SECTION EN

# CONTENTS

## 1. Main Engine Specifications

| Item | | | | Model / Engine | E-BNR32 / RB26DETT |
|---|---|---|---|---|---|
| Displacement | | | | $cm^3$ (cu in) | 2,568 (156.70) |
| Combustion chamber | | | | | Pent-roof type |
| Valve arrangement | | | | | DOHC belt drive |
| Bore × stroke | | | | mm (in) | 86.0 × 73.7 (3.386 × 2.902) |
| Compression ratio | | | | | 8.5 |
| Compression pressure | | | | kPa (kg/$cm^2$, psi)/rpm | 1,177 (12.0, 171)/300 |
| Dimensions (L × W × H) | | | mm (in) | M/T | 870 × 665 × 675 (34.25 × 26.18 × 26.57) |
| Valve opening and closing cycle | Intake valve opening angle (BTDC) | | | (degrees) | 7 |
| | Intake valve closing angle (BBDC) | | | (degrees) | 53 |
| | Exhaust valve opening angle (BBDC) | | | (degrees) | 63 |
| | Exhaust valve closing angle (BTDC) | | | (degrees) | 7 (BTDC) |
| Valve clearance | Intake (warm) | | | mm (in) | 0.51 (0.020) |
| | Exhaust (warm) | | | mm (in) | 0.44 (0.017) |
| Idle speed | | | (rpm) | M/T | 950 |
| Ignition timing | | | (BTDC°/rpm) | M/T | 20/950 |
| Preparation target value | Idle CO density | | | (%) | 0.1 max. |
| | Idle HC density | | | (ppm) | 50 max. |
| Engine oil (factory) | Standard | | | | 7.5W-30 (SG grade for turbo) |
| | Cold climate version | | | | |
| Oil pan capacity (H level) | | | | ℓ (Imp qt) | 4.5 (4) |
| Oil filter capacity | | | | ℓ (Imp qt) | Approx. 0.4 (3/8) |
| Total engine coolant capacity | | | | ℓ (Imp qt) | Approx. 9.0 (7-7/8) |

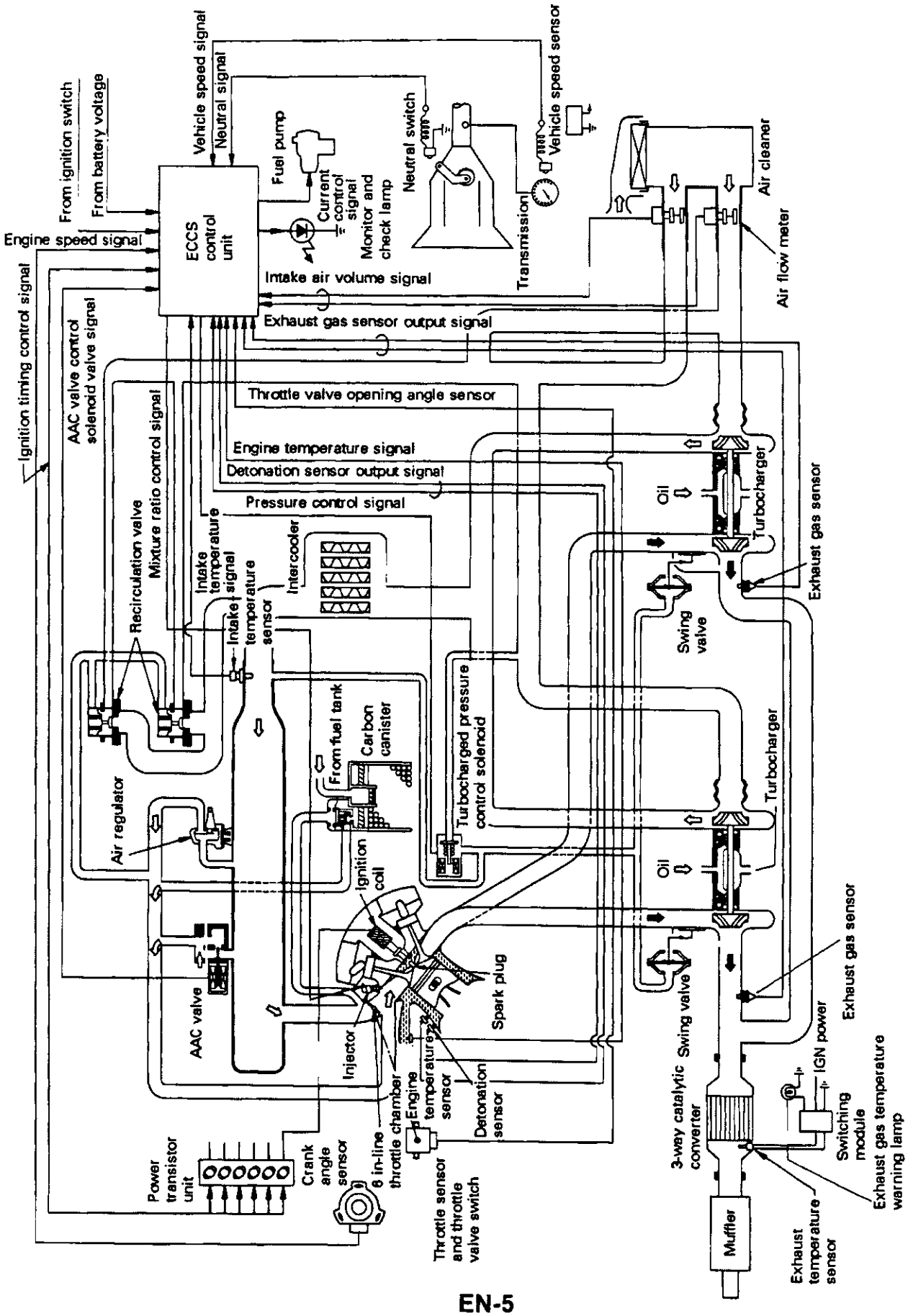
Use recommended genuine Nissan SG grade engine oil [Turbo X (7.5W-30)] or equivalent.

## 2. Emission Control Equipment Specification

| Item | | Model / Engine | |
|---|---|---|---|
| | | Model | E-BNR32 |
| | | Engine | RB26DETT |
| Engine fuel system | | | ECCS (MPi) |
| Air/fuel ratio control system | | | Air/fuel ratio feedback |
| Temperature control air cleaner | | | — |
| Supplemental start equipment | | | Bi-metal type air regulator |
| Intake heat system | | | Hot water heating |
| Ignition system | | | Breakerless type (ECCS electrical distributor) |
| NOx reduction equipment | EGR control system | | — |
| | TV valve operation temperature °C (°F) | | — |
| CO, HC (NOx) reduction equipment | Catalyzer type | | Three-way catalyst |
| | Catalytic converter size [capacity in liters (Imp qt)] | | X3 [1.7 (1-1/2)] |
| Deceleration exhaust gas reduction equipment | Fuel cutoff equipment | | ○ |
| Exhaust gas temperature warning equipment [setting temperature °C (°F)] | | | Thermocouple [850 (1,562)] |
| Evaporative gas control system | | | Canister system |
| Blowby gas reduction system | | | Closed system |

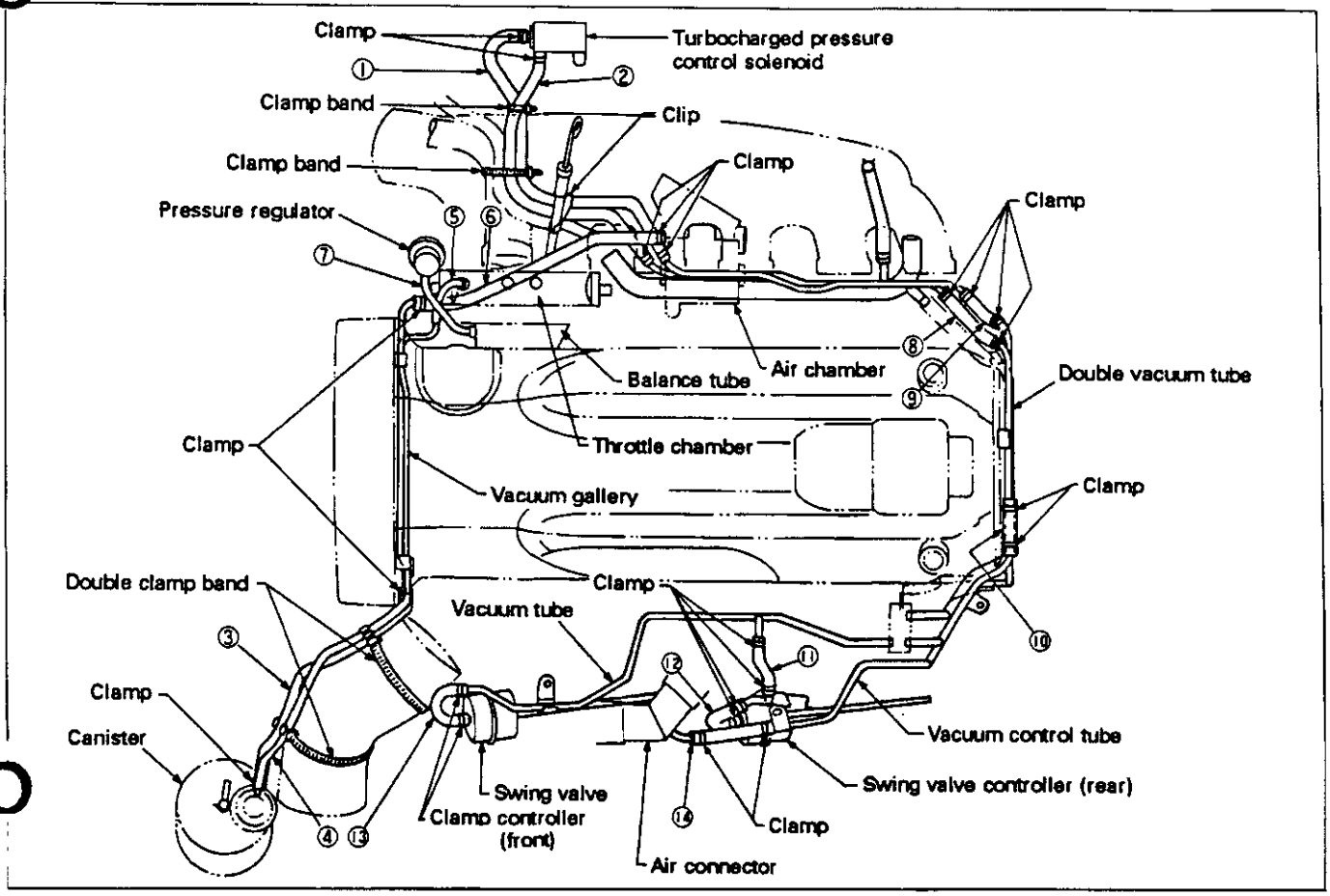
## 3. System Diagram

### 3-1 RB26 DOHC — EGI (ECCS) TWIN-TURBOCHARGER ENGINE



## 4. Vacuum Diagram

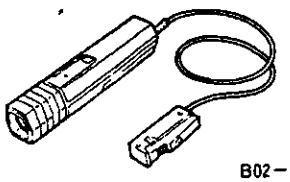
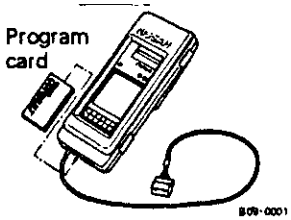
### RB26 DOHC EGI (ECCS) TWIN-TURBOCHARGER ENGINE




| Number | Length mm (in) | Part |
|---|---|---|
| ① | 580 (22.83) | Turbocharged pressure control solenoid - vacuum gallery |
| ② | 560 (22.05) | Turbocharged pressure control solenoid - vacuum gallery |
| ③ | 425 (16.73) | Canister - vacuum gallery |
| ④ | 425 (16.73) | Canister - vacuum gallery |
| ⑤ | 80 (3.15) | Throttle chamber - vacuum gallery |
| ⑥ | 290 (11.42) | Air chamber - vacuum gallery |
| ⑦ | Molded | Pressure regulator - balance tube |
| ⑧ | 120 (4.72) | Vacuum gallery - vacuum gallery |
| ⑨ | 90 (3.54) | Vacuum gallery - vacuum gallery |
| ⑩ | 60 (2.36) | Vacuum gallery - vacuum gallery |
| ⑪ | 90 (3.54) | Vacuum gallery - vacuum gallery |
| ⑫ | Molded | Vacuum gallery - swing valve controller (rear) |
| ⑬ | Molded | Vacuum gallery - swing valve controller (front) |
| ⑭ | 90 (3.54) | Vacuum gallery - vacuum control tube |

## 1. Idle Inspection and Adjustment

### Tools required

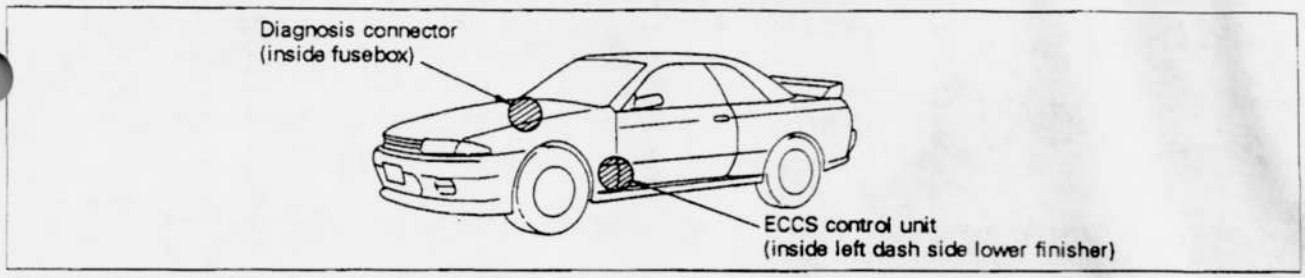
| | Name | | Use |
|---|---|---|---|
| Measurement tool | Super tuner<br>After number EG1151-9000, EG1152-9000, EG1153-9000 and EG1154-9000 | Otherwise, tachometer tester (after number EG1334-9000) | Engine speed inspection |
| | Timing light (internal battery)<br>EG1444 0000 |  <br>B02−1498 | Measures ignition timing. |
| | CO and HC meter | | Measures CO and HC levels. |
| | Electronic system diagnosis tester CONSULT<br>EG1180 0000 |  | Idle test and adjustment |

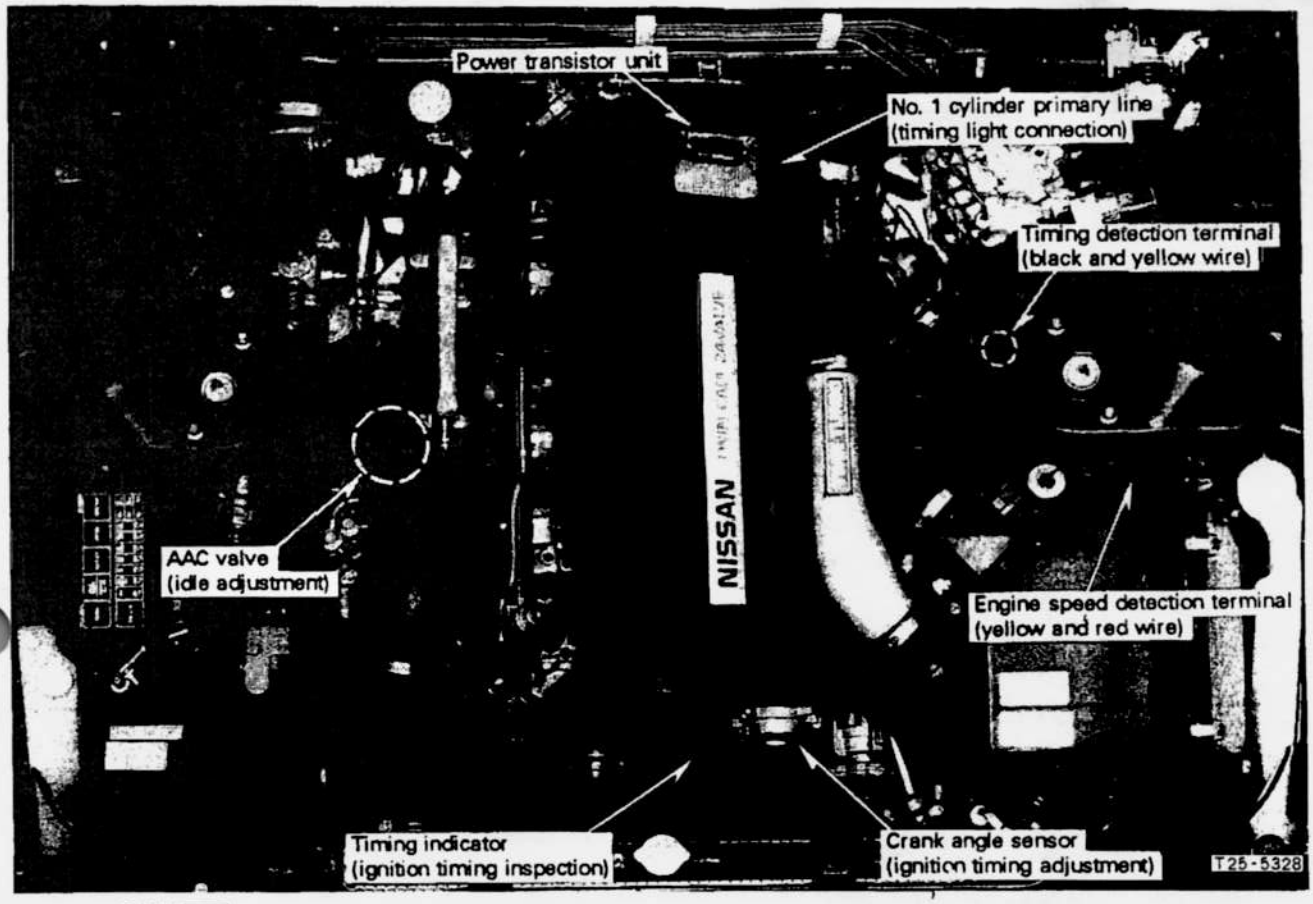
### Idle standard values

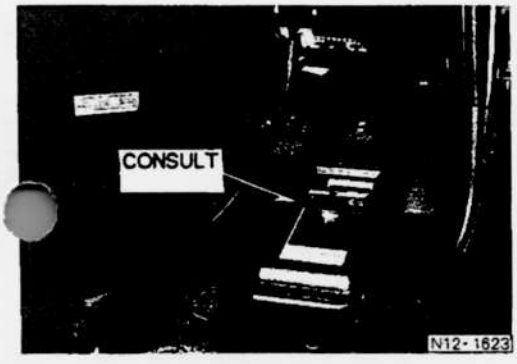
| Item | Engine | RB26DETT |
|---|---|---|
| Idle speed (when air conditioner is ON) | (rpm) | 950 (950) |
| Ignition timing | (BTDC°/rpm) | 20/950 |
| CO/HC density | (%)<br>(ppm) | 0.1 max,<br>50 max. |

**CAUTION:**
**The idle speed, ignition timing, CO and HC density are inter-related. Any adjustment to one effects the others and requires an additional inspection.**

## 1. Idle Inspection and Adjustment (Cont'd)



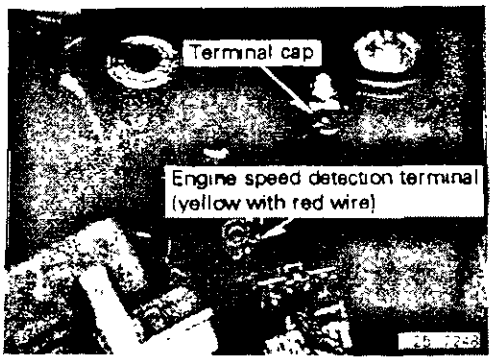

### 1-1 IDLE SPEED INSPECTION AND ADJUSTMENT

**Engine speed measurement unit**

- Warm engine adequately.
- Connect CONSULT to diagnosis connector on vehicle (attached to fuse block area). Turn ignition switch to ON.
- "DIAGNOSIS MODE SELECTION" is displayed.

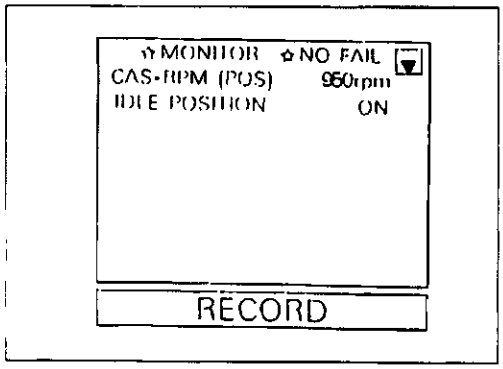
Note: Refer to section B3, 2, 2-2 (2) for details.

## 1. Idle Inspection and Adjustment (Cont'd)




- Connect the measurement unit to the speed detection terminal in the harness connected to the ignition coil from the power transistor.
- After the measurement is completed, always replace the terminal cap in the detection terminal.

**CAUTION:**
**Be sure to check the tachometer specifications because a 6V voltage is generated.**

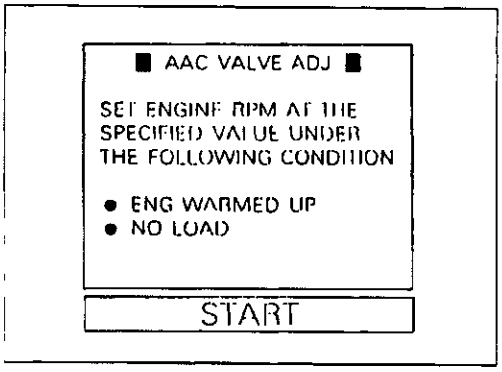



### Inspection

- Warm engine adequately.
- Make sure air conditioning load, power steering oil pump load and electrical loads are not applied.
- Check "IDLE POS" and "CAS - RPM -(POS)" in "DATA MONITOR" mode in CONSULT unit.
- Perform inspection using engine speed measurement.

Note: The measurement unit is limited because the speed output voltage is low (approx. 6V Vp-p).

**CAUTION:**
**Before inspection, make sure the throttle valve switch (idle connection point) is on when the accelerator pedal is not pressed.**



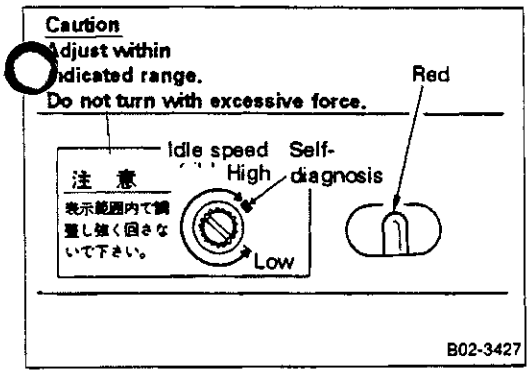

### Adjustment

The idle speed adjustment is basically not necessary because the rated value (control target value) is returned to the control unit. If adjustment becomes necessary, perform the following procedures:

① Select "AAC valve adjustment" in the "WORK SUPPORT" mode. Turn AAC valve assembly idle adjustment screw with a screwdriver until idle speed is 900 rpm.

② Return the "AAC VALVE ADJUSTMENT" screen to "DATA MONITOR" and check idle speed shown on screen meets the specification.

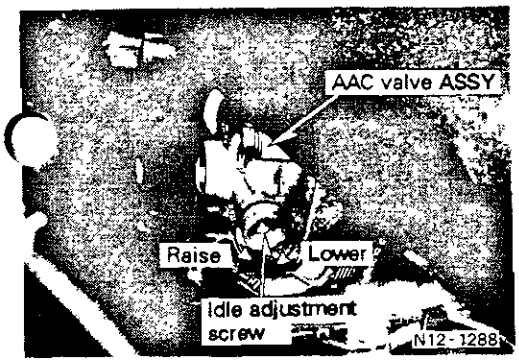
## 1. Idle Inspection and Adjustment (Cont'd)



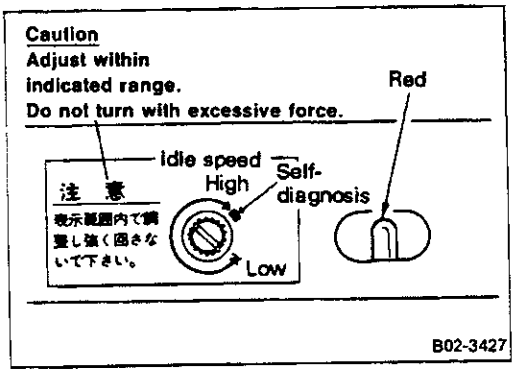

① Make sure ECCS control unit idle control adjustment volume is turned all the way to the left.

**CAUTION:**
**Never turn idle control speed adjustment volume with excessive force. The adjustment screw turning range is 3/4 of a turn.**


② Remove the 2-pin harness connector from the AAC valve to stop the idle speed feedback control. The AAC valve is completely closed at this time and the idle speed should be 900 rpm maximum under normal conditions.




③ Turn the AAC valve assembly idle adjustment screw with a screwdriver to adjust engine speed to 900 rpm.
④ Connect AAC valve harness connector. Make sure idle speed is maintained at specified value.
The engine speed increases when adjustment screw is turned to left (CCW) and decreases when turned to the right (CW).




⑤ If idle speed increases for any reason, turn idle control adjustment volume in ECCS control unit to adjust speed.
Idle adjustment volume increases engine speed when turned to right by a maximum 250 rpm.

**CAUTION:**
**The adjustment volume must be set 40° - 50° from the self-diagnosis position because idle speed is lowered (lowest rpm + 50 rpm) if it is turned all the way to the right (self-diagnosis position).**


### 1-2 IGNITION TIMING CHECK AND ADJUSTMENT

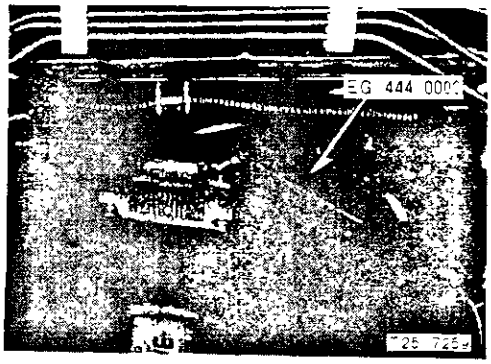
**Timing light connection**

**(1) When using "super tuner"**

- Connect super tuner to timing detection terminal.

**CAUTION:**
**After operation is completed, always attach terminal cap to timing detection terminal (check connector).**

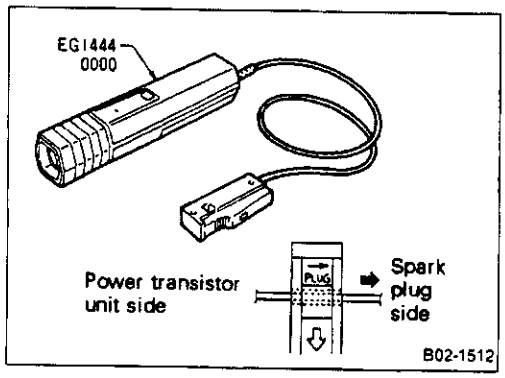
## 1. Idle Inspection and Adjustment (Cont'd)

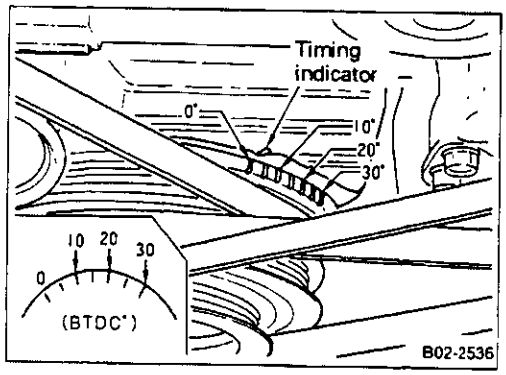



### (2) Using primary current detector timing light

- When using EG1444 0000, attach sensor to No. 1 cylinder primary line.
  (No. 1 cylinder primary line is looped because it is longer than other cylinder primary lines.)

**CAUTION:**
**When using EG1444 0000 (internal battery model), make sure that the sensor direction (arrow direction) faces spark plug when sensor is clipped to primary line.**
**(If primary line direction is not clear, measure with sensor connected in both directions. The correct installation direction is indicated when lower advanced angle value is obtained.)**

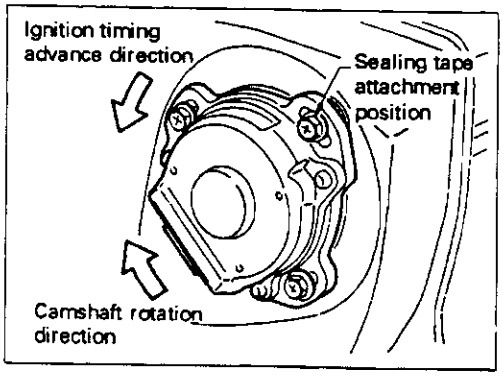



### Inspection

- Make sure idle speed is standard value.
- Make sure ignition timing at engine idle is at standard specification.
- Make sure ignition advances to correct advance angle when engine is raced.

**CAUTION:**
**The 0° timing mark on crank pulley is orange and other points are painted white.**




### Adjustment

Since there is no variation in ignition timing, over an extended time period, ignition timing adjustment is not necessary in principle. Adjust ignition timing when crank angle sensor is installed.

- Set ignition timing by adjusting crank angle sensor installation position.
- Make sure idle speed is standard.
- Loosen the three crank angle sensor mounting bolts and rotate crank angle sensor. Turn sensor to left to advance ignition timing.

## 1. Idle Inspection and Adjustment (Cont'd)

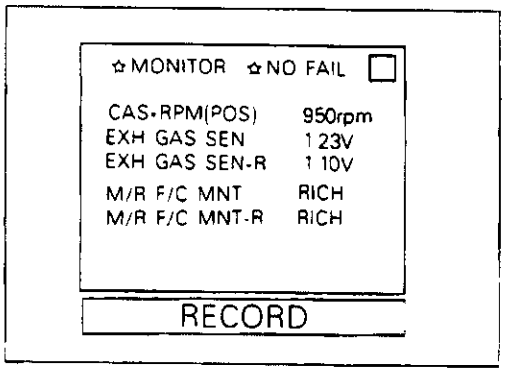
- After adjustment, attach sealing tape to one of the three bolts that secure crank angle sensor.

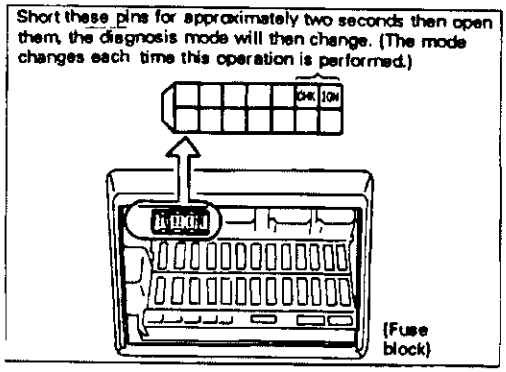
| | |
|---|---|
| Sealing tape part number | B2235 U7410 |

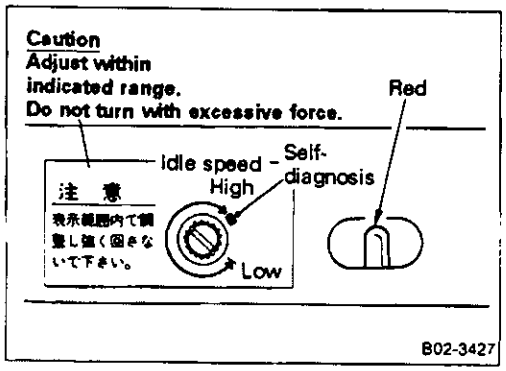
## 1. Idle Inspection and Adjustment (Cont'd)

### 1-3 CO, HC DENSITY INSPECTION

The air/fuel ratio feedback system which has a self-learning function is used and CO and HC density adjustment is not necessary because the correction range is wide.




### Inspection

- Warm up the engine adequately and make sure the idle speed and ignition timing are standard. Check CO, HC density with CO and HC meter.
- If values do not conform to standard perform the following procedures to inspect the air/fuel feedback condition:

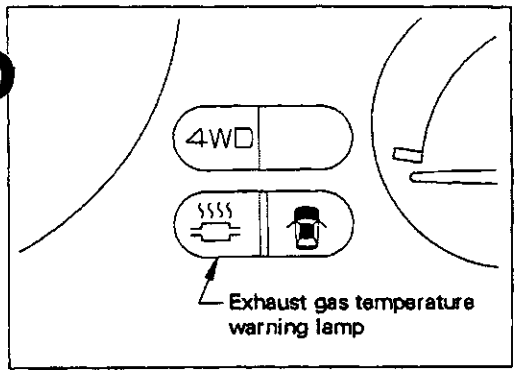
① In the data monitor mode, select "EXHAUST GAS SENSOR MONITOR" and "EXHAUST GAS SENSOR MONITOR (R)".

② Set the engine speed above 2,000 rpm and make sure "RICH" and "LEAN" are displayed alternately.

- Short-circuit the self-diagnosis connector on the vehicle side (near fuse box installation). Otherwise, remove ECCS control unit and operate adjustment volume on control unit side.

① Set the ignition switch "ON" and use a lead line to short-circuit the CHK pin and IGN pin of the diagnosis connector for more than two seconds to release the setting.
(Otherwise turn the ignition switch to "ON" and turn the adjustment volume on the side of the ECCS control unit to the right (CW) until it stops in the self diagnosis mode switching position Ⓑ for more than two seconds and then return it to the original position.)

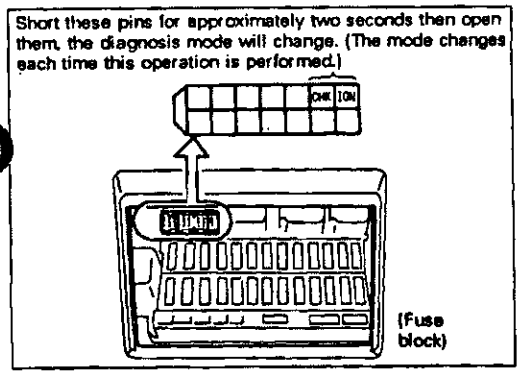
## 1. Idle Inspection and Adjustment (Cont'd)




② After warming up the engine adequately, raise the engine speed until the exhaust temperature warning lamp (or the red lamp on side of control unit) flashes (the flashing will start above approximately 2,000 rpm). The exhaust gas sensor output monitor (R) mode will be set.

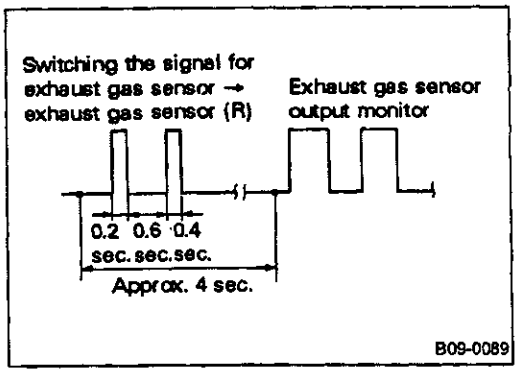
**CAUTION:**
**The accelerator pedal must be pressed intentionally during idling to perform the inspection because the air/fuel ratio feedback control is stopped.**

③ Make sure the exhaust gas temperature warning lamp or red lamp on the side of the control unit flashes in this condition.



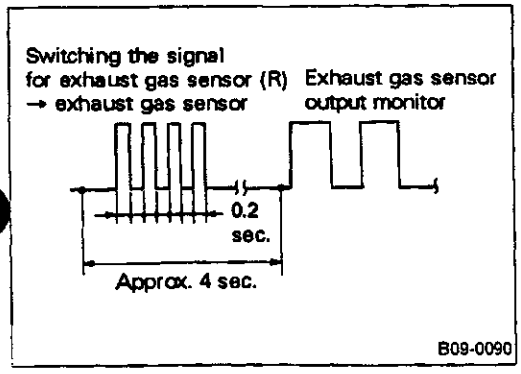

④ Use a lead to short the CHK pin and the IGN pin of the diagnosis connector for more than two seconds one more time to release the self-diagnosis mode. (Otherwise turn the adjustment volume of the ECCS control unit side to the right (CW) until it stops to select the self-diagnosis mode Ⓑ for more than two seconds and then return it to the original position).

Note: Refer to section (B3, 2, Diagnosis System) for explanation of air fuel feedback monitor.




### Exhaust gas sensor monitor mode switching display

① Set the ignition switch to "ON". Use a lead line to short CHK pin and IGN pin of diagnosis connector for more than two seconds to switch mode.
(Otherwise turn ignition switch to "ON" and turn adjustment volume on side of the ECCS control unit to the right (CW) until it stops at self-diagnosis mode switching position Ⓑ for more than two seconds and then return volume to original position.)




② After warming the engine adequately, raise the engine speed until the exhaust gas temperature warning lamp (or the red lamp on side of control unit) flashes (the flashing will start above approximately 2,000 rpm). The rear exhaust gas sensor output monitor mode will be set.

**CAUTION:**
**The accelerator pedal must be pressed intentionally during idling to perform the inspection because the air-fuel ratio feedback control is stopped.**

## 1. Idle Inspection and Adjustment (Cont'd)

③ Make sure the exhaust gas temperature warning lamp or red lamp on the side of the control unit flashes in this condition.

④ Short CHK pin and IGN pin of the diagnosis connector for more than two seconds one more time to release the mode. (Otherwise, turn the adjustment volume on side ECCS control unit to the right (CW) until it stops at self-diagnosis mode switching position Ⓑ for more than two seconds and then return volume to original position.) After the exhaust gas temperature warning lamp (or red lamp on control unit side) flashes two times, the mode switches to the front exhaust gas sensor output monitor mode.

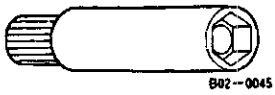
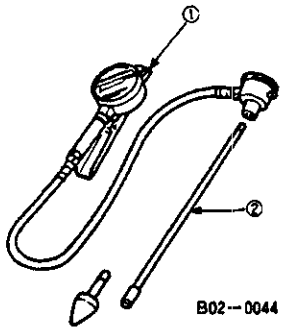
⑤ Make sure that the exhaust gas temperature warning lamp (or red lamp on side of control unit) flashes at about 2,000 rpm.

Note: Refer to section B3, 2, Self-diagnosis System for details about air/fuel ratio feedback monitor.

Note: When switching the exhaust gas sensor output monitor from the No. 1-3 cylinder bank to No. 4-6 cylinder bank, adjust the diagnosis connector (or control unit adjustment volume). The signal pattern is shown in the diagrams.

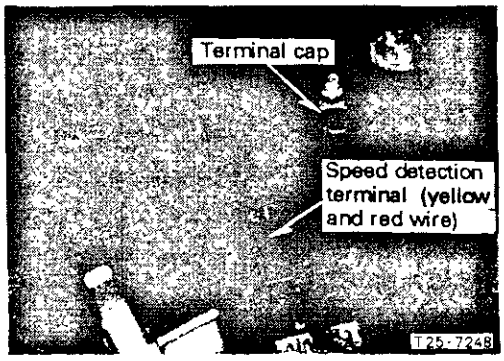
## 2. Compression Pressure Inspection

### Tools required

| | Name | | Application |
|---|---|---|---|
| Tool | Spark plug wrench<br>EG1740 1600<br>(or other regular spark plug wrench set) |  <br>B02--0045 | Removal and installation of small size hexagonal spark plug |
| Measurement tool | Engine speed measurement unit | | To check engine speed. |
| | ① Allen compression gauge<br>EG1505 0000 |  <br>B02--0044 | For engine compression pressure inspection. |
| | ② Compression gauge adaptor<br>EG1505 0101 | | |

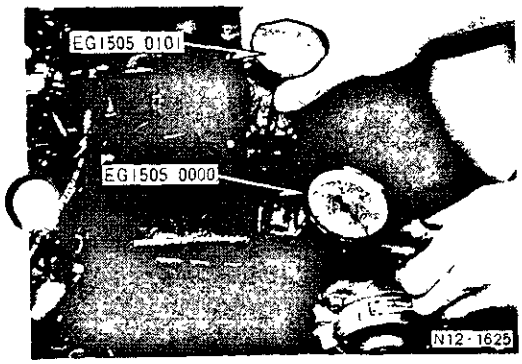
### Compression pressure standard values

| Item \ Engine | | RB26DETT |
|---|---|---|
| Standard value | kPa (kg/cm², psi)/rpm | 1,177 (12.0, 171)/300 |
| Limit value | kPa (kg/cm², psi)/rpm | 883 (9.0, 128)/300 |
| Compression variance limit between cylinders | kPa (kg/cm², psi)/rpm | 98 (1.0, 14)/300 |




#### Engine speed measurement unit installation

- Connect the engine speed measurement unit to the speed detection pin on the harness connected to the ignition coil from the power transistor.
- Always attach the terminal cap with rubber seal after measurement is completed.



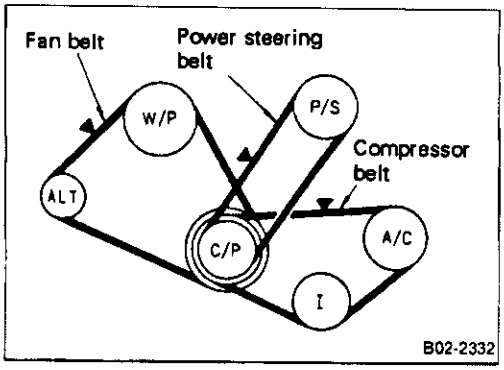

#### Compression gauge installation

- Warm up engine.
- Release fuel pressure.
  (Refer to "Releasing fuel pressure" section B2, 7-1.)
- Remove all spark plugs. (Refer to "SPARK PLUGS" section B2, 10-9.)
- Attach the adaptor to the Allen compression gauge and set it in a spark plug hole.

## 2. Compression Pressure Inspection (Cont'd)

### Inspection

- Press accelerator pedal all the way down. Turn ignition switch to "START" and crank the engine. When gauge needle stops moving read compression pressure and engine speed.
- When engine speed is out of specifications, check specific gravity of the battery and perform test again if battery is functioning properly.
- If the compression pressure is still not standard, inspect the components around the combustion chamber (valves, valves seat, hydraulic valve lifters, piston rings, cylinder bore, cylinder head, cylinder head gasket, etc.). Correct any malfunctions and repeat compression test.




## 3. Belt Tension Inspection and Adjustment

### Inspection

- The inspection should be performed when the engine is cold or more than thirty minutes after the engine is stopped.

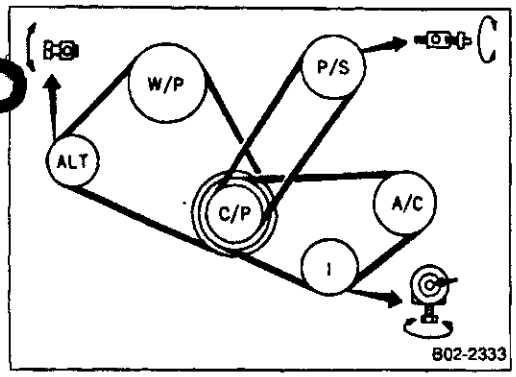
| Item / Part | Belt specification | Belt deflection mm (in) [When 98 N (10 kg, 22 lb) of force is applied at the "▼" position.] | | |
|---|---|---|---|---|
| | | New | Adjustment | Tension limit |
| Power steering belt | Poly-V low-maintenance belt | 8 - 10 (0.31 - 0.39) | 10 - 12 (0.39 - 0.47) | 16 (0.63) |
| Air conditioner compressor belt | Poly-V low-maintenance belt | 6 - 8 (0.24 - 0.31) | 7 - 9 (0.28 - 0.35) | 12 (0.47) |
| Fan belt | Poly-V low-maintenance belt | 3 - 5 (0.12 - 0.20) | 4 - 6 (0.16 - 0.24) | 7.5 (0.295) |

**CAUTION:**

**(1) When the belt is replaced with a new belt increase the tension slightly more than for the used belt to allow for wear-in of the new belt.**

**(2) When the belt deflection exceeds the limit, adjust to the "Adjustment" value.**

**(3) When the belt is installed, make sure pulley groove is aligned correctly.**




## 3. Belt Tension Inspection and Adjustment. (Cont'd)

### Adjustment

| Part \ Item | Adjustment position |
|---|---|
| Power steering belt | Adjustment bolt in power steering pump |
| Air conditioner compressor belt | Adjustment bolt in idler pulley |
| Fan belt | Adjustment bolt in alternator |

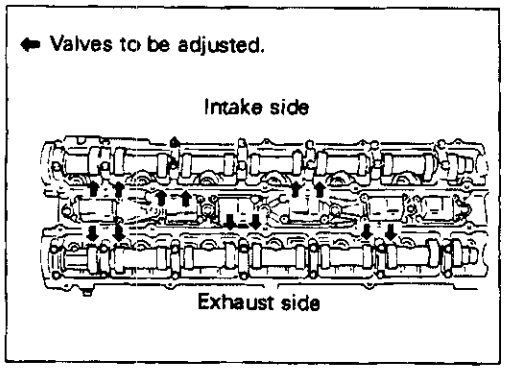
## 4. Valve Clearance Inspection and Adjustment

Additional work required:
Remove the following parts:

- Air duct
- Rocker cover (Refer to "SPARK PLUGS and ROCKER COVER REMOVAL AND INSTALLATION" section B2, 10-9, 10.)

### Inspection

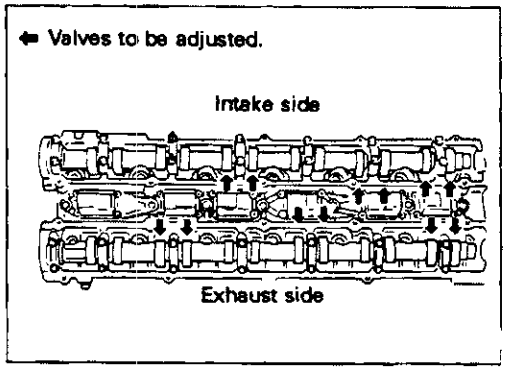
- Adjust valve clearance while engine is cold.
- Remove the air duct, ornaments and rocker cover.




- Turn crankshaft and align crankshaft pulley mark with belt cover indicator.
- No. 1 cylinder is at the compression stroke top dead center when both the intake and exhaust side cams do not move the valve lifters.

| Item \ Part | Valve clearance measurement |
|---|---|
| Intake side | Cylinder No. 1, 2, 4 |
| Exhaust side | Cylinder No. 1, 3, 5 |

Firing order: 1-5-3-6-2-4




- Turn crankshaft one revolution (360°) and align mark on crankshaft pulley with belt cover indicator. (No. 1 cylinder piston exhaust T.D.C.)

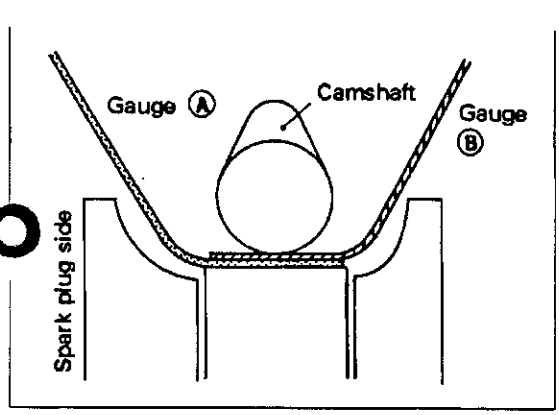
| Item \ Part | Valve clearance measurement |
|---|---|
| Intake side | Cylinder No. 3, 5, 6 |
| Exhaust side | Cylinder No. 2, 4, 6 |

### Valve clearance standard values

[20 ± 5°C (68 ± 9°F)]

| Item \ Part | | Intake | Exhaust |
|---|---|---|---|
| Valve clearance (cold) | mm (in) | 0.45 ± 0.03<br>(0.018 ± 0.001) | 0.38 ± 0.03<br>(0.015 ± 0.001) |
| (Reference value: warm) | mm (in) | 0.51 ± 0.03<br>(0.020 ± 0.001) | 0.44 ± 0.03<br>(0.017 ± 0.001) |

**CAUTION:**
**Always check valves when they are cold.**

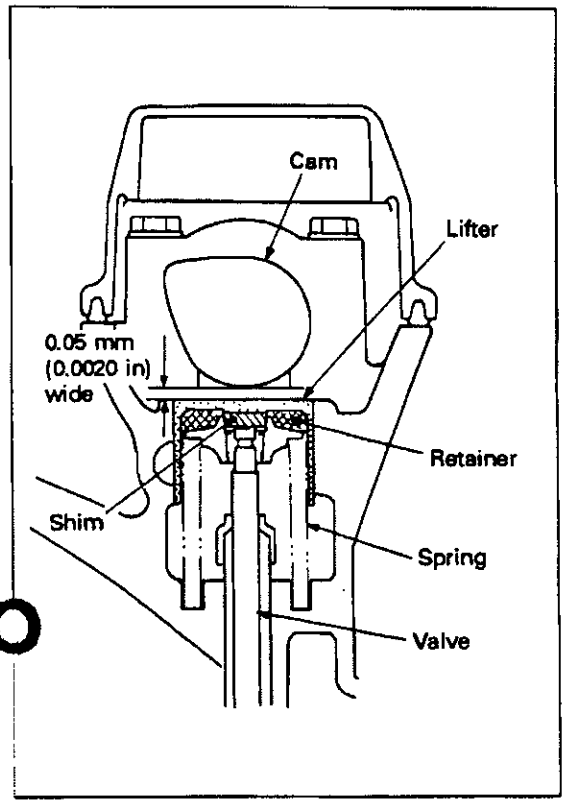



(Cont'd)

**Valve clearance measurement**

- Insert a 0.15 - 0.20 mm (0.0059 - 0.0079 in) feeler gauge Ⓐ from spark plug side.
- Insert feeler gauges Ⓑ from opposite side. Select a gauge thickness that will reduce the clearance to 0 mm (0 in).

Note:
- Do not use more than two gauges for Ⓑ.
- The feeler gauge must conform to JIS (Japanese Industrial Standard) 150A25.




- Valve clearance = gauge Ⓐ + gauge Ⓑ

Reasons for measurement using gauges Ⓐ and Ⓑ:
① The valve clearance setting is larger compared to previous engines.
② Larger gauges cannot be placed parallel to the measurement surface.

- Thick feeler gauge blades have a high rigidity and do not bend easily, so the measurement will be incorrect.
- The error factor increases if a number of thin gauges are layered and the measurement will be incorrect.

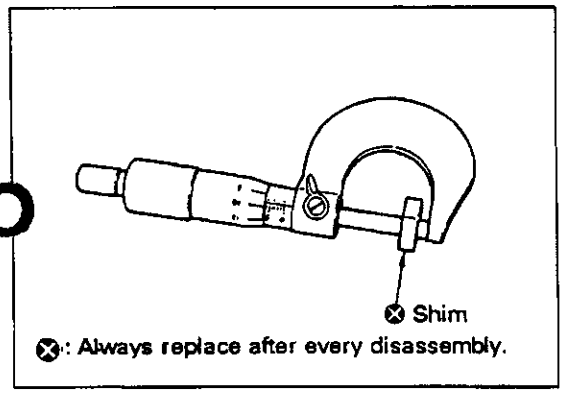
**Valve clearance adjustment**

- The valve clearance adjustment is performed by selecting and inserting a shim of suitable thickness.
- When the measurement valve clearance (t) is out of specification, measure the shim thickness (T) and replace it with a shim that will produce the standard clearance.

**① Shim thickness calculation method**

Example: When the intake valve clearance (t) is 0.50 mm (0.020 in):
0.50 (t) – 0.45 (specified value) = 0.05 mm (0.0020 in)

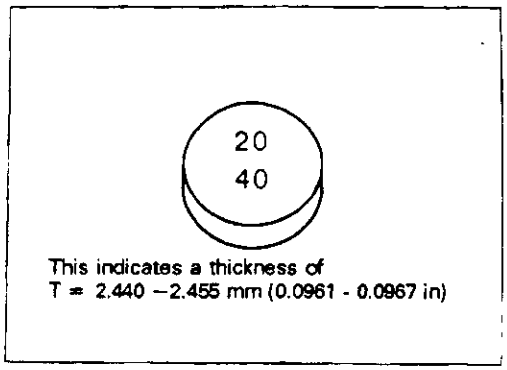
- The valve clearance is 0.05 mm (0.0020 in) greater than specified value.
- Use a shim which is 0.05 mm (0.0020 in) thicker than the current shim to reduce the valve clearance.




**② Current shim thickness (T) calculation method**

- Measure the center of removed shim to determine thickness.

**CAUTION:**
**Do not use measured shims again.**



This indicates a thickness of
T = 2.440 −2.455 mm (0.0961 - 0.0967 in)

## 4. Valve Clearance Inspection and Adjustment (Cont'd)

### ③ Shim selection

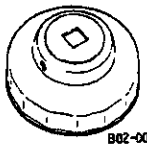
- Removed shim thickness (T) is 2.40 mm (0.0945 in).
  2.40 (T) mm (0.0945 in) + 0.05 mm (0.0020 in) = 2.450 → selection shim thickness
- Select new shim with stamped mark [$^{24}_{40}$] (T = 2.440 – 2.455).

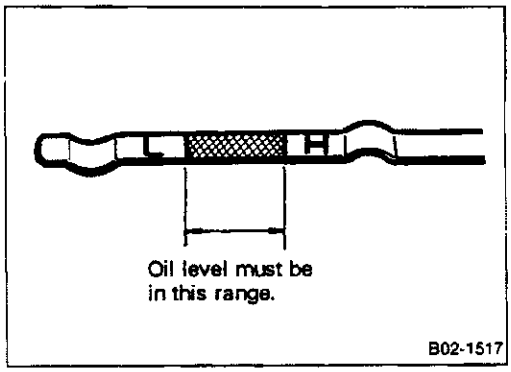
**CAUTION:**
**Select a shim which is within standard value range ±0.03 mm (±0.0012 in).**

### ④ Shim types and classification

- There are 70 types of shims
  The shim sizes range from 2.275 mm (0.0896 in) to 3.325 mm (0.1309 in) in 0.015 mm (0.0006 in) increments.
- After the camshaft is installed, measure valve clearance again and make sure clearance conforms to standard value.

## 5. Lubrication System Inspection

| | Name | | Application |
|---|---|---|---|
| Special tool | Oil filter wrench<br>KV101 062S0 |  <br>B02-0038 | Oil filter removal and installation |
| Measurement tool | Oil pressure gauge | | Used for oil pressure measurement |




### 5-1 LUBRICATION OIL LEVEL INSPECTION

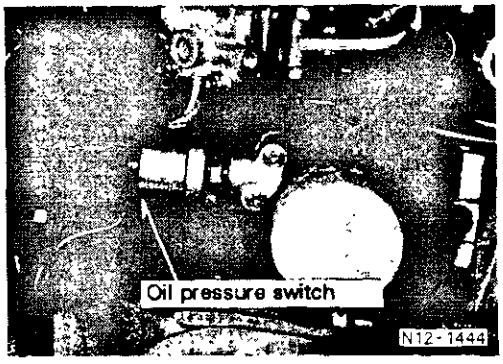
#### Inspection

- The engine oil level should be checked before starting the engine. If the engine has been started, perform the measurement ten minutes after the engine has cooled.
- The oil level should be between the H and L lines on the dipstick.
- The oil must not have any white turbidity or dirt.

| | | |
|---|---|---|
| Replacement interval | RB26DETT | Use SD, SE, SF or SG class oil.<br>Change oil every 5,000 km (3,000 miles) or 6 months. |

Note: Use genuine Nissan [Turbo X (7.5W-30)] for service.

| Item \ Engine | RB26DETT | |
|---|---|---|
| Oil level ℓ (Imp qt) | H | 4.5 (4) |
| | L | 3.5 (3-1/8) |
| Oil supplement volume when replaced ℓ (Imp qt) | Only oil replacement | Approx. 4.2 (3-3/4) |
| | Oil and oil filter replacement | Approx. 4.6 (4) |




### 5-2 OIL PRESSURE INSPECTION

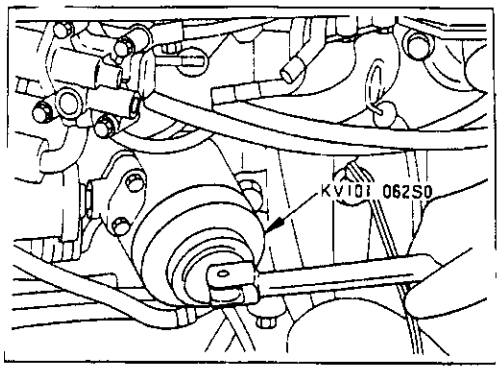
#### Inspection

- Remove the oil pressure switch and connect oil pressure gauge.
- After warming engine, make sure the pressure is appropriate for engine speed.

| Engine speed (rpm) | 800 | 2,000 | 6,000 |
|---|---|---|---|
| Outlet pressure kPa (kg/cm², psi) | Approx. 147 (1.5, 21) | Approx. 294 (3, 43) | Approx. 451 (4.6, 65) |

[Oil temperature: 80°C (176°F)]

## 5. Lubrication System Inspection (Cont'd)




### 5-3 OIL FILTER REPLACEMENT

Refer to "OIL COOLER, OIL FILTER REMOVAL AND INSTALLATION" section B2, 10-15.)

**Removal**

- Use oil filter wrench (special service tool) to remove filter.

**CAUTION:**
**Catch any dripping oil in a rag when removing the filter.**

**Installation**

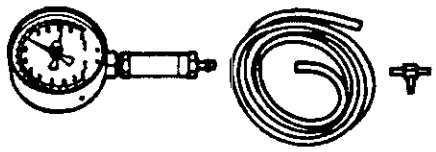
- Before installing new oil filter, clean the oil filter bracket mounting surface on cylinder block and coat the oil filter seal lips lightly with engine oil.
- Screw in the oil filter by hand until a slight resistance is felt and then tighten an additional 2/3 turn.

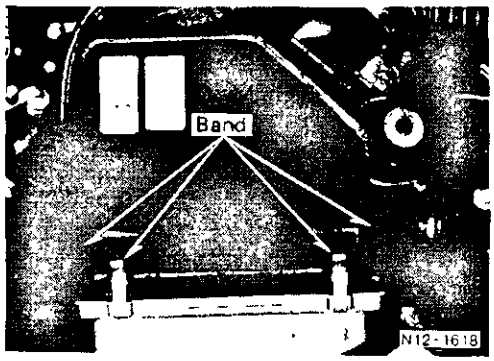
**CAUTION:**
**Start engine and check area around drain plug and oil filter for oil leakage.**

| | | |
|---|---|---|
| Periodic exchange interval | RB26DETT | Use SD, SE, SF or SG class oil. Change oil every 10,000 km (6,000 miles) or 1 year. |

## 6. Exhaust System Inspection

**Tools required**

| | Name | | Application |
|---|---|---|---|
| Measurement tool | Compound gauge EG1508 0001 |  B02—1518 | Used to check turbocharger for excess pressure. |



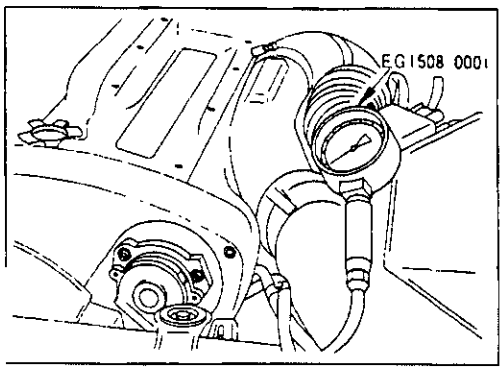

### 6-1 AIR CLEANER ELEMENT INSPECTION

**Inspection**

Remove parts from vehicle.

- Refer to Section 10-2, AIR CLEANER ELEMENT INSTALLATION.
- There should be no excessive dirt or damage in the air cleaner element.

| | | |
|---|---|---|
| RB26DETT | Periodic exchange interval | every 60,000 km (36,000 miles) |




### 6-2 TURBOCHARGER INSPECTION

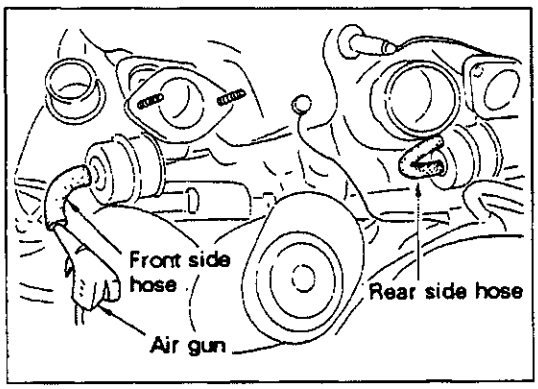
**Function inspection**

- Remove the intake manifold canister hose, and place a cap on the hose. Connect test hose to intake manifold and attach pressure gauge (compound gauge).
- When engine operation test is performed, check that pressure does not rise above approximately 78 to 88 kPa (0.8 to 0.9 kg/cm$^2$, 11 to 13 psi).

## 6. Exhaust System Inspection (Cont'd)

a. When the pressure does not reach specified level:
   - Check for vacuum leak in intake or exhaust system or exhaust gas leak.

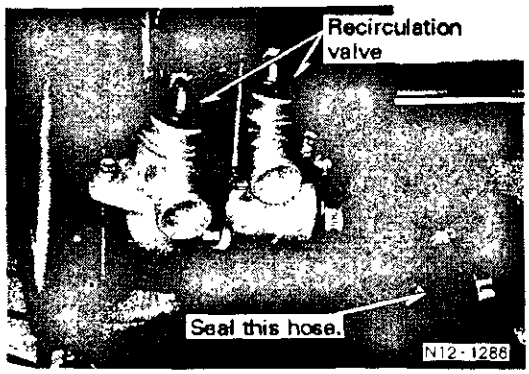
b. When the pressure exceeds the maximum pressure level (approx. 78 to 88 kPa (0.8 to 0.9 kg/cm$^2$, 11 to 13 psi):
   - Check if swing valve controller rubber hose is disconnected or cut.
   - Check if swing valve controller motion malfunctions (stays closed).




### Swing valve controller inspection

- Remove the swing valve controller rubber hose from the vacuum tube side.
- When compressed air [approx. 69 to 78 kPa (0.7 to 0.8 kg/cm$^2$, 10 to 11 psi)] is forced into the hose by an air gun, the control rod must start operation. Stop blowing compressed air into the hose as soon as control rod operation is verified.

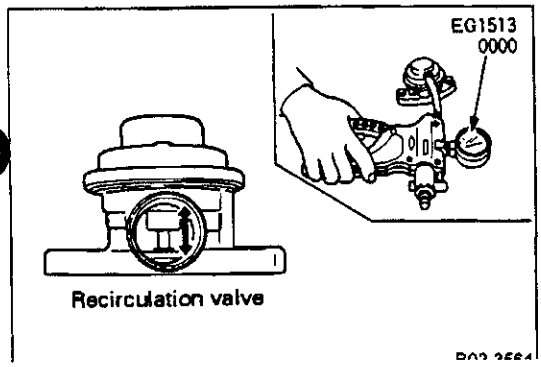
**CAUTION:**
**The diaphragm may be damaged if excessive air pressure is applied. Use the LPG pressure gauge (special service tool for [98 kPa (1 kg/cm$^2$, 14 psi)]) to verify that the air gun pressure is approx. 78 to 88 kPa (0.8 to 0.9 kg/cm$^2$, 11 to 13 psi) before testing the air hose.**




## 6-3 RECIRCULATION VALVE INSPECTION

### Function inspection

- Remove hose on upper flow side of recirculation valve compressor (cover end of hose with cap) and check if air blows back when throttle is closed quickly.

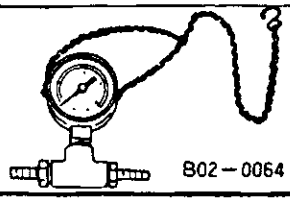


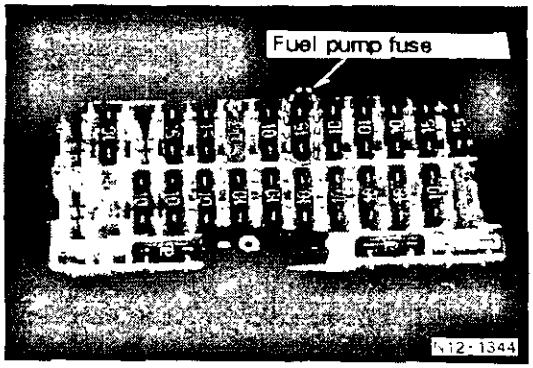

### Unit inspection

- Use a hand vacuum pump to create negative pressure [−20.0 ± 4.0 kPa (−150 ± 30 mmHg, −5.91 ± 1.18 inHg)]. The recirculation valve diaphragm must start to lift and the vacuum pressure must be maintained.

# 7. Fuel System Inspection

## Tools required

| | Item | | Application |
|---|---|---|---|
| Measurement tool | EGI fuel pressure meter ST1959 0000 |  B02—0064 | Fuel pressure measurement |

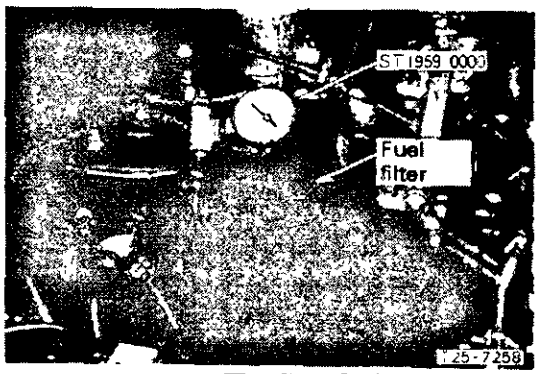


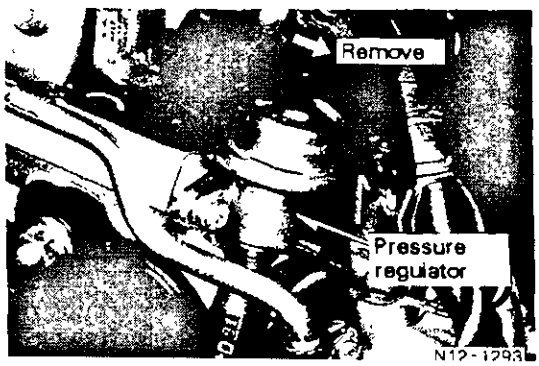

## 7-1 FUEL PRESSURE INSPECTION

### Releasing fuel pressure

- After starting engine, remove fuel pump fuse. After the engine stops, crank the engine over two or three times and the fuel in the pipe will be consumed.
- If the engine does not start, remove the pump fuse and crank the engine three to four times to consume the fuel in fuel lines.

**CAUTION:**
**The battery may become weak easily, so use booster cables to connect it to another vehicle or charged battery if necessary.**




### Fuel pressure meter installation

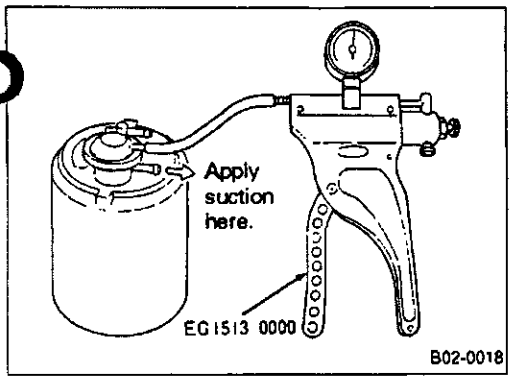
- Connect the fuel pressure meter between fuel filter and fuel line.
- Attach fuel pump fuse.

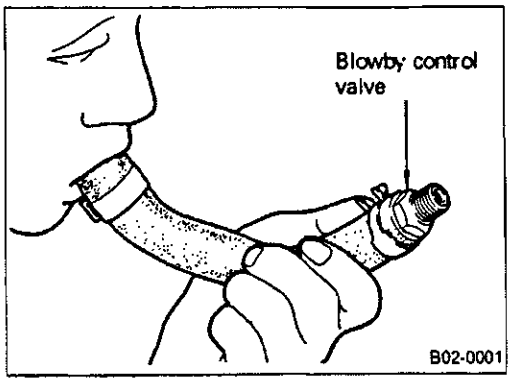
### Fuel pressure inspection

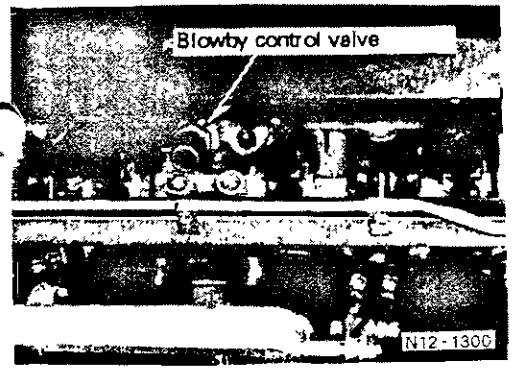
- Start engine and check if the fuel pressure is standard value.
- If the engine does not start, check fuel pressure after 5 seconds when the ignition switch has been turned ON.

### Fuel pressure measurement

| | | |
|---|---|---|
| When ignition switch is ON | kPa (kg/cm², psi) | Approx. 294 (3.0, 43) |
| During idling | kPa (kg/cm², psi) | Approx. 245 (2.5, 36) |
| Idling when pressure regulator vacuum hose is removed. | kPa (kg/cm², psi) | Approx. 294 (3.0, 43) |




## 8. Evaporative Gas Control System Inspection

### 8-1 PURGE CONTROL VALVE INSPECTION

**Inspection**

- Use a hand vacuum pump to apply approximately –53.3 kPa (–400 mmHg, –15.75 inHg) and make sure vacuum pressure is maintained.
- In the preceding condition, check that a small amount of air can be sucked from the manifold vacuum path.

## 9. Blowby Gas Reduction Equipment Inspection

### 9-1 BLOWBY CONTROL VALVE INSPECTION

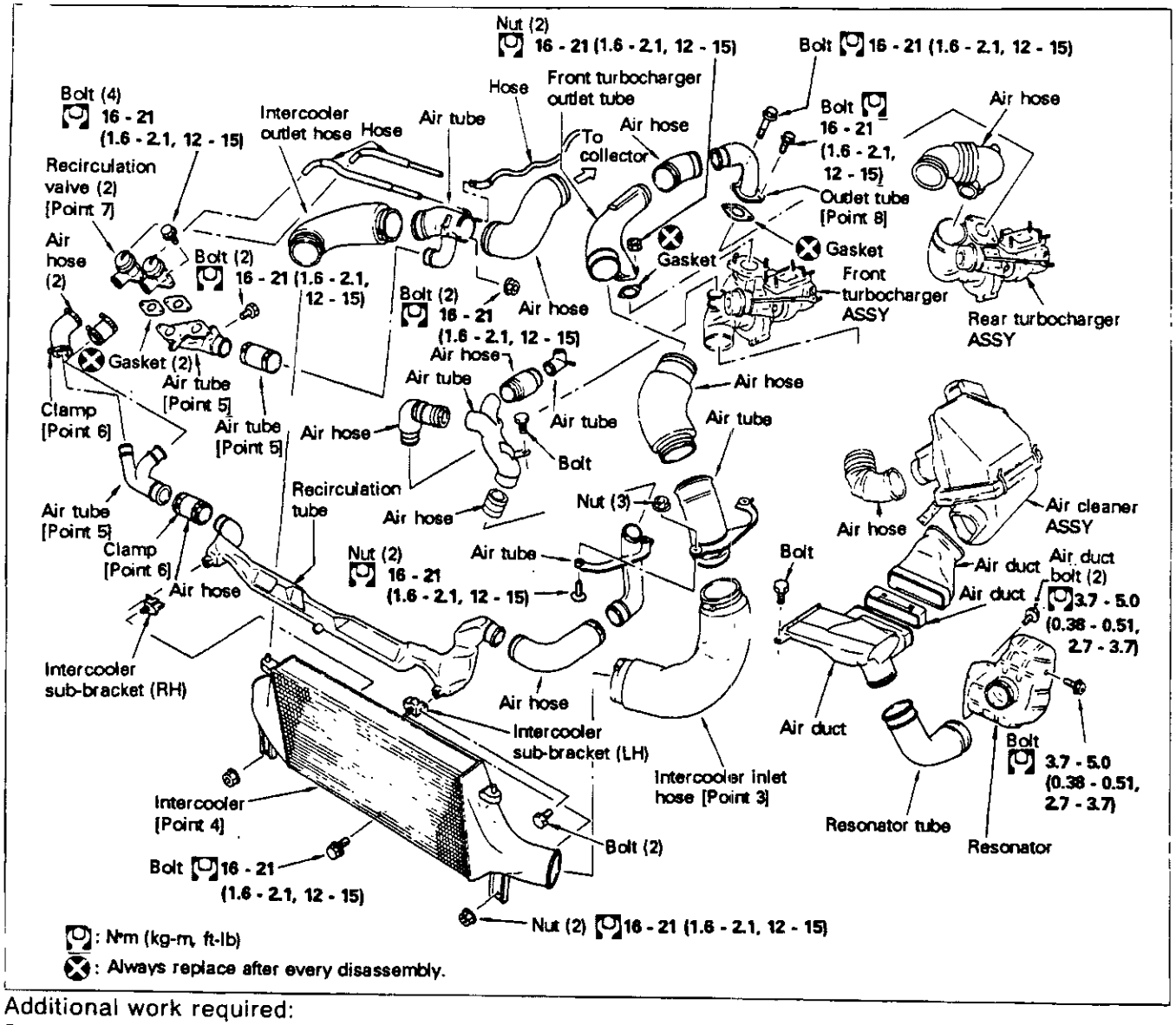
**Inspection**

- Check the blowby control valve flow path.

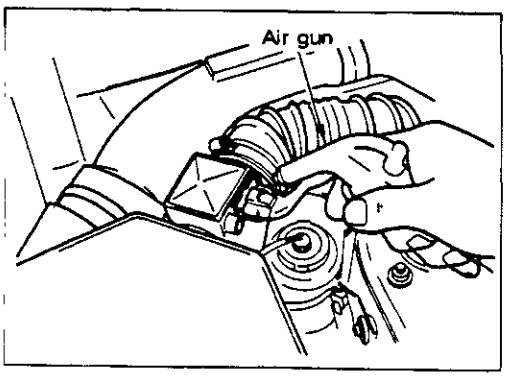
| | Condition |
|---|---|
| Air is blown. | Air passes. |
| Air is drawn in. | No air passes. |

## 10. Removal and Installation of On-vehicle Parts

### 10-1 INTERCOOLER AIR DUCT ASSEMBLY



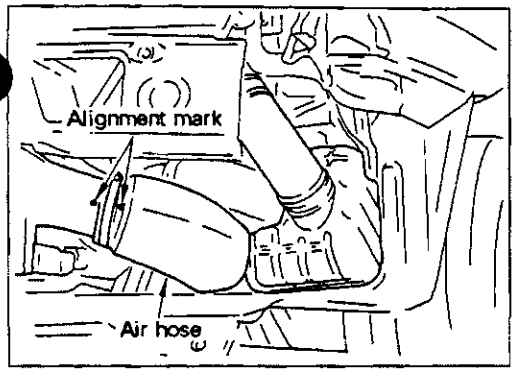

Additional work required:
Remove undercover.
Remove front bumper. (Refer to Section D1-1, Body.)




**[Point 1] Air hose, air duct cleaning**

- Before removing each air hose and air duct, blow off any dirt or dust with an air gun.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



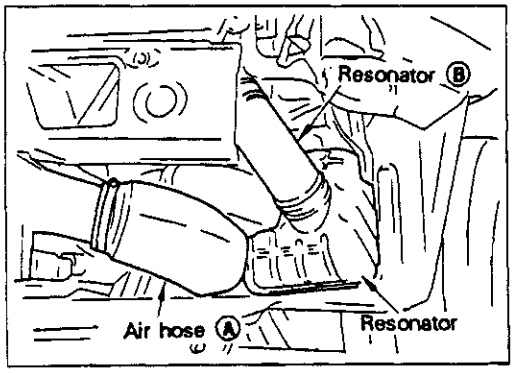

**[Point 2] Remove and install each air hose and tube.**

**Removal**

- Draw alignment marks before removing air hoses and tubes.

**Installation**

- Position air hoses and tubes so the alignment marks coincide. Insert [approximately 30 mm (1.18 in)] hose or tube and tighten clamps securely .



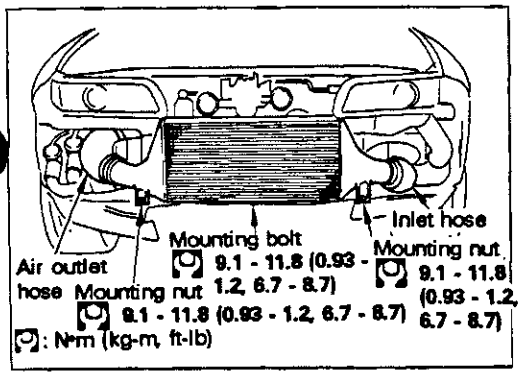

**[Point 3] Remove and install the intercooler inlet hose.**

**Removal**

- Remove the resonator and tube Ⓑ before removing hose Ⓐ.

**Installation**

- Attach hose Ⓐ, then combine resonator and tube Ⓑ as a single unit and install.




**[Point 4] Remove and install intercooler.**

**Removal**

① Remove the bumper finisher and bumper reinforcement. (Refer to Section D Body for details.)
② Separate the intercooler inlet and outlet hoses.
③ Remove the mounting bolt and two nuts. Detach intercooler without scratching the fins .

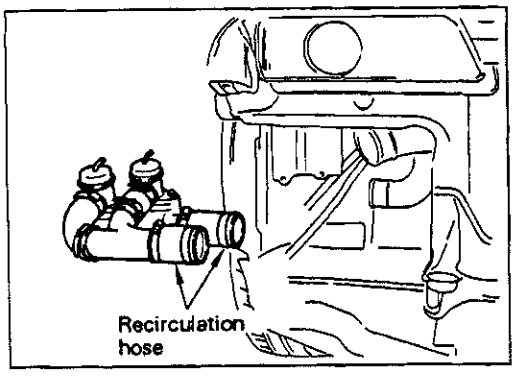
**CAUTION:**

**(1) The fins are aluminum and can be damaged easily. Never place anything on the intercooler or allow tools or other hard objects to contact the fins.**
**(2) The main unit (tank, fins, tube) cannot be disassembled.**

**Installation**

- Assembly is the reverse of disassembly. Perform steps in the sequence ③, ②, ①.

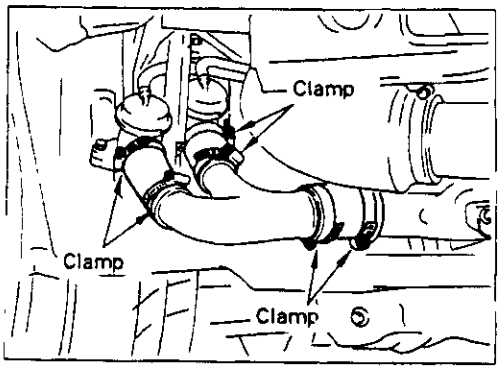
**Tightening torque**
**9.1 - 11.8 N·m (0.93 - 1.2 kg-m, 6.7 - 8.7 ft-lb)**




**[Point 5] Recirculation hose removal and installation**

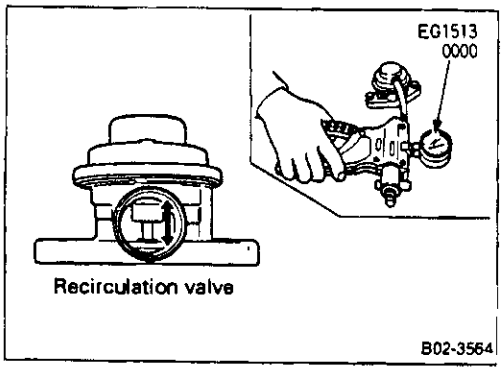
- Remove and install the recirculation hose and tube as shown in the figure on the left.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)




**[Point 6] Recirculation hose clamp installation**

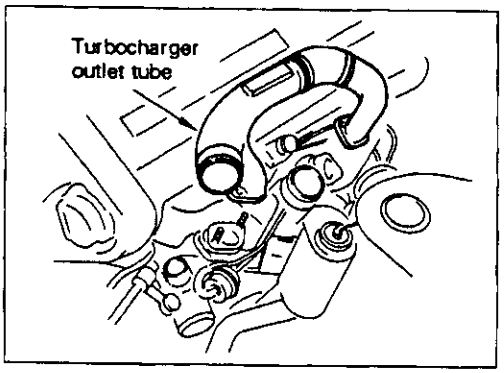
- When the recirculation hose clamp is installed, it must not contact the bumper finisher.




**[Point 7] Recirculation valve inspection**

**Unit inspection**

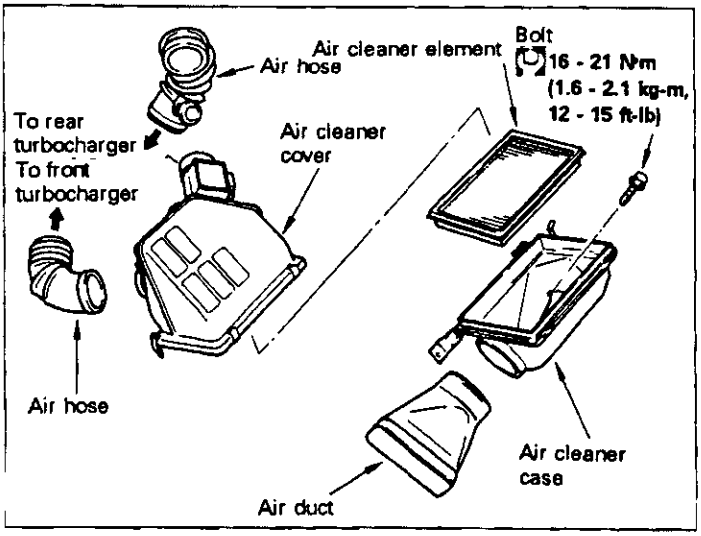
- Use a hand vacuum pump to apply a vacuum [−20.0 ± 2.7 kPa (−150 ± 20 mmHg, −5.91 ± 0.79 inHg)] and check that recirculation valve diaphragm lifts and vacuum pressure is maintained.




**[Point 8] Turbocharger outlet tube removal and installation**

- Remove and install turbocharger outlet tube as shown in figure on left.

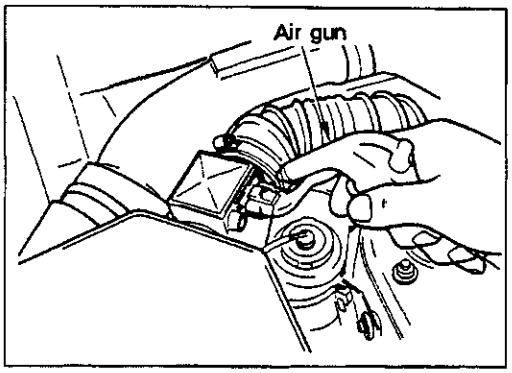
### 10-2 AIR CLEANER ELEMENT




**Additional work required:**

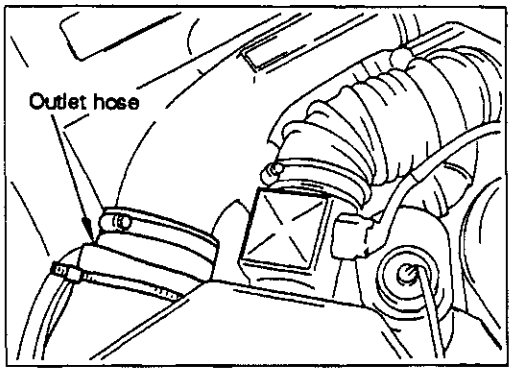
Remove turbocharger outlet hose. [Point 2]

## 10. Removal and Installation of On-vehicle Parts (Cont'd)




**[Point 1] Air hose and air duct cleaning**

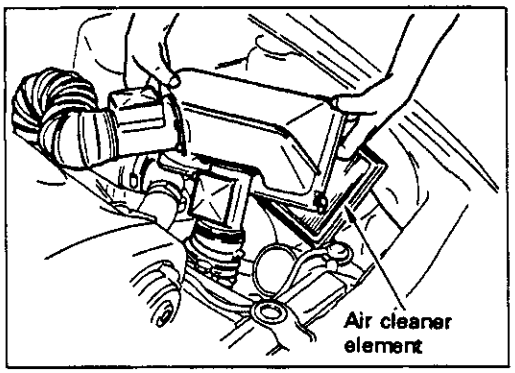
- Use an air gun to blow off any dirt or dust before removing the air cleaner element.




**[Point 2] Air cleaner element removal and installation**

**Removal**

① Remove turbocharger outlet hose.




② Remove the four band clips from air cleaner. Lift air cleaner cover and remove air cleaner element.

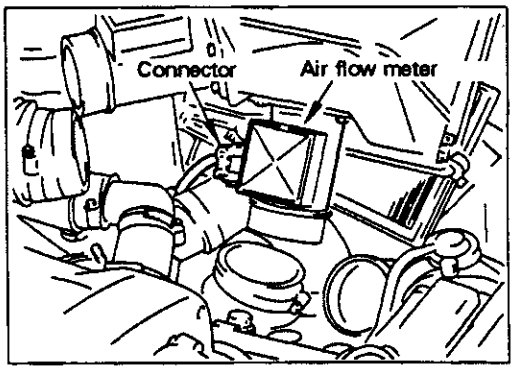
**Installation**

- Install in reverse order of removal.

**[Point 3] Air cleaner element inspection**

- Air cleaner element must not be dirty or damaged.

  **Periodic replacement interval:**
  **Every 60,000 km (36,000 miles)**



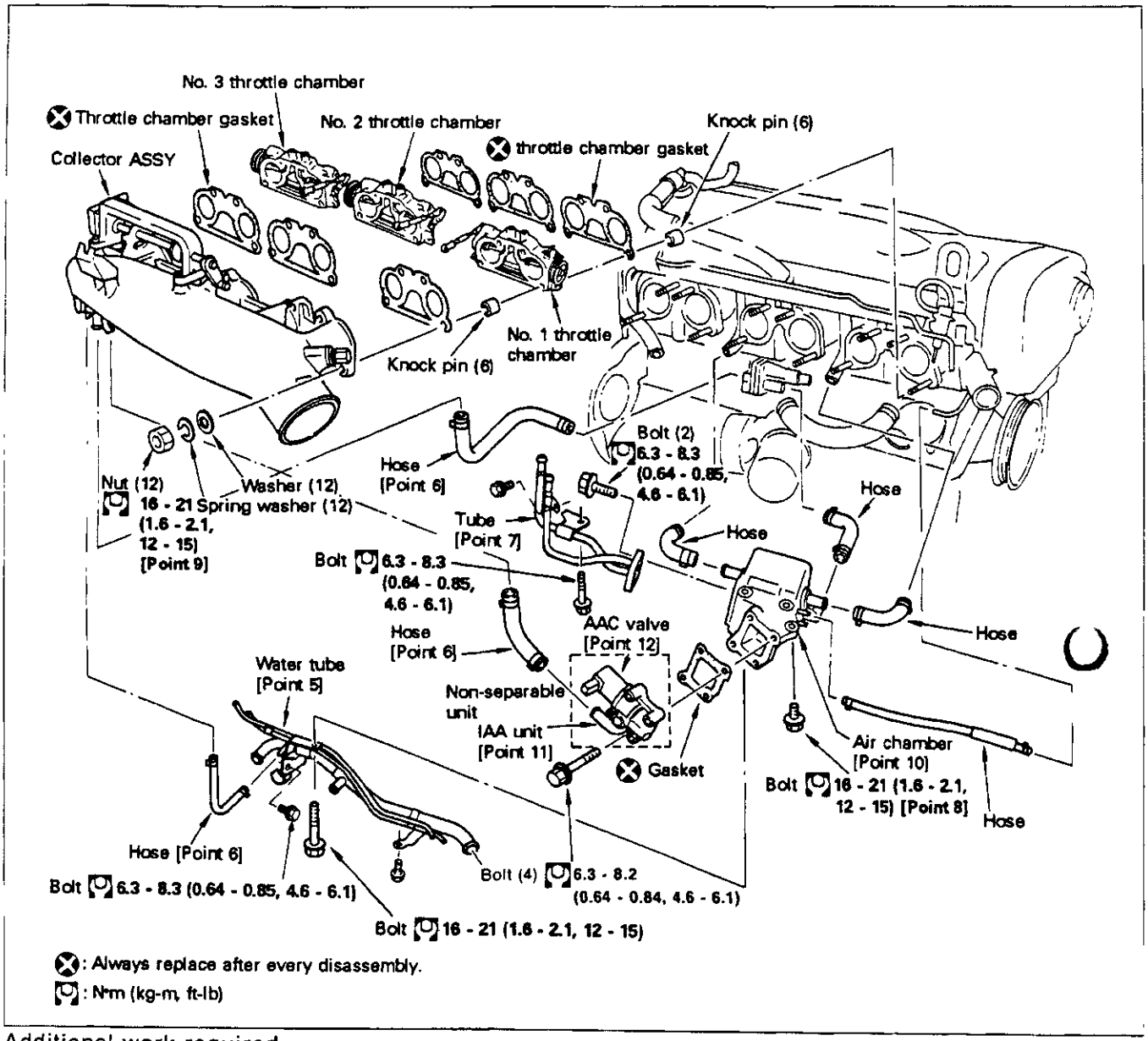

**[Point 4] Air cleaner cover installation**

- First connect air flow meter connector for front turbocharger and then install air cleaner cover.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### 10-3 COLLECTOR ASSY

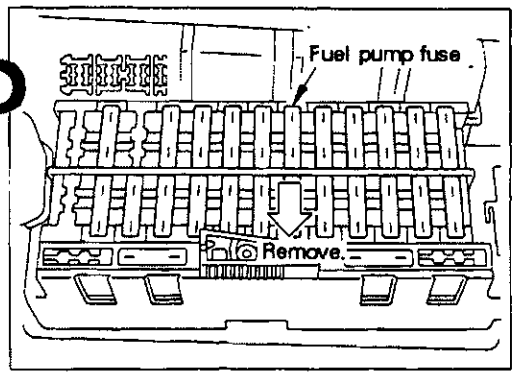
### (1) Collector ASSY removal and installation




Additional work required

- Drain and refill cooling water. [Point 2]
- Release fuel pressure in the fuel lines. [Point 1]
- Acceleration control wire [Point 3]
- Air inlet hose
- EGI harness connector, harness clamp
- All hoses

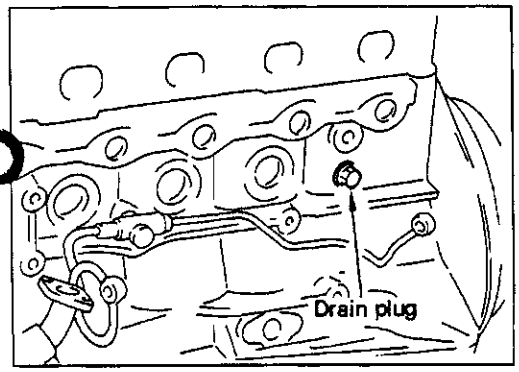
## 10. Removal and Installation of On-vehicle Parts (Cont'd)




### [Point 1] Release fuel pressure

- Start the engine.
- After engine starts, remove fuel pump fuse and wait until engine stops. Crank engine two or three times to use up fuel remaining in fuel lines.
- If the vehicle will not start, remove the fuel pump fuse, crank the engine 4 to 5 times to use up fuel in fuel lines.

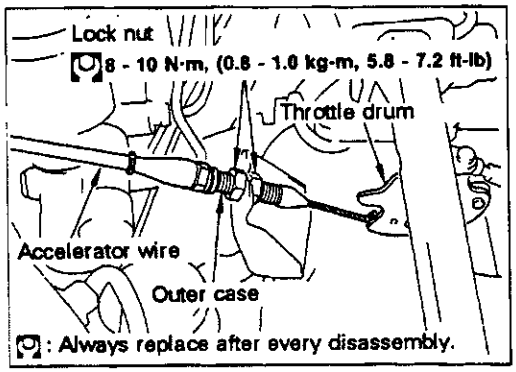
**CAUTION:**
**Connect the battery with booster cables to a battery in another vehicle or charged battery since the battery may drain easily.**




### [Point 2] Drain the cooling water.

- Remove drain plug from cylinder block to drain all coolant from block.

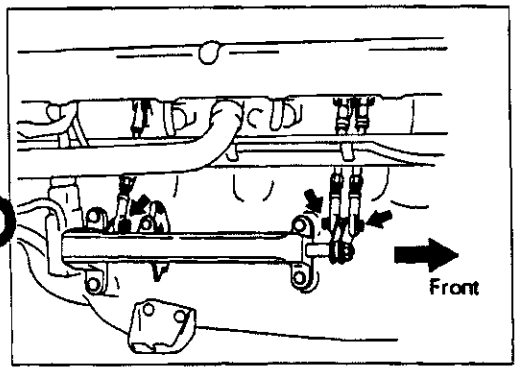
**CAUTION:**
**Make sure coolant does not fall on front exhaust pipe.**




### [Point 3] Accelerator wire adjustment

- Loosen lock nut to provide adequate slack for the accelerator wire and pull outer case in the direction of the accelerator. Return lock nut 1.0 to 1.5 turns from the position the throttle drum starts moving (when there is no play in cable) and tighten.

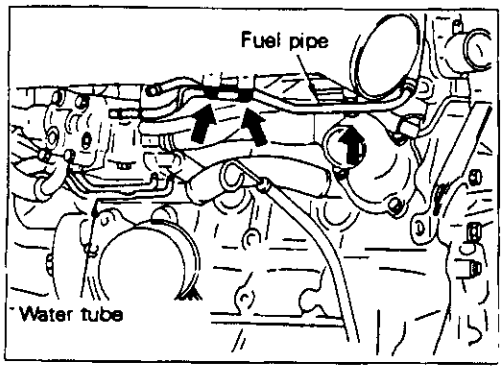
  **Tightening torque:**
  **8 - 10 N·m (0.8 - 1.0 kg-m, 5.8 - 7.2 ft-lb)**




### [Point 4] Remove throttle chamber linkage.

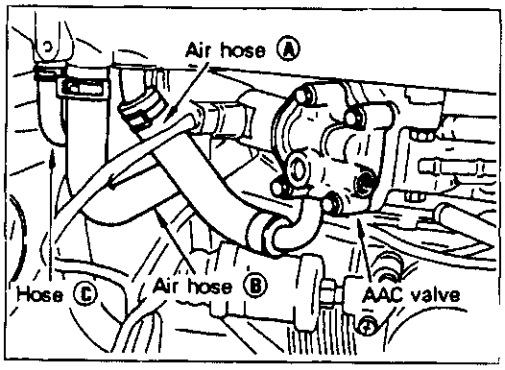
- Remove mounting nuts indicated by arrow marks. Separate the three throttle chamber links from collector side.
- Remove harness from throttle sensor and throttle valve switch.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



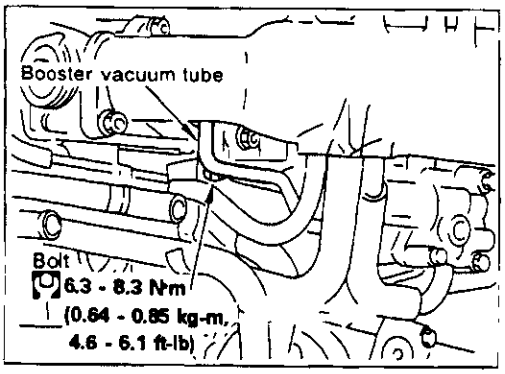

### [Point 5] Fuel pipe removal

- Remove the three bolts indicated by the arrows and separate the fuel pipe.



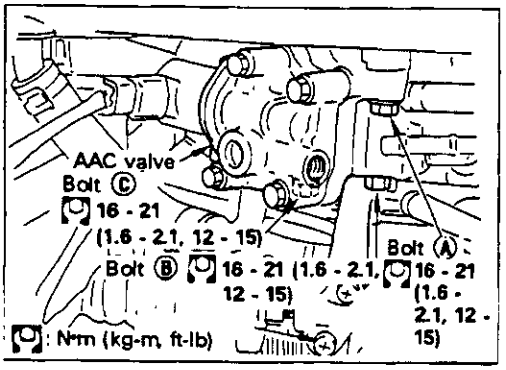

### [Point 6] Air hose removal

- Separate air hoses Ⓐ, Ⓑ and Ⓒ from the collector side.




### [Point 7] Booster vacuum tube removal

- Remove the clamp bolts, separate booster vacuum tube from collector and air chamber and remove tube.




### [Point 8] Air chamber bolts removal and installation

**Removal**

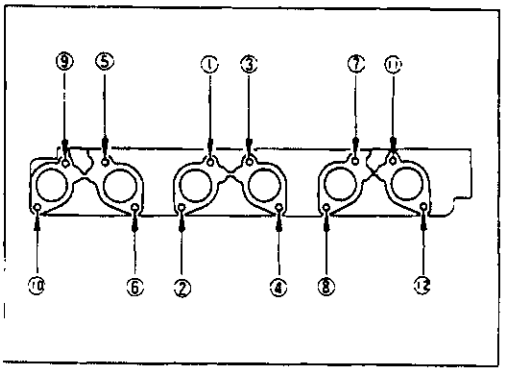
- Remove the three bolts and separate air chamber.

**Installation**

- Insert bolt Ⓑ in air chamber bolt hole, before performing final assembly.

**Tightening torque:**

**16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)**




### [Point 9] Collector nut removal and installation

**Removal**

- Remove the nuts in the reverse order of the figure on the left.

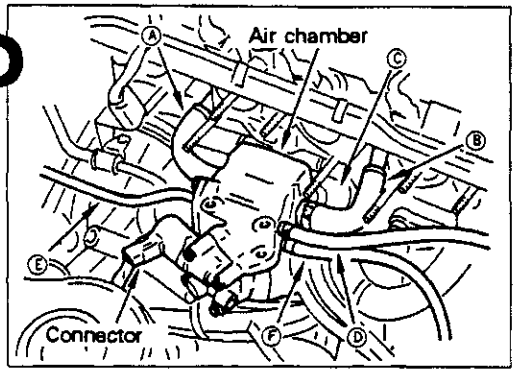
**Installation**

- Tighten nuts in order shown in figure on left uniformly in two to three stages.

**Tightening torque:**

**16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)**

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



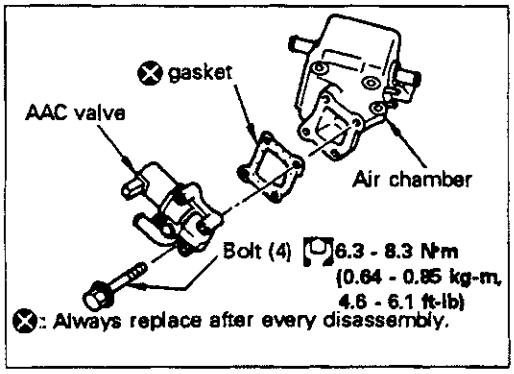

### [Point 10] Air chamber removal and installation

#### Removal

- Separate air hoses Ⓐ, Ⓑ, Ⓒ, vacuum hoses Ⓓ, Ⓕ and AAC valve connector and remove air chamber.

#### Installation

- Position air chamber in place, connect air hoses Ⓒ, Ⓑ, Ⓐ, vacuum hoses Ⓕ, Ⓔ, then connect AAC valve connector.




### [Point 11] AAC valve removal and installation

#### Removal

- Remove the four bolts and detach AAC valve.

