WORKSHOP MANUAL

DAIHATSU F300

[HD-ENGINE]

FOREWORD

This workshop manual describes the maintenance and servicing procedures for Type HD engines which are mounted on the Daihatsu F300.

In this workshop manual, the entire portion is divided into 11 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.

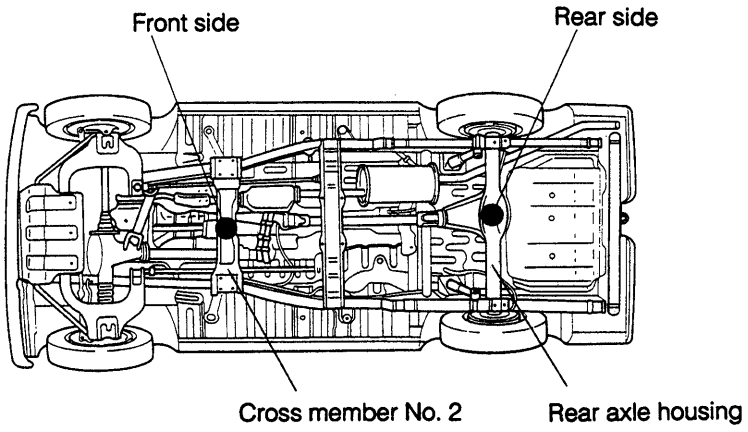
Published in February, 1989

DAIHATSU MOTOR CO., LTD.

WN88E-00001

JACKING POINTS & SUPPORTING POINTS OF SAFETY STANDS

- **Jacking point**
  Front side ..... Cross member No.2
  Rear side ..... Rear axle housing

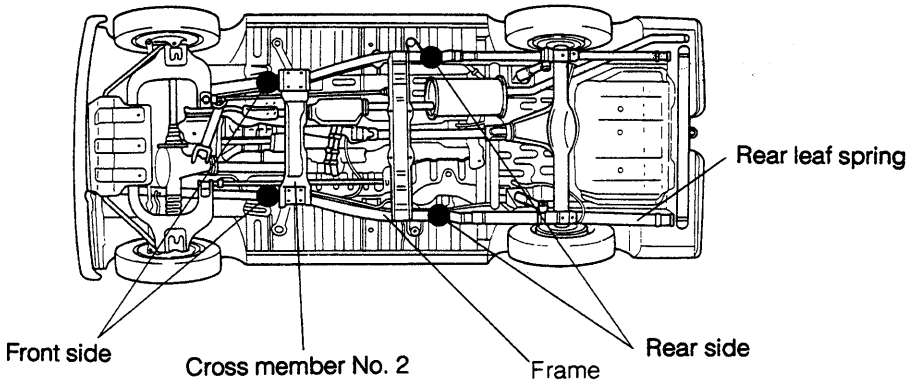


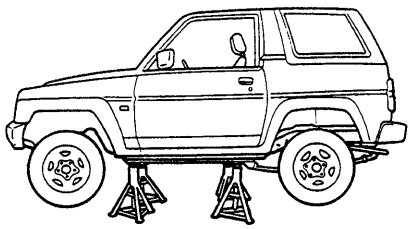
WN88E-GI017

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 below.

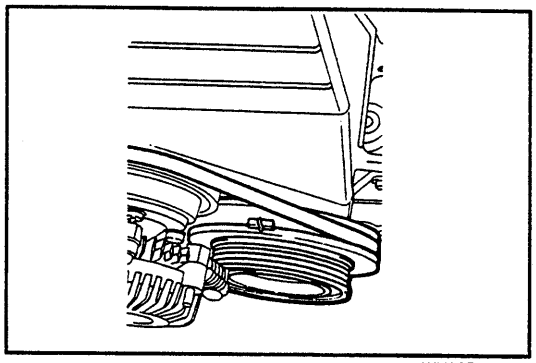
- **Supporting points**
  Front side ..... Frame (In front of the crossmember No.2)
  Rear side ..... Frame (In front of the rear leaf speing)



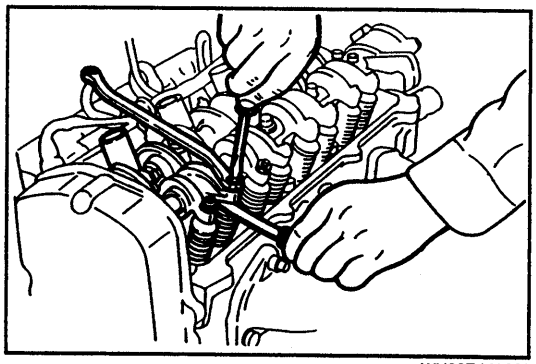


WN88E-GI018

2. Adjustment of valve clearances
(See page EM-9)
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).

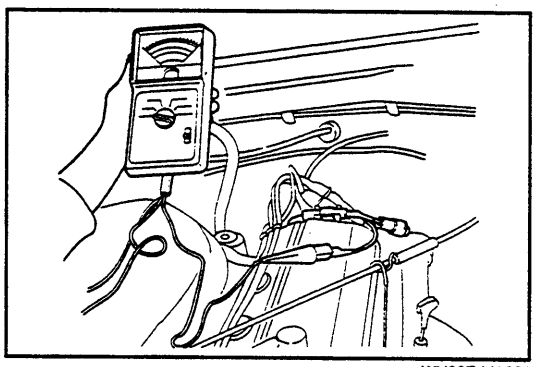

WN88E-MA029

Valve clearances (Hot condition)
Intake: 0.20 - 0.30 mm (0.0078 - 0.0118 inch)
Exhaust: 0.28 - 0.38 mm (0.0110 - 0.0150 inch)

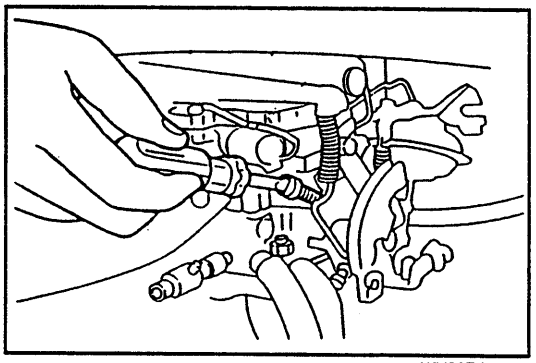

WN88E-MA030

3. Idle speed adjustment
(1) Preparation to be made prior to idle adjustment
- Warm up the engine thoroughly.
- All accessory switches are turned OFF.
On those vehicle equipped with a day-lamp system, set the lamp control switch to the first stage with head lamps turned OFF.
- The air cleaner element is installed.
- All vacuum hoses are connected.

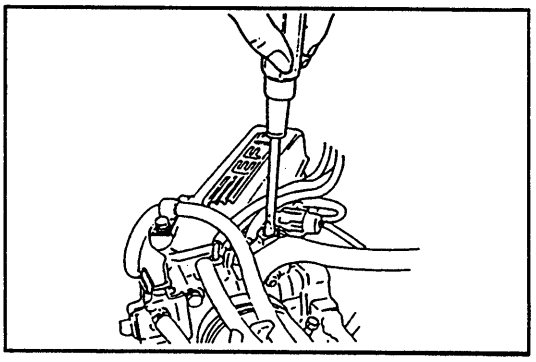
(2) Connect the tachometer to the distributor.
(See page MA-8)


WN88E-MA031

(3) Adjustment
- Carburetor equipped vehicle
Adjust the throttle adjusting screw so that the engine idle speed may become the specified valve.
Engine Idle Speed: 850 ± 50 rpm

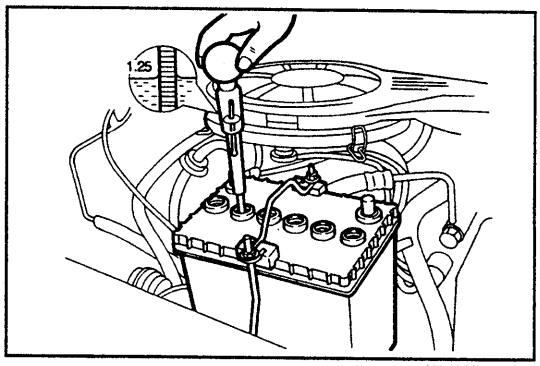

WN88E-MA032

- EFI equipped vehicle
Remove the idle adjusting screw cap from the throttle body. Then, set the idle speed by turning the idle speed adjusting screw.
Engine Idle Speed: 850 ± 50 rpm


WN88E-MA033

5. Battery inspection

(See page CH–4.)



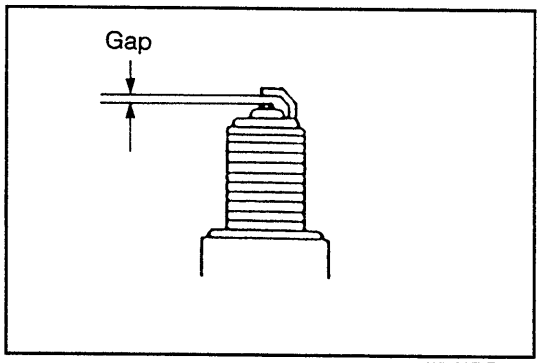
WN88E-EM018

6. Inspection of spark plugs

(See page IG–8.)

Recommended spark plugs

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



WN88E-EM020

7. 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.

WN88E-EM021

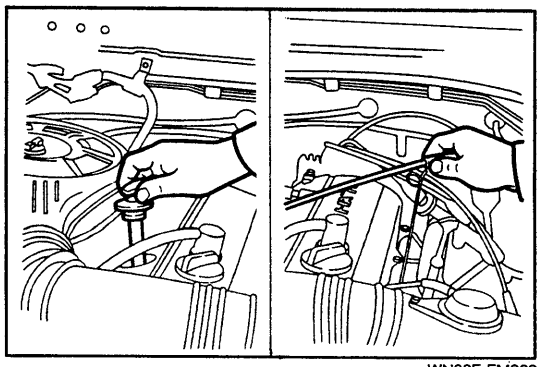
1. Removal of cylinder head cover

   (1) Detach the resistive cords from the clamps.

   NOTE:

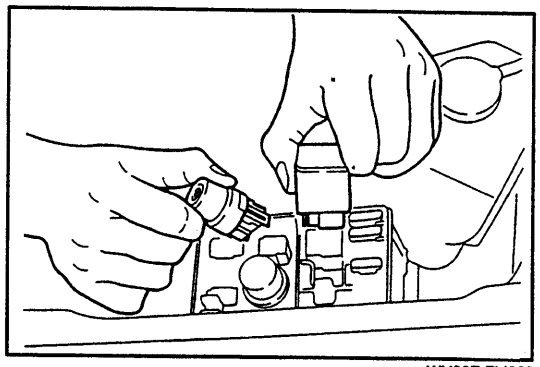
   Be sure to hold the rubber boot during the resistive cord disconnection. Never remove the resistive cord, holding the cord portion.

   (2) Detach the acceleration cable from the cable clamp. (L.H.D unit only)



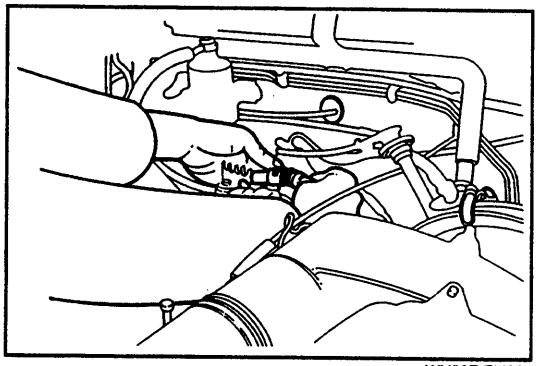
WN88E-EM022

(7) Install the injector relay and fuel pump relay to the relay block.
(HD-E engine only)



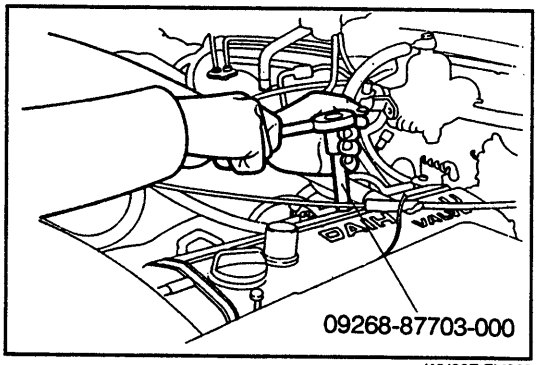
WN88E-EM063

(8) Connect the distributor connector



WN88E-EM064

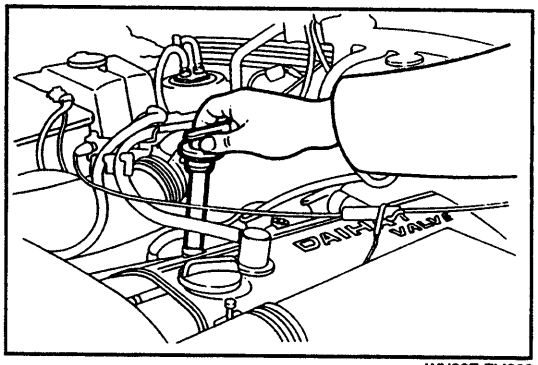
(9) Install the spark plugs using the following SST.
SST: 09268-87703-000
Tightening Torque: 1.5 - 2.2 kg-m (10.9 - 15.9 ft-lb)



WN88E-EM065

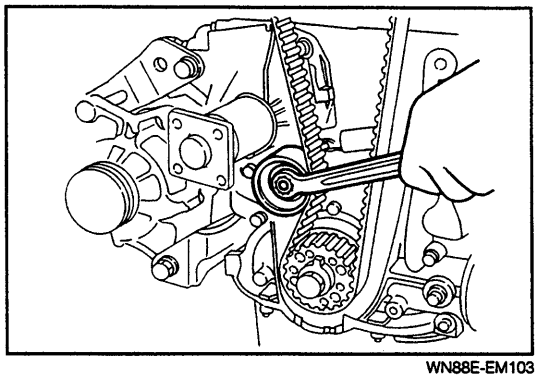
(10) Connect the resistive cord.
NOTE:
- **Be sure that the resistive cord is connected securely to each spark plug.**
- **Care should be exercised not to damage the resistive cord with the spark plug tube.**

(11) Attach the resistive cord to the clamp.

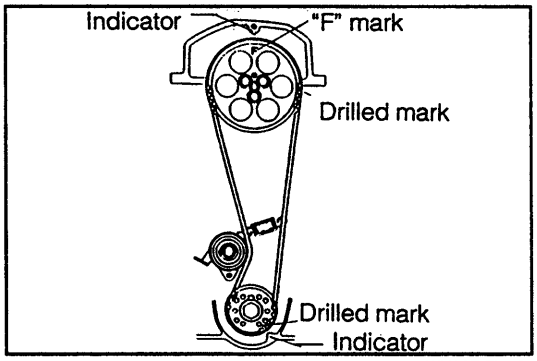


WN88E-EM066

(6) 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)

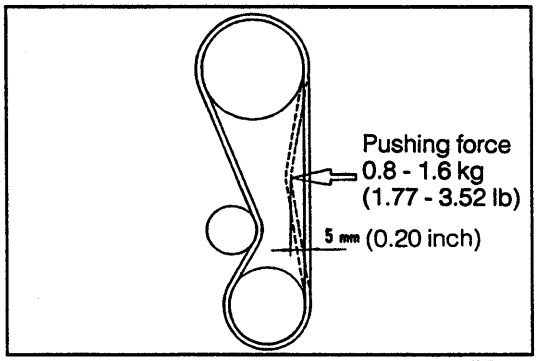

WN88E-EM103

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



WN88E-EM104

(8) Check the timing belt tension. When the midpoint of the belt at the tension side is pushed with hand, ensure that the bend should be applied following specified values.
Specified Pushed Force: 0.8 - 1.6 kg (1.77 - 3.52 lb)
When belt is deflected 5mm (0.20 inch)

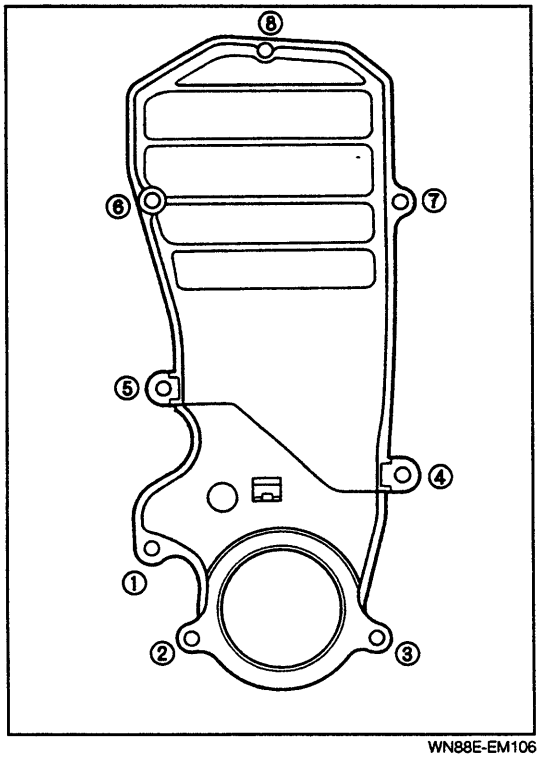


WN88E-EM105

4. Installation of timing belt cover
(1) Install the timing belt cover No. 1 (lower side) with three bolts.
NOTE:
Attaching bolts ④ and ⑤ in the figure are tightened both upper and lower side cover.

