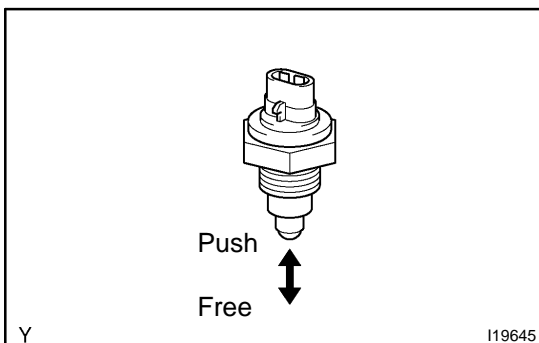


- (b) Using a brass bar and hammer, remove the bearing race (for output shaft).

**HINT:**

At the time of reassembly, please refer to the following item.
Using SST and a press, install the bearing race (for the out put shaft).

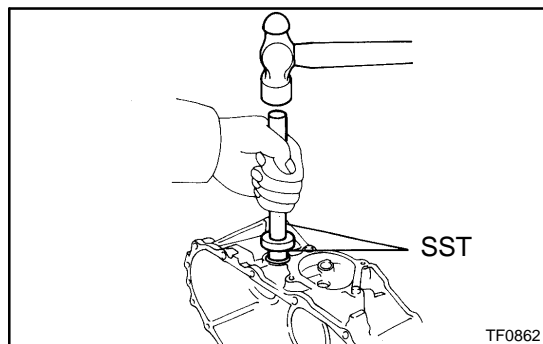
SST 09316-20011, 09316-60011 (09316-00011, 09316-00031)

**23. INSPECT TRANSFER INDICATOR SWITCH**

Check that there is continuity between the terminals, as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

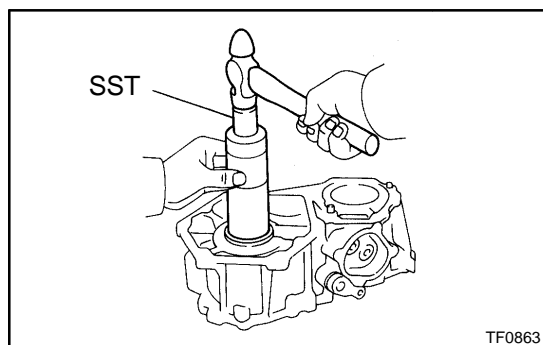
If continuity is not as specified, replace the switch.



REPLACEMENT

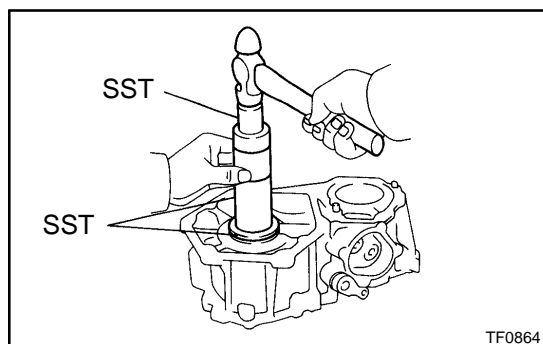
1. REPLACE SHIFT LEVER OIL SEAL

- (a) Using a screwdriver, pry out the oil seal.
- (b) Using SST and a hammer, drive in a new oil seal.
SST 0608-00081, 09950-70010 (09951-07150)



2. REPLACE INPUT SHAFT OIL SEAL

- (a) Using SST and a hammer, drive out the oil seal.
SST 09316-60011 (09316-00011)



- (b) Using SST and a hammer, drive in a new oil seal.
SST 09316-60011 (09316-00011, 09316-00031)

REASSEMBLY

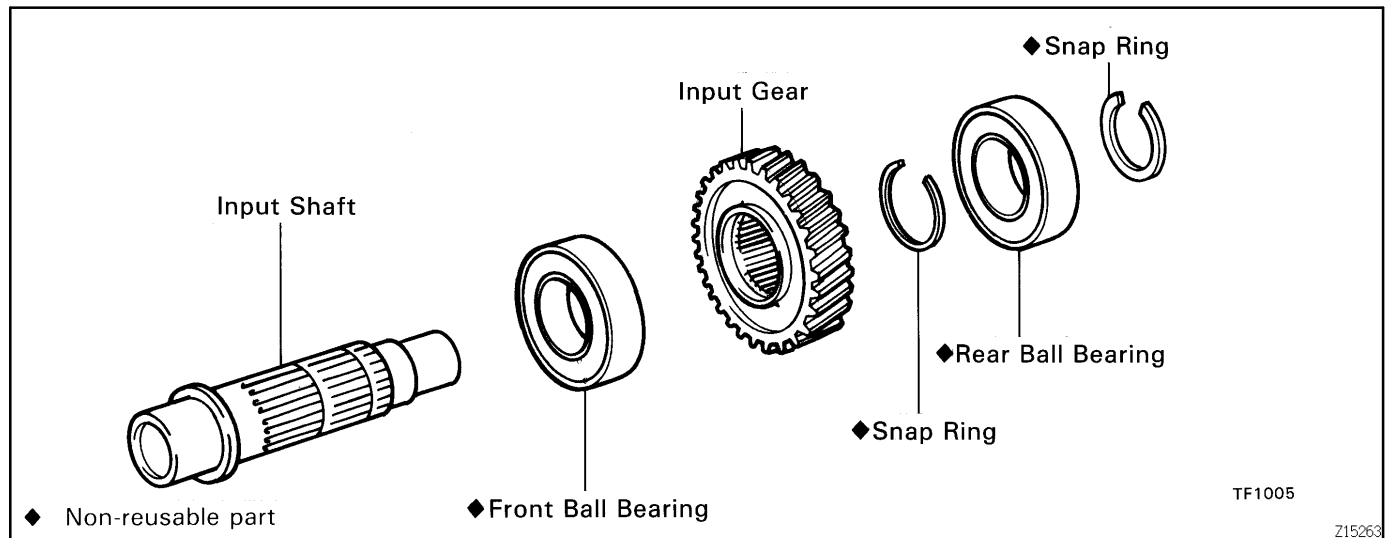
Reassembly is in the reverse order of disassembly (See page [TR-4](#)).

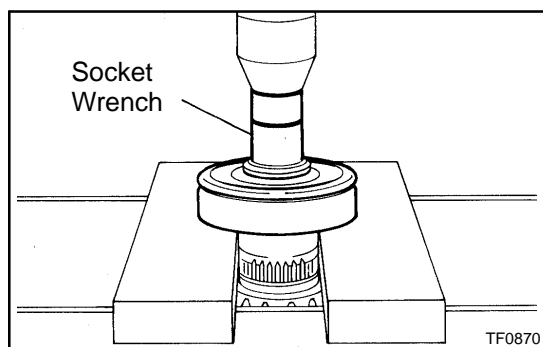
HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

INPUT SHAFT COMPONENTS

TROBS-01

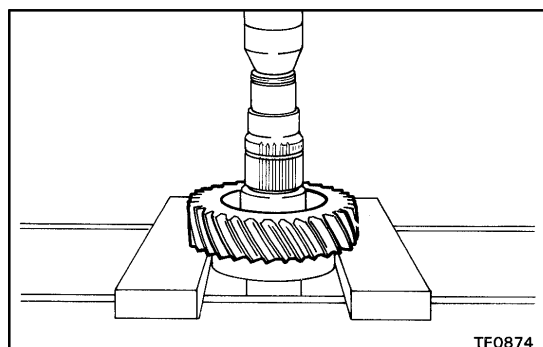




DISASSEMBLY

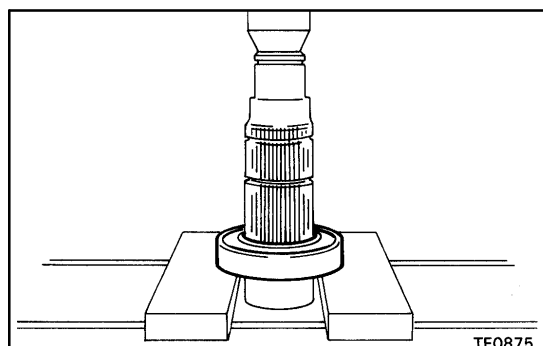
1. REMOVE REAR BALL BEARING

- (a) Using a snap ring expander, remove the snap ring.
- (b) Using a socket wrench and press, remove the rear ball bearing.



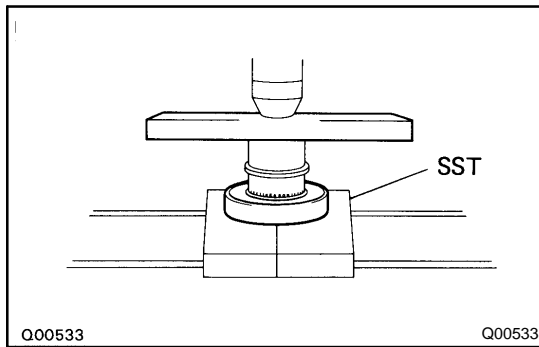
2. REMOVE INPUT GEAR

- (a) Using a snap ring expander, remove the snap ring.
- (b) Using a press, remove the input gear.



3. REMOVE FRONT BALL BEARING

Using a press, remove the front ball bearing.



REASSEMBLY

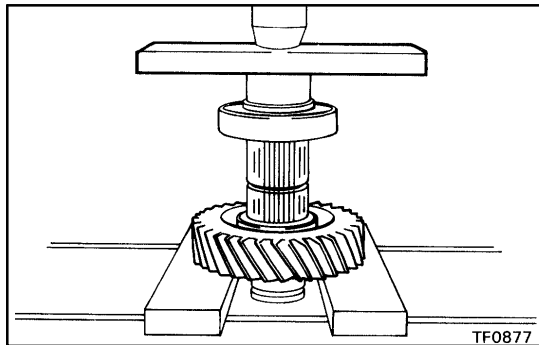
HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

1. INSTALL FRONT BALL BEARING

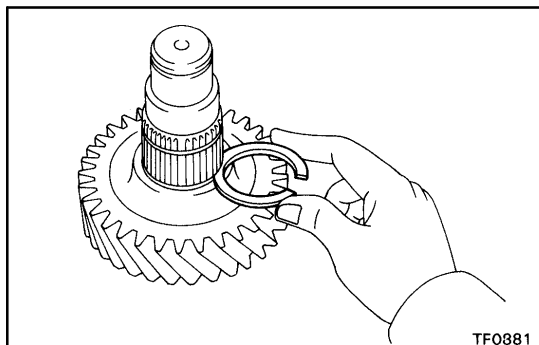
Using SST and a press, install a new front ball bearing.

SST 09527-30010



2. INSTALL INPUT GEAR

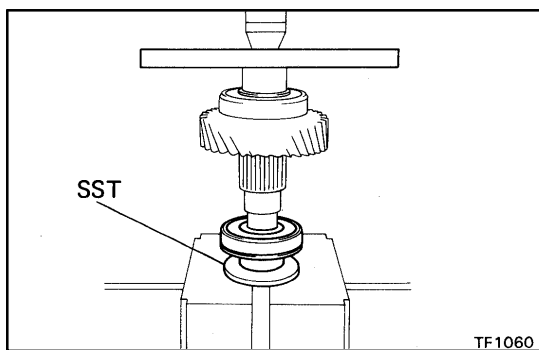
(a) Using a press, install the input gear.