**CAUTION:**

**(1) The AAC valve cannot be disassembled.**

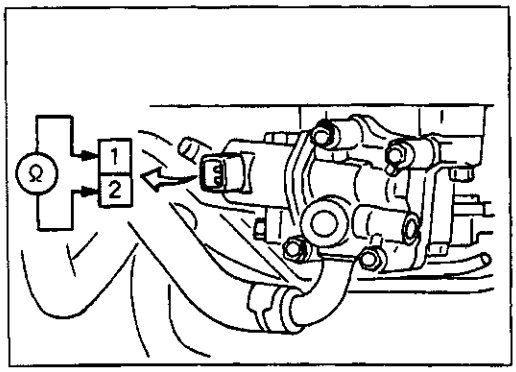
**(2) Replace gasket with a new one.**

#### Installation

- Install gasket and AAC valve.

  **Tightening torque:**

  **6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 4.6 - 6.1 ft-lb)**




### [Point 12] AAC valve inspection

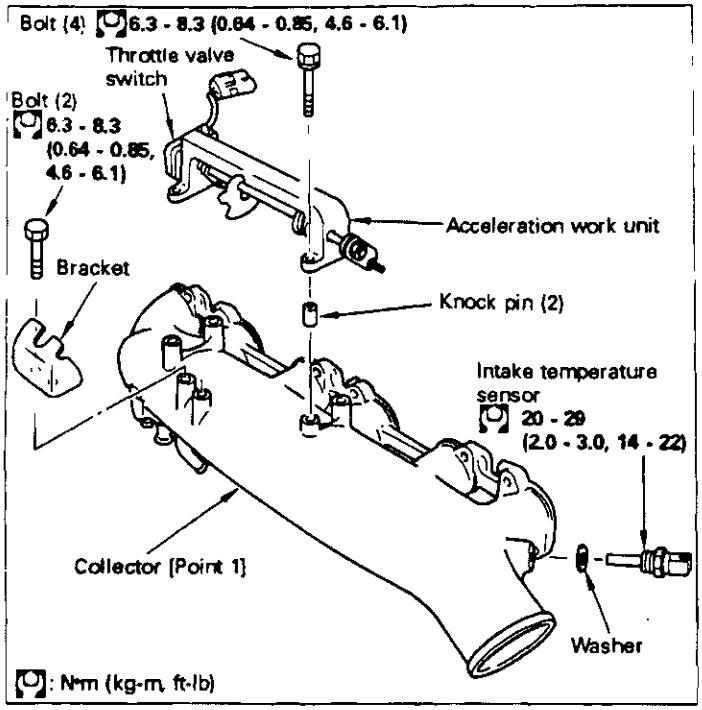
- Measure the AAC valve resistance.

  **Resistance [20°C (68°F)]:**

  **Approx. 9 - 10 (Ω)**

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

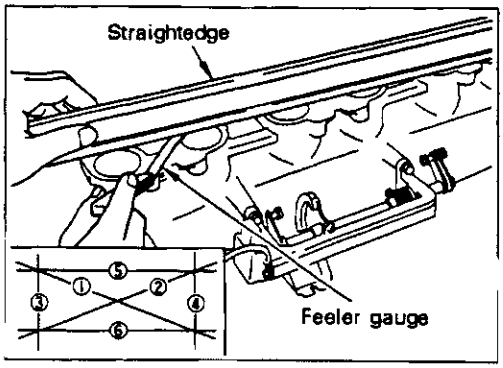
### (2) Collector ASSY disassembly and assembly




**Additional work required:**

- **Collector ASSY installation**

**Refer to Section B3, 6-3, THROTTLE VALVE SWITCH SYSTEM INSPECTION for the throttle valve switch adjustment procedures. Refer to section B2, 10-5, 6 IN-LINE THROTTLE CHAMBER LINKAGE ADJUSTMENT for the related adjustment procedures.**

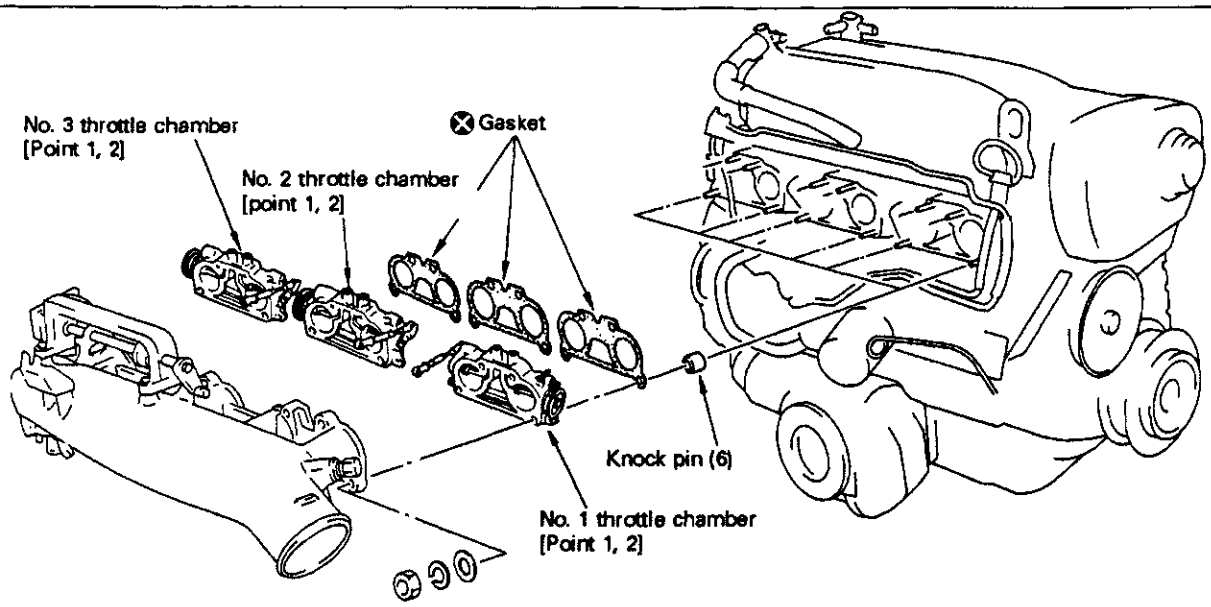



**[Point 1] Collector installation**

- Measure the collector installation surface for distortion in six directions (opposing directions, up, down, left, right, horizontally and vertically).
  **Limit: 0.15 mm (0.0059 in)**

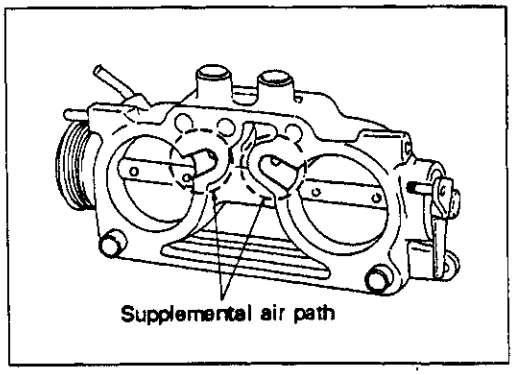
## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### 10-4 6 IN-LINE THROTTLE CHAMBER REMOVAL AND INSTALLATION



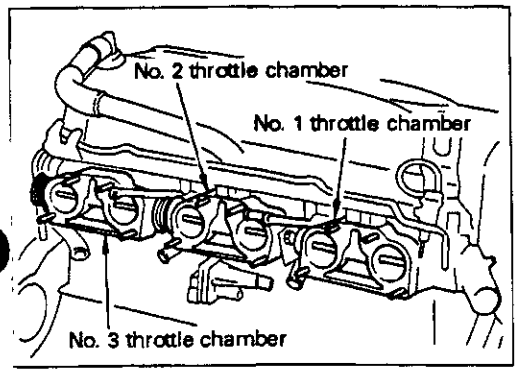

⊗ : Always replace after every disassembly.

Additional work required:
- Collector ASSY removal and installation
- Canister hose




**[Point 1] Throttle chamber inspection**

- Check that there are no cracks and that supplemental air paths are not obstructed.



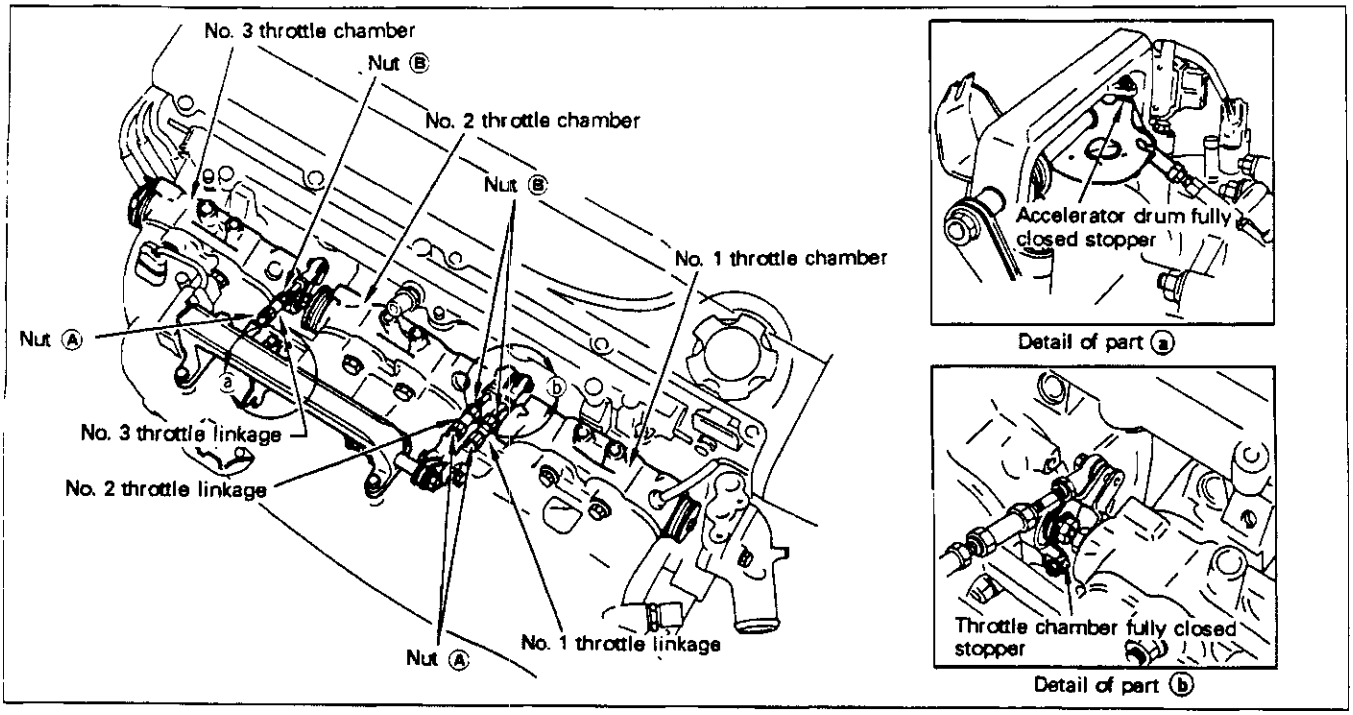

**[Point 2] Throttle chamber installation**

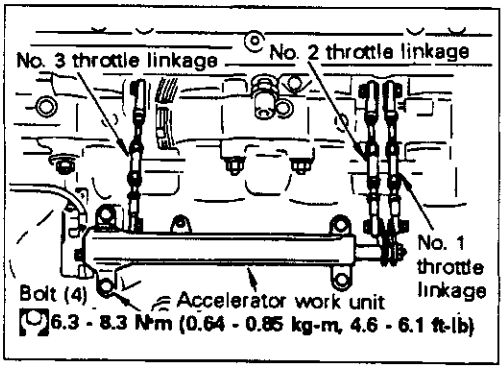
- Install the No. 1 to No. 3 throttle chambers.

**CAUTION:**
**Do not make any mistake when installing the chamber.**

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

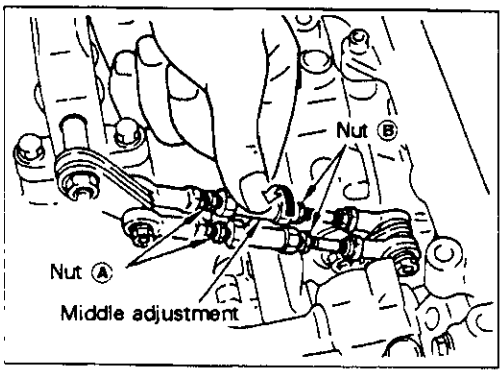
### 10-5 6 IN-LINE THROTTLE CHAMBER LINKAGE ADJUSTMENT




**[Point 1] Accelerator work unit installation**

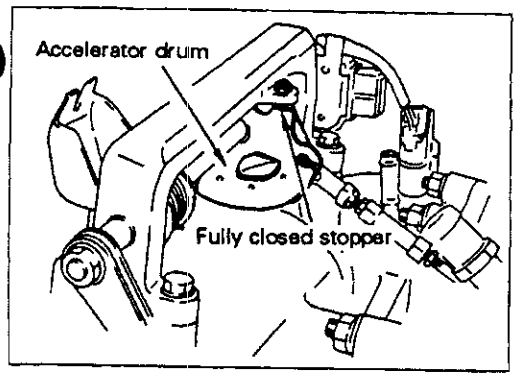
- Install the 6 in-line throttle chamber and accelerator work unit and connect the No. 1, 2 and 3 throttle linkages.



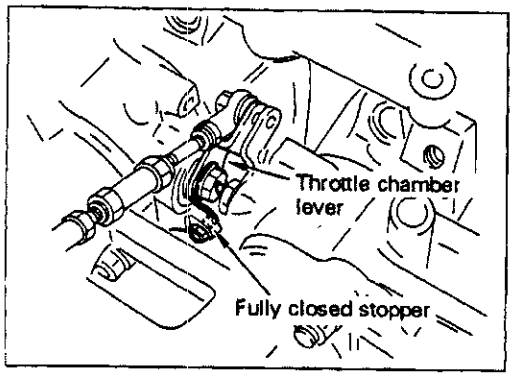

**[Point 2] 6 in-line throttle chamber linkage adjustment**

① Loosen nuts Ⓐ and Ⓑ for each throttle linkage. Turn the middle adjustment of each throttle linkage counterclockwise to shorten the linkage.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



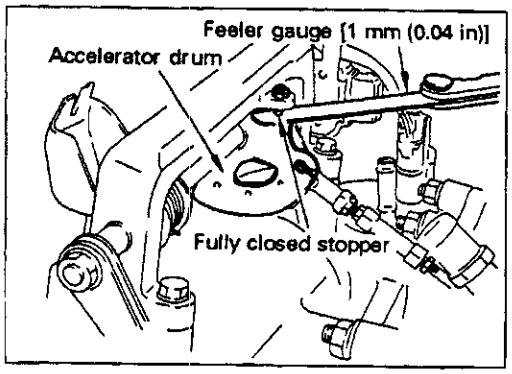

② Shorten each throttle linkage until acceleration drum contacts fully closed stopper on the accelerator work unit side.



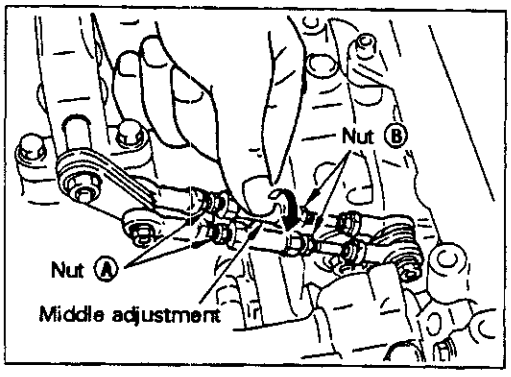

③ Shorten each throttle linkage, so the throttle chamber lever opens wider than fully closed stopper on the throttle chamber side.

**CAUTION:**

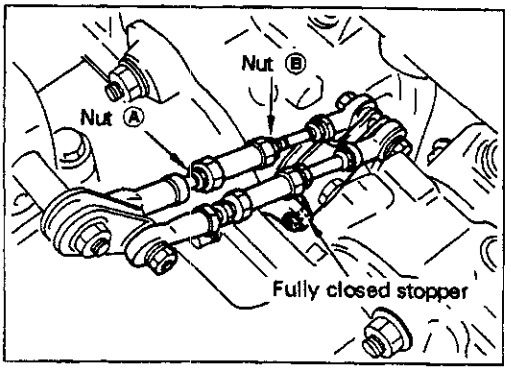
1. **Do not lock nuts Ⓐ and Ⓑ.**
2. **The throttle chamber lever opening angle should be adequate.**




④ Insert a 1 mm (0.04 in) feeler gauge between the accelerator drum and fully closed stopper on the accelerator work unit side.
Secure accelerator drum so it does not move.

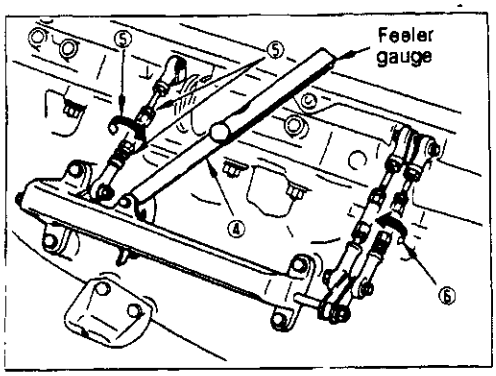



⑤ With feeler gauge inserted, turn the middle adjustment in No. 2 throttle linkage clockwise to lengthen throttle linkage until the throttle chamber lever contacts the fully closed stopper on the throttle chamber side.

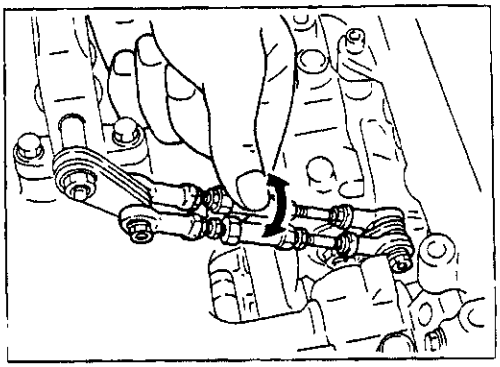



⑥ When the fully closed stopper contacts, the throttle chamber lever, you should feel resistance when turning the throttle linkage with your fingers. Shorten the throttle linkage to the point just before this resistance is felt.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

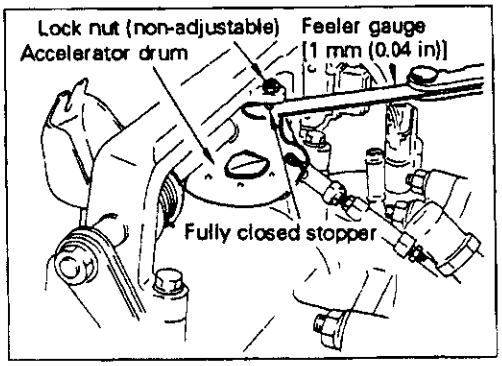



⑦ Perform steps ④, ⑤ and ⑥ to adjust the No. 2 and 1 throttle linkages.



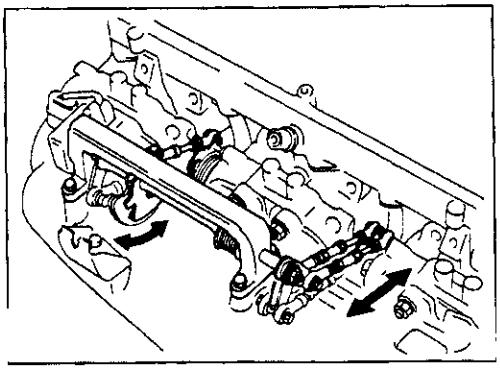
⑧ After the adjustment is completed for the three throttle linkages, tighten lock nuts Ⓐ and Ⓑ.
After the nuts are tightened, No. 1 - 3 throttle linkages must turn with same degree of smoothness.

**CAUTION:**
**The middle adjustment linkage must not turn when the lock nut is tightened.**




⑨ Remove feeler gauge from fully closed stopper on accelerator work unit side.

**CAUTION:**
**Do not adjust fully closed stopper nut.**

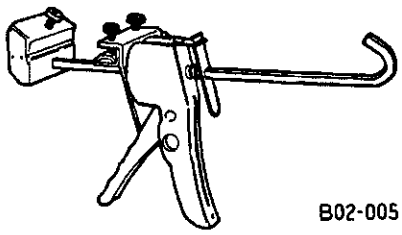


⑩ Completely open and close the 6 in-line throttle chambers repeatedly and check that each throttle chamber moves smoothly.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

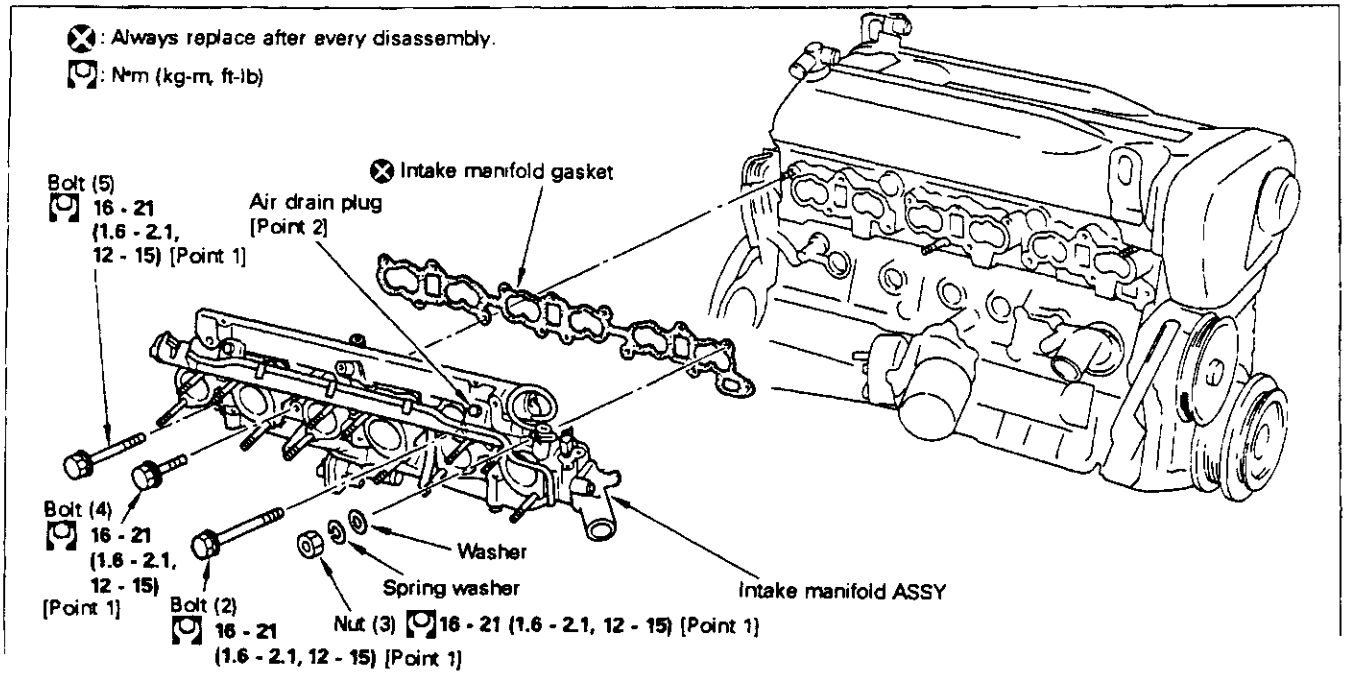
### 10-6 INTAKE MANIFOLD ASSY

**Tools required**

| | Name | | Application |
|---|---|---|---|
| Tool | Tube presser<br>WS3993 |  <br>B02-0051 | Liquid gasket lubrication |

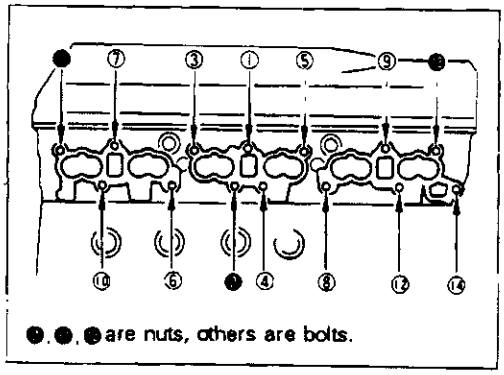
## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### (1) Intake Manifold ASSY Removal and Installation




Additional work required:
Removal and Installation

- Collector ASSY
- Throttle chamber
- ECCS harness connector and all hoses
- Water outlet hose
- Blowby hose




●, ●, ● are nuts, others are bolts.

**[Point 1] Intake manifold ASSY bolt and nut removal and installation**

**Removal**

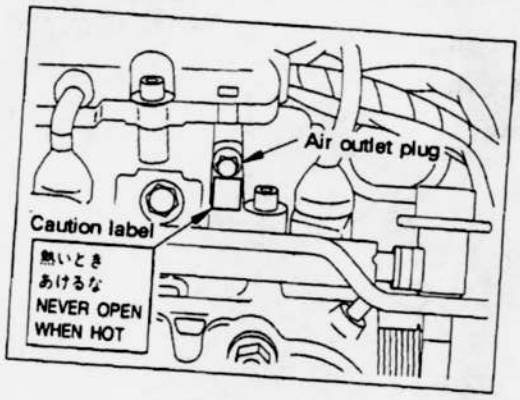
- Removal is the reverse of order shown in the figure on left.

**Installation**

- Installation is performed in order shown in figure. Tighten in gradual steps to uniform tightness.

| | Length: Number of bolts | Installation location |
|---|---|---|
| Bolt length below head mm (in) | 30 (1.18): (4) | ③, ⑤, ⑥, ⑧ |
| | 60 (2.36): (5) | ①, ④, ⑩, ⑫, ⑭ |
| | 65 (2.56): (6) | ⑦, ⑨ |

**Tightening torque:**
**16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)**




## 10. Removal and Installation of On-vehicle Par (Cont'd)

**[Point 2] Air drain plug**

Refer to section B6, 3, for details.

- Perform when engine is cool.

**WARNING:**

**Never remove the air drain plug when engine is warm, becau hot water may escape and cause injury.**

- When pouring coolant into engine, always remove air dra plug to allow air within engine to escape. (This prever overheating.)

**CAUTION:**

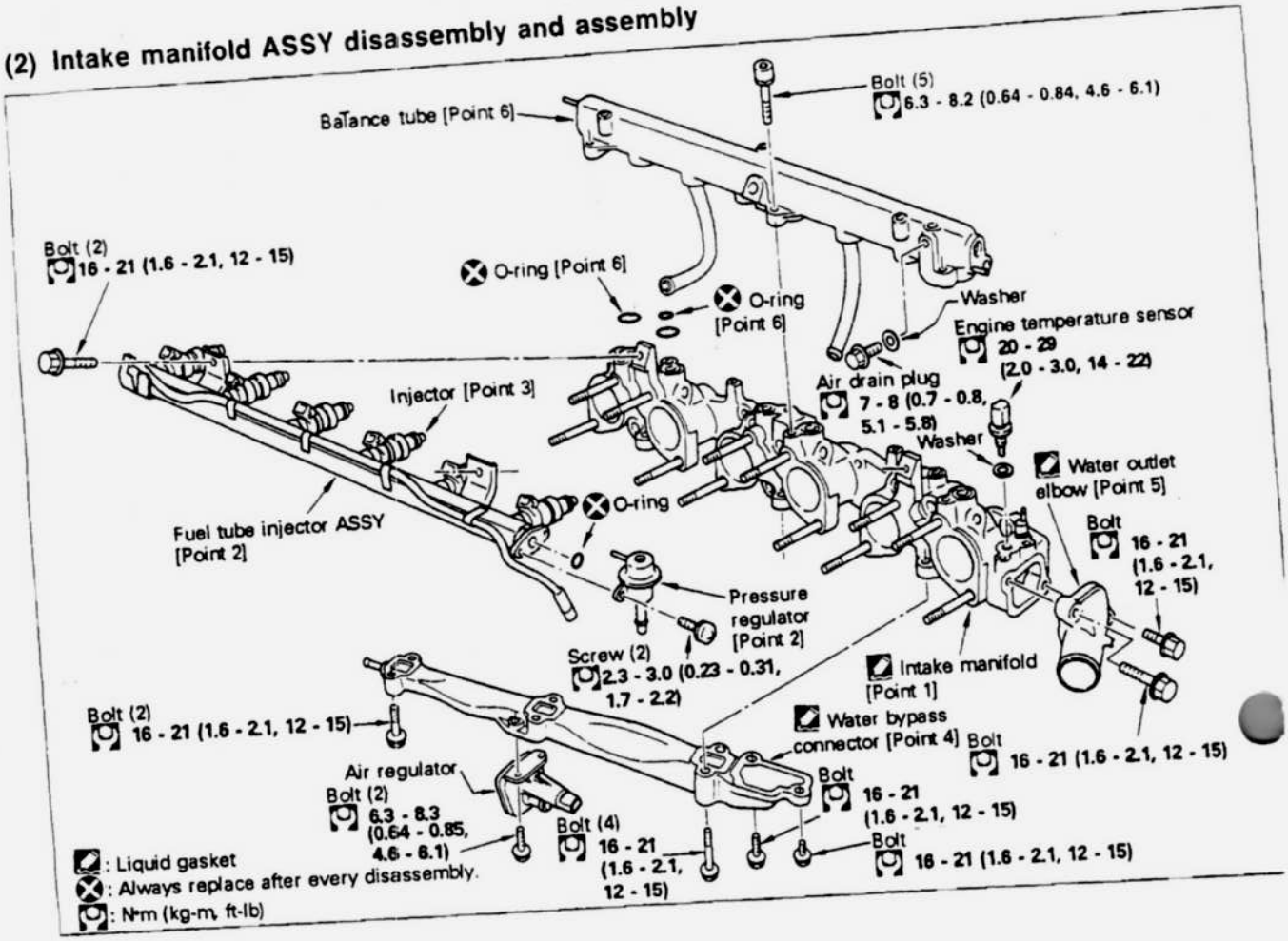
**Be careful not to strip screw threads by over-torquing the a drain plug.**

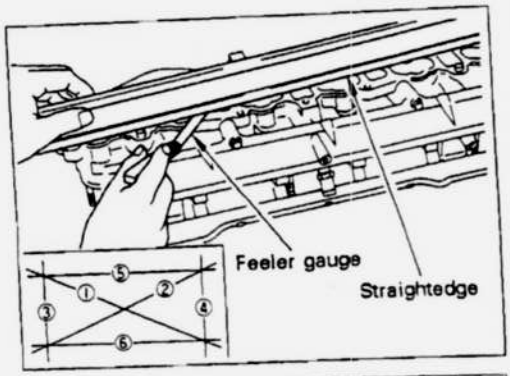
**Tightening torque:**

**7 - 8 N·m (0.7 - 0.8 kg-m, 5.1 - 5.8 ft-lb)**

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### (2) Intake manifold ASSY disassembly and assembly



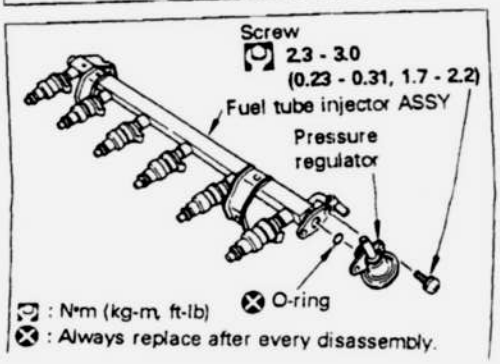




### [Point 1] Intake manifold inspection

- Measure the intake manifold surface for distortions in s separate directions (at opposite directions; up, down, rig left, horizontally and vertically) in a number of locations

**Limit:**

**0.15 mm (0.0059 in)**



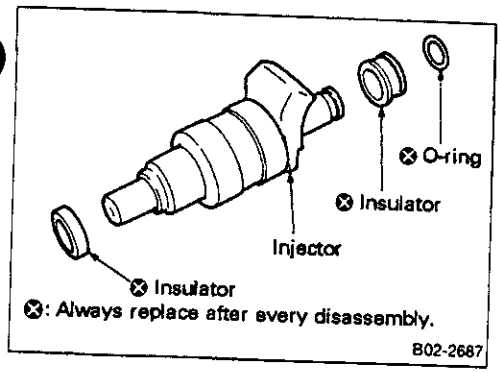

### [Point 2] Fuel tube ASSY

- O-rings must be replaced with new ones when press regulator is removed and installed.

**CAUTION:**

**When pressure regulator is installed, be careful not to sc the surfaces which contact O-rings.**

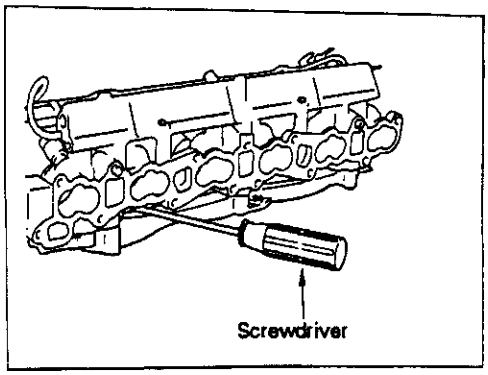
## 10. Removal and Installation of On-vehicle Parts (Cont'd)




### [Point 3] O-rings (for fuel injector pressure regulator)

**Installation precautions**

- Never re-use O-rings.
- Coat O-rings with engine oil (10W-30 or equivalent) or silicon oil (NUC silicon L45 or equivalent) but do not apply solvent to them as this may remove the oil coating.
- Do not allow dirt, dust or foreign matter to adhere to O-rings or other equipment surfaces. Do not use dirty O-rings.
- Be careful when installing O-rings so tools or operator's fingernails do not make scratches, twist or stretch them. In particular, do not insert them in the fuel tube by making them stretch slightly.
- When inserting the fuel injectors and pressure regulator in the fuel tubes, be careful not to install them off-center or rotate them.
- Do not store O-rings in locations subject to ozone, high temperatures or direct sunlight.




### [Point 4] Water bypass connector removal and installation

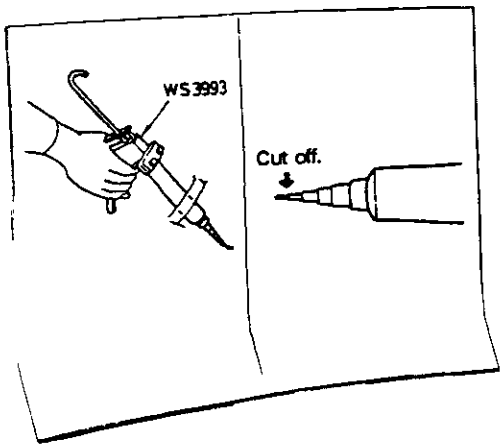
**Removal and cleaning**

- Remove the eight water bypass connector bolts. Insert screwdriver in clearance between the intake manifold and water bypass connector and move it lightly to remove connector.
- Use a scraper and remove liquid gasket.

**CAUTION:**

**Liquid gasket in grooves must also be removed.**

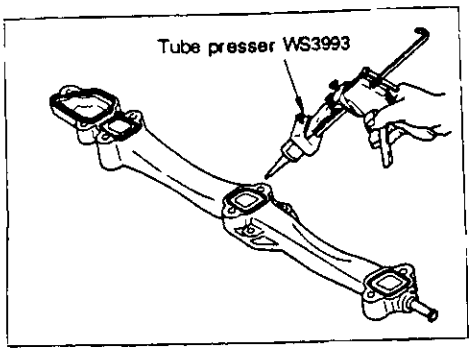
- Wipe off the surface with white gasoline, etc.




**Installation**

- Cut nozzle end of liquid gasket (KP510 00150) in position shown in left figure. Use a tube presser to apply gasket.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)




### Installation

- Apply the liquid gasket (KP510 00510) to water bypass connector surfaces in four locations at one time without stopping, then install water bypass connector within 20 minutes.

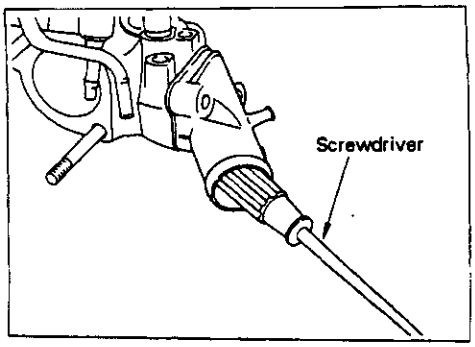
**CAUTION:**

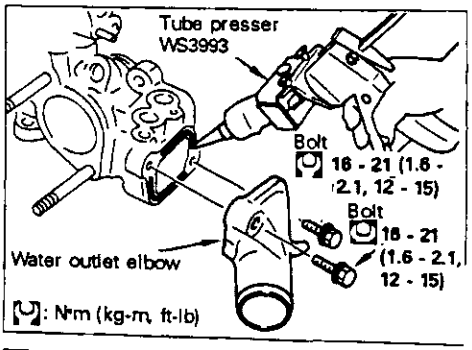
**(1) Apply liquid gasket coating 3.0 mm (0.118 in) wide (target width).**

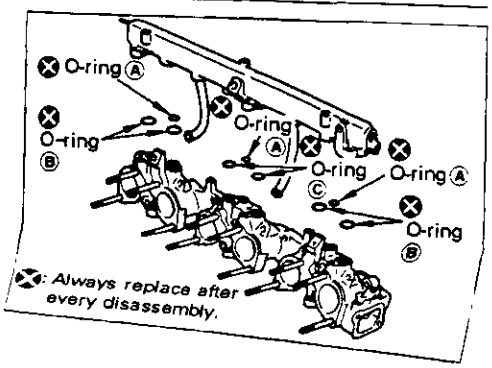
**(2) Coat on the inside of installation holes as shown.**

**Tightening torque:**

**16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)**




### [Point 5] Water outlet elbow

### Removal and cleaning

- Remove the two water outlet elbow mounting bolts. Insert screwdriver handle as shown, and move it up and down to remove elbow.
- Use a scraper to remove liquid gasket from intake manifold and water outlet elbow.

**CAUTION:**

**Liquid gasket in grooves must also be removed.**

- Wipe off the installation surface with white gasoline, etc.

### Installation

- Cut nozzle end of liquid gasket (KP510 00150). Use a tube presser to apply gasket.
- Apply the liquid gasket (KP510 00510) to intake manifold at one time without stopping as shown in figure on left.
- Complete installation within 20 minutes after liquid gasket application.

**CAUTION:**

**Apply liquid gasket coating 3.0 mm (0.118 in) wide.**

**Tightening torque:**

**16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)**

### [Point 6] Balance tube removal and installation

### Removal

- When removing balance tube, check O-ring size.

### Installation

- When installing balance tube, replace O-rings with new ones.
- There are three different O-ring sizes. Be careful to install the correct size.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

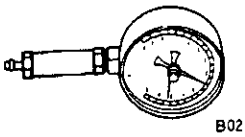
| | Number of unit | Installation location |
|---|---|---|
| O-ring Ⓐ (small) | 3 locations | Cylinders 1, 2, 3, 4, 5, 6 |
| O-ring Ⓑ (large) | 4 locations | Cylinders 1, 2, 5, 6 |
| O-ring Ⓒ (medium) | 2 locations | Cylinders 3, 4 |

- Be careful not to pinch the O-rings during installation.

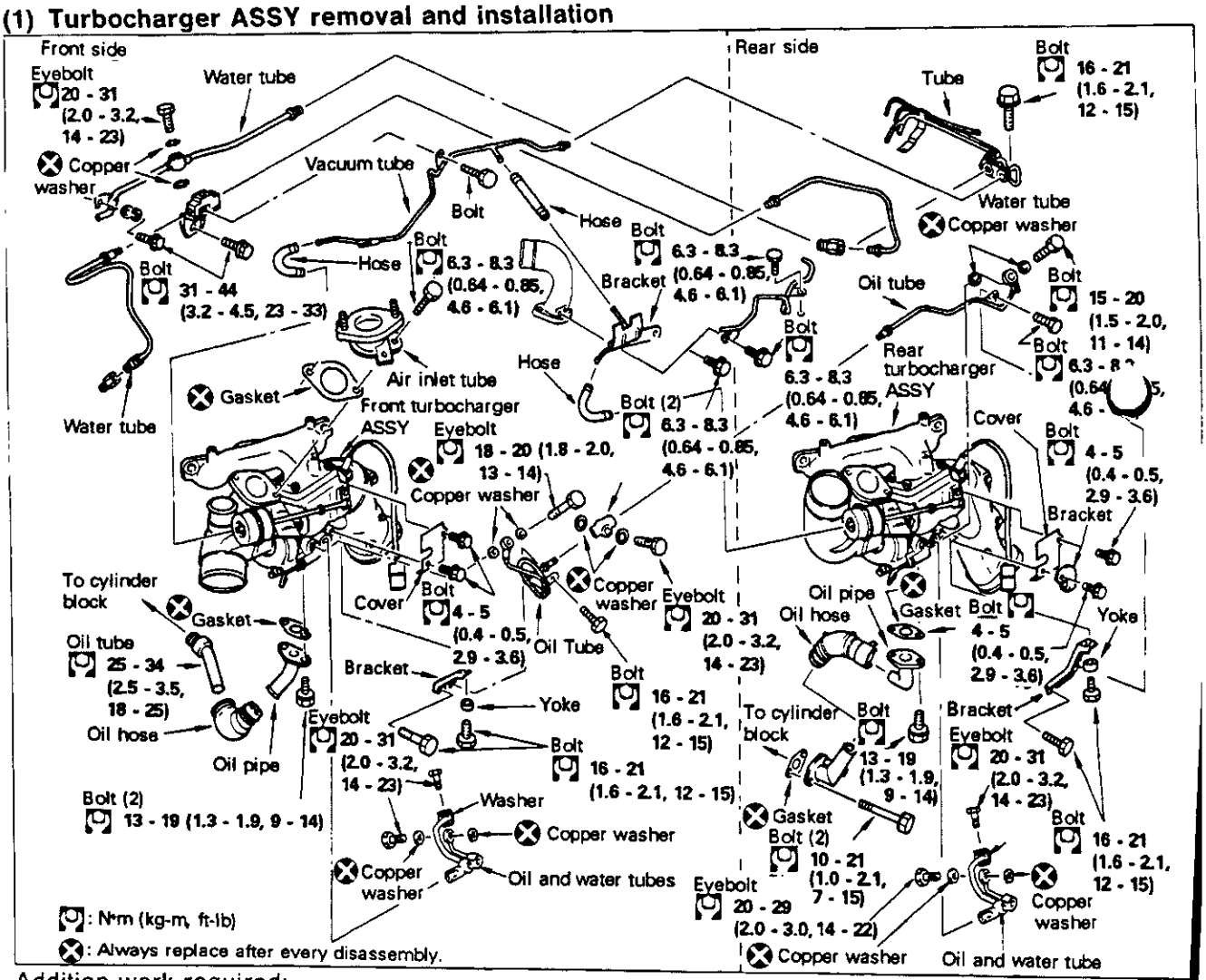
## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### 10-7 TURBOCHARGER ASSY

**Tools required**

| | Name | | Application |
|---|---|---|---|
| Measurement tool | Compound gauge EG1508 0001 |  B02-1948 | Turbocharged pressure control inspection |
| | Dial gauge | | Turbocharger rotor shaft inspection |

**(1) Turbocharger ASSY removal and installation**



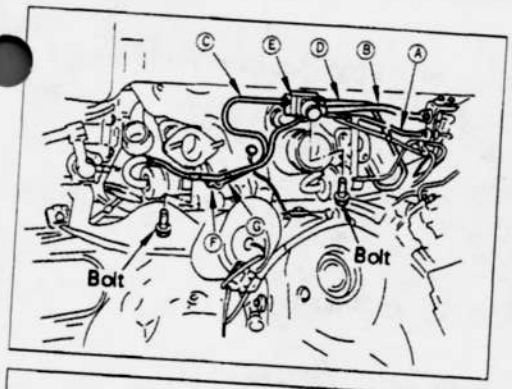

Addition work required:

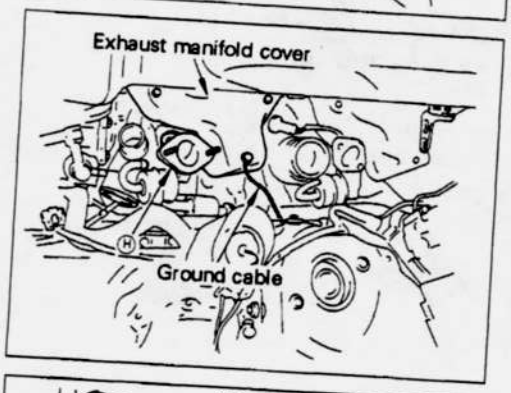
Drain and refill cooling water
Separate exhaust front tube
Remove and install:
Undercover
Exhaust gas sensor connector
*Intercooler air inlet tube, hose*
Air inlet hose

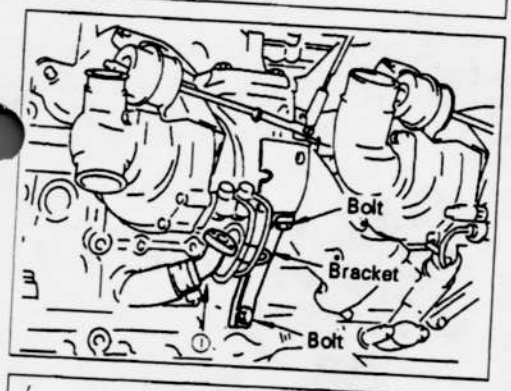
**Note: Also remove cooling water from engine drain plug.**
**(If water is only drained from radiator drain cock, the water inside cylinder block is not drain completely.)**

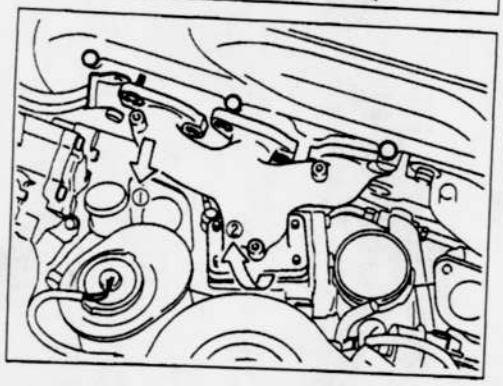
## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### (2) Front turbocharger ASSY installation



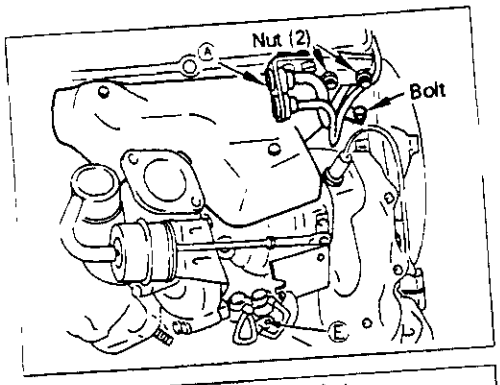
**Removal sequence**

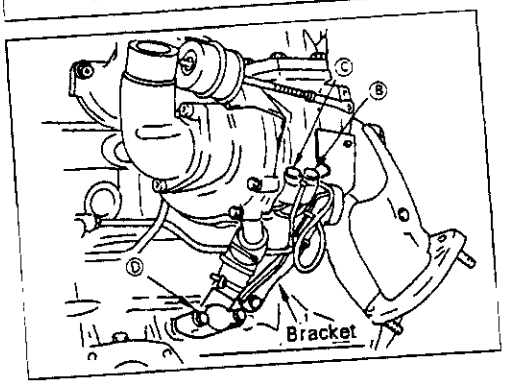
① Loosen the flare nuts of tubes Ⓐ and Ⓑ.
② Remove bolts, and detach tube Ⓐ.
③ Loosen flare nuts of tubes Ⓒ and Ⓓ on the turbo side.
④ Remove hose Ⓑ and bolts.
⑤ Remove bolts and detach tube Ⓔ.
⑥ Remove eyebolts Ⓕ and Ⓖ.
⑦ Remove the two bolts and detach tube Ⓗ. Make sure that bolt mounted on upper side is shorter than lower side.
⑧ Remove the three bolts, cover and ground cable.
⑨ Remove oil return hose.
⑩ Remove the three bolts and detach bracket.
⑪ Remove the four turbocharger bolts.
⑫ Lower turbocharger carefully.
⑬ Remove the six exhaust manifold nuts.
⑭ Pull the exhaust manifold in direction ① and then raise it in direction ② to avoid turbocharger stud.
⑮ Remove exhaust manifold.
⑯ Pull out turbocharger.

**Installation sequence**

- Installation is the reverse of the removal sequence.
- Place turbocharger in bottom of engine compartment before installing exhaust manifold.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)




### (3) Rear turbocharger ASSY removal and installation

Additional work required: remove and install front turbocharger ASSY

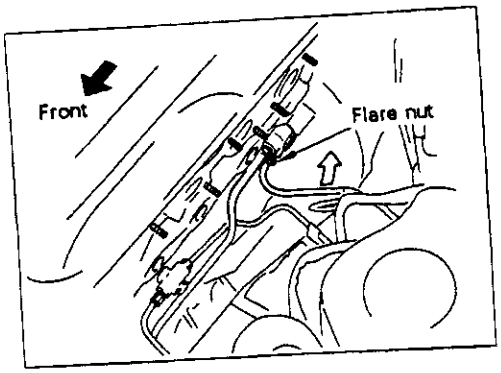
**Removal sequence**

① Remove front turbocharger and exhaust manifold ASSY.
② Remove the two nuts and clip securing bolt, and separate tube Ⓐ.
③ Remove the three bolts and detach exhaust manifold cover.
④ Remove eyebolts Ⓑ and Ⓒ and detach bolt Ⓔ.
⑤ Remove the two bolts and separate tube Ⓓ from cylinder block side.
⑥ Remove the three bolts and detach bracket.

The sequence after this step is the same as numbers ⑪ to ⑯ of front turbocharger removal and installation.

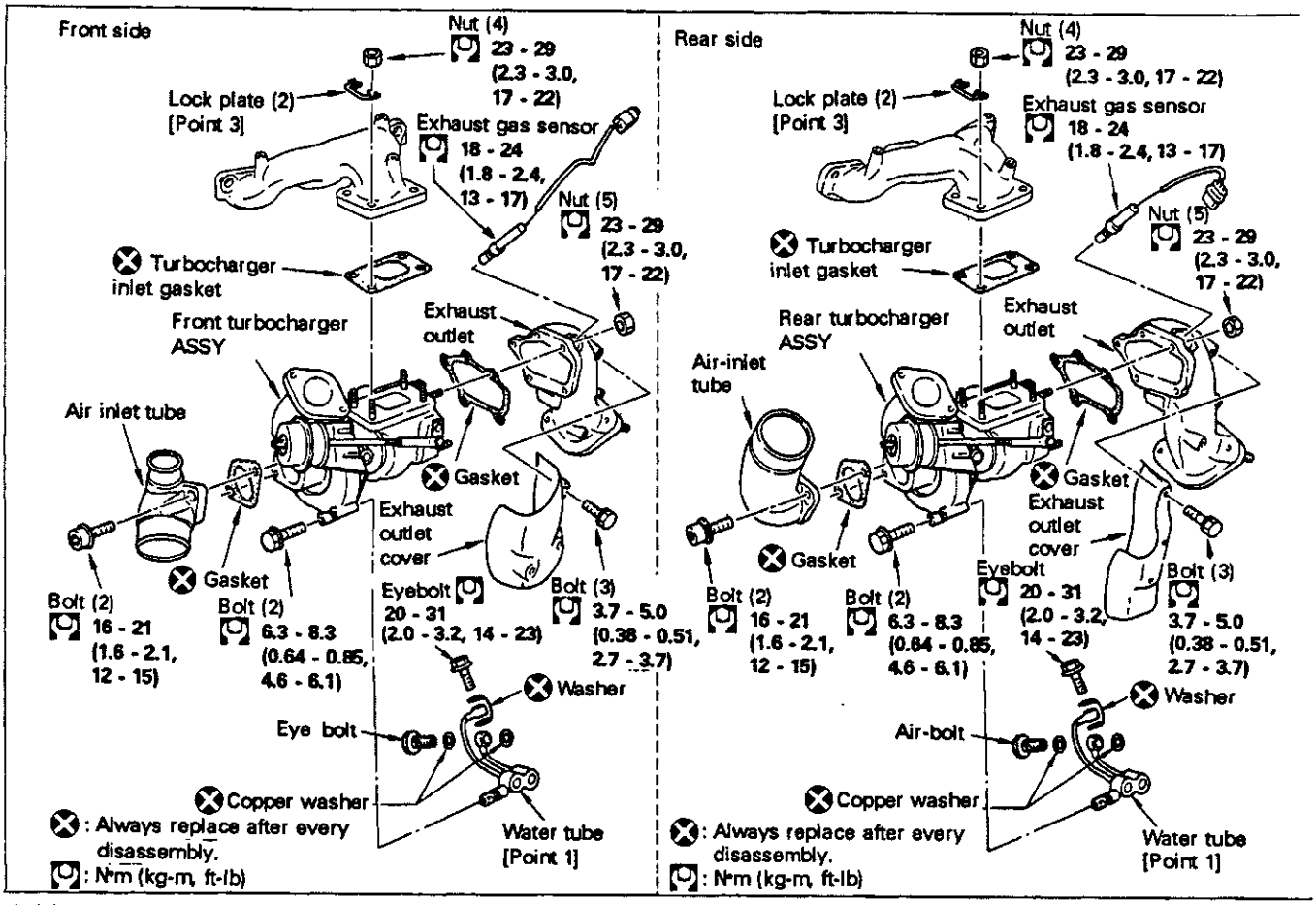
**Installation sequence**

- Installation is the reverse of the removal sequence.
- Before installing eyebolt Ⓑ, loosen water tube flare nut as shown in figure on the left.

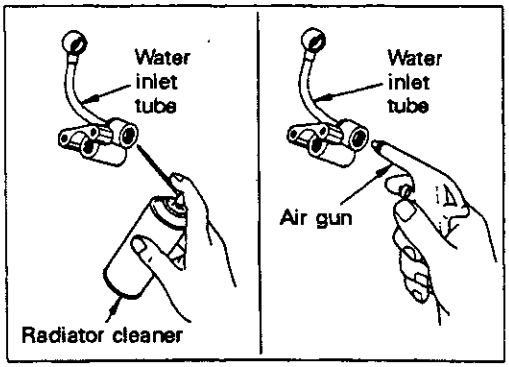


## 10. Removal and Installation of On-vehicle Parts (Cont'd)

### (4) Turbocharger ASSY — Assembly and disassembly

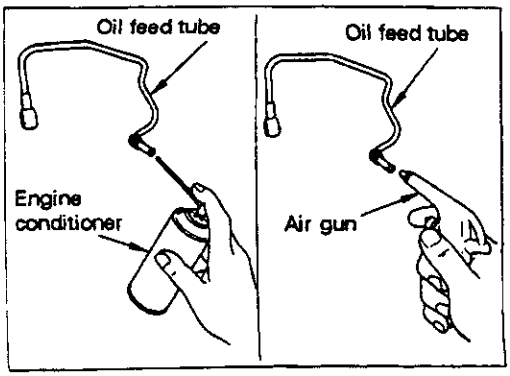



Additional work required:
Turbocharger ASSY removal and installation




**[Point 1] Water tube inspection**

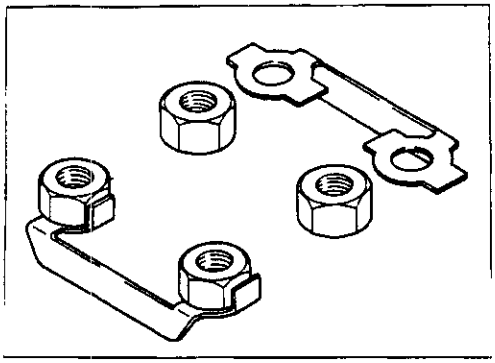
- After cleaning water inlet and outlet tubes with radiat cleaner, blow with compressed air and check for rust o clogging.




**[Point 2] Oil feed tube inspection**

- After cleaning oil feed tube with engine conditioner, blow with compressed air and check for clogging.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



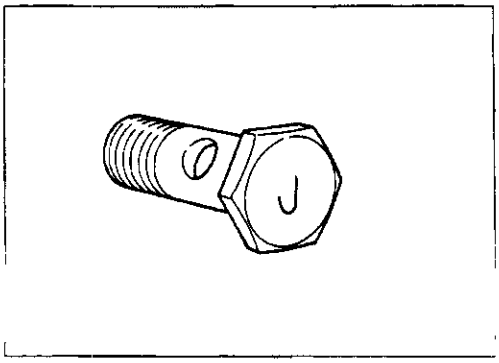
### [Point 3] Lock plate removal and installation

**Removal**

- Spread the lock plate pawls with a screwdriver and loosen the nuts.

**Installation**

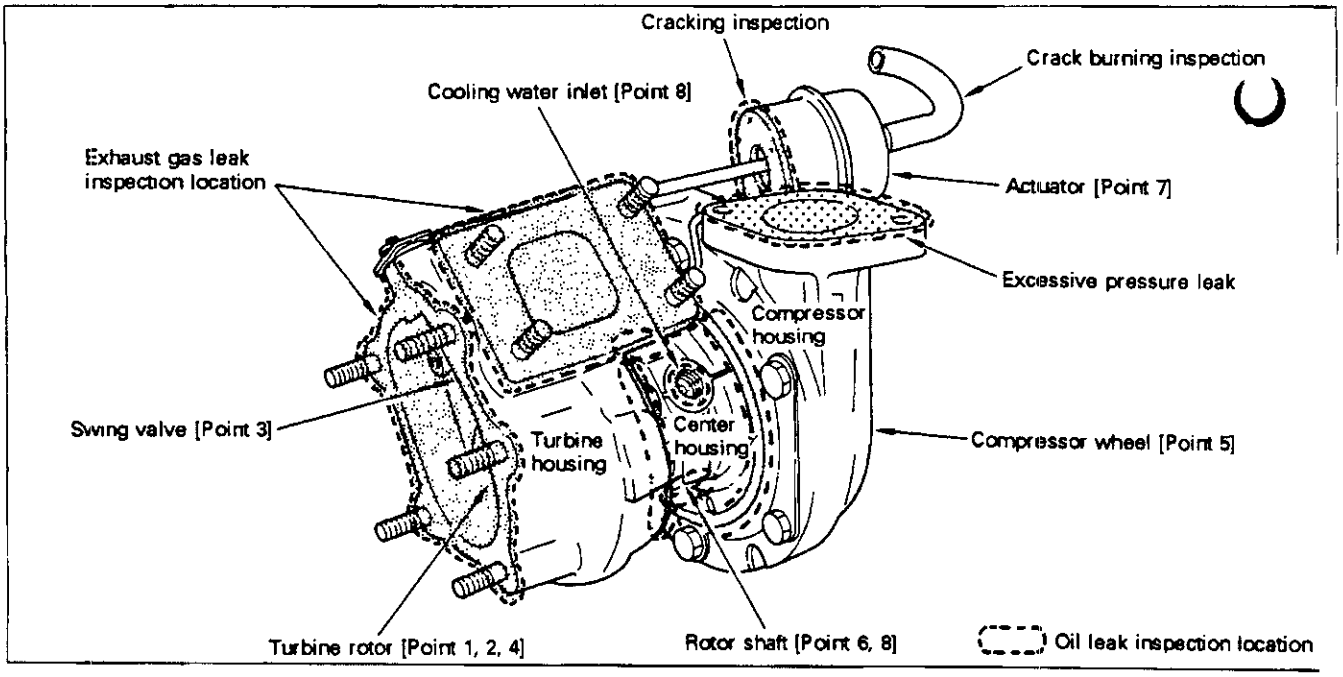
- Position lock plates and turbocharger mounting nuts. After tightening the nuts, bend lock plate pawls onto the nuts.

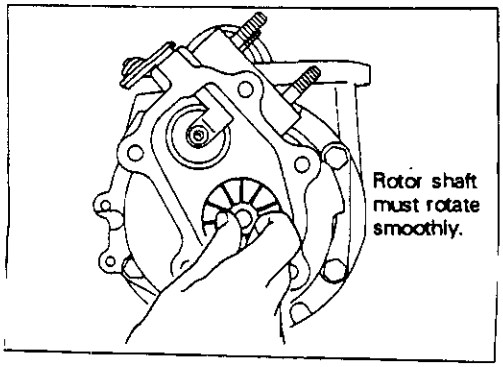



### [Point 4] Eye-bolt determination

- Oil feed (turbocharger side) eye bolts are stamped "J".

### (5) Turbocharger unit inspection

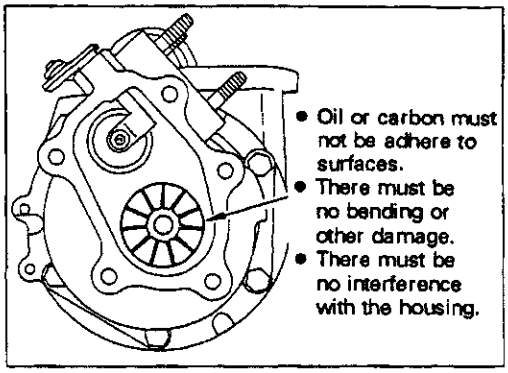



### [Point 1] Rotor shaft inspection

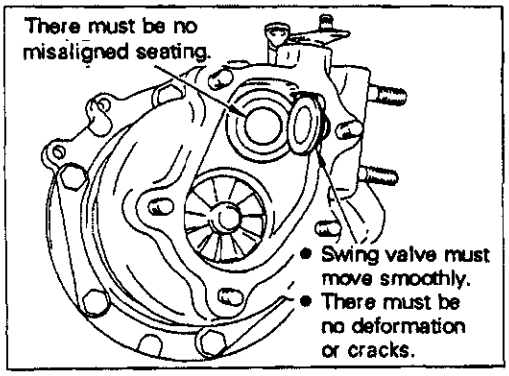
- When rotor shaft is turned by finger, there must be r heaviness or dragging and shaft must turn smoothly.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)



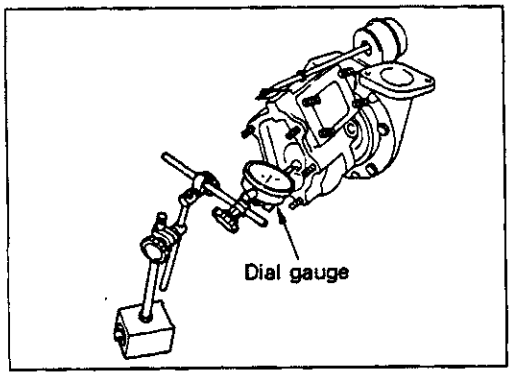

### [Point 2] Turbine rotor inspection

- Oil must not adhere to surfaces.
- There must be no carbon accumulation.
- The vanes of the turbine rotor must not be bent.
- There must be no interference with turbine housing.




### [Point 3] Swing valve inspection

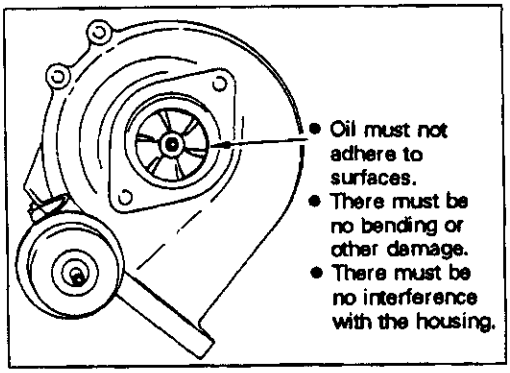
- Remove actuator rod pin and make sure switch valv moves smoothly, without deformation or cracks.
- Make sure there are no misaligned seating surfaces in tu bine housing.




### [Point 4] Rotor shaft play inspection

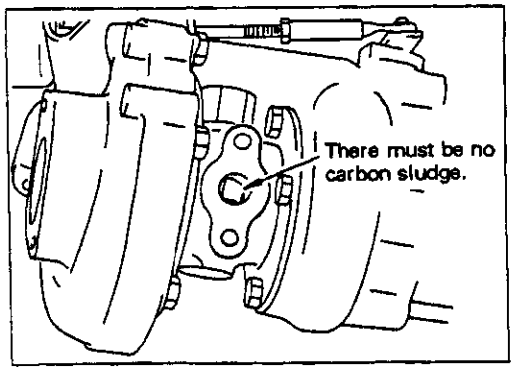
- Position a dial gauge and measure play and thrust clea ance.
- Insert dial gauge in oil return hole and measure rotor sha play.

| | |
|---|---|
| Rotor shaft play | 0.056 - 0.127 mm (0.0022 - 0.0050 in) |
| Thrust clearance | 0.013 - 0.096 mm (0.0005 - 0.0038 in) |




### [Point 5] Compressor wheel inspection

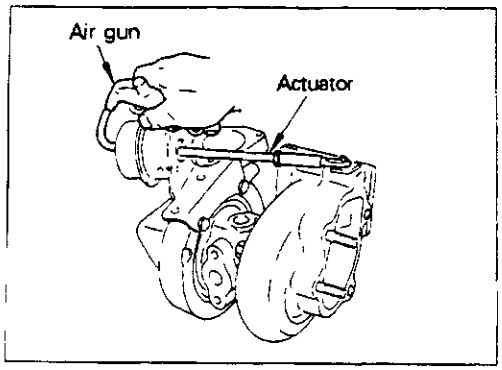
- Oil must not adhere to suction inlet.
- There must be no interference with compressor housing.
- Wheel must not be bent, folded or otherwise damaged.




### [Point 6] Rotor shaft damage

- There must be no carbon sludge accumulation.

## 10. Removal and Installation of On-vehicle Parts (Cont'd)

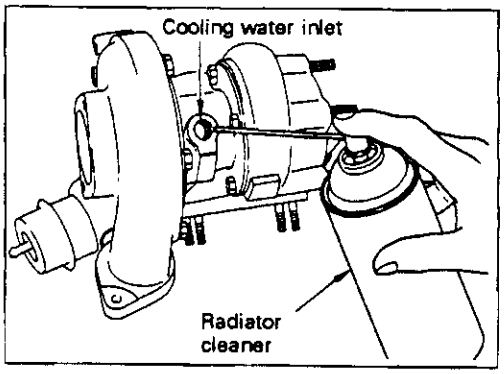



**[Point 7] Swing valve controller inspection**

- Connect the swing valve controller rubber hose to actuator side.
- Check swing valve controller whenever actuator rod is installed or removed.
- Use air gun to blow compressed air [approx. 69 to 78 kPa (0.7 to 0.8 kg/cm$^2$, 10 to 11 psi)] into hose and make sure swing valve controller rod operates. Stop blowing air as soon as rod operates.

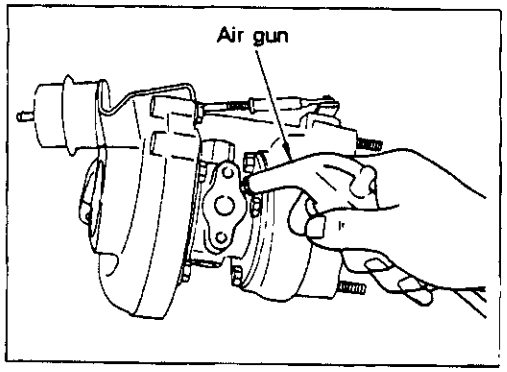
**CAUTION:**

**If air pressure is applied excessively the diaphragm may be damaged. Use the LPG pressure gauge [special tool for approx. 98 kPa (1 kg/cm$^2$, 14 psi)] to verify that the air gun pressure is approx. 78 to 88 kPa (0.8 to 0.9 kg/cm$^2$, 11 to 13 psi) before testing the air hose.**




**[Point 8] Oil and cooling water inlet and outlet cleaning**

- Use engine conditioner to clean oil feed and return passages.
- Use radiator cleaner to clean cooling water feed and return passages.




- Clean with air gun

Clean compressor wheel, turbine wheel, compressor housing and turbine housing with same methods.

### (6) Turbocharger trouble diagnosis (oil leaks, smoke (white or blue smoke), lack of power, poor acceleration, abnormal noise)

**Items to be verified before diagnosis**

① The engine oil level must be between the MIN and MAX marks on the oil level gauge. (When higher than MAX , engine oil flows into the intake duct through the blowby gas recirculation pass and turbocharger may be determined to be malfunctioning.)

② Check with customer to determine if oil is cooled when idling after driving.

If even one malfunction in the following chart is detected in a unit inspection, replace the turbocharger ASSY.

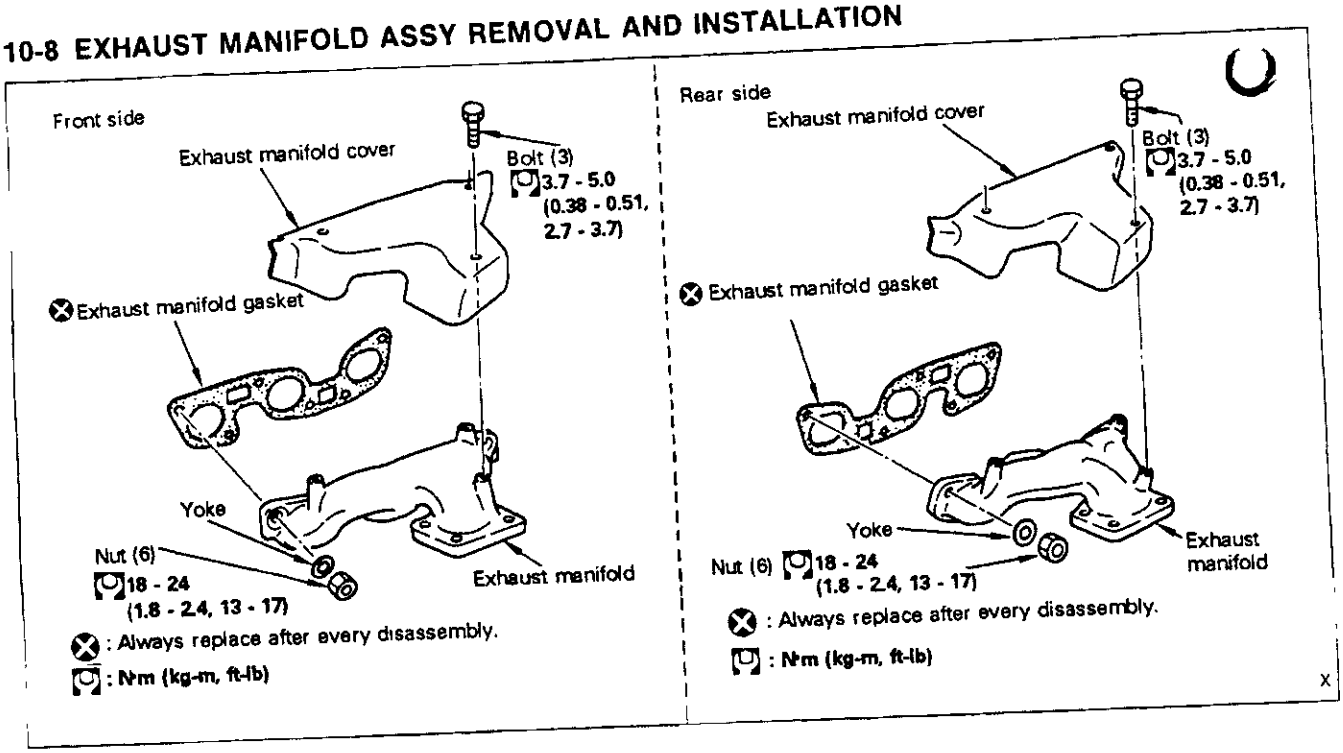
**If none of these conditions are found during inspection, assume there are no turbocharger problems and search for a malfunction in another location.**

| Item / *Reference | Inspection location | Symptom | Possible associated phenomenon | | | |
|---|---|---|---|---|---|---|
| | | | Oil leak | Smoke | Abnormal noise | Lack of power or poor acceleration |
| 2.8 | Turbine rotor | Turbine has oil on rotors. | △ | ● | △ | △ |
| | | Carbon has accumulated. | △ | ● | ○ | ○ |
| | | Rotor scrapes against the housing. | △ | ○ | ● | ○ |
| | | The turbine vanes are bent or folded. | | | ● | ● |
| 5.8 | Compressor wheel | Suction inlet is dirty with oil. | ○ | ○ | | |
| | | Rotor scrapes against the housing. | △ | ○ | ● | ○ |
| | | The turbine vanes are bent or folded. | | | ● | ● |
| 1.4.8 | • Both turbine and compressor<br>• Rotor shaft play inspection | There is strong resistance or scraping when rotated by finger. | | △ | △ | ○ |
| | | Rotation by finger is not possible. | | | | ● |
| | | There is considerable shaking between rotor shaft and turbo ASSY. | △ | △ | ○ | △ |
| 6.8 | Look through oil hole. (Inspect interior with penlight.) | Carbon sludge has accumulated in waste oil hole. | △ | ● | △ | △ |
| 3.7 | Swing valve motion. (Use air gun or air pump.) | The valve does not move smoothly when pressure is applied gradually. (The valve normally opens at pressure greater than [59 to 69 kPa (0.6 to 0.7 kg/cm², 9 to 10 psi)]. | | | | ● |

*: Refer to previous section (5).

[●: Highly possible O: Possible △: Slightly possible]

## 10-8 EXHAUST MANIFOLD ASSY REMOVAL AND INSTALLATION

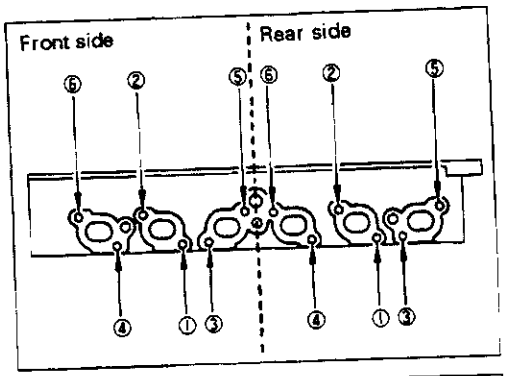



Additional work required:

- Turbocharger removal and installation (Refer to section 10-7)
- Gas leak inspection [Point 1]

### [Point 1] Gas leak inspection

- After removing exhaust manifold, make sure there is no traces of gas leaks from any part of installation.
- After installation, crank engine and check for gas leaks.




### [Point 2] EXHAUST MANIFOLD NUTS REMOVAL AND INSTALLATION

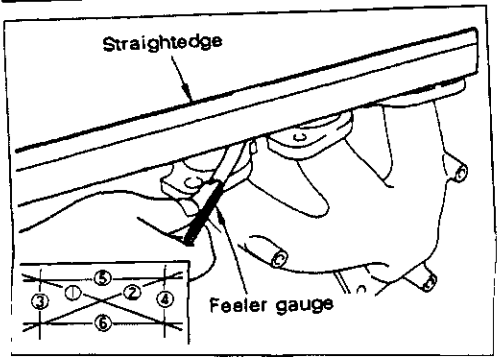
**Removal**

- Removal is the reverse of installation sequence shown in figure.

**Installation**

- The installation sequence is shown in the figure.

| | |
|---|---|
| Tightening torque | 18 - 24 N·m (1.8 - 2.4 kg-m, 13 - 17 ft-lb) |

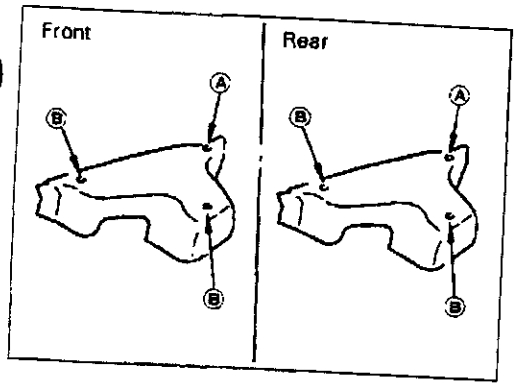



### [Point 3] Exhaust manifold inspection

- **Measure the intake manifold surface for distortions in six separate directions (opposite directions; up, down, right, left, horizontally and vertically) in a number of locations.**

| | |
|---|---|
| Limit | 0.3 mm (0.012 in) |

- Check that no oil, dirt or foreign matter adheres to cylinder head, exhaust manifold installation surface and gasket.




**[Point 4] Exhaust manifold cover installation**

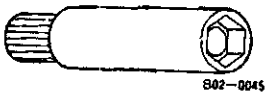
- Attach the exhaust manifold cover bolts in the following sequence (in both front and rear).

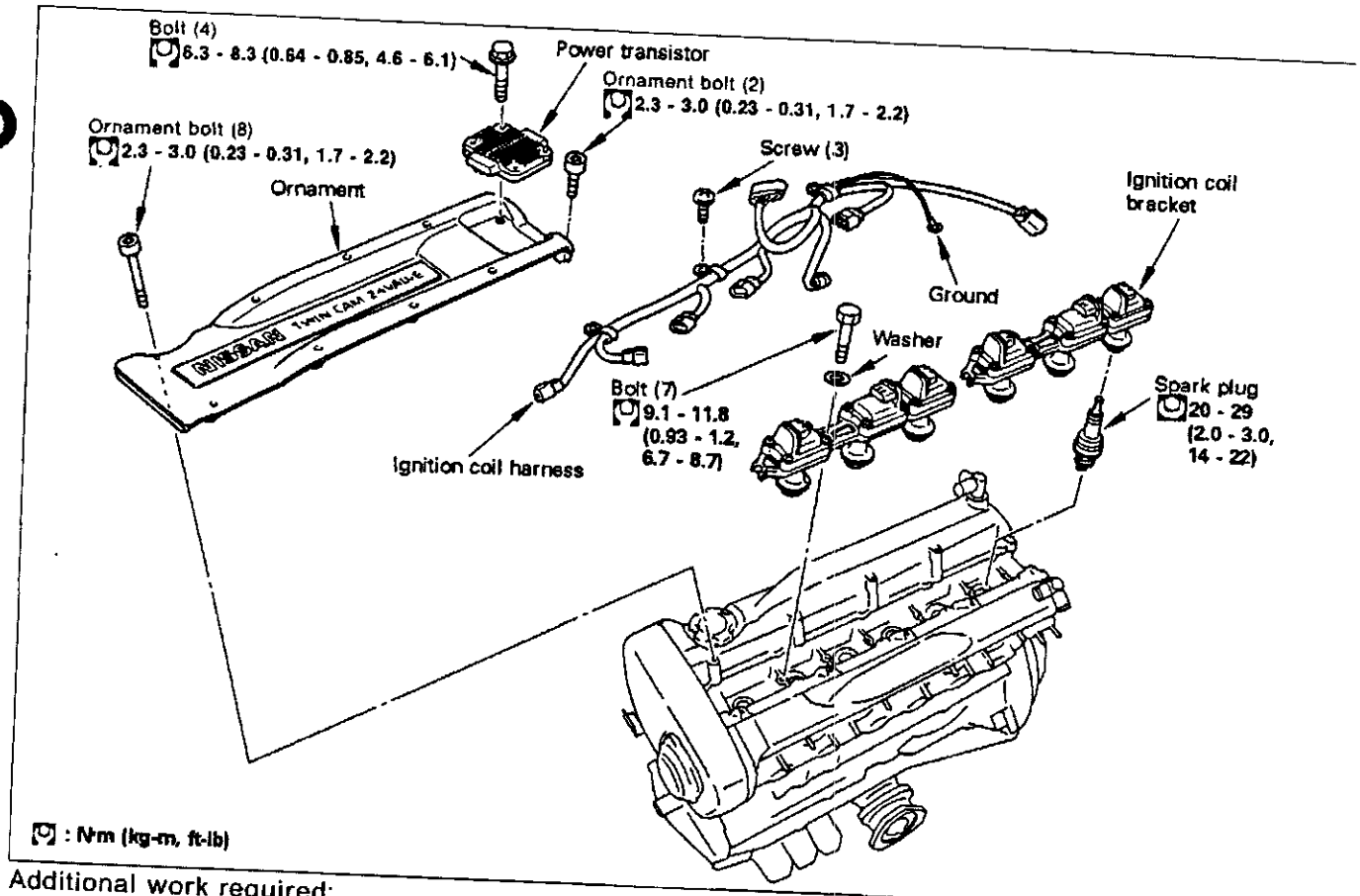
① Temporarily tighten bolts for positioning hole indicated by Ⓐ.
② Tighten bolts in the other two locations Ⓑ.
③ Tighten bolts in holes Ⓐ to specified tightening torque.

| Tightening torque | 3.7 - 5.0 N·m (0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb) |
|---|---|

## 10-9 SPARK PLUGS

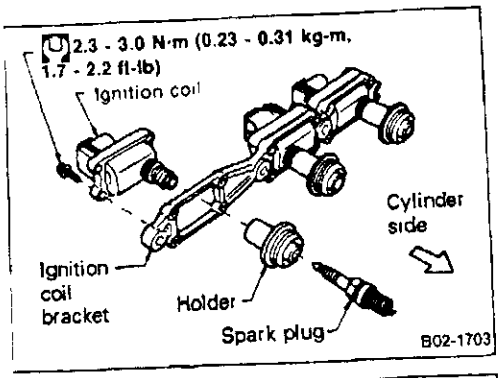
### Tools required

| | Name | | Application |
|---|---|---|---|
| Special tool | Spark plug wrench EG1740 1600 |  | Small hexagonal spark plug removal and installation |




Additional work required:
Remove and install:

- Air inlet pipe
- Blowby hose




### [Point 1] Ignition coil bracket removal and installation

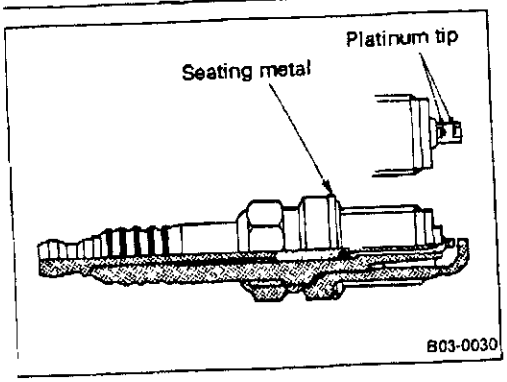
**Removal**

- When removing ignition coil bracket, hold coil to provide additional support while detaching it.

**CAUTION:**
**Do not hold the coil by the connector when removing it.**

**Installation**

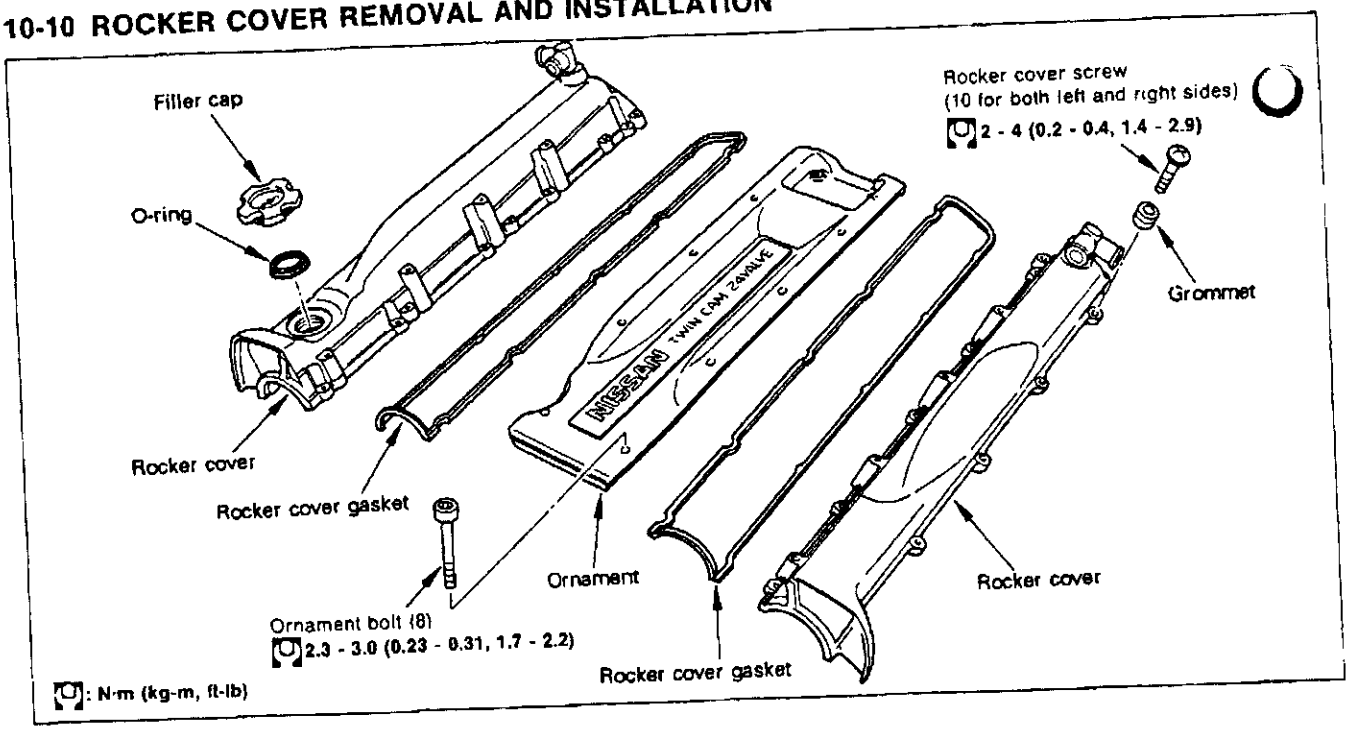
- When installing ignition coil bracket to cylinder head, check that ground line is connected securely.




### [Point 2] Spark plug maintenance

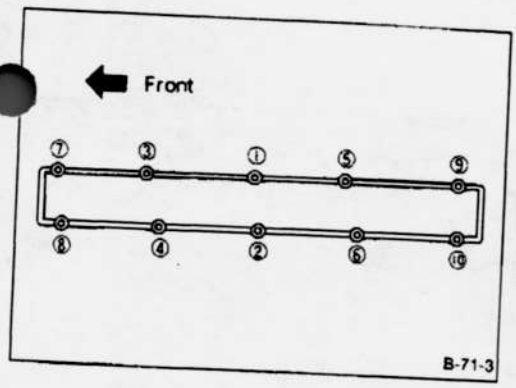
- Gap inspection and adjustment is not necessary because a platinum tip is used.
- Change spark plugs every 100,000 km (60,000 miles).
- When using a compressed air spark plug cleaner, clean the plugs at maximum pressure of 588 kPa (6 kg/cm$^2$, 85 psi) for no more than 20 seconds.
- Do not use a wire brush to clean plugs.

## 10-10 ROCKER COVER REMOVAL AND INSTALLATION




Additional work required:
Remove and install:

- Air inlet pipe
- Blowby hose




**[Point 1] Rocker cover screw removal and installation**

**Removal**

- Perform removal in reverse of sequence shown in the figure on the left.

**Installation**

- Perform installation in sequence shown in the figure on the left.

**CAUTION:**
**Perform removal and installation for intake and exhaust sides by same method.**

| | |
|---|---|
| Tightening torque | 2 - 4 N·m (0.2 - 0.4 kg-m, 1.4 - 2.9 ft-lb) |

**[Point 2] Rocker cover installation surface inspection**

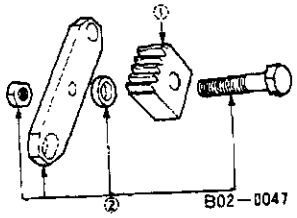
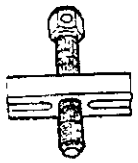
- Check that no oil, dirt or foreign matter adheres to the cylinder head installation surface.

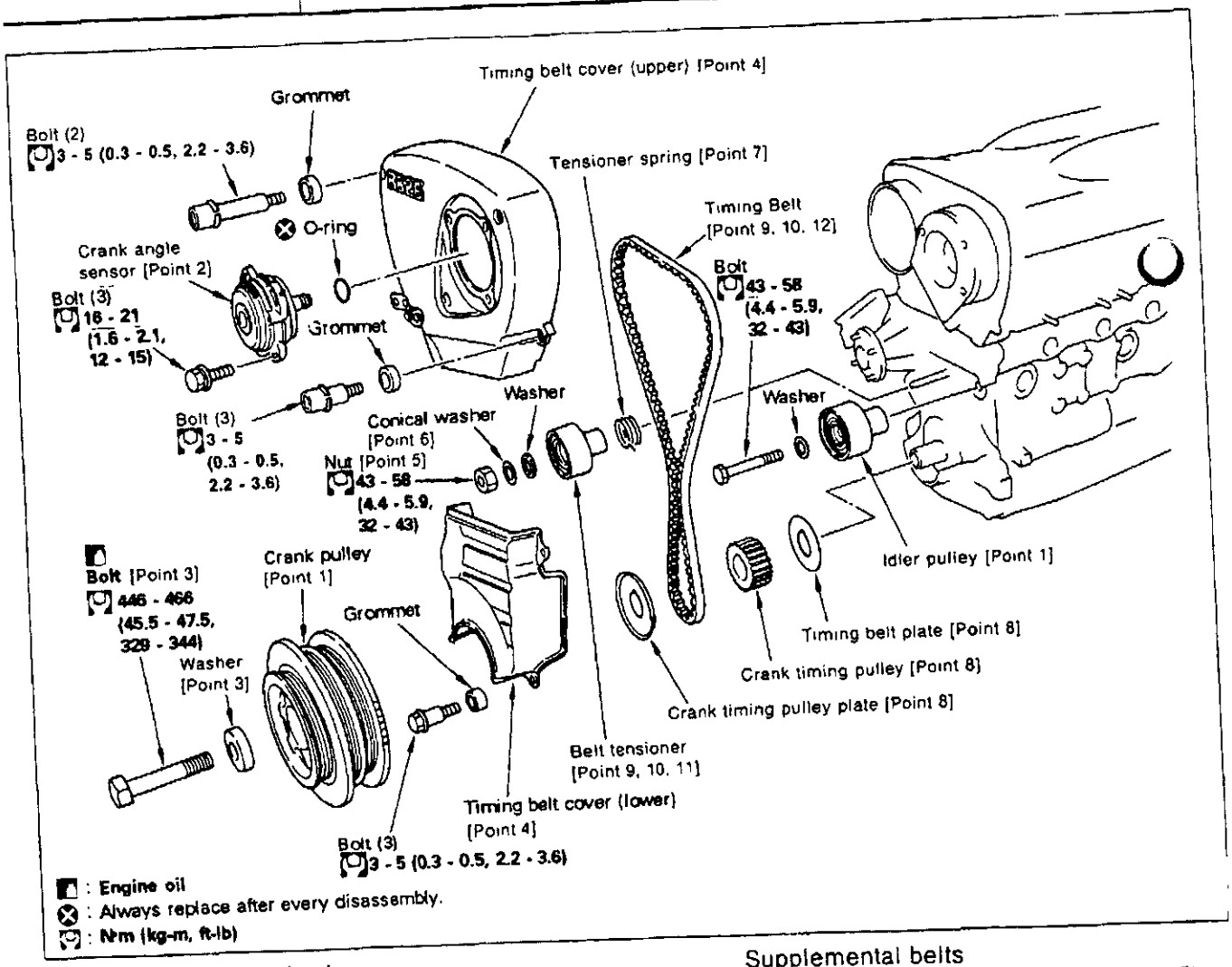
**[Point 3] Rocker cover gasket installation**

- Make sure the rocker cover gasket is positioned securely in groove without twisting, pinching or protrusion.

## 10-11 TIMING BELT REMOVAL AND INSTALLATION

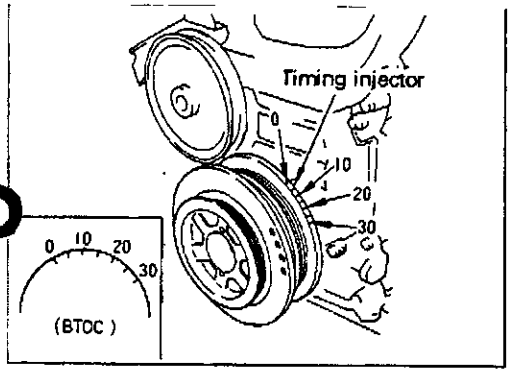
### Tools required

| | Name | | Application |
|---|---|---|---|
| Special tool | Ring gear stopper<br>KV101 104S0<br>① Adapter<br>KV101 10410<br>② Stopper plate<br>KV101 05610 |  | Crank pulley bolt removal and installation |
| | Pulley puller<br>ST2718 0001 |  | Crank pulley removal and installation |



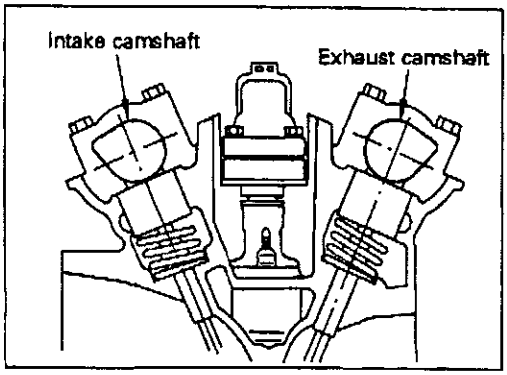

Additional work required:

- Drain and refill: Cooling water
- Remove and install:
  - Under cover
  - Radiator, fan shroud
  - Cooling fan
  - Supplemental belts
  - Water pump pulley
  - Spark plugs
- Check No. 1 cylinder compression T.D.C. position [Point 1]
- Install ring gear stopper [Point 3]

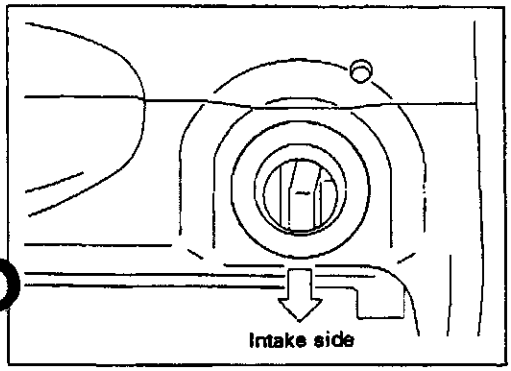



**[Point 1] No. 1 cylinder pressure T.D.C. (top dead center) inspection**

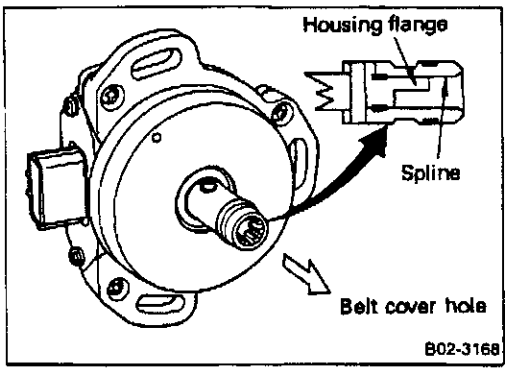
- Align the crank pulley timing mark and belt cover timing indicator (0° position).
  At this time, the No. 1 cylinder is in the compression T.D.C. position when the camshaft is located as described below.




- No. 1 cylinder is at the compression stroke top dead center when both the intake and exhaust side cams do not move the valve lifters.

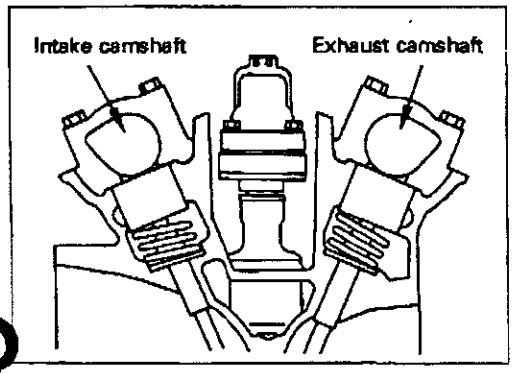


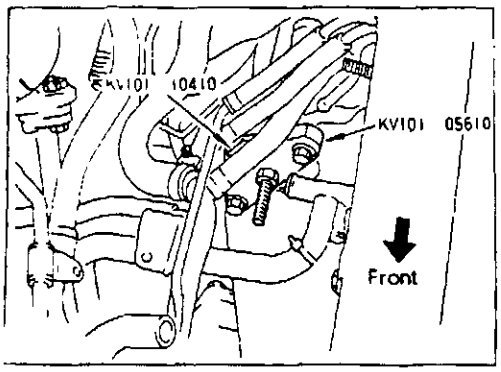

- Remove oil filler cap from intake side rocker cover and check that the front end of camshaft faces the intake side.




**[Point 2] Crank angle sensor installation**

- Apply chassis grease to drive unit spline during installation.
- There is a flange inside drive unit spline so spline only has one insertion position. Check the alignment visually before assembly.
- Check that crank angle sensor can be easily inserted in belt cover holes and sensor moves lightly to right and left, then tighten bolts.
- When sensor does not move lightly, loosen belt cover bolts to position when crank angle sensor was inserted. Move belt cover lightly horizontally and vertically to align it so belt cover holes and camshaft center are aligned and then tighten bolts so crank angle sensor moves lightly.

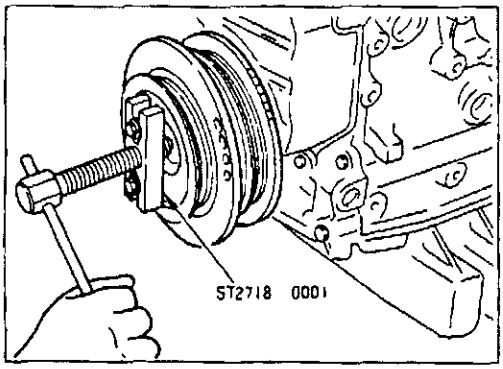




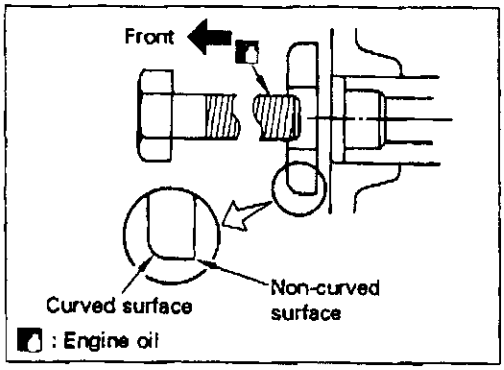

### [Point 3] Removal and installation of crank pulley and bolt

#### Removal

- Remove starter motor, and attach ring gear stopper. (Refer to B5 starter motor removal and installation.)



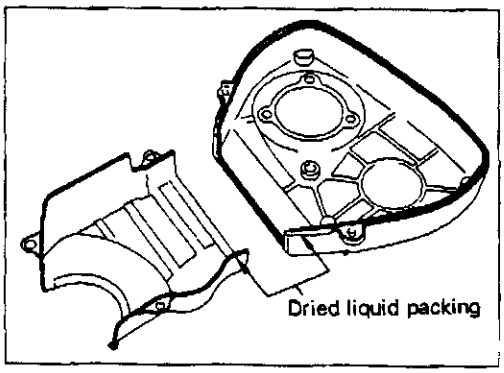

- Use a pulley puller (steering wheel puller) to remove crank pulley. [Bolt size: M6 x 1.0, length below head approx. 50 mm (1.97 in).]




#### Installation

- Position the washers for the crank pulley bolts so the flat surface contacts the crank pulley side and then assemble.
- Apply a coat of engine oil to the threads of crank pulley bolts.

| | |
|---|---|
| Tightening torque | 446 - 466 N·m (45.5 - 47.5 kg-m, 329 - 344 ft-lb) |




### [Point 4] Timing belt cover removal and installation

#### Removal

- Timing belt cover is separated into upper and lower sections. After crank angle sensor is removed, first remove the upper section and then remove lower section in this sequence.