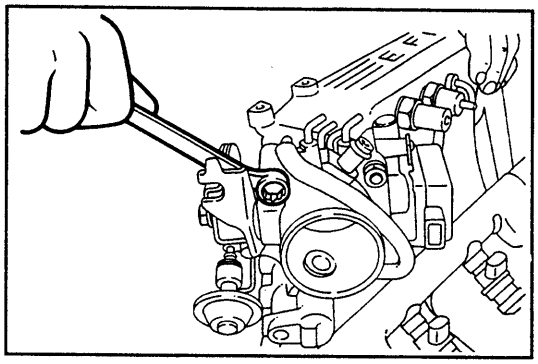
(2) Install the timing belt cover No. 2 (upper side) with five bolts.
Tightening Torque: 0.2 - 0.4 kg-m (1.4 - 2.9 ft-lb)
(For both upper and lower cover)

NOTE:
Attaching bolts ④ and ⑤ should be installed first of all.



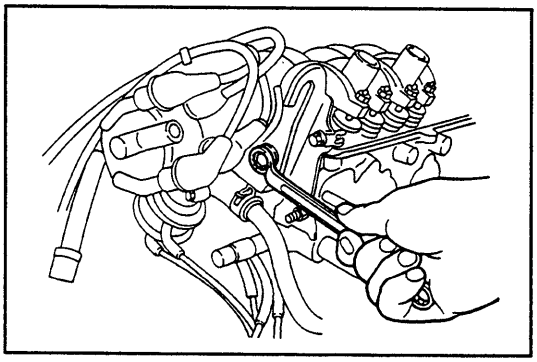
WN88E-EM106

20. Removal of the throttle body
    (1) Disconnect the hose for circulating cooling water from the body.
    (2) Disconnect the two blow-by gas hoses from the throttle body.
    (3) Remove the attaching bolts and nuts of the throttle body from the surge tank.



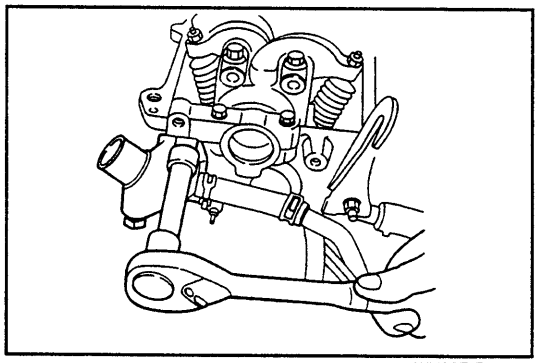
WN88E-EM140C

21. Remove the distributor assy by removing the two attaching bolts.



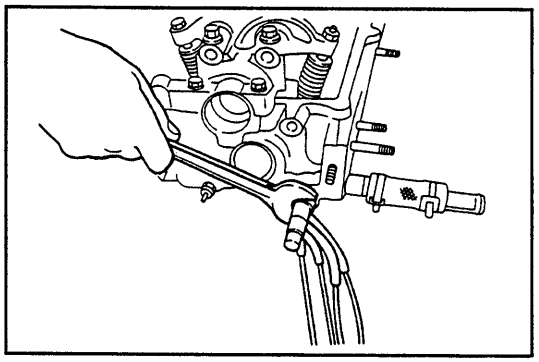
WN88E-EM141A

22. Remove the water outlet housing by removing the attaching bolt and nut.
23. Remove the engine hanger by removing the attaching bolt and nut.



WN88E-EM142A

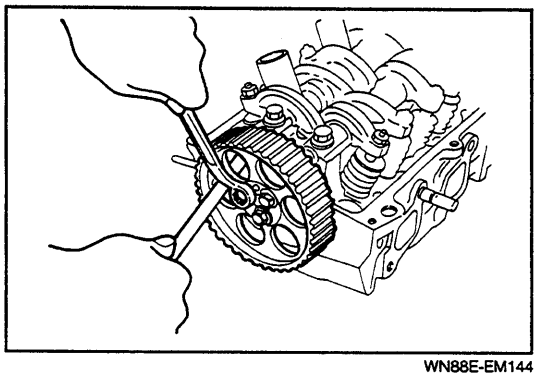
24. Remove the TVSV and water temperature sensor gauge.



WN88E-EM143A

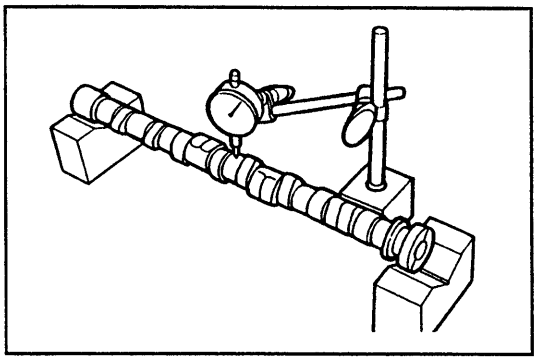
DISASSEMBLY OF CYLINDER HEAD

1. Removal of camshaft timing belt pulley
    (1) Remove the attaching bolts of the camshaft timing belt pulley, while preventing the camshaft timing belt pulley from turning with an adequate iron rod.
    (2) Remove the camshaft timing belt pulley.

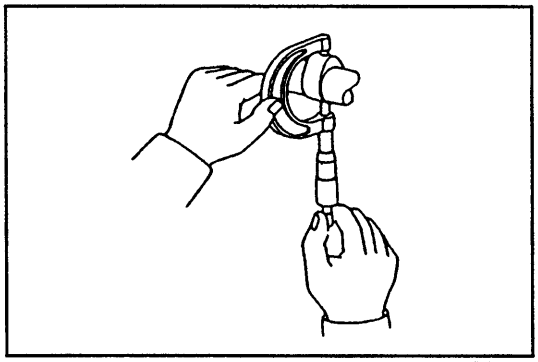


WN88E-EM144

18. Inspection of camshaft
    (1) 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.
    (2) Turn the camshaft one turn. Take the difference between the maximum and minimum readings on the dial gauge during the turning.
    Maximum runout: 0.03 mm (0.0012 inch)


WN88E-EM188

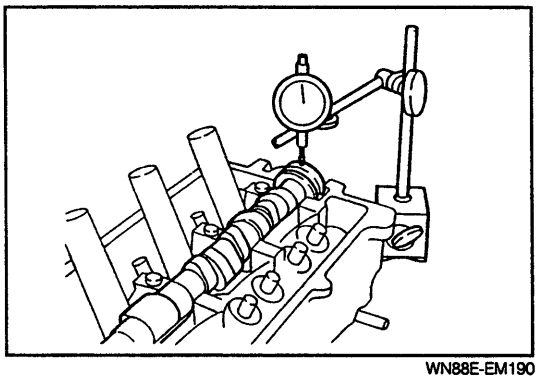
    (3) Checking of cam lobe height
    Measure the cam lobe height, using a micrometer.
    Specified cam lobe height
    Intake: 33.08 - 33.28 mm (1.302 - 1.310 inch)
    Exhaust: 33.00 - 33.20 mm (1.299 - 1.307 inch)
    Minimum Limit
    Intake: 32.9 mm (1.295 inch)
    Exhaust: 32.85 mm (1.293 inch)


WN88E-EM189

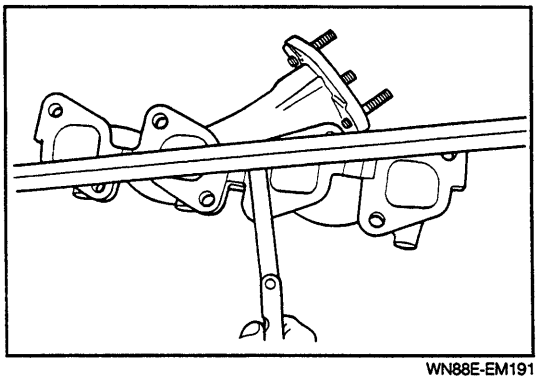
    (4) Inspection of cam for fuel pump
    (Carburetor equipped vehicle only)
    Diameter: 42.65 mm (1.679 inch)

    - Apply engine oil to the cylinder head camshaft journals and install the camshaft.
    - With a dial gauge set exactly from the top direction, turn the camshaft so as to measure the cam stroke.

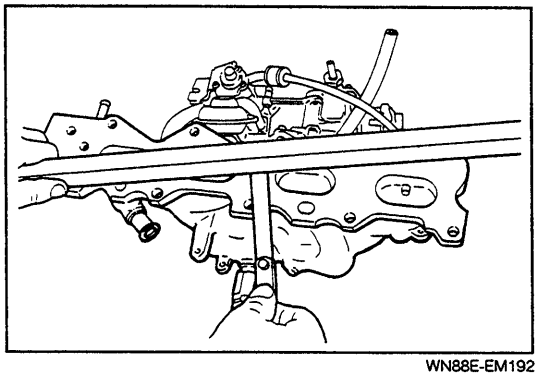
    Minimum cam stroke: 4.8 mm (0.189 inch)


WN88E-EM190

19. Inspection of intake manifold and exhaust manifold
    (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)


WN88E-EM191

    (2) Check the contact surface of the intake manifold with the cylinder head.
    Maximum warpage: 0.1 mm (0.0039 inch)


WN88E-EM192

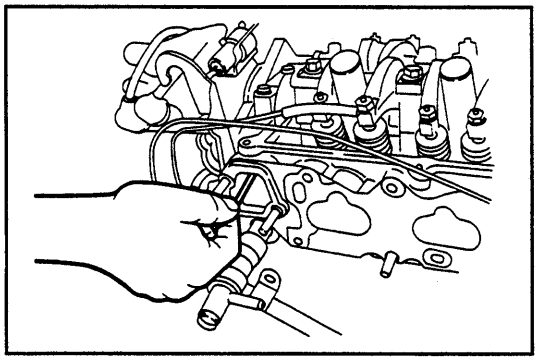
35. Connect the water hose as follows.
    (1) Front heater outlet at dush panel
    (2) Front heater inlet at dush panel

WN88E-EM238

INSTALLATION OF INTAKE MANIFOLD SIDE PARTS

[HD-C Engine]

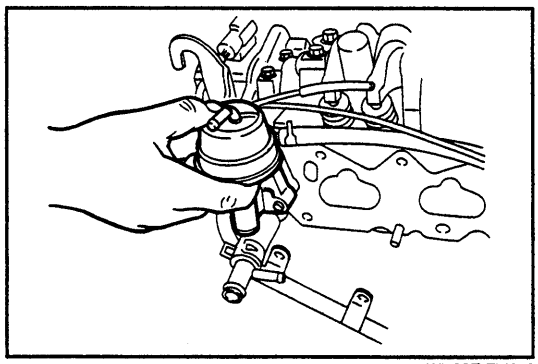
1. Installation of fuel pump
   (1) Attach a new intake manifold gasket.
   (2) Apply engine oil to the fuel pump rod. Insert it into the cylinder head.



WN88E-EM239

   (3) 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.



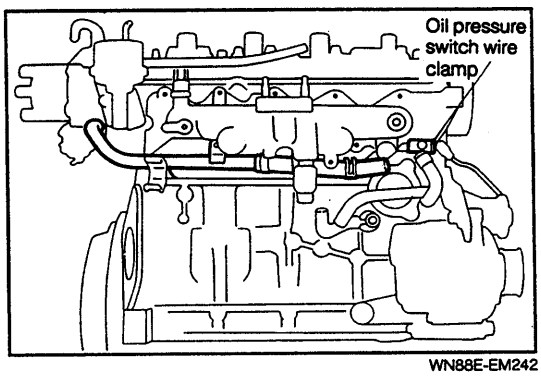
WN88E-EM240

2. 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 down ward.

3. Installation of make manifold
   (1) Attach the intake manifold to the cylinder head.

WN88E-EM241

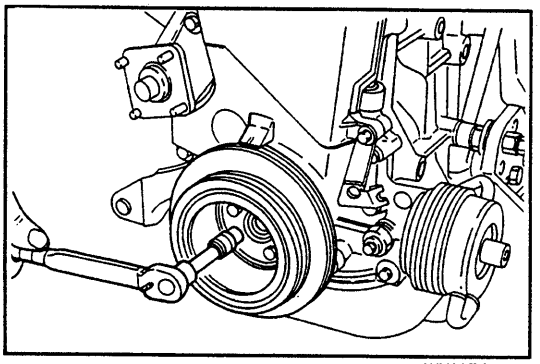
   (2) Install the water by-pass pipe to the stud bolt of the cylinder head, as shown in the figure.
   Connect the by-pass hose to the intake manifold. Attach the hose bands.
   (3) Install the oil pressure switch wire clamp to the stud bolt, as shown in the figure.



WN88E-EM242

4. Install the crankshaft pulley on the crankshaft timing belt pulley with four bolts.
   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 5th speed gear position.**
   - **Special care must exercised to get the specified tightening torque, for the crankshaft may turn slightly, while tightening.**



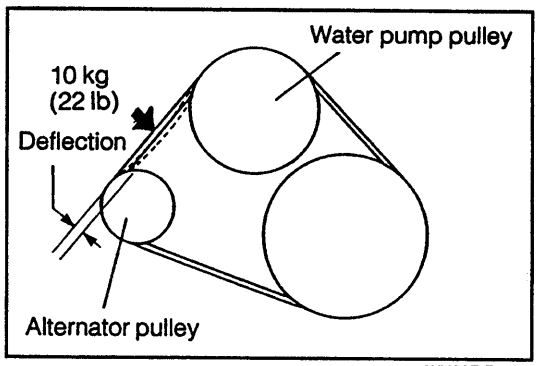
WN88E-EM284

5. Installation of fluid coupling and fan shroud
   (1) Install the water pump pulley to the water pump with temporarily attaching.
   (2) Insert the radiator fan shroud together with the fluid coupling with fan between radiator and the engine.
   (3) Install the fluid coupling to the water pump by means of four bolts through water pump pulley.
   Tightening Torque: 1.0 - 1.8 kg-m (7.2 - 13 ft-lb)

   (4) Insert the lock section of fan shroud to the radiator. Then, Tighten the two attaching bolts of the radiator upper side.
   (5) Connect the water hose to the radiator upper tanks.

WN88E-EM286

6. Install the V belt and 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 a applied to the midpoint.
   Used Belt: 6.0 - 8.0 mm (0.24 - 0.31 inch)
   With a force of 10 kg (22 lb) applied to point indicated in figure

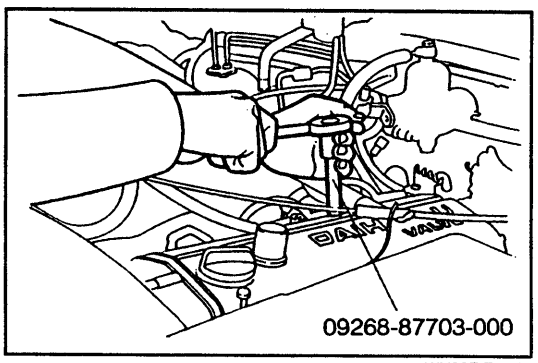


WN88E-EM287

7. Install the power steering pump and the air conditioning pump. (if equipped)
8. Install the drive belt of power steering pump and Install the drive belt of air conditioning pump. (if equipped)

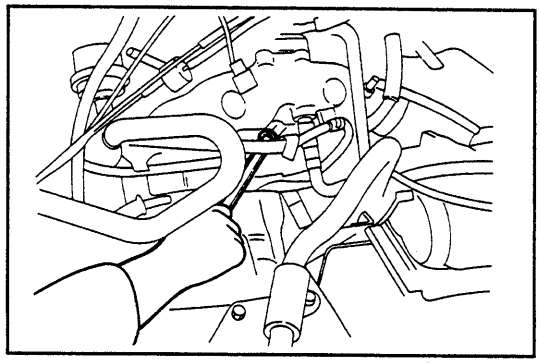
WN88E-EM288

9. Install the reserve tank to the radiator assembly bracket. Insert the over flow hose to the radiator.
10. Install the spark plug by using SST.
    SST: 09268-87703-000



WN88E-EM289

(3) Remove the engine wire clamp.
(4) Remove the engine wire.



WN88E-EM329

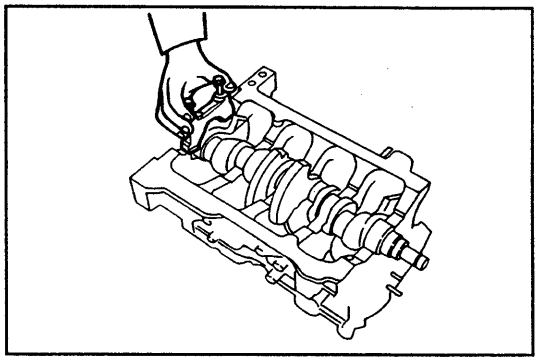
29. Remove the timing belt.
30. Install the engine assembly onto the following SST.
    SST: 09219-87202-000

31. Remove the cylinder head assembly together with intake and exhaust manifold.
    (See page EM–36).

WN88E-EM330

(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.

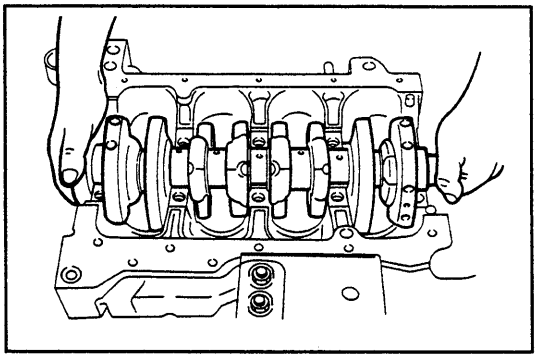
NOTE:
Keep the lower bearing fitted to the main bearing cap. Arrange the removed main bearing caps in order.