(b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.00 (0.0787)	F	2.50 (0.0984)
B	2.10 (0.0827)	G	2.60 (0.1024)
C	2.20 (0.0866)	H	2.70 (0.1063)
D	2.30 (0.0906)	J	2.80 (0.1102)
E	2.40 (0.0945)	–	–

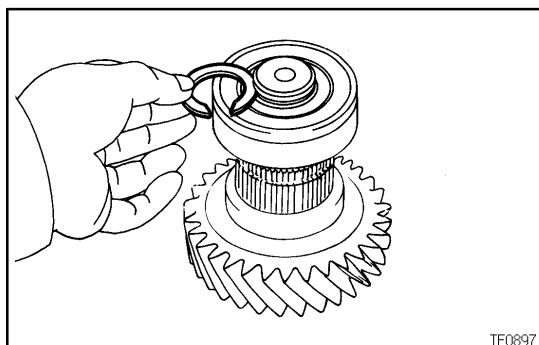
(c) Using a snap ring expander, install a new snap ring.



3. INSTALL REAR BALL BEARING

(a) Using SST and a press, install a new rear ball bearing.

SST 09316-60011 (09316-00031)



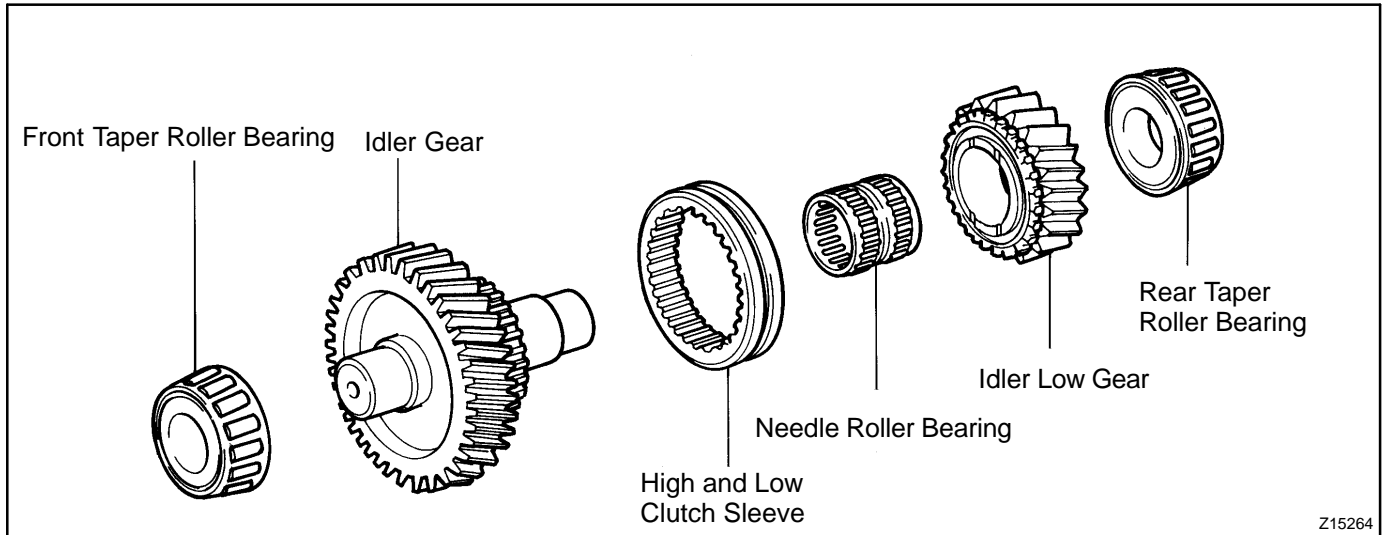
(b) Select a snap ring that will allow minimum axial play.

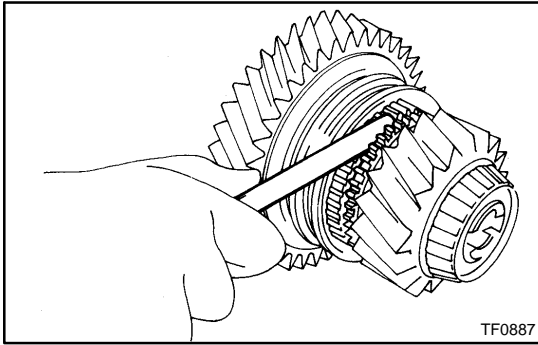
Mark	Thickness mm (in.)
A	2.00 (0.0787)
B	2.10 (0.0827)
C	2.20 (0.0866)
D	2.30 (0.0906)
E	2.40 (0.0945)

(c) Using a snap ring expander, install a new snap ring.

IDLER GEAR COMPONENTS

TROB8-01





DISASSEMBLY

1. INSPECT IDLER LOW GEAR RADIAL AND THRUST CLEARANCE

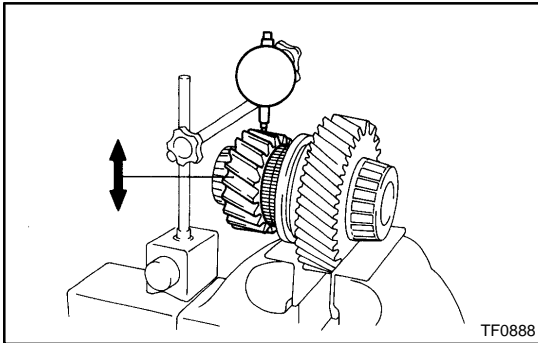
- (a) Using a feeler gauge, measure the idler low gear thrust clearance.

Standard clearance:

0.125–0.275 mm (0.0049–0.0108 in.)

Maximum clearance:

0.275 mm (0.0108 in.)



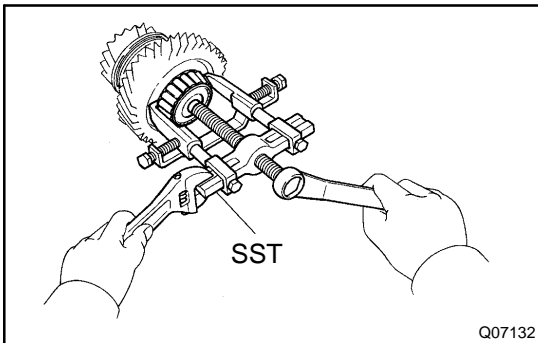
- (b) Using a dial indicator, measure the idler low gear radial clearance.

Standard clearance:

0.015–0.068 mm (0.0006–0.0027 in.)

Maximum clearance:

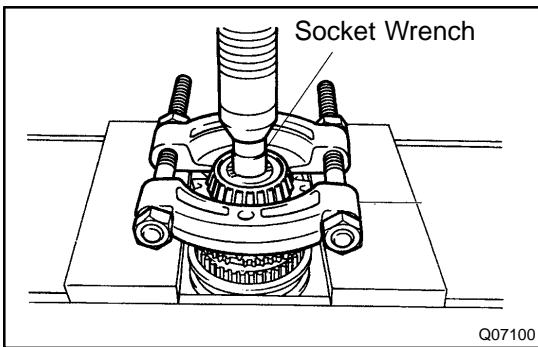
0.068 mm (0.0027 in.)



2. REMOVE FRONT TAPER ROLLER BEARING

Using SST, remove the front taper roller bearing.

SST 09950-40010



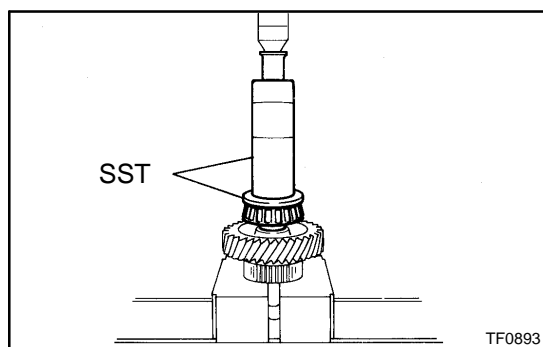
3. REMOVE REAR TAPER ROLLER BEARING

Using SST, a press and socket wrench, remove the rear taper roller bearing.

SST 09950-00020

4. REMOVE IDLER LOW GEAR AND NEEDLE ROLLER BEARING FROM IDLER GEAR

5. REMOVE HIGH AND LOW CLUTCH SLEEVE FROM IDLER GEAR



REASSEMBLY

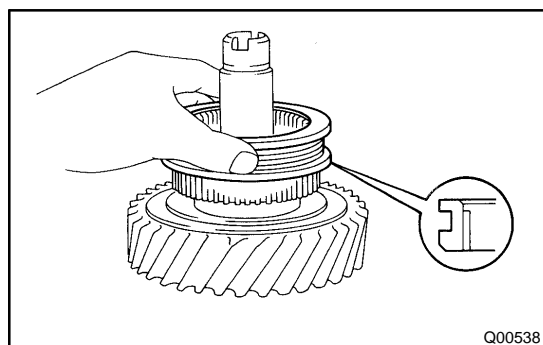
HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

1. INSTALL FRONT TAPER ROLLER BEARING

Using SST and a press, install the front taper roller bearing.

SST 09316-60011 (09316-00011, 09316-00031)



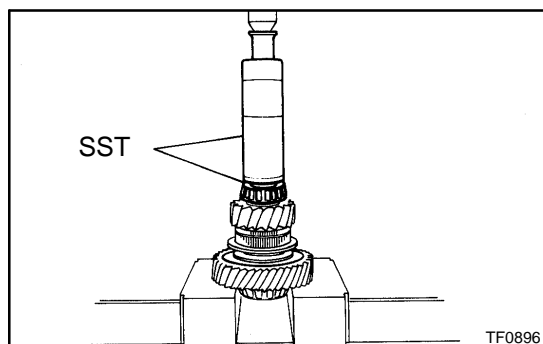
2. INSTALL HIGH AND LOW CLUTCH SLEEVE

HINT:

Make sure to install the high and low clutch sleeve in the correct direction.

3. INSTALL NEEDLE ROLLER BEARING AND IDLER LOW GEAR TO IDLER GEAR

- (a) Apply gear oil to the needle roller bearing.
- (b) Install the needle roller bearing and idler low gear.



4. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bearing.

