

WORKSHOP MANUAL

DAIHATSU

CHARADE

TYPE HC ENGINE

FOREWORD

This workshop manual describes the maintenance and servicing procedures for Type HC engines which are mounted on the Daihatsu Charade.

In this workshop manual, the entire portion is divided into 10 sections and four supplements. Each section has an index along with a table of contents at the beginning. For easier reference, the upper part of each page bears the section title concerned.

All information used in this workshop manual was in effect at the time when the manual was approved for printing. However, the specifications and procedures may be revised due to the continuing improvements in the design without advance notice and without incurring any obligation to us.

Published in November, 1988

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NOTE:

Type HC engine comes in two kinds: One is a carburetor-equipped engine. The other is an EFI-equipped engine.

For simplified expression, the carburetor-equipped engine is coded merely as Type HC-C engine, whereas the EFI-equipped engine is coded merely as Type HC-E engine in this Workshop Manual.

DAIHATSU

CHARADE

TYPE HC ENGINE

GI

GENERAL INFORMATION

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HOW TO USE THIS MANUAL

In this workshop manual, the entire portion is divided into 10 sections and four supplements. Each section has a table of contents in the beginning. For easier reference, a thumb index is provided.

Also, the upper part of each page bears the section title concerned so that you may use this manual readily and fully.

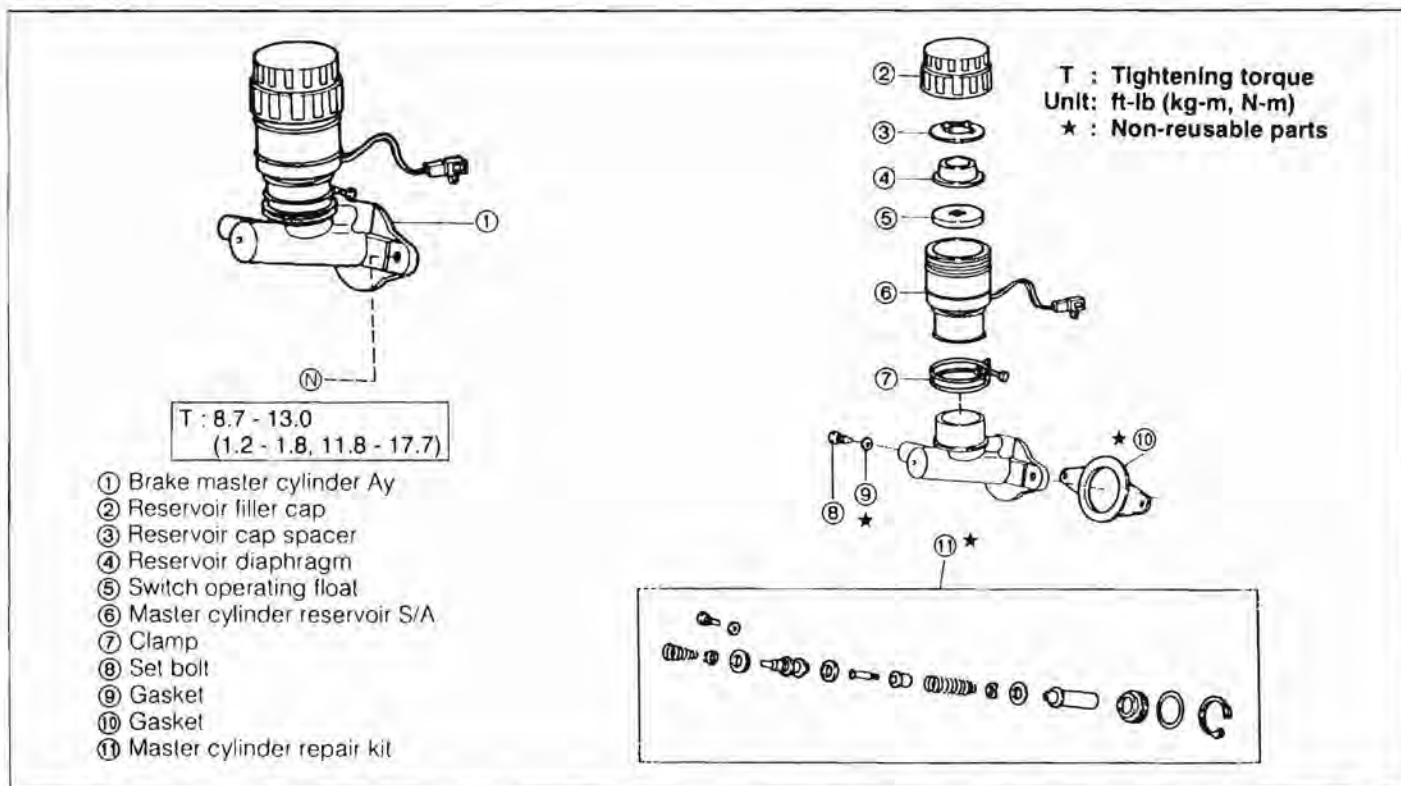
WR88-GI002

CONTENTS OF EXPLANATION

1. Schematic Diagram of Components

- (1) The schematic diagram of components that appears at the beginning of each section describes the nomenclature and installed conditions of each component. Also, the tightening torque is posted in the figure.
- (2) Those parts whose reuse is not permitted bear a "*" mark for an identification purpose. Be certain to replace these parts with new ones during the assembly.

(Example)




WR88-GI003

2. Servicing Procedure

- (1) In principle, the servicing procedure is described in the following sequence given below: Removal → Inspection → Installation, and Disassembly → Inspection → Assembly.
- (2) The explanation covers detailed servicing methods, specifications and notes.
- (3) The main point of each item explains the servicing section and servicing procedure, using illustrations.

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(Example)

What to do	How to it	What to do and where
3. Brake tube installation (1) Install the brake tube to the wheel cylinder temporarily by hands. (2) Tighten the brake tube to the wheel cylinder, using the following SST. SST: 09751-36011-000		

WR88-GI005

- (4) The inspection section in this manual describes only checking operation. Therefore, if you find any malfunction, replace the defective parts with new ones.

3. SST

For those operations which require the use of any SST, the SST numbers concerned are given in bold letters.

Also, a table of all SSTs is collectively posted in the Appendix Data A.

4. Service Specifications

Service specifications are indicated in bold letters or enclosed by heavy lines. Be certain to confirm the specifications concerned.

Service specifications are collectively posted in the Appendix Data B.

5. Tightening Torque

For those operations which require the control of tightening torque, the relevant tightening torque is given in bold letters. Be certain to confirm the tightening torque concerned. Tightening torque specifications are collectively posted in the Appendix Data C.

6. Definitions of Terms

Specified Value ... A value which represents the allowable range during the inspection and adjustment.

Limit A maximum or a minimum limit which the value should not exceed or fall below.

WARNING, CAUTION & NOTE:

All these symbols are indicated in bold letters.

WARNING:

This symbol means that there is a possibility of personal injury of the operator himself or the nearby workers if the operator fails to follow the operating procedure prescribed in this manual.

CAUTION:

This symbol means that there is a possibility of damage to the component being repaired if the operator fails to follow the operating procedure prescribed in this manual.

NOTE:

To accomplish the operation in an efficient manner, additional instructions concerning the operation are given in this section.

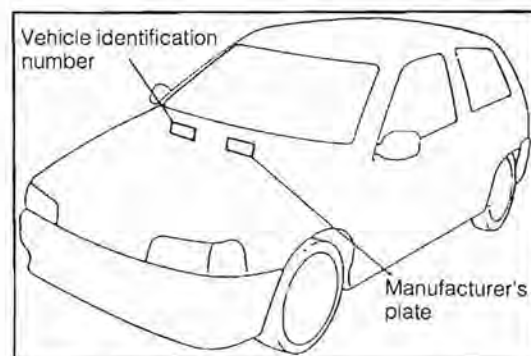
WR88-GI006

IDENTIFICATION INFORMATION

VEHICLE IDENTIFICATION NUMBER

1. Position of Vehicle Identification Number

The vehicle identification number is stamped on the front cowl inside the engine compartment.



WR88-GI007

2. The First Stamped Vehicle Identification Number

* JDA G102S 000600001 *

* JDA G112S 000600001 *

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3. Explanation of Vehicle Identification Number

* JDA G 100 S 0 00000000 *

Manufactured serial number

No meaning (Not used)

Body type code

S: Carriage of passengers

V: Carriage of goods

Daihatsu model code

100: CB 993 cc gasoline engine

CB-61 993 cc gasoline engine

CB-80 993 cc gasoline engine

CB-90 993 cc gasoline engine

101: CL 993 cc diesel engine

CL-61 993 cc diesel engine

102: HC 1295 cc gasoline engine

112: HC 1295 cc gasoline engine (4WD)

Vehicle line

G: Charade

Geographical area, country and manufacturer

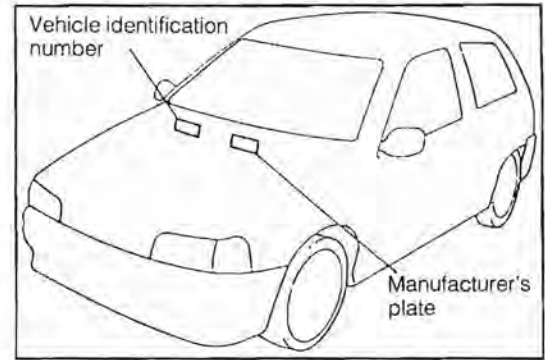
JDA: Asia, Japan, Daihatsu

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MANUFACTURER'S PLATE

1. Position of Manufacturer's Plate

The manufacture's plate is affixed on the cowl panel inside the engine compartment.



WR88-GI010

2. Contents of Manufacturer's Plate

A. General Specification

(1)	DAIHATSUMOTORCO..LTD.JAPAN																			
(2)	TYPE																			
(3)	CHASSIS NO																			
(4)	ENGINE																			
(6)	COLOR					TRIM					(7)									
ENGINE NO																				
ダイハツ工業株式会社																				

WR88-GI010A

B. EC Specification

(1)	DAIHATSU MOTOR OO..LTD																				
																		Kg			(3)
																		Kg			(10)
																		Kg			(11)
																		Kg			(12)
																		Kg			(13)
(2)	TYPE																				
(4)	ENGINE																				
																		COLOR			(6)

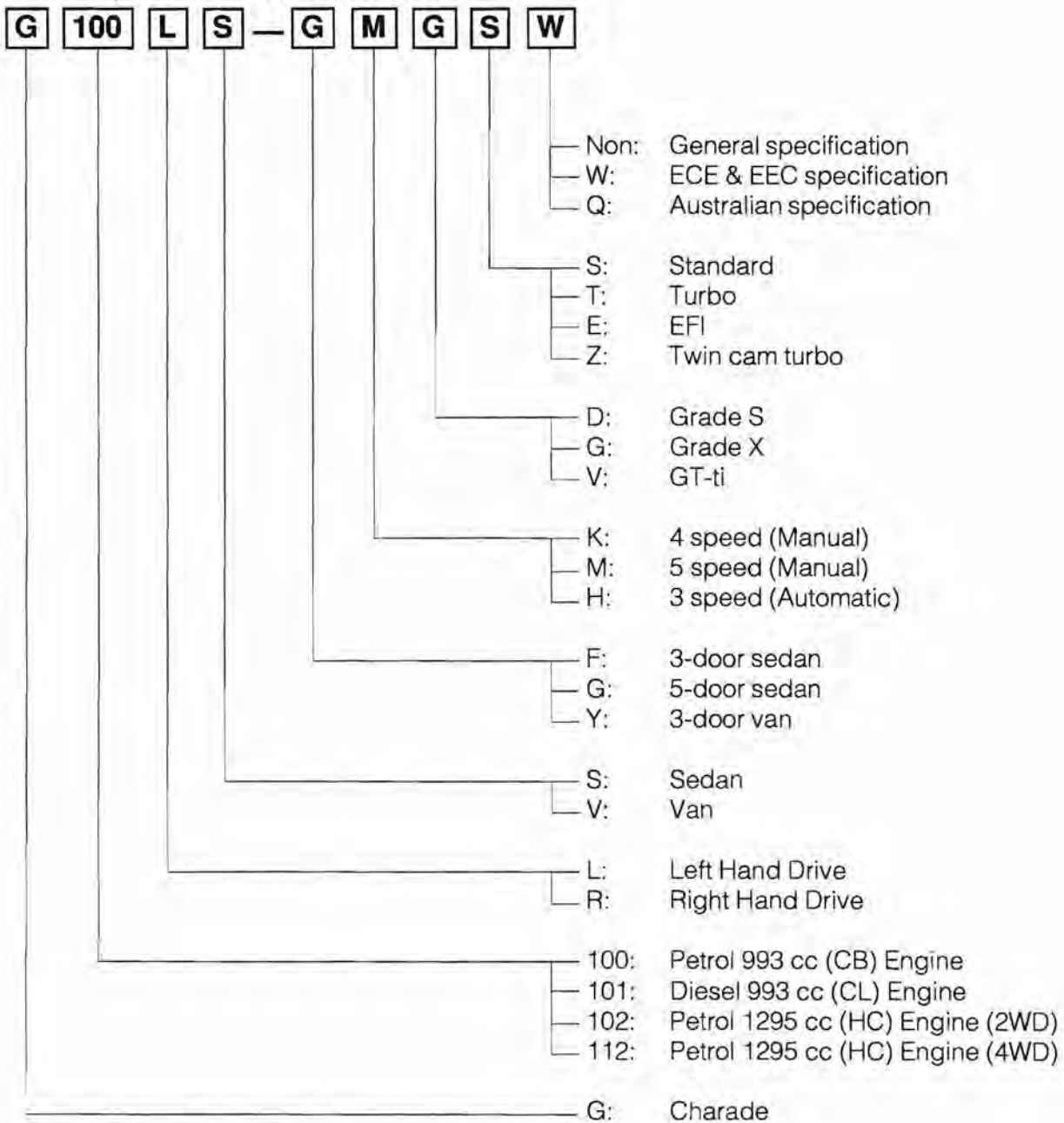
WR88-GI010B

GENERAL INFORMATION

(1) Manufacturer's name, country

(2) Vehicle model

Explanation of Vehicle Model Code



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(3) Chassis No.

This is the same as the vehicle identification number.

(4) Engine type

(5) Engine displacement

Engine type	Displacement	Kind of fuel
CB	993 cc	Gasoline
CB-90	993 cc	Gasoline
CB-80	993 cc	Gasoline
CL	993 cc	Diesel
CL-61	993 cc	Diesel
HC-C	1295 cc	Gasoline
HC-E	1295 cc	Gasoline

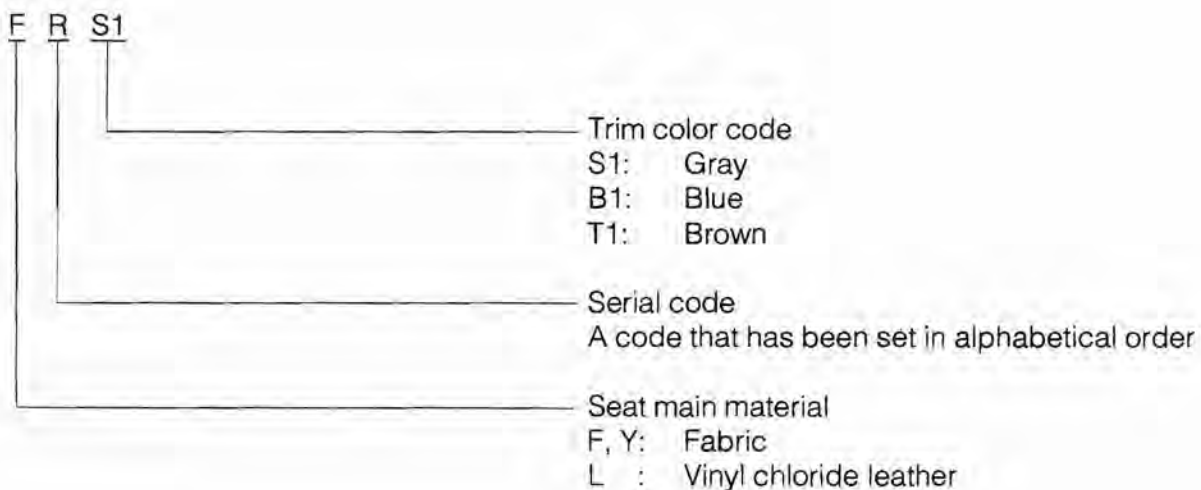
WR88-GI012

(6) Body colors

Color code	Color
W05	White
R06	Red
Y04	Yellow
S07	Silver Metallic
B16	Light Blue Metallic
B17	Navy Blue
S04	Gun Metallic
T03	Beige Metallic
6A5	Black Metallic

WR88-GI013

(7) Trim code



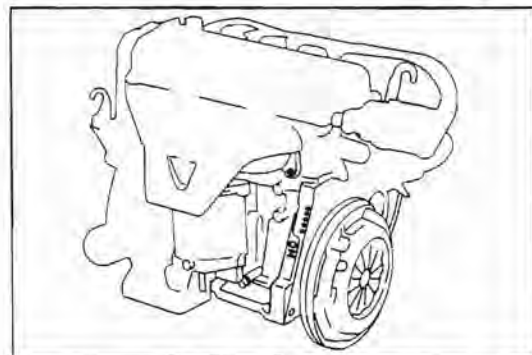
WR88-GI014

GENERAL INFORMATION

- (8) Engine number
This code is not used currently.
- (9) Manufacturer's name in Japanese
- (10) G.V.W (Gross Vehicle Weight)
- (11) G.C.W (Gross Combination Weight)
- (12) Maximum Permissible Front Axle Weight
- (13) Maximum Permissible Rear Axle Weight

ENGINE NUMBER AND TYPE STAMPED POSITION

The engine number is stamped on the side wall of the cylinder block at the transmission side and the engine type is indicated by embossed letters at near the engine number stamped position.



WR68-GI015

WR68-GI016

GENERAL SERVICE INSTRUCTIONS

1. Use fender covers, seat covers or floor sheets so that the vehicle may not get dirty or be scratched.
2. Jacking up
 - (1) When only the front section or rear section of the vehicle is jacked up, be sure to place chocks at the wheels so as to insure safe operations.
 - (2) When the vehicle has been jacked up, be sure to support the vehicle at the specified section using safety stands. (See page GI-12)
3. Handling instructions related to battery
 - (1) Before you start performing the electrical works, make certain to disconnect the battery cable from the negative (-) terminal of the battery.
 - (2) When it becomes necessary to disconnect the battery cables for the purpose of carrying out checks or repairs, always start at the negative (-) battery terminal which is grounded to the body.
 - (3) To avoid damaging the battery plates, after the terminal nut has been loosened, pull out the battery cable straight upward, rather than turning or prying the terminal.
 - (4) Clean the battery terminal posts or cable terminals, using a cloth. Never use a file or other adhesive agents.
 - (5) When connecting the cable terminal to the battery, first the cable terminal should be fitted onto the battery post with the attaching nut in a loose state. Then, tighten the nut. Never tap the terminal onto the battery post, using a hammer.
 - (6) As for the cover at the positive (+) terminal side, be sure to install it at the correct position.
4. Repairing of fuel system

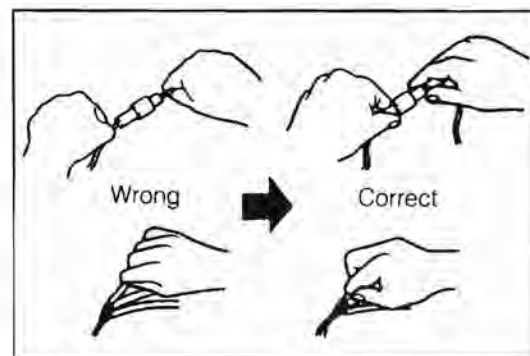
Type HC-E engine employs a high fuel pressure. Therefore, the following notes should be observed.

 - (1) When the union bolt is removed take a measure to prevent the fuel from splashing with a cloth or the like. Slacken the union bolt gradually.
 - (2) Tighten each connecting section to the specified torque.
 - (3) Attach the specified clip to each connecting section.
5. For increased work efficiency and improved accuracy, be sure to utilize the SSTs (Special Service Tools) effectively.
6. Removal and disassembly
 - (1) When disassembling complicated components, put stamped marks or mating marks on those sections where such marks do not affect their functions so that the assembling operation may be performed easily.
 - (2) Each time a part removed, check the part for the assembled condition, deformation, breakage, roughness and scratches.
 - (3) Arrange the disassembled parts in the disassembling order. In addition, separate and arrange those parts to be replaced and those parts to be reused.
 - (4) Thoroughly clean and wash those parts to be reused.
 - (5) Inspection and measurement of part
Perform thorough inspection and measurement on those parts to be reused, as required.
7. Installation and assembly
 - (1) Assemble those satisfactory parts, following the proper procedure and specified standards. (adjusting values and tightening torque, etc.)
 - (2) Ensure that seal packings and grease are applied to those sections where such application is needed.
 - (3) Be sure to use new packings, gaskets, cotter pins and so forth.
 - (4) Ensure that the specified bolts and nuts only be used. Moreover, where specified, make sure to employ a torque wrench to tighten bolts and nuts to the specified torque.
Make sure to use only genuine parts for every replacement.

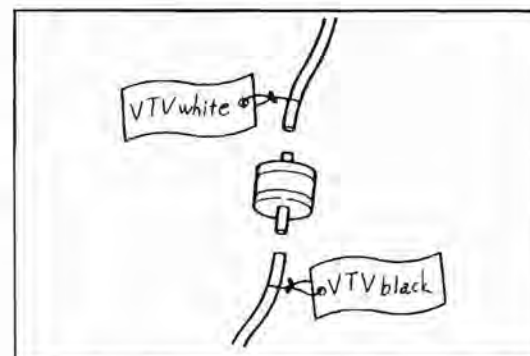
GENERAL INFORMATION

8. Adjustment and operation check
Adjust the reassembled or replaced components to the servicing specifications, using gauges and testers, as required.
9. Handling of hoses, etc.
 - (1) Connect fuel hoses and water hoses, etc. securely so that they exhibit no leakage.
 - (2) When disconnecting fuel hoses, make sure that no fuel is splashed around the hose. (Special care must be exercised as to the engine mount rubber, etc., for there is a possibility that the rubber is deteriorated by the petrol-based liquid.)
10. Observe the following precautions to avoid damage to the parts.
 - (1) When pulling out vacuum hoses, be sure to hold the hose end, not the middle part of the hose.
 - (2) When disconnecting connectors, be sure to hold the connector itself, not the wire portion.
 - (3) Be very careful not to drop electrical components, such as sensors or relays, to the floor. If they are dropped, they must be replaced. Never reuse them.
 - (4) When steam cleaning the engine, take precautionary measures so that no water is applied to the air filter, carburetor, distributor, ignition coil and so forth.
 - (5) Never use an impact wrench to remove or install thermo switches or thermo sensors.
 - (6) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
 - (7) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step-down adapter instead. Once the hose has been stretched, it may leak.
11. Tag hoses before disconnecting them:
 - (1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
 - (2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.
12. The dimensions and specified values that appear in this manual are those values at 20°C (68°F), unless otherwise specified.
13. As for the values other those indicated in "si" unit, such as ft, inch, lb, cu-in and gallon they are the converted values. Therefore, there are cases where the converted values have been rounded up or down according to their use at the time of conversion.

WR88-GI019



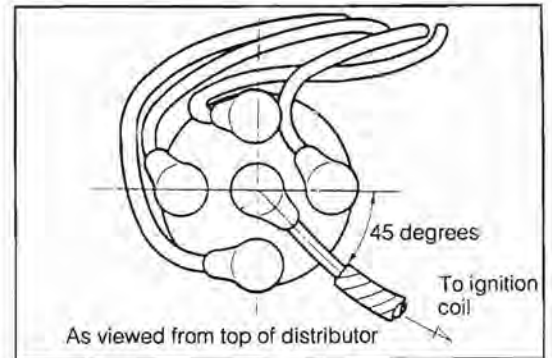
WR88-GI020



WR88-GI021

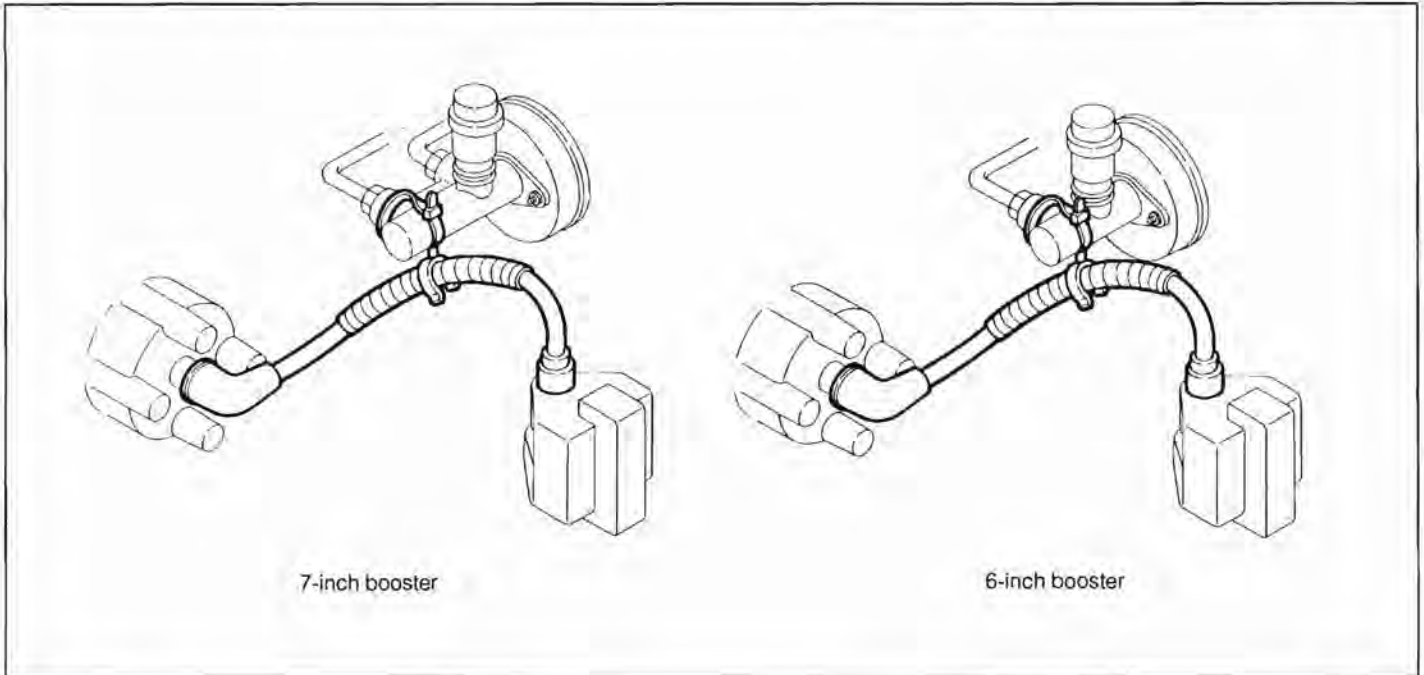
14. Connect the resistive cords as follows:

- (1) Connect the resistive cords to the distributor cap in such a way that the resistive cords may assume an angle as indicated in the right figure.
- (2) Care must be exercised to ensure that the resistive cords may not interfere with any periphery parts.



WR88-GI021B

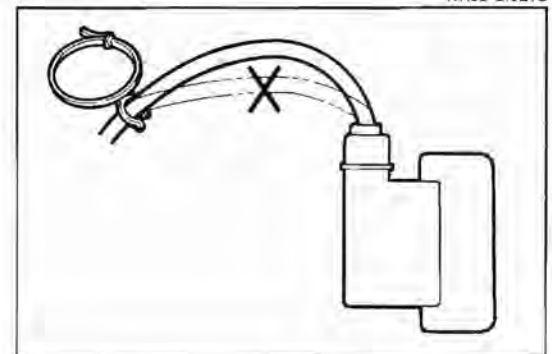
- (3) On the L.H.D. vehicle, be sure to attach the resistive cord to the clamp of the brake master cylinder.



WR88-GI021C

NOTE:

Be very careful not to pull out the coil cord excessively when clamping the resistive cords.

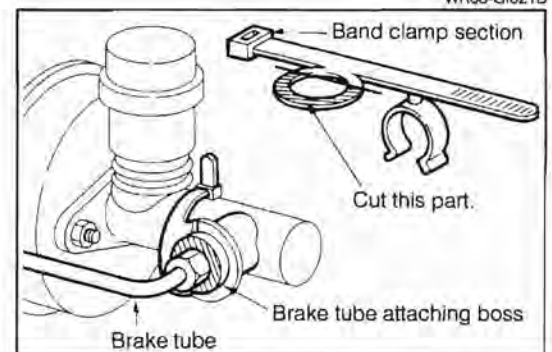


WR88-GI021D

- (4) When replacing the clamp, cut off its position locating section using scissors or the like. Then, attach the clamp as indicated in the right figure.

NOTE:

When attaching the clamp, be sure to tighten its band clamp section fully so that the camp may not be moved out of the specified position.



WR88-GI021E

15. Handling of clamp, etc.

As for the removed hose bands and clamps, etc., be certain to reassemble them securely in the respective original position.

WR88-GI021F

HANDLING INSTRUCTIONS ON CATALYTIC CONVERTER-EQUIPPED VEHICLES

WARNING:

When a great amount of unburnt gas is admitted into the catalytic converter, overheating is prone to occur, resulting in a fire hazard.

To avoid such trouble in advance, be certain to observe the following precautions. Also, be sure to explain such precautions to your customers.

1. Use only unleaded gasoline to your vehicle.
2. Avoid idling the engine for a prolonged length of time.
Do not run the engine continuously at the fast idle speed for more than 10 minutes; at the idle speed for more than 20 minutes.
3. Never perform spark jump tests.
 - (1) The spark jump test must be limited to cases where such test is absolutely necessary. Also, be sure to finish the test in the shortest possible time.
 - (2) Never race the engine during the test.
4. Do not run the engine when the fuel tank becomes nearly empty.
Failure to observe this caution will cause misfiring. Also, it will apply excessive load to the converter, even leading to catalyst damage.
5. Do not dispose the waste catalyst along with parts contaminated with gasoline or oil.

WR88-GI022

JACKING POINTS & SUPPORTING POINTS OF SAFETY STANDS

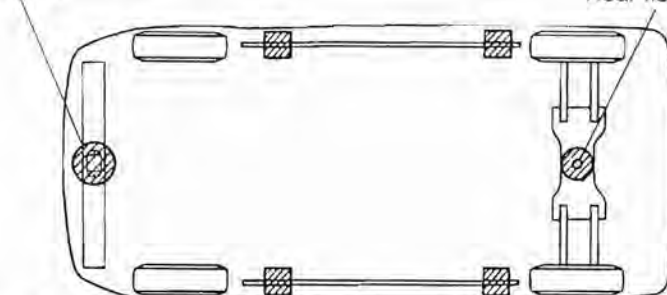
• Jacking point

Front side Front lower cross member jacking bracket

Rear side Center of rear floor cross member

Front lower cross member jacking bracket (Vehicles mounted with Type HC engine)

Rear floor cross member

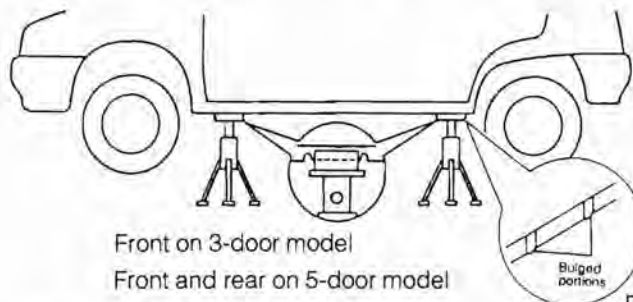


Supporting point of garage jack

Supporting point of safety stand

• Supporting points of safety stands

Four supporting points are located at the right and left sides. (The supporting points have been strengthened by spot-welding reinforcements. Never support the vehicle at points other than the specified points.)



Front on 3-door model

Front and rear on 5-door model

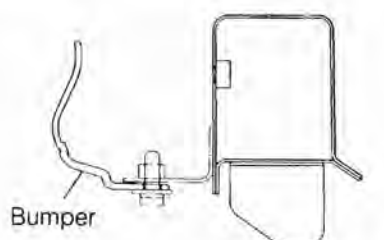
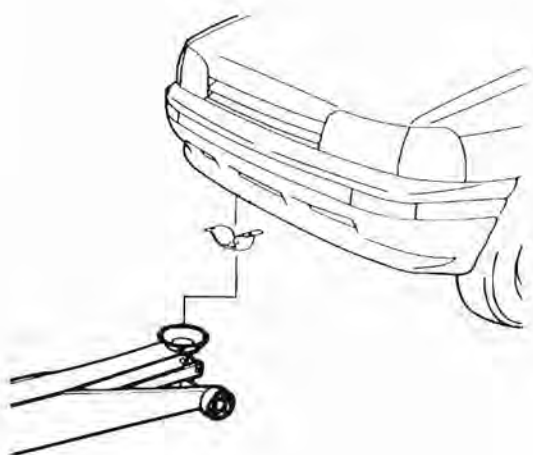
Rear on 3-door model



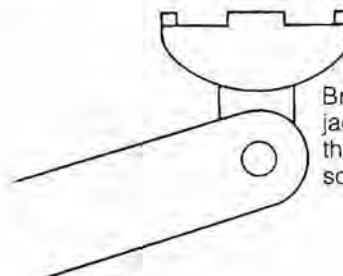
Bulged portions

INSTRUCTIONS ON FRONT JACKING OPERATION

WR88-GI023



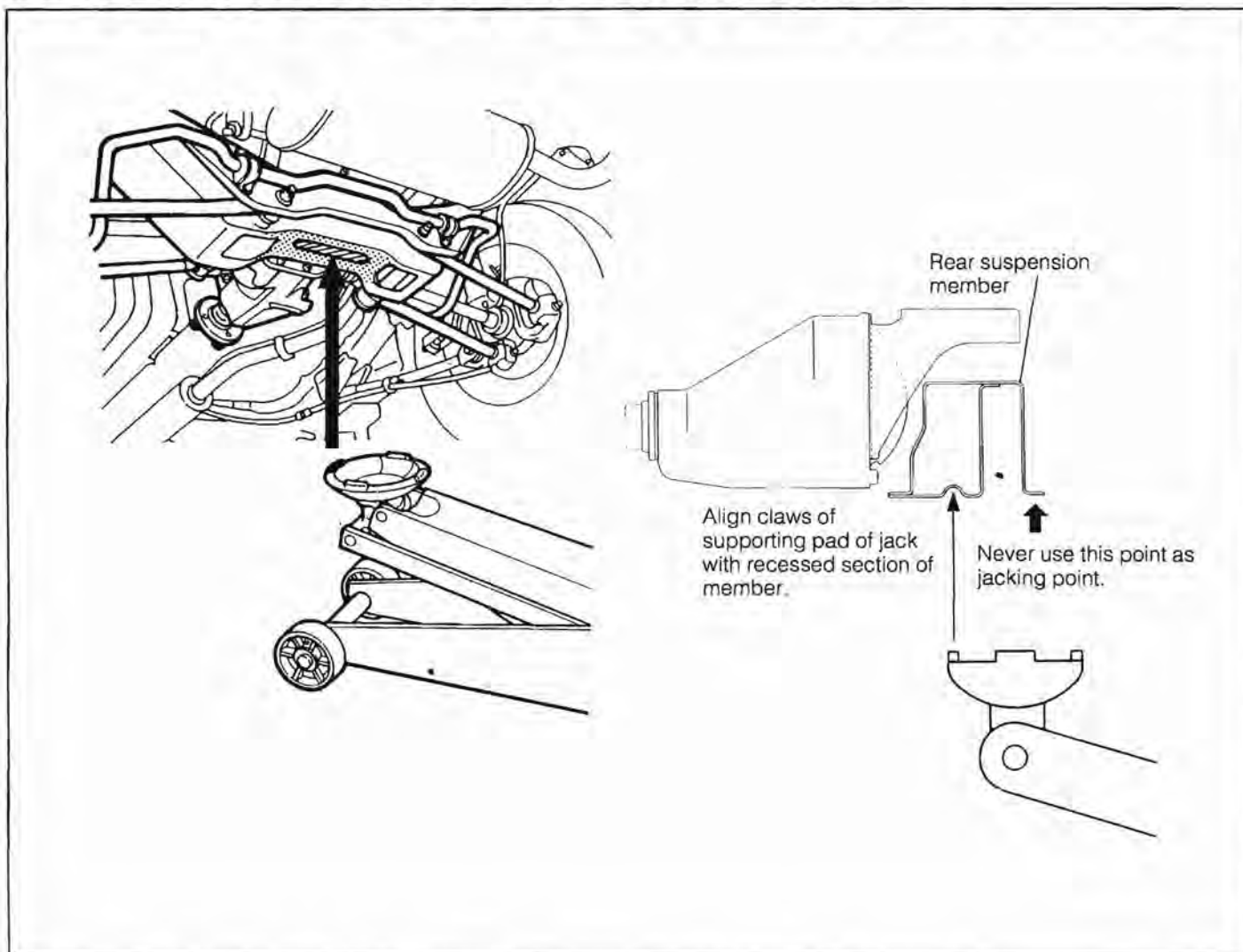
Bumper



Bring supporting pad of jack toward rear side so that bumper may not be scratched.

WR88-GI024

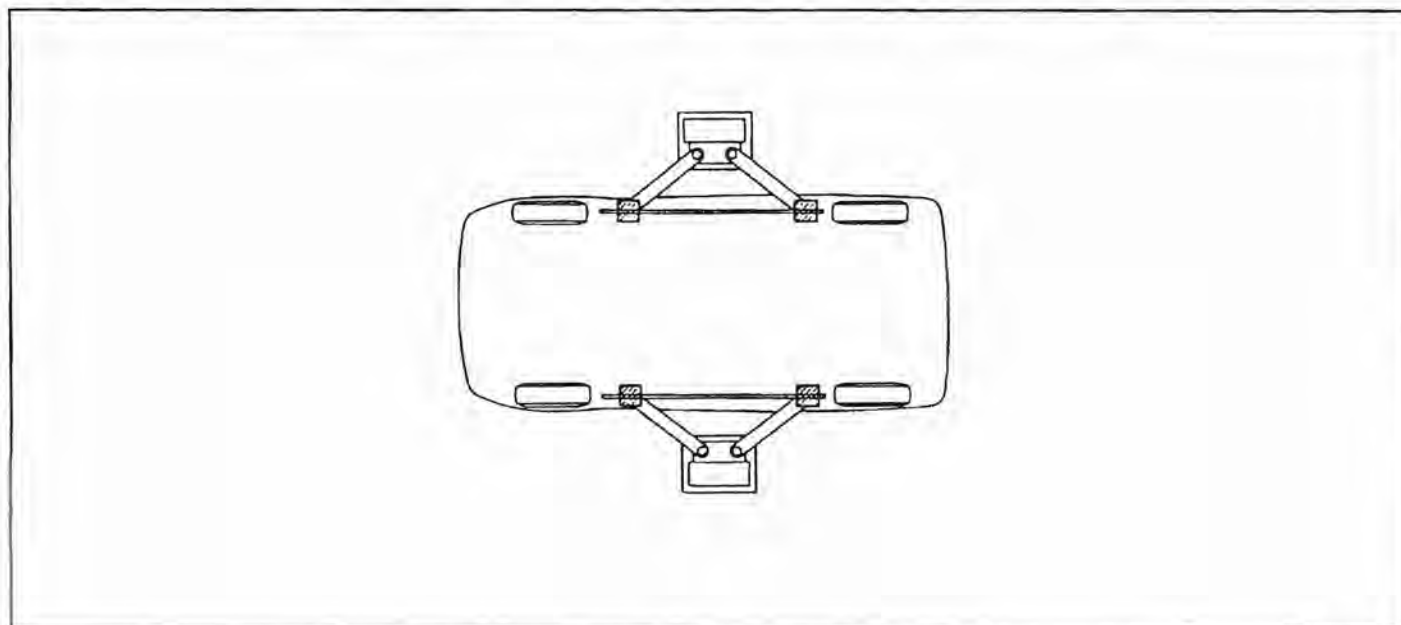
INSTRUCTIONS ON REAR JACKING OPERATION ON 4WD VEHICLE



WR88-GI025

SUPPORTING POINTS OF TWO-POST LIFT

Align the supporting pads of a two-post lift with the supporting points of safety stands, as indicated in the figure above.



WR88-GI026





ABBREVIATION CODES

The abbreviation codes that appear in this workshop manual stand for the following, respectively.

A/C	Air Conditioner
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BVSV	Bimetal Vacuum Switching Valve
ECU	Electronic Control Unit
EFI	Electronic Fuel Injection
EGR	Exhaust Gas Recirculation
EVSV	EGR Vacuum Switching Valve
EX	Exhaust (Manifold Valve)
FL	Fusible Link
IN	Intake (Manifold, Valve)
LH	Left Hand
LHD	Left Hand Drive
LLC	Long Life Coolant
MP	Multipurpose
N.m.	Newton meter
PCV	Positive Crankcase Ventilation
PVSV	Pressure Vacuum Switching Valve
RH	Right Hand
SST	Special Service Tool
STD	Standard
TDC	Top Dead Center
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
W/	With
W/O	without
M/T, MT	Manual Transmission
A/T, AT	Automatic Transmission
2WD	Two-wheel Drive Vehicle
4WD	Four-wheel Drive Vehicle
HIC	Hot Idle Compensator
ITC	Intake air Temperature Compensating valve
TP	Throttle positioner
TWC	Three-way catalyst
C/W	Choke warning
SD	Spark delay
C/O	Choke opener
EVAP	Fuel evaporative emission control
ECU	Electronic control unit

WR88-GI027

The abbreviation codes that appear in the figure stand for the following, respectively.

	Bolt		Screw
	Nut		Washer

WR88-GI028

TROUBLE SHOOTING (HC-C ENGINE)

Problem	Possible causes	Remedies	Page
Engine overheats.	Cooling system faulty Incorrect ignition timing Fuel system faulty Lubrication system faulty	Trouble shoot cooling system. Trouble shoot ignition system. Trouble shoot fuel system. Trouble shoot lubrication system.	CO-2 IG-2 FU-2 LU-2
Engine will not crank or cranks slowly.	Starting system faulty	Trouble shoot starting system.	ST-2
Engine will not start/Hard to start. (Only cases where cranking by starter motor is normal)	Ignition problem • Ignition coil • Distributor • Ignition timing Spark plugs faulty Resistive cords disconnected faulty Vacuum leaky • PCV line • ITC line • Intake manifold • Carburetor hoses • Brake booster line Low compression No fuel supply to carburetor • Fuel line • Fuel filter • Fuel pump Carburetor problems • Carburetor out of adjustment • Choke operation • Flooding (outer vent valve, BVSV) • Needle valve sticking or clogged • Vacuum hose disconnected Fuel cut solenoid valve not open	Inspect ignition coil. Inspect distributor. Reset timing. Inspect plugs. Inspect cords. Check PCV line. Check ITC line. Check intake manifold. Check carburetor hoses. Check brake booster. Check compression. Check fuel line and fuel pump. Repair, as necessary.	IG-2 IG-10 IG-13 IG-34 IG-8 IG-7 EC-4 EC-3 EM-27 FU-2 FU-46 FU-41 FU-2
Rough idle/Engine stalls or misses.	Spark plug faulty Resistive cords faulty Ignition problems • Ignition coil • Distributor Incorrect ignition timing Incorrect valve clearance Low compression Incorrect idle speed Vacuum leaky • PCV line • ITC line • Intake manifold • Carburetor hoses • Brake booster line	Inspect spark plugs. Inspect resistive cords. Inspect ignition coil. Inspect distributor. Reset timing. Adjust valve clearances. Check compression. Adjust idle speed. Check PCV system. Check ITC system. Check intake manifold. Check carburetor hoses. Check brake booster.	IG-8 IG-7 IG-2 IG-10 IG-13 IG-34 EM-11 EM-27 EM-13 EC-4 EC-3

WR88-EM002

Problem	Possible causes	Remedies	Page
Rough idle/Engine stalls or misses.	Engine overheating Carburetor problems <ul style="list-style-type: none">• Slow jet clogged• Idle mixture incorrect• Fuel cut solenoid valve not open• Choke system faulty	Repair, as necessary.	EM-2 FU-2
Engine hesitates/poor acceleration	Spark plug faulty Resistive cords faulty Ignition problems <ul style="list-style-type: none">• Distributor• Ignition coil Incorrect ignition timing Incorrect valve clearances Low compression Engine overheats Air cleaner clogged Fuel system clogged Carburetor problems <ul style="list-style-type: none">• Float level too low• Accelerator pump faulty• Power valve faulty• Choke system faulty• Emission control system malfunctioning• ITC system always ON (hot engine) Intake manifold thermo-control valve (cold engine) Hot water circulating system (cold engine) Clutch slipping Brakes dragging	Inspect spark plugs. Inspect resistive cords. Inspect distributor. Inspect coil. Reset timing. Adjust valve clearances. Check compression. Check cooling system. Check air cleaner. Check fuel system. Repair, as necessary. Check ITC system. Check thermo-control valve. Check hot water circulating system. Trouble shoot clutch. Trouble shoot brakes.	IG-8 IG-7 IG-2 IG-13 IG-10 IG-34 EM-11 EM-27 CO-2 EM-8 FU-2 FU-2
Engine dieseling (Runs after ignition switch is turned off)	Incorrect ignition timing Engine overheating Carburetor problems <ul style="list-style-type: none">• Fuel cut solenoid faulty• Idle speed out of adjustment• Linkage sticking	Reset ignition timing. Check cooling system. Repair, as necessary.	IG-34 CO-2 FU-2
Muffler explosion (after fire) during deceleration only.	TP system faulty	Check TP system.	EC-14
Muffler explosion (after fire) all the time.	Air cleaner clogged Choke system faulty Incorrect ignition timing Incorrect valve clearance	Check air cleaner. Check choke system. Reset ignition timing. Adjust valve clearances.	EM-8 FU-4 IG-34 EM-11

ENGINE MECHANICALS

Problem	Possible causes	Remedies	Page
Engine backfires.	Insufficient fuel flow Incorrect ignition timing Incorrect valve clearances Carbon deposits in combustion chambers Vacuum leaky <ul style="list-style-type: none"> • Carburetor hoses • PCV hoses • Intake manifold • Brake booster line 	Trouble shoot fuel system. Reset ignition timing. Adjust valve clearances. Inspect cylinder head. Repair, as necessary. Check carburetor hoses. Check PCV system. Check intake manifold.	FU-2 IG-34 EM-11 EC-3 EC-4
Excessive oil consumption.	Oil leaky PCV line clogged Piston rings worn or damaged Valve stems worn Valve stem oil seals worn or damaged	Repair, as necessary. Check PCV hose. Check piston rings. (Check compression) Check valves and guides. Replace oil seals.	EC-4 EM-27
Poor fuel economy	Spark plugs faulty Incorrect ignition timing Low compression Air cleaner clogged Fuel leak Carburetor problems <ul style="list-style-type: none"> • Choke system faulty • Idle speed too high • Power valve always on Tires improperly inflated Clutch slipping Brakes dragging	Inspect spark plugs. Reset ignition timing. Check compression. Check air cleaner. Repair, as necessary. Repair, as necessary. Inflate tires to proper pressure. Trouble shoot clutch. Trouble shoot brakes.	IG-8 IG-34 EM-27 EM-8 FU-2
Unpleasant odor	Incorrect idle speed Incorrect ignition timing Vacuum leaky <ul style="list-style-type: none"> • PCV line • Intake manifold • Carburetor hoses • Brake booster line Charcoal canister faulty Fuel filter cap faulty Outer vent valve faulty BVSF faulty	Adjust idle speed. Reset timing Repair, as necessary. Check PCV system. Check intake manifold. Check carburetor hoses. Check brake booster. Check charcoal canister. Check fuel filter cap. Check outer vent valve.	EM-13 IG-34 EC-4 EC-3 EM-30 EC-17 EC-18 EC-9

WR88-EM004

TROUBLE SHOOTING (HC-E ENGINE)

Problem	Possible causes	Remedies	Page
Engine overheats.	Cooling system faulty. Incorrect ignition timing.	Trouble shoot cooling system. Reset timing.	CO-2 IG-49
Engine will not crank or cranks slowly.	Starting system faulty. Charging system faulty	Trouble shoot starting system. Trouble shoot charging system.	ST-2 CH-2
Engine will not start/Hard to start (Only cases where cranking by starter motor is normal)	Ignition problem • Ignition coil • Igniter • Distributor Spark plugs faulty Resistive cords disconnected or faulty. Low compression. No fuel supply to injector • No fuel in tank • Fuel pump not working • Fuel filter clogged • Fuel line clogged or leaking EFI system malfunctioning	Inspect ignition coil. Inspect igniter. Inspect distributor. Inspect plugs. Inspect cords. Check compression. Repair, as necessary. Trouble shoot EFI system.	IG-2 IG-12 IG-17 IG-8 IG-7 EM-27 EF-76 EF-2
Rough idle/Engine stalls or misses.	Spark plugs faulty. Resistive cords faulty. Ignition problem. • Ignition coil • Igniter • Distributor Incorrect ignition timing Incorrect valve clearance Low compression Incorrect idle speed Vacuum leaks. • Throttle body EFI system malfunctioning	Inspect plugs. Inspect cords. Inspect ignition coil. Inspect igniter Inspect distributor. Reset timing. Adjust valve clearance Check compression. Adjust idle speed. Check throttle body. Repair, as necessary.	IG-8 IG-7 IG-12 IG-17 IG-49 EM-11 EM-27 EM-18 EF-115 EF-3
Idle speed is too high.	Fuel line clogged Air suction • Intake manifold • Vacuum hose disconnected • Throttle body EFI system malfunctioning Incorrect idle speed.	Check fuel line. Check intake manifold. Check vacuum hose for proper piping. Check throttle body. Trouble shoot EFI system. Adjust idle speed.	EF-78 EC-22 EF-110, EF-115 EF-3 EM-18

WR88-EM005

Problem	Possible causes	Remedies	Page
Engine hesitates/Poor acceleration	Spark plugs faulty Resistive cords faulty. Incorrect ignition timing. Incorrect valve clearances. Low compression. Fuel system clogged. Air cleaner clogged. Engine overheats. Air leakage • Throttle body Emission control system malfunctioning (cold engine) EFI system malfunctioning	Inspect plugs. Inspect cords. Reset timing. Adjust valve clearances. Check compression. Check fuel system. Check air cleaner. Check cooling system. Check throttle body. Repair as necessary. Repair, as necessary.	IG-8 IG-7 IG-49 EM-11 EM-27 EF-76 EM-9 CO-2 EF-110 EC-21 EF-3
Engine dieseling (Runs after ignition switch is turned off.)	EFI system malfunctioning Incorrect ignition timing.	Repair, as necessary. Reset timing.	EF-3 IG-49
Muffler explosion (after fire) during deceleration only	Incorrect ignition timing. Incorrect valve clearance. Air cleaner clogged. EFI system malfunctioning	Reset timing. Adjust valve clearance. Check air cleaner. Repair, as necessary.	IG-49 EM-11 EM-9 EF-3
Engine backfires.	Incorrect ignition timing. Incorrect valve clearances. EFI system malfunctioning	Reset timing. Adjust valve clearance. Repair, as necessary.	IG-49 EM-11 EF-3
Excessive oil consumption.	Oil leak. PCV line clogged. Piston rings worn or damaged. Valve stems worn. Valve stem oil seals worn or damaged.	Repair, as necessary. Check PCV hose. Check rings. Check valves and guides. Replace oil seal.	EC-23 EM-27

WR88-EM006

Problem	Possible causes	Remedies	Page
Poor fuel economy	Spark plugs faulty. Incorrect ignition timing. Low compression. Air cleaner clogged. Fuel leak. Tires improperly inflated Clutch slipping Brakes dragging EFI system malfunctioning	Inspect spark plugs. Reset timing. Check compression. Check air cleaner. Repair, as necessary. Inflate tires to specified pressure. Trouble shoot clutch. Trouble shoot brakes. Repair, as necessary.	IG-8 IG-49 EM-27 EM-9 EF-2
Unpleasant odor	Incorrect idle speed Incorrect ignition timing Vacuum leaks <ul style="list-style-type: none"> • PCV line • Intake manifold • Throttle body EFI system malfunctioning	Adjust idle speed. Reset ignition timing. Check PCV system. Check intake manifold. Check throttle body. Repair, as necessary.	EM-18 IG-49 EC-23 EF-110 EF-3

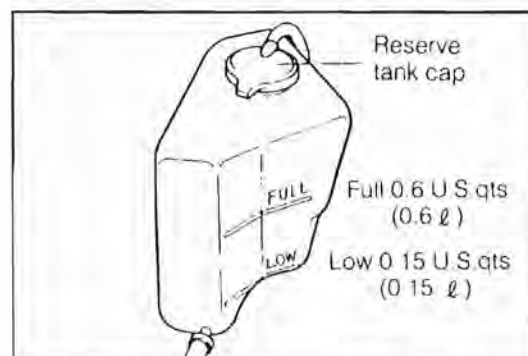
WR88-EM007

ENGINE TUNE-UP

1. Inspection of engine coolant level

(See page CO-2.)

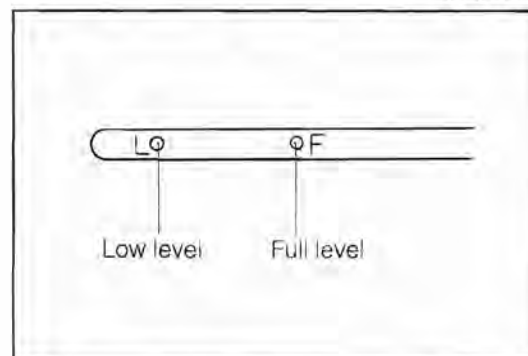
Cooling water capacity: 5.2 liters
(5.5 liters for tropical spec.)
[Including 0.6 liter for reservoir tank]



WR88-EM008

2. Inspection of engine oil level

(See page LU-2.)

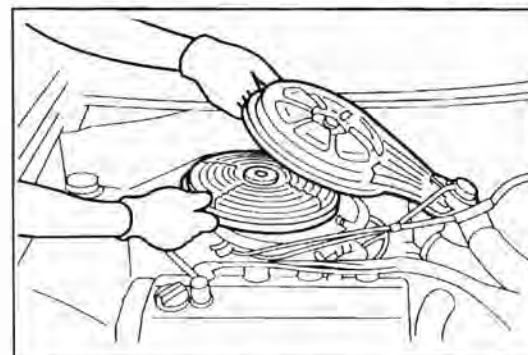


WR88-EM009

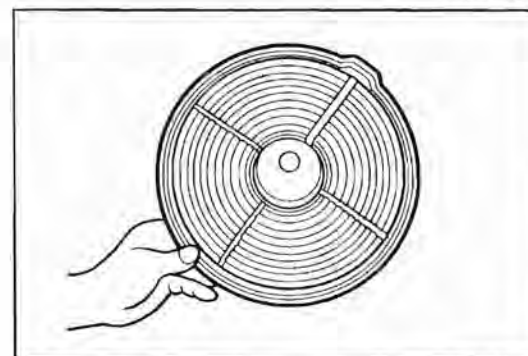
3. Inspection of air filter element

[HC-C engine]

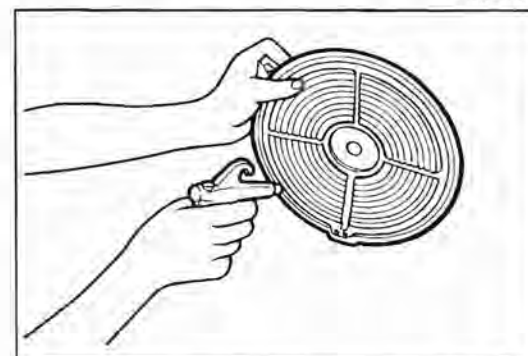
1. Remove the air filter element from the air cleaner case.
2. Visually check that the air filter element is not excessively dirty, damage or oil.
Replace the air filter element, if necessary.
3. Clean the element with compressed air.
First, blow compressed air from the back side of the element thoroughly. Then, blow off the upper side of the element.
CAUTION:
The air pressure to be used for this cleaning operation should not exceed 4.0 kg/cm² (56.9 psi).
Replace the air filter element, if necessary.



WR88-EM010



WR88-EM011

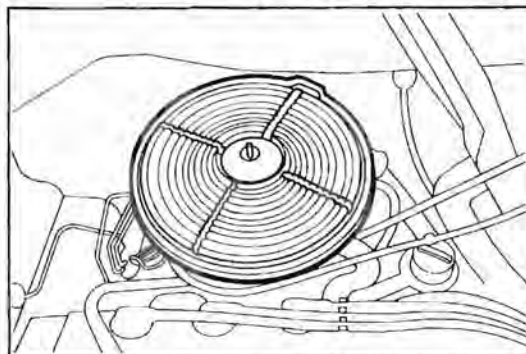


WR88-EM012

4. Install the air cleaner filter element in the air cleaner case.

NOTE:

The air filter element has the correct installation direction to be observed. Turn the air filter element so that the element may be fitted securely in the air cleaner case.



WR88-EM013

[HC-E engine]

1. Remove the air filter element from the air cleaner case.

CAUTION:

On the left hand drive unit, care must be exercised to ensure that the accelerator cable is not interfering with the air cleaner hose.

2. Visually check that the air filter element is not excessively dirty, damage or oil.

Replace the air filter element, if necessary.

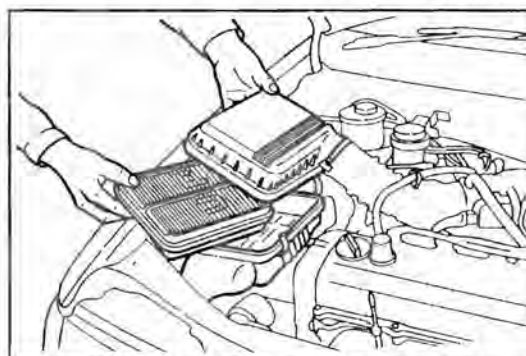
3. Clean the element with compressed air.

First, blow compressed air from the back side of the element thoroughly. Then, blow off the upper side of the element.

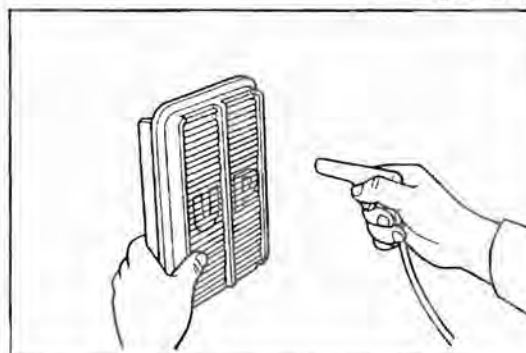
CAUTION:

The air pressure to be used for this cleaning operation should not exceed 4.0 kg/cm^2 (56.9 psi).

Replace the air filter element, if necessary.

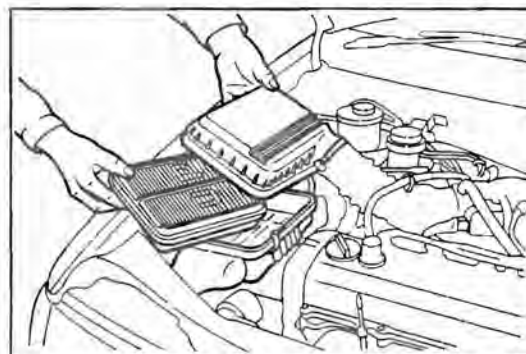


WR88-EM013A



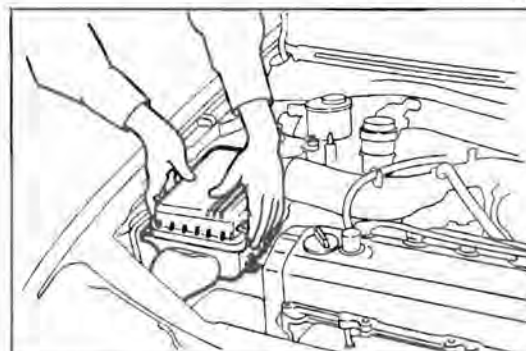
WR88-EM014

4. Install the air cleaner filter element in the air cleaner case with the "UP" mark facing upward.



WR88-EM015

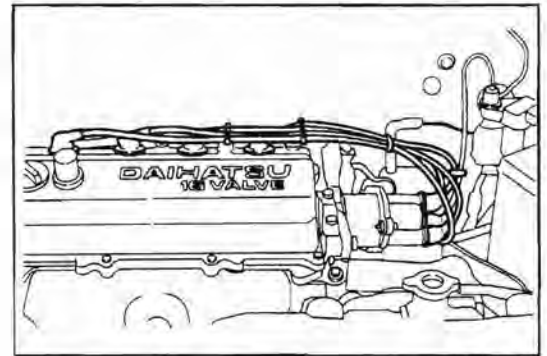
5. Lock the air cleaner caps at the four points.



WR88-EM016

4. Inspection of spark plug cords and distributor cap

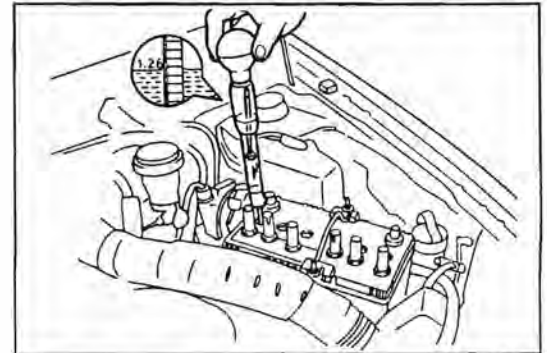
Visually inspect the resistive cords for loose connection, deterioration, cracks or other damage. Also, visually inspect the distributor cap for cracks. Securely connect or replace the parts, as required.



WR88-EM017

5. Battery inspection

(See page CH-4.)



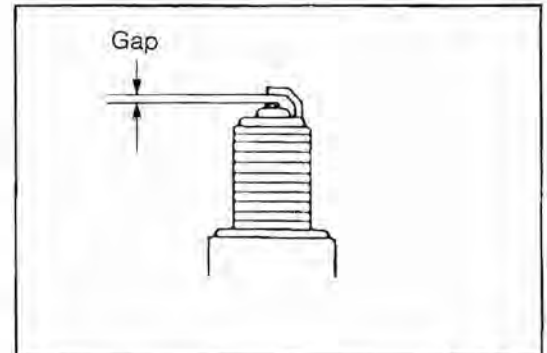
WR88-EM018

6. Inspection of spark plugs

(See page IG-8.)

Recommended spark plugs

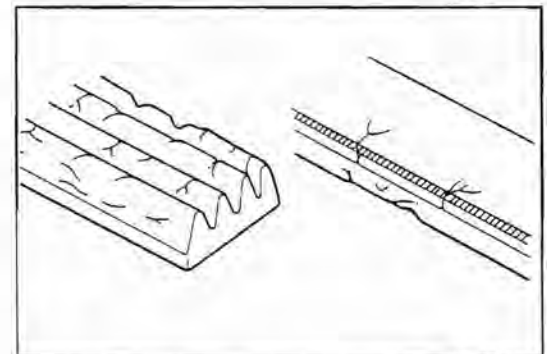
Make	Type
Nippon Denso	K20PR-U11
NGK	BKR6E-11
CHAMPION	RC9YC4



WR88-EM019

7. Inspection of drive belt (V-ribbed belt)

1. Visually check the belt for separation of the adhesive rubber above and below the core, core separation from the belt side, severed core, separation of the the rib from the adhesive rubber, cracks or separation of the ribs, torn or worn ribs or cracks in the inner ridges of the ribs. Replace the drive belt, if necessary.



WR88-EM020

2. Measure the amount of the drive belt deflection when the mid-point of the drive belt between the alternator and the water pump pulley is pushed with a force of 10 kg (22 lb).

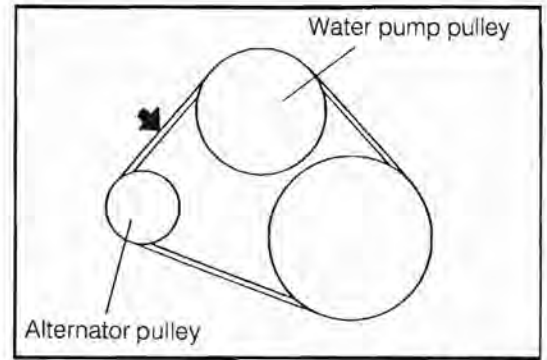
Specified Belt Deflection

- New belt:** 4 - 5 mm (0.16 - 0.19 inch)
[with a force of 10 kg (22 lb) applied at the point shown in the figure.]
- Used belt:** 5 - 6 mm (0.20 - 0.23 inch)
[with a force of 10 kg (22 lb) applied at the point shown in the figure.]

If necessary, adjust the drive belt tension.

NOTE:

- "New belt" refers to a belt which has been used on a running engine for less than five minutes.
- "Used belt" refers to a belt which has been used on a running engine for five minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for about five minutes and then recheck the tension.



WR88-EM021

8. Inspection and adjustment of valve clearances

The measurement and adjustment of valve clearances are carried out when each of the pistons of the No. 1 and No. 4 cylinders is set to the top dead center at the end of the compression stroke.

NOTE:

The valve clearance adjustment is performed normally when the engine is in a hot condition.

"Hot engine condition" denotes a condition in which the cooling water temperature is 75 - 85°C (167 - 185°F) and the engine oil temperature is above 65°C (149°F).

However, when the engine has been overhauled, it is necessary to adjust the valve clearances while the engine is cold and to readjust the valve clearances in a hot condition after warming up the engine.

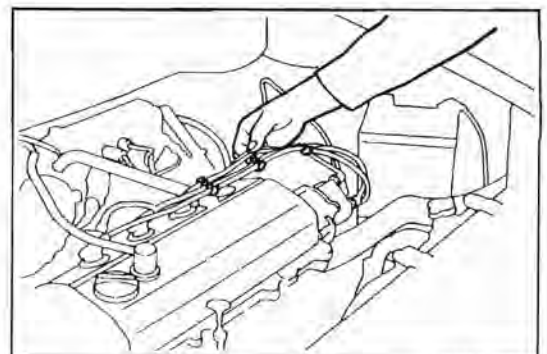
WR88-EM022

Removal of cylinder head cover

- (1) Detach the resistive cords from the clamps.

NOTE:

On the left hand drive unit, disconnect the acceleration cable at the throttle body side. Proceed to remove the cable from the cable clamp.

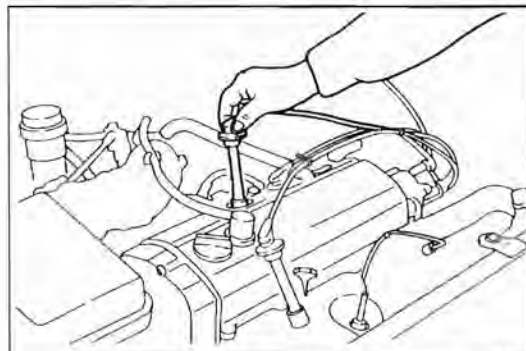


WR88-EM023

- (2) Detach the resistive cords at the cylinder head side.

NOTE:

Be sure to hold the rubber boot during the resistive cord disconnection. Never remove the resistive cord, holding the cord portion.



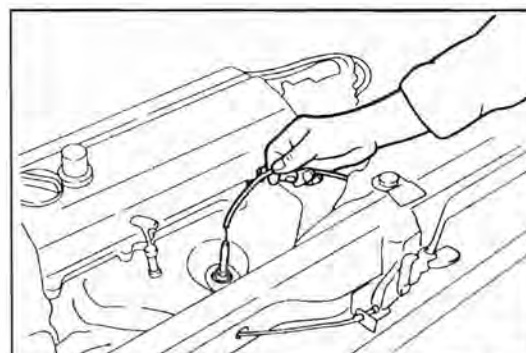
WR88-EM024

- (3) Disconnect the blow-by gas hoses from the cylinder head cover.



WR88-EM025

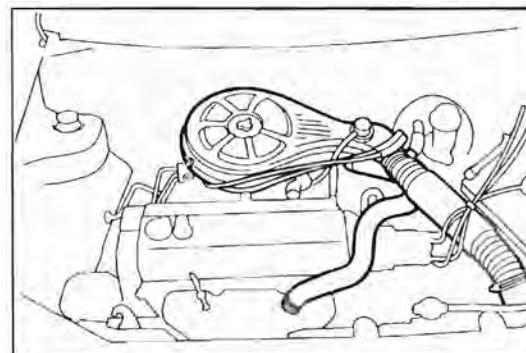
- (4) Detach the oxygen sensor harness from the clamp (HC-E engine only)



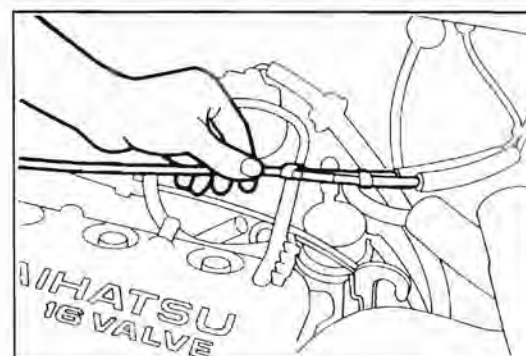
WR88-EM026

- (5) Removal of air cleaner (HC-C engine only)

- 1) Disconnect the vacuum hoses.
 - ITC vacuum hose to carburetor
 - Vacuum hose to BVS
- 2) Remove the air cleaner.
 - ① Disconnect the cool air duct.
 - ② Disconnect the hot air intake duct.
 - ③ Remove the butterfly nuts.
 - ④ Remove the air cleaner attaching bolts.
 - ⑤ Remove the air cleaner.
- 3) Disconnect the accelerator cable and choke cable from the clamp of the cylinder head cover. (Left hand drive unit only)



WR88-EM027



WR88-EM028

- 4) Disconnect the throttle cable from the carburetor.
(Automatic transmission vehicle only)
- (6) Loosen the nine bolts (10 mm) over two or three stages in the sequence shown in the right figure. After removing the bolts, proceed to remove the cylinder head cover.

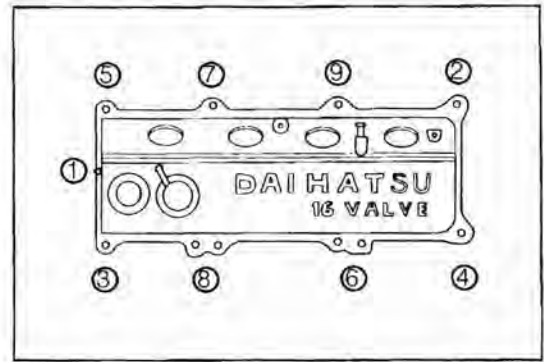
NOTE:

1. Be sure to loosen the bolts progressively and uniformly over two or three stages.
2. Be very careful not damage the grommets of the spark plug tubes.

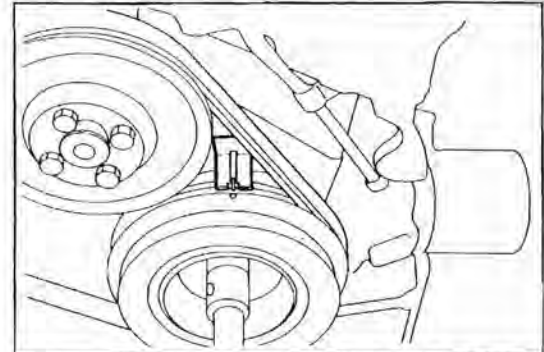
Inspection and adjustment of valve clearances**NOTE:**

Before the adjusting bolts are tightening, apply engine oil to the lock nuts and rocker arm adjusting bolts.

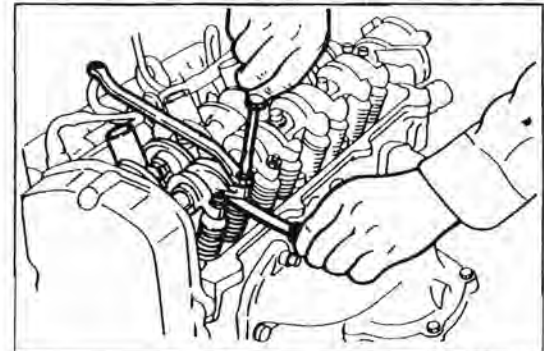
1. Turn the crankshaft until the recessed mark on the crankshaft pulley is aligned with the indicator mark on the timing belt cover.
2. Check to see if the valve rocker arms of the No.1 cylinder are free or are being pushed up. According to the table below, check and/or adjust the valve clearances, using a thickness gauge.
The "o"-mark denotes those valves that can be adjusted under that setting.



WR88-EM030



WR88-EM030A



WR88-EM031

Cylinder No.		1	2	3	4
Rocker arm condition					
When valve rocker arms of No. 1 cylinder are free: (Piston of No. 1 cylinder is at top dead center under compression stroke)	IN	○	○		
	EX	○		○	
When valve rocker arms of No. 4 cylinder are free: (Piston of No. 4 cylinder is at top dead center under compression stroke)	IN			○	○
	EX		○		○

Valve clearances (Hot)

Intake: 0.25 ± 0.07 mm (0.0098 ± 0.0027 inch)

Exhaust: 0.33 ± 0.07 mm (0.01 ± 0.0027 inch)

(Reference)**Valve clearances (Cold)**

Intake: 0.18 mm (0.0071 inch)

Exhaust: 0.25 mm (0.0098 inch)

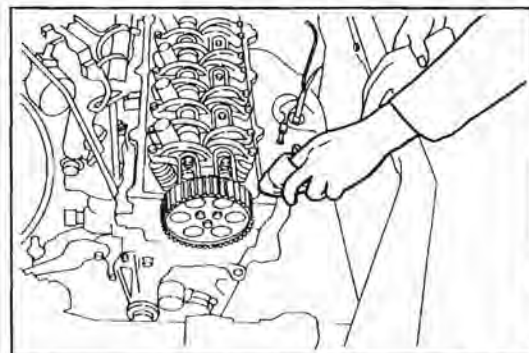
WR88-EM032

3. Turn the crankshaft 360 degrees. Proceed to check and/or adjust the remaining valve clearances.

WR88-EM033

Installation of cylinder head cover

1. Wipe off the oil from the gasket surface of the cylinder head cover.

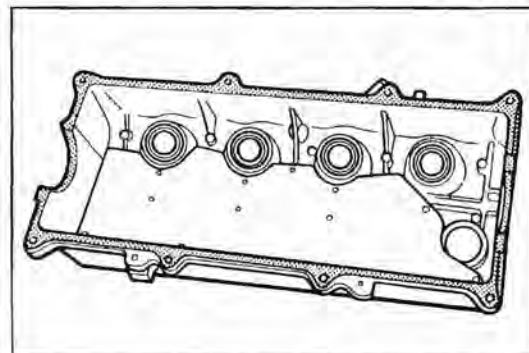


WR88-EM034

2. Check the cylinder head cover gasket for evidence of damage.
Replace the gasket, as required.

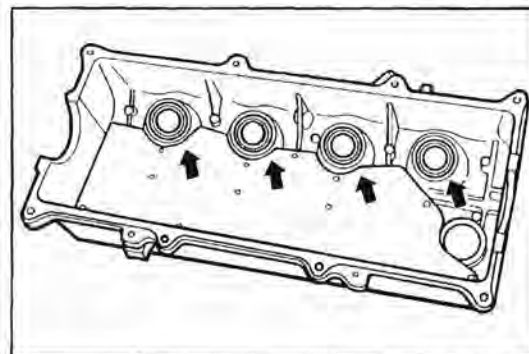
NOTE:

Install the cylinder head cover gasket in such a direction that the identification mark may come at the intake side.



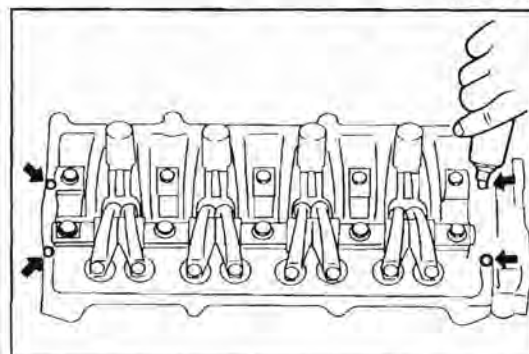
WR88-EM035

3. Check the rubber grommets of the spark plug tubes for evidence of damage.
Replace the rubber grommets, as required.
(See page EM-114.)



WR88-EM036

4. Install the cylinder head cover gasket on the cylinder head.
Apply the Three Bond 1104 to the four points on the cylinder head, as indicated in the figure.

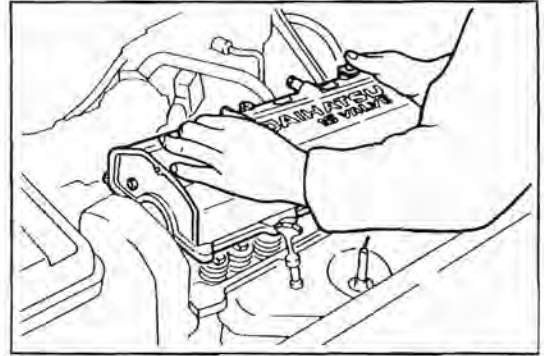


WR88-EM037

5. Install the cylinder head cover on the cylinder head.

NOTE:

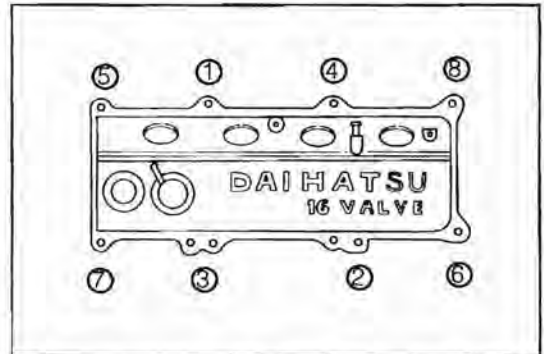
- Be very careful not to damage the rubber grommets for spark plugs during the cover installation.
- Make sure that the rubber grommet is fitted over the spark plug tube.



WR88-EM038

6. Tighten the cylinder head cover bolts over two or three stages in the sequence shown in the right figure, until they are tightened to the specified torque.

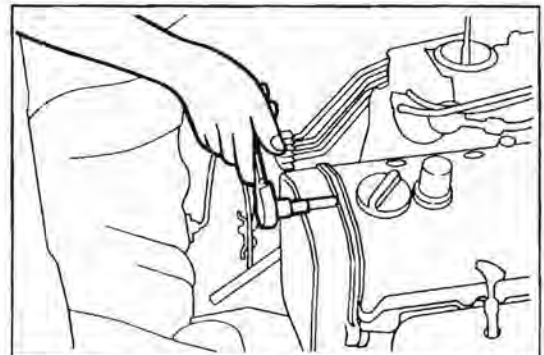
Tightening Torque: 0.3 - 0.5 kg-m (2.2 - 3.6 ft-lb)



WR88-EM039

7. Tighten the timing belt cover attaching bolts.

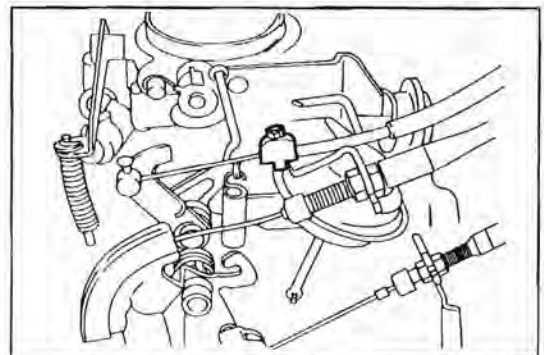
Tightening Torque: 0.2 - 0.4 kg-m (1.4 - 2.9 ft-lb)



WR88-EM040

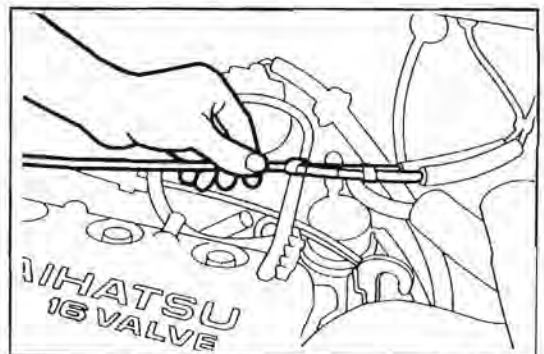
8. Installation of air cleaner assembly (HC-C engine only)

- 1) Connect the throttle cable to the carburetor.
(Automatic transmission vehicle only)



WR88-EM041

- 2) Install the accelerator cable and choke cable to the clamp.
(Left hand drive unit only)



WR88-EM041A

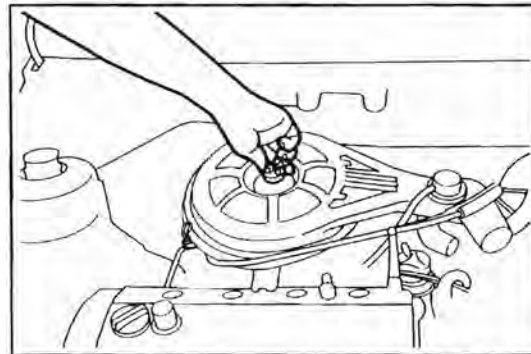
3) Install the air cleaner.

- ① Put the air cleaner assembly on the carburetor.

NOTE:

Inspect the damage of the gasket and exchange it, if necessary.

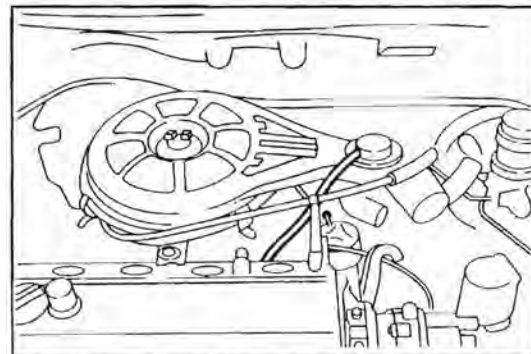
- ② Fasten the air cleaner attaching bolt.
- ③ Fasten the butterfly nuts.



WR88-EM041B

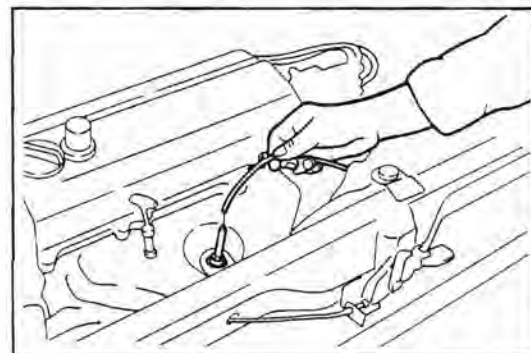
4) Connect rubber hoses

- ① BVSV
- ② ITC Valve
- ③ Cool air intake hose
- ④ Hot air intake hose



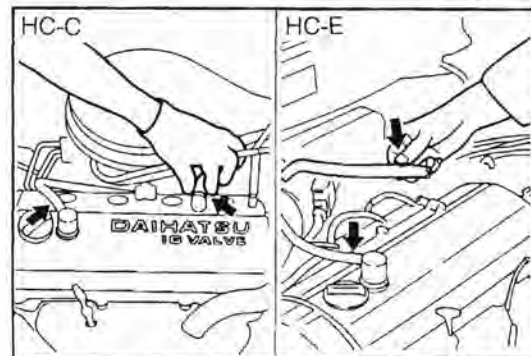
WR88-EM041C

9. Install the oxygen sensor harness to the clamp.
(HC-E engine only)



WR88-EM042

10. Connect the blow-by gas hoses to the cylinder head.

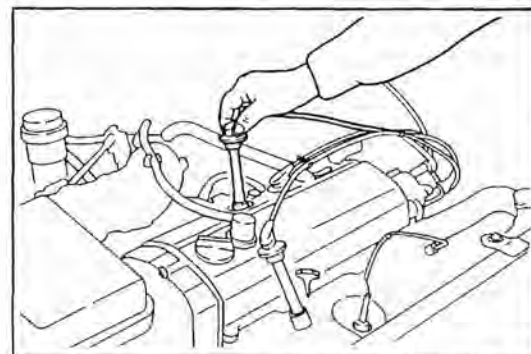


WR88-EM043

11. Install the resistive cords to the cylinder head.

NOTE:

- Be sure that the resistive cord is connected securely to each spark plug.
- Care should be exercised not to damage the resistive cord with the spark plug tube.

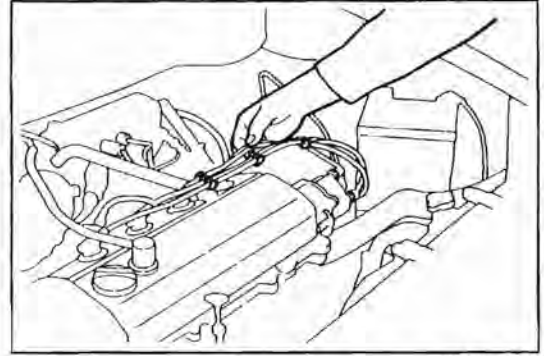


WR88-EM044

12. Install the resistive cords to clamps.

NOTE:

On the left hand drive unit, connect the accelerator cable to the cable clamp. Adjust the accelerator cable in such a way that its axial play may become 3 - 8 mm (0.12 - 0.31 inch).



WR88-EM045

13. Start the engine. Ensure that the engine exhibits no trouble, such as oil leakage.

NOTE:

If the engine exhibits any troubles, repair them depending on the situation.

WR88-EM046

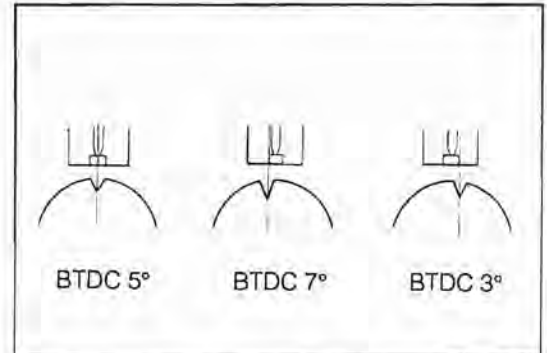
9. Inspection of ignition timing

(See page IG-34 or IG-49.)

Ignition timing	$5 \pm 2^\circ / 1000 \text{ rpm}$ or less
-----------------	--

NOTE:

This does not include the sub-ignition timing advance of the distributor.



WR88-EM047

10. Idle speed adjustment

Preparation to be made prior to idle adjustment

- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- All accessory switches are turned OFF.
On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage.
- The air cleaner element is installed.
- All vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.
- On the automatic transmission vehicle, the gear shift lever is placed in the [N] or [P] range.
- The choke lever is open fully. (HC-C engine)

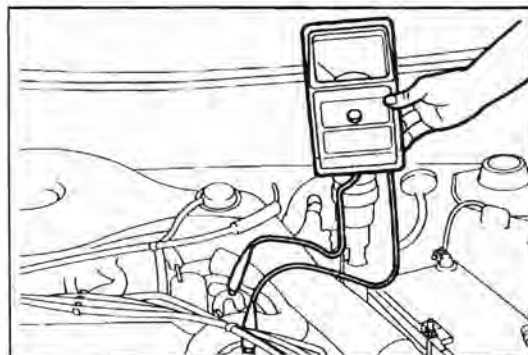
NOTE:

- Do not perform the engine idle speed adjustment while the fan motor is functioning.
- On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage with the headlamps turned OFF.
- Use the SST (09243-00020-000) to adjust the idle mixture adjusting screw.

WM88-EM048

[HC-C engine]

1. Connect the tachometer to the distributor,



WR88-EM049

CAUTION:

- Never allow the tachometer terminal to touch ground as it could result in damage to the ignition coil.
- As some tachometers are not compatible with this ignition system, it is imperative to confirm the compatibility of your meter before it is used.

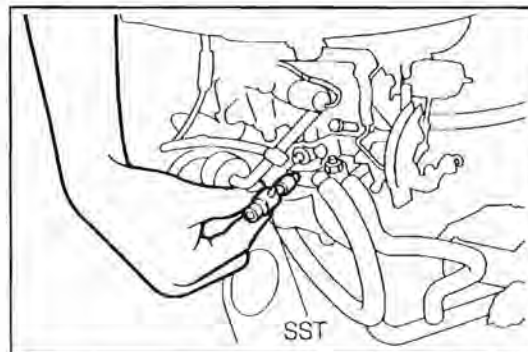
WR88-EM050

2. Back off the idle mixture adjusting screw four turns from the fully closed state.

NOTE:

For this adjustment, it is necessary to prepare the following SST.

SST: 09243-00020-000



WR88-EM051

3. Start the engine. Adjust the throttle adjusting screw so that the engine idle speed may become the specified value.

Engine Idle Speed

M/T vehicle: 850 rpm \pm 50 rpm
A/T vehicle: 900 rpm \pm 50 rpm

[HC-E engine]

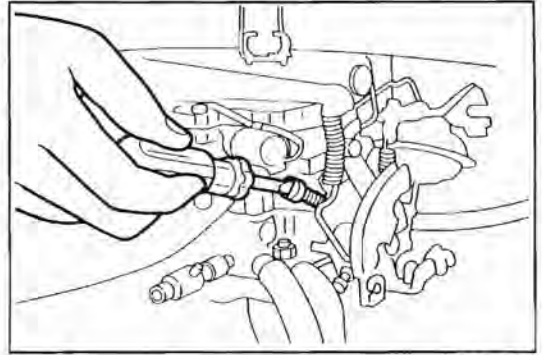
1. Connect the tachometer to the ignition coil.
Connect the measuring terminal of the tachometer to the negative (–) terminal of the ignition coil.

NOTE:

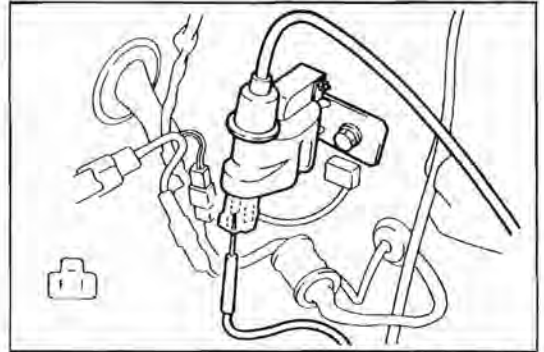
- The ignition coil has no terminal for external connection. Hence, insert an adequate jumper cord from the backside of the connector attached to the ignition coil. Then, connect the other end of the jumper cord to the measuring terminal of the tachometer.
- For the purpose of connecting tachometer, the SST for connecting to the distributor wire is available.
SST: 09991-87703-000

CAUTION:

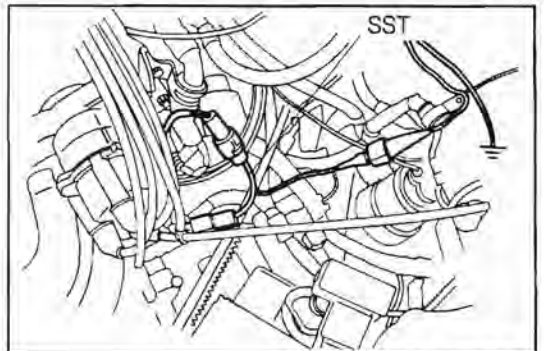
- Never allow the tachometer terminal to touch ground as it could result in damage to the ignitor and/or ignition coil.
 - As some tachometers are not compatible with this ignition system, it is imperative to confirm the compatibility of your meter before it is used.
2. Race the engine to 2500 rpm for about two minutes.
 3. Remove the idle adjusting screw cap from the throttle body.
 4. Set the idle speed by turning the idle speed adjusting screw.
Engine Idle Speed: 850 rpm \pm 50 rpm



WR88-EM052



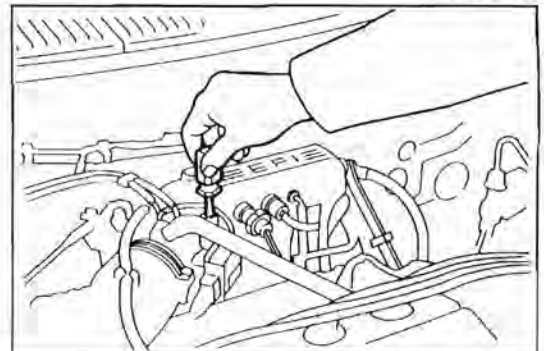
WR88-EM053



WR88-EM054

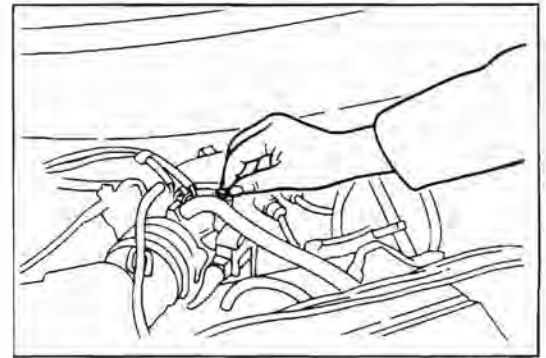


WR88-EM055



WR88-EM056

5. Install the idle adjusting screw cap into the throttle body.



WR88-EM057

6. Remove the tachometer from the ignition coil.

WR88-EM058

11. Fast Idle speed adjustment

[HC-C engine]

Preparation to be made prior to fast idle adjustment

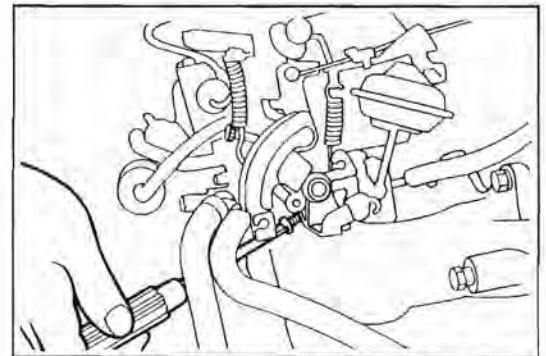
- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- All accessory switches are turned OFF.
On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage.
- The air cleaner element is installed.
- All vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.
- On the automatic transmission vehicle, the gear shift lever is placed in the [N] or [P] range.
- The choke lever is open fully.

NOTE:

- Do not perform the engine fast idle speed adjustment while the fan motor is functioning.
- On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage with the headlamps turned OFF.

WR88-EM059

1. Connect the tachometer to the engine.
2. Pull out the choke lever up to the full position.
3. Depress the accelerator pedal once.
4. Start the engine. Adjust the fast idle adjusting screw so that the engine fast idle speed may become the specified value.



WR88-EM060

Engine Fast Idle Speed

M/T vehicle: 1800 rpm \pm 100 rpm

A/T vehicle: 2200 rpm \pm 100 rpm

12. Throttle positioner check

Preparation to be made prior to throttle positioner check

- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- All accessory switches are turned OFF.
On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage.
- The air cleaner element is installed.
- All vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.

- On the automatic transmission vehicle, the gear shift lever is placed in the [N] or [P] range.
- The choke lever is open fully. (HC-C engine)

NOTE:

- Do not perform the throttle positioner check while the fan motor is functioning.
- On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage with the headlamps turned OFF.

WR88-EM061

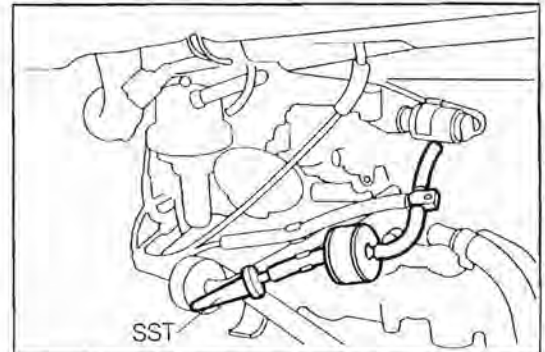
[HC-C engine]

1. Connect the tachometer to the engine.
2. Disconnect the vacuum hose from the throttle positioner. Plug the hole, using the following SST.

SST: 09258-00030

NOTE:

At this time, be sure that the throttle positioner shaft is stretched fully.



WM88-EM062

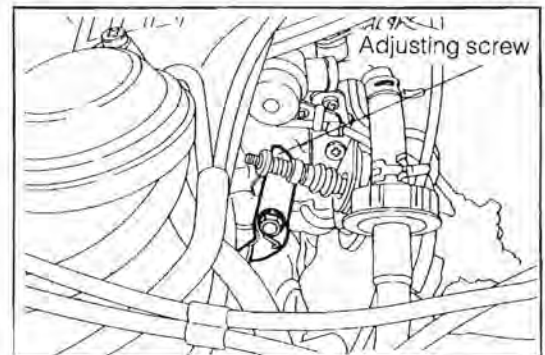
3. Start the engine.
4. Check of touch revolution speed of throttle positioner
The touch revolution speed of the throttle positioner means the engine revolution speed at the time when the adjusting screw of the throttle lever makes contact with the dashpot shaft.

Touch Revolution Speed: 1800 ± 50 rpm

If the touch revolution speed does not conform to the specification, turn the adjusting screw so that the touch revolution speed may become the specified speed.

NOTE:

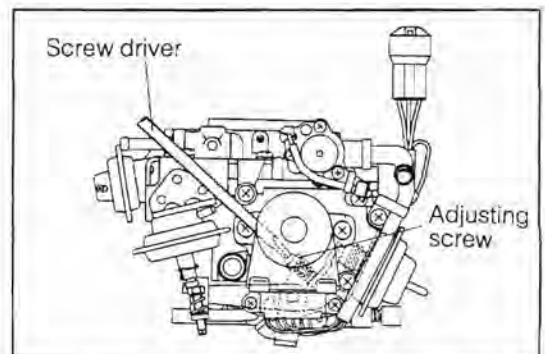
On the automatic transmission vehicle, the adjustment should be performed with the air cleaner assembly removed. However, be sure to plug the vacuum hose connected to the ITC valve.



WR88-EM063

5. Remove the SST. Connect the vacuum hose to the throttle positioner.
6. Hold the engine revolution speed at 3000 rpm for five seconds. Close the throttle valve quickly. Measure the time required for the engine revolution speed to drop from 2000 rpm to 1000 rpm.

Specified time	1.0 - 2.0 second
----------------	------------------



WR88-EM064

7. If the time does not conform to the specification, check/or replace the VTV. Repeat the aforesaid check. If the time does not conform to the specification even after the VTV has been replaced, check the vacuum hoses and vacuum pipes for restriction or damage. Replace the throttle position, as required.

WR88-EM065

[HC-E engine]

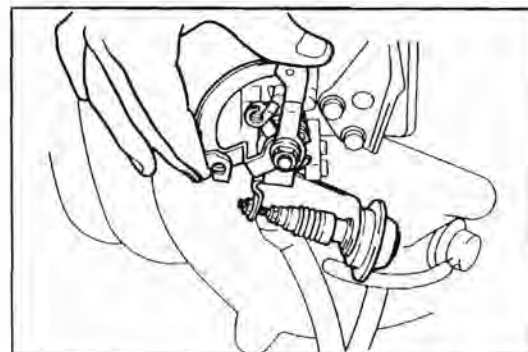
1. Connect the tachometer to the engine. Start the engine.
2. Read the touch revolution speed of the dashpot.

WR88-EM066

- (1) The touch revolution speed of the dashpot means the engine revolution speed at the time when the adjusting screw of the throttle lever makes contact with the dashpot shaft.

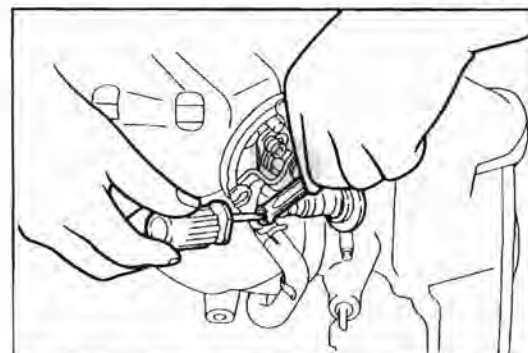
Dashpot Touch Revolution Speed

2WD & 4WD vehicles: 2000 ± 100 rpm
A/T vehicle: 2800 ± 100 rpm



WR88-EM067

- (2) If the touch revolution speed does not conform to the specification, loosen the lock nut of the adjusting screw. Turn the adjusting screw so that the touch revolution speed may become the specified speed.



WR88-EM068

- (3) Hold the engine revolution speed at 3500 rpm. Close the throttle valve quickly. Ensure that the engine revolution speed drops to the idle speed within the specified time.

Specified time

0.5 - 5.0 second

If the time does not conform to the specification, replace the throttle body, as required.

WR88-EM069

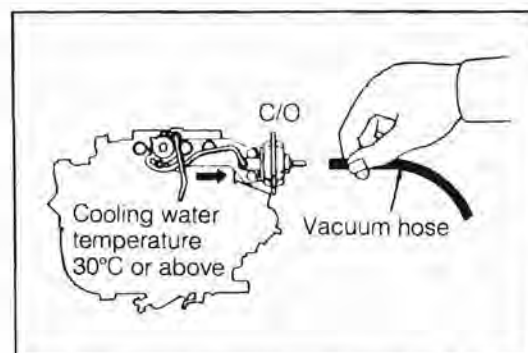
13. Check of choke opener

[HC-C engine]

While the engine is idling, disconnect the vacuum hose connected to the choke opener. If the link functions in the way as described in the table below, it represents that the choke opener is functioning properly.

Cooling water temperature	When hose is reconnected, link moves. (Negative pressure is applied.)
30°C (86°F) or above	

If the link will not move, check the BVSV, and/or choke opener. Replace them, as required.
(See page EC-9)



WR88-EM070

14. Check of idle-up system

[HC-C engine, A/T vehicle]

Preparation to be made prior to idle-up system check

- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- All accessory switches are turned OFF.
On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage.
- The air cleaner element is installed.
- All vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.
- The choke lever is open fully.

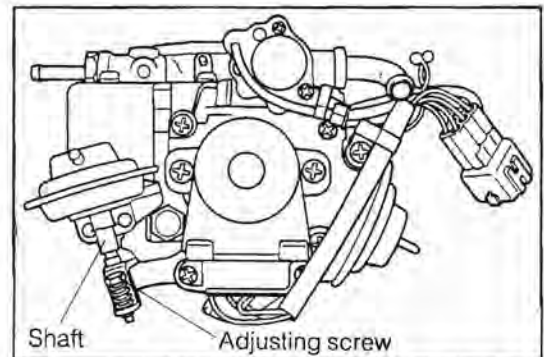
NOTE:

- Do not perform the idle-up system check while the fan motor is functioning.
- On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage with the headlamps turned OFF.

WR88-EM071

1. Apply the parking brake fully.
2. Place a wheel chock at each wheel.
3. Connect an engine tachometer to the engine.
4. Start the engine.
5. Place the shift lever in "D", "R", "2" or "L" range.
6. Turned ON the head lamp switch.
7. Turned ON the blower fan switch to the third stage.
8. At this time, ensure that the shaft of the idle-up device is stretched fully.

If the shaft is not stretched fully, check the VSV or the electrical circuit.



WR88-EM072

9. At this time, check to see if the engine revolution speed conforms to the specification.

Specified Revolution Speed: 700 ± 50 rpm

If the revolution speed does not conform to the specification, turn the adjusting screw so that the engine revolution speed may become the specified speed.

WR88-EM073

15. Check and adjustment of CO/HC concentrations

[HC-C engine]

- Warm up the engine thoroughly. (Continue engine warm-up for another 10 minutes after the fan motor has started its operation.)
- All accessory switches are turned OFF.
On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage.
- The air cleaner element is installed.
- All vacuum hoses are connected.
- Ensure that the intake system exhibits no air leakage.
- Ensure that the exhaust system exhibits no air leakage.

- On the automatic transmission vehicle, the gear shift lever is placed in the [N] or [P] range.
- The choke lever is open fully.

NOTE:

- On those vehicles equipped with a day-lamp system, set the lamp control switch to the first stage with the headlamps turned OFF.
- Use the SST (09243-00020-000) to adjust the idle mixture adjusting screw.
- Make sure that the CO/HC meter is adjusted and calibrated accurately before it is put into use.

WR88-EM074

[CO adjustment]

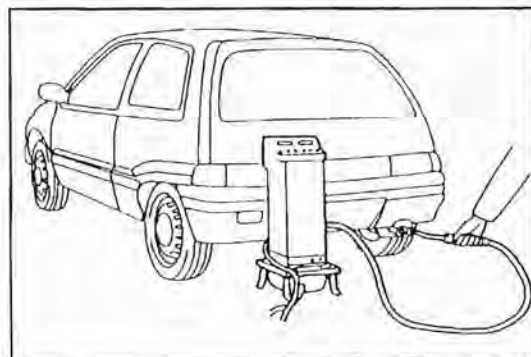
1. Adjust the idle speed.
(See page EM-10.)
2. Race the engine until its speed reaches 2000 rpm.

WR88-EM075

3. Measure the CO concentration at the idle speed. Check to see if the CO concentration conforms to the specification.

Specified CO Concentration: $1.5 \pm 0.5\%$

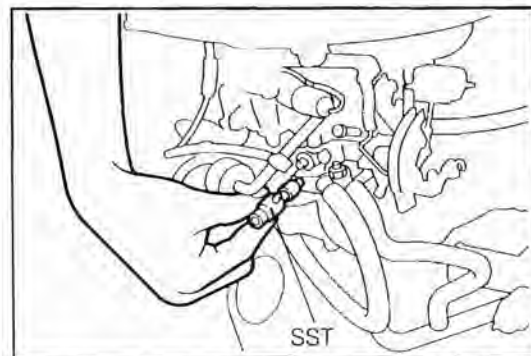
If the measured concentration fails to conform to the specification, perform the adjustments described in the step 4. onward.



WR88-EM076

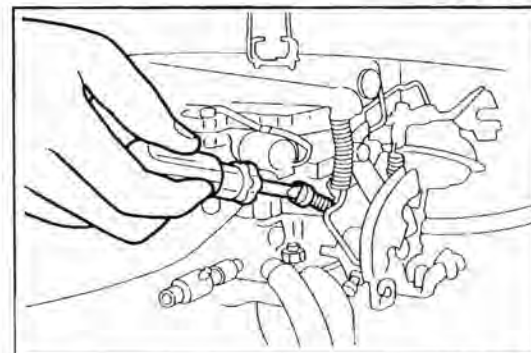
4. Gradually turn the mixture adjusting screw so that the CO concentration may conform to the specification.

SST: 09243-87201-000



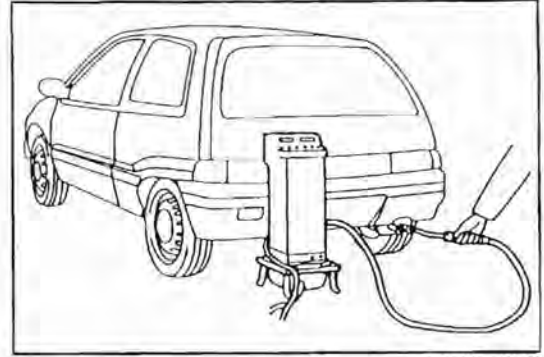
WR88-EM077

5. Turn the throttle adjusting screw so that the idle speed may become the specified speed.



WR88-EM078

6. Measure the CO concentration. Check to see if the CO concentration conforms to the specification.
If the measured concentration fails to conform to the specification, perform the operations described in the step 2. onward. However, if the repeated adjustments will not get the conformity to the specification, carry out the trouble shooting in accordance with the table below.



WR88-EM078A

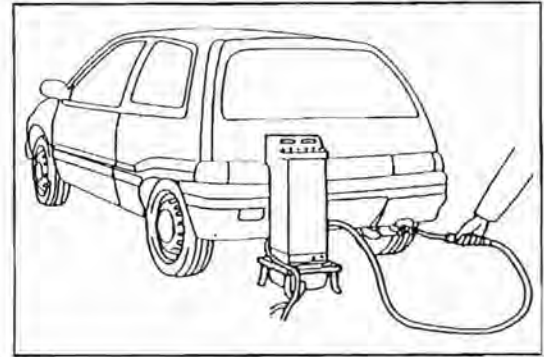
[HC adjustment]

1. Adjust the idle speed.
(See page EM-18.)
2. Measure the HC concentration at the idle speed. Check to see if the HC concentration conforms to the specification.

Specified CO Concentration:

Not to Exceed 1000 PPM

If the measured concentration fails to conform to the specification, carry out the trouble shooting in accordance with the following tables.



WR88-EM079

POSSIBLE CAUSES FOR IMPROPER CO/HC CONCENTRATIONS

Possible cause	Item	CO concentration	HC concentration	Remarks
Ignition timing			○	
Valve clearances			○	
Improper valve seating			○	Compression pressure
Ignition system problems Spark plugs Resistive cord Distributor Ignition coil		○	○	
Air leakage in intake system		○	○	
ITC valve malfunctioning		○	○	
Great mechanical loss of engine inner parts		○	○	

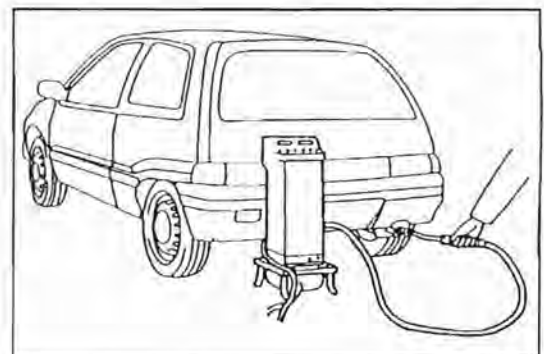
WM88-EM080

16. Checking method of idle HC/CO concentrations

[HC-E engine]

NOTE:

This check is used only to determine whether or not the idle HC/CO emissions comply with the regulations.



WR88-EM081

PRE-CHECK

Initial conditions

1. Air filter element installed
2. All accessories turned OFF
3. All vacuum lines connected
4. All pipes and hose of air intake system connected
5. Ignition timing set correctly
6. Transmission in "N" range
7. Warm up engine thoroughly.
8. Ensure that the exhaust system exhibits no gas leakage.
9. Ensure that the intake system exhibits no air leakage.
10. Tachometer and HC/CO meter at hand and calibrated.
11. Ensure that the engine idle speed is the specified speed.

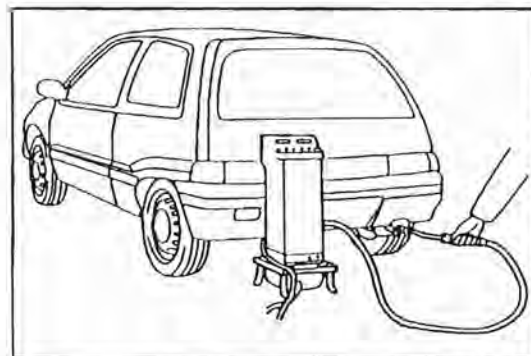
Measurement

1. Insert the HC/CO testing probe into the tailpipe at least 400 mm (15.7 inch).

NOTE:

On the 4WD vehicle, it is necessary to prepare a flexible pipe for this operation.

2. Measurement of HC/CO concentrations at idle speed
Wait at least one minute before the measurement so as to allow the concentrations to stabilize.
Complete the measurement within three minutes.
If the HC/CO concentrations do not conform to the regulations, see the following table for possible causes.



WR88-EM082

WR88-EM083

Trouble Shooting

HC	CO	Problems	Possible causes
High	Normal	Rough idle	<ol style="list-style-type: none"> 1. Faulty ignition <ul style="list-style-type: none"> • Incorrect timing • Fouled, shorted or improperly gapped spark plugs • Open or crossed high tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky exhaust valves 4. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	<ol style="list-style-type: none"> 1. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	<ol style="list-style-type: none"> 1. Restricted air filter 2. Faulty EFI system <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line • Defective water temp. sensor • Defective air temp. sensor • Faulty throttle position sensor • Faulty pressure sensor • Faulty ECU • Faulty Oxygen sensor

WR88-EM085

17. Compression check

NOTE:

After completion of the engine tune-up, if the engine exhibits lack of power, excessive oil consumption or poor fuel economy, measure the cylinder compression pressure.

1. Warm up the engine thoroughly.
2. Turn OFF the ignition key switch.

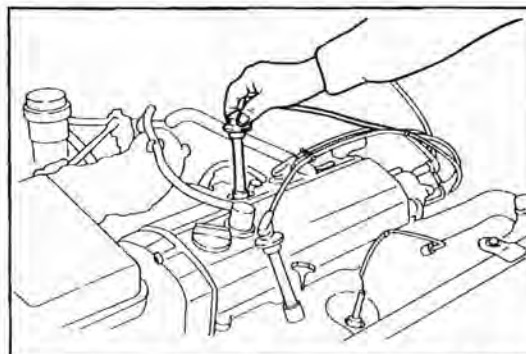
WR88-EM086

3. Removal of spark plugs

- (1) Remove the resistive cords from the clamp.
- (2) Disconnect the resistive cord at spark plug side.

NOTE

Be sure to hold the rubber boot during the resistive cord disconnection. Never remove the resistive cord, holding the cord portion.



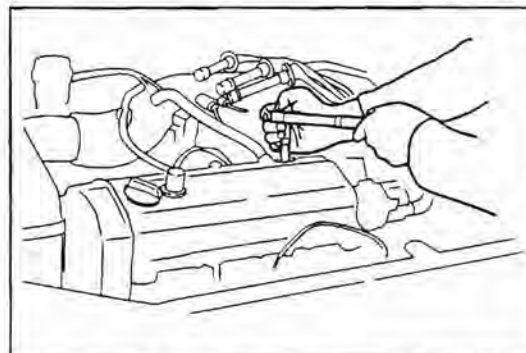
WR88-EM088

- (3) Remove the spark plugs, using the following SST Plug wrench (16 mm).

WARNING:

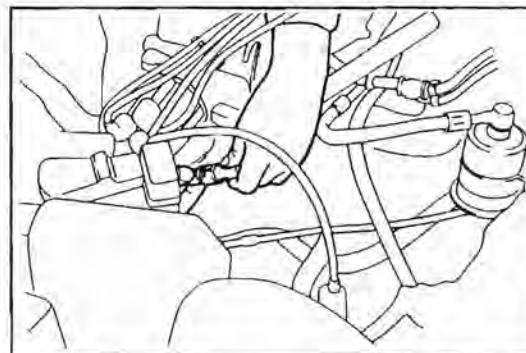
Be very careful not to burn yourself.

SST: 09268-87703-000



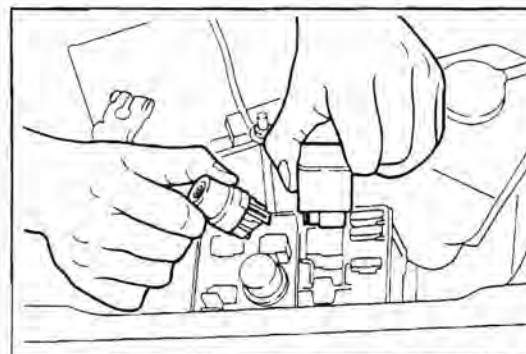
WR88-EM089

- (4) Disconnect the distributor connector.



WR88-EM090

- (5) Pull out the injector relay and fuel pump relay from the relay block.
(HC-E engine only)



WR88-EM091

(6) Measurement of cylinder compression pressure

NOTE:

As for the type HC-C engine, the choke valve should be fully closed.

- 1) Insert a compression gauge into the spark plug hole.
- 2) Depress the accelerator pedal fully.
- 3) While cranking the engine, measure the compression pressure.

NOTE:

Always use a fully charged battery so that at least a revolution speed of 300 rpm is attained.

- 4) Repeat the steps 1) through 3) for each cylinder.

NOTE

- Perform the measurement in the shortest possible time.
- Crank the engine for the same duration for each cylinder.

Compression pressure:

14 kg/cm²/at 300 rpm (199.1 psi/at 300 rpm)

Minimum pressure:

10.5 kg/cm²/at 300 rpm (149.4 psi/at 300 rpm)

Difference between cylinders:

1.5 kg/cm²/at 300 rpm (21.3 psi/at 300 rpm)

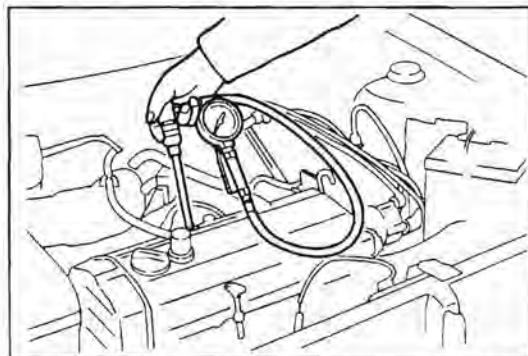
- 5) If the compression of one or more cylinders is low, pour a small amount of engine oil into that cylinder through the spark plug hole and repeat the steps 1) through 4) for the cylinder with low compression.

- If adding oil helps the compression to improve, chances are that the piston rings and/or cylinder bores are worn or damaged.
- If the pressure remains low after the operation described in the step 5) has been performed, the valve may be sticking or seated improperly, or there may be leakage past the gasket.

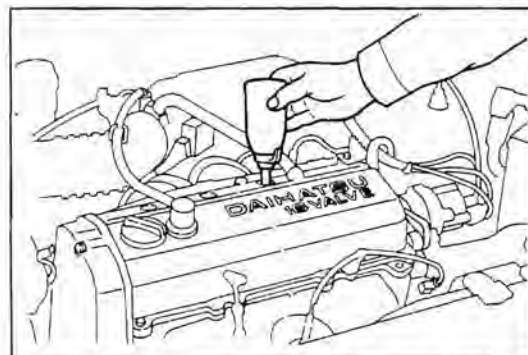
- (7) Install the injector relay and fuel pump relay to the relay block.

(HC-E engine only)

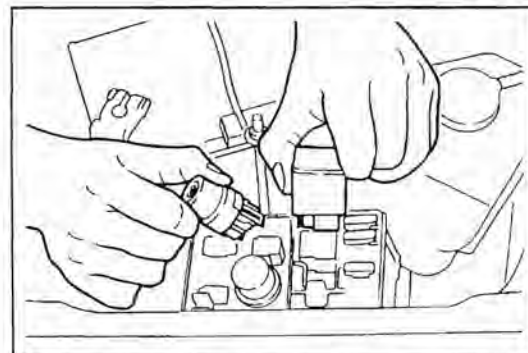
- (8) Connect the distributor connector.



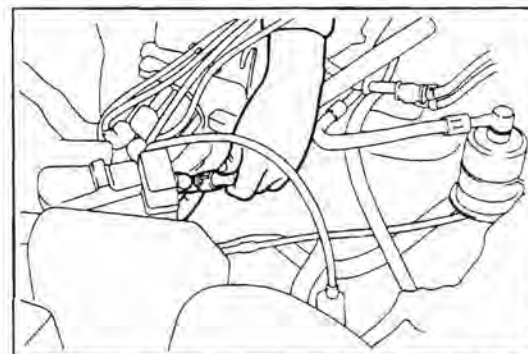
WM88-EM092



WR88-EM094

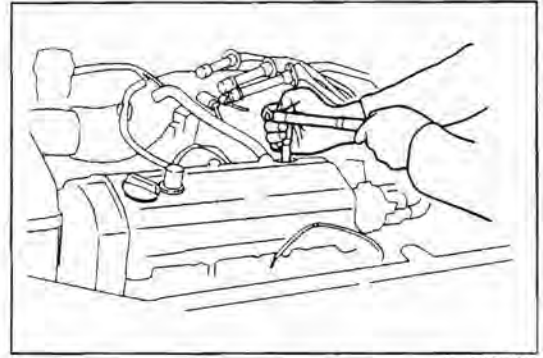


WR88-EM095



WR88-EM096

- (9) Install the spark plugs using the following SST.
 SST: 09268-87703-000
 Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)



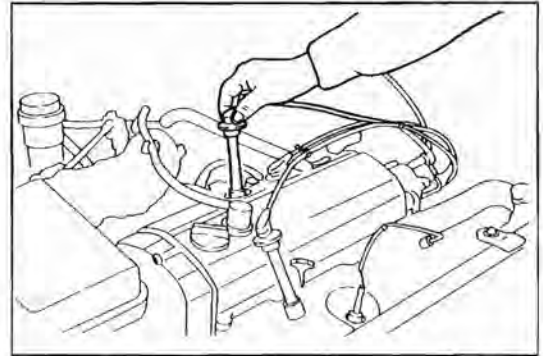
WR88-EM097

- (10) Connect the resistive cord.

NOTE:

- Be sure that the resistive cord is connected securely to each spark plug.
- Care should be exercised not to damage the resistive cord with the spark plug tube.

- (11) Attach the resistive cord to the clamp.

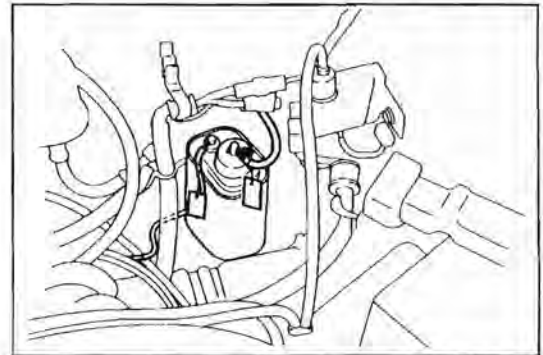


WR88-EM098

18. Inspection of charcoal canister

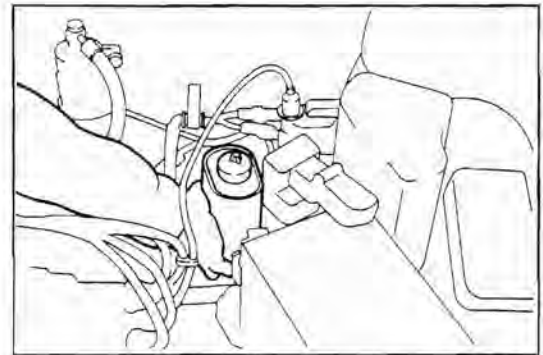
[HC-E engine]

1. Put a label on each hose connected to the charcoal canister so that each hose may be installed to the correct original position.
2. Disconnect the hoses connected to the charcoal canister.



WR88-EM100

3. Unlock the charcoal canister by raising it.



WR88-EM101

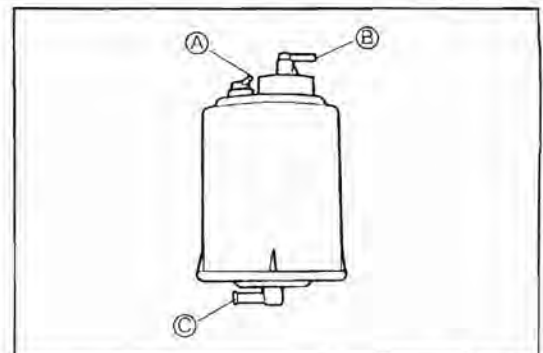
4. Plug the pipe (A) with your finger and blow compressed air of 3 kg/cm² (43 psi) through the pipe (B) (fuel tank side).
 - Check that the air comes out of the bottom pipe (C).
 - Check that no activated charcoal comes out.

Replace the charcoal canister, if necessary.

NOTE:

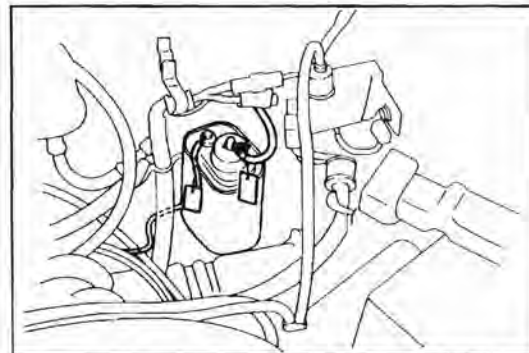
Do not attempt to wash the charcoal canister.

5. Install the charcoal canister.



WR88-EM102

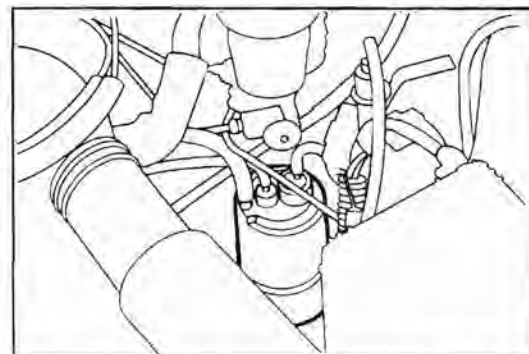
6. Connect the disconnected hoses according to the respective label.
7. Remove the labels attached to the hoses.



WR88-EM104

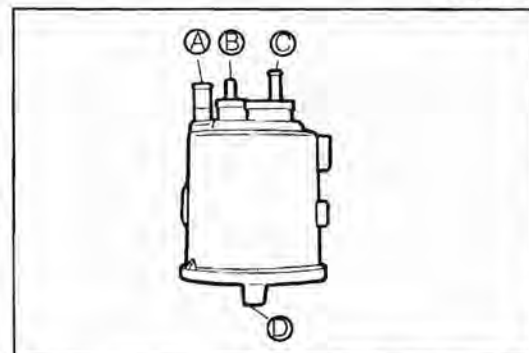
[HC-C engine with GCC specifications only]

1. Put a label on each hose connected to the charcoal canister so that each hose may be installed to the correct original position.
2. Disconnect the hoses connected to the charcoal canister.
3. Unlock the charcoal canister by raising it.



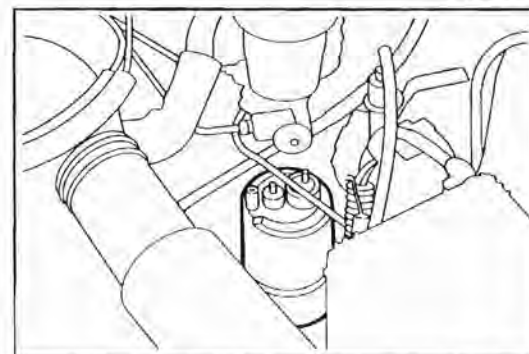
WR88-EM105

4. Plug the pipe A and B with your fingers and blow compressed air of 3 kg/cm^2 (43 psi) through the pipe C (fuel tank side).
 - Check that the air comes out of the bottom pipe D.
 - Check that no activated charcoal comes out.



WR88-EM107

5. Install the charcoal canister.
6. Connect the disconnected hoses according to the respective label.
7. Remove the labels attached to the hoses.

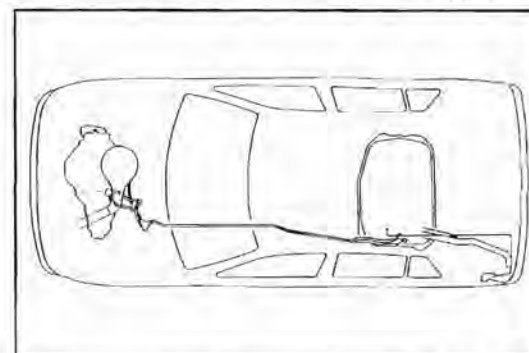


WR88-EM108

19. Inspection of fuel line and connections

Visually inspect the fuel lines for cracks, leakage, loose connections or deformation.

Repair any parts which exhibit defect.

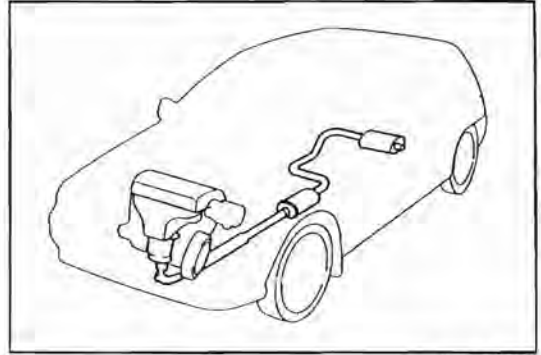


WR88-EM109

20. Inspection of exhaust pipe and mountings

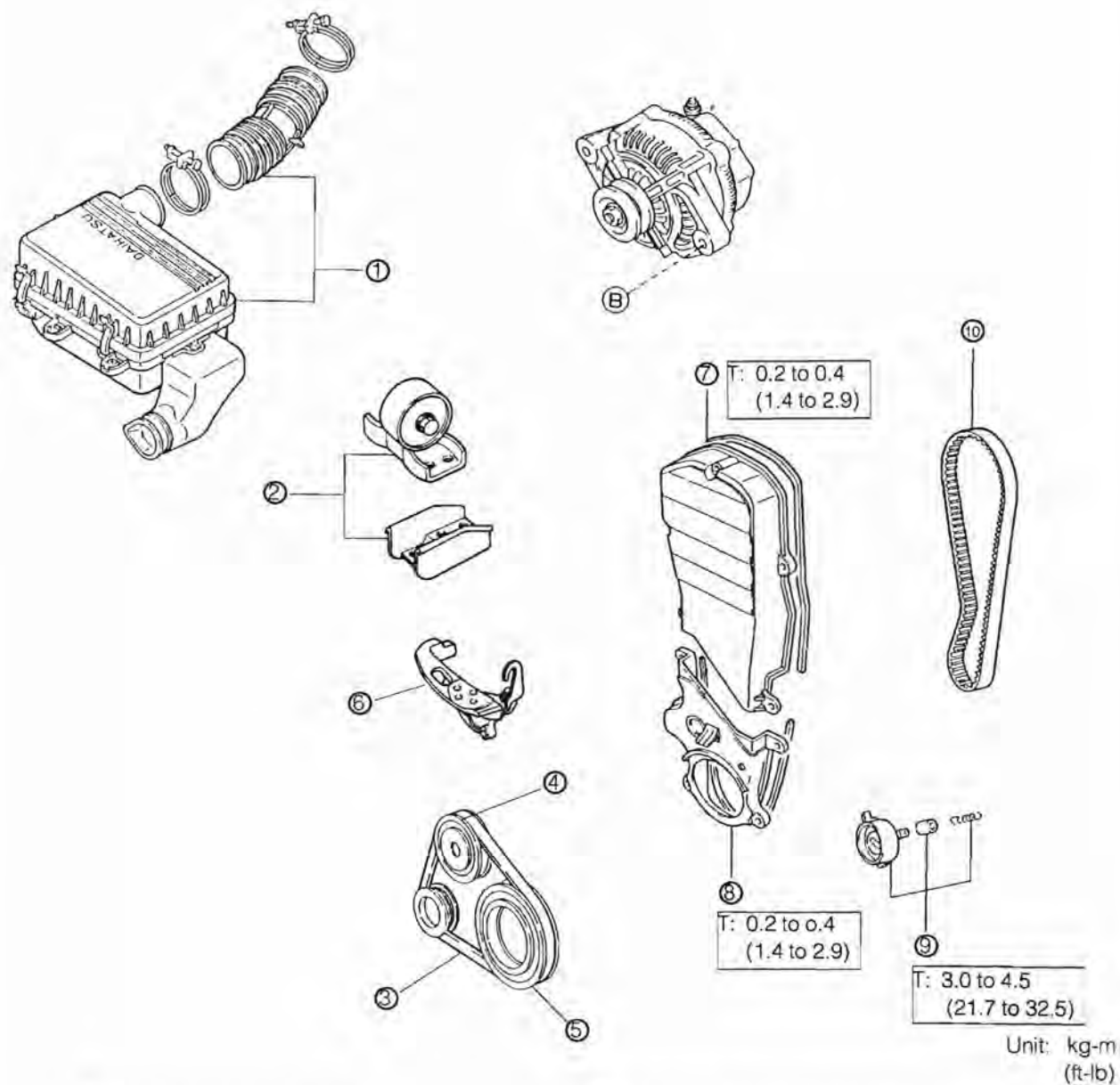
Visually inspect the pipes, hangers and connections for severe corrosion, leakage or damage.

Repair any faulty parts.



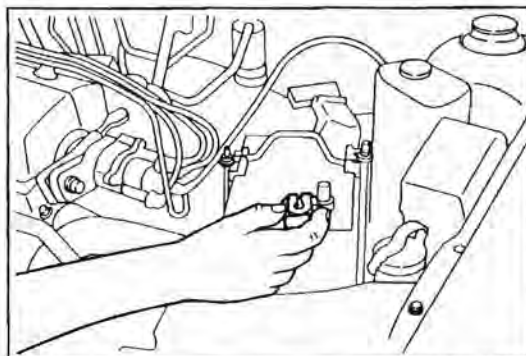
WR88-EM110

TIMING BELT COMPONENTS



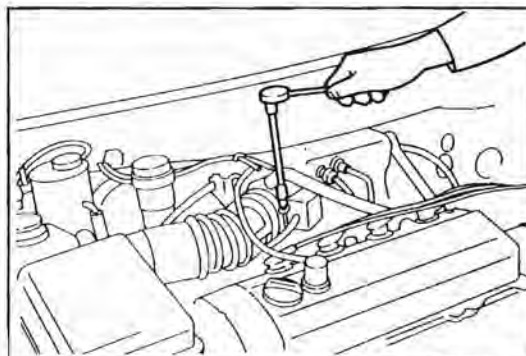
REMOVAL OF TIMING BELT

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.



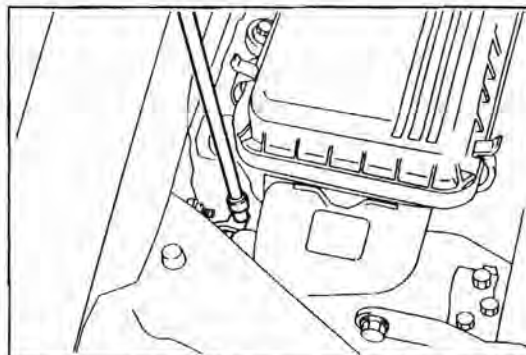
WR88-EM112

2. Removal of air cleaner (HC-E engine only)
 - (1) Remove the air cleaner hose from the throttle body.



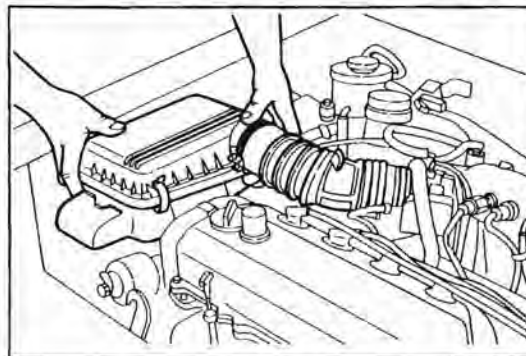
WR88-EM114

- (2) Loosen the cool air intake band.



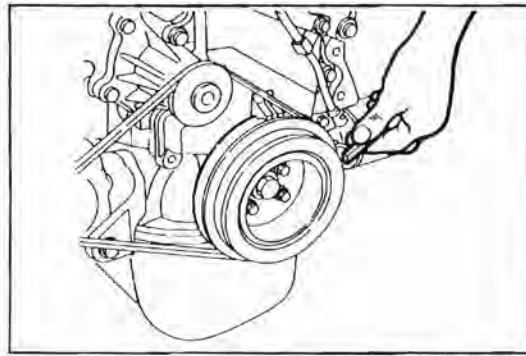
WR88-EM115

- (3) Remove the air cleaner assembly by removing the three air cleaner attaching bolts.



WR88-EM116

3. Disconnect the oil pressure switch wire (engine wire) at the oil pressure side.

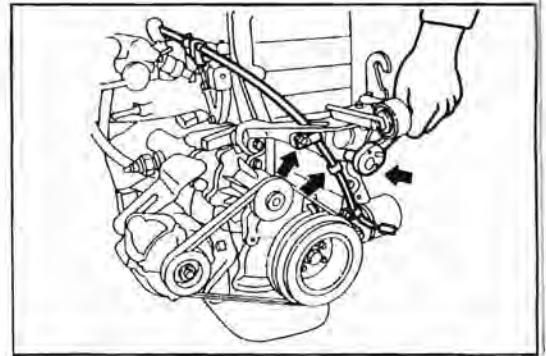


WR88-EM117

4. Remove the three attaching bolts of the oil pressure switch wire (engine wire). Pull out the wire through the hole of the engine mounting right front No.1.

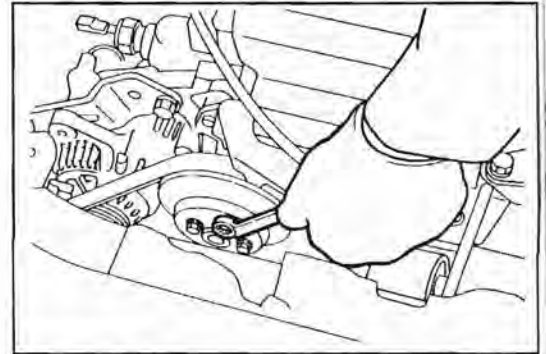
NOTE:

As for the pulled-out wire, bend it toward the injector side.



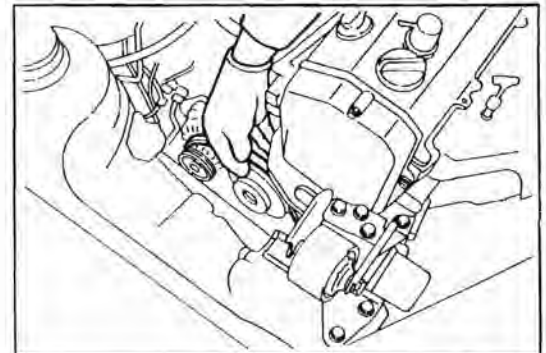
WR88-EM118

5. Loosen the all attaching bolts of the water pump pulley, utilizing the tension of the V-ribbed belt.



WR88-EM119

6. Loosen the two alternator attaching bolts. Then, remove the water pump pulley and V-ribbed belt.



WR88-EM120

7. Slightly jack up the engine with the supporting pad of a garage jack placed underneath the oil pan.

NOTE:

- Place a suitable object, such as a wooden piece, between the oil pan and the supporting pad of the garage jack so as not to deform the oil pan.
- Care must be exercised to ensure that the interposed object is not interfering with the oil drain plug. Failure to observe this note may incur a damaged drain plug.

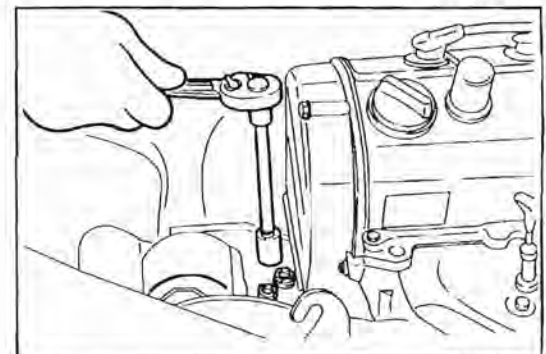


WR88-EM121

8. Remove the three attaching bolts and one nut of the engine mounting right bracket.

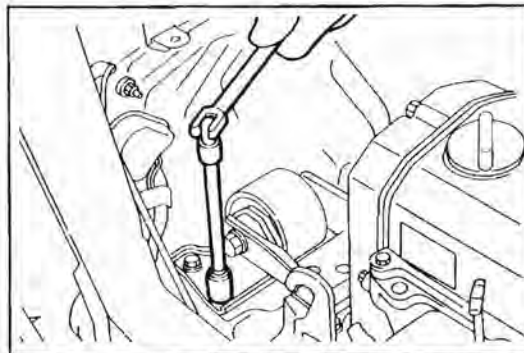
NOTE:

The bracket is installed with the three bolts from the upper side and one nut from the lower side.



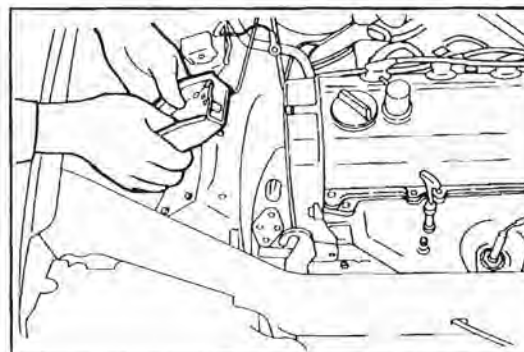
WR88-EM122

9. Remove the three attaching bolts of the engine mounting front insulator.



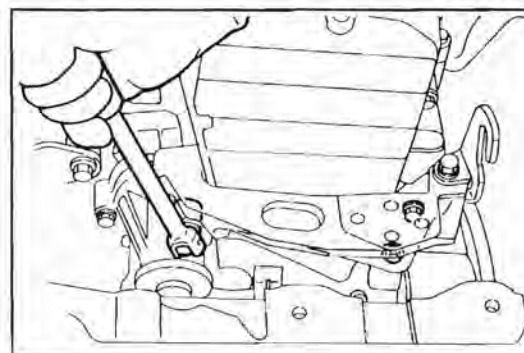
WR88-EM123

10. Remove the engine mounting front insulator together with the engine mounting front right bracket.



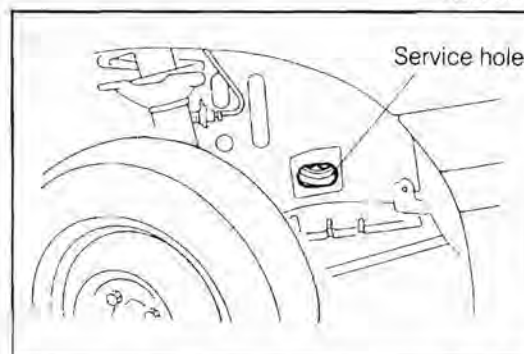
WR88-EM124

11. Remove the engine mounting right front bracket No. 2.



WR88-EM125

12. Remove the service hole cover.

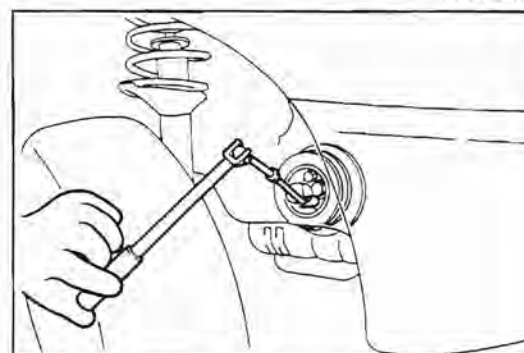


WR88-EM126

13. Remove the four attaching bolts of the crankshaft timing belt pulley.

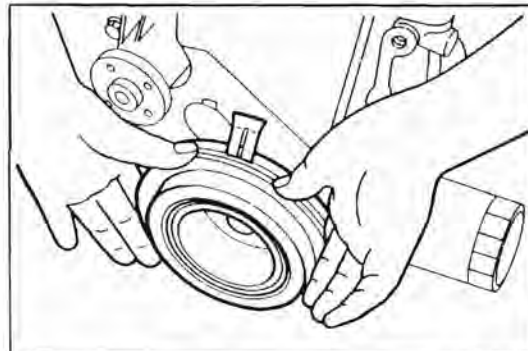
NOTE:

- Place the gear shift lever in the 4th gear position so as to prevent the rotation of the crankshaft in case of manual transmission equipped model.
- On the automatic transmission vehicle, prevent the crankshaft from being rotated by inserting a screwdriver or the like into the ring gear at the rear end section of the cylinder block.



WR88-EM127

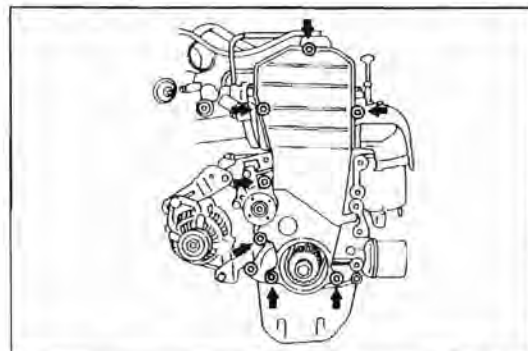
14. Remove the crankshaft timing belt pulley.



WR88-EM128

15. Remove the timing belt upper cover.

16. Remove the timing belt lower cover.



WR88-EM129

17. Removal of timing belt

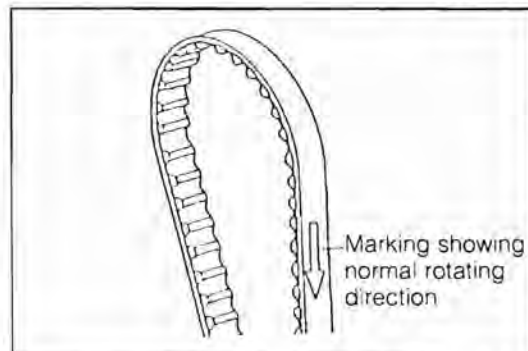
NOTE:

Prior to removal of the timing belt, put an arrow mark indicating the normal rotating direction on the belt, using a chalk or the like.

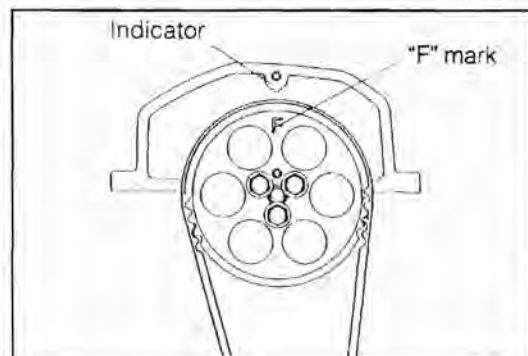
CAUTION:

- Do not try to pry the timing belt with a screwdriver or the like during the removal or installation.
- Do not allow the belt to come into contact with oil, water or dust.
- Do not bend the belt at a sharp angle or turn the belt inside out, for it is very vulnerable to bending.
- Do not utilize the tension of the timing belt pulley when loosening the set bolt of the camshaft timing belt pulley.

(1) Rotate the crankshaft until the "F" mark of the crankshaft timing belt pulley is aligned with the indicator of the cylinder head cover.

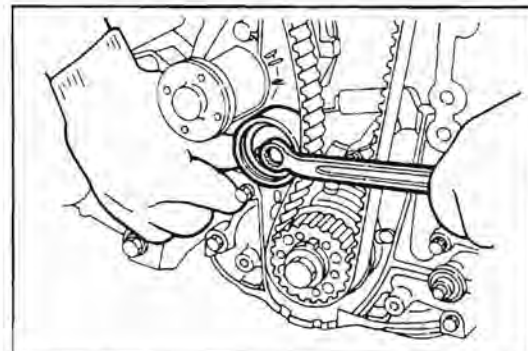


WR88-EM130



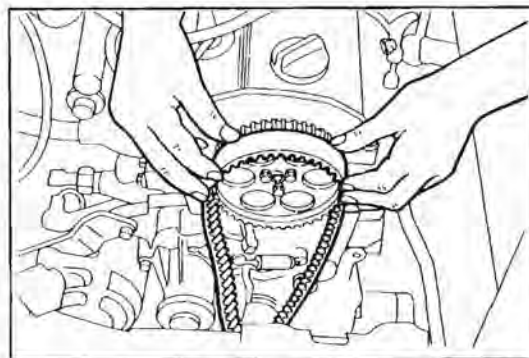
WR88-EM132

(2) Loosen the attaching bolt of the timing belt tensioner. Move the tensioner to the left as far as it will go and tighten the bolt temporarily.



WR88-EM133

- (3) Remove the timing belt.



WR88-EM134

18. Removal of camshaft timing belt pulley

- (1) Remove the oxygen sensor wire from the clamp.
(HC-E engine only)
- (2) Disconnect the resistive cord at the cylinder head cover side.

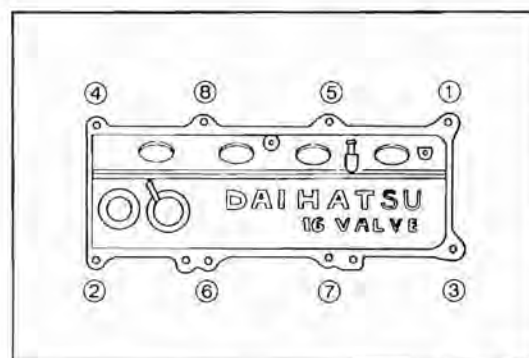
NOTE:

Be sure to hold the rubber boot during the resistive cord disconnection. Never remove the resistive cord, holding the cord portion.

- (3) Disconnect the blow-by gas hoses.
- (4) Remove the air cleaner assembly.
(HC-C engine only)
- (5) Disconnect the accelerator cable and choke cable at the carburetor side and remove them from the clamp.
(HC-C engine only)
- (6) Remove the throttle cable from the carburetor.
(Automatic transmission vehicles mounted with HC-C engine only)
- (7) Disconnect the accelerator cable from cable clamp.
(Left hand drive vehicle with HC-E engine.)

WR88-EM135

- (8) Remove the eight attaching bolts of the cylinder head cover by loosening them progressively over two or three stages, following the sequence shown in the right figure.

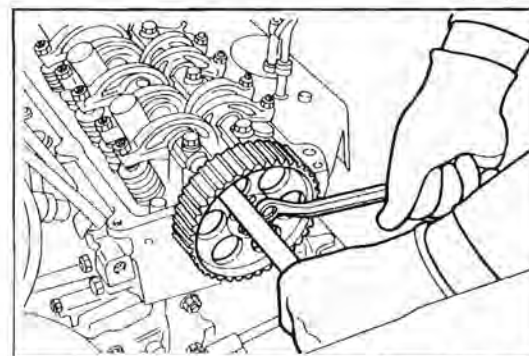


WR88-EM136

- (9) Remove the cylinder head cover.
While preventing the camshaft timing belt pulley from turning using a suitable iron rod, remove the three attaching bolts. Then, remove the camshaft timing belt pulley.

CAUTION:

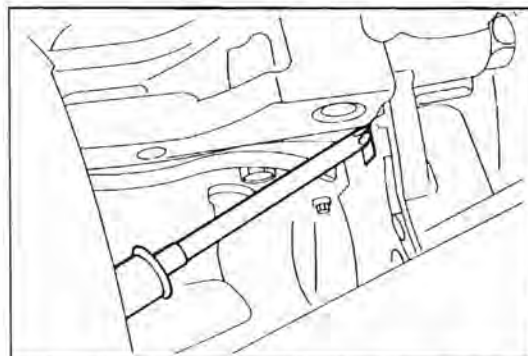
- Never allow the camshaft to turn.
- Be careful not to damage the gasket surface of the cylinder head.



WR88-EM138

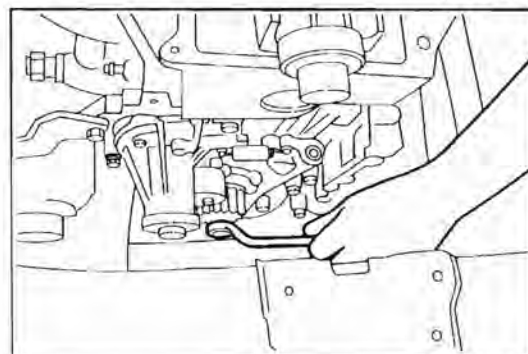
19. Removal of crankshaft timing belt pulley

- (1) Prevent the ring gear from turning by inserting a screwdriver into the gap between the cylinder block lower surface and the clutch housing undercover.



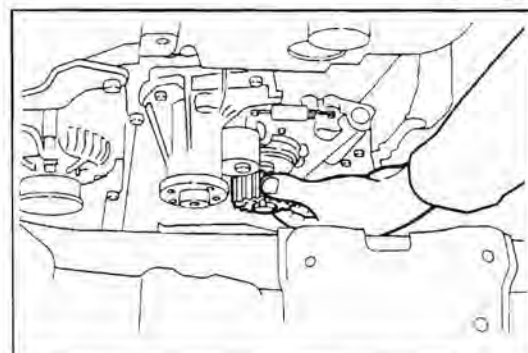
WR88-EM140

- (2) While performing the operation described in the step (1), remove the set bolt of the crankshaft timing belt pulley.



WR88-EM141

- (3) Remove the crankshaft timing belt pulley.

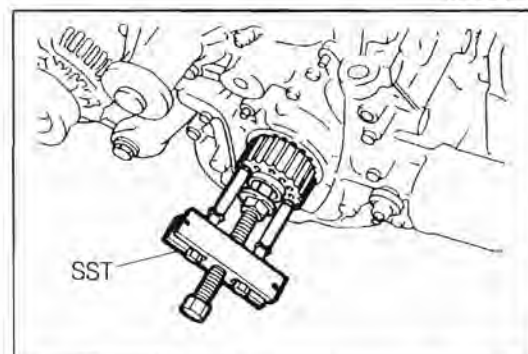


WR88-EM142

NOTE:

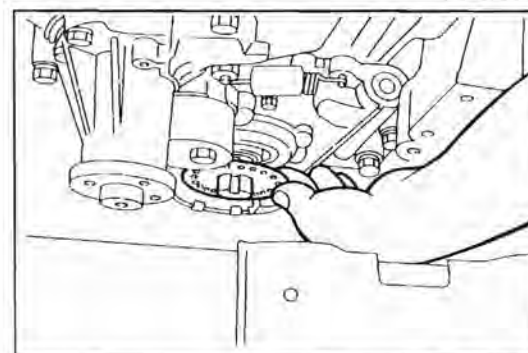
If any difficulty is encountered in removing the crankshaft timing belt pulley, lightly screw in the set bolt of the crankshaft timing belt pulley. Then, remove the pulley, using the following SST.

SST: 09609-20011-000



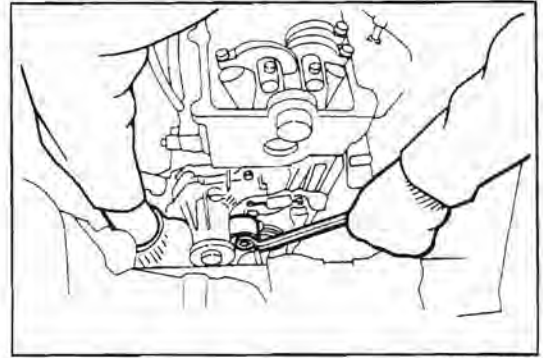
WR88-EM143

20. Remove the timing belt pulley flange.



WR88-EM144

21. Remove the timing belt tensioner and tension spring.



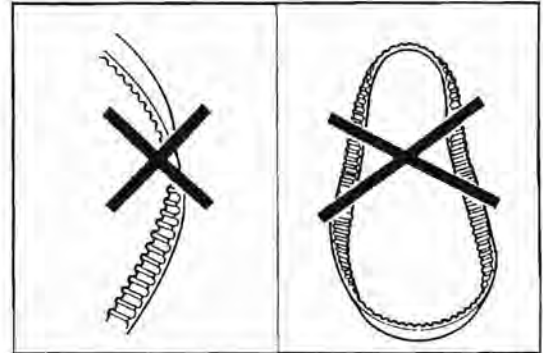
WR88-EM145

INSPECTION OF COMPONENTS

1. Timing belt inspection

CAUTION:

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

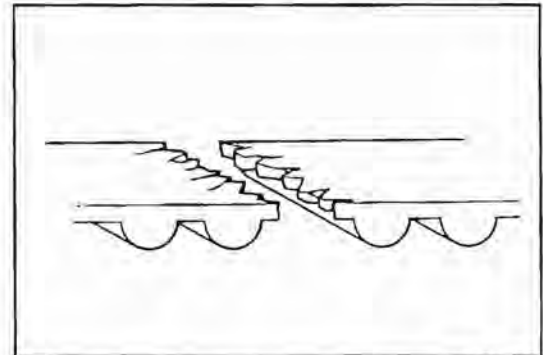


WR88-EV146

If there are defects, as shown in the figures, check the following points and replace the timing belt, if necessary.

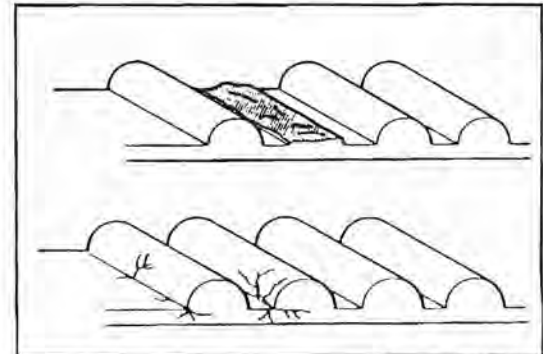
(1) Premature separation

- Check for proper installation.
- Check the timing gear cover gaskets for damage and check for correct installation.



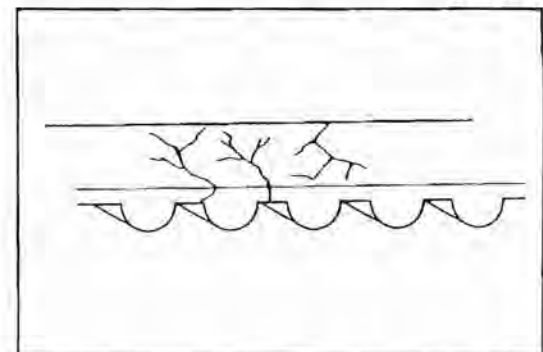
WR88-EM147

(2) If the belt teeth are cracked or damaged, check to see if the camshaft is seized.



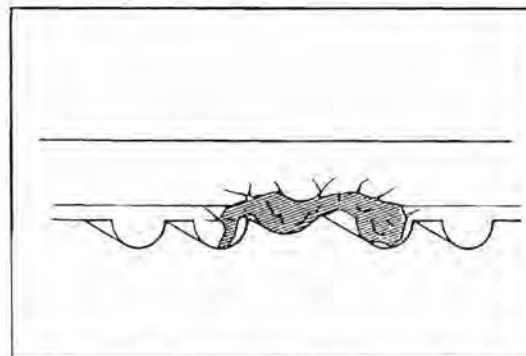
WR88-EM148

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



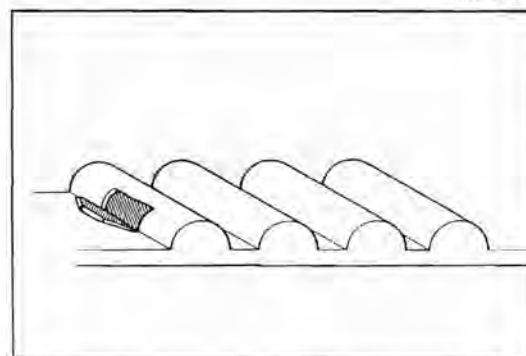
WR88-EM149

- (4) If there is wear or damage on only one side of the belt, check the pulley flange.



WR88-EM150

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



WR88-EM151

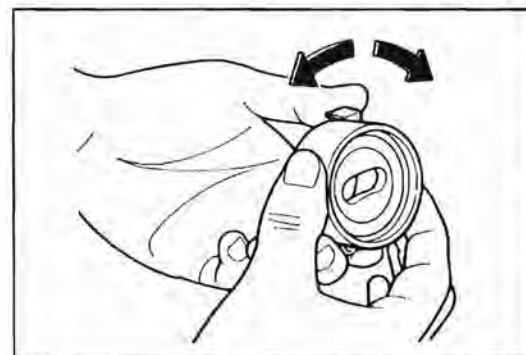
2. Idler pulley inspection

- Check the timing belt pulleys for smooth turning.
- Check the belt contact surface for damage.

If necessary, replace the idler pulley.

CAUTION:

Never wash the idler pulley.



WR88-EM152

3. Inspect tension spring

- (1) Check the free length of the spring

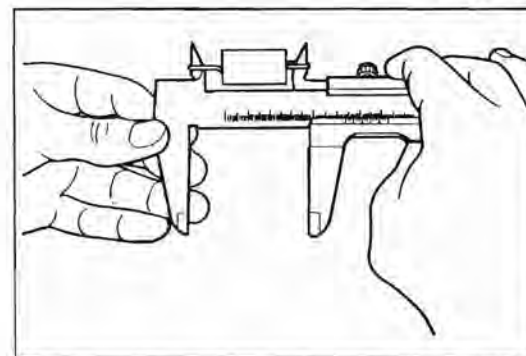
Free length:

- (2) Check the tension of the spring at the specified installation length.

Tension as installed:

2 kg at 57.25 mm (44 lb at 2.25 inch)

If the tension does not conform to the specification, replace the spring.



WR88-EM153

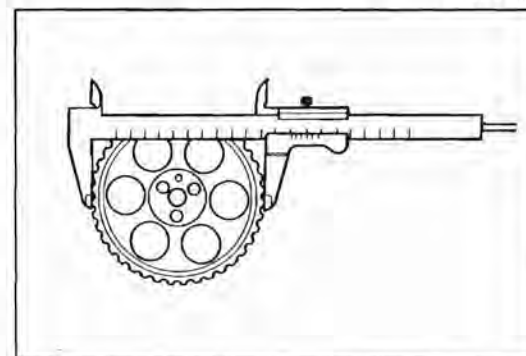
4. Inspection of timing belt pulley

- (1) Measure the maximum width of the timing belt pulley, using vernier calipers.

Wear limit of timing belt pulley:

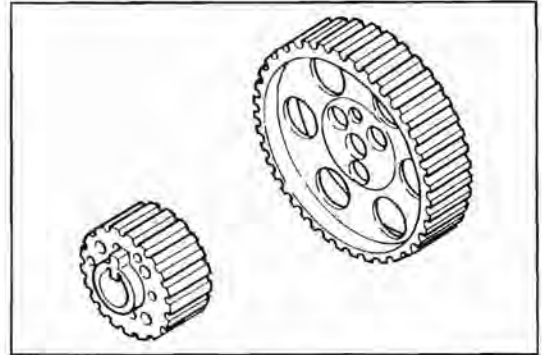
Camshaft timing belt pulley:	119.8 mm (4.717 inch)
Crankshaft timing belt pulley:	59.3 mm (2.335 inch)

If the measured value is less than the specified value, replace the timing belt pulley.



WR88-EM154

- (2) Visually inspect the timing belt pulley for damage.
If necessary, replace the timing belt pulley.

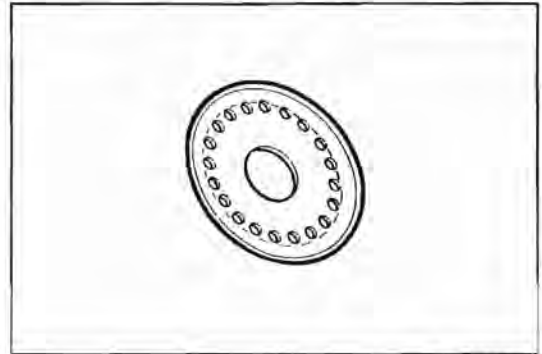


WR88-EM155

5. Inspection of crankshaft timing belt pulley flange

Check the crankshaft timing belt pulley flange for bend, damage and wear.

If necessary, replace the crankshaft timing belt pulley flange.



WR88-EM156

INSTALLATION OF TIMING BELT

(See page EM-32.)

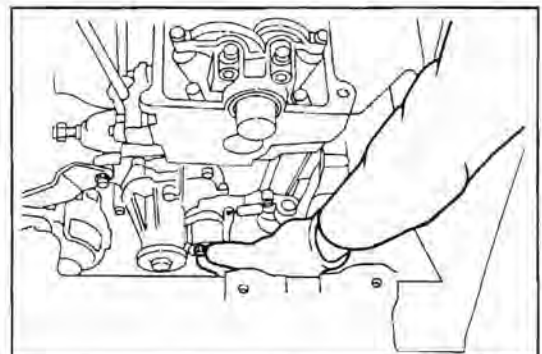
NOTE:

- Check the water pump for water leakage and the oil seal for oil leakage.

Repair any water leakage or oil leakage, if necessary.

WR88-EM157

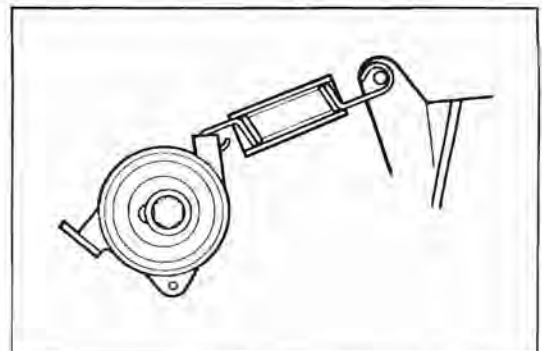
1. Attach the tension spring to the timing belt tensioner. Hang the tension spring hook on the pin. Assemble the timing belt tensioner in place and install the bolt.



WR88-EM157

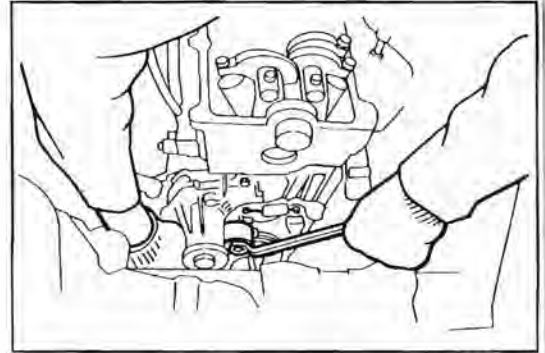
CAUTION:

- Hang the spring hook securely on the pin groove.
- Ensure that the pin at the oil pump is fitted into the pin hole of the timing belt tensioner.



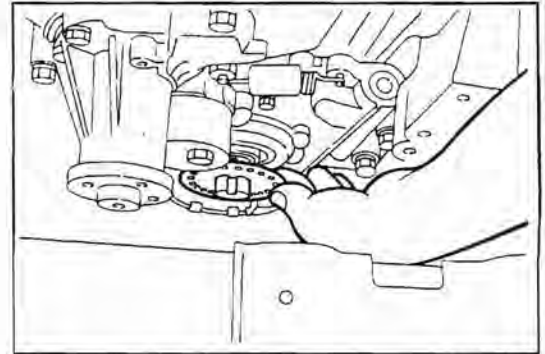
WR88-EM158A

2. While pulling the timing belt tensioner fully toward the water pump side, temporarily tighten the attaching bolt of the timing belt tensioner.



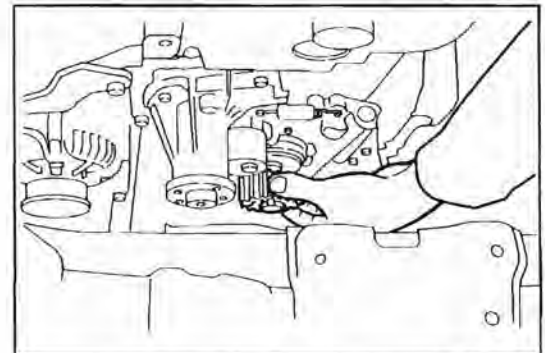
WR88-EM159

3. Install the crankshaft timing belt pulley flange with its recessed side facing toward the oil pump side.



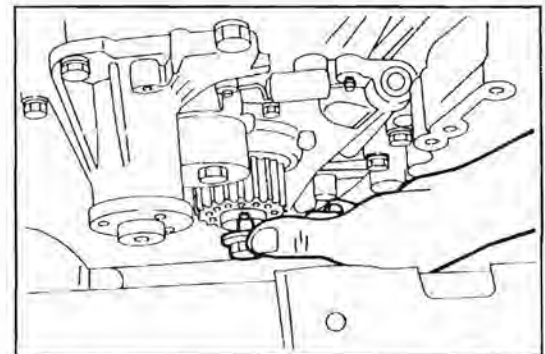
WR88-EM160

4. Install the crankshaft timing belt pulley on the crankshaft by aligning it with the key groove.



WR88-EM161

5. Install the set bolt of the crankshaft timing belt pulley.



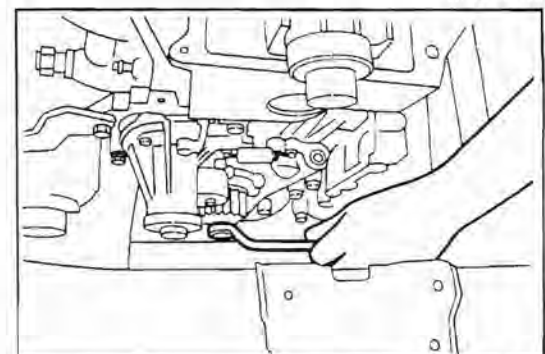
WR88-EM162

6. Prevent the crankshaft from being rotated by placing the gear shift lever in the 4th gear position in the case of the manual transmission vehicle; by inserting a screwdriver or the like into the ring gear at the rear end section of the cylinder block in the case of the automatic transmission vehicle. Then, tighten the set bolt of the crankshaft timing belt pulley.

Tightening Torque: 9.0 - 10.0 kg-m (65.1 - 72.0 ft-lb)

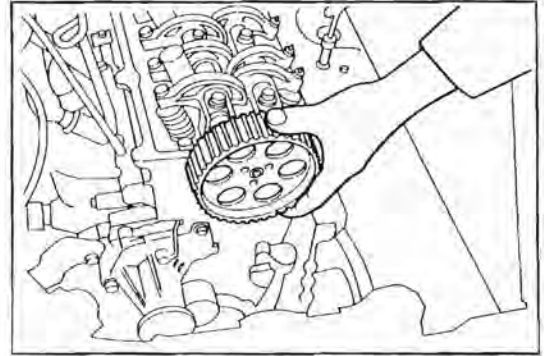
CAUTION:

- It should be noted that the specified torque can not be attained easily due to a slight turning of the crankshaft during the tightening.
- Never allow the crankshaft to turn.



WR88-EM164

7. Install the camshaft timing belt pulley on the camshaft in such a way that the "F" mark can be seen and the locating pin hole is aligned. Then, install the set bolt.



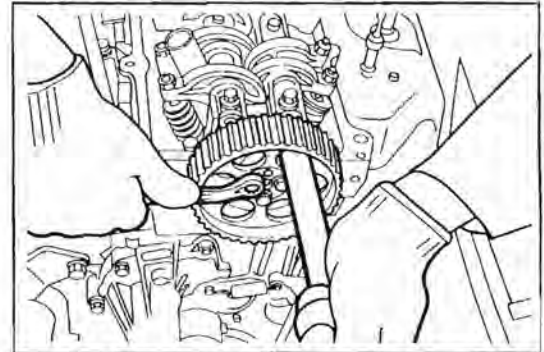
WR88-EM166

8. Install the attaching bolts of the camshaft timing belt pulley, while preventing the pulley from turning by inserting an iron rod into the hole of the pulley.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

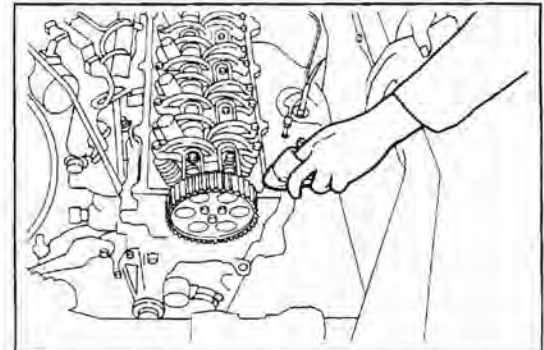
NOTE:

- Be careful not to damage the cylinder head cover gasket surface.



WR88-EM167

9. Wipe off any oil or dirt from the cylinder head cover gasket surface of the cylinder head.

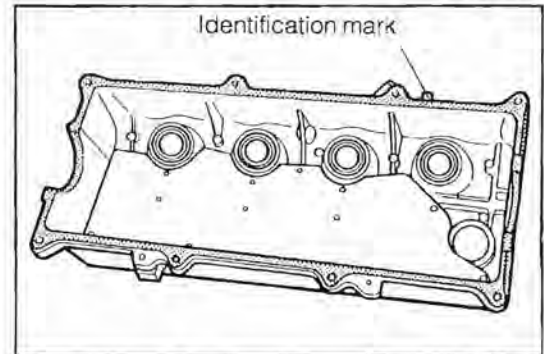


WR88-EM168

10. Check the cylinder head cover gasket for damage. Replace any gasket which exhibits damage.

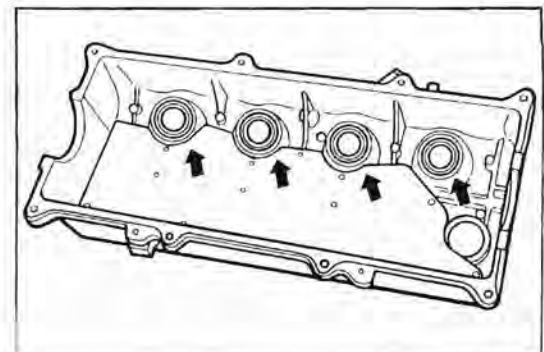
NOTE:

Install a new gasket in such a way that the identification mark comes at the intake manifold side.



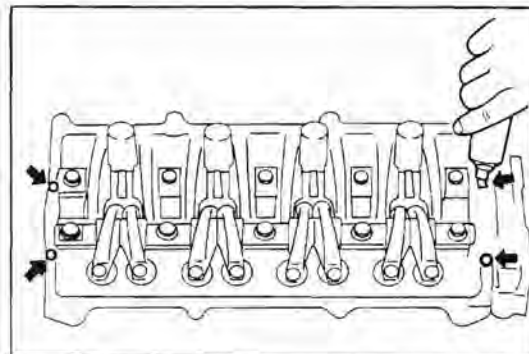
WR88-EM169

11. Check the grommets of the cylinder head spark plug tubes for damage or deformation. Replace any grommet which exhibits damage or deformation. (See page EM-114.)



WR88-EM171

12. Apply the Three Bond 1104 to those points where the camshaft bearing caps No. 1 and No. 5 make contact with the cylinder head.

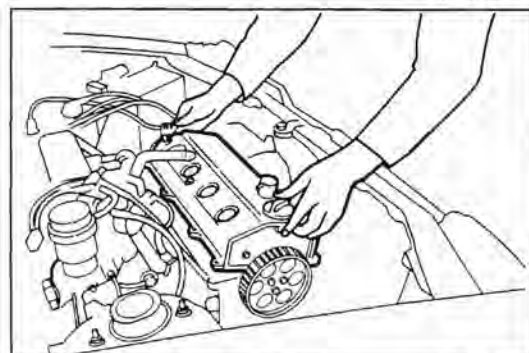


WR88-EM172

13. Install the cylinder head cover to the cylinder head.

NOTE:

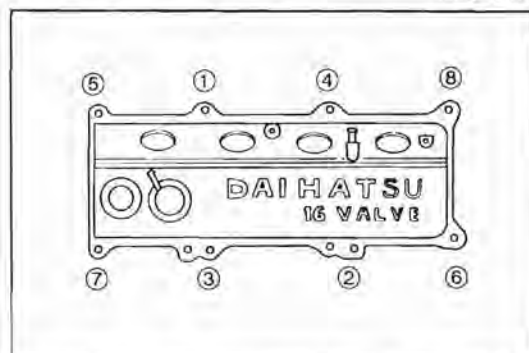
- Be very careful not to scratch the rubber grommet for spark plug tube during installation.
- Care must be exercised to ensure that the rubber grommet will not ride over the spark plug tube.



WR88-EM173

14. Tighten the attaching bolts of the cylinder head cover evenly over two or three stages to the specified torque, following the sequence shown in the right figure.

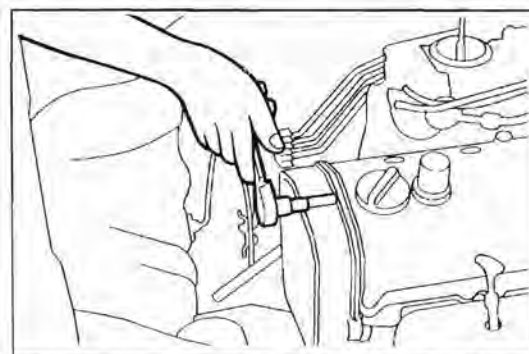
Tightening Torque: 0.3 - 0.5 kg-m (2.2 - 3.6 ft-lb)



WR88-EM174

15. Tighten the attaching bolt of the timing belt.

Tightening Torque: 0.2 - 0.4 kg-m (1.4 - 2.9 ft-lb)

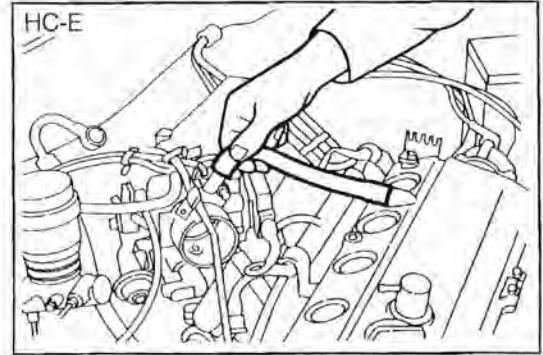


WR88-EM175

16. Install the throttle cable to the carburetor. (See the Chassis Workshop Manual.)
(HC-C Engine Automatic Transmission vehicle only)
17. Attach the accelerator cable and choke cable to the clamp.
(HC-C Engine only)
18. Install the air cleaner and connect the vacuum hoses.
(HC-C Engine only)
19. Reconnect the accelerator cable to the cable clamp.
(Left hand drive vehicle with HC-E engine)

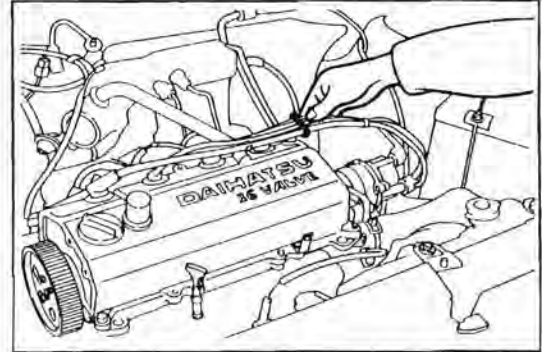
WR88-EM176

20. Connect the PCV hoses.



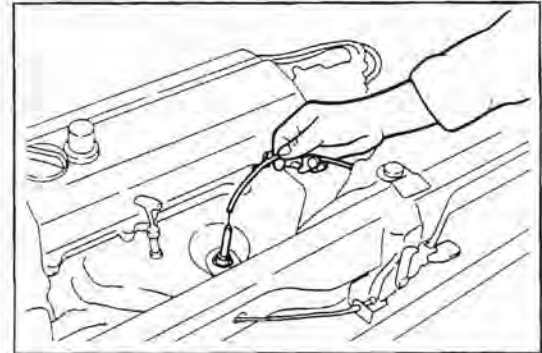
WR88-EM179

21. Connect the resistive cords to the spark plugs. Then, connect the cords to the clamp.



WR88-EM180

22. Connect the oxygen sensor cord to the clamp.
(HC-E engine only)



WR88-EM181

23. Installation of timing belt

CAUTION:

Do not try to pry the timing belt with a screwdriver or the like.

- Do not allow the belt to come into contact with oil, water or dust.
- Do not bend the belt at a sharp angle or turn the belt inside out.
- Perform the engine turning operation at the crankshaft side.
- Do not utilize the tension of the timing belt pulley when tightening the set bolt of the timing belt pulley.
- When the timing belt is reused, install the timing belt in such a way that the direction of the arrow put during the removal may match with the engine rotation direction.
- The adjustment of belt tension should be made when the cylinder block and its ambient temperatures are in between 5 - 50°C (41 - 122°F).

WR88-EM182

- (1) Align the "F" mark of the camshaft timing belt pulley with the indicator on the cylinder head cover.

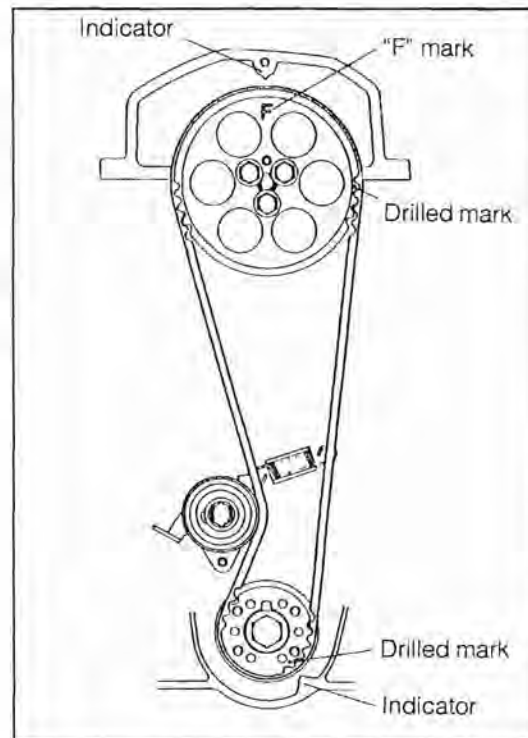
NOTE:

It should be noted that the piston may interfere with the valves if the camshaft is turned independently.

- (2) Align the drilled mark of the crankshaft timing belt pulley with the indicator.

NOTE:

It should be noted that the piston may interfere with the valves if the crankshaft is turned independently.

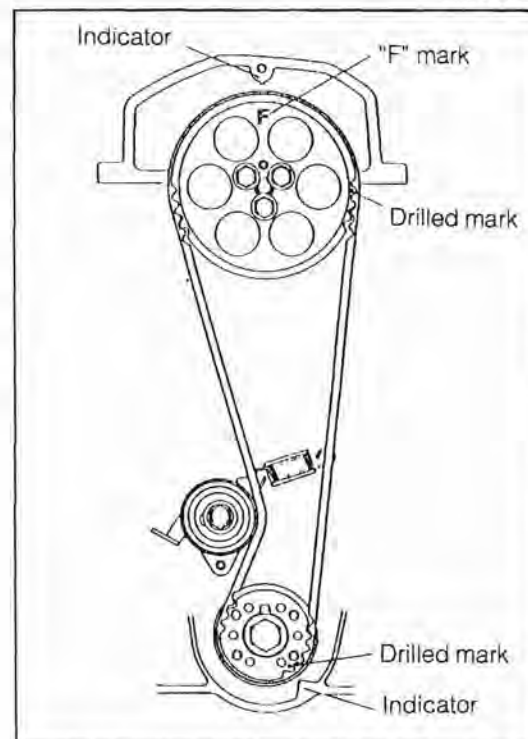


WR88-EM183

- (3) Assemble the timing belt in such a way that the two mating marks on the timing belt may be aligned with the corresponding drilled marks on the crankshaft timing belt pulley and camshaft timing belt pulley.

NOTE:

- When the timing belt is reused, install the timing belt in such a way that there exist 34 teeth of the belt between the drilled marks of the crankshaft timing belt pulley and camshaft timing belt pulley.
- When the timing belt is reused, install the timing belt in such a way that the arrowhead which was put during disassembly comes rotational direction of the timing belt.

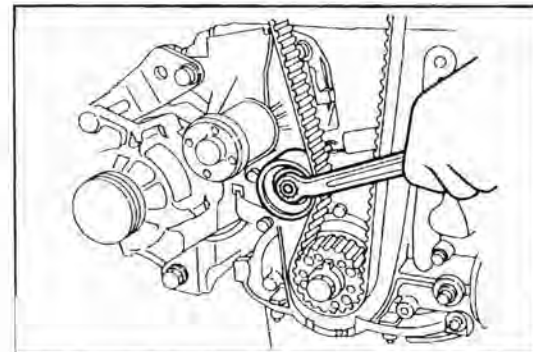


WR88-EM184

- (4) Loosen the attaching bolt of the timing belt tensioner. Apply tension to the timing belt. Temporarily tighten the attaching bolt.

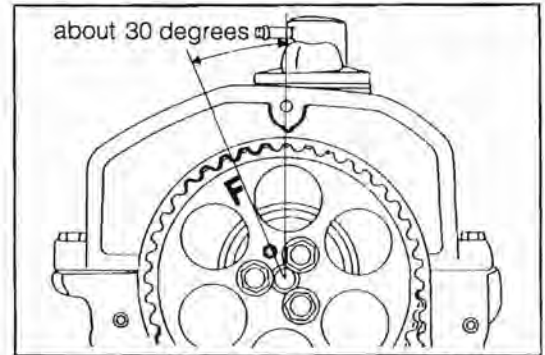
NOTE:

Ensure that the belt exhibits no slack at the tension side of the belt (the side opposite to the tensioner).



WR88-EM185

- (5) Rotate the crankshaft 1.9 turns in the normal direction (to the right as viewed from the engine cylinder No. 1) so that the "F" mark of the camshaft timing belt pulley comes at a point three teeth in the camshaft timing belt pulley before the indicator of the cylinder head cover.

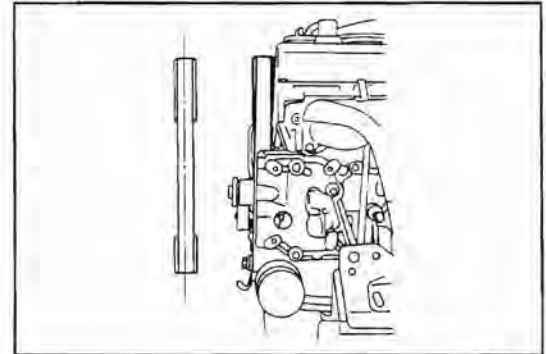


WR88-EM186

CAUTION:

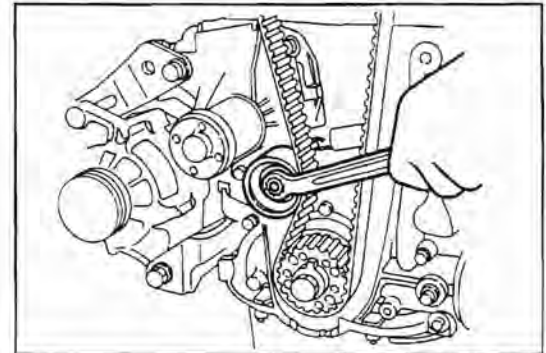
- At this time, never turn the crankshaft reversely.
- Make sure that the belt is not tilted between the crankshaft timing belt pulley and the camshaft timing belt pulley.

If the crankshaft should be reversed or the timing belt should be tilted, turn the crankshaft two more turns.



WR88-EM187

- (6) Make the tensioner free by loosening the attaching bolt of the timing belt tensioner.



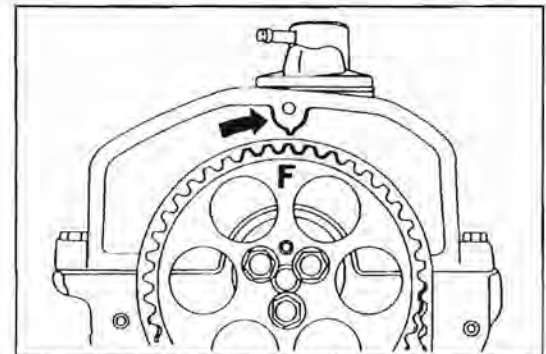
WR88-EM188

- (7) Turn the crankshaft further in the normal direction until the "F" mark of the camshaft timing belt pulley is aligned with the indicator of the cylinder head cover.

CAUTION:

- Never turn the crankshaft reversely.
- Never turn the crankshaft beyond the point where the "F" mark of the camshaft timing belt pulley is aligned with the indicator.

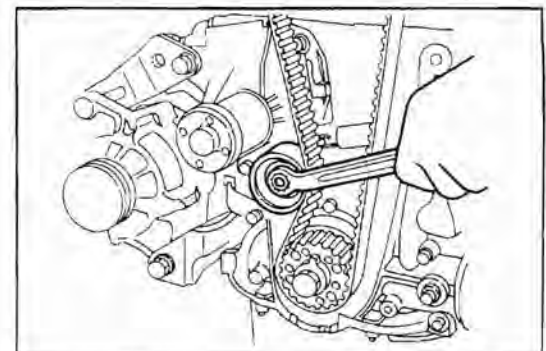
If the crankshaft should be reversed or turned beyond that point, temporarily tighten the tensioner attaching bolt and repeat the operations from the step (5) onward.



WR88-EM189

- (8) Tighten the attaching bolt of the timing belt tensioner to the specified torque.

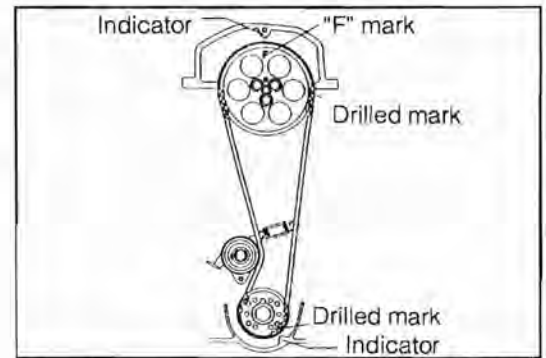
Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EM190

- (9) Ensure that the drilled marks of the crankshaft timing belt pulley and camshaft timing belt pulley are aligned with the corresponding indicators.

If the drilled mark is not aligned with the indicator, repeat the operations from the step (1) onward.



WR88-EM191

24. Checking of timing belt tension

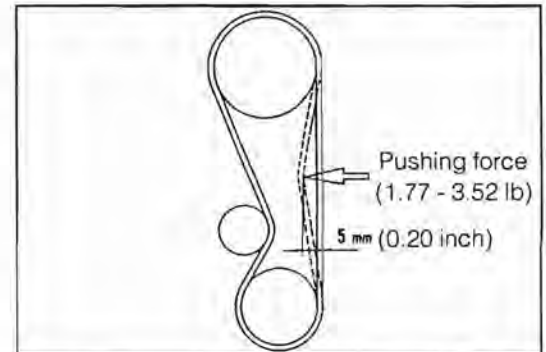
When the midpoint of the belt at the tension side is pushed 5 mm (0.20 inch), ensure that the pushing force is 0.8 - 1.6 kg (1.77 - 3.52 lb).

Specified Pushing Force:

0.8 - 1.6 kg (1.77 - 3.52 lb)

When belt is deflected 5 mm (0.20 inch)

If the belt does not conform to the specification, repeat the operations from the step 23 (4) onward.



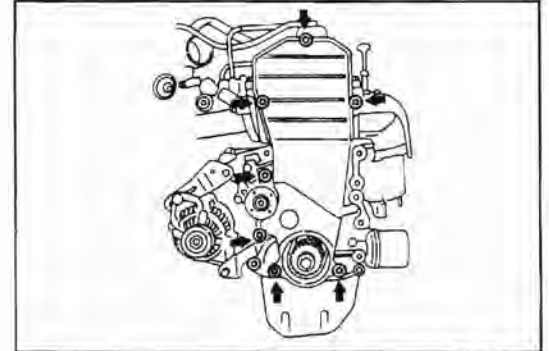
WR88-EM192

25. Install the timing belt lower cover and upper cover.

Tightening Torque: 0.2 - 0.4 kg-m (1.4 - 2.9 ft-lb)

NOTE:

Care must be exercised as to the length of each bolt.



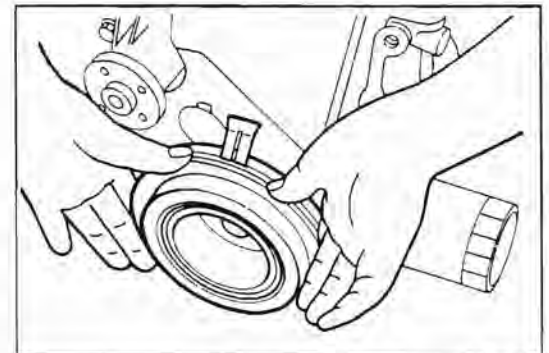
WR88-EM193

26. Install the crankshaft pulley with the four attaching bolts. Tighten the bolts to the specified torque.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.6 ft-lb)

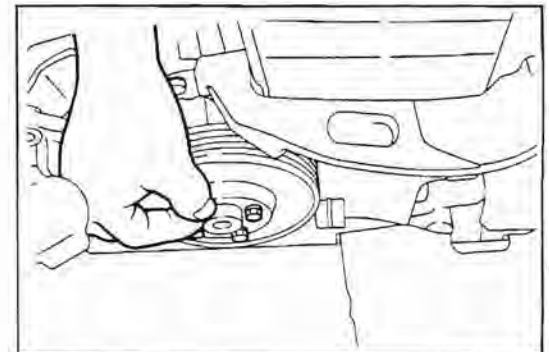
NOTE:

- On the manual transmission vehicle, prevent the crankshaft from turning by placing the gear shift lever in the 4th gear position.
- On the automatic transmission vehicle, prevent the crankshaft from being rotated by inserting a screwdriver or the like into the ring gear section at the rear end section of the cylinder block.



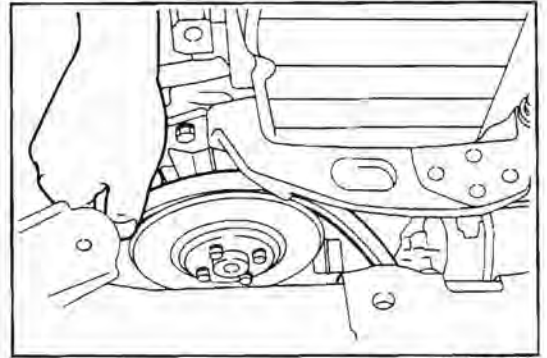
WR88-EM194

27. Install the water pump pulley to the water pump by temporarily tightening the attaching bolt.



WR88-EM195

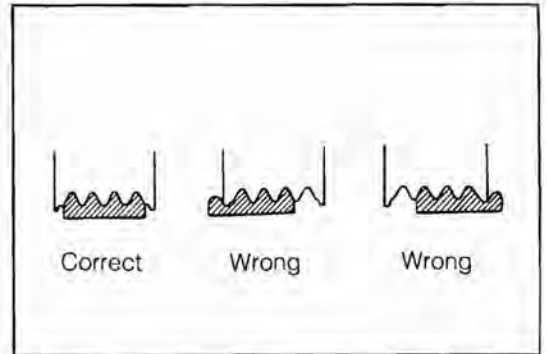
28. Install the V-ribbed belt.



WR88-EM195

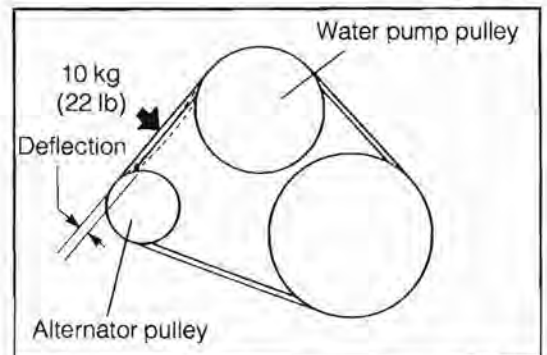
NOTE:

Make sure that the V-ribbed belt is fitted properly in the groove of each pulley.



WR88-EM197

29. Perform the adjustment in such a way that the deflection at the midpoint between the water pump pulley and the alternator may become the specified value when a force of 10 kg (22 lb) is applied to the midpoint.



WR88-EM198

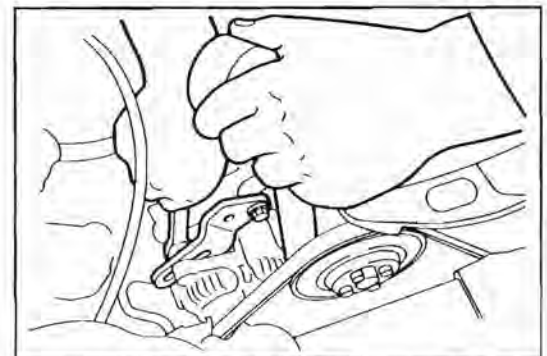
Specified Belt Deflection:

New Belt: 4.0 - 5.0 mm (0.16 - 0.19 inch)
With a force of 10 kg (22 lb) applied to point indicated in figure

Used Belt: 5.0 - 6.0 mm (0.2 - 0.23 inch)
With a force of 10 kg (22 lb) applied to point indicated in figure

NOTE:

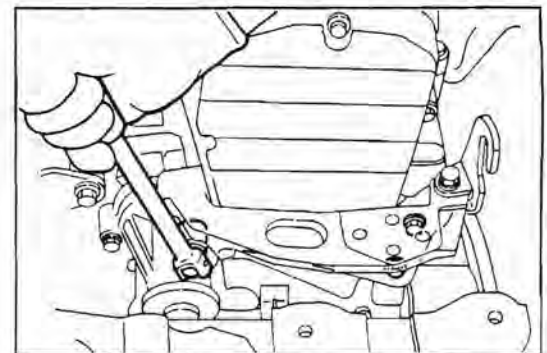
- The used belt denotes a belt which has been used for more than five minutes after it was put into use.



WR88-EM199

30. Install the engine mounting front right bracket No.2.

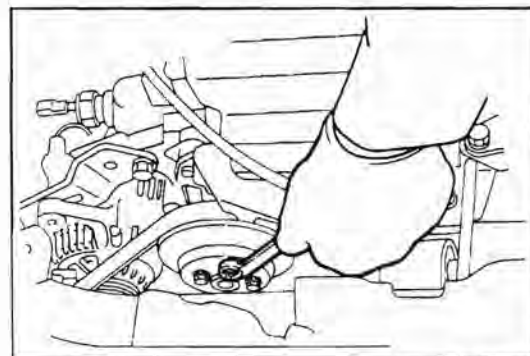
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM200

31. Tighten the attaching bolts of the water pump pulley by utilizing the tension of V-ribbed belt.

Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5ft-lb)

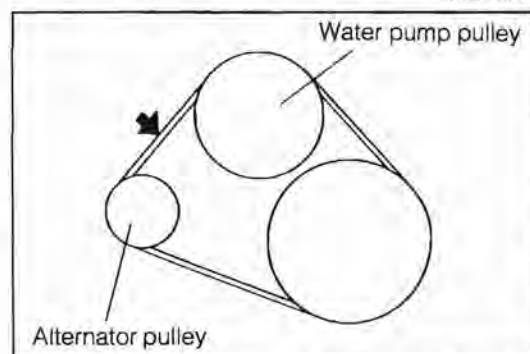


WR88-EM201

32. Ensure that the belt deflection meets the specification when the midpoint between the water pump pulley and the alternator is pushed with a force of 10 kg (22 lb).

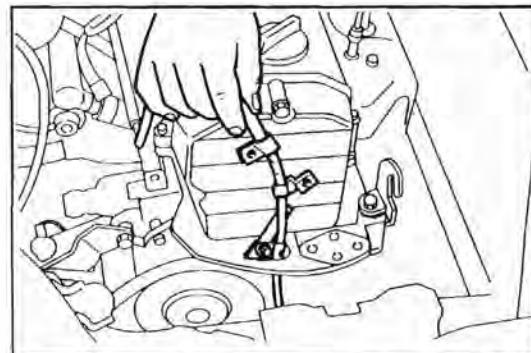
(See the step 29.)

If the deflection does not conform to the specification, perform the adjustment so that the specification may be satisfied.



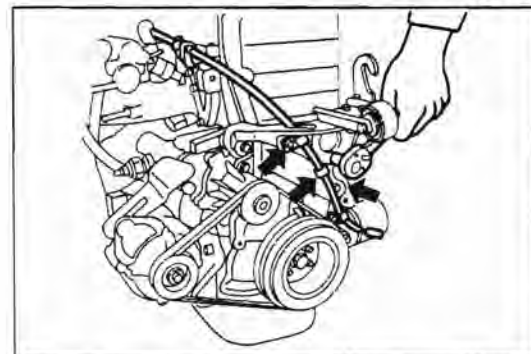
WR88-EM202

33. Insert the oil pressure switch wire into the hole of the engine mounting front bracket No. 1.



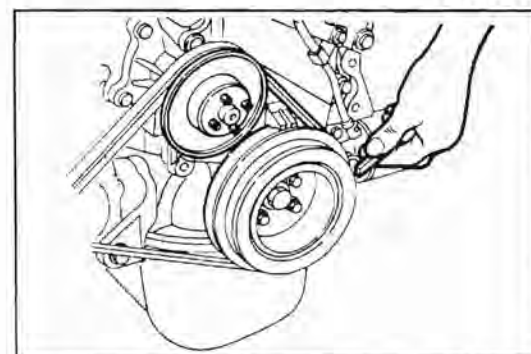
WR88-EM203

34. Attach the oil pressure switch wire with the bolt.



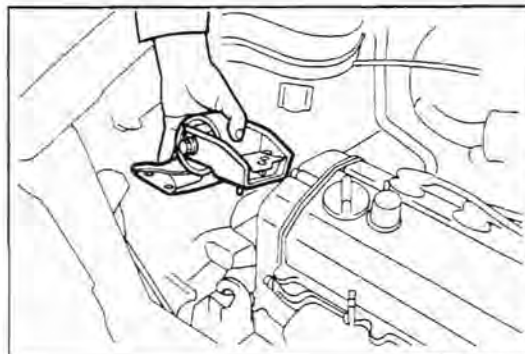
WR88-EM204

35. Connect the oil pressure switch wire connector to the oil pressure switch.



WR88-EM205

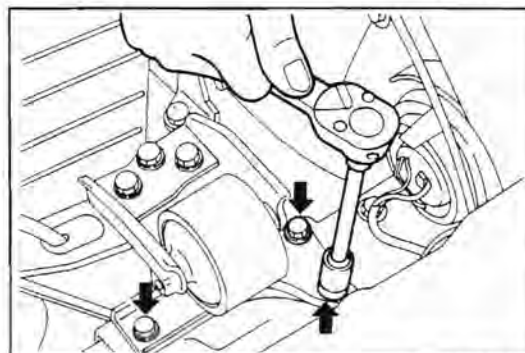
36. Install the engine mounting front insulator together with the engine mounting front right bracket.



WR88-EM206

37. Tighten the three attaching bolts of the engine mounting front insulator.

Tightening Torque: 4 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM207

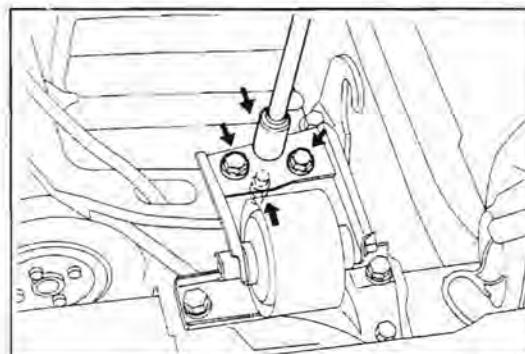
38. Tighten the three attaching bolts and one nut of the engine mounting right bracket.

Tightening Torque:

Bolt: 4 - 5.5 kg-m (29.0 - 39.7 ft-lb)

Nut: 1.5 - 2.3 kg-m (10.9 - 16.6 ft-lb)

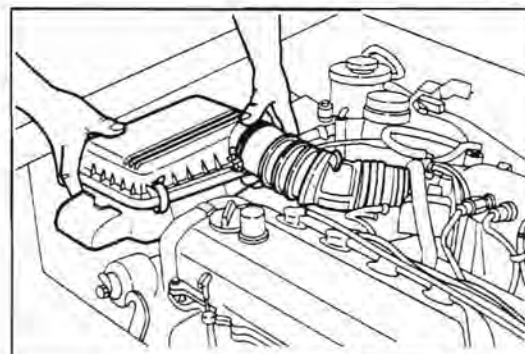
39. Remove the garage jack.



WR88-EM208

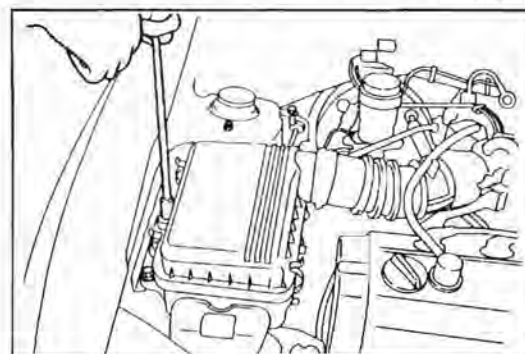
40. Installation of air cleaner
(HC-E engine only)

(1) Install the air cleaner to the body.



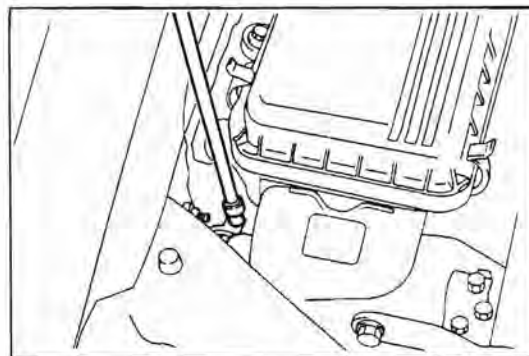
WR88-EM210

(2) Tighten the air cleaner attaching bolt.



WR88-EM211

(3) Tighten the cool air intake band.



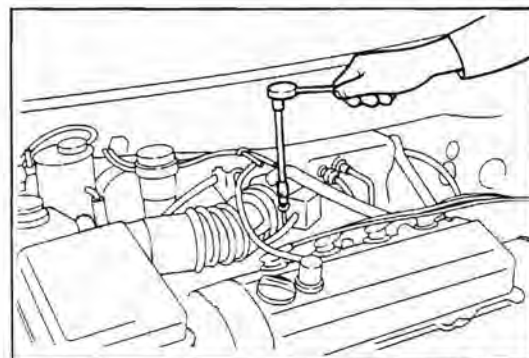
WR88-EM212

(4) Connect the air cleaner hose from the throttle body.

41. Install the accelerator cable to the clamp.

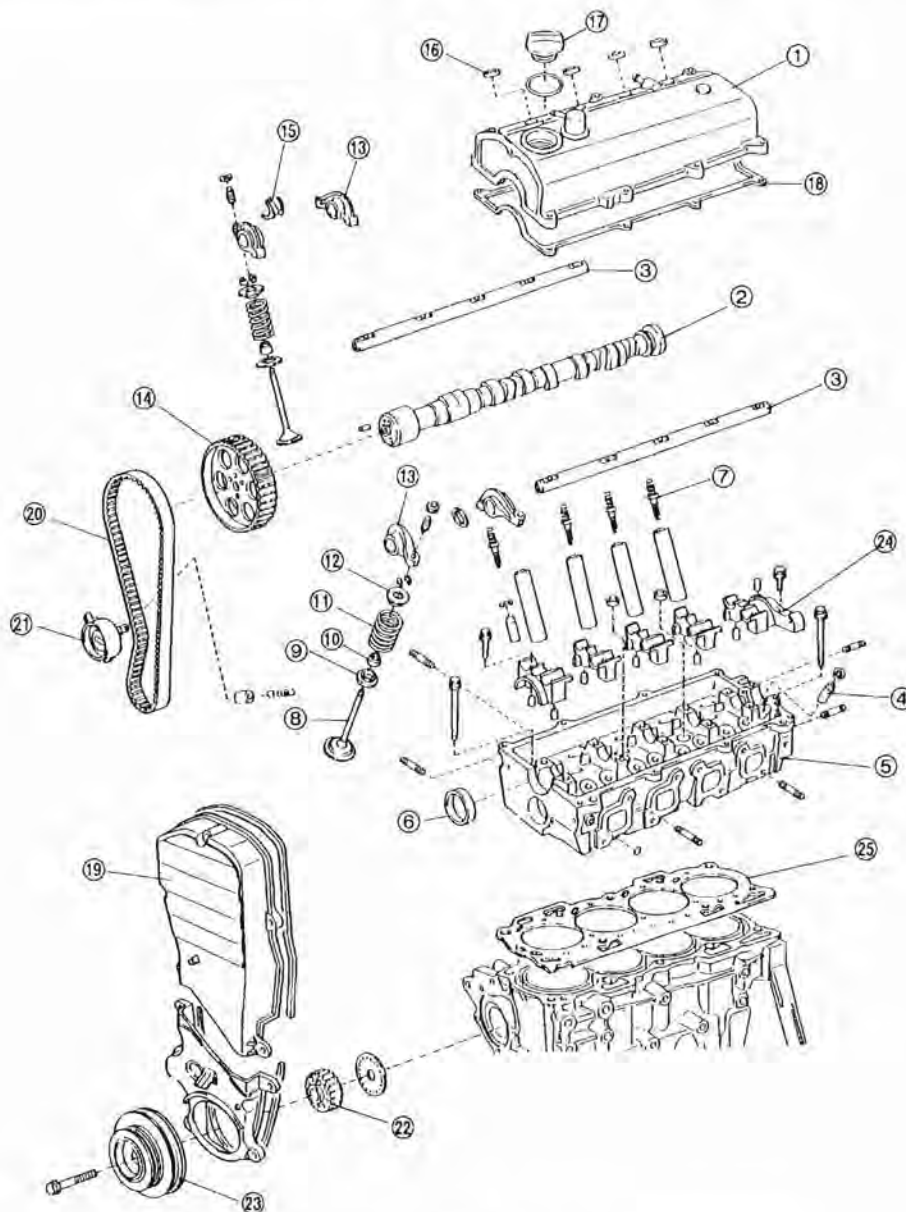
(LHD vehicle only)

42. Reconnect the battery ground cable to the negative (-) terminal of the battery.



WR88-EM213

CYLINDER HEAD COMPONENTS



- ① Cylinder head cover
- ② Camshaft
- ③ Valve rocker shaft
- ④ Valve guide
- ⑤ Cylinder head
- ⑥ Oil seal
- ⑦ Spark plug
- ⑧ Valve
- ⑨ Spring seat
- ⑩ Valve stem oil seal
- ⑪ Valve spring
- ⑫ Valve spring retainer
- ⑬ Valve rocker arm

- ⑭ Camshaft timing belt pulley
- ⑮ Spacer
- ⑯ Grommet
- ⑰ Oil filler cap
- ⑱ Gasket
- ⑲ Timing belt upper cover
- ⑳ Timing belt
- ㉑ Timing belt tensioner
- ㉒ Crankshaft timing belt pulley
- ㉓ Crankshaft pulley
- ㉔ Camshaft cap
- ㉕ Cylinder head gasket

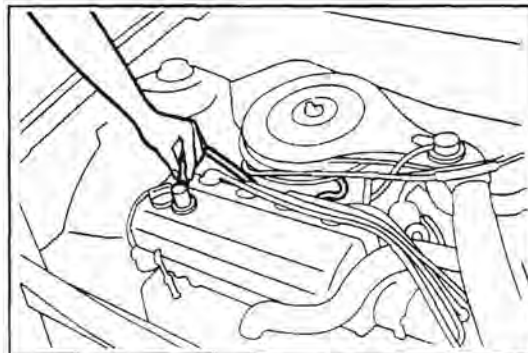
REMOVAL OF CYLINDER HEAD

[HC-C engine]

1. Disconnect the battery ground cable from the negative (–) terminal of the battery.
2. Drain the coolant.
(See page CO-3.)
3. Remove the timing belt.
(See page EM-32 to 37.)
 - (1) Disconnect the oil pressure switch wire at the oil pressure switch side.
 - (2) Remove the three attaching bolts of the oil pressure switch wire. Remove the oil pressure switch from the hole of the engine mounting right front bracket No. 1.
 - (3) Remove the water pump pulley.
 - (4) Support the oil pan with a garage jack.
 - (5) Remove the attaching bolt and nut of the engine mounting right bracket.
 - (6) Remove the engine mounting front insulator.
 - (7) Remove the engine mounting right front bracket No. 2.
 - (8) Remove the crankshaft pulley.
 - (9) Remove the timing belt upper cover.
 - (10) Remove the timing belt lower cover.
 - (11) Loosen the timing belt tensioner. Temporarily tighten the timing belt tensioner while it is pushed toward the water pump side.
 - (12) Remove the timing belt.

WR88-EM217

4. Remove the PCV hoses.

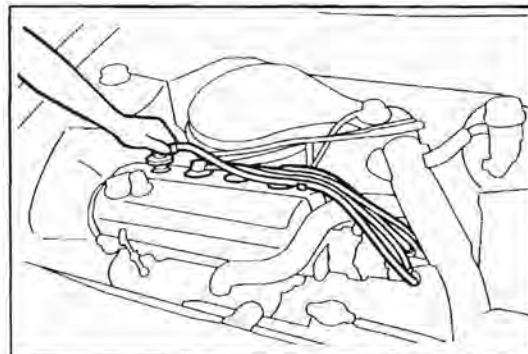


WR88-EM218

5. Remove the resistive cords.

NOTE:

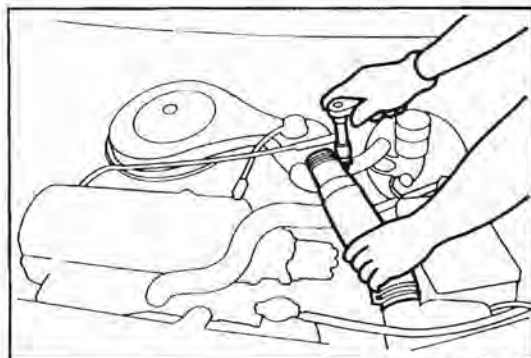
When removing the cord, be sure to hold its rubber section.
Do not pull out the cord, holding the cord portion.



WR88-EM219

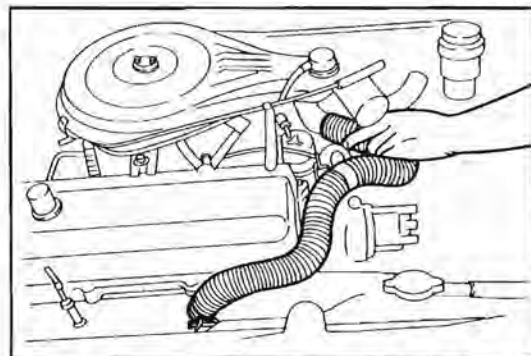
6. Removal of air cleaner

(1) Disconnect the cool air intake hose at the air cleaner side.



WR88-EM220

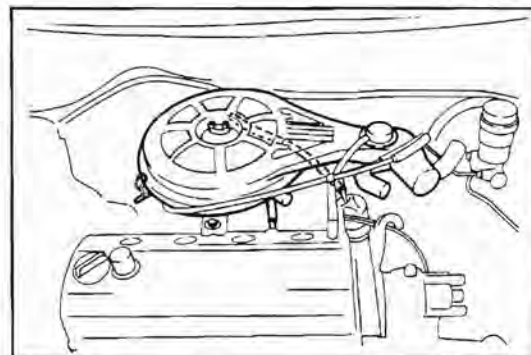
(2) Disconnect the hot air intake hose.
(Except tropical specification)



WR88-EM221

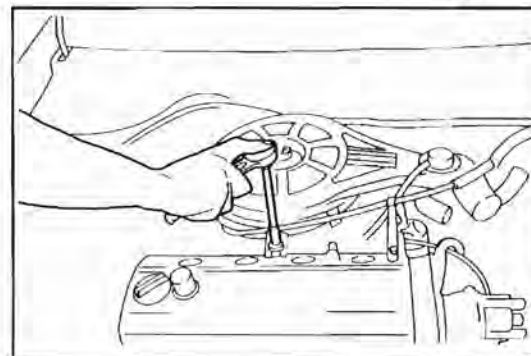
(3) Disconnect the following rubber hoses from the air cleaner.

- ITC vacuum hose to carburetor
- Vacuum nose to BVSV
- PCV hoses



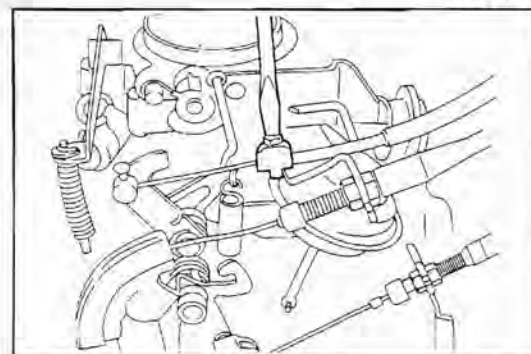
WR88-EM222

(4) Remove the air cleaner by removing the air cleaner attaching bolt and wing nut.



WR88-EM223

7. Disconnect the choke cable from the carburetor.
8. Disconnect the accelerator cable from the carburetor.
9. Disconnect the throttle cable from the carburetor.



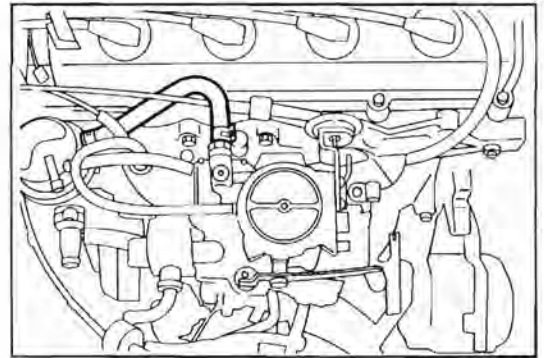
WR88-EM224

10. Removal of carburetor.

CAUTION:

Never smoke during the work, nor allow any naked flame to be brought near the working site.

(1) Disconnect the fuel hose from the carburetor.



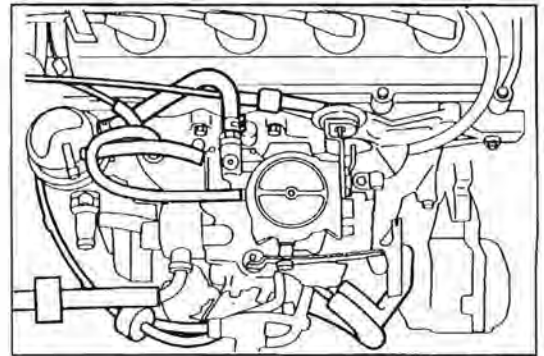
(2) Disconnect the hot water circulating hose from the carburetor.

(3) Disconnect the following vacuum hoses from the carburetor.

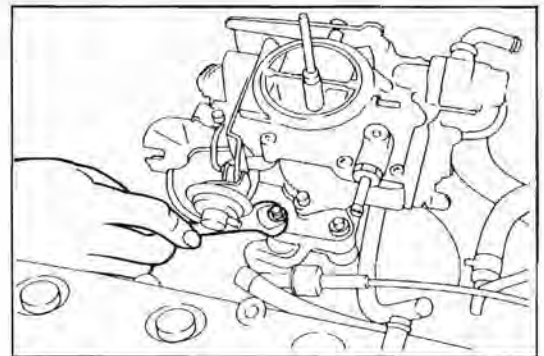
- Outer vent hose
- Choke opener hose
- Vacuum hose to BVSV
- Throttle positioner
- Vacuum hose to air filter
- Vacuum hose to distributor
- Vacuum hose to idle-up VSV (AT vehicle only)

(4) Disconnect the connectors of the solenoid valve and outer vent valve.

(5) Disconnect the throttle position sensor connector.



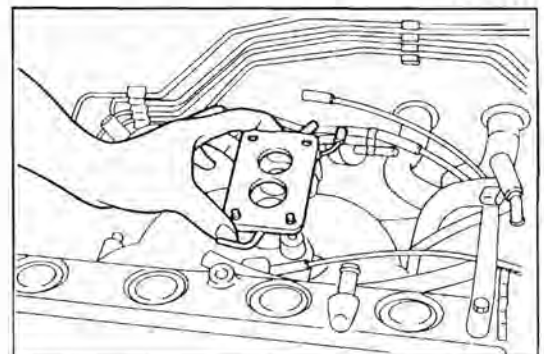
(6) Remove the carburetor by removing the four attaching nuts.



(7) Remove the carburetor heat insulator from the intake manifold.

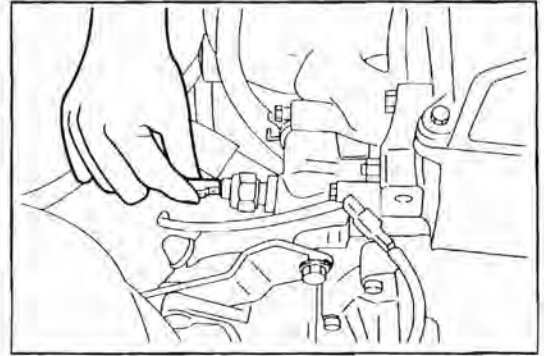
NOTE:

Be very careful not to apply a force to the pipe section.



11. Removal of intake manifold

(1) Disconnect the thermo control switch connector.

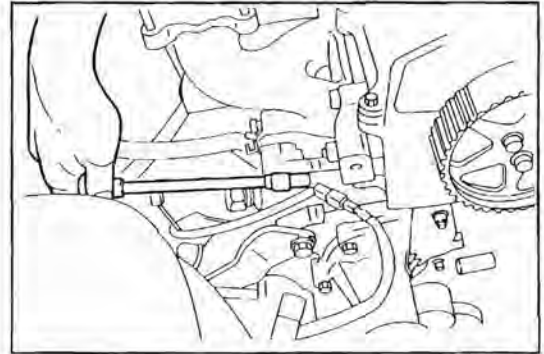


WR88-EM231

(2) Remove the thermostat by removing the water inlet.

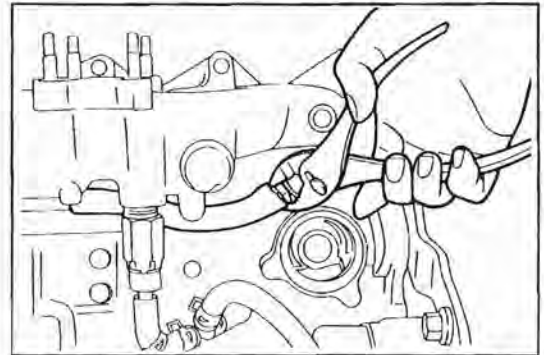
NOTE:

- Since the cooling water will flow out, place a suitable container below the water inlet.
- Care must be exercised to ensure that no water gets to the alternator.



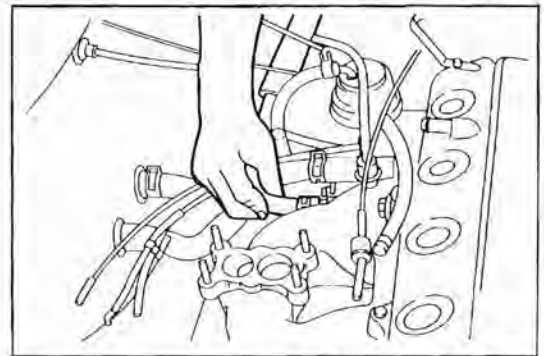
WR88-EM232

(3) Disconnect the bypass hose from the intake manifold.



WR88-EM233

(4) Disconnect the booster hose from the intake manifold.

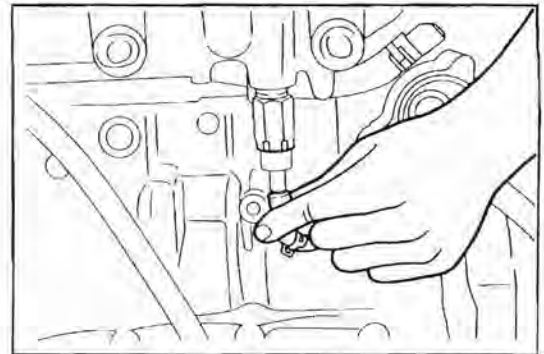


WR88-EM234

(5) Disconnect the water hose from the thermo valve.

(6) Remove the engine wire clamp from the intake manifold.

(7) Remove the intake manifold stay.



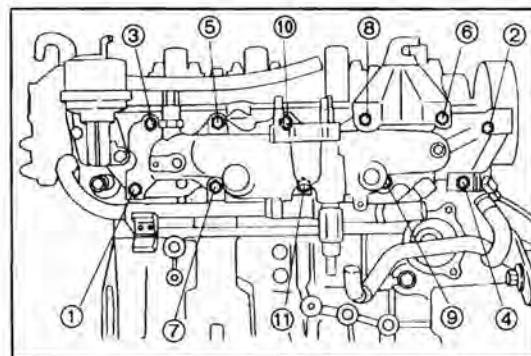
WR88-EM235

- (8) Loosen the intake manifold attaching bolts evenly over two or three stages in the sequence indicated in the right figure. Remove the intake manifold by removing the attaching bolts.

- (9) Remove the intake manifold gasket.

NOTE:

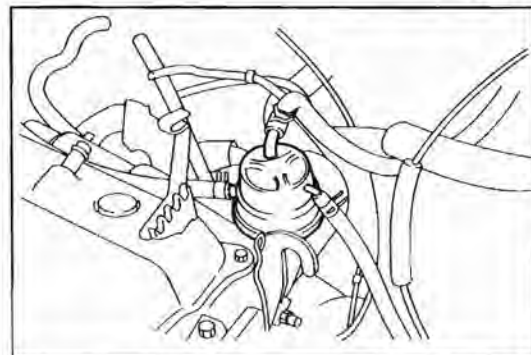
The gasket for plant use is integral with the fuel pump gasket. It is, therefore, necessary to cut the gasket along with the contour of the fuel pump, using a cutter knife or the like.



WR88-EM237

12. Removal of fuel pump

- (1) Disconnect the fuel hoses from the fuel pump.



WR88-EM239

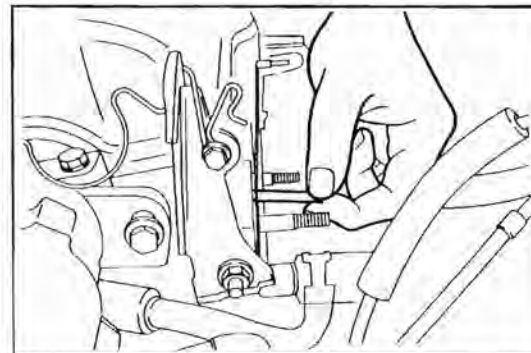
- (2) Remove the fuel pump by removing the two attaching nuts of the fuel pump.

NOTE:

Since the oil will flow out, use a suitable cloth so that no oil gets to the starter and so forth.

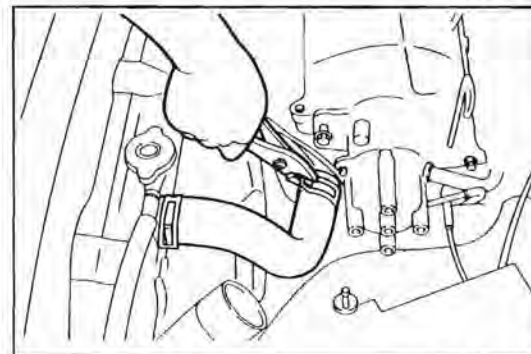
- (3) Remove the fuel pump rod.

- (4) Remove the fuel pump insulator.



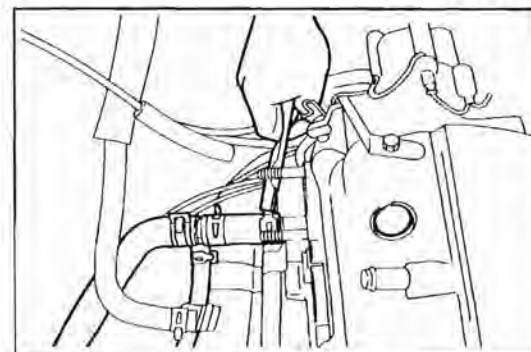
WR88-EM240

13. Disconnect the water outlet hose at the cylinder head side.



WR88-EM241

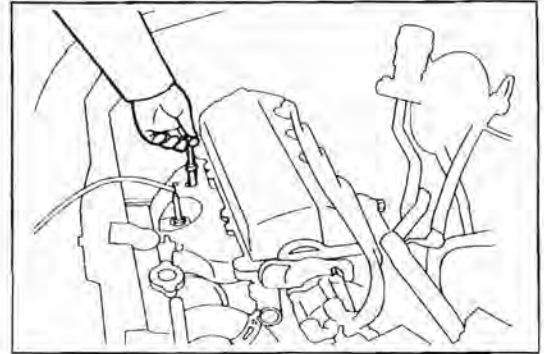
14. Disconnect the heater inlet hose at the cylinder head side.



WR88-EM242

15. Removal of exhaust manifold

(1) Pull out the oil level gauge.



WR88-EM243

(2) Remove the oil level gauge guide attaching bolt.

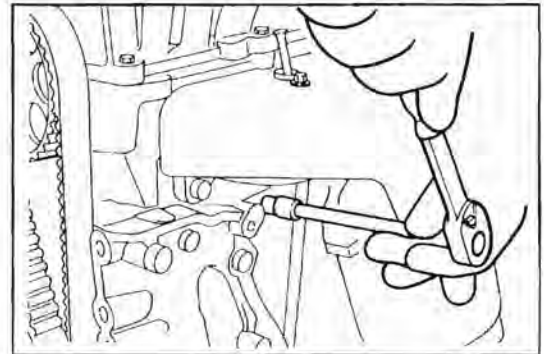
NOTE:

On the air conditioner-equipped vehicle, remove the compressor. Suspend it at the vehicle side, using an adequate string.

(3) Remove the exhaust manifold cover.

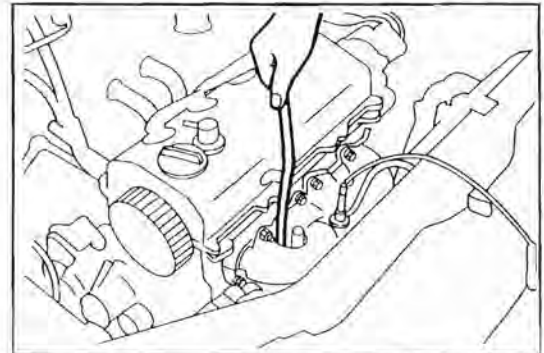
NOTE:

On the vehicle having tropical specifications, it is necessary to remove the radiator previous to this operation.



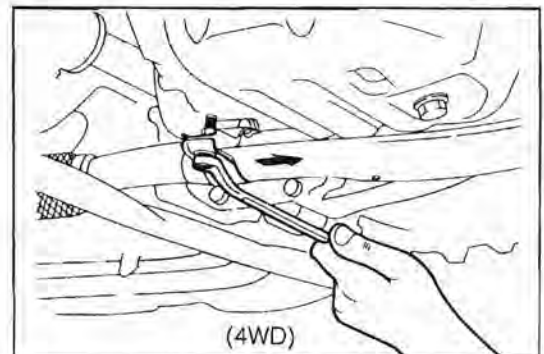
WR88-EM244

(4) Remove the oil level gauge guide.



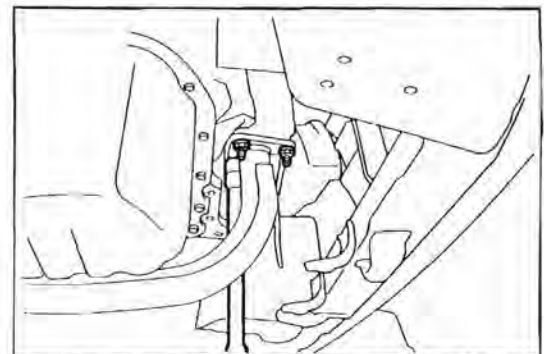
WR88-EM245

(5) Remove the exhaust pipe clamp bolt. Remove the clamp.



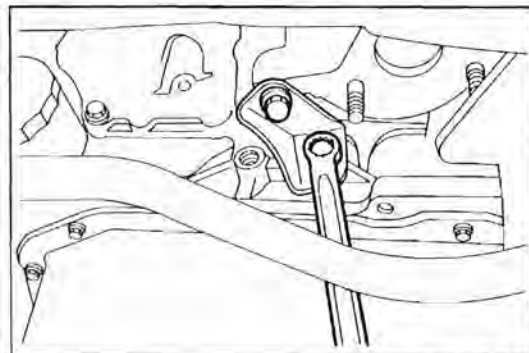
WR88-EM246

(6) Disconnect the exhaust pipe from the exhaust manifold No. 2.



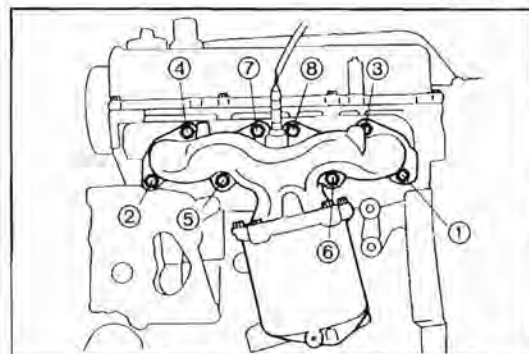
WR88-EM247

- (7) Remove the exhaust manifold stay by removing the attaching bolts of the exhaust manifold stay.



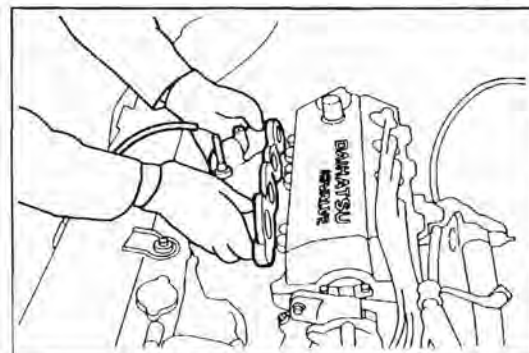
WR88-EM248

- (8) Loosen the exhaust manifold attaching bolts evenly over two or three stages in the sequence indicated in the right figure. Remove the exhaust manifold by removing the attaching bolts.



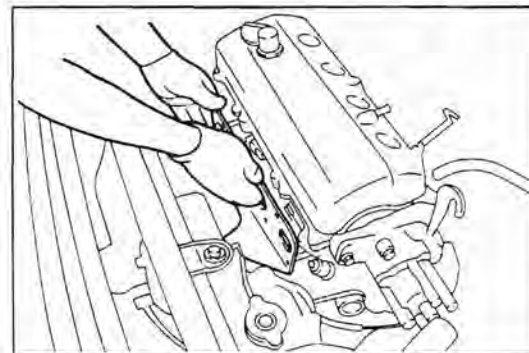
WR88-EM249

- (9) Remove the exhaust manifold.



WR88-EM250

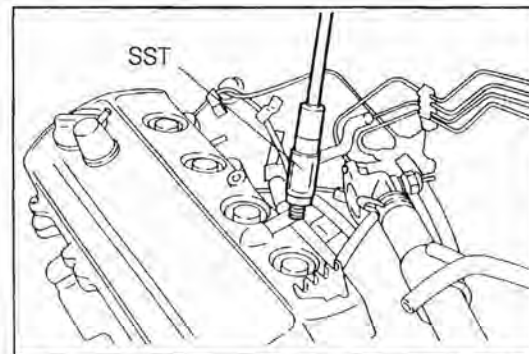
- (10) Remove the exhaust manifold gasket.



WR88-EM251

16. Removal of cylinder head

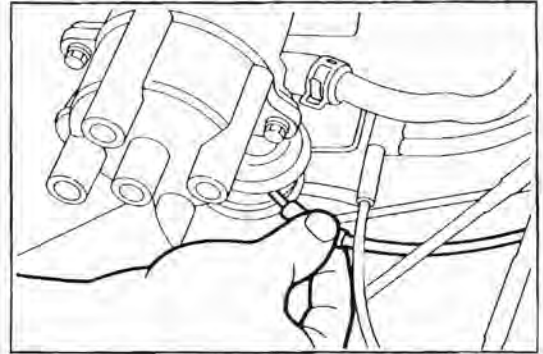
- (1) Remove the spark plugs, using the following SST.
SST: 09268-87703-000



WR88-EM252

(2) Removal of distributor

- 1) Disconnect the vacuum hoses from vacuum advancer.

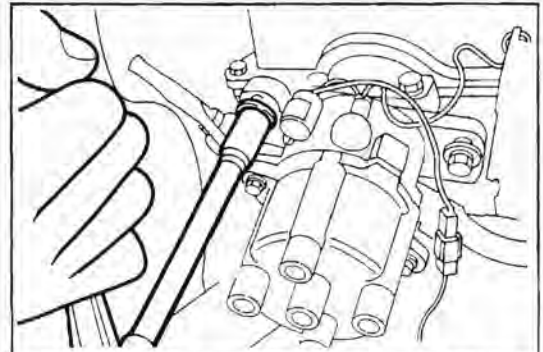


WR88-EM253

- 2) Disconnect the distributor connector.
- 3) Remove the distributor by removing the two attaching bolts.

NOTE:

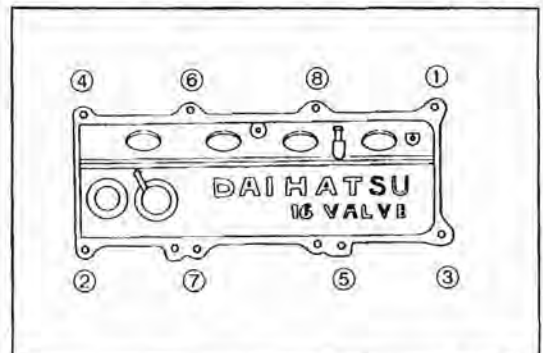
Since the oil will flow out, place a suitable cloth or the like under the distributor connected section.



WR88-EM254

- (3) Loosen the cylinder head cover attaching bolts evenly over two or three stages in the sequence indicated in the right figure. Remove the cylinder head cover attaching bolts.

- (4) Remove the cylinder head cover.



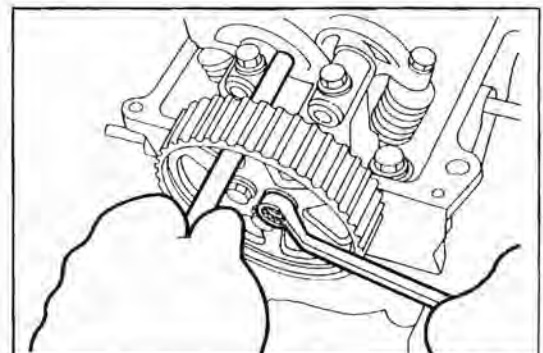
WR88-EM255

- (5) Remove the attaching bolts of the camshaft timing belt pulley, while preventing the camshaft timing belt pulley from turning by means of a suitable iron rod.

NOTE:

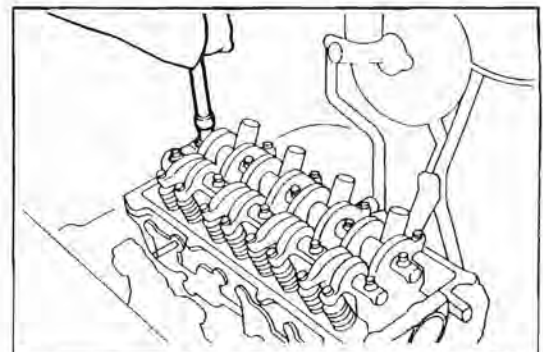
- Do not turn the camshaft independently.
- Be very careful not to damage the cylinder head cover gasket surface.

- (6) Remove the camshaft timing belt pulley.



WR88-EM256

- (7) Loosen the ten cylinder head flanged head hexagon bolts evenly over two or three stages. Remove the hexagon bolts.

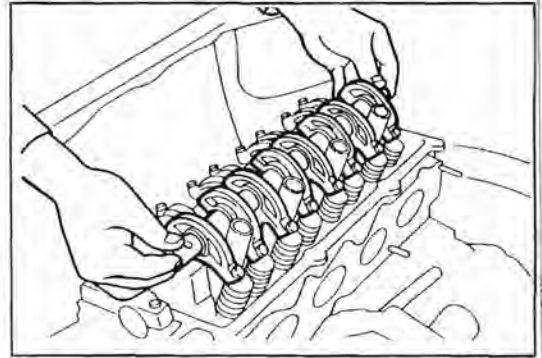


WR88-EM257

- (8) Remove the valve rocker shaft together with the rocker arms from the cylinder head.
Remove the rocker arms, spacers and wave washers from the removed valve rocker shaft.

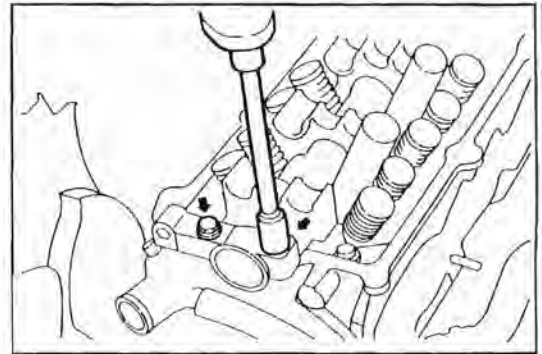
NOTE:

Arrange the removed parts in order so that their respective original installation positions may be known readily.



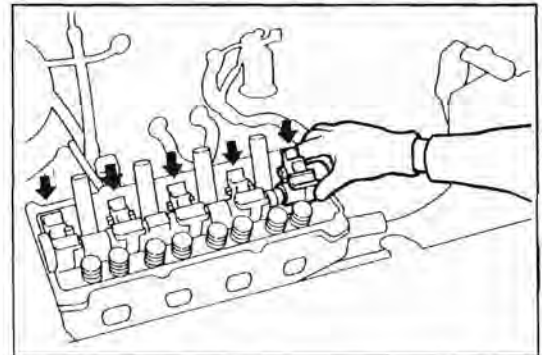
WR88-EM258

- (9) Remove the two attaching bolts of the camshaft cap No. 5.



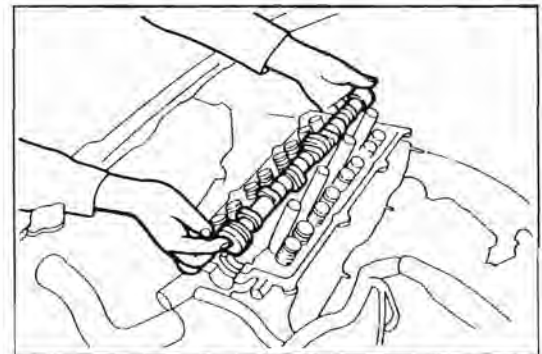
WR88-EM259

- (10) Remove the camshaft bearing caps.



WR88-EM260

- (11) Remove the camshaft from the cylinder head.



WR88-EM261

- (12) Loosen the cylinder head bolts evenly over two or three stages in the sequence indicated in the right figure.
Remove the cylinder head bolts.

Reference

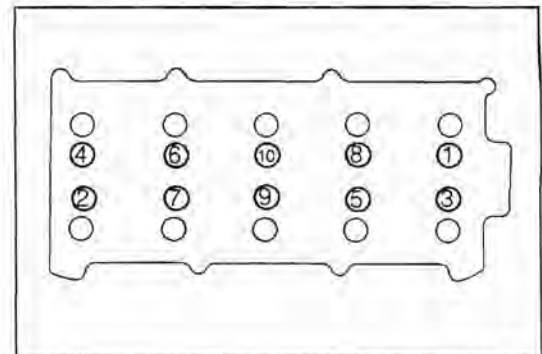
The bolts ① and ③ are shorter than other bolts.

Nominal length of bolts ① and ③ :

112 mm (4.41 inch)

Nominal length of other bolts:

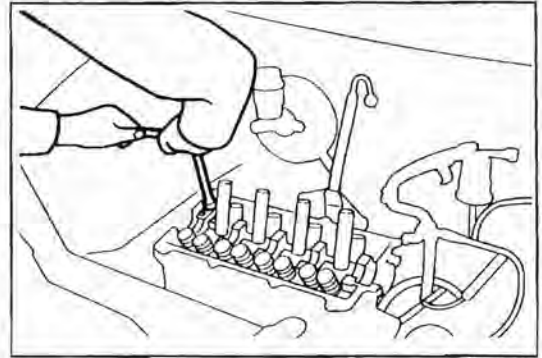
155 mm (6.1 inch)



WR88-EM262

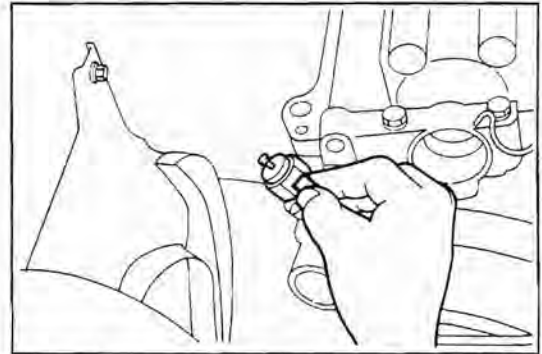
NOTE:

Be certain to loosen the cylinder head bolts evenly. Failure to observe this caution will cause cracks or distortion of the cylinder head, even leading to engine seizure.



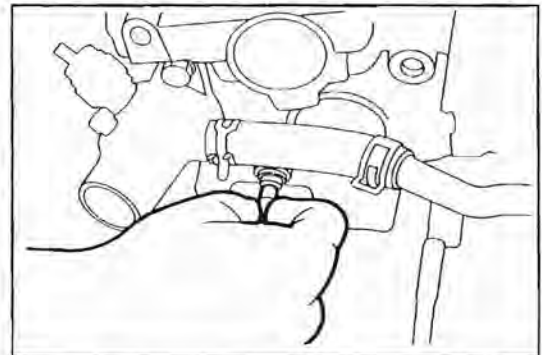
WR88-EM263

- (13) Disconnect the water temperature switch connector.
(ECE & EEC specifications only)



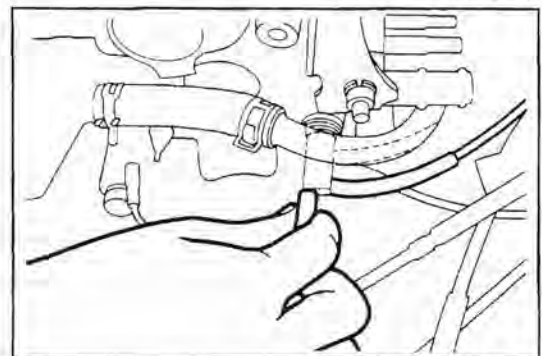
WR88-EM264

- (14) Disconnect the water temperature sender gauge connector.



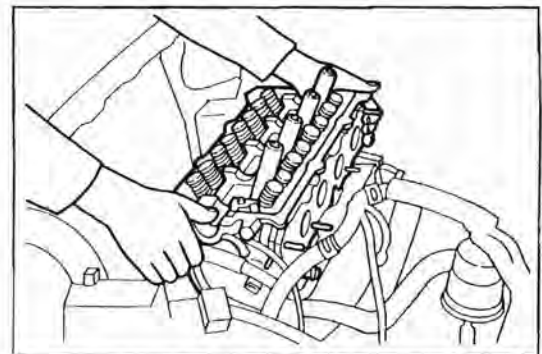
WR88-EM265

- (15) Disconnect the vacuum hose from the BVSV.



WR88-EM266

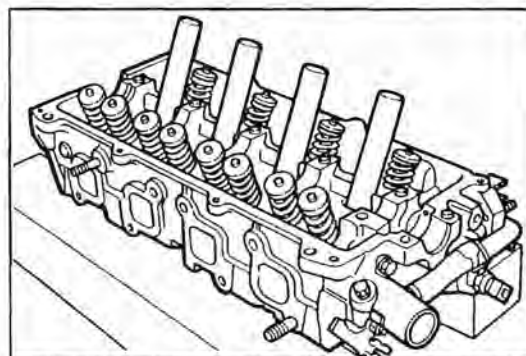
- (16) Remove the cylinder head from the cylinder block.



WR88-EM267

NOTE:

Place the removed cylinder head on suitable two wooden blocks in order that the cylinder head gasket surface may not be damaged.



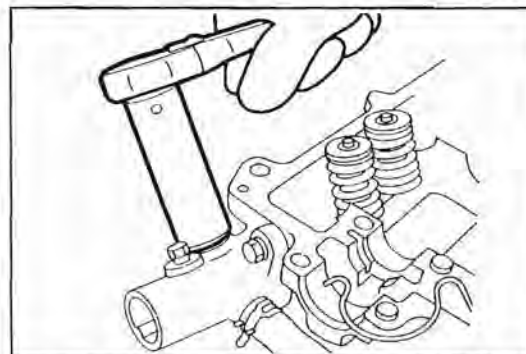
WR88-EM268

- (17) Remove the water temperature switch from the water outlet.

(ECE & EEC specifications only)

NOTE:

To remove the water temperature switch, use a long box wrench.

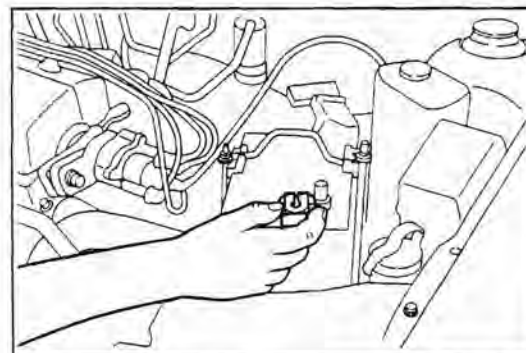


WR88-EM269

REMOVAL OF CYLINDER HEAD

[HC-E engine]

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the coolant.
(See page CO-3.)
3. Remove the timing belt.
(See page EM-32 to 37)
 - (1) Remove the air cleaner assembly.
 - (2) Disconnect the oil pressure switch wire at the oil pressure switch side.
 - (3) Remove the clamp bolt of the oil pressure switch wire.
 - (4) Pull out the oil pressure wire from the engine mounting right front bracket No. 1.
 - (5) Remove the water pump pulley.
 - (6) Remove the V-ribbed belt.
 - (7) With the oil pan supported by a garage jack, remove the engine mounting right bracket and engine mounting front insulator.
 - (8) Remove the engine mounting right front bracket No. 2.
 - (9) Remove the crankshaft pulley.
 - (10) Remove the timing belt cover.
 - (11) Remove the timing belt tensioner.
 - (12) Remove the timing belt.



WR88-EM270

WR88-EM271

4. Removal of engine wire

(1) Disconnect the following connectors.

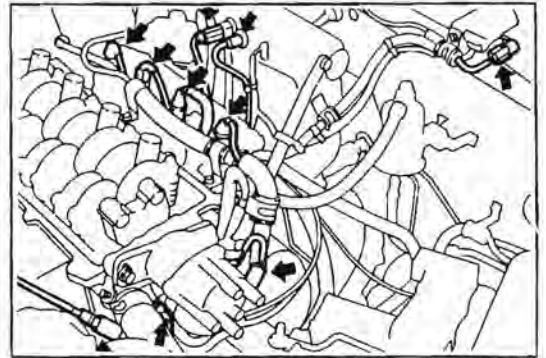
- 1) Throttle position sensor connector
- 2) Intake air temperature sensor connector
- 3) Pressure sensor connector
- 4) Injector connectors
- 5) Cooling water temperature sensor connector
- 6) Distributor connector
- 7) Water temperature sensor gauge connector
- 8) Oxygen sensor connector

(2) Remove the engine wire clamp, clamp bolt and ground cable.

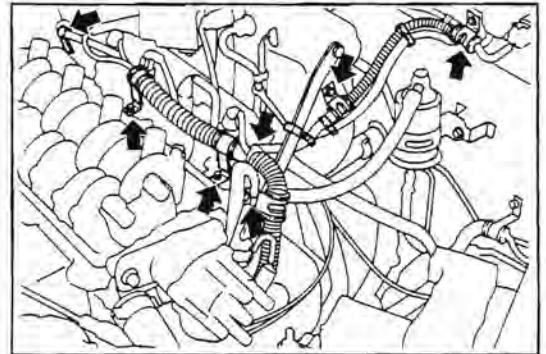
NOTE:

Disconnect the pressure sensor wire together with the vacuum hose.

(3) Pull out the engine wire toward the transmission side.

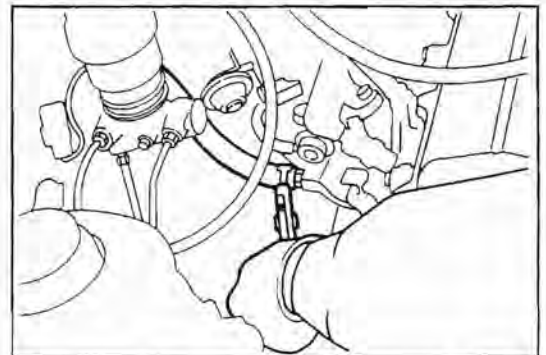


WR88-EM272



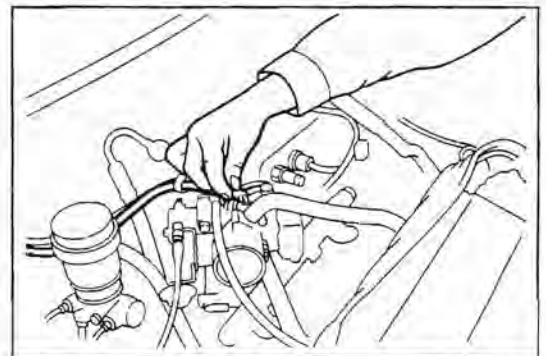
WR88-EM273

5. Disconnect the brake booster hose at the engine side.



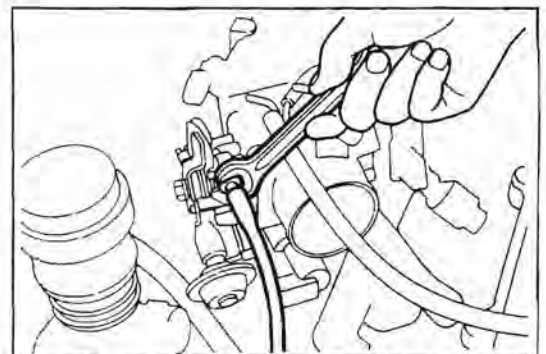
WR88-EM274

6. Disconnect the rubber hose for the idle-up VSV at the throttle body side.



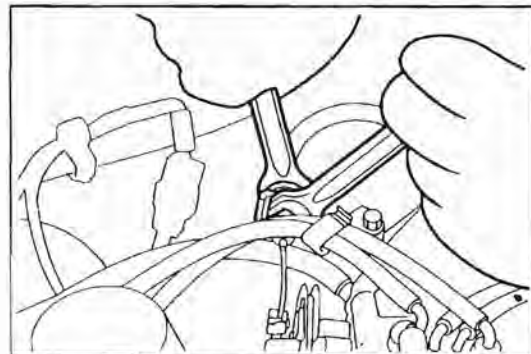
WR88-EM275

7. Remove the accelerator cable.



WR88-EM276

8. Remove the throttle cable.
(Automatic transmission vehicle only)

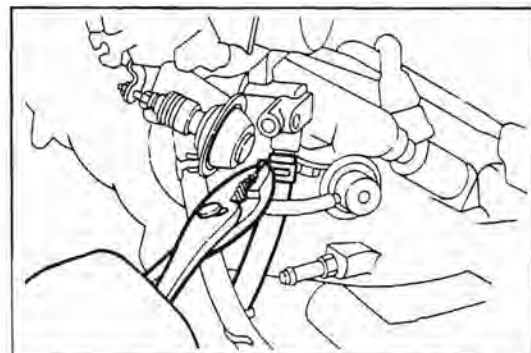


WR88-EM277

9. Removal of throttle body.
(1) Disconnect the hose for circulating cooling water from the throttle body.

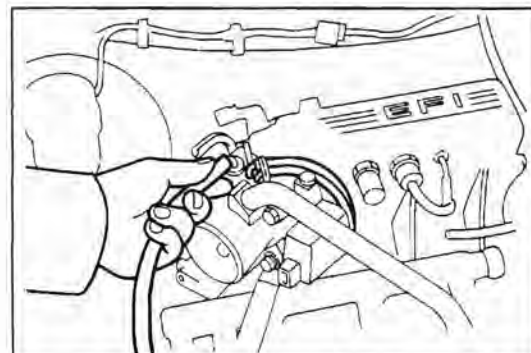
NOTE:

Place an adequate container under the throttle body, because the cooling water flows out during the disconnection.



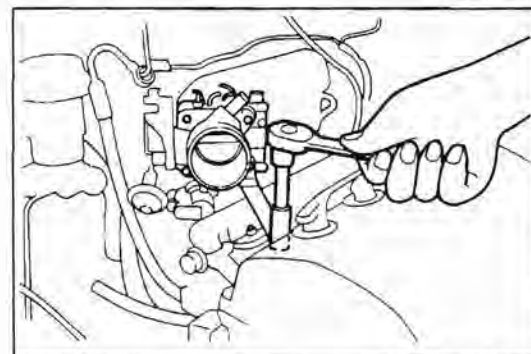
WR88-EM278

- (2) Disconnect the two blow-by gas hoses, the two vacuum hoses for charcoal canister and distributor from the throttle body.



WR88-EM279

- (3) Remove the attaching bolts and nuts of the throttle body and the surge tank stay No.1. Remove the throttle body from the surge tank.

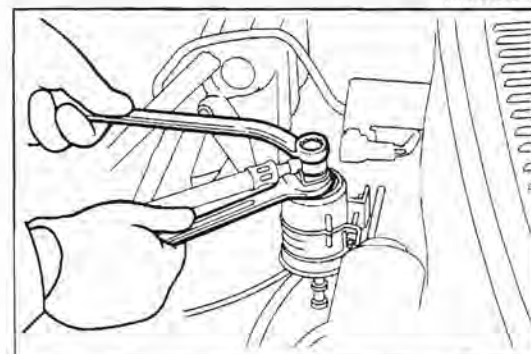


WR88-EM280

10. Disconnect the fuel hose No.1 from the fuel filter.

CAUTION:

- The fuel pressure inside the fuel line is set to a pressure 2.55 kg/cm^2 (2.5 atm) higher than the atmospheric pressure. Hence, gradually loosen the connection while preventing the fuel from splashing with a cloth or the like.
- Place an adequate container under the fuel filter, because the fuel flows out.
- When disconnecting the fuel hose, take precautionary measures to prevent any dirt from entering into the fuel line.

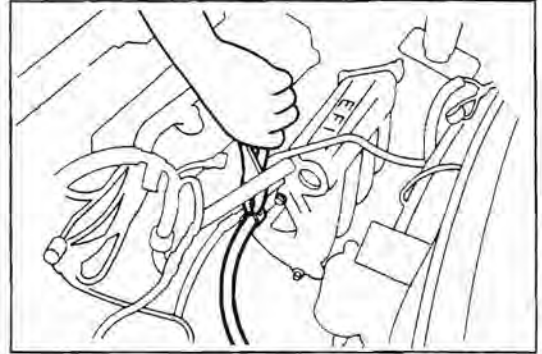


WR88-EM281

11. Disconnect the fuel return hose from the pressure regulator.

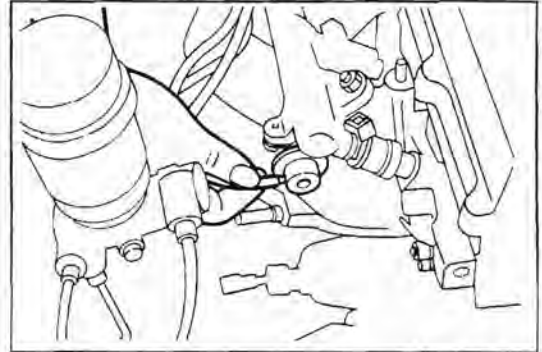
CAUTION:

- Place an adequate cloth or container under the connection, because the fuel flows out.
- When disconnecting the fuel hose, take precautionary measures to prevent any dirt from entering into the fuel line.



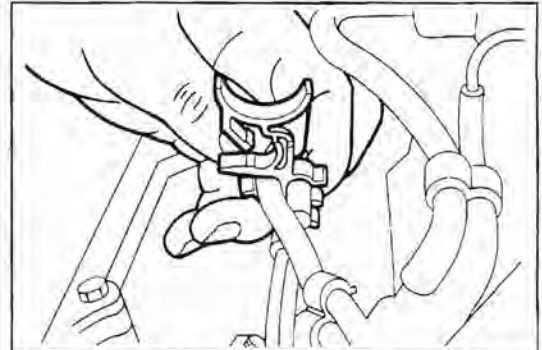
WR88-EM282

12. Disconnect the vacuum hose for the pressure regulator.



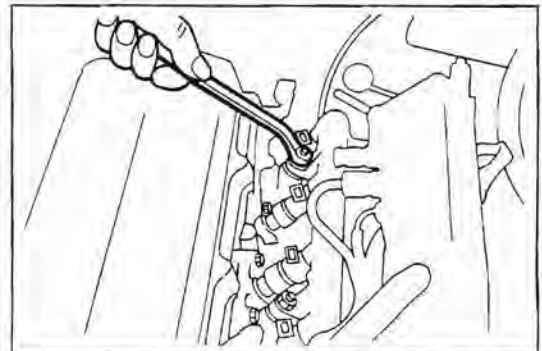
WR88-EM283

13. Remove the vacuum hose clamp from the pressure regulator pipe.



WR88-EM284

14. Remove the attaching nut of the delivery pipe.

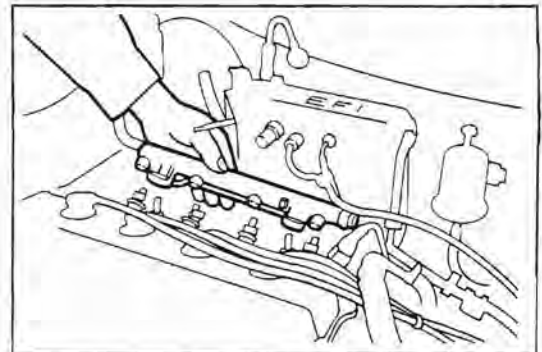


WR88-EM285

15. Remove the delivery pipe.

NOTE:

- Leave the injector at the manifold side.
- Be very careful not to drop the injectors.
- Place an adequate cloth or the like under the injector, because the fuel flows out.

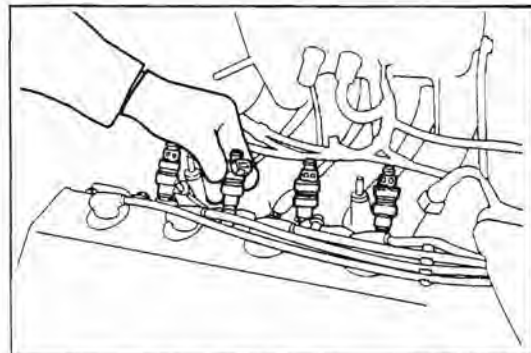


WR88-EM286

16. Remove the injector from the manifold.

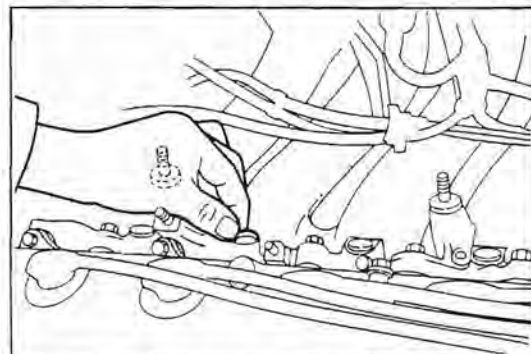
NOTE:

- Put a tag or the like on each injector so that the installing position of the injector may be identified.



WR88-EM287

17. Remove the injector vibration insulators and delivery pipe insulators.



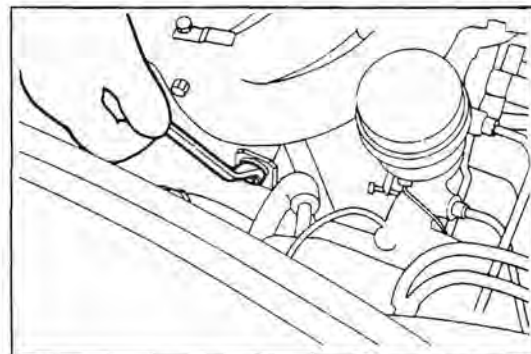
WR88-EM288

18. Disconnect the two vacuum hoses connected to the surge tank.



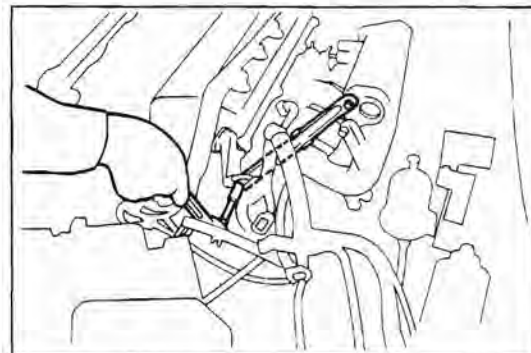
WR88-EM289

19. Remove the surge tank stay No. 2 and the attaching bolt of the surge tank. Loosen the nut tightening both the surge tank and cylinder block.



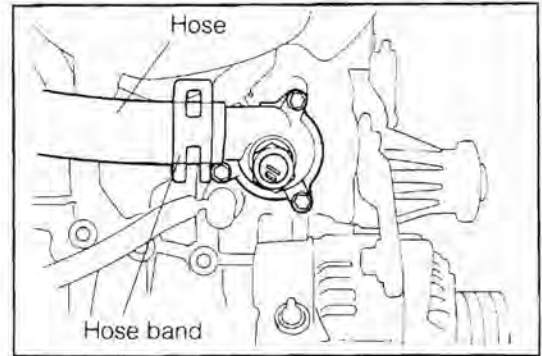
WR88-EM290

20. Remove the surge tank stay No. 3 and engine hanger.



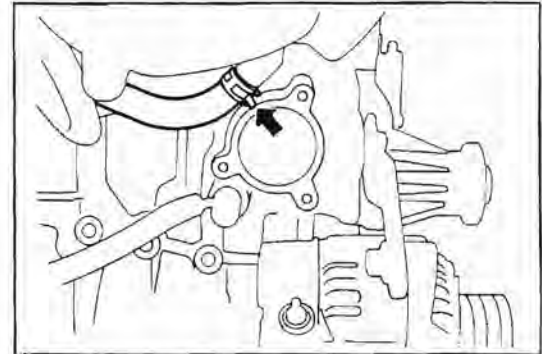
WR88-EM291

21. Disconnect the radiator thermo control switch connector.
Remove the water inlet.



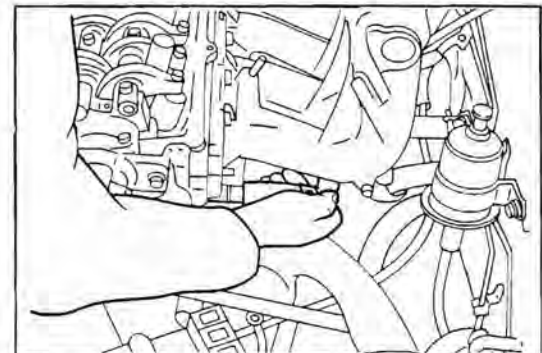
WR88-EM292

22. Disconnect the water by-pass inlet hose.



WR88-EM293

23. Disconnect the heater inlet hose at the cylinder head side.

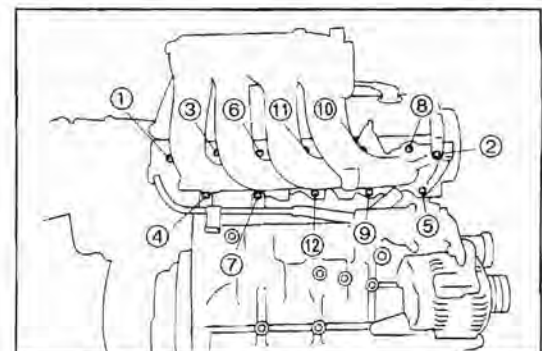


WR88-EM294

24. Remove the throttle cable clamp from the dash panel side of intake manifold.
(Automatic Transmission vehicle only. See the Chassis Workshop Manual.)

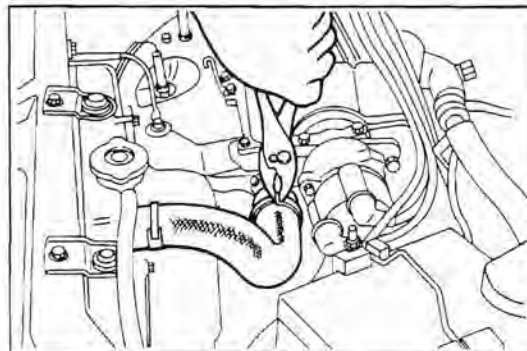
WR88-EM295

25. Remove the attaching bolts and nuts of the intake manifold by loosening them evenly over two or three stages, following the sequence shown in the right figure. Remove the intake manifold.



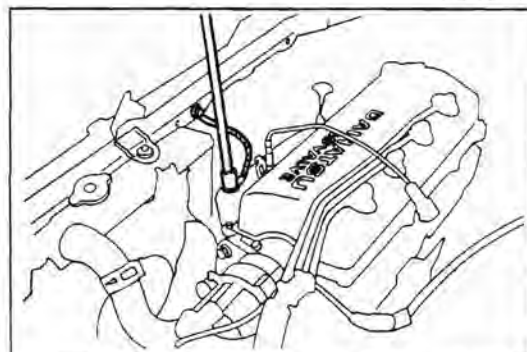
WR88-EM296

26. Disconnect the water outlet hose at the cylinder head side.



WR88-EM297

27. Disconnect the engine ground cable at the exhaust manifold side. (Radio-equipped vehicle only)



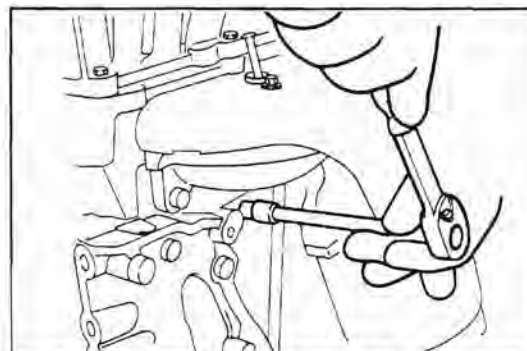
WR88-EM298

28. Pull out the oil level gauge.

29. Remove the attaching bolt of the oil level gauge guide.

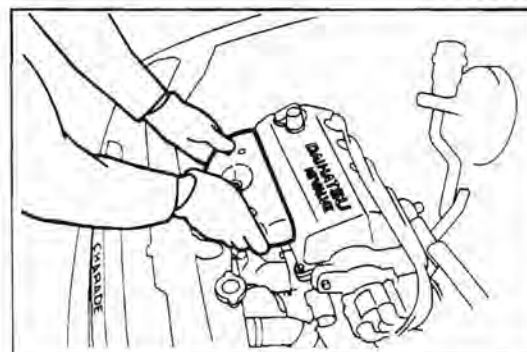
NOTE:

On models equipped with the air conditioner, prior to removal of this bolt, remove the compressor attaching bolt, and hang the compressor at the body side, by using a string.