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.**



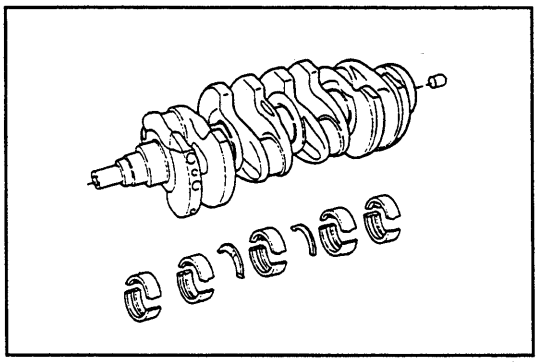
WN88-EM361

(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

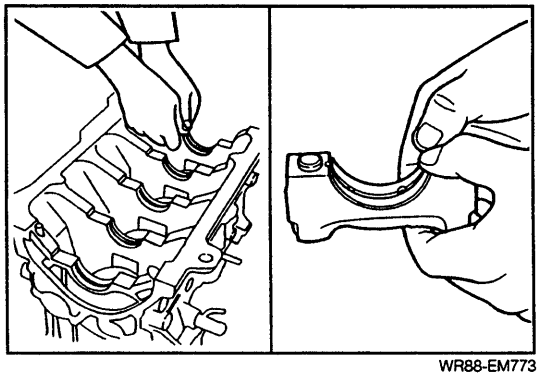
(5) Check the main journals and bearings for pitting or scratches.
If the main journals are damaged, replace the crankshaft. (See page EM-93.)
If the main journal bearings are damaged, replace the main journal bearings.



WN88-EM362

(6) Install the main bearings to the cylinder block and crankshaft main bearing cap.

NOTE:
Do not touch the metal surface of the bearing.



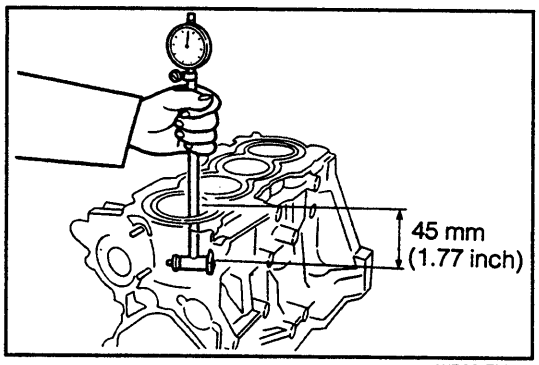
WR88-EM773

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.

WR88-EM813

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-EM814

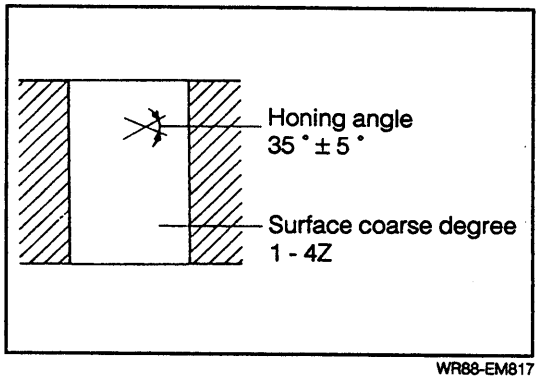
2. Determining cylinder finishing diameter
   (1) Measure the diameter of the oversized piston to be used, using a micrometer.
   NOTE:
   - The measurement should be conducted at the skirt section 13 mm (0.51 inch) from the piston lower end.
   - Perform the measurement horizontally, not in a tilted 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

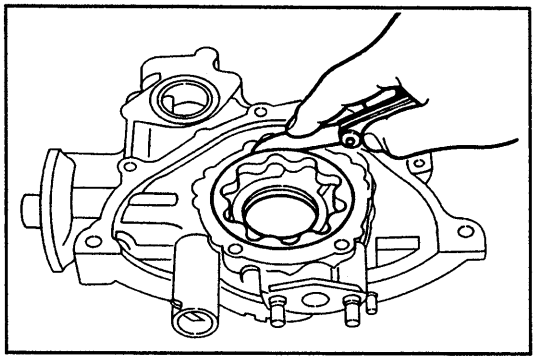
3. Hone the cylinder after the boring.
   (1) Bore the cylinder, leaving a honing allowance of 0.02 mm (0.0008 inch).
   (2) Hone the cylinder.
   Honing angle: 35° ± 5°
   Surface coarse degree: 1 - 4Z



WR88-EM817

(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)

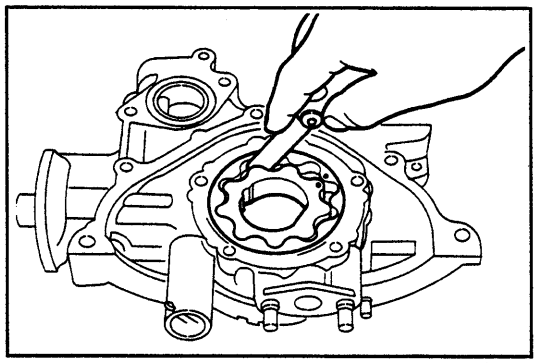
Replace the oil pump if the body clearance exceeds the specified value.



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)

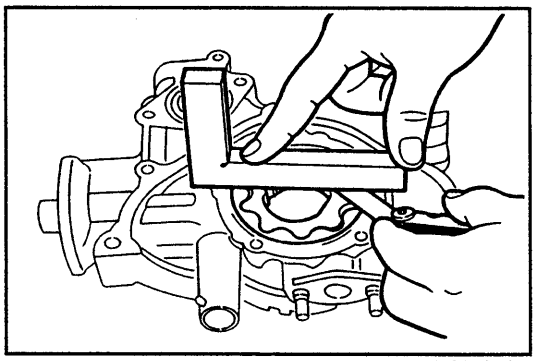
Replace the rotor set if the tip clearance exceeds the specified value.



WR88-EM855

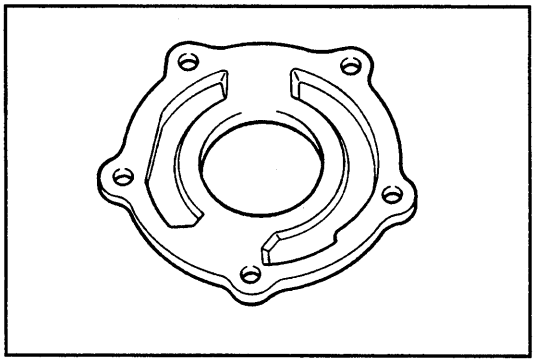
(4) Measure the side clearance between the oil pump body and the rotor set, using and a straightedge and a thickness gauge.
Side Clearance: 0.035 - 0.085 mm (0.0014 - 0.033 inch)

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

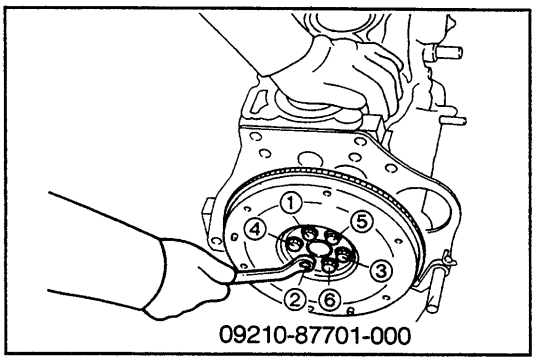
ASSEMBLY OF OIL PUMP

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

(3) Tighten the flywheel attaching bolts temporarily 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)



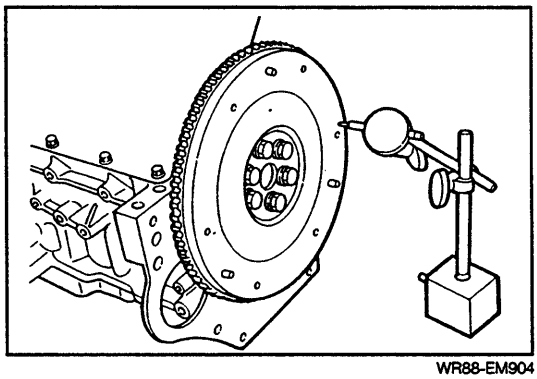
WR88-EM902

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).

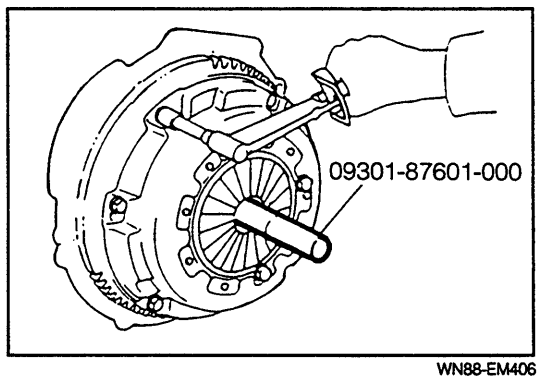
(4) Tighten the flywheel attaching bolts to the specified torque in the sequence indicated in the right figure.
Tightening Torque: 8.0 - 10.0 kg-m (57.9 - 72.3 ft-lb)

(5) Measure the flywheel runout, using a dial gauge.
Allowable Runout Limit: 0.1 mm (0.0039 inch)


WR88-EM904

NOTE:
Replace the flywheel if its runout exceeds the allowable limit.

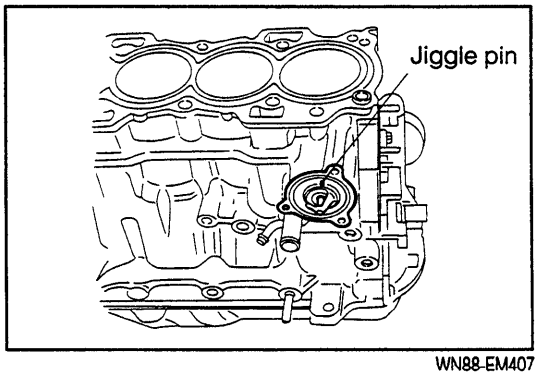
9. Assembly of clutch disc and pressure plate
(1) Insert the following SST into the crankshaft rear end.
SST: 09301-87601-000



WN88-EM406

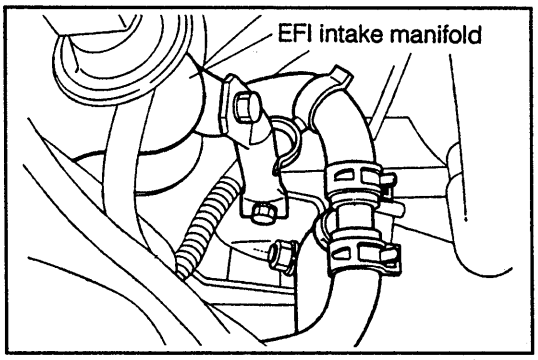
(2) Install the clutch disc.
(3) Install the pressure plate, lining up the locating pin of the pressure plate. Tighten the attaching bolts to the specified torque.
Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)

10. 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.



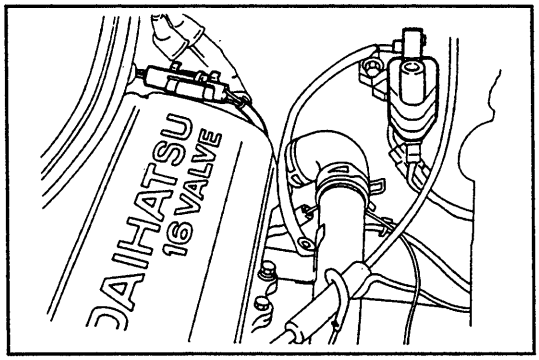
WN88-EM407

13. Install the serge tank stay No. 2 between engine mounting bracket and intake manifold. (HD-E engine only)
    Tightening Torque: 1.5 - 2.2 kg-m (10.8 - 15.9 ft-lb)



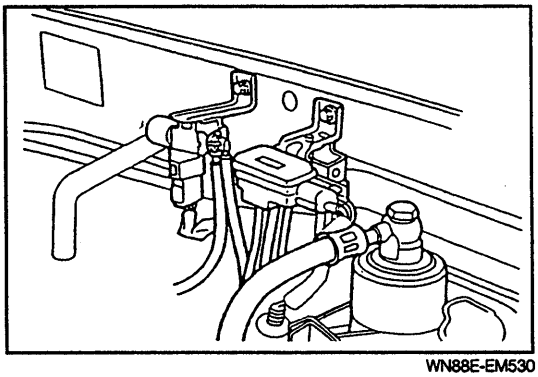
WN88E-EM528

14. Connect the accelerator cable to the position.
15. Clamp the accelerator cable to resistive cord No. 1 by using the clamp. (Only for L.H.D. carburetor-equipped vehicles)
16. connect the coupler of wiring harness of the distributor.
17. Connect the resistive cord from the ignition coil.

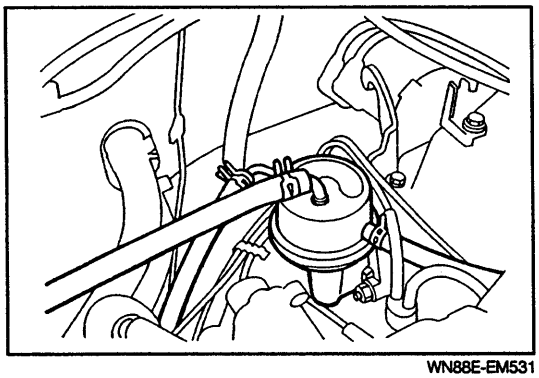


WN88E-EM529

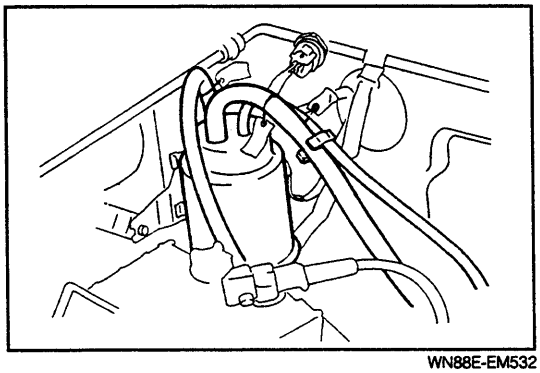
18. Connect the pressure sensor to the dash panel. (HD-E engine only)
19. Connect the idle-up VSV to the dash panel (HD-E engine only)


WN88E-EM530

20. Connect the fuel hose to the fuel filter.
21. Connect the fuel return hose.


WN88E-EM531

22. Connect the outer vent hose to the charcoal canister. (GCC specification only)
23. Connect the hose between the charcoal canister and throttle body. (HD-E engine only)


WN88E-EM532

8. Harness Around Battery

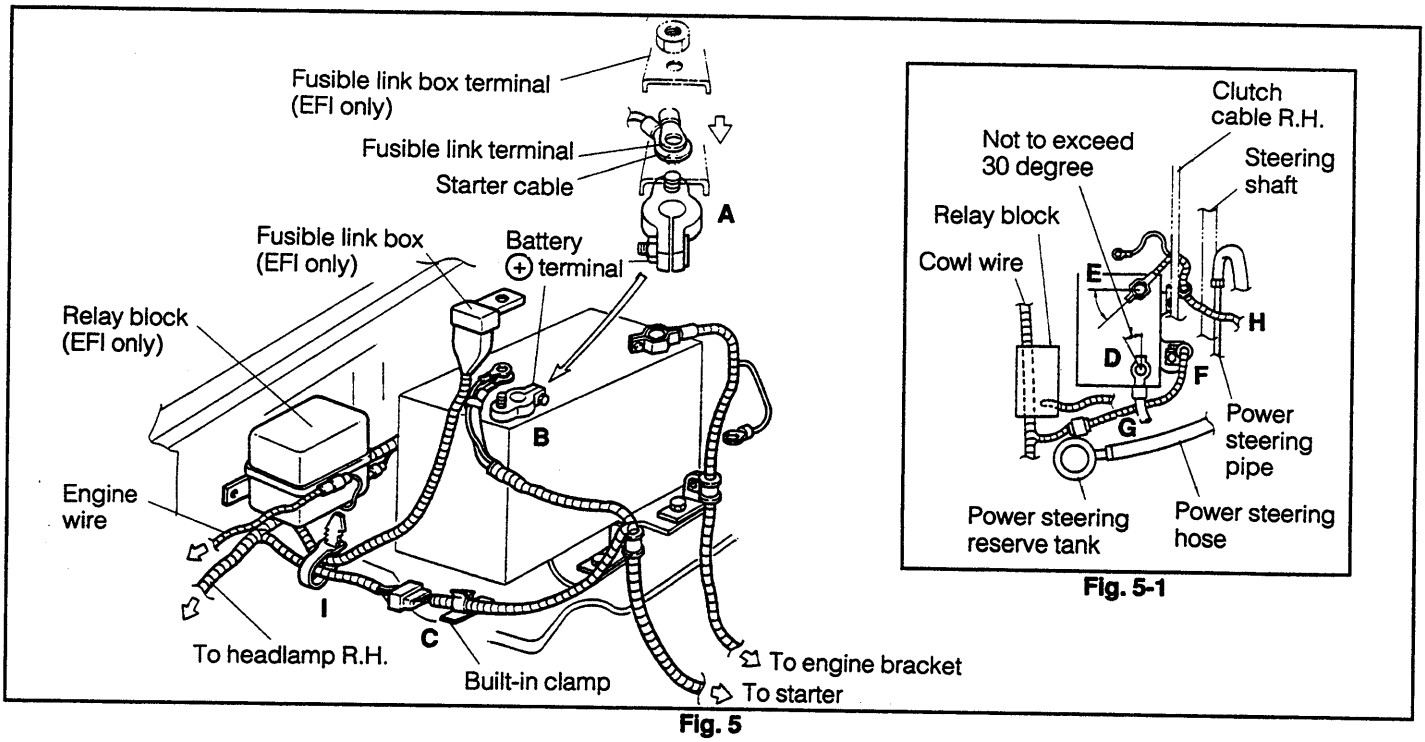


Fig. 5-1

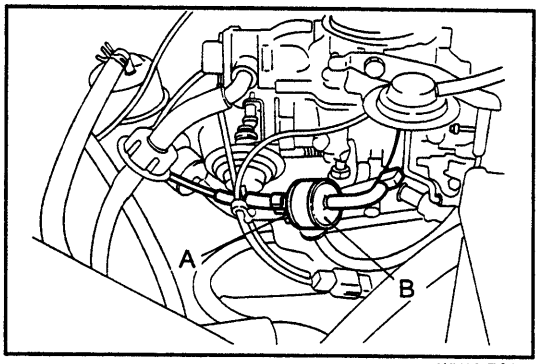
Fig. 5

No.	Work procedure	Parts	Control item
1	Perform assembly so that the bent member [ ] of the fusible link box terminal may not ride on the starter cable and fusible link terminal. (Fig. 6)	A	Ensure that the terminal does not ride on other parts.
2	Install the following parts to the battery ⊕ terminal in this sequence: (1) starter cable (2) fusible link terminal and (3) fusible link box terminal. (Fig. 6)	B	Ensure that all parts are assembled as specified.
3	Clamp the battery cable ⊕ leading to the cowl at the side of the carrier.	C	Ensure that the cable is clamped securely to the bracket.
4	Install the battery terminal ⊕ in such a direction that the terminal assumes an angle not to exceed 30 degrees inward as viewed toward the front of the vehicle. (Fig. 6-1)	D	Ensure that the terminal assumes an angle of not more than 30 degrees.
5	Route the battery terminal ⊖ cable below the clutch cable on R.H.D. vehicle. Also, install the terminal at an angle of 45 degrees inward as viewed toward the rear of the vehicle. (Fig. 6-1)	E	Ensure that the battery cable is routed above the clutch cable and the terminal assumes an angle of 45 degrees.
6	When the battery cable ⊕ is clamped at the clamp guide section, install the clamp in such a way that the cowl junction may come at the front side of the vehicle. (Fig. 6-1)	F	Install the cowl junction comes at the front side of the vehicle.
7	Route the cowl junction and harness leading to fusible link box through between the power steering hose and the battery. (Fig. 2)	G	Ensure that the cowl junction and harness leading to fusible link box is routed through between the power steering hose and the battery.
8	Route the battery cable ⊖ above the power steering pipe. (Fig. 2)	H	Ensure that the battery cable ⊖ is routed above the power steering pipe.
9	Secure the relay box-to-fusible link box wire and the cable leading to the battery by means of band clamps.	I	Ensure that the wires are clamped securely.

