ISUZU

# N SERIES

# TRAINING MANUAL


ISUZU MOTORES LIMITED

Service Marketing Department

# GENERAL INFORMATION

| SERVICE INTERVAL: (Use odometer reading or months Whichever comes first) | × 1,000 km | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | × 1,000 mile | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | |
| Torsion bar spring (Independent suspension model only) | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Ball joint boots for damage (Independent suspension model only) | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Ball joints for excessive play (Independent suspension model only) | | — | — | — | I | — | — | — | I | — | — | or every 36 months |
| Mounts for looseness or damage | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Shock absorbers for oil leakage | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Shock absorbers mount for looseness | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Upper links (Independent suspension model only) | | L | L | L | L | L | L | L | L | L | L | or every 9 months |
| **WHEELS** | | | | | | | | | | | | |
| Wheel pins and nuts | | — | T | — | T | — | T | — | T | — | T | or every 18 months |
| Wheel discs for damage | | — | I | — | I | — | I | — | I | — | I | or every 18 months |
| Hub bearings grease | | — | — | — | R | — | — | — | R | — | — | or every 36 months |
| Tire pressures and damage | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| **ELECTRICAL EQUIPMENT** | | | | | | | | | | | | |
| Specific gravity of battery electrolyte | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| **OTHERS** | | | | | | | | | | | | |
| Lights, horn, windshield, wiper and washers | | I | I | I | I | I | I | I | I | I | I | or every 9 months |
| Bolts and nuts on chassis and body | | — | — | — | I | — | — | — | I | — | — | or every 36 months |

(I): Inspect and correct or replace as necessary (A): Adjust (R): Replace or change (T): Tighten to specified torque (L): Lubricate

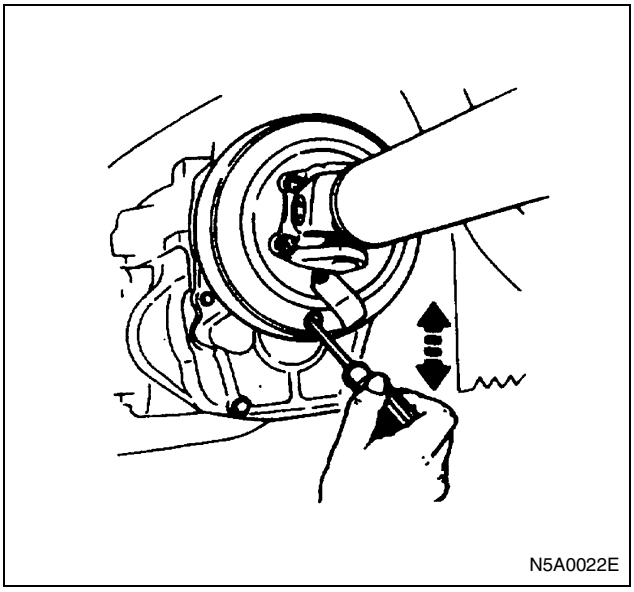
## MEMO

| | |
|---|---|
| — | Not available |
| ❍ | Standard |
| ❑ | Factory option |
| | Non |

| No. | Models | FRONT BRAKE | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DISC BRAKE | | | | | | | | | DRUM BRAKE | | | | | | | | | | | |
| | | WHEEL CYL | | | DISC | | | | | | Type | | WHEEL CYL. | | | DRUM. | | | LINING | | | |
| | | Inside dia. (in) | | | Thickness (mm) | | | Outside dia. (mm) | | | 2L | D2L | Inside dia. (in) | | | Inside dia. (in) | | | Width (mm) | | | |
| | | 2+1/8 | 2 | 2+1/4 | 35 | 40 | 42 | 265 | 293 | 310 | | | 1+1/8 | 1+3/16 | 1+3/8 | 279.4 | 300 | 320 | 60 | 75 | 100 | 120 |
| 1 | NHR55EU-1CB | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 2 | NHR55EU-1CY | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 3 | NHR55EU-1CYIN | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 4 | NHR55EU-1BWS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 5 | NHR55EU-3CB | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 6 | NHR55EU-3CYZJ | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 7 | NHR55EU-3CBSN | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 8 | NHR55EL-1CBS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 9 | NHR55EL-1CYS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 10 | NHR55EL-1CY | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 11 | NHR55EL-1CXY | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 12 | NHR55EL-1CYCLJ | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 13 | NHR55EL-1BWS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 14 | NHR55EL-3CBS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 15 | NHR55EL-3CYS | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |
| 16 | NHR55EL-3CB | | | | | | | | | | ❍ | | ❍ | | | ❍ | | | ❍ | | | |

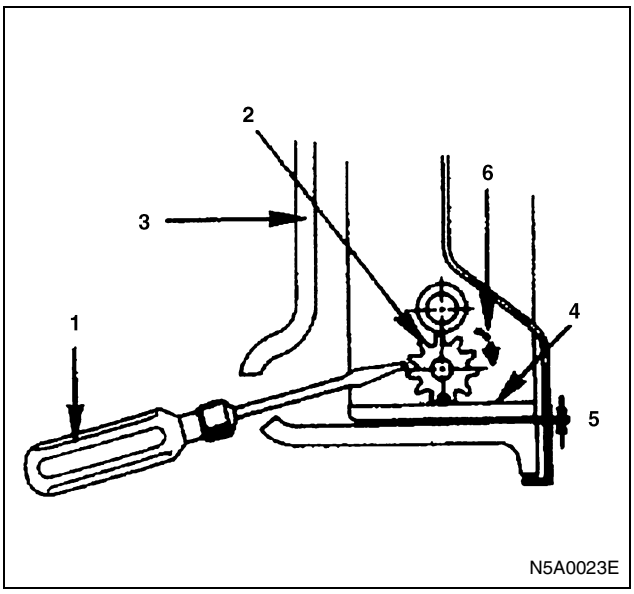
| | |
|---|---|
| — | Not available |
| ❍ | Standard |
| ❑ | Factory option |
| | Non |

| No. | Models | FRONT BRAKE | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DISC BRAKE | | | | | | | | | | DRUM BRAKE | | | | | | | | | | | | |
| | | WHEEL CYL. | | | DISC | | | | | | | Type | | | WHEEL CYL. | | | DRUM. | | | LINING | | | |
| | | Inside dia. (in) | | | Thickness (mm) | | | Outside dia. (mm) | | | | 2L (W/O AUTO) | 2L (W AUTO) | D2L | Inside dia. (in) | | | Inside dia. (in) | | | Width (mm) | | | |
| | | 2+1/8 | 2 | 2+1/4 | 35 | 40 | 42 | 265 | 293 | 310 | 363 | | | | 1+1/8 | 1+3/16 | 1+3/8 | 279 | 300 | 320 | 60 | 75 | 100 | 120 |
| No. | Models | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 61 | NPR66GL-5JXY | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 62 | NPR66GDL-5LX | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 63 | NPR66GDL-5LXS | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 64 | NPR66GL-5LXY | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 65 | NPR66GL-5LXYS | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 66 | NPR70GL-5LXYRJ2 | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 67 | NPR77LL-5DXYEJ | ❍ | | — | | ❍ | — | | ❍ | — | — | — | — | — | — | — | — | | | — | | — | — | — |
| 68 | NPR66LL-5EXYG | — | | — | | — | — | | — | — | — | — | — | ❍ | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 69 | NPR77LL-5HXYEJ | ❍ | | — | | ❍ | — | | ❍ | — | — | — | — | — | — | — | — | | | — | | — | — | — |
| 70 | NPR66LL-5JXA2 | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 71 | NPR66LL-5JXY2 | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 72 | NPR66LL-5JXAS | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 73 | NPR66LL-5JXYS | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 74 | NPR70LL-5JXYRJ2 | — | | — | | — | — | | — | — | — | ❍ | — | — | ❍ | — | — | | | ❍ | | ❍ | — | — |
| 75 | NPR66LL-5LXA | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 76 | NPR66LL-5LXY | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 77 | NPR66LL-5LYB | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 78 | NPR71LL-5LXYGJ | — | | — | | — | — | | — | — | — | — | ❍ | — | — | ❍ | — | | | ❍ | | — | — | ❍ |
| 79 | NPR66LL-5LVXY | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | — | | | ❍ | | — | ❍ | — |
| 80 | NQR71LL-5NVXY | — | | — | | — | — | | — | — | — | ❍ | — | — | — | ❍ | ❑ | | | ❍ | | — | — | ❍ |


N5A0022E

6. Back off the adjusting screw the specified number of notches.

| Adjusting Screw Notches and Clearance | | |
|---|---|---|
| Brake Type mm (in) | Notches | Clearance mm (in) |
| 178 (7.008), 190 (7.480) | 30 | 0.75 (0.029) |
| 203.2 (8.000) | 8 | 0.23 (0.009) |



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**Legend**

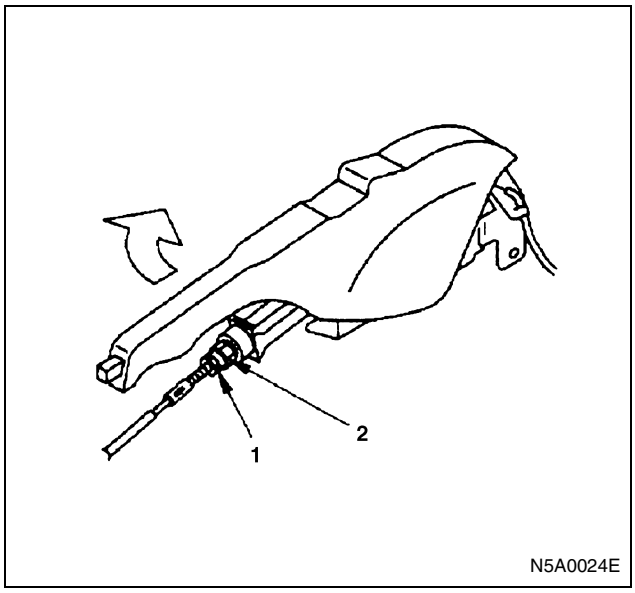
1. Screwdriver
2. Adjusting screw
3. Brake drum
4. Brake shoe
5. Clearance
6. Direction of brake shoe expansion (for 178 mm, 190 mm)
   Brake Type (203 mm) is direction to the counter rotation.

7. Reinstall the check hole cover.
8. Lower the rear wheels to the floor.

**Parking Brake Lever Travel Adjustment**

1. Fully set the parking brake lever and release it several times.
   Leave the parking brake lever in the released position.
2. Loosen the parking brake control wire lock nut (1).
3. Turn the adjuster (2) to adjust the lever travel to the specified notches.

| Parking brake lever travel at 147 N (15 kg / 33 lbs) notches |
|---|
| 6 to 8 |