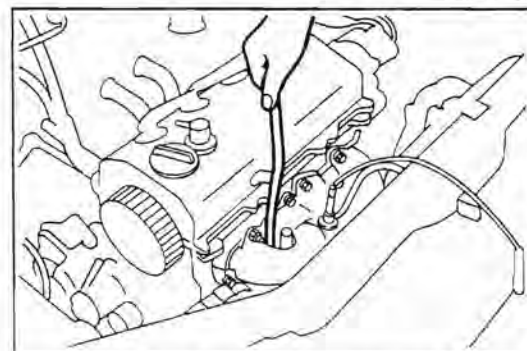
WR88-EM299

30. Remove the exhaust manifold cover by removing its attaching bolts.



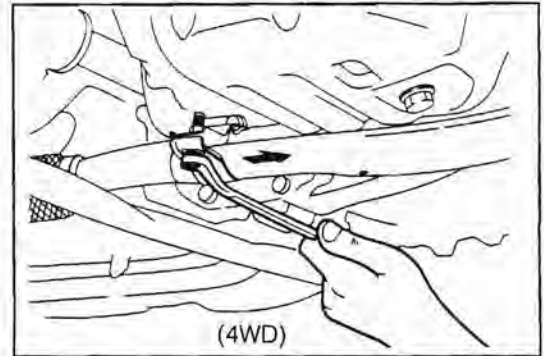
WR88-EM300

31. Remove the oil level gauge guide.



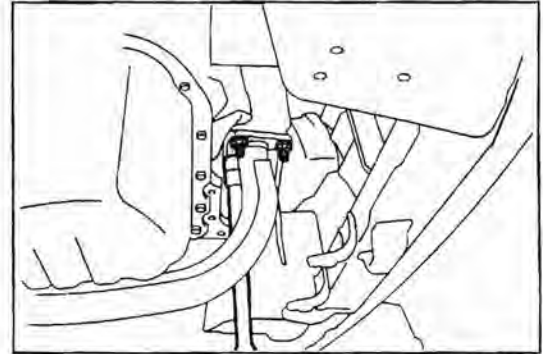
WR88-EM301

32. Remove the exhaust pipe clamp bolt. Remove the clamp.



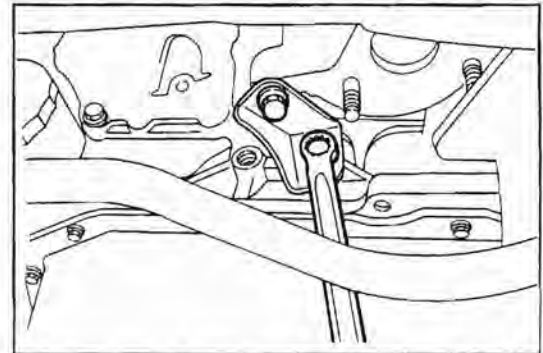
WR88-EM302

33. Remove the attaching nut of the exhaust pipe. Remove the exhaust pipe from the exhaust manifold No. 2.



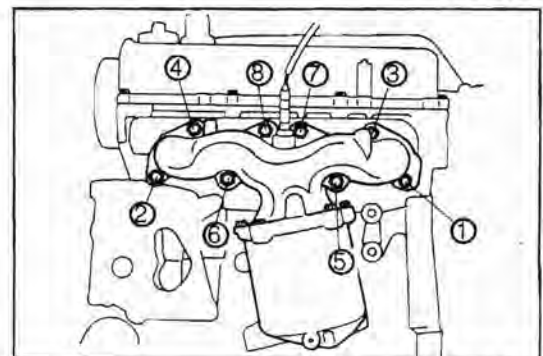
WR88-EM303

34. Remove the exhaust manifold stay by removing its attaching bolts.



WR88-EM304

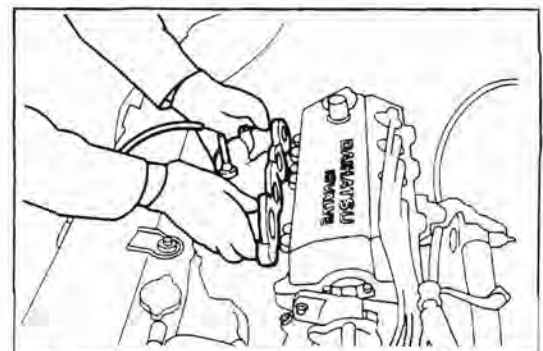
35. Remove the attaching bolts and nuts of the exhaust manifold by loosening them evenly over two or three stages, following the sequence shown in the right figure.



WR88-EM305

36. Remove the exhaust manifold.

37. Remove the exhaust manifold gasket.



WR88-EM306

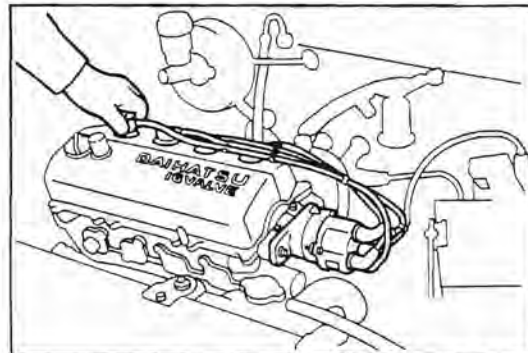
38. Remove the resistive cords.

NOTE:

Hold the rubber grommet portion during the removal. Never pull the cord portion.

39. Remove the spark plugs using the following SST.

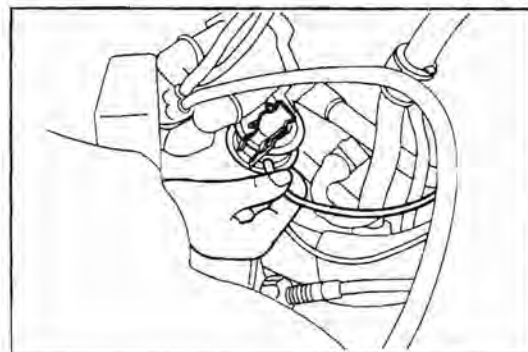
SST: 09268-87703-000



WR88-EM307

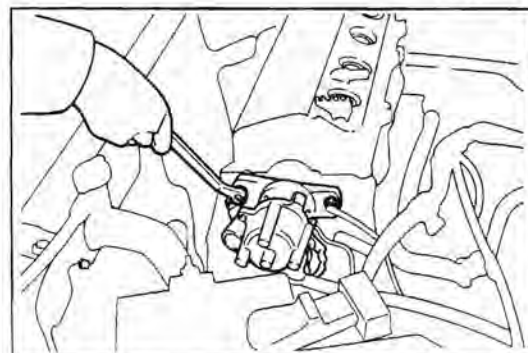
40. Removal of distributor

(1) Remove the vacuum hose for vacuum advancer.



WR88-EM308

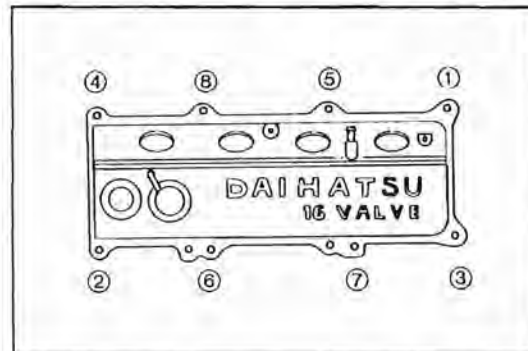
(2) Remove the distributor by removing its attaching bolts.



WR88-EM309

41. Remove the attaching bolts of the cylinder head cover by loosening them over two or three stages, following the sequence shown in the right figure.

42. Remove the cylinder head cover.

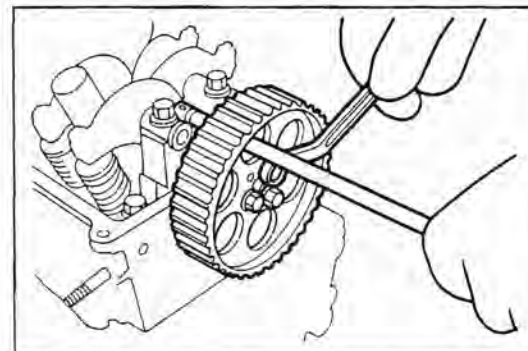


WR88-EM310

43. Remove the attaching bolt of the camshaft timing belt pulley, while preventing the camshaft timing belt pulley from turning with an adequate iron rod.

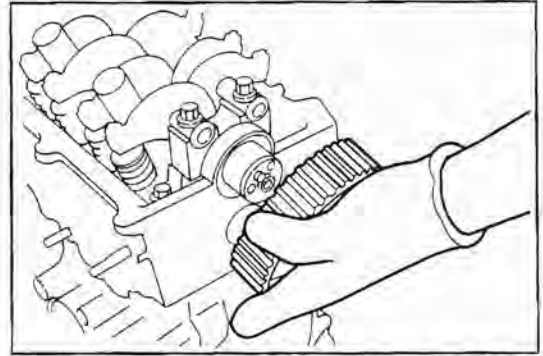
CAUTION:

- Never turn the camshaft independently.
- Do not damage the cylinder head cover gasket surface.



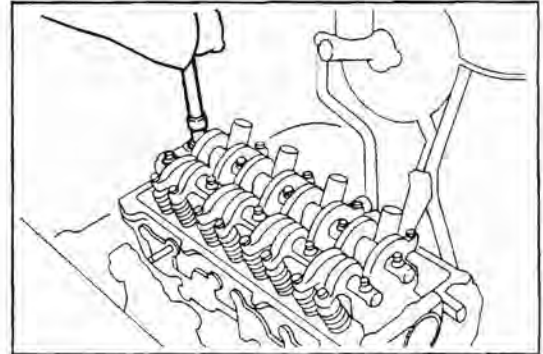
WR88-EM311

44. Remove the camshaft timing belt pulley.



WR88-EM312

45. Loosen the ten based head hexagon bolts evenly over two or three stages. Proceed to pull out them.

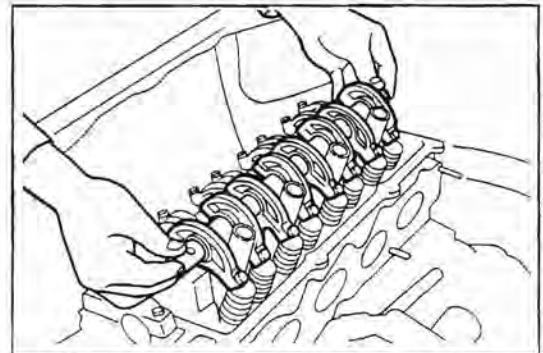


WR88-EM313

46. Remove the valve rocker shaft together with the rocker arms from the cylinder head.

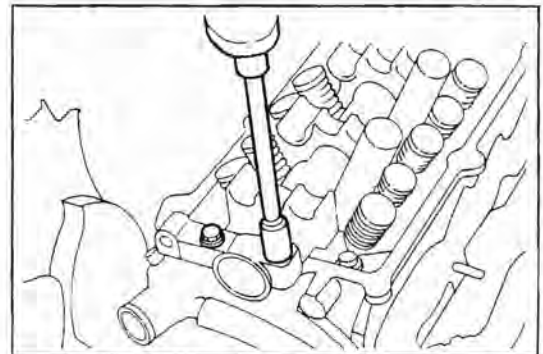
NOTE:

Remove the rocker arm spacers and wave washers from the removed valve rocker shaft. Arrange the spacers and washers in order so that their installing positions may be identified.



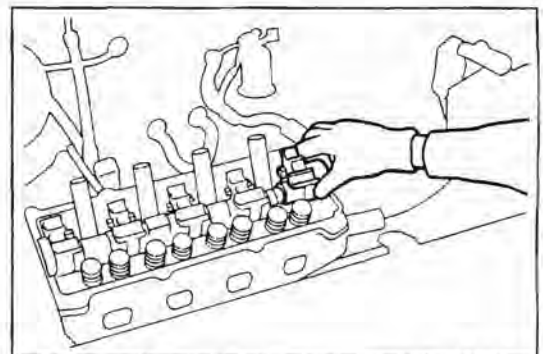
WR88-EM314

47. Remove the two attaching bolts of the camshaft cap No. 5.



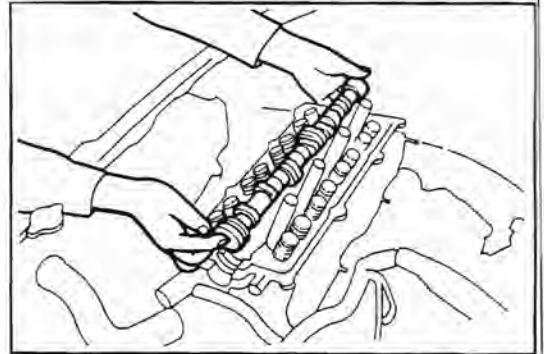
WR88-EM315

48. Remove the camshaft bearing caps.



WR88-EM316

49. Remove the camshaft from the cylinder head.



WR88-EM317

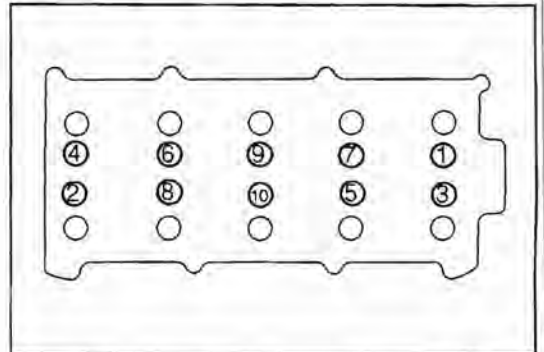
50. Loosen the cylinder head bolts evenly over two or three stages, following the sequence shown in the right figure. Proceed to pull out them.

Reference:

The bolts ① and ③ are shorter than the other bolts.

Nominal length of bolts ① and ③: 112 mm (4.41 inch)

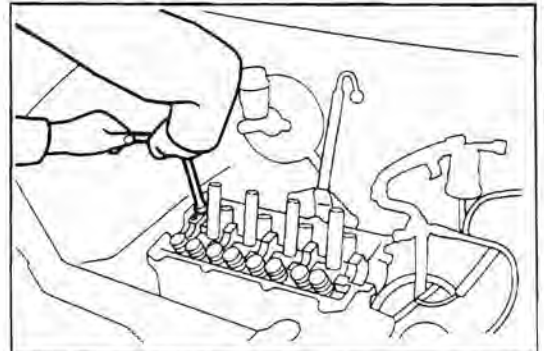
Nominal length of other bolts: 155 mm (6.10 inch)



WR88-EM318

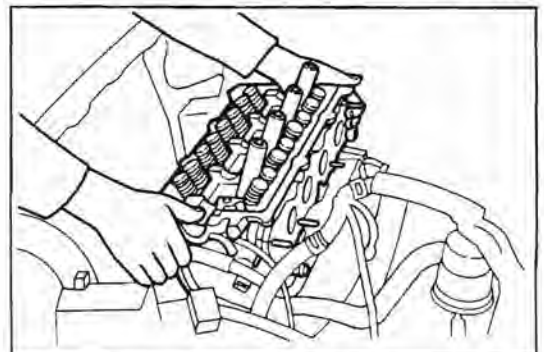
NOTE:

Failure to loose the cylinder head bolts evenly may cause cylinder head cracking or warpage, even leading to engine seizure.



WR88-EM319

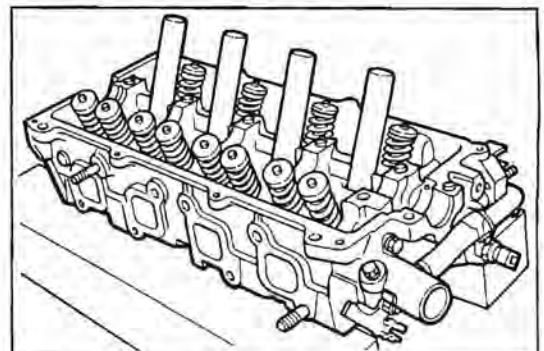
51. Remove the cylinder head from the cylinder block.



WR88-EM320

NOTE:

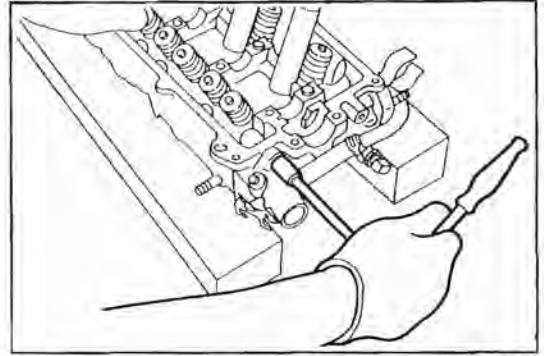
To prevent the cylinder head gasket surface from being damaged, take a precautionary measure, such as placing the removed cylinder head on two adequate wooden blocks.



WR88-EM321

DISASSEMBLY OF CYLINDER HEAD

1. Remove the water outlet from the cylinder head.

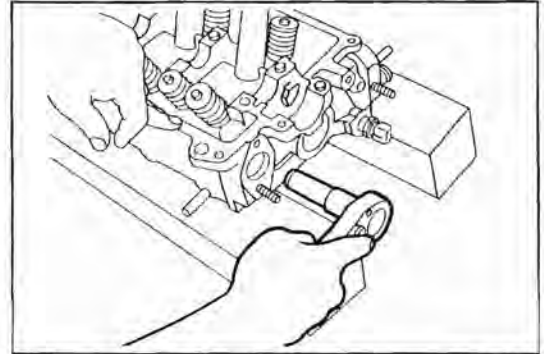


WR88-EM322

2. Remove the water temperature sender gauge from the cylinder head.

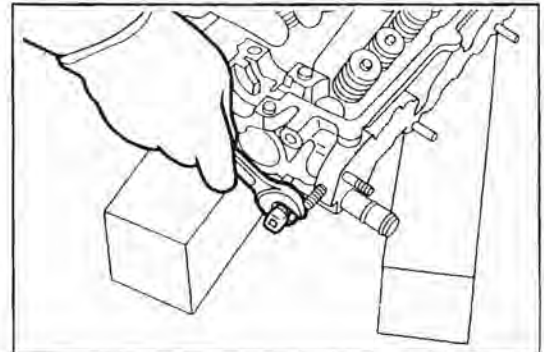
NOTE:

For removal operation, use a long box wrench.



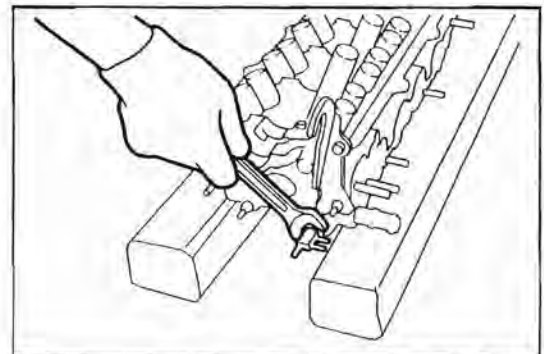
WR88-EM323

3. Remove the water temperature sensor from the cylinder head.
(HC-E engine only)



WR88-EM324

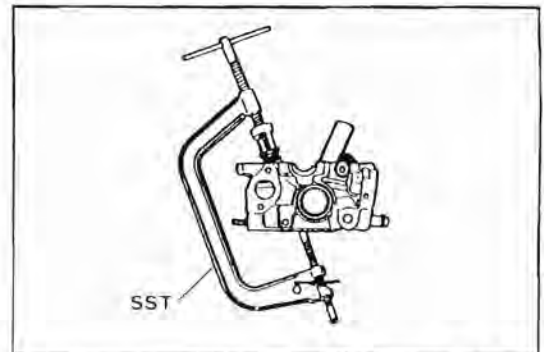
4. Remove the BVSV from the cylinder head.
(HC-C engine only)



WR88-EM325

5. Remove the valve spring retainer locks, using the following SST.

SST: 09202-87702-000

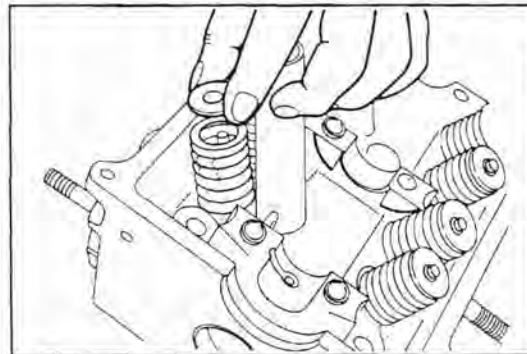


WR88-EM346

6. Remove the valve spring retainers and valve springs.

NOTE:

Arrange the removed parts in order so that their installing positions may be known easily.

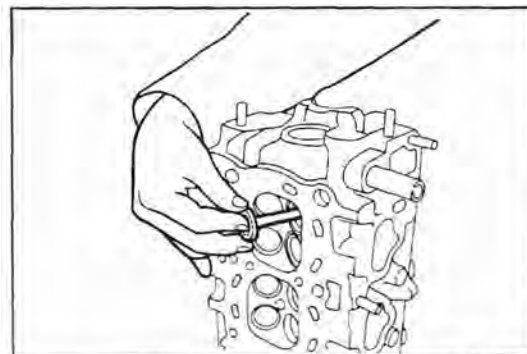


WR88-EM327

7. Remove the valves.

NOTE:

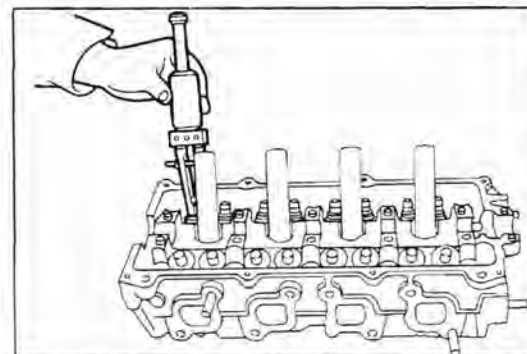
Arrange the removed parts in order so that their installing positions may be known easily.



WR88-EM328

8. Remove the valve stem oil seal by your hand or using the following SST.

SST: 09201-87704-000

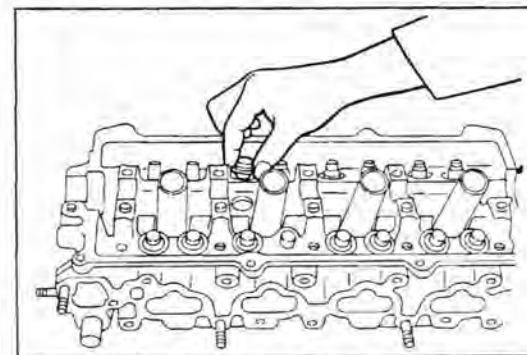


WR88-EM329

9. Remove the valve spring seats.

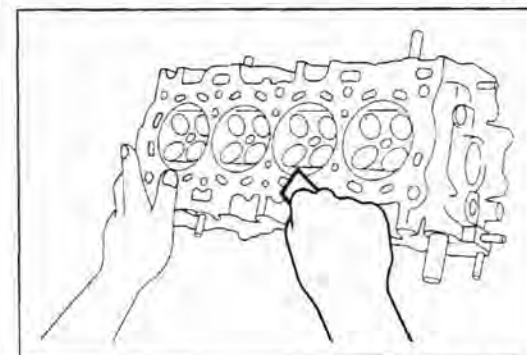
NOTE:

Arrange the removed parts in order so that their installing positions may be known easily.



WR88-EM330

10. Wash the disassembled parts except for electrical parts, plastic parts and grease sealed bearings. Dry them by blowing compressed air.



WR88-EM331

INSPECTION, CLEANING AND REPAIRS OF CYLINDER HEAD COMPONENTS

1. Cleaning of top of each piston and cylinder block
 - (1) Turn the crankshaft until each piston is brought to the top dead center.
Using a gasket scraper, remove all carbon deposits from the piston tops.
 - (2) Using a gasket scraper, remove any remaining gasket material from the top of the cylinder block.
Blow carbon deposits, water and oil from the bolt holes.

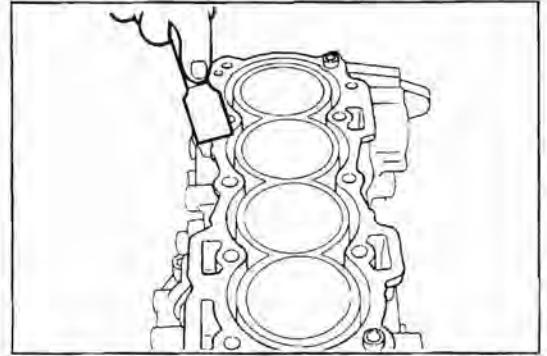
WARNING:

Protect your eyes during the cleaning operation using compressed air.

CAUTION:

Do not scratch the gasket surfaces of the piston and cylinder block.

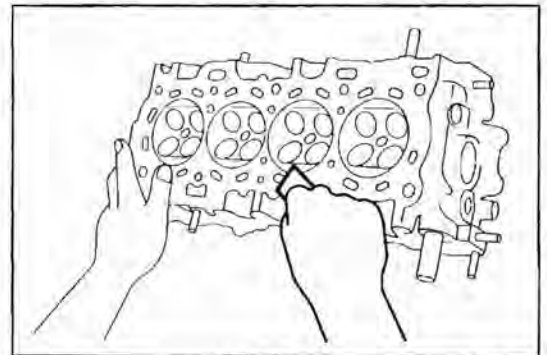
- (3) Set the piston No.1 to the top dead center.



WR88-EM332

2. Removal of gasket material

Using a gasket scraper, remove any remaining gasket material from the cylinder head and manifold surfaces.



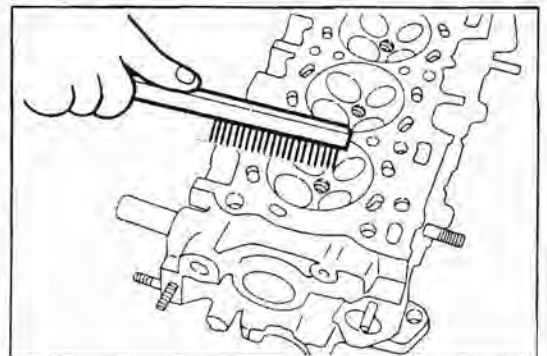
WR88-EM333

3. Cleaning of combustion chamber

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

CAUTION:

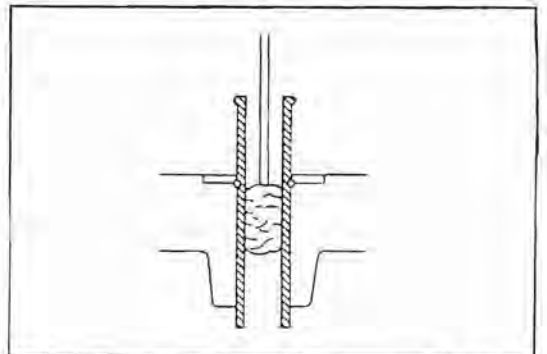
Be careful not to scratch the cylinder head gasket contact surfaces.



WR88-EM334

4. Cleaning of valve guide bushings

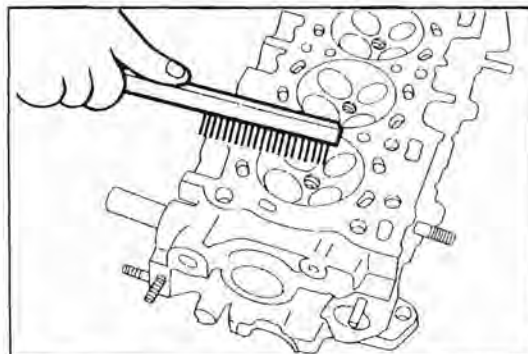
Using a valve guide brush and solvent, clean all the valve guide bushings.



WR88-EM335

5. Cleaning of cylinder head

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



WR88-EM336

6. Inspection of cylinder head for flatness

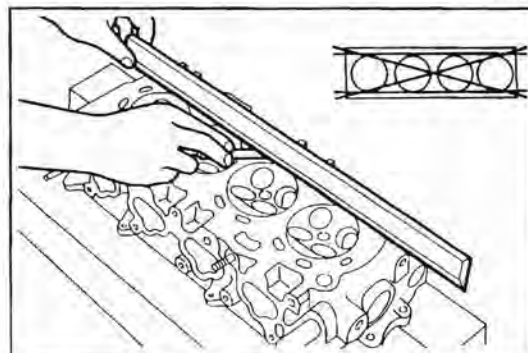
Using a precision straight edge and a feeler gauge, check the gasket surfaces contacting the cylinder block and manifolds for warpage.

Maximum surface warpage:

Cylinder block side: 0.10 mm (0.0039 inch)

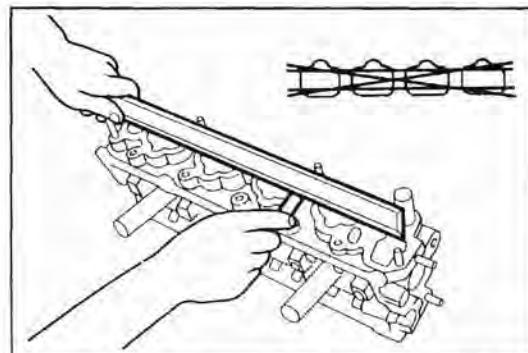
Intake manifold side: 0.10 mm (0.0039 inch)

Exhaust manifold side: 0.10 mm (0.0039 inch)

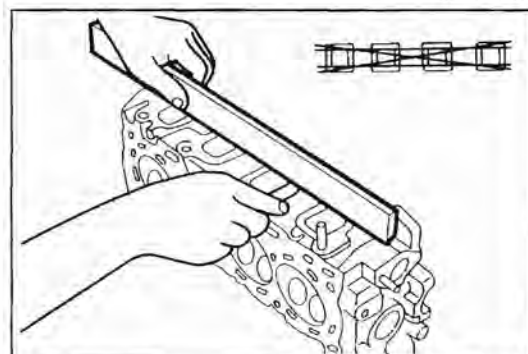


WR88-EM337

If surface warpage of the cylinder block side exceeds the maximum limit, replace the cylinder head.



WR88-EM338

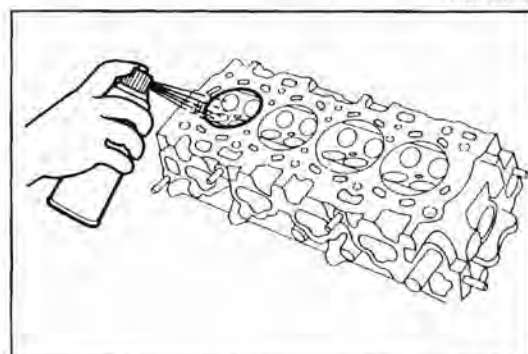


WR88-EM339

7. Inspection of cylinder head for cracks

Using a dye penetrant, check the combustion chamber, intake and exhaust ports, cylinder head surface and top of the cylinder head for cracks.

If a crack is found, replace the cylinder head.



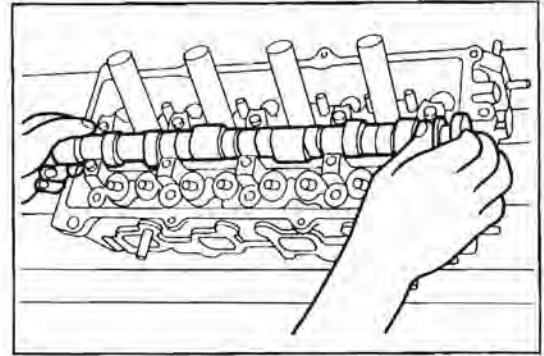
WR88-EM340

8. Inspection of camshaft oil clearance

NOTE:

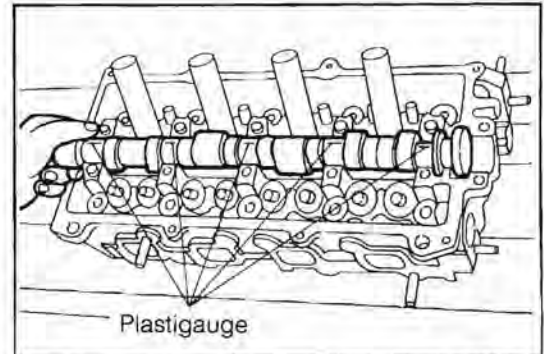
Prior to this oil clearance check, the camshaft should be checked for bend in advance. (See page EM-88.)

(1) Install the camshaft to the cylinder head.



WR88-EM341

(2) Place a plastigauge on each bearing.



WR88-EM342

(3) Install the bearing caps and rocker shafts. Tighten them to the specified torque.

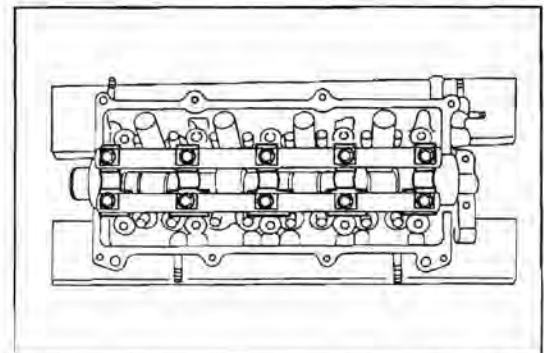
Tightening Torque:

M10 bolt 2.9 - 3.7 kg-m/Dry*
(21.0 - 26.7 ft-lb)/Dry*

M8 bolt 1.3 - 1.7 kg-m/Dry*
(9.5 - 12.2 ft-lb)/Dry*

NOTE:

- Each bearing cap bears a cap number.
- The intake valve rocker shaft can be identified by the recessed sections on it.
- The valve rocker shaft should be installed in such a direction that the side having a wider chamfer comes at the timing belt side.
- Ensure that the bolt holes and bolts are dry when tightening the bolts. (Ensure that no oil or the like gets to the bolt holes and bolts.)



WR88-EM343

(4) Remove the bearing caps and measure the oil clearance.

Clearance

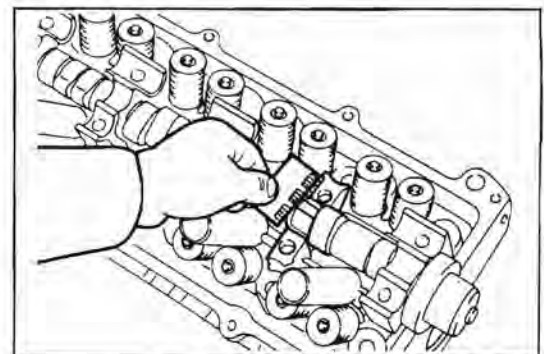
Specified Value: 0.035 - 0.076 mm
(0.0014 - 0.0029 inch)

Allowable Limit: 0.17 mm (0.0067 inch)

If the oil clearance exceeds the allowable limit, replace the cylinder head and camshaft as a set.

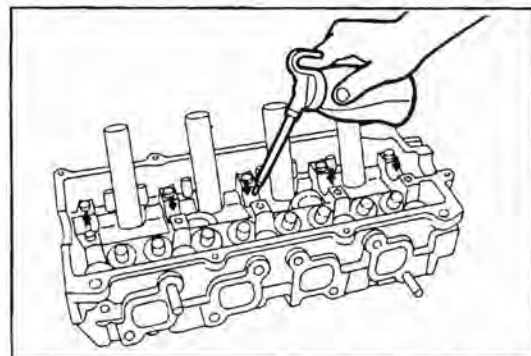
NOTE:

After completion of the check, remove the plastigauges. Wash the camshaft and bearing caps in cleaning solvent.



WR88-EM343A

9. Inspection of camshaft thrust clearance
(1) Apply engine oil to the camshaft journals.



WR88-EM345

- (2) Install the camshaft to the cylinder head. Install the bearing caps and rocker shafts and tighten them to the specified torque.

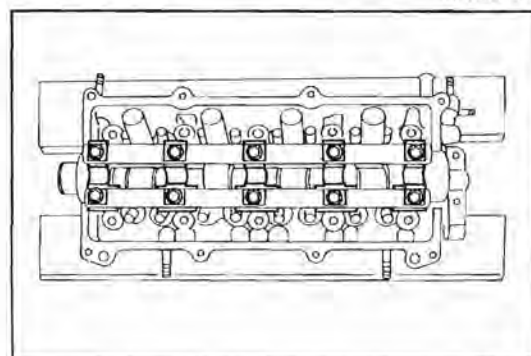
Tightening Torque:

M10 bolt 2.9 - 3.7 kg-m/Dry*
(21.0 - 26.8 ft-lb)/Dry*

M8 bolt 1.3 - 1.7 kg-m/Dry *
(9.4 - 12.3 ft-lb)/Dry*

NOTE:

- Each bearing cap bears a cap number.
- The intake valve rocker shaft can be identified by the recessed sections on it.
- The valve rocker shaft should be installed in such a direction that the side having a wider chamfer comes at the timing belt side.
- Ensure that the bolt holes and bolts are dry when tightening the bolts. (Ensure that no oil or the like gets to the bolt holes and bolts.)



WR88-EZ

- (3) With a dial gauge attached to the camshaft, measure the thrust clearance.

Thrust Clearance

Specified Value: 0.1 - 0.25 mm (0.0039 - 0.0098 inch)

Allowable Limit: 0.45 mm (0.018 inch)

If the camshaft thrust clearance exceeds the allowable limit, replace the camshaft and cylinder head as a set.

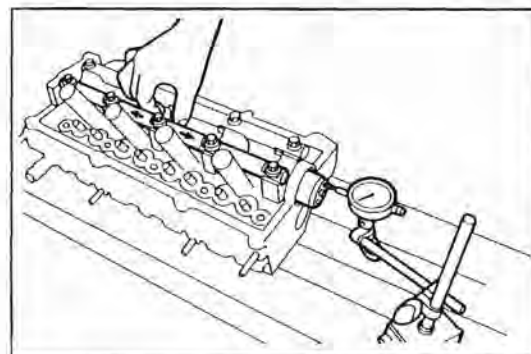
Reference

Cylinder head thrust surface width:

4.10 - 4.20 mm (0.162 - 0.165 inch)

Camshaft thrust surface width:

3.95 - 4.00 mm (0.156 - 0.157 inch)



WR88-EM347

10. Inspection and grinding of valves

(1) Visually inspect the valve stem for seizure or damage.

NOTE:

- If seizure or damage is found, replace the valve and valve guide bush as a set.
- However, this replacement should be performed only after the checks for the valve seat, valve stem and guide bush have been finished.
- The valve guide bush hole must be used for refacing the valve seat. Hence, if the valve guide bush hole exhibits any roughness due to seizure, etc., rectify the hole with an adjustable reamer.

(2) Visually inspect the valve head for melting or damage.

If the valve head exhibits any melting or damage, replace the valve.

If the roughness on the contact surface can be corrected, grind the valve seat contact surface with a valve refacer.

(3) Grind the valves only enough to obtain a smooth contact surface with the valve seat.

Valve Face Angle: 45.5° **NOTE:**

Make sure the valves are ground to the correct valve face angle.

(4) Visually inspect the valve stem end for abnormal wear.

If the valve stem end exhibits abnormal wear, correct the stem end with a valve refacer. However, this correction should be made within a limit of 2 mm (0.079 inch) from that of standard length.

[Reference]

Valve Length (STD):

Intake Valve: 112.8 mm (4.441 inch)

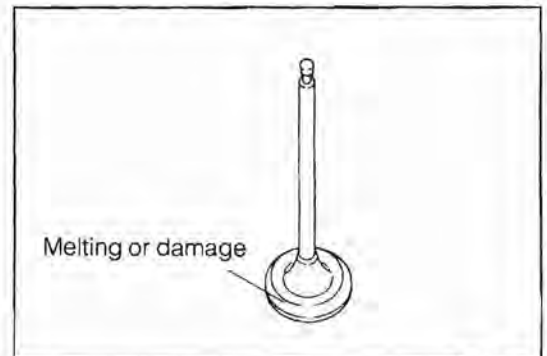
Exhaust Valve: 114.5 mm (4.508 inch)

NOTE:

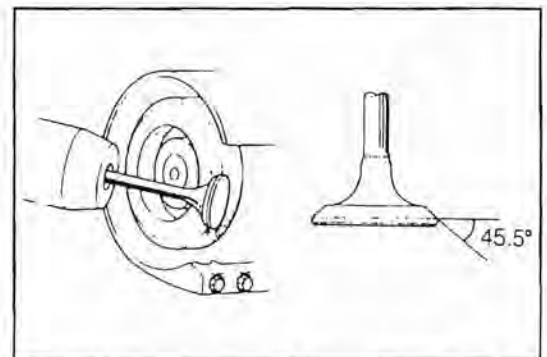
Be very careful not to allow the valve to be overheated during grinding.



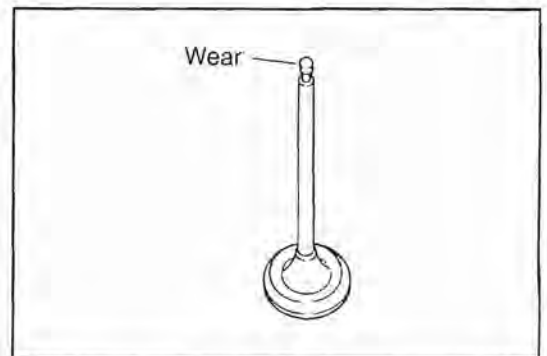
WR88-EM348



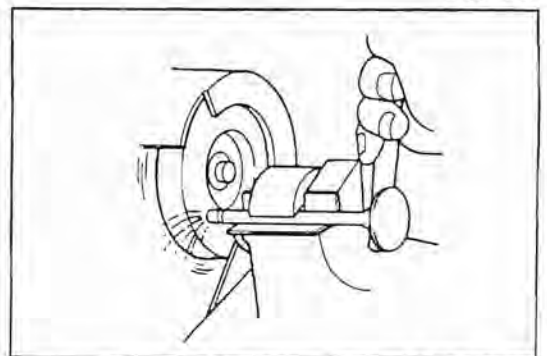
WR88-EM349



WR88-EM350



WR88-EM351



WR88-EM352

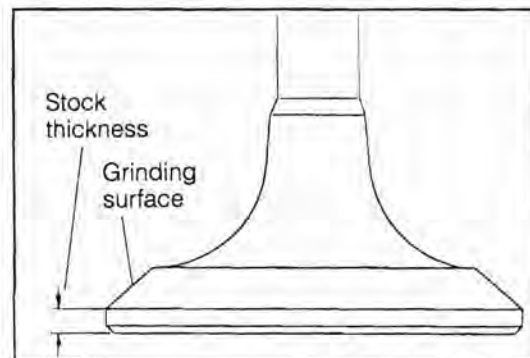
- (5) Inspect the valve head for its stock thickness.

Minimum Stock Thickness

Intake Valve: 0.8 mm (0.0315 inch)

Exhaust Valve: 1.0 mm (0.0394 inch)

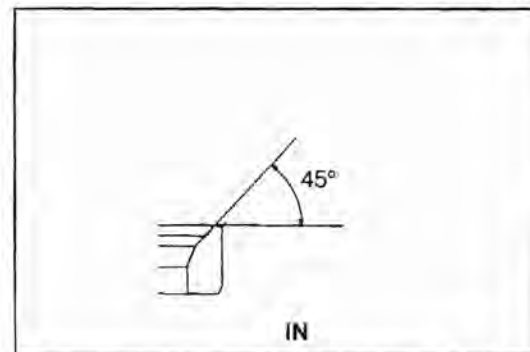
If the stock thickness of the valve head is less than the minimum stock thickness, replace it with a new one.



WR88-EM353

11. Inspection and cleaning of valve seats

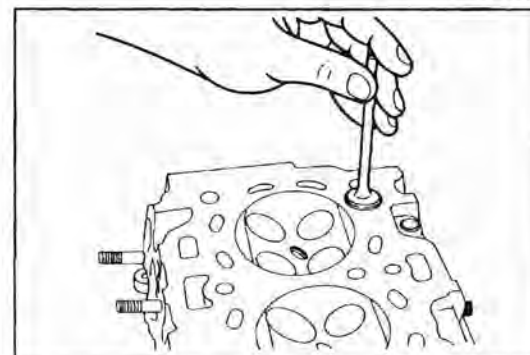
- (1) Using a 45-degree valve seat cutter, reface the valve seats. Remove only enough metal stock to clean the seats.
- (2) Apply a thin film of red lead (or white lead) to the valve seat.
- (3) Let the valve drop by its own weight onto the valve seat two or three times.
- (4) Take out the valve.



WR88-EM354

- (5) Inspect the valve face and seat for the following items.

- ① Ensure that the valve seat contact surface of the valve is continuous over the whole circumference. If not, replace the valve.
- ② Ensure that the valve contact surface of the valve seat is continuous over the whole circumference. If not, reface the valve seat.



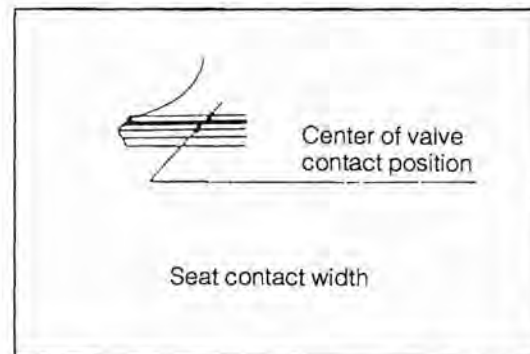
WR88-EM355

- ③ Measure the width of the contact surface of valve seat.

Contact surface of valve seat:

1.2 - 1.6 mm (0.048 - 0.062 inch)

If not, reface the valve seat.

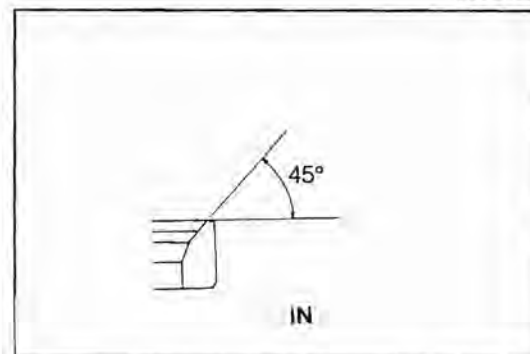


WR88-EM356

12. Refacing of valve seat

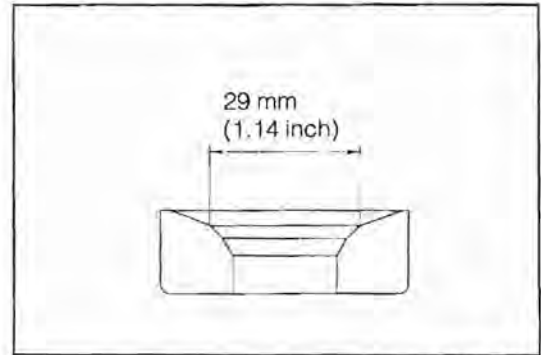
- (1) Refacing procedure for intake valve seats

- ① Using a 45-degree cutter, recondition the roughness on the valve-to-valve seat contact surface, only enough to obtain a smooth surface.



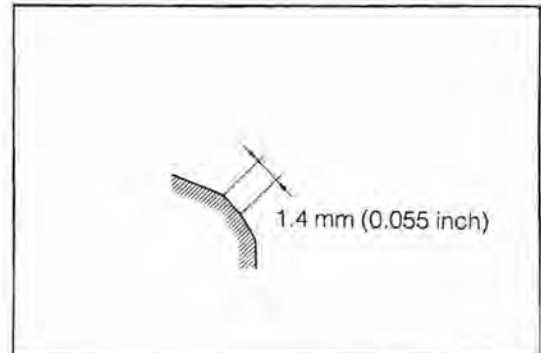
WR88-EM357

- ② Using a 30-degree cutter, cut the valve seat in such way that the circumference of the surface refaced by the 45-degree cutter may become 29 ± 0.1 mm (1.14 ± 0.004 inch)



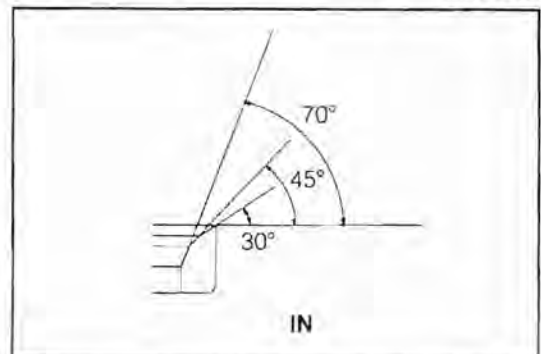
WR88-EM358

- ③ Using a 70-degree cutter, cut the seat in such way that the width, of the surface refaced by the 45-degree cutter may become 1.4 mm (0.055 inch).



WR88-EM359

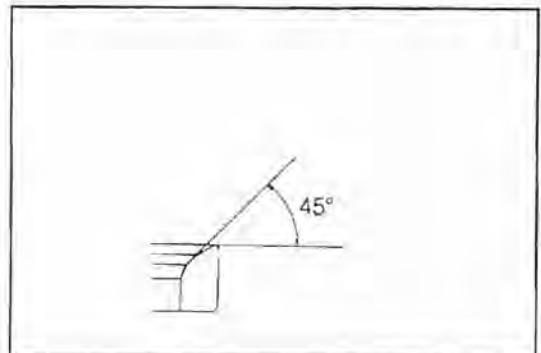
- ④ Using the 45-degree cutter, remove burrs produced during the refacing by the 30-degree and 70-degree cutters.



WR88-EM360

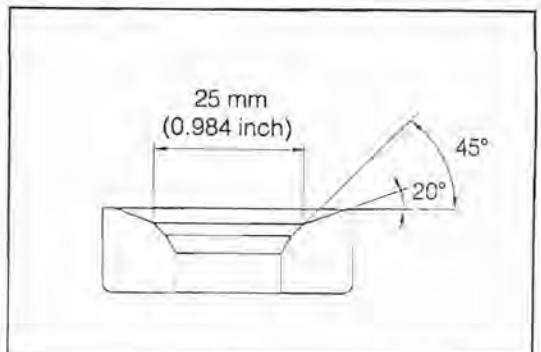
(2) Refacing procedure for exhaust valve seats

- ① Using a 45-degree cutter, recondition the roughness on the valve-to-valve seat contact surface, only enough to obtain a smooth surface.



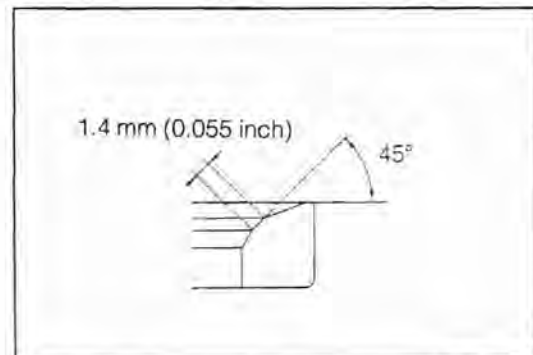
WR88-EM361

- ② Using a 20-degree cutter, cut the valve seat in such a way that the circumference of the surface refaced by the 45-degree cutter may become 25 mm (0.984 inch).



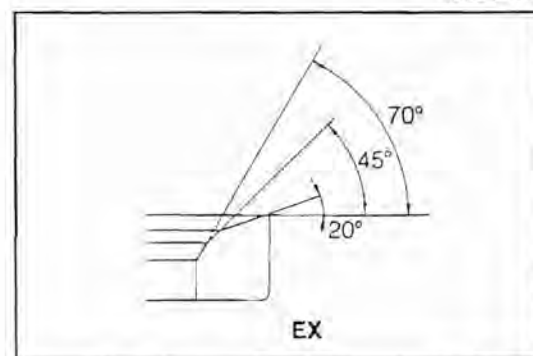
WR88-EM362

- ③ Using a 70-degree cutter, cut the valve seat in such a way that the width of the surface refaced by the 45-degree cutter may become 1.4 mm (0.055 inch).



WR88-EM363

- ④ Using the 45-degree cutter, remove burrs produced during the refacing by the 20-degree and 70-degree cutters.



WR88-EM364

13. Hand lapping of valves

- (1) Perform hand lapping of the valves and valve seats, using an abrasive compound.
- (2) Clean the valves and valve seats after the hand lapping of the valves.

14. Inspection of valve recession

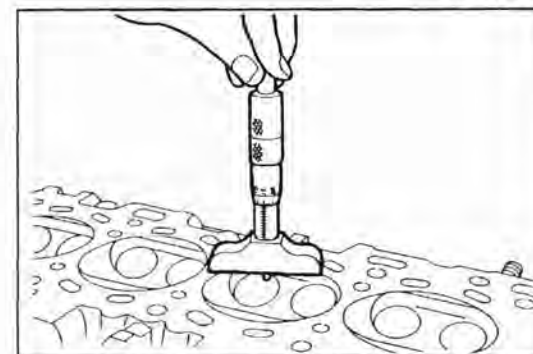
After the valve seat has been refaced, install the new valve. Measure the distance between the cylinder attaching surface of the cylinder head (attaching surface of the cylinder head gasket) and the upper most section of the valve. Ensure that the distance does not exceed the following maximum limit.

Maximum limit

Intake valve 2.775 mm (0.1092 inch)

Exhaust valve 6.026 mm (0.2372 inch)

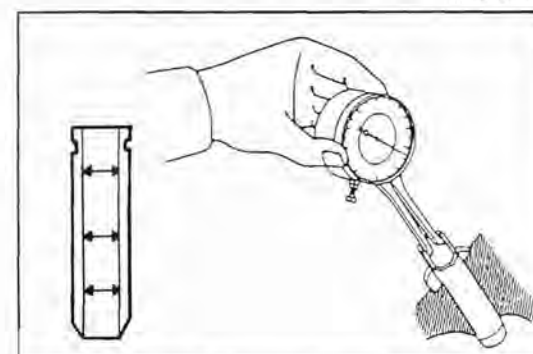
If the recession exceeds the maximum limit, replace the cylinder head.



WR88-EM366

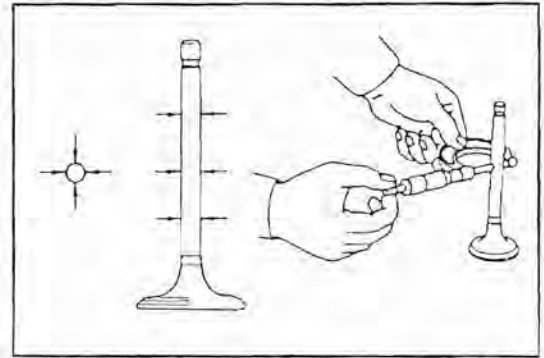
15. Inspection of valve stem-to-guide bushing oil clearance

- (1) Using a caliper gauge, measure the inner diameter of the valve guide at six points. Record the measured values.



WR88-EM367

- (2) Using a micrometer, measure the diameter of the valve stem at six points.
Record the measured values.



WR88-EM368

- (3) Calculation of oil clearance
Calculate the oil clearance of each valve according to the following formula.

$$\text{Oil clearance} = \text{Inner diameter of valve stem guide} - \text{Outer diameter of valve stem}$$

Specified Oil Clearance

Intake valve side: 0.020 - 0.060 mm
(0.00079 - 0.0023 inch)

Exhaust valve side: 0.025 - 0.065 mm
(0.00099 - 0.0025 inch)

Allowable Limit

Intake valve side: 0.080 mm (0.0031 inch)

Exhaust valve side: 0.090 mm (0.0035 inch)

If the calculated oil clearance exceeds the allowable limit, replace the valve guide bush and valve as a set.

WR88-EM369

16. Replacement of valve guide bush

CAUTION:

Removal and installation of the valve guide bush should be carried out while the cylinder head temperature is 80°C - 100°C (176°F - 182°F) after heating it gradually.

- (1) Intake valve guide bush

NOTE:

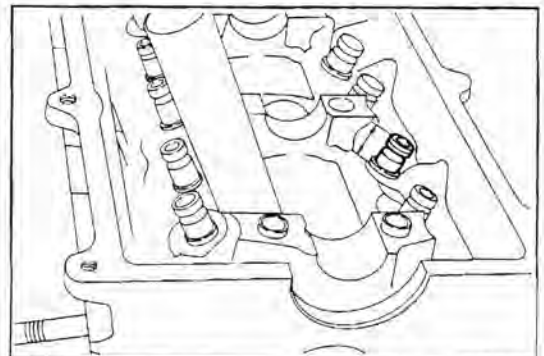
If the intake valve guide bush has been already installed with a locating ring, replace the cylinder head.

- ① Drive out the valve guide bush from the combustion chamber side, using the following SST.

SST: 09201-87705-000

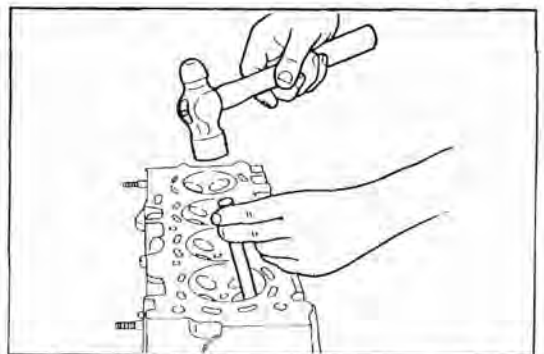
NOTE:

Be very careful not to tap the cylinder head.



WR88-EM370

WR88-EM371



WR88-EM372

- ② Drive a new valve guide bush into position, until the snap ring contacts the cylinder head, using the following SST.

SST: 09201-87705-000

CAUTION:

- Be very careful not to give an excessive impact during the installation. Failure to observe this caution will result in valve guide bush cracks.
 - Care should be exercised not to detach the snap ring due to driving the valve guide bush excessively.
- ③ Using an adjustable reamer, ream the valve guide bush to remove any burr or the like.

NOTE:

This reaming should be made only enough to remove the burr or the like.

- ④ Inspection of oil clearance

Ensure that the oil clearance meets the specifications.

Oil Clearance:

Specified Value:

Intake 0.020 - 0.060 mm
(0.00079 - 0.0023 inch)

Allowable Limit:

Intake 0.08 mm (0.0031 inch)

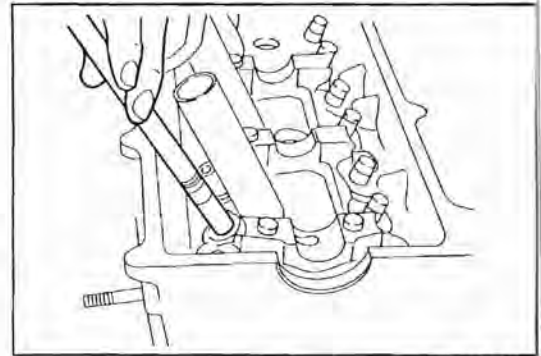
- (2) Exhaust valve guide bush

NOTE:

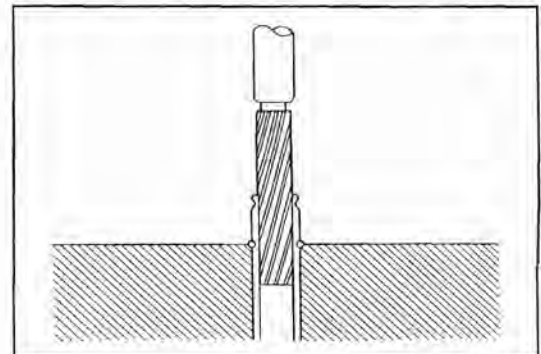
When the locating ring for the valve guide bush is located 14 mm from the upper end of the valve guide bush, replace the cylinder head.

- ① Drive out the valve guide bush from the combustion chamber side, using the following SST.

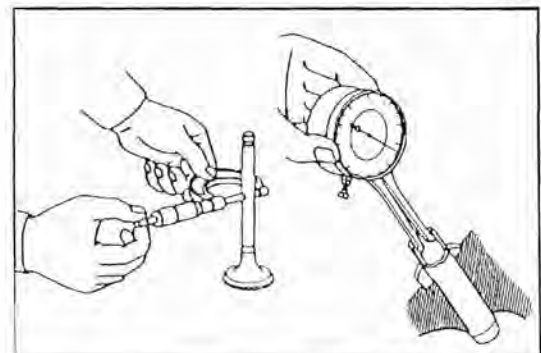
SST: 09201-87705-000



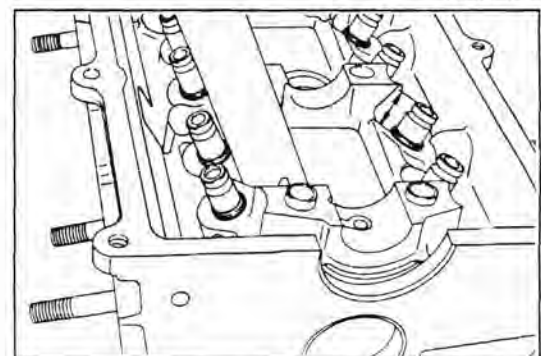
WR88-EM373



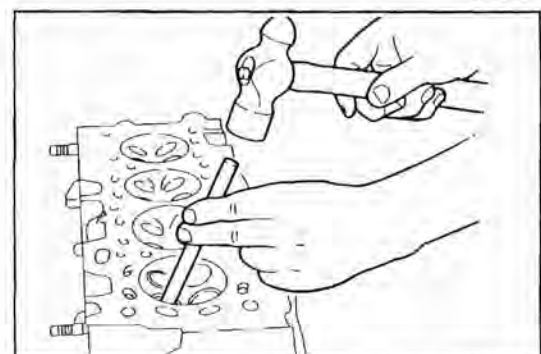
WR88-EM374



WR88-EM375



WR88-EM376



WR88-EM377

- ② Drive a new valve guide bush into position, until the snap ring contacts the cylinder head, using the following SST.

SST: 09201-87705-000

CAUTION:

- Be very careful not to give an excessive impact during the installation. Failure to observe this caution will result in valve guide bush cracks.
- Care should be exercised not to detach the snap ring due to driving the valve guide bush excessively.

- ③ Using an adjustable reamer, ream the valve guide bush to remove any burr or the like.

NOTE:

This reaming should be made only enough to remove the burr or the like.

- ④ Inspection of oil clearance

Ensure that the oil clearance meets the specifications.

Oil Clearance:

Specified Value:

Exhaust 0.025 - 0.065 mm
(0.00099 - 0.0025 inch)

Allowable Limit:

Exhaust 0.09 mm (0.0035 inch)

17. Inspection of valve springs

- (1) Check the valve spring for squareness, using a steel square.

Maximum squareness: 1.6 mm (0.063 inch)

If the squareness exceeds the maximum limit, replace the valve spring.

- (2) Measure the valve spring for free length and spring tension, using a spring tester.

Minimum free length: 44.3 mm (1.74 inch)

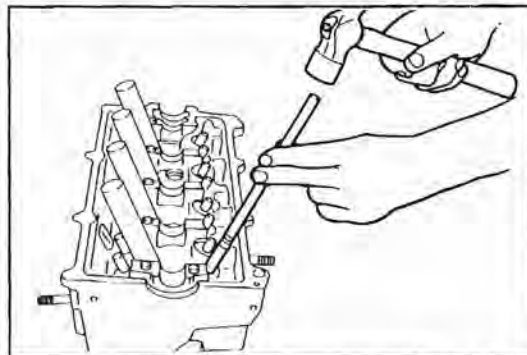
Minimum tension/installation height:

26.4 (58.216)/38.0 mm (1.5 inch)

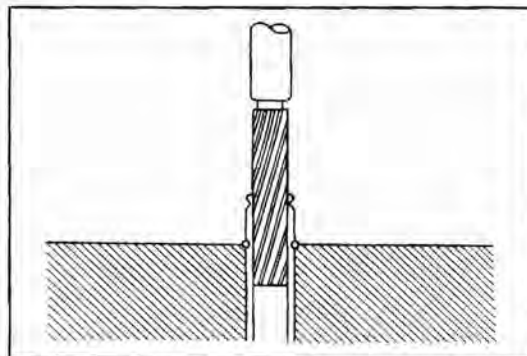
If the minimum free length and/or minimum tension is less than the minimum limit, replace the valve spring.

Reference

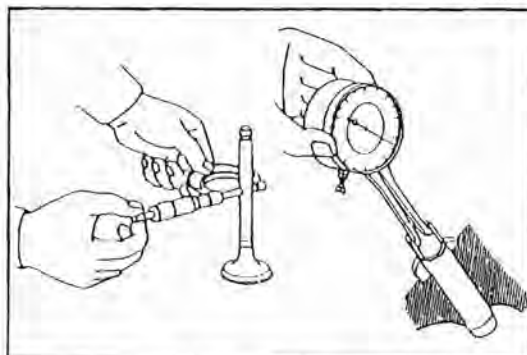
Standard free length: 45.2 - 46.0 mm
(1.78 - 1.81 inch)



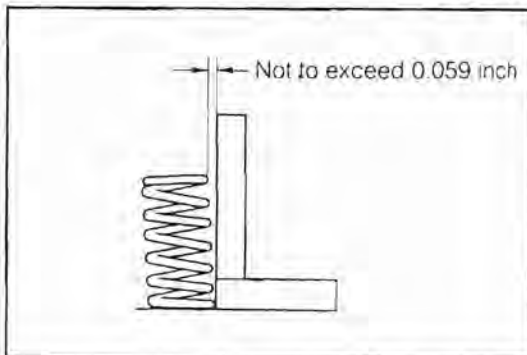
WR88-EM378



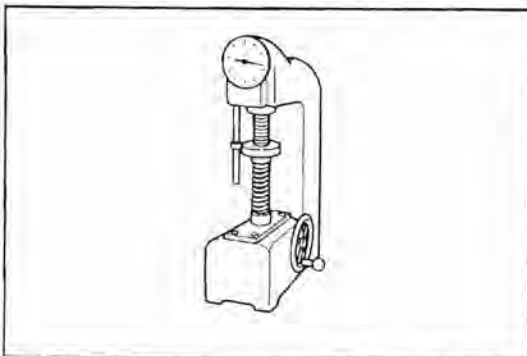
WR88-EM379



WR88-EM380



WR88-EM381

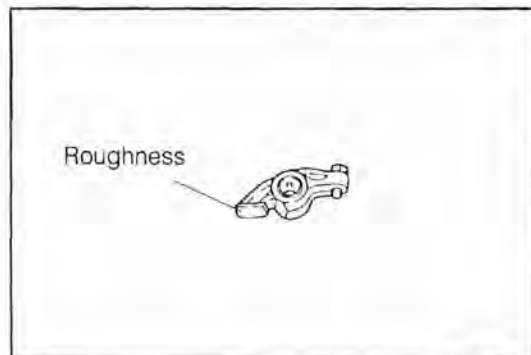


WR88-EM382

18. Inspection of valve rocker arms and valve rocker shaft

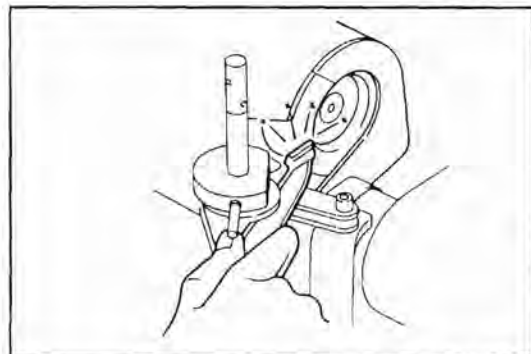
- (1) Visually inspect the valve rocker arm for cracks, seizure or wear.

Replace the valve rocker arm, if necessary.



WR88-EM383

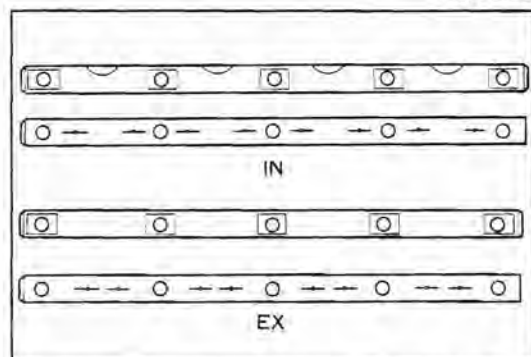
- (2) If the valve rocker arm-to-cam contact surface is worn excessively, grind or replace the rocker arm.



WR88-EM384

- (3) Visually inspect the valve rocker shaft for cracks, seizure or wear.

Replace the valve rocker shaft, if necessary.



WR88-EM385

- (4) Valve rocker shaft-to-valve rocker arm

- Using a dial gauge, measure the inner diameter of the valve rocker arm in two directions, 90 degrees apart from each other.
- Using micrometer, measure the outer diameter of the valve rocker arm attaching position of the camshaft in two directions, 90 degrees apart from each other.
- Calculate the oil clearance by subtracting the rocker shaft diameter from the rocker arm diameter.

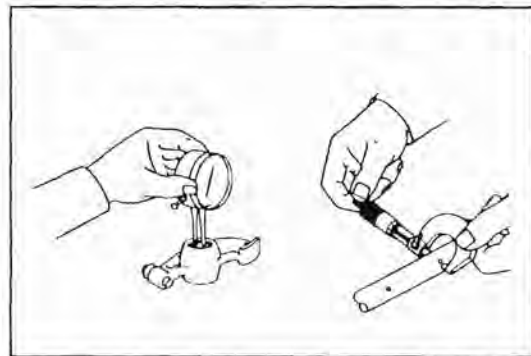
Oil Clearance

Specified Value: 0.012 - 0.053 mm
(0.00048 - 0.0020 inch)

Allowable Limit: 0.08 mm (0.0031 inch)

NOTE:

The measurement of the rocker shaft outer diameter must be performed at the assembling position of each rocker shaft.



WR88-EM386

Reference

- Identification of valve rocker shafts
On the intake valve rocker shaft, recesses for the spark plug tube are provided.
Also, the oil grooves are provided very closely to the bolt holes.
On the exhaust valve rocker shaft, the oil grooves are located near the midpoint of the bolt holes.
- Installing direction of valve rocker shaft
The valve rocker shaft should be installed in such a way that the side having a wider chamfer comes at the timing belt side.
- Identification of valve rocker arm
The valve rocker arm comes in four kinds; two kinds each for the intake side and exhaust side, as shown in the right figure.
- Specified dimensions of valve rocker shaft and valve rocker arm

Outer diameter of valve rocker shaft:

19.468 - 19.488 mm (0.7665 - 0.7672 inch)

Bore diameter of valve rocker arm:

19.500 - 19.521 mm (0.7678 - 0.7685 inch)

19. Inspection of valve rocker arm, spacer and wave washer

- (1) Measure the free width of the spacer, using vernier calipers.

Minimum Free Width: 22.0 mm (0.866 inch)

Replace the spacer whose free length is less than the minimum free width.

- (2) Visually inspect the wave washer for flattened condition or damage.

Replace the wave washer, if necessary.

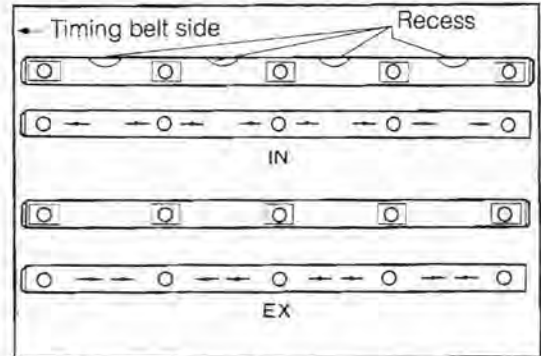
20. Inspection of camshaft

- (1) Checking camshaft for runout

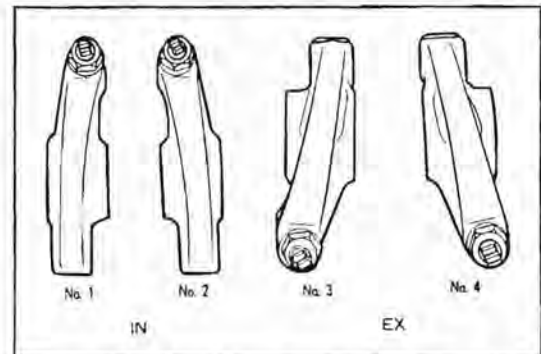
Support the camshaft at its both ends with V-shaped blocks. Set a dial gauge to the mid-point of the center journal section of the camshaft. Turn the camshaft one turn, making sure that the camshaft will not move in the axial direction. Take a reading on the dial gauge during the turning. Calculate the maximum runout, i.e. the difference between the maximum and minimum readings.

Maximum runout: 0.03 mm (0.0012 inch)

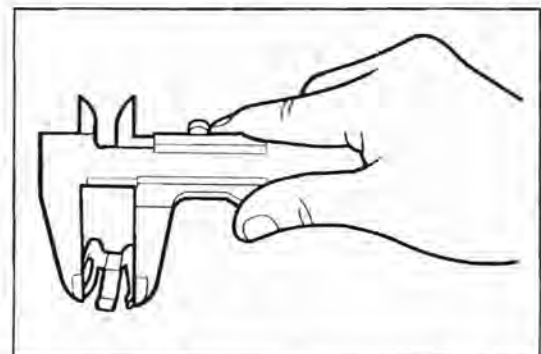
If the runout exceeds the maximum limit, replace the camshaft.



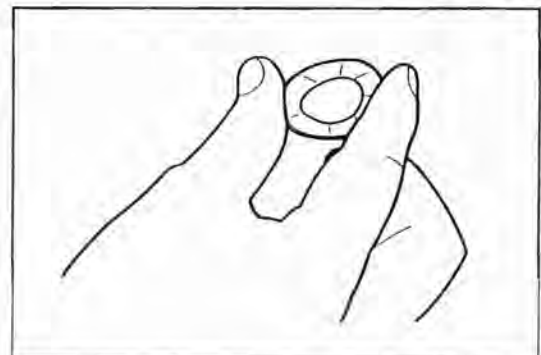
WR88-EM387



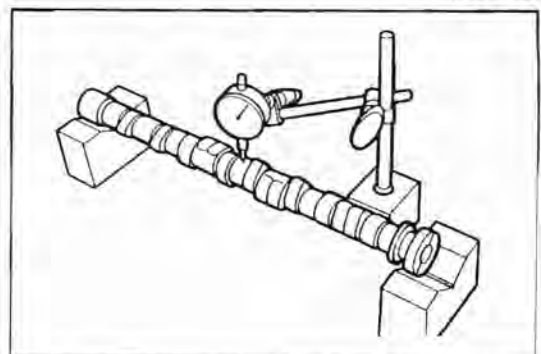
WR88-EM388



WR88-EM389



WR88-EM390



WR88-EM391

(2) Checking of cam lobe height

Measure the cam lobe height, using a micrometer.

Specified Cam Lobe Height:

HC-E

Intake: 33.37 - 33.57 mm (1.314 - 1.322 inch)

Exhaust: 32.76 - 32.96 mm (1.290 - 1.298 inch)

HC-C

Intake: 32.76 - 32.96 mm (1.290 - 1.298 inch)

Exhaust: 32.76 - 32.96 mm (1.290 - 1.298 inch)

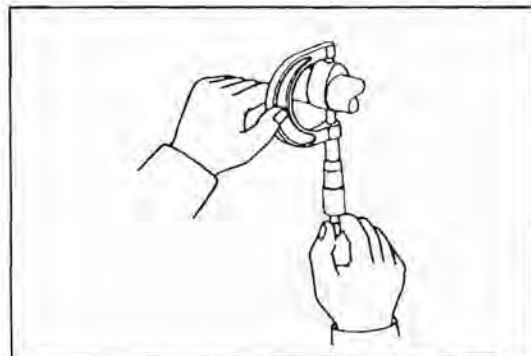
Minimum Limit:

HC-E Intake: 33.2 mm (1.307 inch)

Exhaust: 32.6 mm (1.283 inch)

HC-C Intake: 32.6 mm (1.283 inch)

Exhaust: 32.6 mm (1.283 inch)



WR88-EM392

(3) Inspection of cam for fuel pump

(HC-C engine only)

- 1) Measure the diameter of the fuel pump cam rod contacting surface over the entire periphery of the cam, and ensure that the measured value is not less than the specified value.

Specified value: 42.65 mm (1.68 inch)

If this measured-value is less than the specified value, replace the camshaft.

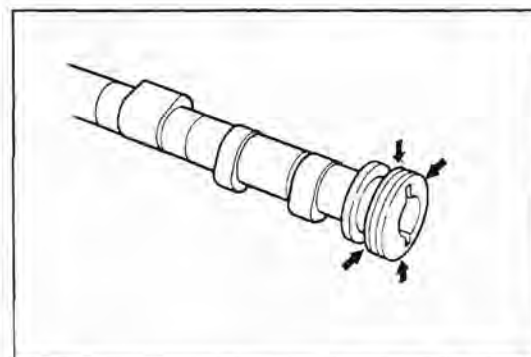
- 2) Apply engine oil to the cylinder head camshaft journals and install the camshaft.

- 3) Cam for driving camshaft fuel pump

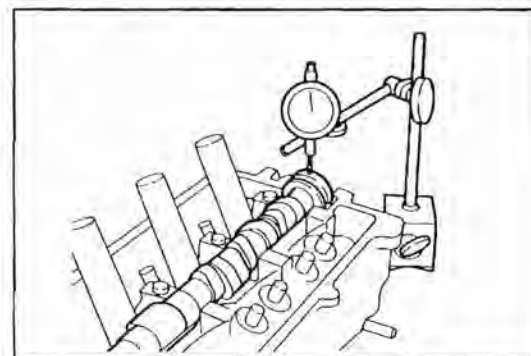
With a dial gauge set exactly from the top direction, turn the camshaft so as to measure the cam stroke.

Minimum Cam Stroke: 4.8 mm (0.189 inch)

Replace the camshaft if the cam stroke is less than the minimum cam stroke.



WR88-EM393

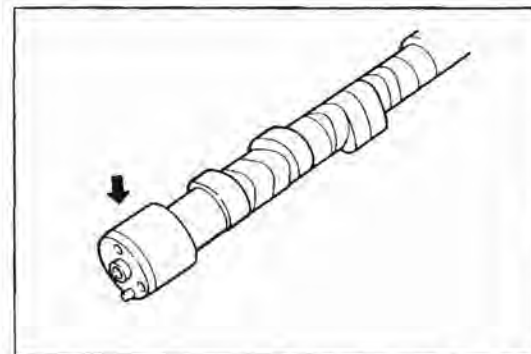


WR88-EM394

- 4) Inspection of oil seal contact surface

Inspect the oil seal contact surface for abnormal wear.

Replace the camshaft if the contact surface exhibits any abnormal wear.

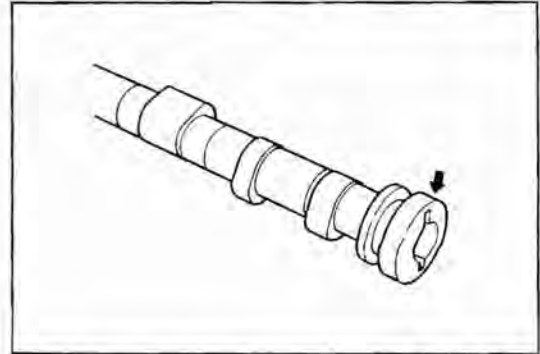


WR88-EM395

- (5) Inspection of groove for driving distributor
Visually inspect to see if any damage is present at the groove for driving the distributor.
Replace the camshaft if the groove exhibits any damage.

NOTE:

If any damage is present, check the distributor side, too. (See page IG-26 or IG-42.)



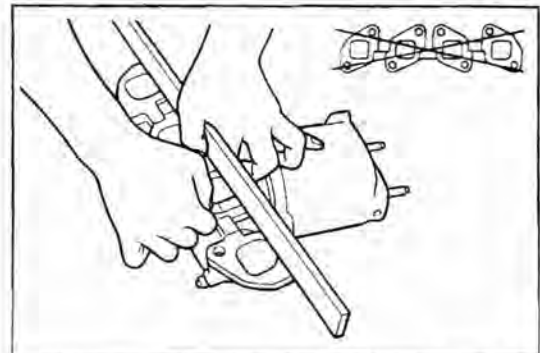
WR88-EM396

21. Inspection of manifold and surge tank

- (1) Check the cylinder head attaching surface of the exhaust manifold for warpage, using a straight edge and a thickness gauge.

Maximum Warpage: 0.1 mm (0.0039 inch)

If the warpage exceeds the maximum limit, replace the exhaust manifold No.1.

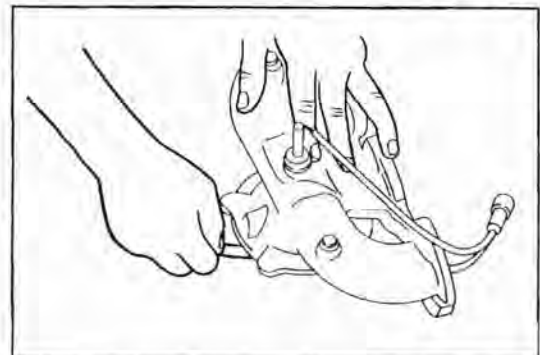


WR88-EM397

- (2) Disassemble the exhaust manifolds No.1 and No.2. Check the contact surface of the exhaust manifold No.1 with the exhaust manifold No.2 for warpage, using a surface plate and a thickness gauge.

Maximum Warpage: 0.1 mm (0.0039 inch)

If the warpage exceeds the maximum limit, replace the exhaust manifold No.1.

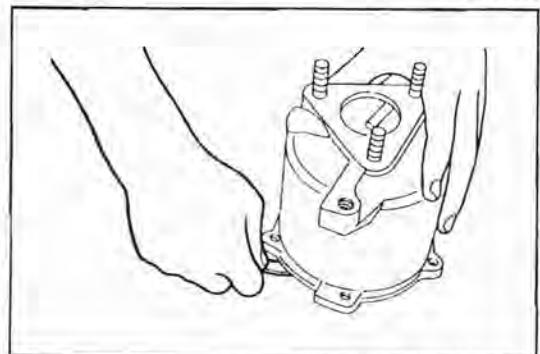


WR88-EM398

- (3) Check the contact surface of the exhaust manifold No.2 with the exhaust manifold No.1 for warpage, using a surface plate and a thickness gauge.

Maximum Warpage: 0.1 mm (0.0039 inch)

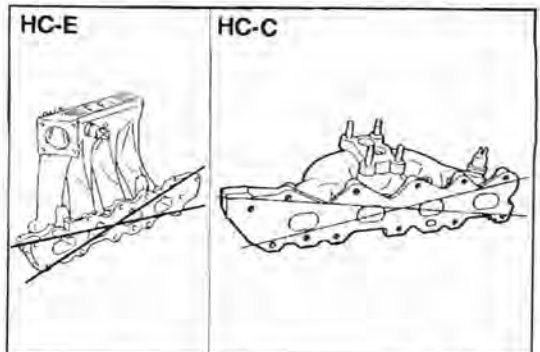
If the warpage exceeds the maximum limit, replace the exhaust manifold No.2.



WR88-EM399

- (4) Check the contact surface of the intake manifold with the cylinder head.

Maximum Warpage: 0.1 mm (0.0039 inch)



WR88-EM400

22. Check the valve spring seats, valve spring retainers and valve retainer locks for damage and cracks.
If any damage is present, replace such faulty parts.

ASSEMBLY OF CYLINDER HEAD

(See page EM-53.)

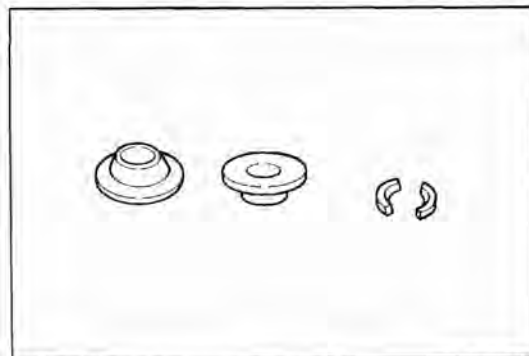
NOTE:

- (1) Thoroughly clean all parts to be assembled.
 - (2) Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
 - (3) Replace all gaskets and oil seals with new ones.
1. Assembly of cylinder head (When new cylinder head is installed:)
- When new cylinder head is installed, spark plug tubes and a heater outlet tube have been furnished separately. Assemble these parts, following the procedure given below.
- (1) Wash the cylinder head in cleaning solvent and dry it with compressed air.
 - (2) Apply a thin film of the Three Bond 1377B to the cylinder head attaching surfaces for the spark plug tubes.
 - (3) With a wooden piece or the like placed on the upper end of the spark plug tube, drive the spark plug tube to the cylinder head in such an extent that the distance between the spark plug tightening surface and the upper end of the spark plug tube becomes 139 mm (5.57 inch).

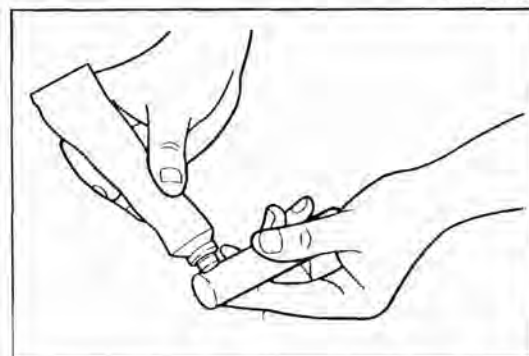
NOTE:

- Be very careful not to drive the spark plug too deeply.
- Be very careful not to damage the upper end of the spark plug tube.
- When driving the spark plug tube into position, make sure that the tube will not tilt in relation to the cylinder head tube hole.

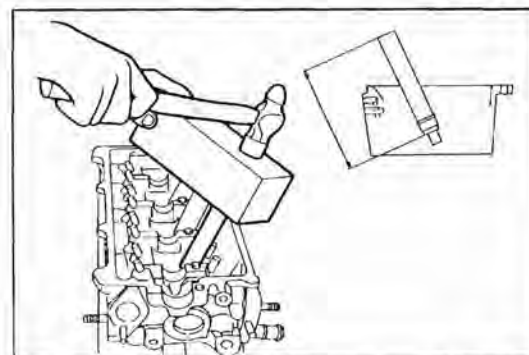
- (4) Put a mark at a point 45.0 ± 1.0 mm (1.772 ± 0.039 inch) from the forward end of the heater outlet tube.



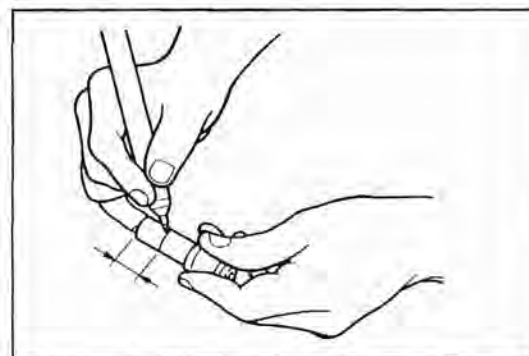
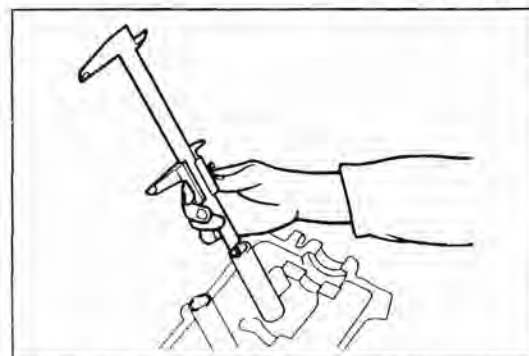
WR88-EM401



WR88-EM404

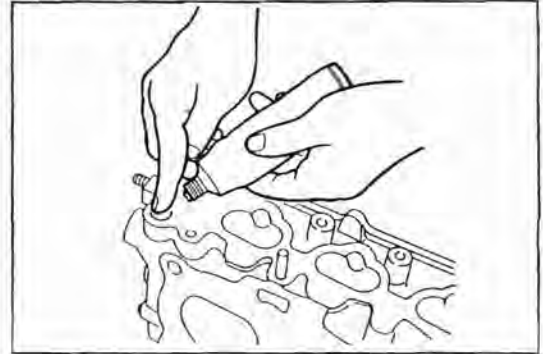


WR88-EM405



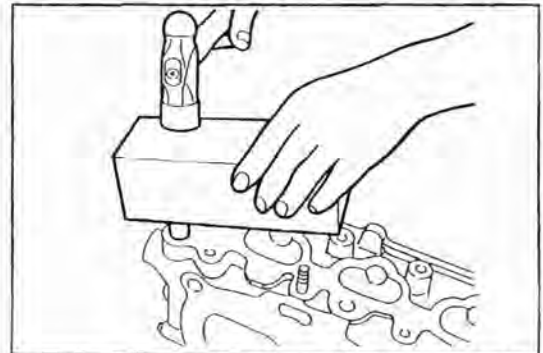
WR88-EM406

(5) Apply a thin film of the Three Bond 1377B to the attaching section for the heater outlet tube on the cylinder head.



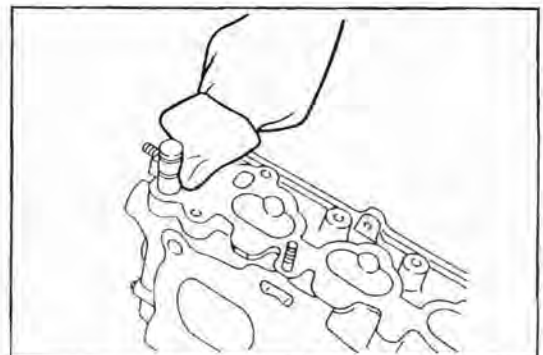
WR88-EM407

(6) With a wooden piece interposed, drive the heater outlet tube to the point marked in Step (4).



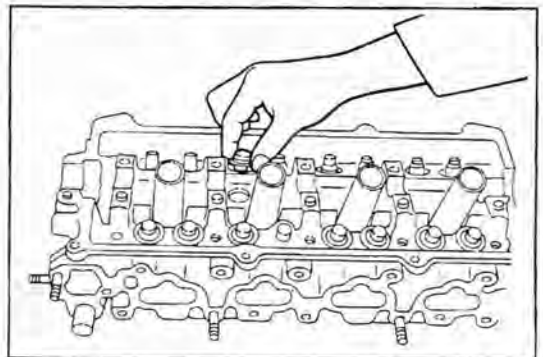
WR88-EM408

(7) After completion of the operation, remove any oozed bond, wooden chips and so forth.



WR88-EM409

2. Install the valve spring seats to the cylinder head.



WR88-EM410

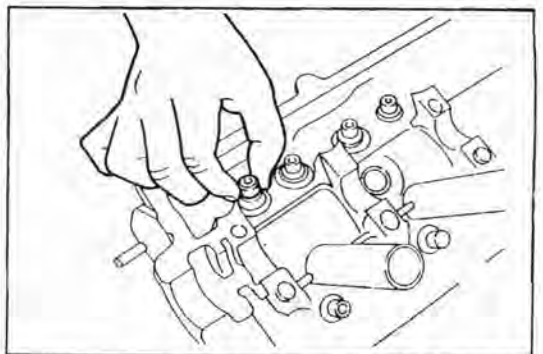
3. Installation of valve stem oil seal

(1) Apply engine oil to the bore of the valve stem oil seal.

(2) Drive the valve stem oil seal into the valve stem guide bush by hand.

NOTE:

- When driving the oil seal, make sure that the oil seal is not tilted.
- Do not reuse any oil seal which was tilted or driven diagonally.
- Hold the frame of the oil seal. Do not touch the rubber section of the oil seal.

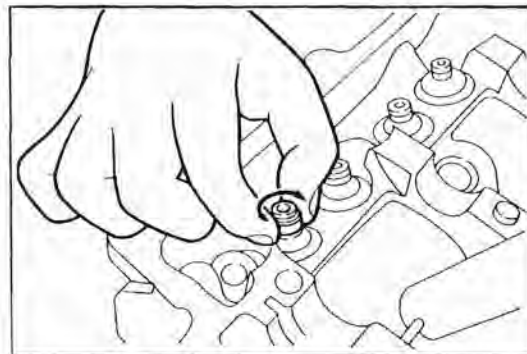


WR88-EM411

(3) Turn the oil seal slightly by hand to see if it can be turned.

NOTE:

- Never rotate the oil seal more than one turn, because excessive turning may cause scratches on the oil seal.
- If the oil seal can not be turned by hand, it means that the oil seal has been tilted, driven diagonally or press-fitted improperly.
- Do not reuse any oil seal which was tilted or driven diagonally.



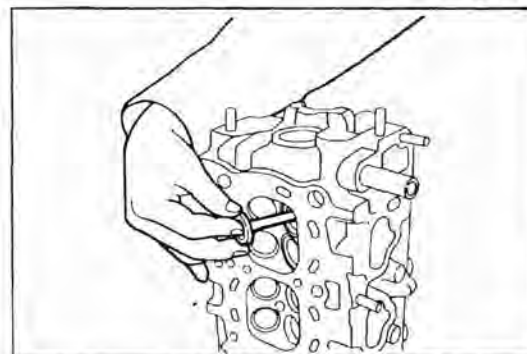
WR88-EM412

4. Apply oil to the valve stem. Install the valve to the cylinder head.

NOTE:

Care must be exercised as to the installing position. Do not pull out the valve once it has been inserted.

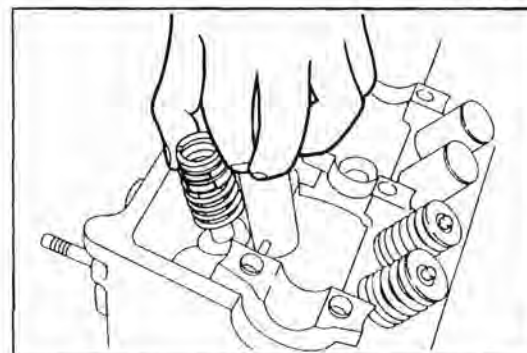
If the inserted valve should be pulled out, replace the valve stem oil seal.



WR88-EM413

5. Assembly of valve springs, valve spring retainers and valve spring retainer locks

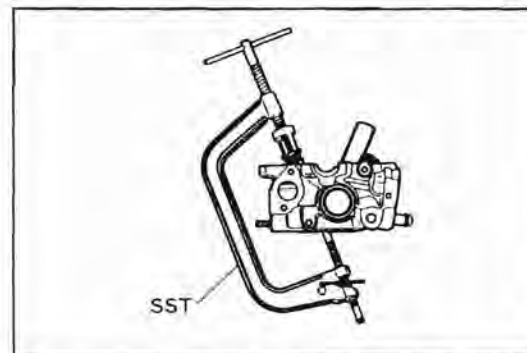
(1) Assemble the valve spring in such a way that the painted side (the side having a larger pitch) comes at the valve spring retainer.



WR88-EM414

(2) Install the valve spring retainer to the valve spring. Install the valve spring retainer locks while compressing the valve spring retainer, using the following SST.

SST: 09202-87002-000

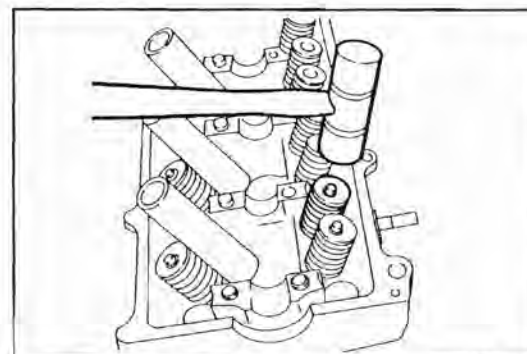


WR88-EM415

(3) After installing the valve spring retainer lock, lightly tap the valve spring retainer with a hammer or the like so as to ensure that the valve spring retainer locks are installed securely.

WARNING

- During this operation, care must be exercised to ensure that the valve spring retainer or retainer locks may not be jumped out.
- Protect your eyes with safety goggles during this operation.

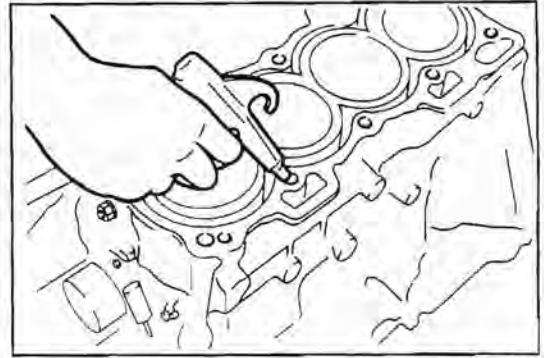


WR88-EM416

6. Clean the cylinder block head bolt holes.

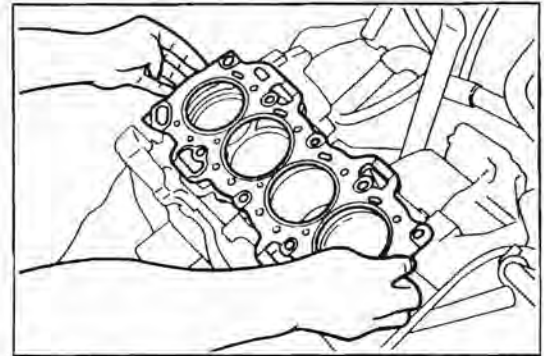
WARNING:

Protect your eyes with goggles when using compressed air.



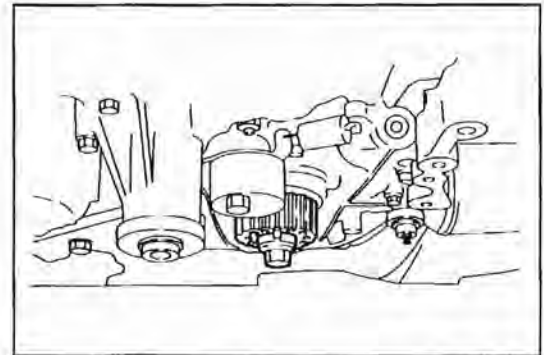
WR88-EM417

7. Clean the cylinder block upper gasket surface. Install the cylinder head gasket, while aligning it with the pin ring for locating use.



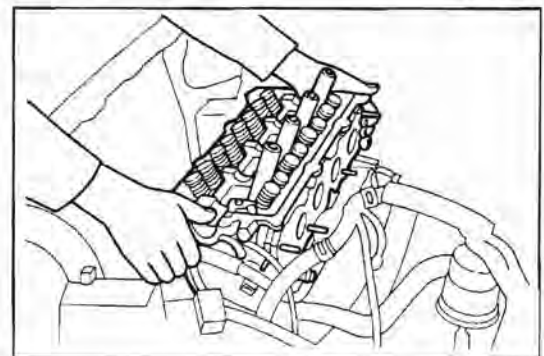
WR88-EM418

8. Turn the crankshaft so that the crankshaft key groove may come at the top position.



WR88-EM419

9. Install the cylinder head on the cylinder block.



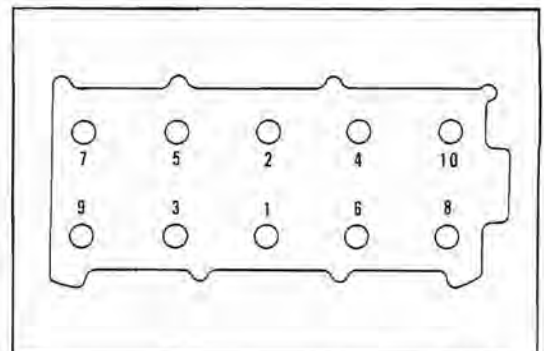
WR88-EM420

10. Coat each cylinder head bolt with a thin film of engine oil. Using these bolts, install the cylinder head to the cylinder block. Tighten the bolts evenly over two or three stages, following the sequence shown in the right figure.

Tightening Torque: 5 - 6 kg-m (36.2 - 43.4 ft-lb)

NOTE:

- Failure to tighten the bolts evenly may cause cracks and distortion of the cylinder head, even leading to engine seizure.
- Make sure that all the bolts are torqued uniformly to a constant level, not only they are torqued within the specified range.



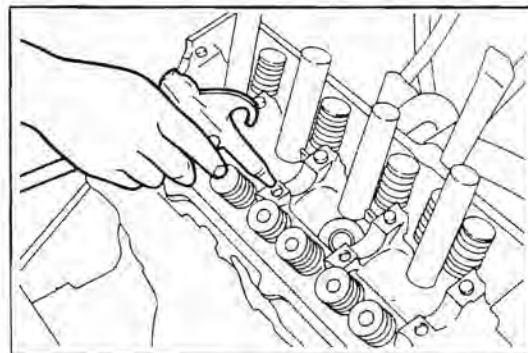
WR88-EM421

11. Installation of camshaft and rocker shafts

- (1) Wash and dry the holes for the camshaft cap attaching bolts.

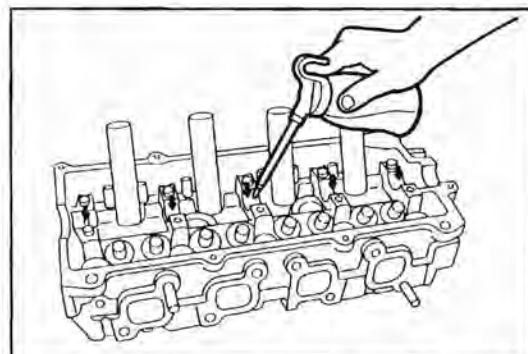
CAUTION:

When using compressed air, protect your eyes with safety goggles.



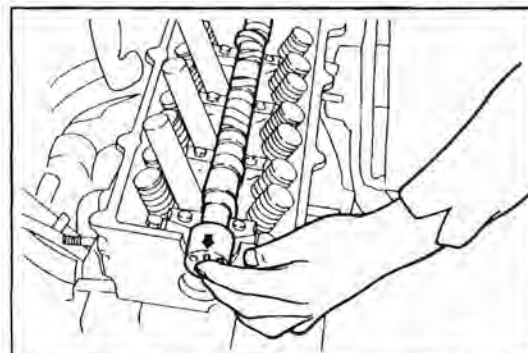
WR88-EM422

- (2) Liberally apply engine oil to the journal sections and thrust bearing sections.



WR88-EM423

- (3) Assemble the camshaft on the cylinder head in such a way that the locating pin for the camshaft timing belt pulley comes exactly at the top position.



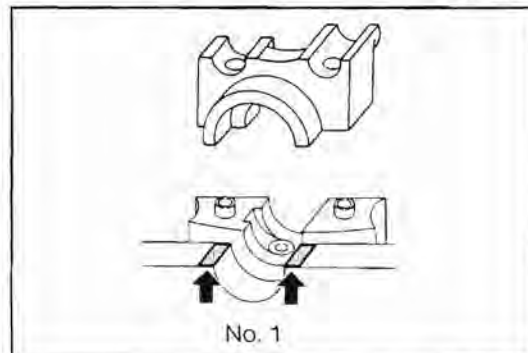
WR88-EM424

- (4) Apply the Three Bond 1104 to the camshaft cap No.1 attaching section of the cylinder head at those points shown in the right figure.

* Apply engine oil to the camshaft journal section.

NOTE:

Be very careful not to allow any oil to flow into the bearing cap attaching holes.

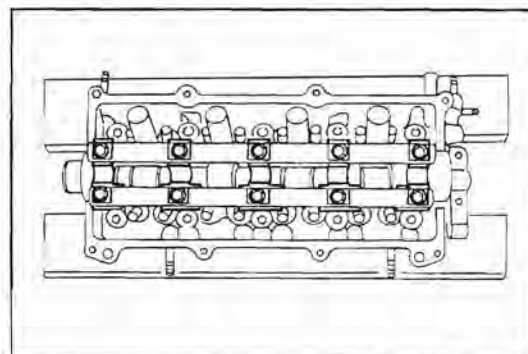


WR88-EM425

- (5) Install the camshaft bearing caps in the sequence of embossed figures on the caps.

NOTE:

Before the camshaft bearing caps are installed, wipe off any bond oozed from the camshaft cap No.1.

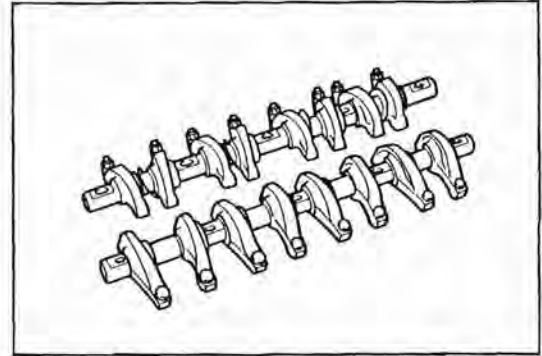


WR88-EM426

- (6) Assemble the valve rocker arms and wave washers onto the valve rocker shaft, while applying engine oil liberally as shown in the right figure.

NOTE:

- The intake valve rocker shaft can be identified by the recessed sections on it.

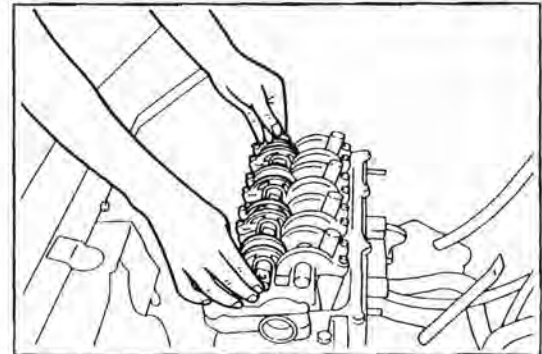


WR88-EM427

- (7) Install the valve rocker shaft on the camshaft caps.

NOTE:

For easier installation, it is advisable to insert the rocker arm first to the camshaft cap side.



WR88-EM428

- (8) Clean the attaching bolts and dry them with compressed air. Install them to the cylinder head through the rocker shafts and camshaft caps. Tighten the bolts evenly over two or three stages to the specified torque.

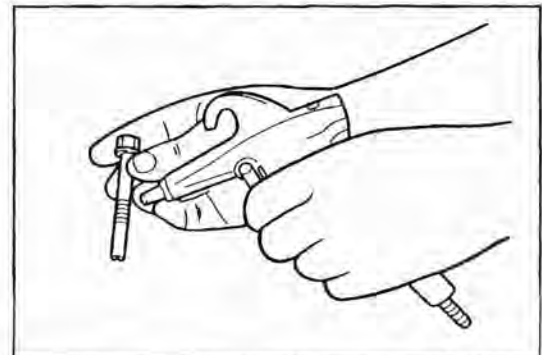
Tightening Torque:

M10 bolt 3.7 kg-m (26.7 ft-lb)

M8 bolt 1.7 kg-m (12.29 ft-lb)

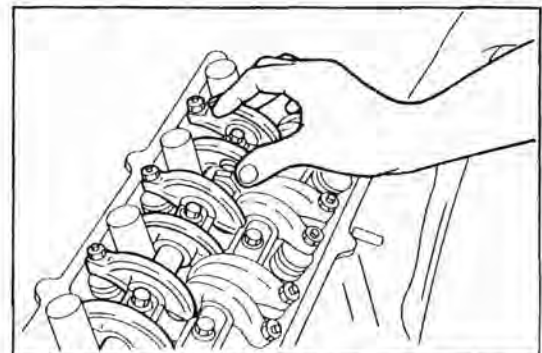
CAUTION:

- Never exceed the specified tightening torque.
- The bolts and bolt holes should be dry when tightening the bolts.
- When using compressed air, protect your eyes with safety goggles.



WR88-EM429

12. Install the spacers into between the intake valve rocker arms on the rocker shaft.



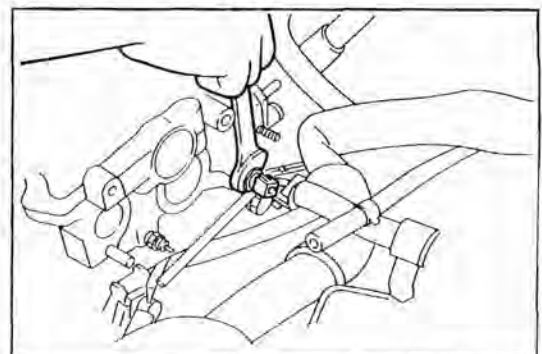
WR88-EM430

13. Clean the threaded portion of the water temperature sensor. Wind seal tape around the threaded portion and install the sensor to the cylinder head. (HC-E engine only)

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

NOTE:

When using a new water temperature sensor, seal tape is unnecessary since seal material is coated on the water temperature sensor.



WR88-EM431

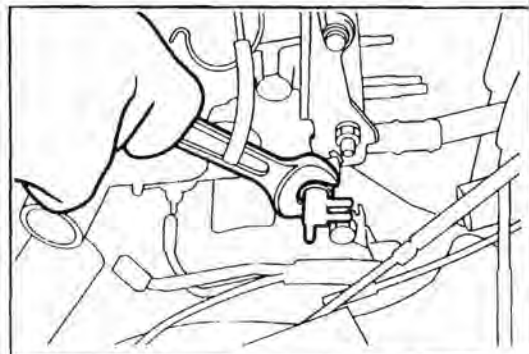
14. Clean the threaded portion of the BVSV. Wind seal tape around the threaded portion and install the BVSV to the cylinder head.

(HC-C engine only)

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

NOTE:

When using a new BVSV, seal tape is unnecessary since seal material is coated on the BVSV.



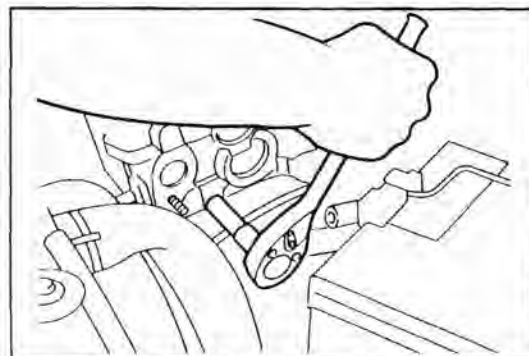
WR88-EM432

15. Clean the threaded portion of the water temperature sender gauge. Wind seal tape around the threaded portion. Tighten the gauge to the cylinder head, using the long box wrench.

Tightening Torque: 1.2 - 2.0 kg-m (8.7 - 14.5 ft-lb)

NOTE:

When using a new sender gauge, seal tape is unnecessary since seal material is coated on the sender gauge.

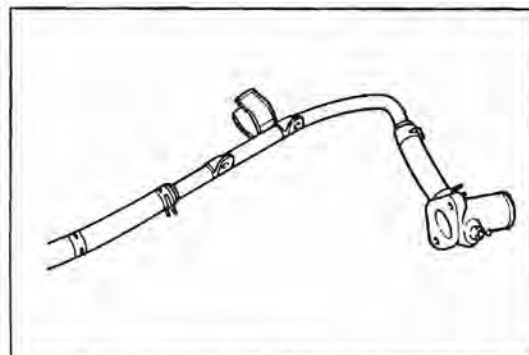


WR88-EM433

16. Connect the by-pass hoses and by-pass pipe to the water outlet.

NOTE:

Care must be exercised to ensure that the hose installed on the cylinder head may not be twisted.

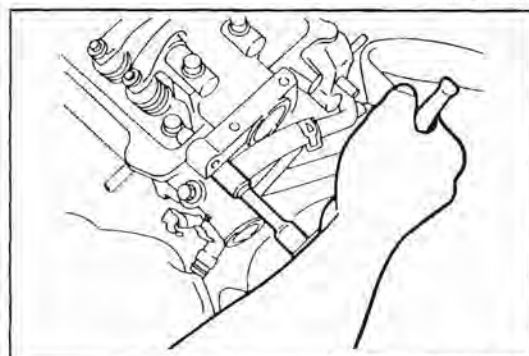


WR88-EM434

17. Install the water outlet with the gasket interposed.

NOTE:

Tighten the oxygen sensor connector clamp, too, at the stud bolt side. (HC-E engine only)



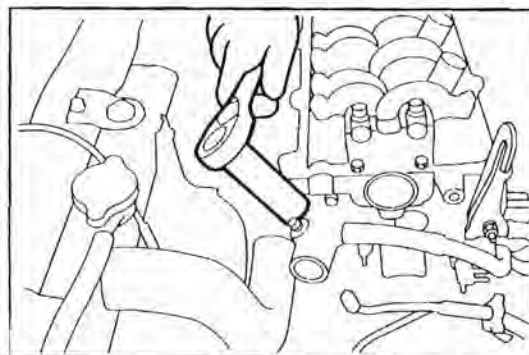
WR88-EM435

18. Wind seal tape around the threaded portion of the water temperature switch (for choke warning). Install the water temperature switch to the cylinder head (The HC-C engine with ECE & EEC specifications).

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

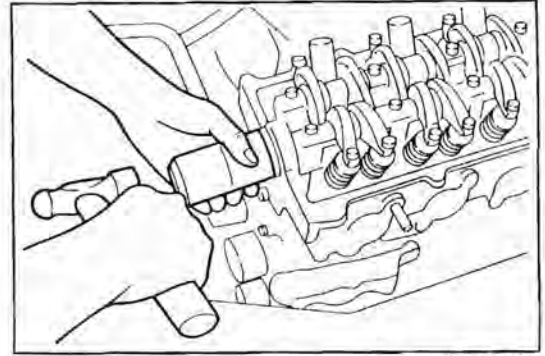
NOTE:

When using a new water temperature switch, seal tape is unnecessary since seal material is coated on the switch.



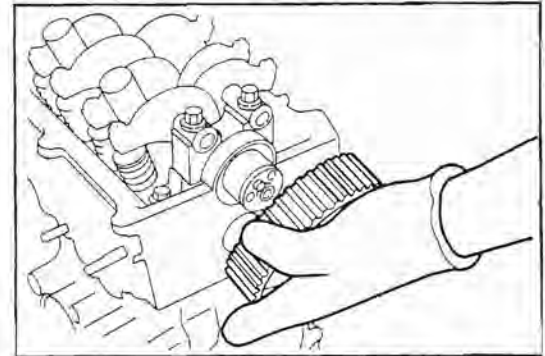
WR88-EM436

19. Apply engine oil to the bore of the type T oil seal for the camshaft. Drive the oil seal into position, using the following SST.
SST: 09636-20010-000



WR88-EM437

20. Install the camshaft timing belt pulley in such a way that it is aligned with the locating pin of the camshaft and the "F" mark can be seen from the timing belt side.



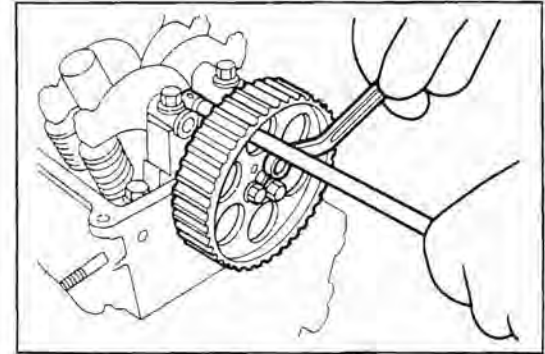
WR88-EM438

21. Attach the attaching bolts of the camshaft timing belt pulley. Tighten the attaching bolt while preventing the camshaft timing belt pulley from turning by means of a suitable iron rod.

Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)

NOTE:

- Do not turn the camshaft independently.
- Be very careful not to damage the cylinder head cover gasket surface.
- The bolts and bolt holes should be dry during the tightening.

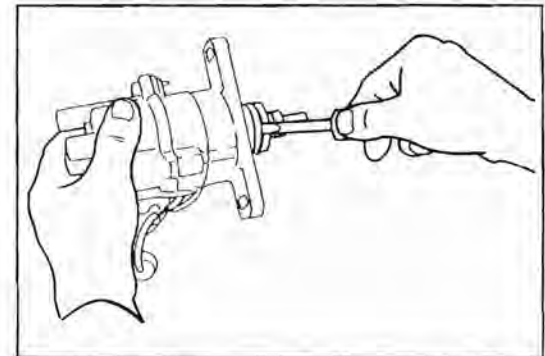


WR88-EM439

22. Replace the "O" ring of the distributor body with a new one.

NOTE:

Care must be exercised to avoid scratching the new "O" ring.

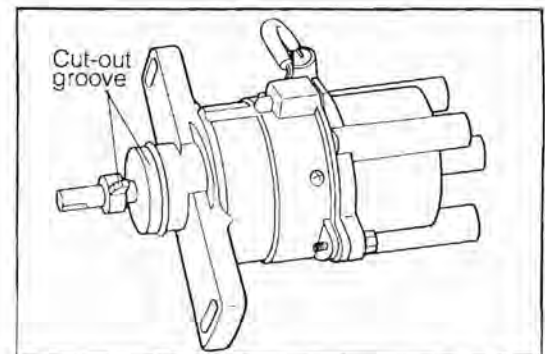


WR88-EM440

23. Align the cut-out section of the distributor proper with the cut-out groove of the cup ring. Assemble the distributor on the cylinder head, lining up the protrusion of the distributor with the camshaft groove. During this installation, the aligned cut-out sections must come at the top side of the engine.

NOTE:

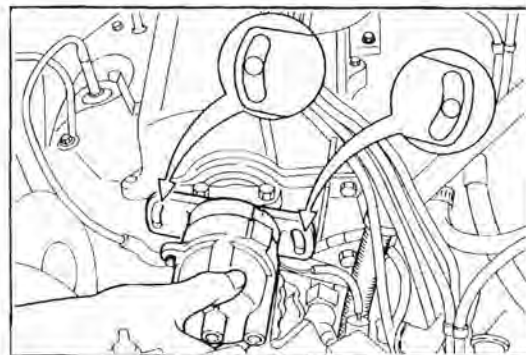
Apply oil to the "O" ring.



WR88-EM441

24. With the center of each elongated hole on the flange section of the distributor proper aligned with the corresponding threaded hole of the cylinder head, tighten the distributor attaching bolts.

Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)



WR88-EM442

25. Connect the distributor connector, the water temperature sender gauge and the water temperature sensor connector.

NOTE:

Connection of the water temperature switch connector is performed only for ECE & EEC specifications.

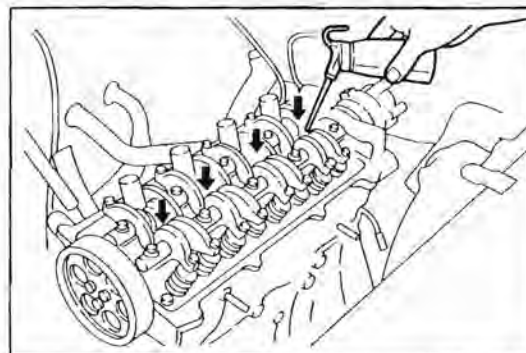
WR88-EM443

26. Fill 30 cc (1.83 cub inch) of engine oil to the oil well of each cylinder of the cylinder head.

27. Install the exhaust manifold gasket on the cylinder head.

NOTE:

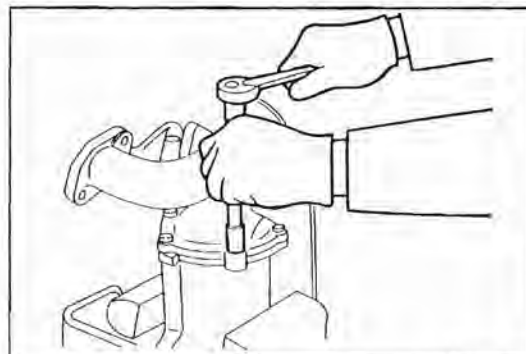
The exhaust manifold gasket should be installed in such a direction that the side where the grommet turned-out section is bulged may come at the exhaust manifold.



WR88-EM444

28. Connect the exhaust manifold No.2 to the exhaust manifold No.1, with a new cushion interposed.

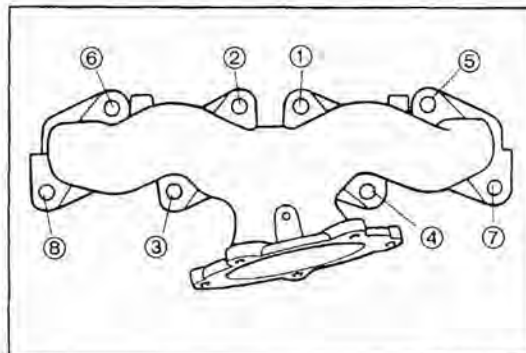
Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.7 ft-lb)



WR88-EM445

29. Install the exhaust manifold to the cylinder head. Tighten the attaching bolts evenly over two or three stages, following the sequence in the right figure.

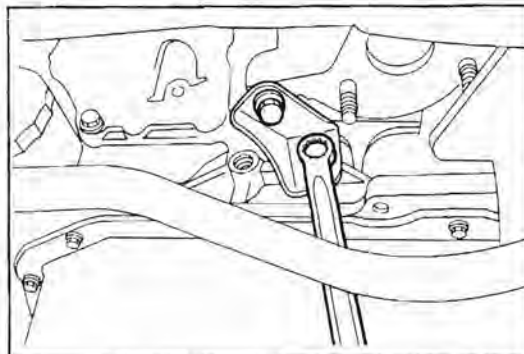
Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EM446

30. Install the exhaust manifold stay to the cylinder block exhaust manifold No.2 and tighten the attaching bolts.

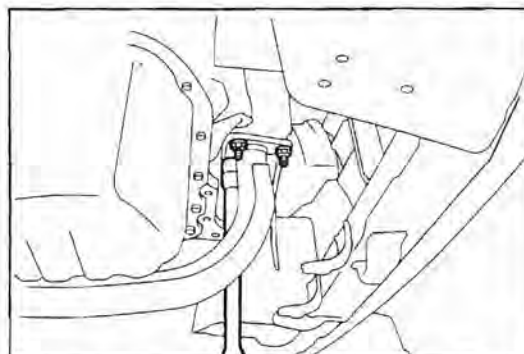
Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EM447

31. Connect the exhaust pipe to the exhaust manifold No.2 with a new gasket interposed. Then, tighten the attaching nuts.

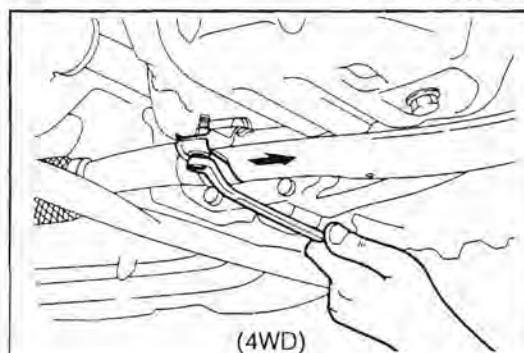
Tightening Torque: 3.0 - 5.0 kg-m (21.7 - 36.2 ft-lb)



WR88-EM448

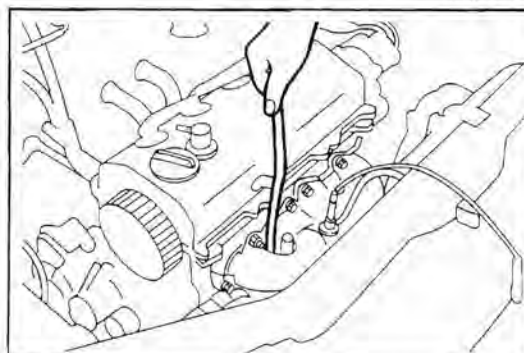
32. Install the exhaust clamp and tighten the clamp bolts.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.7 ft-lb)



WR88-EM449

33. Replace the "O" ring of the oil level gauge guide with a new "O" ring. Insert the oil level gauge guide into the cylinder block.

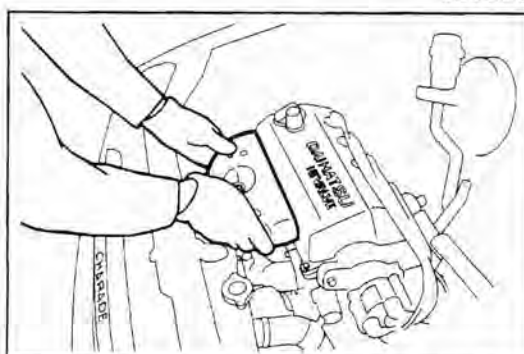


WR88-EM450

34. Install the exhaust manifold cover and tighten the attaching bolts.

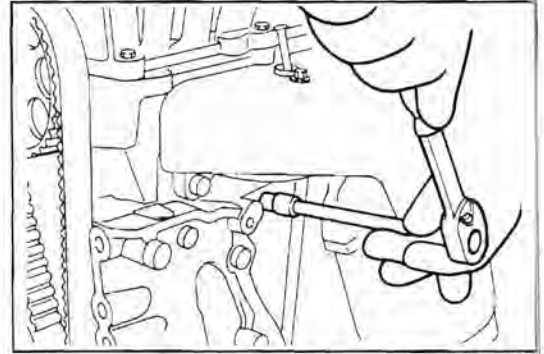
NOTE:

The exhaust manifold of the type HC-C engine is 3-split type.



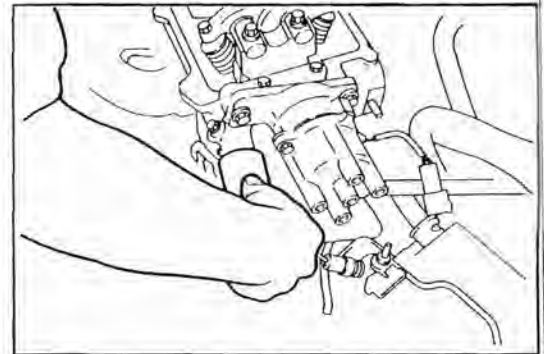
WR88-EM451

35. Install the oil level gauge guide to the cylinder block.
36. Install the oil level gauge.



WR88-EM452

37. Connect the water outlet hose to the water outlet. Install the hose band.

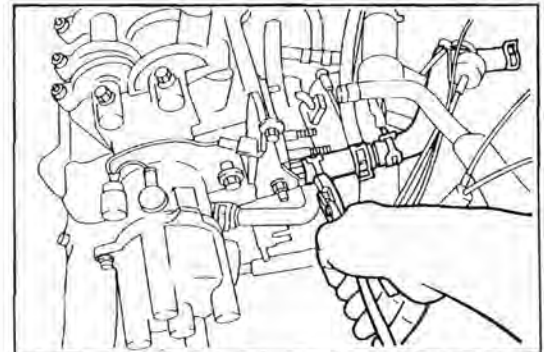


WR88-EM453

INSTALLATION OF INTAKE MANIFOLD SIDE PARTS

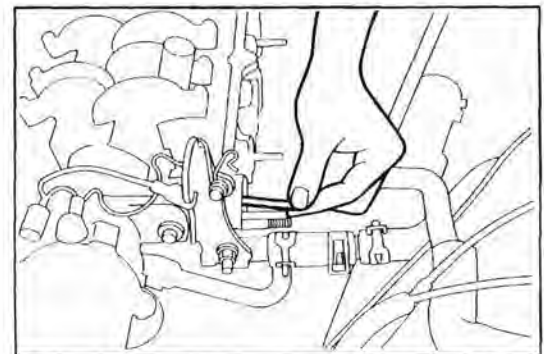
[HC-C engine]

1. Connect the heater inlet hose to the cylinder head. Attach the hose bands.



WR88-EM454

2. Installation of fuel pump
 - (1) Apply engine oil to the fuel pump rod. Insert it into the cylinder head.



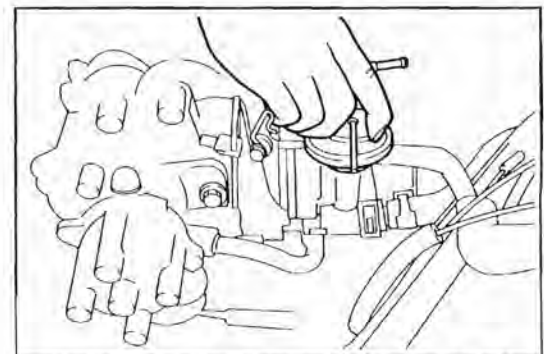
WR88-EM455

- (2) Install the fuel pump to the cylinder head with a new fuel pump insulator interposed.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

NOTE:

Be careful to install the insulator in the correct assembly direction. Failure to observe this caution will fail to assemble the insulator because it will interfere with other parts.

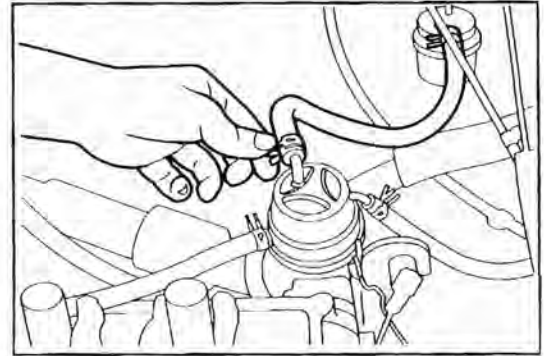


WR88-EM456

- (3) Connect the fuel hose to the fuel pump. Attach the hose bands.

NOTE:

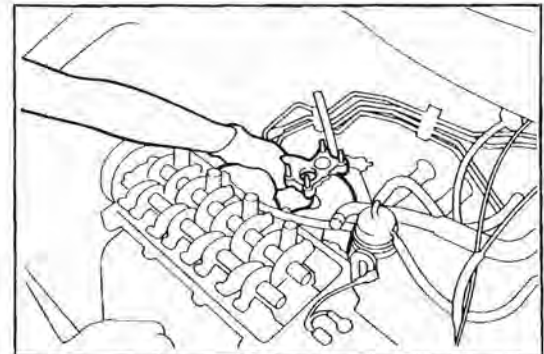
The knobbed section of the hose clip for the fuel hose between the fuel pump and the carburetor should be faced downward.



WR88-EM457

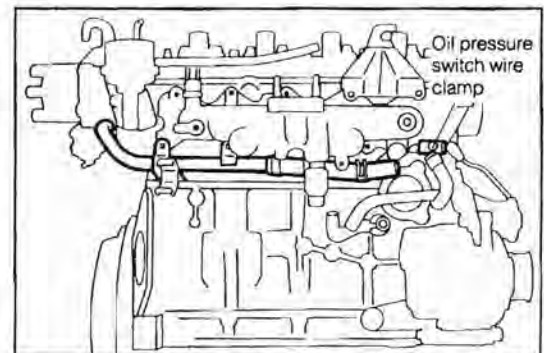
3. Installation of intake manifold

- (1) Attach the intake manifold to the cylinder head with a new gasket interposed.



WR88-EM458

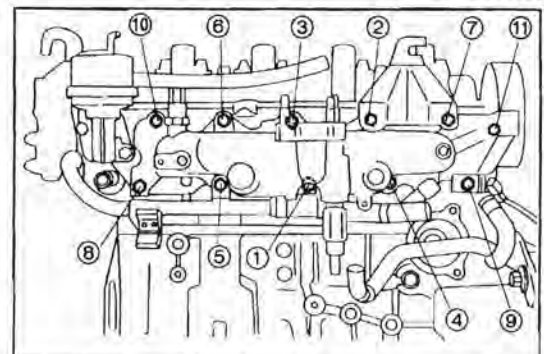
- (2) Install the water by-pass pipe to the stud bolt of the cylinder head, as shown in the right figure.
 (3) Install the oil pressure switch wire clamp to the stud bolt, as shown in the right figure.
 (4) Install the throttle cable bracket to the position shown in the right figure and tighten it temporarily.
 (A/T vehicle only)



WR88-EM459

- (5) Tighten the intake manifold attaching bolts and nuts evenly to the specified torque over two or three stages in the sequence as indicated in the right figure.

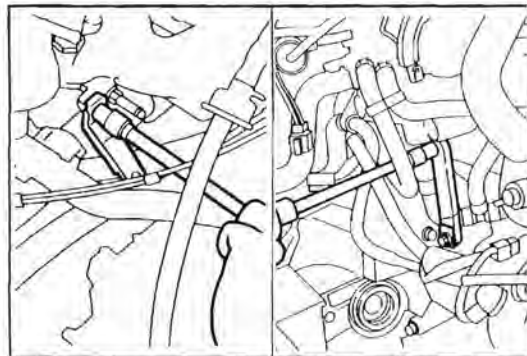
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



WR88-EM460

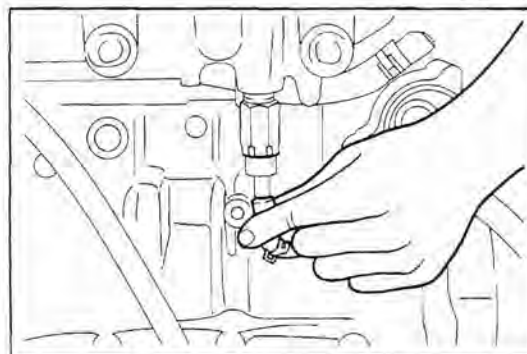
4. Install the intake manifold stay.

5. Install the engine wire clamp stay to the intake manifold.



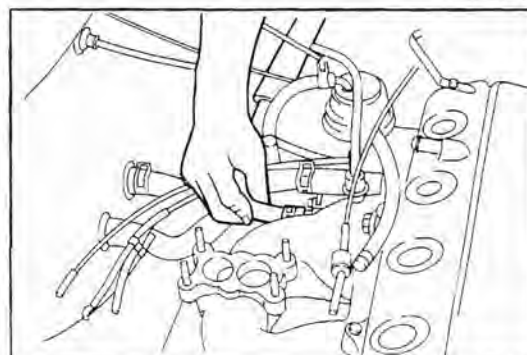
WR88-EM462

6. Connect the water hose to the thermo valve. Attach the hose bands.



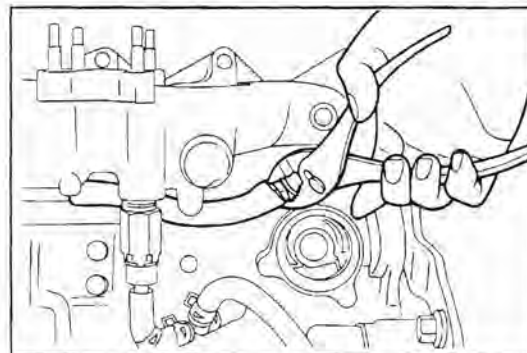
WR88-EM463

7. Connect the booster hose to the intake manifold in such a way that the arrow mark of the booster hose faces the intake manifold side.



WR88-EM464

8. Connect the by-pass hose to the intake manifold. Attach the hose bands.



WR88-EM465

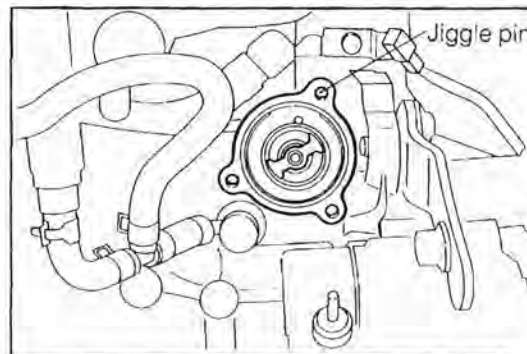
9. Installation of water inlet
(1) Install the thermostat to the cylinder block in such a way the jiggle pin of the thermostat comes exactly at the top of the engine.

NOTE:

Be very careful not to damage the gasket section.

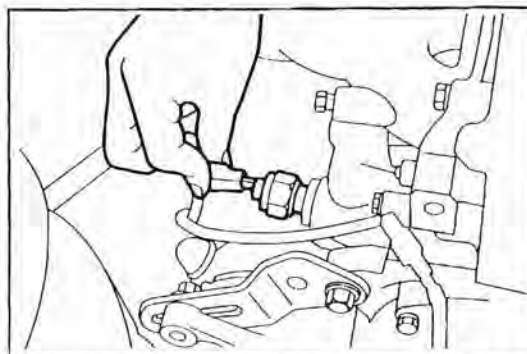
- (2) Install the water inlet to the cylinder block.

Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5 ft-lb)



WR88-EM466

(3) Connect the thermo control switch connector.



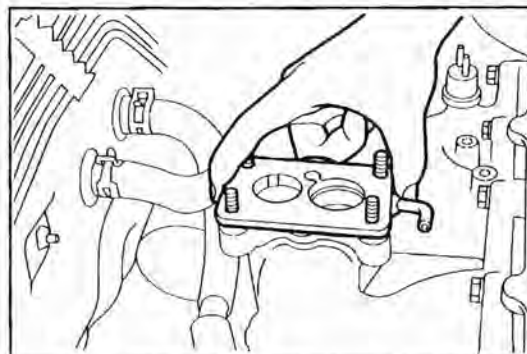
WR88-EM467

10. Install the carburetor heat insulator to the intake manifold.

NOTE:

Be very careful not to damage the gasket.

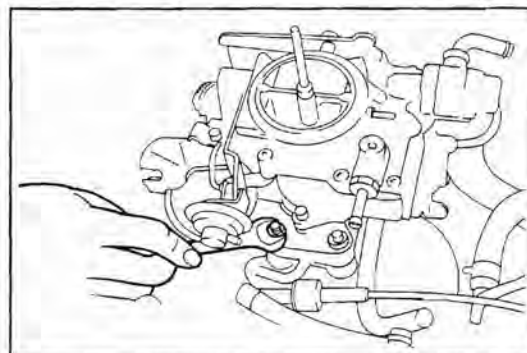
Replace the heat insulator with a new part if the gasket exhibits damage.



WR88-EM468

11. Install the carburetor to the intake manifold.

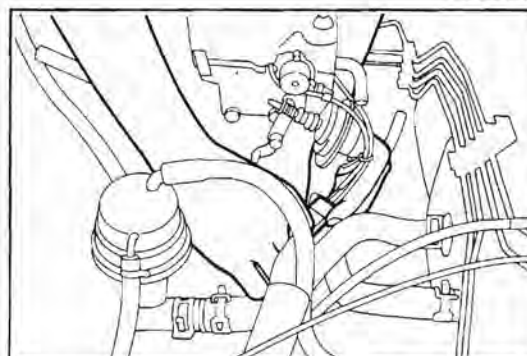
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



WR88-EM469

12. Connection of connectors

- (1) Connect the throttle position sensor connector.
(A/T vehicle only)
- (2) Connect the connectors of the solenoid valve and outer vent valve.

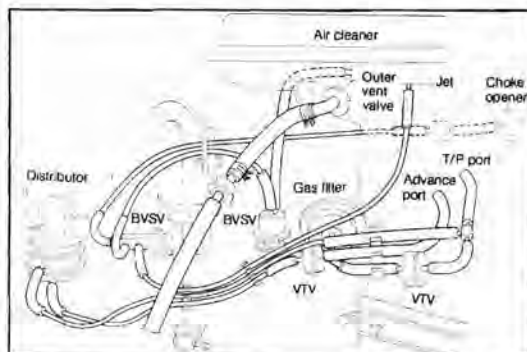


WR88-EM470

13. Connection of vacuum hoses

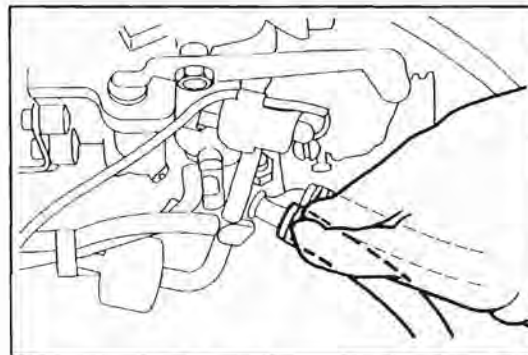
Connect the vacuum hose, as shown in the right figure.

- Outer vent hose to outer vent
- Choke opener to BVSV
- Carburetor to BVSV
- Dashpot to carburetor
- Vacuum hose to gas filter
- Vacuum hose to distributor



WR88-EM471

14. Connect the hot water circulating hose to the carburetor. Attach the hose bands.

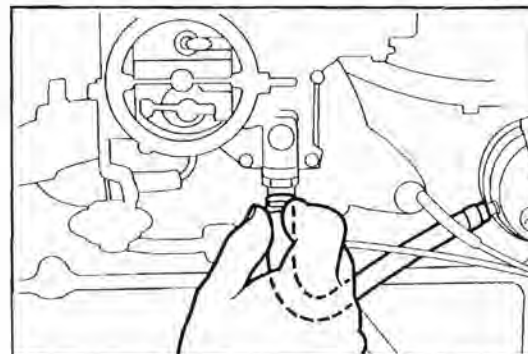


WR88-EM472

15. Connect the fuel hose to the carburetor. Attach the hose bands.

NOTE:

Install the hose band in such a way that its knobbed section faces downward.

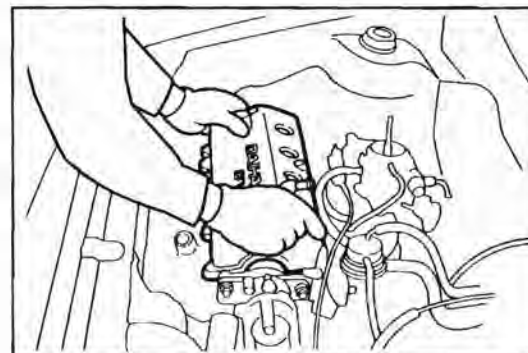


WR88-EM473

16. Install the cylinder head cover to the cylinder head temporarily.

NOTE:

- Be very careful not to scratch the rubber grommet for spark plug tube during the installation.
- Care must be exercised to ensure that the rubber grommet will not ride over the spark plug tube.

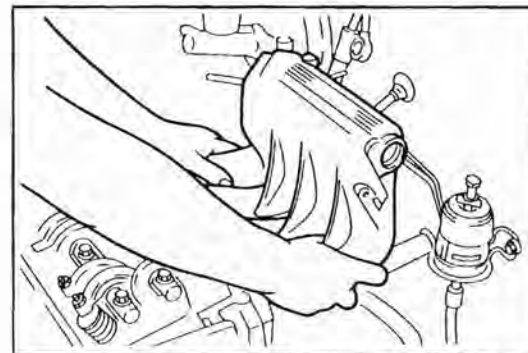


WR88-EM474

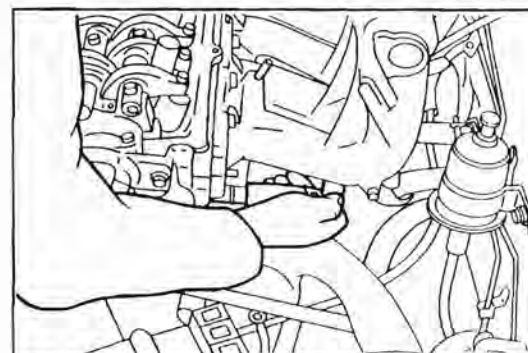
INSTALLATION OF INTAKE MANIFOLD SIDE PARTS

[HC-E engine]

1. Install the intake manifold to the cylinder head with a new intake manifold gasket interposed.
2. Connect the heater inlet hose to the cylinder head and attach the hose band.

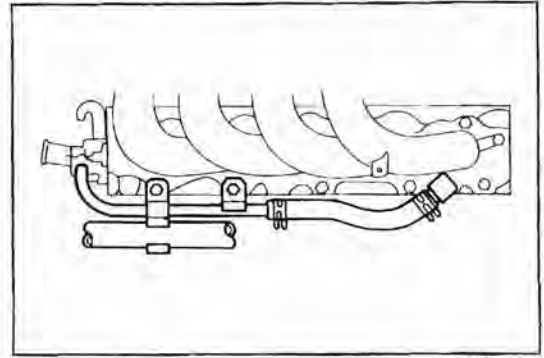


WR88-EM475



WR88-EM476

3. Install the water by-pass pipe to the stud bolt for intake manifold installation use, as shown in the right figure.



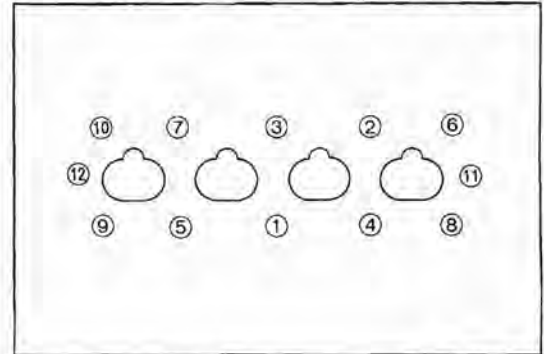
WR88-EM477

4. Tighten the attaching bolts and nuts of the intake manifold evenly over two or three stages, following the sequence in the right figure.

Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)

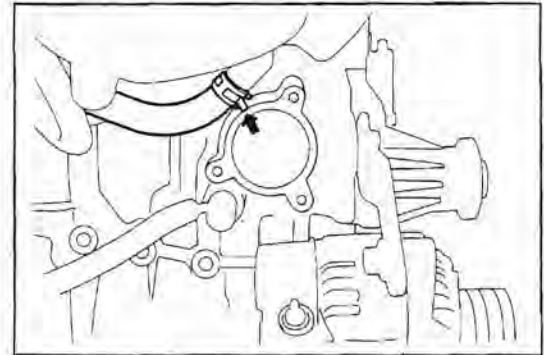
NOTE:

Do not install the nut bearing an asterisk "*" mark. Attach the wire harness clamp on the point with the asterisk "*" mark.



WR88-EM478

5. Connect the water by-pass inlet hose and attach the hose band.



WR88-EM479

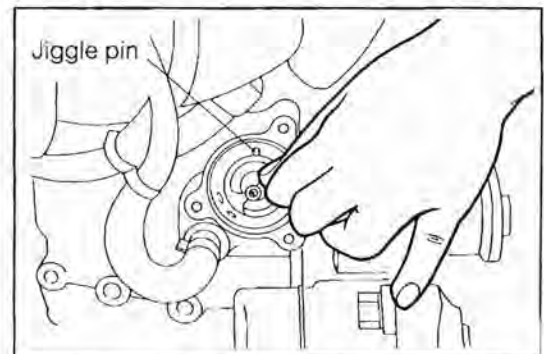
6. Install the thermostat in such a way that a jiggle pin of the thermostat comes exactly at the top position of the engine. Install the water inlet.

Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5 ft-lb)

NOTE:

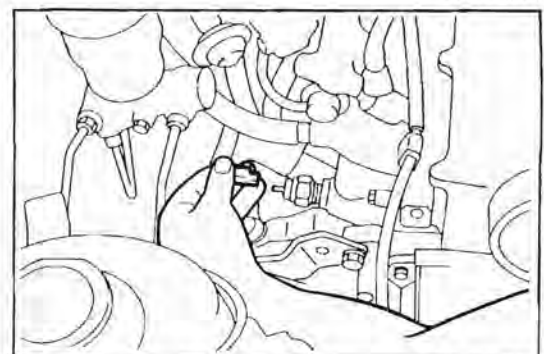
Make sure that the jiggle pin comes exactly above the engine during the thermostat installation.

Failure to observe this caution may cause overheating and/or engine seizure.



WR88-EM480

7. Connect the thermo control switch connector.

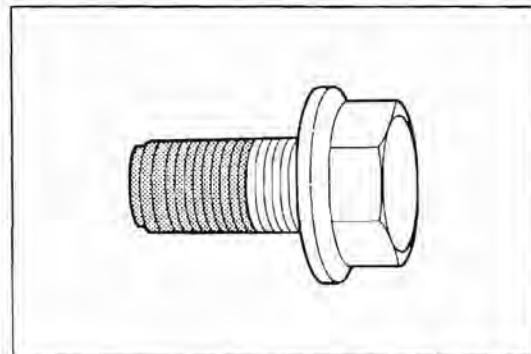


WR88-EM481

8. Clean the surge tank side attaching bolt of the surge tank stay No.3. Apply a thin film of the Three Bond 1104 to the threaded portion.

NOTE:

Be careful not to let the bond to stick to the bolt washer.



WR88-EM482

9. Install the engine hanger No.2 and surge tank stay No.3 to the stud bolt at the cylinder head transmission side. Install the surge tank stay No.3 to the surge tank side. Tighten the attaching nuts and bolts.

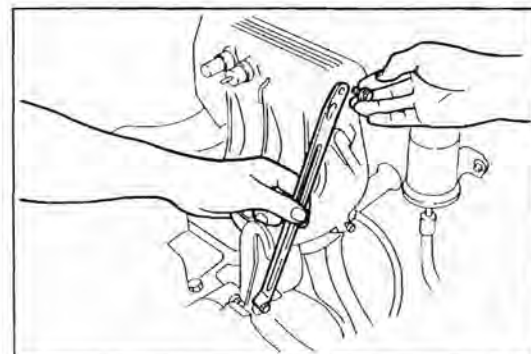
Tightening Torque:

Nut 1.9 - 3.1 kg-m (13.7 - 22.4 ft-lb)

Bolt 1.9 - 3.1 kg-m (13.7 - 22.4 ft-lb)

NOTE:

- Only for the manual transmission-equipped vehicles.
- On the 4WD vehicle, tighten the transmission bleeder hose clamp, too, at the cylinder head side.



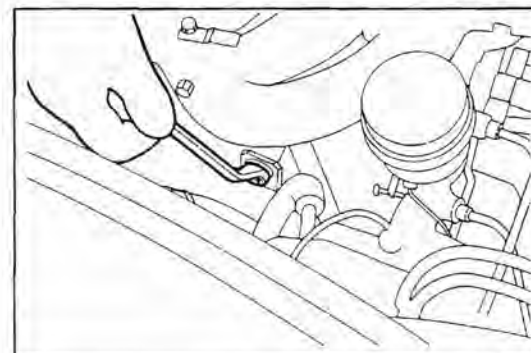
WR88-EM483

10. Fit the surge tank stay No.2 to the surge tank. Tighten the attaching bolt and nut.

Tightening Torque:

Bolt 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

Nut 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



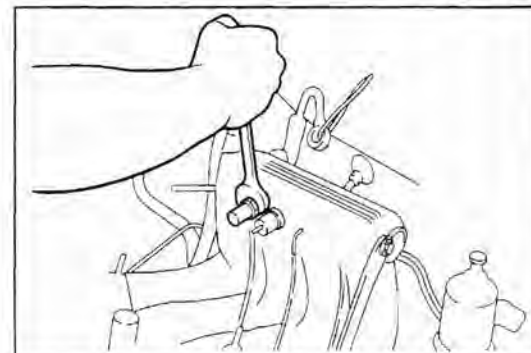
WR88-EM484

11. Install the intake air temperature sensor to the surge tank with a new washer interposed.

Tightening Torque: 3.0 - 4.0 kg-m (21.7 - 28.9 ft-lb)

NOTE:

This operation is required only when the intake air temperature sensor has been removed.



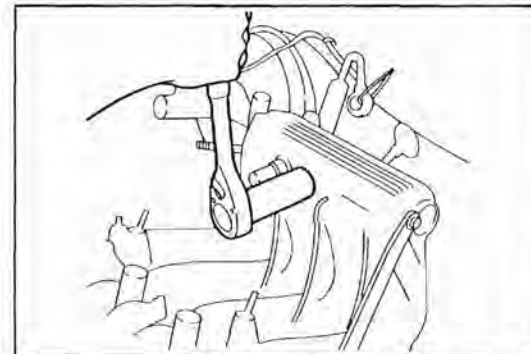
WR88-EM485

12. Clean the threaded portion of the gas filter. Wind seal tape around the threaded portion and install it to the surge tank.

Tightening Torque: 1.2 - 2.0 kg-m (8.7 - 14.5 ft-lb)

NOTE:

- This operation is required only when the gas filter has been removed.
- Use a hexagonal long box wrench for tightening.

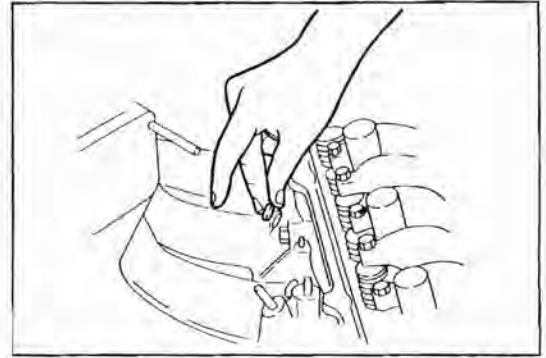


WR88-EM486

13. Install the injector vibration insulator to the intake manifold section.

CAUTION:

Prior to installation, check the insulator for damage and cracks. Replace any faulty insulator with a new part.

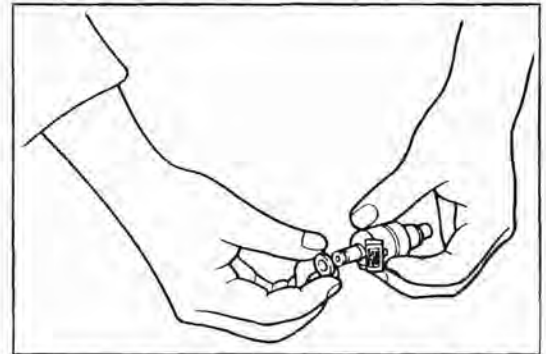


WR88-EM487

14. Remove the "O" ring of the injector. Remove the grommet and check it for damage or cracks.

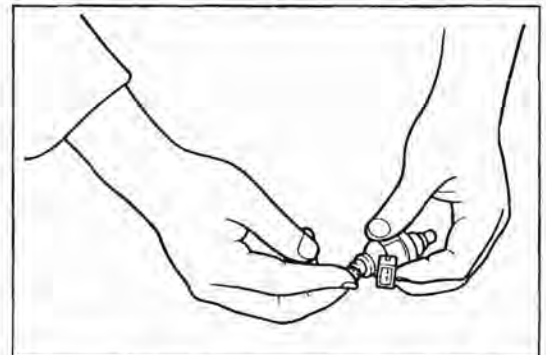
NOTE:

If the grommet exhibits any fault, replace it with a new one.



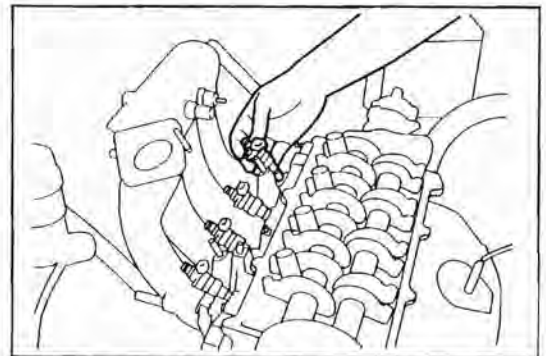
WR88-EM488

15. Install the grommet and new "O" ring to the injectors.



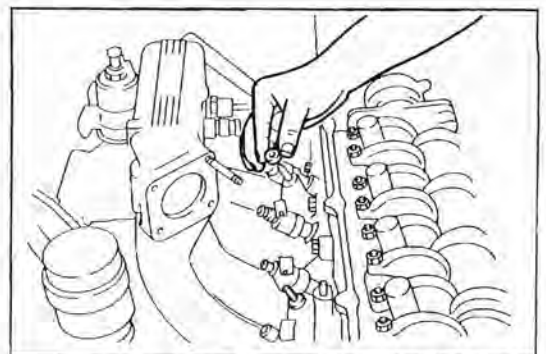
WR88-EM489

16. Insert the injector to the vibration insulator hole of the intake manifold.



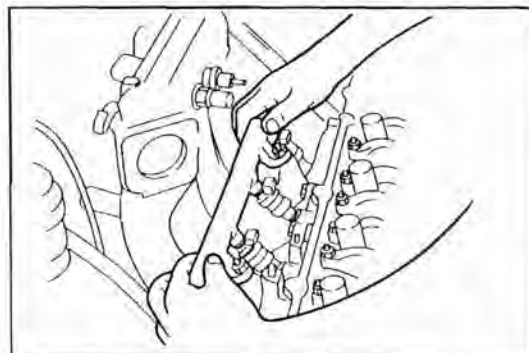
WR88-EM490

17. Install the delivery pipe insulator to the stud bolt of the intake manifold.



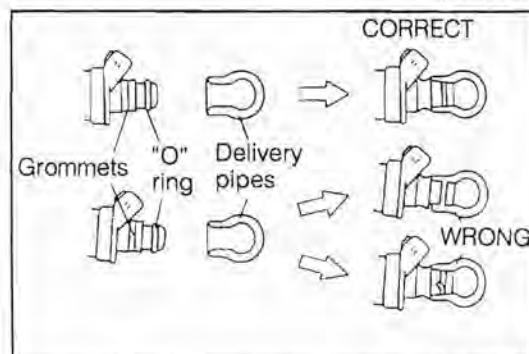
WR88-EM491

18. Apply gasoline or silicon oil to the "O" ring of the injector. Then, install the delivery pipe.



CAUTION:

- Be very careful not to damage the "O" ring of the injector during the delivery pipe installation.
- Do not install the delivery pipe diagonally to the injector.

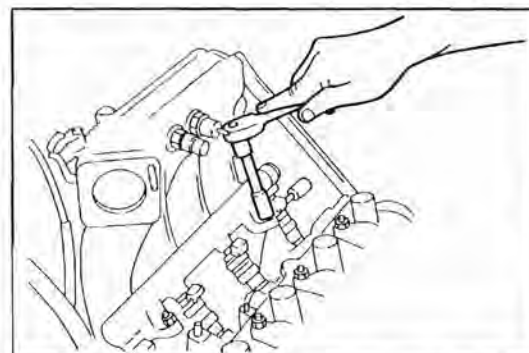


19. Tighten the attaching nuts of the delivery pipe.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

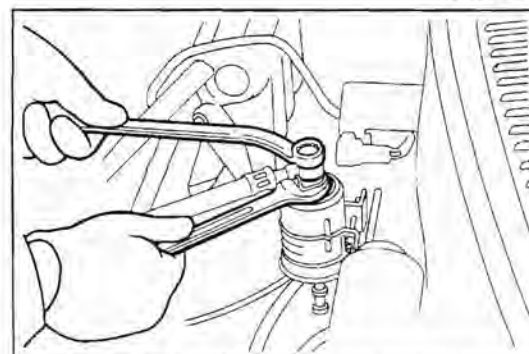
NOTE:

After tightening the delivery pipe, make sure that the injector can be turned by hand. If the injector can not be turned, it indicates probably a damaged injection "O" ring. Hence, replace the injector "O" ring with a new part.

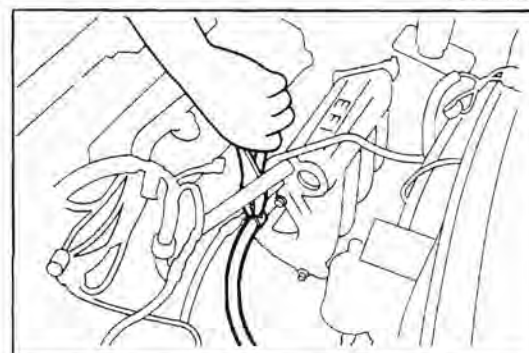


20. Install the fuel hose No.1 to the delivery pipe fuel filter with a new gasket interposed.

Tightening Torque: 3.5 - 4.5 kg-m (25.3 - 32.5 ft-lb)



21. Connect the fuel return hose to the pressure regulator. Connect the hose clamp.



22. Install the throttle body to the surge tank with a new gasket interposed. Install the surge tank stay No.1 to the throttle body intake manifold, using bolts and nuts.



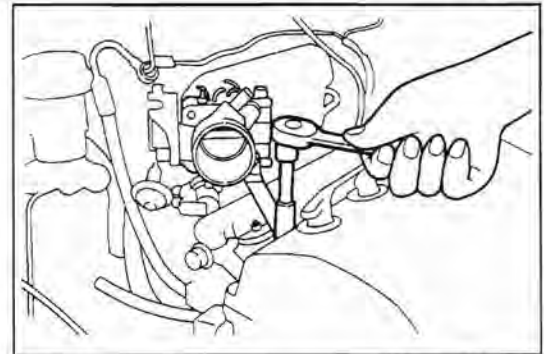
WR88-EM497

23. Tighten the attaching bolts and nuts of the throttle body and surge tank stay No.1.

Tightening Torque:

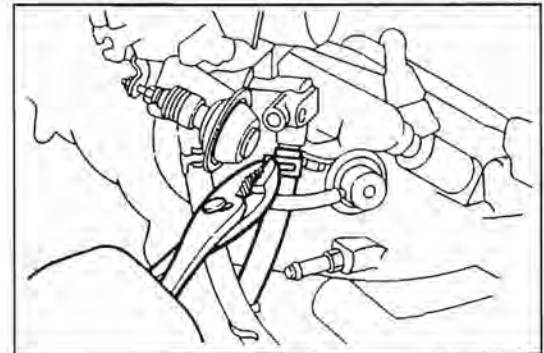
Bolt 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

Nut 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



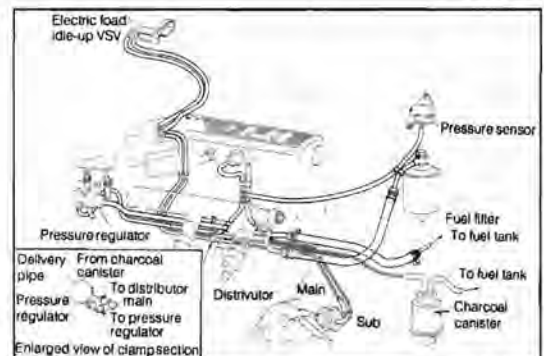
WR88-EM498

24. Connect the cooling water hoses to the throttle body.



WR88-EM499

25. Connect the vacuum hose as shown in the right figure. Connect the hose clamp between the delivery pipe and the pressure regulator.

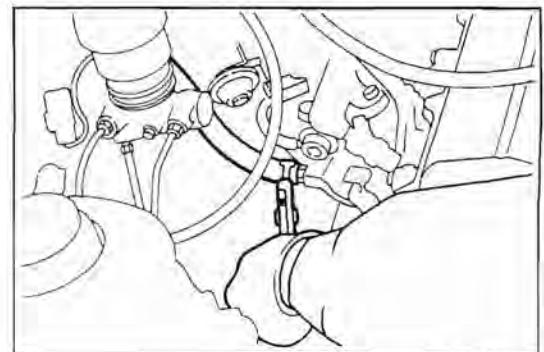


WR88-EM500

26. Connect the brake booster hose to the intake manifold.

NOTE:

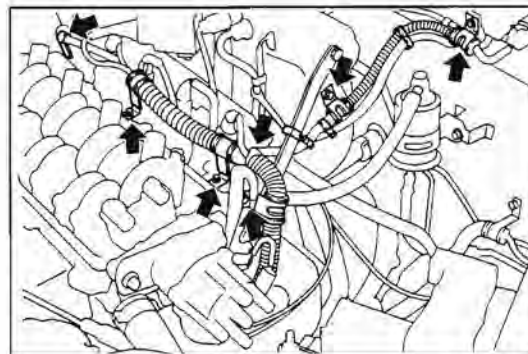
Connect the brake booster hose in such a way that the arrow-head faces toward the intake manifold side.



WR88-EM501

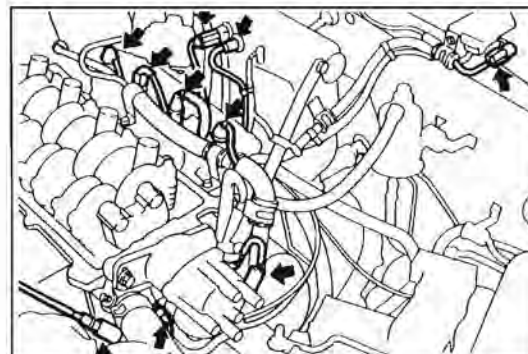
27. Connection of engine wire

- (1) Install the engine wire clamp, clamp bolt and ground cable.



- (2) Connect the following connectors.

- 1) Oxygen sensor connector
- 2) Water temperature sender gauge connector
- 3) Distributor connector
- 4) Cooling water temperature sensor connector
- 5) Injector connectors
- 6) Pressure sensor connector
- 7) Intake air temperature sensor connector
- 8) Throttle position sensor connector
- 9) A/C water temperature switch connector (Only for A/T and A/C equipped vehicles)



NOTE:

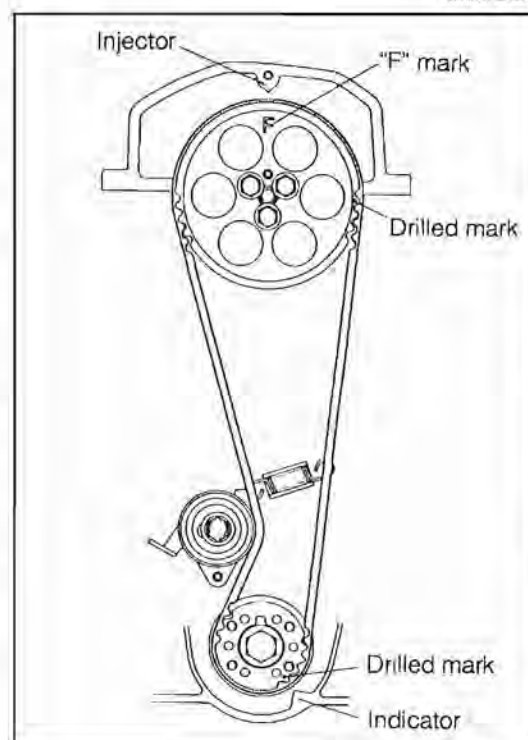
- Clamp the vacuum hose to the pressure sensor cord.
- Clamp the pressure sensor cord to the surge tank stay.

28. Temporarily install the cylinder head cover to the cylinder head.

INSTALLATION OF TIMING BELT

(See page EM 41 to 52.)

1. Install the timing belt tensioner and tensioner spring. Temporarily tighten them, while they are being pushed toward the alternator side.
2. Align the mating marks of the crankshaft timing belt pulley and camshaft timing belt pulley with the corresponding mating marks.
3. Install the timing belt.
4. Loosen the tensioner attaching bolt so that tension may be given to the belt. Then, temporarily tighten the attaching bolt again.
5. Turn the crankshaft 1.9 turns.
6. Loosen the tensioner attaching bolt.
7. Turn the crankshaft until the "F" mark of the camshaft is aligned with the indicator on the cylinder head cover.
8. Tighten the tensioner attaching bolt to the specified torque.
9. Remove the cylinder head cover.



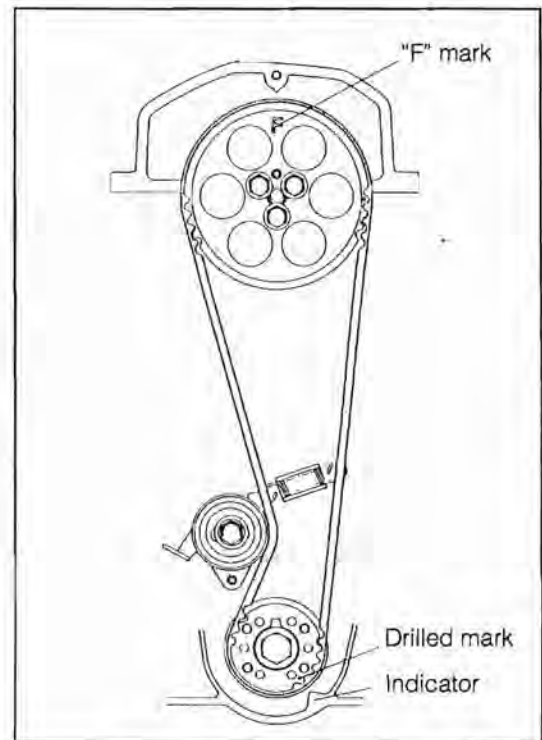
ADJUSTMENT AND INSTALLATION OF OTHER PART

1. Adjustment of Valve Clearances

NOTE:

When tightening the adjusting nuts, apply engine oil to the lock nuts, adjusting bolts and rocker arms.

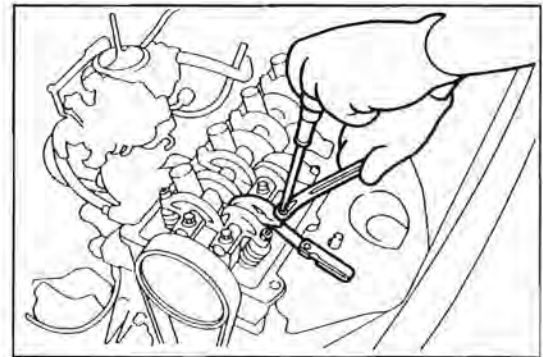
- (1) Align the drilled mark of the crankshaft timing belt pulley with the indicator mark of the oil pump.



WR88-EM506

- (2) Check to see if the valve rocker arms of the No. 1 cylinder are in a free state or they are pushed up by the cam. Adjust the valve clearances in accordance with the table below.

The "o" mark represents a valve which can be adjusted at that time.



WR88-EM507

Cylinder No.		1	2	3	4
Rocker arm condition					
When valve rocker arms of No. 1 cylinder are free: (Piston of No. 1 cylinder is at top dead center under compression stroke)	IN	O	O		
	EX	O		O	
When valve rocker arms of No. 4 cylinder are free: (Piston of No. 4 cylinder is at top dead center under compression stroke)	IN			O	O
	EX		O		O

Valve Clearance:

Intake 0.18 mm (0.0071 inch)

Exhaust 0.25 mm (0.0098 inch)

WR88-EM508

- (3) Turn the crankshaft 360 degrees. Adjust the valve clearances of the remaining valves.

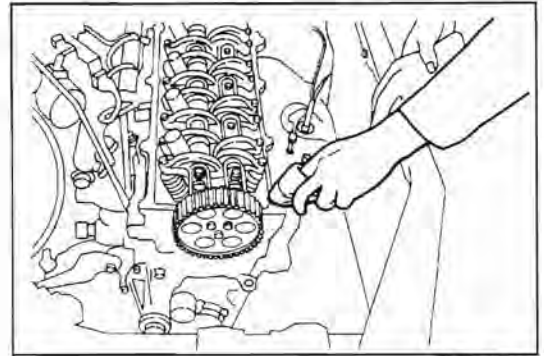
NOTE:

The valve clearances should be readjusted after the engine has been warmed up thoroughly.

WR88-EM509

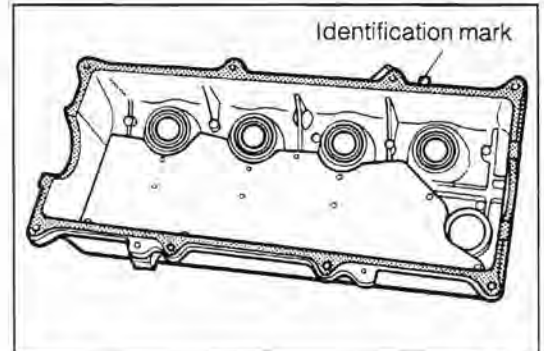
2. Installation of cylinder head cover

- (1) Clean the cylinder head gasket surface of the cylinder head.



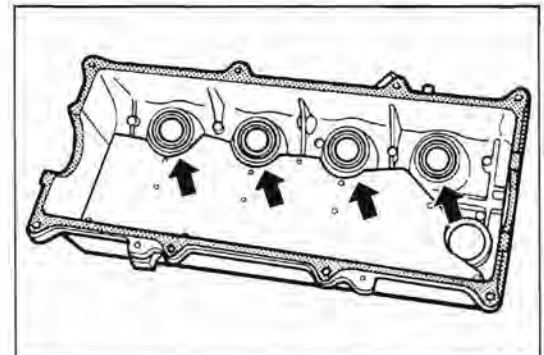
WR88-EM510

- (2) Check the cylinder head for damage.
Replace the cylinder head gasket, as required.
Assemble the cylinder head gasket with the identification mark facing toward the intake side.



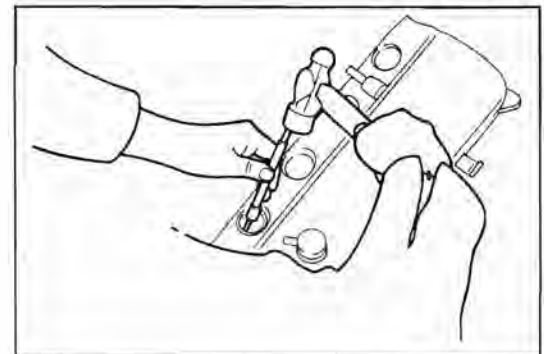
WR88-EM511

- (3) Check the rubber grommets of the spark plug tubes for damage.
Replace the rubber grommets, as required.



WR88-EM512

Replacement of rubber grommets
For removal operation, use a slotted pin puller.



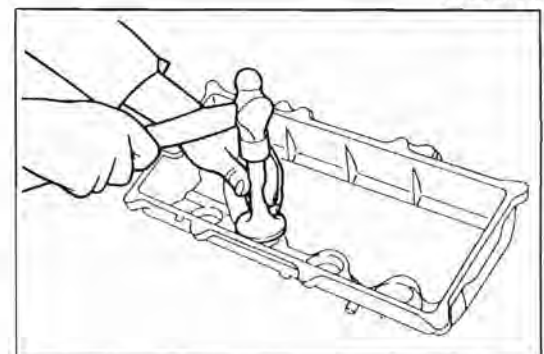
WR88-EM513

When installing the grommet, drive it into position, using the following SST.

SST: 09388-87702-000

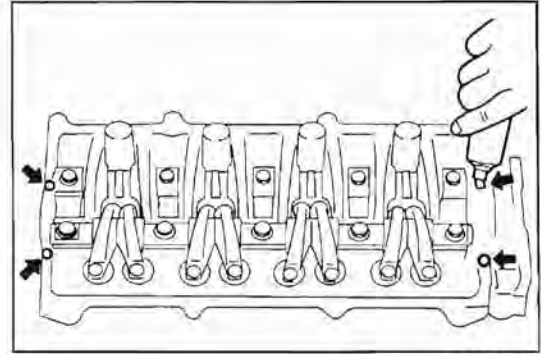
NOTE:

- Make sure that the grommet is not tilted when it is driven into position.
- Be sure to use a suitable wooden piece so as to prevent the cylinder head cover from damage.
- Be very careful not to damage the lip section of the grommet.



WR88-EM514

- (4) Apply the Three Bond 1104 to the cylinder head at points indicated in the figure.

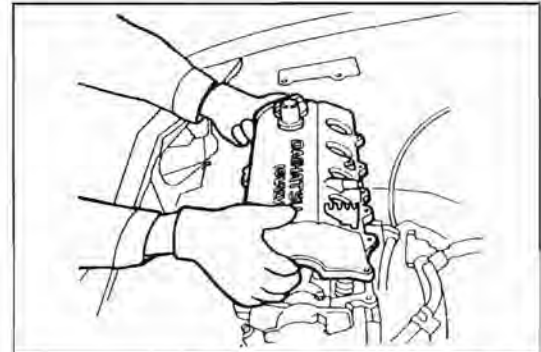


WR88-EM515

- (5) Install the cylinder head cover to the cylinder head.

NOTE:

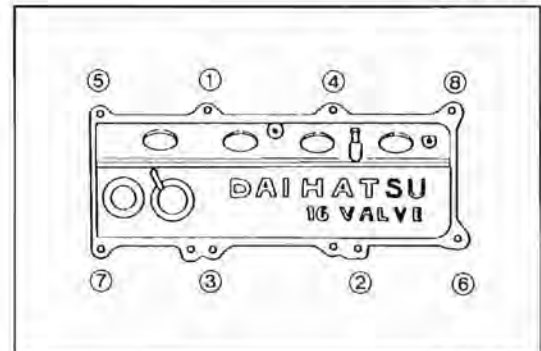
- Be very careful not to scratch the rubber grommet for the spark plug tube during the installation.
- Care must be exercised to ensure that the rubber grommet will not ride over the spark plug tube.



WR88-EM516

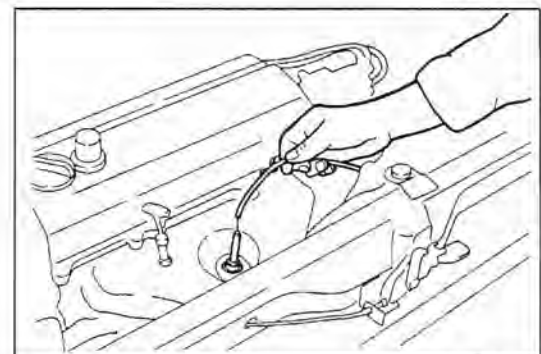
- (6) Tighten the cylinder head cover bolts evenly over two or three stages to the specified torque, following the sequence shown at the right figure.

Tightening Torque: 0.3 - 0.5 kg-m (21.7 - 36.1 ft-lb)



WR88-EM517

- (7) Install the oxygen sensor harness to the clamp.
(HC-E engine only)

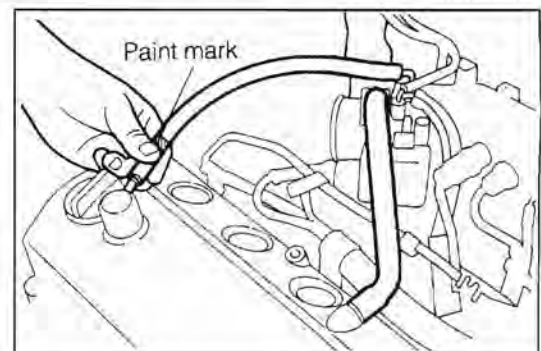


WR88-EM518

- (8) Connect the blow-by gas hoses to the cylinder head and throttle body.
(HC-E engine only)

NOTE:

Make sure to install the PCV hose in such a direction that its side bearing a paint mark may come at the cylinder head side.



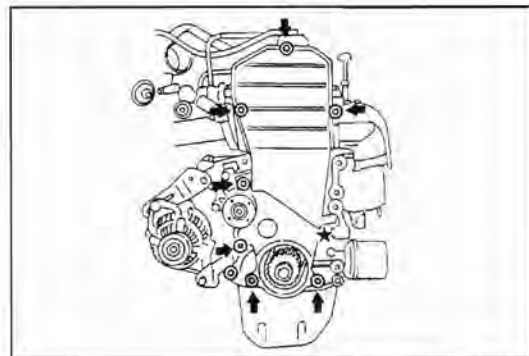
WR88-EM519

3. Install the timing belt cover.

Tightening Torque: 0.2 - 0.4 kg-m (1.5 - 2.8 ft-lb)

NOTE:

As for the section bearing the "*" mark, do not tighten the bolt.



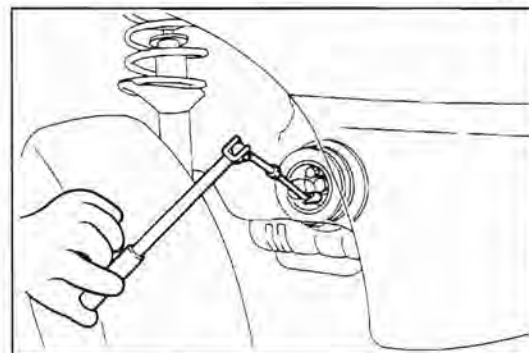
WR88-EM520

4. Install the crankshaft timing belt pulley.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.7 ft-lb)

NOTE:

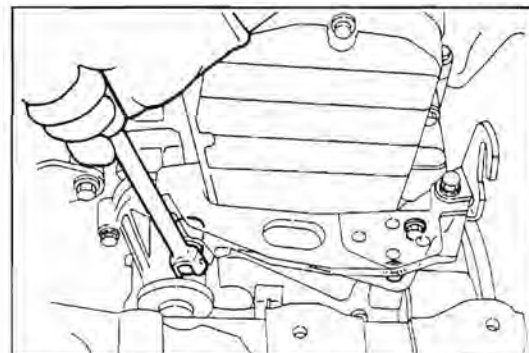
- Prevent the engine from turning by placing the shift lever in the four speed gear position.
- Special care must be exercised to get the specified tightening torque, for the crankshaft may turn slightly, while tightening.



WR88-EM521

5. Install the engine mounting front right bracket No.2.

Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM522

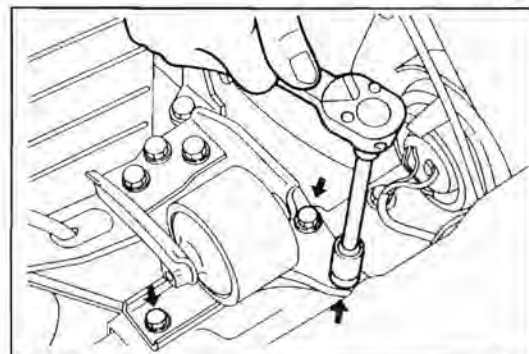
6. Install the engine mounting right bracket and engine mounting front insulator.

Tightening Torque:

Bolt 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)

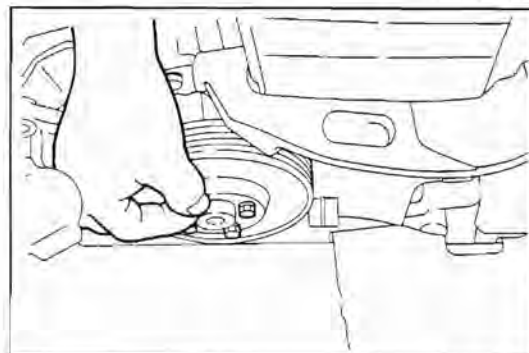
Nut 1.5 - 2.3 kg-m (10.8 - 16.6 ft-lb)

7. Remove the garage jack which is supporting the oil pan.



WR88-EM523

8. Temporarily attach the water pump pulley.

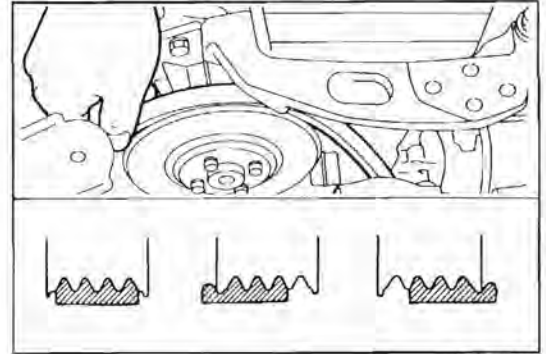


WR88-EM524

9. Install the V-ribbed belt. Adjust the belt tension.
(See page CH-6.)

NOTE:

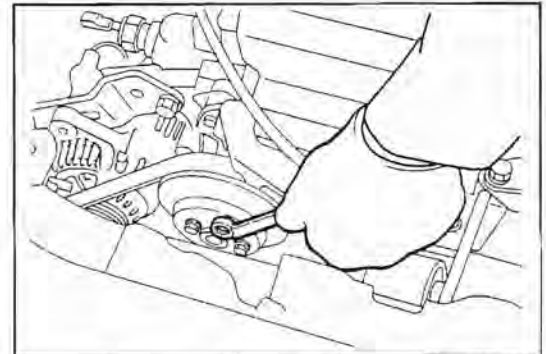
Make sure that the V-ribbed belt is engaged in each pulley correctly.



WR88-EM525

10. Tighten the attaching bolts of the water pump pulley, using the V-ribbed belt tension.

Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5 ft-lb)

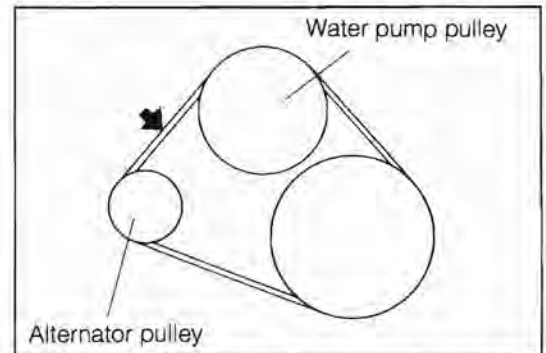


WR88-EM526

11. Check and adjust the tension of the V-ribbed belt.
(See page CH-6)

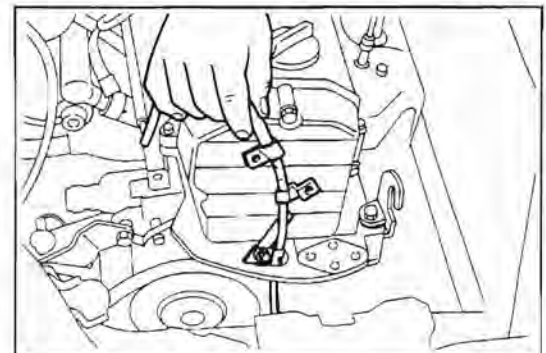
NOTE:

If the belt tension does not meet the specification, adjust the tension.



WR88-EM527

12. Route the oil pressure switch wire through the hole of the engine mounting front right No.1.

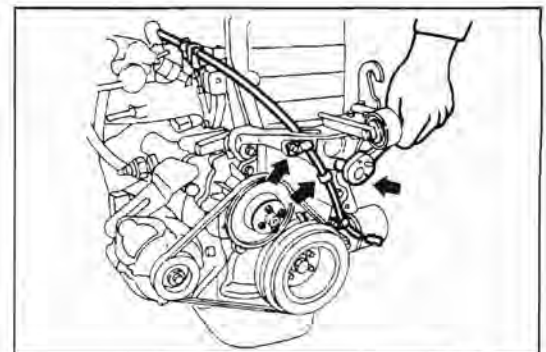


WR88-EM528

13. Install the clamp bolt of the oil pressure switch wire.

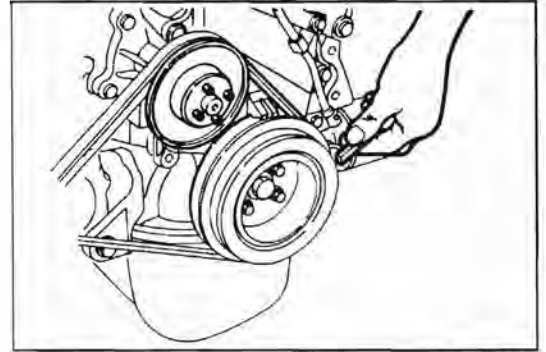
NOTE:

Install the oil pressure switch wire without any looseness between the clamps.



WR88-EM529

14. Connect the oil pressure switch connector to the oil pressure switch.



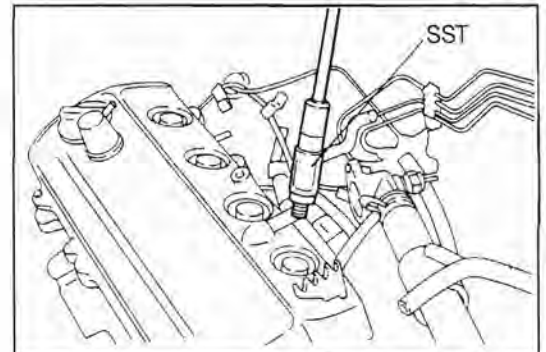
WR88-EM530

15. Install the spark plug by using the SST.

SST: 09268-87703-000

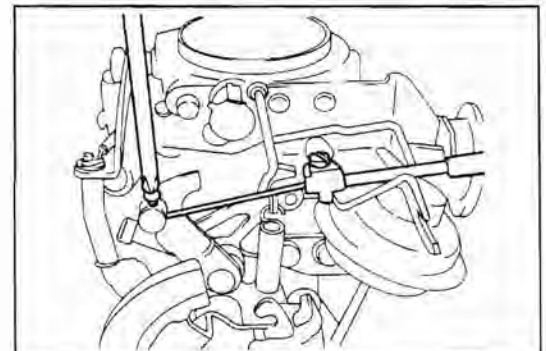
NOTE:

Be careful not to damage the terminal of the spark plug front end.



WR88-EM531

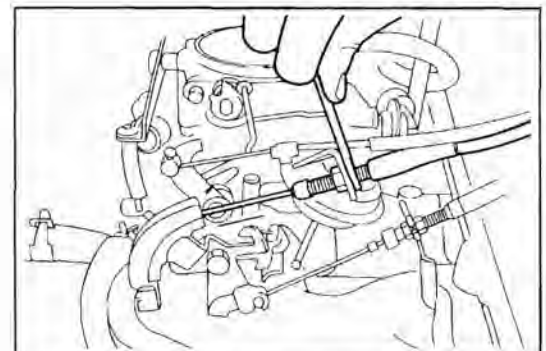
16. Connect the choke cable to the carburetor.
(Type HC-C engine)



WR88-EM532

17. Connect the accelerator cable to the carburetor. Adjust the accelerator cable so that the free play in its axial direction may be 3 - 8 mm (0.12 - 0.31 inch).

18. Connect the throttle cable to the carburetor.
(Type HC-C engine mounted AT vehicle)

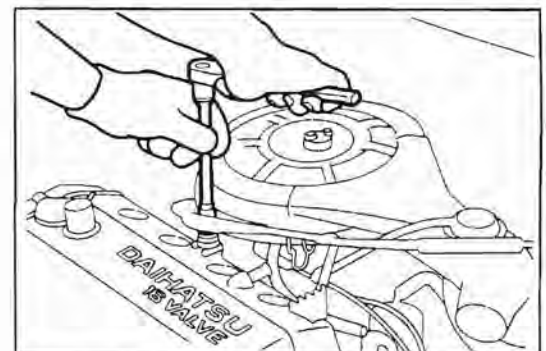


WR88-EM533

19. Install the air cleaner onto the carburetor.
(Type HC-C engine)

NOTE:

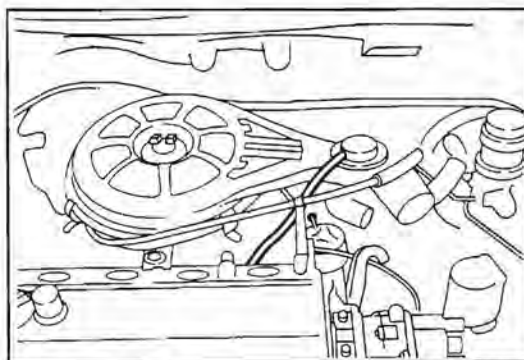
In this time, if the gasket is damaged, replace the gasket.



WR88-EM534

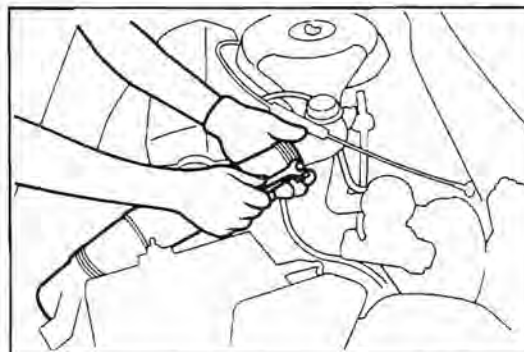
20. Connect the vacuum hoses as follows. (Type HC-C engine)

- Between the air cleaner and the BVSV
- Between the carburetor and the ITC valve
- Between the outer vent valve and the BVSV



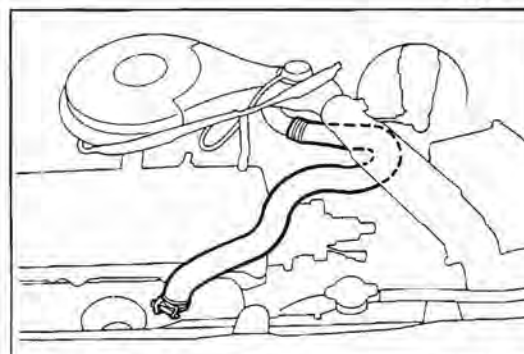
WR88-EM535

21. Install the cool air intake. (Type HC-C engine)



WR88-EM536

22. Install the hot air intake hose. (Type HC-C engine)



WR88-EM537

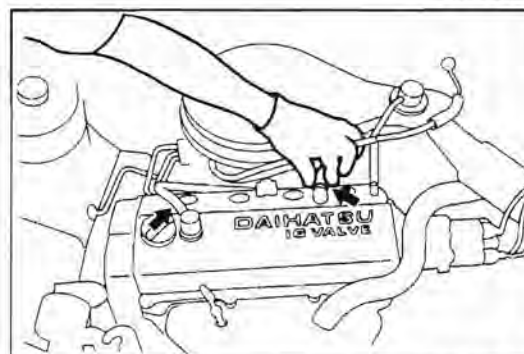
23. Install the PCV hoses. (Type HC-C engine)

- Between the heat insulator and the cylinder head cover.

NOTE:

The hose end of the side where the white point is daubed should be connected to the oil separator side of the cylinder head.

- Between the air cleaner and the cylinder head cover.



WR88-EM538

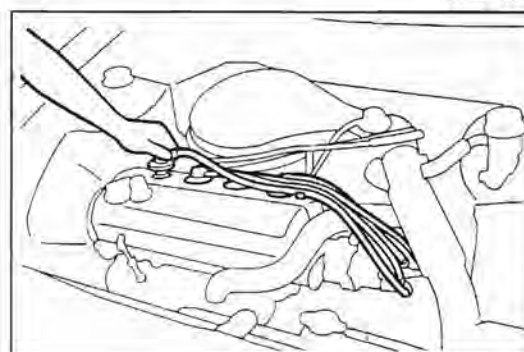
24. Connect the resistive cord. (Type HC-C engine)

NOTE:

- Hold the rubber boot section of the resistive cord. Securely connect it to the spark plugs, the distributor cap and the ignition coil.
- Be careful not to damage the resistive cord with the spark plug tube.

25. Connect the resistive cord to the cord clamp.

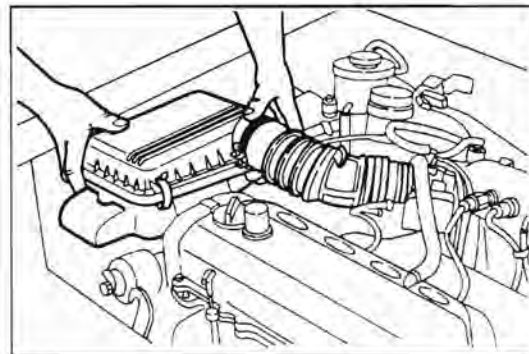
(Type HC-C engine)



WR88-EM539

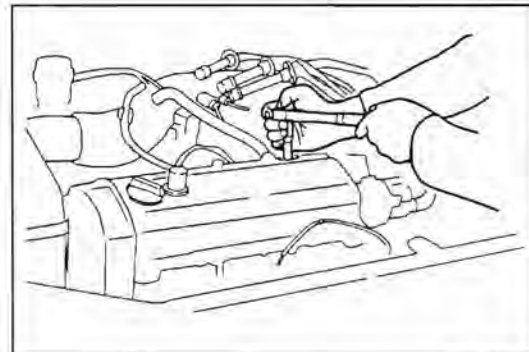
INSTALLATION OF AIR CLEANER [HC-E engine]

1. Installation of air cleaner assembly
 - (1) Install the air cleaner to the vehicle.
 - (2) Connect the air cleaner hose to the throttle body. Attach the hose band.
 - (3) Tighten the hose band for cool air intake use.



WR88-EM540

2. Install the spark plugs, using the following SST.
SST: 09268-87703-000
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

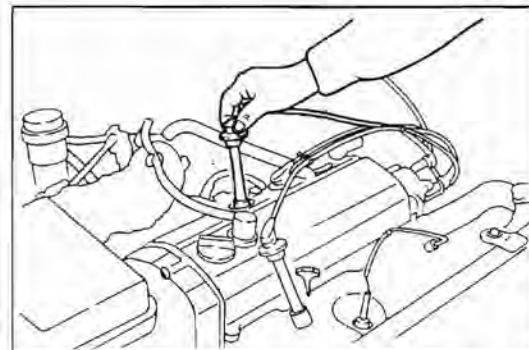


WR88-EM541

3. Connect the resistive cords to the ignition coil, distributor and spark plugs. Attach the wire clamps.

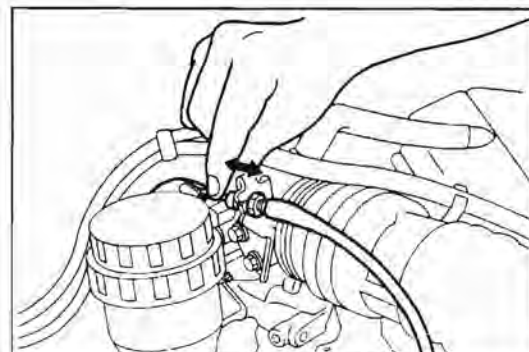
NOTE:

- Be sure that the resistive cord is connected securely to each spark plug.
- Be careful not to damage the resistive cord with the spark plug tube.



WR88-EM542

4. Connect the accelerator cable. Adjust the play in the axial direction of the accelerator cable to 3 - 8 mm (0.12 - 0.31 inch).

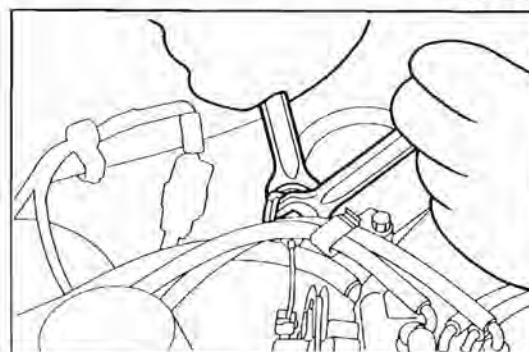


WR88-EM543

5. Connect the throttle cable in such a way that the play becomes zero. (Automatic transmission vehicle only)
(Refer to the Chassis Workshop Manual)

NOTE:

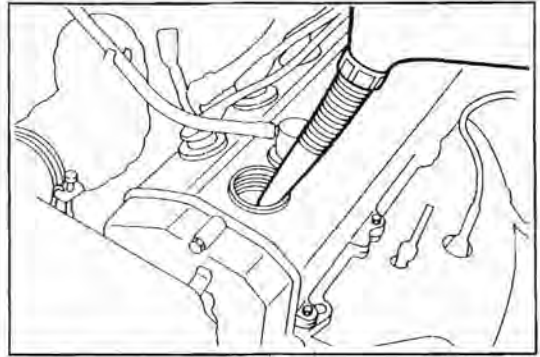
After the throttle cable has been connected, secure the throttle valve to the back side of the intake manifold by means of a clamp.



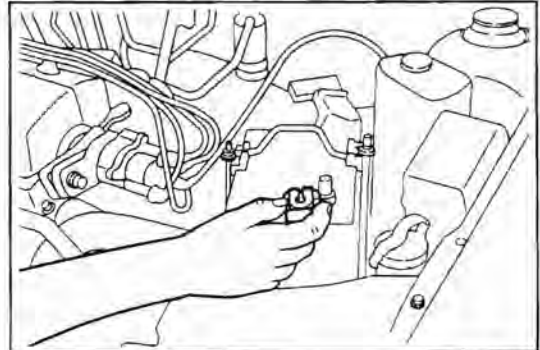
WR88-EM544

FILLING OF ENGINE OIL AND COOLING WATER

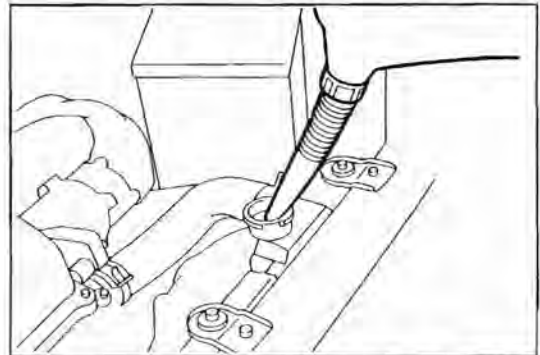
1. Fill the engine oil to the F level.
(See page LU-5)
2. Reconnect the battery ground cable to the negative (-) terminal of the battery.
3. Fill the cooling water.
(See page CO-3.)
4. Start the engine. Check the engine for oil, fuel and water leakages.
If any leakage exists, repair the faulty parts.
5. Stop the engine. Recheck the oil level two or three minutes later.
If the oil level is too low, add the engine oil to the F level.
(See page LU-5.)
6. Allow the temperature of the engine to drop to the room temperature. Check the cooling water level at the reserve tank.
If the cooling water level is insufficient, replenish the cooling water.
(See page CO-2.)



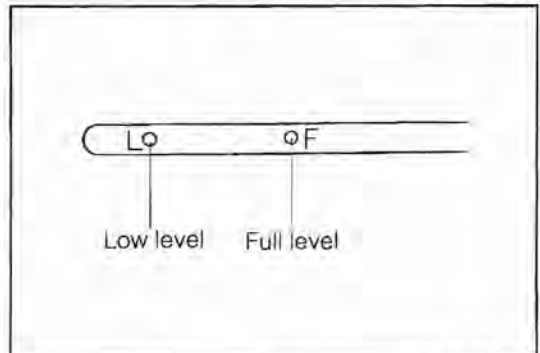
WR88-EM545



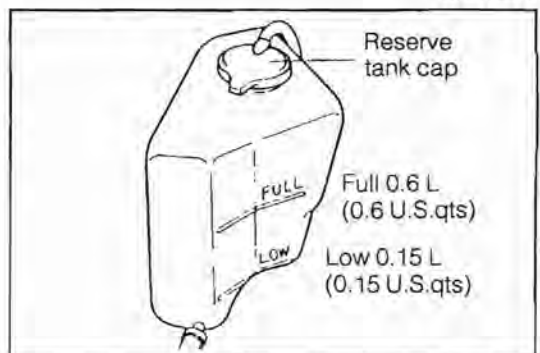
WR88-EM546



WR88-EM547



WR88-EM549



WR88-EM550

7. Perform the engine tune-up.
(See page EM-8.)

WR88-EM551



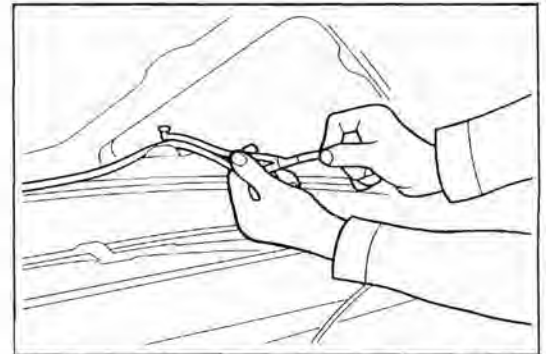
INSTRUCTIONS PRIOR TO OPERATION

Install fender covers to the fenders so that no scratch may be made to the fenders.

WR88-EM553

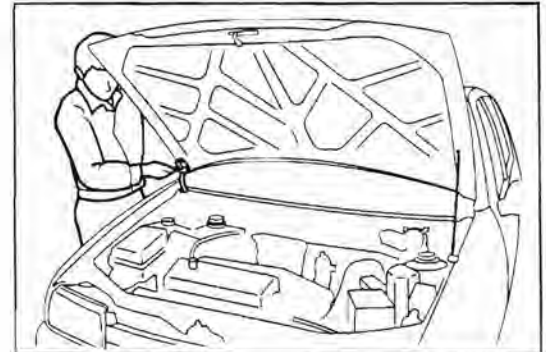
ENGINE REMOVAL [HC-C engine]

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Disconnect the wires of the positive (+) terminal from the battery positive terminal.
3. Remove the engine hood, as follows:
 - (1) Disconnect the windshield washer hose from the three-way joint. Remove the hose from the clamp of the engine hood.



WR88-EM554

- (2) Remove the hood, being very careful not to scratch the body and hood.



WR88-EM555

4. Drain the coolant.
(See page CO-3.)
5. Drain the engine oil.
(See page LU-4.)
6. Draining transmission oil
(See the Chassis workshop manual)
 - (1) Place a suitable container below the transmission drain plug.
 - (2) Drain the transmission oil by removing the transmission oil drain plug.
 - (3) Install the drain plug and tighten it to the specified torque.

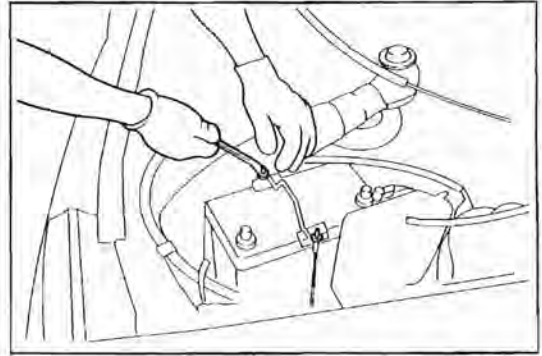
WR88-EM556

WR88-EM557

7. Remove the battery hold-down clamp and battery clamp bolts.
8. Remove the battery.

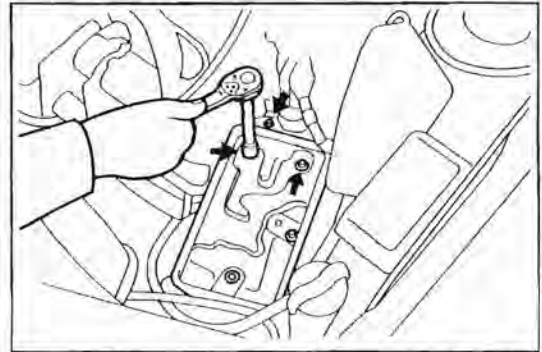
CAUTION:

Handle the battery carefully. Never allow any flame to be brought to the battery.



WR88-EM558

9. Removal of battery carrier
 - (1) Remove the wiring clamp bolt.
 - (2) Remove the washer hose from the clamp.
 - (3) Remove the battery carrier by removing the four bolts.



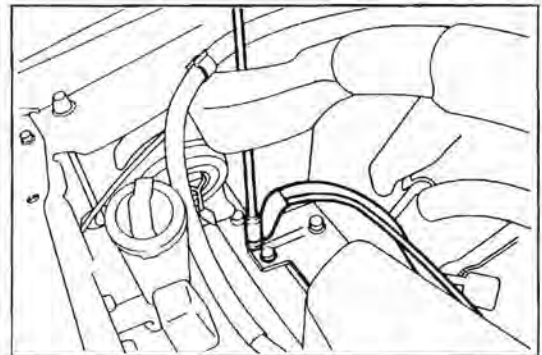
WR88-EM559

10. Remove the battery ground cable from the vehicle body.

NOTE:

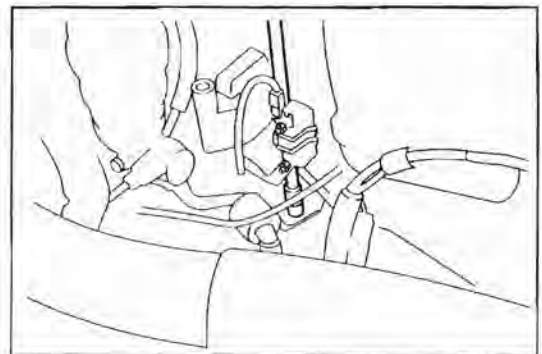
The ground cable connecting section is different between the manual transmission-equipped vehicles and the automatic transmission-equipped vehicles.

11. Disconnect the resistive cord from the ignition coil.



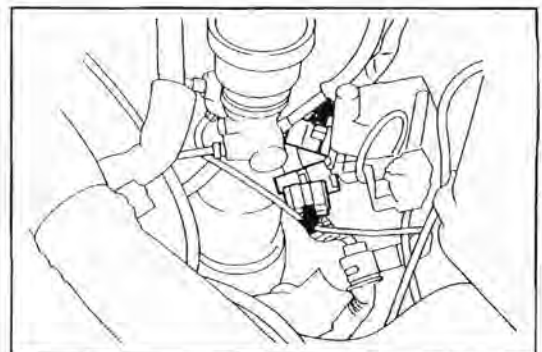
WR88-EM560

12. Remove the clamp bolt of the engine wire.



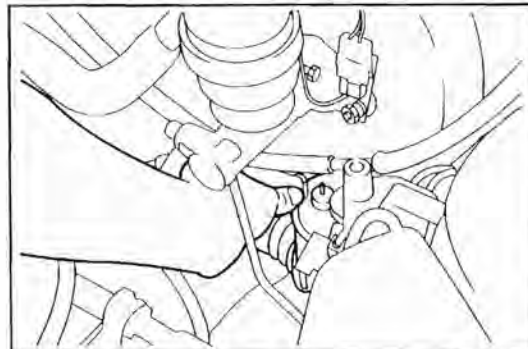
WR88-EM561

13. Disconnect the cowl wire and engine wire.



WR88-EM562

14. Disconnect the outer vent hose from the charcoal canister.
(GCC specification only).

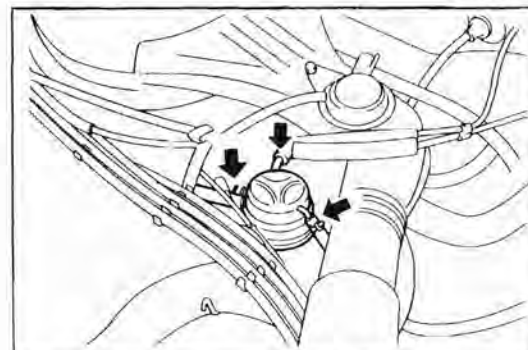


WR88-EM563

15. Disconnect the fuel inlet hose and fuel return hose from the fuel pump.

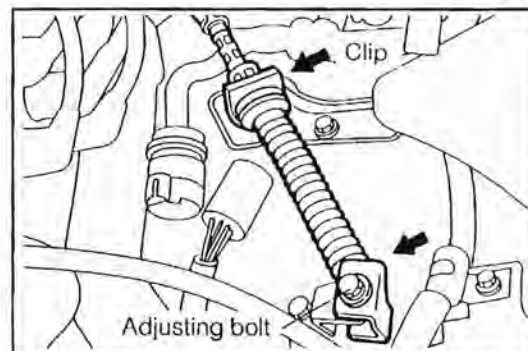
NOTE:

Make sure to plug the disconnected hose so that no fuel may flow out.



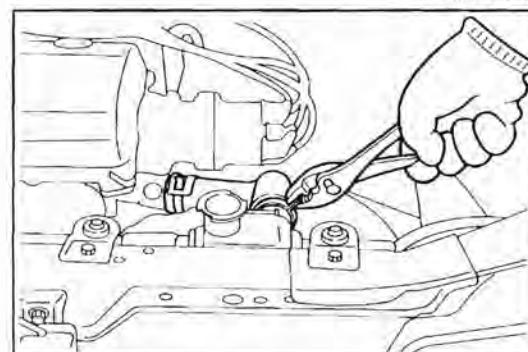
WR88-EM564

16. Remove the speedometer cable from the transmission.
17. Removal of clutch cable (M/T vehicle only)
 (1) Remove the clutch cable weight.
 (2) Remove the clutch cable from the transmission.
18. Removal of control cable (A/T vehicle only)
 (See the Chassis workshop manual)
 (1) Pull out the adjusting bolt of the control shaft lever.
 (2) Remove the clip provided at the transmission upper section. Then remove the control cable.



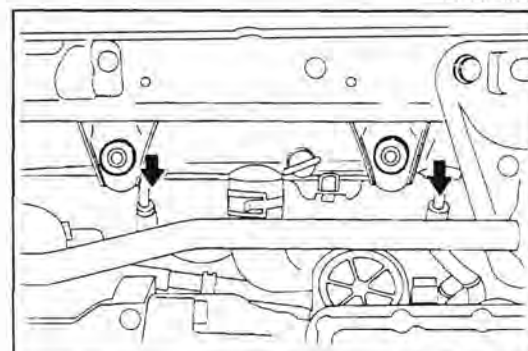
WR88-EM565

19. Disconnect the radiator hoses from the radiator.
 • Upper hose
 • Lower hose
20. Disconnect the oil cooler hose from the radiator. (Oil cooler-equipped vehicle only)



WR88-EM566

21. Disconnect the oil cooler hoses from the radiator. (A/T vehicle only)

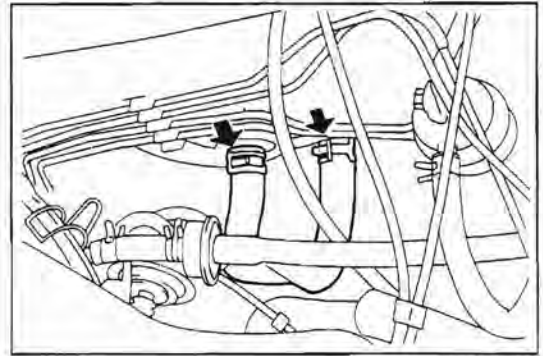


WR88-EM568

22. Disconnect the heater hoses from the heater.

NOTE:

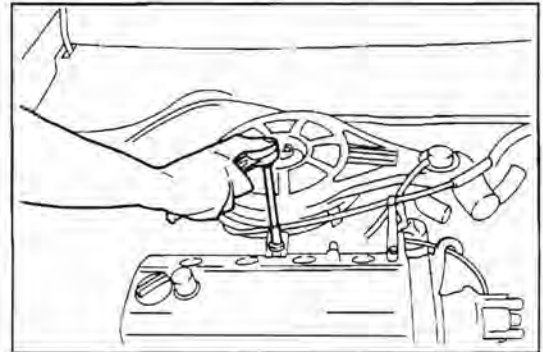
Be very careful not to apply any force to the heater pipe.



WR88-EM569

23. Removal of air cleaner.

- (1) Remove the cool air intake hose.
- (2) Remove the hot air intake hose.
- (3) Remove the following vacuum hoses.
- (4) Vacuum hose to BVSV
- (5) Vacuum hoses to ITC
- (6) PCV hoses



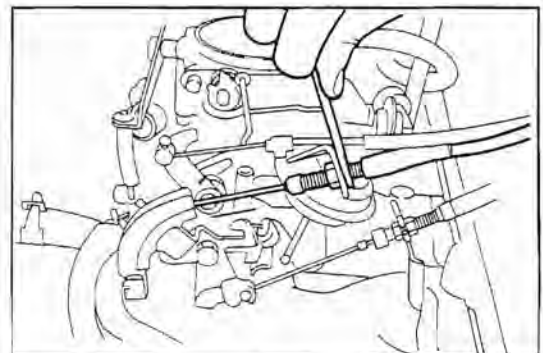
WR88-EM570

- (4) Remove the air cleaner assembly.

24. Remove the choke cable from the carburetor.

25. Remove the accelerator cable from the carburetor. Remove it from the cable clamp.

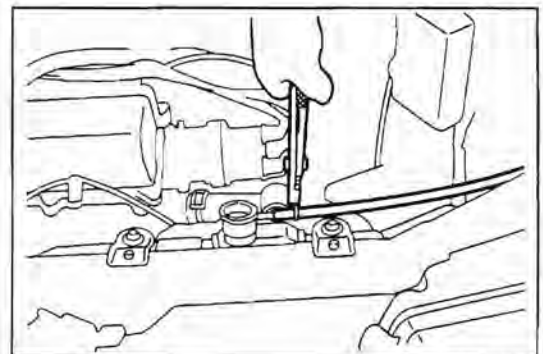
26. Remove the throttle cable from the carburetor. (A/T vehicle only)



WR88-EM571

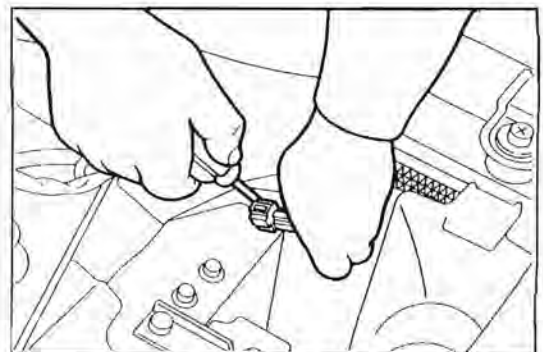
27. Radiator removal

- (1) Remove the reserve tank hose.



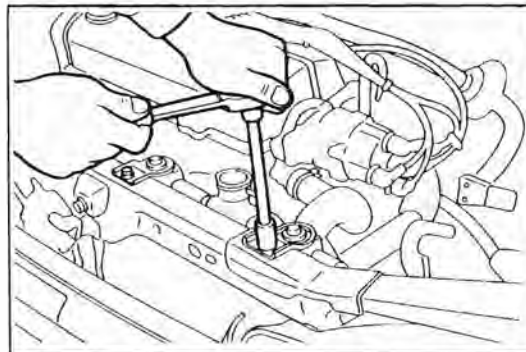
WR88-EM572

- (2) Remove the radiator cooling fan motor connector by disconnecting it from the body clamp.



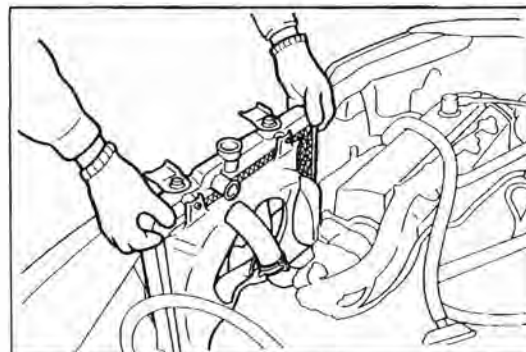
WR88-EM573

- (3) Remove the attaching bolts of the radiator bracket No. 1.



WR88-EM574

- (4) Remove the radiator.

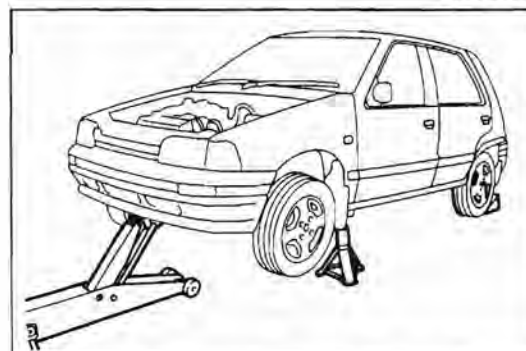


WR88-EM575

28. Jack up the vehicle and support it with safety stands.

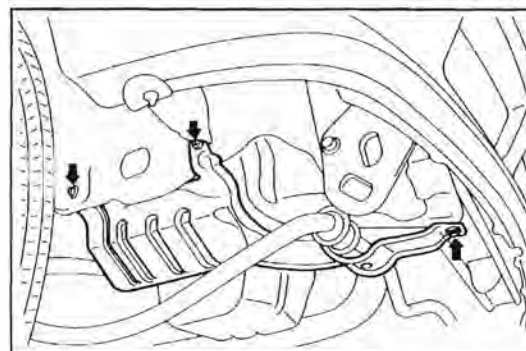
CAUTION:

Place a chock at the rear tire.



WR88-EM576

29. Remove the engine undercover by removing the three attaching bolts.



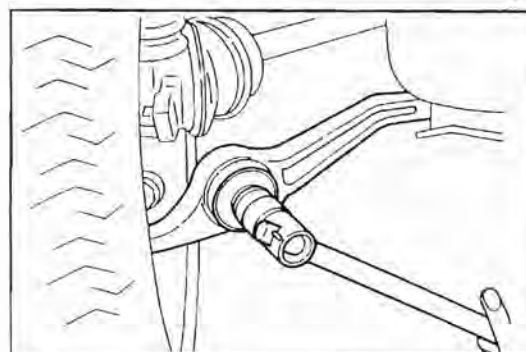
WR88-EM577

30. Remove the stabilizer bar, as follows:

- (1) Remove the stabilizer bar end nuts and retainers.
- (2) Remove the attaching bolts of the stabilizer bracket.
- (3) Remove the stabilizer bar from the vehicle.

CAUTION:

Never reuse the attaching nuts.

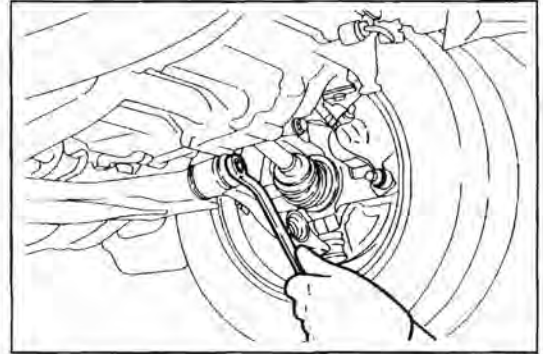


WR88-EM578

31. Remove the nuts which attach the suspension lower arm to the suspension lower arm bracket. Remove the suspension lower arm from the suspension lower arm bracket.

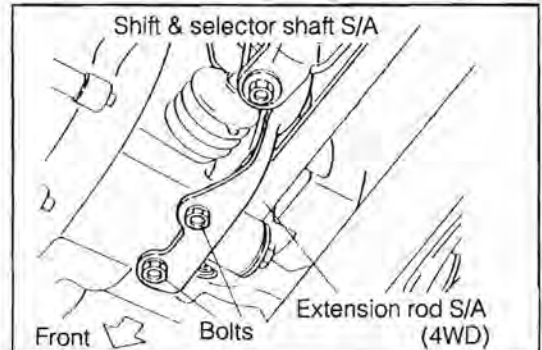
CAUTION:

Never reuse the attaching nuts.



WR88-EM579

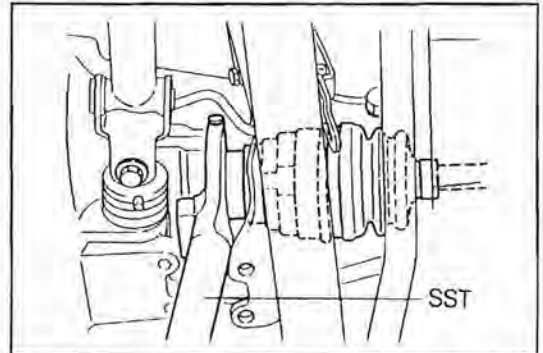
32. Disconnect the shift & select shaft and extension rods from the transmission. (MT vehicle only)



WR88-EM580

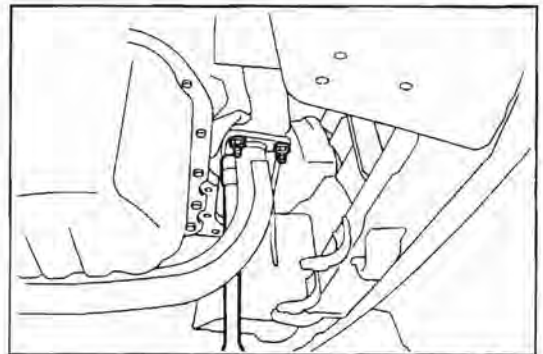
33. Disconnect each drive shaft from the transmission at the in-board side.

SST: 09648-87201-000



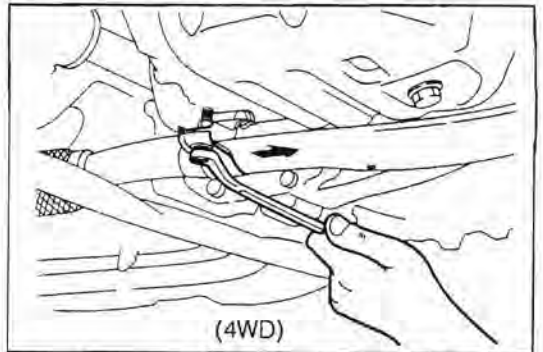
WR88-EM581

34. Remove the attaching bolts of the exhaust front pipe at the exhaust manifold No. 2 side.



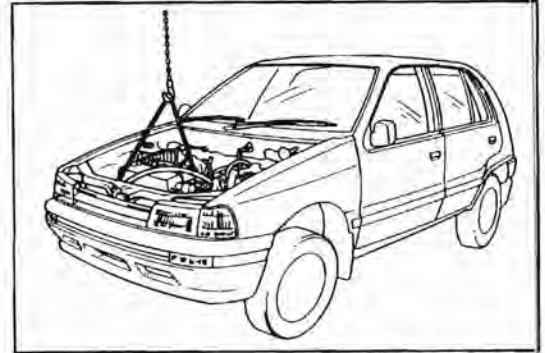
WR88-EM582

35. Remove the attaching bolt of the exhaust pipe support bracket clamp of the exhaust front pipe. Slide the clamp.



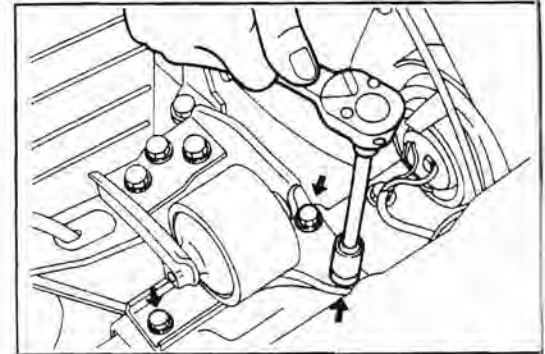
WR88-EM583

36. Sling the engine, using a chain block.



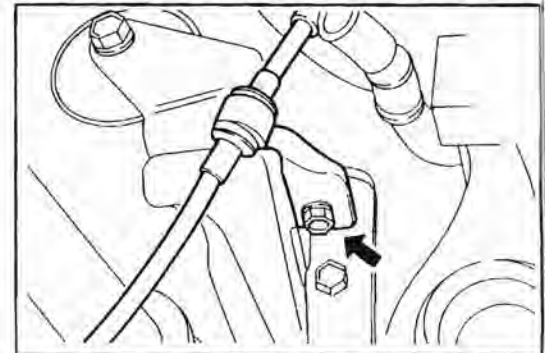
WR88-EM584

37. Remove the three attaching bolts of the engine mounting front insulator.



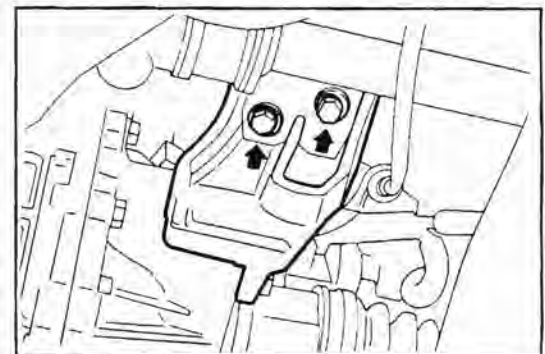
WR88-EM585

38. Remove the shift control cable clamp of the rear engine mounting bracket.



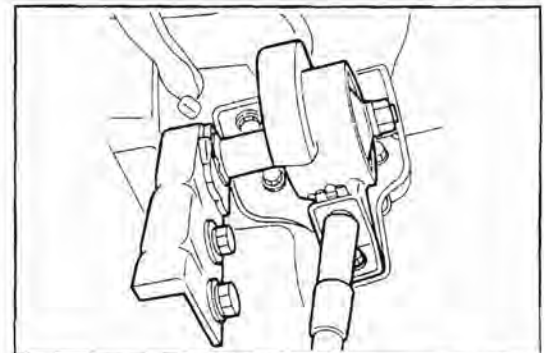
WR88-EM585B

39. Remove the bolts which connect the engine mounting rear bracket No.1 to the engine mounting rear bracket No.2.



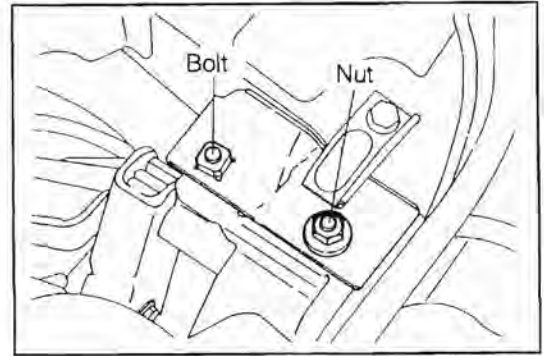
WR88-EM586

40. Remove the engine mounting left stay attaching bolts from the engine mounting lower left insulator and engine mounting front lift bracket. Remove the stay.
(Only for manual transmission-equipped vehicles).



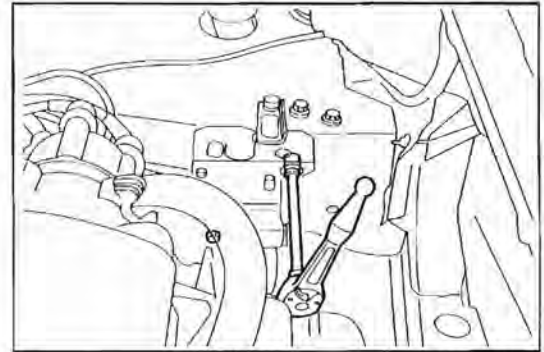
WR88-EM587

41. Remove the bolt and nut which connect the engine mounting front left bracket to the insulator.



WR88-EM588

42. Lower the engine slightly. Remove the engine mounting front bracket from the vehicle.

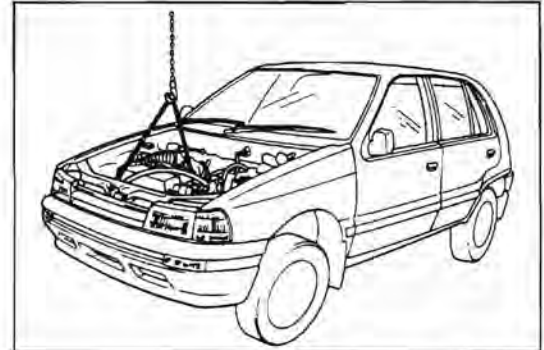


WR88-EM589

43. Take out the engine from the vehicle.

NOTE:

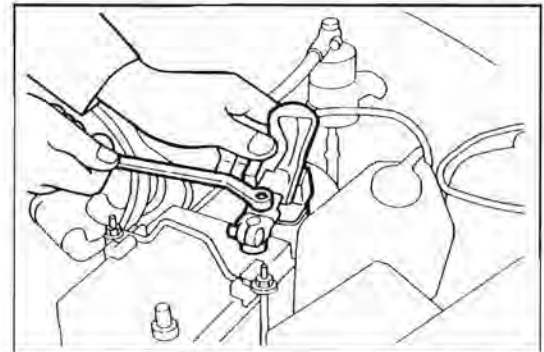
Be very careful not to allow the engine to hit the vehicle body, and/or other parts.



WR88-EM590

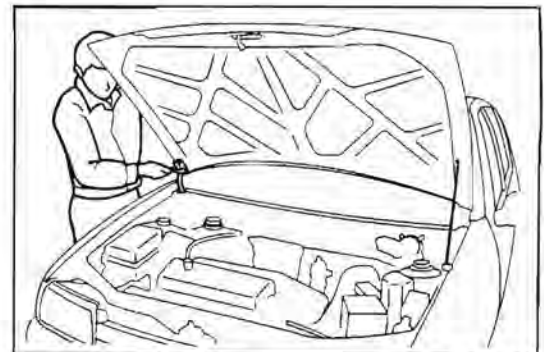
ENGINE REMOVAL [HC-E engine]

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Disconnect the wires of the positive (+) terminal from the battery positive terminal.



WR88-EM591

3. Remove the engine hood.
 - (1) Disconnect the windshield washer hose from the nozzle. Remove the clamp of the engine hood.
 - (2) Remove the hood, being very careful not to scratch the body and hood.

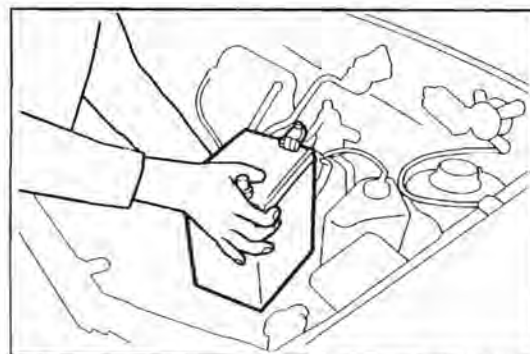


WR88-EM592

4. Drain the coolant.
(See page CO-3.)
5. Drain the transmission oil.
(See the Chassis workshop manual)
 - (1) Place a suitable container under the transmission drain plug.
 - (2) Drain the transmission oil by removing the transmission oil drain plug.
 - (3) Install and tighten the drain plug.
(M/T vehicle)
Tightening Torque: 3.0 - 5.0 kg-m
(21.7 - 36.2 ft-lb)
(A/T vehicle)
Tightening Torque: 8 - 2.3 kg-m
(13.1 - 16.6 ft-lb)
6. Drain the transfer oil. (4WD vehicle only)
(See the Chassis workshop manual)
 - (1) Place a suitable container under the transfer drain plug.
 - (2) Drain the transfer oil by removing the transfer oil drain plug.
 - (3) Tighten the transfer drain plug.
Tightening Torque: 4.0 - 6.0 kg-m
(29.0 - 43.3 ft-lb)
7. Remove the battery hold-down clamp.

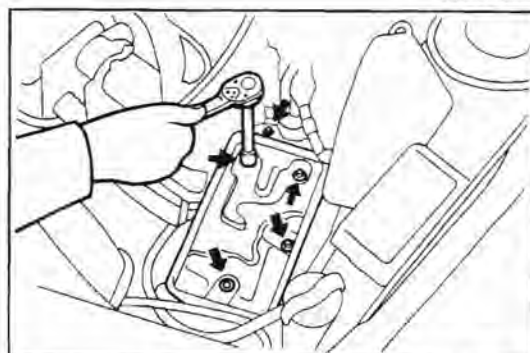
WR88-EM594

8. Remove the battery.
CAUTION:
Handle the battery carefully. Never allow any flame to be brought to the battery.



WR88-EM595

9. Removal of battery carrier
 - (1) Remove the wiring clamp bolt.
 - (2) Remove the washer hose from clamp.
 - (3) Remove the battery carrier by removing the four bolts.

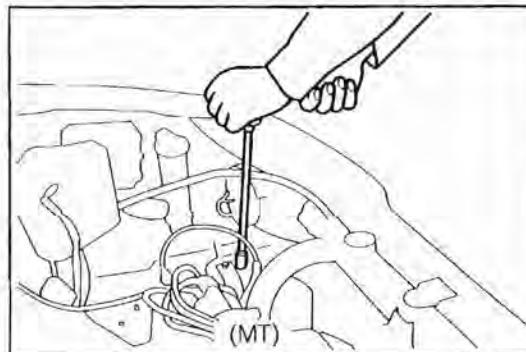


WR88-EM596

10. Remove the battery ground cable from the vehicle body.

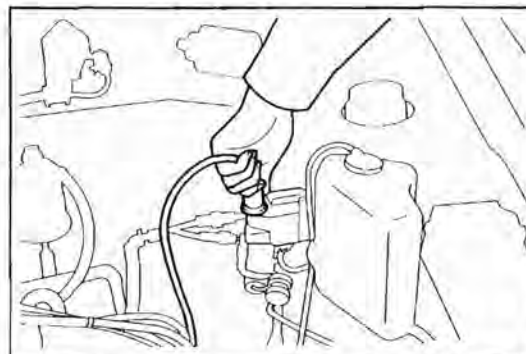
NOTE:

The ground cable connecting section is different between the manual transmission-equipped vehicles and the automatic transmission-equipped vehicles.



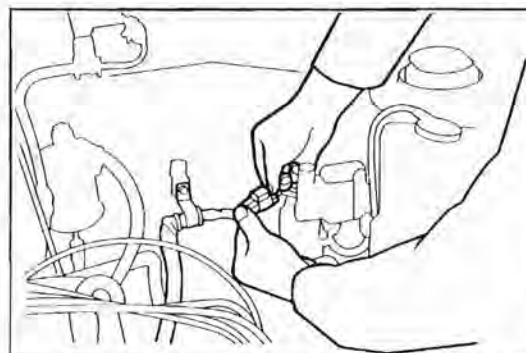
WR88-EM597

11. Disconnect the resistive cord from the ignition coil.



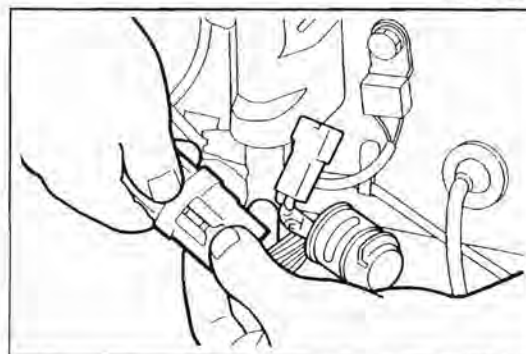
WR88-EM598

12. Disconnect the cowl wire and alternator wire.



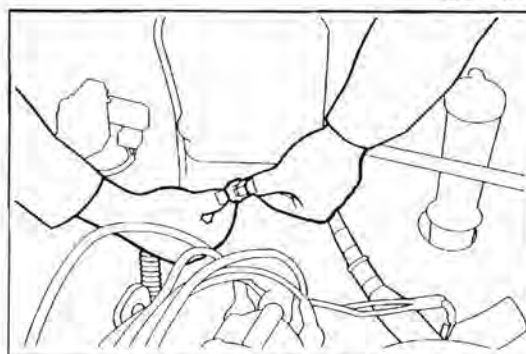
WR88-EM599

13. Disconnect the cowl wire and engine wire.



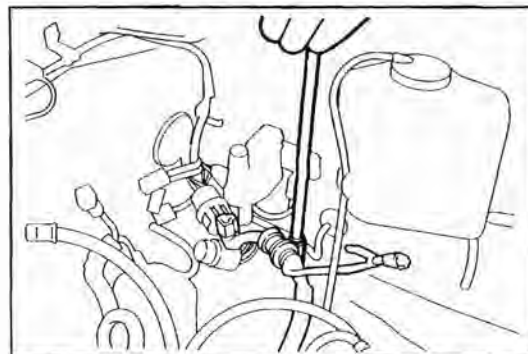
WR88-EM600

14. Disconnect the engine wire and fuse box cord connector.



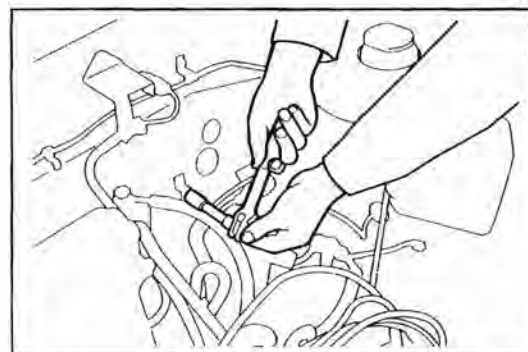
WR88-EM601

15. Remove the body clamp of the engine wire.



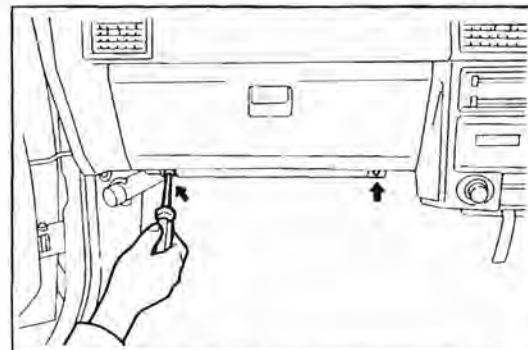
WR88-EM602

16. Remove the body clamp bolt of the alternator wire.



WR88-EM603

17. Remove the attaching screws of the glove compartment box.

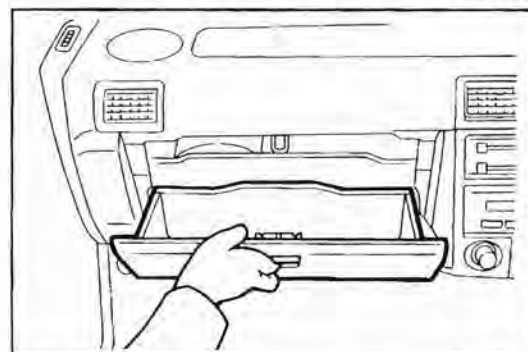


WR88-EM604

18. Remove the glove compartment box.

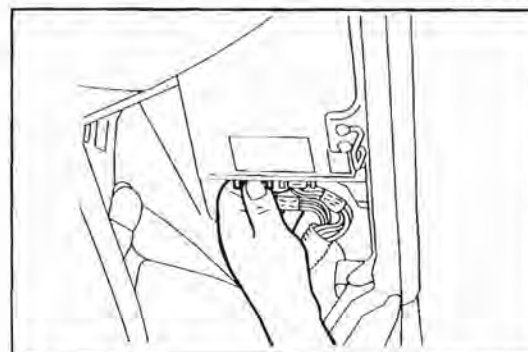
NOTE:

Pull out the glove compartment upper trim from the recess section of the instrument panel.



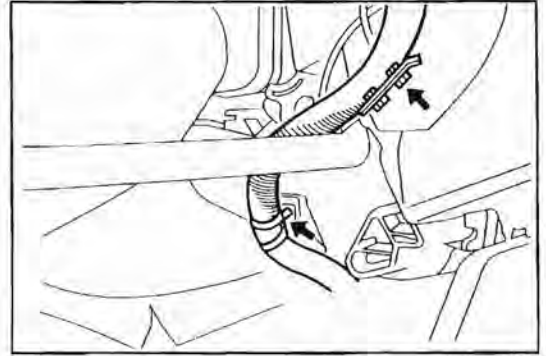
WR88-EM605

19. Disconnect the engine wire connector from the engine control computer assembly (ECU).



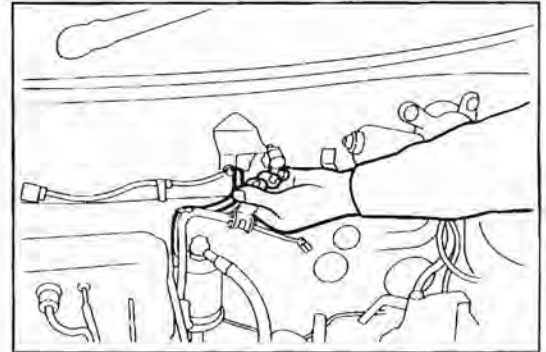
WR88-EM606

20. Detach the two engine wire clamps.
21. Detach the engine wire clamp bolt provide at the dash panel.
22. Pull out the engine wire toward the engine compartment.



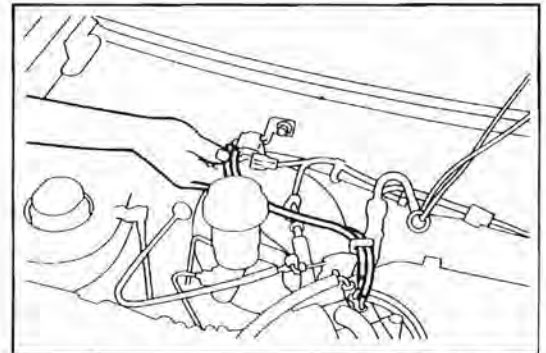
WR88-EM607

23. Remove the pressure sensor connector, clamp bolt and vacuum hose from the pressure sensor.



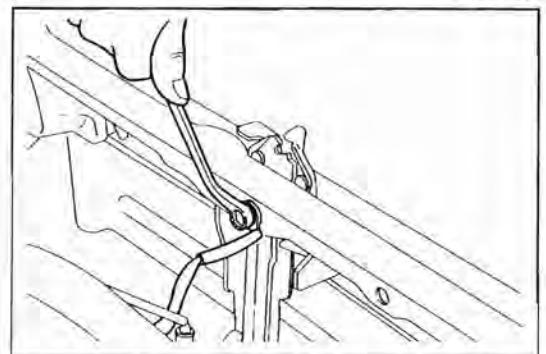
WR88-EM608

24. Disconnect the idle-up VSV vacuum hose at the VSV side.



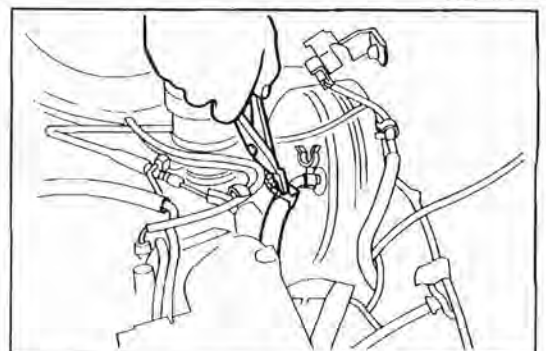
WR88-EM609

25. Remove the engine ground cable.
(Radio-equipped vehicle only)



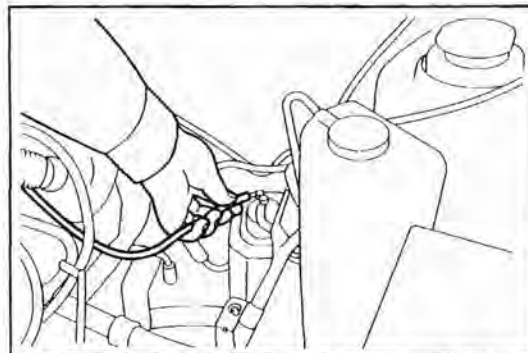
WR88-EM610

26. Disconnect the brake booster hose.



WR88-EM611

27. Disconnect the vacuum hose of the charcoal canister from the charcoal canister.

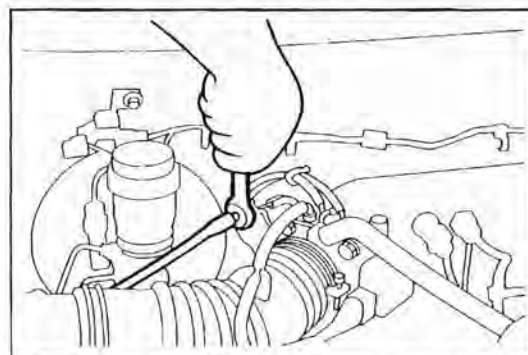


WR88-EM612

28. Removal of clutch cable (M/T vehicle only)
(See the Chassis Workshop Manual)
(1) Remove the clutch cable weight.
(2) Remove the clutch cable from the transmission.
29. Remove the control cable from the throttle body.
(See the Chassis Workshop Manual)

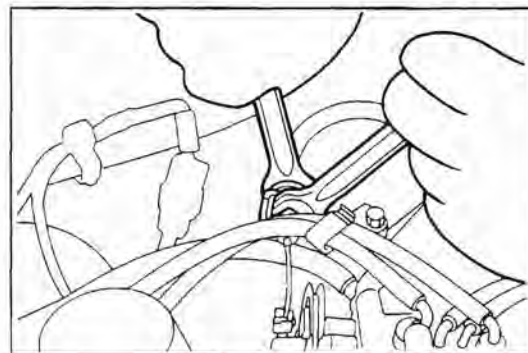
WR88-EM613

30. Remove the accelerator cable from the throttle body.



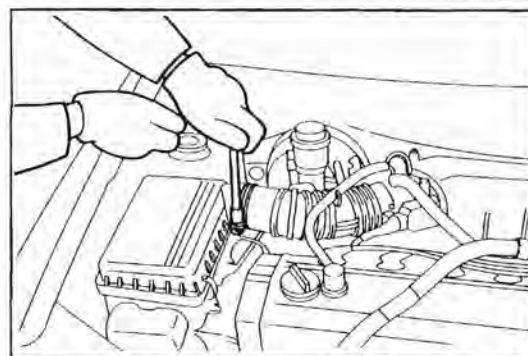
WR88-EM614

31. Remove the throttle cable from the throttle body. (A/T vehicle only)
32. Remove the throttle cable clamp from the intake manifold.
33. Disconnect the speedometer cable and remove it from the transmission or the transfer case.



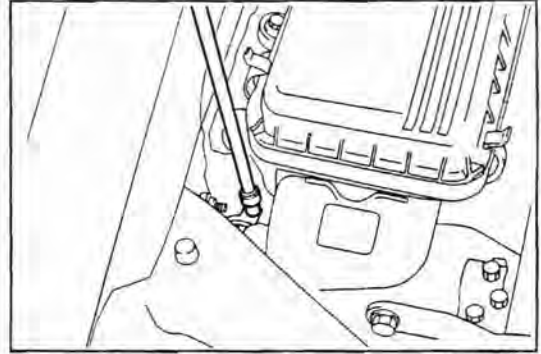
WR88-EM615

34. Removal of air cleaner
(1) Remove the air cleaner hose from the air cleaner.

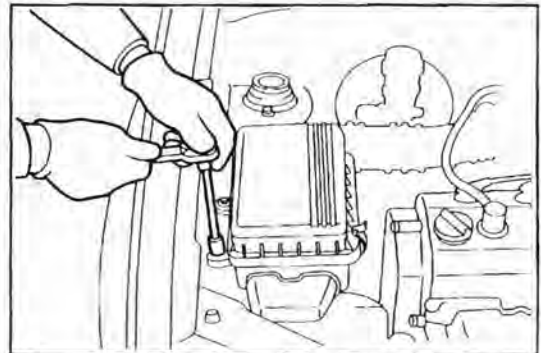


WR88-EM616

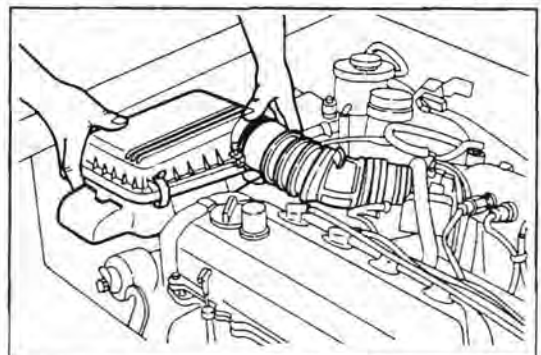
(2) Disconnect the air cleaner from the cool air inlet.



(3) Remove the three attaching bolts of the air cleaner.

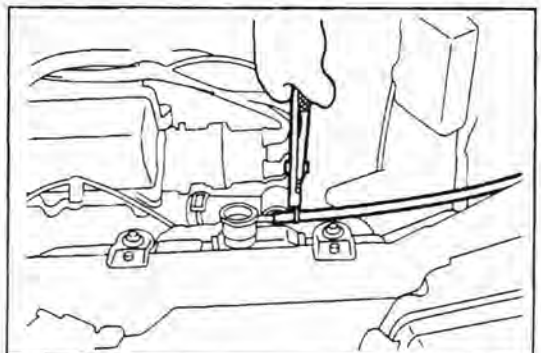


(4) Remove the air cleaner.

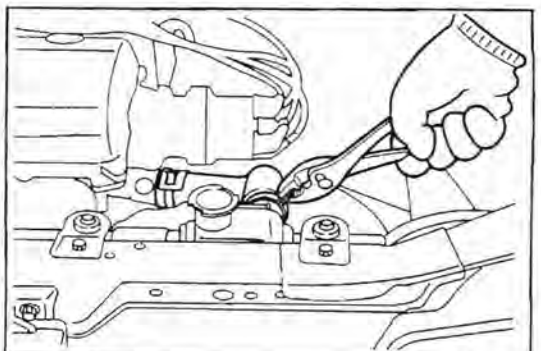


35. Radiator removal

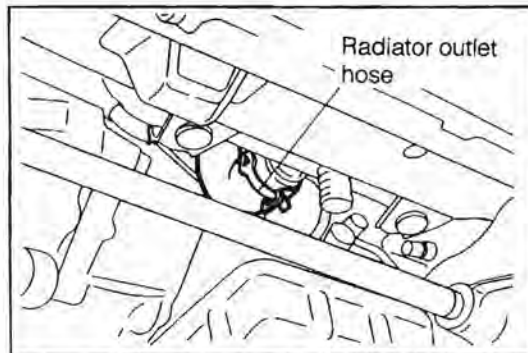
(1) Remove the reserve tank hose.



(2) Remove the radiator upper hose from the radiator.



- (3) Remove the radiator lower hose from the radiator.

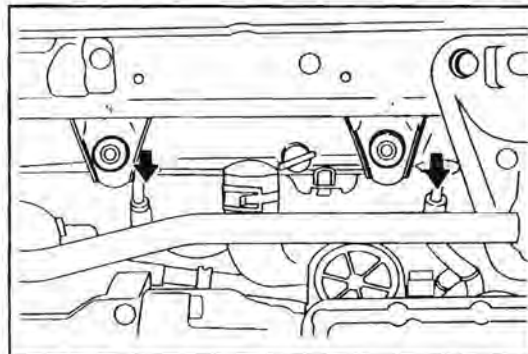


WR88-EM622

- (4) Remove the water hose for the oil cooler from the radiator.
(5) Disconnect the inlet and outlet hoses of the automatic oil cooler.
(A/T vehicle only)

CAUTION:

Never reuse the inlet hose, outlet hose and hose clamp.



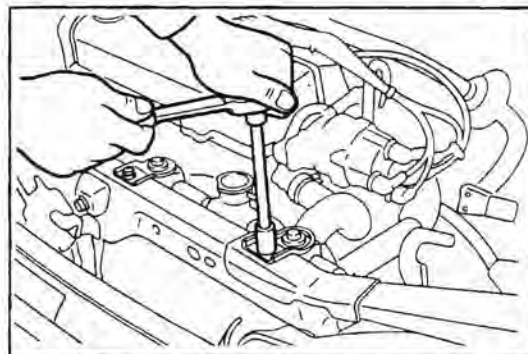
WR88-EM624

- (6) Remove the radiator cooling fan motor connector from the vehicle body.



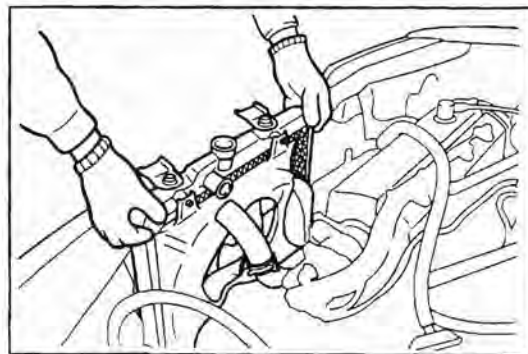
WR88-EM625

- (7) Remove the attaching bolt of the radiator bracket No.1.



WR88-EM626

- (8) Remove the radiator.

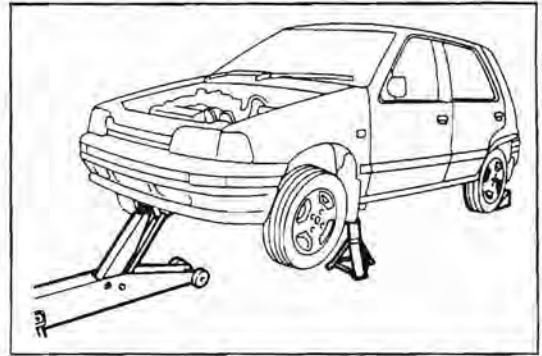


WR88-EM627

36. Jack up the vehicle and support it with safety stands.

CAUTION:

Place chocks at the rear wheels.

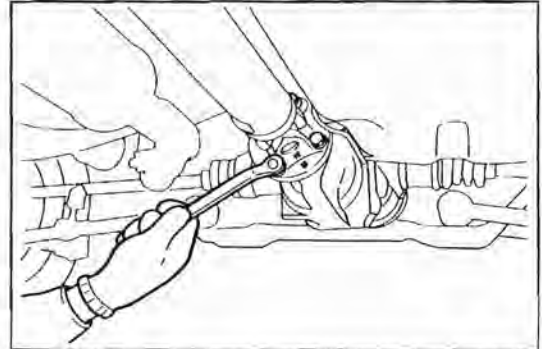


WR88-EM628

37. Remove the attaching bolts of the propeller shaft.
(4WD vehicle only)

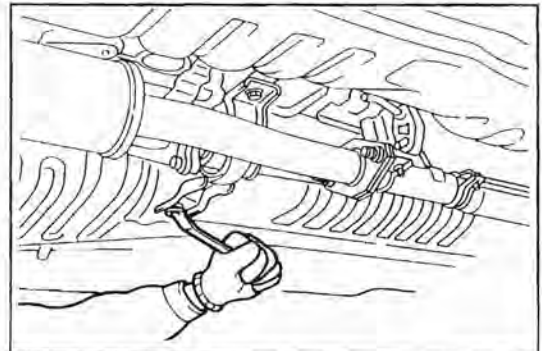
CAUTION:

Prior to removing the attaching bolts, daub mate marks on the propeller shaft and rear differential flange using an oily pen or the like so that the original installation position may be known clearly.



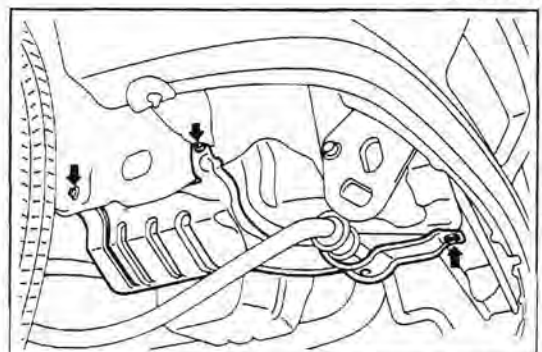
WR88-EM629

38. Remove the attaching bolts of the intermediate bearing bracket. Pull out the propeller shaft. (4WD vehicle only)



WR88-EM630

39. Remove the engine undercover by removing the three attaching bolts.

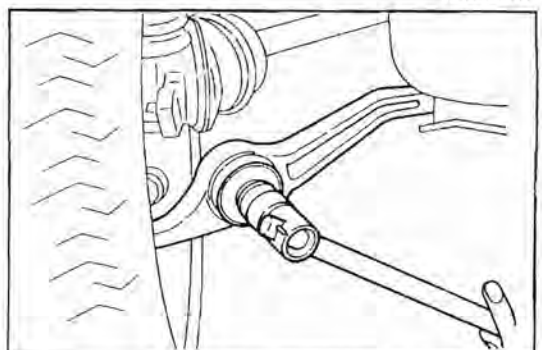


WR88-EM631

40. Remove the stabilizer bar.

CAUTION:

Never reuse the attaching nuts.



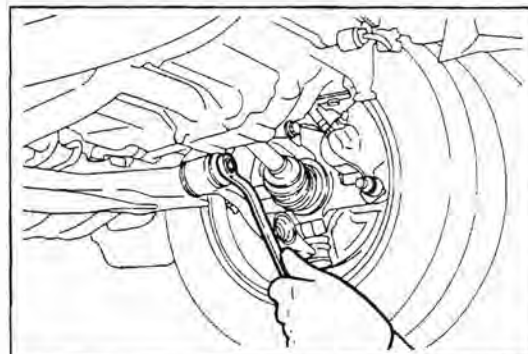
WR88-EM632

ENGINE MECHANICALS

41. Remove the nuts which attach the suspension lower arm to the suspension lower arm bracket. Remove the suspension lower arm from the suspension lower arm bracket.

CAUTION:

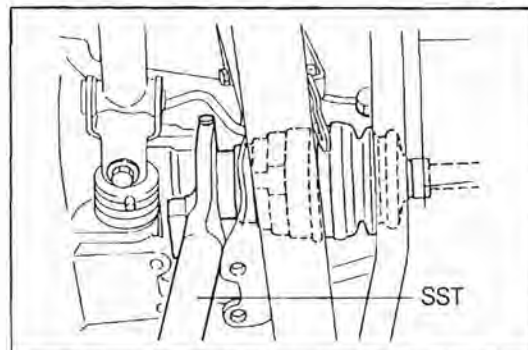
Never reuse the attaching nuts.



WR88-EM633

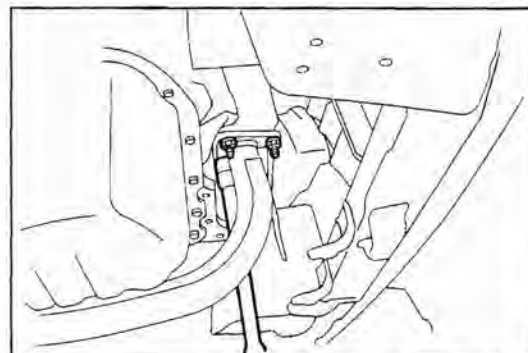
42. Disconnect the drive shafts from the transmission at the in-board ball joint side.

SST: 09648-87201-000



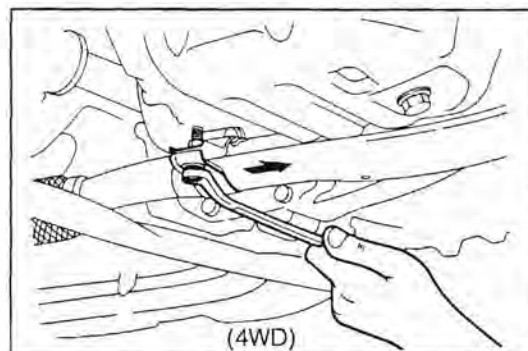
WR88-EM634

43. Remove the attaching bolt at the exhaust manifold No.2 side of the exhaust front pipe.



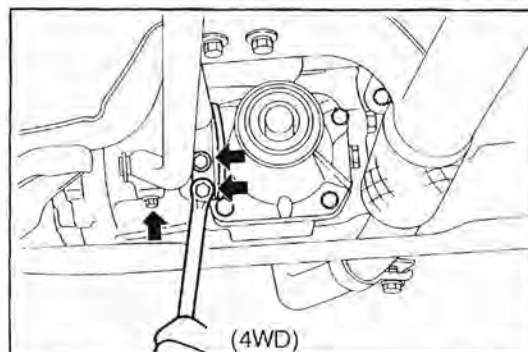
WR88-EM635

44. Remove the attaching bolt of the exhaust pipe support bracket clamp of the exhaust front pipe. Slide the clamp.



WR88-EM636

45. Remove the shift & select shaft and extension rod from the transmission. (MT vehicle only)

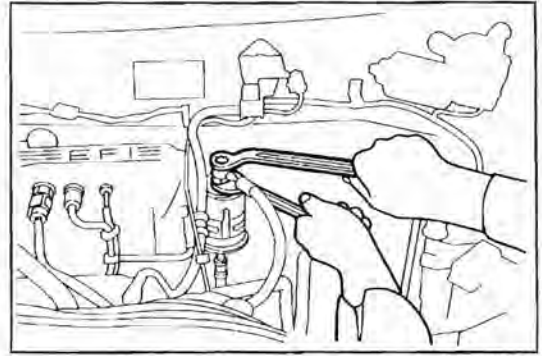


WR88-EM637

46. Disconnect the fuel hose No.1 at the fuel filter side.

CAUTION:

The pressure in the fuel line is kept 2.55 kg/cm^2 higher than the atmospheric pressure. Hence, when the fuel line is loosened, be sure to prevent the fuel from splashing using an adequate cloth or the like. Furthermore, place a suitable container under the fuel filter because the fuel flows out.

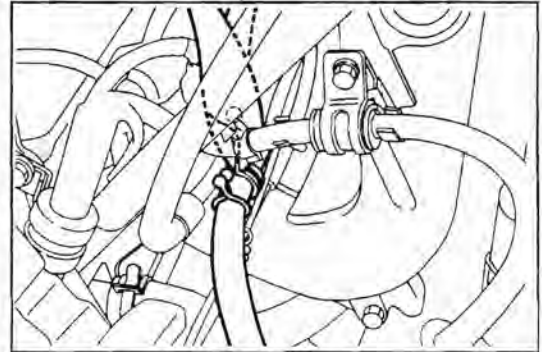


WR88-EM638

47. Remove the fuel return hose from the pressure regulator.

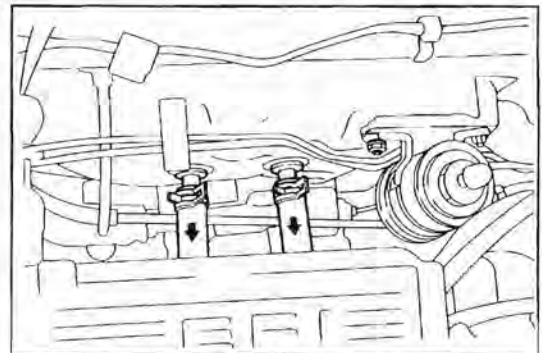
CAUTION:

Be sure to prevent the fuel from splashing using a suitable container, cloth or the like because the fuel flows out.



WR88-EM639

48. Disconnect the heater hose.



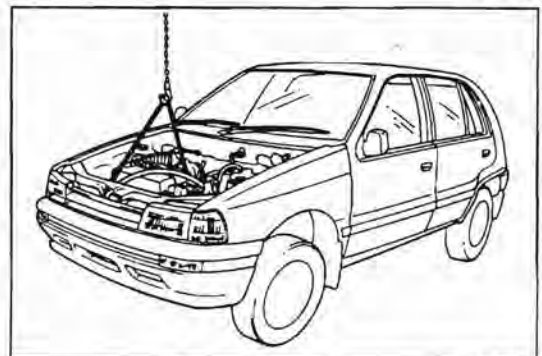
WR88-EM640

49. Sling the engine, using a chain block.

NOTE:

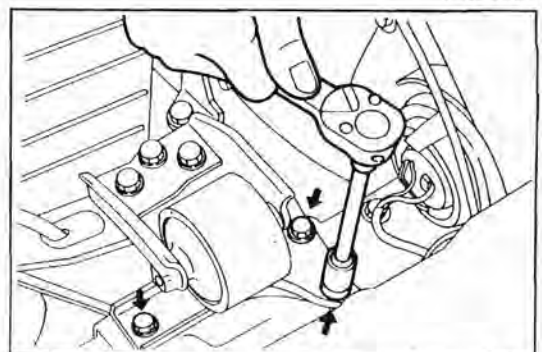
The engine sling device is available as SST.

SST: 09090-04010-000



WR88-EM641

50. Remove the three attaching bolts of the engine mounting front insulator.

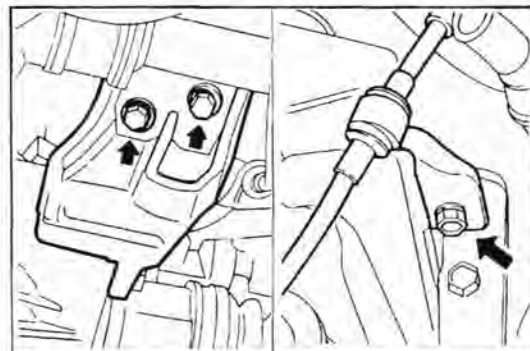


WR88-EM642

51. Remove the bolts connecting the engine mounting rear bracket No.1 to the engine mounting rear bracket No.2.

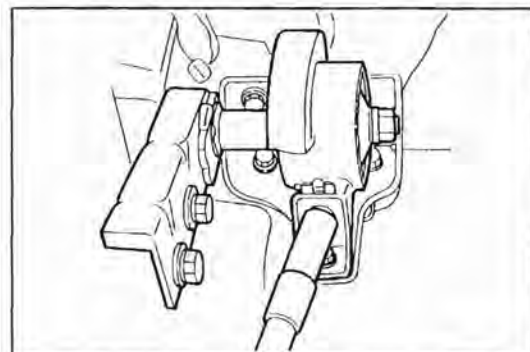
NOTE:

On model AT vehicle remove the shift control cable clamp of the engine mounting rear bracket before this operation.



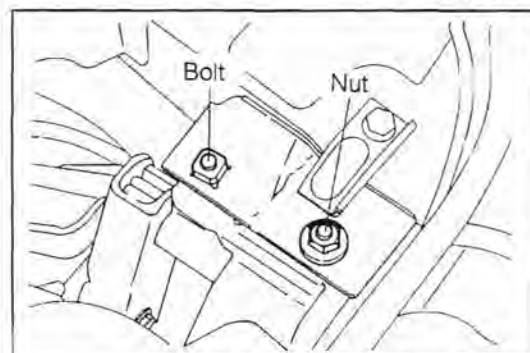
WR88-EM643

52. Remove the engine mounting left stay attaching bolt and engine mounting lower left insulator from the engine mounting front left bracket No.1. Then remove the stay.
(2WD vehicles only)



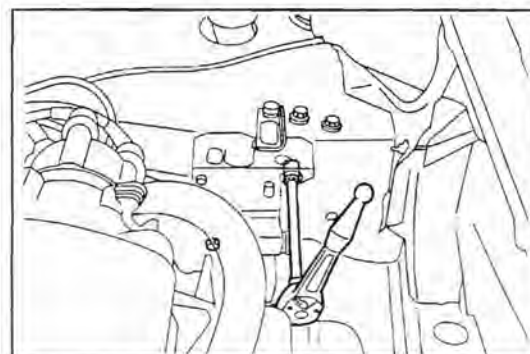
WR88-EM644

53. Remove the bolt and nut which connect the engine mounting front left bracket to the insulator.



WR88-EM645

54. Lower the engine slightly. Remove the engine mounting bracket from the vehicle.

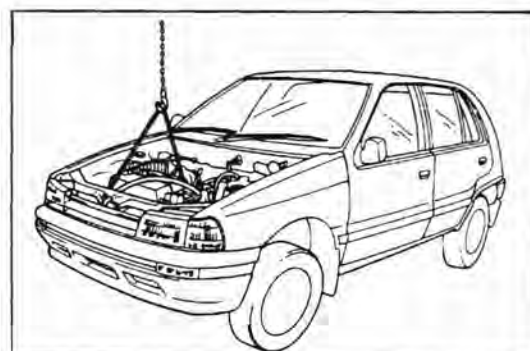


WR88-EM646

55. Take out the engine from the vehicle.

CAUTION:

Be very careful not to allow the engine to hit to the vehicle body and/or other parts.

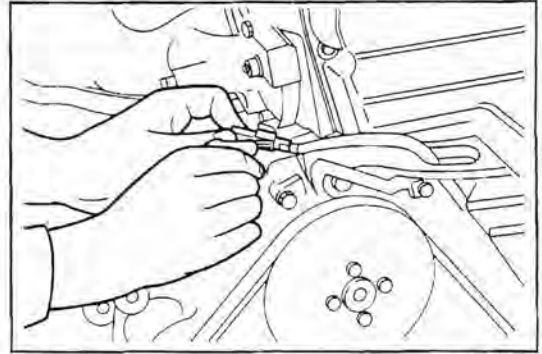


WR88-EM647

PREPARATION FOR DISASSEMBLY [HC-C engine]

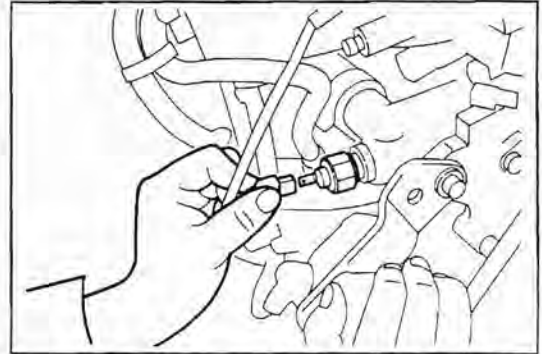
1. Removal of alternator wire

- (1) Disconnect the oil pressure switch wire connector from the clamp.



WR88-EM648

- (2) Disconnect the fan motor switch connector.

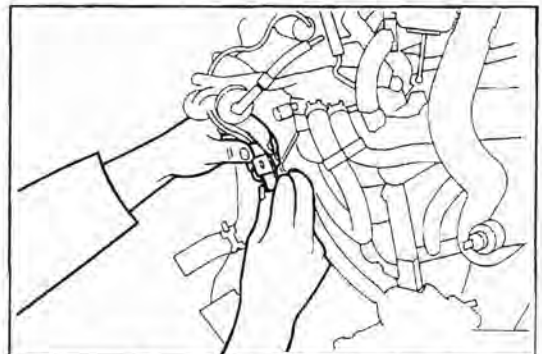


WR88-EM649

- (3) Disconnect the alternator connector.
- (4) Disconnect the alternator terminal B.
- (5) Disconnect the starter terminal ST.
- (6) Disconnect the starter terminal B.

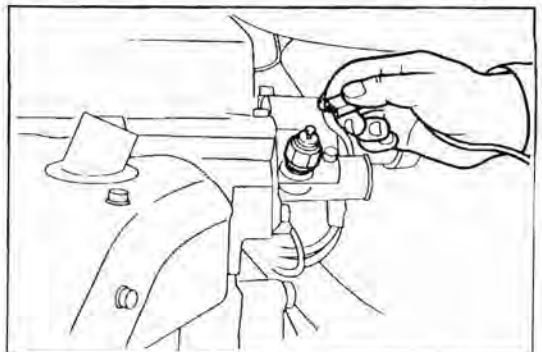
WR88-EM650

- (7) Disconnect the solenoid valve outer vent valve connector.
- (8) Disconnect the throttle position sensor connector. (A/T vehicle only)



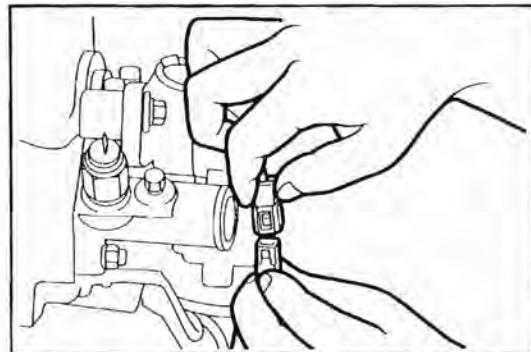
WR88-EM651

- (9) Disconnect the water temperature switch connector. (ECE & EEC specifications only)



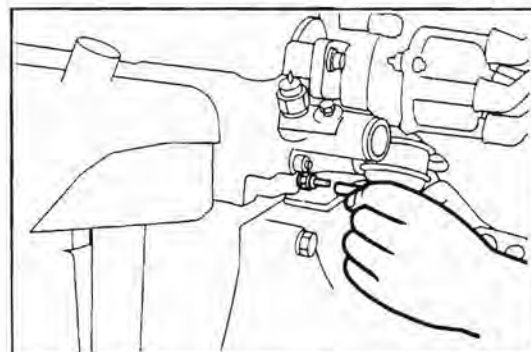
WR88-EM652

(10) Disconnect the distributor connector.