WN88E-EM516

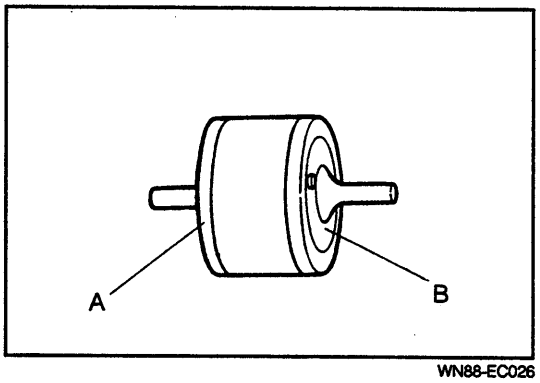
Inspection of VTV

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.



WN88-EC025

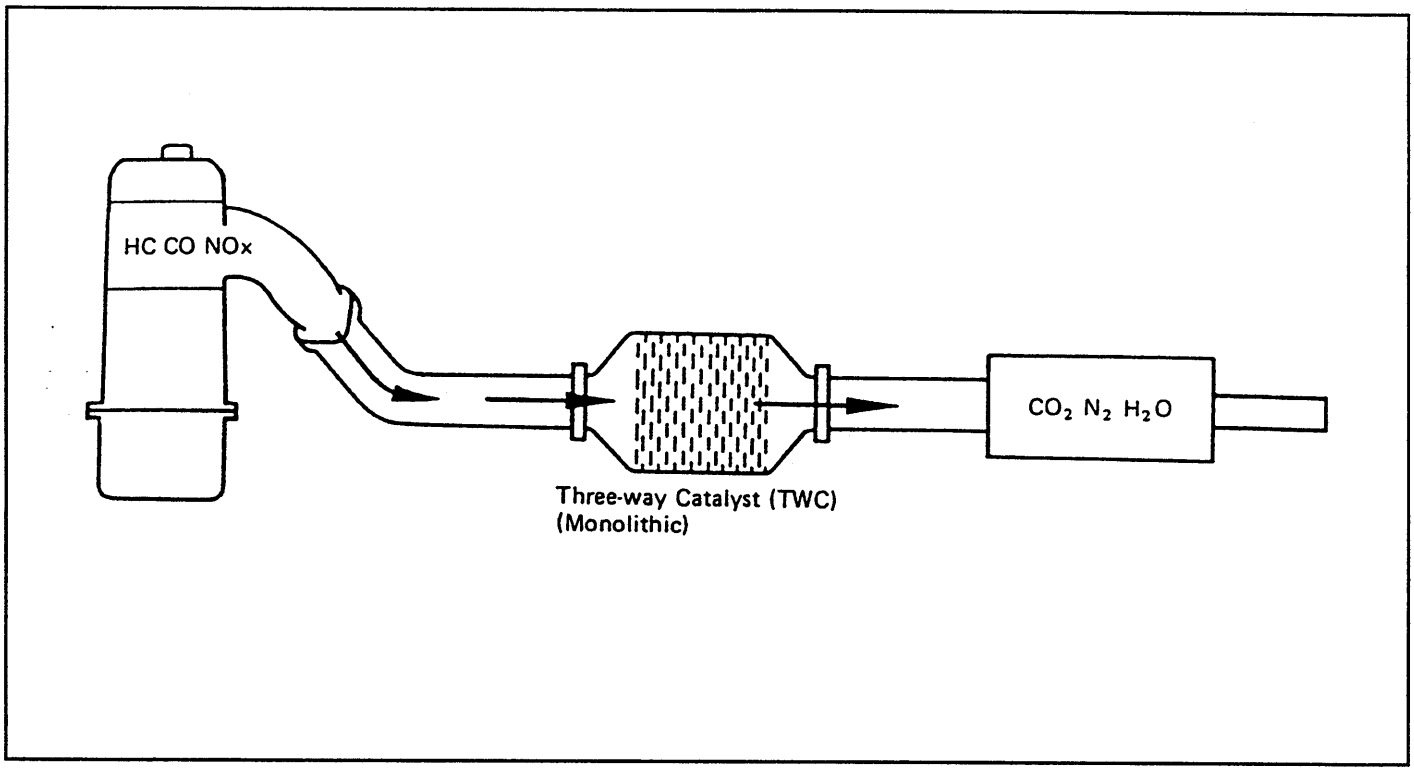
2. Blow your breath into the VTV from the throttle positioner side (side A). Ensure that there is restriction.
   If no restriction exists, replace the VTV.



WN88-EC026

THREE-WAY CATALYST (TWC) 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 (CO_2), water vapor (H_2O) and nitrogen (N_2).



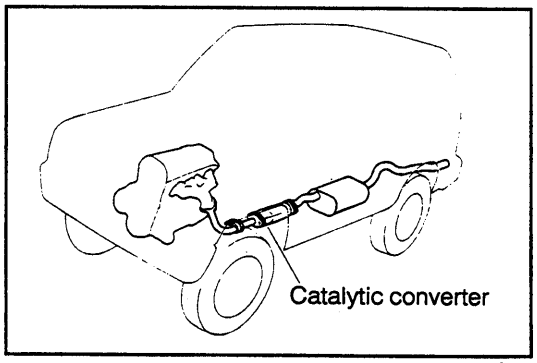
WN88-EC045

Exhaust gas component		TWC		Exhaust gas
HC, CO and NOx	⇒	Oxidation and reduction	⇒	CO_2, H_2O and N_2

WR88-EC088

Inspection of exhaust pipe assembly

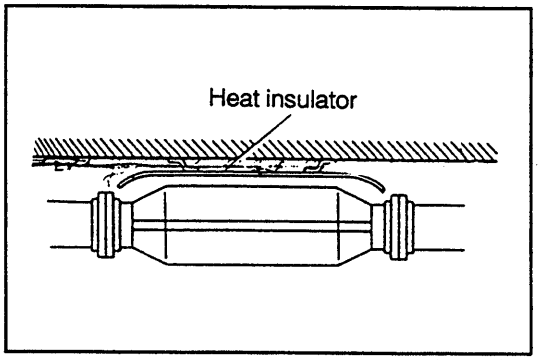
1. Check the connections for looseness or damage.
2. Check the clamps for weakness, bend or damage.



WN88-EC046

Inspection of heat insulator

1. Check heat insulator for damage.
2. Check for adequate clearance between catalytic converter and heat insulator.



WN88-EC047

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

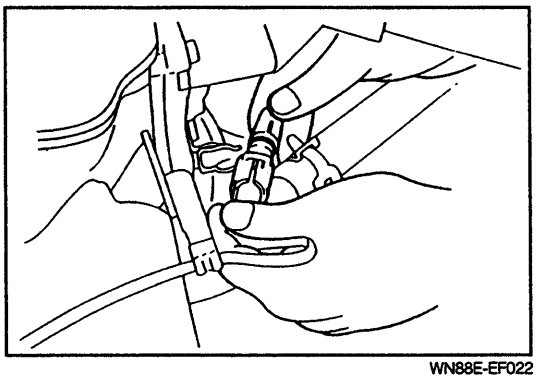
   (4) Ignition system
   - Spark plugs faulty
   - Resistive cords faulty
   - Distributor and igniter faulty
   - Ignition coil faulty

   (5) Air induction system
   - Admission of air

   (6) Others
   - Ignition timing adjusted improperly
   - Idle speed adjusted improperly
   - Idle-up VSV malfunctioning

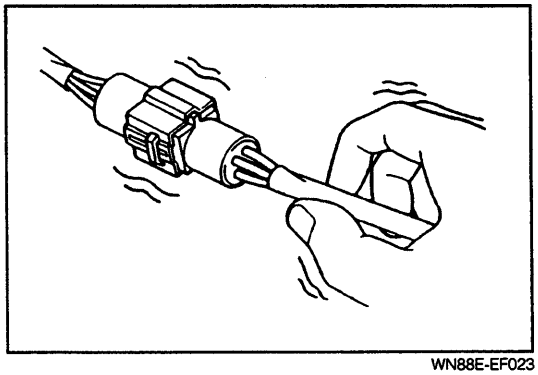
WN88E-EF021

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.



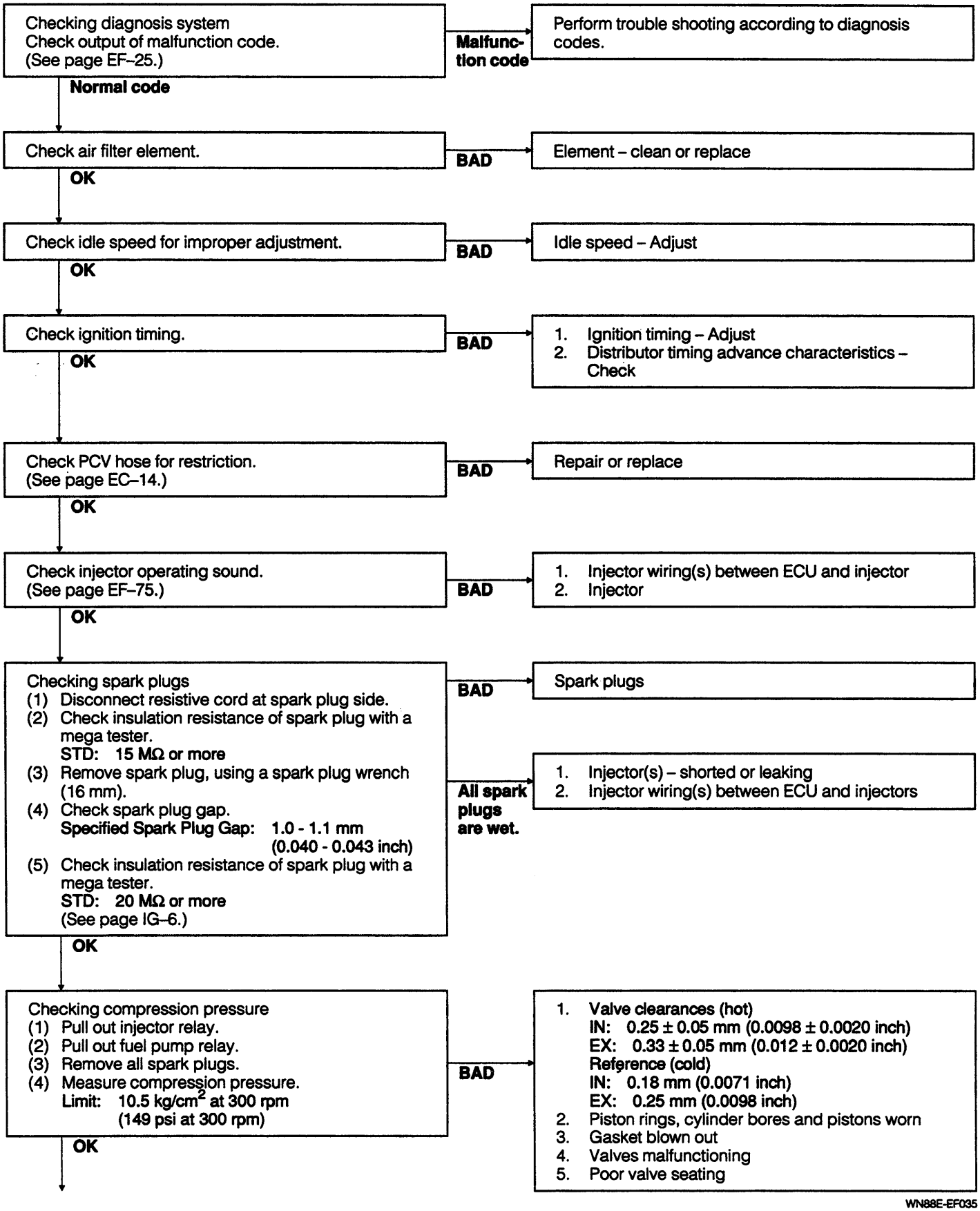
WN88E-EF022

   (3) Check to see if the malfunction phenomenon takes place when applying light vibration to the connector or the wire connected to the connector.