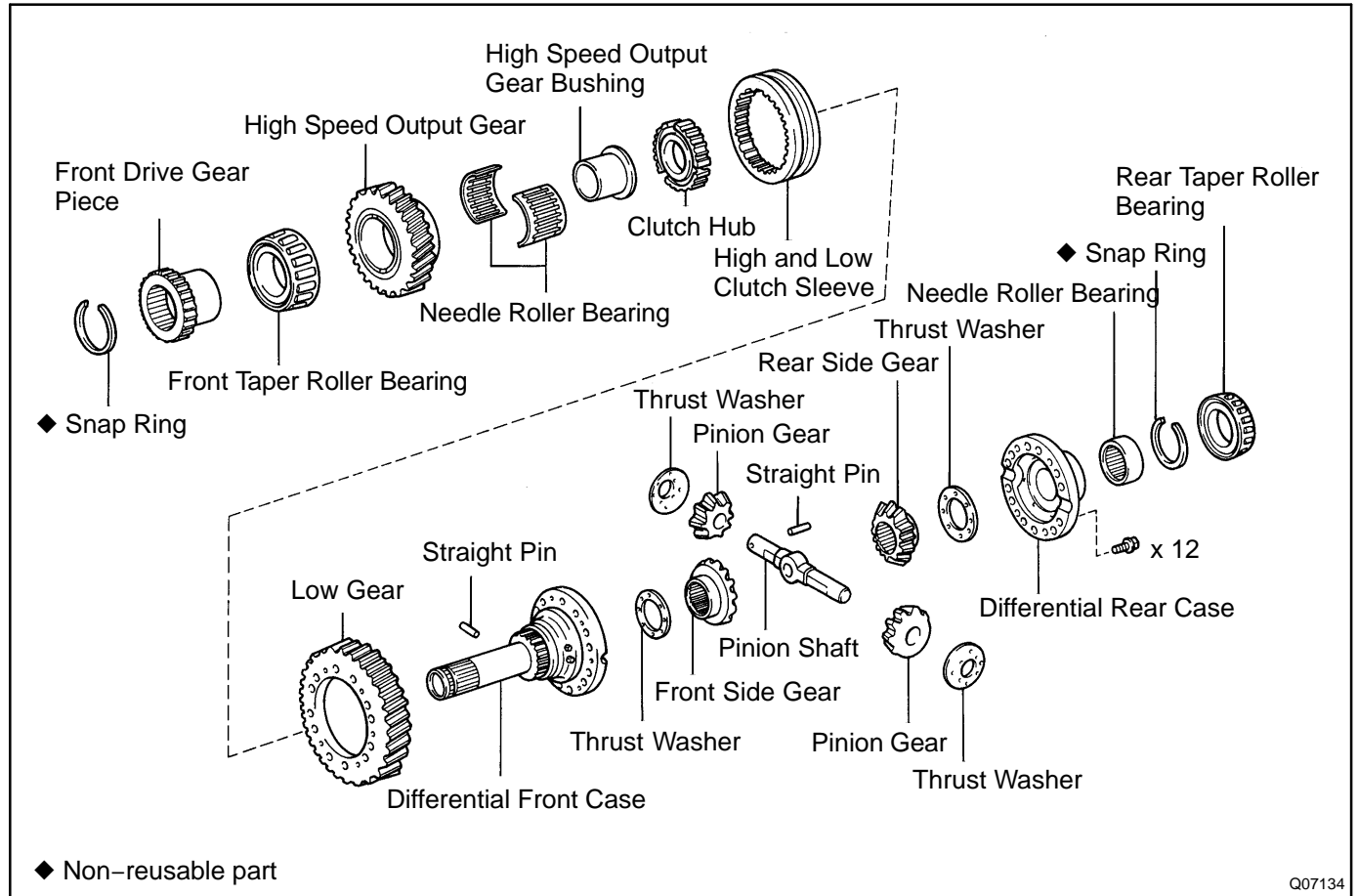
SST 09316-60011 (09316-00011, 09316-00071)

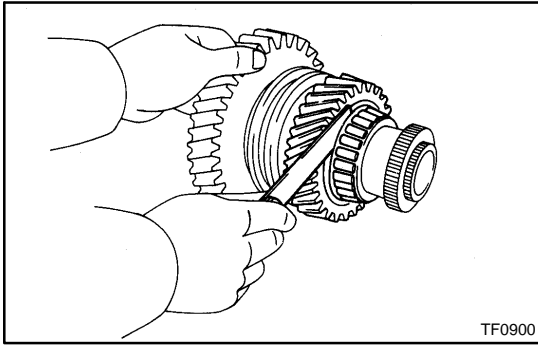
5. INSPECT IDLER LOW GEAR RADIAL AND THRUST CLEARANCE

(See page [TR-16](#))

CENTER DIFFERENTIAL COMPONENTS

TROBB-01





DISASSEMBLY

1. INSPECT HIGH SPEED OUTPUT GEAR RADIAL AND THRUST CLEARANCE

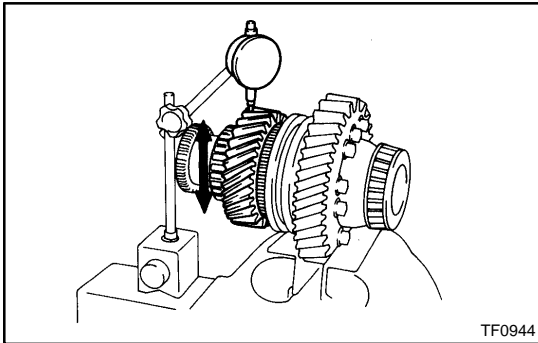
- (a) Using a feeler gauge, measure the high speed output gear thrust clearance.

Standard clearance:

0.10–0.25 mm (0.0039–0.0098 in.)

Maximum clearance:

0.25 mm (0.0098 in.)



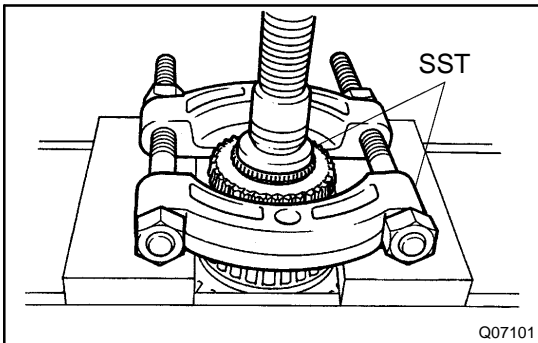
- (b) Using a dial indicator, measure the high speed output gear radial clearance.

Standard clearance:

0.035–0.091 mm (0.0014–0.0036 in.)

Maximum clearance:

0.091 mm (0.0036 in.)

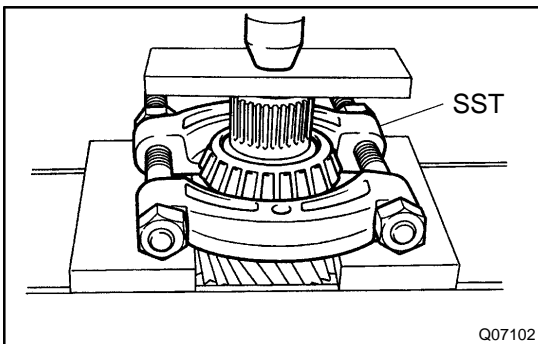


2. REMOVE FRONT DRIVE GEAR PIECE

- (a) Using a snap ring expander, remove the snap ring.
 (b) Using SST and a press, remove the front drive gear piece.
 SST 09950-00020, 09950-60010 (09951-00320)

NOTICE:

Be careful not to drop the center differential assembly.



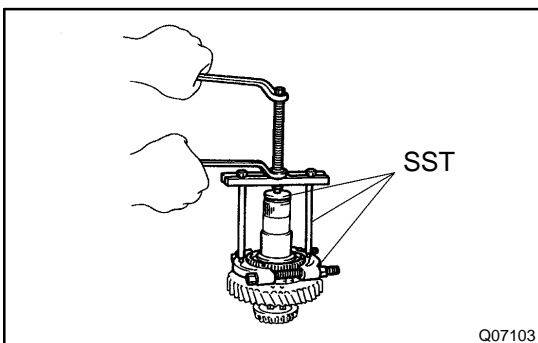
3. REMOVE FRONT TAPER ROLLER BEARING

Using SST and a press, remove the front taper roller bearing.
 SST 09950-00020

4. REMOVE HIGH SPEED OUTPUT GEAR

5. REMOVE NEEDLE ROLLER BEARING

6. REMOVE HIGH AND LOW CLUTCH SLEEVE ASSEMBLY

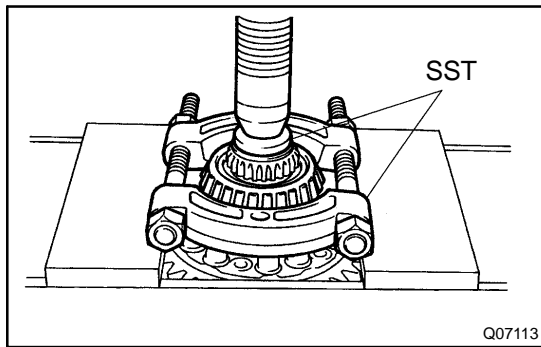


7. REMOVE HIGH SPEED OUTPUT GEAR BUSHING AND CLUTCH HUB

- (a) Using SST and a press, remove the high speed output gear bushing and clutch hub.

SST 09550-00020, 09950-00030, 09950-60010
 (09951-00320)

- (b) Using a magnetic finger, remove the straight pin from the differential front case.

**8. REMOVE REAR TAPER ROLLER BEARING**

Using SST and a press, remove the rear taper roller bearing.
SST 09950-00020, 09950-60010 (09951-00320)

9. REMOVE DIFFERENTIAL REAR CASE

Remove the 12 bolts and differential rear case.

10. REMOVE REAR SIDE GEAR AND THRUST WASHER**11. REMOVE PINION SHAFT, PINION GEAR AND THRUST WASHER**

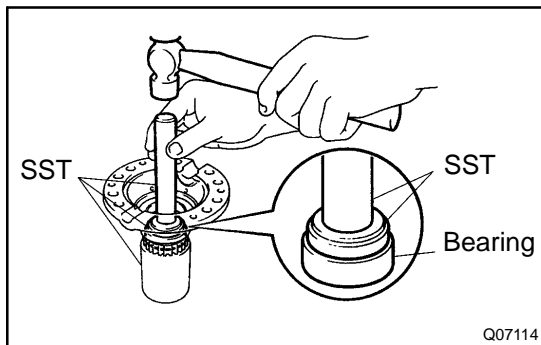
- (a) Remove the straight pin from the pinion shaft.
- (b) Remove the pinion shaft, 2 pinion gears and thrust washers.
- (c) Remove the front side gear and thrust washer.

12. REMOVE LOW GEAR

Using a plastic hammer, tap and remove the low gear.

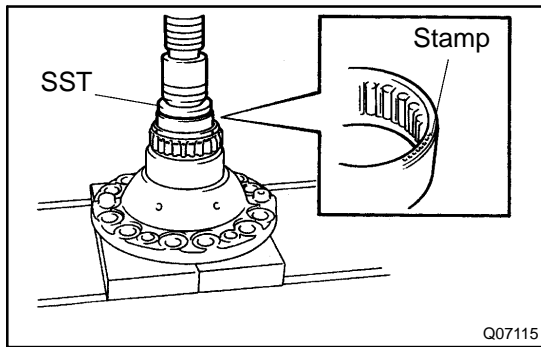
NOTICE:

Be careful not to damage the low gear.