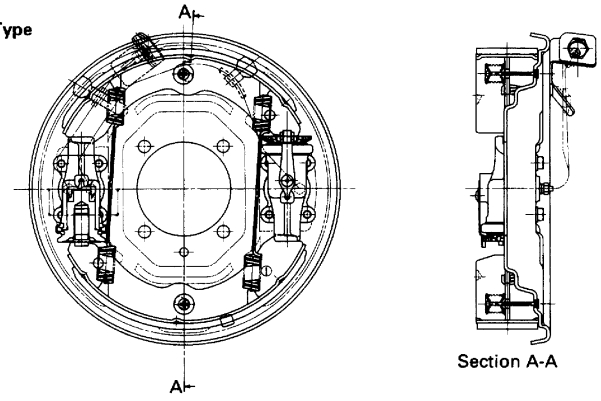
N5A0024E

4. Retighten the control wire lock nut (1).
5. Check the parking brake lever travel (measured in notches).

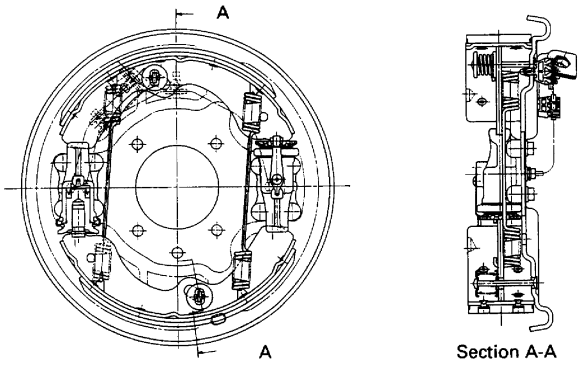
## Front Drum Brake

### Drum Inside Diameter

279.4 & 300 mm – 2L Type

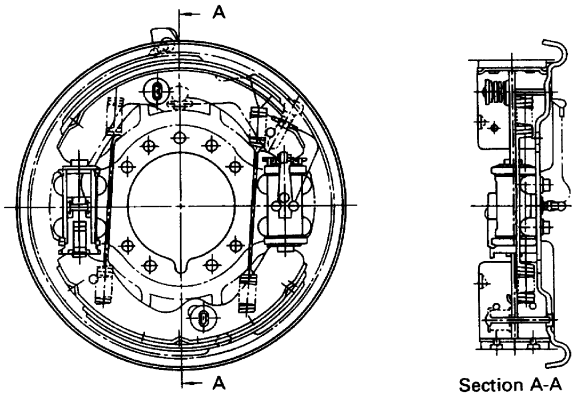



320 mm – 2L Type

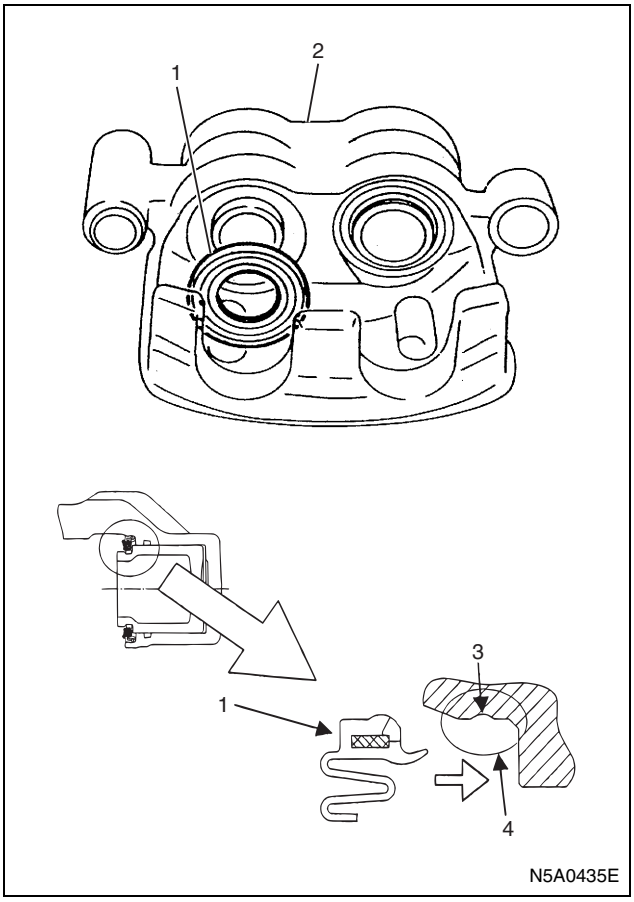



N5A0047E

### NPS




N5A0048E

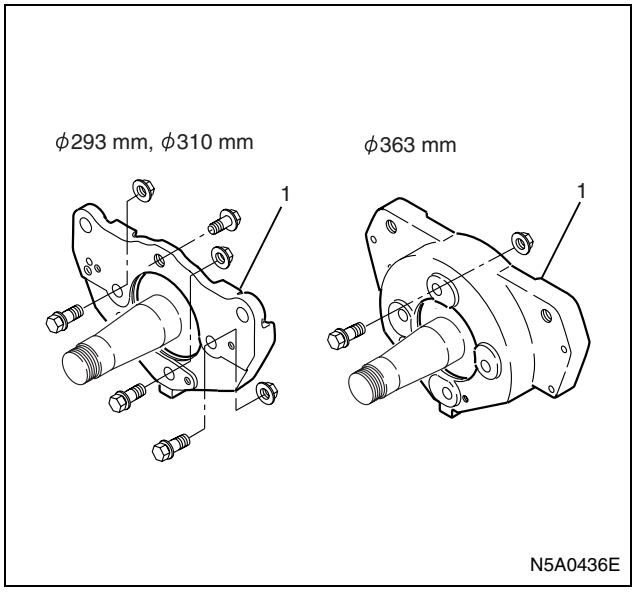



**Legend**
1. Piston Boot
2. Body Assembly
3. Cylinder Body Groove
4. Boot Insert Portion

## Installation

1. Adapter
   - Install the adapter to the knuckle.
   - Tighten the fixing bolts and nuts to the specified torque.

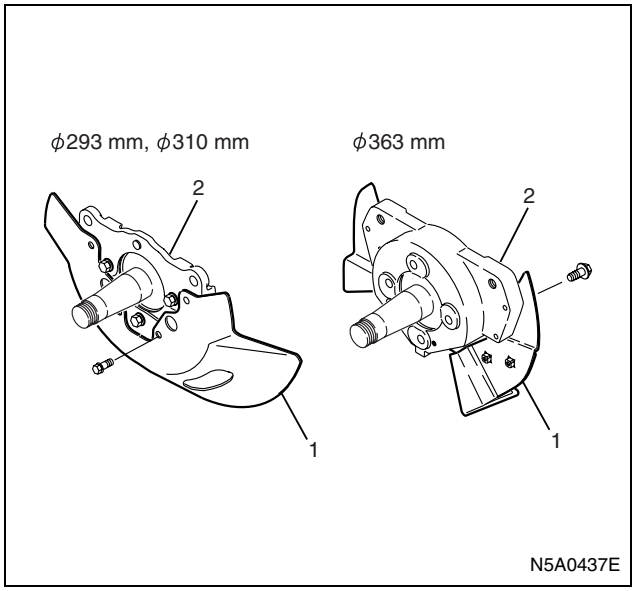
**Tighten:**
Fixing bolts and nuts to 162 N·m (16.5 kg·m / 119 lb·ft).




**Legend**
1. Adapter

2. Wind Guide
   - Tighten the fixing bolts to the specified torque.

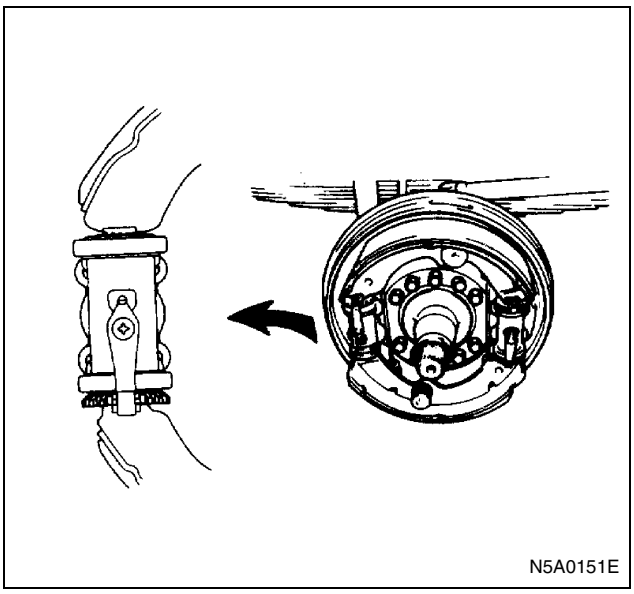
**Tighten:**
Fixing bolts to 13 N·m (1.3 kg·m / 113 lb·in).




**Legend**
1. Wind Guide
2. Adapter

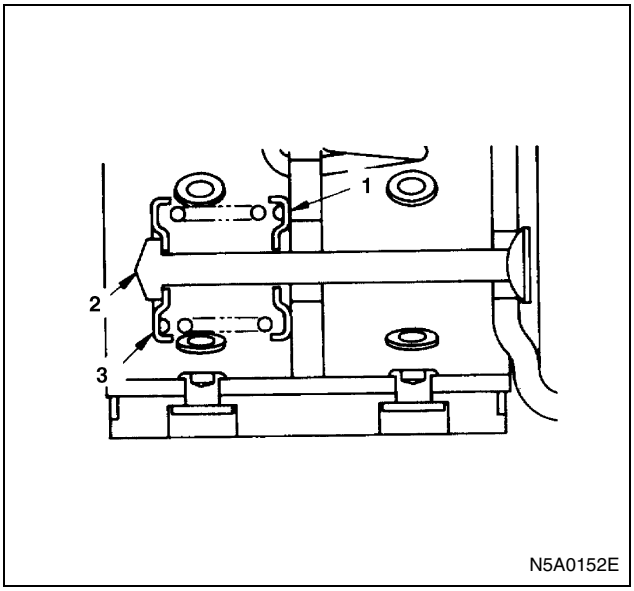
3. Support Assembly
   - Tighten the fixing bolts to the specified torque.

**Tighten:**
Fixing nuts to 221 N·m (22.5 kg·m / 163 lb·ft).


N5A0151E

4) Install the brake shoes and the return springs to the wheel cylinders.
Keep the brake lining clean.

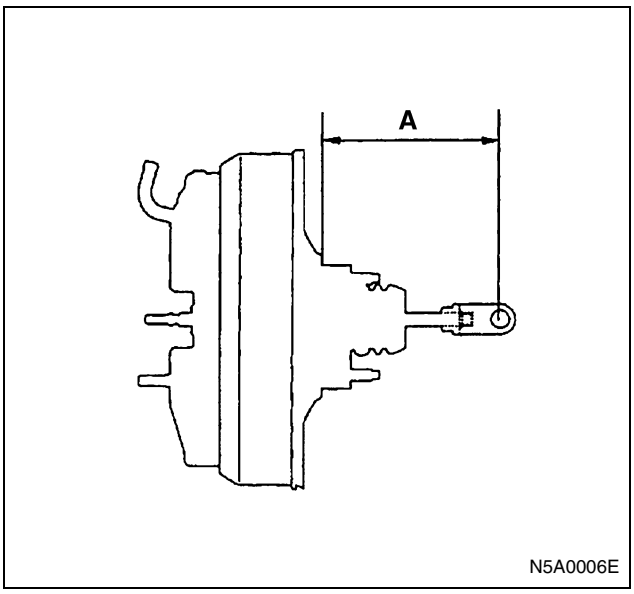
6. Shoe Holding Spring, Cup and Pin
1) Before installing the holding pin, apply a coat of molybdenum disulfide grease to the holding cup seating faces (1) contacting the brake shoe.



N5A0152E

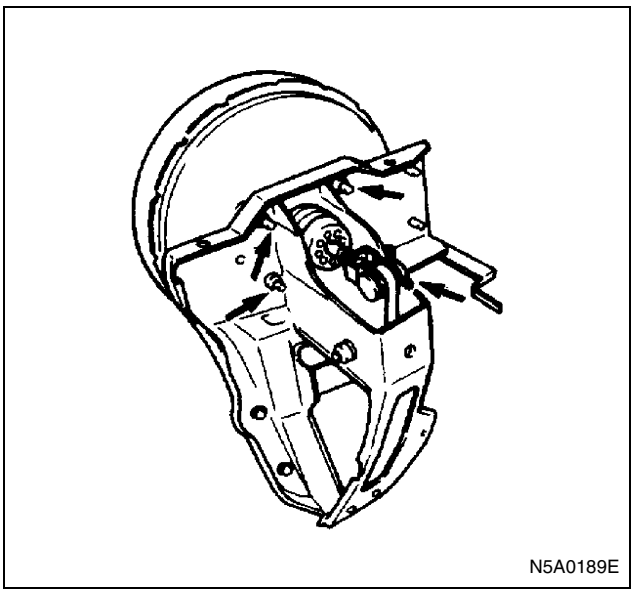
2) After installation of the pins, cups and the springs, make sure the pin (2) seats to the cup (3) properly.

After assembly, adjust the lining clearance and air bleeding the brake, referring to “SERVING” in Section 00 of this section.




4) Install the vacuum booster to brake pedal assembly.

- Adjust the clearance between the tip of threaded portion of the stop light switch and the pedal arm to 0.5 — 1.0 mm (0.02 — 0.04 in).

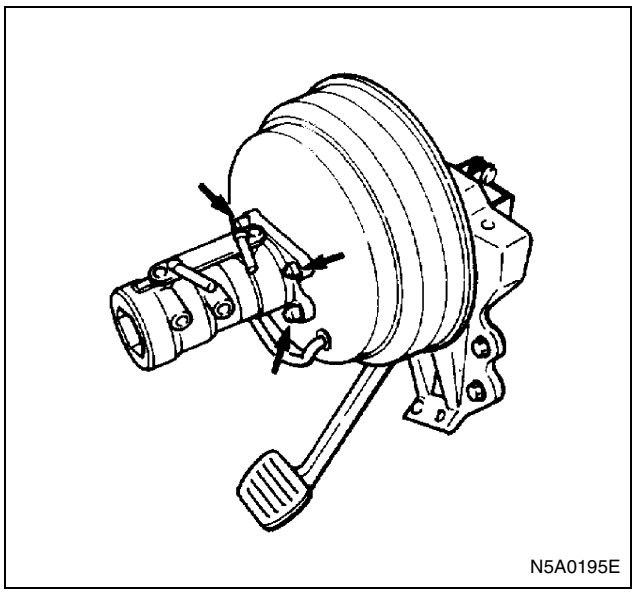



5) Tighten the vacuum booster bolts to the specified torque.

**Tighten:**
Vacuum booster bolts to 14 N·m (1.4 kg·m / 122 lb·in)

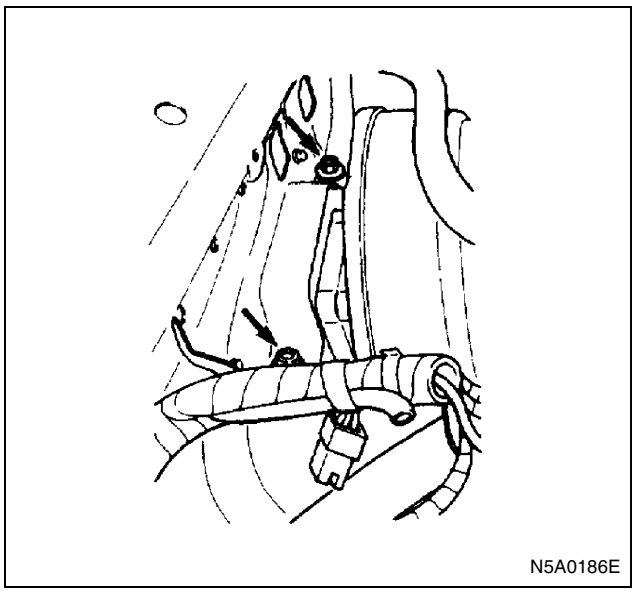
6) Install the master cylinder assembly to vacuum booster or brake pedal assembly.
7) Tighten the master cylinder nut to the specified torque.

**Tighten:**
Master cylinder nut to 14 N·m (1.4 kg·m / 122 lb·in)




8) Install the vacuum booster and brake pedal assembly.

**Tighten:**
Vacuum booster and brake pedal assembly bolts to 42 N·m (4.3 kg·m / 32 lb·ft)

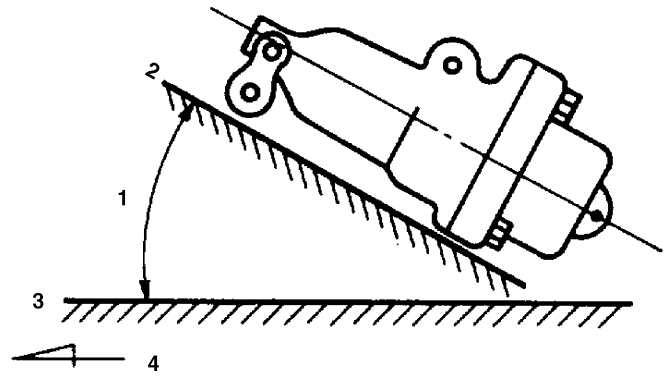



9) Connect the brake hoses and pipes.

| Models | (A) N (kg/lb) | (B) kPa (kg/cm$^2$/psi) | (C) kPa (kg/cm$^2$/psi) | (D) kPa (kg/cm$^2$/psi) |
|---|---|---|---|---|
| NPR75-5E | 8826(900/1984) | 5031±588 (51.3±6/730±85) | 1697±196 (17.3±2/246±28) | 2922±343 (29.8±3.5/424±50) |
| NPR77-5H | 8826(900/1984) | | | |
| NPR70/75-5J/5HW | 14710(1500/3307) | | | |
| NPR75-5J/5HW | 14710(1500/3307) | | | |
| NPR70/75-5L/5KW | 16671(1700/3748) | | | |
| NQR75-5L/5KW | 14710(1500/3307) | | | |
| NQR75-5N (Australia) | 12749(1300/2866) | | | |
| NPR66-5J | 8826(900/1984) | | | |
| NPR66-5E | 15691(1600/3527) | | | |
| NPR66-5L (South Africa) | 12749(1300/2866) | | | |
| NPR66-5L (GCC) | 13729(1400/3086) | | | |
| NPR71 / NQR70-5L | 13729(1400/3086) | | | |
| NQR71-5N | 13729(1400/3086) | | | |
| NQR75-5N (South Africa) | 14710(1500/3307) | | | |
| NPS71/75-5J | 17652(1800/3968) | | | |

## Deceleration Sensing Proportioning Valve

### DSPV Mounting Angle




N5A0230E

**Legend**

1. Mounting angle
2. Mounting surface
3. Ground surface
4. Front

| Models | Mounting Angle |
|---|---|
| NHR | 12°00′±45′ |
| NKR | 12°30′±45′ |

Conduct the following inspections, and if any abnormality is found, replace.

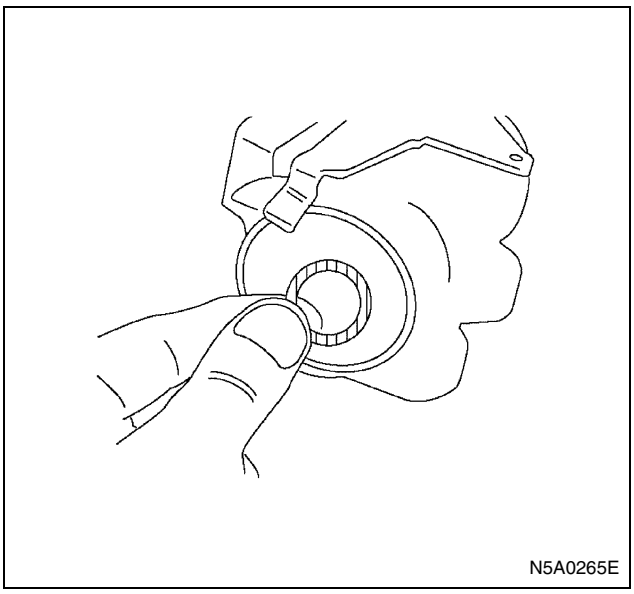
**Legend**

1. Turn the lever to the arrow, and extend the spring
2. Assemble the lever from the direction
3. Connecting point of lever and spring

3. Install the lever fixing bolt to the specified torque.
4. Make sure not to bite the lever between the bolt sleeve and body surface.
5. Make sure fit the lever to the gear properly after fixing the bolt.