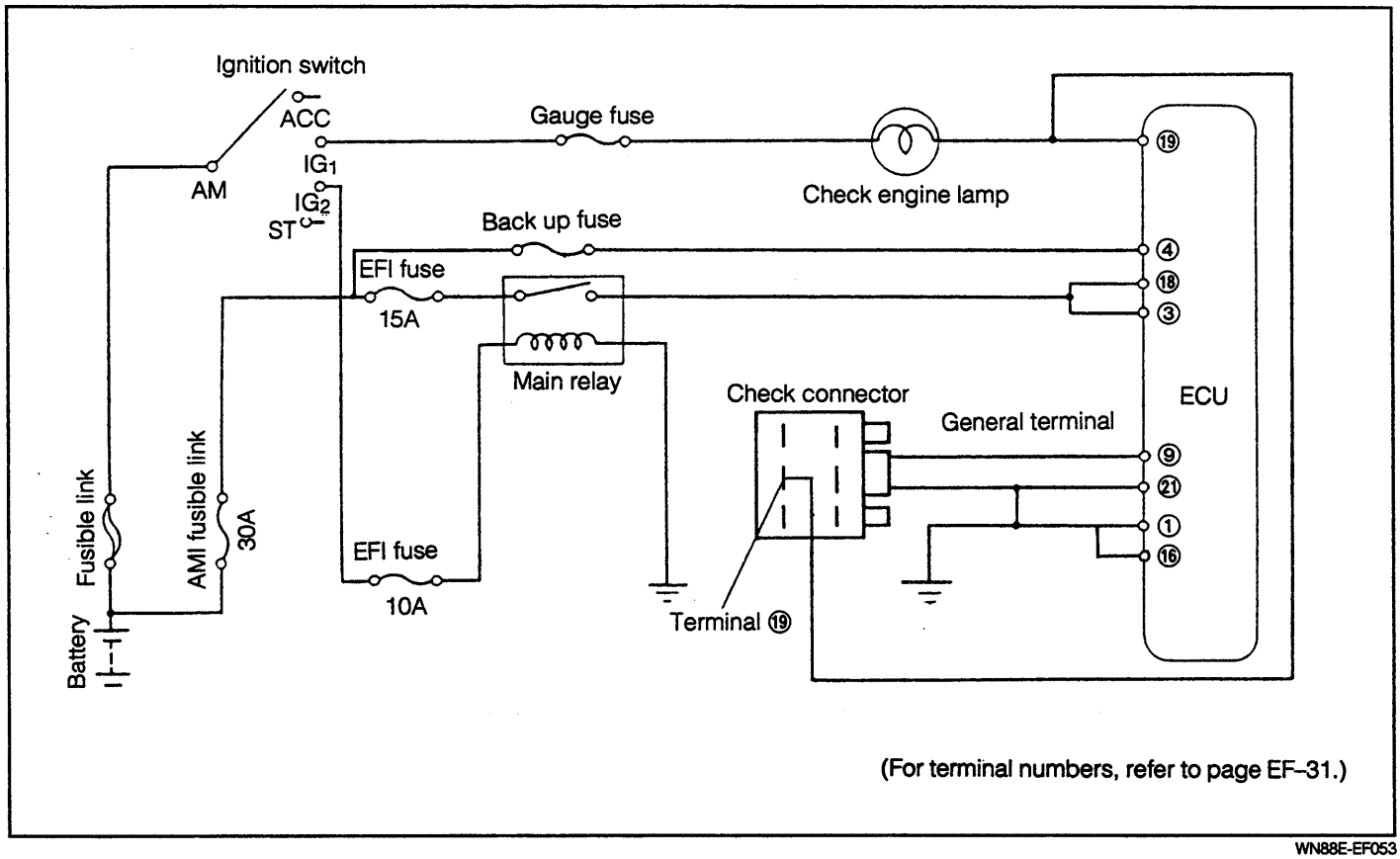
WN88E-EF023

7 Symptom .... Engine idle speed too low and/or rough idling



WN88E-EF035

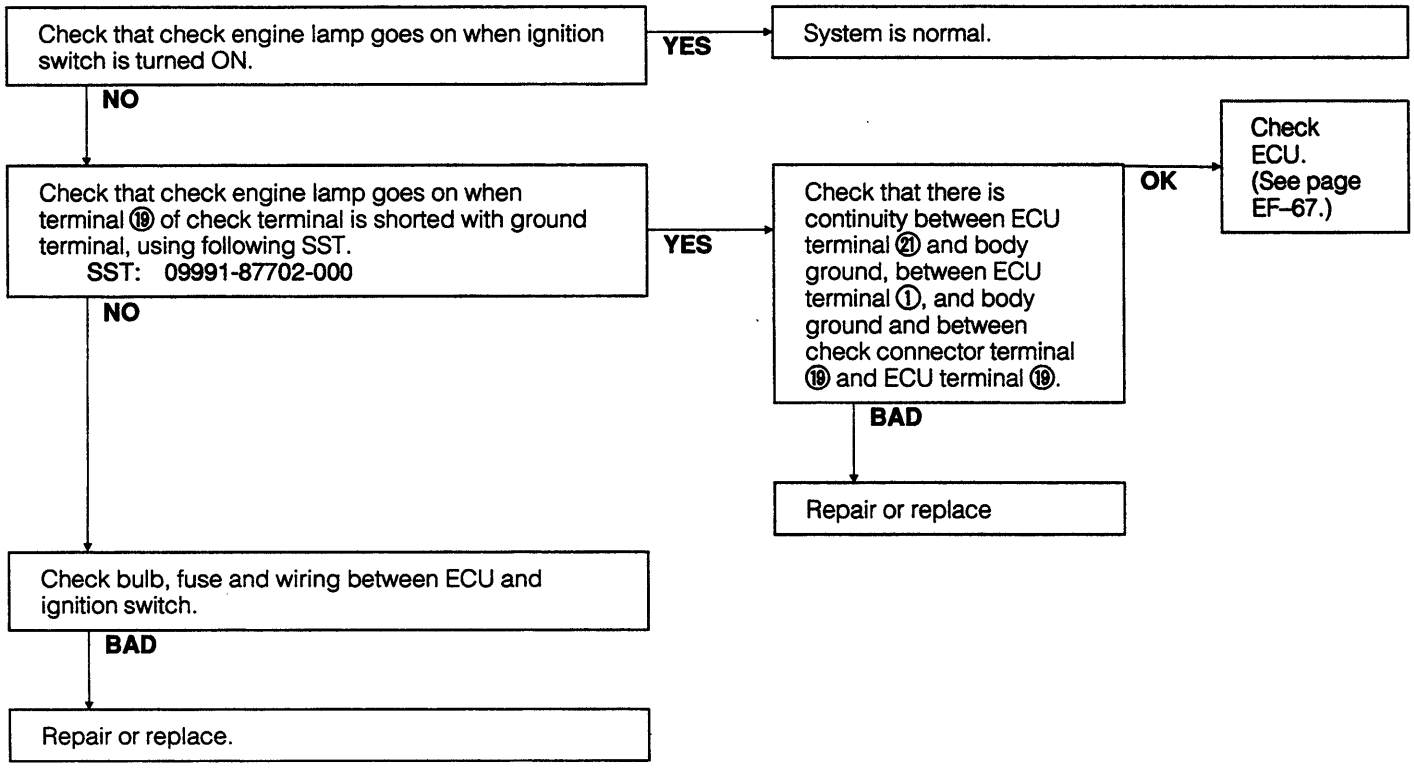
Inspection of Diagnosis System Circuit



WN88E-EF053

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-30.

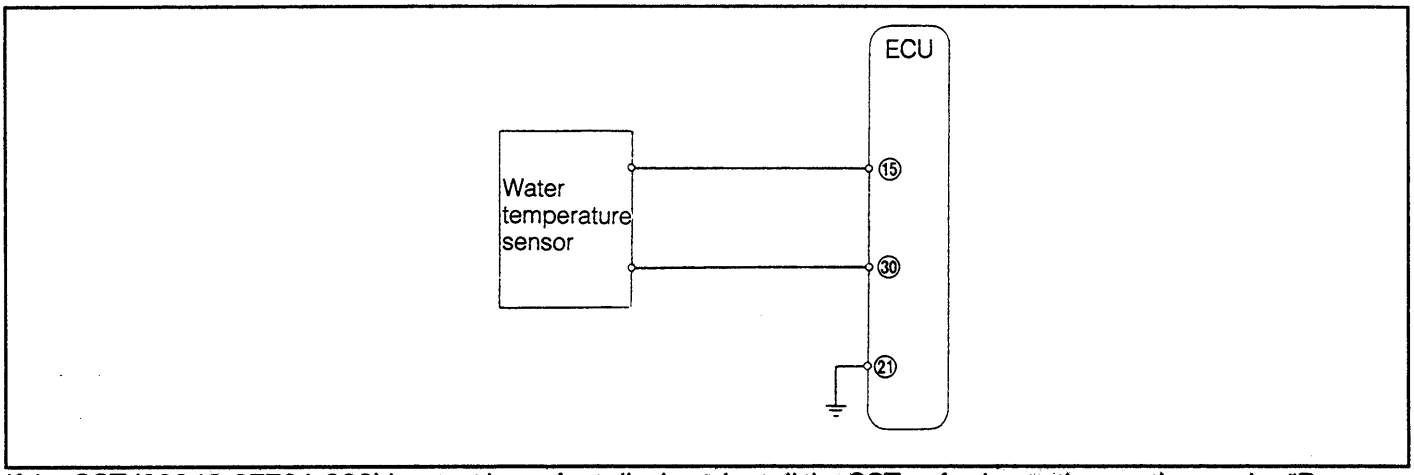
1



WN88E-EF054

No.	Terminals	Trouble	Conditions		STD voltage
4	⑮ - ㉚	No voltage	Ignition switch ON	Coolant temperature 80 - 90°C (176 - 194°F)	0.40 - 0.55

WN88E-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–30.

WN88E-EF074

① There is no specified voltage between SST terminals ⑮ and ㉚.

② Check that there is voltage between SST terminals ③ or ⑱ and ㉑.

OK — **BAD**

BAD: Refer to "Trouble Shooting, No.1 ③ - ㉑." (See page EF–34.)

Check water temperature sensor. (See page EF–52.)

OK — **BAD**

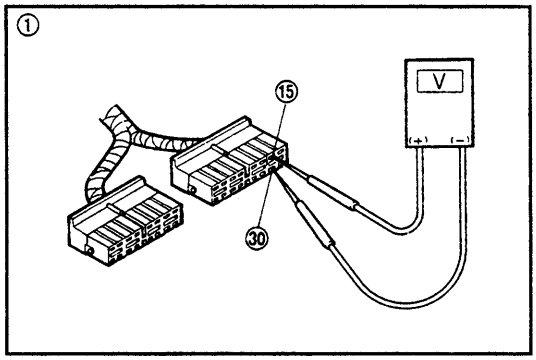
BAD: Replace water temperature sensor.

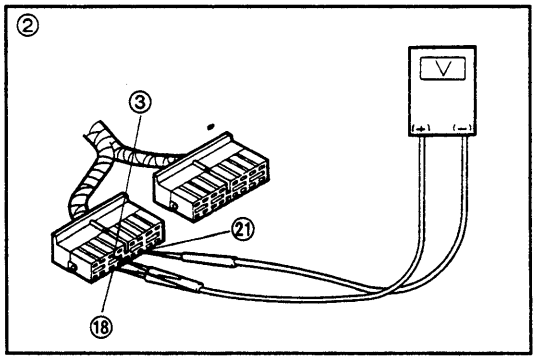
Check wiring between ECU and water temperature sensor.

OK — **BAD**

BAD: Repair or replace.

Check ECU. (See page EF–67.)

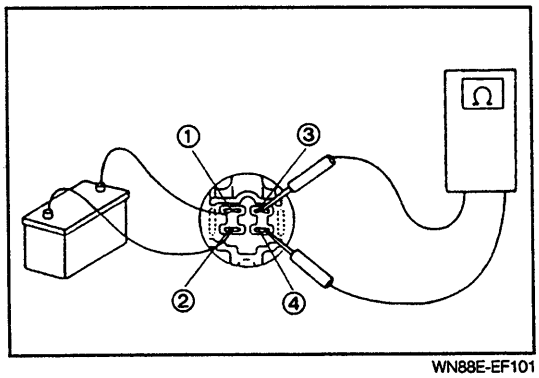




WN88E-EF075

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.

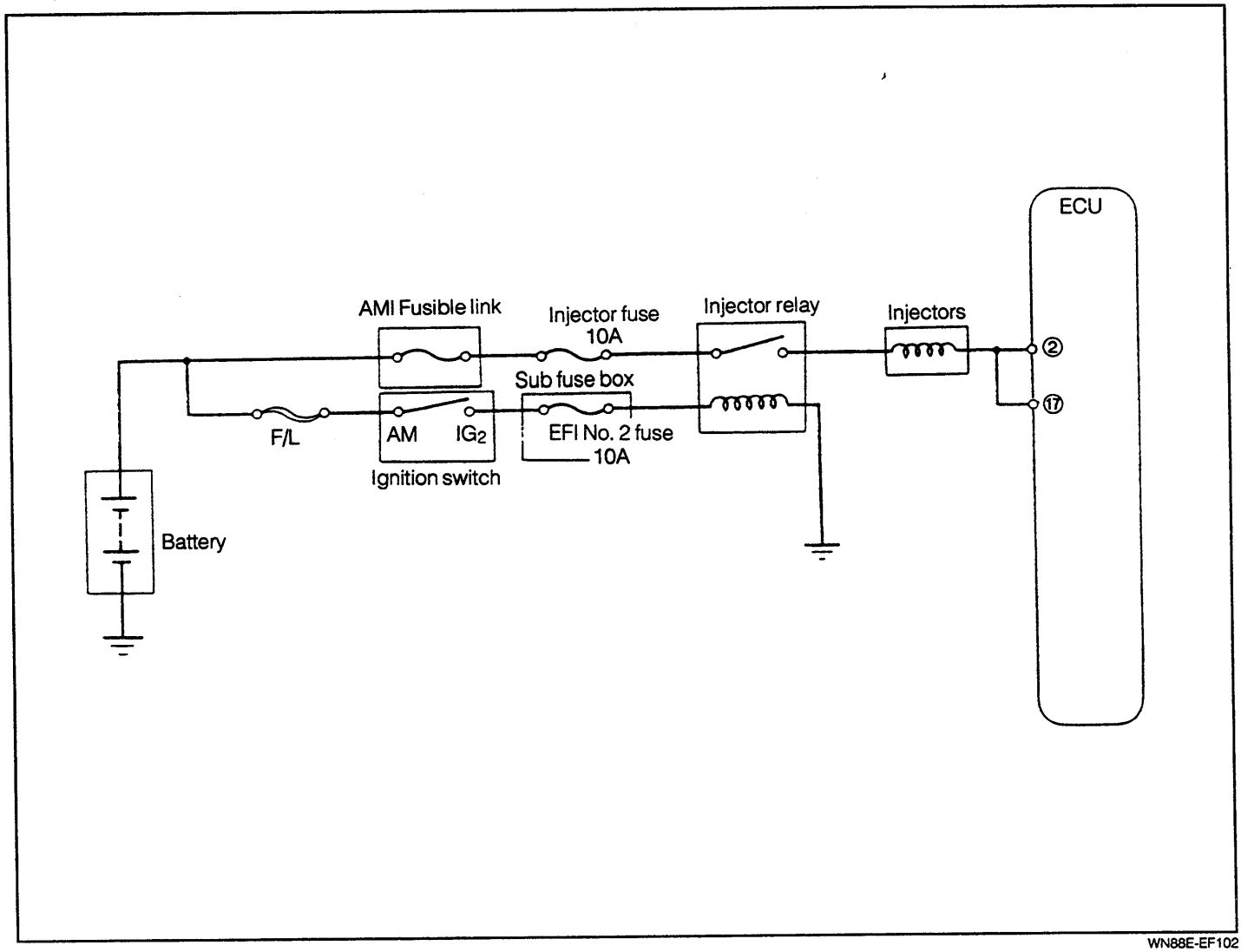


WN88E-EF101

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

WN88E-EF101A

INJECTOR RELAY



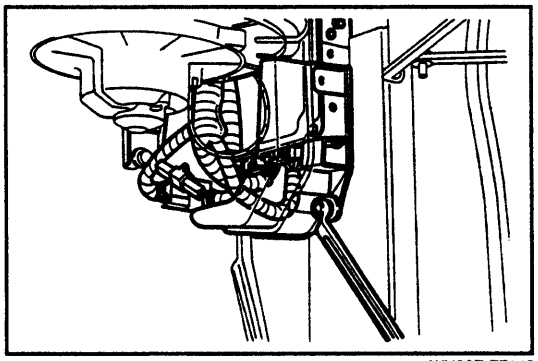
WN88E-EF102

Inspection of Pressure Sensor
Measurement of Output Voltage of Pressure Sensor

1. Connection of SST

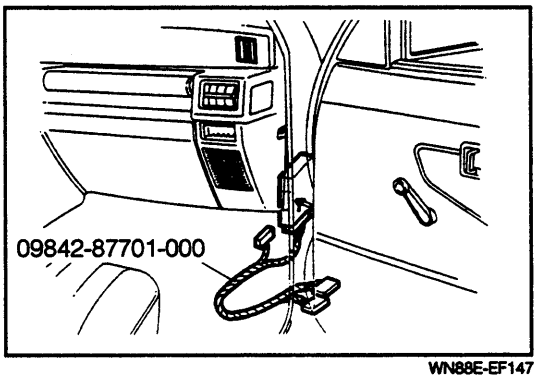
WN88E-EF145

(1) Disconnect the ground cable terminal from the negative (–) terminal of the battery.
(2) Remove the ECU cover.



WN88E-EF146

(3) Connect the following SST between the ECU and the engine wire.
SST: **09842-87701-000**

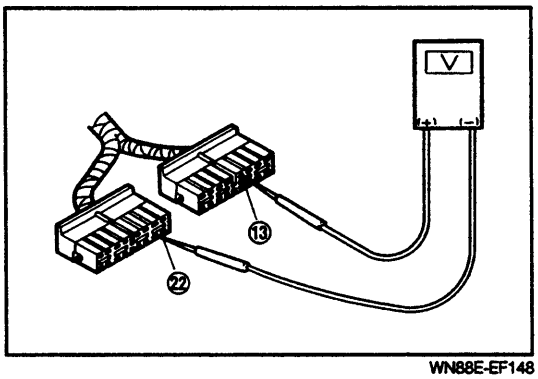


WN88E-EF147

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.

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.



WN88E-EF148

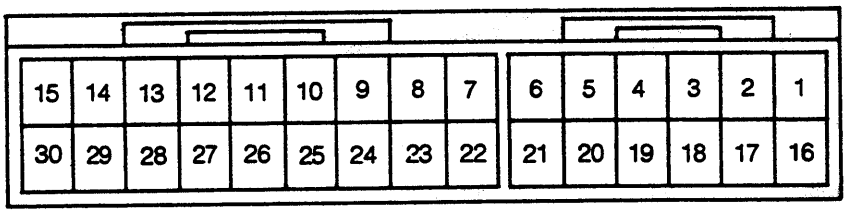
Specified Value

Measuring point		Atmospheric pressure mmHg (inchHg)	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

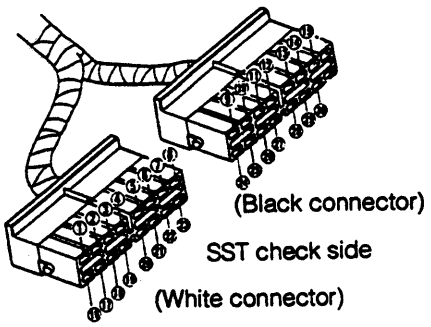
ECU CONNECTORS

No.	Contents of connection	No.	Contents of connection
1	Power ground	15	Cooling water temperature sensor
2	Injector	16	Power ground
3	Battery +B (Main relay)	17	Injector
4	Battery +B (Back-up)	18	Battery +B (Main relay)
5	Idle-up VSV	19	Check engine lamp
6	Feedback check terminal	20	Fuel pump relay
7	Ignition coil (negative)	21	Engine ground
8	Starter switch	22	Pressure sensor ground
9	Test terminal	23	Air conditioner magnet clutch
10	Idle switch	26	Vehicle speed sensor
11	Electric load signal	28	Power switch
12	Sensor power supply (approx. 5V)	29	Oxygen sensor
13	Pressure sensor	30	Sensor ground
14	Intake air temperature sensor		

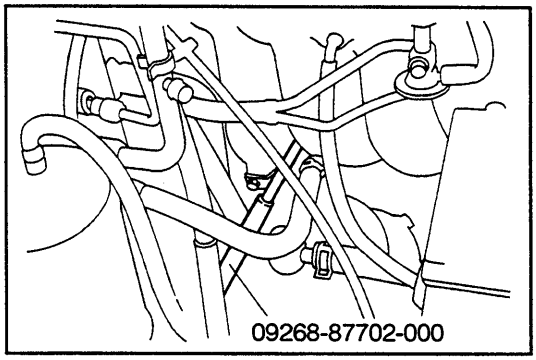
WN88E-EF181



ECU side

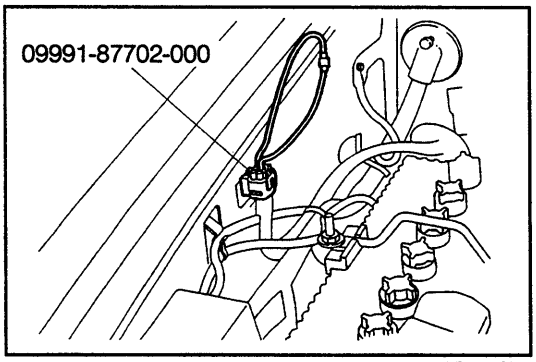


5. Connect a suitable fuel hose (about 2 meter long) to the pressure regulator.
   Reference:
   This fuel hose is included in the SST (09268-87702-000).
6. Insert one end of the fuel hose in a measuring cylinder.
7. Detach the check connector cap.