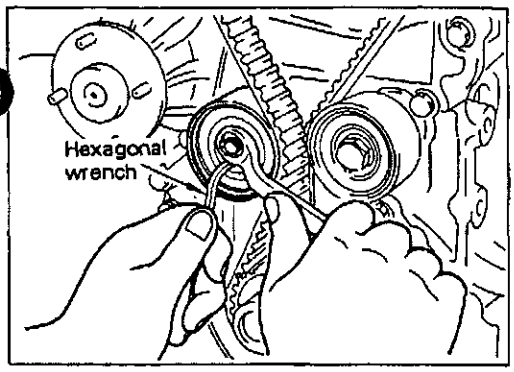
#### Installation

- Installation is performed in reverse sequence of removal.

**CAUTION:**

**Do not scratch dried liquid packing when removing and installing timing belt cover.**

| | |
|---|---|
| Tightening torque | 3 - 5 N·m (0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb) |

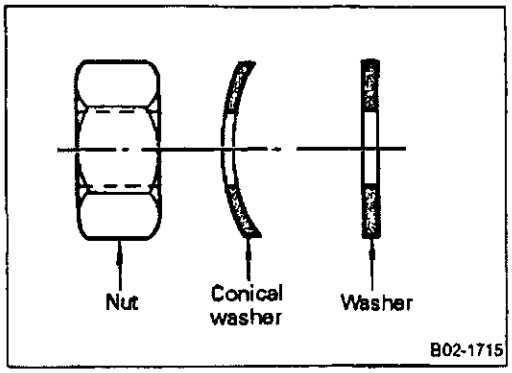



### [Point 5] Belt tensioner nut removal and installation

- When removing and installing belt tensioner nuts, secure the tensioner firmly with a hexagonal wrench.

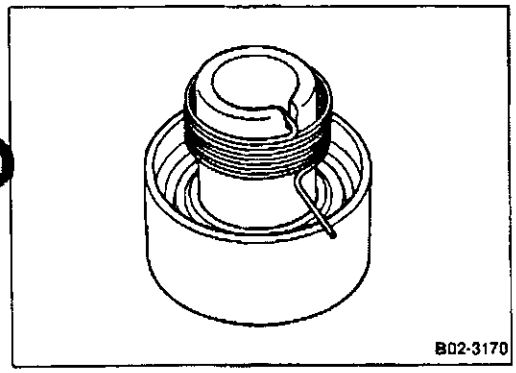
**CAUTION:**
**Do not loosen inserted stud at disassembly.**

| | |
|---|---|
| Tightening torque | 43 - 58 N·m (4.4 - 5.9 kg-m, 32 - 43 ft-lb) |



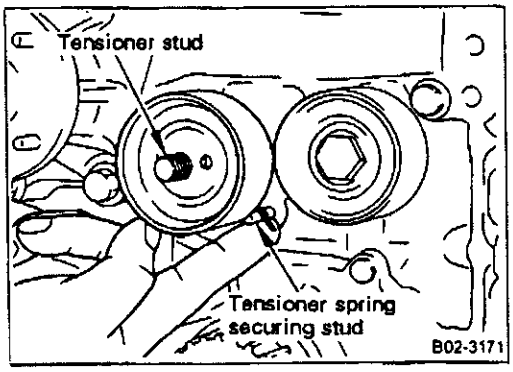

### [Point 6] Conical washer installation

- Pay close attention to the installation direction of conical washers.
  The washer should be set with face the chamfered side facing the tensioner pulley side.

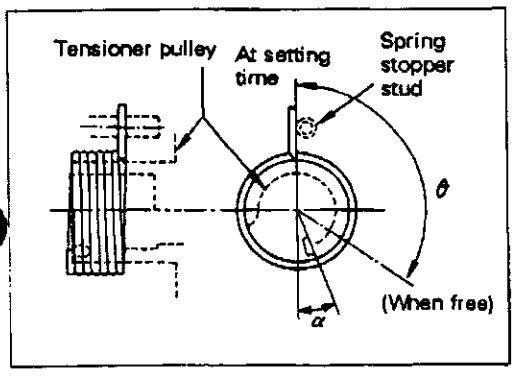



### [Point 7] Tensioner spring installation

- Assemble the tensioner spring so it engages the belt tensioner pulley as shown in the figure.
- The tensioner spring must be assembled together with the belt tensioner pulley in the cylinder block.

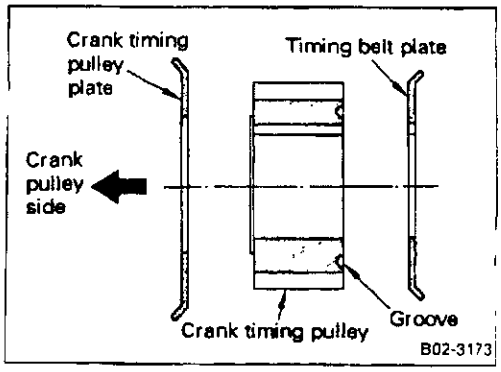



- When tensioner pulley is free, hook the tensioner spring on the upper side of tensioner spring stud.



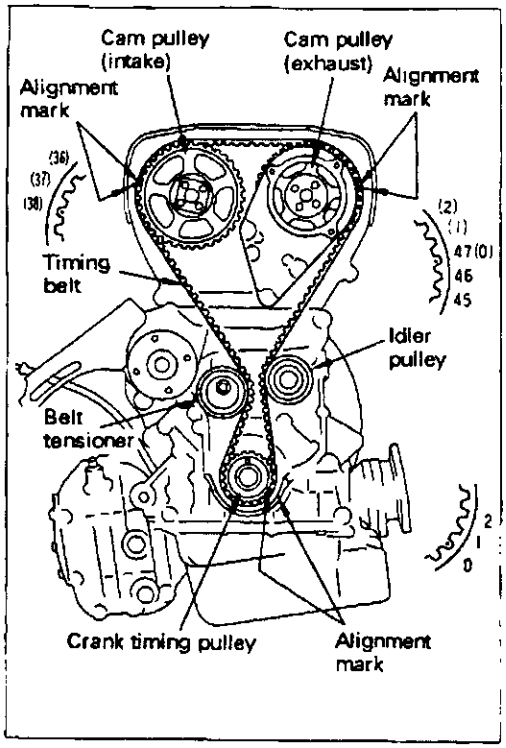

### Tensioner spring specifications

| Spring wire diameter | Set angle: α | Free angle: θ | Classification paint |
|---|---|---|---|
| 1.8 mm (0.071 in) | Approx. 20° | Approx. 163° | Yellow-green |




### [Point 8] Crank timing pulley and plate installation

- Be careful to observe front and rear positioning of timing belt plate, crank timing pulley and crank timing pulley plate when installation is performed.




### [Point 9] Timing belt alignment mark verification and installation

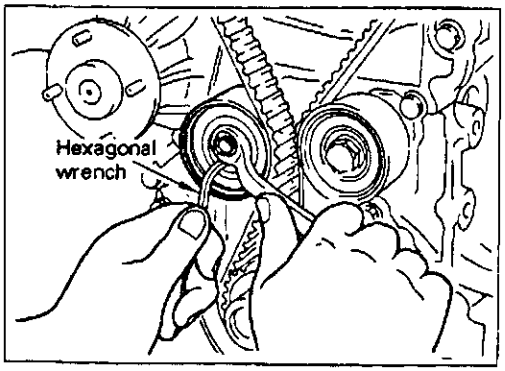
**If paint on upper belt is unclear when disassembly is performed, paint a mark on belt that indicates rotation direction.**

- Position the alignment marks of the intake and exhaust cam pulleys with the respective belt cover alignment marks. (No. 1 cylinder is at T.D.C.)
- Align the crank timing pulley alignment mark with the mark on oil pump housing. The groove must be straight up at this time. (No.1 cylinder compression T.D.C.)
- Move the belt tensioner clockwise at a 70 - 80° angle, and secure it temporarily with belt tensioner nut. (This will minimize the offset between the tensioner shaft and timing belt.)
- Align timing belt pulley marks and install belt. Align the number of ridges of exhaust cam pulley alignment mark and crank pulley (inner) alignment mark as shown in the figure on left.
- After loosening nuts and adjusting belt tension, secure tensioner with hexagonal wrench so it does not rotate together and tighten nut.

**CAUTION:**

**(1) At timing belt assembly, check that it engages correctly with pulley and does not float.**

**(2) When disassembly is performed, replace belts whenever possible.**




### [Point 10] Timing belt tension adjustment

- Remove spark plugs, and align timing belt alignment marks with pulley marks and install timing belt onto each pulley.
- Loosen tensioner securing nut so belt tension is applied by tensioner spring.
- In this condition, turn crank pulley more than two turns clockwise to check belt movement and stop slowly at No. 1 cylinder compression T.D.C. point.
- Insert the hexagonal wrench in hexagonal hole. While holding it by hand so the tensioner does not move, tighten the tensioner securing nut to specified tightening torque.

| | |
|---|---|
| Tightening torque | 43 - 58 N·m (4.4 - 5.9 kg-m, 32 - 43 ft-lb) |

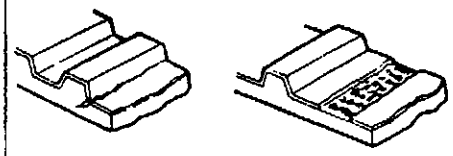
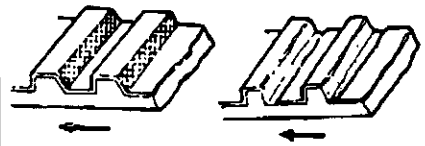
- The initial tension on the belt should be approximately 196 N (20 kg, 44 lb) in this condition.

**[Point 11] Idler and tensioner pulley installation**

- Do not loosen inserted studs at disassembly. If studs are loosened, coat inserted stud with Locktite solution (Japan Locktite KK) or equivalent.

**[Point 12] Timing belt inspection**

- Replace timing belt if inspection indicates any problem.

| Item | Condition | Cause |
|---|---|---|
| Missing tooth<br>Cracked tooth |  | Camshaft lock<br>Crank angle sensor lock |
| Cracks in rear side |  | Tensioner lock<br>Engine overheating<br>Interference with belt cover, etc. |
| Wear and cracks on side surface |  | Belt misalignment<br>Belt plate malfunction |
| Worn teeth |  | Large sliding motion resistance in crank angle sensor and crankshaft |
| Oil or water adhesion | | Oil seal malfunction<br>Water leaks in water pump |

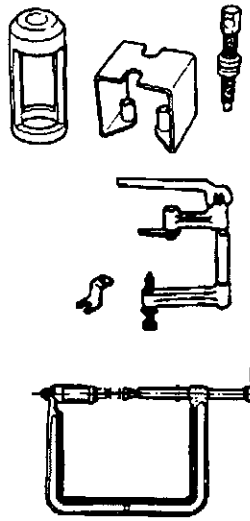
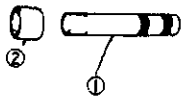
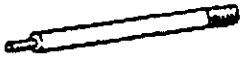
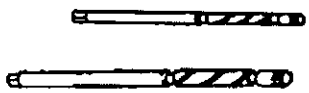
**CAUTION:**

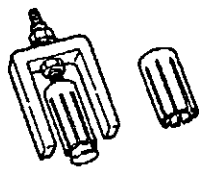
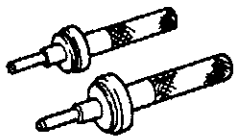
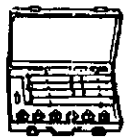
**Make sure timing belt is not twisted or bent sharply. Also make sure there is no oil film or water on belt.**

## 10-12 CYLINDER HEAD ASSY

**Be careful when handling exhaust valves because metallic sodium is sealed inside. Refer to Page EN-67**

### Tools required

| | Name | | Application |
|---|---|---|---|
| Special tool | Pulley holder<br>KV101 09900<br>or<br>KV101 09300,<br>ST3152 0000,<br>ST3153 0000 |  | Cam pulley bolt removal and installation |
| | Valve spring compressor<br>KV101 11300<br><br>ST1207 0000<br><br>KV101 089S0 |  | Valve spring installation and removal |
| | Valve oil seal puller<br>KV101 07900 |  | Valve oil seal removal |
| | Valve oil seal drift and drift attachment<br>① KV101 07501<br>② KV101 14800 |  | Valve oil seal insertion |
| | Valve guide drift |  | Valve guide installation and removal |
| | Valve guide reamer for guide insertion hole correction<br>Exhaust side<br><br>Guide inner diameter correction<br>Intake side<br>KV101 11600 6.0 mm (0.236 in) dia.<br>Exhaust side<br>KV101 07700 7.0 mm (0.276 in) dia. |  | Valve guide insertion hole and guide internal diameter correction |

| | Name | | Application |
|---|---|---|---|
| Special tool | Valve seat remover, intake side, exhaust side |  | Valve seat removal |
| | Valve seat drift intake side, exhaust side |  | Valve seat insertion |
| | Valve seat cutter set |  | Valve seat form correction |
| Tool | Valve surface grinder | | |
| Measurement tool | Inside micrometer | | Lifter guide, etc., inspection |
| | Micrometer | | Camshaft, etc., inspection |
| | Dial gauge | | Camshaft, etc., inspection |
| | V-block | | Camshaft, etc., inspection |
| | Valve spring tester | | Valve spring, etc., inspection |
| | Square edge | | Valve spring, etc., inspection |
| | Square edge | | Cylinder head, etc., inspection |

## SPECIAL PRECAUTIONS TO ENSURE SAFE DISPOSAL OF SODIUM-FILLED EXHAUST VALVES

The handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent exposure to water, the sodium metal which lines the inner portion of the exhaust valve will react violently, forming sodium hydroxide and releasing hydrogen gas which may result in an explosion or fire.

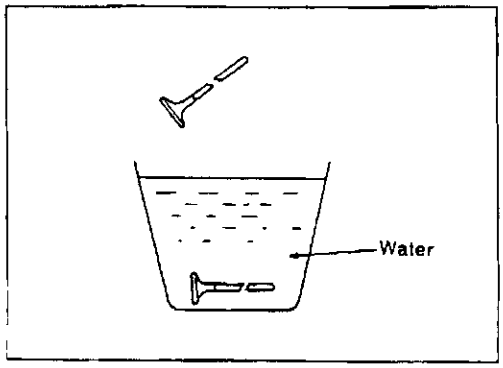
- **Damage to eyes may result in loss of vision**
- **Contact with skin will result in burns**
- **Fire may occur.**

### ① Basic precautions

- Never attempt to break valve and remove sodium metal.
- In principle, dispose of used valves by returning them to the Nissan service office.
- If valve(s) is/are damaged, remove valve(s), and perform sodium-filled valve disposal operations (neutralization and waste water disposal).

### ② Processing method

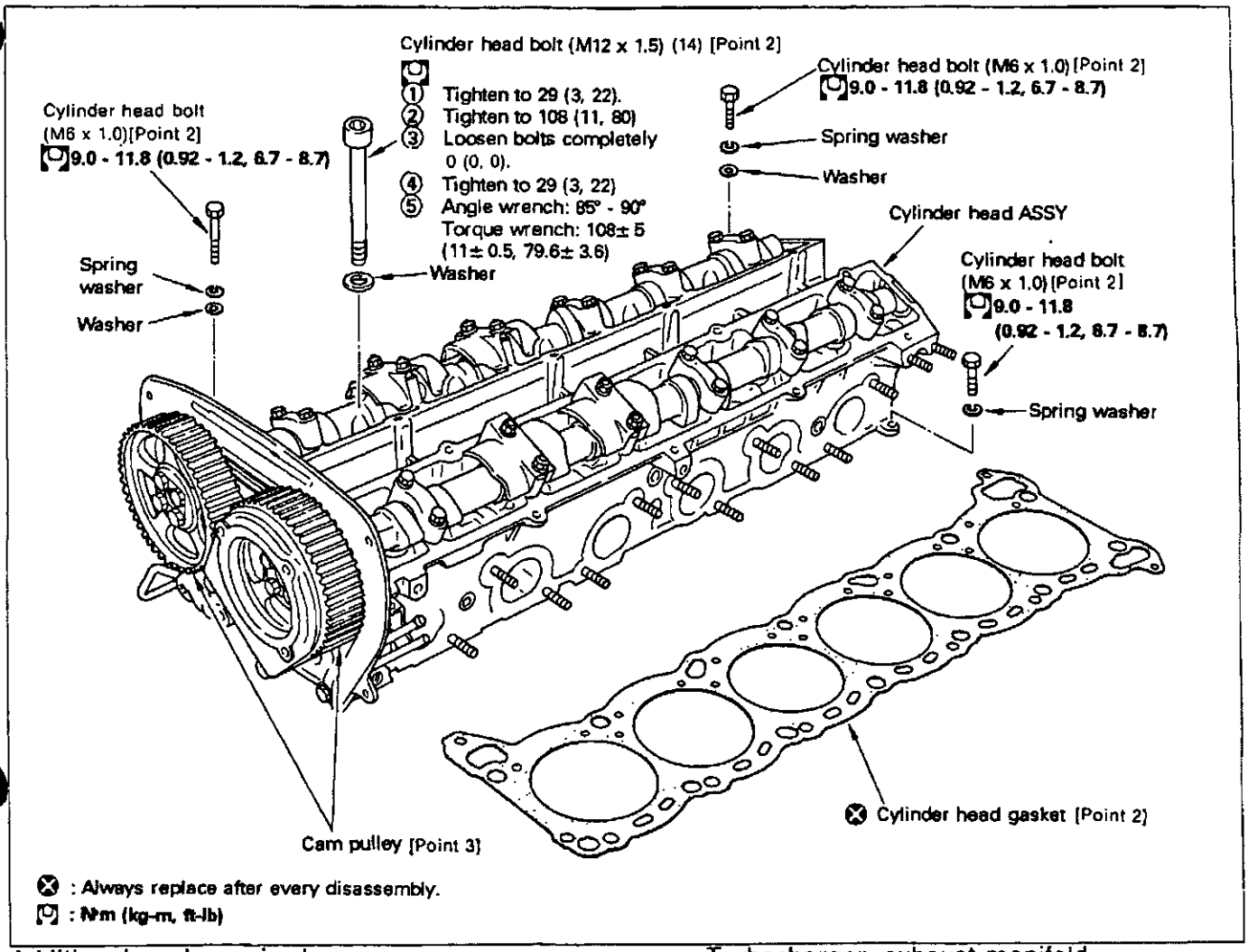
In principle, dispose of used valves by returning them to the Nissan service office.
If local industrial waste treatment companies do not perform the required press processing and it is clearly established that a solvent method can be used instead, this type of disposal method is also acceptable.
If valve(s) is/are damaged, remove valve(s), neutralize by water reaction and dispose of them with the same method used for ordinary scrap metal.
Processing must be performed as follows.




- Wear rubber gloves to remove valves from cylinder head.
- Pour more than 10 liters (2-1/4 Imp gal) of water into a bucket in a well-ventilated area.
- Submerge the damaged valves in the bucket.
- The reaction is violent so stand 2 to 3 meters (7 to 10 ft) from bucket.
- Hydrogen gas is produced so do not bring any naked flame near bucket.
- After the reaction is finished (4 - 5 hrs.), use large tweezers to pick the valves out. The valves can be disposed of by the same method used for other waste products at this time.
- Dealers should check their respective state and local regulations concerning any chemical treatment or waste water discharge permits which may be required to dispose of the resultant (high alkalinity) waste water.

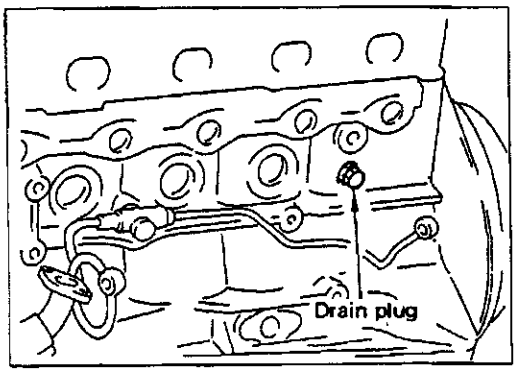
**CAUTION:**
**Make sure the resultant (high alkalinity) waste water does not contact your skin. If the waste water does contact the skin, wash the affected area immediately with large quantities of water.**

## (1) Cylinder head ASSY removal and installation




Additional work required:

- Drain and refill: Cooling water [Point 1]
- Remove and install:
  - Collector
  - Throttle chamber
  - Intake manifold
  - Turbocharger, exhaust manifold
  - Timing belt
  - Rocker cover
  - Spark plugs
- Installation: Check No. 1 cylinder compression T.D.C. position [Point 3]




### [Point 1] Cooling water drain and refill

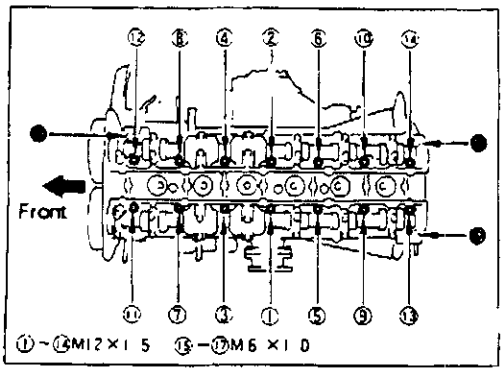
#### Removal

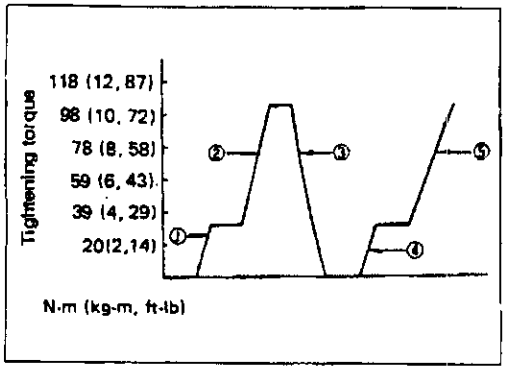
- Remove water completely from cylinder block drain plug.

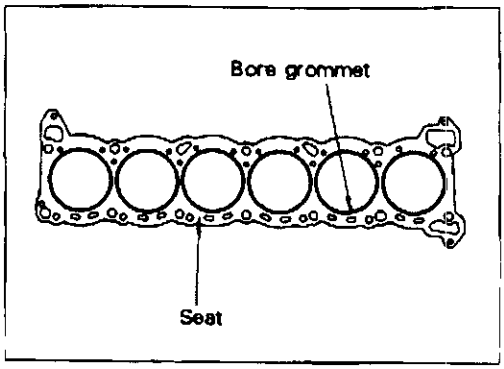
**CAUTION:**
**Do not allow water to enter exhaust front tube.**

#### Refilling water:

- Refer to (B6) "Cooling Water Filling Procedures" for details.




### [Point 2] Cylinder head bolts removal and installation

**Removal**

- Remove bolts in reverse sequence of figure on left.

**Installation**

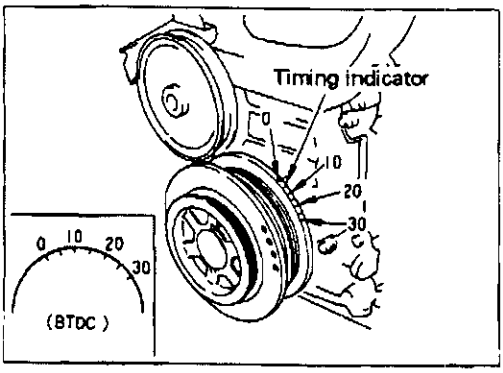
- Remove bolts in sequence shown in figure on left.
- The cylinder head bolts (M12 x 1.5) are torqued by a two-step method in which bolts are tightened two times.

① Tighten to 29 N·m (3 kg-m, 22 ft-lb).
② Tighten to 108 N·m (11 kg-m, 80 ft-lb).
③ Loosen bolts completely 0 N·m (0 kg-m, 0 ft-lb).
④ Tighten to 29 N·m (3 kg-m, 22 ft-lb).
⑤ Turn bolts 85 to 90 degrees clockwise when angle wrench is used. Tighten bolts to 103 to 113 N·m (10.5 to 11.5 kg-m, 76 to 83 ft-lb) when torque wrench is used.

**CAUTION:**

**When angle wrench is not used, never attempt to approximate the tightening angle visually.**

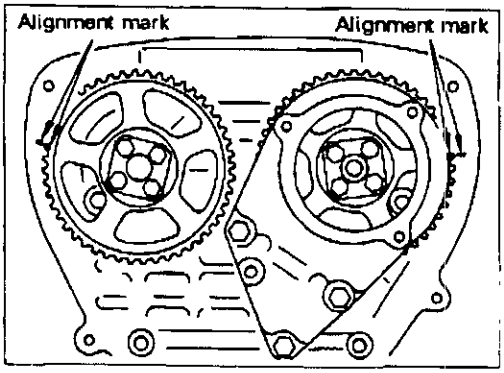
- When gasket is installed, be careful not to hit or scratch gasket seat and bore grommet.
- When gasket is installed, clean cylinder head lower surface and cylinder block upper surface and remove all water, oil and foreign matter. Use compressed air to blow out the bore holes.




### [Point 3] No. 1 cylinder compression T.D.C. verification

Before installing cylinder head ASSY on cylinder block, the crank pulley and cam pulley must be positioned at the No. 1 cylinder compression T.D.C. point.

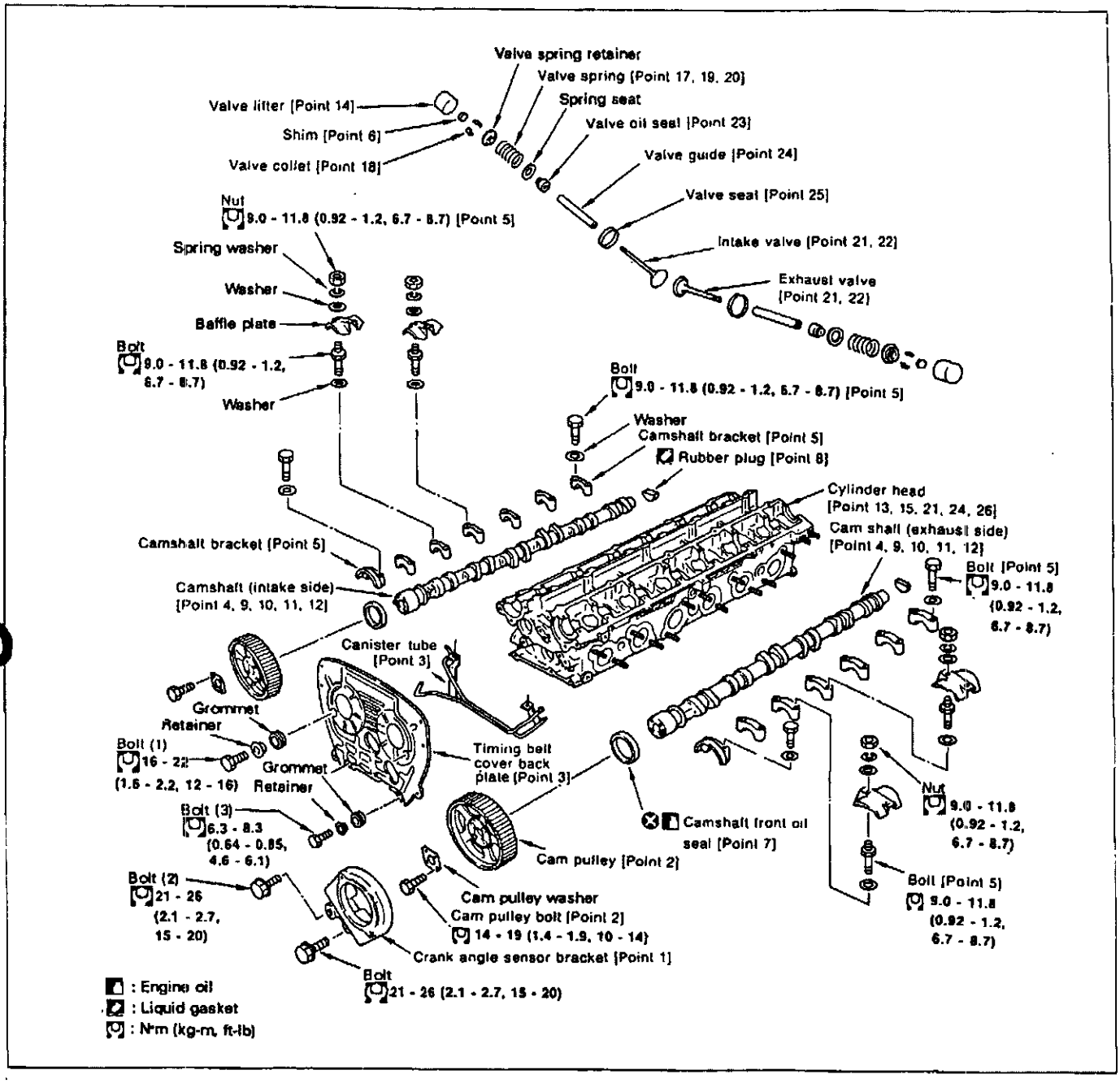
- The crank pulley timing mark and timing belt cover timing indicator (0°) must be aligned.




- Intake and exhaust cam pulley alignment marks must be positioned with their respective belt cover alignment marks.

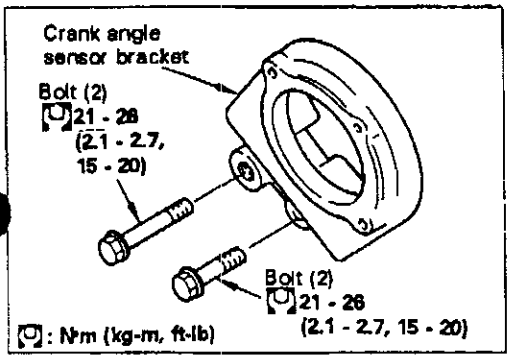
## (2) Cylinder head ASSY disassembly and assembly

**Special Precautions to Ensure Safe Disposal of Sodium-filled Exhaust Valves**
**Refer to page EN-66 for details.**




Additional work required:

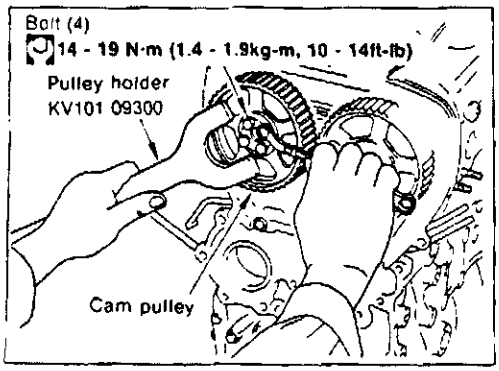
- Cylinder head ASSY removal and installation

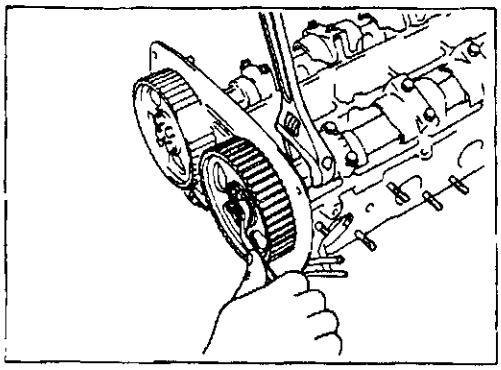



### [Point 1] Crank angle sensor bracket installation

- The crank angle sensor bracket is positioned onto the cylinder head by using knock pins (2 locations). Align the positions correctly when installing the crank angle sensor.

| | |
|---|---|
| Crank angle sensor bracket bolt tightening torque | 21 - 26 N·m (2.1 - 2.7 kg-m, 15 - 20 ft-lb) |



### [Point 2] Cam pulley removal and installation

#### Removal

- Secure the pulley with a pulley holder or sprocket wrench and remove cam pulley bolts.

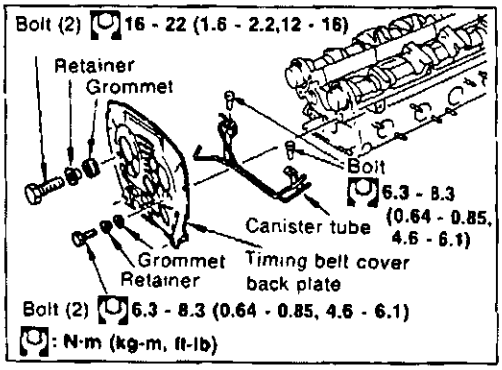
| | |
|---|---|
| Pulley holder | KV101 09900<br>or<br>[KV101 09300,<br>ST3152 0000, or ST3153 0000] |

#### Installation

- Align camshaft knock pin and cam pulley knock pin holes to install camshaft pulley.
- Use a pulley holder or sprocket wrench to tighten the cam pulley bolt.

| | |
|---|---|
| Cam pulley bolt tightening torque | 14 - 19 N·m (1.4 - 1.9 kg-m, 10 - 14 ft-lb) |

- To remove and install cam pulley bolts, use the proper tool to secure the hexagonal part in front of camshaft.




### [Point 3] Timing belt cover back plate removal and installation

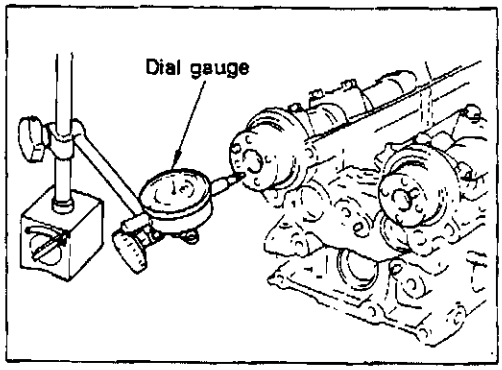
#### Removal

- Remove back plate bolts and detach back plate.

#### Installation

- Assemble back plate with canister tube and then install back plate.

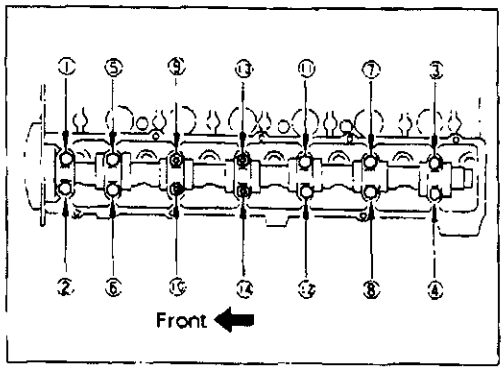
| | | |
|---|---|---|
| Back plate bolt tightening torque N·m (kg-m, ft-lb) | M6 | 6 3 - 8.3 (0.64 - 0.85, 4.6 - 6.1) |
| | M8 | 16 - 21 (1.6 - 2 1, 12 - 15) |




### [Point 4] Camshaft end play inspection

- Set a dial gauge at front end of camshaft in thrust direction. When camshaft moves in front and rear direction, read the dial gauge runout width.

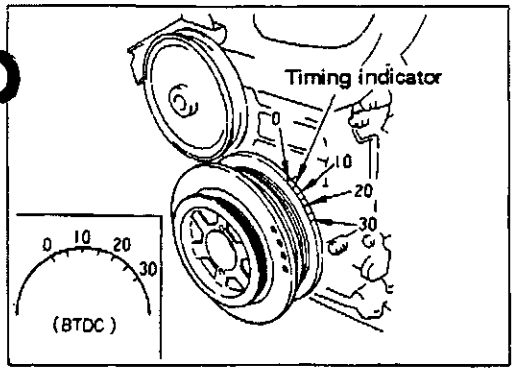
| | |
|---|---|
| Standard value | 0.030 - 0.080 mm (0.0012 - 0.0031 in) |




### [Point 5] Camshaft bracket removal and installation

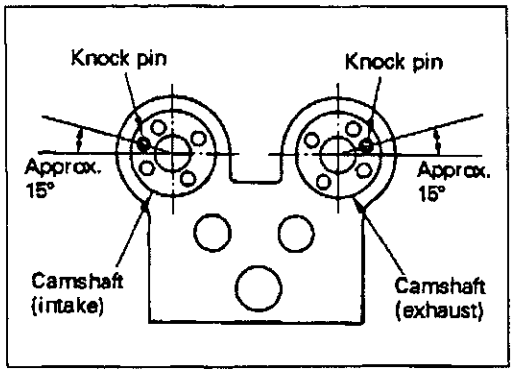
#### Removal (intake and exhaust camshafts)

- Before removing camshaft bracket, paint marks to indicate bracket position and direction.
- Remove cam bracket bolts by loosening them gradually in several stages, in reverse sequence shown in left figure.

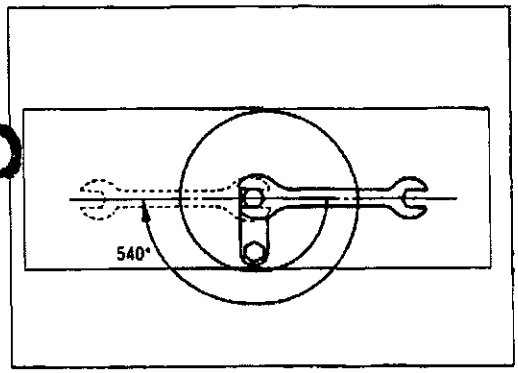



### Installation

- Align crank pulley timing mark and timing belt cover timing indicator (0°) so No. 1 cylinder is at compression T.D.C. position. (This operation is not necessary when cylinder head is removed as single unit.)




- Turn camshaft so No. 1 cylinder is at compression T.D.C. position. (Operation is easier if the camshaft is turned 60° before or after No. 1 cylinder T.D.C. point when cylinder head is installed as single unit.)
  Verify position of No. 1 cylinder is at compression T.D.C. by knock pin in front end of camshaft.
- To install camshaft, temporarily tighten No. 1 cam bracket and check that camshaft thrust section is positioned securely.
- Tighten cam shaft bolt 540° (1.5 turns) in the numeric order shown in upper left figure.

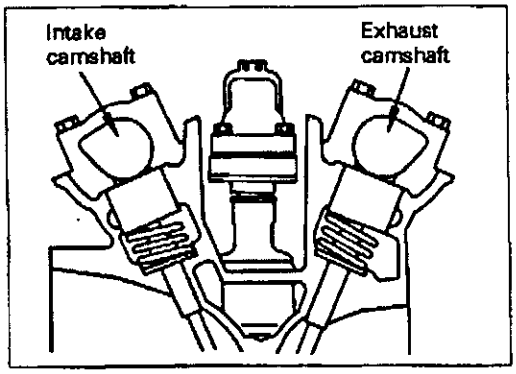



| | |
|---|---|
| Cam bracket tightening torque | 9.0 - 11.8 N·m (0.92 - 1.2 kg-m, 6.7 - 8.7 ft-lb) |

**CAUTION:**

**(1) Before installation, coat the cam journals and end of camshaft with engine oil.**

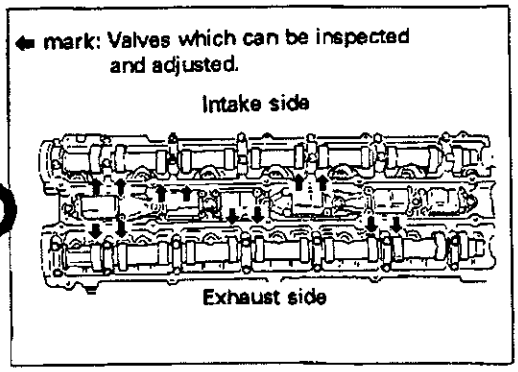
**(2) Do not rotate camshaft. (The valves and pistons may interfere.)**




### [Point 6] Valve clearance adjustment

#### No. 1 cylinder compression T.D.C. point

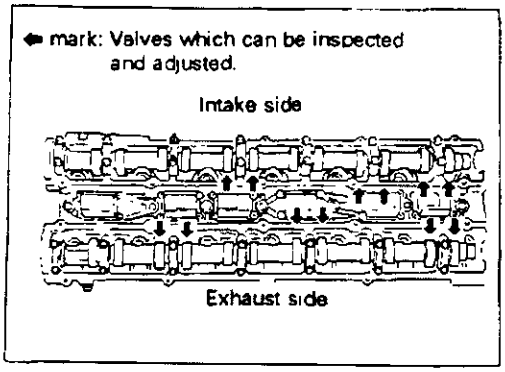
- Turn camshafts (intake and exhaust) so No. 1 cylinder is at the compression T.D.C. position.
- Check knock pin position of camshaft front end to verify No. 1 cylinder compression T.D.C. position.




- No. 1 cylinder is at compression stroke top dead center when both the intake and exhaust side cams do not move the valve lifters.

| Item \ Part | Valve clearance measurement |
|---|---|
| Intake side | Cylinder No. 1, 2, 4 |
| Exhaust side | Cylinder No. 1, 3, 5 |

Firing order: 1-5-3-6-2-4




- Rotate intake and exhaust camshafts 180°.
- No. 6 cylinder is at compression stroke top dead center when both the intake and exhaust side cams do not move the valve lifters.

| Item \ Part | Valve clearance measurement |
|---|---|
| Intake side | Cylinder No. 3, 5, 6 |
| Exhaust side | Cylinder No. 2, 4, 6 |

### Valve clearance specifications

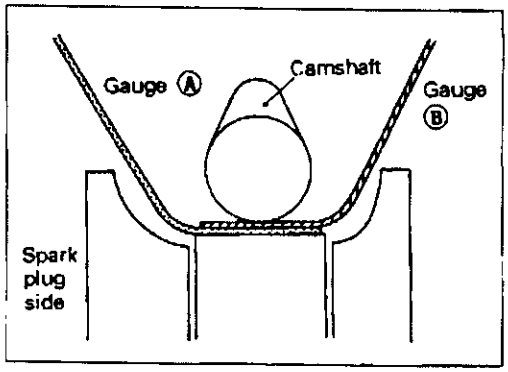
[20 ± 5°C (68 ± 9°F)]

| Item \ Part | Intake | Exhaust |
|---|---|---|
| Valve clearance (cold) mm (in) | 0.45 ± 0.03 (0.018 ± 0.001) | 0.38 ± 0.03 (0.015 ± 0.001) |
| (Reference value: hot) mm (in) | 0.51 ± 0.03 (0.020 ± 0.001) | 0.44 ± 0.03 (0.017 ± 0.001) |

**CAUTION:**
**Always inspect when engine is cold.**

### Reference: Compensation by room temperature

| Room temperature °C (°F) | 0 ± 5 (32 ± 9) | 10 ± 5 (50 ± 9) | 20 ± 5 (68 ± 9) | 30 ± 5 (86 ± 9) |
|---|---|---|---|---|
| Compensation value mm (in) | +0.02 (+0.0008) | +0.01 (+0.0004) | 0 (0) | −0.01 (−0.0004) |

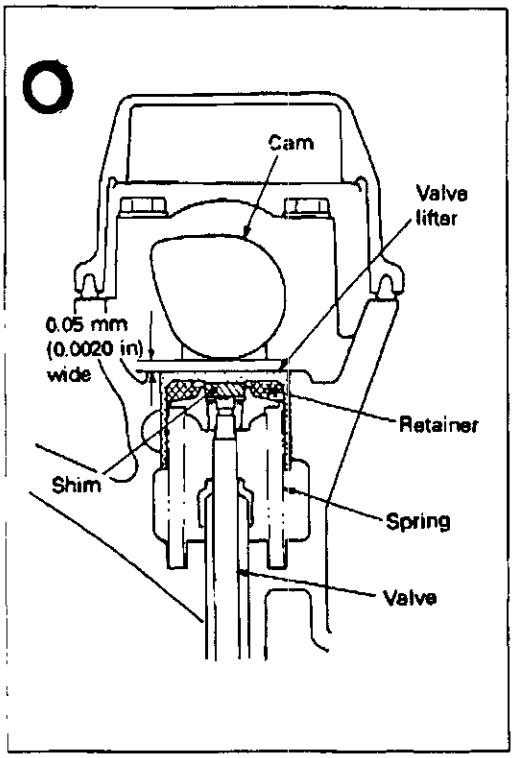



### Valve clearance measurement method

- Insert a 0.15 to 0.20 mm (0.0059 to 0.0079 in) feeler gauge Ⓐ from spark plug side.
- Insert feeler gauge(s) Ⓑ from opposite side. Select a gauge thickness that will reduce the clearance to 0 mm (0 in).

**Note:**
- **Do not use more than two gauges for Ⓑ.**
- **The feeler gauge must conform to JIS (Japanese Industrial Standard) 150A25.**
- Valve clearance = gauge Ⓐ + gauge Ⓑ

Reasons for measurement using gauges Ⓐ and Ⓑ
① The valve clearance setting is larger compared to previous engines.
② The gauges cannot be placed parallel to the measurement surface due to the structure.
- The blade of thick gauges has a high rigidity and does not bend easily, resulting in a large measurement error.
- The error increases if a number of thin gauges are layered and the measurement will be incorrect.



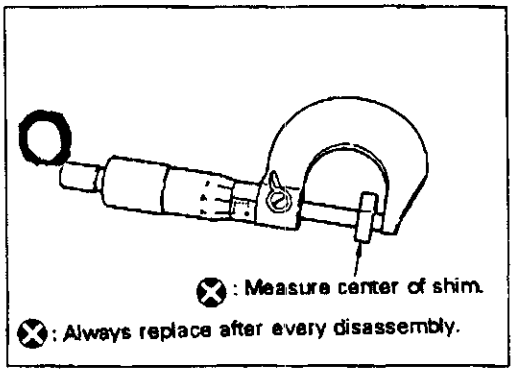

### Valve clearance adjustment

- Select the shim for the valve clearance.
- When measured valve clearance (t) does not conform to specified value, measure shim thickness (T) and replace it with a shim that will produce the standard clearance.

### ① Shim thickness calculation method

Example: When intake valve clearance (t) is 0.50 mm (0.020 in): 0.50 (t) - 0.45 (specified value) = 0.05 mm (0.0020 in).

- The valve clearance is 0.05 mm (0.0020 in) greater than specified value.
- Use shim 0.05 mm (0.0020 in) thicker than current thickness to narrow valve clearance.




### ② Current shim thickness (T) measurement method

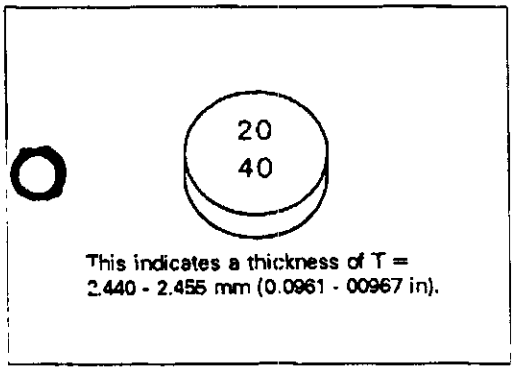
- Use micrometer and measure center of shim.

**CAUTION:**
**Dispose of shims which have been measured and do not use them again.**

### ③ Shim selection

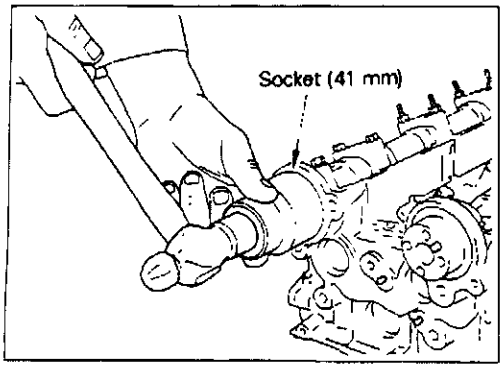
- When current shim thickness (T) is 2.40 mm (0.0945 in): 2.40 (T) mm (0.0945 in) + 0.05 mm (0.0020 in) = 2.450 → selected shim thickness
- Read the identification mark [ $\frac{24}{40}$ ] (T: 2.440 to 2.455) to select shim closest to required thickness.

**CAUTION:**
**The shim thickness tolerance is ±0.03 mm (0.0012 in).**




### ④ Identify the shim type

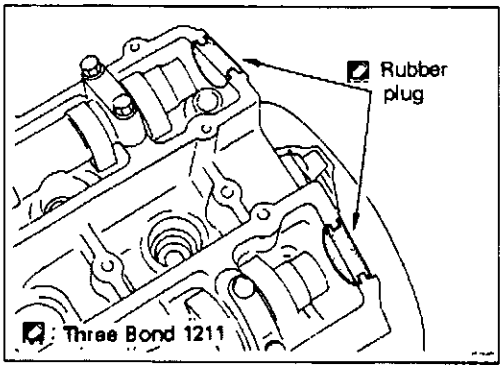
- There are 70 different types of shims.
  Sizes range from 2.275 mm (0.0896 in) to 3.325 mm (0.1309 in) in 0.015 mm (0.0006 in) increments.
- After installing camshaft, measure valve clearance again to check that clearance is within specifications.




### [Point 7] Camshaft front oil seal installation

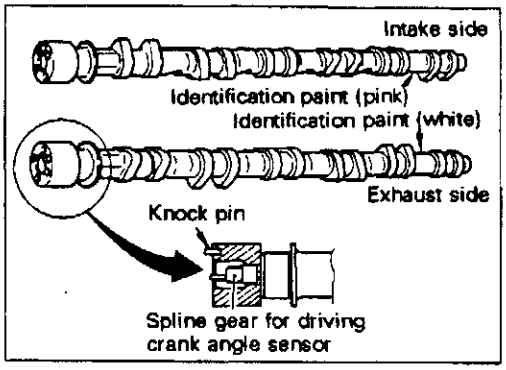
- Be careful not to scratch or make a burr in the oil seal. Use a socket smaller than the seal (41 mm) and drive it into same level as front surface of oil seal retainer.
- Apply a coat of engine oil to the entire perimeter of oil seal lip.

**CAUTION:**
**Do not scratch the oil seal and lip.**




### [Point 8] Camshaft rear rubber plug installation

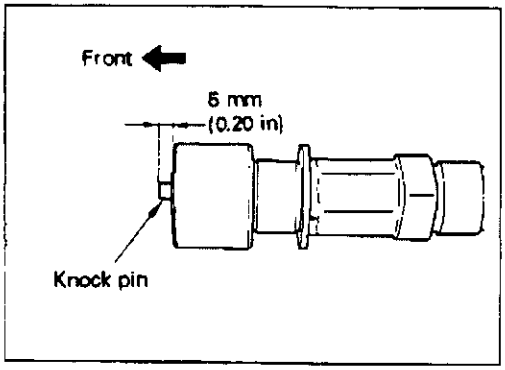
- Before installing rubber plug, remove oil, water, etc., on surface and clean thoroughly.
- When assembling rubber plug, coat it with adhesive (Three Bond 1211).




### [Point 9] Intake and exhaust camshaft classification

- Intake and exhaust camshafts can be identified by identification paint color and presence of a spline gear for driving the crank angle sensor.

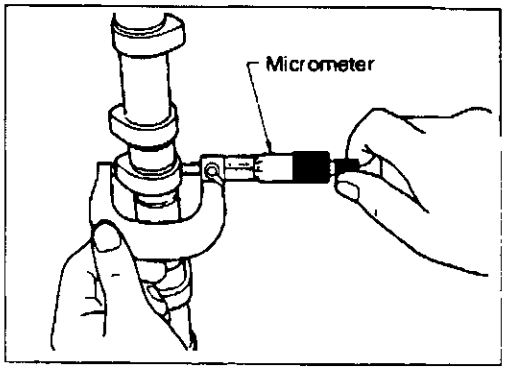
| Camshaft | Identification paint | Spline gear |
|---|---|---|
| Intake camshaft | Pink | No |
| Exhaust camshaft | White | Yes |




### [Point 10] Camshaft knock pin insertion

- The protrusion distance is 5 mm (0.20 in) for camshaft knock pin insertion.

| Knock pin protrusion distance | 5 mm (0.20 in) |
|---|---|



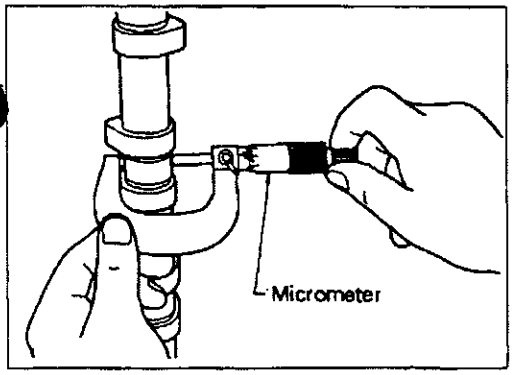

### [Point 11] Camshaft inspection

#### Cam height inspection

- Use a micrometer to measure cam height.

Unit: mm (in)

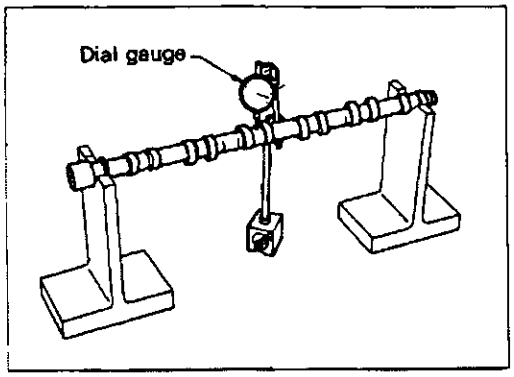
| | Intake side | Exhaust side |
|---|---|---|
| Cam height standard value | 40.58 (1.5976) | 40.28 (1.5858) |
| Cam lift (reference) | 8.58 (0.3378) | 8.28 (0.3260) |




### Camshaft journal outside diameter inspection

- Use micrometer to measure outside diameter of camshaf journal.

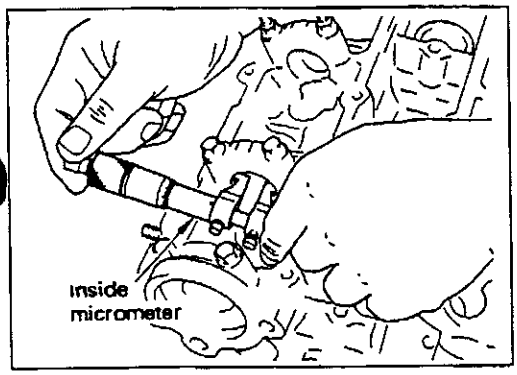
| | No. 1 - No. 7 |
|---|---|
| Standard value | 27.935 - 27.955 mm (1.0998 - 1.1006 in) |




### [Point 12] Camshaft runout inspection

- Use V-blocks on fixed surface to support both camshaft enc journals (No. 1 and No. 7).
- Avoid the oil groove in the center of the No. 4 journal anc position the dial gauge vertically.
- Turn the camshaft by hand one rotation and read the move ment width on dial gauge.
- The runout is equal to one-half of the movement width indi cated on dial gauge.

| | |
|---|---|
| Standard value | 0.05 mm (0.0020 in) |




### [Point 13] Cylinder head cam bracket inside diameter inspection

- **Tighten the cam bracket to specified torque.**

| | |
|---|---|
| Cam bracket bolt tightening torque | 9.0 - 11.8 N·m (0.92 - 1.2 kg-m, 6.7 - 8.7 ft-lb) |

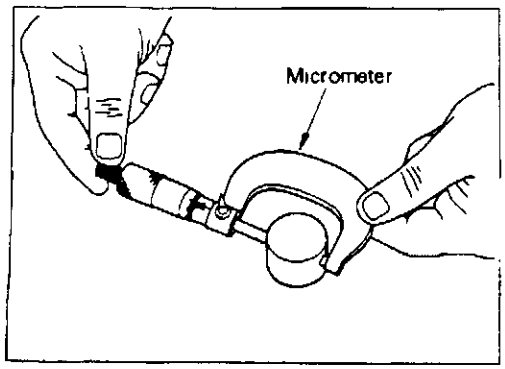
- Use bore gauge or inside micrometer to measure inside diameter.

| | No. 1 - No. 7 |
|---|---|
| Standard value | 28.000 - 28.021 mm (1.1024 - 1.1032 in) |

### [Point 14] Camshaft oil clearance inspection

- The oil clearance can be calculated from the camshaft journal outside diameter and bracket inside diameter measured in [Point 11] and [Point 13].
  (Clearance) = (cam bracket inside diameter) – Camshaft journal (outside diameter)

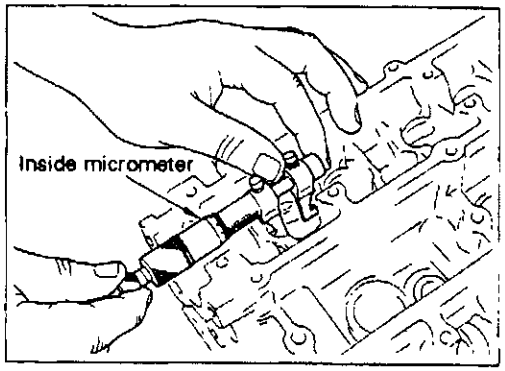
| | No. 1 - No. 7 |
|---|---|
| Standard value | 0.045 - 0.086 mm (0.0018 - 0.0034 in) |




### [Point 15] Valve lifter inspection

- Check contact and sliding surfaces for wear or scratches. Replace if damaged.
- Use a micrometer to check the valve lifter outside diameter.

| | |
|---|---|
| Standard value | 30 955 - 30 965 mm (1.2187 - 1.2191 in) |




### [Point 16] Cylinder head lifter bore inspection

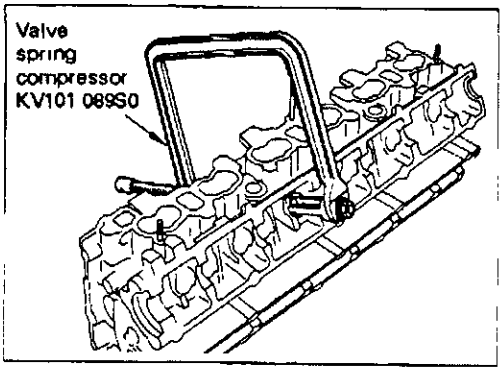
- Check bore surface for wear or scratches.
- Use inside micrometer to measure valve lifter hole diameter.

| | |
|---|---|
| Standard value | 31.0 - 31.020 mm (1.2205 - 1.2213 in) |

### [Point 17] Valve lifter-to-lifter hole clearance inspection

- Check the clearance using values for the valve lifter outside diameter and valve lifter hole diameter measured in [Point 15] and [Point 16].
  (Clearance) = (valve lifter hole diameter) – (valve lifter outside diameter)

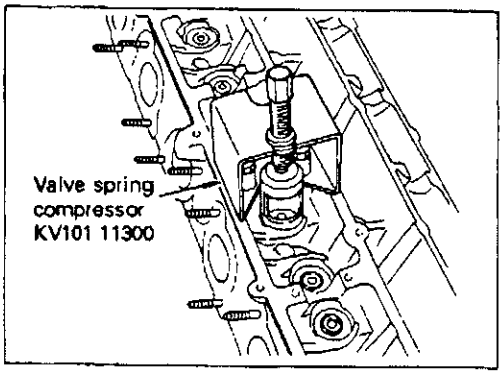
| | |
|---|---|
| Standard value | 0.025 - 0.065 mm (0.0010 - 0.0026 in) |




### [Point 18] Valve spring removal and installation

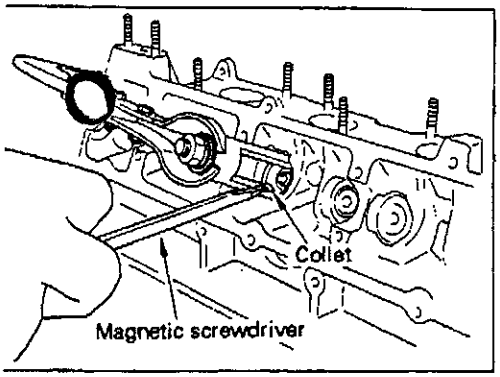
**When cylinder head is removed from vehicle:**

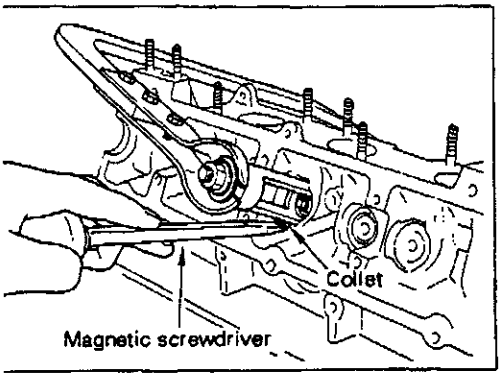
- Use valve spring compressor (KV101 089S0) to remove and install valves.




**When cylinder head is installed in vehicle.**

- Use valve spring compressor (KV101 11300) to remove and install valve springs.




### [Point 19] Valve collet removal and installation

**Removal**

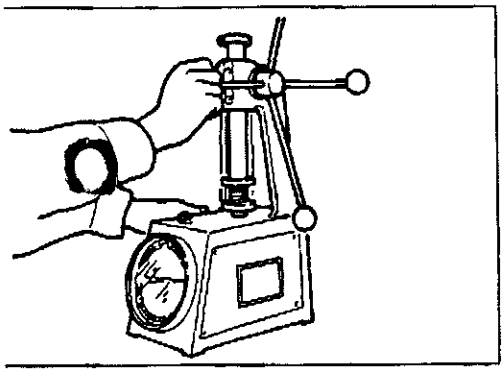
- Use tweezers for removal and installation of collet.

**Installation**

- Apply a small coating of petroleum jelly to the internal surface of collet.
- Use a magnetic screwdriver.

① Upper collet installation
Attach collet to lower side of magnetic screwdriver blade and install in the valve stem.

② Lower collet installation
Attach collet to upper side of magnetic screwdriver blade and install in the valve stem.



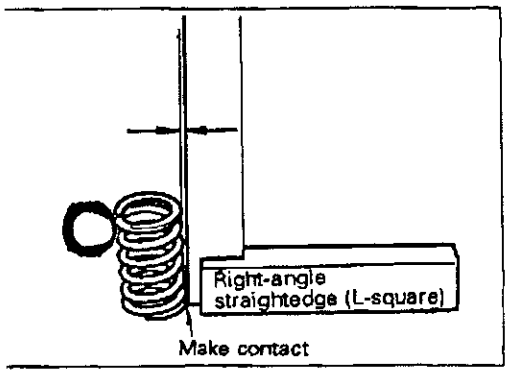
### [Point 20] Valve spring inspection

**Free length and pressure load inspection**

- Use a valve spring tester to check spring pressure.

| | Standard value | Limit value |
|---|---|---|
| Free length mm (in) | 46.54 (1.8323) | — |
| Installation load N (kg, lb) | 235.4 (24.0, 52.9) | 220.7 (22.5, 49.6) |
| Identification color | White | — |

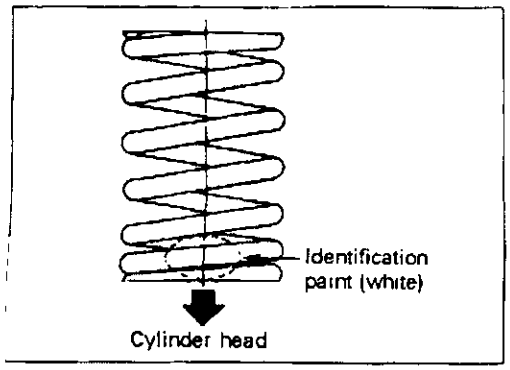
Note: Installation load is the force required to compress the spring to a 35 mm (1.38 in) length.




**Valve spring squareness inspection**

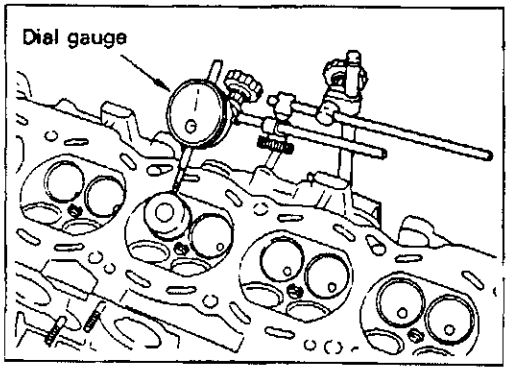
- Place a right-angle straightedge (L-square, etc.) so it contacts spring. Turn spring and measure the maximum clearance between upper spring surface and right angle surface to determine out-of-square distance.

| | |
|---|---|
| Limit | 1.8 mm (0.071 in) |




### [Point 21] Valve spring installation

- Install uneven pitch type spring with narrow pitch end toward cylinder head (identification color side down).

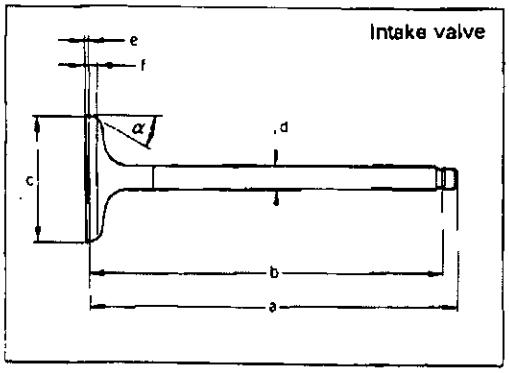


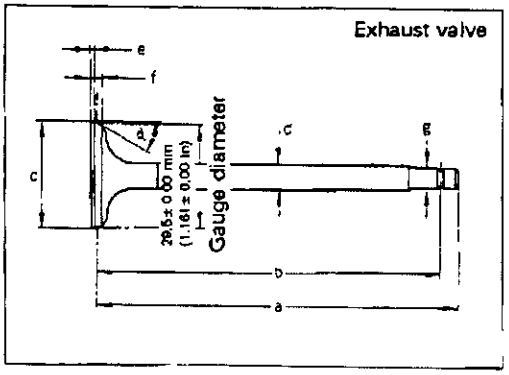

### [Point 22] Valve guide clearance inspection

- Protrude valve approximately 15 mm (0.59 in) from valve guide hole into combustion chamber. Measure valve deflection by swinging it in direction parallel to dial gauge.
- The clearance is equal to one-half of the dial gauge reading (deflection width).

| | | Intake | Exhaust |
|---|---|---|---|
| Limit | mm (in) | 0.1 (0.004) | 0.1 (0.004) |

- If clearance exceeds limit, verify valve stem diameter and replace valve or valve guide.



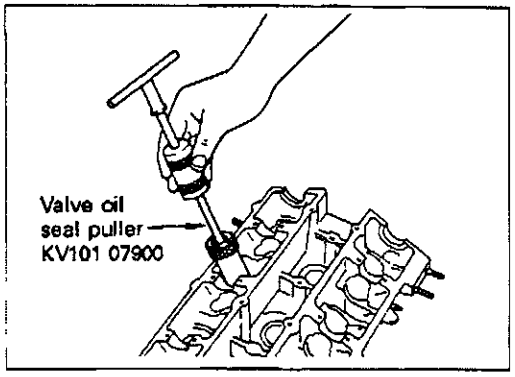

### [Point 23] Valve inspection

**Outside diameter measurement**

Unit : mm (in)

| Valve | a | b | c | d | e | f | g | α |
|---|---|---|---|---|---|---|---|---|
| Intake | 100.98 ± 0.1 (3.9756 ± 0.0039) | 97.45 ± 0.15 (3.8366 ± 0.0059) | $34.5^{+0.2}_{0}$ ( $1.358^{+0.008}_{0}$ ) | $6.0^{-0.020}_{-0.035}$ ($0.2362^{-0.0008}_{-0.0014}$) | 1.3 (0.051) | $2.6^{+0.3}_{0}$ ($0.102^{+0.012}_{0}$) | — | 45°30′ |
| Exhaust | 99.98 ± 0.1 (3.9362 ± 0.0039) | 95.48 ± 0.15 (3.7590 ± 0.0059) | $30.0^{+0.2}_{0}$ ( $1.181^{+0.008}_{0}$ ) | $7.0^{-0.080}_{-0.095}$ ( $0.2756^{-0.0031}_{-0.0037}$ ) | 1.2 (0.047) | $2.9^{+0.3}_{0}$ ($0.114^{+0.012}_{0}$) | $6.0^{-0.020}_{-0.055}$ ($0.236^{-0.0008}_{-0.0022}$) | 45°30′ ± 15′ |

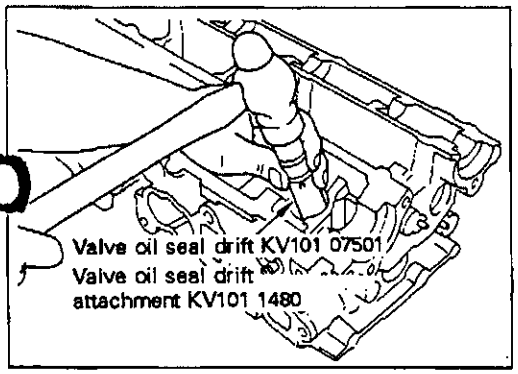
**Be especially careful in handling and disposal of valves because exhaust valves are filled with metallic sodium. Refer to Page EN-67.**




### [Point 24] Valve oil seal removal and installation

#### Removal

- Use valve oil seal puller to remove valve seal.



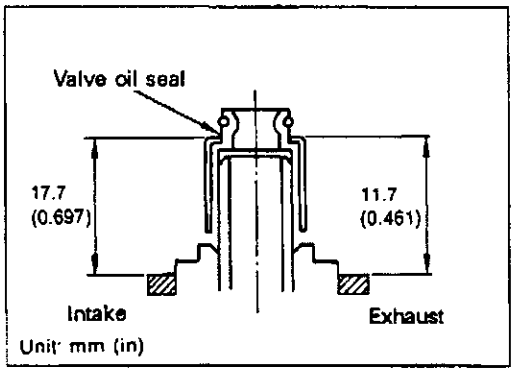

#### Installation

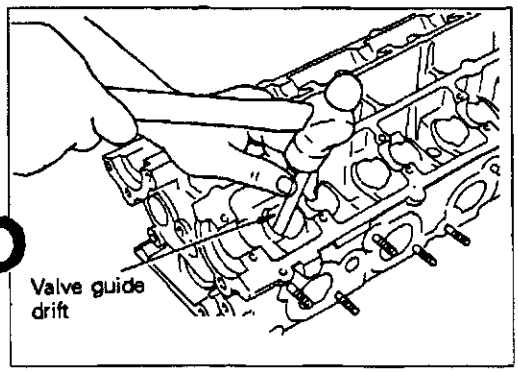
- Use valve oil seal drift to install valve seals.

| Part / Tools | Intake | Exhaust |
|---|---|---|
| Drift | KV101 07501 | |
| Drift attachment | KV101 14800 | |

**CAUTION:**
**Coat inside of valve oil seal with engine oil before installation.**

- Install valve oil seal as shown in figure.

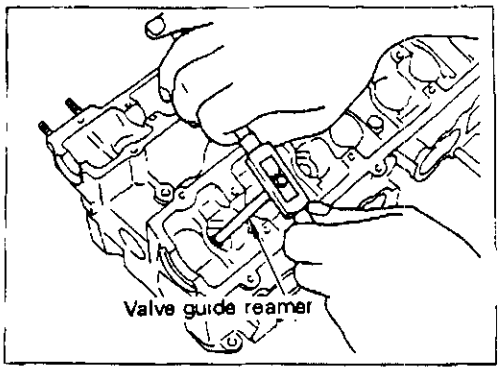



### [Point 25] Valve guide removal and installation

#### Removal

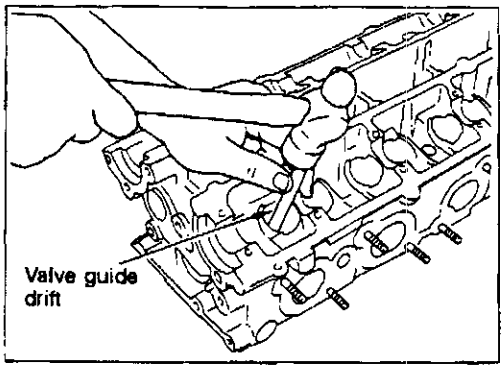
- Use valve guide drift and tap it from combustion chamber side to remove seal.



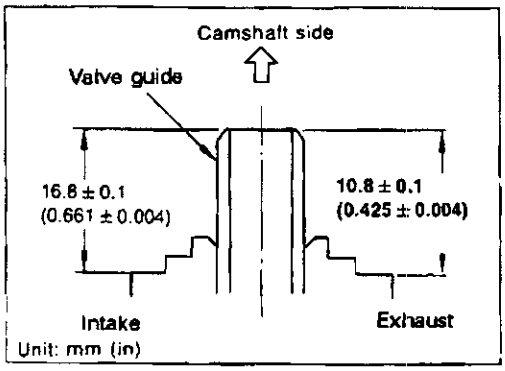

### Installation

- Ream cylinder head valve guide holes with valve guide reamer at normal temperature to rectify the hole diameter [when using 0.5 mm (0.020 in) oversize service part)].

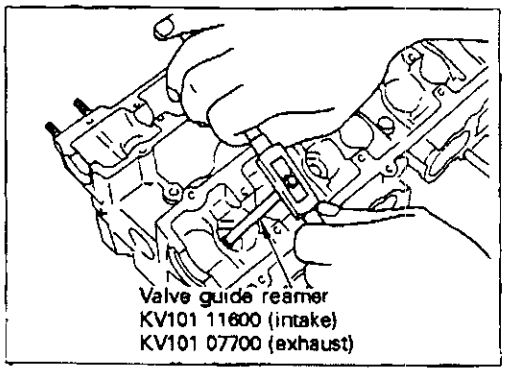
| | | |
|---|---|---|
| Rectified value mm (in) | Intake side | 10.46 - 10.478 (0.4118 - 0.4125) |
| | Exhaust side | 11.46 - 11.478 (0.4512 - 0.4519) |




- Heat cylinder head in an oil bath to approximately 150 to 160°C (302 to 320°F). Use a valve guide drift or press-fit tool and press valve guide from camshaft side.

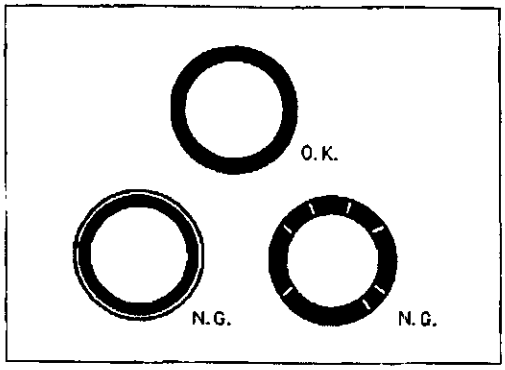



- The press-fit dimensions are shown in figure at left.




- Ream the inside of the inserted valve guide with valve guide reamer.

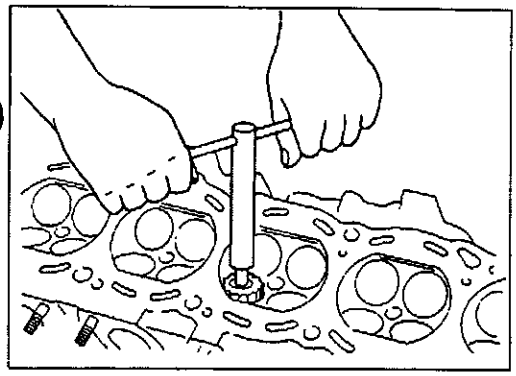
| | | |
|---|---|---|
| Finished internal diameter standard value mm (in) | Intake side | 6.000 - 6.018 (0.2362 - 0.2369) |
| | Exhaust side | 7.000 - 7.018 (0.2756 - 0.2763) |




### [Point 26] Valve seat

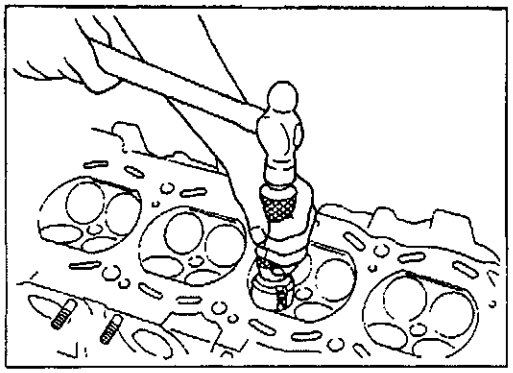
### Inspection

- Check contacting surfaces of valve seat and valve.
- Replace valve or valve seat if contacting surface is too large or improper, or grind both surfaces and lap with abrasive compound.



- When surfacing valve seat due to poor contact, inspec valve guide clearance and valve stem hole clearance.
- Use valve seat cutter or valve seat grinder and finish tc standard value.

**CAUTION:**
**When using valve seat cutter, press firmly and cut evenly with both hands to produce uniform cutting surface.**



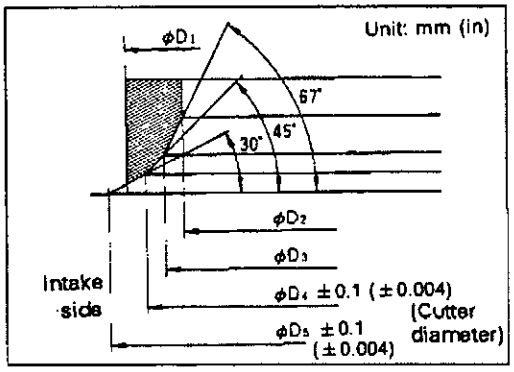
### Removal

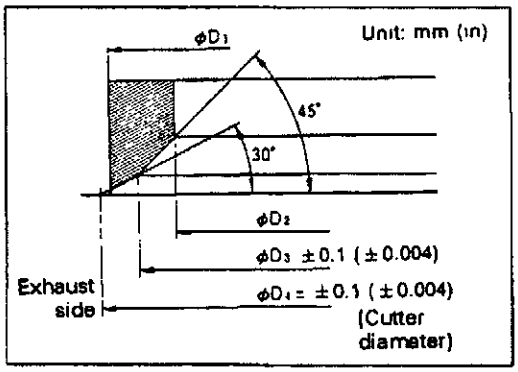
- Minimize valve seat thickness by cutting it, then remove.

### Installation

① Drive valve seat into cylinder head using valve seat as shown in figure.

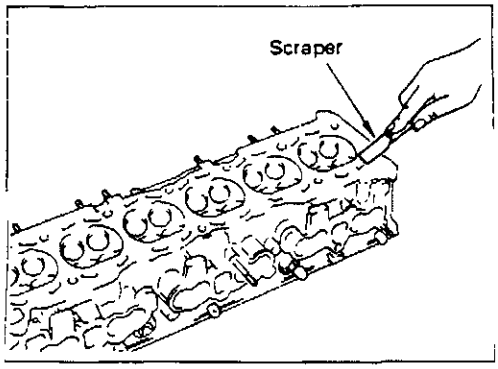
- Exhaust valve seats are available in 0.5 mm (0.020 in) over size. When using oversize valve seats, cut and grind seat ing recess in cylinder head to fix valve seats.



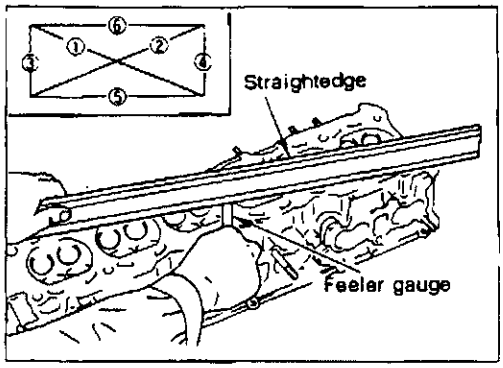

Unit: mm (in

| Item / Valve oversize | | Cylinder head finishing | Valve seat | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | φd | $\phi D_1$ | $\phi D_2$ | $\phi D_3$ | $\phi D_4$ | $\phi D_5$ | H |
| Intake | Standard | $36\,^{+0.016}_{0}$ ($1.4173\,^{+0.0006}_{0}$) | $36\,^{+0.113}_{+0.097}$ ($1.4173\,^{+0.0044}_{+0.0038}$) | 30 ± 0.15 (1.1811 ± 0.0059) | 32 (1.26) | 34.3 (1.358) | 37.5 (1.476) | $6.6\,^{0}_{0.1}$ ($0.260\,^{0}_{-0.004}$) |
| | 0.5 (0.020) | $36.5\,^{+0.016}_{0}$ ($1.4370\,^{+0.0006}_{0}$) | $36.5\,^{+0.113}_{+0.097}$ ($1.4370\,^{+0.0044}_{+0.0038}$) | 30 ± 0.15 (1.1811 ± 0.0059) | 32 (1.26) | 34.3 (1.358) | — | 5.8 ± 0.05 (0.2283 ± 0.0020) |
| Exhaust | Standard | $32\,^{+0.016}_{0}$ ($1.2598\,^{+0.0006}_{0}$) | $32\,^{+0.096}_{+0.080}$ ($1.2598\,^{+0.0038}_{+0.0031}$) | 25 ± 0.15 (0.9843 ± 0.0059) | 29.6 (1.165) | 32.5 (1.280) | — | $6.6\,^{0}_{0.1}$ ($0.260\,^{0}_{-0.004}$) |
| | 0.5 (0.020) | $32.5\,^{+0.016}_{0}$ ($1.2795\,^{+0.0006}_{0}$) | $32.5\,^{+0.096}_{+0.080}$ ($1.2795\,^{+0.0038}_{+0.0031}$) | 25 ± 0.15 (0.9843 ± 0.0059) | 29.6 (1.165) | — | — | 5.8 ± 0.05 (0.2283 ± 0.0020) |




**[Point 27] Cylinder head inspection**

- Remove all traces of oil, fur, gasket, sealing compound, carbon, and other foreign matter from cylinder head surface.



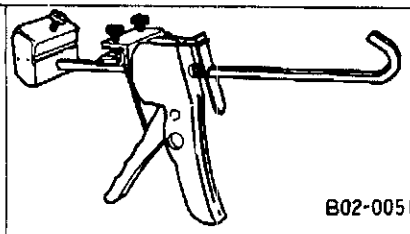

- Measure lower surface of cylinder head in six directions to check for distortion.

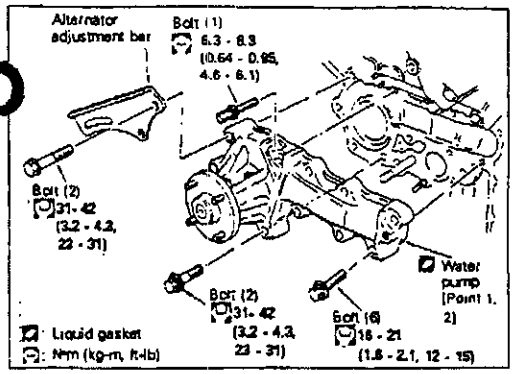
| Limit | 0.2 mm (0.008 in) |
|---|---|

- When distortion is within the limit, resurface the cylinder head.
- If distortion exceeds the limit, replace cylinder head.

## 10-13 WATER PUMP REMOVAL AND INSTALLATION

### Tools required

| | Name | | Application |
|---|---|---|---|
| Tool | Tube presser<br>WS3993 |  | Liquid gasket application |



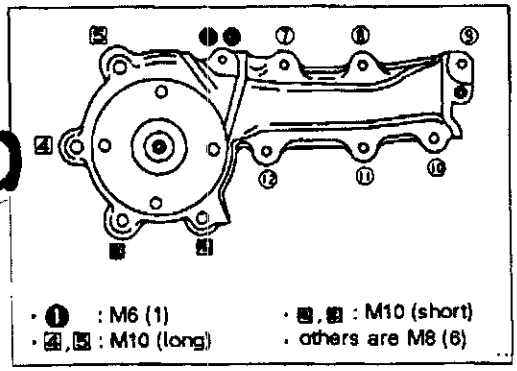

Additional work required:

- Drain and refill cooling water. (Refer to section B6, 3.)
- Remove and install:
  Cooling fan, water pump pulley
  Alternator adjustment bolt
  Timing belt cover, timing belt

**CAUTION:**

**Loosen engine drain plug to remove cooling water from cylinder block.**

**(If water is only drained from the radiator drain cock, the cylinder block will not drain completely.)**




### [Point 1] Water pump removal and installation

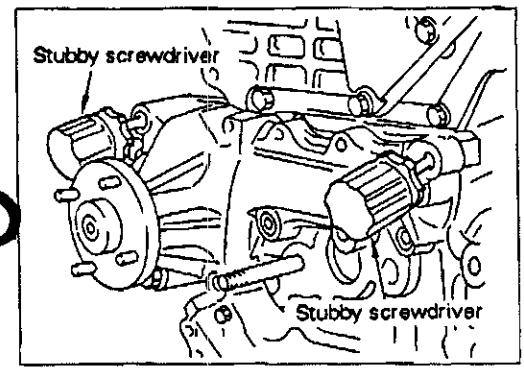
#### Removal

- When removing water pump assembly, be careful not to get coolant on timing chain. If any water does spill, wipe it off immediately.
- Remove water pump bolts in the reverse of sequence in figure on left.

#### Installation

- Install bolts in the numbered sequence in figure on left.

| Installation location | Bolt size | Number of bolts | Tightening torque N·m (kg-m, ft-lb) |
|---|---|---|---|
| ① | M6 | 1 | 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1) |
| ⑦, ⑥, ⑨, ⑩, ⑪, ⑫ | M8 | 6 | 16 - 21 (1.6 - 2.1, 12 - 15) |
| ②, ③, ④, ⑤ | M10 | 4 | 31 - 42 (3.2 - 4.3, 23 - 31) |




#### Removal and cleaning

- Insert stubby screwdrivers in bolt holes as shown, and move them up and down to remove water pump.

**CAUTION:**

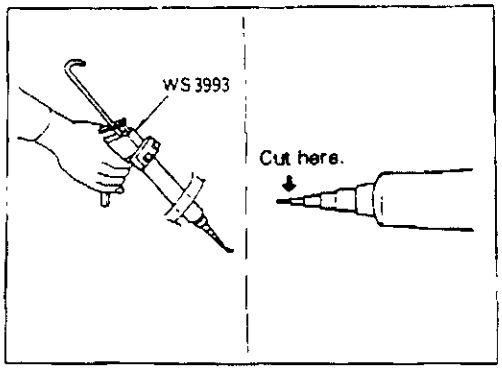
**Be careful not to damage screws in cylinder block side.**

- Use a scraper to remove all traces of liquid gasket from mating surface.

**CAUTION:**

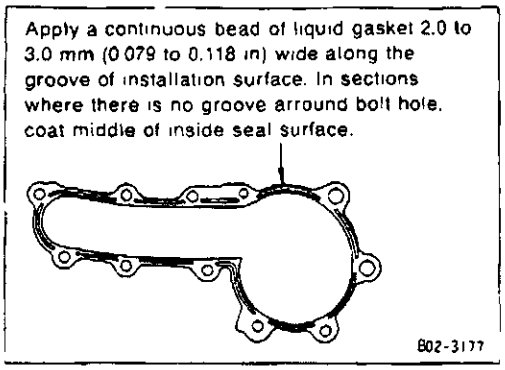
**Also remove any liquid gasket remaining in grooves.**

- Clean installation surface with white gasoline.




**Installation**

- Cut nozzle end of liquid gasket tube (KP510 00150) as shown in figure and use tube presser for application.




- Apply a continuous bead of liquid gasket (KP510 00150) to water pump sealing surface.

**CAUTION:**

**(1) Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide.**

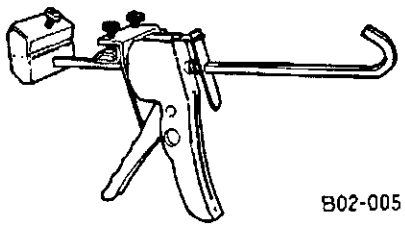
**(2) Installation should be done within 5 minutes after liquid gasket application.**

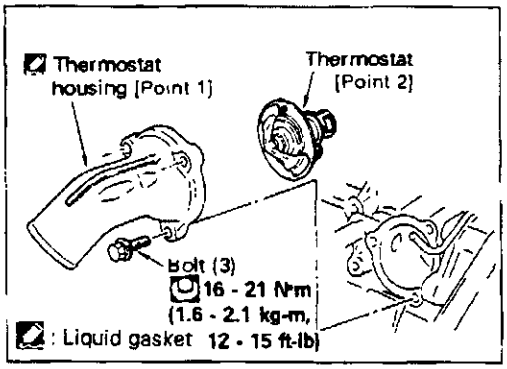
**[Point 2] Water pump inspection**

- Rotate water pump by hand and check for abnormal sound and smooth operation.
- There must be no traces of water leaks.

## 10-14 THERMOSTAT REMOVAL AND INSTALLATION

### Tools required

| | Name | | Application |
|---|---|---|---|
| Tool | Tube presser WS3993 |  B02-0051 | Liquid gasket application |
| Measurement tool | Thermometer | | Water temperature measurement |




Additional work required:

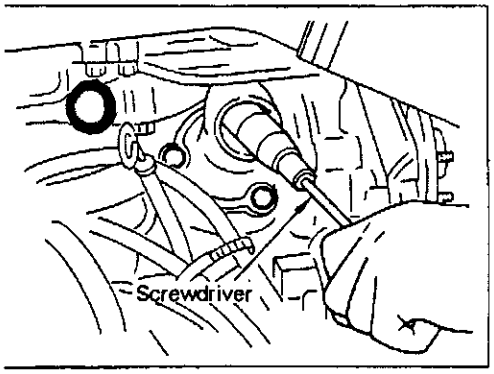
- Drain and refill cooling water.

**CAUTION:**

**Loosen engine drain plug to remove cooling water from cylinder block.**

**(If water is only drained from the radiator drain cock, the cylinder block will not drain completely.)**

- Disconnect and connect water inlet hose.



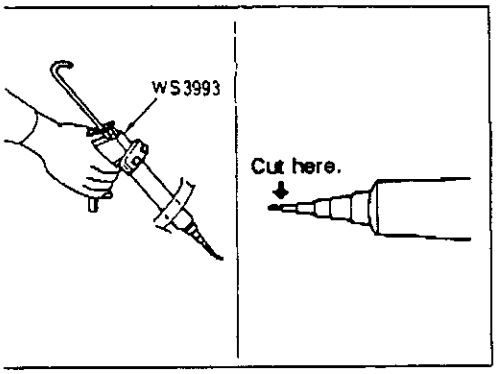

### [Point 1] Thermostat housing removal and installation

#### Removal and cleaning

- Insert screwdriver handle into thermostat housing. Pry lightly up and down and remove housing.
- Use a scraper to remove the liquid gasket.

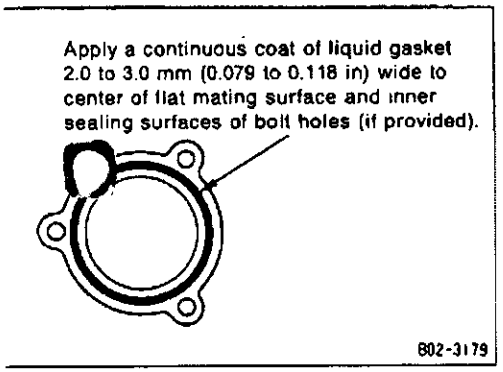
**CAUTION:**
**Be sure to also remove liquid gasket in grooves.**

- Clean mating surface with white gasoline or equivalent.




#### Installation

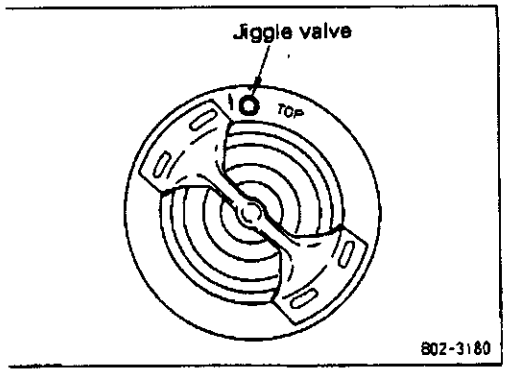
- Cut nozzle end of liquid gasket (KP510 00150) tube as shown in figure.




- Apply a continuous bead of liquid gasket (KP510 00150) to sealing surface using tube presser, and install the housing within 5 minutes after coating.

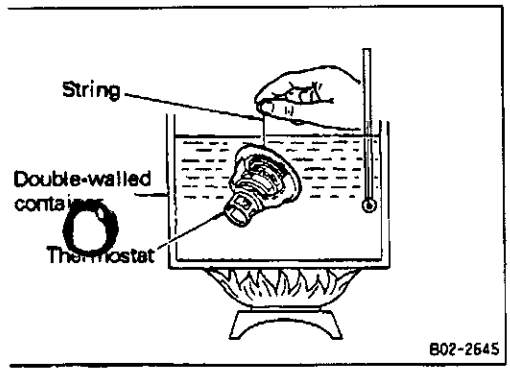
**CAUTION:**
**Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide.**

| | |
|---|---|
| Tightening torque | 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb) |




### [Point 2] Thermostat installation

- "TOP" mark (jiggle valve) must face up when thermostat is inserted in housing.



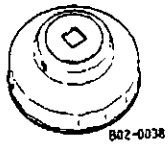

### [Point 3] Thermostat inspection

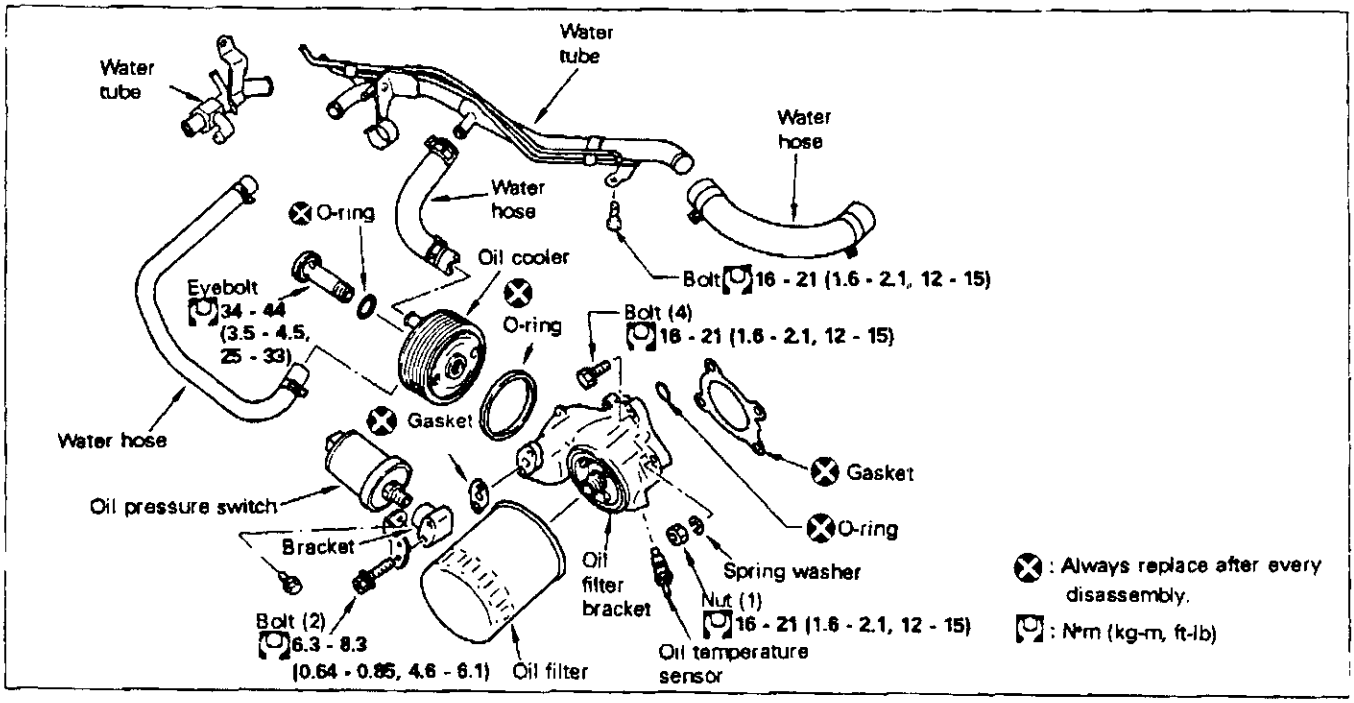
- Check valve opening temperature and maximum valve lift.
- Hang thermostat by string in valve and submerge in heated water in double walled container and stir water while heating it up.
- The opening temperature is the temperature when the valve opens and thermostat falls from string.

| | Standard, cooled location |
|---|---|
| Valve opening temperature °C (°F) | 76.5 (170) |
| Max. valve lift mm (in)/°C (°F) | 10 (0.39) min./90 (194) |

## 10-15 OIL COOLER, OIL FILTER REMOVAL AND INSTALLATION

### Tools required

| | Name | | Application |
|---|---|---|---|
| Special tool | Oil filter wrench<br>KV101 062S0 |  | Oil filter removal and installation |



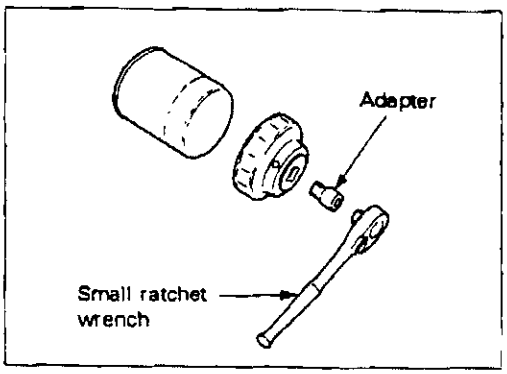

Additional work required:

- Drain and refill cooling water.

**CAUTION:**

**Loosen engine drain plug to remove cooling water from cylinder block.**
**(If water is only drained from the radiator drain cock, the cylinder block will not drain completely.)**

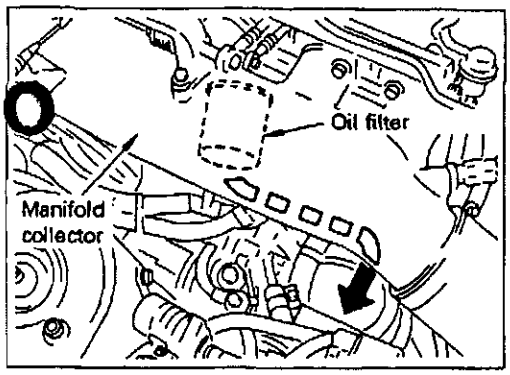
- Disconnect and connect switch harness connectors.




### [Point 1] Oil filter removal and installation

#### Removal

1. Remove oil level gauge.
2. Remove turbocharged pressure control vacuum hose clamp and move vacuum hose out of the way.
3. Move main harness clamp out of the way.
4. Remove oil filter using oil filter wrench.




### Installation

- Before installing new oil filter, wipe off dust, etc. from oil filter mounting bracket surface. Apply a thin coat of engine oil to oil filter O-ring.
- Screw oil filter on bracket by hand until a slight resistance is felt, then tighten an additional 2/3 turn with oil filter wrench. After tightening, start engine and check for oil leaks.

### Removal

- Face lower part of oil filter down and move out in direction of arrow in figure on left. Remove through aperture behind manifold collector.