**Plain washer**

Make sure to assemble the plain washer of coating side to the adjust side.




Assemble the plain washer with the copper-colored surface facing inward and the coating (black) surface facing outward.

**Notice:**

Failure to assemble the plain washer or assembling it inside out causes auto adjuster not to operate properly. Be sure to assemble it correctly.

**Drum Inside Diameter 370 mm**

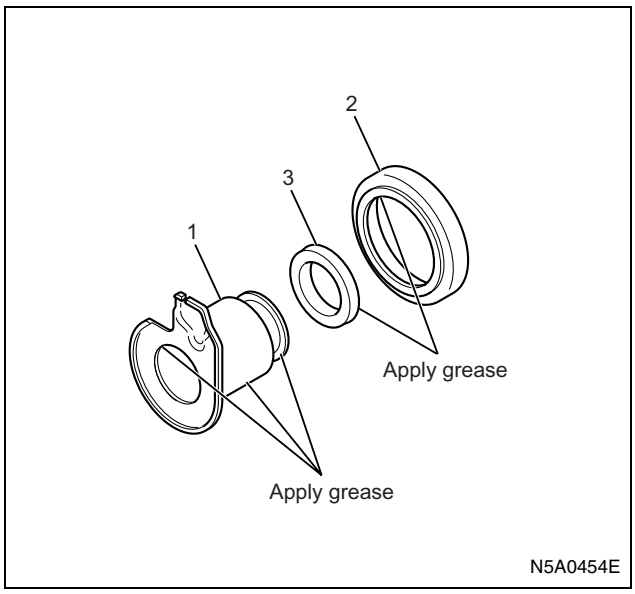
1. Assemble the piston.
   1) Apply grease to the outer circumference of piston (1) and installation groove of boot. Install the boot (2) and apply grease to the insertion groove of cup.

**Notice:**

After installation of boot, make sure that there are still enough grease in boot.

   2) Assemble the grease-applied piston cup (3) to piston.

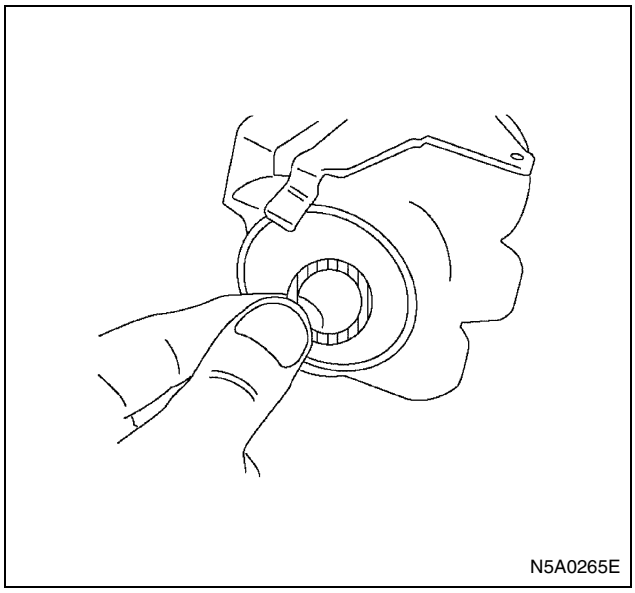
Grease: NIGLUBE RX-2




2. Install the washer (OIL LESS) (1).
   Apply grease to both sides.

**Plain washer**

Make sure to assemble the plain washer of coating side to the adjust side.




Assemble the plain washer with the copper-colored surface facing inward and the coating (black) surface facing outward.

**Notice:**

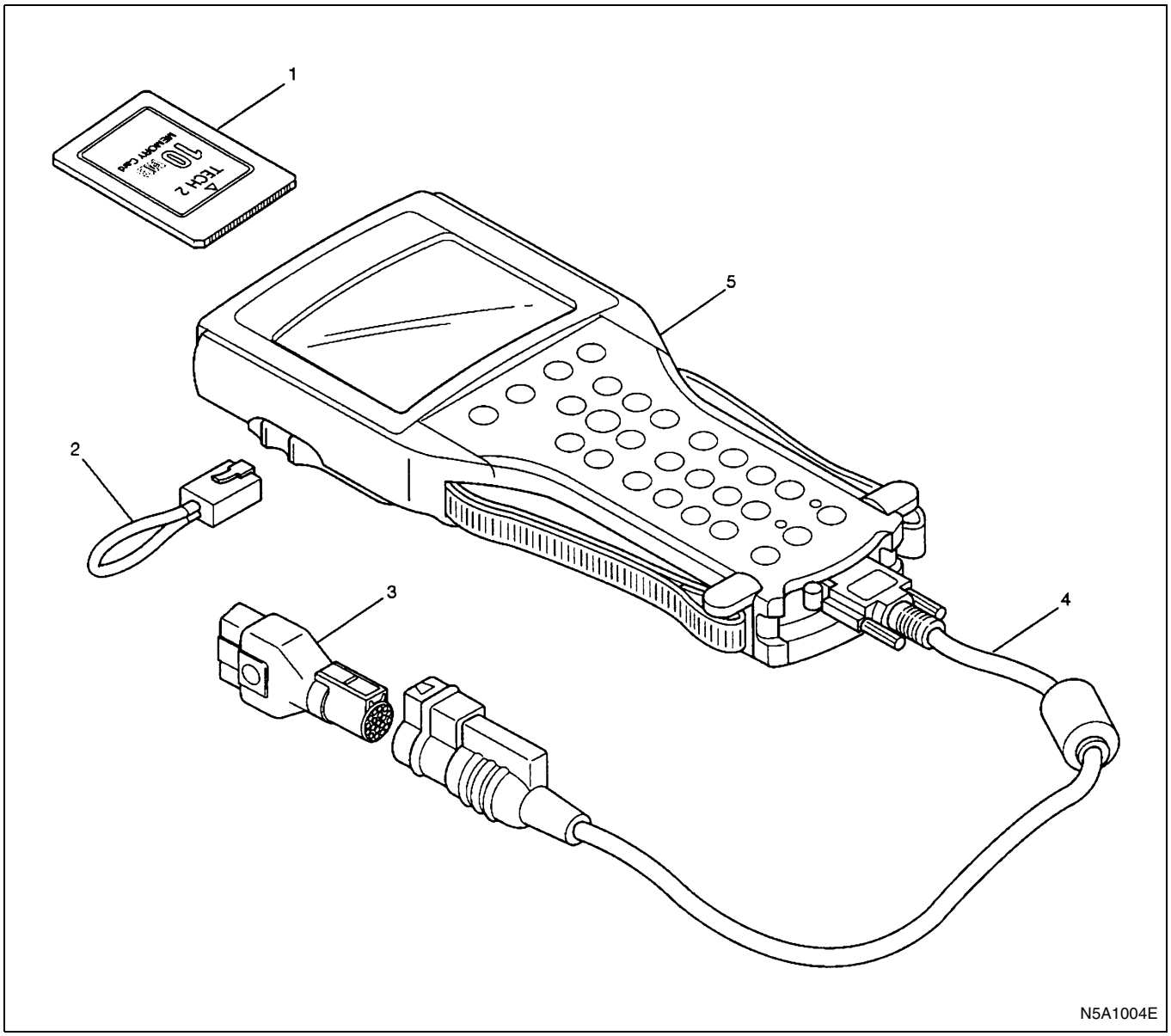
Failure to assemble the plain washer or assembling it inside out causes auto adjuster not to operate properly. Be sure to assemble it correctly.

3. Install the washer (SUS) (2).
4. Install the adjuster gear and nut assembly (3).
   Apply grease to the inner surface of piston and adjuster gear and nut assembly, and assemble it to piston.

Grease: NIGLUBE RX-2

## Tech 2 Scan Tool

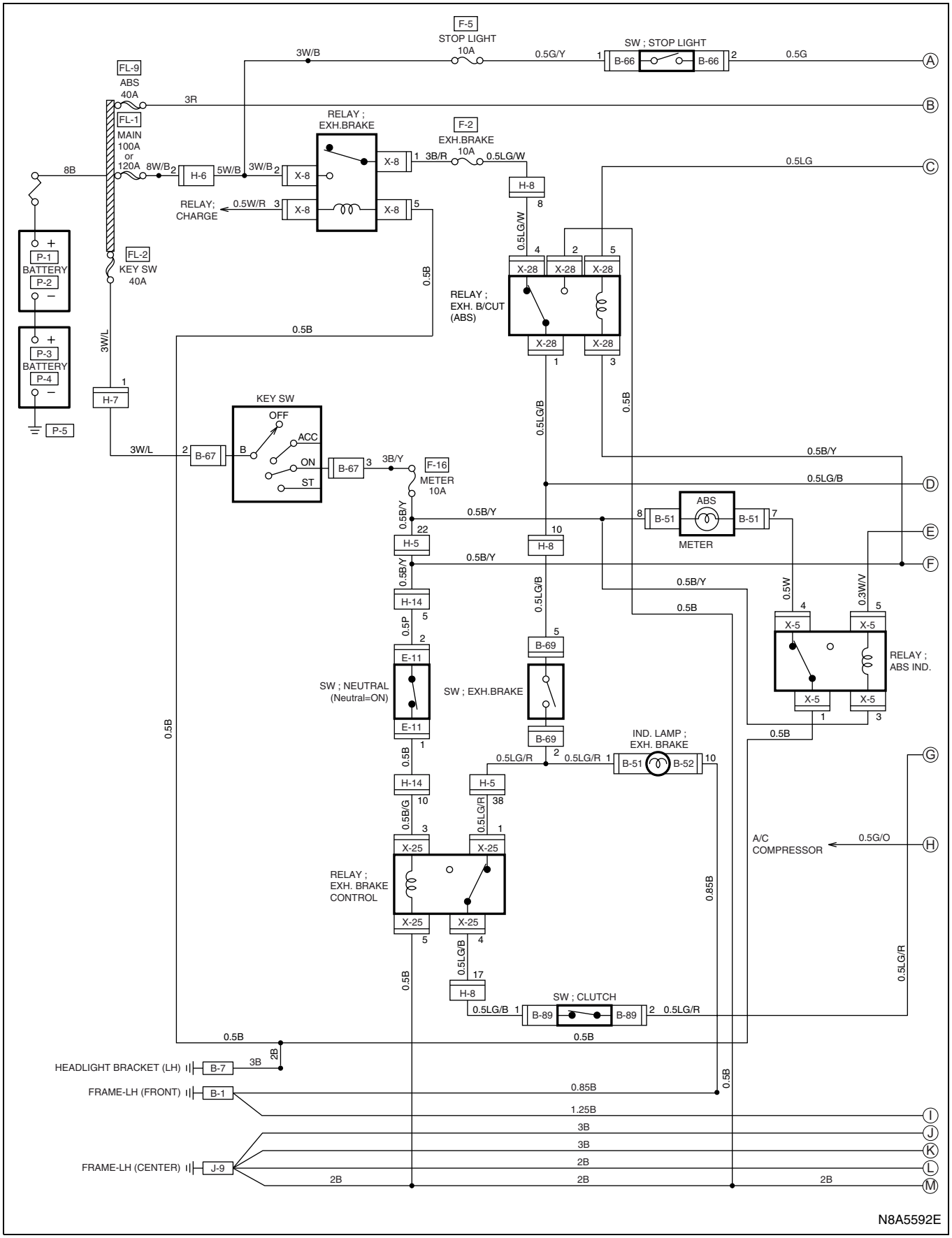
From 98 MY, Isuzu dealer service departments are recommended to use Tech 2. Please refer to Tech 2 scan tool user guide.



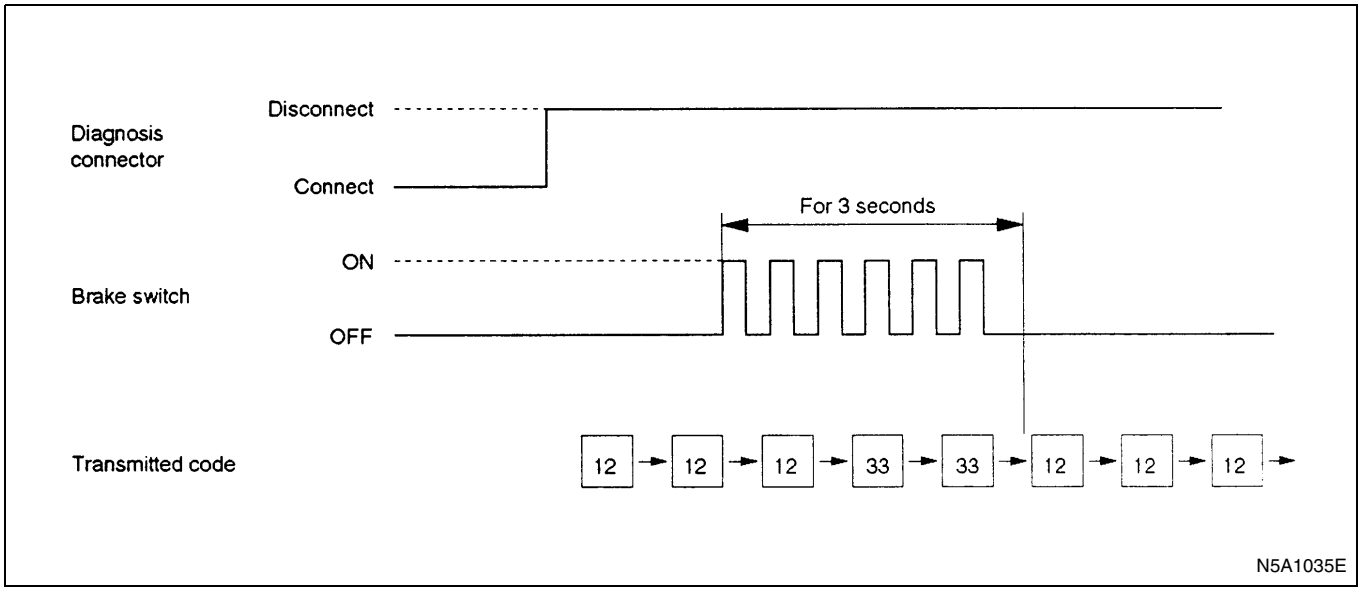

**Legend**

1. PCMCIA Card
2. RS 232 Loop Back Connector
3. SAE 16/19 Adapter
4. DLC Cable
5. Tech 2

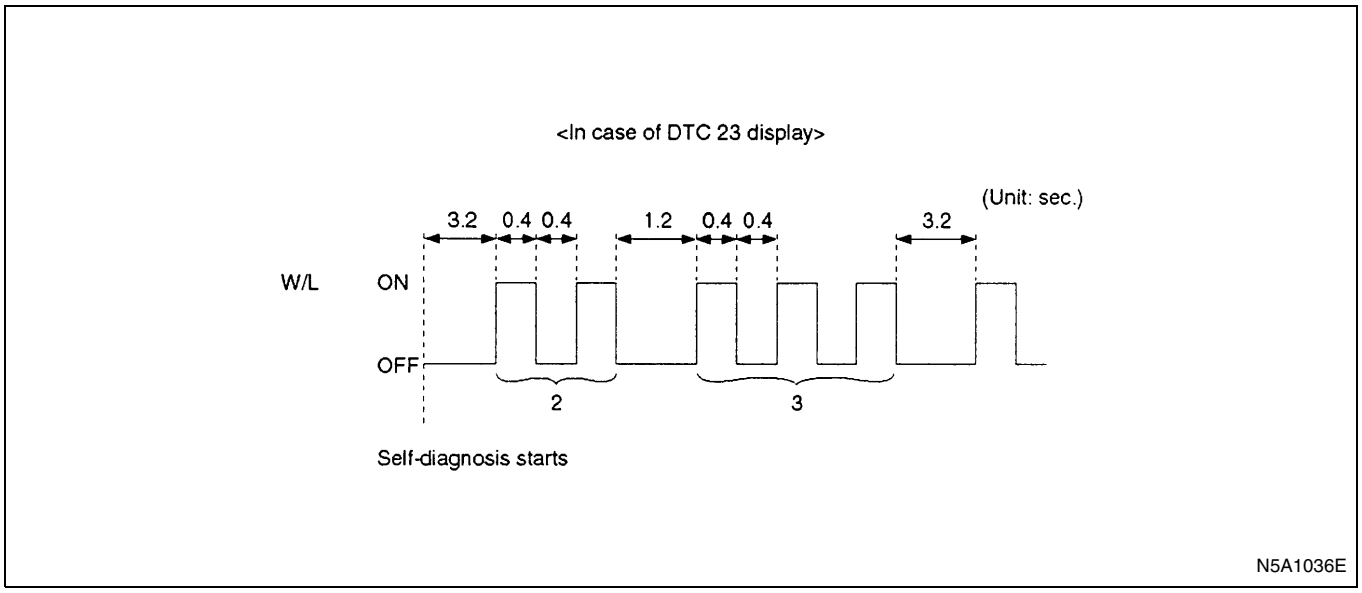
## 24 Volt (4HE1 Engine, Single Cab Model)