WN88E-EF198

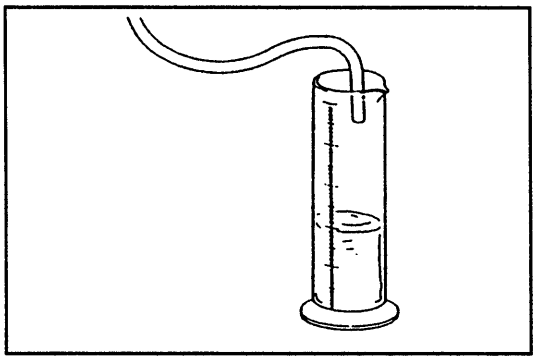
8. Connect the SST (09991-87702-000) to the check connector. Connect th SST terminal F (White/Black) to the ground terminal (Black).
9. Connect the ground cable terminal to the negative (–) terminal of the battery.
10. Turn ON the ignition switch for 15 seconds. Then, turn OFF the switch.



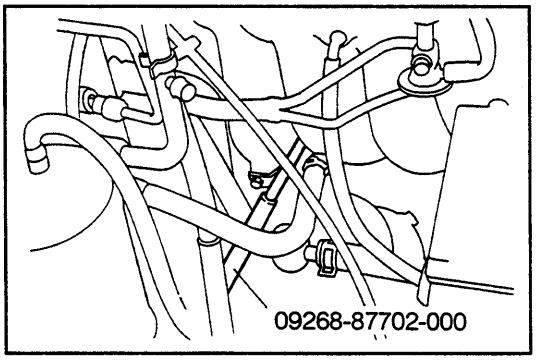
WR88-EF217

11. Measure the amount of fuel collected in the measuring cylinder.
    Specified Amount of Fuel: 235 cc or more (14.34 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.

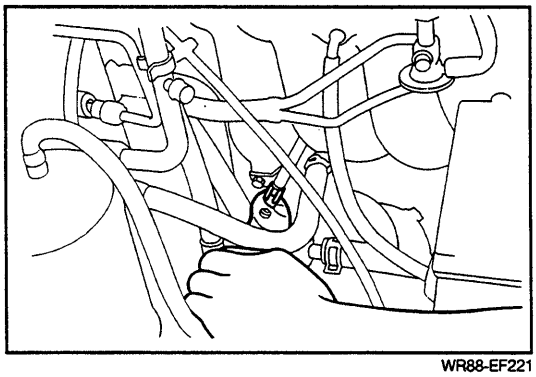

WN88E-EF199

13. Remove the SST (09991-87702-000) from the check connector.
14. Attach the cap on the check connector.
15. Disconnect the fuel hose connected to the pressure regulator.



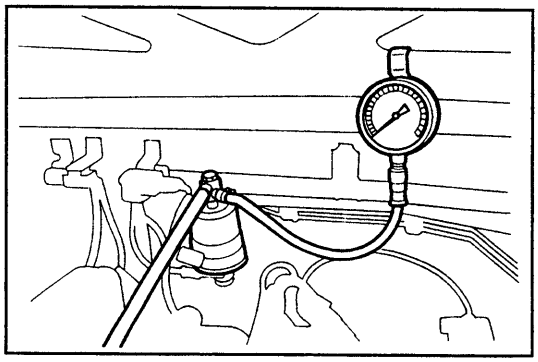
WN88E-EF200

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

5. Check to see if the fuel pressure conforms to the specification.
   Specified Fuel Pressure: 2.3 - 2.8 kg/cm^2 (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.



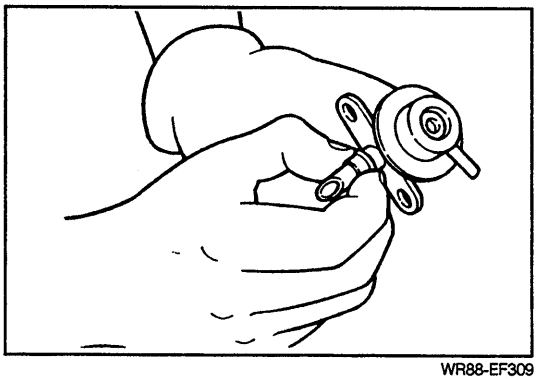
WR88-EF307

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.

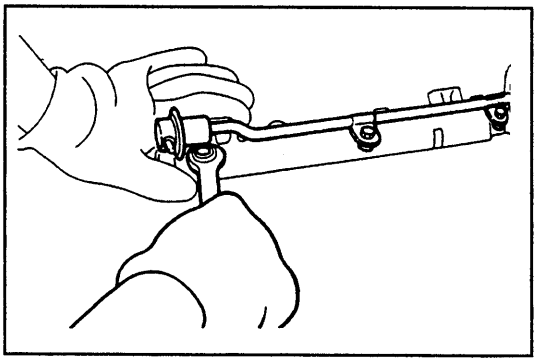
WR88-EF308

4. Replace the pressure regulator "O" ring with a new part.



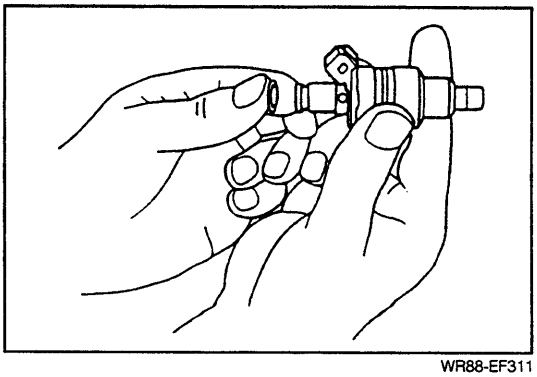
WR88-EF309

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)



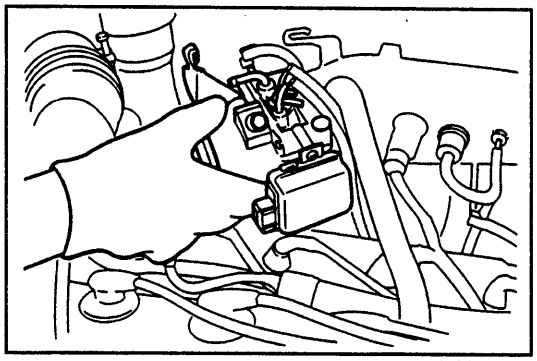
WR88-EF310

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

(2) Remove the attaching bolts and nuts of the throttle body.
(3) Remove the throttle body.



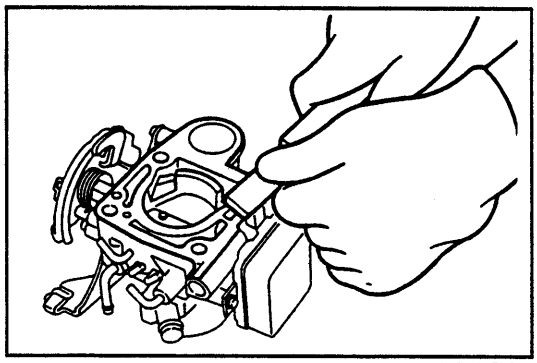
WR88-EF354

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.

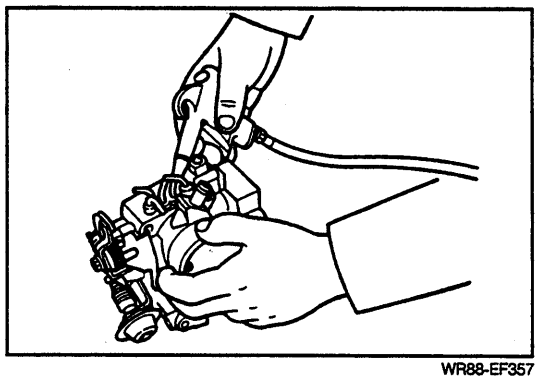
WR88-EF355

(2) Remove the gasket material from the surge tank attached surface of the throttle body.



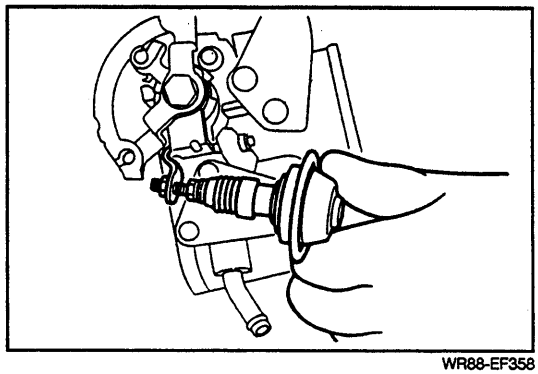
WR88-EF356

(3) Clean all passages by blowing compressed air.
WARNING:
Be sure to protect your eyes, wearing goggles.



WR88-EF357

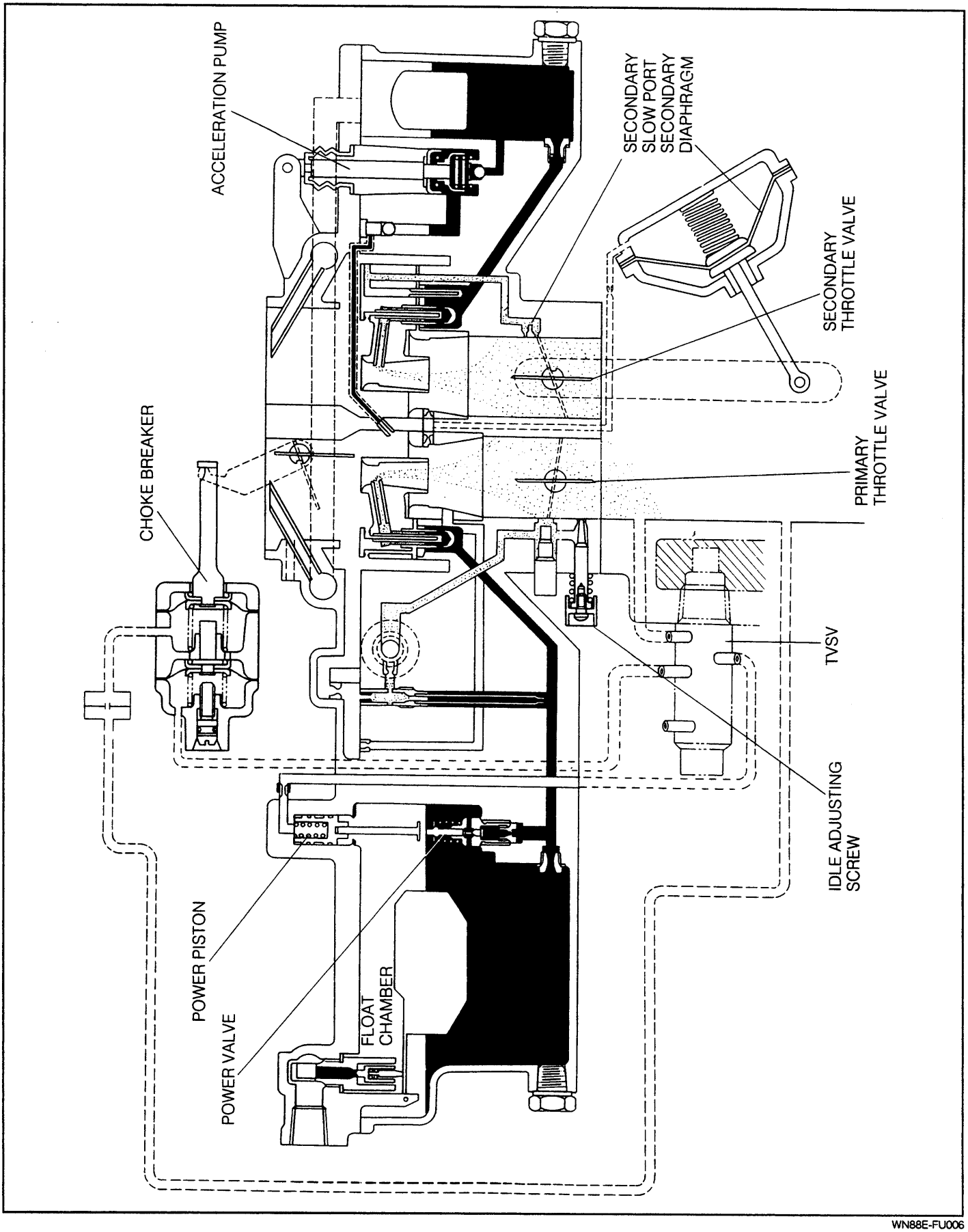
2. Check of throttle valve
   (1) Check that the throttle lever is in full contact with the dashpot.
   (2) When the throttle lever is opened, check to see if the dashpot lever comes out.



WR88-EF358

CARBURETOR

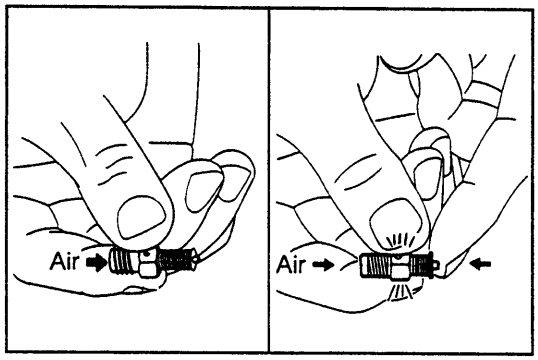
SCHEMATIC DIAGRAM



WN88E-FU006

4. Inspection of power valve

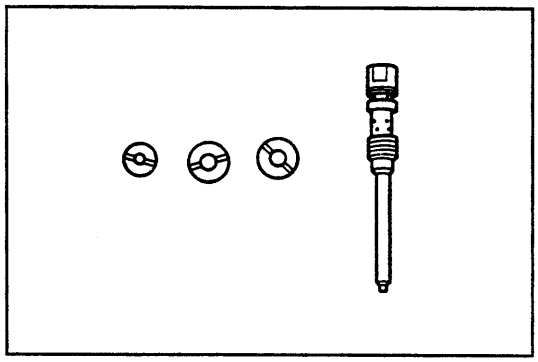
Ensure that air continuity exists when the valve is pushed. Also, ensure that no air continuity exists when the valve is not pushed.



WR88-FU077

5. Inspection of jets

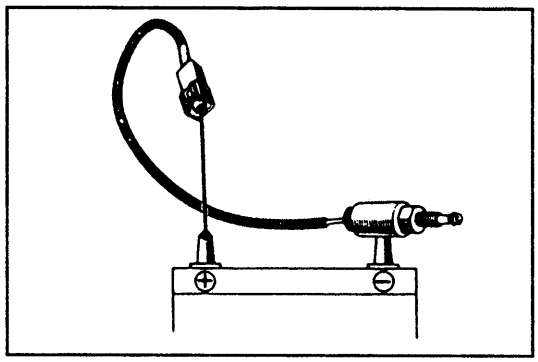
Check each jet for restriction or damage.



WR88-FU078

6. Inspection of solenoid valve

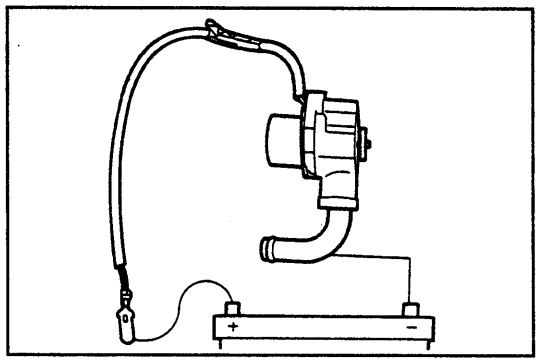
Ensure that the valve is opened when the solenoid valve is energized. Also, ensure that the valve is closed when the solenoid valve is not energized.



WR88-FU079

7. Inspection of outer vent valve

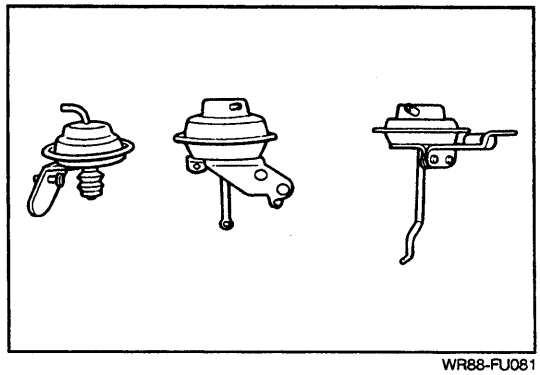
Ensure that the valve is closed when the solenoid valve is energized. Also, ensure that the valve is opened when the solenoid valve is not energized.



WR88-FU080

8. Inspection of each diaphragm

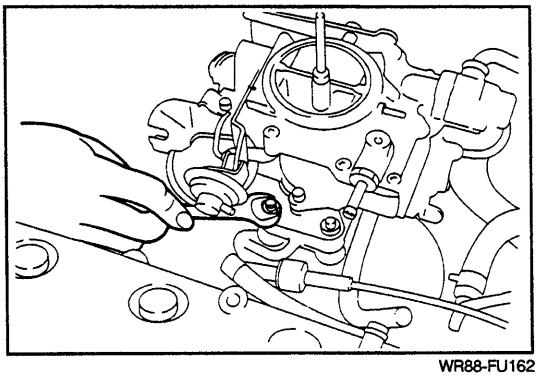
Ensure that the rod is drawn into the diaphragm chamber when a negative pressure is applied to each diaphragm.