## 11. Engine Removal and Installation

### Basic items

This section describes how to use an engine hoist and transmission jack to remove and install the RB26DETT engine.
Additional work required:
Inspection and adjustment after installation
Position vehicle on a flat and solid surface.
Remove and install:

- Battery
- Engine hood
- Cooling water
- Radiator
- Starter motor
- Front drive shaft
- Transmission ASSY

**Engine compartment left side:**

- Exhaust gas sensor harness disconnection
- Ground line connector separation
- Power steering oil pump [Point 4].
- Air conditioning compressor [Point 4].
- Air inlet pump, air cleaner upper case

**Engine compartment front side:**

- Cooling fan

**Engine compartment upper side:**

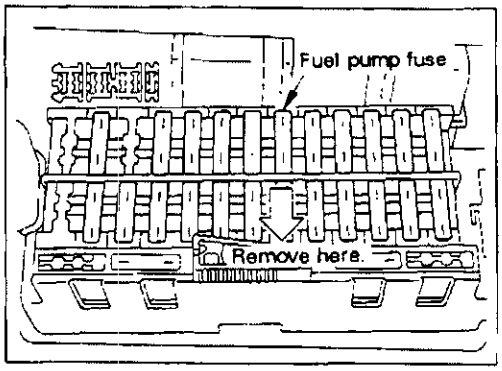
- ECCS harness connectors

**Engine compartment right side:**

- Fuel feed, return hoses separation [Point 1].
- Accelerator cable separation [Point 2].
- Engine main harness and ground line separation [Point 3].
- Heater hose separation
- Vacuum hoses separation

**Vehicle body, lower side:**

- Engine under cover
- Front section of exhaust pipe separation
- Right and left engine mount brackets [Point 6, 7]
- Power steering oil tube separation [Point 5]

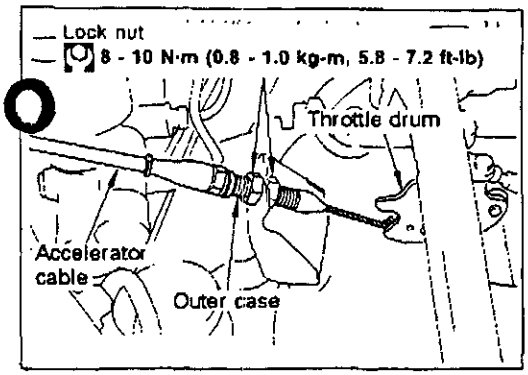



### [Point 1] Release fuel pressure

- After starting engine, remove fuel pump fuse and run engine until it stops. Crank the engine over two or three times to consume fuel in fuel lines.
- When unable to start vehicle, remove fuel pump fuse and crank engine four to five times to consume fuel in fuel lines.

**CAUTION:**
**The battery can be run down easily, so connect booster cables to another vehicle or charged battery.**

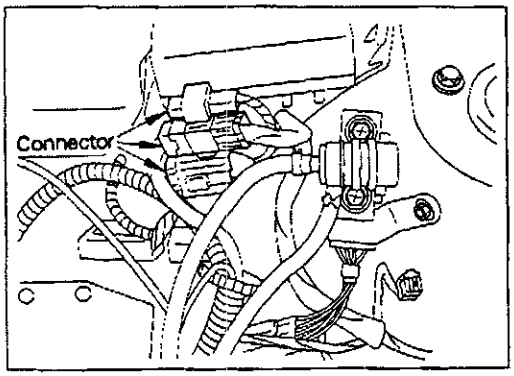
## 11. Engine Removal and Installation (Cont'd)




### [Point 2] Accelerator wire adjustment

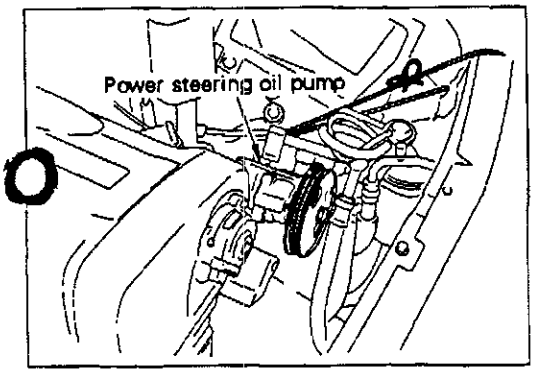
- Loosen lock nut to provide adequate slack for the acceler ator wire, and pull outer case in the direction of the accel erator pedal until throttle drum starts to move (when there is no play in cable). Return lock nut 1.0 to 1.5 turns ther tighten.

| Tightening torque | 8 - 10 N·m (0.8 - 1.0 kg-m, 5.8 - 7.2 ft-lb) |
|---|---|



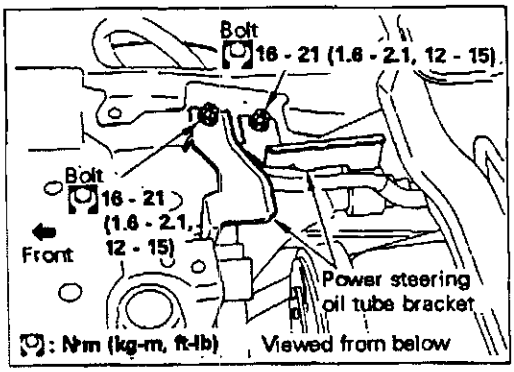

### [Point 3] Engine main harness, ground line separation

- Disconnect connectors behind battery for harnesses o alternator, starter motor and transmission systems.



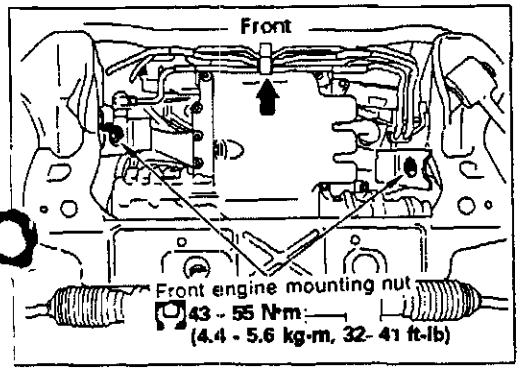

### [Point 4] Air compressor, power steering oil pump movement

- Remove bolts securing each unit to brackets. Leave pipes connected and secure to side of body with string, being careful not to scratch body.




### [Point 5] Power steering fluid tube bracket separation

- Remove bolts, and separate power steering fluid tube bracket, and move toward body side.

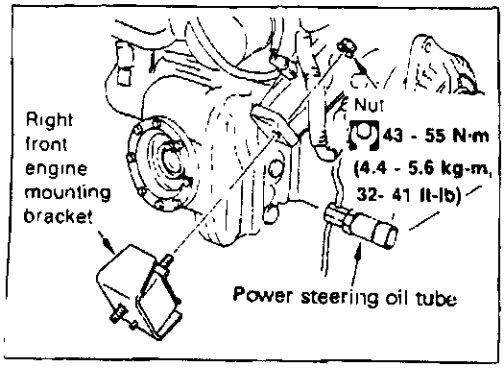



### [Point 6] Front engine mounting nut removal

- Make sure engine slings are securely hooked by engine hoist chain and remove front engine mounting nuts.

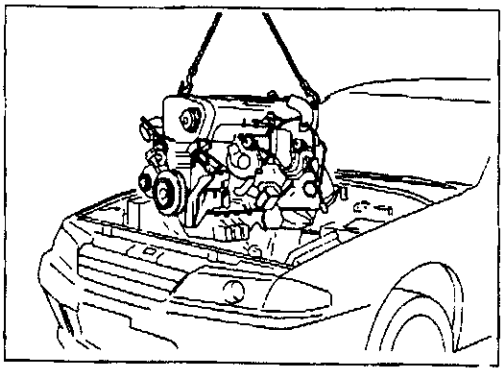
| Tightening torque | 43 - 55 N·m (4.4 - 5.6 kg-m, 32 - 41 ft-lb) |
|---|---|

## 11. Engine Removal and Installation (Cont'd)




**[Point 7] Right front engine mounting bracket removal**

- Remove nut and remove right engine mounting bracket to move engine toward front of vehicle.

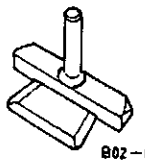
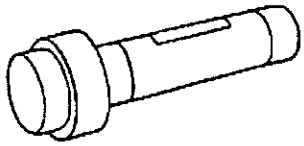
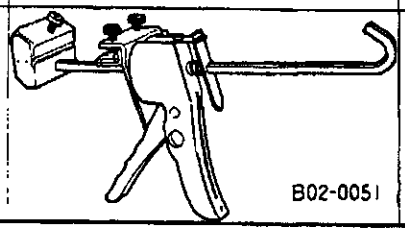


**[Point 8] Engine ASSY removal and installation**

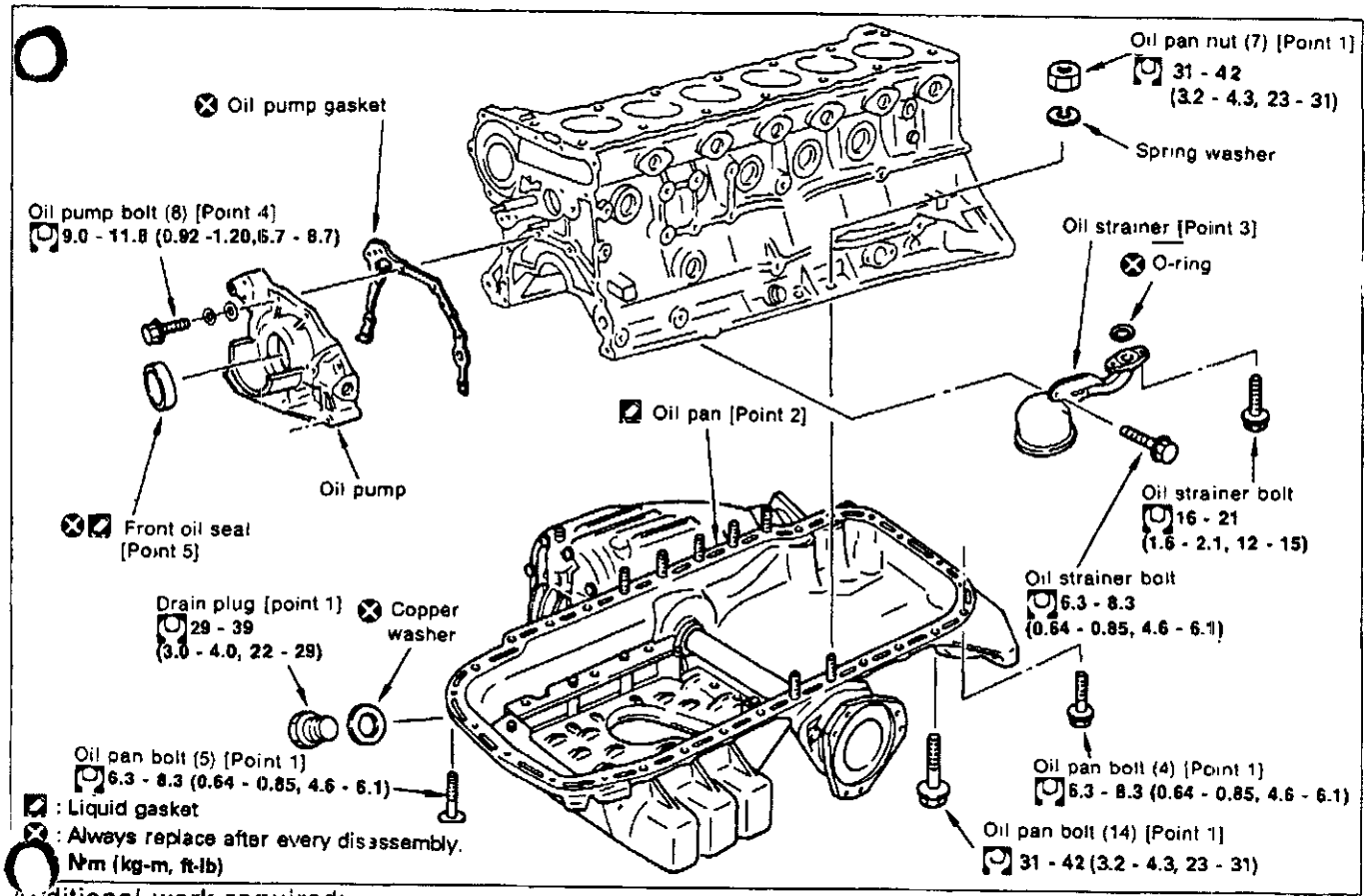
- Operate hoist chain, and change engine angle gradually, being careful so it does not interfere with vehicle and remove engine.

## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation

**Tools required**

| | Name | | Application |
|---|---|---|---|
| Special tools | Seal cutter<br>KV101 11100 |  | Oil pan removal |
| | Oil seal drift<br>KV401 00900 |  | Oil seal insertion |
| Tool | Tube presser<br>WS3993 |  | Liquid gasket application |

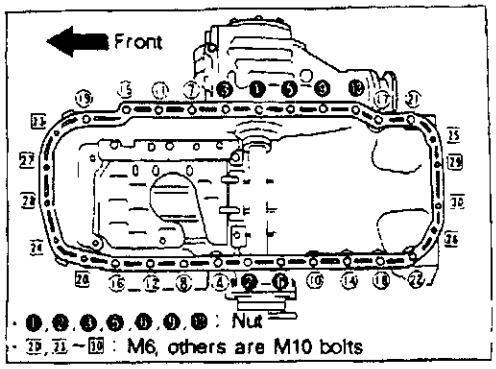
### (1) OIL PAN, OIL PUMP AND OIL STRAINER REMOVAL AND INSTALLATION




Additional work required:

- Engine ASSY removal and installation
- Engine oil draining and refilling

## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation (Cont'd)




### [Point 1] Oil pan bolt, nut removal and installation

#### Removal

- Remove bolts and nuts in reverse order of installation shown in figure on left.

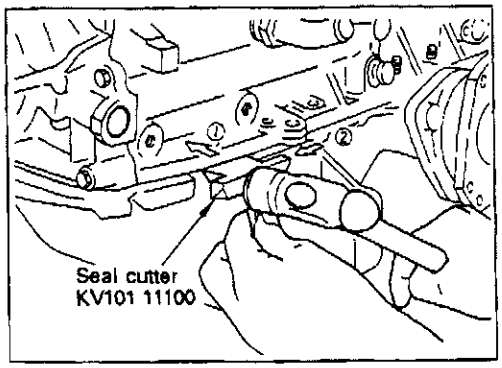
#### Installation

- Tighten nuts and bolts in numerical order shown in figure on left.

**CAUTION:**

**Make sure there is no dirt, dust or debris on oil pan installation surface.**

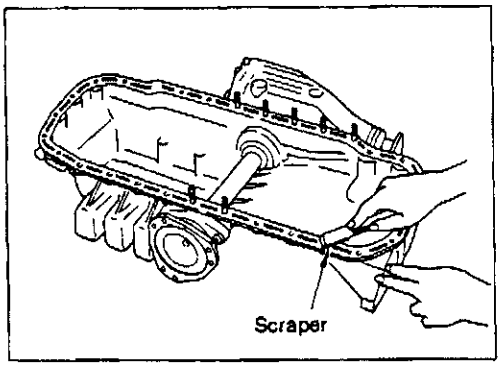
| Installation position | Bolt size | Number of bolts | Tightening torque N·m (kg-m, ft-lb) |
|---|---|---|---|
| ⑳ ㉓ - ㊵ | M6 | 9 | 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1) |
| ④ ⑦ ⑧ ⑩ - ⑫, ⑭ - ⑲ ㉑ ㉒ | M10 | 14 | 31 - 42 (3.2 - 4.3, 23 - 31) |
| ① ② ③ ⑤ ⑥ ⑨ ⑬ | M10 (nut) | 7 | 31 - 42 (3.2 - 4.3, 23 - 31) |




### [Point 2] Oil pan removal and installation

#### Removal and cleaning

- Insert seal cutter between cylinder block and oil pan and remove oil pan by tapping seal cutter.



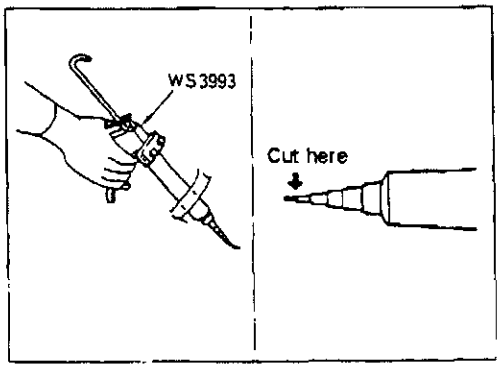

- Use a scraper to remove all traces of liquid gasket from mating surface.

**CAUTION:**

**(1) Use a scraper to remove all liquid gasket and seal material attached to cylinder block and oil pan flange groove. Remove all gasket material and other debris that falls into the oil pan.**

**(2) Be careful not to scratch oil pan.**

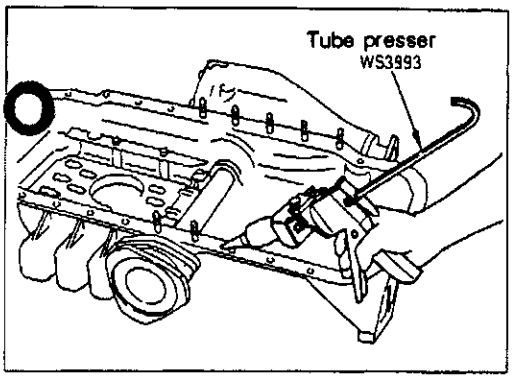
- Clean all contact surfaces with white gasoline or equivalent.




#### Installation

- Cut off nozzle tip of liquid gasket (KP510 00510) at point shown in figure on left and insert in tube presser.

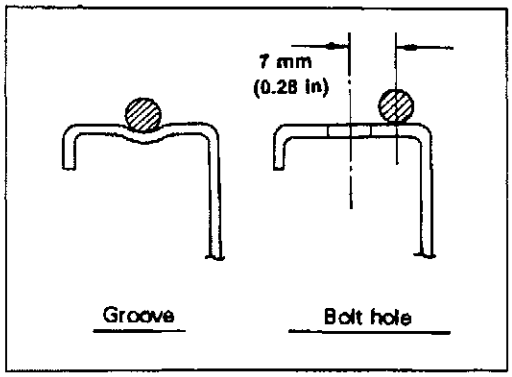
## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation (Cont'd)




### Installation

Apply liquid gasket to inner sealing surfaces as shown in figure. Installation should be performed within 5 minutes after coating.

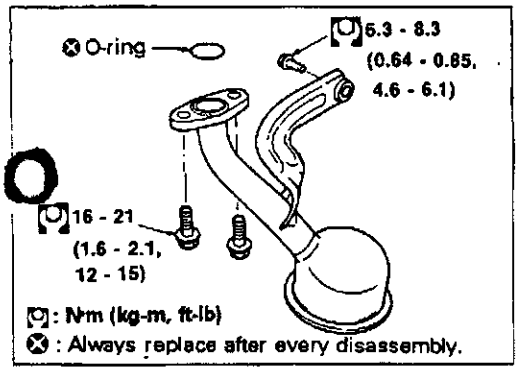
- Apply a continuous bead of liquid gasket (KP510 00150) to mating surfaces of oil pan.




- Apply liquid gasket (KP510 00150) to areas 7 mm (0.28 in) inside from center of oil pan bolt holes.

**CAUTION:**

**(1) Be sure liquid gasket application is 4.0 mm (0.157 in) wide.**
**(2) Wait at least 30 minutes before refilling engine oil and engine coolant.**




### [Point 3] Oil strainer installation

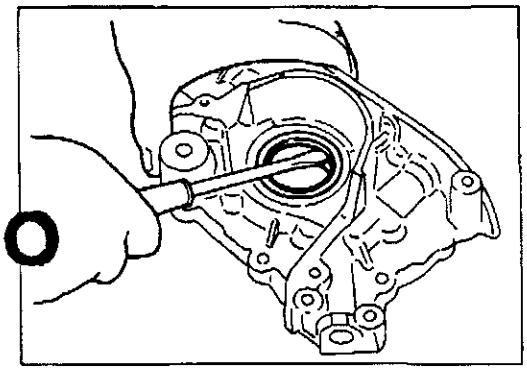
- When installing oil strainer, make sure O-ring is inserted securely in groove and then install.

| | | |
|---|---|---|
| Tightening torque N·m (kg-m, ft-lb) | M8 | 16 - 21 (1.6 - 2.1, 12 - 15) |
| | M6 | 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1) |

### [Point 4] Oil pump installation bolts

- There are 4 types of bolts so be careful not to mistake them when they are installed.

| Installation position | Length below head mm (in) | Number of bolts | Tightening torque N·m (kg-m, ft-lb) |
|---|---|---|---|
| ① | 20 (0.79) | 4 | 9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7) |
| ② | 35 (1.38) | 2 | 9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7) |
| ③ | 45 (1.77) | 1 | 9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7) |
| ④ | 55 (2.17) | 1 | 9.0 - 11.8 (0.92 - 1.2, 6.7 - 8.7) |

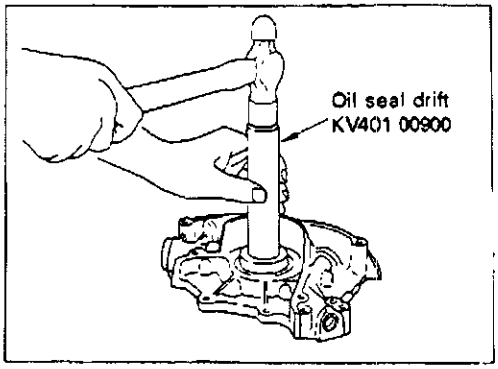


### [Point 5] Front oil seal removal and installation

#### Removal

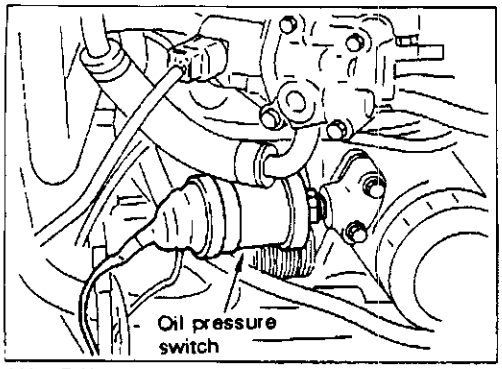
- Use a screwdriver to remove front oil seal from front cover.

## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation (Cont'd)




### Installation

- Be careful not to scratch or damage oil seal retai Use oil seal drift and insert it at same level as front surface o oil pump housing.
- Apply engine oil or chassis grease to area around oil sea lip.



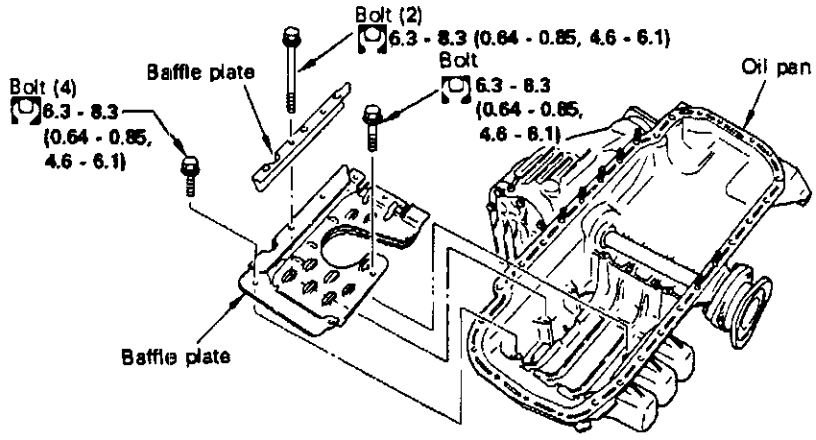

### [Point 6] Oil leak and oil pressure check

- After installation, warm up engine and check for oil leak and proper oil pressure.
- To perform oil pressure inspection, remove oil pressur switch and attach oil pressure gauge.

| Engine speed (rpm) | Idling | 2,000 | 6,000 |
|---|---|---|---|
| Delivery pressure kPa (kg/cm², psi) | Approx. 147 (1.5, 21) | Approx. 294 (3, 43) | Approx. 451 (4.6, 65) |

Oil temperature at 80°C (176°F

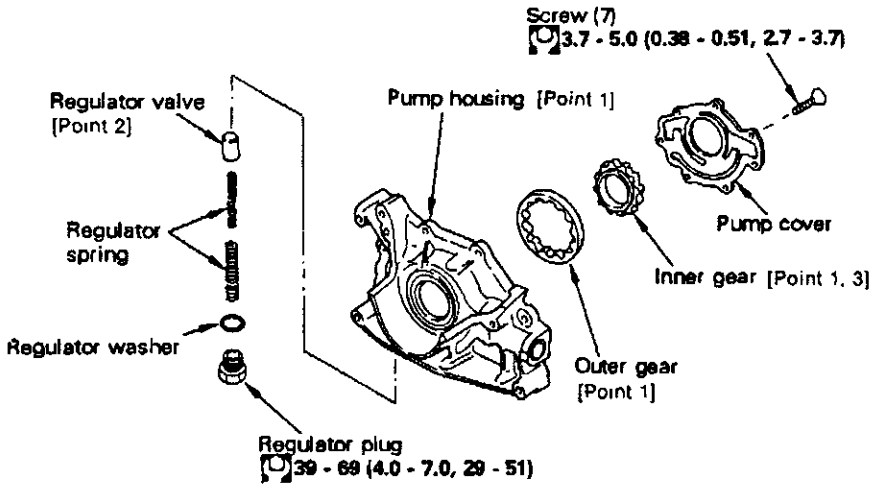
## (2) OIL PAN DISASSEMBLY AND ASSEMBLY



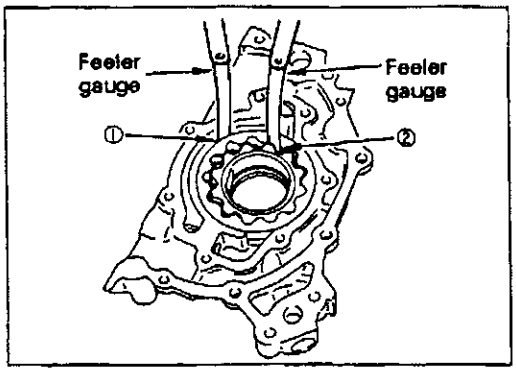

: N·m (kg-m, ft-lb)

## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation (Cont'd)

### (3) OIL PUMP DISASSEMBLY AND ASSEMBLY




: N·m (kg-m, ft-lb)



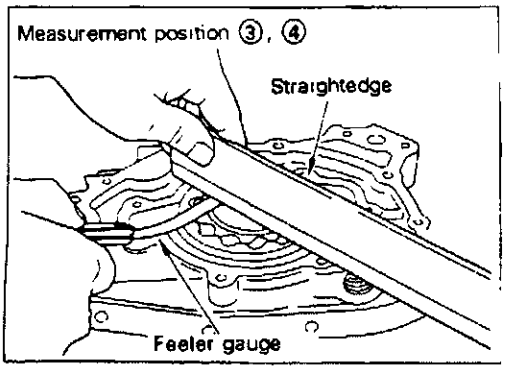

**[Point 1] Oil pump inspection**

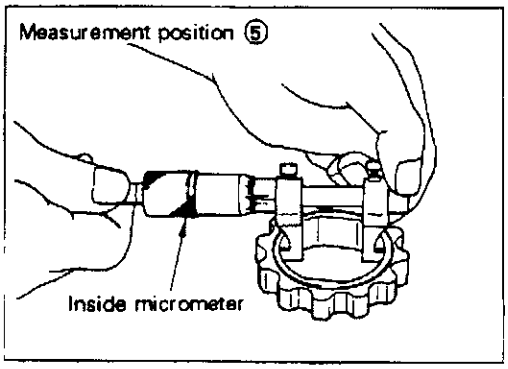
- Check inner gear, outer gear and housing for scratches c wear.
- Use a feeler gauge and measure the following clearance:

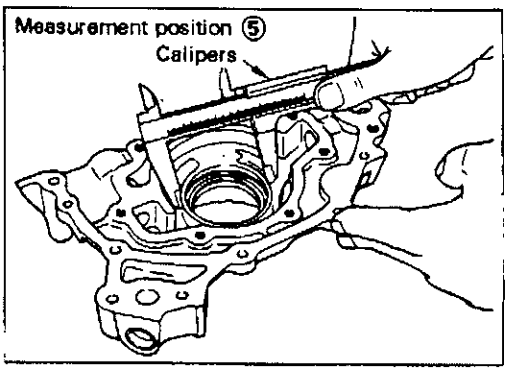
| | Measurement position | Standard value mm (in |
|---|---|---|
| ① | Outer gear and housing clearance | 0.114 - 0.2 (0.0045 - 0.0079) |
| ② | Outer gear and inner gear top clearance | 0.180 (0.0071) max. |
| ③ | Inner gear and housing side clearance | 0.05 - 0.07 (0.0020 - 0.0028) |
| ④ | Outer gear and housing side clearance | 0.05 - 0.11 (0.0020 - 0.0043) |
| ⑤ | Inner gear and housing flange clearance | 0.045 - 0.091 (0.0018 - 0.0036) |

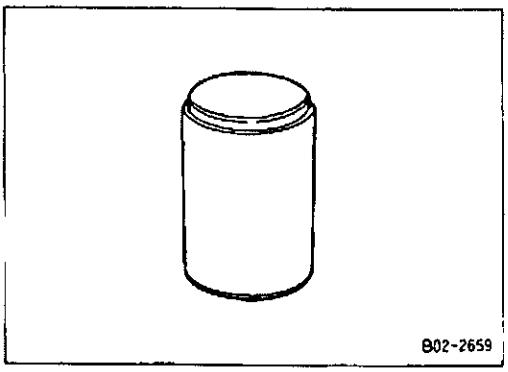
**CAUTION:**
**Measurement position ⑤ is the figure obtained by subtractin the housing flange outside diameter from the inner gear insid diameter.**

## 12. Oil Pan, Oil Pump and Oil Strainer Removal and Installation (Cont'd)



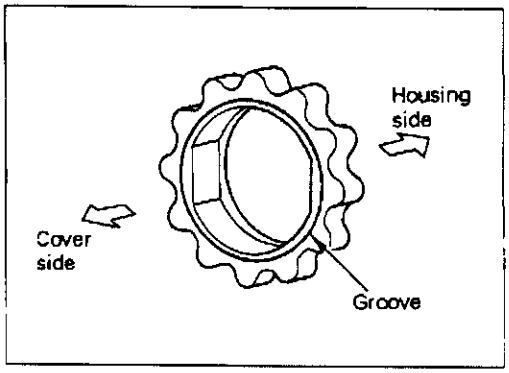




### [Point 2] Regulator inspection

- Check oil pressure regulator valve sliding surface and spring for wear and damage.

| | |
|---|---|
| Valve and valve hole clearance | 0.04 - 0.097 mm (0.0016 - 0.0038 in) |




### [Point 3] Inner gear installation

- Be careful because the inner gear has specific assembly direction.
- The side with the groove must face the cover side.

This section describes the complete disassembly of the engine assembly removed from vehicle without transmission. It also explains the inspection, replacement of malfunctioning, damaged or worn parts, necessary adjustments and sequential assembly order to produce a standard engine condition.

## 13-1 OVERHAUL CAUTIONS

### (1) Disassembly

① Use correct and suitable tools whenever possible, and do not try any unsafe or unreasonable procedures.
② Be careful with operations on mating surfaces and sliding surfaces to prevent loss of surface accuracy.
③ Make marks on disassembled parts for organized, thorough damage detection and precise assembly.
④ Loosen nuts and bolts in a diagonal direction from the outside, being careful to follow the numerical order when indicated.

### (2) Inspection, repair and replacement

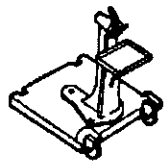
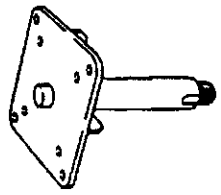
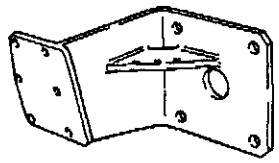
① Repair or replace after completing parts inspection following the inspection procedures. Perform the same inspection for the new parts and replace parts as necessary.

### (3) Assembly

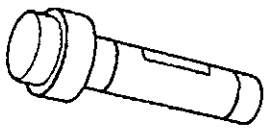
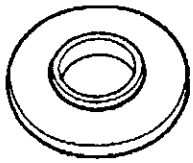
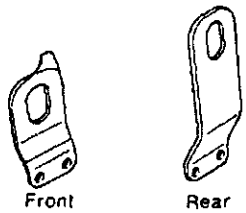
① Always use a torque wrench to tighten nuts and bolts to the specified torque.
② Tighten nuts and bolts from the center to the outside diagonal direction, gradually in two or three successive stages. Follow the numerical order when indicated.
③ Gaskets, packing, oil seals and O-rings should be replaced with new ones in principle.
④ Each part should be cleaned thoroughly and blown off with compressed air. In particular, check that oil and water passages are not clogged or obstructed.
⑤ Be careful not to scratch or damage sliding or mating surfaces. Clean off all dust, debris or foreign matter. Lubricate all sliding surfaces with an adequate coating of oil.

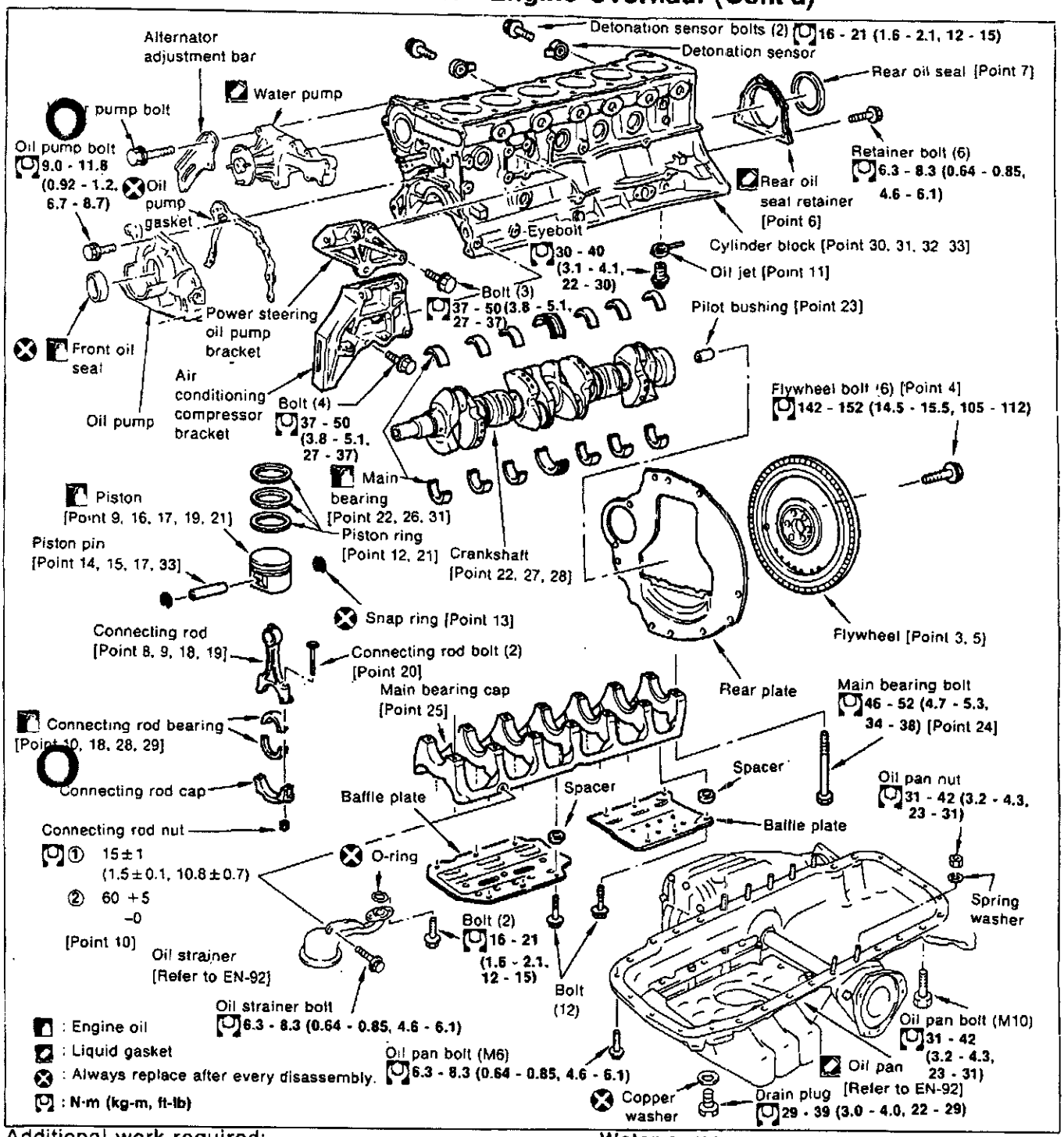
## 13-2 CYLINDER BLOCK ASSY ASSEMBLY AND DISASSEMBLY

### Tools required

| | Name | | Application |
|---|---|---|---|
| Special tools | Engine stand ASSY<br>ST0501 S000 |  | Engine main unit overhaul |
| | Engine attachment<br>KV101 06500 |  | |
| | Engine sub-attachment<br>KV101 14500 |  | |

## 13. Engine Overhaul (Cont'd)

| | Name | | Application |
|---|---|---|---|
| Special tools | Rear axle bearing drift<br>KV401 00900 |  | Rear oil seal installation |
| | Rear oil seal drift<br>ST3002 2000 |  | |
| | Pilot bearing puller<br>ST1661 0001 |  | Pilot bushing removal |
| Tools | Piston ring compressor | | Piston ASSY installation |
| | Piston ring expander | | Piston ring removal and installation |
| Measurement tools | Dial gauge | | Crankshaft, etc. inspection |
| | Magnetic stand | | Crankshaft, etc. inspection |
| | Inside micrometer | | Connecting rod, etc. inspection |
| | Plastigage | | Oil clearance inspection |
| | Micrometer | | Piston, etc. inspection |
| | Connecting rod aligner | | Connecting rod inspection |
| | Bore gauge | | Cylinder block, etc. inspection |
| | V-block | | Crankshaft, etc. inspection |
| | Straightedge | | Cylinder block, etc. inspection |
| Service settings | Engine slinger |  | Engine removal and installation |




Additional work required:

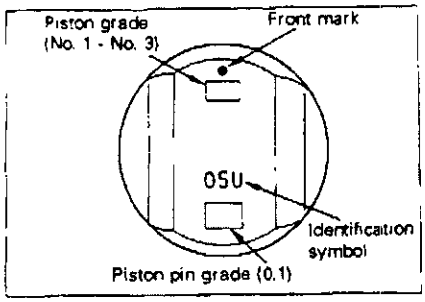
- Drain and refill: cooling water [Point 1]
- Remove and install:
  - Engine
  - Collector
  - Throttle chamber
  - Intake manifold
  - Turbocharger, exhaust manifold
  - Timing belt
  - Cylinder head ASSY
  - Alternator
  - Starter motor
  - Clutch cover, clutch disc
  - Oil pan, oil strainer
  - Water pump
  - Oil pump
  - Oil cooler, oil strainer
  - All harnesses and connectors

# 13. Engine Overhaul (Cont'd)

Reference: Engine selection assembly

Part | Grade Indication | Selection Combination

## Piston



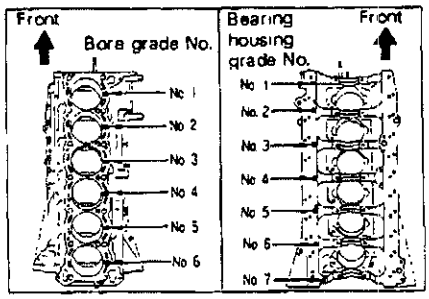

### ① Piston selection

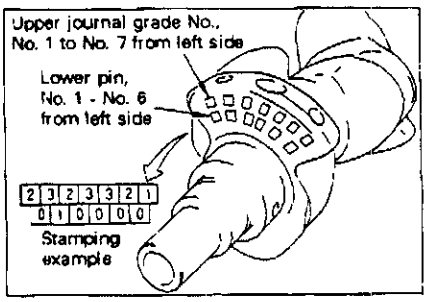
Unit: mm (in)

| (Stamp) / Grade No | 1 | 2 | 3 |
|---|---|---|---|
| Cylinder block bore diameter | 86.010 (3.3862) Max<br>Greater than 86.000 (3.3858) | 86.020 (3.3866) Max<br>Greater than 86.010 (3.3862) | 86.030 (3.3870) Max<br>Greater than 86.020 (3.3866) |
| Piston diameter | 85.955 (3.3844) Max<br>Greater than 85.955 (3.3840) | 85.975 (3.3848) Max<br>Greater than 85.965 (3.3844) | 85.985 (3.3852) Max<br>Greater than 85.975 (3.3848) |
| Piston clearance | 0.035 - 0.055 (0.0014 - 0.0022) | | |

Service setting part
Piston and piston pin
STD 1 STD 2 STD 3, 0.50S 1.00S

## Main bearing



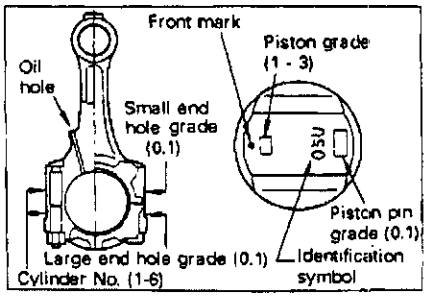

### ② Main bearing selection

Unit: mm (in)

| Cylinder block bearing housing inner diameter | | | 58.651 (2.3091) Max / Greater than 58.645 (2.3089) | 58.657 (2.3093) Max / Greater than 58.651 (2.3091) | 58.663 (2.3096) Max / Greater than 58.657 (2.3093) | 58.670 (2.3098) Max / Greater than 58.663 (2.3096) |
|---|---|---|---|---|---|---|
| Crankshaft journal diameter | Grade No. stamp | | 0 | 1 | 2 | 3 |
| 54.975 (2.1644) Max / Greater than 54.969 (2.1641) | 0 | Bearing grade No. | STD 0 | STD 1 | STD 2 | STD 3 |
| | | Bearing thickness | 1.818 - 1.821 (0.0716 - 0.0717) | 1.821 - 1.824 (0.0717 - 0.0718) | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Black | Brown | None | Yellow |
| 54.969 (2.1641) Max / Greater than 54.963 (2.1639) | 1 | Bearing grade No. | STD 1 | STD 2 | STD 3 | STD 4 |
| | | Bearing thickness | 1.821 - 1.824 (0.0717 - 0.0718) | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Brown | None | Yellow | Blue |
| 54.963 (2.1639) Max / Greater than 54.957 (2.1637) | 2 | Bearing grade No. | STD 2 | STD 3 | STD 4 | STD 5 |
| | | Bearing thickness | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) | 1.833 - 1.836 (0.0722 - [illegible]) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/[illegible] (0.0011/0.0019) |
| | | Identification color | None | Yellow | Blue | Green |
| 54.957 (2.1637) Max / Greater than 54.951 (2.1634) | 3 | Bearing grade No. | STD 3 | STD 4 | STD 5 | STD 6 |
| | | Bearing thickness | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) | 1.833 - 1.836 (0.0722 - 0.0723) | 1.836 - 1.839 (0.0723 - 0.0724) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Yellow | Blue | Green | Pink |

Service setting parts STD 0 - 6 US 0.25 mm (0.0098 in)

## Piston pin



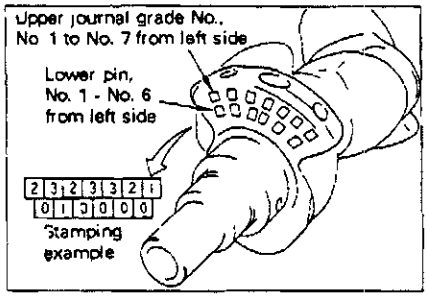

### ③ Piston pin selection

Unit: mm (in)

| Grade No. / (Stamp) | | 1 | 2 |
|---|---|---|---|
| Piston pin hole diameter | (in) | 21.006 - 21.000 (0.8270 - 0.8268) | 21.012 - 21.006 (0.8272 - 0.8270) |
| Piston pin external diameter | (in) | 20.995 - 20.989 (0.8266 - 0.8263) | 21.001 - 20.995 (0.8268 - 0.8266) |
| Piston pin clearance | (in) | 0.005 - 0.017 (0.0002 - 0.0007) | |

Service setting
Piston and piston pin
STD 1 STD 2 STD 3 0.50S, 1.00S

## Connecting rod bearing



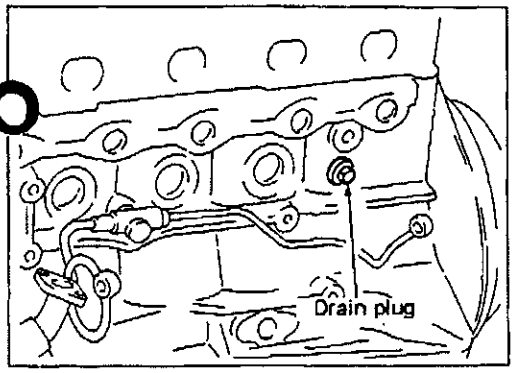

### ④ Connecting rod bearing selection

Unit: mm (in)

| Crank pin diameter | Connecting rod large end, inside diameter / Grade No. stamp | Less than 51.007 (2.0081) / 51.000 (2.0079) Min<br>0 | 51.013 (2.0084) Max / 51.007 (2.0081) Max<br>1 |
|---|---|---|---|
| 47.974 (1.8887) Max. / Greater than 47.968 (1.8885) | 0 | Bearing grade No. STD 0<br>Bearing thickness 1.500 - 1.503 (0.0591 - 0.0592)<br>Oil clearance 0.020/0.039 (0.0008/0.0015)<br>Identification color None | STD 1<br>1.503 - 1.506 (0.0592 - 0.0593)<br>0.021/0.039 (0.0008/0.0015)<br>Brown |
| 47.968 (1.8885) Max / Greater than 47.961 (1.8882) | 1 | STD 1<br>1.503 - 1.506 (0.0592 - 0.0593)<br>0.020/0.040 (0.0008/0.0016)<br>Brown | STD 2<br>1.506 - 1.509 (0.0593 - [illegible])<br>0.021/0.040 (0.0008/0.0016)<br>Green |

Service setting parts
US 0.08 mm (0.0031 in), US 0.12 mm (0.0047 in), US 0.25 mm (0.0098 in)

## 13. Engine Overhaul (Cont'd)



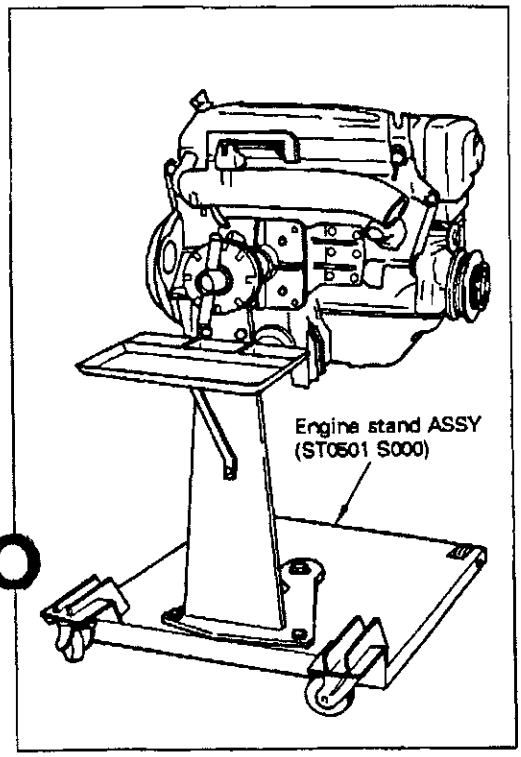

### [Point 1] Cooling water, drain and refill

**Draining**

- Drain the water in the cylinder block completely from the drain plug.

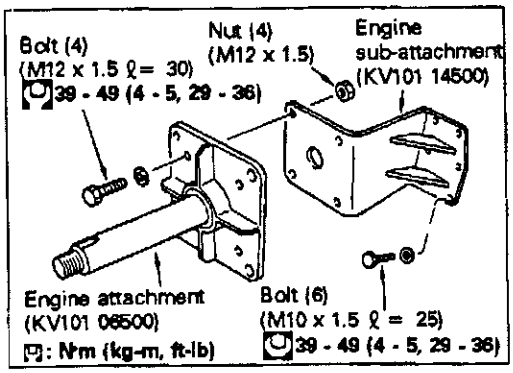
**Refilling**

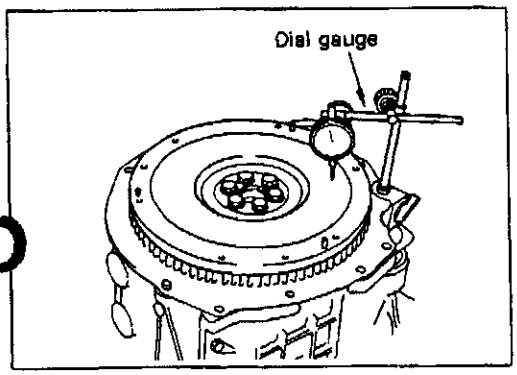
- Refer to Cooling Water Filling Method (B6) for details.




### [Point 2] Engine stand installation and removal

- The engine sub-attachment is attached by 6 bolts to engine mounting bracket on right side of engine.

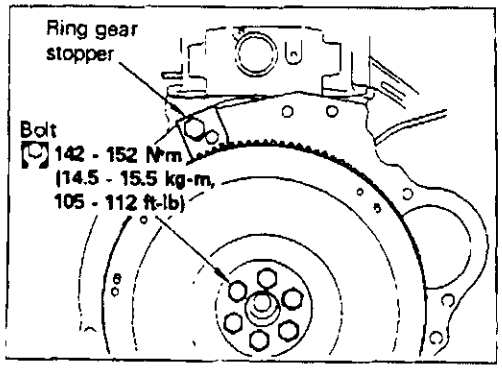



### [Point 3] Flywheel runout

- Set dial gauge to flywheel where it contacts clutch.
- Turn the flywheel and measure the runout.

| | |
|---|---|
| Runout (total indicator reading) | 0.10 mm (0.0039 in) |




### [Point 4] Flywheel removal and installation

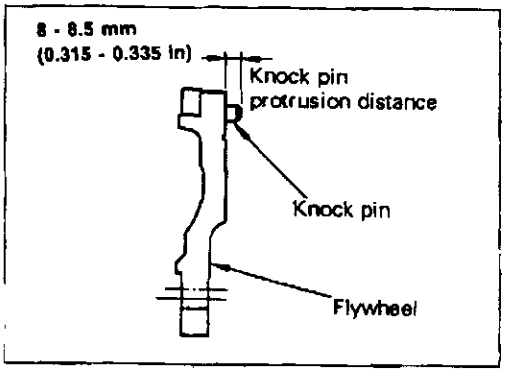
**Removal**

- Use ring gear stopper to secure flywheel and remove.

**Installation**

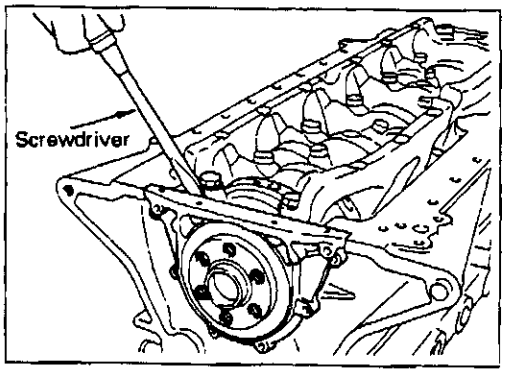
- Before installing bolts, coat the thread and flange of bolt with engine oil.
- After tightening the flywheel installation bolts halfway, use the ring gear stopper to secure flywheel and tighten bolts.

| | |
|---|---|
| Flywheel bolt tightening torque | 142 - 152 N·m<br>(14.5 - 15.5 kg-m, 105 - 112 ft-lb) |




### [Point 5] Flywheel knock pin insertion

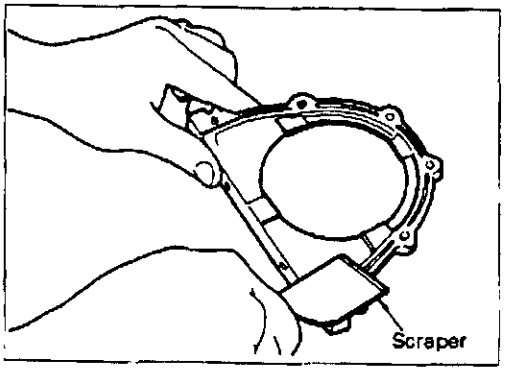
- Insert the flywheel knock pin so pin protrudes 8 to 8.5 mm (0.315 to 0.335 in).




### [Point 6] Rear oil seal retainer removal and installation

**Removal**

- Insert a screwdriver in the gap between main bearing cap and rear oil seal retainer to remove seal.



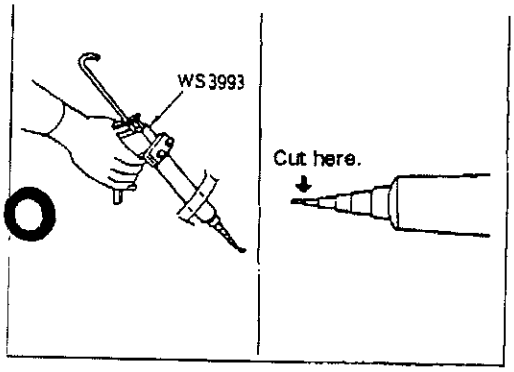

**Cleaning**

- Use a scraper to remove liquid gasket.

**CAUTION:**

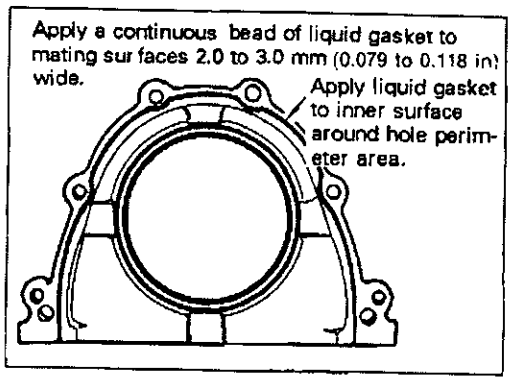
**Also remove liquid gasket in grooves.**

- Clean the cylinder block side in the same way.
- Clean mating surface with white gasoline or equivalent.




### Installation

- Apply liquid gasket to mating surface and install unit within 5 minutes after coating.
- Cut nozzle end of liquid gasket (KP510 00150) tube as shown in figure and use tube presser for application.

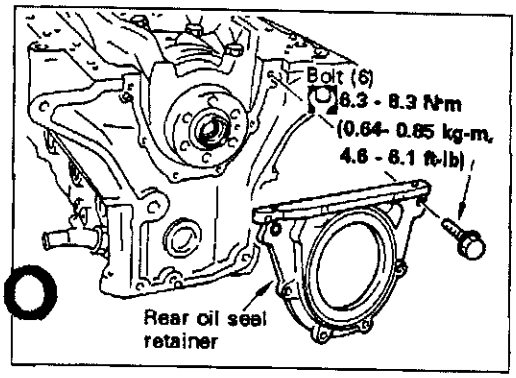



- Apply liquid gasket continuously to rear oil seal retainer as shown in the figure on left.

**CAUTION:**

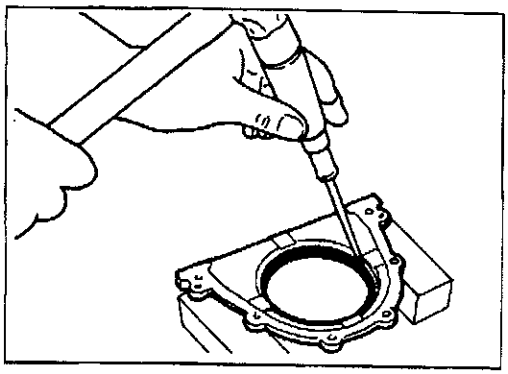
**(1) Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide.**

**(2) Refill engine oil and start engine 30 minutes after assembly is completed.**




- Align rear oil seal retainer with dowel pins.
- Tighten the 6 bolts uniformly.

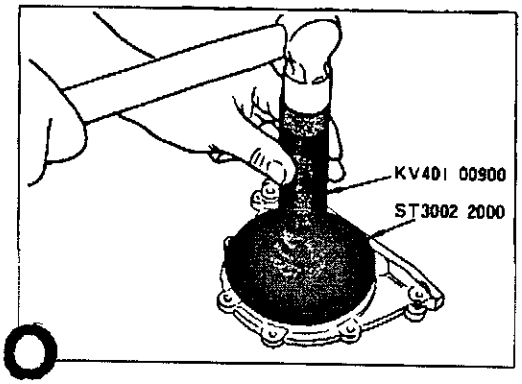
| | |
|---|---|
| Rear oil seal retainer bolt tightening torque | 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 4.6 - 6.1 ft-lb) |



### [Point 7] Rear oil seal removal and installation

### Removal

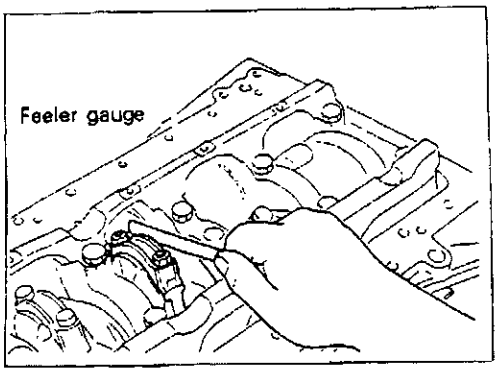
- Use a screwdriver or suitable tool to remove the seal.




### Installation

- Be careful not to scratch or damage the oil seal perimeter area. Use an oil seal drift [outside diameter: 100 mm (3.94 in)] to install new oil seal.
- Apply a coat of engine oil or chassis grease to oil seal lip perimeter area.

## 13. Engine Overhaul (Cont'd)

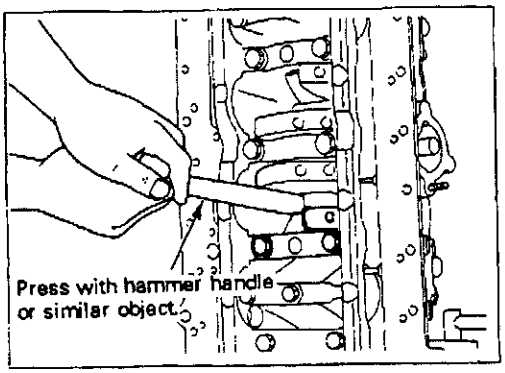



### [Point 8] Connecting rod side clearance inspection

- Use a feeler gauge to measure the thrust clearance between the connecting rod and crank arm.

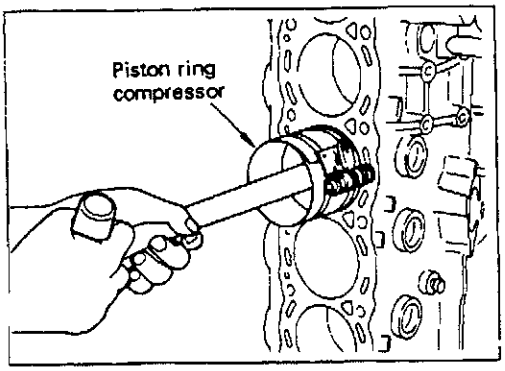
Unit: mm (in)

| | |
|---|---|
| Standard | 0.2 - 0.3 (0.008 - 0.012) |
| Limit | 0.4 (0.016) |




### [Point 9] Piston and connecting rod ASSY removal and installation

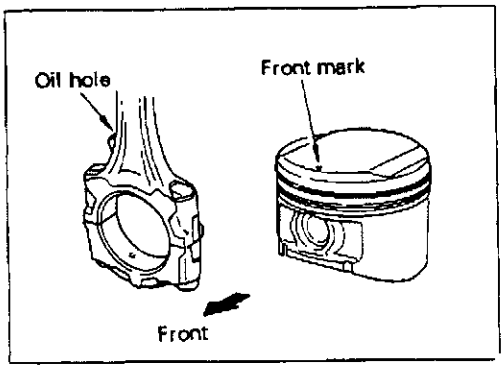
- Use a hammer handle or similar tool to press unit to cylinder head side.

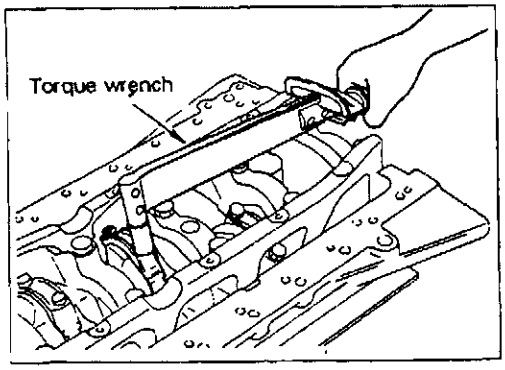



### Installation

- Set crank pin at B.D.C. (bottom dead center) position.
- Coat cylinder bore, crank pin and piston with engine oil.
- Assemble piston with front mark on piston head facing the front of engine.
- Use a piston ring compressor to install piston and connecting rod assembly in cylinder block.

**CAUTION:**
**Be careful not to strike or deform oil jet pipe with large end of connecting rod.**



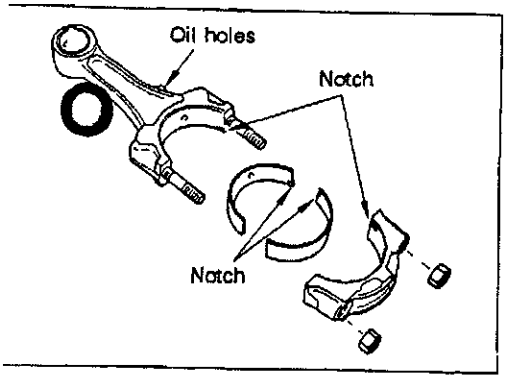

### [Point 10] Connecting rod nut tightening

- Apply engine oil to connecting rods and nuts before assembly.
- Tighten nuts in two or three stages.

| | | |
|---|---|---|
| 1st time | Torque wrench | 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb) |
| 2nd time | Angle wrench (°) | 60 - 65 |

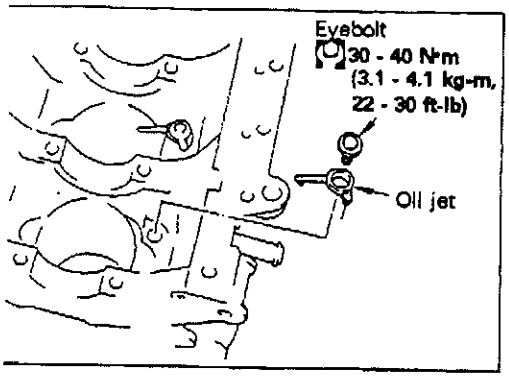
**CAUTION:**
**Do not use visual angle measurement for tightening torque if an angle wrench is not available.**

## 13. Engine Overhaul (Cont'd)




### [Point 10] Connecting rod bearing installation

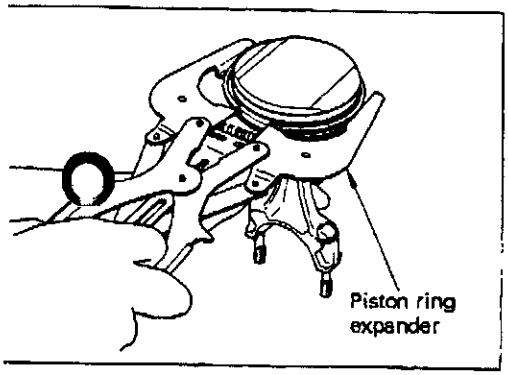
- Apply engine oil to bearing surfaces when assembling connecting rods and bearings. Do not apply engine oil to rear side of bearing, only clean this area.
- Align connecting rod bearing retainer notches and install.
- Align connecting rod oil holes and bearing oil holes.




### [Point 11] Oil jet installation

- Set oil jet position securely and check that it does not interfere with piston.
  If oil jet pipe contacts piston or is bent, replace it with new part.

| | |
|---|---|
| Oil jet tightening torque | 30 - 40 N·m<br>(3.1 - 4.1 kg-m, 22 - 30 ft-lb) |




### [Point 12] Piston ring removal and installation

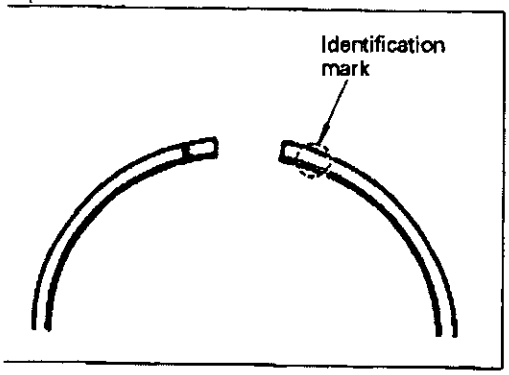
#### Removal

- Use piston ring expander to remove rings.

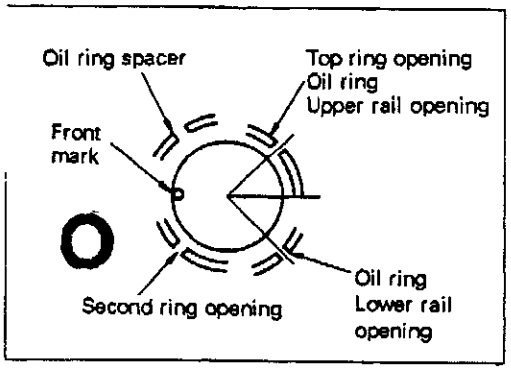
**CAUTION:**
**Be careful not to scratch piston.**

#### Installation

- Use piston ring expander to install piston rings in correct position.



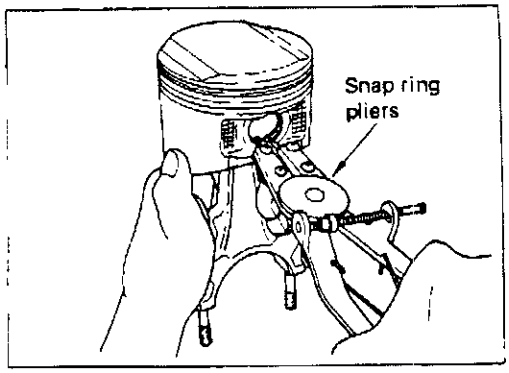

- The stamped marks on top and second piston ring openings must face up.




Position piston ring openings as shown in the figure on left and install.

**CAUTION:**
**Be careful not to scratch piston.**

## 13. Engine Overhaul (Cont'd)




**[Point 13] Snap ring removal and installation**

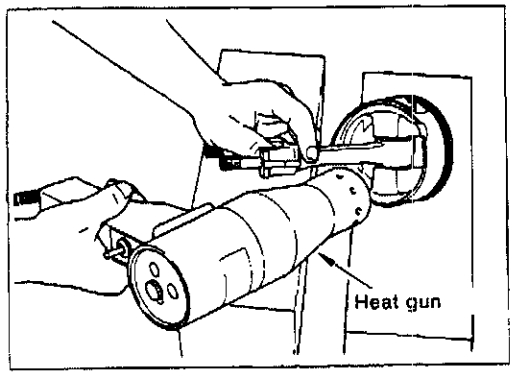
**Removal**

- Use snap ring pliers to remove rings.

**Installation**

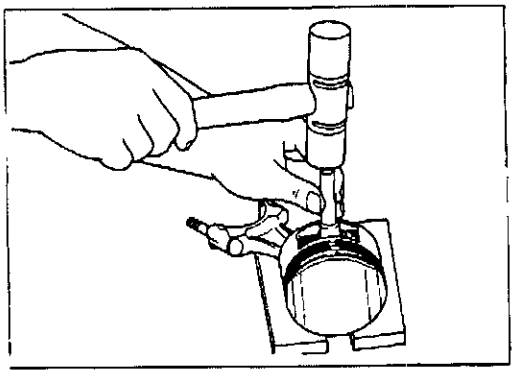
- Use snap ring pliers and install ring securely in groove.

**CAUTION:**
**Do not reuse snap rings.**




**[Point 14] Piston pin removal and installation**

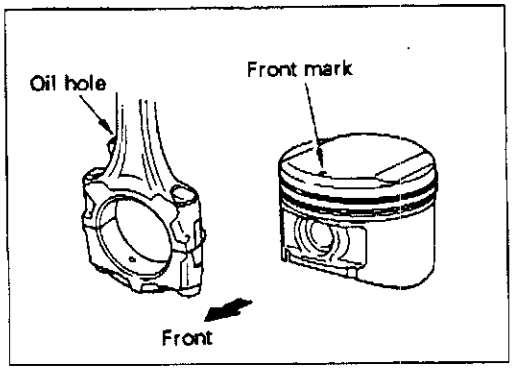
- When removing and installing piston pin, use a heat gun to heat piston to 60 to 70°C (140 to 158°F).



- Place suitable tool against piston pin and use press or plastic hammer.

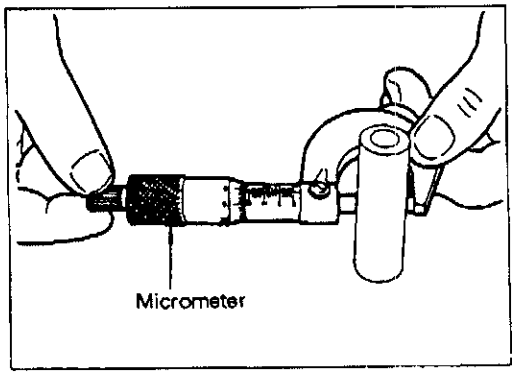
**Piston pin press-fit**

- Apply a liberal amount of oil to pin, pin hole, and connecting rod small hole.




- Position piston front mark so the connecting rod oil hole faces right side of engine (left side when viewed from front) and press-fit.

**CAUTION:**
**Press-fit piston pin from the front of piston to the rear side of piston.**

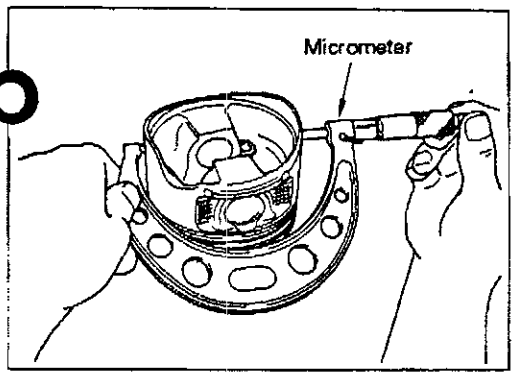



**[Point 15] Piston pin inspection**

- Measure outside diameter of piston pin with micrometer.

| | |
|---|---|
| Standard | 20.989 - 21.001 mm (0.8263 - 0.8268 in) |

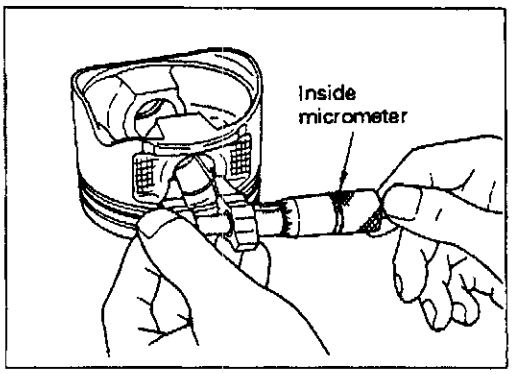
## 13. Engine Overhaul (Cont'd)




### [Point 16] Piston inspection

- Measure outside piston skirt diameter with micrometer.

| Measuring point | Distance from bottom: 13 mm (0.51 in) |
|---|---|
| Standard | 85.955 - 85.985 mm (3.3840 - 3.3852 in) |




- Measure inside diameter of piston pin hole with inside micrometer.

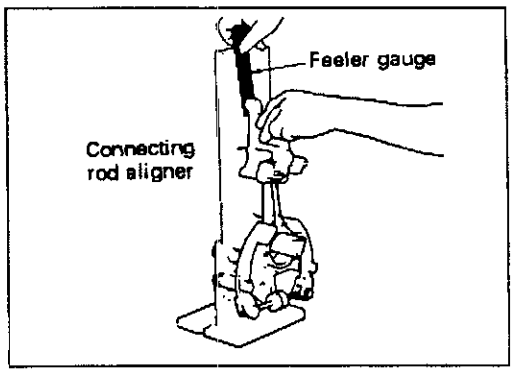
| Standard | 20.987 - 20.999 mm (0.8263 - 0.8267 in) |
|---|---|

- Five types of pistons are available for service (STD1, STD2, STD3, 0.50S, 1.00S).

### [Point 17] Piston pin clearance inspection

- Piston pin clearance is the figure obtained by subtracting the piston pin outside diameter [Point 15] from the piston pin hole inside diameter [Point 16].

| Piston pin clearance at normal temperature [20°C (68°F)] | 0 to –0.004 (0 to –0.0002 in) |
|---|---|

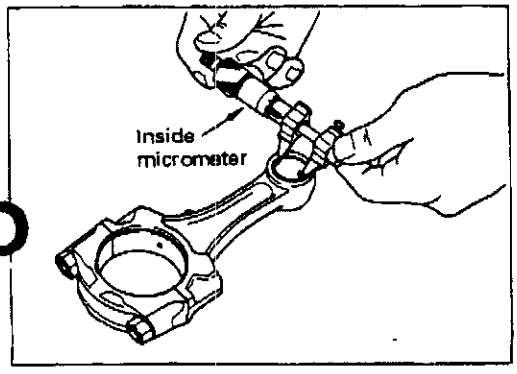



### [Point 18] Connecting rod inspection

#### Bend and torsion inspection

- Measure the bend and torsion with connecting rod aligner.

| Bend limit | 0.15 mm (0.0059 in) |
|---|---|
| Torsion limit | 0.3 mm (0.012 in) |

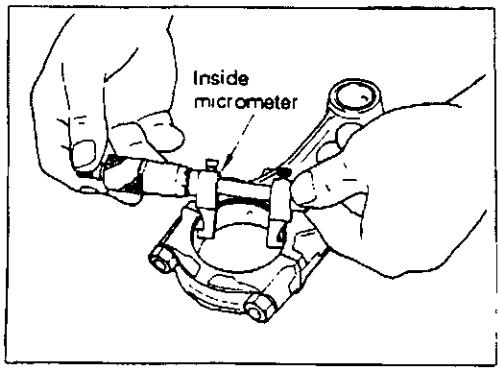



#### Small end inside diameter inspection

- Using an inside micrometer, measure inside diameter of connecting rod small end.

| Standard | 21.000 - 21.012 mm (0.8268 - 0.8272 in) |
|---|---|

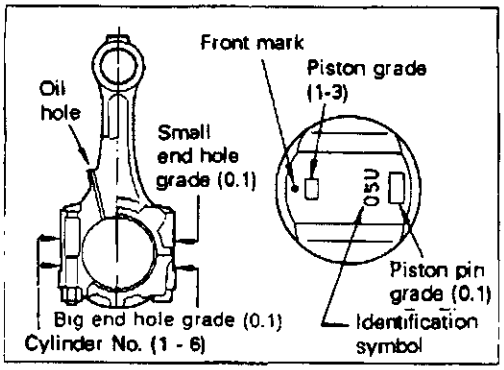
## 13. Engine Overhaul (Cont'd)




### Connecting rod bearing inside diameter inspection

- Install connecting rod bearing in connecting rod and cap. Tighten connecting rod nuts to specified torque and measure connecting rod bearing inside diameter.

| | | | |
|---|---|---|---|
| Connecting rod nut tightening torque | 1st time | Torque wrench | 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb) |
| | 2nd time | Angle wrench | 60° - 65° |
| Standard value | 47 989 - 48 007 mm (1.8893 - 1.8900 in) | | |

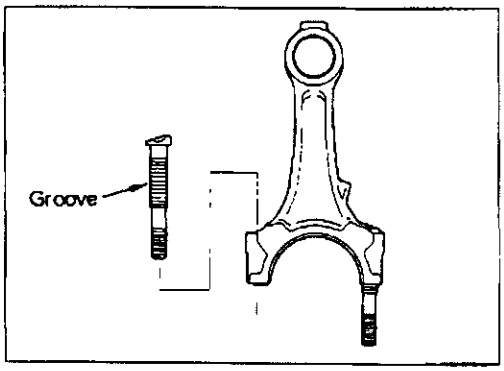



### [Point 19] Connecting rod small end bushing clearance

- The measurement difference of the small end inside diameter [Point 18] and outside diameter of piston pin [Point 15] is the bushing clearance. (Full float type)

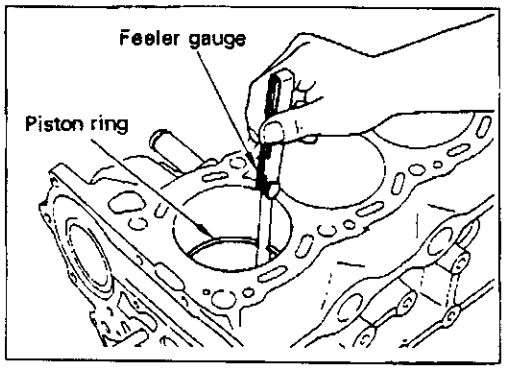
| | |
|---|---|
| Bushing clearance standard | 0.005 - 0.017 mm (0.0002 - 0.0007 in) |

- The connecting rod small end and piston pin outside diameter are separated into two grades at the factory. Check that the grades (0.1) conform for both parts because the rod and pin are selected and fitted according to bushing clearance.




### [Point 20] Connecting rod cap bolts

- Connecting rod cap bolts have grooves to prevent them from disengaging.
- For this reason, do not tap the ends to remove bolts.

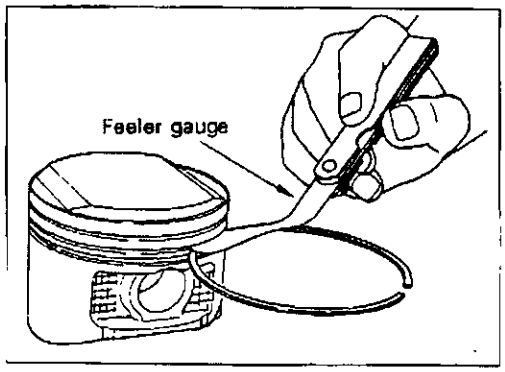



### [Point 21] Piston ring end gap and side clearance

#### Ring end gap inspection

- Using a piston, press the piston ring into the middle of the cylinder, and measure the gap.

| Item \ Part | Top ring | 2nd ring | Oil ring |
|---|---|---|---|
| Standard mm (in) | Bore grade 1, 2, 3: 0.24 - 0.34 (0.0094 - 0.0134) | 0.42 - 0.57 (0.0165 - 0.0224) | 0.20 - 0.60 (0.0079 - 0.0236) |

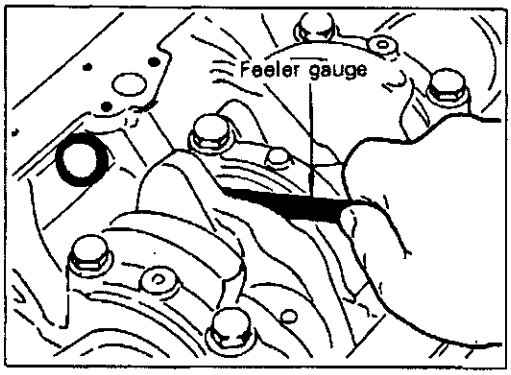



#### Side clearance inspection

- Measure the clearance between piston ring and piston ring groove.

| Item \ Part | Top ring | 2nd ring | Oil ring |
|---|---|---|---|
| Standard mm (in) | 0.040 - 0.075 (0.0016 - 0.0030) | 0.030 - 0.065 (0.0012 - 0.0026) | 0.065 - 0.135 (0.0026 - 0.0053) |

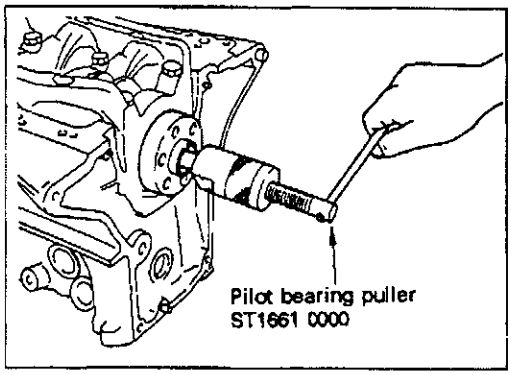
- Three types of piston rings (STD, 0.50S, 1.00S) are available for service.




### [Point 22] Crankshaft thrust clearance inspection

- Use a feeler gauge to measure the clearance between the thrust bearing (No. 4 bearing) and the crank arm when moving the crankshaft toward front and rear of engine.

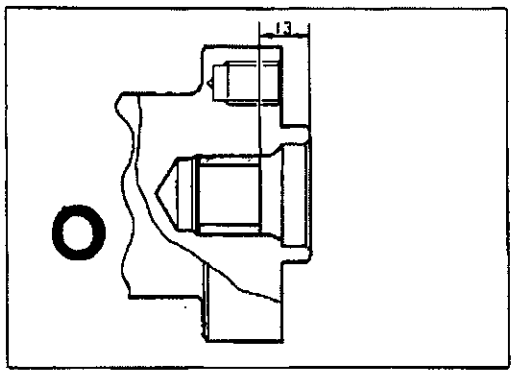
| | |
|---|---|
| Standard | 0.05 - 0.18 mm (0.0020 - 0.0071 in) |
| Limit | 0.3 mm (0.012 in) |




### [Point 23] Pilot bushing removal and installation

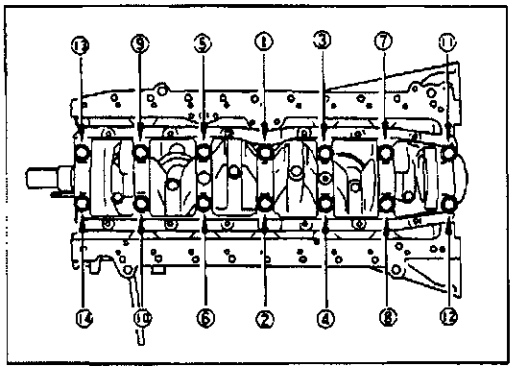
**Removal**

- Use a pilot bearing puller to remove pilot bushing.




**Installation**

- The pilot bushing installation position is shown in figure on left.



### [Point 24] Main bearing bolt removal and installation

**Removal**

- Remove bearing bolts in reverse order of numbered sequence shown in the figure.

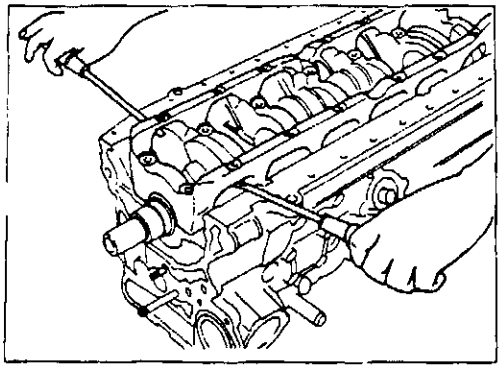
**Installation**

- Tighten the bearing bolts to the specified torque in two or three steps in the sequence shown in the figure. After tightening to the specified torque, check that crankshaft turns smoothly.

| | |
|---|---|
| Main bearing bolt tightening torque | 46 - 52 N·m (4.7 - 5.3 kg-m, 34 - 38 ft-lb) |

**CAUTION:**
**Apply a coating of engine oil to the bolt threads and bolt seats.**

## 13. Engine Overhaul (Cont'd)



### [Point 25] Main bearing cap removal and installation

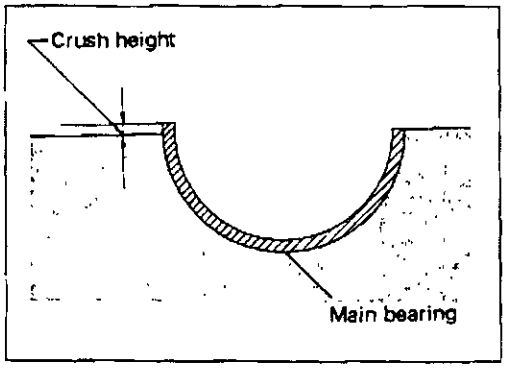
#### Removal

- Use screwdrivers to pry the bearing caps open.

**CAUTION:**
**Be careful not to scratch the oil pan rail surface.**

#### Installation

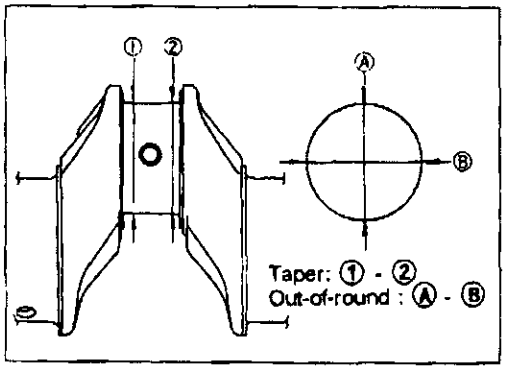
- Position main bearing cap ensuring the installation direction, then fit onto cylinder block by lightly tapping it in a number of locations with a copper hammer or suitable tool.




### [Point 26] Main bearing inspection

- The bearing end should protrude when installed in main bearing cap or cylinder block.

This protrusion is called the crush height.

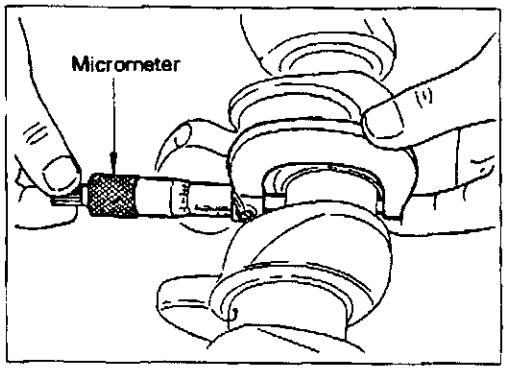



### [Point 27] Crankshaft inspection

#### Out-of-round and taper inspection

- Use a micrometer to check each journal (No. 1 to No. 7) and each pin (No. 1 to No. 6) in four locations shown in the figure.
- The out-of-round value is the difference of the dimensions in directions Ⓐ and Ⓑ.
- The taper value is the difference of the dimensions measured at points ① and ②.

| | |
|---|---|
| Out-of-round and taper limit | 0.005 mm (0.0002 in) |

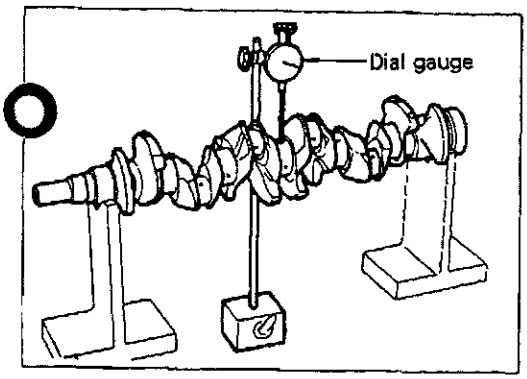



#### Pin and journal inspection

- Use a micrometer to measure pin and journal diameters.

| | |
|---|---|
| Pin diameter standard | 47.961 - 47.974 mm (1.8882 - 1.8887 in) |
| Journal diameter standard | 54.951 - 54.975 mm (2.1634 - 2.1644 in) |

## 13. Engine Overhaul (Cont'd)




### Curve inspection

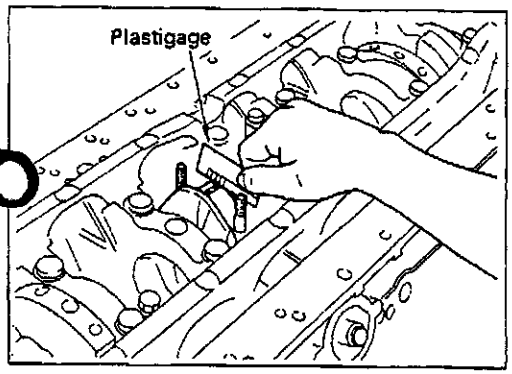
- Use V-blocks on a fixed surface and support journals o both ends of crankshaft (No. 1 and No. 7).
- Position the dial gauge vertically on middle of No. 4 jou nal as shown.
- Turn crankshaft by hand in one direction and read dia gauge movement.
- The runout is equal to one-half of dial gauge movement.

| Limit | 0.05 mm (0.0020 in) |
|---|---|

### [Point 28] Connecting rod bearing oil clearance inspection

### Method A (using inside micrometer and micrometer)

- The oil clearance can be calculated from the connectin rod bearing inside diameter and the crankshaft pin diame ter measured in [Point 18] and [Point 27].
  (oil clearance) = (bearing inside diameter) – (crankshaf pin diameter)




### Method B (using plastigage)

- Remove all dust from crankshaft pins and bearing surfaces
- Cut off a piece of plastigage slightly shorter than the bear ing width. Place the plastigage on crankshaft in direction o axis, being careful not to place on oil hole.
- Assemble connecting rod bearing in connecting rod cap and tighten connecting rod nuts to specified torque.

| | | | |
|---|---|---|---|
| Connecting rod nut tightening torque | 1st time | Torque wrench | 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb) |
| | 2nd time | Angle wrench (°) | 60 - 65 |

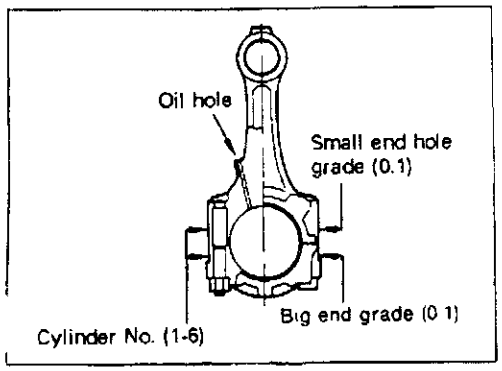
**CAUTION:**
**Do not turn crankshaft or connecting rod while plastigage is being inserted.**

- Remove connecting rod cap and bearing. Measure plasti- gage width with plastigage scale.

| | |
|---|---|
| Standard | 0.020 - 0.040 mm (0.0008 - 0.0016 in) |
| Limit | 0.090 mm (0.0035 in) |

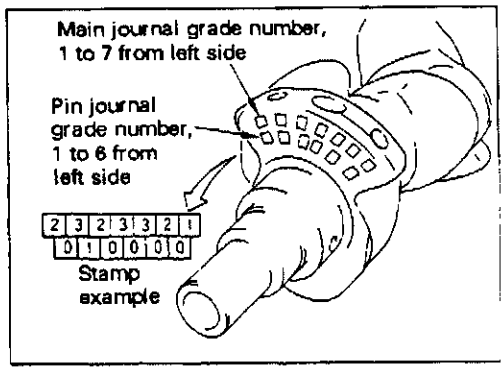
- If the oil clearance exceeds the limit, refer to [Point 29] and select the appropriate bearing.

## 13. Engine Overhaul (Cont'd)




### [Point 29] Connecting rod bearing selection and engaging

- Select the proper sized bearing because connecting rod bearing prevents fluctuation in the oil clearance. Three bearing thicknesses are available to fit the inside diameter of the big end of connecting rod and the crank pin diameter grade.
- When replacing connecting rod bearing, check big end inside diameter grade (indicated on the opposite side of connecting rod oil hole) and the pin diameter grade (indicated on crankshaft No. 1 counterweight front surface). Select connecting rod bearing with proper thickness according to the following table.

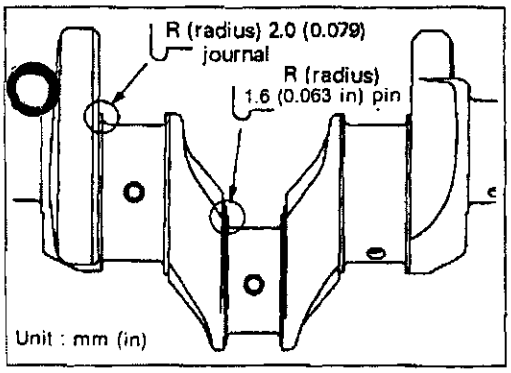



### Connecting rod bearing selection chart

Unit: mm (in)

| Connecting rod large end inside diameter | | Less than 51.007 (2.0081) 51.000 (2.0079) max. | 51.013 (2.0084) max. 51.007 (2.0081) |
|---|---|---|---|
| Crank pin diameter | Grade number stamp | 0 | 1 |
| 47.974 (1.8887) max. Greater than 47.968 (1.8885) | 0 | Bearing grade No.: STD 0 Bearing thickness: 1.500 - 1.503 (0.0591 - 0.0592) Oil clearance: 0.020/ 0.039 (0.0008/0.0015) Identification color: None | STD 1 1.503 - 1.506 (0.0592 - 0.0593) 0.021/0.039 (0.0008/0.0015) Brown |
| 47.968 (1.8885) max. 47.961 (1.8882) min. | 1 | STD 1 1.503 - 1.506 (0.0592 - 0.0593) 0.020/0.040 (0.0008/0.0016) Brown | STD 2 1.506 - 1.509 (0.0593 - 0.0594) 0.021/0.040 (0.0008/0.0016) Green |

## 13. Engine Overhaul (Cont'd)

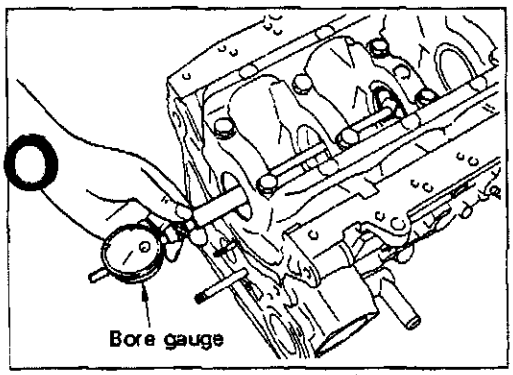



- When using undersize bearings, measure bearing inside diameter when bearing is installed. Grind pin so oil clearance conforms to specified value.

Unit: mm (in)

| Size | Thickness | Grade No. |
|---|---|---|
| US0.08 (0.0031) | 1.541/1.549 (0.0607/0.0610) | 8 |
| US0.12 (0.0047) | 1.561/1.569 (0.0615/0.0618) | 12 |
| US0.25 (0.0098) | 1.626/1.634 (0.0640/0.0643) | 25 |

**CAUTION:**
**Be careful not to scratch fillet roll when the crank pin is being ground for use with undersize bearing.**




**[Point 30] Main bearing oil clearance**

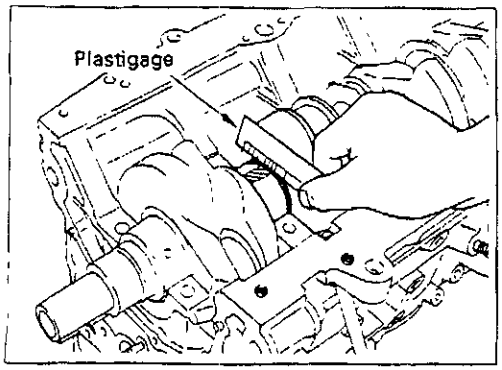
**Method A (using bore gauge and micrometer)**

- Install main bearing in cylinder block and attach bearing cap. Tighten bearing cap bolts to specified torque and measure bearing inside diameter.

| | |
|---|---|
| Bearing cap bolt tightening torque | 46 - 52 N·m (4.7 - 5.3 kg-m, 34 - 38 ft-lb) |

- The oil clearance distance can be calculated from the values for the outside diameter of crank journal measured in [Point 27].
  (Oil clearance) = (bearing inside diameter – (crankshaft outside diameter)

## 13. Engine Overhaul (Cont'd)




| | |
|---|---|
| Standard | 0.028 - 0.047 mm (0.0011 - 0.0019 in) |
| Limit | 0.090 mm (0.0035 in) |

- If oil clearance exceeds limit value, refer to [Point 31] and select suitable bearing.

**Method B (using plastigage)**

- Remove all dust and oil from each crankshaft journal and bearing surface.
- Cut off a piece of plastigage slightly shorter than the bearing width. Place the plastigage on crankshaft in direction of axis, being careful not to place on oil hole.
- Assemble main bearing and bearing cap. Install bearing cap onto cylinder block and tighten cap bolts to the specified torque.

| | |
|---|---|
| Bearing cap bolt tightening torque | 46 - 52 N·m (4.7 - 5.3 kg-m, 34 - 38 ft-lb) |

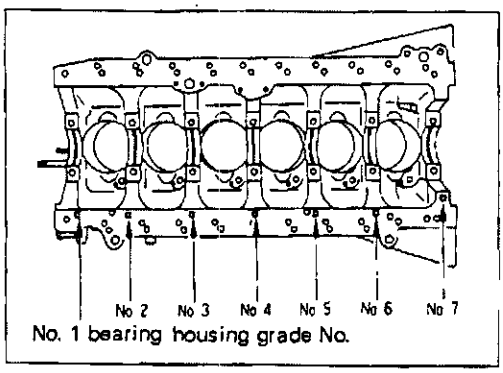
**CAUTION:**

**Do not turn crankshaft while plastigage is being inserted.**

- Remove bearing cap and bearing. Measure plastigage width on plastigage scale.

**CAUTION:**

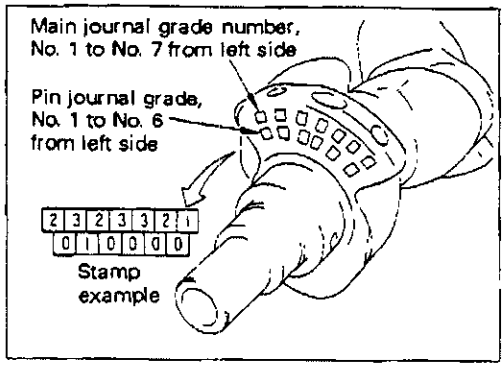
**If excessive bearing clearance still exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained when measured by Method A as well.**




### [Point 31] Main bearing selection and engagement

- Select the proper sized bearing because main bearing prevents fluctuation in the oil clearance. Seven bearing thicknesses are available to fit the cylinder block bearing housing and crank journal diameter grade.

  Note: Selection engagement is performed only for standard size.



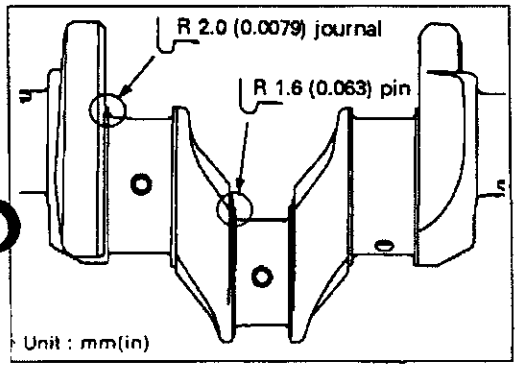

- When replacing main bearing, check the bearing grade (indicated on bottom face of cylinder block) and journal diameter grade (indicated on crankshaft No. 1 counterweight front surface). Select main bearing with proper thickness according to the following table.

## 13. Engine Overhaul (Cont'd)

### Main bearing selection table

Unit: mm (in

| Cylinder block bearing housing inner diameter | | | 58.651 (2.3091) Max. Greater than 58.645 (2.3089) | 58.657 (2.3093) Max. Greater than 58.651 (2.3091) | 58.663 (2.3096) Max. Greater than 58.657 (2.3093) | 58.670 (2.3098) Max. Greater than 58.663 (2.3096) |
|---|---|---|---|---|---|---|
| Crankshaft journal diameter | Grade No. stamp | | 0 | 1 | 2 | 3 |
| 54.975 (2.1644) Max. Greater than 54.969 (2.1641) | 0 | Bearing grade No. | STD 0 | STD 1 | STD 2 | STD 3 |
| | | Bearing thickness | 1.818 - 1.821 (0 0716 - 0.0717) | 1.821 - 1.824 (0.0717 - 0.0718) | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) |
| | | Oil clearance | 0.028/0.046 st.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Black | Brown | None | Yellow |
| 54.969 (2.1641) Max. Greater than 54.963 (2.1639) | 1 | Bearing grade No. | STD 1 | STD 2 | STD 3 | STD 4 |
| | | Bearing thickness | 1.821 - 1.824 (0.0717 - 0.0718) | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Brown | None | Yellow | Blue |
| 54.963 (2.1639) Max. Greater than 54.957 (2.1637) | 2 | Bearing grade No. | STD 2 | STD 3 | STD 4 | STD 5 |
| | | Bearing thickness | 1.824 - 1.827 (0.0718 - 0.0719) | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) | 1.833 - 1.836 (0.0722 - 0.0723) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | None | Yellow | Blue | Green |
| 54.957 (2.1637) Max. Greater than 54.951 (2.1634) | 3 | Bearing grade No. | STD 3 | STD 4 | STD 5 | STD 6 |
| | | Bearing thickness | 1.827 - 1.830 (0.0719 - 0.0720) | 1.830 - 1.833 (0.0720 - 0.0722) | 1.833 - 1.836 (0.0722 - 0.0723) | 1.836 - 1.839 (0.0723 - 0.0724) |
| | | Oil clearance | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.046 (0.0011/0.0018) | 0.028/0.047 (0.0011/0.0019) |
| | | Identification color | Yellow | Blue | Green | Pink |



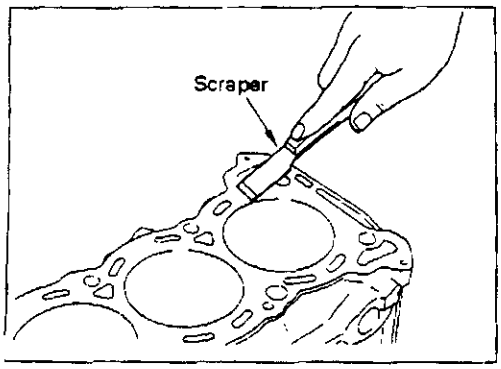

- When using undersize bearings, measure bearing inside diameter when bearing is installed and grind journal so oil clearance conforms to specified clearance.