**13. REMOVE NEEDLE ROLLER BEARING**

- (a) Using a screwdriver, remove the snap ring.
- (b) Using SST and a hammer, remove the needle roller bearing from the differential rear case.

SST 09223-00010, 09950-60010 (09951-00400),
09950-70010 (09951-07150)



REASSEMBLY

HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

1. INSTALL NEEDLE ROLLER BEARING

- (a) Using SST and a press, install the needle roller bearing to the differential rear case.

SST 09612-24014 (09612-10050)

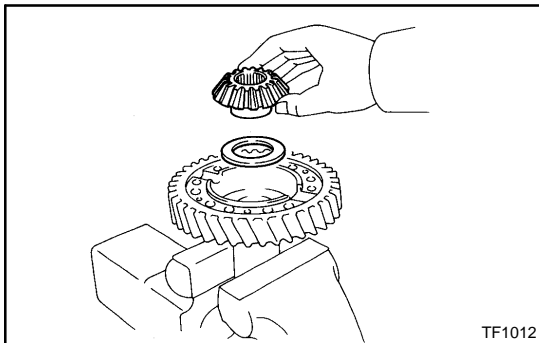
HINT:

Install the bearing to the differential rear case, taking care that its stamped side comes in contact with SST.

- (b) Install the snap ring.

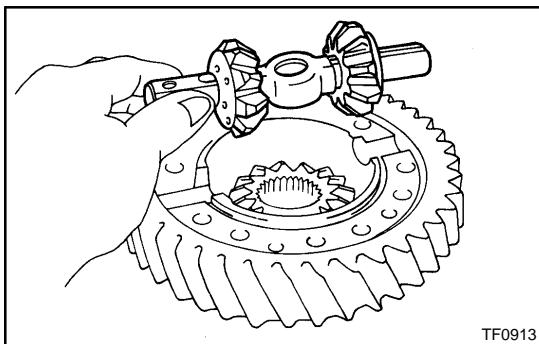
2. INSTALL LOW GEAR

- (a) Clean the contact surface of the differential case.
 (b) Heat the low gear in boiling water.
 (c) Carefully remove the low gear from the water.
 (d) After the moisture on the low gear has completely evaporated, quickly install the low gear to the differential case.

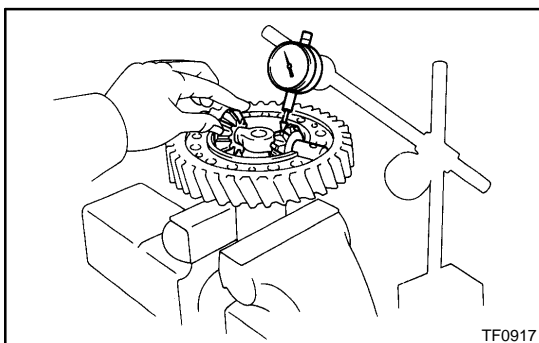


3. INSTALL PINION SHAFT, PINION GEAR AND THRUST WASHER

- (a) Install the front side gear and thrust washer to the differential front case.



- (b) Install the pinion shaft, 2 pinion gears and thrust washers to the differential front case.



- (c) Using a dial indicator, measure the front case backlash.

HINT:

Push the pinion shaft.

Minimum backlash: 0.05 mm (0.0020 in.)

If the backlash is not within the specification, replace the thrust washer with one of the correct size and reinstall the thrust washer.

Thickness mm (in.)	Thickness mm (in.)
1.70 (0.0669)	2.45 (0.0965)

1.85 (0.0728)	2.60 (0.1024)
2.00 (0.0787)	2.75 (0.1083)
2.15 (0.0846)	2.90 (0.1142)
2.30 (0.0906)	3.05 (0.1201)

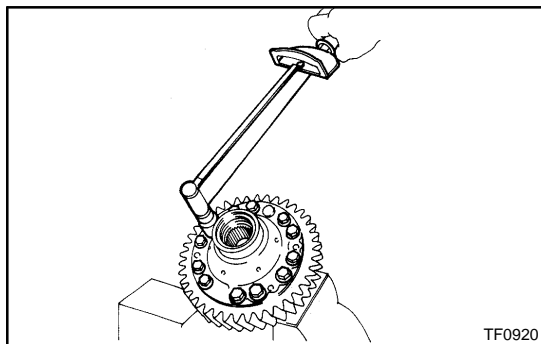
(d) In the same way, measure the rear case backlash.

4. INSTALL STRAIGHT PIN TO PINION SHAFT

5. INSTALL REAR SIDE GEAR AND THRUST WASHER

6. INSTALL DIFFERENTIAL REAR CASE

Install the differential rear case and 12 set bolts.



TF0920

7. TORQUE REAR CASE SET BOLT

(a) Torque the rear case 12 set bolts.

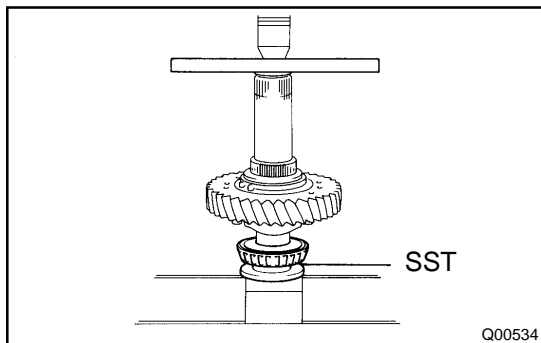
Torque: 88 N·m (900 kgf-cm, 65 ft-lbf)

(b) Turn the pinion gear.

(c) Loosen the rear case 12 set bolts.

(d) Torque the rear case 12 set bolts.

Torque: 98 N·m (1,000 kgf-cm, 72 ft-lbf)

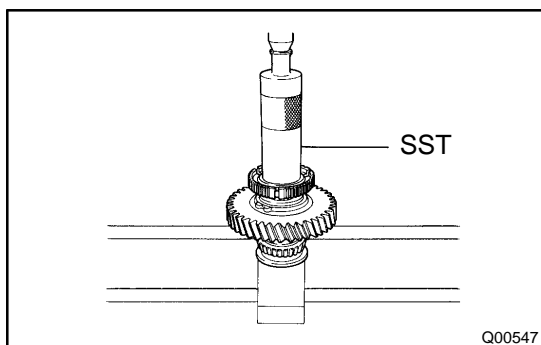


Q00534

8. INSTALL REAR TAPER ROLLER BEARING

Using SST and a press, install the rear taper roller bearing.

SST 09316-12010

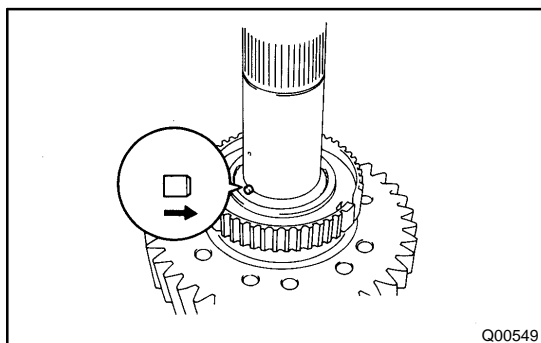


Q00547

9. INSTALL CLUTCH HUB

Using SST and a press, install the clutch hub.

SST 09316-12010, 09316-60011 (09316-00011)



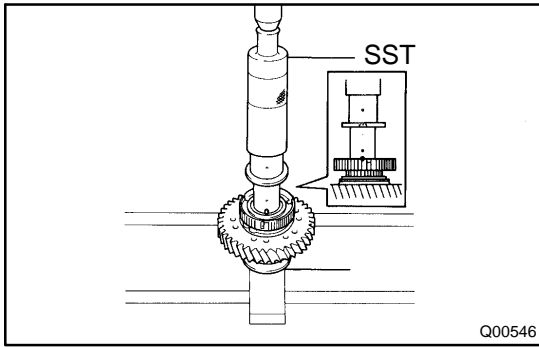
Q00549

10. INSTALL HIGH SPEED OUTPUT GEAR BUSHING

(a) Apply MP grease to the straight pin.

(b) Install the straight pin, as shown.

TRANSFER – CENTER DIFFERENTIAL

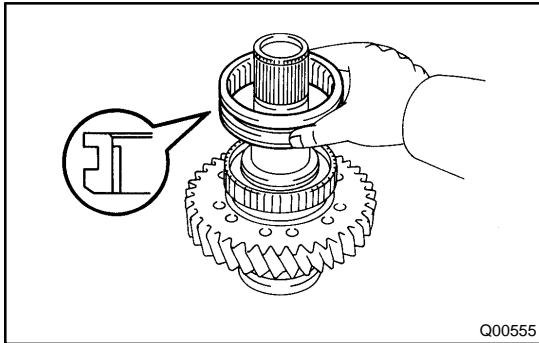


- (c) Using SST and a press, install the high speed output gear bushing.

SST 09316-12010, 09316-60011 (09316-00011)

NOTICE:

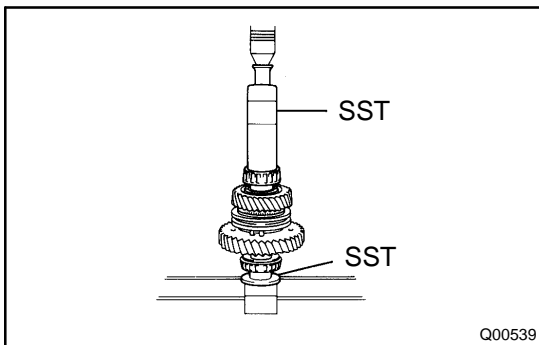
Before pressing, align the holes on the bushing and shaft so that the pin on the shaft aligned with the cutting portion of the bushing.

**11. INSTALL HIGH AND LOW CLUTCH SLEEVE****HINT:**

Make sure to install the high and low clutch sleeve in the correct direction.

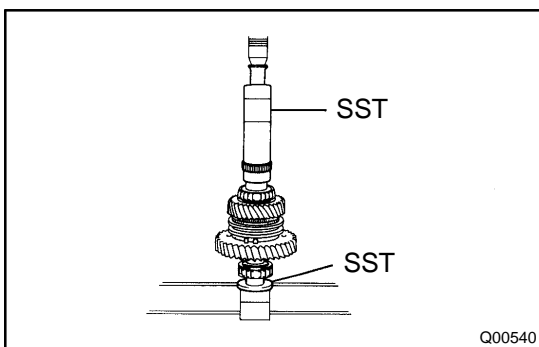
12. INSTALL HIGH SPEED OUTPUT GEAR AND NEEDLE ROLLER BEARING

- (a) Apply gear oil to the needle roller bearing.
(b) Install the high speed output gear and needle roller bearing.