3. How to erase code:
   - Conduct brake switch ON/OFF operation 6 or more times within 3 seconds of self-diagnosis startup.
   - The code cannot be erased if more than 3 seconds have passed since self-diagnosis startup, or if self-diagnosis has started with brake switched on (brake pedal depressed).
   - DTCs can be erased also by Tech 2.




4. An example of DTC display
   Display of DTC 23




After displaying DTC 12 three times, one DTC after another is displayed, starting with the most recent one. (However, display is discontinued after about 5 minutes.)
The DTC 12 is displayed repeatedly. (display is discontinued after about 5 minutes)

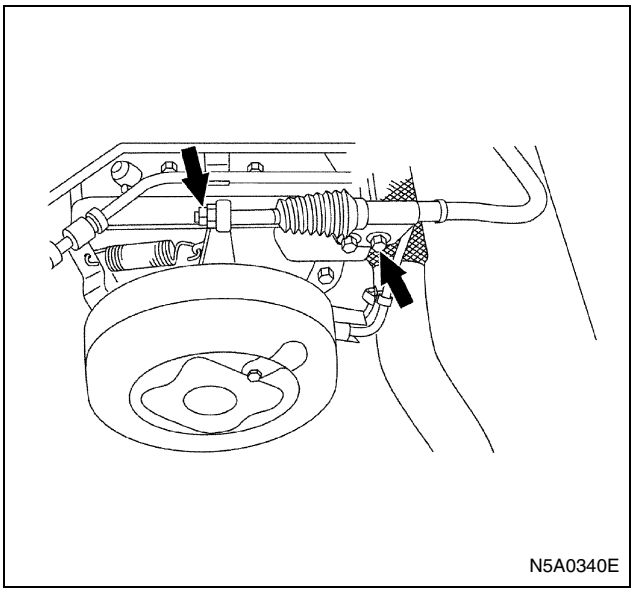
## Chart C-1-2 FR Speed Sensor Output Inspection Procedure

| Step | Action | Value(s) | YES | NO |
|---|---|---|---|---|
| 1 | 1. Turn the key off.<br>2. Disconnect EHCU connector.<br>3. Jack up the vehicle, with all wheels off the ground.<br>4. Measure the AC voltage between J-177 EHCU connector terminals 10 and 11 while turning FR wheel at a speed of 0.5 RPS.<br>Does the DVM display a voltage within the specified value? | 200 mV or more | Go to Step 5 | Go to Step 2 |
| 2 | 1. Disconnect FR sensor connector.<br>2. Using DVM, measure the resistance between J-74 sensor connector terminals 1 and 2.<br>Does the DVM display a resistance within the specified value? | 1.0 — 2.0 k ohms | Go to Step 4 | Go to Step 3 |
| 3 | 1. Locate open circuit, poor connection or short circuit on the harness between EHCU and sensor connectors.<br>2. Repair the harness.<br>Is action complete? | — | Go to Step 5 | — |
| 4 | Replace FR sensor.<br>Is action complete? | — | Go to Step 5 | — |
| 5 | 1. Reconnect all components, ensure all components are properly mounted.<br>2. Clear diagnostic trouble code.<br>Was this step finished? | — | Go to “Basic diagnostic flow chart”. | — |

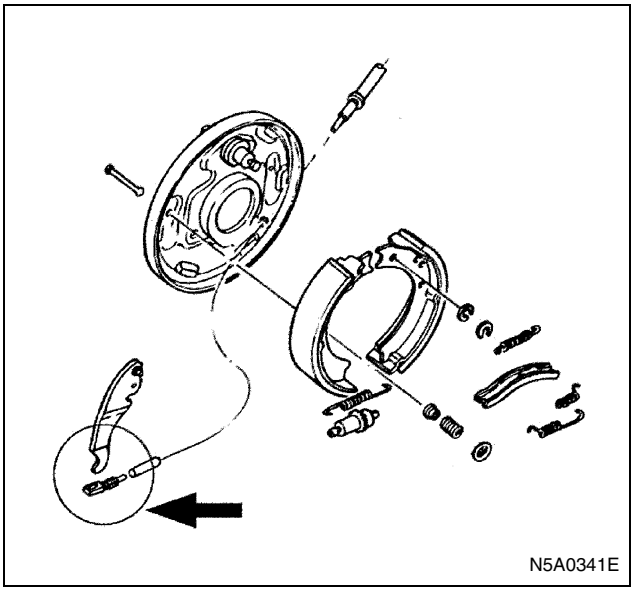
## Chart C-1-3 RL Speed Sensor Output Inspection Procedure

| Step | Action | Value(s) | YES | NO |
|---|---|---|---|---|
| 1 | 1. Turn the key off.<br>2. Disconnect EHCU connector.<br>3. Jack up the vehicle, with all wheels off the ground.<br>4. Connect a 120 ohms resistor between J-177 EHCU connector terminal 22 and ground. Apply voltage of 12 V to EHCU connector terminal 22.<br>5. Using DVM, measure the DC voltage between J-177 connector terminal 22 and ground while turning RL wheel at a speed of 0.5 RPS.<br>Does the DVM display a voltage within the specified value? | 0.2 — 4.5 V | Go to Step 5 | Go to Step 2 |

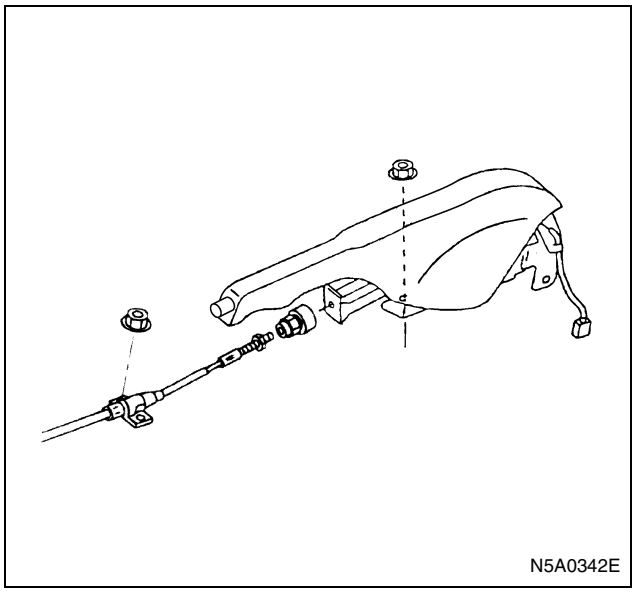
– Remove the mounting bolt from the cable bracket, and disconnect the parking brake cable from the transmission.


N5A0340E

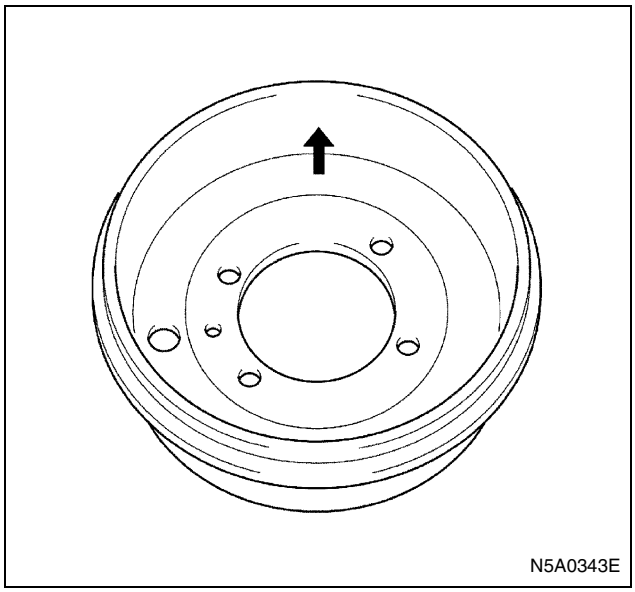
• 178, 190 mm TYPE
  – Remove the parking brake drum.
  – Disconnect the cable from the lever of the parking brake assembly.


N5A0341E

5. Remove the parking brake drum.
  • Remove the adjusting hole cover and the parking brake drum.
6. Remove the coupling driver.
  • Remove the lock nut that was loosened in step 3, and remove the coupling driver using a universal puller.
7. Remove the parking brake assembly.
8. Remove the parking brake lever assembly.
  • Loosen the adjusting nut, and disconnect the parking brake cable from the lever.
  • Disconnect the connector.
  • Loosen the retaining nut, and remove the parking brake lever assembly.


N5A0342E

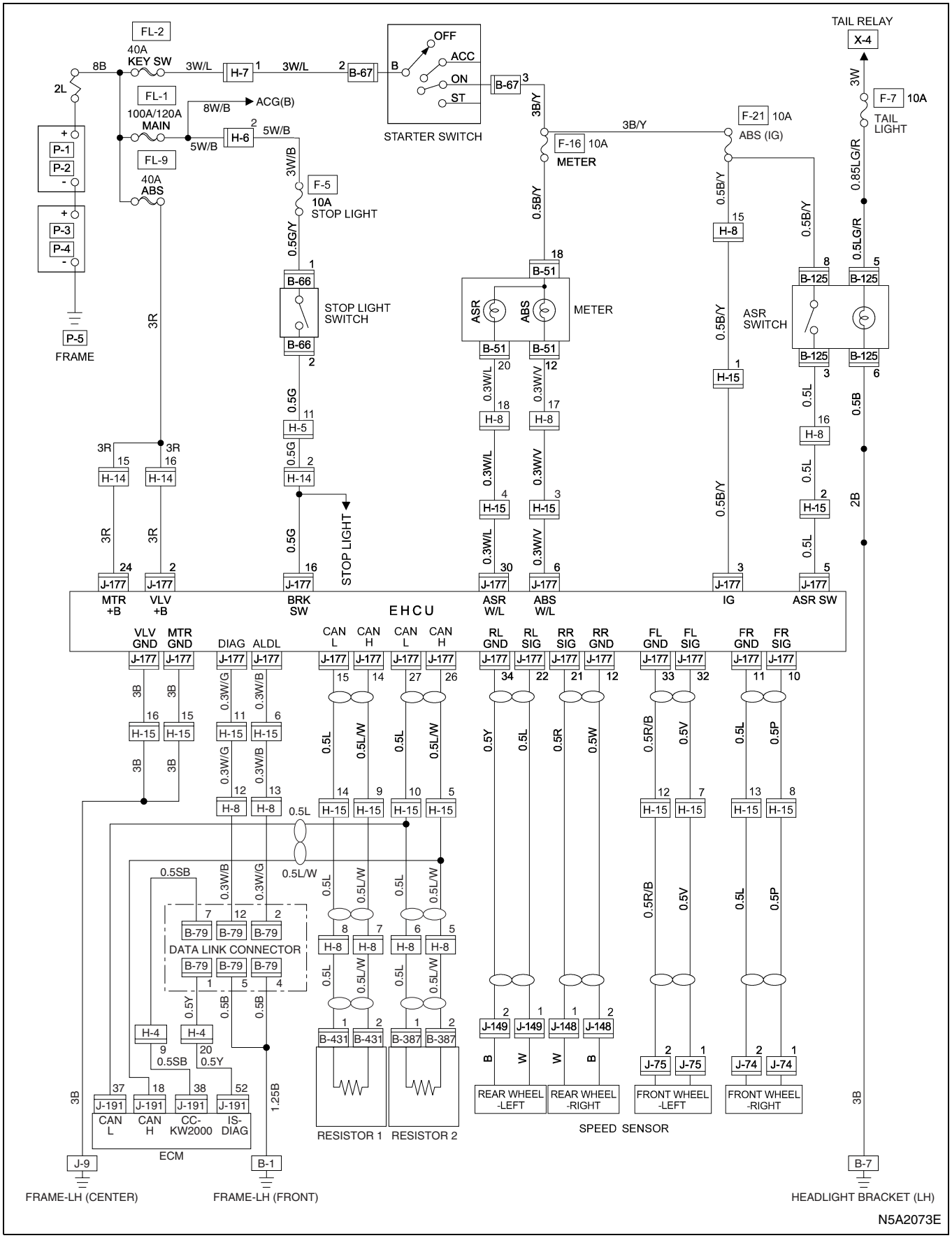
9. Inspect the parking brake drum.
  • Inspect the parking brake drum for damage, wear, step wear, or cracking. If any defect is found, correct or replace the parking brake drum with a new one.
  • Measure the inside diameter of the parking brake drum.


N5A0343E

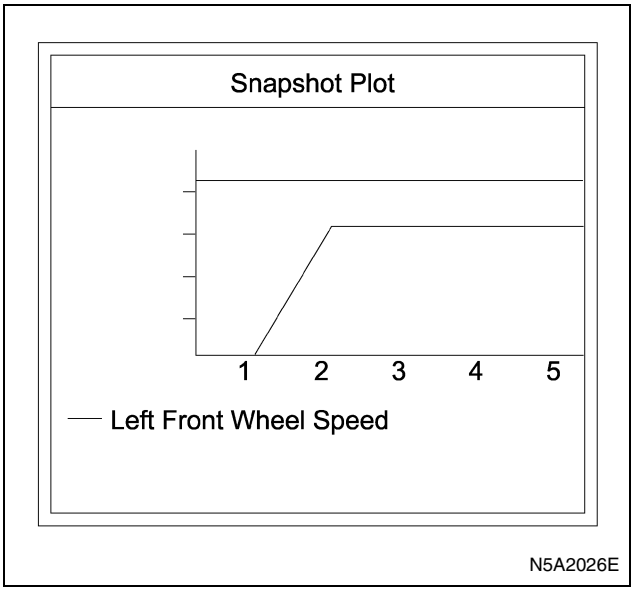
Drum inside diameter
178 mm (7.00 in) type parking brake
Standard value = 178 mm (7.00 in), limit = 179 mm (7.05 in)
190 mm (7.48 in) type parking brake
Standard value = 190 mm (7.48 in), limit = 191 mm (7.52 in)
203 mm (7.99 in) type parking brake
Standard value = 203 mm (7.99 in), limit = 204 mm (8.03 in)

## MEMO

## Circuit Diagram



**Snapshot (graph plotting)**




- The snapshot can record the data list menu and plot a graph.
- Utilizing this mode, reproduce and record the conditions claimed by the customer to identify the engine data fault.
- The stored data can be replayed with a domestic power supply.