Unit: mm (in

| Size | Thickness | Grade No. |
|---|---|---|
| US0.25 (0.0098) | 1.950/1.958 (0.0768/0.0771) | 25 |

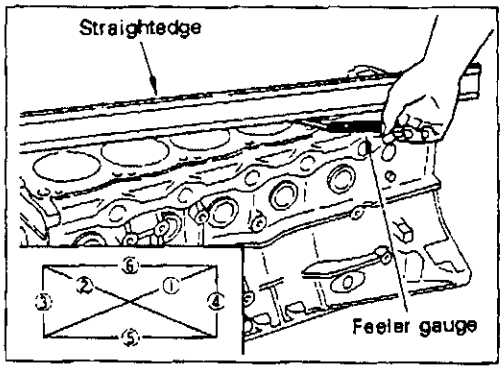
**CAUTION:**
**When crankshaft journal is being ground for use with undersize bearings, do not scratch the fillet roll.**

## 13. Engine Overhaul (Cont'd)




**[Point 32] Cylinder block inspection and correction**

- Remove all oil and water deposits, gasket, seal material and carbon from cylinder block.

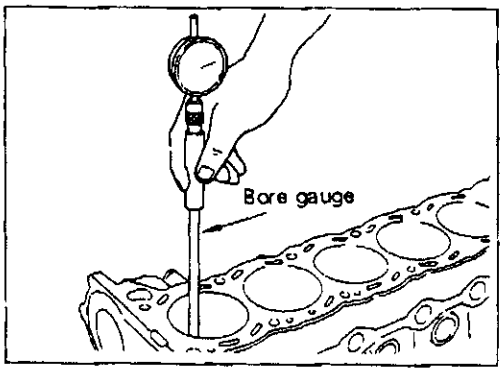



**Upper surface distortion and wear inspection**

- Clean upper face of cylinder block and measure the distortion in six directions.

| Limit | 0.1 mm (0.004 in) |
|---|---|

- If the distortion exceeds the specified limit, resurface face with surface grinder or replace block if necessary.



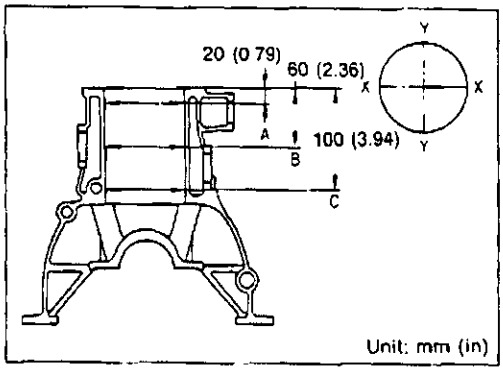

**Cylinder inside diameter inspection**

- Use bore gauge and measure cylinder bore for wear, out-of-round and taper. Measure in three vertical locations (A, B, C) and two directions (X, Y) for a total of six locations.

Unit: mm (in)

| | |
|---|---|
| Cylinder inside diameter standard | 86.000 - 86.050 (3.3858 - 3.3878) |
| Wear limit | 0.2 (0.008) |
| Out-of-round limit | 0.015 (0.0006) |
| Taper limit | 0.010 (0.0004) |

(1) Out-of-round measurement is difference of measurement in two directions (X, Y).
(2) Taper is difference of measurement at top and bottom (A, C).




- Perform honing or boring when abnormality is inspected.

## 13. Engine Overhaul (Cont'd)

### Cylinder honing

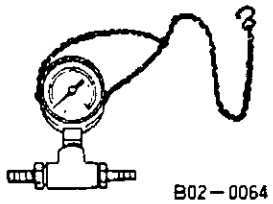
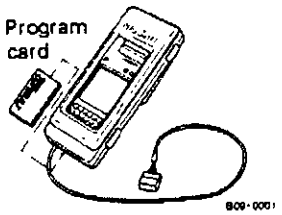
- There are three types of oversize pistons, STD (standard - 0.02), OS (0.5) and OS (1.0). When oversize pistons ar used, hone the cylinder so the clearance between pisto and cylinder conforms to the specified value described i [Point 33]. Oversize piston rings must be used that fit th oversize piston.

### [Point 33] Piston-to-cylinder bore clearance

- The clearance can be calculated from the measured value for the piston skirt outside diameter [Point 16] and cylinde inside diameter [Point 32] (X direction B location).
  (Clearance) = (cylinder inside diameter) — (piston ski outside diameter)

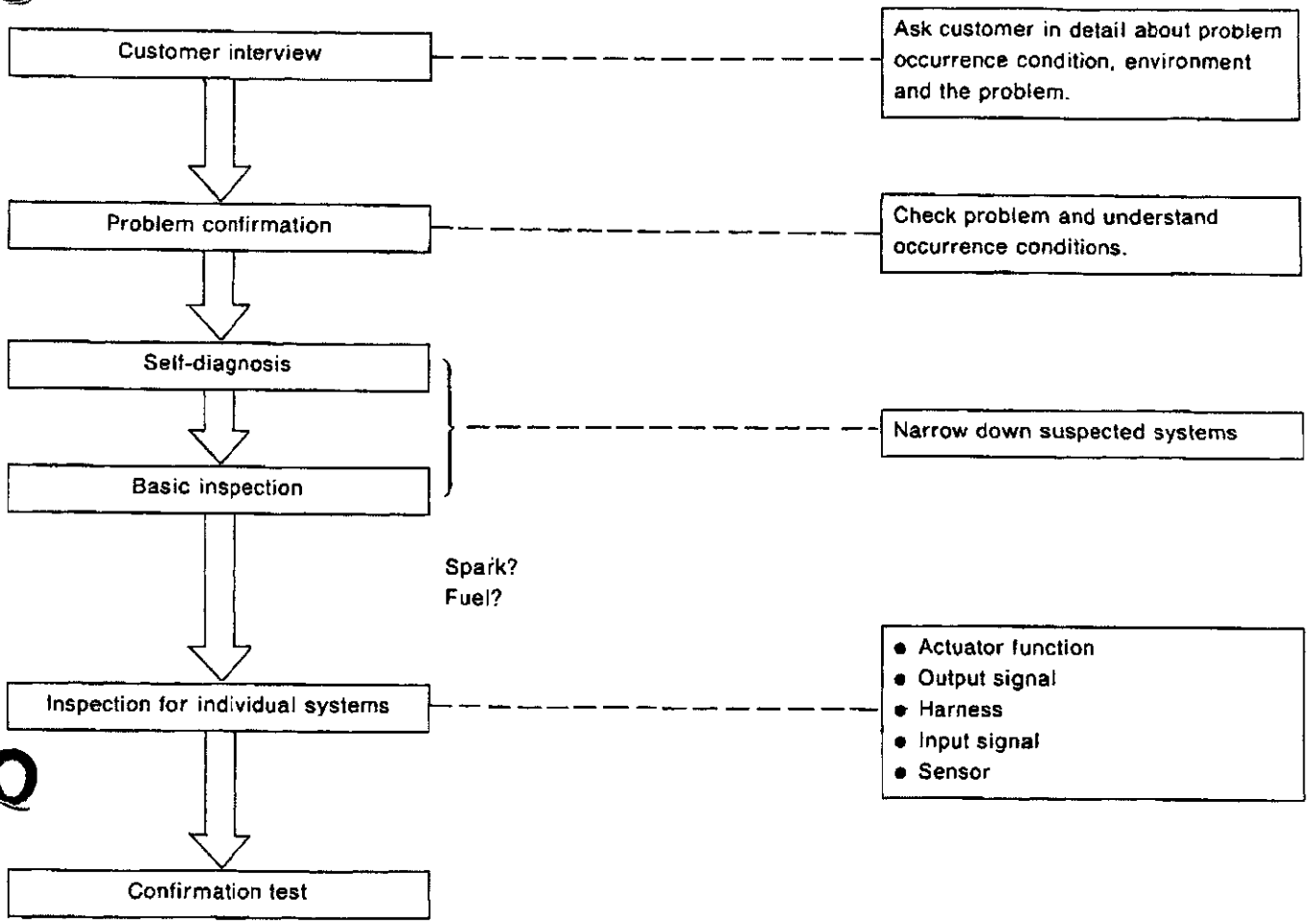
| | |
|---|---|
| Standard at normal temperature | 0.035 - 0.055 mm (0.0014 - 0.0022 in) |

## Tools required

| | Name | | Application |
|---|---|---|---|
| Measurement tool | EGI fuel pressure gauge<br>ST1959 0000 |  | Fuel pressure measurement |
| | Circuit tester | | Resistance, voltage measurement |
| | Handy vacuum pump<br>EG1513 000 | | Part inspection |
| | Engine tachometer | | Engine speed inspection |
| | Electronic system diagnosis tester<br>CONSULT<br>EG1180 0000 |  | System inspection, diagnosis |
| | Check adapter II<br>EG1771 0000 | | Control unit input and output signal inspection |
| | Oscilloscope | | |

# 1. Trouble Diagnosis

## 1-1 TROUBLE DIAGNOSTIC PROCEDURE




**CAUTION:**
**Engine problems are roughly divided into two types: problems relating to engine main body and those related to control system. This section explains the trouble diagnostic method for the control system under the assumption that the engine main body is normal. Consequently, attention should also be paid to the condition of the engine main body and gasoline quality.**

## 1. Trouble Diagnosis (Cont'd)

**KEY POINTS**

**WHAT** ..... Vehicle & engine model
**WHEN** ..... Date, Frequencies
**WHERE** ..... Road conditions
**HOW** ..... Operating conditions, Weather conditions, Symptoms

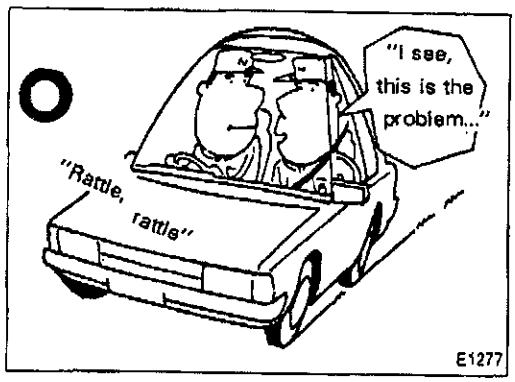
### (1) Diagnostic worksheet

There are many kinds of operating conditions that lead to malfunctions on engine components.
A good grasp of such conditions can make trouble-shooting faster and more accurate.
In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms and conditions when a customer complains.
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

**Worksheet sample**

| | | |
|---|---|---|
| Customer name MR/MS | Model & Year | VIN |
| Engine # | Trans. | Mileage |
| Incident Date | Manuf. Date | In Service Date |
| Symptoms — ☐ Startability | ☐ Impossible to start ☐ No combustion ☐ Partial combustion<br>☐ Partial combustion affected by throttle position<br>☐ Partial combustion NOT affected by throttle position<br>☐ Possible but hard to start ☐ Others [ ] | |
| Symptoms — ☐ Idling | ☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle<br>☐ Others [ ] | |
| Symptoms — ☐ Driveability | ☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power<br>☐ Intake backfire ☐ Exhaust backfire<br>☐ Others [ ] | |
| Symptoms — ☐ Engine stall | ☐ At the time of start ☐ While idling<br>☐ While accelerating ☐ While decelerating<br>☐ Just after stopping ☐ While loading | |
| Incident occurrence | ☐ Just after delivery ☐ Recently<br>☐ In the morning ☐ At night ☐ In the daytime | |
| Frequency | ☐ All the time ☐ Under certain conditions ☐ Sometimes | |
| Weather conditions | ☐ Not affected | |
| Weather | ☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ] | |
| Temperature | ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F | |
| Engine conditions | ☐ Cold ☐ During warm-up ☐ After warm-up<br>Engine speed 0 2,000 4,000 6,000 8,000 rpm | |
| Road conditions | ☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down) | |
| Driving conditions | ☐ Not affected<br>☐ At starting ☐ While idling ☐ At racing<br>☐ While accelerating ☐ While cruising<br>☐ While decelerating ☐ While turning (RH/LH)<br>Vehicle speed 0 10 20 30 40 50 60 MPH | |
| Check engine light | ☐ Turned on ☐ Not turned on | |

## 1. Trouble Diagnosis (Cont'd)



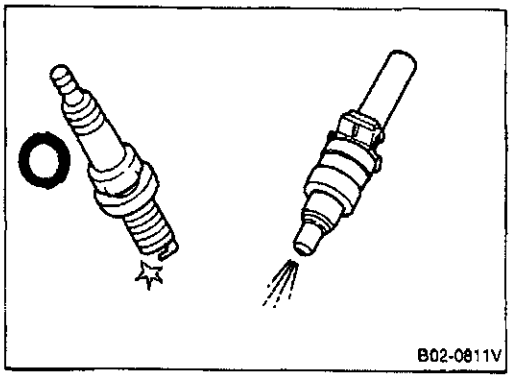

### (2) Problem confirmation

- Customer's explanation is often insufficient in clarifying the status of the problem. Reproduction of the problem on the actual car and its confirmation and analysis are therefore essential. If unable to reproduce the problem, ask the customer in detail about its occurrence conditions and try to reproduce it under the indicated conditions. If unable to reproduce, manually shake the concerned harness to check for poor contact or other problems.
- It is also recommended to collect and analyze the data using CONSULT while driving.
- When checking the actual vehicle, record data on normal portions to assist in diagnosing a problem.

### (3) Self-diagnosis

- If problems are attributable to the ECCS signal system, problem diagnosis should be narrowed down using the self-diagnostic function.

| | |
|---|---|
| • What happened up to present? | Self-diagnosis |
| • How about the signal system at present? | Real-time diagnosis or switch ON/OFF diagnosis using the CONSULT "Data Monitor" function. |




### (4) Basic inspection

- Check if the three elements of combustion are functioning normally. Find out which system is faulty; fuel system, ignition system or idling control system.

| | |
|---|---|
| • Fuel? | Are injector and fuel pump operating? |
| • Ignition? | Are sparks present? |
| • Idling control? | Is AAC valve operating? |
| • Air-fuel ratio? | Is air-fuel ratio feedback function normal? |

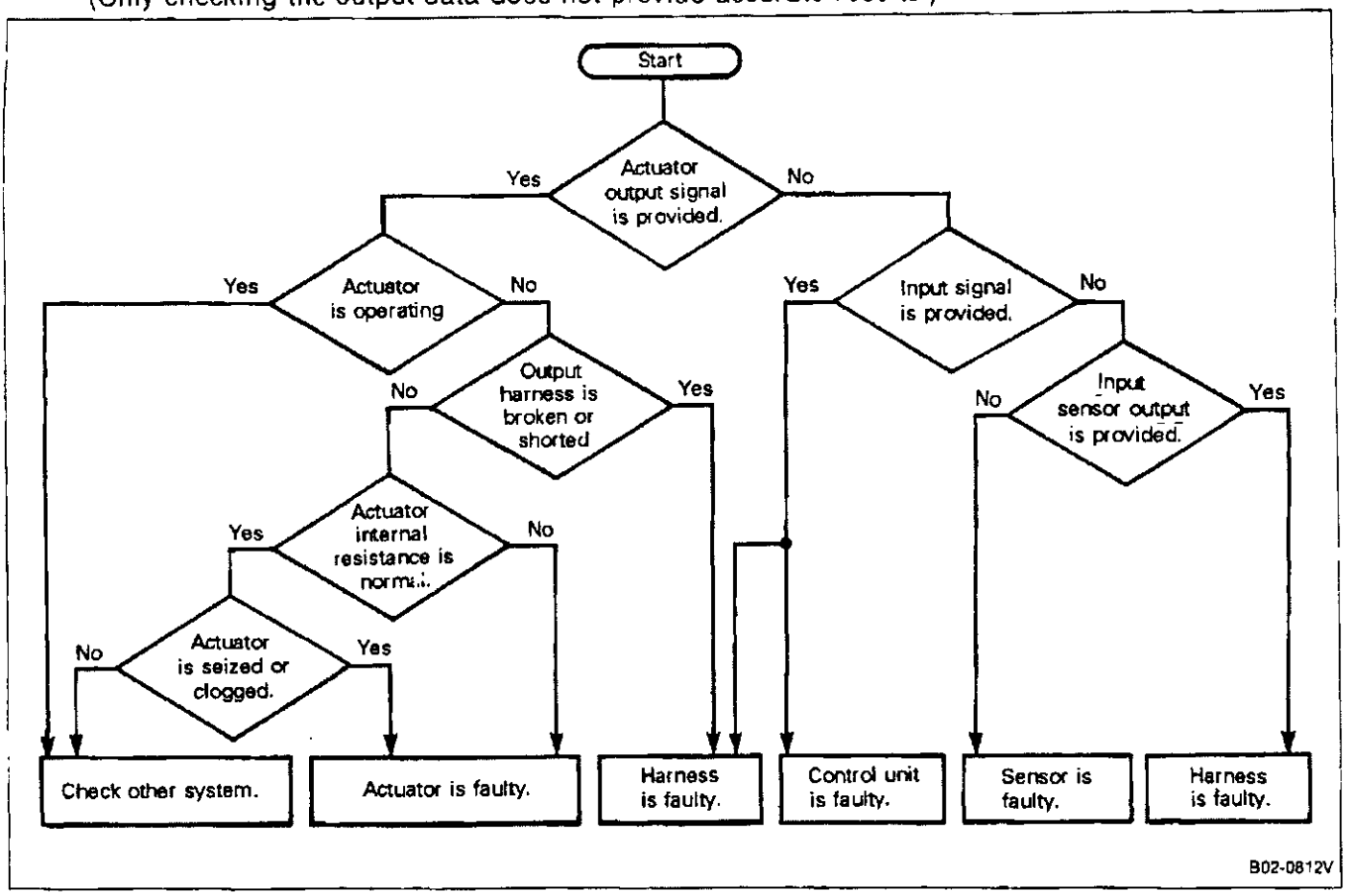
## 1. Trouble Diagnosis (Cont'd)

### (5) Individual system inspection

An efficient method for ECCS diagnosis is to check the control unit output signals first. Continue by checking individual parts such as actuators and sensors as well as input signals according to the results of the output signal check.

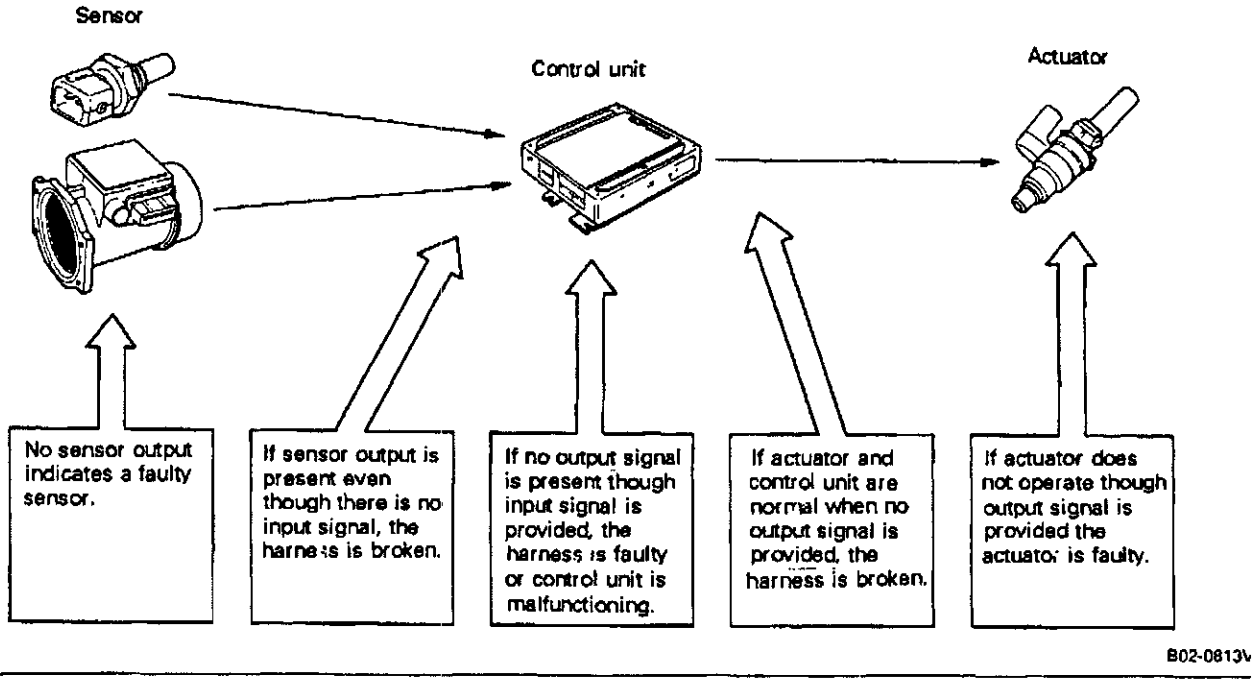
**[Procedure]**

Note: The input data must be monitored first when using CONSULT.
(Only checking the output data does not provide accurate results.)



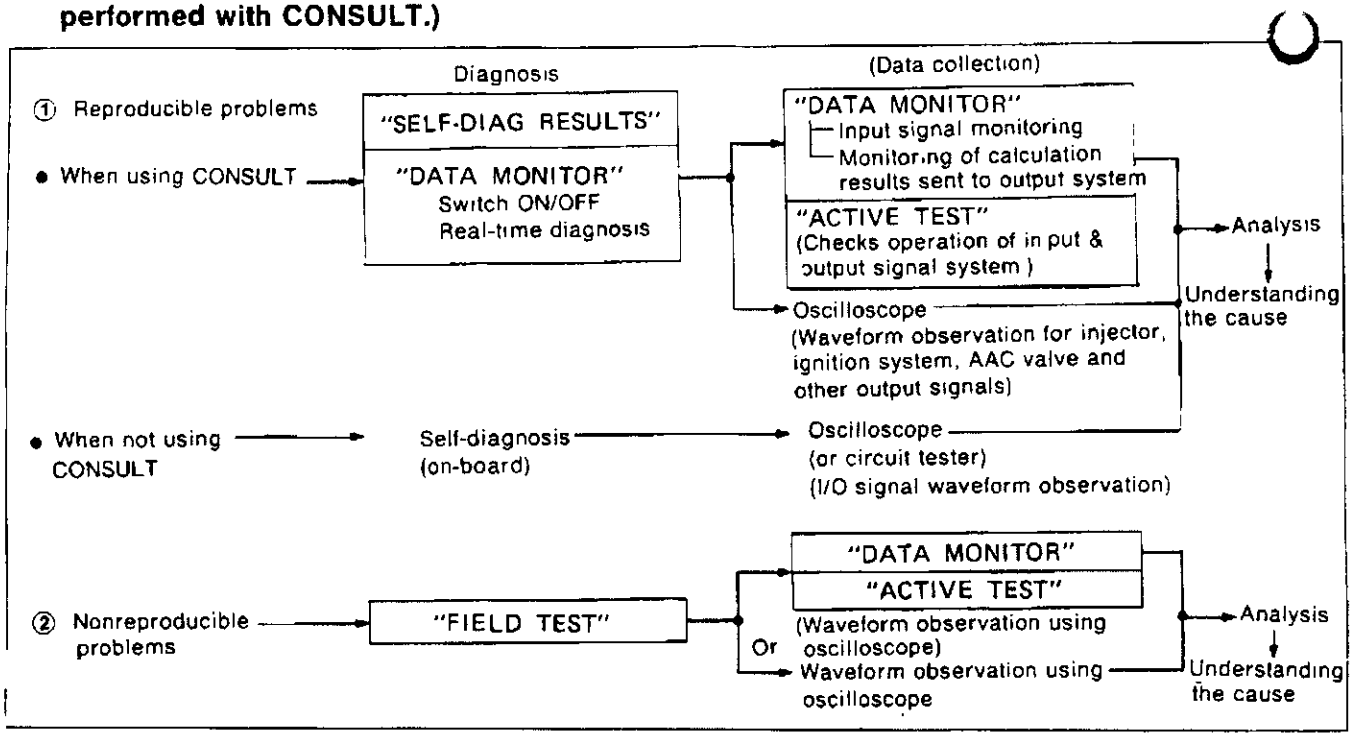
## 1. Trouble Diagnosis (Cont'd)

**[Analysis]**



## 1. Trouble Diagnosis (Cont'd)

**(6) Trouble diagnosis using measuring instruments (Operations in square frames ☐ to be performed with CONSULT.)**



## 1. Trouble Diagnosis (Cont'd)

### 1-2 MAJOR ECCS INPUT SIGNALS AND CONTROL ITEMS

Understanding the relationship between the input signals and control items (output) of ECCS is essential to efficiently determine the cause of problems.

| Input \ Output | Fuel injection control (injector) | Ignition control (power transistor, IGN coil) | Idle control (ACC valve) |
|---|---|---|---|
| Crank angle sensor 120° signal | • Determination of injector injection timing<br>• Engine rpm input signal | • Ignition timing start point | • Engine rpm input signal |
| Crank angle sensor 1° signal | • Engine speed input signal | • Ignition timing count | • Engine speed input signal |
| Air flow meter | • Intake air volume measurement and control of injector injection pulse width | • Ignition timing control | |
| Engine temperature sensor | • Engine temperature enrichment correction<br>• Fuel cut range change | • Ignition timing alteration due to water temperature | • Target speed change according to water temperature |
| Start signal | • Start time enrichment | • Ignition timing control during cranking | |
| Throttle sensor | • Fuel injection interrupt<br>• Enrichment correction during acceleration and deceleration<br>• Fuel cut judgment during speed change control<br>• Intake air volume measurement | | |
| Soft idle switch (idle judgment by throttle opening angle) | • Fuel cut due to ON signal<br>• ON* → OFF time enrichment | • Ignition timing change | • Idle control start by ON signal |

Note *: Throttle sensor judges ON-OFF time instead of idle contact. During the ON time, fully closed throttle or "fully closed throttle + α (partially open)" throttle is detected. (The idle contact is used as backup system if throttle sensor problem occurs.)

## 1. Trouble Diagnosis (Cont'd)

| Input \ Output | Fuel injection control (injector) | Ignition control (power transistor, IGN coil) | Idle control (ACC valve) |
|---|---|---|---|
| Vehicle speed sensor | • Fuel cut changeover vehicle speed<br>• Fuel cut at 0 km/h (0 MPH) vehicle speed<br>• Transmission shift position judgment | | • Idle control start at vehicle speed below 8 km/h (5 MPH) |
| Exhaust gas sensor | • Pulse width control by air-fuel ratio feedback | | |
| Detonation sensor | | • Ignition timing change | |
| Battery voltage | • Pulse width correction | • Excitation angle change | • Target rpm change |
| Air conditioner switch | | | • Target rpm change after engine warms up |
| Neutral switch | | • Ignition timing change (at idle) | • Idle control start in neutral position |
| Power steering switch | | | • Prevention of engine speed reduction when power steering is turned. |

### 1-3 DIAGNOSIS CHART ITEM BY PROBLEM

(1) Unable to start ... No initial combustion
(2) Unable to start ... Initial combustion occurs but is incomplete.
(3) Hard to start ... Hard to start when engine is cold.
(4) Hard to start ... Hard to start after warm-up.
(5) Hard to start ... Hard to start when engine is hot or cold.
(6) Poor idling ... Fast idling inoperative
(7) Poor idling ... Low idle rpm (after warm-up)
(8) Poor idling ... High idle rpm (after warm-up)
(9) Unstable idling ... Cold engine only
(10) Unstable idling ... During warm-up
(11) Poor driveability ... Engine breathing
(12) Poor driveability ... Knocking
(13) Poor driveability ... Lack of output, poor acceleration, poor response
(14) Engine stalls when starting off
(15) Engine stall during idling
(16) Engine stall during driving
(17) Engine stall when decelerating or immediately after stopping
(18) Engine stall when electrical load or power steering load is applied

## 1. Trouble Diagnosis (Cont'd)

### Diagnostic chart by problem

### Unable to start ... No initial combustion

**[Analysis]**

Ignition spark is not generated or no fuel is injected.

- Check if fuel pump is rotating.
- If no ignition spark is generated and no injector operating noise is heard, check the control unit input (crank angle sensor signal) or control unit power supply.
- If injector is operating but no spark is generated, the control unit and crank angle sensor can be judged as normal. In this case, check the ignition output system (power transistor, ignition coil, etc.)
- If ignition spark is generated but injector is not operating, check the ignition output system (injector power supply, harness, etc.).

**[Chart]**

**Fuel pump?** (See 5-1)

└Operating? — Check fuel hose for tension in CONSULT active test mode.
Or
Check if pump operating noise is heard for five seconds after turning ignition switch ON. (If NOT, check fuel pump system.)

**Injector?** (See 5-2)

└Operating? — Check if injector operating noise is heard when cranking engine.
Or
Check using CONSULT data monitor mode if injection pulse is output when cranking engine.
(The injection pulse value monitored on CONSULT indicates the calculation results of input signals from the crank angle sensor and air flow meter. As a result, the injector may not be operating even if this value is correct.)
If not correct:

- Check control unit terminal voltage when cranking engine.
- Check injector power supply circuit
- Crank angle sensor input signal inspection

**Ignition spark?**

└Is there a spark? — Check if tachometer needle moves during cranking.
Check using real-time diagnostic mode. (CONSULT data monitor)
Check using a timing light.

- Remove plug and visually check for spark.

If NOT O.K.:

- Check control unit output signal (ignition signal)
- Check control unit input signal (crank angle sensor)
- Check power transistor and ignition coil resistance value

## (2) Unable to start ... Initial combustion occurs but is incomplete

**[Analysis]**

Occurrence of initial combustion means that sparks are created. The following three cases are possible.

① Initial combustion only
- Is fuel system (fuel pump, fuel injector) operating?

② Engine fires incompletely
- Check if fuel injection quantity is too small or large.
  - ○ Check if fuel pressure is normal.
  - ○ Check if water temperature enrichment is provided.
  - ○ Check if start-time enrichment is provided.
  - ○ Check if ignition timing is normal.

③ Engine fires completely if accelerator pedal is moved up and down.
- Check if AAC valve operation is normal.

**[Chart]**

**Fuel pressure?** (See 3-3)

- Is pump operating? → Check fuel hose for tension in CONSULT active test mode.
  Or
  Check if fuel pump operating noise is heard for five seconds after ignition switch is turned ON.
  Is fuel pump operating during cranking?
  (If NOT O.K., check the fuel pump system.)

**Injection quantity?**

- Engine temperature enrichment provided? → Check water temperature of CONSULT data monitor mode.
  Or
  Disconnect engine temperature sensor connector and check for any change.
  - Check water temperature resistance value
  - Check engine temperature sensor output voltage.
- Start-time enrichment provided? → Check "START" signal [ON/OFF] (CONSULT data monitor mode)

**Idling control?** (See 5-4)

- Is idling rpm increased? → Check AAC valve operation (CONSULT active test).
  Check if AAC valve is fully closed (CONSULT data monitor).
  Check AAC valve circuit for disconnection or loose connectors.

**Ignition system?**

- Is ignition timing normal? → Try to advance or retard timing angle.
- Is ignition correct? → Check spark plugs for fouling.
  Check for ignition misfiring
  (Check using a timing light or CONSULT real-time diagnostic mode.)

## 1. Trouble Diagnosis (Cont'd)

**(3) Hard start ... Hard to start when engine is cold.**

**[Analysis]**

The systems relating to water temperature must be checked because this problem only occurs when the engine is cold.

- Fuel injection enrichment from engine temperature sensor signal is not functioning when temperature is low.
- Idling speed control is not functioning normally.
- Start-time enrichment is not functioning.
- Cranking speed is too low.

**[Chart]**

**Engine temperature correction?** (See 6-6)

- Engine temperature sensor signal?
  - Check using CONSULT data monitor mode.
  - Or
  - Disconnect engine temperature sensor connector and check for any change.
    - Check engine temperature sensor resistance value.
    - Check engine temperature sensor output voltage.
- Idling control?
  - Check AAC valve for operation (CONSULT active test)
  - Check if AAC valve is not fully closed. (CONSULT data monitor)
  - Check AAC valve circuit for disconnection, loose connector, etc.

**Start-time enrichment?** (See 6-10)

- Check if START signal is provided. — (Check using CONSULT data monitor mode.)

**Cranking speed?**

- Is battery normal?
- Check starter system including starter and cable (resistance, poor contact, etc.).

## 1. Trouble Diagnosis (Cont'd)

### (4) Hard start ... Hard to start after warm-up

**[Analysis]**

This problem may be related to the water temperature control.

- Check if engine temperature correction is inaccurate.
- Check if fuel pressure is correct or if air bubbles are generated in the fuel when the engine is hard to start, especially when water temperature is high.
- Check if engine cranking speed is low.

**[Chart]**

**Engine temperature correction?** (See 6-6)

- Engine temperature sensor signal?
  - Check using CONSULT data monitor.
  - Or
  - Disconnect engine temperature sensor connector and check for any change.
    - Check engine temperature sensor resistance value.
    - Check engine temperature sensor output voltage.

**Fuel pressure?**

- Check by increasing fuel pressure. — Disconnect pressure regulator vacuum hose or block return line by clamping return hose.
- Heat-resistance problem? — Cool fuel hose using damp rag

**Cranking speed?**

- Is battery normal?
- Check starting system.

## 1. Trouble Diagnosis (Cont'd)

### (5) Hard start ... Hard to start regardless of engine temperature

**[Analysis]**

Spark arc is created but air-fuel ratio seems to be incorrect.

- Check fuel pressure.
- Check fuel injection quantity. (Is engine temperature correction accurate?)
- Check if idling speed is controlled.
- Check for misfiring and incorrect ignition timing.
- Check if cranking speed is too low.

**[Chart]**

**Fuel pressure?** (See 3-3)

- Fuel pump?
  - Set CONSULT active test mode and check fuel hose tension.
    Or
  - Check if pump operating noise is heard 5 seconds after turning ignition switch ON.
    - Check if pump operating noise is heard even when cranking.
    - Check if fuel pressure is approx. 245 to 294 kPa (2.5 to 3 kg/cm$^2$, 36 to 43 psi)
- Check by increasing fuel pressure.
  - Disconnect pressure regulator vacuum hose and check for any change. (Also check by clamping return hose.)
- Check fuel system for clogging.
  - Check fuel filter.

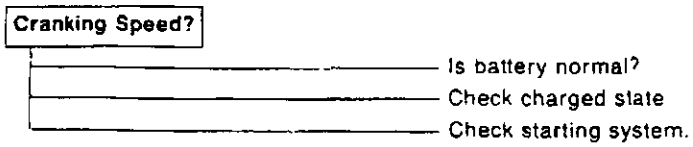
**Engine temperature correction?** (See 6-6)

- Check engine temperature sensor signal.
  - Check using CONSULT data monitor mode.
    Or
  - Disconnect engine temperature sensor connector and check for any change.
    - Check engine temperature sensor resistance value.
    - Check engine temperature sensor output voltage.
- Check idling control.
  - Check if AAC valve operation is normal. (CONSULT active test mode)
  - Check if AAC valve is not fully closed. (CONSULT data monitor mode)
  - Check AAC valve circuit for disconnection, such as loose connector, etc.

**Ignition system?** (See 6-1)

- Check for ignition misfiring.
  - Check in real-time diagnostic mode (CONSULT data monitor mode).
  - Check crank angle sensor output for missing pulses. (Check by CONSULT data monitor mode or with oscilloscope.)
  - Is spark plug gap normal?
- Is ignition timing normal?
  - Check by advancing or retarding the angle.

## 1. Trouble Diagnosis (Cont'd)

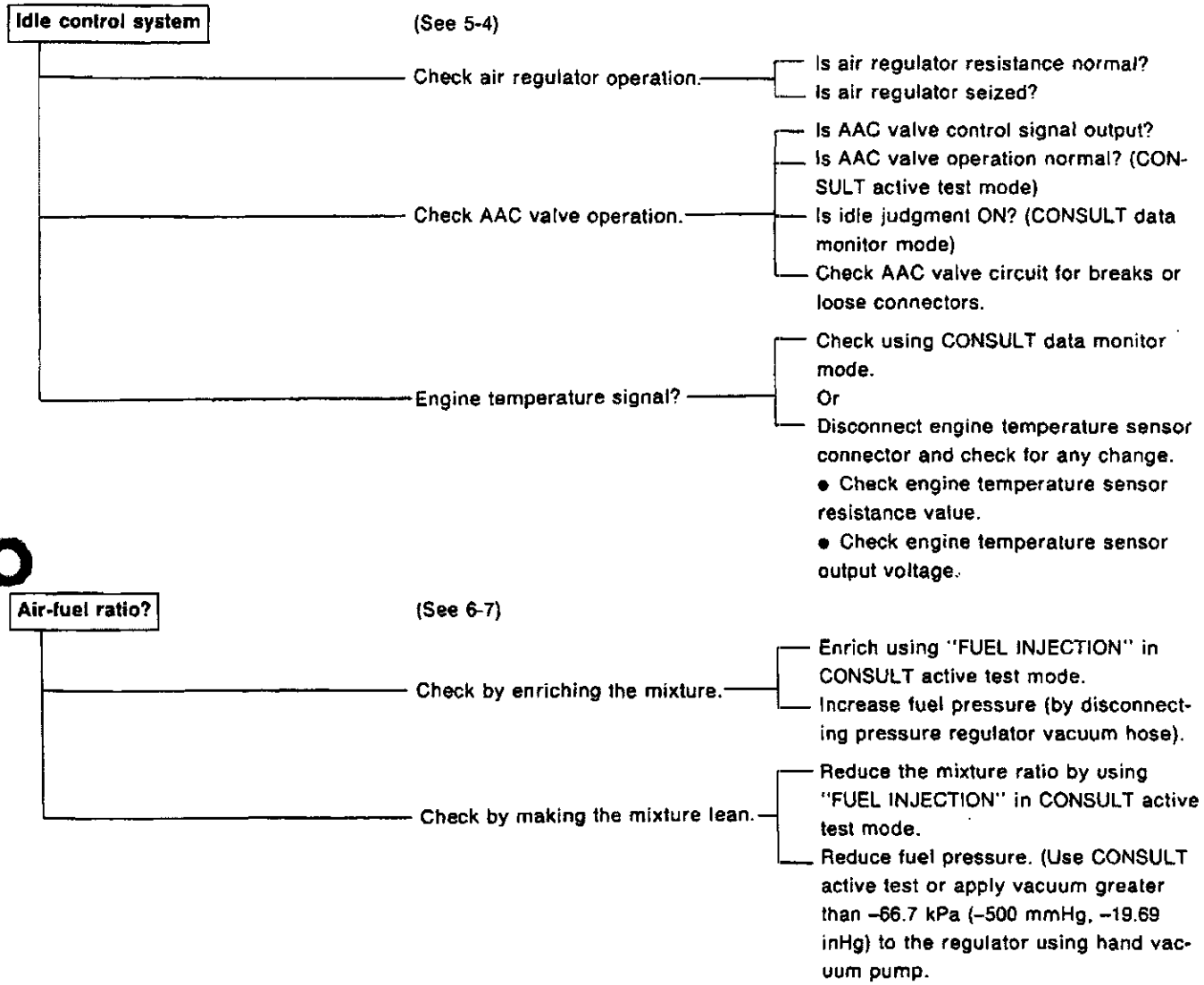


## (6) Poor idling ... Fast idle inoperative

**[Analysis]**

This problem may be due to abnormal control of AAC valve and air regulator because idling speed is controlled by these devices.
The air-fuel ratio and ignition timing also relate to this problem.

**[Chart]**



## (7) Poor idling ... Low idling rpm (after warm-up)

### [Analysis]

Idling speed is controlled by the AAC valve. A low idling rpm means insufficient auxiliary air volume through AAC valve.

### [Chart]

**Idling control system** (See 5-4)

- AAC valve operation?
  - Is AAC valve control signal issued?
  - Is AAC valve operation normal? (CONSULT active test)
  - Measure resistance value of single AAC valve and check for seizure.
  - Check AAC valve circuit for breaks and connector for looseness.
  - Is idle adjustment screw adjusted correctly?
- Input signal?
  - Is idle judgment ON? (CONSULT data monitor)
  - Is air conditioner switch and neutral switch turned ON? (Check in CONSULT data monitor mode.)

**Is ignition timing normal?**

## 1. Trouble Diagnosis (Cont'd)

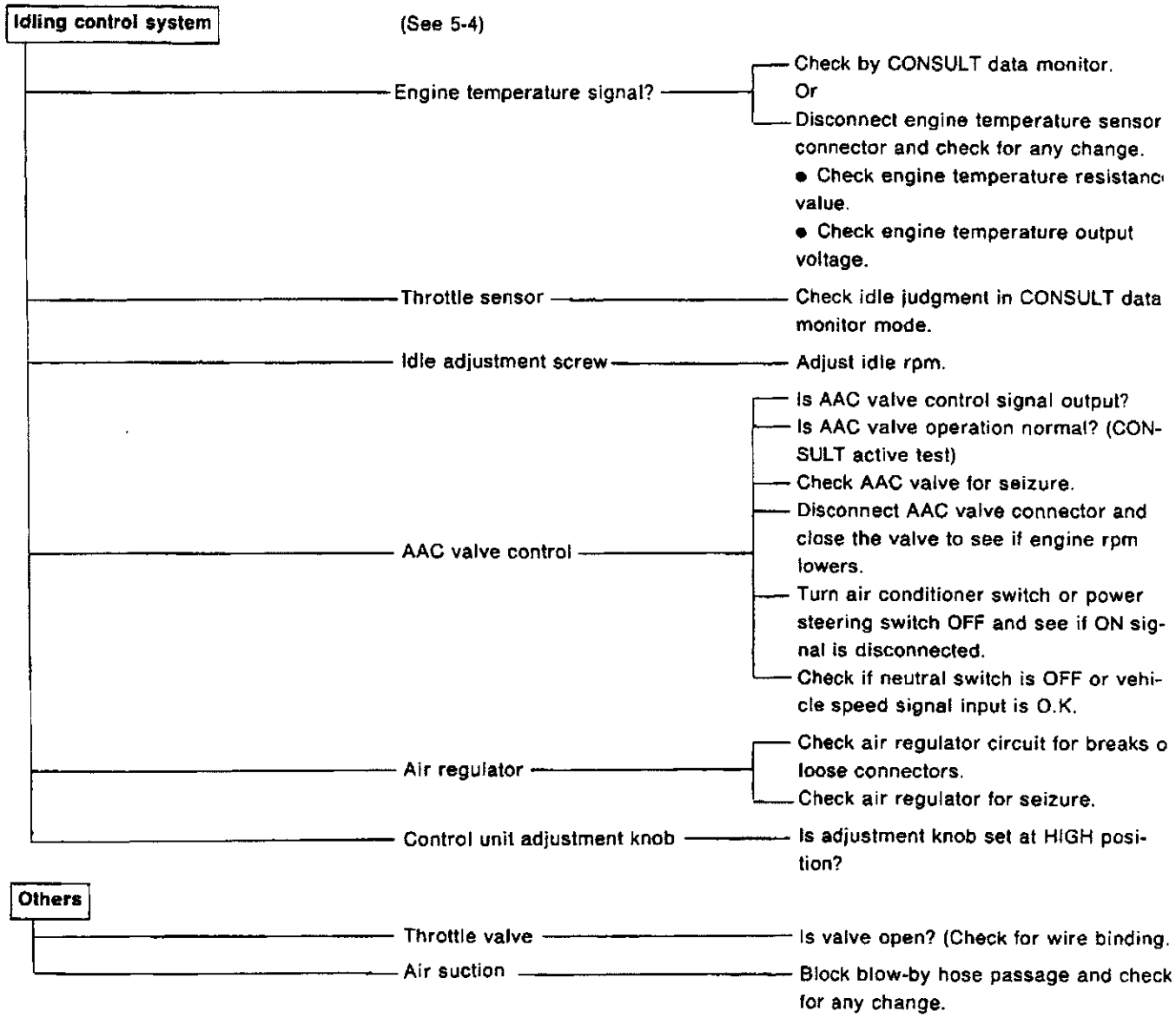
### (8) Poor idling ... High idle rpm (after warm-up)

**[Analysis]**

High idling can be caused by the following factors.

- Low engine temperature signal. (Actual engine temperature differs from monitored temperature.)
- Idle judgment (throttle sensor) is OFF.
- Air conditioner switch and power steering switch are ON continuously.
- AAC value is seized.
- Idle adjustment screw is not adjusted correctly. (Excessive throttle open position does not redu engine rpm even if AAC valve is fully closed.)
- Air regulator is not energized.
- Air regulator is seized.
- Control unit adjustment knob is set at HIGH position.
- Throttle valve is open.
- Air is being sucked in.

**[Chart]**

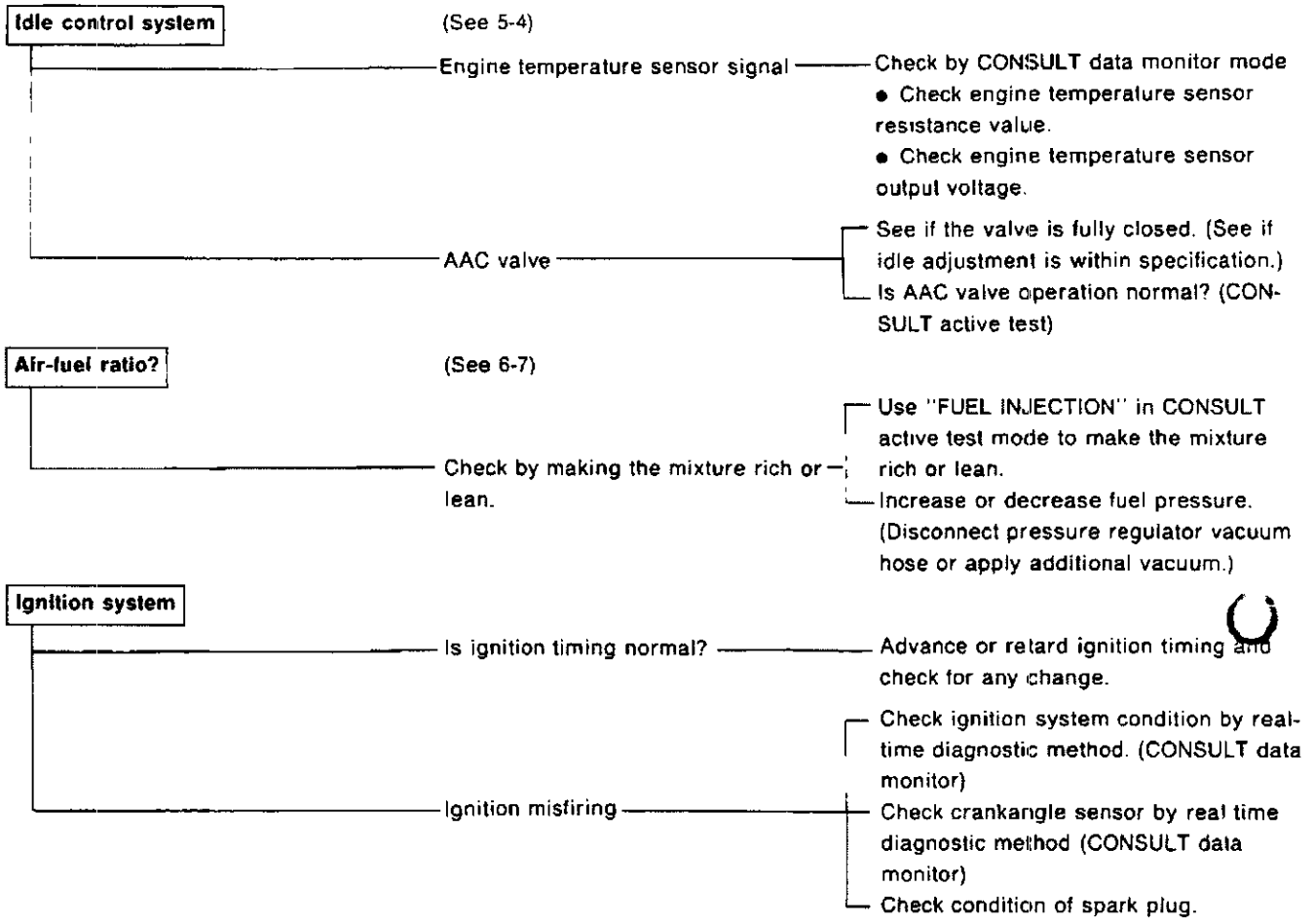


## (9) Unstable idling ... Cold engine only

**[Analysis]**

Since idling is unstable only when the engine is cold, cause of this problem can be narrowed down to the relationship between the engine temperature and idle control system. This problem also relates to the air-fuel ratio, ignition timing, misfiring, etc.

**[Chart]**




## (10) Unstable idling ... After warm-up

**[Analysis]**

This problem relates to various factors including air-fuel ratio, ignition system and compression. It is necessary to determine factors beginning with items that are easy to check.

- Idle rpm control system ... AAC valve operation?
- Air-fuel ratio ... Fuel pressure?
  - Injection quantity? (Enriched?)
  - Air suction?
- Ignition system ... Ignition timing
  - Ignition misfiring (missing signal pulse)
- Engine main unit ... Poor compression

## 1. Trouble Diagnosis (Cont'd)

**[Chart]**

**Idle control system** (See 5-4)

- Check by disabling control function. — Disconnect AAC valve connector and check for any change.
- Control circuit
  - Check if control signal is output and check signal condition. (Use CONSULT data monitor or oscilloscope.)
  - Is AAC valve operation normal? (CONSULT active test)
  - Disconnect AAC valve connector and check by adjusting with IAS.
  - Check AAC valve for seizure.
  - Check if idle judgment is ON. (CONSULT data monitor)
  - Check circuit for breaks and connectors for looseness.

**Air-fuel ratio** (See 6-7)

- Check by enriching the mixture. — Enrich using "FUEL INJECTION" item of CONSULT active test mode, or by disconnecting regulator vacuum hose and clamping off the return hose.
- Check by making the mixture lean. — Reduce the mixture ratio by using "FUEL INJECTION" item of CONSULT active test mode, or applying vacuum greater than –66.7 kPa (–500 mmHg, –19.69 inHg) with hand vacuum pump to pressure regulator.
- Check by stopping feedback.
  - Perform CONSULT active test mode (clear with "SELF-LEARNING CONT" item)
  - Or
  - Disconnect exhaust gas sensor connector. (Set the circuit from racing mode to idling mode.)
- Engine temperature signal?
  - Check using CONSULT data monitor mode.
  - Or
  - Disconnect engine temperature sensor connector and check for any change.
    - Check engine temperature sensor resistance value.
    - Check engine temperature sensor output voltage.
- Check for air suction. — Check vacuum line and blow-by hose.

**Ignition system**

- Is ignition timing normal? — Advanced or retarded ignition timing angle and check for any change.
- Ignition misfiring
  - Check ignition system by real-time diagnosis (CONSULT data monitor mode).
  - Check condition of crank angle sensor by real-time diagnosis (CONSULT data monitor).
  - Check condition of spark plug.

**Engine main body**

Compression pressure? — Measure compression pressure. (Check valve timing, valve seats, piston rings, etc.)

## (11) Poor driveability ... Engine breathing

**[Analysis]**

Items to be checked vary if this problem occurs during acceleration or during cruising.

① During acceleration

- Engine breathing while depressing the accelerator may be caused by momentary misfiring, or momentary occurrence of lean mixture (no interrupt injection).
- Increased tension of harnesses or air duct due to inclination of engine during acceleration can also be a cause of poor contact.
- Clogging in fuel system is a cause for engine breathing because sufficient fuel pressure cannot be maintained during acceleration.

② During cruising

- Lean mixture and engine breathing caused by poor feedback of air-fuel ratio data.
- Misfiring of ignition system caused by leaks.
- Poor contact or malfunction of signal system, use of low quality gasoline.

**[Chart]**

### ① When accelerating

**Air-fuel ratio** (See 6-7)

- Stop feedback — Perform CONSULT active test mode (set to 0% by "FUEL INJECTION" item). Or Check by disconnecting exhaust gas sensor.
- Enrich mixture — Perform CONSULT active test mode (increasing "FUEL INJECTION" item) or enrich mixture by disconnecting engine temperature sensor connector and inserting a 600Ω resistance after warming up the engine.
- Idle judgment — Check idle judgment ON/OFF operation in CONSULT data monitor mode.
- Throttle sensor — Check if output voltage varies with throttle opening.
- Fuel pressure — Check if fuel pressure is maintained even while racing the engine.
- Air leak — Check air duct for looseness.
- Air flow meter output — Check output voltage (by CONSULT data monitor).

## 1. Trouble Diagnosis (Cont'd)

**Ignition system**

- Ignition misfiring → Check signal system (ignition signal, crank angle sensor signal, air flow meter signal) for instantaneous break by using real-time diagnosis (CONSULT data monitor) or oscilloscope.
  Check spark plug gap.
  Check if ignition coil power supply voltage is lowered.
- Ignition timing → Check if fail-safe mode is not set due to a detonation sensor error. (Check by self-diagnosis.)

② When cruising

**Air-fuel ratio** (See 6-7)

- Feedback function
  - Check by CONSULT active test mode. (Set mixture ratio by fuel injection quantity correction to 0%.)
    Or
  - Check by disconnecting exhaust gas sensor connector.
  - Set self-diagnosis mode 2 and see if exhaust gas temperature warning lamp (or control unit red lamp) is flashing (exhaust gas sensor monitor diagnosis) or check in CONSULT data monitor mode.
  - Set self-diagnosis mode 2 and check if exhaust gas temperature warning lamp (or control unit red lamp) is flashing more than 5 times in 10 seconds when engine is running at 2,000 rpm, or check by CONSULT data monitor.
- Idle judgment → Check if throttle sensor is OFF when accelerator pedal is depressed. (CONSULT data monitor)

**Ignition system**

- Ignition misfiring → Check for instantaneous break in signal system using real-time diagnosis. (Ignition signal, crank angle sensor signal, air flow meter signal) (Use CONSULT data monitor or oscilloscope.)

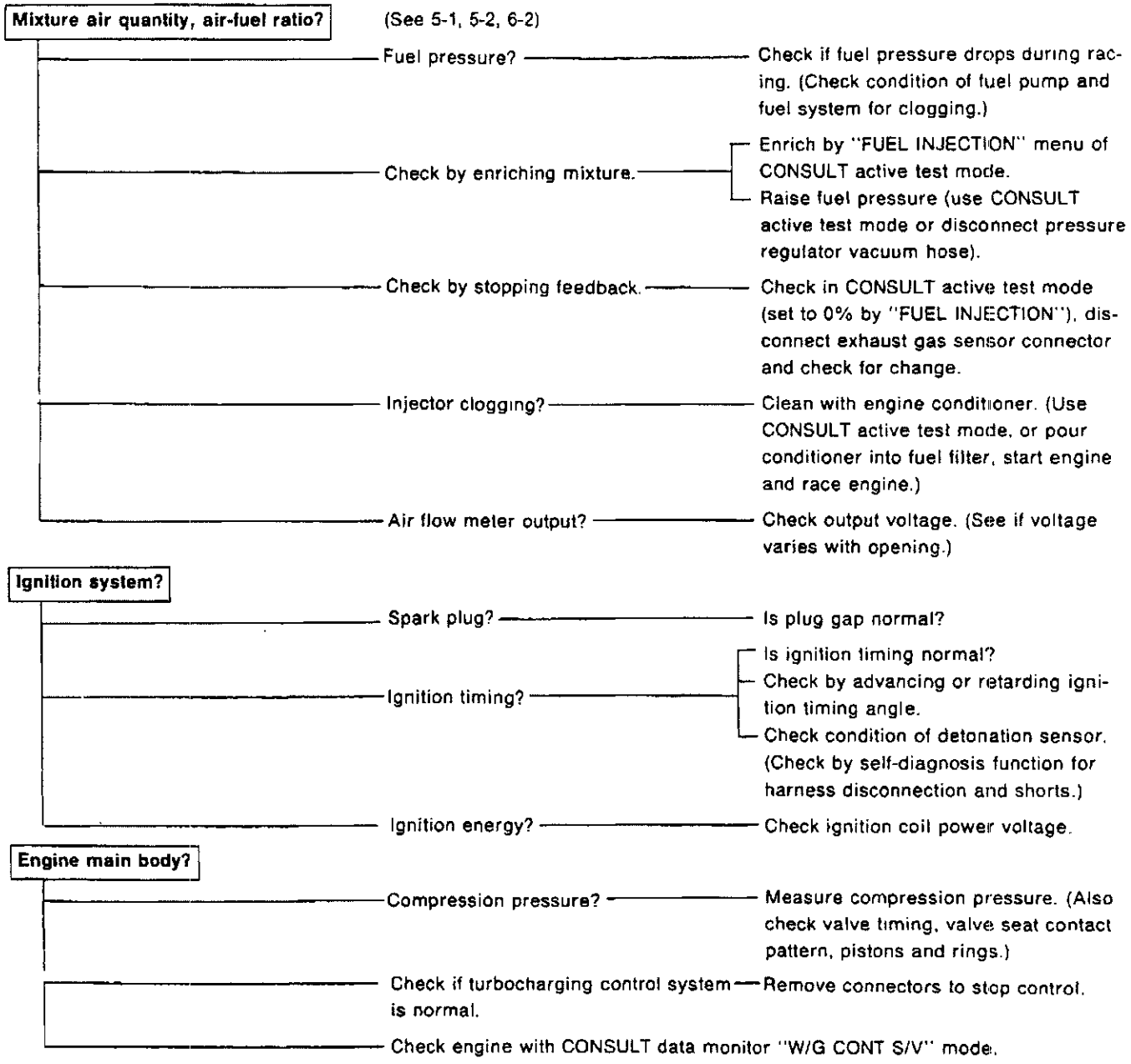
## 1. Trouble Diagnosis (Cont'd)

### (13) Poor driveability ... Lack of output, poor acceleration, poor response

**[Analysis]**

Lack of power, poor acceleration and poor response are generally caused by insufficient mixture quantity (lack of fuel, lack of air) or incorrect air-fuel mixture ratio.
In the injection system, these problems are caused by lack of ignition energy or incorrect ignition timing.
Lack of compression pressure and excessive friction due to seizure in engine main body are also causes of these conditions.

**[Chart]**



## 1. Trouble Diagnosis (Cont'd)

### (14) Engine stalls when starting

**[Analysis]**

Misfiring while depressing accelerator pedal or insufficient torque causes engine to stall when starting off.

- Misfiring
  - ○ Too lean or too rich air-fuel mixture ratio
  - ○ Large error in ignition timing
  - ○ Weak spark
- Insufficient torque
  - ○ Lean or rich mixture
  - ○ Insufficient intake air quantity
  - ○ Insufficient compression pressure

**[Chart]**

**Self-diagnosis**

Check if occurrence of error is stored by self-diagnosis function.

**Air-fuel ratio?** (See 6-4, 6-6, 6-7)

- Check by enriching the mixture. → Enrich using "FUEL INJECTION" item of CONSULT active test mode or by disconnecting regulator vacuum hose.
- Check by making the mixture lean. → Reduce the mixture ratio by using "FUEL INJECTION" item of CONSULT active test mode, or applying vacuum greater than –66.7 kPa (–500 mmHg, –19.69 inHg) with vacuum hand pump to pressure regulator.
- Check by stopping feedback. → Perform CONSULT active test (0% air-fuel ratio is obtained by "FUEL INJECTION")
  Or
  Disconnect exhaust gas sensor connector. (Race engine and return to idle.)
- Check canister. → Check by blocking purge line.
- Check idle judgment. → Check if idle judgment is OFF when accelerator is ON. (Check by CONSULT data monitor mode.)
- Check engine temperature sensor.
- Check throttle sensor. → Check if accelerator opening signal is output.

**Ignition?**

- Spark? → Check spark plug (fouling, gap, electrodes)
- Ignition timing → Check if ignition timing is correct.
- Ignition error? → Check by "REAL-TIME DIAG" (CONSULT data monitor mode).

**Intake air quantity?**

- Check if throttle valve opens normally.
- Check for leaks from turbocharger system (rear flow) or ducts.

**Compression pressure?**

Measure compression → Check valve timing for error, valves for incorrect contact pattern, pistons and rings for damage.

## (15) Engine stall during idling

**[Analysis]**

Engine stall during idling may be caused by one of the following conditions. (Check idling speed, and then check for misfiring.)

- Improper idling speed
- Improper AAC valve control (Check for delayed response.)
- Excessively lean or rich mixture ratio
- Ignition error
- Poor contact of connector, etc.
- Relation to electrical load ON-OFF

**[Chart]**

**Self-diagnosis**

Check if any abnormal data is stored in self-diagnosis.

**Idling control?** (See 5-4)

Check for proper control.
- Is idling speed normal or adjusted?
- Is AAC valve fully closed? (Check for loose connector.)
- Close AAC valve and check for any change.
- Is AAC valve control signal issued? (Race engine and check voltage.)
- Is AAC valve operation normal? (CONSULT active test)
- Disconnect AAC valve connector, and check by adjusting with IAS.
- See if idle judgment is ON.

# 1. Trouble Diagnosis (Cont'd)

**Air-fuel ratio?** (See 6-7)

- Is air-fuel ratio normal? — Select self-diagnosis mode 2 and check if exhaust gas temperature warning lamp (or red lamp on control unit) is flashing more than 5 times in 10 seconds when engine is running at 2,000 rpm, or check by CONSULT data monitor.
- Check by enriching the mixture. — Enrich using "FUEL INJECTION" item of CONSULT active test mode, by disconnecting pressure regulator vacuum hose or closing off the return hose.
- Check by making the mixture lean. — Reduce the mixture ratio by using "FUEL INJECTION" item of CONSULT active test mode, or applying vacuum greater than –66.7 kPa (–500 mmHg, –19.69 inHg) with hand pump to pressure regulator.
- Check by stopping feedback. — Perform CONSULT active test (0% air-fuel ratio is obtained by "FUEL INJECTION")
  Or
  Disconnect exhaust gas sensor connector. (Set circuit from racing mode one time and return to idling mode.)
- Check fuel pump operation. — Check for pump stop.
- Check fuel system for clogging. — Race engine and check fuel pressure for drop.

**Others**

- Check for poor contact. — Using real-time diagnosis mode, check ignition signal, crank angle sensor signal and air flow meter signal for instantaneous break and missing pulses. (Use CONSULT data mode or oscilloscope.)
- Check spark plugs. — Check for fouling and plug gap.

## 1. Trouble Diagnosis (Cont'd)

### (16) Engine stalls during driving

**[Analysis]**

Engine stall during cruising may be caused by misfiring. If engine stalls during acceleration, it may be caused by misfiring or insufficient torque.

- Too rich or lean air fuel mixture
- Ignition error
- Incorrect ignition timing
- Insufficient intake air quantity
- Insufficient compression pressure
- Misfiring, fuel pump stop, etc. caused by poor electrical contact

**[Chart]**

**Self-diagnosis**

- Check the stored data by self-diagnosis for any abnormality.

① When cruising

**Air-fuel ratio?** (See 6-7)

- Idle judgment? — Check if idle judgment goes OFF when accelerator pedal is pressed. (Check in CONSULT data monitor mode.)
- Check for normal feedback. — Race engine at 2,000 rpm in self-diagnosis mode and check if exhaust gas temperature warning lamp (or red lamp on control unit) is flashing more than 5 times in 10 seconds or check by CONSULT data monitor.
- Stop feedback and check for any change. — Perform CONSULT active test. Or Check by disconnecting exhaust gas sensor connector.
- Intake air quantity signal — Check for poor contact using CONSULT data monitor ("REAL-TIME DIAG") mode.

**Ignition?**

- Ignition timing? — Is ignition timing normal?
- Ignition misfiring — Check ignition signal and crank angle sensor signal for missing pulses in CONSULT data monitor ("REAL-TIME DIAG") mode.

## 1. Trouble Diagnosis (Cont'd)

② During acceleration

**Air-fuel ratio?**

- Idle judgment? — Check if idle judgment goes OFF-ON when accelerator pedal is pressed and released. (Check in CONSULT data monitor mode.)
- Throttle sensor? — Check if voltage output varies with throttle opening. (Check in CONSULT data monitor mode.)
- Check for normal feedback. — Race engine at 2,000 rpm in self-diagnosis mode and check if exhaust gas temperature warning lamp (or red lamp on control unit) is flashing more than 5 times in 10 seconds or check by CONSULT data monitor.
- Stop feedback and check for any change.
  - Perform CONSULT active test. ("FUEL INJECTION" set to 0%)
    Or
  - Check by disconnecting exhaust gas sensor connector.
- Intake air quantity signal
  - Check for poor contact using CONSULT data monitor ("REAL-TIME DIAG") mode.
  - Check for air flow or leaking after turbocharger operation.

**Misfiring?**

- Ignition timing? — Is ignition timing normal?
- Ignition misfiring? — Check ignition signal and crank angle sensor signal for missing pulses in CONSULT data monitor ("REAL-TIME DIAG") mode.

**Compression pressure?**

- Measure compression pressure.

## 1. Trouble Diagnosis (Cont'd)

### (17) Engine stalls when decelerating or immediately after stopping.

**[Analysis]**

Reduced engine rpm when releasing accelerator can lead to engine stall. Another cause is misfiring.

- Incorrect adjustment of idling control
- Incorrect air-fuel ratio
- Ignition error

**[Chart]**

**Idle control?** (See 5-4)

- Idling speed?
  - Check if idling speed is normal and idle adjustment is correct.
  - Check if AAC valve is fully closed
- Is control normal?
  - Check if AAC valve control signal is output.
  - Check if AAC valve operates normally (CONSULT active test)
  - Check if AAC valve is OK.
  - Check if idle judgment is ON when accelerator is OFF. (CONSULT data monitor)
  - Check by disconnecting AAC valve connector (fully closed AAC).

**Air-fuel ratio?** (See 6-7)

- Stop feedback and check for any change.
  - Perform CONSULT active test.
  - Or
  - Check by disconnecting exhaust gas sensor connector.
- Check for normal feedback control.
  - Race engine at 2,000 rpm in self-diagnosis mode and check if exhaust gas temperature warning lamp (or red lamp on control unit) is flashing more than 5 times in 10 seconds or check by CONSULT data monitor.
- Check by enriching the mixture.
  - Enrich using "FUEL INJECTION" item of CONSULT active test mode or disconnecting regulator vacuum hose.
- Check by making the mixture lean.
  - Reduce the mixture ratio by using "FUEL INJECTION" item of CONSULT active test mode, or applying vacuum greater than –66.7 kPa (–500 mmHg, –19.69 inHg) with hand vacuum pump to pressure regulator.

**Ignition?**

- Check for ignition error.
  - Check ignition signal and crank angle sensor signal for missing pulses. Check by CONSULT data monitor ("REAL-TIME DIAG") mode.

## 1. Trouble Diagnosis (Cont'd)

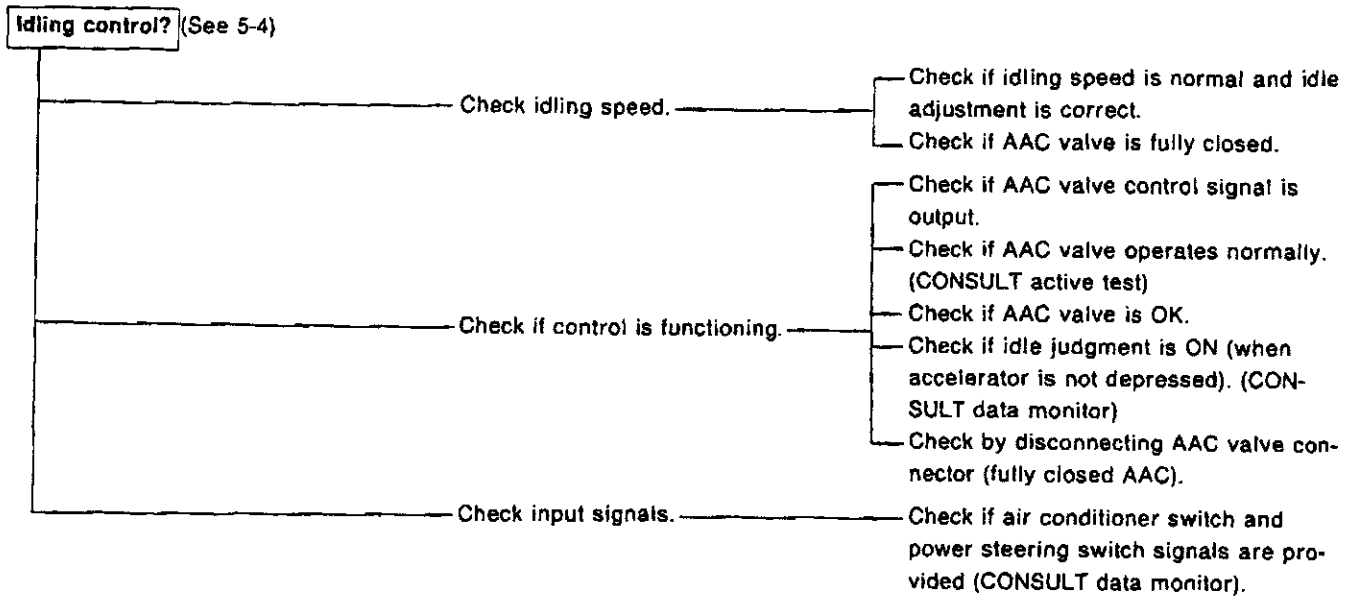
### (18) Engine stalls when electrical load or power steering load is applied

**[Analysis]**

Check if idling is increased when load switch is turned ON (AAC valve correction quantity increases when load is applied).

- Check if ON signal is input from each switch.
- Check if AAC valve is operating.

**[Chart]**



# 2. Diagnostic System

## 2-1 GENERAL

The diagnostic system performance has been greatly improved concerning warning indication to drivers, operation of the self-diagnostic system, and application of the newly developed electrical system diagnostic tester CONSULT.

**(1) Enhanced fault alarm items**

If an error occurs in the ECCS system during driving, the exhaust gas temperature warning lamp flashes in the combination meter. At the same time, the backup function is activated to ensure the safety of the occupants and vehicle.

**(2) Simplified troubleshooting**

The following features have been incorporated for ease of inspection and problem diagnosis of ECCS system.

**① Improvement of self-diagnostic function**

The diagnostic modes have been rearranged and the mode shift and display systems have been simplified.

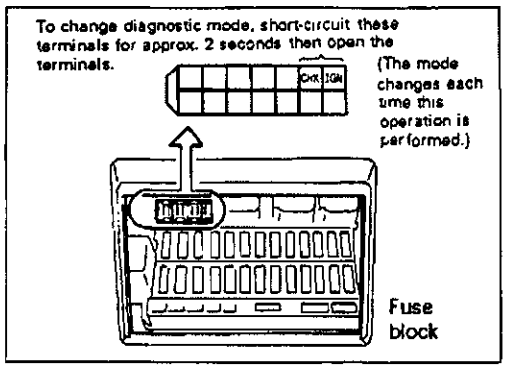
New system

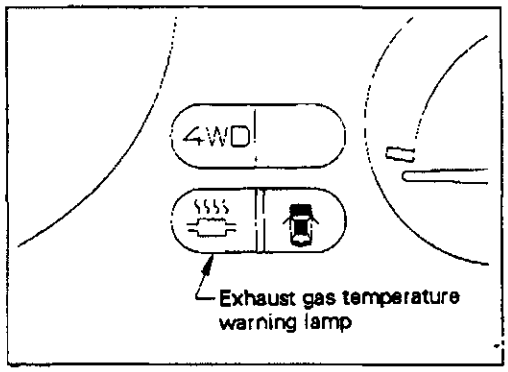
| Diagnostic mode | | Mode selection | Display |
|---|---|---|---|
| 1 | Fault alarm (Same as the former backup display mode) | By diagnostic connector installed on lower side of fuse block (Also adjustable by the knob installed on control unit) | Indicated by exhaust gas temperature warning lamp (also linked with the red lamp on control unit) |
| 2 | Exhaust gas sensor monitor (Same as the former air-fuel ratio feedback display) | | |
| | Self-diagnosis | | |
| (The former ON/OFF switch diagnosis and real-time diagnosis are included in the operations performed by CONSULT as explained in item ② on the next page.) | | | |

Current system

| Diagnostic mode | | Mode selection | Display |
|---|---|---|---|
| 1 | Backup display | By adjustment knob on control unit. | Indicated by red or green lamps on control unit. |
| 2 | Air-fuel ratio feedback display | | |
| 3 | Ordinary self-diagnosis | | |
| 4 | ON/OFF switch diagnosis | | |
| 5 | Real-time diagnosis | | |

## 2. Diagnostic System (Cont'd)




**② Adoption of electronic system diagnostic tester for problem diagnosis.**

The diagnostic functions have been modified to enable use of the newly developed electrical system diagnostic tester CONSULT to simplify complex diagnosis procedures.

CONSULT is a compact and lightweight hand-held type test device especially designed for automotive service operations, and can be used by simply connecting it to the diagnostic connector installed on the vehicle. This tester permits data display, recording and printing.

## 2. Diagnostic System (Cont'd)

The CONSULT system has the following functions.

| Mode | | Description | | Mode selection | Display |
|---|---|---|---|---|---|
| Diagnostic mode | SELF-DIAGNOSTIC RESULTS | Self-diagnosis | The same number of items are possible as previously described ①. | Diagnostic modes can be selected easily by the touch-sensitive keys of CONSULT. | Displayed data can be read easily on the CONSULT screen |
| | DATA MONITOR | • Used to identify major cause of fault, according to results of self-diagnosis<br>• Permits monitoring (observation and recording) and printing of input and output data of the control unit.<br>• Permits data to be recorded in case of engine damage or engine stall.<br>• The former diagnostic modes listed below are included in this monitor item | | | |
| | | • Exhaust gas sensor monitor | Displays exhaust gas sensor output voltage and if mixture is lean or rich | | |
| | | • Switch ON/OFF | Same as former function. | | |
| | | • Real-time diagnosis | Same as the former function | | |
| | ACTIVE TEST | • Used to examine major causes of problems according to self-diagnosis results and data monitor<br>• Used to check actuator operation by giving driving signal to the actuator. | | | |
| Supplemental | WORK SUPPORT | • Used to reduce additional operation when checking idling, etc.<br>(Example: When adjusting AAC valve, feedback control can be fixed by using this mode.) | | | |

## 2. Diagnostic System (Cont'd)

### ECCS control unit input/output signals and applicable modes

| Signal name \ Mode | | Self-diagnosis | Data monitor | Active test | Work support |
|---|---|---|---|---|---|
| Input | Crank angle sensor | ○ | ○ | | |
| | Air flow meter | ○ | ○ | | |
| | Engine temperature sensor | ○ | ○ | ○ | |
| | Exhaust gas sensor | | ○ | | |
| | Vehicle speed sensor | | ○ | | |
| | Battery voltage | | ○ | | |
| | Throttle sensor | ○ | ○ | | ○ |
| | Idle position (throttle sensor) | | ○ | | |
| | Intake temperature sensor | ○ | ○ | | |
| | Detonation sensor | ○ | | | |
| | Ignition switch (Start signal) | | ○ | | |
| | Air conditioner, neutral, power steering oil pressure switch | | ○ | | |
| Output | Injectors | | ○ | ○ | |
| | Power transistor (ignition signal) | ○ | ○ (Ignition timing) | ○ (Ignition timing) | |
| | A.A.C. valve | | ○ | ○ | ○ |
| | Air conditioner relay | | ○ | | |
| | Fuel pump relay | | ○ | ○ | |
| | Wastegate valve control solenoid valve | | ○ | | |

## 2. Diagnostic System (Cont'd)

### 2-2 SELF-DIAGNOSIS

Self-diagnosis can be performed by indications from the exhaust gas temperature warning lamp in the combination meter and the red lamp on the ECCS control unit, or by displaying data on the CONSULT screen.

### (1) Exhaust gas temperature warning lamp indication

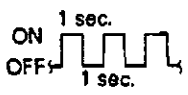
Two diagnostic modes are available. In each mode, diagnosis is performed by operating the diagnostic connector terminal installed on the vehicle. (Diagnosis can also be performed using the adjustment knob on the control unit.) The diagnosis results are displayed by the exhaust gas temperature warning lamp in the combination meter and the red warning lamp on the control unit.

**Basic operation and indication**

| Mode \ Item | | Operation | Indication (Flashing of exhaust gas temperature warning lamp and red warning lamp of control unit.) |
|---|---|---|---|
| Mode 1 | Fault alarm | Ignition switch ON<br>Engine rotation | Alarm: Faulty system is indicated by warning lamp flashing pattern (backup function).<br>Normal: Warning lamp remains OFF. |
| Mode 2 | Self-diagnosis | Ignition switch ON<br>↓<br>Diagnosis mode shift<br>↓<br>Engine stop<br>(with ignition switch remaining ON) | Fault: Faulty system is indicated by flashing code<br>Normal: Flashing code "55" is displayed. |
| | Exhaust gas sensor monitor | Self-diagnosis status described above<br>↓<br>Engine rotation | Lamp ON means "lean" mixture; OFF means "rich" mixture. |

① Fault alarm mode (Mode 1)

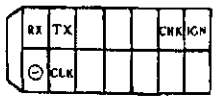
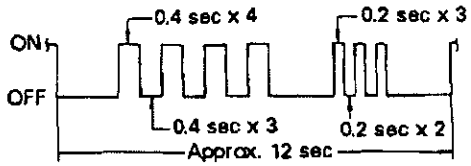
| Step | Operation | Indication |
|---|---|---|
| 1 | Turn ignition switch ON. Mode 1 is normally set by this operation.<br>[Pay attention to the following case that may occur: If the ignition switch is turned OFF in the self-diagnosis mode and then turned ON in a few seconds, the self-diagnosis mode will be executed. In this case, the self-diagnosis mode must be selected. (See item ②.)] | Indicated by flashing exhaust gas temperature warning lamp in combination meter and red lamp of control unit. (These lamps are linked together.) |

| | Engine rotation | Indication | Condition |
|---|---|---|---|
| Alarm | Stop | ON (lamp check) | — |
| | Rotating | ON / OFF   | CPU backup (All models) (Lamp flashes when engine is OFF.) |
| Normal | OFF | ON (lamp check) | — |
| | Rotating | OFF | |

| Step | Operation |
|---|---|
| 2 | Run engine. |

## 2. Diagnostic System (Cont'd)

② Self-diagnostic mode (Mode 2)

| Step | Operation | Indication |
|---|---|---|
| 1 | Turn ignition switch ON. Select the diagnostic mode by the method indicated below because the fault alarm mode is normally set after turning the ignition switch ON. Use a lead to short-circuit the CHK and IGN terminals connected on the diagnosis connector located on the vehicle (near the fuse block) for approx. 2 seconds, then separate the terminals.<br>(Diagnosis connector)<br>  <br><br>(The fault alarm mode and self-diagnosis mode alternate each time the operation described above is performed. ) | By flashing of the exhaust gas temperature warning lamp in combination meter and red lamp in control unit is used. (Operation of these two lamps is linked together.)<br>Example: Indication of code number "43".<br>  <br> |
| 2 | Shut off engine (with the ignition switch remaining in ON position.) (If the engine is operated in this condition, the exhaust gas sensor monitor in the next mode is activated. ) | |

(Reference) Names of diagnostic connector terminals
CHK: Diagnosis start (check)
IGN: Ignition power supply
⊖: GND
RX: Control unit data reception
TX: Control unit data transmission
CLK: Transmission synchronization signal (clock)

| Code No. | Diagnosis item | Error (code number) state |
|---|---|---|
| 11 | Crank angle sensor signal system | • 1° signal or 120° signal is not input for a certain period of time after starting engine.<br>• Incorrect signal waveform (abnormal correlation between 1° signal and 120° signal) |
| 12 | Air flow meter signal system | • Hot wire disconnection<br>• Disconnection or short-circuit in air flow meter power supply line, ground line or signal system.<br>• Signal output is below 0.5 volts for a certain period during engine operation.<br>• Signal output is higher than 2 volts for a certain period of time with engine stalled, or when ignition switch is set to ON from OFF. |
| 13 | Engine temperature sensor signal system | • Break or short-circuit in engine temperature sensor signal system |
| 21 | Ignition signal system | • Ignition signal is not generated continuously even though crank angle sensor signal is entered. (Disconnection between power transistor and control unit) |
| 34 | Detonation sensor signal system | • Disconnection or short-circuit in detonation sensor signal system |
| 41 | Intake temperature sensor signal system | • Disconnection or short-circuit in intake temperature sensor signal system |
| 43 | Throttle sensor signal system | • Disconnection or short-circuit in throttle sensor signal system (When engine is running, short-circuit occurs when voltage is 0.2V maximum except for N range. Disconnection occurs when voltage is 5V minimum.) |
| 55 | No error | • No abnormality was detected in any of the above signal systems. |

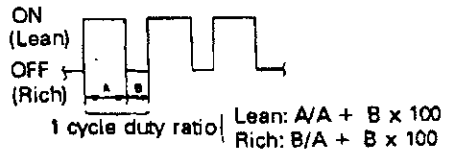
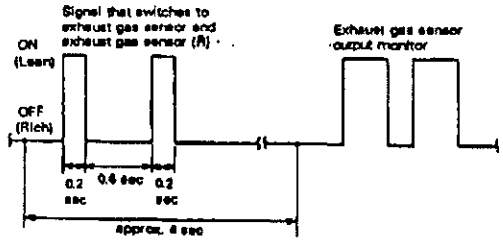
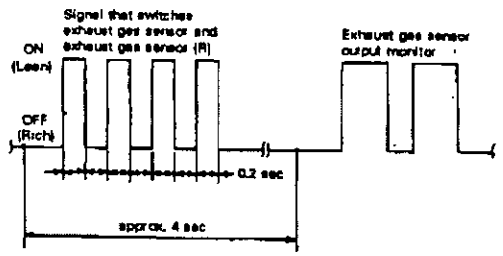
## 2. Diagnostic System (Cont'd)

### How to erase memory

(a) Stop engine in mode 2 and short-circuit terminals "CHK" and "IGN" of the diagnostic connector for approx. 2 seconds, then disconnect. This will erase the memory on all diagnosis items. (The memory is also erased when the self-diagnosis mode is switched to the fault alarm mode.) Refer to the diagram indicated in table above.

(b) When method (a) is not used: The memory is erased automatically if the ignition switch "START" operation is performed successfully 50 times.
(The memory is automatically erased every 50 "START" operations of the ignition switch.)

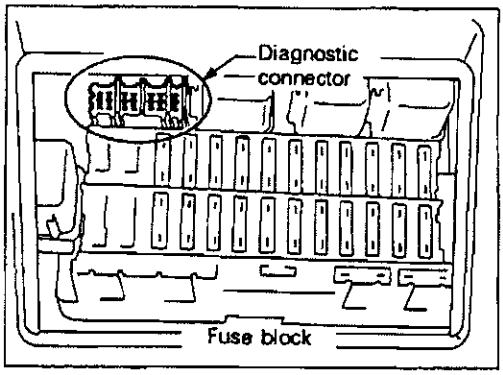
③ Exhaust gas sensor monitor mode (mode 2)

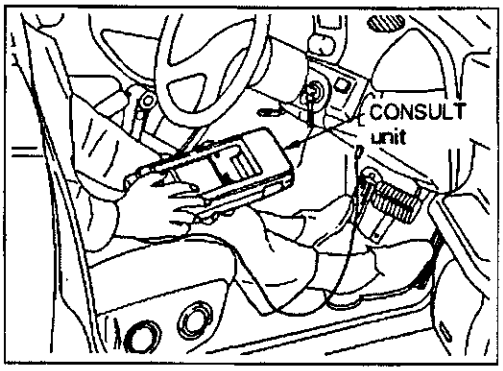
| Step | Operation | Indication |
|---|---|---|
| 1 | Set ignition switch to "ON".<br>Make sure self-diagnosis mode is set. If problem alarm mode is set, connect diagnostic connector "CHK" and "IGN" terminals for approx. 2 seconds then disconnect the terminals. (See item ② above.) | Indication is made by the warning lamp (exhaust gas temperature warning lamp) on the instrument panel and the red lamp on the control unit. (These two lamps are linked together.)<br>① During air-fuel ratio feedback control:<br>When exhaust gas sensor output is "RICH": Lamps are OFF<br>When exhaust gas sensor output is "LEAN": Lamps are ON<br>(Reference) The lamp ON and OFF indication is the same as that of the air-fuel ratio feedback correction coefficient indicated by the red lamp in the former control unit.<br>② When air-fuel ratio feedback control is clamped: The status immediately before clamping is maintained.<br>③ When air-fuel ratio feedback control is faulty: OFF<br>Display example<br>  |
| 2 | Start engine.<br>Note: Mode cannot be changed while engine is operating.<br>After engine warms up adequately, increase engine speed until exhaust gas temperature warning lamp (approx. 2,000 rpm or until red lamp in control unit starts to flash) and exhaust gas sensor output monitor (R) mode is set.<br>**Caution: Check by pressing the accelerator pedal slightly because the air-fuel ratio feedback control is clamped during idling.**<br>Check that exhaust gas temperature warning lamp (or red lamp in control unit) flashes in this condition.<br>Connect terminals "CHK" and "IGN" of the diagnostic connector for approx. 2 seconds, then disconnect. After the exhaust gas temperature warning lamp (or red lamp in control unit) flashes 2 times, the exhaust gas sensor output monitor mode is switched. | The status of the air-fuel ratio is indicated by the duty ratio in one cycle.<br>  <br>  |

## 2. Diagnostic System (Cont'd)

### (2) CONSULT display screen

- Connect CONSULT to the diagnostic connector on the vehicle (lower side of fuse block) on the vehicle. Data is displayed on the CONSULT screen as the touch-sensitive keys of CONSULT are operated. The exhaust gas sensor monitoring, switch ON/OFF operation and real-time diagnosis are performed using the data monitor mode (see item 2-4).




① "SELF-DIAGNOSTIC RESULTS" mode
The diagnosis items are the same as those listed in item (1) ②. Faulty system name is indicated.

| Step | Operation | Display |
|---|---|---|
| 1 | Connect CONSULT to diagnostic connector of vehicle. | ■ SELF-DIAG RESULTS ■ □<br>FAILURE DETECTED TIME<br>ENGINE TEMP SENSOR 0<br>ERASE PRINT |
| 2 | Set ignition switch to "ON". (Shut off engine.) | |
| 3 | Check with "SELF-DIAGNOTIC RESULTS". | |
| 4 | To print, touch "PRINT" key. To erase stored data, touch "ERASE" key. | |

The number of times the vehicle has been driven after detecting the last problem is displayed here. If the same problem is still present, "0" is displayed.

## 2. Diagnostic System (Cont'd)

### 2-3 FAIL-SAFE FUNCTION AND BACKUP FUNCTION

The fail-safe function ensures the safety of the driver and vehicle using the control unit control signals in case of an error in an important system device such as a sensor, etc.
The backup function ensures normal vehicle operation even when an error occurs in a vital sensor. For this purpose, the control unit ignores the signal sent from a failed sensor like this and outputs prearranged control signals.
When the backup function is operating, the fault alarm mode is set and the exhaust gas temperature warning lamp flashes in the combination meter.

| Item | Description of problem | Fail-safe or backup | Alarm indication |
|---|---|---|---|
| CPU backup | When detecting error in internal circuit of control unit | • Ignition timing is fixed at a specified value<br>• Fuel injection is fixed in 3 patterns: start-time injection, idling injection and driving injection. | • Exhaust gas temperature warning lamp flashes in 1-sec intervals.<br>• Reduce driving speed when CPU backup is performed |
| Air flow meter | When intake air quantity signal is disconnected during engine operation. | • There are two air flow meters to provide a backup meter if one is faulty (which enables almost normal operation). If both meters malfunction, the fail-safe function is set.<br>• Fuel injection pulse width is fixed at a specified value.<br>• Fuel is cut off at 2,400 rpm. | ("12" is indicated in self-diagnosis mode.) |
| Engine temperature sensor | When short-circuited or disconnected. | Normal engine operation is enabled. | ("13" is indicated in self-diagnosis mode.) |
| Detonation sensor | When short-circuited or disconnected. | A maximum 5° angle is delayed in knock control area. | ("34" is indicated in self-diagnosis mode.) |
| Throttle sensor backup | When short-circuited (approx. 0.2V max.) or disconnected (approx. 5V min.) during engine operation. | Idle judgment is switched from a software switch (throttle sensor) to mechanical switch (throttle valve switch). | ("43" is indicated in self-diagnosis mode.) |

## 2. Diagnostic System (Cont'd)

### 2-4 DATA MONITOR

The data monitor can be utilized when performing troubleshooting or trouble diagnosis according to the self-diagnosis results.
CONSULT performs monitoring (display and recording) and printing of the ECCS control unit input and output signal data. In case of engine malfunction or engine stall, the data before and after occurrence of the error can be recorded by manual or automatic operation.

#### (1) Monitoring items and description

Some monitor items are not applicable to all vehicles. (Inapplicable items are not displayed.)

| Monitor item | Unit | Description | Remarks |
|---|---|---|---|
| CAS. RPM (POS) | rpm | Engine rpm computed from POS (1°) signal sent from crank angle sensor | Accuracy slightly lowered at less than idle speed. |
| AIR FLOW METER | V | Air flow meter output voltage | Voltage is fixed at approximately 0V when engine is stopped. |
| AIR FLOW METER-R | | | |
| ENG TEMP SEN | °C °F | Engine temperature value converted from engine temperature sensor voltage | If disconnection or short-circuit occurs in sensor circuit, fail-safe function is activated and engine temperature is fixed at a certain level. (The value increases until a certain value of the timer is reached right after the ignition switch is turned ON.) |
| EXH GAS SEN | V | Exhaust gas sensor output voltage | Sensor output is fixed at 0V when engine is stopped. |
| EXH GAS SEN-R | | | |
| M/R F/C MNT | (RICH/ LEAN) | Air-fuel ratio of exhaust gas sensor signal during air-fuel ratio feedback control<br>RICH: Sensor detects rich mixture and control is performed to reduce mixture ratio.<br>LEAN: Sensor detects lean mixture and control is performed to increase mixture ratio. | • After turning ignition switch "ON", "LEAN" status is displayed until air-fuel ratio feedback control starts.<br>• If clamp occurs, the status just before clamp occurrence is indicated. |
| M/R F/C MNT-R | | | |
| CAR SPEED SEN | km/h, mph | Value computed from vehicle speed sensor signal | — |
| BATTERY VOLT | V | ECCS control unit power supply voltage | — |
| THROTTLE SEN | | Throttle sensor output voltage | — |
| INT/A TEMP SEN | °C °F | The value converted from intake temperature sensor output voltage to intake temperature. | Fail-safe is activated if disconnection or short-circuit occurs and this value is fixed. (The value right after ignition switch is turned ON is increased to a certain value by the timer.) |
| START SIGNAL | (ON/ OFF) | ON/OFF setting is determined from each signal output. | "OFF" is indicated irrespective of starter signal after starting engine. |
| IDLE POSITION | | | Idle judgment determined from throttle sensor output. (When throttle sensor is faulty, a backup is performed using the throttle valve switch.) |
| AIR COND SIG | | | — |
| NEUTRAL SW | | | |
| PW/ST SIGNAL | | | |
| INJ PULSE | msec | Value computed by control unit | A value is indicated with engine stopped. |
| INJ PULSE-R | | | |

## 2. Diagnostic System (Cont'd)

| Monitor item | Unit | Description | | Remarks |
|---|---|---|---|---|
| IGN TIMING | BTDC (°) | Value computed by control unit | | A fixed value is indicated with engine stopped. |
| AAC VALVE | % | Value computed by control unit<br>"%": Proportional solenoid system<br>(Opening increases with numerical value ) | | |
| A/F ALPHA | % | Mean value of air-fuel ratio feedback correction factor for each cycle | | A fixed value is indicated with engine stopped. |
| A/F ALPHA-R | % | Mean value of air-fuel ratio feedback correction factor for each cycle | | A fixed value is indicated with engine stopped. |
| AIR COND RLY | (ON/OFF) | Control condition computed by control unit. | | — |
| FUEL PUMP RLY | (ON/OFF) | Control condition computed by control unit. | | — |
| W/G CONT S/V | (ON/OFF) | Control condition computed by control unit | ON: Correction passage "open"<br>OFF: Correction passage "closed" | — |
| ■ VOLTAGE | Voltage probe measurement value is indicated. | | | |
| ■ PULSE | Pulse probe measurement value is indicated. | | | |

Note: AIR FLOW METER, EXH GAS SEN, M/R F/C MNT, INJ PULSE, A/F ALPHA are monitored independently by cylinders groups 1-3 (-R) and 4-6.

## 2. Diagnostic System (Cont'd)

### (2) Operation and display

| Step | Operation | Display (example) |
|---|---|---|
| 1 | Connect CONSULT to diagnostic connector on vehicle. | ☆MONITOR ☆NO FAIL<br>CAS•RPM (POS) 950rpm<br>AIR FLOW MTR 0.92V<br>AIR FLOW MTR-R 0.82V<br>ENG TEMP SEN 57°C<br>EXH GAS SEN 1.44V<br>EXH GAS SEN-R 0.02V<br>M/R F/C MNT RICH<br>M/R F/C MNT-R RICH<br>CAR SPEED SEN 0km/h<br>BATTERY VOLT 14.0V<br>RECORD |
| 2 | Run engine or drive vehicle. | |
| 3 | Select a desired item on "DATA MONITOR" menu. | ★RECORD4/8 ☆NO FAIL<br>CAS•RPM (POS) 950rpm<br>AIR FLOW MTR 0.92V<br>AIR FLOW MTR 0.82V<br>ENG TEMP SEN 62°C<br>EXH GAS SEN 1.40V<br>EXH GAS SEN-R 0.90V<br>M/R F/C MNT RICH<br>M/R F/C MNT-R RICH<br>CAR SPEED SEN 0km/h<br>BATTERY VOLT 14.0V<br>RECORD |
| 4 | Press "RECORD" key. | |

① Exhaust gas sensor monitor
Exhaust gas sensor output voltage and RICH/LEAN status are displayed.

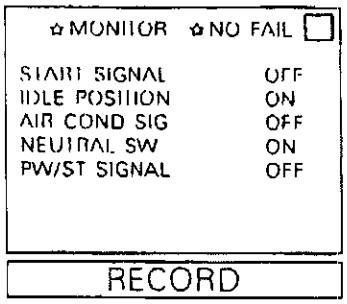
| Step | Operation | Display (example) |
|---|---|---|
| 1 | Connect CONSULT to diagnostic connector on vehicle. | ☆MONITOR ☆NO FAIL<br>CAS•RPM (POS) 950rpm<br>EXH GAS SEN 1.23V<br>EXH GAS SEN-R 1.10V<br>M/R F/C MNT RICH<br>M/R F/C MNT-R RICH<br>RECORD |
| 2 | Run engine. | |
| 3 | Select EXH GAS SEN, EXH GAS SEN-R, M/R F/C MNT and M/R F/C MNT-R items on "DATA MONITOR" menu. | |
| 4 | To record data, press "RECORD" key. | |

## 2. Diagnostic System (Cont'd)

② Switch ON/OFF
The ON/OFF status of each switch is indicated.

| Step | Operation |
|---|---|
| 1 | Connect CONSULT to vehicle's diagnostic connector |
| 2 | Run engine or drive vehicle. |
| 3 | Select each switch on "DATA MONITOR" menu. |
| 4 | Set operating condition for applicable switch and check ON/OFF display. |

Display (example)

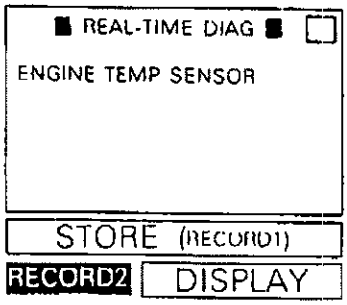



Diagnosis item
(1) Ignition switch START signal system
(2) Air conditioner switch signal system
(3) Neutral switch signal system
(4) Power steering switch signal system
(5) Throttle position (throttle sensor system)

③ Real-time diagnosis
Although the diagnosis items are the same as those listed in item (2) Self-diagnosis, and Switch ON/OFF in section 2-2, this diagnostic mode provides higher detection capability than the self-diagnosis mode (2).

| Step | Operation |
|---|---|
| 1 | Connect CONSULT to vehicle's diagnostic connector |
| 2 | Run engine or drive vehicle. |
| 3 | Check using "DATA MONITOR" REAL-TIME DIAG mode. [If any abnormality is detected, data monitoring is stopped and data is recorded automatically.] |

Display (example)



## 2-5 ACTIVE TEST

The active test mode is utilized to examine the problem diagnosis according to self-diagnosis results and data monitor results. CONSULT gives driving signals to the actuators while isolating the on-board ECCS control unit, to check if the actuator is functioning normally.

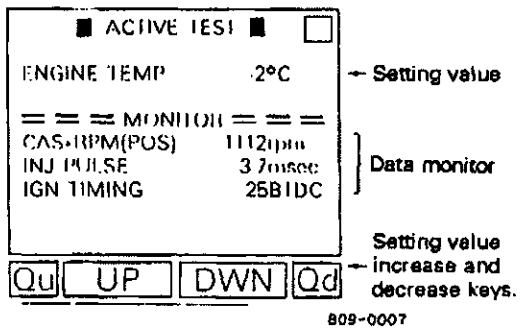
### (1) Test items and description

Some test items do not apply to all vehicle models. (Inapplicable items are not displayed.)

| Active test item | Description |
|---|---|
| FUEL INJECTION | Varies air-fuel ratio. |
| AAC VALVE OPENING | Sets control value (opening). |
| ENGINE TEMPERATURE | Sets engine temperature. |
| IGNITION TIMING | Sets delay angle correction value. |
| POWER BALANCE | Fixes AAC valve opening and can stop specified injector operation. Engine speed at this time can be displayed. |
| FUEL PUMP RELAY | Turns ON/OFF. |
| SELF-LEARNING CONT | Clears learned data on air-fuel ratio feedback correction factor. |

### (2) Operation and display

| Step | Operation | Display (example) |
|---|---|---|
| 1 | Connect CONSULT to vehicle diagnostic connector. | |
| 2 | Run engine or drive vehicle. | |
| 3 | Select desired test item on "ACTIVE TEST" menu. | |
| 4 | Press "START" key and input a set value. | |




Note:
- The set value will be canceled if test is terminated, canceled or power is turned OFF (CONSULT power OFF, ignition switch OFF, disconnection of battery terminal) during active test.
- If the diagnostic connector is disconnected during active test, the active test set status is maintained until the ignition switch is turned OFF.

## 2. Diagnostic System (Cont'd)

### 2-6 WORK SUPPORT

CONSULT can be used as a powerful aid for idling checks and other engine tune-up operations. It issues instructions to the ECCS control unit to perform control and displays the input and output signal data being used. Actual tune-up operation (for example, turning adjustment screw, etc.) must be performed manually by the mechanic.