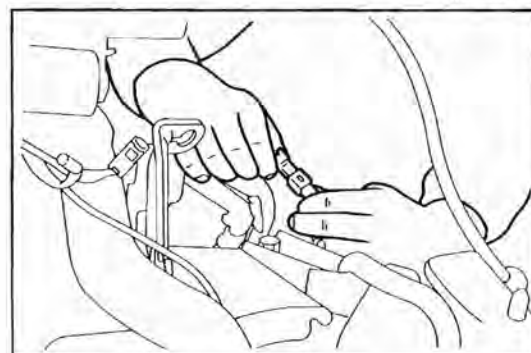
WR88-EM653

(11) Disconnect the water temperature sender gauge connector.



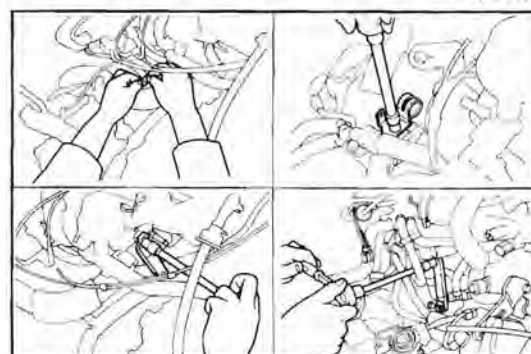
WR88-EM654

(12) Disconnect the back-up lamp switch connector.



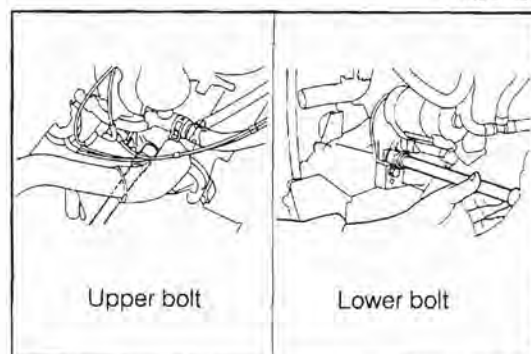
WR88-EM655

(13) Removal of engine wire clamp.
Remove the engine wire.



WR88-EM656

2. Removal of starter motor.

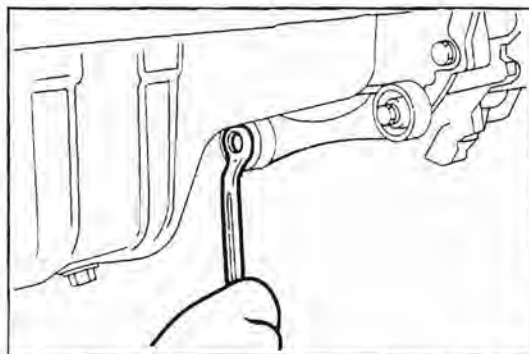


WR88-EM657

3. Remove the front power plant stiffener and rear power plant stiffener.

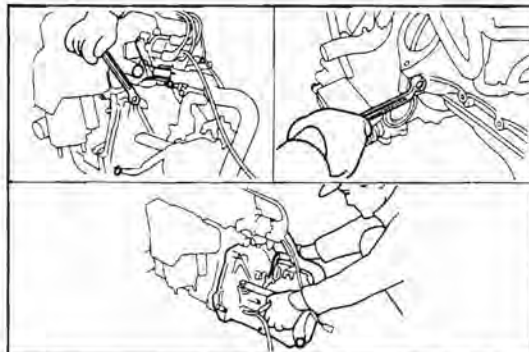
WR88-EM658

4. Remove the exhaust pipe No. 1 support bracket and power plant stiffener with the transmission undercover.
5. Remove the bolts connecting the drive plate to torque converter (AT vehicles only)



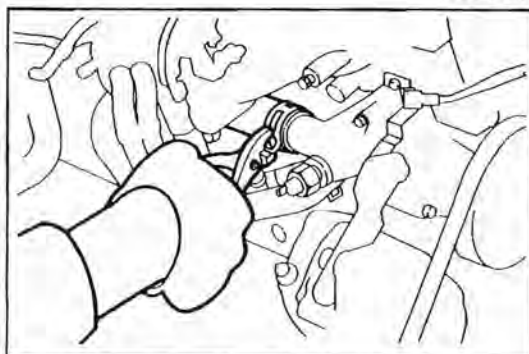
WR88-EM659

6. Remove the transmission.



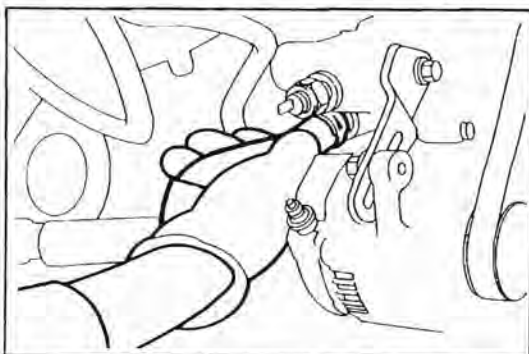
WR88-EM660

7. Remove the engine water inlet hose.



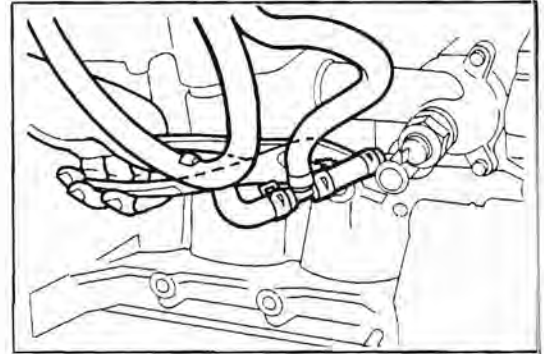
WR88-EM661

8. Remove the heater outlet hose.



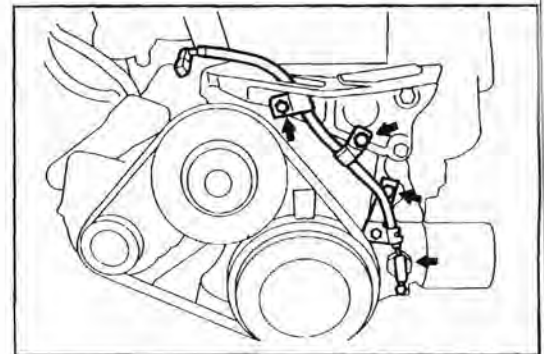
WR88-EM662

9. Remove the water inlet hose.
10. Detach the resistive cords.



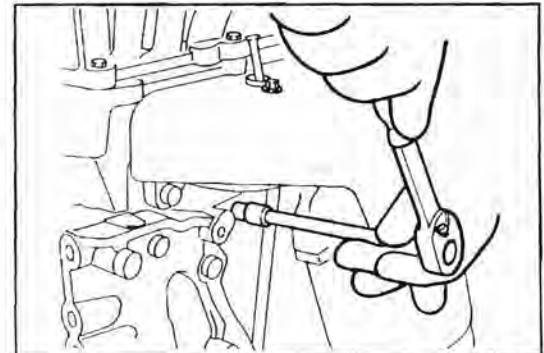
WR88-EM663

11. Remove the oil pressure switch wire clamp and connector.



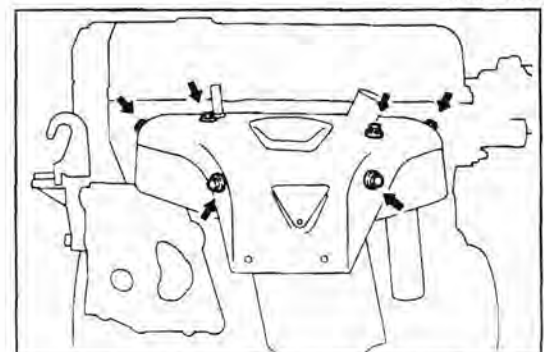
WR88-EM665

12. Remove the oil level gauge.
13. Remove the oil level gauge guide attaching bolt.
NOTE:
On the air conditioner-equipped vehicle, remove the compressor. Suspend it at the vehicle side, using an adequate string.



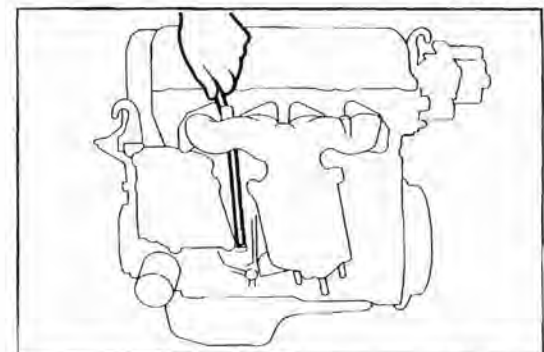
WR88-EM666

14. Remove the exhaust manifold cover.



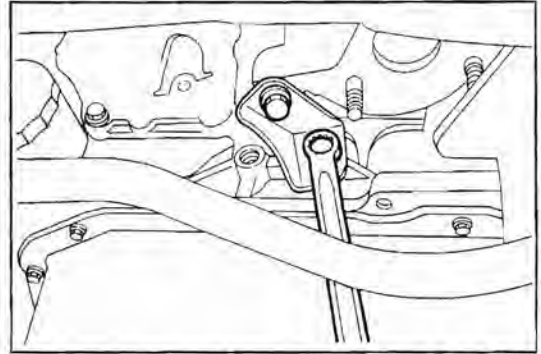
WR88-EM667

15. Remove the oil level gauge guide.



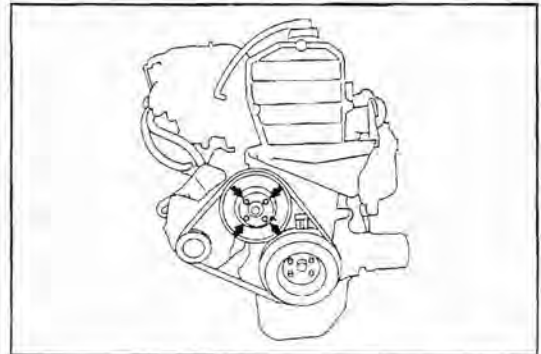
WR88-EM668

16. Remove the exhaust manifold stay.



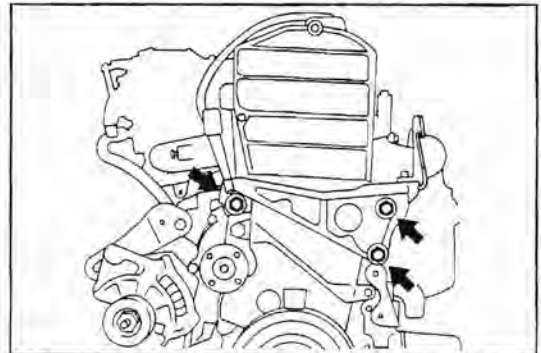
WR88-EM669

17. Loosen the water pump pulley attaching bolt utilizing the tension of the drive belt. Remove the water pump attaching bolt.



WR88-EM670

18. Remove the engine mounting right bracket.



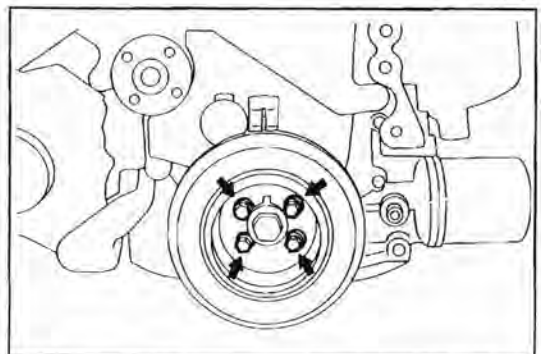
WR88-EM671

19. Remove the crankshaft pulley.

NOTE:

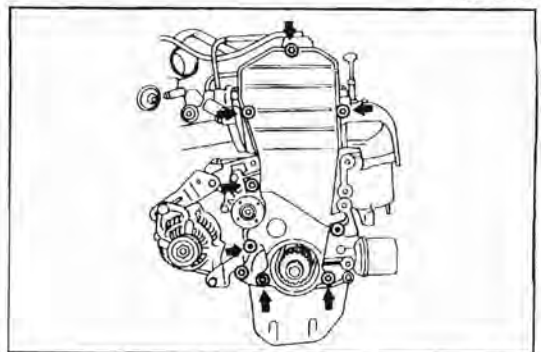
When the crankshaft pulley is removed prevent the crankshaft from turning, using the following SST.

SST: 09210-87701-000



WR88-EM672

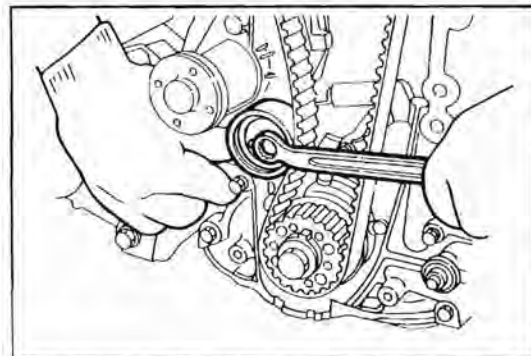
20. Remove the timing belt cover.



WR88-EM673

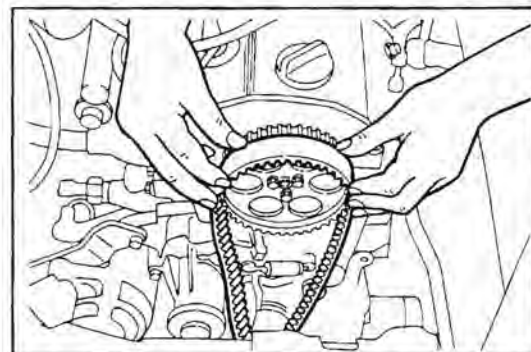
21. Removal of timing belt

- (1) Loosen the timing belt tensioner.
- (2) Temporarily tighten the timing belt tensioner while it is pushed toward the alternator side.



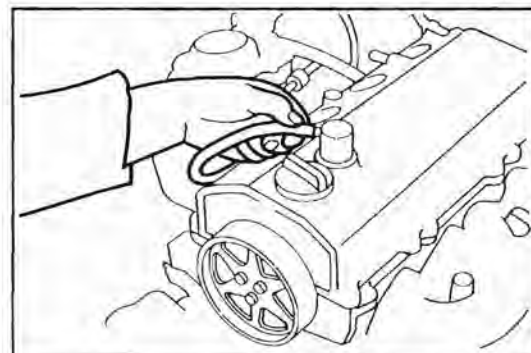
WR88-EM674

- (3) Remove the timing belt.



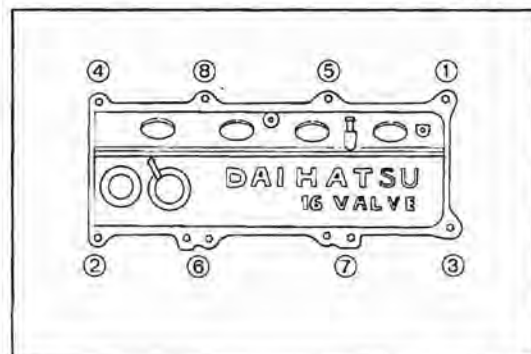
WR88-EM675

22. Disconnect the blow-by gas hose.



WR88-EM676

23. Loosen the cylinder head cover attaching bolts evenly over two or three stages in the sequence indicated in the right figure. Remove the cylinder head cover attaching bolts. Proceed to remove the cylinder head cover.

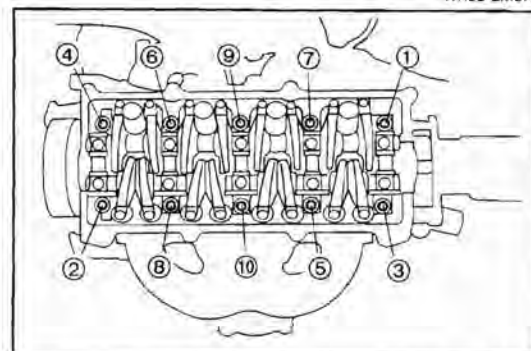


WR88-EM677

24. Loosen the cylinder head bolts evenly over two or three stages in the sequence indicated in the right figure. Remove the cylinder head bolts.

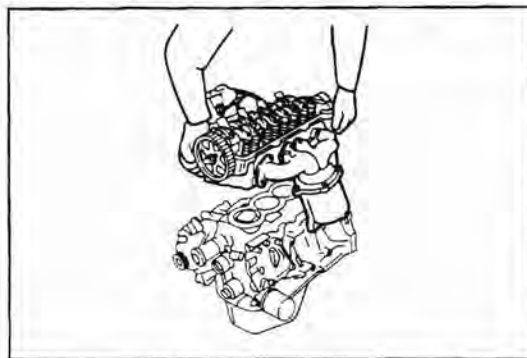
NOTE:

Be certain to loosen the cylinder head bolts evenly. Failure to observe this caution will cause cracks or distortion of the cylinder head, even leading to engine seizure.



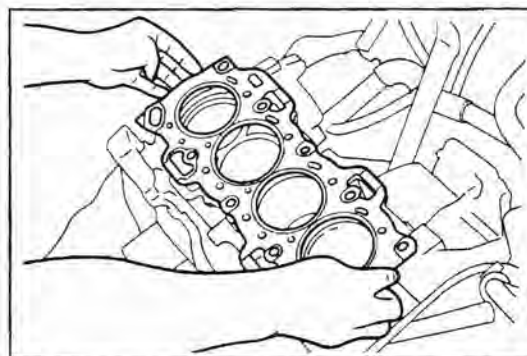
WR88-EM678

25. Remove the cylinder head from the cylinder block.



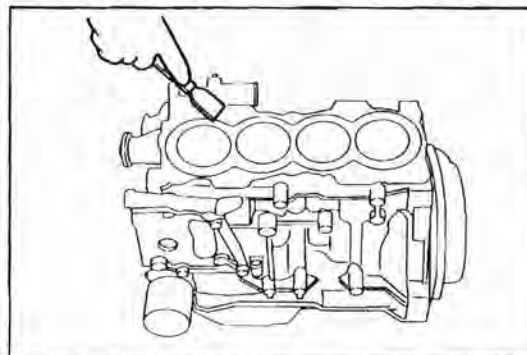
WR88-EM679

26. Remove the cylinder head gasket.



WR88-EM680

27. Remove any remaining gasket materials from the gasket surfaces of the cylinder head and cylinder block, using a gasket scraper.

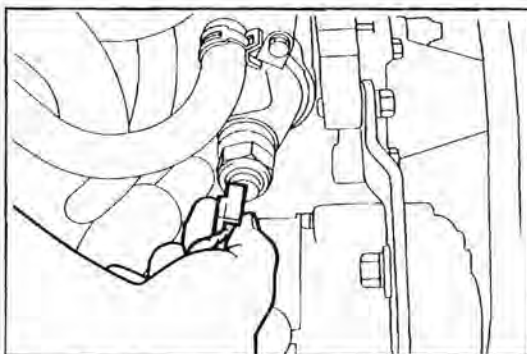


WR88-EM681

PREPARATION FOR DISASSEMBLY [HC-E engine]

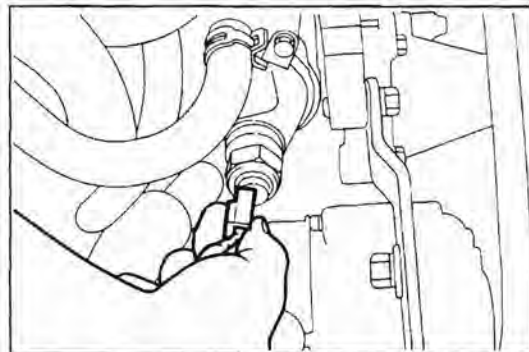
1. Removal of alternator wire

- (1) Disconnect the alternator wire from the alternator terminal B.
- (2) Disconnect the alternator connector of the alternator wire.



WR88-EM682

- (3) Disconnect the radiator fan motor switch connector.

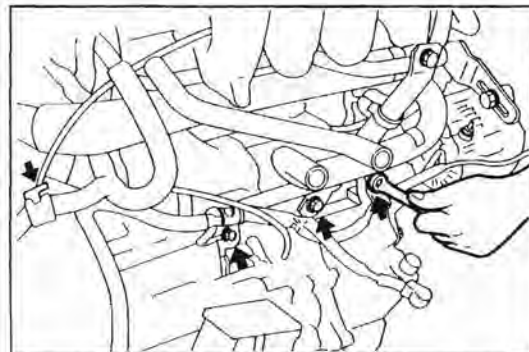


WR88-EM683

- (4) Disconnect the alternator wire from the starter terminal B.
(5) Disconnect the alternator wire from the starter terminal ST.
(6) Disconnect the speed sensor connector (AT vehicles only.)

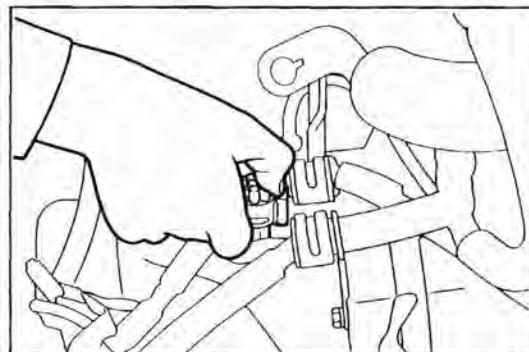
WR88-EM684

- (7) Remove the alternator wire clamp bolt.



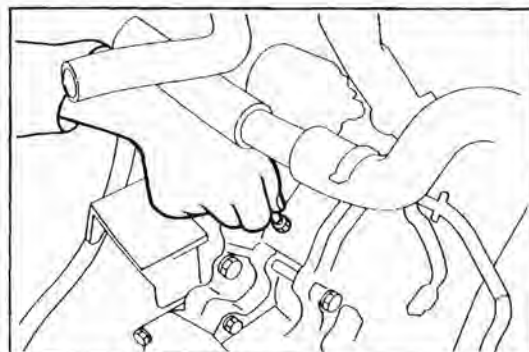
WR88-EM685

- (8) Remove the check connector from the connector bracket of the transmission.



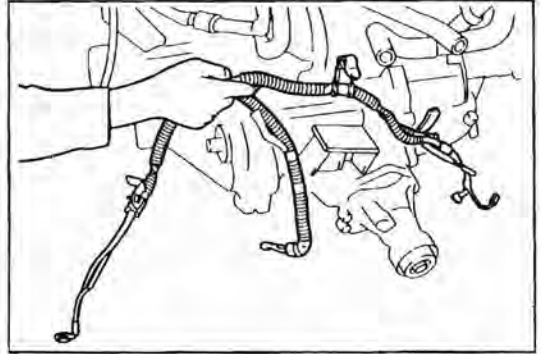
WR88-EM686

- (9) Remove the bleeder hose.



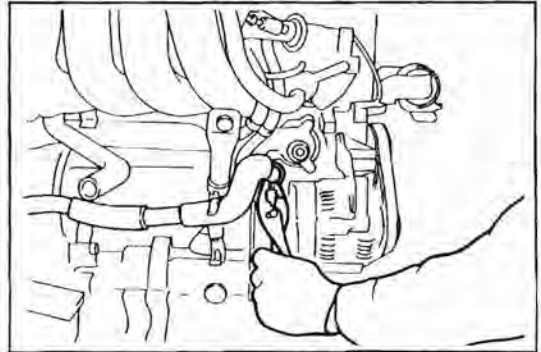
WM88-EM687

(10) Remove the alternator wire.



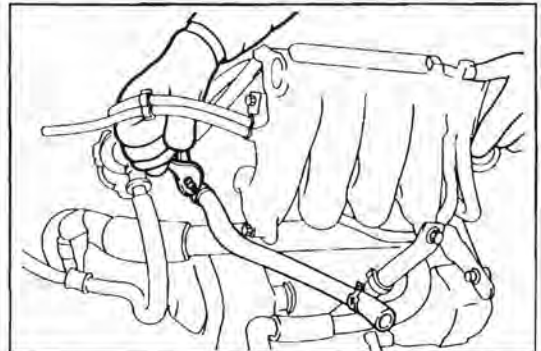
WR88-EM688

2. Remove the heater outlet hose.



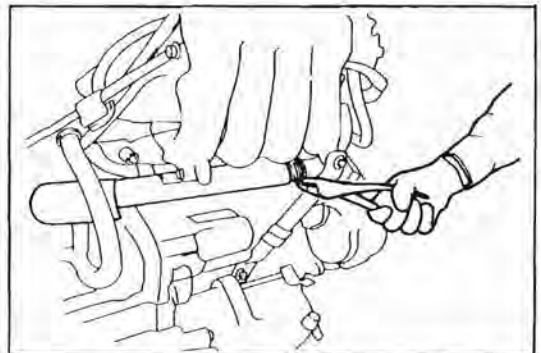
WR88-EM689

3. Remove the heater inlet hose.



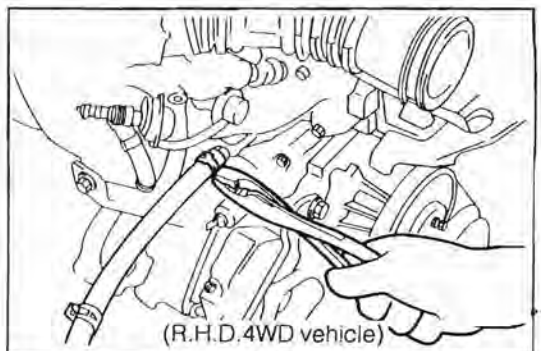
WR88-EM690

4. Remove the radiator lower hose.



WR88-EM691

5. Remove the brake booster hose.

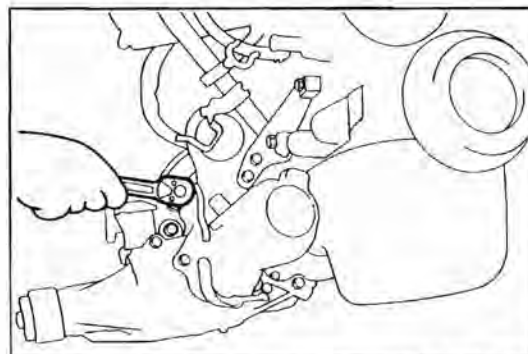


WR88-EM692

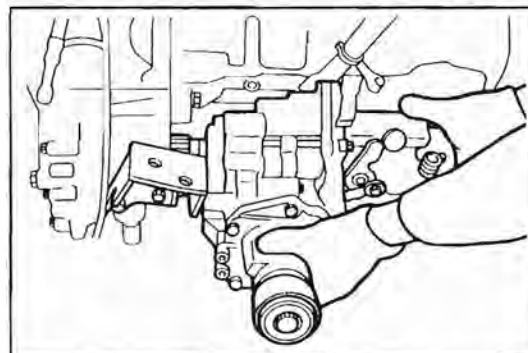
6. Remove the alternator.
7. Remove the starter motor.

WR88-EM693

8. Remove the transfer assembly by removing the attaching bolts.
(4WD vehicle only)

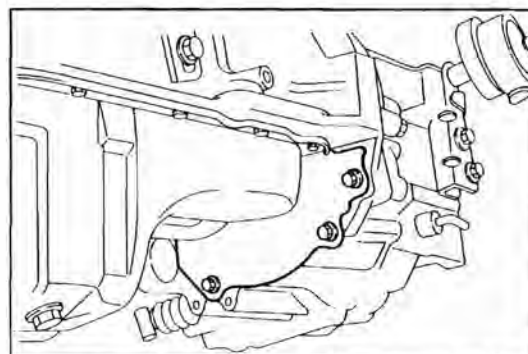


WR88-EM694



WR88-EM695

9. Remove the clutch housing undercover.
(4WD vehicles only.)

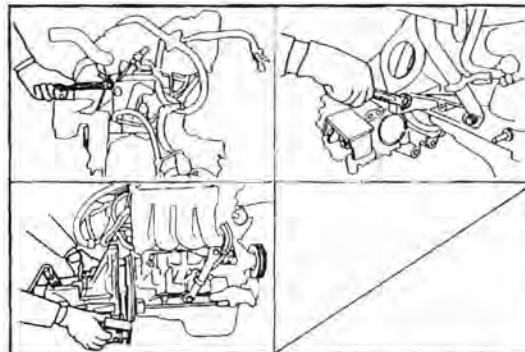


WR88-EM696

10. Remove the front power plant stiffener and rear plant stiffener. (Except 4WD vehicles)
11. Remove the exhaust pipe No. 1 support bracket and power plant stiffener with the transmission undercover.
12. Remove the bolts connecting the drive plate to the torque converter.
(A/T vehicle only)

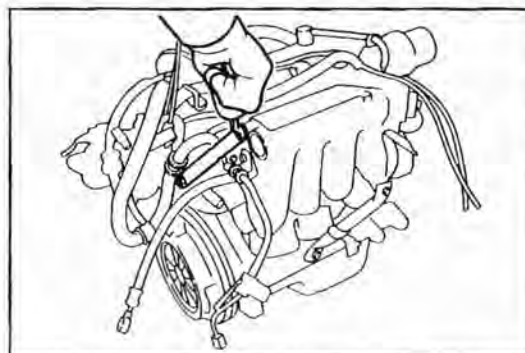
WR88-EM697

13. Remove the transmission from the engine.
14. Place the engine on a suitable working bench or install it on an engine stand.



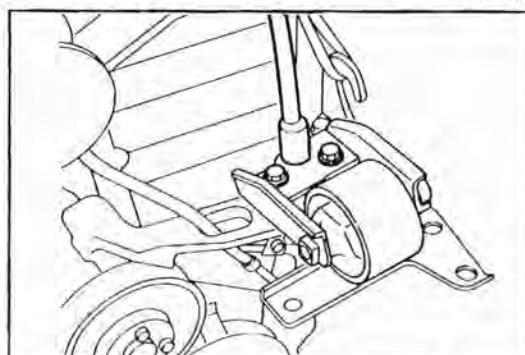
WR88-EM698

15. Remove the surge tank stay No.3.
(Only for manual transmission-equipped vehicles)



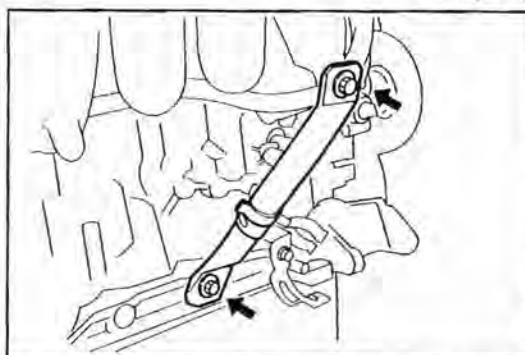
WR88-EM699

16. Remove the engine right mounting bracket from the engine front mounting right bracket.



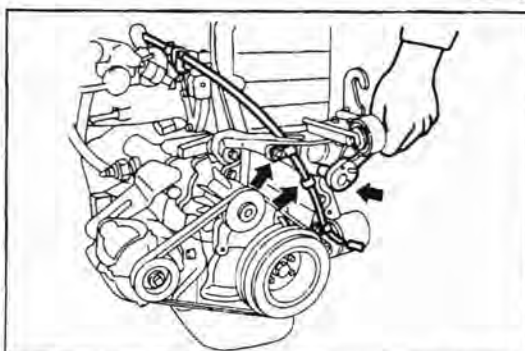
WR88-EM700

17. Remove the surge tank stay No.2.



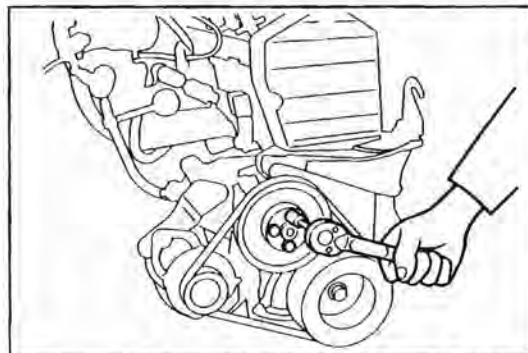
WR88-EM701

18. Remove the oil pressure wire from the engine mounting right bracket and timing belt cover by removing the connector and three clamp bolts.



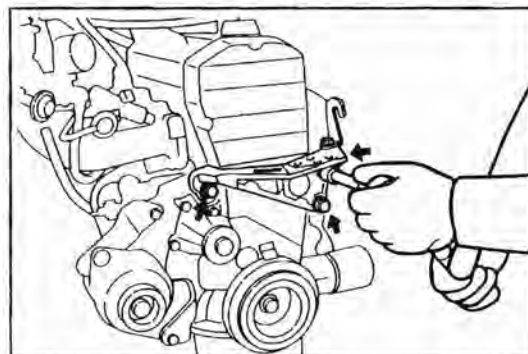
WR88-EM702

19. Remove the water pump pulley.



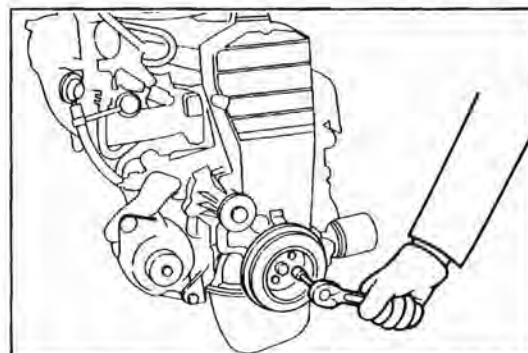
WR88-EM703

20. Remove the engine mounting right bracket.



WR88-EM704

21. Remove the crankshaft pulley.

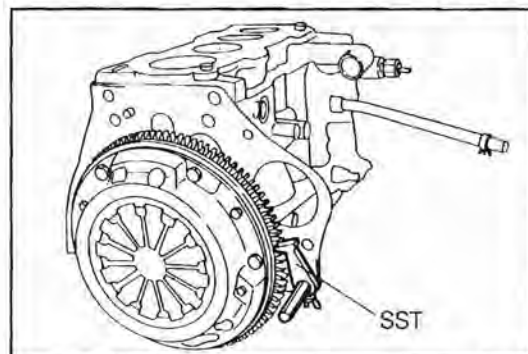


WR88-EM705

NOTE:

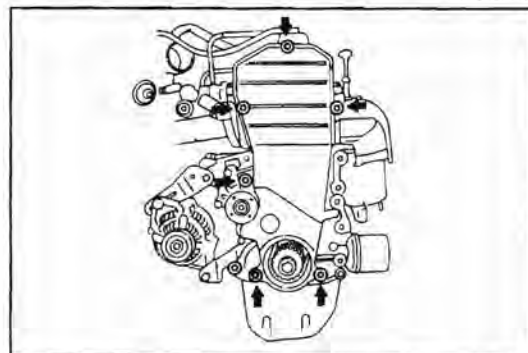
When the crankshaft pulley is removed, prevent the crankshaft from turning, using the following SST.

SST: 09210-87701-000



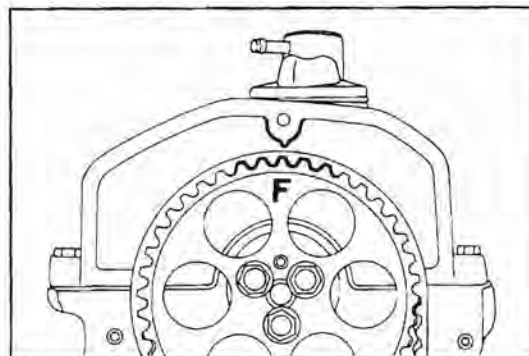
WR88-EM706

22. Remove the timing belt cover.



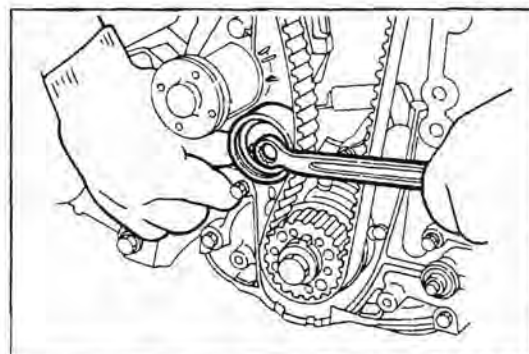
WR88-EM707

23. Turn the crankshaft, until the "F" mark on the camshaft timing belt pulley is aligned with the indicator mark on the cylinder head cover.



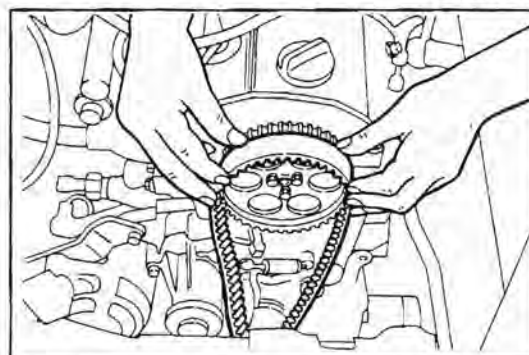
WR88-EM708

24. Loosen the tensioner attaching bolt. Push the tensioner toward the water pump as far as it will go. Then, tighten the tensioner attaching bolt temporarily.



WR88-EM709

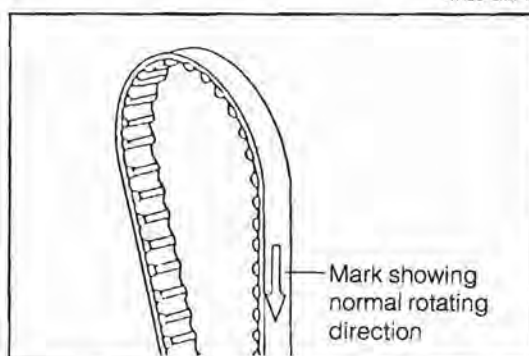
25. Remove the timing belt.



WR88-EM710

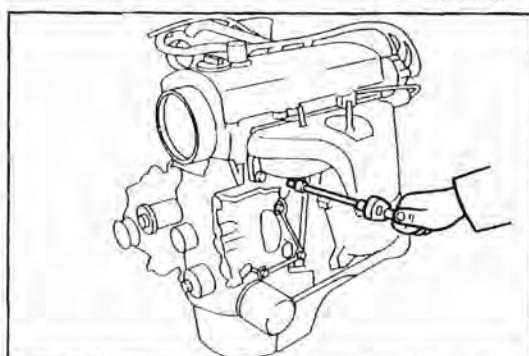
NOTE:

If the timing belt is reused, an arrow mark indicating the rotation direction should be put on the belt, using chalk or the like.



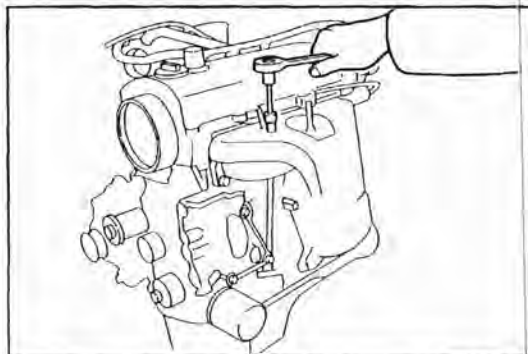
WR88-EM711

26. Pull out the oil level gauge.
27. Remove the attaching bolt of the oil level gauge guide.



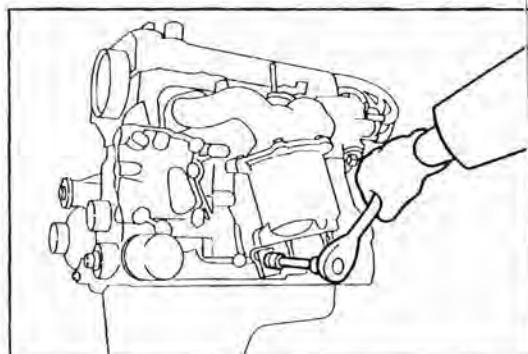
WR88-EM712

28. Remove the exhaust manifold cover. Remove the oil level gauge guide.



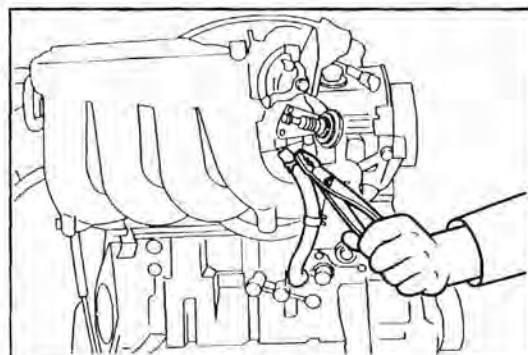
WR88-EM713

29. Remove the exhaust manifold stay.



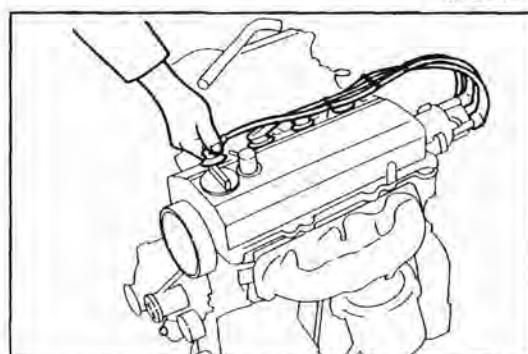
WR88-EM714

30. Disconnect the water hose connected to the throttle body.



WR88-EM715

31. Remove the two ventilation hoses.

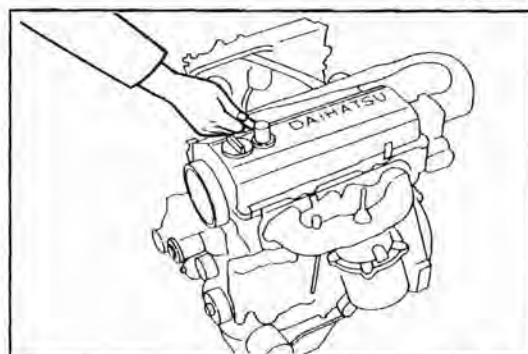


WR88-EM716

32. Remove the resistive cords.

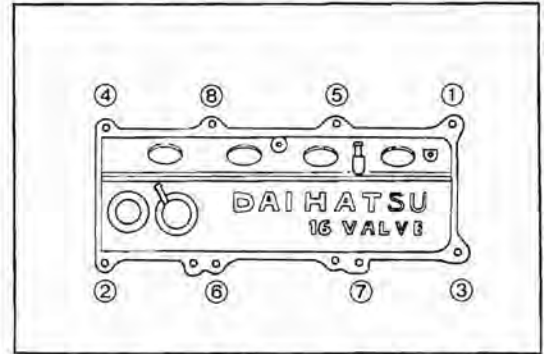
NOTE:

- Do not bend the resistive cords at a sharp angle.
- Never pull out the cord, holding the cord section.



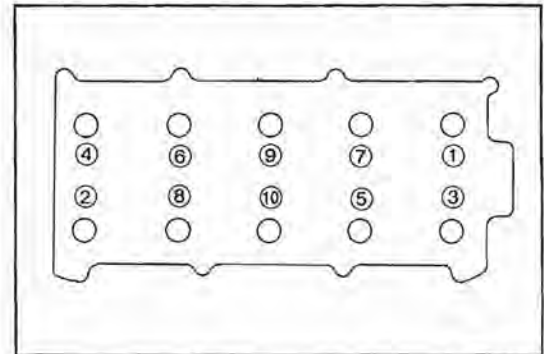
WR88-EM717

33. Loosen the attaching bolts of the cylinder head cover over two or three stages in the sequence as indicated in the right figure. Remove the cylinder head cover.



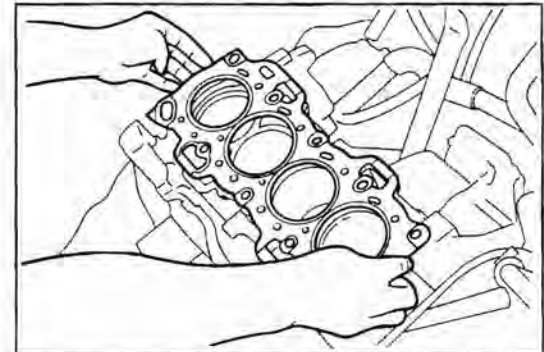
WR88-EM718

34. Loosen the cylinder head bolts over two or three stages in the sequence as indicated in the right figure. Remove the cylinder head from the cylinder block.



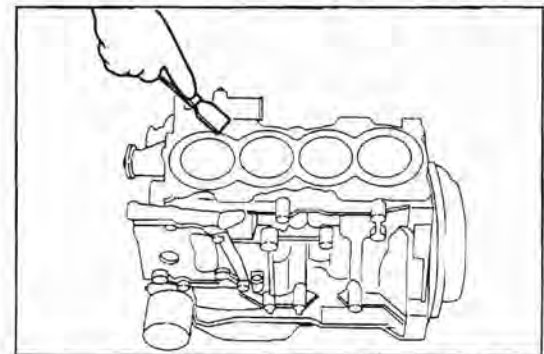
WR88-EM719

35. Remove the cylinder head gasket.



WR88-EM720

36. Remove the cylinder head gasket from the cylinder head upper surface, using a gasket scraper.



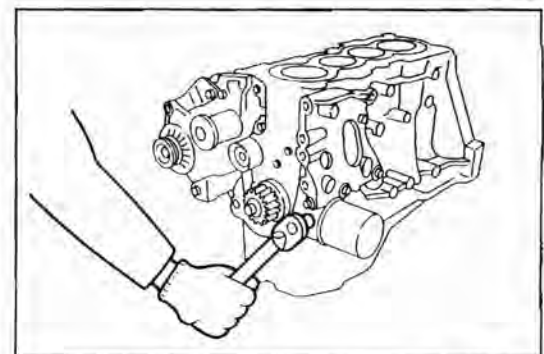
WR88-EM721

DISASSEMBLY OF CYLINDER BLOCK

1. Remove the oil pressure switch.

NOTE:

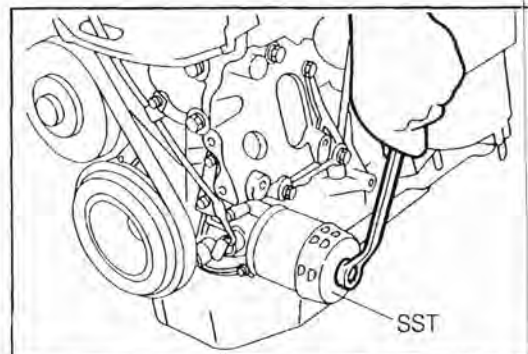
Use a hexagon box wrench for the removal operation.



WR88-EM722

2. Remove the oil filter, using following SST.

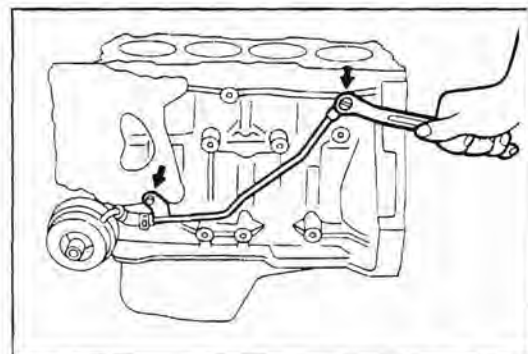
SST: 09228-87201-000



WR88-EM723

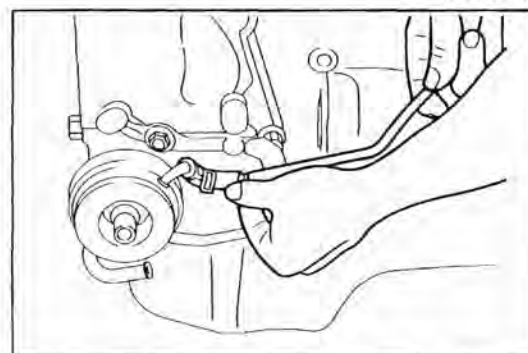
3. Removal of oil cooler.

(1) Remove the oil cooler pipe from the cylinder block.



WR88-EM724

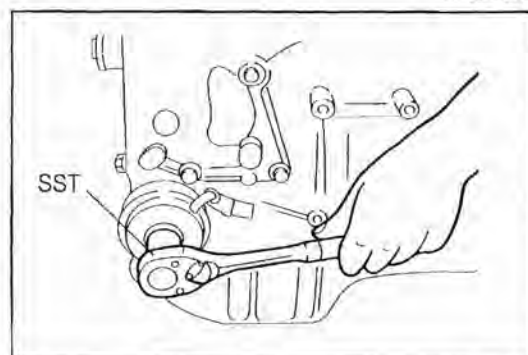
(2) Release the hose band and remove the oil cooler pipe.



WR88-EM725

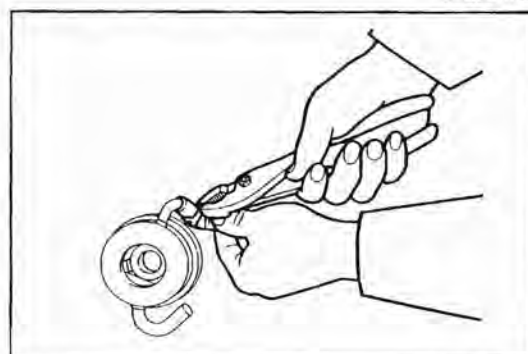
(3) Remove the oil cooler from cylinder block, using the following SST.

SST: 09268-87704-000



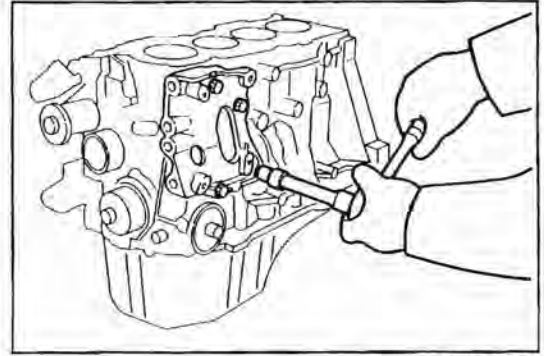
WR88-EM726

(4) Remove the water hose from oil cooler.



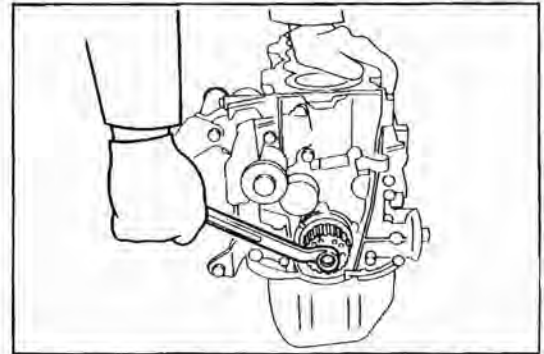
WR88-EM727

4. Remove the engine front right mounting No.1.



WR88-EM728

5. Remove the crankshaft pulley bolt.

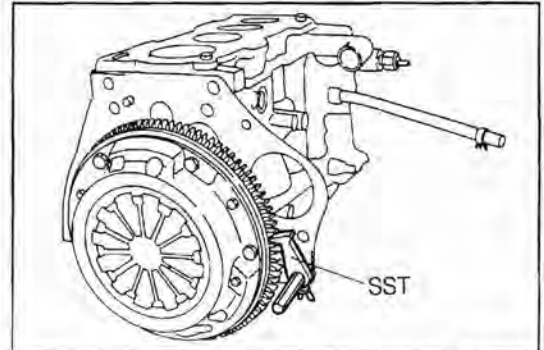


WR88-EM729

NOTE:

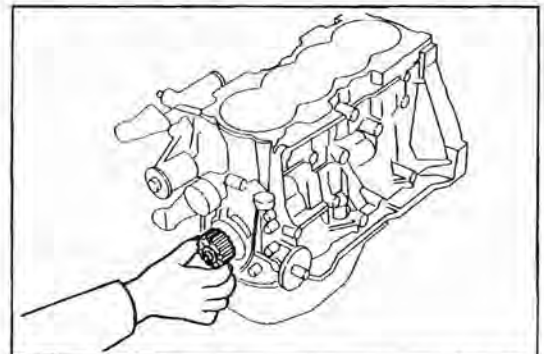
Prevent the ring gear from turning, using the following SST.

SST: 09210-87702-000



WR88-EM730

6. Remove the crankshaft pulley.

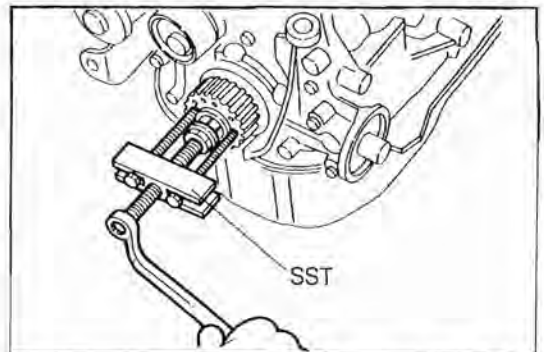


WR88-EM731

NOTE:

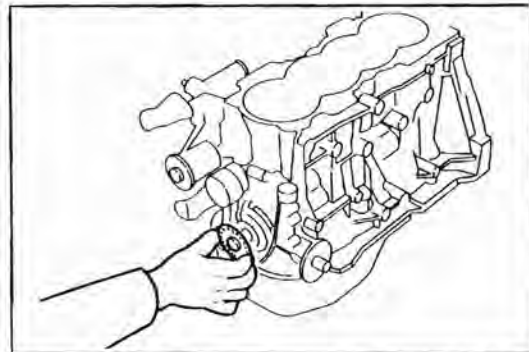
If the crankshaft pulley can not be removed by hand, install the following SST with the crankshaft pulley bolt interposed.

SST: 09609-20011-000



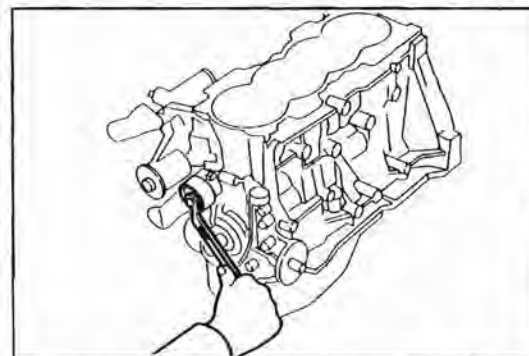
WR88-EM732

7. Remove the crankshaft pulley flange.



WR88-EM733

8. Remove the tensioner and tension spring.

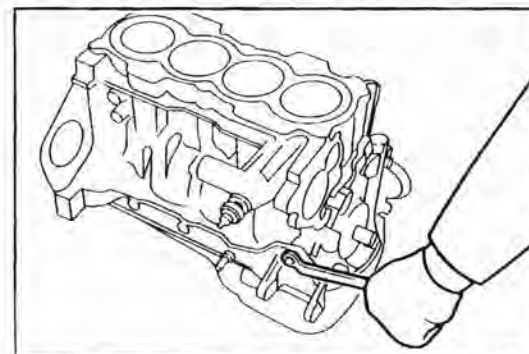


WR88-EM734

9. Remove the water pump.
10. Remove the water pump gasket.

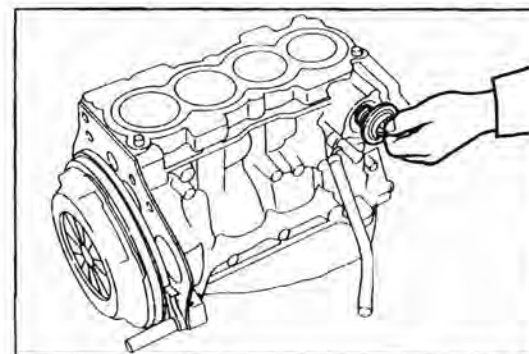
WR88-EM735

11. Remove the alternator bracket.



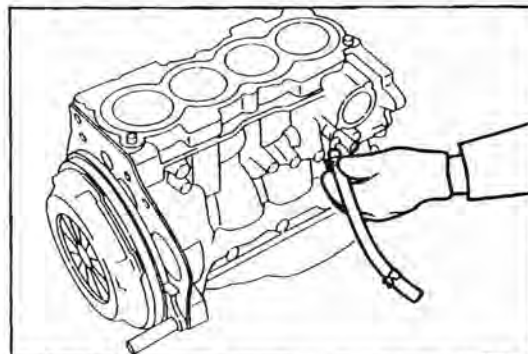
WR88-EM736

12. Remove the radiator thermo control switch from the water inlet. Remove the water inlet and thermostat.



WR88-EM737

13. Remove the water hose for the throttle body.
(HC-E Engine only)



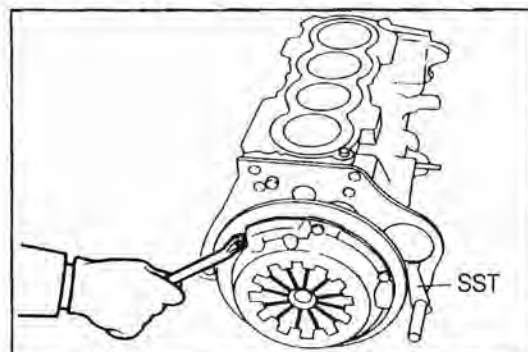
WR88-EM738

14. Remove the pressure plate and clutch disc. (M/T vehicle only)

NOTE:

Prevent the pressure plate from turning, using the following SST.

SST: 09210-87701-000

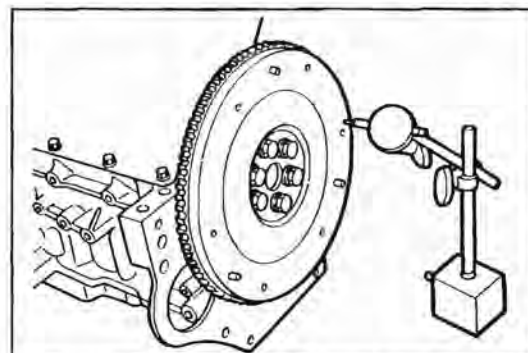


WR88-EM739

15. Check of flywheel for runout (M/T vehicle only)

NOTE:

If the runout does not conform to the specification, confirm the tightening torque of the flywheel. Only case where the tightening torque conforms to the specified value, replace the flywheel.



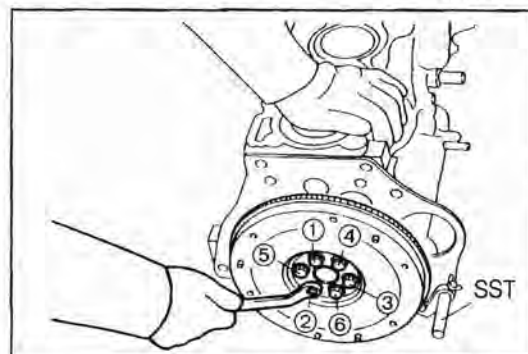
WR88-EM740

16. Loosen the attaching bolts of the flywheel or drive plate in the sequence as indicated in the right figure. Remove the flywheel or drive plate.

NOTE:

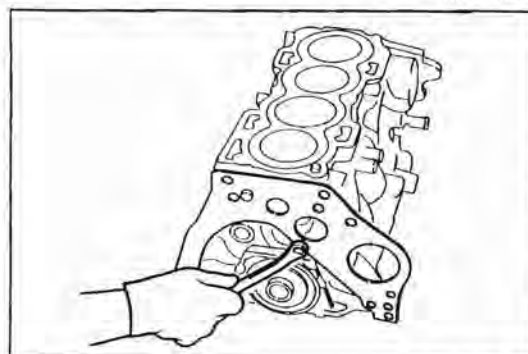
Prevent the flywheel from turning, using the following SST.

SST: 09210-87701-000



WR88-EM741

17. Remove the rear end plate.



WR88-EM742

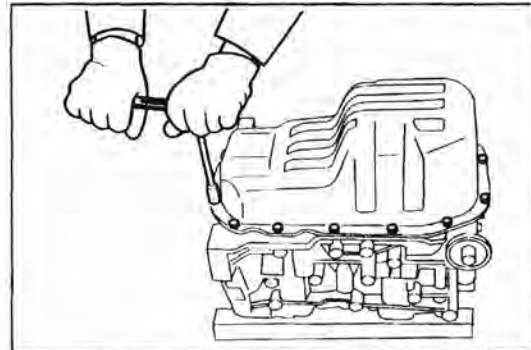
18. Removal of oil pan

- (1) Prepare two suitable wooden blocks. Place the cylinder block on those blocks.

NOTE:

Be very careful not to damage the piston head.

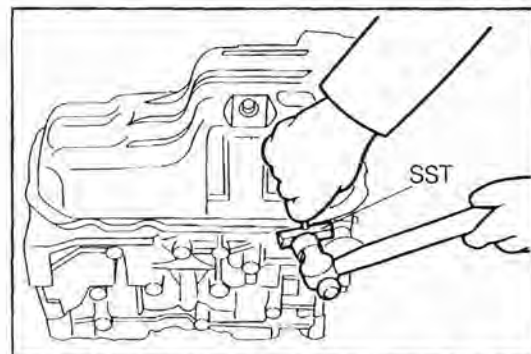
- (2) Loosen the attaching bolts and nuts of the oil pan over two or three stages. Pull out the bolts and nuts.



WR88-EM743

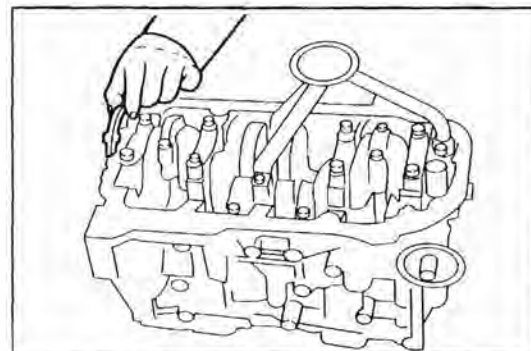
- (3) Separate the oil pan from the cylinder block by driving the following SST into between the cylinder block and the oil pan.

SST: 09032-00100-000



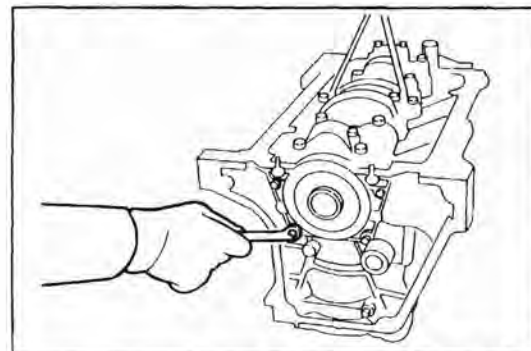
WR88-EM744

19. Remove the oil pan gasket.



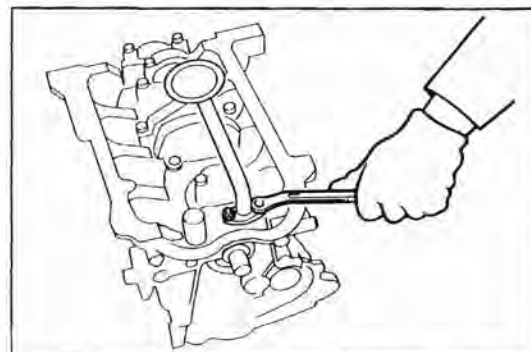
WR88-EM745

20. Remove the rear oil seal retainer.



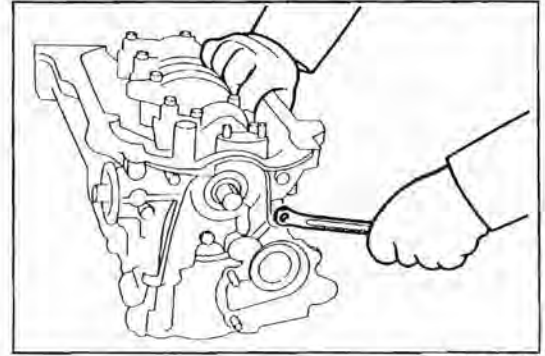
WR88-EM746

21. Remove the oil pump strainer.



WR88-EM747

22. Remove the oil pump.



WR88-EM748

23. Measurement of connecting rod thrust clearance.
Measure the thrust clearance between the connecting rod and the crankshaft, using a thickness gauge.

Thrust clearance:

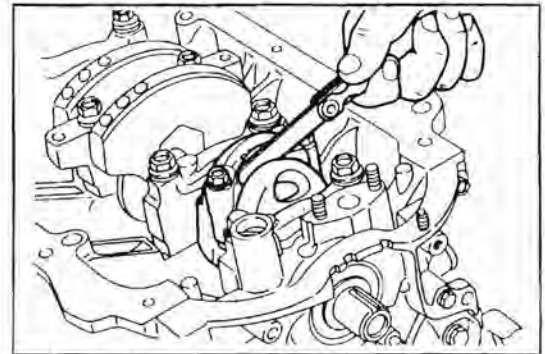
Standard 0.15 - 0.4 mm (0.0060 - 0.015 inch)

Maximum 0.45 mm (0.017 inch)

NOTE:


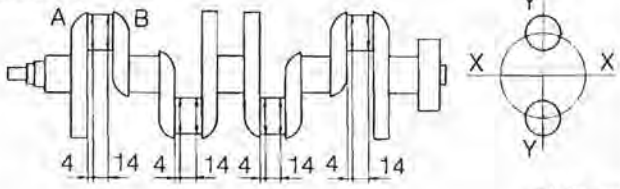
The thrust clearance should be measured while the connecting rod is being pushed against either side of the crankshaft in the axial direction. Measure the thrust clearance at the opposite side.

If the clearance exceeds the specified value, replace the connecting rod or the crankshaft, or both of them, referring to the width of the big end of the connecting rod in the thrust direction and the side width of the crankpin journal.



WR88-EM749

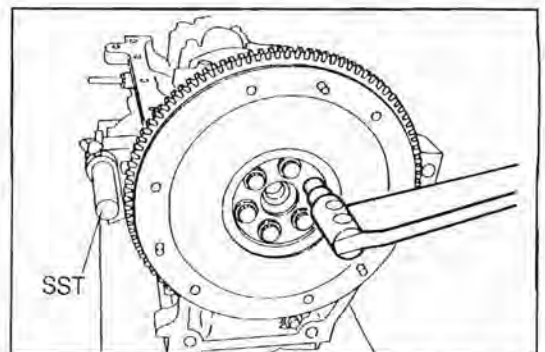
Reference

Width of big end of connecting rod in thrust direction	Side width of crankpin
21.80 - 21.85 mm (0.858 - 0.860 inch)	22.0 - 22.2 mm (0.867 - 0.874 inch)
	<p>Crankshaft</p>  <p>Unit: mm</p>

WR88-EM750

24. Measurement of crankpin journal oil clearance

(1) Install the flywheel temporarily.

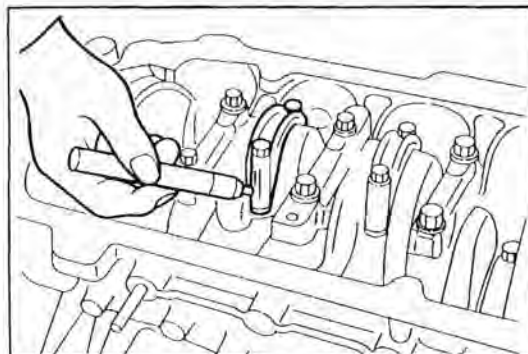


WR88-EM751

- (2) Wipe off any oil from the side of the mate surface between the connecting rod bearing cap and the connecting rod. Daub a mate mark with an oily paint on the side so that the parts can be assembled correctly in the original combination.

(Also ensure that the cylinder number may be identified)

- (3) Turn the crankshaft, until the connecting rod bearing cap to be removed comes at the oil pan side.

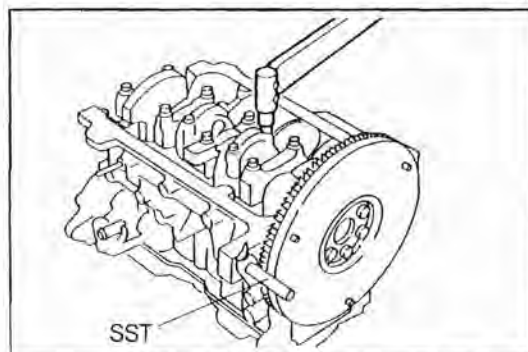


WR88-EM752

- (4) Lock the flywheel to prevent the crankshaft from turning, using the following SST.

SST: 09210-87701-000

- (5) Loosen the connecting rod bearing cap nuts evenly over two or three stages. Then, remove the connecting rod bearing cap nuts.



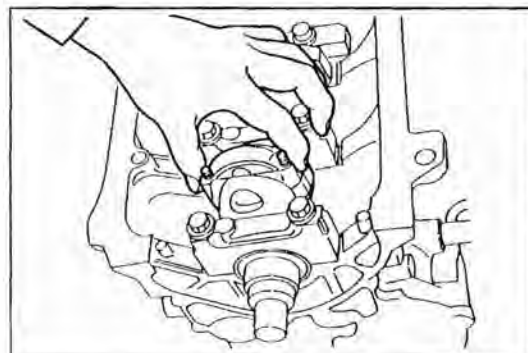
WR88-EM753

- (6) Remove the bearing cap.

NOTE:

Replace the crankshaft if the crankpin journals exhibit damages, such as seizure.

(See page EM-182.)

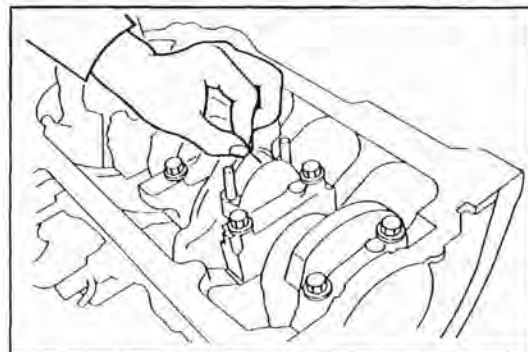


WR88-EM754

- (7) Place a plastigage on the crankpin journal.

NOTE:

Wipe off any oil from the crankpin journal.



WR88-EM755

- (8) Install the connecting rod cap, making sure that the mate marks are lined up. Tighten the connecting rod bearing cap nuts evenly over two or three stages to the specified torque.

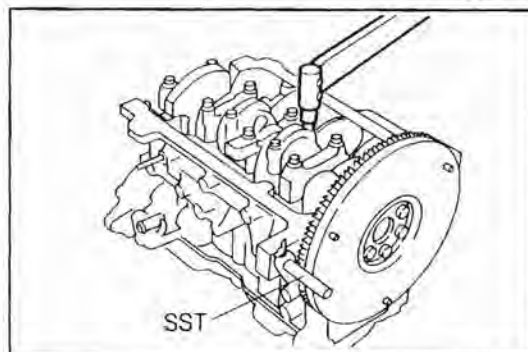
Tightening Torque: 3.5 - 4.5 kg-m (25.4 - 32.5 ft-lb)

NOTE:

When tightening of the bearing cap nuts, apply engine oil to the bearing cap nuts.

Prevent the crankshaft from turning, using the SST.

SST: 09210-87701-000



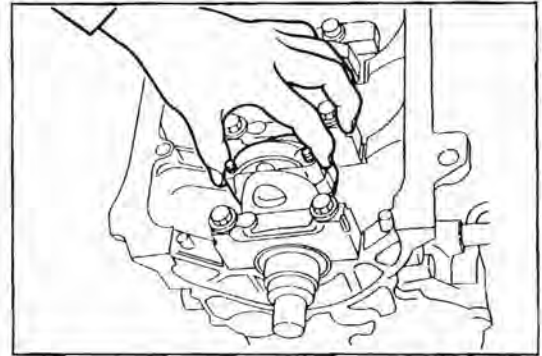
WR88-EM756

- (9) Loosen the connecting rod bearing cap nuts evenly over two or three stages. Then, remove the connecting rod bearing cap.

NOTE:

Prevent the crankshaft from turning, using the SST.

SST: 09210-87701-000



WR88-EM757

- (10) Measure the plastigage width at its widest point.

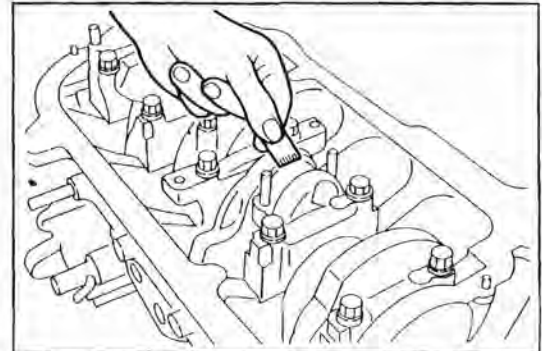
Oil Clearance: 0.020 - 0.044 mm

(0.00079 - 0.0017 inch)

If the oil clearance fails to conform to the specified value, measure the crankpin journal diameter and select a suitable connecting rod bearing or replace the crankshaft.

- (11) Remove the plastigage from the crankpin journal.

- (12) Measure the oil clearances of the remaining crankpin journals.



WR88-EM758

25. Selection of connecting rod bearings

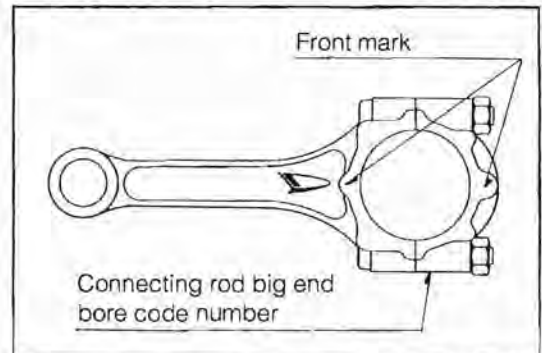
NOTE:

The replacement of the connecting rod bearings should be performed after all inspections have been finished.

- (1) Read the connecting rod big end bore code number.

NOTE:

The connecting rod big end bore code number comes in three kinds of 4, 5 and 6.

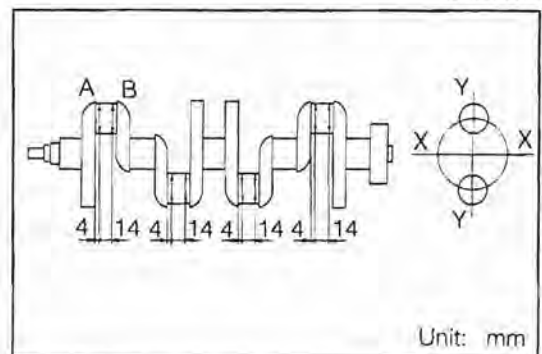


WR88-EM759

- (2) Measure the diameter of the crankpin journal.

The measurement should be performed at four points, 90 degrees spaced, for each crankpin journal at the points shown in the right figure. The maximum value is regarded as the crankpin journal diameter.

However, if the variation in the measured diameters exceeds 0.044 mm (0.0017 inch), replace the crankshaft.



Unit: mm

WR88-EM760

ENGINE MECHANICALS

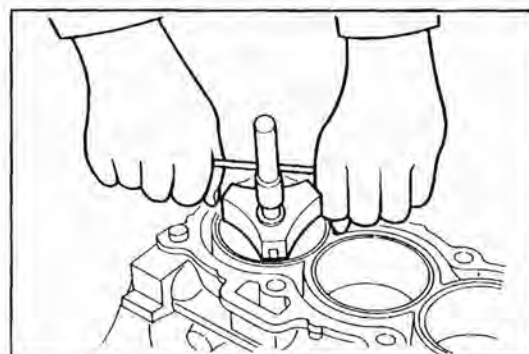
(3) Select the connecting rod bearing or replace the crankshaft, based on the results of (1) and (2).

Connecting rod big end bore code number	crankpin journal diameter	Bearing classification number (color)	Remarks
4	44.993 - 45.000 (1.7714 - 1.7716)	1 (Yellow)	—
	44.985 - 44.992 (1.7710 - 1.7713)	2 (Green)	—
	44.976 - 44.984 (1.7708 - 1.7710)	3 (Brown)	—
	44.975 or less (1.7706)	—	Crankshaft replacement
5	44.993 - 45.000 (1.7714 - 1.7716)	2 (Green)	—
	44.985 - 44.992 (1.7710 - 1.7713)	3 (Brown)	—
	44.976 - 44.984 (1.7708 - 1.7710)	4 (Black)	—
	44.975 or less (1.7706)	—	Crankshaft replacement
6	44.993 - 45.000 (1.7714 - 1.7716)	3 (Brown)	—
	44.985 - 44.992 (1.7710 - 1.7713)	4 (Black)	—
	44.976 - 44.984 (1.7708 - 1.7710)	5 (Blue)	—
	44.975 or less (1.7706)	—	Crankshaft replacement

WR88-EM761

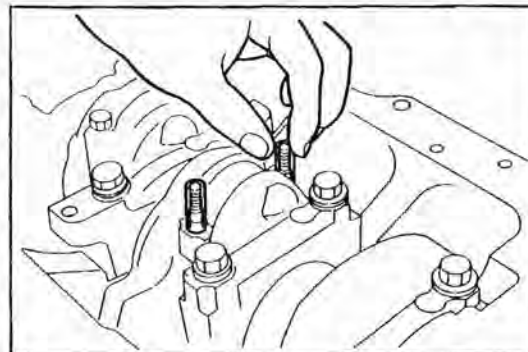
26. Piston Removal

(1) Remove all carbon deposits from the piston ring ridges.



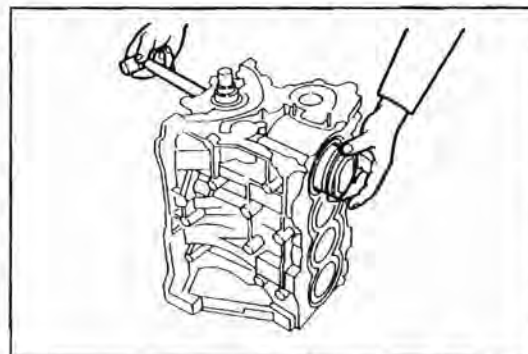
WR88-EM762

- (2) Cover each connecting rod bolt with a short piece of hose to protect the crankpin journal from damage.



WR88-EM763

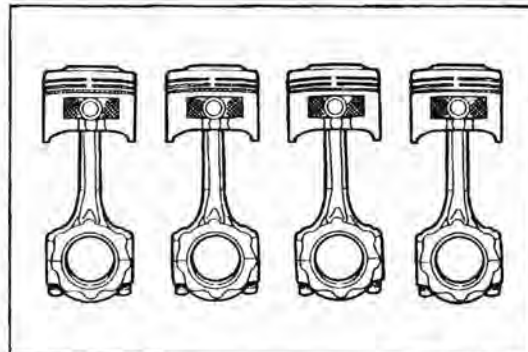
- (3) Push out the piston and connecting rod assembly and the upper bearing through the top of the cylinder block.



WR88-EM764

NOTE:

- Arrange the disassembled pistons and connecting rod in order so that their installation positions may be known readily.
- Care should be exercised so as not to damage the bearings.



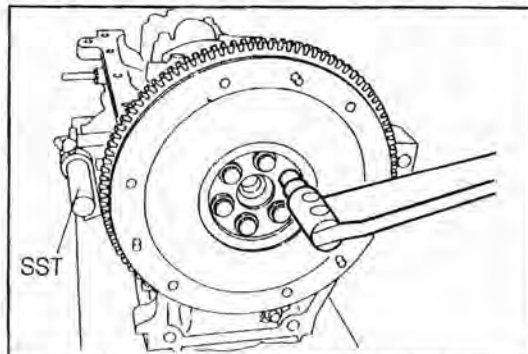
WR88-EM765

27. Remove the flywheel.

NOTE:

Prevent the ring gear from turning with the SST.

SST: 09210-87701-000



WR88-EM766

28. Check of crankshaft thrust clearance

NOTE:

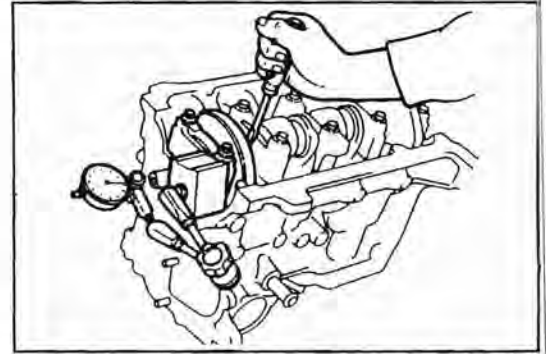
Measure the thrust clearance, using a dial gauge.

Thrust Clearance:

Specified value: 0.02 - 0.22 mm
(0.00079 - 0.0086 inch)

Allowable limit: 0.30 mm
(0.012 inch)

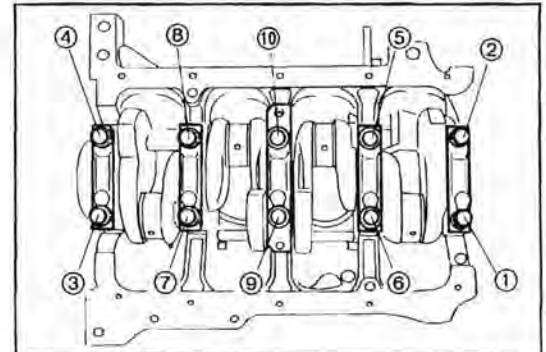
If the thrust clearance exceeds the allowable limit, measure the width of the crankshaft thrust bearing contact surface. If the measured value is less than 39.92 mm (1.57 inch), replace the thrust washer. If the measured value exceeds 39.92 (1.57 inch), replace the crankshaft and thrust washer.



WR88-EM767

29. Check of crankshaft main journal oil clearance

- (1) Gradually loosen the main bearing cap bolts over three stages in the numerical sequence shown in the figure. Remove the bearing cap bolts.

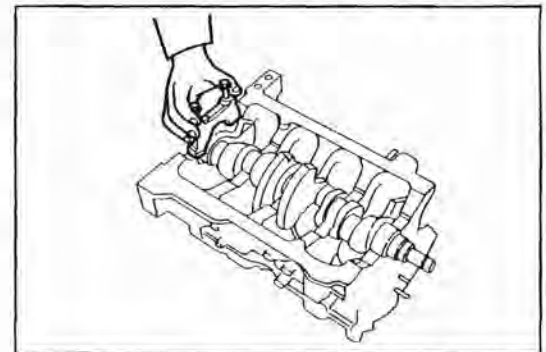


WR88-EM768

- (2) With the main bearing cap bolts inserted into the bolt holes of the main bearing cap, wiggle the bearing cap back and forth. Remove the bearing cap together with the lower bearing.

NOTE:

Keep the lower bearing fitted to the main bearing cap. Arrange the removed main bearing caps in order.

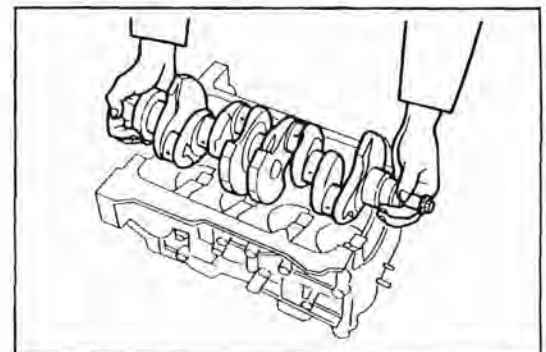


WR88-EM769

- (3) Lift off the crankshaft.

NOTE:

- Be very careful not to allow the main bearings to be mixed with the bearings of the other cylinders.
- Remove the thrust washer.



WR88-EM770

- (4) Clean the main journals and bearings, using cleaning solvent. Blow them with compressed air.

CAUTION:

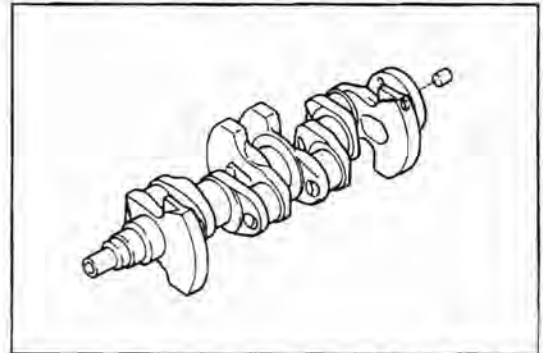
Protect your eyes with safety goggles during the cleaning operation.

WR88-EM771

- (5) Check the main journals and bearings for pitting or scratches.

If the main journals are damaged, replace the crankshaft.
(See page EM-182.)

If the main journal bearings are damaged, replace the main journal bearings.
(See page EM-169.)

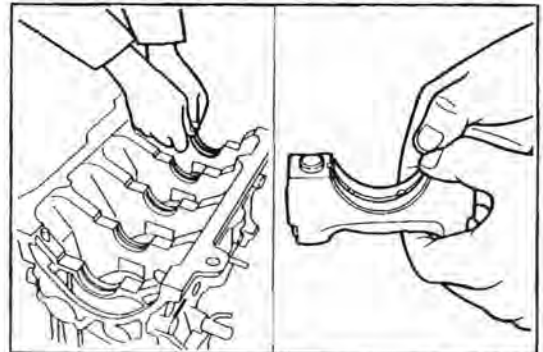


WR88-EM772

- (6) Install the main bearings to the cylinder block and crankshaft main bearing cap.

NOTE:

Do not touch the metal surface of the bearing.

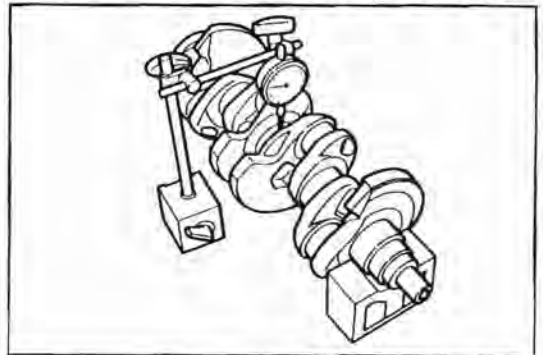


WR88-EM773

- (7) Support the both ends of the crankshaft with a V-block. Measure the crankshaft runout with a dial gauge.

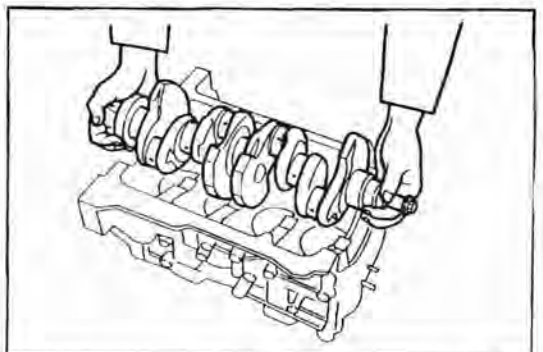
Allowable limit of runout: 0.06 mm (0.00236 inch)

If the runout exceeds the allowable limit, replace the crankshaft.



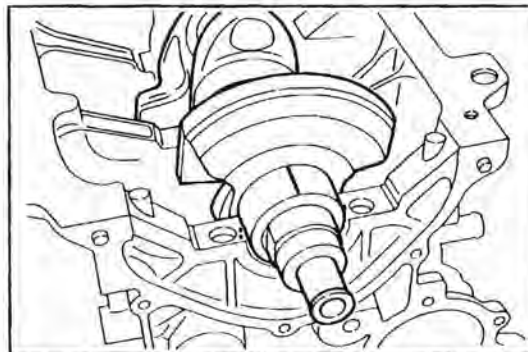
WR88-EM774

- (8) Place the crankshaft in the cylinder block.



WR88-EM775

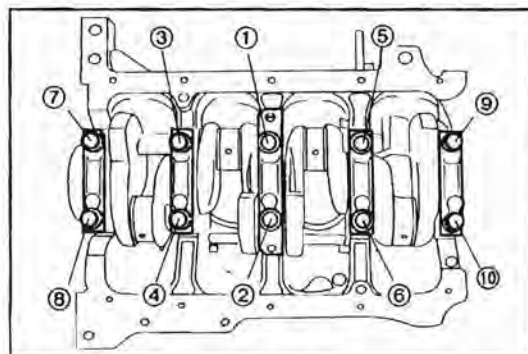
- (9) Lay a strip of plastigage across each crankshaft main journal.



WR88-EM776

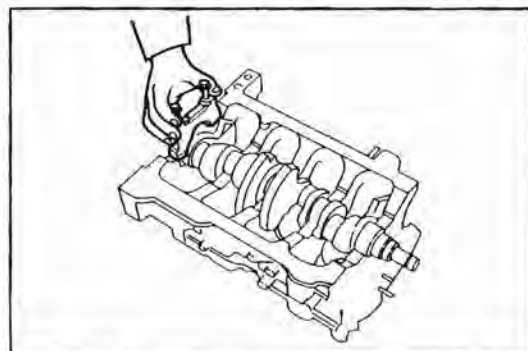
- (10) Install the crankshaft bearing caps. Tighten the crankshaft bearing cap bolts evenly in the sequence indicated in the right figure.

Tightening Torque: 4.5 - 5.5 kg-m (32.5 - 39.8 ft-lb)



WR88-EM777

- (11) Remove the main bearing caps with the lower bearings fitted on them.



WR88-EM778

- (12) Measure the plastigage width at its widest point.

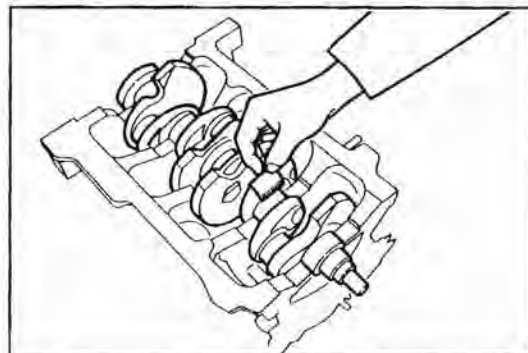
Oil Clearance: 0.024 - 0.042 mm

(0.00095 - 0.0016 inch)

If the oil clearance fail to conform to the specified value, measure the crankshaft main journal diameter and select suitable connecting rod bearings or replace the crankshaft.

(See page EM-182.)

- (13) Remove the plastigage from the crankshaft main journals.



WR88-EM779

30. Selection of crankshaft bearings

NOTE:

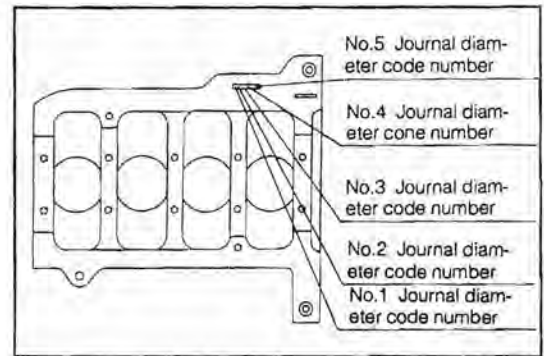
The replacement of the crankshaft bearings should be performed after all inspections have been finished.

WR88-EM780

- (1) Read the cylinder block main journal diameter code number.

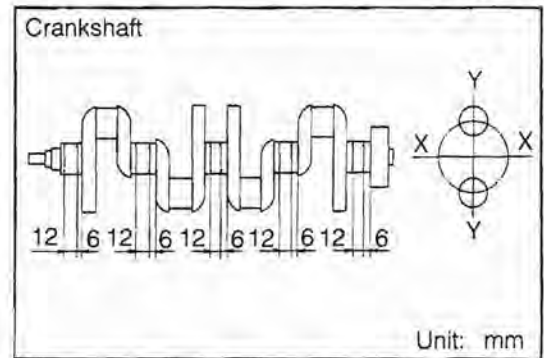
NOTE:

The main journal diameter code comes in four kinds of 5, 6, 7 and 8.



WR88-EM781

- (2) Measure the diameter of the crankshaft main journals. The measurement should be performed at four points, 90 degrees spaced, for each crankshaft main journal at the points shown in the right figure. The maximum value is regarded as the crankshaft main journal diameter. However, if the variation in the measured diameters exceeds 0.026 mm (0.0010 inch), replace the crankshaft.



WR88-EM782

ENGINE MECHANICALS

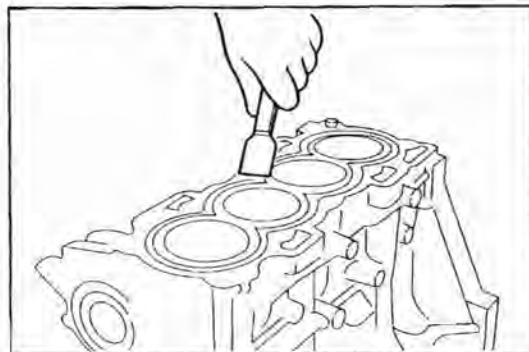
(3) Select the crankshaft bearings or replace the crankshaft, based on the results of (1) and (2).

Main journal diameter code mm (inch)	Crankmain journal diameter	Bearing classification number (color)	Remarks
5	49.995 - 50.000 (1.9684 - 1.9685)	1 (Yellow)	—
	49.989 - 49.994 (1.9681 - 1.9682)	2 (Green)	—
	49.983 - 49.988 (1.9679 - 1.9680)	3 (Brown)	—
	49.976 - 49.982 (1.9676 - 1.9677)	4 (Black)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
6	49.995 - 50.000 (1.9684 - 1.9685)	2 (Green)	—
	49.989 - 49.994 (1.9681 - 1.9682)	3 (Brown)	—
	49.983 - 49.988 (1.9679 - 1.9680)	4 (Black)	—
	49.976 - 49.982 (1.9676 - 1.9677)	5 (Blue)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
7	49.995 - 50.000 (1.9684 - 1.9685)	3 (Brown)	—
	49.989 - 49.994 (1.9681 - 1.9682)	4 (Black)	—
	49.983 - 49.988 (1.9679 - 1.9680)	5 (Blue)	—
	49.976 - 49.982 (1.9676 - 1.9677)	6 (White)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
8	49.995 - 50.000 (1.9684 - 1.9685)	4 (Black)	—
	49.989 - 49.994 (1.9681 - 1.9682)	5 (Blue)	—
	49.983 - 49.988 (1.9679 - 1.9680)	6 (White)	—
	49.976 - 49.982 (1.9676 - 1.9677)	7 (Pink)	—
	49.975 or less (1.9675)	—	Crankshaft replacement

WR88-EM783

INSPECTION OF CYLINDER BLOCK

1. Removal of gasket material
Remove all gasket materials from the cylinder block.
2. Cleaning of cylinder block
Clean the cylinder block, using a soft brush and cleaning solvent.

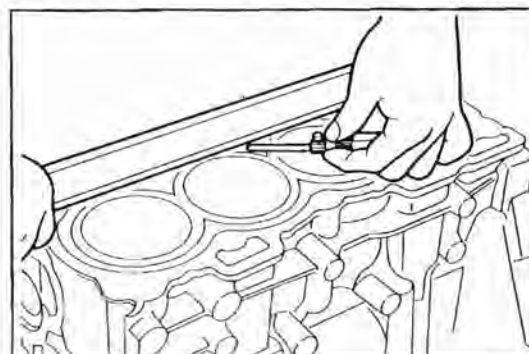


WR88-EM784

3. Inspection of top surface of cylinder block
Using a precision straightedge and a thickness gauge, check the surface contacting the cylinder head gasket for warpage in the six directions as shown in the figure.

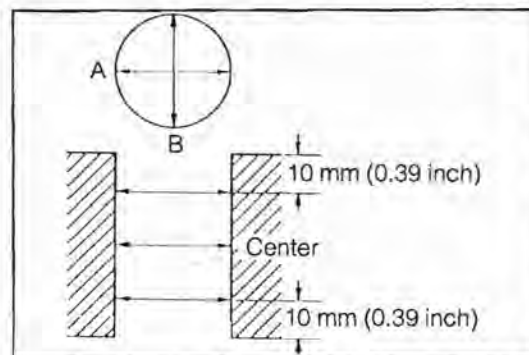
Maximum Warpage: 0.10 mm (0.0039 inch)

If the warpage exceeds the allowable limit, replace the cylinder block.



WR88-EM785

4. Measurement of cylinder bores
(1) Measure the bore diameter of each cylinder at the four points shown in the right figure. Ensure that the difference between the maximum and minimum bore diameters of each cylinder is within 0.1 mm (0.0039 inch).



WR88-EM786

If the difference between the maximum and minimum values exceeds 0.1 mm (0.0039 inch), perform boring and/or honing for the cylinder bore in accordance with the oversized piston.

The honing angle is $35^\circ \pm 5^\circ$. The surface coarse degree is 1 - 4Z.

WR88-EM787

Reference

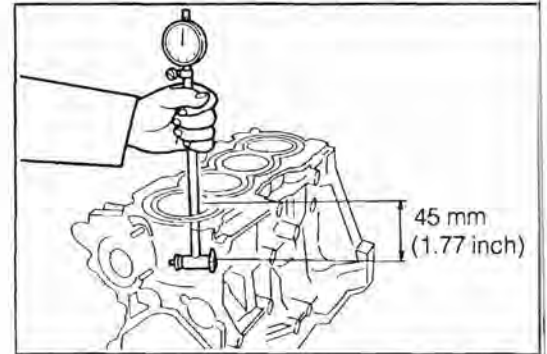
The table below shows the cylinder bore diameter when oversized pistons are used.

However, after the diameter of the replacement piston has been measured, perform the finishing in accordance with the piston diameter.

Standard	O/S 0.25
76.000 - 76.030 mm (2.9922 - 2.9933 inch)	76.250 - 76.280 mm (3.002 - 3.0031 inch)

WR88-EM788

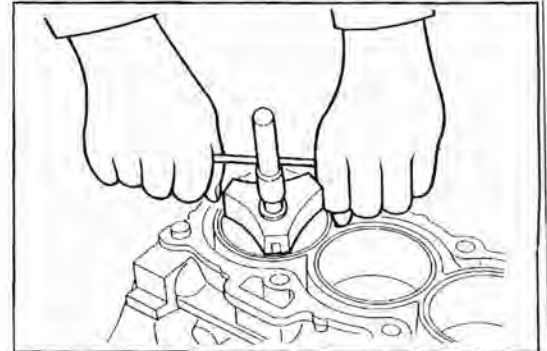
- (2) Measure the bore diameter of each cylinder at a position shown in the right figure. The measured value is regarded as the cylinder bore diameter.



WR88-EM789

5. Removal of cylinder ridges

If ridges are formed at the upper parts of the cylinder bores, use a ridge reamer to remove the ridges.



WR88-EM790

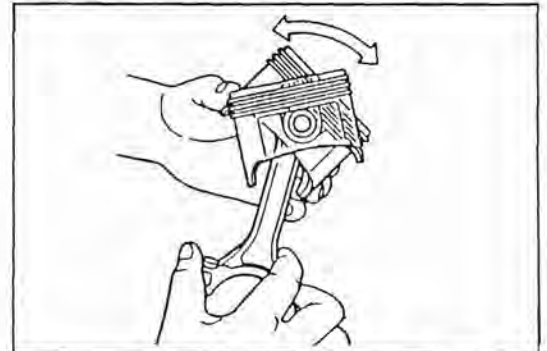
INSPECTION OF PISTONS AND CONNECTING RODS

1. Inspection of 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 piston pin as a set. (See page EM-176)

NOTE:

When the piston is moved back and forth on the piston pin, you may encounter hard movement. However, if the piston moves smoothly without any binding, this fitting of the piston is normal.



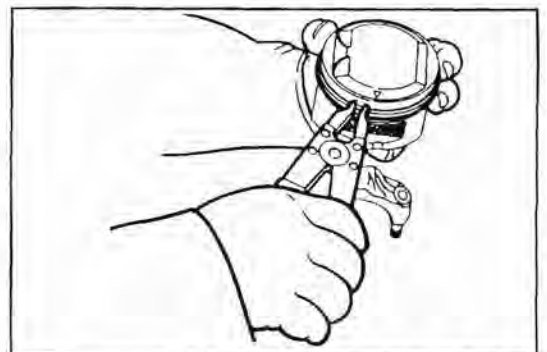
WR88-EM791

2. Removal of piston rings

NOTE:

- Arrange the removed piston rings in order so that their installation positions may be known readily.
- Do not expand the piston ring unnecessarily beyond the required extent.

- (1) Remove the piston rings No. 1 and No. 2, using a piston ring expander.
- (2) Remove the oil ring side rails by hand.
- (3) Remove the oil ring expander by hand.



WR88-EM792

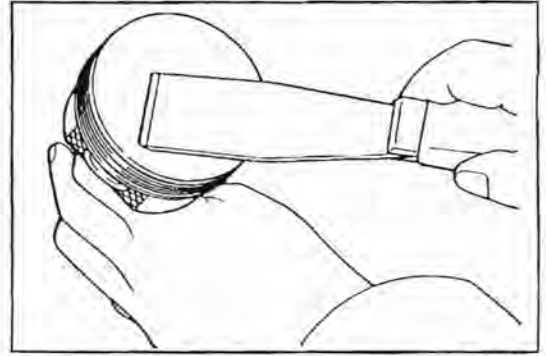
INSPECTION OF PISTONS

1. Cleaning of pistons
 - (1) Remove the carbon deposits from the piston top, using a gasket scraper or the like.

NOTE:
Be very careful not to scratch the piston.

 - (2) Clean the piston grooves with a broken piston ring or a groove cleaning tool.

NOTE:
Be very careful not to scratch the piston.
2. Inspection of pistons
Visually inspect the piston for cracks, damage or seizure.
Replace the piston, if necessary.

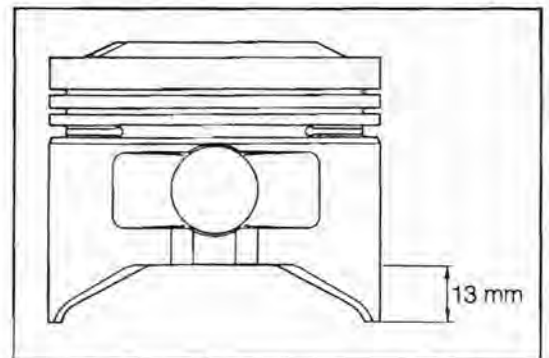


WR88-EM793

3. Measurement of piston diameter
 - (1) Measure the piston outer diameter horizontally at a point 13 mm (0.51 inch) from the lower end of the piston at right angles to the piston pin.
 - (2) Calculation of piston-to-cylinder bore clearance
Subtract the measured piston outer diameter from the measured cylinder bore diameter. Ensure that this piston-to-cylinder bore clearance is less than 0.11 mm (0.0043 inch).

Piston-to-Cylinder Bore Clearance:

Specified Value	0.045 - 0.065 mm
	(0.0018 - 0.0025 inch)
Allowable Limit	0.11 mm
	(0.0043 inch)



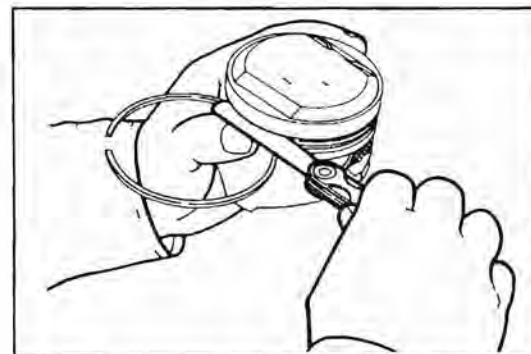
WR88-EM795

If the piston-to-cylinder bore clearance exceeds the allowable limit, perform boring and honing the cylinder bores so that the cylinder bore diameter may match with the oversized piston.

(See page EM-178.)

However, when the cylinder bore diameter exceeds 76.28 mm (3.003 inch), replace the cylinder block.

4. Inspection of piston ring groove side clearance
Measure the side clearances of the piston rings No.1 and No.2 over the entire periphery of each groove, using a thickness gauge.
The maximum measured value is regarded as the piston ring side clearance.



WR88-EM797

Piston ring side clearance

	Specified value	mm (inch)	Allowable limit	mm (inch)
Compression ring No.1	0.03 - 0.07	(0.0012 - 0.0027)	0.12	(0.0047)
Compression ring No.2	0.02 - 0.06	(0.00079 - 0.0023)	0.12	(0.0047)

If the piston side clearance exceeds the allowable limit, measure the piston ring thickness. Referring to the piston ring standard thicknesses given below, replace the piston ring and/or piston so that the piston ring side clearance may become less than the allowable limit.

WR88-EM798

Piston ring specified thickness

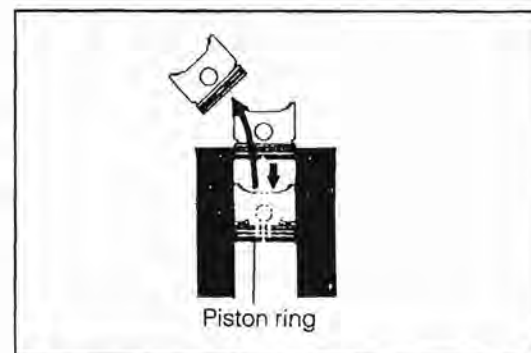
Compression ring No.1	mm (inch)	1.17 - 1.19	(0.0461 - 0.0468)
Compression ring No.2	mm (inch)	1.47 - 1.49	(0.0579 - 0.0586)

NOTE:

When replacing the piston rings, a set of piston rings for one cylinder should be replaced.

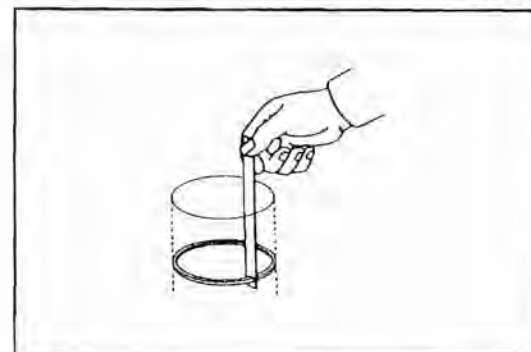
WR88-EM799

5. Inspection of piston ring end gap
- (1) Apply engine oil to the cylinder walls.
 - (2) Insert the piston rings into the cylinder bore.
 - (3) Using a piston, push down the piston ring to a point 110 mm (4.33 inch) measured from the cylinder block upper surface.



WR88-EM800

- (4) Measure the piston ring end gap, using a thickness gauge or a feeler gauge.



WR88-EM801

Piston ring end gap

	Specified value	mm (inch)	Allowable limit	mm (inch)
Compression ring No.1	0.27 - 0.42	(0.011 - 0.016)	0.7	(0.028)
Compression ring No.2	0.35 - 0.50	(0.0138 - 0.0196)	0.8	(0.031)
Oil ring	0.20 - 0.70	(0.0079 - 0.027)	1.0	(0.039)

If the piston ring end gap exceeds the allowable limit, a set of piston rings for one cylinder should be replaced.

WR88-EM802

ASSEMBLY/DISASSEMBLY OF PISTON & CONNECTING ROD

1. Disassembly of piston and connecting rod

Use the following SSTs for the disassembling operation.

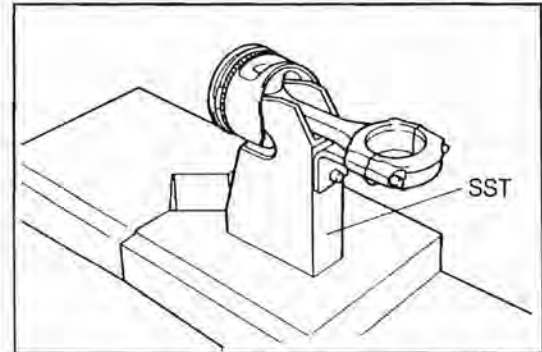
SST: 09221-87704-000

09221-87705-000

- (1) Install the connecting rod in the following SST as shown in the right figure.

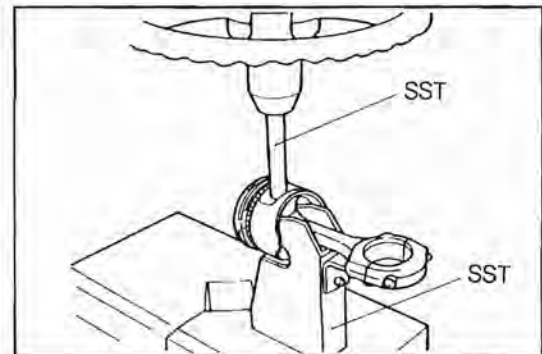
SST: 09221-87704-000

WR88-EM803



WR88-EM804

- (2) Insert the longer SST into the piston pin hole. Press off the piston, using a hydraulic press.



WR88-EM805

2. Inspection of connecting rods

- (1) Visually inspect the connecting rods for damage or cracks.

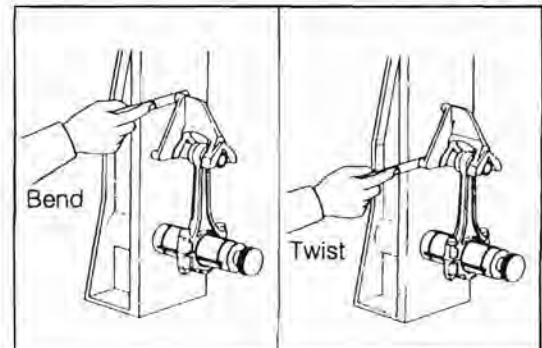
- (2) Check the connecting rod for bend and twist, using a connecting rod aligner.

Maximum bend: 0.05 mm (0.0020 inch)

Maximum twist: 0.05 mm (0.0020 inch)

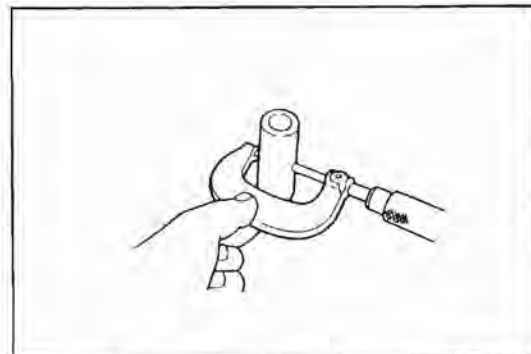
If the bend and/or twist is greater than the maximum limit, replace the connecting rod assembly.

(See page EM-185.)



WR88-EM806

3. Inspection of piston pin-to-connecting rod interference fit
 - (1) Measure the outer diameter of the piston pin contacting with the connecting rod, using a micrometer.



WR88-EM807

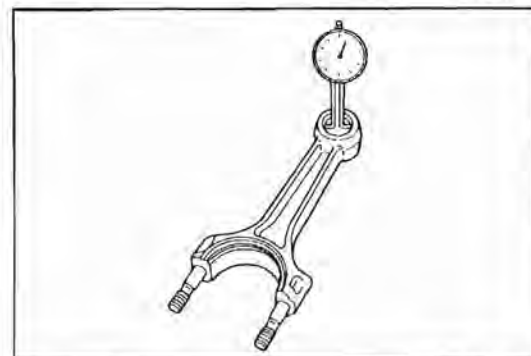
- (2) Measure the inner diameter of the connecting rod, using a bore dial gauge.
 - (3) Determine the interference fit by subtracting the inner diameter of the connecting rod from the outer diameter of the piston pin.

Interference Fit:

0.012 - 0.044 mm (0.00047 - 0.00173 inch)

If the interference fit does not conform to the specification, replace the connecting rod.

(See page EM-184.)



WR88-EM808

3. Assembly of piston and connecting rod

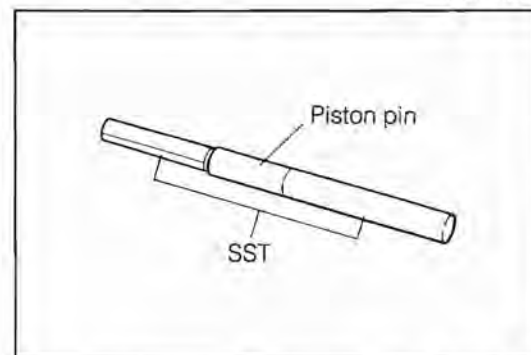
Use the following SSTs for the assembling operation.

SST: 09221-87704-000

09221-87705-000

- (1) Install the piston pin to the following SST in a way shown in the right figure.

SST: 09221-87705-000



WR88-EM809

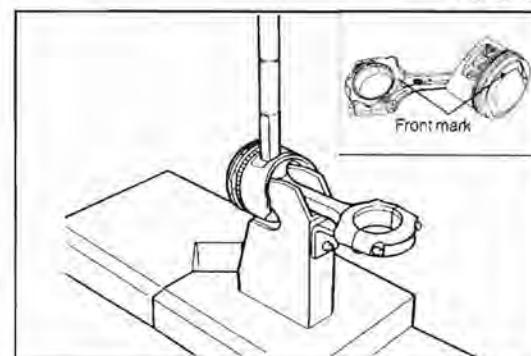
- (2) Install the piston and connecting rod in the SST in a way shown in the right figure. Insert the SST installed with the piston pin into the piston pin hole.

SST: 09221-87704-000

09221-87705-000

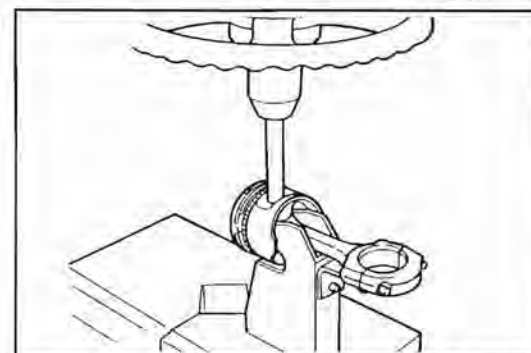
NOTE:

The piston and connecting rod should be assembled in such a way that the piston front mark and connecting rod front mark come in the same direction.



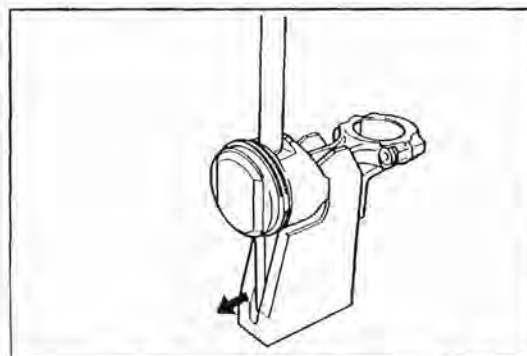
WR88-EM810

- (3) Press the piston pin into the piston and connecting rod, using a hydraulic press.



WR88-EM811

- (4) Remove the piston and connecting rod assembly from the SST. Remove the SST from the piston pin.



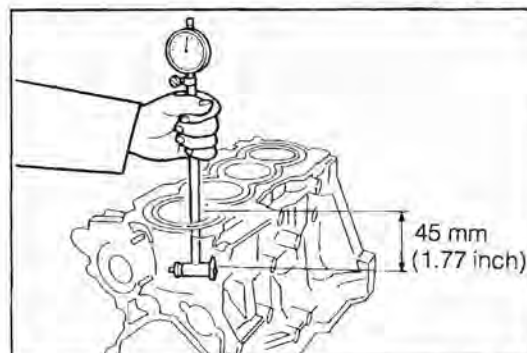
WR88-EM812

CYLINDER BORING

NOTE:

- When the cylinder is bored, all cylinders should be bored at the same time.
- As for piston rings, use oversized piston rings.

1. Measurement of cylinder bore diameter
Measure the diameter at a point 45 mm (1.77 inch) from the cylinder upper surface in the direction shown in the right figure.
If the measured value exceeds 76.28 mm (3.00 inch), replace the cylinder block.



WR88-EM813

WR88-EM814

2. Determining cylinder finishing diameter
(1) Measure the diameter of the oversized piston to be used, using a micrometer.

NOTE:

- The measurement should be conducted at the skirt section 13 mm (0.51 inch) from the piston lower end.
- Perform the measurement horizontally, not in a tilted state.

WR88-EM815

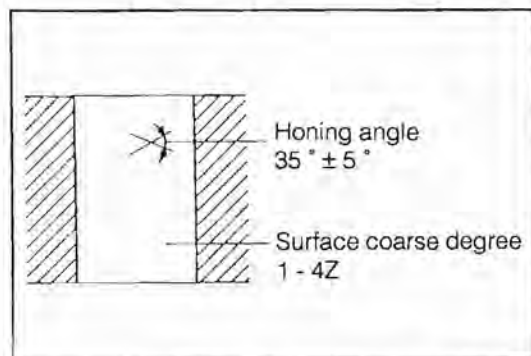
- (2) Calculate the finishing dimension, as follows.

- A: Piston diameter
- B: Piston-to-cylinder bore clearance
0.045 - 0.065 mm
(0.0018 - 0.0025 inch)
- C: Honing allowance
0.02 mm (0.0008 inch)
- D: Finishing diameter
- $D = A + B - C$

WR88-EM816

3. Hone the cylinder after the boring.
 - (1) Bore the cylinder, leaving a honing allowance of 0.02 mm (0.0008 inch).
 - (2) Hone the cylinder.

Honing angle: $35^{\circ} \pm 5^{\circ}$
Surface coarse degree: 1 - 4Z



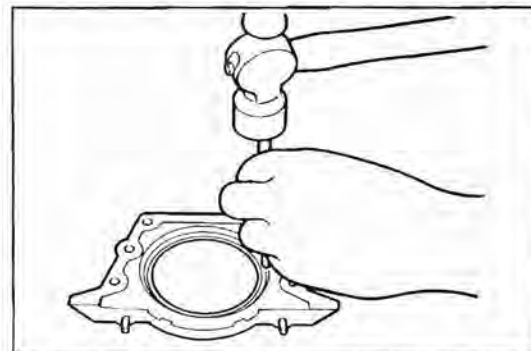
WR88-EM817

REPLACEMENT OF REAR OIL SEAL

- (1) Removal of rear oil seal
Remove the rear oil seal from the rear oil seal retainer, using a pin punch.

NOTE:

Be very careful not to damage the oil seal retainer.



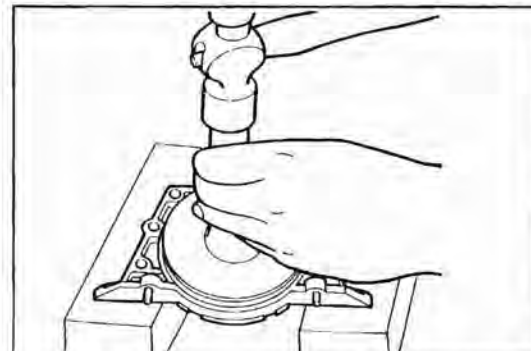
WR88-EM818

- (2) Installation of rear oil seal
Drive a new rear oil seal into position, using the following SST.

SST: 09223-41010-000

NOTE:

Care must be exercised to ensure that the oil seal is not driven in a tilted state.



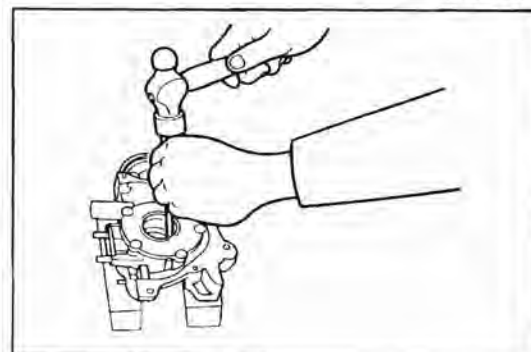
WR88-EM819

REPLACEMENT OF FRONT OIL SEAL

- (1) Removal of front oil seal
Remove the front oil seal from the oil pump, using a pin punch.

NOTE:

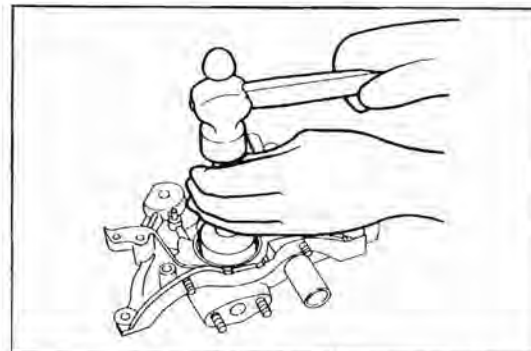
Be very careful not to damage the oil pump during the removal.



WR88-EM820

- (2) Installation of front oil seal
Drive a new front oil seal into position, using the following SST.

SST: 09310-87102-000



WR88-EM821

REPLACEMENT OF CYLINDER BLOCK

NOTE:

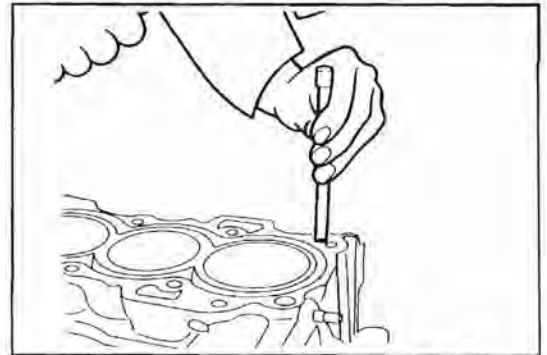
The cylinder block is furnished along with the pistons as a set. Hence, make sure that each piston is installed in the mated cylinder bore.

1. Wash the cylinder block using cleaning solvent.
2. Drive the oil orifice until it is recessed 3.0 ± 1.0 mm (0.12 ± 0.039 inch) from the cylinder upper surface.

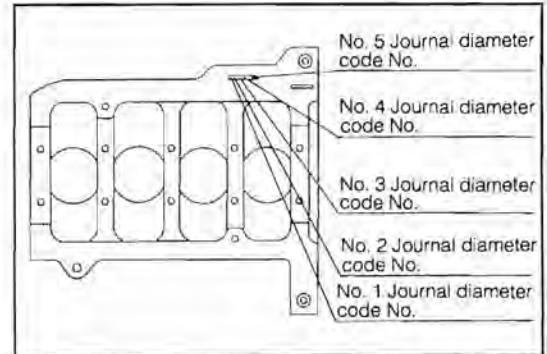
NOTE:

For driving this oil orifice, use an iron rod having an outer diameter of 10 mm (0.39 inch).

3. Selection of crankshaft bearings
(1) Read the crankshaft journal diameter code number of the cylinder block.

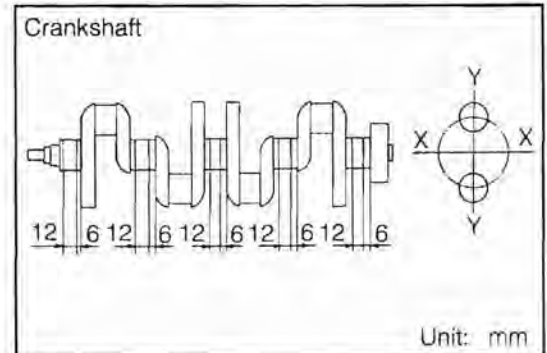


WR88-EM822



WR88-EM823

- (2) Measure the main journal diameter of the crankshaft at those points indicated in the right figure.
 - The measurement should be conducted in four directions for each main journal, 90 degrees spaced, at those points indicated in the right figure.



WR88-EM824

- (3) Select the crankshaft bearings in accordance with the table below.

WR88-EM825

ENGINE MECHANICALS

Crankshaft journal hole code	Crankshaft journal diameter mm (inch)	Crankshaft bearing classification No. (color)	Remarks
5	50.000 - 49.995 (1.9685 - 1.9684)	1 (Yellow)	—
	49.994 - 49.989 (1.9682 - 1.9681)	2 (Green)	—
	49.988 - 49.983 (1.9680 - 1.9679)	3 (Brown)	—
	49.982 - 49.976 (1.9677 - 1.9676)	4 (Black)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
6	50.000 - 49.995 (1.9685 - 1.9684)	2 (Green)	—
	49.994 - 49.989 (1.9682 - 1.9681)	3 (Brown)	—
	49.988 - 49.983 (1.9680 - 1.9679)	4 (Black)	—
	49.982 - 49.976 (1.9677 - 1.9676)	5 (Blue)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
7	50.000 - 49.995 (1.9685 - 1.9684)	3 (Brown)	—
	49.994 - 49.989 (1.9682 - 1.9681)	4 (Black)	—
	49.988 - 49.983 (1.9680 - 1.9679)	5 (Blue)	—
	49.982 - 49.976 (1.9677 - 1.9676)	6 (White)	—
	49.975 or less (1.9675)	—	Crankshaft replacement
8	50.000 - 49.995 (1.9685 - 1.9684)	4 (Black)	—
	49.994 - 49.989 (1.9682 - 1.9681)	5 (Blue)	—
	49.988 - 49.983 (1.9680 - 1.9679)	6 (White)	—
	49.982 - 49.976 (1.9677 - 1.9676)	7 (Pink)	—
	49.975 or less (1.9675)	—	Crankshaft replacement

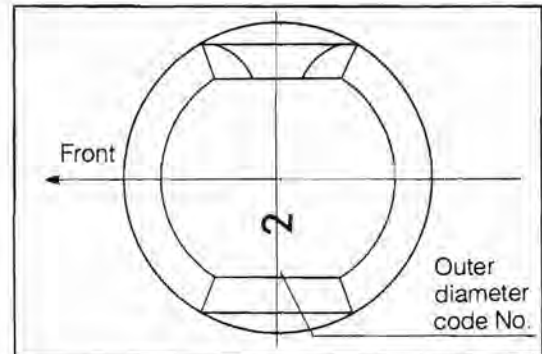
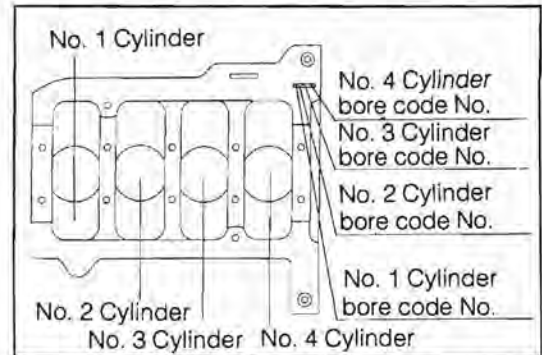
WR88-EM826

4. Selection of pistons (reference)
 (1) Read the cylinder block bore code number.

- (2) Select a piston having the same classification number as the cylinder block bore code number.

NOTE:

The piston code number is stamped on the top of each piston.



REPLACEMENT OF CRANKSHAFT

(Replacement of the crankshaft only)

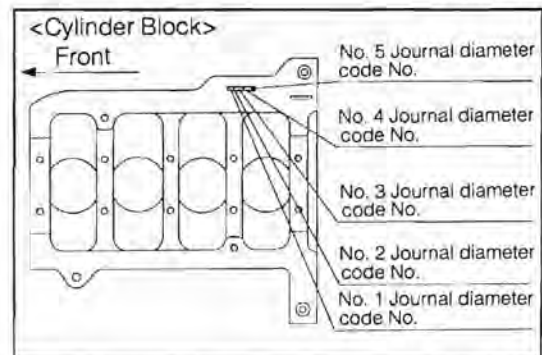
1. Wash the crankshaft using cleaning solvent. Dry it with compressed air.

NOTE:

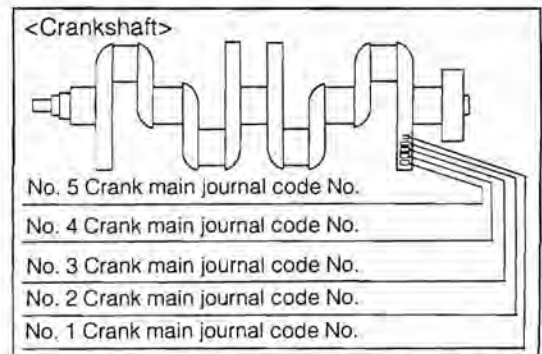
- Make sure that the oil gallery exhibits no restriction due to rust-proof oil.
- As for the crankshaft for automatic transmission, drive the rear end bush into the rear end of the crankshaft with a brass rod so as to prevent damage to the bush.

2. Selection of crankshaft bearings

- (1) Read the crankshaft journal diameter code number of the cylinder block.



- (2) Read the crankshaft main journal diameter code number.



- (3) Establish the crankshaft bearing classification number, using the table below.

Cylinder block		Crankshaft journal			
		1	2	3	4
Crankshaft journal diameter code No.	5	4	3	2	1
	6	5	4	3	2
	7	6	5	4	3
	8	7	6	5	4

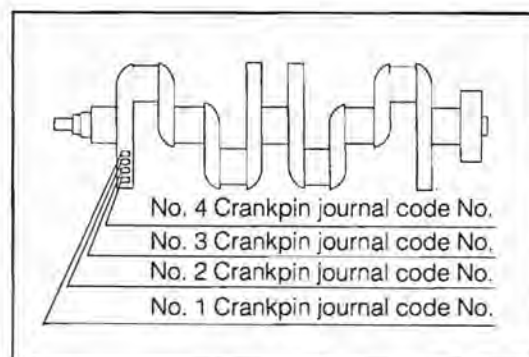
WR88-EM832

Reference

Bearing classification No.	1	2	3	4	5	6	7
Identification color	Yellow	Green	Brown	Black	Blue	White	Pink

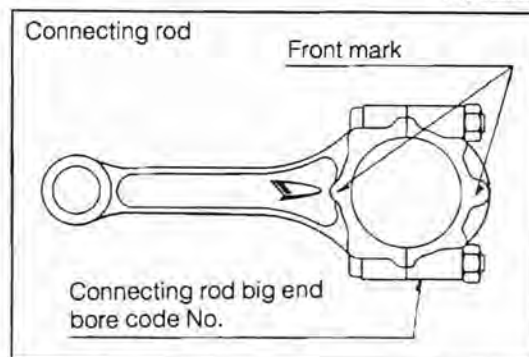
WR88-EM833

3. Selection of connecting rod bearings
(1) Read the crankpin journal diameter code number.



WR88-EM834

- (2) Read the connecting rod big end bore code number.



WR88-EM835

- (3) Establish the classification number of the connecting rod bearing, using the table below.

Connecting rod		Crankpin journal diameter code No.		
		1	2	3
Connecting rod big end borecode No.	4	3	2	1
	5	4	3	2
	6	5	4	3

WR88-EM836

Reference

Bearing classification No.	1	2	3	4	5
Identification color	Yellow	Green	Brown	Black	Blue

WR88-EM837

REPLACEMENT OF CONNECTING RODS

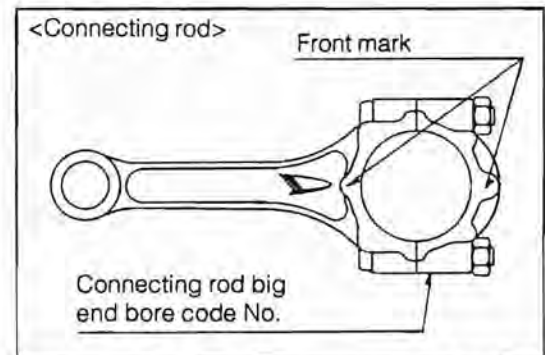
1. Wash the connecting rods using cleaning solvent.

WARNING:

Be sure to protect your eyes, wearing goggles.

WR88-EM838

2. Selection of connecting rod bearings
 - (1) Read the connecting rod big end bore code number.



WR88-EM839

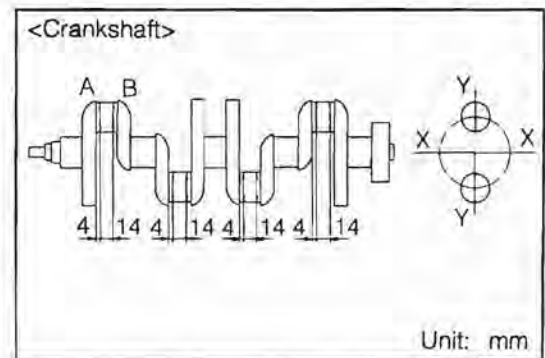
- (2) Measure the crankshaft pin diameter of the crankshaft in four directions for each crankshaft pin, 90 degrees spaced, at those points indicated in the right figure.

NOTE:

The greatest value among the measured diameters is regarded as the crankpin journal diameter.

However, if the difference among the measured values exceeds 0.044 mm (0.0017 inch), replace the crankshaft.

- (3) Select the connecting rod bearing in accordance with the table posted in next page.



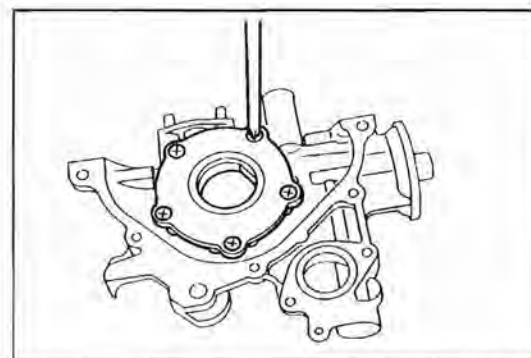
WR88-EM840

Connecting rod big end bore code No.	Crankpin journal diameter mm (inch)	Connecting rod bearing classification No. (color)	Remarks
4	45.000 - 44.993 (1.7716 - 1.7714)	1 (Yellow)	—
	44.992 - 44.985 (1.7713 - 1.7711)	2 (Green)	—
	44.984 - 44.976 (1.7710 - 1.7708)	3 (Brown)	—
	44.975 or less (1.7706)	—	Crankshaft replacement
5	45.000 - 44.993 (1.7716 - 1.7714)	2 (Green)	—
	44.992 - 44.985 (1.7713 - 1.7711)	3 (Brown)	—
	44.984 - 44.976 (1.7710 - 1.7708)	4 (Black)	—
	44.975 or less (1.7706)	—	Crankshaft replacement
6	45.000 - 44.993 (1.7716 - 1.7714)	3 (Brown)	—
	44.992 - 44.985 (1.7713 - 1.7711)	4 (Black)	—
	44.984 - 44.976 (1.7710 - 1.7708)	5 (Blue)	—
	44.975 or less (1.7706)	—	Crankshaft replacement

WR88-EM841

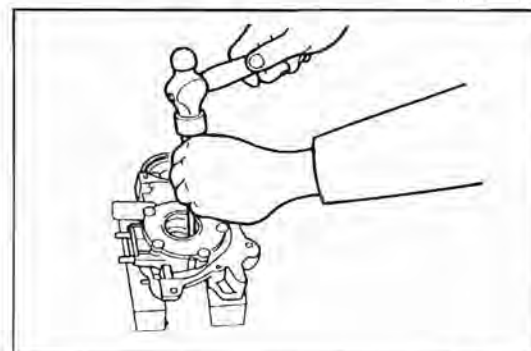
DISASSEMBLY OF OIL PUMP

1. Detach the oil pump cover.



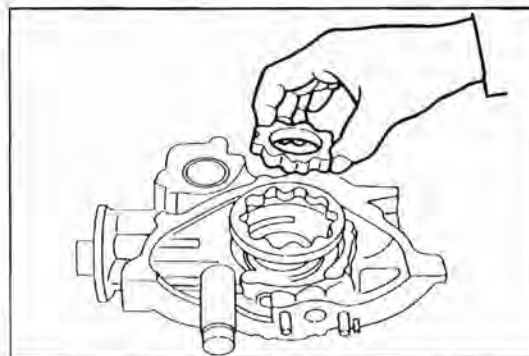
WR88-EM842

2. Remove the front oil seal.



WR88-EM843

- 3 Remove the oil pump rotor set.

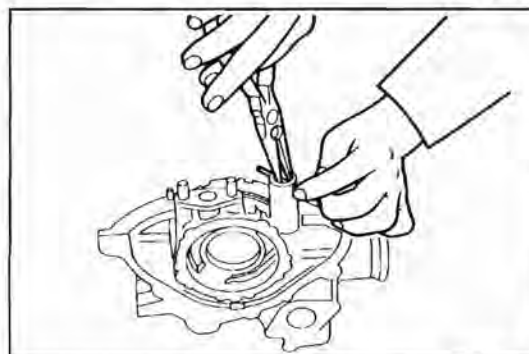


WR88-EM844

4. Pull out the cotter pin, while pushing the spring retainer with nose pliers or the like.

NOTE:

Put an appropriate cloth, etc. on the retainer spring so that it may not jump out.

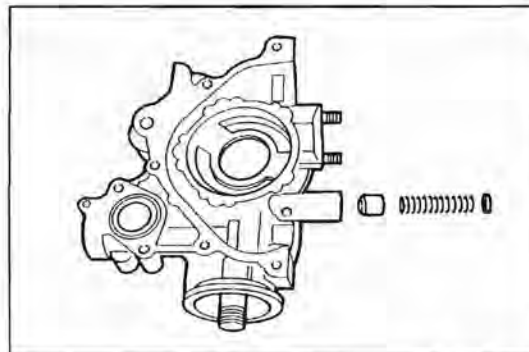


WR88-EM845

5. Remove the oil pump relief valve spring retainer, compression spring and oil pump relief valve.

NOTE:

Wash the disassembled parts in cleaning solvent.

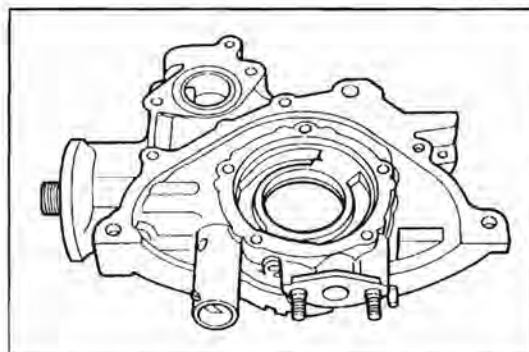


WR88-EM846

6. Inspection of each part

- (1) Check the pump body for damage.

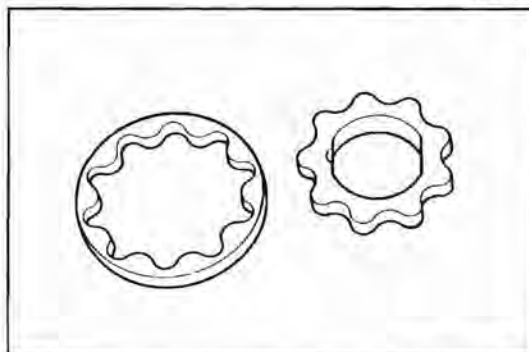
Replace the pump body if it exhibits damage.



WR88-EM847

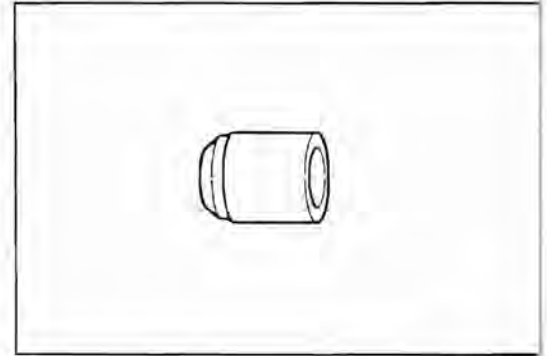
- (2) Check the rotor set for damage.

Replace the rotor set if it exhibits damage.



WR88-EM848

- (3) Check the oil pump relief valve for damage. Replace the relief valve if it exhibits damage. Also, check to see if any damage is present at the relief valve installation hole of the oil pump body.

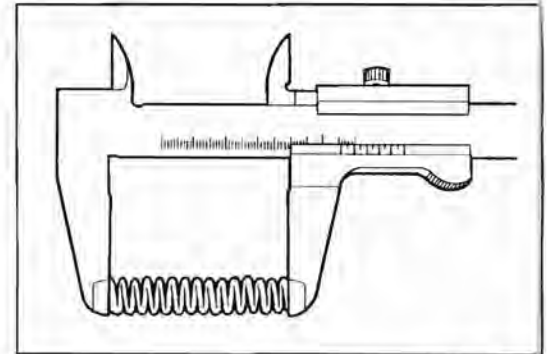


WR88-EM849

- (4) Check the compression spring for damage. Also, measure its free length.

Specified Free Length: 57 mm (2.244 inch)

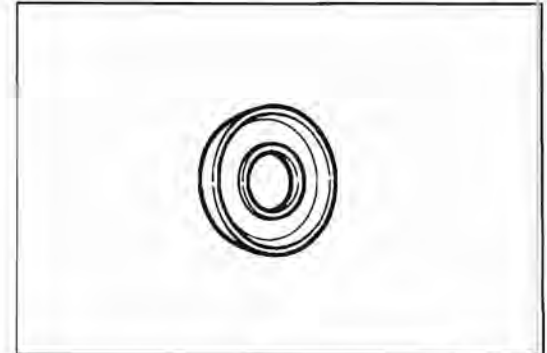
Replace the compression spring if it exhibits damage or the free length is less than the specified value.



WR88-EM850

- (5) Check the oil pump relief valve spring retainer for damage.

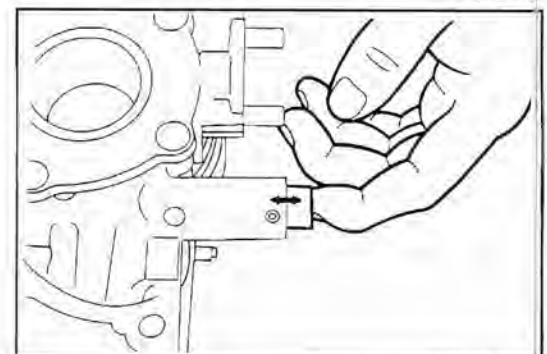
Replace the retainer if it exhibits damage.



WR88-EM851

- (6) Apply engine oil to the oil pump relief valve. Insert the oil pump relief valve into the oil pump body. Check to see if the valve slides smoothly.

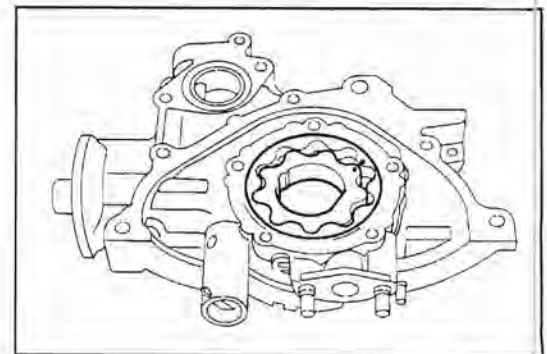
Replace the oil pump body if the valve fails to slide smoothly.



WR88-EM852

7. Measurement of body clearance, tip clearance and side clearance

- (1) Apply a thin film of engine oil to the rotor mate surface of the oil pump body as well as to the rotor set. Assemble the rotor set in the oil pump body in such a way that the drilled mark may be seen from the outside.

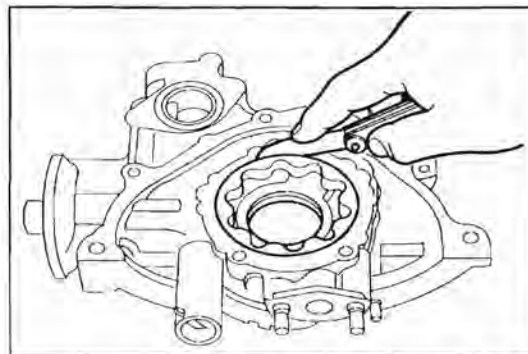


WR88-EM853

- (2) Measure the body clearance between the oil pump body and the outer rotor, using a thickness gauge.

Body Clearance: 0.20 - 0.28 mm (0.0079 - 0.011 inch)

Replace the oil pump if the body clearance exceeds the specified value.

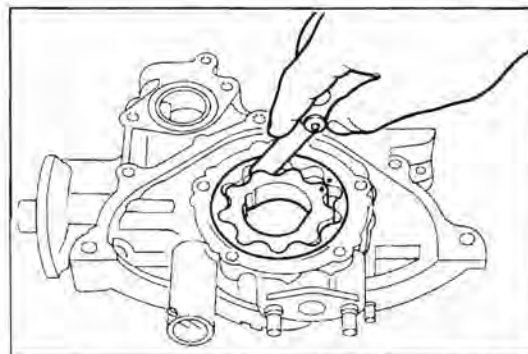


WR88-EM854

- (3) Measure the tip clearance of the rotor set, using a thickness gauge.

Tip Clearance: 0.16 - 0.24 mm
(0.0063 - 0.094 inch)

Replace the rotor set if the tip clearance exceeds the specified value.

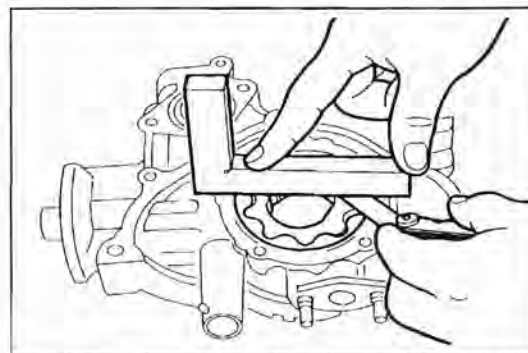


WR88-EM855

- (4) Measure the side clearance between the oil pump body and the rotor set, using a straightedge and a thickness gauge.

Side Clearance: 0.035 - 0.085 mm
(0.0014 - 0.033 inch)

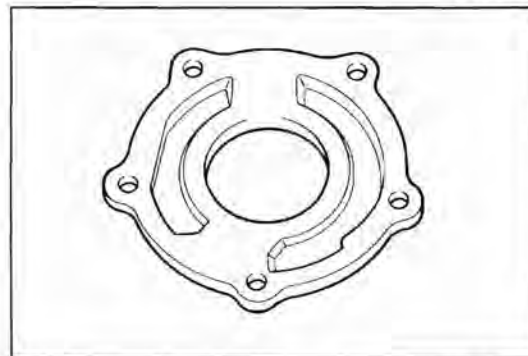
Replace the oil pump if the side clearance exceeds the specified value.



WR88-EM856

8. Check to see if any wear is present at the rotor set mate surface of the pump cover.

Replace the oil pump cover if it exhibits wear.



WR88-EM857

ASSEMBLY OF OIL PUMP

NOTE:

Wash those parts to be assembled in cleaning solvent. Dry them using compressed air.

WARNING:

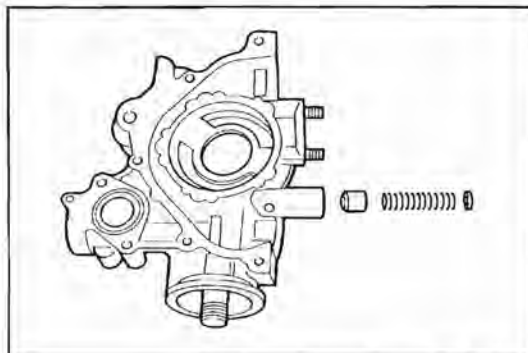
When you use compressed air, be sure to protect your eyes, wearing goggles.

WR88-EM858

1. Apply engine oil to the relief valve. Then, insert the relief valve into the oil pump body.
2. Insert the compression spring and retainer into the oil pump body.

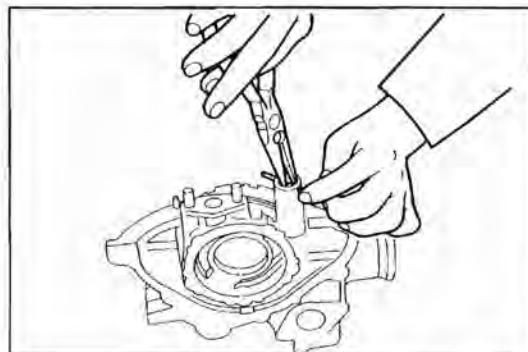
NOTE:

Install the retainer in such a direction that its projected side may come at the compression spring side.



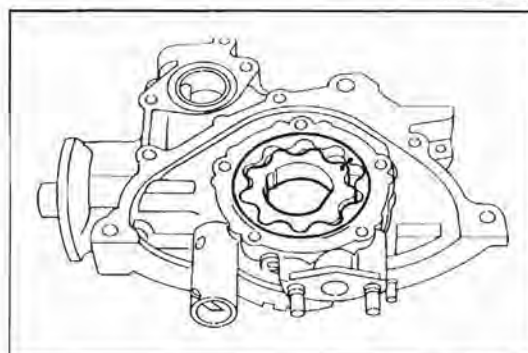
WR88-EM859

3. Insert a new cotter pin into the retainer while the retainer is being compressed with pliers, etc. Split the end of the cotter pin to form an anchor-like shape.



WR88-EM860

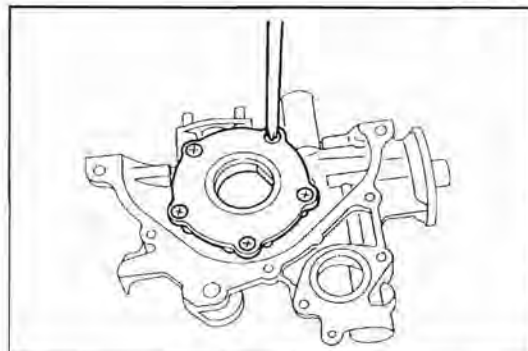
4. Apply engine oil to the rotor set. Assemble the rotor set in the pump body in such a direction that the drilled mark of the rotor may be seen from the outside.



WR88-EM861

5. Install the oil pump cover. Tighten the cover to the specified torque.

Tightening Torque: 0.8 - 1.3 kg-m (5.8 - 9.4 ft-lb)

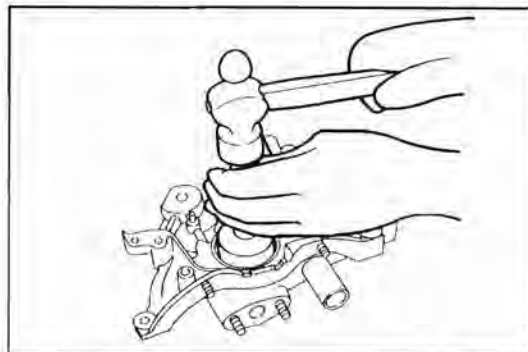


WR88-EM862

6. Drive a new oil seal into position, using the following SST.
SST: 09310-87102-000

NOTE:

- Be very careful not damage the oil pump during the installation.
- Make sure that the oil seal is not driven into position in a tilted state.



WR88-EM863

INSPECTION OF FLYWHEEL

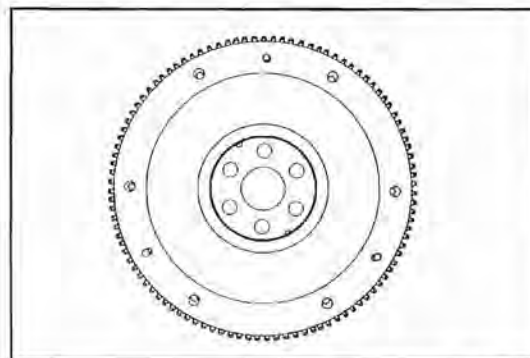
Inspect the flywheel for cracks or damage.
Replace the flywheel if it exhibits defects.

INSPECTION AND REPLACEMENT OF RING GEAR

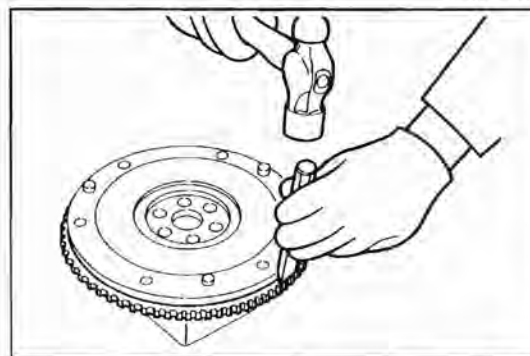
Inspect the ring gear for damage.
Replace the ring gear if it exhibits defects.

REMOVAL/INSTALLATION OF RING GEAR

1. Place the ring gear on an adequate wooden block. Drive out the ring gear, using a chisel in combination with a hammer.

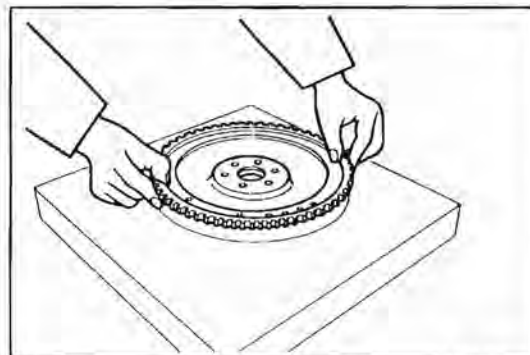


WR88-EM864



WR88-EM865

2. Place a new ring gear horizontally on the flywheel.



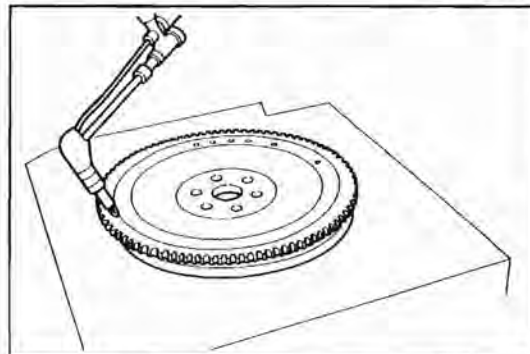
WR88-EM866

3. Using a gas burner, heat the ring gear evenly, until the ring gear due to its own weight fits onto the flywheel.

NOTE:

- Do not tap the ring gear using a hammer or the like.
- Never cool the ring gear quickly using water or the like.

4. Allow the ring gear to cool naturally.



WR88-EM867

ASSEMBLY OF CYLINDER BLOCK

(See page EM-122.)

NOTE:

- As for those parts to be reassembled, wash them in cleaning solvent (excluding those parts, such as grease-sealed type bearings, dust seals and electrical parts). Then, dry them using compressed air.
- Remove any remaining sealer, etc. from the threaded portions of the switches and sensors.

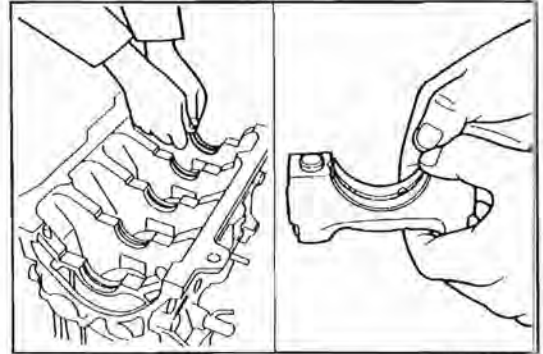
WR88-EM868

1. Crankshaft installation

- (1) Install the bearings to the cylinder block and crankshaft bearing caps.

NOTE:

Do not touch with the front and back surfaces of each bearing. Be sure to hold the bearing at its edge surfaces.

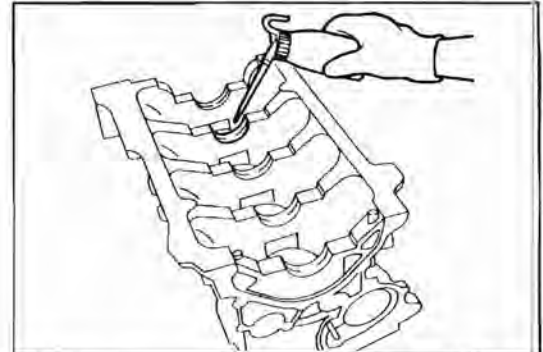


WR88-EM86/9

- (2) Lubricate the surface of each bearing with engine oil.

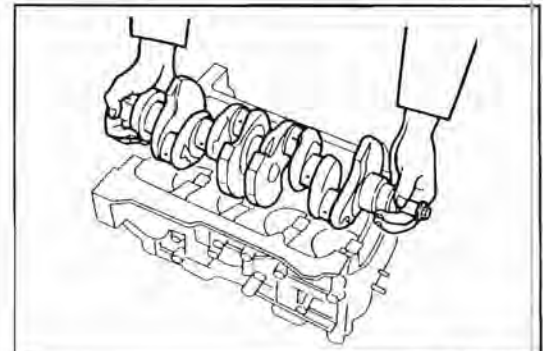
NOTE:

- Do not touch with the front and back surfaces of each bearing.
- Never apply engine oil to the crankshaft bearing caps.



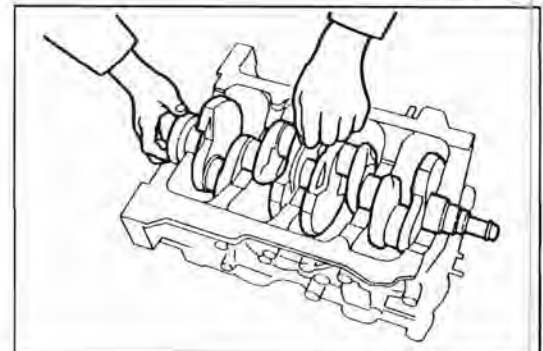
WR88-EM87/0

- (3) Install the crankshaft in the cylinder block.



WR88-EM87/1

- (4) Apply engine oil to the thrust washers. With the side having the oil groove facing toward the crankshaft side, insert each thrust washer between the crankshaft main journal No.3 and the cylinder block.

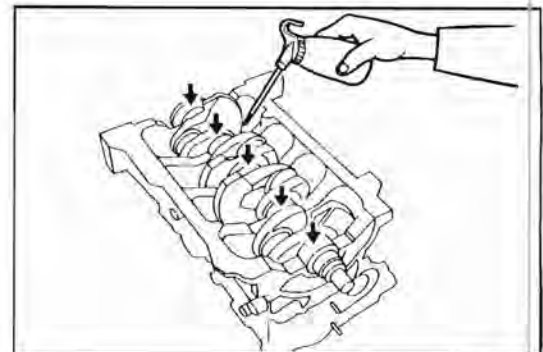


WR88-EM87/2

- (5) Apply engine oil to the crankshaft main journal sections.

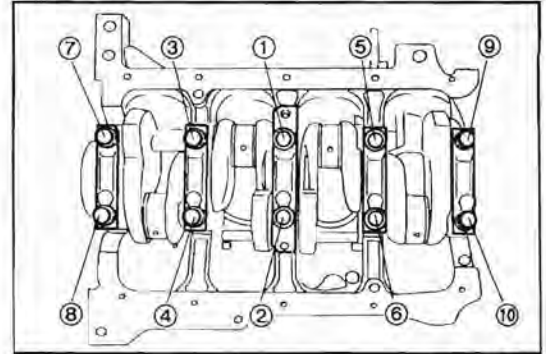
NOTE:

Care must be exercised to ensure that no oil flows into the bearing cap attaching bolt holes.



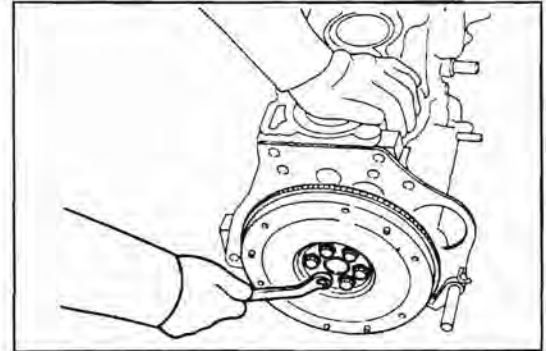
WR88-EM87/3

- (6) Install the crankshaft bearing caps with the arrow marks facing toward the oil pump side and also in the numerical sequence.
- (7) Thinly apply engine oil to the crankshaft bearing cap bolts. Tighten the bolts to the specified torque over two or three stages in the sequence shown in the right figure.
Tightening Torque: 4.5 - 5.5 kg-m
(32.55 - 39.78 ft-lb)



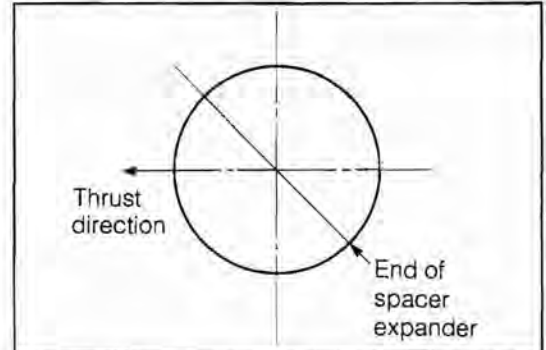
WR88-EM874

2. Assembly of piston and connecting rod
Install the flywheel on the crankshaft temporarily.
NOTE:
Care must be exercised to ensure that no oil, etc. gets to the bolts or bolt holes.



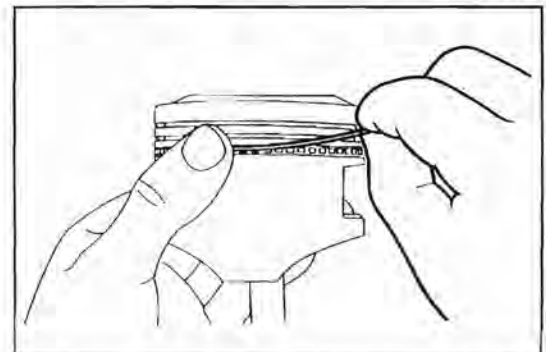
WR88-EM875

- (1) Install the oil ring spacer expander in the oil ring groove. Ensure that the expander end may not line up with the thrust direction nor with the axial direction.
NOTE:
Do not expand the spacer expander to an extent more than necessary.



WR88-EM876

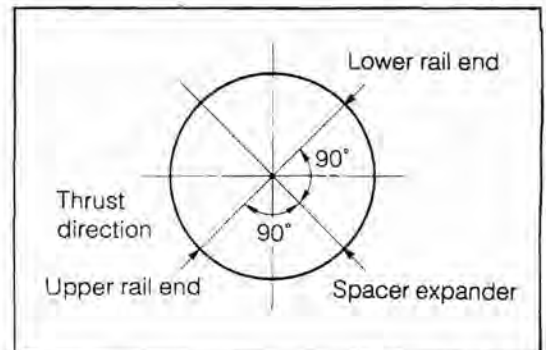
- (2) Fit the upper rail into position in such a manner that it is wound up while pushing the edge section of the oil ring spacer expander with your thumb.



WR88-EM877

NOTE:

- Ensure that the rail end is deviated 90 degrees to the left from the end of the oil ring spacer expander.
- Do not expand the rail to an extent more than necessary.

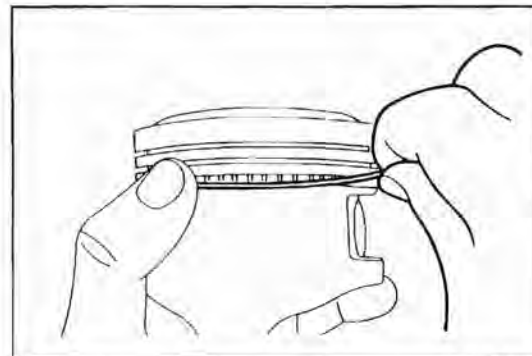


WR88-EM878

- (3) Fit the lower rail into position in such a manner that it is wound up.

NOTE:

- Ensure that the rail end is deviated 90 degrees to the right from the end of the oil ring spacer expander.
- Do not expand the rail to an extent more than necessary.
- Make sure that the oil ring can be rotated smoothly.



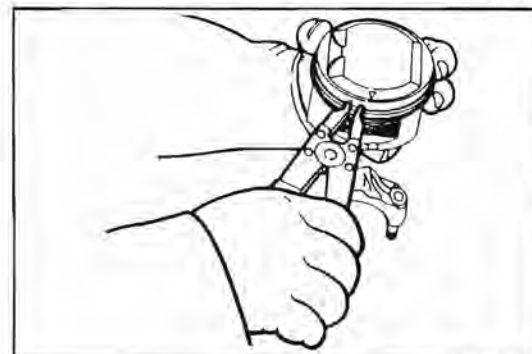
WR88-EM879

- (4) Install the compression ring No.2 with the stamped mark of T, 2T, N or 2N facing upward, using a piston ring expander.

NOTE:

Do not expand the piston ring to an extent more than necessary.

- (5) Install the compression ring No. 1 with the stamped mark of T or N facing upward, using a piston ring expander.

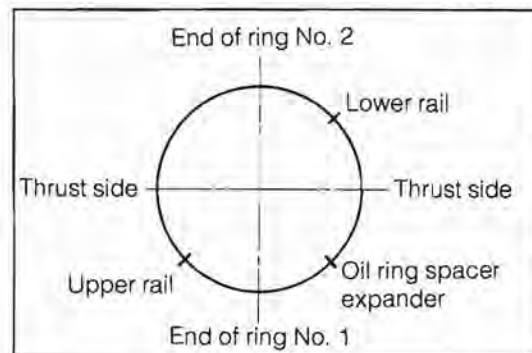


WR88-EM880

- (6) Position the piston rings so that each ring end may come at the respective points as indicated in the right figure.

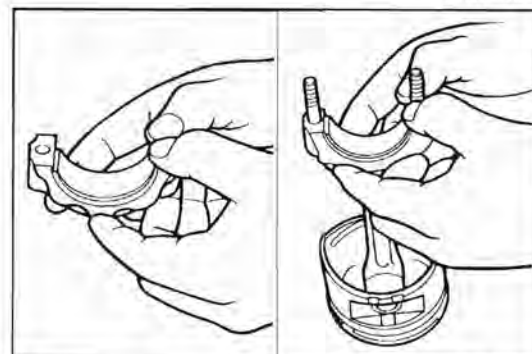
NOTE:

It is not necessarily required to follow strictly the right figure. However, be sure that the ring end is not lined up with the thrust direction. Also, each ring should be deviated about 120 to 180 degrees from the adjacent ring.



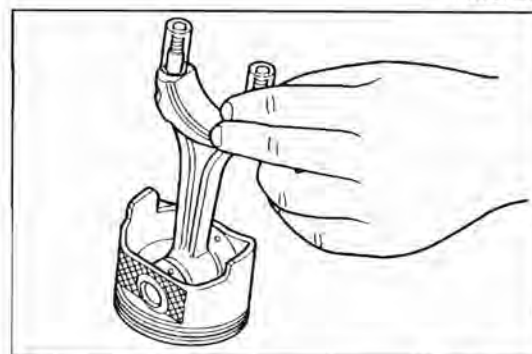
WR88-EM881

- (7) Install the connecting rod bearings on the connecting rod and connecting rod cap, making sure that your fingers will not touch with the front and back surfaces of the bearings.



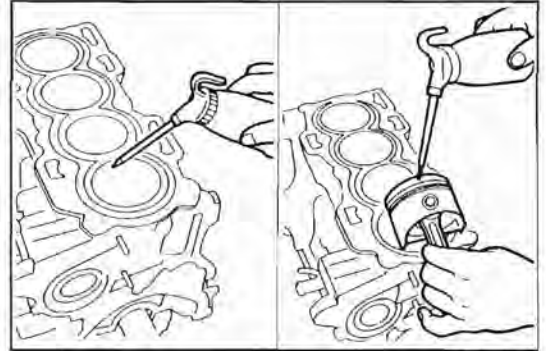
WR88-EM882

- (8) Cut an appropriate vinyl hose to a suitable length. Fit the vinyl hose to each connecting rod bolt sections.



WR88-EM883

- (9) Apply engine oil to the piston rings, piston pins, connecting rod bearings, cylinder walls and crankpin journals.



WR88-EM884

- (10) Compress the piston rings by means of the piston ring compressor SST, making sure that the piston ring ends will not move during the installation.

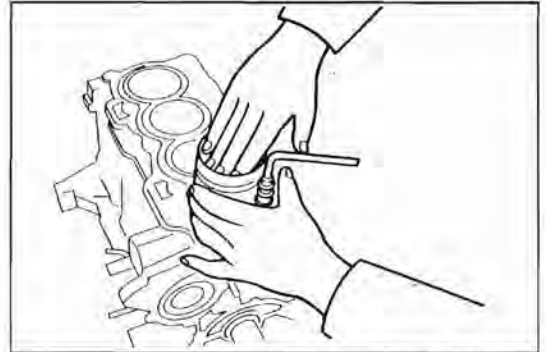
SST: 09217-87001-000

- (11) Push the piston by hand into the cylinder bore with the front mark facing toward the oil pump side.

NOTE:

- Be very careful to avoid damaging the connecting rod bearings during the installation.
- Care must be exercised to ensure that the crankpin journal is not scratched by the connecting rod.

- (12) Push the piston by hand until the connecting rod reaches the crankpin journal.



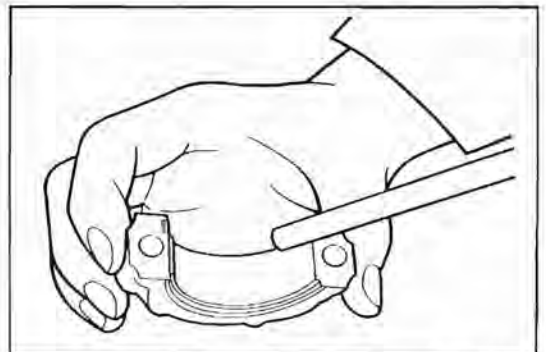
WR88-EM885

- (13) Apply engine oil to the bearing surface of each connecting rod bearing.

NOTE:

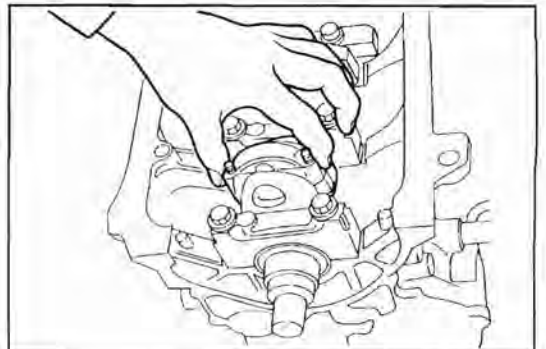
Do not touch with the bearing front surface.

- (14) Remove the vinyl hoses which were attached to the connecting rod bolt sections.



WR88-EM886

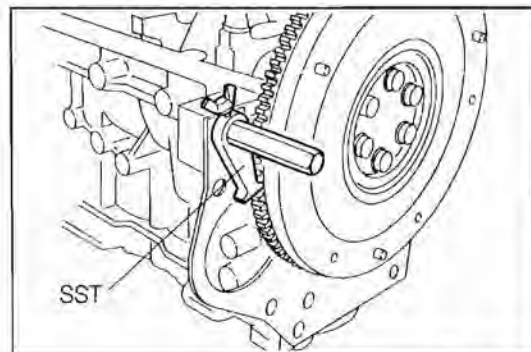
- (15) Install the connecting rod cap with the front mark facing toward the oil pump side.



WR88-EM887

- (16) Prevent the crankshaft from turning, using the following SST.

SST: 09210-87701-000

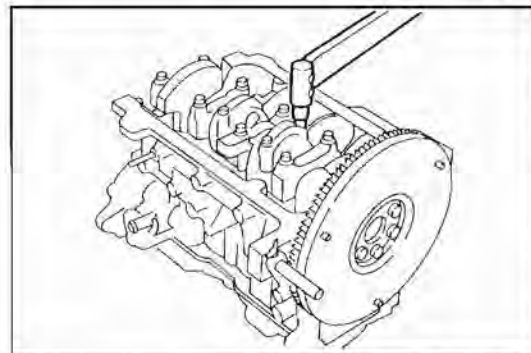


WR88-EM888

- (17) Thinly apply engine oil to the connecting rod cap attaching nuts. Tighten the nuts to the specified torque evenly over two or three stages.

Tightening Torque: 3.5 - 4.5 kg-m (25.4 - 32.5 ft-lb)

- (18) Perform the operations described in the steps (1) through (18) for each cylinder.

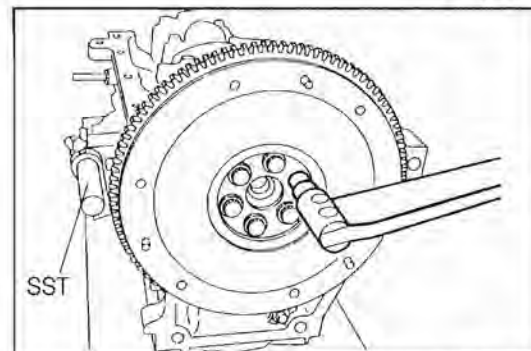


WR88-EM889

- (19) Remove the flywheel.

- (20) Remove the following SST.

SST: 09210-87701-000

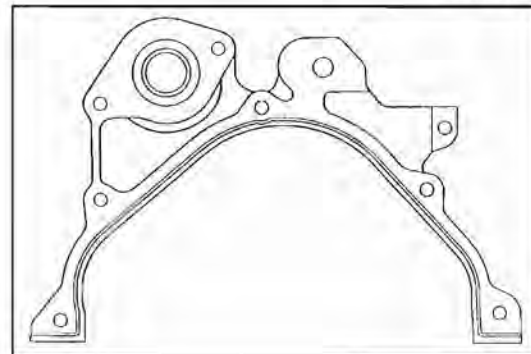


WR88-EM890

3. Installation of oil pump

- (1) Apply the Three Bond 1207C to the oil pump installation surface of the cylinder block, as indicated in the right figure.

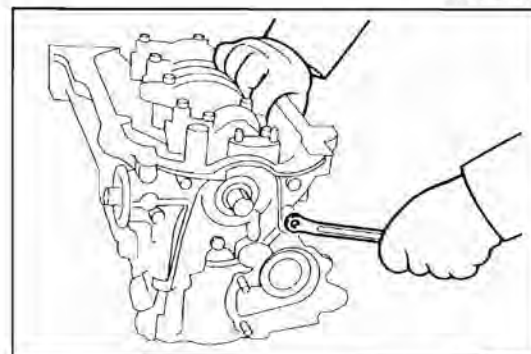
- (2) Replace the "O" ring of the oil pump with a new part.



WR88-EM891

- (3) Apply engine oil to the inner surface of the oil seal. Install the oil pump to the cylinder block. Perform tightening to the specified torque.

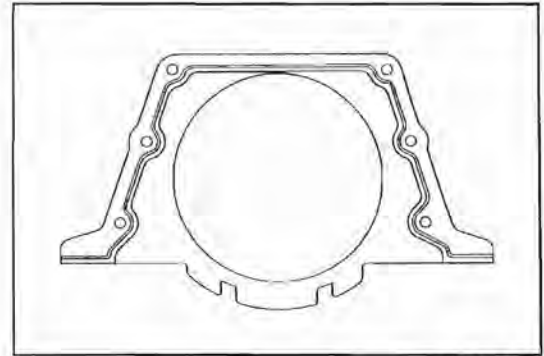
Tightening Torque: 0.6 - 0.9 kg-m (4.4 - 6.5 ft-lb)



WR88-EM892

4. Installation of oil seal retainer

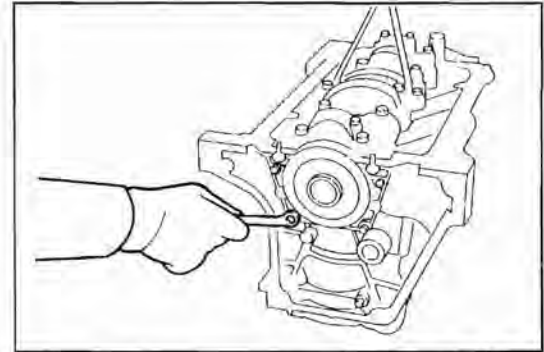
- (1) Apply the Three Bond 1207C to the oil seal retainer installation surface of the cylinder block, as indicated in the right figure.



WR88-EM893

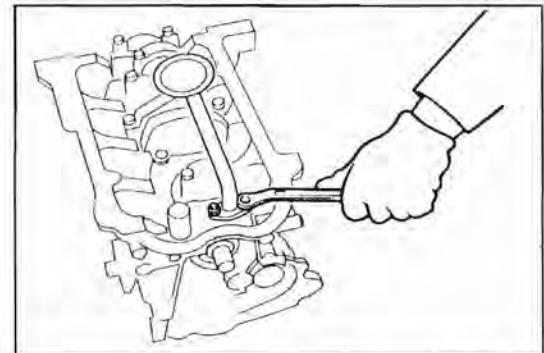
- (2) Apply engine oil to the inner surface of the oil seal. Install the oil seal retainer to the cylinder block. Perform tightening to the specified torque.

Tightening Torque: 0.6 - 0.9 kg-m (4.4 - 6.5 ft-lb)



WR88-EM894

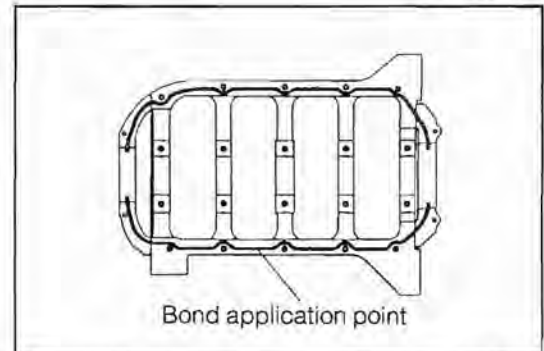
5. Install the oil strainer with a new gasket interposed.



WR88-EM895

6. Installation of oil pan

- (1) Apply the Three Bond 1207C to the oil pan installation surface of the cylinder block, as indicated in the right figure.



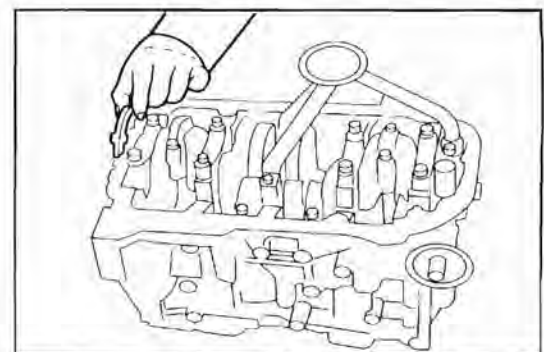
Bond application point

WR88-EM896

- (2) Place the oil pan gasket.

NOTE:

Ensure that the end section of the oil pan gasket is overlapped at least 10 mm (0.39 inch) with the Three Bond 1207C.



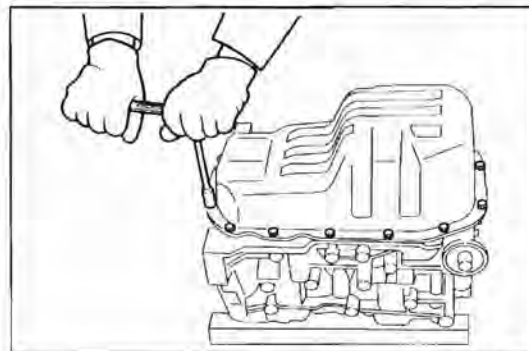
WR88-EM897

- (3) Install the oil pan. Tighten the oil pan attaching nuts and bolts to the specified torque over two or three stages.
Tightening Torque: 0.7 - 1.2 kg-m (5.1 - 8.6 ft-lb)

7. Install the rear end plate.

8. Installation of flywheel
(M/T vehicle only)

- (1) Install the flywheel on the crankshaft.



WR88-EM898

- (2) Application of flywheel bolt sealing material

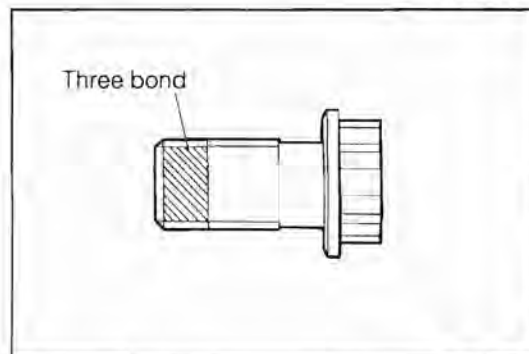
- ① Wash the flywheel bolts. Then, degrease and dry them.

NOTE:

When degreasing the bolts, remove any oil completely, using a solvent such as a degreasing spraying agent or alcohol.

CAUTION:

- Make sure that no bond nor other foreign matter, such as dust, gets to the bolts.
- Even when new bolts are used, be sure to perform this operation.



WR88-EM901

- ② Check the flywheel bolts for damage. Replace any flywheel bolt which exhibits damage with a new one.

CAUTION:

Even when a new bolt is used, be sure to perform the operation in the step (1).

- ③ Clean the flywheel bolt threaded holes at the rear end section of the crankshaft. Degrease and dry them.

CAUTION:

- Make sure that no bond nor other foreign matter, such as dust, gets to the bolt threaded holes.
- As for degreasing, wipe off any oil from the threaded portion with a cloth damped with alcohol.
- Never allow alcohol to get to resin or rubber parts, specifically, the rear oil seal.

- ④ Clean the bolt seating surface of the flywheel and degrease it.

NOTE:

- As for degreasing, wipe the bolt seating surface with a cloth damped with alcohol.
- Never allow alcohol to get to resin or rubber parts.

- ⑤ Apply two to three drops of the Three Bond 1324 to the forward end of the threaded portion of each flywheel bolt.

CAUTION:

- If the Three Bond 1324 is applied excessively beyond the specified amount, the oil will penetrate up to the bolt seating surface. This may cause loosening of the bolts.
- Never use bond sealers other than the designated one.
- Never allow the bond sealer to get to resin or rubber parts.

- (3) Tighten the flywheel attaching bolts to the specified torque in the sequence indicated in the right figure.

Tightening Torque: 4.5 - 6.5 kg-m
(32.5 - 47.0 ft-lb)

NOTE:

Prevent the crankshaft from turning at the ring gear section, using the following SST.

SST: 09210-87701-000

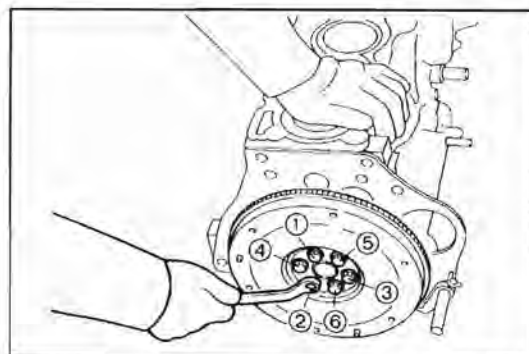
CAUTION:

When tightening the bolt, make sure that no bond is present on the bolt seating surface.

If the bond oozes out, perform the operations again, starting the step (2).

- (4) Tighten the flywheel attaching bolts to the specified torque in the sequence indicated in the right figure.

Tightening Torque: 8.0 - 10.0 kg-m
(57.9 - 72.3 ft-lb)



WR88-EM902

- (5) Measure the flywheel runout, using a dial gauge.
Allowable Runout Limit: 0.1 mm (0.0039 inch)

NOTE:

Replace the flywheel if its runout exceeds the allowable limit.

9. Installation of drive plate

(A/T vehicle only)

(1) Application of flywheel bolt sealing material

- ① Wash the flywheel bolts. Then, degrease and dry them.

NOTE:

When degreasing the bolts, remove any oil completely, using a solvent such as a degreasing spraying agent or alcohol.

CAUTION:

- Make sure that no bond nor other foreign matter, such as dust, gets to the bolts.
- Even when new bolts are used, be sure to perform this operation.

- ② Check the flywheel bolts for damage. Replace any flywheel bolt which exhibits damage with a new one.

CAUTION:

Even when a new bolt is used, be sure to perform the operation in the step (1).

- ③ Clean the flywheel bolt threaded holes at the rear end section of the crankshaft. Degrease and dry them.

CAUTION:

- Make sure that no bond nor other foreign matter, such as dust, gets to the bolt threaded holes.
- As for degreasing, wipe off any oil from the threaded portion with a cloth damped with alcohol.
- Never allow alcohol to get to resin or rubber parts, specifically, the rear oil seal.

- ④ Wash the centering plate. Then, degrease and dry it.

NOTE:

- When degreasing the center plate, remove any oil completely, using a solvent such as a degreasing spraying agent or alcohol.
- Never allow the solvent to get to resin or rubber parts.

- ⑤ Apply two to three drops of the Three Bond 1324 to the forward end of the threaded portion of each flywheel bolt.

CAUTION:

- If the Three Bond 1324 is applied excessively beyond the specified amount, the oil will penetrate up to the bolt seating surface. This may cause loosening of the bolts.
- Never use bond sealers other than the designated one.
- Never allow the bond sealer to get to resin or rubber parts.

- (2) Install the drive plate and centering plate to the crankshaft end. Tighten the attaching bolts temporarily.

Tightening Torque: 4.5 - 6.5 kg-m (32.5 - 47.0 ft-lb)

NOTE:

Prevent the crankshaft from turning at the ring gear section, using the following SST.

SST: 09210-87701-000

- (3) Tighten the drive plate attaching bolts to the specified torque in the sequence indicated in the right figure.

Tightening Torque: 8.0 - 10.0 kg-m
(57.9 - 72.3 ft-lb)

NOTE:

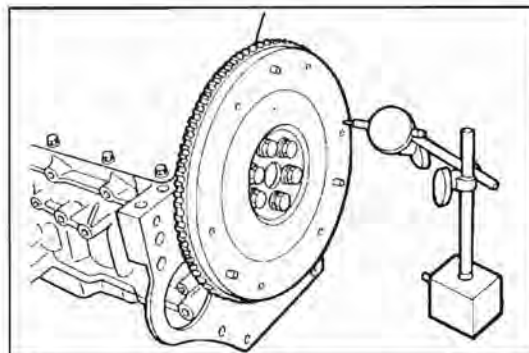
Prevent the crankshaft from turning at the ring gear section, using the following SST.

SST: 09210-87701-000

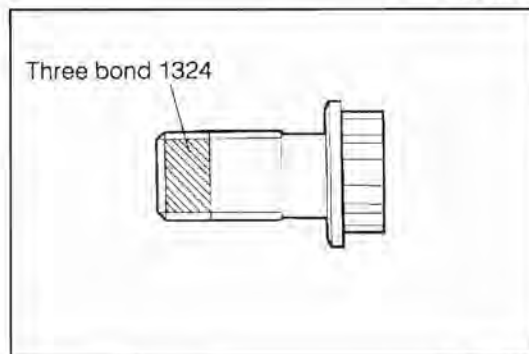
CAUTION:

When tightening the bolt, make sure that no bond is present on the bolt seating surface.

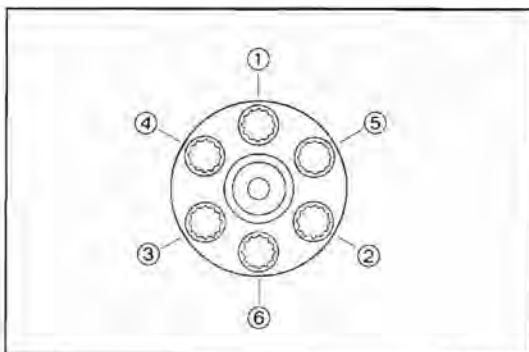
If the bond oozes out, perform the operations again, starting the step (1).



WR88-EM904



WR88-EM905



WR88-EM906

10. Assembly of clutch disc and pressure plate

(M/T vehicle only)

(1) Insert the following SST into the crankshaft rear end.

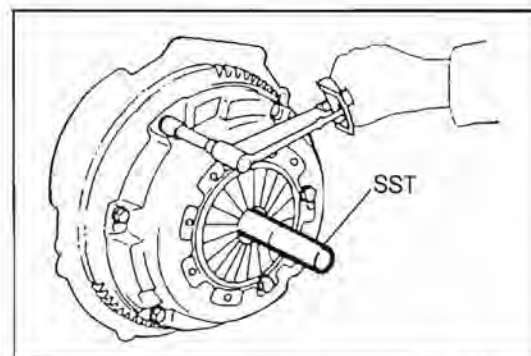
SST: 09301-87703-000

(2) Install the clutch disc.

WR88-EM906

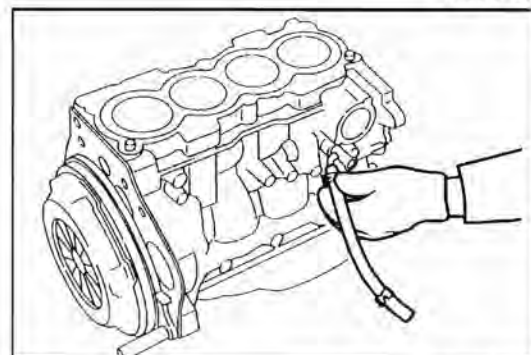
(3) Install the pressure plate, lining up the locating pin of the pressure plate. Tighten the attaching bolts to the specified torque.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



WR88-EM906

11. Install the water hose for throttle body use to the cylinder block. Attach the hose bands. (HC-E engine)

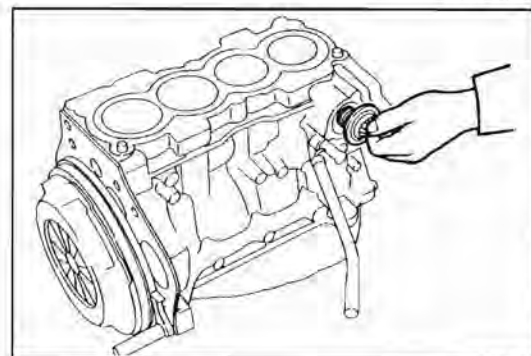


WR88-EM910

12. Install the thermostat in the cylinder block in such a way that the jiggle pin section may come at the upper side.

CAUTION:

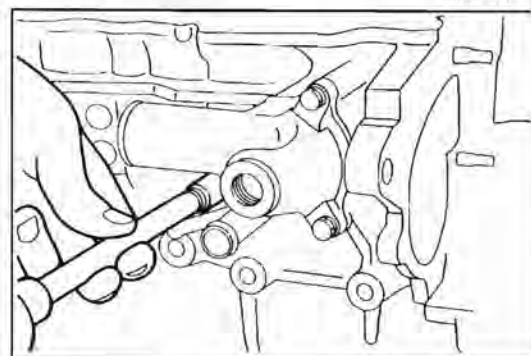
Make sure to install the jiggle pin of the thermostat in the correct direction. Failure to observe this precaution will be cause of overheating.



WR88-EM911

13. Install the water inlet.

Tightening Torque: 0.6 - 0.9 kg-m (4.4 - 6.5 ft-lb)



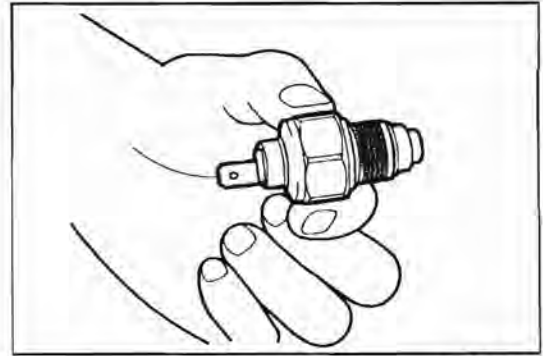
WR88-EM912

14. Installation of radiator thermo control switch

- (1) Clean the threaded portion of the radiator thermo control switch. Wind seal tape around the threaded portion.

NOTE:

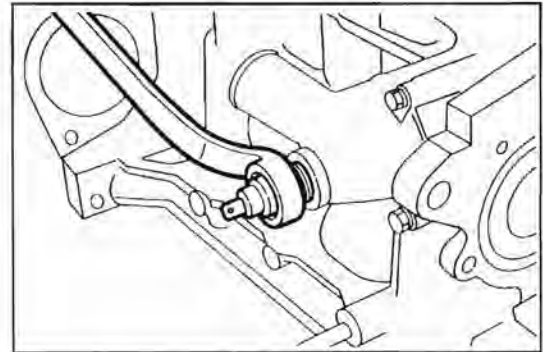
If a new thermo control switch has been installed, it is unnecessary to wind the seal tape.



WR88-EM913

- (2) Install the radiator thermo control switch on the water inlet.

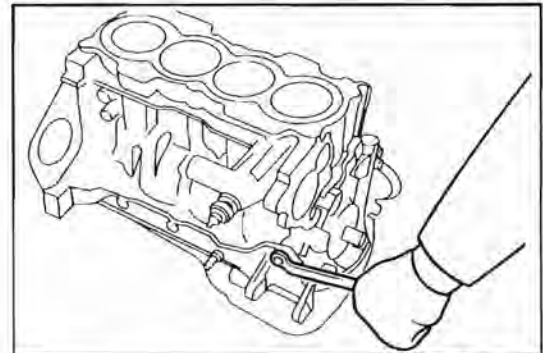
Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)



WR88-EM914

15. Install the alternator bracket.

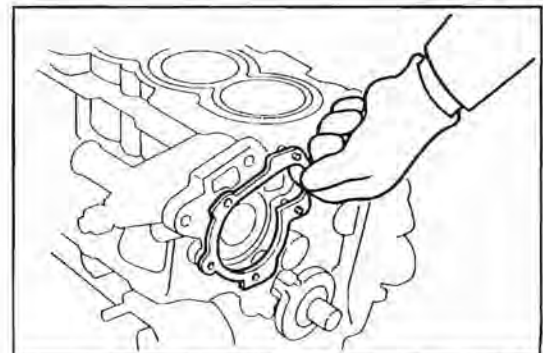
Tightening Torque: 3.5 - 5.0 kg-m (25.3 - 36.2 ft-lb)



WR88-EM915

16. Installation of water pump

- (1) Install a new water pump gasket on the cylinder block.



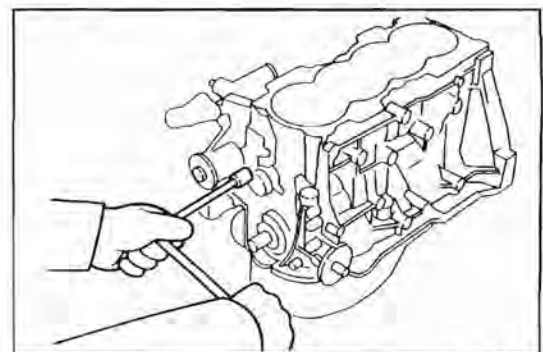
WR88-EM916

- (2) Install and tighten the water pump to the specified torque.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

NOTE:

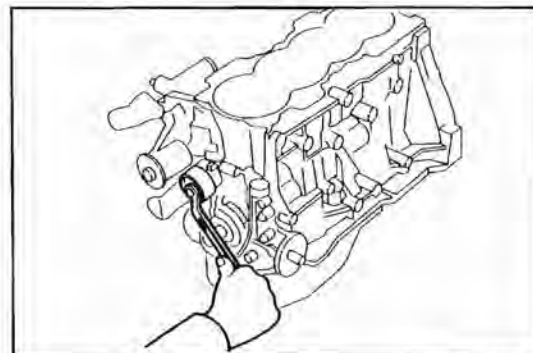
When the stud bolts have been replaced, apply the Three Bond 1377B to the threaded portion at the cylinder block side.



WR88-EM917

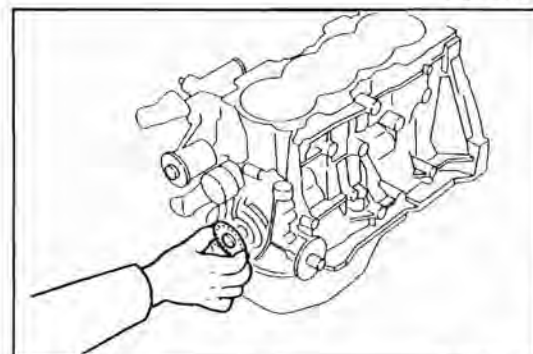
ENGINE MECHANICALS

17. Assemble the tensioner tension spring as indicated in the right figure. Push the tensioner to the alternator side as far as it will go. Tighten the tensioner temporarily.



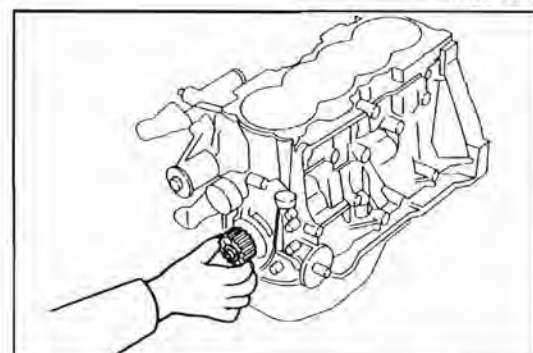
WR88-EM918

18. Install the crankshaft pulley flange in such a way that its recessed side may come at the cylinder block side.



WR88-EM919

19. Install the crankshaft timing belt pulley.



WR88-EM920

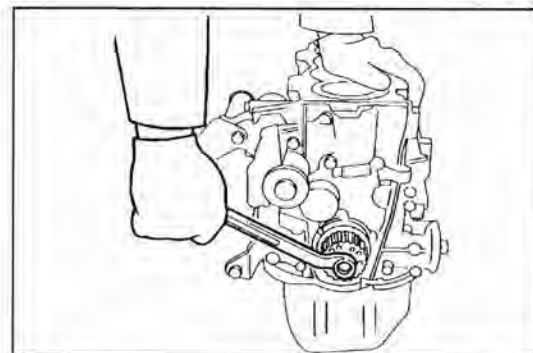
20. Install the crankshaft timing belt attaching bolt. Tighten the bolt to the specified torque.

Tightening Torque: 9.0 - 10.0 kg-m (65.1 - 72.3 ft-lb)

NOTE:

Prevent the crankshaft from turning, using the following SST.

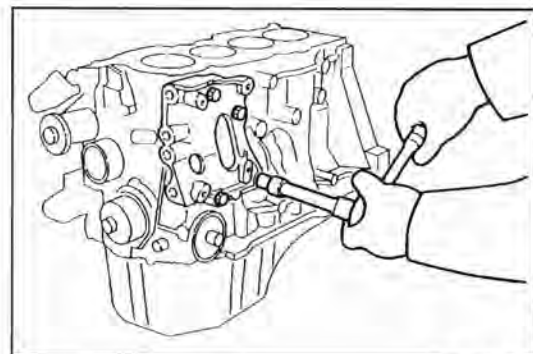
SST: 09210-87701-000



WR88-EM921

21. Install the engine right front mounting No. 1.

Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)

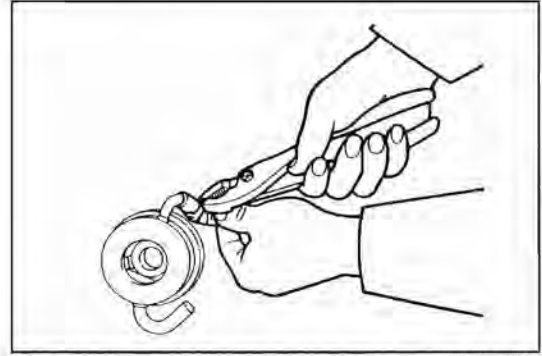


WR88-EM922

22. Install the oil cooler.

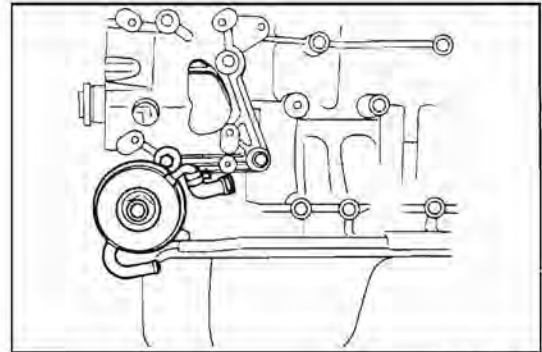
(Oil cooler-equipped vehicle only)

- (1) Install a new "O" ring.
- (2) Connect the oil cooler hose to the oil cooler.



WR88-EM923

- (3) Place the rib for locating the oil cooler to the cylinder block. Then install the oil cooler with the set bolts.

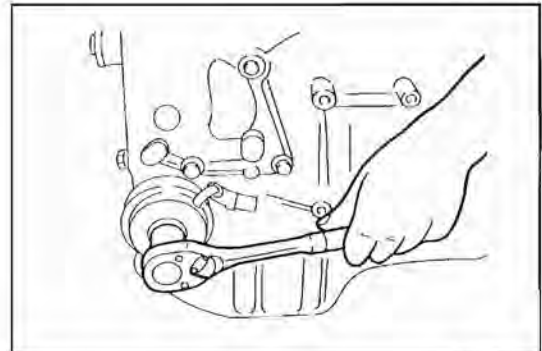


WR88-EM924

- (4) Tighten the set bolts to the specified torque using the following SST.

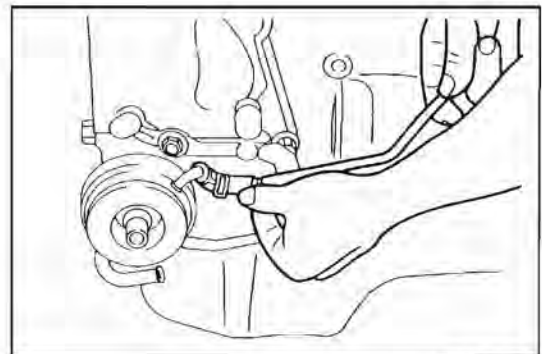
SST: 09268-87704-000

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)



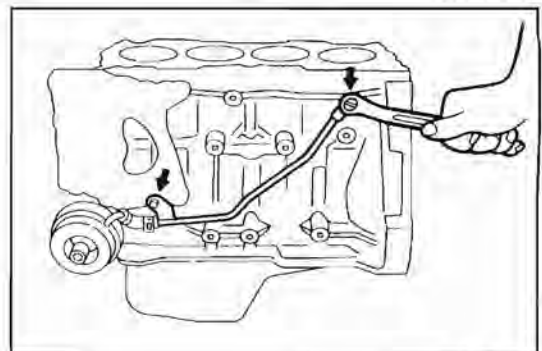
WR88-EM925

- (5) Connect the oil cooler inlet pipe into the oil cooler hose and install the hose band.



WR88-EM926

- (6) Install the oil cooler pipe to the cylinder block with a new gasket interposed.



WR88-EM927

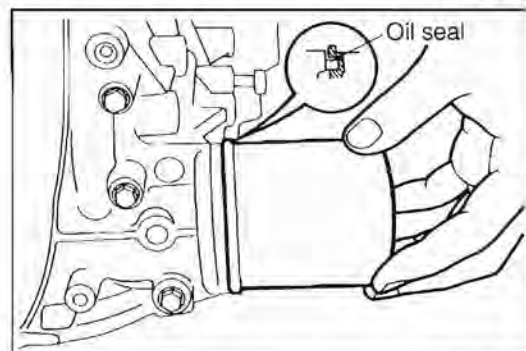
23. Installation of oil filter

- (1) Thinly apply engine oil to the oil seal of the oil filter.



WR88-EM928

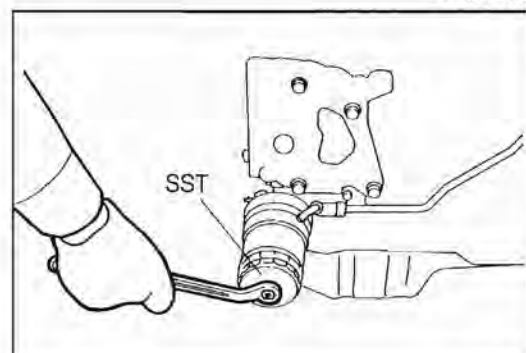
- (2) Screw in the oil filter until the oil seal of the oil filter comes in contact with the oil pump or the contact surface of the oil cooler.



WR88-EM929

- (3) Then, rotate the oil filter further one complete turn (360 degrees), using the following SST.

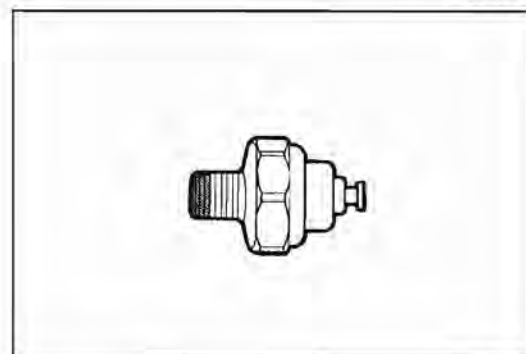
SST: 09228-87201-000



WR88-EM930

24. Installation of oil pressure switch

- (1) Clean the threaded portion of the oil pressure switch.
Wind seal tape around the threaded portion.

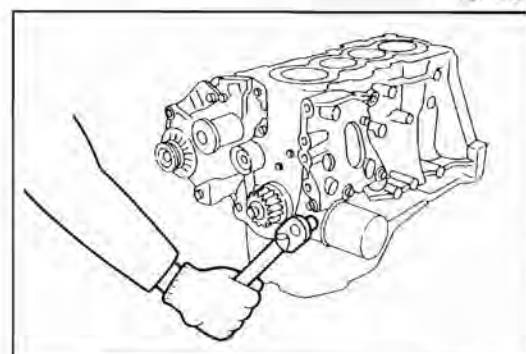


WR88-EM931

- (2) Tighten the oil pressure switch to the specified torque using a long box wrench having a hexagonal hole.

Tightening Torque: 1.2 - 2.0 kg-m (8.7 - 14.5 ft-lb)

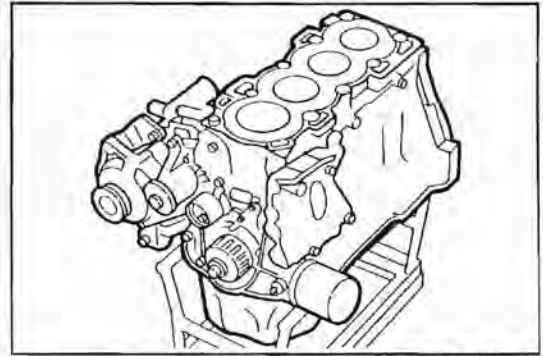
25. Install the alternator.



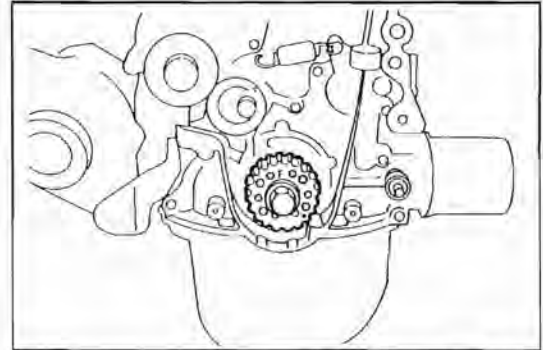
WR88-EM932

ASSEMBLY OF CYLINDER HEAD [HC-C engine]

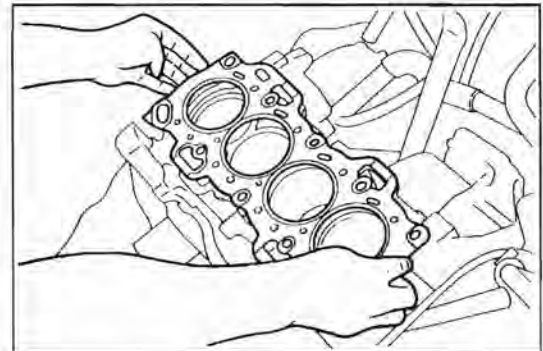
1. Place the cylinder block on a suitable working bench.
 2. Align the drilled mark of the crankshaft timing belt pulley with the indicator of the oil pump.
 3. Install the cylinder head gasket on the cylinder block.
 4. Turn the crankshaft, until the "F" mark of the camshaft timing belt pulley comes exactly at the top position.
 5. Install the cylinder head assembly on the cylinder block.
- NOTE:**
Be very careful not to damage the cylinder head gasket and cylinder head gasket surface.



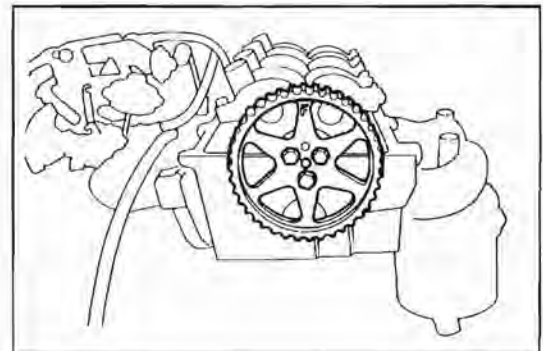
WR88-EM933



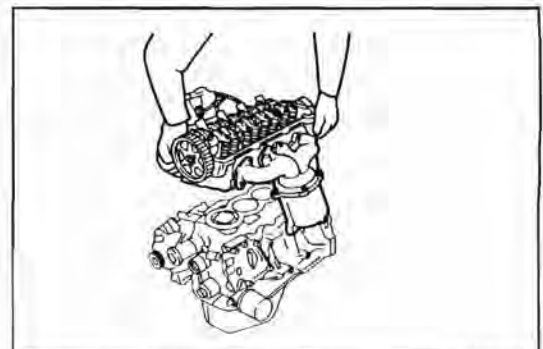
WR88-EM934



WR88-EM935



WR88-EM936



WR88-EM937

6. Apply engine oil to the threaded portion of each cylinder head bolt. Install the bolts to the cylinder head.

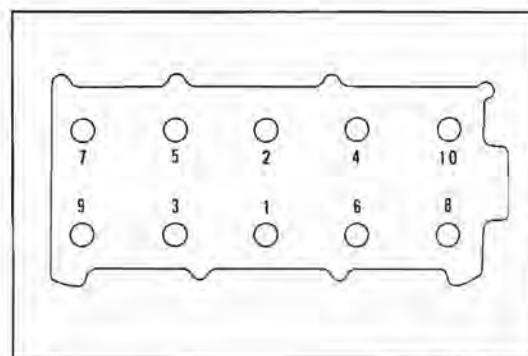
NOTE:

- As for the two bolts at the distributor side, use the bolt whose nominal length is 112 mm (4.41 inch), which is shorter than that of others.
- The cylinder head bolt attaching holes provided on the cylinder block should be dry condition.

WR88-EM938

7. Tighten the cylinder head bolts evenly over two or three stages to the specified torque, following the sequence shown in the right figure.

Tightening Torque: 5.0 - 6.0 kg-m (36.2 - 43.4 ft-lb)



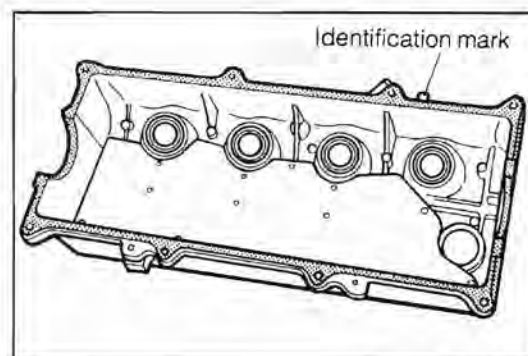
WR88-EM939

8. Installation of cylinder head cover

- (1) Check the cylinder head cover gasket for damage.
Replace the cylinder head cover gasket if it is damaged.

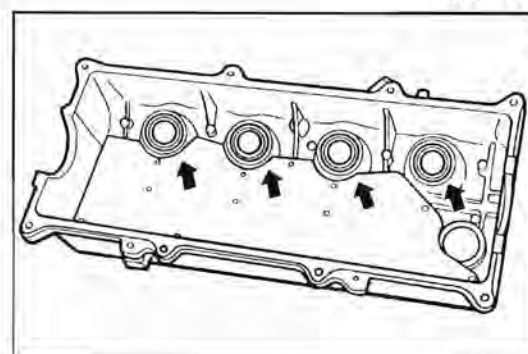
WR88-EM940

- (2) Removal of cylinder head cover gasket
(Only case where such replacement is required:)
Remove the cylinder head cover gasket from the cylinder head cover. Install a new cylinder head cover gasket in such a way that the identification mark comes at the intake side.



WR88-EM941

- (3) Check the spark plug tube grommets for damage.
Replace any grommet which exhibits damage.
(See page EM-114)

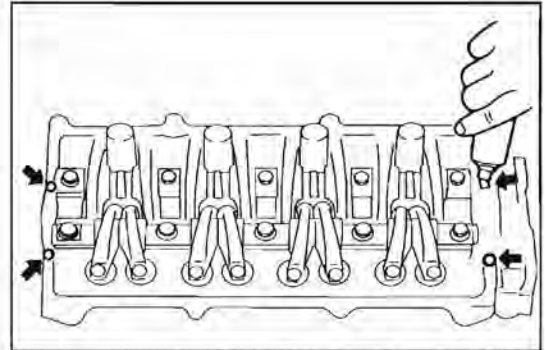


WR88-EM942

- (4) Wipe off any oil from the cylinder head cover gasket surface of the cylinder head.

WR88-EM943

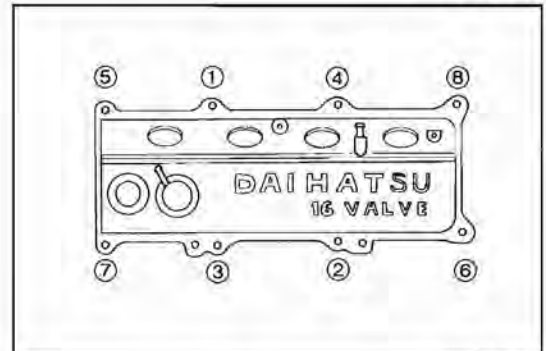
- (5) Apply the Three Bond 1104 to the mate surface of the cylinder head with the camshaft bearing caps No.1 and No.5, but only to those sections which contact the cylinder head gasket.



WR88-EM944

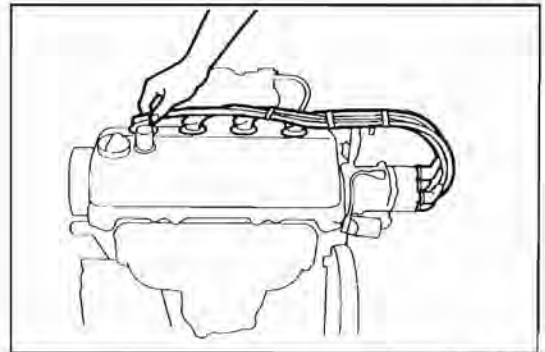
- (6) Install the cylinder head cover to the cylinder head. Tighten the cylinder head cover attaching bolts to the specified torque, following the sequence in the right figure.

Tightening Torque: 0.3 - 0.5 kg-m (2.2 - 3.6 ft-lb)



WR88-EM945

- (7) Connect the resistive cords to the distributor spark plug. Attach the resistive cords to the clamp.

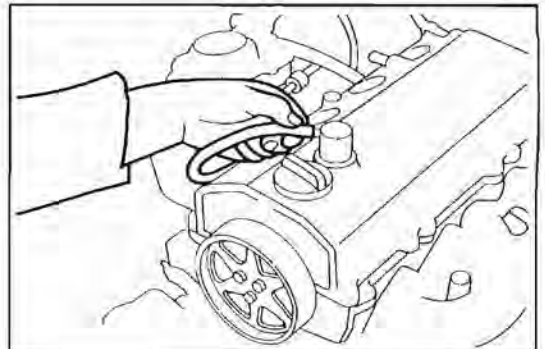


WR88-EM946

- (8) Connect the PCV hose to the cylinder head cover.

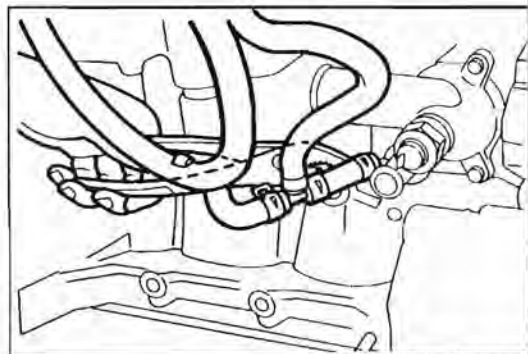
NOTE:

The side that the paint mark is daubed should be connected to the cylinder head cover side.



WR88-EM947

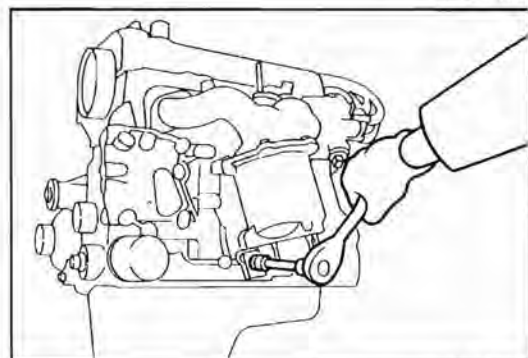
9. Connect the water hose to the cylinder block.



WR88-EM943

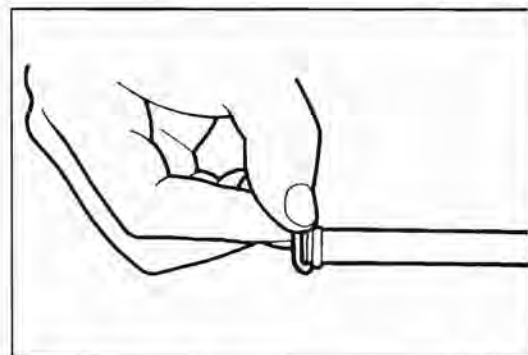
10. Install the exhaust manifold stay.

Tightening Torque: 3.0 - 4.5kg-m (21.7 - 32.5 ft-lb)



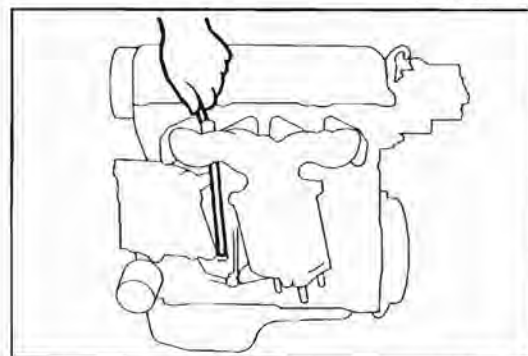
WR88-EM949

11. Replace the "O" ring of the oil level gauge guide with a new "O" ring.



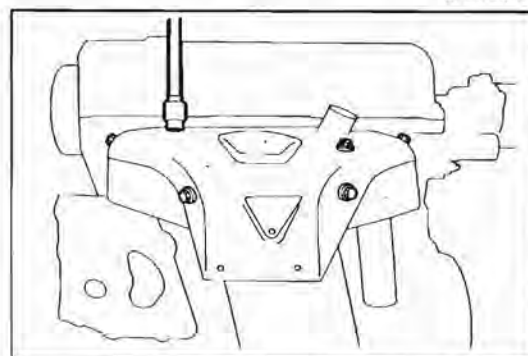
WR88-EM950

12. Insert the oil level gauge guide into the cylinder block.



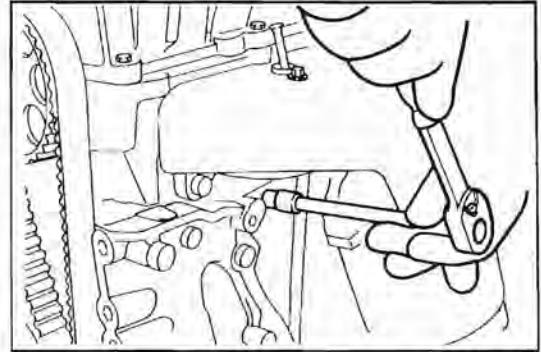
WR88-EM951

13. Attach the exhaust manifold cover.



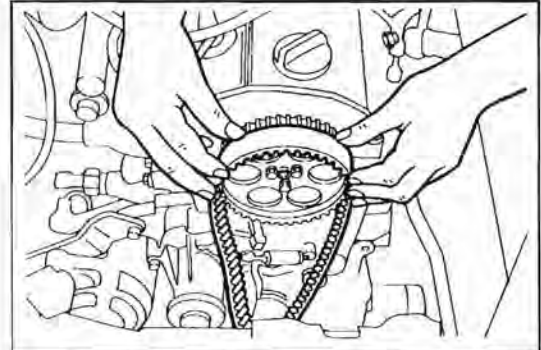
WR88-EM952

14. Install the oil level gauge guide attaching bolts.
Tightening Torque: 0.4 - 0.7 kg-m (2.9 - 5.1 ft-lb)



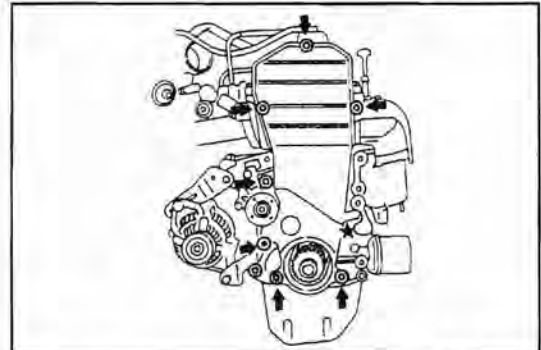
WR88-EM953

15. Install the oil level gauge.
16. Installation of timing belt
 - (1) Check the timing belt.
(See page EM-39.)
 - (2) Install the timing belt.
(See page EM-45.)



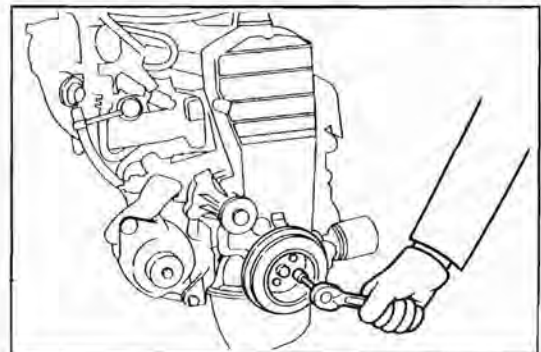
WR88-EM954

17. Install the timing belt cover.
NOTE:
Do not install the bolt with the "*" mark. (This bolt is tightened together with the oil pressure switch wire clamp.)



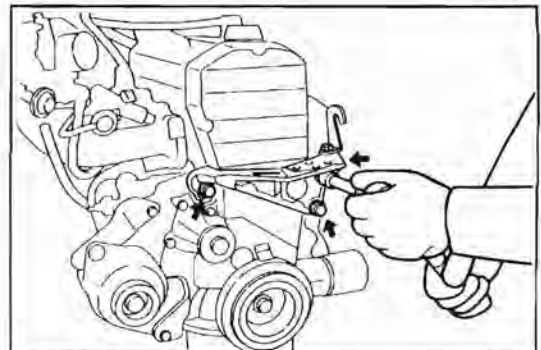
WR88-EM955

18. Install the crankshaft timing belt pulley.
Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.7 ft-lb)
NOTE:
Prevent the crankshaft from turning, using the following SST.
SST: 09210-87701-000



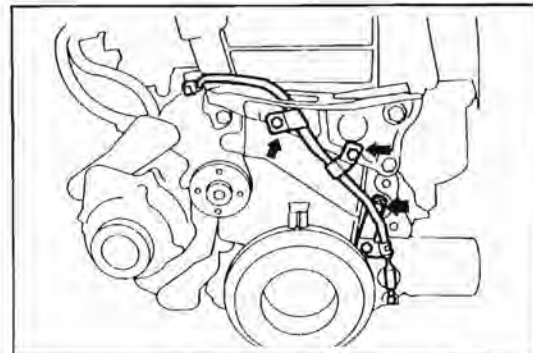
WR88-EM956

19. Install the engine mounting right bracket.
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM957

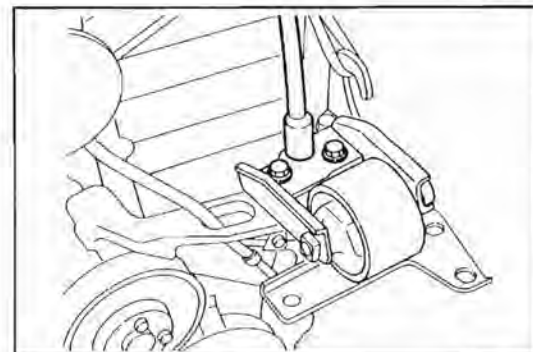
20. Install the water pump pulley.
21. Connect the oil pressure switch wire to the oil pressure switch. Install the clamp bolt.
22. Install the oil pressure switch wire to the engine.



WR88-EM958

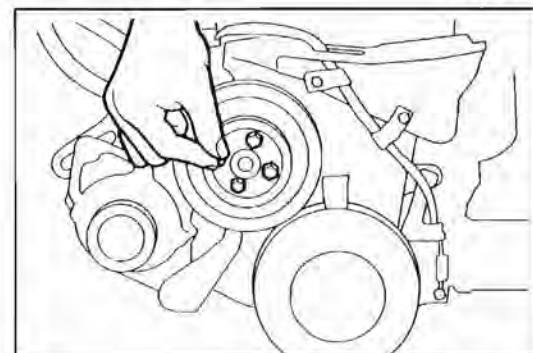
23. Install the engine right mounting front bracket to the engine mounting right bracket.

Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM959

24. Install the water pump pulley. Temporarily tighten the attaching bolts.

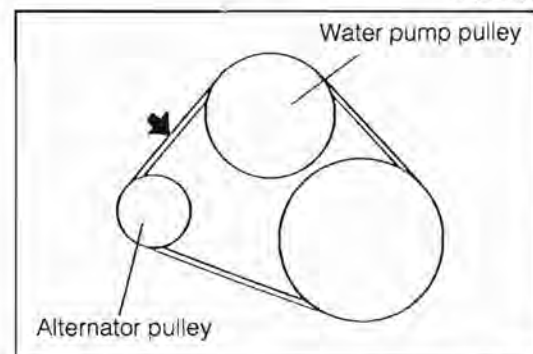


WR88-EM960

25. Install the drive belt. Adjust the belt tension.
(See page CH-24)

NOTE:

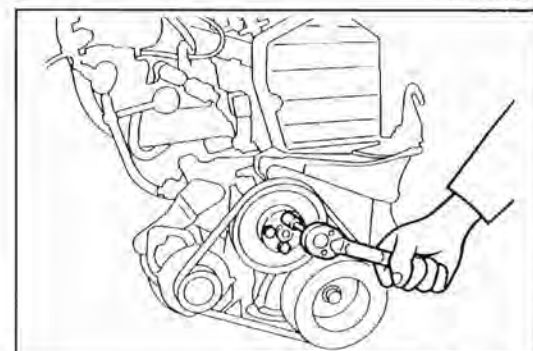
Ensure that the fan belt is fitted properly on each pulley.



WR88-EM961

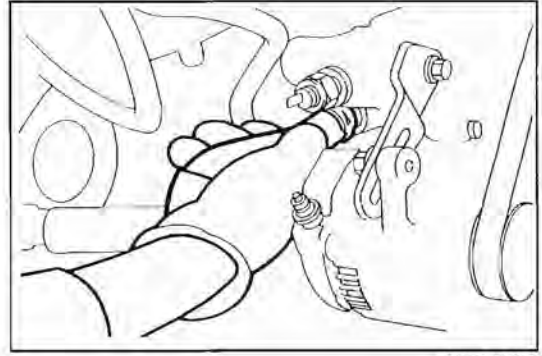
26. Tighten the water pump pulley bolt by utilizing the drive belt tension.

Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5 ft-lb)



WR88-EM962

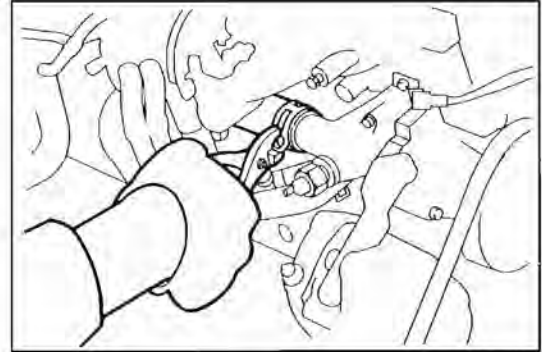
27. Install the heater outlet hose.



WR88-EM963

28. Connect the heater inlet hose.

29. Install the water inlet hose.

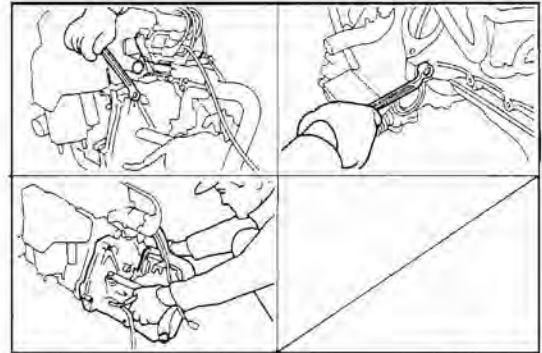


WR88-EM965

30. Sling the engine, using a chain block.

31. Install the transmission to the engine.

Tightening Torque: 5.0 - 7.0 kg-m (36.2 - 50.6 ft-lb)



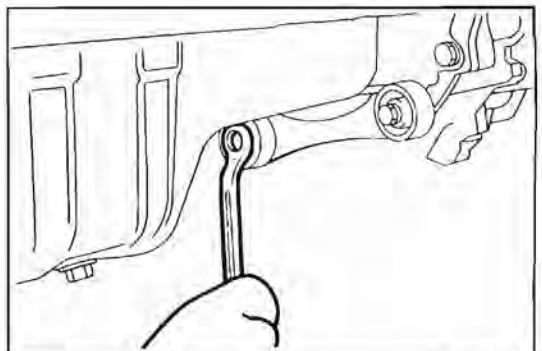
WR88-EM966

32. Install the attaching bolts of the drive plate torque converter.

Tightening Torque: 2.3 - 3.3 kg-m (16.6 - 23.9 ft-lb)

WR88-EM968

33. Install the power plant stiffener with the transmission under cover and exhaust pipe No. 1 support bracket.
(2WD vehicle only)

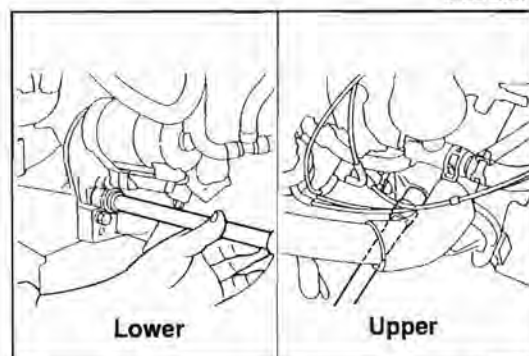


WR88-EM969

34. Install the front power plant stiffener and rear plant stiffener.
(2WD vehicle only)
35. Install the transmission under cover.
(4WD vehicle only)

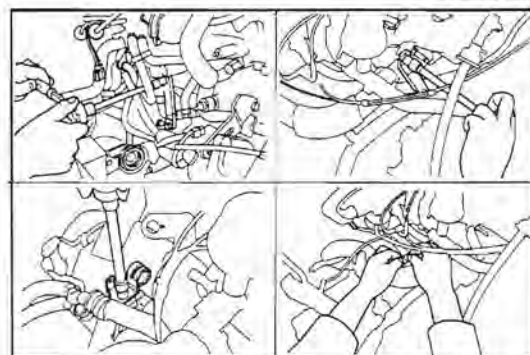
36. Install the starter motor.
Tightening Torque: 5.0 - 7.0 kg-m (36.2 - 50.6 ft-lb)

WR88-EM97



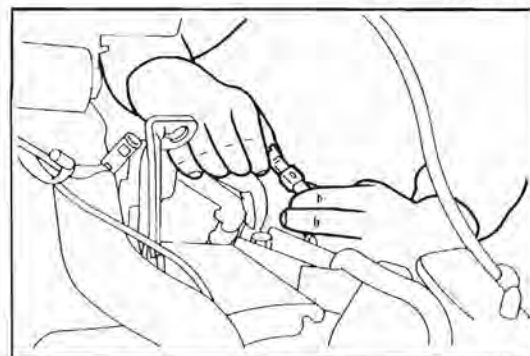
37. Installation of engine wire
(1) Attach the engine wire clamp to the engine wire.

WR88-EM97



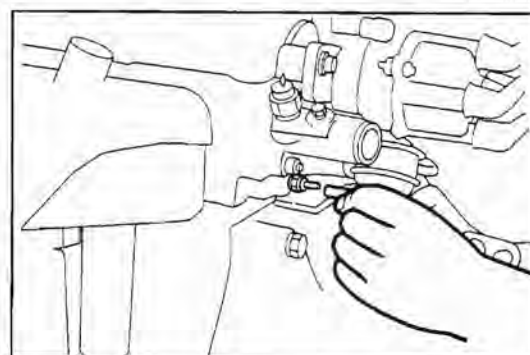
WR88-EM97

- (2) Connect the back lamp switch connector.



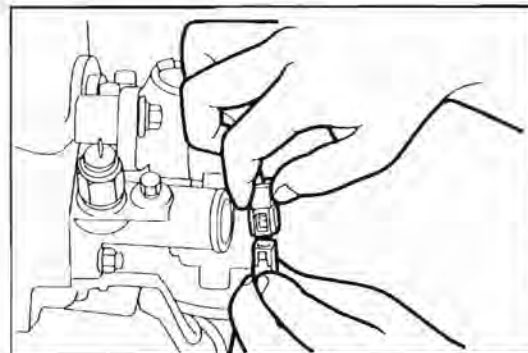
WR88-EM97

- (3) Connect the water temperature sender gauge connector.



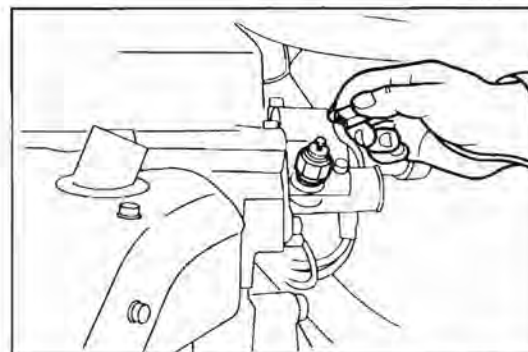
WR88-EM97

(4) Connect the distributor connector.



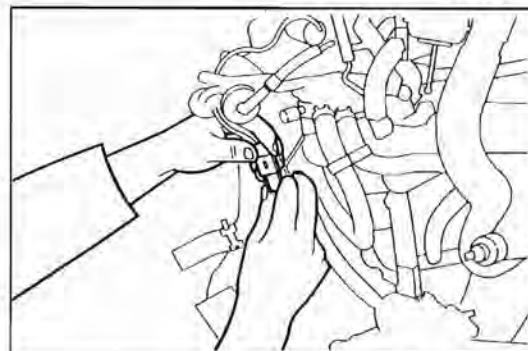
WR88-EM975

(5) Connect the water temperature sensor connector.
(ECE & EEC specifications only)



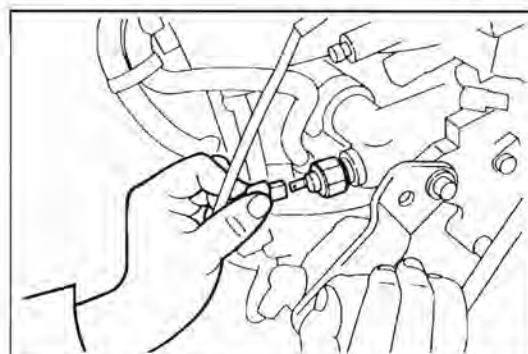
WR88-EM976

(6) Connect the throttle position sensor connector.
(7) Connect the speed sensor connector. (AT vehicle only)
(8) Connect the solenoid valve outer vent valve connector.



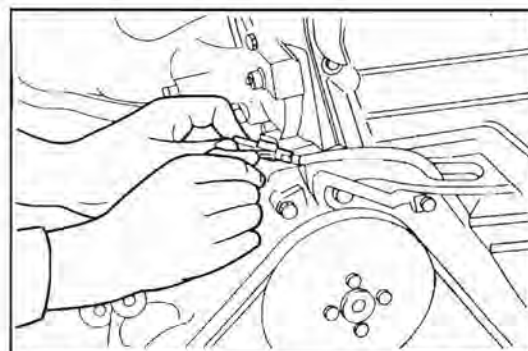
WR88-EM978

(9) Connect the starter terminal B.
(10) Connect the starter terminal ST.
(11) Connect the alternator terminal B.
(12) Connect the alternator connector.
(13) Connect the water thermo switch connector.



WR88-EM980

(14) Connect the oil pressure switch wire connector.



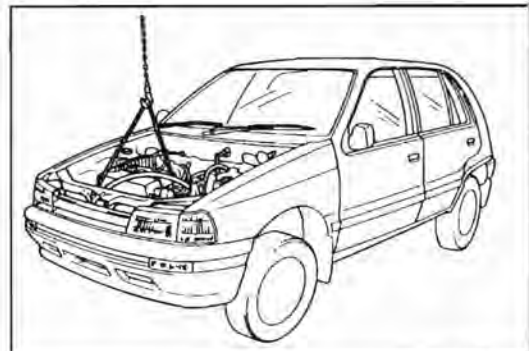
WR88-EM981

ENGINE INSTALLATION

1. Insert the engine into the vehicle.

NOTE:

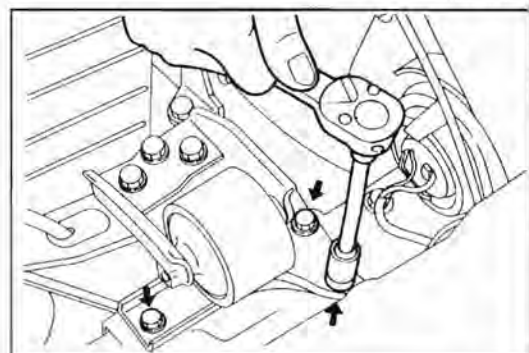
Be very careful not to hit the engine to the vehicle body and/or other parts.



WR88-EM962

2. Tighten the attaching bolts of the engine mounting front insulator.

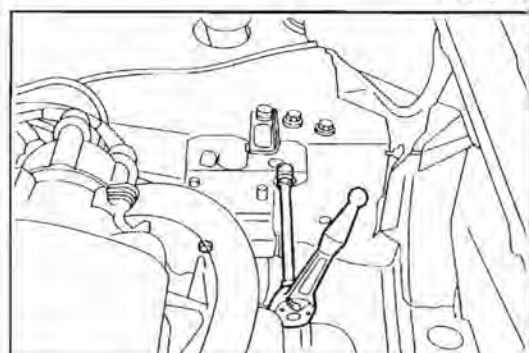
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM963

3. Lower the engine to such a point that the engine mounting front left bracket can be installed. Install the engine mounting front left bracket to the vehicle body.

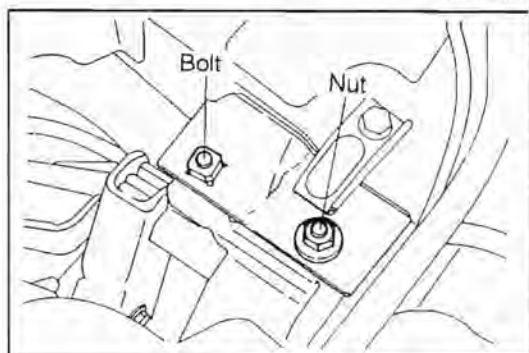
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM964

4. Using a chain block, lift the engine to such a point that the engine mounting lower left insulator can be installed. Install the engine mounting lower insulator to the engine mounting front left bracket.

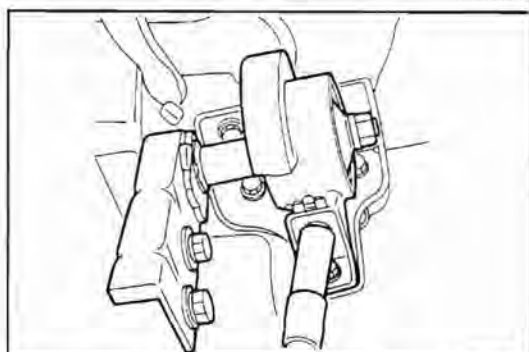
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM985

5. Install the engine mounting left stay.

Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



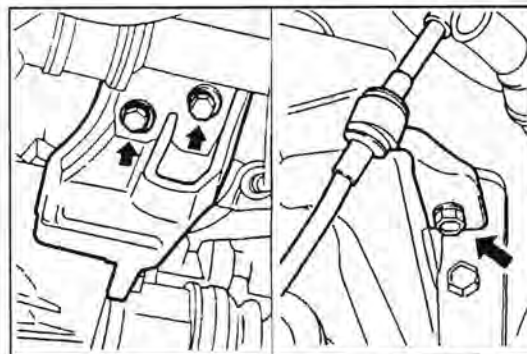
WR88-EM986

6. Using a chain block, adjust the engine position so that the engine rear bracket No.1 comes at the same height as the engine mounting bracket No.2.
7. Connect the engine mounting rear bracket No.1 to the engine mounting rear bracket No.2.

Tightening Torque: 5.5 - 7.0 kg-m (39.8 - 50.6 ft-lb)

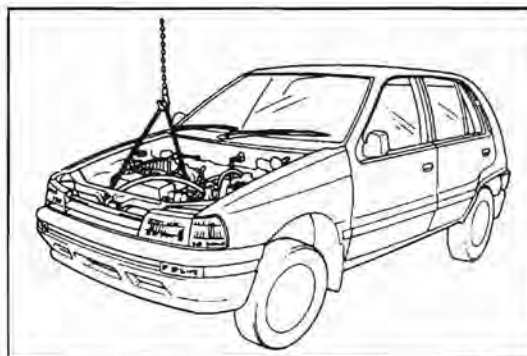
NOTE:

On the AT vehicle install the shift control cable clamp to the engine mounting rear bracket after this operation.



WR88-EM987

8. Remove the chain block from the engine.

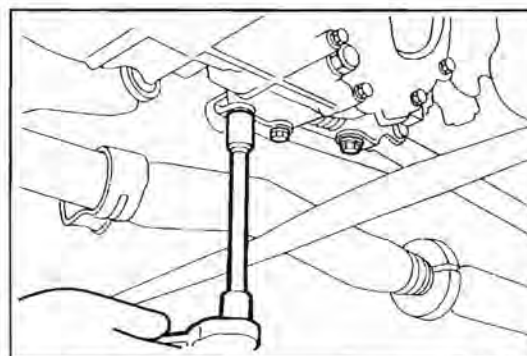


WR88-EM988

9. Connect the drive shaft to the transmission.

WR88-EM989

10. Install the extension rod and shift & select shaft to the transmission.



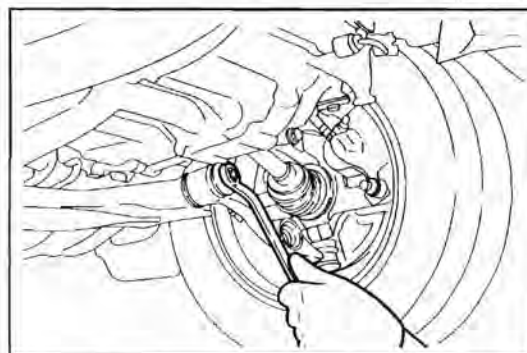
WR88-EM990

11. Install the lower arm to the lower armbracket. Tighten the nuts with a plate interposed.

Tightening Torque: 8.0 - 10.5 kg-m (57.9 - 75.9 ft-lb)

NOTE:

Never reuse the nuts.



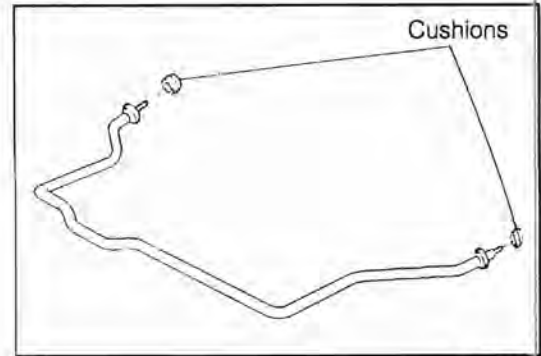
WR88-EM991

12. Installation of stabilizer

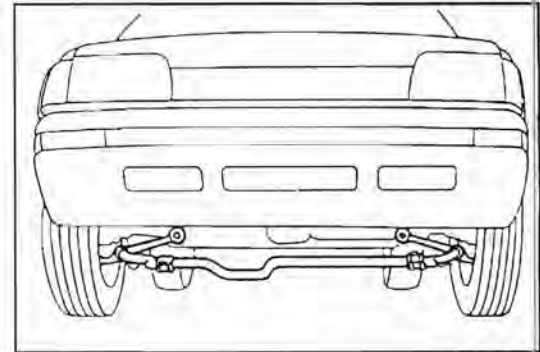
NOTE:

See the Chassis Workshop Manual.

(1) Install the stabilizer bar to the lower arm.



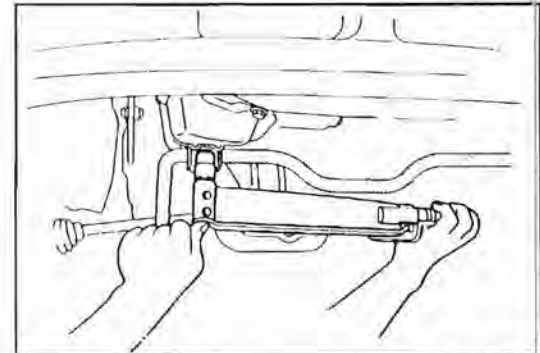
(2) Install the stabilizer bracket.



(3) Attach the cushions to the stabilizer bar.

Install the stabilizer bracket in place.

Tightening Torque: 4.0 - 6.0 kg-m (28.9 - 43.4 ft-lb)

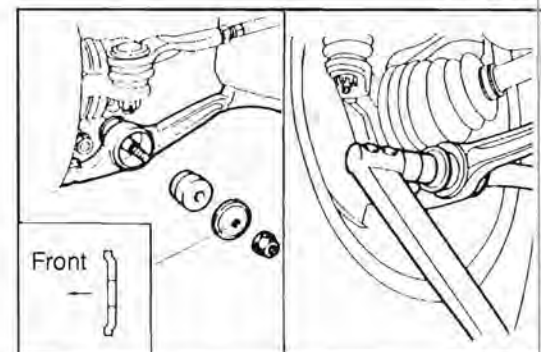


(4) Install the cushion and retainer to the stabilizer. Tighten the attaching nut.

Tightening Torque: 7.5 - 11.0 kg-m (54.2 - 80.0 ft-lb)

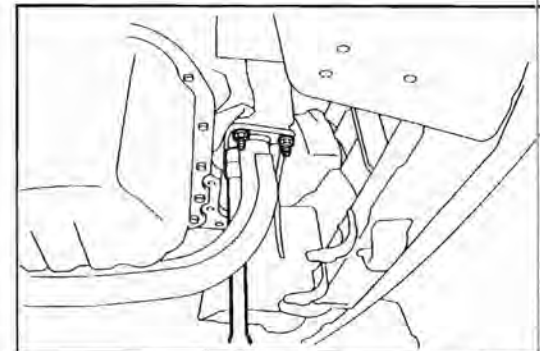
NOTE:

- Install the retainer in such a direction that its concave side may come at the cushion side.
- Never reuse the attaching nut.

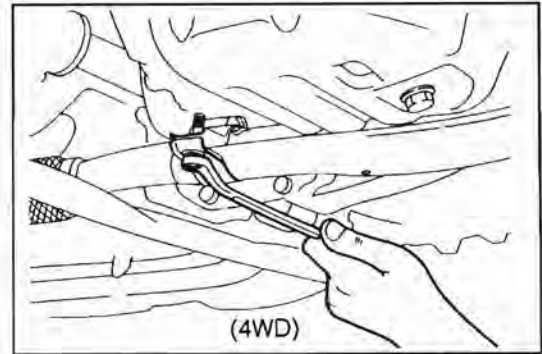


13. Install the exhaust front pipe to the exhaust manifold No.2 with a new gasket interposed.

Tightening Torque: 5.0 - 7.6 kg-m (36.2 - 55.0 ft-lb)

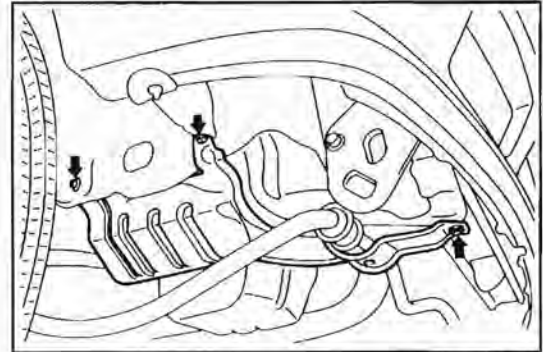


14. Attach the exhaust pipe support bracket clamp to the bracket. Tighten the attaching bolts.
Tightening Torque: 3.5 - 5.0 kg-m (25.3 - 36.2 ft-lb)



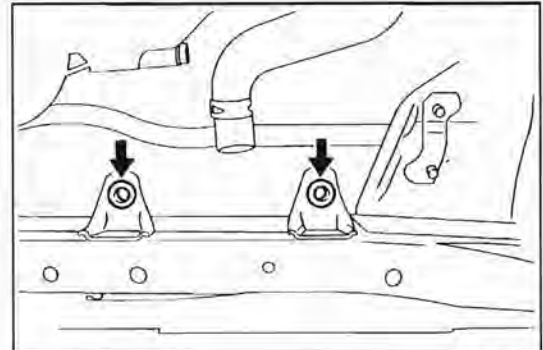
WR88-EM997

15. Install the engine undercover.



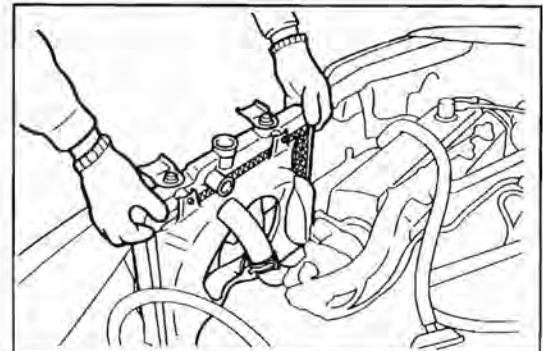
WR88-EM998

16. Jack down the vehicle.
17. Installation of radiator
 - (1) Ensure that the rubber grommets of the radiator lower support are installed.



WR88-EM999

- (2) Mount the radiator on the vehicle.

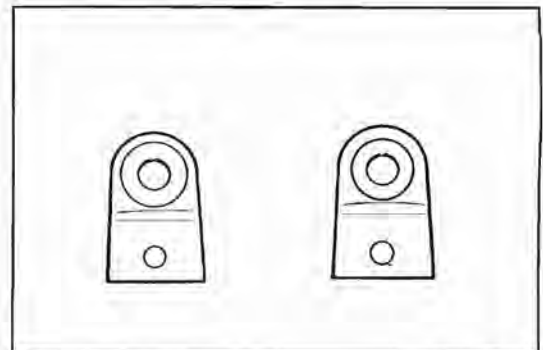


WR88-EM1000

- (3) Install the radiator bracket No.1.

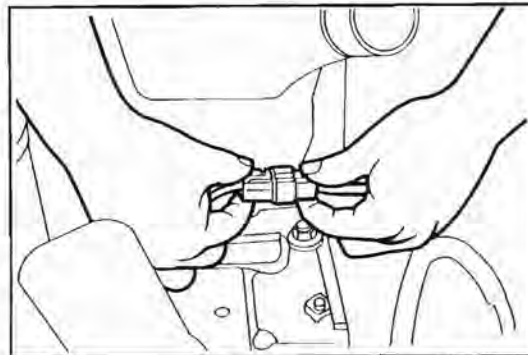
NOTE:

Replace the rubber grommet which exhibits damage.



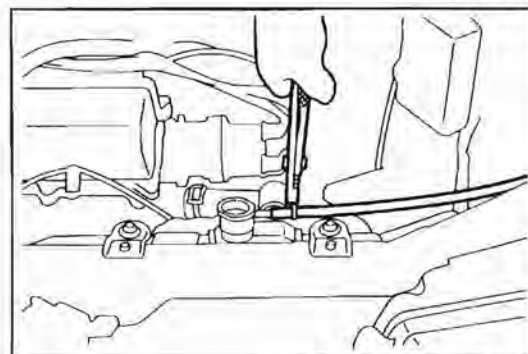
WR88-EM1001

- (4) Connect the radiator cooling fan motor connector and clamp it to the body.



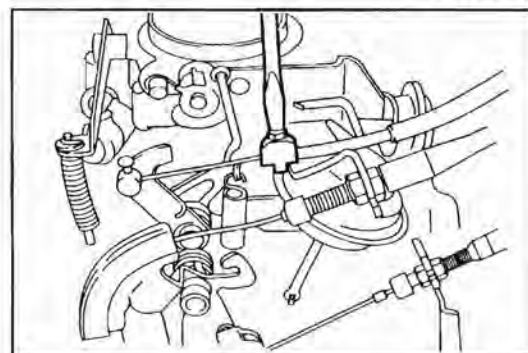
WR88-EM1002

- (5) Connect the reserve tank hose. Attach the hose bands.



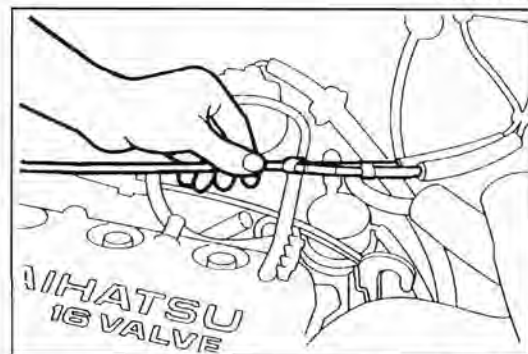
WR88-EM1003

18. Connect the throttle cable to the carburetor. (AT vehicle only)
19. Connect the accelerator cable to the carburetor. Adjust the accelerator cable in such a way that the play in the axial direction may become 3.0 - 8.0 mm (0.12 - 0.31 inch).
20. Connect the choke cable to the carburetor.



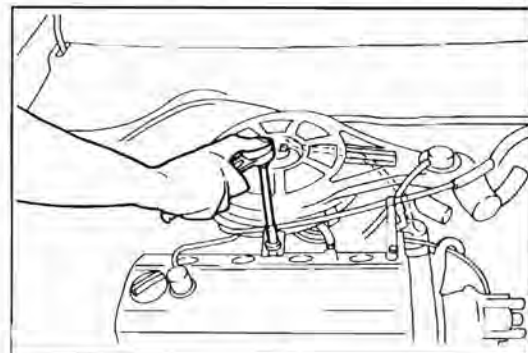
WR88-EM1004

21. Install the choke accelerator cable to the clamp.



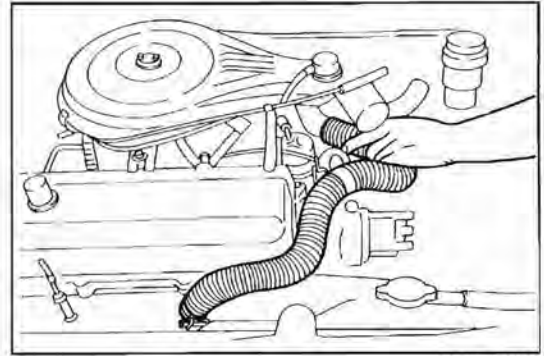
WR88-EM1005

22. Installation of air cleaner
(1) Install the air cleaner.
(2) Connect the vacuum hoses.
 - Vacuum hose to BVSV
 - Vacuum hose to ITC
 - PCV hose



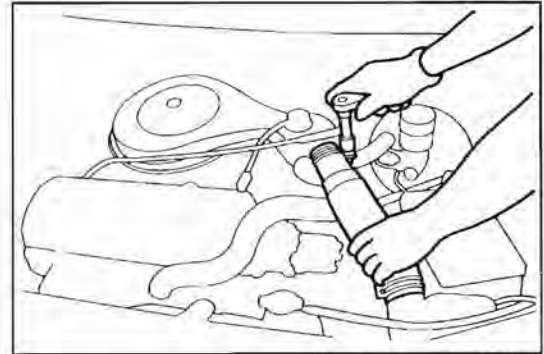
WR88-EM1006

(3) Install the hot air intake hose.



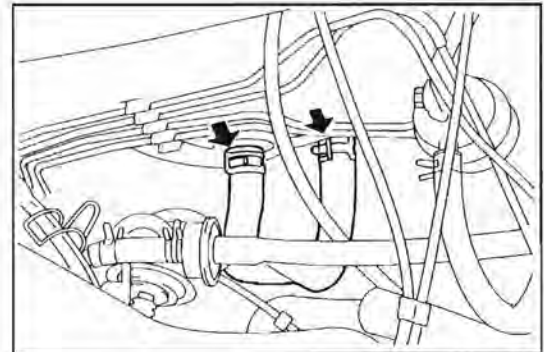
WR88-EM1007

(4) Install the cool air intake.



WR88-EM1008

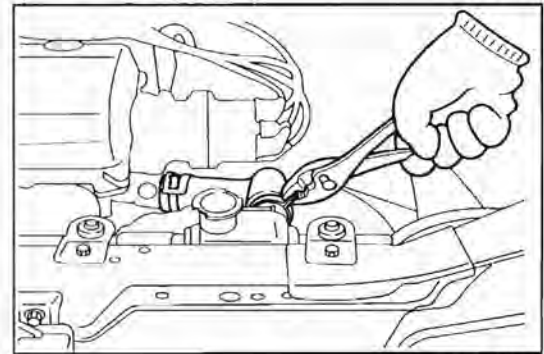
23. Connect the heater hoses to the heater core.



WR88-EM1009

24. Connect the radiator upper hose and lower hose. Attach the hose bands.

25. Connect the oil cooler hose to the radiator.
(Oil cooler-equipped vehicle only)

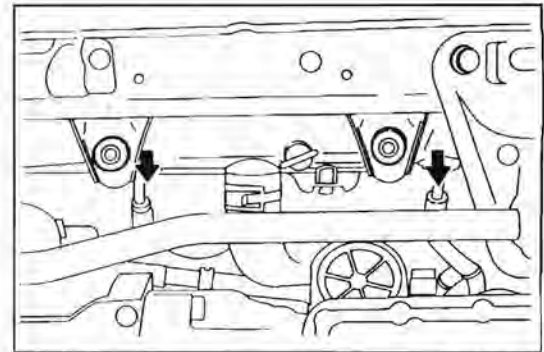


WR88-EM1010

26. Connect the new oil cooler hoses. Install new hose clips.
(A/T vehicle only)

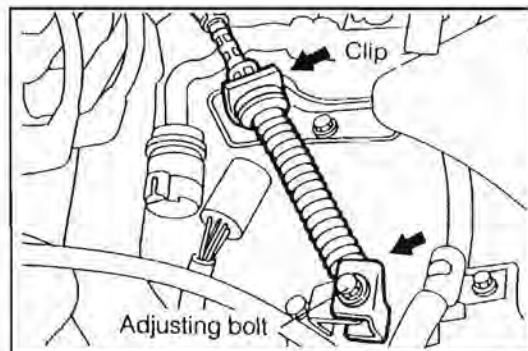
CAUTION:

- Never reuse the oil cooler hoses and hoses clips.
- Make sure that no oil or dirt gets to the connected sections.



WR88-EM1011

27. Connection of clutch cable (M/T vehicle only)
(See the Chassis Workshop Manual)
- (1) Install the clutch cable to the transmission.
 - (2) Install the clutch cable weight.
 - (3) Adjust the clutch pedal free travel.
28. Connection of control cable (A/T vehicle only)
(See the Chassis Workshop Manual)
- (1) Insert the shift control cable into the bracket and install the clip.
 - (2) Shift the control shift lever into the **[N]** range.
In this state, with the shift lever lightly pushed from **[N]** position to **[R]** position side, tighten the adjusting bolt.
 - (3) Ensure that the shift lever can be shifted to each range with a moderate decent feeling.



WR88-EM101 2

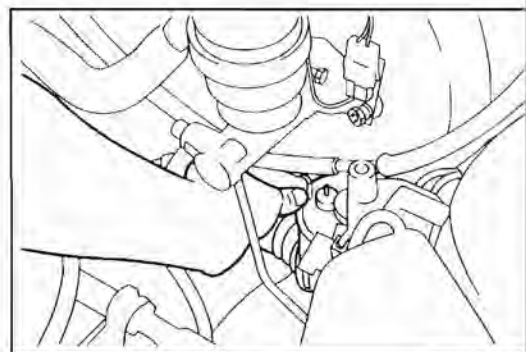
29. Connect the speedometer cable to the transmission.
30. Connect the fuel inlet and return hoses to the fuel pump. Attach the hose bands.

NOTE:

Install the hose band in such a way that its knobbed section faces downward

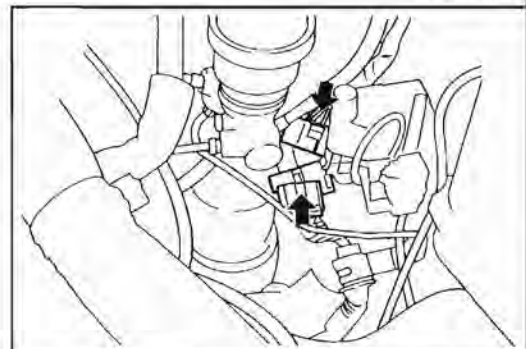
WR88-EM10 3

31. Connect the outer vent hose to the charcoal canister. (GCC specifications only)



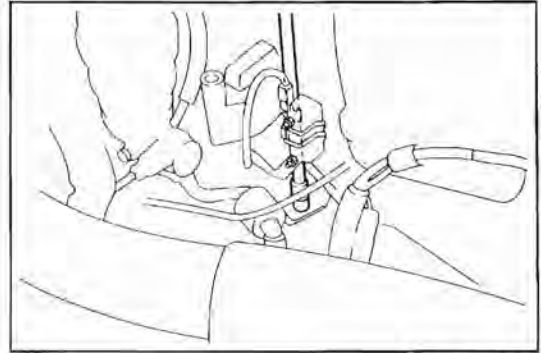
WR88-EM10 4

32. Connect the cowl wire and engine wire.



WR88-EM10 5

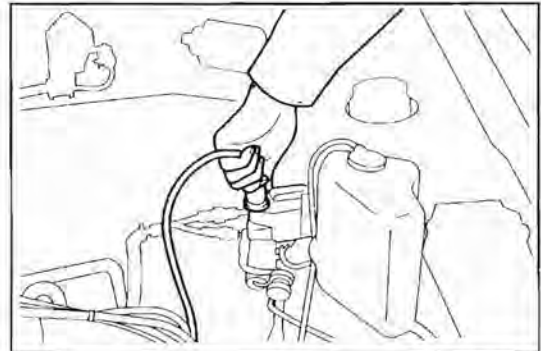
33. Install the body clamp bolt of the engine wire.



WR88-EM1016

34. Connect the resistive cord to the ignition coil.

35. Connect the brake booster hose in such a direction that the arrow mark faces to the manifold side.

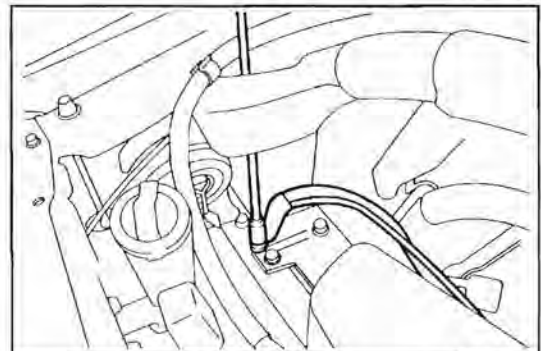


WR88-EM1017

36. Connect the battery ground cable to the body.

NOTE:

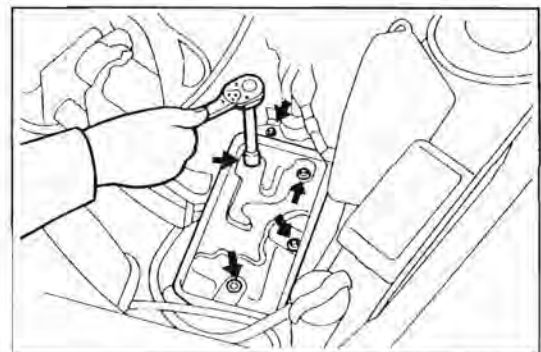
The ground cable connecting section is different between the manual transmission equipped vehicles and the automatic transmission equipped vehicles.



WR88-EM1018

37. Installation of battery carrier

- (1) Install the battery carrier with the four attaching bolts.
- (2) Attach the washer hose to the clamp.
- (3) Install the engine wire clamp with the bolt.



WR88-EM1019

38. Installation of battery

- (1) Place the battery on the battery carrier.

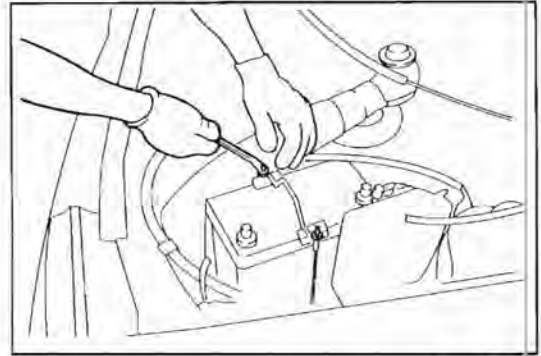


WR88-EM1020

(2) Install the battery hold-down clamp.

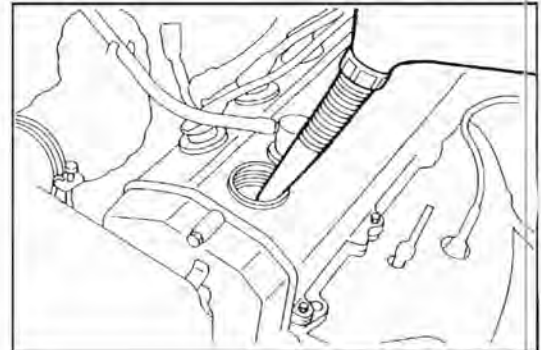
NOTE:

Care must be exercised so as not to damage the battery due to excessive tightening of it.



WR88-EM1021

39. Fill engine oil.
(See page LU-5)

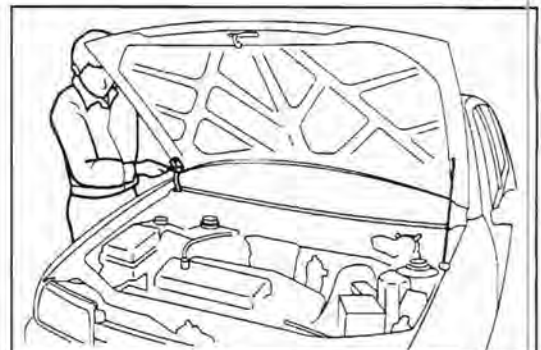


WR88-EM1022

40. Fill transmission oil.
(See the Chassis Workshop Manual)
41. Fill cooling water.
(See page CO-3.)
42. Reconnect the wire of the positive terminal to the battery positive (+) terminal.
43. Reconnect the battery ground cable to the negative (-) terminal of the battery.
44. Start the engine. Ensure that the engine exhibits no leakage of cooling water or oil.

WR88-EM1023

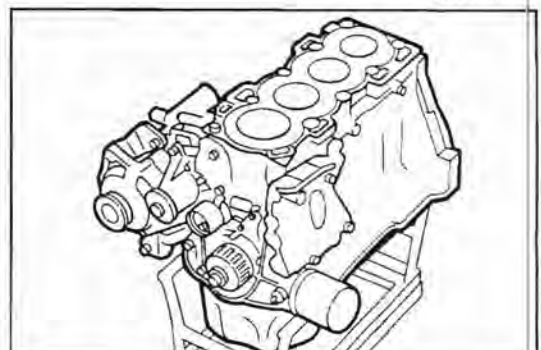
45. Perform the engine tune-up.
46. Installation of engine hood
(1) Install the engine hood to the vehicle.
NOTE:
Be very careful not to damage the body and engine hood.
(2) Connect the washer hose.
47. Check the front alignment.
(See the Chassis Workshop Manual)



WR88-EM1024

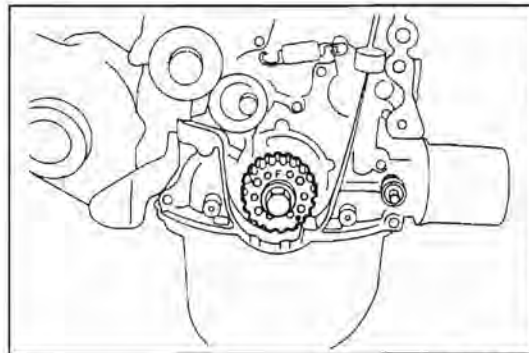
ASSEMBLY OF CYLINDER HEAD [HC-E engine]

1. Place the cylinder block on suitable engine bench.



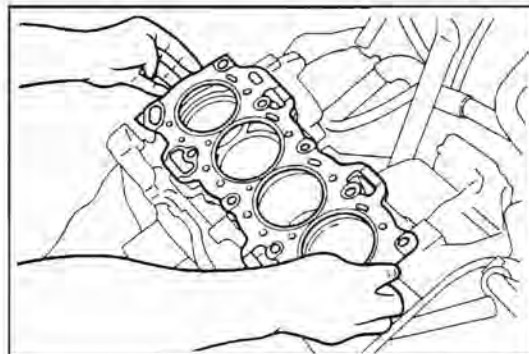
WR88-EM1025

2. Align the drilled mark of the crankshaft timing belt pulley with the indicator of the oil pump.



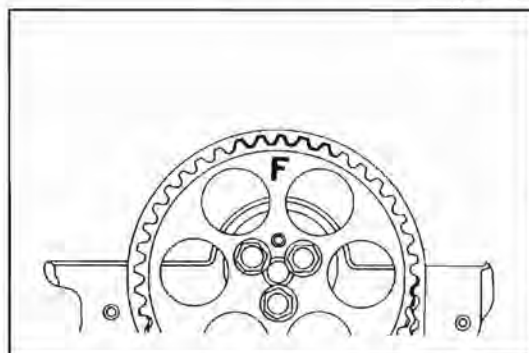
WR88-EM1026

3. Install the cylinder head gasket on the cylinder block.



WR88-EM1027

4. Turn the crankshaft, until the "F" mark of the camshaft timing belt pulley comes exactly at the top position.

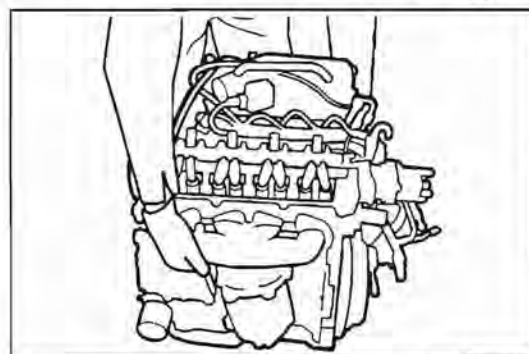


WR88-EM1028

5. Install the cylinder head assembly on the cylinder block.

NOTE:

Be very careful not to damage the cylinder head gasket or the cylinder head gasket surface during the installation.



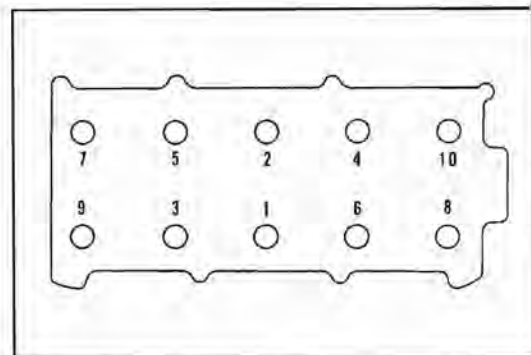
WR88-EM1029

6. Thinly apply engine oil to the threaded portion of each cylinder head bolt. Install the cylinder head bolts into position.

NOTE:

- As for the two bolts at the distributor side, their nominal length is 112 mm (4.41 inch), that is shorter than the rest of the cylinder head bolts.
 - The cylinder head attaching bolt holes provided on the cylinder block should be dry condition.
7. Tighten the cylinder head bolts evenly to the specified torque over two to three stages in the sequence shown in the right figure.

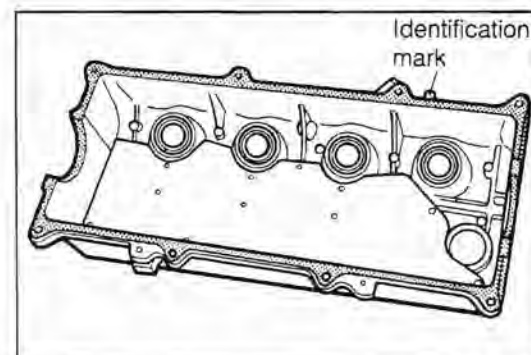
Tightening Torque: 5.0 - 6.0 kg-m (36.2 - 43.3 ft-lb)



WR88-EM103D

8. Installation of cylinder head cover

- (1) Check the cylinder head cover gasket for damage. Replace the cylinder head cover gasket if it exhibits damage.