## DTC:C0226 (Flash Code 26) ECM Communication Fault

### Check flow B-6

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 1 | Inspect the engine control, and repair or replace any faulty parts.<br>Is this step completed? | — | Go to Step2 | Go to Step1 |
| 2 | Perform the check flow B-5.<br>Is this step completed? | — | Go to Step3 | Go to Step2 |
| 3 | 1. Clear the DTC.<br>2. Perform the test drive.<br>3. Check for DTC.<br>Was DTC C0226 detected? | — | Go to Step4 | Go to Step5 |
| 4 | Replace the EHCU.<br>Is this step completed? | — | Go to Step5 | — |
| 5 | 1. Install all the components, and check that those are installed properly.<br>2. Clear the DTC.<br>Is this step completed? | — | Go to “Diagnostic basic flow”. | Go to Step5 |

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 17 | Replace the EHCU.<br>Is this step completed? | — | Go to Step18 | — |
| 18 | 1. Install all the components, and check that those are installed properly.<br>2. Clear the DTC.<br>Is this step completed? | — | Go to “Diagnostic basic flow”. | Go to Step18 |

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 5 | 1. Install all the components, and check that those are installed properly.<br>2. Clear the DTC.<br>Is this step completed? | — | Go to “Diagnostic basic flow”. | Go to Step5 |

**FR Wheel Speed Sensor Output Check Procedure**
**Check flow C-1-2**

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 1 | 1. Turn the starter switch OFF.<br>2. Disconnect the EHCU connector.<br>3. Jack-up the vehicle to lift the front wheels off the floor.<br>4. Measure the AC voltage between the J177 connector terminals 10 and 11 while turning the FR wheel half turn/sec.<br>Is the value within specified value? | 200mV or more | Go to Step5 | Go to Step2 |
| 2 | 1. Disconnect the FR sensor connector J-74.<br>2. Measure the resistance between the J-74 connector terminals 1 and 2 (sensor side).<br>Is the value within specified value? | 1 — 2kΩ | Go to Step4 | Go to Step3 |
| 3 | Replace the FR sensor.<br>Is this step completed? | — | Go to Step5 | — |
| 4 | Repair the circuit for open/short circuit, and the connector for improper connection between the connector of EHCU and the sensor connector.<br>Is this step completed? | — | Go to Step5 | — |
| 5 | 1. Install all the components, and check that those are installed properly.<br>2. Clear the DTC.<br>Is this step completed? | — | Go to “Diagnostic basic flow”. | Go to Step5 |

**Speed Sensor Output Check Procedure (With Tech 2)**
**Check flow TC-1**

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 1 | 1. Connect the Tech 2.<br>2. Check each sensor lowest speed from the “Wheel sensor”.<br>Is the sensor speed 4km/h (2mph) or more? | — | Go to Step2 | Go to Step6 |
| 2 | Check the suspicious sensor circuit for open circuit. (Check with shaking the wire and the connector.)<br>Is the sensor circuit connection normal? | — | Replace the speed sensor.Go to Step3 | Repair.Go to Step3 |

**Speed Sensor Output Check Procedure**

**Check flow TC-1**

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 1 | 1. Connect the Tech 2.<br>2. Check each sensor lowest speed from the “Wheel sensor”.<br>Is the sensor speed 4km/h (2 mph) or more? | — | Go to Step2 | Go to Step6 |
| 2 | Check the suspicious sensor circuit for open circuit. (Check with shaking the wire and the connector.)<br>Is the sensor circuit connection normal? | — | Replace the speed sensor.Go to Step3 | Repair.Go to Step2 |
| 3 | Check each sensor lowest speed from the “Wheel sensor”.<br>Is the sensor speed 4km/h (2 mph) or more? | — | Go to Step4 | Go to Step6 |
| 4 | Check the sensor rotor.<br>Is the sensor rotor normal? | — | Go to Step5 | Replace the sensor rotor. Go to Step5 |
| 5 | Check each sensor lowest speed from the “Wheel sensor”.<br>Is the sensor speed 4km/h (2 mph) or more? | — | Repair the circuit or connector between the EHCU and the speed sensor. Go to Step6 | Go to Step6 |
| 6 | Install all the components, and check that those are installed properly.<br>Is this step completed? | — | Repeat “Diagnostic basic flow”. | Go to Step6 |

Used for checking the front speed sensor, or the rear speed sensor when no DTC is set.

**CAUTION:**
On the vehicle that the rear tires have smaller diameter, the rear wheel speed may be indicated a little higher than the front wheel speed. Check the speed after driving a while at a constant speed.

## Unstable Idling

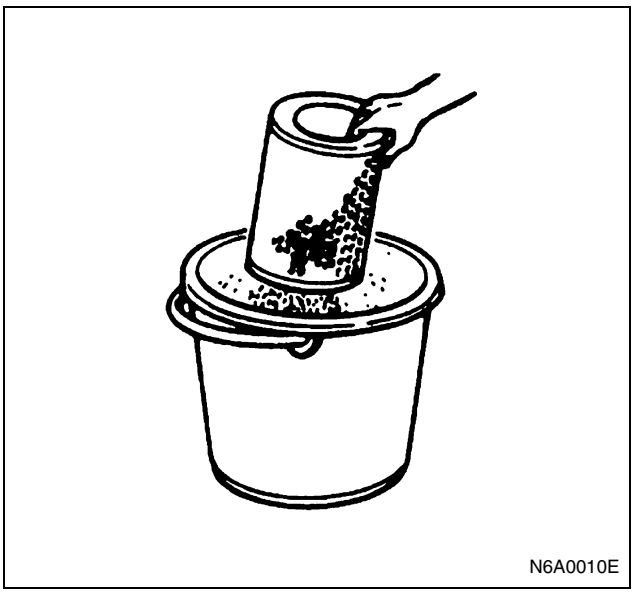
| Check point | Possible cause | Correction |
|---|---|---|
| Idling system | Idling improperly adjusted | Adjust the idling |
| Fast idling speed control device | Defective fast idling speed control device | Repair or replace the fast idling speed control device |
| Accelerator control system | Accelerator control system improperly adjusted | Adjust the accelerator control system |
| Fuel system | Fuel system leakage or blockage | Repair or replace the fuel system |
| | Air in the fuel system | Bleed the air from the fuel system |
| | Water particles in the fuel system | Change the fuel |
| Fuel filter | Clogged fuel filter element | Replace the fuel filter element or the fuel filter cartridge |
| Fuel feed pump | Defective fuel feed pump | Repair or replace the fuel feed pump |
| Injection nozzle | Injection nozzle sticking | Replace the injection nozzle |
| | Injection nozzle injection starting pressure too low<br>Improper spray condition | Adjust or replace the injection nozzle |
| Injection pump | Defective delivery valve resulting in fuel drippage after fuel injection | Replace the delivery valve |
| | Injection timing improperly adjusted | Adjust the injection timing |
| | Insufficient injection volume | Adjust the injection volume |
| | Defective idle spring | Replace the idle spring |
| | Defective governor lever operation | Repair or replace the governor lever |
| | Regulator valve improperly adjustment | Adjust or replace the regulator valve |
| | Broken plunger spring | Replace the plunger spring |
| | Worn plunger | Replace the plunger assembly |
| | Worn cam disc | Replace the cam disc |
| Valve clearance | Valve clearance improperly adjusted | Adjust the valve clearance |
| Compression pressure | Blown out cylinder head gasket<br>Worn cylinder liner<br>Piston ring sticking between the valve and the valve seat | Replace the related parts |

| | | | Engine Model | |
|---|---|---|---|---|
| | | | 4HE1-TC (4HE1-XS, XN) 98EPA | 4HE1-TC (4HE1-XS) SPEC. EURO3 |
| Item | **Preheating system** | | Quick-On-Start System II | |
| | **Exhaust system** | | | |
| | Pipe outside diameter × Thickness | | | |
| | Front pipe | mm (in) | 60.5 × 2.0 (2.38 × 0.079) | |
| | Middle pipe | mm (in) | 60.5 × 2.0 (2.38 × 0.079) | |
| | Rear pipe | mm (in) | 60.5 × 1.6 (2.38 × 0.063) | |
| | Silencer type | | Silencer with built-in catalytic converter (platinum) | Silencer with built-in catalytic converter (iron oxide) |
| | Inside diameter | mm (in) | Approximately 200 (7.87) | |
| | **Exhaust gas recirculation system (EGR)** | | Equipped | Equipped (cooled) |


N6A0009E

### Carbon and Dust Fouled Element

1. Prepare a cleaning solution of Isuzu Genuine Element Cleaner (Donaldson D1400) diluted with water.
2. Immerse the element in the solution for twenty minutes.


N6A0010E

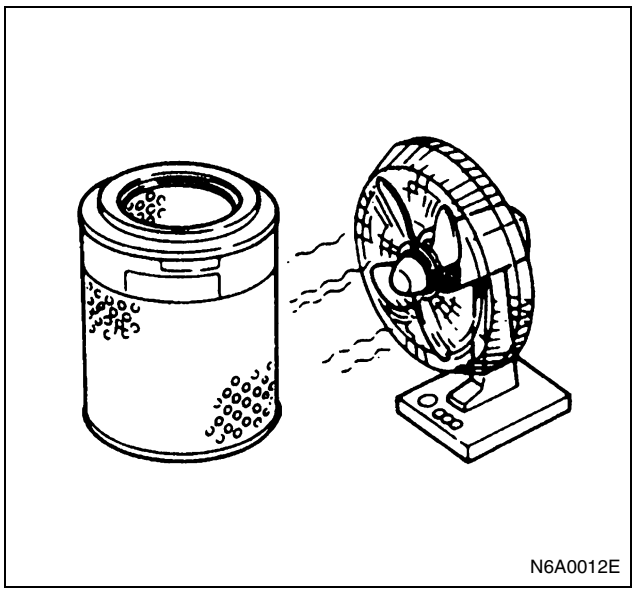
3. Remove the element from the solution and rinse it well with running water.
   Water pressure must not exceed 274 kPa (2.8 kg/cm$^2$ / 39.8 psi).


N6A0011E

4. Dry the element in a well ventilated area.
   An electric fan will hasten drying.

**Caution:**
Do not use compressed air or an open flame to dry the element quickly. Damage to the element will result.

It will usually take two or three days for the element to dry completely. Therefore, it is a good idea to have a spare on hand to use in the interim.


N6A0012E

## Lubricating System

### Main Oil Filter (Disposable Spin-On Cartridge Element)

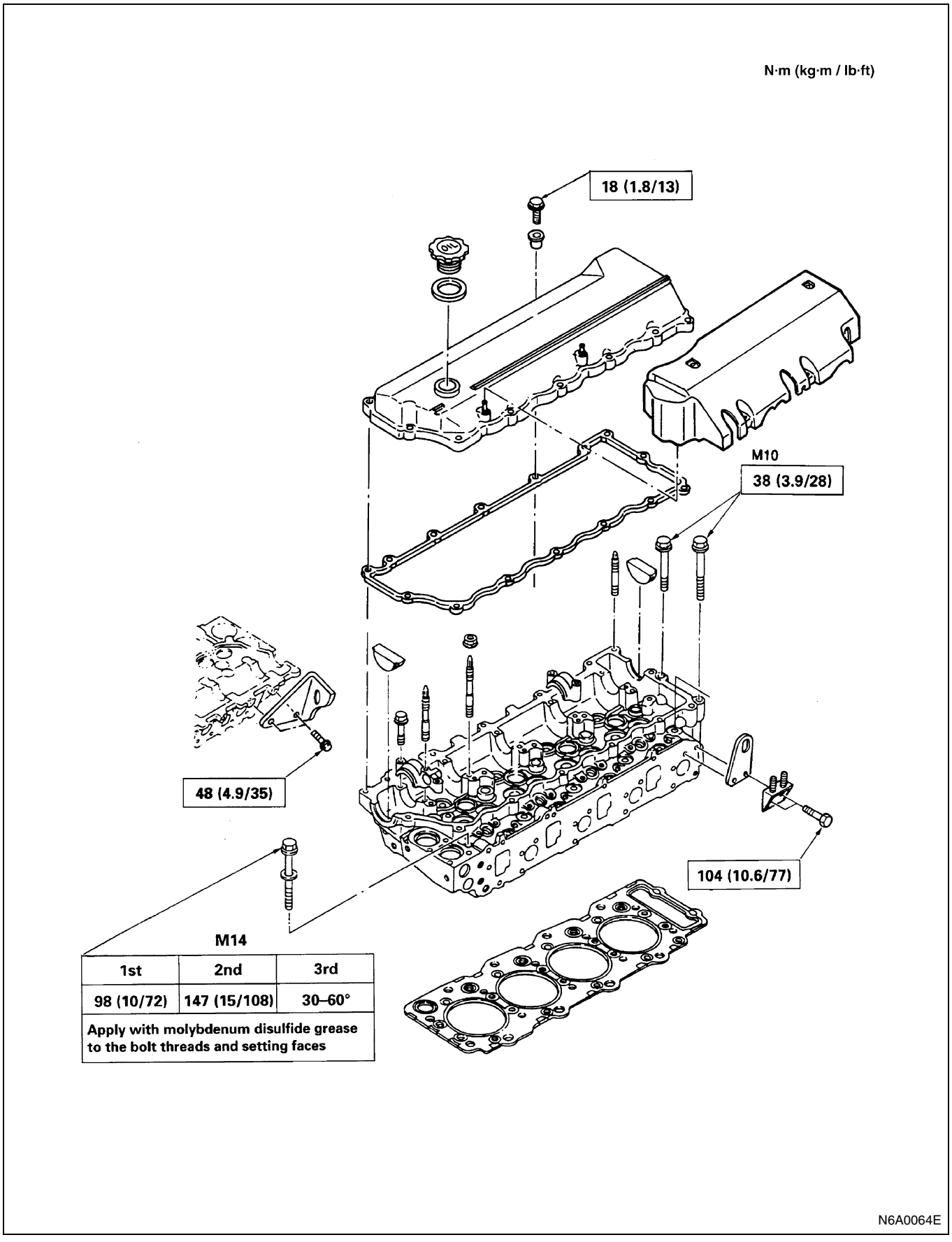
#### Replacement Procedure

1. Loosen the used oil filter by turning it counterclockwise with the filter wrench.
   Filter Wrench: 1-85221-097-0

# FIXING TORQUE

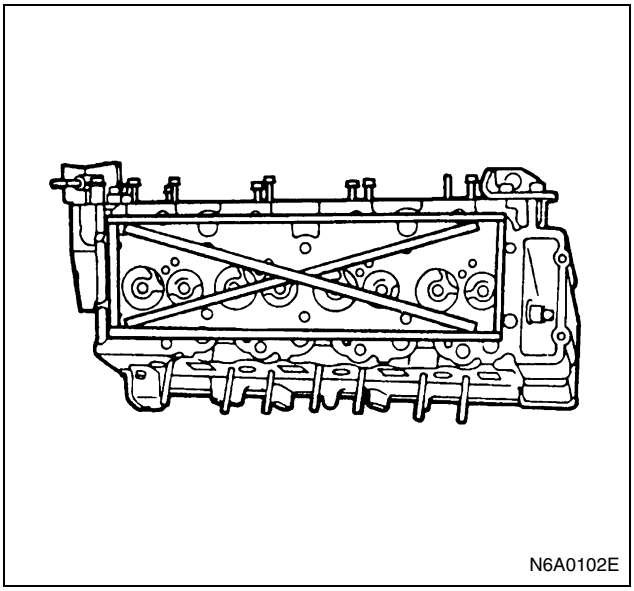
## Cylinder Head, Head Gasket and Head Cover