#### (1) Support items and description

| Work support item | Description |
|---|---|
| AAC VALVE ADJ | Fully closes AAC valve and displays idling rpm. |
| THROTTLE SENSOR ADJ | Closes AAC valve completely and displays throttle sensor output voltage. |

Note: Although it is possible to adjust the "IGNITION TIMING", this adjustment should not be performed because it may cause the timing to become unstabilized.

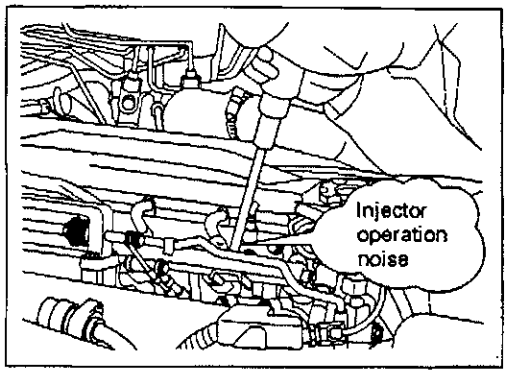
#### (2) Operation and display

| Step | Operation | Display (example) |
|---|---|---|
| 1 | Connect CONSULT to vehicle diagnostic connector. | ■ AAC VALVE ADJ ■<br>SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION<br>• ENG WARMED UP<br>• NO LOAD<br>START |
| 2 | Run engine. | |
| 3 | Select desired item on "WORK SUPPORT" menu. | ■ AAC VALVE ADJ ■ □<br>**** ADJ MONITOR ****<br>CAS·RPM(POS) 612rpm<br>— CONDITION SETTING —<br>AAC VALVE FIXED<br>= = = MONITOR = = =<br>ENG TEMP SEN 83°C<br>IDLE POSITION ON<br>AIR COND SIG OFF |
| 4 | Press "START" key and execute operation. | |

Note: The work support mode is maintained until ignition switch is turned OFF if the diagnostic connector is disconnected or while CONSULT is being used as a support.

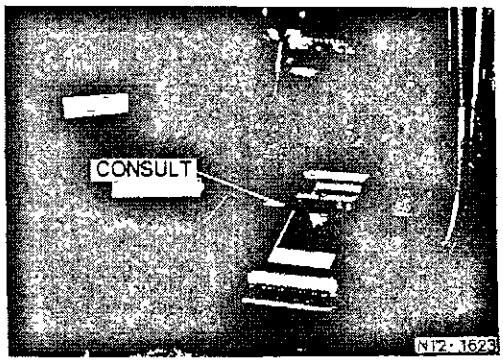
## 3. Basic Inspection

Inspect the three elements of combustion (1. Is fuel injected? 2. Does the spark arc? 3. Does the AAC valve work?) and determine if the faulty system is the fuel system, ignition system or idle control system.



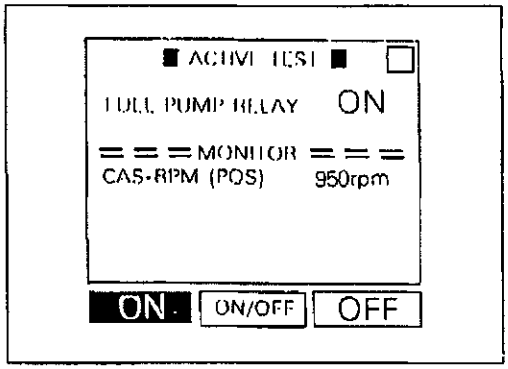

### 3-1 INJECTOR OPERATION INSPECTION

- Place a stethoscope or screwdriver on the injector and check for injector operation noise (click, click, click) while cranking engine.
  If NG: Inspect the injector control circuit.

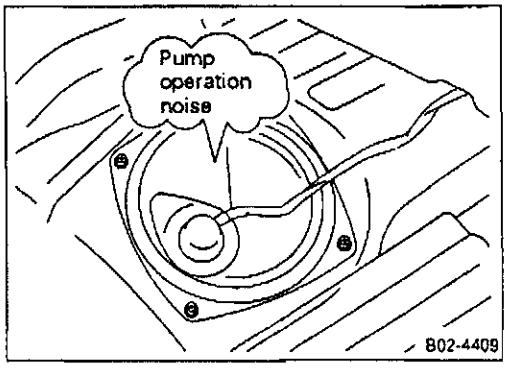



### 3-2 FUEL PUMP INSPECTION

- Connect CONSULT to the diagnosis terminal on the side of the vehicle (near fuse block).
  Note: See B3, 2.2-2 (2)



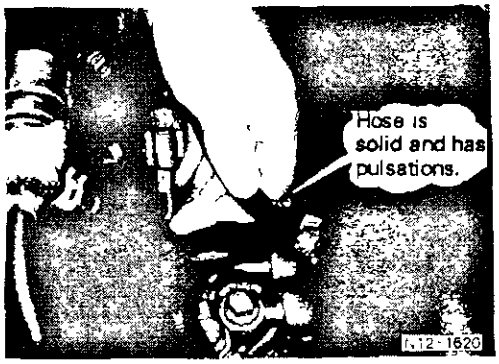

- Turn the ignition switch "ON" and select the "ACTIVE TEST" mode. Press the operation key when "FUEL PUMP RELAY" is displayed and check for pump operation noise.




- After turning ignition switch "ON", check for fuel pump operation noise for 5-sec interval.
- There must be a fuel pump operation noise while cranking engine.
  If NG: Inspect fuel pump control circuit.

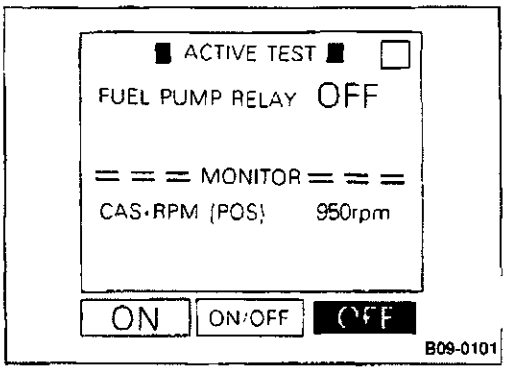
## 3. Basic Inspection (Cont'd)

### 3-3 FUEL PRESSURE INSPECTION

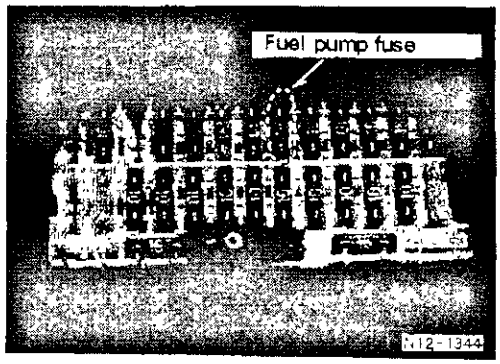



#### (1) Simple inspection

- When the fuel pump is operating, press the hose between fuel filter and fuel gallery with a finger. There must be tension and pulsations in the hose.




- Run the engine.
- Select the "FUEL PUMP RELAY" item in the "ACTIVE TEST" mode.
- Press the OFF button to release fuel pressure.

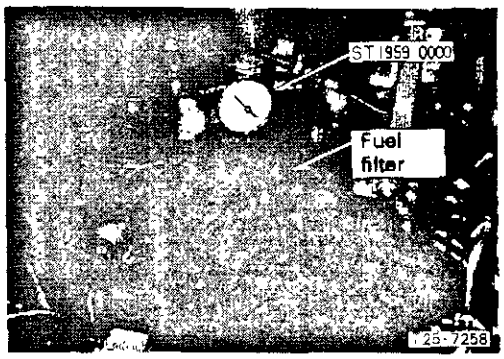



#### (2) Inspection using fuel pressure gauge

**Fuel pressure release**

- After starting engine, remove fuel pump fuse. Crank engine 2 or 3 times to remove fuel in lines.
- When engine will not start, remove pump fuse and crank engine 4 to 5 times to remove fuel in lines.

**Note: The battery may become weak easily, so use booster cables to connect it to another vehicle or battery if necessary.**




**Fuel pressure gauge installation**

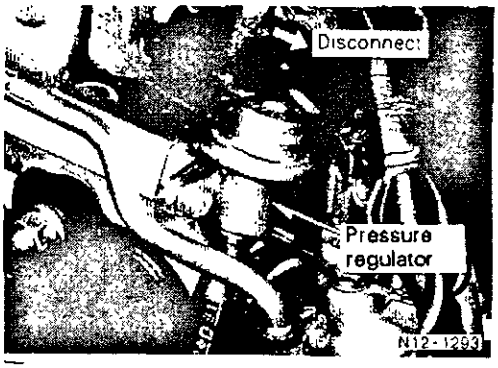
- Connect the fuel pressure gauge between the fuel strainer and fuel gallery.
- Install the fuel pump fuse.
- Start engine and check if fuel pressure reaches standard value.

**Fuel pressure inspection**

Unit: kPa (kg/cm², psi)

| Condition \ Engine | RB26DETT |
|---|---|
| Idling | Approx. 245 (2.5, 36) |
| When pressure regulator vacuum hose is removed | Approx. 294 (3.0, 43) |

## 3. Basic Inspection (Cont'd)



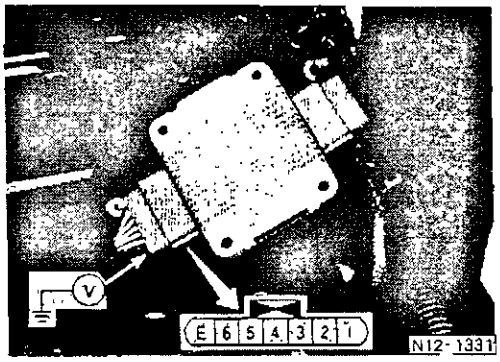

- In vehicles with starting problems, turn ignition switch ON and check fuel pressure for 5-sec interval when fuel pump is rotating.

| Condition \ Engine | RB26DETT |
|---|---|
| Ignition switch "ON" for 5-sec interval | Approx. 294 kPa (3.0 kg/cm², 43 psi) |

If NG:

| | |
|---|---|
| Fuel pressure is abnormally high. | • Pressure regulator is faulty.<br>• Return system is clogged or hose is bent. |
| Fuel pressure is abnormally low. | • Pressure regulator is faulty.<br>• Fuel pump output is faulty.<br>• Fuel supply system is clogged. |

Note: The fuel pressure should be also checked when the engine speed is increased.

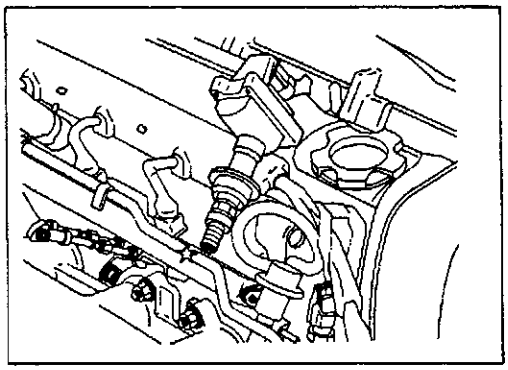



### 3-4 SPARK INSPECTION

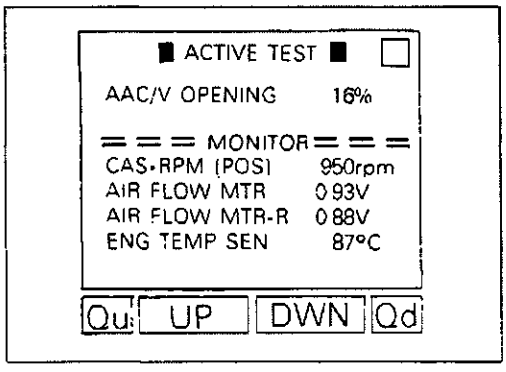
- Measure the voltage with a test probe at power transistor coil side terminal for spark signal of the primary system.

  Terminals 1 - 6 when cranking engine Approx. 9.5V

- Primary system check can also be performed by timing light or tachometer needle deflection.



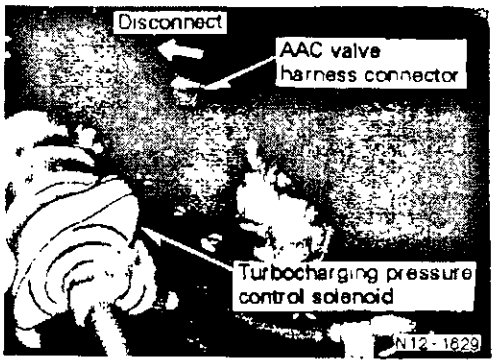
- To check if spark actually arcs or not, remove ignition coil (No. 1 cylinder is easiest), connect spark plug and place it against collector or other part for ground. Check if spark arcs when engine is cranked.
  If NG: Inspect ignition control system.



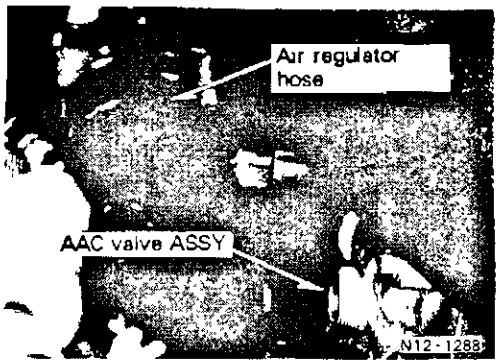

### 3-5 AAC VALVE OPERATION INSPECTION

- Start the engine.
- Set any angle in the "AAC VALVE OPENING" item of "ACTIVE TEST" mode.
- Check if idle speed at this time varies from set value.

## 3. Basic Inspection (Cont'd)

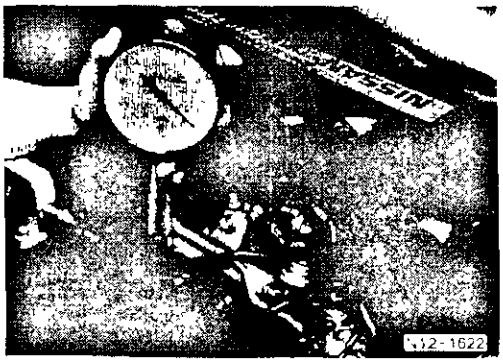



- After warming engine, check if idle speed lowers fror specified value when AAC valve connector is removed.




### 3-6 AIR REGULATOR OPERATION INSPECTION

- Start engine when cold, and check if idle speed lower when air regulator hose is closed or partially pressed.
- Start engine when cold and check if specified idle spee increases after AAC valve connector is removed an engine warms up.
- Connect AAC valve connector, and warm up engine ade quately.
- After warming up, remove AAC valve connector again an check if idle speed gradually decreases below specifie value.




### 3-7 INTAKE MANIFOLD VACUUM

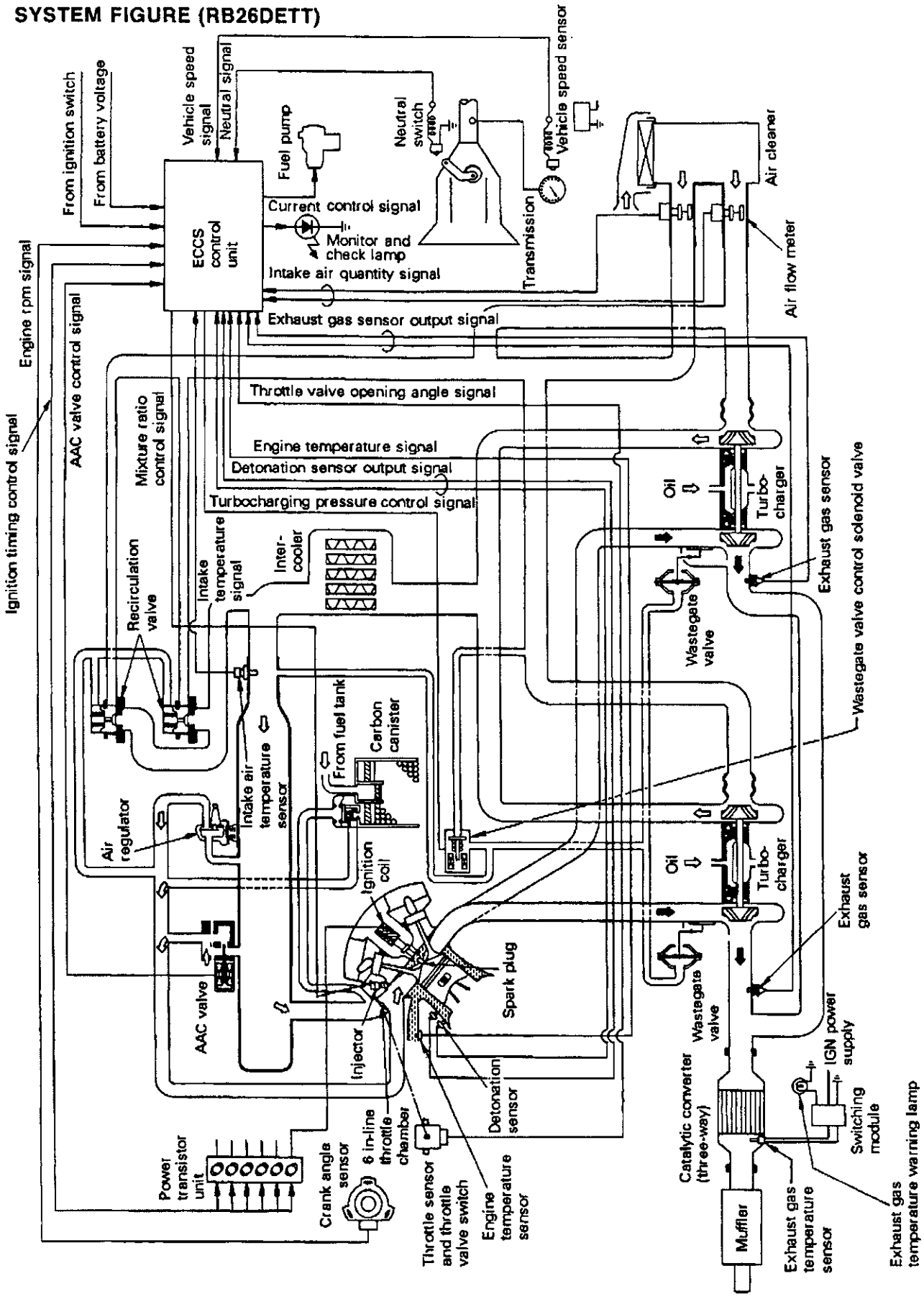
- After warming up engine, check vacuum when idling.

| | |
|---|---|
| Reference | Approx. –64.0 kPa (–480 mmHg, –18.90 inHg) |

- The vacuum value will be abnormal if there are air leak or other problems with combustion or main engine body Locate and correct the cause of problem.

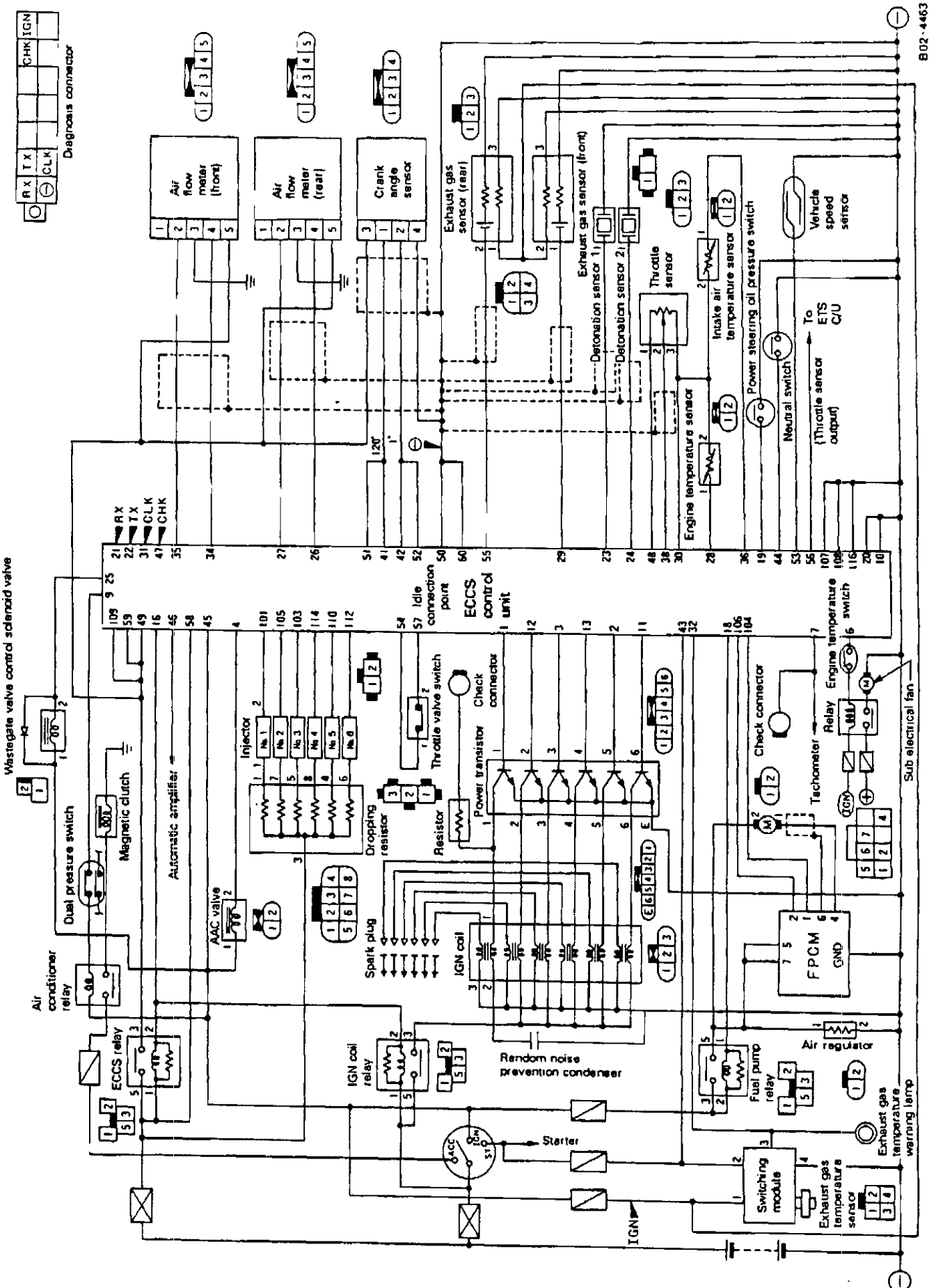
## 4. System Figure and Circuit Diagram

### 4-1 SYSTEM FIGURE (RB26DETT)



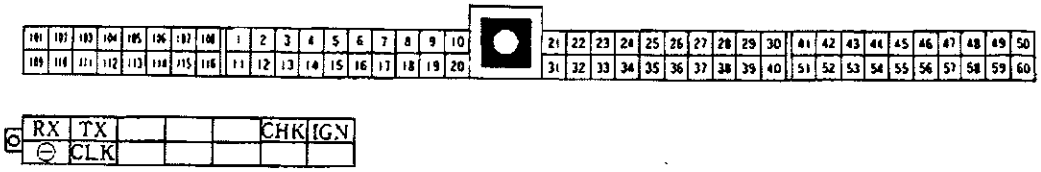
## 4. System Figure and Circuit Diagram (Cont'd)

### 4-2 CIRCUIT DIAGRAM (RB26DETT)



## 4. System Figure and Circuit Diagram (Cont'd)

### ECCS control unit pin layout figure: RB26DETT




B02-3431

| Terminal number | Description | Terminal number | Description |
|---|---|---|---|
| 1 | Ignition signal (power transistor) Cyl. No. 1 | 11 | Ignition signal (power transistor) Cyl. No. 6 |
| 2 | Ignition signal (power transistor) Cyl. No. 5 | 12 | Ignition signal (power transistor) Cyl. No. 2 |
| 3 | Ignition signal (power transistor) Cyl. No. 3 | 13 | Ignition signal (power transistor) Cyl. No. 4 |
| 4 | AAC valve | 14 | — |
| 5 | — | 15 | — |
| 6 | Sub electrical fan relay (engine temperature switch) | 16 | ECCS relay |
| 7 | Tachometer speed signal | 17 | — |
| 8 | — | 18 | Fuel pump relay |
| 9 | Air conditioner relay (air conditioner cut signal) | 19 | Power steering oil pressure switch |
| 10 | Ground (ignition signal system) | 20 | Ground (ignition signal system) |
| 21 (RX) | Receive (control unit data reception) | 31 (CLK) | Clock (synchronization signal) |
| 22 (TX) | Transmit (data sent from control unit) | 32 | Monitor and check lamp (red) |
| 23 | Detonation sensor 1 (cyl 1 to 3) | 33 | — |
| 24 | Detonation sensor 2 (cyl 4 to 6) | 34 | Air flow meter ground |
| 25 | Wastegate valve control solenoid valve | 35 | Air flow meter intake air quantity signal (front) |
| 26 | Air flow meter ground | 36 | Intake air temperature sensor |
| 27 | Air flow meter intake air quantity signal (rear) | 37 | — |
| 28 | Engine temperature sensor | 38 | Throttle opening output |
| 29 | Exhaust gas sensor (front) | 39 | — |
| 30 | Sensor ground (throttle sensor, engine temperature sensor) | 40 | — |
| 41 | Crank angle sensor (120° signal) | 51 | Crank angle sensor (120° signal) |
| 42 | Crank angle sensor (1° signal) | 52 | Crank angle sensor (1° signal) |
| 43 | Ignition switch START signal | 53 | Vehicle speed sensor |
| 44 | Neutral switch | 54 | Throttle valve switch (idle connection point) |
| 45 (IGN) | Ignition switch (IGN) | 55 | Exhaust gas sensor (Rear) |
| 46 | Air conditioner switch | 56 | Throttle sensor output signal |

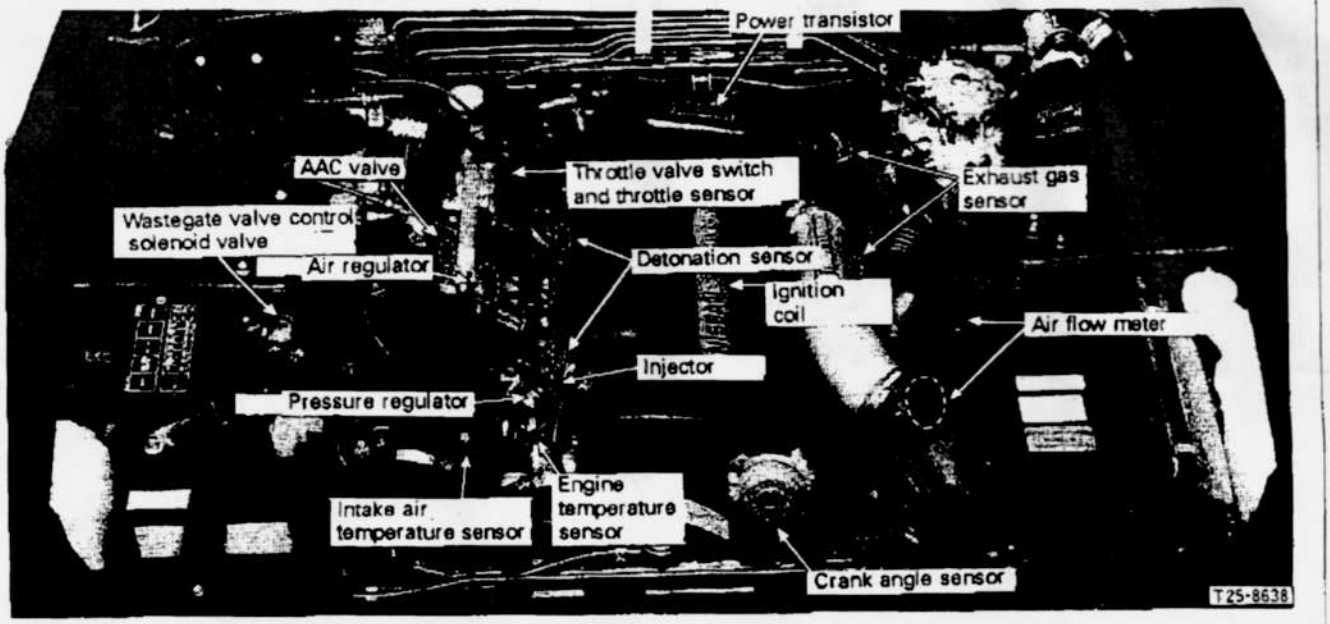
## 4. System Figure and Circuit Diagram (Cont'd)

| | | | |
|---|---|---|---|
| 47 (CHK) | Check (diagnosis activation) | 57 | Throttle valve switch power supply |
| 48 | Throttle sensor power supply supply | 58 | Battery power supply |
| 49 | Control unit power supply | 59 | Control unit power supply |
| 50 | Ground (control unit) | 60 (⊖) | Ground (control unit) |
| 101 | Injector No. 1 | 109 | Injector power supply (counter electromotive reflex circuit) |
| 102 | — | 110 | Injector No. 5 |
| 103 | Injector No. 3 | 111 | — |
| 104 | Fuel pump terminal voltage control output (FPCM) 1 | 112 | Injector No. 6 |
| 105 | Injector No. 2 | 113 | — |
| 106 | Fuel pump terminal voltage control output (FPCM) 2 | 114 | Injector No. 4 |
| 107 | Injector ground | 115 | — |
| 108 | Injector ground | 116 | Injector ground |

The terminal symbol enclosed in parentheses ( ) is the self-diagnosis connector symbol.

## 4. System Figure and Circuit Diagram (Cont'd)

### ECCS Component Parts

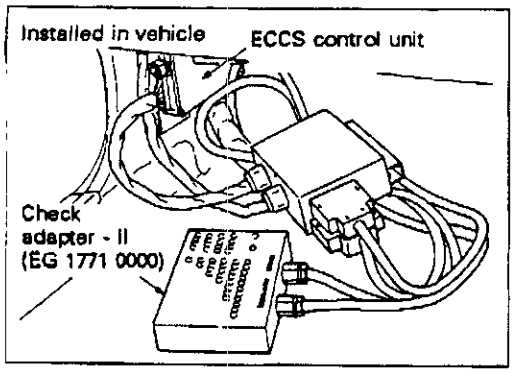



T25-8638

| | Component part | Type | Installation position |
|---|---|---|---|
| Actuator system | Wastegate valve control solenoid valve | Solenoid system | Strut tower right |
| | Pressure regulator | Diaphragm system | Fuel pipe front end |
| | Injector | Top feed type | Intake manifold |
| | Fuel pump | Roller vane type | Fuel tank |
| | Air regulator | Bi-metal type | Intake manifold lower part |
| | AAC valve | Solenoid type | Intake manifold collector lower part |
| | Ignition coil | Mini mold type | Cylinder head (above each plug) |
| | Power transistor unit | For 6-channel low-voltage electronic distribution | Rocker cover ornament |
| Sensor system | Crank angle sensor | Photocell (camshaft drive) | Cylinder head left front |
| | Air flow meter (2) | Hot wire type | Front left |
| | Intake air temperature sensor | Thermistor type | Intake manifold collector |
| | Throttle sensor | Variable resistor type | Accelerator work unit |
| | Throttle valve switch | ON/OFF switch | Accelerator work unit |
| | Engine temperature sensor | Thermistor type | Water outlet |
| | Exhaust gas sensor | Heater attached (titanium) | Front and rear exhaust outlets |
| | Detonation sensor | Pressure-electrical type | Cylinder block |
| | Fuel pump modulator | Operation amplifier | Rear pillar inner |

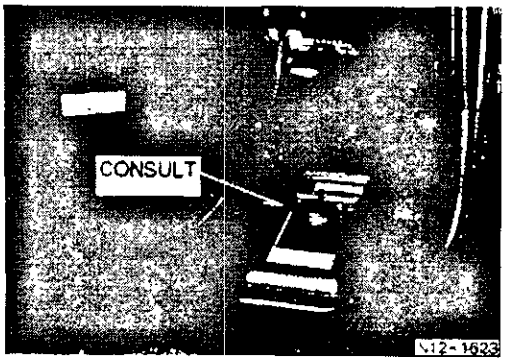
## 5. Actuator System Inspection

Use measurement equipment such as a circuit tester, CONSULT electrical system diagnosis tester and oscilloscope to perform the inspection. Refer to item 1., 1-1 (6) for the measurement equipment operation procedures.
The following preparation must be performed when using this equipment.




### (1) Using circuit tester and oscilloscope

- Use check adapter to perform the measurement.



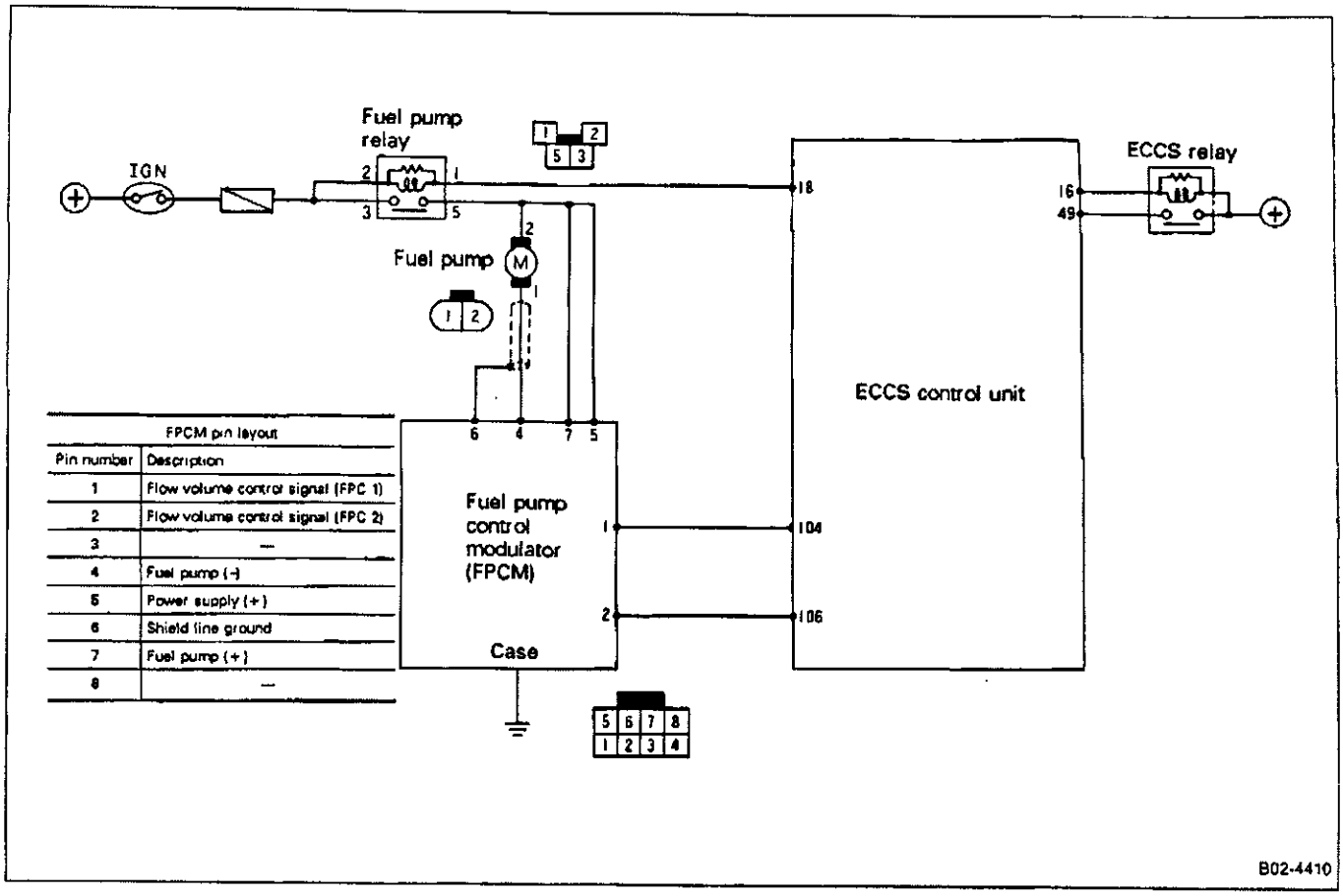

### (2) Using CONSULT

- Connect CONSULT to the diagnostic connector on vehicle (near the fuse block).

**Note: See section 2, 2-2 (2) for details.**

## 5. Actuator System Inspection (Cont'd)

### 5-1 FUEL PUMP SYSTEM INSPECTION

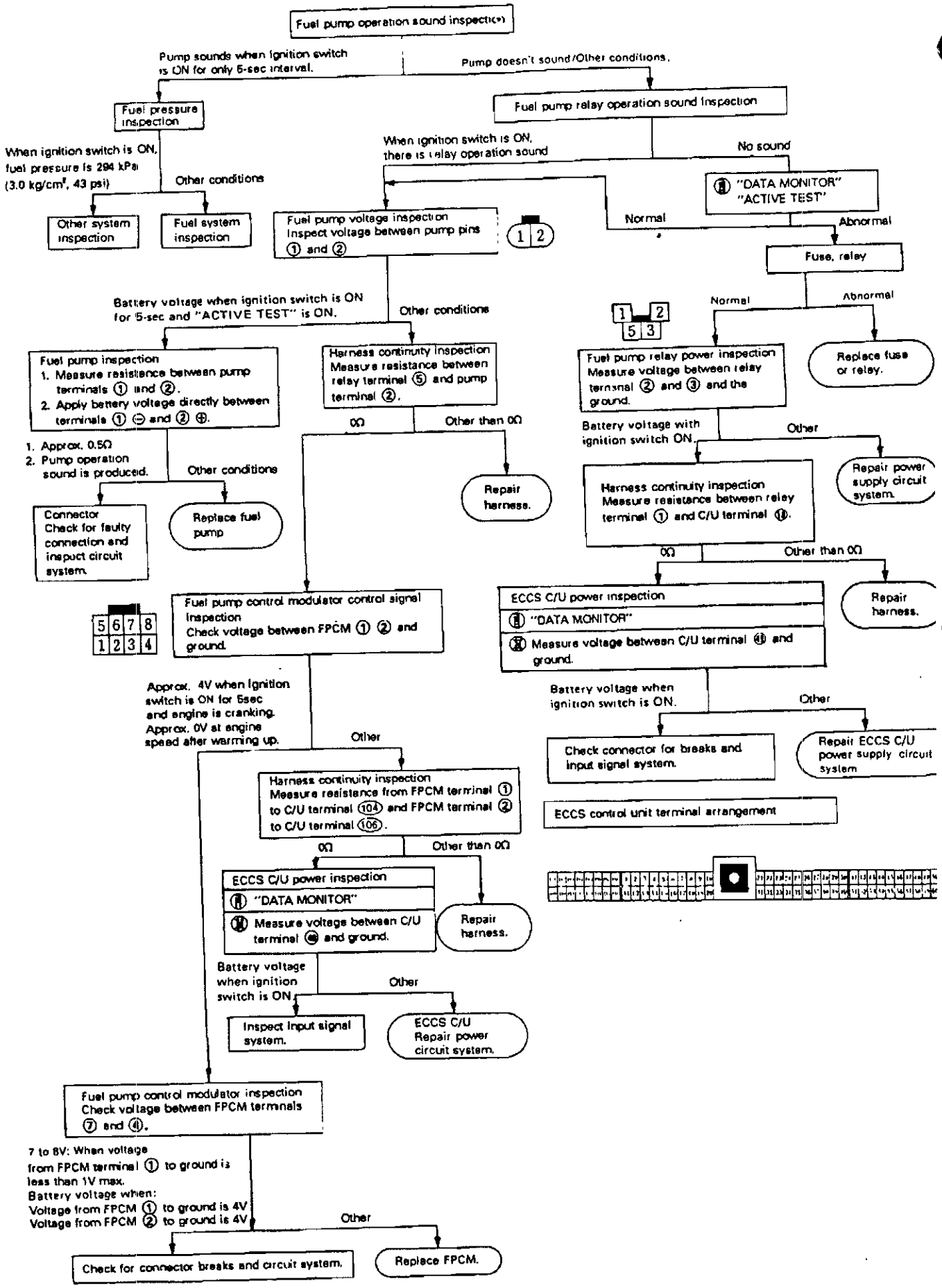



FPCM pin layout

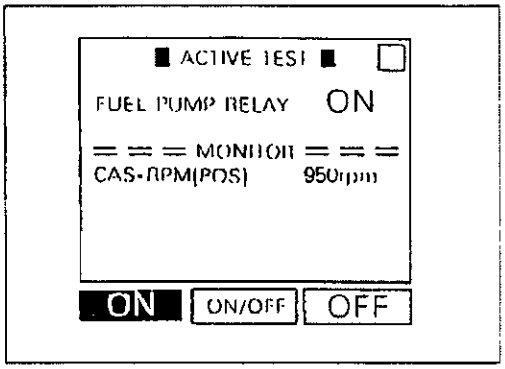
| Pin number | Description |
|---|---|
| 1 | Flow volume control signal (FPC 1) |
| 2 | Flow volume control signal (FPC 2) |
| 3 | — |
| 4 | Fuel pump (–) |
| 5 | Power supply (+) |
| 6 | Shield line ground |
| 7 | Fuel pump (+) |
| 8 | — |

## 5. Actuator System Inspection (Cont'd)

### Fuel pump system trouble diagnosis flowchart

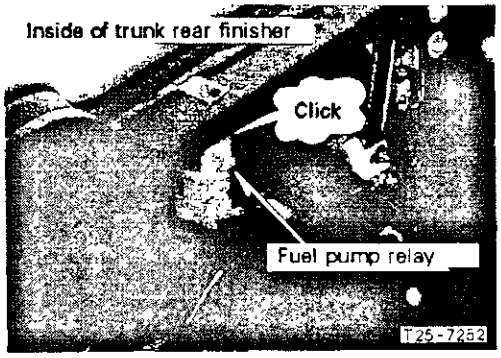


## 5. Actuator System Inspection (Cont'd)

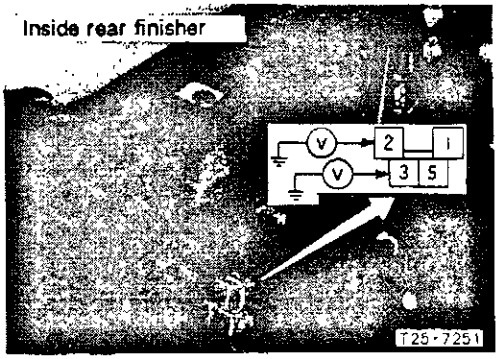



### (1) Fuel pump relay operation inspection

- Turn ignition switch "ON", select "FUEL PUMP RELAY" of "ACTIVE TEST" mode. Press the ON key and check if pump operation makes an operation sound.



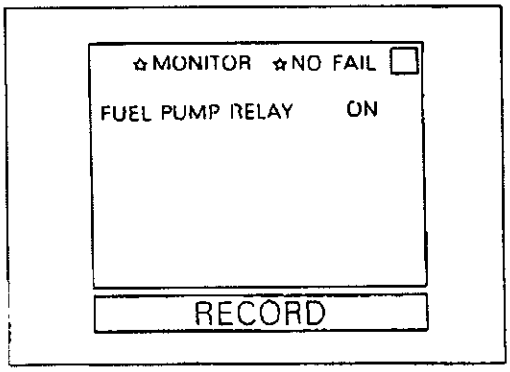

- When the ignition switch is "ON", the relay operation sound must be audible. The pump must sound in 5 sec after relay is turned on.
- After the engine has stopped, turn ignition key to OFF in 1.5 sec.




### (2) Fuel pump relay power inspection

- Disconnect fuel pump relay and measure the voltage between following terminals and ground when the ignition switch is ON.

| Engine / Measurement location / Condition | RB26DETT | |
|---|---|---|
| | Between ground and terminal (2) on fuel pump relay harness side. | Between ground and terminal (3) on fuel pump relay harness side. |
| When ignition switch is ON. | Battery voltage | ← |

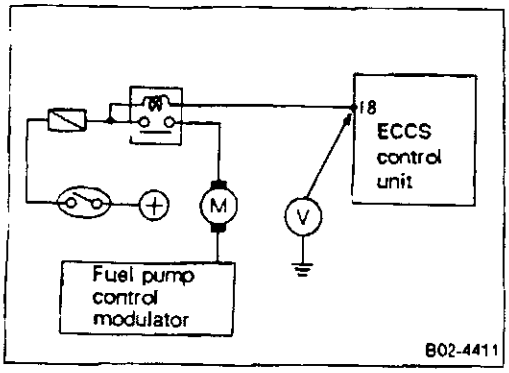



### (3) Fuel pump control signal inspection

- Select "FUEL PUMP RLY" item of "DATA MONITOR" mode and check following items.

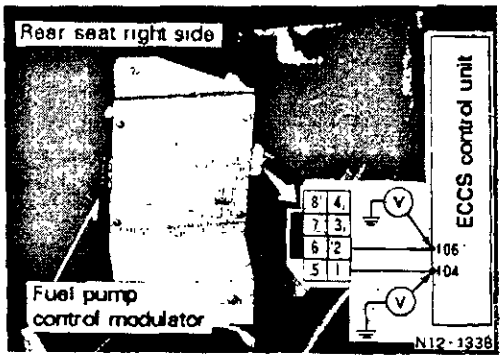
| Item / Condition | Fuel pump relay |
|---|---|
| When ignition switch is ON (engine is not running) | OFF |
| When cranking engine | ON |
| When idling | ON |

## 5. Actuator System Inspection (Cont'd)




- Measure the voltage between the following terminals and the ground when the ECCS control unit connectors are connected.

| Condition \ Engine | | RB26DETT |
|---|---|---|
| | Measurement location | Between ECCS C/U terminal (18) and ground |
| When ignition switch is ON (with engine stopped) | Within 5 seconds right after turning switch ON. | Approx. 1V |
| | After 5 seconds right after turning switch ON. | Battery voltage |
| Cranking engine | | Approx. 1V |
| Idling | | Approx. 1V |




### (4) Fuel pump control modulator control signal inspection

- Measure the voltage between the following terminals and the ground when the ECCS control unit connectors are connected.

| Condition \ Engine | RB26DETT | |
|---|---|---|
| Measurement location | Between ECCS C/U terminal (104) and ground (FPCM1) | Between ECCS C/U terminal (106) and ground (FPCM2) |
| Ignition switch ON (with engine stopped) | Approx. 4V<br>0V after 5 sec. | ← |
| Starting or with high load | Approx. 4V | ← |
| Idling | Approx. 0V | — |
| Medium load | Approx. 4V | Approx. 0V |

- Check voltage at FPCM terminals 4 and 7.

| Condition \ Measurement location | Between FPCM terminal 4 and ground | Between FPCM terminal 7 and ground |
|---|---|---|
| Idling | Battery voltage – Approx. 6V | Battery voltage |
| Medium load | Battery voltage – Approx. 8V | |
| Starting or with high load | Approx. 0V | |

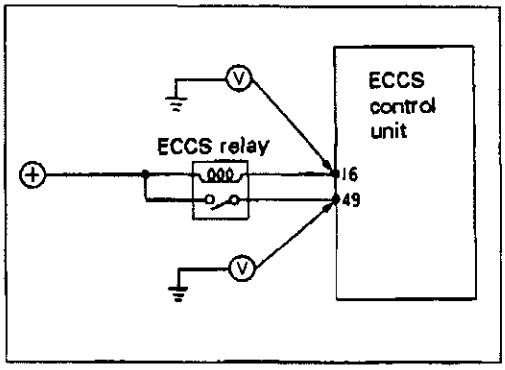
## 5. Actuator System Inspection (Cont'd)

### (5) ECCS control unit power inspection

- Select "BATTERY VOLTAGE" item in "DATA MONITOR" mode and perform the following inspection.

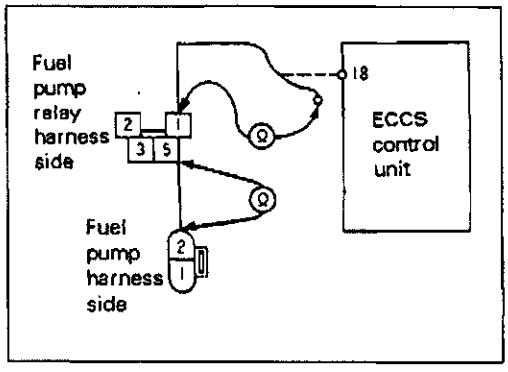
| Item / Condition | Battery voltage |
|---|---|
| Ignition switch ON | 11 - 14V |

**CAUTION:**
**The same setting as ON state is maintained for a few seconds right after the ignition switch is turned ON → OFF and then ON again.**




- Measure the voltage between the following terminals and the ground when the ECCS control unit connectors are connected.

| Engine / Measurement location / Condition | RB26DETT | |
|---|---|---|
| | Between ECCS C/U terminal (16) and ground | Between ECCS C/U terminal (49) and ground |
| Ignition switch OFF | Battery voltage | Approx. 0V |
| Ignition switch ON | Approx. 0V | Battery voltage |
| Cranking | Approx. 0V | Battery voltage |
| Idling | Approx. 0V | Battery voltage |

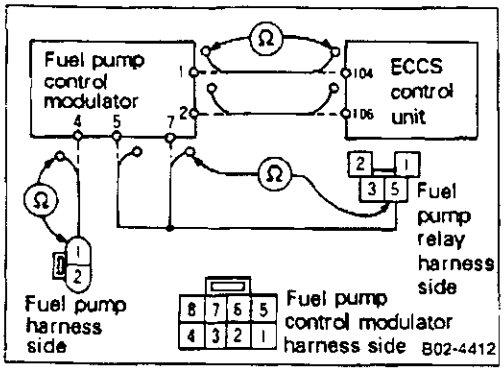



### (6) Harness continuity inspection

- Disconnect harness connectors of ECCS control unit, fuel pump relay and fuel pump and measure resistance between the following terminals.

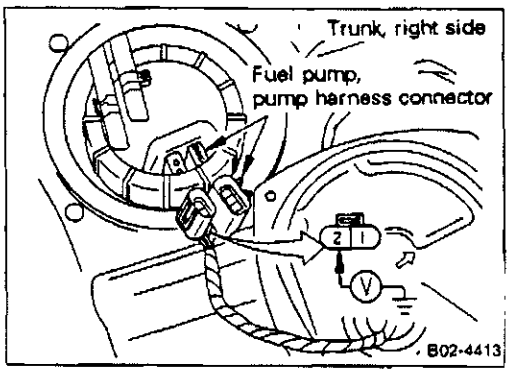
| Engine / Measurement location | RB26DETT |
|---|---|
| Between ECCS C/U harness terminal (18) and fuel pump relay harness terminal (1) | 0Ω |
| Between fuel pump harness terminal (2) and fuel pump relay harness terminal (5) | 0Ω |

## 5. Actuator System Inspection (Cont'd)




- Remove each connector and measure the resistance between the following terminals.

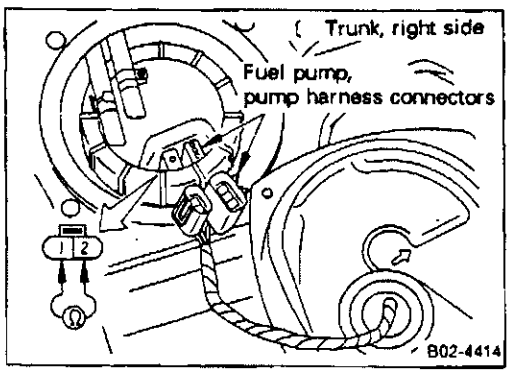
| Measurement location \ Engine | RB26DETT |
|---|---|
| Between ECCS C/U terminal (104) and FPCM harness terminal (1)<br>Between ECCS C/U terminal (106) and FPCM harness terminal (2)<br>Between fuel pump relay harness terminal (5) and FPCM harness terminal (5)<br>Between fuel pump relay harness terminal (5) and FPCM harness terminal (7)<br>Between fuel pump harness terminal (1) and FPCM harness terminal (4) | 0Ω |




### (7) Fuel pump voltage inspection

- Disconnect the fuel pump connector and measure the voltage between the following terminals and ground.

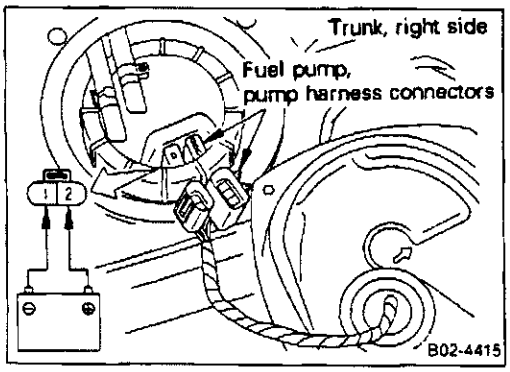
| Condition \ Measurement location \ Engine | RB26DETT<br>Between fuel pump harness terminal (2) and ground |
|---|---|
| 5 sec after ignition switch is turned ON | Battery voltage |
| Cranking | Battery voltage |




### (8) Fuel pump inspection

- Disconnect the fuel pump connector and measure the resistance between the following fuel pump terminals.

| Measurement location \ Engine | RB26DETT |
|---|---|
| Between fuel pump terminal (1) and (2) | Approx. 0.4 - 0.7Ω |

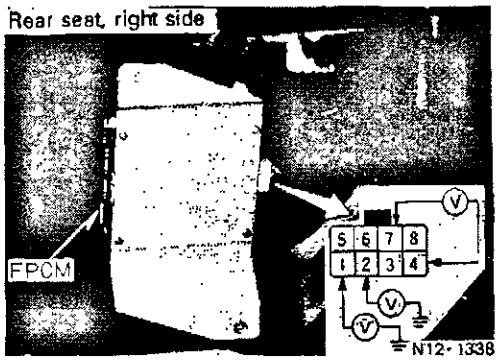



- Disconnect the fuel pump connectors, apply the battery voltage directly to the following fuel pump terminals and check fuel pump operation.
  - Pump terminal (2) to battery positive terminal (+)
  - Pump terminal (1) to battery negative terminal (–)

**CAUTION:**
**Be careful because damage will occur if connection is made with the incorrect battery polarity. Do not generate any sparks because fuel tank is nearby.**

## 5. Actuator System Inspection (Cont'd)

### (9) Fuel pump control modulator inspection



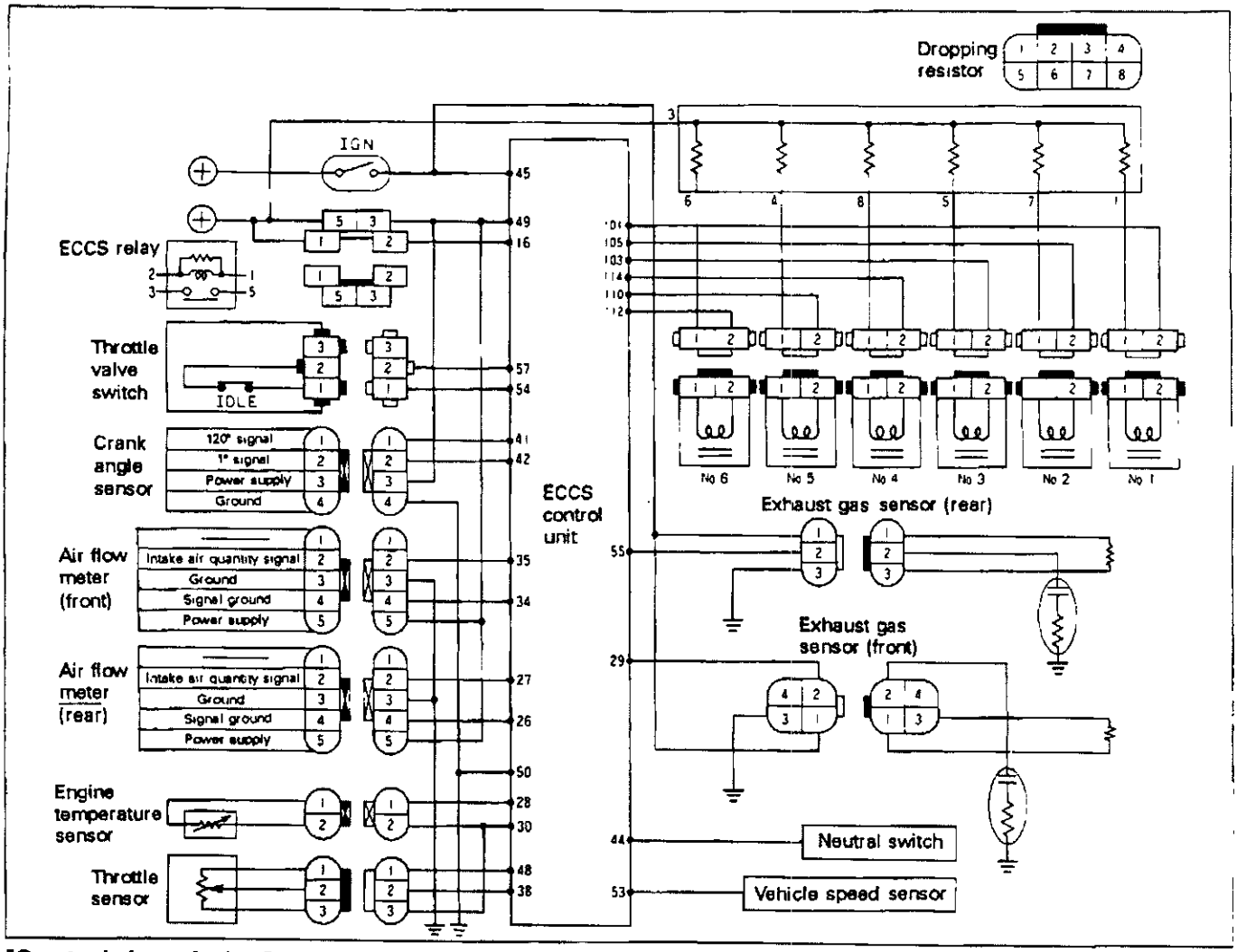

- When fuel pump control modulator connector is connected, measure the voltage between the following terminals.

| Measurement location | Condition | Voltage between FPCM terminal (1) and ground | Voltage between FPCM terminal (2) and ground |
|---|---|---|---|
| Voltage between FPCM terminals (7) and (4) | 6.6 - 7.0V | 0 - 1V | — |
| | 8.8 - 9.2V | Approx. 4V | 0 - 1V |
| | Battery voltage | Approx. 4V | ← |

## 5. Actuator System Inspection (Cont'd)

### 5-2 INJECTOR SYSTEM INSPECTION

**[Control circuit diagram]**




**[Control description]**

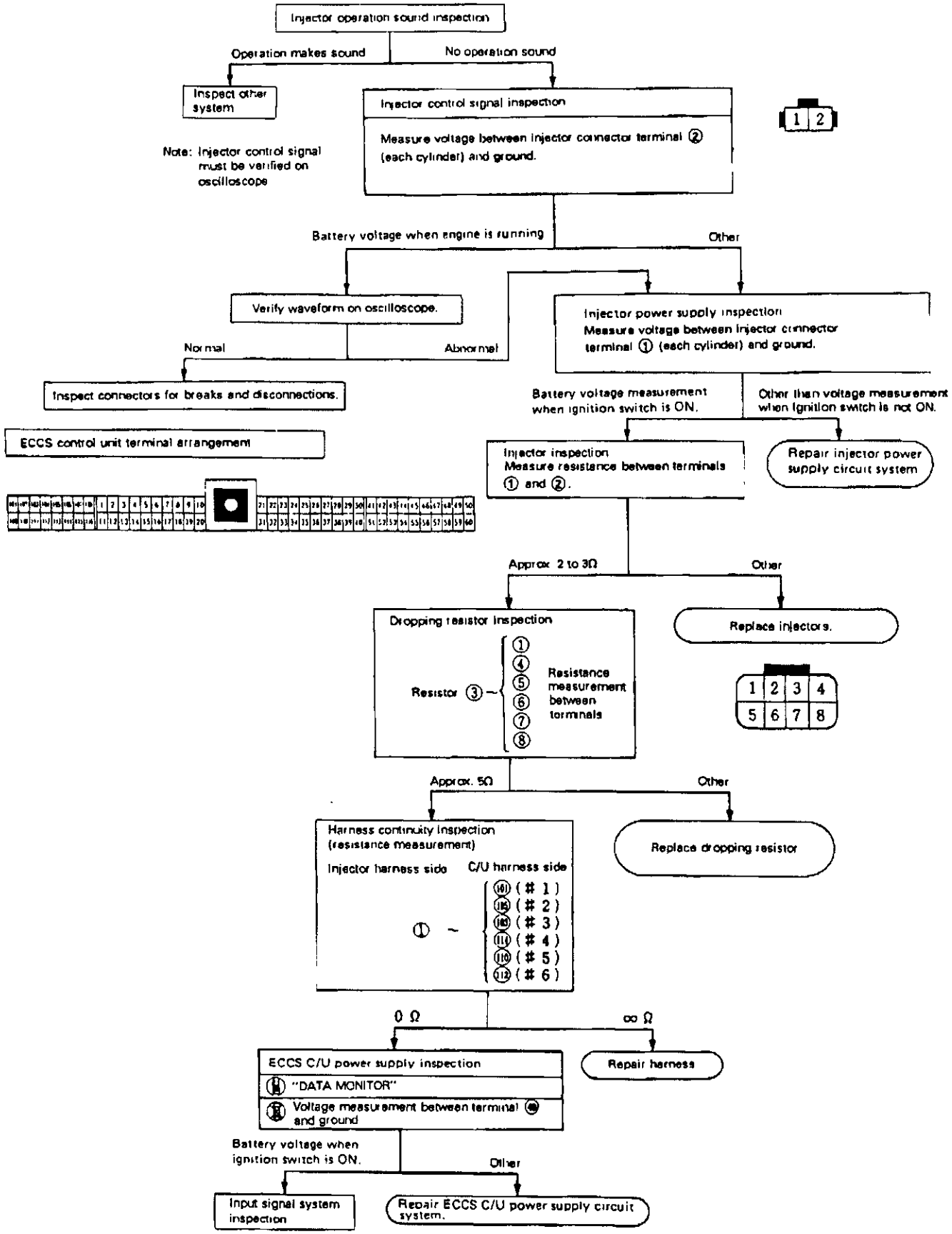
| Input signal | Terminal number | Control description | Remarks |
|---|---|---|---|
| Crank angle sensor 120° signal<br>Crank angle sensor 1° signal | 41, 51<br>42, 52 | • Determines injector injection timing.<br>• Reads engine speed. | — |
| Air flow meter intake air quantity signal | 27, 35 | • Detects intake air quantity, and determines basic injection quantity (injection pulse width) based on engine load. | • Fail-safe function activated when disconnected. |
| START signal | 43 | • Increases fuel quantity when starting. Determines injection quantity when starter SW is ON. | — |
| Engine temperature sensor signal | 28 | • Performs injection increase according to engine temperature.<br>• Fuel cut range changes according to engine temperature. | • Fail-safe activated when short-circuit or disconnection occurs. |
| Exhaust gas sensor signal | 29, 55 | • Injection pulse width control according to air-fuel ratio feedback. | • According to control block condition. |
| Throttle valve SW (idle connection point) | 54 | — | • Activated when throttle sensor damage occurs.<br>• Idle judgment backup. |

## 5. Actuator System Inspection (Cont'd)

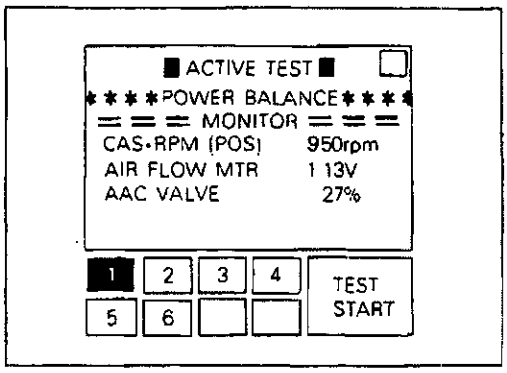
| Input signal | Terminal number | Control description | Remarks |
|---|---|---|---|
| Throttle sensor | 38 | • Fuel cut during deceleration<br>• Flow correction during acceleration or deceleration<br>• Interruption injection<br>• Idle judgment<br>• Deceleration fuel cut according to ON signal.<br>• Acceleration increase when ON goes to OFF. | — |
| Vehicle speed sensor | 53 | • Fuel cut interrupts speed and fuel cut at 0 km/h (0 MPH ) vehicle speed | — |
| Battery voltage | 49 | • Injection pulse width correction | — |
| Intake air temperature sensor | 36 | • Detects intake air quantity temperature and corrects injection pulse width. | — |

## 5. Actuator System Inspection (Cont'd)

### Injector system trouble diagnosis flowchart



## 5. Actuator System Inspection (Cont'd)

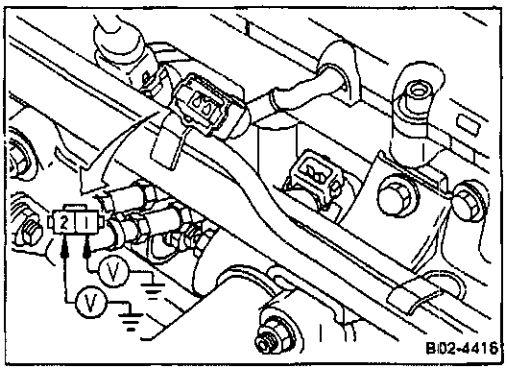



- Use "POWER BALANCE" in the CONSULT active test mode to change the idle speed and check the injector operation.

**CAUTION:**

**(1) There is a necessary minimum test time limit to prevent error.**

**(2) Avoid performing the test during driving.**

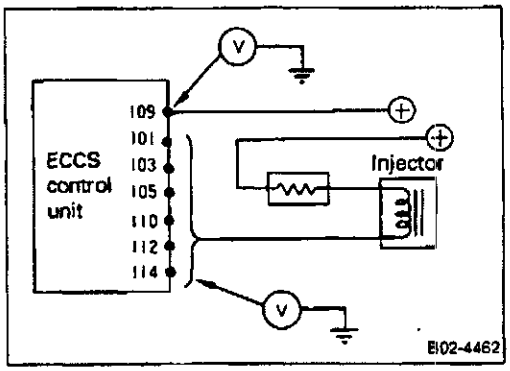



### (1) Injector control signal and power inspection

**[Injector connectors]**

- Disconnect the injector connectors and measure the voltage between the following terminals and ground.

| Engine | RB26DETT | |
|---|---|---|
| Measurement location | Control circuit | Power supply circuit |
| Condition | Between harness terminal (2) and ground | Between harness terminal (1) and ground |
| Ignition switch ON | Battery voltage | ← |
| Cranking engine | Approx. 10V | ← |
| Engine running | The voltage decreases as the engine speed increases (approx. 0.2V decrease for each engine speed increase of 2,000 rpm). | Battery voltage |




**[ECCS control unit connectors]**

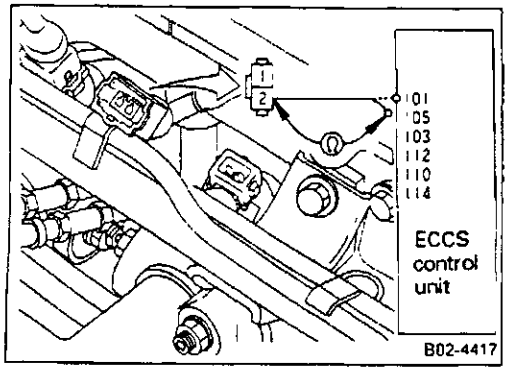
| Engine | RB26DETT | |
|---|---|---|
| Measurement location | Control circuit | Power supply circuit |
| Condition | Between ECCS C/U terminals (101), (103), (105), (110), (112), (114) and ground | Between ECCS C/U terminal (109) and ground |
| Ignition switch ON | Battery voltage | ← |
| Cranking engine | Approx. 10V | ← |
| Engine running | The control unit voltage decreases as the battery voltage and engine speed increases (approx. 0.2V decrease for each engine speed increase of 2,000 rpm). | Battery voltage |

### (2) ECCS control unit power supply inspection

- Refer to fuel pump system.

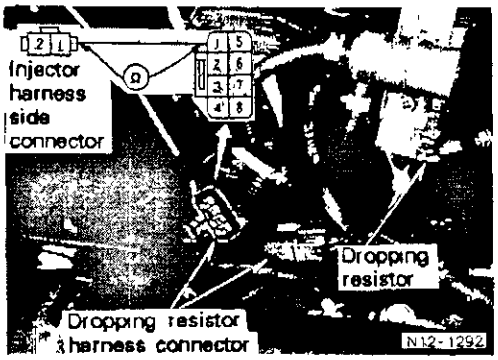
## 5. Actuator System Inspection (Cont'd)

### (3) Harness continuity inspection



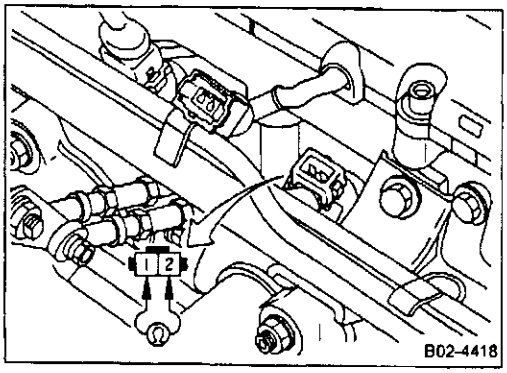

- Disconnect the control unit and injector connectors an measure the resistance between the following terminals.

| Measurement location | | Engine | RB26DETT |
|---|---|---|---|
| ECCS C/U harness | | Injector harness terminal (2) | |
| Terminal (101) | to | No. 1 cylinder | 0Ω |
| Terminal (105) | to | No. 2 cylinder | |
| Terminal (103) | to | No. 3 cylinder | |
| Terminal (114) | to | No. 4 cylinder | |
| Terminal (110) | to | No. 5 cylinder | |
| Terminal (112) | to | No. 6 cylinder | |




- Disconnect the harness connector from the injector an dropping resistor and measure the resistance between th following terminals.

| Measurement location | | Engine | RB26DETT |
|---|---|---|---|
| Dropping register harness | | Injector harness terminal (1) | |
| Terminal (1) | to | No. 1 cylinder | 0Ω |
| Terminal (4) | to | No. 5 cylinder | |
| Terminal (5) | to | No. 3 cylinder | |
| Terminal (6) | to | No. 6 cylinder | |
| Terminal (7) | to | No. 2 cylinder | |
| Terminal (8) | to | No. 4 cylinder | |



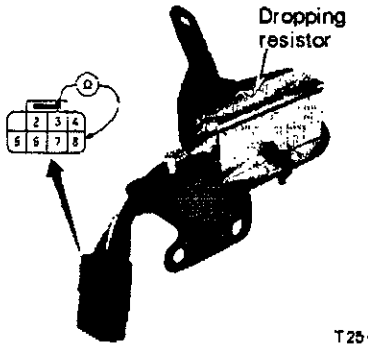

### (4) Injector inspection

- Disconnect the injector connectors and measure the resis tance between the terminals for each injector.

| Measurement location | Engine | RB26DETT |
|---|---|---|
| Between injector terminals (1) and (2) (for all cylinders) | | Approx. 2 - 3Ω |

## 5. Actuator System Inspection (Cont'd)

### (5) Dropping resistor inspection



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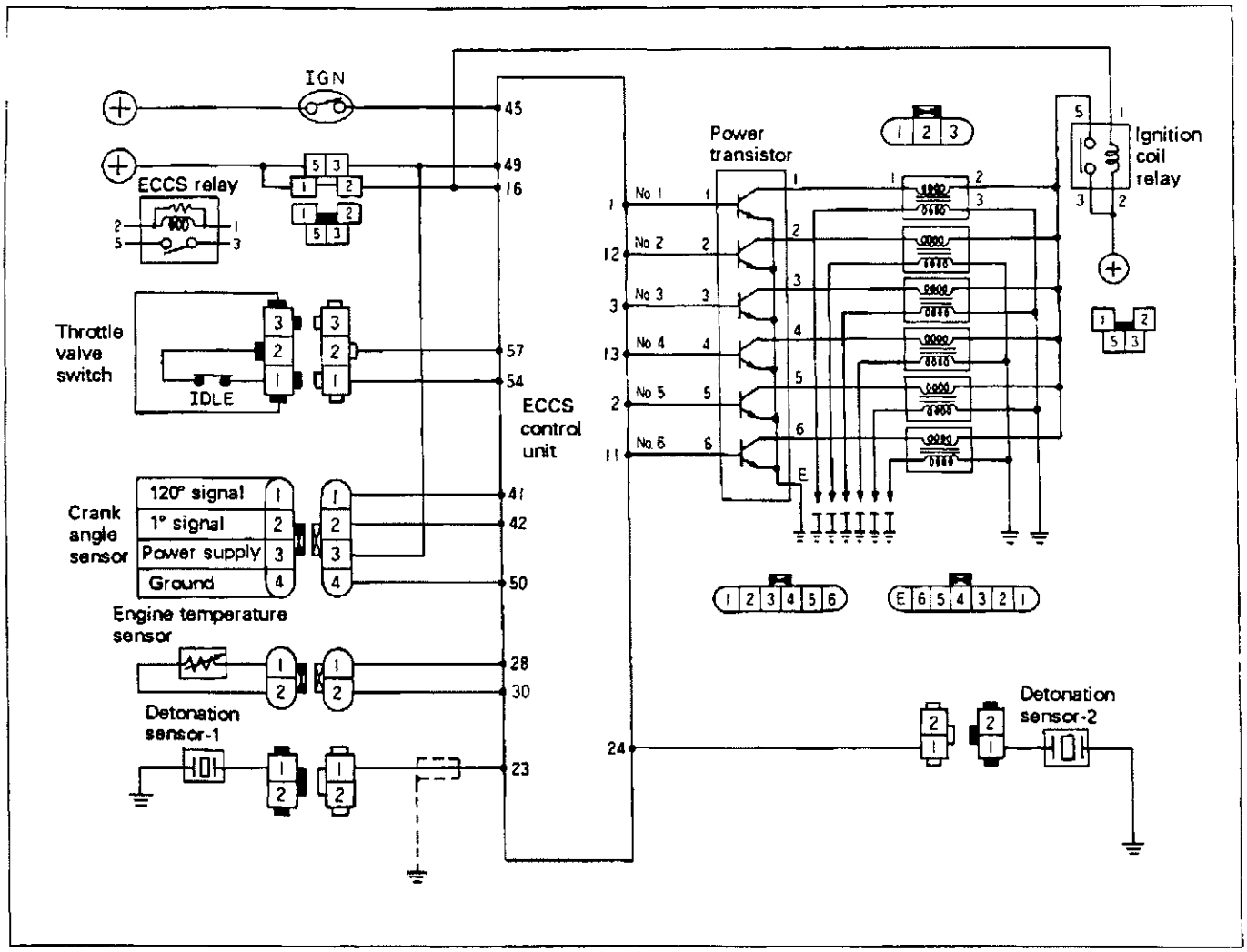
- Disconnect the dropping resistor connector and measure the resistance between the following terminals.

| Measurement location | | Engine: RB26DETT |
|---|---|---|
| Dropping resistor terminal (3) and | Terminal (1) | Approx. 5Ω |
| | Terminal (4) | |
| | Terminal (5) | |
| | Terminal (6) | |
| | Terminal (7) | |
| | Terminal (8) | |

## 5-3 IGNITION SYSTEM INSPECTION

### [Control circuit]




### [Control description]

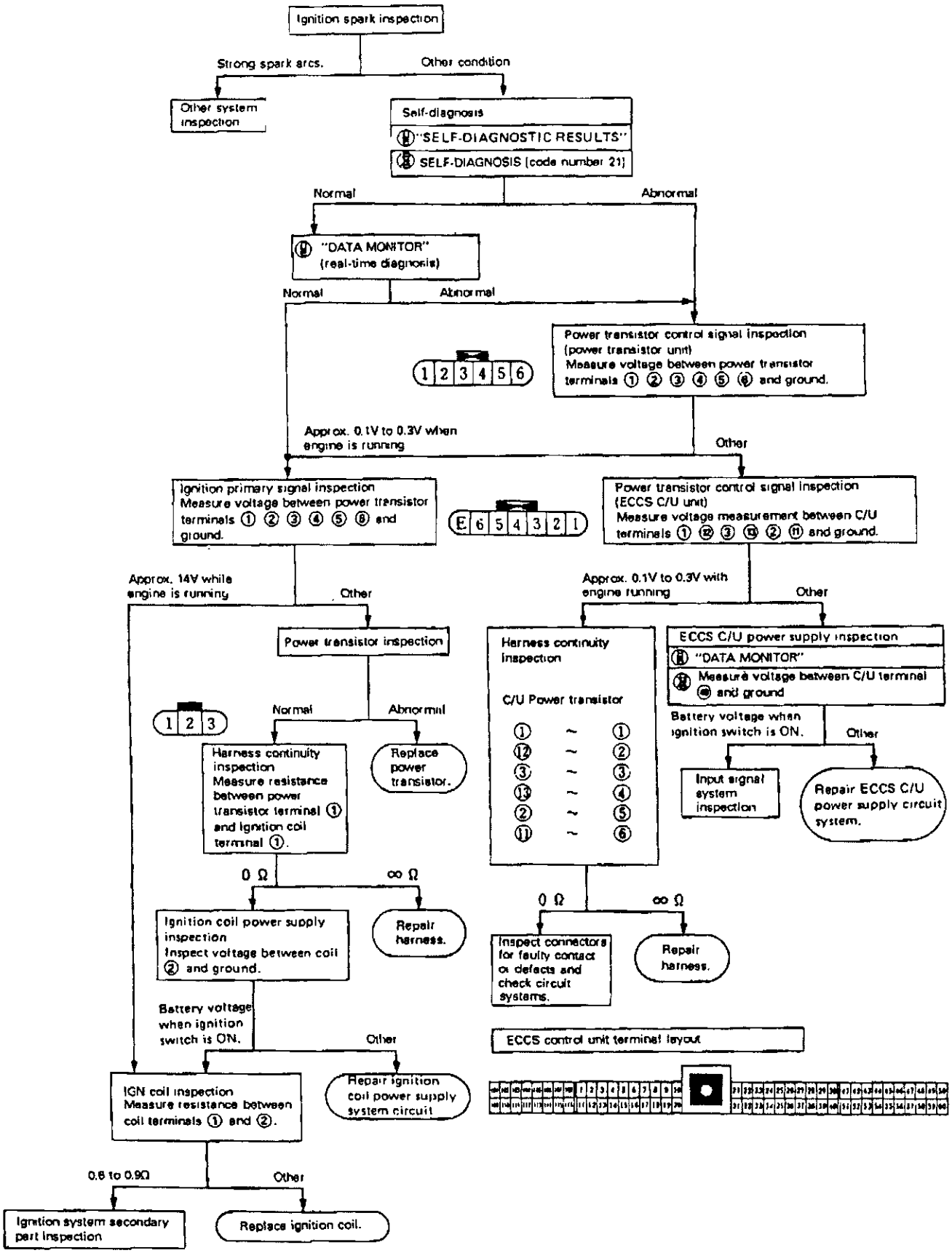
| Input signal | Terminal number | Control description | Remarks |
|---|---|---|---|
| Crank angle sensor 120° signal | 41, 51 | • Ignition timing start point. | • The ignition cannot be performed if there is an instantaneous break in the 120° signal.<br>• The ignition cannot be performed if there is an instantaneous break in the 1° signal. |
| Crank angle sensor 1° signal | 42, 52 | • Ignition timing count.<br>• The ignition timing is set according to the map indicated by 120° signal. | |
| Engine temperature sensor | 28 | • Changes injector injection timing according to engine temperature.<br>• Control for low and high engine temperature conditions. | • Fail-safe is performed when there is a short-circuit or disconnection. [20°C (68°F) at starting, gradually increasing to 80°C (176°F)] |
| Throttle valve SW (idle connection point) | 54 | — | • Activated when throttle sensor damage occurs.<br>• Idle judgment backup. |

## 5. Actuator System Inspection (Cont'd)

| Input signal | Terminal number | Control description | Remarks |
|---|---|---|---|
| Throttle sensor | 38 | • Fuel cut during deceleration<br>• Flow correction during acceleration or deceleration<br>• Interruption injection<br>• Idle judgment<br>• Deceleration fuel cut according to ON signal.<br>• Acceleration fuel increase during ON-OFF operation. | — |
| START signal | 43 | • Controls ignition timing when cranking engine. | — |
| Detonation sensor | 23, 24 | • Detects detonation and changes ignition timing. | • Fail-safe is activated if short-circuit or disconnection occurs. (Fixed volume delay angle) |

## 5. Actuator System Inspection (Cont'd)

### Ignition system trouble diagnosis flowchart




Note: An oscilloscope must be used to check the output waveform of the ignition system.

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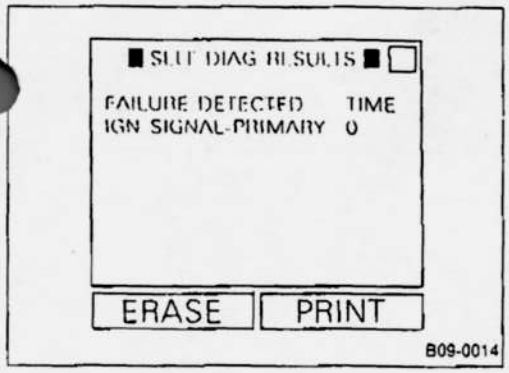
## 5. Actuator System Inspection (Cont'd)

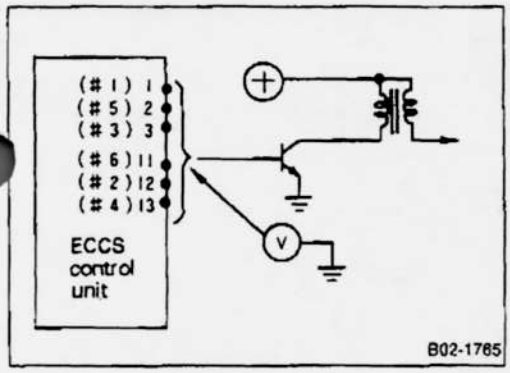



### (1) Self-diagnosis

- When the ignition switch is ON and engine is cranking, check faulty system name in "SELF-DIAGNOSTIC RESULTS" mode.
- When there is abnormal output, inspect the assumed locations in the following sequence.

Power transistor (short) → ECCS harness (short) → ECCS control unit

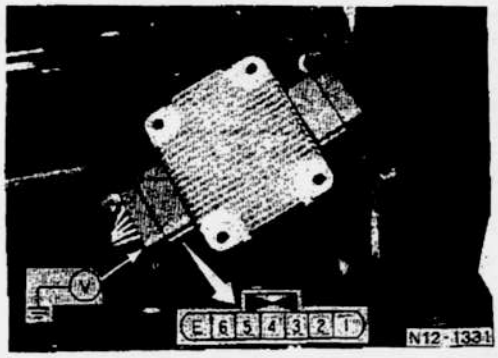
- Set ignition switch to ON.
- Perform the diagnosis mode selection procedure with the diagnosis connector in vehicle. Check the code number of the faulty system displayed by the flashing exhaust gas temperature warning lamp on the instrument panel. (See 2, 2-2, ②.)




### (2) Power transistor control signal inspection

- Measure voltage between the following connectors and ground when ECCS control unit connectors are connected.

| Engine / Measurement location / Condition | RB26DETT<br>Voltage between ECCS C/U terminals 1, 2, 3, 11, 12, 13 and ground |
|---|---|
| Cranking | 0.2 - 0.3V |
| Idling | 0.2 - 0.3V |
| 2,500 rpm | Approx. 0.4V |

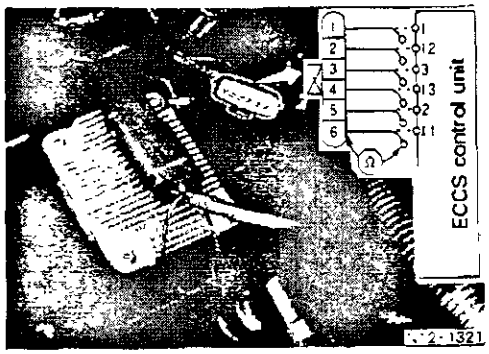



### (3) Ignition primary voltage signal inspection

- Measure the primary voltage of coil side connector of power transistor.

| Engine / Measurement location / Condition | RB26DETT<br>Voltage between power transistor IGN coil side terminals 1, 2, 3, 4, 5, 6, and ground | Voltage between IGN coil side terminal E and ground. |
|---|---|---|
| Cranking | Approx. 10V | 0V |
| Idling | Approx. 14V | 0V |
| 2,500 rpm | Approx. 14V | 0V |

## 5. Actuator System Inspection (Cont'd)

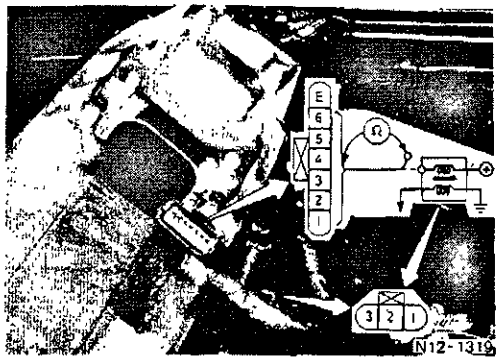



### (4) Harness continuity inspection

- Disconnect the connectors on the input side of the ECCS control unit and power transistor unit, and measure the resistance between the following terminals.

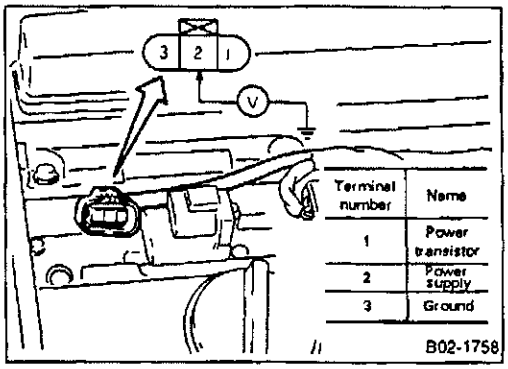
| Measurement location | | | | Engine RB26DETT |
|---|---|---|---|---|
| | ECCS C/U harness | | Power transistor unit harness (6 polarity terminal) | |
| Between | terminal 1 | and | terminal 1. | 0Ω |
| Between | terminal 12 | and | terminal 2. | |
| Between | terminal 3 | and | terminal 3. | |
| Between | terminal 13 | and | terminal 4. | |
| Between | terminal 2 | and | terminal 5. | |
| Between | terminal 11 | and | terminal 6. | |

## 5. Actuator System Inspection (Cont'd)



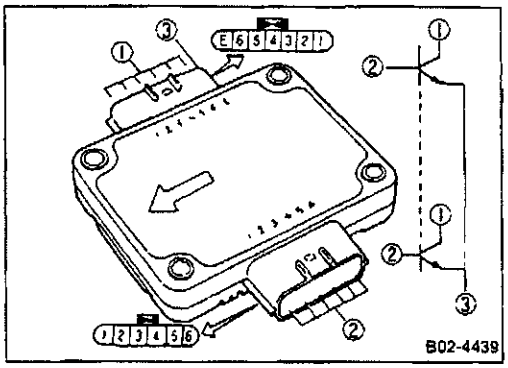

- Disconnect the connector from the power transistor unit output side and ignition coil, and measure the resistance between the following terminals.

| Measurement location | | | Engine: RB26DETT |
|---|---|---|---|
| Power transistor unit harness (7 polarity terminal side) | | Ignition coil connector harness (terminal 1) | |
| Terminal 1 | to | No. 1 cylinder | 0Ω |
| Terminal 2 | to | No. 2 cylinder | |
| Terminal 3 | to | No. 3 cylinder | |
| Terminal 4 | to | No. 4 cylinder | |
| Terminal 5 | to | No. 5 cylinder | |
| Terminal 6 | to | No. 6 cylinder | |




- Disconnect ignition coil connector and measure the voltage between the following terminals.

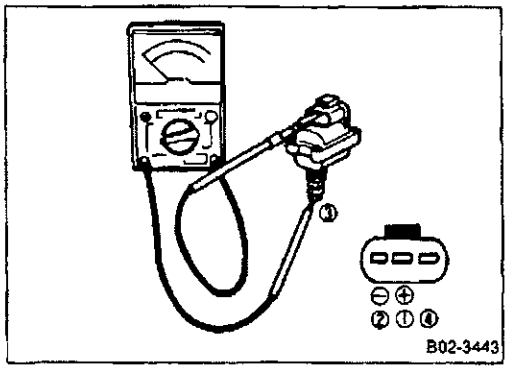
| Engine: RB26DETT | Measurement location: Between ignition coil connector harness terminal (2) and ground |
|---|---|
| Condition | |
| Ignition switch ON | Battery voltage |




### (5) Power transistor inspection

- Check the resistance value between all power transistor terminals with an analog circuit tester probe by changing the positive ⊕ and negative ⊖ poles.

| Inspection terminals and values | |
|---|---|
| ① - ③ | ⊕ - ⊖ Not 0 or ∞Ω < ⊖ - ⊕ ∞Ω |
| ② - ③ | ⊕ - ⊖ Not 0 or ∞Ω ≒ Not ⊖ - ⊕ 0 or ∞Ω |
| ① - ② | ⊕ - ⊖ Not 0 or ∞Ω < ⊖ - ⊕ ∞Ω |




### (6) Ignition coil inspection

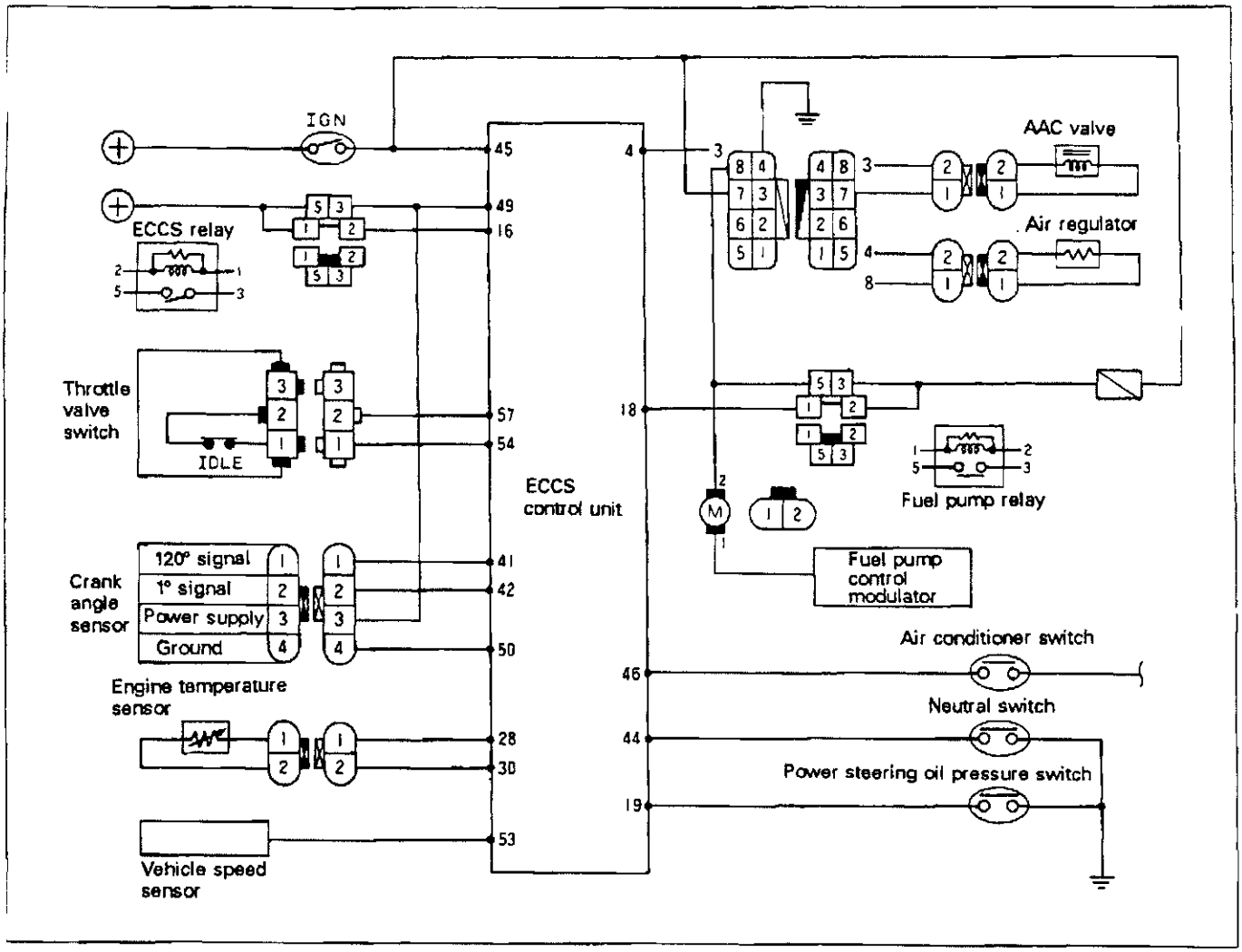
- Measure primary coil resistance value.

| Measurement location | | Engine: RB26DETT |
|---|---|---|
| Primary coil resistance value (① - ②) | (Ω) | 0.6 - 0.9 |

(Reference): Secondary coil resistance value (③ - ④): ∞Ω

## 5-4 IDLE SPEED CONTROL SYSTEM INSPECTION

### [Control circuit]




### [Control description]

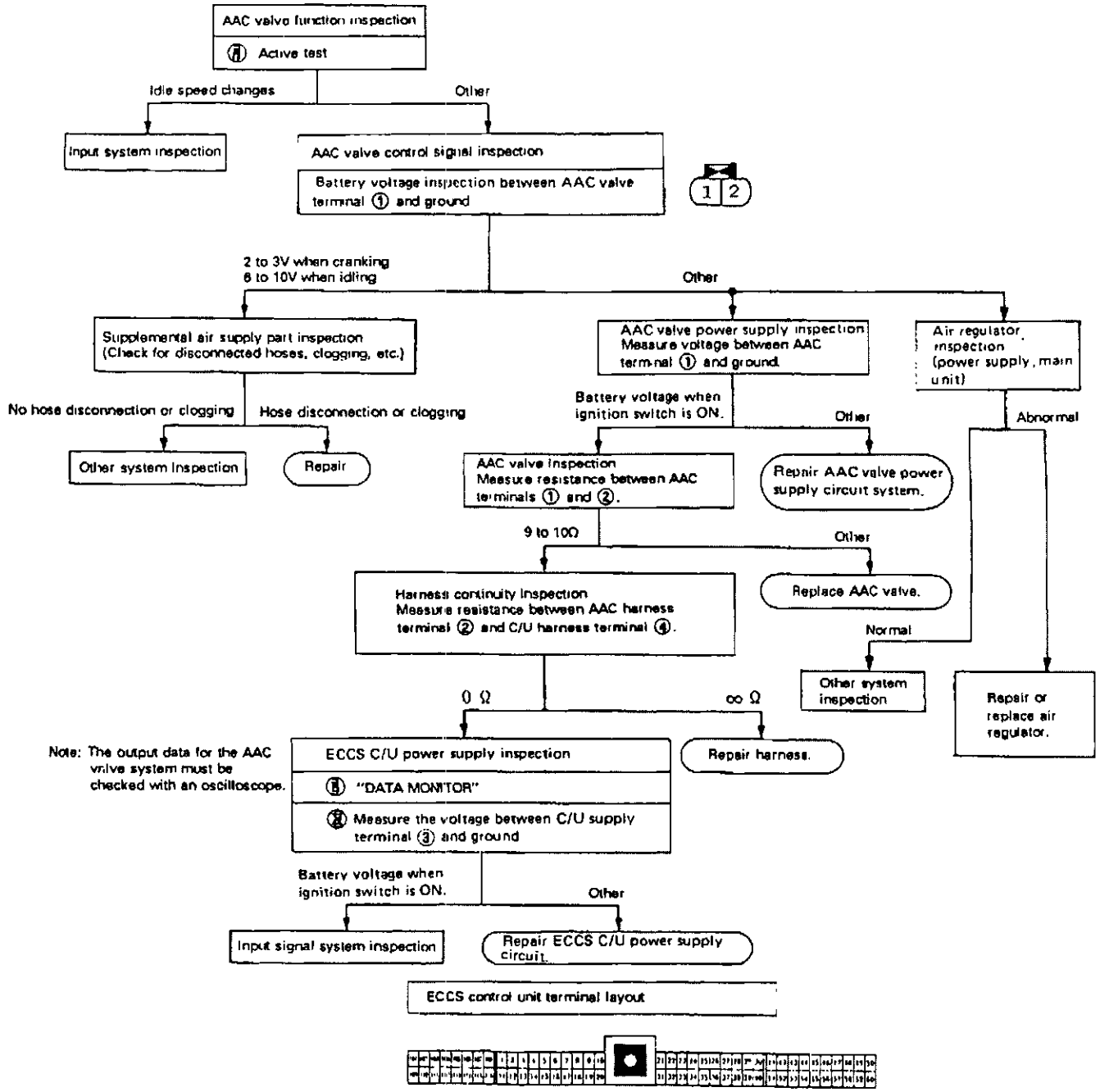
| Input signal | Terminal number | Control description |
|---|---|---|
| Crank angle sensor 1° signal | 42, 52 | • Engine speed is read and feedback control is performed for the speed value. |
| Engine temperature sensor | 28 | • The target engine speed is changed according to cooling water temperature. |
| Throttle valve SW (idle connection point) | 54 | • Activated when throttle sensor damage occurs. (Idle judgment backup.) |
| Throttle sensor | 38 | • Deceleration fuel cut<br>• Flow correction at acceleration or deceleration<br>• Interruption injection<br>• Idle judgment<br>• Deceleration fuel cut according to ON signal.<br>• Acceleration increase when ON goes to OFF. |
| Vehicle speed sensor | 53 | • Idle control starts at vehicle speed under 8 km/h (5 MPH). |
| Air conditioning switch | 46 | • After engine warms up, increases idle when air conditioning is turned ON. |
| Neutral switch | 44 | • Starts idle control in neutral position. |

## 5. Actuator System Inspection (Cont'd)

| Input signal | Terminal* number | Control description |
|---|---|---|
| Power steering oil pressure switch | 19 | • Increases idle speed when power steering fluid pressure is too high. |
| Battery voltage | 49 | • When battery voltage is low (less than 12V), idle speed is increased. |

## 5. Actuator System Inspection (Cont'd)

### Idle speed control system trouble diagnosis flowchart

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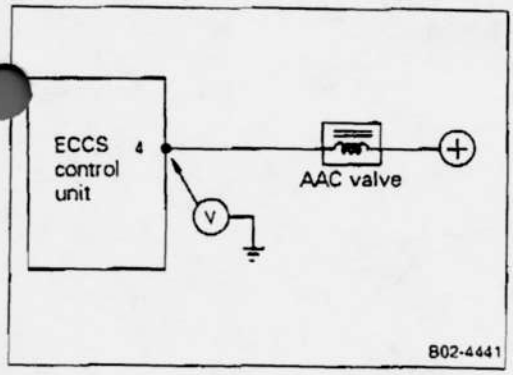
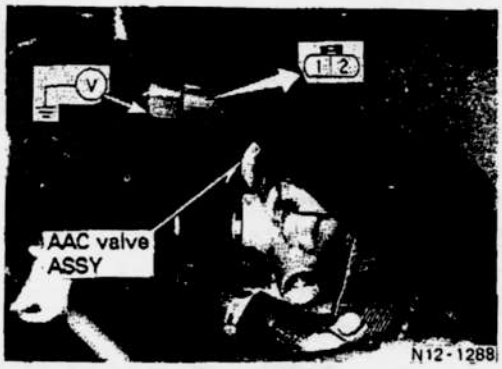
## 5. Actuator System Inspection (Cont'd)

### (1) AAC valve control signal inspection

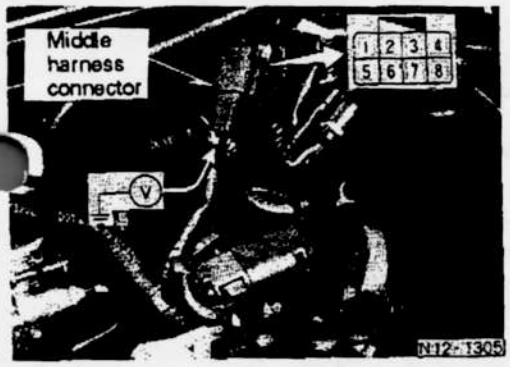



- When ECCS control unit connector is connected, measure the voltage between the following terminals and ground.