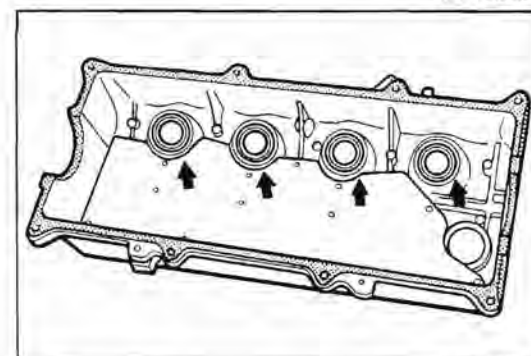


WR88-EM103

- (2) Replacement of cylinder head cover gasket (Only case where such replacement is required)

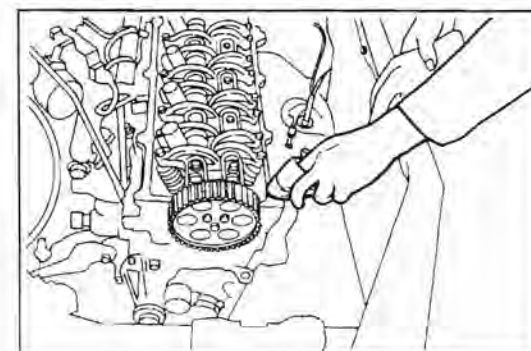
Remove the cylinder head cover gasket from the cylinder head cover. Install a new cylinder head cover gasket in such a direction that the identification mark comes at the intake side.

- (3) Check the spark plug tube grommet for damage. Replace any grommet which exhibits damage. (See page EM-114.)



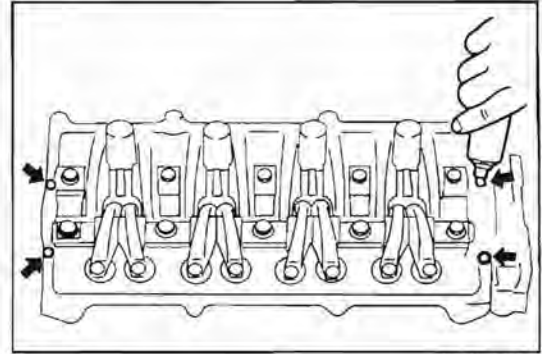
WR88-EM1032

- (4) Wipe off any oil from the cylinder head cover gasket surface of the cylinder head.



WR88-EM1033

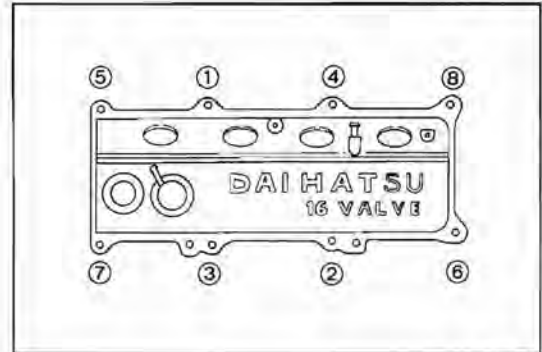
- (5) Apply the Three Bond 1104 to the mate surface of the cylinder head with the camshaft bearing caps No. 1 and No. 5, but only to those sections which contact the cylinder head gasket.



WR88-EM1034

- (6) Install the cylinder head cover to the cylinder head. Tighten the cylinder head cover attaching bolts to the specified torque in the sequence shown in the right figure.

Tightening Torque: 0.3 - 0.5 kg-m (2.17 - 3.61 ft-lb)



WR88-EM1035

9. Connect the resistive cords to the distributor and spark plugs. Attach the resistive cords to the clamp.

NOTE:

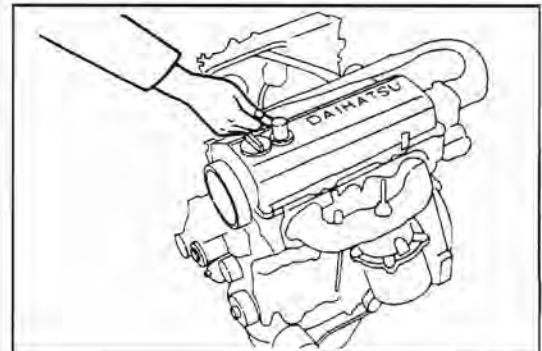
- Do not bend the resistive cord to a sharp angle.
- Never pull out the resistive cord, holding the cord portion.
- Be sure to connect the resistive cord, holding the grommet section.
- Care must be exercised to ensure that the resistive cord may not be frayed by the spark plug tube section.

WR88-EM1036

10. Install the two PCV hoses.

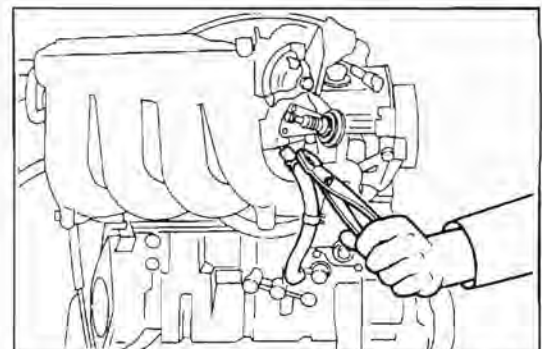
NOTE:

Install the PCV hose in such a way that the side which white paint mark is daubed may come to the cylinder head side.



WR88-EM1037

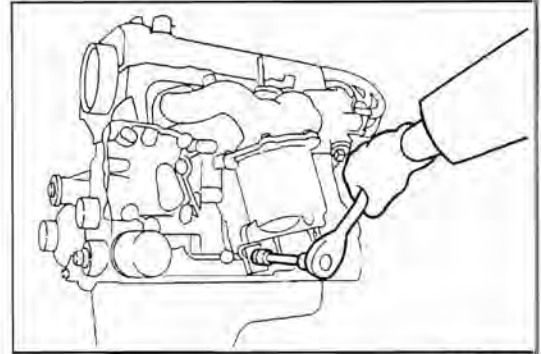
11. Connect the water hose to the throttle body.



WR88-EM1038

12. Install the exhaust manifold stay.

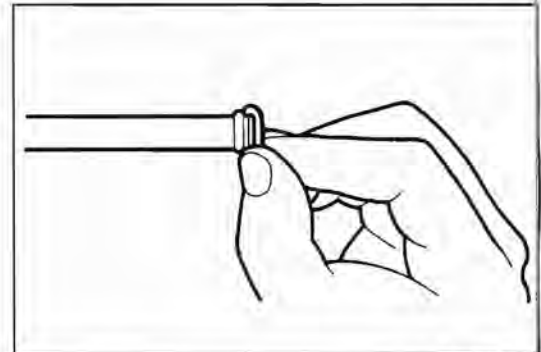
Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EM103

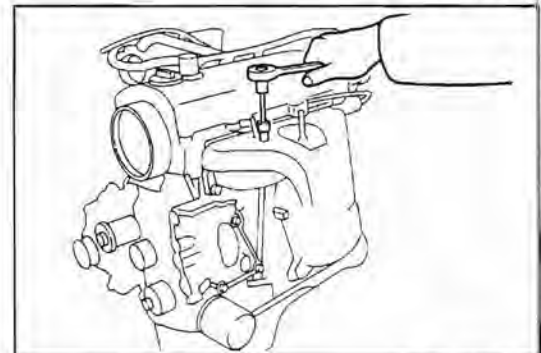
13. Replace the "O" ring of the oil level gauge guide with a new "O" ring.

14. Insert the oil level gauge guide to the cylinder block.



WR88-EM104

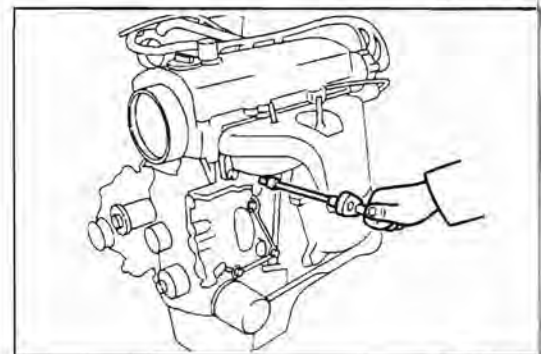
15. Attach the exhaust manifold cover.



WR88-EM104

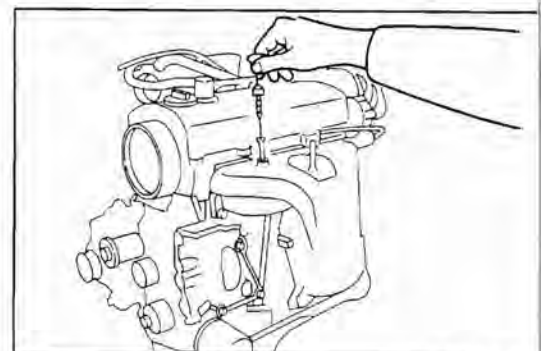
16. Install the oil level gauge guide attaching bolt.

Tightening Torque: 0.4 - 0.7 kg-m (2.9 - 5.1 ft-lb)



WR88-EM104

17. Attach the oil level gauge.



WR88-EM104

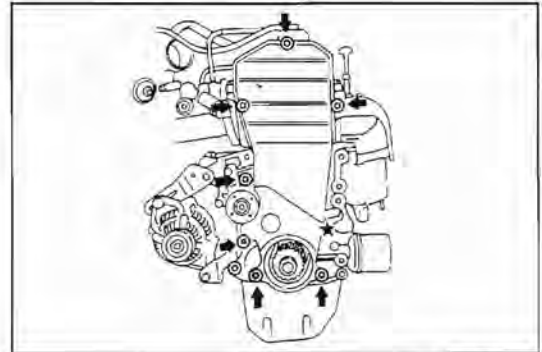
18. Installation of timing belt
- (1) Check the timing belt.
(See page EM-39.)
 - (2) Install the timing belt.
(See page EM-45.)

WR88-EM1044

19. Attach the timing belt cover.

NOTE:

An asterisk "*" mark denotes that this part is not installed.
(The oil pressure switch wire clamp is tightened in common at this point.)



WR88-EM1045

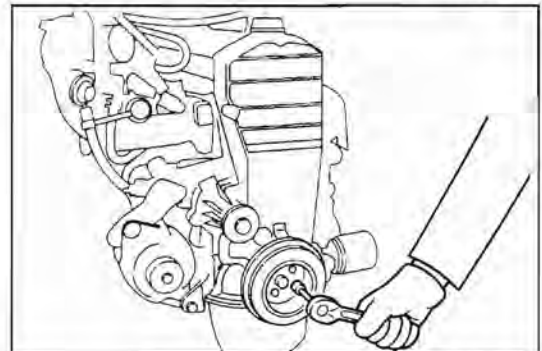
20. Install the crankshaft pulley.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.6 ft-lb)

NOTE:

Prevent the crankshaft from turning, using the following SST.

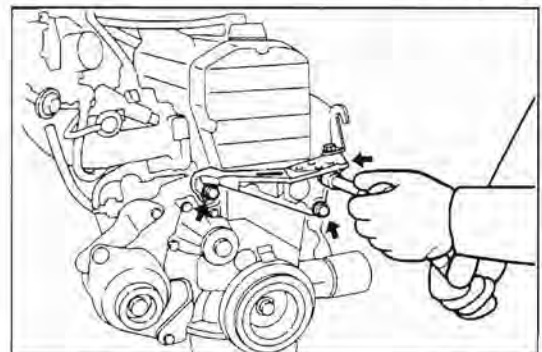
SST: 09210-87701-000



WR88-EM1046

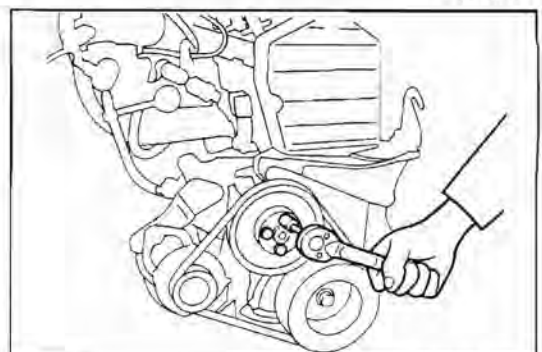
21. Install the engine mounting bracket.

Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



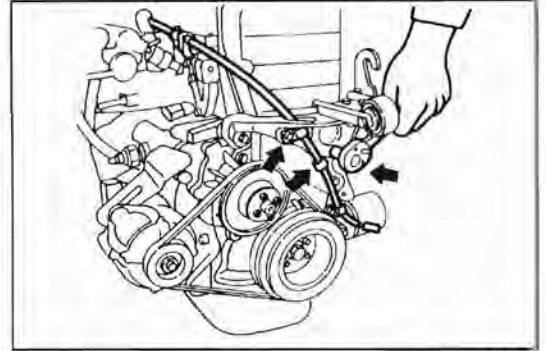
WR88-EM1047

22. Install the water pump pulley.



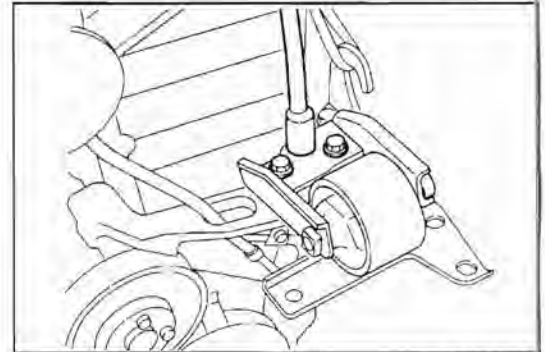
WR88-EM1048

23. Connect the oil pressure wire to the oil pressure switch. Install the clamp bolt.



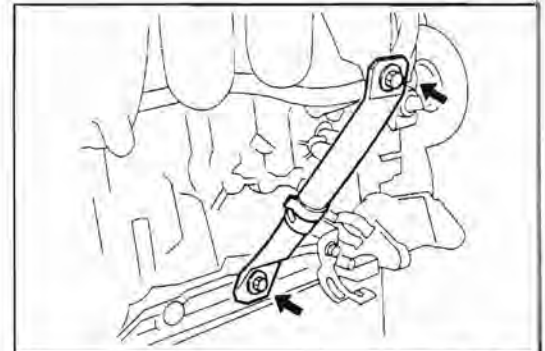
WR88-EM1049

24. Attach the engine mounting front bracket to the engine mounting right bracket.



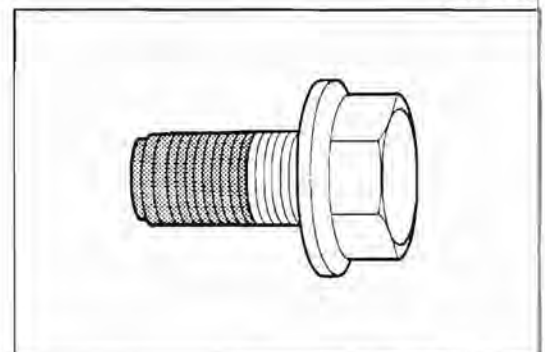
WR88-EM1050

25. Install the surge tank stay No.2.
Tightening Torque: 1.9 - 3.1 kg-m (13.8 - 22.4 ft-lb)



WR88-EM1051

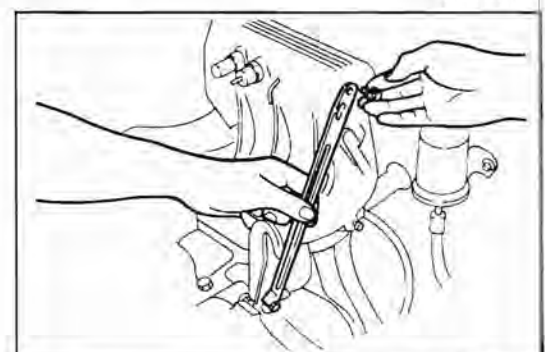
26. Clean the surge tank stay No.3 attaching bolt at the surge tank side. Thinly apply the Three Bond 1104 to the attaching bolt.



WR88-EM1052

27. Install the surge tank stay No. 3, engine hanger No.2 and bleeder hose clamp.

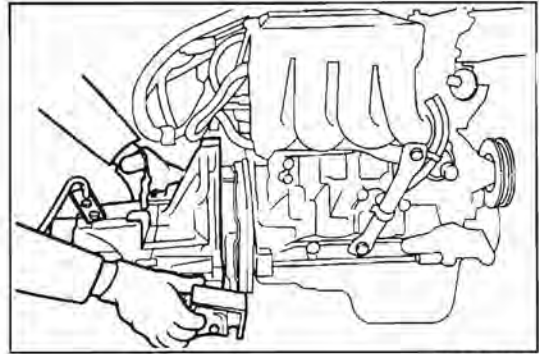
28. Sling the engine, using a chain block.



WR88-EM1053

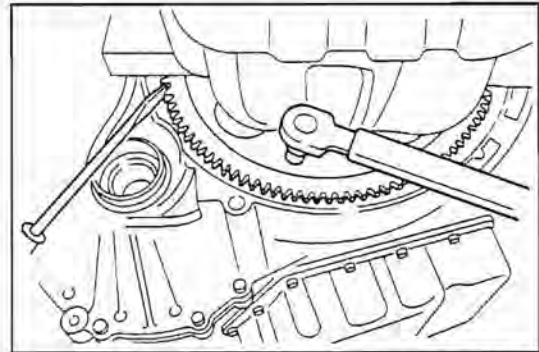
29. Lower the engine to the floor. Attach the transmission to the engine.

Tightening Torque: 5.0 - 7.0 kg-m (36.2 - 50.6 ft-lb)



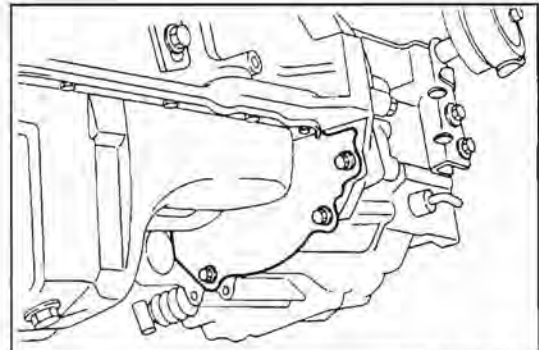
WR88-EM1054

30. Install and tighten the drive plate and torque converter attaching bolts.
(A/T vehicles only)



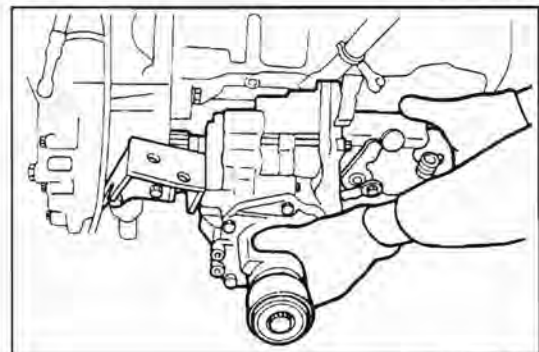
WR88-EM1055

31. Attach the clutch housing undercover.
(A/T vehicles only)
32. Install the power plant stiffener with the transmission under cover and exhaust pipe No.1 support bracket. (2WD vehicle only)
33. Install the front power plant stiffener and rear power plant stiffener. (2WD vehicle only)



WR88-EM1056

34. Install the transfer assembly.
(4WD vehicle only)



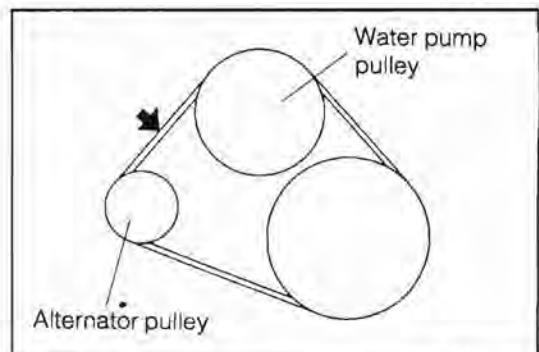
WR88-EM1057

35. Install the starter motor.
Tightening Torque: 5.0 - 7.0 kg-m (36.2 - 50.6 ft-lb)

36. Install the alternator.
37. Install the fan belt. Adjust the tension.
(See page CH-24.)

NOTE:

Ensure that the fan belt is fitted properly on each pulley.

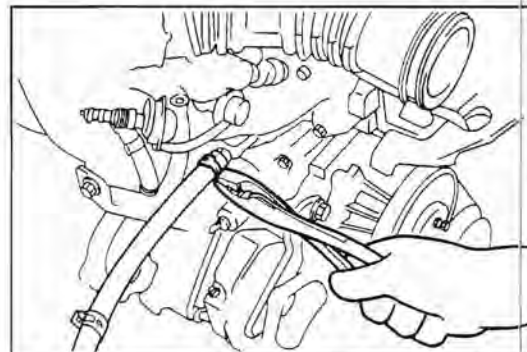


WR88-EM1060

38. Install the brake booster hose in such a direction that the side having an arrow mark may face toward the surge tank.

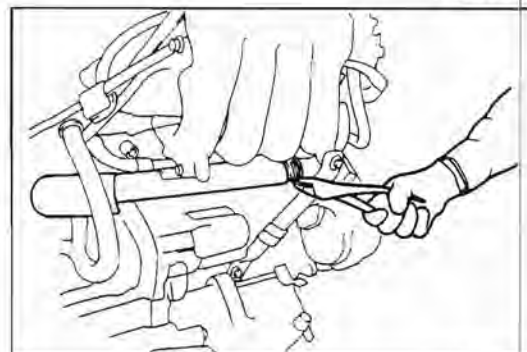
WARNING:

Make sure that the brake booster hose is installed in the correct direction so that the arrow head faces toward the surge tank.



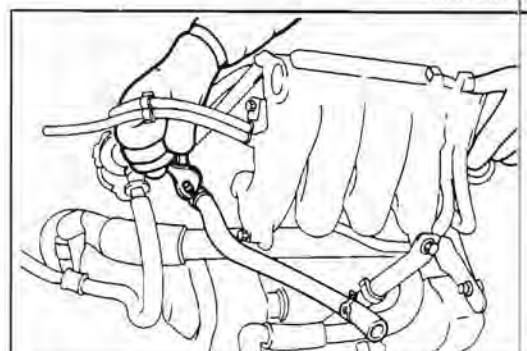
WR88-EM1061

39. Install the radiator lower hose. Attach the hose bands.



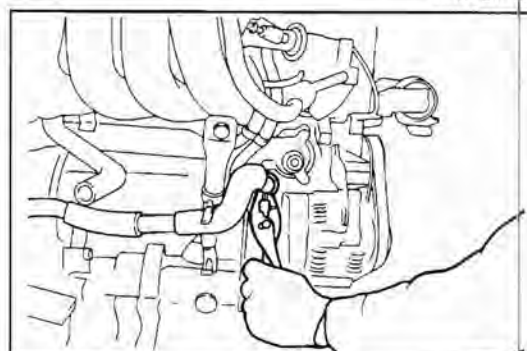
WR88-EM1062

40. Install the heater inlet hose. Attach the hose bands.



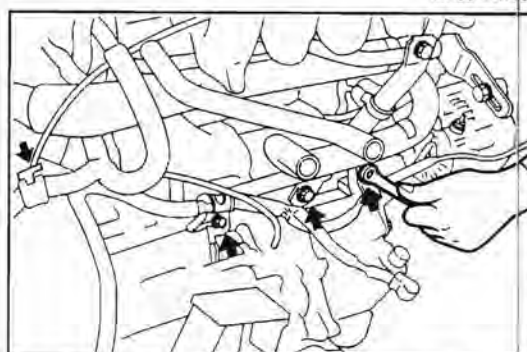
WR88-EM1063

41. Install the heater outlet hose. Attach the hose bands.



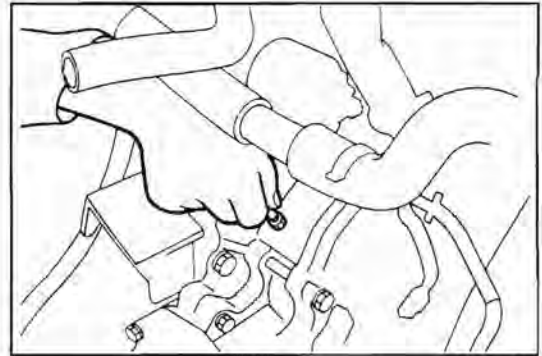
WR88-EM1064

42. Install the alternator wire. Tighten the clamp bolt.



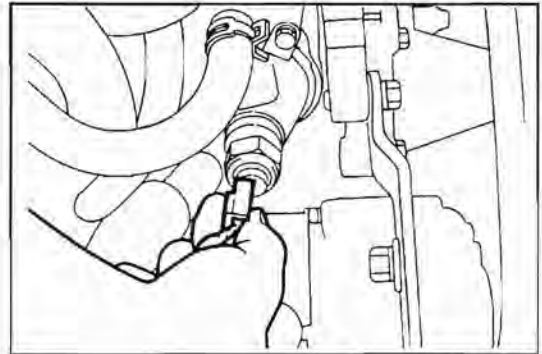
WR88-EM1065

43. Connect the bleeder hose to the hose clamp.
(4WD vehicle only)



WR88-EM1066

44. Connect the starter terminal ST of the alternator wire to the starter.
45. Connect the starter terminal B of the alternator wire to the starter.
46. Connect the radiator fan motor switch connector.



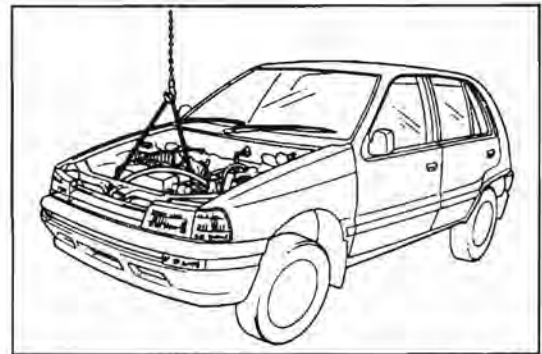
WR88-EM1068

47. Connect the alternator connector of the alternator wire to the alternator.
48. Connect the alternator terminal B of the alternator wire to the alternator.

WR88-EM1069

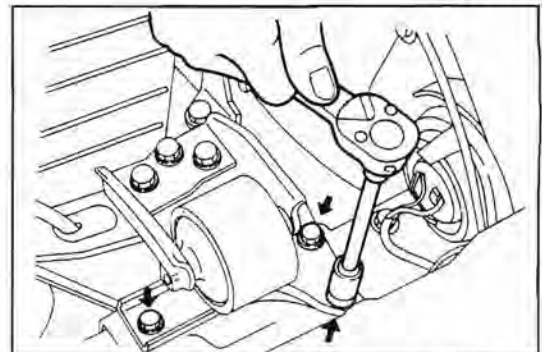
ENGINE INSTALLATION [HC-E engine]

1. Place the engine in the engine compartment.
NOTE:
Be very careful not to allow the engine to hit the vehicle body.



WR88-EM1070

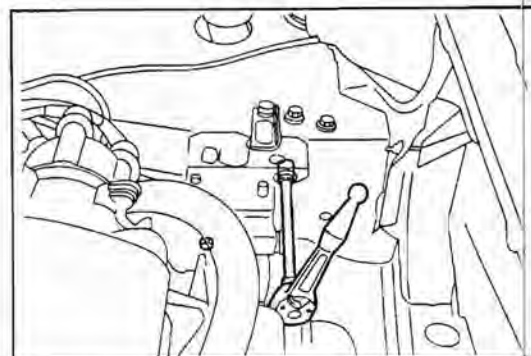
2. Tighten the engine mounting front insulator attaching bolts.
Tightening Torque: 4.0 -5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM1071

3. Lower the engine to such an extent that the engine mounting front left bracket may be installed. Proceed to install the engine mounting front left bracket on the vehicle body.

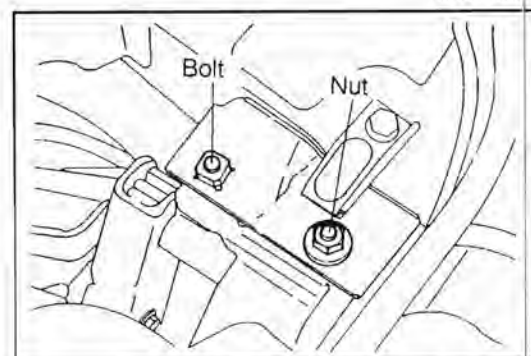
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM1072

4. Using the chain block, raise the engine to such an extent that the engine mounting lower left insulator may be installed. Proceed to install the engine mounting lower left insulator on the engine mounting front left bracket.

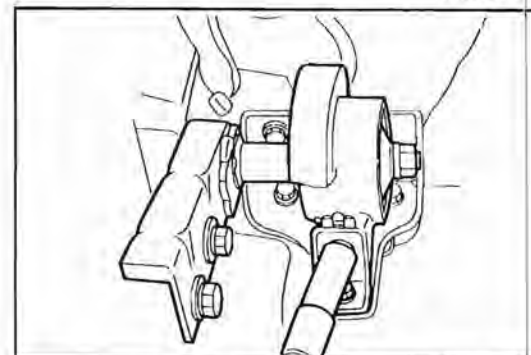
Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM1073

5. Install the engine mounting left stay.
(M/T vehicle only)

Tightening Torque: 4.0 - 5.5 kg-m (28.9 - 39.8 ft-lb)



WR88-EM1074

6. Using the chain block, adjust the engine height so that the engine rear bracket No. 1 may be aligned with the engine mounting bracket No. 2.

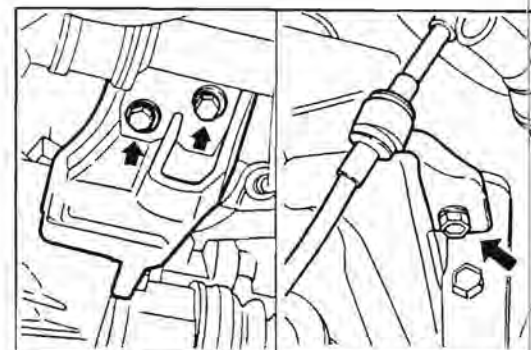
WR88-EM1075

7. Connect the engine mounting rear bracket No. 1 to the engine mounting bracket No. 2.

Tightening Torque: 5.5 - 7.0 kg-m (39.8 - 50.6 ft-lb)

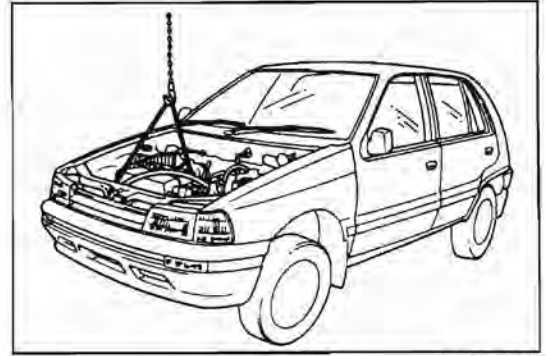
NOTE:

On the AT vehicle install the shift control cable clamp to the engine mounting rear bracket after this operation.



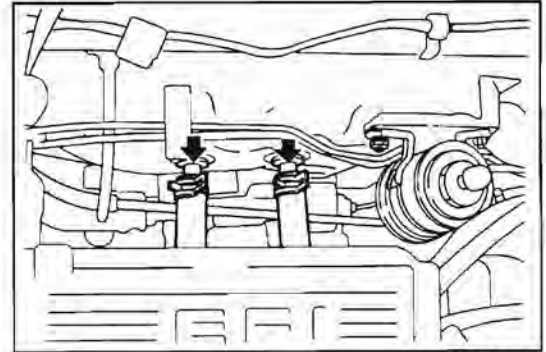
WR88-EM1076

8. Remove the chain block from the engine.



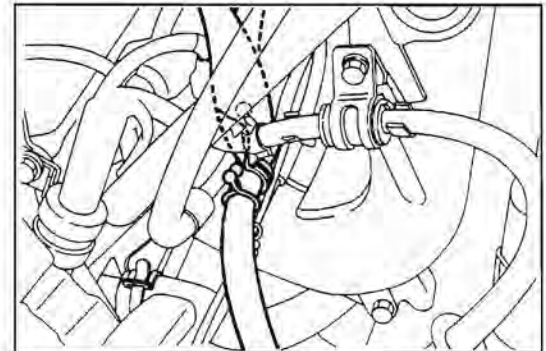
WR88-EM1077

9. Connect the heater hose. Attach the hose bands.



WR88-EM1078

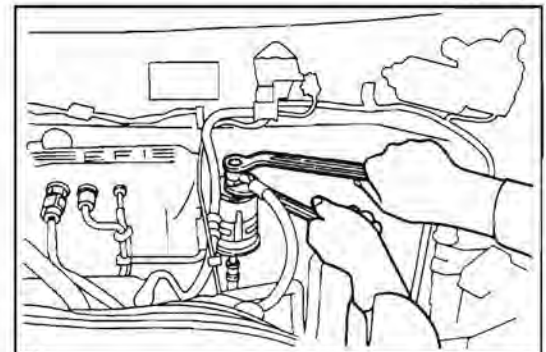
10. Connect the fuel return hose to the pressure regulator. Attach the hose clips.



WR88-EM1079

11. Install the fuel hose No. 1 to the fuel filter with a new gasket interposed.

Tightening Torque: 3.5 - 4.5 kg-m (25.3 - 32.5 ft-lb)



WR88-EM1080

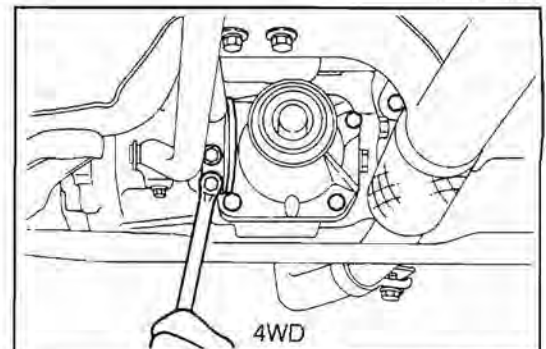
12. Connect the shift & select shaft and extension rod to the transmission. (MT vehicle only)

Tightening Torque: 1.0 - 1.6 kg-m (7.2 - 11.6 ft-lb)

NOTE:

Extension rod is connected to:

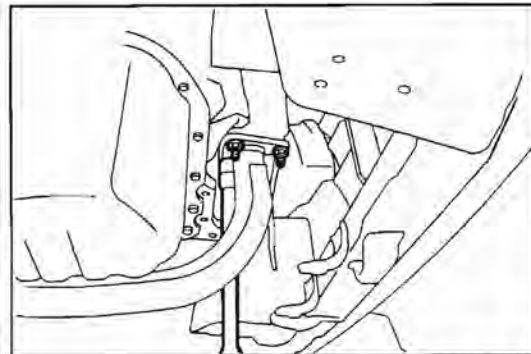
- 4WD Transfer Extension housing
- 2WD Transmission case



WR88-EM1081

13. Install the exhaust front pipe to the exhaust manifold No. 2 with a new gasket interposed.

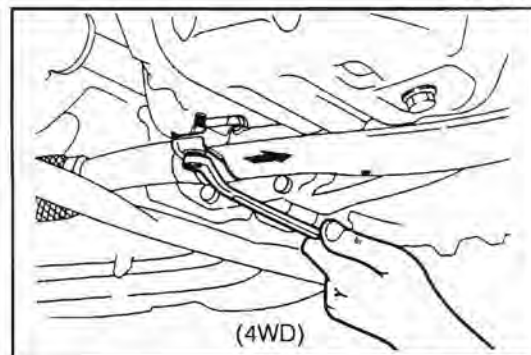
Tightening Torque: 5.0 - 7.6 kg-m (36.2 - 55.0 ft-lb)



WR88-EM1082

14. Connect the clamp to the support bracket of the exhaust front pipe.

Tightening Torque: 3.5 - 5.0 kg-m (25.4 - 36.1 ft-lb)



WR88-EM1083

15. Connect the drive shafts to the transmission.

NOTE:

Be very careful to avoid damaging the lip section of the oil seal during the connection.

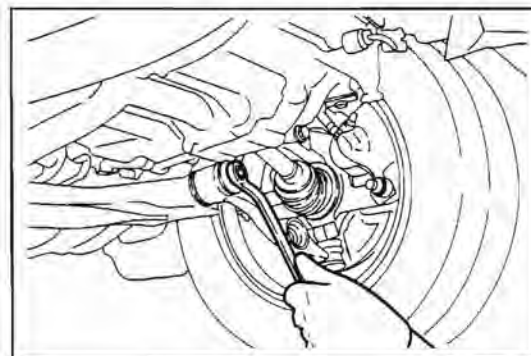
WR88-EM1084

16. Install the suspension lower arm to the suspension lower arm bracket. Tighten the attaching nuts.

Tightening Torque: 8.0 - 10.5 kg-m (57.9 - 75.9 ft-lb)

NOTE:

- Never reuse the attaching nuts.
- Ensure that no oil, etc. gets to the threaded portion of the lower arm bracket.



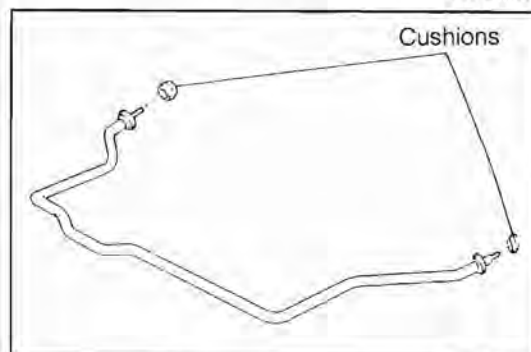
WR88-EM1085

17. Installation of stabilizer bar

NOTE:

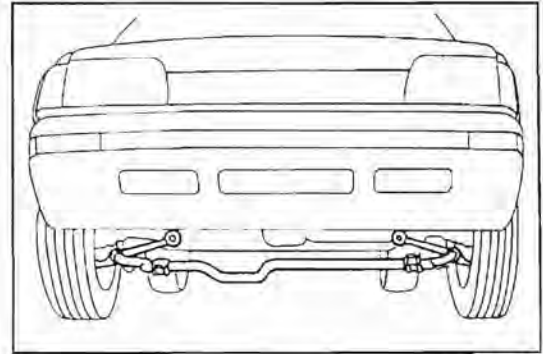
See the chassis workshop manual.

- (1) Attach the cushions to the stabilizer bar.



WR88-EM1086

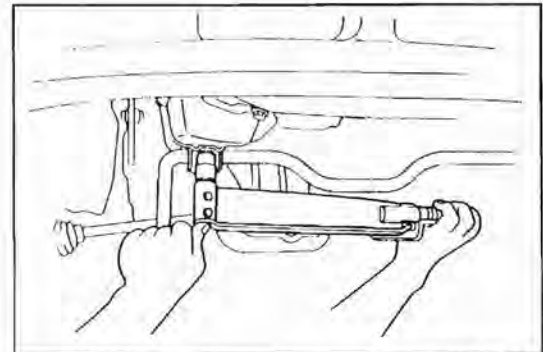
(2) Install the stabilizer bar to the lower arm.



WR88-EM1087

(3) Attach the cushions to the stabilizer bar. Install the stabilizer bracket in place.

Tightening Torque: 4.0 - 6.0 kg-m (28.9 - 43.4 ft-lb)



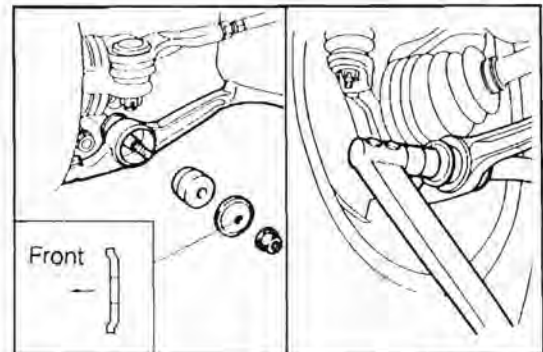
WR88-EM1088

(4) Install the cushion and retainer to the stabilizer. Tighten the attaching nut.

Tightening Torque: 7.5 - 11.0 kg-m (54.2 - 80.0 ft-lb)

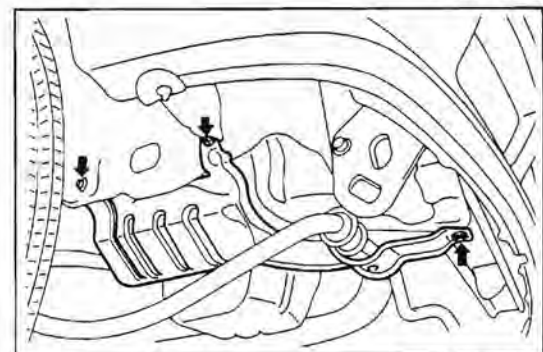
NOTE:

- Install the retainer in such a direction that its concave side may come at the cushion side.
- Never reuse the attaching nut.



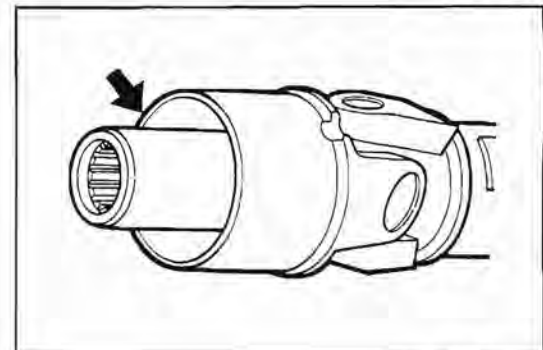
WR88-EM1089

18. Install the engine undercover.



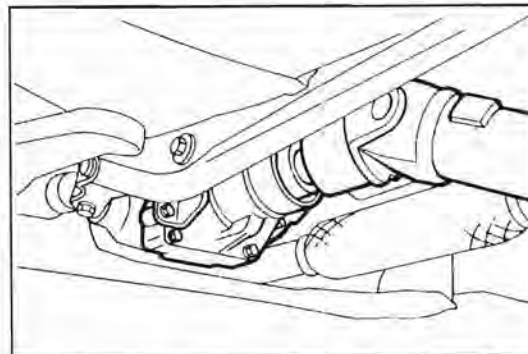
WR88-EM1090

19. Thinly apply transmission oil to the oil seal contact surface of the propeller shaft.
(4WD vehicle only)



WR88-EM1091

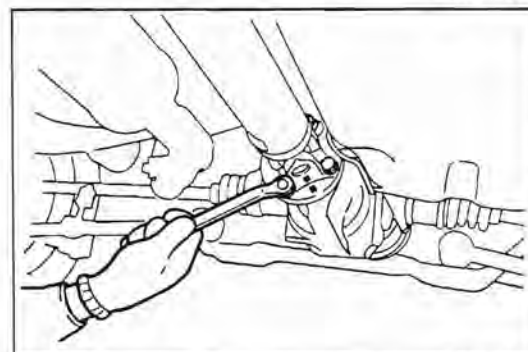
20. Connect the propeller shaft to the transfer, being very careful not to damage the oil seal.
(4WD vehicle only)



WR88-EM1092

21. Install the propeller shaft to the rear differential, making sure that the mate marks daubed during the removal are lined up.
(4WD vehicle only)

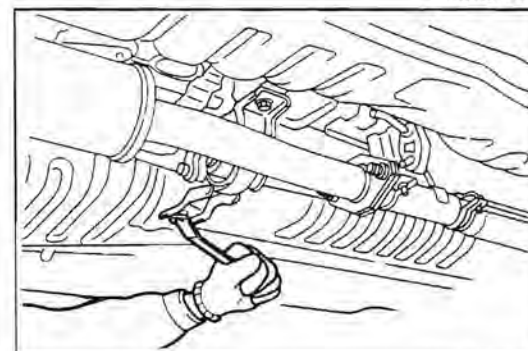
Tightening Torque: 5.2 - 7.1 kg-m (37.7 - 51.3 ft-lb)



WR88-EM1093

22. Install the intermediate bearing bracket of the propeller shaft.
(4WD vehicle only)

Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EM1094

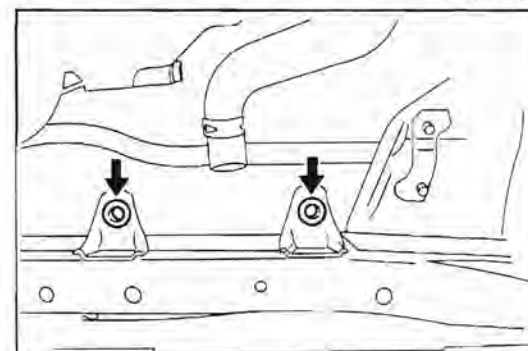
23. Fill transmission oil. (M/T and A/T vehicles)
(See the Chassis Workshop Manual.)

24. Fill transfer oil. (4WD vehicle only)
(See the Chassis Workshop Manual.)

25. Jack up the vehicle. Remove the safety stands.

26. Installation of radiator

- (1) Ensure that the radiator lower bracket rubber grommets are installed in position.

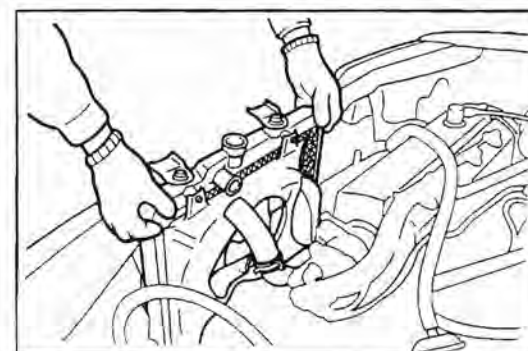


WR88-EM1095

- (2) Install the radiator on the lower bracket.

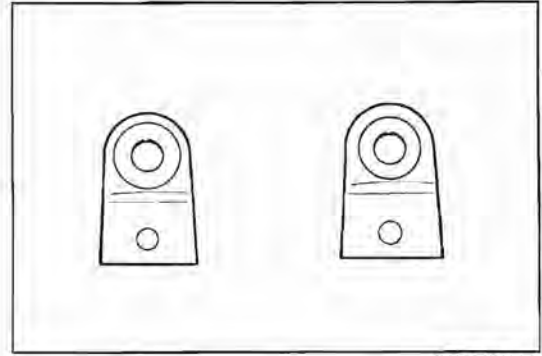
NOTE:

After the radiator has been installed, ensure that the rubber grommets are mounted correctly in place.



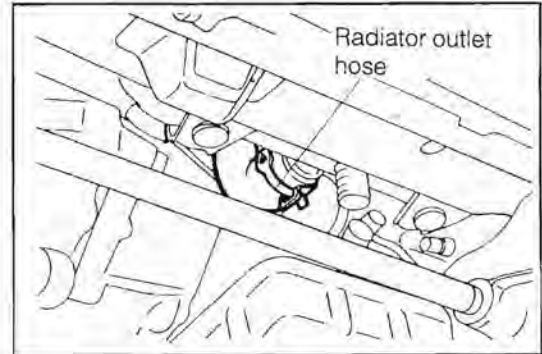
WR88-EM1096

- (3) Check the rubber grommet of the radiator bracket No. 1 for damage.
Replace the grommet if it exhibits damage.



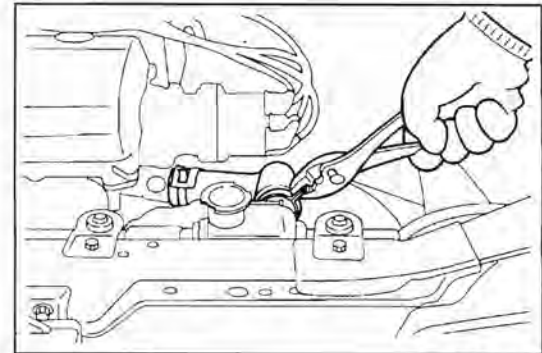
WR88-EM1097

27. Connect the radiator lower hose to the radiator. Attach the hose bands.



WR88-EM1098

28. Connect the radiator upper hose to the radiator. Attach the hose bands.
29. Connect the oil cooler hose,
(Oil-cooler-equipped vehicles only)

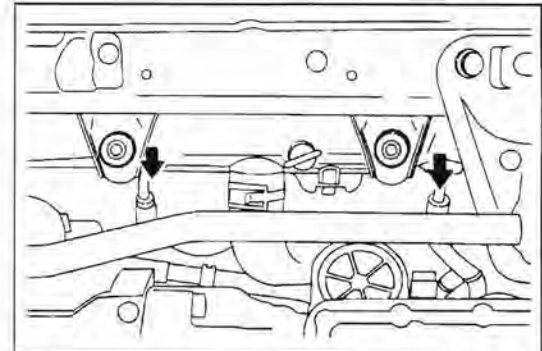


WR88-EM1099

30. Replace the oil cooler hose and hose bands with new parts. Connect the oil cooler hose to the transmission and radiator, respectively.

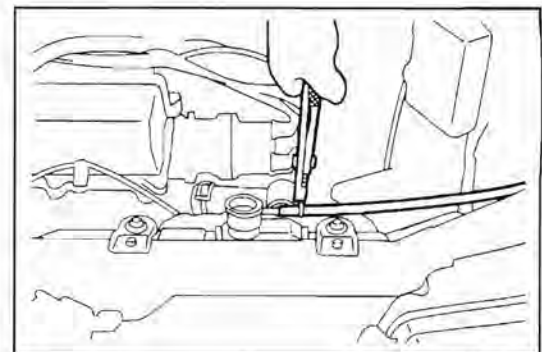
NOTE:

- Never reuse the oil cooler hose and hose bands.
- Ensure that no oil gets to the connecting sections.



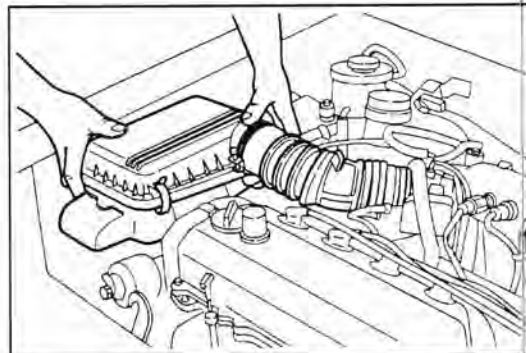
WR88-EM1100

31. Connect the reserve tank hose. Attach the hose bands.



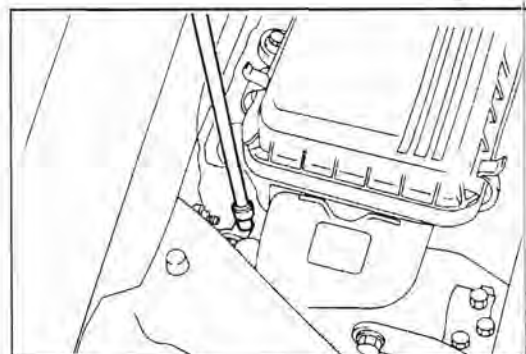
WR88-EM1101

32. Install the aircleaner to the vehicle with the attaching bolts.



WR88-EM1102

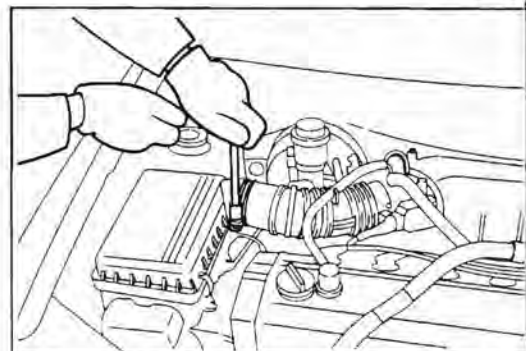
33. Tighten the cool air inlet hose bands of the air cleaner.



WR88-EM1103

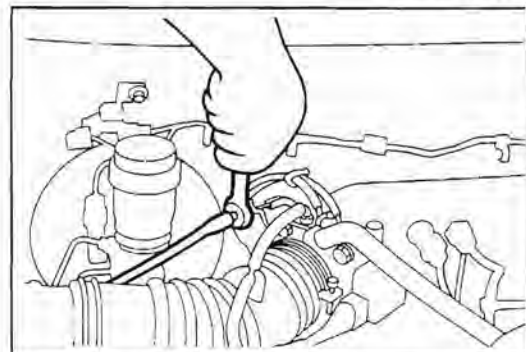
34. Connect the air cleaner hose. Attach the hose clamps.

35. Connect the speedometer cable to the transmission or the transfer case.



WR88-EM1104

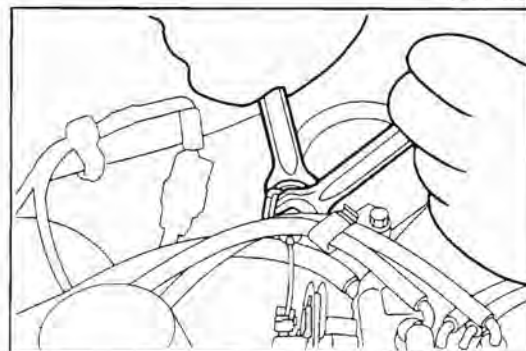
36. Install the accelerator cable to the throttle body in such a way that the play of the accelerator cable may become 3.0 to 8.0 mm (0.12 to 0.31 inch) after this installation.



WR88-EM1105

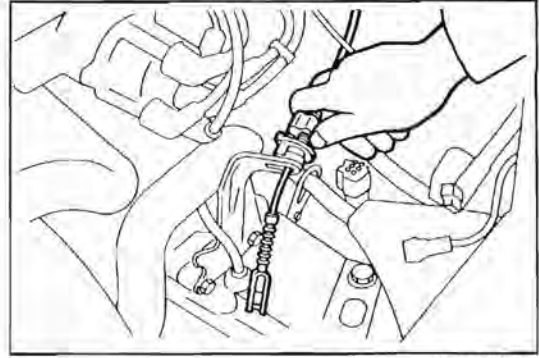
37. Install the throttle cable to the throttle body in such a way that the play becomes zero.

38. With the throttle cable clamped, install the throttle cable clamp to the intake manifold by means of the clamp bolt.

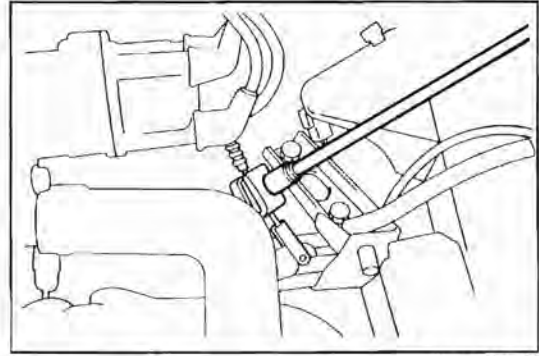


WR88-EM1106

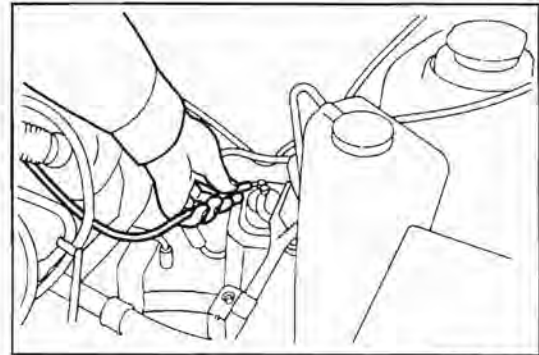
39. Connect the clutch cable to the transmission. Adjust the clutch free travel.
(MT vehicle only. See the Chassis Workshop Manual)



40. Install the damper weight to the clutch cable.
41. Adjust the clutch pedal free play.
(MT vehicle only. See the Chassis Workshop Manual)



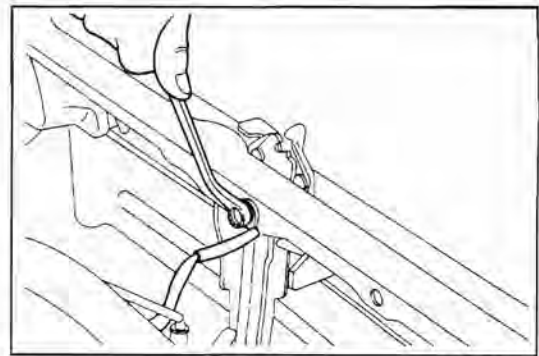
42. Connect the vacuum hose to the charcoal canister.



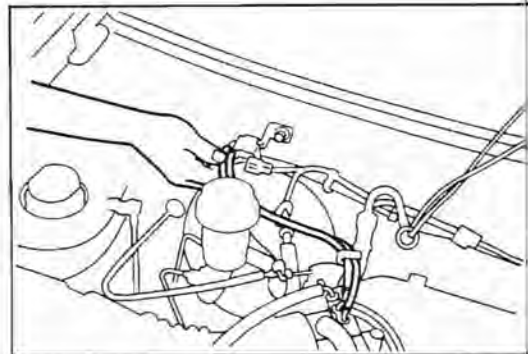
43. Connect the brake booster hose to the brake booster.
NOTE:
Connect the brake booster hose in such a way that the arrow-head may come to the intake manifold side.

WR88-EM1110

44. Connect the engine ground cable to the exhaust manifold.
(Radio-equipped vehicle only)

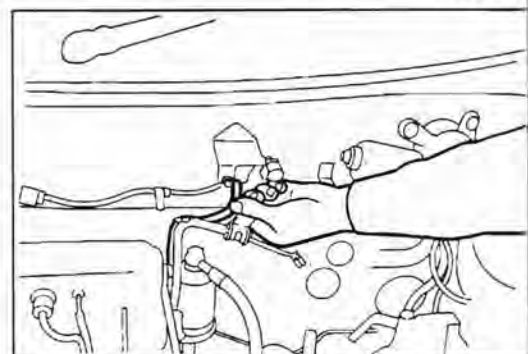


45. Connect the VSV to the idle-up VSV vacuum hose.



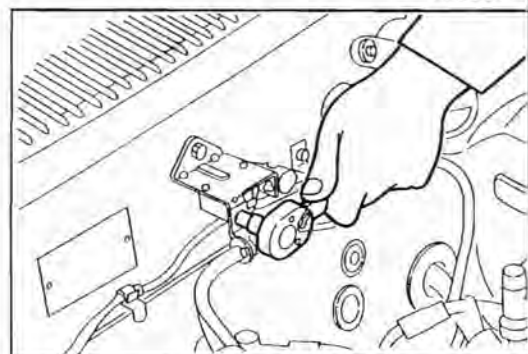
WR88-EM1112

46. Connect the pressure sensor connector and vacuum hose to the pressure sensor.



WR88-EM1113

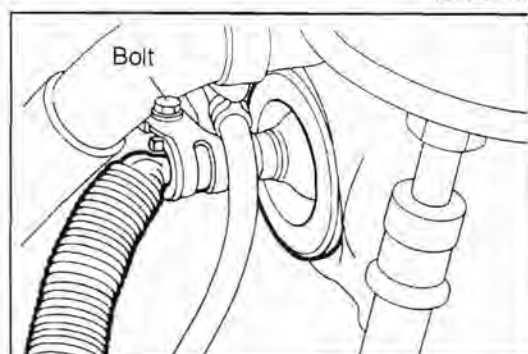
47. Tighten the pressure sensor cord clamp bolt.



WR88-EM1114

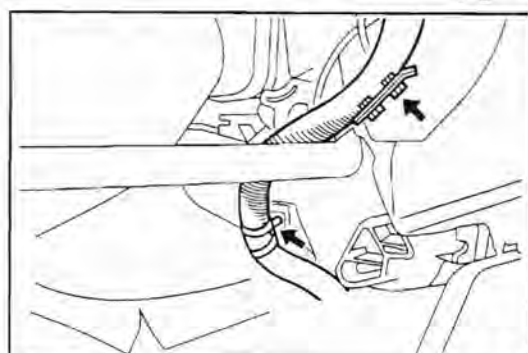
48. Push the engine wire leading to the ECU into the vehicle inside. Attach the rubber grommet to the body panel.

49. Install the engine wire clamp bolt.



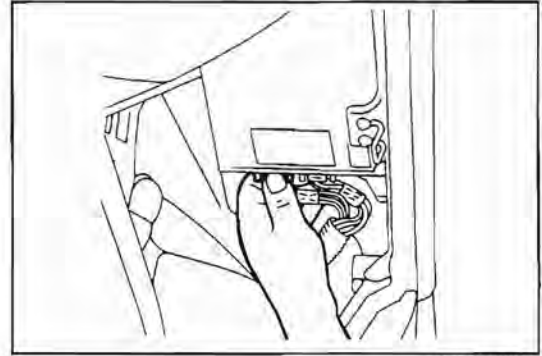
WR88-EM1115

50. Connect the engine wire clamps at the two points.



WR88-EM1116

51. Connect the engine wire connector to the engine control computer assembly (ECU).

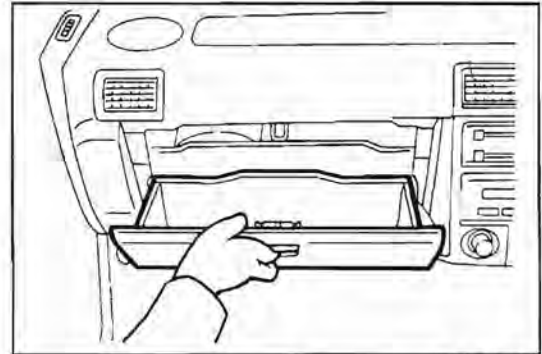


WR88-EM1117

52. Install the glove compartment box.

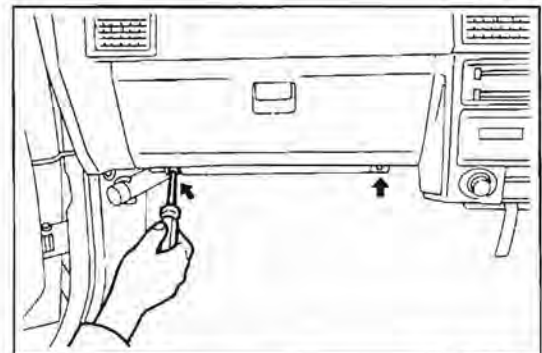
NOTE:

Insert the upper trim section of the glove compartment through the recessed section of the instrument panel.



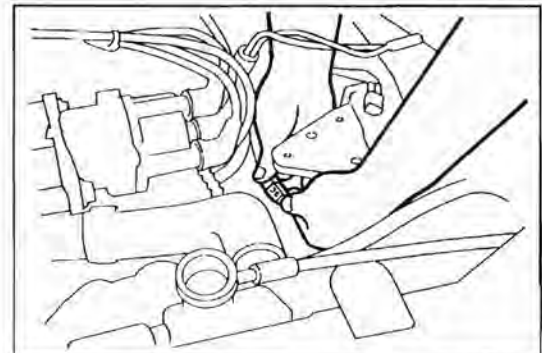
WR88-EM1118

53. Tighten the attaching screws of the glove compartment box.



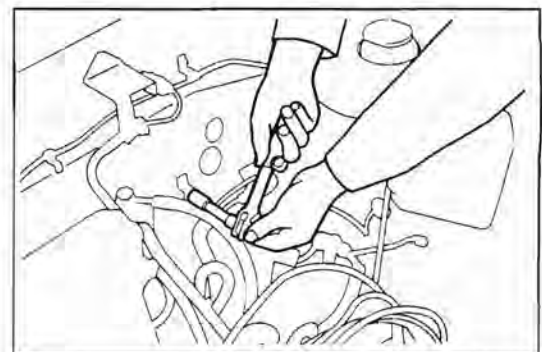
WR88-EM1119

54. Connect the back-up lamp switch connector.



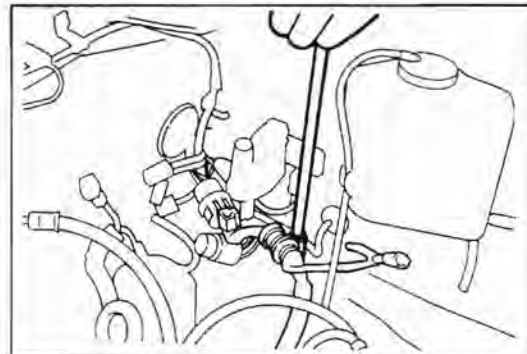
WR88-EM1120

55. Attach the alternator wire by means of the clamp bolt.



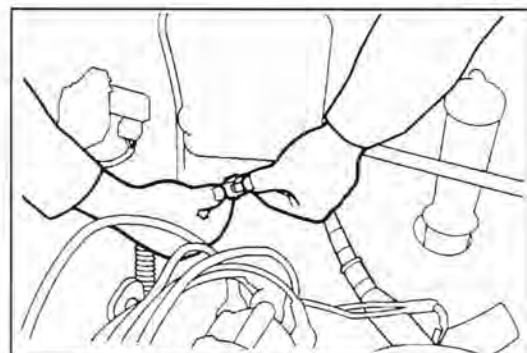
WR88-EM1121

56. Clamp the engine wire to the body.



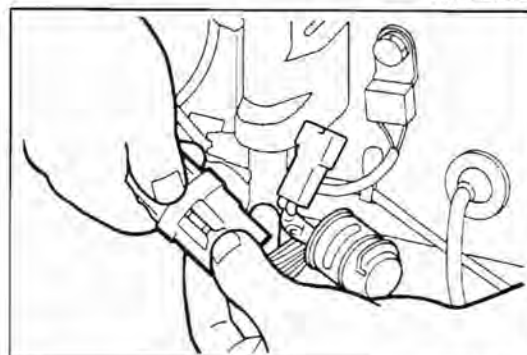
WR88-EM1122

57. Connect the engine wire and fuse box cord connector.



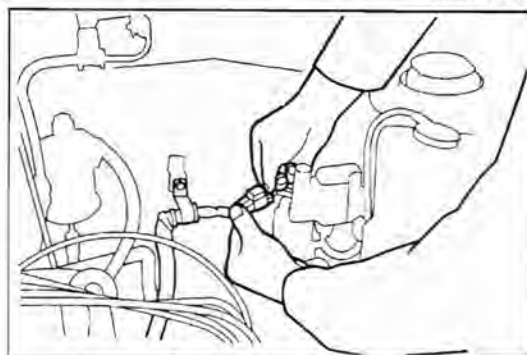
WR88-EM1123

58. Connect the engine wire to the cowl wire.



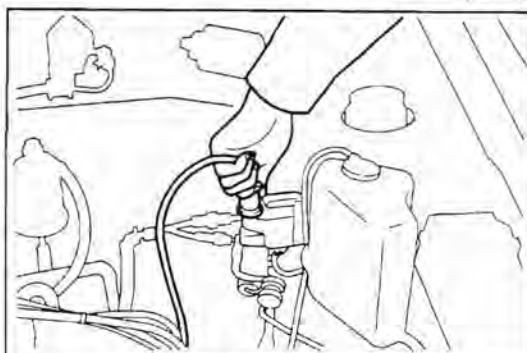
WR88-EM1124

59. Connect the alternator wire to the cowl wire.



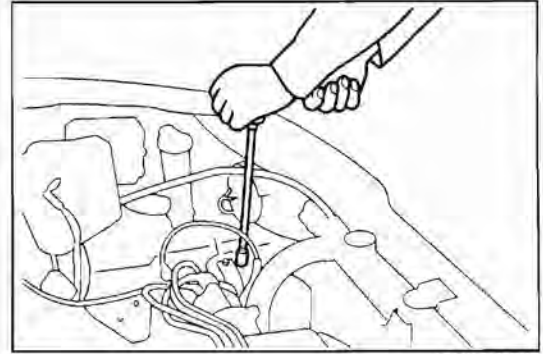
WR88-EM1125

60. Connect the resistive cord to the ignition coil.



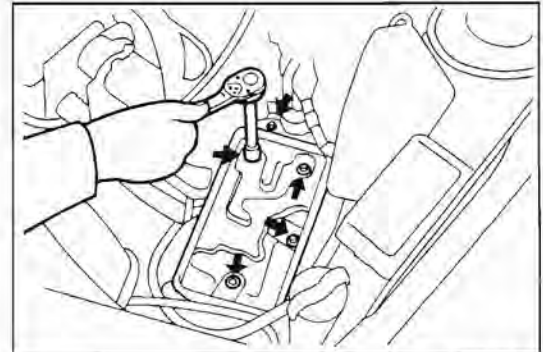
WR88-EM1126

61. Connect the battery ground cable to the frame.



WR88-EM1127

62. Installation of battery carrier
 (1) Install the battery carrier by tightening the four bolts.
 (2) Install the wiring clamp.



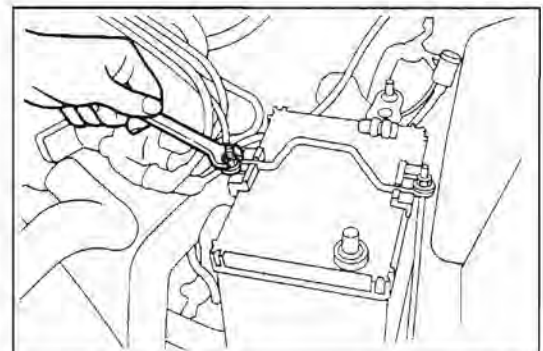
WR88-EM1128

63. Place the battery on the battery carrier.
CAUTION:
 Handle the battery carefully. Never allow any flame to be brought to the battery.



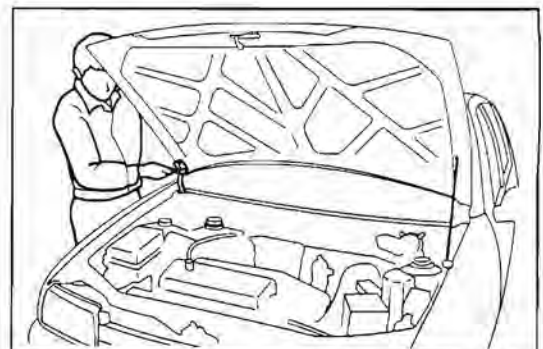
WR88-EM1129

64. Secure the battery by means of the battery hold-down clamp.



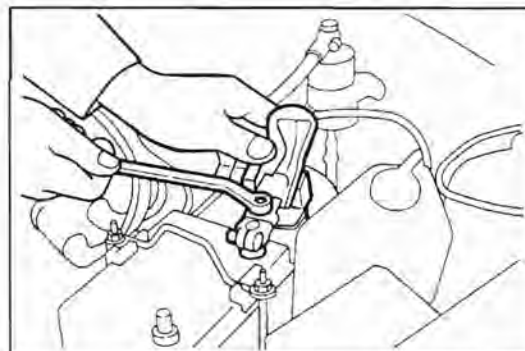
WR88-EM1130

65. Installation of engine hood
 (1) Install the engine hood.
NOTE:
 Be very careful not to scratch the body and engine hood during the installation.



WR88-EM1131

- (2) Attach the window washer hose to the clamp of the engine hood. Connect it to the nozzle.
66. Connect the wires of the positive terminal to the battery positive terminal.

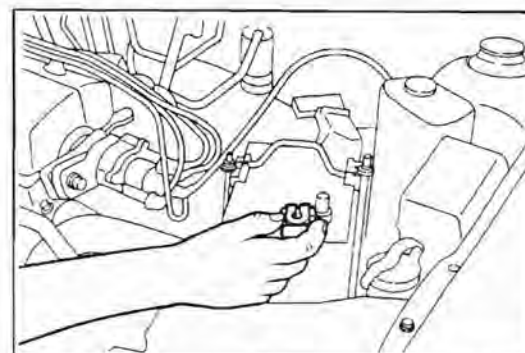


WR88-EM112

67. Ensure that the ignition key switch is set to the OFF position.

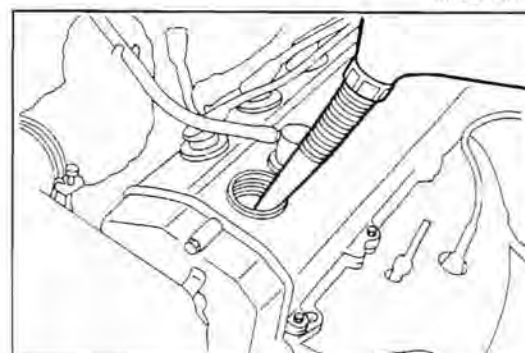
WR88-EM113

68. Connect the battery ground cable to the negative (-) terminal of the battery.



WR88-EM113A

69. Fill engine oil.
(See page LU-5.)



WR88-EM113E

70. Fill cooling water.
(See page CO-3.)
71. Start the engine. Check that there is no leakage of the engine oil, transmission oil and cooling water.

NOTE:

When the engine is started for the first time, for easier starting, it is advisable that the turning ON/OFF of the ignition key switch is repeated four or five times at intervals of two seconds.

72. Check the front alignment.
(See the Chassis Workshop Manual)

WR88-EM113E

DAIHATSU

CHARADE

TYPE HC ENGINE

EC

EMISSION CONTROL SYSTEMS

[HC-C Engine]

PURPOSE OF SYSTEM	EC- 2
COMPONENT LAYOUT & SCHEMATIC DIAGRAM	EC- 3
POSITIVE CRANKCASE VENTILATION SYSTEM (PCV)	EC- 4
CHOKE WARNING SYSTEM	EC- 5
SPARK DELAY SYSTEM	EC- 8
CHOKE OPENER SYSTEM	EC- 9
THROTTLE POSITIONER SYSTEM	EC-14
FUEL EVAPORATIVE EMISSION CONTROL SYSTEM	EC-17

[HC-E Engine]

PURPOSE OF SYSTEMS	EC-21
COMPONENT LAYOUT	EC-22
POSITIVE CRANKCASE VENTILATION SYSTEM	EC-23
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THROTTLE POSITIONER SYSTEM	EC-26
THREE-WAY CATALYST SYSTEM	EC-27

WR88-EC001

PURPOSE OF SYSTEM [HC-C Engine]

System	Abbreviation	PURPOSE
Positive crank case ventilation	PCV	Prevents blow-by gases from being released to atmosphere (HC)
Choke warning * ³	C/W	Reduces HC and CO.
Spark delay * ²	SD	Reduces HC and NOx.
Choke opener	C/O	Reduces HC and CO.
Throttle positioner	TP	Reduces HC and CO.
Fuel evaporative emission control * ¹	—	Reduces HC.

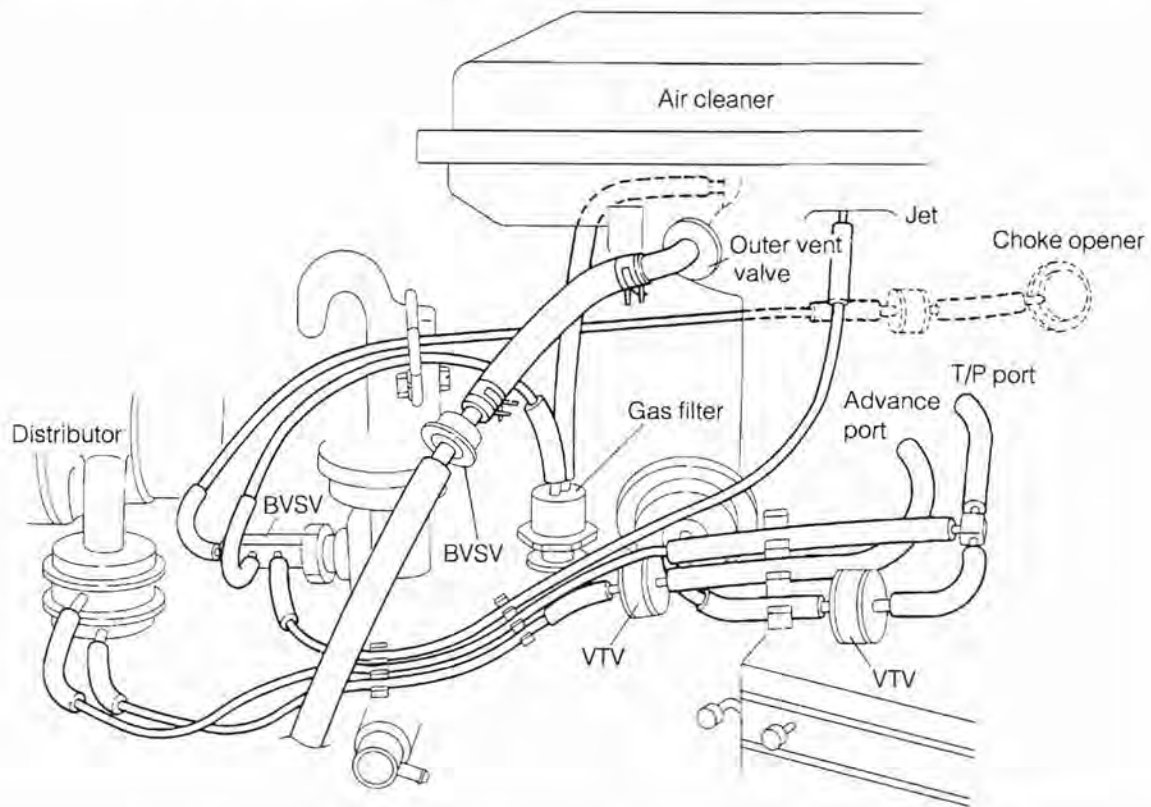
*1 GCC specifications only

*2 M/T vehicle only

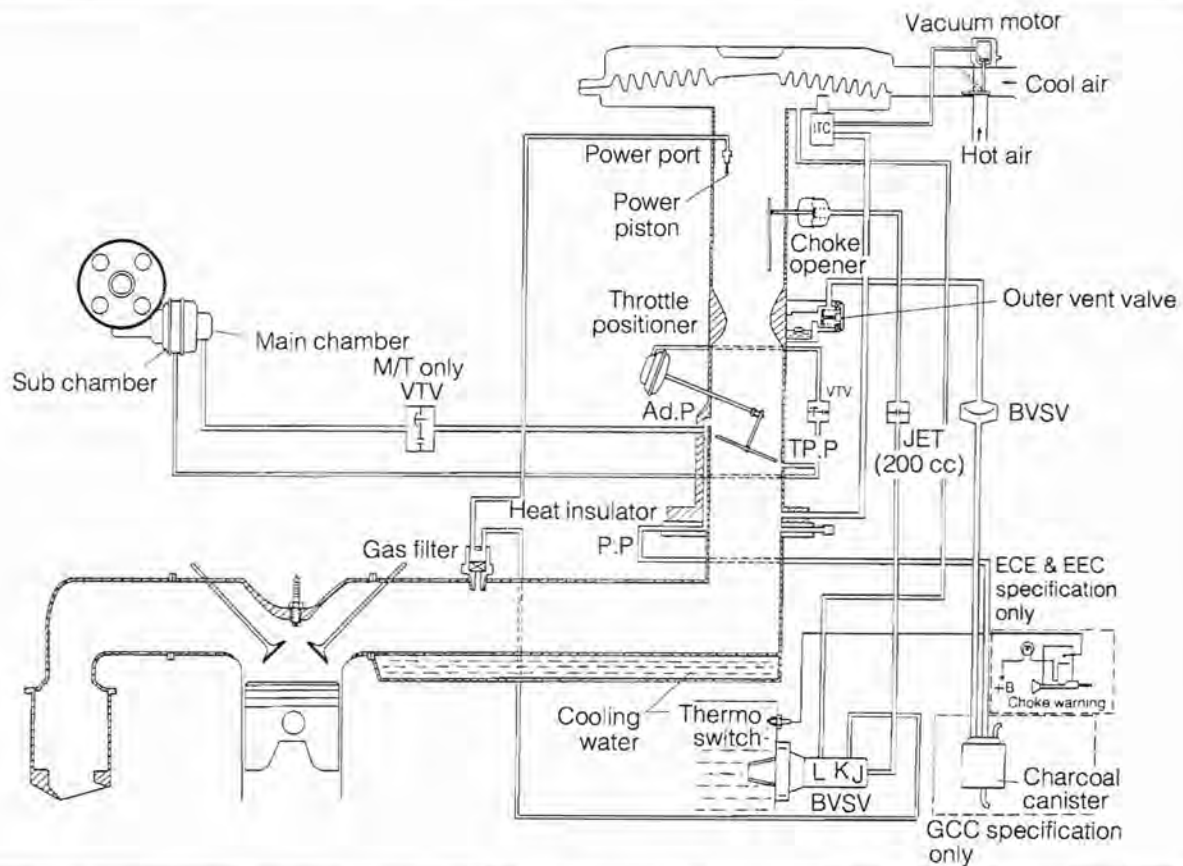
*3 ECE & EEC specifications only

WR88-EC002

COMPONENT LAYOUT & SCHEMATIC DIAGRAM



WR88-EC003



WR88-EC004

POSITIVE CRANKCASE VENTILATION

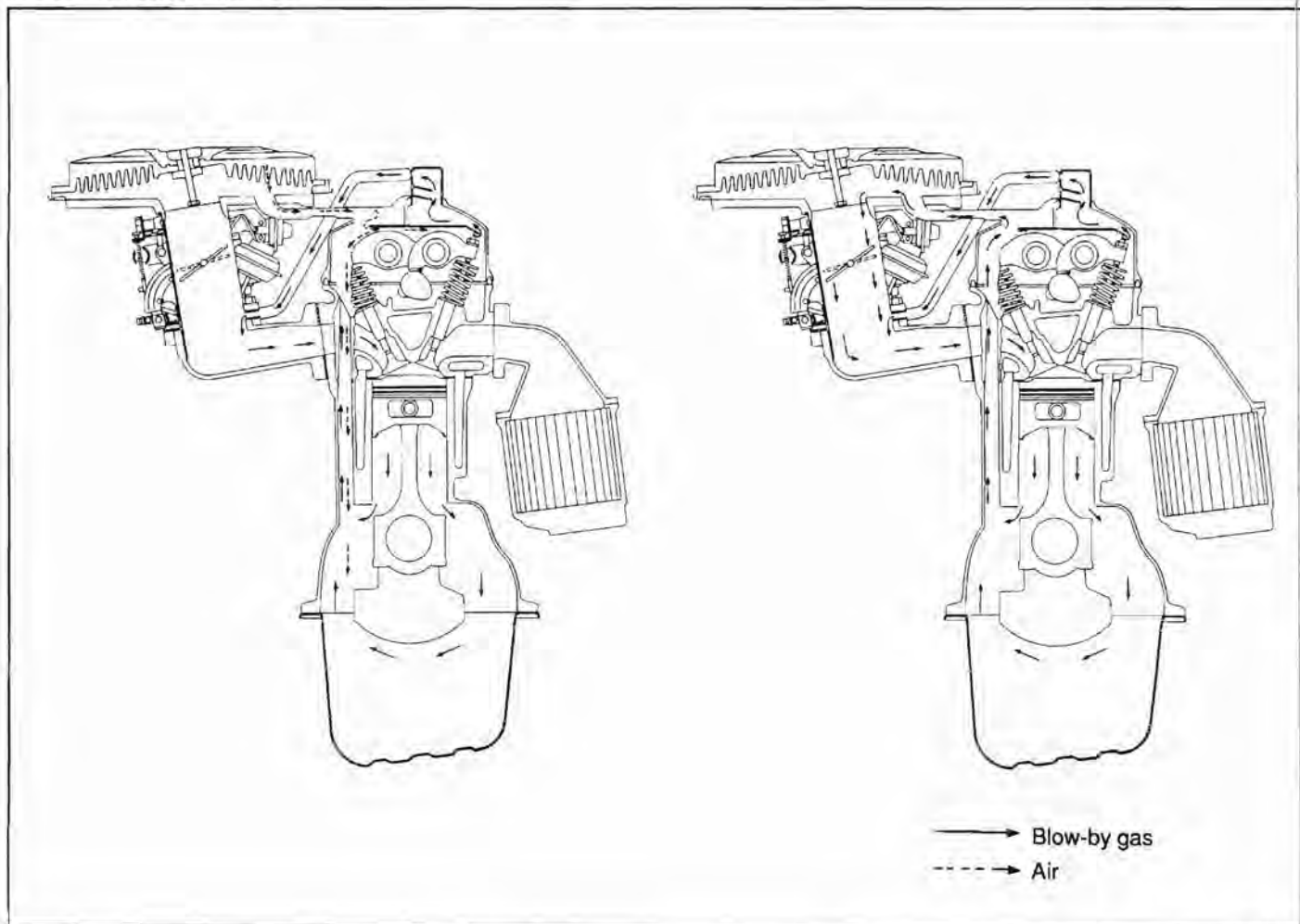
To combat with air-pollution problems, the engine is equipped with a sealed type positive crankcase ventilation system in order to prevent blow-by gases generated inside the crankcase from being released into the atmosphere.

The blow-by gases generated inside the crankcase flow into the cylinder head side through the gas passages of the cylinder block.

When the throttle valve opening degree is small, first the oil in the blow-by gas is separated by the oil separator provided at the cylinder head cover. Then, the blow-by gases flow from the carburetor heat insulator section to the intake manifold. Thus, the gases are sucked into the cylinder and burned there again.

At this time, fresh air flows from the upstream of the throttle valve into the cylinder head cover. The air flow rate is restricted by a jet located at the cylinder head cover, thus stabilizing the engine idling.

When the throttle valve opening degree is great and/or a large amount of blow-by gases are generated, the blow-by gases flow through both the upstream and the downstream of the throttle valve and are sucked into the combustion chamber.



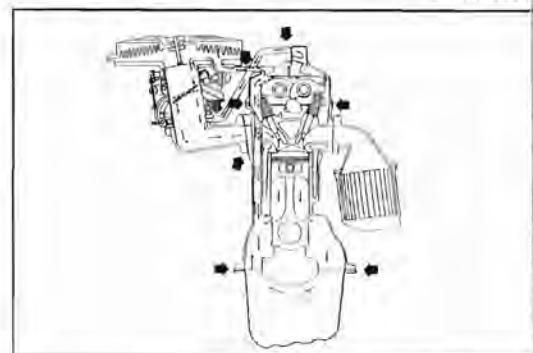
WR88-EC005

INSPECTION OF PCV HOSE & CONNECTION

Visual inspection of hoses and connection

Check the hoses for improper connections, cracks, leak or damage.

Replace or repair any part which exhibits defects.



WR88-EC005

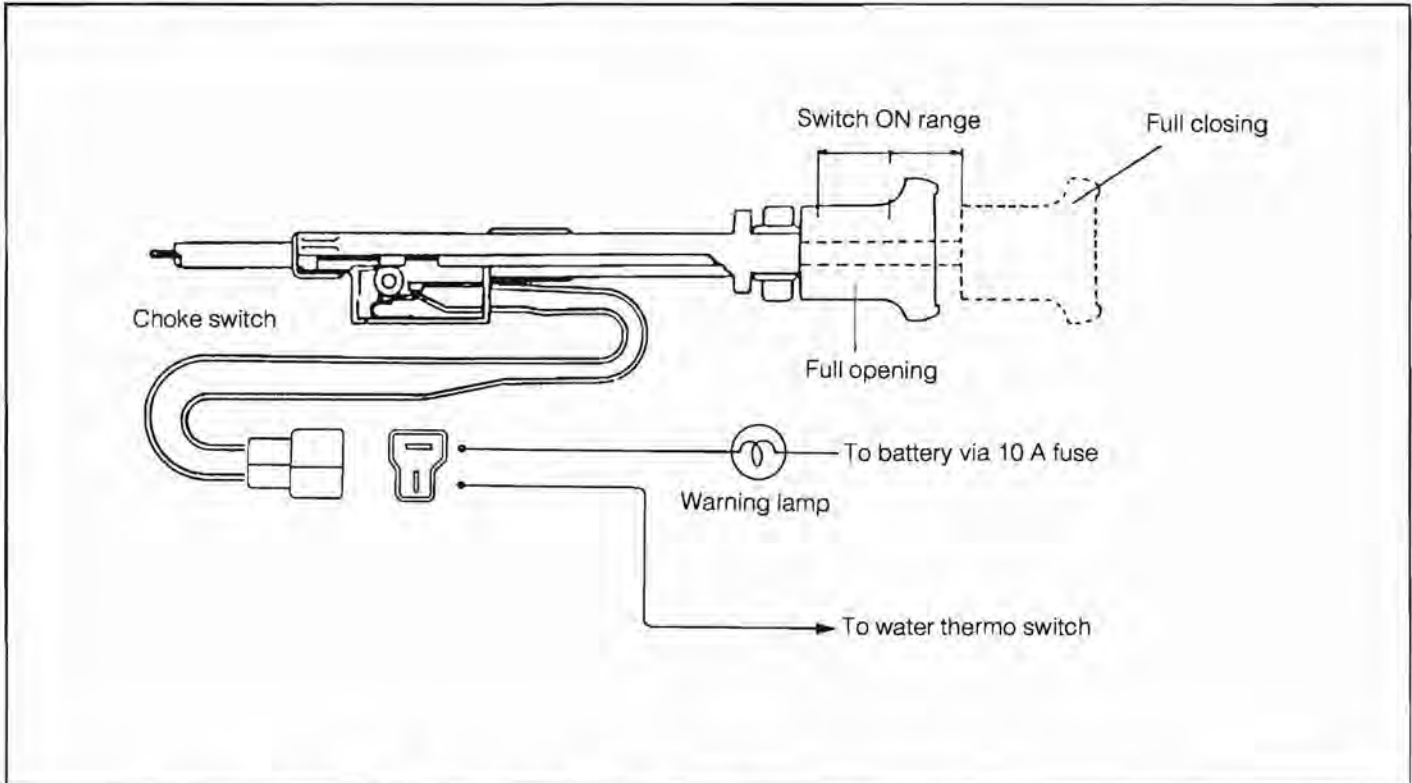
CHOKE WARNING SYSTEM

(ECE & EEC specifications only)

This choke warning system is provided to prevent the increase of fuel consumption and unburnt gas emissions due to the driver's failure to return the choke button to the original position.

In the event that the choke button remains in its pulled state even after the engine has been warmed-up, the warning lamp goes on by detecting the warmed-up state by means of the water thermo switch which functions at 60 °C (140 °F).

This system intends to reduce those emissions of CO and HC. Furthermore, it prevents the catalyst from being overheated.

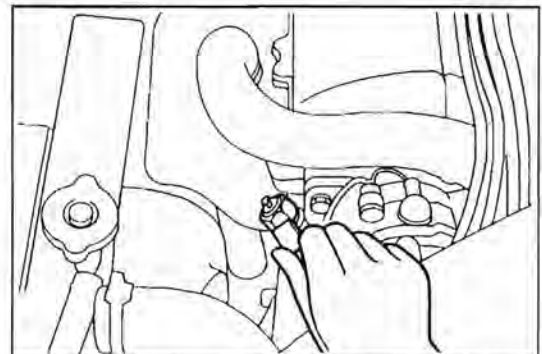


WR88-EC007

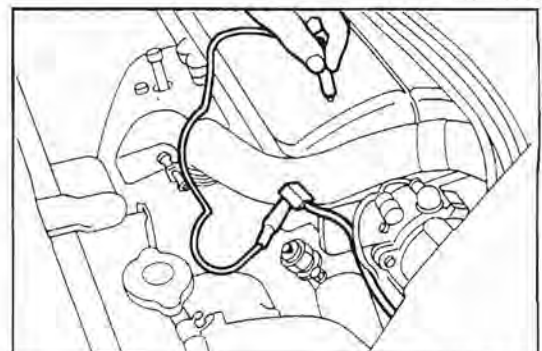
INSPECTION OF CHOKE WARNING SYSTEM

Choke warning system

1. Disconnect the water temperature switch connector.
2. Ground the connector terminal at the engine wire side to the engine.

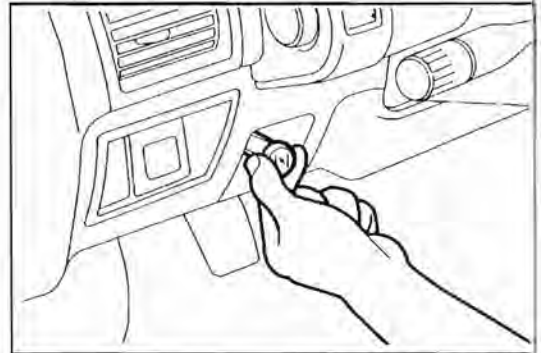


WR88-EC008



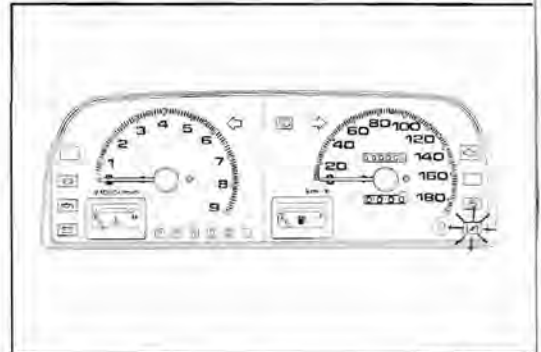
WR88-EC009

3. Fully pull the choke knob.



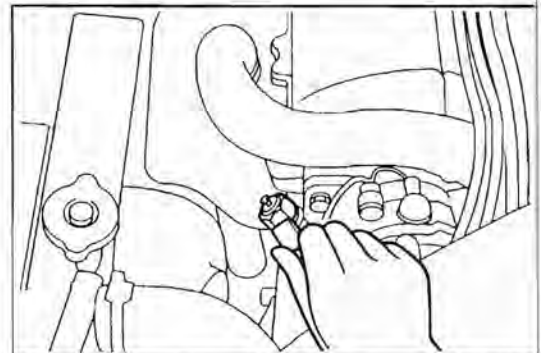
WR88-EC010

4. Turn ON the ignition switch.
5. Ensure that the choke warning lamp goes on.
If the lamp fails to go on, check the warning lamp choke switch and wiring.



WR88-EC011

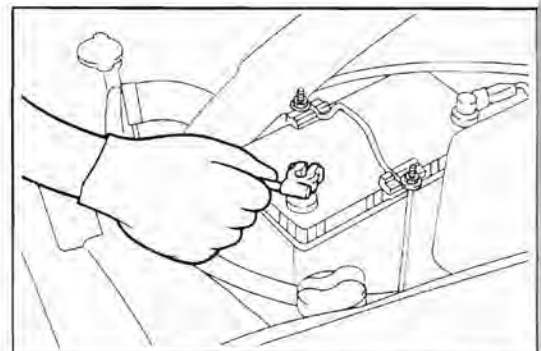
6. Reconnect the water temperature switch connector.
Ensure that the choke warning lamp will not go on when the cooling water temperature is below 55 °C (131 °F).
If the lamp goes on, replace the water temperature switch.
When the cooling water temperature is below 55 °C (131 °F), start the engine. Warm up the engine until the cooling water temperature rises above 65 °C (145 °F). Ensure that the choke warning lamp goes on.
If the lamp fails to go on, replace the water temperature switch.
7. Turn OFF the ignition key switch.



WR88-EC012

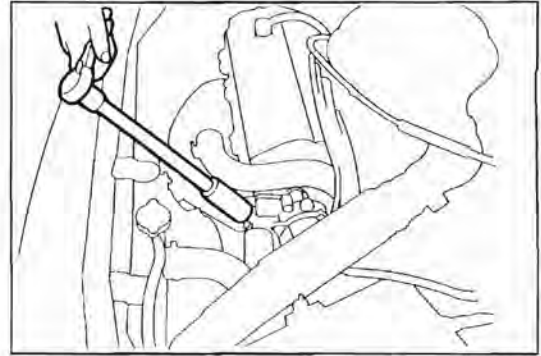
Replacement of water temperature sensor

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the cooling water.
(See page CO-3.)
3. Disconnect the water temperature sensor connector.



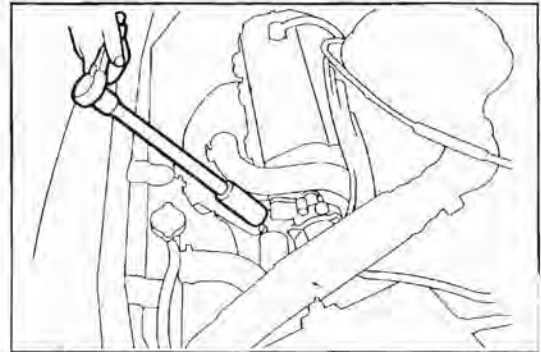
WR88-EC013

4. Remove the water temperature sensor.
NOTE:
 For the removal, use a long box wrench.



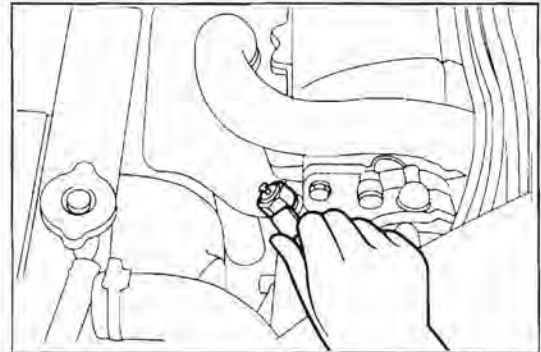
WR88-EC014

5. Wind seal tape around the threaded portion of a new water temperature sensor and install it to the water outlet.
Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)



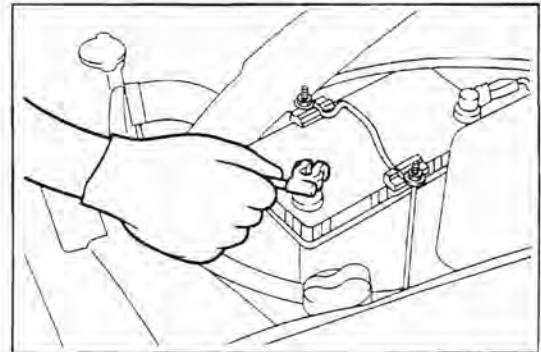
WR88-EC015

6. Connect the water temperature sensor connector.



WR88-EC016

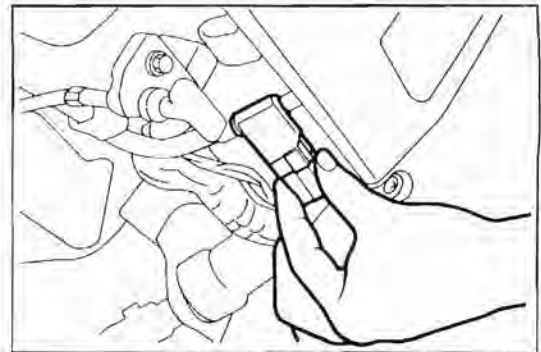
7. Fill cooling water.
 (See page CO-3.)
8. Connect the battery ground cable to the negative (-) terminal of the battery.



WR88-EC017

Inspection of Choke Switch

1. Disconnect the choke switch connector.



WR88-EC018

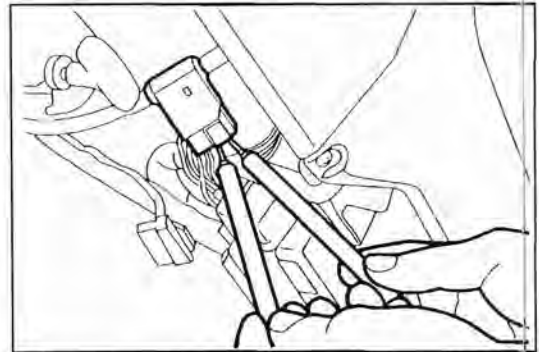
EMISSION CONTROL SYSTEMS

2. Check that there is continuity between terminals of the choke switch.

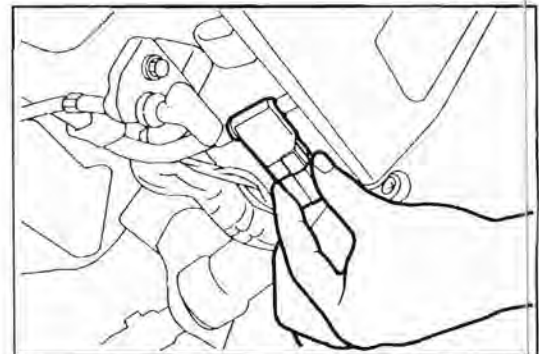
When choke knob is pulled to first stage or pulled fully:	Continuity exists.
When choke knob is returned:	No continuity exists.

Replace the choke cable, if necessary.

3. Connect the choke switch connector.



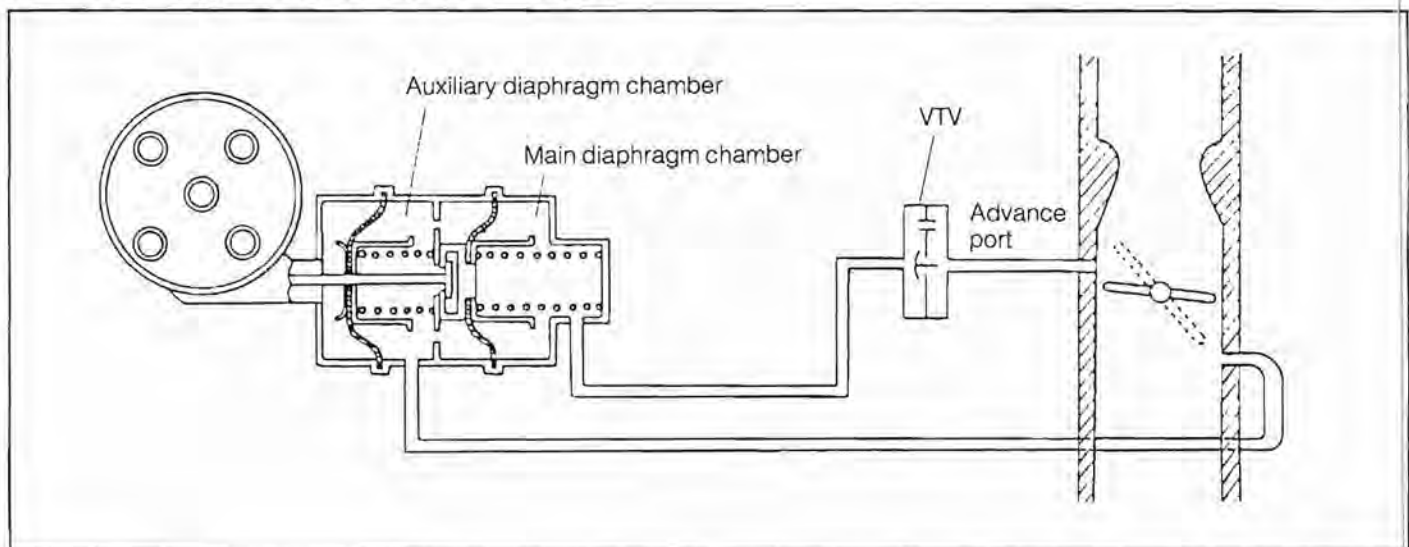
WR88-EC019



WR88-EC010

SPARK DELAY SYSTEM (M/T Vehicle only)

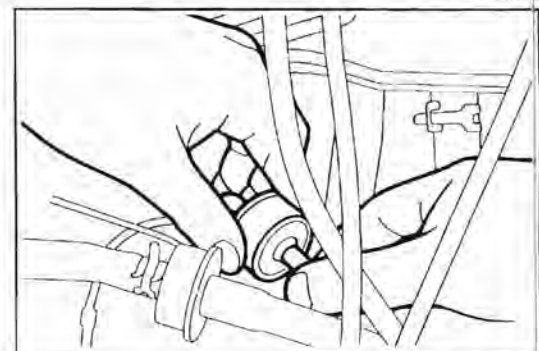
During an acceleration period, this system reduces the HC and NOx emissions generated during the transient period by retarding the ignition advance timing temporarily. This is accomplished by means of the VTV which retards the application of a negative pressure being applied to the main diaphragm of the distributor vacuum advancer through the carburetor advance port.



WR88-EC021

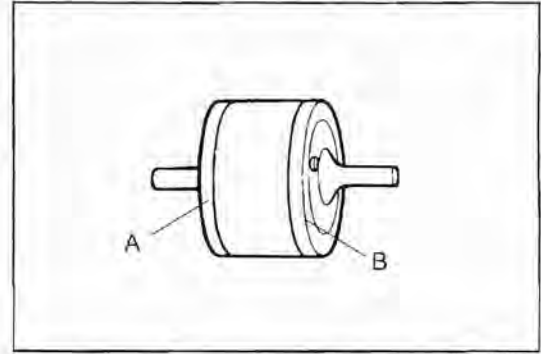
Check of Ignition Timing

1. Warm up the engine thoroughly.
Stop the engine. Remove the VTV.



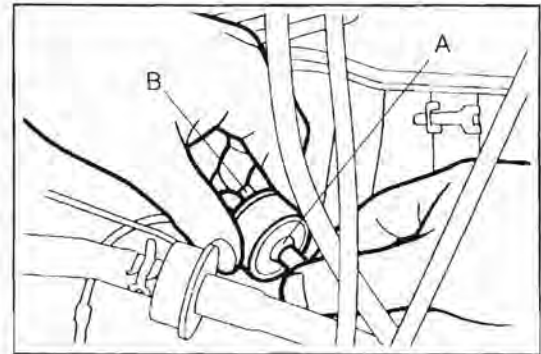
WR88-EC022

2. Inspection of VTV
 - (1) Blow your breath into the VTV carburetor side (side B).
Ensure that the air passes through without restriction.
If significant restriction exists, replace the VTV.
 - (2) Blow your breath into the VTV distributor side (side A).
Ensure that there is restriction.
If no restriction exists, replace the VTV.



WR88-EC023

3. Install the VTV to the engine.



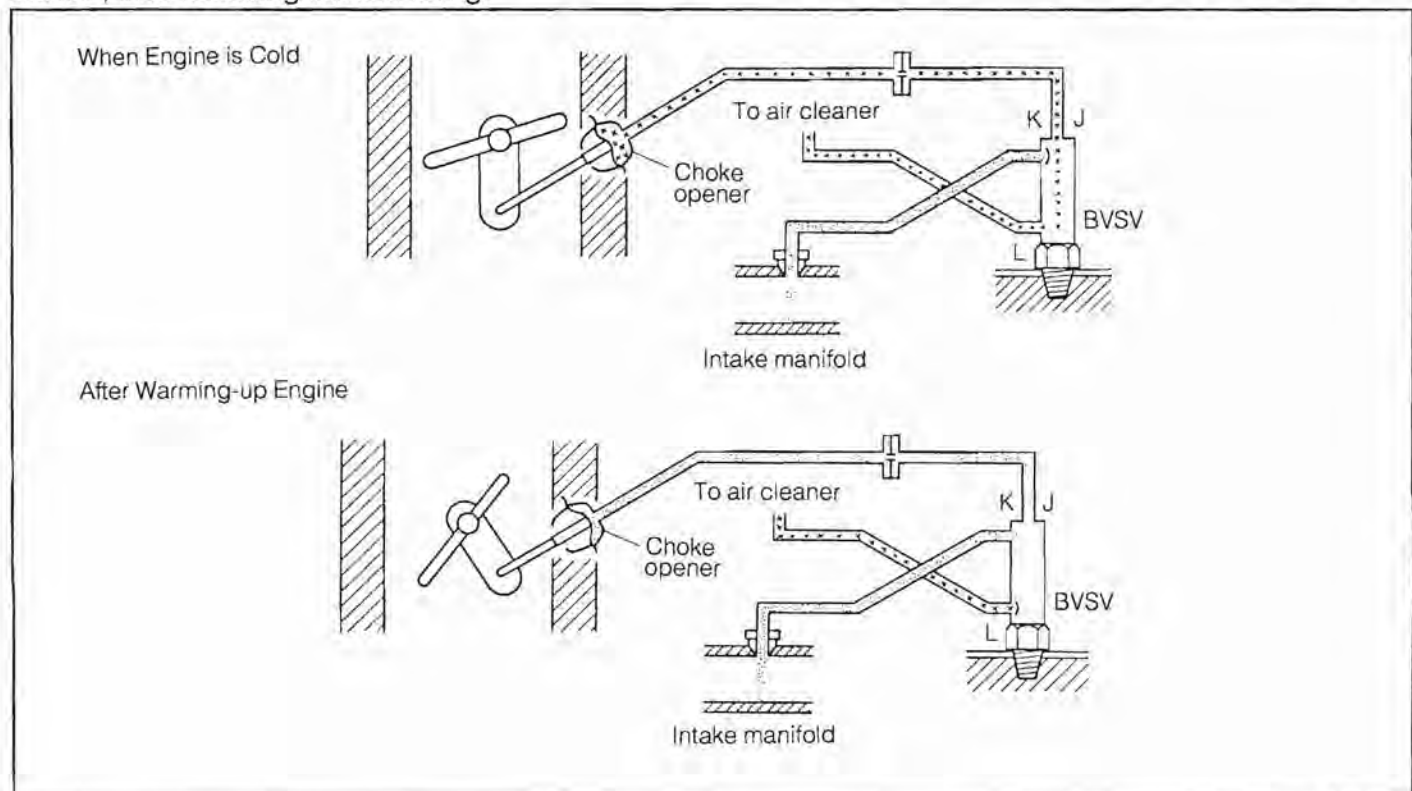
WR88-EC024

CHOKE OPENER SYSTEM

If the choke valve remains closed after the engine has warmed up, the mixture becomes too rich, thereby increasing HC and CO emissions.

In order to prevent this condition, this system detects the cooling water temperature by means of the BVSV. If the cooling water temperature rises above 30 °C (86 °F), this system operates the choke opener by means of the intake manifold negative pressure so as to open the choke valve forcibly. In this way, the HC and CO emissions can be reduced.

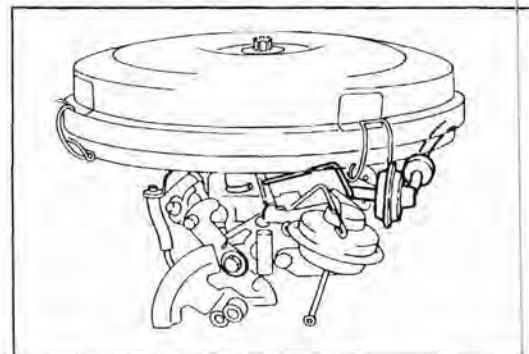
Furthermore, if the fast idle cam rests on the fast idle cam follower, this system lifts the fast idle cam through the link, thus releasing the fast idling.



WR88-EC025

Inspection of Choke Opener System

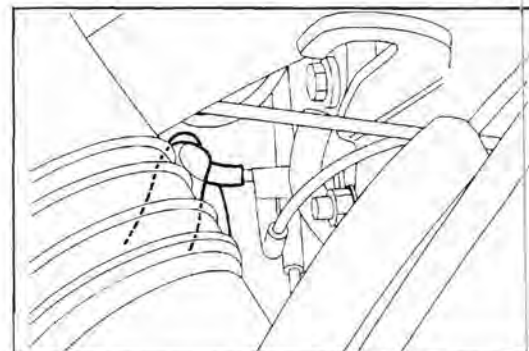
1. Warm up the engine thoroughly.
2. Ensure that the choke opener is operating.
If it is not operating, check the BVSV and choke opener.



WR88-EC026

3. With the vacuum hose of the BVSV at the choke opener side disconnected, ensure that the choke opener remains in-operative.

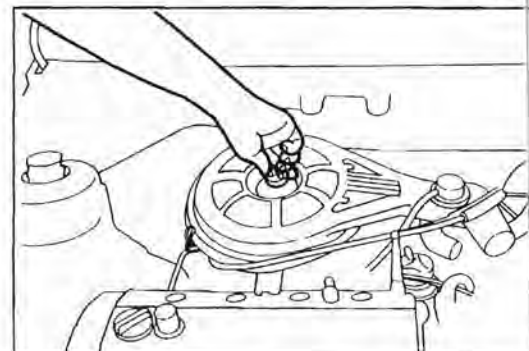
If it is operating, check the choke opener.



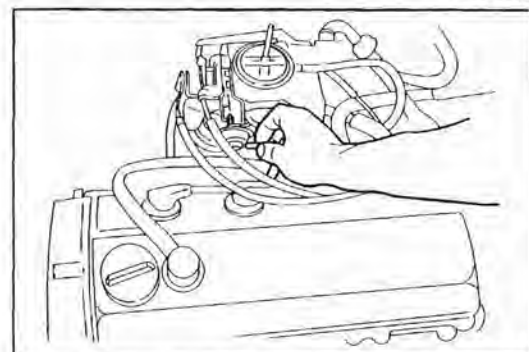
WR88-EC027

Unit Inspection of Choke Opener

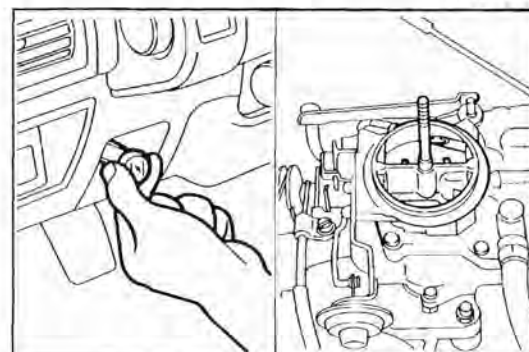
1. Removal of air cleaner element
 - (1) Remove the following hoses, etc.
 - Vacuum hose to BVSV
 - ITC vacuum hose to carburetor
 - Cool air intake
 - Hot air intake
 - (2) Remove the air cleaner.
2. Disconnect the vacuum hose connected to the choke opener.
3. With the choke knob fully pulled, depress the accelerator pedal fully once. Ensure that the choke valve is closed.
<Reference>
Choke valve full-closing angle: 20 degrees



WR88-EC028



WR88-EC029

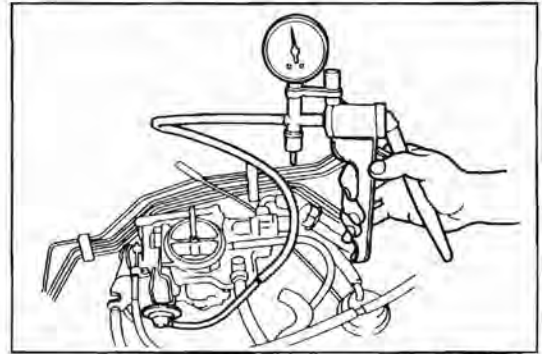


WR88-EC030

4. Connect a MityVac to the choke opener and apply a negative pressure (250 mmHg or more). Ensure that the choke valve opens about 10 degrees.

<Reference>

Choke valve opening angle: 30 degrees



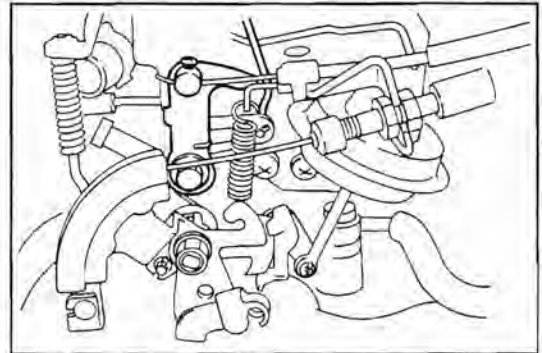
WR88-EC031

If the choke valve will not open, check the choke opener.
If the choke valve will not open to the specified degree, replace the choke opener rod.

Ensure that the fast idle cam follower resting on the fast idle cam is disengaged from the first stage at the same time as the choke valve opens.

If the fast idle cam follower will not be disengaged, replace the fast idle cam rod.

If the choke valve opening degree fails to meet the specified angle, bend the choke opener link so that the choke valve opening degree becomes the specified angle.

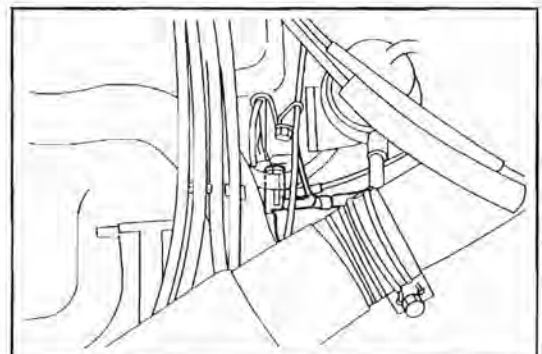


WR88-EC032

5. Connect the vacuum hose to the choke opener.
6. Install the air cleaner element.

Inspection of BVS

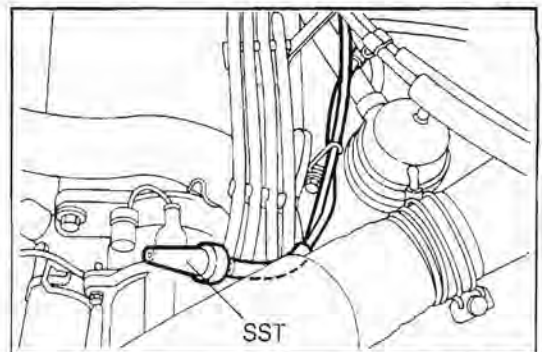
1. Disconnect the vacuum hose connected to the BVS.



WR88-EC034

2. Plug the vacuum hose at the air filter side of the intake manifold.

SST: 09258-00030-000



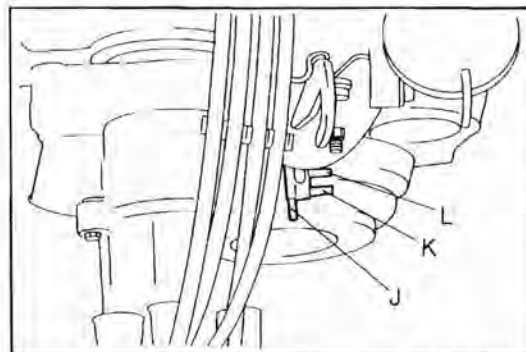
WR88-EC035

- Check to see if continuity exists between each port under the following cooling water temperature conditions.

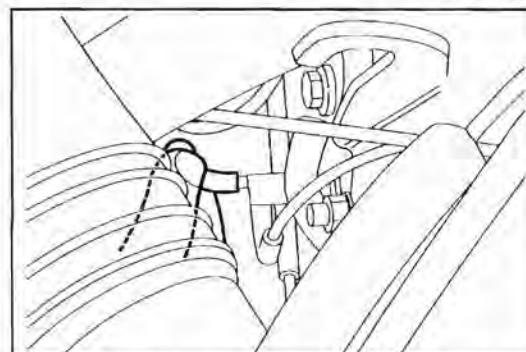
Port name	K	J	L
Cooling water temperature			
10 °C (50 °F) or below		○—○	
30 °C (86 °F) or above	○—○		○

○—○ mark denotes that vent continuity exists. If the requirements above are not satisfied, perform the BVSV unit inspection.

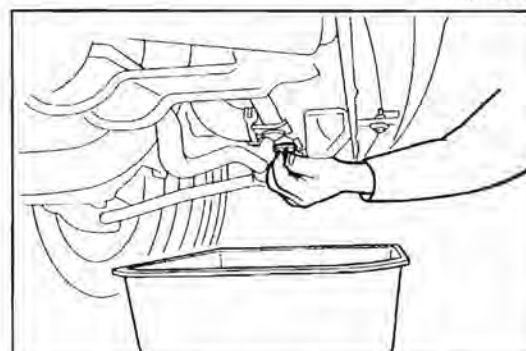
- Connect the vacuum hose to the BVSV.



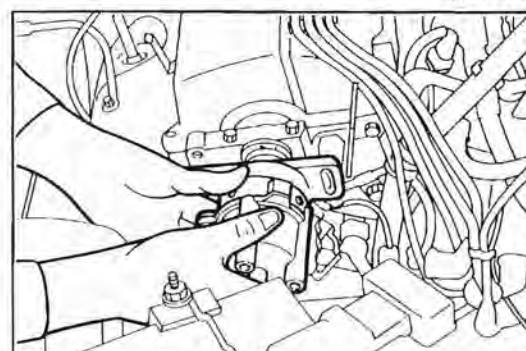
WR88-EC036



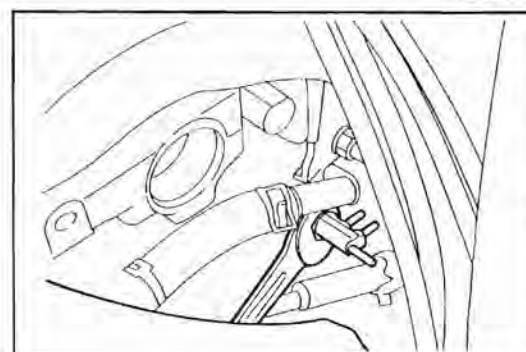
WR88-EC037



WR88-EC038



WR88-EC039



WR88-EC040

Unit Inspection of BVSV

- Drain the cooling water.
(See page CO-3.)
- Remove the distributor, as follows.
 - Disconnect the distributor connector.
 - Disconnect the resistive cords.
 - Disconnect the vacuum hose.
 - Set the No.1 cylinder to the ignition timing.
(i.e. when the ignition timing is set properly and the valve rocker arms of the No.1 cylinder are free.)
 - Pull out the distributor.
- Remove the BVSV.
NOTE:
Be very careful not to damage the BVSV by hitting it to the by-pass pipe.

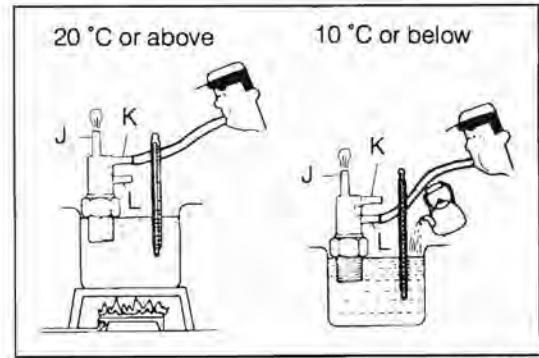
4. Inspection of BVS

Submerge the BVS thermo sensing section into water. Check to see if continuity exists between each port under the following conditions.

Condition	Port name		
	K	J	L
Cooling water temperature: 10 °C (50 °F) or below		○—○	○—○
Cooling water temperature 30 °C (86 °F) or above	○—○		○—○

○—○ mark denotes that vent continuity exists.

If the requirements in the table above are not satisfied, replace the BVS.



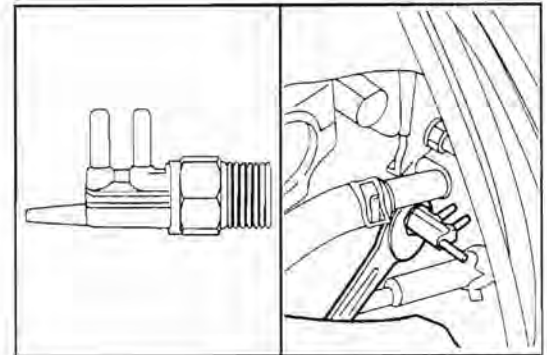
WR88-EC041

5. Wind seal tape around the threaded portion of the BVS. Install the BVS on the cylinder head.

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

NOTE:

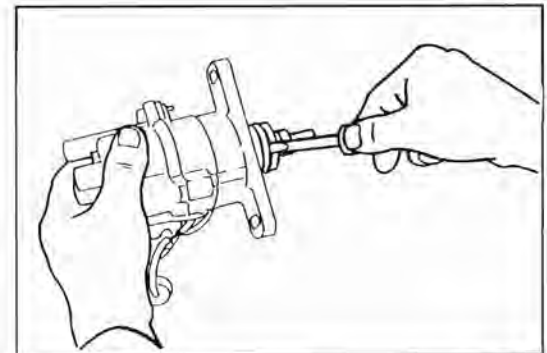
- Make sure that the pipe comes to the position indicated in the right figure.
- Since a new BVS is coated with sealing agent, it is unnecessary to wind any seal tape.



WR88-EC042

6. Installation of distributor

(1) Replace the distributor "O" ring with a new one.



WR88-EC044

(2) Align the cut-out section of the distributor body with that of the coupling.

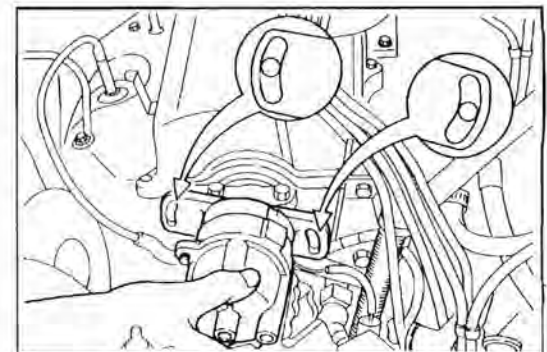
(3) Attach the distributor to the cylinder head.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

(4) Connect the resistive cords to the distributor.

(5) Connect the distributor connector.

(6) Connect the vacuum hose.



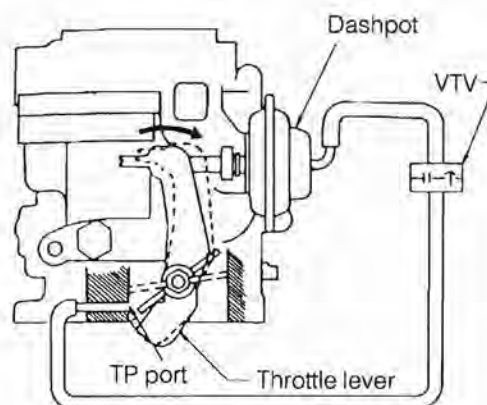
WR88-EC045

7. Fill cooling water.
(See page CO-3.)
8. Perform the ignition timing adjustment.
(See page IG-34.)

WR88-EC046

THROTTLE POSITIONER SYSTEM

This system prevents the throttle valve from suddenly closing, thus reducing the CO and HC emission.



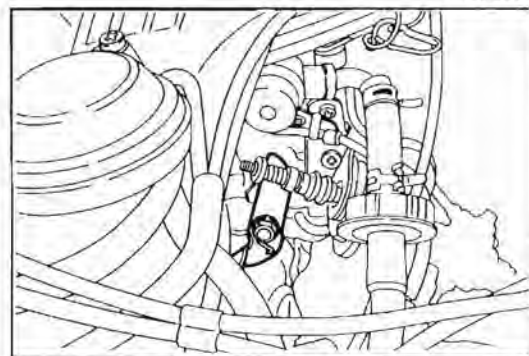
WR88-EC047

Inspection of Throttle Positioner

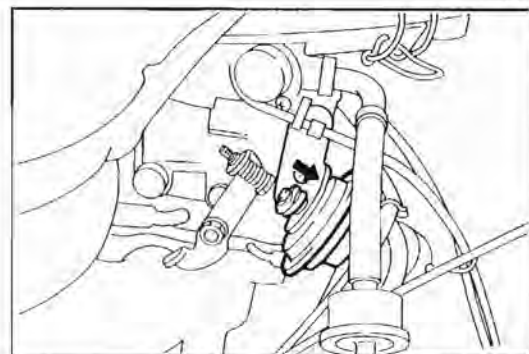
NOTE:

On the automatic transmission vehicles, make sure that the idle-up mechanism is not functioning. Also, make certain that the all accessory switches are turned OFF.

1. Connect a tachometer.
2. When the engine is stopped, ensure that the dashpot shaft is extended fully.
3. Start the engine. Ensure that the dashpot shaft has retracted fully into the inside of the dashpot.



WR88-EC048



WR88-EC049

4. Open the throttle valve to keep the engine speed at about 2500 rpm. Ensure that the dashpot shaft is extended fully.

WR88-EC050

5. Quickly close the throttle valve. Take the reading of the engine revolution speed at the time when the throttle lever contacts the dashpot.

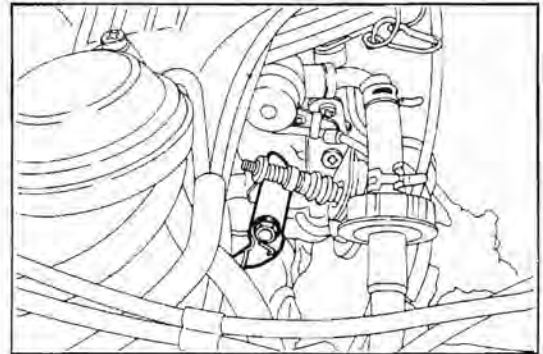
Dashpot Touch Revolution Speed: 1800 ± 50 rpm

If the touch revolution speed will not conform to the specified value, turn the adjusting screw so that the touch revolution speed may meet the specification.

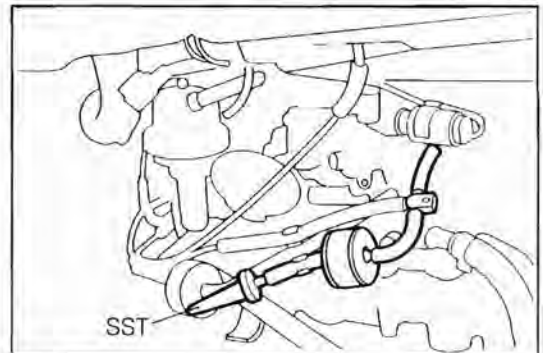
NOTE:

Prior to the adjustment, the rubber hose connected to the throttle positioner should be disconnected and be plugged, using the following SST.

SST: 09258-00030-000



WR88-EC051



WR88-EC052

6. Hold the engine revolution speed at about 3000 rpm at least five seconds by opening the throttle valve. Then, release the throttle lever. Check that the time required for the engine revolution speed to drop from 2000 rpm to 1000 rpm conforms to the specified value.

Specified Time: 1.0 - 2.0 seconds

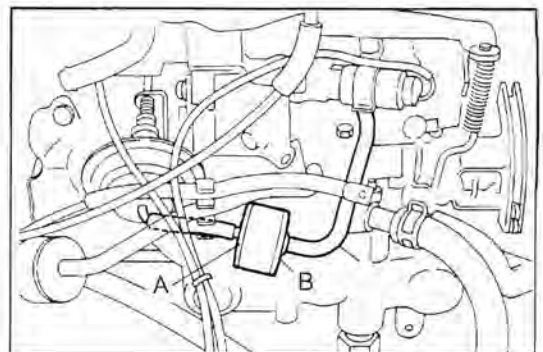
If the time will not conform to the specification, check the direction of the VTV. Then, proceed to check the VTV.

7. Remove the tachometer.

Inspection of VTV

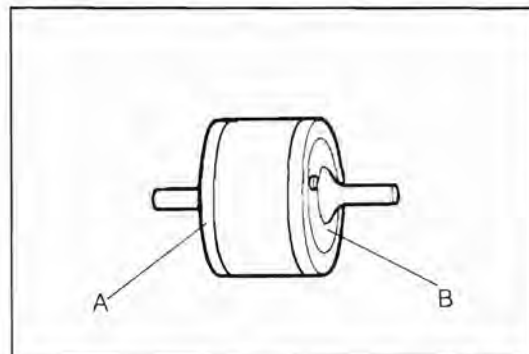
1. Remove the VTV. Blow your breath into the VTV from the carburetor side (side B). Ensure that the air passes through without restriction. If significant restriction exists, replace the VTV.

WR88-EC053



WR88-EC054

2. Blow your breath into the VTV from the throttle positioner side (side A). Ensure that there is restriction. If no restriction exists, replace the VTV.

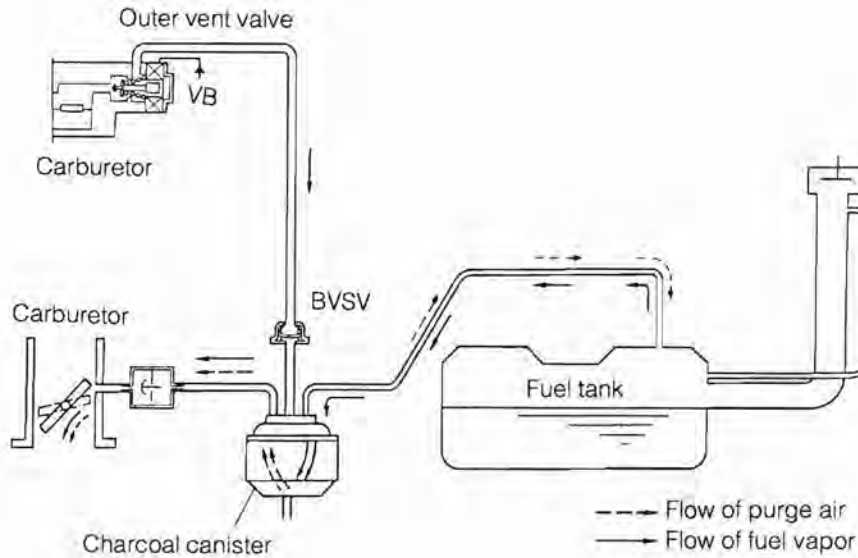


WR88-EC055

FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

(GCC Specifications Only)

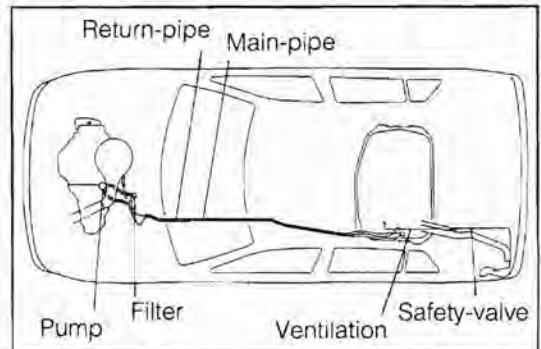
This system prevents the HC emission evaporated from the carburetor float chamber and fuel tank from being released directly to the atmosphere.



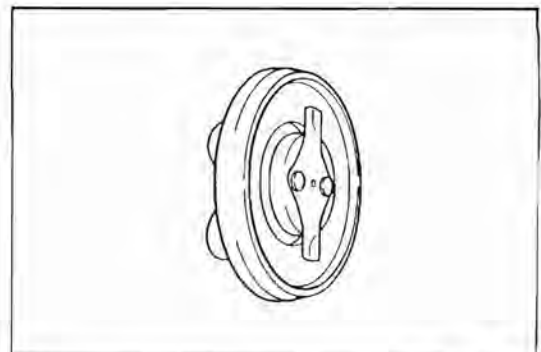
WR88-EC056

Inspection Of Fuel Vapor Lines, Fuel Tank & Filler Cap

1. Visual inspection of fuel vapor line and connections
Check the line and connections for loose connections, kinks or damage.
2. Visual inspection of fuel tank
Check the fuel tank for deformation, cracks or fuel leakage.
3. Visual inspection of fuel filler cap
Check the cap and gasket for damage or deformation.
Replace the cap, if necessary.



WR88-EC057



WR88-EC059

Inspection of Charcoal Canister

1. Disconnect the rubber hoses and remove the charcoal canister.

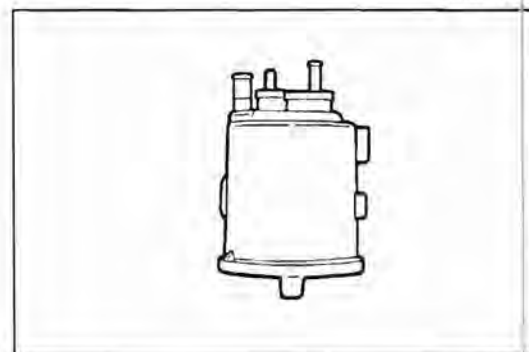
NOTE:

Put a tag on each of the rubber hoses so that they may be reconnected correctly to the original positions.



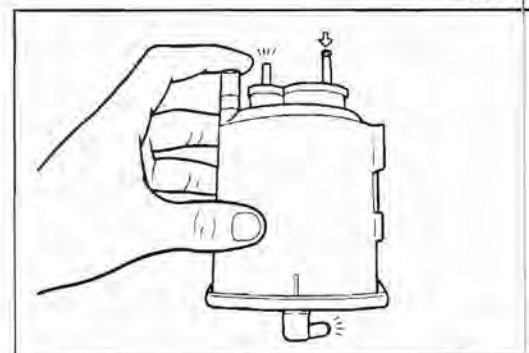
WR88-ECC60

2. Visual inspection of charcoal canister case
Visually inspect the charcoal canister case for cracks or damage.



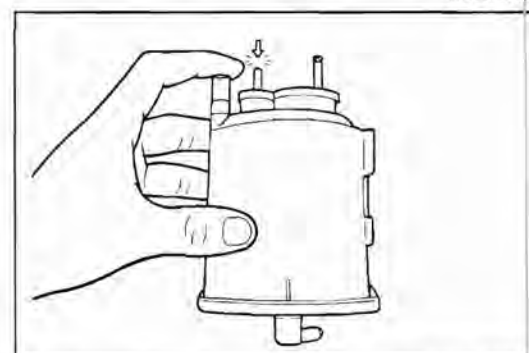
WR88-ECC61

3. Check of canister for restriction
(1) With the pipe at the BVSV side plugged with your finger, apply compressed air from the pipe at the fuel tank side. Ensure that air leaks from the other pipe.



WR88-ECC62

- (2) Apply compressed air from the purge side. Ensure that no air continuity exists.
If the check results are unsatisfactory, replace the charcoal canister.



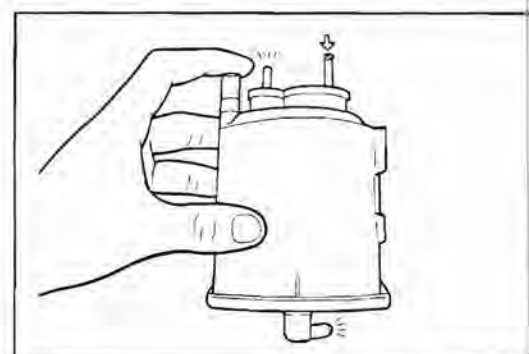
WR88-ECC63

4. Cleaning of filter in canister
Clean the filter by blowing compressed air of 3 kg/cm² (43 psi) into the tank pipe while holding the other upper canister pipe closed.

NOTE:

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

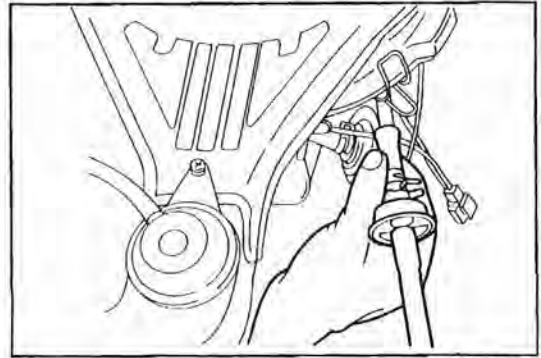
5. Install the charcoal canister and reconnect the rubber hose.



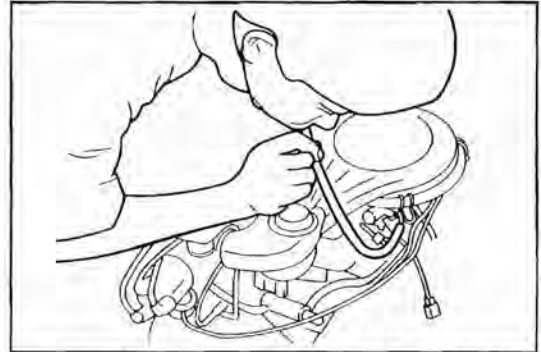
WR88-ECC64

Inspection of Outer Vent Valve

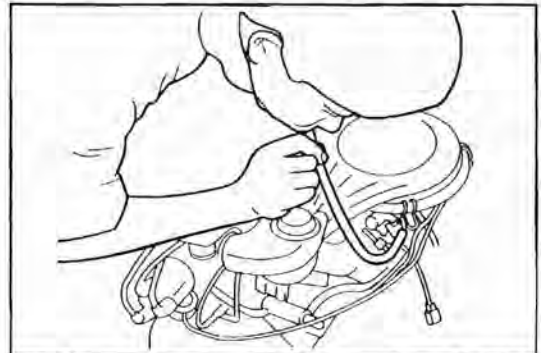
1. Disconnect the rubber hose at the BVSV side.
2. With the ignition key switch turned ON, blow air into the outer vent valve. Ensure that no air continuity exists. If air continuity exists, check to see if any abnormality is present in the electric circuit of the outer vent valve. Then, replace the outer vent valve, as required.
CAUTION:
Never inhale the air during the continuity inspection.
3. With the ignition key switch turned OFF, blow air into the outer vent valve. Ensure that air continuity exists. If no air continuity exists, check to see if any abnormality is present in the electric circuit of the outer vent valve. Then, replace the outer vent valve, as required.
CAUTION:
Never inhale the air during the continuity inspection.
4. Connect the rubber hose to the BVSV. Attach the hose bands.



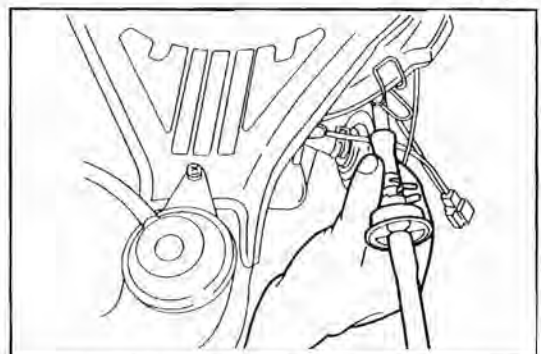
WR88-EC065



WR88-EC066



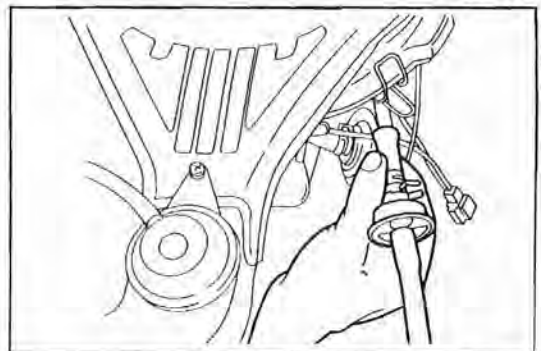
WR88-EC067



WR88-EC068

Inspection of BVSV

1. Remove the BVSV.



WR88-EC069

EMISSION CONTROL SYSTEMS

2. Check the air continuity of the BVSV under the following ambient air temperature conditions.

Below 50 °C (122 °F)

No air continuity exists.

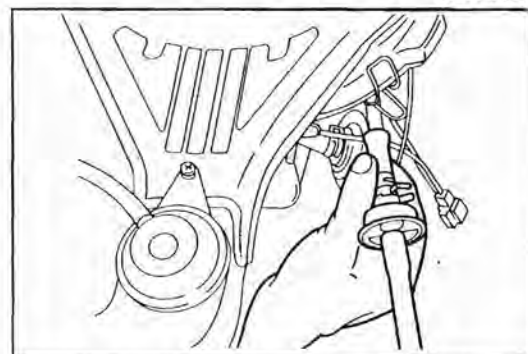
Above 65 °C (149 °F)

Air continuity exists.



WR88-EC07

3. Install the BVSV on the carburetor.



WR88-EC07

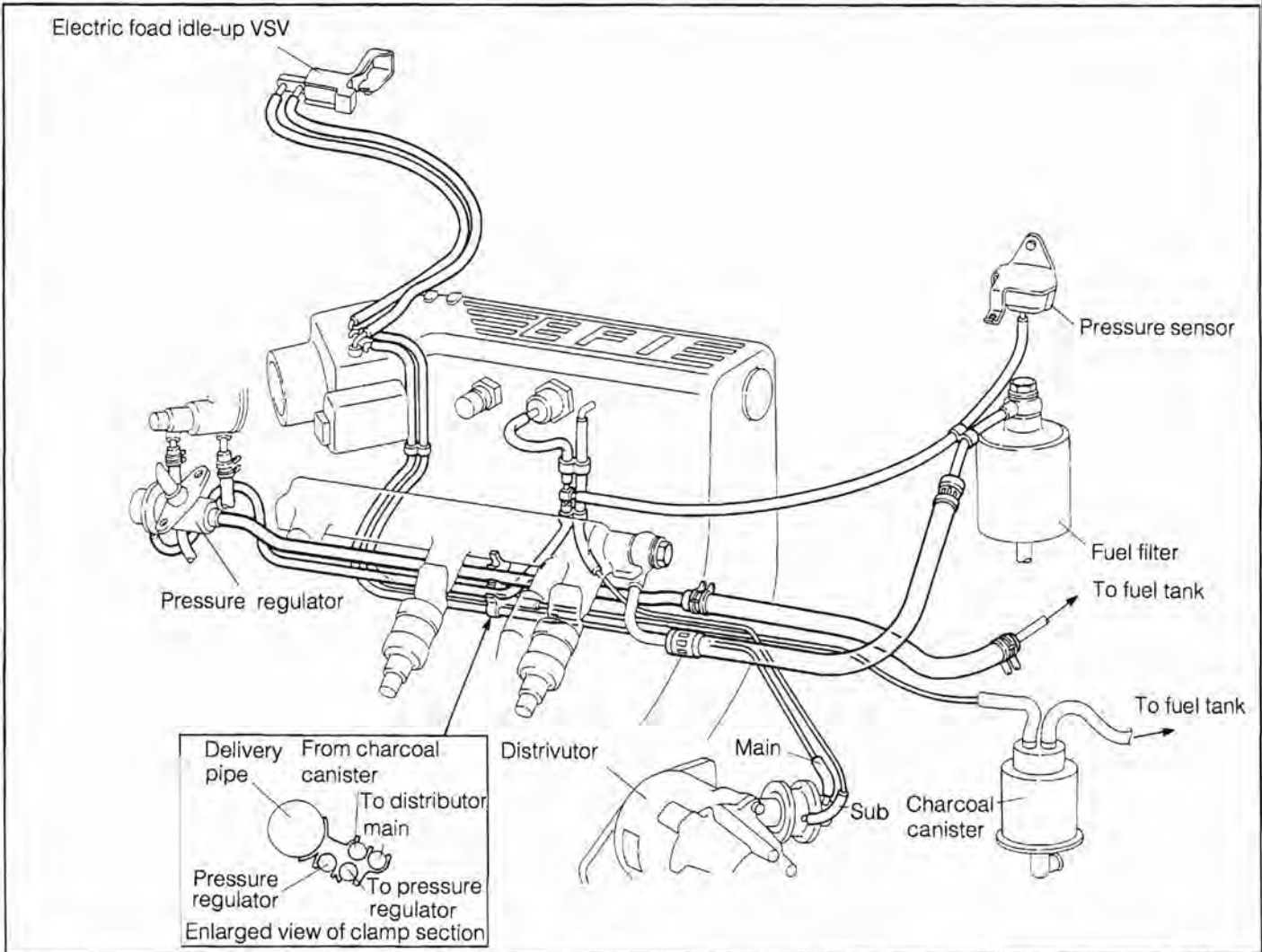
PURPOSE OF SYSTEMS [HC-E Engine]

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduction of blow-by gas (HC emission)
Fuel evaporative emission control	EVAP	Reduction of evaporative HC emission
Throttle positioner	TP	Reduction of HC and CO emissions
Three-way catalyst	TWC	Reduction of HC, CO and NOx emissions
Electronic fuel injection*	EFI	Regulation of all engine conditions for reduction of exhaust emissions

* For inspection and repairs of the EFI system, refer to the EFI section.

WR68-EC072

COMPONENT LAYOUT



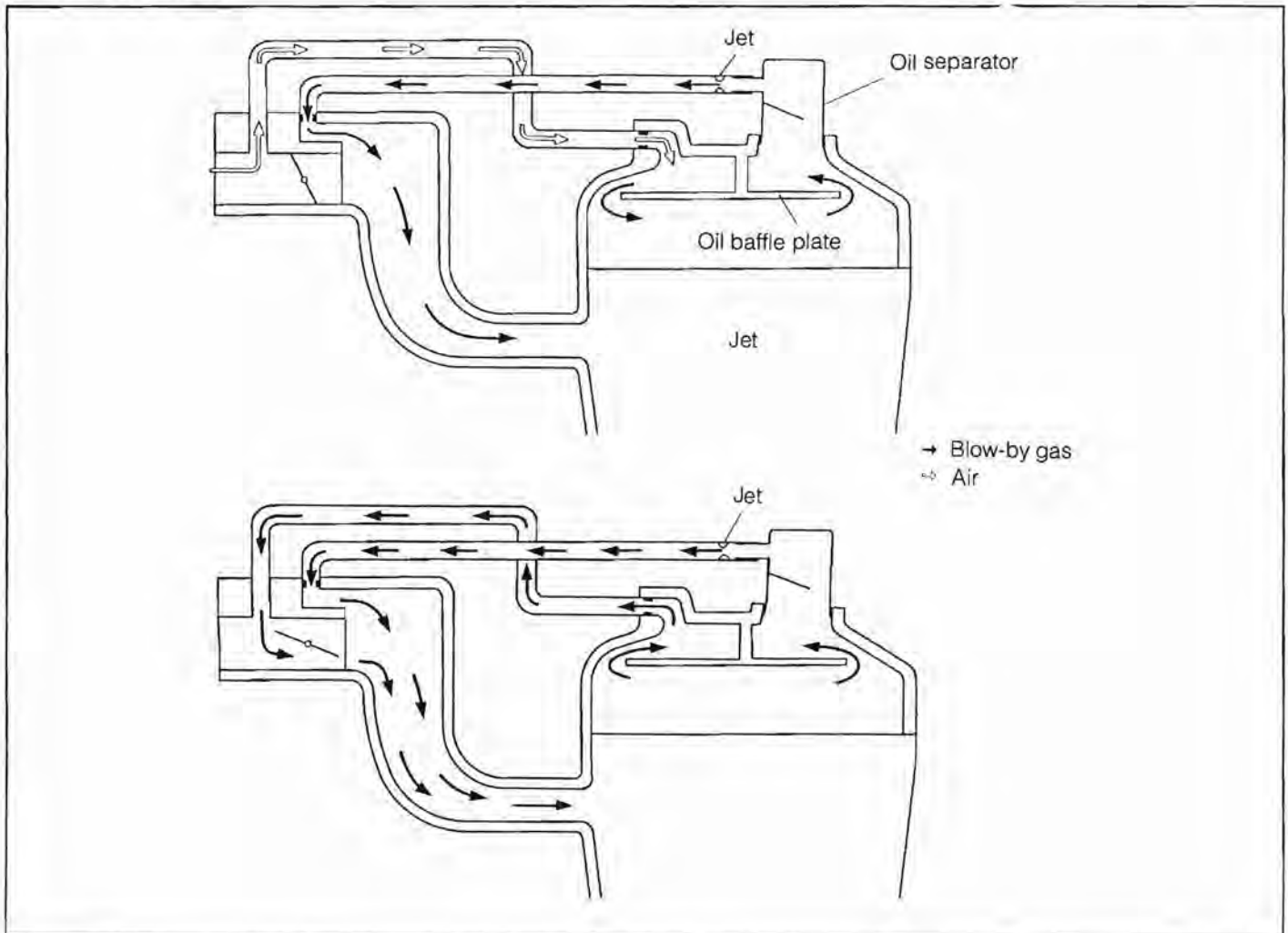
WR88-EC073

POSITIVE CRANKCASE VENTILATION SYSTEM

To combat with air-pollution problems, the engine is equipped with a sealed type positive crankcase ventilation system in order to prevent blow-by gases generated inside the crankcase from being released into the atmosphere.

The blow-by gases generated inside the crankcase flow into the cylinder side through the gas path of the cylinder block. When the opening degree of the throttle valve is small, oil in the blow-by gases is separated by the oil separator provided at the cylinder head cover. Then, the blow-by gases are sucked into the cylinders from the throttle body to be burnt there again.

Fresh air enters the cylinder head cover from the upstream path of the throttle valve. At this time, the air flow rate is regulated by a jet provided at the cylinder head cover, thus stabilizing the engine idling. When the opening degree of the throttle valve is large and/or when a large amount of blow-by gases are generated, the blow-by gases are sucked into the combustion chambers both through the upstream path and the downstream path of the throttle valve.

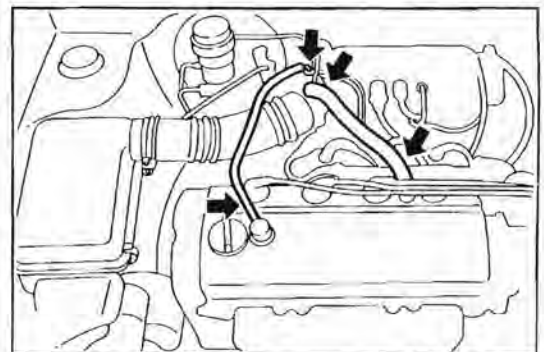


WR88-EC074

INSPECTION OF PCV HOSE & CONNECTION

Visual inspection of hoses and connections check the hoses and connections for cracks, leakage or damage.

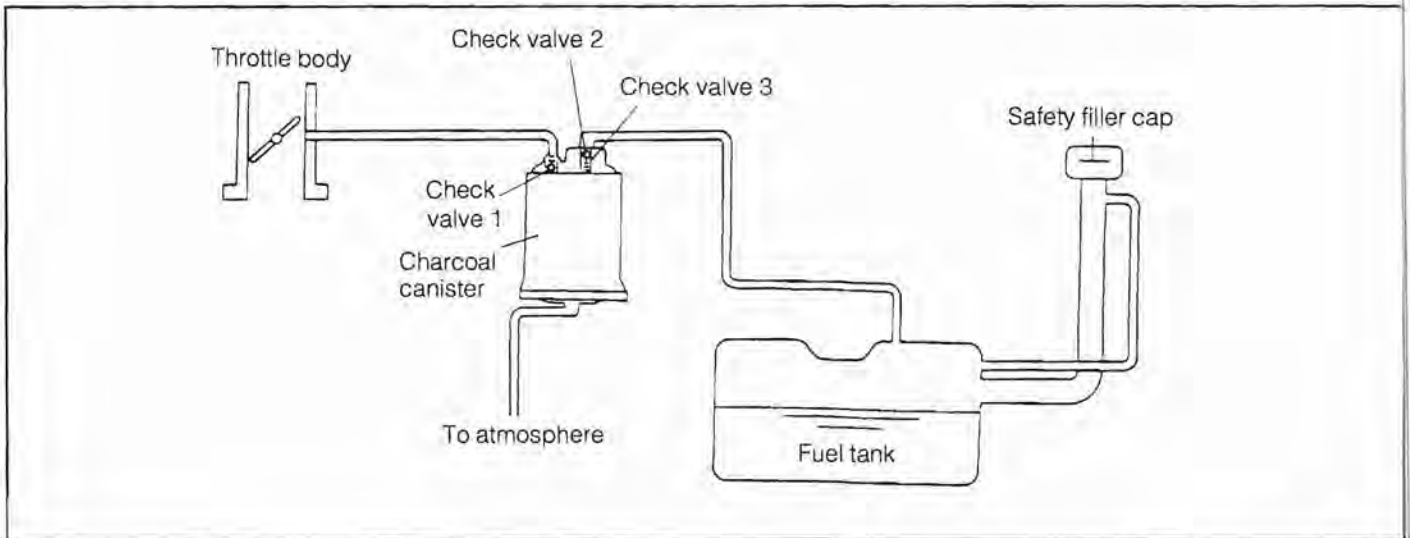
If any parts exhibit fault, replace or repair them, as required.



WR88-EC075

FUEL EVAPORATIVE EMISSION CONTROL SYSTEM

The fuel evaporative emission control system employs the charcoal canister type. The charcoal canister type leads the fuel vapor into the charcoal canister which uses activated carbon to absorb HC emission. The separated HC emission is drawn into the throttle body to be burnt together with mixture in the combustion chamber when the BVSV opens according to the engine coolant temperature.



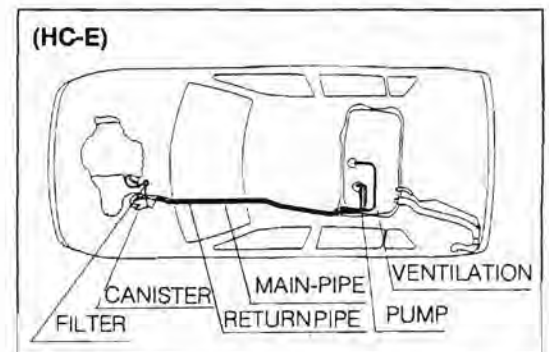
WR88-EC076

Pressure condition in tank	Engine condition	Canister check valve			Check valve in safety filler cap	Evaporated Fuel (HC)
		1	2	3		
High pressure in tank	When engine is rotating:	open	open	closed	closed	HC emission is sucked into engine through charcoal canister
High vacuum in tank	When engine is rotating:	open	closed	open	open	HC engine absorbed by charcoal canister is sucked into engine
High pressure in tank	When engine is stopped:	closed	open	closed	closed	HC emission is absorbed by charcoal canister
High vacuum in tank	When engine is stopped:	closed	closed	open	open	HC emission remains absorbed by charcoal canister. However, a part of HC emission is returned to fuel tank when negative pressure in fuel tank becomes great

WR88-EC077

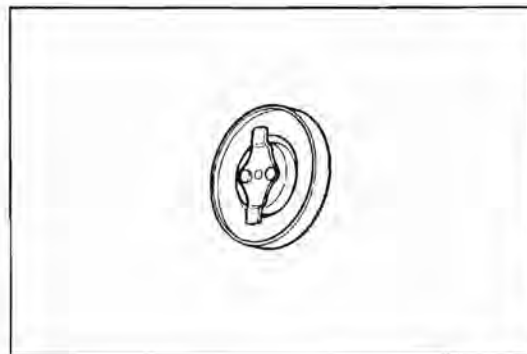
Inspection of fuel vapor lines, fuel tank & filler cap

1. Visual inspection of fuel vapor lines and connections
Check the lines and connections for loose connections, kinks or damage.
2. Visual inspection of fuel tank
Check the fuel tank for deformation, cracks or fuel leakage.



WR88-EC078

3. Visual inspection of fuel filler cap
Check the cap and gasket for damage or deformation.
Replace the cap, if necessary.



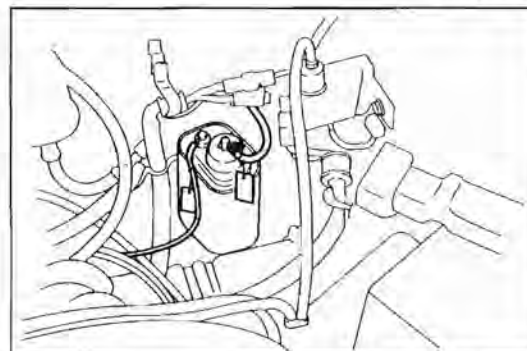
WR88-EC079

Inspection of charcoal canister

1. Disconnect the rubber hose and remove the charcoal canister.

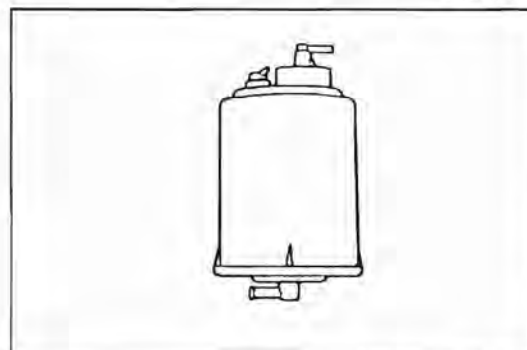
NOTE:

Prior to disconnection of the rubber hose, put a tag on the hose so that the original installation position may be known easily.



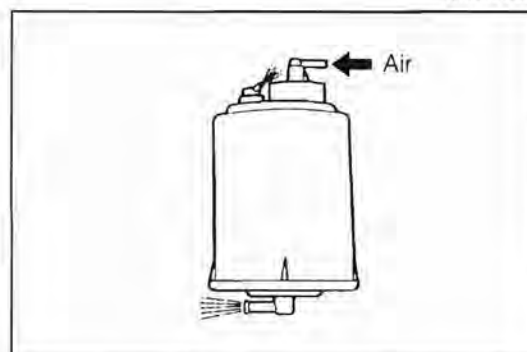
WR88-EC080

2. Visual inspection of charcoal canister
Visually inspect the charcoal canister case for cracks or damage.



WR88-EC081

3. Check of filter for restriction
 - (1) Blow low pressure compressed air into the tank pipe.
Ensure that air flows without resistance from the other pipe.
 - (2) Blow air into the purge pipe. Ensure that no air flows from the other pipe.
Replace the charcoal canister, if it exhibits any defect.



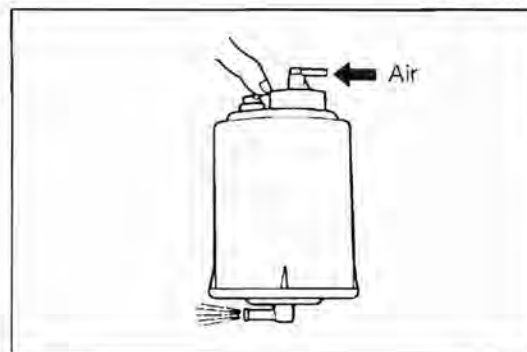
WR88-EC082

4. Cleaning of filter in canister
Clean the filter by blowing compressed air of 3 kg/cm² (43 psi) into the tank pipe while holding the other upper canister pipe closed.

NOTE:

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

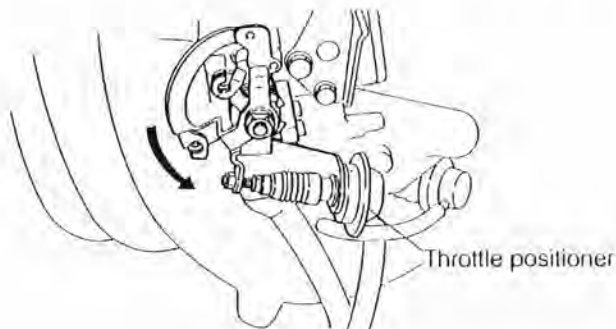
5. Install the charcoal canister and reconnect the rubber hose.



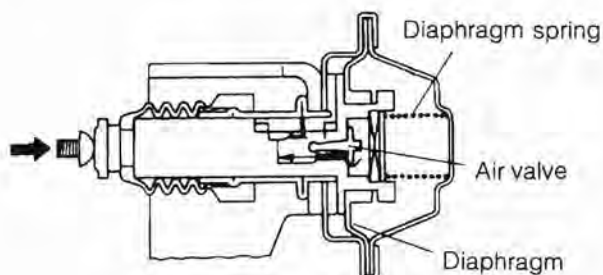
WR88-EC083

THROTTLE POSITIONER SYSTEM

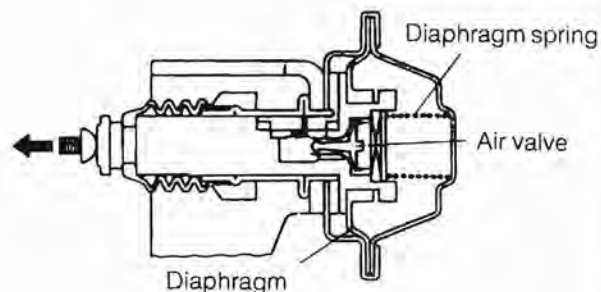
This system prevents the throttle valve from suddenly closing, thus reducing the CO and HC emissions.



Throttle valve closing



Throttle valve opening



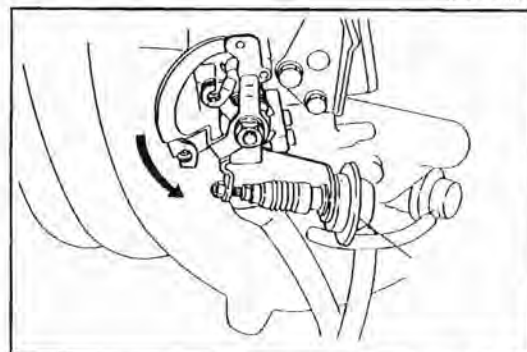
WR88-EC084

Conditions	TP diaphragm	Throttle valve
Idling	Pushed in by return force of throttle valve	Idle speed position
Normal driving	Pushed out by diaphragm spring	Opened position
Deceleration	Pushed in by return force of throttle valve*	Slightly opens and then slowly closes to the idle position.

* At this point, the function of the air valve provided inside the TP diaphragm prevents the throttle valve from being closed suddenly.

WR88-EC085

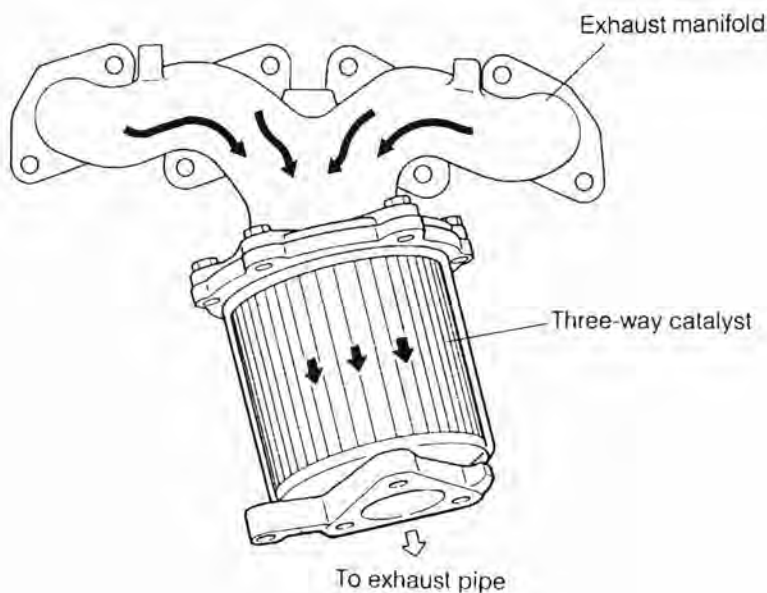
Inspection of throttle positioner (TP) system (See page EM-20)



WR88-EC086

THREE-WAY CATALYST SYSTEM

If this three-way catalyst, the oxidation of carbon monoxide (CO) and the reduction of nitrogen oxides (NOx) contained in exhaust gas can take place simultaneously. Thus, the three-way catalyst purifies the exhaust gas by converting its harmful components gas into harmless carbon dioxide (CO₂), water vapor (H₂O) and nitrogen (N₂).



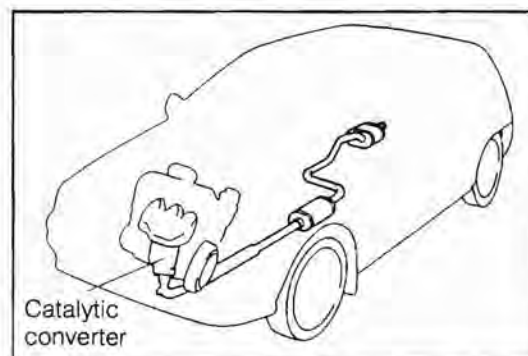
WR88-EC087

Exhaust gas component		TWC		Exhaust gas
HC, CO and NOx	⇒	Oxidation and reduction	⇒	CO ₂ , H ₂ O and N ₂

WR88-EC088

Inspection of exhaust pipe assembly

1. Check the connections for looseness or damage.
2. Check the clamps for weakness, bend or damage.

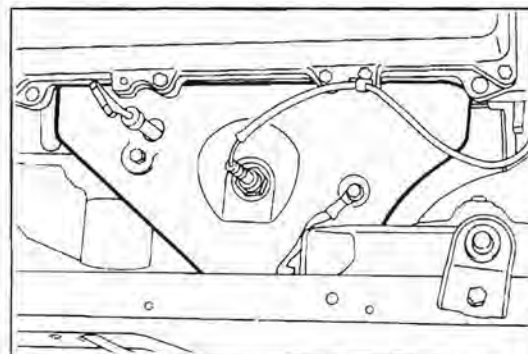


WR88-EC089

Inspection of catalytic converter

Check of protector for dents or damage

If any part of the protector is damaged or dented to such an extent that it contacts the catalyst, repair or replace the protector.

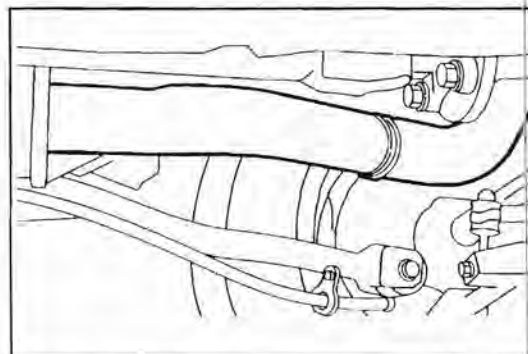


WR88-EC090

Inspection of heat insulator

Check the heat insulator for damage.

If the heat insulator exhibits any damage, repair or replace the exhaust pipe.



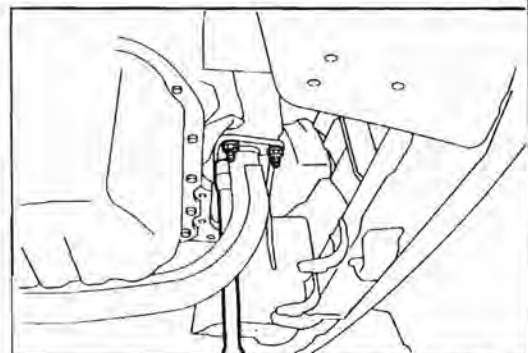
WR88-EC091

Replacement of catalytic converter

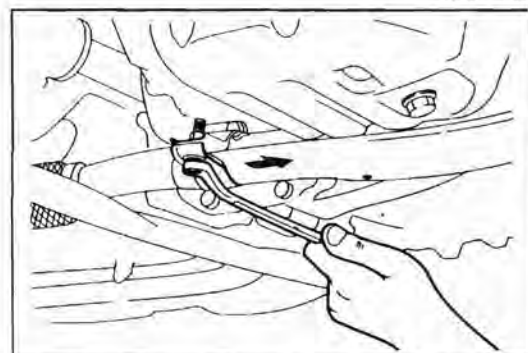
CAUTION:

Do not perform any operation while the exhaust manifold is still hot.

1. Jack up the vehicle and support it with safety stands.
(See page IG-12)
2. Removal of front exhaust pipe
 - (1) Remove the nut connecting the front exhaust pipe to the exhaust manifold No. 2.
 - (2) Remove the exhaust pipe clamp bolt. Remove the clamp from the exhaust pipe bracket.

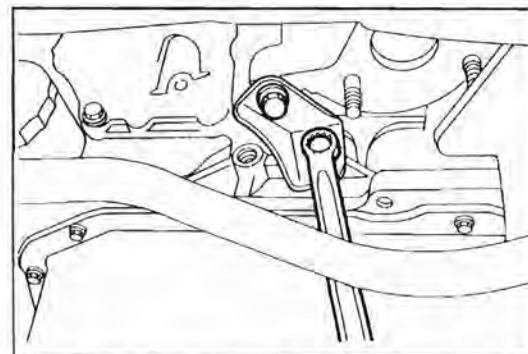


WR88-EC092



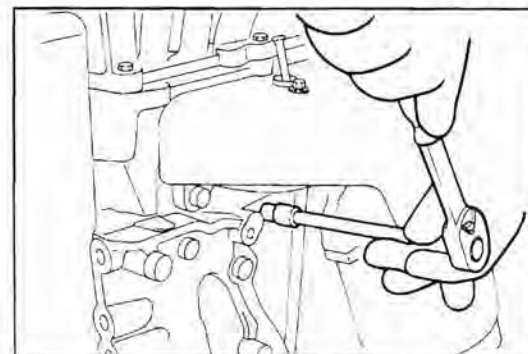
WR88-EC093

3. Remove the exhaust manifold stay.



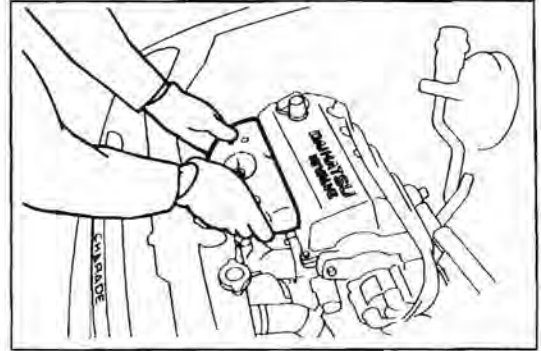
WR88-EC094

4. Pull out the oil level gauge.
5. Remove the attaching bolt of the oil level gauge.



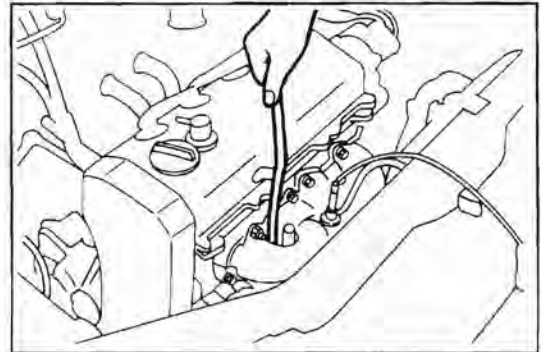
WR88-EC095

6. Remove the exhaust manifold cover.



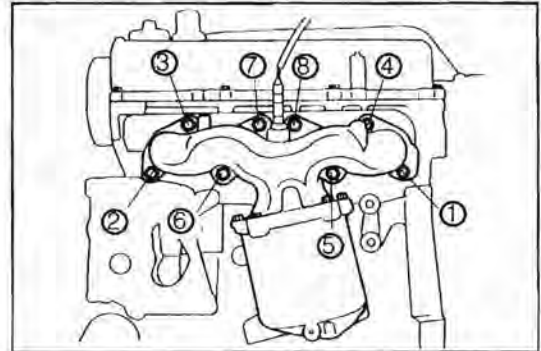
WR88-EC096

7. Pull out the oil level gauge guide.



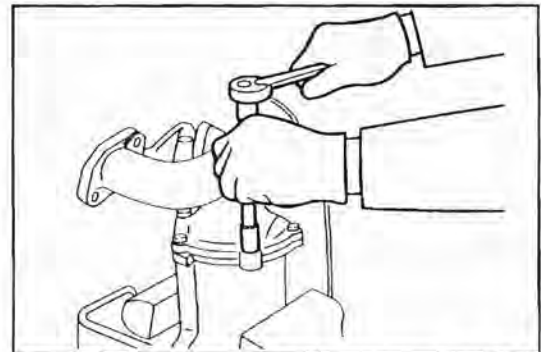
WR88-EC097

8. Remove the exhaust manifold case No. 1 from the cylinder head by removing the attaching bolts, following the sequence shown in the right figure.



WR88-EC098

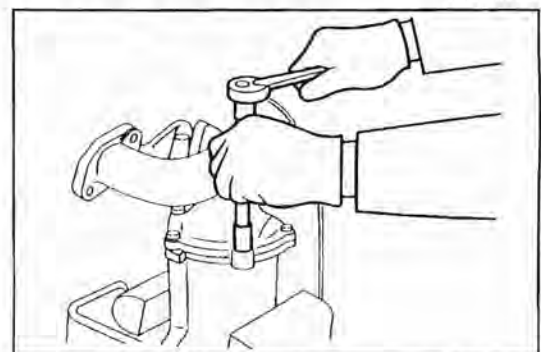
9. Disassemble the exhaust manifold case No. 1 from the exhaust manifold case No. 2.



WR88-EC099

10. Install the new exhaust manifold case No. 2 to the exhaust manifold case No. 1 with the new cushion interposed.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.6 ft-lb)

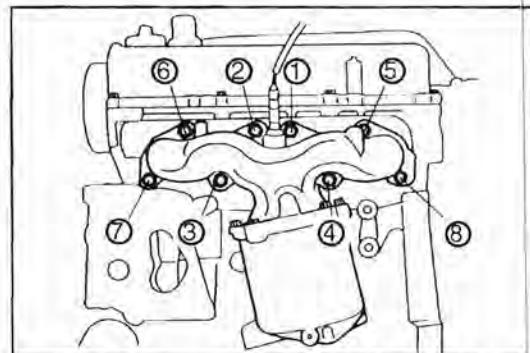


WR88-EC100

11. Install the exhaust manifold case No. 1 to the cylinder head with a new gasket interposed.

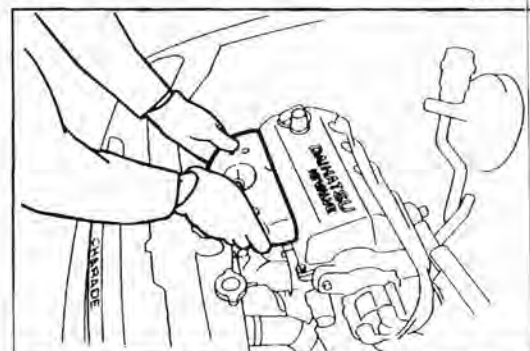
Tighten the attaching bolts, following the sequence shown in the right figure.

Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)



WR88-EC101

12. Install the exhaust manifold cover.

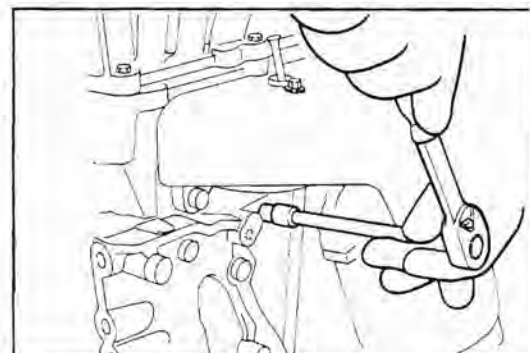


WR88-EC102

13. Tighten the attaching bolts of the oil level gauge guide.

14. Install the exhaust manifold stay.

Tightening Torque: 3.0 - 4.5 kg-m (21.7 - 32.5 ft-lb)

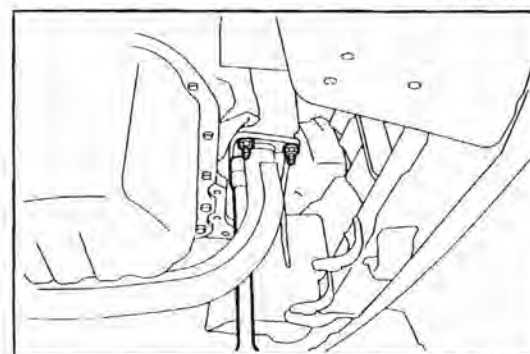


WR88-EC103

15. Installation of exhaust pipe

- (1) Install the exhaust pipe to the exhaust manifold case No. 1 with a new gasket interposed. Tighten the attaching nuts.

Tightening Torque: 5.0 - 7.6 kg-m (36.2 - 54.9 ft-lb)



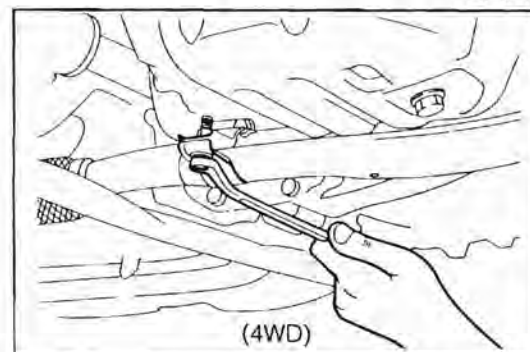
WR88-EC104

- (2) Install the exhaust support to the exhaust pipe support bracket No. 1. Tighten the attaching bolts.

Tightening Torque: 3.5 - 5.0 kg-m (25.3 - 36.2 ft-lb)

16. Jack down the vehicle.

17. Start the engine. Ensure that there is no exhaust gas leakage.



WR88-EC105

DAIHATSU

CHARADE

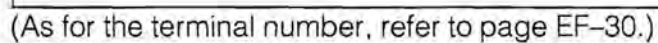
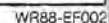
TYPE HC ENGINE

EF

EFI SYSTEM

SYSTEM CIRCUIT	EF- 2	THROTTLE POSITION SENSOR	
PRECAUTIONS	EF- 3	MT VEHICLE	EF- 58
INSPECTION PRECAUTION	EF- 3	AT VEHICLE	EF- 59
TROUBLE SHOOTING	EF- 8	PRESSURE SENSOR	EF- 61
DIAGNOSIS SYSTEM	EF- 24	IDLE-UP VSV	EF- 63
TROUBLE SHOOTING WITH		OXYGEN SENSOR	EF- 66
VOLT/OHMMETER	EF- 29	ELECTRONIC CONTROL	
ECU CONNECTORS	EF- 30	UNIT (ECU)	EF- 69
TROUBLE SHOOTING		ECU CONNECTORS	EF- 71
EFI ELECTRONIC CIRCUIT WITH		FUEL SYSTEM	EF- 76
VOLT/OHMMETER	EF- 32	FUEL PUMP	EF- 76
ELECTRONIC CONTROL SYSTEM	EF- 48	FUEL TANK AND LINE	EF- 86
MAIN RELAY	EF- 49	FUEL FILTER ELEMENT	EF- 94
INJECTOR RELAY	EF- 50	PRESSURE REGULATOR	EF- 97
FUEL PUMP RELAY	EF- 52	INJECTORS	EF-105
WATER TEMPERATURE SENSOR	EF- 53	AIR INDUCTION SYSTEM	EF-110
INTAKE AIR TEMPERATURE		THROTTLE BODY	EF-110
SENSOR	EF- 56	AUXILIARY AIR VALVE	EF-115

WR88-EF001



PRECAUTIONS

1. The engine control system has self diagnosis function. The ECU memorizes malfunction codes for malfunctions which are occurring at present and/or occurred in the past.
Memorized malfunction codes are erased when the battery is disconnected. Be sure to read the diagnosis code before starting any operations relating to the encountered malfunctions.
2. Before disconnecting the fuel line system, be sure to disconnect the cable (wire) from the negative terminal of the battery.
3. The fuel line is pressurized to a pressure 2.5 atm. (2.55 kg/cm²) higher than the pressure inside the surge tank. Therefore, when disconnecting the fuel line, be sure to prevent the fuel from splashing with a cloth or the like.
4. Do not allow gasoline to get to any parts made of rubber, leather, and/or resin.
5. When cleaning the engine compartment, be very careful to protect the electrical system from water.

WR88-EF004

INSPECTION PRECAUTIONS

Maintenance Precautions

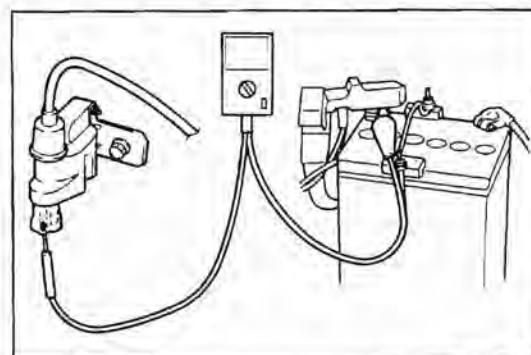
1. Ensure that the engine is correctly tuned up.
2. Precautions during gauge connection
 - (1) Connect the measuring terminal of the tachometer to the negative (-) terminal of the ignition coil.

NOTE:

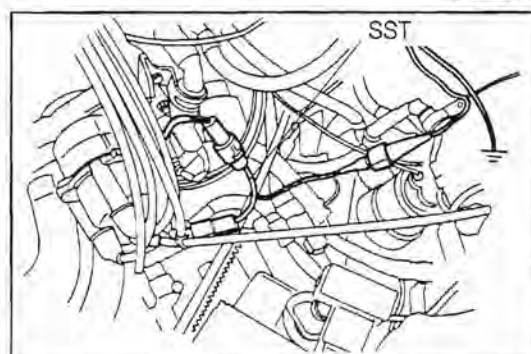
- The ignition coil has no terminal for external connection. Hence, insert an adequate jumper cord from the backside of the connector attached to the ignition coil. Then, connect the other end of the jumper cord to the measuring terminal of the tachometer.
- For the purpose of connecting tachometer, the SST for connecting to the distributor wire is available.
SST: 09991-87703-000

CAUTION:

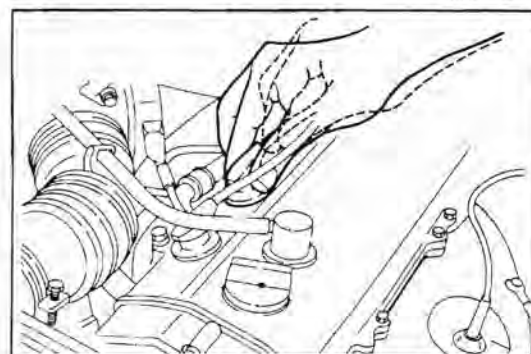
- Never allow the tachometer terminal to touch ground as it could result in damage to the ignitor and/or ignition coil.
 - As some tachometers are not compatible with this ignition system, it is imperative to confirm the compatibility of your meter before it is used.
- (2) Use the battery as power source for a timing light, tachometer and so forth.
3. If engine misfire takes place, the following measures should be taken.
 - (1) Ensure that the battery terminals, etc. are connected properly.
 - (2) Handle the resistive cords carefully.
 - (3) After completion of repairs, ensure that the ignition coil terminals and other ignition system wires are reconnected securely.
 4. Precautions during oxygen sensor handling
 - (1) Never drop the oxygen sensor or hit it to other objects.
 - (2) Do not submerge the oxygen sensor in water, nor put the oxygen sensor in water for the purpose of cooling it.



WR88-EF005



WR88-EF006A



WR88-EF006

When the Vehicle is Equipped With Wireless Installation (HAM, CB, etc.):

The ECU has been so designed that it is resistant to external influence.

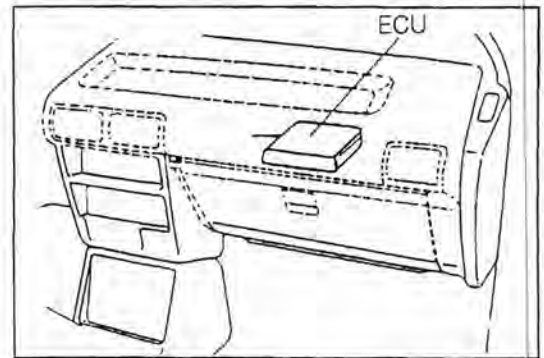
However, if a vehicle is equipped with a CB wireless installation and so forth (even if its output is only 10W), it may affect the ECU adversely.

Specifically, if antenna or its cord is located near the ECU, the ECU is liable to be effected adversely. Therefore, observe the following precautions.

1. Install an antenna at a place as far away as possible from the ECU.

The ECU is installed at the upper/inner section of the instrument panel in front of the passenger's seat. Therefore, the antenna should be installed at the rear of the vehicle.

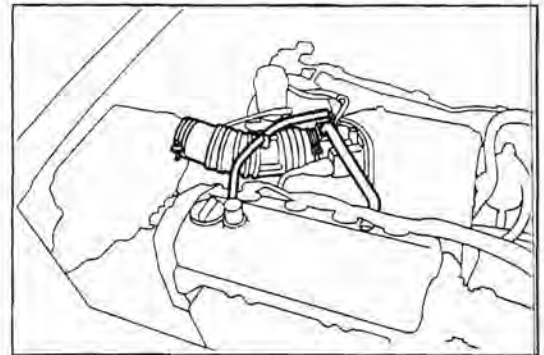
2. The antenna cord should be kept at least 20 cm (7.9 inch) away from the engine wire. Never wind the antenna with the engine wire with tapes.
3. Adjust the antenna output correctly.
4. Never install a wireless installation with a high output on the vehicle.



WR88-EF007

Air Induction System

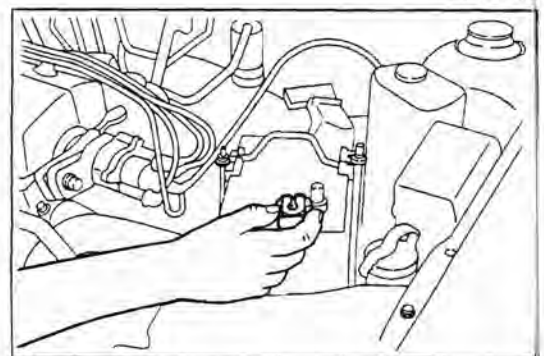
1. Unless all of the oil level gauge, oil filler cap, ventilation hose and so forth are installed securely, engine tune-up can not be performed properly.
2. If air leakage (air admission) is present between the throttle body and the cylinder head, the engine revolution speed can not be adjusted.



WR88-EF008

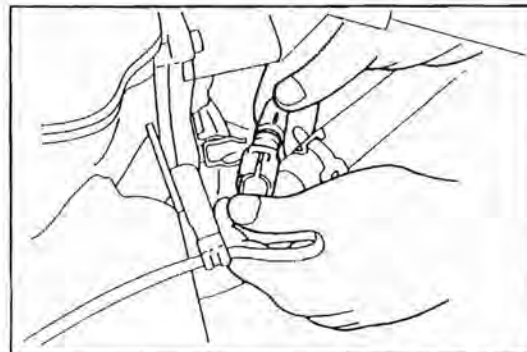
Electronic Control System

1. When disconnecting the connector of the EFI system wiring, prior to the disconnection, be sure to turn OFF the ignition switch and pull out the back-up fuse. Or disconnect the cable (wire) from the negative battery terminal. When disconnecting the ECU connector, be sure to disconnect the cable from the negative battery terminal.

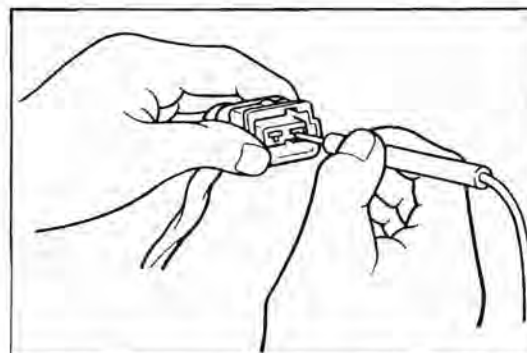


WR88-EF009

2. When installing the battery, care must be exercised not to mistake the battery polarity.
3. Never apply strong impacts to the parts. Pay utmost attention during the installation/removal.
It is not permitted to reuse any EFI-related parts which have been dropped or undergone strong impacts.
4. During repairs, do not tamper those terminals other than those specified.
Slight contact of terminals could damage the transistorized circuits, causing serious malfunctions.
5. Never open the cover of the ECU.
6. When the system is checked on a rainy day, be very careful not to allow water to get into connector terminals.
When the engine compartment is washed, prevent water from being splashed to the EFI related parts and wiring connectors.
7. Every part should be replaced as an assembly.
8. Before connecting or disconnecting the wiring connector, confirm the lock shape.
(1) Release the lock. Disconnect the connector.
(2) Insert the connector until the lock is engaged completely.
9. When the connector terminal is checked by means of a circuit tester.
Avoid applying excessive force so that the terminal may not be deformed.



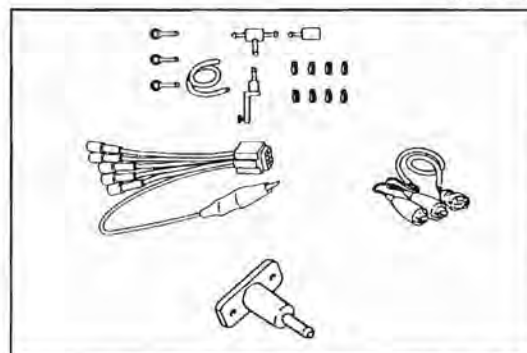
WR88-EF010



WR88-EF011

10. When checking the injector and cold start injector, use the following SSTs.

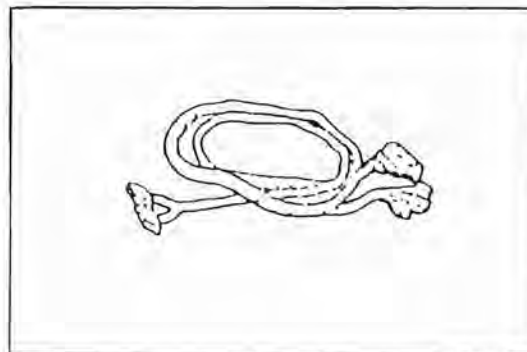
SST: 09268-87702-000
 09842-30040-000
 09991-87702-000
 09283-87703-000



WR88-EF012

11. When measuring voltages for each system, use the following SST.

SST: 09842-87701-000



WR88-EF013

Fuel System

1. The fuel line is pressurized to a pressure of 2.55 kg/m^2 (36.3 psi). Therefore, when disconnecting part of the fuel line, prevent the fuel from splashing, using a cloth or the like. Since a large amount of gasoline flows out, perform the operation, following the procedure given below.
 - (1) Place an adequate container or a piece of cloth, etc. under a connection.
 - (2) Loosen the connection slowly, while preventing the fuel from splashing, using a cloth or the like.
 - (3) Disconnect the connection.
 - (4) Plug the connection with a rubber plug or the like so that no dust may enter into the fuel line.
2. When connecting the flare nut or union bolt of the high-pressure pipe, observe the following instructions.

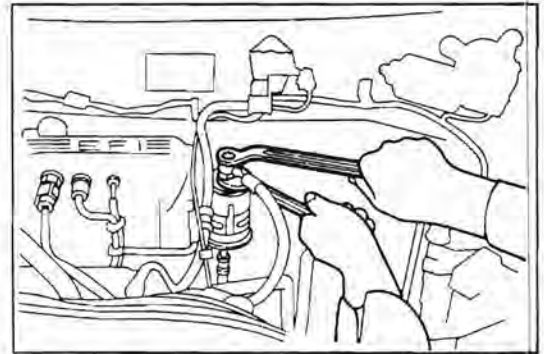
[Union bolt type]

- (1) Always use new gaskets.
 - (2) First tighten the union bolt with your fingers.
 - (3) Next, tighten the union bolt to the specified torque.
- Tightening Torque:** 3.5 - 4.5 kg-m (25.3 - 32.5 ft-lb)

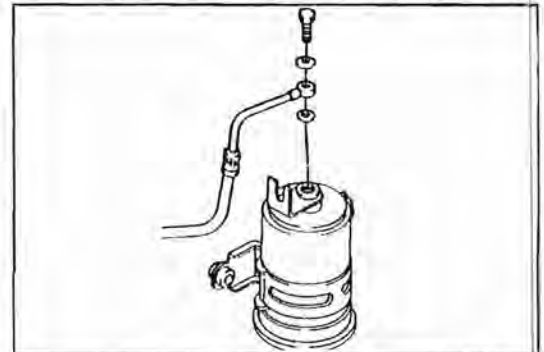
[Flare nut type]

- (1) Coat the flare nut with a thin film of engine oil. Tighten the flare nut fully with your fingers.
 - (2) Tighten the flare nut to the specified torque.
- Tightening Torque:** 3.5 - 4.4 kg-m (25.3 - 31.8 ft-lb)

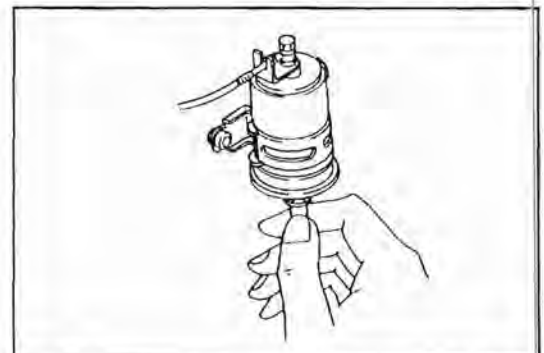
3. When removing/installing the injector, observe the following instruction.
 - (1) Do not reuse the "O" ring.
 - (2) When installing the "O" ring to the injector, be careful not to damage the "O" ring.
 - (3) Before connecting the injector with the delivery pipe, apply silicon oil or gasoline to the "O" ring. (Never use engine oil, gear oil, brake oil and so forth.)
4. Install the injector to the delivery pipe and cylinder head, as shown in the figure.



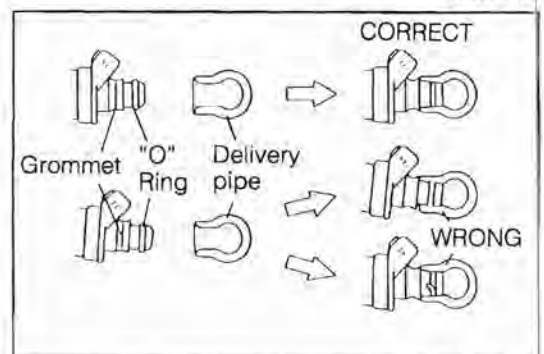
WR88-EF014



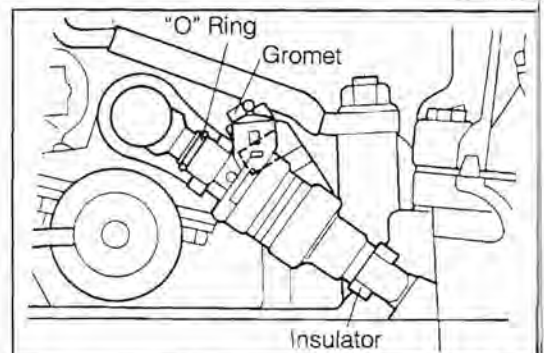
WR88-EF015



WR88-EF016



WR88-EF017



WR88-EF018

5. When part of the fuel line is disconnected, e.g. during repairs, check the fuel line for fuel leakage after the operation has been completed, as follows:

- (1) Short the terminal F (White/Black) with the ground terminal (Black) of the check terminal, using following SST.

SST: 09991-87702-000

NOTE:

The check terminal is located at the upper section of the transmission.

CAUTION:

As for the terminals other than those specified, never allow them to be connected or shorted.

- (2) Turn ON the ignition switch. (with the engine in a stopped state)

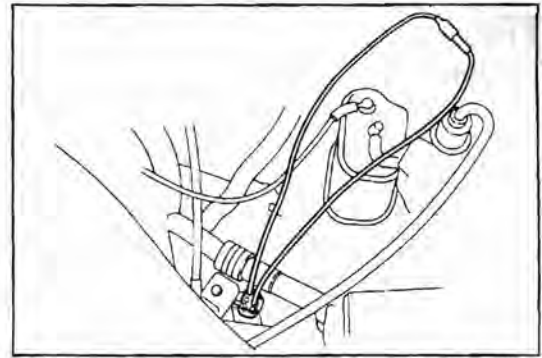
NOTE:

The check terminal is located at the upper section of the transmission.

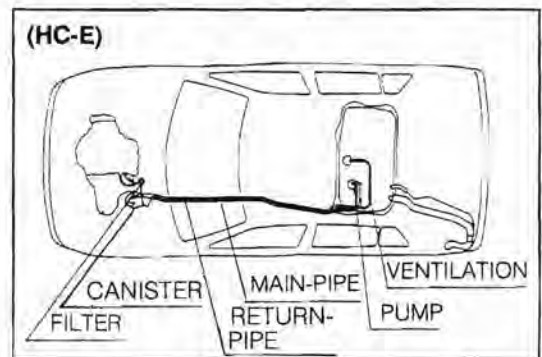
At this time, a fuel pressure of 2.55 kg/cm^2 (36.3 psi) is being applied to the fuel line.

Under this conditions, check the fuel line system for evidence of leakage.

If any leakage is present at the fuel line system, repair leaky points. Recheck the system for leakage.



WR88-EF019



WR88-EF020

TROUBLE SHOOTING

Trouble Shooting Hints

1. In most cases, engine troubles are attributable to systems other than the EFI system.
Prior to starting the trouble shooting or the EFI system, check other systems.

- (1) Power supply

- Battery voltage
- Fuse blown
- Fusible link blown

- (2) Body ground

- (3) Fuel supply

- Fuel leakage
- Fuel filter clogged
- Fuel pump malfunctioning

- (4) Ignition system

- Spark plugs faulty
- Resistive cords faulty
- Distributor and igniter faulty
- Ignition coil faulty

- (5) Air induction system

- Admission of air

- (6) Others

- Ignition timing adjusted improperly
- Idle speed adjusted improperly
- Idle-up VSV malfunctioning

2. Most of troubles related to the EFI system are merely caused by poor wire connections.

Ensure that connectors are connected securely.

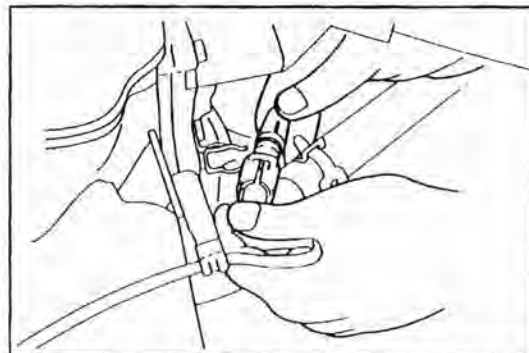
Check connectors, being careful as to the following points.

- (1) Visually inspect that terminals are not bent.

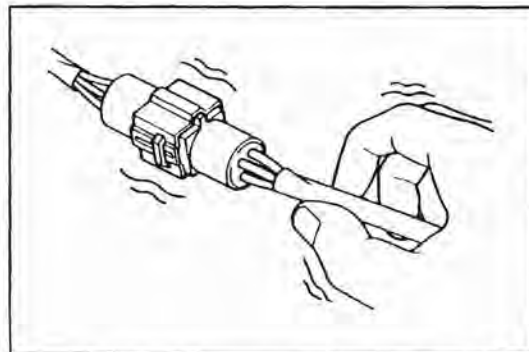
- (2) Ensure that connectors are securely connected and locked.

- (3) Check to see if the malfunction phenomenon takes place when applying light vibration to the connector or the wire connected to the connector.

WR88-EF021



WR88-EF022



WR88-EF023

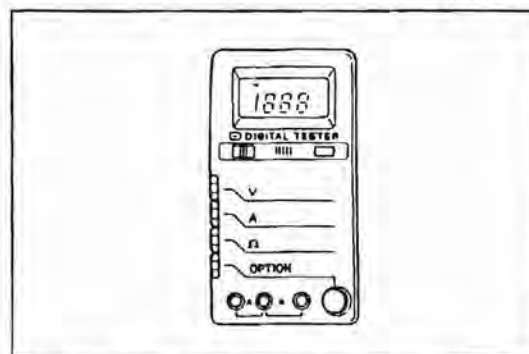
3. Check the ECU thoroughly before replacing the ECU.

The ECU is an expensive, sophisticated part.

When the ECU has been replaced according to an instruction appearing in the trouble shooting, be sure to reinstall the old ECU and ensure that the malfunction takes place again. In this way, confirm that the malfunction is obviously attributable to the old ECU.

4. For the trouble shooting, use a volt/ohmmeter whose internal resistance is $10\text{ k}\Omega/\text{V}$ or more.

Use of a volt/ohmmeter whose internal resistance is less than $10\text{ k}\Omega/\text{V}$ may cause an ECU malfunction or wrong diagnosis. Furthermore, be sure to employ a meter whose resolution is 0.1V or more, 0.5Ω or more and whose accuracy is $\pm 2\%$ or more.



WR88-EF024

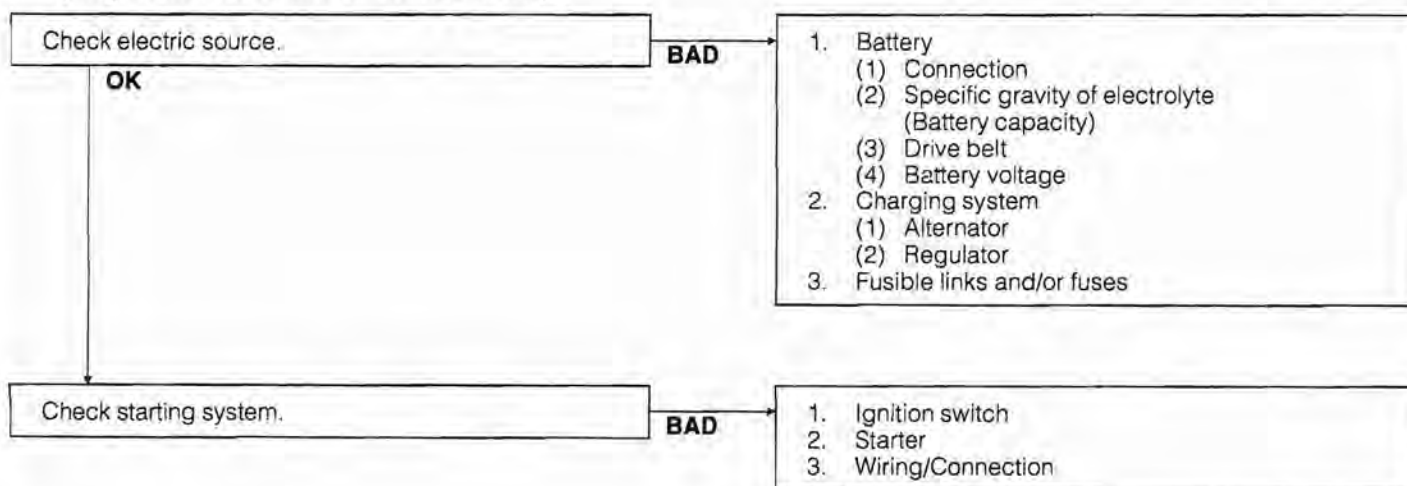
WR88-EF025

5. In this trouble shooting, no consideration has been made to any displacement of timing belt teeth. Hence, if the trouble persists even after the trouble shooting has been carried out, check to see if the timing belt exhibits any tooth skipping.

WR88-EF025A

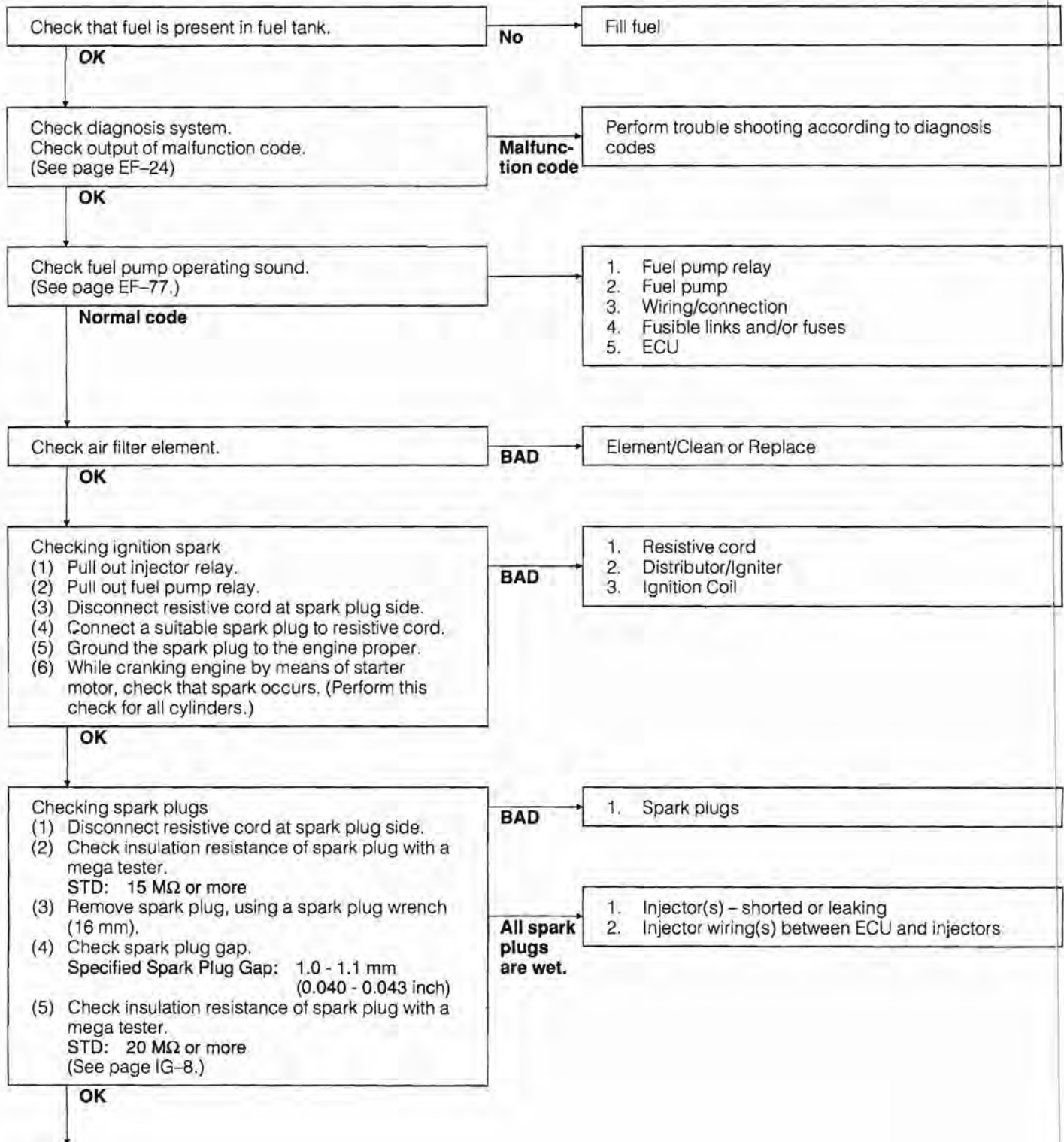
TROUBLE SHOOTING PROCEDURE

- 1 Symptom Engine will not start.
(Engine will not crank or cranks slowly.)

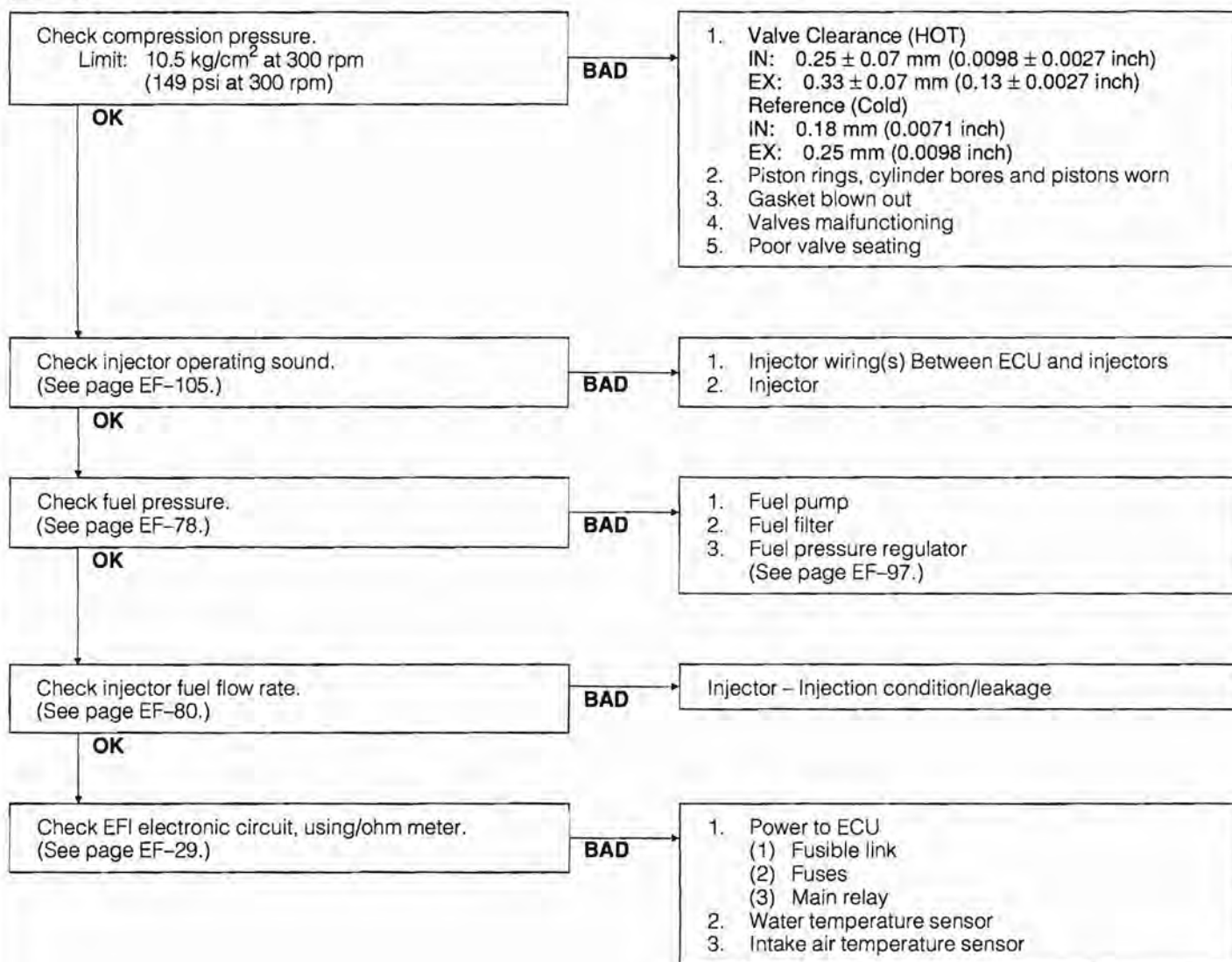


WR88-EF026

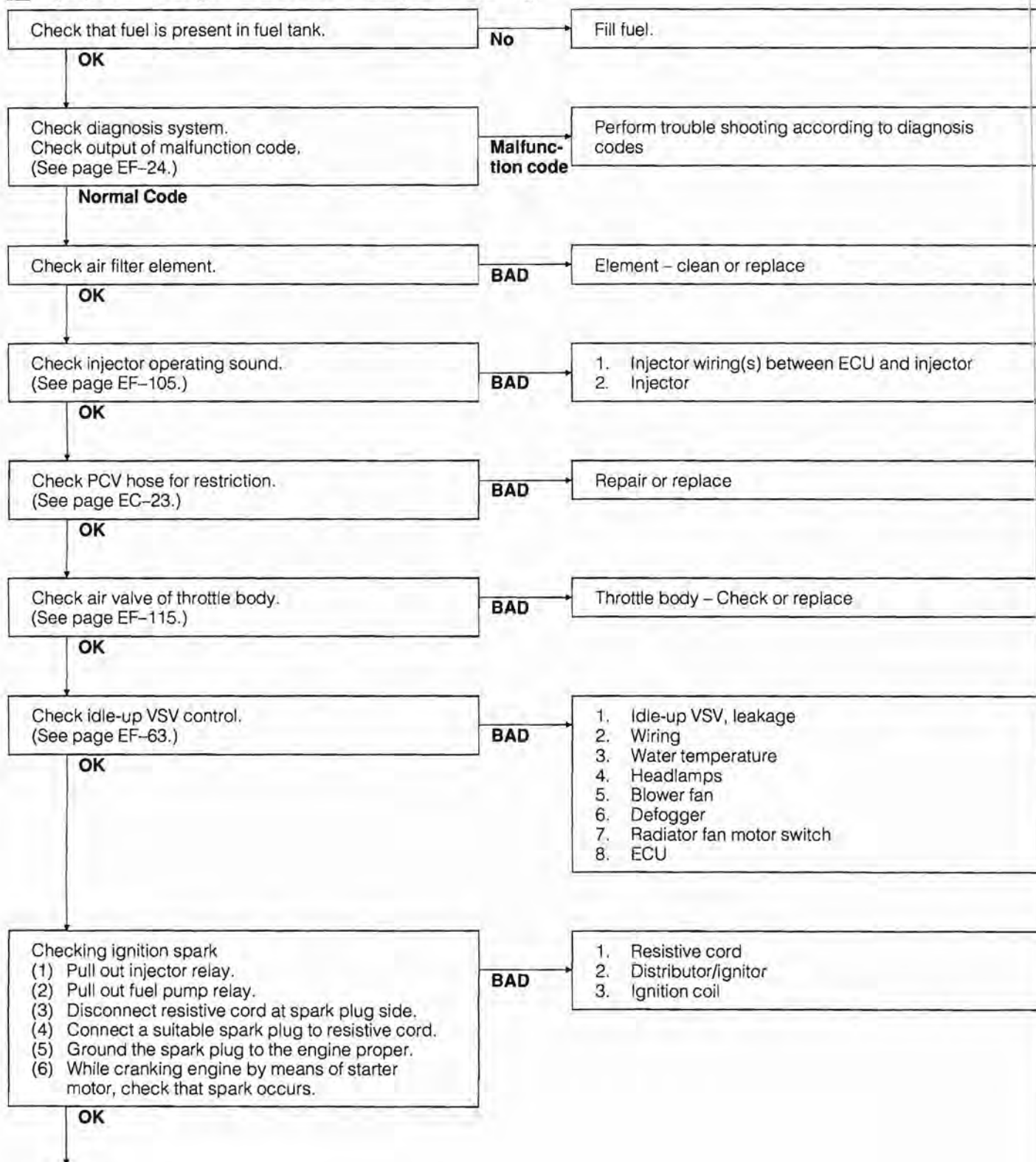
- 2 Symptom Engine will not start.
(Engine cranks normally.)



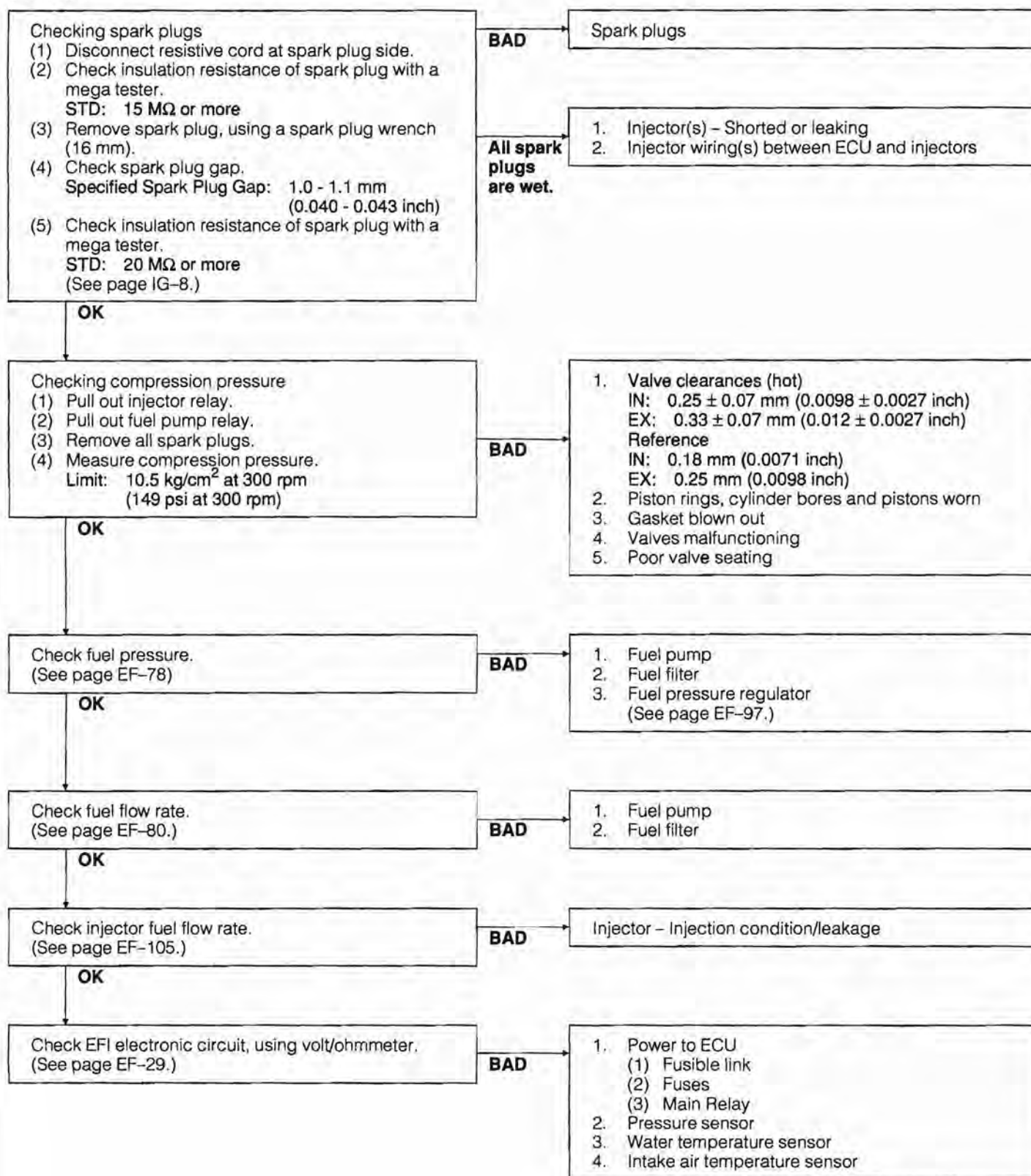
(Cont'd)



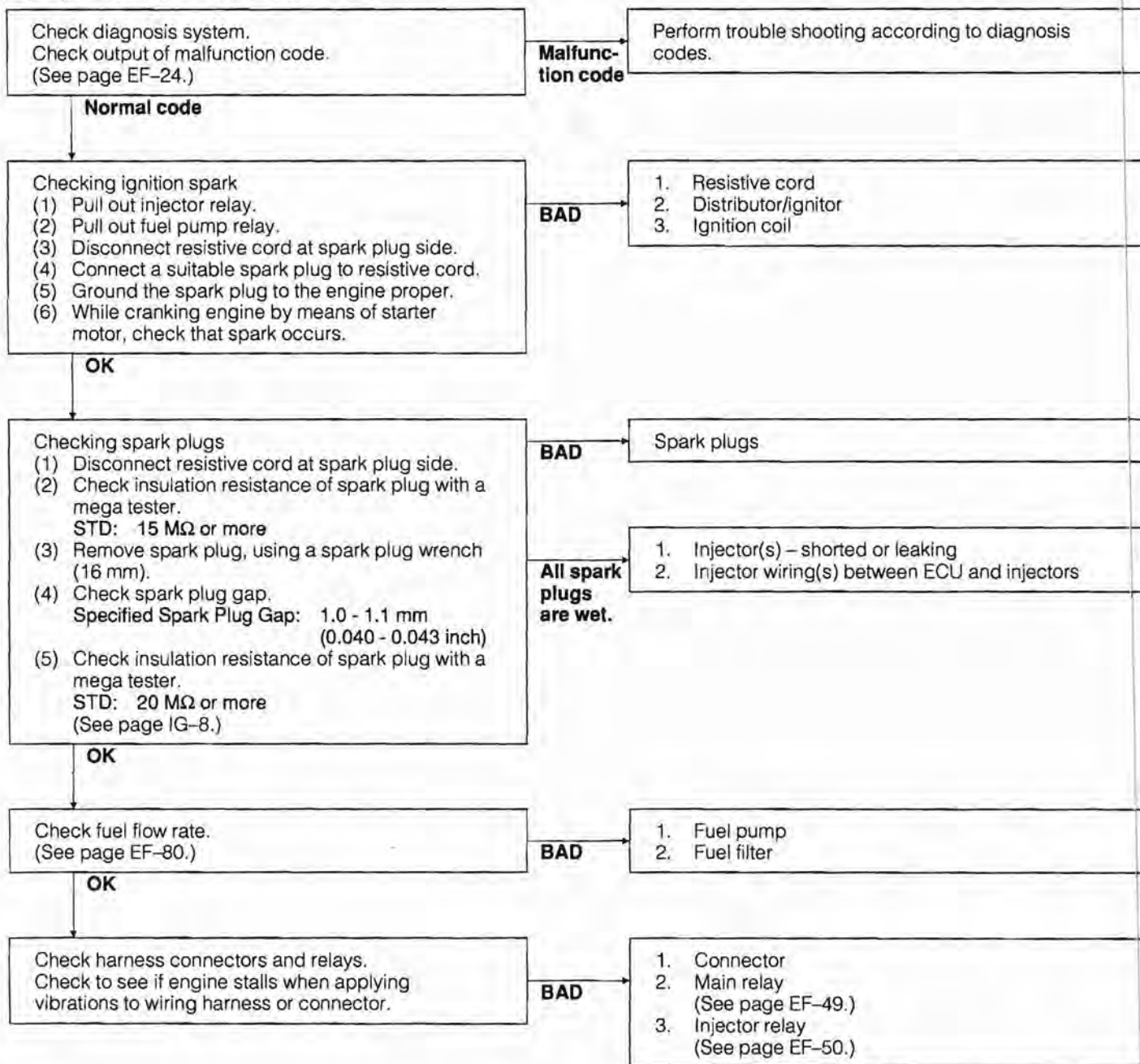
3 Symptom Engine stalls immediately after starting.



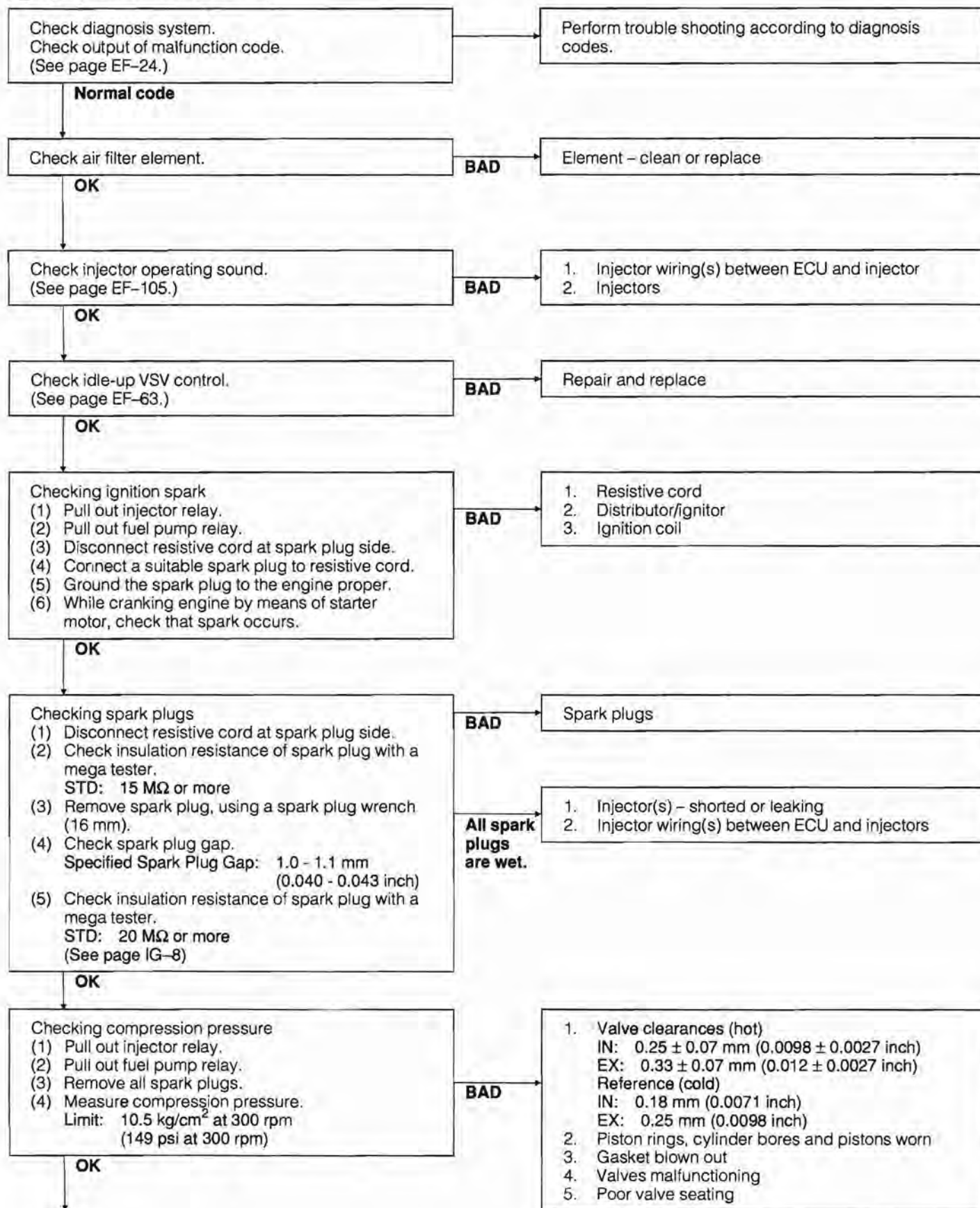
(Cont'd)



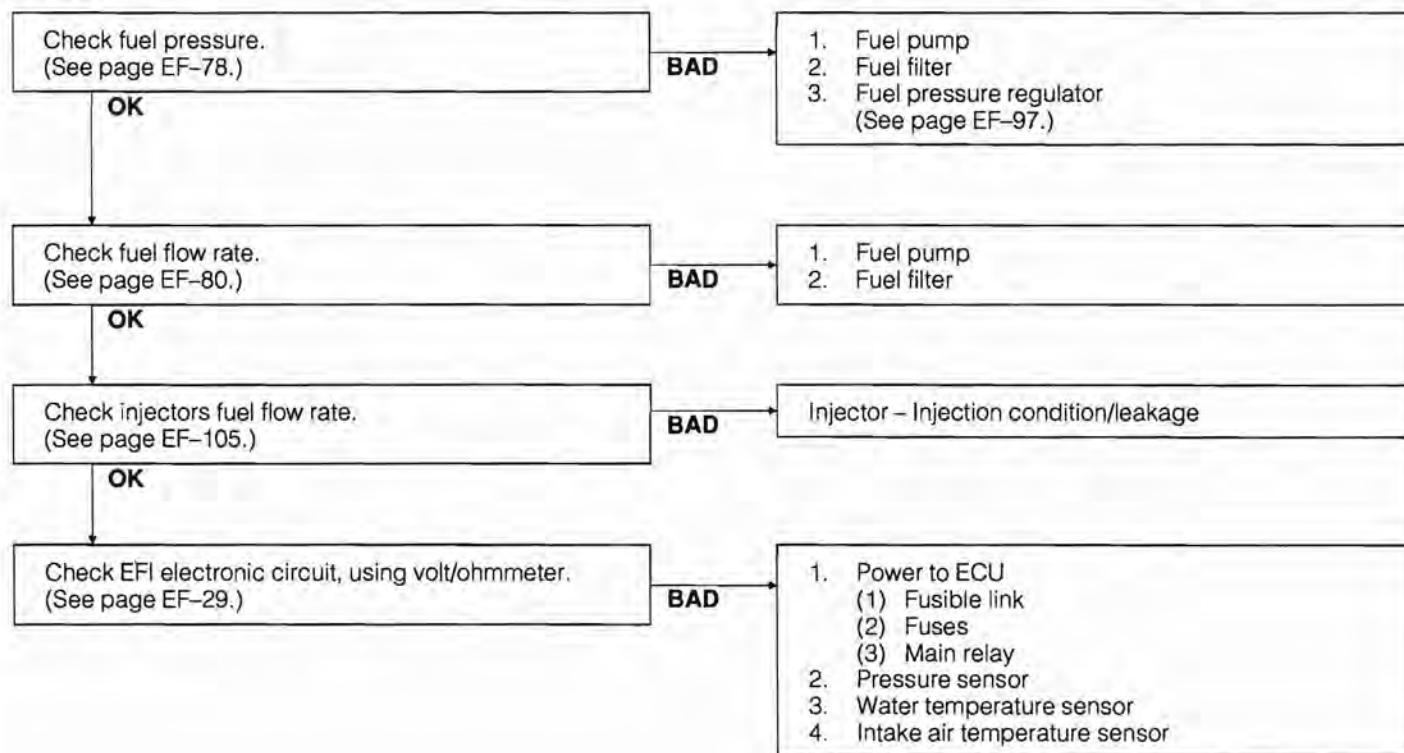
4 Symptom Engine often stalls.



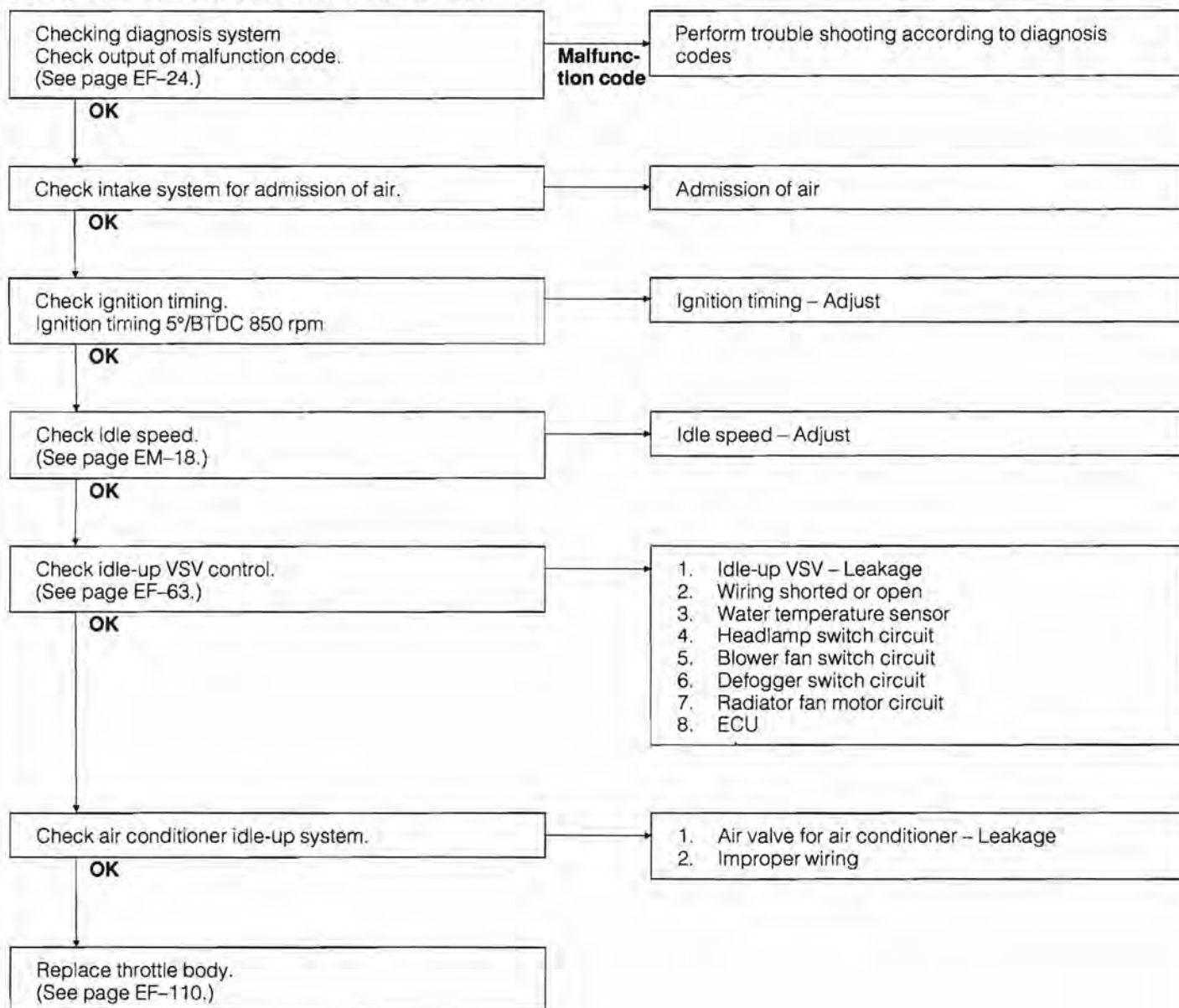
5 Symptom Hard starting



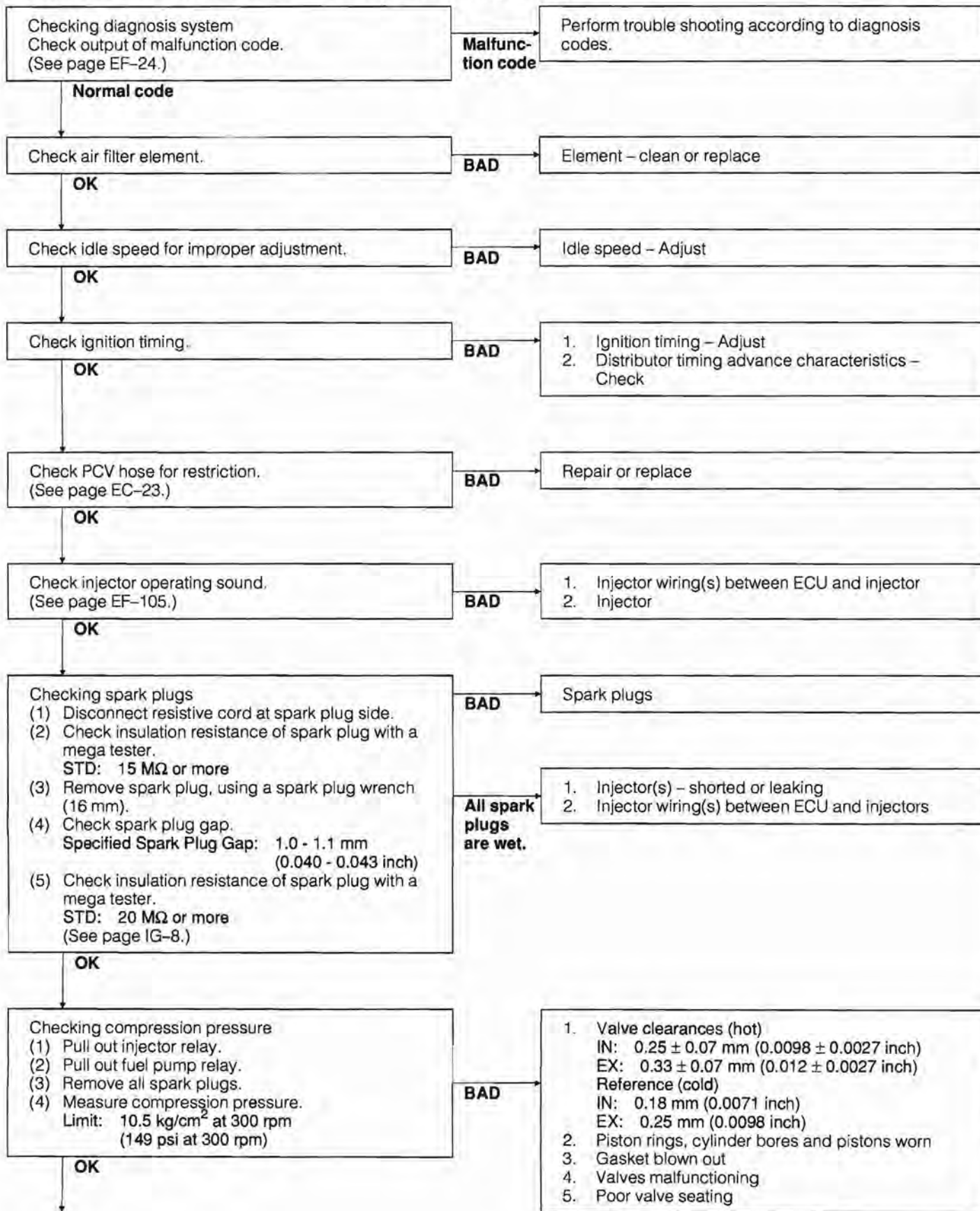
(Cont'd)



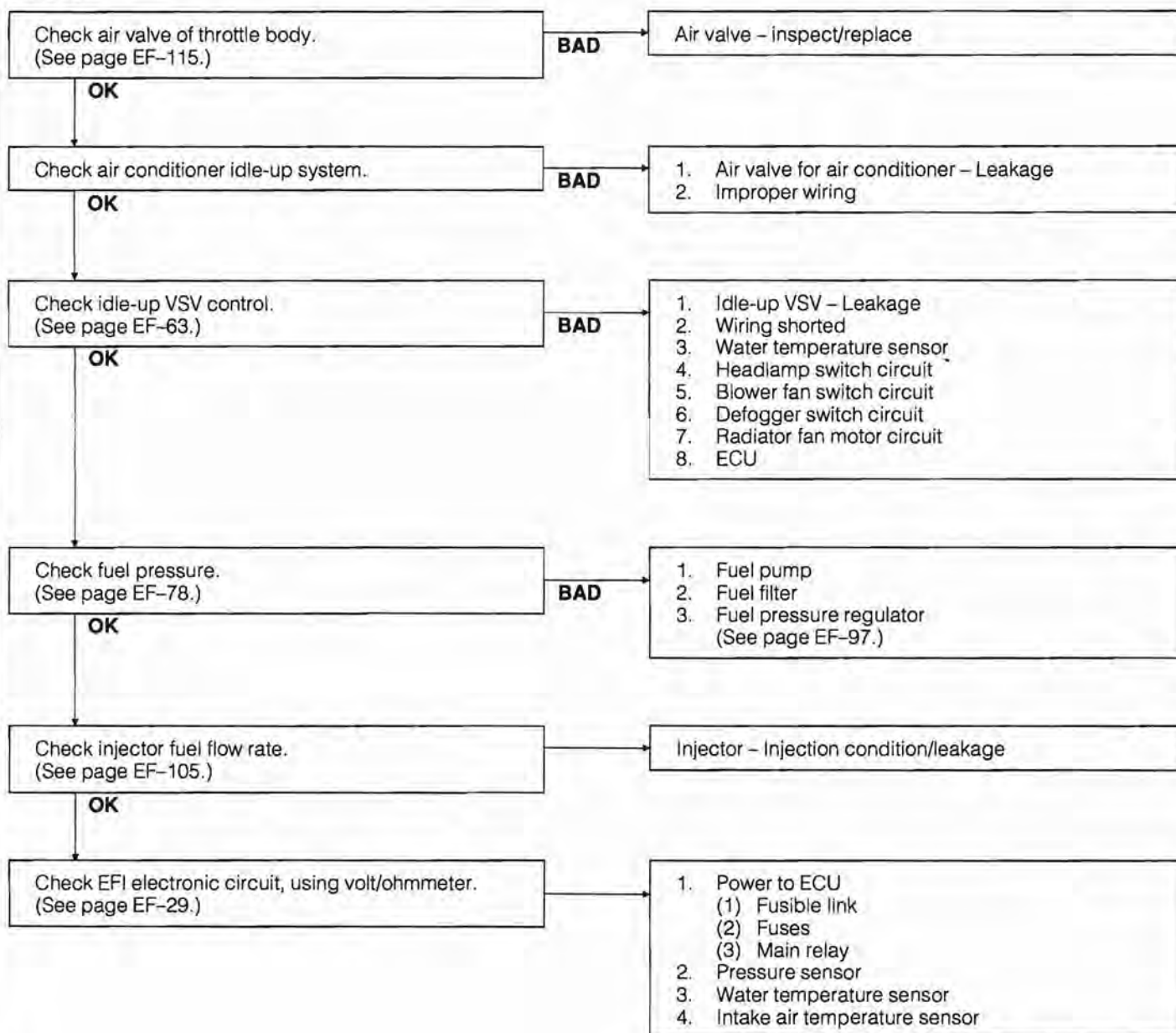
6 Symptom Engine idle speed too high



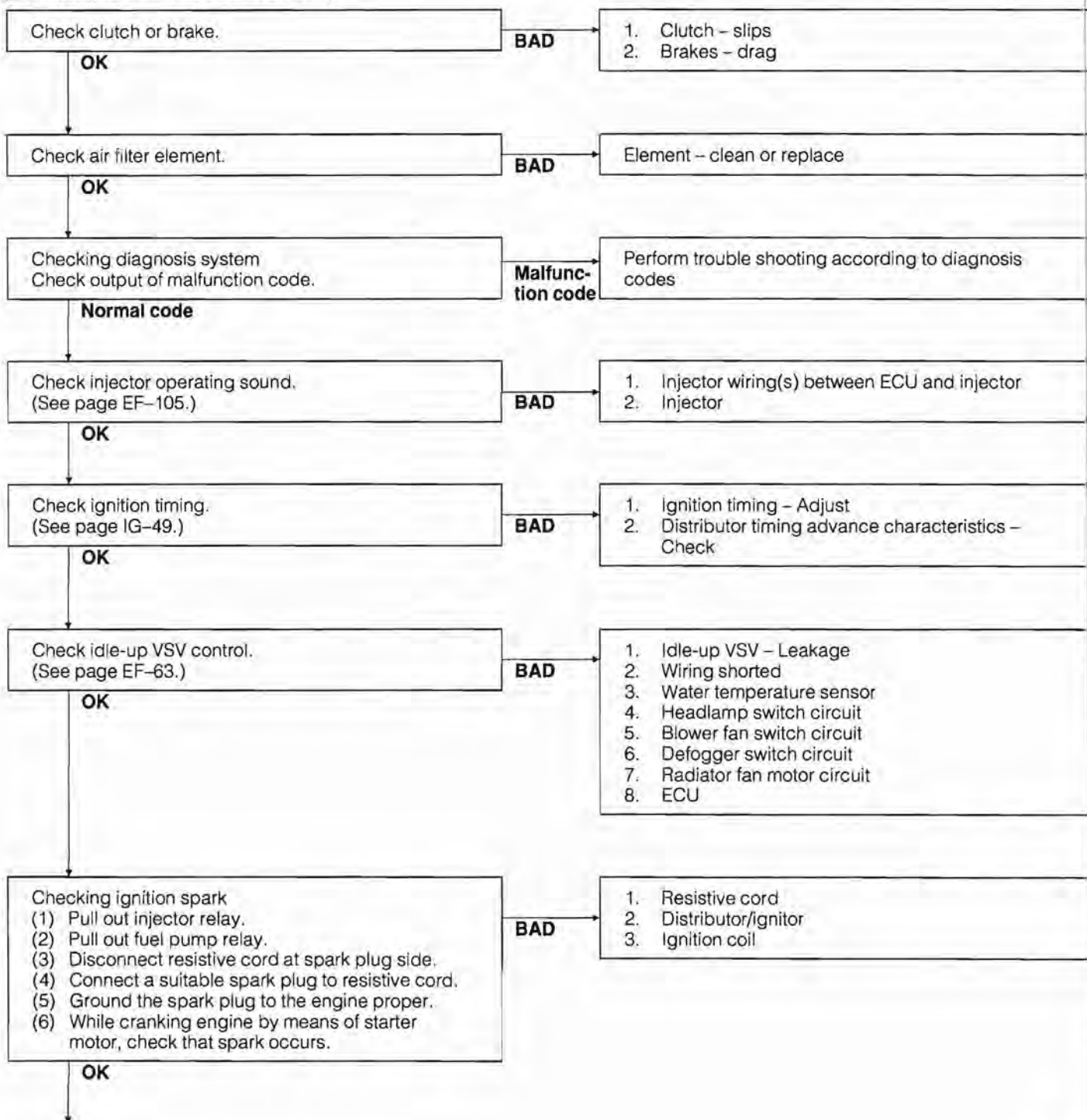
7 Symptom Engine idle speed too low and/or rough idling



(Cont'd)

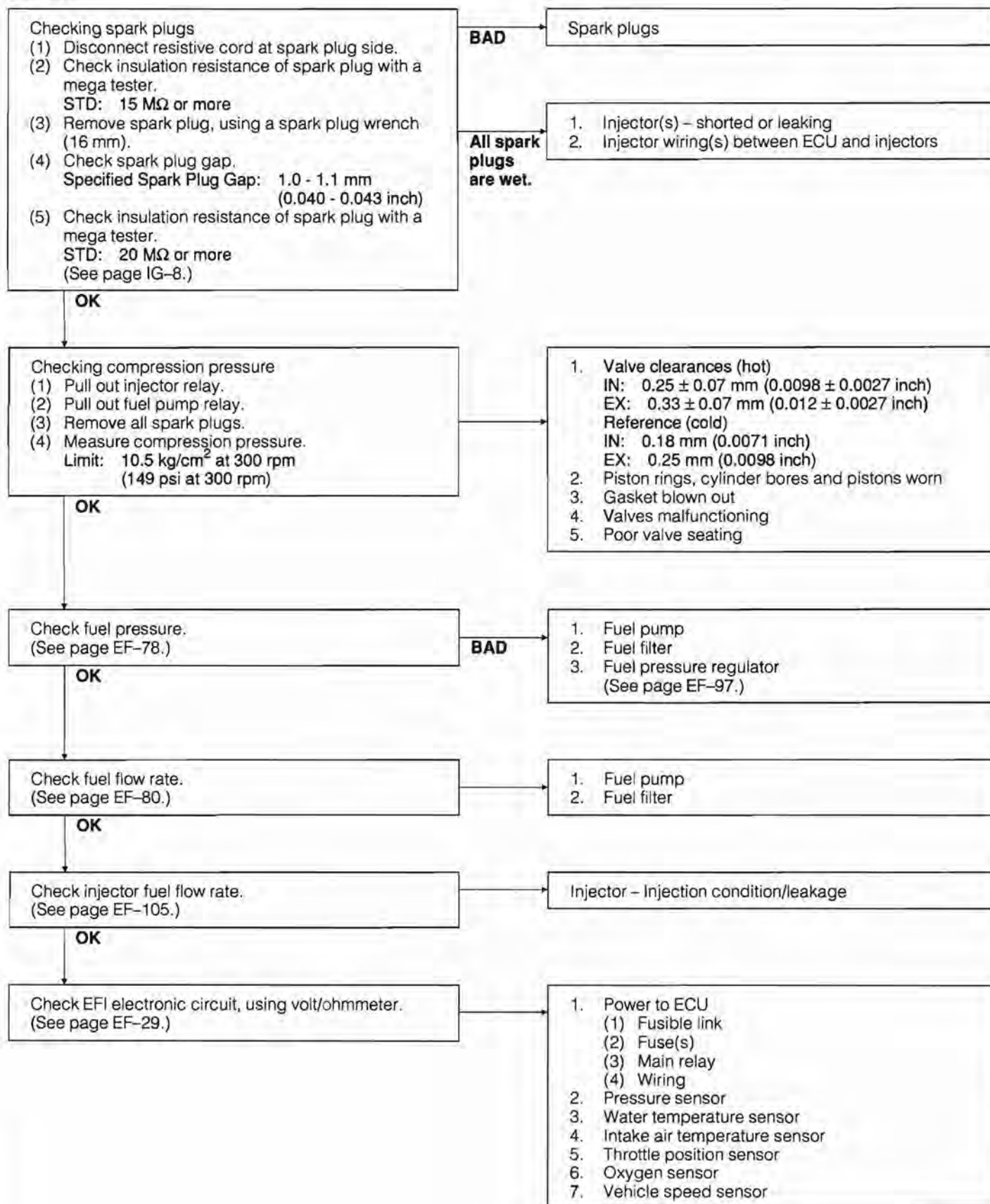


8 Symptom Poor driveability



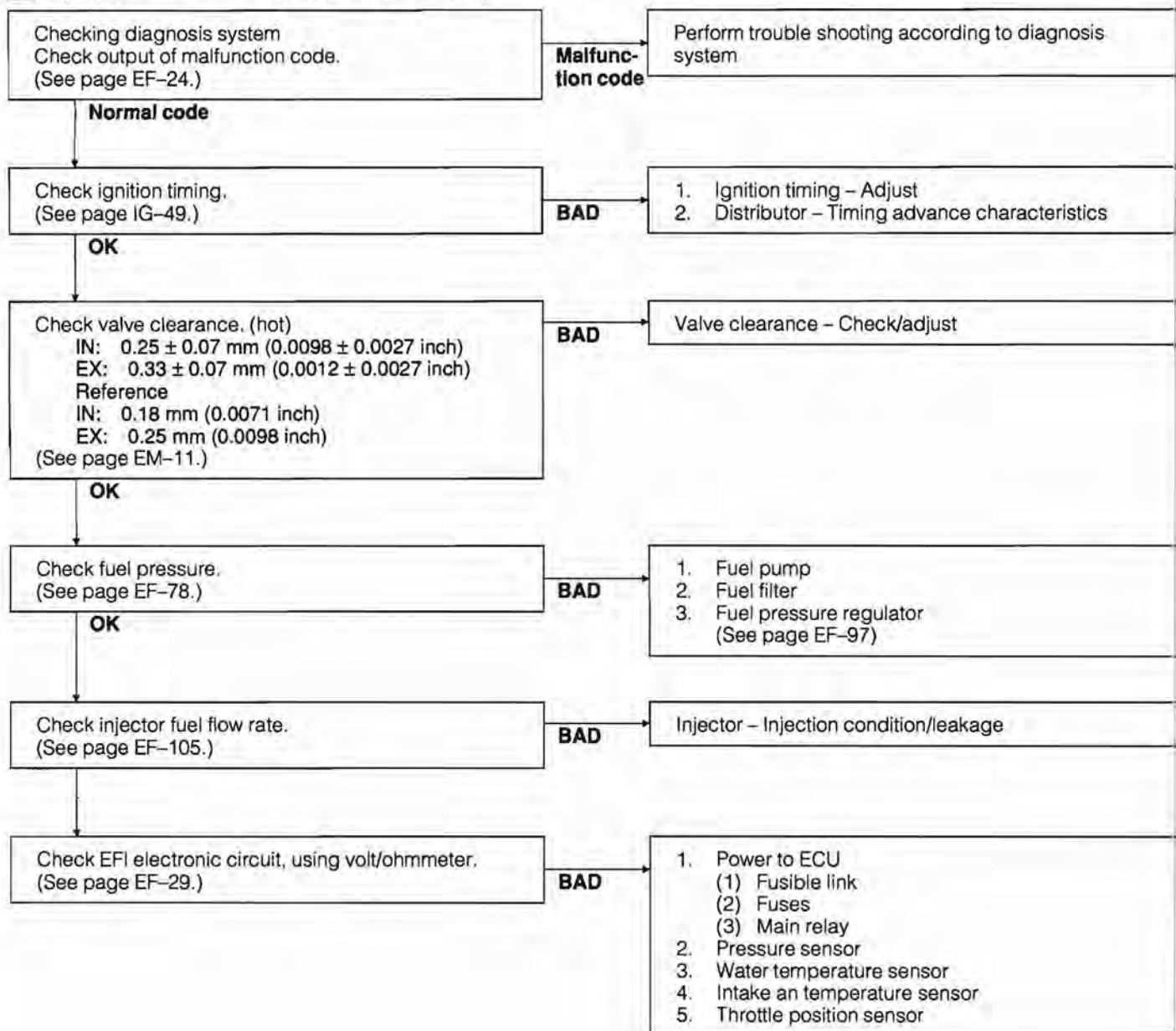
WR88-EF037

(Cont'd)

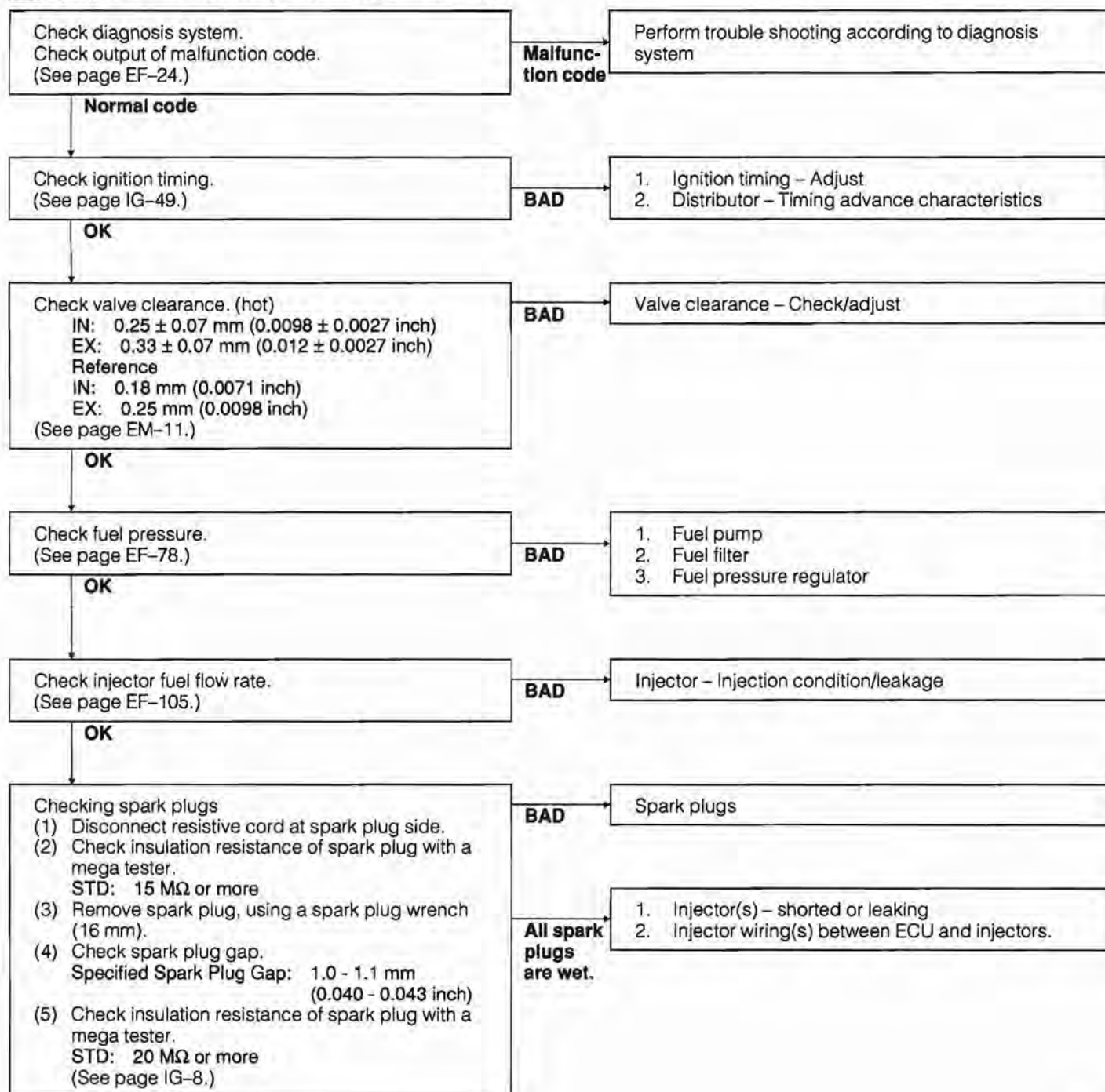


WR88-EF038

9 Symptom Backfire (Lean fuel mixture)



10 Symptom Afterfire (Rich mixture – Misfire)



WR88-EF040

DIAGNOSIS SYSTEM

Description

A self diagnosis system is built in the ECU. If any abnormality should occur in the signal systems of the various sensors, the self diagnosis system memorizes the malfunction code in the ECU. In respect to important abnormalities, the check engine lamp at the instrument panel goes on, thus warning the driver of the abnormality.

When the abnormality is cleared, the check engine lamp goes out.

When the T terminal of the check terminal is shorted with the ground terminal, the code number of the malfunction code that has been memorized in the ECU will be indicated in a form of flashing of the check engine lamp in the instrument panel.

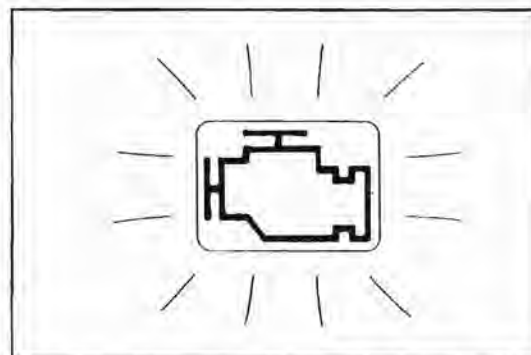
This memorized malfunction code number is erased when the battery ground cable is disconnected from the negative (-) terminal of the battery, or when the back-up fuse in the relay block assembly is disconnected with the ignition key switch turned OFF.

WR88-EF041

Check of "Check Engine" Warning Light

1. When the ignition switch is turned ON, the check engine lamp goes on.
(Engine is under a stopped state.)
If not, see page EF-28.
2. When the engine starts, the check engine lamp goes off.

If the check engine lamp remains illuminated, it indicates that the diagnosis system has detected system malfunctions.



WR88-EF042

Output of Diagnosis Codes

1. Initial conditions
 - (1) Battery voltage of 11 volts or more
 - (2) Throttle valve fully closed
 - (3) All accessory switches turned OFF

WR88-EF043

2. Short the Test terminal of the check terminal with the ground terminal, using the following SST.

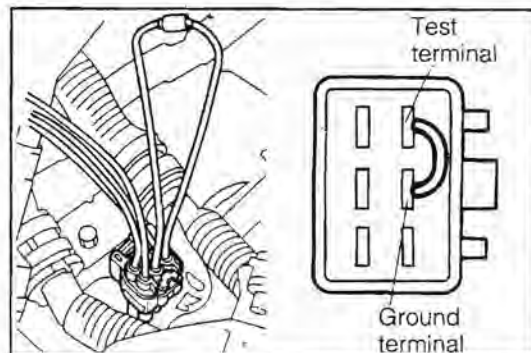
SST: 09991-87702-000

NOTE:

The check terminal is located at the upper section of the transmission.

CAUTION:

Care must be exercised to ensure that no connection is made on terminals except for those specified.

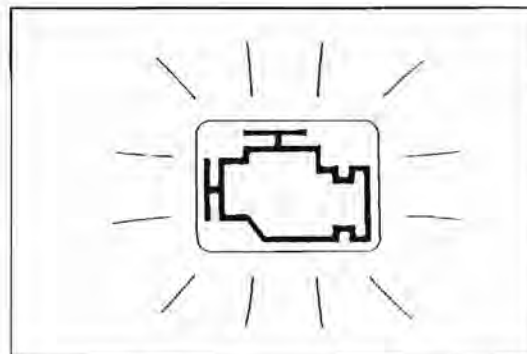


WR88-EF044

3. Set the ignition switch to ON position. At this time, be careful not to start the engine.
4. Read the diagnosis code by observing the flashing number of the check engine lamp.

NOTE:

If the check engine lamp fails to flash, it is likely that the ECU is malfunctioning. Hence, proceed to inspection of diagnosis system circuit.

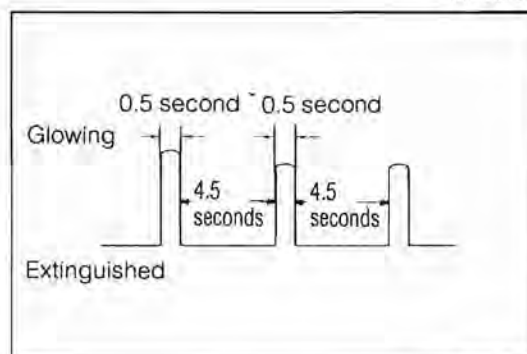


WR88-EF045

Output form of diagnosis code

- (1) Indication of normal code number
(Code number 1 – normal function)

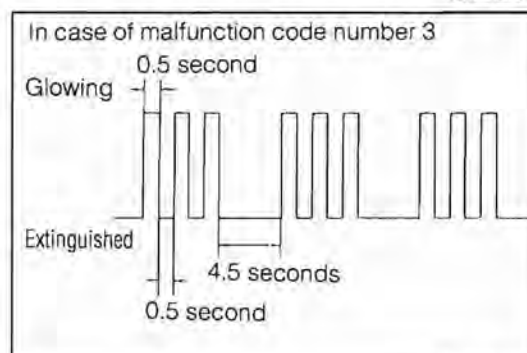
The check engine lamp glows for 0.5 second, 4.5 seconds later after the ignition key switch has been turned ON. After a lapse of 4.5 seconds, the check engine lamp again glows for 0.5 second. Then, this pattern will be repeated.



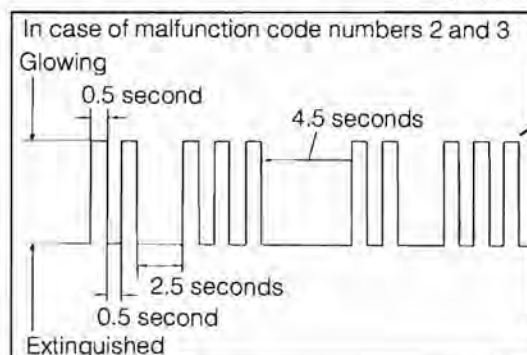
WR88-EF046

- (2) Indication of malfunction code number

- When one malfunction code number is indicated:
The check engine lamp repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 4.5 seconds, the check engine lamp again repeats glowing the same times as the number of the malfunction code at intervals of 0.5 second. Then, this pattern will be repeated.
- When plural malfunction code numbers are indicated:
The check engine lamp repeats glowing the same times as the number of the first malfunction code at intervals of 0.5 second, 4.5 seconds later after the ignition key switch is turned ON. After a lapse of 2.5 seconds, the check engine lamp repeats glowing the same times as the number of the next malfunction code at intervals of 0.5 second.
The memorized code numbers are indicated in the sequence of code number, starting from a smaller number.
The indication of the malfunction codes is repeated 4.5 seconds later after the memorized code numbers have been indicated.



WR88-EF047



WR88-EF048

5. After the diagnosis codes have been read, remove the SST at the check terminal.
6. Install the cap on the check terminal.

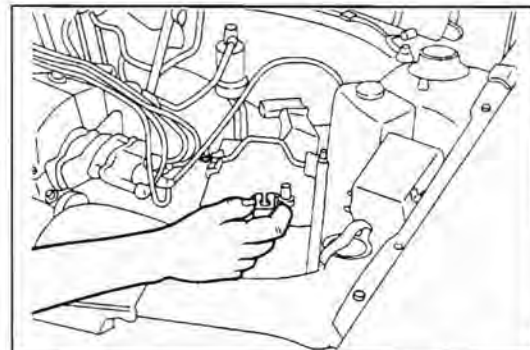
WR88-EF049

Cancelling Diagnosis Code

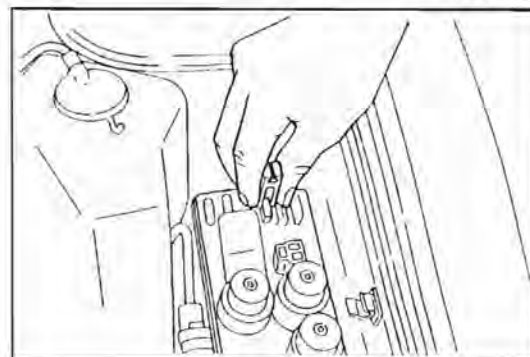
To erase the diagnosis codes memorized in the ECU after malfunctions have been repaired, disconnect the battery ground cable from the negative (-) terminal of the battery. Or disconnect the back-up fuse of the relay block assembly in the engine compartment for at least 10 seconds with the ignition switch turned OFF. (The ambient temperature should be below 20°C (68°F).)

NOTE:

When disconnecting the fuse, be sure to use a fuse puller. The fuse puller is located at the upper section of the fuse block in the vehicle interior.