**Except for 4HE1-TC (Engine)**



**Notice:**
Do not regrind the cylinder head lower face.

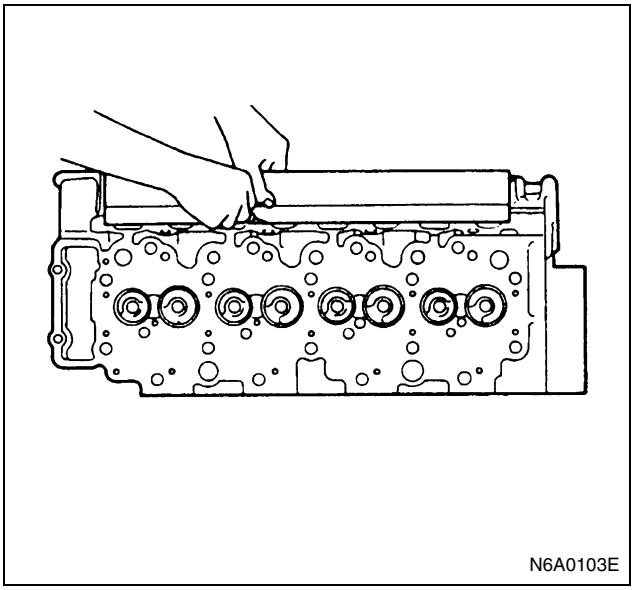
| Cylinder Head Lower Face Warpage | mm (in) |
|---|---|
| Standard | Limit |
| 0.05 (0.002) or less | 0.2 (0.008) |




### Manifold Fitting Face Warpage

Use a straight edge and a feeler gauge to measure the manifold cylinder head fitting face warpage.
Regrind the manifold cylinder head fitting faces if the measured value is greater than the specified limit.

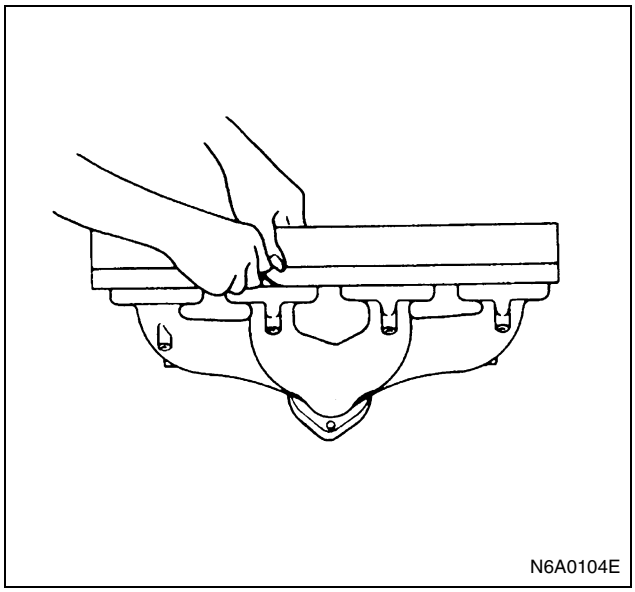
| Manifold Fitting Face Warpage | mm (in) |
|---|---|
| Standard | Limit |
| 0.05 (0.002) or less | 0.2 (0.008) |




### Exhaust Manifold Warpage

Use a straight edge and a feeler gauge to measure the manifold cylinder head fitting face warpage.
If the measured values exceed the specified limit, the manifold must be replaced.

| Exhaust Manifold Warpage | mm (in) |
|---|---|
| Standard | Limit |
| 0.05 (0.002) or less | 0.24 (0.008) |

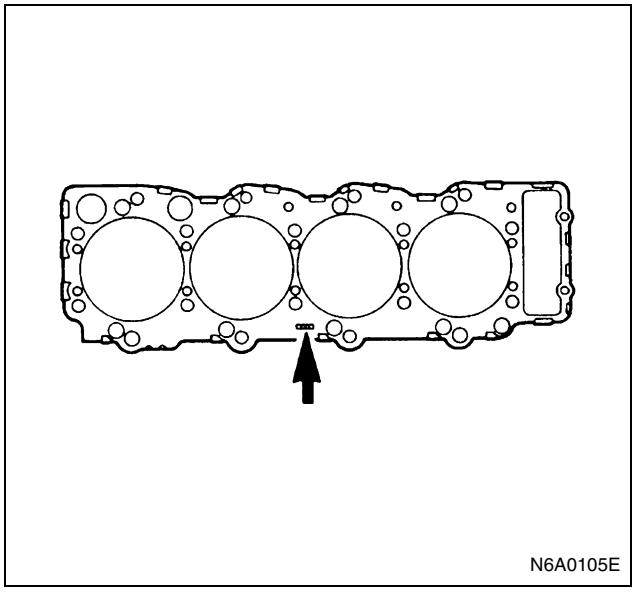



## Reassembly

Install the cylinder head gasket with its “PART NUMBER” mark facing up and toward the left of the engine.

**Caution:**
Do not reuse the cylinder head gasket.

Above works refer to “CYLINDER BLOCK” section in this manual.




1. Cylinder Head

8. Rocker Arm Shaft

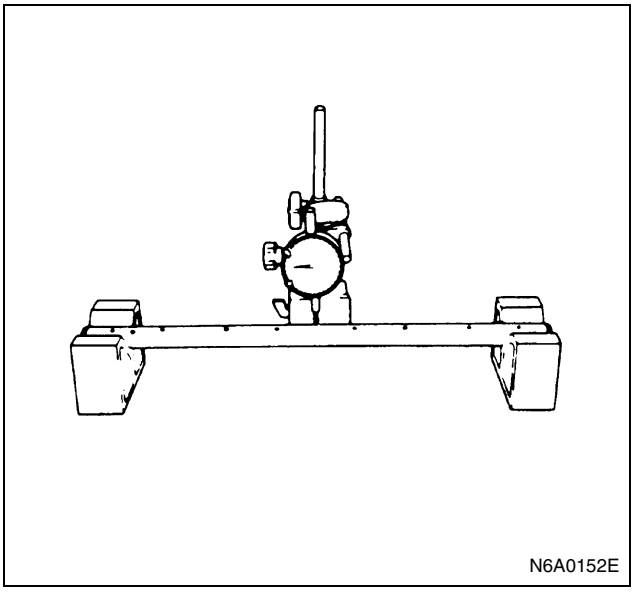
## Inspection and Repair

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

### Rocker Arm Shaft Run-Out

1) Place the rocker arm shaft on V-blocks.
2) Use a dial indicator to measure the rocker arm shaft central portion run-out.
   If the run-out is very slight, correct the rocker arm shaft run-out with a bench press. The rocker arm must be at cold condition.
   If the measured rocker arm shaft run-out exceeds the specified limit, the rocker arm shaft must be replaced.

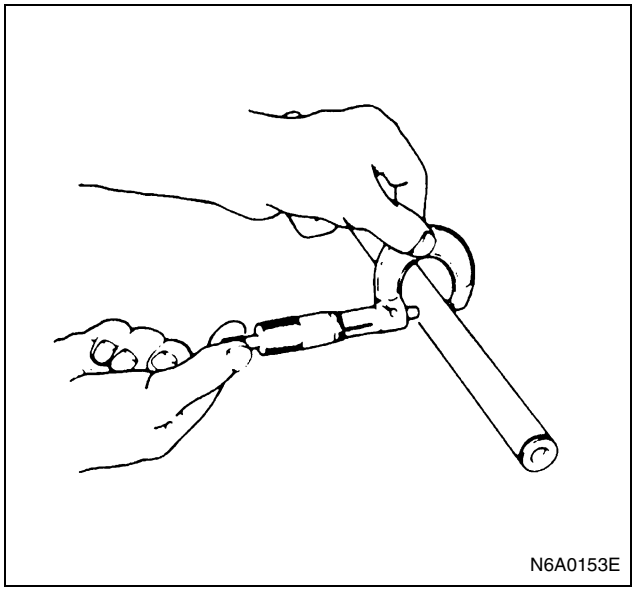
| Rocker Arm Shaft Run-Out | mm (in) |
|---|---|
| Limit | 0.3 (0.012) |




### Rocker Arm Shaft Outside Diameter

Use a micrometer to measure the rocker arm fitting portion outside diameter.
If the measured value is less than the specified limit, the rocker arm shaft must be replaced.

| Rocker Arm Shaft Outside Diameter | | mm (in) |
|---|---|---|
| Standard | Limit | |
| 21.979 — 22.000 (0.8653 — 0.8661) | 21.85 (0.8602) | |

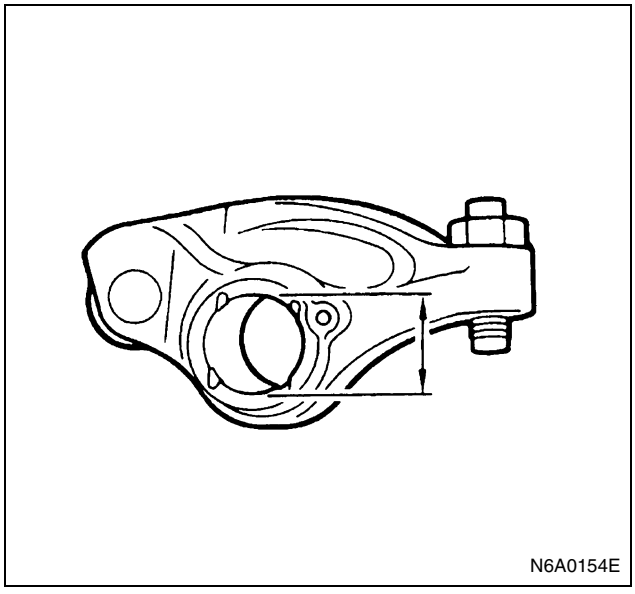



### Rocker Arm Bushing Inside Diameter

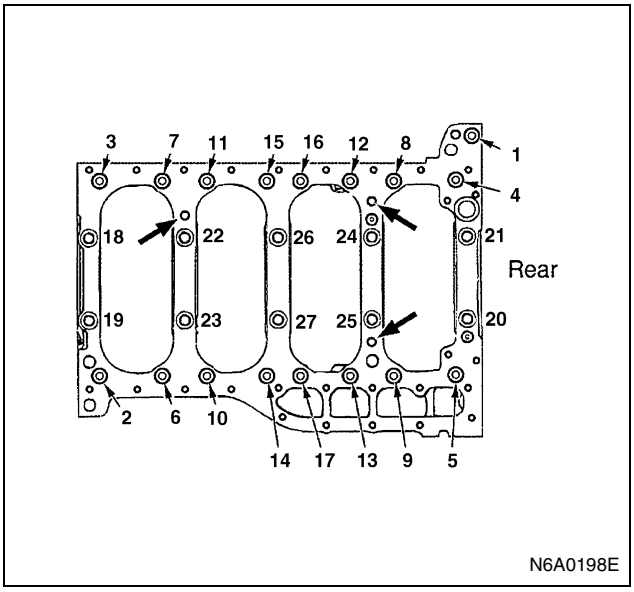
Use either a vernier caliper or a dial indicator to measure the rocker arm bushing inside diameter.

| Rocker Arm Bushing Inside Diameter | | mm (in) |
|---|---|---|
| Standard | Limit | |
| 22.010 — 22.035 (0.8665 — 0.8675) | 22.15 (0.8720) | |

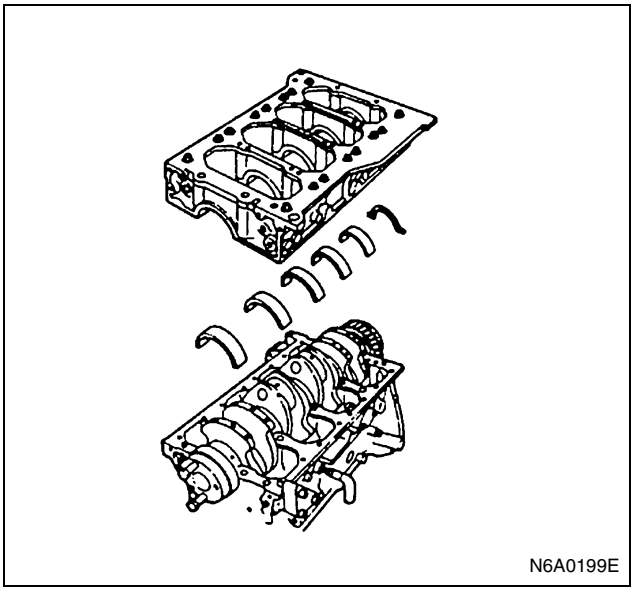
| Rocker Arm and Rocker Arm Shaft Clearance | | mm (in) |
|---|---|---|
| Standard | Limit | |
| 0.010 — 0.056 (0.0004 — 0.0022) | 0.2 (0.0079) | |



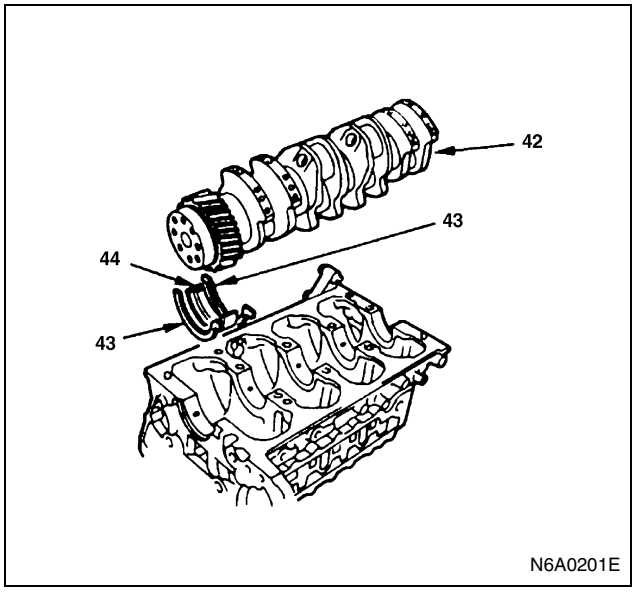

Check to see if the rocker arm oil port is free of obstructions.