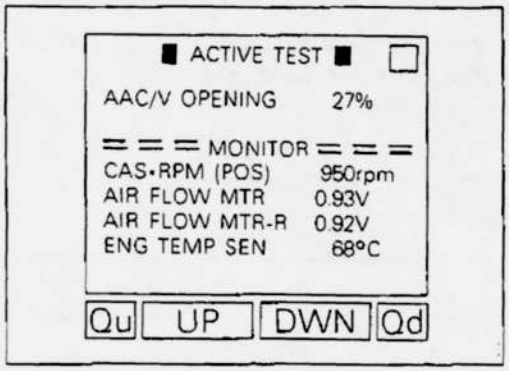
| Condition \ Measurement location | Engine | RB26DETT<br>Between ECCS C/U terminal (4) and ground |
|---|---|---|
| Ignition switch is ON | | Battery voltage |
| Cranking engine | | 2 - 3V |
| Idling | When cold | 6 - 7V |
| | After warm-up | 8 - 10V |




- Measure the voltage between the AAC valve connector terminal (2) and middle harness connector terminal (3) and ground.




### (2) AAC valve function inspection



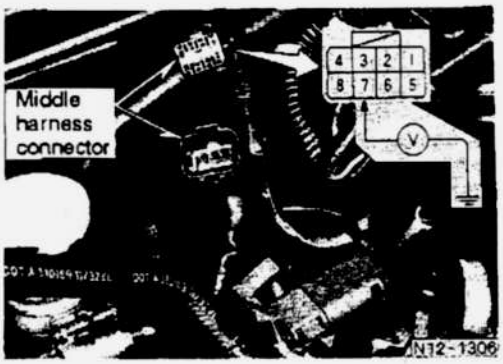

- Use "AAC VALVE OPENING" item of "ACTIVE TEST" mode to set an optional angle.
- Check that idle speed changes corresponding to setting value at this time.

### (3) AAC valve power inspection

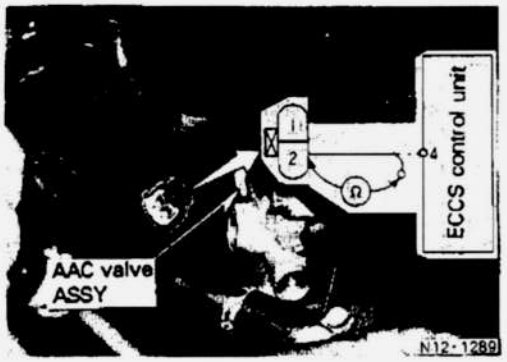

- Disconnect AAC valve connector and measure voltage between the following terminals and ground.

| Condition \ Measurement location | Engine | RB26DETT<br>Between AAC valve connector harness terminal (1) and ground. |
|---|---|---|
| When ignition switch is ON. | | Battery voltage |

## 5. Actuator System Inspection (Cont'd)



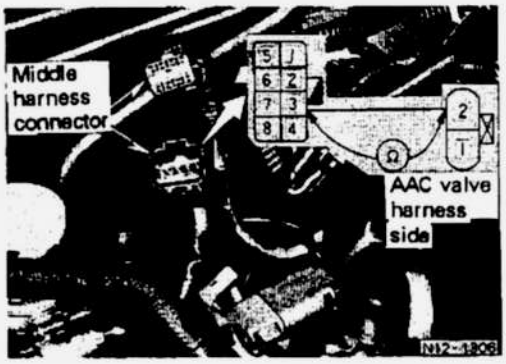

- Measure the voltage between the middle harness connector terminal (7) and the ground.




### (4) Harness continuity inspection

- Disconnect the connector from the ECCS control unit and AAC valve and measure the resistance between the following terminals.

| Engine | RB26DETT | |
|---|---|---|
| Measurement location | Between ECCS control unit harness terminal (4) and AAC valve harness terminal (2) | 0Ω |

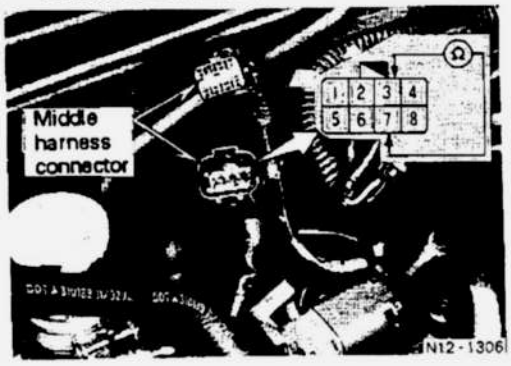



| Engine | RB26DETT | |
|---|---|---|
| Measurement location | Between Middle connector AAC valve terminal (3) and AAC valve harness terminal (2) | 0Ω |


### (5) AAC valve inspection

- Disconnect the AAC valve connector and measure the resistance between the following AAC valve terminals.

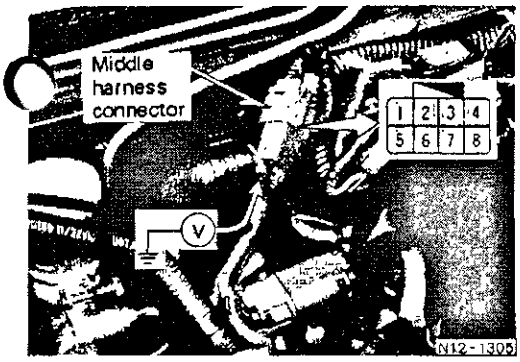
| Measurement location \ Engine | RB26DETT |
|---|---|
| Between AAC valve terminals (1) and (2) | 9 - 10Ω |




- Measurement can also be performed at middle connecto terminals.

| Measurement location \ Engine | RB26DETT |
|---|---|
| Between AAC valve terminals (3) and (7) | 9 - 10Ω |

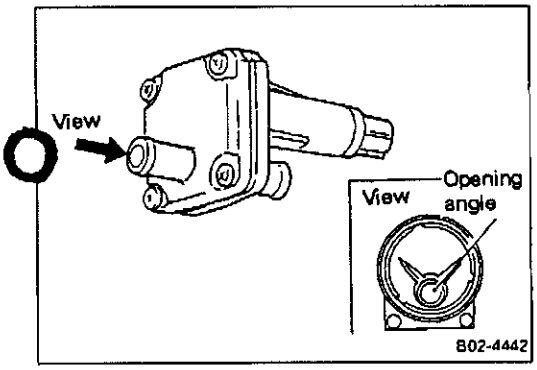
## 5. Actuator System Inspection (Cont'd)




### (6) Air regulator power supply inspection

- Measure the voltage between the following terminals and ground when the air regulator middle harness is connected.

| Engine / Measurement location / Condition | RB26DETT<br>Between middle harness connector terminal (8) and ground |
|---|---|
| Ignition switch ON | 5-sec interval battery voltage |
| Cranking | Approx. 1V |
| Idling | Approx. 1V |

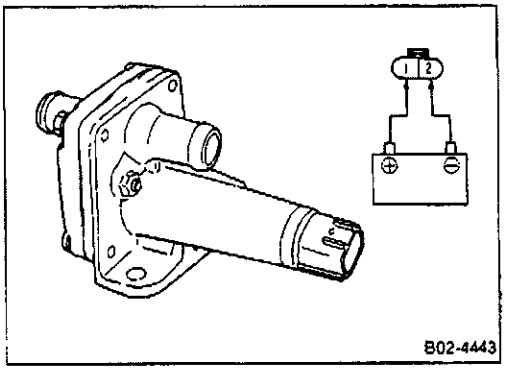



### (7) Air regulator inspection

① Shutter opening angle inspection (static characteristic)

- Visually inspect the shutter angle.

| Ambient temperature °C (°F) | Shutter opening angle |
|---|---|
| –20 (–4) max. | Fully open |
| 20 (68) | Half-open |
| 60 (140) min. | Fully closed |




② Inspection (dynamic characteristic)

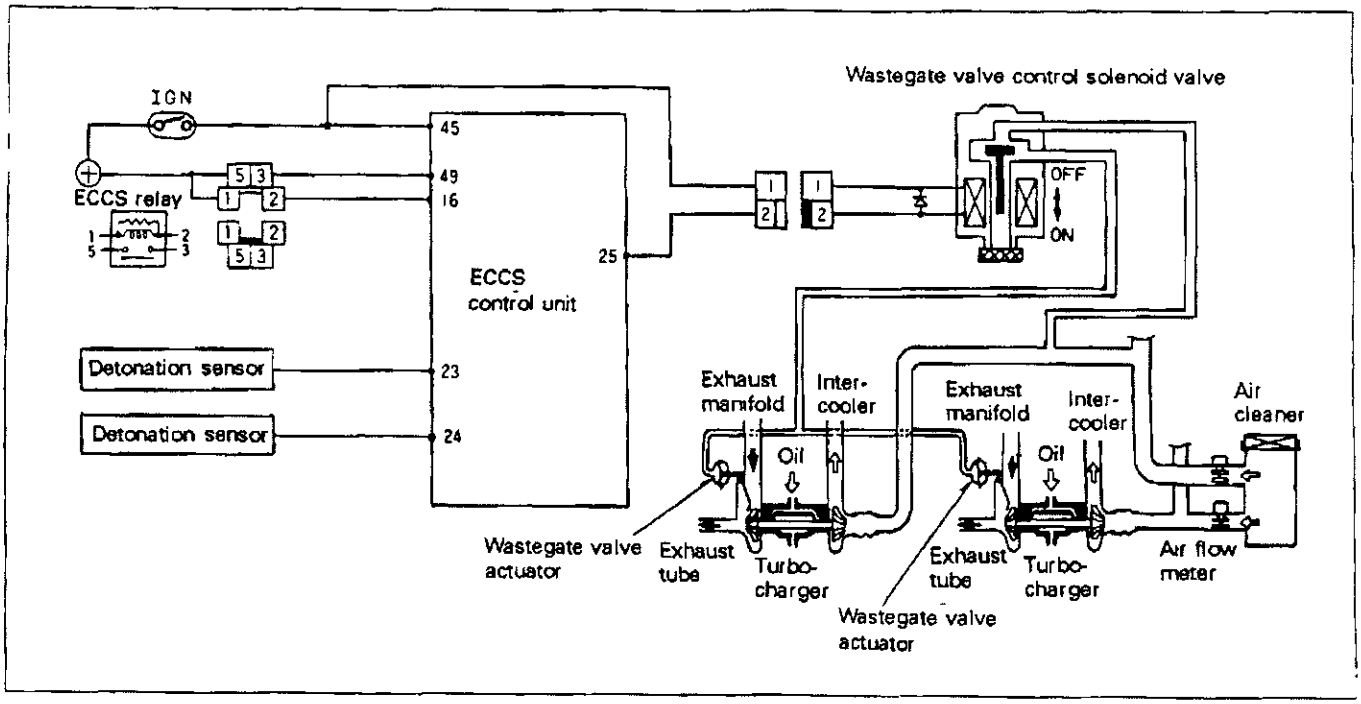
- Apply current from the battery to the terminals and check changes in shutter opening angle.

The shutter must gradually close fully within 7 minutes. [Ambient temperature approx. 20°C (68°F)]

(Reference) Heater resistance value: 75Ω [20°C (68°F)]

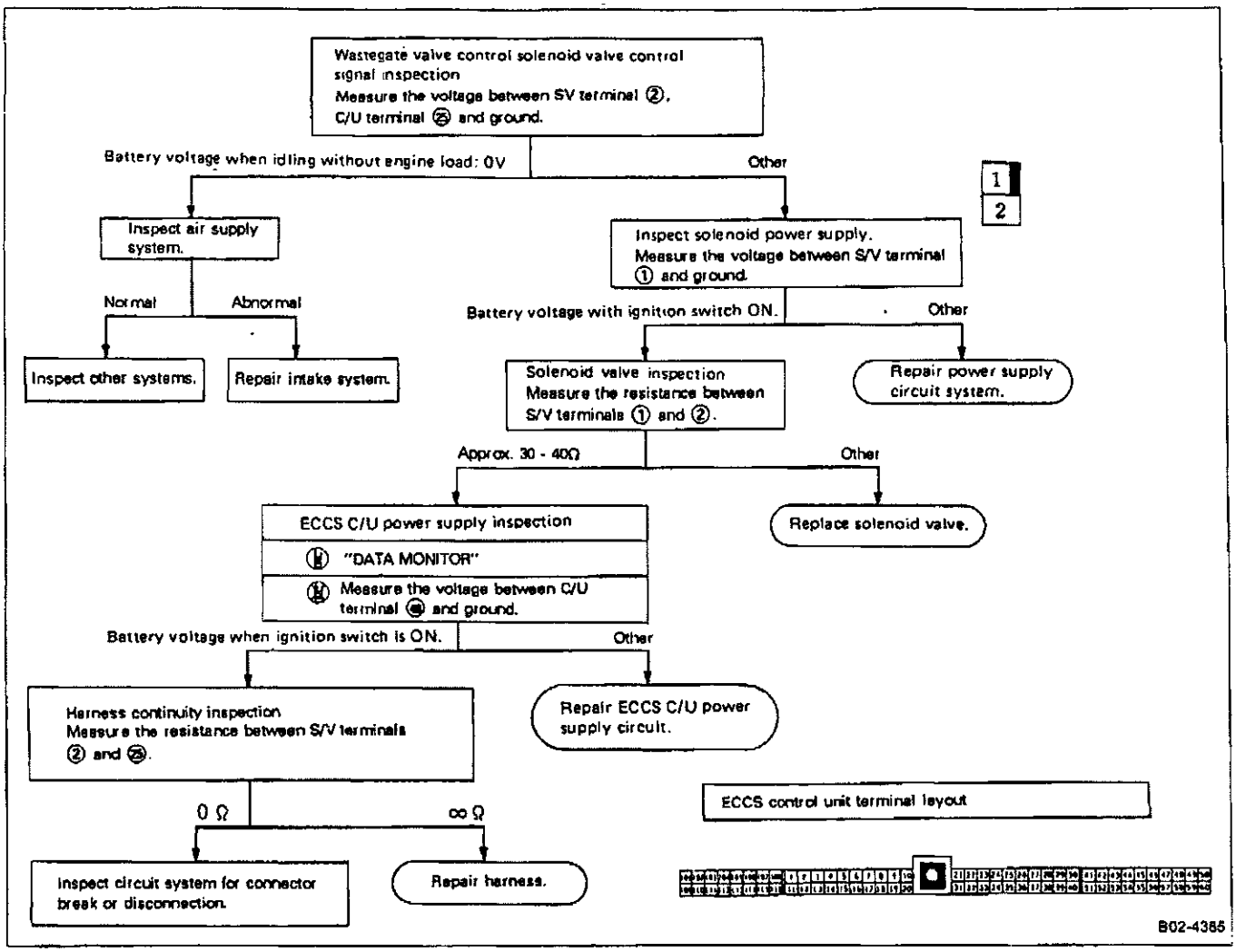
## 5. Actuator System Inspection (Cont'd)

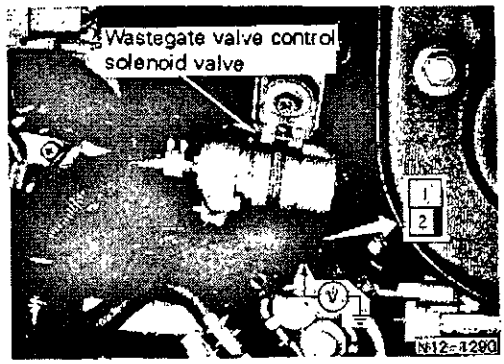
### 5-5 WASTEGATE VALVE CONTROL SYSTEM INSPECTION



## 5. Actuator System Inspection (Cont'd)

### Wastegate valve control system trouble diagnosis flowchart



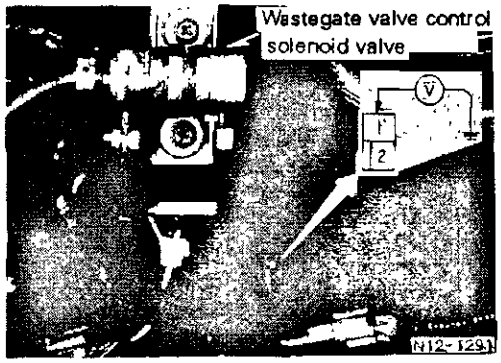




### (1) Wastegate valve control solenoid valve control signal inspection

- When wastegate valve control solenoid valve connectors are connected, measure the voltage between the following terminals and ground.
- When ECCS control unit connectors are connected, measure the voltage between the following terminals and ground.

| Engine / Measurement location / Condition | RB26DETT |
|---|---|
| Measurement location | • Between solenoid valve terminal (2) and ground<br>• Between ECCS C/U terminal (25) and ground |
| Idling | Battery voltage |
| With accelerator pedal depressed | Approx. 0V |

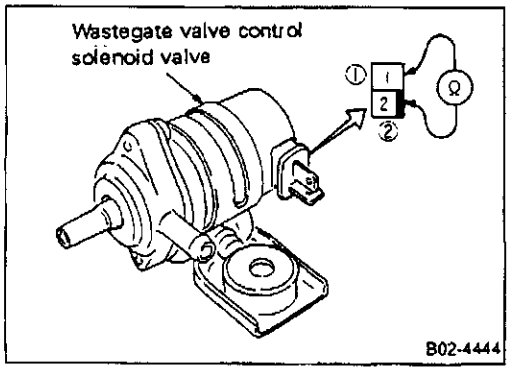
## 5. Actuator System Inspection (Cont'd)




### (2) Wastegate valve control solenoid valve power suppl inspection

- Remove the wastegate valve control solenoid valve cor nector and measure the voltage between the following ter minals and the ground.

| Engine / Measurement location / Condition | RB26DETT |
|---|---|
| | Between solenoid valve harness terminal (1) and ground |
| Ignition switch ON | Battery voltage |



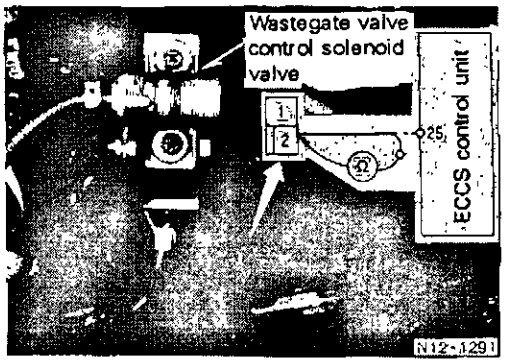

### (3) Wastegate valve control solenoid valve inspection

- Disconnect the wastegate valve control solenoid valve cor nector and measure the resistance between the followin terminals.

| Engine / Measurement location | RB26DETT |
|---|---|
| Between solenoid side terminals (1) and (2) | 30 - 40Ω |

### (4) ECCS control unit power supply inspection

- Refer to the fuel pump system section.




### (5) Harness continuity inspection

- Disconnect the connectors from the wastegate valve contr solenoid valve and ECCS control unit and measure th resistance between the following terminals.

| Engine / Measurement terminal | RB26DETT |
|---|---|
| Between ECCS C/U harness terminal (25) and solenoid valve harness terminal (2) | 0Ω |

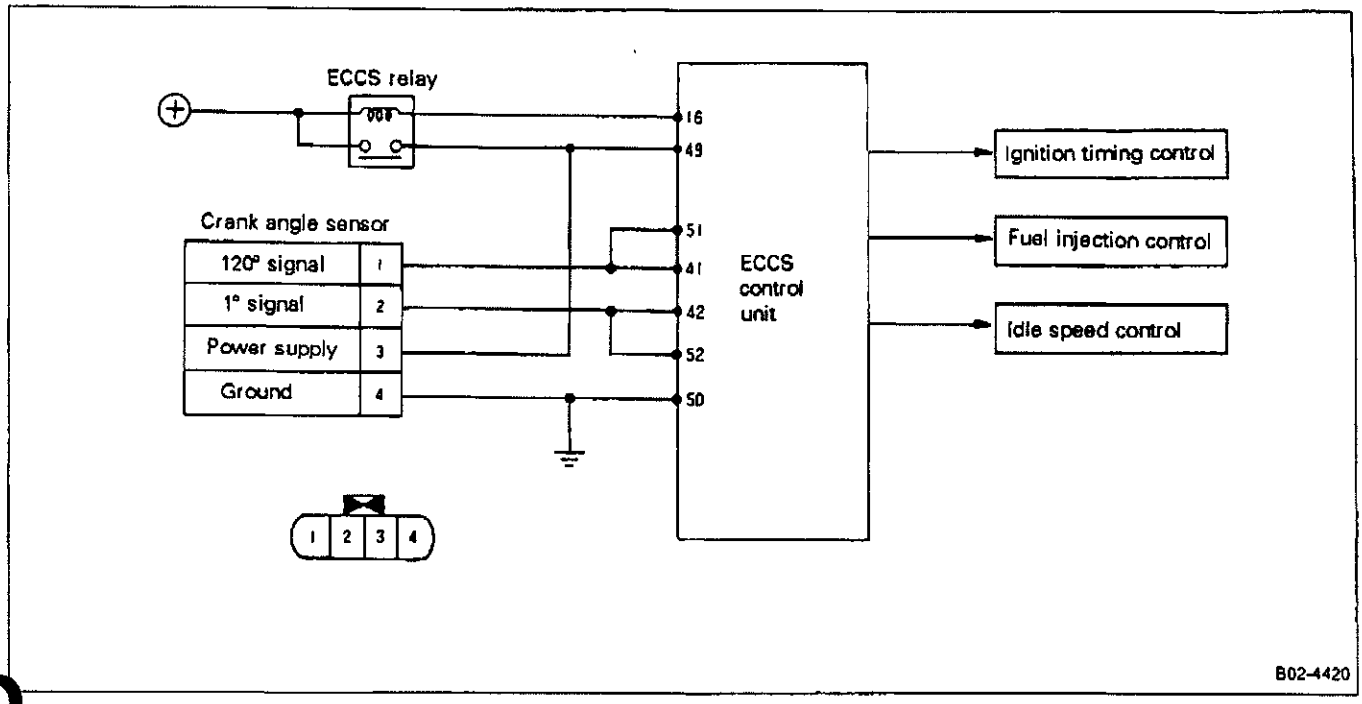
## 5-6 SUB ELECTRICAL FAN SYSTEM INSPECTION

Refer to item B6, 6.

## 6. Sensor System Inspection

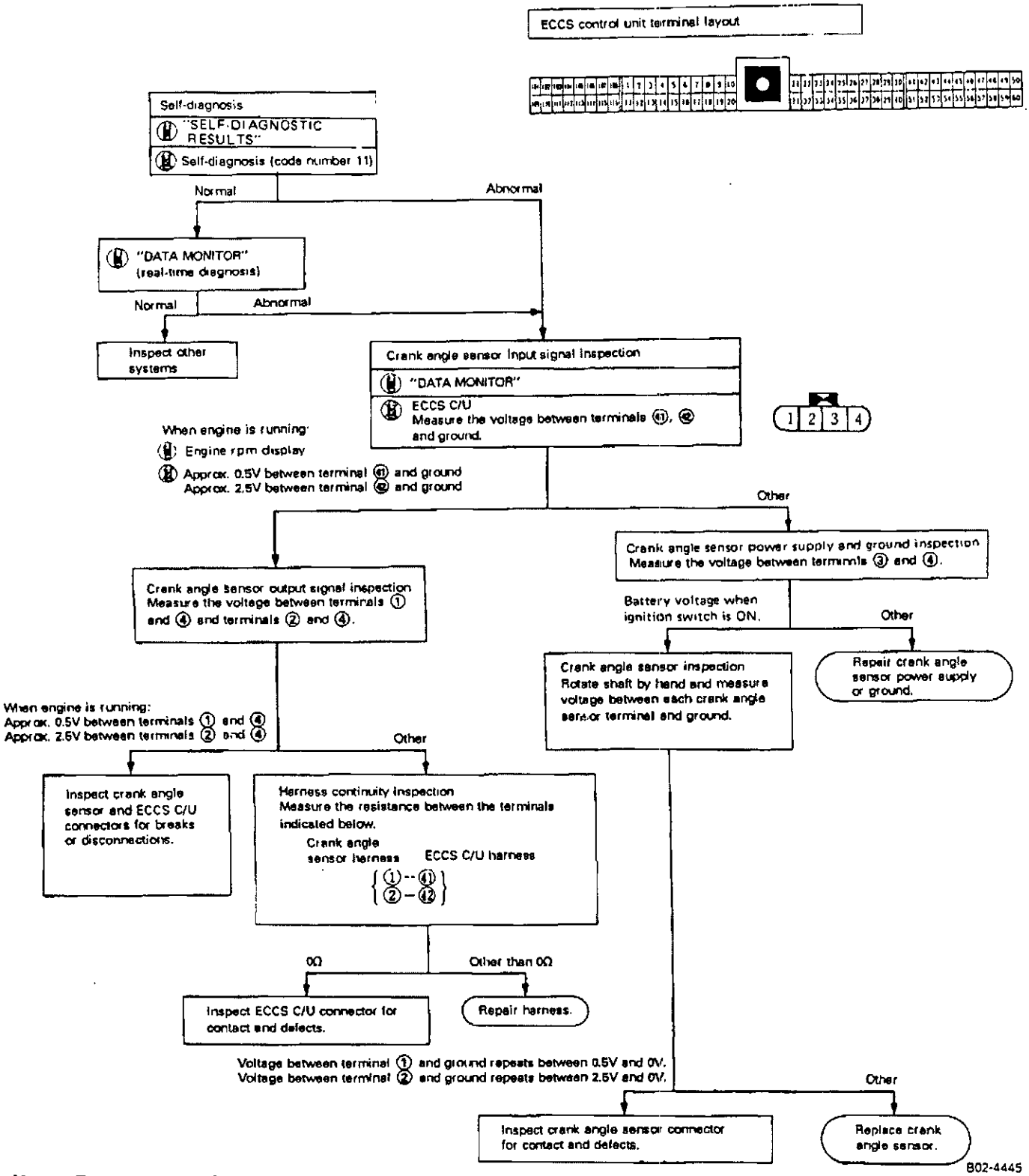
Use a circuit tester, CONSULT electrical system diagnosis tester and oscilloscope to test the sensor system. Refer to section 1, 1-1, (6) for an explanation of the measurement equipment operation procedures. Refer to section 5. for preparation.

### 6-1 CRANK ANGLE SENSOR SYSTEM INSPECTION



## 6. Sensor System Inspection (Cont'd)

### Crank angle sensor system trouble diagnosis flowchart




**Note: For crank angle sensor system inspection, use CONSULT and oscilloscope to check output waveform.**

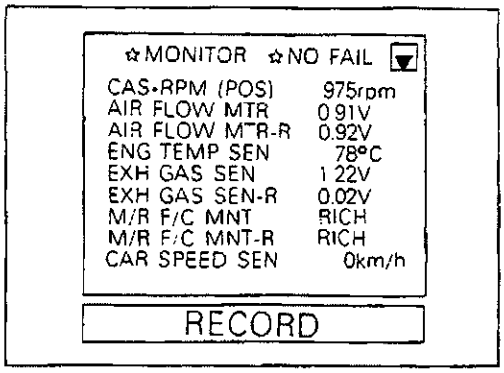
## 6. Sensor System Inspection (Cont'd)

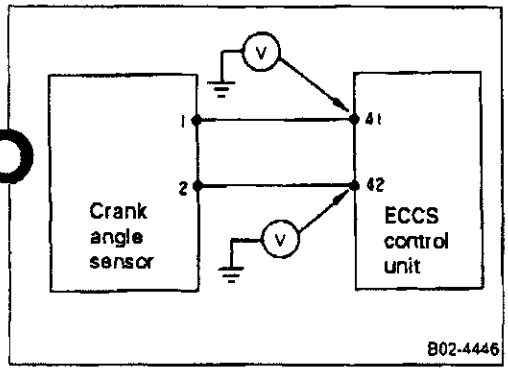
### (1) Self-diagnosis

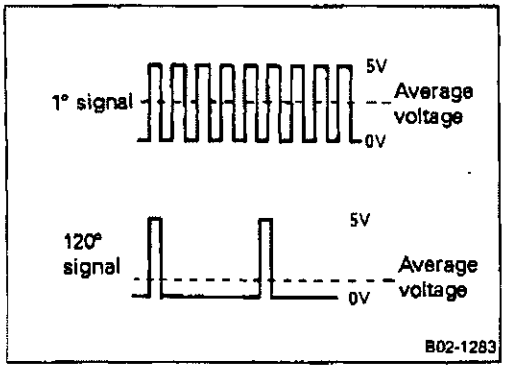
Normally in a self-diagnosis operation, when "CODE 11" or "FAULTY SYSTEM NAME " (when using CONSULT) is displayed if the 1° or 120° signal is not input within a fixed period of time. When this occurs, examine the following items carefully.

- When the malfunction reoccurs, use the real-time diagnosis (CONSULT "DATA MONITOR" mode) or oscilloscope to detect disconnections.
- When an abnormality is detected, consider these locations in the following sequence because there may be other malfunctions besides the crank angle sensor.

| ECCS harness (faulty contact) → crank angle sensor → ECCS control unit |
|---|




### (2) Input signal inspection

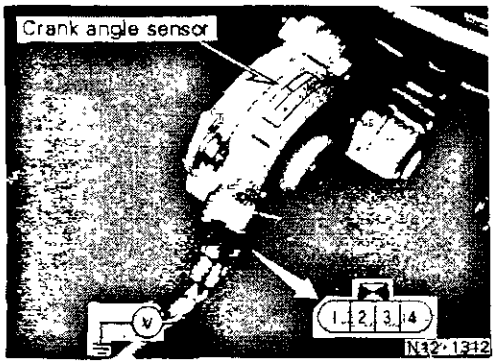
- Use the "CAS·RPM(POS)" item of the "DATA MONITOR" mode to determine engine speed.

- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine / Measurement location / Condition | RB26DETT | |
|---|---|---|
| | Between ECCS C/U terminal (41) and ground (120° signal) | Between ECCS C/U terminal (42) and ground (1° signal) |
| Ignition switch ON | 0V or approx. 5V | ← |
| Cranking | Approx. 0.5V | 2 - 3V |
| Idling | 0.3 - 0.7V | 2 - 3V |

**CAUTION:**
**The voltages in this chart are average voltage values of the pulse waveform measured by a circuit tester and these are the reference values. The waveform must be checked by an oscilloscope.**

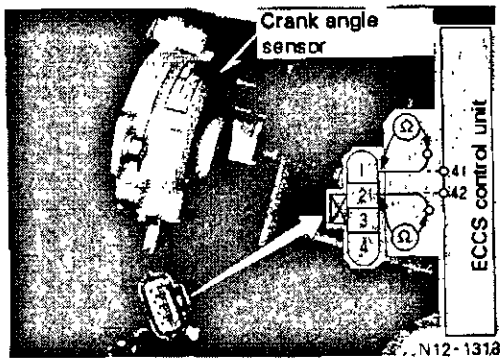
## 6. Sensor System Inspection (Cont'd)




### (3) Sensor output signal inspection

- Connect crank angle sensor connector, insert voltage measurement probe behind rear of connector and measure the voltages between following terminals.

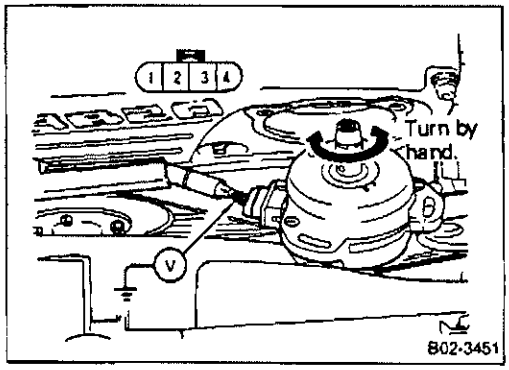
| Engine / Measurement location / Condition | RB26DETT | | |
|---|---|---|---|
| | Between crank angle sensor terminal (2) and ground (1° signal) | Between crank angle sensor terminal (1) and ground (120° signal) | Between crank angle sensor terminal (3) and ground (power) |
| Ignition switch ON | 0V or approx. 5V | ← | Battery voltage |
| Cranking engine | 2 - 3V | Approx. 0.5V | Battery voltage |
| Idling | 2 - 3V | 0.3 - 0.7V | Battery voltage |




### (4) Harness continuity inspection

- Disconnect connectors of ECCS control unit and crank angle sensor. Measure the resistance between the following terminals.

| Engine | RB26DETT | | |
|---|---|---|---|
| Measurement location | ECCS C/U harness | Crank angle sensor harness | 0 Ω |
| | Terminals (41) - (1)<br>(42) - (2) | | |



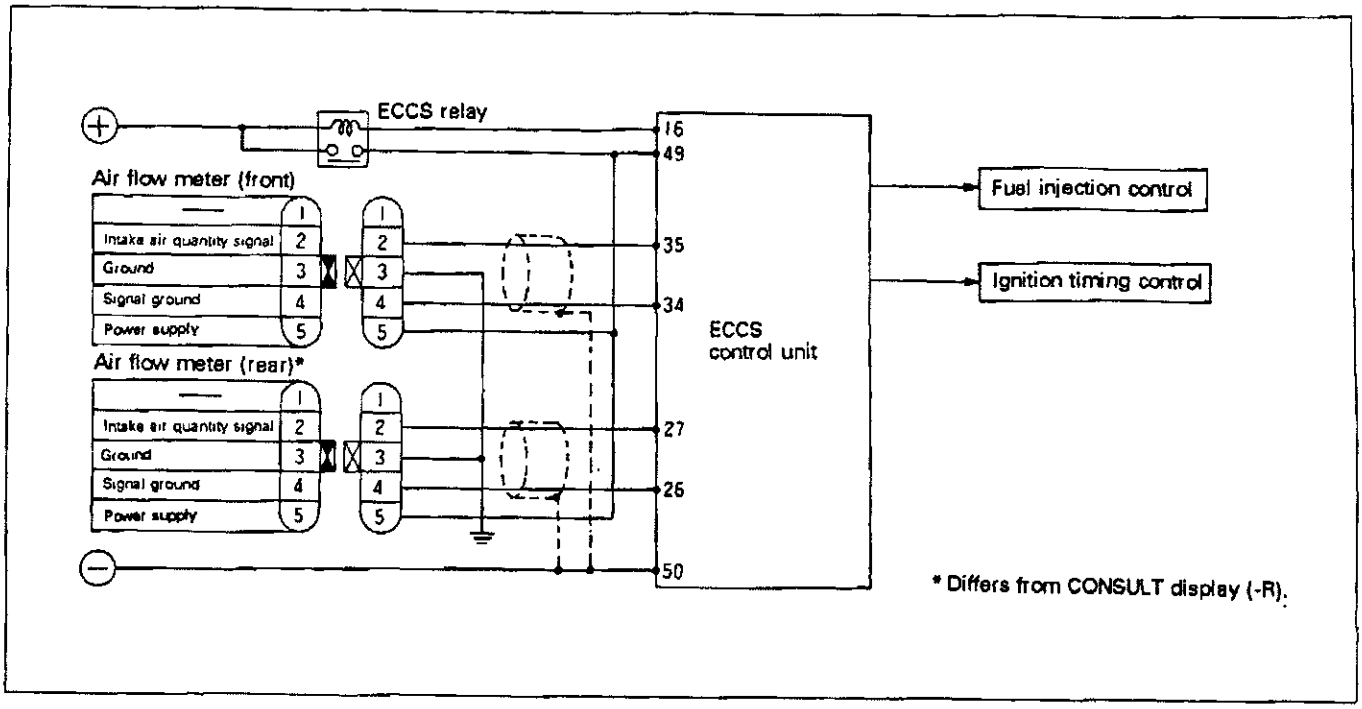

### (5) Crank angle sensor inspection

- Disconnect crank angle sensor from engine, turn shaft by hand and measure connector voltage.

| Engine / Measurement location / Condition | RB26DETT | | | |
|---|---|---|---|---|
| | Between crank angle sensor terminal (2) and ground (1° signal) | Between crank angle sensor terminal (1) and ground (120° signal) | Between crank angle sensor terminal (3) and ground (power supply) | Between crank angle sensor terminal (4) and ground (ground) |
| Ignition switch ON | 0V or approx. 5V | ← | Battery voltage | 0V |

**CAUTION:**
**To prevent injector from operating, remove fuse or connector before inspection. When an apparent abnormality is detected by self-diagnosis according to shaft rotation, be careful because it may not be an actual abnormality in this case.**

## 6-2 AIR FLOW METER SYSTEM INSPECTION

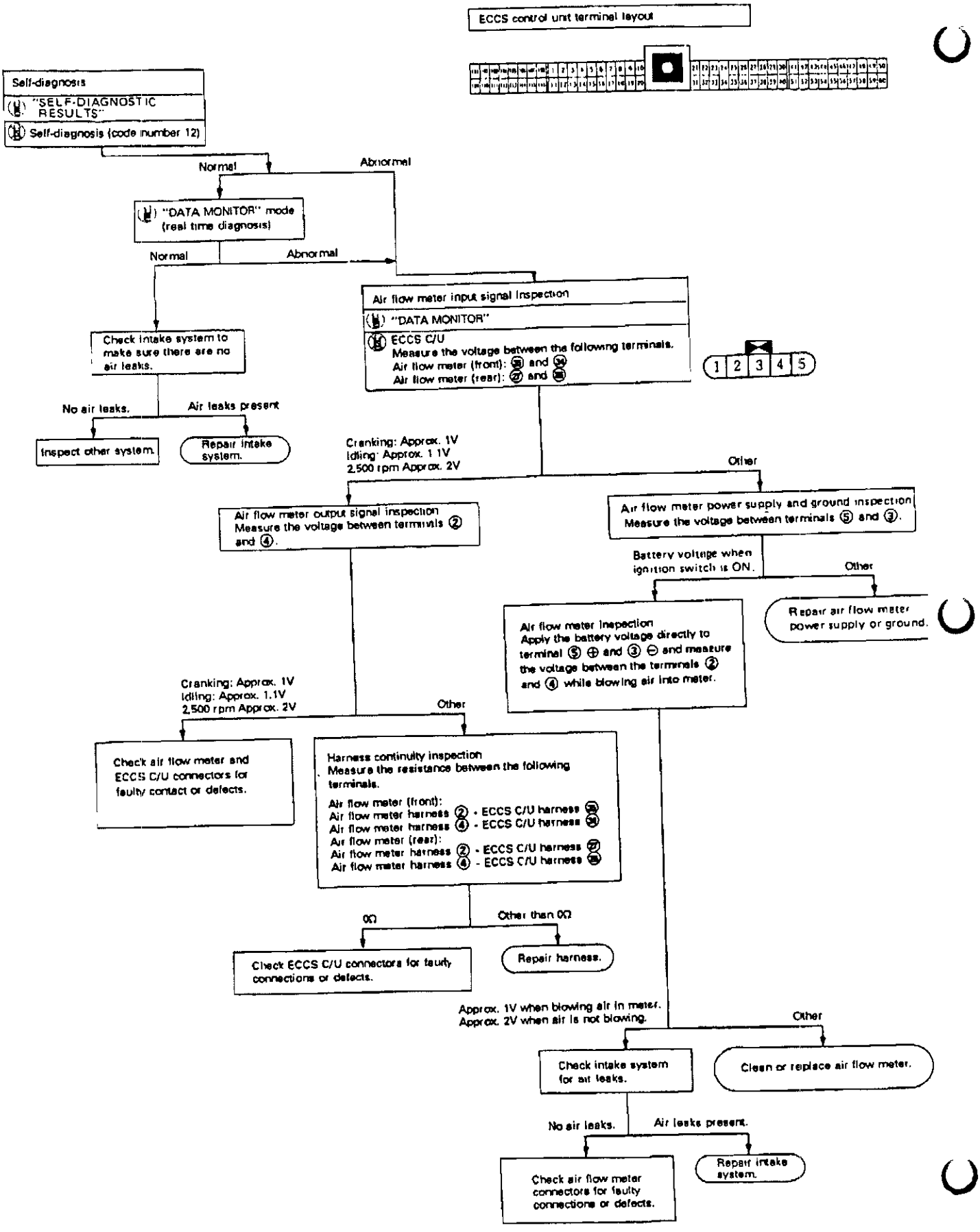



### Cylinder air flow meter, CONSULT (data monitor) display items

| Cylinder No. | Air flow meter | ECCS C/U terminal number | CONSULT (data monitor) display |
|---|---|---|---|
| No. 1, 2, 3 cyl. | AFM (Front) | ECCS C/U ㉟ | AIR FLOW METER-R |
| No. 4, 5, 6 cyl. | AFM (Rear) | ECCS C/U ㉗ | AIR FLOW METER |

## 6. Sensor System Inspection (Cont'd)

### Air flow meter system trouble diagnosis flowchart

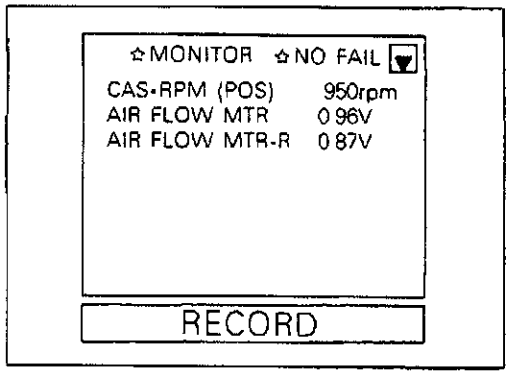


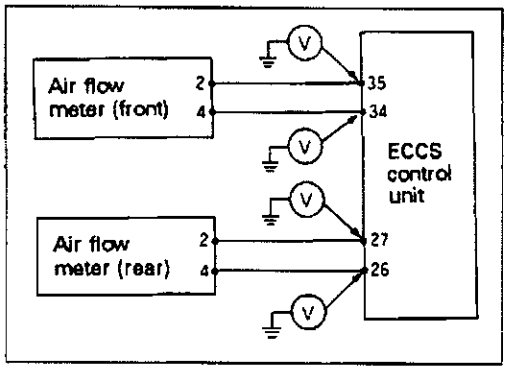
## 6. Sensor System Inspection (Cont'd)

### (1) Self-diagnosis

- When the "CODE No. 12" or "FAULTY SYSTEM - AIR FLOW METER" (when CONSULT is used) are normally displayed in self-diagnosis, the intake air quantity signal voltage is abnormally high or low, and a disconnection or short-circuit in the signal system should be considered.
- When the malfunction occurs again, use real-time diagnosis (CONSULT "DATA MONITOR" mode) or oscilloscope to detect instantaneous breaks.
- When an abnormality is detected, consider these locations in the following sequence because there may be other malfunctions besides the air flow sensor.

| |
|---|
| When intake air quantity is low: ECCS harness (faulty contact) → air flow meter → ECCS control unit → intake system (not airtight) |
| When intake air quantity is high: ECCS harness (faulty contact) → intake system (not airtight), faulty wastegate valve control, air flow meter → ECCS control unit |




### (2) Input signal inspection

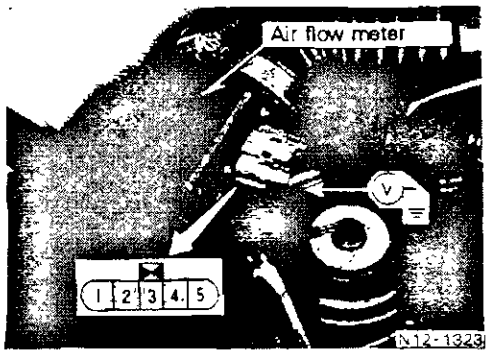
- Use "AIR FLOW METER" and "AIR FLOW METER (R)" in the "DATA MONITOR" mode to check the following items.

| Item / Condition | Air flow meter (F) | Air flow meter (R) |
|---|---|---|
| Ignition switch ON | Approx. 0.3V | ← |
| Idling | Approx. 1.1V | ← |
| 2,500 rpm | 1.5 - 2.0 | ← |

- Measure the voltage between the following terminals with the ECCS control unit harness connected.

| Item / Measurement location / Condition | Air flow meter (F) | | Air flow meter (R) | |
|---|---|---|---|---|
| | ECCS C/U terminal (35) and ground (intake air quantity signal) | ECCS C/U terminal (34) and ground (ground signal) | ECCS C/U terminal (27) and ground (intake air quantity signal) | ECCS C/U terminal (26) and ground (ground signal) |
| Ignition switch ON | Approx. 0.3V | 0V | Approx. 0.3V | 0V |
| Cranking engine | Approx. 1V | 0V | Approx. 1V | 0V |
| Idling | Approx. 1.1V | 0V | Approx. 1.1V | 0V |

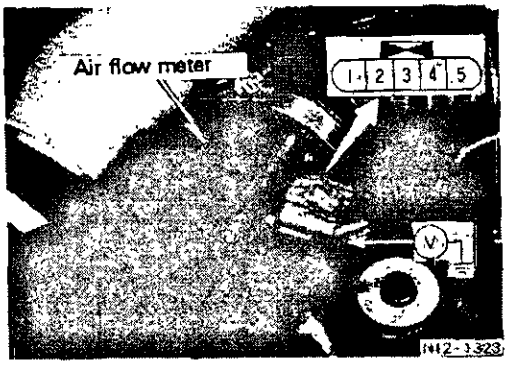
## 6. Sensor System Inspection (Cont'd)




### (3) Air flow meter output signal inspection

- Measure the voltage between the following terminals with the air flow meter connectors connected.

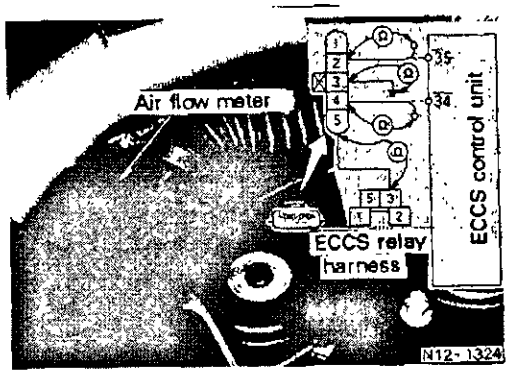
| Item / Measurement location / Condition | Air flow meter (F) | | Air flow meter (R) | |
|---|---|---|---|---|
| | Air flow meter terminal (2) and ground (intake air quantity signal) | Air flow meter terminal (4) and ground (ground signal) | Air flow meter terminal (2) and ground (intake air quantity signal) | Air flow meter terminal (4) and ground (ground signal) |
| Ignition switch ON | Approx. 0.3V | 0V | Approx. 0.3V | 0V |
| Cranking engine | Approx. 1V | 0V | Approx. 1V | 0V |
| Idling | Approx. 1.1V | 0V | Approx. 1.1V | 0V |




### (4) Air flow meter power supply inspection

- Measure the voltage between the following terminals and the ground with the air flow meter harness connected.

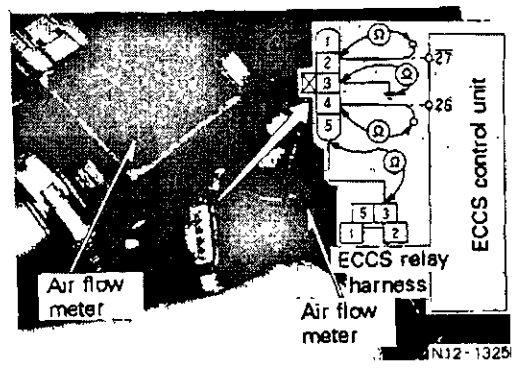
| Engine / Measurement location / Condition | RB26DETT |
|---|---|
| | Between air flow meter terminal (5) and ground |
| Ignition switch ON and engine running | Battery voltage |

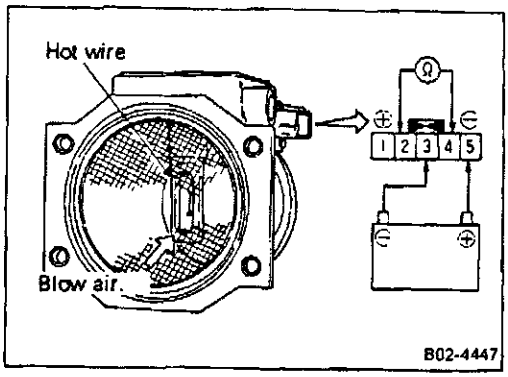



### (5) Harness continuity inspection

- Disconnect the ECCS control unit and air flow meter connectors and measure the resistance between the following terminals.

| | Air flow meter (Front) | | | Air flow meter (Rear) | | |
|---|---|---|---|---|---|---|
| | Air flow meter harness | ECCS C/U harness | | Air flow meter harness | ECCS C/U harness | |
| Measurement location | terminal (2) to terminal (35)<br>terminal (4) to terminal (34)<br>terminal (3) to body ground<br>terminal (5) to ECCS relay harness terminal (3) | | 0Ω | terminal (2) to terminal (27)<br>terminal (4) to terminal (26)<br>terminal (3) to body ground<br>terminal (5) to ECCS relay harness terminal (3) | | 0Ω |






## 6. Sensor System Inspection (Cont'd)

### (6) Air flow meter inspection

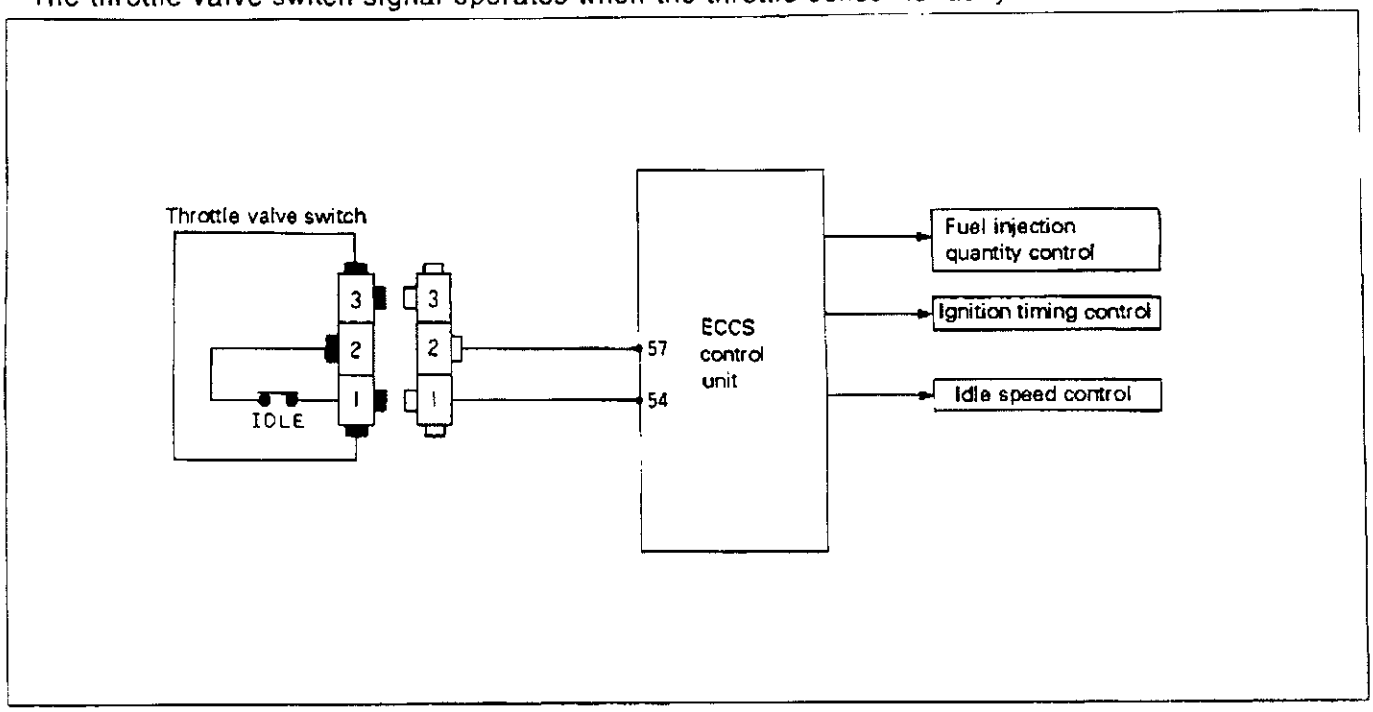
- Apply the battery voltage directly to terminal (5) ⊕ and (3) ⊖ and measure the voltage change between the terminals (2) and (4) while blowing air on hot wire.

| Condition \ Engine | RB26DETT |
|---|---|
| No air blowing | Approx. 0.8V |
| Blow air. | Approx. 2V |

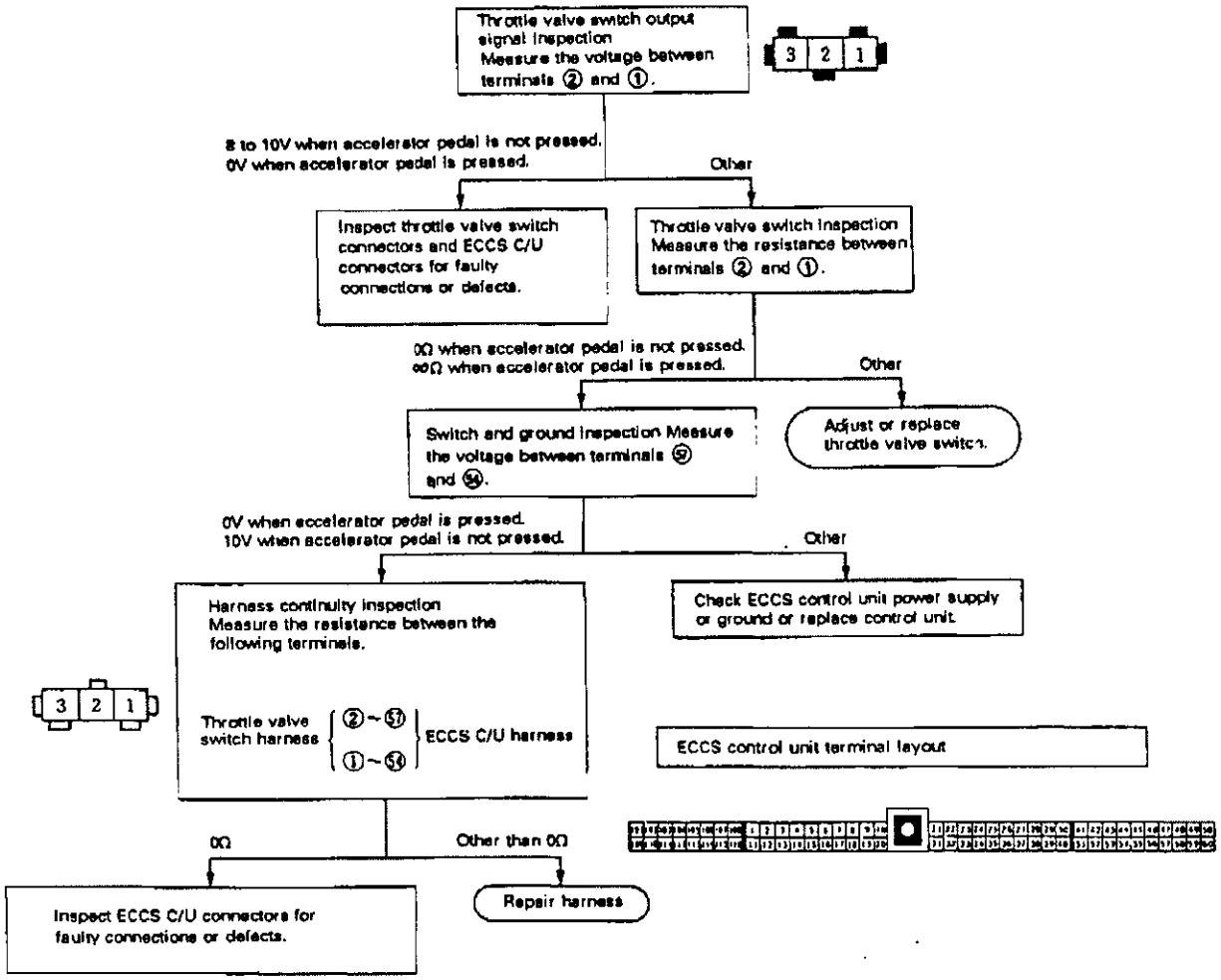
## 6. Sensor System Inspection (Cont'd)

### 6-3 THROTTLE VALVE SWITCH SYSTEM INSPECTION

* The throttle valve switch signal operates when the throttle sensor is faulty.

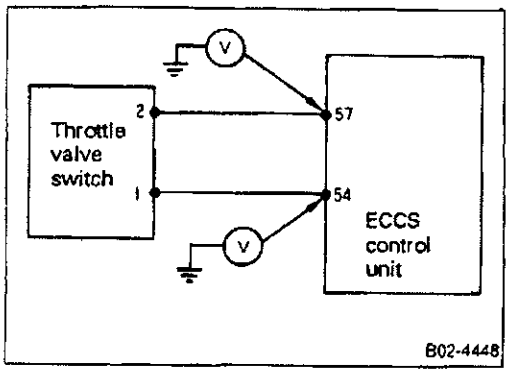



### Throttle valve switch system trouble diagnosis flowchart



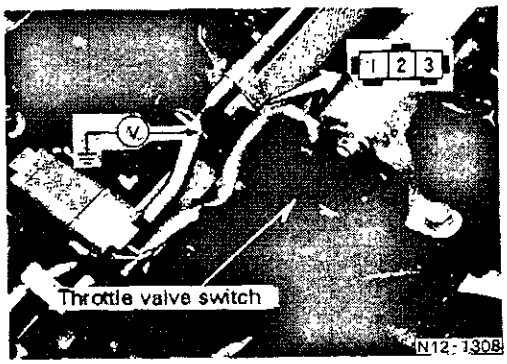
## 6. Sensor System Inspection (Cont'd)

### (1) Input/output signal inspection




- Measure the voltage between the following terminals and the ground with the ECCS control unit harness connected.
- Measure the voltage between the throttle valve switch connector terminal (2) and body ground.

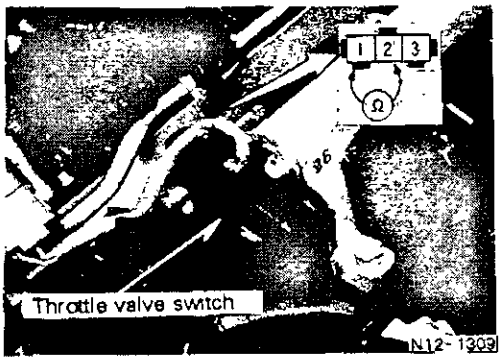
| Condition \ Measurement location | | Between ECCS control unit terminal (54) and ground (or throttle valve switch terminal (1) and ground) |
|---|---|---|
| | | Engine: RB26DETT |
| Ignition switch ON or engine running | Accelerator pedal is not pressed (idle contact ON) | 8 - 10V |
| | Accelerator pedal is pressed (idle contact OFF) | 0V |
| Cranking engine | | Approx. 8V |




- Measure the voltage between the following terminals and the ground with the ECCS control unit harness connected.
- Measure the voltage between the throttle valve switch connector terminal (2) and body ground.

| Condition \ Measurement location | Between ECCS control unit terminal (57) and ground (or throttle valve switch terminal (2) and ground) |
|---|---|
| Engine | RB26DETT |
| Ignition switch ON | 8 - 10V |

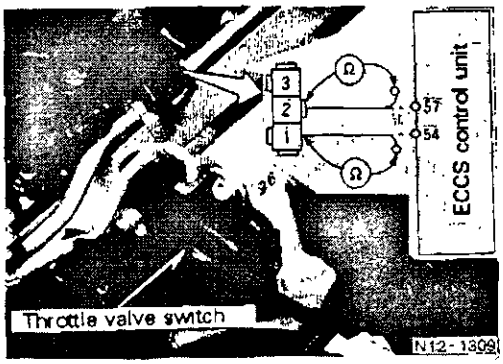
## 6. Sensor System Inspection (Cont'd)




### (2) Throttle valve switch inspection (idle contact point)

- Remove the throttle valve switch connector and measure the resistance between the following throttle valve switch terminals.

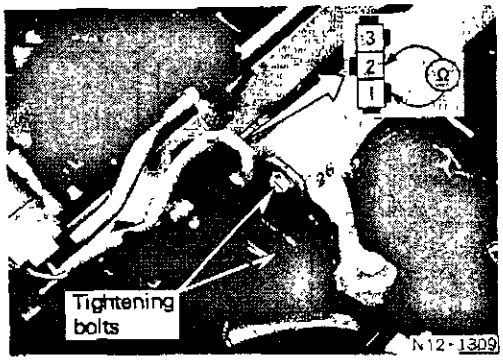
| Engine / Measurement location / Condition | RB26DETT<br>Between throttle valve switch terminals (2) and (1) |
|---|---|
| Accelerator pedal is not pressed (idle contact ON) | 0Ω |
| Accelerator pedal is pressed (idle contact OFF) | ∞ Ω |




### (3) Harness continuity inspection

- Remove the throttle valve switch and ECCS control uni connectors and measure the resistance between the follow ing terminals.

| Engine | RB26DETT | | | |
|---|---|---|---|---|
| Measurement location | ECCS C/U harness | | Throttle valve switch harness | 0Ω |
| | Terminal (54) | to | terminal (1) | |
| | Terminal (57) | to | terminal (2) | |




### (4) Idle contact point (touch speed) inspection and adjustment

- Remove the AAC valve connector and inspect the unit wher the AAC valve is fully opened.

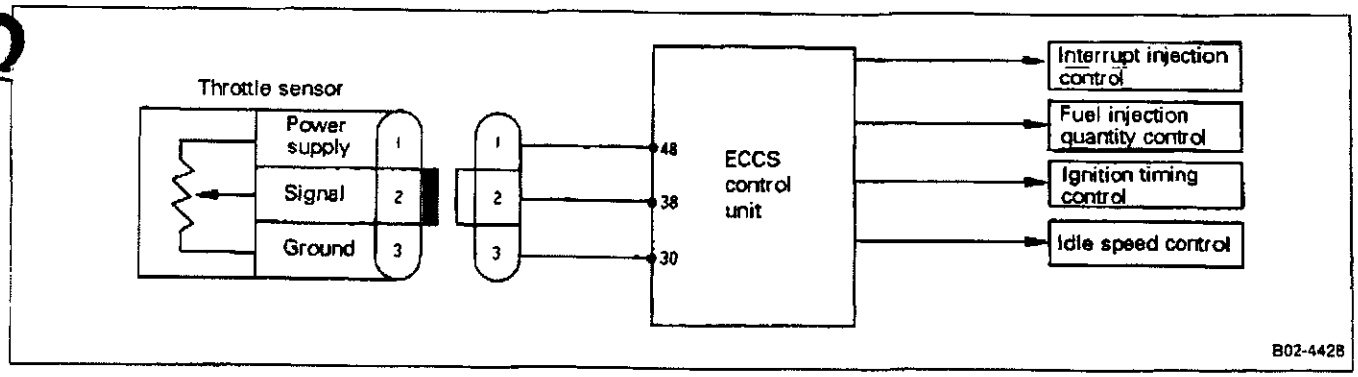
| | |
|---|---|
| Idle contact point tachometer speed (rpm) | 1,200 ± 500 |

When the tachometer speed does not conform to the specifie value, perform the adjustment as follows.

- Loosen the throttle valve switch tightening bolts (2).
- Remove the throttle valve switch connectors, place a tes probe between throttle valve switch terminals (1) and (2 and measure the resistance.
- Press on the accelerator pedal and gradually release peda to lower the engine speed. Rotate the throttle valve switcl body and secure it in the position where the tachomete speed conforms to the specified value and the idle contac point is "ON" (the resistance between terminals (1) and (2 is 0Ω).
- Tighten the throttle valve switch tightening bolts.
- Make sure that the idle is ON observing by the tachomete speed as described above.
- Connect the throttle valve switch connectors.

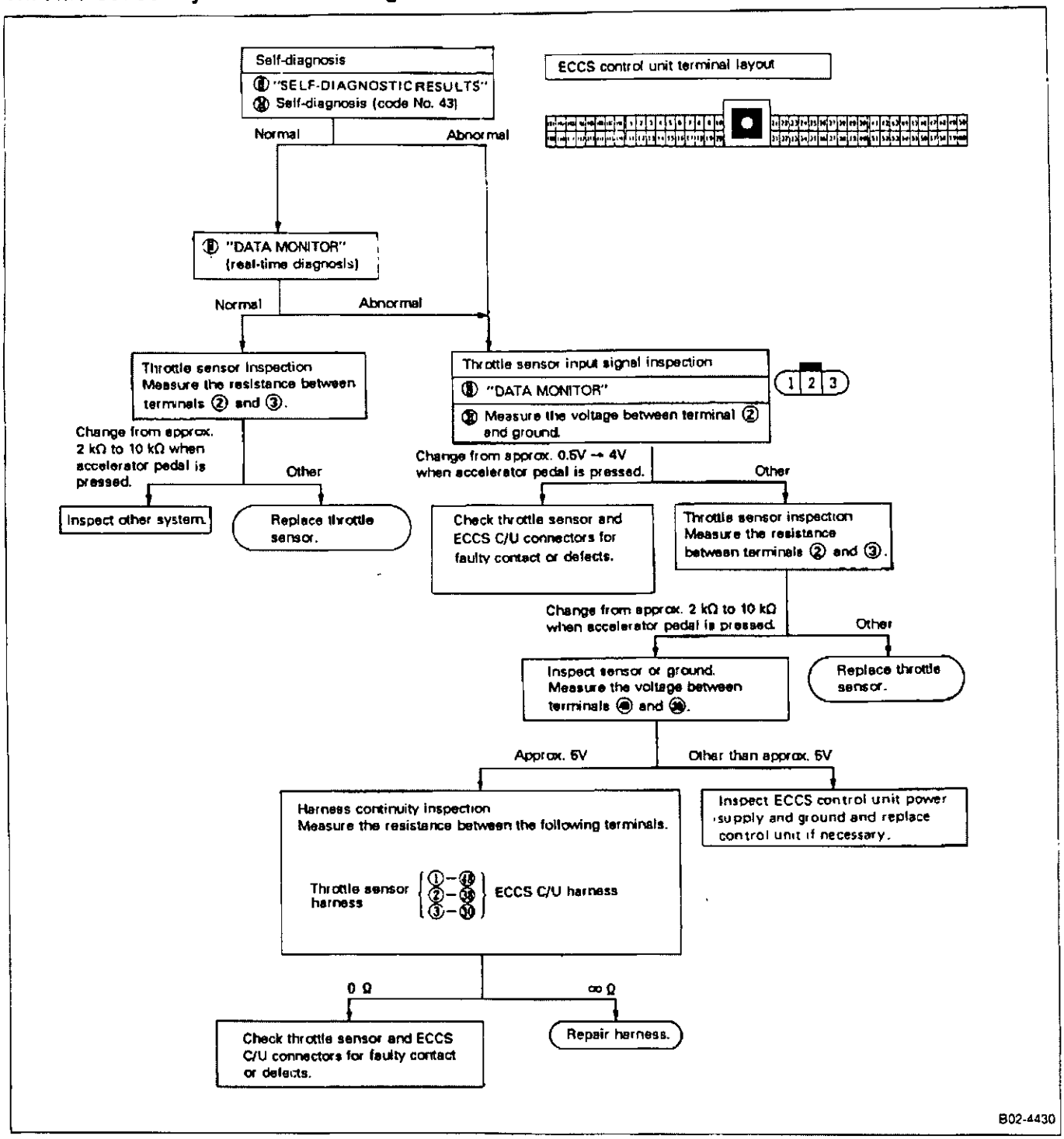
## 6. Sensor System Inspection (Cont'd)

### 6-4 THROTTLE SENSOR SYSTEM INSPECTION



## 6. Sensor System Inspection (Cont'd)

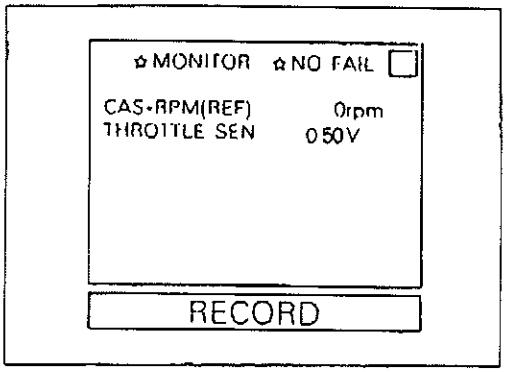
### Throttle sensor system trouble diagnosis flowchart




### (1) Self-diagnosis

- There is a disconnection or short-circuit in the signal system when "CODE No. 43" is displayed in regular self-diagnosis (mode 2). If this occurs, check throttle sensor resistance, harness continuity, etc.
  - If the problem reoccurs, use real-time diagnosis mode or an oscilloscope to check for instantaneous break in the signal.

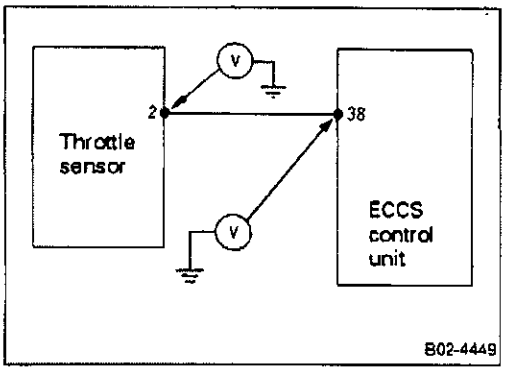
## 6. Sensor System Inspection (Cont'd)




### (2) Input signal inspection

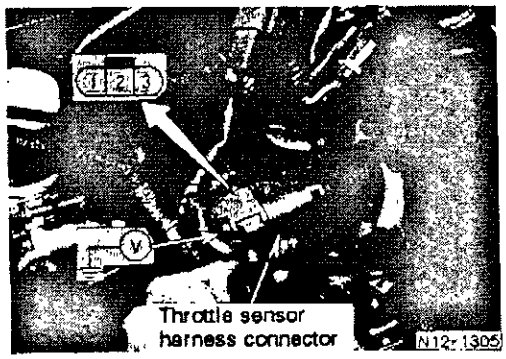
- Use the "THROTTLE SENSOR" setting of "DATA MONITOR" mode to check the following items.

| | | | Throttle sensor |
|---|---|---|---|
| Ignition switch ON | Accelerator pedal not pressed | | Approx. 0.5V |
| | Accelerator pedal pressed | Half-way | 0.5 - 4.0V |
| | | Fully pressed | Approx. 4.0V |




- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.
- Measure the voltage between terminal (2) and ground with throttle sensor harness connected.

| Condition \ Measurement location | | Engine: RB26DETT<br>Between ECCS C/U terminal (38) and ground (or throttle sensor terminal (2) and ground) |
|---|---|---|
| Ignition switch ON | | Approx. 0.5V |
| Cranking engine | | Approx. 0.5V |
| Engine running | Accelerator pedal not pressed | Approx. 0.5V |
| | Accelerator pedal pressed (half-way) | 0.5 - 4V |

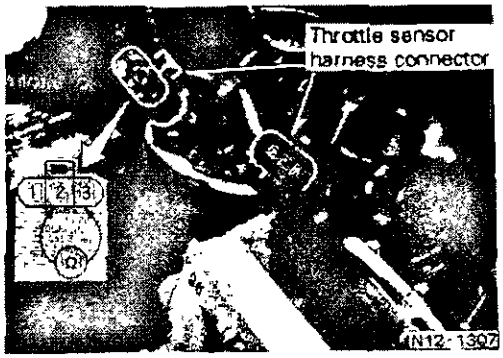



### (3) Throttle sensor power inspection

- Measure the voltage between the following terminals and ground with throttle sensor harness connected.

| Condition \ Measurement location | Engine: RB26DETT<br>Between throttle sensor terminal (1) and ground |
|---|---|
| Ignition switch ON and engine running | Approx. 5V |

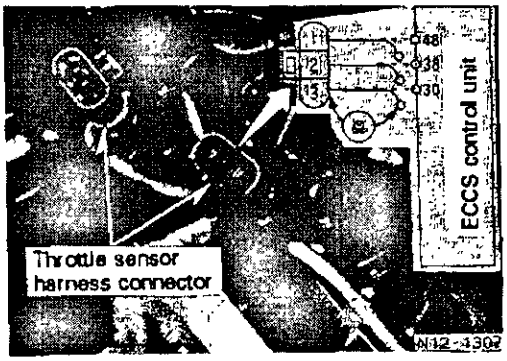
## 6. Sensor System Inspection (Cont'd)




### (4) Throttle sensor inspection

- Remove the throttle sensor connector and measure the resistance between the following terminals when the accelerator pedal is pressed and not pressed.

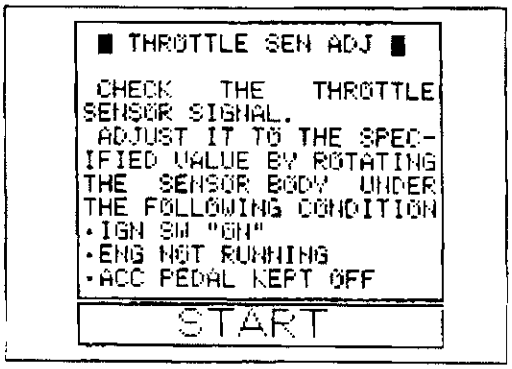
| Engine / Measurement location / Condition | RB26DETT<br>Between throttle sensor terminals (2) and (3) |
|---|---|
| Accelerator pedal not pressed. | Approx. 2 kΩ |
| Accelerator pedal partially pressed. | Approx. 2 - 10 kΩ<br>(Resistance increases as pedal is pressed.) |
| Accelerator pedal fully pressed. | Approx. 10 kΩ |




### (5) Harness continuity inspection

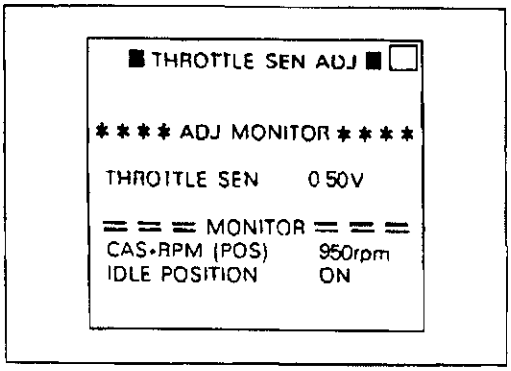
- Remove the ECCS control unit and throttle sensor connectors and measure the resistance between the following terminals.

| Engine | RB26DETT | | | | |
|---|---|---|---|---|---|
| | ECCS C/U harness | | Throttle sensor harness | | |
| Measurement location | Terminals | (48) | to | (1) | 0Ω |
| | | (38) | to | (2) | |
| | | (30) | to | (3) | |

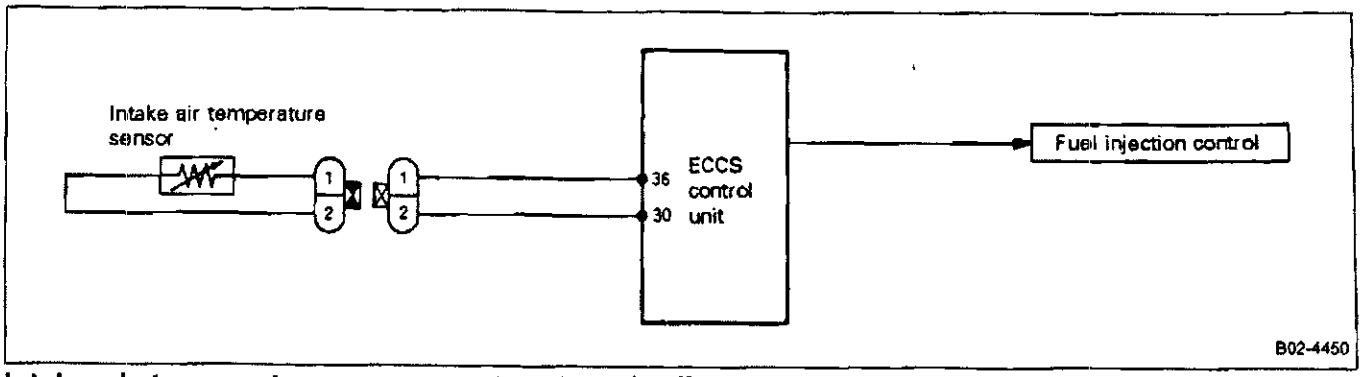



### (6) Throttle sensor inspection

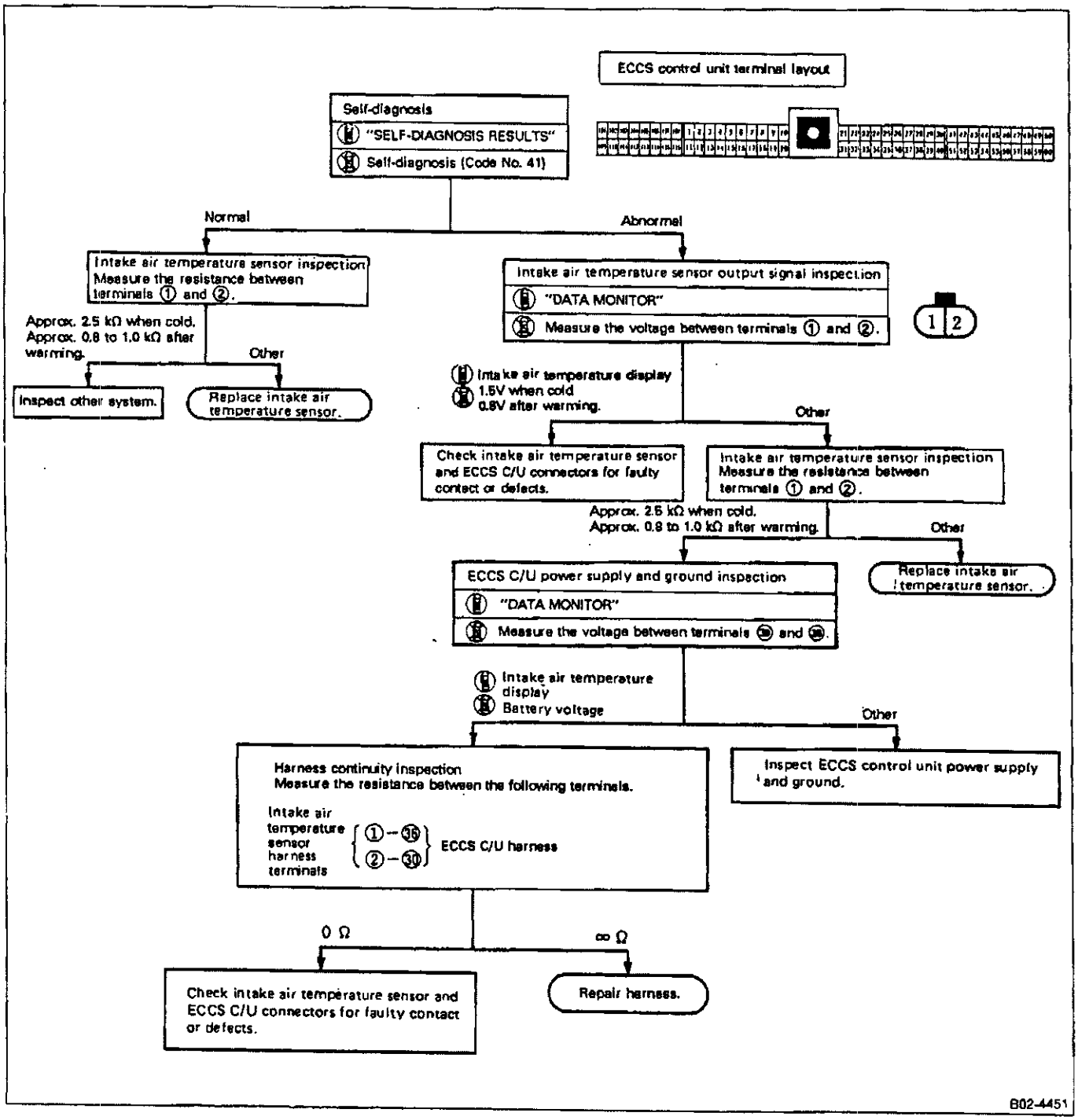
- Warm engine adequately and check operation using "THROTTLE SENSOR ADJUSTMENT" in "WORK SUPPORT" mode. (The throttle sensor does not need to be adjusted.)



## 6-5 INTAKE AIR TEMPERATURE SENSOR SYSTEM INSPECTION



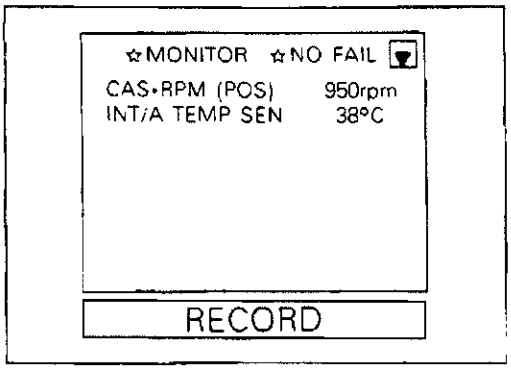

### Intake air temperature sensor system trouble diagnosis flowchart

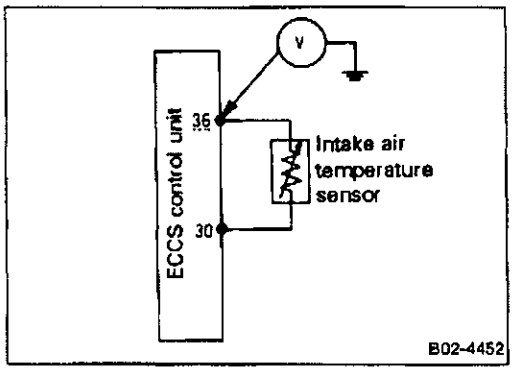


## 6. Sensor System Inspection (Cont'd)

### (1) Self-diagnosis

- There is a disconnection or short-circuit in the signal system when "CODE No. 41" in regular self-diagnosis or "FAILURE DETECTED IN T/A TEMP SEN" (when CONSULT is used) is displayed.
- If the problem reoccurs, use real-time diagnosis mode (CONSULT data monitor) or an oscilloscope to check for instantaneous break in the signal.



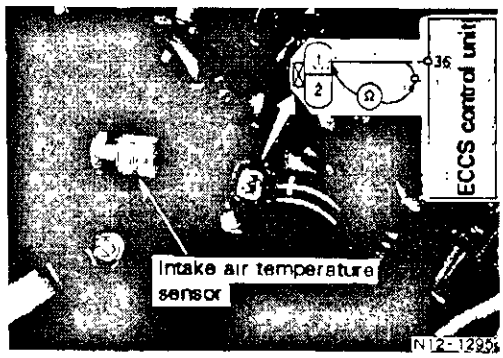

### (2) Input signal inspection

- Use the "INT/A TEMP SEN" setting of "DATA MONITOR" mode to check the following items.

| Condition \ Measurement location | Intake air temperature sensor |
|---|---|
| Ignition switch ON | Temperature display corresponds to intake air temperature. |
| Idling | |

- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Condition | | Between ECCS C/U terminal (36) and ground |
|---|---|---|
| Ignition switch OFF | | 0V |
| Ignition switch ON | Approx. 20°C (68°F) | 1.5V |
| | Approx. 45°C (113°F) | 0.8V |
| Idling | Approx. 20°C (68°F) | 1.5V |
| | Approx. 45°C (113°F) | 0.8V |



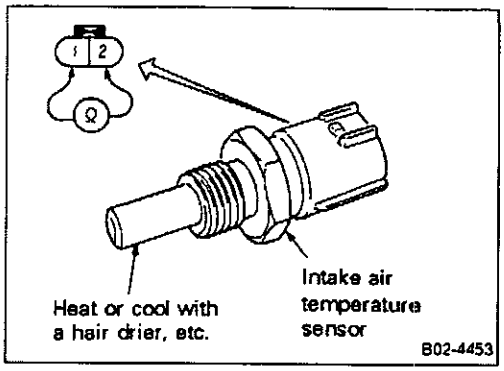

### (3) Harness continuity inspection

- Remove the ECCS control unit and intake air temperature sensor connectors and measure the resistance between the following terminals.

| Measurement location | | |
|---|---|---|
| | Between ECCS control unit harness terminal (36) and intake air temperature sensor harness terminal (1) | 0Ω |

## 6. Sensor System Inspection (Cont'd)

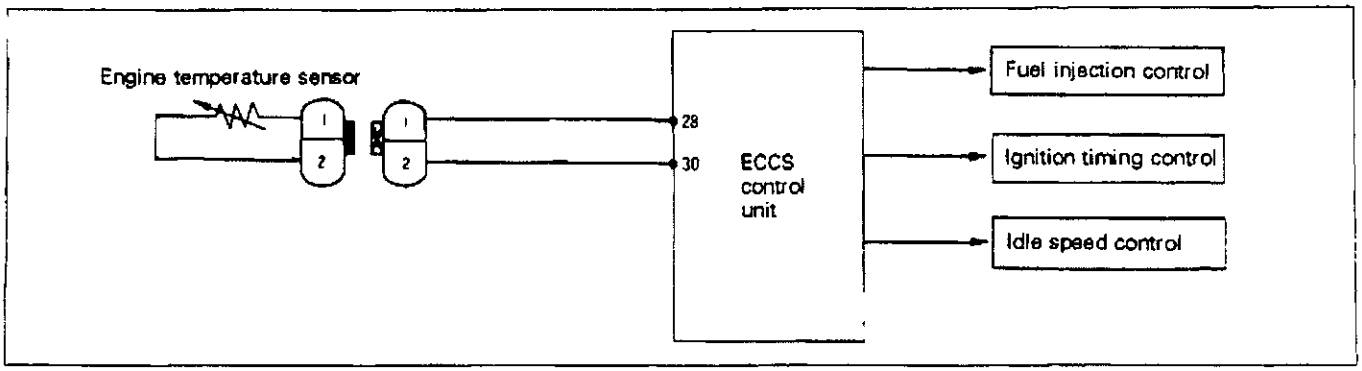
### (4) Intake air temperature sensor inspection



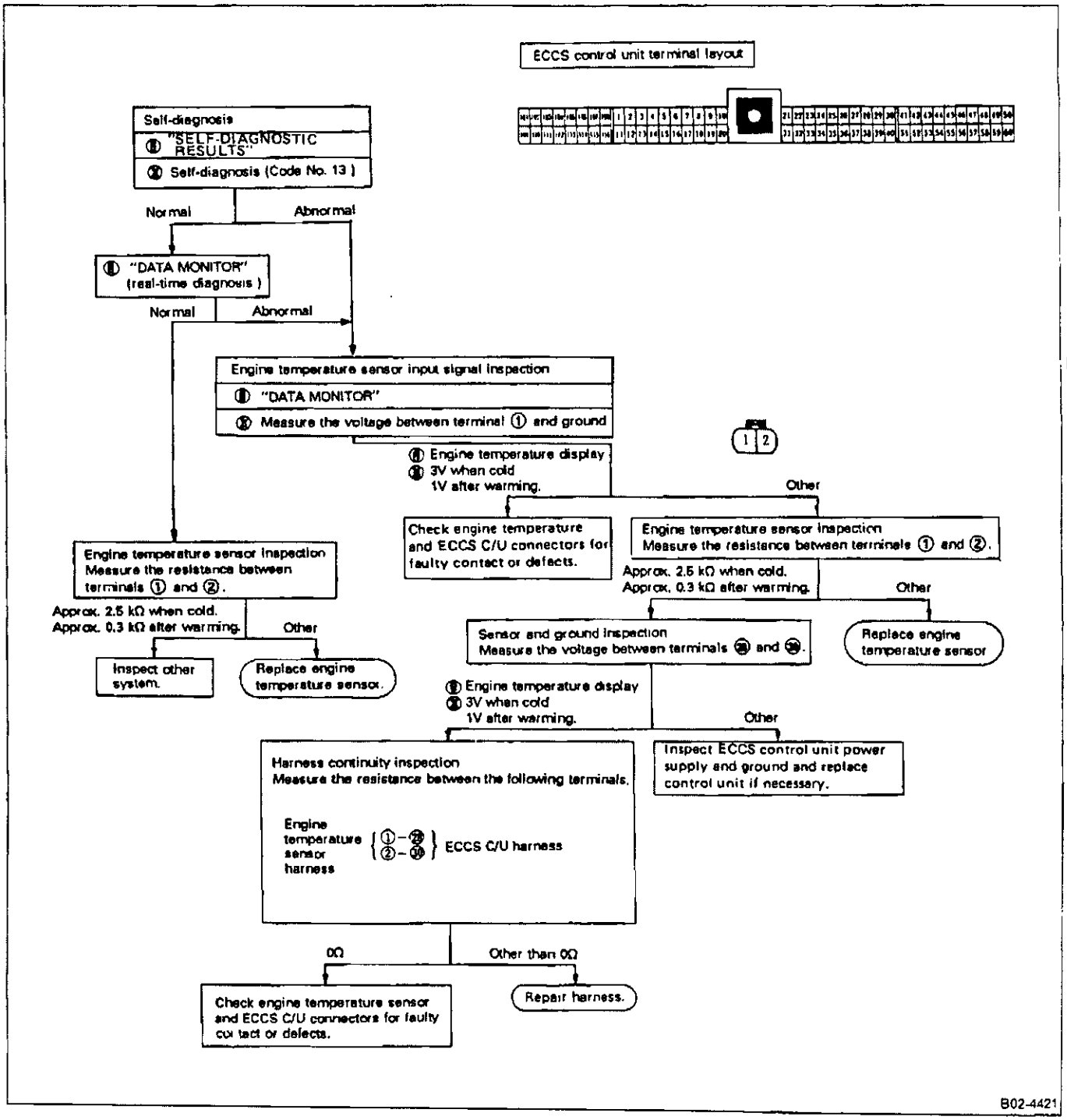

- Remove the intake air temperature sensor connector, heat or cool it with a hair dryer or industrial dryer and measure the resistance between the following terminals.

| Condition \ Measurement location | Between intake air temperature sensor terminals (1) and (2) |
|---|---|
| Approx. 20°C (68°F) | Approx. 2.5 kΩ |
| Approx. 50°C (122°F) | Approx. 0.8 - 1.0 kΩ |

## 6-6 ENGINE TEMPERATURE SENSOR SYSTEM INSPECTION



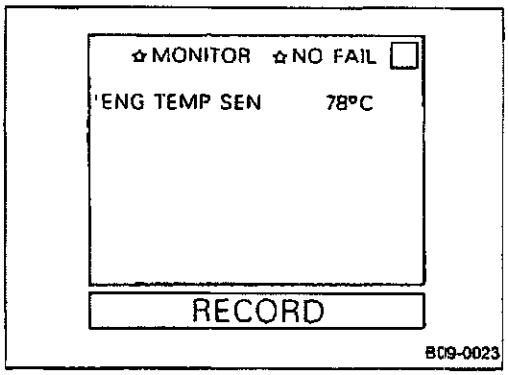

### Engine temperature sensor system trouble diagnosis flowchart

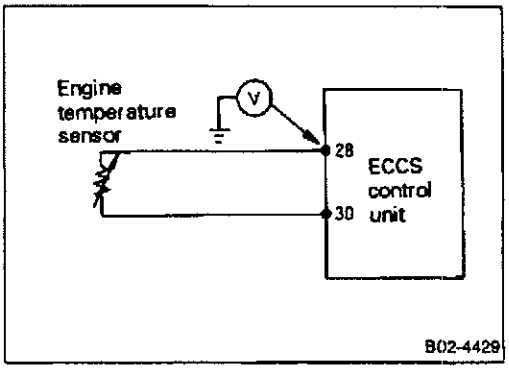


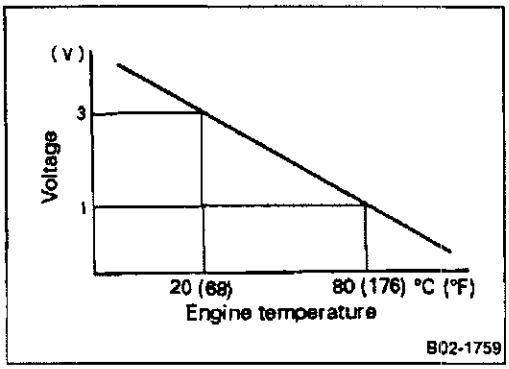
## 6. Sensor System Inspection (Cont'd)

### (1) Self-diagnosis

- There is a disconnection or short-circuit in the signal system when "CODE No. 13" in regular self-diagnosis or "FAILURE DETECTED ENG TEMP SEN" (when CONSULT is used) is displayed.
- If the problem reoccurs, use real-time diagnosis mode (CONSULT DATA MONITOR mode) or an oscilloscope to check for instantaneous break in the signal.




### (2) Input signal inspection

- Use the 'WATER TEMP. SENSOR" setting of "DATA MONITOR" to check the following items.

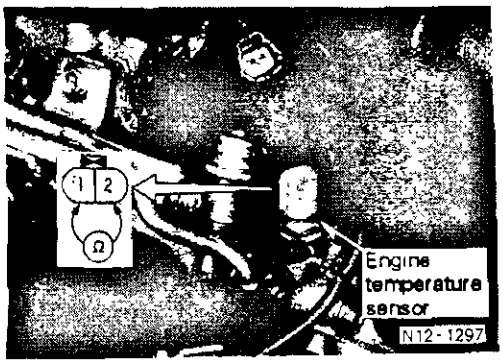
| Item / Condition | Engine temperature sensor |
|---|---|
| Ignition switch ON | Engine temperature is displayed. |

**CAUTION:**
**When engine temperature sensor malfunctions, it is set to a fixed value by the fail-safe function.**

- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Condition: Engine | RB26DETT | |
|---|---|---|
| Condition: Measurement location | | Between ECCS C/U terminal (28) and ground |
| Ignition switch ON | Engine temperature | Approx. 20°C (68°F) | Approx. 3V |
| | | Approx. 80°C (176°F) | Approx. 1V |

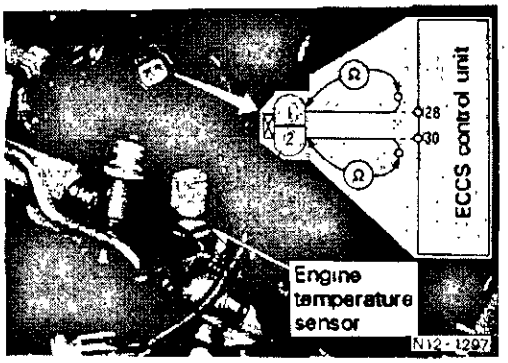
## 6. Sensor System Inspection (Cont'd)




### (3) Engine temperature sensor resistance value inspection

- Remove the engine temperature sensor connector and measure the resistance between the following terminals.

| Condition \ Measurement location | Engine: RB26DETT — Between engine temperature sensor connector terminals (1) and (2) |
|---|---|
| Engine temperature: Approx. 20°C (68°F) | Approx 2.5 kΩ |
| Engine temperature: Approx. 80°C (176°F) | Approx. 0.3 kΩ |

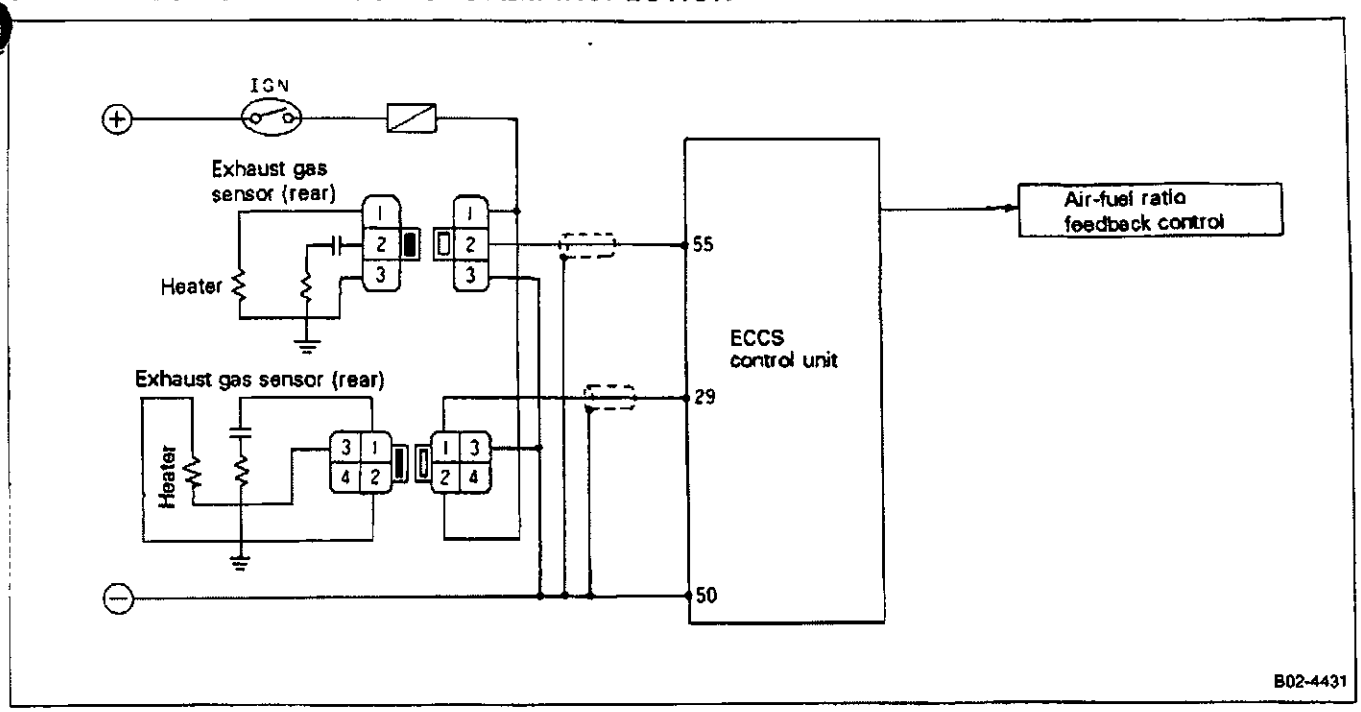



### (4) Harness continuity inspection

- Remove the ECCS control unit and engine temperature sensor harness connectors and measure the resistance between the following terminals.

| Engine | RB26DETT | | | |
|---|---|---|---|---|
| Measurement location | ECCS C/U harness | | Engine temperature sensor harness | 0Ω |
| | Terminal (28) | to | terminal (1) | |
| | Terminal (30) | to | terminal (2) | |

## 6-7 EXHAUST GAS SENSOR SYSTEM INSPECTION

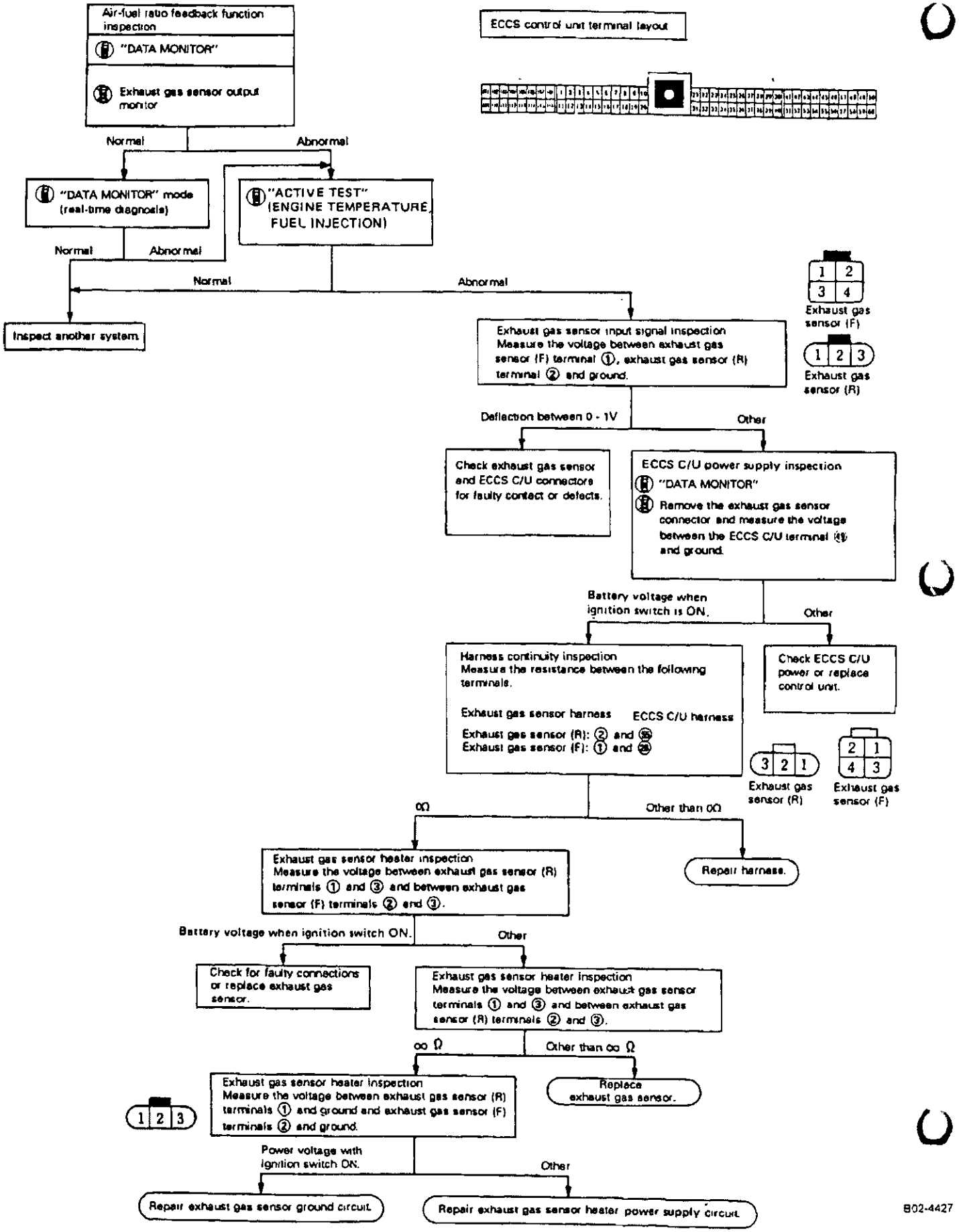



### Cylinder, exhaust gas sensor, CONSULT (DATA MONITOR) display

| Cylinder No. | Exhaust gas sensor | ECCS C/U terminal number | CONSULT (DATA MONITOR) display |
|---|---|---|---|
| No. 1, 2, 3, cylinders | Exhaust gas sensor (Front) | ECCS C/U terminal (29) | EXH GAS SEN-R |
| No. 4, 5, 6 cylinders | Exhaust gas sensor (Rear) | ECCS C/U terminal (55) | EXH GAS SEN |

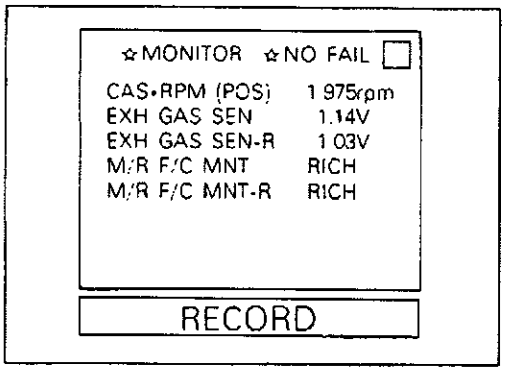
## 6. Sensor System Inspection (Cont'd)

### Exhaust gas sensor system trouble diagnosis flowchart



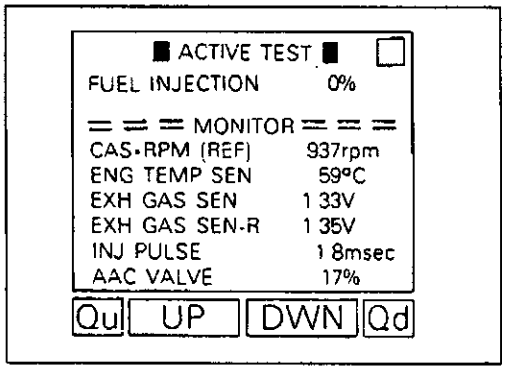
## 6. Sensor System Inspection (Cont'd)

### (1) Fuel-air ratio feedback function inspection




- Warm the engine and check the following items with "EXH GAS SEN", "EXH GAS SEN-R" (output voltage) and "M/R F/C MNT", "M/R F/C MNT-R" (lean/rich) displayed in "DATA MONITOR" mode.

| Item / Condition | Exhaust gas sensor, exhaust gas sensor (R) | Exhaust gas sensor monitor, exhaust gas sensor monitor (R) |
|---|---|---|
| | (Output voltage display) | RICH, LEAN display |
| Engine speed, at approx. 2,000 rpm | Approx. 0 - 1V is displayed. The display cycle is 5 times or more in 10 sec interval. | RICH, LEAN display must be synchronized with output voltage display. |




- Provide setting value in "ACTIVE TEST" (fuel injection quantity correction) and check exhaust gas sensor function

- Using diagnosis connector on the vehicle side (at fuse block), set CONSULT to "EXHAUST GAS SENSOR MONITOR" and check fuel injection condition by flashing of exhaust gas temperature warning lamp on instrument panel.