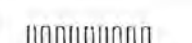


WR88-EF050



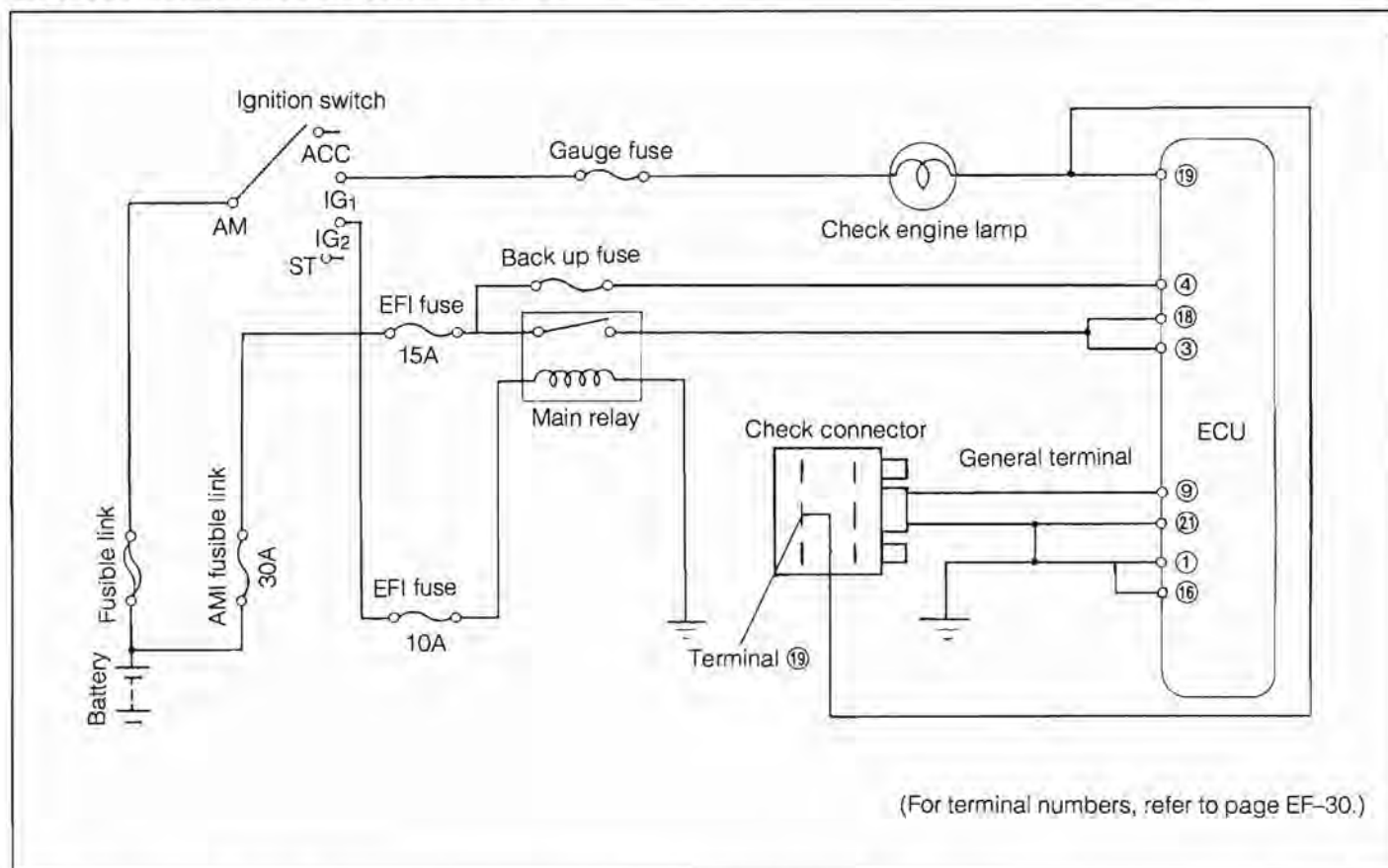
WR88-EF051

DIAGNOSIS CODE

Code No.	Number of glowing of check engine lamp	Diagnosis item	Diagnosis contents	Trouble area	See page
1		Normal	—	—	—
2		Pressure sensor	When the signal from pressure sensor becomes open or shorted.	1. Pressure sensor circuit 2. Pressure sensor 3. ECU	EF-35
3		Ignition signal	When the ignition signal fails to be inputted.	1. Ignition circuit 2. Ignitor and/or distributor 3. ECU	EF-37
4		Water temperature sensor	When the signal from the water temperature sensor becomes open or shorted.	1. Water temperature sensor circuit 2. Water temperature sensor 3. ECU	EF-38
5		Oxygen sensor signal and/or abnormal air-to-fuel ratio	<ul style="list-style-type: none"> When the signal from oxygen sensor becomes open or shorted under certain conditions When air-to-fuel ratio becomes too lean abnormally: 	1. Oxygen sensor circuit 2. Oxygen sensor 3. ECU 4. Fuel system 5. Pressure sensor	EF-39 EF-35
7		Throttle position sensor signal	<ul style="list-style-type: none"> When both idle switch and power switch enter "ON" conditions: 	1. Throttle position sensor circuit 2. Throttle position sensor 3. ECU	EF-40
8		Intake air temperature sensor signal	<ul style="list-style-type: none"> When the signal from the intake air temperature sensor becomes open or shorted. 	1. Air temperature sensor circuit 2. Air temperature sensor 3. ECU	EF-41
9		Vehicle speed sensor signal	<ul style="list-style-type: none"> When the vehicle speed sensor signal becomes open or shorted under certain conditions 	1. Vehicle speed sensor circuit 2. Vehicle speed sensor 3. ECU	EF-42
10		Starter signal	When the starter signal becomes open or shorted. However, it should be noted that this code may be memorized when the vehicle is started by being pushed.	1. Starter signal circuit 2. ECU	EF-43
11		Switch signal	<p>When even if one of the following conditions is satisfied with the test terminal shorted with ground terminal:</p> <ul style="list-style-type: none"> when the idle switch is turned OFF when the air condition switch is turned ON when the shift lever is placed in ranges other than parking range or neutral range on A/T vehicle <p>However, no memorizing will take place.</p>	1. Air conditioner switch circuit 2. Idle switch circuit 3. Air conditioner switch 4. Throttle position sensor (idle switch) 5. Neutral start switch circuit 6. Neutral start switch 7. ECU	EF-44

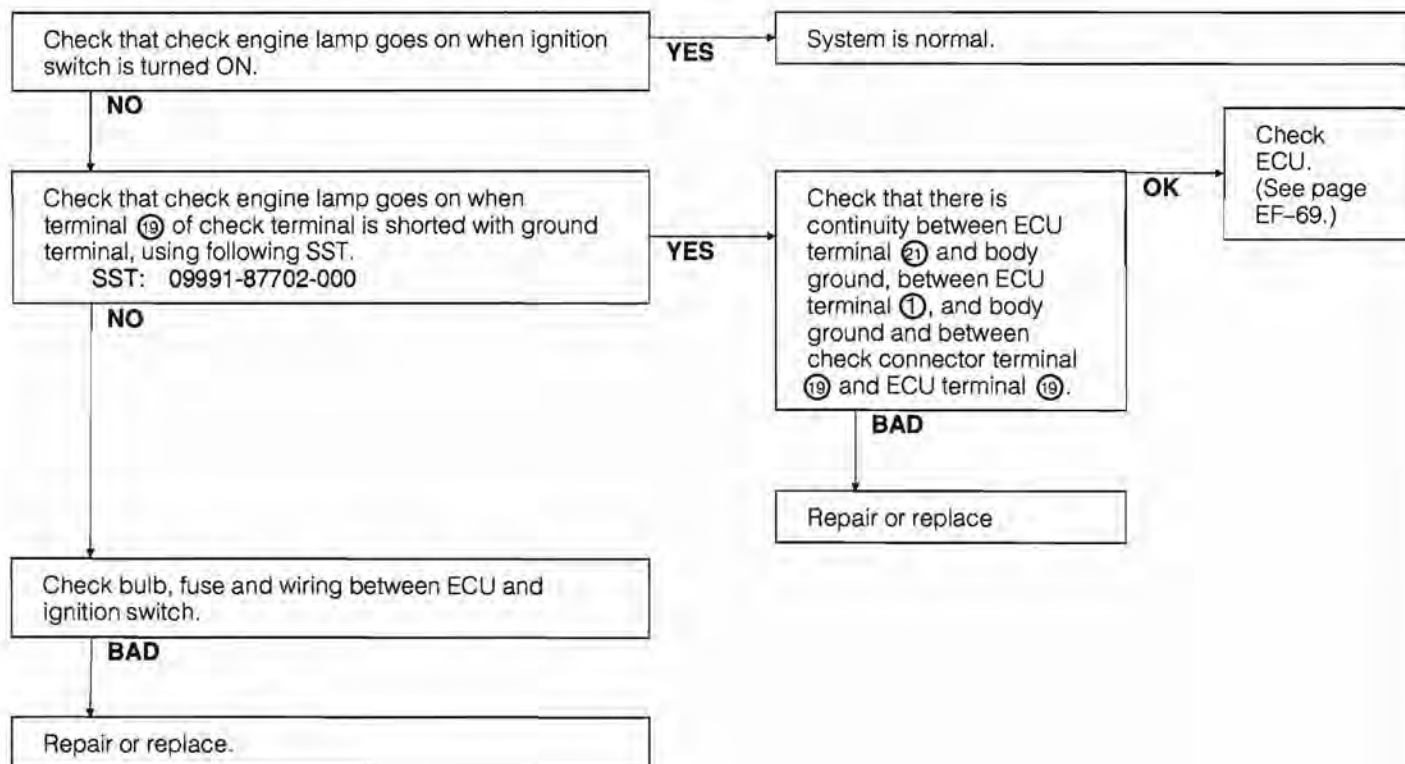
WR88-EF052

Inspection of Diagnosis System Circuit

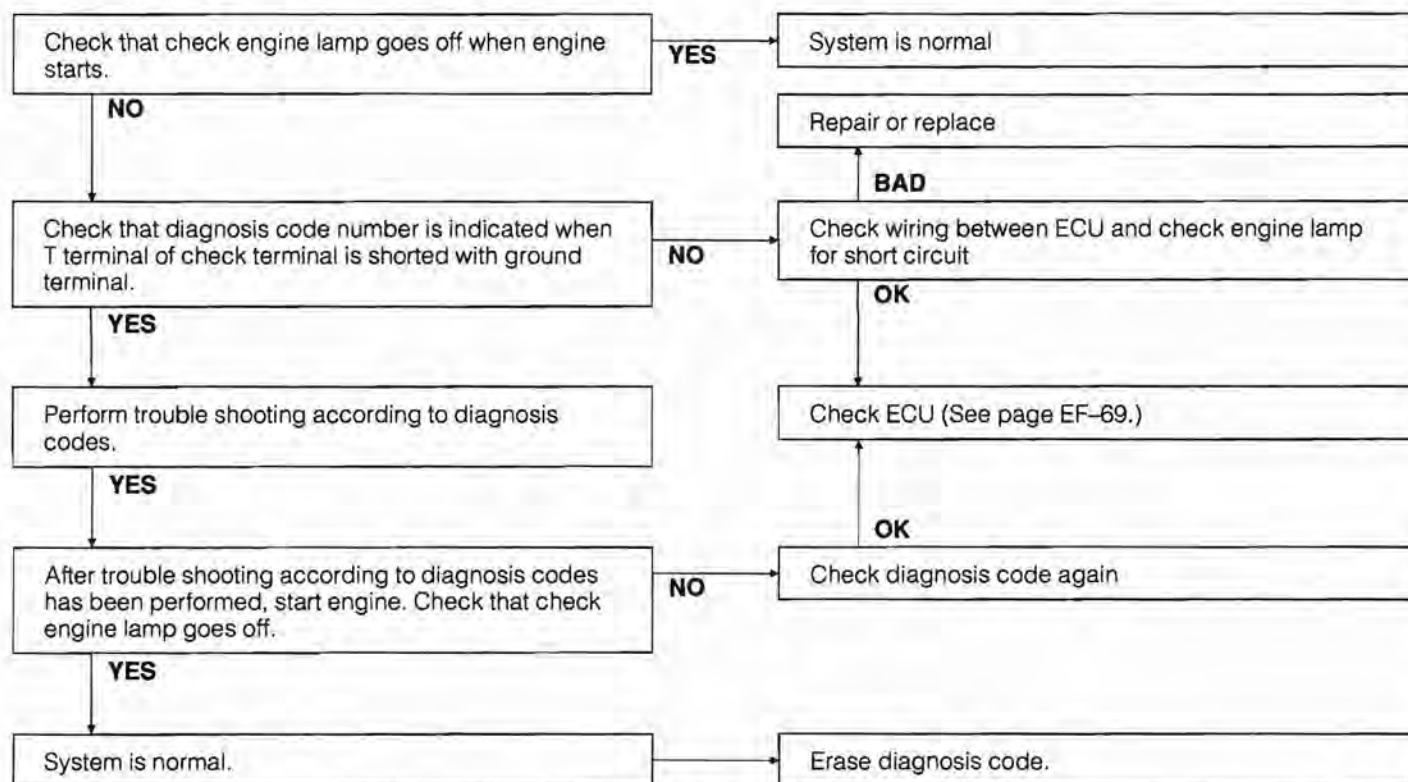


If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

1



2



WR88-EF055

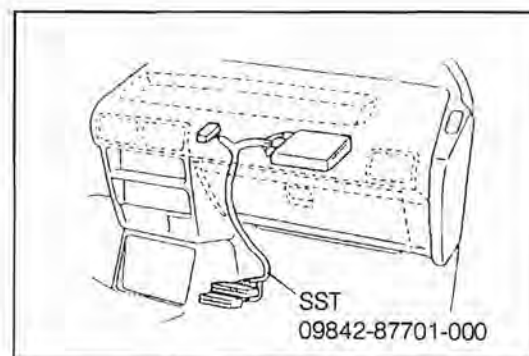
TROUBLE SHOOTING WITH VOLT/OHMMETER

Preparation of Trouble Shooting

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Remove the glove compartment box.
3. Install the SST between the ECU and the engine harness.
SST: 09842-87701-000
4. Reconnect the battery ground cable to the negative (-) terminal of the battery.

CAUTION:

- After completion of the inspection, before the SST is removed, be sure to disconnect the battery ground cable from the negative (-) battery terminal. After the ECU and engine harness have been connected, reconnect the battery ground cable to the negative (-) battery terminal.
- As for the SST, before it is connected, make sure that there is no open circuit or short between its terminal.



WR88-EF056

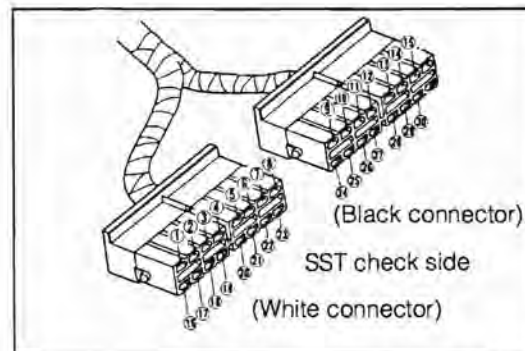
Check Procedure for EFI System

NOTE:

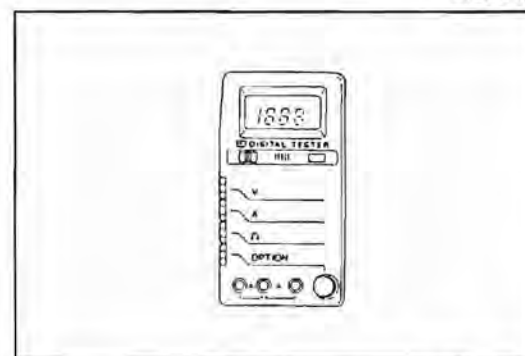
1. The EFI circuit can be checked by measuring the resistance and voltage at the SST terminals.
2. The voltage check should be conducted under a condition where all connectors are connected.
3. Make sure that the battery voltage is 11 volts or more when the ignition switch is turned ON.
 - For the check, use such a voltmeter (circuit tester) whose internal impedance is 10 k Ω /V or more. Furthermore, be sure to employ a meter whose resolution is 0.1V or more, 0.5 Ω or more and whose accuracy is $\pm 2\%$ or more.

NOTE:

If any problem is encountered during this check, see the section under "Trouble Shooting for EFI Electronic Circuit with Volt/Ohmmeter."



WR88-EF057



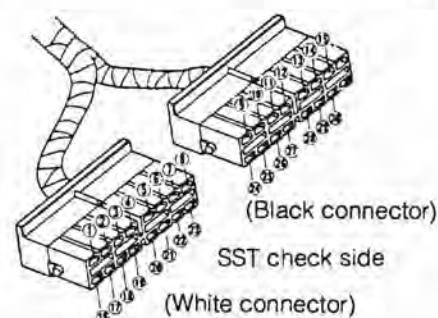
WR88-EF058

ECU CONNECTORS

No.	Contents of connection	No.	Contents of connection
1	Power ground	16	Power ground
2	Injector	17	Injector
3	Battery +B (Main relay)	18	Battery +B (Main relay)
4	Battery +B (Back-up)	19	Check engine lamp
5	Idle-up VSV	20	Fuel pump relay
6	Feedback check terminal	21	Engine ground
7	Ignition coil (negative)	22	Pressure sensor ground
8	Starter switch	23	Air conditioner magnet clutch
9	Test terminal	24	Shift position switch
10	Idle switch	25	AT/MT detecting terminal
11	Electric load signal	26	Vehicle speed sensor
12	Sensor power supply	27	Shift position switch
13	Pressure sensor	28	Power switch
14	Intake air temperature sensor	29	Oxygen sensor
15	Cooling water temperature sensor	30	Sensor ground

WR88-EF059

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
30	29	28	27	26	25	24	23	22	21	20	19	18	17	16



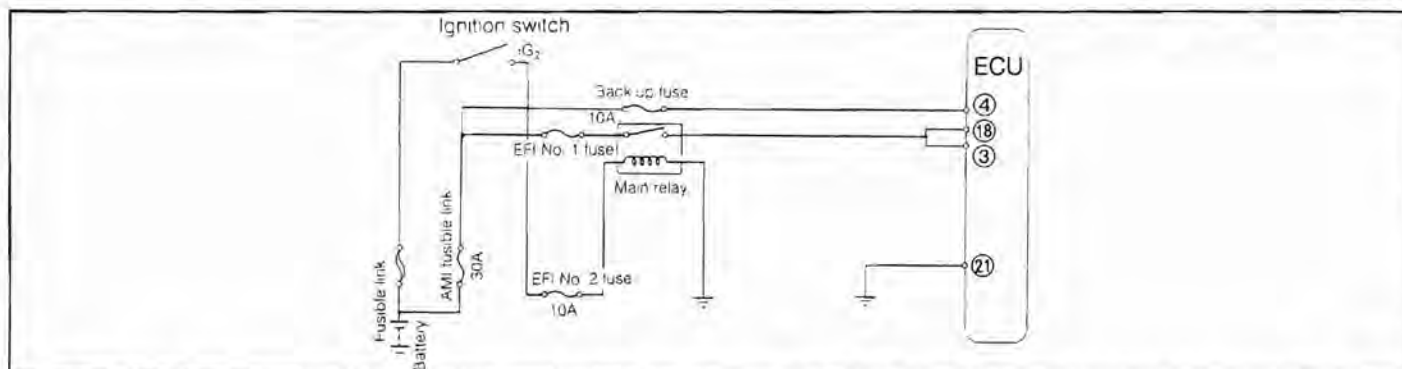
Voltage at ECU Wiring Connectors

No.	Terminal code (SST terminal)		STD voltage (V)	Conditions		See page
1	④ - ②① Negative		10 - 15.5	All time		EF-33
	⑬ - ②①			Ignition switch ON		EF-33
	⑱ - ②①			Ignition switch ON		EF-33
2	⑫ - ②②		4.5 - 5.5	Ignition switch ON		EF-35
	⑬ - ②②		3.2 - 3.8	Ignition switch ON	When atmospheric pressure is 760 mmHg (29.9 inchHg)	EF-35
3	⑦ - ②①		10 - 15.5	Ignition switch ON		EF-37
4	⑮ - ③①		0.40 - 0.55	Ignition switch ON	After engine has fully warmed up Cooling water temperature: 80 - 90°C (176 - 194°F)	EF-38
5	⑳ - ②①		Voltage changes more than 8 times within 10 seconds	Ignition switch ON	When engine speed is held at 3000 rpm for two minutes after engine has fully warmed up:	EF-39
7	M/T vehicle	㉔ - ②①	4.5 - 5.5	Ignition switch ON	Throttle valve fully closed	EF-40
			1.0 or less	Ignition switch ON	Throttle valve fully opened	
	A/T vehicle	㉔ - ②①	1.0 or less	Ignition switch ON	Throttle valve fully closed	EF-40
			4.5 - 5.5	Ignition switch ON	Throttle valve fully opened	
8	⑭ - ③①		0.9 - 3.0	Ignition switch ON	Air temperature inside surge tank: 20°C (68°F)	EF-41
9	㉔ - ②①		0 - 10 to 15.5	Ignition switch ON	When vehicle is moved: (Voltage changes 4 times while vehicle moves 1.5m)	EF-42
10	⑮ - ②①		6 - 15.5	When ignition switch is set to ST position:		EF-43
11	㉔ - ②①		10 - 15.5	Ignition switch ON	When engine rotating, air conditioner switch turned ON and compressor operating:	EF-44
	⑩ - ③①		1.0 or less	Ignition switch ON	Throttle valve fully closed	EF-44
			10 - 15.5	Ignition switch ON	Throttle valve fully opened	EF-44
	㉗ - ②①		1.0 or less	Ignition switch ON	When shift lever is shifted to D, 2 or L range: (A/T vehicle only)	EF-44
	㉘ - ②①		10.0 - 15.5	Ignition switch ON	When shift lever is shifted to reverse range: (A/T vehicle only)	EF-44

WR88-EF060

No.	Terminals	Trouble	Conditions	STD voltage
1	④ - ②①	No voltage	At all times (But, voltage drops during engine starting period.)	10 - 15.5
	③ - ②①	No voltage	Ignition switch ON	10 - 15.5
	⑱ - ②①			

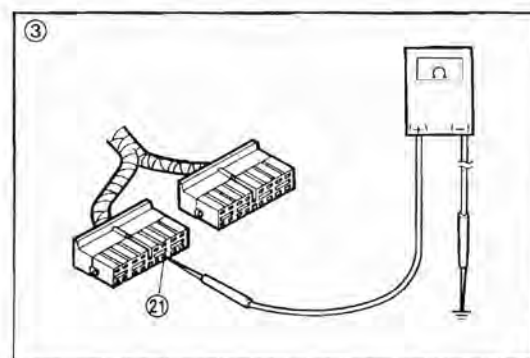
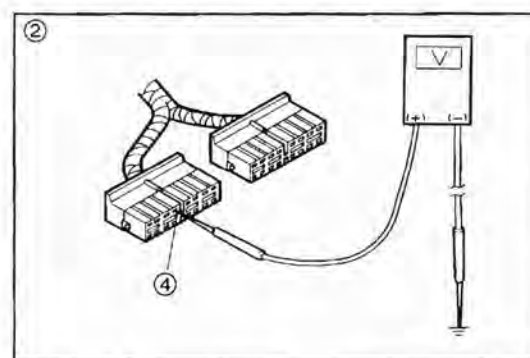
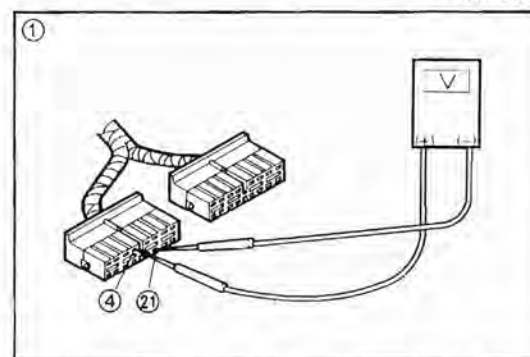
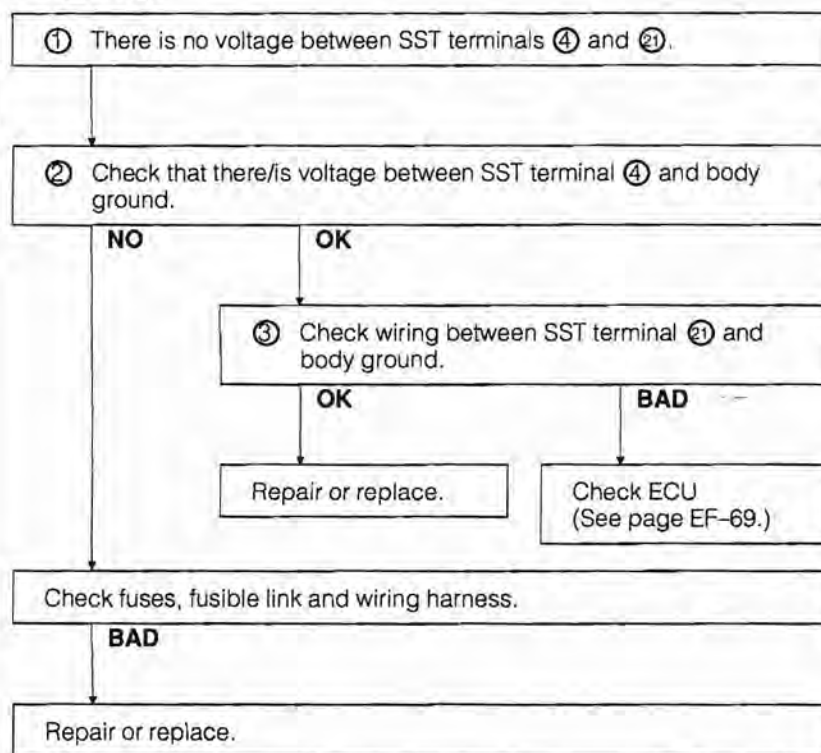
WR88-EF062



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

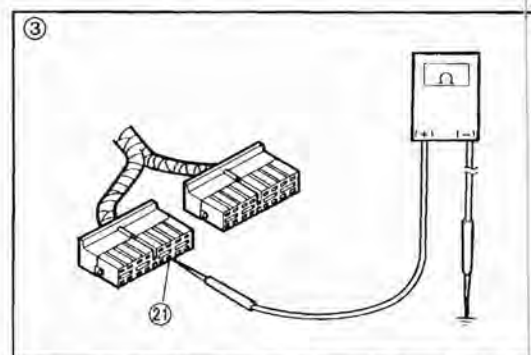
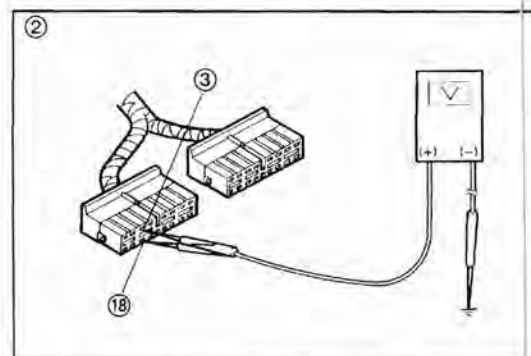
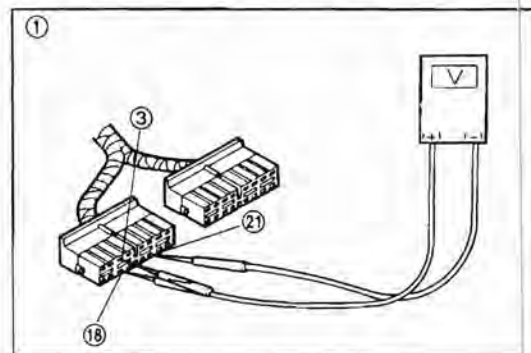
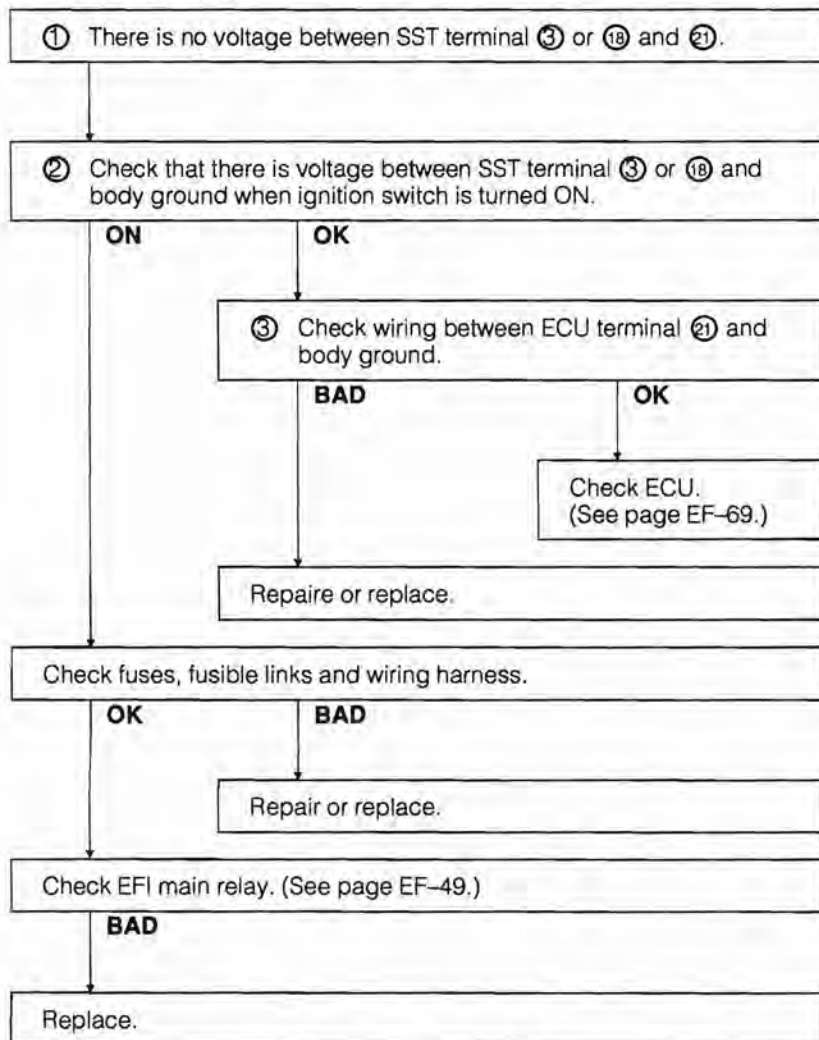
WR88-EF063

④ - ②①



WR88-EF064

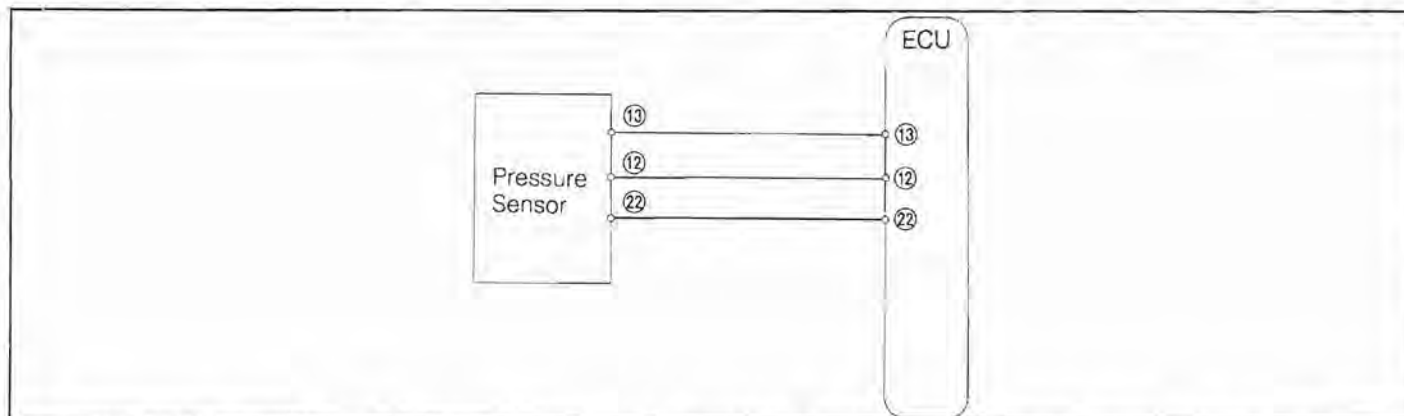
• ③ or ⑱ - ⑳



WR88-EF015

No.	Terminals	Trouble	Conditions	STD voltage
2	⑫ - ⑫	No voltage	Ignition switch ON	4.5 - 5.5
	⑬ - ⑫		Ignition switch ON At time of atmospheric pressure of 760 mmHg	3.2 - 3.8

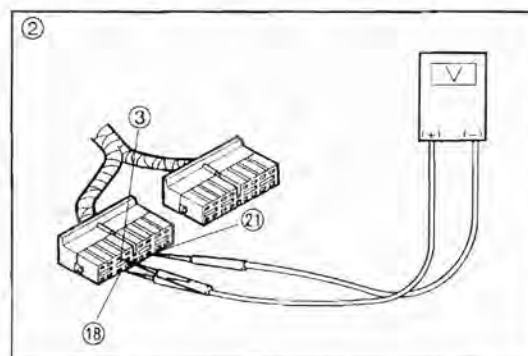
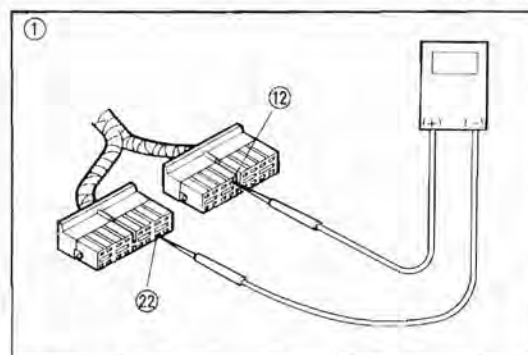
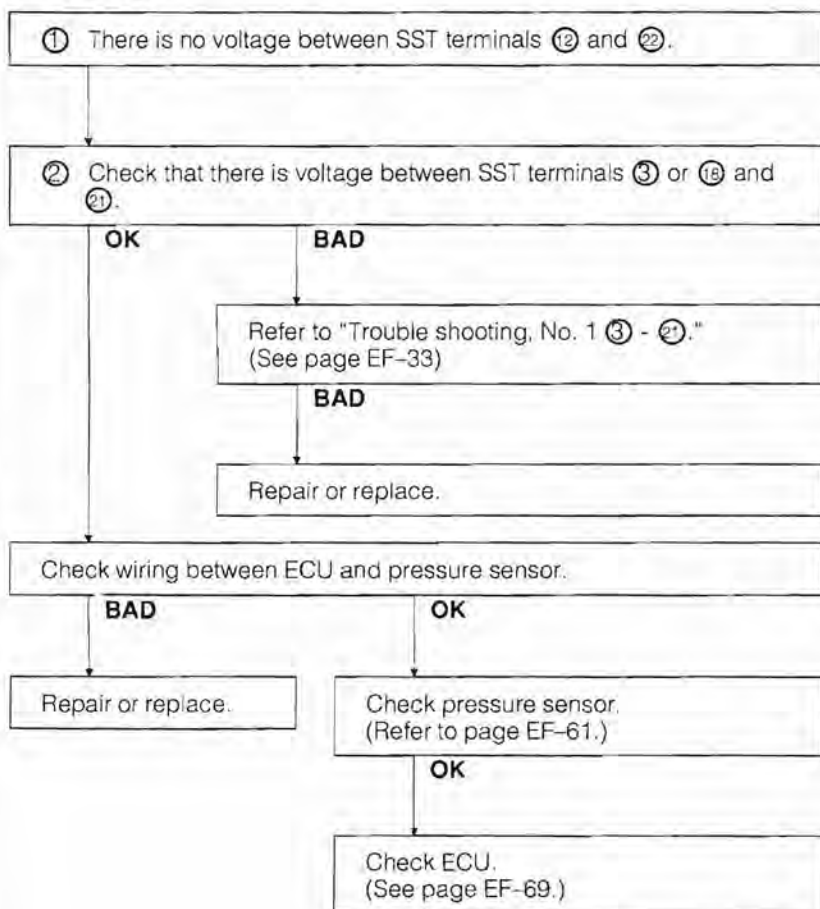
WR88-EF066



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

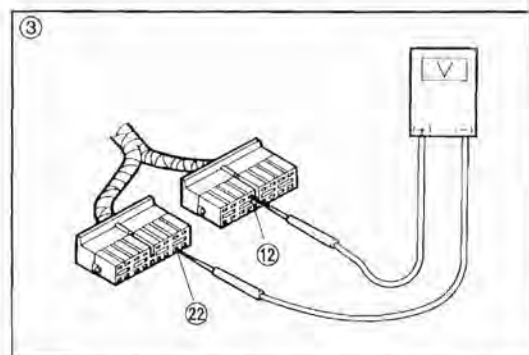
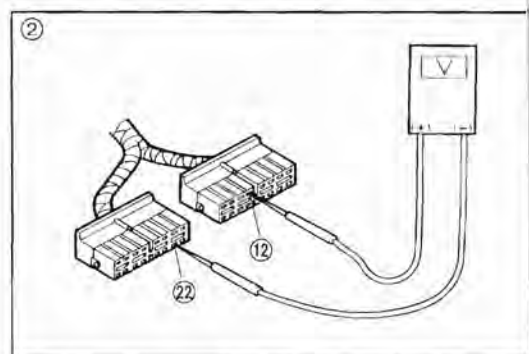
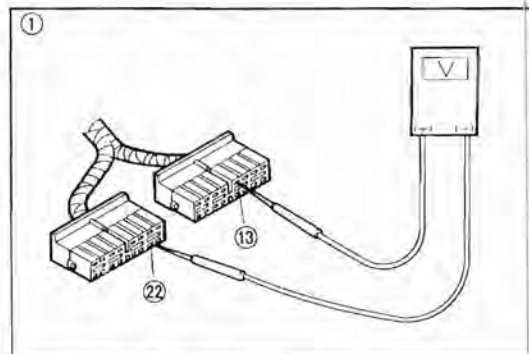
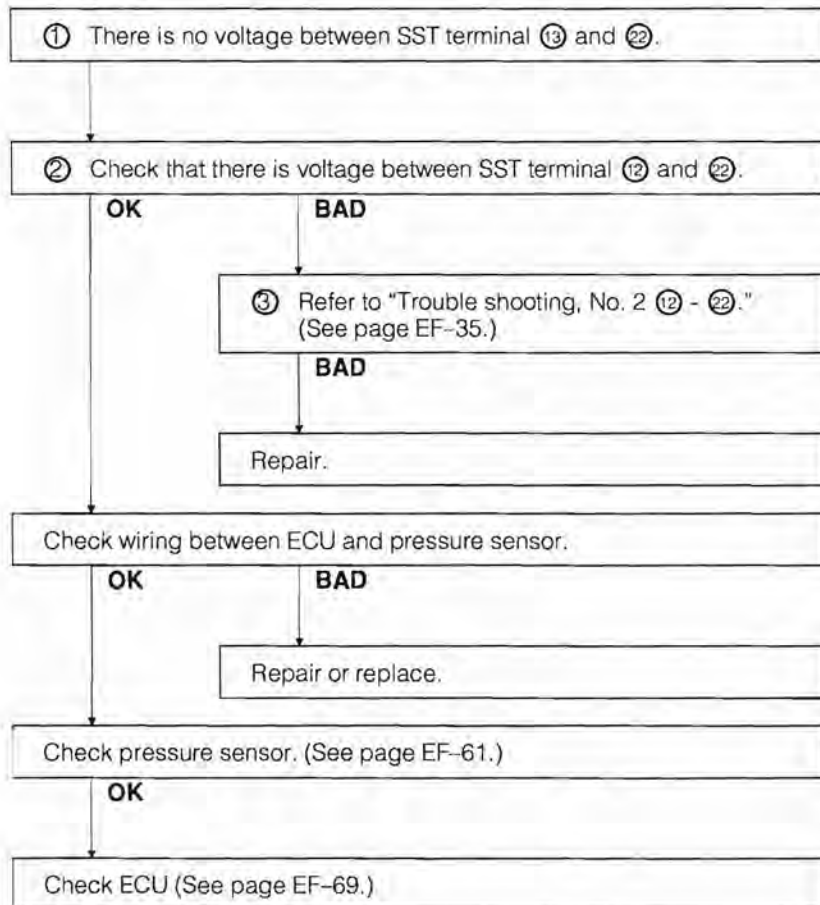
WR88-EF067

• ⑫ - ⑫



WR88-EF068

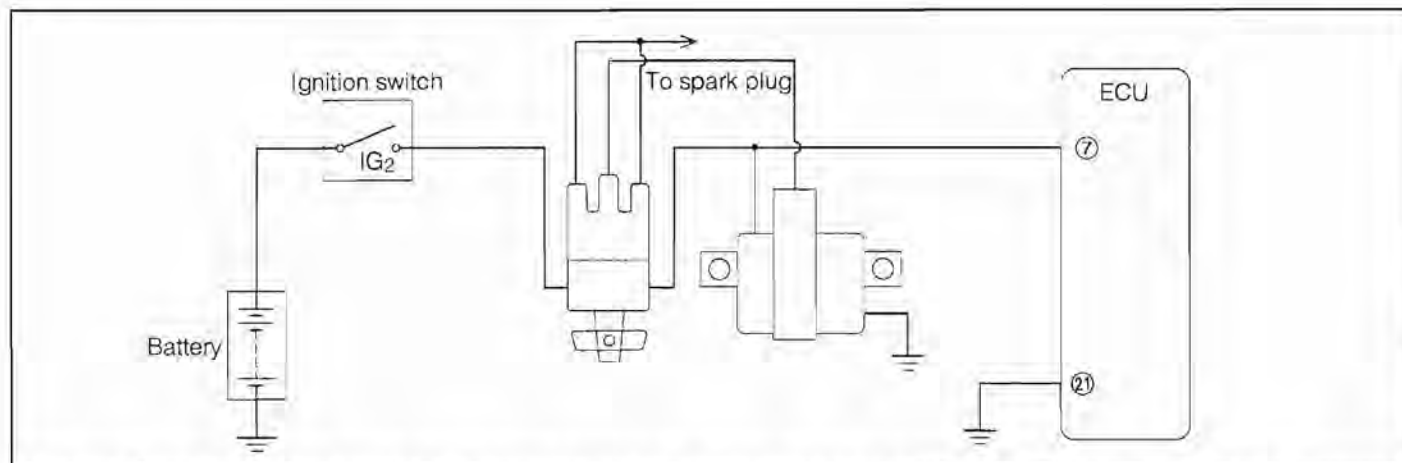
• ⑬ - ②②



WR88-EF069

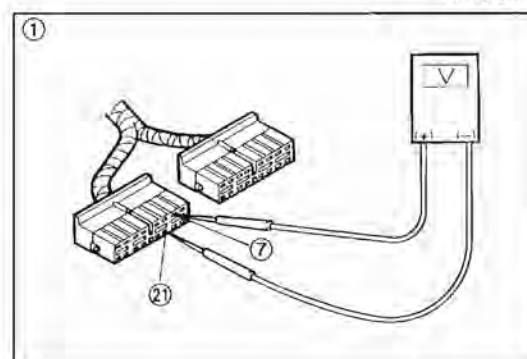
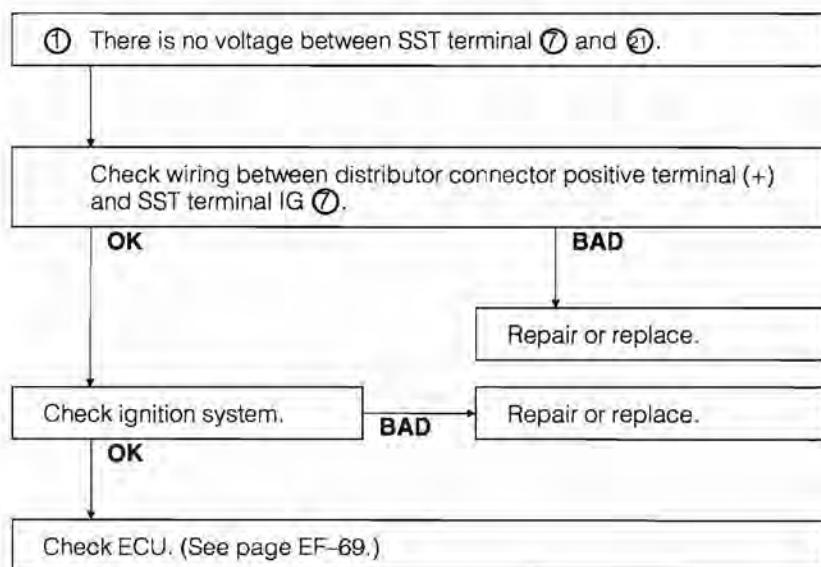
No.	Terminals	Trouble	Conditions	STD voltage
3	⑦ - ⑳ Ground	No voltage	Ignition switch ON	10 - 15.5

WR88-EF070



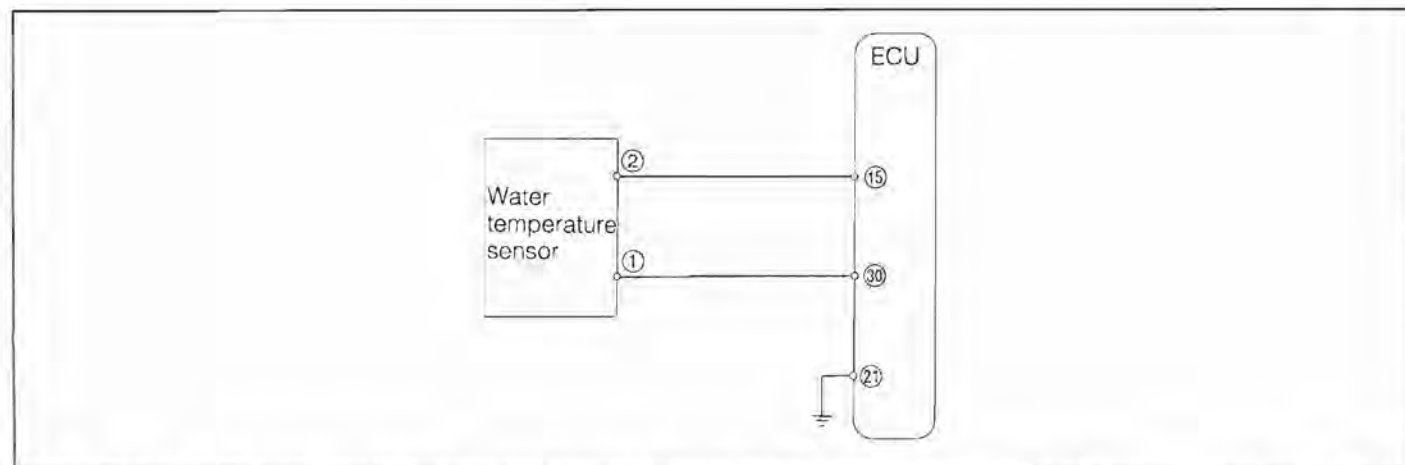
If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

WR88-EF071



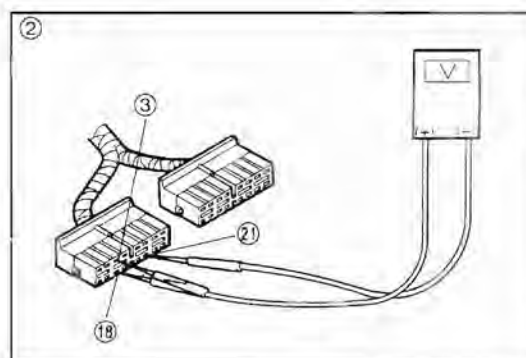
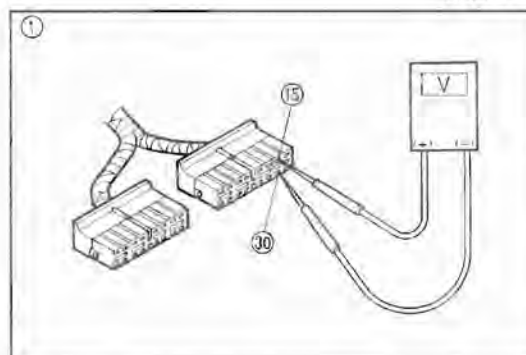
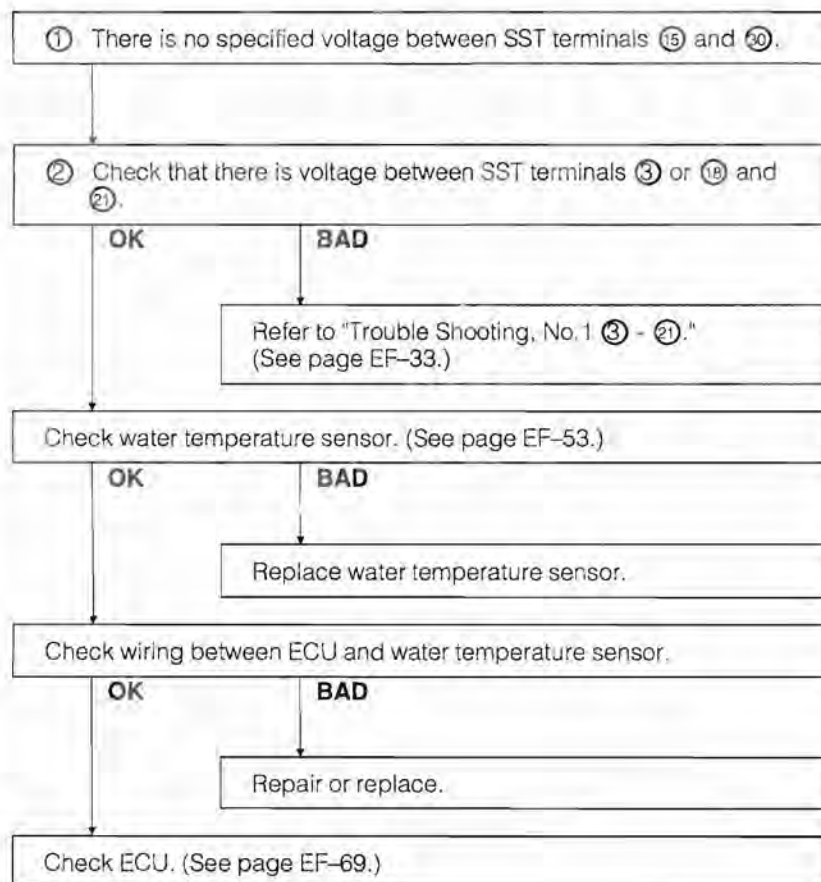
No.	Terminals	Trouble	Conditions		STD voltage
4	⑮ - ⑳	No voltage	Ignition switch ON	Coolant temperature 80 - 90°C (176 - 194°F)	0.40 - 0.55

WR88-EF073



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

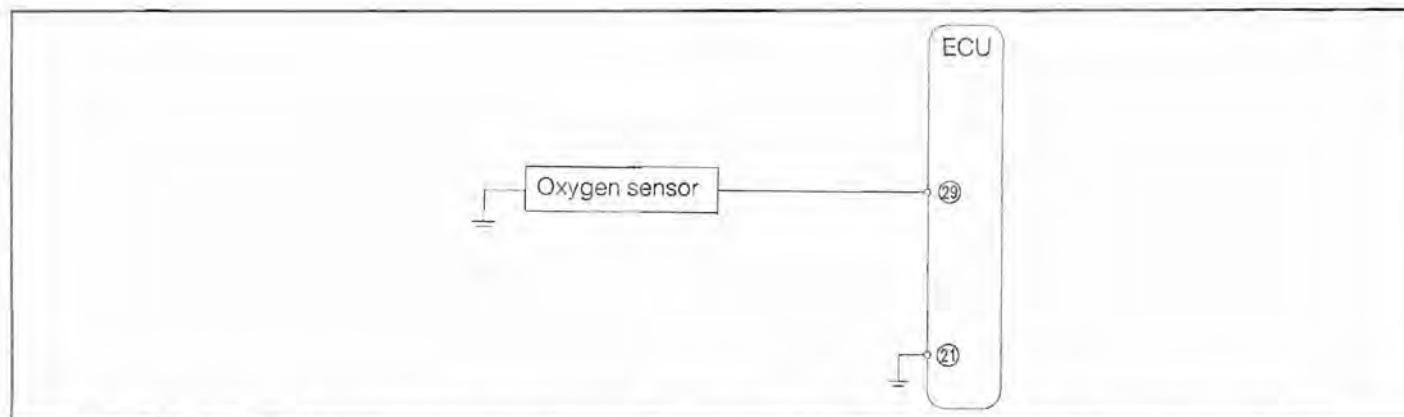
WR88-EF074



WR88-EF075

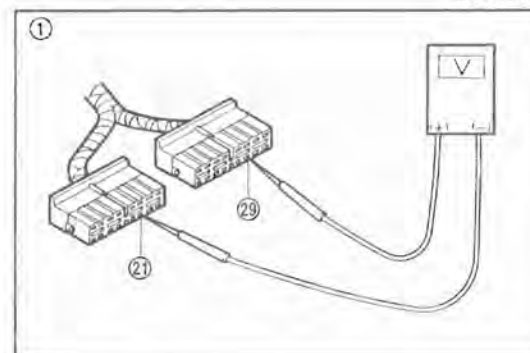
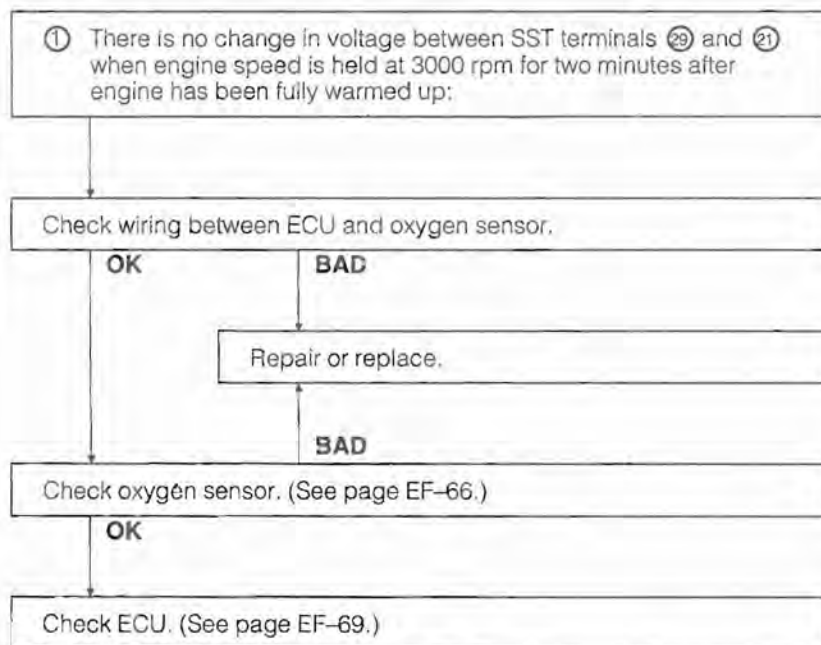
No.	Terminals	Trouble	Conditions	STD voltage
5	②⑨ - ②①	No voltage changes	Ignition switch ON	When engine speed is held at 3000 rpm for two minutes after engine has been fully warmed up: Voltage changes more than 8 times within 10 seconds.

WR88-EF076



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

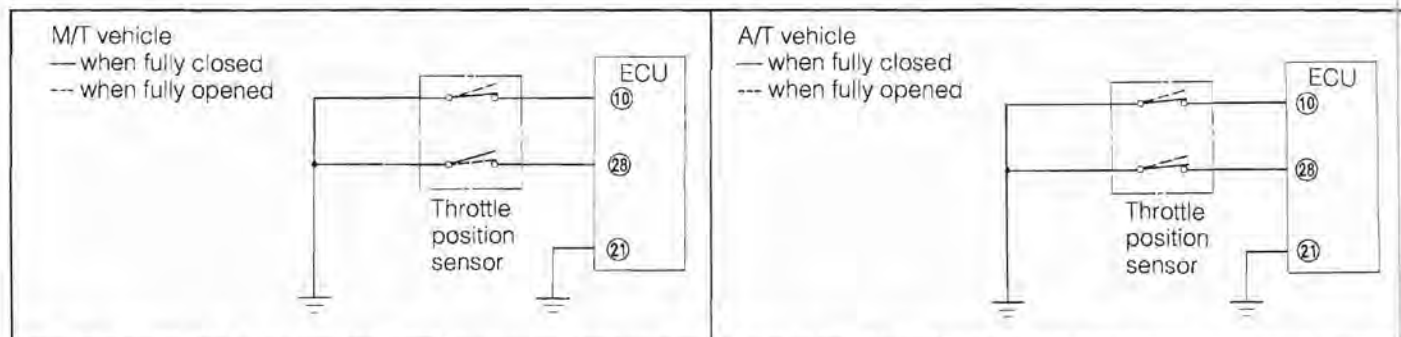
WR88-EF077



WR88-EF078

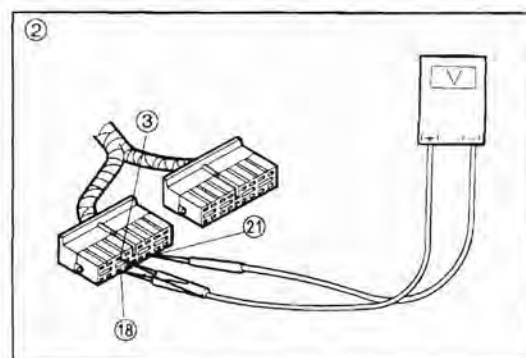
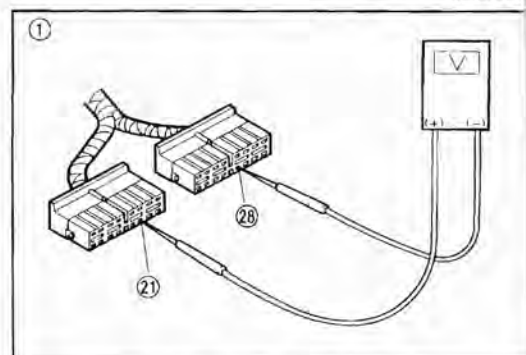
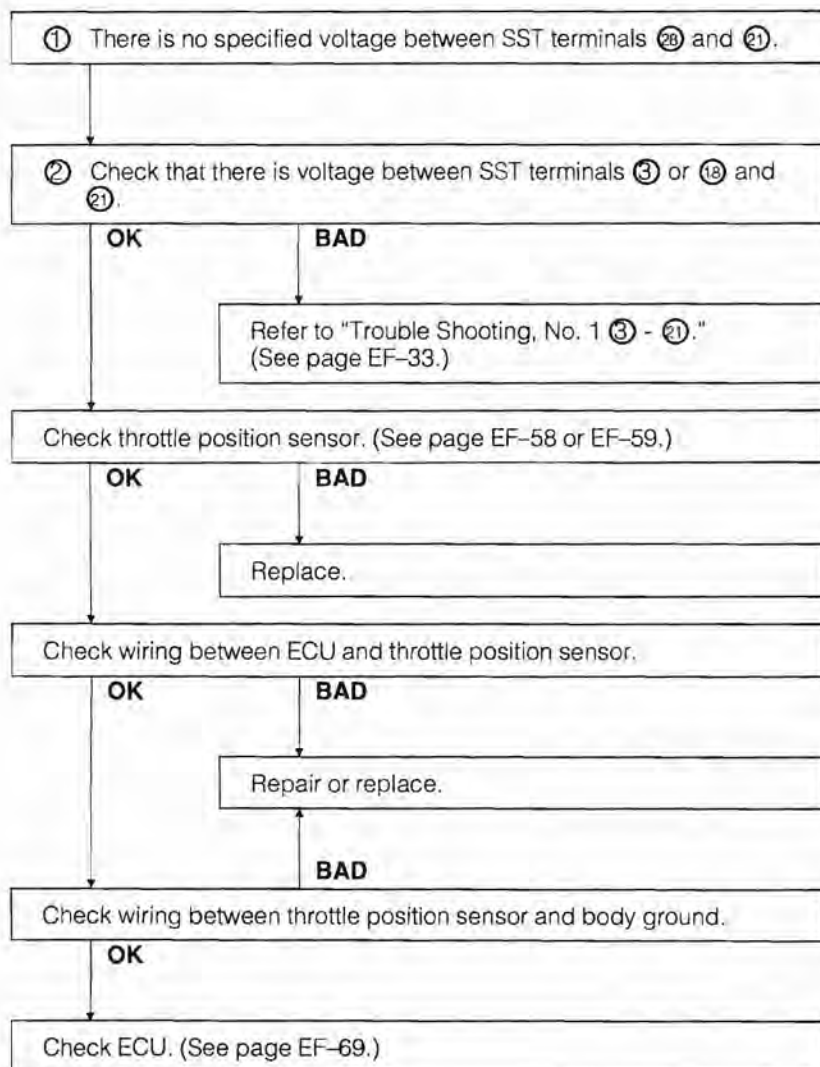
No.	Terminals		Trouble	Conditions		STD voltage
7	M/T vehicle	Ⓓ - Ⓔ	No voltage	Ignition switch ON	Throttle valve fully closed	4.5 - 5.5
			1.0V or more	Ignition switch ON	Throttle valve fully opened	1.0 or less
	A/T vehicle		1.0 or more	Ignition switch ON	Throttle valve fully closed	1.0 or less
			No voltage	Ignition switch ON	Throttle valve fully opened	4.5 - 5.5

WR85-EF079



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

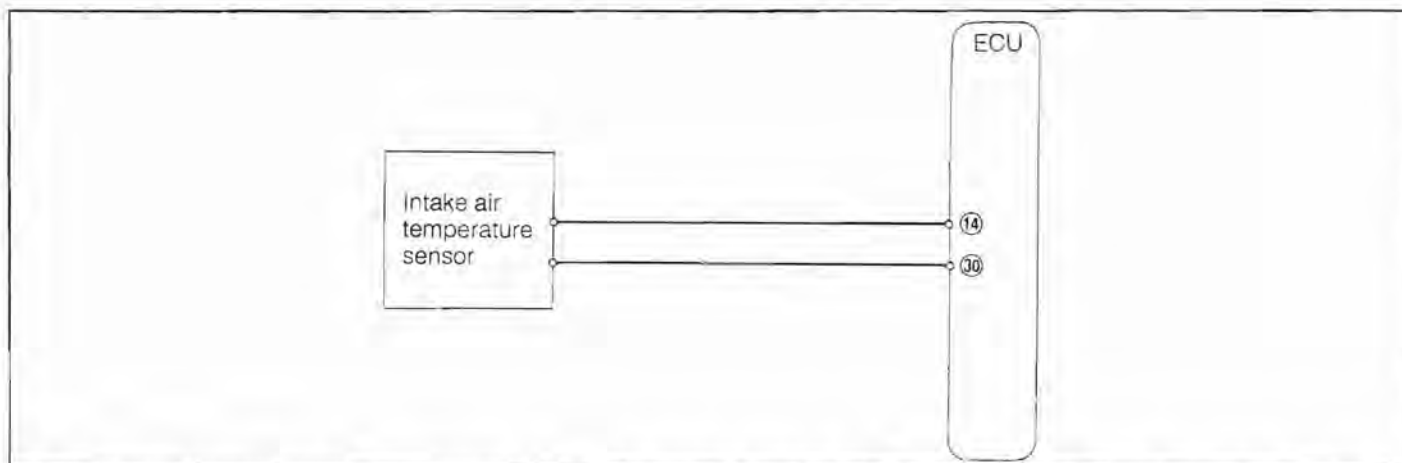
WR88-EF080



WR88-EF081

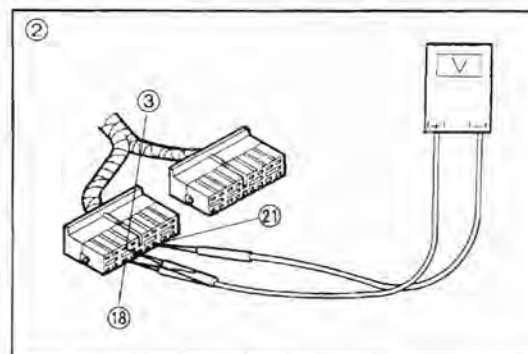
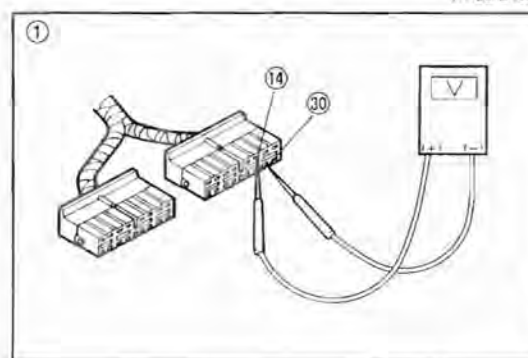
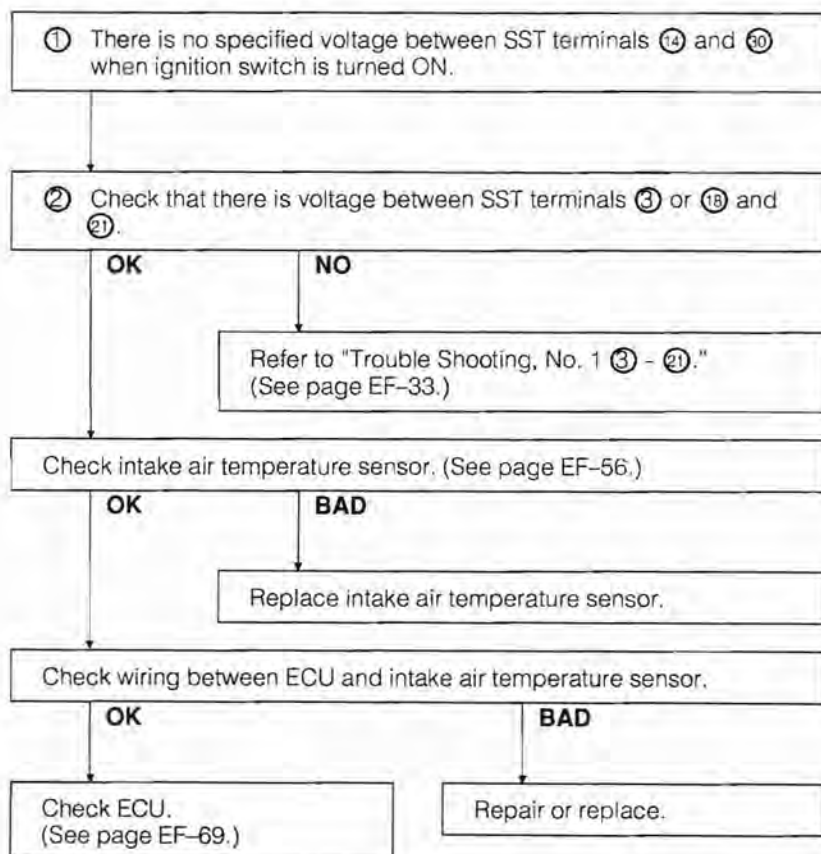
No.	Terminals	Trouble	Conditions	STD voltage
8	⑭ - ③⑩	No voltage	Ignition switch ON Air temperature inside surge tank 20°C (68°F)	0.9 - 3.0

WR88-EF082



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

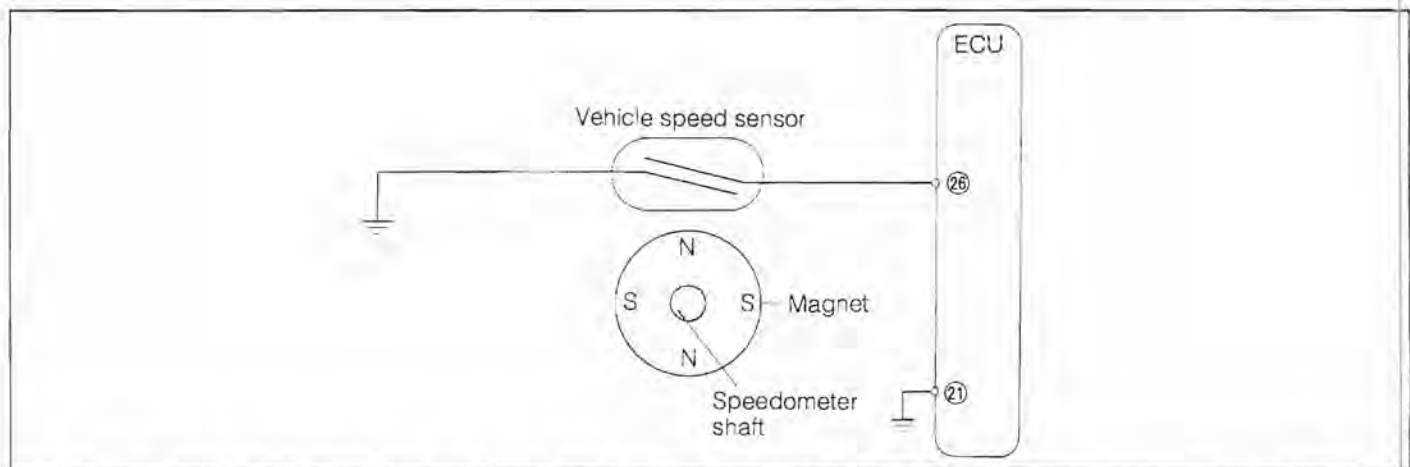
WR88-EF083



WR88-EF084

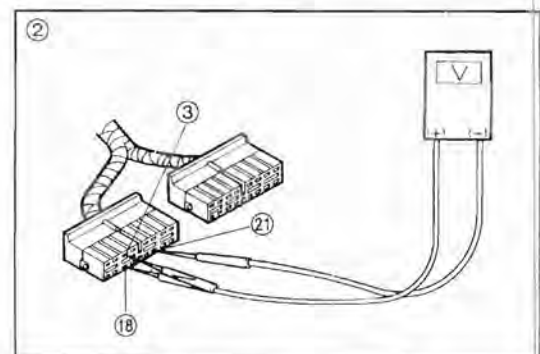
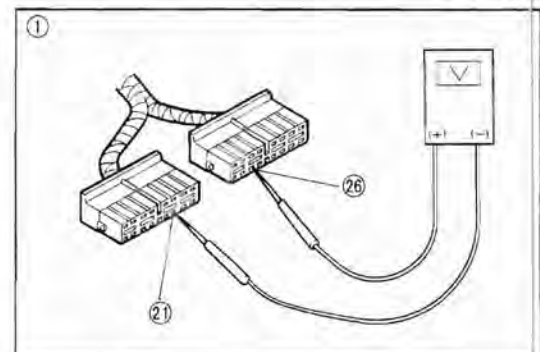
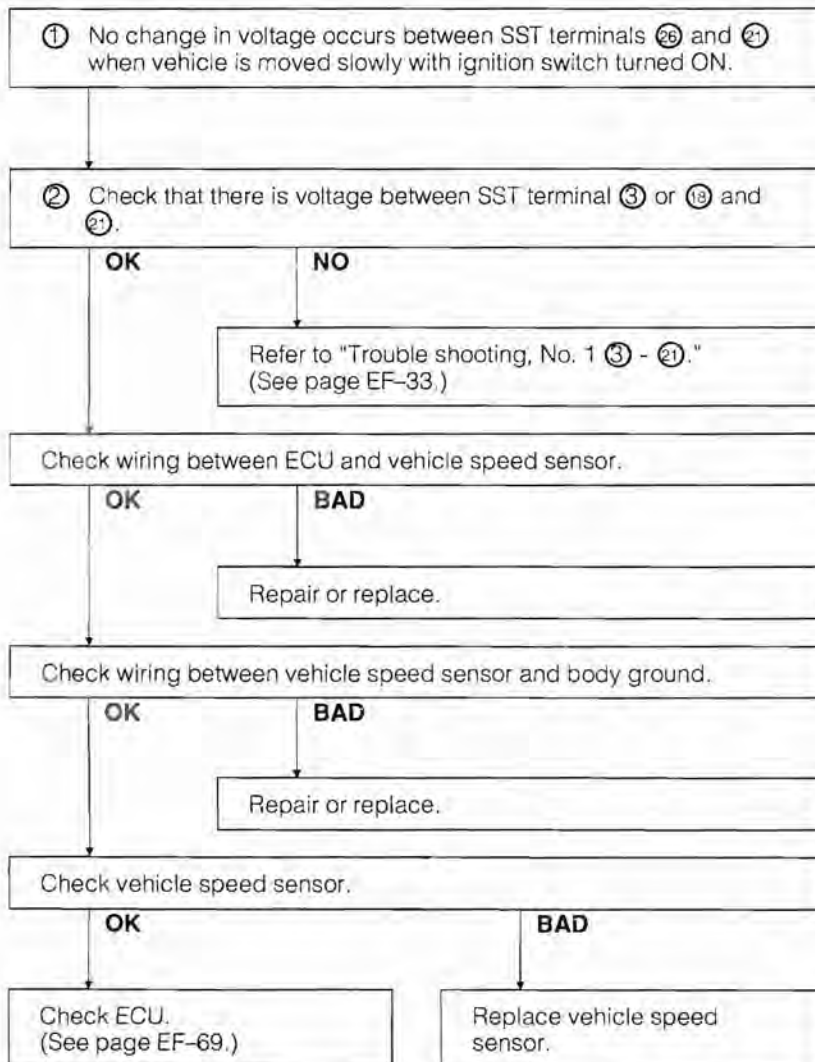
No.	Terminals	Trouble	Conditions	STD voltage
9	②⑥ - ②①	No voltage changes	Ignition switch ON When vehicle is moved slowly:	0 to 10 - 15.5

WR88-EF015



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

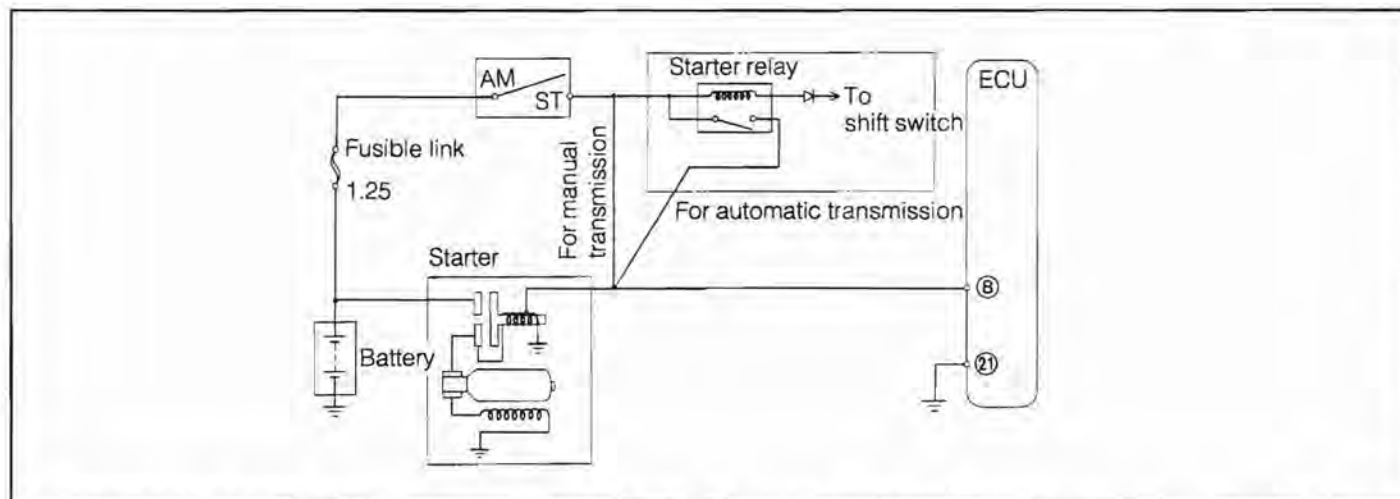
WR88-EF016



WR88-EF017

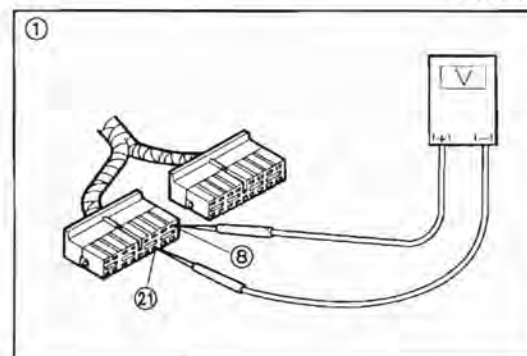
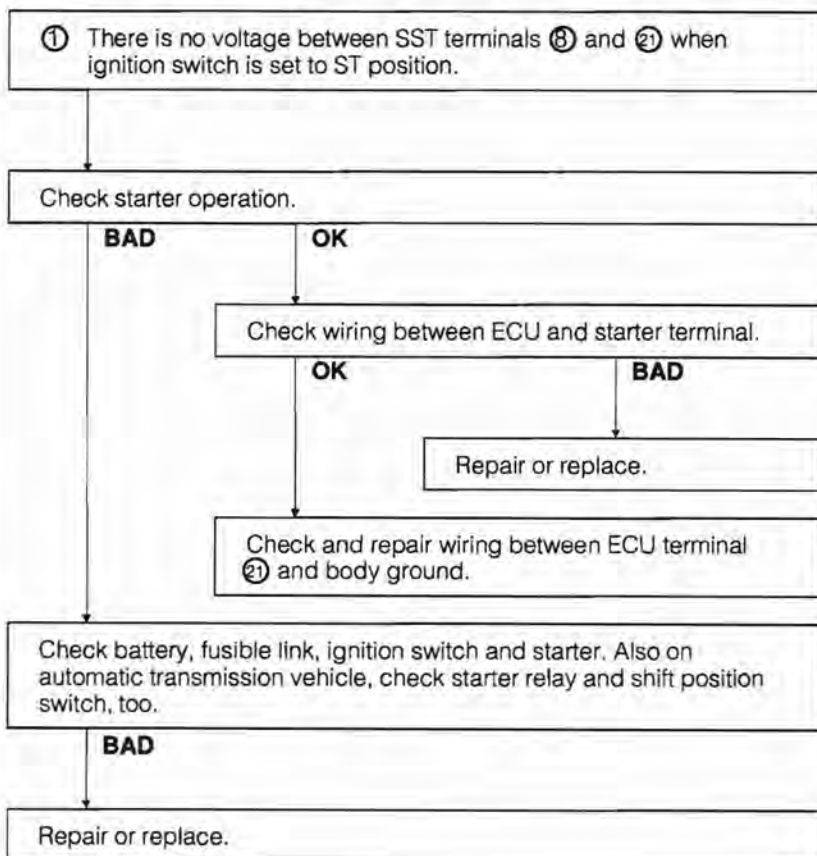
No.	Terminals	Trouble	Conditions	STD voltage
10	⑧ - ⑳	No voltage	Ignition switch ST position	6 - 15.5

WR88-EF088



If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

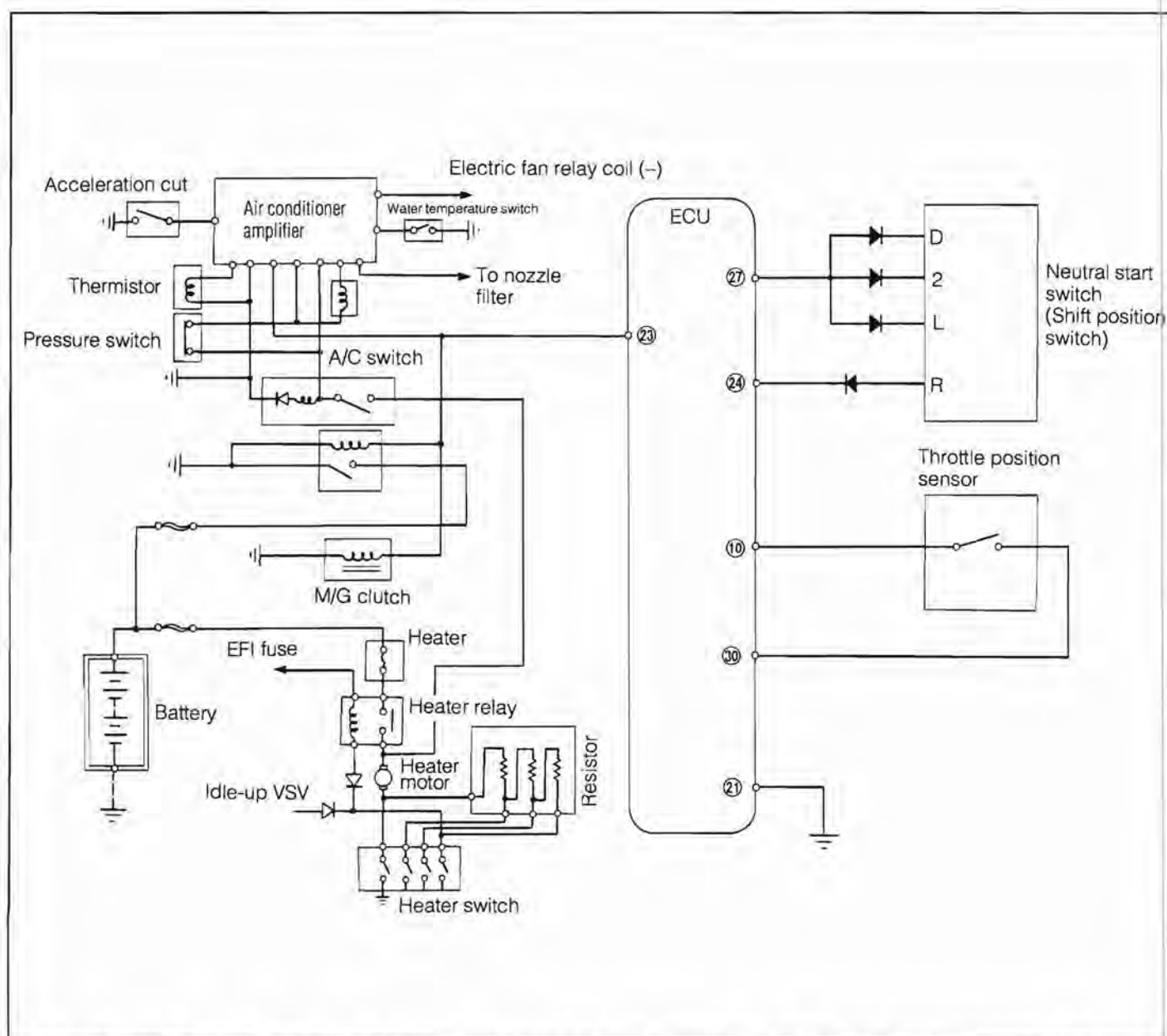
WR88-EF089



WR88-EF090

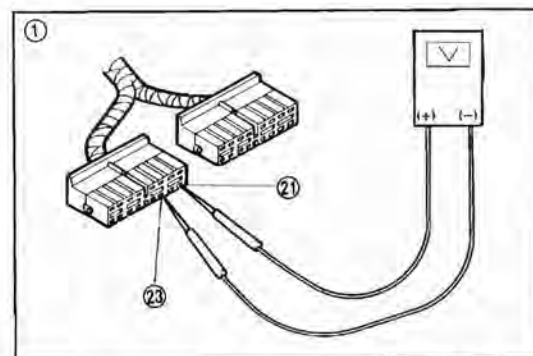
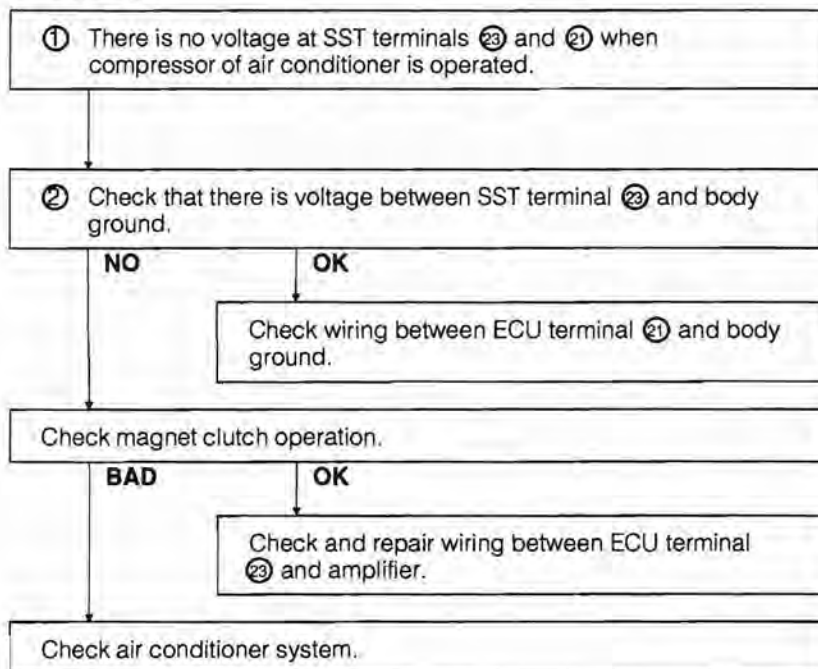
No.	Terminals	Trouble	Conditions		STD voltage
11	②③ - ②①	No voltage	Ignition switch ON	With engine rotating, air conditioner switch turned ON and magnet clutch turned ON:	10 - 15.5
	⑩ - ③③	No specified voltage	Ignition switch ON	Throttle valve fully closed	0 - 0.6
			Ignition switch ON	Throttle valve fully opened	10 - 15.5
	②⑦ - ②①	No specified voltage	Ignition switch ON	When shift lever is shifted to D, 2 or L range: (A/T vehicle only)	1.0 or less
	②④ - ②①	No specified voltage	Ignition switch ON	When shift lever is shifted to reverse range: (A/T vehicle only)	10.0 - 15.5

WRBA-EFOB1

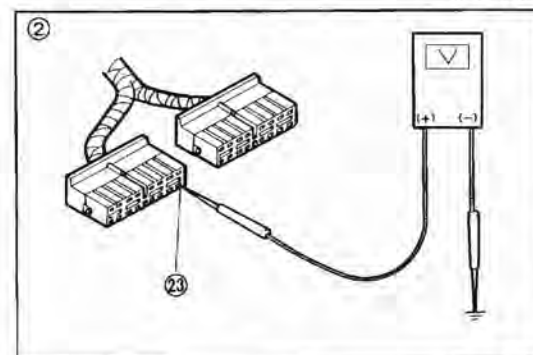


If the SST (09842-87701-000) has not been installed yet, install the SST, referring to the section under "Preparation of Trouble-shooting" at page EF-29.

• 23 - 21

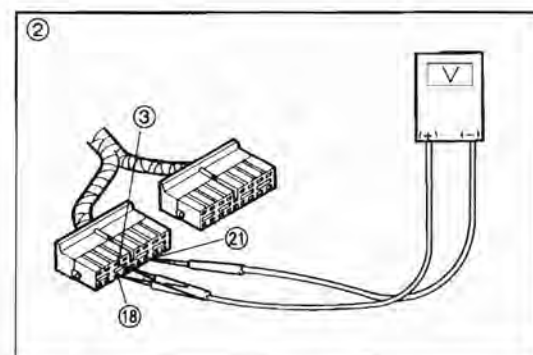
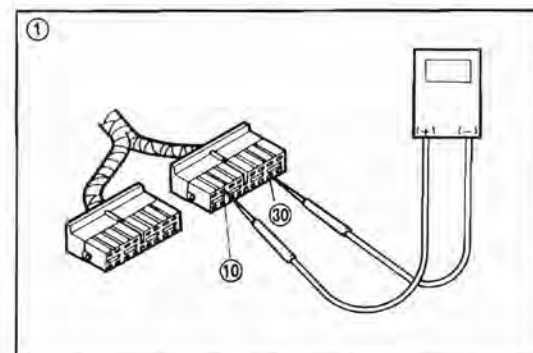
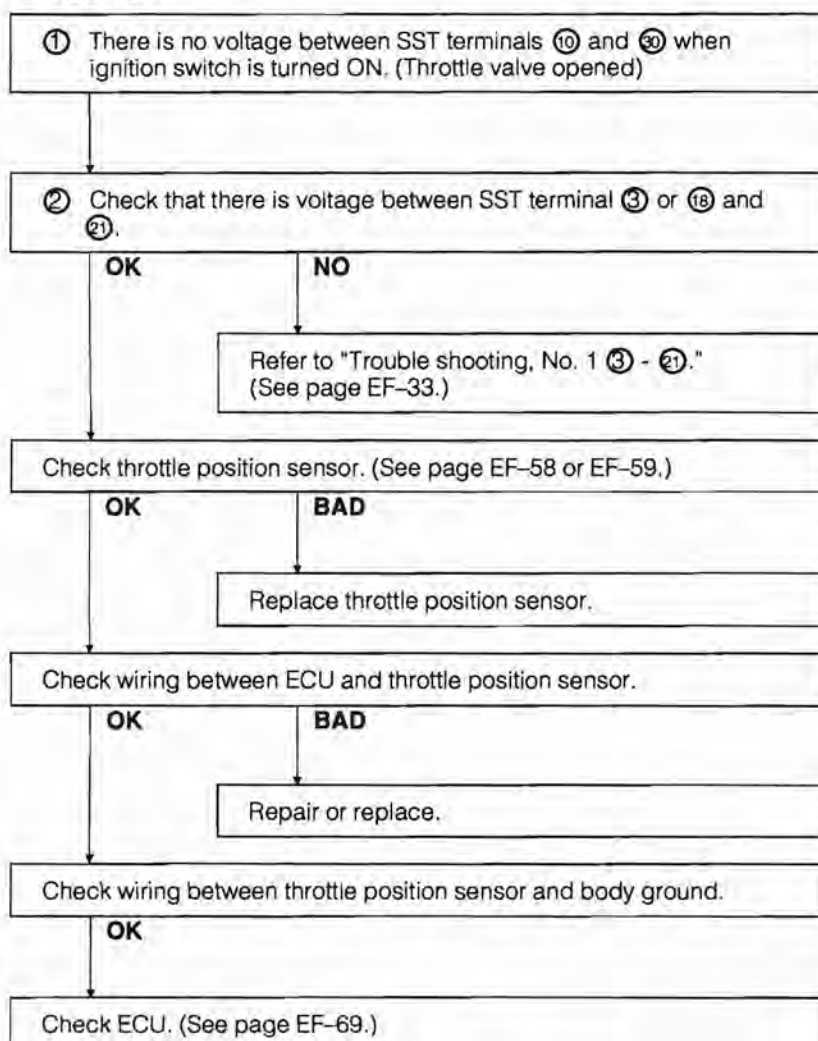


WR88-EF057



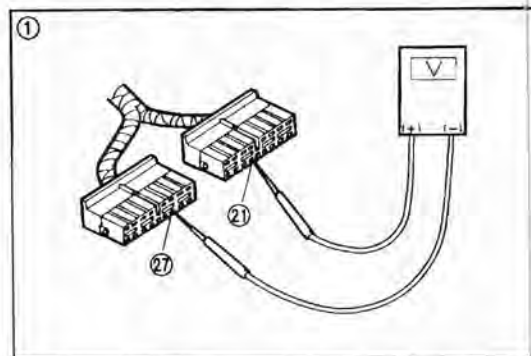
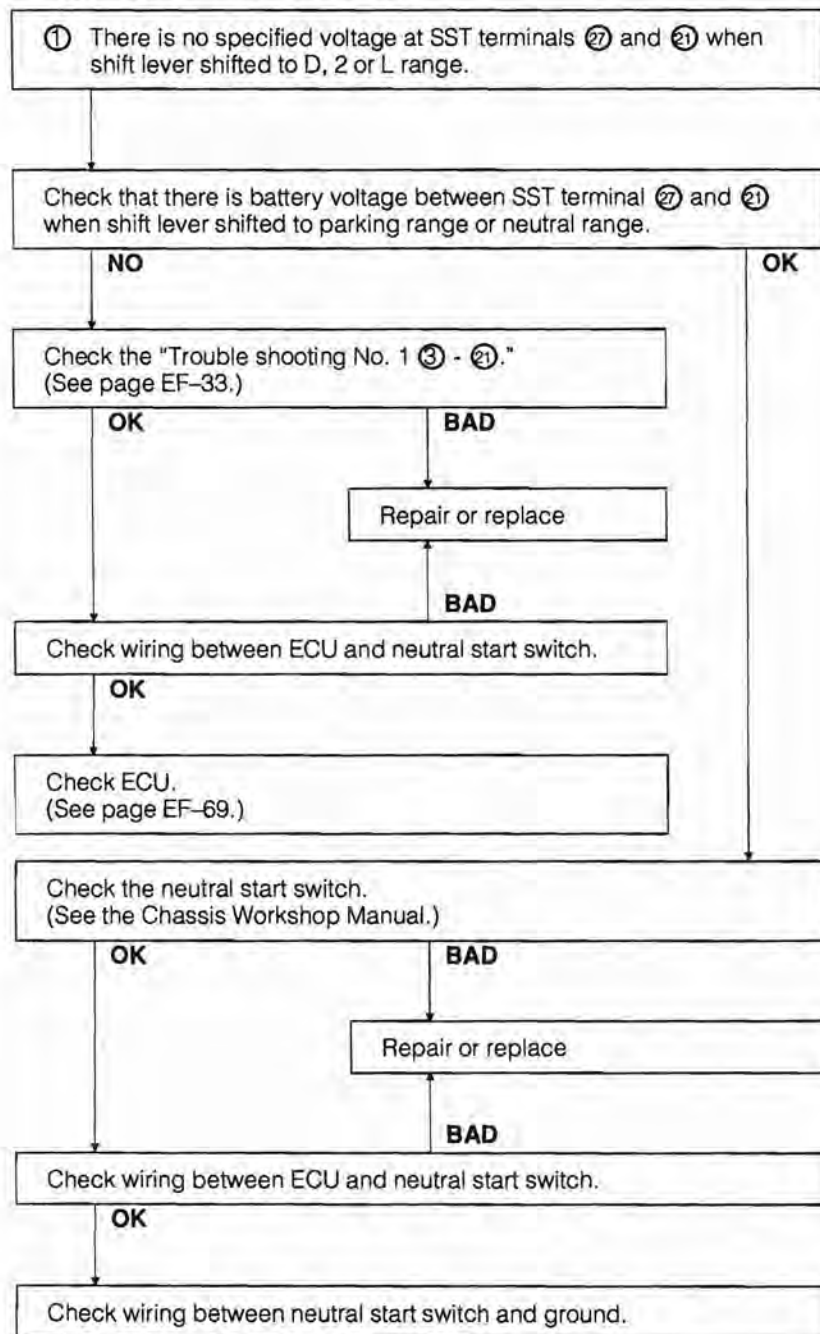
WR88-EF093

• 10 - 30



WR88-EF094

• ②⑦ - ②① [A/T vehicle only]



WR88-EF09K

• 24 - 21

There is no specified voltage at SST terminals 24 and 21 when shift lever shifted to reverse range.

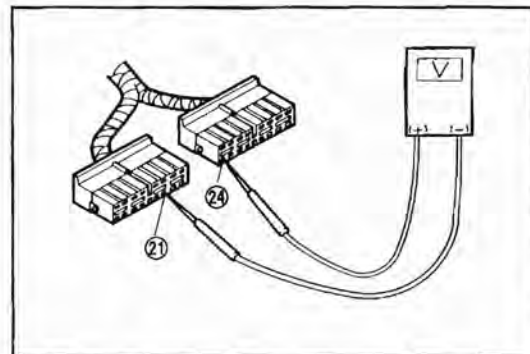
Check wiring between ECU and neutral start switch.

OK

Check the neutral start switch
(See the Chassis Workshop Manual.)

OK

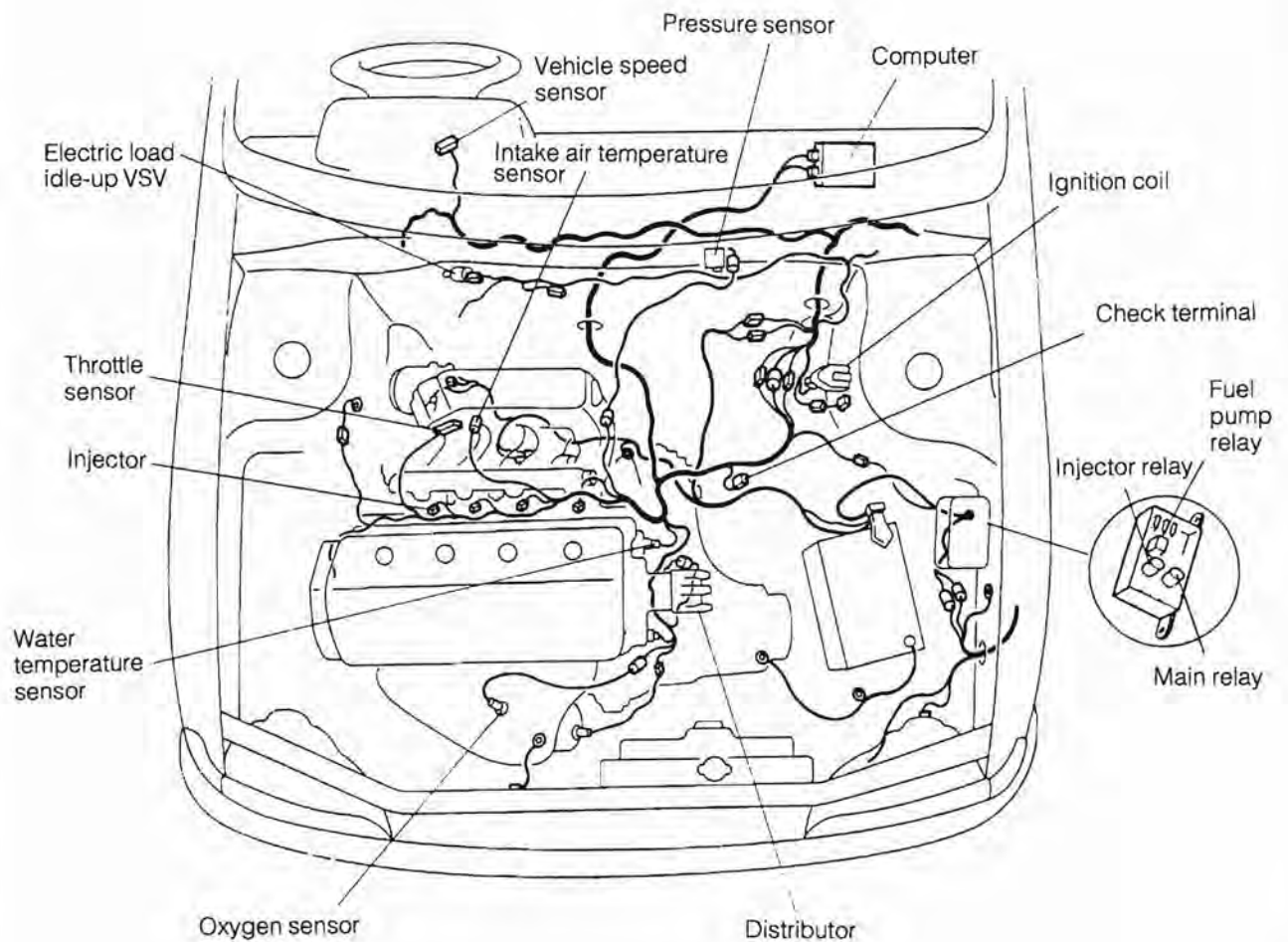
Check ECU.
(See page EF-69.)



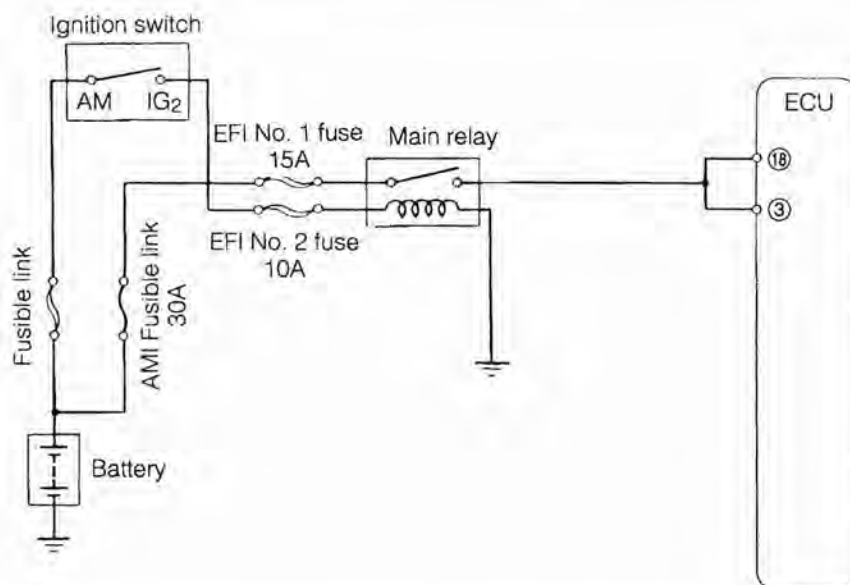
WR88-EF096

ELECTRONIC CONTROL SYSTEM

LOCATION OF ELECTRONIC CONTROL PARTS



MAIN RELAY



WR88-EF098

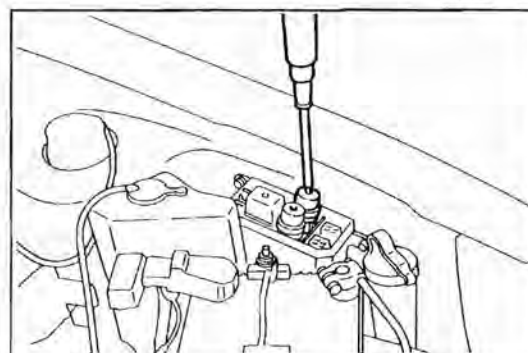
Inspection of EFI Main Relay

1. Check of main relay operation

When the ignition switch is turned ON, check to see if the relay emits an operating sound. Or check to see if you will feel an operating vibration with a screwdriver or the like placed on the relay.

CAUTION:

The relay may become very hot during the operation. Hence, do not touch the relay by your hand.



WR88-EF099

2. Inspection of relay continuity

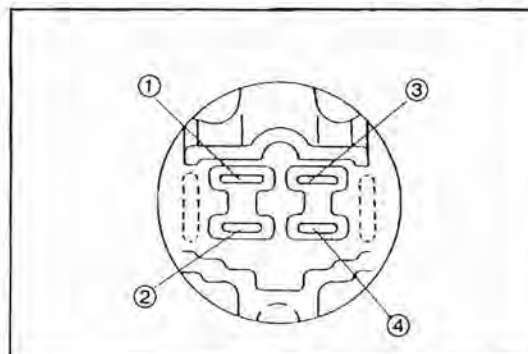
(1) Check that there is the specified resistance between the terminals ① and ②

Resistance: 60 - 85Ω at 20°C (68°F)

(2) Check that there is no continuity between the terminals ③ and ④.

(3) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.

(4) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.



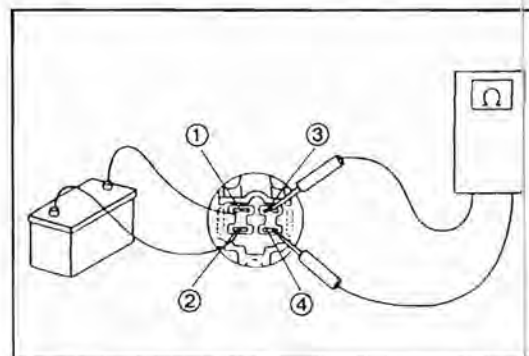
WR88-EF100

If the continuity test results do not conform to specifications, replace the relay.

3. Inspection of relay operation

- (1) Apply the battery voltage across the terminals ① and ②.
- (2) Check that there is continuity between the terminals ③ and ④.

If the operation test results do not conform to specifications, replace the relay.



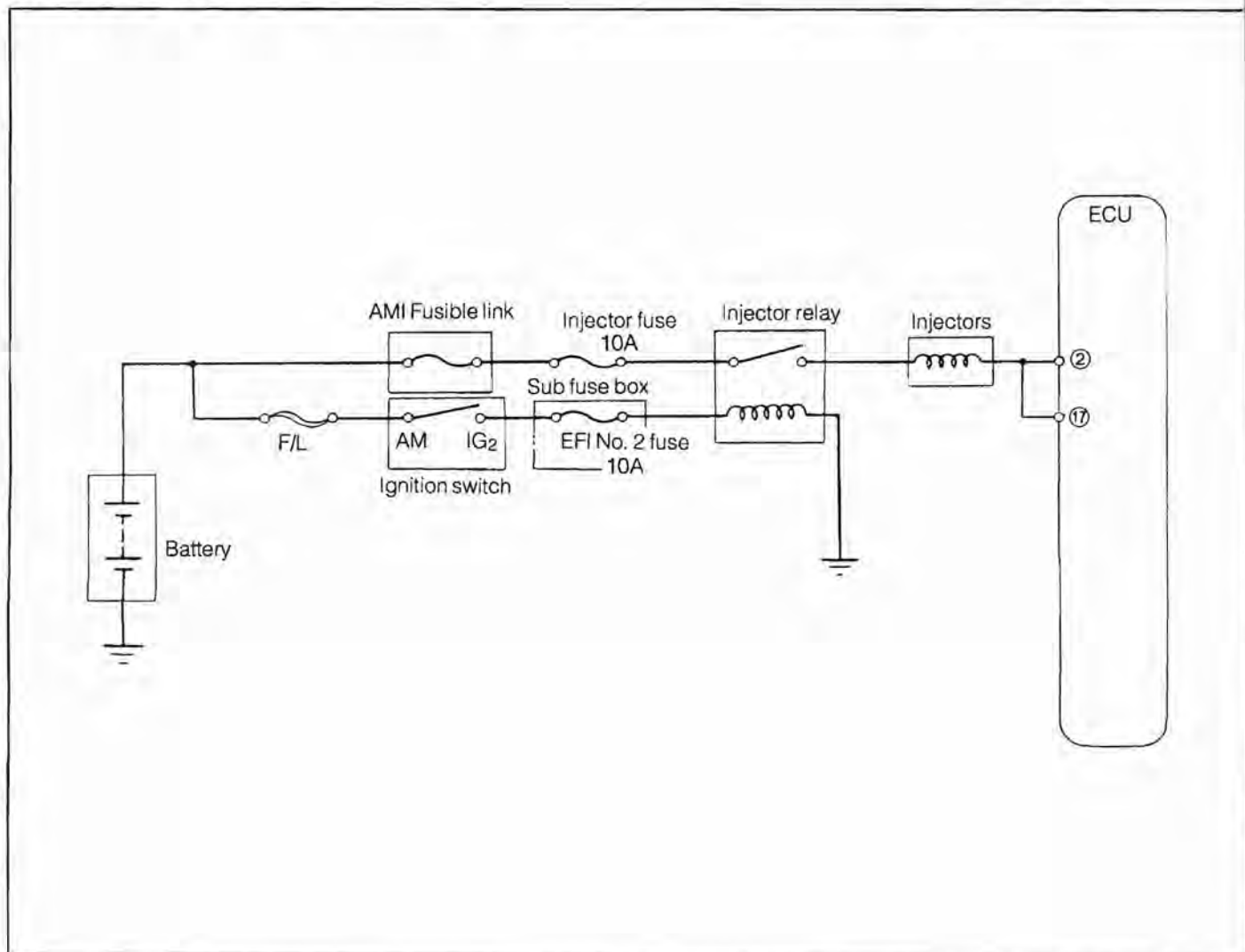
WR88-EF101

4. If the main relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.

- (1) Fusible links
- (2) Ignition switch
- (3) Fuses
- (4) Wiring and wiring connector

WR88-EF101A

INJECTOR RELAY



WR88-EF102

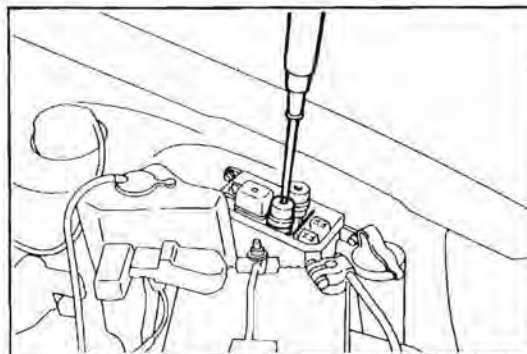
Inspection of injector relay

1. Check of injector relay operation

When the ignition switch is turned ON, check to see if the relay emits an operating sound. Or check to see if you will feel an operating vibration with a screwdriver or the like placed on the relay.

CAUTION:

The relay may become very hot during the operation. Hence, do not touch the relay by your hand.



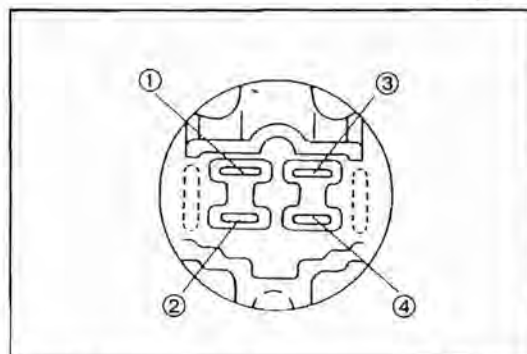
WR88-ER103

2. Inspection of relay continuity

- (1) Check that there is the specified resistance between the terminals ① and ②.

Resistance: 60 - 85Ω at 20°C (68°F)

- (2) Check that there is no continuity between the terminals ③ and ④.

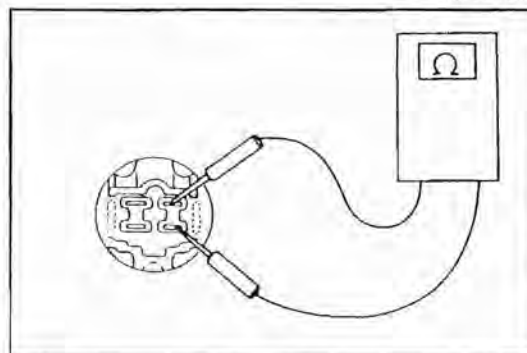


WR88-EF104

- (3) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.

- (4) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

If the continuity test results do not conform to specifications, replace the relay.



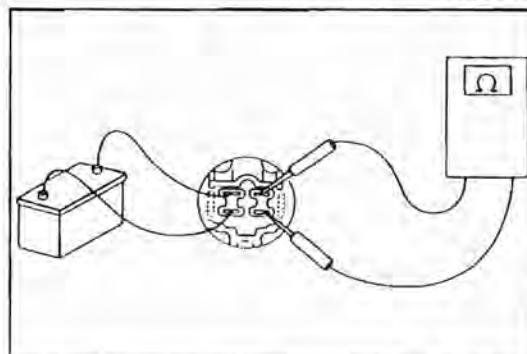
WR88-EF105

3. Inspection of relay operation

- (1) Apply the battery voltage across the terminals ① and ②.

- (2) Check that there is continuity between the terminals ③ and ④.

If the operation test results do not conform to specifications, replace the relay.

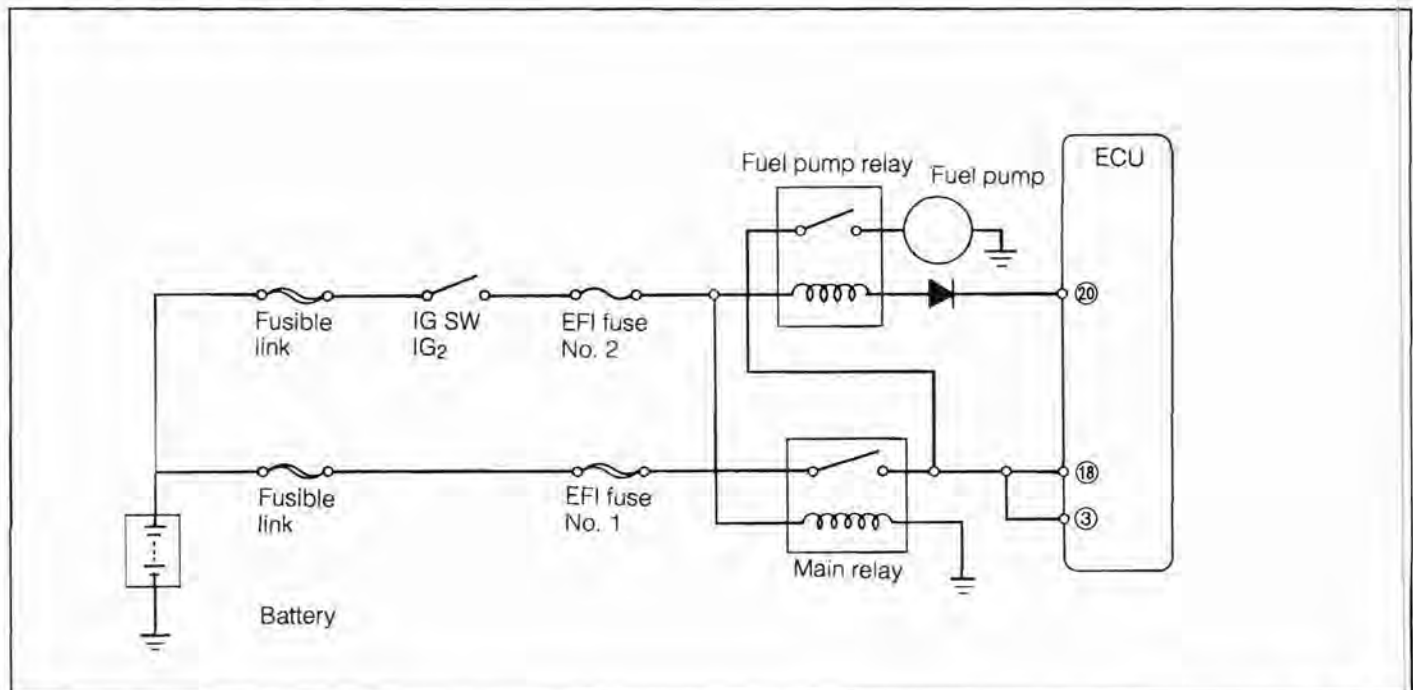


WR88-EF106

4. If the injector relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.

- (1) Fusible links
- (2) Fuses
- (3) Ignition switch
- (4) Wiring and wiring connector

FUEL PUMP RELAY



WR88-EF108

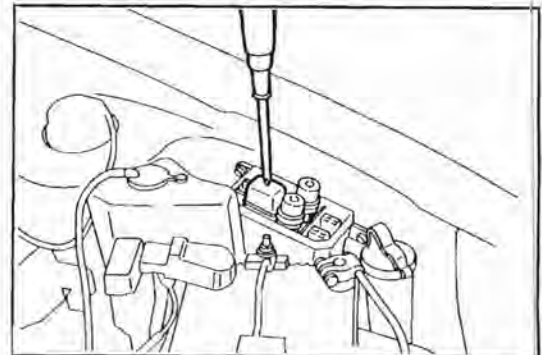
Inspection of Fuel Pump Relay

1. Check of fuel pump relay operation.

When the ignition switch is set to the ON position, check to see if the relay emits an operating sound. Or check to see if you will feel an operating vibration with a screwdriver or the like placed on the relay.

CAUTION:

The relay may become very hot during the operation. Hence, do not touch the relay by your hand.



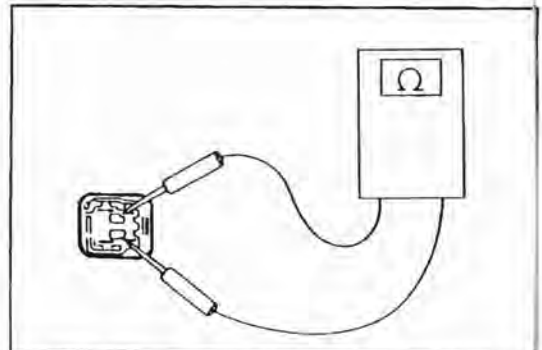
WR88-EF110

2. Inspection of relay continuity

- (1) Check that there is the specified resistance between the terminals ① and ②.

Resistance: 70 - 90Ω at 20°C (68°F)

- (2) Check that there is no continuity between the terminals ③ and ④.

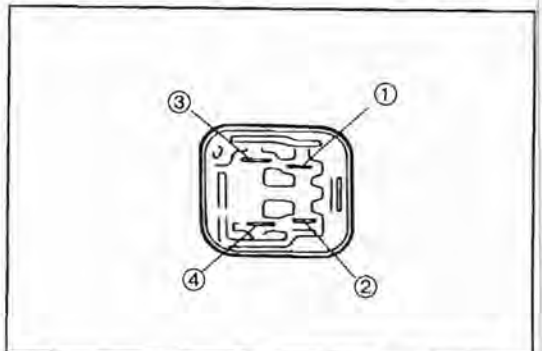


WR88-EF111

- (3) Check that there is no continuity between the terminals ① and ③ and also between the terminals ① and ④.

- (4) Check that there is no continuity between the terminals ② and ③ and also between the terminals ② and ④.

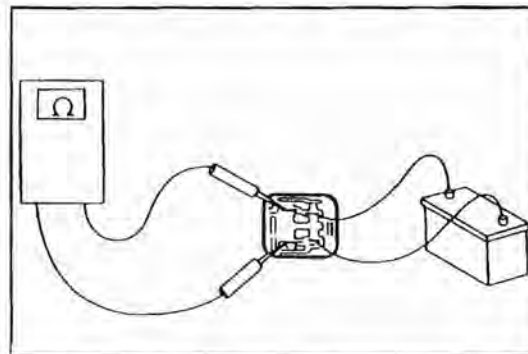
If the continuity test results do not conform to specifications, replace the relay.



WR88-EF112

3. Inspection of relay operation
 - (1) Apply the battery voltage across the terminals ① and ②.
 - (2) Check that there is continuity between the terminals ③ and ④.

If the operation test results do not conform to specifications, replace the relay.

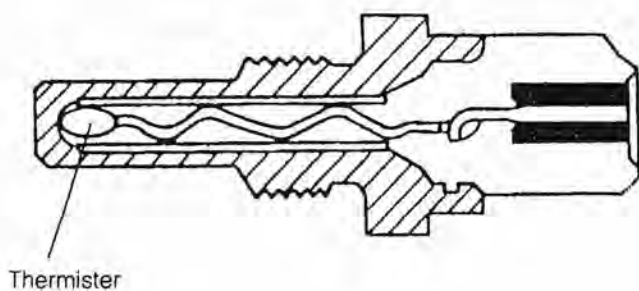


WR88-EF113

4. If the fuel pump relay persists to be inoperative after the checks 1 through 3 have been performed satisfactorily, check the following items.
 - (1) Fusible links
 - (2) Ignition switch
 - (3) Fuses
 - (4) Main relay (See page EF-49.)
 - (5) Wiring and wiring connector
 - (6) ECU (See page EF-69.)

WR88-EF114

WATER TEMPERATURE SENSOR



Thermister

Specification

Water temperature °C (°F)	Resistance kΩ
80 (176)	0.322 ± 0.1
60 (140)	0.584 ± 0.2
40 (104)	1.140 ± 0.3
20 (68)	2.450 ± 0.5
0 (32)	5.88 ± 1.5
-20 (-4)	16.2 ± 1.6

WR88-EF115

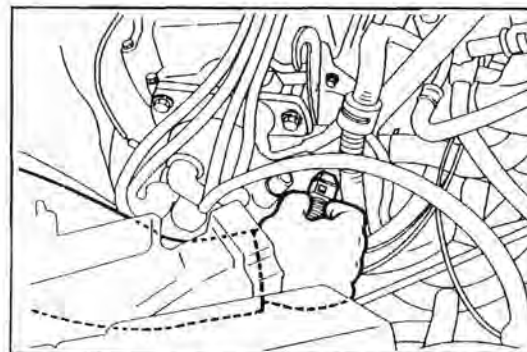
Inspection of Water Temperature Sensor

Measurement of Resistance of Water Temperature Sensor

1. Disconnect the connector.

NOTE:

Be sure to un-lock the lock of connector, when disconnect or connect the connector.



WR88-EF116

2. Start the engine. Read the resistance at the time when the radiator fan motor begins to rotate.

Resistance: $0.322 \pm 0.1 \text{ k}\Omega$

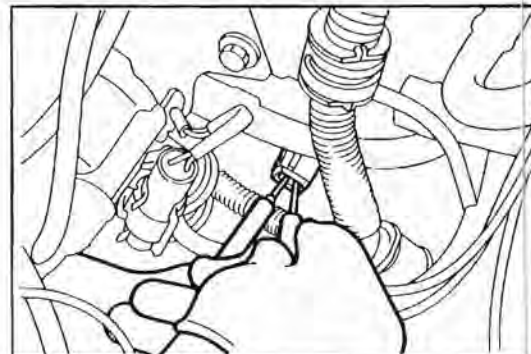
If the measured resistance will not conform to the specification, remove the water temperature sensor and perform the unit inspection.

3. Check that there is no continuity between each terminal of the water temperature sensor and the body.

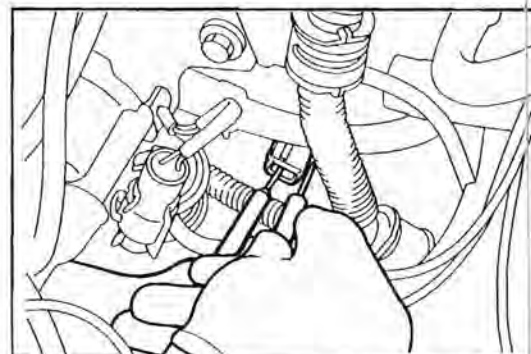
If there is continuity, replace the water temperature sensor.

NOTE:

- Before the water temperature sensor is removed, drain the coolant.
- After completion of the sensor replacement, refill the coolant. (See page CO-3.)



WR88-EF17



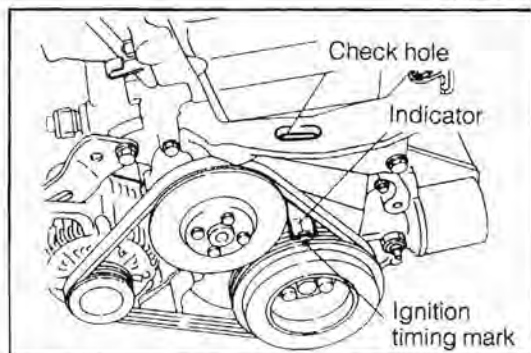
WR88-EF18

Water Temperature Sensor Removal Test

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
2. Drain the cooling water. (See page CO-3.)

3. Distributor removal

- (1) Turn the crankshaft, until the mark on the crankshaft timing belt pulley is aligned with the indicator mark on the timing belt cover. (Ensure that the rocker arms of the cylinder No.1 at the timing belt side are in a free state. If the rocker arms are not in a free state, turn the crankshaft one more complete turn (360°).



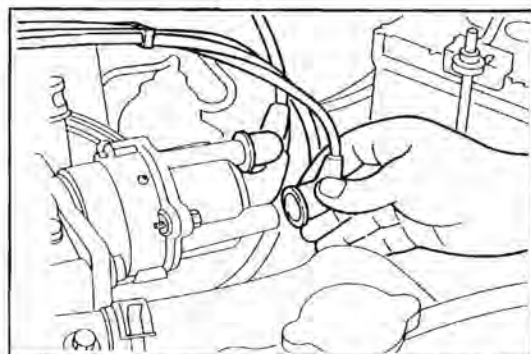
WR88-EF119

WR88-EF120

- (2) Remove the high-tension cords from distributor cap.

NOTE:

Be sure to remove the high-tension cord by holding the rubber grommet. Never pull out the cord section.



WR88-EF121

- (3) Disconnect the distributor connector.
- (4) Disconnect the vacuum hoses from vacuum advancer.
- (5) Remove the distributor by removing the distributor set bolts.

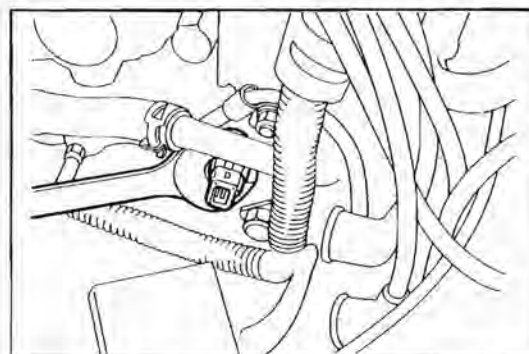
NOTE:

Since the oil flows out during the removal, place a suitable cloth underneath the distributor.

WR88-EF122

4. Removal of water temperature sensor

- (1) Remove the water temperature sensor connector.
- (2) Remove the water temperature sensor.



WR88-EF123

5. Unit check

- (1) Immerse the heat sensing section of the water temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table below.

Specifications

Water temperature °C (°F)	Resistance (kΩ)
80 (176)	0.322 ± 0.1
60 (140)	0.584 ± 0.2
40 (104)	1.140 ± 0.3
20 (68)	2.450 ± 0.5
0 (32)	5.88 ± 1.5
-20 (-4)	16.2 ± 1.6



WR88-EF124

If the resistance will not conform to the specifications, replace the water temperature sensor.

- (2) Check that there is no continuity between each terminal of the water temperature sensor and sensor body. If there is continuity, replace the intake air temperature sensor.

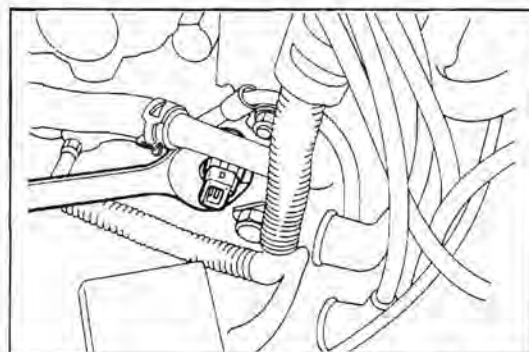
6. Installation of water temperature sensor

- (1) Wind sealing tape to the water temperature sensor switch and install it to the cylinder. Connect the connector.

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

NOTE:

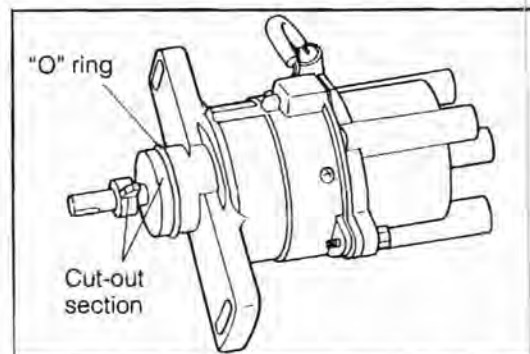
The new sensor is coated with sealer, therefore seal tape is unnecessary if the sensor is replaced with new one.



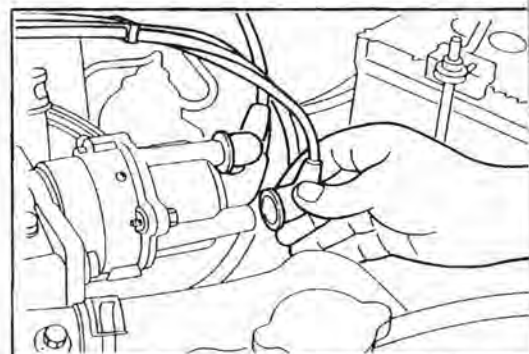
WR88-EF125

(2) Distributor installation (See page IG-47)

- ① Replace the distributor "O" ring with a new part.
- ② With the coupling cut-out section of the distributor aligned with the cut-out section of the distributor body, insert the distributor into the cylinder head. At this time, ensure that the distributor attaching bolt hole of the cylinder head comes at the center of the elongated hole for the distributor bolt. Then, torque the distributor set bolt.
- ③ Connect the vacuum hoses to the vacuum advancer.
- ④ Connect the distributor connector. Install the connector to the clamp.
- ⑤ Connect the high-tension cords to the distributor cap.



WR88-EF126

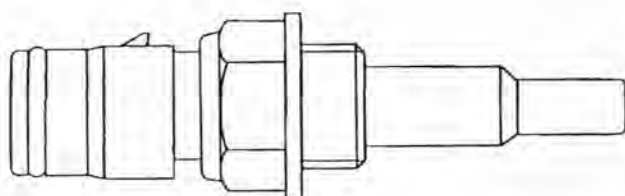


WR88-EF127

- (3) Connect the ground cable terminal to the battery negative (-) terminal.
- (4) Fill cooling water. (See page CO-3.)
- (5) Adjust the ignition timing. (See page IG-49.)
- (6) Start the engine. Ensure that no water or oil leakage is present.
- (7) Check the oil level. (See page LU-2.)

WR88-EF128

INTAKE AIR TEMPERATURE SENSOR



Specification

Intake air temperature °C (°F)	Resistance kΩ
80 (176)	0.322 ± 0.1
60 (140)	0.584 ± 0.2
40 (104)	1.140 ± 0.3
20 (68)	2.450 ± 0.5
0 (32)	5.88 ± 1.5
-20 (-4)	16.2 ± 1.6

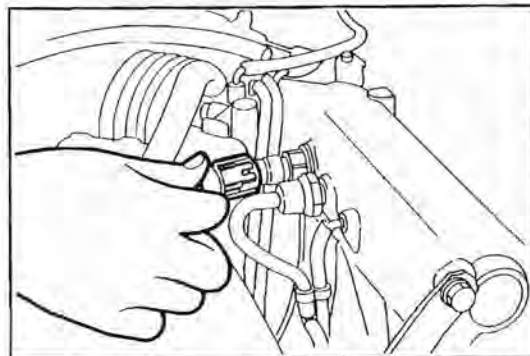
WR88-EF129

Inspection of Intake Air Temperature Sensor Measurement of Resistance of Intake Air Temperature Sensor

1. Disconnect the connector.

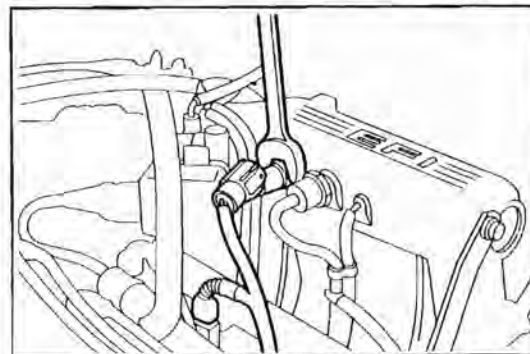
NOTE:

Do not pull out the lead wire. While holding the connector section, unlock the lock and pull out the connector.



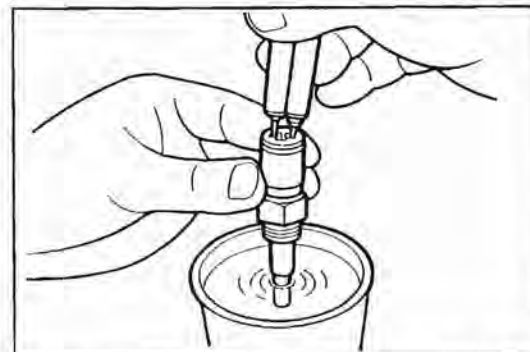
WR88-EF130

2. Remove the intake air temperature sensor.



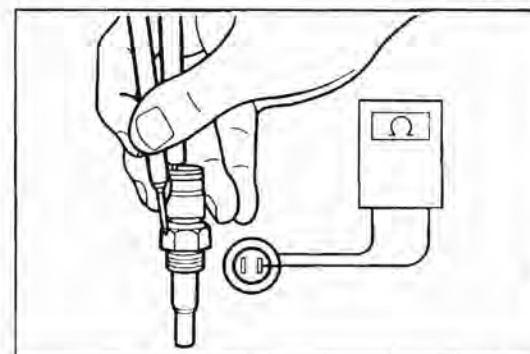
WR88-EF131

3. Immerse the heat sensing section of the water temperature sensor in water. Raise the water temperature gradually. Check to see if the resistance varies within the specified values in accordance with the table in the preceding page. If the measured resistance will not conform to the specifications, replace the intake air temperature sensor.



WR88-EF132

4. Check that there is no continuity between each terminal of the intake air temperature sensor and the sensor body. If there is continuity, replace the intake air temperature sensor.

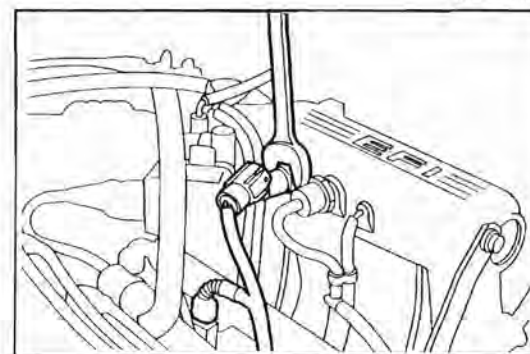


WR88-EF133

5. Install the intake air temperature sensor to the surge tank with a new gasket interposed.

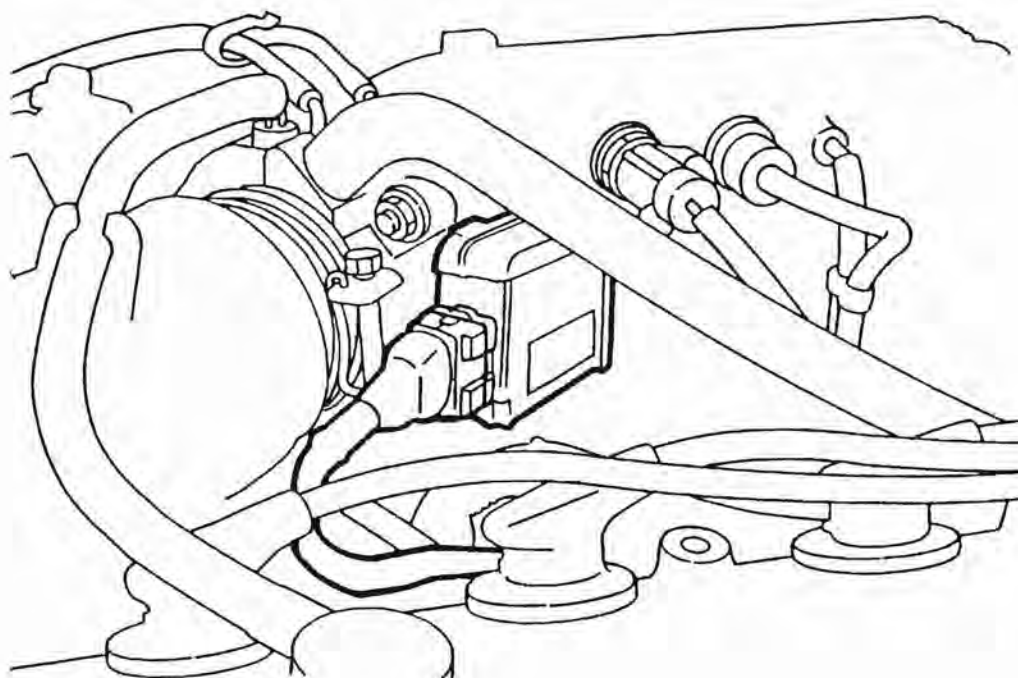
Tightening Torque: 3.0 - 4.0 kg-m (21.7 - 28.9 ft-lb)

6. Connect the intake air temperature sensor connector.



WR88-EF134

THROTTLE POSITION SENSOR (M/T Vehicle)



WR88-EF135

Inspection of Throttle Position Sensor

1. Unlock the throttle position sensor connector and disconnect it.

CAUTION:

When disconnecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.

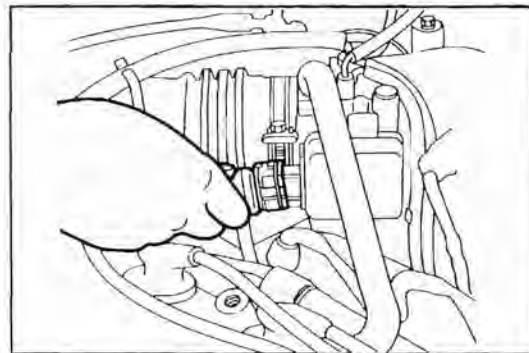
2. Measure the resistance between the terminals of the throttle position sensor.
 - (1) Measure the resistance between ⑩ and ⑳ under the following conditions.

Throttle valve closed fully	0.2Ω or less at 20°C (68°F)
Throttle valve opened fully	10 kΩ or more

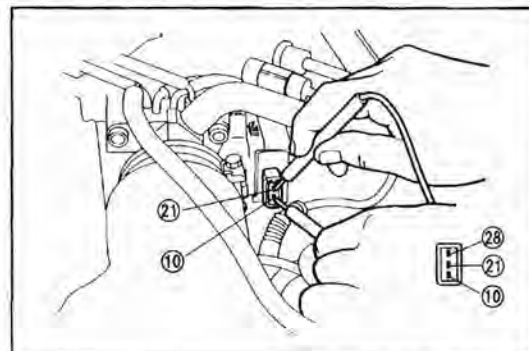
If the measured resistance does not conform to the specification, replace the throttle body. (See page EF-110.)

CAUTION:

Be very careful not to damage the terminal.



WR88-EF136



WR88-EF137

- (2) Measure the resistance between ②⑧ and ②① under the following conditions.

Throttle valve closed fully	10 kΩ or more
Throttle valve opened fully	5Ω or less

If the measured resistance does not conform to the specification, replace the throttle body. (See page EF-110.)

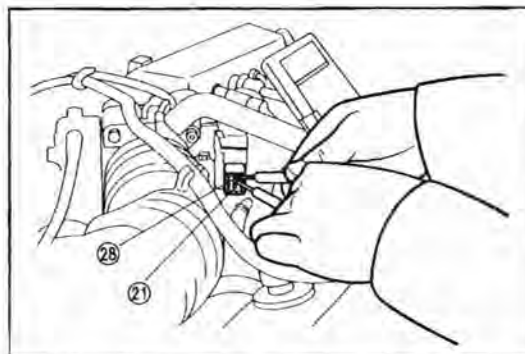
CAUTION:

Be very careful not to damage the terminal.

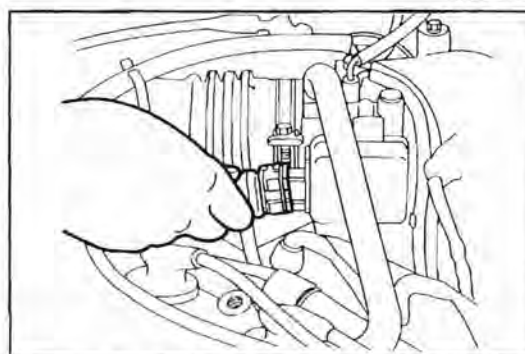
3. Connect the throttle position sensor connector.

CAUTION:

When connecting the connector, care must be exercised to ensure that no excessive load is applied to the throttle position sensor.

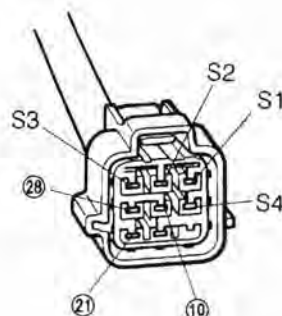
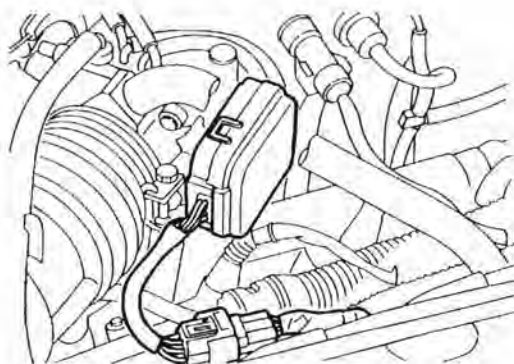


WR88-EF138



WR88-EF139

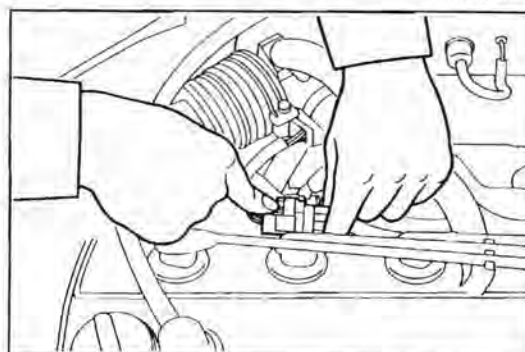
THROTTLE POSITION SENSOR (A/T Vehicle)



WR88-EF140

Inspection of Throttle Position Sensor

1. Disconnect the throttle position sensor connector.



WR88-EF141

2. Measure the resistance between the terminals of the throttle position sensor.

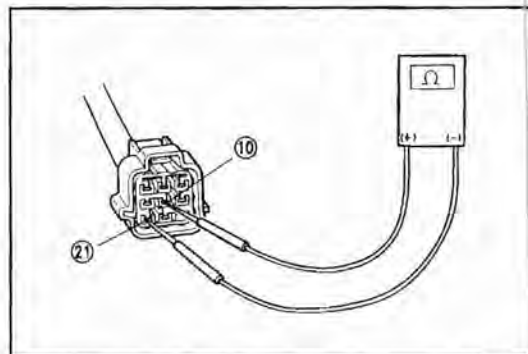
(1) Measure the resistance between (10) and (21) under the following conditions.

Throttle valve closed fully	1.0Ω or less
Throttle valve opened fully	1000 kΩ or more

If the measured resistance does not conform to the specification, replace the throttle body. (See page EF-110.)

NOTE:

Be very careful not to damage the terminal.



WR88-EF142

(3) Measure the resistance between (28) and (21) under the following conditions.

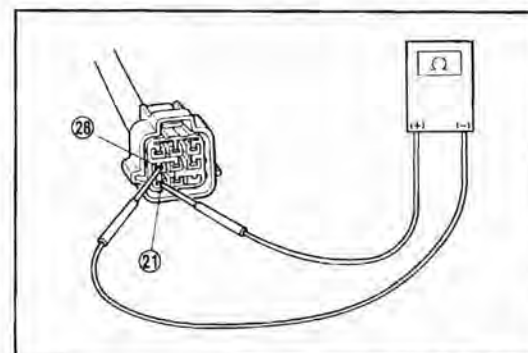
Throttle valve closed fully	1.0 Ω or less
Throttle valve opened fully	1000 kΩ or less

If the measured resistance does not conform to the specification, replace the throttle body.

(See page EF-110.)

NOTE:

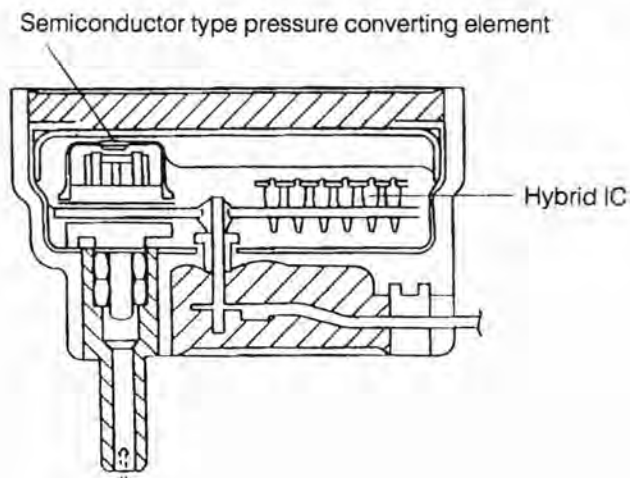
Be very careful not to damage the terminal.



WR88-EF143

3. Connect the throttle position sensor connector.

PRESSURE SENSOR



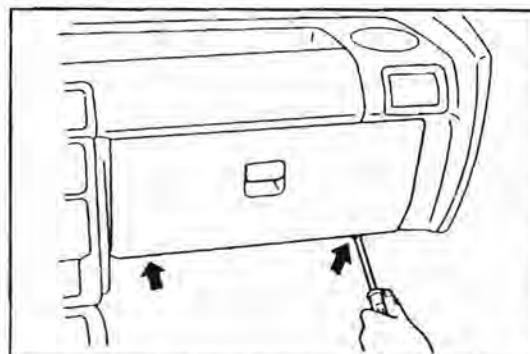
WR88-EF144

Inspection of Pressure Sensor**Measurement of Output Voltage of Pressure Sensor**

1. Connection of SST

WR88-EF145

- (1) Disconnect the ground cable terminal from the negative (-) terminal of the battery.
- (2) Remove the glove compartment subassembly.



WR88-EF146

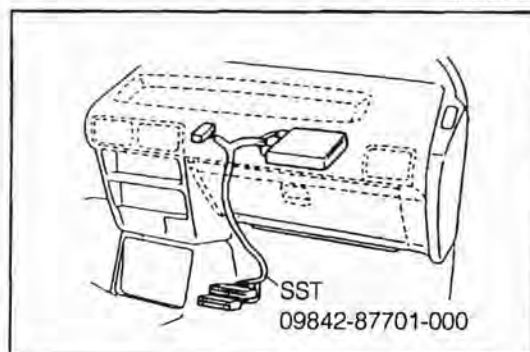
- (3) Connect the following SST between the ECU and the engine wire.

SST: 09842-87701-000

NOTE:

Before the SST is installed, be sure to perform continuity and short tests between SST terminals.

- (4) Reconnect the ground cable terminal to the negative (-) terminal of the battery.

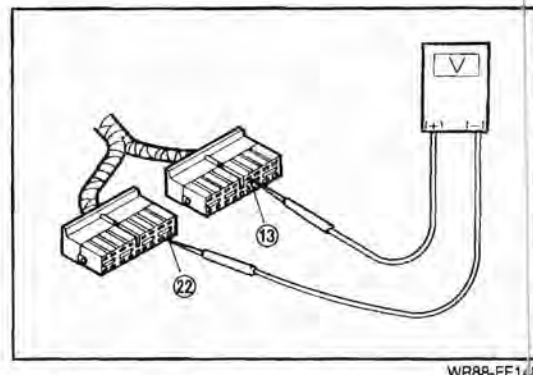


WR88-EF147

2. Check of output of pressure sensor
 - (1) Measure the voltage between the SST terminals ⑬ and ②② when the ignition switch is turned ON.

Specified Value

Measuring point	Atmospheric pressure	Voltage V
Altitude (height above sea level) m (ft)	mmHg (inchHg)	
0 (0)	760 (29.92)	3.3 - 3.9
500 (1640)	716 (28.19)	3.2 - 3.8
1000 (3280)	674 (26.54)	3.0 - 3.6



WR88-EF148

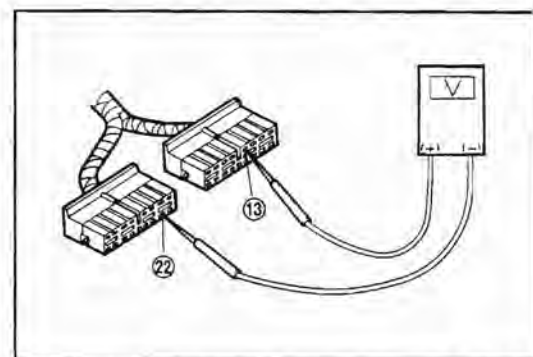
If the measured voltage does not conform to the specification, measure the voltage between the SST terminals ⑬ and ②②. Ensure that the measured voltage is within a range of 4.5 to 5.5 volts. Then, proceed to replace the pressure sensor. When the pressure sensor is replaced, it is necessary to replace the gas filter, too.

If the measured voltage between the SST terminals ⑬ and ②② does not conform to the specification, check the wiring between the ECU and the pressure sensor. If there is no trouble with the wiring, check the ECU. (See page EF-69.)

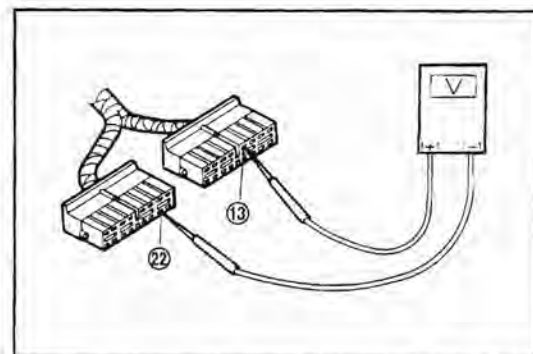
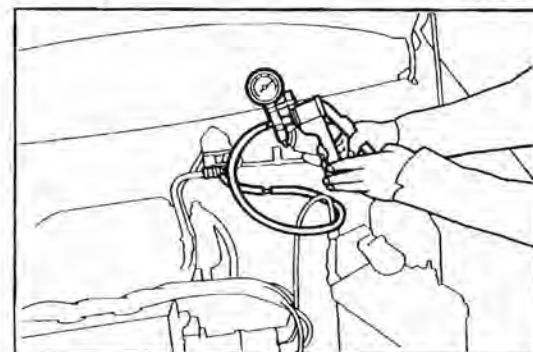
- (2) Disconnect the rubber hose connected to the pressure sensor. Apply a negative pressure of 200 mmHg (7.87 inchHg) to the pressure sensor, using a MityVac. Check that the measured voltage between the SST terminals ⑬ and ②② drops by 0.65 - 0.95, compared with the voltage measured in the step ①.

If the measured voltage fails to drop by the specified value, replace the pressure sensor.

When the pressure sensor is replaced, it is necessary to replace the gas filter, too.



WR88-EF149



WR88-EF150

- (3) Remove the MityVac from the pressure sensor.
- (4) Connect the rubber hose disconnected in the step (2) to the pressure sensor.

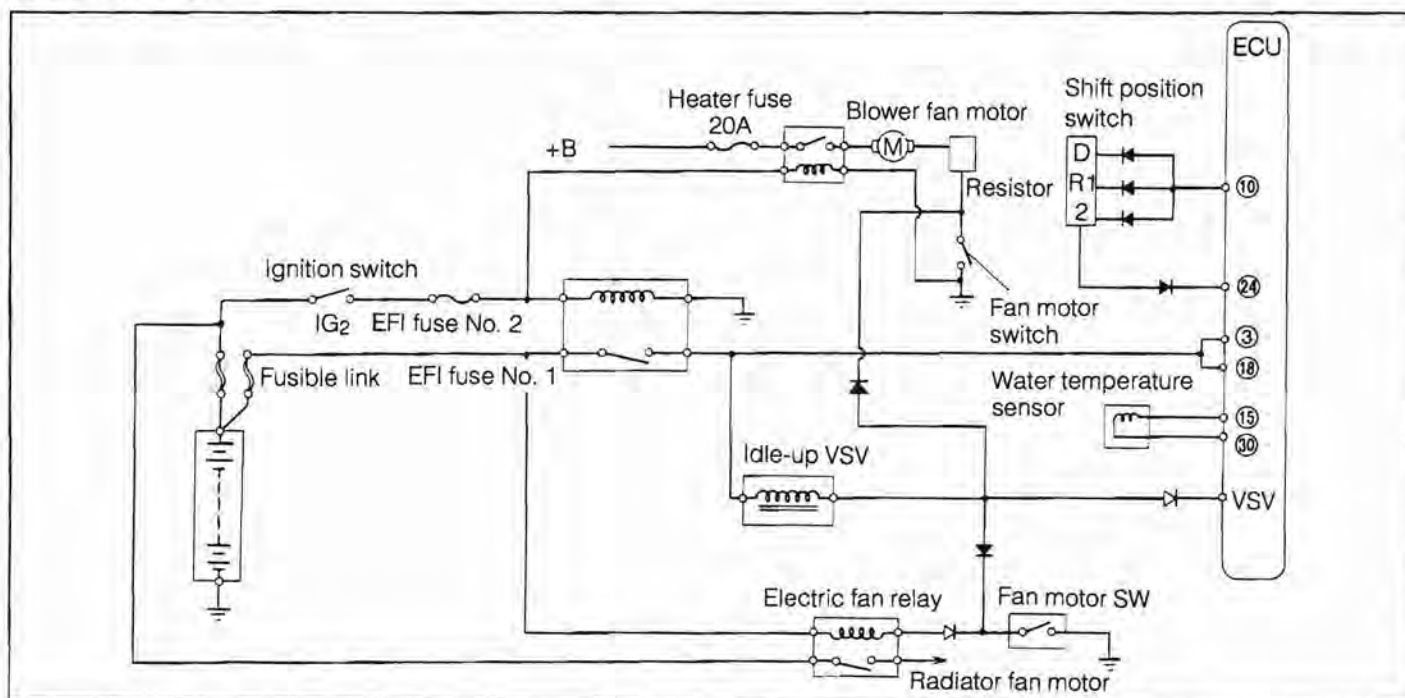
WR88-EF151

3. SST removal

- (1) Disconnect the ground cable terminal from the negative (-) terminal of the battery.
- (2) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
- (3) Connect the engine wire to the ECU.
- (4) Install the glove compartment box to the instrument panel.
- (5) Reconnect the ground cable terminal to the negative (-) terminal of the battery.

WR88-EF152

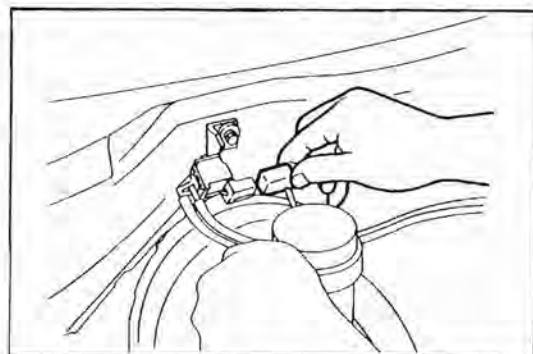
IDLE-UP VSV



WR88-EF153

Unit Inspection of Idle-up VSV

1. Disconnect the idle-up VSV connector.

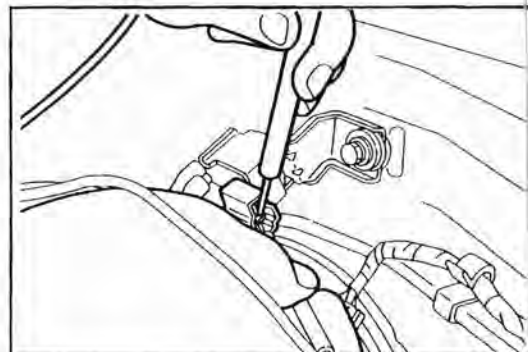


WR88-EF154

2. Measure the resistance between the idle-up VSV terminals.

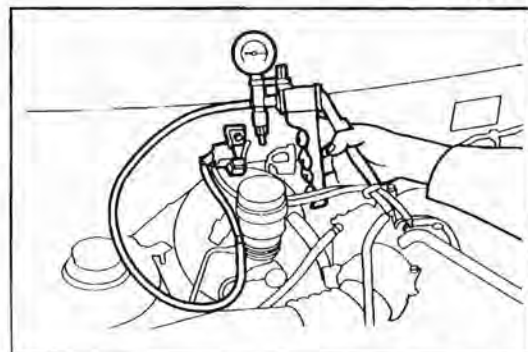
Specified value	30 - 50Ω at 20°C (68°F)
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If the resistance will not conform to the specification, replace the idle-up VSV.



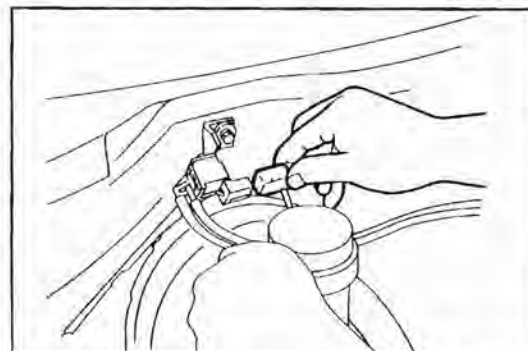
WR88-EF155

3. Disconnect the rubber hose connected to the idle-up VSV and connect a MityVac or a vacuum pump. Apply a negative pressure of 100 mmHg (3.94 inchHg).
If no negative pressure is applied, replace the idle-up VSV.



WR88-EF156

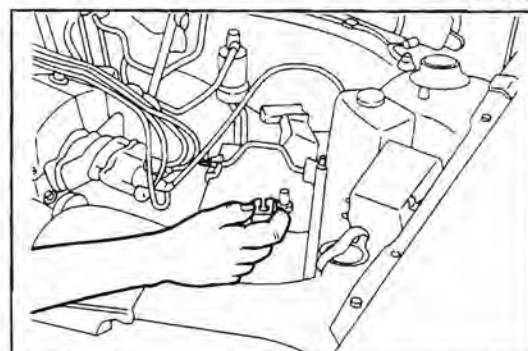
4. Connect the idle-up VSV connector and turn ON the ignition key switch. Check to see if the negative pressure applied in the step 3 becomes zero.
During this check, a voltage should be applied to the connector side.
5. Connect the disconnected rubber hose to the idle-up VSV.



WR88-EF157

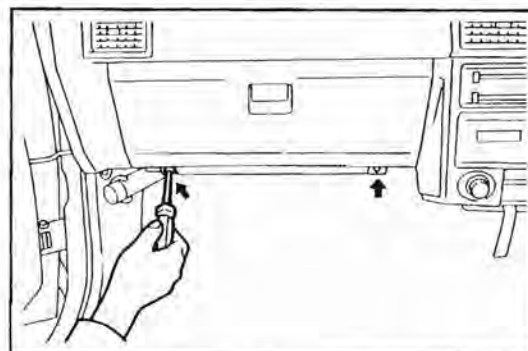
Check of Idle-up VSV Control

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.



WE88-EF158

2. Remove the glove compartment subassembly.



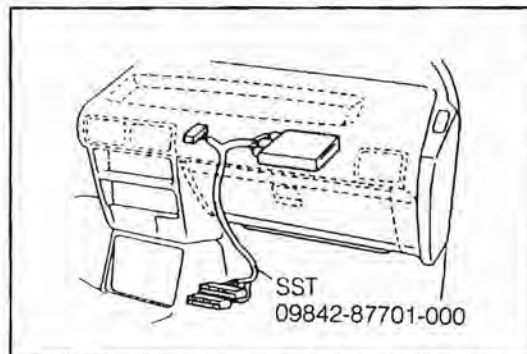
WR88-EF159

3. Connect the following SST between the ECU and the engine wire.

SST: 09842-87701-000

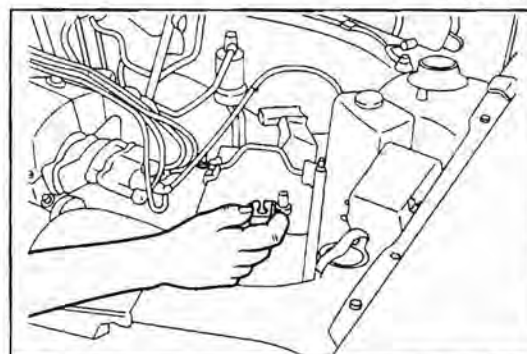
NOTE:

Before the SST is installed, be sure to perform continuity and short tests between SST terminals.



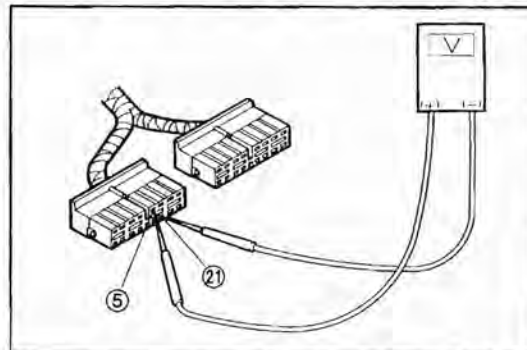
WR88-EF160

4. Reconnect the ground cable terminal to the negative (-) terminal of the battery.



WR88-EF161

5. With the engine running, measure the voltage across the SST terminals ⑤ and ②①.



WR88-EF162

No.	Condition	Measured voltage
1	Engine has warmed up fully after starting.	3V or less
2	Defogger ON	
3	Headlamps ON	
4	Blower fan motor operating	
5	Shift lever placed in range other than N or P range	
6	Radiator fan motor ON	

The measurement should not be performed when plural conditions of those described above are met concurrently.

If the check results will not conform to the requirements given in the table above, check and repair the following sections.

WR88-EF163

No.	Check item
1	Check water temperature sensor-related parts. (See page EF-38.) Check ECU. (See page EF-69.)
2, 3	Check to see if battery voltage is applied to between SST terminals ⑪ and ⑫ when defogger switch and/or headlamp switch is turned ON. If battery voltage is applied, check ECU. If no battery voltage is applied, check wiring from ECU ⑪ terminal to defogger switch and/or headlamp switch.
4	Check and repair wiring between blower fan motor switch and idle-up VSV.
5	Check that there is continuity between neutral start switch (shift position sensor) and ECU. Also, check that there is continuity between neutral switch and ground and/or battery power supply.
6	Check and repair wiring between radiator fan motor switch and idle-up VSV.

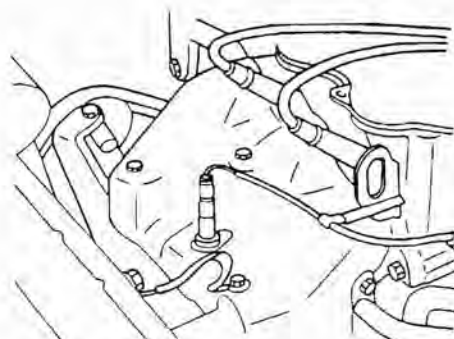
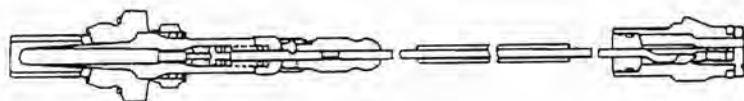
WR88-EF164

6. SST removal

- (1) Disconnect the ground cable terminal from the negative (-) terminal of the battery.
- (2) Remove the SST by disconnecting the ECU and engine wire connectors of the SST.
- (3) Connect the engine wire to the ECU.
- (4) Install the glove compartment box.
- (5) Reconnect the ground cable terminal to the negative (-) terminal of the battery.

WR88-EF165

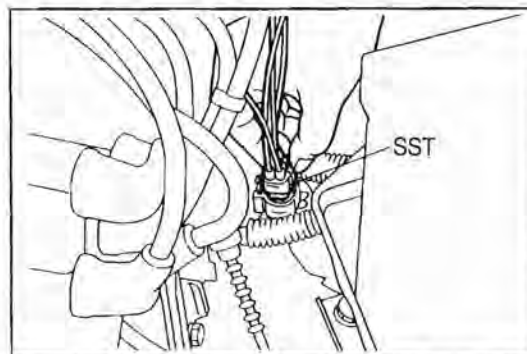
OXYGEN SENSOR



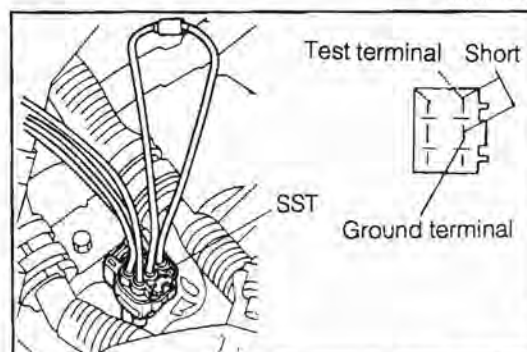
WR88-EF166

Inspection of Oxygen Sensor

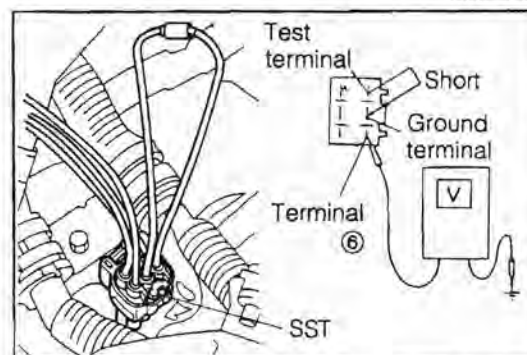
1. Install the SST to the check terminal.
SST: 09991-87702-000
 2. Warm up the engine.
 3. After the engine has been warmed up, hold the engine speed for two minutes at 3000 rpm.
 4. Short the SST Test terminal (brown) with the ground terminal (black).
 5. Connect a voltmeter between the SST terminal ⑥ (green) and the engine ground.
 6. Hold the engine speed at around 3000 rpm. Ensure that the reading of the voltmeter hooked up in the step 5 changes eight times or more for 10 seconds.
When the change in voltage occurs eight times or more, the oxygen sensor is functioning normally.
- If the change in voltage fails to occur eight times or more in the check described in the step 6, perform trouble shooting, following the instruction given below.
- In case that the change in voltage occurs less than eight times:
Proceed to Step 7.
- In case that no change in voltage occurs at all:
Proceed to Step 10.
7. Release the short between the SST Test terminal and the ground terminal.



WR88-EF167



WR88-EF168



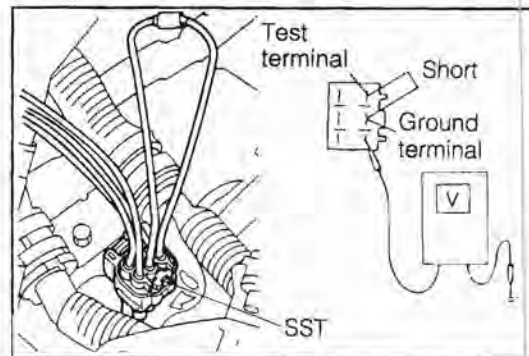
WR88-EF169

WR88-EF170

8. Again hold the engine speed for two minutes at 3000 rpm.

Afterwards, while holding the engine speed at around 3000 rpm, short the SST Test terminal with the ground terminal.

SST: 09991-87702-000



WR88-EF171

9. Check that the change in voltage between the SST terminal VF and the engine ground occurs eight times or more. If the change in voltage occurs eight times or more, the oxygen sensor is functioning normally.

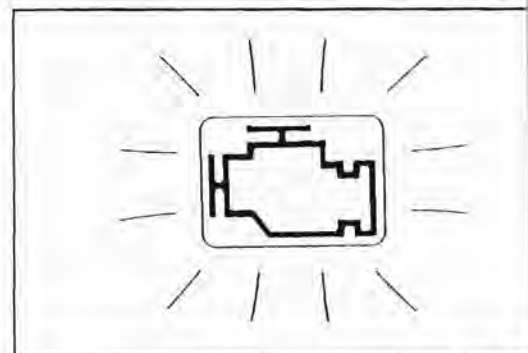
If the change in voltage occurs less than eight times, replace the oxygen sensor.

In case that no change in voltage occurs at all, proceed to the step 10.

10. Perform the diagnosis check. Read the diagnosis code. (See page EF-24.)

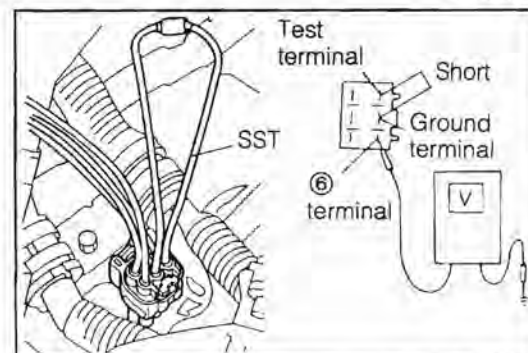
If any code or codes other than the normal code are indicated, carry out the trouble shooting according to diagnosis codes.

When the normal code is indicated, proceed to the step 11.



WR88-EF173

11. Start the engine and warm it up.
12. Hold the engine speed for two minutes at 3000 rpm. Then, hold the engine speed at around 3000 rpm. Short the Test terminal with the ground terminal.

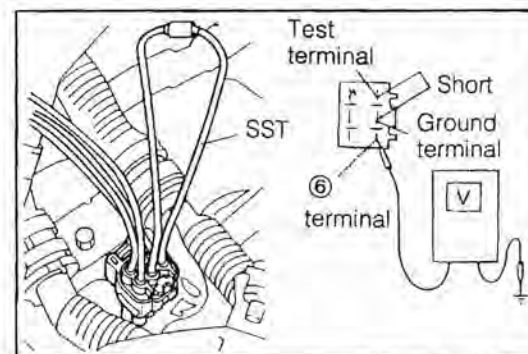


WR88-EF174

13. While the operation described in the step (12) is being performed, measure the voltage between the SST terminal ⑥ and the engine ground. If the measured voltage is more than 0V, it means that the air-to-fuel ratio of the fuel mixture is too rich. Remedy the cause for the too rich fuel mixture. If the measured voltage is 0V and the engine is idling normally, replace the oxygen sensor.

If the measured voltage is 0V and the engine is not idling normally, remedy the cause for the too lean fuel mixture.

14. Remove the SST from the check connector.
15. Install the cap to the check connector.



WR88-EF175

ELECTRONIC CONTROL UNIT (ECU)

Inspection of ECU

1. Measurement of ECU voltage

NOTE:

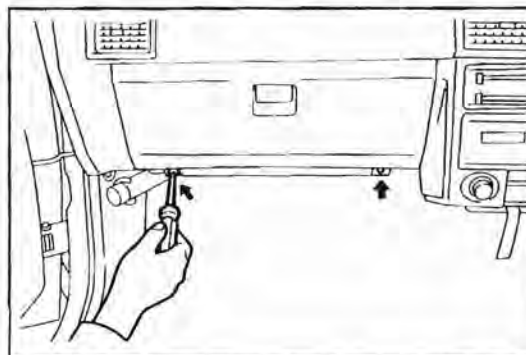
- The wiring circuit of the EFI can be checked by measuring the voltage and resistance at the ECU terminals.
- The measurement of voltage should be conducted while all of the connectors are connected.
- Make sure that the battery voltage is 11 volts or more when the ignition switch is turned ON.

(1) Preparation of measurement

- ① Disconnect the ground cable terminal from the negative terminal (–) of the battery.

WR88-EF176

- ② Remove the glove compartment subassembly.



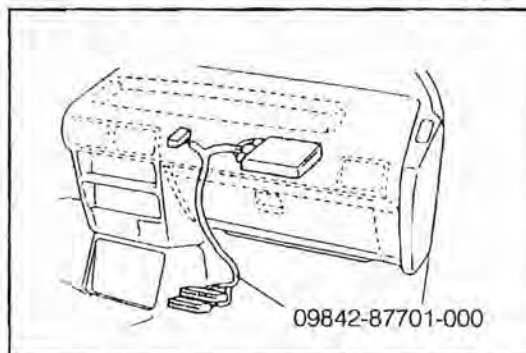
WR88-EF177

- ③ Connect the SST between the ECU and the engine wire.

SST: 09842-87701-000

NOTE:

Before the SST is installed, be sure to perform continuity and short tests between SST terminals.



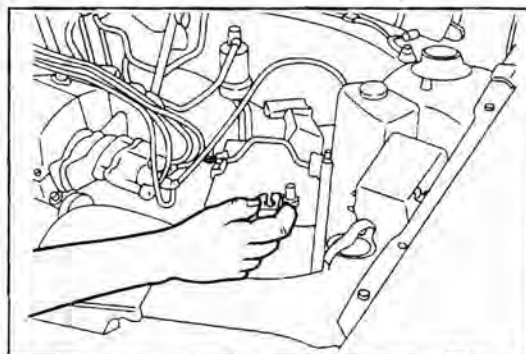
WR88-EF178

- ④ Connect the ground cable terminal to the negative terminal (–) of the battery.

NOTE:

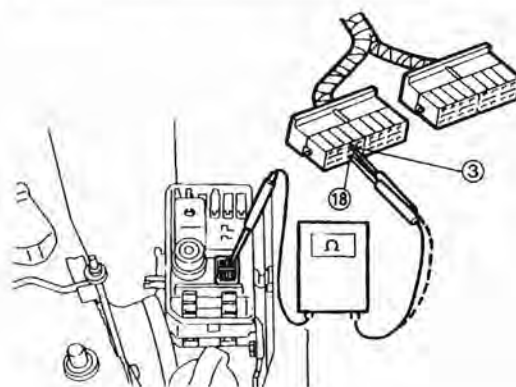
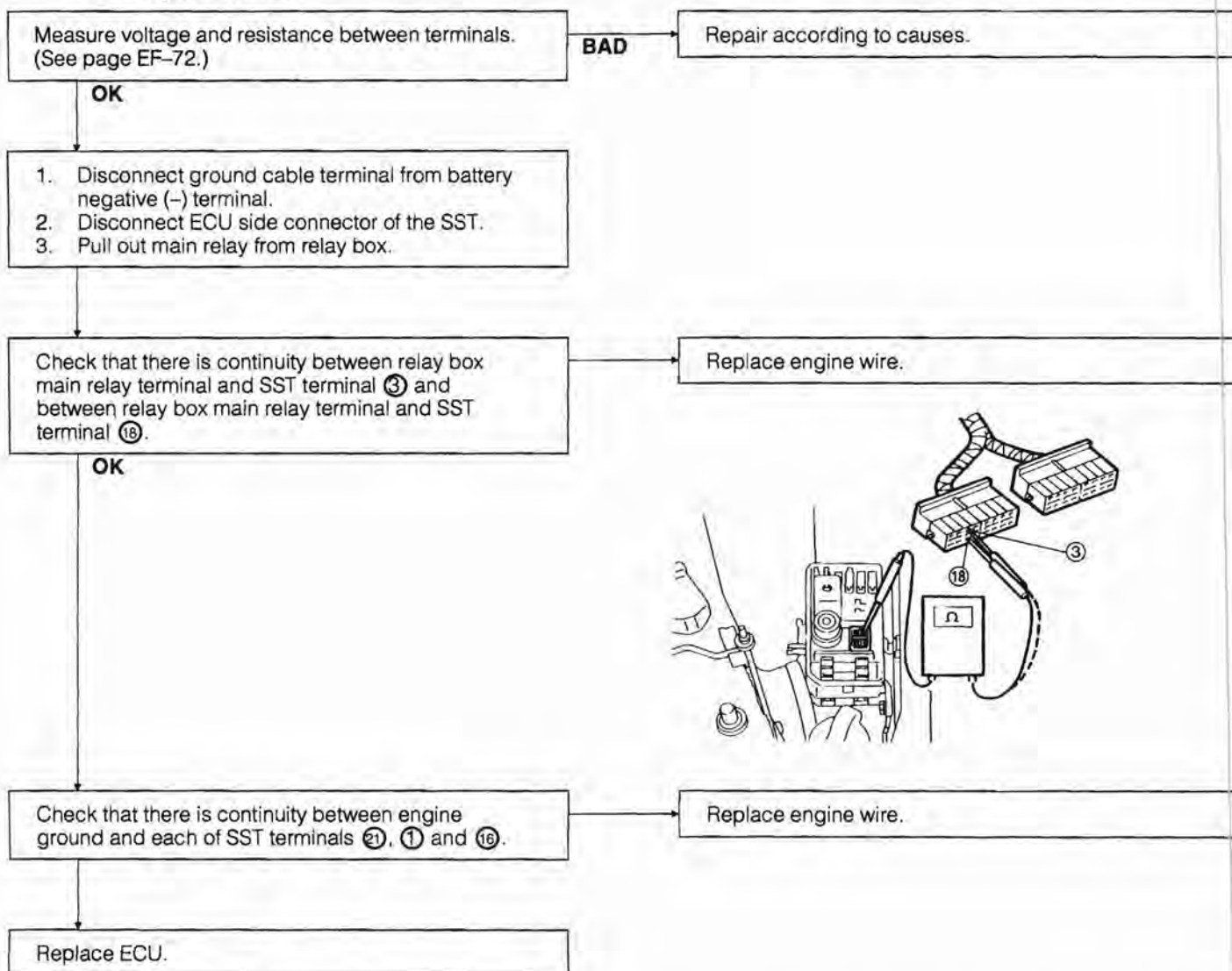
After completion of the inspection, before the SST is removed, be sure to disconnect the battery ground cable from the negative (–) battery terminal.

After the ECU and engine wire have been connected, reconnect the battery ground cable to the negative (–) battery terminal.



WR88-EF179

- (2) Measure the voltage and resistance between each terminal. Check that the measured voltage and resistance conform to the specifications. Perform the check and repair in accordance with the flow chart given below.

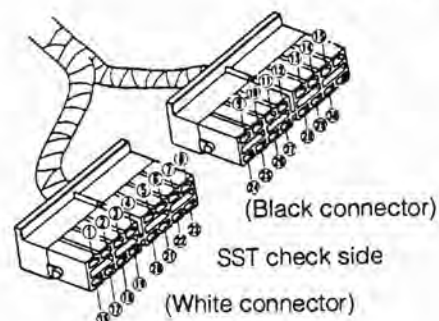


ECU CONNECTORS

No.	Contents of connection	No.	Contents of connection
1	Power ground	16	Power ground
2	Injector	17	Injector
3	Battery +B (Main relay)	18	Battery +B (Main relay)
4	Battery +B (Back-up)	19	Check engine lamp
5	Idle-up VSV	20	Fuel pump relay
6	Feedback check terminal	21	Engine ground
7	Ignition coil (negative)	22	Pressure sensor ground
8	Starter switch	23	Air conditioner magnet clutch
9	Test terminal	24	Shift position switch
10	Idle switch	25	AT/MT detecting terminal
11	Electric load signal	26	Vehicle speed sensor
12	Sensor power supply (approx. 5V)	27	Shift position switch
13	Pressure sensor	28	Power switch
14	Intake air temperature sensor	29	Oxygen sensor
15	Cooling water temperature sensor	30	Sensor ground

WR88-EF181

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
30	29	28	27	26	25	24	23	22	21	20	19	18	17	16



Voltage or Resistance at ECU Wiring Connectors

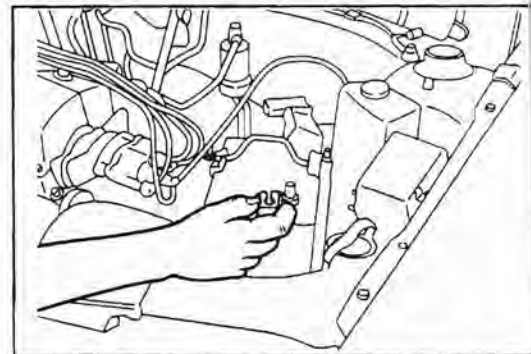
Terminals	STD voltage or resistance	Conditions	Remedies
① - ②①	1Ω or less	Ignition switch OFF	Proceed to flow chart ②.
② - ②①	1V or less	Ignition switch OFF (after more than one minute)	Check power supply.
	10 - 15.5V	Ignition switch ON	
③ - ②①	0.1V or less	Ignition switch OFF (after more than ten seconds)	Check power supply.
	10 - 15.5V	Ignition switch ON	
④ - ②①	10 - 15.5V	At all times (Measured voltage is lower than specified voltage only at during starting period.)	Check power supply.
⑤ - ②①	10 - 15.5V	Engine fully warmed up. All accessory switches turned OFF and radiator fan motor not rotating.	Check power supply.
	3.0V or less	Idle-up VSV ON	Check idle-up VSV control.
⑥ - ②①	4.5 - 5.5V	Ignition switch ON. Terminal T shorted with ground terminal. Throttle valve fully closed.	Proceed to flow chart ②.
	1V or less		Check diagnosis code.
	0 - 4.5 to 5.5V (Measured voltage varies.)	Ignition switch ON. Terminal T shorted with ground terminal. Engine revolution speed held at 3000 rpm after it has fully warmed up.	Oxygen sensor system
⑦ - ②①	0.1V or less	Ignition switch OFF	Check power supply.
	10 - 15.5V	Ignition switch ON	
⑧ - ②①	0.1V or less	Ignition switch OFF	Check power supply.
	6 - 15.5V	When ignition switch is set to ST position	
⑨ - ②①	0.1V or less	Ignition switch OFF	Check T-terminal wiring.
	10 - 15.5V	Ignition switch ON	
⑩ - ②①	0.5V or less	Ignition switch ON. Throttle valve fully closed.	Throttle position sensor system.
	10 - 15.5V	Ignition switch ON. Throttle valve fully opened.	
⑪ - ②①	0.1V or less	Ignition switch ON. Headlamp switch and/or defogger switch OFF.	Check idle-up VSV control.
	9 - 15.5V	Ignition switch ON. Headlamp switch and/or defogger switch ON.	
⑫ - ②②	0.1V or less	Ignition switch OFF	Check VCC wiring.
	4.5 - 5.5V	Ignition switch ON	
⑬ - ②②	3.2 - 3.8V	Ignition switch ON. Atmospheric pressure is 760 mmHg (29.9 inchHg).	Check pressure sensor.
⑭ - ③①	0.9 - 3.0V	Ignition switch ON. Air temperature inside surge tank: 20°C (68°F)	Check intake air temperature sensor.
⑮ - ③①	0.4 - 0.5V	Ignition switch ON. After engine has been warmed up fully. (Cooling water temperature: 80 - 90°C (176 - 194°F))	Check cooling water temperature sensor.

Terminals	STD voltage or resistance		Conditions	Remedies
⑩ - ①	1Ω or less		Ignition switch OFF	Proceed to flow chart ②.
⑪ - ②①	1V or less		Ignition switch OFF (after more than one minute)	Check/repair injector power supply.
	10 - 15.5V		Ignition switch ON	
⑫ - ②①	0.1V or less		Ignition switch OFF	Check and repair ECU power supply.
	10 - 15.5V		Ignition switch ON	
⑬ - ②①	3V or less		Ignition switch ON (Check engine lamp illuminated.)	Check power supply for check engine lamp.
	10 - 15.5V		Engine is rotating. (Check engine lamp not illuminated.)	
⑭ - ②①	1V or less		Ignition switch ON. Fuel pump is operating.	Check/repair fuel pump power supply.
	10 - 15.5V		Ignition switch ON. Fuel pump is stopped.	
⑮ - Engine ground	0.2Ω or less		Ignition switch OFF	Check ground wiring.
⑯ - ②①	0.5Ω or less		Ignition switch OFF	Replace ECU.
⑰ - ②①	1.0 - 15.5V		Engine is rotating. Air conditioner compressor is rotating. (Genuine air conditioner-equipped vehicle)	Check air conditioner wiring.
⑱ - ②①	0.1V or less		Ignition switch ON. Shift lever shifted in [N] or [P] range.	Check neutral start switch.
	10 - 15.5V		Ignition switch ON. When shift lever is shifted to [R] range. (A/T vehicle only)	
⑲ - ②①	M/T 10 - 15.5V		Ignition switch ON	Check wiring.
	A/T 0.1V or less		Ignition switch ON	Check ECU output.
⑳ - ②①	0 - 10 to 15.5V		Ignition switch ON When vehicle is moved. (Measured voltage changes 4 times for movement of 1.5m.)	Check speed sensor.
㉑ - ②①	10 - 15.5V		Ignition switch ON. When shift lever is shifted to [N] , [P] or [R] range. (A/T vehicle only)	Check neutral start switch. (Shift position sensor)
	1.0V or less		Ignition switch ON. When shift lever is shifted to [D] , [2] or [L] range. (A/T vehicle only)	
㉒ - ②①	M/T	4.5 - 5.5V	Ignition switch ON. Throttle valve fully closed.	Check throttle position sensor.
		0.5V or less	Ignition switch ON. Throttle valve fully opened.	
	A/T	0.5V or less	Ignition switch ON. Throttle valve fully closed.	
		4.5 - 5.5V	Ignition switch ON. Throttle valve fully opened.	
㉓ - ②①	0.1V or less		Ignition switch ON (after more than 60 seconds)	Check oxygen sensor.
	Voltage varies within 0 - 1.0V		After engine has warmed up fully. When engine revolution is held at 3000 rpm for more than 2 minutes:	Check fuel system.
㉔ - ②①	1Ω or less		Ignition switch ON	Proceed to flow chart ②.

WR88-EF163

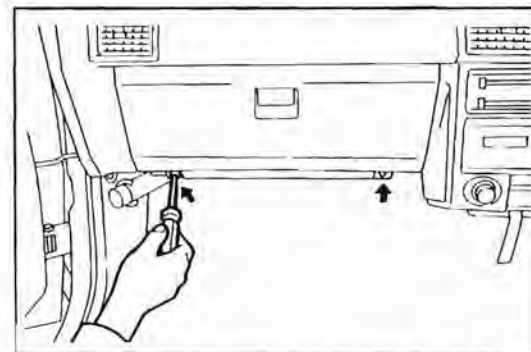
ECU Replacement

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.



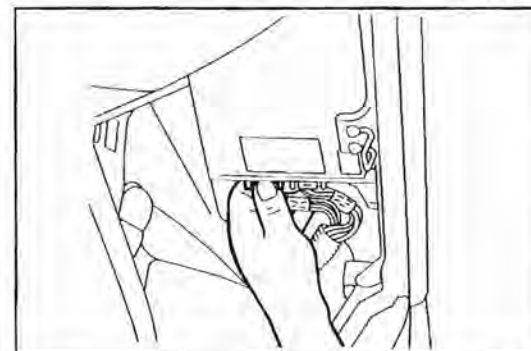
WR88-EF185

2. Remove the glove compartment box.



WR88-EF186

3. Disconnect the engine wire connector from the ECU.

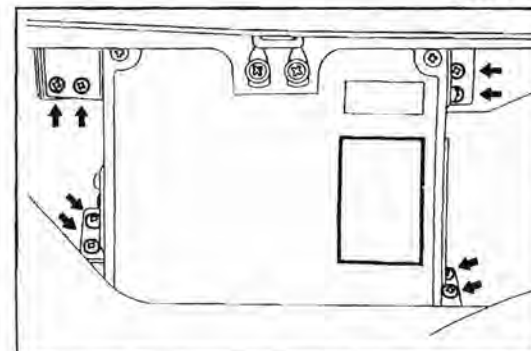


WR88-EF187

4. Remove the ECU from the instrument panel by removing the attaching screws.
5. Install a new ECU to the instrument panel.

CAUTION:

Do not touch with the bracket screws mounted on the ECU proper. This tampering will cause an ECU malfunction.



WR88-EF188

6. Connect the engine wire connector to the ECU.
7. Install the glove compartment box on the instrument panel.
8. Connect the ground cable terminal to the negative (–) terminal of the battery.

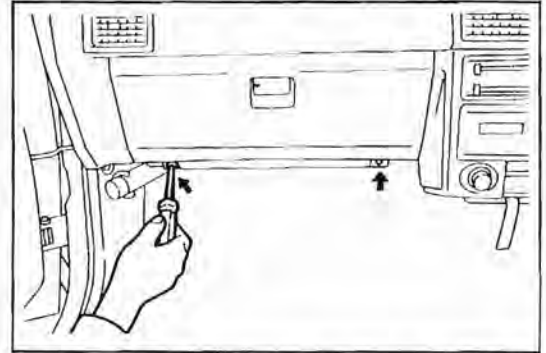
WR88-EF190

SST Removal

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
2. Disconnect the connectors of the ECU and engine wire from the SST so as to remove the SST.
3. Connect the engine wire connector to the ECU.

WR88-EF191

4. Install the glove compartment box on the instrument panel.



WR88-EF192

5. Reconnect the ground cable terminal to the negative (-) terminal of the battery.

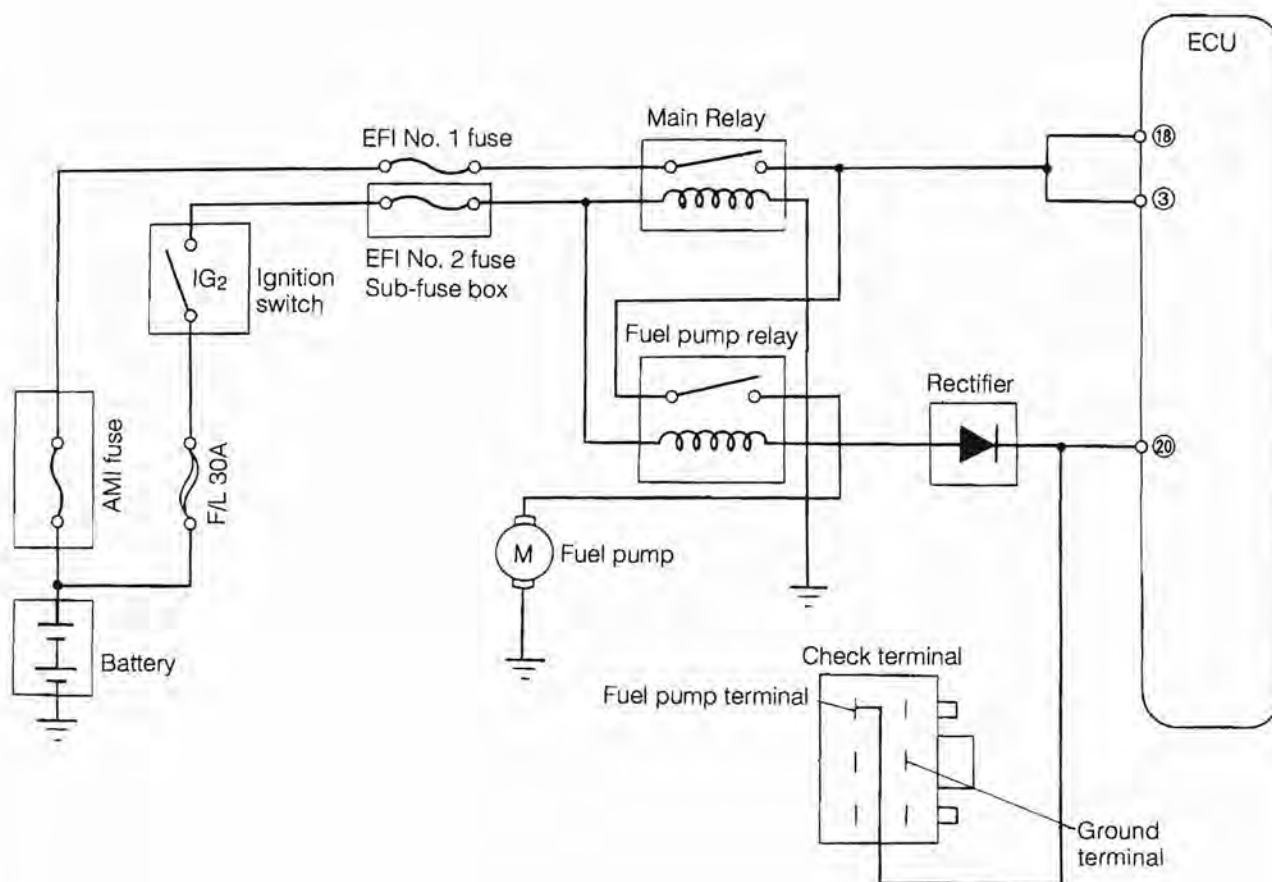
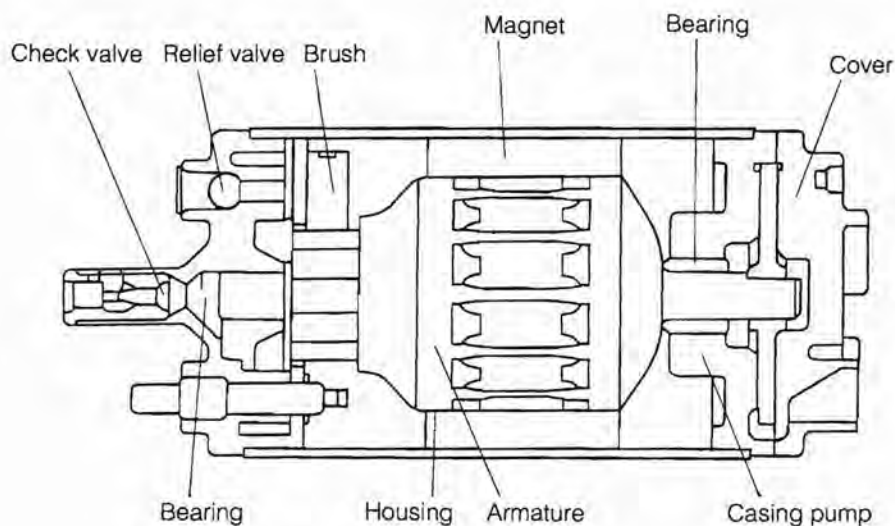
WR88-EF193

FUEL SYSTEM

FUEL PUMP

WARNING:

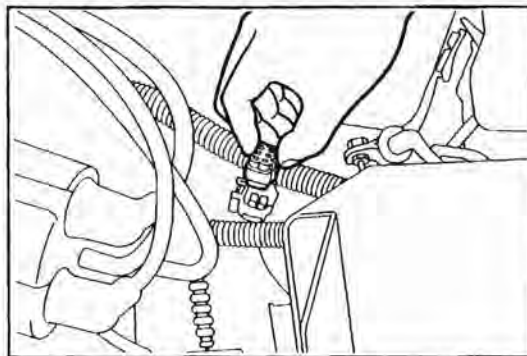
When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.



In-Vehicle Inspection**Check of Fuel Pump Operation**

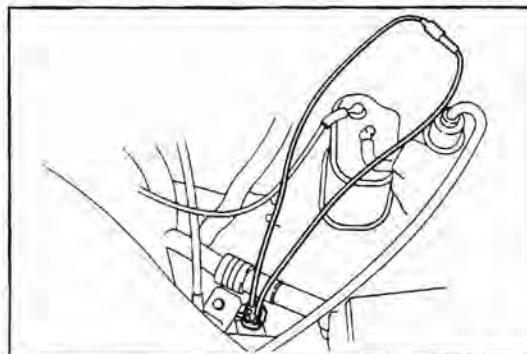
1. Connection of SST (09991-87702-000)

(1) Detach the check connector cap.



WR88-EF195

(2) Connect the SST to the check connector. Connect the SST terminal F (white/black) to the ground terminal (black).



WR88-EF196

2. Check of fuel flowing sound

(1) Turn ON the ignition key switch.

WR88-EF197

(2) Check to see if you can hear fuel flowing sound around the pressure regulator.

(3) If you can hear no fuel flowing sound, check the following parts. Repair them, as required.

- Fusible links
- Fuses
- Main relay
- Fuel pump relay
- Fuel pump
- Wiring and wiring connections



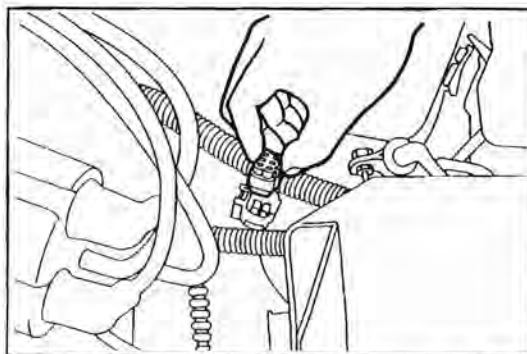
WR88-EF198

3. SST Removal

(1) Turn OFF the ignition switch.

(2) Remove the SST from the check terminal.

(3) Attach the cap on the check terminal.



WR88-EF200

Check of Fuel Pressure

1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
3. Place a suitable container or cloth, etc. under the fuel filter.

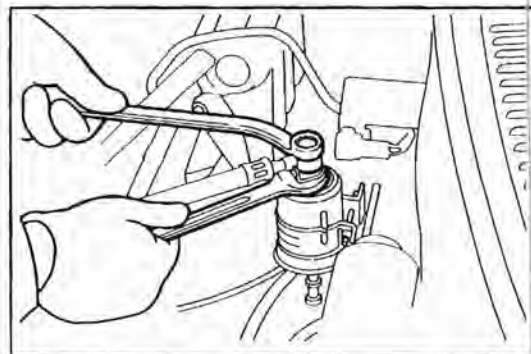
WR88-EF201

4. Loosen the union bolt gradually.

CAUTION:

The fuel pressure at the inside of the fuel line is approximately 2.55 kg/cm^2 (36.27 psi) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing.

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

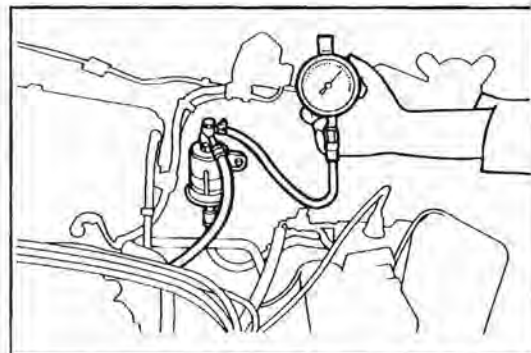


WR88-EF202

5. Install the SST (fuel pressure gauge) between the fuel hose No. 1 and the fuel filter by means of the union bolt with a new gasket interposed.

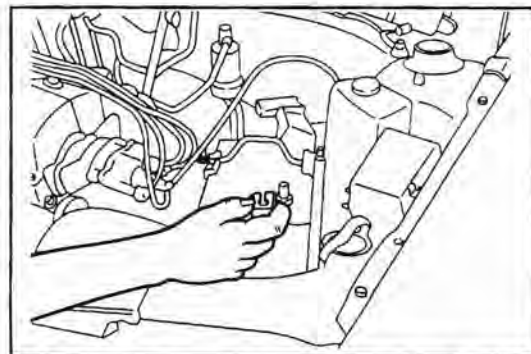
SST: 09268-87701-000

Tightening Torque: 3.5 - 4.5 kg-m (25.3 - 32.5 ft-lb)



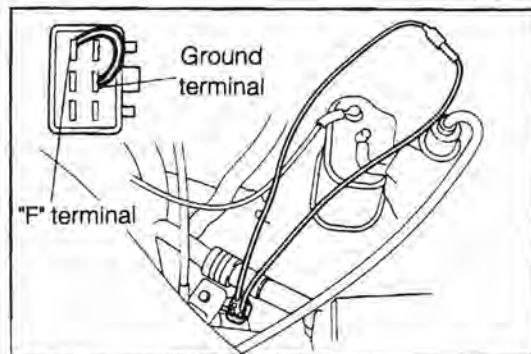
WR88-EF203

6. Reconnect the ground cable terminal to the negative (-) terminal of the battery.



WR88-EF204

7. Connection of SST (09991-87702-000)
 - (1) Remove the cap on the check terminal.
 - (2) Connect the SST to the check connector.
 - (3) Connect the SST terminal F (white/black) to the ground terminal (black).
8. Turn ON the ignition switch.



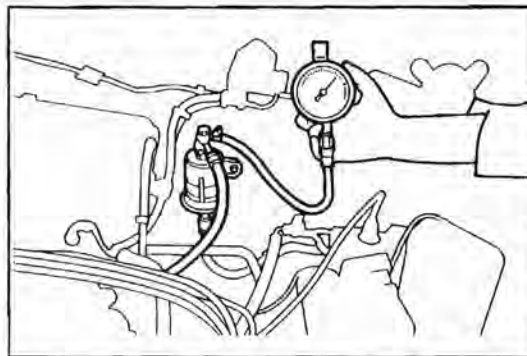
WR88-EF205

9. Check to see if the fuel pressure conforms to the specified pressure.

Specified Fuel Pressure: 2.3 - 2.8 kg/cm² (33 - 40 psi)

If the fuel pressure is higher than the specified pressure, check and/or repair the following items.

- (1) Fuel return hose and/or pipe for restriction or damage.
- (2) Rubber hose connected between pressure regulator and surge tank for restriction.
- (3) If the check results of (1) and (2) are satisfactory, replace the pressure regulator. (See page EF-97.)



If the fuel pressure is lower than the specified pressure, check and/or repair the following items.

- (1) Fuel hose and/or pipe for restriction or damage or leakage.
- (2) Fuel filter for restriction. (See page EF-94.)
- (3) Check fuel flow rate. (See page EF-80.)
- (4) Pressure regulator. (See page EF-97.)

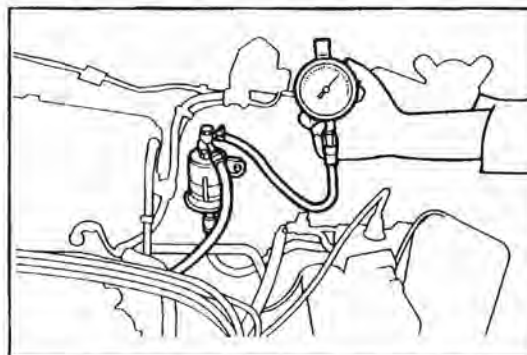
WR88-EF206

10. Turn OFF the ignition switch. After a lapse of three minutes, check to see if the fuel pressure is the specified pressure or more.

Specified Fuel Pressure: 1.8 kg/cm² or more
(25.6 psi or more)

If the fuel pressure is lower than the specified pressure, check and/or repair the following items.

- (1) Injector (See page EF-106.)
- (2) Pressure regulator (See page EF-97.)
- (3) Fuel hose and/or pipe for damage or leakage.
- (4) If the check results of (1) and (2) are satisfactory, replace the fuel pump.



WR88-EF207

11. SST Removal

- (1) Turn OFF the ignition key switch.
- (2) Disconnect the ground cable terminal from the negative terminal (–) of the battery.
- (3) Loosen the fuel filter union bolt gradually.

CAUTION:

The fuel pressure at the inside of the fuel line is approximately 2.5 atm. higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing.

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

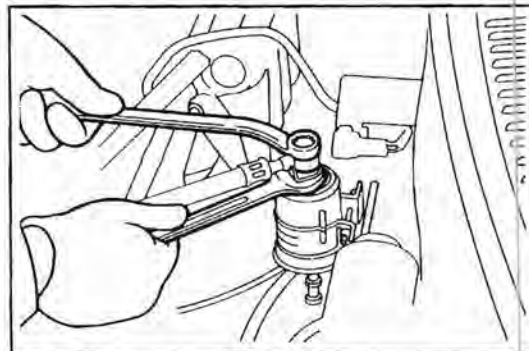
- (4) Remove the SST (fuel pressure gauge).

SST: 09268-87701-000

WR88-EF208

- (5) Install the fuel hose No. 1 to the fuel filter by means of the union bolt with a new gasket interposed.

Tightening Torque: 3.5 - 4.5 kg-m (25.3 - 32.5 ft-lb)



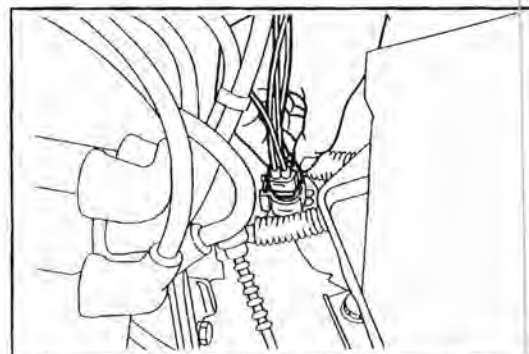
WR88-EF209

- (6) Remove the SST from the check connector.

SST: 09991-87702-000

- (7) Attach the cap on the check connector.

- (8) Reconnect the ground cable terminal to the negative (-) terminal of the battery.



WR88-EF210

12. Check of Fuel Leakage

Start the engine. Check to see if any fuel leakage is present. Repair any defective part if the fuel leakage exists.

WR88-EF211

Check of Fuel Flow Rate

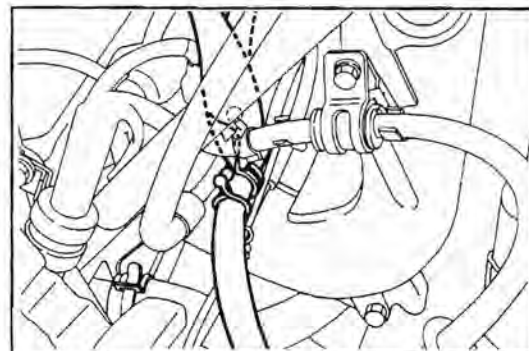
1. Ensure that the battery voltage is 12 volts or more.
2. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
3. Place a suitable container or cloth, etc. under the pressure regulator.

WR88-EF212

4. Disconnect the fuel return hose connected to the pressure regulator.

CAUTION:

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so that no fuel may get to the alternator.

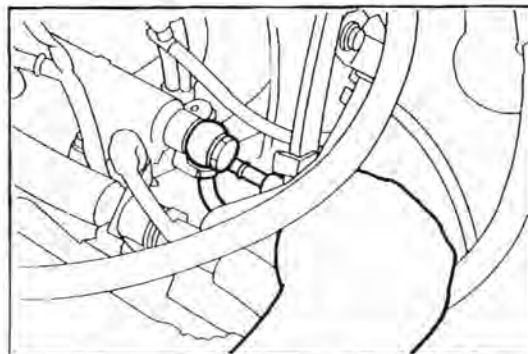


WR88-EF213

5. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.

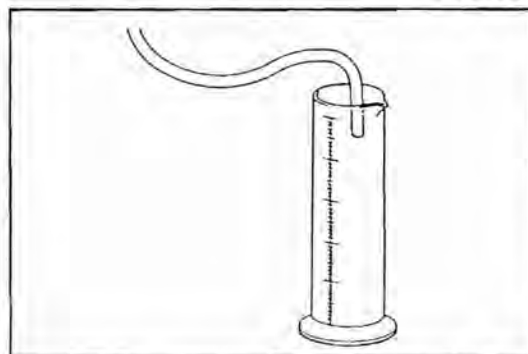
Reference:

This fuel hose is included in the SST (09268-87702-000).



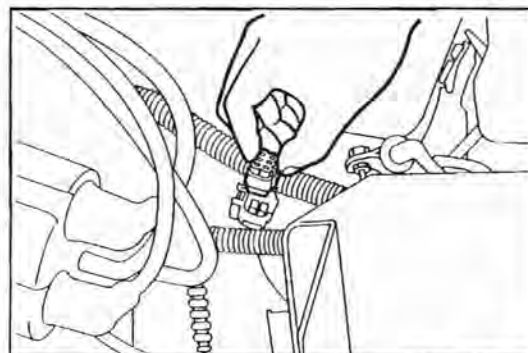
WR88-EF214

6. Insert one end of the fuel hose in a measuring cylinder.



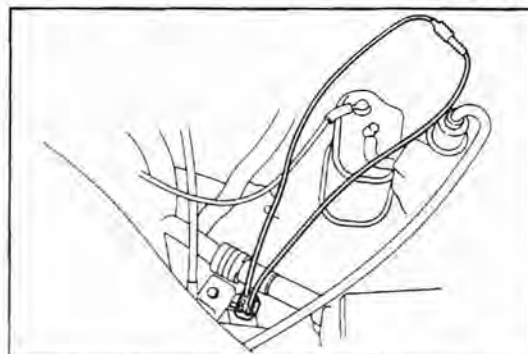
WR88-EF215

7. Detach the check connector cap.



WR88-EF216

8. Connect the SST (09991-87702-000) to the check connector. Connect the SST terminal F (White/Black) to the ground terminal (Black).
9. Connect the ground cable terminal to the negative (-) terminal of the battery.
10. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.



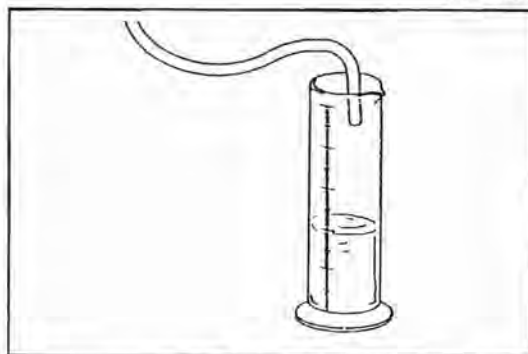
WR88-EF217

11. Measure the amount of fuel collected in the measuring cylinder.

Specified Amount of Fuel: 275 cc or more
(16.78 cub inch or more)

If the fuel amount is less than the specified amount, check the fuel filter.

12. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

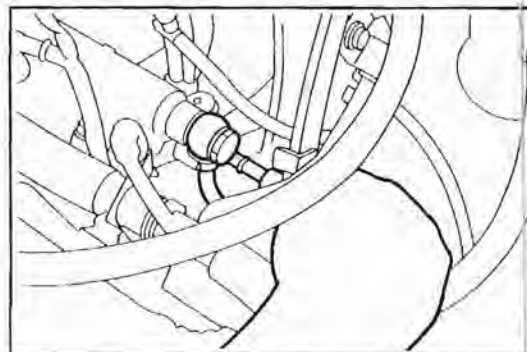


WR88-EF218

13. Remove the SST (09991-87702-000) from the check connector.
14. Attach the cap on the check connector.

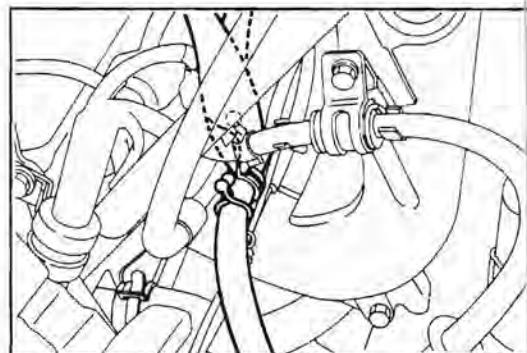
WR88-EF219

15. Disconnect the fuel hose connected to the pressure regulator.



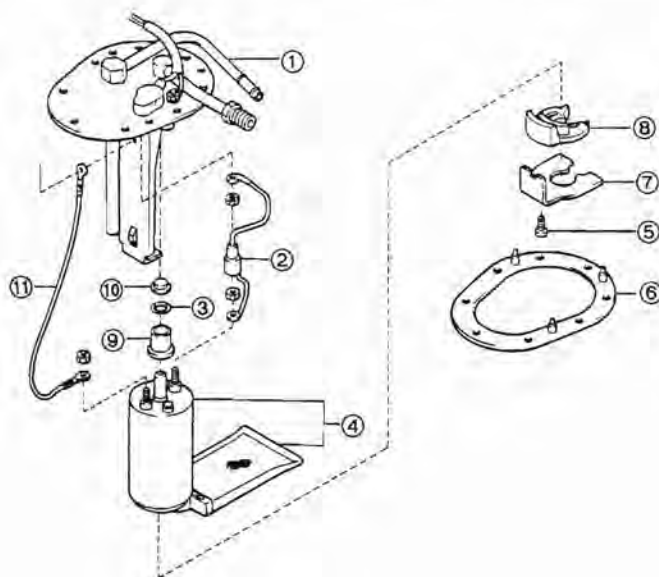
WR88-EF220

16. Connect the fuel return hose to the pressure regulator. Attach the clips.
17. Reconnect the ground cable terminal to the negative (-) terminal of the battery.
18. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.



WR88-EF221

Removal of Fuel Pump (4WD vehicle only) Components



- ① Fuel pump bracket
- ② Lead wire
- ③ "O" ring
- ④ Fuel pump Ay
- ⑤ Toothed washer
- ⑥ Fuel pump gasket
- ⑦ C bracket
- ⑧ Cushion
- ⑨ Spacer
- ⑩ Cap
- ⑪ Lead wire

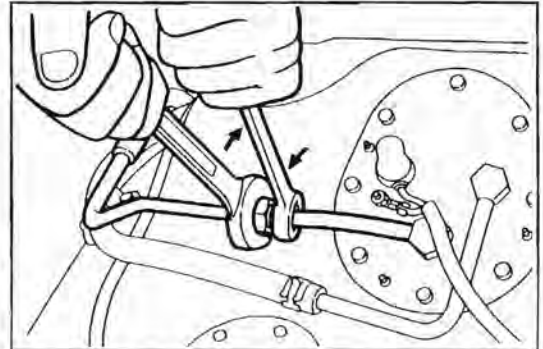
WR88-EF222

Removal of Fuel Pump**WARNING:**

When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.

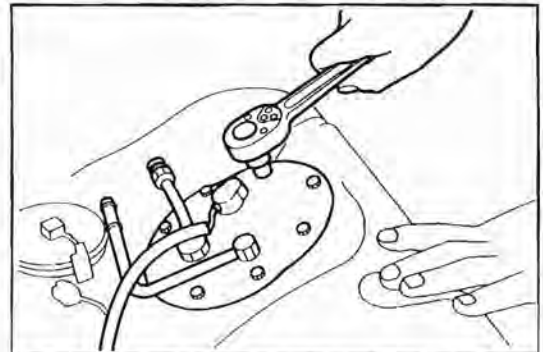
WR88-EF223

1. Remove the fuel tank.
(See page EF-86.)
2. Removal of fuel pump bracket from fuel tank
 - (1) Remove the fuel main hose and fuel return pipe from the fuel pump bracket.



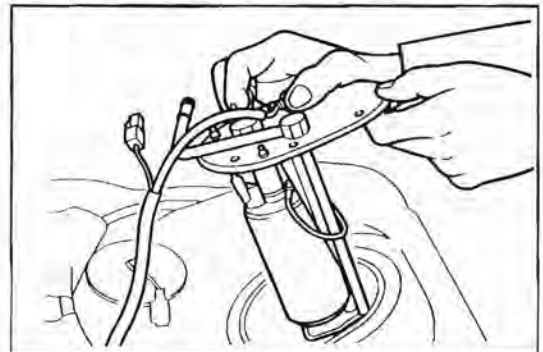
WR88-EF224

- (2) Remove the fuel pump bracket attaching bolts.



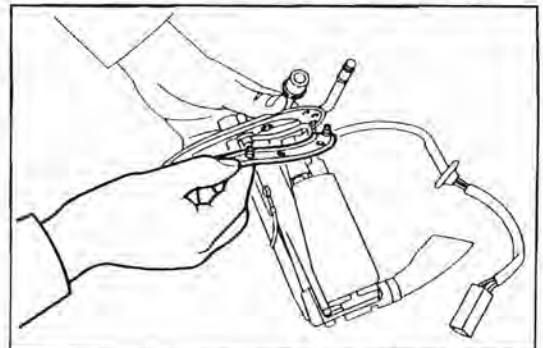
WR88-EF225

- (3) Remove the fuel pump bracket from the fuel tank.



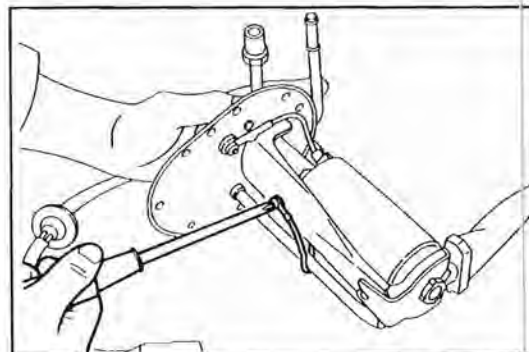
WR88-EF226

3. Remove the fuel pump bracket gasket.



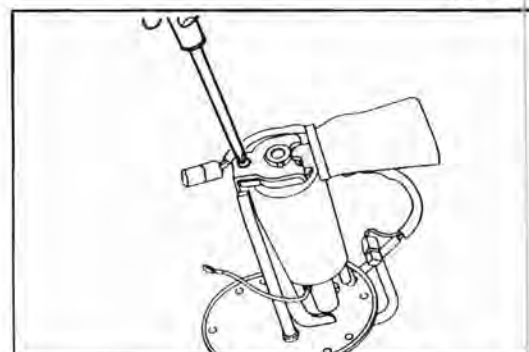
WR88-EF227

4. Remove the nut. Disconnect the two wires from the fuel pump bracket.



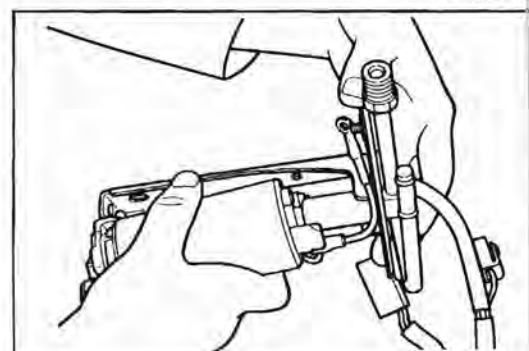
WR88-EF228

5. Remove the C bracket attaching screws.



WR88-EF229

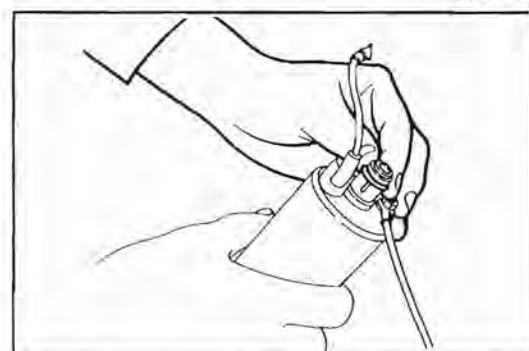
6. Remove the fuel pump.
7. Remove the rubber cushion from the fuel pump.



WR88-EF230

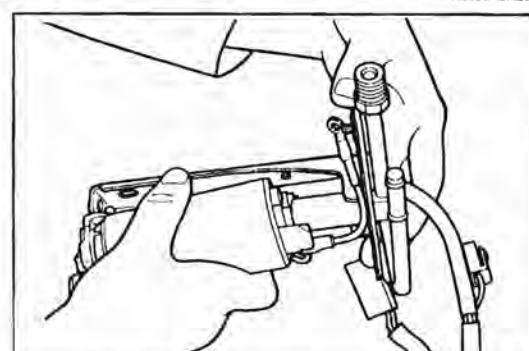
Assembly of Fuel Pump Bracket

1. Replace the "O" ring.
2. Install the rubber cushion to the fuel pump.



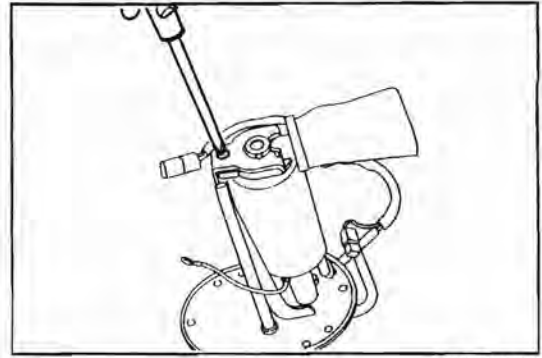
WR88-EF232

3. Insert the fuel pump into the fuel pump bracket.



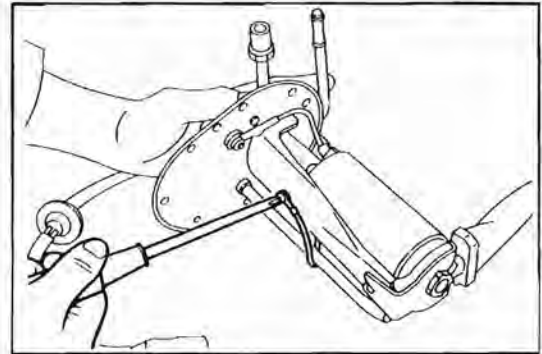
WR88-EF233

4. Install the C bracket to the fuel pump bracket.



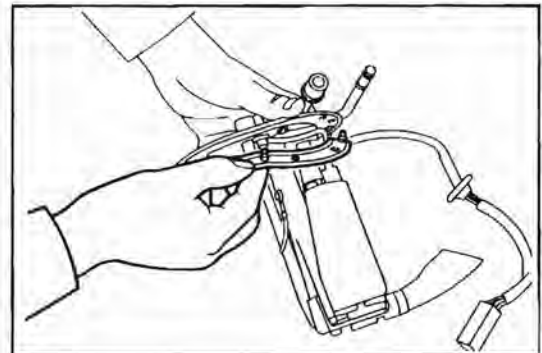
WR88-EF234

5. Connect the two wires to the fuel pump bracket.



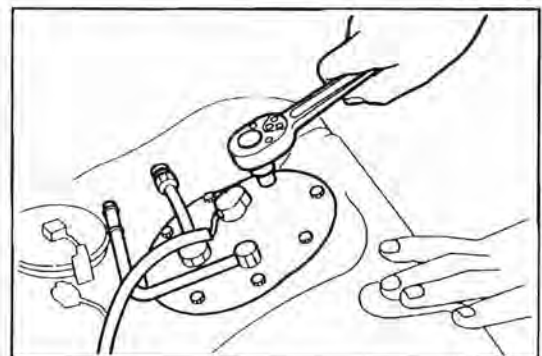
WR88-EF235

6. Install a new gasket to the fuel pump bracket.



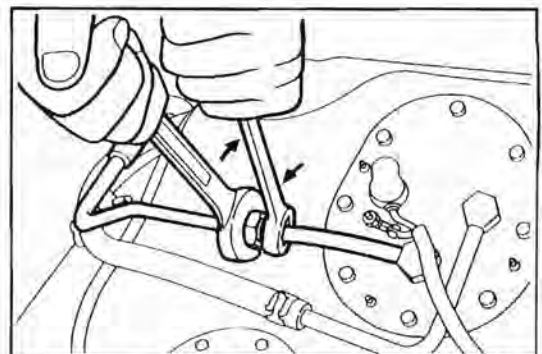
WR88-EF236

7. Install the fuel tank bracket to the fuel tank. Tighten the fuel pump bracket attaching bolts.



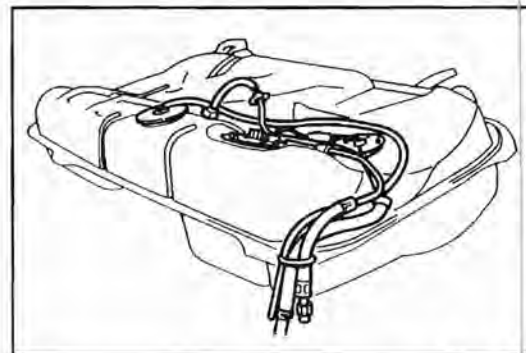
WR88-EF237

8. Connect the fuel main hose and return hose to the fuel tank bracket.



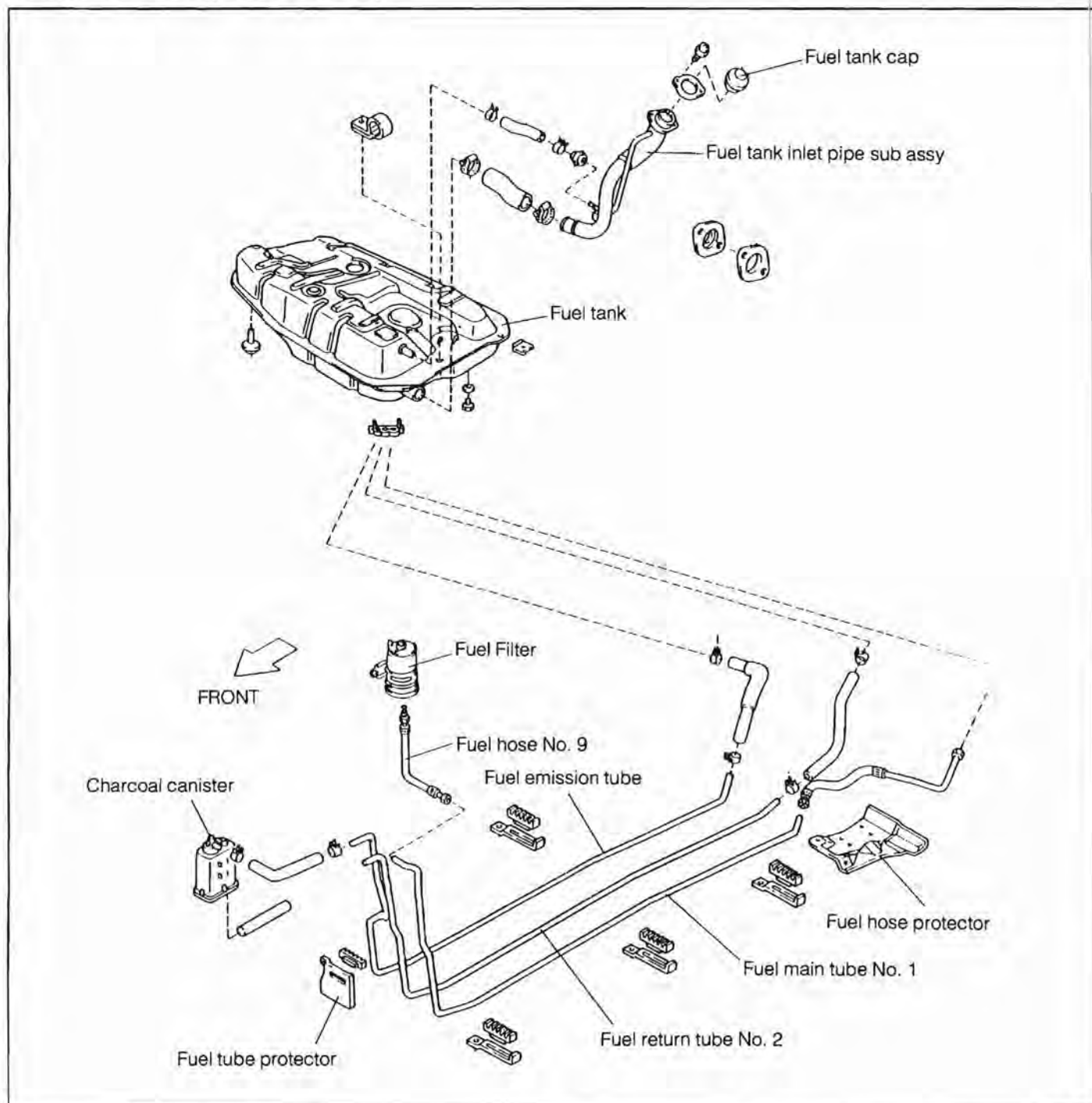
WR88-EF238

9. Connect the fuel sender gauge connector. Attach the harness to the fuel tank clamp.
10. Attach the fuel main and return hoses to the hose clamp by means of the bolt.



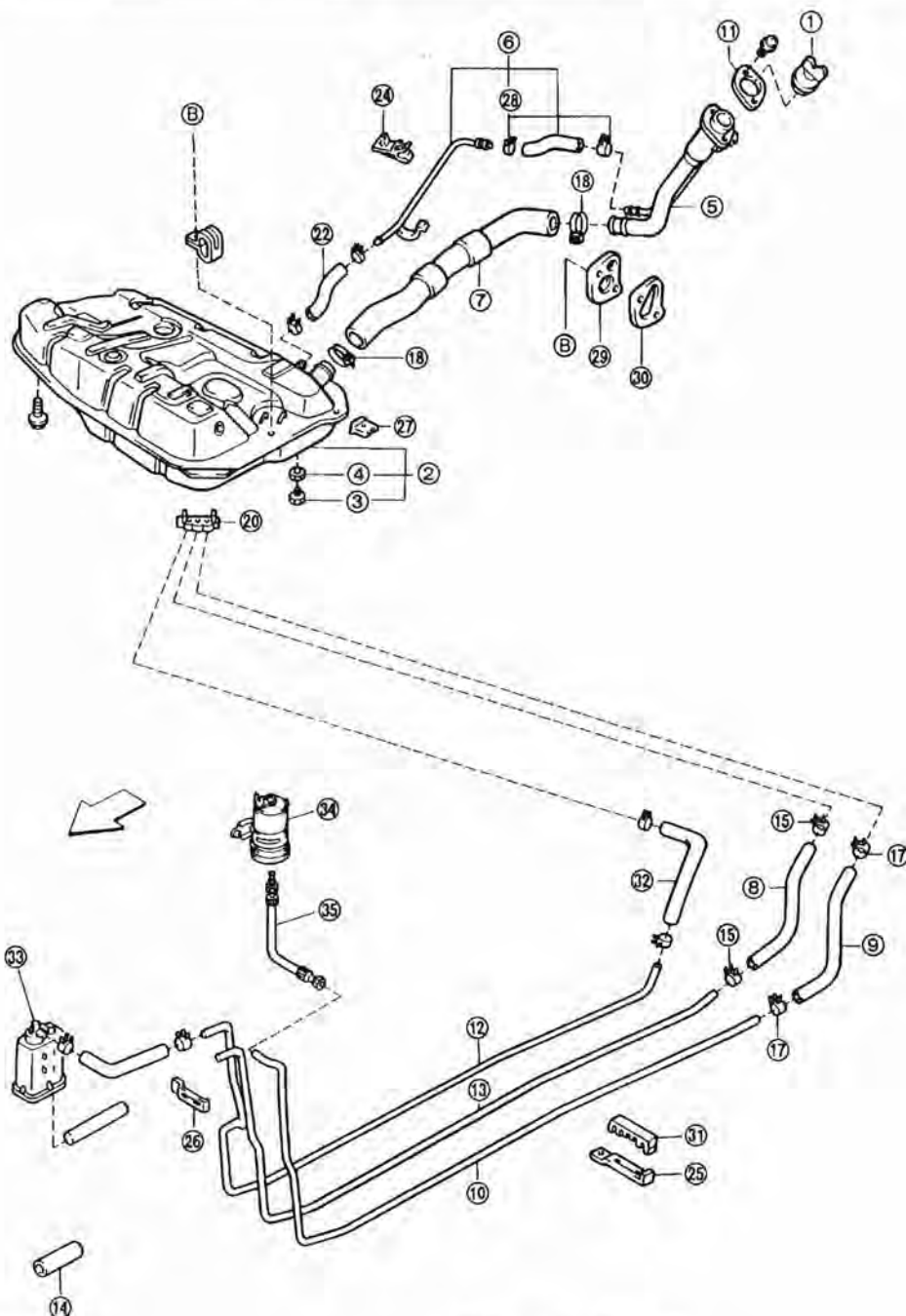
WR88-EF239

FUEL TANK AND LINE COMPONENTS (2WD vehicle)



WR88-EF240

COMPONENTS (4WD vehicle)



- ① Fuel tank cap
- ② Fuel tank
- ③ Drain plug
- ④ Gasket
- ⑤ Fuel tank inlet pipe
- ⑥ Breather tube
- ⑦ Inlet hose
- ⑧ Fuel hose No. 1
- ⑨ Fuel hose No. 3
- ⑩ Fuel main tube No. 1
- ⑪ Fuel tank inlet pipe shield
- ⑫ Fuel emission tube
- ⑬ Return tube No. 2
- ⑭ Charcoal canister hose
- ⑮ Fuel hose No. 1 clip
- ⑯ Fuel hose No. 2 clip

- ⑰ Fuel hose No. 3 clip
- ⑱ Inlet hose clamp
- ⑲ Hose clip
- ⑳ Clamp
- ㉑ Fuel hose No. 4
- ㉒ Fuel hose No. 5
- ㉓, ㉔, ㉕, ㉖, ㉗ Clamp
- ㉘ Fuel tank flange reinforcement
- ㉙ Fuel hose No. 6 clip
- ㉚ Fuel inlet pipe lower seal
- ㉛ Fuel inlet pipe seal lower plate
- ㉜ Fuel hose
- ㉝ Charcoal canister
- ㉞ Fuel filter
- ㉟ Fuel hose No. 9

Precautions

1. Always use a new gasket when replacing the fuel tank or components.
2. Each part should be tightened securely to the specified torque.

WARNING:

Always keep fire away from the working place.

WR88-EF242

Inspection of Fuel Lines and Connections

1. Connect the following SST to the check connector. Short the terminal F (White/Black) to the ground terminal (Black).

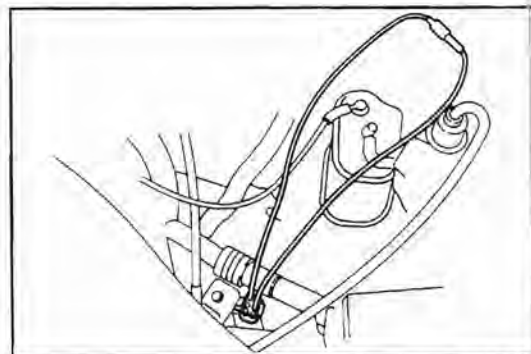
SST: 09991-87702-000

2. Turn ON the ignition switch.
3. Check the fuel lines and connections for cracks, leakage or deformation.
If any crack, leakage or deformation is present, replace or repair the part concerned.
4. Turn OFF the ignition switch. Remove the SST from the check terminal. Attach the cap to the check terminal.
5. Check the fuel tank for deformation, cracks or fuel leakage.
If the fuel tank exhibits any defect, repair or replace the fuel tank.
6. Check the filler neck for damage or fuel leakage.
If the filler neck exhibits any defect, repair or replace the filler neck.
7. Check to see if the hose and tube connections are installed as shown in the right figure.
If any problem is found, repair or replace the parts, as required.

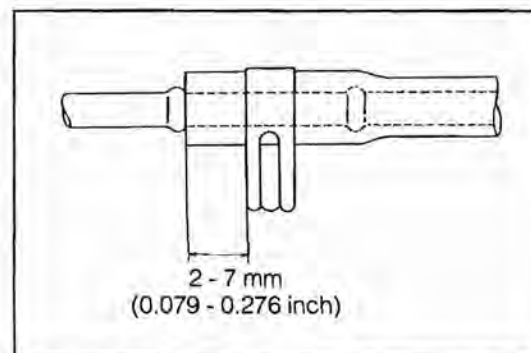
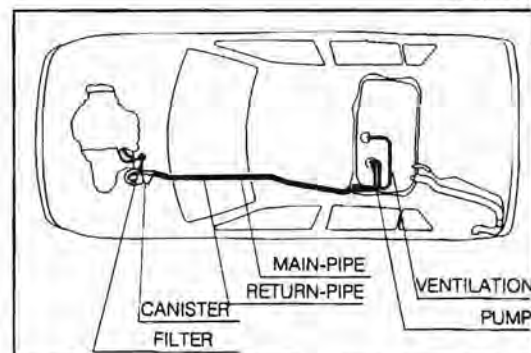
8. Check to see if the fuel tank cap gasket exhibits damage.
Replace the fuel tank cap, too, if damage exists.

WARNING:

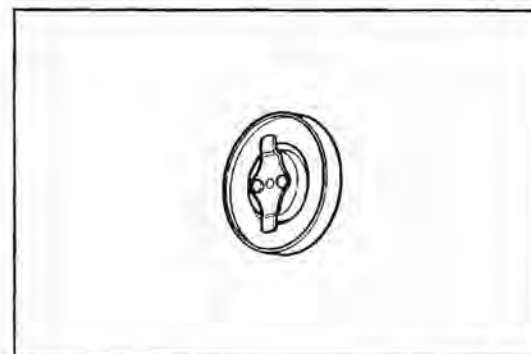
When working on the fuel system, never smoke nor allow any open flame to be brought near the working site.



WR88-EF243



WR88-EF244



WR88-EF245

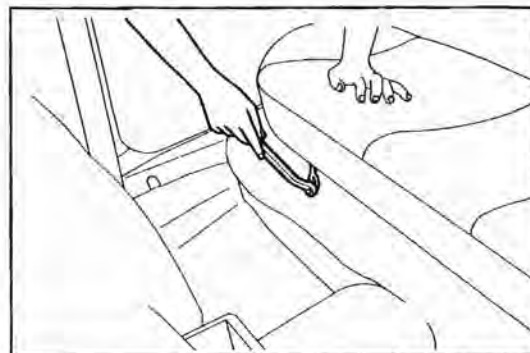
Removal of Fuel Tank (4WD vehicle only)

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

WR88-EF247

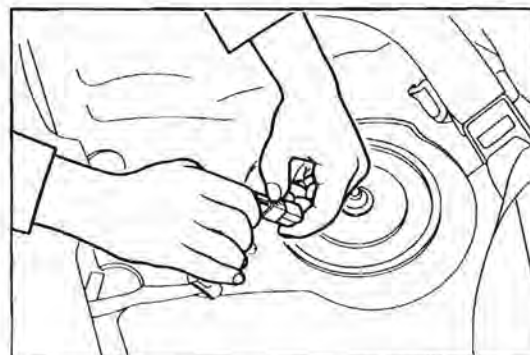
2. Disconnection of fuel sender gauge and fuel pump connector.

- (1) Remove the rear seat cushion.



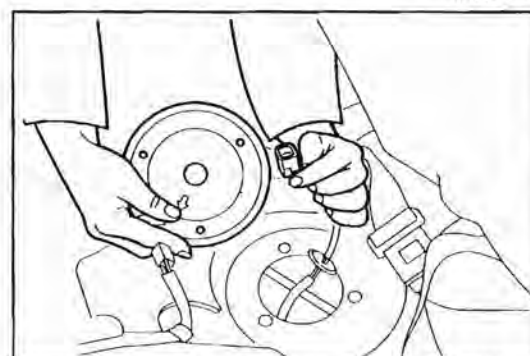
WR88-EF248

- (2) Disconnect the connector.



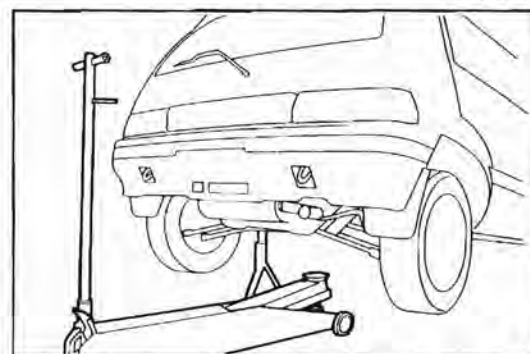
WR88-EF249

- (3) Remove the fuel sender gauge cover.
Detach the rubber grommet from the fuel sender gauge cover.



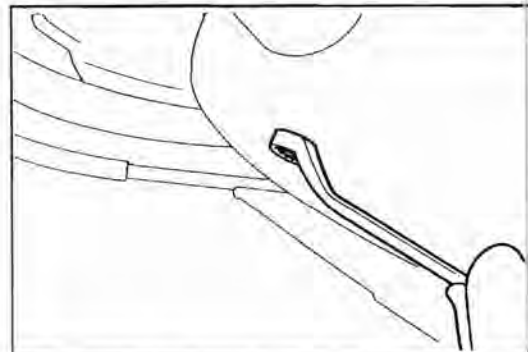
WR88-EF250

2. Jack up the vehicle and support it with safety stands.



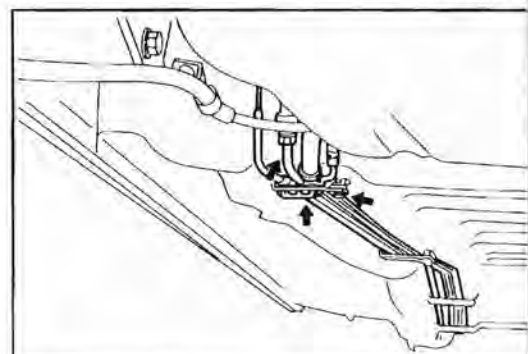
WR88-EF251

3. Drain the fuel from the fuel tank by removing the drain plug.
After the fuel has been drained, install the drain plug.



WR88-EF252

4. Removal of fuel tank
 - (1) Disconnect the main pipe, return pipe and bleeder pipe.

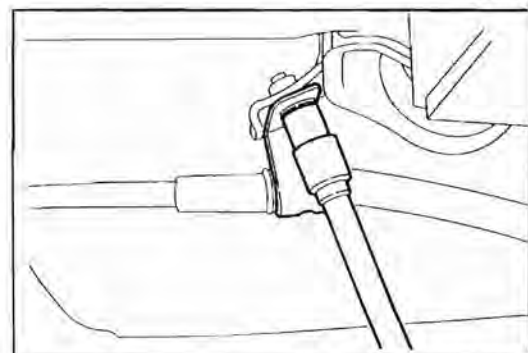


WR88-EF253

- (2) Remove the parking brake wire and clamp bolt.

NOTE:

The operation above is required only for the left side of the vehicle.

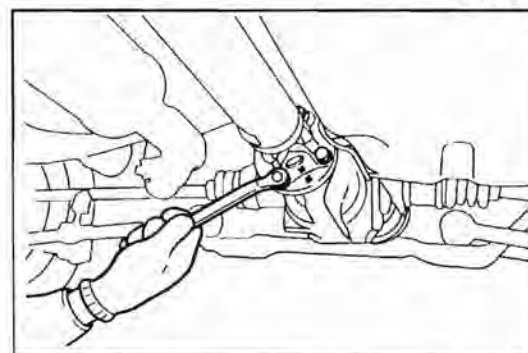


WR88-EF254

- (3) Disconnect the propeller shaft.

NOTE:

Before the propeller shaft is removed, a mate mark should be put on the differential plate and propeller shaft, using paint or the like.

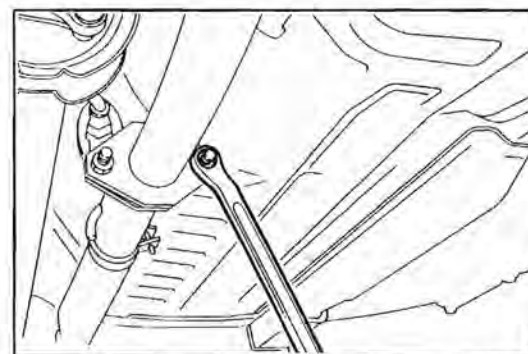


WR88-EF255

- (4) Remove the exhaust pipe.

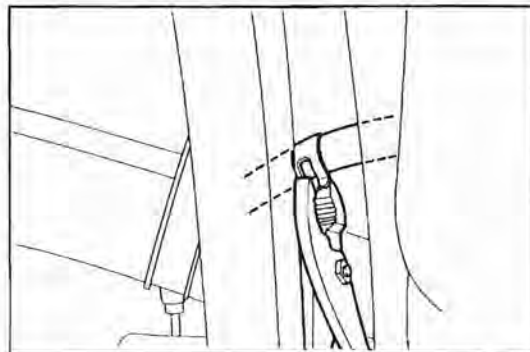
NOTE:

On the 4WD vehicle, it is necessary to remove the center pipe.



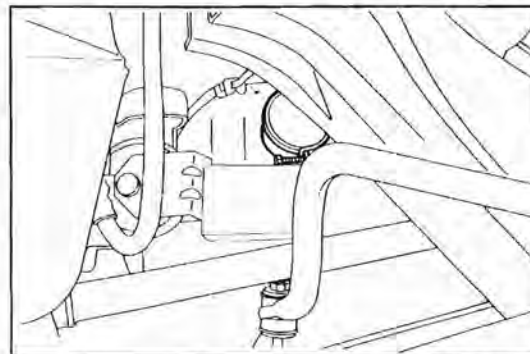
WR88-EF256

(5) Disconnect the fuel hose No. 5.



WR88-EF257

(6) Remove the fuel inlet hose.



WR88-EF258

(7) Remove the fuel tank by removing the five attaching bolts.

NOTE:

Be very careful not to damage the parking brake wire during the removal.

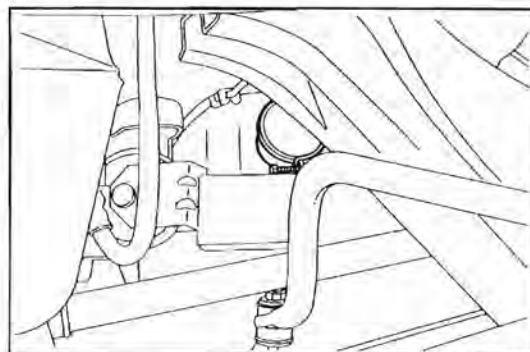
WR88-EF259

Installation of Fuel Tank

1. Install the fuel tank with the attaching bolts.

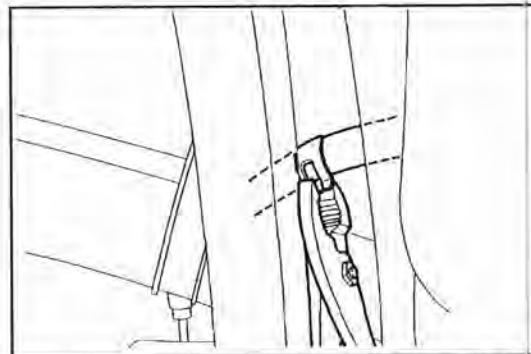
WR88-EF260

2. Connect the fuel inlet hose. Attach the hose bands.



WR88-EF261

3. Connect the fuel hose No. 5. Attach the hose bands.

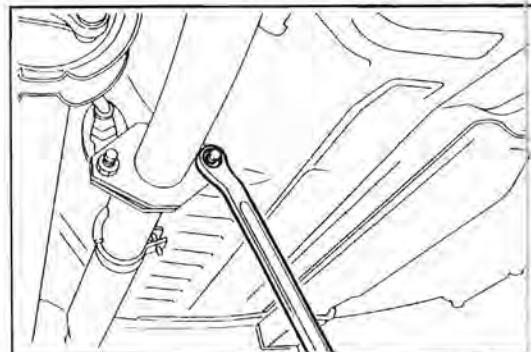


WR88-EF262

4. Install the exhaust pipe.
Tightening Torque: 4.0 - 6.0 kg-m (28.9 - 43.4 ft-lb)

NOTE:

Replace the gasket with a new part.

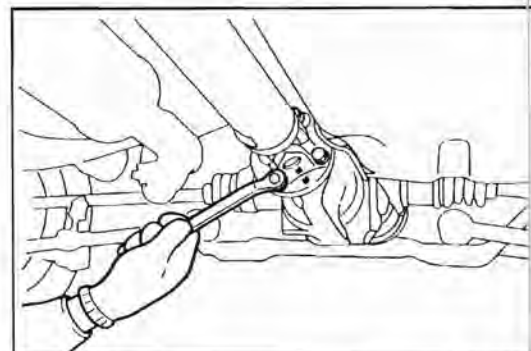


WR88-EF263

5. Install the propeller shaft.
Tightening Torque: 5.2 - 7.1 kg-m (37.6 - 51.4 ft-lb)

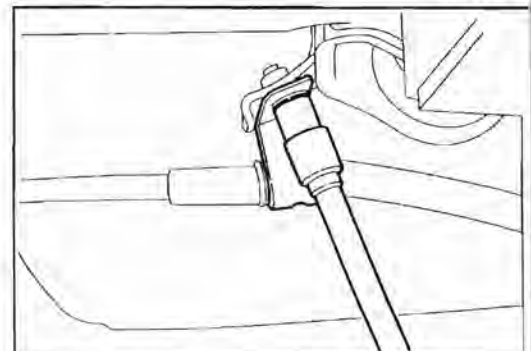
NOTE:

When installing the propeller shaft, be sure to line up the mate marks which were put during the removal.



WR88-EF264

6. Install the parking brake wire and clamp bolt.

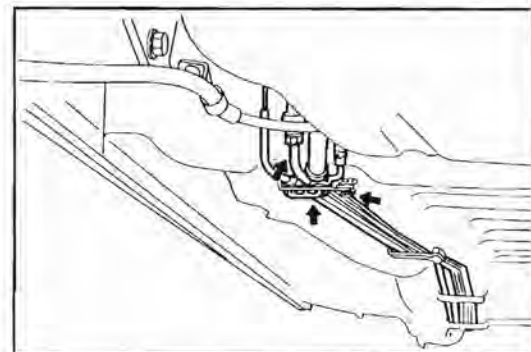


WR88-EF265

7. Connect the main pipe, return pipe and bleeder pipe.
Flare Nut Tightening Torque: 3.5 - 4.4 kg-m
(25.3 - 31.8 ft-lb)

NOTE:

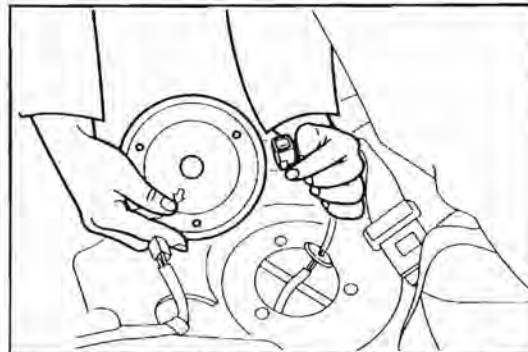
When connecting the hose on each of the return pipe and bleeder pipe, be sure to fit the hose positively up to the hose stopper.



WR88-EF266

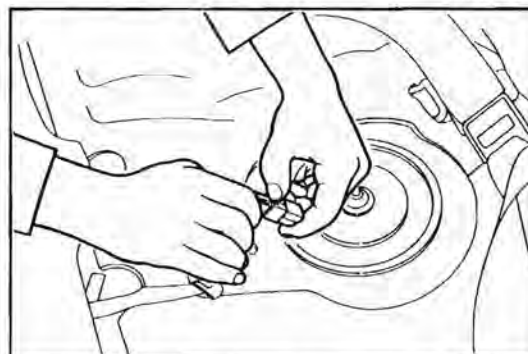
8. Fill the fuel tank with fuel. Check that the fuel tank exhibits any leakage. Repair any defective part if fuel leakage exists.

9. Connection of sender gauge and fuel pump connector.
 - (1) Route the wiring through the fuel sender gauge cover. Attach the grommet to the fuel sender gauge cover.



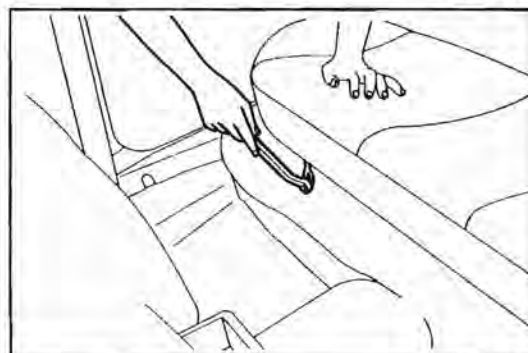
WR88-EF267

- (2) Connect the connector.



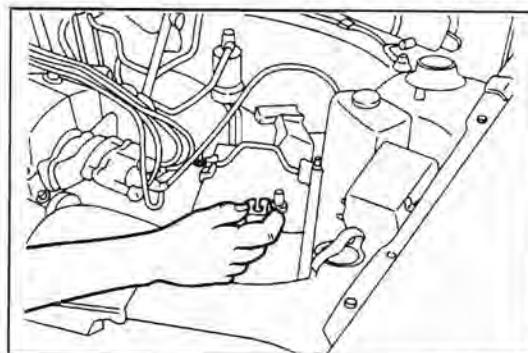
WR88-EF268

- (3) Install the rear seat cushion.



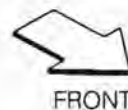
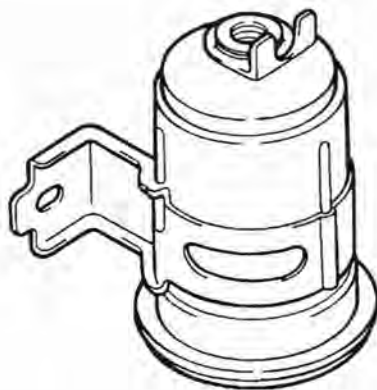
WR88-EF269

10. Connect the ground cable terminal to the negative (-) terminal of the battery.
11. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if the fuel leakage exists.



WR88-EF270

FUEL FILTER ELEMENT



WR88-EF272

Check of Fuel Filter Element

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

WR88-EF273

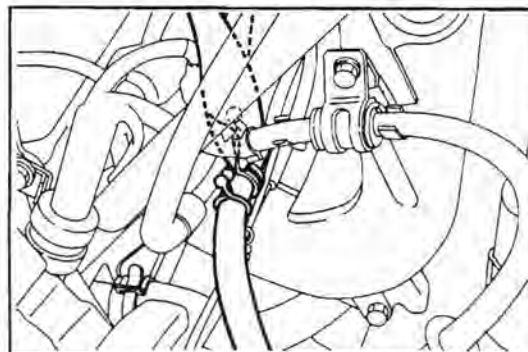
2. Disconnect the fuel return hose connected to the pressure regulator. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.

Reference:

This fuel hose is included in the SST (09268-87702-000).

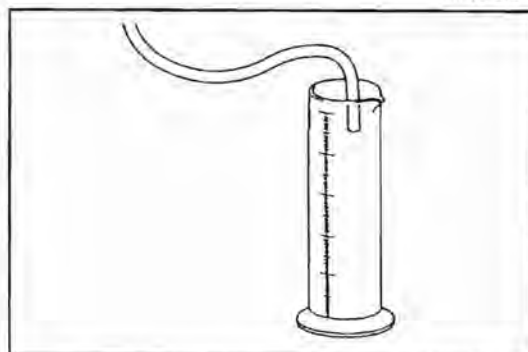
CAUTION:

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the pressure regulator so as to prevent fuel splashing.



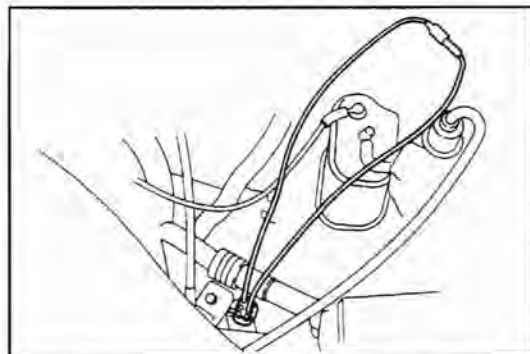
WR88-EF274

3. Insert one end of the fuel hose in a measuring cylinder.



WR88-EF275

4. Connection of SST (09991-87702-000)
 - (1) Detach the cap from the check connector.
 - (2) Connect the SST to the check connector.
 - (3) Short the SST terminal F (White/Black) to the ground terminal (Black).
5. Connect the ground cable terminal to the negative (-) terminal of the battery.
6. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.



WR88-EF276

7. Measure the amount of fuel collected in the measuring cylinder. Check to see if the measured amount conforms to the specification.

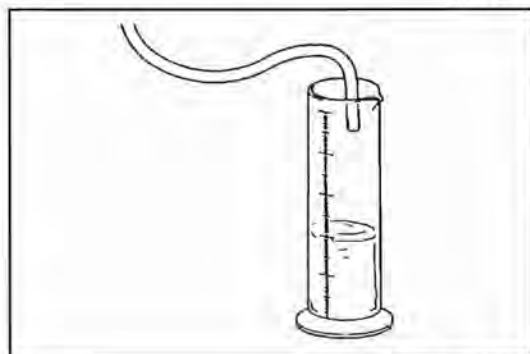
Specified Amount of Fuel: 275 cc or more
(16.78 cub inch or more)

NOTE:

If it becomes necessary to bleed air, be sure to conduct the measurement at least twice.

If the fuel amount conforms to the specification, perform the operation, starting from the step 20 onward.

If the fuel amount is less than the specified amount, perform the operation, starting from the step 8 onward.



WR88-EF277

8. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

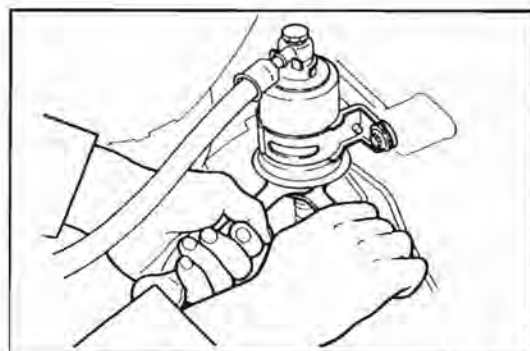
WR88-EF278

9. Loosen the fuel flare nut gradually.

CAUTION:

The fuel pressure at the inside of the fuel line is approximately 2.5 kg/cm² (36 psi) higher than the atmospheric pressure. Hence, be sure to gradually loosen the flare nut and use a cloth, etc. so as to prevent fuel from splashing.

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts or electrical parts of the vehicle.

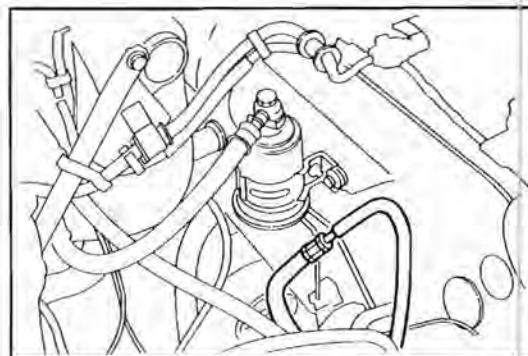


WR88-EF279

10. Connect a suitable fuel hose (about 2 meter long) to the fuel pipe.

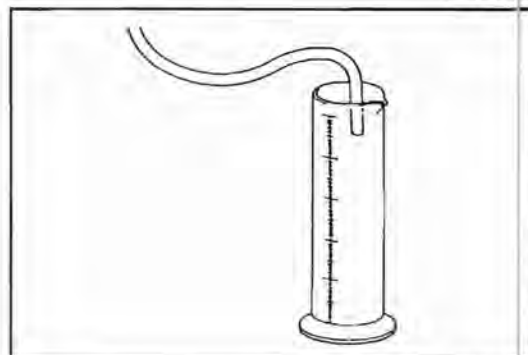
Reference:

This fuel hose is included in the SST (09268-87702-000).



WR88-EF280

11. Insert one end of the fuel hose in a measuring cylinder.



WR88-EF281

12. Reconnect the ground cable terminal to the negative (-) terminal of the battery.
13. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.

WR88-EF282

14. Measure the amount of fuel collected in the measuring cylinder.

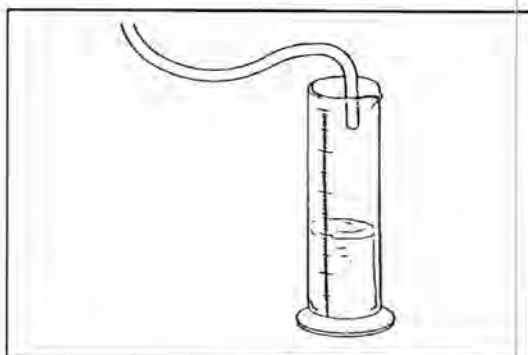
**Specified Amount of Fuel: 275 cc or more
(16.78 cub inch or more)**

If the fuel amount conforms to the specification, replace the fuel filter.

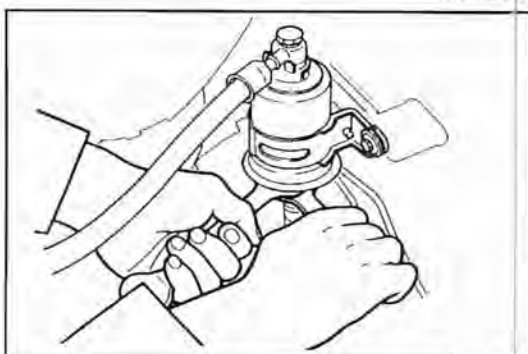
If the fuel amount is less than the specified amount, check the fuel pump filter for restriction. Then, replace the fuel pump as required. (See page EF-82.)

15. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
16. Coat the flare nut with a thin film of engine oil. Screw in the flare nut into the fuel filter fully by your hand.
17. Tighten the flare nut.

Tightening Torque: 3.5 - 4.4 kg-m (25.3 - 31.8 ft-lb)

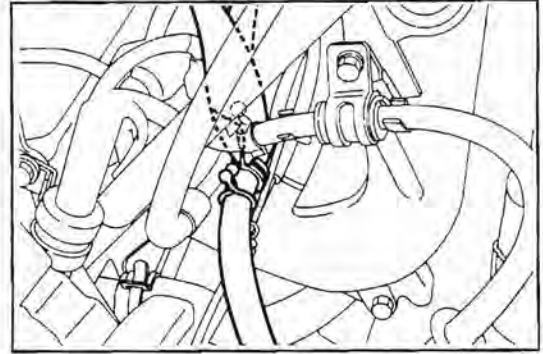


WR88-EF283



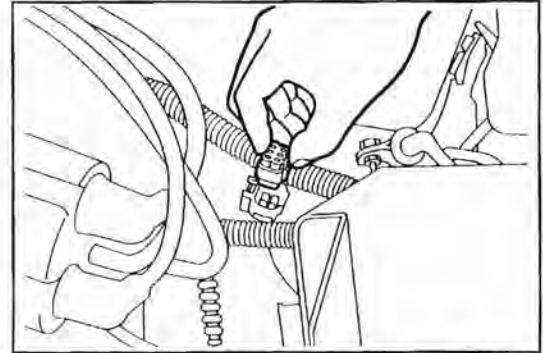
WR88-EF284

18. Disconnect the fuel hose connected to the pressure regulator.
19. Connect the fuel return hose to the pressure regulator. Attach the clips.



WR88-EF285

20. Remove the SST from the check connector.

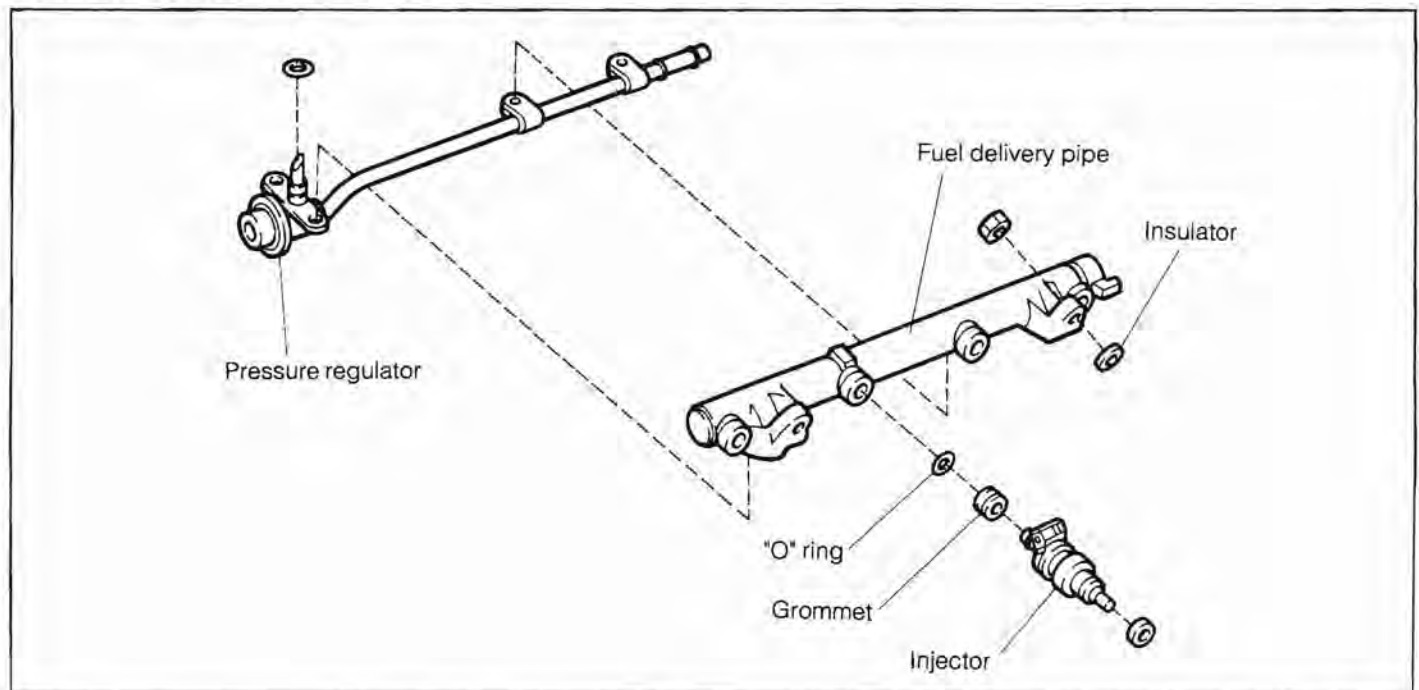


WR88-EF286

21. Attach the cap on the check connector.
22. Reconnect the ground cable terminal to the negative (-) terminal of the battery.
23. Start the engine. Check to see if any fuel leakage is present. Repair any defective part if fuel leakage exists.

WR88-EF287

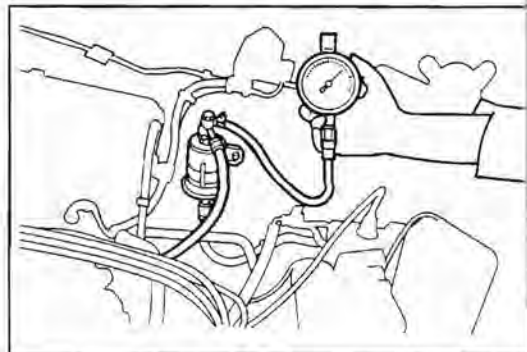
PRESSURE REGULATOR



WR88-EF288

In-Vehicle Inspection

Check the fuel pressure. (See page EF-78.)



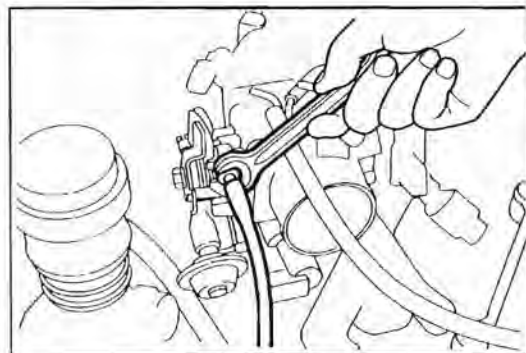
WR88-EF289

Removal of Pressure Regulator

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

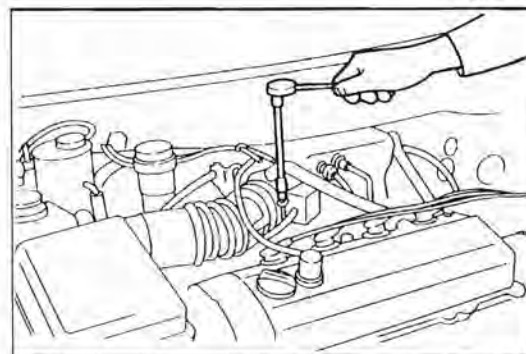
WR88-EF290

2. Detach the accelerator cable from the throttle body.



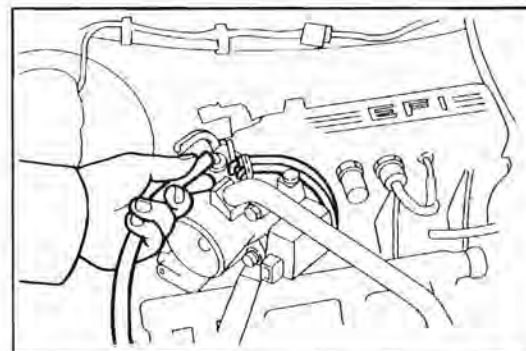
WR88-EF291

3. Remove the throttle cable from the throttle body. (A/T vehicle only)
4. Remove the air cleaner hose from the throttle body.



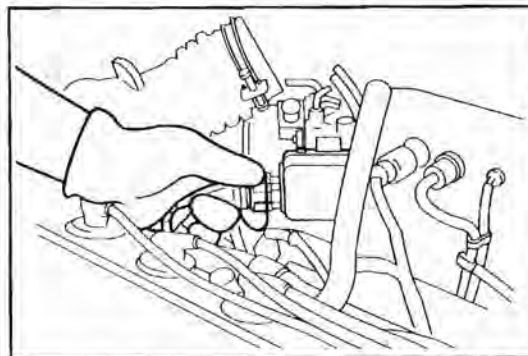
WR88-EF293

5. Disconnect the rubber hoses from the throttle body.



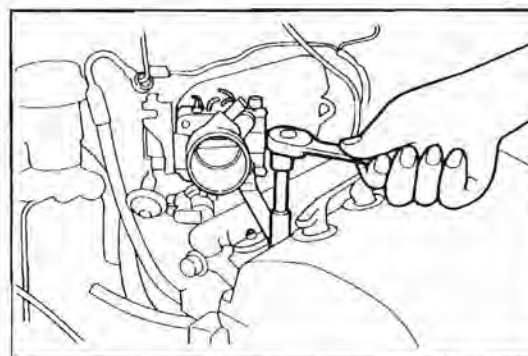
WR88-EF294

6. Disconnect the throttle position sensor connector.



WR88-EF295

7. Remove the attaching bolts and nuts of the throttle body surge tank stay No. 1.

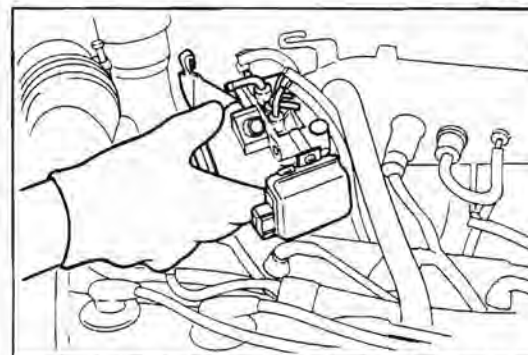


WR88-EF296

8. Remove the throttle body from the surge tank.

NOTE:

Be very careful not to damage the cooling water hose during the removal.



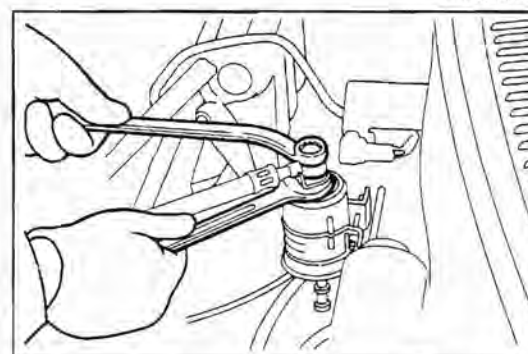
WR88-EF297

9. Disconnect the fuel hose No. 1 at the fuel filter side.

CAUTION:

The fuel pressure at the inside of the fuel line is approximately 2.5 kg/cm^2 (36 psi) higher than the atmospheric pressure. Hence, be sure to gradually loosen the union bolt so as to prevent fuel from splashing.

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the fuel filter so that no fuel may get to the resin or rubber parts of the vehicle.

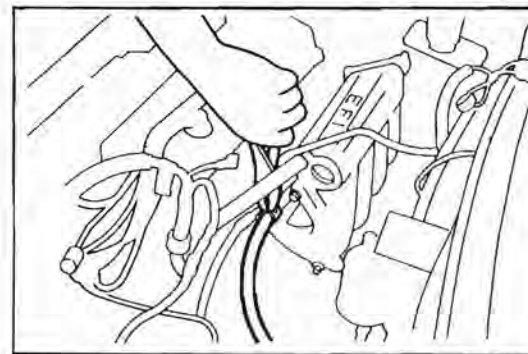


WR88-EF298

10. Disconnect the fuel return hose from the pressure regulator.

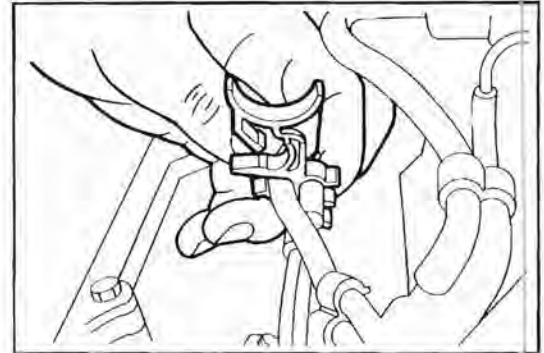
CAUTION:

Since the fuel will flow out, be certain to place a suitable container or cloth, etc. under the connection so as to prevent fuel from splashing.



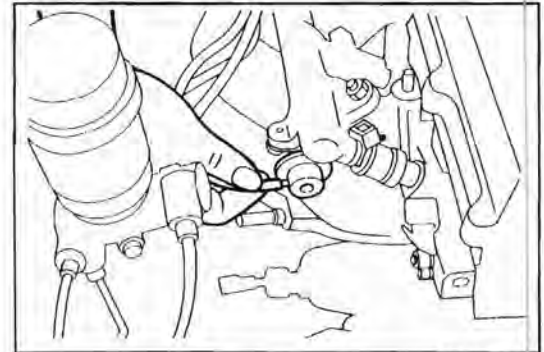
WR88-EF299

11. Detach the rubber hose clamps from the delivery pipe and pressure regulator.



WR88-EF300

12. Disconnect the vacuum hose from the pressure regulator.

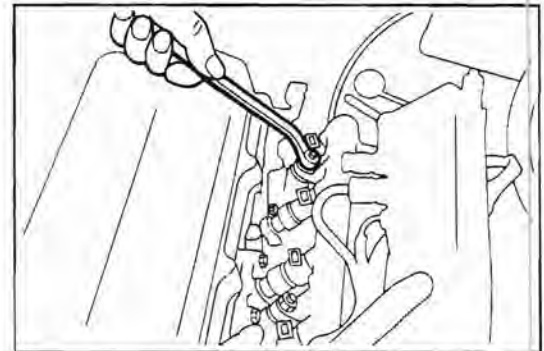


WR88-EF301

13. Disconnect the delivery pipe.

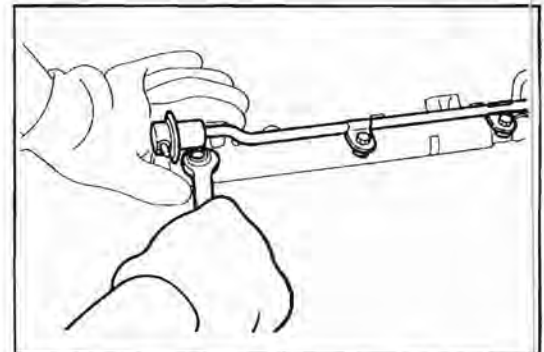
NOTE:

- Care must be exercised to ensure that no fuel gets to the alternator, starter, or any rubber, vinyl or plastic parts.
- Leave the injector at the manifold side. (Be very careful not to drop the injector.)



WR88-EF302

14. Remove the pressure regulator from the delivery pipe.



WR88-EF303

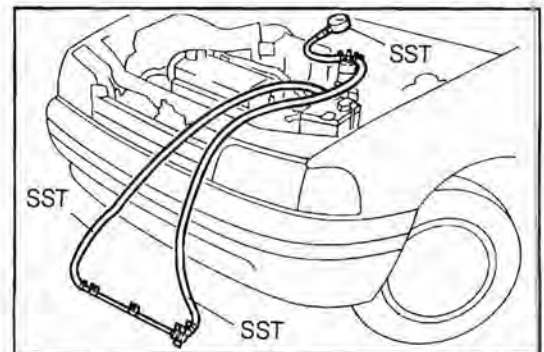
Inspection of Pressure Regulator

1. Using the following SSTs, connect the pressure regulator, as indicated in the figure.

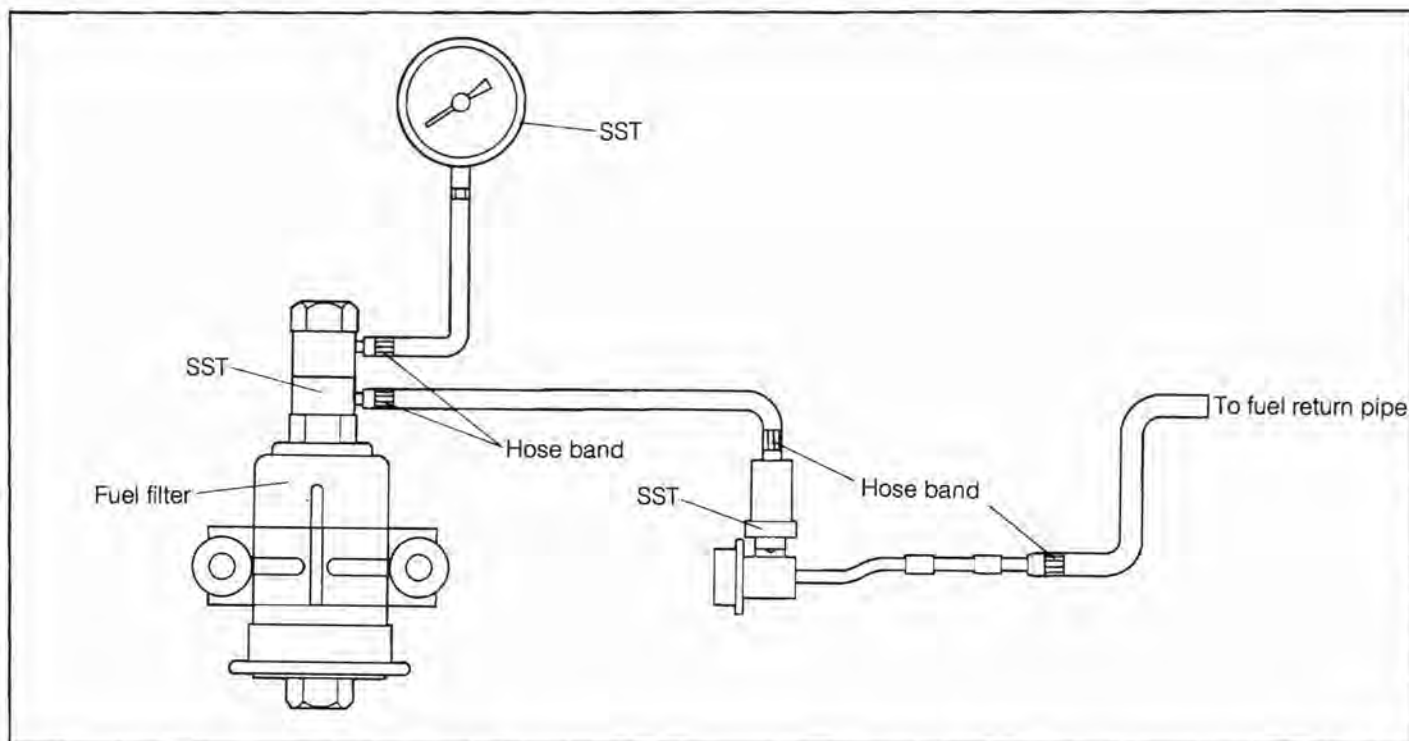
SSTs: 09268-87701-000
09268-87702-000
09283-87703-000

NOTE:

When connecting the pressure regulator, install a new gasket to the union bolt connection and a new "O" ring to the "O" ring seal section. Also, attach hose bands to the hose connections.