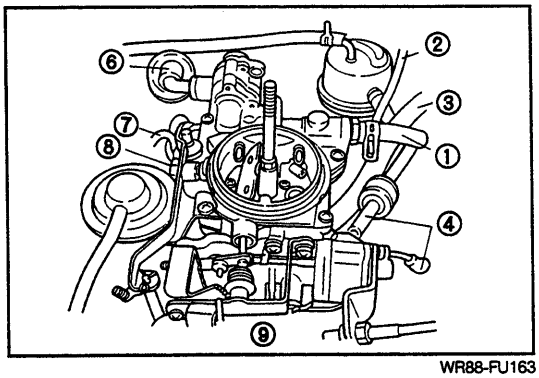
WR88-FU081

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)


WR88-FU162

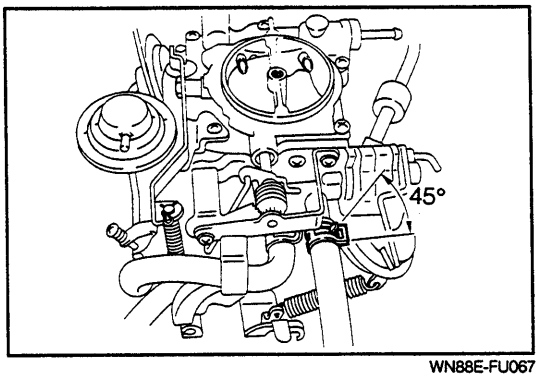
3. Connect the outer vent valve connector of the solenoid valve and the throttle position sensor connector.
4. Connect the following hoses to the carburetor.
   ① Fuel inlet hose
   ② ITC vacuum hose
   ③ PCV gas hose
   ④ Choke braker vacuum hose
   ⑤ Vacuum hoses to gas filter
   ⑥ Outer vent hose
   ⑦ Throttle position vacuum hose
   ⑧ Vacuum hose to distributor
   ⑨ Coolant circulating hoses



WR88-FU163

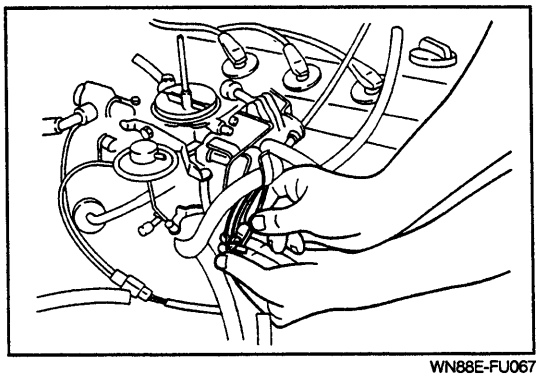
   NOTE:
   Ensure that the hose clamp is installed at correct position as indicated at right figure.

5. Connect the accelerator cable to the carburetor. Adjust the axial play of the accelerator cable to 3 - 8 mm (0.12 - 0.31 inch).

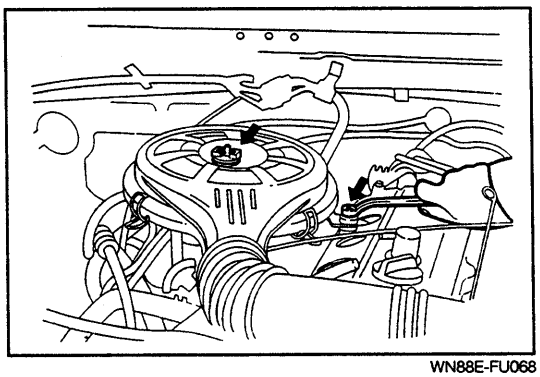


WN88E-FU067

6. Install the air cleaner.
7. 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

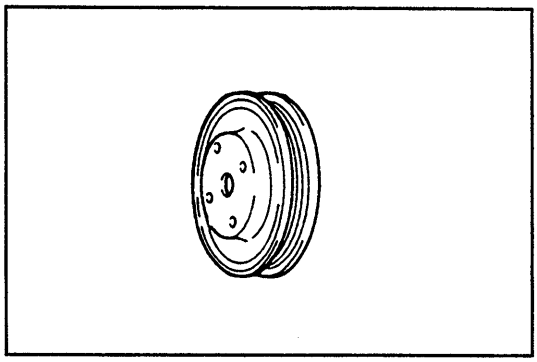

WN88E-FU067

8. Fill coolant.
   (See page CO-3.)
9. Connect the ground cable to the negative (–) terminal of the battery.
10. Tune up the engine.

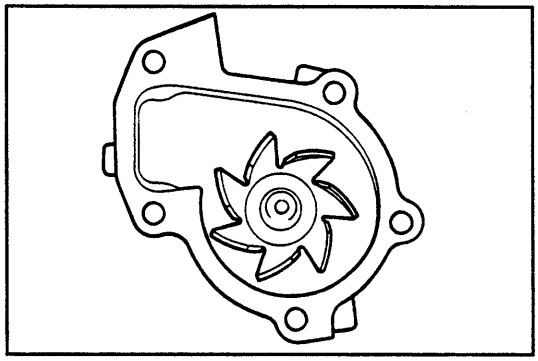

WN88E-FU068

INSPECTION OF WATER PUMP-RELATED PARTS

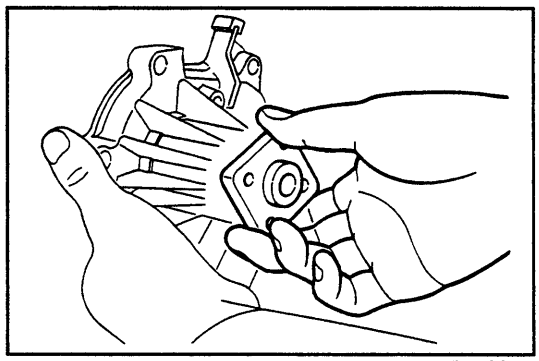
1. Check the water pump pulley for damage or deformation.
   Replace the water pump if it exhibits damage or deformation.


WR88-CO014

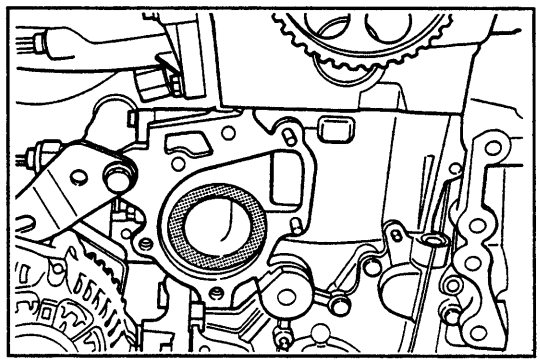
2. Visually inspect the water pump rotor for damage or deformation.
   Replace the water pump if the water pump rotor exhibits damage or deformation.


WR88-CO015

3. Ensure that the water pump rotates smoothly by hand.
   Replace the water pump if it will not rotate smoothly.

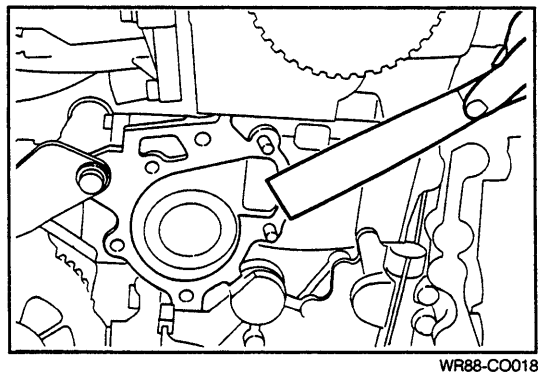

WR88-CO016

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.

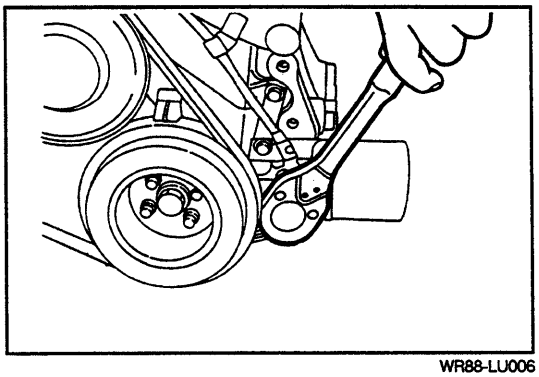

WN88E-CO006

INSTALLATION OF WATER PUMP

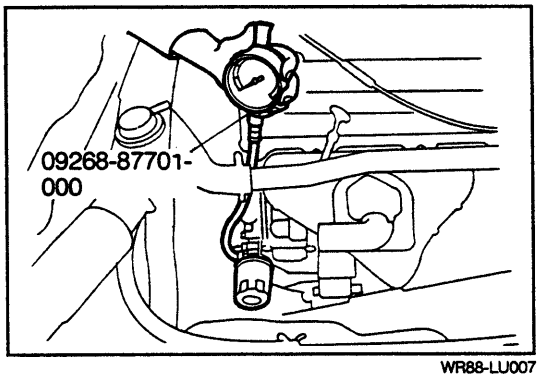
1. Remove the gasket material from the water pump installing surface of the cylinder block, using a gasket scraper.


WR88-CO018

(2) Remove the oil pressure switch.
NOTE:
Use a hexagonal long box wrench for the removal.


WR88-LU006

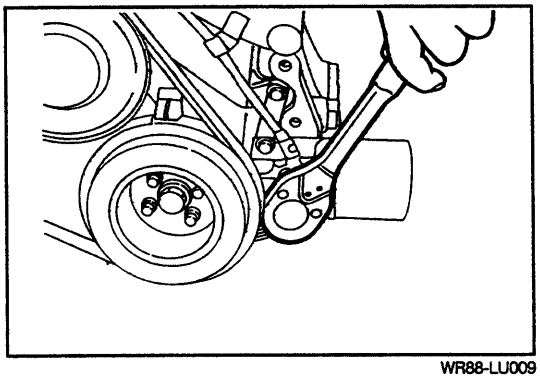
(3) Install the oil pressure gauge.
NOTE:
The pressure gauge is available as a SST.
SST: 09268-87701-000



WR88-LU007

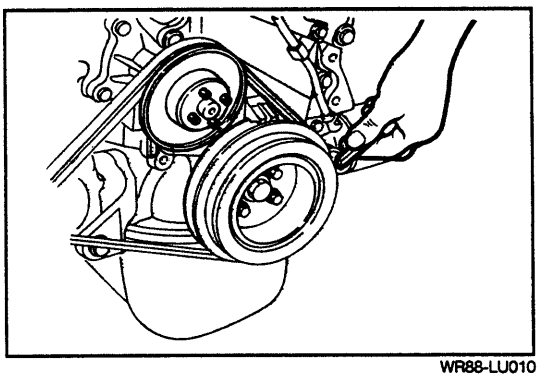
(4) Starting engine
Start the engine and warm it to the normal operating temperature.
At Idle Speed: More Than 0.2 kg/cm^2 (2.8 psi)
At 3000 rpm: 2.5 - 5.0 kg/cm^2 (35.6 - 71.0 psi)

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.


WR88-LU009

(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 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.**

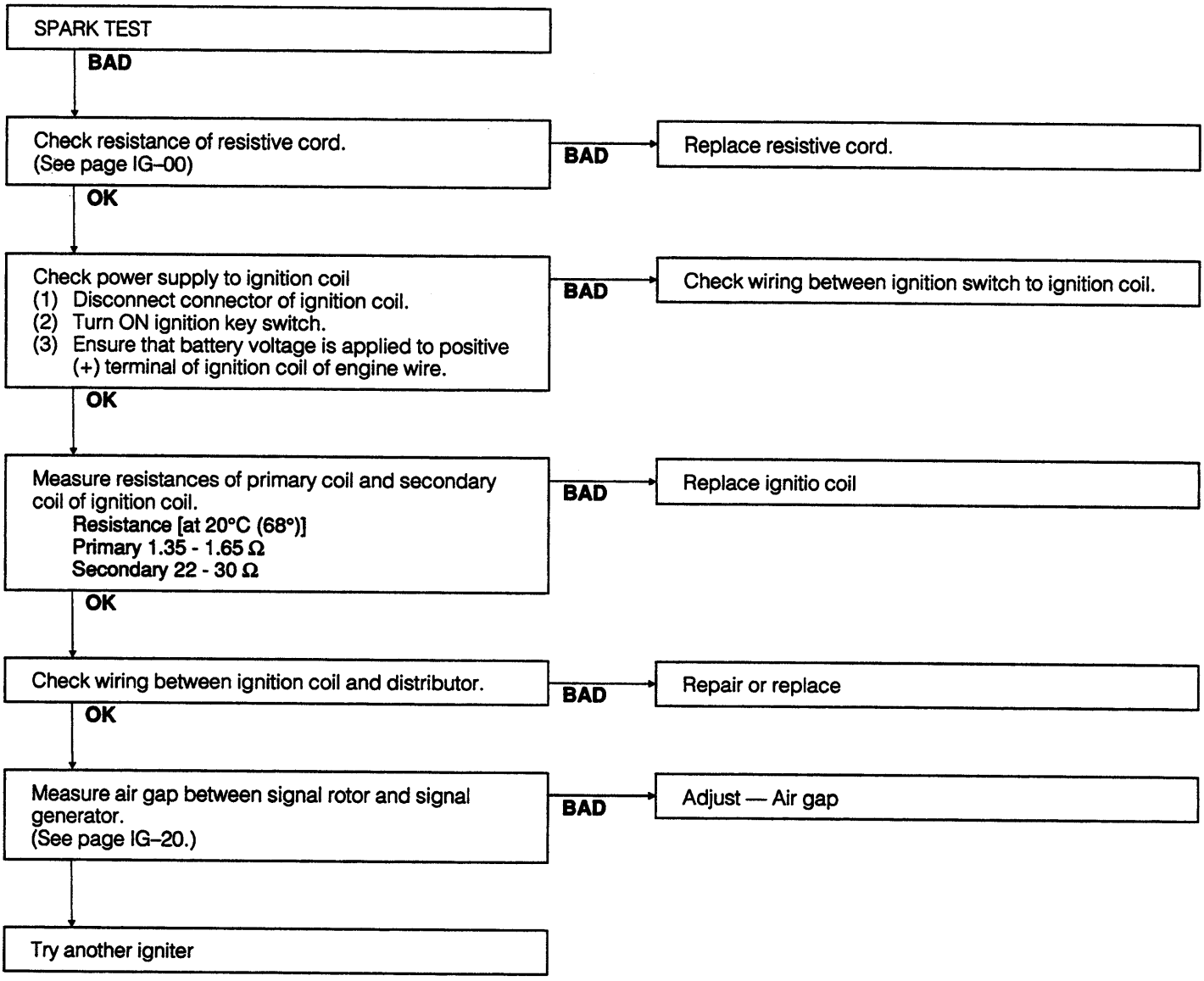

WR88-LU010

(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.

WR88-LU011

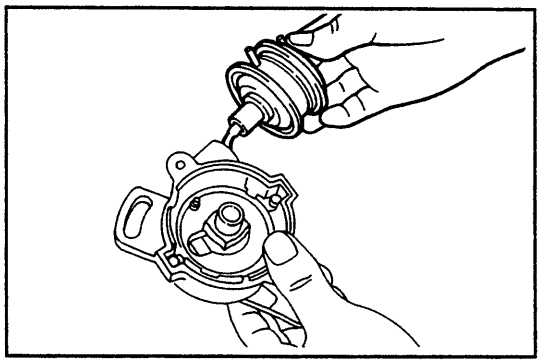
4. Ensure that the timing light flashes while the engine is being cranked by the starter motor.
   If the timing light flashes, check the resistive cord and spark plug.
   If the timing light will not flash, perform the check according to the chart given below.
   NOTE:
   After completion of the inspection, reconnect the fuel pump relay and injector relay to the relay box. (Only for HD-E engine)

WN88E-IG006



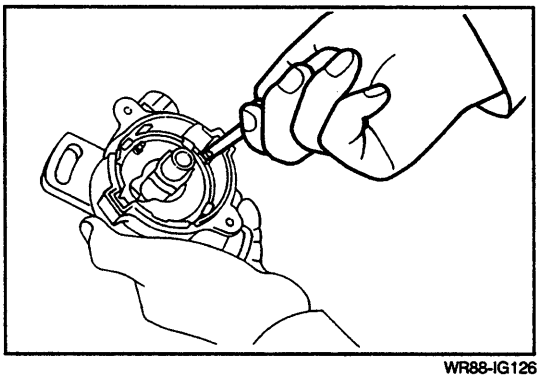
WN88E-IG007

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.