**Exhaust gas sensor function**

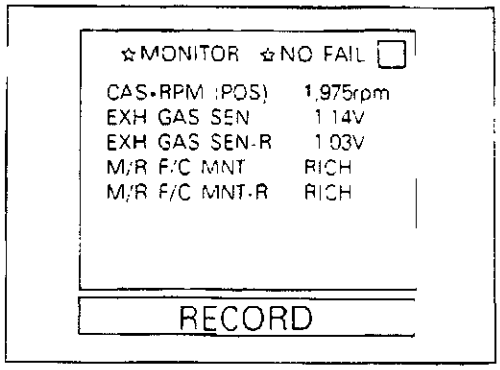
Exhaust gas temperature warning lamp must flash 5 times or more in 10-sec interval when engine is running at approx. 2,000 rpm.

**Feedback function**

Exhaust gas temperature warning lamp must flash periodically when engine speed is running at approx. 2,000 rpm.

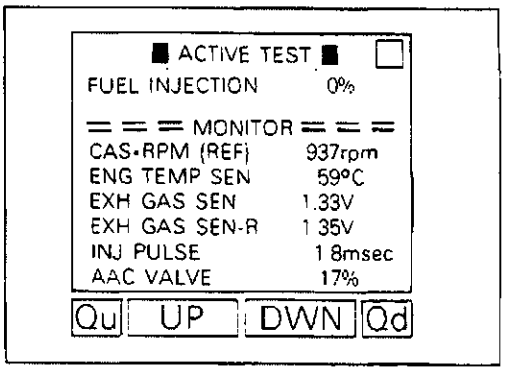
## 6. Sensor System Inspection (Cont'd)

### (1) Fuel-air ratio feedback function inspection




- Warm the engine and check the following items with "EXH GAS SEN", "EXH GAS SEN-R" (output voltage) and "M/R F/C MNT", "M/R F/C MNT-R" (lean/rich) displayed in "DATA MONITOR" mode.

| Item / Condition | Exhaust gas sensor, exhaust gas sensor (R) | Exhaust gas sensor monitor, exhaust gas sensor monitor (R) |
|---|---|---|
| | (Output voltage display) | RICH, LEAN display |
| Engine speed, at approx. 2,000 rpm | Approx 0 - 1V is displayed. The display cycle is 5 times or more in 10 sec interval. | RICH, LEAN display must be synchronized with output voltage display. |




- Provide setting value in "ACTIVE TEST" (fuel injection quantity correction) and check exhaust gas sensor function

- Using diagnosis connector on the vehicle side (at fuse block), set CONSULT to "EXHAUST GAS SENSOR MONITOR" and check fuel injection condition by flashing of exhaust gas temperature warning lamp on instrument panel.

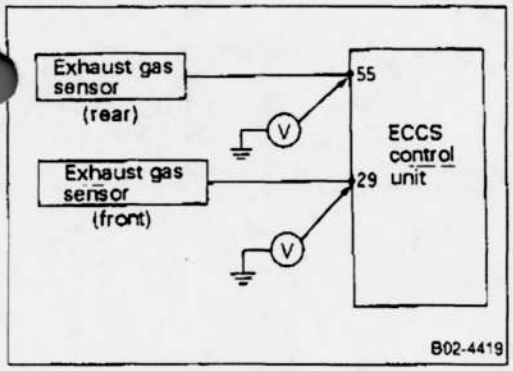
**Exhaust gas sensor function**

Exhaust gas temperature warning lamp must flash 5 times or more in 10-sec interval when engine is running at approx. 2,000 rpm.

**Feedback function**

Exhaust gas temperature warning lamp must flash periodically when engine speed is running at approx. 2,000 rpm.

## 6. Sensor System Inspection (Cont'd)




### (2) Input signal inspection

- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Measurement location / Condition | Exhaust gas sensor (Front) | Exhaust gas sensor (Rear) |
|---|---|---|
| | Between ECCS control unit terminal (29) and ground | Between ECCS control unit terminal (55) and ground |
| Racing at approx. 2,000 rpm | Deflection between approx. 0 and 1V | ← |



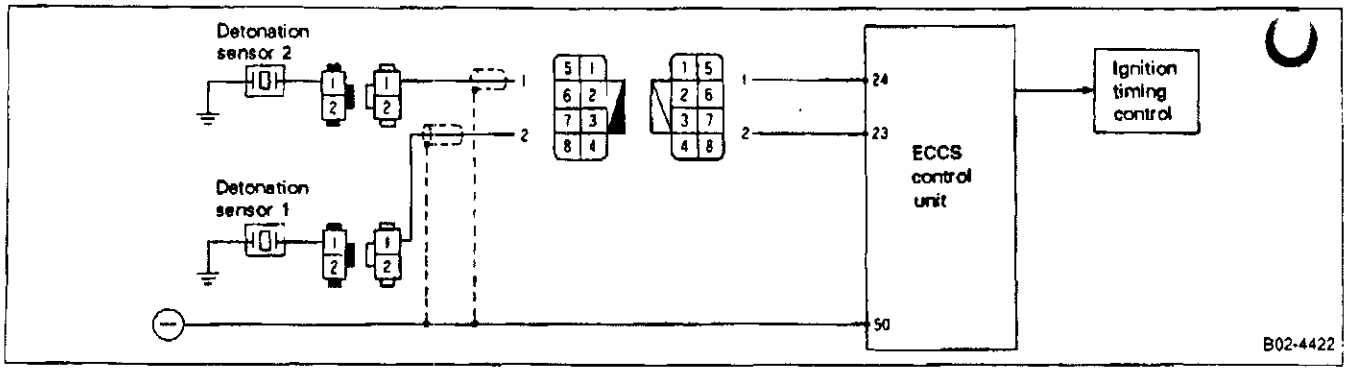
### (3) Harness continuity inspection

- Remove the ECCS control unit and exhaust gas sensor connectors and measure the resistance between the following terminals.

| | Exhaust gas sensor (front) | | Exhaust gas sensor (rear) | |
|---|---|---|---|---|
| Measurement location | Between ECCS control unit harness terminal (29) and exhaust gas sensor harness terminal (1) | 0Ω | Between ECCS control unit harness terminal (55) and exhaust gas sensor harness terminal (2) | 0Ω |

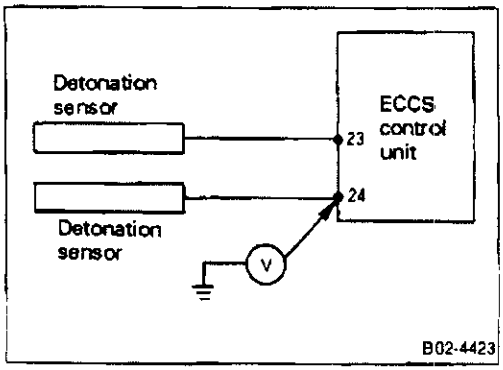
## 6. Sensor System Inspection (Cont'd)

### 6-8 DETONATION SENSOR SYSTEM INSPECTION




### (1) Self-diagnosis

- There is a disconnection or short-circuit in the signal system when "CODE No. 34" in regular self-diagnosis or "FAILURE DETECTED DETONATION SENSOR (when CONSULT is used) is displayed.
- If the problem reoccurs, use real-time diagnosis mode (CONSULT DATA MONITOR mode) or an oscilloscope to check for instantaneous break in the signal.




### (2) Input signal inspection

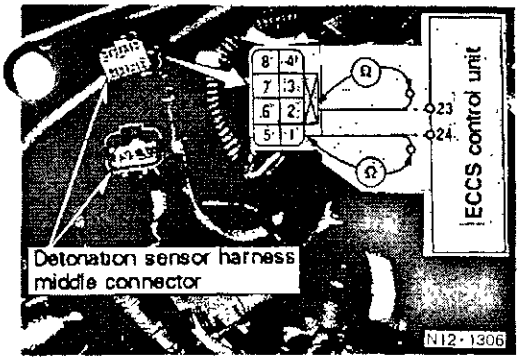
- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine | RB26DETT | |
|---|---|---|
| Measurement location / Condition | Between ECCS control unit terminal (23) and ground | Between ECCS control unit terminal (24) and ground |
| Ignition switch ON | Approx. 0.3V | ← |
| Cranking engine | Approx. 0.3V | ← |
| Idling | Approx. 0.3V | ← |

**CAUTION:**

**The detonation sensor input signal must be measured by an oscilloscope because its resistance is larger than the circuit tester resistance. The signal should also be checked with self-diagnosis and harness continuity inspection.**

## 6. Sensor System Inspection (Cont'd)

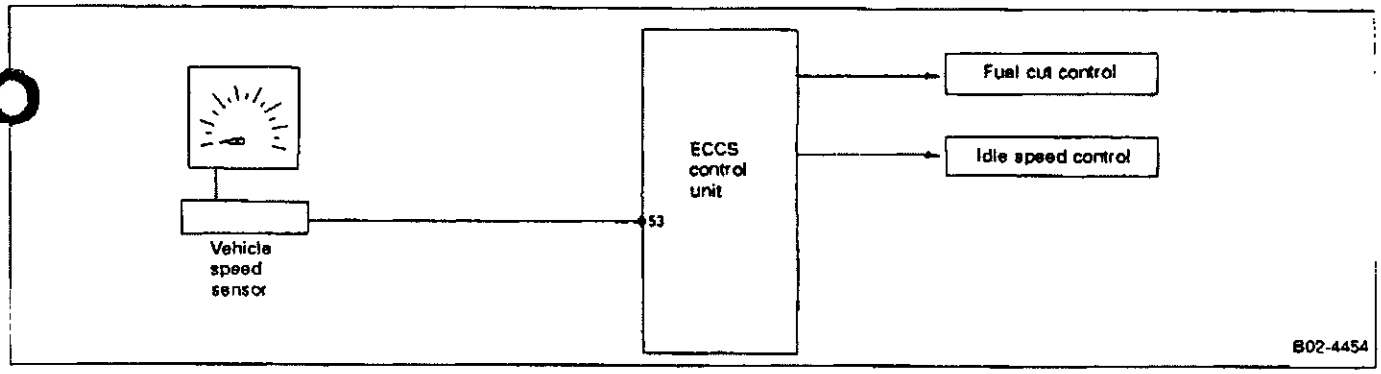


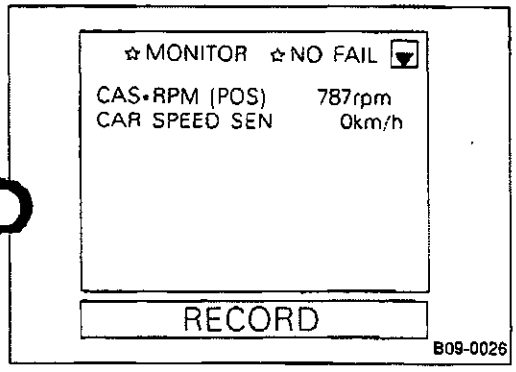

### (3) Harness continuity inspection

- Remove the ECCS control unit and detonation sensor middle connector and measure the resistance between the following terminals.

| Engine | RB26DETT | | |
|---|---|---|---|
| Measurement location | ECCS control unit harness terminal | Detonation sensor middle harness connector terminal | 0Ω |
| | (23) and | (2) | |
| | (24) and | (1) | |

## 6-9 VEHICLE SPEED SENSOR SYSTEM INSPECTION



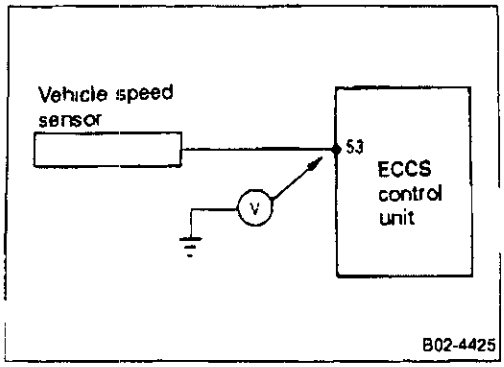




### (1) Input signal inspection

- Select "VEHICLE SPEED SENSOR" in "DATA MONITOR" mode and check following items.

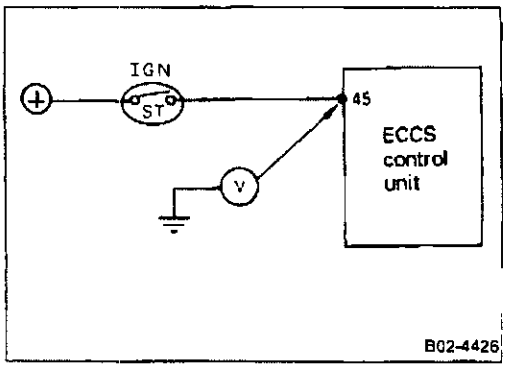
| Item / Condition | Vehicle speed sensor |
|---|---|
| When drive wheels are rotating. | Vehicle speed is displayed. |

## 6. Sensor System Inspection (Cont'd)




- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine / Measurement location / Condition | RB26DETT<br>Between ECCS control unit terminal (53) and ground |
|---|---|
| When drive wheels are rotating slowly | Deflection between 0V and 5V (also appears as deflection around 1V) |



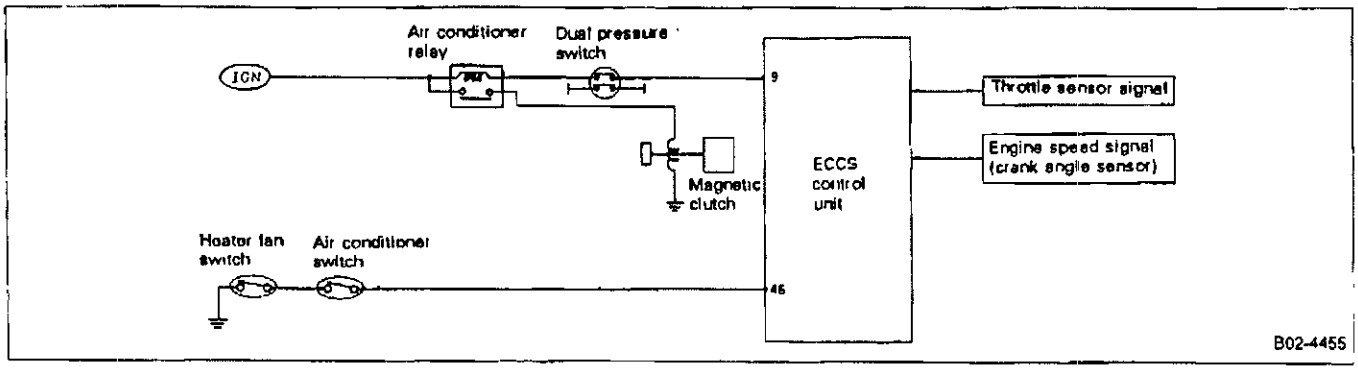

### 6-10 IGNITION SWITCH (START switch) SIGNAL INSPECTION

#### (1) Input signal inspection

- In "DATA MONITOR" mode, perform key operation to check if ignition switch "START" signal is input correctly.
- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine / Measurement location / Condition | RB26DETT<br>Between ECCS control unit terminal (45) and ground |
|---|---|
| Other than ignition switch at "START" | 0V |
| Ignition switch at "START" | Battery voltage |

### 6-11 AIR CONDITIONER SIGNAL INSPECTION

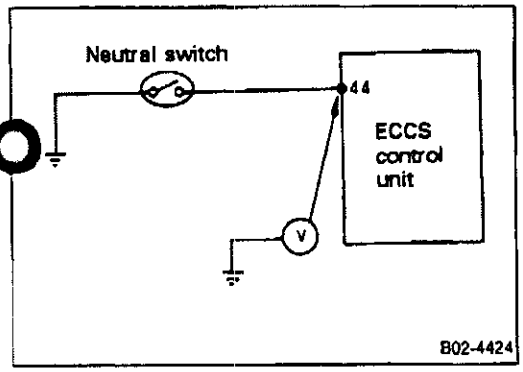


## 6. Sensor System Inspection (Cont'd)

### (1) Input signal inspection

- In "DATA MONITOR" mode, perform air conditioner switch operation to check if air conditioner switch signal is input correctly.
- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine / Measurement location / Condition | RB26DETT | |
|---|---|---|
| | Between ECCS control unit terminal (9) and ground | Between ECCS control unit terminal (46) and ground |
| Air conditioner OFF | Battery voltage | 8 - 9V |
| Air conditioner ON | 0 - 1V | ← |

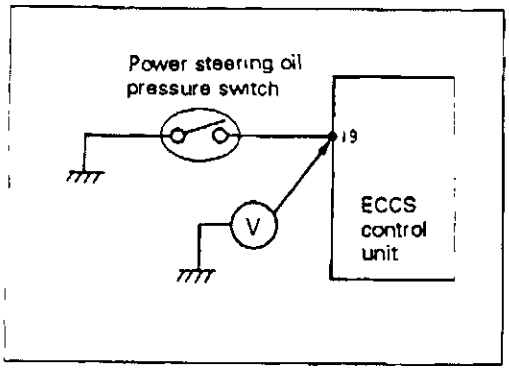



## 6-12 NEUTRAL SWITCH SIGNAL INSPECTION

### (1) Input signal inspection

- In "DATA MONITOR" mode, perform shift lever operation to check if neutral switch signal is input correctly.
- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Engine / Measurement location / Condition | | RB26DETT |
|---|---|---|
| | | Between ECCS control unit terminal (44) and ground |
| Ignition switch ON | Not "N" position | 4 - 5V |
| | At "N" position | Approx. 0V |




## 6. Sensor System Inspection (Cont'd)

### 6-13 POWER STEERING OIL PRESSURE SWITCH SIGNAL INSPECTION

### (1) Input signal inspection

- In "DATA MONITOR" mode, perform power steering operation to check if power steering oil pressure switch signal is input correctly.
- Measure the voltage between the following terminals and ground with ECCS control unit harness connected.

| Condition \ Measurement location | | Between ECCS control unit terminal (19) and ground |
|---|---|---|
| Idling | Power steering OFF | Approx. 5V |
| | Power steering ON | Approx 0V |

# 7. ECCS Control Unit Input/Output Signals (RB26DETT)

## 7-1 CONSULT INSPECTION VALUES

### (1) Data monitor

Note: The output signal is displayed as the calculation data on console unit so the correct value will be displayed even if the output circuit (harness) is inadvertently disconnected.

| Monitor Item | Data Monitor | | | | | Problem Inspection Item |
|---|---|---|---|---|---|---|
| | Condition | | Normal reference value | | | |
| CAS·RPM (POS) (detected engine speed according to 1° and 120° signals) | • Tachometer set<br>• Engine running | | There must be no abnormal change in speed. | | | Crank angle sensor system |
| AIR FLOW MTR (output voltage)<br>AIR FLOW MTR-R (output voltage) | • After warming up engine<br>• Idling (N range, air conditioner OFF) | | Approx. 0.7 - 1.2V (1.0 - 1.7V at 2,000 rpm with no load)<br>Note: The two air flow meters may have a difference of 0V to 0.4V in some cases. | | | Air flow meter system |
| ENG TEMP SEN (engine temperature ) | After warming up engine | | Above approx. 70°C (158°F) | | | Engine temperature sensor system |
| EXH GAS SEN (output voltage)<br>EXH GAS SEN-R (output voltage) | After warming up engine | 2,000 rpm with no load | Changes between 0 - 0.3V and 0.6 -1V. | | | • Exhaust gas sensor system<br>• Intake system air leak or air intake<br>• Injector system |
| M/R F/C MNT (RICH/LEAN)<br>M/R F/C MNT-R (RICH/LEAN) | | | RICH, LEAN repeats 5 times or more in 10 sec. | | | |
| CAR SPEED SEN (vehicle speed signal) | While driving or with drive wheels turning. | | Should generally conform to speedometer display. | | | Vehicle speed sensor system |
| BATTERY VOLT | • Ignition switch ON<br>• Engine stopped | | 11 - 14V | | | • Battery<br>• ECCS control unit power system |
| THROTTLE SEN (output voltage) | • Ignition switch ON<br>• Engine stopped | Throttle fully closed. | RB20DET | | 0.5 | • Throttle sensor system |
| | | | RB26DETT | | 0.5 | |
| | | Throttle fully open. | RB20DET | | 4.0 | |
| | | | RB26DETT | | 4.0 | |
| INT/A TEMP SE (intake temperature sensor output) | After warming up engine. | | Intake air temperature is displayed. | | | Intake temperature sensor system |
| INJ PULSE (injection pulse width) | After warming up engine. | Idling (N range, air conditioner OFF) | Reference | RB20DET | 1.4 - 2.2 msec | • Air flow meter system<br>• Intake system air leaks or air suction (entire input)<br>• Input signal system (entire) |
| | | | | RB26DETT | | |
| INJ PULSE-R (injection pulse width) | | 2,000 rpm with no load. | | RB20DET | 1.4 - 2.2 msec | |
| | | | | RB26DETT | | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

| Monitor Item | Data Monitor | | | | Problem Inspection Item |
|---|---|---|---|---|---|
| | Condition | | Normal reference value | | |
| IGN TIMING | After warming up engine. | Idling (N range, air conditioner OFF) | RB20DET | 15° | • Air flow meter system |
| | | | RB26DETT | 20° | |
| | | 2,000 rpm with no load. | Advance greater than 10° angle compared to idle position. | | |
| AAC VALVE | After warming up engine | Idling (N range, air conditioner OFF) | Approx. 15 - 35% | | • IAS adjustment<br>• AAC valve system |
| | | 2,000 rpm with no load. | (Approx. 30 - 50%) | | |
| A/F ALPHA (air-fuel ratio feedback correction coefficient) | • After warming up engine.<br>• 2,000 rpm with no load. | | 75 - 125% | | • Air flow meter system<br>• Injector system<br>• Canister (purge) inspection<br>• Intake system air leak or air suction |
| A/F ALPHA-R (air-fuel ratio feedback correction coefficient) | | | | | |
| START SIGNAL | • Ignition switch ON<br>• Engine stopped | "START" | ON | | Starter SW system |
| | | "OFF" | OFF | | |
| AIR COND SIG | Idle | Air conditioner SW ON | ON | | Air conditioner SW system |
| | | Air conditioner SW OFF | OFF | | |
| NEUTRAL SW | | N or P range | ON | | Neutral switch system |
| | | Other than N or P range | OFF | | |
| PW/ST SIGNAL | | Steering turning | ON | | Power steering SW system |
| | | Steering neutral position | OFF | | |
| IDLE POSITION | Idling | | ON | | Throttle sensor system |
| | Other than idling | | OFF | | |
| FUEL PUMP RLY | • Ignition switch ON | Stop | OFF | | Fuel pump system |
| | | Running | ON | | |
| AIR COND RLY | • Idle | Air conditioner ON | ON | | Air conditioner relay system |
| | | Air conditioner OFF | OFF | | |
| | • Within 10 seconds during acceleration | Air conditioner ON | OFF | | |
| W/G CONT S/V | | | ON | | |
| | | | OFF | | |
| ■ POWER VOLTAGE | Voltage probe measurement value is displayed. | | | | |
| ■ PULSE | Pulse probe measurement value is displayed | | | | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

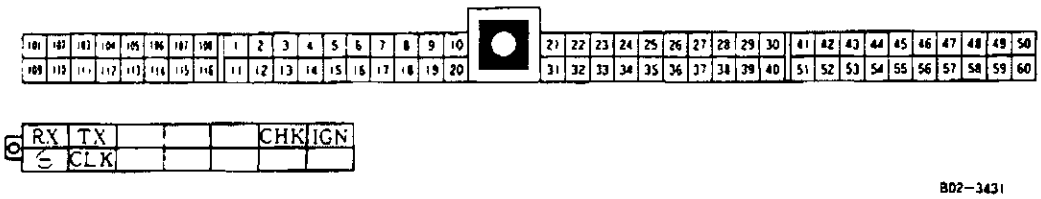
### (2) Active test

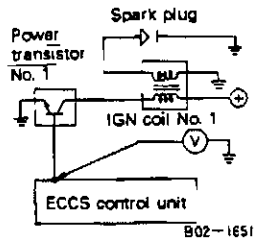
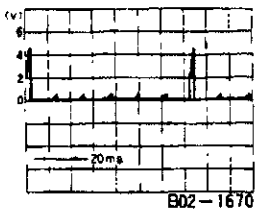
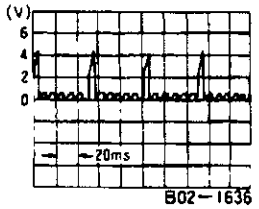
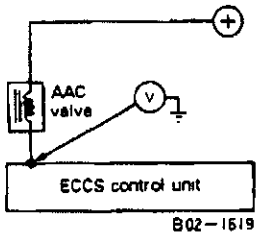
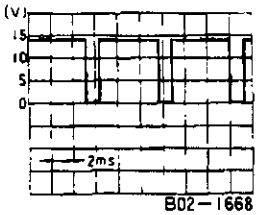
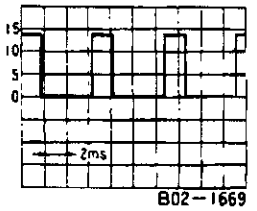
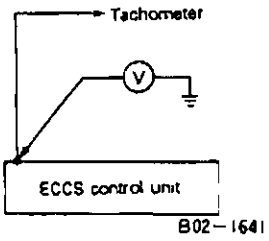
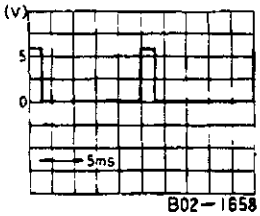
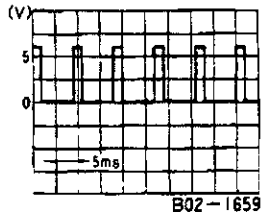
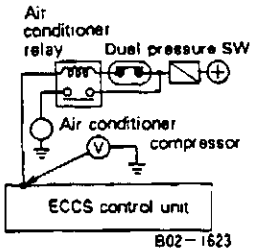
| Set item | Active Test | | Judgment and Inspection Item |
|---|---|---|---|
| | Condition | Active Test Description | |
| ENGINE TEMPERATURE | Problem occurrence condition | Set engine temperature high or low.<br>**Caution: Do not set extreme values as this can cause spark plug burning.** | Perform following inspections to check if problem is solved.<br>Eliminate: Engine temperature sensor system<br>Injector system.<br>Air flow meter, exhaust gas sensor system<br>Not eliminated: Other item inspection |
| FUEL INJECTION | Problem occurrence condition | Set the air-fuel ratio rich or lean.<br>**Caution: Do not set extreme values because this may damage engine or catalytic converter.** | Perform following inspections to check if problem is solved.<br>Eliminate: Exhaust gas sensor system<br>Air flow meter, engine temperature sensor system<br>Injector system<br>Not eliminated: Other item inspection |
| IGNITION TIMING | Problem occurrence condition | Delay ignition timing.<br>**Caution: Do not set extreme values because this may damage engine or catalytic converter.** | Perform following inspections to check if problem is solved.<br>Eliminate: Ignition timing adjustment<br>Detonation sensor system<br>Not eliminated: Other item inspection |
| AAC VALVE OPENING | Engine running | • Increase control duty ratio.<br>The engine speed should increase.<br>• Decrease control duty ratio.<br>The engine speed should decrease. | If the condition described on left cannot be verified, check AAC valve system. |
| POWER BALANCE | Engine running | Set the AAC valve open to stop the specified injector operation and the injector speed can be displayed at this time.<br>**Caution: Do not perform this operation while driving (to preserve the catalyzer.)** | Eliminate: Injector system |
| FUEL PUMP RELAY | • Ignition switch ON.<br>• Engine stop. | Turn ignition switch ON, OFF and ON so pump operation makes a sound. The fuel pressure will rise.<br>**Caution: Do not perform this operation except under conditions described on left.** | If the condition described on left cannot be verified, check relay system of fuel pump and fuel pump system. |
| SELF-LEARNING CONT | • The air-fuel ratio feedback correction coefficient learning factor is cleared. | | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

### RB26DETT

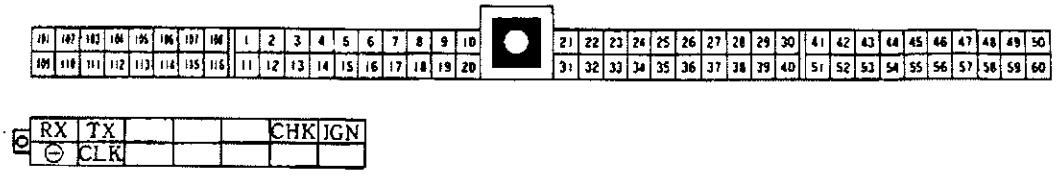
RB26DETT



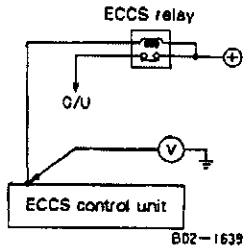
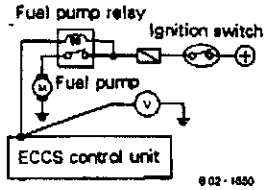
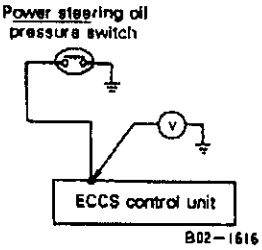
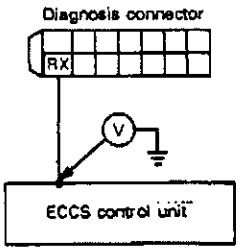
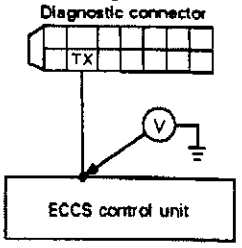

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 1<br>2<br>3<br>11<br>12<br>13 | Power transistor control signal |  | 0.2 - 0.3V<br>  | | Approx. 0.4V<br>  | |
| 4 | AAC valve control signal |  | Cold: 6 - 7V<br>Warm: 8 - 10V<br>  | | Approx. 5V<br>  | |
| 7 | Engine speed signal for tachometer |  | Approx. 1V<br>  | | Approx. 2.4V<br>  | |
| 9 | Air conditioner relay |  | Air conditioner OFF:<br>Battery voltage<br>Air conditioner ON:<br>Approx. 1V | | ← | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

RB26DETT

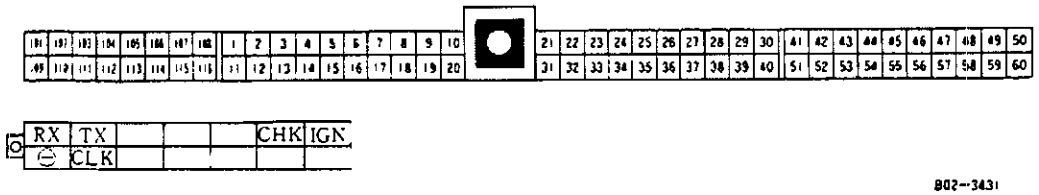


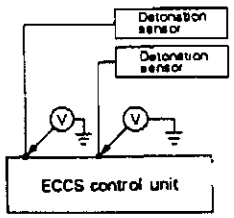
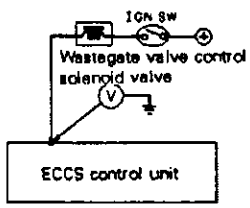
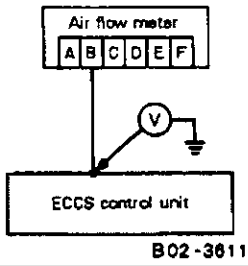
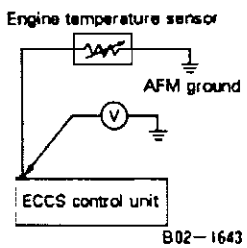
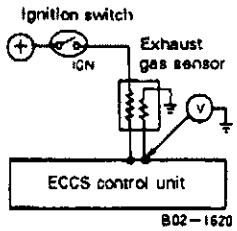

B02-3431

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 16 | ECCS relay |   | Approx. 1V (Ignition switch OFF: Battery voltage) | | Approx. 0V | |
| 18 | Fuel pump relay |   | 0V | | 0V | |
| 19 | Power steering oil pressure switch signal |   | Power steering ON: 0V Power steering OFF: 5V | | ← | |
| 21 (RX) | Receive (control unit data reception) |   | 10V | | ← | |
| 22 (TX) | Transmit (data transmission from control unit) |   | 0V | | ← | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

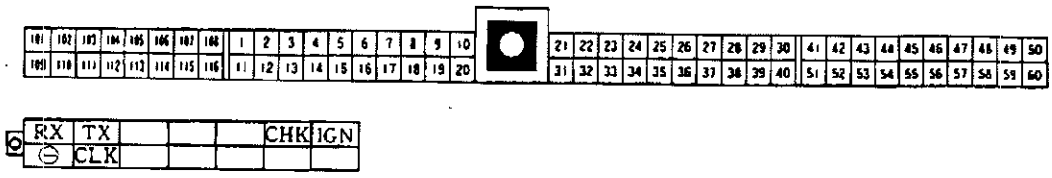
RB26DETT



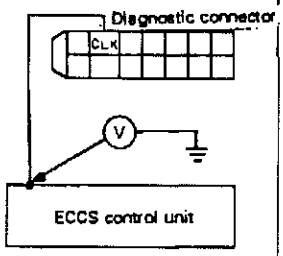
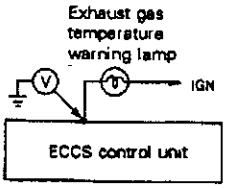
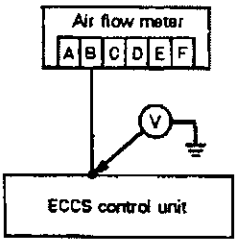
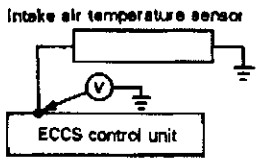
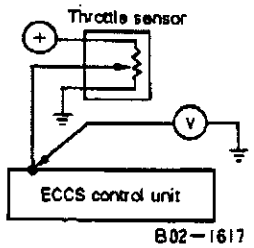

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 23<br>24 | Detonation sensor signal |  | Approx. 0.3V | | ← | |
| 25 | Wastegate valve control solenoid valve |  | Power voltage | | Approx. 0V | |
| 27 | Air flow meter (rear) (Intake air quantity signal) |  | Approx. 1V | | Approx. 1.5V | |
| 28 | Engine temperature sensor signal |  | Engine temperature 80°C (176°F). Approx. 1V<br>Engine temperature 20°C (68°F): Approx. 3V | | ← | |
| 29 | Exhaust gas sensor signal (front) |  | Approx. 0 - 1V | | Deflects between approx. 0 - 1V | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

RB26DETT

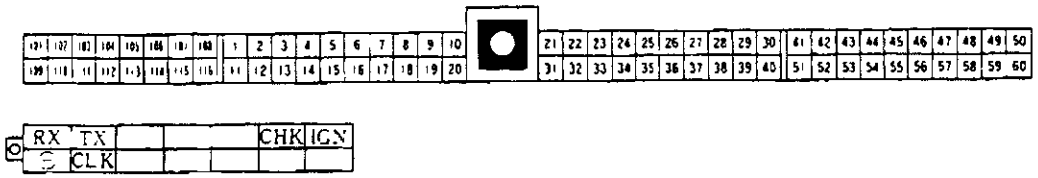



B02-3431

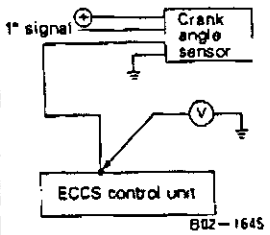
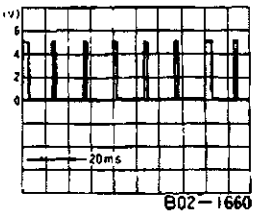
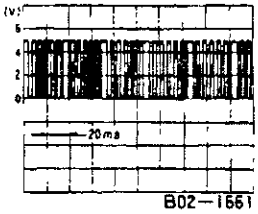
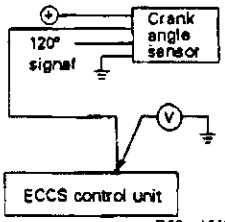
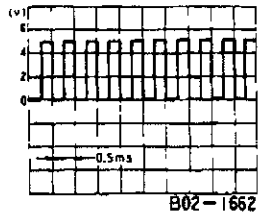
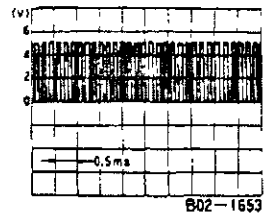
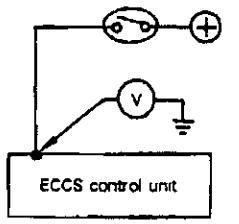
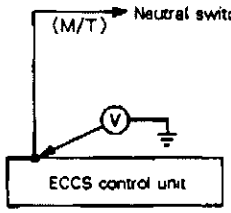
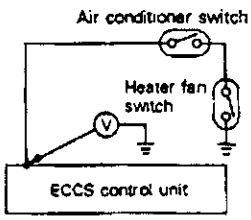
| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 31 (CLK) | Clock (synchronization signal) |   B02-3612 | 0V | | ← | |
| 32 | Monitor and check lamp (red lamp) |   B02-3476 | Lamp not lit: Power voltage<br>Lamp is lit: 0V | | ← | |
| 35 | Air flow meter (front) (Intake air quantity signal) |   B02-3611 | Approx. 1V | | Approx. 1.5V | |
| 36 | Intake air temperature sensor signal |   B02-2410 | Cold: approx. 1.5V<br>Warm: approx. 0.8V | | ← | |
| 38 | Throttle sensor signal |   B02-1617 | Approx. 0.5V | | 0.5 - 4V (Voltage increases if accelerator pedal is pressed.) | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

RB26DETT

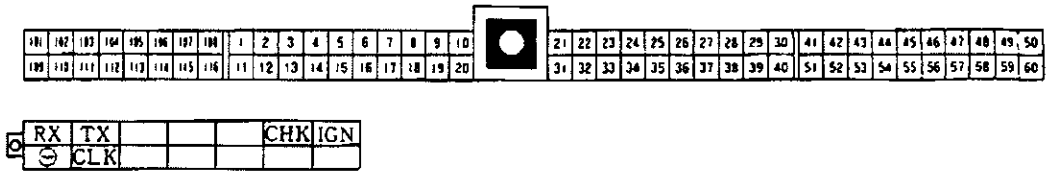


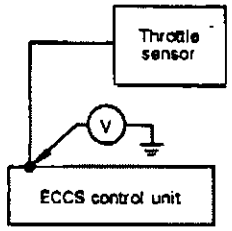
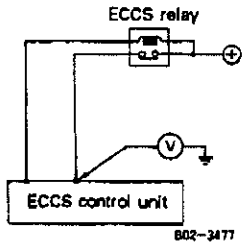
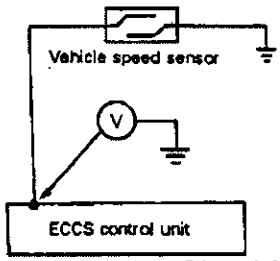
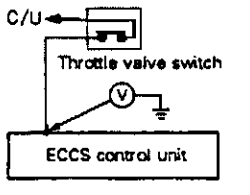
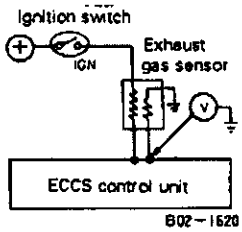

B02-3431

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 41<br>51 | Crank angle sensor 120° signal |  B02-1645 | 0.3 - 0.7V<br>  B02-1660 | | 0.3 - 0.7V<br>  B02-1661 | |
| 42<br>52 | Crank angle sensor 1° signal |  B02-1646 | 2 - 3V<br>  B02-1662 | | 2 - 3V<br>  B02-1663 | |
| 43 | Ignition switch (Start signal) |  B02-1960 | 0V<br>(Ignition switch at START: battery voltage) | | 0V | |
| 44 | Neutral switch signal |  | N. or P. range: 0V<br>Other than N or P range: 4 - 5V | | ← | |
| 46 | Air conditioner switch signal |  B02-1627 | Air conditioner OFF: Battery voltage<br>Air conditioner ON: 0V | | ← | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

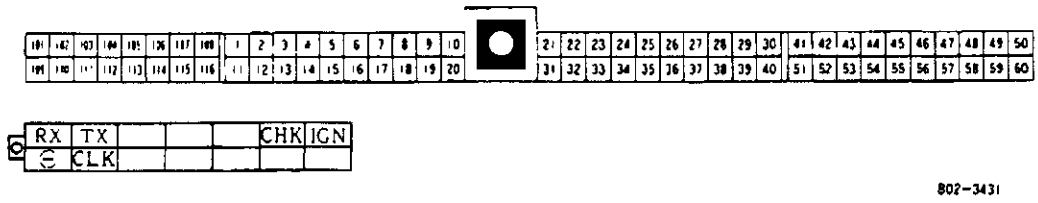
RB26DETT



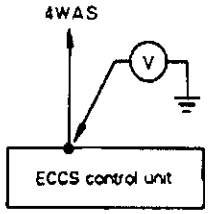
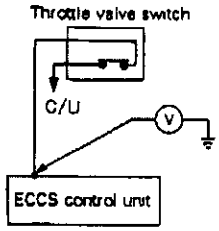
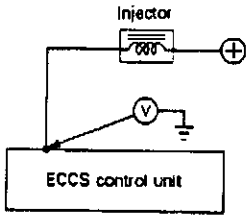
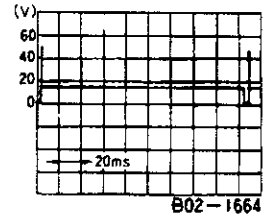
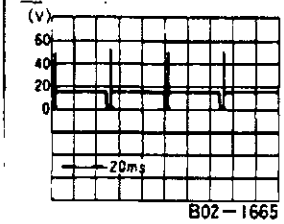
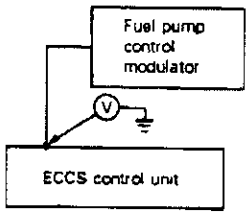
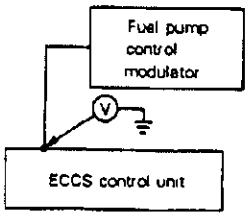

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 48 | Throttle sensor (power supply) |   | 5V | | ← | |
| 49 | Control unit power supply |   | Battery voltage | | ← | |
| 53 | Vehicle speed sensor signal |   | D range (or 1st) with rear wheels jacked up: 0.5 - 1.5V<br>The value actually deflects between 0V and 5V. However, it appears to deflect around 1V, according to vehicle speed. | | ← | |
| 54 | Throttle valve switch (idle contact point) |   | Approx. 10V | | Accelerator pressed: 0V | |
| 55 | Exhaust gas sensor signal (rear) |   | Approx. 1V | | Deflects between 0 - 1V | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

RB26DETT




B02-3431

| Terminal Number | Signal Name | Circuit | At idle | | At approx. 2,500 rpm | |
|---|---|---|---|---|---|---|
| | | | Standard | Memo | Standard | Memo |
| 56 | Throttle sensor output signal |   B02-4457 | Approx. 0.5V | | Approx. 0.5 - 4V (Voltage increases as accelerator pedal is pressed.) | |
| 57 | Throttle valve switch (power supply) |   | Battery voltage | | ← | |
| 101<br>103<br>105<br>110<br>112<br>114 | Injector control signal |   B02-1628 | Approx. battery voltage.   B02-1664 | | Approx. battery voltage.   B02-1665 | |
| 104 | Fuel pump terminal voltage control signal (FPCM1) |   B02-1630 | Idling (after warming engine): 0V | | During middle load: 4V | |
| 106 | Fuel pump terminal voltage control signal (FPCM2) |   B02-1630 | — | | During middle load: 0V | |

## 7. ECCS Control Unit Input/Output Signals (RB26DETT) (Cont'd)

### 7.3 ECCS CONTROL UNIT OPERATION CAUTIONS

**(1) Control unit equipment**

- Never install a control unit that is not specified for the vehicle.
- Do not apply excessive force to the installation bracket.

**(2) Connector removal and installation**

- When removing and installing connectors, do not bend or apply unnecessary force and observe following points.

① Connector removal

- Turn ignition switch OFF and ECCS relay OFF before removing connectors.
- Hold connector firmly to disconnect without applying force to harness.
- Do not use a screwdriver or similar tool to loosen the connector lock.

② Connector installation

- Turn ignition switch OFF.
- Make sure pins are not bent on control unit connector and then connect securely.
- Tighten bolts securely until injector surface reaches orange color indicator of connector and surface is even.

**(3) Control unit power**

- Never make a reverse connection to the battery.
- Use battery voltage in 10 - 16V range.

**(4) Idle speed adjustment knob**

- Do not turn past lock position.
- Do not turn adjustment knob when ambient temperature lower than 0° (32°F).

**(5) Water and Oil**

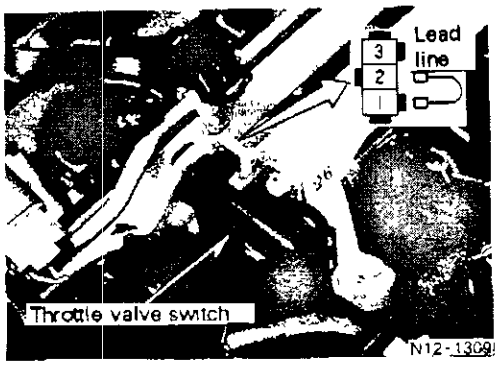
- Be careful not to allow rain drops or water to wet the control unit.
- Be careful that condensation does not form due to sudden increase in temperature. If there is any moisture, dry control unit adequately before installing in vehicle.
- Make sure no oil adheres to connectors.
- Do not clean the control unit with volatile solvent cleaners.

**(6) Dropping and Impact**

- Do not drop the control unit or subject it to strong impact.
- Do not use upper and lower covers for the control unit which are dented.

**(7) Control unit screws and cover**

- Do not remove the upper and lower covers from the control unit.
- Do not turn the screws in the control unit main body.




## 8. Deceleration Exhaust Gas Emission Control Equipment Inspection

8-1

**Throttle valve switch short-circuit**

- Remove the throttle valve switch harness connector and use a lead line to connect harness connector terminals (2) and (3). (The throttle valve sequence power and idle connection points are set ON.)

**Fuel cut inspection**

- After warming engine, place the transmission in neutral and run engine at 2,000 rpm. Lower the speed to approx. 1,000 rpm and then raise the speed to 2,000 rpm again and check for fuel cut. (If the accelerator opening angle is fixed, repeat the procedures described above.)

## 9. Air Conditioner Cut System Inspection

### 9-1 AIR CONDITIONER CUT SYSTEM FUNCTION INSPECTION

- When the engine is idling, turn air conditioner switch ON and then race the engine. Make sure the air conditioner compressor goes ON and then OFF.

## Special tools

| | Name | Application |
|---|---|---|
| Measurement equipment | Hydrometer | Battery specific gravity inspection |
| | Circuit tester | Resistance, voltage inspections |

## Specifications

| Item | | Engine | RB26DETT |
|---|---|---|---|
| Battery type (capacity) | Standard | (V-Ah) | 34B19R (12-17) |
| | Option | (V-Ah) | 80D26R (12-55) |
| Alternator type (output) | Standard | Mitsubishi (V-A) | A3T45594 (12-90A) |
| Starter motor (output) | Standard | Hitachi (kW) | S114-505 (1.4) |
| | | Mitsubishi (kW) | MIT-70685 (1.4) |
| Injection coil | | Hanshin | MCP302 |
| Distributor | | Hitachi | D6Y88-01 |
| | | Mitsubishi | T0T49171 |
| Spark plug (arc gap) | Standard | NGK | PFR6A-11 (1.1) |
| | Option | NGK | PFR5A-11 (1.1)<br>PFR7A-11 (non-adjustable) |

Note: The battery capacity value is the 5-hour rate that conforms to the new JIS standard and the value is 80% of the former 20-hour rate.

[New model name] (example) 34 B 19 R

- R — Terminal polarity position
- 19 — Battery length dimensions (rounded off)
- B — Battery width x box height classification
- 34 — Performance rank (Starting function added to 5-hr capacity rate)

## 1. Battery Inspection

### Voltage inspection

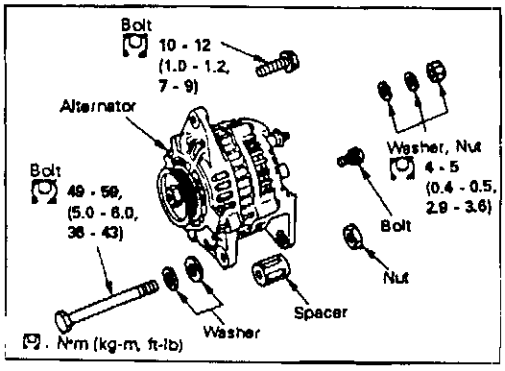
| | | |
|---|---|---|
| Normal | (V) | 12.4 - 12.8 |
| Limit (charge required) | (V) | 12.4V or less |
| (Start limit) | (V) | 12V [20°C (68°F)] |

### Specific gravity inspection [20°C (68°F)]

| | | |
|---|---|---|
| Normal | | 1.29 - 1.22 |
| Limit (charge required) | (V) | 1.22 or less |
| Service life | | There is a variation width of more than 0.04 between each cell. |

- Additional water does not need to be added to the battery during the service life of normal driving. When driving for extended periods of time in high temperatures, the fluid level may decrease according to vehicle driving conditions. Check the fluid level with the level indicator (upper, lower) and replenish to the upper level as necessary.

**Note: Distilled water must be used to refill the battery. If ordinary water is used, fluid loss will increase and may cause discharge.**




Additional work required:
Belt tension inspection and adjustment

## 2. Alternator

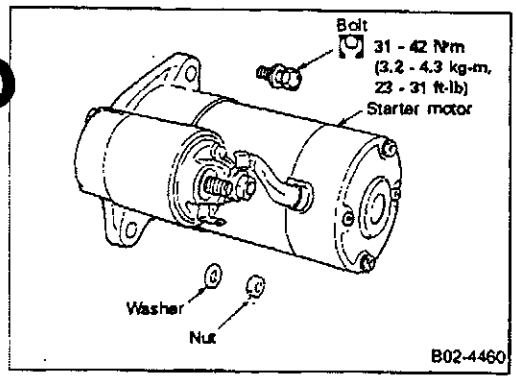
### (1) Alternator removal and installation

### (2) Alternator inspection

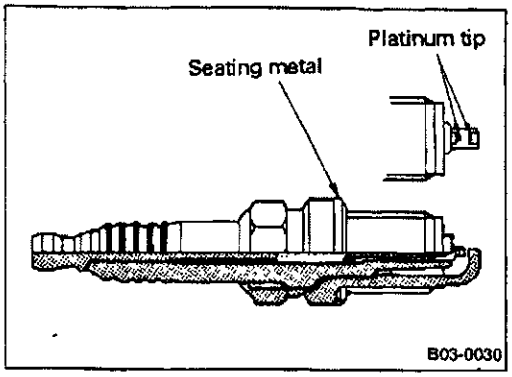
### Output voltage inspection

- Turn ignition switch ON and check that charge warning lamp lights.

| | | |
|---|---|---|
| Standard | (V/rpm) | 13.9 - 14.9/2,000 (accessories OFF) |




## 3. Starter Motor Removal and Installation

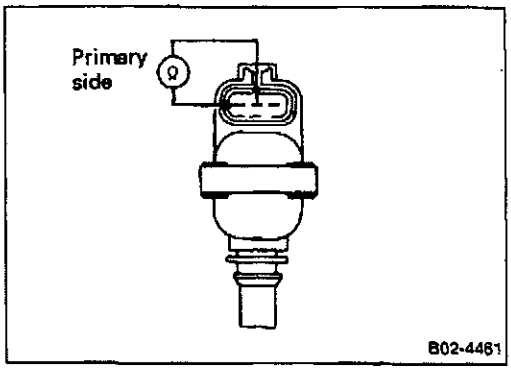



## 4. Platinum Plug Inspection

### Installation Precautions

**Periodic replacement interval: 100,000 km (60,000 miles)**

- Gap inspection and adjustment and plug cleaning with wire brush should not be performed because this m scrape off the platinum particulate from the platinum surface. If plugs are cleaned with an air cleaner, the clea ing should be performed in less than 20 seconds at an pressure less than 588 kPa (6.0 kg/cm$^2$, 85 psi).
- When replacing the spark plugs, always use parts specifi by Nissan.




## 5. Ignition Coil Inspection

- Check the primary and secondary coil resistance value.

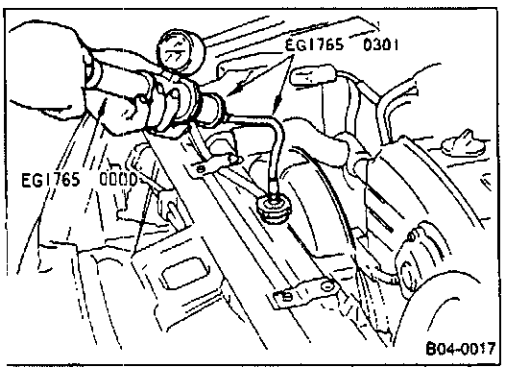
| Item \ Engine | | RB26DETT |
|---|---|---|
| Primary resistance | Ω | 0.6 - 0.9 |
| Secondary resistance | kΩ | — |

## Preparation tools

| | Name | Application |
|---|---|---|
| Special tool | Radiator cap tester EG1765 0000 | Radiator and cap pressure test |
| | Radiator cap hose adapter EG1765 0301 | Small cap adapter |

## Specifications

| Item | | Engines | RB26DETT |
|---|---|---|---|
| Radiator | Core size (vertical × horizontal × thickness) mm (in) | | 380 × 646 × 25 (14.96 × 25.43 × 0.98) |
| | Fin pitch mm | | 15 |
| | Cap injection-valve opening pressure kPa (kg/cm², psi) | | 88 (0.9, 13) |
| | Radiation performance (kcal/h°C) | | 1,080 |
| | A/T oil cooler | | — |
| | Tank material | | Plastic |
| | Core material | | Aluminum |
| Shroud | | | One-piece unit (lower shroud) |
| Cooling fan | | External diameter mm (in) × number of layers | 420 (16.54) × 8 |
| | | Coupling | 3 levels |
| Sub electrical cooling fan | | External diameter mm (in) × number of layers | 320 (12.60) × 4 |
| | | Motor output (W) | 160 |
| | | Engine temperature switch operation °C (°F) | 90 (194) |
| Thermostat injection-valve opening engine temperature [standard] °C (°F) | | | 76.5 (170) |
| LLC mixture proportion [standard/cold region] (%) | | | 30 |
| Reserve tank capacity ℓ (Imp qt) | | | Approx. 0.7 (5/8) |
| Cooling water total capacity ℓ (Imp qt) | | | Approx. 8.7 (7-5/8) |

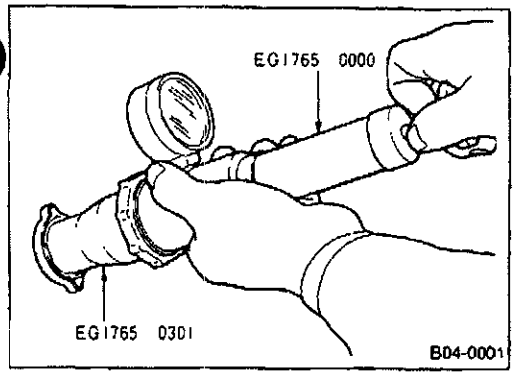


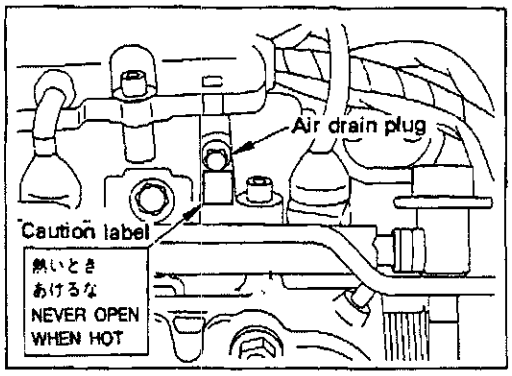

## 1. Radiator Inspection

### Cooling water leak inspection

- Use radiator cap tester to apply pressure [limit 98 kPa (1.0 kg/cm², 14 psi)] and check for leakage.

**CAUTION:**
**When using the radiator cap tester, always connect the adapter and make sure filler cap is not deformed.**




## 2. Radiator Cap Inspection

### Inspection

- Clean cap rubber packing seal surface and vacuum w dry brush.
- Attach radiator cap tester to cap, apply pressure and che that valve operates correctly.

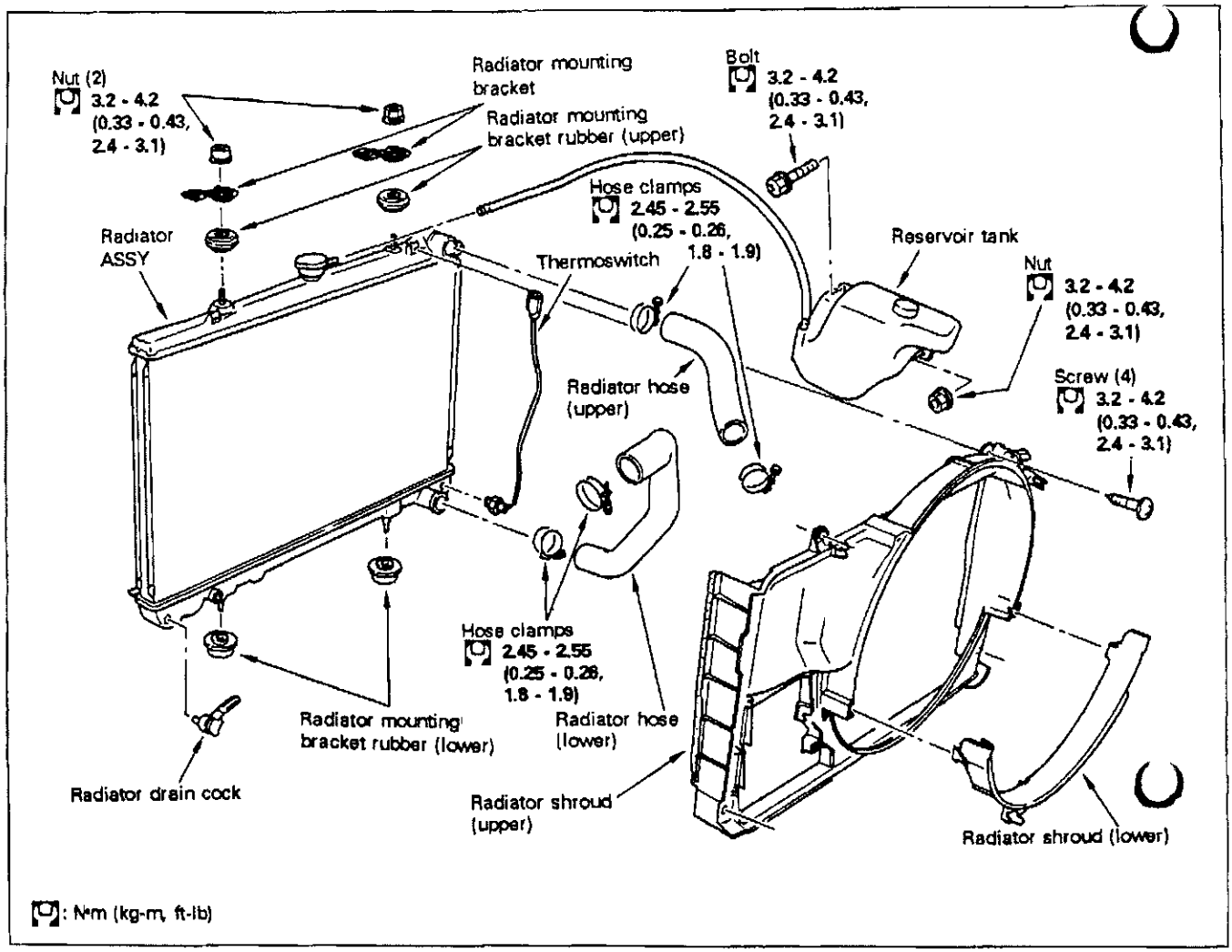
| | |
|---|---|
| Radiator cap relief pressure | 59 - 98 kPa {0.6 - 1.0 kg/cm$^2$, 9 - 14 psi} |

- Pull vacuum valve with finger and check operation.

## 3. Cooling Water Filling Procedures

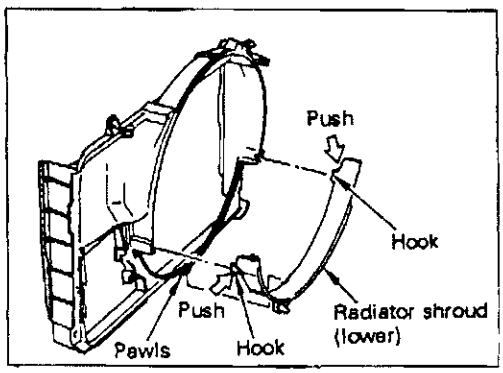
① Make sure the radiator hoses and heater hose clamps a tightened securely.
② Set the heater control lever to the "HOT" position. (In vel cles equipped with automatic air conditioners, first tu ignition switch to ON and remove the external sensor co nector.)
③ Release the radiator cap and air drain plug.
④ Fill the radiator gradually [filling speed: slower than 2 lite (1-3/4 Imp qt)/min] to the top of the spout with coolant. Fill the radiator until the water in the reserve tank reach the "MAX" level indicator.
⑤ After closing the radiator cap and air drain plug (F system), start the engine and allow it to idle.
⑥ The engine will continue to idle until the thermostat open (Touch the radiator flow hose and make sure hot water flowing). If a large volume of air remains, the water ter perature gauge needle will move past the middle becau the engine temperature rises abnormally. If this occur stop the engine until it cools and add water to the radiat repeatedly as described above. After the thermostat open race the engine for 10 seconds at 2,500 rpm two or thre times. Check that the water temperature does not ris excessively at this time.
⑦ Stop the engine and allow it to cool. Release the radiat cap and check the fluid level. If the fluid level lowers, retu to step ④ and repeat the operation. If the fluid level doe not lower, add water until the reserve tank reaches th "MAX" line.
⑧ In vehicles equipped with automatic air conditioning, co nect the fresh air sensor connector.

## 4. Radiator Removal and Installation



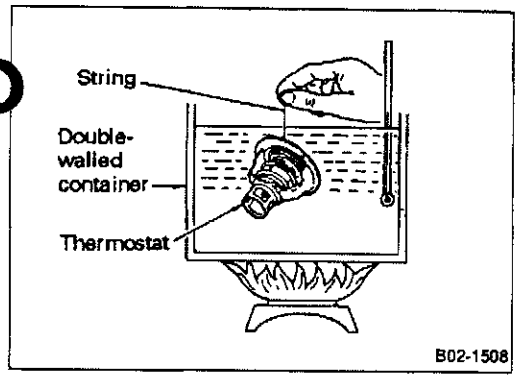

Additional work required:

- Drain and fill: Cooling water
- Remove: Supplementary electrical fan connector




**[Point 1] Radiator shroud (lower) removal**

- While pushing hooks (left and right, 2 locations) to release remove pawls and detach shroud.

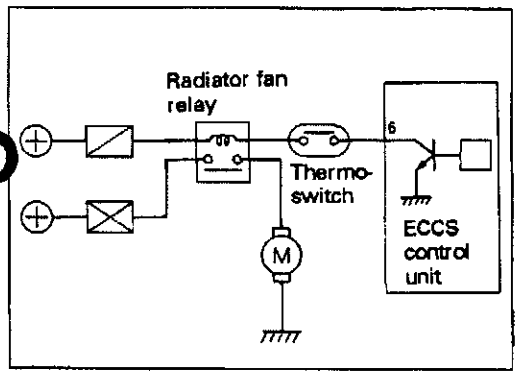



## 5. Thermostat Inspection

### Inspection

- Check that valve opening temperature and maximum valve lift conform to specified value.
- Place a string in thermostat valve and insert in container of water. While holding thermostat heat the water.
- The valve opening temperature is the temperature when the thermostat falls off the string.

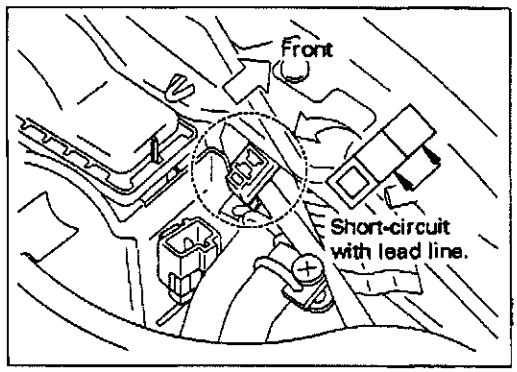
| Item \ Engine | RB26DETT |
|---|---|
| Valve opening temperature °C (°F) | 76.5 (170) |
| Maximum valve lift mm/°C (in/°F) | 10 (0.39) minimum/90 (194) |




## 6. Sub Electrical Fan Inspection

### Operation

| Radiator fan "ON" condition | Thermoswitch "ON" [engine temperature 90°C (194°F) min] |
|---|---|




### Function inspection

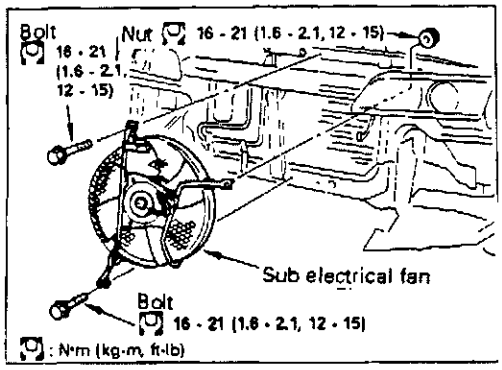
- With ignition switch in OFF position, remove switch harness connectors and short-circuit harness connector.
- With ignition switch in ON position, check that fan motor operates correctly.

### Thermoswitch inspection

- Heat thermoswitch with high-temperature water or oil (heat with heat gun, for example) and check if it conforms to values in following chart.

| | | |
|---|---|---|
| Engine temperature °C (°F) | Valve raised: 90 ± 3 (194 ± 5.4) max. Valve lowered: 83 ± 3 (181 ± 5.4) max. | Valve raised: 90 ± 3 (194 ± 5.4) min. Valve lowered: 83 ± 3 (181 ± 5.4) min. |
| Thermoswitch connection condition | Non-continuity | Continuity |

| | |
|---|---|
| Thermoswitch tightening torque | 3 - 5 N·m (0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb |




## 7. Sub Electrical Fan Removal and Installation

Additional work required;

- Remove and install: Intercooler
  Harness connectors

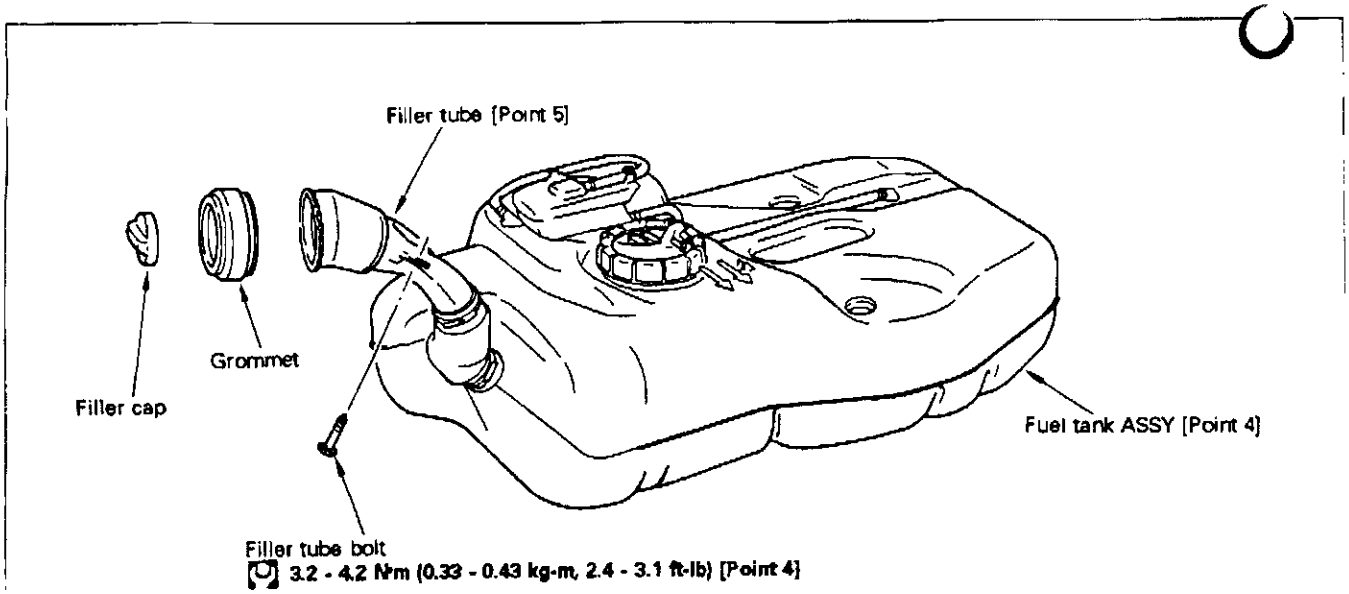
## Preparation tools

| | Name | Application |
|---|---|---|
| Measurement tool | Circuit tester | Fuel gauge inspection |

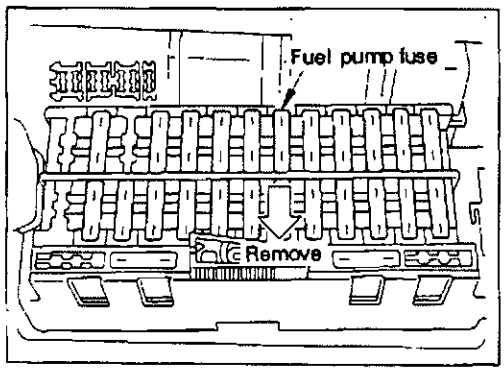
## Specifications

| Item | | | Engine: RB26DETT |
|---|---|---|---|
| Fuel tank main body | Nominal capacity ℓ (Imp gal) | | 72 (15-7/8) |
| | Intake air capacity ℓ (Imp qt) | | 5.5 (4-7/8) |
| | Remaining volume capacity for warning lamp activation ℓ (Imp qt) | | Approx. 13 (11-1/2) |
| | Warning lamp effective remaining volume ℓ (Imp qt) | | Approx. 12.8 (11-1/4) |
| | Fuel gauge E indication effective volume ℓ (Imp qt) | | Approx. 8 (7) |
| | Drain plug | | None |
| Fuel pump | | | Tank internal electrical system |
| Filler cap | Type | | Screw-in (vacuum relief valve installed) |
| | Relief valve opening valve pressure kPa (mmHg, inHg) | | −6.0 to −3.3 (−45 to −25, −1.77 to −0.98) |
| Fuel overflow prevention system | | | Internal air chamber system (check valve attached) |
| Reservoir tank capacity ℓ (Imp qt) | | | — |
| Fuel gauge unit | Gauge system | | Float arm system |
| | Resistance value Ω | F | Approx. 6 |
| | | E | Approx. 80 |
| | Remaining volume warning system | | Thermistor system |
| Evaporation system | | | Canister system |
| Fuel tube diameter | Outlet mm (in) | | 8 (0.31) |
| | Return mm (in) | | 8 (0.31) |

## 1. Fuel Tank Removal and Installation




Additional work required:
- Drain: Fuel
- Remove: Fuel pressure relief valve [Point 1]
  Fuel tank internal pressure relief
  Filler tube protector
  Inspection hole cover [Point 2]
  Fuel gauge unit, fuel pump harness connector [Point 3]
  Fuel tank protector
  Hoses

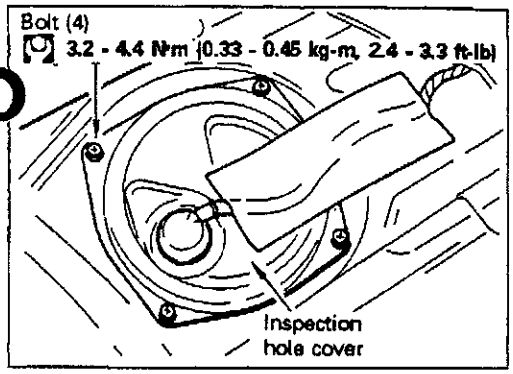



### [Point 1] Fuel pressure relief

- After starting engine, remove fuel pump fuse and wait unti engine stops. Crank engine 2-3 times to consume fuel ir lines.
- In vehicles which cannot be started, remove fuel pump fuse, crank engine 4-5 times to consume fuel in lines.

**CAUTION:**
**The battery may become weak easily, so use booster cables tc connect it to another vehicle or battery if necessary.**

## 1. Fuel Tank Removal and Installation (Cont'd)




### [Point 2] Inspection hole cover removal and installation

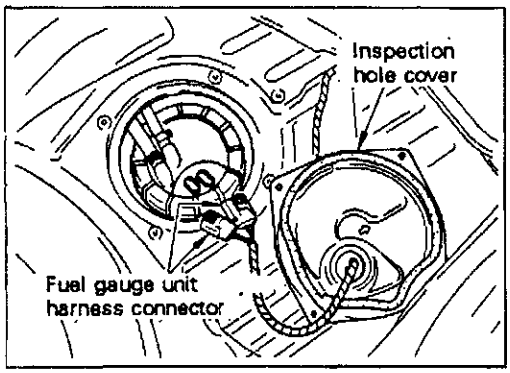
**Removal**

- Remove the trunk floor carpet and detach the inspection hole cover.

**Installation**

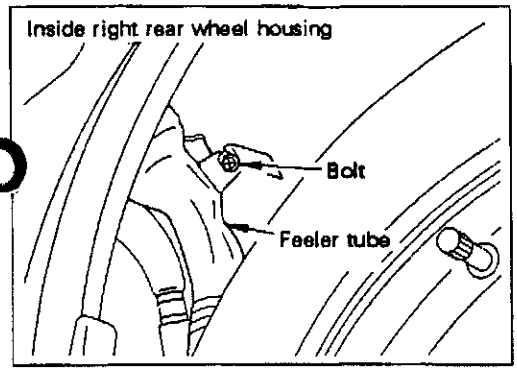
- Check that fuel gauge unit and fuel pump harness connectors are connected securely.
- Check that fuel hose connections are secure.

| | |
|---|---|
| Bolt tightening torque | 3.2 - 4.4 N·m (0.33 - 0.45 kg-m, 2.4 - 3.3 ft-lb) |




### [Point 3] Fuel gauge unit, fuel pump harness connector removal

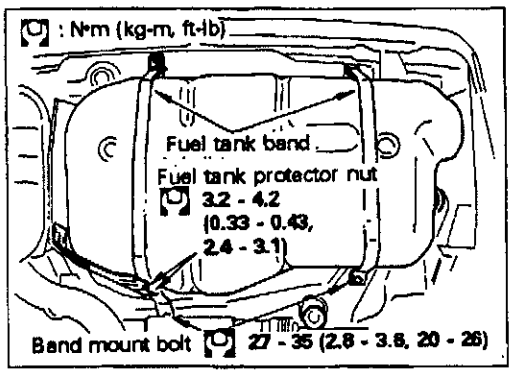
- Remove inspection hole cover. Detach fuel gauge unit and fuel pump harness connector.




### [Point 4] Fuel tank removal and installation

**Removal**

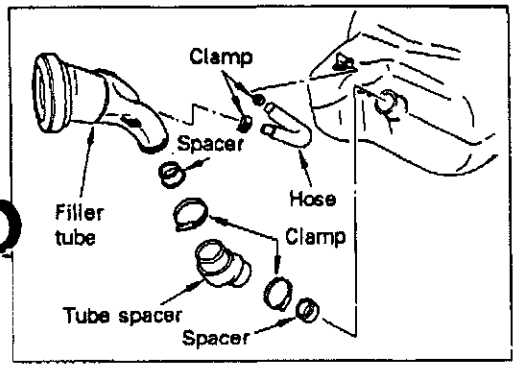
- Remove feeler tube protector, and detach bolt shown in figure on left.
- Remove feeler tube grommet from body.
- Remove fuel tank protector, fuel tank band mount bolts and detach fuel tank.




**Installation**

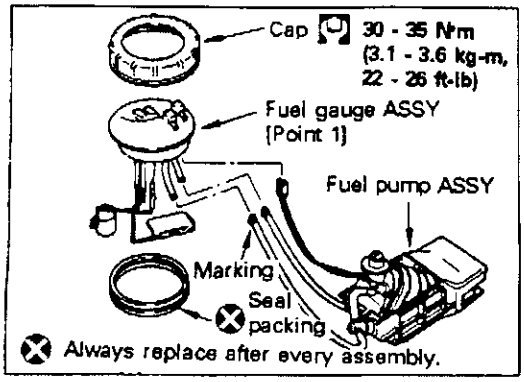
- Attach tank and secure by tightening mount bolt on front side of right member to specified torque.

| | |
|---|---|
| Band mount bolt tightening torque | 27 - 35 N·m (2.8 - 3.6 kg-m, 20 -26 ft-lb) |
| Protector nut tightening torque | 3.2 - 4.2 N·m (0.33 - 0.43 kg-m, 2.4 - 3.1 ft-lb) |




### [Point 5] Filler tube installation

- Insert spacer between fuel tank and filler tube and connect tube. Tighten clamps securely.
- Tighten filler tube grommets to body.




## 2. Fuel Gauge ASSY

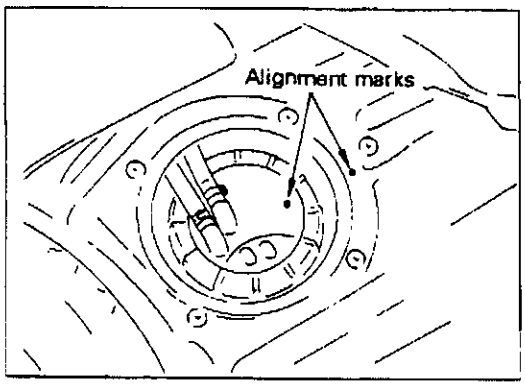
### (1) Fuel gauge ASSY removal and installation

Additional work required:

- Remove: Fuel pressure relief, internal pressure relief
  Inspection hole cover
  Fuel gauge unit
  Fuel pump harness connector
  Fuel hose (return, feed)

**CAUTION:**

- **Install gauge unit with care.**
- **Do not touch float and arm to prevent them from bending.**
- **Do not bend or twist harness.**




### [Point 1] Fuel gauge ASSY removal and installation

#### Removal

- Attach alignment marks to the fuel gauge ASSY and fuel tank and then remove the cap.
- Raise fuel gauge ASSY, remove 2 hoses in tank (marked section is outlet side), fuel pump harness connector and detach fuel gauge ASSY.

**CAUTION:**

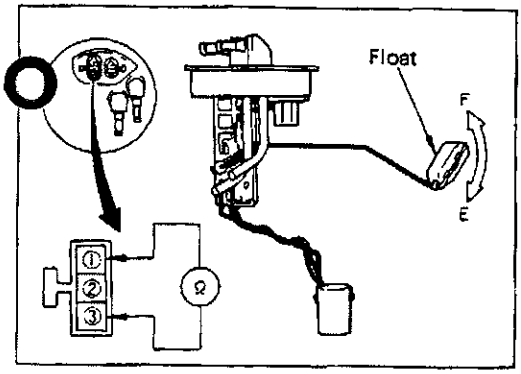
**Be especially careful not to damage fuel gauge ASSY.**

#### Installation

- Check marking on hose inside tank and connect fuel gauge ASSY.
- Check that fuel gauge ASSY and fuel tank alignment marks are positioned correctly and tighten cap.

| | |
|---|---|
| Tightening torque | 30 - 35 N·m<br>(3.1 - 3.6 kg-m, 22 - 26 ft-lb) |

## 2. Fuel Gauge ASSY (Cont'd)

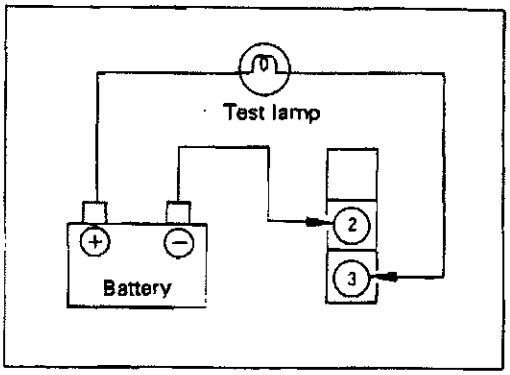



### (2) Fuel gauge ASSY inspection

**① Float inspection**

- Place the float at the F (lever upper side) and E (lever down side) positions and check the resistance.

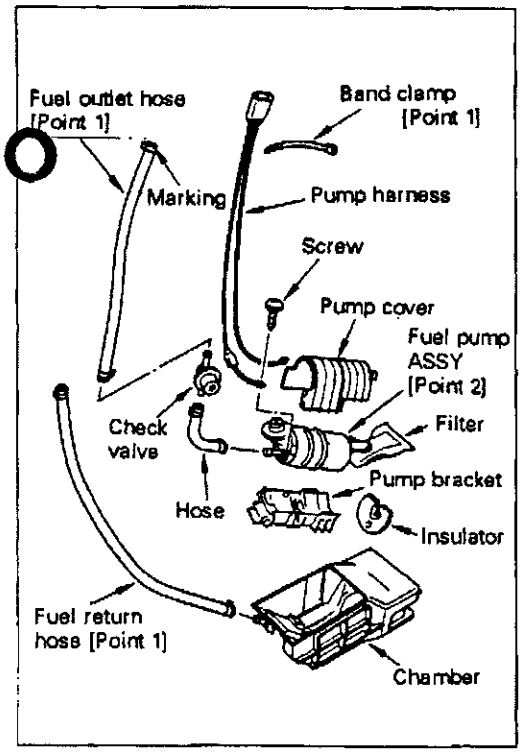
| Float position / Inspection terminal | F position | E position |
|---|---|---|
| ④ - ⑤ | Approx. 6Ω | Approx. 80Ω |




**② Low fuel warning lamp sensor inspection**

- Connect a 12V - 3.4 W test lamp or equivalent.

- Wash sensor with gasoline or white gasoline and check that lamp does not light after approximately 3 minutes have elapsed.
- Remove sensor from gasoline or white gasoline and check that lamp lights within 3 minutes.




## 3. Fuel Pump Removal and Installation

### (1) Fuel pump disassembly

Additional work required:

- Remove: Fuel pressure relief, internal pressure relief
  Fuel gauge

**CAUTION:**

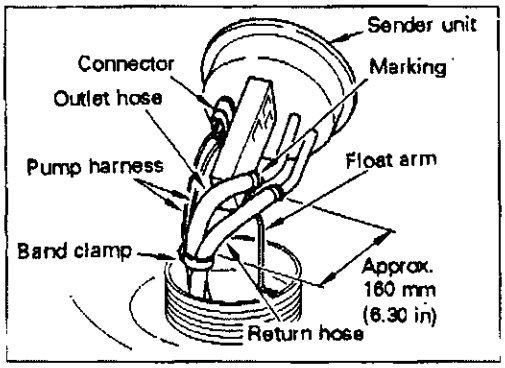
- **Be careful when handling fuel pump.**
- **Do not use pump again if it is dropped.**
- **Do not allow dirt or debris to adhere to the filter.**
- **Do not twist or turn harness.**

## 3. Fuel Pump Removal and Installation (Cont'd)

### [Point 1] Fuel hose removal and installation

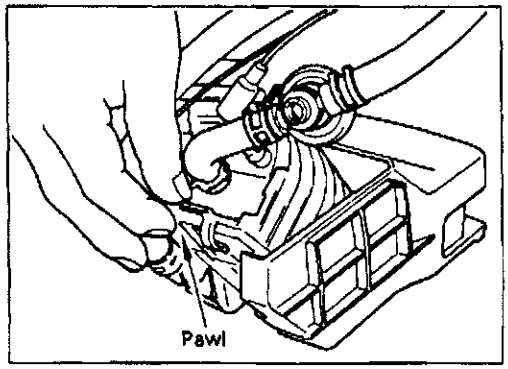
**Removal**

- Raise fuel gauge ASSY, remove 2 hoses in tank (marked section is outlet side), fuel pump harness connector and detach fuel gauge ASSY.




**Installation**

- Check fuel hose marking, connect fuel gauge ASSY. Position pump harness and clamp band 160 mm (6.30 in) from gauge ASSY connecting part and tighten securely.
- Be careful that fuel hose and fuel harness turn inside tank from the right to front side of vehicle and do not cause any interference with float arm.




### [Point 2] Fuel pump removal and installation

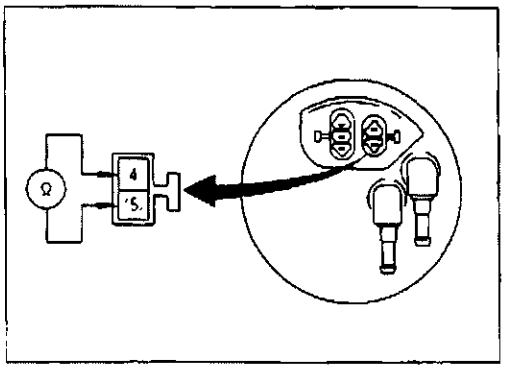
**Removal**

- Push the pawl lightly on rear side of pump bracket, and remove fuel pump in pump rotation direction.

**CAUTION:**
**The fuel return hose must not be removed.**

**Installation**

- Insert fuel pump in fuel chamber and attach pawl on rear side of pump bracket in retaining notch inside fuel chamber. Insert pump in axial direction.




### (2) Fuel pump inspection

**Inspection**

- Apply voltage from the battery to harness connectors terminals ④ and ⑤ to check pump operation.

## Specifications

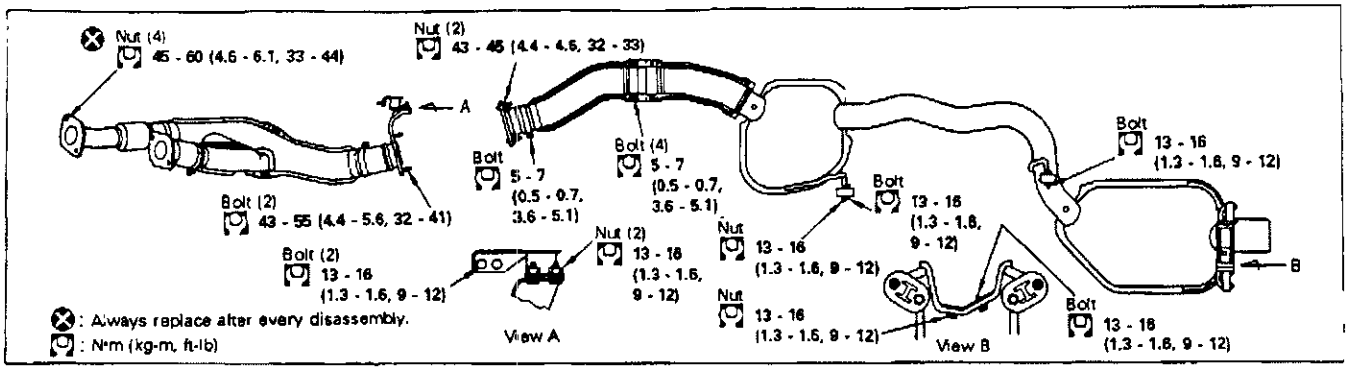
| Item \ Engine | | | RB26DETT |
|---|---|---|---|
| Front tube | Tube outer diameter mm (in) | Dual portion | 54 (2.13) |
| | | Single portion | 70 (2.76) |
| | Long dual tube | | — |
| | Flexible tube | | Installed |
| | Pre-muffler [capacity ℓ (Imp qt)] | | — |
| Muffler ASSY | Center tube outer diameter mm (in) | | 70 (2.76) |
| | Pre-muffler [capacity ℓ (Imp qt)] | | Installed [7.0 (6-1/8)] |
| | Flexible tube | | — |
| | Dynamic damper | | Installed |
| | Main muffler capacity ℓ (Imp gal) | | 16 (3-1/2) |
| | Tail pipe external diameter mm (in) | | 59 × 83 (2.32 × 3.27) (ellipse) |
| Catalytic converter | Types | | Under body floor, three-way, single-unit |
| | Capacity ℓ (Imp qt) | | 1.7 (1-1/2) |
| | Catalytic metal | | Platinum rhodium |
| Exhaust gas temperature warning equipment operation temperature °C (°F) | | | 850 (1,562) |

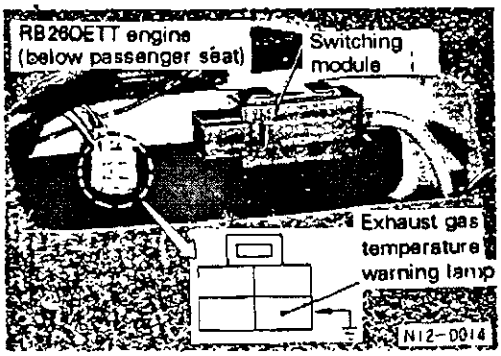
### Exhaust system part inspection, warning precautions

- The heat resistance and corrosion resistance in exhaust system parts and component shape have been carefully considered in the design process, so only use genuine Nissan parts for replacement.
- Clean each connection part and connect securely, making sure there are no gas leaks.
- Always use new gaskets in the front and rear of catalytic converter.
- Always use new parts for exhaust manifold connection gasket and nuts.
- After assembling each part, warm engine, raise speed to 2,000 to 3,000 rpm and make sure there are no gas leaks, sealing compound leaks or sealing gaps.
- Replace parts rather than repairing extreme deformation in heat insulation panels. If extreme amounts of dirt have accumulated, clean these areas.
- When attaching heat insulation panels, make sure there is adequate clearance and no interference between exhaust pipes.

## 1. Exhaust Pipe, Catalytic Converter and Heat Panel Tightening Torques

### (1) RB26DETT (4WD)




## 2. Exhaust Gas Temperature Warning Equipment Inspection

### Basic inspection

- Turn ignition key ON and check that exhaust gas temperature warning lamp does not light.
- Exhaust gas temperature warning lamp must light when ignition is at START and must go off when engine starts.

### Exhaust gas temperature warning lamp replacement and inspection

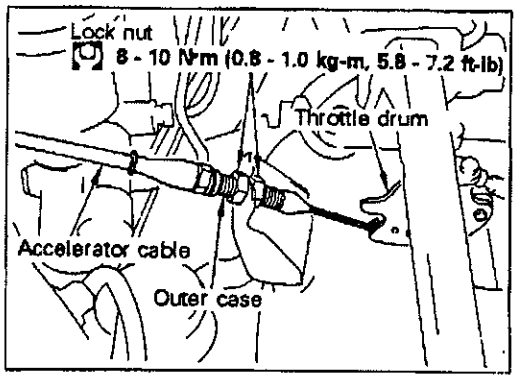
- Remove vehicle harness from switching module.
- Use lead line to ground vehicle side harness connector exhaust gas temperature warning lamp terminal.
- Inspect condition of exhaust gas temperature warning lamp with ignition switch turned ON.

| | |
|---|---|
| Lamp lights | • Faulty circuit between ignition switching module<br>• Faulty key sensing module or sensor |
| Lamp does not light | • Exhaust gas temperature warning lamp is burned out.<br>• Exhaust gas temperature warning lamp power circuit is faulty. |

## 1. Accelerator Pedal Inspection and Adjustment

### Accelerator pedal inspection

- The engine must be at full throttle when accelerator pedal is pressed down fully (pedal lever contacts the stopper completely).

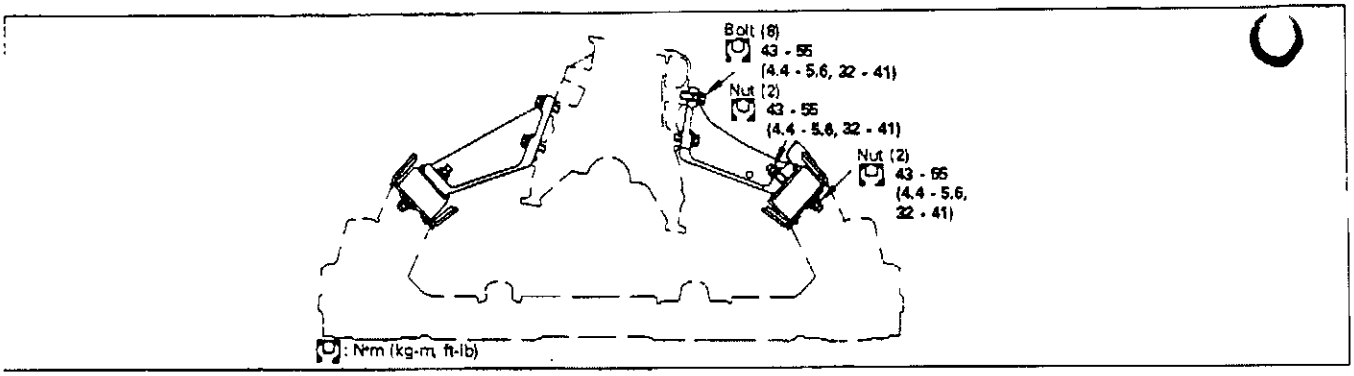



### Accelerator pedal adjustment

- Loosen lock nuts so accelerator cable has adequate slack. Pull outer case in direction of accelerator pedal from position where throttle drum starts operating (there must be no play at this point), return lock nuts 1.0 to 1.5 turns and tighten securely.

| | |
|---|---|
| Tightening torque | 8 - 10 N·m (0.8 - 1.0 kg-m, 5.8 - 7.2 ft-lb) |

## 1. Front Engine Mounting (RB26DETT)




## 2. Rear Engine Mounting (RB26DETT)