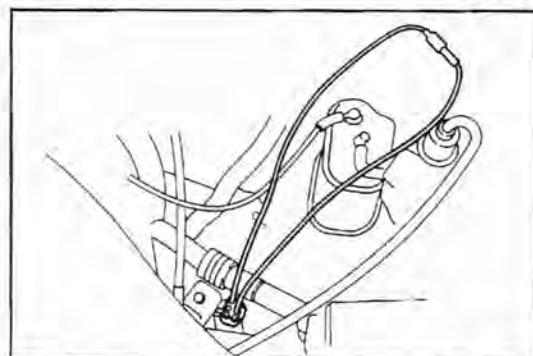


WR88-EF304



WR88-EF306

2. Connect the ground cable terminal to the negative (-) terminal of the battery.
3. Connection of SST (09991-87702-0000)
 - (1) Detach the cap from the check connector.
 - (2) Connect the SST to the check connector.
 - (3) Short the SST terminal F (White/Black) to the ground terminal (Black).
4. Turn ON the ignition key switch.



WR88-EF307

5. Check to see if the fuel pressure conforms to the specification.

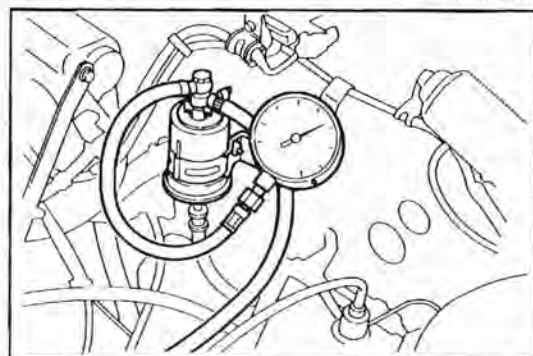
Specified Fuel Pressure: 2.3 - 2.8 kg/cm² (33 - 40 psi)

If the fuel pressure fails to conform to the specification, replace the pressure regulator.

6. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
7. Remove the SSTs from the respective parts.

NOTE:

Attach the cap on the check connector.



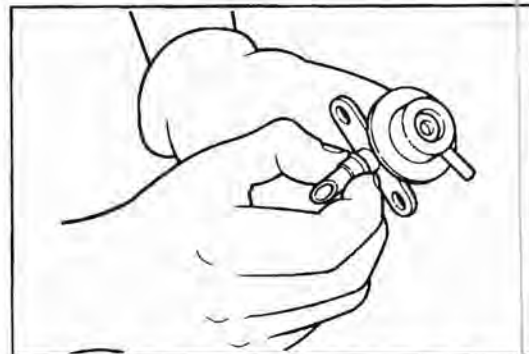
WR88-EF308

Assembly of Pressure Regulator

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
2. Disconnect the following SST from the check connector.
SST: 09991-87702-000
3. Attach the check connector cap in place.

WR88-EF308

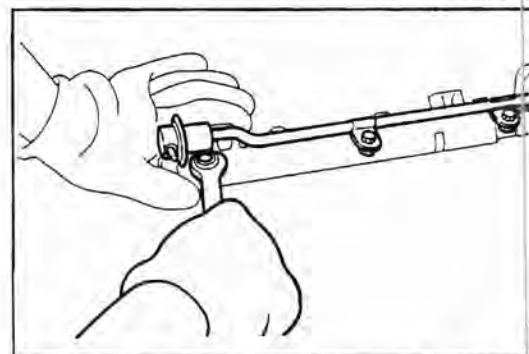
4. Replace the pressure regulator "O" ring with a new part.



WR88-EF309

5. Apply silicon oil or gasoline to the "O" ring of the pressure regulator. Install the "O" ring to the delivery pipe and tighten the attaching bolts.

Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)

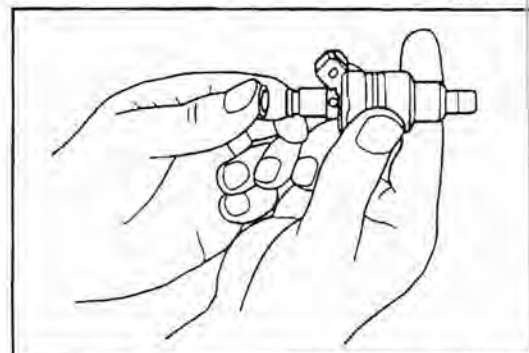


WR88-EF310

6. Replace the injector "O" ring with a new part.

NOTE:

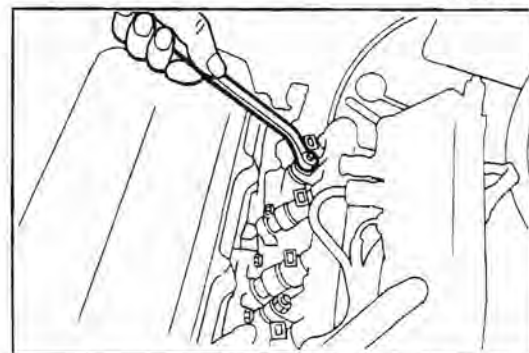
Visually inspect the grommets and insulators of the injectors for any evidence of damage. Replace any defective parts if they exhibit damage.



WR88-EF311

7. Apply silicon oil or gasoline to the "O" ring of the injector. Install the delivery pipe.

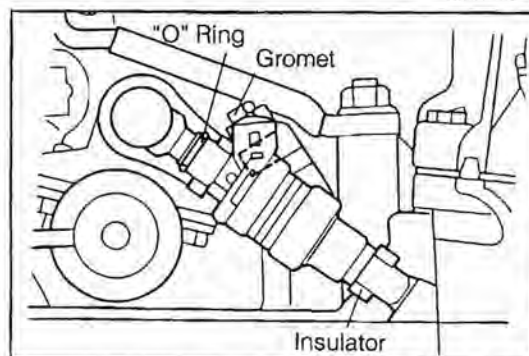
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



WR88-EF312

NOTE:

- Be very careful not to damage the injector "O" ring during the installation.
- When connecting the delivery pipe and injector, make sure that they are installed straight, not in a tilted state.



WR88-EF313

8. Ensure that the injector can rotate by your hand.

If the injector can not be rotated smoothly, most likely the injector is installed in a tilted state. It is, therefore, necessary to reassemble the injector using a new injector "O" ring.

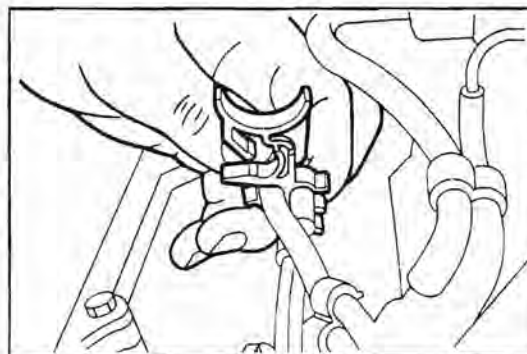
NOTE:

Never push the injector toward the insulator side or the grommet side. Failure to observe this caution will cause fuel leakage.



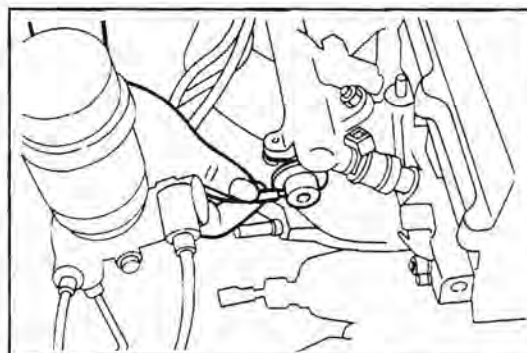
WR88-EF314

9. Connect the rubber hose clamps to the delivery pipe and pressure regulator.



WR88-EF315

10. Connect the vacuum hose to the pressure regulator.



WR88-EF316

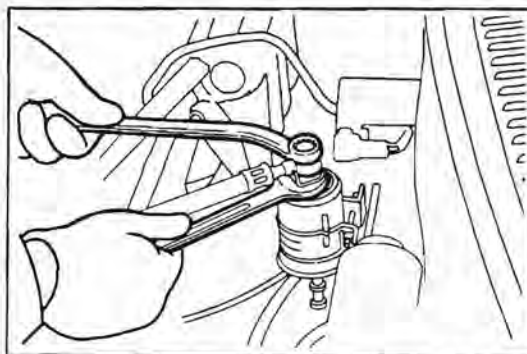
11. Connect the fuel return hose to the pressure regulator. Attach the hose clamps.



WR88-EF317

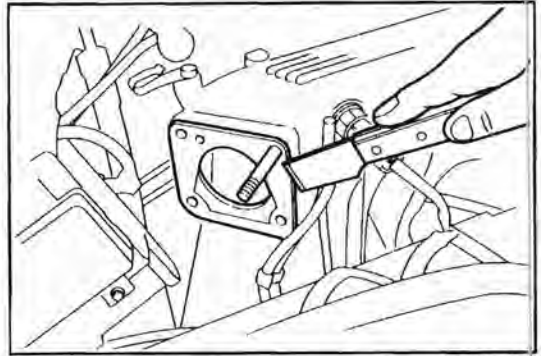
12. Install the fuel hose No. 1 to the fuel filter with a new gasket interposed.

Tightening Torque: 3.5 - 4.5 kg-m (25.4 - 32.5 ft-lb)



WR88-EF318

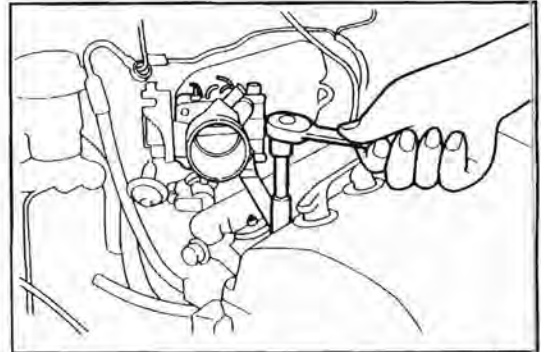
13. Remove the gasket material from the throttle body and surge tank, using a gasket scraper.
14. Install a new throttle body gasket on the surge tank.



WR88-EF319

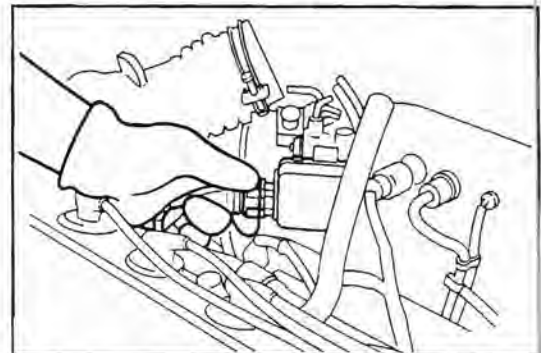
15. Install the throttle body surge tank stay. Install it on the surge tank.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



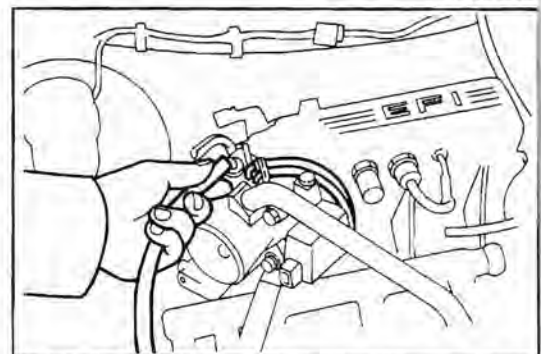
WR88-EF320

16. Connect the throttle position sensor connector.



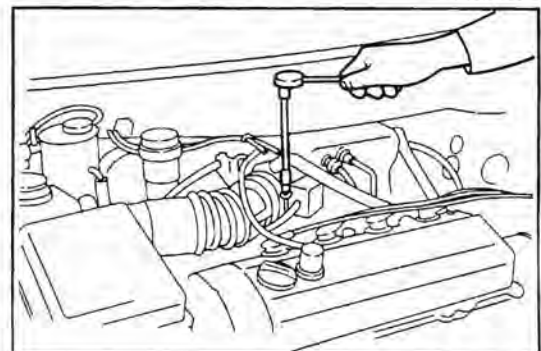
WR88-EF321

17. Connect the rubber hose to the throttle body. (See page EC-22.)



WR88-EF322

18. Connect the air cleaner hose to the throttle body. Tighten the hose bands.



WR88-EF323

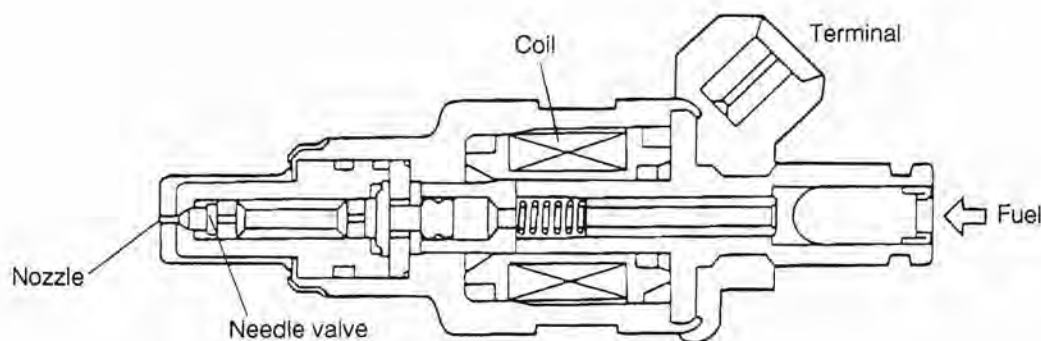
19. Connect the accelerator cable to the throttle body. Perform the adjustment so that the play in the axial direction may become 3 to 8 mm (0.12 to 0.31 inch).
20. Install the throttle cable. (A/T vehicle only)
NOTE:
 The throttle cable should be installed in such a way that the play in the axial direction becomes zero.
 (See the Chassis Workshop Manual.)
21. Connect the ground cable terminal to the negative (–) terminal of the battery.

WR88-EF324

22. Repeat the turning ON/OFF of the ignition key switch four to five times at intervals of two seconds.
23. Start the engine. Check the engine for fuel leakage or water leakage.
 Repair the leaky points if leakage exists.

WR88-EF325

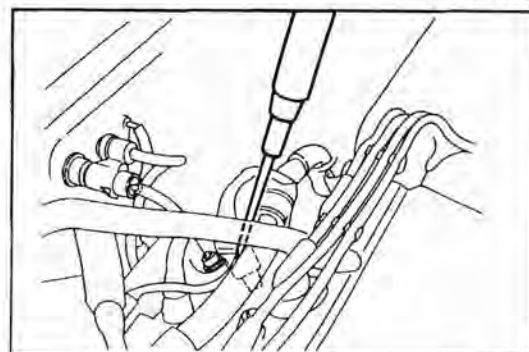
INJECTORS



WR88-EF326

In-Vehicle Inspection

1. Check of injector operation
 - (1) Using a sound scope, check to see if each injector emits an operating sound when the engine is being started or cranked.
 - (2) If a sound scope is not available apply a screw driver or the like to the injector and check to see if you can feel an operating vibration.

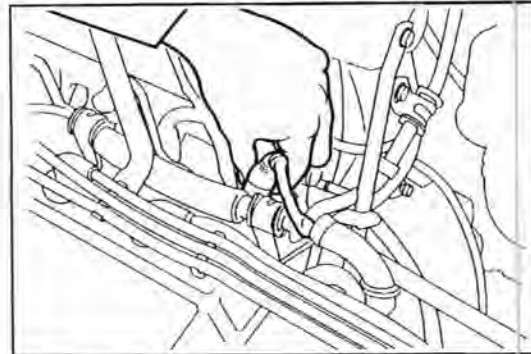


WR88-EF327

If the injector emits no operating sound or emits an abnormal sound, check the wiring, wiring connector or injector.

2. Measurement of resistance of injector

(1) Disconnect the injector connector of the engine wire.

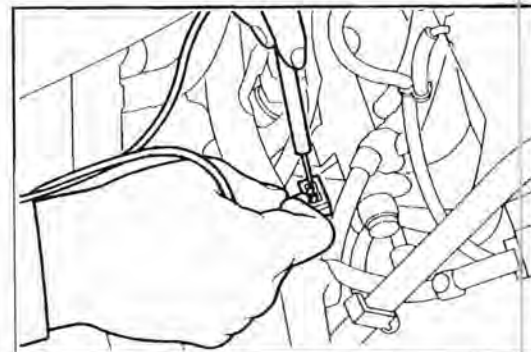


WR88-EF328

(2) Measure the resistance between the terminals of each injector.

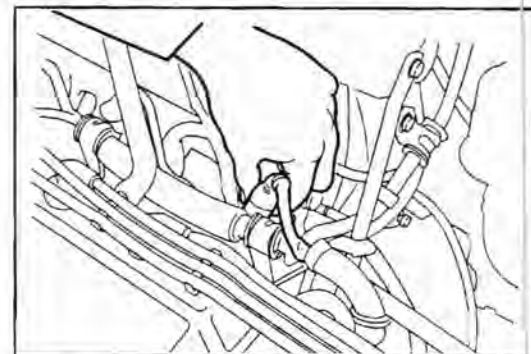
Specified Resistance: 11 - 15Ω [at 20°C (68°F)]

If the resistance between the terminals is not within the specification, replace the injector.



WR88-EF329

(3) Connect the injector connector of the engine wire to the injector.



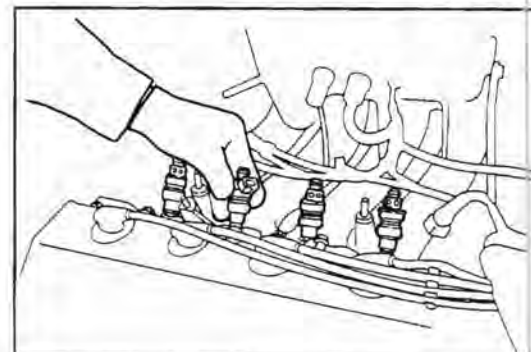
WR88-EF330

Removal of Injector

1. Remove the pressure regulator. (See page EF-98.)
2. Disconnect the injector connector.
3. Remove the injector.

NOTE:

Do not remove the injector cover.



WR88-EF331

Inspection of Injector

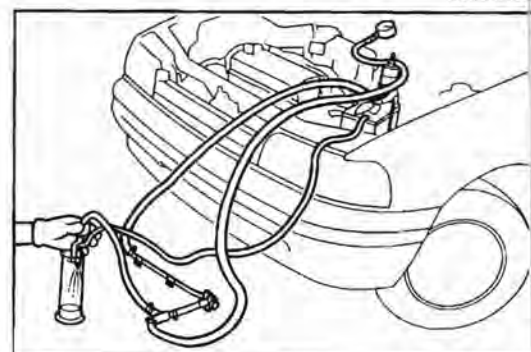
1. Using the following SSTs, connect the injector, as indicated in the figure. Insert the injector in the measuring cylinder.

SSTs: (1) 09268-87701-000

(2) 09268-87703-000

(3) 09268-87702-000

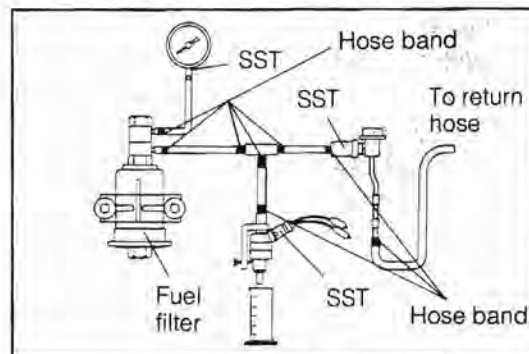
(4) 09842-30040-000



WR88-EF332

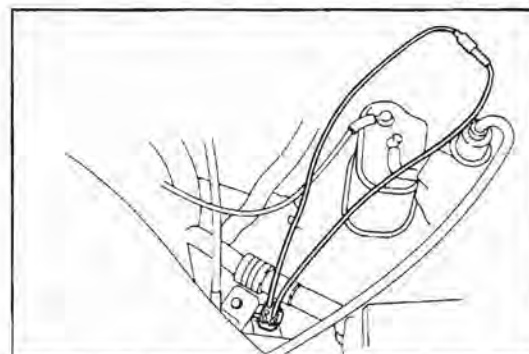
NOTE:

- Install a new gasket to the union bolt connection.
- Install a new "O" ring to the "O" ring seal section.
- Attach the hose bands to the rubber hose connections.
- Attach a suitable vinyl hose to the tip-end of the injector so as to prevent fuel from splashing.
- Remove the injector grommet. Check to see if the injector grommet exhibits any damage.



WR88-EF333

2. Remove the check connector cap.
3. Connect the SST to the check connector.
SST: 09991-87702-000
4. Connect the terminal F (white/black) of the check connector to the ground terminal (Black).



WR88-EF334

5. Connect the ground cable terminal to the negative (-) terminal of the battery.
6. Turn ON the ignition switch.

WR88-EF335

7. Perform energizing for 60 seconds by means of the SST (09842-30040-000).
8. Measure the amount of fuel collected in the measuring cylinder.
specified pressure.

Specified Amount of Fuel:

Approx. 152 - 168 cc (Approx. 9.27 - 10.25 cub inch)

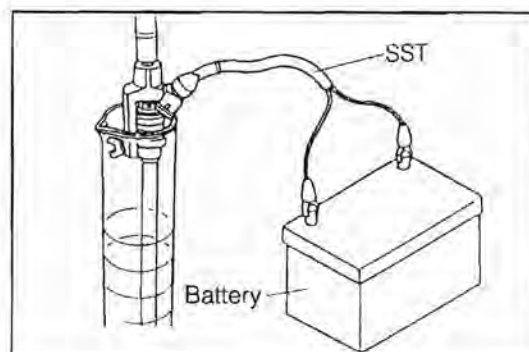
Variation between Each Injector:

5 cc or less (0.3 cub inch or less)

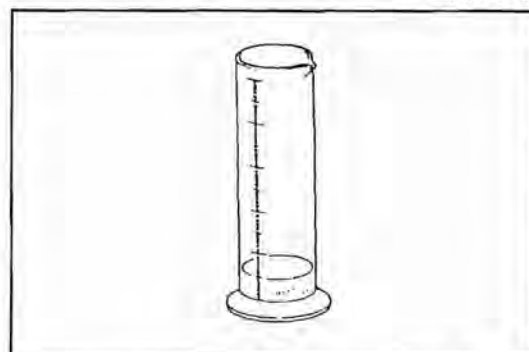
NOTE:

- Conduct the measurement two or three times for each injector.
- Before the injector is pulled out, make certain to turn OFF the ignition key.
- When removing the injector, use a suitable cloth or the like so as to prevent fuel from splashing.
- Prior to the test, perform air bleeding for the fuel hose.

If the amount of fuel fails to conform to the specification, replace the injector.



WR88-EF336



WR88-EF337

9. Leakage check

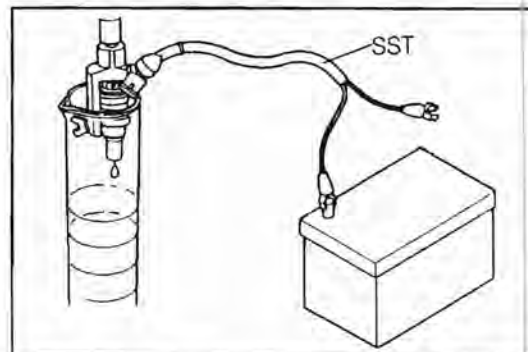
With the SST (09842-30040-000) in not energized state, turn ON the ignition key switch. Check any fuel leakage from the injector nozzle.

Fuel Leakage: Less Than one Drop of Fuel per Minute

If the leakage exceeds the specified value, replace the injector.

NOTE:

Prior to the test, remove the vinyl hose that was attached on the injector.



WR88-EF338

11. Turn OFF the ignition key.

12. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

13. Disconnect the SST.

NOTE:

Care must be exercised as to fuel splashing or fuel flowing.

WR88-EF339

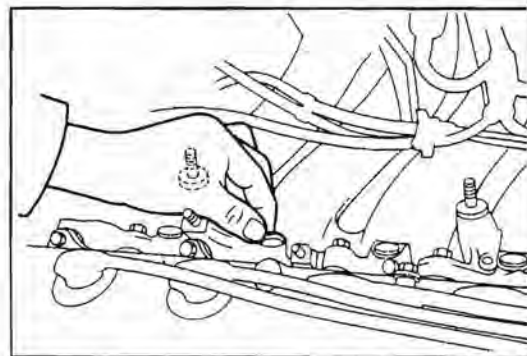
Installation of Injector

1. Check the insulator and grommet of each injector for damage.

Replace the insulator and/or grommet if damage exists.

WR88-EF340

2. Install the insulator on the manifold section.



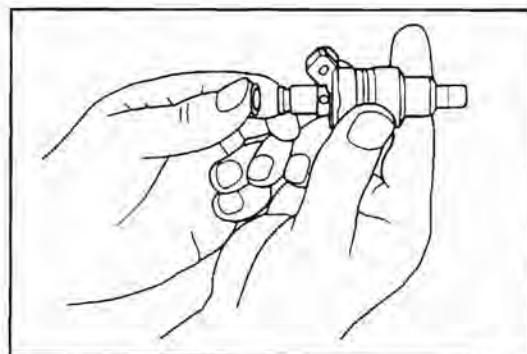
WR88-EF341

3. Install the grommet on the injection.

4. Replace the injector "O" ring with a new part.

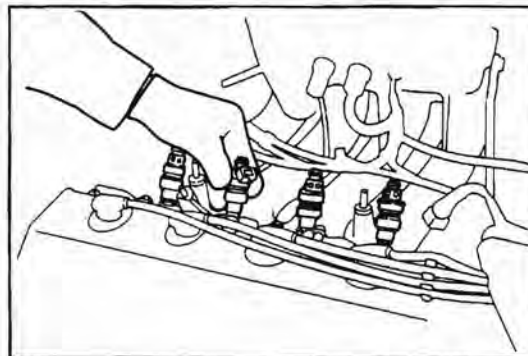
NOTE:

Be very careful to avoid damaging the "O" ring.



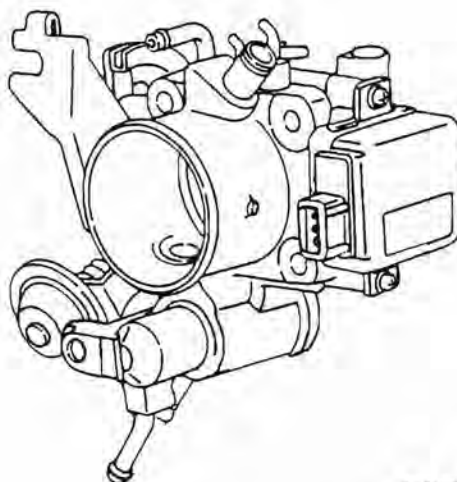
WR88-EF342

5. Insert the injector into the insulator.
6. Install the delivery pipe. (See page EF-101.)



WR88-EF343

AIR INDUCTION SYSTEM THROTTLE BODY



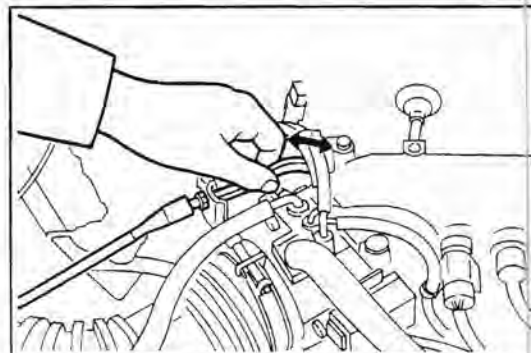
(MT)

NOTE: As for AT vehicle, the shape of connector is different from that of MT vehicle.

WR88-EF3/4

In-Vehicle Inspection Check of Throttle Body

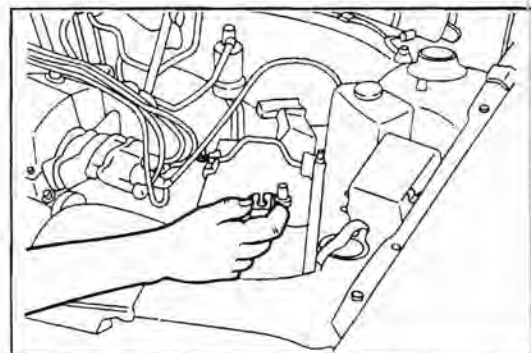
1. Ensure that the throttle linkage operates smoothly.
Replace the throttle body if the throttle lever fails to operate smoothly.
2. Check the throttle positioner sensor.
(See page EF-58 or EF-59.)
3. Check the throttle positioner.
(See page EM-20.)



WR88-EF3/5

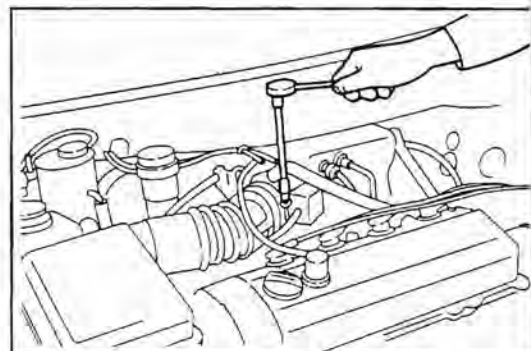
Removal of Throttle Body

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.



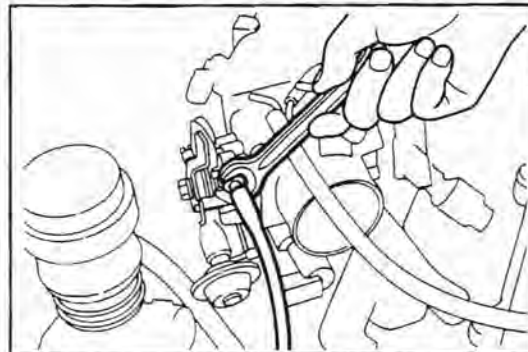
WR88-EF3/6

2. Disconnect the air cleaner hose from the throttle body.



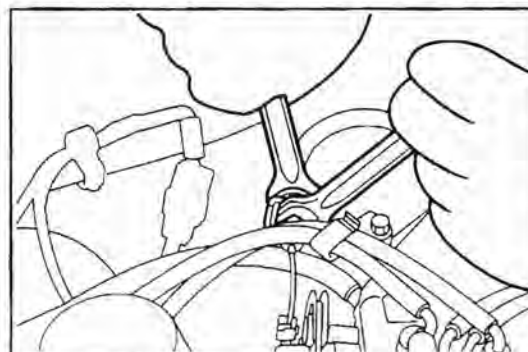
WR88-EF3/7

3. Disconnect the accelerator cable.



WR88-EF348

4. Disconnect the throttle cable.
(A/T vehicle only)

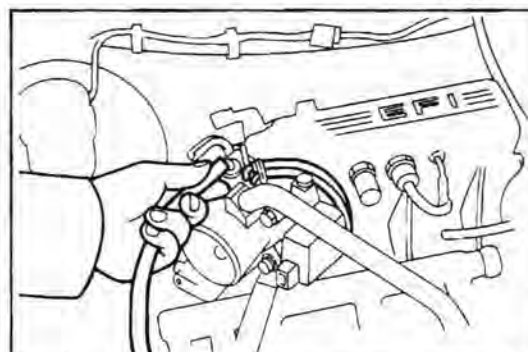


WR88-EF349

5. Disconnect the vacuum hoses.

NOTE:

Prior to the disconnection, put a tag on each vacuum hose so that the original installation position may be known readily during the installation.

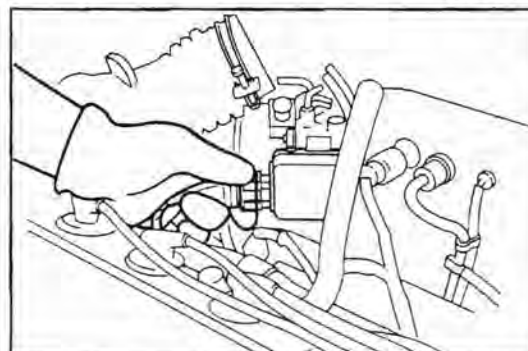


WR88-EF350

6. Disconnect the connector of the throttle positioner sensor.

NOTE:

It should be noted that the position and shape of the connector differ on the automatic transmission vehicle.

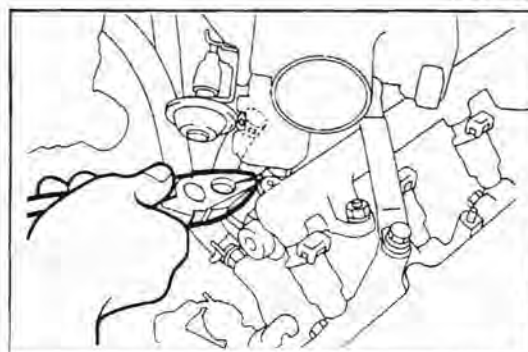


WR88-EF351

7. Disconnect the water hoses from the throttle body.

NOTE:

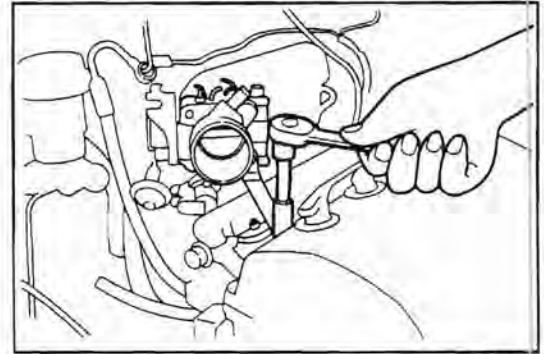
- Using a suitable cloth, take a precautionary measure so that no water gets to the electrical equipment of the vehicle.
- Be sure to plug the disconnected water hoses by suitable plug to prevent the water from flowing out.



WR88-EF352

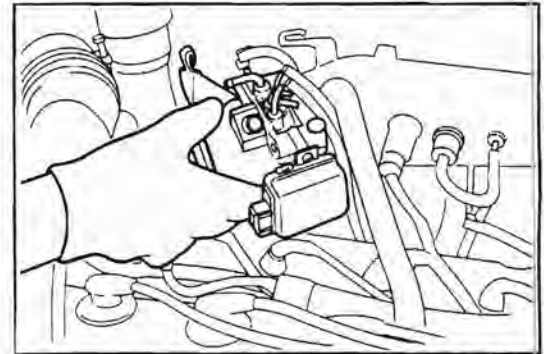
8. Removal of throttle body

- (1) Remove the attaching bolts and nuts of the surge tank stay No. 1.



WR88-EF353

- (2) Remove the attaching bolts and nuts of the throttle body.
- (3) Remove the throttle body.



WR88-EF354

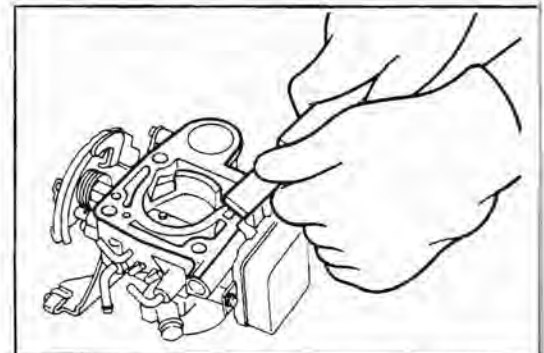
Inspection of Throttle Body

1. Cleaning of throttle body prior to inspection

- (1) Clean the cast part with a soft brush, a wet cloth or the like.

WR88-EF355

- (2) Remove the gasket material from the surge tank attached surface of the throttle body.

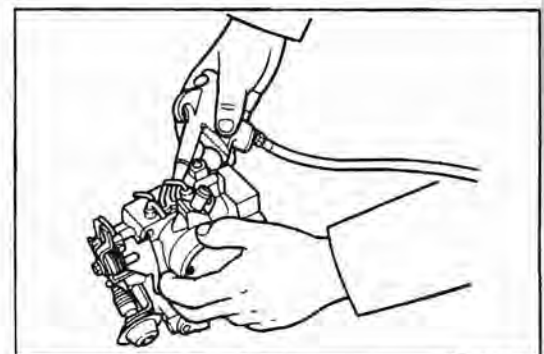


WR88-EF356

- (3) Clean all passages by blowing compressed air.

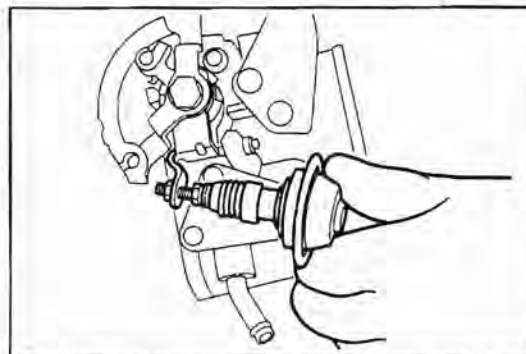
WARNING:

Be sure to protect your eyes, wearing goggles.



WR88-EF357

2. Check of throttle valve
 - (1) Check that the throttle lever is in full contact with the dashpot.
 - (2) When the throttle lever is opened, check to see if the dashpot lever comes out.



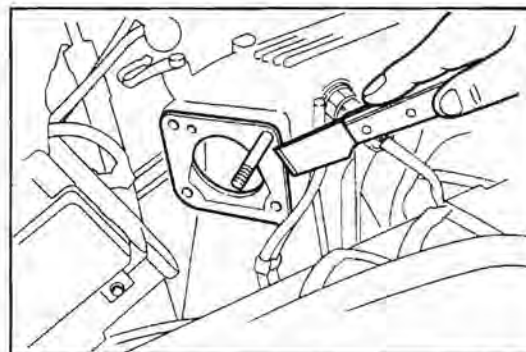
WR88-EF358

- (3) Check the throttle position sensor.
(See page EF-58 or EF-59.)
Replace the throttle body if it exhibits any defect.

WR88-EF359

Installation of Throttle Body

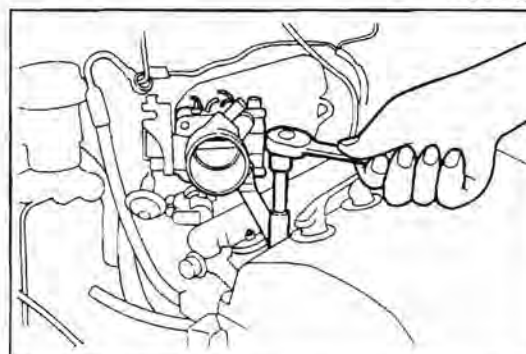
1. Remove any gasket material from the throttle body attaching surface of the surge tank.



WR88-EF360

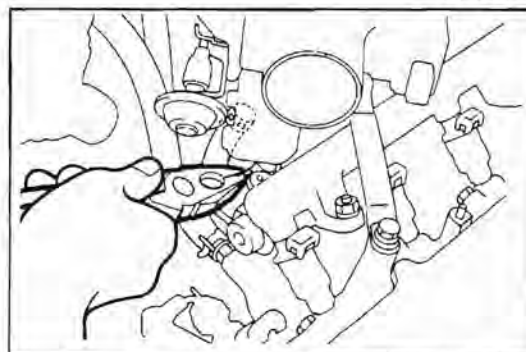
2. Install the throttle body on the surge tank with a new gasket interposed. Attach the surge tank stay No. 1.
3. Tighten the attaching bolts and nuts of the throttle body and surge tank stay No. 1.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



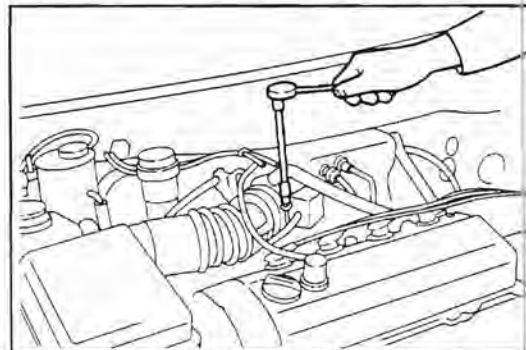
WR88-EF361

4. Connect the water hoses to the throttle body. Attach the hose clips.



WR88-EF362

5. Connect the air cleaner hose to the throttle body. Attach the hose bands.

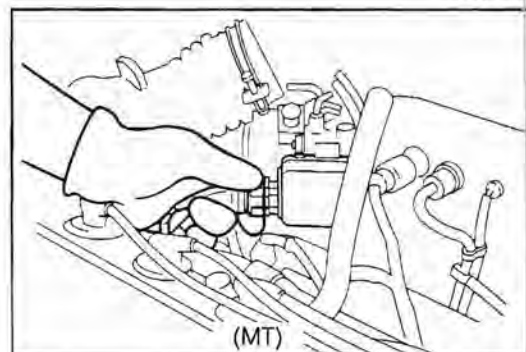


WR88-EF3/3

6. Connect the throttle position sensor connector.

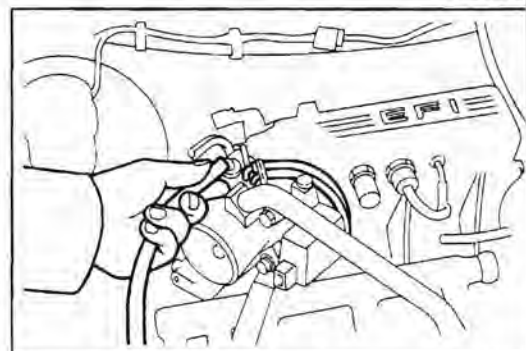
NOTE:

It should be noted that the position and shape of the connector differ on the automatic transmission vehicle.



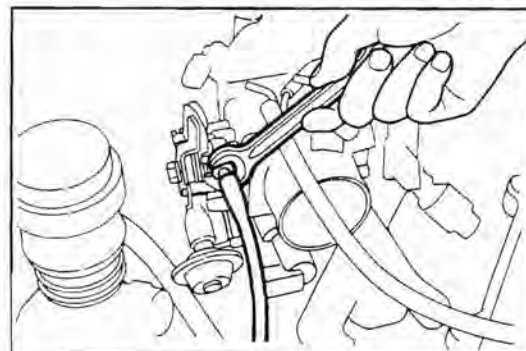
WR88-EF3/4

7. Connect the vacuum hoses to the throttle body.



WR88-EF3/5

8. Connect the accelerator cable to the throttle body. Perform the adjustment so that the play in the axial direction may become 3 to 8 mm (0.12 to 0.31 inch).

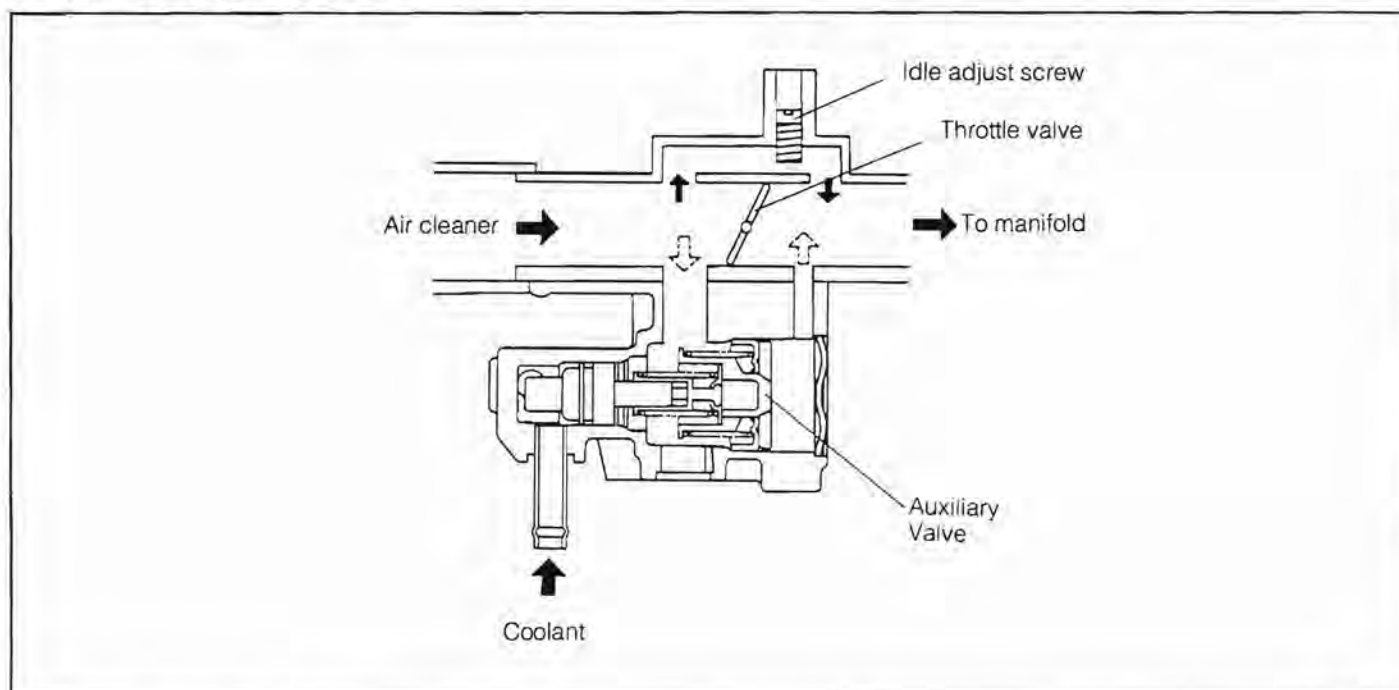


WR88-EF3/6

9. Connect the throttle cable to the throttle body. (At vehicle only)
(See the Chassis Workshop Manual.)
10. Fill coolant.
(See page CO-3.)
11. Connect the ground cable terminal to the negative (-) terminal of the battery.
12. Start the engine. Recheck the engine for water leakage.
Repair the leaky point if water leakage exists.

WR88-EF3/7

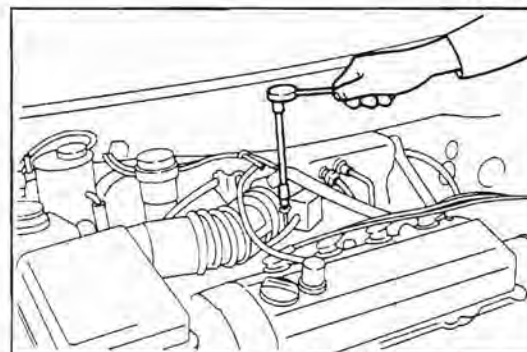
AUXILIARY AIR VALVE



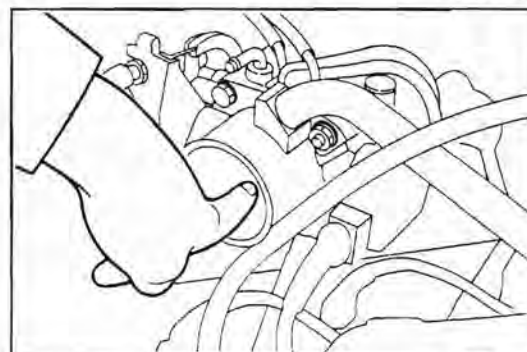
WR88-EF368

In-Vehicle Inspection**Check Operation**

1. Disconnect the air cleaner hose from the throttle body.
2. Start the engine. Check that there is air continuity at the auxiliary air valve port under the following conditions. Perform the check, following the procedures given below.
 When the cooling water temperature is below 50°C (122°F) apply your finger to the auxiliary air valve port. Ensure that the engine speed drops.
 When the cooling water temperature is above 80°C (176°F) apply your finger to the auxiliary air valve port. Ensure that the engine speed does not change.
 If the auxiliary air valve exhibits any malfunction, replace the throttle body.



WR88-EF369



WR88-EF370

Removal of Auxiliary Air Valve

Remove the throttle body.

(See page EF-110.)

WR88-EF371

Installation of Auxiliary Air Valve

Installation of throttle body

(See page EF-113.)

WR88-EF372

DAIHATSU

CHARADE

TYPE HC ENGINE

FUEL SYSTEM

(HC-C Engine)

FU

PRECAUTIONS	FU- 2
TROUBLE SHOOTING	FU- 2
IN-VEHICLE INSPECTION	FU- 3
CARBURETOR	FU- 7
FUEL PUMP	FU-41
FUEL FILTER	FU-46

WR88-FU001

PRECAUTIONS

1. Before working on the fuel system, be sure to disconnect the ground cable from the negative (–) terminal of the battery.
2. When working on the fuel system, never allow any naked fire to be brought near the working site. Also, never smoke cigarette or the like.
3. Do not allow the fuel to get to any parts made of rubber or resin.
4. Do not work on the fuel system of more than one vehicle at the same time.
5. Be certain to keep each part of the fuel system from contamination.
6. Be very careful not to allow any dirt or the like be mixed into the fuel system during the servicing operation.
7. Make sure to keep the working site clean. Also, be sure not to loose any part, specifically small parts.
8. Never loose nor mix up those pins, clips and springs with each other.

WR88-FU002

TROUBLE SHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/hard to start (Only case where cranking by startor motor is normal)	Carburetor problems <ul style="list-style-type: none"> • Choke operation • Needle valve sticking or clogged • Vacuum hose disconnected or damage • Fuel cut solenoid vlave not open • Outer vent valve not open 	Check choke system Check float and needle Check fuel cut solenoid valve Check outer vent valve	FU-4 FU-19 EC-3 FU-5, FU-20 FU-5, FU-20
Rough idle or stalls	Carburetor problems <ul style="list-style-type: none"> • Idle speed incorrect • Slow jet clogged • Idle mixture incorrect • Fuel cut solenoid valve not open • Fast idle speed setting incorrect (Cold engine) • Choke operation • Fuel pump faulty • Fuel filter clogged • Fuel line clogged • Fuel line bent or kinked 	Adjust idle speed Adjust idle mixture Check fuel cut solenoid valve Adjust fast idle speed Check choke system	EM-18 FU-20 EM-23 FU-5, FU-20 EM-20 FU-4, FU-20 FU-41 FU-46
Engine hesitates/poor acceleration	Carburetor problems <ul style="list-style-type: none"> • Float level too low • Accelerator pump faulty • Power valve faulty • Power piston faulty • Choke valve closed or open 	Adjust float level Check power valve Check power piston Check choke system	FU-33 FU-4 FU-20 FU-19 FU-4

WR88-FU003

Problem	Possible cause	Remedy	Page
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> • Fuel line clogged • Fuel pump faulty • Fuel filter clogged • Fuel line clogged • Fuel line bent or kinked 	Check fuel line Check fuel pump Replace fuel filter check fuel line Replace fuel line	FU-41 FU-46
Engine dieseling (Runs after ignition switch is turned off)	Carburetor problems <ul style="list-style-type: none"> • Linkage sticking • Idle speed or first idle speed out of adjustment • Fuel cut solenoid faulty 	Adjust idle speed or first idle speed Check fuel cut solenoid valve	FU-3 EM-18, EM-20 FU-5, FU-20
Poor fuel mileage	Carburetor problems <ul style="list-style-type: none"> • Choke faulty • Idle speed too high • Power valve always open • Idle mixture incorrect Fuel leak	Check choke system Adjust idle speed Check power piston and valve Adjust idle mixture Repair as necessary	FU-4 EM-18 FU-19, FU-20 EM-23
Unpleasant odor	Outer vent valve always open	Check outer vent valve	FU-5, FU-20

WR88-FU004

IN-VEHICLE INSPECTION

1. Removal of air cleaner

NOTE:

Before starting the engine, plug the ITC valve hoses, etc. to prevent rough idling.

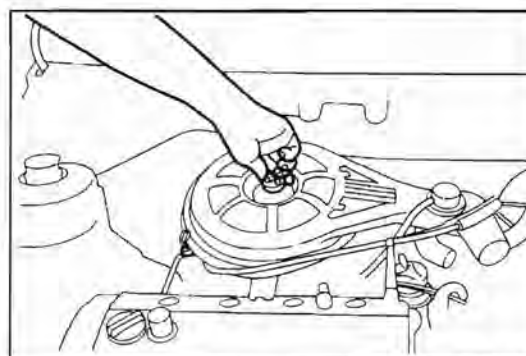
(1) Remove the following hoses:

- Vacuum hose to BVS
- ITC vacuum hose to carburetor
- PCV gas hose
- Hot air intake hose
- Cool air intake hose

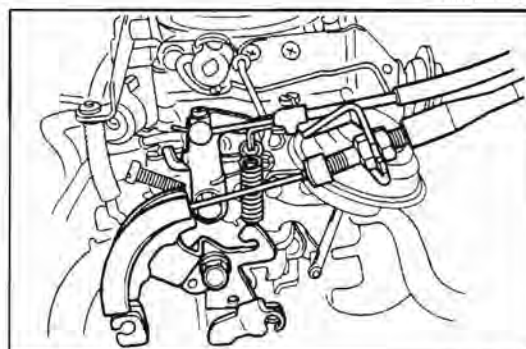
(2) Remove the air cleaner.

2. Inspection of carburetor and linkage

- (1) Ensure that each screw plug is installed correctly.
- (2) Check each linkage for evidence of excessive wear. Also, check to see if any snap ring is missing.
- (3) With the acceleration pedal fully depressed, check to see if the throttle valve opens fully.



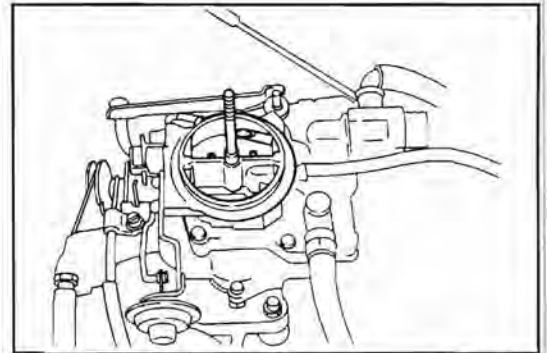
WR88-FU005



WR88-FU006

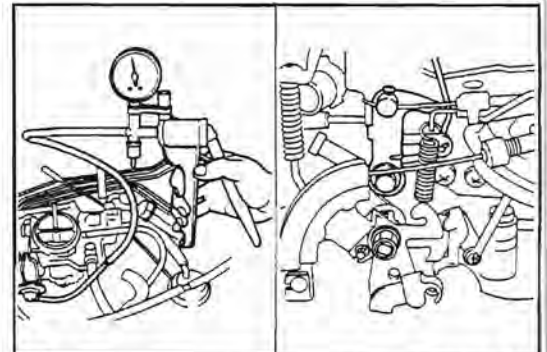
3. Inspection of choke system

- (1) With the choke knob pulled out fully, depress the accelerator pedal once fully. Under this condition, check to see if the choke valve is closed completely.



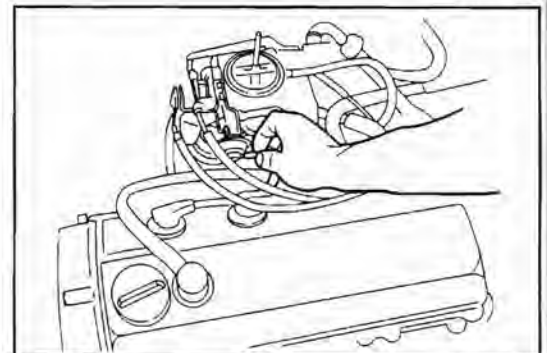
WR88-FU007

- (2) Attach a MityVac to the choke opener. Apply a negative pressure (at least 250 mm Hg). Check to see if the choke valve opening is approximately 30 degrees and the cam follower disengages from the first stage of the fast idle cam.



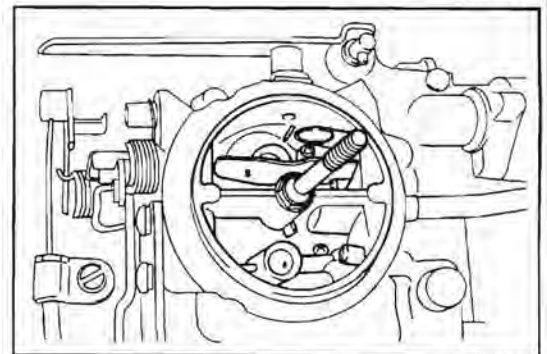
WR88-FU008

- (3) Remove the MityVac. Connect the rubber hose to the choke opener.



WR88-FU009

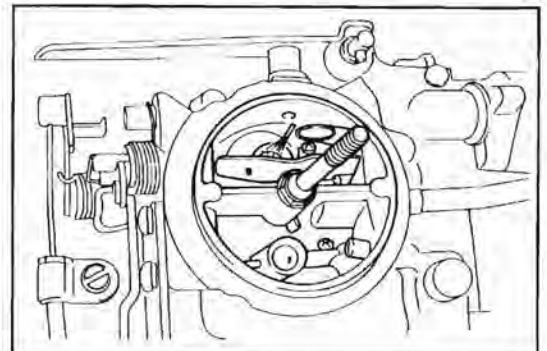
- (4) Return the choke knob fully. Check to see if the choke valve opens completely.



WR88-FU011

4. Inspection of acceleration pump

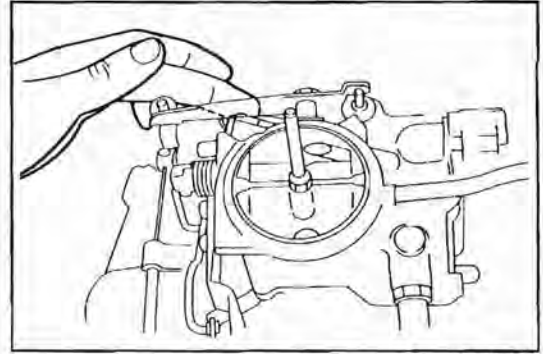
Check to see if the fuel spurts out from the acceleration nozzle when throttle valve is opened quickly.



WR88-FU010

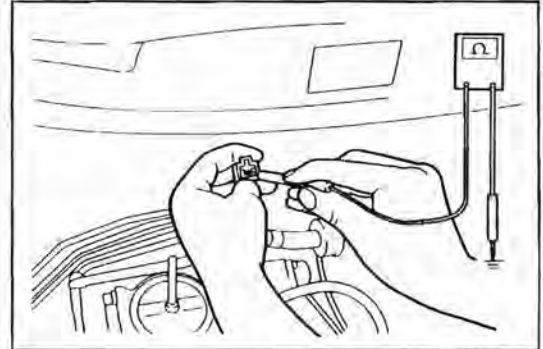
5. Inspection of solenoid valve

- (1) Check to see if you can feel the operation of the solenoid valve when the ignition switch is turned ON/OFF.
If the solenoid valve remains inoperative, check the power supply for the solenoid valve. Then, proceed to the check described in the step (2) below.



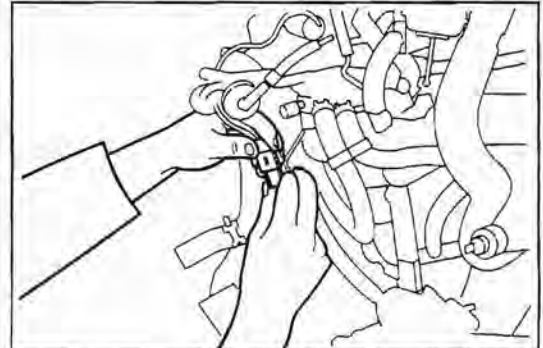
WR88-FU012

- (2) Disconnect the connector from the carburetor. Check to see if the resistance between the solenoid valve terminal and the carburetor proper conforms to the specification.
Specified Resistance: 80 - 100Ω at 20°C (68°F)
If the resistance fails to conform to the specification, replace the solenoid valve.



WR88-FU013

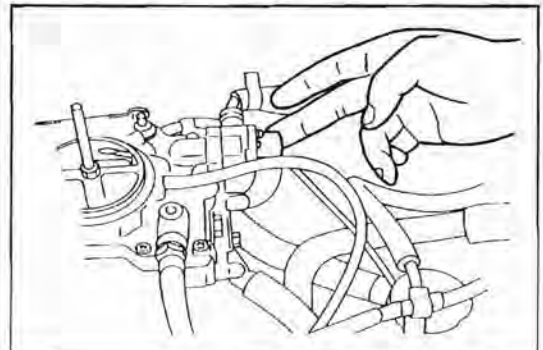
- (3) Reconnect the connector.



WR88-FU014

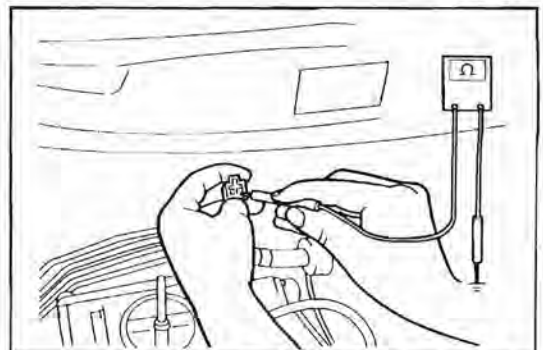
6. Inspection of outer vent valve

- (1) Check to see if you can feel the operation of the outer vent valve when the ignition switch is turned ON/OFF.
If the outer vent valve remains inoperative, check the power supply for the outer vent valve. Then, proceed to the check described in the step (2) below.



WR88-FU015

- (2) Disconnect the connector from the carburetor. Check to see if the resistance between the outer vent valve terminal and the carburetor proper conforms to the specification.
Specified Resistance: 30 - 40Ω at 20°C (68°F)
If the resistance fails to conform to the specification, replace the outer vent valve.



WR88-FU016

- (3) Reconnect the outer vent valve connector.
- (4) Disconnect the outer vent hose from the BVSV. Turn ON the ignition key switch.

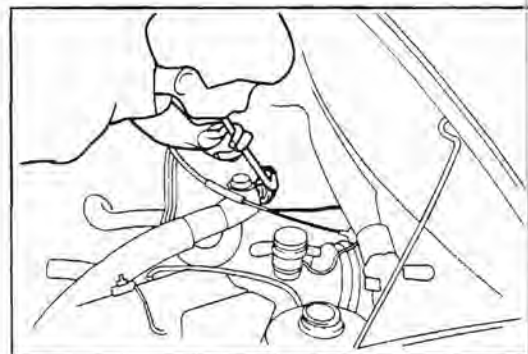
WR88-FU017

- (5) Blow air from the outer vent hose. Ensure that no air continuity exists.

If air continuity exists, replace the outer vent valve.

WARNING:

Be very careful not to inhale the air.



WR88-FU018

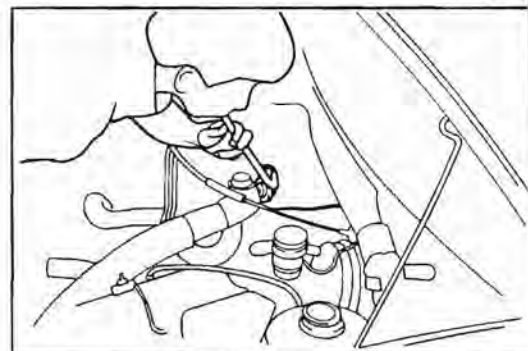
- (6) Turn OFF the ignition key switch.

- (7) Blow air from the outer vent hose. Ensure that air continuity exists.

If no air continuity exists, replace the outer vent valve.

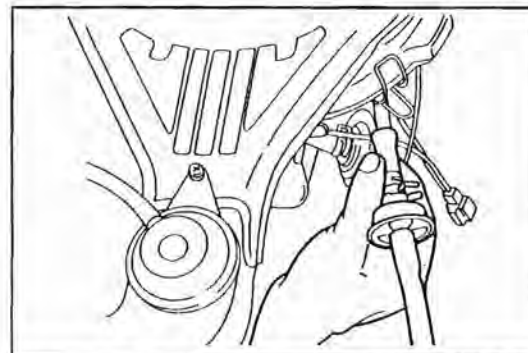
WARNING:

Be very careful not to inhale the air.



WR88-FU019

- (8) Connect the outer vent hose to the BVSV.



WR88-FU020

7. Inspection of choke opener

(See page FU-4, EM-22)

8. Inspection of fast idle

(See page EM-20)

9. Inspection of throttle positioner

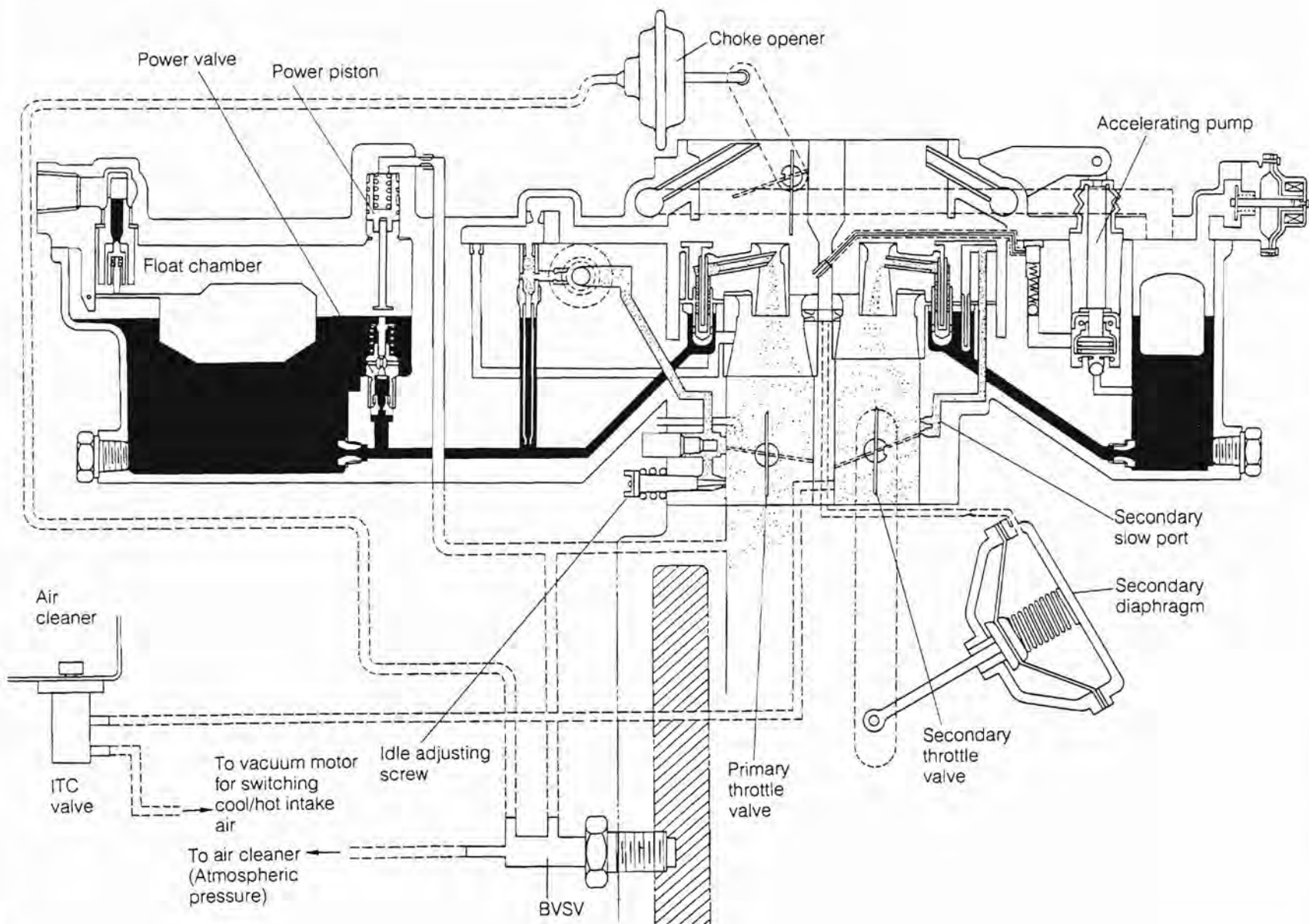
(See page EM-20)

10. Inspection of idle-up system

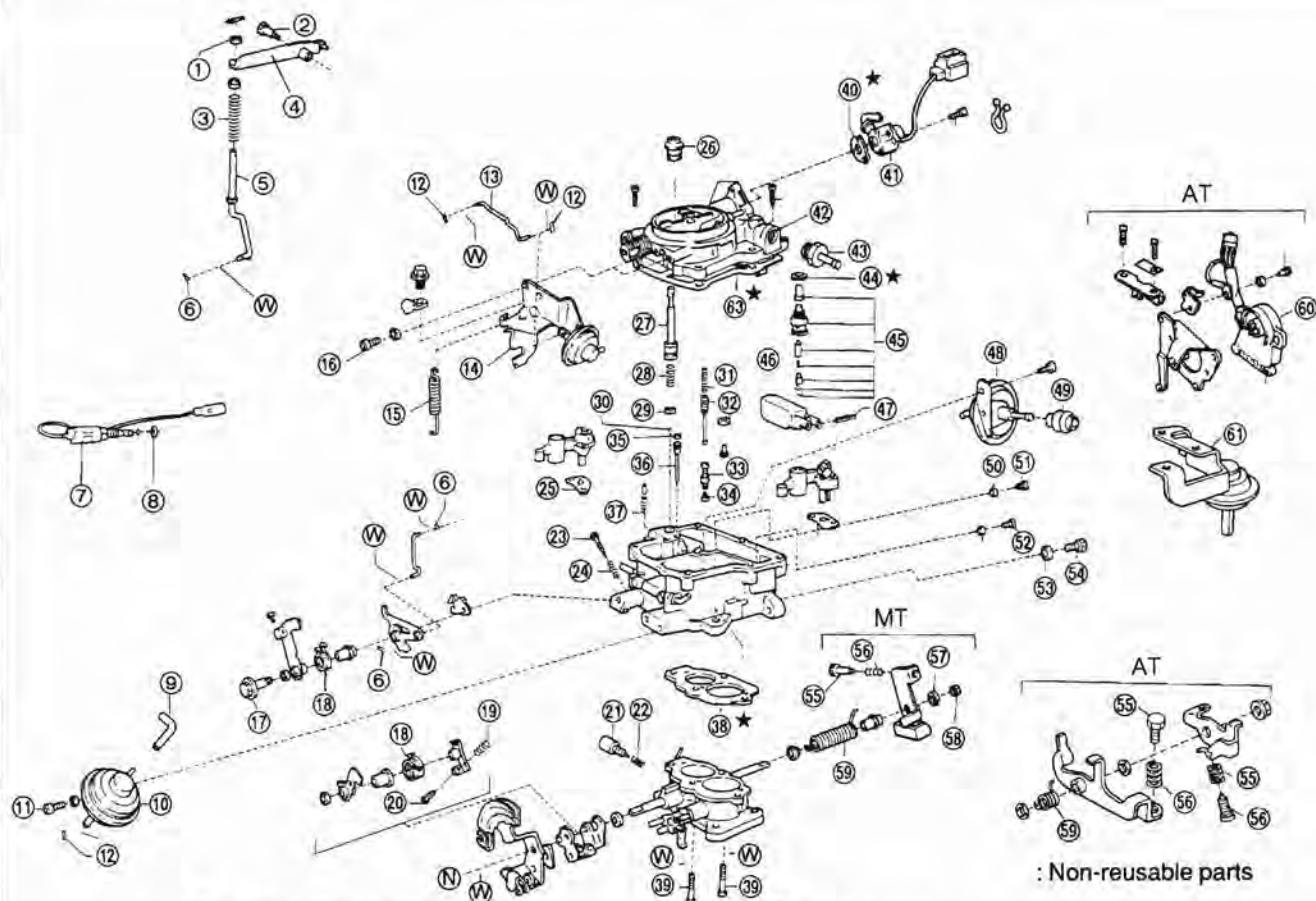
(See page EM-23)

WR88-FU021

CARBURETOR SCHEMATIC DIAGRAM



COMPONENTS



- ① Plunger inner washer
- ② Pump arm set screw
- ③ Pump arm spring
- ④ Accelerator pump lever
- ⑤ Accelerator pump rod
- ⑥ Snap ring
- ⑦ Solenoid valve
- ⑧ Solenoid valve gasket
- ⑨ Vacuum hose
- ⑩ Diaphragm sub assembly
- ⑪ Diaphragm housing set screw
- ⑫ Snap ring No.1
- ⑬ Choke opener link
- ⑭ Choke opener
- ⑮ Throttle return spring
- ⑯ Screw
- ⑰ First idle cam set spring
- ⑱ Return spring
- ⑲ First idle cam spring
- ⑳ First idle set screw
- ㉑ Idle mixture adjusting screw
- ㉒ Idle adjusting spring
- ㉓ Throttle adjusting screw
- ㉔ Throttle adjusting spring
- ㉕ Venturi gasket
- ㉖ Boot
- ㉗ Pump plunger
- ㉘ Pump damping spring
- ㉙ Check ball retainer
- ㉚ Check ball
- ㉛ Power piston spring

- ㉜ Power piston
- ㉝ Power valve
- ㉞ Power jet
- ㉟ "O" ring
- ㊱ Slow jet
- ㊲ Steel ball No.2
- ㊳ Body flange gasket
- ㊴ Set screw
- ㊵ Gasket
- ㊶ Outer vent valve
- ㊷ Union nipple gasket
- ㊸ Union nipple
- ㊹ Needle valve seat gasket
- ㊺ Needle valve assembly
- ㊻ Float assembly
- ㊼ Float lever pin
- ㊽ Positioner
- ㊾ Boot
- ㊿ Main jet gasket
- 1st main jet
- 2nd main jet
- Main passage plug gasket
- Main passage plug
- Adjusting screw
- Adjusting screw spring
- Lock washer
- Throttle lever set screw
- Return spring
- Throttle sensor
- Idle-up diaphragm
- Air horn gasket

: Non-reusable parts

REMOVAL OF CARBURETOR

1. Disconnect the ground cable terminal from the negative (–) terminal of the battery.
2. Drain the coolant. (See page CO–3)

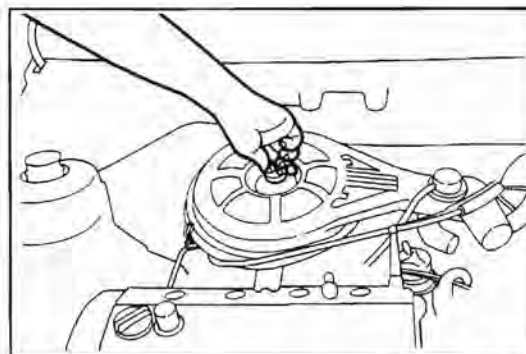
WR88-FU024

3. Removal of air cleaner

- (1) Remove the following rubber hoses:

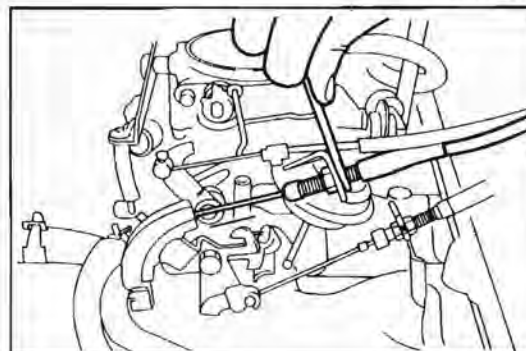
- 1) Vacuum hose to BVS
- 2) ITC vacuum hose to carburetor
- 3) Blow-by gas hose
- 4) Cool air intake hose
- 5) Hot air intake hose

- (2) Remove the air cleaner.



WR88-FU025

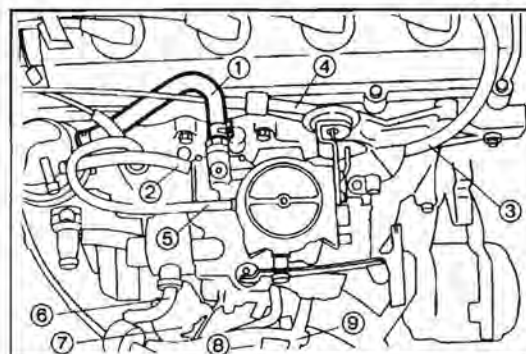
4. Disconnect the accelerator cable from the carburetor.
5. Disconnect the choke cable from the carburetor.
6. Disconnect the throttle cable from the carburetor.
(A/T vehicle only)



WR88-FU026

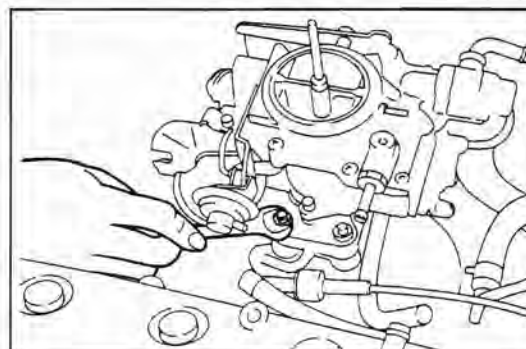
7. Remove the following hoses from the carburetor:

- ① Fuel inlet hose
- ② ITC vacuum hose
- ③ PCV gas hose
- ④ Choke opener vacuum hose
- ⑤ Vacuum hoses to gas filter
- ⑥ Outer vent hose
- ⑦ Throttle positioner vacuum hose
- ⑧ Vacuum hose to distributor
- ⑨ Coolant circulating hoses



WR88-FU027

8. Disconnect the solenoid valve outer vent valve connector.
9. Disconnect the throttle positioner sensor connector.
10. Remove the four attaching nuts of the carburetor. Remove the carburetor.



WR88-FU028

DISASSEMBLY OF CARBURETOR

NOTE:

The following operations have been arranged in such a way that checks are performed for a certain single unit alone at a time. *This will* avoid any occurrence of wrong assembling of similar subassemblies which would likely occur when operations were carried out concurrently.

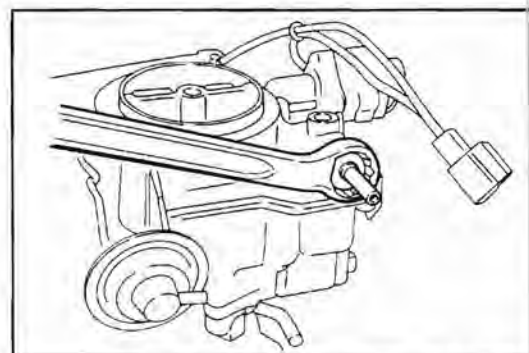
- (1) Be sure to arrange the disassembled parts in order that reassembling may be performed readily.
- (2) Do not mix up those balls, clips, springs and so forth.
- (3) Be sure to employ the following SST, a set of screwdrivers for carburetor use.

SST: 09860-87201-000

WR88-FU029

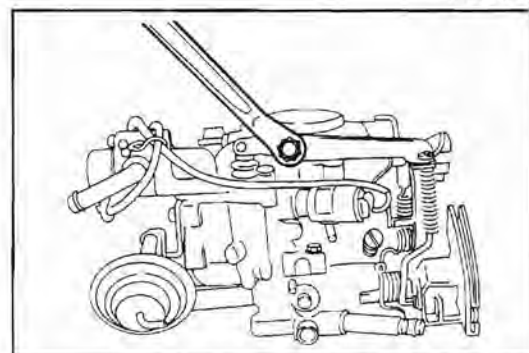
DISASSEMBLY OF AIR HORN

1. Remove the air cleaner set bolt.
2. Removal of air horn assembly
 - (1) Remove the fuel inlet union and gasket.



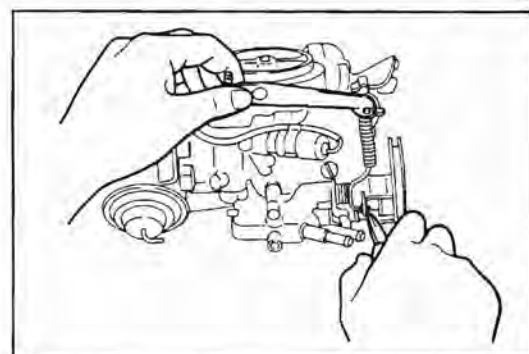
WR88-FU030

- (2) Remove the accelerator pump arm set screw.



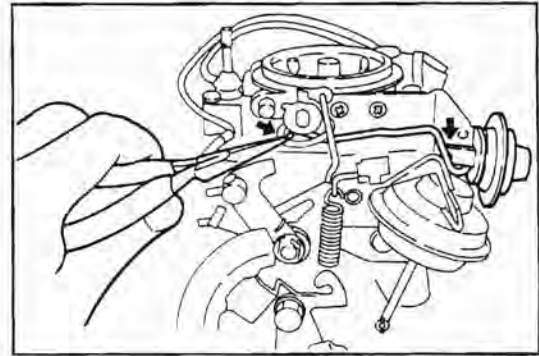
WR88-FU031

- (3) Remove the accelerator pump rod and lever.



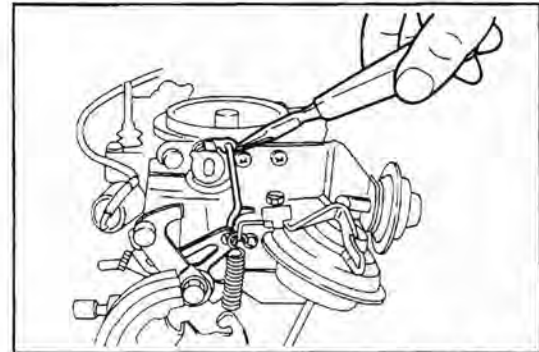
WR88-FU032

(4) Remove the choke opener link.



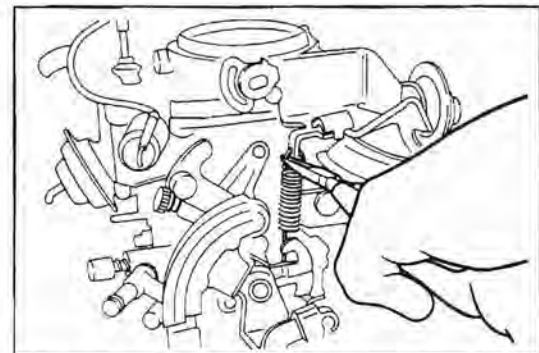
WR88-FU033

(5) Remove the fast idle cam link.



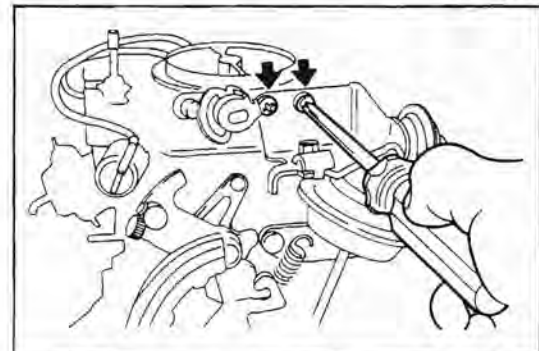
WR88-FU034

(6) Detach the throttle return spring.



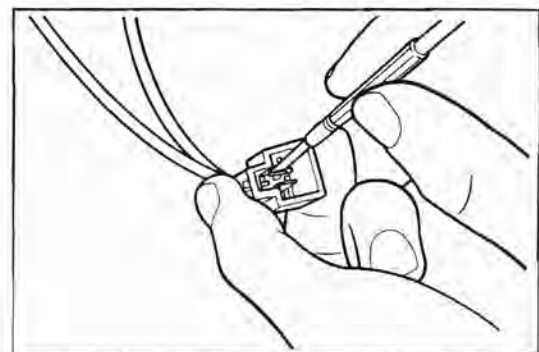
WR88-FU035

(7) Remove the choke opener.



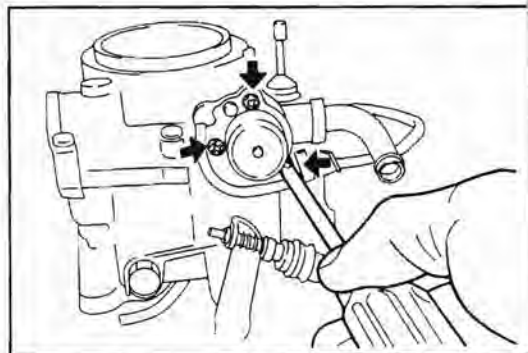
WR88-FU036

(8) Disconnect the outer vent valve connector from the socket.



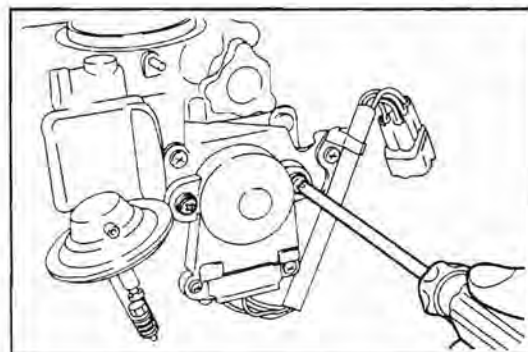
WR88-FU037

(9) Remove the outer vent valve.



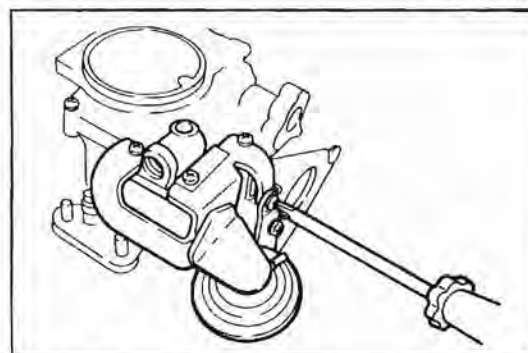
WR88-FU033

(10) Remove the throttle positioner sensor.
(A/T vehicle only)



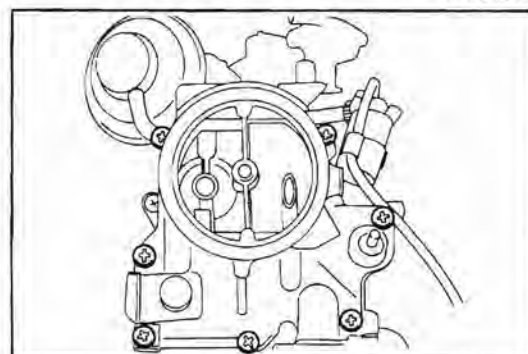
WR88-FU036

(11) Remove the idle-up diaphragm.
(A/T vehicle only)



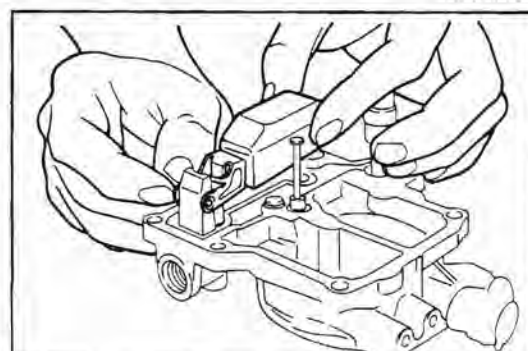
WR88-FU040

(12) Remove the seven attaching screws of the air horn.
(Four attaching screws in the case of the A/T vehicle)
Remove the air horn.



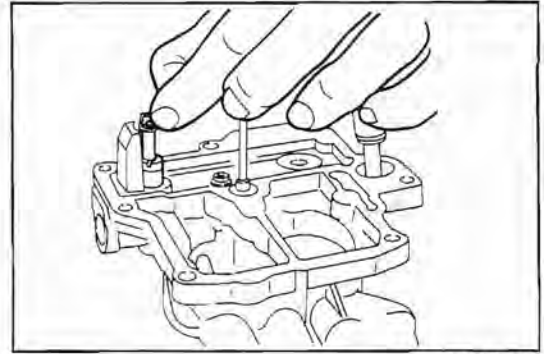
WR88-FU041

(13) Remove the float.



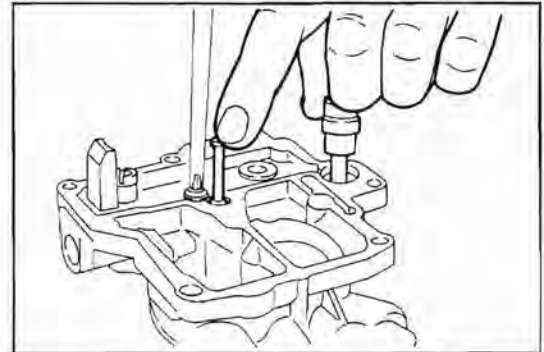
WR88-FU042

(14) Remove the needle valve.



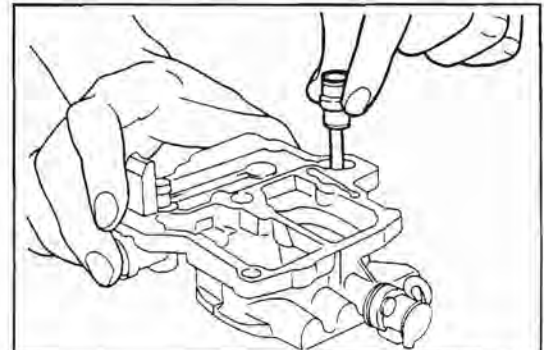
WR88-FU043

(15) Remove the power piston.



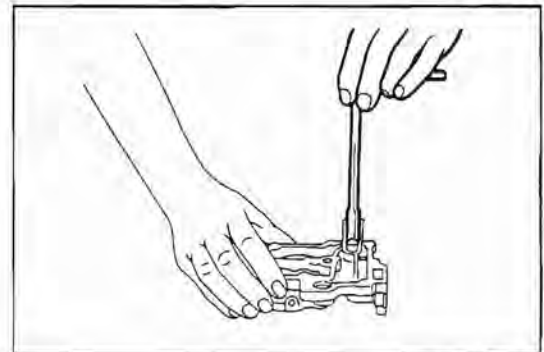
WR88-FU044

(16) Remove the acceleration pump piston.



WR88-FU045

(17) Remove the needle valve seat.

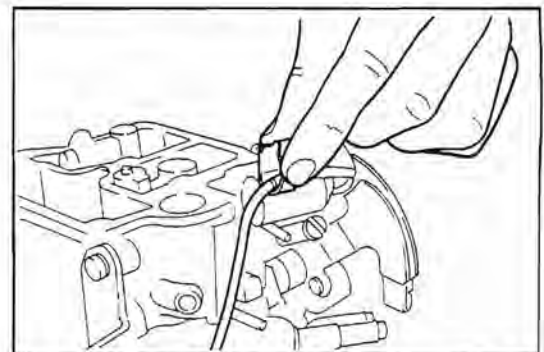


WR88-FU046

DISASSEMBLY OF CARBURETOR BODY

1. Removal of solenoid valve

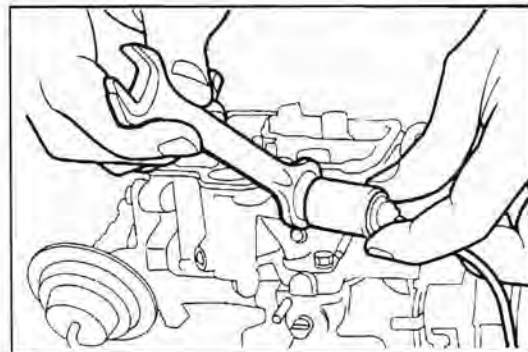
(1) Remove the solenoid valve wire clamp.



WR88-FU047

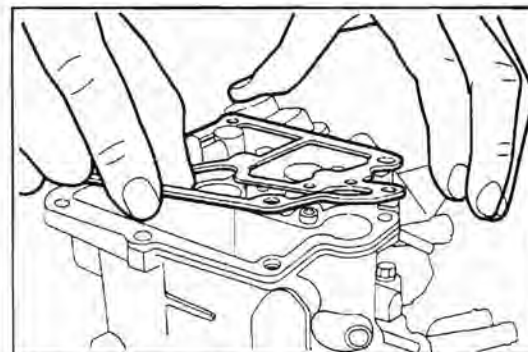
FUEL SYSTEM

(2) Remove the solenoid valve.



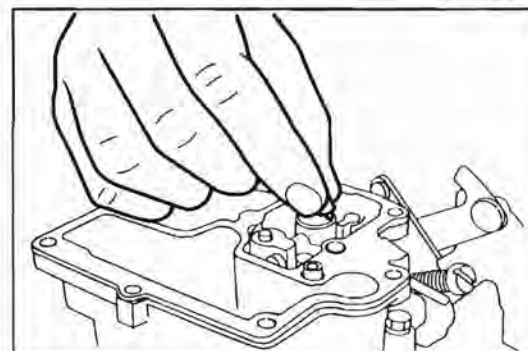
WR88-FU049

2. Remove the gasket.



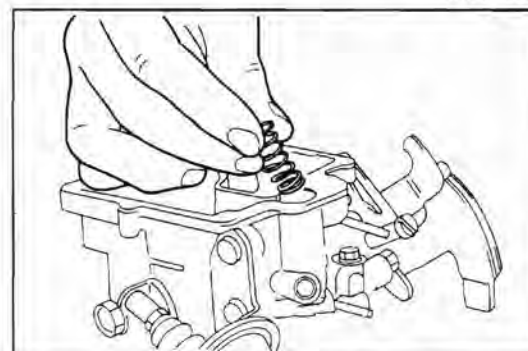
WR88-FU049

3. Remove the discharge weight and spring ball.



WR88-FU050

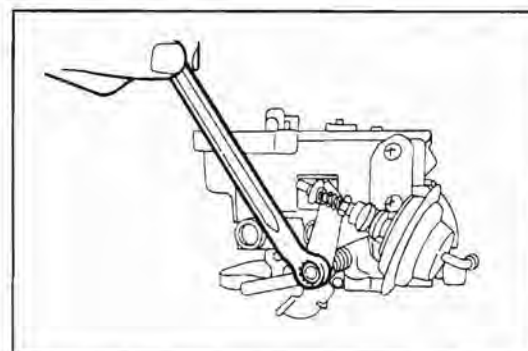
4. Remove the acceleration pump return spring.



WR88-FU051

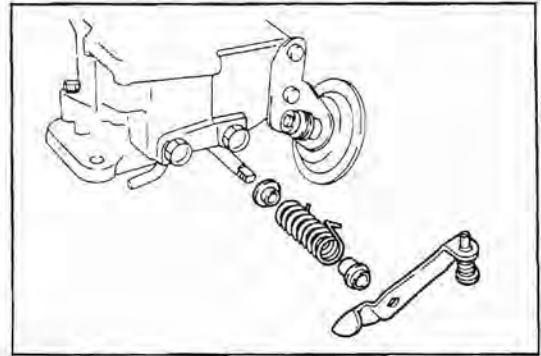
5. Removal of throttle positioner
(M/T vehicle)

(1) Remove the throttle lever set nut.



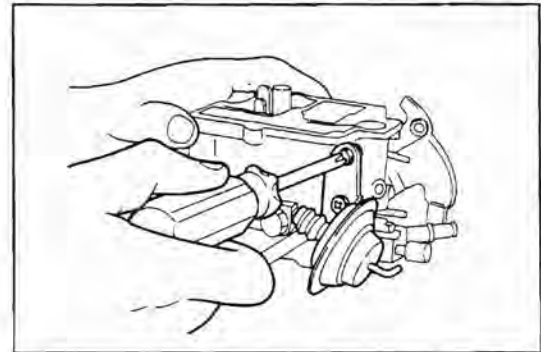
WR88-FU052

- (2) Remove the throttle positioner lever.
- (3) Remove the collars and spring.



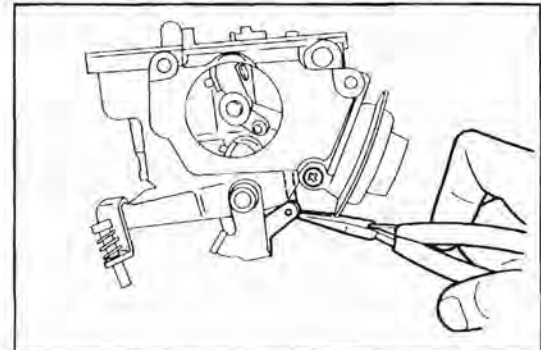
WR88-FU053

- (4) Remove the throttle positioner.



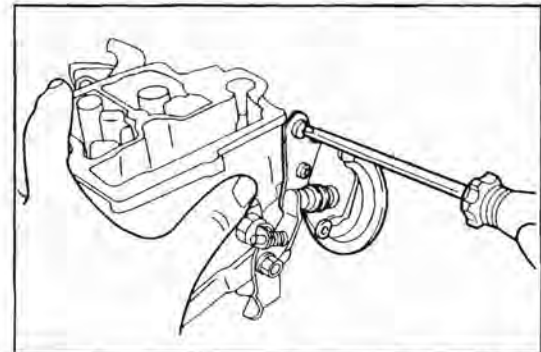
WR88-FU054

- 6. Removal of throttle positioner (A/T vehicle)
- (1) Remove the shift position switch bracket.



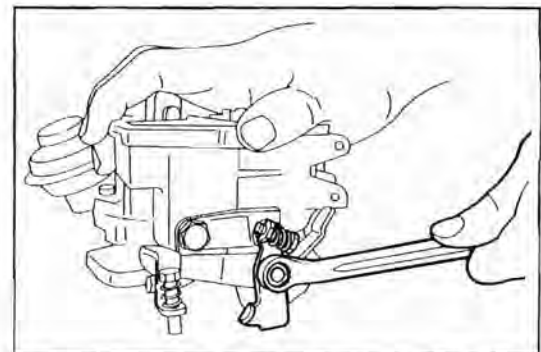
WR88-FU055

- (2) Remove the throttle positioner.



WR88-FU056

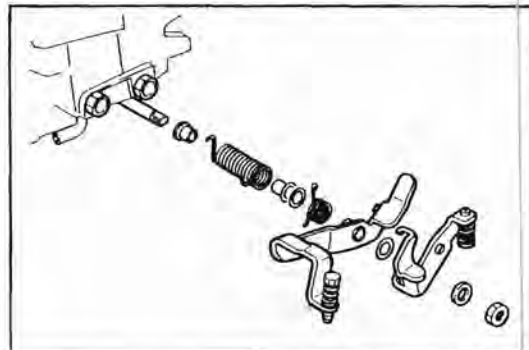
- (3) Remove the throttle positioner lever.



WR88-FU057

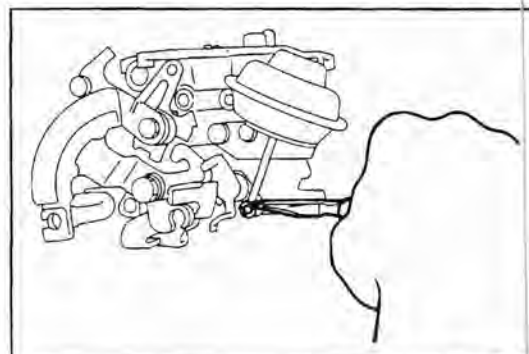
FUEL SYSTEM

- (4) Remove the throttle positioner spring washer, spring and collar.



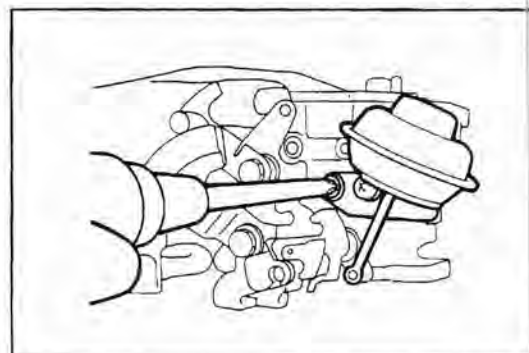
WR88-FU058

7. Removal of secondary throttle valve diaphragm
(1) Remove the pin. Disconnect the link.



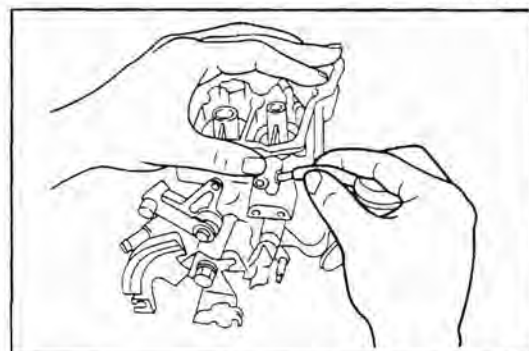
WR88-FU059

- (2) Remove the secondary throttle diaphragm.



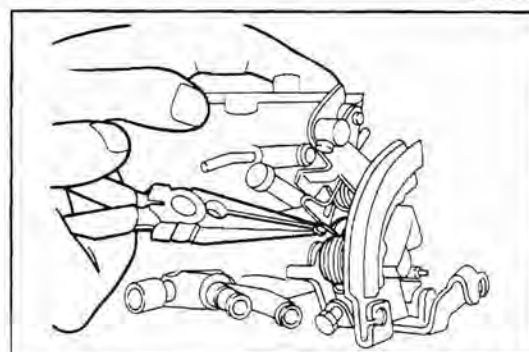
WR88-FU060

- (3) Remove the rubber hose.



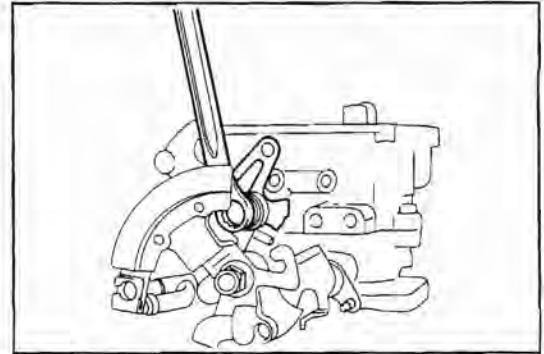
WR88-FU061

8. Removal of fast idle cam set screw
(1) Detach the throttle return spring from the fast idle cam.



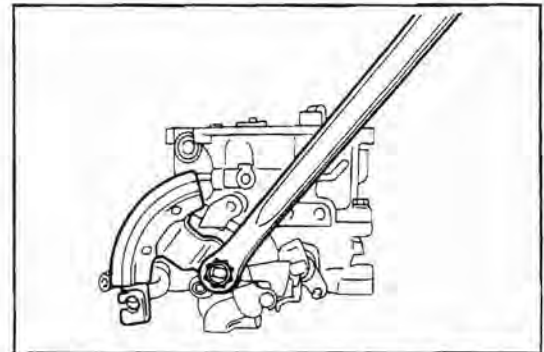
WR88-FU062

- (2) Remove the fast idle cam set screw together with the fast idle cam lever spring and choke lever return spring bracket.



WR88-FU063

9. Remove the throttle lever, kick-up lever, fast idle adjusting lever, spring and collar.

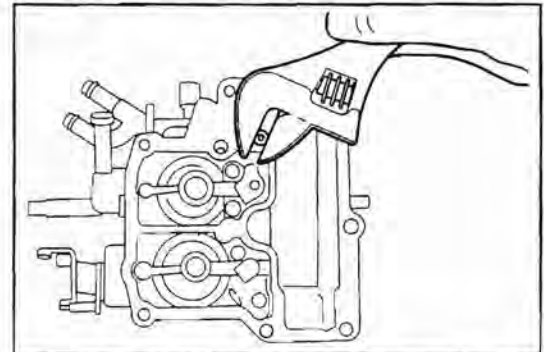


WR88-FU064

10. Remove the slow jet.

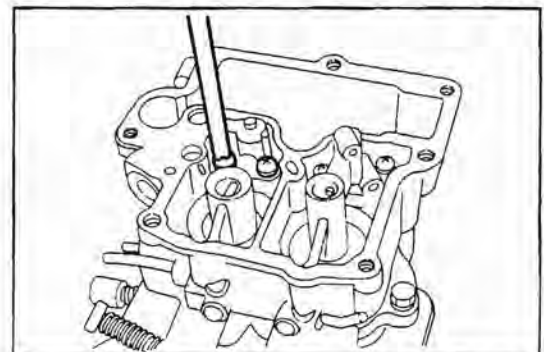
NOTE:

Never reuse the "O" ring.



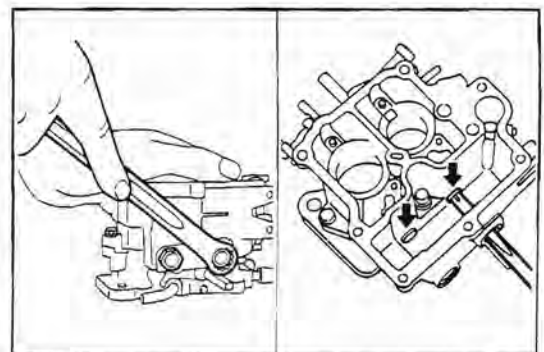
WR88-FU065

11. Remove the primary and secondary small venturi tubes and gaskets.



WR88-FU066

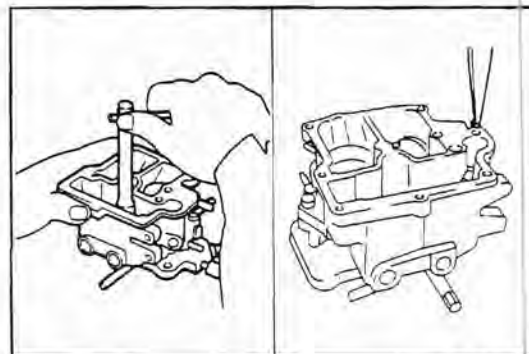
12. Remove the main passage plug. Remove the primary and secondary main jets.



WR88-FU067

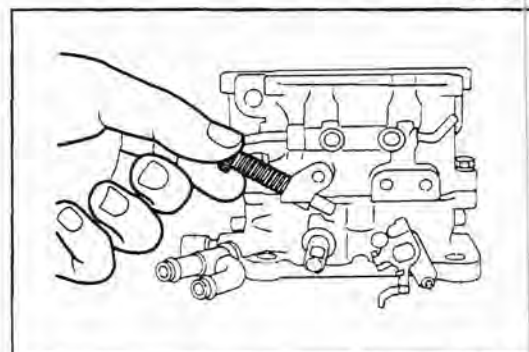
FUEL SYSTEM

13. Remove the power valve, using the SST.
14. Remove the acceleration pump check ball retainer.



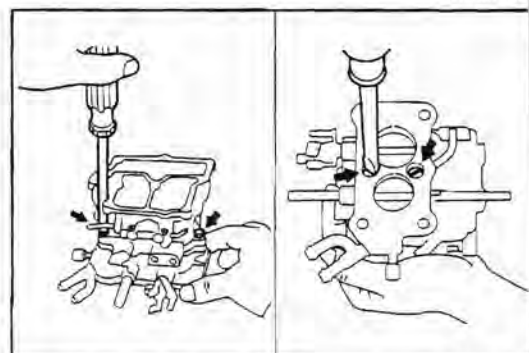
WR88-FU038

15. Remove the throttle adjusting screw.



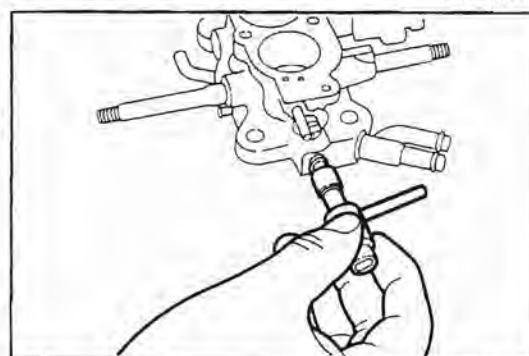
WR88-FU069

16. Disassembly of carburetor body and flange
Remove the attaching bolts and nuts. Disassemble the carburetor body and flange.



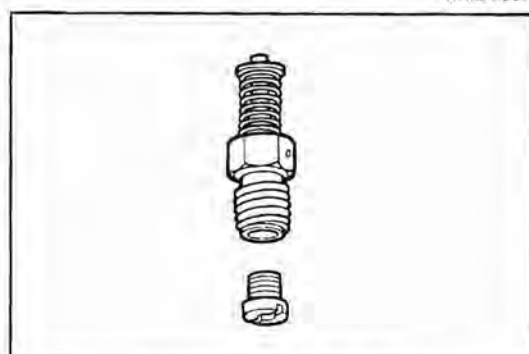
WR88-FU070

17. Remove the idle mixture adjusting screw, using the SST.



WR88-FU071

18. Remove the power jet from the power valve.



WR88-FU072

CLEANING OF EACH PART

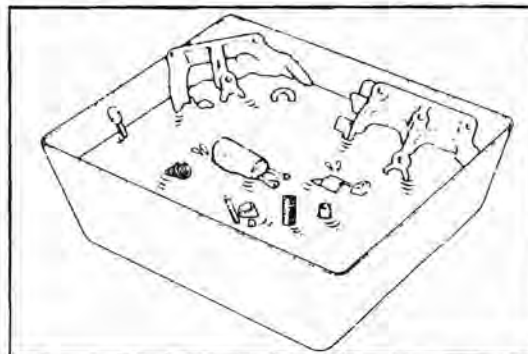
1. Clean the carburetor parts except for the diaphragms and electrical parts, using carburetor cleaner and a soft brush.
2. Remove carbon deposits by means of a soft brush.
3. Clean each of the jets and nozzles, using compressed air.

NOTE:

Never clean the jets or orifices with a piece of wire or a drill. This could enlarge the openings and result in poor fuel mileage.

WARNING:

Be sure to protect your eyes with safety goggles, when using compressed air.

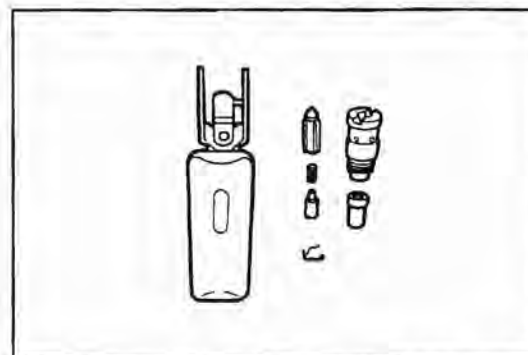


WR88-FU073

INSPECTION OF CARBURETOR

1. Inspection of float and needle valve

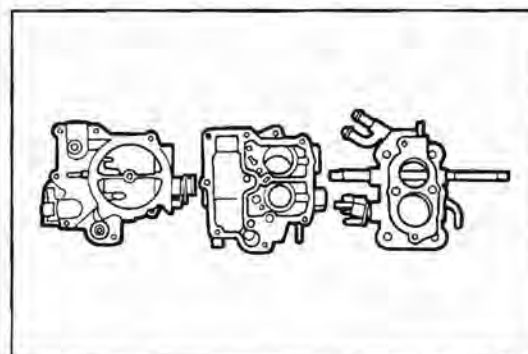
- (1) Inspect the float lever pin for scratches and excessive wear.
- (2) Inspect the float for broken lip. Also, inspect the float lever pin for wear.
- (3) Inspect the float for leakage.
- (4) Inspect the pin for damage.
- (5) Inspect the valve and plunger for wear or damage.
- (6) Inspect the spring for breakage and/or deformation.
- (7) Inspect the strainer for breakage, restriction or damage.
- (8) Inspect the valve seat for wear or damage.



WR88-FU074

2. Inspection of air horn, body and flange

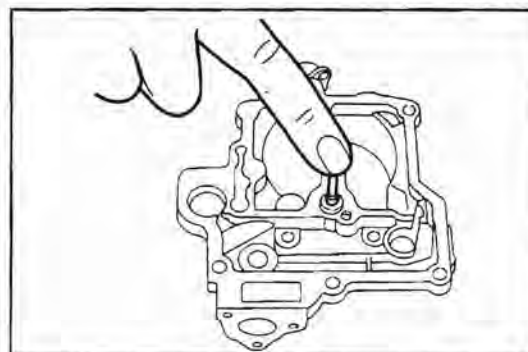
- (1) Check each part for cracks, wear or damage.
- (2) Check to see if each valve functions smoothly.
- (3) Check each air passage for restriction.
Replace any defective part, as required.



WR88-FU075

3. Inspection of power piston

Check to see if the power piston functions smoothly.

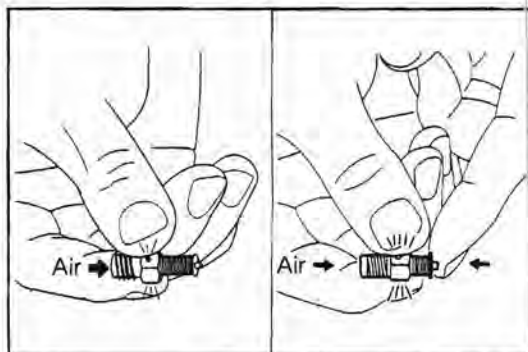


WR88-FU076

FUEL SYSTEM

4. Inspection of power valve

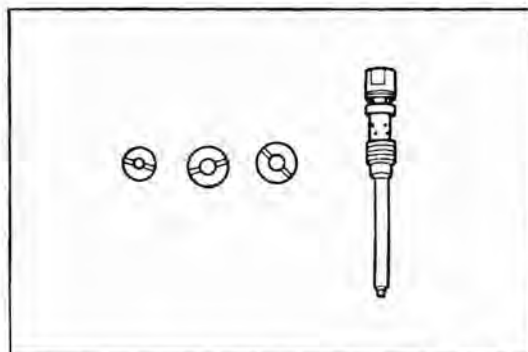
Ensure that air continuity exists when the valve is pushed. Also, ensure that no air continuity exists when the valve is not pushed.



WR88-FU07

5. Inspection of jets

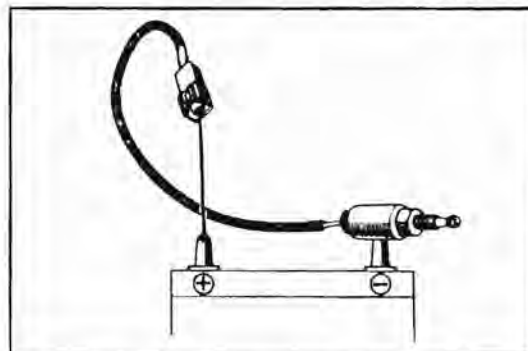
Check each jet for restriction or damage.



WR88-FU076

6. Inspection of solenoid valve

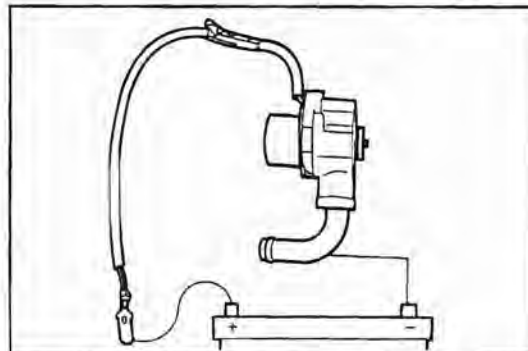
Ensure that the valve is opened when the solenoid valve is energized. Also, ensure that the valve is closed when the solenoid valve is not energized.



WR88-FU079

7. Inspection of outer vent valve

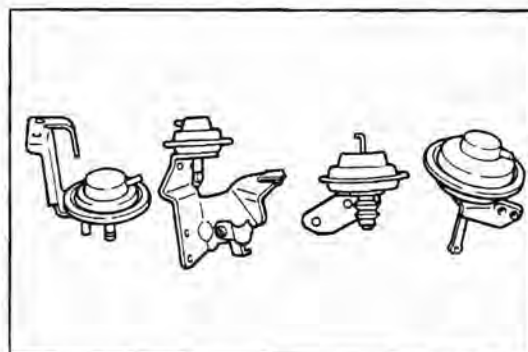
Ensure that the valve is closed when the solenoid valve is energized. Also, ensure that the valve is opened when the solenoid valve is not energized.



WR88-FU080

8. Inspection of each diaphragm

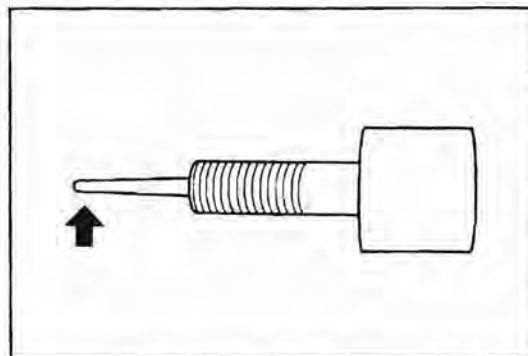
Ensure that the rod is drawn into the diaphragm chamber when a negative pressure is applied to each diaphragm.



WR88-FU081

9. Inspection of idle mixture adjusting screw

Check to see if any damage or wear is present at the tip end of the adjusting screw.



WR88-FU082

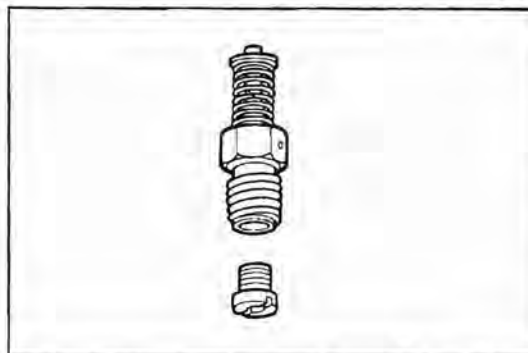
ASSEMBLY OF CARBURETOR

NOTE:

Be sure to use new gaskets and "O" rings.

ASSEMBLY OF CARBURETOR BODY & FLANGE

1. Install the power jet in the power valve.

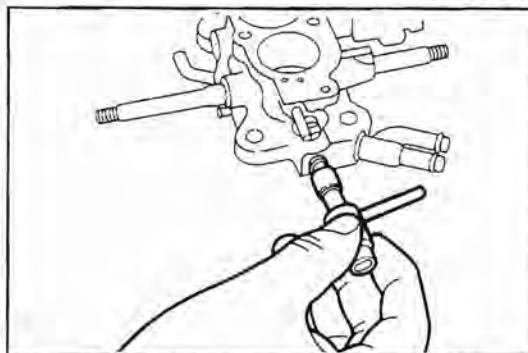


WR88-FU084

2. Screw in the idle mixture adjusting screw fully into the flange, using the SST. Then, back off the adjusting screw four turns.

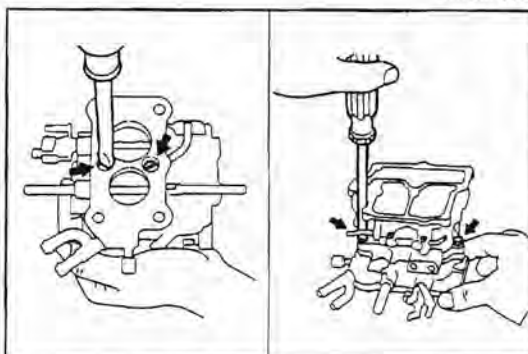
NOTE:

Care must be exercised to ensure that no damage may be made to the tip-end of the adjusting screw by tightening the idle mixture adjusting screw excessively.



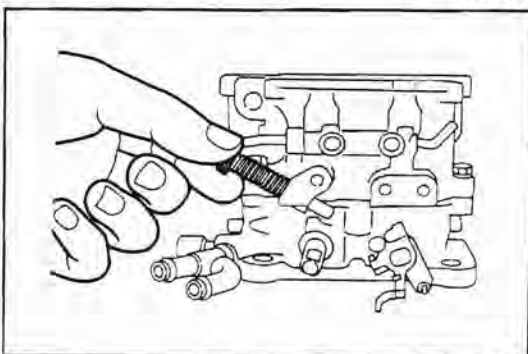
WR88-FU085

3. Assembly of carburetor body and flange
Install the throttle body with a new gasket interposed.



WR88-FU086

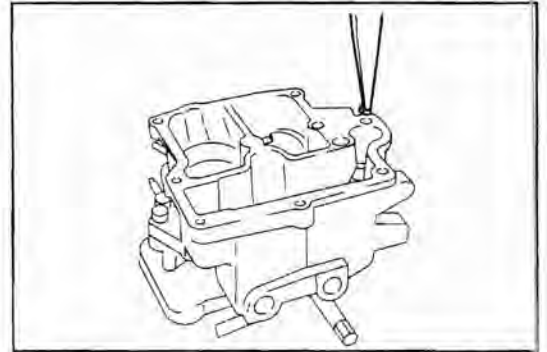
4. Install the throttle adjusting screw.



WR88-FU087

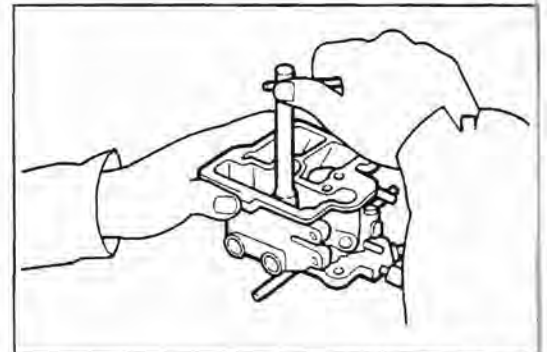
FUEL SYSTEM

5. Install the check ball retainer with the acceleration pump check ball inserted in place.



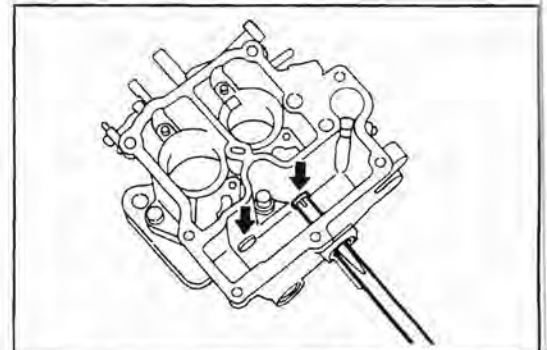
WR88-FU086

6. Install the power valve, using the SST.



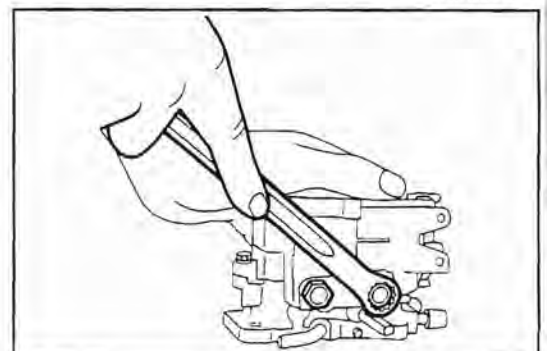
WR88-FU085

7. Install the primary and secondary main jets.
NOTE:
Be sure to use new gaskets.



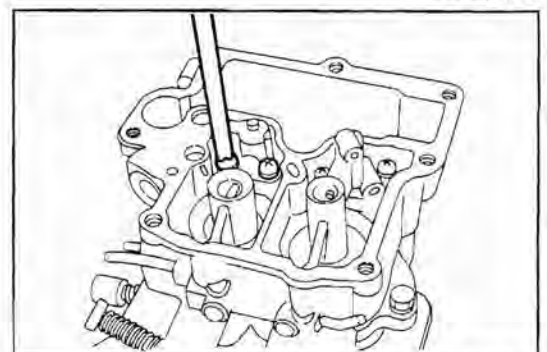
WR88-FU090

8. Install the main passage plug.
NOTE:
Be sure to use a new gasket.



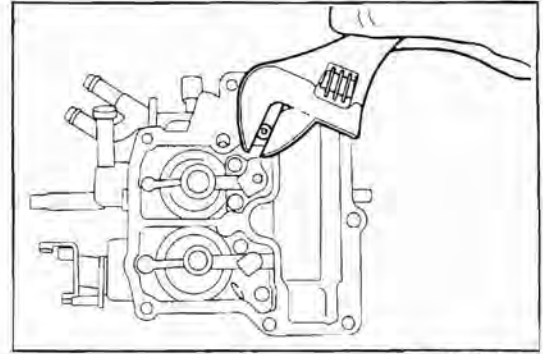
WR88-FU091

9. Install the primary and secondary small venturi tubes with new gaskets interposed.



WR88-FU092

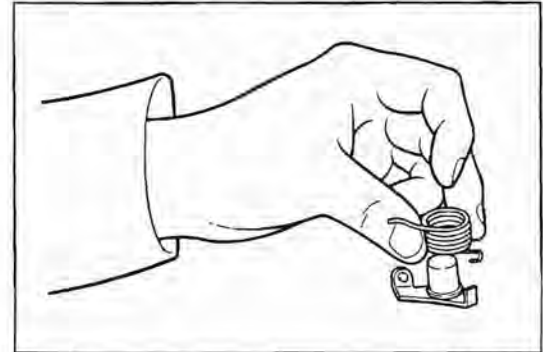
10. Install the slow jet, using a new "O" ring.



WR88-FU093

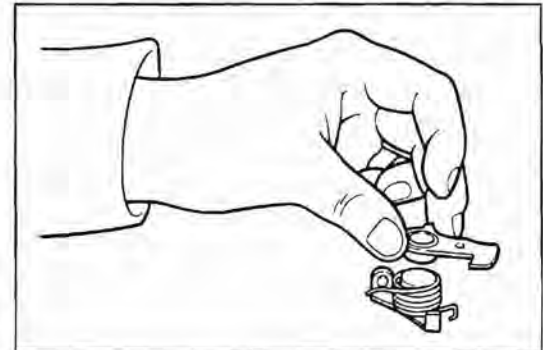
11. Assembly of throttle lever

(1) Insert the collar and spring onto the fast idle lever.



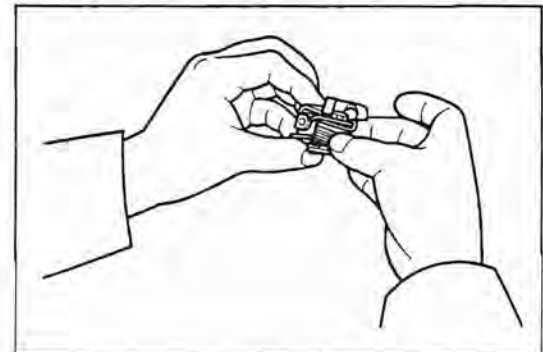
WR88-FU094

(2) Insert the collar onto the kick-up lever.



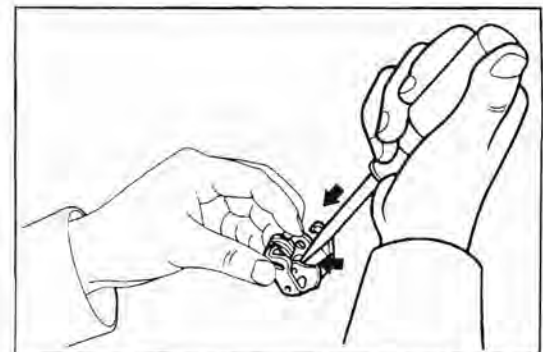
WR88-FU095

(3) Insert the fast idle lever, collar and spring kick-up lever assembly onto the throttle adjusting lever.



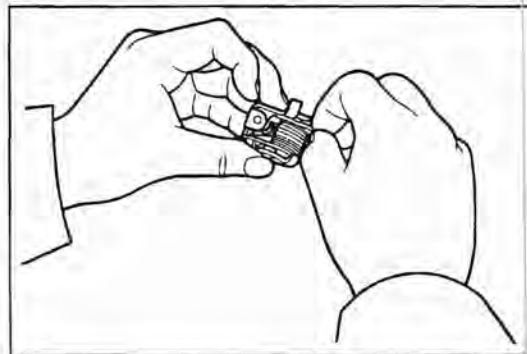
WR88-FU096

(4) Insert the fast idle adjusting spring onto the throttle idle adjusting lever.



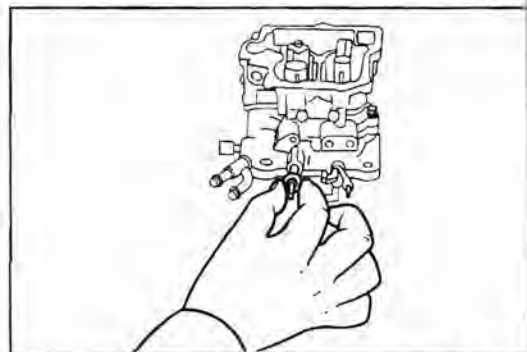
WR88-FU097

- (5) Insert the collar into between the throttle adjusting lever and the fast idle lever.



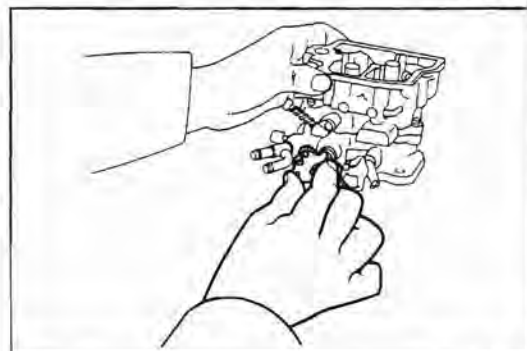
WR88-FU068

- (6) Insert the thrust washer into the throttle shaft.



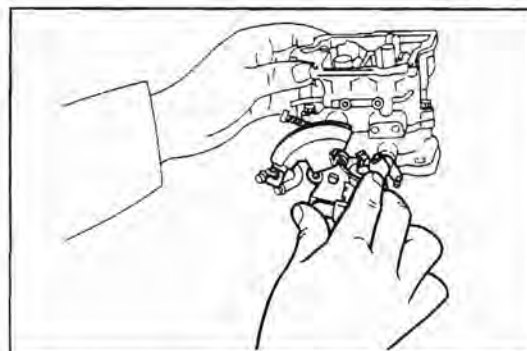
WR88-FU069

- (7) Install the throttle adjusting lever onto the throttle shaft.



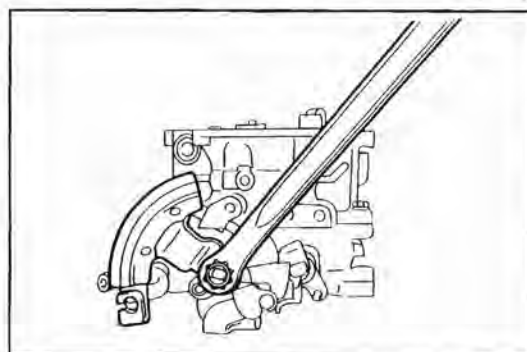
WR88-FU100

- (8) Assemble the throttle lever with the protrusion of the throttle lever aligned with the hole of the throttle adjusting lever.



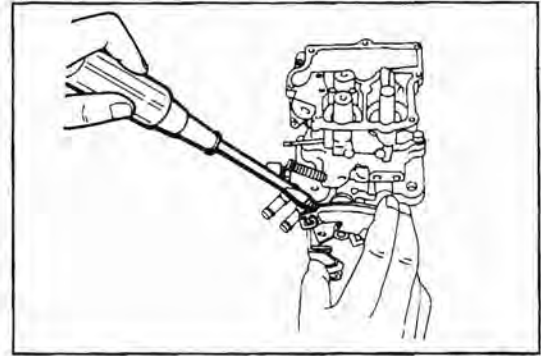
WR88-FU101

- (9) Tighten the nut.



WR88-FU102

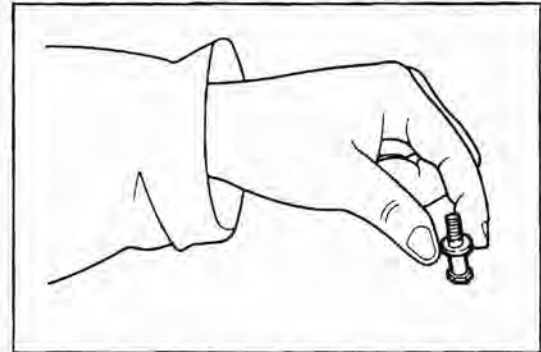
(10) Install the fast idle adjusting screw.



WR88-FU103

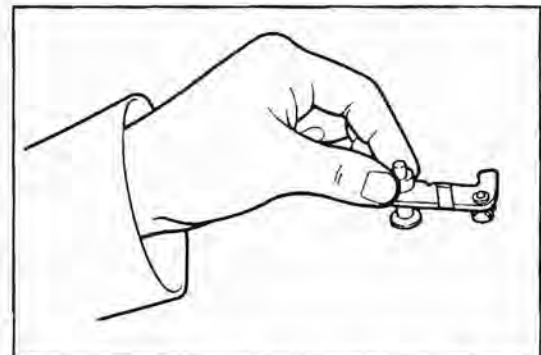
12. Assembly of fast idle cam set screw

(1) Install the thrust washer onto the fast idle cam set screw.



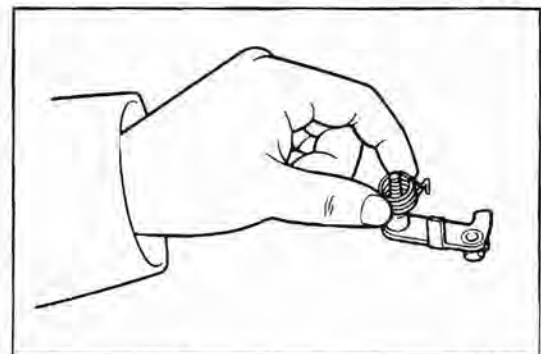
WR88-FU104

(2) Assemble the choke lever on the fast idle cam set screw.



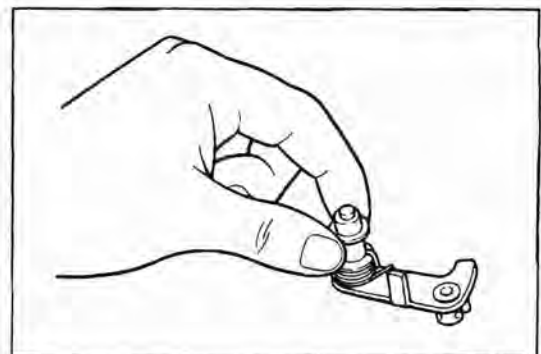
WR88-FU105

(3) Install the choke lever return spring.



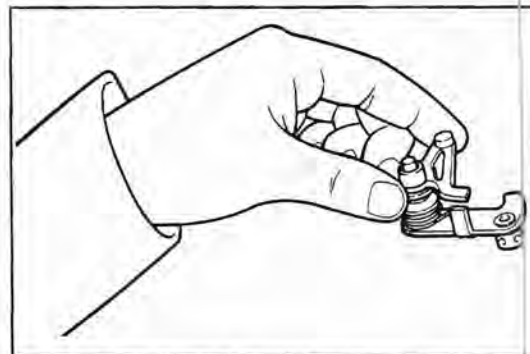
WR88-FU106

(4) Insert the collar in place.



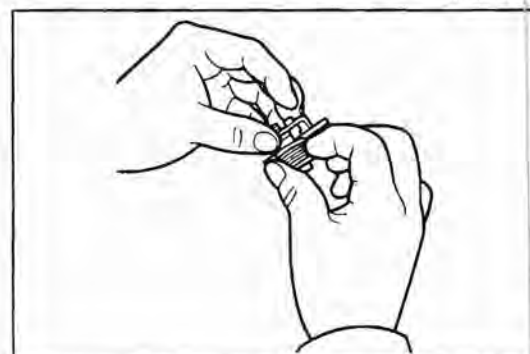
WR88-FU107

(5) Assemble the fast idle cam.



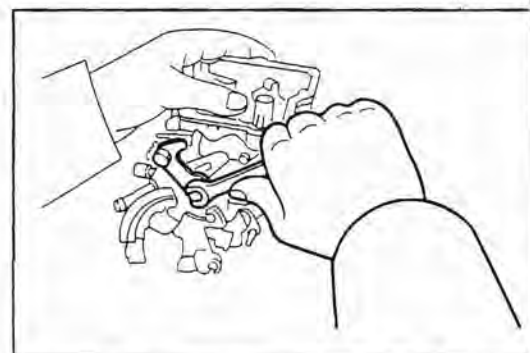
WR88-FU108

(6) Install the choke lever return spring bracket. Attach the return spring to the bracket and choke lever.



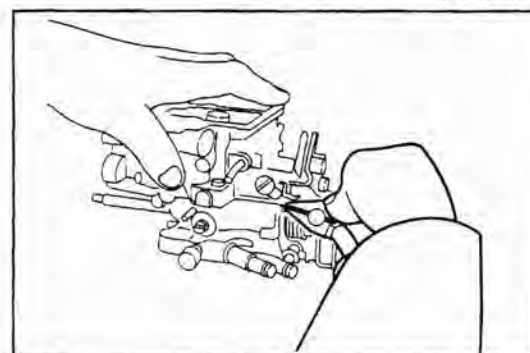
WR88-FU109

(7) Install the fast idle cam set screw in the carburetor body.



WR88-FU110

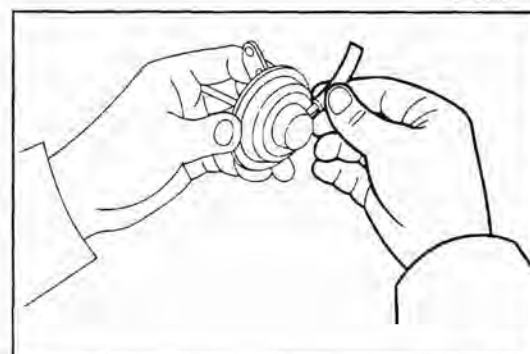
13. Attach the throttle return spring to the choke lever spring bracket.



WR88-FU111

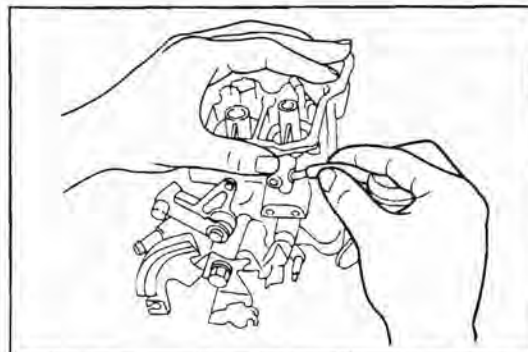
14. Installation of secondary throttle diaphragm

(1) Connect the rubber hose to the diaphragm.



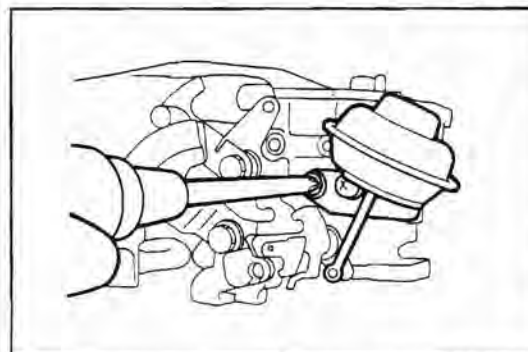
WR88-FU112

- (2) Attach to the carburetor body the other end of the rubber hose that has been connected to the diaphragm.



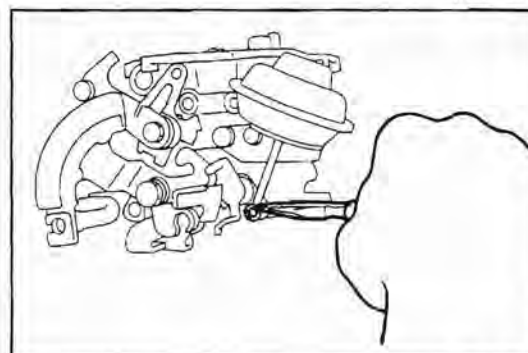
WR88-FU113

- (3) Install the diaphragm in the carburetor body.



WR88-FU114

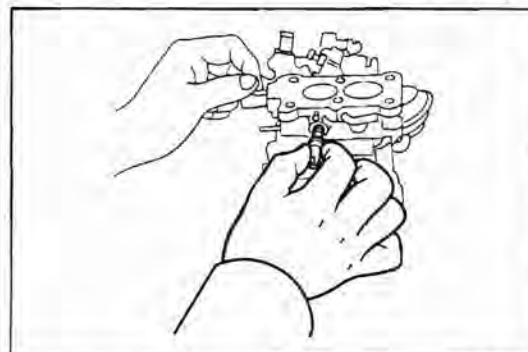
- (4) Connect the diaphragm rod and install the washer snap ring.



WR88-FU115

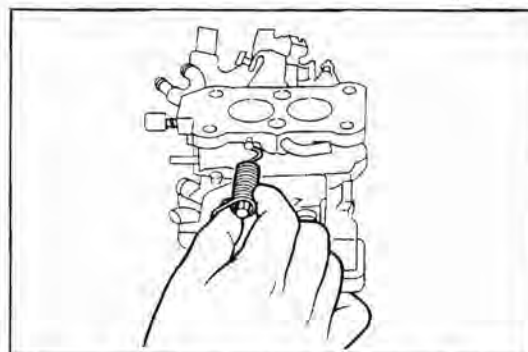
15. Installation of throttle positioner (M/T vehicle)

- (1) Install the collar on the throttle shaft.



WR88-FU116

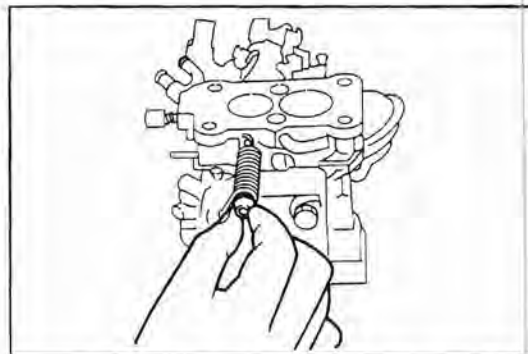
- (2) Install the throttle return spring on the throttle shaft.



WR88-FU117

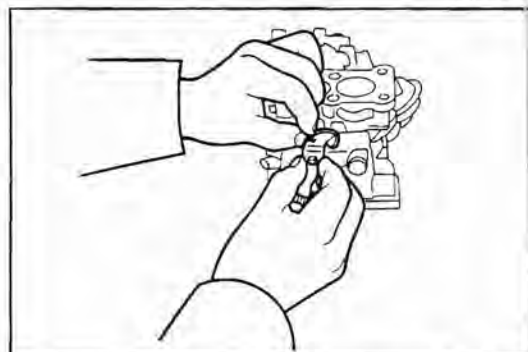
FUEL SYSTEM

- (3) Install the collar and thrust washer on the throttle shaft.



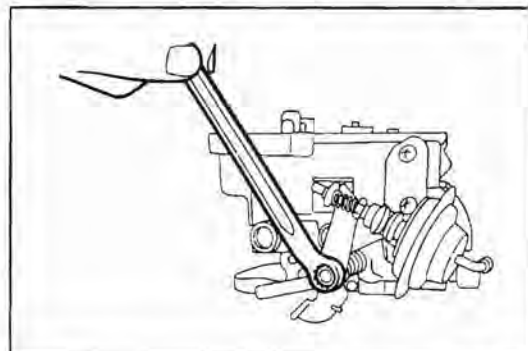
WR88-FU118

- (4) While installing the dashpot lever on the throttle shaft, attach the return spring to the dashpot lever.



WR88-FU119

- (5) Install the spring washer, then tighten the nut.

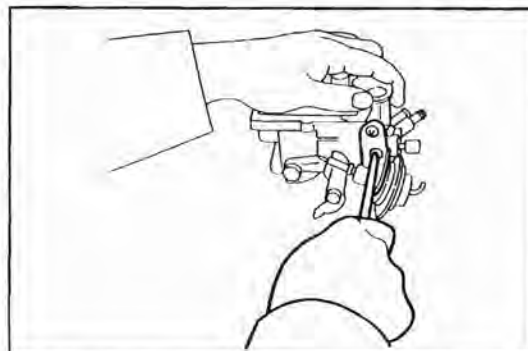


WR88-FU120

- (6) Install the throttle positioner.

NOTE:

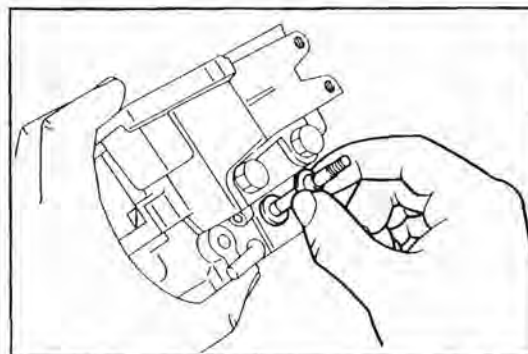
Be very careful not to damage the rubber boot section during the installation.



WR88-FU121

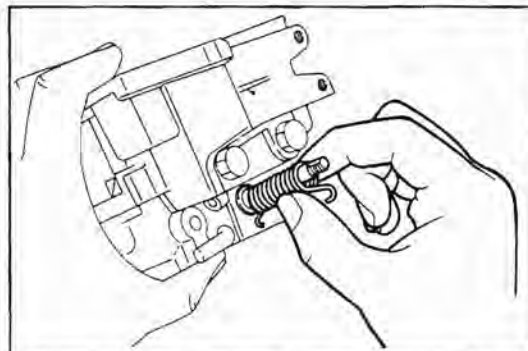
16. Installation of throttle positioner (A/T vehicle)

(1) Install the collar on the throttle shaft.



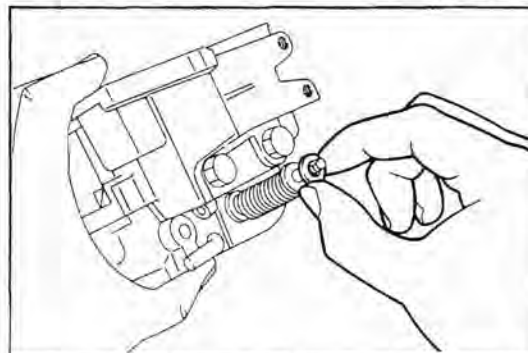
WR88-FU121A

(2) Install the throttle return spring on the throttle shaft.



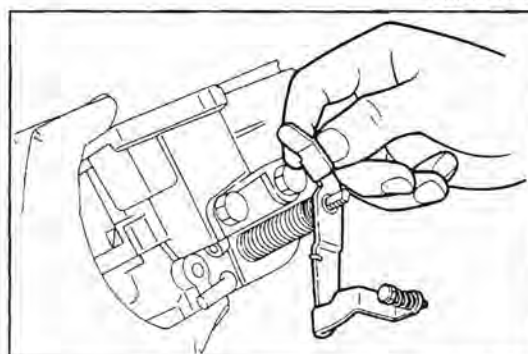
WR88-FU121B

(3) Install the collar and thrust washer on the throttle shaft.



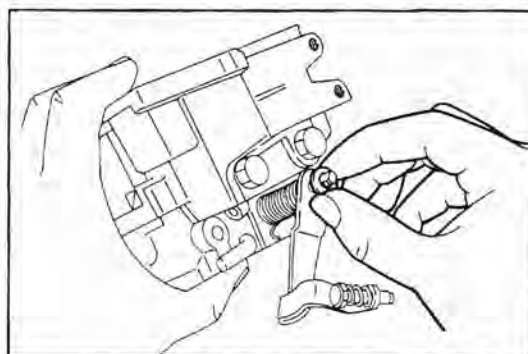
WR88-FU121C

(4) Install the dashpot lever return spring on the dashpot lever. Then, install the dashpot lever on the throttle shaft.



WR88-FU121D

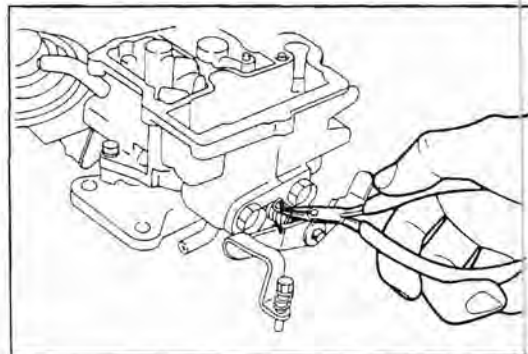
(5) Install the thrust washer on the throttle shaft.



WR88-FU121E

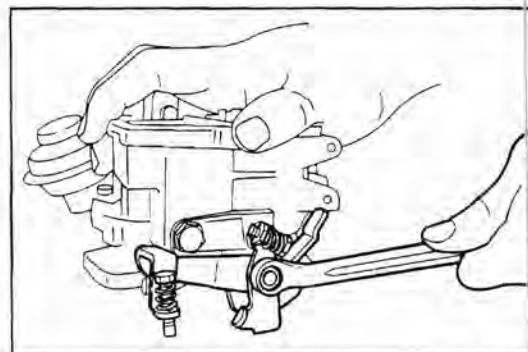
FUEL SYSTEM

- Attach the dashpot lever return spring to the carburetor body, as indicated in the figure.



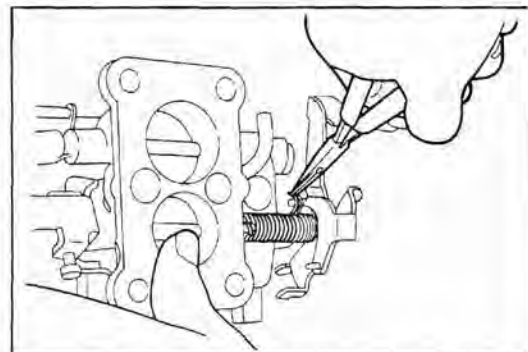
WR88-FU121F

- (6) Install the dashpot lever No. 2 to the throttle shaft. Install the attaching nut.



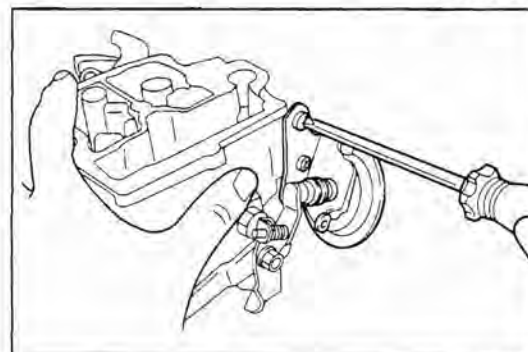
WR88-FU121G

- (7) Install the throttle return spring to the dashpot lever No. 2.



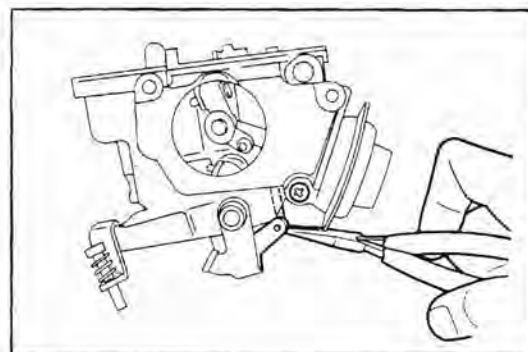
WR88-FU121H

- (8) Install the throttle positioner.



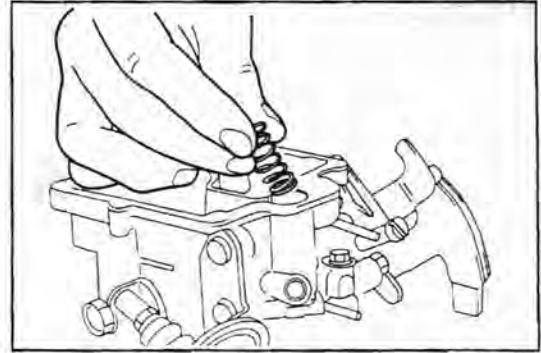
WR88-FU121I

- (9) Install the shift position switch bracket.



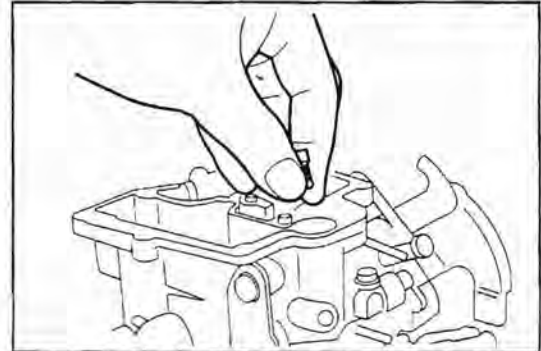
WR88-FU121J

17. Attach the acceleration pump return spring to the carburetor.



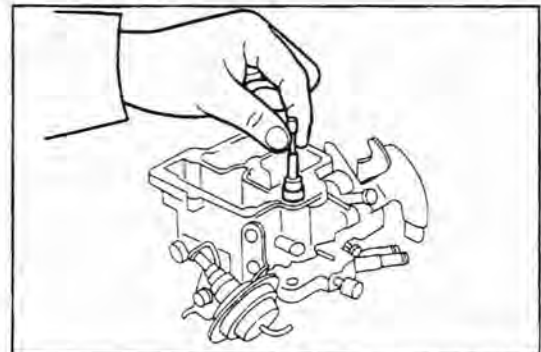
WR88-FU123

18. Assemble the ball, spring and discharge weight in the carburetor.



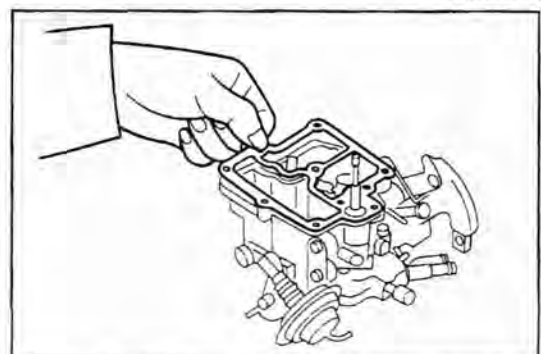
WR88-FU124

19. Assemble the acceleration pump.



WR88-FU125

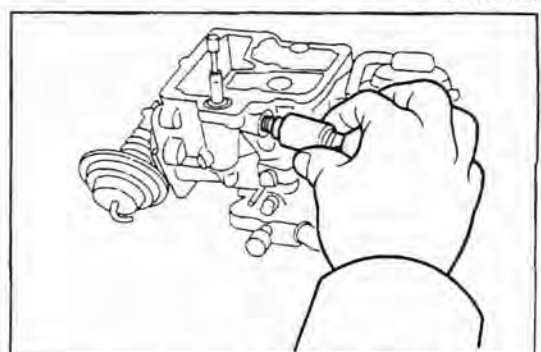
20. Install a new gasket on the carburetor body.



WR88-FU126

21. Installation of solenoid valve

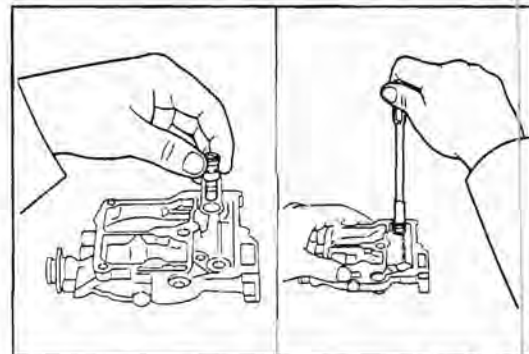
- (1) Install the solenoid valve in the carburetor body.
- (2) Install the solenoid valve wire clamp in place.



WR88-FU127

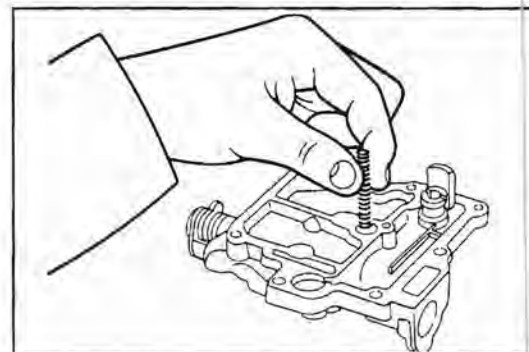
ASSEMBLY OF AIR HORN

1. Install the needle valve seat to the air horn with a new gasket interposed.



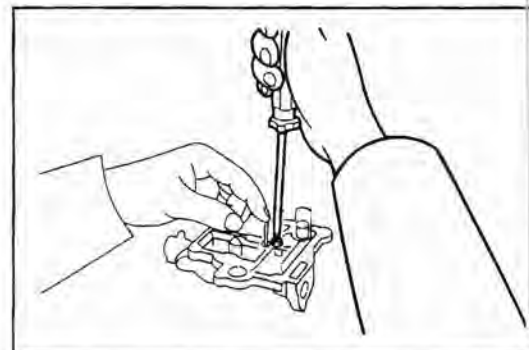
WR88-FU128

2. Insert the power piston spring into the air horn.



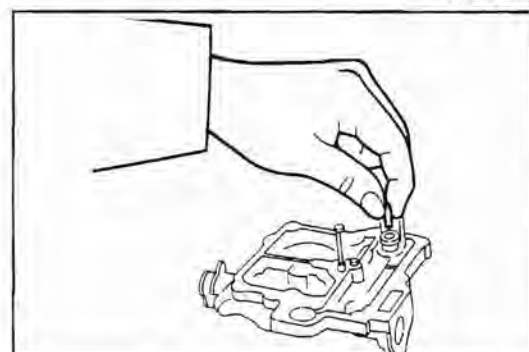
WR88-FU129

3. While inserting the power piston into the air horn, install the lock plate.



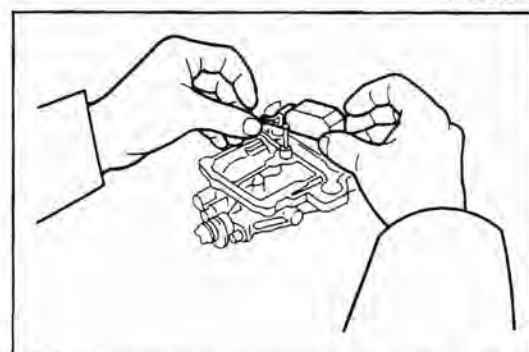
WR88-FU130

4. Remove the snap pin for pulling-off needle valve use. Insert the snap pin into the valve seat.



WR88-FU131

5. Install the float.



WR88-FU132

6. Adjustment of float level

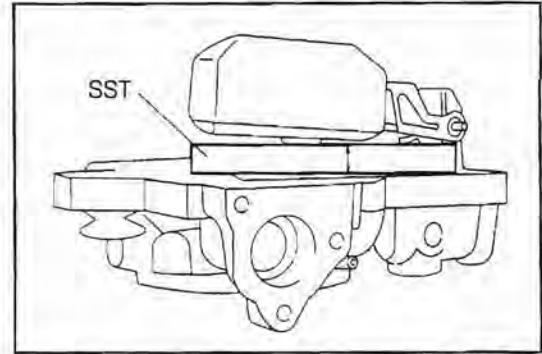
- (1) Check the dimension under the float's own weight, using the following SST.

Dimension under Float's Own Weight:

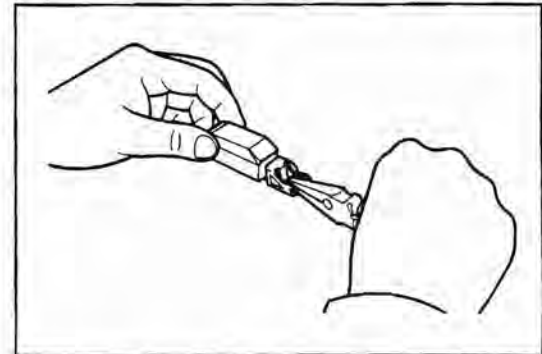
8 mm (0.315 inch)

SST: 09240-00014-000

Adjust the dimension under the float's own weight by bending the lip section of the float if the measured value fails to conform to the specified value.



WR88-FU133



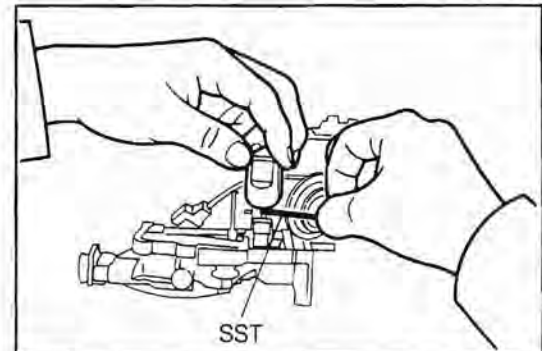
WR88-FU134

- (2) Check the lip dimension using the following SST.

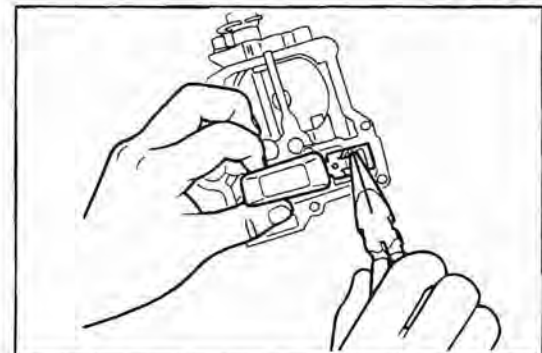
Lip Dimension: 1.6 mm (0.063 inch)

SST: 09240-00020-000

Adjust the lip dimension by bending the lever of the float if the measured value fails to conform to the specified value.

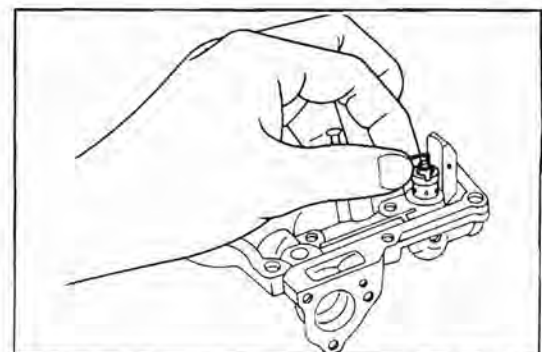


WR88-FU135



WR88-FU136

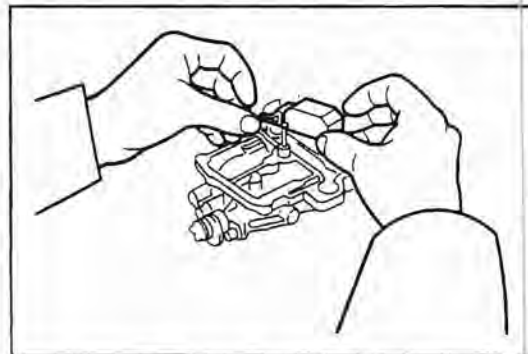
- (3) Remove the float. Install the snap pin for pulling-off use to the needle valve.



WR88-FU137

FUEL SYSTEM

(4) Install the float.

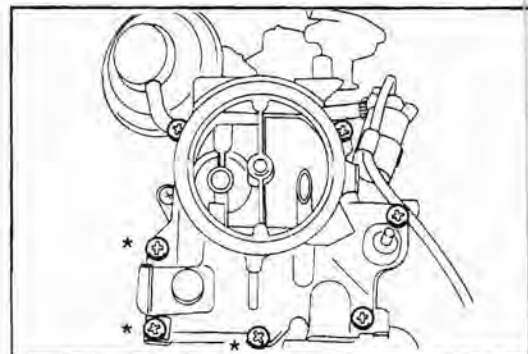


WR88-FU138

7. Install the air horn to the carburetor body. (Seven screws in the case of M/T vehicle, four screws in the case of A/T vehicle)

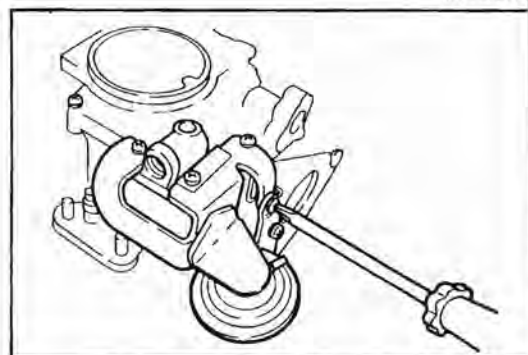
NOTE:

The asterisked (*) mark denotes those attaching screws for the manual transmission vehicle only.



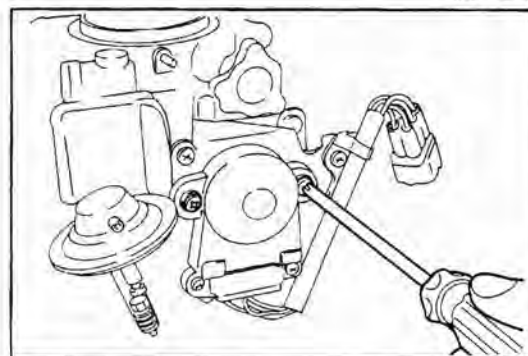
WR88-FU139

8. Install the idle-up diaphragm.
(A/T vehicle only)



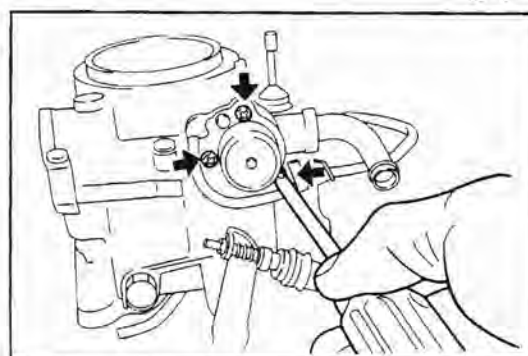
WR88-FU140

9. Install the throttle position sensor.
(A/T vehicle only)



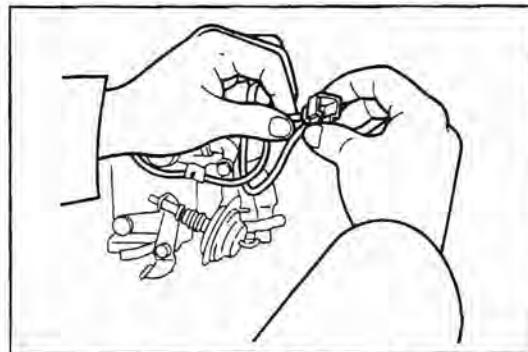
WR88-FU141

10. Install the outer vent valve with a new gasket interposed.



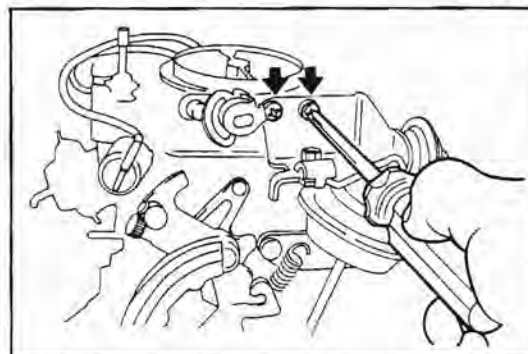
WR88-FU142

11. Connect the outer vent terminal to the connector.



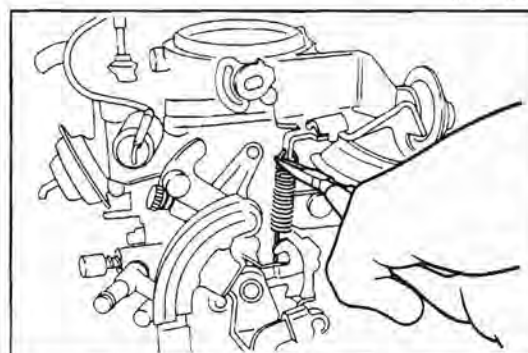
WR88-FU143

12. Install the choke opener to the air horn.



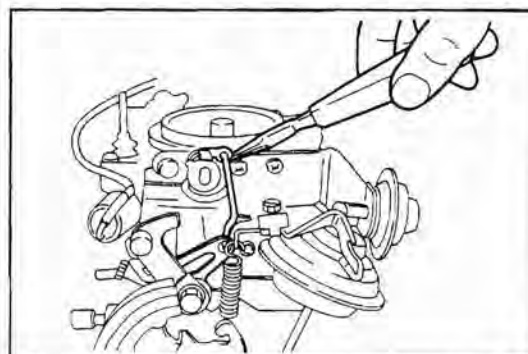
WR88-FU144

13. Install the throttle return spring.



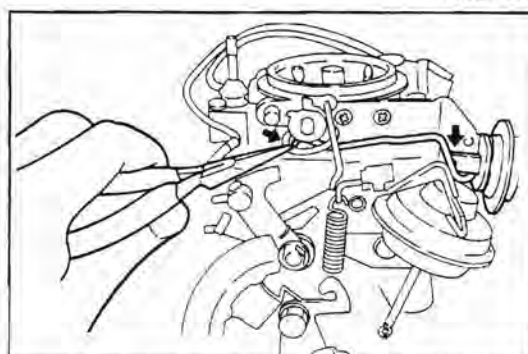
WR88-FU145

14. Install the fast idle cam link. Attach the snap ring.



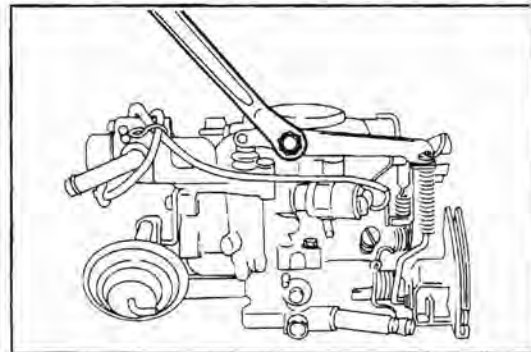
WR88-FU146

15. Install the choke opener link. Attach the snap ring.



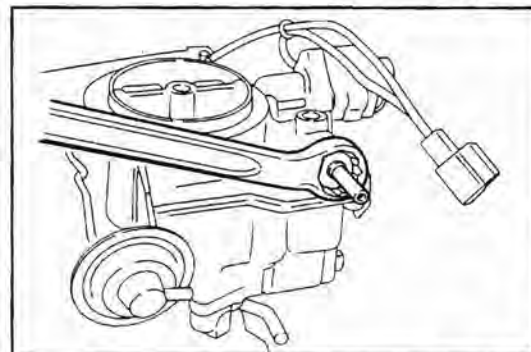
WR88-FU147

16. Install the accelerating pump rod.



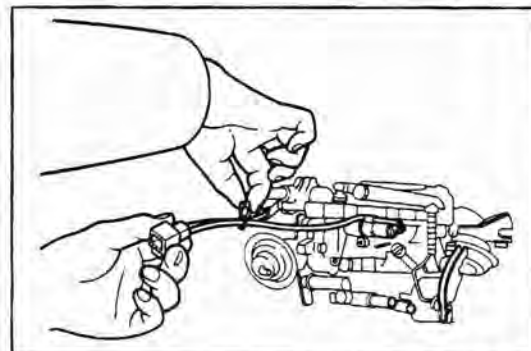
WR88-FU148

17. Install the fuel inlet with a new gasket interposed.



WR88-FU149

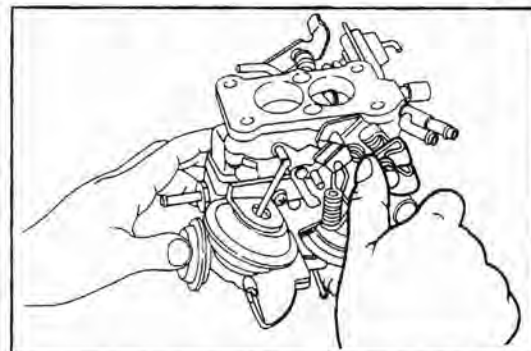
18. Attach the harness clamp.



WR88-FU150

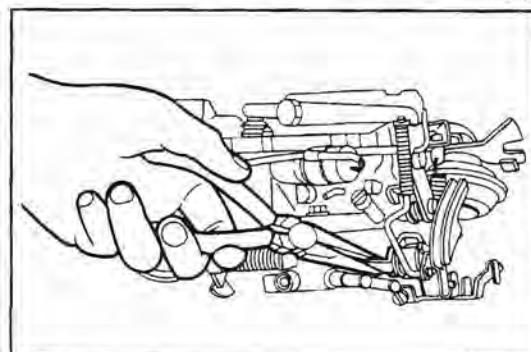
ADJUSTMENT OF CARBURETOR

1. Inspection of throttle valve opening angle
 - (1) Visually inspect the valve opening angle when the primary throttle valve is opened fully.
Full Opening Angle: 90°



WR88-FU151

Adjust the opening angle by bending the throttle lever stopper if the measured value fails to conform to the specified value.

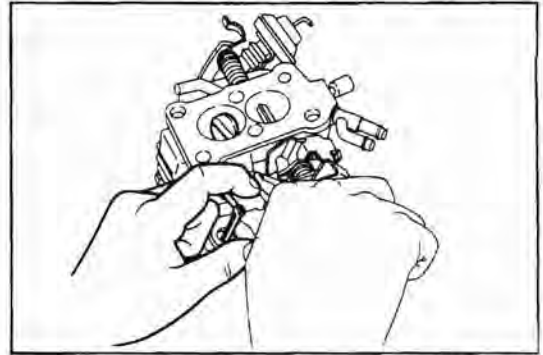


WR88-FU152

- (2) Visually inspect the valve opening angle when the secondary throttle valve is opened fully.

Full Opening Angle: 80°

Adjust the opening angle by bending the throttle lever stopper if the measured value fails to conform to the specified value.



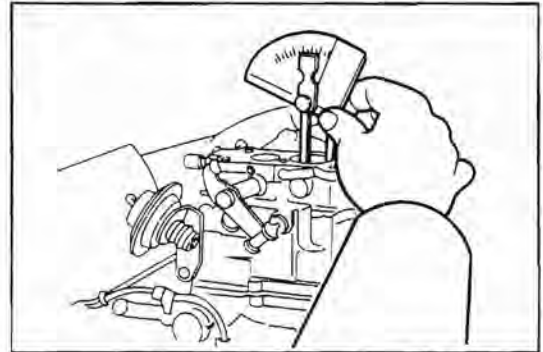
WR88-FU153

2. Inspection of kick-up opening angle

Measure the opening angle of the secondary valve when the primary throttle valve is opened fully, using the following SST.

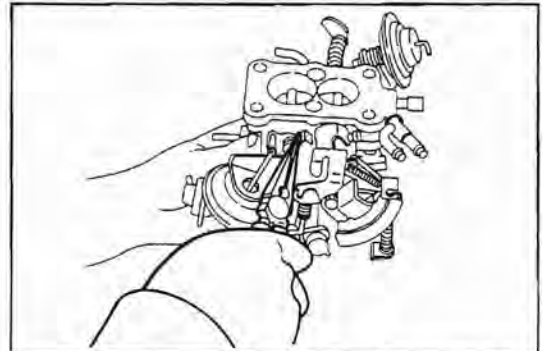
SST: 09240-00014-000

Kick-Up Opening Angle: 23°



WR88-FU154

Adjust the kick up opening angle by bending the secondary throttle lever if the measured value fails to conform to the specified value.



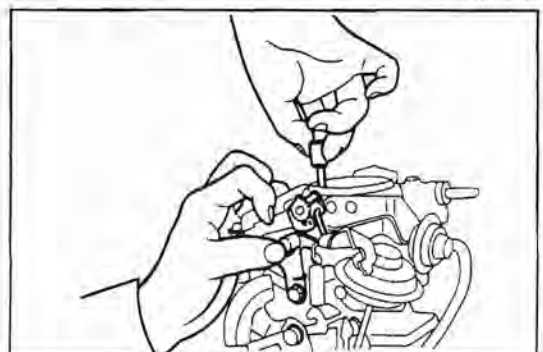
WR88-FU155

3. Inspection of choke opener

- (1) Open the choke valve fully. Operate the choke opener by applying a negative pressure to it. At this time, check to see if the clearance between the choke valve and the body conforms to the specified value.

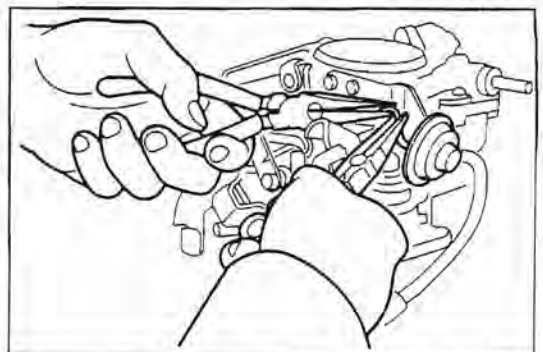
Clearance between choke valve and body:

4.4 mm (0.173 inch) when choke opener is operating



WR88-FU156

Adjust the clearance by bending the choke opener link if the measured value fails to conform to the specified value.



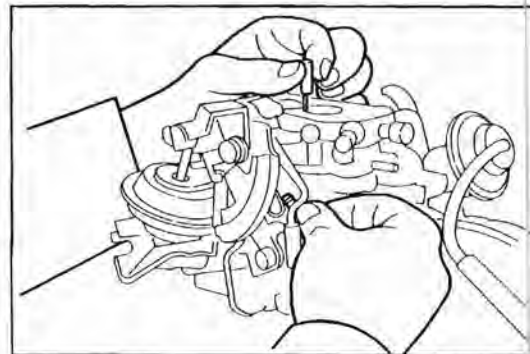
WR88-FU157

FUEL SYSTEM

4. Adjust the throttle adjusting screw so that the throttle valve opening angle may become 0.3 mm (0.0118 inch).

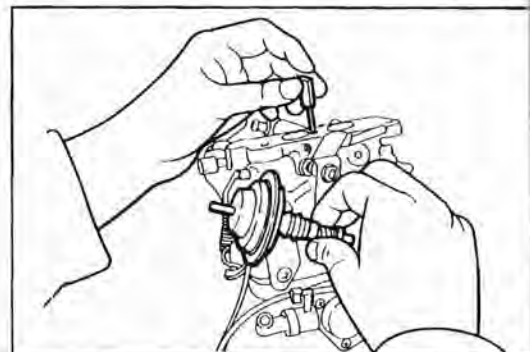
NOTE:

Be sure to apply a negative pressure to the throttle positioner so as to keep it in an operating state.



WR88-FU15B

5. Under the condition that a negative pressure is not applied to the throttle positioner, adjust the opening angle of the throttle valve to about 0.45 mm (0.0177 inch).

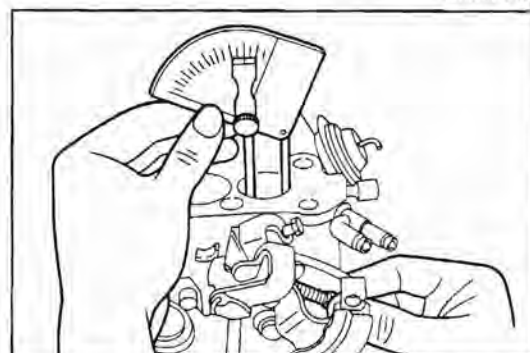


WR88-FU15B

6. Adjustment of throttle position switch

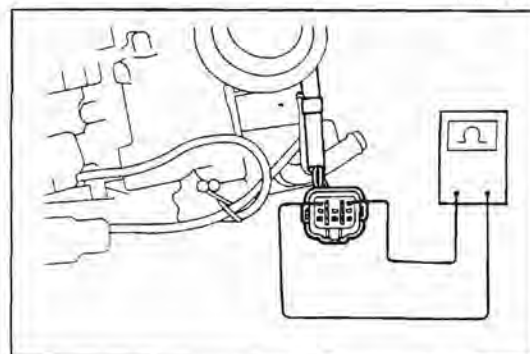
- (1) Turn the throttle adjusting screw so that the throttle valve opening may be set to about 21.2 degrees.

SST: 09240-00014-000



WR88-FU160

- (2) Connect an ohmmeter to the ground terminal and terminal S4 of the throttle positioner connector.

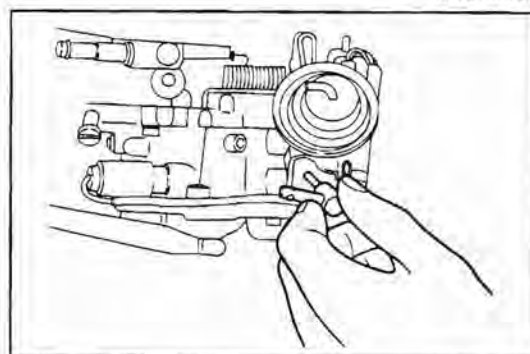


WR88-FU160A

- (3) Back off the throttle positioner sensor adjusting screw, until such a point where continuity no longer exists. (At least 1000 k Ω)

NOTE:

If continuity persists even after the adjusting screw has been fully backed off, correct the installing position of the throttle positioner sensor by loosening the throttle positioner sensor attaching screws.



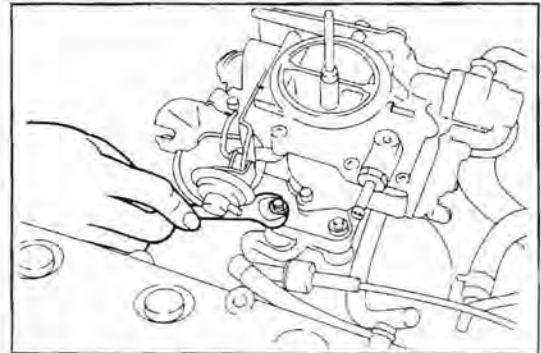
WR88-FU160B

- (4) Screw in the throttle positioner sensor adjusting screw, until such a point where continuity is obtained.
- (5) Adjust the throttle adjusting screw.
(See page FU-38.)
7. Ensure that each part operates smoothly.
8. Install the air cleaner set bolt.

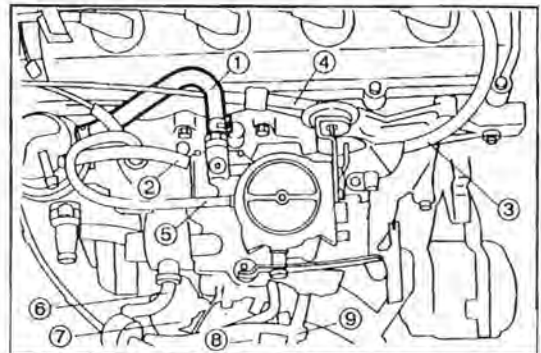
WR88-FU161

INSTALLATION OF CARBURETOR

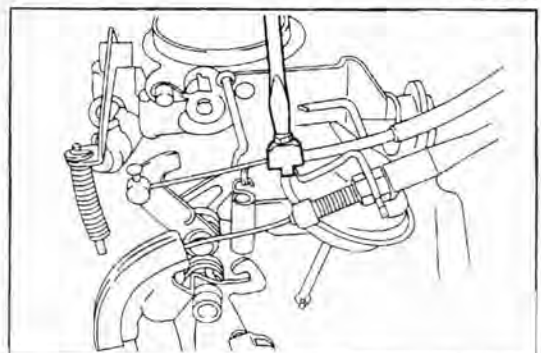
1. Inspection of heat insulator
Visually inspect the gasket surface of the heat insulator. Replace the heat insulator if it exhibits damage.
2. Install the carburetor to the intake manifold with the heat insulator interposed. Tighten the attaching nuts to the specified torque.
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)
3. Connect the outer vent valve connector of the solenoid valve and the throttle position sensor connector.
4. Connect the following hoses to the carburetor.
 - ① Fuel inlet hose
 - ② ITC vacuum hose
 - ③ PCV gas hose
 - ④ Choke opener vacuum hose
 - ⑤ Vacuum hoses to gas filter
 - ⑥ Outer vent hose
 - ⑦ Throttle position vacuum hose
 - ⑧ Coolant circulating hoses
5. Connect the choke cable to the carburetor.



WR88-FU162



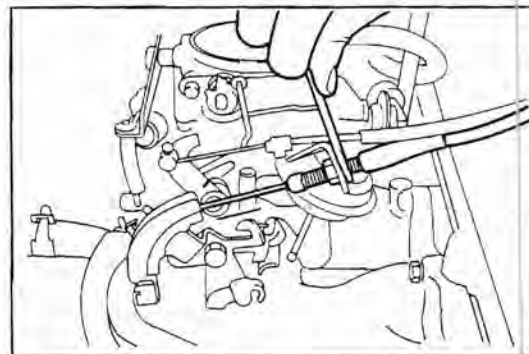
WR88-FU163



WR88-FU164

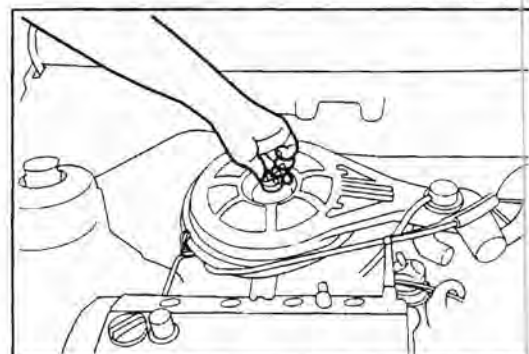
FUEL SYSTEM

6. Connect the accelerator cable to the carburetor. Adjust the axial play of the accelerator cable to 3 - 8 mm (0.12 - 0.31 inch).
7. Connection of throttle cable
(See the Chassis Workshop Manual)



WR88-FU155

8. Install the air cleaner.
9. Connect the following rubber hoses to the air cleaner.
 - (1) Vacuum hose to BVSV
 - (2) ITC vacuum hose to carburetor
 - (3) Blow-by gas hose
 - (4) Cool air intake hose
 - (5) Hot air intake hose

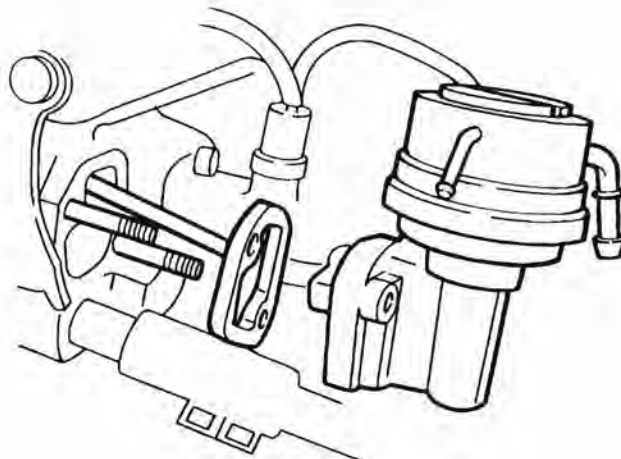


WR88-FU156

10. Fill coolant.
(See page CO-3.)
11. Connect the ground cable to the negative (-) terminal of the battery.
12. Tune up the engine.

WR88-FU166A

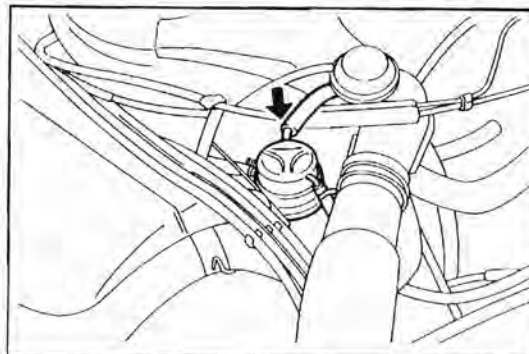
FUEL PUMP



WR88-FU167

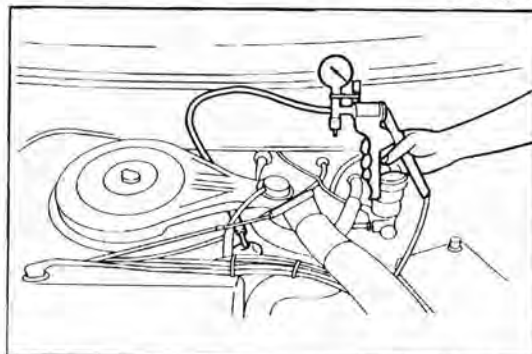
IN-VEHICLE INSPECTION

1. Disconnect the fuel inlet hose of the fuel pump from the fuel pump.
Plug the disconnected hose so that no fuel will flow out.



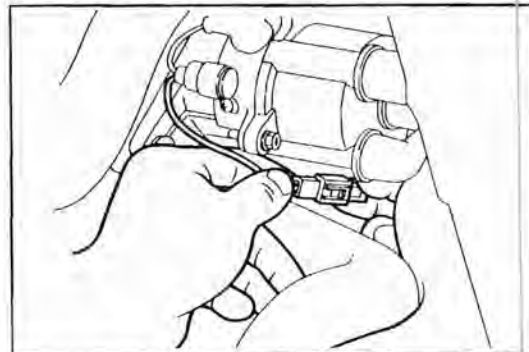
WR88-FU168

2. Connect a vacuum meter (MityVac).



WR88-FU169

3. Disconnect the connector of the distributor.



WR88-FU170

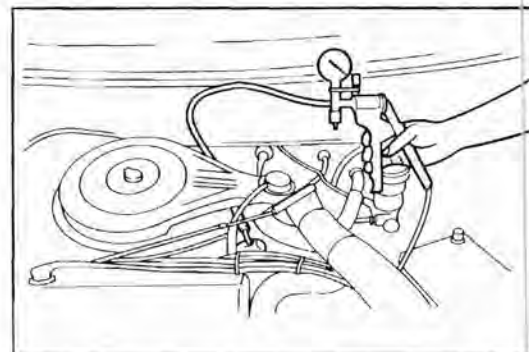
4. Depress the accelerator pedal fully. Read the negative pressure while the engine is being cranked by means of the starter motor. Check to see if the measured value is the specified value or more.

Specified Negative Pressure: More than 100 mmHg

If the negative pressure is less than the specified value, replace the fuel pump after checking the push rod of the fuel pump and the push rod stroke.

5. Connect the connector of the ignition coil.

6. Connect the fuel inlet hose to the fuel pump.



WR88-FU171

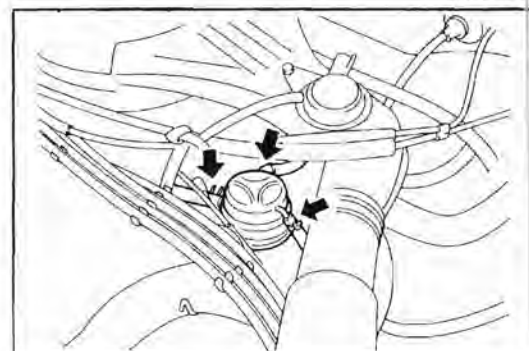
UNIT INSPECTION OF FUEL PUMP

1. Removal of fuel pump

(1) Disconnect the fuel hoses from the fuel pump.

NOTE:

Plug the disconnected hose so that no fuel will flow out.



WR88-FU172

(2) Remove the fuel pump by removing the attaching nuts.

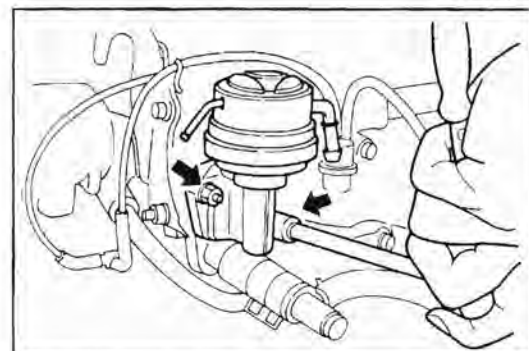
NOTE:

- Since the engine oil will flow out, be sure to put a suitable cloth so that no engine oil may splash on the starter and so forth.
- If the heater hose band is interfering, displace the hose band.

(3) Remove the insulator.

NOTE:

Never reuse the insulator.



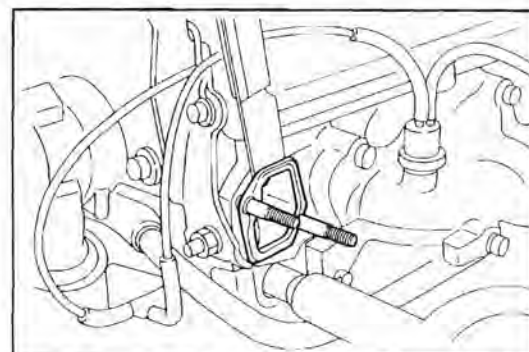
WR88-FU173

(4) Cut the gasket along the intake manifold. Remove any gasket material remaining on the fuel pump installation section, using a gasket scraper.

NOTE:

This cutting of the gasket is required only when the gasket used at the assembly line in the manufacturer has been installed.

Be very careful not to damage the gasket installation surface during the operations.



WR88-FU174

2. Inspection of fuel pump

CAUTION:

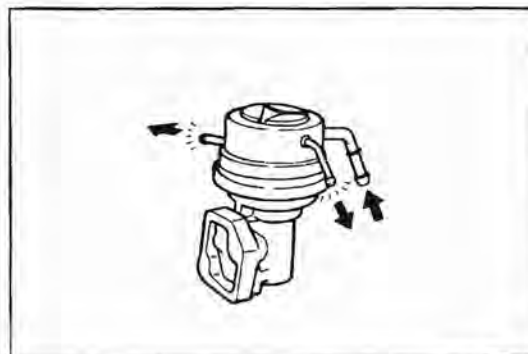
- Prior to the check, fill a small amount of fuel into the fuel pump. Thus, the inspection should be performed under a condition that the valve is wet. When the valve is dry, the following inspection can not be performed correctly.

WARNING:

- Never work on the fuel system in proximity of a fire.
- Never allow any fire to be brought near the working site.

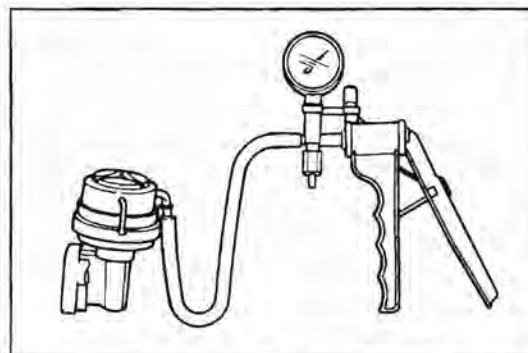
WR88-FU175

- (1) Blow air from the inlet side of the fuel pump. Ensure that air continuity exists.
Replace the fuel pump if no air continuity exists.



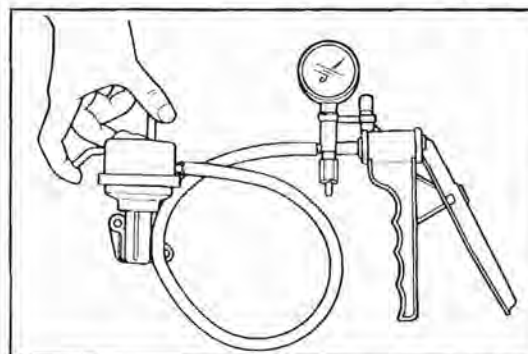
WR88-FU176

- (2) Install a MityVac to the inlet side of the fuel pump and apply a negative pressure. Ensure that the applied pressure is retained.
Replace the fuel pump if the pressure is not retained.



WR88-FU177

- (3) Plug the inlet pipe and return pipe of the fuel pump. Install a MityVac to the outlet pipe and apply a negative pressure. Ensure that the applied pressure is retained.
Replace the fuel pump if the pressure is not retained.



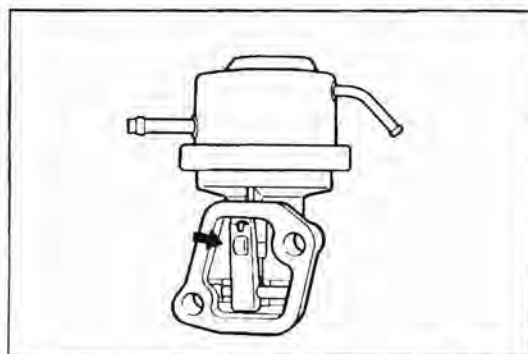
WR88-FU178

- (4) Visually inspect the push rod-contact-surface of the fuel pump.

NOTE:

When the contact surface is not a mirror-like surface, it means that the contact surface is worn out.

Replace the fuel pump if the contact surface exhibits wear.



WR88-FU179

FUEL SYSTEM

3. Inspection of fuel pump push rod

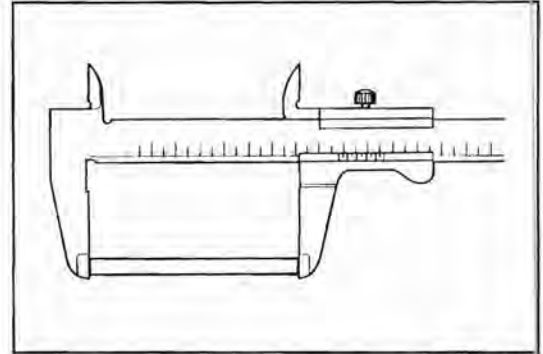
Ensure that the overall length of the push rod is the specified value or more.

Minimum Length: 87.00 mm (3.425 inch)

Reference

STD: 87.95 - 88.25 mm (3.463 - 3.474 inch)

Replace the push rod if its overall length is less than the specified value.



WR88-FU189

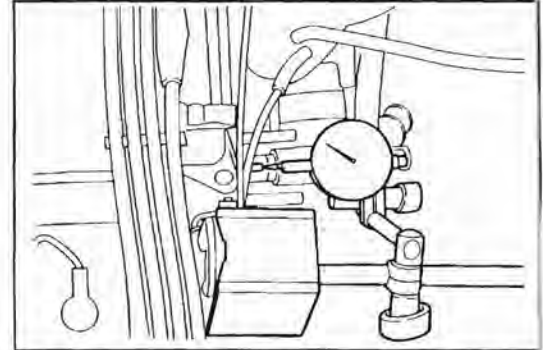
4. Checking fuel pump cam for wear

(1) Insert the push rod of the fuel pump into the cylinder head. Set a dial gauge.

(2) Turn the crankshaft two turns. Measure the stroke of the push rod of the fuel pump. Ensure that the stroke is the specified value or more.

Minimum Stroke: 4.8 mm (0.189 inch)

Replace the camshaft if the stroke is less than the specified value.



WR88-FU187

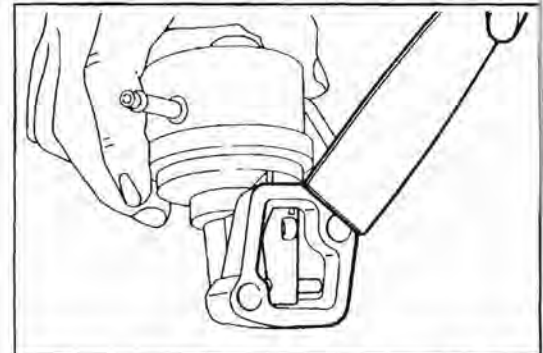
INSTALLATION OF FUEL PUMP

1. Remove any remaining gasket material from the insulator installation surface of the fuel pump, using a gasket scraper.

NOTE:

Be very careful not to damage the gasket contact surface.

2. Wipe off any oil from the oil pump installation surface of the cylinder head.

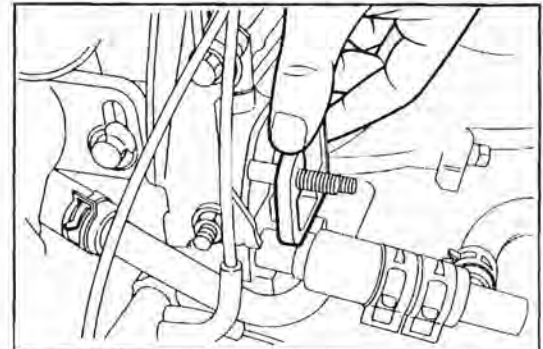


WR88-FU183

3. Install a new insulator to the cylinder head.

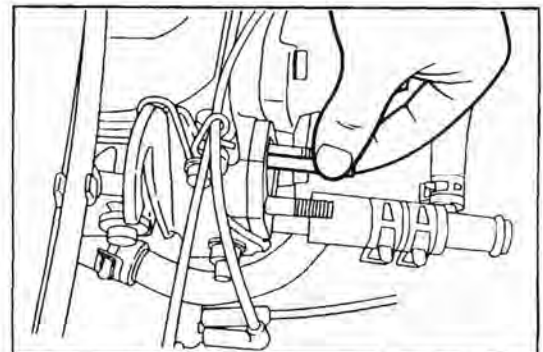
NOTE:

Never reuse the insulator.



WR88-FU185

4. Insert the fuel pump push rod into the cylinder head.



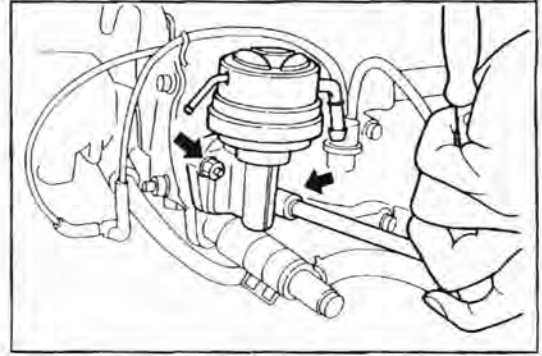
WR88-FU185A

5. Install the fuel pump to the cylinder head. Tighten the attaching nuts.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

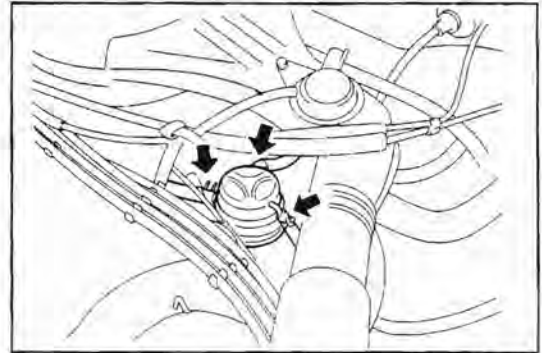
NOTE:

If the hose band is displaced, be sure to install the hose band correctly.



WR88-FU186

6. Connect the fuel hose to the fuel pump. Attach the hose bands.

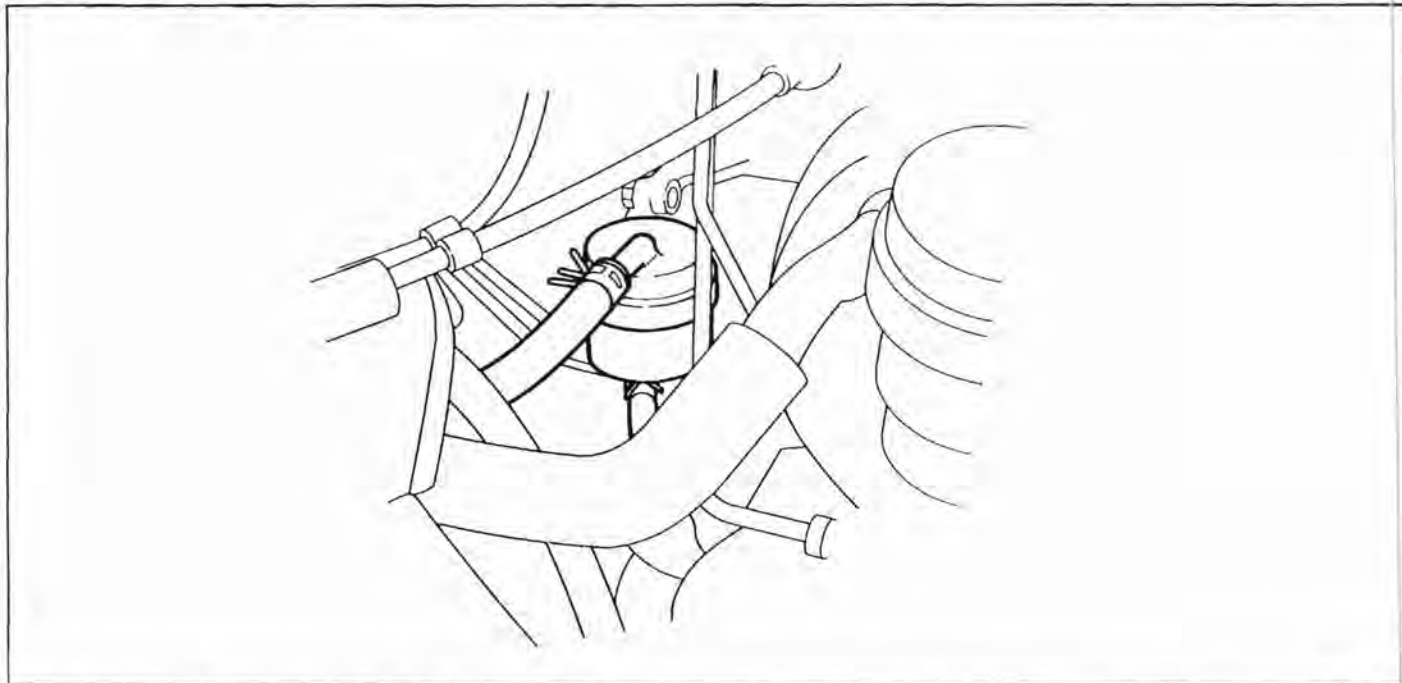


WR88-FU187

7. Connect the connector of the distributor.
8. Start the engine. Ensure that the engine exhibits no fuel leakage.
Repair any leaky points, as required.

WR88-FU188

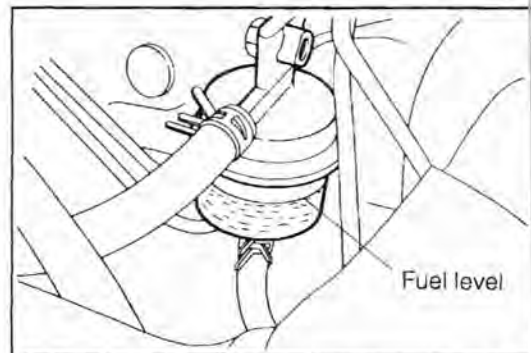
FUEL FILTER



WR88-FU128

IN-VEHICLE INSPECTION

1. Start the engine.
2. Check the fuel level of the fuel filter. Check to see if the fuel level comes at the upper side of the fuel filter. Replace the fuel filter if the fuel level comes at the upper side of the fuel filter.
3. Stop the engine.



WR88-FU129

REPLACEMENT OF FUEL FILTER

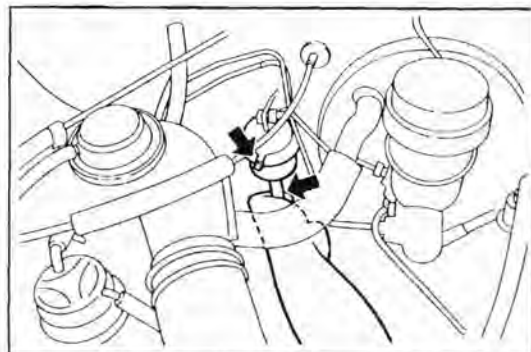
WARNING:

- Never work on the fuel system in proximity of a fire.
- Never allow any fire to be brought near the working site.

1. Disconnect the fuel hose from the fuel filter.

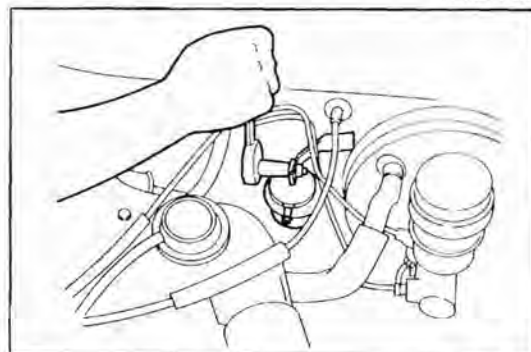
NOTE:

Plug the disconnected hose so that no fuel may flow out.



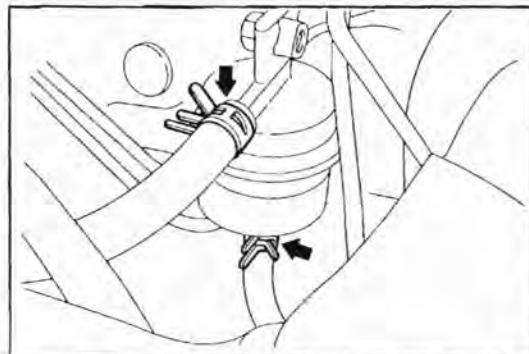
WR88-FU192

2. Remove the fuel filter by removing the bolts attaching the fuel filter.
3. Install a new fuel filter. Tighten the attaching bolts.



WR88-FU193

4. Connect the fuel hose to the fuel filter. Attach the hose bands.
5. Start the engine. Ensure that the engine exhibits no fuel leakage.
Repair any leaky points, as required.



WR68-FU194

DAIHATSU

CHARADE

TYPE HC ENGINE

COOLING SYSTEM

CO

TROUBLE SHOOTING	CO- 2
PRECAUTIONS	CO- 2
CHECK & CHANGE OF ENGINE	
COOLANT	CO- 2
WATER PUMP	CO- 4
THERMOSTAT	CO- 7
RADIATOR	CO- 9
ELECTRIC COOLING FAN	CO-14
RADIATOR THERMO CONTROL	
SWITCH	CO-18
RADIATOR FAN MOTOR RELAY	CO-20

WR88-CO001

TROUBLE SHOOTING

Problem	Possible cause	Remedies	Page
Engine overheats	Poor quality coolant	Replenish coolant.	CO-2
	Water pump drive belt loose or missing	Adjust or replace belt.	CH-24
	Dirt, leaves or insects on radiator	Clean radiator.	CO-9
	Leaky hoses, water pump, the thermostat housing, radiator, heater, core plugs or head gasket	Repair as necessary.	
	Thermostat faulty	Check thermostat.	CO-7
	Ignition timing retarded	Set timing.	IG-34, IG-49
	Electric cooling system faulty	Inspect electric cooling system	CO-14
	Radiator hose plugged or deteriorated	Replace hose.	
	Water pump faulty	Replace water pump.	CO-4
	Radiator plugged or cap faulty	Check radiator.	CO-9
	Cylinder head or block cracked or plugged	Repair as necessary.	CO-10

WR88-CO002

PRECAUTIONS

- As regards water to be used as cooling water, use soft water which does not contain salts of minerals, calcium, magnesium and so forth.
- If the coolant gets to the vehicle body, immediately flush away the coolant using water.
- Never open the radiator cap when the cooling water is still hot.
- The inside of the radiator is under a pressurized condition when the cooling water is hot. Therefore, if the radiator cap should be removed, the cooling water will blow off, possibly causing injuries such as scald.

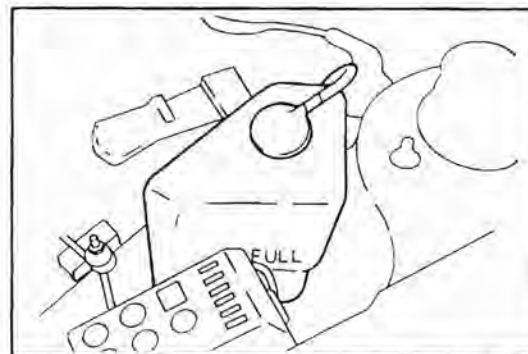
WR88-CO003

CHECK & CHANGE OF ENGINE COOLANT

1. Check of coolant level

Check to see if the coolant level is between the LOW and FULL lines of the reserve tank.

If the coolant level is near the low level or below the low level, add the coolant up to the full level.



WR88-CO004

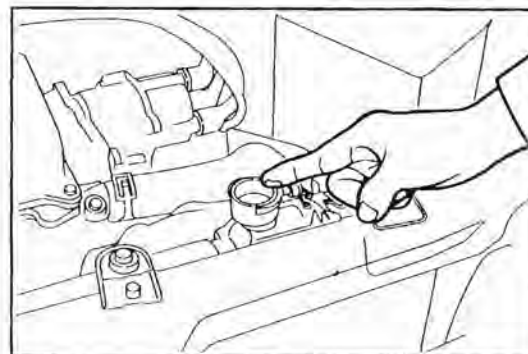
2. Check of coolant quality

There should not be any excessive deposits of rust or water scales around the radiator cap or the radiator filler hole. Also, the coolant should be free of oil.

Change the coolant if it is excessively dirty.

CAUTION:

Never open the radiator cap when the engine is still hot.



WR88-CO005

3. Change of engine coolant

(1) Remove the radiator cap.

CAUTION:

Never open the radiator cap and/or the drain plug when the engine is still hot. Care must be exercised to avoid getting scalded.

WR88-CO006

(2) Place an adequate container, below the radiator drain plug. Drain the coolant by removing the drain plug.

(3) Close the drain plug.

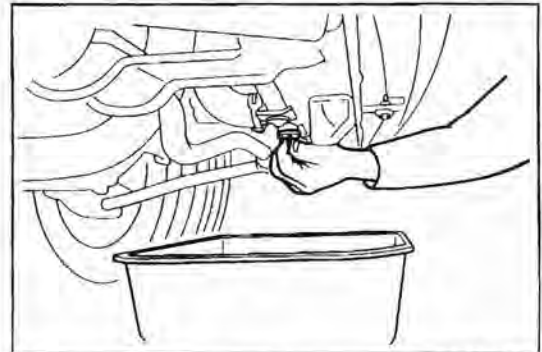
(4) Fill the system with water.

(5) Start the engine, and stop it.

(6) Repeat the steps (1) through (5) two to three times.

NOTE:

Replace the drain plug gasket with a new one.



WR88-CO007

(7) Fill the radiator and reserve tank with antifreeze solution in accordance with the instructions of the manufacturer of the antifreeze solution.

CAUTION:

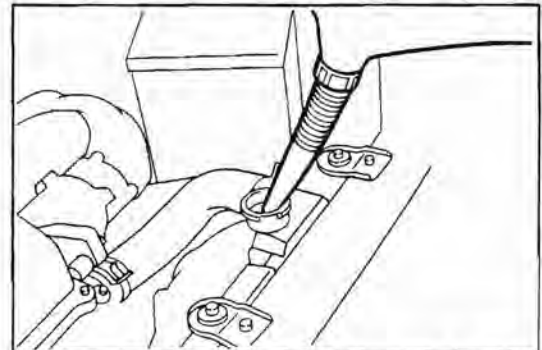
Use a Good brand of ethylene-glycol base antifreeze solution.

Coolant capacity:

General specification 5.2 liter (4.6 IMP qt)

Tropical specification 5.5 liter (4.8 IMP qt)

[including 0.6 liter (0.5 IMP qt) for reserve tank]



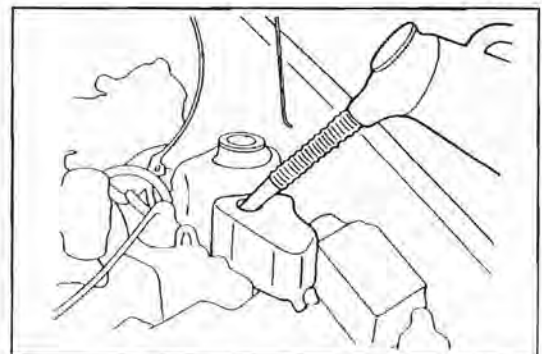
WR88-CO008

(8) Fill the system with water.

(9) Start the engine. Check the coolant level. Add water, as required.

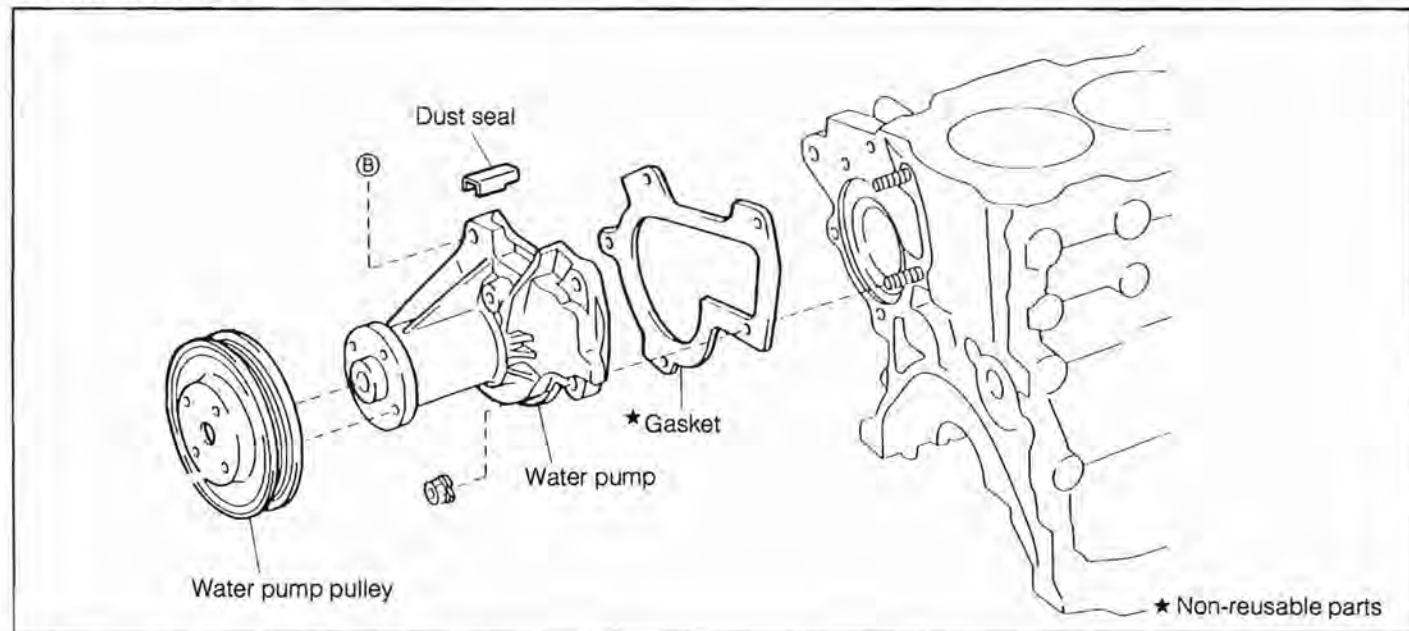
(10) Tighten the radiator cap.

(11) Warm the engine, until the radiator fan motor starts to rotate. Afterwards, allow the coolant to cool down to normal temperature. Recheck the coolant level at reserve tank. Add water to the full level, as required.



WR88-CO009

WATER PUMP COMPONENTS



WR88-CO010

REMOVAL OF WATER PUMP

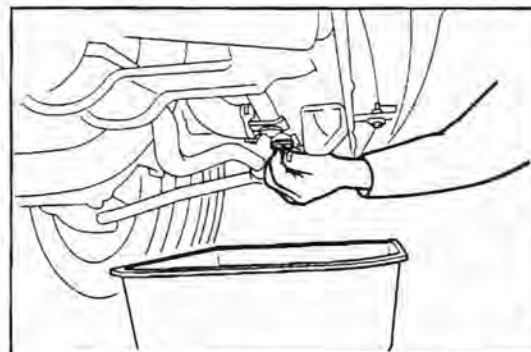
1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the coolant as follows.
Open the radiator cap and drain plug, and allow the coolant to drain into a clean container.

CAUTION:

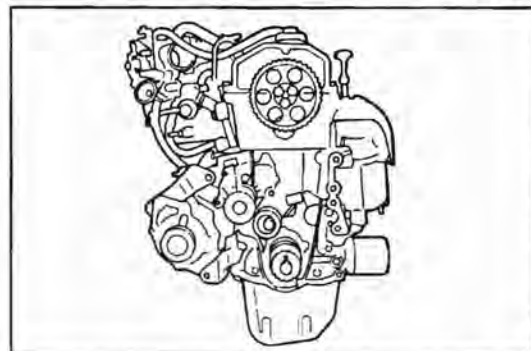
Never open the radiator cap and/or drain plug. When the engine is still hot.

3. Remove the timing belt.
(See pages EM-33 to EM-37)

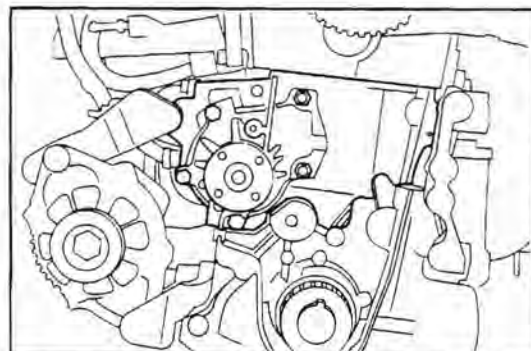
4. Remove the water pump by removing the attaching bolts and nuts of the water pump.



WR88-CO011



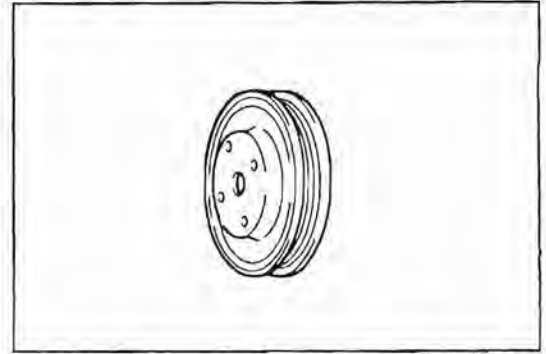
WR88-CO012



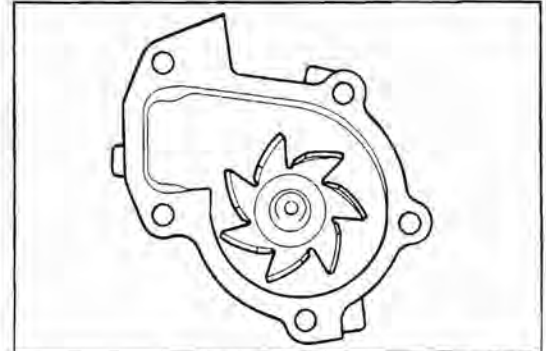
WR88-CO013

INSPECTION OF WATER PUMP-RELATED PARTS

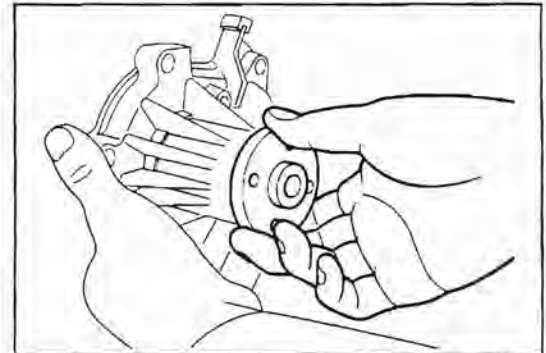
1. Check the water pump pulley for damage or deformation.
Replace the water pump if it exhibits damage or deformation.
2. Visually inspect the water pump rotor for damage or deformation.
Replace the water pump if the water pump rotor exhibits damage or deformation.
3. Ensure that the water pump rotates smoothly by hand.
Replace the water pump if it will not rotate smoothly.
4. Check the water pump cover section of the cylinder block for damage or wear.
Replace the cylinder block if the water pump cover section exhibits damage or wear.
(See page EM-123.)



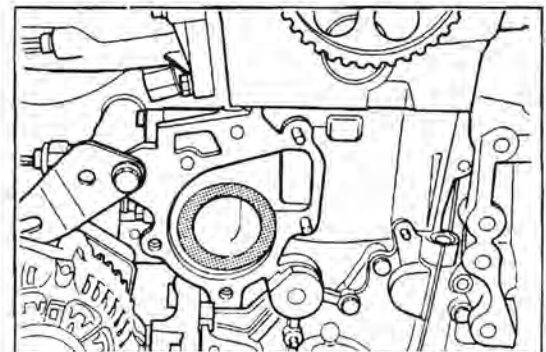
WR88-CO014



WR88-CO015



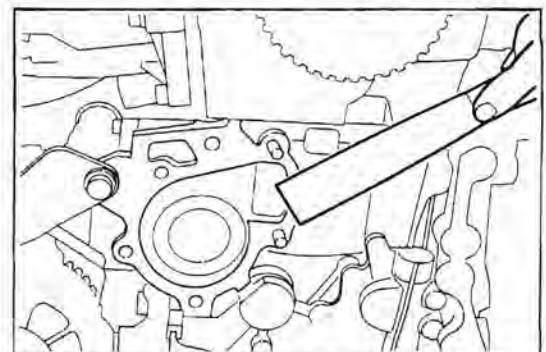
WR88-CO016



WR88-CO017

INSTALLATION OF WATER PUMP

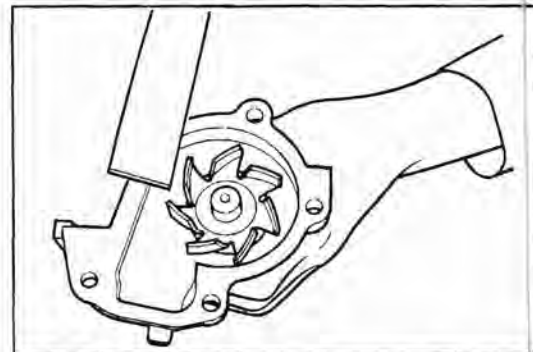
1. Remove the gasket material from the water pump installing surface of the cylinder block, using a gasket scraper.



WR88-CO018

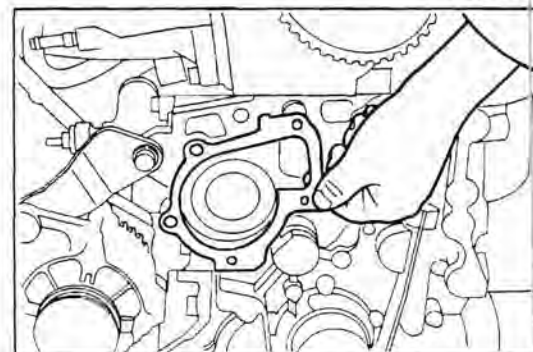
COOLING SYSTEM

2. Remove the gasket material from the water pump, using a gasket scraper.



WR88-CO019

3. Install a new gasket to the cylinder block.



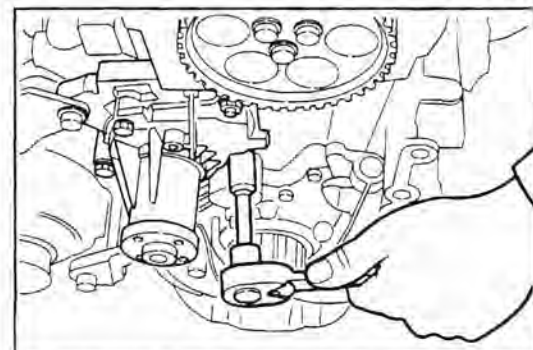
WR88-CO020

4. Install the water pump to the cylinder block. Tighten the attaching bolts evenly over two or three stages to the specified torque.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

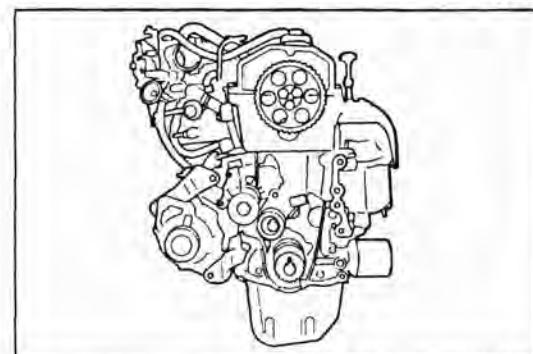
NOTE:

After tightening bolts, ensure that the water pump rotates smoothly by hand.



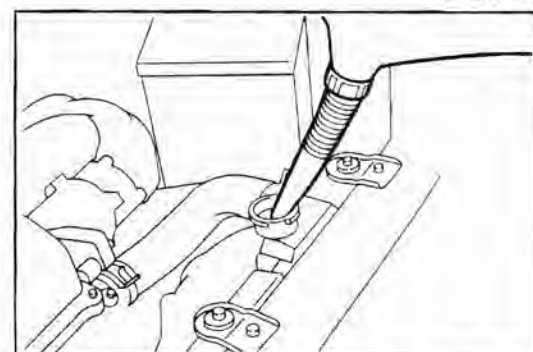
WR88-CO021

5. Install the timing belt.
(See page EM-41 to EM-52.)



WR88-CO022

6. Fill coolant.
(See page CO-3.)



WR88-CO023

THERMOSTAT

REMOVAL OF THERMOSTAT

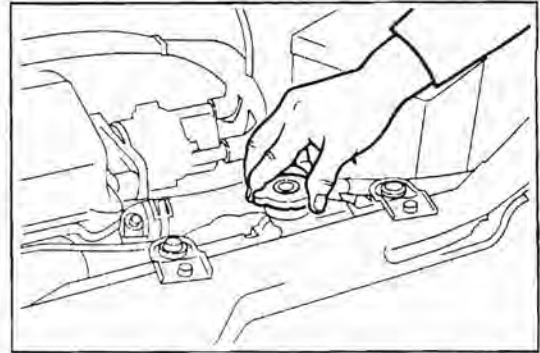
1. Drain the coolant as follows:

- (1) Remove the radiator cap.

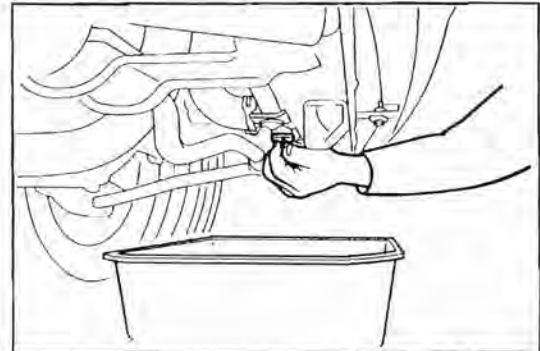
CAUTION:

Never open the radiator cap and/or drain plug when the coolant is still hot.

- (2) Place a suitable container below the radiator drain plug.
Drain the coolant by removing the drain plug.
 - (3) Tighten the drain plug.

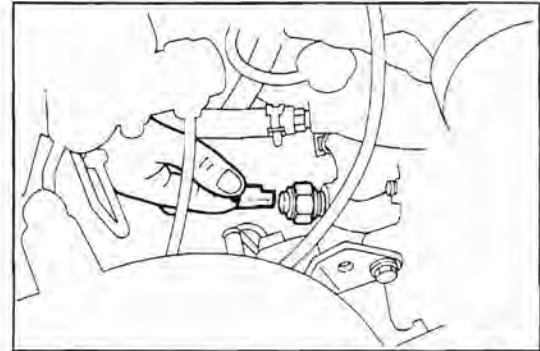


WR88-CO024



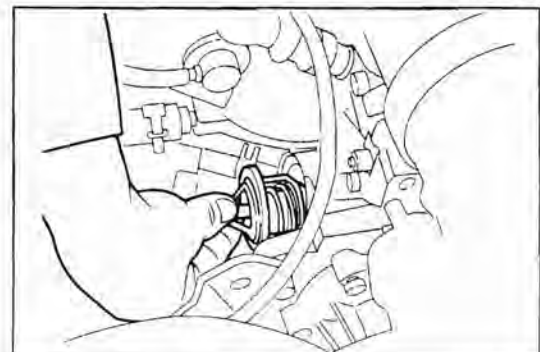
WR88-CO025

2. Disconnect the connector of the radiator thermo control switch.



WR88-CO026

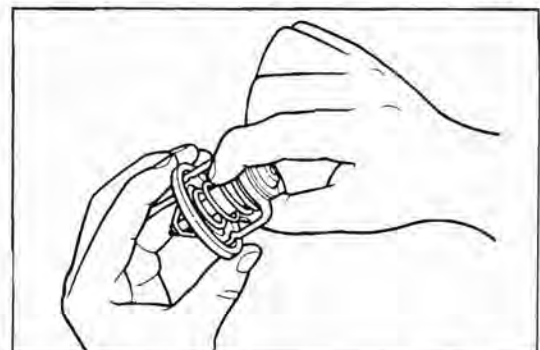
3. Remove the thermostat by removing the water inlet.



WR88-CO027

INSPECTION OF THERMOSTAT

1. Ensure that the thermostat valve is closed completely at room temperature 20°C (68°F) and the spring has no play.
Replace the thermostat if the valve is open or the spring has a play.



WR88-CO028

COOLING SYSTEM

2. Check the rubber grommet of the thermostat for damage or crack.
Replace the thermostat if the rubber grommet exhibits damage or crack.

3. Immerse the thermostat in water, and check the valve opening temperature by heating the water gradually.

Specifications	Valve opening temperature °C (°F)	Valve lift
General specifications	76 - 80 (168.8 - 176)	8.5 mm or more at 91°C (0.34 inch or more at 195.8°F)
ECE & EEC specifications	82 - 86 (179.6 - 186.8)	8.5 mm or more at 98°C (0.34 inch or more at 208.4°F)

Replace the thermostat if the valve operation fails to conform to the specifications.

INSTALLATION OF THERMOSTAT

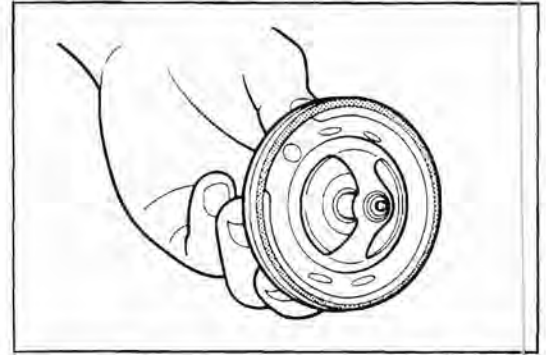
1. Assemble the thermostat in such a way that the jiggle pin comes exactly at the top of the engine.

NOTE:

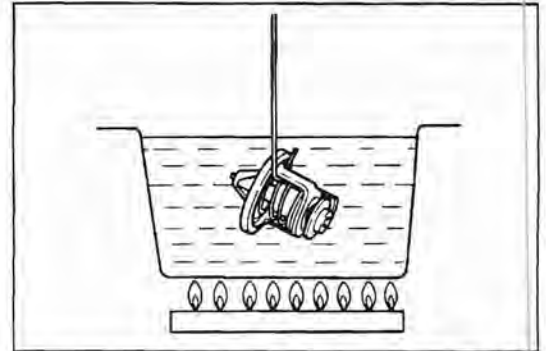
The thermostat should be installed in such a way the jiggle pin may face upward. Failure to observe this caution may cause engine malfunction.

2. Install the water inlet.
Tightening Torque: 0.6 - 0.9 kg-m (4.3 - 6.5 ft-lb)

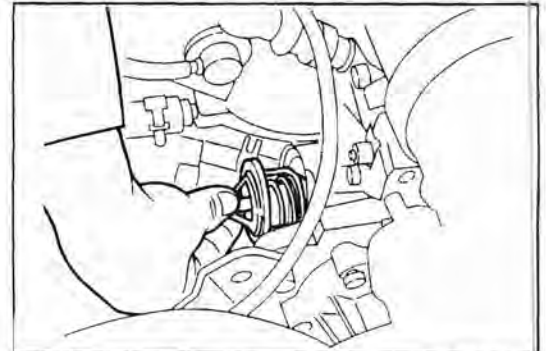
3. Connect the radiator thermo control switch connector.



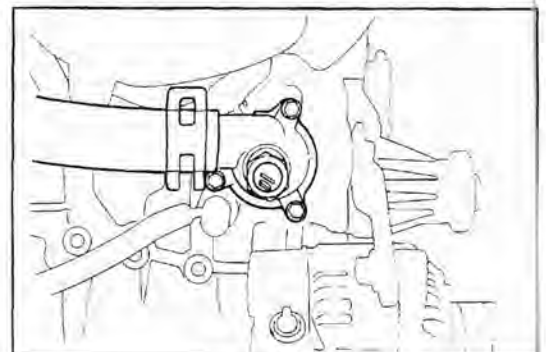
WR88-CO029



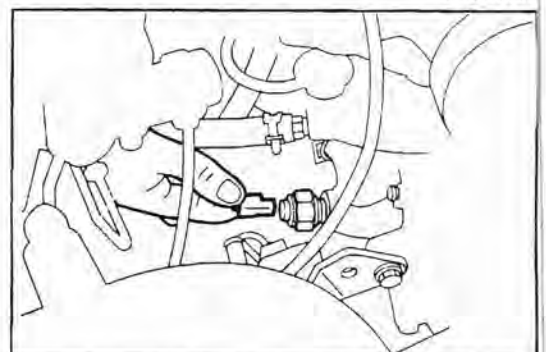
WR88-CO030



WR88-CO031



WR88-CO032



WR88-CO033

4. Fill coolant.
(See page CO-3.)
5. Start the engine and check it for leakage.
Repair the leaky point if the leakage exists.

RADIATOR

CLEANING OF RADIATOR

Using water or steam cleaner, remove mud and dirt from the radiator core.

CAUTION:

When using a high pressure type cleaner, be careful not to deform radiator core fins.

Keep a distance of more than 40 - 50 cm (15.75 - 19.69 inch) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 30 - 50 kg/cm² (427 - 711 psi). Also, the injection angle of pressurized water should be right angles to the radiator.

INSPECTION OF RADIATOR

1. Check of radiator cap

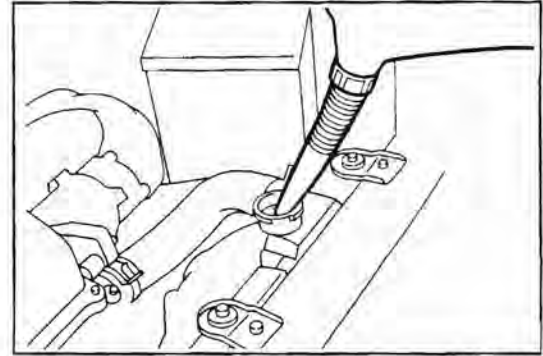
- (1) Check the radiator cap by means of a radiator cap tester to see if the relief valve opens at a pressure of 0.6 - 1.05 kg/cm² (8.53 - 14.9 psi).
If the radiator cap does not conform to the specification, replace the radiator cap.

CAUTION:

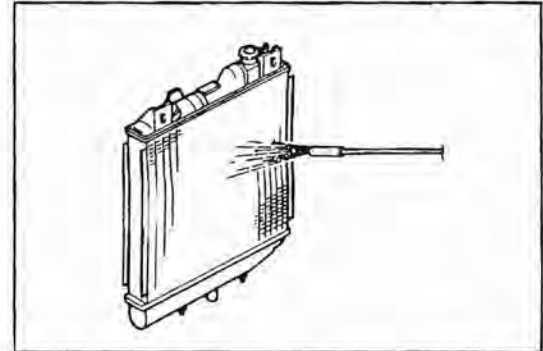
Never open the radiator cap when the engine is still hot.

- (2) Check the seal packing of the radiator cap for damage. Replace the radiator cap with a new one, if any damage exists.

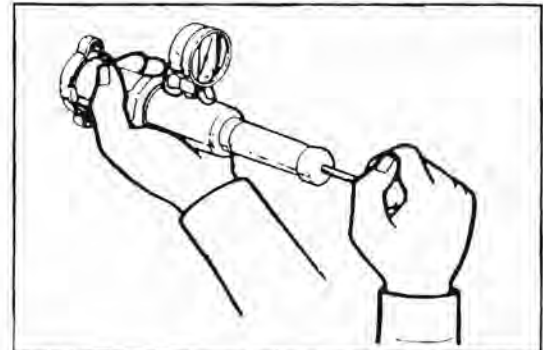
- (3) Lift the valve at the vacuum side with your fingers. Ensure that the valve is functioning properly. Replace the radiator cap with a new one, if the valve fails to function.



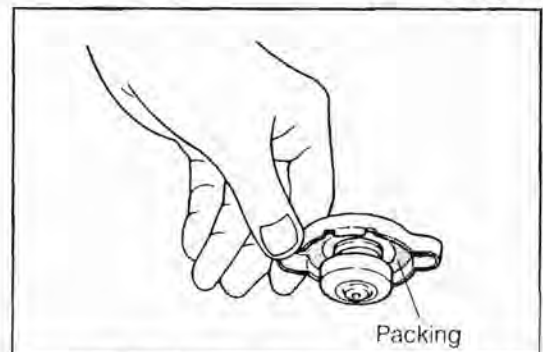
WR88-CO034



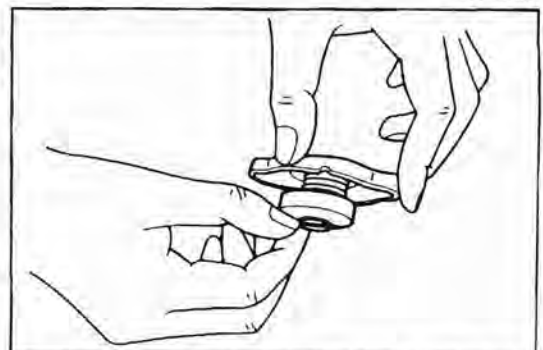
WR88-CO034



WR88-CO036



WR88-CO037



WR88-CO038

COOLING SYSTEM

2. Check of cooling system for leakage

- (1) Fill the radiator with coolant. Attach a radiator cap tester.
- (2) Warm up the engine.
- (3) Apply a pressure of 1.2 kg/cm^2 (17 psi) to the cooling system by means of a radiator tester.

If the pressure drops, check the hoses, radiator, water pump and heater for evidence of leakage.

If no external leakage is found, check the heater core, cylinder block, cylinder head, oil cooler and throttle body for evidence of leakage.

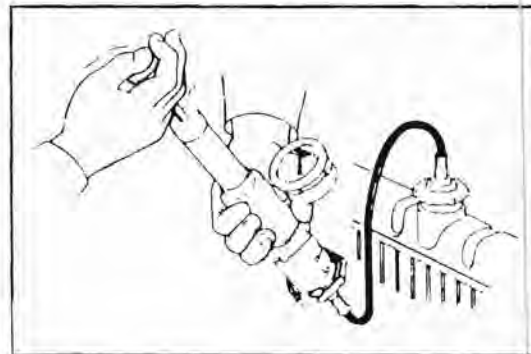
Check the hoses for deterioration, cracks, bulge or damage.

Replace the defective part(s) if necessary.

- (4) Remove the radiator cap tester from the radiator.

CAUTION:

Never remove the radiator cap tester when the coolant temperature is still high.



WR88-CO039

REMOVAL OF RADIATOR

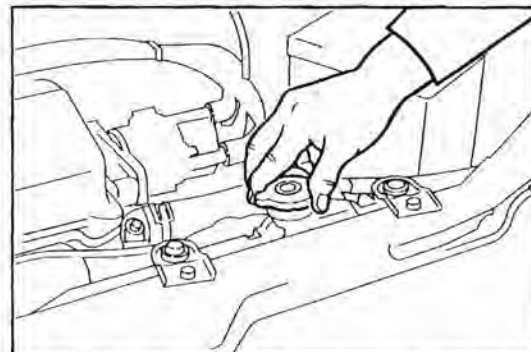
1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

2. Drain the coolant as follows:

- (1) Remove the radiator cap.

CAUTION:

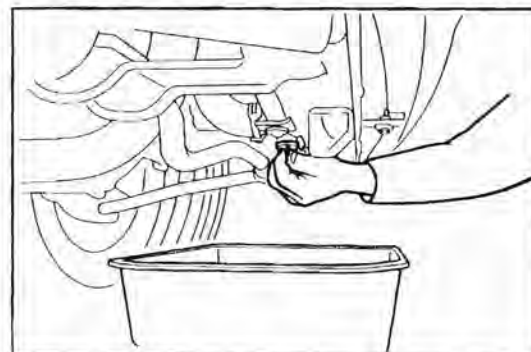
Never open the radiator cap and/or drain cap when the coolant is still hot.



WR88-CO040

- (2) Place a suitable container below the radiator drain plug.
Drain the coolant by removing the drain plug.

- (3) Tighten the drain plug.



WR88-CO041

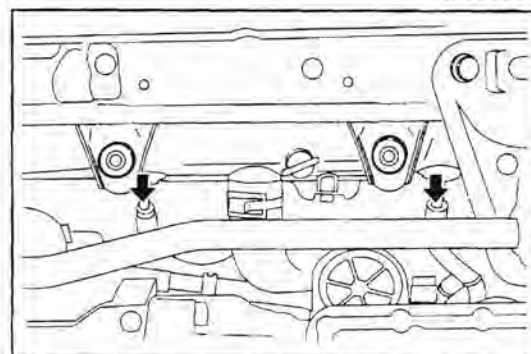
3. Disconnect the two oil cooler hoses for the automatic transmission. (A/T vehicle only)

NOTE:

- Receive the oil with a suitable container because the torque converter oil flows out.
- Prevent oil flowing by installing suitable plugs to the disconnected hoses.

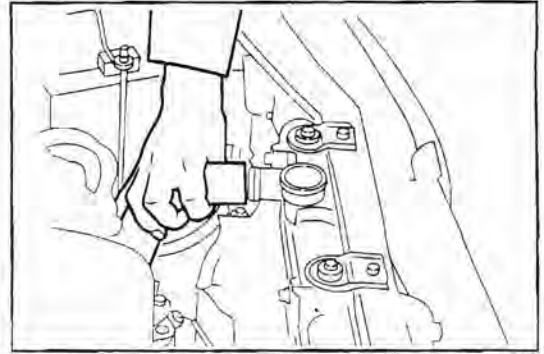
CAUTION:

Never reuse the oil cooler hoses and hose bands for automatic transmission use.



WR88-CO042

4. Disconnect the coolant reservoir hose and radiator upper and lower hoses.
5. Disconnect the oil cooler hose from the radiator lower tank. (Oil cooler-equipped vehicle only)



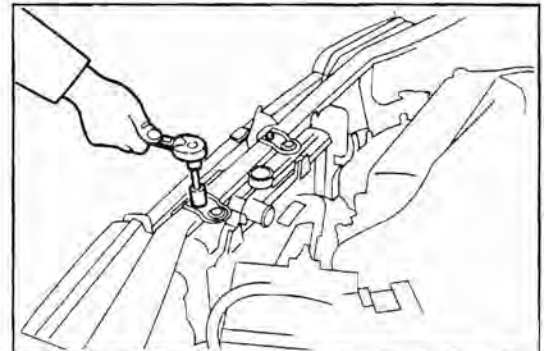
WR88-CO043

6. Disconnect the fan motor connector. Then, detach the connector from the body clamp.



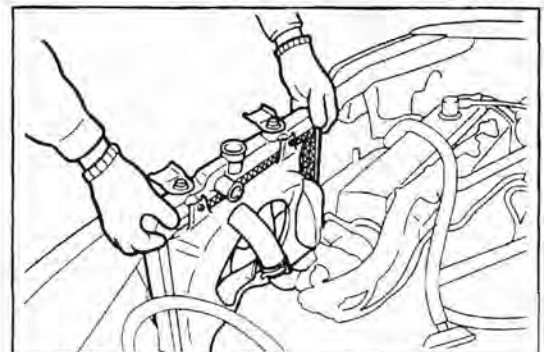
WR88-CO044

7. Remove the radiator upper bracket.
NOTE:
 On the HC-C engine mounted vehicle, disconnect the cool air intake hose.



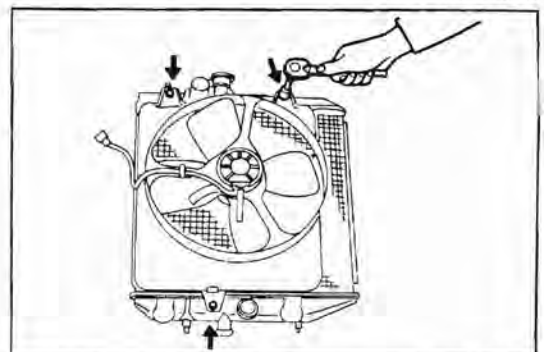
WR88-CO045

8. Remove the radiator together with the fan shroud from the vehicle.



WR88-CO046

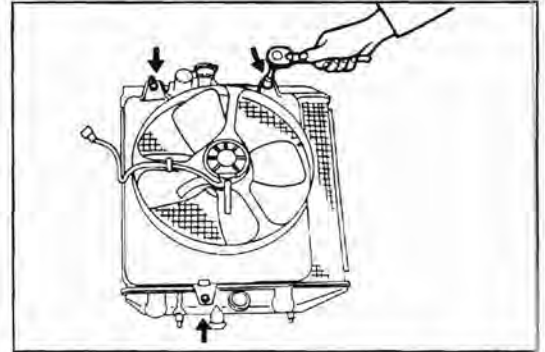
9. Remove the fan shroud from the radiator.



WR88-CO047

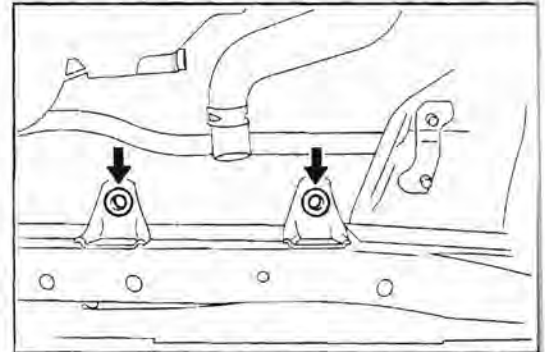
INSTALLATION OF RADIATOR

1. Install the fan shroud together with the fan motor on the radiator.



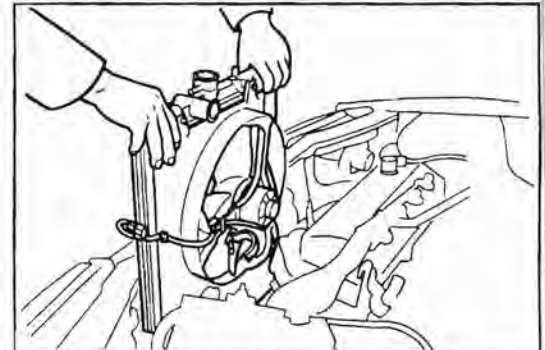
WR88-CO040

2. Ensure that the rubber grommet of the radiator lower mounting is in position.



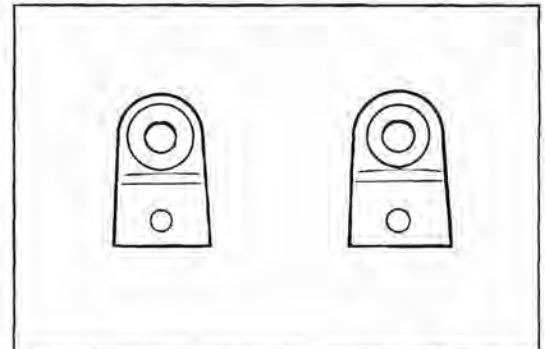
WR88-CO049

3. Install the radiator to the lower mounting.
NOTE:
Ensure that the rubber grommet exhibits no deformation.



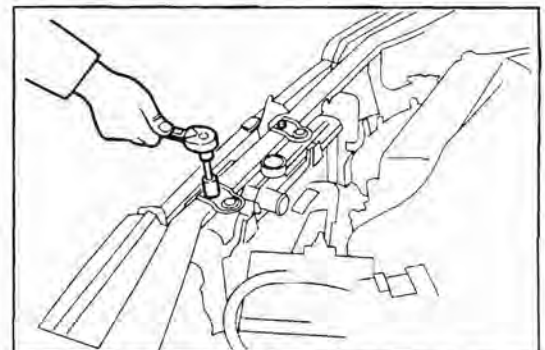
WR88-CO050

4. Check the rubber grommet of the radiator bracket for damage or crack.
Replace the rubber grommet if it exhibits damage or crack.



WR88-CO051

5. Install the radiator bracket. Secure the radiator.
NOTE:
On the HC-C engine-mounted vehicle, connect the cool air intake hose.



WR88-CO052

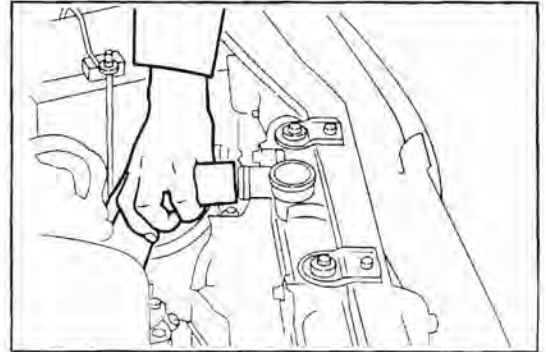
6. Connect the fan motor connector. Clamp it on the engine.



WR88-CO053

7. Connect the oil cooler hoses. Install the hose clamps. (Oil cooler-equipped vehicle only)

8. Connect the radiator upper and lower hoses to the radiator. Install the hose bands.



WR88-CO054

9. Connection of oil cooler hoses (A/T vehicle only)

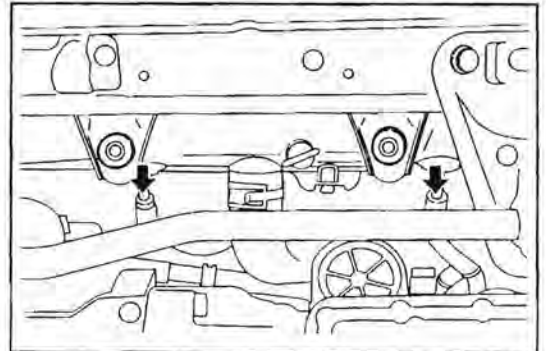
(1) Remove the oil cooler hoses.

(2) Wipe off any oil from the connecting section of the oil cooler hoses.

(3) Connect new oil cooler hoses. Install new hose clips.

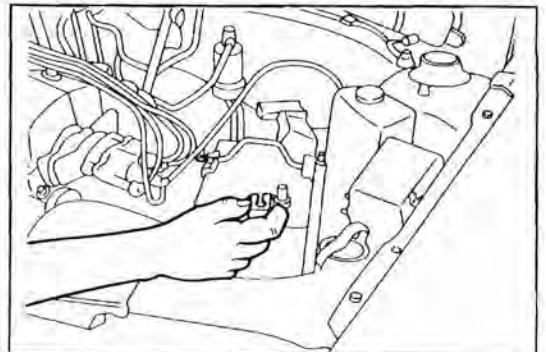
CAUTION:

- Never reuse the oil cooler hoses and hose clips.
- Make sure that no oil or dirt gets to the connected sections.



WR88-CO055

10. Connect the battery ground cable to the negative (-) terminal of the battery.

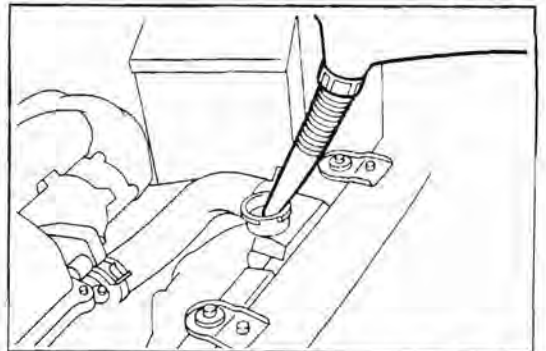


WR88-CO056

11. Add automatic transmission oil
(See the Chassis Workshop Manual)

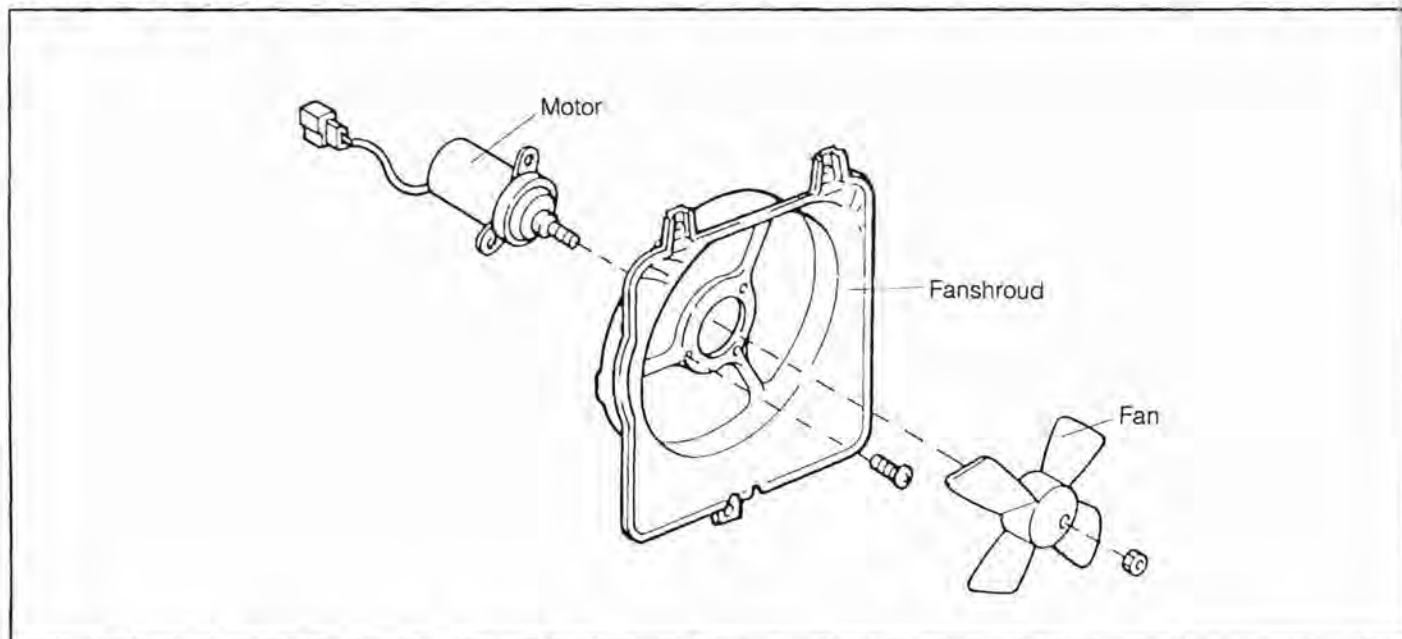
12. Fill coolant.
(See page CO-3.)

13. Start the engine and check it for leakage.
Repair the leaky point if leakage exists.



WR88-CO057

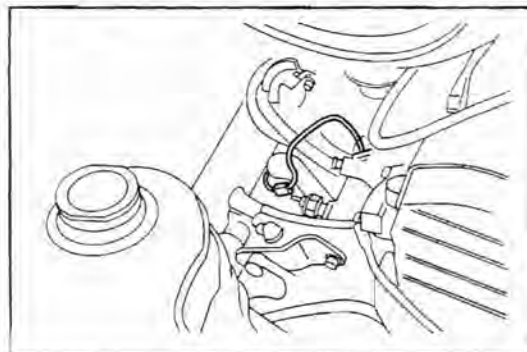
ELECTRIC COOLING FAN COMPONENTS



WR88-CO058

IN-VEHICLE INSPECTION (HC-C engine)

1. Turn ON the ignition key switch.
Ensure that the fan is not rotating when coolant is cold [below 83°C (181.4°F)].
If the fan motor is rotating, check the radiator thermo control switch and wiring for short.
2. Disconnect the radiator fan motor connector and short the disconnected connector to the engine ground.
3. Ensure that the fan is rotating.
4. Turn off the ignition switch and reconnect the disconnected connector to the radiator fan motor switch.
5. Start the engine.
6. Ensure that the fan motor is rotating when coolant temperature rises above 94°C (171.2°F).
If the fan motor is not rotating, replace the radiator thermo control switch.



WR88-CO059

IN-VEHICLE INSPECTION (HC-E engine)

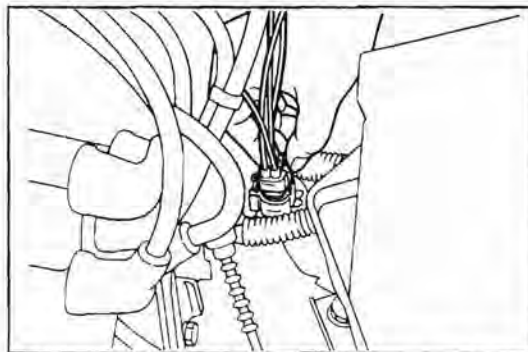
1. Turn ON the ignition key switch.
Ensure that the fan is not rotating when the coolant is cold. [below 83°C (181.4°F)].
If the fan motor is rotating, check the radiator thermo control switch, fan motor relay and wiring for short.
2. Turn OFF the ignition key switch.
3. Remove the cap of the check terminal.

NOTE:

The check terminal is located at the upper side of the transmission.

WR88-CO060

4. Connect the SST (09991-87702-000) to the check terminal.
5. Connect the SST terminal R (blue) to the ground terminal (black).
6. Turn ON the ignition key switch.
Ensure that the fan motor is rotating.
If the fan motor is not rotating, check the wiring to the fan motor relay, fan motor and/or radiator thermo control switch for open wire.
7. Disconnect the SST from the check connector.
8. Install the cap on the check terminal.
9. Start the engine.
10. Ensure that the fan motor is rotating when the coolant temperature rises above 94°C (171.2°F).
If the fan motor is not rotating, replace the radiator thermo control switch.

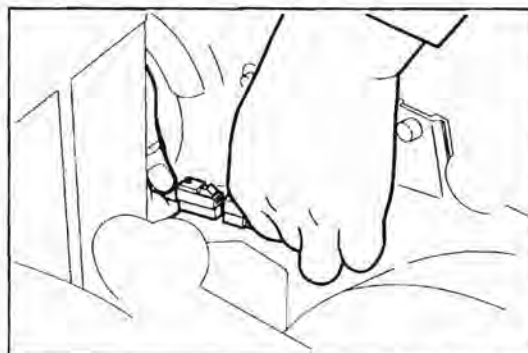


WR88-CO061

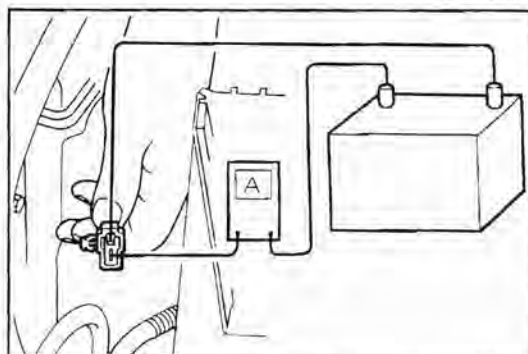
WR88-CO062

INSPECTION OF RADIATOR FAN MOTOR

1. Disconnect the radiator fan motor connector. Then, detach it from the body clamp.
2. Connect an ammeter in series between the radiator fan motor connector and the battery. Ensure that the fan motor is rotating.
Read the amperage.
Amperage: 4 - 6.5 A
If the motor will not rotate or the amperage fails to conform to the specification, replace the fan motor.
3. Connect the radiator fan motor connector. Clamp it to the body hole.



WR88-CO063

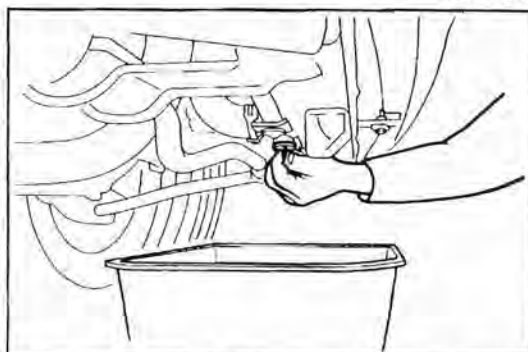


WR88-CO064

REPLACEMENT OF RADIATOR FAN MOTOR

REMOVAL OF RADIATOR FAN MOTOR

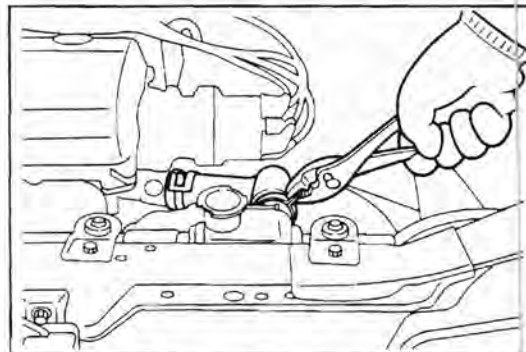
1. Drain the coolant.
(See page CO-3.)



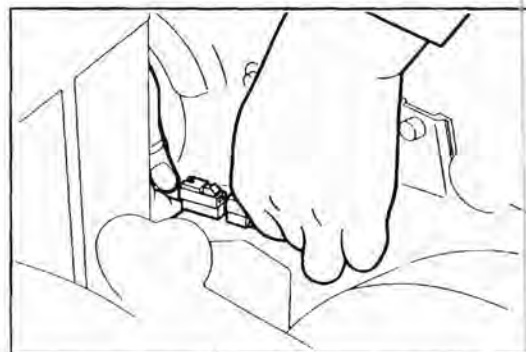
WR88-CO065

COOLING SYSTEM

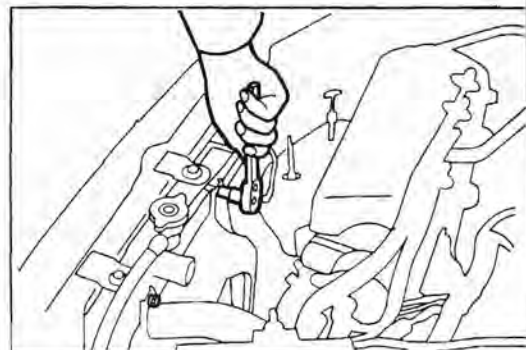
2. Disconnect the radiator upper hose.



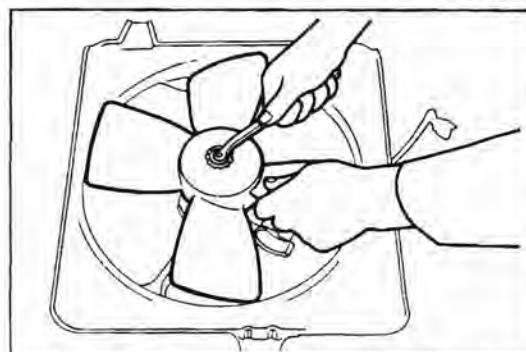
3. Disconnect the radiator fan motor connector. Then, detach it from the body clamp.



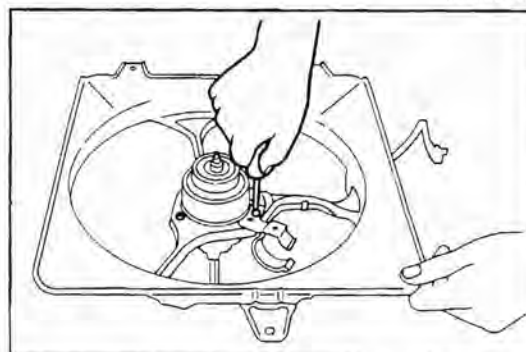
4. Remove the radiator fan shroud.



5. Remove the fan from the fan motor.



6. Remove the fan motor from the fan shroud.

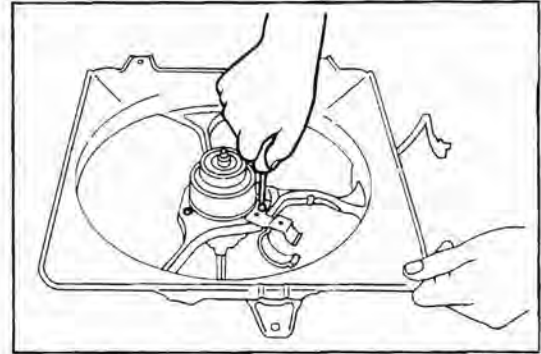


INSTALLATION OF RADIATOR FAN MOTOR

1. Install the radiator fan motor to the fan shroud.

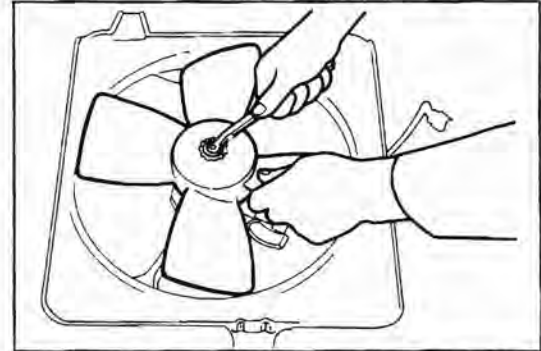
NOTE:

Install the radiator fan motor in such a way the drainage hose comes at the lower side of the vehicle.



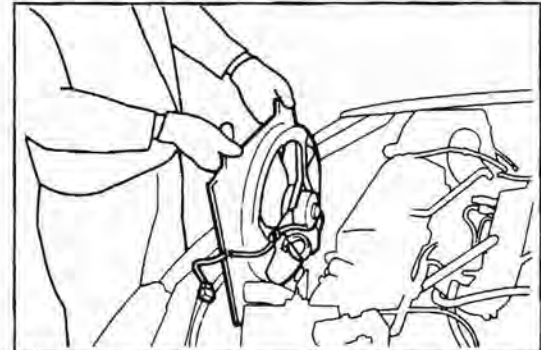
WR88-CO071

2. Install the fan to the fan motor.



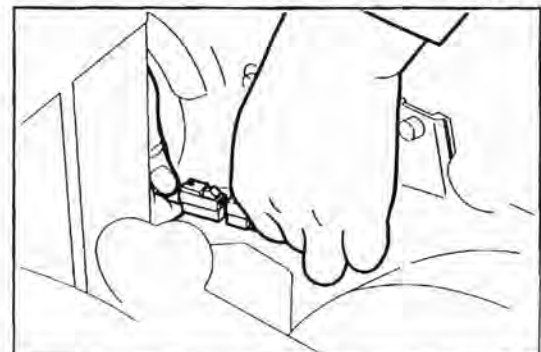
WR88-CO072

3. Attach the radiator fan shroud to the radiator.



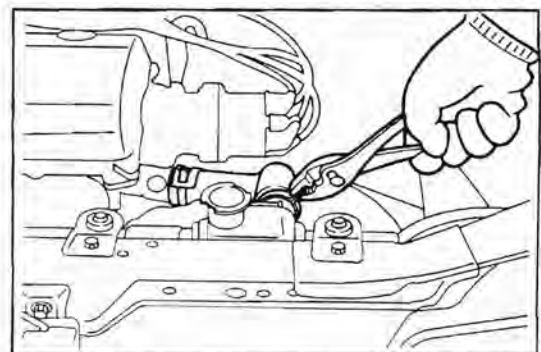
WR88-CO073

4. Connect the radiator fan motor connector. Clamp it to the body.



WR88-CO074

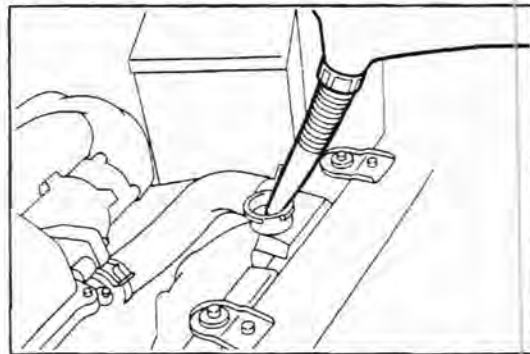
5. Connect the radiator upper hose. Install the hose bands.



WR88-CO075

COOLING SYSTEM

6. Fill coolant.
(See page CO-3.)



WR88-CO076

7. Start the engine and check for water leakage.

NOTE:

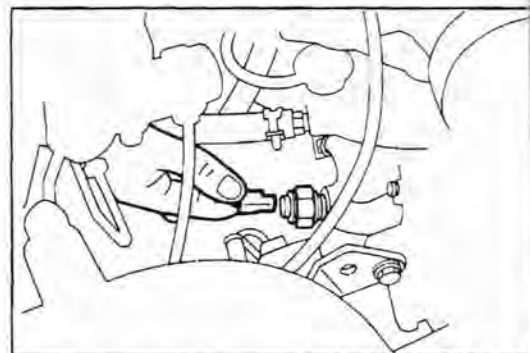
Repair the leaky point if leakage exists.