**13. INSTALL FRONT TAPER ROLLER BEARING**

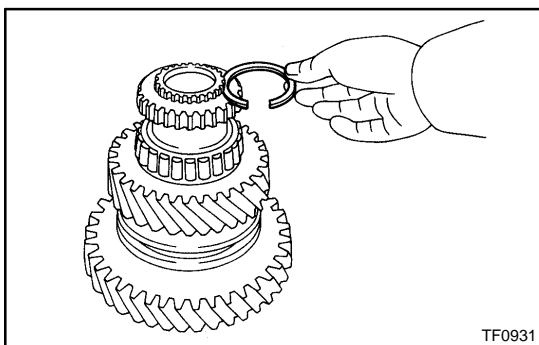
Using SST and a press, install the front taper roller bearing.

SST 09316-12010, 09316-60011 (09316-00011)

**14. INSTALL FRONT DRIVE GEAR PIECE**

Using SST and a press, install the front drive gear piece.

SST 09316-12010, 09316-60011 (09316-00011)

**15. INSTALL SNAP RING**

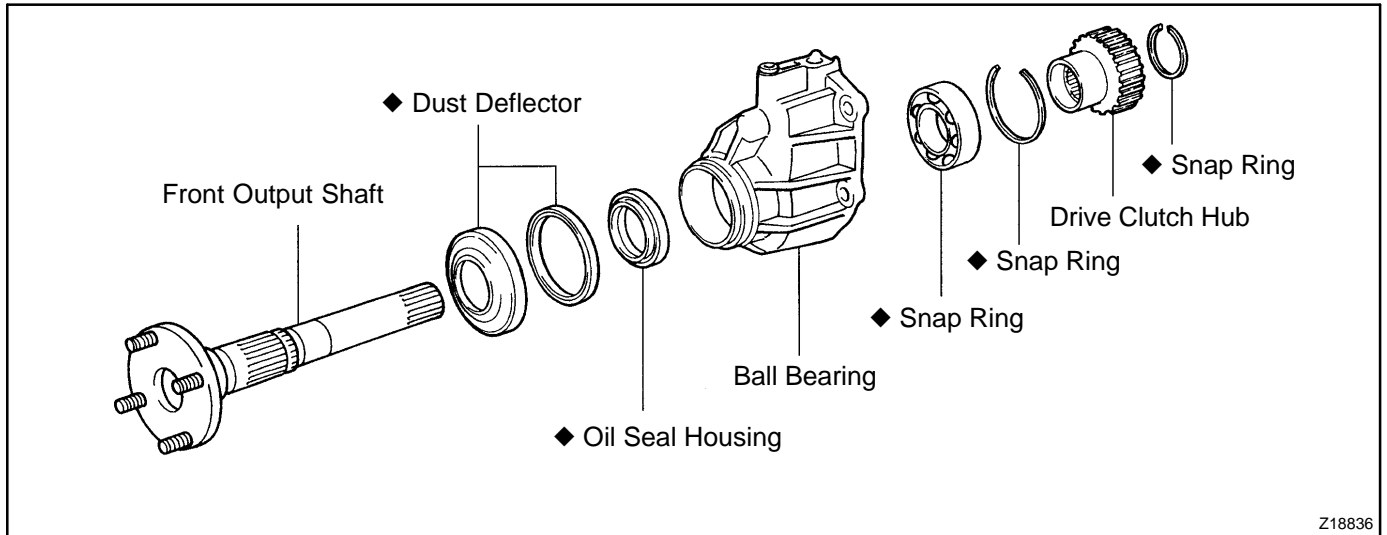
- (a) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.00 (0.0787)	G	2.60 (0.1024)
B	2.10 (0.0827)	H	2.70 (0.1063)
C	2.20 (0.0866)	J	2.80 (0.1102)
D	2.30 (0.0906)	K	1.80 (0.0709)
E	2.40 (0.0945)	L	1.90 (0.0748)
F	2.50 (0.0984)	–	–

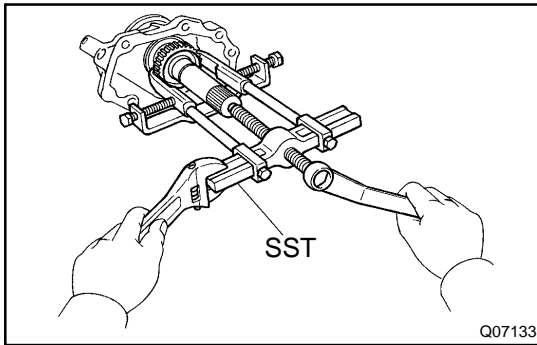
- (b) Using a snap ring expander, install a new snap ring.
- 16. INSPECT HIGH SPEED OUTPUT GEAR RADIAL AND THRUST CLEARANCE (See page [TR-19](#))**

FRONT EXTENSION HOUSING COMPONENTS

TROBE-01



Z18836

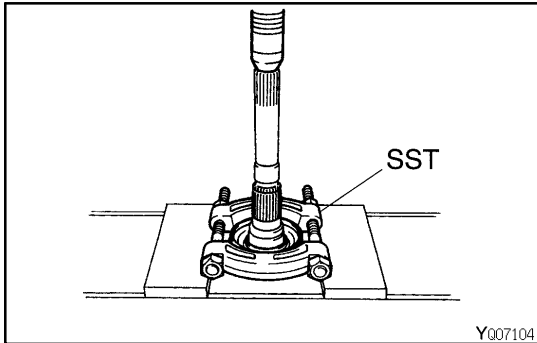


DISASSEMBLY

1. REMOVE DRIVE CLUTCH HUB

- (a) Using a snap ring expander, remove the snap ring.
- (b) Using SST, remove the drive clutch hub.

SST 09950-40010



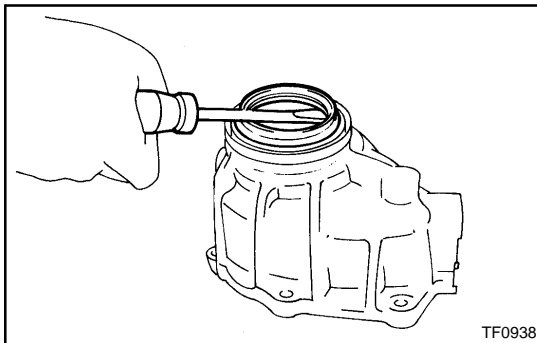
2. REMOVE FRONT OUTPUT SHAFT

Using a plastic hammer, drive out the front output shaft.

3. REMOVE DUST DEFLECTOR

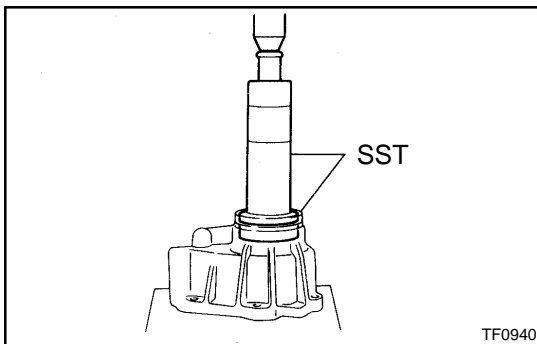
- (a) Using SST and a press, remove the dust deflector.
- (b) Using a screwdriver and hammer, tap the dust deflector and remove it from the extension housing.

SST 09950-00020



4. REMOVE OIL SEAL

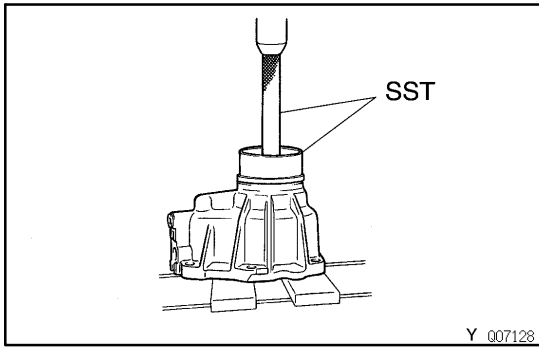
Using a screwdriver, pry out the oil seal from the front extension housing.



5. REMOVE BALL BEARING

- (a) Using a screwdriver, remove the snap ring.
- (b) Using SST and a press, remove the ball bearing.

SST 09316-60011 (09316-00011, 09316-00071)



REASSEMBLY

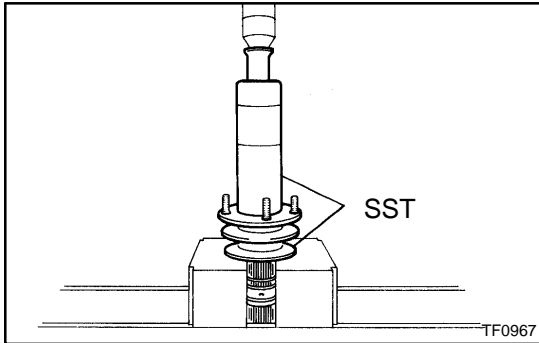
HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

1. INSTALL DUST DEFLECTOR

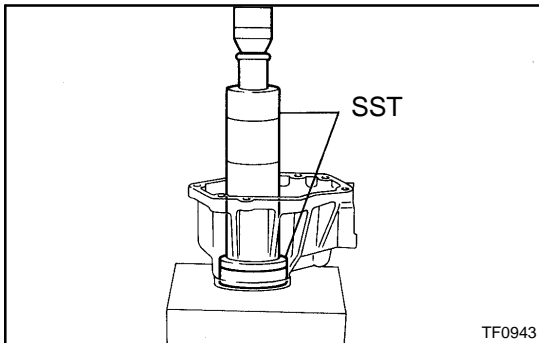
- (a) Using SST and a press, install a new dust deflector to the front extension housing.

SST 09223-15020, 09950-70010 (09951-07150)



- (b) Using SST and a press, install a new dust deflector to the front output shaft.

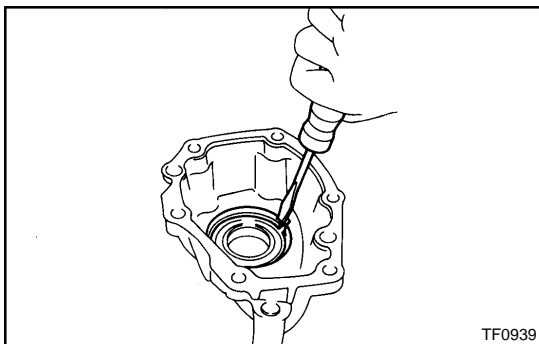
SST 09316-20011, 09316-60011 (09316-00011)



2. INSTALL BALL BEARING

- (a) Using SST and a press, install the ball bearing to the front extension housing.