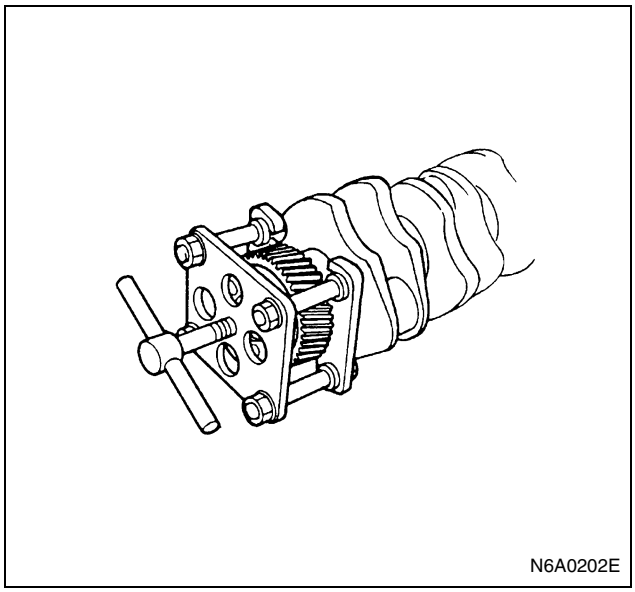

40. Thrust Bearing Lower
41. Crankshaft Bearing Lower




42. Crankshaft Assembly
43. Thrust Bearing Upper
44. Crankshaft Bearing Upper




45. Crankshaft Gear
    1) Use the crankshaft gear remover to remove the crankshaft gear.
       Crankshaft Gear Remover: 8-9439-6818-0
    2) Remove the crankshaft feather key.




46. Crankshaft

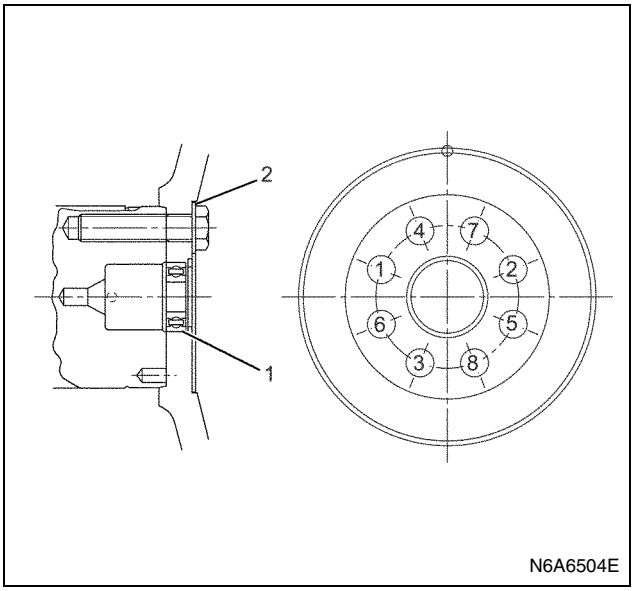
## Inspection and Repair

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

**Crankshaft End Play**

1. Set the dial indicator to the crankshaft end and measure the end play.
2. If the measured value exceeds the specified limit, the thrust bearings must be replaced.

**Tighten:**
Flywheel bolt to
- 1st step: 78 N·m (8.0 kg·m / 58 lb·ft)
- 2nd step: 90 — 120°

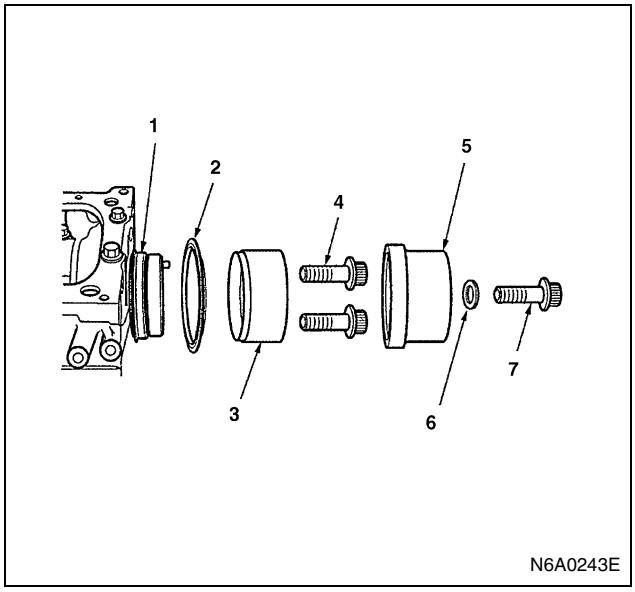



**Legend**
1. Washer
2. Pilot bearing

5) Remove the crankshaft stopper.

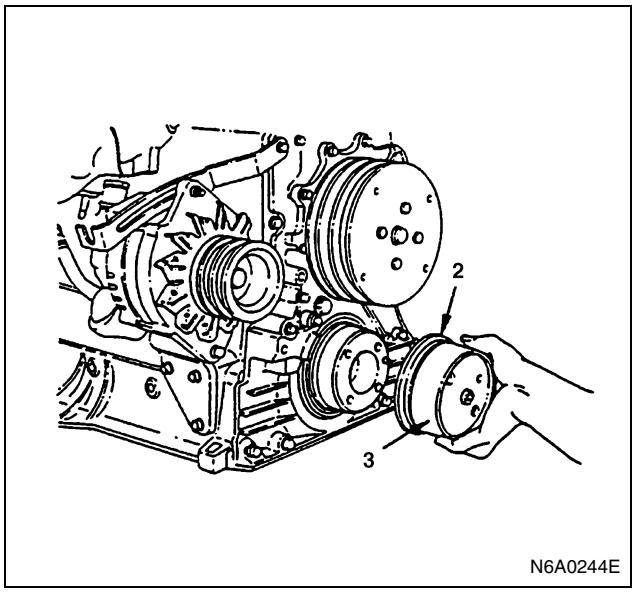
28. Crankshaft Front Slinger
Press in the slinger using the oil seal setting tool kit.
Oil Seal Setting Tool Kit: 5-8840-2431-0

| Front slinger and oil seal setting tools | | | |
|---|---|---|---|
| Part Name | Stamp | Slinger | Oil Seal |
| Adapter | FT | ❍ | ❍ |
| Sleeve | FT | ❍ | ❍ |
| Oil seal adapter ring | FT | | ❍ |
| Center bolt | — | ❍ | ❍ |
| Adapter bolt | — | ❍ | ❍ |

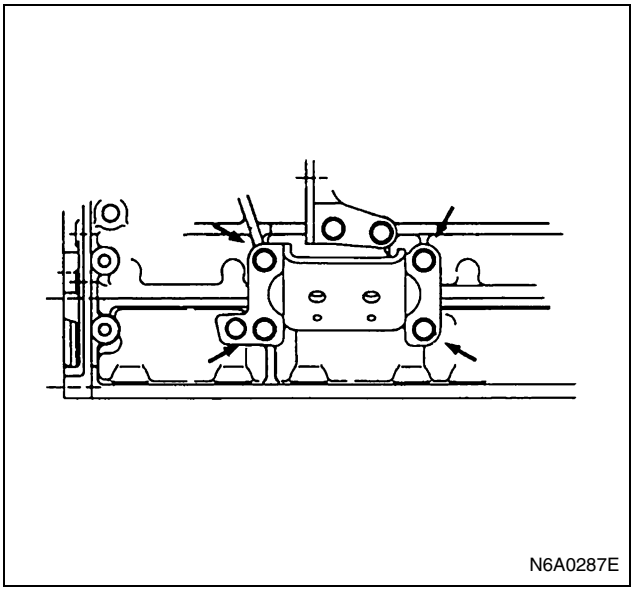



**Legend**
1. Crankshaft
2. Slinger
3. Adapter
4. Adapter bolt
5. Sleeve
6. Washer (5 mm (0.20 in))
7. Center bolt

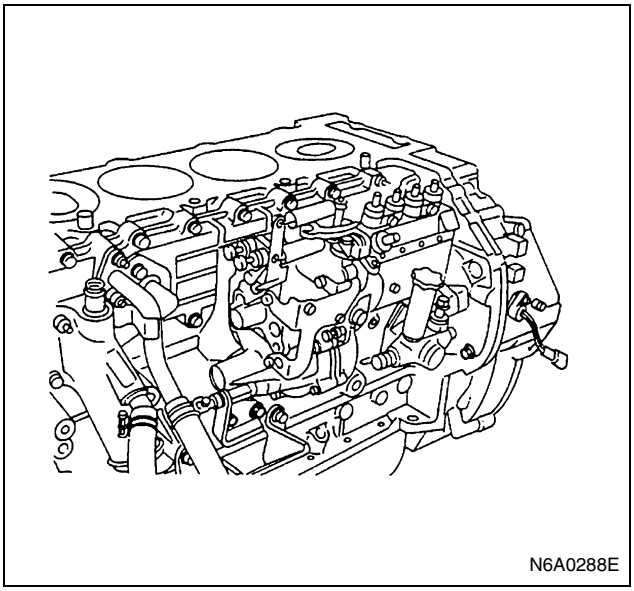
1) Insert the slinger (2) into the end of the adapter (3) and install the adapter on the crankshaft.



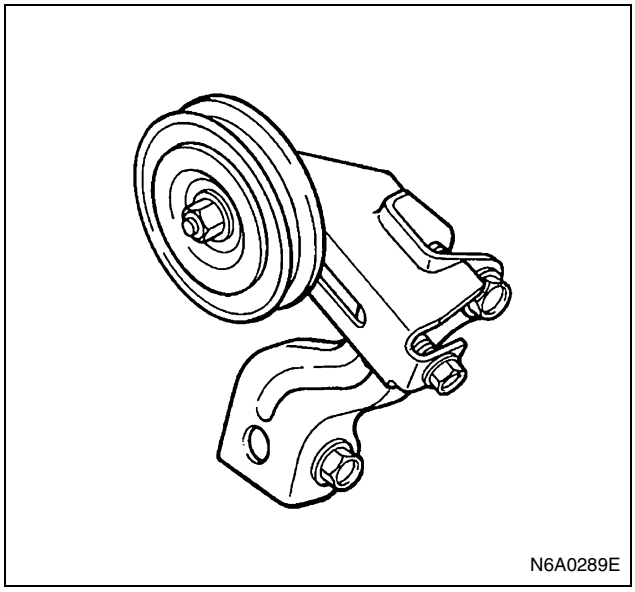

2) Cover the sleeve (5)and tighten the bolt until the sleeve comes to contact the adapter stopper (8).



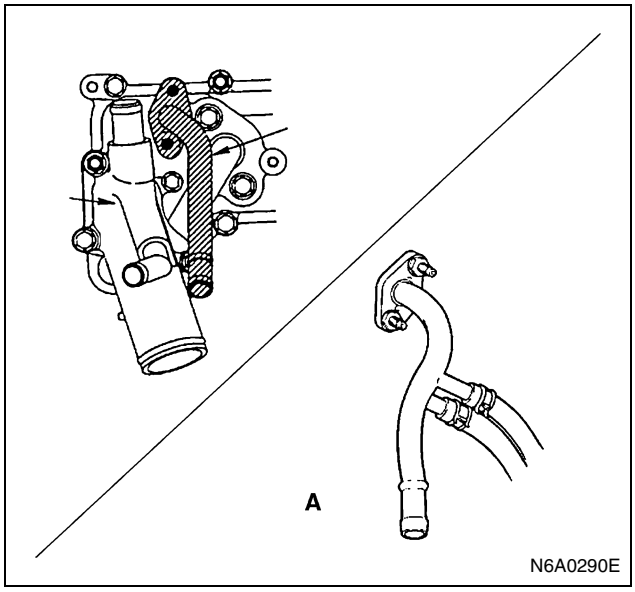

16. Injection Pump Assembly
    1) Remove the injection pump bracket bolts and the injection pump rear bracket bolts.
    2) Then remove the injection pump assembly.




17. Injection Pump Rubber Spacer
18. Idle Pulley Bracket (If equipped with A/C)



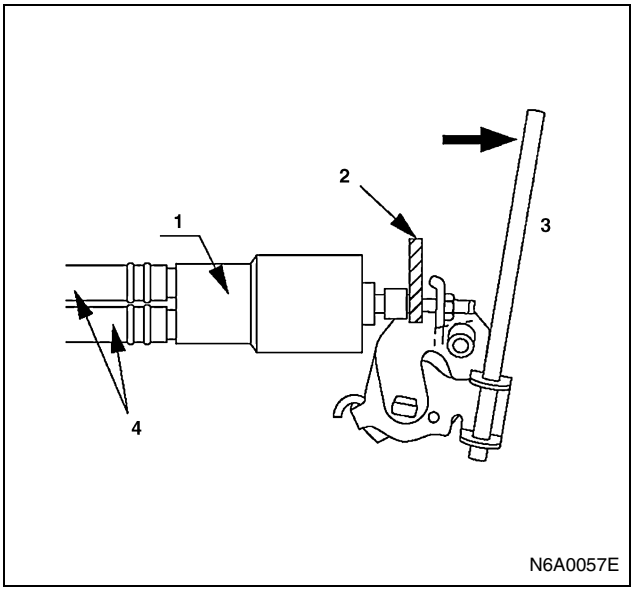

19. Heater Pipe
20. Water Suction Pipe




**Legend**
A. 4HF1-2

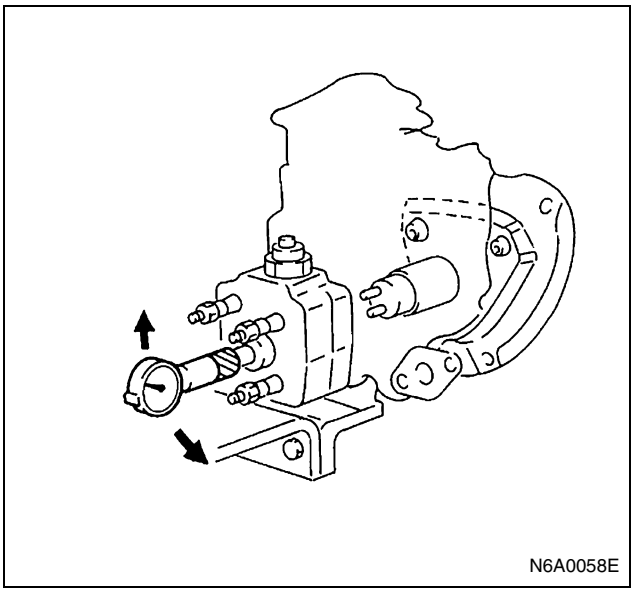
21. Oil Cooler Assembly
    1) Remove the oil cooler bolts.
    2) Install a oil cooler fixing bolt to the oil cooler replacer hole as shown in the illustration, and tighten the bolt alternately a little at a time.

2) Disconnect Injection Pipe.
3) Put down Wax CSD lever, insert a spacer 10 — 20 mm (0.39 — 0.47 in) thick between the plunger and adjust bolt, and cancel the Wax CSD.