WR88-CO077

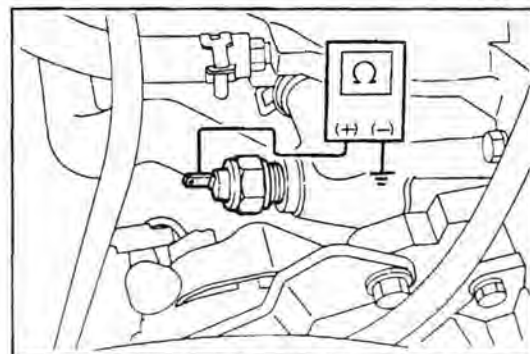
RADIATOR THERMO CONTROL SWITCH

INSPECTION OF RADIATOR THERMO CONTROL SWITCH

1. Disconnect the thermo control switch connector.
2. Connect an ohmmeter, as shown in the right figure.



WR88-CO078



WR88-CO079

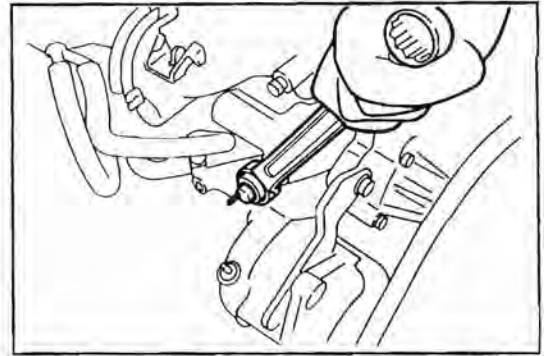
3. Ensure that no continuity exists when the coolant is below 83°C (181.4°F).
If continuity exist, replace the radiator thermo control switch.
4. Start the engine. Ensure that continuity exists when the coolant temperature rises above 94°C (201.2°F).
If no continuity exists, replace the radiator thermo control switch.

WR88-CO080

UNIT INSPECTION OF RADIATOR THERMO CONTROL SWITCH

1. Removal of radiator thermo control switch

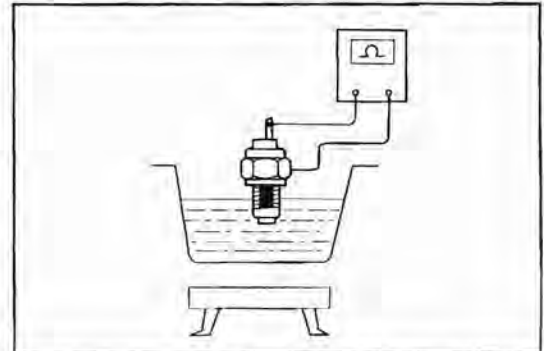
- (1) Connect the ground cable terminal from the negative (-) terminal of the battery.
- (2) Drain the coolant.
(See page CO-3)
- (3) Remove the radiator thermo control switch.



WR88-CO082

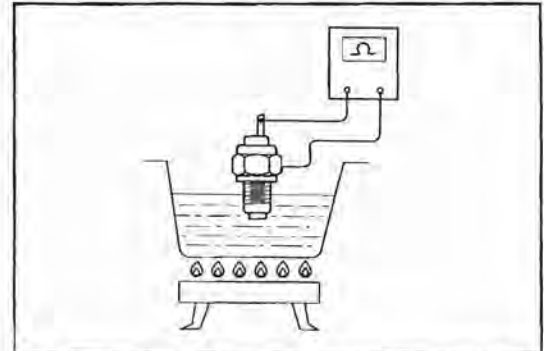
2. Unit inspection of radiator thermo control switch

- (1) Connect an ohmmeter to the radiator thermo control switch.
- (2) Submerge the heat sensing section of the radiator thermo control switch into water whose temperature is below 83°C (181.4°F). Ensure that no continuity exists. If continuity exists, replace the radiator thermo control switch.



WR88-CO083

- (3) When the temperature of the water into which the heat sensing section of the radiator thermo control switch is submerged is raised above 94°C (201.2°F), ensure that continuity exists. If no continuity exists, replace the radiator thermo control switch.



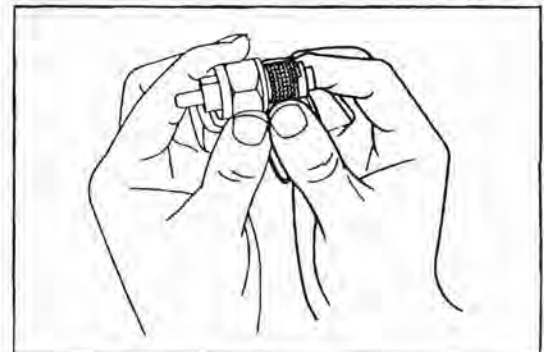
WR88-CO084

3. Installation of radiator thermo control switch

- (1) Clean the threaded portion of the radiator thermo control switch. Wind seal tape around the threaded portion.

NOTE:

Since a new thermo control switch is coated with seal materials, it is unnecessary to apply seal tape to it.

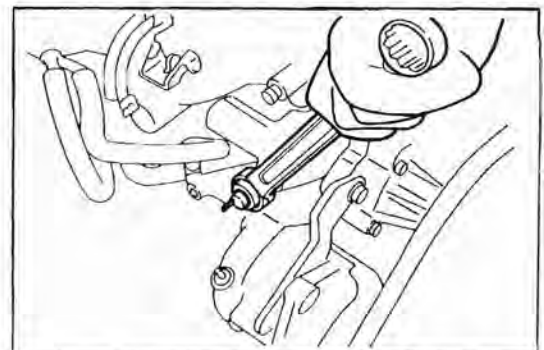


WR88-CO085

- (2) Install the radiator thermo control switch to the water inlet. Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)
- (3) Fill coolant.
(See page CO-3)
- (4) Connect the ground cable to the negative terminal of the battery.
- (5) Start the engine and check for water leakage.

NOTE:

Repair the leaky point if leakage exists.

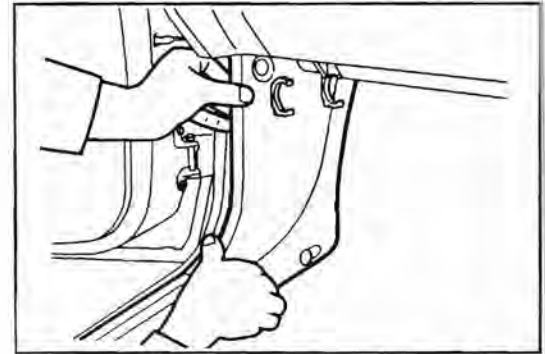


WR88-CO086

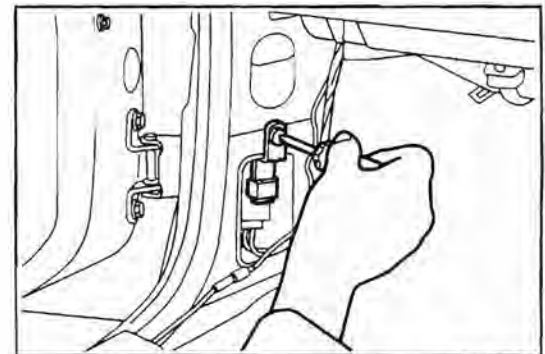
RADIATOR FAN MOTOR RELAY

INSPECTION OF RADIATOR FAN MOTOR RELAY (HC-E engine Only)

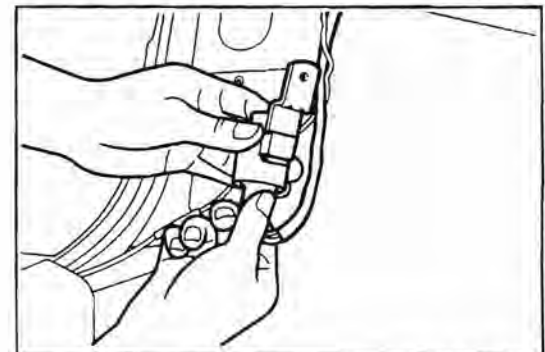
1. Remove the cowl side trim.



2. Remove the radiator fan motor relay.

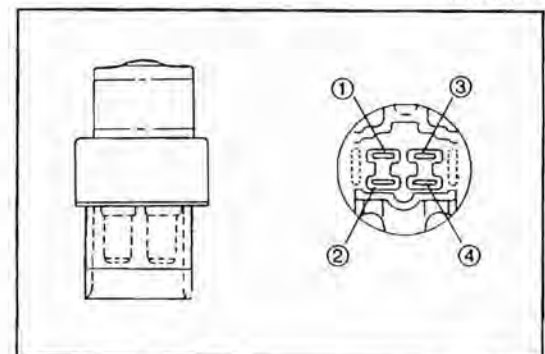


3. Disconnect the fan motor relay connector.



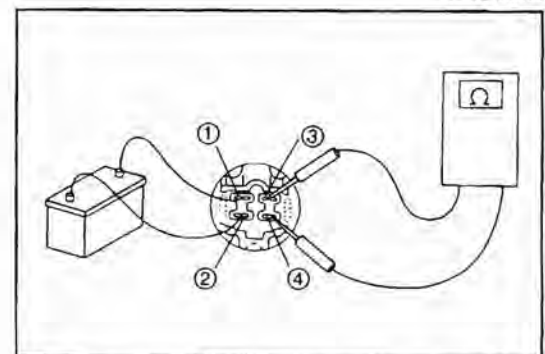
4. Inspection of relay continuity

- (1) Ensure that the resistance between the terminals ① and ② is not more than 100Ω , using an ohmmeter.
 - (2) Ensure that no continuity exists between the terminals ① and ③ as well as between the terminals ① and ④.
 - (3) Ensure that no continuity exists between the terminals ② and ③ as well as between the terminals ② and ④.
- If the relay continuity test results do not conform to specifications, replace the relay.



5. Inspection of relay operation

- (1) Apply the battery voltage across the terminals ① and ②.
 - (2) Ensure that continuity exists between the terminals ③ and ④, using an ohmmeter.
- If the test results do not conform to specifications, replace the relay.



6. Connect the fan motor relay connector.
7. Install the radiator fan motor relay.
8. Install the cowl side trim.

WR88-CO092

DAIHATSU

CHARADE

TYPE HC ENGINE

LUBRICATION SYSTEM

TROUBLE SHOOTING	LU-2
OIL PRESSURE CHECK	LU-2
ENGINE OIL CHANGE & OIL FILTER REPLACEMENT	LU-4
OIL COOLER	LU-6

WR88-LU001

LU

TROUBLE SHOOTING

Problem	Possible causes	Remedies	Page
Oil leakage	Cylinder head, cylinder block oil cooler or oil pump body damaged or cracked Oil seal faulty Gasket faulty	Repair, if necessary. Replace oil seal. Replace gasket.	
Low oil pressure	Oil leakage Relief valve faulty Oil pump faulty Poor quality engine oil Crankshaft bearing faulty Connecting rod bearing faulty Oil filter clogged Low oil level	Repair, as necessary. Replace relief valve. Repair oil pump. Change engine oil Replace bearing. Replace bearing. Replace oil filter. Check oil level	EM-188 EM-186 LU-2 EM-168 EM-163 LU-4 LU-2
High oil pressure	Relief valve faulty	Replace relief valve.	EM-188

WR88-LU002

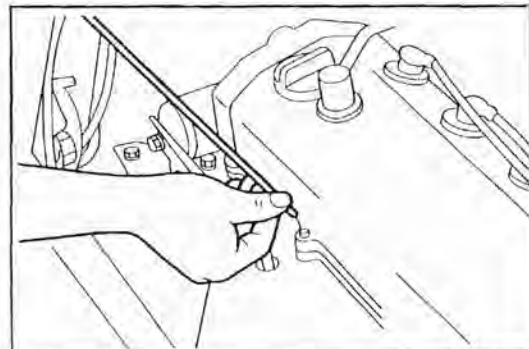
OIL PRESSURE CHECK

1. Oil quality check

Check the oil for deterioration, ingress of water, discoloring or dilution.

If oil quality is poor, change the oil.

Use API grade SE or higher multigrade viscosity, fuel-efficient oil. (See page LU-5)



WR88-LU003

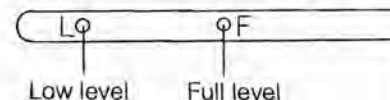
2. Oil level check

The oil level should be between the L and F levels on the dipstick.

If the level is low, check to see if any oil leakage is present. Add oil to the F level.

NOTE:

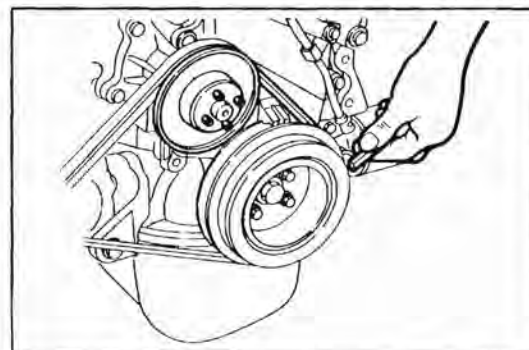
The amount of oil between the [L] level and the [F] equals to one liter (Imp. gal.).



WR88-LU004

3. Oil pressure check

(1) Disconnect the oil pressure switch connector.

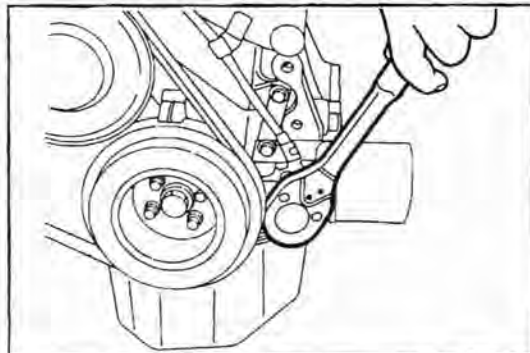


WR88-LU005

(2) Remove the oil pressure switch.

NOTE:

Use a hexagonal long box wrench for the removal.



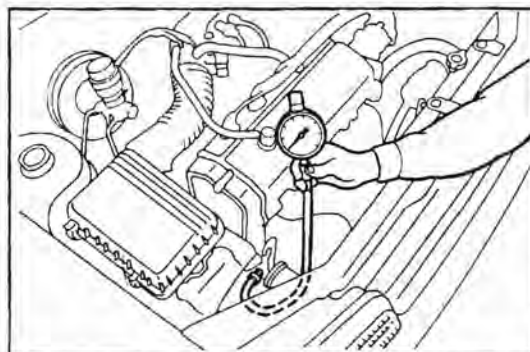
WR88-LU006

(3) Install the oil pressure gauge.

NOTE:

The pressure gauge is available as a SST.

SST: 09268-87701-000



WR88-LU007

(4) Starting engine

Start the engine and warm it to the normal operating temperature.

At Idle Speed: More Than 0.2 kg/cm^2 (2.8 psi)

At 3000 rpm: $2.5 - 5.0 \text{ kg/cm}^2$ (35.6 - 71.0 psi)

If the measured value fails to conform to the specified value, check and repair the oil pump.

(See the section under "Cylinder Block of Engine Mechanicals.")

(5) Stop the engine.

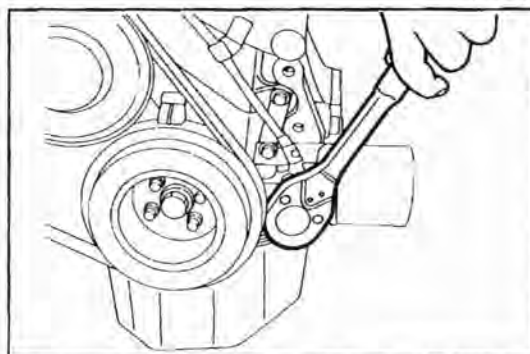
(6) Remove the oil pressure gauge.

(7) Clean the threaded portion of the oil pressure switch. Wind seal tape around the threaded portion. Install the oil pressure switch in the oil pump.

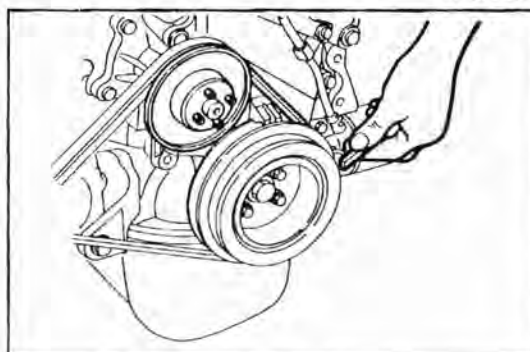
Tightening Torque: $1.2 - 2.0 \text{ kg-m}$ (8.7 - 14.5 ft-lb)

NOTE:

- Use a hexagonal long box wrench for the installation.
- The new oil pressure switch is coated with sealing materials.



WR88-LU009



WR88-LU010

(8) Connect the connector of the oil pressure switch.

(9) Start the engine and check it for oil leakage.

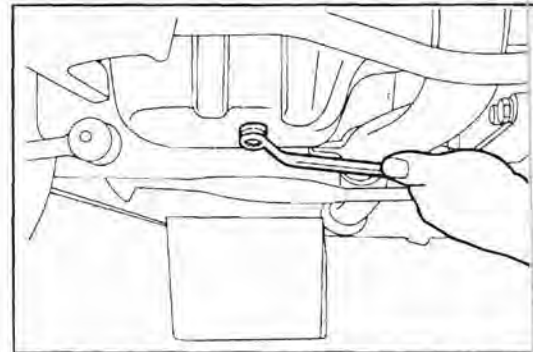
Repair the leaky point if oil leakage exists.

ENGINE OIL CHANGE & OIL FILTER REPLACEMENT

1. Drain the engine oil as follows:
 - (1) Place a suitable container under the oil drain plug.
 - (2) Drain the oil by removing the oil drain plug.

CAUTION:

When the oil is still hot, care must be exercised to avoid getting scalded.



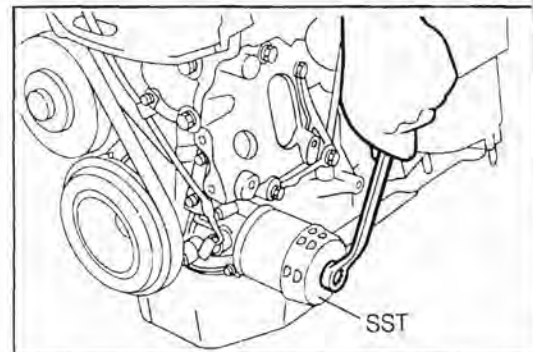
WR88-LU012

2. Oil filter replacement
 - (1) Remove the oil filter element, using the following SST.

SST: 09228-87201-000

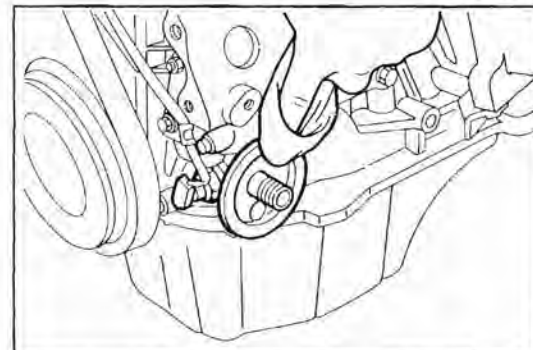
NOTE:

Place a suitable container under the oil filter because the engine oil flows out.



WR88-LU013

- (2) Inspect and clean the oil filter installation surface.



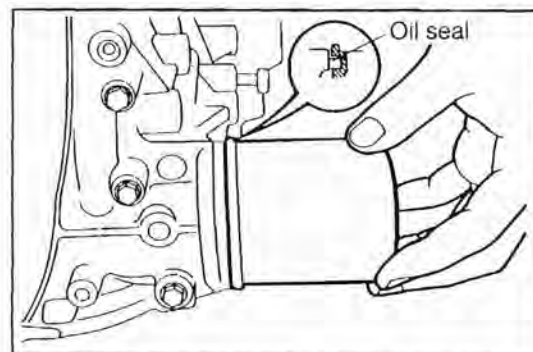
WR88-LU014

- (3) Thinly apply engine oil to the "O" ring of a new oil filter.



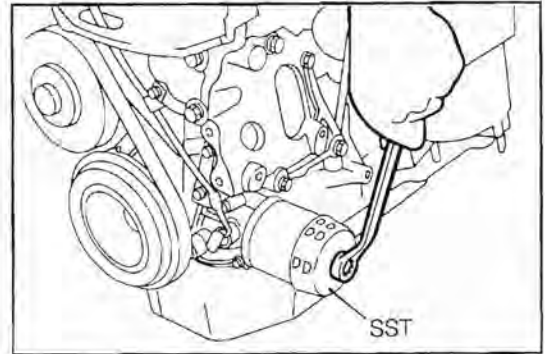
WR88-LU015

- (4) Screw in the oil filter by hand, until the "O" ring of the oil filter contacts the oil filter installing surface.



WR88-LU016

- (5) Tighten the oil filter three fourths to one complete turn, using the following SST.
- SST: 09228-87201-000



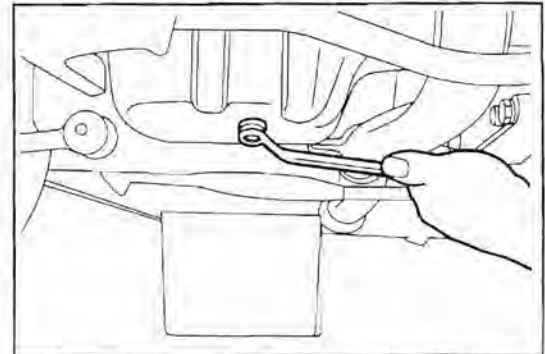
WR88-LU017

3. Filling engine oil
- (1) Clean the oil drain plug. Install it with a new gasket interposed.

NOTE:

Remove any remaining gasket material from the oil pan, using a gasket scraper.

Tightening Torque: 2.0 - 3.0 kg-m (14.5 - 21.7 ft-lb)



WR88-LU018

- (2) Fill the engine with engine oil.
- The oil should be API grade SE or higher multigrade viscosity, fuel-efficient oil.

Oil capacity

When only engine oil is changed:

3.3 liter (2.9 IMP qt)

When engine oil is changed and oil filter is replaced:

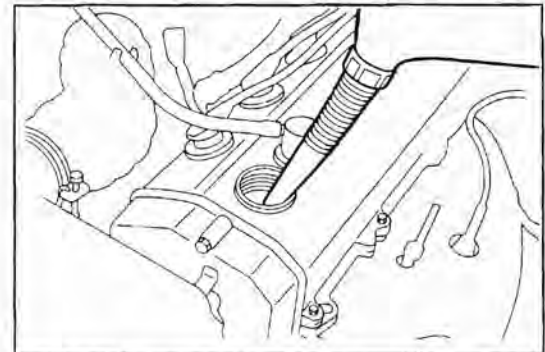
3.6 liter (3.08 IMP qt)

After engine has been overhauled or when engine oil has been drained completely from engine:

4.0 liter (3.52 IMP qt)

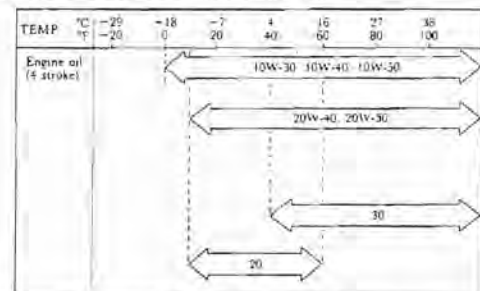
NOTE:

On the oil cooler-equipped vehicle, the oil capacity is 79 cc greater than the amount specified above,



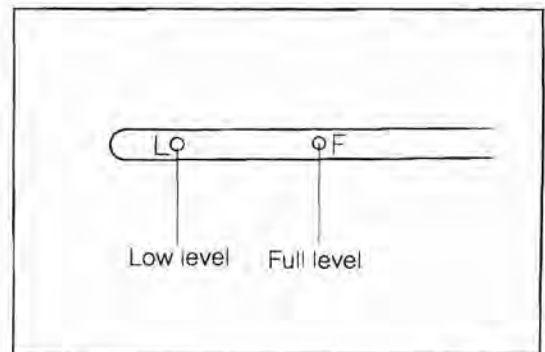
WR88-LU019

Recommended Viscosity (SAE)



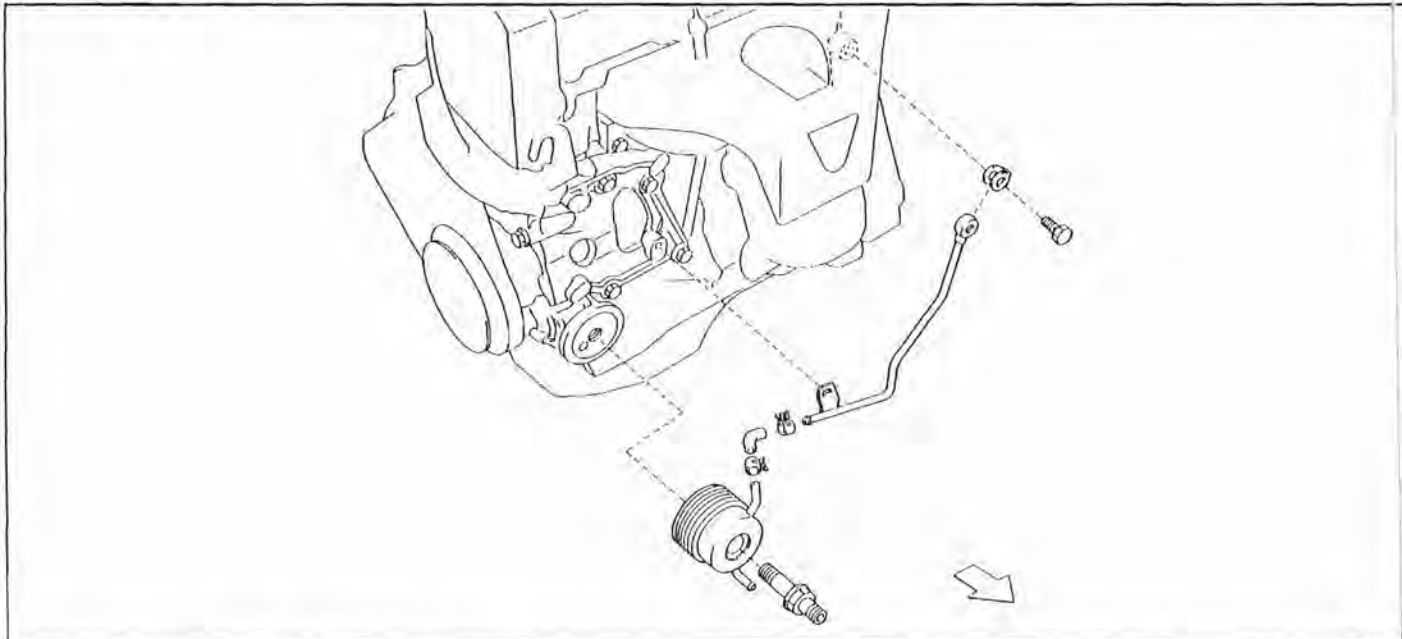
WR88-LU020

- (3) Start the engine and check it for leakage.
- Repair the leaky point if oil leakage exists.
- (4) Stop the engine. After a lapse of two or three minutes, check the oil level.
- If oil level is less than the high level, replenish the oil to the full level.



WR88-LU021

OIL COOLER (Oil Cooler-Equipped Vehicle Only) COMPONENTS



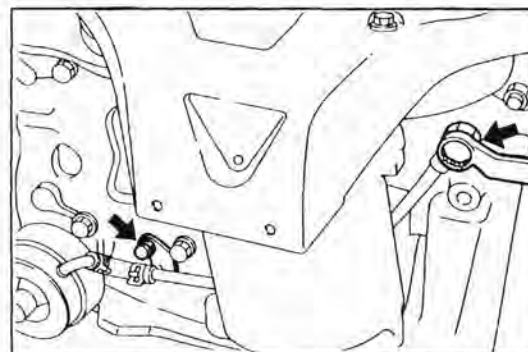
WR88-LU022

REMOVAL OF OIL COOLER

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the coolant. (See page CO-3.)
3. Remove the oil filter. (See page LU-4.)
4. Disconnect the oil cooler hose at the radiator side.

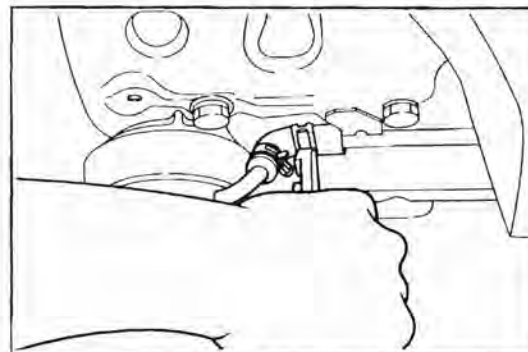
WR88-LU023

5. Disconnect the oil cooler pipe from the cylinder block.



WR88-LU023A

6. Remove the oil cooler pipe from the hose by sliding the hose bands.



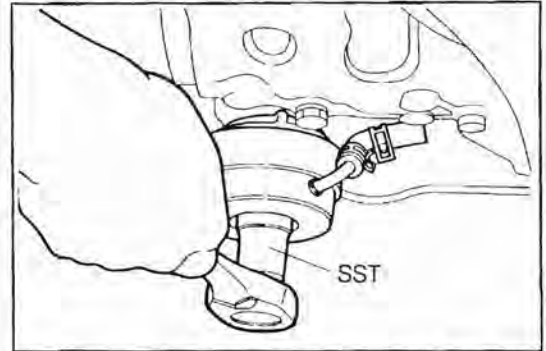
WR88-LU023B

7. Remove the oil cooler, using the following SST.

SST: 09268-87704-000

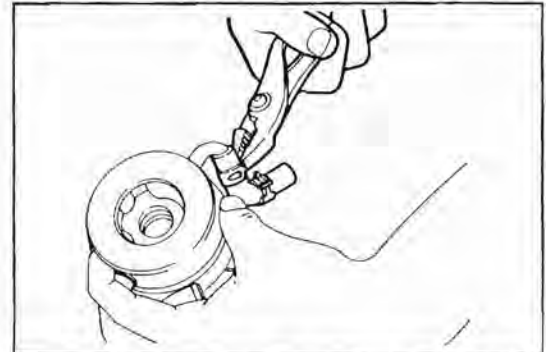
NOTE:

Place a suitable container below the oil cooler attaching section so as to receive any oil and water flowing from the oil cooler.



WR88-LU023C

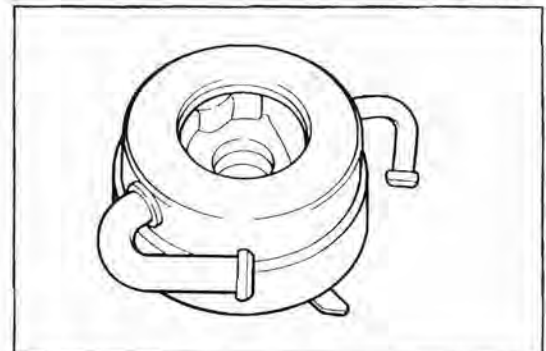
8. Disconnect the water hose from the oil cooler.



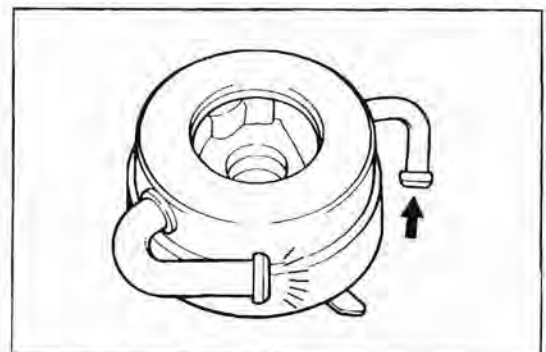
WR88-LU024

INSPECTION OF OIL COOLER

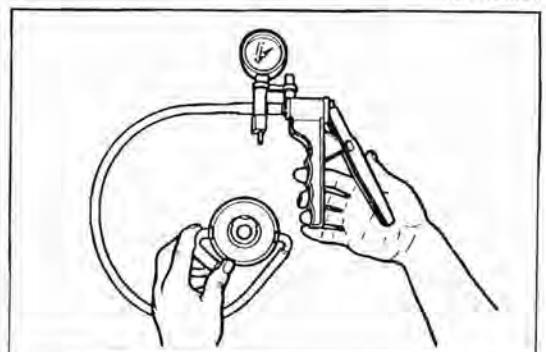
1. Check the oil cooler for damage.
Replace the oil cooler if the oil cooler exhibits damage.
2. Blow air from one end of the oil cooler pipe. Ensure that air continuity exists.
3. With one end of the oil cooler pipe plugged with your finger, apply a negative pressure of 100 mmHg (3.937 inchHg) to the other end, using a MityVac or a vacuum pump. Ensure that the applied negative pressure is retained.
If the negative pressure is not kept, replace the oil cooler.



WR88-LU025



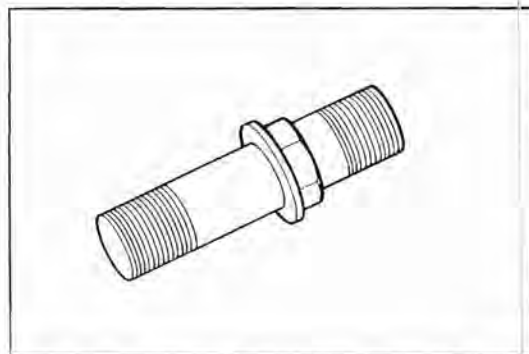
WR88-LU026



WR88-LU027

LUBRICATION SYSTEM

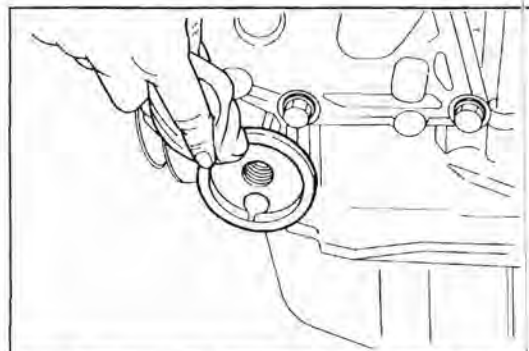
4. Check the oil cooler set bolt for damage.
Replace the oil cooler set bolt if it exhibits damage.



WR88-LU018

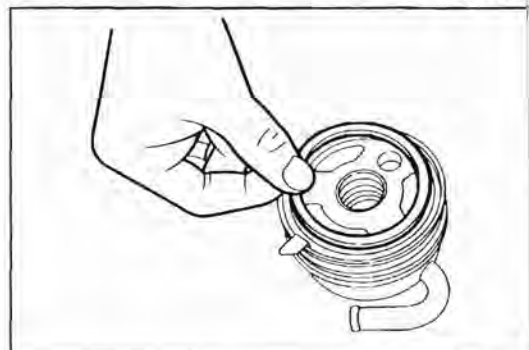
INSTALLATION OF OIL COOLER

1. Clean the oil cooler attaching surface of the oil pump.



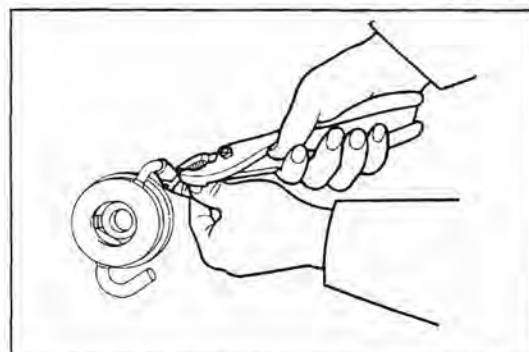
WR88-LU025A

2. Install the new "O" ring on the cooler.



WR88-LU0293

3. Connect the water hose to the oil cooler. Attach the hose bands.

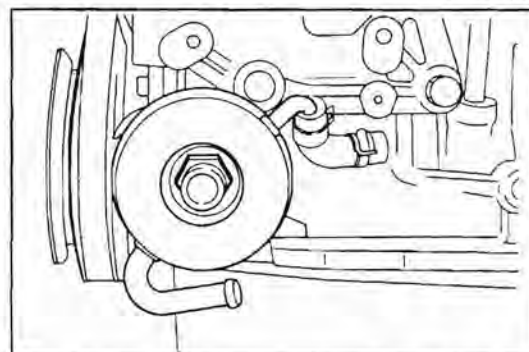


WR88-LU030

4. Using the set bolts, install the oil cooler by making the locating rib of the oil cooler contact with the cylinder block.

NOTE:

Care must be exercised to ensure that the "O" ring may not be displaced during the installation.

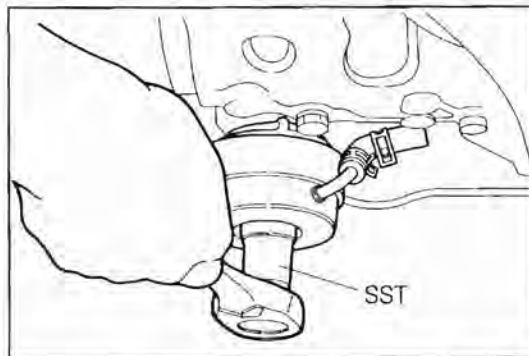


WR88-LU031A

5. Tighten the set bolts to the specified torque, using the following SST.

SST: 09268-87704-000

Tightening Torque: 2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

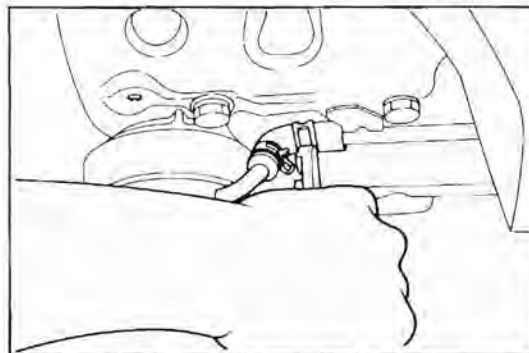


WR88-LU031B

6. Connect the oil cooler inlet pipe to the oil cooler hose that has been installed on the oil cooler.

NOTE:

Install the oil cooler pipe, by taking into consideration an angle at which it is mounted on the cylinder block.



WR88-LU031C

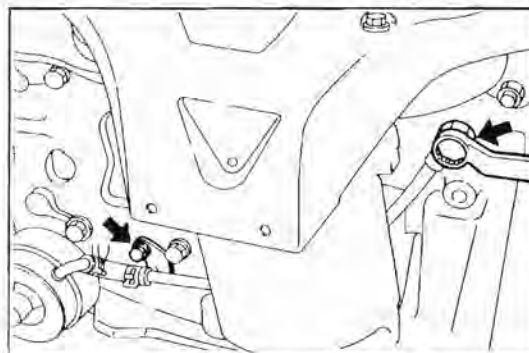
7. Install the oil cooler pipe on the cylinder block with a new gasket interposed.

Tightening Torque (Union bolt):

2.5 - 3.5 kg-m (18.1 - 25.3 ft-lb)

NOTE:

Never reuse the gasket.



WR88-LU032

8. Installation of oil filter

(1) Clean the oil filter installation surface of the oil cooler.

(2) Install the oil filter. (See page LU-4.)

9. Connect the oil cooler hose at the radiator side. Attach the hose bands.

10. Fill coolant. (See page CO-3.)

11. Connect the battery ground cable to the negative (-) terminal of the battery.

12. Start the engine. Check to see if any oil leakage or fuel leakage is present.

If the engine exhibits any defect, repair it or replace the defective part, as required.

13. Stop the engine. After two or three minutes, check the engine oil level, using the oil level gauge. Replenish engine oil to the FULL level, as required. (See page LU-5.)

(1) Screw in the oil filter by hand, until the "O" ring of the oil filter contacts the oil filter installing surface.

(2) Screw in the oil filter third fourths to one turn, using the following SST.

SST: 09228-87201-000

DAIHATSU

CHARADE

TYPE HC ENGINE

IGNITION SYSTEM

PRECAUTIONS	IG- 2
TROUBLE SHOOTING	IG- 2
IGNITION SYSTEM (HC-C)	IG- 3
IGNITION SYSTEM (HC-E)	IG- 5
INSPECTION OF RESISTIVE CORDS	IG- 7
INSPECTION OF SPARK PLUG	IG- 8
INSPECTION OF IGNITION COIL	
(HC-C)	IG-10
(HC-E)	IG-12
INSPECTION OF DISTRIBUTOR	
(HC-C)	IG-13
REPLACEMENT OF BREAKER POINT	
(HC-C)	IG-15
INSPECTION OF DISTRIBUTOR	
(HC-E)	IG-17
DISTRIBUTOR (HC-C)	IG-22
DISTRIBUTOR (HC-E)	IG-37

WR88-IG001

IG

PRECAUTIONS

1. Do not leave the ignition key switch turned ON for more than ten minutes while the engine is stopped.
2. When a tachometer is connected to the system, connect the test probe of the tachometer to the negative (-) terminal of the ignition coil.
3. As some tachometers are not compatible with this ignition system, it is recommended to confirm the compatibility of your unit before using.
4. Never allow the ignition coil terminals to touch ground. It could result in damage to the ignitor and/or the ignition coil.
5. Do not disconnect the battery cable when the engine is running.
6. Make sure that the ignitor is properly grounded to the body. (HC-E engine Only).

WR88-IG01/2

TROUBLE SHOOTING

Problem	Possible causes	Remedies	Page
Engine will not start/hard to start. (Engine crank normally.)	Incorrect ignition timing	Reset timing.	IG-34, IG-49
	Ignition coil faulty	Inspect coil.	IG-10, IG-12
	Igniter faulty (HC-E Engine Only)	Inspect igniter.	IG-3, IG-5
	Distributor faulty	Inspect distributor.	IG-12, IG-17
	Resistive cords faulty	Inspect resistive cords.	IG-7
	Spark plugs faulty	Inspect plugs.	IG-8
	Ignition wiring disconnected or broken	Inspect wiring.	
Rough idle or engine stalls.	Spark plugs faulty	Inspect plugs.	IG-8
	Ignition wiring faulty	Inspect wiring.	
	Incorrect ignition timing	Reset timing.	IG-34, IG-49
	Ignition coil faulty	Inspect coil.	IG-10, IG-12
	Igniter faulty	Inspect igniter.	IG-3, IG-5
	Distributor faulty	Inspect distributor.	IG-12, IG-17
	Resistive cords faulty	Inspect resistive cords.	IG-7
Engine hesitation/poor acceleration	Spark plugs faulty	Inspect plugs.	IG-8
	Ignition wiring faulty	Inspect wiring.	
	Incorrect ignition timing	Reset timing.	IG-34, IG-49
Engine dieseling (Engine runs after ignition switch is turned OFF.)	Incorrect ignition timing	Reset timing.	IG-34, IG-49
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing.	IG-34, IG-49
Engine backfire	Incorrect ignition timing	Reset timing.	IG-34, IG-49
Poor fuel economy	Spark plugs faulty	Inspect plugs.	IG-8
	Incorrect ignition timing	Reset timing.	IG-34, IG-49
Engine overheating	Incorrect ignition timing	Reset timing.	IG-34, IG-49

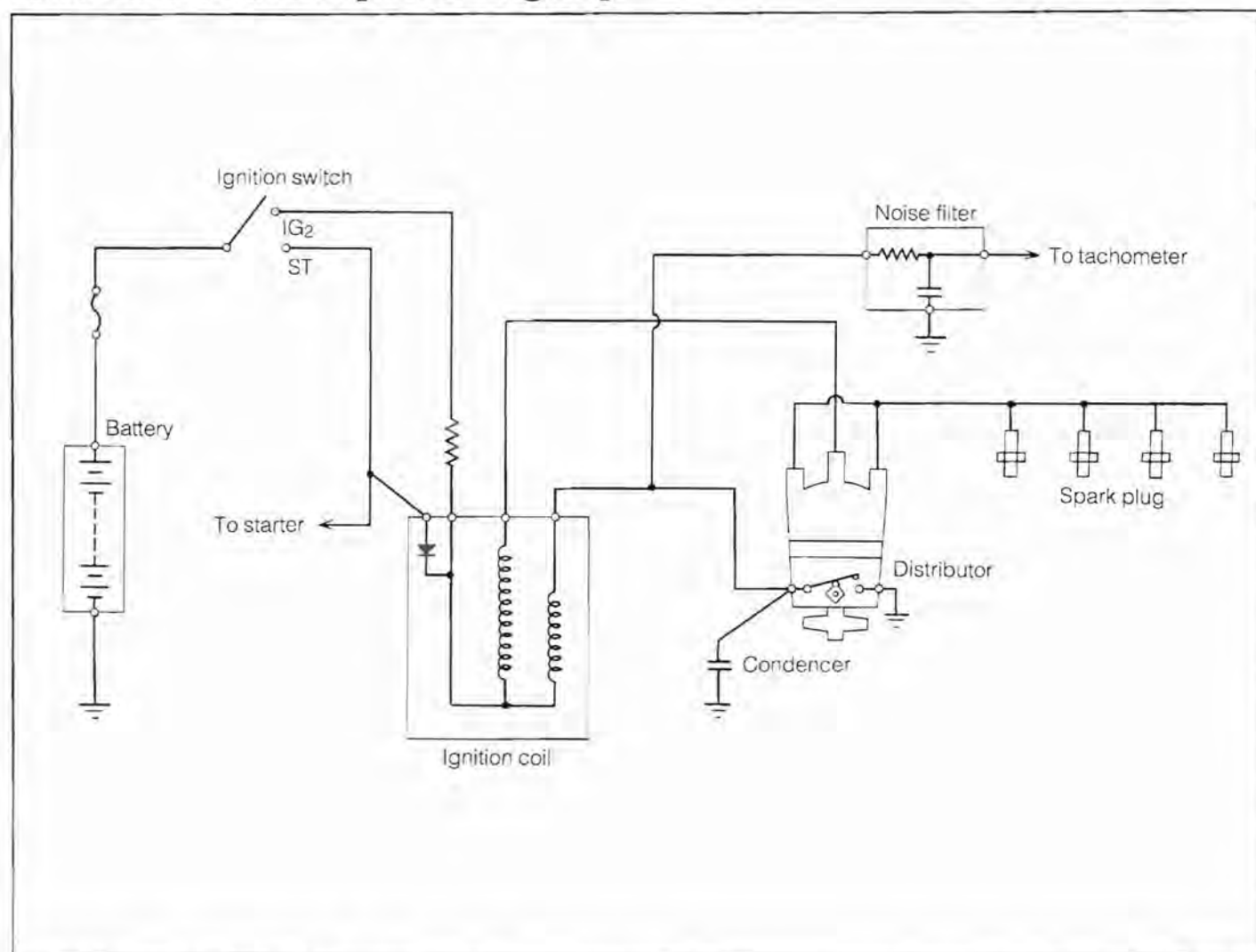
NOTE:

In the case of the HC-C engine mounted vehicle, "Incorrect ignition timing" includes an improper heel gap of the breaker points, roughness of the breaker point surfaces and so forth. It is, therefore, necessary to check these points along with the ignition timing.

(See page IG-13.)

WR88-IG003

IGNITION SYSTEM [HC-C Engine]



WR88-IG004

IN-VEHICLE INSPECTION

Spark Test

(Check as to whether spark occurs)

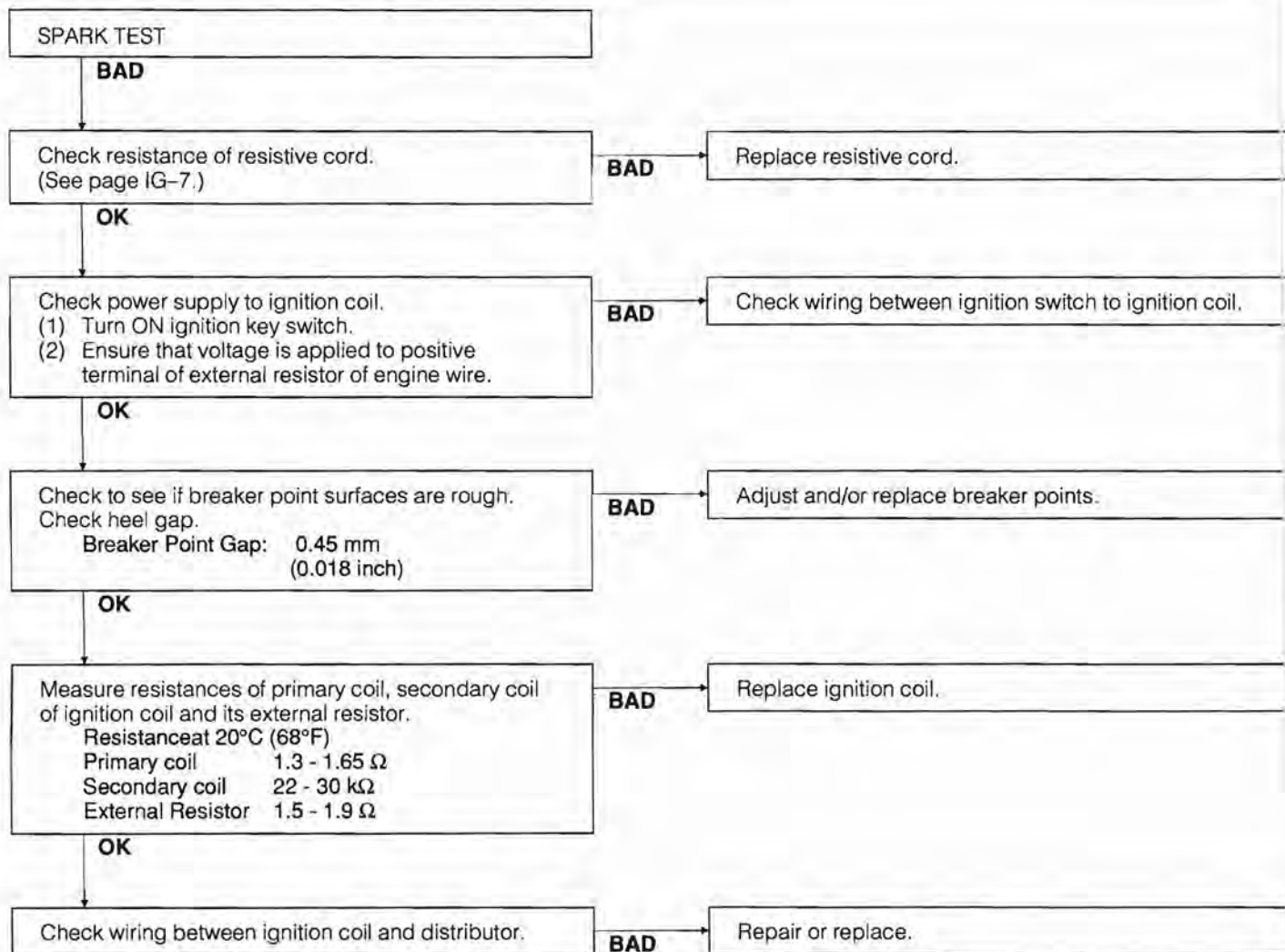
1. Connect a timing light onto the resistive cord between the distributor and the ignition coil.
2. Ensure that the timing light flashes when the engine is being cranked by means of the starter motor.

If the timing light flashes, proceed to the resistive cord check and spark plug check.

If the timing light fails to flash, perform the check in accordance with the flow chart in the next page.

WR88-IG006

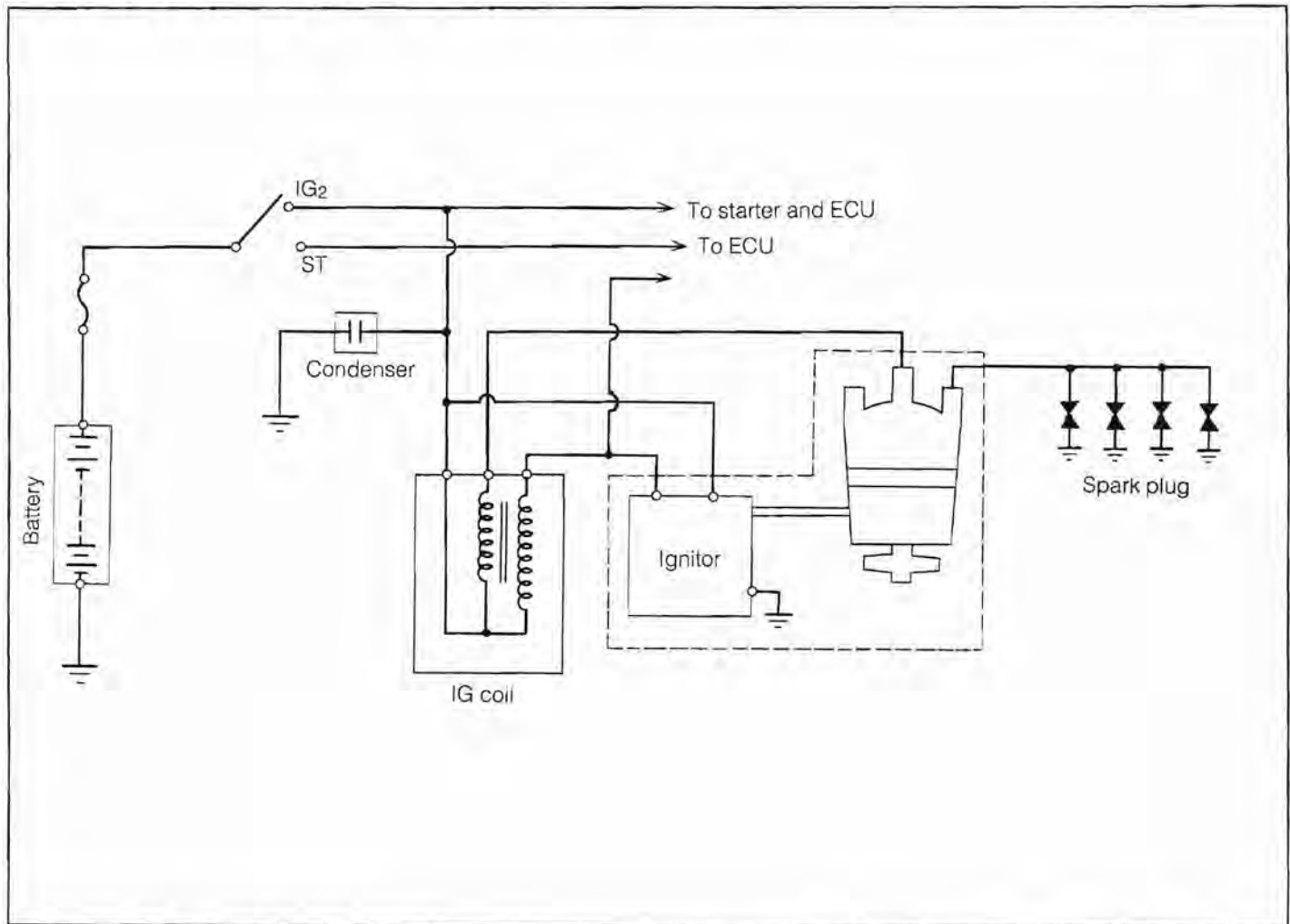
IGNITION SYSTEM



WR88-IG007

IGNITION SYSTEM [HC-E Engine]

IGNITION SYSTEM CIRCUIT



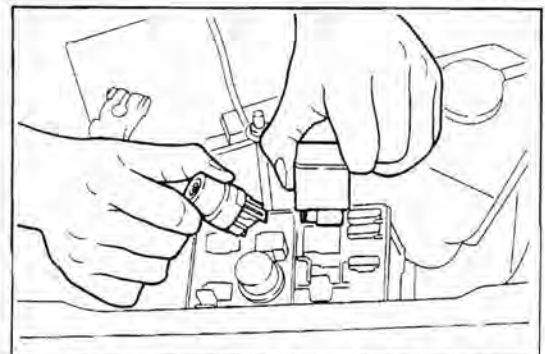
WR88-IG015

IN-VEHICLE INSPECTION

Spark test

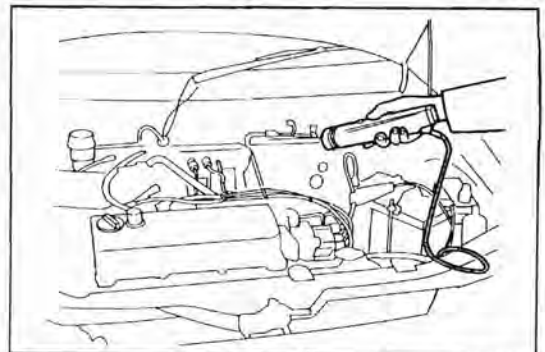
(Check to see if spark occurs)

1. Turn OFF the ignition key switch.
2. Disconnect the fuel pump relay and injector relay from the relay box.



WR88-IG016

3. Connect a timing light to the resistive cord between the distributor and the ignition coil.



WR88-IG017

IGNITION SYSTEM

4. Ensure that the timing light flashes while the engine is being cranked by the starter motor.

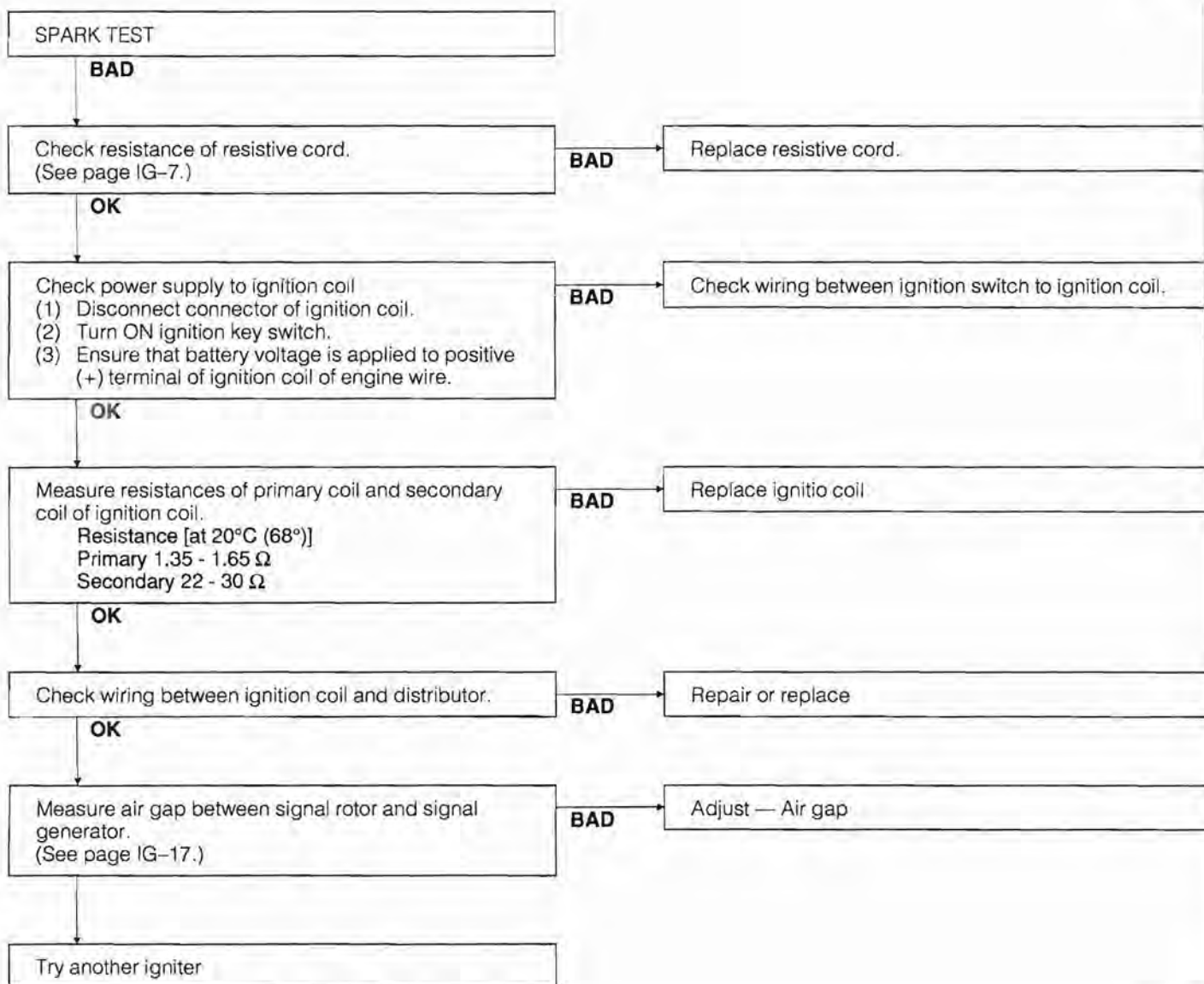
If the timing light flashes, check the resistive cord and spark plug.

If the timing light will not flash, perform the check according to the chart given below.

NOTE:

After completion of the inspection, reconnect the fuel pump relay and injector relay to the relay box.

WR88-IG018



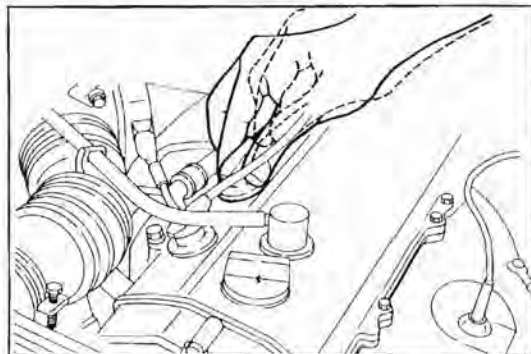
WR88-IG019

INSPECTION OF RESISTIVE CORDS

1. Carefully remove the resistive cords from the spark plugs and ignition coil by holding their rubber boots.

CAUTION:

Do not hold the cord portion or bend the cord. Otherwise, the conductor inside the cord may be damaged.



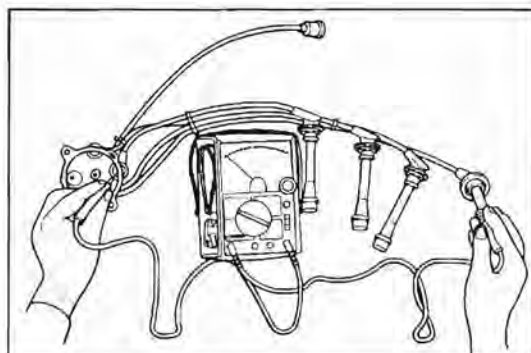
WR88-IG020

2. Disconnect the distributor connector from the connector clamp.
3. Remove the distributor cap.

WR88-IG021

4. Inspection of resistance of resistive cord and distributor cap terminal

Maximum resistance: 15 k Ω



WR88-IG022

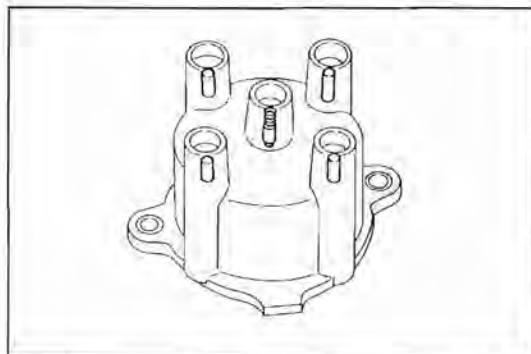
If the resistance exceeds the maximum limit, check the distributor cap terminals.

Replace the resistive cord and/or distributor cap, as required.

5. Install the distributor cap with distributor cap gasket interposed.

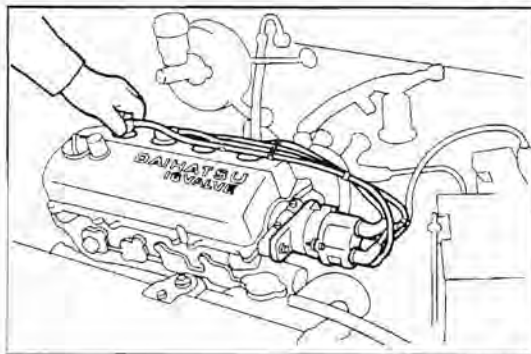
NOTE:

If the distributor gasket is damaged, replace it with a new one.



WR88-IG023

6. Connect the resistive cords to the spark plugs and ignition coil.

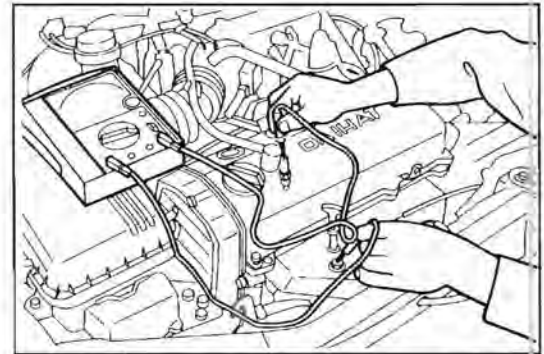


WR88-IG024

IGNITION SYSTEM

INSPECTION OF SPARK PLUG

1. Carefully remove the resistive cords from the spark plugs by holding their rubber boots.
2. Inspection of electrode
 - (1) When a megger (Insulation resistance meter) is used:
Measure the insulation resistance of the spark plug.
Minimum Insulation Resistance: 15 MΩ
If the measured insulation resistance is less than 15 MΩ, proceed to the step 3.



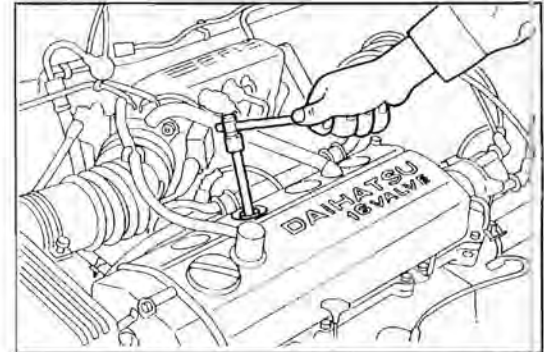
WR88-IG01/5

- (2) When a megger is not available:
 - ① Start the engine. Warm up the engine completely.
 - ② Race the engine at 4000 rpm for five seconds.
 - ③ Remove the spark plug, using the following SST.
SST: 09268-87703-000

CAUTION:

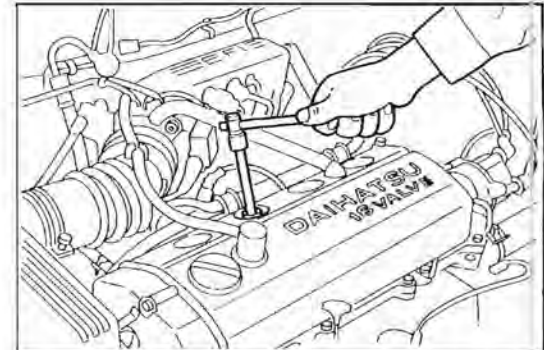
Since the spark plugs are hot, care must be exercised to avoid getting scalded.

- ④ Visually inspect the spark plug.
If the electrode is dry: Satisfactory
If the electrode is wet: Proceed to the step 4.



WR88-IG01/6

3. Removal of spark plug
Remove the spark plug, using the following SST.
SST: 09268-87703-000



WR88-IG01/7

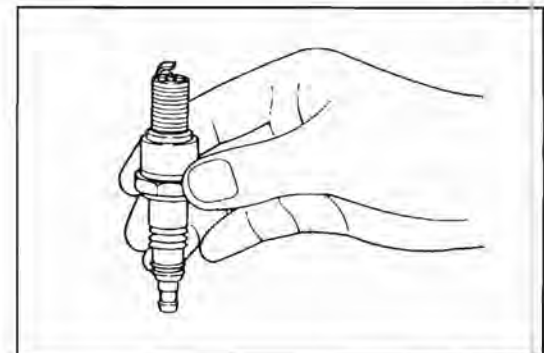
4. Visual inspection of spark plug
Visually inspect the spark plug for electrode wear, thread or insulator damage.
Replace the spark plug if it exhibits damage.

Recommended Spark Plug

	CHAMPION	NIPPON DENSO	NGK
HC-C	RC9YC4	K20PR-U11	BKR6E-11
HC-E	RC9YC4	K20PR-U11	BKR6E-11

NOTE:

All four spark plugs should have the same heat range and be ones manufactured by the same manufacturer.



WR88-IG01/8

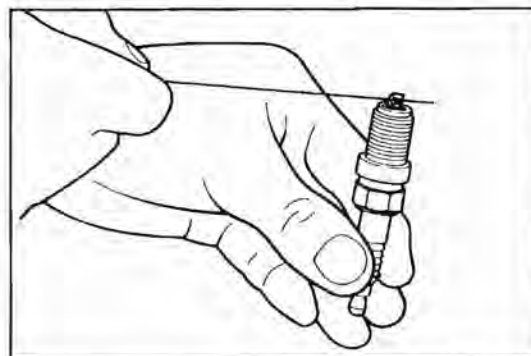
5. Inspection of electrode gap

Measure the electrode gap, using a plug gap gauge.

Electrode Gap: 1.0 - 1.1 mm (0.040 - 0.043 inch)

If the electrode gap of a used spark plug is not within the specification, replace the spark plug with a new one.

If the electrode gap of a new spark plug is not within the specification, adjust the gap by bending the base of the ground electrode, being careful not to touch the tip.



WR88-IG029

6. Cleaning of spark plug

If the electrode has traces of wet carbon, dry the electrode and clean it with a spark plug cleaner.

Air Pressure: Not to Exceed 6 kg/cm² (85 psi)

Duration: Less Than 20 Seconds

NOTE:

If there are traces of oil, remove it with gasoline before the spark plug is cleaned by the spark plug cleaner.

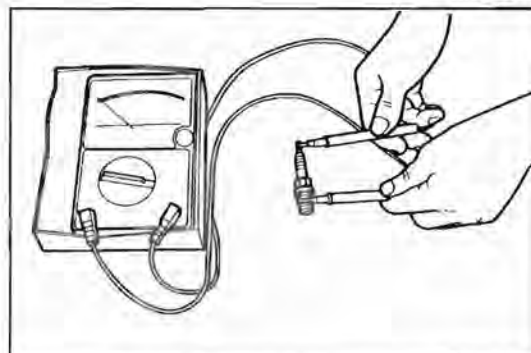


WR88-IG030

7. Inspection of spark plug insulation resistance

More Than 20 MΩ

If the insulation resistance is less than the specified value, replace the spark plug.



WR88-IG031

8. Installation of spark plug

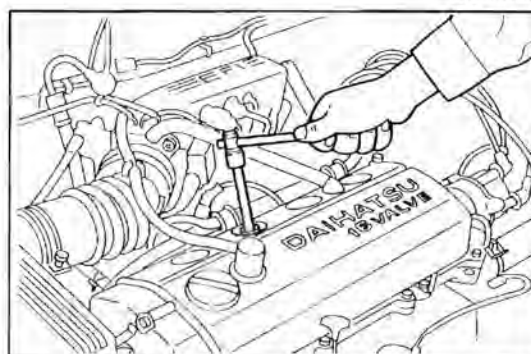
Install the spark plugs. Tighten them to the specified torque, using the following SST.

SST: 09268-87703-000

Tightening Torque: 1.5 - 2.2 kg-m (10.8- 15.9 ft-lb)

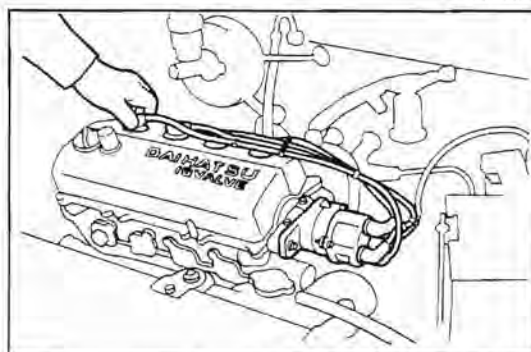
NOTE:

Since the insulator strength of a small spark plug is comparatively smaller than that of regular spark plugs, when tightening, be sure to use the tool exclusively used for this application. Also, when tightening, never use the wrench in a crooked way.



WR88-IG032

9. Connect the resistive cord to the spark plug.



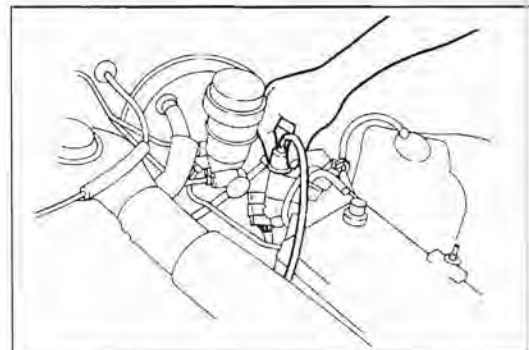
WR88-IG033

INSPECTION OF IGNITION COIL [HC-C engine]

1. Disconnect the resistive cord from the ignition coil.

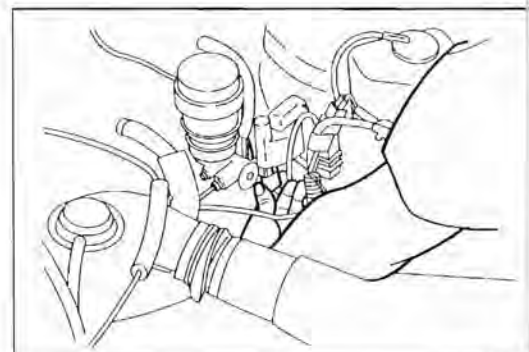
NOTE:

Do not hold the cord during the disconnection. Be sure to disconnect the cord by holding its rubber boot.



WR88-IG008

2. Disconnect the cowl wire connector from the ignition coil.



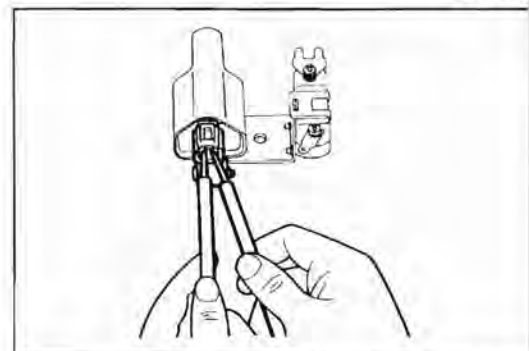
WR88-IG009

3. Check of primary coil resistance

Measure the resistance of the primary coil across the terminals of the ignition coil connector.

Primary Coil Resistance [at 20°C (68°F)]: 1.3 - 1.65 Ω

If the measured resistance fails to conform to the specification, replace the ignition coil.



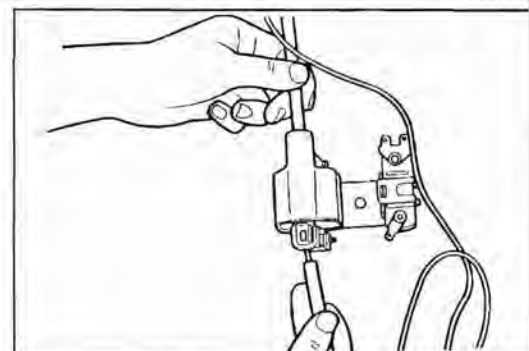
WR88-IG010

4. Check of secondary coil resistance

Measure the resistance of the secondary coil across the positive (+) terminal of the ignition coil and the resistive cord connecting terminal.

Secondary Coil Resistance [at 20°C (68°F)]: 22 - 30 k Ω

If the measured resistance fails to conform to the specification, replace the ignition coil.

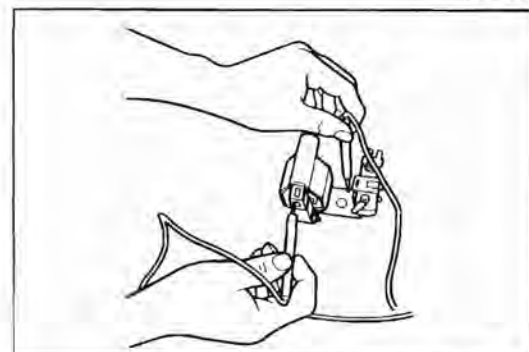


WR88-IG011

5. Check of insulation resistance

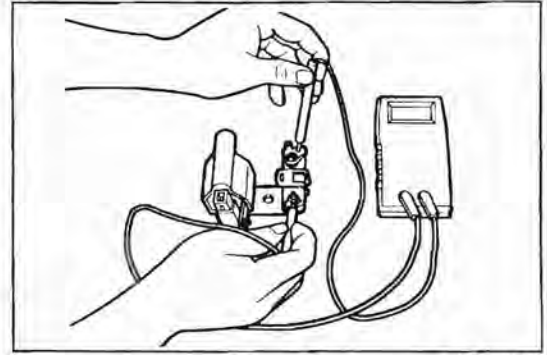
Ensure that no continuity exists between the positive and negative terminals of the ignition coil and the body ground. If continuity exists, replace the ignition coil.

Insulation resistance: More than 1000 k Ω
(Infinity)



WR88-IG012

6. Check of resistance of external resistor
Check to see if the resistance of the external resistor is within the specified range.
Resistance: 1.5 - 1.9 Ω
If the measured resistance fails to conform to the specification, replace the external resistor.



WR88-IG013

7. Connect the cowl wire connector to the ignition coil.
8. Connect the resistive cord to the ignition coil.

WR88-IG014

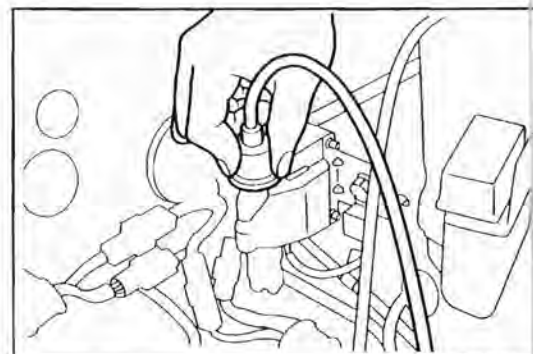
IGNITION SYSTEM

INSPECTION OF IGNITION COIL [HC-E engine]

1. Disconnect the resistive cord from the ignition coil.

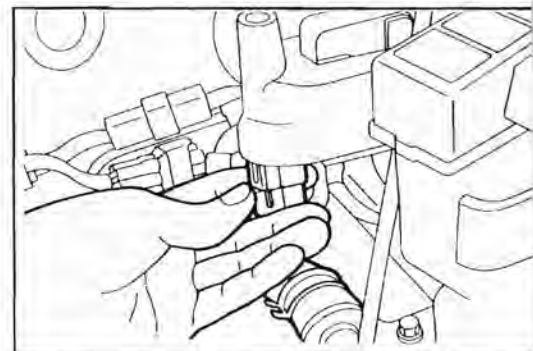
NOTE:

Do not hold the cord portion during disconnection. Be sure to disconnect the cord by holding the rubber boot.



WR88-IG024

2. Disconnect the cowl wire connector from the ignition coil.



WR88-IG035

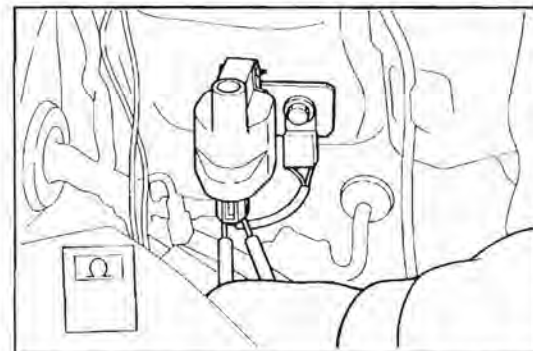
3. Check of primary coil resistance

Measure the resistance of the primary coil across the ignition coil terminals, as shown in the right figure.

Primary Coil Resistance at 20°C (68°F):

1.35 - 1.65 Ω

If the measured value fails to conform to the specification, replace the ignition coil.



WR88-IG036

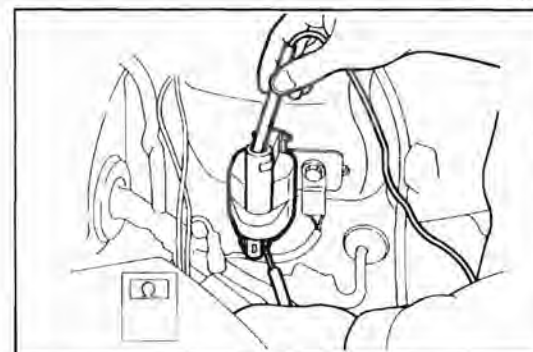
4. Check of secondary coil resistance

Measure the resistance of the secondary coil between the positive (+) terminal of the ignition coil and the resistive cord terminal, as shown in the right figure.

Secondary Coil Resistance at 20°C (68°F):

22 - 30 k Ω

If the measured value fails to conform to the specification, replace the ignition coil.



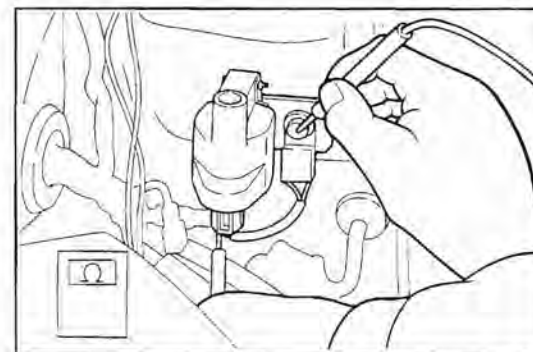
WR88-IG037

5. Check of insulation resistance

Measure the insulation resistance between positive (+) terminal of the ignition coil and coil case.

**Insulation resistance: More than 1000 k Ω
(Infinity)**

If the measured value fails to conform to the specification, replace the ignition coil.



WR88-IG038

6. Connect the cowl wire connector to the ignition coil.
7. Connect the resistive cords to the ignition coil.

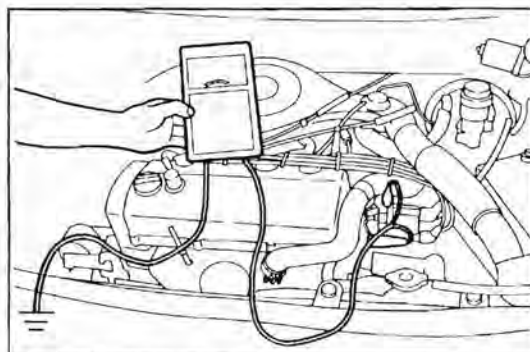
WR88-IG040

INSPECTION OF DISTRIBUTOR [HC-C engine]

1. Check of dwell angle
Connect the dwell angle tester to the distributor. Measure the dwell angle.

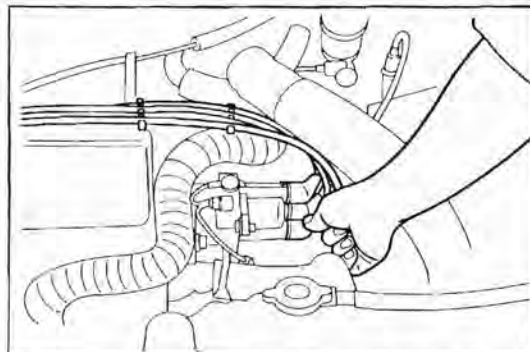
Dwell Angle: $52^{\circ} \pm 3^{\circ}$

If the dwell angle fails to conform to the specified value, check the heel gap.



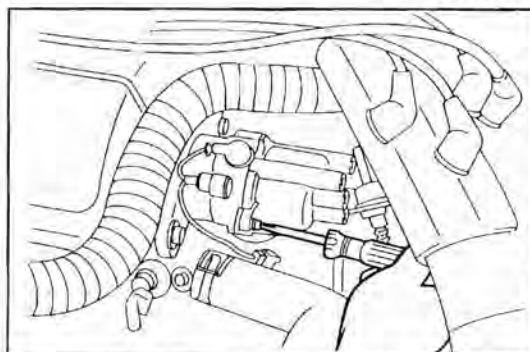
WR88-IG041A

2. Check of breaker point surfaces
(1) Remove the resistive cords from the distributor cap.



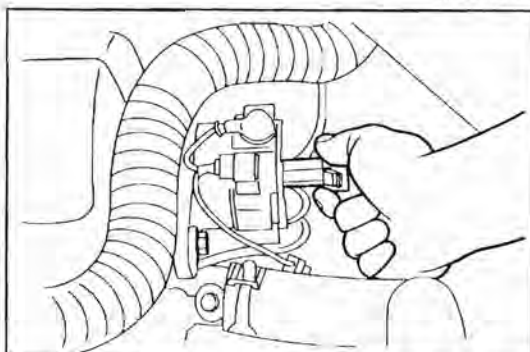
WR88-IG041B

- (2) Remove the distributor cap.



WR88-IG041C

- (3) Remove the rotor.



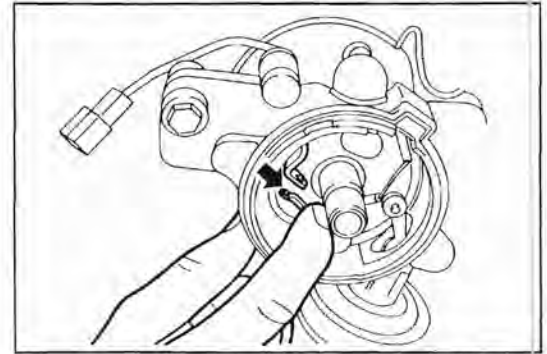
WR88-IG041D

IGNITION SYSTEM

- (4) Check of breaker point surfaces
Ensure that the breaker point surfaces exhibit no roughness and damage.
Replace the breaker points if they exhibit roughness or damage.

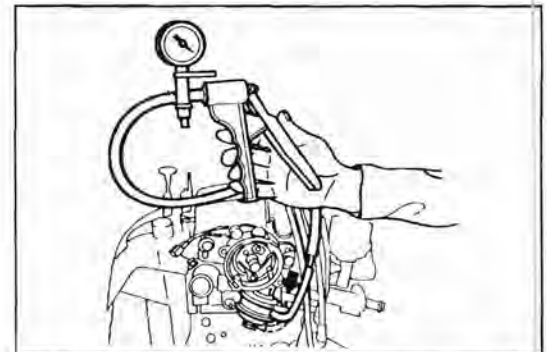
NOTE:

- Do not touch the point surfaces.
- Do not correct the point surfaces.



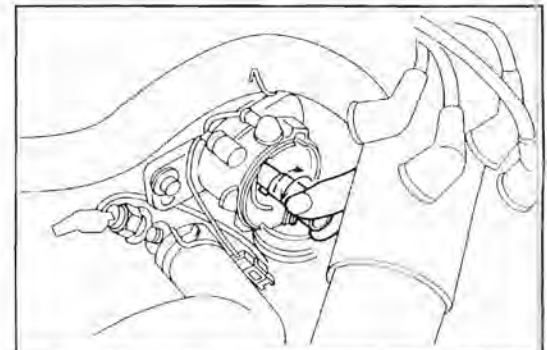
WR88-IG042

2. Check of vacuum advancer
- (1) Disconnect the vacuum hoses from the vacuum advancer.
- (2) Apply a negative pressure of more than 150 mmHg. Ensure that the vacuum advancer operates.
Repair or replace the vacuum advancer, as required, if it will not operate.
- (3) Connect the disconnected vacuum hoses to the vacuum advancer.



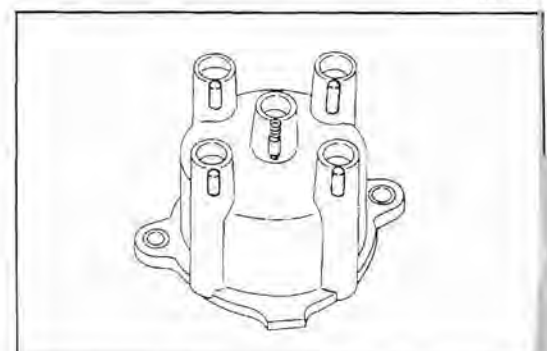
WR88-IG043

3. Check of governor advancer
- (1) Install the rotor to the distributor.
- (2) Turn the rotor counterclockwise and release it. Ensure that the rotor returns clockwise rapidly.
Repair or replace the rotor, as required, if it will not return to the original point.
- (3) Check the rotor for excessive play.
Repair or replace the rotor, as required, if it exhibits excessive play.



WR88-IG044

4. Check of distributor cap
- Check the distributor cap for cracks. Also, check its electrode center carbon for wear or damage, etc.
If any damage, etc. is present, replace the distributor cap.

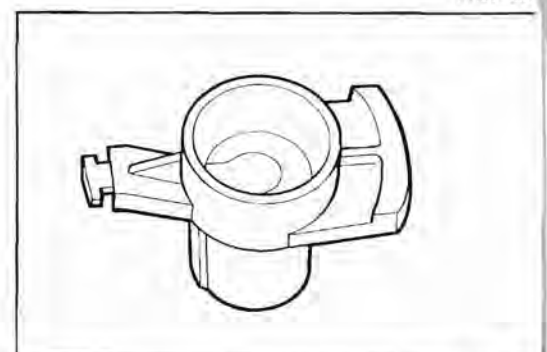


WR88-IG045

5. Check of rotor
- Check to see if the rotor exhibits any wear, electrolytic corrosion and cracks, etc. at the center carbon contact surface and electrode.
- If any damage is present, replace the rotor, as required.
6. Install the rotor on the distributor camshaft.
7. Install the distributor cap.

NOTE:

If the distributor cap gasket exhibits damage, replace the gasket with a new one.



WR88-IG046

8. Connect the resistive cords to the distributor cap.

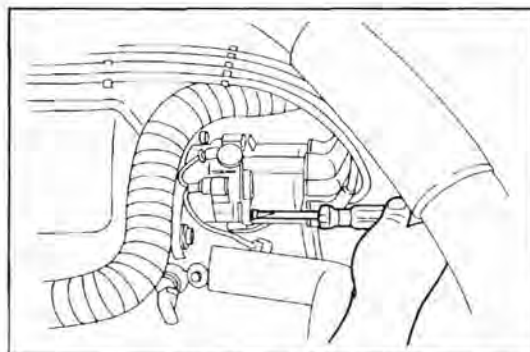
WR88-IG047

REPLACEMENT OF BREAKER POINT [HC-C engine]

NOTE:

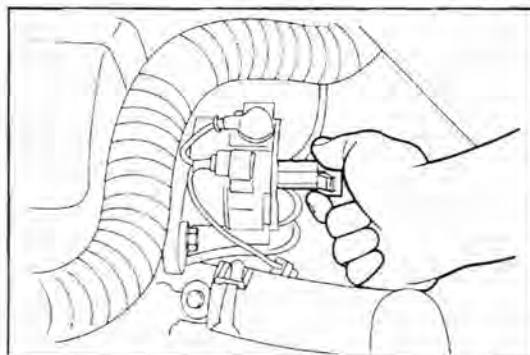
- Be very careful not to scratch the breaker point surfaces nor to allow oil to get to the breaker point surfaces.

1. Remove the distributor cap.
(Keep the resistive cords connected.)



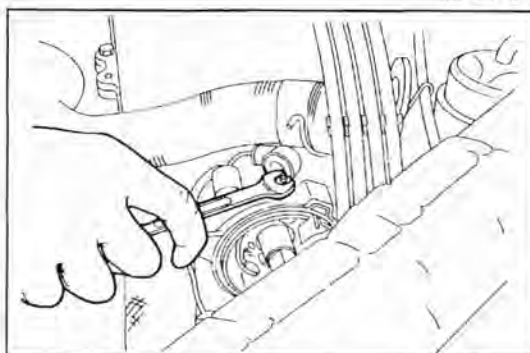
WR88-IG048A

2. Remove the rotor.



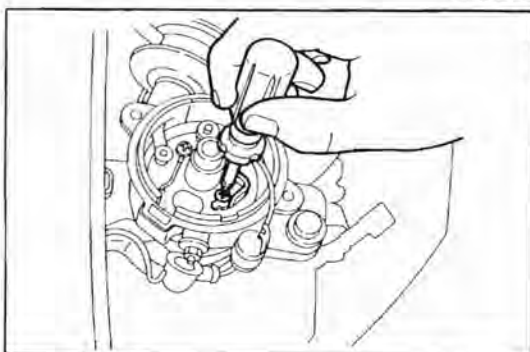
WR88-IG048B

3. Removal of breaker points
(1) Remove the lead wire of the breaker points.



WR88-IG049

- (2) Remove the breaker points by removing the attaching screws.

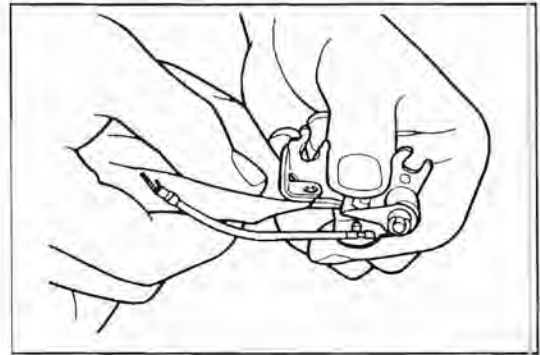


WR88-IG050

IGNITION SYSTEM

4. Installation of breaker points

- (1) Clean the point surfaces of new breaker points with a soft cloth damped with solvent and dry them.
- (2) Apply high-temperature grease to the heel section of the breaker points.

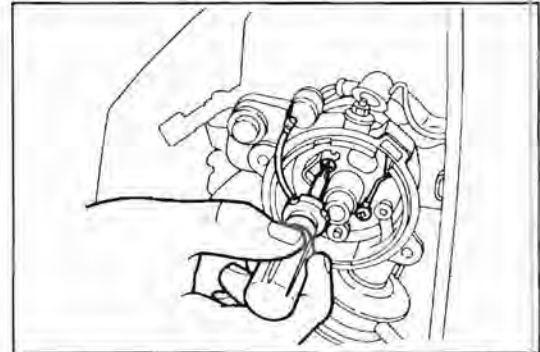


WR88-IG051A

- (3) Install the breaker points to the stationary plate together with the lead wire. Temporarily tighten the attaching screws.

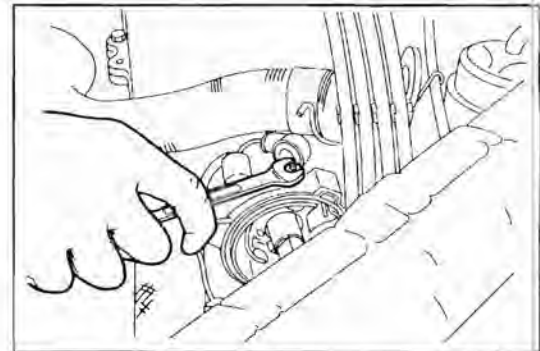
NOTE:

The lead wire terminal should be installed between the breaker points and the screw.



WR88-IG051B

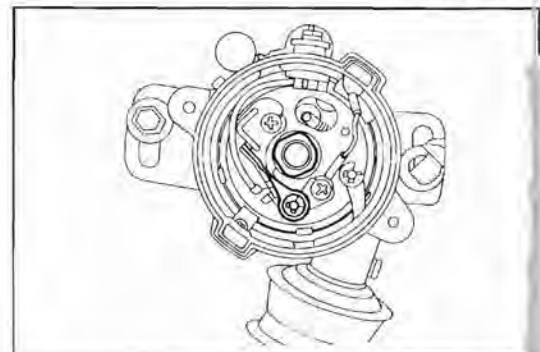
- (4) Connect the lead wire of the breaker points to the terminal. Tighten the nut.



WR88-IG051C

5. Adjustment of heel gap

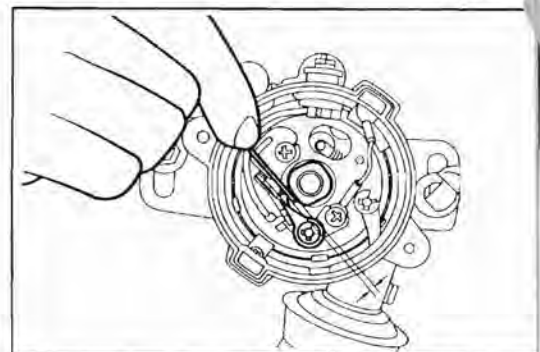
- (1) Rotate the crankshaft until the distributor cam comes to the point shown in the right figure.



WR88-IG05

- (2) Adjust the heel gap in such a way that the clearance between the cam and the heel conforms to the specified value, using a filler gauge or a thickness gauge.

Heel Gap: 0.45 mm (0.018 inch)



WR88-IG052B

6. Install the rotor to the distributor camshaft.
7. Install the distributor cap to the distributor.

NOTE:

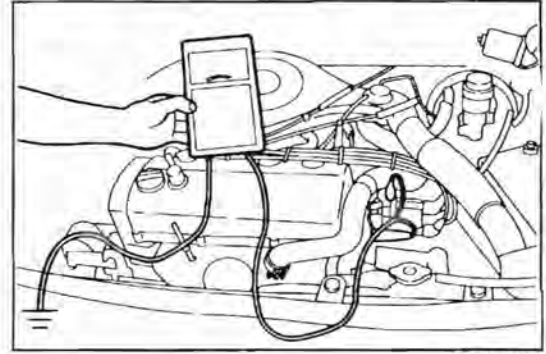
Replace the cap gasket with a new part if it exhibits damage.

8. Check and adjustment of dwell angle
Connect the dwell angle tester. Check to see if the dwell angle conforms to the specified value.

Dwell Angle: $52^{\circ} \pm 3^{\circ}$

Reduce the heel gap if the dwell angle is more than the specified value. Increase the heel gap if the dwell angle is less than the specified value.

9. Perform the ignition timing adjustment.
(See page IG-34.)

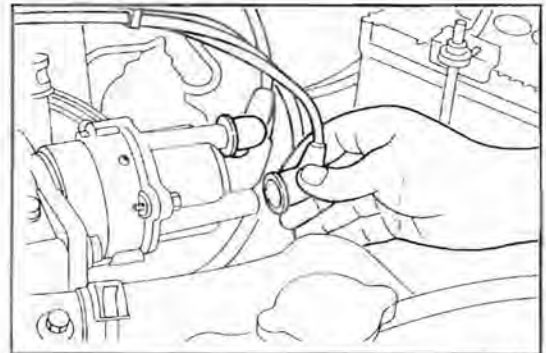


WR88-IG053

INSPECTION OF DISTRIBUTOR [HC-E engine]

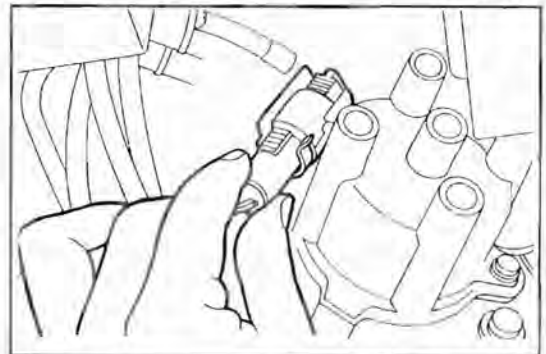
Check and Adjustment of Air Gap

1. Remove the resistive cord from the distributor cap.



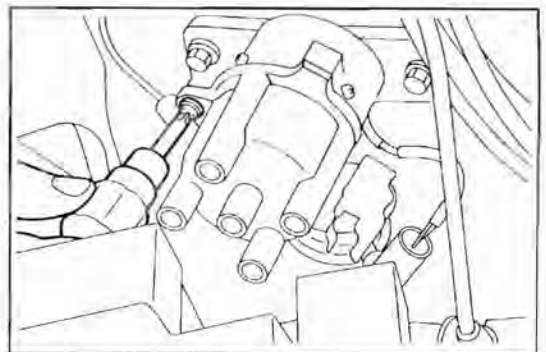
WR88-IG054

2. Remove the distributor connector from the clamp.



WR88-IG055

3. Remove the distributor cap.



WR88-IG056

IGNITION SYSTEM

4. Check of vacuum advancer

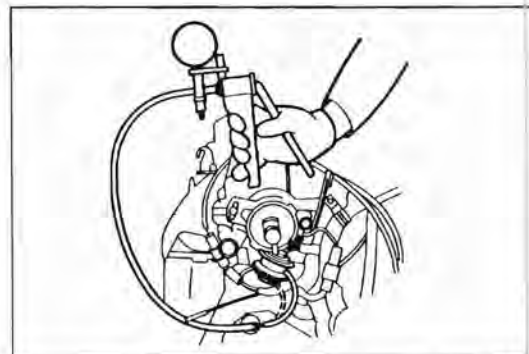
- (1) Disconnect the vacuum hoses from the vacuum advancer.

- (2) Apply a negative pressure of more than 150 mmHg (7.87 inchHg).

Ensure that vacuum advancer operates.

Repair or replace the vacuum advancer, as required, if it will not operate.

- (3) Connect the disconnected vacuum hoses to the vacuum advancer.



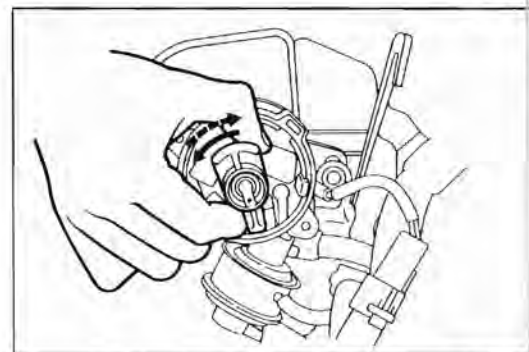
WR88-IG057

5. Check of governor advancer

- (1) Turn the rotor clockwise and release it. Ensure that the rotor returns counterclockwise rapidly.

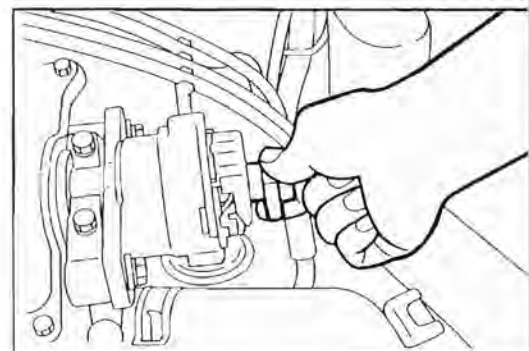
Repair or replace the rotor, as required, if it will not return to the original position.

- (2) Check the rotor for excessive play.



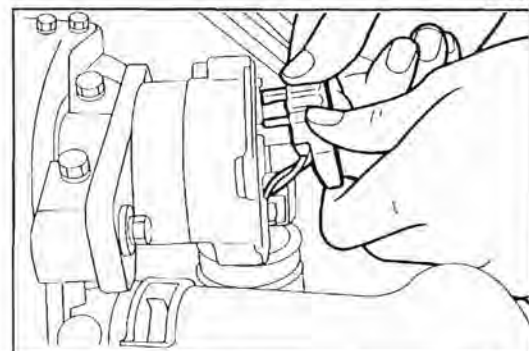
WR88-IG058

6. Pull out the rotor.



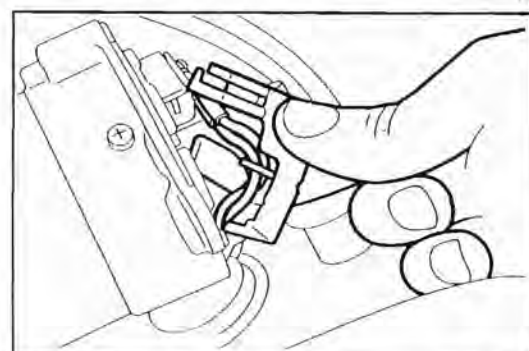
WR88-IG059

7. Remove the lock, being very careful not to damage the ignitor dust-proof cover. Then, pull out the wire from the signal generator, making sure that no damage is made to the wire.



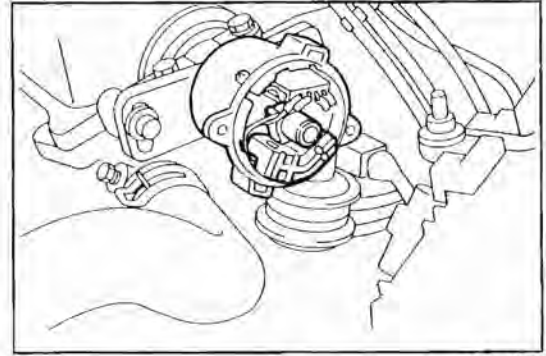
WR88-IG060

8. From the dust-proof cover, remove the wire led from the signal generator. Be very careful not to damage the wire.



WR88-IG061

9. Turn the crankshaft until the signal generator faces toward the signal rotor.

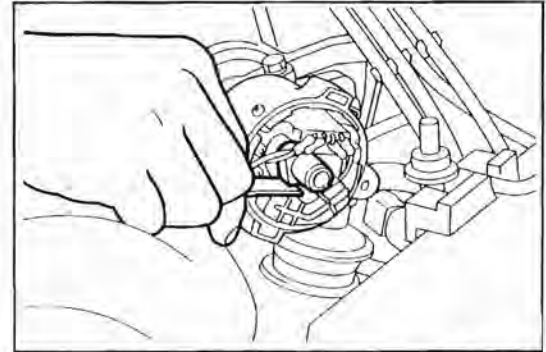


WR88-IG062

10. At all four points check to see if the air gap between the signal generator and the signal rotor conforms to the specified value.

Specified Gap: 0.2 - 0.4 mm (0.0079 - 0.015 inch)

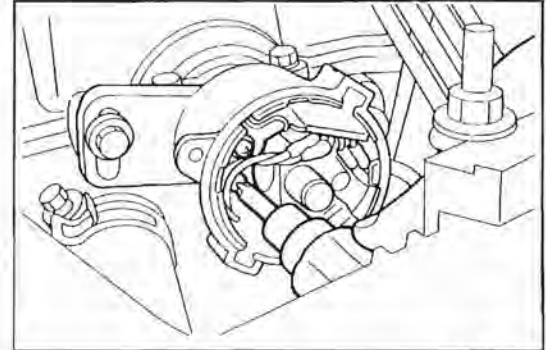
If the air gap fails to conform to the specified value, adjust the air gap.



WR88-IG063

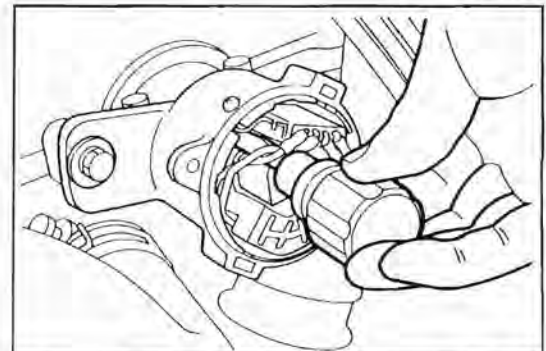
11. Adjustment of air gap

(1) Loosen the attaching screws of the signal generator.



WR88-IG064

(2) Adjust the air gap between the signal generator and the signal rotor to the specified value.



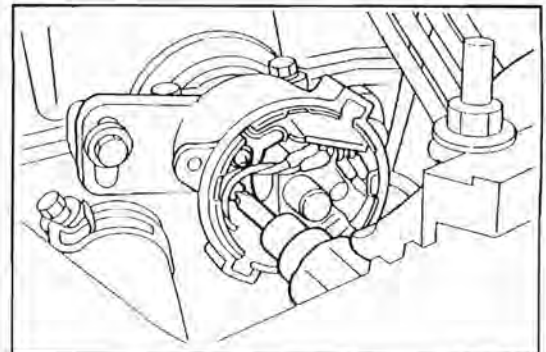
WR88-IG065

(3) Tighten the attaching screws of the signal generator.

NOTE:

Tighten the screws as tight as possible, while not damaging them.

Specified Value: 12 - 21 kg-cm (10.4 - 18.2 inch-lb)



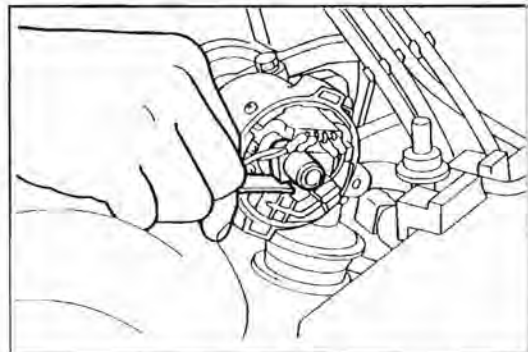
WR88-IG066

IGNITION SYSTEM

- (4) Check the air gap.

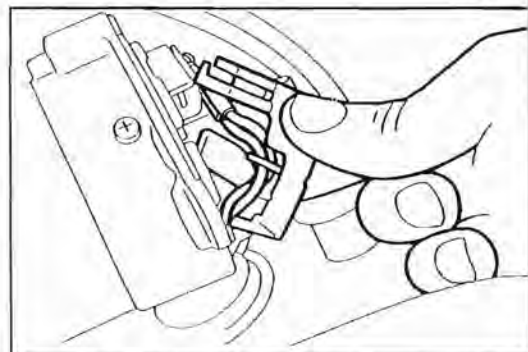
Specified Value: 0.2 - 0.4 mm (0.0079 - 0.015 inch)

If the air gap fails to conform to the specified value, adjust the air gap again.



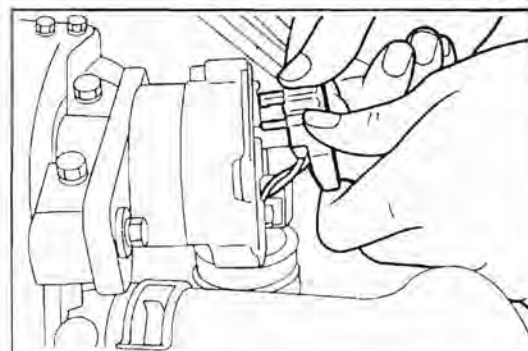
WR88-IG067

12. Install the wire from the signal generator to the dust-proof cover.



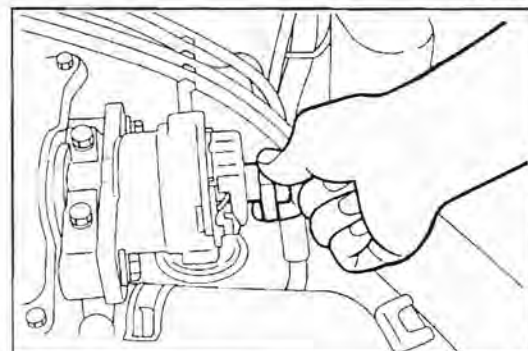
WR88-IG068

13. Install the dust-proof cover to the ignitor.



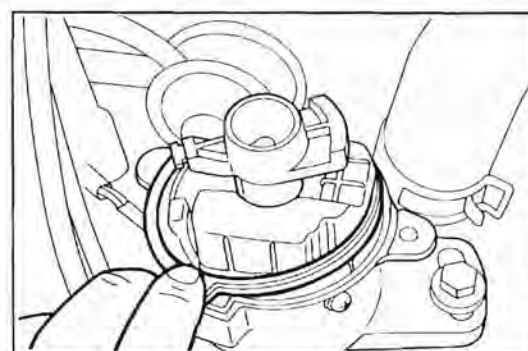
WR88-IG069

14. Install the rotor.



WR88-IG070

15. Check the distributor cap gasket for cracks or damage.
If it exhibits cracks or damage, replace the gasket with new one.

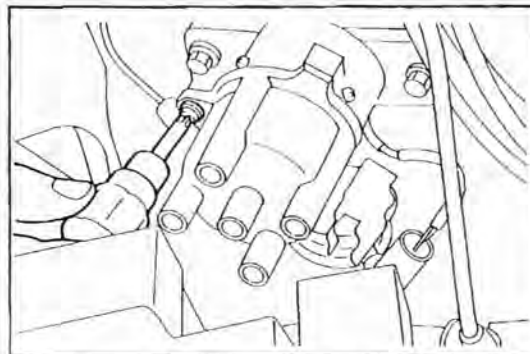


WR88-IG071

16. Install the distributor cap gasket.

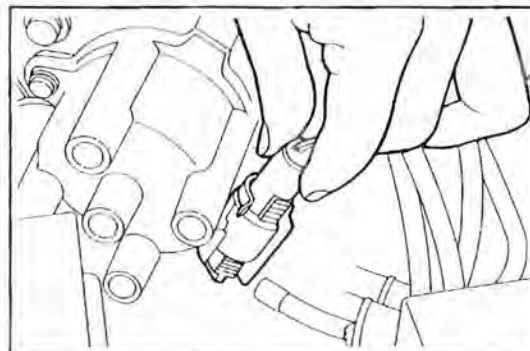
NOTE:

Tighten the distributor connector clamp, too, at the vacuum
advancer side.



WR88-IG072

17. Connect the distributor connector. Install it to the clamp.

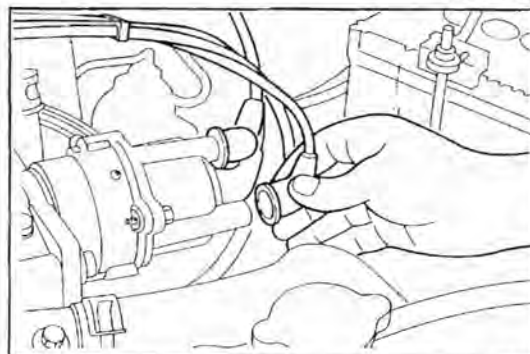


WR88-IG073

18. Connect the resistive cord to the distributor cap.

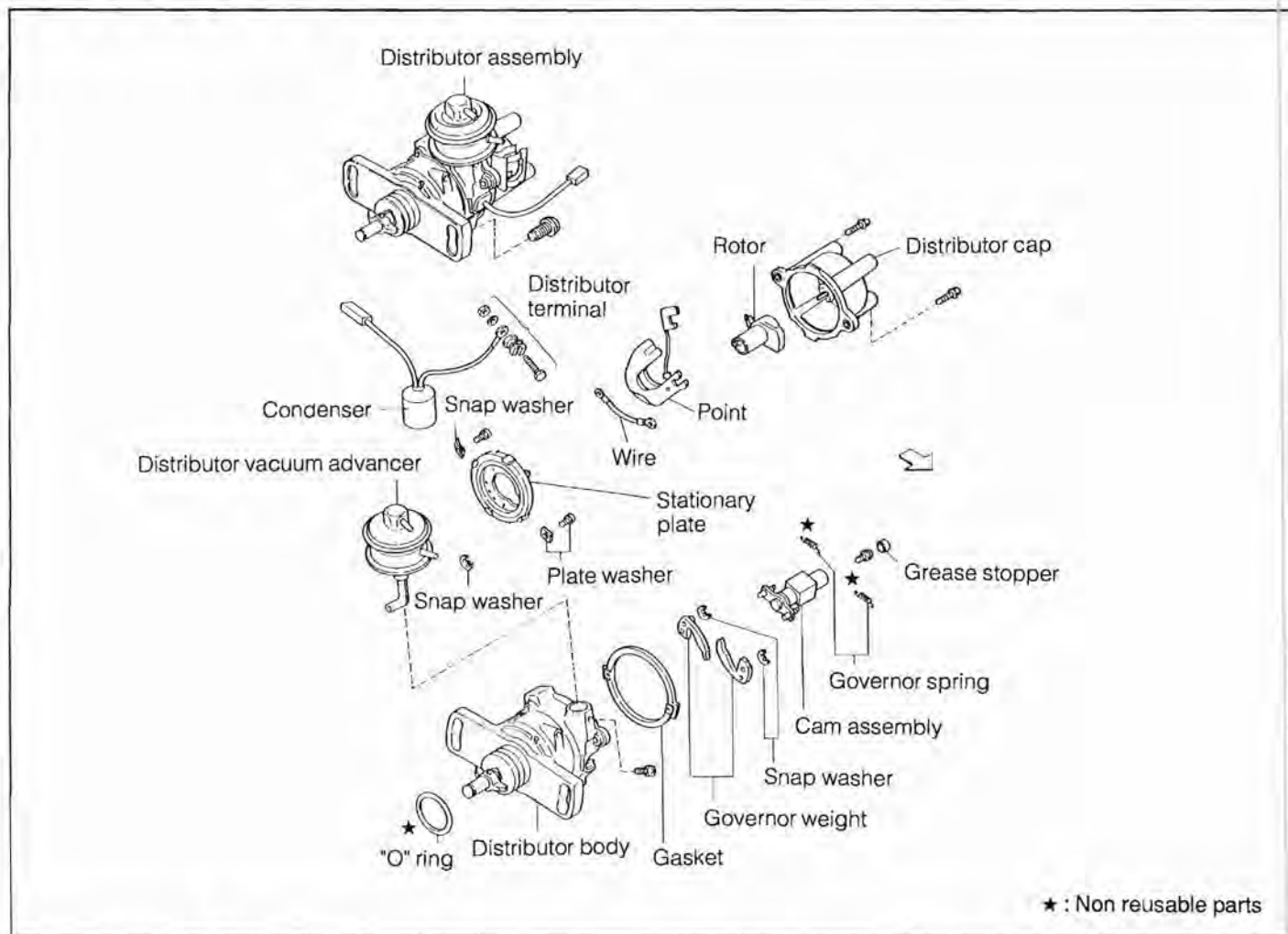
19. Perform the ignition timing adjustment.

(See page IG-49.)



WR88-IG074

DISTRIBUTOR [HC-C Engine] COMPONENTS



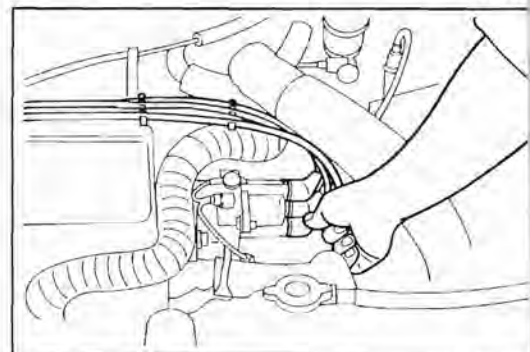
WR88-IG015

REMOVAL OF DISTRIBUTOR

1. Disconnect the battery ground cable from the negative terminal of the battery.
2. Disconnect the resistive cords from the distributor cap.

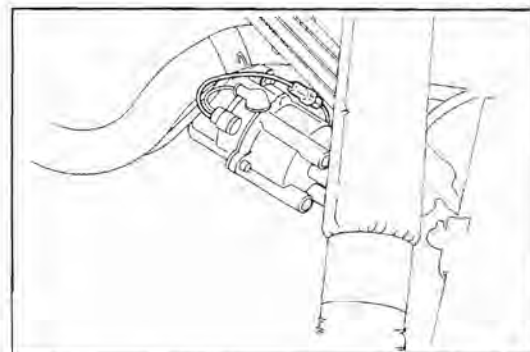
NOTE:

Do not hold the cord during disconnection. Be sure to disconnect the cord by holding the rubber boot.



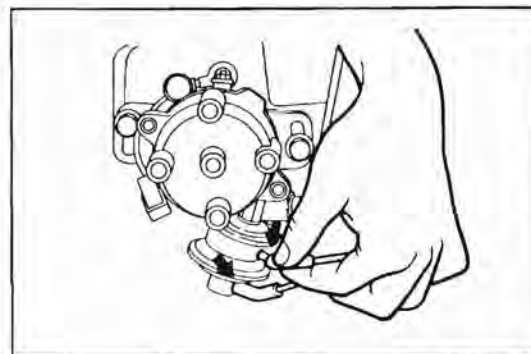
WR88-IG076A

3. Disconnect the distributor connector.



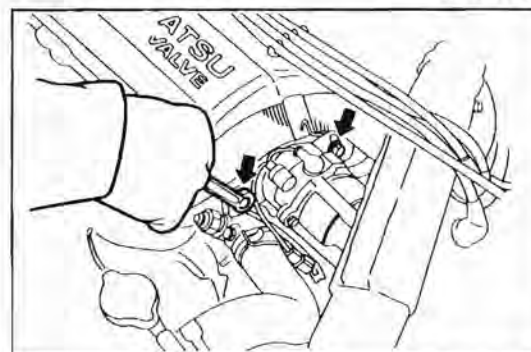
WR88-IG076

4. Disconnect the vacuum advancer hoses.
NOTE:
 Prior to the disconnection, put a tag so that the original installation position may be identified readily.



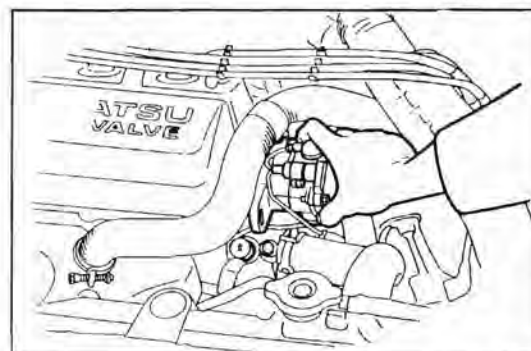
WR88-IG077A

5. Remove the distributor set bolt.



WR88-IG077B

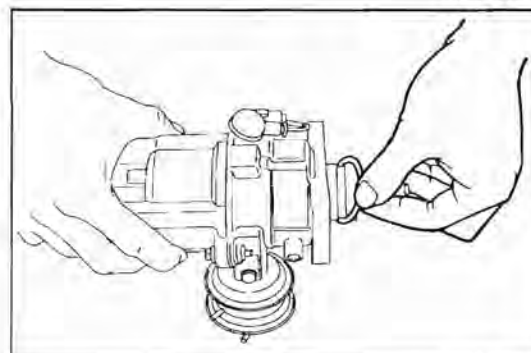
6. Pull out the distributor from the cylinder head.
NOTE:
 Since the engine oil flows out, insert a suitable cloth under the distributor connecting section.



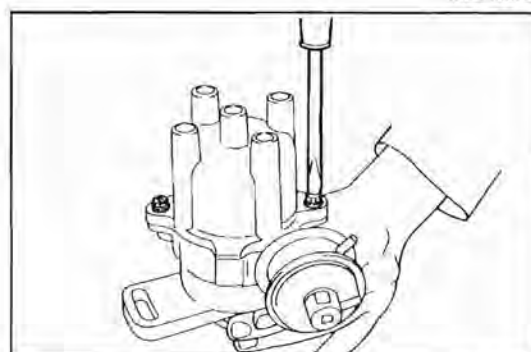
WR88-IG077C

DISASSEMBLY OF DISTRIBUTOR

1. Remove the "O" ring from the distributor housing.
2. Remove the distributor cap from the distributor housing.



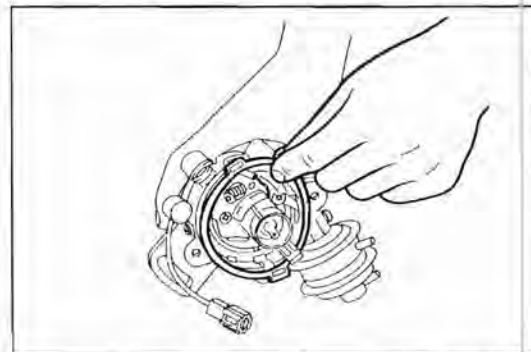
WR88-IG078A



WR88-IG078B

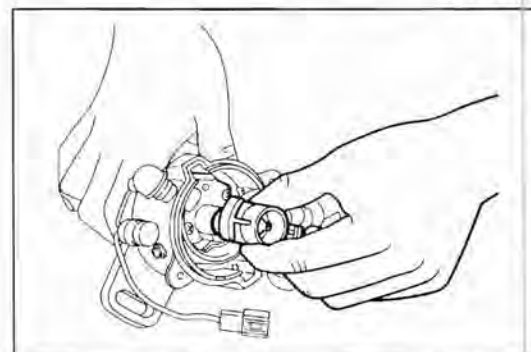
IGNITION SYSTEM

3. Remove the distributor cap gasket.



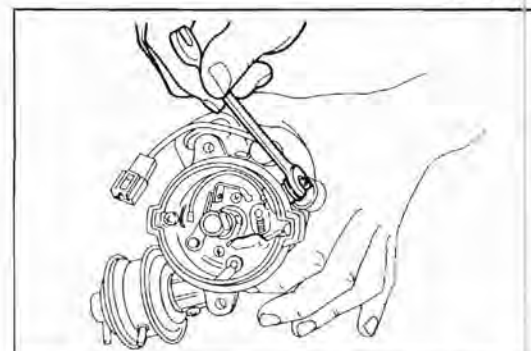
WR88-IG079C

4. Remove the rotor.



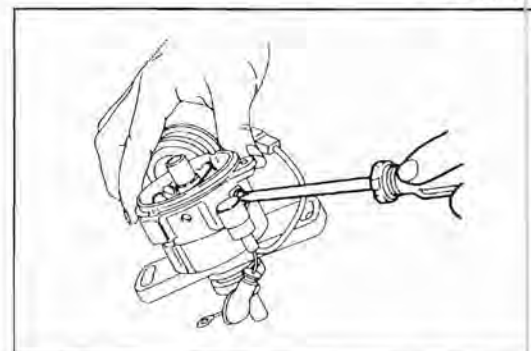
WR88-IG079D

5. Remove the terminal nut. Remove the lead wire of the condenser, insulator and terminal.



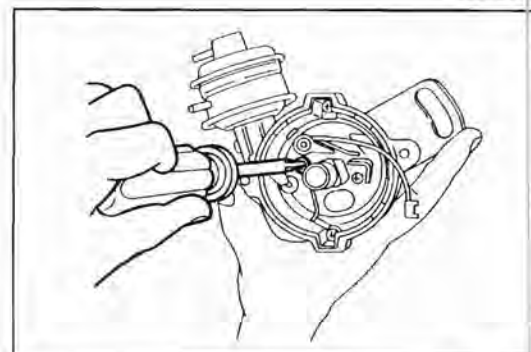
WR88-IG079E

6. Remove the condenser.



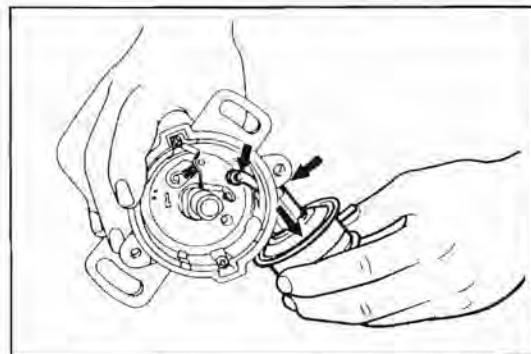
WR88-IG079A

7. Remove the two screws and breaker points.



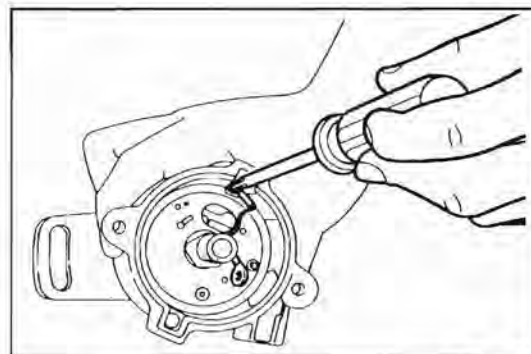
WR88-IG079B

8. Removal of vacuum advancer
 - (1) Remove the vacuum advancer attaching screws.
 - (2) Remove the snap washer.
 - (3) Remove the vacuum advancer from the pin of the stationary plate. Pull out the vacuum advancer from the distributor housing.



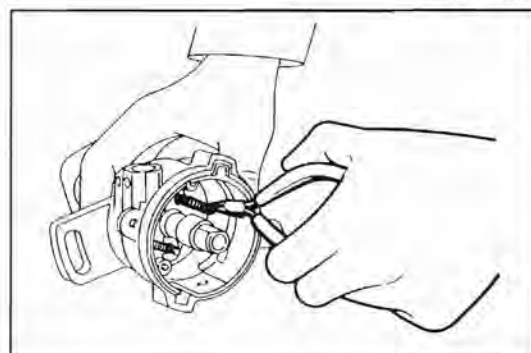
WR88-IG080

9. Remove the stationary plate as follows:
 - (1) Remove the two screws, ground wire and plate washers.
 - (2) Remove the stationary plate.



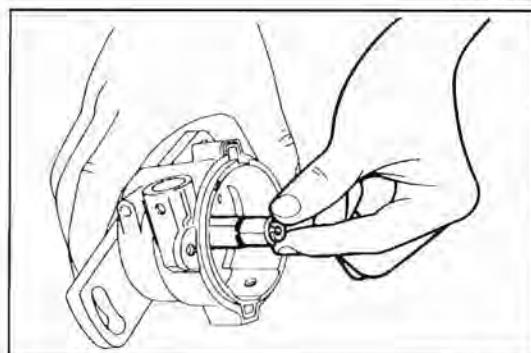
WR88-IG081

10. Removal of cam assembly
 - (1) Remove the governor springs.



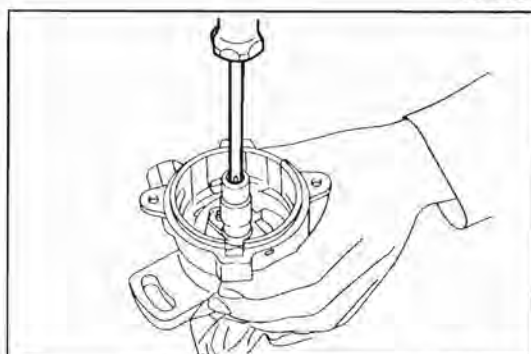
WR88-IG082

- (2) Remove the grease stopper.



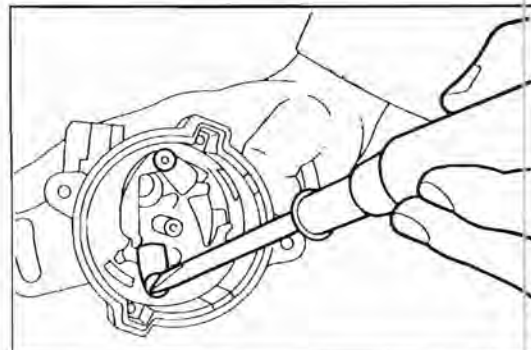
WR88-IG083A

- (3) Remove the cam assembly by removing the cam assembly set screw.



WR88-IG083B

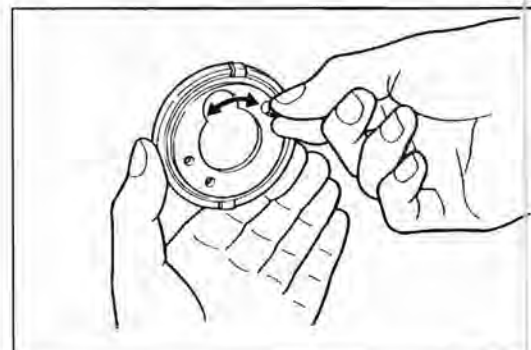
11. Remove the snap washer for the governor weight. Remove the governor weight.



WR88-IG033

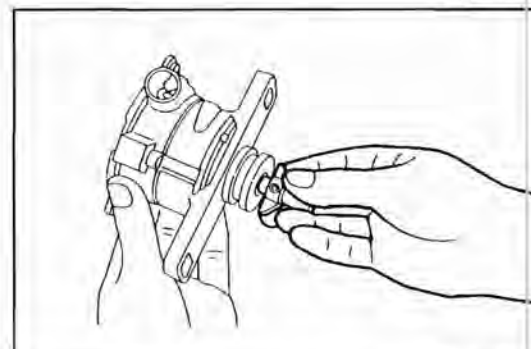
INSPECTION OF DISTRIBUTOR COMPONENTS

1. Inspection of stationary plate
Check to see if the stationary inner plate rotates on the outer plate smoothly.
Replace the stationary plate if it will not rotate smoothly.



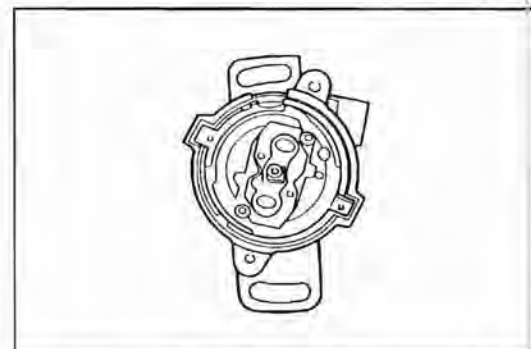
WR88-IG034

2. Inspection of distributor housing
 - (1) Check to see if the governor shaft rotates smoothly.
Replace the distributor housing if it will not rotate smoothly.



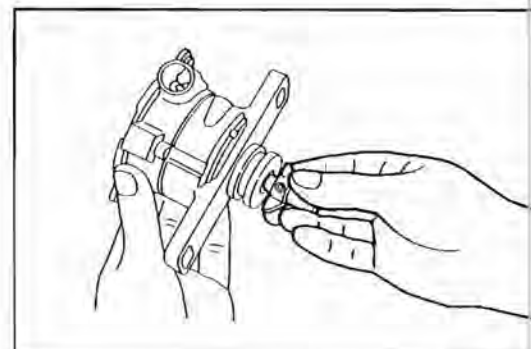
WR88-IG035

- (2) Check the governor weight sliding section for wear and damage.
Replace the distributor housing if the sliding section exhibits wear or damage.



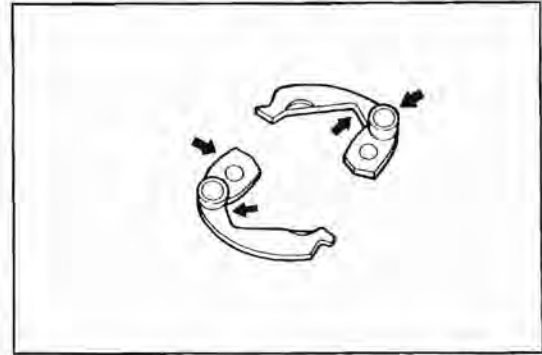
WR88-IG036

- (3) Check the coupling section of the governor shaft for wear and damage. Also, check to see if any excessive play is present in the turning direction.
Replace the distributor housing if the coupling section exhibits wear, damage and/or excessive play in the turning direction.



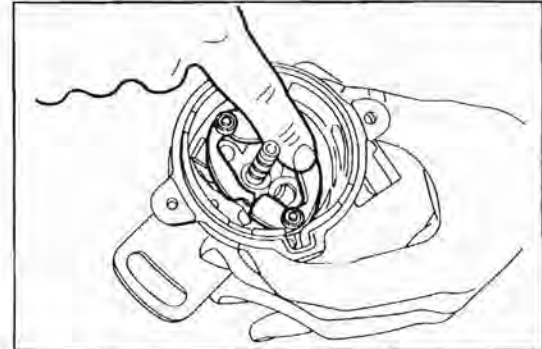
WR88-IG037

3. Inspection of governor weight for damage or wear
 - (1) Visually inspect the governor weight for damage and wear.
Replace the governor weight if it exhibits damage or wear.



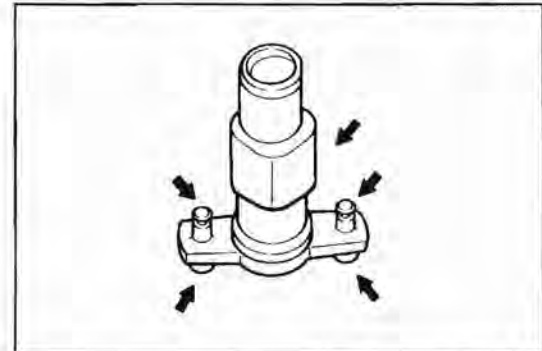
WR88-IG088

- (2) Install the governor weight to the governor shaft. Check to see if any excessive play is present between the governor weight and the governor shaft.
Replace the governor weight and/or distributor housing, as required, if excessive play is present.



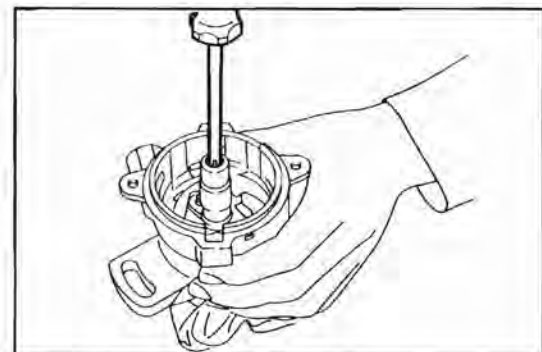
WR88-IG089

4. Inspection of cam assembly
 - (1) Visually inspect the cam for damage.
Replace the signal rotor assembly if it exhibits damage.
 - (2) Check the pin section of the cam assembly for wear or damage.
Replace the signal rotor assembly if the pin section exhibits wear or damage.



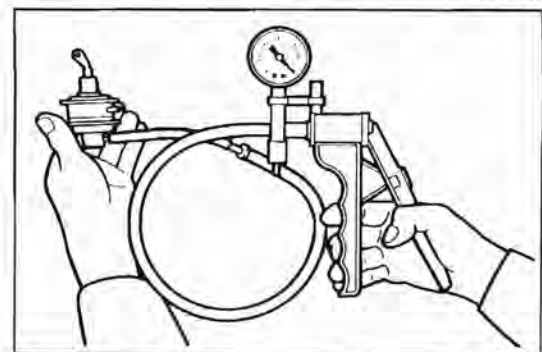
WR88-IG090

- (3) Install the cam assembly to the governor shaft temporarily. Check to see if the cam is tilted.
Replace the cam assembly and/or distributor housing if the cam is tilted.



WR88-IG092

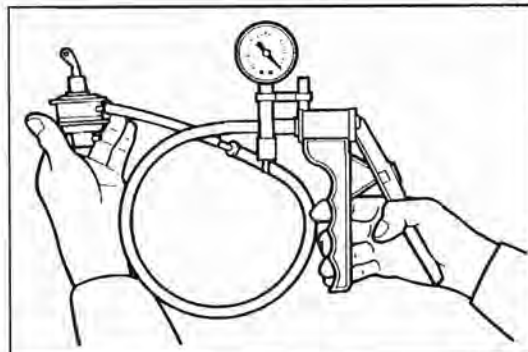
5. Inspection of vacuum advancer
 - (1) Gradually apply a negative pressure to the main diaphragm of the vacuum advancer. Ensure that the rod of the vacuum advancer is drawn into the diaphragm room side, corresponding to the negative pressure.
Replace the vacuum advancer if the rod will not be drawn.



WR88-IG093

IGNITION SYSTEM

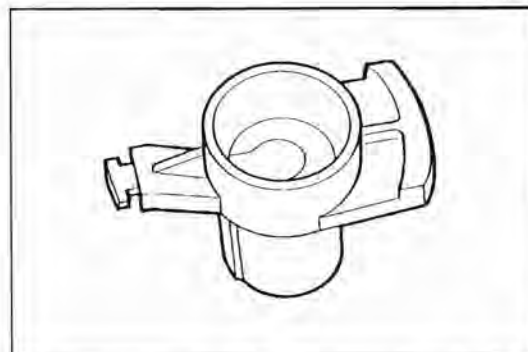
- (2) Gradually apply a negative pressure to the sub-diaphragm of the vacuum advancer. Ensure that the rod of the vacuum advancer is drawn into the diaphragm room side, corresponding to the negative pressure. Replace the vacuum advancer if the rod will not be drawn.



WR88-IG094

6. Inspection of rotor

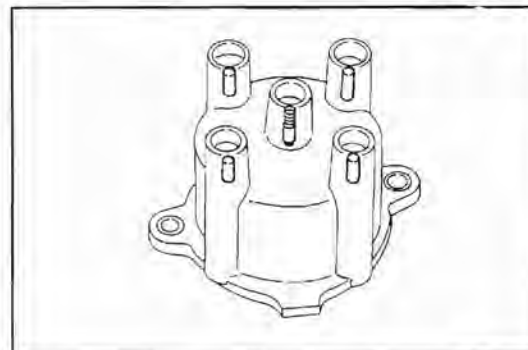
Check the center carbon contacting surface and electrode for damage, such as wear, electrolytic corrosion and cracks. Replace the rotor, as required, if the surface or electrode exhibits damage.



WR88-IG095

7. Inspection of distributor cap

Check the distributor cap for cracks. Also, check the electrode and center carbon for damage, such as wear. Replace the distributor cap if the cap, electrode or carbon exhibits damage.



WR88-IG096

8. Inspection and cleaning of breaker points

- (1) Check the breaker point surfaces for roughness and damage.

Replace the points if the surfaces exhibit roughness or damage.

- (2) Check each sliding section of the breaker points for damage.

Replace the points if the section exhibits damage.

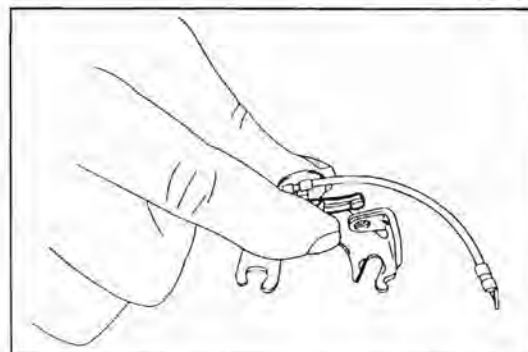
- (3) Visually inspect the spring of the breaker points.

Replace any faulty breaker points.

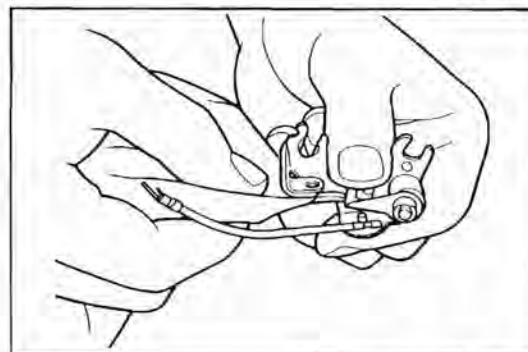
- (4) Check the ground wire of the breaker points for damage and open wire.

Replace any faulty breaker points.

- (5) Clean the breaker point surfaces with a soft cloth dampened with solvent and dry them.



WR88-IG097A



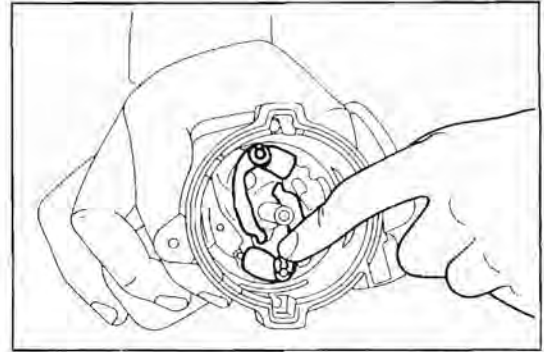
WR88-IG097B

ASSEMBLY OF DISTRIBUTOR

1. Install the governor weight to the distributor housing. Install the snap washer.

NOTE:

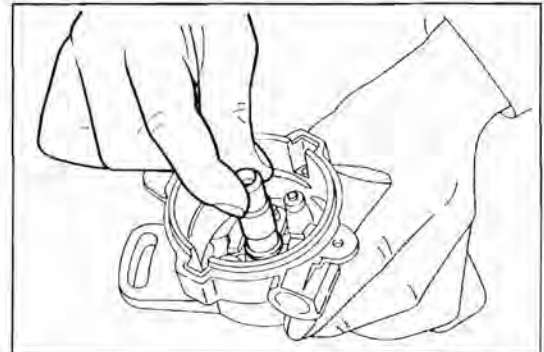
Apply a thin film of high-temperature grease to the sliding section.



WR88-IG098A

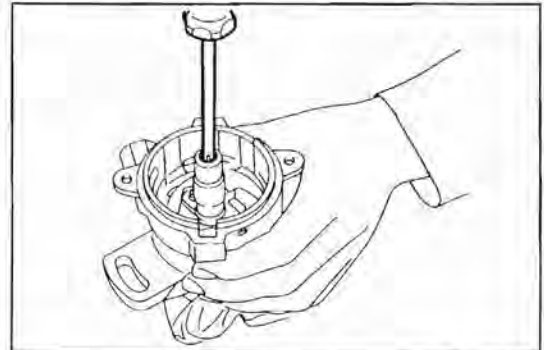
2. Installation of cam assembly

- (1) Apply a thin film of high-temperature grease to the sliding section of the cam assembly. Install the signal rotor assembly to the distributor housing.



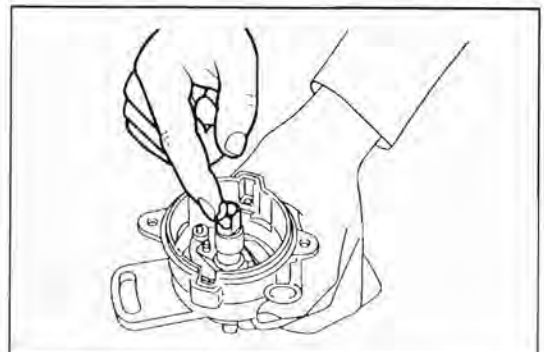
WR88-IG098B

- (2) Tighten the attaching screw.



WR88-IG098C

- (3) Pack high-temperature grease in the signal rotor assembly.

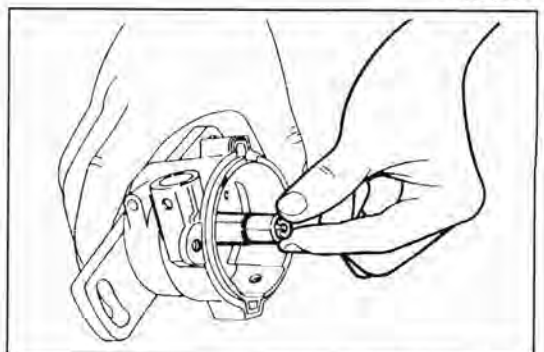


WR88-IG098D

- (4) Press the grease stopper by your hand.

NOTE:

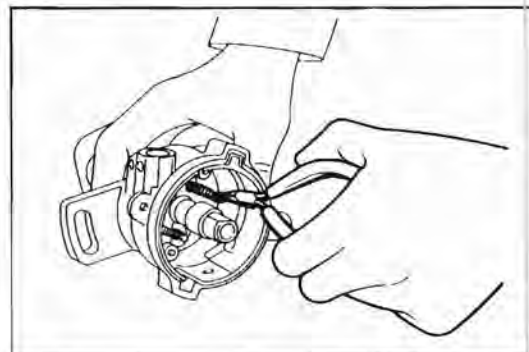
Wipe off any excess grease which has oozed out.



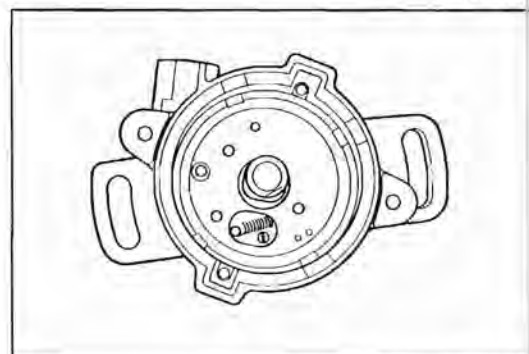
WR88-IG098E

IGNITION SYSTEM

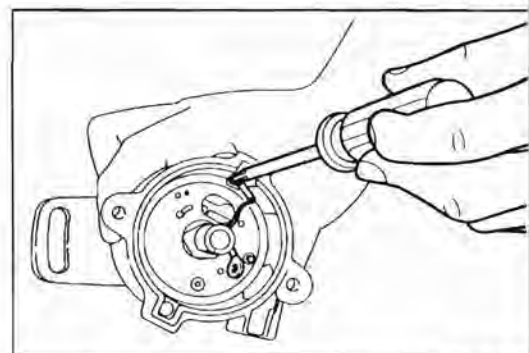
3. Install new governor springs to the governor weight and cam assembly.
4. Assemble the stationary plate, lining up the cut-out section of the distributor housing.
5. Install the stationary plate and ground wire with the attaching plate washer of the stationary plate and the two screws.
6. Insert the vacuum advancer into the distributor housing. Connect it to the pin of the stationary inner plate.
7. Align the screw hole of the vacuum advancer with the screw hole of the distributor housing. Tighten the attaching screw.



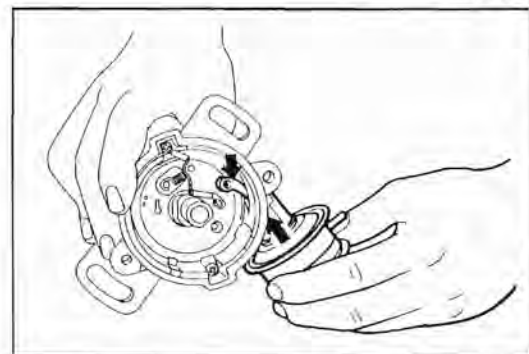
WR88-IG099



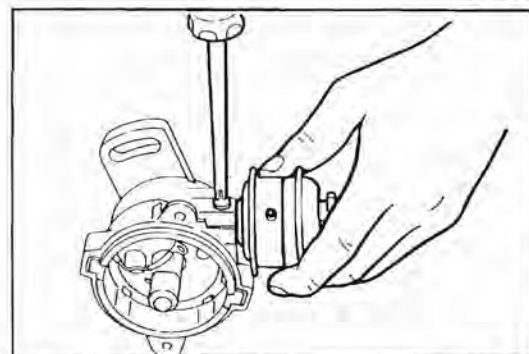
WR88-IG100



WR88-IG101

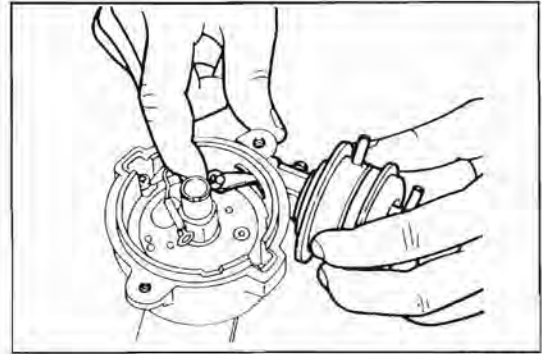


WR88-IG105A



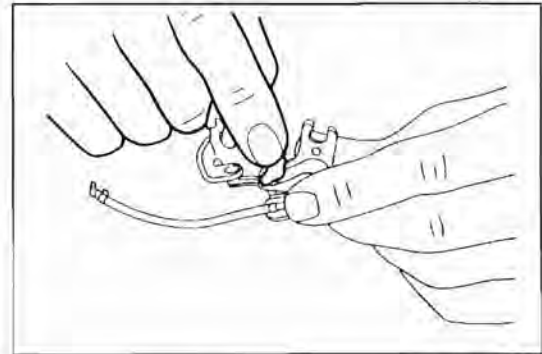
WR88-IG105B

8. Attach the snap washer to the pin connected with the vacuum advancer of the stationary plate.



WR88-IG105C

9. Apply high-temperature grease to the heel section of the breaker points.

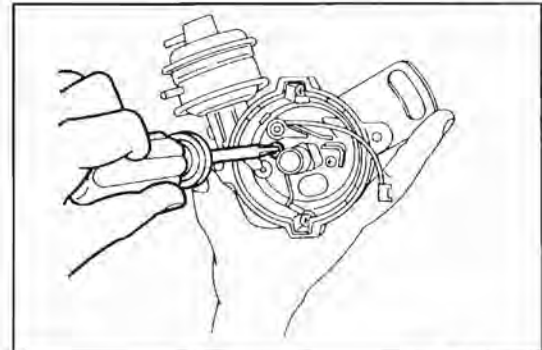


WR88-IG105D

10. Install the breaker points to the stationary plate together with the lead wire. Tighten the two screws temporarily.

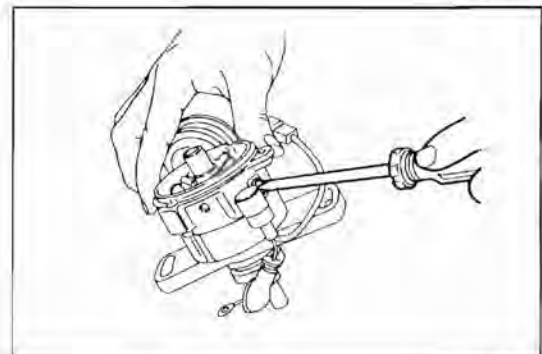
NOTE:

The lead wire terminal should be installed between the breaker points and the screw.



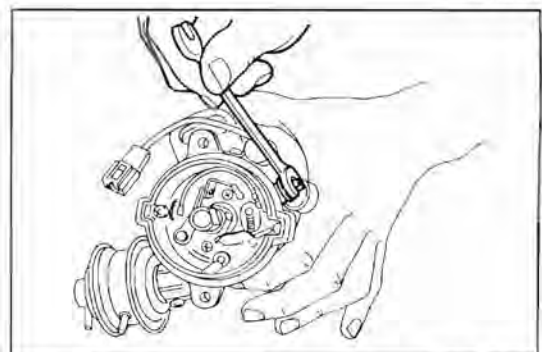
WR88-IG105E

11. Install the condenser.



WR88-IG105F

12. Install the terminal and insulator. Connect the lead wires of the condenser and breaker points to the terminal. Tighten the nut.



WR88-IG105G

IGNITION SYSTEM

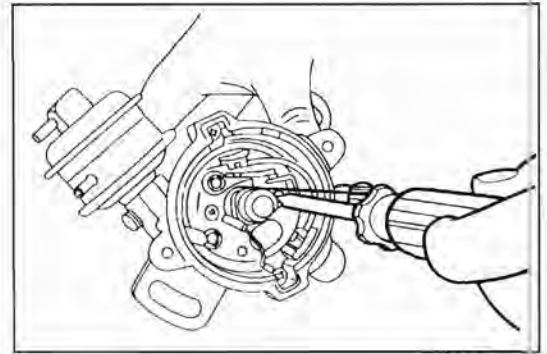
13. Adjustment of heel gap

Adjust the clearance between the distributor cam and the heel section of the breaker points to the specified value.

Heel Gap: 0.45 mm (0.018 inch)

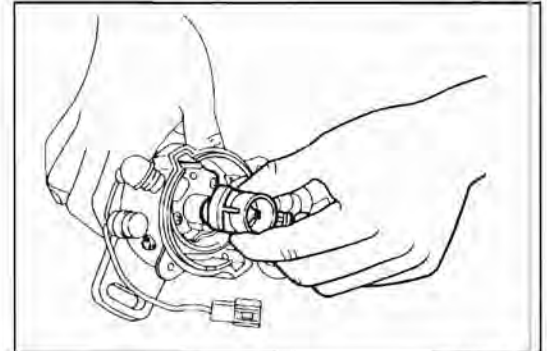
NOTE:

Never touch the surfaces of the breaker points.



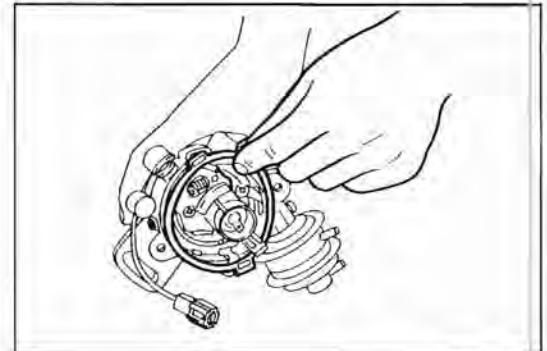
WR88-IG10eH

14. Install the rotor.



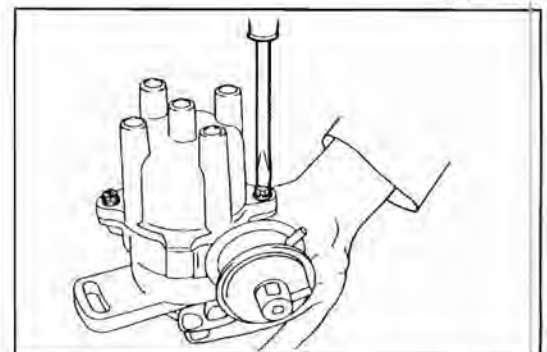
WR88-IG10Si

15. Check the distributor cap gasket. Replace the distributor cap gasket with a new part if it is faulty. Install the new gasket on the distributor body.



WR88-IG10Sj

16. Install the distributor cap to the distributor.

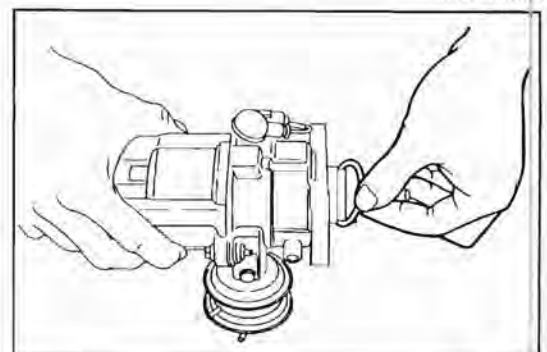


WR88-IG10eK

17. Install a new "O" ring to the distributor housing.

NOTE:

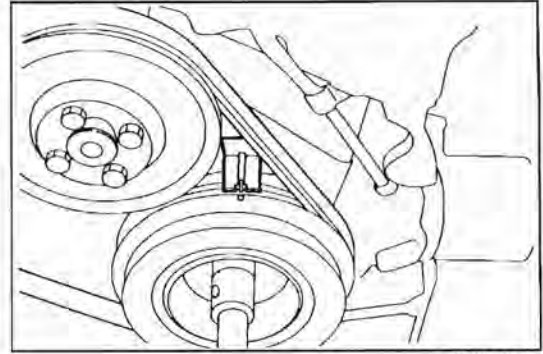
- Be very careful not to scratch the "O" ring.
- Be sure to use a new "O" ring when the distributor has been once removed from the cylinder head.



WR88-IG10eL

INSTALLATION OF DISTRIBUTOR [HC-C engine]

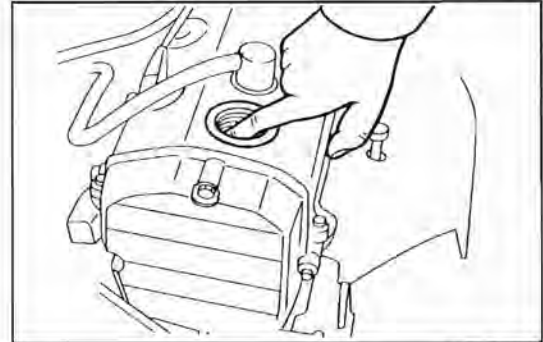
1. Turn the crankshaft, until the No. 1 cylinder (at the timing belt side) comes at the top dead center at the end of the compression stroke.
Under this conditions, the crankshaft timing marks are aligned and the valve rocker arms of the No. 1 cylinder are not operative (the rocker arms actuated by the camshaft are not pushing down the valves).



WR88-IG106

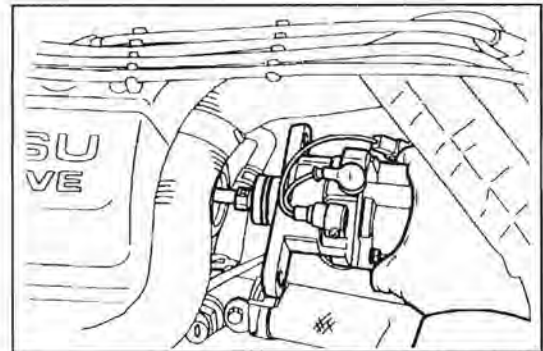
NOTE:

Ensure that the No. 1 rocker arms are not operating. This check can be performed by moving the rocker arms with your fingers after removing the oil filler cap.



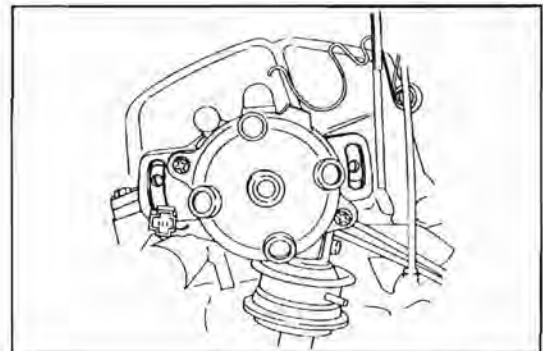
WR88-IG106A

2. Align the cut-out section of the distributor housing with the cut-out section of the coupling.



WR88-IG106B

3. Insert the distributor into the cylinder head. At this time, ensure that the distributor attaching hole at the cylinder head side comes at the center of the elongated hole of the distributor installation section.

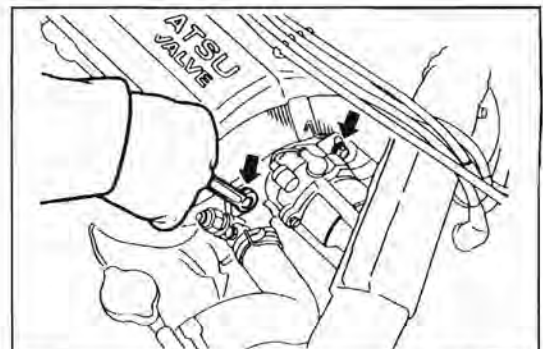


WR88-IG106C

4. Temporarily tighten the distributor attaching bolts.

NOTE:

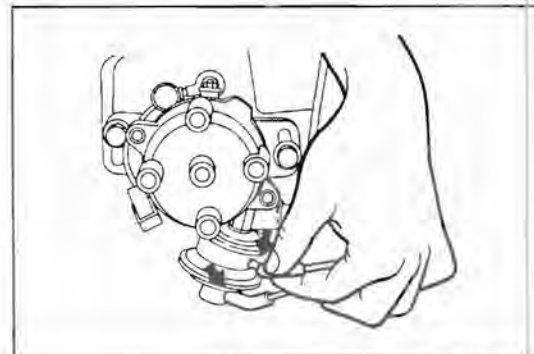
The final tightening should be performed after the check and adjustment of the ignition timing have been completed.



WR88-IG106D

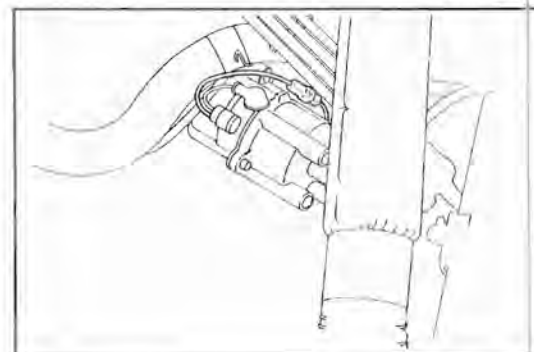
IGNITION SYSTEM

5. Connect the vacuum hose to the vacuum advancer.



WR88-IG101A

6. Connect the distributor connector.

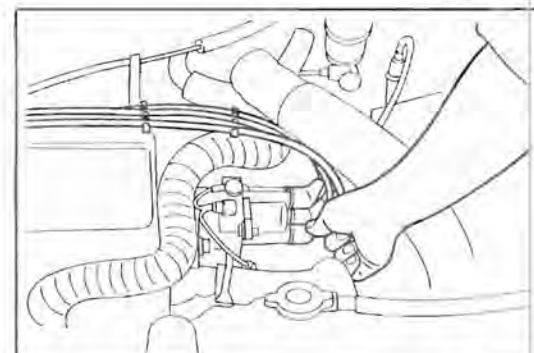


WR88-IG101B

7. Connect the resistive cords to the distributor cap.

8. Install the resistive cords to the clamp.

9. Connect the battery ground cable to the negative (–) terminal of the battery.



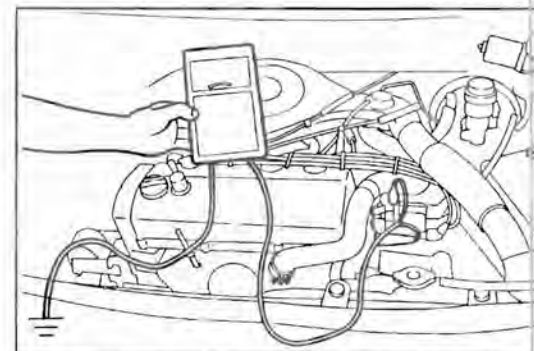
WR88-IG101C

10. Check and adjustment of dwell angle

Connect the dwell angle tester to the distributor. Check to see if the dwell angle conforms to the specified value.

Dwell Angle: $52^\circ \pm 3^\circ$

Reduce the heel gap if the dwell angle is more than the specified value. Increase the heel gap if the dwell angle is less than the specified value.



WR88-IG101D

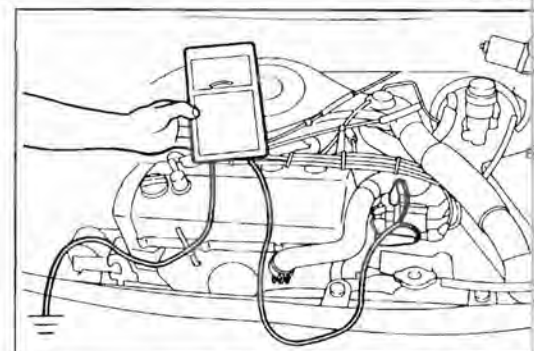
11. Check and adjustment of ignition timing

(1) Start the engine. Warm up the engine.

(2) Connect a tachometer to the distributor.

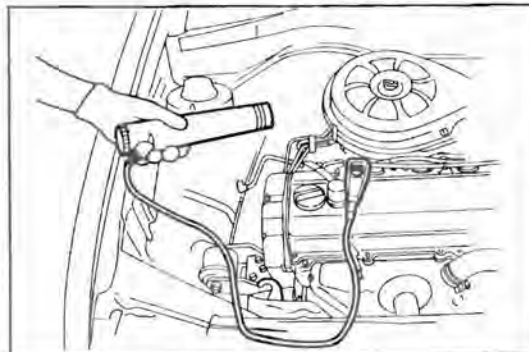
CAUTION:

- Never allow the tachometer terminal to touch ground. It could result in damage of the ignition coil.
- As some tachometers are not compatible with this ignition system, it is recommended to confirm the compatibility with your unit before its use.



WR88-IG101E

- (3) Connect a timing light to the resistive cord of the No.1 cylinder (at the timing belt side).



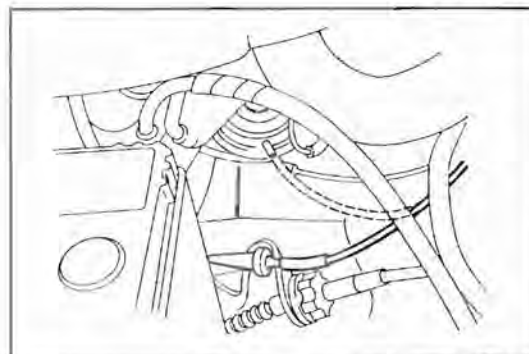
WR88-IG109B

- (4) Disconnect the vacuum hose at the sub-side of the vacuum advancer of the distributor. Plug the disconnected vacuum hose, using the following SST.

SST: 09258-00030-000

- (5) Ensure that the engine revolution speed is below 1000 rpm and stable.
If the engine revolution speed exceeds 1000 rpm or it is unstable, adjust the engine revolution speed to the idle speed

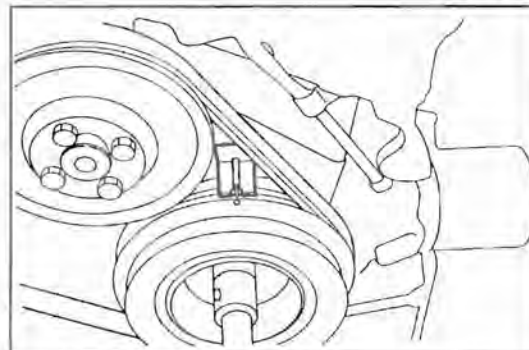
(See page EM-18.)



WR88-IG111A

- (6) Check to see if the ignition timing mark of the crankshaft pulley is aligned with the indicator of the timing belt cover, using the timing light.

Tighten the distributor attaching bolts to the specified torque when the ignition timing mark is aligned with the indicator.

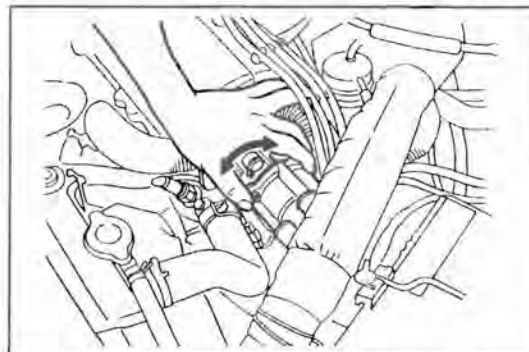


WR88-IG111B

- (7) Loosen the distributor attaching bolts. Adjust the distributor installation position, until the ignition timing mark of the crankshaft pulley is aligned with the indicator of the timing belt cover.

Reference

If the distributor is turned clockwise, the timing will be advanced. Conversely, if the distributor is turned counterclockwise, the timing will be retarded.

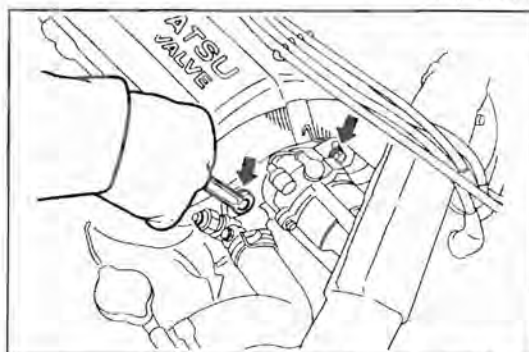


WR88-IG111C

- (8) Tighten the distributor attaching bolts to the specified torque, making sure that the ignition timing is not disturbed.

Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

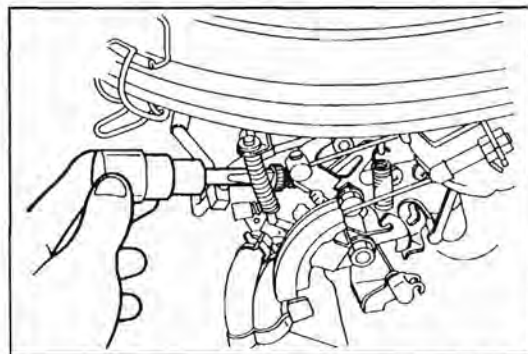
- (9) Connect the vacuum hose at the sub-side of the vacuum advancer to the vacuum advancer.



WR88-IG111D

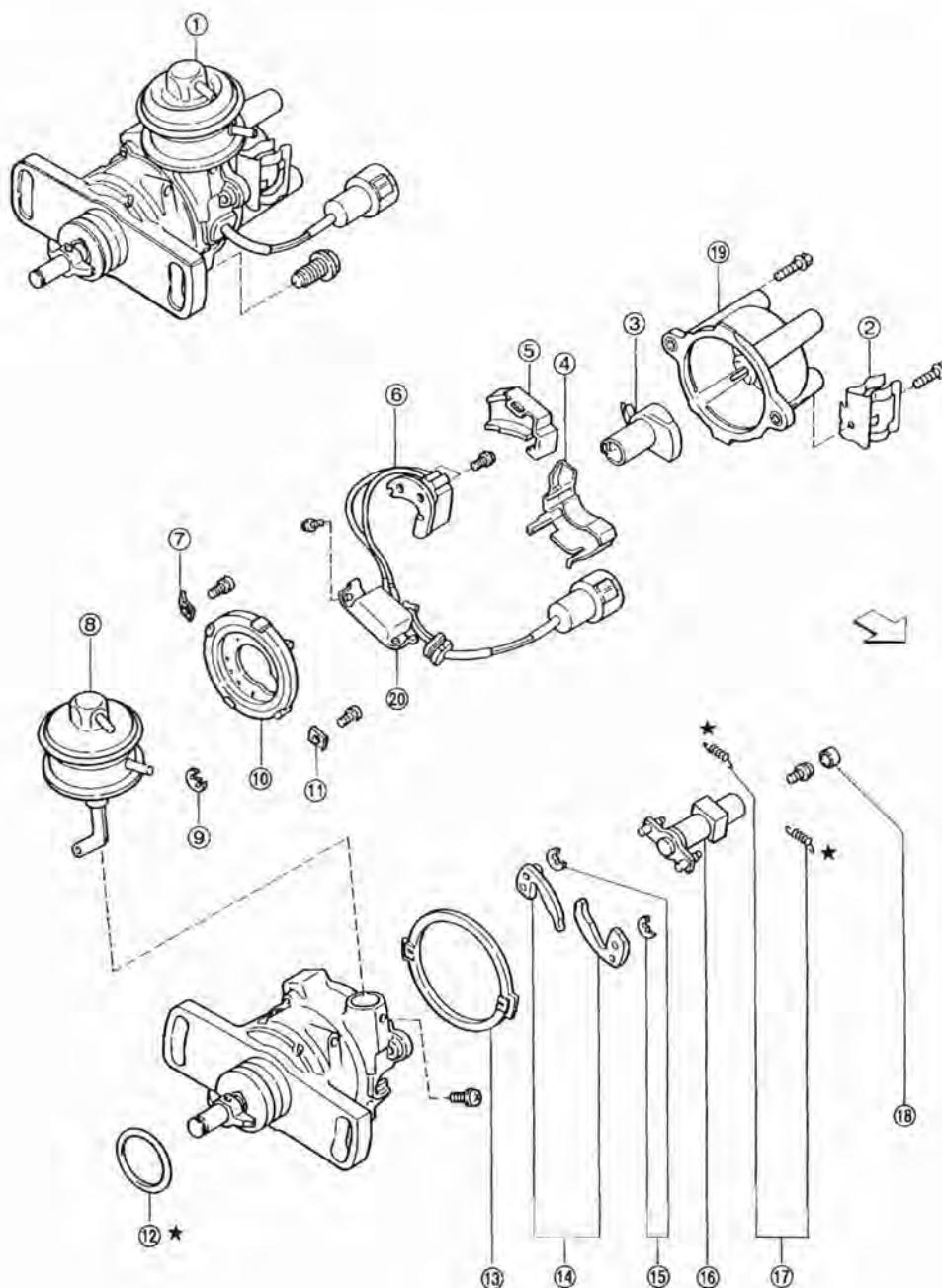
IGNITION SYSTEM

12. Adjust the engine idle speed.
(See page EM-18.)
13. Check the oil level.
(See page LU-2.)



WR88-IG111E

DISTRIBUTOR [HC-E Engine] COMPONENTS



★ : Non reusable parts

- ① Distributor assembly
- ② Distributor connector clamp
- ③ Distributor rotor
- ④ Dust-proof cover
- ⑤ Dust-proof cover
- ⑥ Pick-up coil
- ⑦ Plate washer
- ⑧ Distributor vacuum advancer
- ⑨ Snap washer
- ⑩ Stationary plate

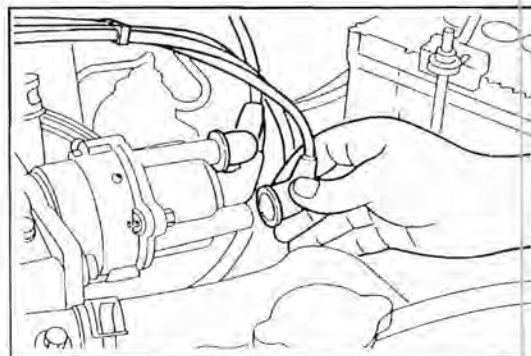
- ⑪ Plate washer
- ⑫ *O* ring
- ⑬ Distributor gasket
- ⑭ Governor weight
- ⑮ Snap washer
- ⑯ Signal rotor assembly
- ⑰ Governor spring
- ⑱ Grease stopper
- ⑲ Distributor cap
- ⑳ Ignitor

REMOVAL OF DISTRIBUTOR

1. Disconnect the battery ground cable from the negative terminal of the battery.
2. Disconnect the resistive cords from the distributor cap.

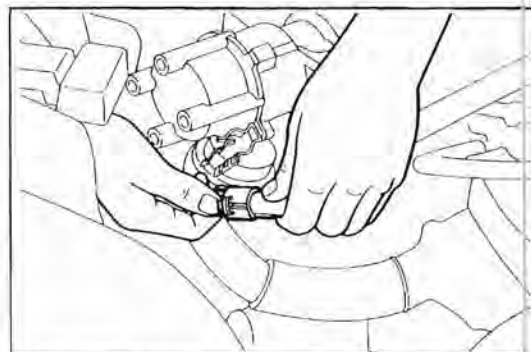
NOTE:

Do not hold the cord during disconnection. Be sure to disconnect the cord by holding the rubber boot.



WR88-IG113

3. Disconnect the distributor connector.

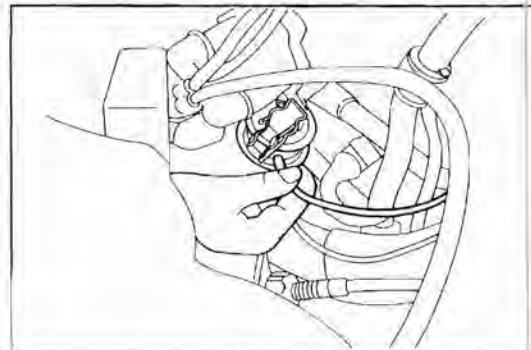


WR88-IG114

4. Disconnect the vacuum advancer hoses.

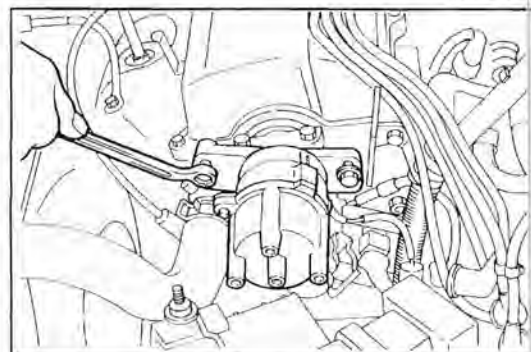
NOTE:

Prior to the disconnection, put a tag so that the original installation position may be identified readily.



WR88-IG115

5. Remove the distributor set bolt.

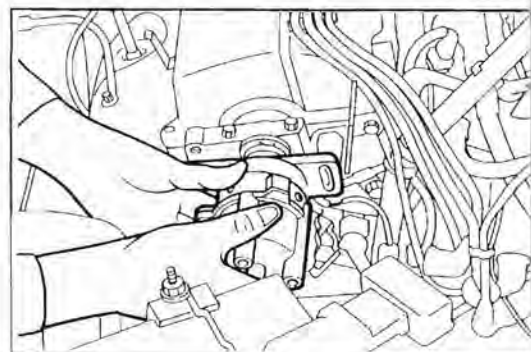


WR88-IG116

6. Pull out the distributor from the cylinder head.

NOTE:

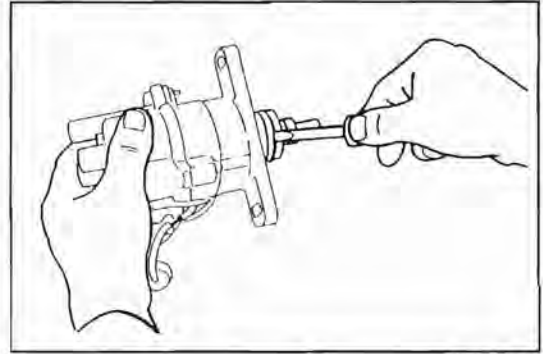
Since the engine oil flows out, insert a suitable cloth under the distributor connecting section.



WR88-IG117

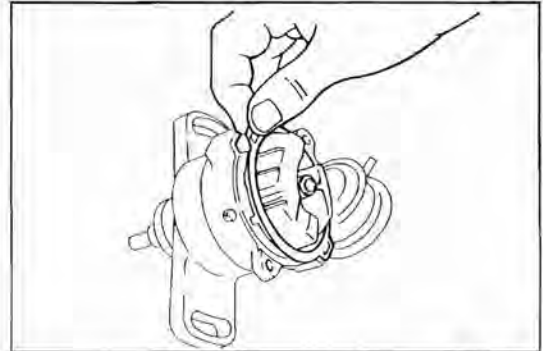
DISASSEMBLY OF DISTRIBUTOR

1. Remove the "O" ring from the distributor housing.
2. Remove the distributor cap from the distributor housing.



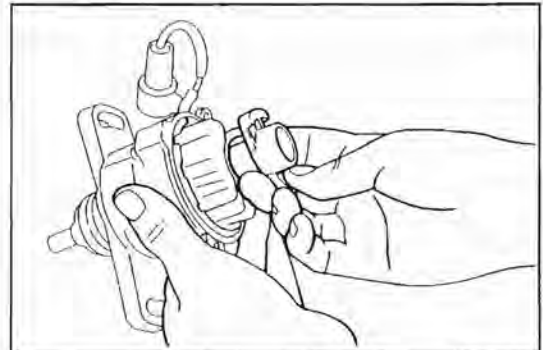
WR88-IG118

3. Remove the distributor cap gasket.



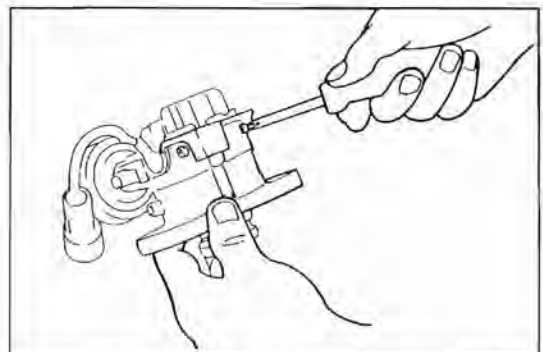
WR88-IG119

4. Remove the rotor.



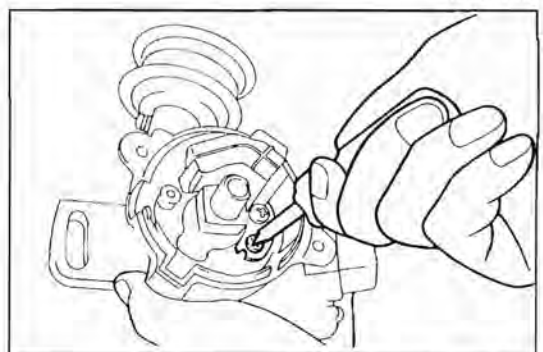
WR88-IG120

5. Remove the ignitor by removing the two attaching screws.



WR88-IG121

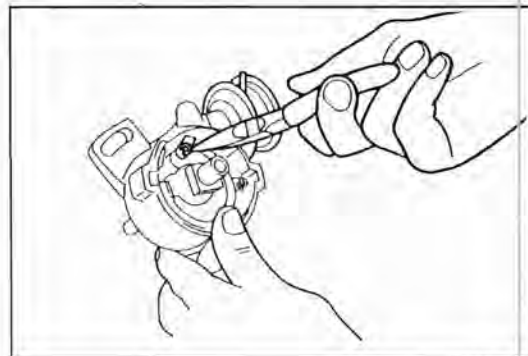
6. Remove the signal generator by removing the two attaching screws.



WR88-IG122

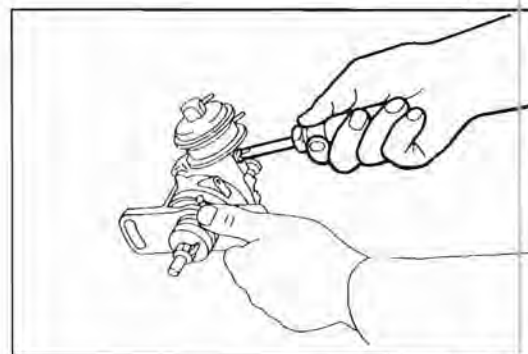
IGNITION SYSTEM

7. Remove the snap washer of the vacuum advancer.



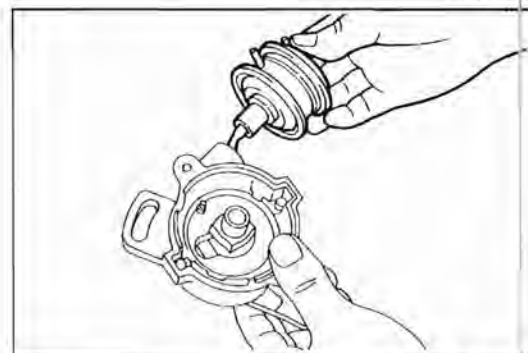
WR88-IG 23

8. Remove the attaching screw of the vacuum advancer.



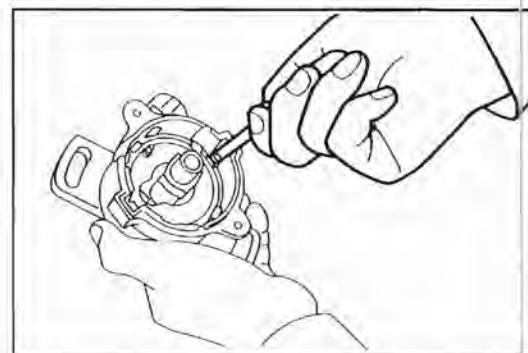
WR88-IG 24

9. Remove the "E" ring and remove the vacuum advancer from the pin of the stationary plate.
Pull out the vacuum advancer from the distributor housing.



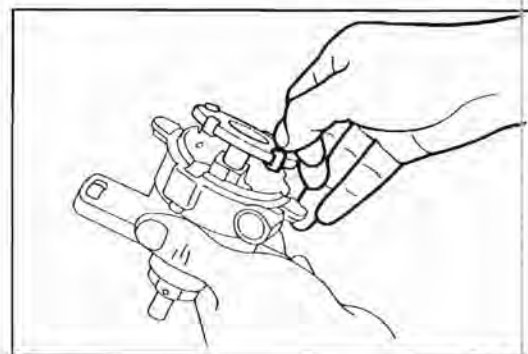
WR88-IG 25

10. Remove the attaching screws and plate of the distributor stationary plate.



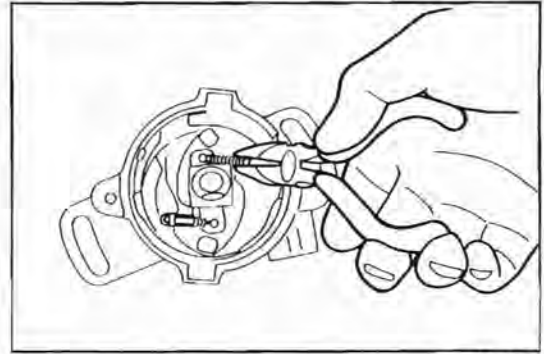
WR88-IG 26

11. Remove the stationary plate from the distributor housing.



WR88-IG 27

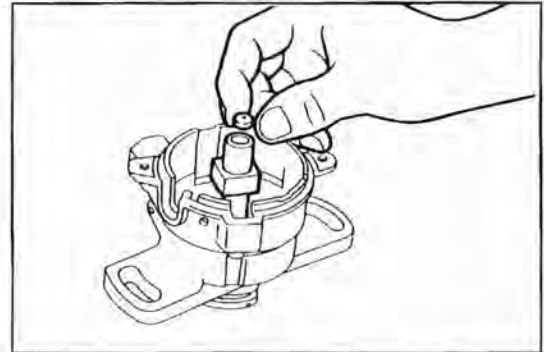
12. Remove the governor springs.



WR88-IG128

13. Removal of signal rotor assembly

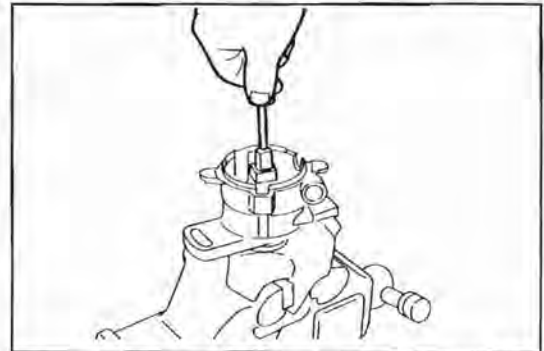
(1) Remove the grease stopper.



WR88-IG129

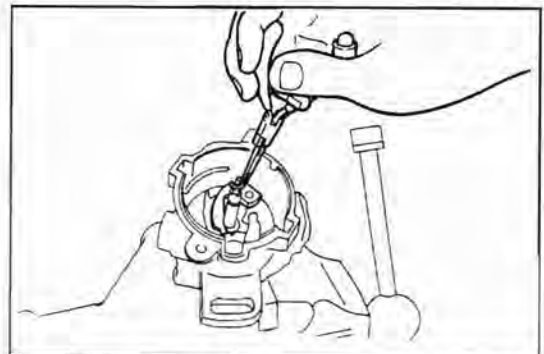
(2) Remove the attaching screws of the signal rotor assembly.

(3) Remove the signal rotor assembly.



WR88-IG130

14. Remove the snap washer of the governor weight. Remove the governor weight.



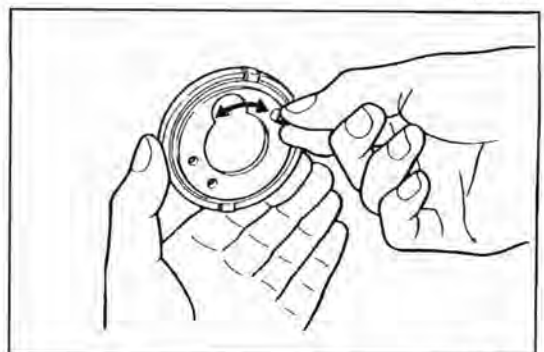
WR88-IG132

INSPECTION OF DISTRIBUTOR COMPONENTS

1. Inspect the stationary plate.

Check to see if the stationary inner plate rotates on the outer plate smoothly.

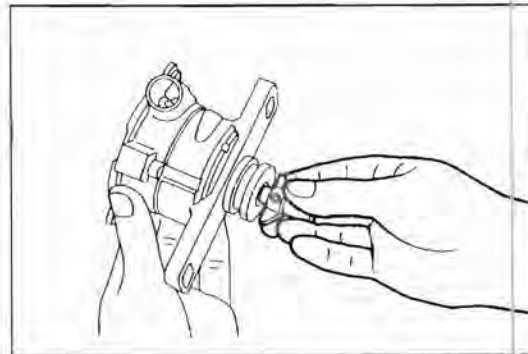
If the inner plate will not rotate smoothly, replace the stationary plate.



WR88-IG133

2. Inspection of Distributor Housing

- (1) Check to see if the governor shaft rotates smoothly.
If it will not rotate smoothly, replace the distributor housing.



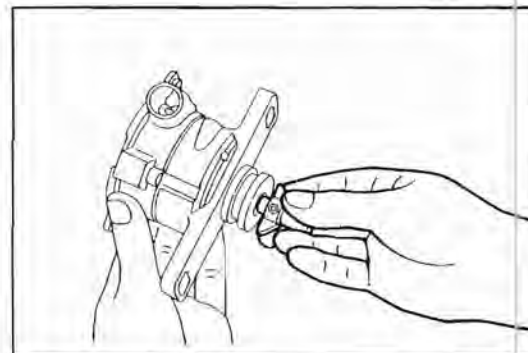
WR88-IG13

- (2) Check the sliding section of the governor weight for wear or damage.
Replace the distributor housing if it exhibits wear or damage.



WR88-IG13

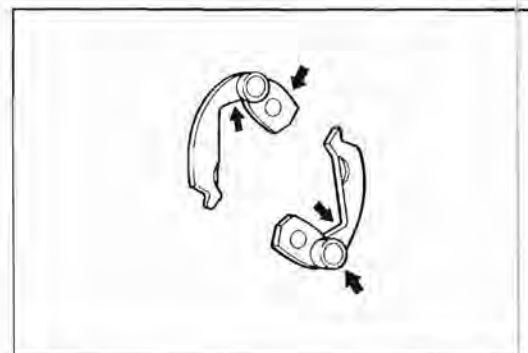
- (3) Check the coupling section of the governor shaft for wear or damage. Also, check to see if any excessive play is present in the turning direction.
Replace the distributor housing if it exhibits wear, damage and/or excessive play in the turning direction.



WR88-IG136

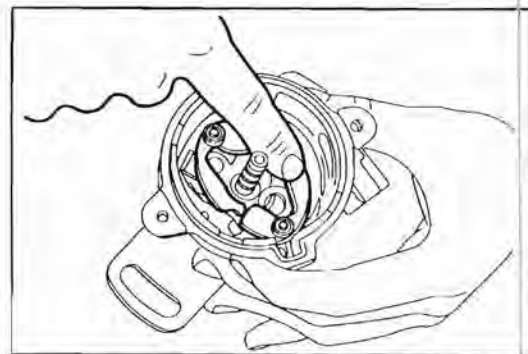
3. Inspection of Governor Weight for Damage or Wear

- (1) Visually inspect the governor weight for damage or wear.
Replace the governor weight if it exhibits damage or wear.



WR88-IG137

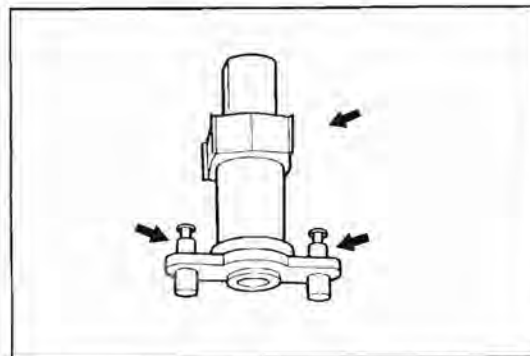
- (2) Install the governor weight to the governor shaft. Check to see if any excessive play is present.
If excessive play is present, replace the governor weight and/or distributor housing, as required.



WR88-IG138

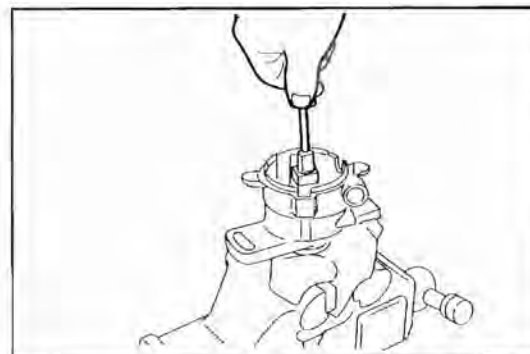
4. Inspection of Signal Rotor Assembly

- (1) Visually inspect the signal rotor for damage.
Replace the signal rotor assembly if it exhibits damage.
- (2) Check the pin section of the signal rotor assembly for wear or damage.
Replace the signal rotor assembly if the pin section exhibits wear or damage.



WR88-IG139

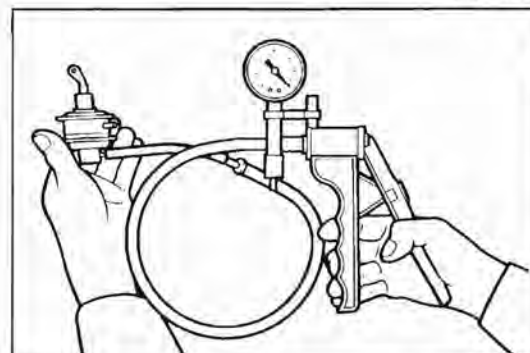
- (3) Install the signal rotor assembly to the governor shaft temporarily. Check to see if the signal rotor is tilted.
Replace the signal rotor assembly and/or distributor housing if it is tilted.



WR88-IG140

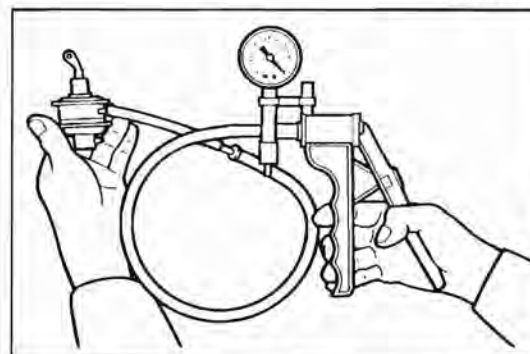
5. Inspection of Vacuum Advancer

- (1) Gradually apply a negative pressure to the main diaphragm of the vacuum advancer. Ensure that the rod of the vacuum advancer is drawn into the diaphragm room side, corresponding to the negative pressure.
Replace the vacuum advancer if the rod will not be drawn.



WR88-IG141

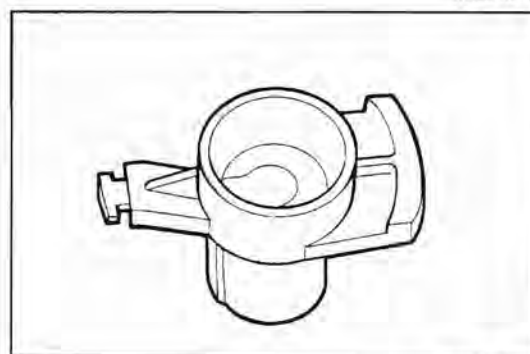
- (2) Gradually apply a negative pressure to the sub diaphragm of the vacuum advancer. Ensure that the rod of the vacuum advancer is drawn into the diaphragm room side, corresponding to the negative pressure.
Replace the vacuum advancer if the rod will not be drawn.



WR88-IG142

6. Inspection of Rotor

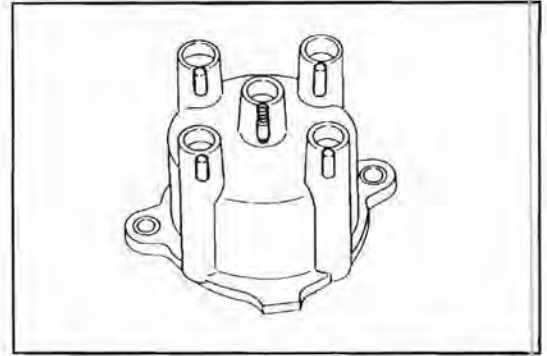
Check the center carbon contacting surface and electrode for damage, such as wear, electrolytic corrosion and cracks. If the surface or electrode exhibits damage, replace the rotor, as required.



WR88-IG143

7. Inspection of Distributor Cap

Check the distributor cap for cracks. Also, check the electrode and center carbon for damage, such as wear. Replace the distributor cap if the cap, electrode or carbon exhibits damage.



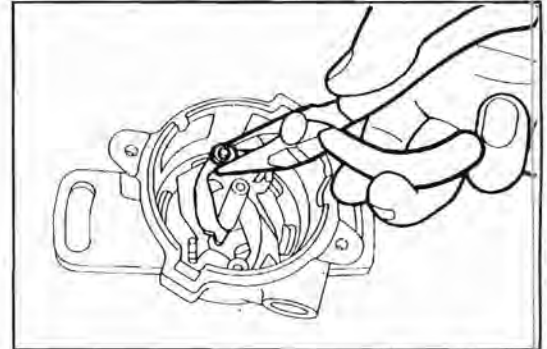
WR88-IG144

ASSEMBLY OF DISTRIBUTOR

1. Install the governor weight to the distributor housing. Install the snap washer.

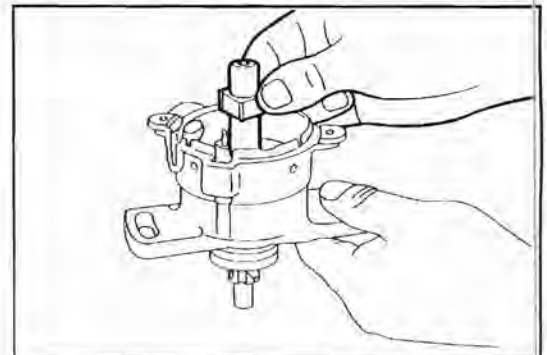
NOTE:

Thinly apply high-temperature grease to the sliding section.



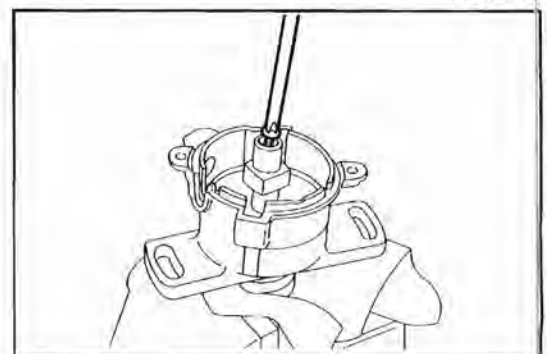
WR88-IG145

2. Installation of signal rotor assembly
 - (1) Thinly apply high-temperature grease to the sliding section of the signal rotor assembly. Install the signal rotor assembly to the distributor housing.



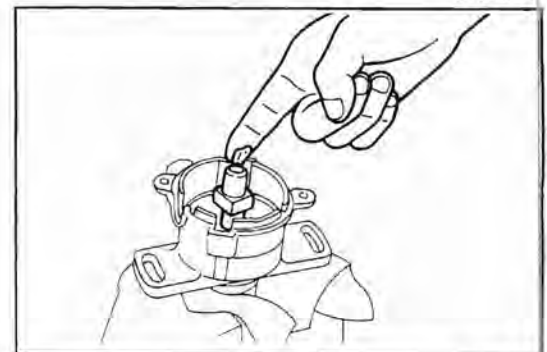
WR88-IG146

- (2) Tighten the attaching screw.



WR88-IG147

- (3) Pack high-temperature grease in the signal rotor assembly.



WR88-IG148

(4) Press the grease stopper by your hand.

NOTE:

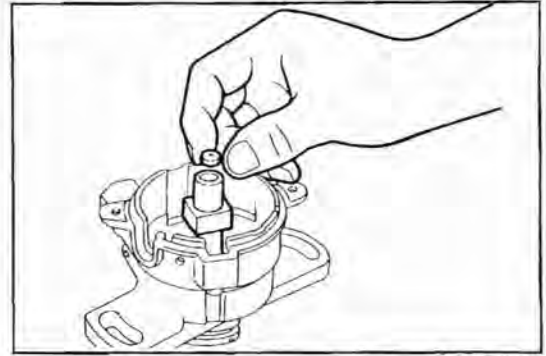
Wipe off any excess grease which has oozed out.

3. Install the new governor spring to the distributor.

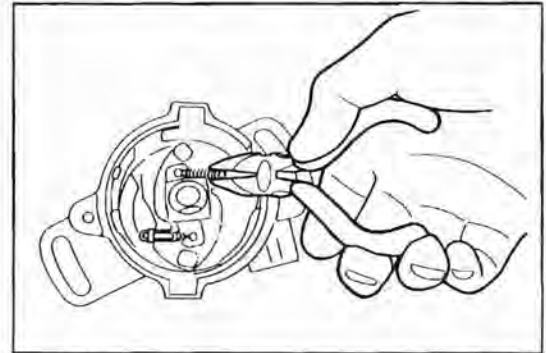
4. Assemble the stationary plate, lining up the cut-out section of the distributor housing.

5. Secure the stationary plate installation seat and stationary plate with the screws.

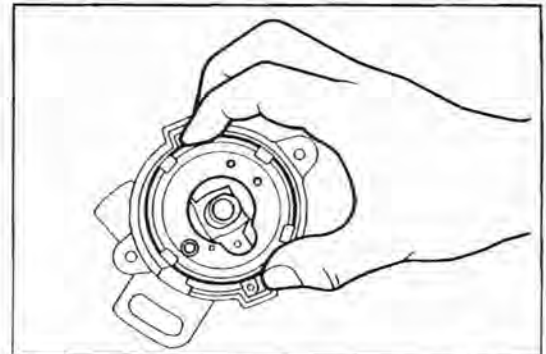
6. Insert the vacuum advancer into the distributor housing. Connect it to the pin of the stationary inner plate.



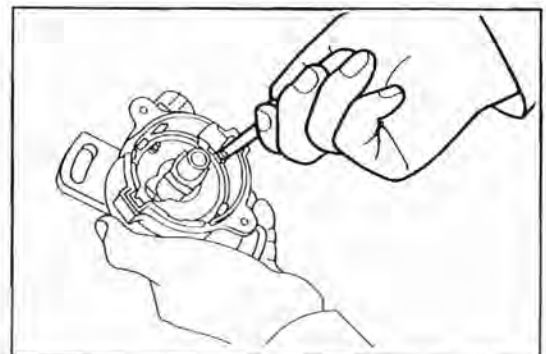
WR88-IG149



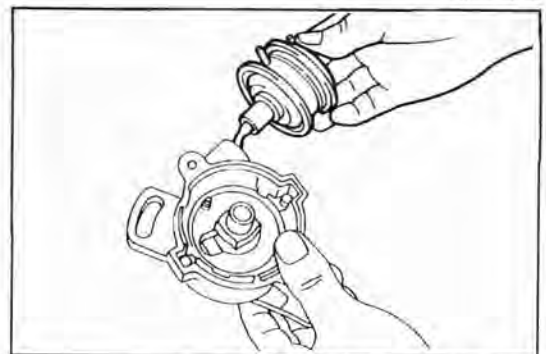
WR88-IG150



WR88-IG151



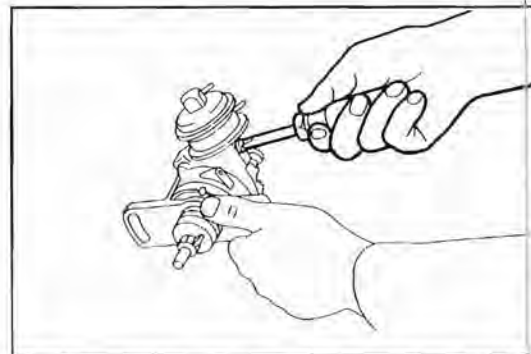
WR88-IG152



WR88-IG153

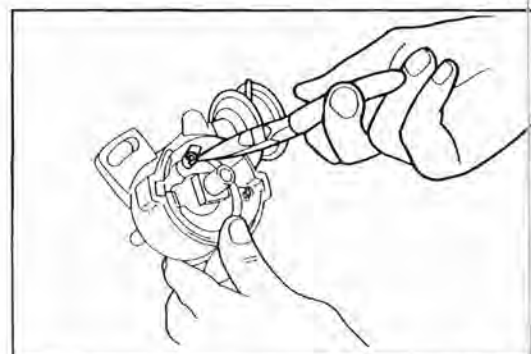
IGNITION SYSTEM

7. Align the screw hole of the vacuum advancer with the screw hole of the distributor housing. Install and tighten the attaching screw.



WR88-IG154

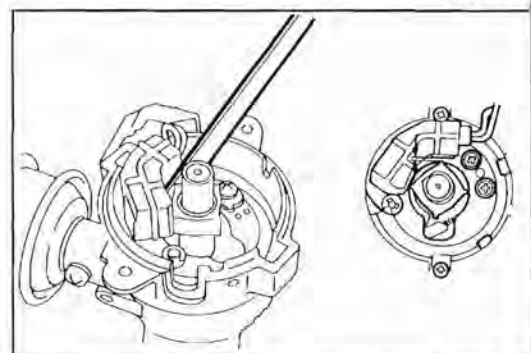
8. Attach the snap washer of the vacuum advancer.



WR88-IG155

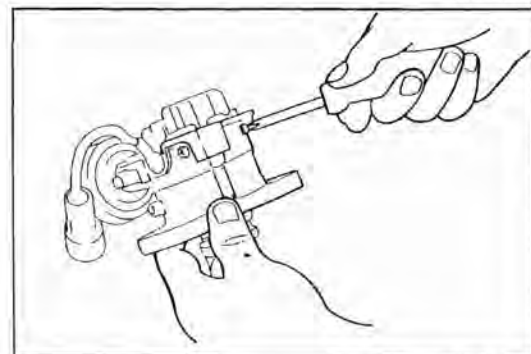
9. Installation of signal generator

Install the signal generator to the stationary plate. Adjust the air gap in such a way that the air gap in relation to the signal rotor is 0.2 - 0.4 mm (0.0079 - 0.015 inch).



WR88-IG156

10. Install the ignitor to the distributor with the screw.



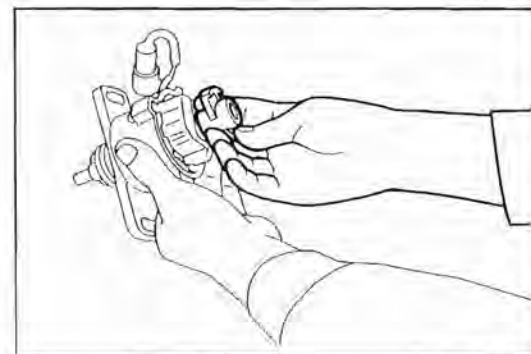
WR88-IG157

11. Attach the rotor.

12. Install a distributor cap gasket to distributor body.

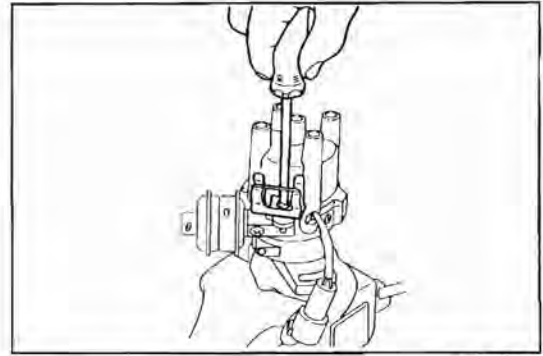
NOTE:

If the gasket is damaged, replace it with a new one.



WR88-IG158

13. Install the distributor cap to the distributor housing.
Also, tighten the clamp of the distributor connector, too, at the vacuum advancer side of the distributor cap attaching screw.

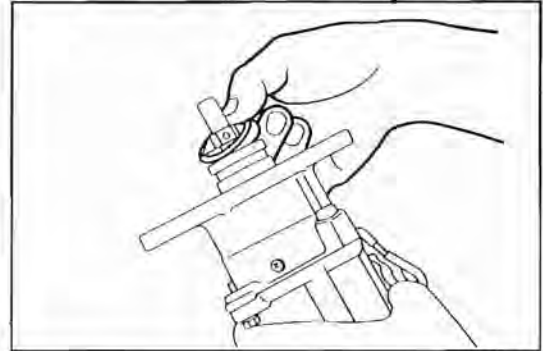


WR88-IG160

14. Install a new "O" ring to the distributor housing.

NOTE:

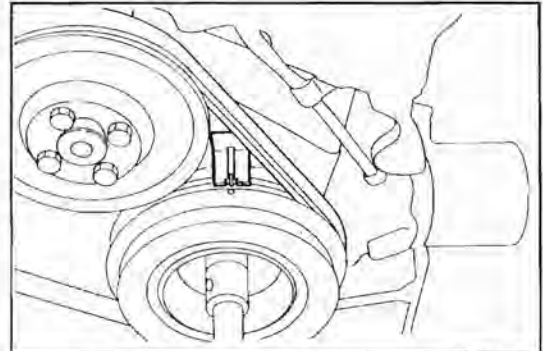
- Be very careful not to damage the "O" ring.
- When the distributor is pulled from the cylinder head once, be sure to replace the "O" ring with a new part.



WR88-IG161

INSTALLATION OF DISTRIBUTOR

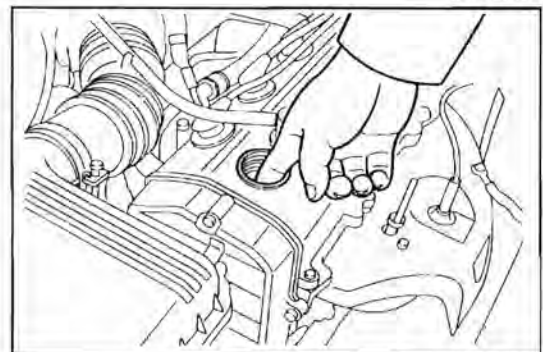
1. Turn the crankshaft, until the No.1 cylinder (at the timing belt side) comes at the top dead center at the end of the compression stroke.
Under this conditions, the crankshaft timing marks should be aligned and the valve rocker arms should be inoperative (the rocker arms actuated by the camshaft are not pushing down the valves).



WR88-IG162

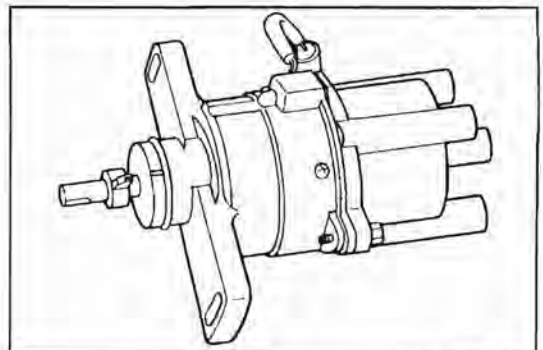
NOTE:

Ensure that the No.1 rocker arms are not operating. This check can be performed by moving the rocker arms with your fingers after removing the oil filler cap.



WR88-IG163

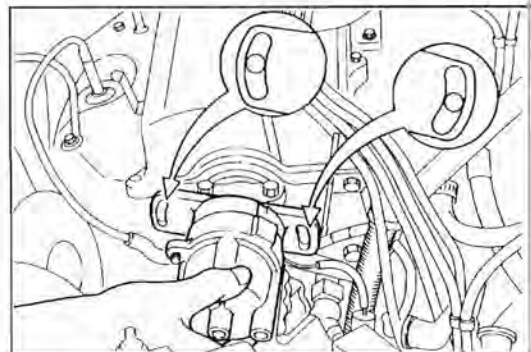
2. Align the cut-out section of the distributor housing with the cut-out section of the coupling.



WR88-IG164

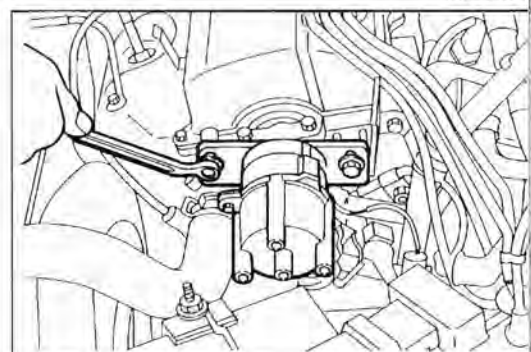
IGNITION SYSTEM

3. Insert the distributor into the cylinder head. At this time, ensure that the distributor attaching hole of the cylinder head comes at the center of the elongated hole for the distributor bolt.



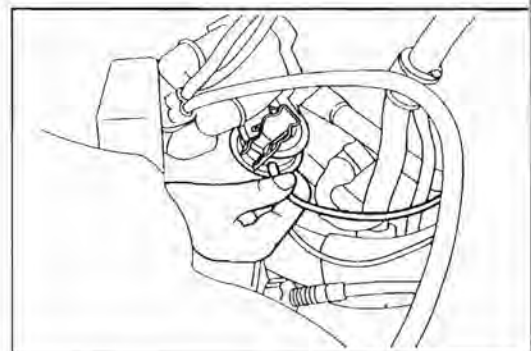
WR88-IG165

4. Tighten the distributor attaching bolts temporarily.
NOTE:
The final tightening should be performed after the check and adjustment of the ignition timing have been completed.



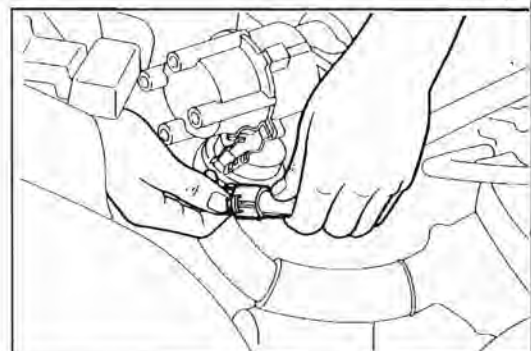
WR88-IG166

5. Connect the vacuum advancer hoses.



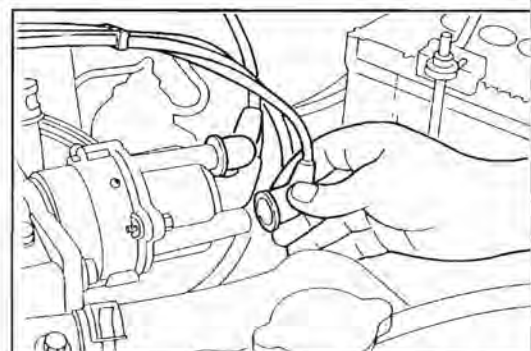
WR88-IG167

6. Connect the distributor connector. Install it to the clamp.



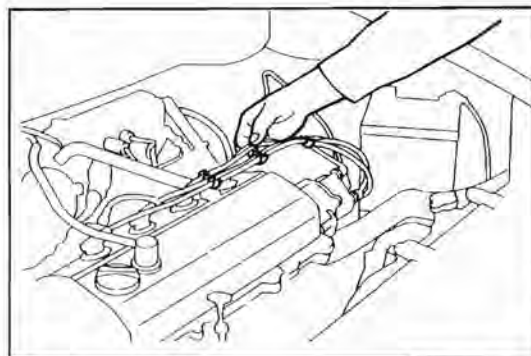
WR88-IG168

7. Connect the resistive cords to the distributor cap.



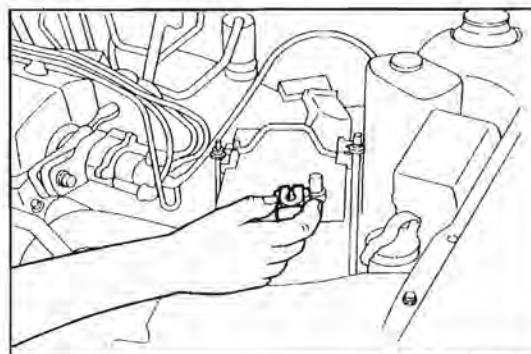
WR88-IG169

8. Install the clamp to the resistive cord.



WR88-IG170

9. Connect the ground cable terminal to the negative (-) terminal of the battery.



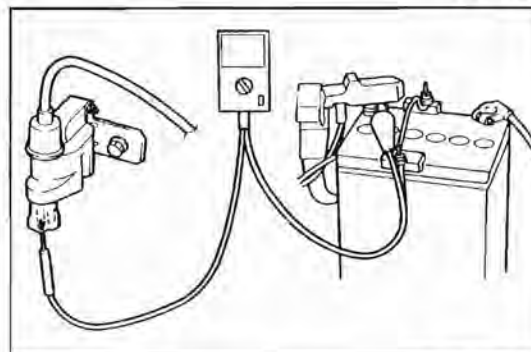
WR88-IG171

10. Check and adjustment of ignition timing

(1) Start the engine. Warm up the engine.

(2) Connection of tachometer and timing light

1) Connect the cable for measuring tachometer use to the negative terminal of the ignition coil.



WR88-IG172

NOTE:

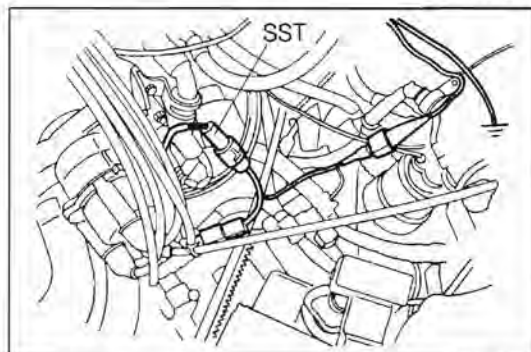
Fully use the following SST which is capable of connecting tachometers other than a clamp-on type tachometer.

SST: 09991-87703-000

CAUTION:

- Never allow the tachometer terminal to touch ground. It could result in damage to the ignitor and/or ignition coil.
- As some tachometers are not compatible with this ignition system, it is recommended to confirm the compatibility of your unit before using.

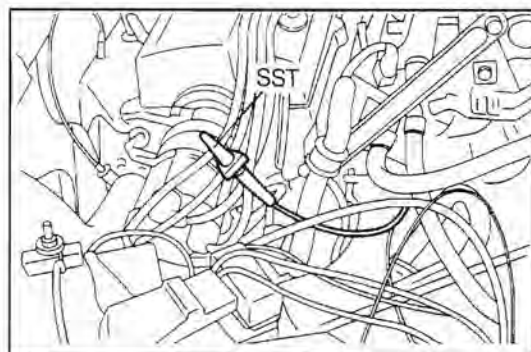
2) Connect the timing light to the resistive cord of the No.1 cylinder (at the timing belt side).



WR88-IG173

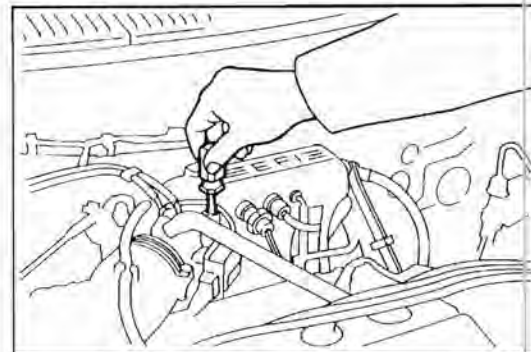
(3) Disconnect the vacuum hose at the sub side of the vacuum advancer of the distributor. Plug the disconnected vacuum hose, using the following SST (stopper).

SST: 09258-00030-000



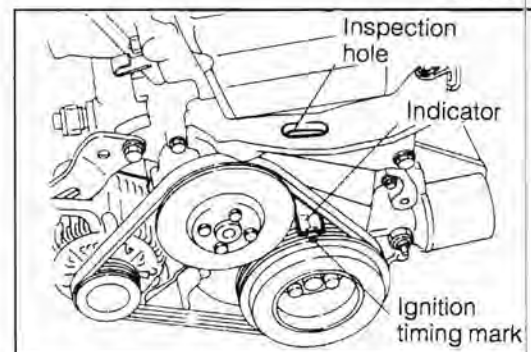
WR88-IG174

- (4) Ensure that the engine revolution is under 1000 rpm and stable.
If the engine revolution exceeds 1000 rpm or is unstable, adjust the engine idle speed.
(See page EM-18.)



WR88-IG175

- (5) Check to see if the ignition timing mark of the crankshaft pulley is aligned with the indicator of the timing belt cover.
Tighten the distributor attaching bolts to the specified torque if the ignition timing mark is aligned with the indicator.

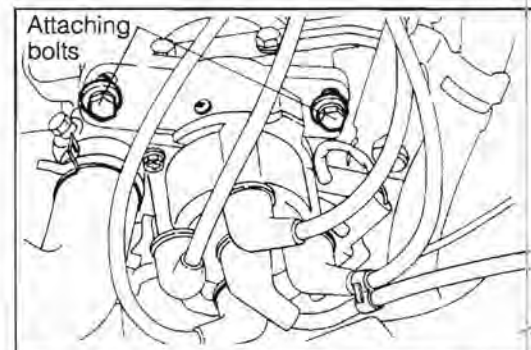


WR88-IG176

- (6) Loosen the distributor attaching bolts. Adjust the distributor installation position, until the ignition timing mark of the crankshaft pulley is aligned with the indicator of the timing belt cover.

Reference

If the distributor is turned clockwise, the timing will be advanced. Conversely, if the distributor is turned counterclockwise, the timing will be retarded.

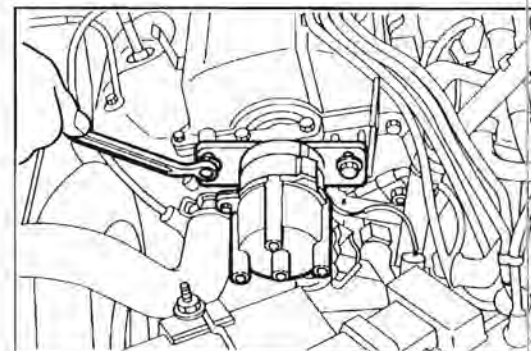


WR88-IG177

- (7) Tighten the distributor attaching bolts to the specified torque, making sure that the ignition timing is not disturbed.

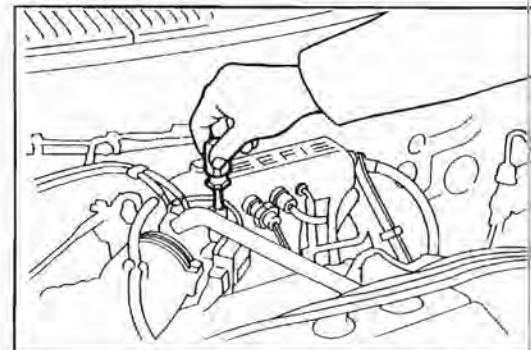
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

11. Connect the vacuum hose at the sub side of the vacuum advancer to the vacuum advancer.



WR88-IG178

12. Adjust the engine idle speed.
(See page EM-18.)
13. Check the oil level.
(See page LU-2.)



WR88-IG179

DAIHATSU

CHARADE

TYPE HC ENGINE

STARTING SYSTEM

TROUBLE SHOOTING	ST- 2
STARTING SYSTEM CIRCUIT	ST- 2
STARTER	ST- 3
STARTER RELAY (A/T Vehicle Only)	ST-28

WR88-ST001

ST

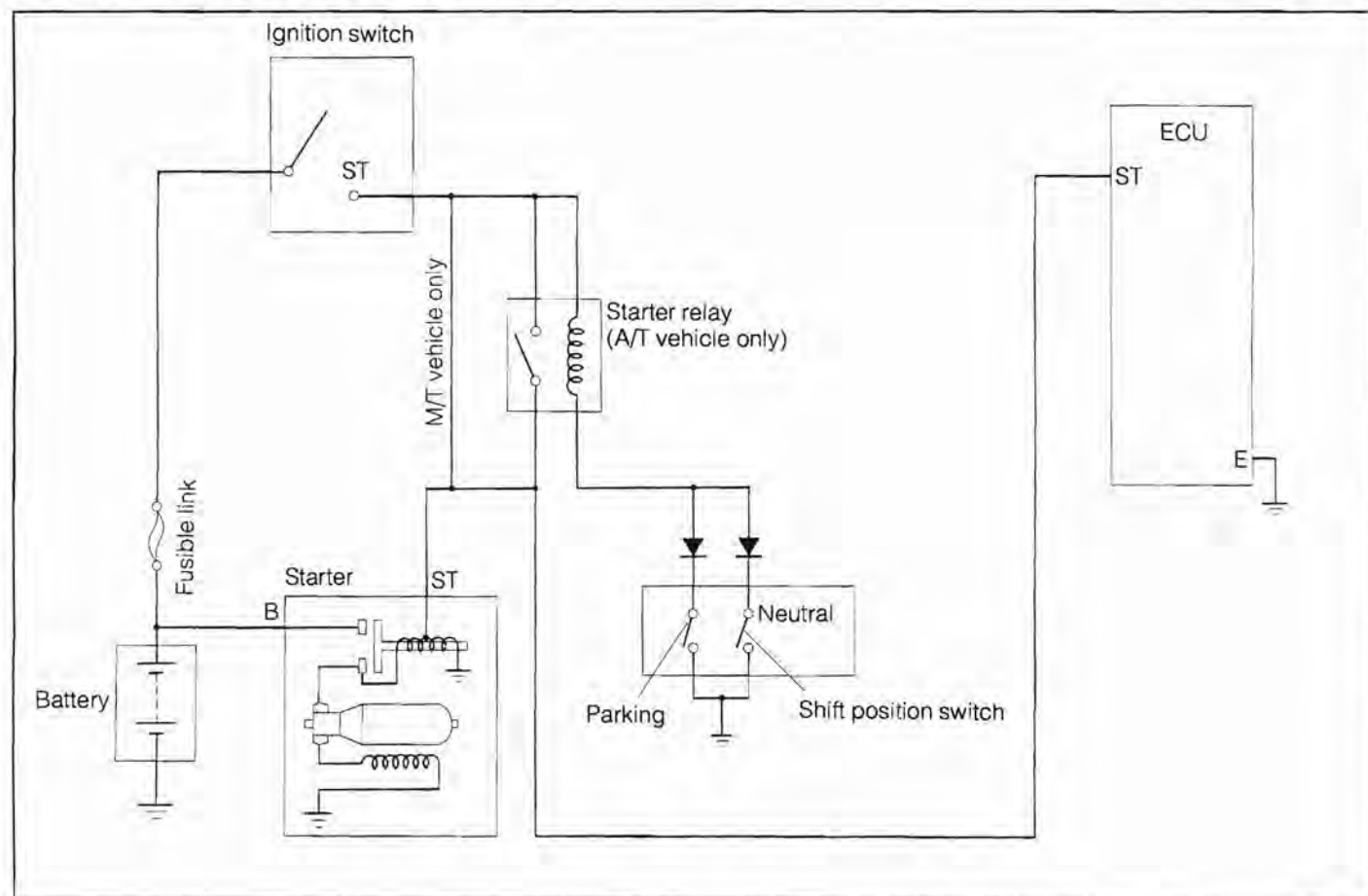
STARTING SYSTEM

TROUBLE SHOOTING

Problem	Possible cause	Remedies	Page
Engine will not crank	Battery not fully charged	Check specific gravity of battery electrolyte. Charge or replace battery.	CH-4
	Battery cables loose, corroded or worn	Repair or replace cables.	CH-4
	Shift position switch faulty	Adjust or replace shift position switch.	
	Starter relay faulty	Replace starter relay.	ST-28
	Fusible link blown	Replace fusible link.	
	Starter faulty	Repair starter.	ST-3
	Ignition switch faulty	Replace ignition switch.	
Engine cranks slowly	Battery not fully charged	Check specific gravity of battery electrolyte. Charge or replace battery.	CH-4
	Battery cables loose, corroded or worn	Repair or replace cables.	
	Starter faulty	Repair starter.	ST-3
Starter keeps running	Starter faulty	Repair starter.	ST-3
	Ignition switch faulty	Replace ignition switch.	
	Short in wiring	Repair wiring.	
Starter spins – engine will not crank	Pinion gear teeth broken or faulty starter	Repair starter	ST-3
	Flywheel teeth broken	Replace flywheel.	

WRAA-ST002

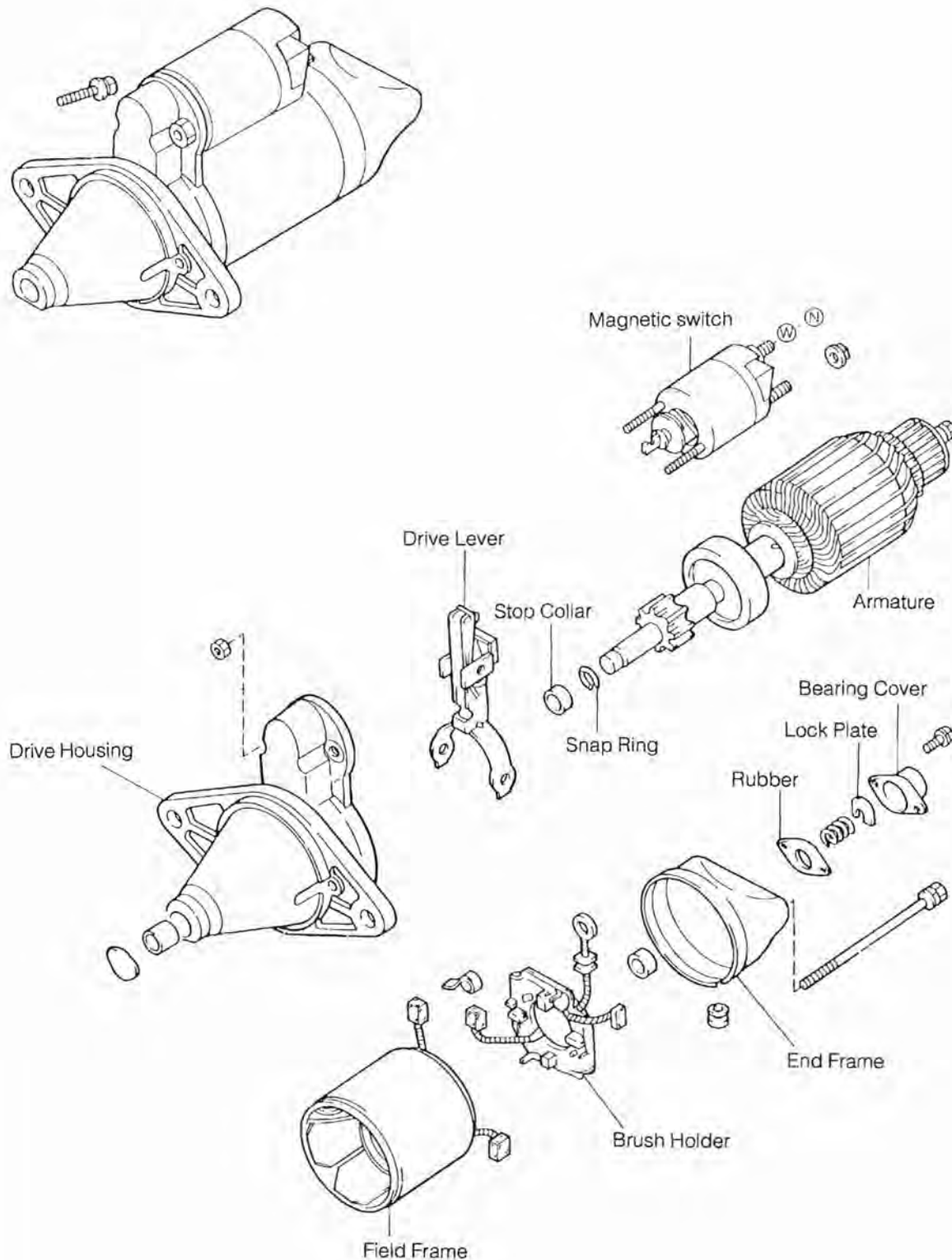
STARTING SYSTEM CIRCUIT



WB88-ST003

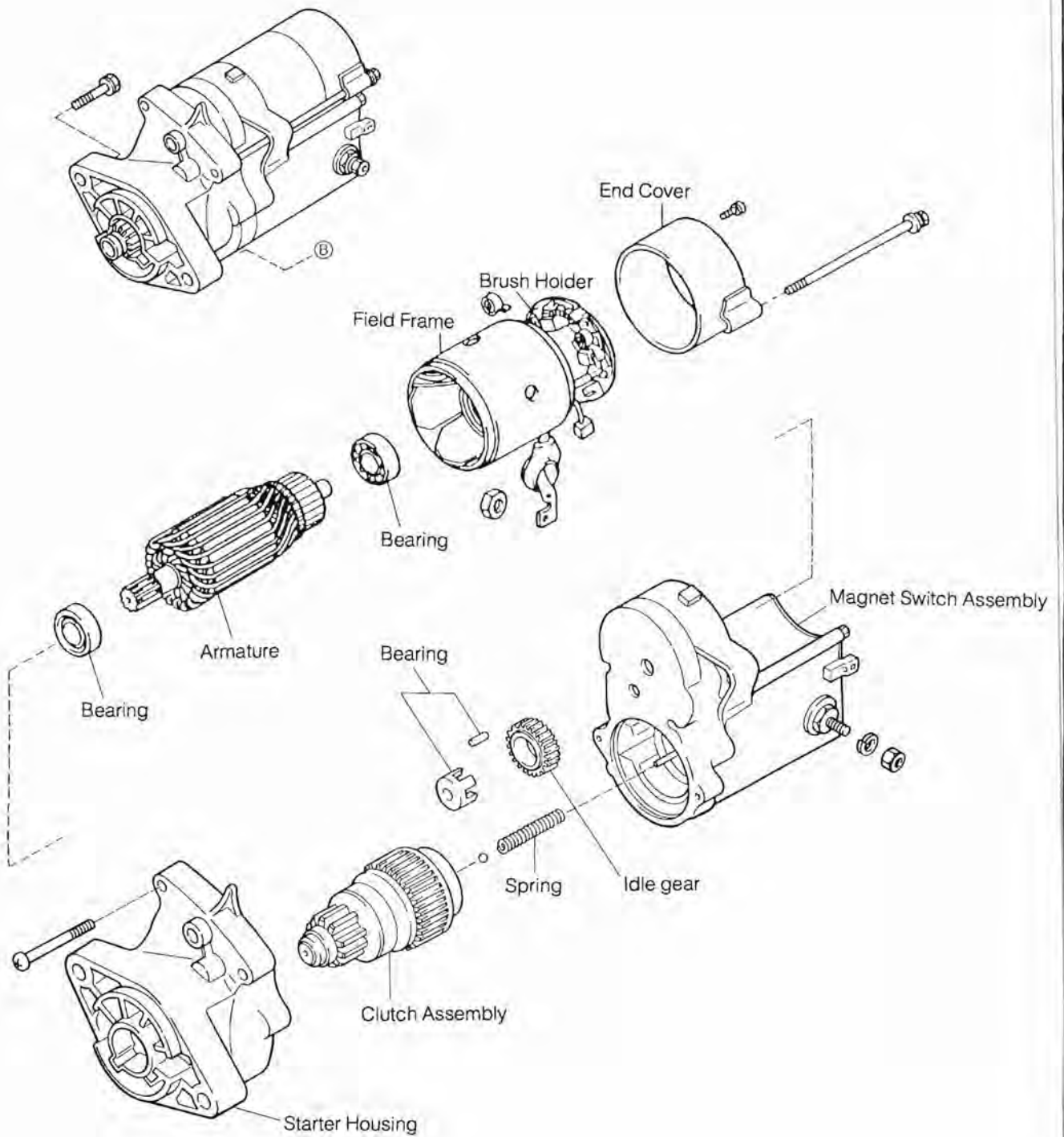
STARTER**COMPONENTS**

0.8 kW, 0.9 kW Conventional Starter Motor



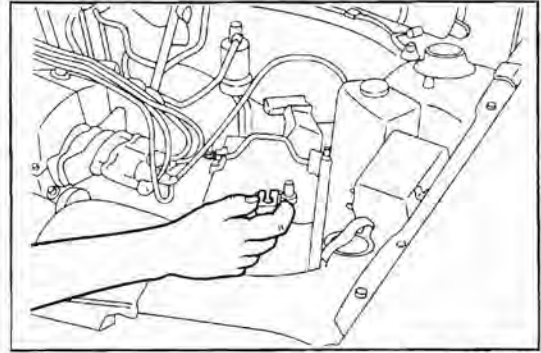
STARTING SYSTEM

1.0 kW Reduction Type Starter Motor



REMOVAL OF STARTER MOTOR

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

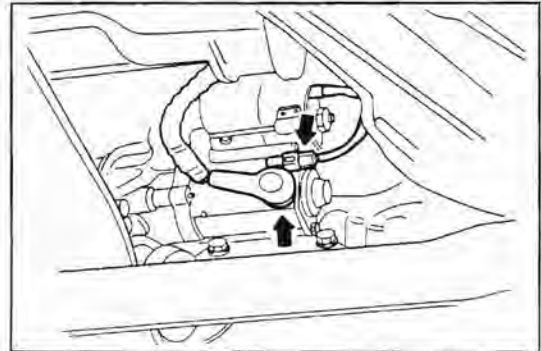


WR88-ST006

2. Jack up the vehicle and support it with safety stands. (See page GI-12.)

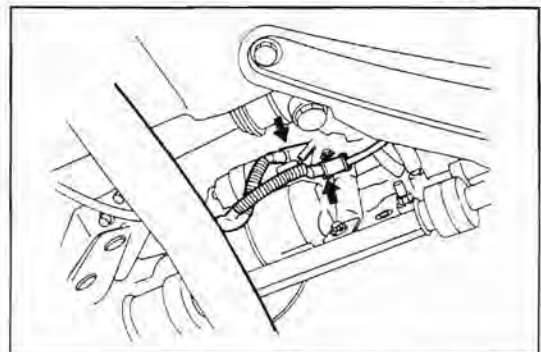
WR88-ST007

3. Disconnection of two wires from starter
 - (1) Disconnect the starter terminal ST of the alternator wire from the starter.



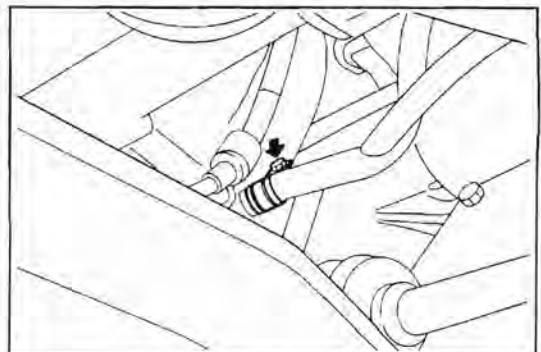
WR88-ST008

- (2) Disconnect the starter terminal B of the alternator wire from the starter.



WR88-ST009

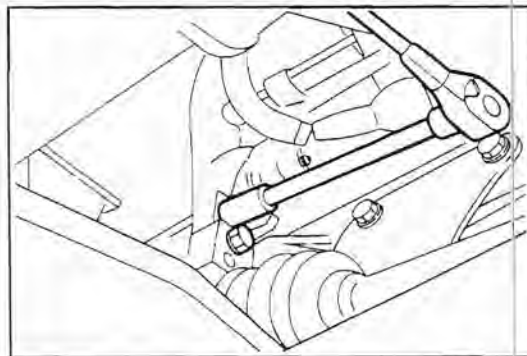
4. Detach the wire harness from the clamp by removing the wire harness clamp bolt.



WR88-ST010

STARTING SYSTEM

5. Removal of starter motor attaching bolts
 - (1) Remove the upper attaching bolt.
 - (2) Remove the lower attaching bolt from the underside of the vehicle.



WR88-ST011

6. Remove the starter motor.

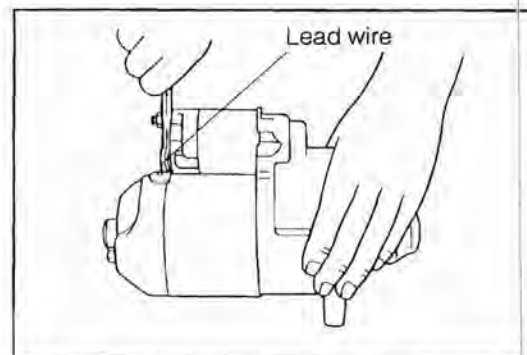
NOTE:

During the removal, pull out the drive housing or the stator housing from the bell housing by raising the starter motor end frame section toward the intake manifold side.

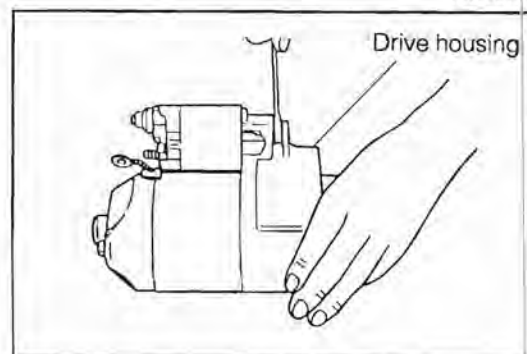
WR88-ST013

DISASSEMBLY OF CONVENTION STARTER MOTOR

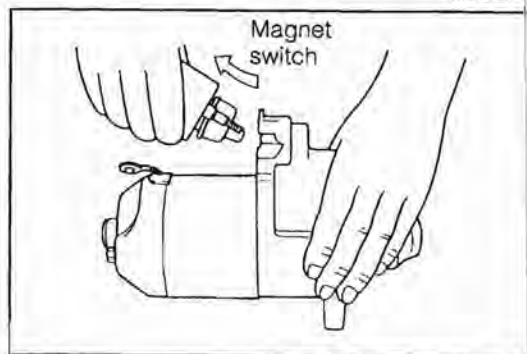
1. Disconnect the lead wire from the magnetic switch.
2. Remove the attaching nut of the magnetic switch from the drive housing.
3. Remove the magnetic switch from the drive housing.



WR88-ST014

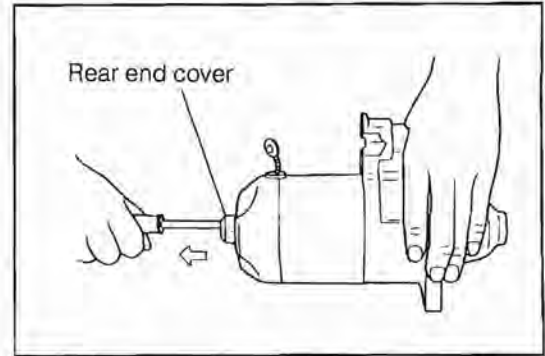


WR88-ST015



WR88-ST016

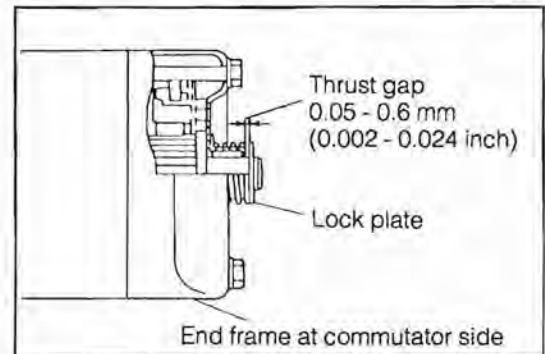
4. Remove the end frame cover by removing the two screws.



WR88-ST017

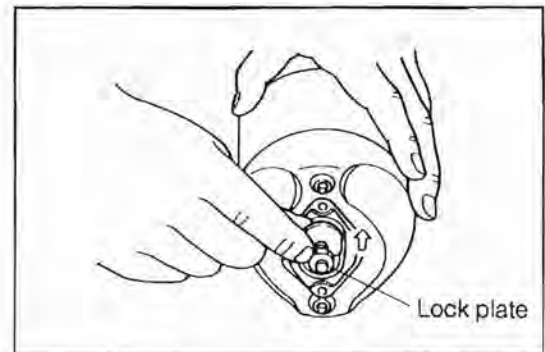
5. Using a thickness gauge, measure the thrust clearance of the armature shaft at a point between the lock plate and the end frame.

Thrust Clearance: 0.05 - 0.60 mm (0.002 - 0.024 inch)



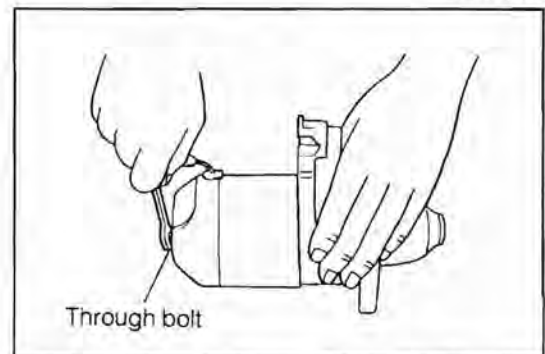
WR88-ST018

6. Remove the lock plate, brake spring and rubber from the commutator end frame.



WR88-ST019

7. Remove the commutator end frame from the field frame by removing the two through bolts.

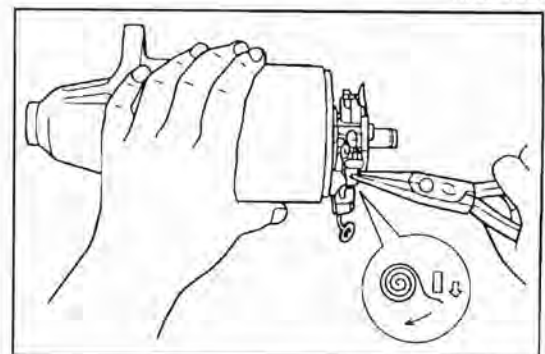


WR88-ST020

8. Remove the brushes from the brush holder by lifting the brush springs by means of nose pliers or the like.

NOTE:

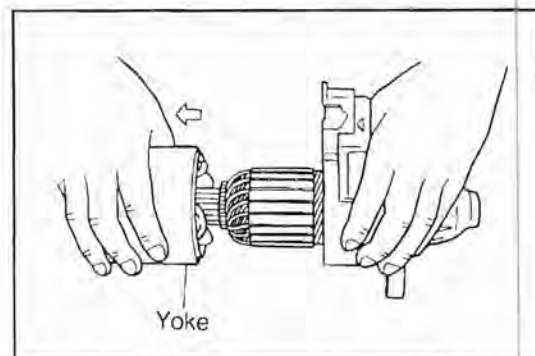
Care must be exercised not to scratch the commutator during the removal.



WR88-ST021

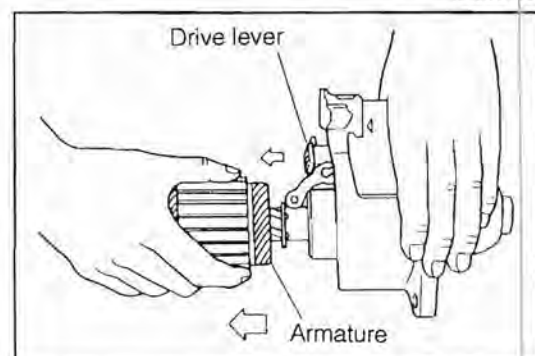
STARTING SYSTEM

9. Remove the yoke from the armature.



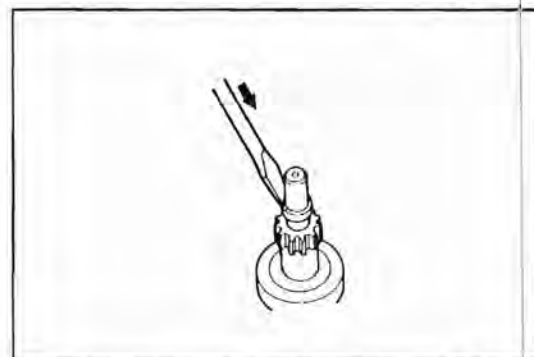
WR88-ST022

10. Remove the drive lever and armature from the drive housing.



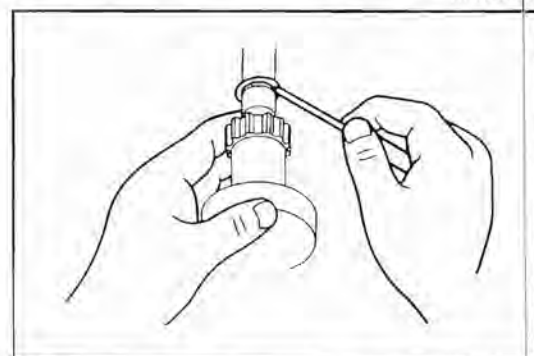
WR88-ST023

11. Remove the stop collar from the snap ring by tapping the collar with a screwdriver or the like placed on it.



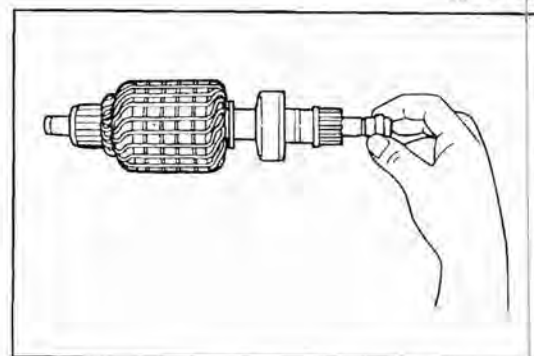
WR88-ST024

12. Remove the snap ring by prying it off with a screwdriver.



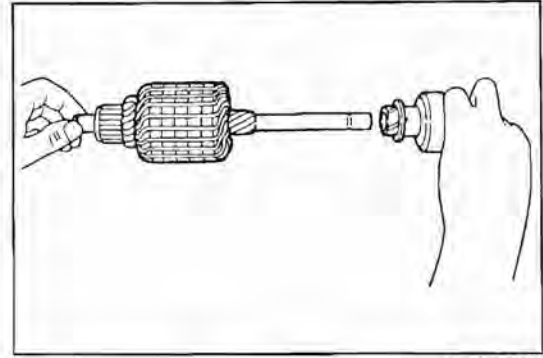
WR88-ST025

13. Remove the collar.



WR88-ST026

14. Remove the clutch.

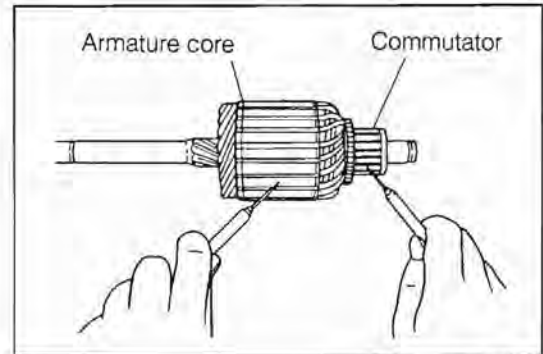


WR88-ST027

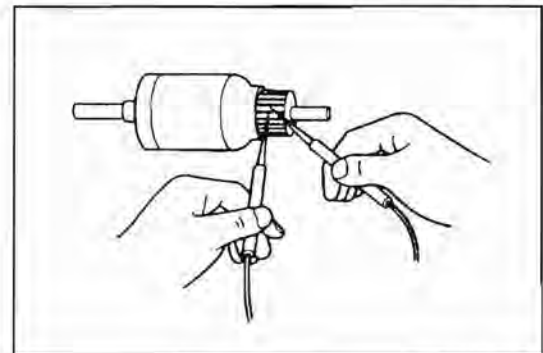
INSPECTION OF CONVENTIONAL STARTER

Armature Coil

1. Check of armature insulation
Ensure that no continuity exists between the commutator and the armature coil, using an ohmmeter.
If continuity exists, replace the armature.
2. Check of commutator continuity
Check continuity between each adjacent segment of the commutator, using an ohmmeter.
If no continuity exists between any adjacent segments, replace the armature.



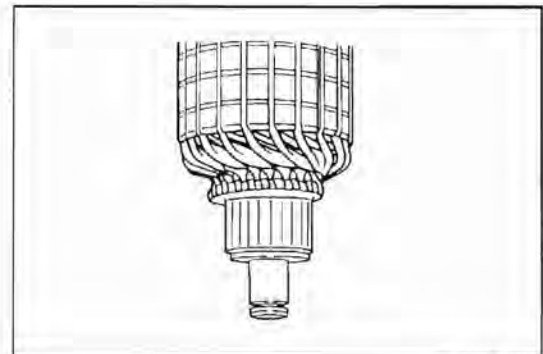
WR88-ST028



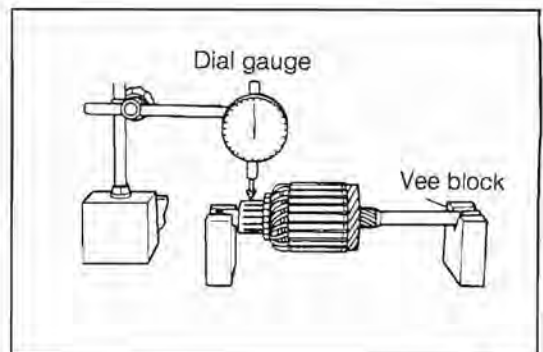
WR88-ST029

Commutator

1. Check each contact surface of the commutator segments with the brushes for burning.
If the surfaces are dirty or burnt, correct the commutator surfaces, using abrasive paper (No. 400) or a lathe.
2. Check of commutator for circle runout
Support the armature at its both ends on a Vee block.
Check the commutator for circle runout, using a dial gauge.
Circle Runout Limit: 0.40 mm (0.016 inch)
If the circle runout exceeds the allowable limit, turn down the commutator on a lathe.
At this point, care must be exercised to ensure that the commutator diameter is not less than the minimum requirement diameter of 27 mm (1.063 inch).



WR88-ST030



WR88-ST031

STARTING SYSTEM

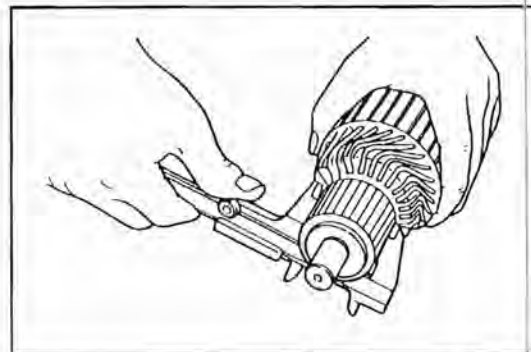
3. Measurement of commutator diameter

Measure the commutator diameter by means of a micrometer or vernier caliper.

Standard Diameter: 28 mm (1.102 inch)

Minimum diameter: 27 mm (1.063 inch)

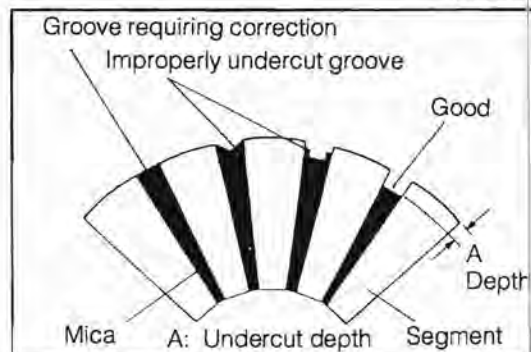
If the commutator diameter is less than the minimum diameter, replace the armature.



WR88-ST032

4. Check of commutator undercut

If the depth of the insulator groove between commutator segments is less than 0.2 mm (0.0079 inch). It is necessary to undercut the insulator so that the groove depth may become 0.5 - 0.8 mm (0.020 - 0.031 inch).



WR88-ST033

Yoke

1. Field coil continuity test

Perform field coil continuity test at a point between the lead wire and the brush, using an ohmmeter.

If no continuity exists, replace the yoke

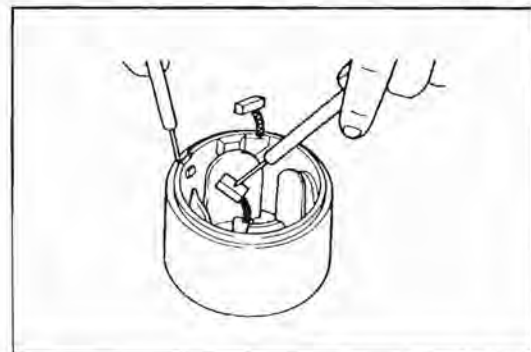


WR88-ST034

2. Field coil short test

Perform field coil short test at a point between the brush and the yoke proper, using an ohmmeter.

If no continuity exists, replace the yoke.



WR88-ST035

Brushes

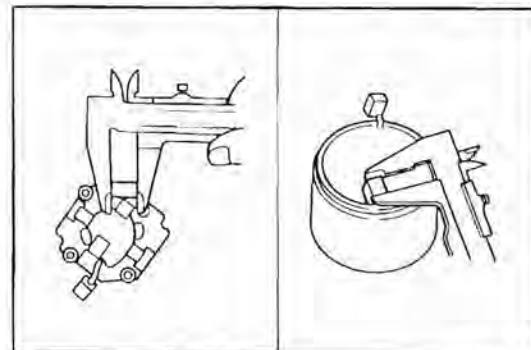
Measurement of brush length

Measure the brush length, using vernier calipers.

Standard Length: 16 mm (0.63 inch)

Minimum length: 10.5 mm (0.41 inch)

If the length is less than the minimum requirement, replace the brush holder or the yoke, as required.



WR88-ST036

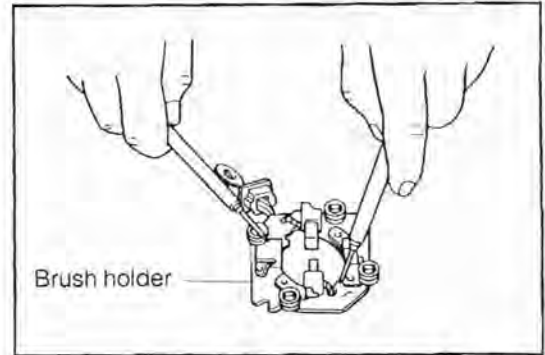
Brush Holder

Check of brush holder for insulation

Measure the insulation between the positive and negative terminals of the brush holder, using an ohmmeter.

Insulation Resistance: 100 MΩ or more

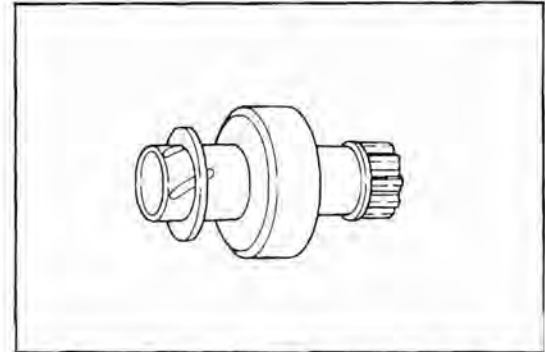
If the insulation resistance is less than the specification, replace the brush holder.



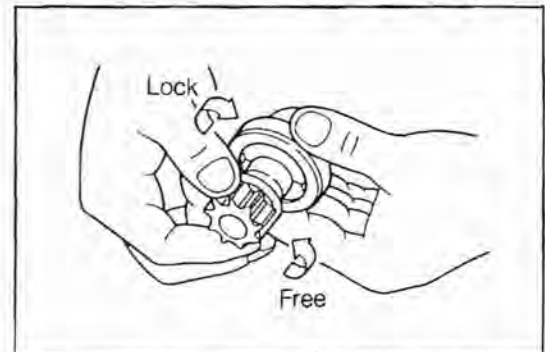
WR88-ST-037

Clutch

1. Inspection of pinion gear and spline teeth
Check the teeth of the pinion gear and spline for wear or damage.
If the teeth exhibit any damage, replace the clutch. Also, inspect the flywheel ring gear for wear or damage.
2. Check of starter clutch
While holding the clutch, turn the pinion clockwise. Ensure that the pinion turns smoothly.
Turn the pinion counterclockwise. Ensure that the pinion is locked.
If the check results are unsatisfactory, replace the starter clutch.



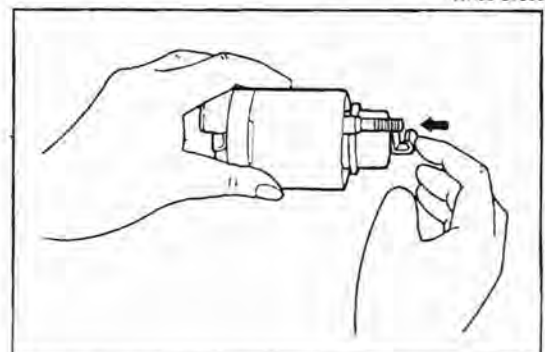
WR88-ST038



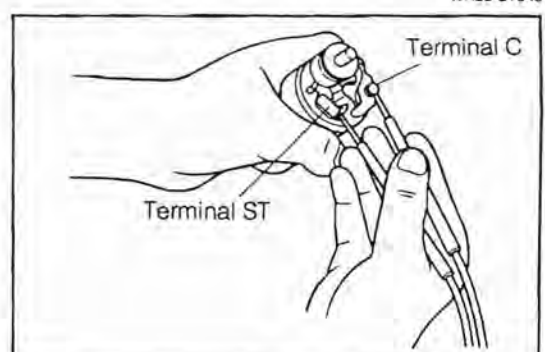
WR88-ST039

Magnetic Switch

1. Plunger check
Push in the plunger with your fingers and release your fingers. Ensure that the plunger returns quickly to the original position. If the plunger exhibits poor returning or fails to return, replace the magnetic switch.
2. Pull-in coil open circuit test
Using an ohmmeter, ensure that continuity exists between the terminal ST and terminal C.
If no continuity exists, replace the magnetic switch.



WR88-ST040



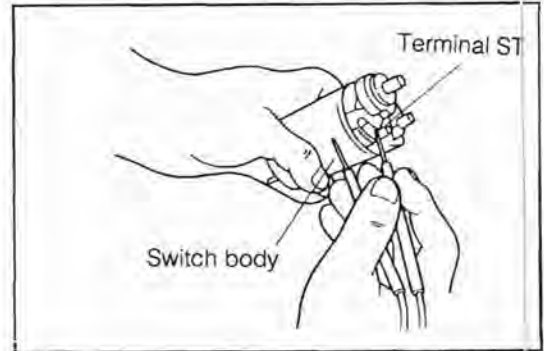
WR88-ST041

STARTING SYSTEM

3. Hold-in coil open circuit test

Ensure that continuity exists between the terminal ST and the switch body.

If no continuity exists, replace the magnetic switch.



WR88-ST042

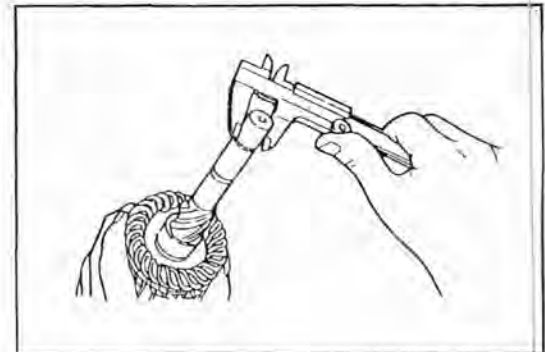
Check of Bush-To-Shaft Clearance

1. Measure the inner diameters of the bushes of the drive housing and commutator end frame.



WR88-ST043

2. Measure the outer diameter of the armature bearing section.



WR88-ST044

3. Determine the clearance by subtracting the outer diameter of the armature bearing section from the inner diameter of the drive shaft.

Clearance Limit: 0.2 mm (0.0079 inch)

If the clearance exceeds the limit, replace the drive housing bearing.

WR88-ST045

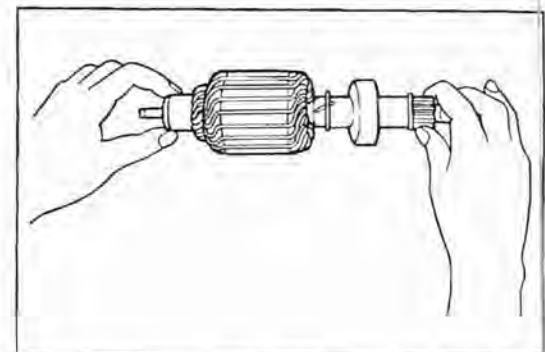
ASSEMBLY OF CONVENTION STARTER

(See page ST-3.)

NOTE:

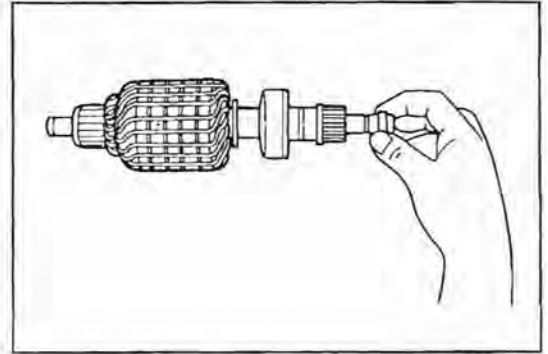
Use high-temperature grease to lubricate the bearings and sliding parts when assembling the starter.

1. Install the clutch on the armature shaft.



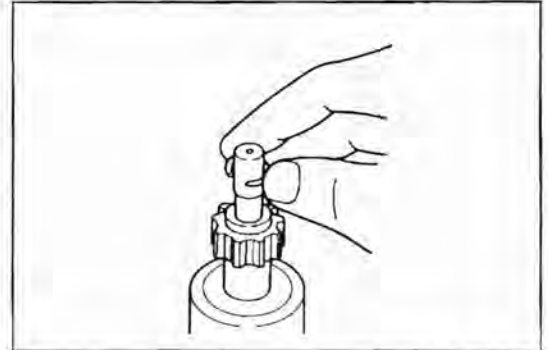
WR88-ST046

2. Install the collar on the armature shaft.



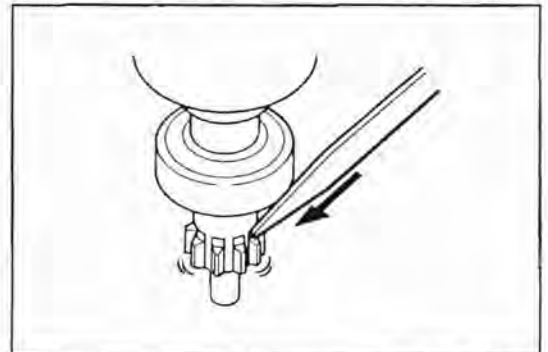
WR88-ST047

3. Fit the snap ring onto the armature shaft.



WR88-ST048

4. Tap the pinion so that the collar may come onto the snap ring, using a screwdriver.

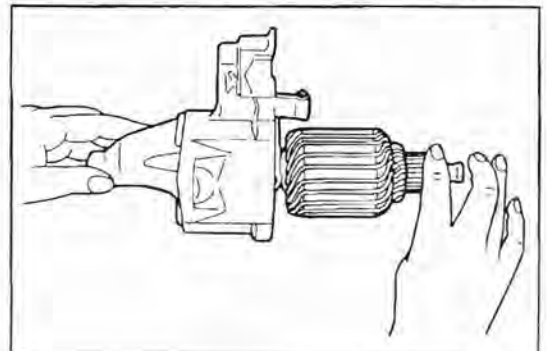


WR88-ST049

5. Install the drive lever and armature in the drive housing.

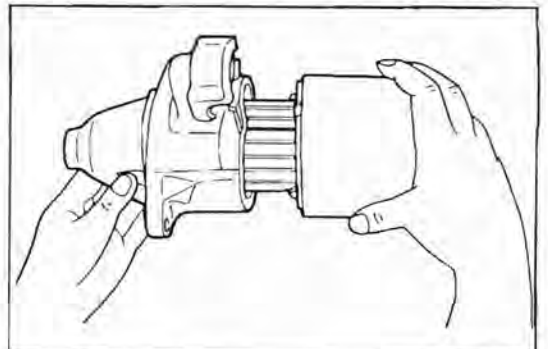
NOTE:

Apply high-temperature grease to the sliding sections of the armature shaft and drive lever.



WR88-ST050

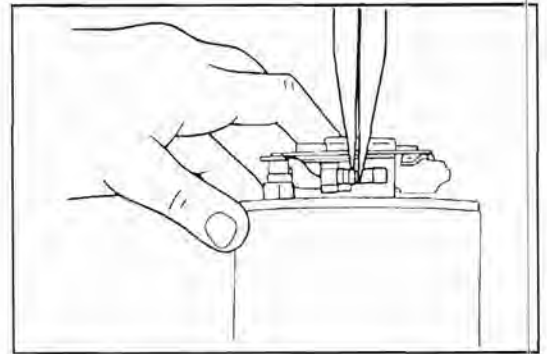
6. Install the yoke in the drive housing.



WR88-ST051

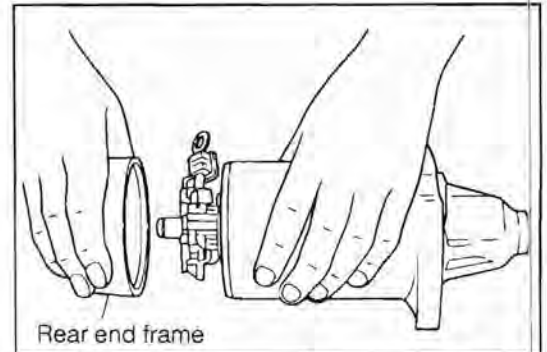
STARTING SYSTEM

7. Install the brush holder over the armature shaft.
8. While the brush springs are held in a raised state by means of nose pliers or a piece of wire, install the brushes (four pieces) in the brush holder.



WR88-ST052

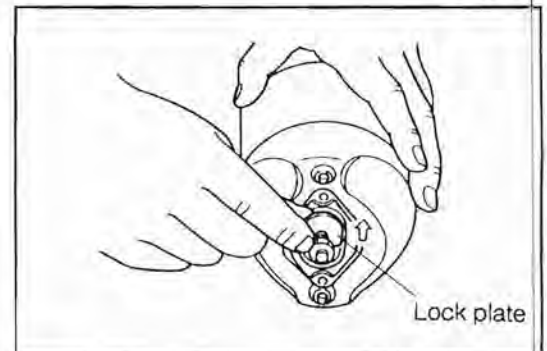
9. Attach the commutator end frame to the stator yoke assembly with the two through bolts.



Rear end frame

WR88-ST053

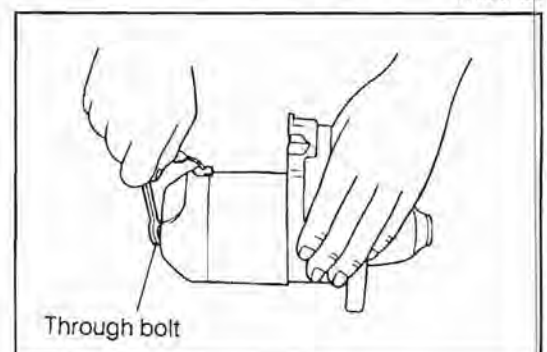
10. Install the rubber, brake spring and lock plate in this order onto the armature shaft.