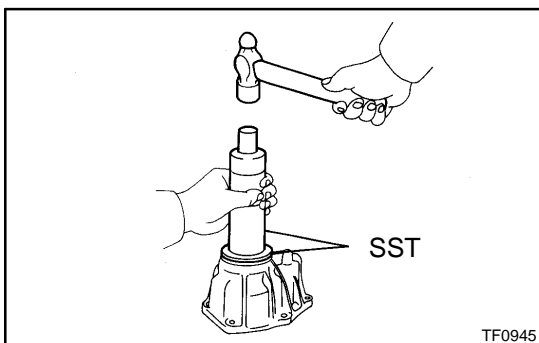
SST 09316-60011 (09316-00011, 09316-00031)



- (b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	1.7 (0.0669)
B	1.8 (0.0709)

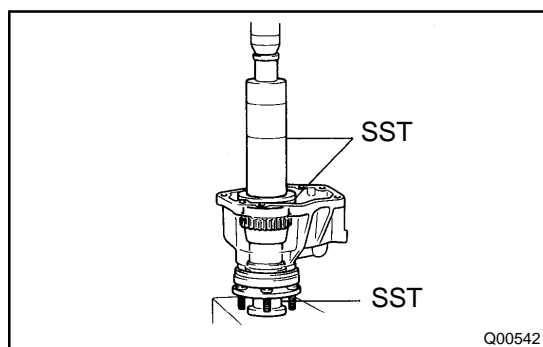
- (c) Using a screwdriver, install a new snap ring.



3. INSTALL OIL SEAL

Using SST and a hammer, drive in a new oil seal to the front extension housing.

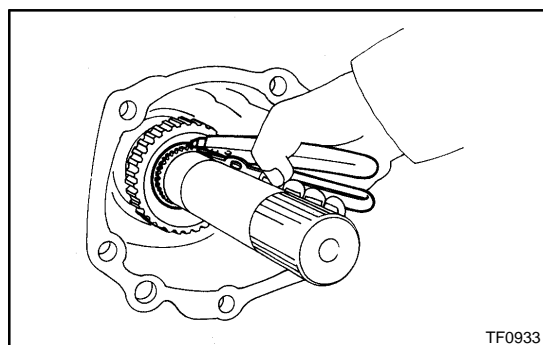
SST 09316-60011 (09316-00011, 09316-00061)



4. INSTALL FRONT OUTPUT SHAFT AND DRIVE CLUTCH HUB

- (a) Using SST and a press, install the front output shaft and drive clutch hub.

SST 09316-20011, 09316-60011 (09316-00011, 09316-00041, 09316-00071)



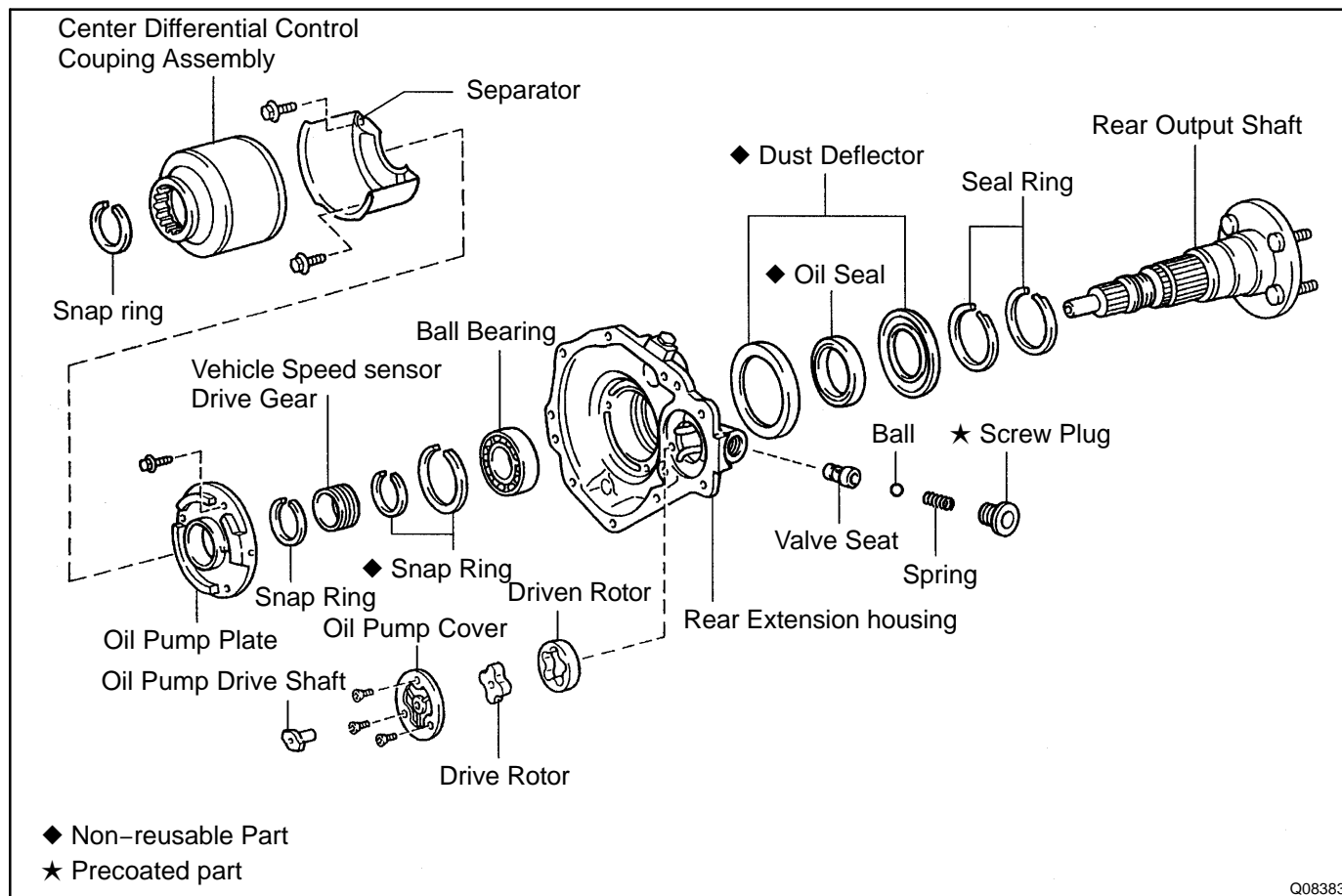
- (b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	1.8 (0.0709)
B	1.9 (0.0748)
C	2.0 (0.0787)
D	2.1 (0.0827)
E	2.2 (0.0866)

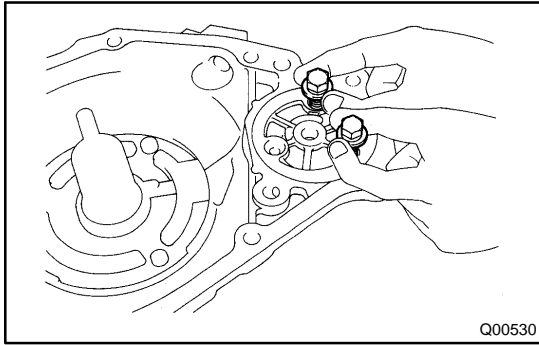
- (c) Using a snap ring expander, install a new snap ring.

REAR EXTENSION HOUSING COMPONENTS

TROBH-01

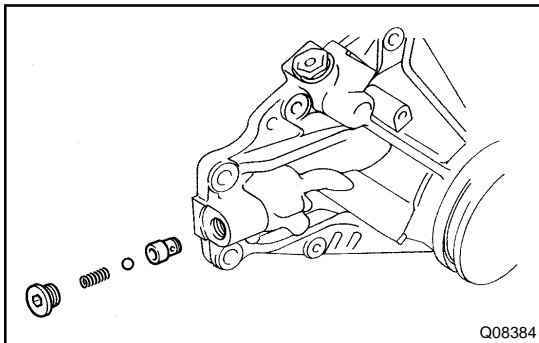


Q08383

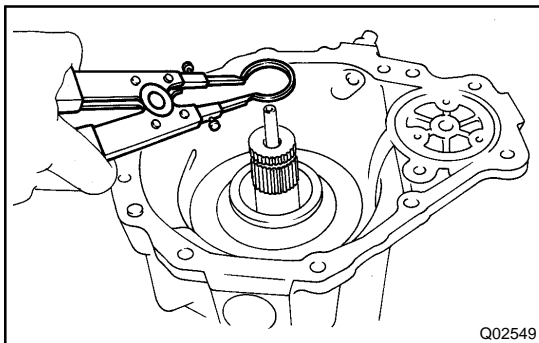


DISASSEMBLY

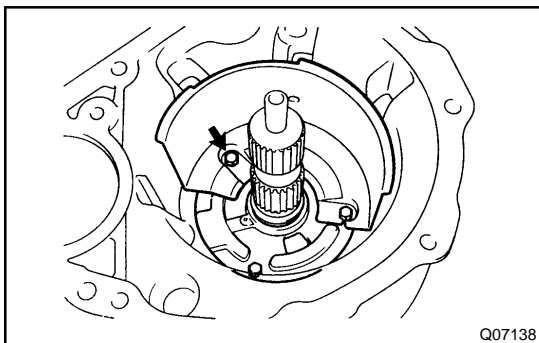
1. **REMOVE OIL PUMP DRIVE SHAFT**
2. **REMOVE OIL PUMP COVER**
 - (a) Using a torx socket wrench (T30), remove the 3 screws.
 - (b) Install the 2 suitable bolts to the pump cover.
 - (c) Remove the pump cover from the rear extension housing.
3. **REMOVE DRIVE ROTOR FROM DRIVEN ROTOR**
4. **REMOVE DRIVEN ROTOR FROM REAR EXTENSION HOUSING**



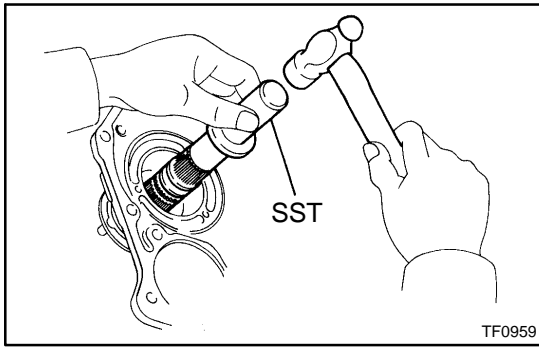
5. **REMOVE SCREW PLUG, SPRING, BALL AND VALVE SEAT**
 - (a) Using a hexagon wrench, remove the screw plug.
 - (b) Using a magnetic finger, remove the spring, ball and valve seat from the rear extension housing.



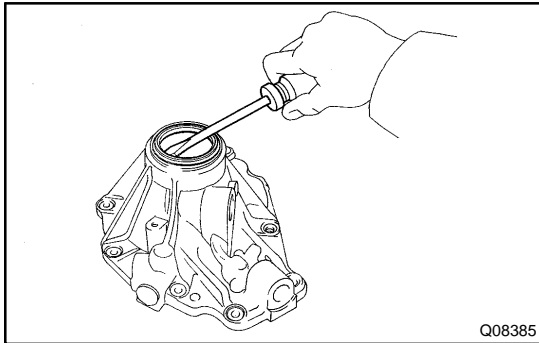
6. **REMOVE CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY**
 - (a) Using a snap ring expander, remove the snap ring.
 - (b) Remove the coupling assembly from the rear extension housing.



7. **REMOVE SEPARATOR AND OIL PUMP PLATE**
Remove the 3 bolts, separator and oil pump plate.
8. **REMOVE VEHICLE SPEED SENSOR DRIVE GEAR**
 - (a) Using a snap ring expander, remove the snap ring.
 - (b) Remove the vehicle speed sensor drive gear.