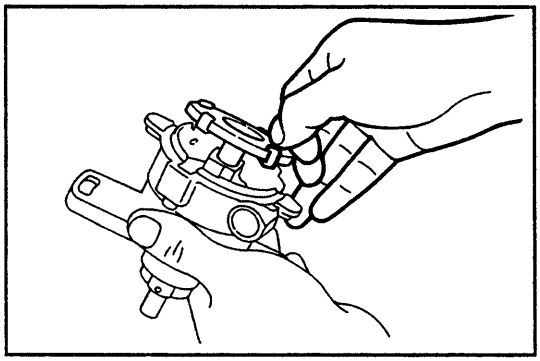
WR88-IG125

10. Remove the attaching screws and plate of the distributor stationary plate.



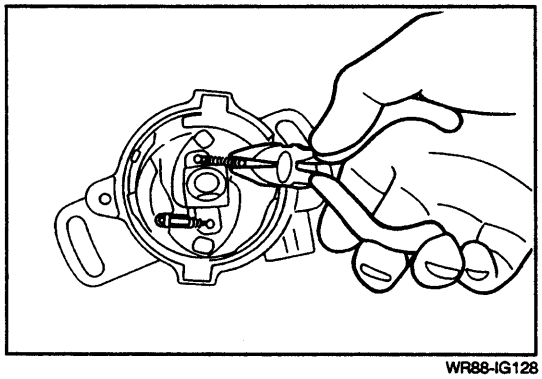
WR88-IG126

11. Remove the stationary plate from the distributor housing.



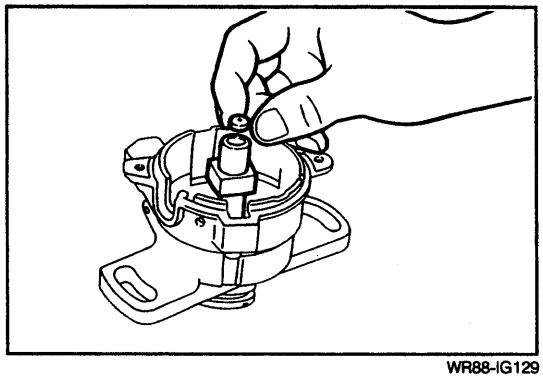
WR88-IG127

12. Remove the governor springs.



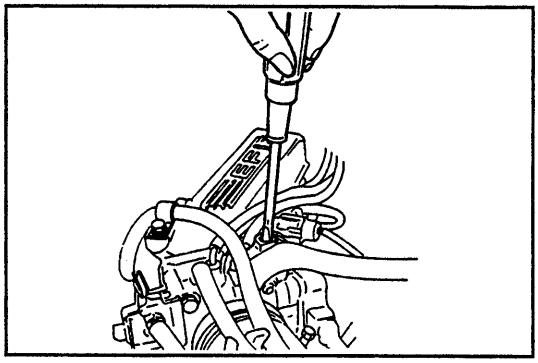
WR88-IG128

13. Removal of signal rotor assembly
    (1) Remove the grease stopper.



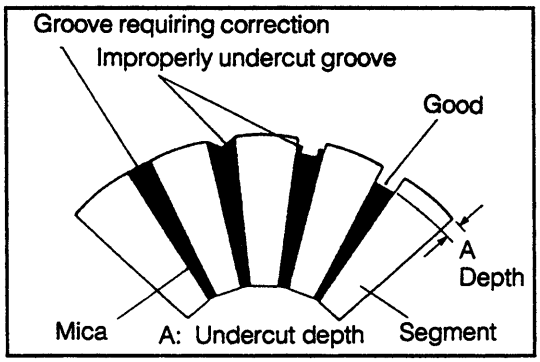
WR88-IG129

12. Adjust the engine idle speed.
    (See page MA–10.)
13. Check the oil level.
    (See page LU–2.)



WN88E-IG024

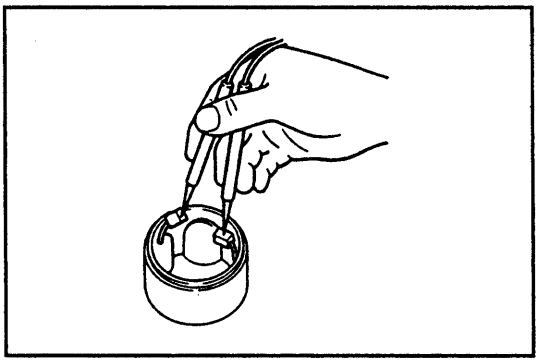
4. Check of commutator undercut
   If the depth of the insulator groove between commutator segments is less than 0.2 mm (0.0079 inch). It is necessary to undercut the insulator so that the groove depth may become 0.5 - 0.8 mm (0.020 - 0.031 inch).



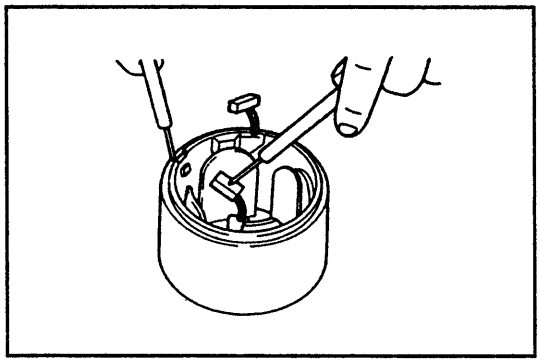
WR88-ST033

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.

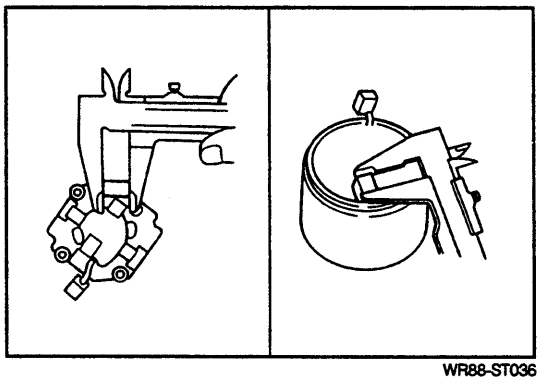

WR88-ST035

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.

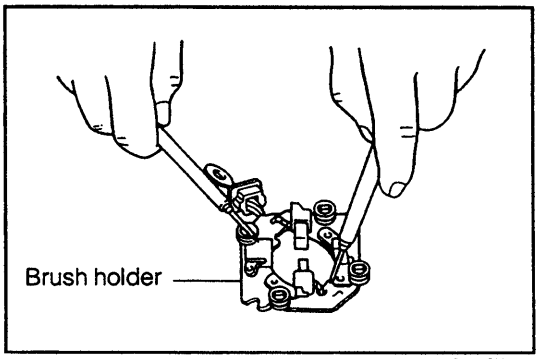

WR88-ST036

Brush Holder

Check of brush holder for insulation
Measure the insulation between the positive and negative terminals of the brush holder, using an ohmmeter.

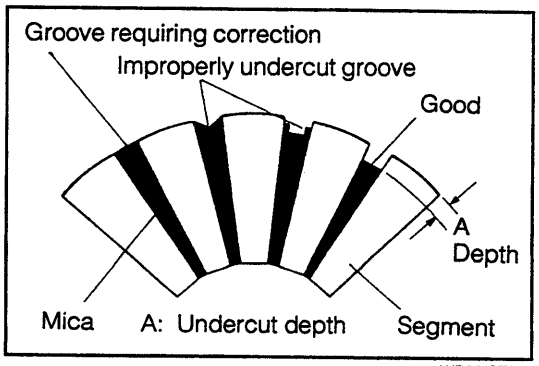
Insulation Resistance: 100 MΩ or more

If the insulation resistance is less than the specification, replace the brush holder.



WR88-ST-037

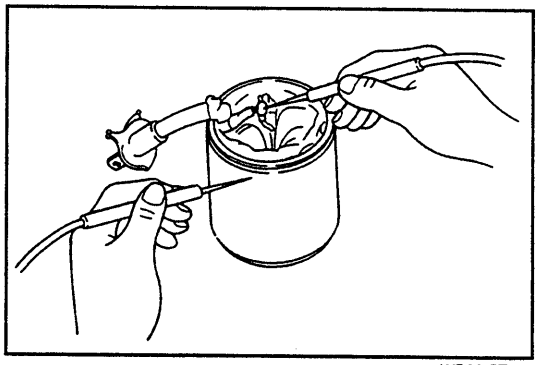
4. Check of commutator undercut
   If the depth of the insulator groove between commutator segments is less than 0.2 mm (0.0079 inch), it is necessary to undercut the insulator so that the groove depth may become 0.6 mm (0.024 inch).



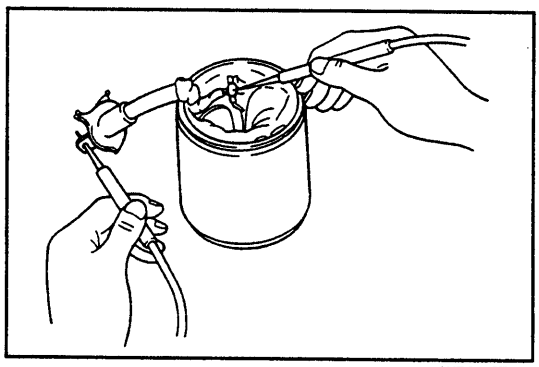
WR88-ST081

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.

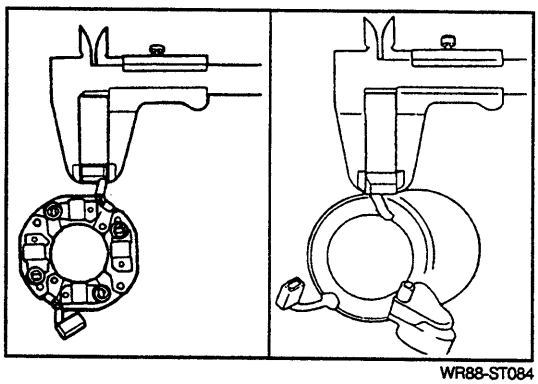

WR88-ST083

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.

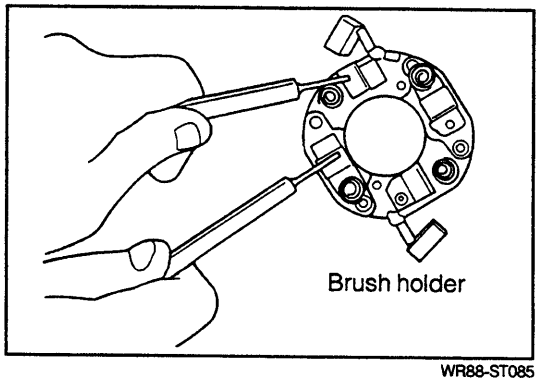

WR88-ST084

Brush Holder

Check of brush holder for insulation
Measure the insulation between the positive and negative terminals of the brush holder, using an ohmmeter.

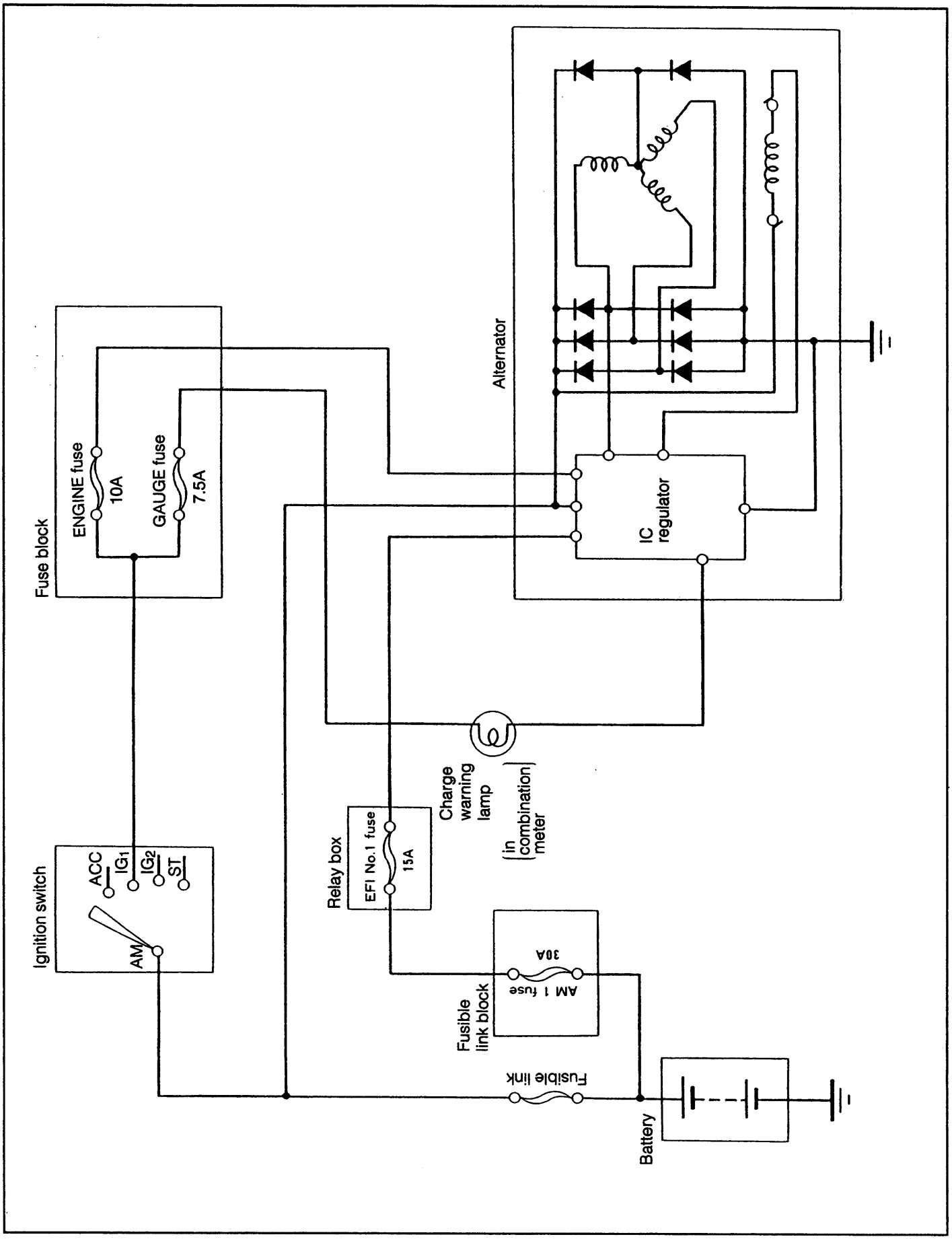
Insulation Resistance: 100 MΩ or more

If the insulation resistance is less than the specification, replace the brush holder.



WR88-ST085

CHARGING SYSTEM CIRCUIT



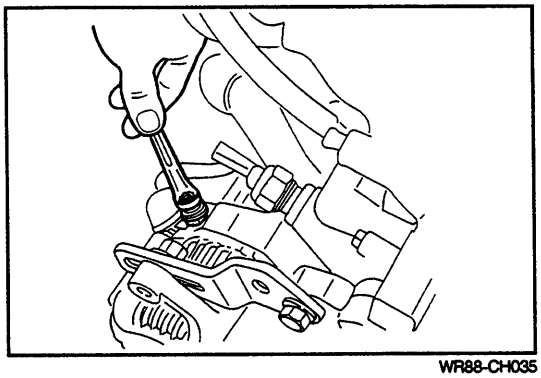
WN88E-CH003

REMOVAL OF ALTERNATOR

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

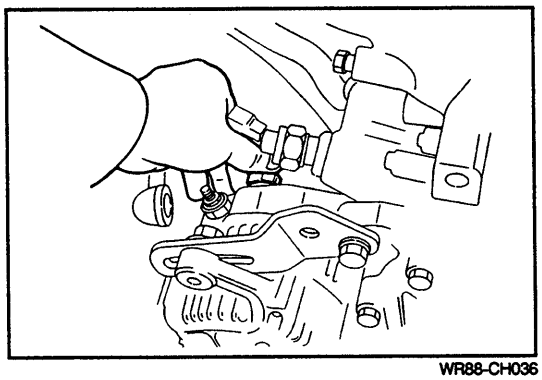
WR88-CH034

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.

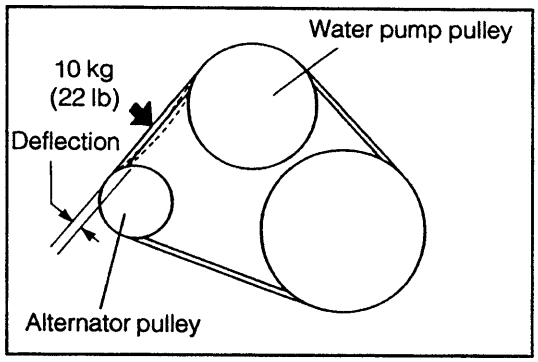
4. Removal of alternator
   (1) Remove the alternator attaching bolts.

WR88-CH037

   (2) Remove the alternator from the engine compartment.

WR88-CH038

3. Installation of alternator drive belt
   (1) Install the alternator drive belt properly.
   (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).



WN88E-CH006

Specified Belt Deflection
New belt: 5.0 - 7.0 mm (0.20 - 0.28 inch)
(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)
Used belt: 6.0 - 8.0 mm (0.24 - 0.31 inch)
(With a pressed force of 10 kg (22 lb) applied to a point indicated in figure)

NOTE:
- **"New belt" refers to a belt with 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-CH082

4. Reconnect the ground cable terminal to the negative (–) terminal of the battery.

WR88-CH083

SERVICE SPECIFICATIONS

TUNE-UP

Drive belt deflection with a pressed force of 10 kg (22 lb)		
Alternator	New belt	5.0 - 7.0 mm (0.20 - 0.28 inch)
	Used belt	6.0 - 8.0 mm (0.24 - 0.31 inch)
Coolant capacity w/heater [Excluding 1.0 liter for reserve tank]		5.5 liters [5.8 liters for tropical specifications]
Engine oil capacity		
Whole amount		3.8 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 ± 0.05 mm (0.0098 ± 0.0020 inch)
	Exhaust	0.33 ± 0.05 mm (0.012 ± 0.0020 inch)
[Reference (cold)]		
	Intake	0.18 mm (0.0071 inch)
	Exhaust	0.25 mm (0.0098 inch)

Spark plugs

Manufacturer	DENSO	NGK	CHAMPION
Type	K20PR-U11	BKR6E-11	RC9YC4
Thread	M14 x 1.25		
Spark plug gap mm (inch)	1.0 - 1.1 (0.040 - 0.043)		

Ignition timing	B.T.D.C. 3 ± 2°/1000 rpm or less (However, engine revolution must be stable.)

Idle speed

Engine type	HD-C	HD-E
Idle speed	850 ± 50 rpm	850 ± 50 rpm

Fast idle speed adjustment (HD-C) Full position	1300 - 2000 rpm

Throttle positioner touch revolution (rpm)

HD-C	HD-E
1500 ± 50	1800 ± 100

Throttle positioner operating time	HD-C	0.5 - 5.0 seconds
	HD-E	1.0 - 5.0 seconds
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)

WN88E-B004

DAIHATSU

F300

[HD-ENGINE]

TIGHTENING TORQUE

WRC88-C001

C