Lock plate

WR88-ST054

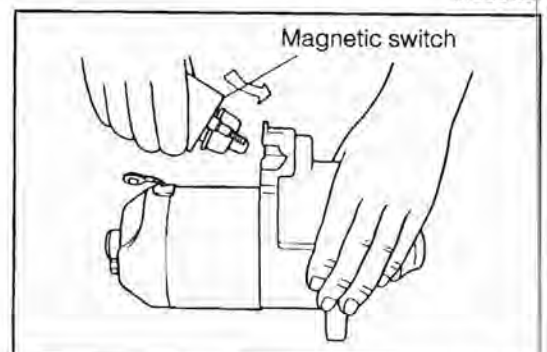
11. Install the rear end frame cover in place with the two screws.



Through bolt

WR88-ST055

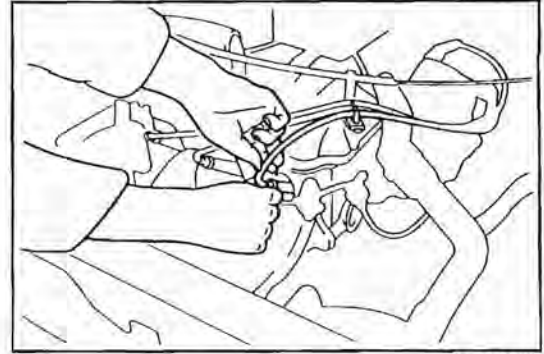
12. While hooking the magnetic switch over the drive lever, install the magnetic switch onto the drive housing. Secure the magnetic switch with the two nuts.



Magnetic switch

WR88-ST056

13. Connect the lead wire to the magnetic switch.



WR88-ST057

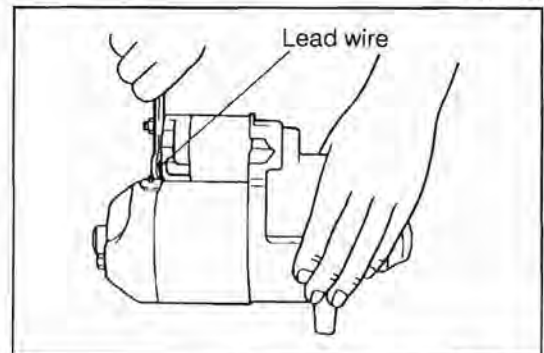
PERFORMANCE TEST OF CONVENTIONAL STARTER MOTOR

CAUTION:

Each of the following tests must be performed within three to five seconds. If you fail to observe this caution and the starter is energized for more than this duration, the coil may be burnt out.

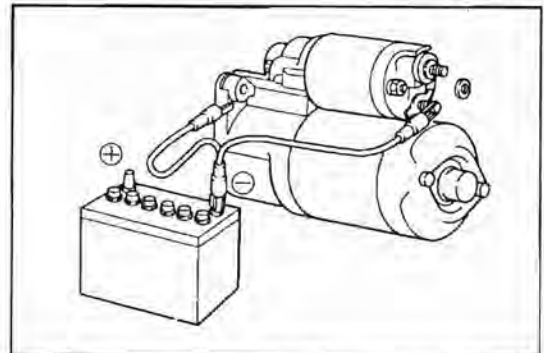
1. Pull-in Test

- (1) Disconnect the lead wire from the magnetic switch terminal.



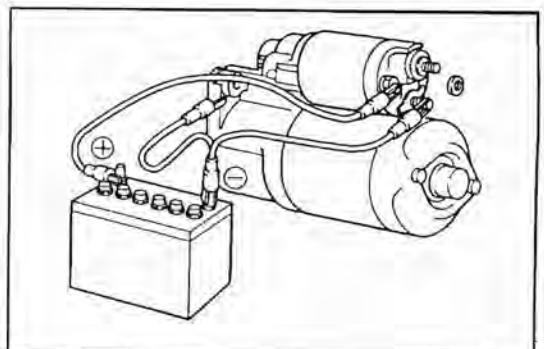
WR88-ST058

- (2) Connect the negative (-) terminal of the battery to the starter body and magnetic switch terminal.



WR88-ST059

- (3) Connect the positive (+) terminal to the terminal ST. Ensure that the pinion is pushed outward. If the drive pinion fails to move out, replace the magnetic switch.



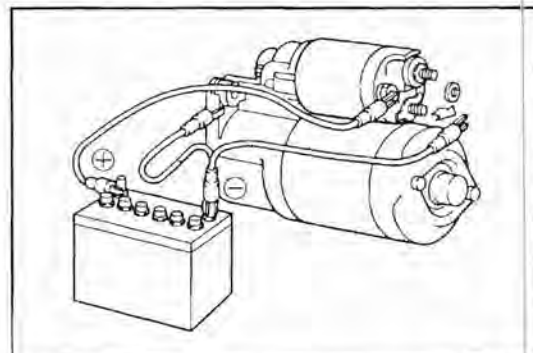
WR88-ST060

WR88-ST061

2. Hold-in Test

After the check has been performed following the same procedure as with the pull-in test, disconnect the negative terminal of the magnetic switch terminal.

Ensure that the drive pinion is held in a pushed-out state. If the drive pinion fails to be held, replace the magnetic switch.

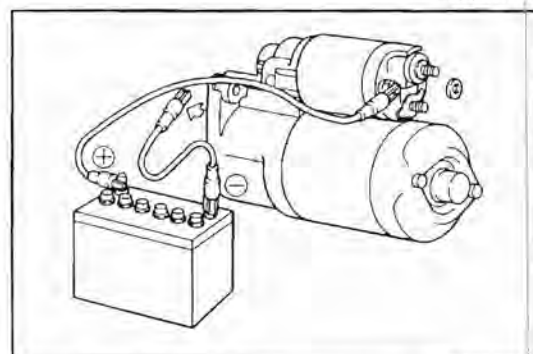


WR88-ST052

3. Inspection of Plunger Return

After the check has been performed following the same procedure as with the hold-in test, disconnect the ground terminal of the starter body. Ensure that the drive pinion is drawn into the drive housing.

If the drive pinion fails to be drawn, replace the magnetic switch.



WR88-ST053

4. No-load Performance Test

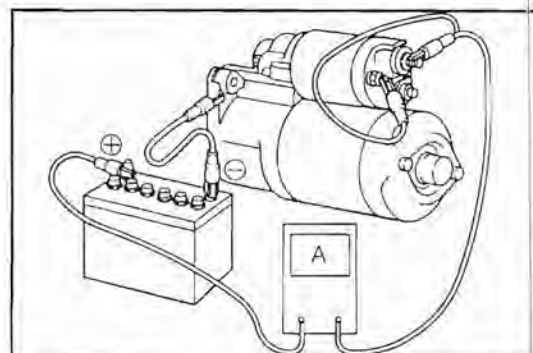
Connect the battery and an ammeter to the starter as shown in the right figure. Ensure that the starter rotates smoothly with the pinion moving out.

Measure the current the starter is drawing.

Specified Current: Less Than 50A at 11V

NOTE:

Prior the test, be sure to connect the lead wire to the magnetic switch.

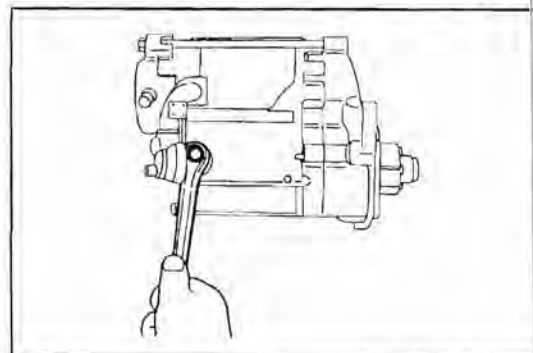


WR88-ST064

DISASSEMBLY OF REDUCTION TYPE STARTER MOTOR

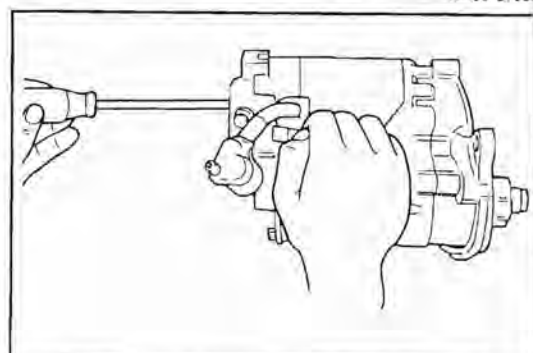
(See page ST-4.)

1. Disconnect the lead wire from the magnetic switch.



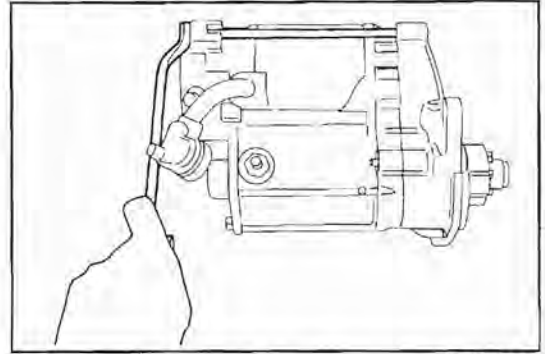
WR88-ST065

2. Remove the brush holder retaining screws from the commutator end frame.



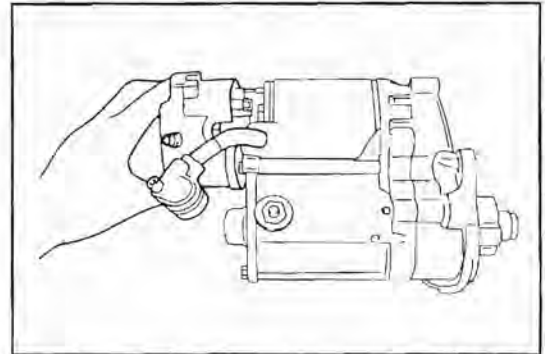
WR88-ST066

3. Remove the two through bolts from the commutator end frame.



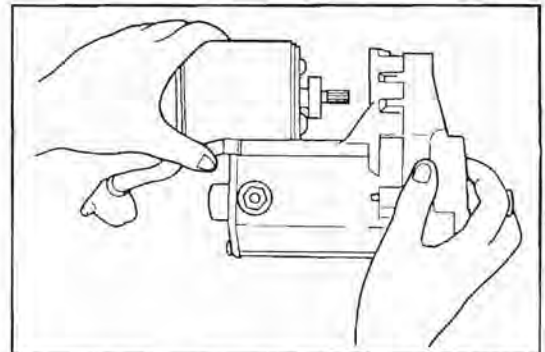
WR88-ST067

4. Remove the commutator end frame and "O" ring.



WR88-ST068

5. Remove the yoke together with the armature from the drive housing.
6. Remove the "O" ring.

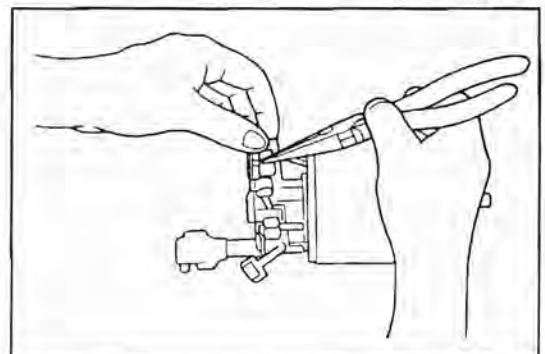


WR88-ST069

7. Remove the brushes from the brush holder by means of nose pliers or the like.

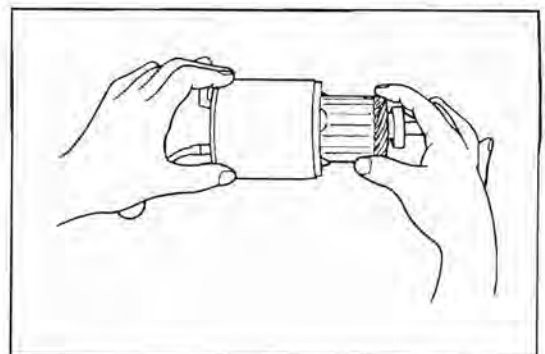
NOTE:

Care must be exercised not to damage the brushes during the removal.



WR88-ST070

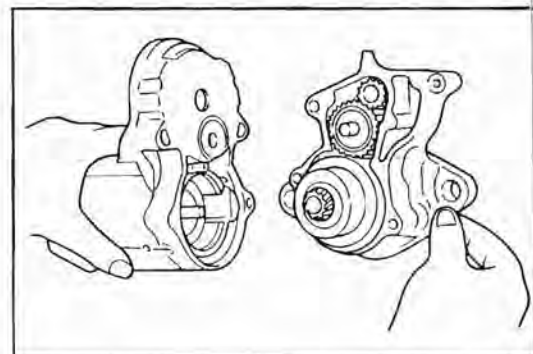
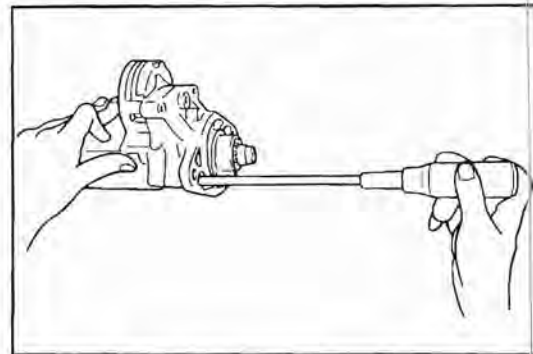
8. Remove the armature from the yoke, being very careful not to damage the brushes.



WR88-ST071

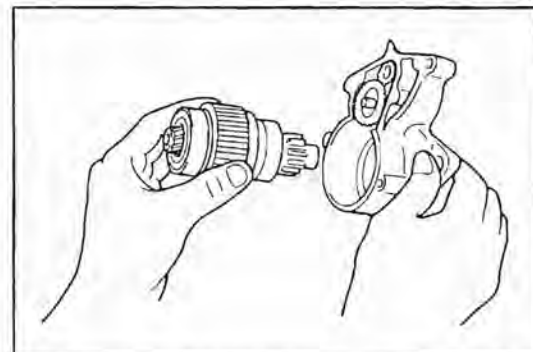
STARTING SYSTEM

9. Remove the starter switch assembly from the drive housing by removing the two screws.



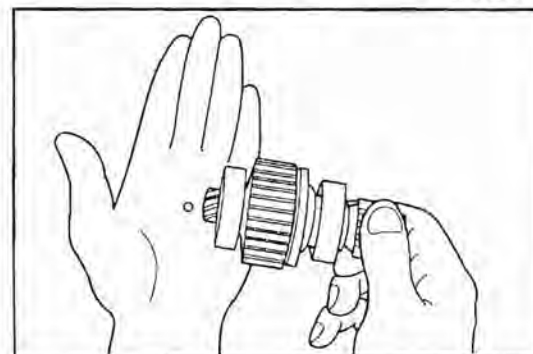
WR88-ST072

10. Remove the clutch assembly from the drive housing.



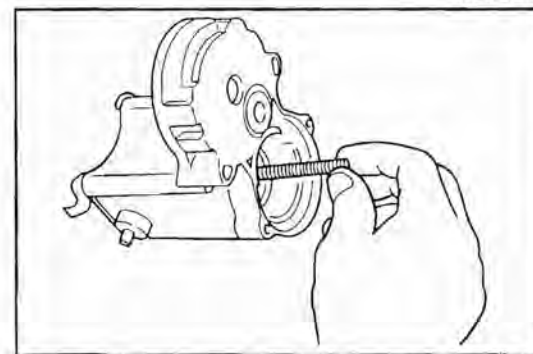
WR88-ST073

11. Remove the steel ball from the clutch assembly.



WR88-ST074

12. Remove the return spring from the starter switch assembly.

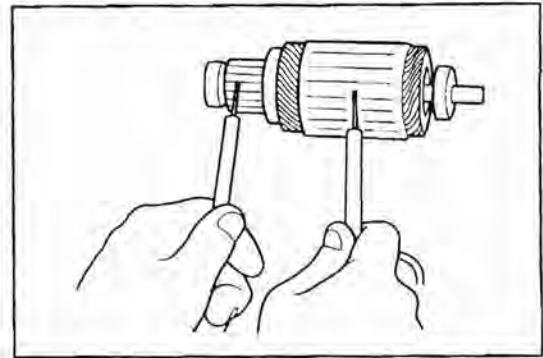


WR88-ST075

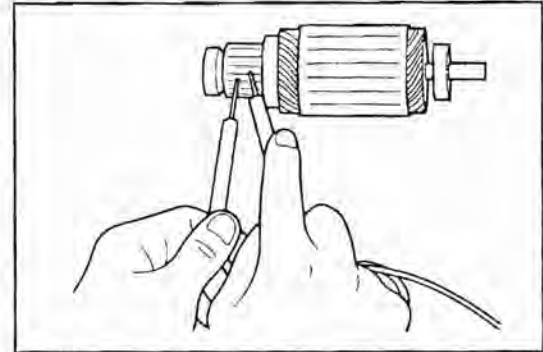
INSPECTION OF REDUCTION TYPE STARTER MOTOR

Armature Coil

1. Check of armature insulation
Ensure that no continuity exists between the commutator and the armature coil, using an ohmmeter.
If continuity exists, replace the armature.
2. Check of commutator continuity
Check continuity between each adjacent segment of the commutator, using an ohmmeter.
If no continuity exists between any adjacent segments, replace the armature.



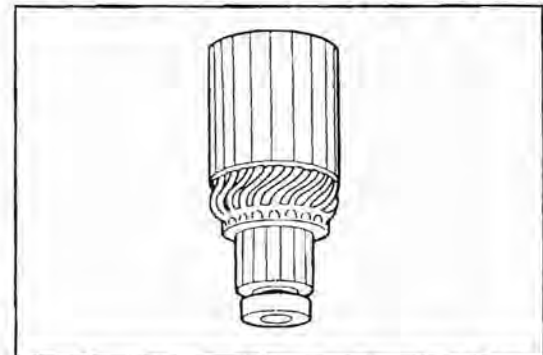
WR88-ST076



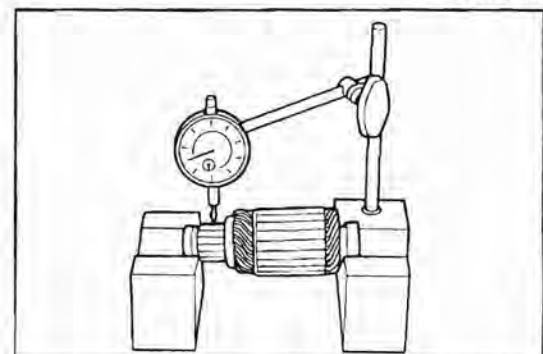
WR88-ST077

Commutator

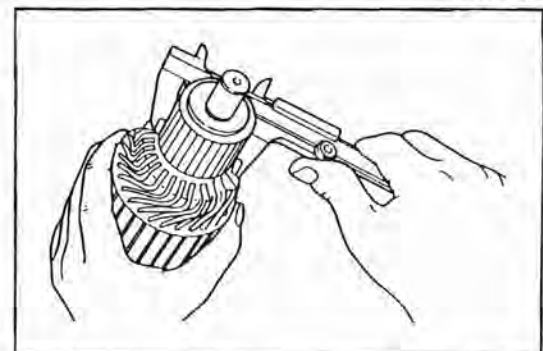
1. Check each contact surface of the commutator segments with the brushes for burning.
If the surfaces are dirty or burnt, correct the commutator surfaces, using abrasive paper (No. 400) or a lathe.
2. Check of commutator for circle runout
Support the armature at its both ends on a Vee block.
Check the commutator for circle runout, using a dial gauge.
Circle Runout Limit: 0.05 mm (0.0020 inch)
If the circle runout exceeds the allowable limit, turn down the commutator on a lathe.
At this point, care must be exercised to ensure that the commutator diameter is not less than the minimum requirement diameter of 29.0 mm (1.142 inch).
3. Measurement of commutator diameter
Measure the commutator diameter by means of a micrometer or vernier caliper.
Standard Diameter: 30.0 mm (1.181 inch)
Minimum Diameter: 29.0 mm (1.142 inch)
If the commutator diameter is less than the minimum diameter, replace the armature.



WR88-ST078



WR88-ST079

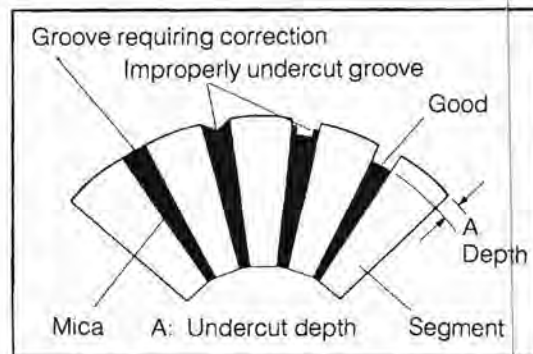


WR88-ST080

STARTING SYSTEM

4. Check of commutator undercut

If the depth of the insulator groove between commutator segments is less than 0.2 mm (0.0079 inch), it is necessary to undercut the insulator so that the groove depth may become 0.6 mm (0.024 inch).

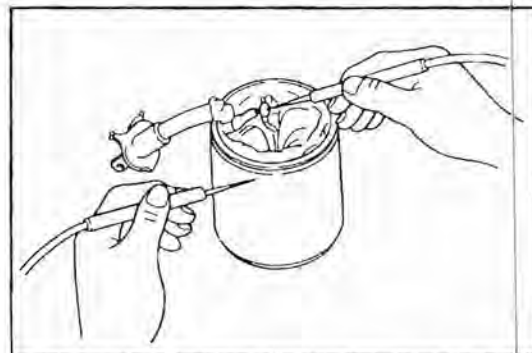


WR88-ST081

Yoke

1. Field coil continuity test

Perform field coil continuity test at a point between the lead wire and the brush, using an ohmmeter. If no continuity exists, replace the yoke.



WR88-ST082

2. Field coil short test

Perform field coil short test at a point between the brush and the yoke proper, using an ohmmeter. If no continuity exists, replace the yoke.



WR88-ST083

Brushes

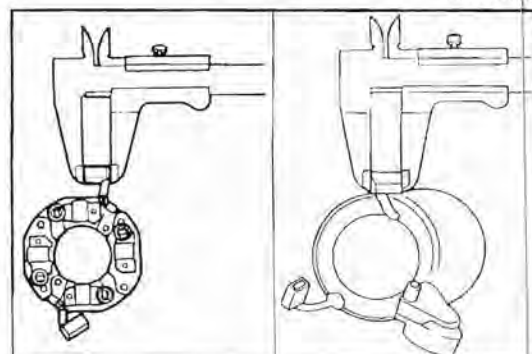
Measurement of brush length

Measure the brush length, using vernier calipers.

Standard Length: 13.0 mm (0.51 inch)

Minimum Length: 8.5 mm (0.33 inch)

If the length is less than the minimum requirement, replace the brush holder or the yoke, as required.



WR88-ST084

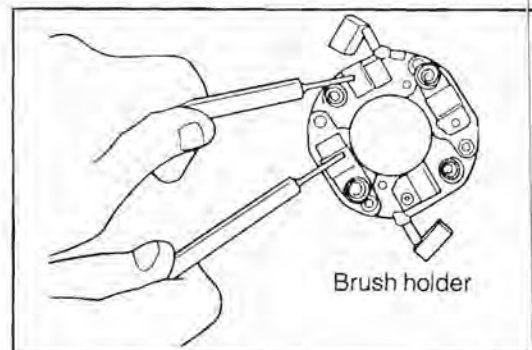
Brush Holder

Check of brush holder for insulation

Measure the insulation between the positive and negative terminals of the brush holder, using an ohmmeter.

Insulation Resistance: 100 MΩ or more

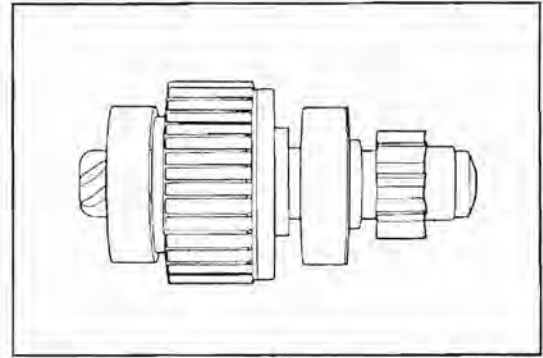
If the insulation resistance is less than the specification, replace the brush holder.



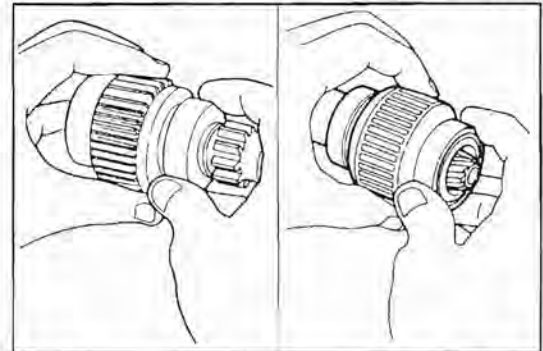
WR88-ST085

Clutch

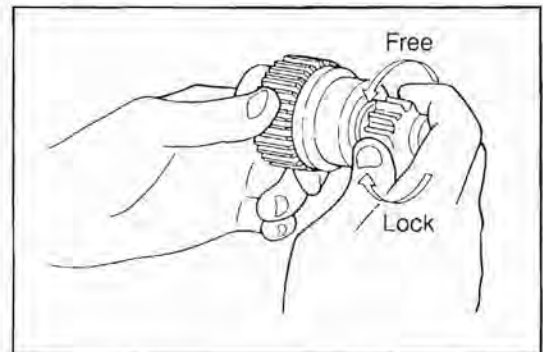
1. Inspection of pinion gear and spline teeth
Check the teeth of the pinion gear and spline for wear or damage.
If the teeth exhibit any damage, replace the clutch. Also, inspect the flywheel ring gear for wear or damage.
2. Bearing check
Lightly turn the bearing hand. Ensure that the bearing turns smoothly.
3. Check of starter clutch
While holding the clutch, turn the pinion clockwise. Ensure that the pinion turns smoothly.
Turn the pinion counterclockwise. Ensure that the pinion is locked.
If the check results are unsatisfactory, replace the starter clutch.



WR88-ST086



WR88-ST087



WR88-ST088

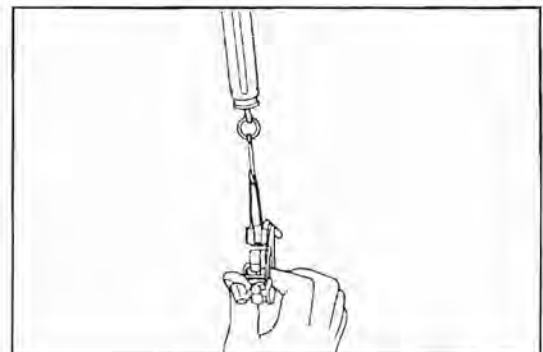
Brush Spring

Measure the brush spring tension, using spring scale.

Tension with Spring Installed:

1.785 - 2.415 kg (3.94 - 5.32 lb)

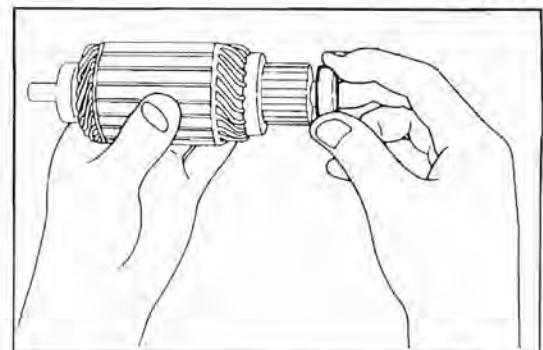
If the spring tension is less than the specification, replace the spring.



WR88-ST089

Bearing

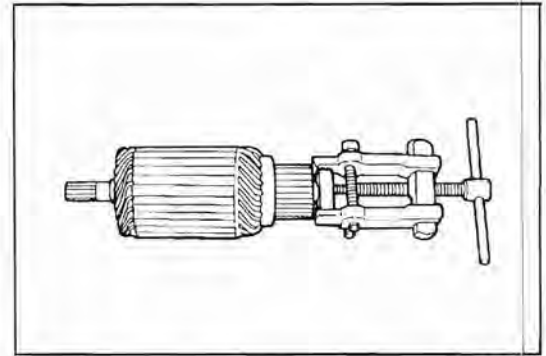
1. Inspection of bearings
Turn the bearing while applying a force to it by your hand.
Ensure that the bearing turns smoothly. If the bearing fails to turn smoothly, replace the bearing.



WR88-ST090

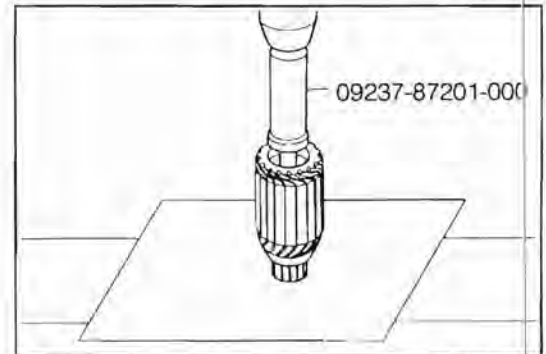
STARTING SYSTEM

2. Bearing replacement (Only when bearing is faulty)
 - (1) Remove the bearing, using a armature bearing puller,



WR88-ST091

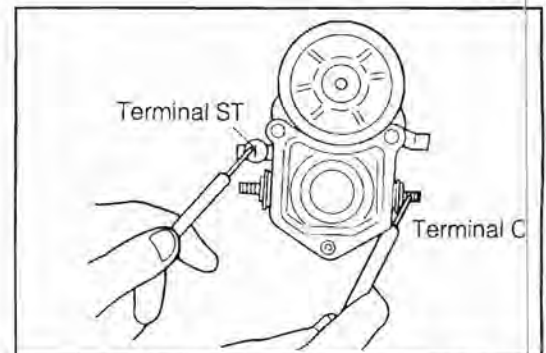
- (2) Press the bearing into the armature shaft, using a press in conjunction with the SST.
SST: 09237-87201-000



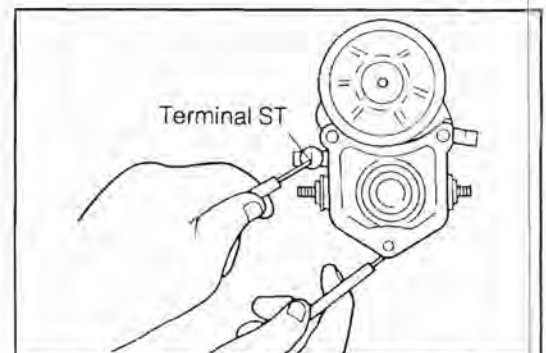
WR88-ST092

Magnetic Switch

1. Pull-in coil test
Using an ohmmeter, ensure that continuity exists between the terminal ST of the starter and the terminal C.
If no continuity exists, replace the magnetic switch.
2. Hold-in coil test
Ensure that continuity exists between the terminal ST of the magnetic switch and the switch body.
If no continuity exists, replace the magnetic switch.



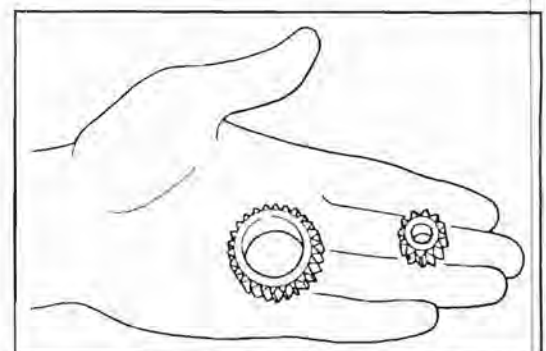
WR88-ST093



WR88-ST094

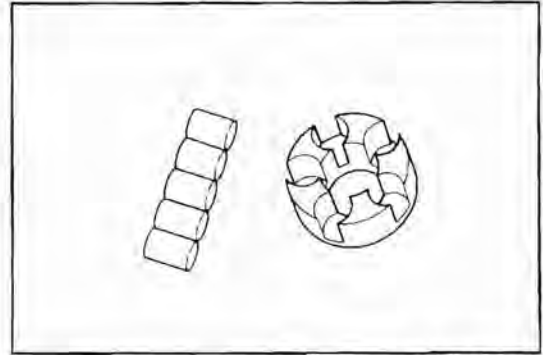
Gears

1. Check the starter drive pinion and starter idle gear for damage or wear.
Replace the gear which exhibits damage or wear.



WR88-ST095

2. Check the starter idle gear clutch and clutch retainer for damage or wear.
Replace the clutch or retainer, as required.



WR88-ST096

ASSEMBLY OF REDUCTION TYPE STARTER MOTOR

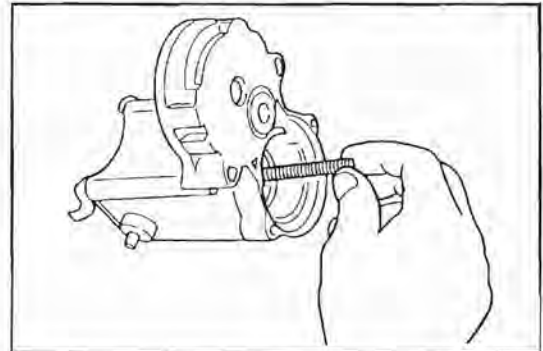
(See page ST-4.)

NOTE:

Use high-temperature grease to lubricate the bearings and gears when assembling the starter.

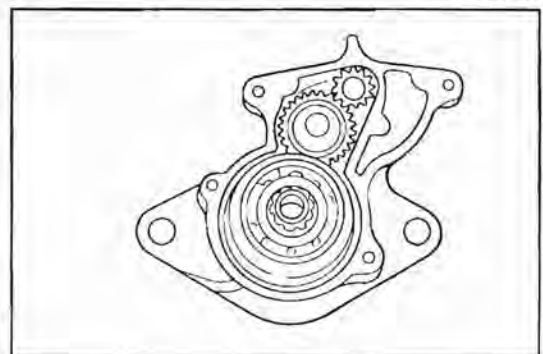
WR88-ST097

1. Install the return spring in the starter switch assembly.



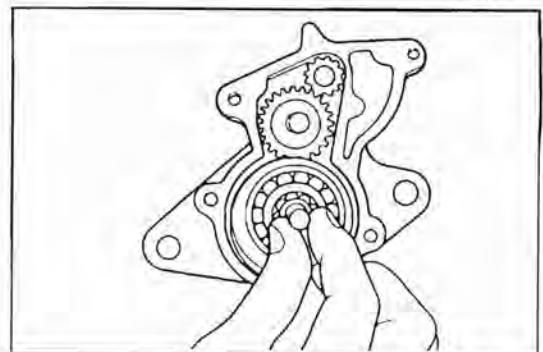
WR88-ST098

2. Fit the steel ball in the starter clutch assembly.



WR88-ST099

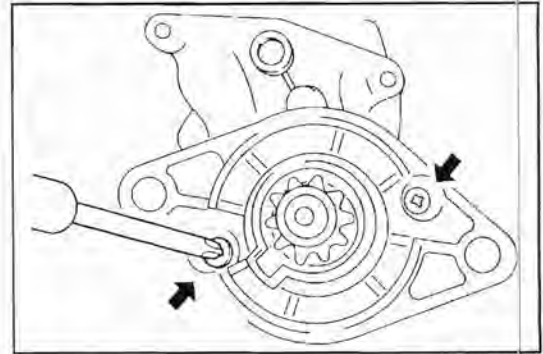
3. Assemble the starter clutch housing, idle gear clutch retainer, idle gear clutch roller and starter drive pinion in the starter drive housing.



WR88-ST100

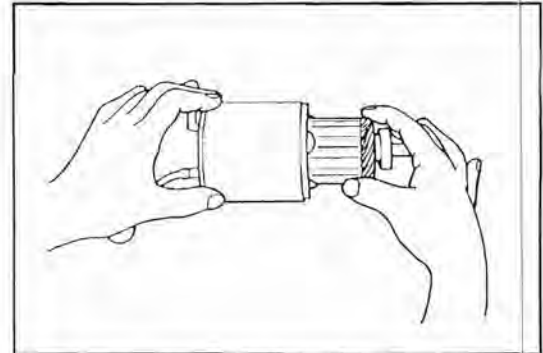
STARTING SYSTEM

4. Install the starter magnetic switch assembly in the starter drive housing. Secure the switch assembly with the two screws.



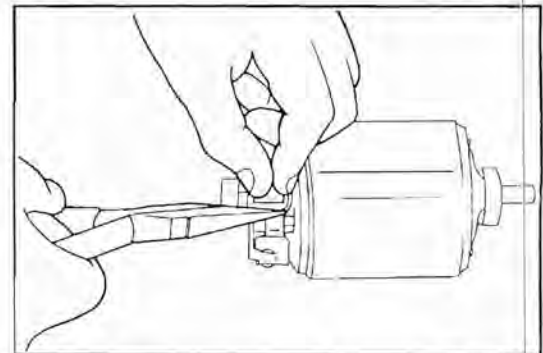
WR88-ST 01

5. Insert the armature into the yoke.



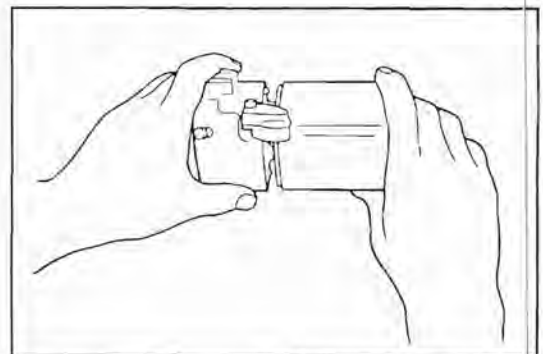
WR88-ST 02

6. While the brush holder is held in a raised state by means of a screwdriver or nose pliers, insert the brushes.



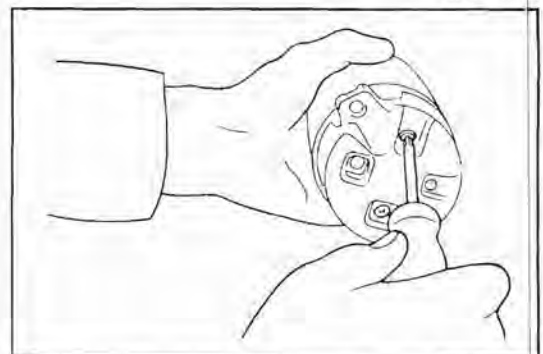
WR88-ST 03

7. Attach the commutator end frame to the yoke with a new "O" ring interposed.



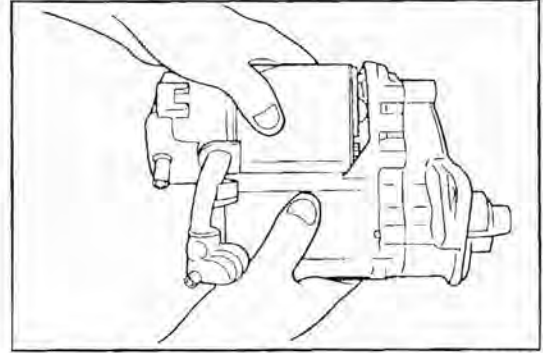
WR88-ST 04

8. Install the brush holder on the end frame, using the two screws.



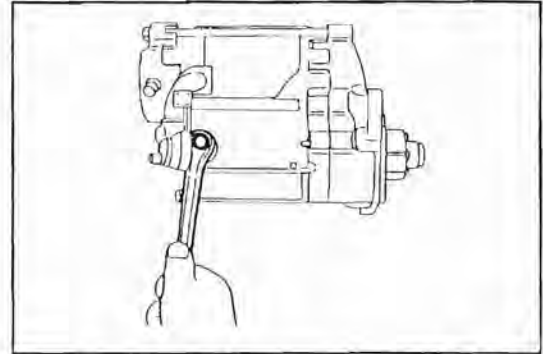
WR88-ST 05

9. Install the yoke on the drive housing with a new "O" ring interposed. Make sure that the cut-out marks are aligned with each other. Secure the yoke with the two through bolts.



WR88-ST106

10. Connect the lead wire to the magnetic switch terminal.



WR88-ST107

PERFORMANCE TEST OF REDUCTION TYPE STARTER MOTOR

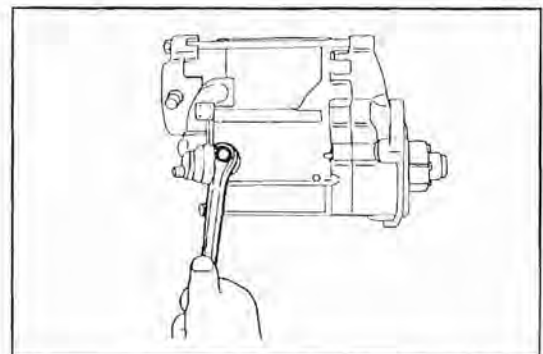
CAUTION:

Each of the following tests must be performed within three to five seconds. If you fail to observe this caution and the starter is energized for more than this duration, the coil may be burnt out.

WR88-ST108

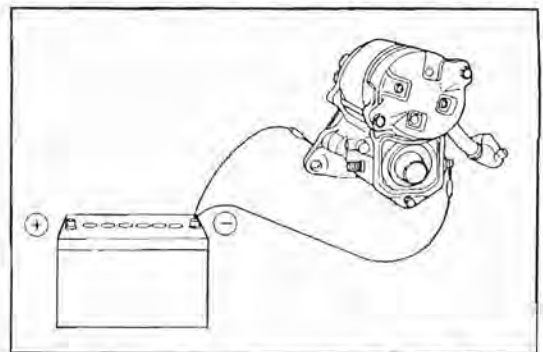
1. Pull-in Test

- (1) Disconnect the lead wire from the magnetic switch terminal.



WR88-ST109

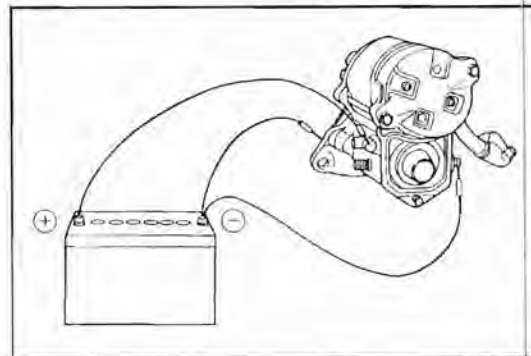
- (2) Connect the negative (-) terminal of the battery to the starter body and magnetic switch terminal.



WR88-ST110

STARTING SYSTEM

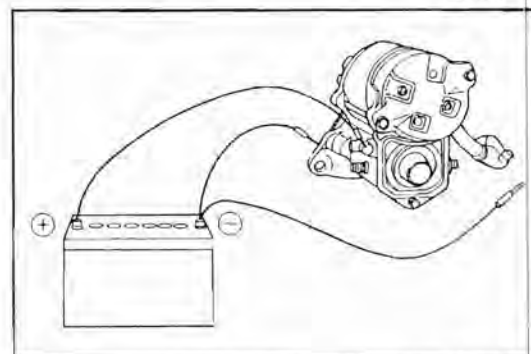
- (3) Connect the positive (+) terminal to the terminal ST. Ensure that the pinion is pushed outward. If the drive pinion fails to move out, replace the magnetic switch.



WR88-ST111

2. Hold-in Test

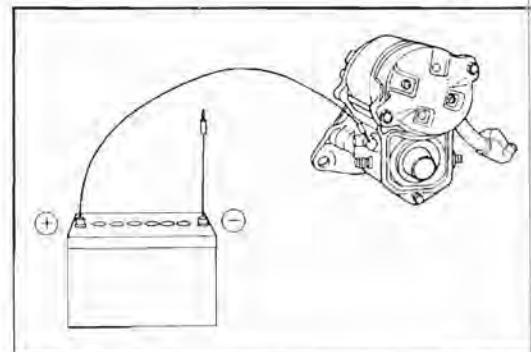
After the check has been performed following the same procedure as with the pull-in test, disconnect the negative terminal of the magnetic switch terminal. Ensure that the drive pinion is held in a pushed-out state. If the drive pinion fails to be held, replace the magnetic switch.



WR88-ST112

3. Inspection of Plunger Return

After the check has been performed following the same procedure as with the hold-in test, disconnect the ground terminal of the starter body. Ensure that the drive pinion is drawn into the drive housing. If the drive pinion fails to be drawn into the drive housing, replace the clutch assembly and return spring.



WR88-ST113

4. No-load Performance Test

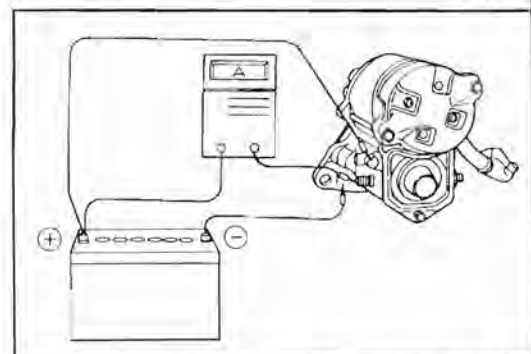
Connect the battery and an ammeter to the starter as shown in the right figure. Ensure that the starter rotates smoothly with the pinion moving out.

Measure the current the starter is drawing:

Specified Current: Less Than 90A at 11.5V

NOTE:

Prior to test, be sure to connect the lead wire to the magnetic switch.



WR88-ST114

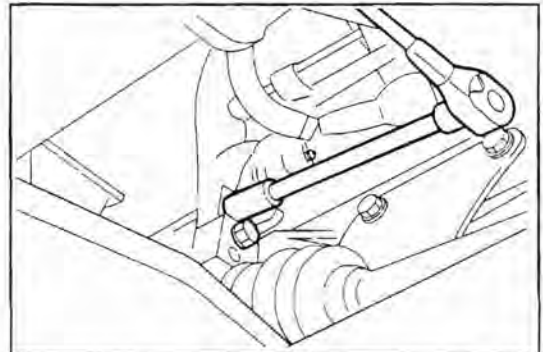
INSTALLATION OF REDUCTION TYPE STARTER MOTOR

1. Install the starter motor to the bell housing.

WR88-ST115

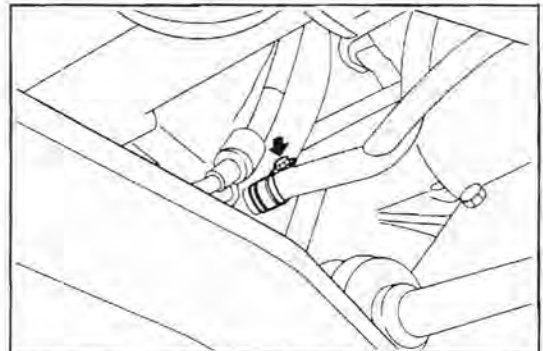
2. Tighten the attaching bolts of the starter motor to the specified torque.

Tightening Torque: 5.0 - 7.0 kg-m (36.2 - 50.6 ft-lb)



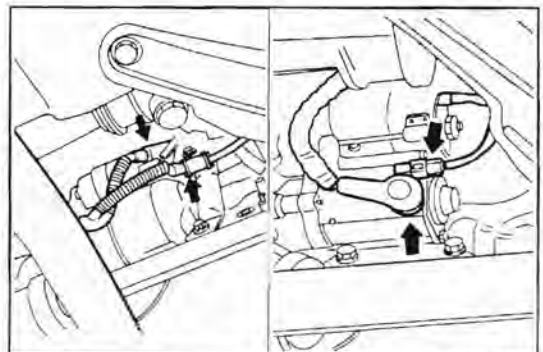
WR88-ST116

3. Jack up the vehicle and remove the safety stands.
4. Attach the wire harness to the clamp. Tighten the clamp bolt.



WR88-ST118

5. Connect the starter terminal B of the alternator wire to the starter.



WR88-ST119

6. Connect the starter terminal ST of the alternator wire to the starter.
7. Connect the ground cable terminal to the negative (-) terminal of the battery.

WR88-ST120

STARTER RELAY (A/T Vehicle Only)

INSPECTION OF STARTER RELAY

1. Inspection of Starter Relay

NOTE:

The starter relay is mounted on the left cowl side in the case of the HC-C engine mounted vehicle; at the backside of the combination meter in the case of the HC-E engine mounted vehicle.

WR88-ST122

Inspection of Relay Continuity

Using an ohmmeter, ensure that continuity exists between the terminals ① and ②.

If no continuity exists, replace the relay.

Using an ohmmeter, ensure that no continuity exists between the terminals ③ and ④.

If continuity exists, replace the relay.

Using an ohmmeter, ensure that no continuity exists between the terminals ③ and the terminal ① or ②.

If continuity exists, replace the relay.

Using an ohmmeter, ensure that no continuity exists between the terminals ④ and the terminal ① or ②.

If continuity exists, replace the relay.

Inspection of Relay Operation

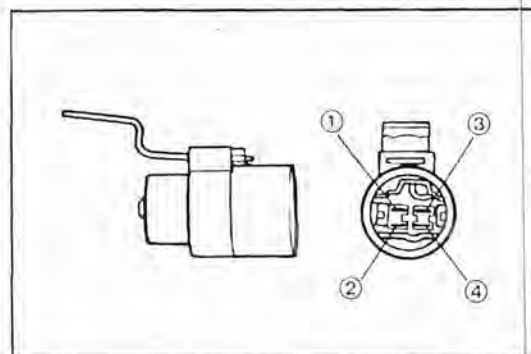
(1) Apply the battery voltage to the terminals ① and ② of the relay.

(2) Ensure that continuity exists between the terminals ③ and ④ of the relay.

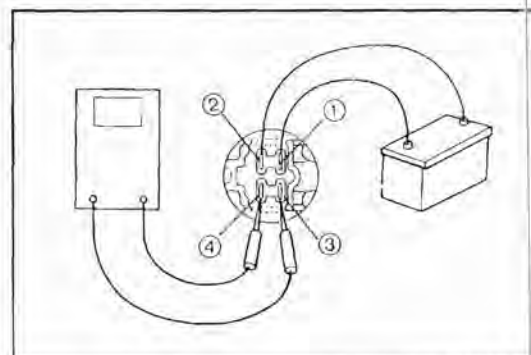
If no continuity exists, replace the relay.

Shift position switch

(See the chassis workshop manual)



WR88-ST123



WR88-ST124

DAIHATSU

CHARADE

TYPE HC ENGINE

CHARGING SYSTEM

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WR88-CH001

PRECAUTIONS

1. Prior to the inspection, make sure that the battery cables are connected securely.
2. When a quick charging operation is carried out, first be sure to disconnect the battery cables.
3. Never use a high-voltage insulation resistance tester for the purpose of conducting this inspection.
4. Under no circumstances should the battery cables be disconnected while the engine is rotating.

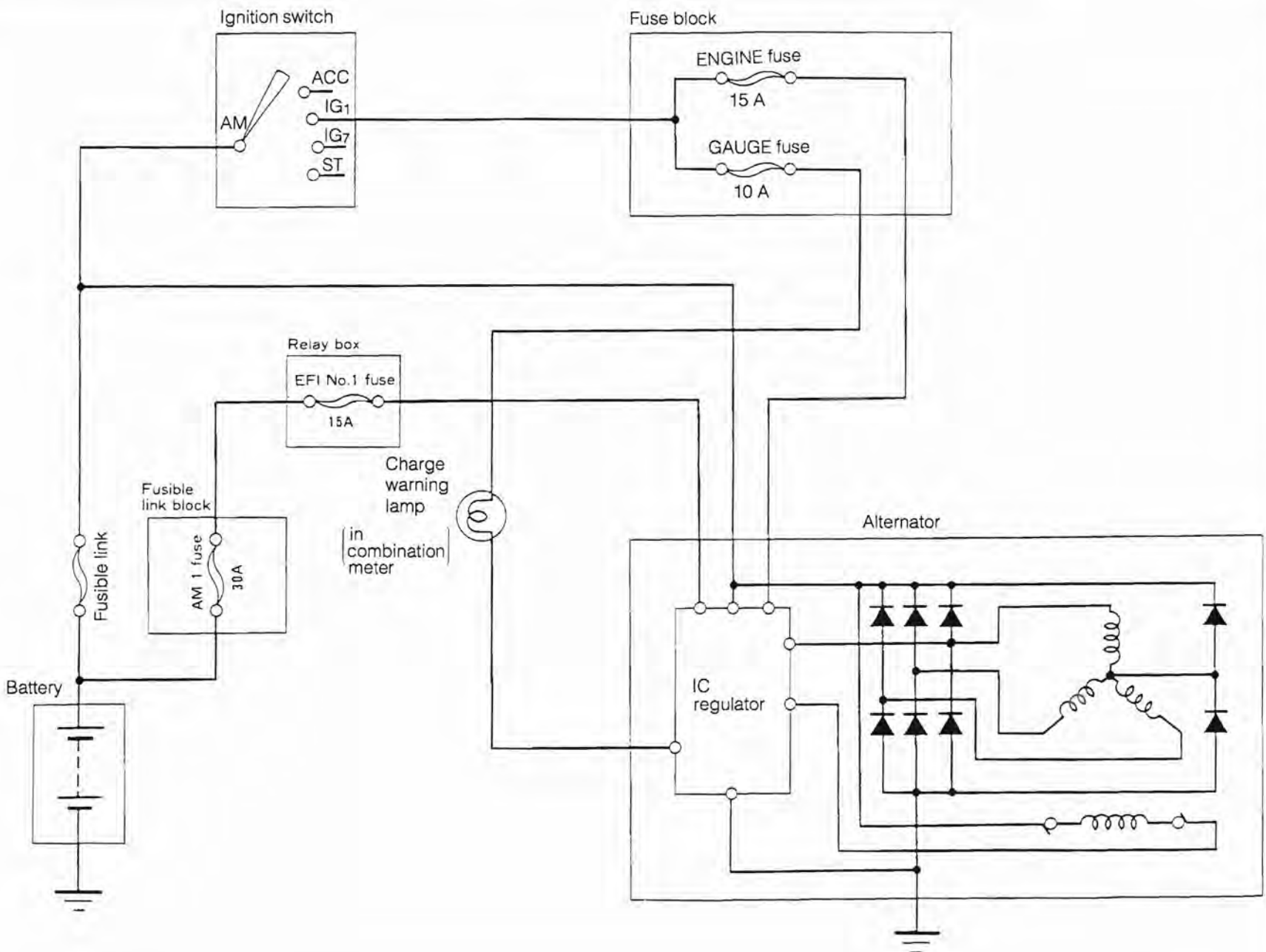
WR88-CH002

TROUBLE SHOOTING

Problem	Possible causes	Remedies	Page
Charge warning lamp will not glow even if ignition switch is turned ON.	Fuse blown Lamp bulb burnt Poor connection of wiring Open wire IC regulator faulty	Check gauge fuse. Replace bulb. Repair poor connection of wiring. Repair or replace. Replace regulator assembly.	CH-7
Charge warning lamp will not go out even if engine has started.	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown IC regulator or alternator faulty Wiring faulty	Adjust or replace. Repair or replace cables. Check gauge fuse. Replace fusible link. Check charging system. Repair or replace.	CH-5 CH-5 CH-7

WR88-CH003

CHARGING SYSTEM CIRCUIT



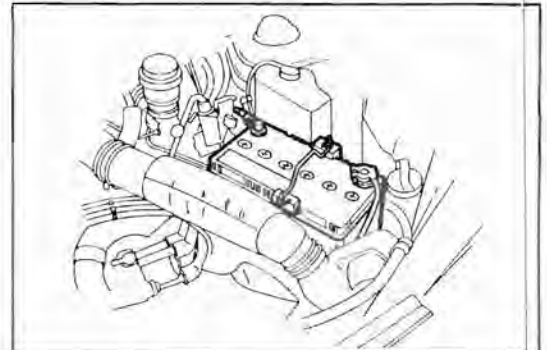
IN-VEHICLE INSPECTION

CAUTION:

- Never touch at the battery terminals immediately after the vehicle has been operated.
- Be certain to turn OFF the ignition key switch during the inspection.

WR88-CH005

1. Check the battery case for proper installing condition and cracks.
If the battery case exhibits improper installing condition or cracks, replace or repair the battery, as required.

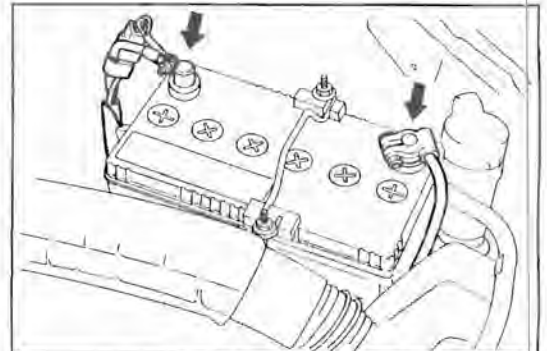


WR88-CH006

2. Check to see if the battery terminals exhibit corrosion and/or loose condition.
If the battery terminals exhibit corrosion and/or loose condition, remove the battery cable terminals from the terminal of the battery. Remove any rust, using a wire brush or a fine abrasive paper. After the battery terminals have been connected, coat these terminal with a thin film of lithium grease.

NOTE:

After the battery terminals have been cleaned, make sure that no rust particle remains on the terminals.



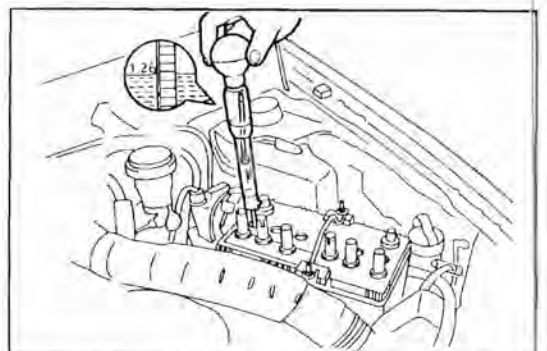
WR88-CH008

3. Check of specific gravity of battery electrolyte
Measure the specific gravity of the electrolyte of each cell, using a hydrometer. Ensure that the specific gravity is within the specified value.

Standard specific gravity:

When fully charged at 20 °C (68 °F)

1.25 or more



WR88-CH009

If the specific gravity is not within the specified value, check the electrolyte level and/or replenish distilled water. Then, charge the battery until the specific gravity reaches the specified value.

<Reference>

$$\begin{array}{l} \text{Specific gravity} \\ \text{at standard} \\ \text{temperature} \end{array} = \begin{array}{l} \text{Measured} \\ \text{specific} \\ \text{gravity} \end{array} + 0.0007 \times \begin{array}{l} (\text{Electrolyte} - 20) \\ \text{temperature} \\ \text{at time of} \\ \text{measurement } ^\circ\text{C} \end{array}$$

CAUTION:

Utmost care must be exercised as to the handling of electrolyte. Be very careful not to allow the electrolyte to touch with your skin, clothes or any parts of the vehicle.

WR88-CH010

- First-aid treatment for dilute sulfuric acid

Nature of accident	First-aid treatment
Acid gets to vehicle body.	Immediately flush the affected area using a large amount of clean running water, until no acid content remains any more.
* Acid gets into your eyes.	Immediately flush your eyes using a large amount of clean running water for at least 15 minutes with your eyes in open state.
* Acid gets to your skin or clothes.	Immediately flush the affected area using a large amount of clean running water, until no acid content remains any more. Afterwards, neutralize them with a soap. Finally flush them with water.
Acid is spilled.	Immediately flush the affected area using a large amount of water, until no acid content remains any more. Afterwards, neutralize the area with slaked lime, sodium or the like.
* Acid is swallowed.	Immediately flush the mouth with clean water. Let him drink raw eggs, milk or a large amount of water. Let him lie quietly.

- After the aforesaid first-aid treatment has been done, call a physician immediately.

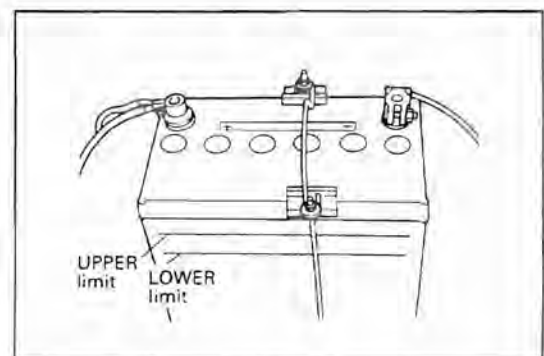
WR88-CH011

4. Inspection of battery electrolyte level

Ensure that the battery electrolyte level is the highest level. If the battery electrolyte level of any cell is not the highest level, replenish distilled water to the highest level.

NOTE:

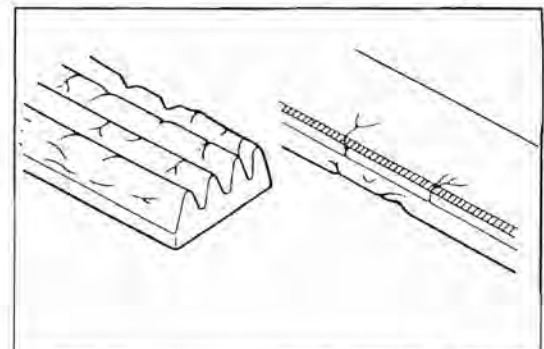
- Never add city tap water or sulfuric acid, etc. instead of distilled water.
- If the electrolyte level of each battery cell differs greatly, it is advisable to inspect to see if any electrolyte leakage is present.



WR88-CH012

5. Inspection of drive belt

- Visually check the belt for separation of the adhesive rubber above and below the core, core separation from the adhesive rubber, cracking or separation of the ribs, torn or worn ribs or cracks in the inner ridges of the ribs. If necessary replace the drive belt.



WR88-CH013

CHARGING SYSTEM

(2) Measurement of amount of belt deflection

Push the midpoint of the drive belt between the alternator pulley and the water pump pulley by applying a force of 10 kg (22 lb). Measure the deflection of the drive belt.

Specified Belt Deflection

New belt: 4.0 - 5.0 mm (0.16 - 0.19 inch)

(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)

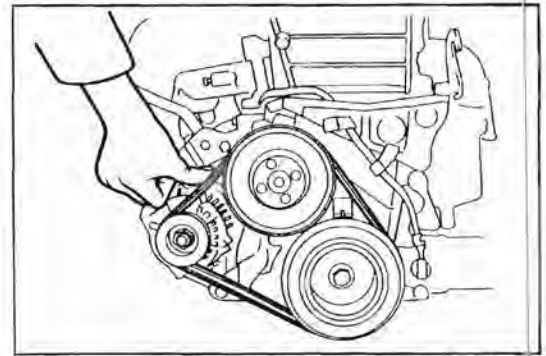
Used belt: 5.0 - 6.0 mm (0.20 - 0.23 inch)

(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)

Adjust the drive belt tension, if necessary.

NOTE:

- "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 replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for about 5 minutes and then recheck the tension.



WR88-CH014

6. Check of fuses for continuity

Fusible link

Fusible link block

EFI No. 1 fuse

Engine fuse

Gauge fuse

7. Checking alternator wiring and listening for abnormal noises

(1) Check to see if the alternator wire is connected properly to the alternator.

(2) Ensure that the alternator emits no abnormal noise while the engine is running.

WR88-CH015

8. Check of charge warning lamp circuit

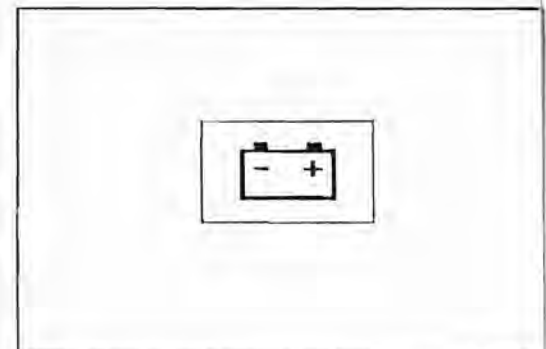
(1) Turn OFF all accessory switches.

(2) Start the engine and warm up the engine thoroughly. Turn OFF the ignition switch.

(3) When the ignition switch is turned ON, ensure that the charge warning lamp goes on.

(4) After the engine has started, ensure that the charge warning lamp goes out.

If the warning lamp does not function as specified, troubleshoot the warning lamp circuit.



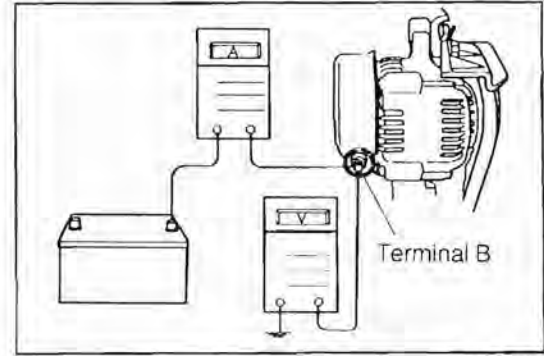
WR88-CH016

9. Check of charging circuit under no-loaded state

NOTE:

If a battery/alternator tester is available, connect such tester to the charging circuit according to the manufacturer's instructions.

- (1) If such a tester is not available, connect a voltmeter and an ammeter to the alternator wiring and alternator as follows:
 - Disconnect the battery ground cable from the negative (-) terminal of the battery.
 - Connect an ammeter in series between the alternator wire terminal B and the alternator as indicated in the right figure.
 - Connect the positive (+) terminal of a voltmeter to the terminal B as indicated in the right figure.
 - Connect the negative (-) terminal of the voltmeter to the engine ground.
 - Wind vinyl tape around each connection section so as to prevent short.
 - Reconnect the battery ground cable to the negative (-) terminal of the battery.



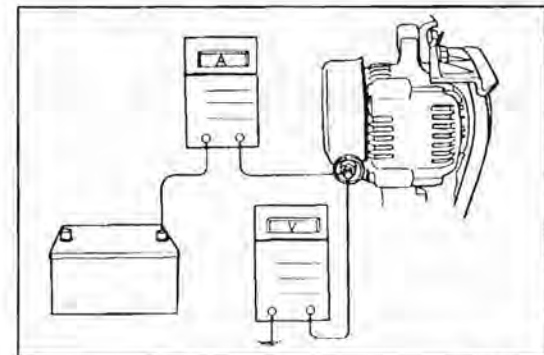
- (2) Check the charging circuit as follows:

- (1) Start the engine and warm it up.
- (2) Raise the engine speed from the idle speed to 2000 rpm. Take the readings of the ammeter and voltmeter.

Standard Amperage: Not to exceed 10 A

Standard Voltage: Standard Amperage 14.2 - 14.8 V

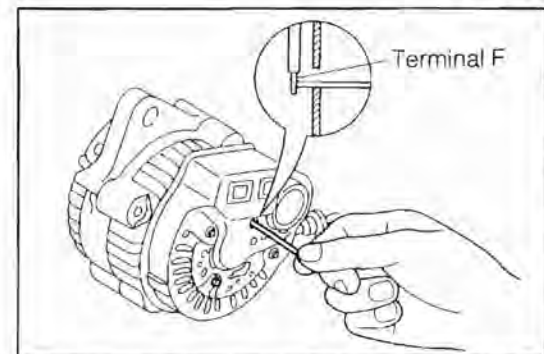
If the voltage reading is greater than the standard voltage, replace IC regulator.



If the voltage reading is less than the standard voltage, ground the terminal F as indicated in the right figure. Proceed to start the engine.

If the voltage reading becomes greater than the standard voltage under this setting, replace the IC regulator.

If the voltage reading is still less than the standard voltage under this setting, check the alternator.



10. Check of charging circuit under loaded state

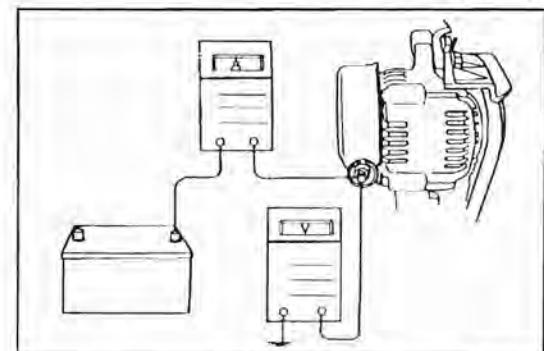
- (1) Start the engine. Maintain the engine speed at 2000 rpm. Turn ON the high beams of the headlamps and set the blower fan motor switch to the Hi position. Take the reading of the ammeter.

Standard Amperage: 30 A or more

If the ammeter reading is less than 30A, repair the alternator. (See page CH-13.)

NOTE:

When the battery is in a fully charged state, the ammeter reading may be less than 30 A during the aforesaid test.



BATTERY REMOVAL

Caution:

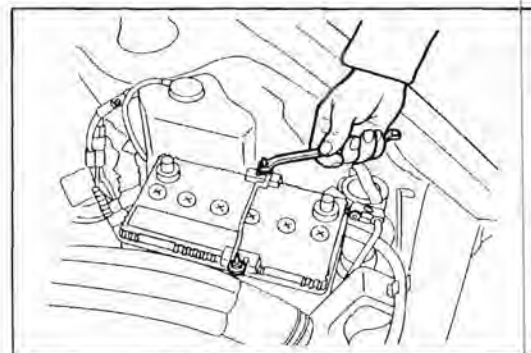
- Never touch at the battery terminals immediately after the vehicle has been operated.
- Be certain to turn OFF the ignition key.
- Never allow any fire to be brought near the battery.

NOTE:

Be very careful not to drop the battery or apply strong vibration to the battery.

WR88-CH021

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
2. Disconnect the positive terminal from the positive (+) terminal of the battery.
3. Remove the battery hold-down clamp.
4. Remove the battery.



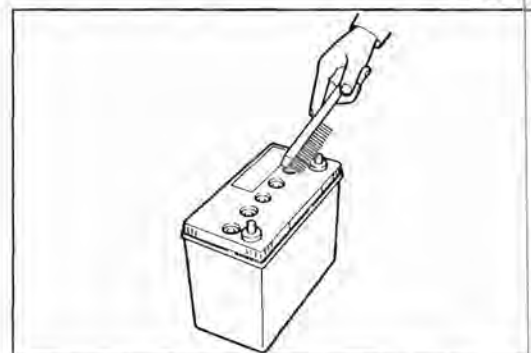
WR88-CH022

CLEANING, INSPECTION & CHARGING OF BATTERY

1. Remove any rust from the battery terminals by means of a wire brush or a fine abrasive paper, or sodium water and a soft brush.

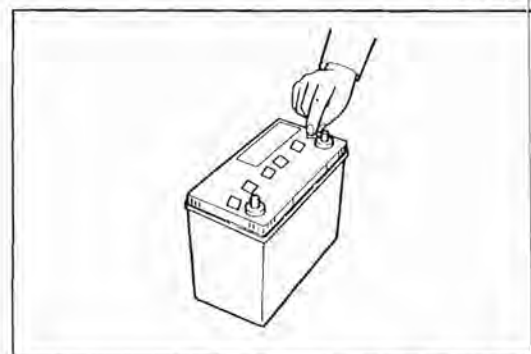
NOTE:

After the battery terminals have been cleaned, make sure that no rust particle remains on the terminals.



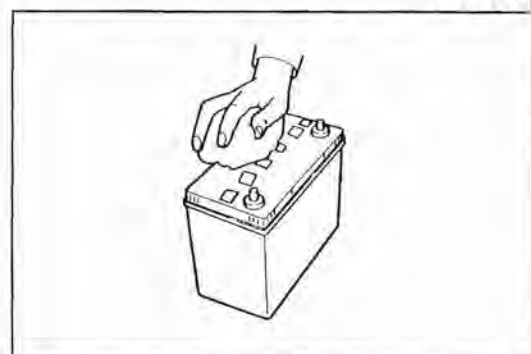
WR88-CH023A

2. Using adhesive tape or the like, seal the vent hole of each cell plug. Flush the battery with clean water, using a soft brush.



WR88-CH023B

3. Wipe off the battery surface using a cloth dampened by clean water. Proceed to dry the battery.



WR88-CH024A

4. Battery capacity check

(1) Check by hydrometer

Measure the specific gravity of the electrolyte of each cell, using a hydrometer. Ensure that the specific gravity is within the specified value.

Standard Specific Gravity:

When fully charged at 20 °C (68 °F)

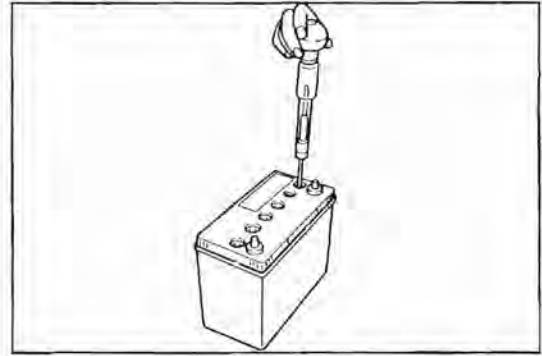
If the specific gravity is not within the specified value, check the electrolyte level and/or replenish distilled water. Then, charge the battery until the specific gravity reaches the specified value.

If the battery is prone to be discharged (the specific gravity drops) even after the battery has been charged, despite the fact that the charging system of the vehicle has no malfunction, it is necessary to replace the battery. However, make sure that the wiring harness of the vehicle has no defect.

Reference

Specific gravity at standard temperature = Measured specific gravity + 0.0007

[Temperature of electrolyte at time of measurement : 20 °C (68 °F)]



WR88-CH024

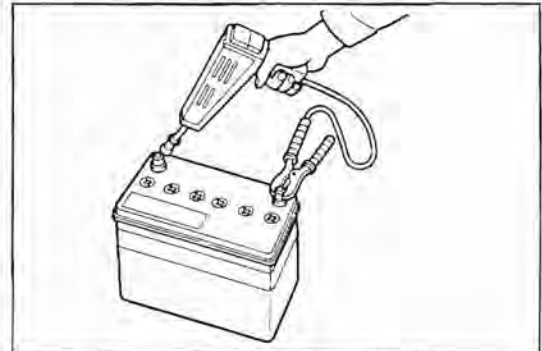
(2) Reserve capacity check by battery tester

Connect a battery tester to the battery so as to check the capacity.

NOTE:

The battery tester should be operated in accordance with the operating instructions set forth by the manufacturer.

If the battery capacity is not within the specified value, check the electrolyte level and/or replenish distilled water. Then, charge the battery until the battery capacity reaches the specified level. (See page CH-5.)



WR88-CH025

5. Battery recharging

CAUTION:

- Never perform quick charging for the MF (Maintenance Free) battery.
- Care must be exercised to ensure that the electrolyte temperature will not rise above 45 °C (113 °F) during the charging. If the electrolyte temperature will likely exceed this level, suspend the charging or reduce the charging current to a half level.
- Never allow any fire to be brought near the battery.
- Make sure that the charging side is well ventilated during the charging or immediately after the charging.
- If the battery is charged with the battery mounted on the vehicle, be certain to turn OFF the ignition switch. Then, disconnect the battery ground cable from the battery negative (-) terminal.
- The switch of the battery charger should be turned OFF first, whenever it is connected or disconnected from the battery.
- Do not use a battery tester or a hydrometer during the charging.
- If it is necessary to approach the battery during the charging or immediately after the charging, be sure to wear goggles. Also, keep your face away from the battery, whenever possible. As for the removal type battery cell plugs, remove them. Care must be exercised not to lose them.
- If the electrolyte level is low, be sure to replenish distilled water. (See page CH-5.)
- Under no circumstances should the battery charger be connected to the battery reversely. Upon completion of the charging, positively install each cell plug. Flush the battery with clean water.

(1) Determination of charging current

The charging should be carried out using a current that is one tenth of the five-hour rate capacity.

Example:

50 AH(5-hour rate)

$$\text{Charging current (A)} = \frac{\text{Battery capacity (5-hour rate)}}{10}$$

WR88-CH027

(2) Determination of charging time

The charging time can be determined, using the following formula given below:

$$\text{Charging time (hour)} = \frac{\text{Discharge amount (AH)}}{\text{Charging current (A)}}$$

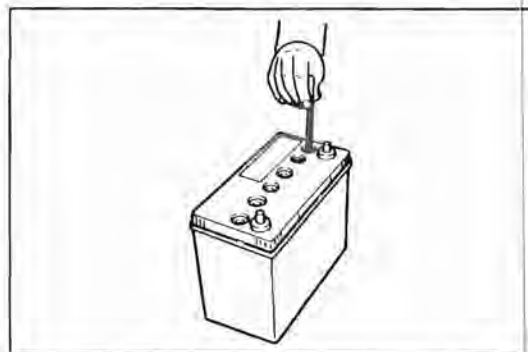
WR88-CH028

(3) Connection of battery charger

- (1) Ensure that the charger switch is turned OFF.
- (2) Insert a thermometer into the battery.
- (3) Connect the charger to the battery.
- (4) Set the timer of the charger. Turn ON the switch.

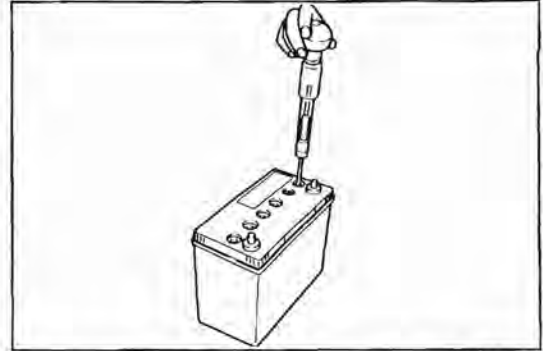
CAUTION

Care must be exercised to ensure that the electrolyte temperature will not rise above 45 °C (113 °F) during the charging.



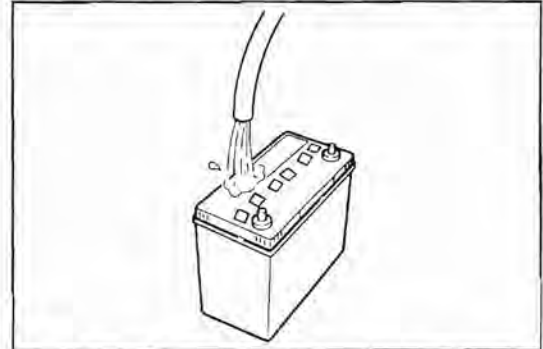
WR88-CH029

- (4) Check the battery capacity.
(See page CH-9.)
If the battery fails to reach the specified specific gravity even after the battery has been recharged several times, replace the battery.



WR88-CH030

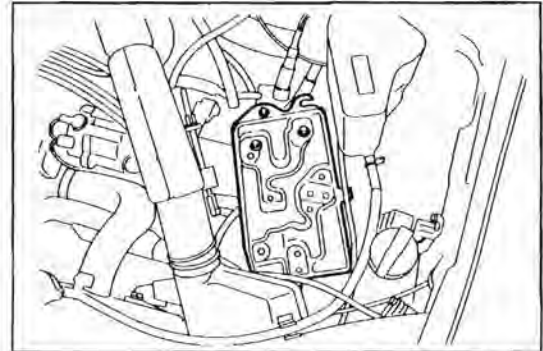
- (5) Flush the battery with water.
(See page CH-8.)



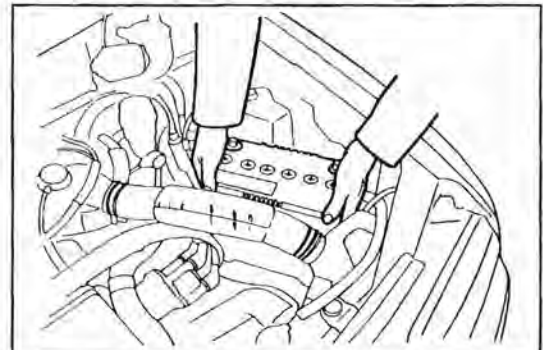
WR88-CH031

BATTERY INSTALLATION

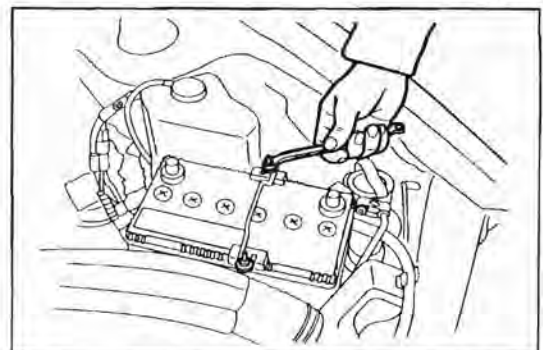
1. Remove any dust from the battery carrier.
2. Install the battery on the battery carrier in such a direction that the negative (-) terminal of the battery may come at the front side of the vehicle.
3. Install the battery hold-down clamp.
NOTE:
 - Be very careful not to tighten the hold-down clamp excessively.
 - Install the battery carrier in such a direction that the claw of the hold-down clamp faces toward the front of the vehicle.



WR88-CH032A



WR88-CH032B



WR88-CH032C

CHARGING SYSTEM

4. Connect the positive terminal to the positive (+) terminal of the battery.

NOTE:

Ensure that the terminal at the wiring exhibits no rust or the like. If any rust is present, remove the rust using a wire brush or a fine abrasive paper.

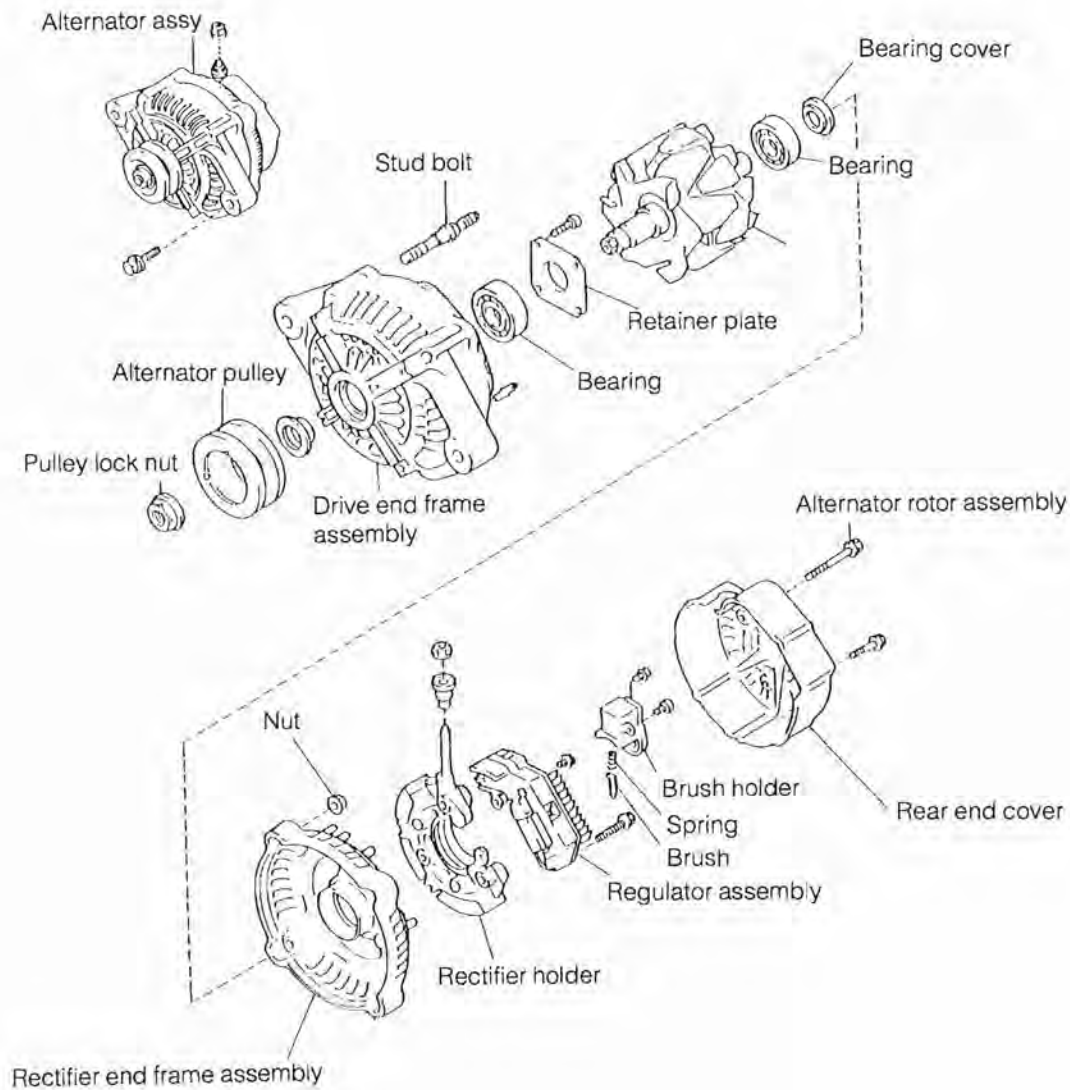
5. Connect the ground cable terminal to the negative (-) terminal of the battery.

NOTE:

Ensure that the terminal at the wiring exhibits no rust or the like. If any rust is present, remove the rust using a wire brush or a fine abrasive paper.

WR88-CH032

ALTERNATOR COMPONENTS

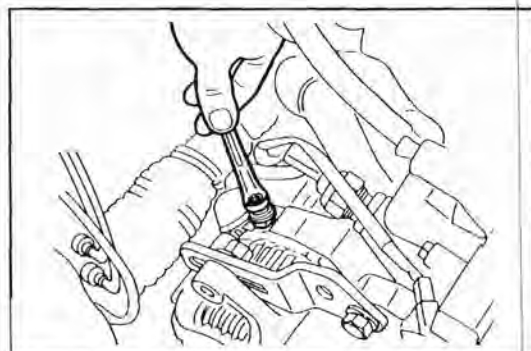


REMOVAL OF ALTERNATOR

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.

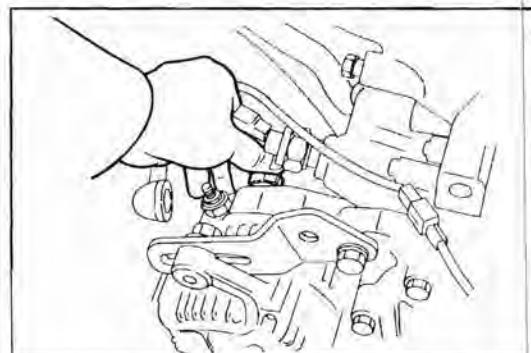
WR88-CH034

2. Disconnection of wires from alternator
 - (1) Remove the nut and wire from the alternator.



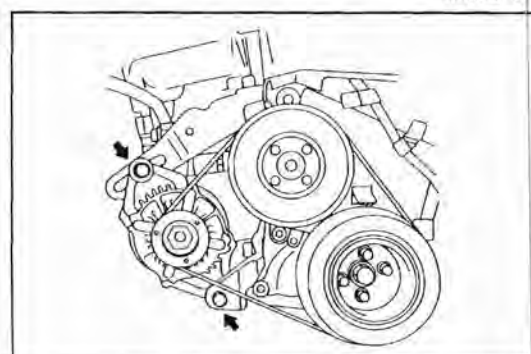
WR88-CH035

- (2) Disconnect the connector from the alternator.



WR88-CH036

3. Removal of alternator drive belt
Loosen the alternator attaching bolts. Remove the drive belt.
4. Removal of alternator
 - (1) Remove the alternator attaching bolts.



WR88-CH037

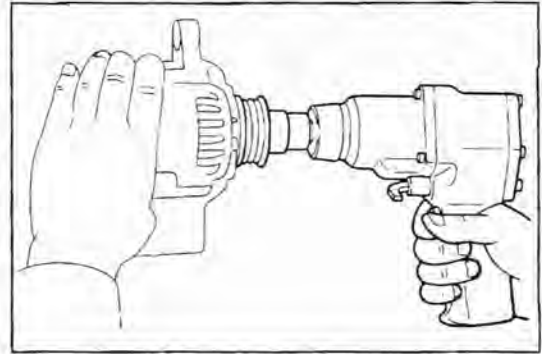
- (2) Remove the alternator from the engine compartment.

DISASSEMBLY OF ALTERNATOR

1. Remove the alternator pulley lock nut by means of an impact wrench.

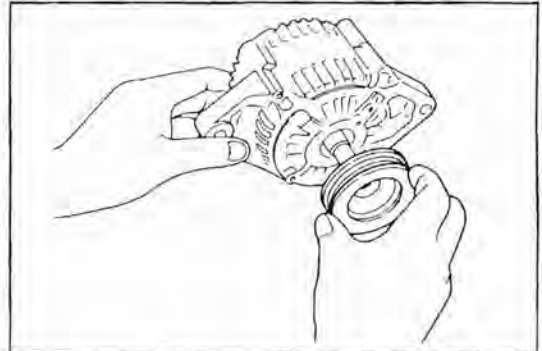
NOTE:

Be sure to use an impact wrench having a hexagonal hole.



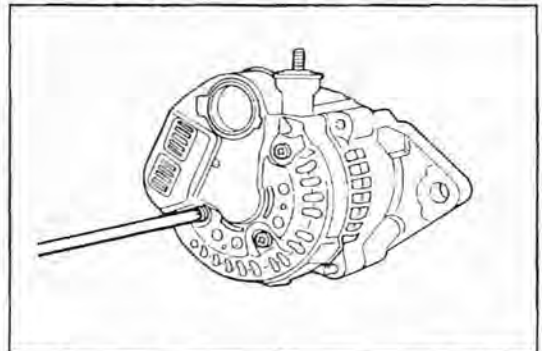
WR88-CH039

2. Remove the alternator pulley.



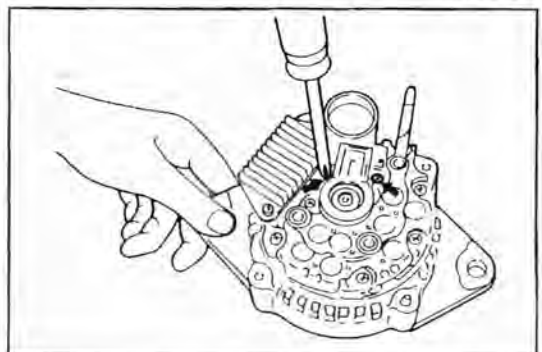
WR88-CH040

3. Removal of rear end cover
 - (1) Remove the nut and terminal insulator.
 - (2) Remove the three nuts and cover.



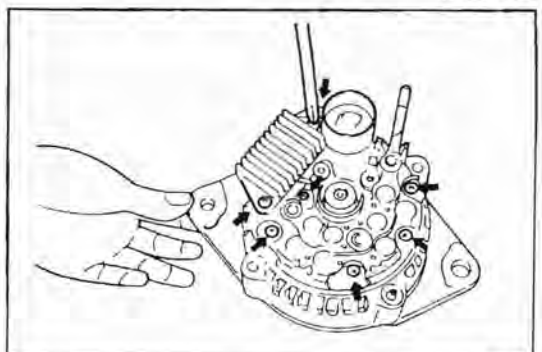
WR88-CH041

4. Remove the brush holder.



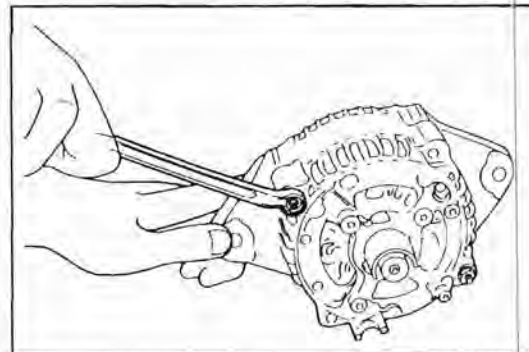
WR88-CH042

5. Remove the rectifier holder and regulator assembly.
 NOTE:
 Before the rectifier holder is removed, be sure to straighten the stator wire.



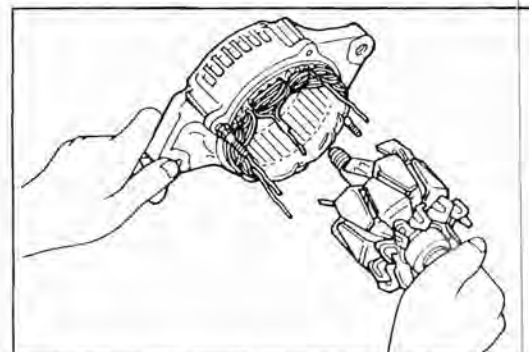
WR88-CH043

6. Remove the rectifier end frame assembly.



WR88-CH044

7. Remove the rotor from the drive end frame assembly.

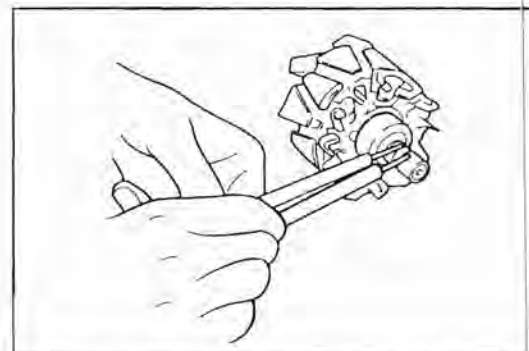


WR88-CH045

INSPECTION OF ALTERNATOR

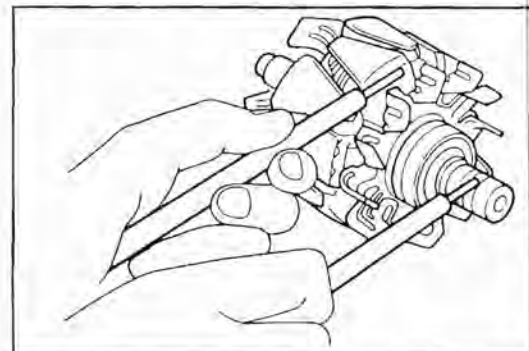
Rotor

1. Inspection of rotor for open circuit
Using an ohmmeter, check to see if specified resistance exists between the rotor slip rings.
Standard Resistance: $2.9 \pm 0.2 \Omega$
If no specified resistance exists, replace the rotor.



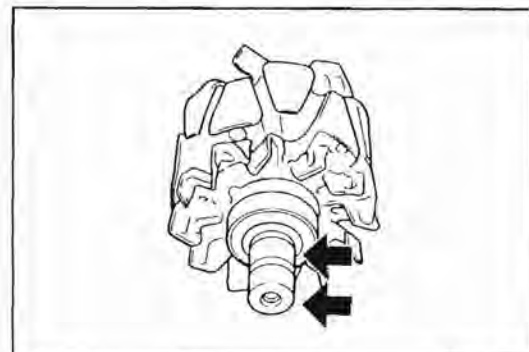
WR88-CH046

2. Inspection of rotor for ground
Ensure that no continuity exists between the rotor slip rings and the rotor core.
If continuity exists, replace the rotor.



WR88-CH047

3. Inspection of slip rings
(1) Check to see if the slip ring surface exhibits roughness, abnormal wear and/or burning.
Replace the rotor, if necessary.



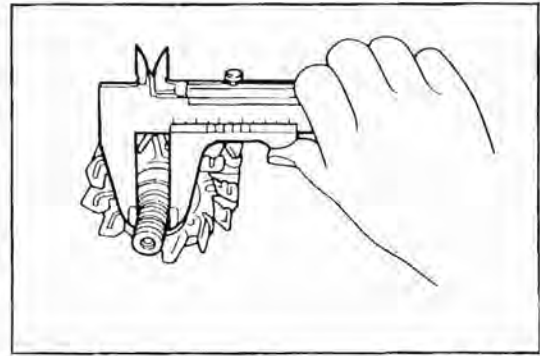
WR88-CH048

- (2) Measure the outer diameter of the slip ring, using vernier calipers.

Standard diameter: 14.4 mm (0.57 inch)

Minimum diameter: 14 mm (0.55 inch)

If the slip ring diameter is less than the minimum diameter, replace the rotor assembly.



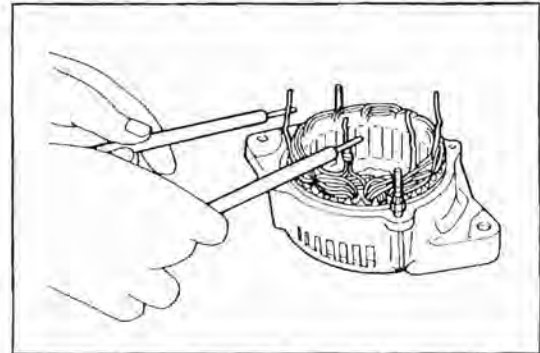
WR88-CH049

Stator

1. Inspection of stator for open circuit

Using an ohmmeter, check to see if any open circuit of the stator coil is present between the leads.

If no continuity exists, replace the end frame assembly.

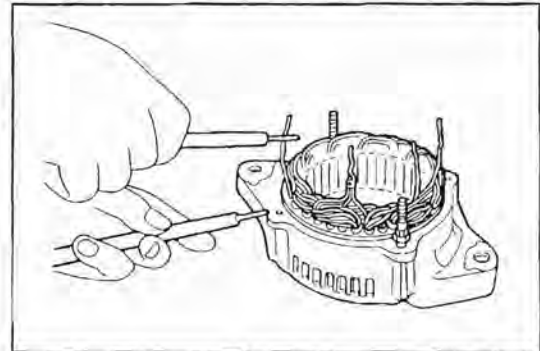


WR88-CH050

2. Inspection of stator for short circuit

Using an ohmmeter, check to see if any short circuit of the stator coil is present between the coil lead and the drive end frame.

If continuity exists, replace the drive end frame assembly.



WR88-CH051

Brush and Brush Holder

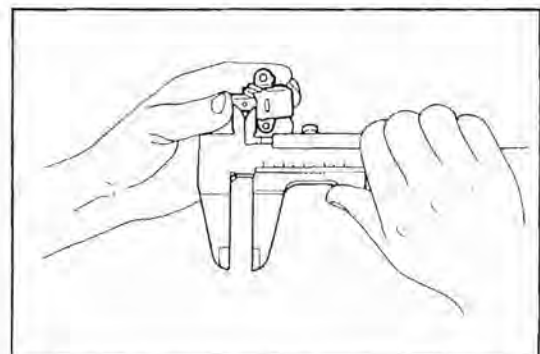
1. Measurement of exposed brush length

Measure the exposed brush length, using a scale.

Standard exposed length: 10.5 mm (0.41 inch)

Minimum exposed length: 1.5 mm (0.06 inch)

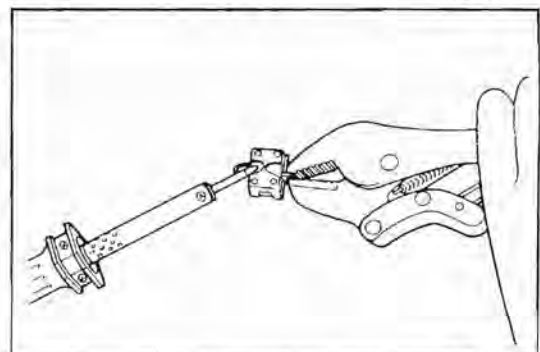
If the exposed length is less than the minimum requirement, replace the brushes.



WR88-CH052

2. Replacement of brushes (If necessary)

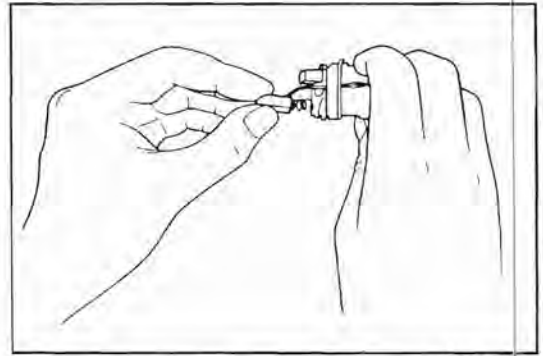
- (1) Remove the brush and spring from the brush holder by melting the solder by means of a soldering iron.



WR88-CH053

CHARGING SYSTEM

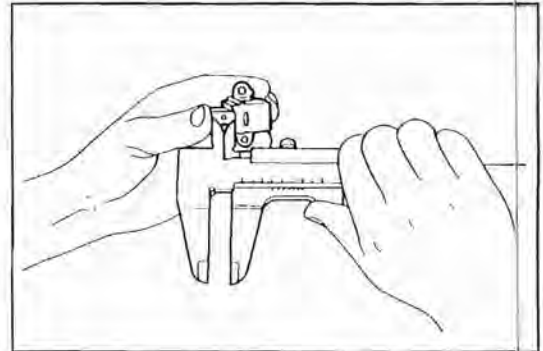
- (2) Install the brush cord in the brush holder with the spring fitted in place.



WR88-CH054

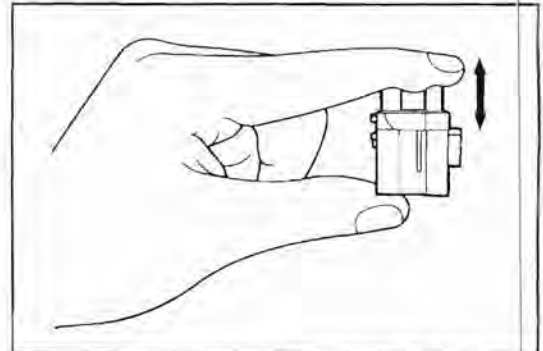
- (3) Solder the brush cord in the brush holder in such a way that the exposed length of the brush meets the specification.

Standard exposed length: 10.5 mm (0.41 inch)



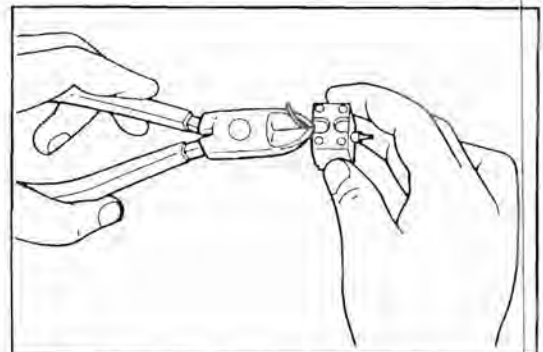
WR88-CH055

- (4) Ensure that the brush moves freely in the brush holder.



WR88-CH056

- (5) Cut off any excess remaining wire and apply an insulation paint.

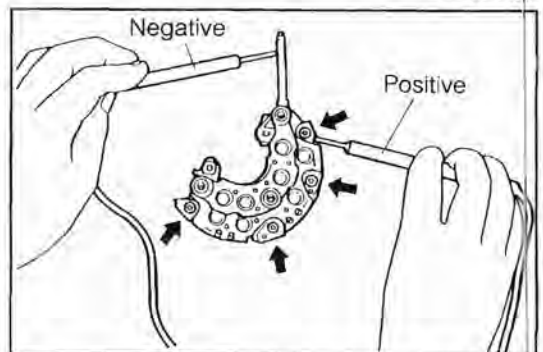


WR88-CH057

Rectifier

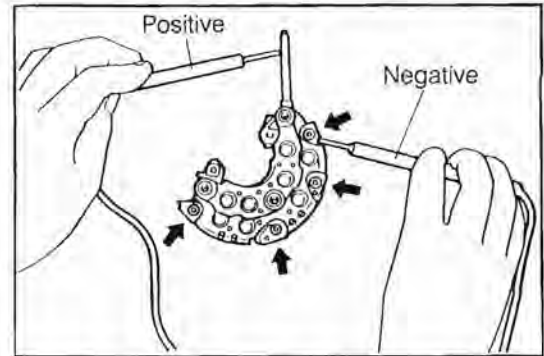
1. Inspection of rectifier at positive side

- (1) Ensure that continuity exists between the positive stud bolt of the rectifier holder and the rectifier terminal by connecting an ohmmeter as indicated in the right figure. If no continuity exists, replace the rectifier holder.



WR88-CH058

- (2) Ensure that no continuity exists between the positive stud bolt of the rectifier holder and the rectifier terminal by connecting an ohmmeter as indicated in the right figure. If continuity exists, replace the rectifier holder.



WR88-CH059

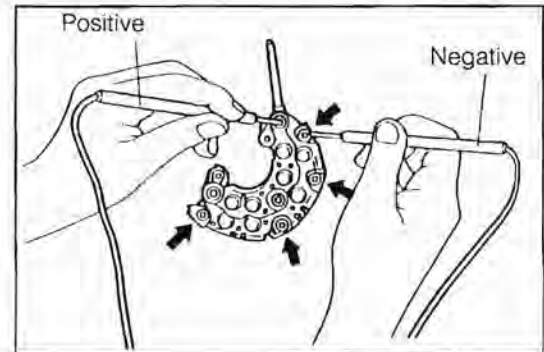
2. Inspection of rectifier at negative side

- (1) Ensure that continuity exists between each of the negative terminals of the rectifier holder and each rectifier terminal by connecting an ohmmeter as indicated in the right figure.

If no continuity exists, replace the rectifier holder.

REFERENCE

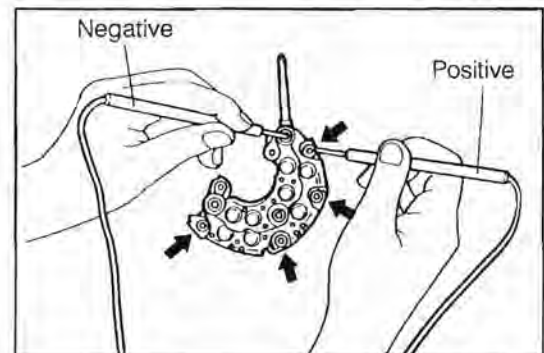
Resistance about 900 k Ω



WR88-CH060

- (2) Ensure that no continuity exists between each of the negative terminals of the rectifier holder and each rectifier terminal by connecting an ohmmeter as indicated in the right figure.

If continuity exists, replace the rectifier holder.



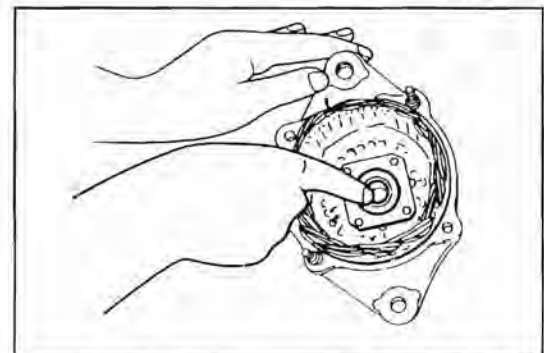
WR88-CH061

Bearings

1. Inspection of front bearing

Ensure that the bearing turns smoothly.

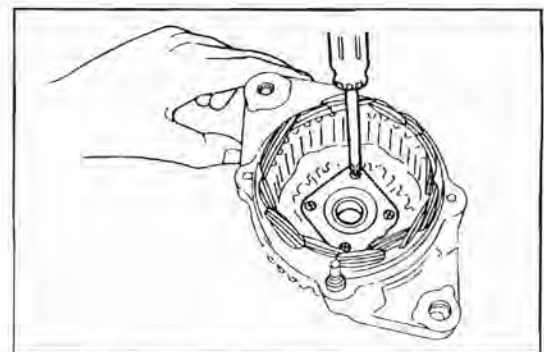
Replace the bearing, if necessary.



WR88-CH062

2. Replacement of front bearing (If necessary)

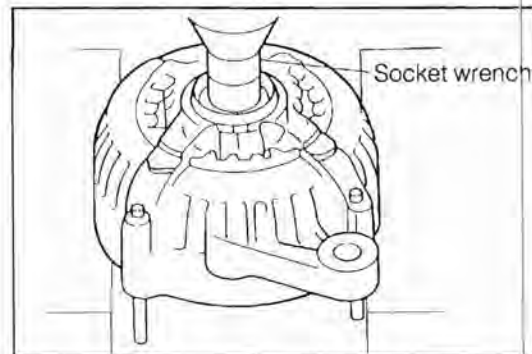
- (1) Remove the four screws and retainer plate.



WR88-CH063

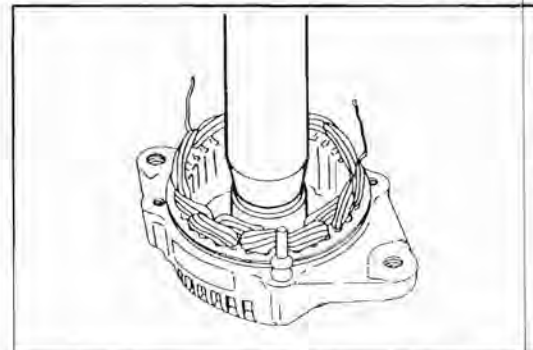
CHARGING SYSTEM

- (2) Remove the front bearing from the drive end frame, using a socket wrench in conjunction with a press.



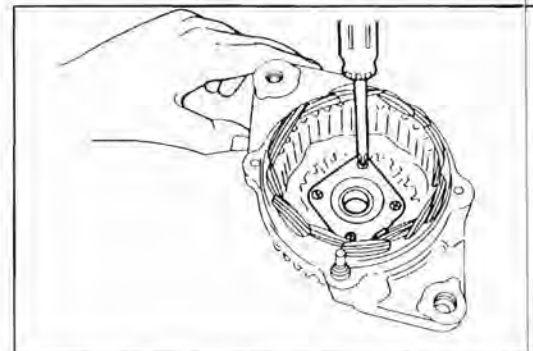
WR88-CH064

- (3) Press the new front bearing into the drive end frame, using suitable socket wrench.



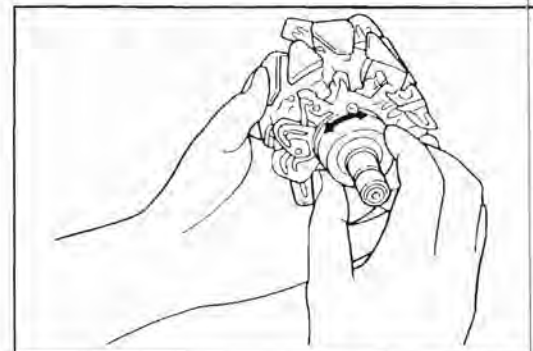
WR88-CH065

- (4) Attach the retainer plate to the drive end frame with the four screws.



WR88-CH066

3. Inspection of rear bearing
Ensure that the bearing turns smoothly.
Replace the bearing, if necessary.

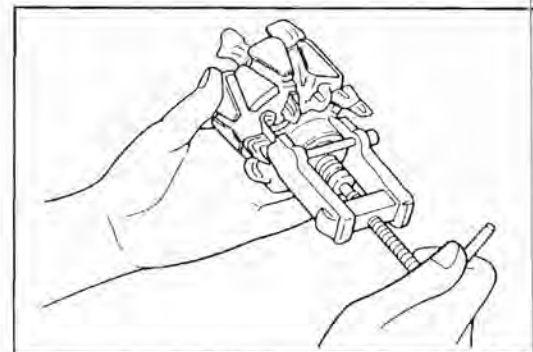


WR88-CH067

4. Replacement of rear bearing (if necessary)
(1) Remove the rear bearing and bearing cover from the rotor, using the armature bearing puller.

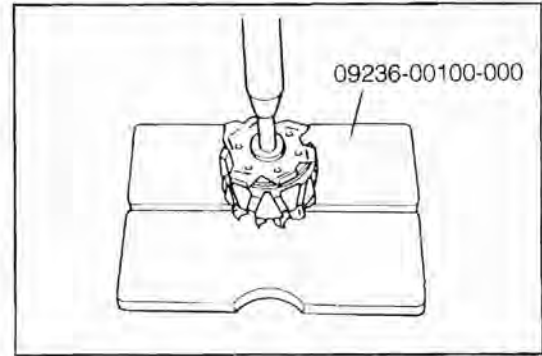
NOTE:

Be very careful not to damage the fan during the removal.



WR88-CH068

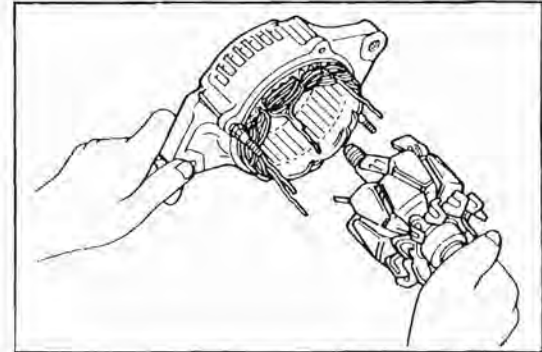
- (2) Press a new rear bearing and bearing cover, using a hydraulic press in combination with the following SST.
SST: 09236-00100-000



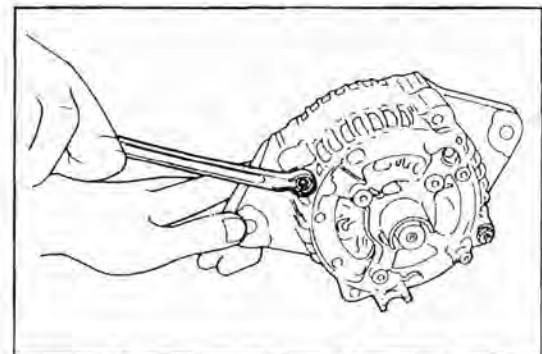
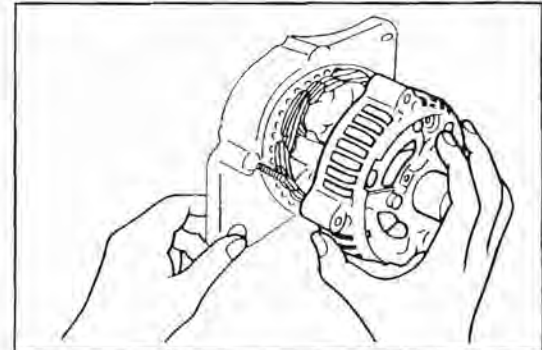
WR88-CH069

ASSEMBLY OF ALTERNATOR

1. Install the rotor in the drive end frame assembly.
2. Installation of rectifier end frame on drive end frame
Install the rectifier end frame on the drive end frame with the two bolts and two nuts.
Be very careful not to damage the coil cord during the installation.

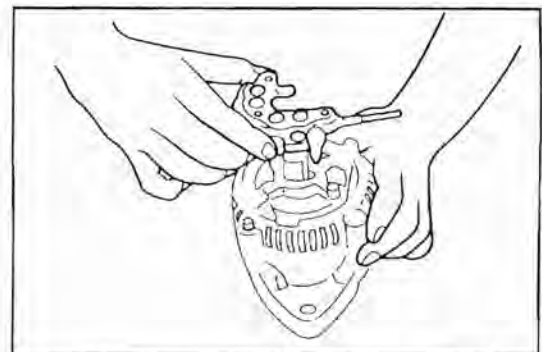


WR88-CH070



WR88-CH071

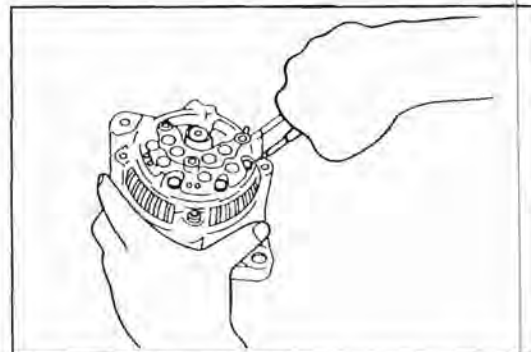
3. Installation of rectifier holder, regulator assembly and brush holder
 - (1) Attach the rectifier holder to the end frame with the coil wires passed through the aperture of the rectifier holder.



WR88-CH072

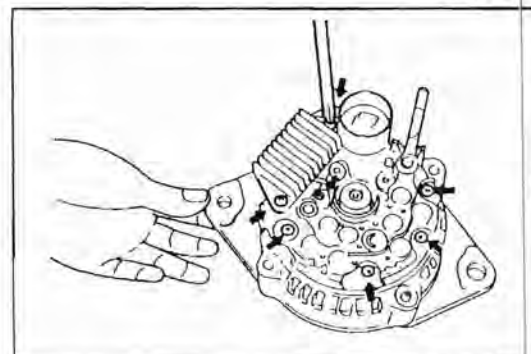
CHARGING SYSTEM

- (2) Wind the coil wire around the installing section of the rectifier attaching bolt.



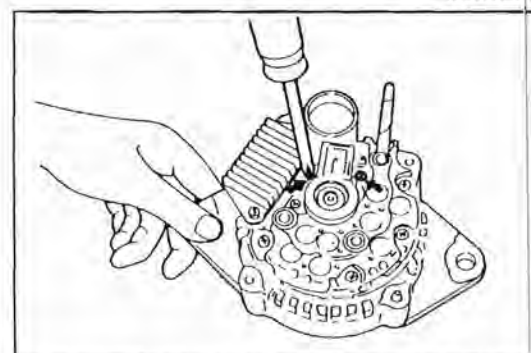
WR88-CH073

- (3) Install the regulator assembly and rectifier holder. Secure them with the attaching screws.



WR88-CH074

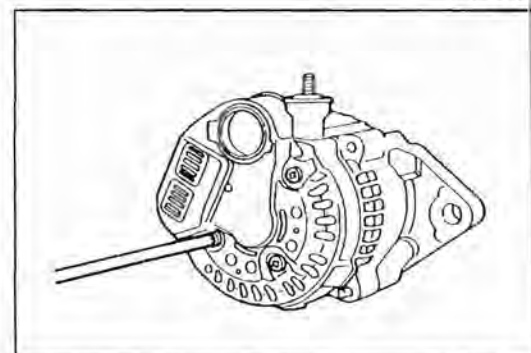
- (4) Install the brush holder in such a way that a gap of at least 1 mm (0.04 inch) is provided between the brush holder and the regulator assembly. Secure the brush holder with the two screws.



WR88-CH075

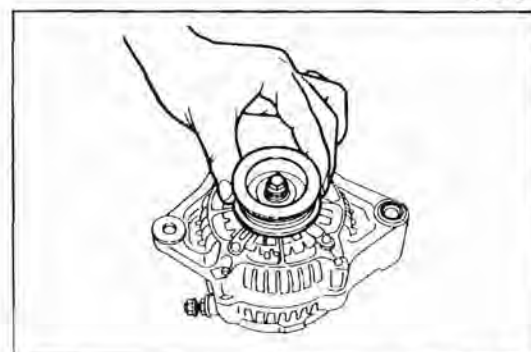
4. Installation of rear end cover

- (1) Install the rear end cover with the three nuts.
- (2) Install the terminal insulator and tighten it with the nut.



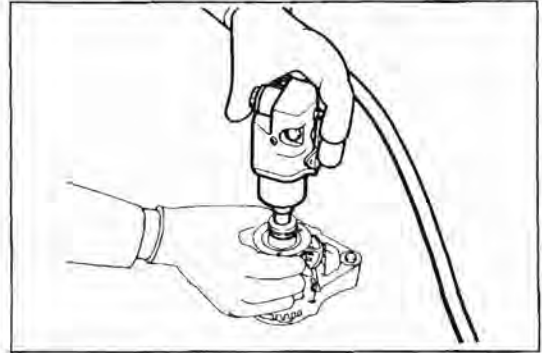
WR88-CH076

5. Attach the pulley to the rotor shaft.



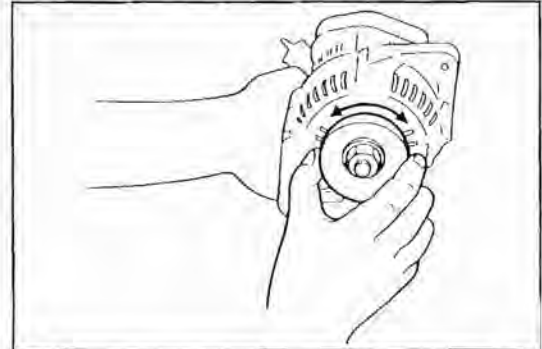
WR88-CH077

6. Install the pulley lock nut by means of an impact wrench.
NOTE:
 Be sure to use an impact wrench having a hexagonal hole.



WR88-CH077B

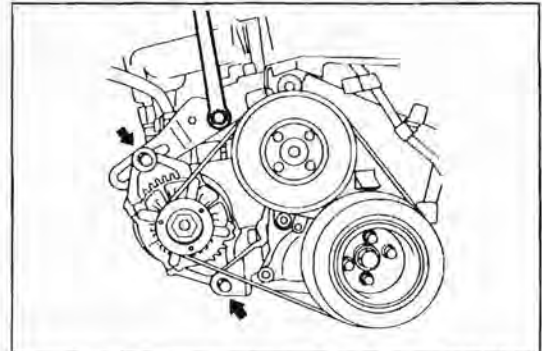
7. Ensure that the rotor turns smoothly.



WR88-CH078

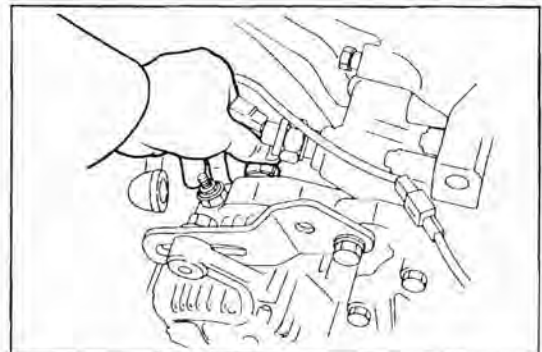
INSTALLATION OF ALTERNATOR

1. Installation of alternator on vehicle
 Install the alternator on the engine with the two attaching bolts.



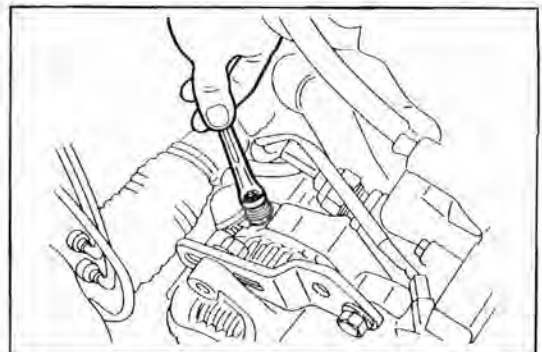
WR88-CH079A

2. Connection of wire to alternator
 (1) Connect the connectors to the alternator.



WR88-CH079B

- (2) Install the wire and nut to the alternator.

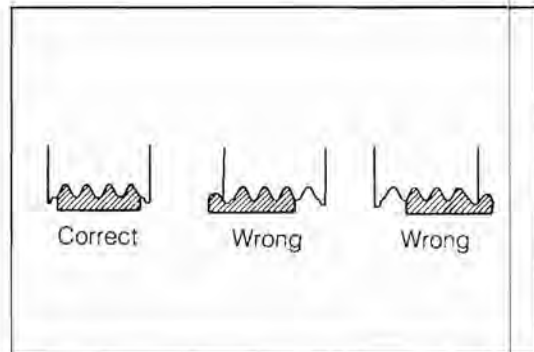


WR88-CH079C

3. Installation of alternator drive belt
 - (1) Install the alternator drive belt properly.

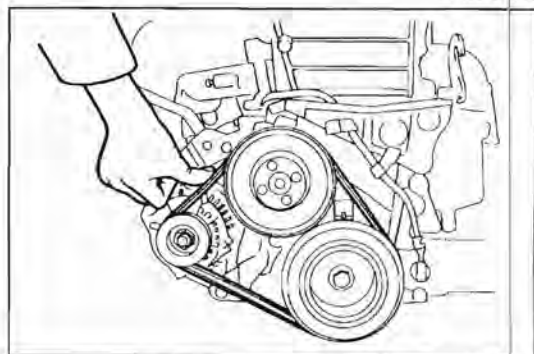
NOTE:

Make sure that the alternator drive belt is properly engaged in the groove of each pulley.



WR88-CH-080

- (2) Tension adjustment of drive belt
Adjust the belt tension in such a way that the deflection of the drive belt meets the specification when you push the midpoint of the drive belt between the alternator pulley and the water pump pulley by applying a force of 10 kg (22 lb).



WR88-CH-081

Specified Belt Deflection

New belt: 4.0 - 5.0 mm (0.16 - 0.19 inch)

(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)

Used belt: 5.0 - 6.0 mm (0.20 - 0.23 inch)

(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)

NOTE:

- "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 5 minutes or more.
- If belt replaced with new one, run the engine for about 5 minutes and then recheck the tension.

WR88-CH-082

4. Reconnect the ground cable terminal to the negative (-) terminal of the battery.
5. Perform the in-vehicle inspection. (See page CH-4.)

WR88-CH-083

DAIHATSU

CHARADE

TYPE HC ENGINE


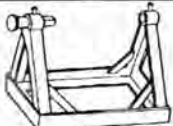
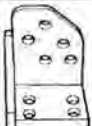





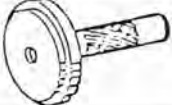
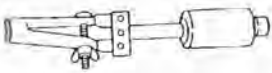



SSTs

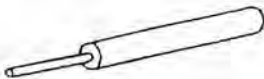





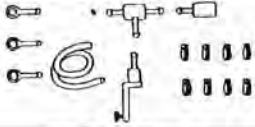

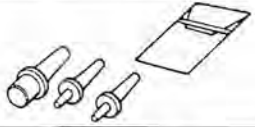


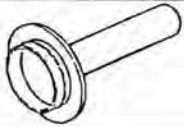

SSTsA-2


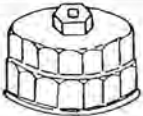



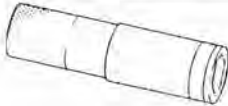

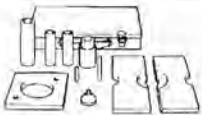

WR88-SST001

A

SST (Special Service Tools)

Shape	Part No. and Name	Purpose	Remarks
	* ⁵ 09090-04010-000 Engine sling device	Removal and installation of engine	
	* ⁵ 09219-87202-000 Engine overhaul stand	Stand for engine overhaul	This stand is to be used in combination with engine overhaul attachment.
	* ¹ * ⁵ 09219-87701-000 Engine overhaul attachment	Attaching engine to overhaul stand (However, it is necessary to modify attachment.)	This attachment is to be used in combination with engine overhaul stand.
	09210-87701-000 Flywheel holder	Preventing crankshaft from turning	
	09609-20011-000 Steering wheel puller	Removal of crankshaft timing belt pulley	
	09636-20010-000 Upper ball joint dust cover replacer	Installation of camshaft oil seal	
	* ⁵ 09202-87002-000 Valve cotter remover & replacer	Installation and removal of valves	
	* ⁵ 09217-87001-000 Piston replacing guide	Guiding piston during insertion	
	09223-41010-000 Crankshaft rear oil seal replacer	Installation of crankshaft rear oil seal	
	09201-87704-000 Valve stem oil seal cover	Removal of valve stem oil seals	
	09310-87102-000 Counter shaft front bearing replacer	Installation of crankshaft front oil seal	
	* 09221-87704-000 Piston pin remover & replacer body	Removal and installation of piston pins	This remover & replacer body is to be used in combination with piston pin remover & replacer guide.
	* 09221-87705-000 Piston pin remover & replacer guide	Removal and installation of piston pins	This remover & replacer guide is to be used in combination with piston pin remover & replacer body.

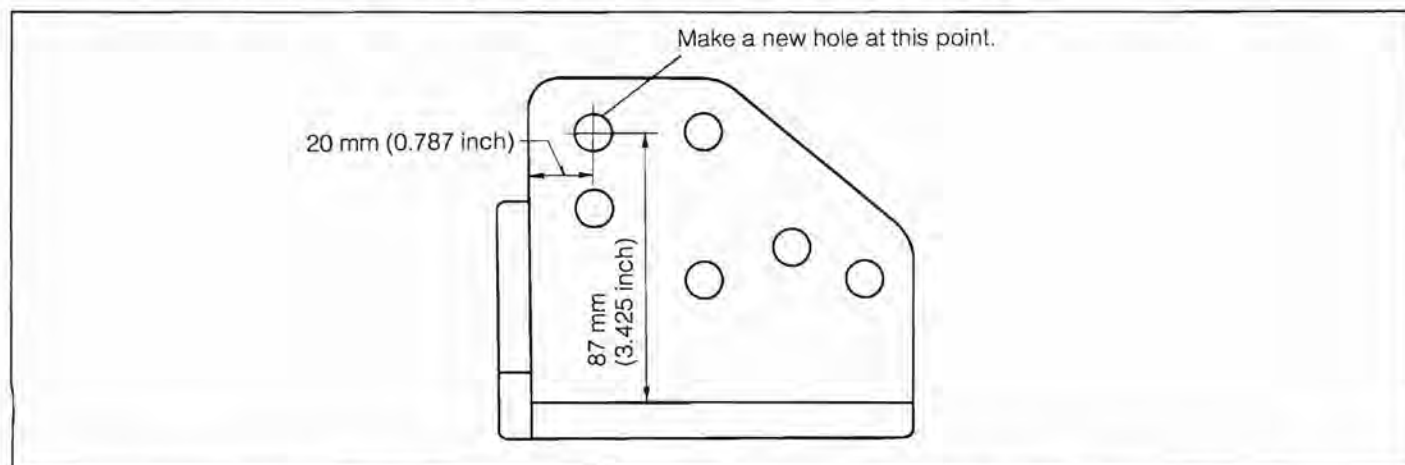
Shape	Parts No. and Name	Purpose	Remarks
	* 09201-87705-000 Valve guide bush remover & replacer	Removal and installation of valve guide bushes	
	09991-87702-000 Engine control system inspection sub harness	* Shorting terminal T * Actuating fuel pump, radiator fan motor, etc.	Only for HC-E engine
	09842-87701-000 EFC-II computer check sub harness	Inspection of computer input/output voltage	Only for HC-E engine
	09842-30040-000 EFI inspection wire D	Inspection of fuel injectors	Only for HC-E engine
	09268-87701-000 EFI fuel pressure gauge	Inspection of fuel pressure	Only for HC-E engine
	* 09283-87703-000 Pressure regulator adopter	* Inspection of injectors * Inspection of pressure regulator * Inspection of fuel pressure	Only for HC-E engine Used in combination with 09268-87702-000
	09268-87702-000 Injection measuring tool set	* Inspection of injectors * Inspection of pressure regulator * Inspection of fuel pressure	Only for HC-E engine Used in combination with 09283-87703-000
	* 09301-87703-000 Clutch guide tool	Assembling clutch	
	09258-00030-000 Plug set	Plugging rubber hoses	
	09860-11011-000 Carburetor screwdriver set	Overhaul of carburetor	Only for HC-C engine
	09648-87201-000 Drive shaft replacer	Disconnecting drive shafts	
	* 09388-87702-000 Transfer replacer	Press-fitting of rubber grommets	
	* *2 09268-87704-000 Oil cooler set bolt box wrench	Removal and installation of oil cooler (only for oil cooler-equipped vehicle)	Only for oil cooler-equipped vehicle

Shape	Parts No. and Name	Purpose	Remarks
	09032-00100-000 Oil pan seal cutter	Removal of oil pan	
	09228-87201-000 Oil filter wrench	Removal and installation of oil filter	
	09243-00020-000 Idle adjust wrench	Adjustment of idle mixture adjusting screw	Only for HC-C engine
	09240-00020-000 Wire gauge set	Adjustment of carburetor	Only for HC-C engine
	09240-00014-000 Carburetor adjusting gauge set	Adjustment of carburetor	Only for HC-C engine
	* ³ ⁵ 09268-87703-000 Plug wrench	Removal and installation of spark plugs	
	* ⁴ 09991-87703-000 Tacho pulse pick-up wire	Connecting engine tachometer	Only for HC-C engine
	09236-00100-000 Water pump overhaul tool	Assembling alternator rear bearing cover	
	* ⁵ 09990-87702-000 Engine oil pressure gauge	Measurement of engine oil pressure	

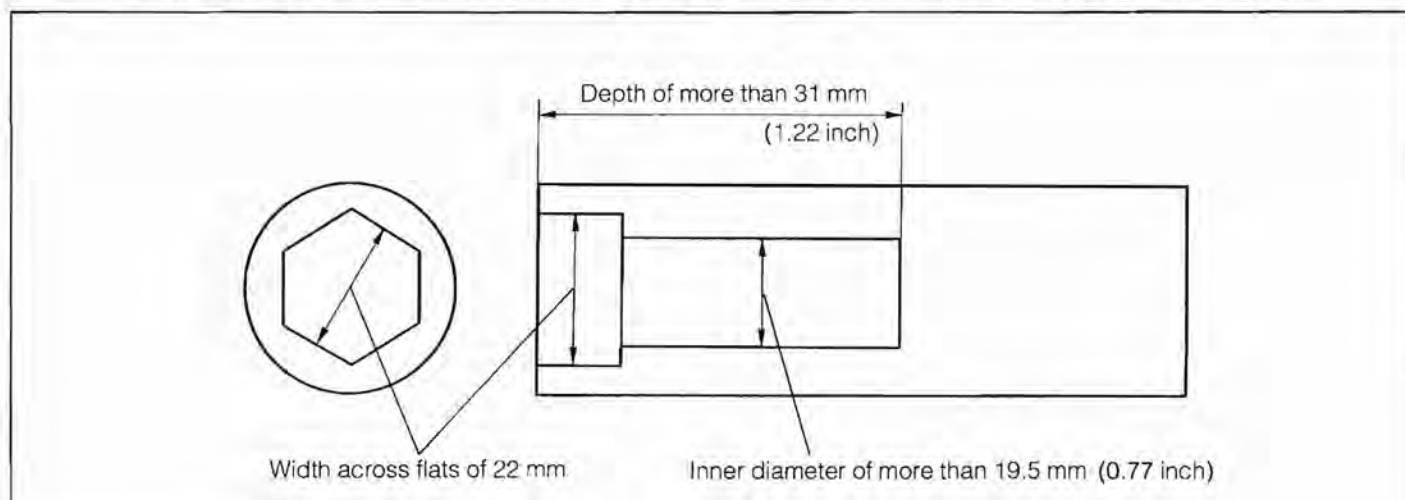
WR88-SST004

NOTE:

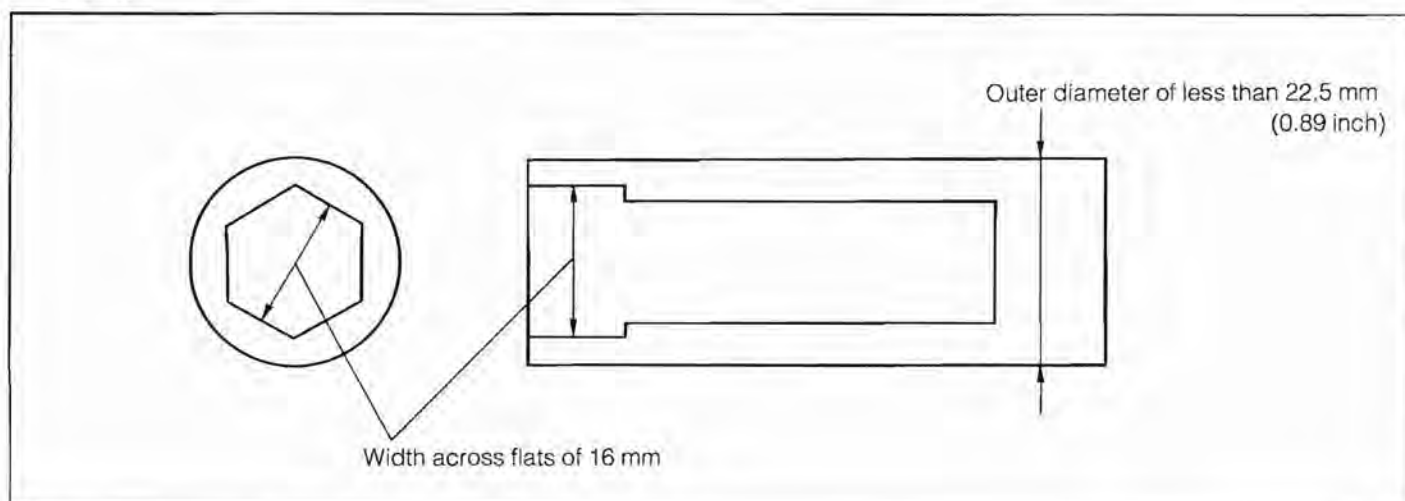
- * Newly provided SST
- *1 Modification required for engine overhaul attachment
It is necessary to modify the engine overhaul attachment as indicated below.



- *2 There is no need for the oil cooler set bolt if your box wrench satisfies the following requirements.



- *3 There is no need for the spark plug wrench if your spark plug box wrench satisfies the following requirements.



- *4 Not required, if your tachometer is a clamp-on type.
- *5 Commercially-available

Reference:

LIST OF EQUIPMENT AND OTHER TOOLS REQUIRED

General Tools

General Service Equipment

- Two-post lift
- Garage jack
- Safety stands
- Valve refacer
- Valve seat cutters
- Hydraulic press
- Ridge reamer
- Air compressor
- Reamer

WR88-SST016

Measuring Equipment

- Torque wrench
- Vernier calipers
- Dial gauge (with magnet base)
- Dial caliper gauge (for bore measurement use)
- Micrometers (for bore measurement use and depth measurement use)
- Thickness gauge
- Tachometer and dwell angle tester
- Ohmmeter, ammeter and voltmeter (Circuit tester)
- Torque wrench
- Straightedge
- Surface plate
- Spring tester
- Compression gauge
- Hydrometer
- Battery tester
- Square gauge
- Megger (ohmmeter)
- Spring scale
- Connecting rod aligner

WR88-SST017

Consuming Articles

- Plastigauge
- Blue lead or red lead
- Dye penetrant
- Compound (for valve lapping)
- Solvent
- Engine oil (10W-30/SE or higher)

WR88-SST018

Liquid Gasket

Nomenclature	Application	Part number
Three Bond 1104	Camshaft bearing cap and cylinder head cover gasket section (arched section), etc.	999-04808-U9-005
Three Bond 1377B	Spark plug tube, heater outlet pipe and heater union	999-04808-U9-004
Three Bond 1207C	Oil pan, rear oil seal retainer and oil pump	999-6313-6323-00
Three Bond 1324	Flywheel bolt	999-04808-U9-006

WR88-SST019

DAIHATSU

CHARADE

TYPE HC ENGINE

ENGINE SPECIFICATIONS

ENGINE SPECIFICATIONS	B- 2
SERVICE SPECIFICATIONS	B- 5
TUNE-UP	B- 5
ENGINE MECHANICALS	B- 7
FUEL SYSTEM	B-10
SPECIFICATIONS	B-10
LUBRICATION SYSTEM	B-10
COOLING SYSTEM	B-11
IGNITION SYSTEM	B-11
STARTING SYSTEM	B-12
CHARGING SYSTEM	B-12
EFI SYSTEM	B-13
VOLTAGES AT ECU WIRING	
CONNECTORS	B-15

WR88-B001

ENGINE SPECIFICATIONS

Item				Engine type	HC-C	HC-E
Engine Proper	Type				Petrol, 4-cycle	Petrol, 4-cycle
	Mounting location				Front	Front
	Cylinder No. and arrangement				4-cylinder-in-line, mounted transversely	4-cylinder-in-line, mounted transversely
	Combustion chamber type				Pent roof type	Pent roof type
	Valve mechanism				Belt-driven overhead camshaft	Belt-driven overhead camshaft
	Bore × stroke			mm (inch)	76 × 71.4	76 × 71.4
	Compression ratio				9.5	9.5
	Compression pressure			kg/cm ² -rpm (psi-rpm)	14 - 350 (199.1 - 350)	14 - 350 (199.1 - 350)
	Maximum output	SAE net	kW/rpm	General specifications	56/6,500	66/6,500
		EEC	kW/rpm	Australian specifications	56/6,500	66/6,500
		EEC DIN	kW/rpm	ECE & EEC specifications	56/6,500	66/6,500
	Maximum torque	SAE net	Nm/rpm	General specifications	102/3,900	105/5,000
		EEC	Nm/rpm	Australian specifications	102/3,900	105/5,000
		EEC DIN	Nm/rpm	ECE & EEC specifications	102/3,900	105/5,000
	Engine dimensions [Length × width × height]			mm (inch)	635 × 511 × 652 (25.00 × 20.12 × 25.67)	635 × 511 × 652 (25.00 × 20.12 × 25.67)
	Service engine weight			kg (lb)	91 (200.7)	90 (198.5)
	Number of piston rings	Compression ring			2	2
		Oil ring			1	1
	Valve timing	Intake	Open		10°BTDC	5°BTDC
			Close		40°ABDC	55°ABDC
		Exhaust	Open		56°BBDC	51°BBDC
			Close		6°BTDC	1°BTDC
	Valve clearance		mm (inch)			
			Intake		[Hot] 0.25 (0.0098)	[Hot] 0.25 (0.0098)
			Exhaust		[Hot] 0.33 (0.0130)	[Hot] 0.33 (0.0130)
	Idling speed		rpm			
			Manual transmission		850±50	850±50
			Automatic transmission		900±50	850±50
	Blow-by gas recirculating system					Closed type

WR88-B0C2

Item			Engine type	HC-C	HC-E
Lubri- cating System	Lubricating method			Fully-forced feed method	Fully-forced feed method
	Oil Pump type			Trochoid type	Trochoid type
	Oil filter type			Full-flow filter type, filter paper type	Full-flow filter type, filter paper type
	Lubrication oil capacity	liter	Whole amount	4.0	4.0
			When only oil is changed	3.3	3.3
			When oil and oil filter are changed	3.5	3.5
Oil cooler type			Water-cooled type (only for tropical spec.)	Water-cooled type (4-Wheel drive only)	
Super charger type				—	—
Cooling System	Cooling method			Water-cooled, electromotor type	Water-cooled, electromotor type
	Radiator type			Corrugation type forced circulation	Corrugation type forced circulation
	Coolant capacity	liter	Manual transmission	5.2 (5.5 for tropical spec.) [Including 0.6 for reserve tank]	5.2 [Including 0.6 for reserve tank]
			Automatic transmission	5.2 (5.5 for tropical spec.) [Including 0.6 for reserve tank]	5.2 [Including 0.6 for reserve tank]
	Water pump type			Centrifugal type, "V" belt-driven type	Centrifugal type, "V" belt-driven type
Thermostat type			Wax pellet type	Wax pellet type	
Air cleaner	Type			Unwoven cloth	Unwoven cloth
	Number			1	1
Fuel System	Fuel tank	Capacity	liter	37	40 (2WD) 37 (4WD)
		Location		Mounted underneath rear seat floor	Mounted underneath rear seat floor
	Fuel pipe material			Rubber and steel type	Rubber and steel tube
	Fuel pump type			Diaphragm type	Electromotor type
	Fuel filter type			Filter paper type	Filter paper type
	Car- buretor	Manufacturer		Aisan kogyo	—
		Type		Two-barrel type	—
		Throttle valve diameter	mm (inch)	28 (1.10), 32 (1.26)	—
		Venturi diameter	mm (inch)	21 (0.38), 25 (0.98)	—
		Choke valve type		Manual type, butterfly-shaped valve	—
	Fuel injection device			—	Electronic type
	Injection nozzle or Injector	Type of nozzle retainer		—	With cushion rubber type
		Nozzle type		—	Electronic controlled throttle type
Injection pressure		kg/cm ² (psi)	—	2.55 (1.84)	

WR88-B003

ENGINE SPECIFICATIONS

Item				Engine type	HC-C			HC-E				
Engine electrical system	Ignition system	Voltage			V	12 [Negative ground]			12 [Negative ground]			
		Type				Battery ignition type			Full transistor type, battery ignition type			
		Ignition timing				BTDC 5°±2°/Idling			BTDC 5°±2°/Idling			
		Firing order				1 — 3 — 4 — 2			1 — 3 — 4 — 2			
		Distributor	Distributor type				Conventional type			Full-transistorized type		
			Breaker type				Contact-point type			—		
			Performance of timing advancing mechanism	Centrifugal type			0°/800 rpm, 14.5°/2800 rpm			0°/600 rpm, 12.5°/3000 rpm		
				Vacuum type			M/T 0°/-100 mmHg, 15°/-410 mmHg A/T 0°/-100 mmHg, 10°/-300 mmHg			0°/-80 mmHg, 10°/-420 mmHg		
		Spark plug	Manufacturer				DENSO	NGK	CHAMPION	DENSO	NGK	CHAMPION
			Type	For ECE & EEC			K20PR-U11	BKR6E-11	RC9YC4	K20PR-U11	BKR6E-11	RC9YC4
				Except for ECE & EEC			K20PR-U11	BKR6E-11	RC9YC4	K20PR-U11	BKR6E-11	RC9YC4
			Thread				M14 × 1.25			M14 × 1.25		
			Spark plug gap			mm (inch)	1.0 - 1.1 (0.04 - 0.043)	1.0 - 1.1 (0.04 - 0.043)	1.0 - 1.1 (0.04 - 0.043)	1.0 - 1.1 (0.04 - 0.043)	1.0 - 1.1 (0.04 - 0.043)	1.0 - 1.1 (0.04 - 0.043)
	Glow plug	Type				—			—			
		Voltage, current			V-A	—			—			
	Battery	Type	General specifications			34B17L, * ¹ 55B24L			34B17L, * ¹ 55B24L			
			ECE & EEC specifications			55B24L			55B24L			
			Australian specifications			34B17L			34B17L			
		Capacity AH	General specifications			27 (5HR), * ¹ 36 (5HR)			27 (5HR), * ¹ 36 (5HR)			
			ECE &EEC specifications			36 (5HR)			36 (5HR)			
			Australian specifications			—			27 (5HR)			
	Alternator	Type				3-Phase alternating current commutating type			3-Phase alternating current commutating type			
		Output			V-A	12 - 45			12 - 50, * ² 12 - 45			
		Regulator type				Contact-pointless type			Contact-pointless type			
	Starter	Type				Magnet engaging type			Magnet engaging type			
		Output			V-KW	12 - 0.8			12 - 0.8	12 - 0.9	12 - 1.0	
	Radio noise suppressing device						Resistive cord			Resistive cord		

NOTE:

*¹ Option

*² For ECE & EEC specification with out day-light system.

WR88-B004

SERVICE SPECIFICATIONS

TUNE-UP

Drive belt deflection with a pressed force of 10 kg (22 lb)																			
Alternator	New belt	4.0 - 5.0 mm (0.16 - 0.19 inch)																	
	Used belt	5.0 - 6.0 mm (0.20 - 0.23 inch)																	
Coolant capacity w/heater [Including 0.6 liter for reserve tank]		5.2 liters (4.58 IMP qt) [5.5 liters (4.84 IMP qt) for tropical specifications]																	
Engine oil capacity																			
Whole amount		4.0 liters (3.52 IMP qt)																	
When only oil is changed	Full level	3.3 liters (2.9 IMP qt)																	
	Low level	2.3 liters (2.02 IMP qt)																	
When oil and filter are changed		3.5 liters (3.08 IMP qt)																	
		NOTE If oil cooler equipped engine, add 79 cc (4.82 cub inch) for whole amount.																	
Valve clearances (hot)																			
	Intake	0.25 ± 0.07 mm (0.0098 ± 0.0027 inch)																	
	Exhaust	0.33 ± 0.07 mm (0.012 ± 0.0027 inch)																	
[Reference (cold)]																			
	Intake	0.18 mm (0.0071 inch)																	
	Exhaust	0.25 mm (0.0098 inch)																	
Spark plugs																			
<table><tr><td>Manufacturer</td><td>DENSO</td><td>NGK</td><td>CHAMPION</td></tr><tr><td>Type</td><td>K20PR-U11</td><td>BKR6E-11</td><td>RC9YC4</td></tr><tr><td>Thread</td><td colspan="3">M14 × 1.25</td></tr><tr><td>Spark plug gap</td><td>mm (inch)</td><td colspan="2">1.0 - 1.1 (0.040 - 0.043)</td></tr></table>				Manufacturer	DENSO	NGK	CHAMPION	Type	K20PR-U11	BKR6E-11	RC9YC4	Thread	M14 × 1.25			Spark plug gap	mm (inch)	1.0 - 1.1 (0.040 - 0.043)	
Manufacturer	DENSO	NGK	CHAMPION																
Type	K20PR-U11	BKR6E-11	RC9YC4																
Thread	M14 × 1.25																		
Spark plug gap	mm (inch)	1.0 - 1.1 (0.040 - 0.043)																	
Ignition timing		5 ± 2°/1000 rpm or less (However, engine revolution must be stable.)																	
Idle speed																			
<table><tr><td colspan="2">Engine type</td><td>HC-C</td><td>HC-E</td></tr><tr><td>Transmission type</td><td></td><td></td><td></td></tr><tr><td>Manual transmission</td><td></td><td>850 ± 50 rpm</td><td>850 ± 50 rpm</td></tr><tr><td>Automatic transmission</td><td></td><td>900 ± 50 rpm</td><td>850 ± 50 rpm</td></tr></table>				Engine type		HC-C	HC-E	Transmission type				Manual transmission		850 ± 50 rpm	850 ± 50 rpm	Automatic transmission		900 ± 50 rpm	850 ± 50 rpm
Engine type		HC-C	HC-E																
Transmission type																			
Manual transmission		850 ± 50 rpm	850 ± 50 rpm																
Automatic transmission		900 ± 50 rpm	850 ± 50 rpm																
Fast idle speed adjustment (HC-C)																			
	Full position	M/T 1800 ± 100 rpm A/T 2200 ± 100 rpm																	
Throttle positioner touch revolution (rpm)																			
<table><tr><td>HC-C</td><td colspan="2">HC-E</td></tr><tr><td></td><td>M/T</td><td>A/T</td></tr><tr><td>1800 ± 50</td><td>2000 ± 100</td><td>2800 ± 100</td></tr></table>				HC-C	HC-E			M/T	A/T	1800 ± 50	2000 ± 100	2800 ± 100							
HC-C	HC-E																		
	M/T	A/T																	
1800 ± 50	2000 ± 100	2800 ± 100																	
Throttle positioner operating time		HC-C	1.0 - 2.0 seconds																
		HC-E	0.5 - 5.0 seconds																

ENGINE SPECIFICATIONS

A/T Idle-up revolution (HC-C)		700 ± 50 rpm
Compression pressure (at 300 rpm)	Standard	14.0 kg/cm ² (199.1 psi)
	Minimum	10.5 kg/cm ² (149.3 psi)
	Difference between cylinders	1.5 kg/cm ² (21.3 psi)
Accelerator cable play in axial direction		3 - 8 mm (0.12 - 0.31 inch)

WR88-B016

ENGINE MECHANICALS

Timing belt pulley	Wear limit	Camshaft	119.80 mm (4.717 inch)	
		Crankshaft	59.37 mm (2.335 inch)	
Timing belt tension spring		Free length	53.65 mm (2.11 inch)	
		Installation load	2 kg at 57.25 mm (4.41 lb at 2.25 inch)	
Camshaft	Oil clearance (cylinder head-to-camshaft)		0.035 - 0.076 mm (0.0014 - 0.0029 inch)	
	Maximum limit		0.17 mm (0.0067 inch)	
	Thrust clearance		0.1 - 0.25 mm (0.0040 - 0.0098 inch)	
	Maximum limit		0.45 mm (0.018 inch)	
	Journal diameter			
	Fuel pump cam diameter			
		Standard		
		Minimum	42.65 mm (1.68 inch)	
	Fuel pump cam stroke			
		Standard	5.0 mm (0.197 inch)	
		Minimum	4.8 mm (0.189 inch)	
	Valve cam lobe height			
	(HC-E)			
		Intake	Standard	33.37 - 33.57 mm (1.314 - 1.322 inch)
			Minimum	33.2 mm (1.307 inch)
		Exhaust	Standard	32.76 - 32.96 mm (1.290 - 1.298 inch)
			Minimum	32.6 mm (1.283 inch)
	(HC-C)			
		Intake	Standard	32.76 - 32.96 mm (1.290 - 1.298 inch)
			Minimum	32.6 mm (1.283 inch)
		Exhaust	Standard	32.76 - 32.96 mm (1.290 - 1.298 inch)
		Minimum	32.6 mm (1.283 inch)	
Maximum circle run out			0.03 mm (0.0012 inch)	
Cylinder head	Warpage	Cylinder block side	0.10 mm (0.0039 inch)	
		Intake manifold side	0.10 mm (0.0039 inch)	
		Exhaust manifold side	0.10 mm (0.0039 inch)	
	Valve seat angle	Intake	30° - 45° - 70°	
		Exhaust	20° - 45° - 70°	
	Valve contacting angle		45°	
	Valve seat contacting width			
		Standard	1.4 mm (0.055 inch)	
		Allowance	1.2 - 1.6 mm (0.048 - 0.062 inch)	
	Maximum valve seat recession		0.5 mm (0.0197 inch)	
	(Depth measured from cylinder head gasket surface to uppermost part of a new valve inserted into position)			
		Intake	2.775 mm (0.1092 inch)	
		Exhaust	6.026 mm (0.2372 inch)	

WR88-B007

ENGINE SPECIFICATIONS

Valves	Valve length	Intake valve	112.8 mm (4.441 inch)
		Exhaust valve	114.5 mm (4.508 inch)
	Valve face angle		45.5°
	Valve stock thickness (Minimum)		
		Intake	0.8 mm (0.0315 inch)
		Exhaust	1.0 mm (0.0394 inch)
	Valve stem oil clearance		
	Intake	Standard	0.020 - 0.060 mm (0.00079 - 0.0023 inch)
Valve springs		Maximum	0.080 mm (0.0031 inch)
	Exhaust	Standard	0.025 - 0.065 mm (0.00099 - 0.0025 inch)
		Maximum	0.090 mm (0.0035 inch)
Valve rocker arm and valve rocker shaft	Free length	Standard	45.2 - 46.0 mm (1.78 - 1.81 inch)
		Minimum	44.3 mm (1.74 inch)
	Installed tension at 38.0 mm (1.50 inch)		26.4 kg (58.2 lb)
	Maximum out-of-squareness		1.6 mm (0.063 inch)
Valve rocker arm spacer	Oil clearance	Standard	0.012 - 0.053 mm (0.00048 - 0.0020 inch)
		Maximum	0.08 mm (0.0031 inch)
	Valve rocker arm bore diameter		19.500 - 19.521 (0.7678 - 0.7685 inch)
	Valve rocker shaft outer diameter		19.468 - 19.488 mm (0.7665 - 0.7672 inch)
Exhaust manifold No. 1	Free width		22.00 mm (0.867 inch)
Exhaust manifold No. 2	Warpage	Cylinder head side	0.1 mm (0.0039 inch)
		Exhaust manifold No. 2 side	0.1 mm (0.0039 inch)
Intake manifold	Warpage	Exhaust manifold No. 1 side	0.1 mm (0.0039 inch)
Cylinder block	Warpage	Cylinder head side	0.1 mm (0.0039 inch)
	Maximum cylinder head surface warpage		0.1 mm (0.0039 inch)
	Cylinder bore diameter		
		Standard	76.000 - 76.030 mm (2.9922 - 2.9933 inch)
		O/S 0.25	76.250 - 76.280 mm (3.0020 - 3.0031 inch)
Piston, piston pin and piston rings	Bore honing angle		35° ± 5°
	Coarse degree		1 - 4 Z
Piston, piston pin and piston rings	Piston-to-cylinder bore clearance		
		Standard	0.045 - 0.065 mm (0.00178 - 0.00256 inch)
		Maximum limit	0.11 mm (0.0043 inch)
	Piston ring groove-to-piston ring side clearance		
	Standard.	No. 1	0.03 - 0.07 mm (0.0012 - 0.0027 inch)
		No. 2	0.02 - 0.06 mm (0.00079 - 0.0023 inch)
	Maximum		0.12 mm (0.0047 inch)
	Piston ring thickness		
Piston, piston pin and piston rings	Standard	No. 1	1.17 - 1.19 mm (0.0461 - 0.0468 inch)
		No. 2	1.47 - 1.49 mm (0.0579 - 0.0586 inch)

WR88-B003

Piston, piston pin and piston rings	Piston ring end gap	Standard	No. 1	0.27 - 0.42 mm (0.011 - 0.016 inch)
			No. 2	0.35 - 0.50 mm (0.0138 - 0.0196 inch)
			0.1	0.20 - 0.70 mm (0.0079 - 0.027 inch)
	Maximum	No. 1	0.7 mm (0.028 inch)	
		No. 2	0.8 mm (0.031 inch)	
		0.1	1.0 mm (0.039 inch)	
	Piston pin-to-connecting rod inference fit			0.012 - 0.044 mm (0.00048 - 0.00173 inch)
Piston-to-piston pin clearance			0.005 - 0.011 mm (0.00020 - 0.00043 inch)	
Flywheel	Runout	Maximum	0.1 mm (0.0039 inch)	
Connecting rod	Big end thrust clearance			
		Standard	0.15 - 0.4 mm (0.006 - 0.015 inch)	
		Maximum	0.45 mm (0.018 inch)	
	Maximum bend		0.05 mm (0.0020 inch)	
	Maximum twist		0.05 mm (0.0020 inch)	
Crankshaft	Crankpin journal oil clearance			0.020 - 0.044 mm (0.00079 - 0.0017 inch)
	Main journal oil clearance			0.024 - 0.042 mm (0.00095 - 0.0016 inch)
	Crankpin journal diameter			44.975 - 45.000 mm (1.7707 - 1.7716 inch)
	Main journal diameter			49.975 - 50.000 mm (1.9676 - 1.9685 inch)
	Thrust clearance	Standard	0.02 - 0.22 mm (0.00079 - 0.0086 inch)	
		Maximum limit	0.30 mm (0.012 inch)	
	Runout	Maximum	0.06 mm (0.0024 inch)	
Water temperature switch (HC-C)	Operating temperature			
		ON	63°C (145.4°F) or more	
		OFF	55°C (131.0°F) or less	

WR68-B009

ENGINE SPECIFICATIONS

FUEL SYSTEM SPECIFICATIONS

Carburetor	Float level	Dimension assumed by its own weight	8 mm (0.315 inch)
	Lip dimension		1.6 mm (0.063 inch)
	Throttle valve closed angle		
	Primary		9°
	Secondary		20°
	Throttle valve fully opened angle		
	Primary		90°
	Secondary		80°
	Kick-up angle		23°
	Secondary touch angle		50°
	Choke valve-to-body clearance during choke opener operating period		4.4 mm (0.173 inch)
	Throttle valve-to-body clearance with throttle valve opened fully		0.3 mm (0.012 inch)
	Throttle valve-to-body clearance during dash-pot operating period		0.45 mm (0.018 inch)
	Number of backing-off of idle mixture adjusting screw		4
Fuel pump (HC-C)	Solenoid valve resistance		80 - 100 Ω
	Outer vent resistance		30 - 45 Ω
	Throttle valve opening during throttle positioner switch ON period (A/T vehicle only)		21.2°
	Suction force at 300 rpm		100 mm Hg or more (3.9 inch Hg or more)
	Push rod length	Standard	87.95 - 88.25 mm (3.463 - 3.474 inch)
		Minimum	87.000 mm (3.425 inch)
	Push rod stroke	Standard	5.0 mm (0.197 inch)
		Minimum	4.8 mm (0.189 inch)

WR88-B01D

LUBRICATION SYSTEM

Oil pump	Compression spring free length		57 mm (2.24 inch)
	Body clearance		0.20 - 0.28 mm (0.0079 - 0.011 inch)
	Tip clearance		0.16 - 0.24 mm (0.0063 - 0.0094 inch)
	Side clearance		0.035 - 0.085 mm (0.0014 - 0.0033 inch)
	Oil pressure	idling	0.2 kg/cm ² or more (2.84 psi or more)
		at 3000 rpm	0.25 - 5.0 kg/cm ² (3.56 - 71.1 psi)

WR88-B01

COOLING SYSTEM

Radiator cap	Relief valve opening pressure	
	Standard	0.75 - 1.05 kg/cm ² (10.7 - 14.9 psi)
	Minimum	0.6 kg/cm ² (8.5 psi)
Thermostat	Valve opening temperature	
	General specifications	82 - 86°C (179.6 - 186.8°F)
	ECE & EEC specifications	76 - 80°C (168.8 - 176.0°F)
	Valve lift	
	General specifications	8.5 mm or more at 98°C (0.34 inch or more at 208.4°F)
	ECE & EEC specifications	8.5 mm or more at 91°C (0.34 inch or more at 195.8°F)
Thermo control switch	Operating temperature	
	General specifications	
	ON	88°C (190.4°F)
	OFF	83°C (181.4°F)
	ECE & EEC specifications	
	ON	94°C (201.2°F)
	OFF	89°C (192.2°F)
Radiator fan motor	Output	80W
	Amperage	4.0 - 6.5 A

WR88-B012

IGNITION SYSTEM

Ignition timing	No sub vacuum timing advance takes place. (Engine revolution must be stable at 1000 rpm or less.)	BTDC 5 ± 2°
High-tension cord	Resistance	Maximum
		15 kΩ per cord
Distributor	[HC-C] Dwell angle	52 ± 3°
	Heel gap	0.45 mm (0.018 inch)
	[HC-E] Air gap between signal rotor and signal generator	0.2 - 0.4 mm (0.0079 - 0.015 inch)
Ignition coil	[HC-C] Primary coil	1.0 - 1.5 Ω at 20°C (68°F)
	Secondary coil	26 - 29 Ω at 20°C (68°F)
	External resistance	1.5 - 2.0 Ω at 20°C (68°F)
	[HC-E] Primary coil	1.35 - 1.65 Ω at 20°C (68°F)
	Secondary coil	22 - 30 k Ω at 20° (68°F)

WR88-B013

ENGINE SPECIFICATIONS

STARTING SYSTEM

Conventional type starter motor	Rating voltage and output power		12 V 0.8 kW/0.9 kW
	No-load characteristic at 11.0 V		
	Amperage		Less than 50 A
	rpm		More than 5,000 rpm
	Brush length	Standard	16.0 mm (0.63 inch)
		Minimum	10.5 mm (0.41 inch)
	Commutator		
	Outer diameter	Standard	28 mm (1.102 inch)
		Minimum	27 mm (1.063 inch)
	Undercut depth	Standard	0.5 - 0.8 mm (0.0197 - 0.0314 inch)
		Minimum	0.2 mm (0.0079 inch)
	Maximum circle runout		0.4 mm (0.016 inch)
Reduction type starter motor	Rating voltage and output power		12 V 1.0 kW
	No-load characteristic at 11.5 V		
	Amperage		Less than 90 A
	rpm		More than 3,000
	Brush length	Standard	13.0 mm (0.51 inch)
		Minimum	8.5 mm (0.33 inch)
	Commutator		
	Outer diameter	Standard	30 mm (1.18 inch)
		Minimum	29 mm (1.14 inch)
	Undercut depth	Standard	0.6 mm (0.024 inch)
		Minimum	0.2 mm (0.0079 inch)
	Maximum circle runout		0.05 mm (0.0020 inch)
	Spring installed load		1.785 - 2.415 kg (3.94 - 5.32 lb)

WR88-B014

CHARGING SYSTEM

Battery specific gravity			1.25 - 1.27
Alternator	Rated output	Amperage	45 A/50 A
	Rotor coil resistance		2.9 ± 0.2 Ω at 20°C (68°F)
	Slip ring diameter	Standard	14.4 mm (0.57 inch)
		Minimum	14.0 mm (0.55 inch)
	Brush exploded length	Standard	10.5 mm (0.41 inch)
			1.5 mm (0.06 inch)
	IC regulating voltage		14.2 - 14.8 V

WR88-B015

EFI SYSTEM

Fuel pressure regulator	Fuel pressure at No. vacuum	2.3 - 2.8 kg/cm ² (32.8 - 39.8 psi)
Injector	Resistance at 20°C (68°F) (approx.)	11.0 - 15.0 Ω
	Injection amount (approx.)	152 - 168 cc/60 seconds at 20°C (68°F) (9.28 - 10.2 cub inch)
	Difference between each injector	5 cc or less (0.31 cub inch or less)
	Fuel leakage	Less than one drop of fuel per minute
EFI main relay Injector relay	Between terminals ① - ② ③ - ④	60 - 85 Ω Infinity
Fuel pump relay	Between terminals ① - ② ③ - ④	70 - 90 Ω Infinity
Idle-up VSV	Resistance	30 - 50 Ω at 20°C (68°F)
Throttle position sensor (MT)	Resistance Between terminals ⑩ - ⑪ Throttle valve closed fully Throttle valve opened fully Between terminals ⑫ - ⑬ Throttle valve closed fully Throttle valve opened fully	0.2 Ω or less at 20°C (68°F) 10 kΩ or less at 20°C (68°F) 10 kΩ or more 5 Ω or less at 20° (68°F)
Throttle position sensor (AT)	Resistance Between terminals ⑩ - ⑪ Throttle valve closed fully Throttle valve opened fully Between terminals ⑫ - ⑬ Throttle valve closed fully Throttle valve opened fully	1.0 Ω or less at 20°C (68°F) 1000 kΩ or more 1.0 Ω or less at 20°C (68°F) 1000 kΩ or more
Fuel pump	Fuel flow amount	275 cc or more/15 seconds (16.78 cub inch or more/15 seconds)

WF88-B016

ENGINE SPECIFICATIONS

	Cooling water temperature	Resistance
Water temperature sensor Intake air temperature sensor	80°C (176°F)	0.322 ± 0.1 kΩ
	60°C (140°F)	0.584 ± 0.2 kΩ
	40°C (104°F)	1.14 ± 0.3 kΩ
	20°C (68°F)	2.45 ± 0.5 kΩ
	0°C (32°F)	5.88 ± 1.5 kΩ
	-20°C (-4°F)	16.2 ± 3.2 kΩ
Pressure sensor Output between SST terminals ⑬-⑳ (ground) (When engine is stopped.)		
Measuring point	Atmospheric pressure mm Hg (inch Hg)	Voltage V
Altitude (height above sea level) m (ft)		
0 (0)	760 (29.92)	3.3 - 3.9
500 (1640)	716 (28.19)	3.2 - 3.8
1000 (3280)	674 (26.54)	3.0 - 3.6

WR88-B017

VOLTAGES AT ECU WIRING CONNECTORS

Terminals	STD voltage or resistance	Conditions	Remedies
(1) - (21)	1 Ω or less	Ignition switch OFF.	Proceed to flow chart (2).
(2) - (21)	1V or less	Ignition switch OFF (after more than one minute).	Check power supply.
	10 - 14.8V	Ignition switch ON.	
(3) - (21)	0.1V or less	Ignition switch OFF (after more than ten seconds).	Check power supply.
	10 - 14.8V	Ignition switch ON.	
(4) - (21)	10 - 14.8V	At all times. (Measured voltage is lower than specified voltage only at during starting period.)	Check power supply.
(5) - (21)	10 - 14.8V	Engine fully warmed up. All accessory switches turned OFF and radiator fan motor not rotating.	Check power supply.
	3.0V or less	Idle-up VSV ON.	Check idle-up VSV control.
(6) - (21)	4.5 - 5.5V	Ignition switch ON. T-terminal shorted with ground terminal. Throttle valve fully closed.	Proceed to flow chart (2).
	1V or less		Check diagnosis code.
	0 - 4.5 to 5.5V (Measured voltage varies)	Ignition switch ON. T-terminal shorted with ground terminal. Engine revolution speed build at 300 rpm after it has fully warmed up.	Oxygen sensor system.
(7) - (21)	0.1V or less	Ignition switch OFF.	Check power supply.
	10 - 14.8V	Ignition switch ON.	
(8) - (21)	0.1V or less	Ignition switch OFF.	Check power supply.
	6 - 14.8V	When ignition switch is set to ST position.	
(9) - (21)	0.1V or less	Ignition switch OFF.	Check T-terminal wiring.
	10 - 14.8V	Ignition switch ON.	
(10) - (21)	0.5V or less	Ignition switch ON. Throttle valve fully closed.	Throttle position sensor system.
	10 - 14.8V	Ignition switch ON. Throttle valve fully opened.	
(11) - (21)	0.1V or less	Ignition switch ON. Headlamp switch and/or defogger switch OFF.	Check idle-up VSV control.
	9 - 14.8V	Ignition switch ON. Headlamp switch and/or defogger switch ON.	
(12) - (22)	0.1V or less	Ignition switch OFF.	Check VCC wiring.
	4.5 - 5.5V	Ignition switch ON.	
(13) - (22)	3.2 - 3.8V	Ignition switch ON. Atmospheric pressure is 760 mmHg (29.9 inchHg).	Check pressure sensor.
(14) - (30)	0.9 - 3.0V	Ignition switch ON. Air temperature inside surge tank: 20°C (68°F).	Check intake air temperature sensor.
(15) - (30)	0.4 - 0.5V	Ignition switch ON. After engine has been warmed up fully. (Cooling water temperature: 80 - 90°C (176 - 194°F).	Check cooling water temperature sensor.
(16) - (1)	1 Ω or less	Ignition switch OFF.	Proceed to flow chart (2).
(17) - (21)	1V or less	Ignition switch OFF (after more than one minute).	Check/repair injector power supply.
	10 - 14.8V	Ignition switch ON.	

WR88-B018

ENGINE SPECIFICATIONS

Terminals	STD voltage or resistance		Conditions	Remedies
(18) - (21)	0.1V or less		Ignition switch OFF.	Check/repair ECU power supply.
	10 - 14.8V		Ignition switch ON.	
(19) - (21)	3V or less		Ignition switch ON. (Check engine lamp illuminated.)	Check power supply for check engine lamp.
	10 - 14.8V		Engine is rotating. (Check engine lamp not illuminated).	
(20) - (21)	1V or less		Ignition switch ON. Fuel pump is operating.	Check/repair fuel pump power supply.
	10 - 14.8V		Ignition switch ON. Fuel pump is stopped.	
(21) - Engine ground	0.2Ω or less.		Ignition switch OFF.	Check ground wiring.
(22) - (21)	0.5Ω or less.		Ignition switch OFF.	Replace ECU.
(23) - (21)	10 - 14.8V		Engine is rotating. Air conditioner compressor is rotating. (Genuine air conditioner-equipped vehicle.)	Check air conditioner wiring.
(24) - (21)	0.1V or less		Ignition switch ON. Shift lever shifted in [N] or [P] range.	Check neutral start switch.
	10 - 14.8V		Ignition switch ON. Shift lever shifted in [R] range. (A/T vehicle only.)	Check neutral start switch. (Shift position sensor.)
(25) - (21)	M/T	10 - 14.8V	Ignition switch ON.	Check wiring.
	A/T	0.1V or less	Ignition switch ON.	Check ECU output.
(26) - (21)	0 - 10 to 14.8V		Ignition switch ON. When vehicle is moved. (Measured voltage changes 4 times for movement of 1.5 m.)	Check speed sensor
(27) - (21)	10 - 14.8V		Ignition switch ON. When shift lever is shifted to [N] , [P] or [R] range. (A/T vehicle only.)	Check neutral start switch. (Shift position sensor.)
	1.0V or less		Ignition switch ON. When shift lever is shifted to [D] , [2] or [L] range. (A/T vehicle only.)	
(28) - (21)	M/T	4.5 - 5.5V	Ignition switch ON. Throttle valve fully closed.	Check throttle position sensor.
		0.5V or less	Ignition switch ON. Throttle valve fully opened.	
	A/T	0.5V or less	Ignition switch ON. Throttle valve fully closed.	
		4.5 - 5.5V	Ignition switch ON. Throttle valve fully opened.	
(29) - (21)	0.1V or less		Ignition switch ON (after more than 60 seconds).	Check oxygen sensor.
	Voltage varies within 0 - 1.0V		After engine has warmed up fully. When engine revolution is held as 3000 rpm for more than 2 minutes:	Check fuel system.
(30) - (21)	1Ω or less		Ignition switch ON.	Proceed to flow chart (2).

WR88-B013

DAIHATSU

CHARADE

TYPE HC ENGINE

TIGHTENING TORQUES

TIGHTENING TORQUES FOR MAIN

COMPONENTS	C-2
METHOD TO IDENTIFY STRENGTH DIVISION OF BOLTS	C-2
TIGHTENING TORQUE TABLE FOR GENERAL STANDARD BOLTS	C-3
ENGINE	C-4

WRC88-C001

TIGHTENING TORQUES









TIGHTENING TORQUE FOR MAIN COMPONENTS

1. When you want to find out a suitable tightening torque for a bolt, first determine the strength division of the said bolt, using the table below. Then, locate suitable tightening torque in the tightening torque table described later.
2. As for the tightening torque for a nut, find out suitable tightening torque in the same way as with the paragraph 1 above, based on the mating bolt.
3. Tightening torque posted in the workshop manual is a standard value for steel fasteners. It is, therefore, necessary to modify these tightening torque when you lighten fasteners made of materials other than steel. This rule also applies to such instances where bolts are undergoing heat or other stress, such as vibratory loads and so forth.

WRC88-C002

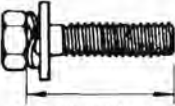
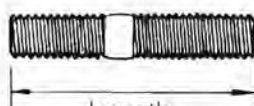
METHOD TO IDENTIFY STRENGTH DIVISION OF BOLTS

1. Identification Method by Checking Bolts Themselves

	Configuration and how to determine strength division		Strength division		Configuration and how to determine strength division		Strength division
Hexagon bolt		Bolt having an embossed or stamped figure at its head section	4 = 4T 5 = 5T 6 = 6T 7 = 7T	Welded bolt			4T
		No mark	4T	Stud bolt		No mark	4T
		Bolt having two embossed lines at its head section	5T 6T			Bolt having about 2 mm deep recess at one end or both ends	6T
		Bolt having three embossed lines at its head section	7T				

WRC88-C003

2. Identification Method by Part Numbers

Hexagon Bolt Part number example 9 1 1 1 1 - 4 0 6 2 0 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Nominal length (mm)</p> </div> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Nominal diameter (mm)</p> </div> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Strength division</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <div style="display: flex; justify-content: space-around;"> <div>Nominal length</div> <div>Nominal diameter</div> </div> </div>		Stud Bolt Part number example 9 2 1 3 2 - 4 0 6 2 0 <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Nominal length (mm)</p> </div> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Nominal diameter (mm)</p> </div> <div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100px; margin: 0 auto;"></div> <p>Strength division</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <div style="display: flex; justify-content: space-around;"> <div>Length</div> <div>Nominal diameter</div> </div> </div>	
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WRC88-C004

TIGHTENING TORQUE TABLE FOR GENERAL STANDARD BOLTS

Category	Nominal diameter	Pitch	Standard tightening torque kg-m (ft-lb)	
			Standard torque	Tightening range
4T (Bolt having a mark of "4" at its head section) Example of part number (91○○○ - 4○○○○)	6	1	0.47 (3.4)	0.4 - 0.7 (2.9 - 5.1)
	8	1.25	1.11 (8.0)	1.0 - 1.6 (7.2 - 11.6)
	10	1.25	2.25 (16.3)	1.9 - 3.1 (14 - 22.5)
	10	1.5	2.14 (15.5)	1.8 - 3.0 (13 - 22)
	12	1.25 (ISO)	4.40 (31.8)	3.5 - 5.5 (25 - 40)
	12	1.5	3.89 (28.1)	3.5 - 5.5 (25 - 40)
	12	1.75	3.74 (27.1)	3.0 - 5.0 (22 - 36)
	13	1.5	5.08 (36.7)	4.5 - 7.0 (33 - 51)
	14	1.5	6.33 (45.8)	5.0 - 8.0 (36 - 58)
	14	2	5.93 (42.9)	4.7 - 7.7 (34 - 56)
	16	1.5	9.57 (69.2)	7.5 - 11.0 (54 - 80)
	16	2	9.10 (65.8)	7.1 - 10.6 (51 - 77.5)
5T (Bolt having a mark of "5" at its head section) Example of part number (91○○○ - 5○○○○)	6	1	0.71 (5.1)	0.6 - 0.9 (4.3 - 6.5)
	8	1.25	1.66 (12.0)	1.5 - 2.2 (11 - 16)
	10	1.25	3.37 (24.4)	3.0 - 4.5 (22 - 33)
	10	1.5	3.20 (23.1)	2.7 - 4.2 (19.5 - 30.5)
	12	1.25 (ISO)	5.84 (42.2)	5.0 - 7.0 (36 - 51)
	12	1.5	5.84 (42.2)	5.0 - 7.0 (36 - 51)
	12	1.75	5.60 (40.5)	4.8 - 6.8 (34 - 49)
	13	1.5	7.63 (55.2)	6.5 - 9.0 (47 - 65)
	14	1.5	9.50 (68.7)	7.5 - 11.0 (54 - 79.5)
	14	2	8.90 (64.4)	7.0 - 10.5 (51 - 76)
	16	1.5	14.36 (103.9)	12.0 - 17.0 (87 - 123)
	16	2	13.58 (98.2)	11.5 - 16.5 (83 - 119)
6T (Bolt having a mark of "6" at its head section) Example of part number (91○○○ - 6○○○○)	6	1	0.71 (5.1)	0.6 - 0.9 (4.3 - 6.5)
	8	1.25	1.66 (12.0)	1.5 - 2.2 (11 - 16)
	10	1.25	3.37 (24.4)	3.0 - 4.5 (22 - 33)
	10	1.5	3.20 (23.1)	2.7 - 4.2 (19.5 - 30.5)
	12	1.25 (ISO)	5.84 (42.2)	5.0 - 7.0 (36 - 51)
	12	1.5	5.84 (42.2)	5.0 - 7.0 (36 - 51)
	12	1.75	5.61 (40.6)	4.8 - 6.8 (35 - 49)
7T (Bolt having a mark of "7" at its head section) Example of part number (91○○○ - 7○○○○)	6	1	0.95 (6.87)	0.8 - 1.2 (5.8 - 8.7)
	8	1.25	2.20 (15.9)	2.0 - 3.0 (14.5 - 22)
	10	1.25	4.50 (32.5)	4.0 - 5.5 (29 - 40)
	10	1.5	4.30 (31.1)	3.7 - 5.2 (27 - 38)
	12	1.25 (ISO)	7.78 (56.3)	7.0 - 9.0 (51 - 65)
	12	1.5	7.78 (56.3)	7.0 - 9.0 (51 - 65)
	12	1.75	7.48 (54.1)	6.0 - 8.5 (43 - 61.5)
	13	1.5	10.17 (73.6)	8.0 - 12.0 (58 - 88)
	14	1.5	12.67 (91.6)	10.0 - 15.0 (72 - 108)
	14	2	11.86 (85.8)	9.5 - 14.0 (69 - 101)
	16	1.5	19.15 (138.5)	15.0 - 23.0 (108 - 166)
	16	2	18.11 (131.0)	14.9 - 22.0 (108 - 159)

WRC88-C005

TIGHTENING TORQUES

ENGINE

Unit: kg-m (ft-lb)

Tightening component	Tightening torque
Cylinder head × Spark plug	1.5 - 2.2 (10.8 - 15.9)
Cylinder head × Cylinder head cover	0.3 - 0.5 (2.2 - 3.6)
Cylinder head × Rocker shaft	M10 Bolt 2.9 - 3.7 (21.0 - 26.8) M8 Bolt 1.3 - 1.7 (9.4 - 12.3)
Cylinder head × Cylinder block	5.0 - 6.0 (36.2 - 43.4)
Cylinder head × Water temperature sensor (HC-E engine only)	2.5 - 3.5 (18.1 - 25.3)
Cylinder head × BVSF (HC-C engine only)	2.5 - 3.5 (18.1 - 25.3)
Cylinder head × Water temperature sender gauge	1.2 - 2.0 (8.7 - 14.5)
Cylinder head × Distributor	1.5 - 2.2 (10.8 - 15.9)
Cylinder head × Exhaust manifold	3.0 - 4.5 (21.7 - 32.5)
Cylinder head × Intake manifold	1.5 - 2.2 (10.8 - 15.9)
Cylinder head × Fuel pump	1.5 - 2.2 (10.8 - 15.9)
Cylinder block × Water inlet	0.6 - 0.9 (4.3 - 6.5)
Cylinder block × Crankshaft main bearing cap	4.5 - 5.5 (32.5 - 39.8)
Cylinder block × Oil pump	0.6 - 0.9 (4.3 - 6.5)
Cylinder block × Rear oil seal retainer	0.6 - 0.9 (4.3 - 6.5)
Cylinder block × Water pump	1.5 - 2.2 (10.8 - 15.9)
Cylinder block × Engine right front mounting No. 1	3.0 - 4.5 (21.7 - 32.5)
Cylinder block × Transmission	5.0 - 7.0 (36.2 - 50.6)
Cylinder block × Oil cooler pipe	2.5 - 3.5 (18.1 - 25.3)
Surge tank × Intake air temperature sensor	3.0 - 4.0 (21.7 - 28.9)
Surge tank × Gas filter	1.2 - 2.0 (8.7 - 14.5)
Surge tank × Throttle body	1.5 - 2.2 (10.8 - 15.9)
Body × Engine mounting front insulator	4.0 - 5.5 (28.9 - 39.8)
Body × Engine mounting front left bracket	4.0 - 5.5 (28.9 - 39.8)
Body × Stabilizer bracket	4.0 - 6.0 (28.9 - 43.4)
Body × Immediate bearing bracket	3.0 - 4.5 (21.7 - 32.5)
Crankshaft × Flywheel	8.0 - 10.0 (57.9 - 72.0)
Crankshaft × Drive plate	8.0 - 10.0 (57.9 - 72.0)
Crankshaft × Crankshaft timing belt pulley	9.0 - 10.0 (65.1 - 72.0)
Intake manifold × Delivery pipe	1.5 - 2.2 (10.8 - 15.9)
Intake manifold × Carburetor (HC-C engine only)	1.5 - 2.2 (10.8 - 15.9)
Exhaust manifold No. 1 × Exhaust manifold No. 2	3.0 - 4.5 (21.7 - 32.5)
Exhaust manifold No. 2 × Exhaust pipe	5.0 - 7.6 (36.2 - 55.0)
Exhaust manifold stay	3.5 - 5.0 (25.3 - 36.2)
Exhaust pipe clamp	2.0 - 3.0 (8.7 - 14.5)
Engine mounting front right bracket	4.0 - 5.5 (28.9 - 39.8)
Engine mounting right bracket × Engine mounting front right bracket	Bolt 4.0 - 5.5 (28.9 - 39.8) Nut 1.5 - 2.3 (10.8 - 16.6)
Engine mounting lower insulator × Engine mounting front left bracket	4.0 - 5.5 (28.9 - 39.8)
Engine mounting rear bracket No. 2 × Engine mounting rear bracket No. 1	5.5 - 7.0 (39.8 - 50.6)
Engine mounting left stay	4.0 - 5.5 (28.9 - 39.8)

TIGHTENING TORQUES

Unit: kg-m (ft-lb)

Tightening component	Tightening torque
Oil pump x Oil cooler	2.5 - 3.5 (18.1 - 25.3)
Oil pump x Oil pressure switch	1.2 - 2.0 (8.7 - 14.5)
Oil pan	0.7 - 1.2 (5.1 - 8.7)
Oil pan x Drain plug	2.0 - 3.0 (14.5 - 21.7)
Oil pump body x Oil pump cover	0.8 - 1.3 (5.8 - 9.4)
Oil level gauge guide	0.4 - 0.7 (2.9 - 5.1)
Surge tank stay No. 1	1.5 - 2.2 (10.8 - 15.9)
Surge tank stay No. 2	1.9 - 3.1 (13.7 - 22.4)
Surge tank stay No. 3	2.0 - 3.0 (8.7 - 14.5)
Camshaft x Camshaft timing belt pulley	1.5 - 2.2 (10.8 - 15.9)
Timing belt cover	0.2 - 0.4 (1.4 - 2.9)
Timing belt tensioner	3.0 - 4.5 (21.7 - 32.5)
Crankshaft timing belt pulley x Crankshaft pulley	2.0 - 3.0 (14.5 - 21.7)
Water pump pulley x Water pump	0.6 - 0.9 (4.3 - 6.5)
Water inlet x Water temperature switch (HC-C engine with ECE & EEC specifications only)	2.5 - 3.5 (18.1 - 25.3)
Water inlet x Thermo control switch	2.5 - 3.5 (18.1 - 25.3)
Fuel filter x Fuel hose No. 1	3.5 - 4.5 (25.3 - 32.5)
Fuel filter x Fuel pipe	3.5 - 4.4 (25.3 - 31.8)
Fuel hose No. 1 x Delivery pipe	3.5 - 4.5 (25.3 - 32.5)
Connecting rod x Connecting rod cap	3.5 - 4.5 (25.3 - 32.5)
Clutch cover x Flywheel	1.5 - 2.2 (10.8 - 15.9)
Transmission x Starter motor	5.0 - 7.0 (36.2 - 50.6)
Lower arm x Lower arm bracket	8.0 - 10.5 (57.9 - 75.9)
Lower arm x Stabilizer bar	7.5 - 11.0 (54.2 - 80.0)
Propeller shaft x Rear differential	5.2 - 7.1 (37.6 - 51.4)
Front pipe x Rear pipe	4.0 - 6.0 (28.9 - 43.4)
Fuel pump x Fuel pipe	3.5 - 4.4 (25.3 - 31.8)

WRC88-MT007

DAIHATSU

CHARADE

TYPE HC ENGINE

WIRING DIAGRAM

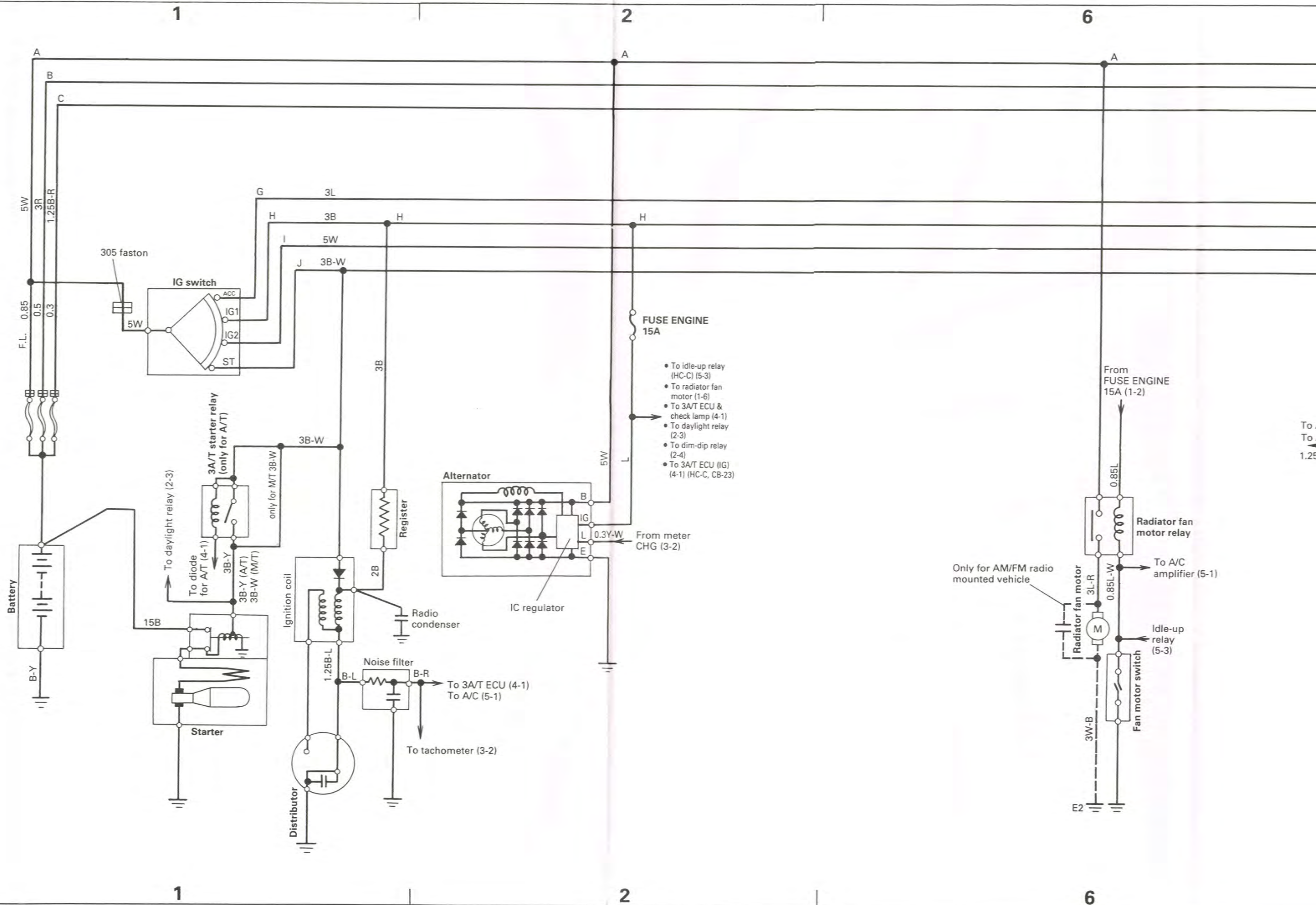
SYSTEM INDEX	D-2
WIRING DIAGRAM FOR TYPE HC-E	
ENGINE	D-3
WIRING DIAGRAM FOR TYPE HC-C	
ENGINE	D-7

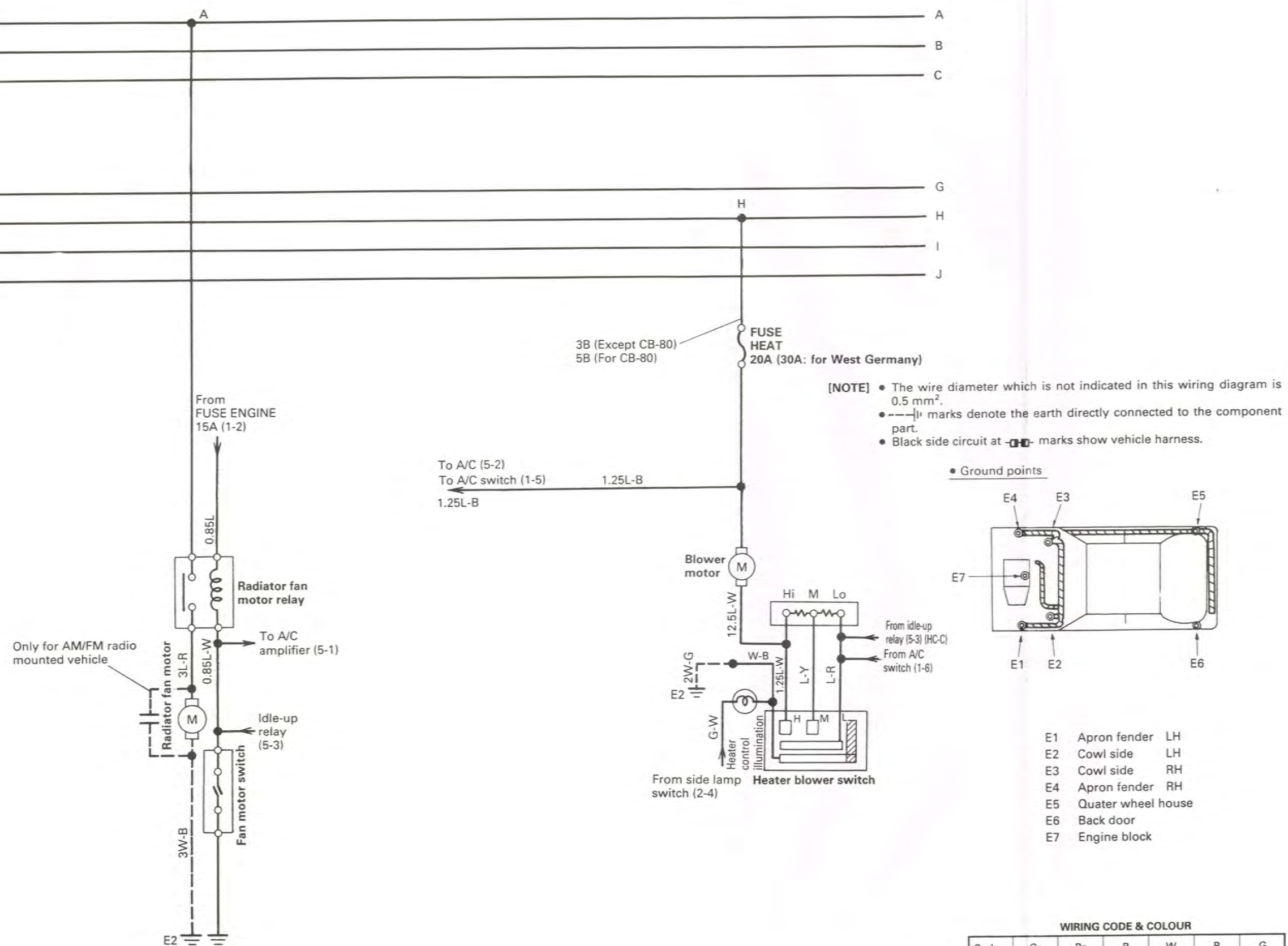
WRC88-WD001

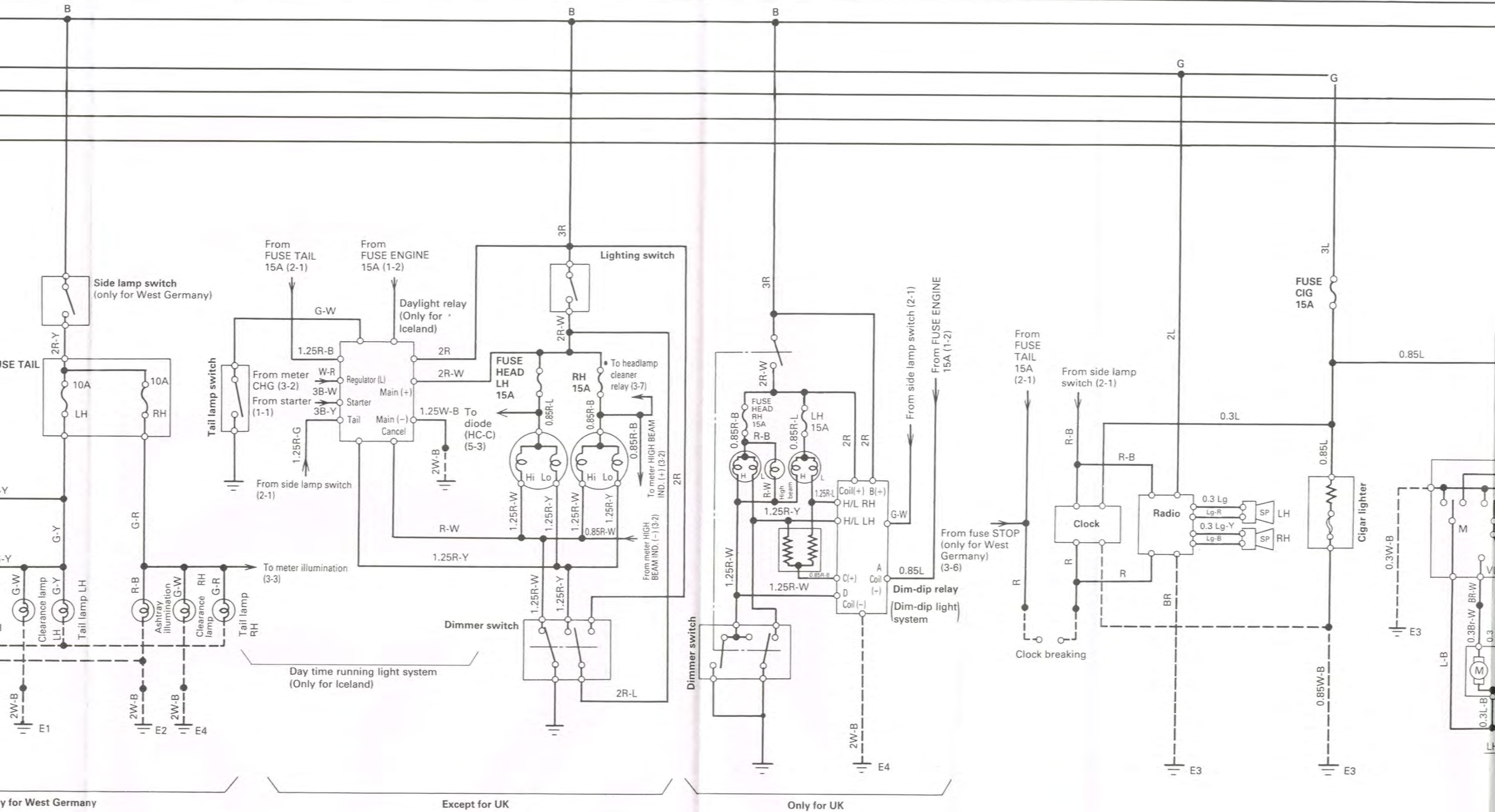
SYSTEM INDEX

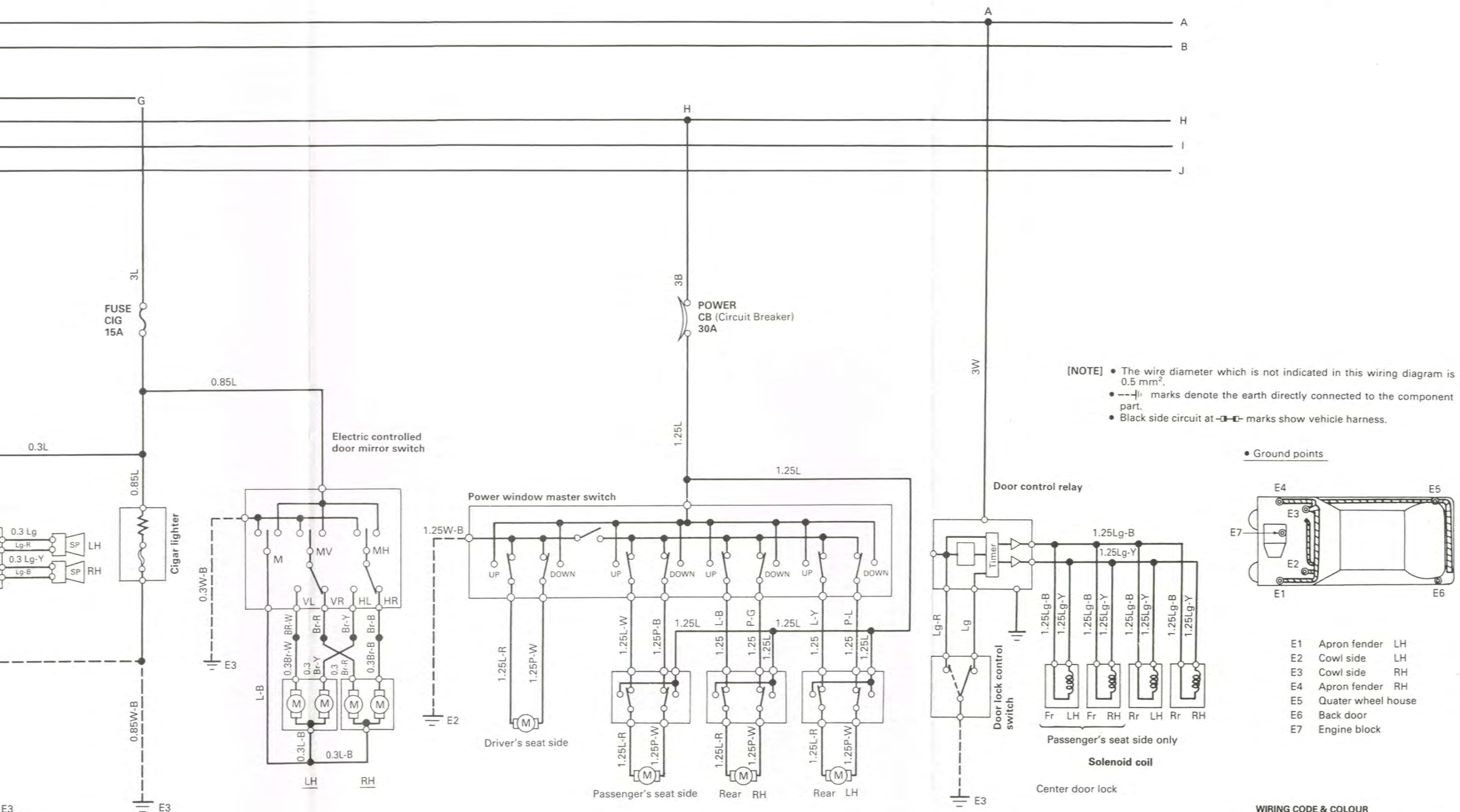
SYSTEMS	LOCATION	
	TYPE HC-E E/G	TYPE HC-C E/G
Air Conditioner	1-4	1-5
Alternator & Regulator	1-1	1-2
Automatic Transmission ECU	4-2	4-2
Battery	1-1	1-1
Central Door Lock	2-7	2-7
Cigar Lighter	2-5	2-5
Clock	2-5	2-5
Combination Meter	3-2	3-2
Daylight Relay	2-3	2-3
Dim-dip Relay	2-4	2-4
Distributor	1-1	1-1
EFI ECU	7-2	—
Electronic Door Mirror	2-6	2-6
Front Wiper & Washer	3-7	3-7
Headlamp	2-3	2-3
Headlamp Cleaner	3-7	3-7
heater	1-3	1-7
Horn	3-5	3-5
Ignition Coil	1-1	1-1
Luggage Room Lamp	3-6	3-6
Light-on-Warning Buzzer	3-5	3-5
Power Window	2-6	2-6
Radiator Fan Motor	1-6	1-6
Radio	2-5	2-5
Rear Window Defogger	3-6	3-6
Rear Wiper & Washer	3-7	3-7
Room Lamp	3-7	3-7
Side lamp	2-1	2-1
Sun Roof	3-1	3-1
Starter	1-4	1-1
Stop Lamp	3-6	3-6
Turn Signal & Hazard Lamp	3-4	3-4

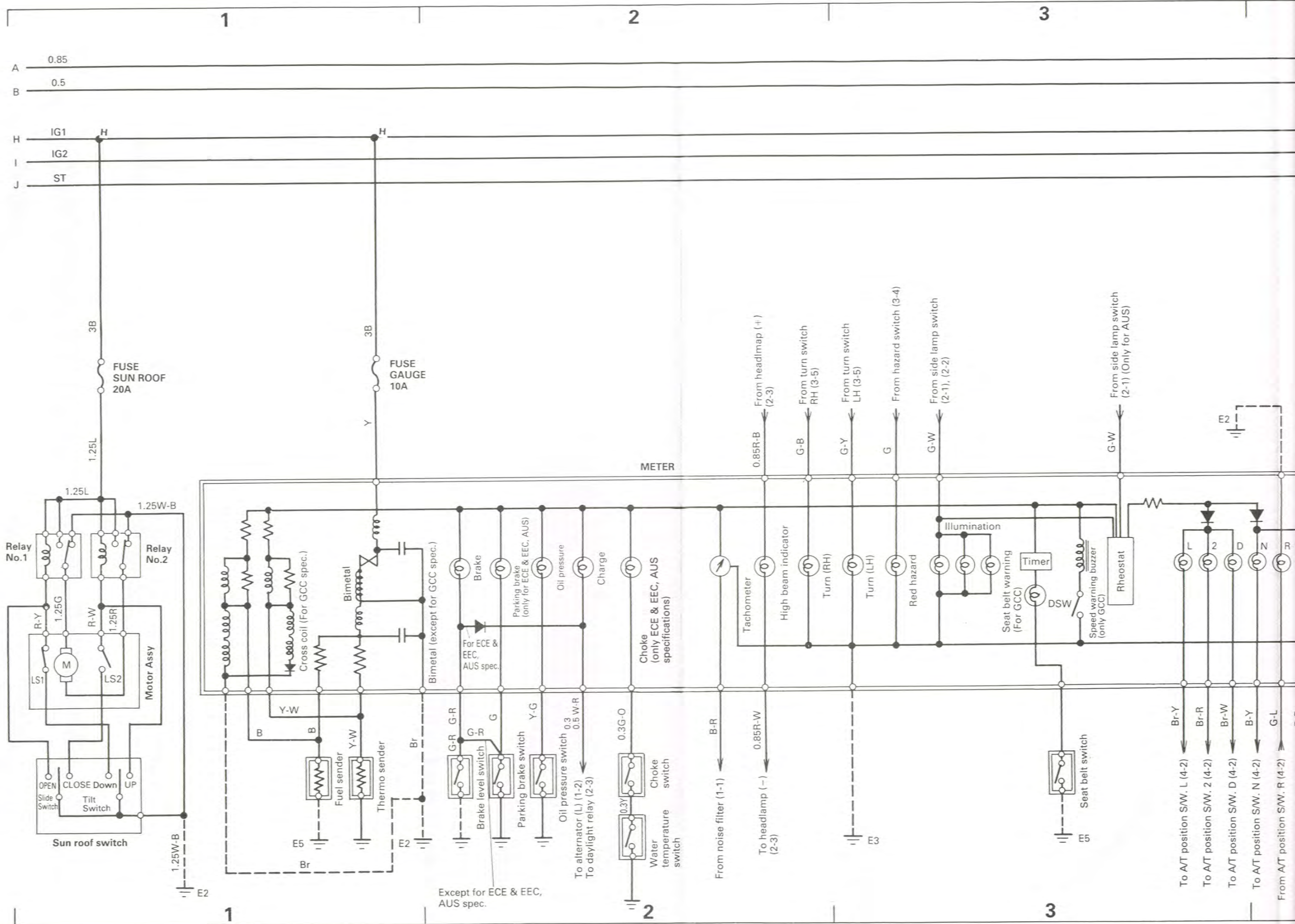
WIRING DIAGRAM FOR TYPE HC-C ENGINE

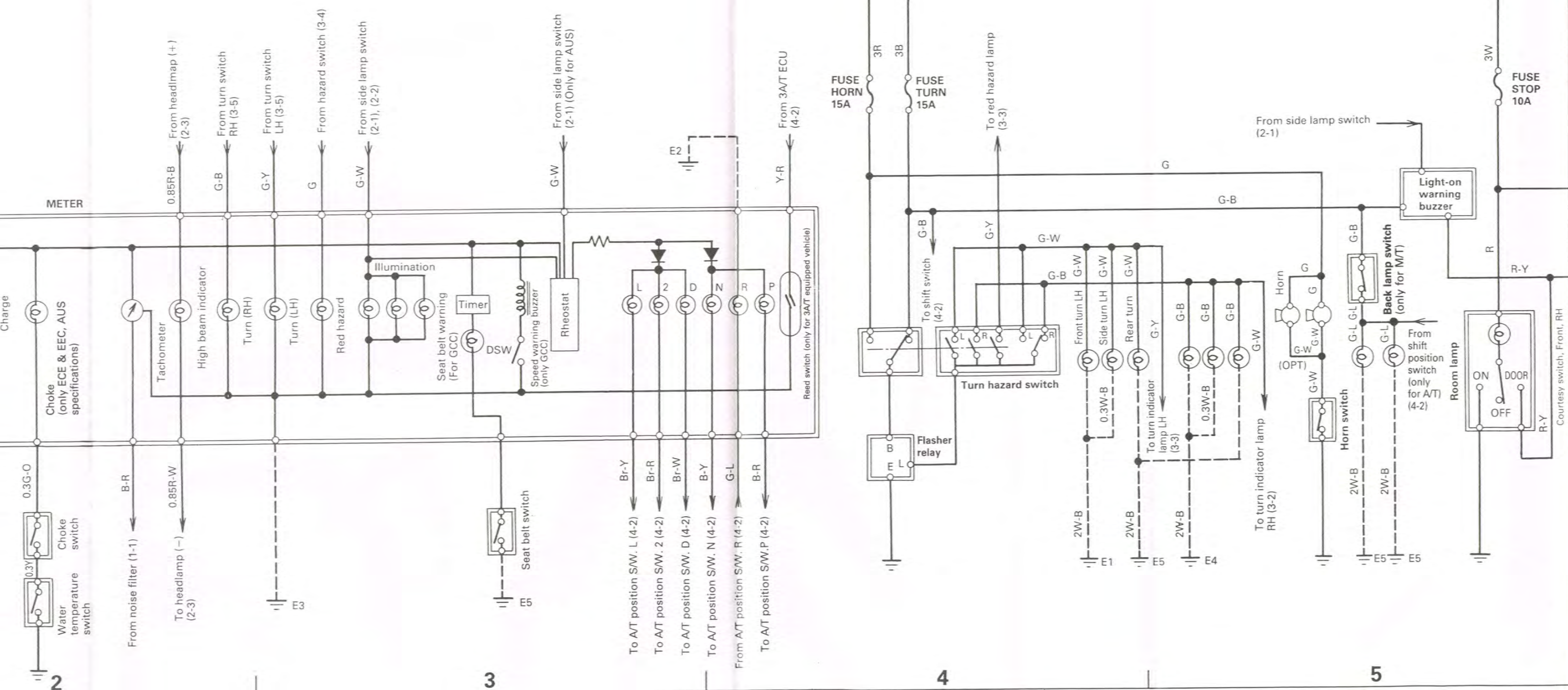




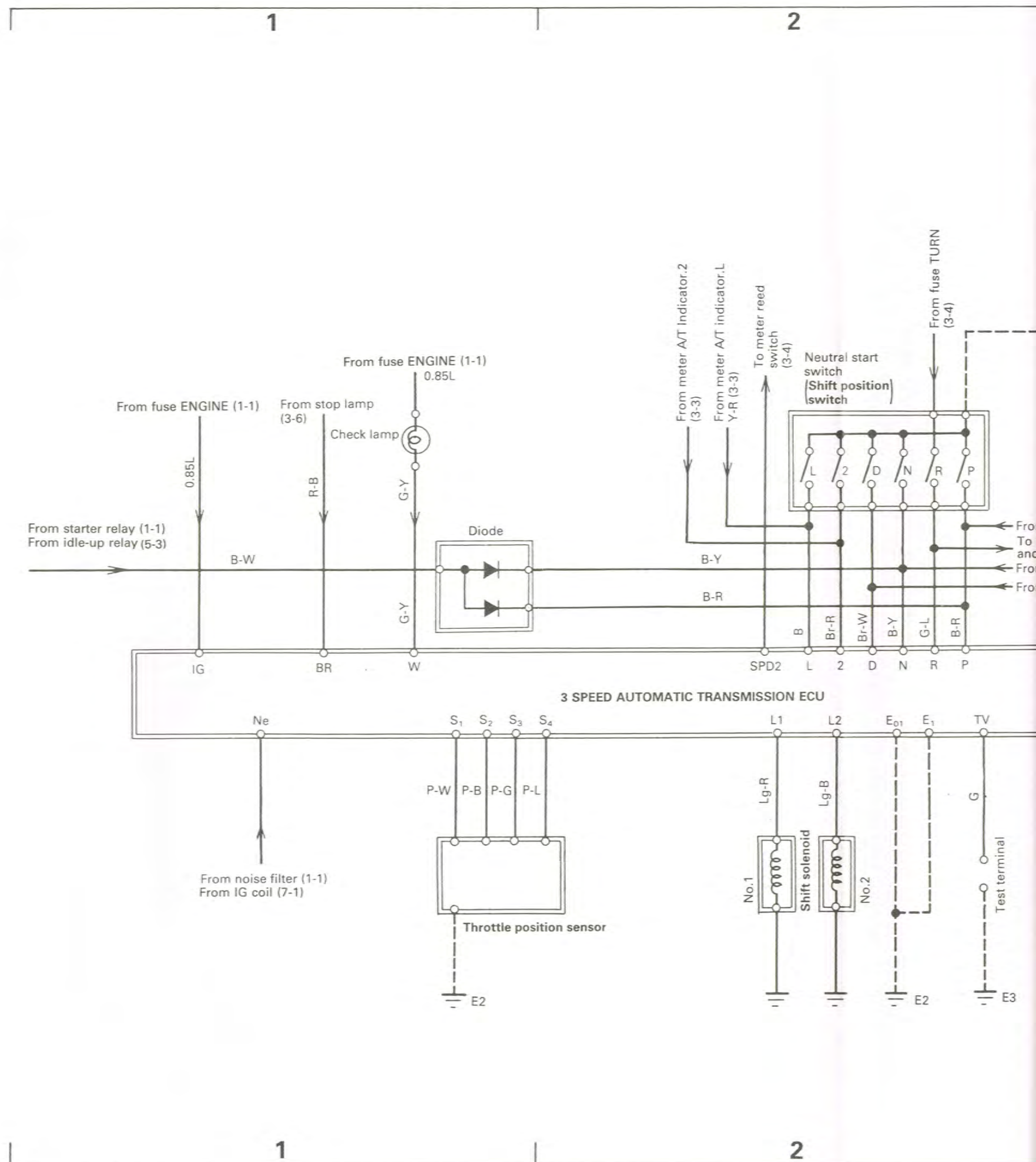


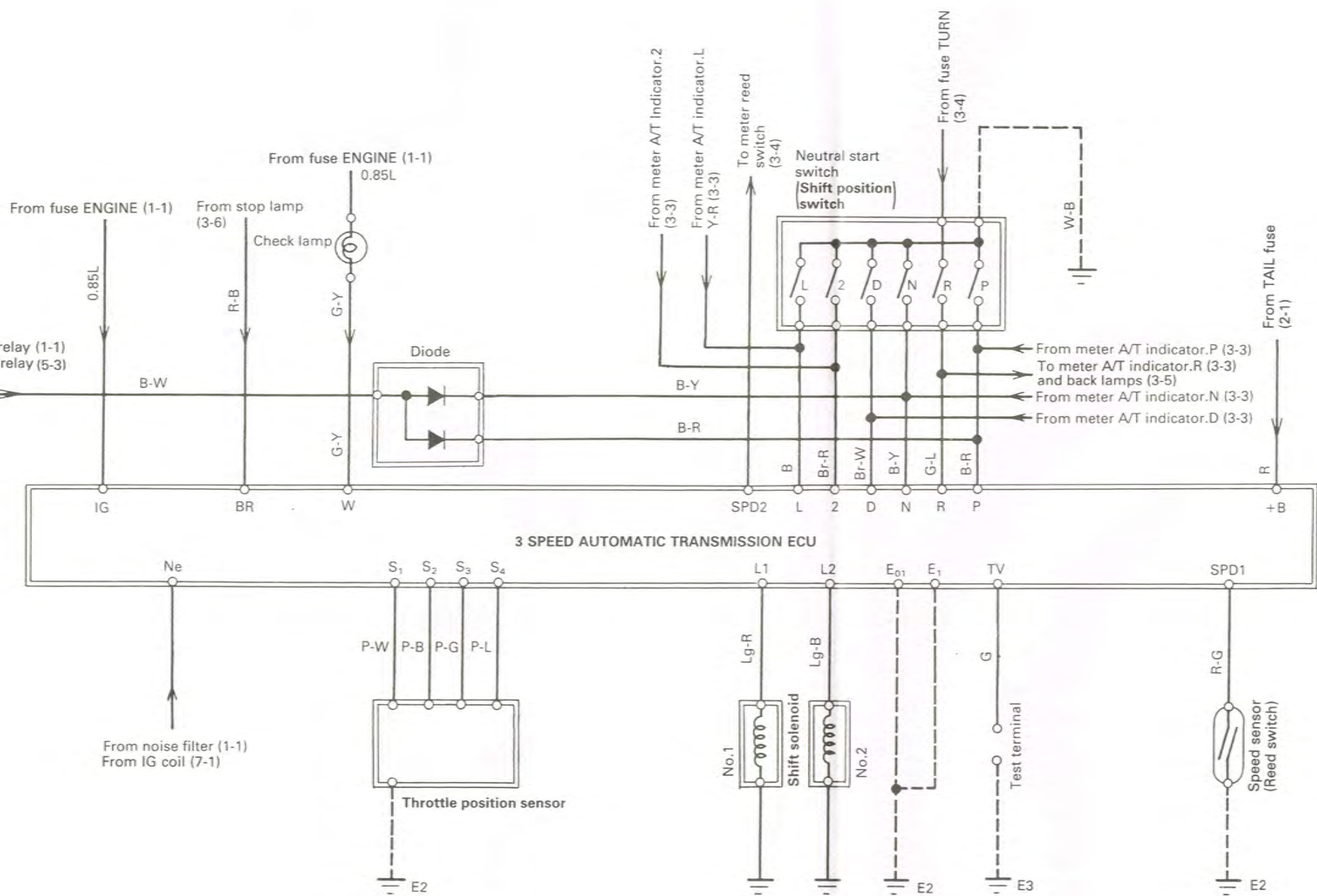




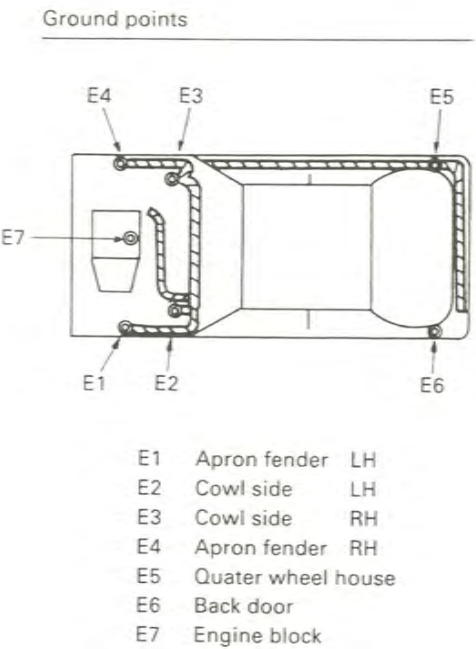




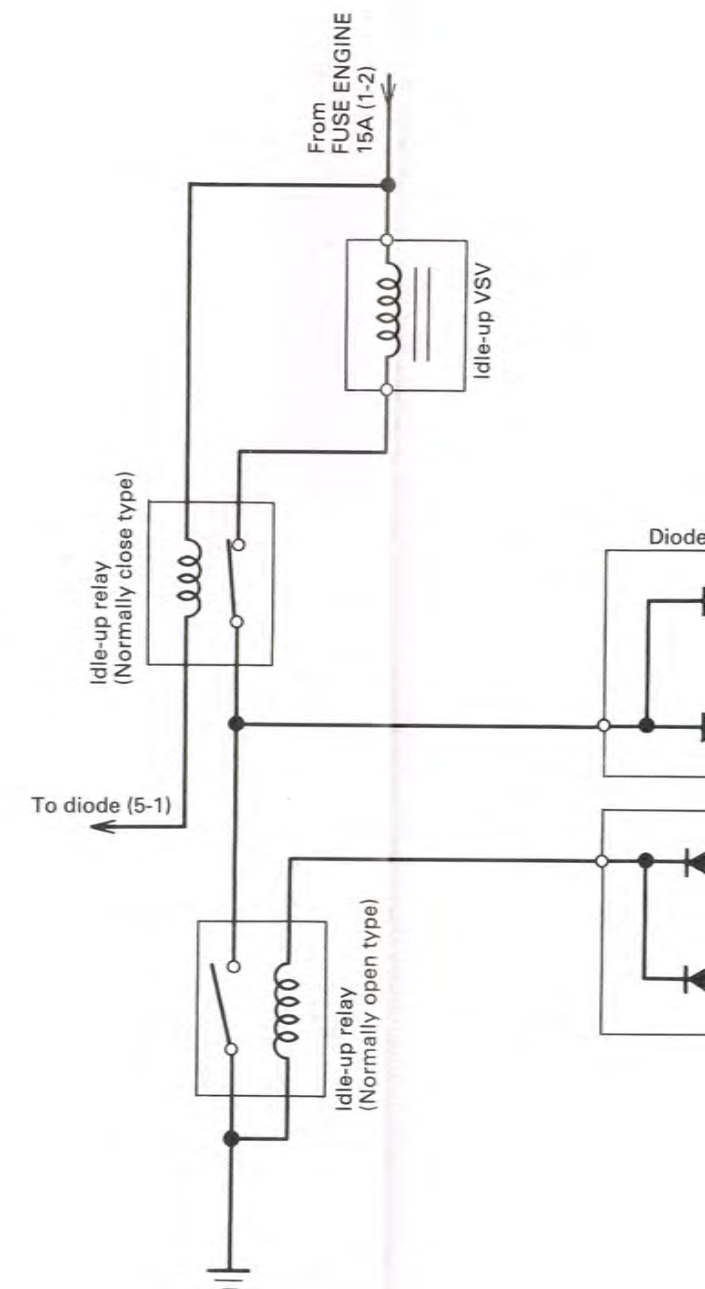
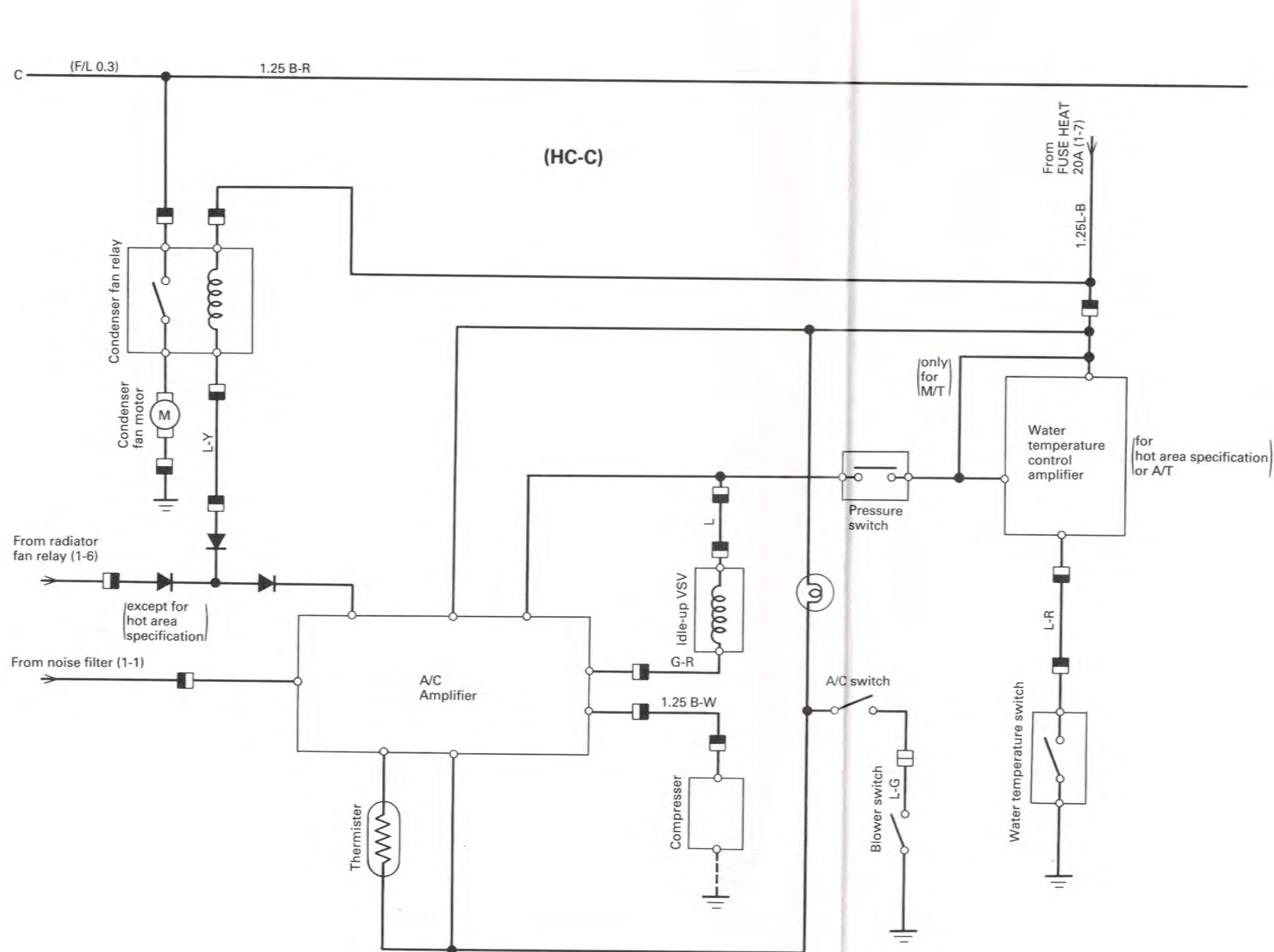


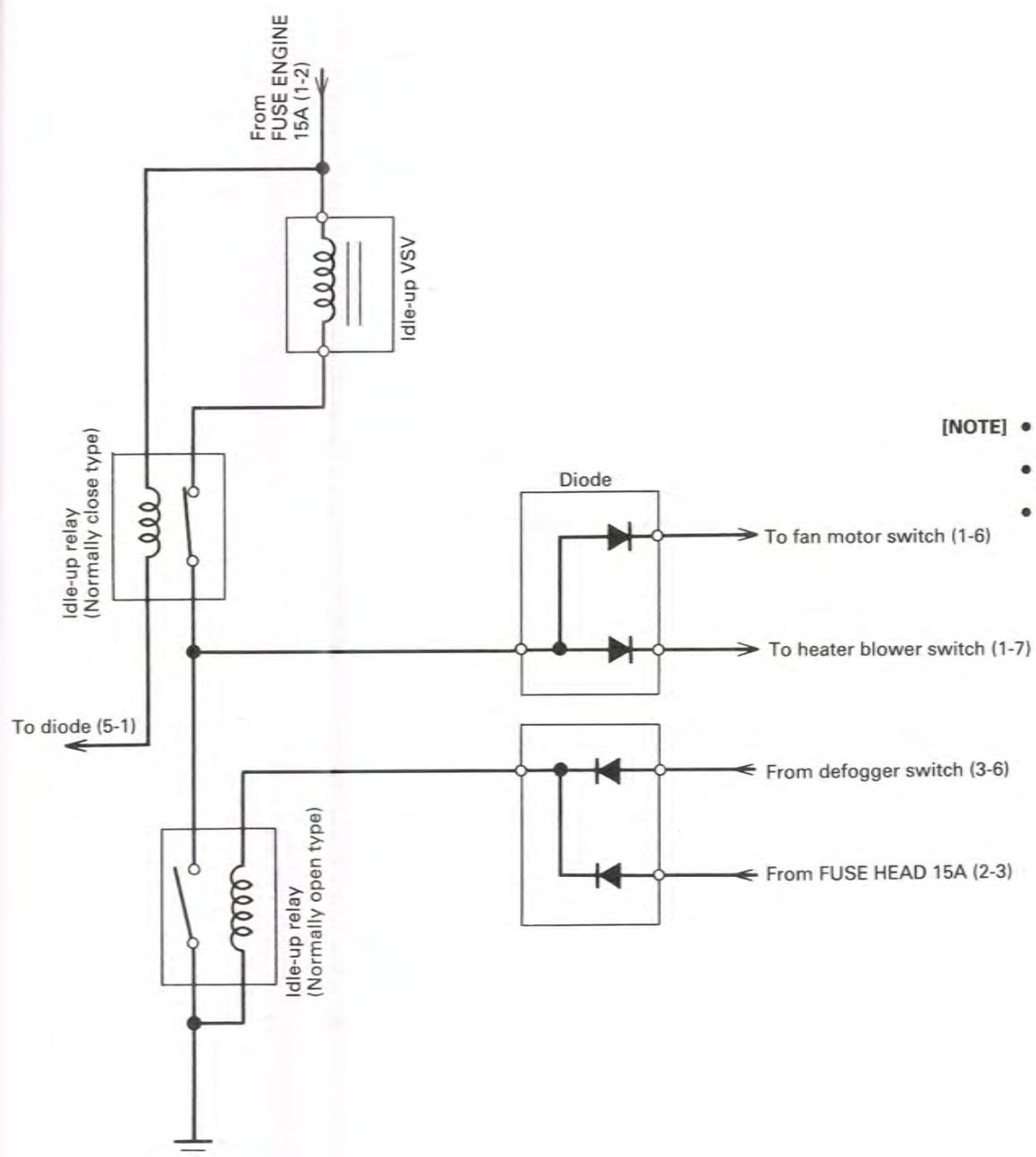


[NOTE] • The wire diameter which is not indicated in this wiring diagram is 0.5 mm².
• ---| marks denote the earth directly connected to the component part.
• Black side circuit at ---| marks show vehicle harness.



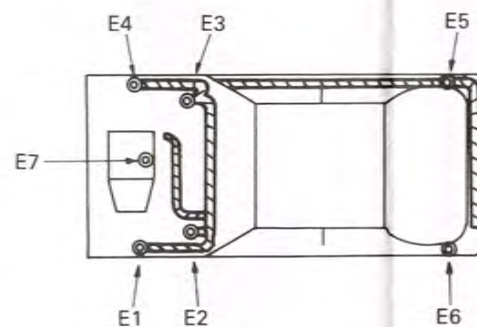
WIRING CODE & COLOUR						
Code	Gr	Br	B	W	R	G
Colour	Gray	Brown	Black	White	Red	Green
Code	Y	L	O	P	Lg	
Colour	Yellow	Blue	Orange	Pink	Light green	





[NOTE] • The wire diameter which is not indicated in this wiring diagram is 0.5 mm².
 • —| marks denote the earth directly connected to the component part.
 • Black side circuit at —| marks show vehicle harness.

• Ground points

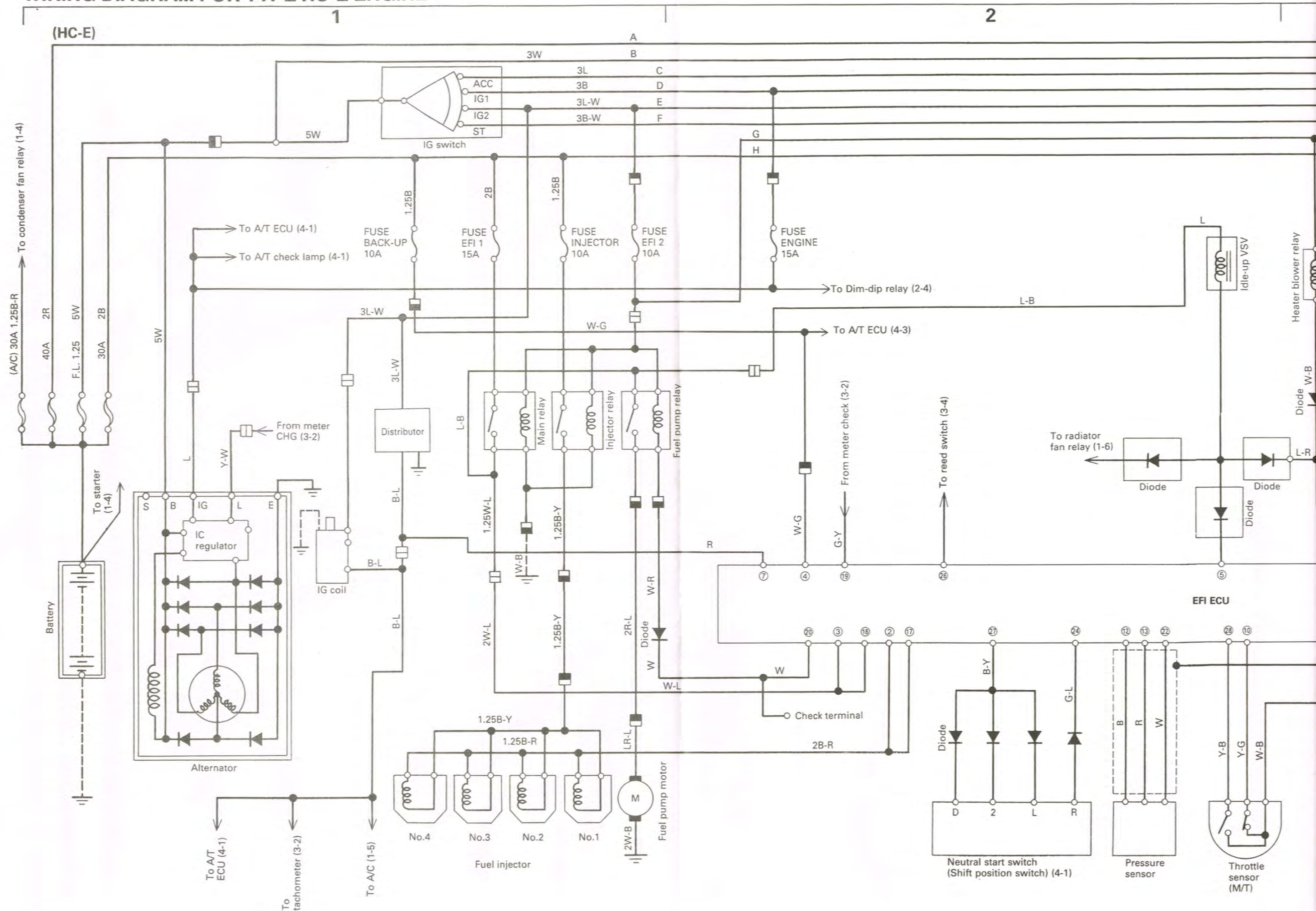


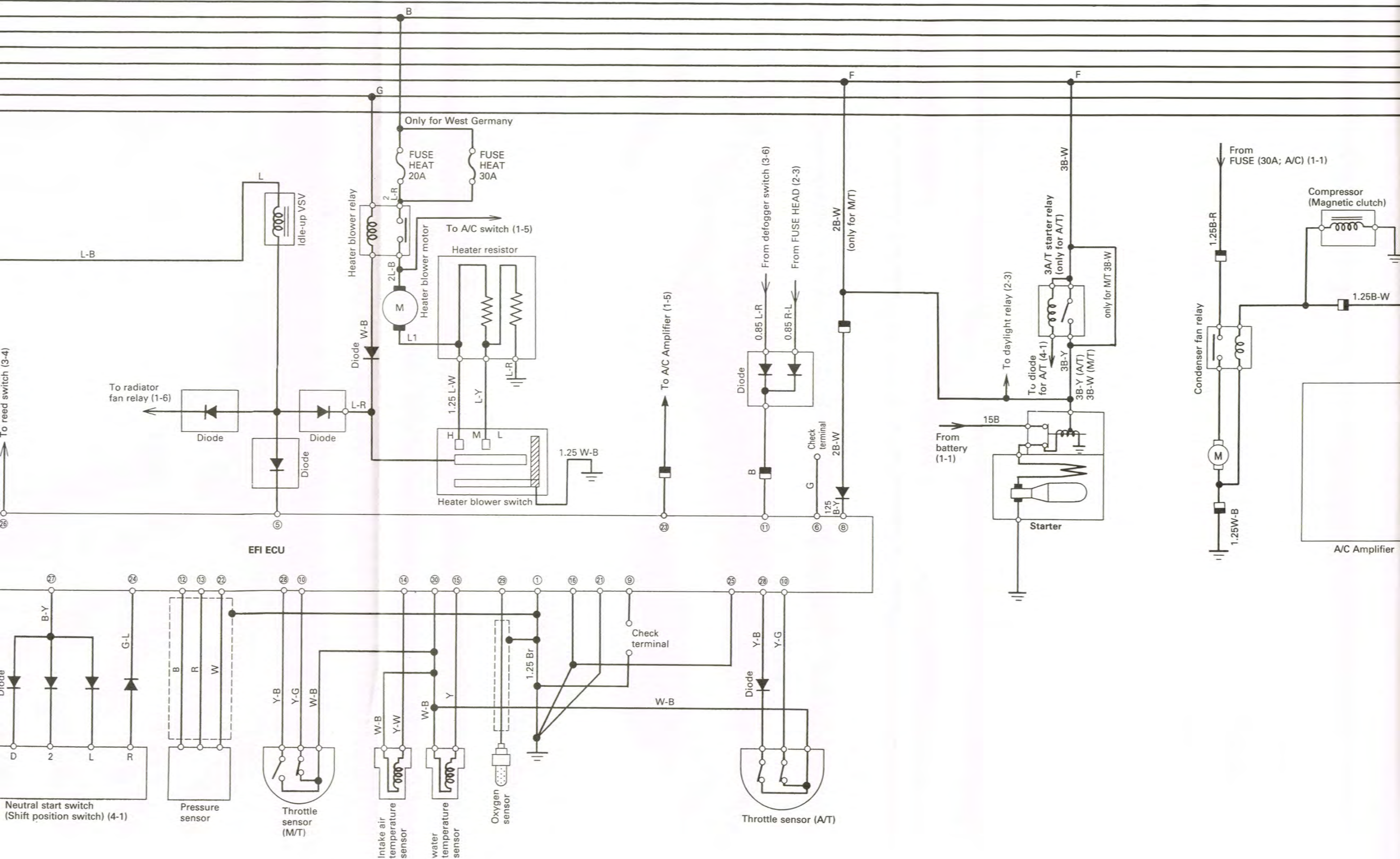
E1 Apron fender LH
 E2 Cowl side LH
 E3 Cowl side RH
 E4 Apron fender RH
 E5 Quarter wheel house
 E6 Back door
 E7 Engine block

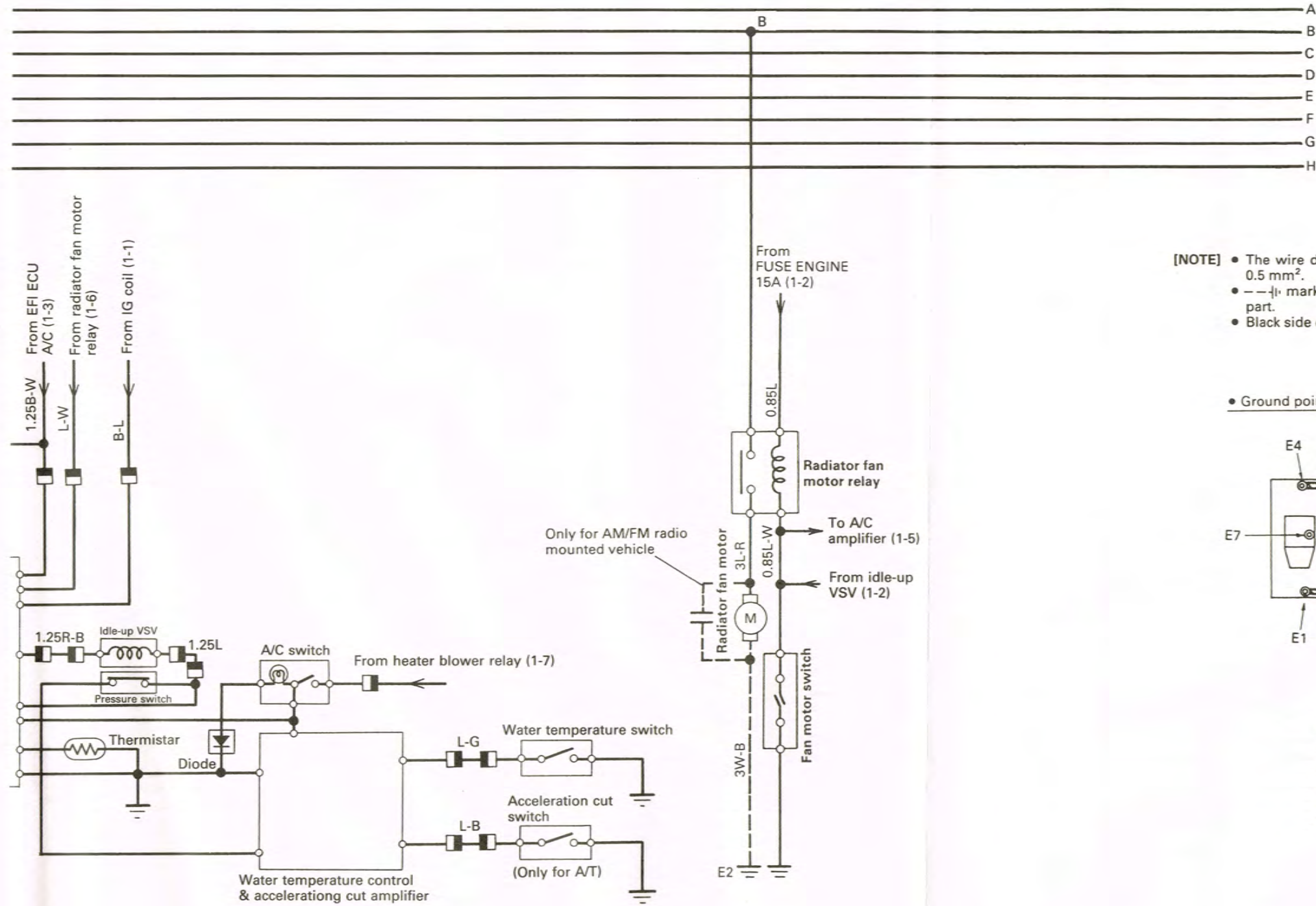
WIRING CODE & COLOUR

Code	Gr	Br	B	W	R	G
Colour	Gray	Brown	Black	White	Red	Green
Code	Y	L	O	P	Lg	
Colour	Yellow	Blue	Orange	Pink	Light green	

WIRING DIAGRAM FOR TYPE HC-E ENGINE



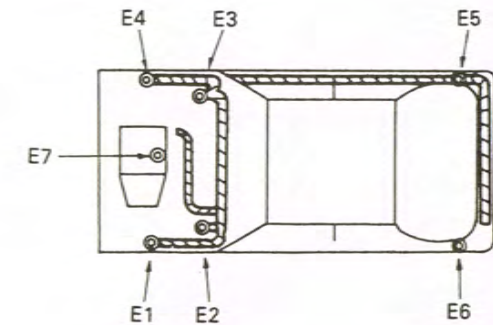




[NOTE]

- The wire diameter which is not indicated in this wiring diagram is 0.5 mm².
- —|— marks denote the earth directly connected to the component part.
- Black side circuit at —□— marks show vehicle harness.

- Ground points



E1	Apron fender	LH
E2	Cowl side	LH
E3	Cowl side	RH
E4	Apron fender	RH
E5	Quater wheel house	
E6	Back door	
E7	Engine block	

WIRING CODE & COLOUR

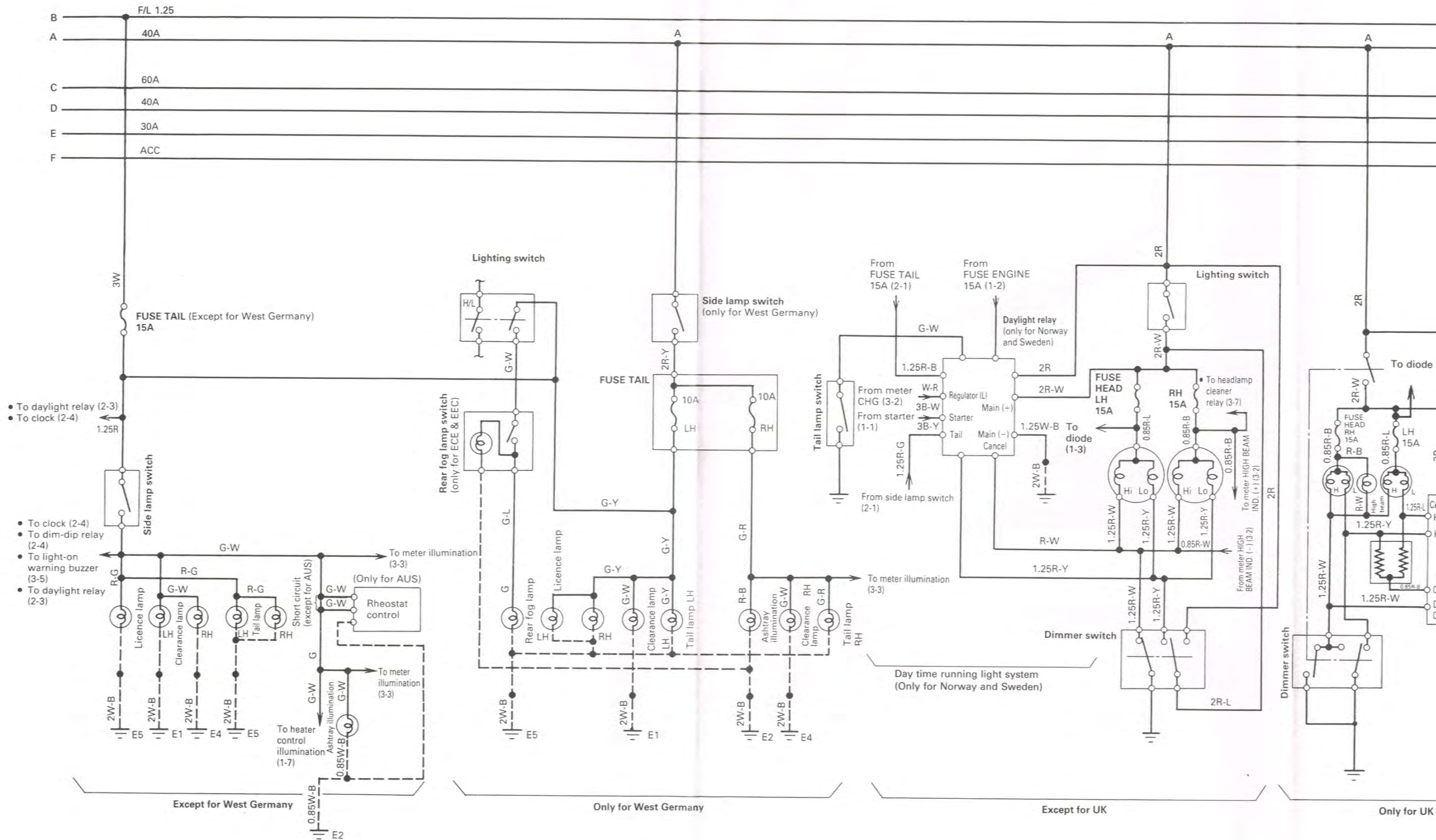
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Colour	Gray	Brown	Black	White	Red	Green

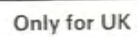
Code	Y	L	O	P	Lg
Colour	Yellow	Blue	Orange	Pink	Light green

1

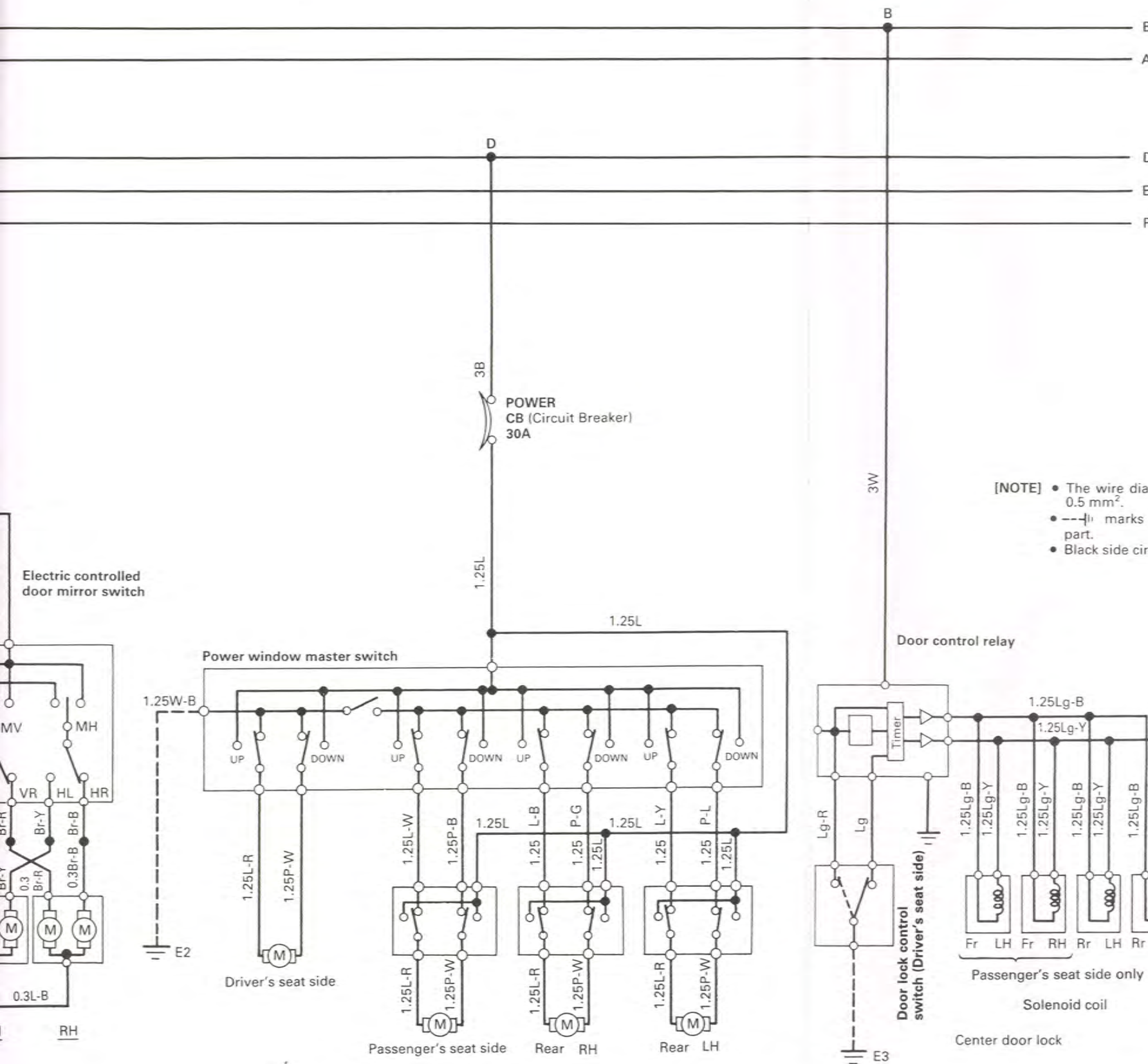
2

3



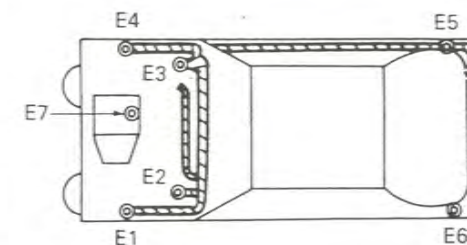


Only for UK



[NOTE] • The wire diameter which is not indicated in this wiring diagram is 0.5 mm².
 • ---| marks denote the earth directly connected to the component part.
 • Black side circuit at -| marks show vehicle harness.

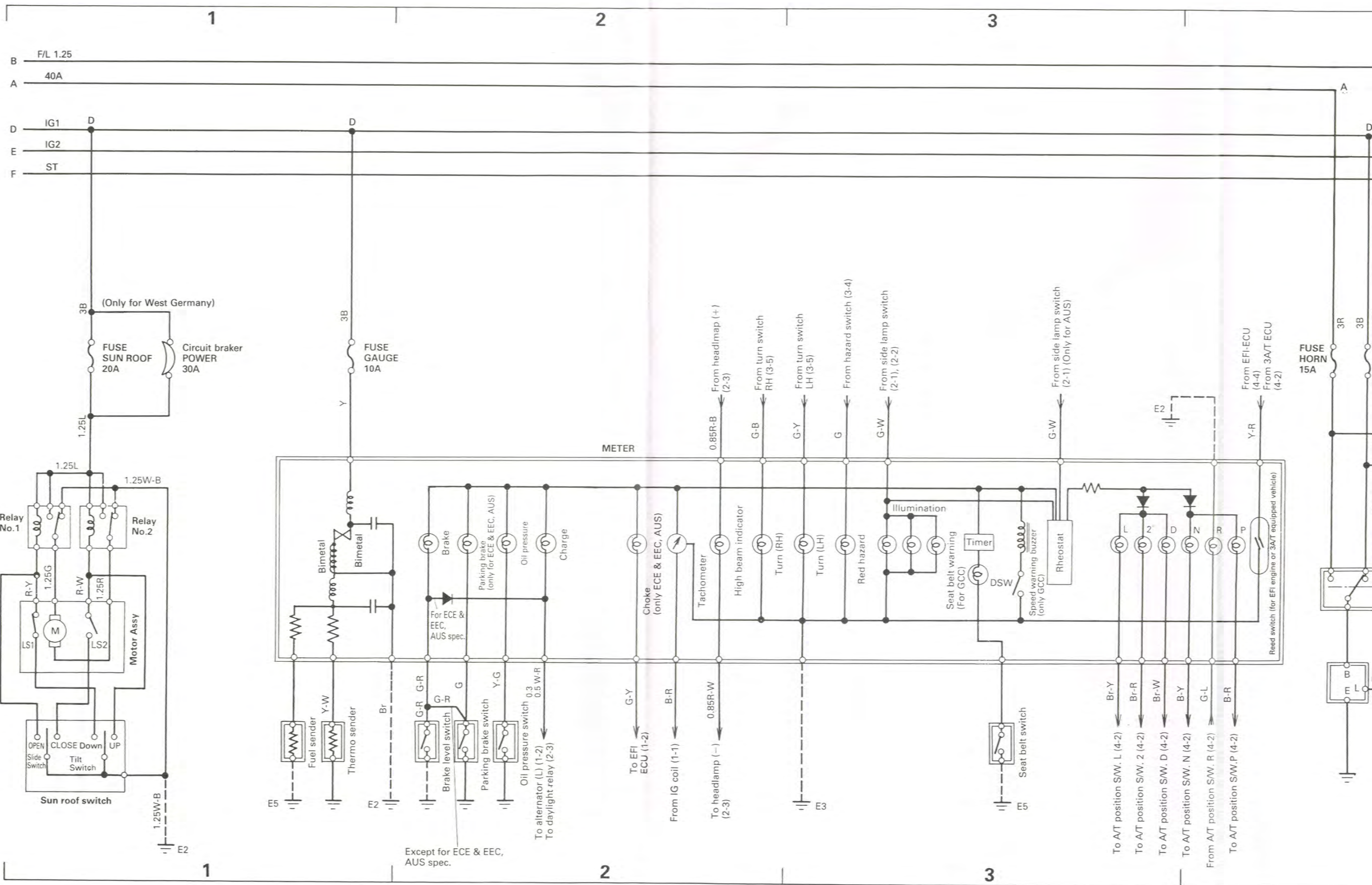
• Ground points

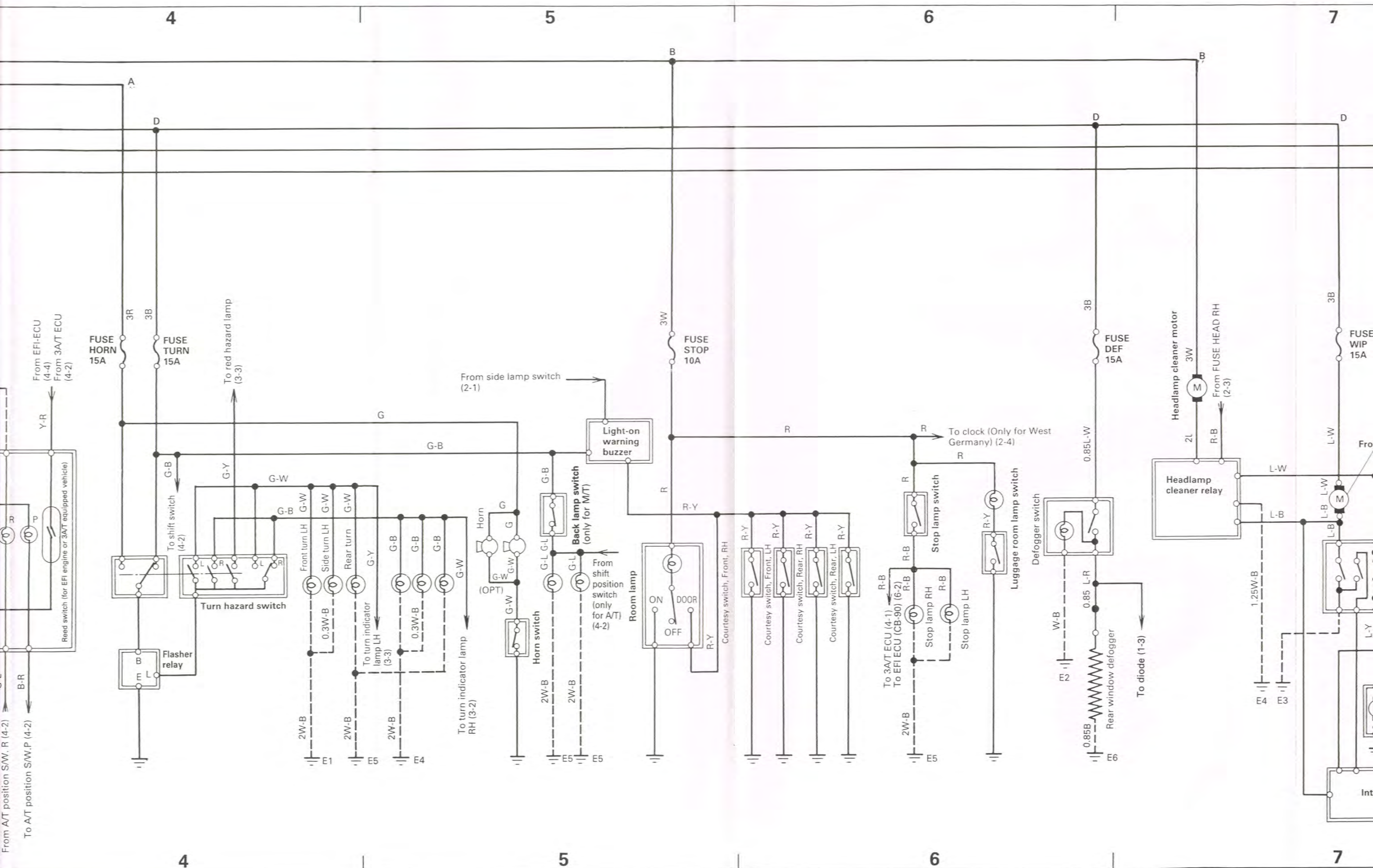


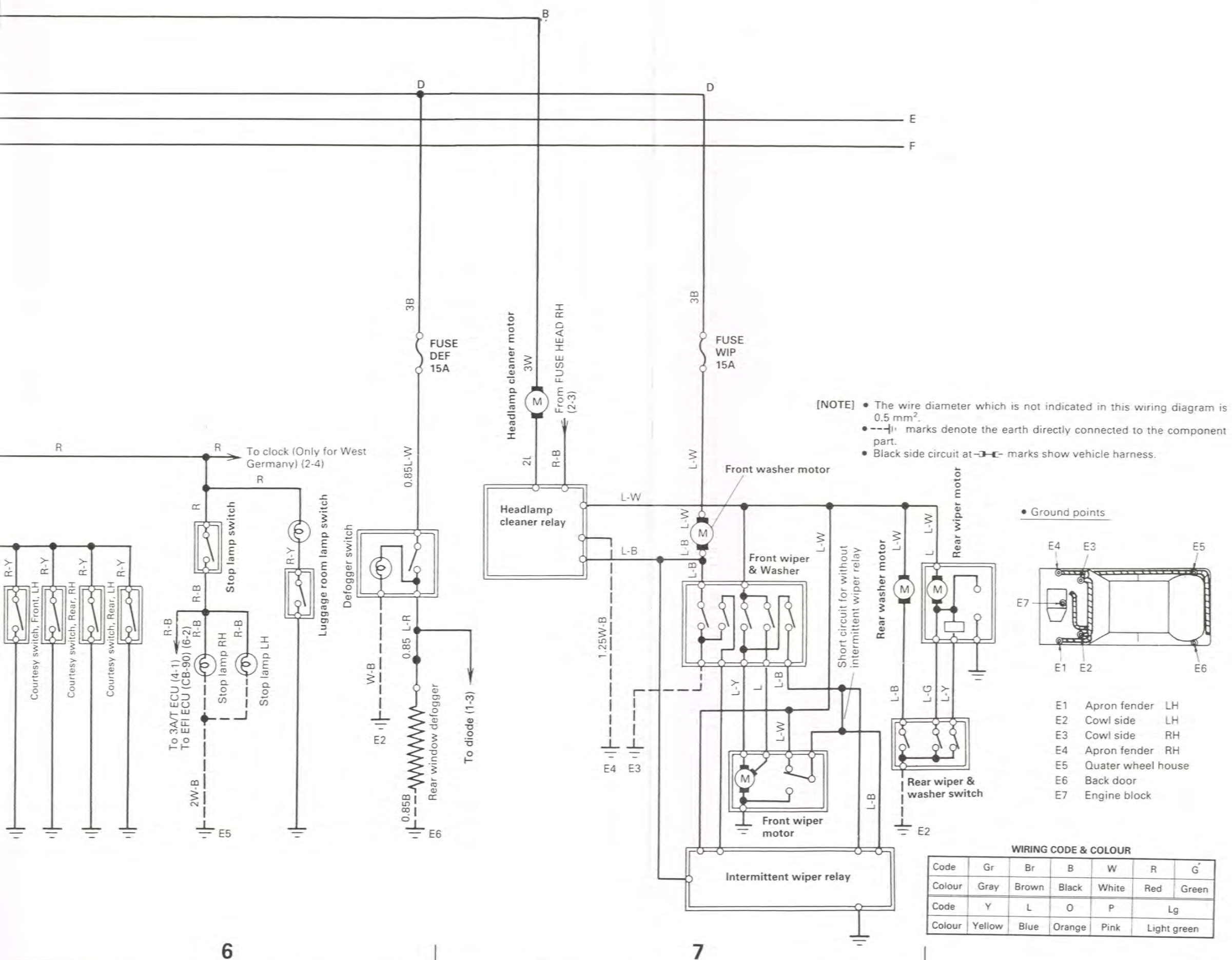
- E1 Apron fender LH
- E2 Cowl side LH
- E3 Cowl side RH
- E4 Apron fender RH
- E5 Quater wheel house
- E6 Back door
- E7 Engine block

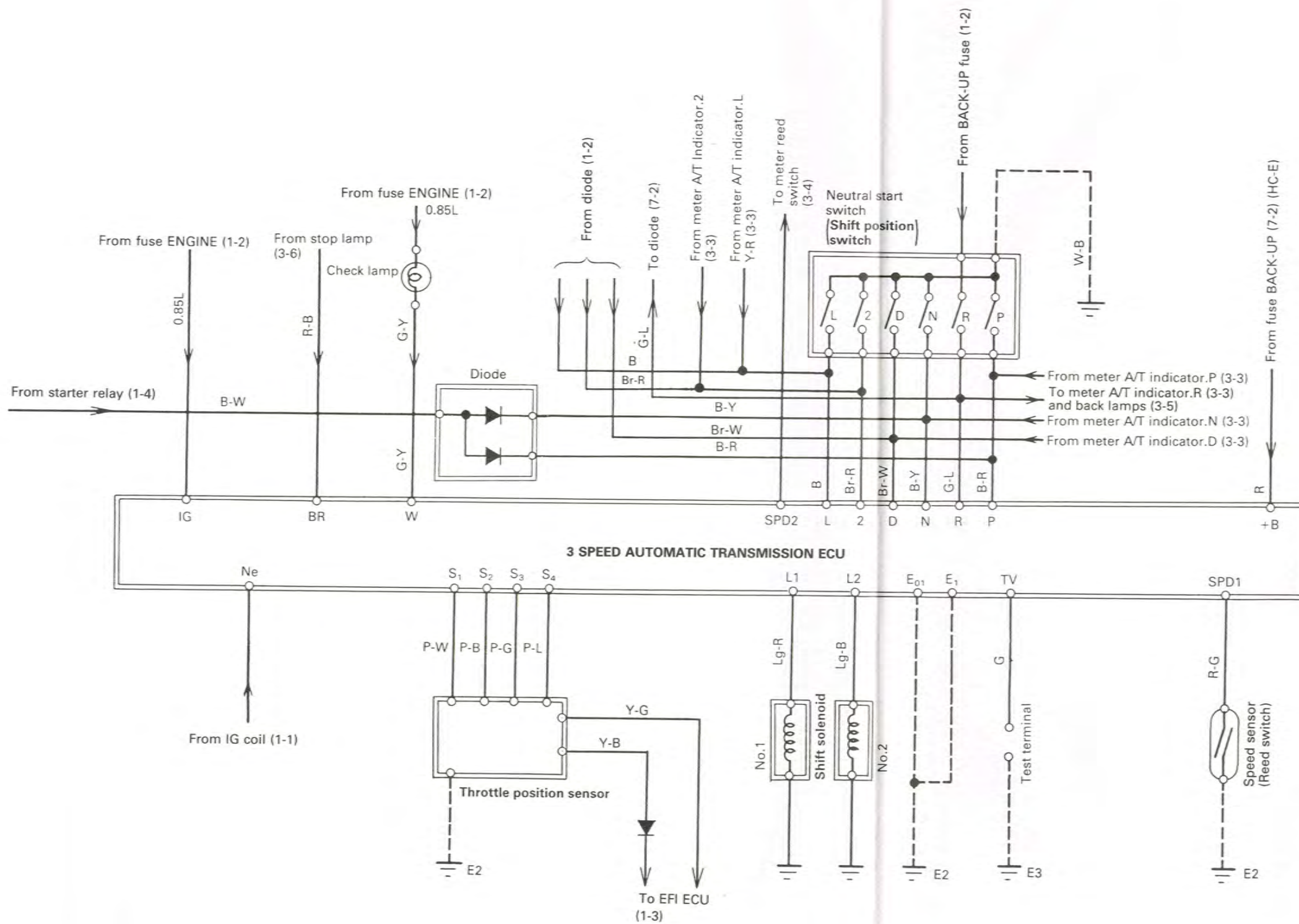
WIRING CODE & COLOUR

Code	Gr	Br	B	W	R	G
Colour	Gray	Brown	Black	White	Red	Green
Code	Y	L	O	P	Lg	
Colour	Yellow	Blue	Orange	Pink	Light green	



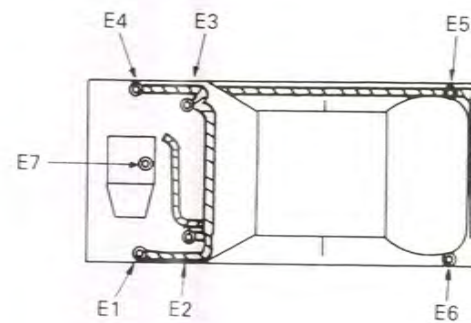






[NOTE] • The wire diameter which is not indicated in the diagram is 0.5 mm².
 • ---| marks denote the earth directly connected to the part.
 • Black side circuit at ---| marks show vehicle has a black side circuit.

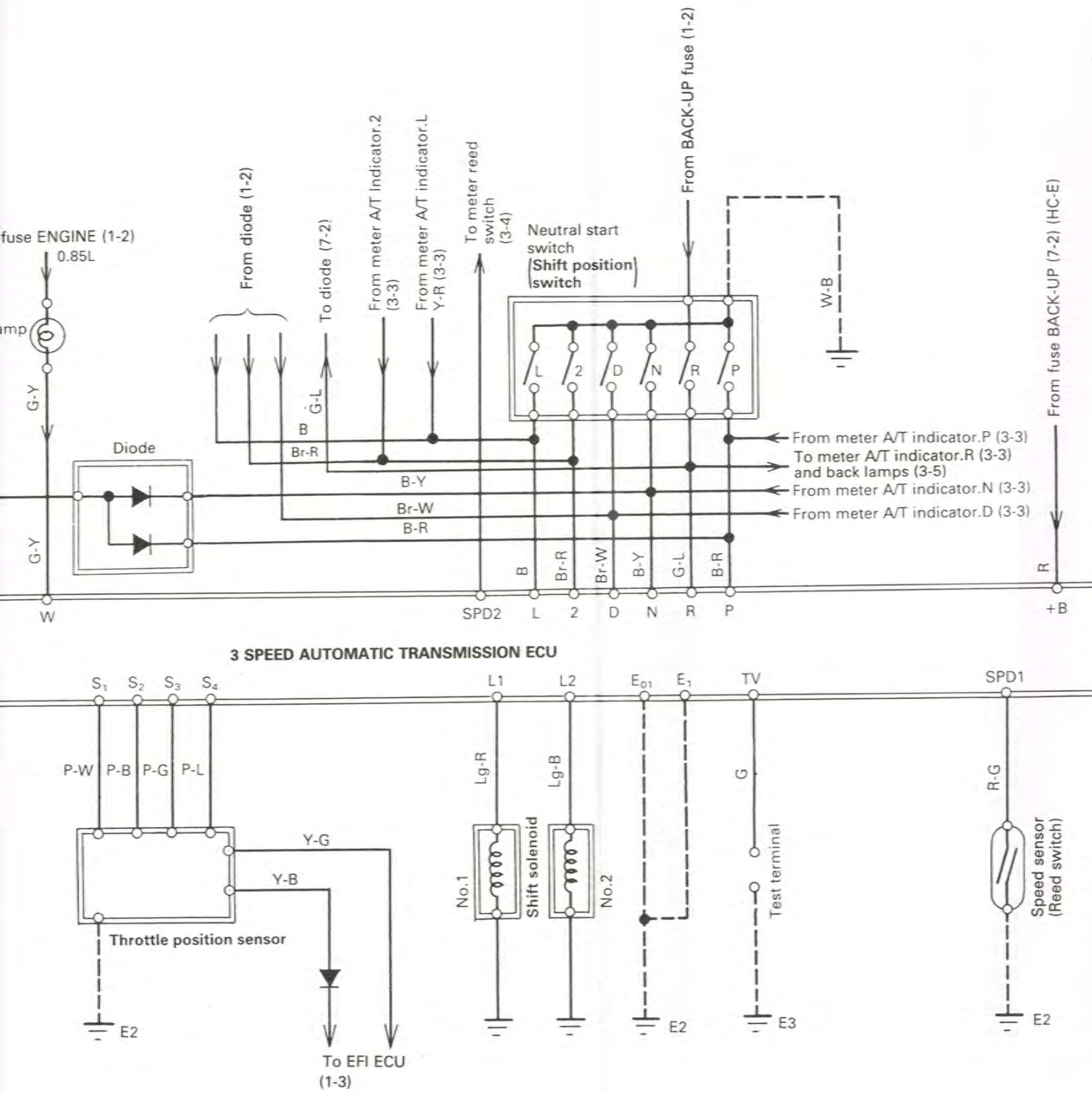
Ground points



E1 Apron fender LH
 E2 Cowl side LH
 E3 Cowl side RH
 E4 Apron fender RH
 E5 Quarter wheel house
 E6 Back door
 E7 Engine block

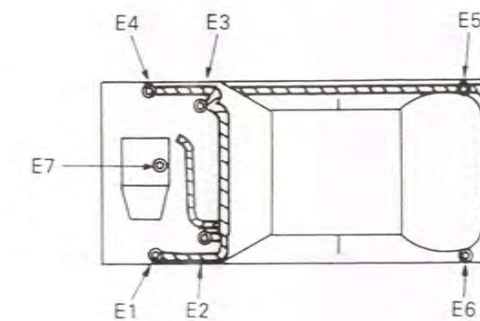
WIRING CODE & COLOUR

Code	Gr	Br	B	W	P
Colour	Gray	Brown	Black	White	Pink
Code	Y	L	O	P	
Colour	Yellow	Blue	Orange	Pink	



[NOTE] • The wire diameter which is not indicated in this wiring diagram is 0.5 mm².
 • ---| marks denote the earth directly connected to the component part.
 • Black side circuit at ---| marks show vehicle harness.

Ground points



- E1 Apron fender LH
- E2 Cowl side LH
- E3 Cowl side RH
- E4 Apron fender RH
- E5 Quater wheel house
- E6 Back door
- E7 Engine block

WIRING CODE & COLOUR

Code	Gr	Br	B	W	R	G
Colour	Gray	Brown	Black	White	Red	Green
Code	Y	L	O	P	Lg	
Colour	Yellow	Blue	Orange	Pink	Light green	