**9. REMOVE REAR OUTPUT SHAFT**

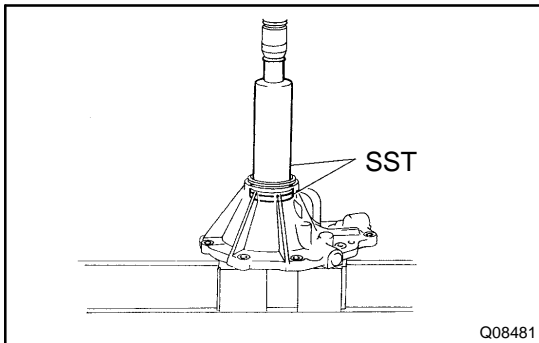
- (a) Using a snap ring expander, remove the snap ring.
- (b) Using SST and a hammer, remove the rear output shaft.
SST 09325-12010
- (c) Remove the 2 seal rings from the rear output shaft.

**10. REMOVE DUST DEFLECTOR**

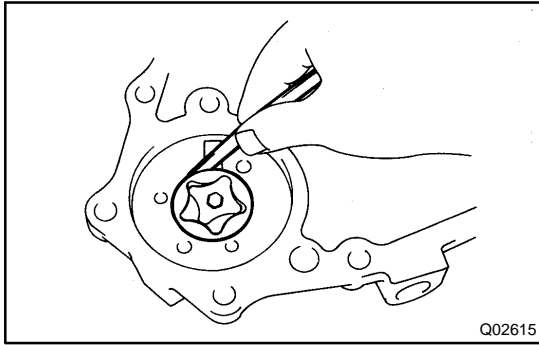
- (a) Using a screwdriver and hammer, remove the rear extension housing dust deflector.
- (b) Using a screwdriver and hammer, remove the rear output shaft dust deflector.

11. REMOVE OIL SEAL

Using a screwdriver, pry out the oil seal from the rear extension housing.

**12. REMOVE BALL BEARING**

- (a) Using a screwdriver, remove the snap ring.
- (b) Using SST and a press, remove the ball bearing to the rear extension housing.
SST 09316-60011 (09316-00011, 09316-00021)



INSPECTION

1. INSPECT DRIVEN ROTOR BODY CLEARANCE

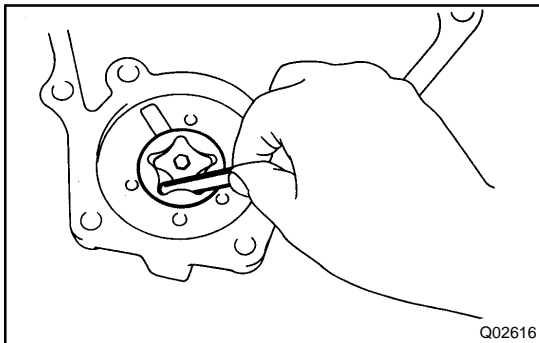
- (a) Install the drive rotor to the driven rotor.
- (b) Using a feeler gauge, measure the body clearance between the drive rotor and extension housing.

Standard body clearance:

0.08–0.17 mm (0.0031–0.0067 in.)

Maximum body clearance: 0.17 mm (0.0067 in.)

If the body clearance exceeds the maximum, replace the drive rotor or driven rotor.



2. INSPECT DRIVEN ROTOR TIP CLEARANCE

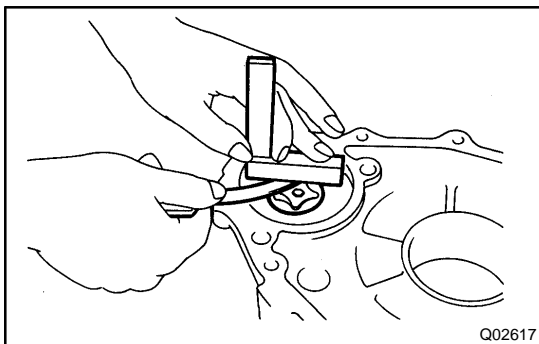
Using a feeler gauge, measure the tip clearance between the driver rotor and driven rotor.

Standard tip clearance:

0.05–0.15 mm (0.0020–0.0059 in.)

Maximum tip clearance: 0.15 mm (0.0059 in.)

If the tip clearance exceeds the maximum, replace the drive rotor or driven rotor.



3. INSPECT OIL PUMP SIDE CLEARANCE

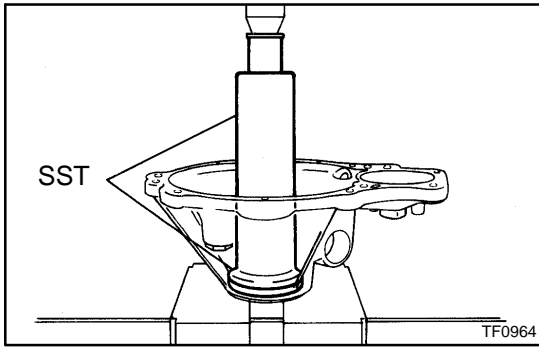
Using a steel straight edge and feeler gauge, measure the side clearance of oil pump.

Standard side clearance:

0.03–0.10 mm (0.0012–0.0039 in.)

Maximum side clearance: 0.10 mm (0.0039 in.)

If the side clearance exceeds the maximum, replace the drive rotor or driven rotor.



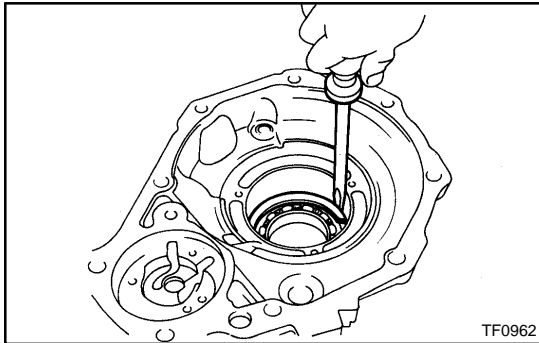
REASSEMBLY

HINT:

Coat all of the sliding and rotating surfaces with gear oil before assembly.

1. INSTALL BALL BEARING

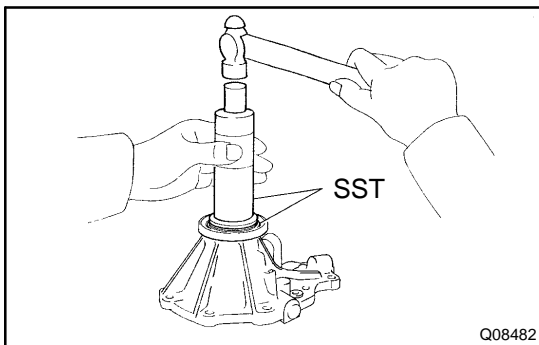
- (a) Using SST and a press, install the ball bearing.
SST 09316-60011 (09316-00011, 09316-00031)



- (b) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
A	1.7 (0.0669)
B	1.8 (0.0709)

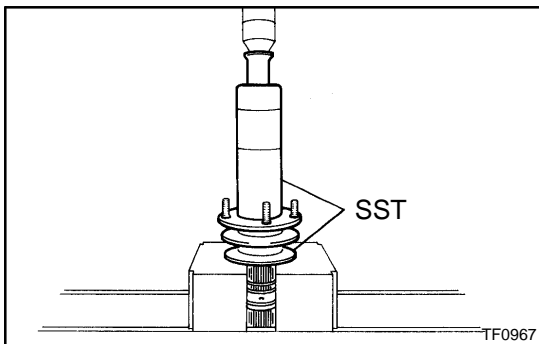
- (c) Using a screwdriver, install a new snap ring.



2. INSTALL DUST DEFLECTOR

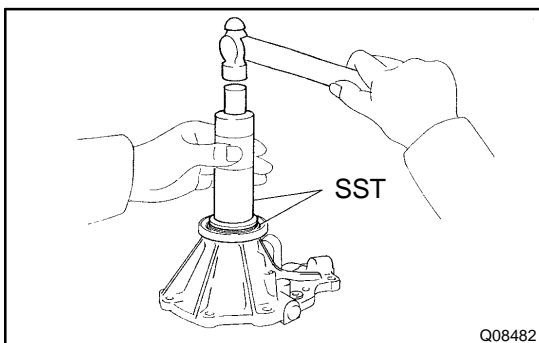
- (a) Using SST and a hammer, install a new rear extension housing dust deflector.

SST 09316-60011 (09316-00011, 09316-00041)



- (b) Using SST and a press, install a new rear output shaft dust deflector.

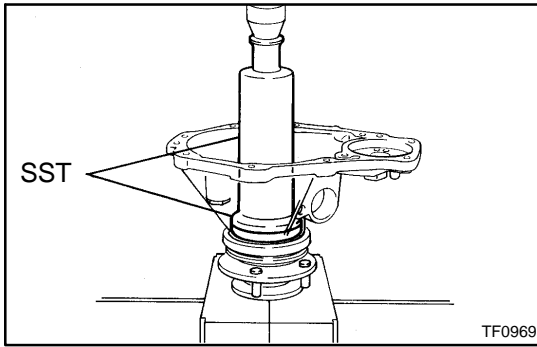
SST 09316-20011, 09316-60011 (09316-00011)



3. INSTALL OIL SEAL

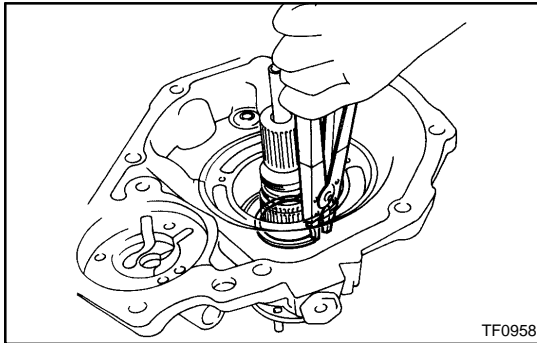
Using SST and a hammer, drive in a new oil seal.

SST 09316-60011 (09316-00011, 09316-00031)



4. INSTALL REAR OUTPUT SHAFT

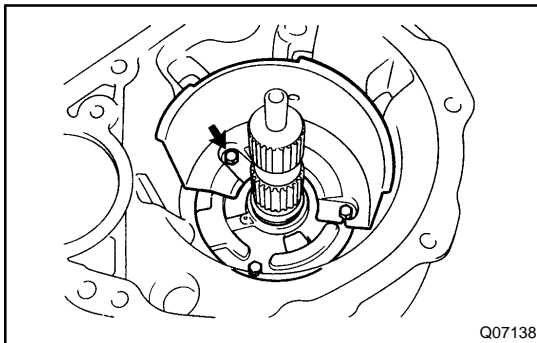
- (a) Using SST and a press, install the rear output shaft.
SST 09316-20011, 09316-60011 (09316-00011, 09316-00031)
- (b) Install the 2 seal rings to the rear output shaft.



- (c) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.95 (0.0768)
2	2.05 (0.0807)
3	2.15 (0.0847)
4	2.25 (0.0886)

- (d) Using a snap ring expander, install a new snap ring.



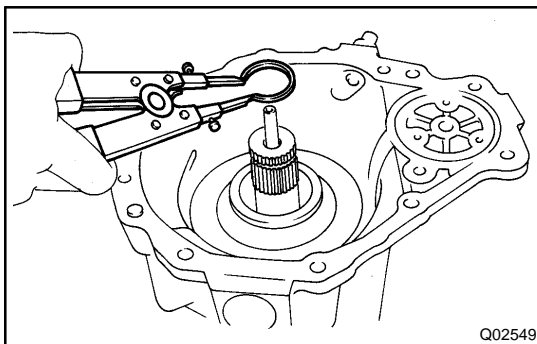
5. INSTALL VEHICLE SPEED SENSOR DRIVE GEAR

- (a) Install the vehicle speed sensor drive gear.
- (b) Using a snap ring expander, install the snap ring.

6. INSTALL OIL PUMP PLATE AND SEPARATOR

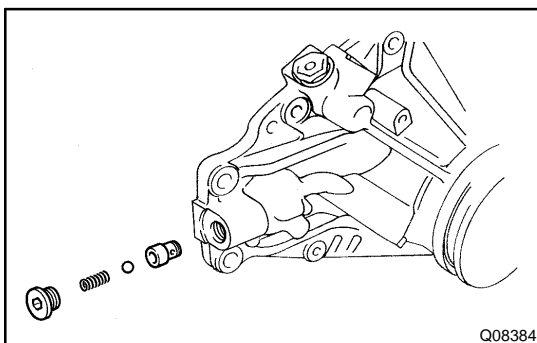
- (a) Install the oil pump plate.
- (b) Install the separator.
- (c) Install and torque the 3 bolts.

Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)



7. INSTALL CENTER DIFFERENTIAL CONTROL COUPLING ASSEMBLY

- (a) Install the coupling assembly to the output shaft.
- (b) Using a snap ring expander, install the snap ring.

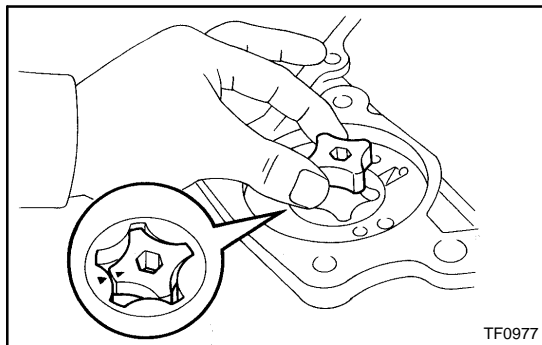


8. INSTALL VALVE SEAT, BALL, SPRING AND SCREW PLUG

- (a) Apply gear oil to the ball.
- (b) Install the valve seat, ball and spring.
- (c) Apply liquid sealer to the screw plug.
Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent
- (d) Using a hexagon wrench, install and torque the screw plug.

Torque: 29 N·m (300 kgf·cm, 22 ft-lbf)

TRANSFER – REAR EXTENSION HOUSING

**9. INSTALL DRIVEN ROTOR**

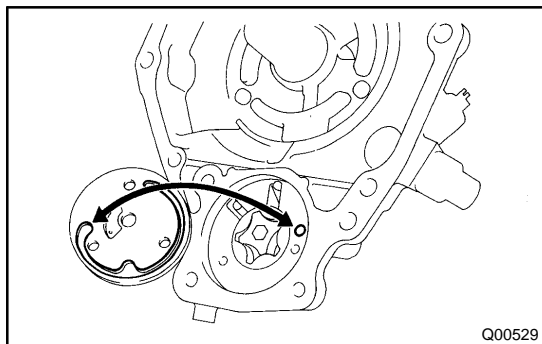
- (a) Apply gear oil to the driven rotor.
- (b) Install the driven rotor.

10. INSTALL DRIVE ROTOR

- (a) Apply gear oil to the drive rotor.
- (b) Install the drive rotor.

HINT:

Align the alignment marks.

**11. INSTALL OIL PUMP COVER**

- (a) Install the oil pump cover.
- (b) Using a torx socket wrench (T30), install and torque the 3 screws.

Torque: 4.9 N·m (50 kgf·cm, 43 in.-lbf)

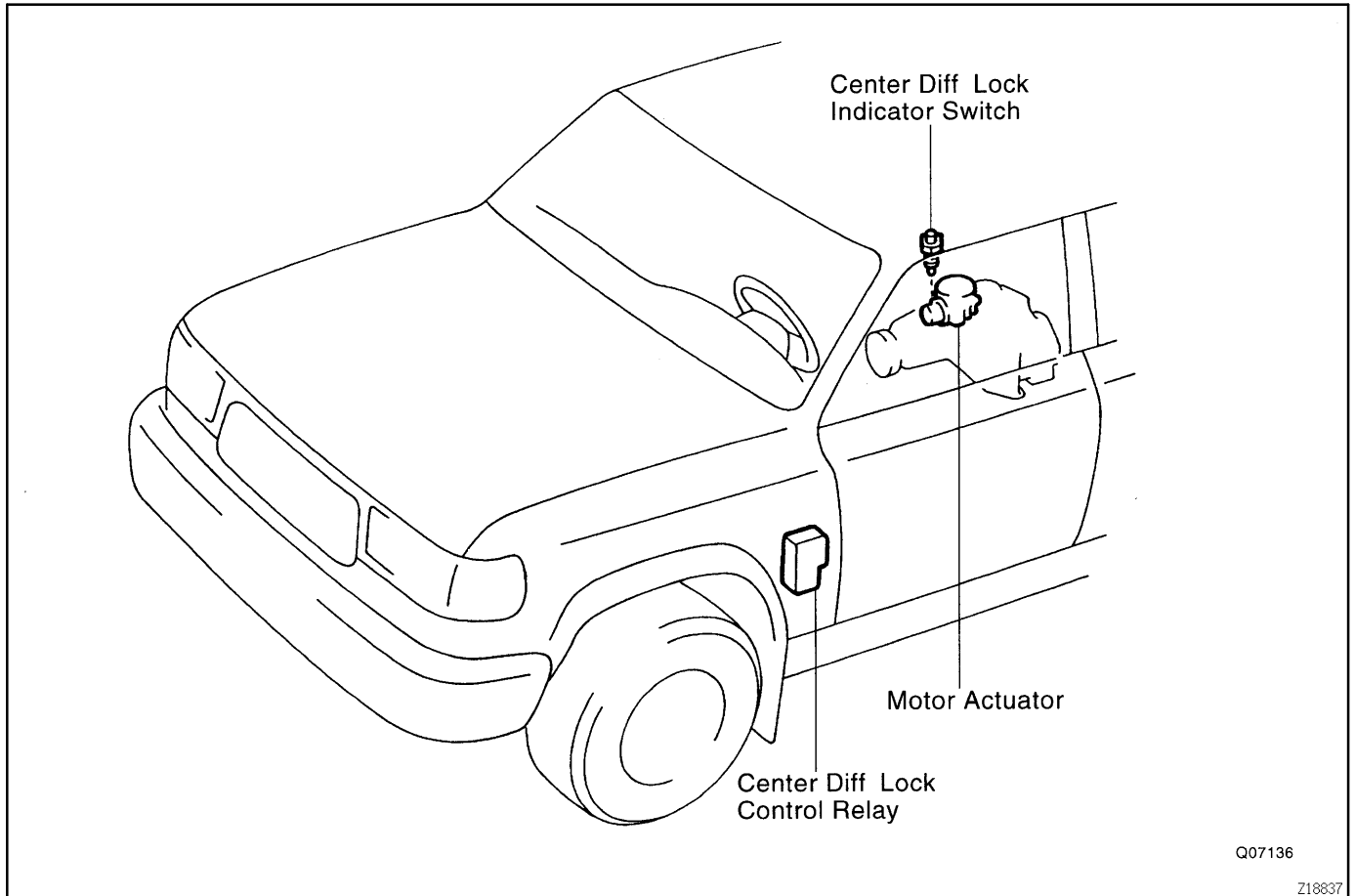
NOTICE:

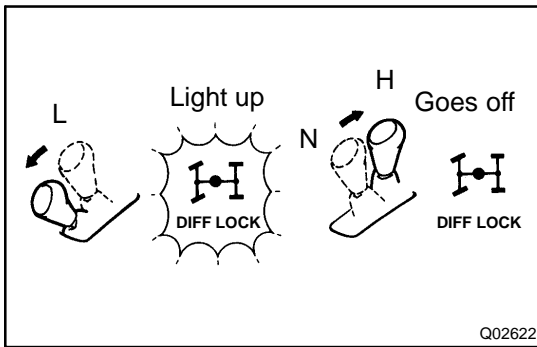
Align the oil hole of the rear extension housing and oil groove end of the oil pump cover.

12. INSTALL OIL PUMP DRIVE SHAFT

MOTOR SHIFT CONTROL SYSTEM LOCATION

TROBL-01



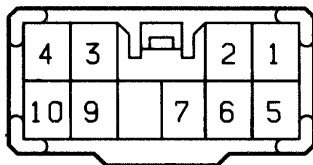


INSPECTION

1. INSPECT SHIFT LEVER POSITION

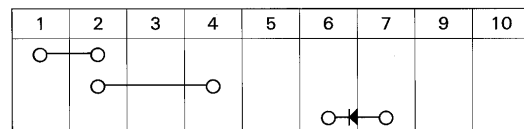
- Start the engine, and turn the center diff lock switch to OFF.
- Check that the center diff indicator light comes on when the transfer shift lever shifted to the "L" position. Check that the light goes off when the lever is shifted to the "N" or "H" position.

Relay Side



2. INSPECT CENTER DIFF LOCK CONTROL RELAY

- Check that there is continuity between the terminals, as shown in the chart.



HINT:

There is a diode between the terminals 6 and 7. If the circuit shown no continuity, change the positive (+) and negative (-) probes and recheck the circuit.

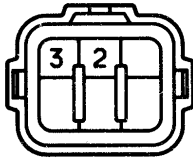
- Apply battery positive voltage between the terminals and check that there is continuity between the terminals, as shown in the chart.

Terminal		1	2	3	4	5	6	7	8	9	10
Battery positive voltage											
⊕	⊖										
6	5	○—○	○—○								
7	2		○—○							○—○	
9	10		○—○	○—○							

○—○ : Continuity
○×○ : No continuity

V06651

If continuity is not as specified, replace the relay.

Motor Actuator Side

IS-6-2

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3. INSPECT MOTOR ACTUATOR

- (a) Measure the resistance between the terminals 2 and 3.
Standard resistance: 0.3 – 100 Ω
- (b) Measure the resistance between the terminals 2 or 3 and body ground.

Standard resistance: More than 0.5 M Ω

If the resistance value is not as specified, replace the motor actuator.