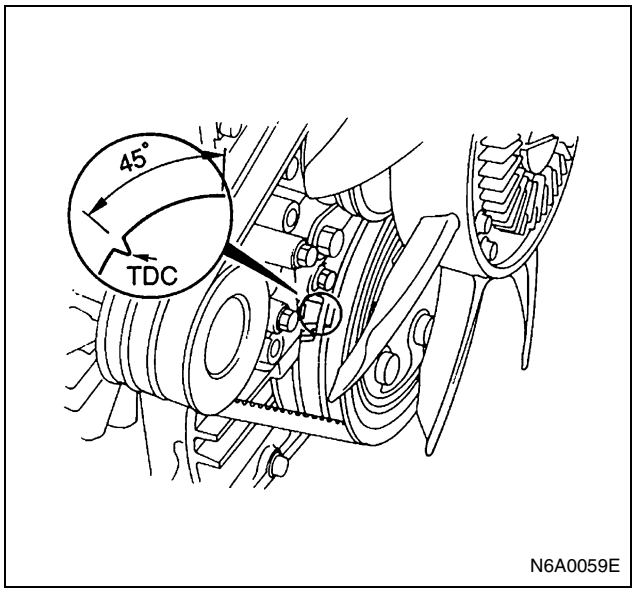



**Legend**
1. Water house
2. Wax CSD
3. Spacer
4. Lever

4) Remove the pump rear plug, connect a dial gage and set the lift at 1 mm (0.039 in).
Special Tool
Measuring device: 5-8840-0145-0

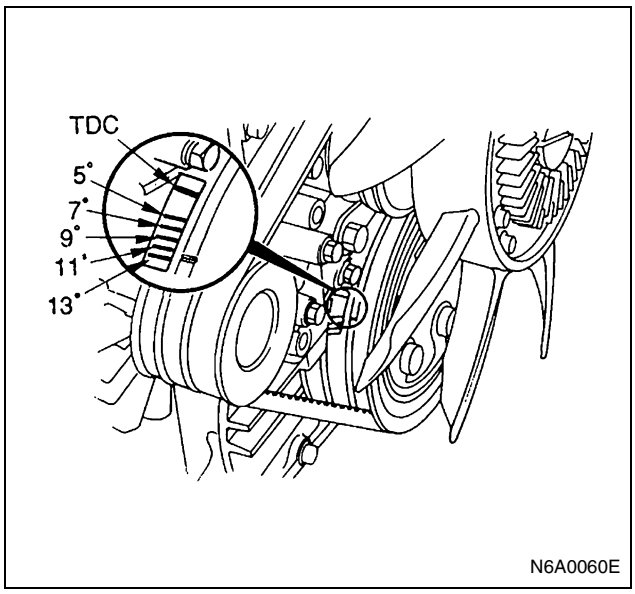



5) Set the crankshaft damper pulley TDC mark to the pointer or 45° before TDC.
6) Set the dial gage to the "0" position.
7) Turn the crankshaft leftwise and rightwise a little and make sure that the needle stays in the "0" position.




8) Turn the crankshaft in the normal direction and read the measuring device's indication at the 12° before TDC position.

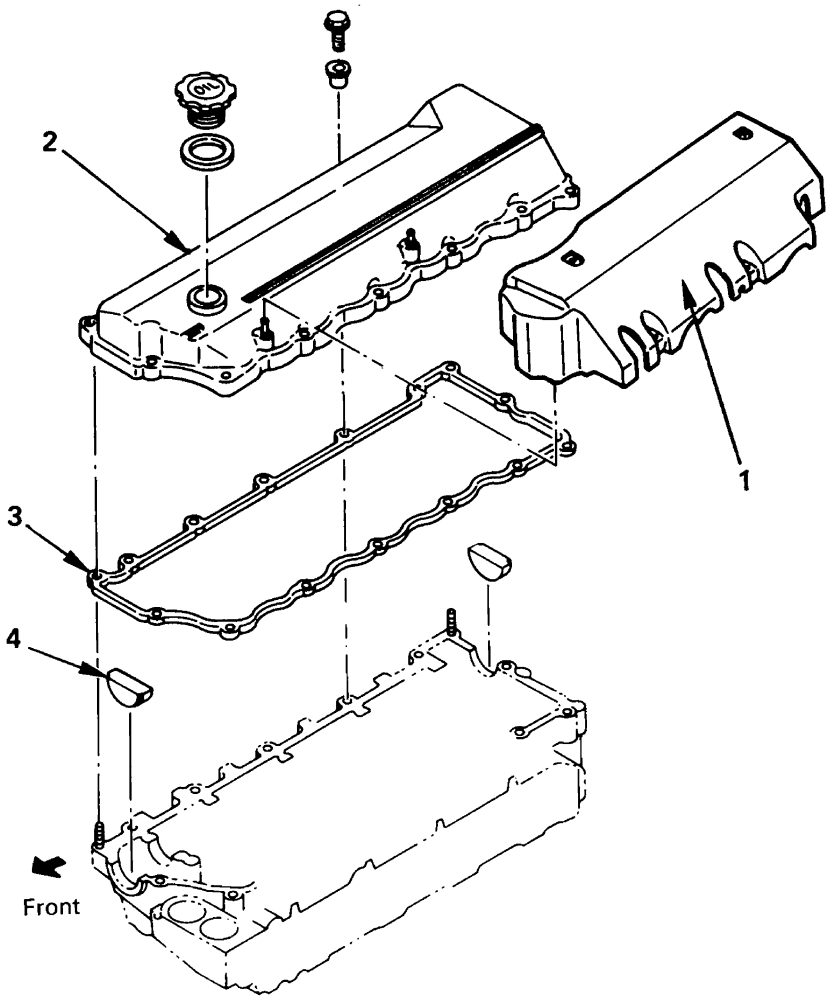
**Notice:**
As there is no 12° mark, set midway between the 11° and 13 marks.
Standard value: 0.5 mm (0.0197 in)




43. Injection Timing Adjustment (4HF1-2 model only)
If injection timing is out of the specified range, follow the following procedure for adjustment:
1) Loosen injection pump fixing nuts and bracket bolt.
2) Adjust the mounting angle of injection pump:
   - If injection timing is too fast, bring the injection pump closer to the engine.
   - If injection timing is too slow, put the injection pump more distant from the engine.

# CYLINDER HEAD COVER

## Component




N6A0381E

**Legend**

1. Nozzle cover
2. Cylinder head cover
3. Cylinder head cover gasket
4. Rubber plug

## Removal

**Preparation**

- Disconnect battery ground cable.
- Tilt the cab.

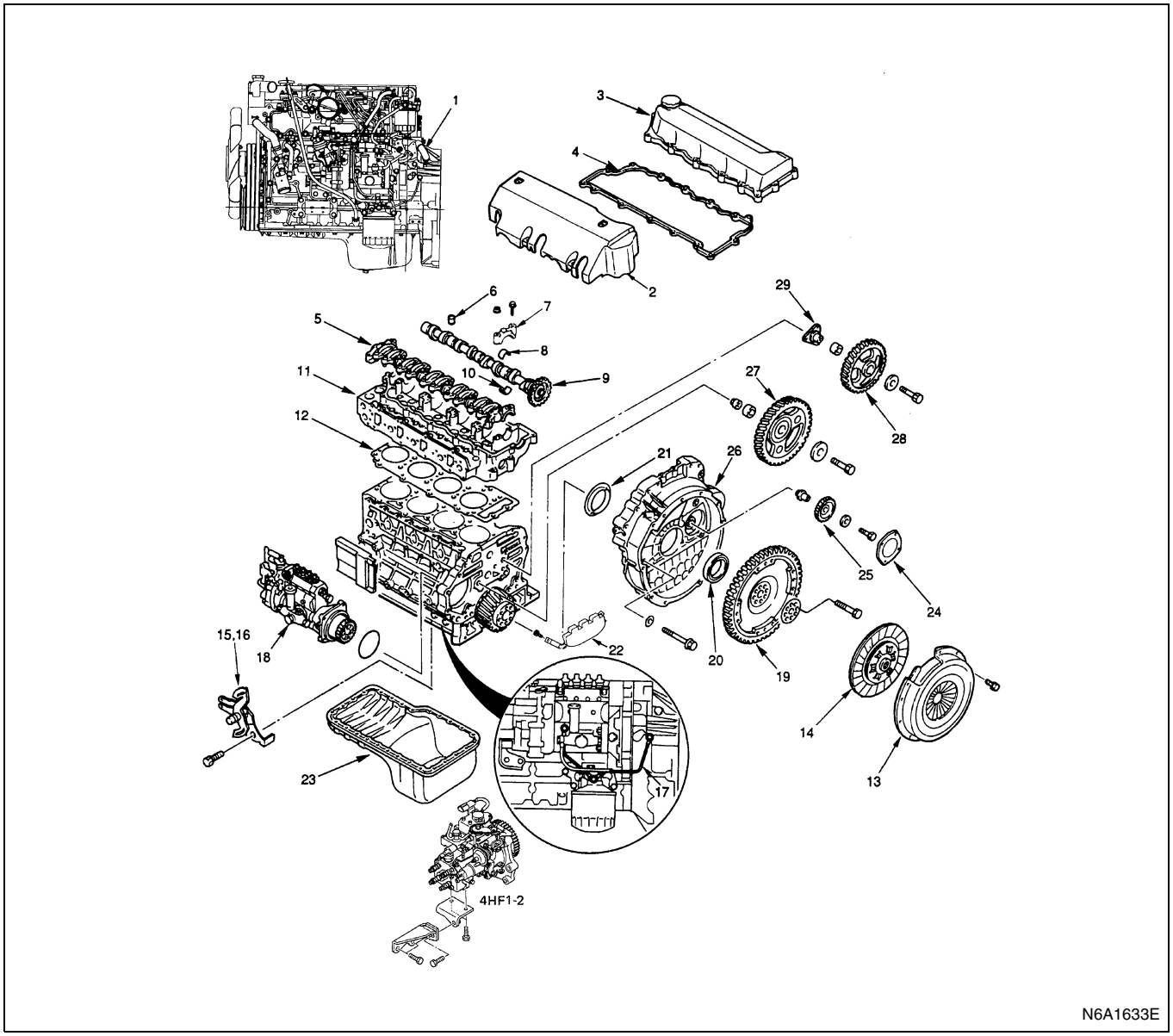
1. Nozzle Cover
2. Cylinder Head Cover
3. Cylinder Head Cover Gasket
4. Rubber Plug

## Installation

1. Rubber Plug
   1) Apply a 3 — 4 mm (0.12 — 0.16 in) bead of the recommended liquid gasket (Three Bond 1207B) or its equivalent to the cylinder head front and rear plug arch.
   2) Install the rubber plugs to the cylinder head upper faces.
   3) Apply a 3 — 4 mm (0.12 — 0.16 in) bead of the recommended liquid gasket (Three Bond 1207B) or its equivalent to the rubber plugs and cylinder head upper faces. Refer to arrows in the illustration.

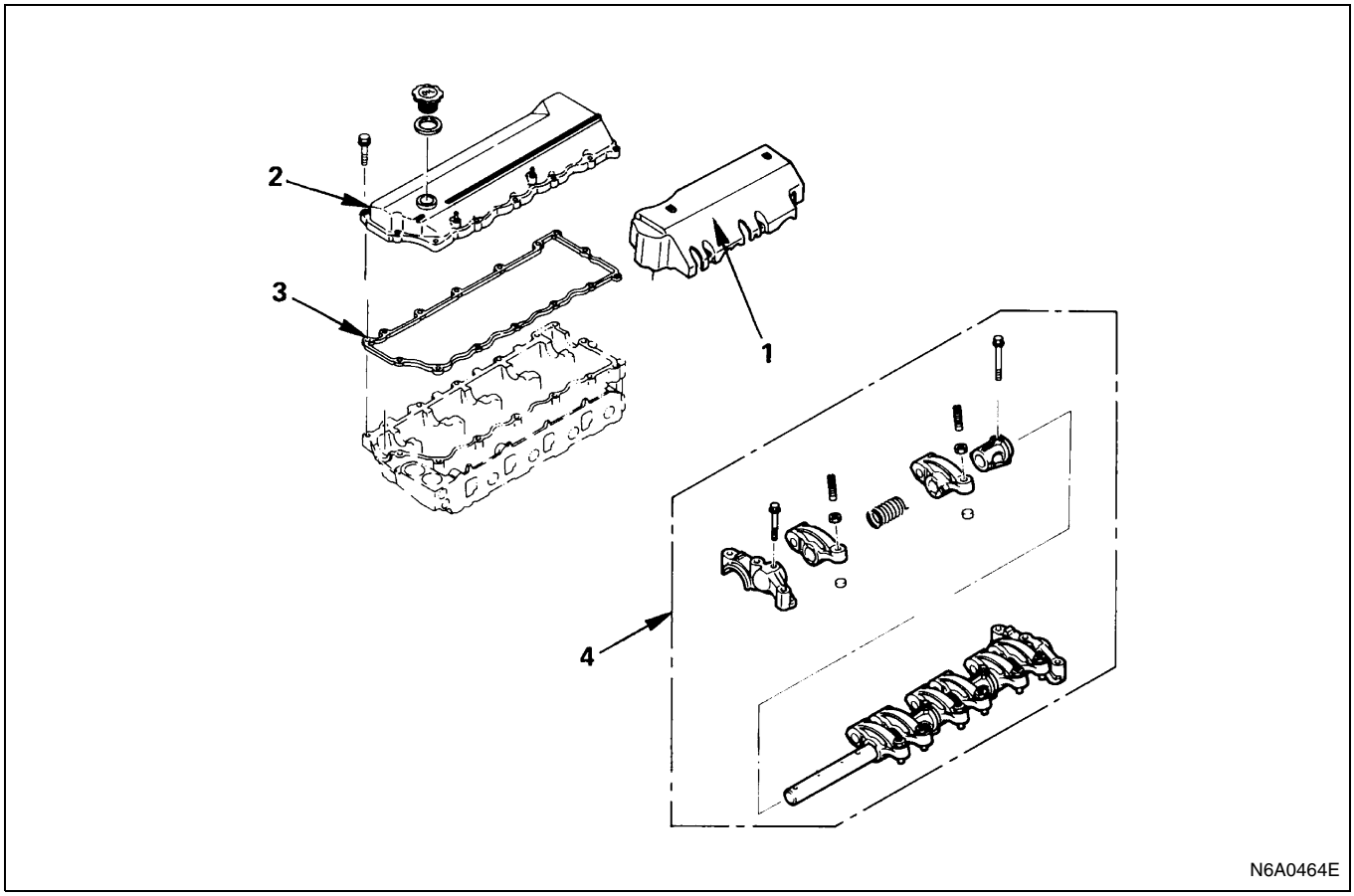
# TIMING GEAR REPLACEMENT

## Component



# ROCKER ARM SHAFT ASSEMBLY

## Component




**Legend**

1. Nozzle cover
2. Cylinder head cover
3. Cylinder head cover gasket
4. Rocker arm shaft assembly

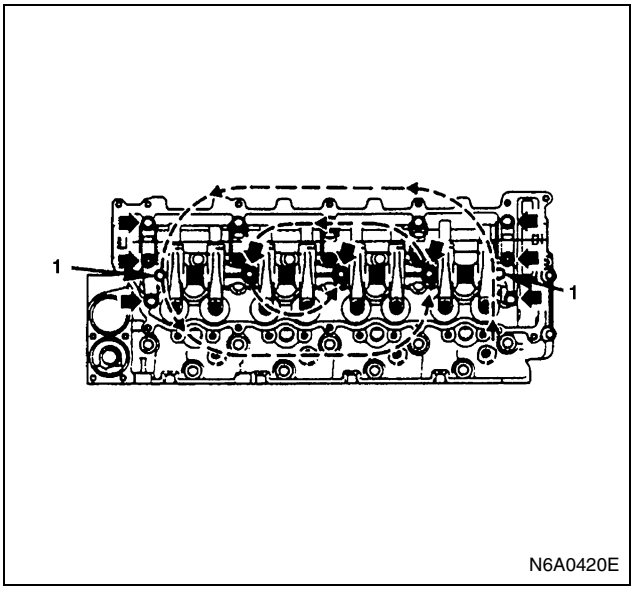
## Removal

**Preparation**

- Disconnect battery ground cable.
- Tilt the cab.

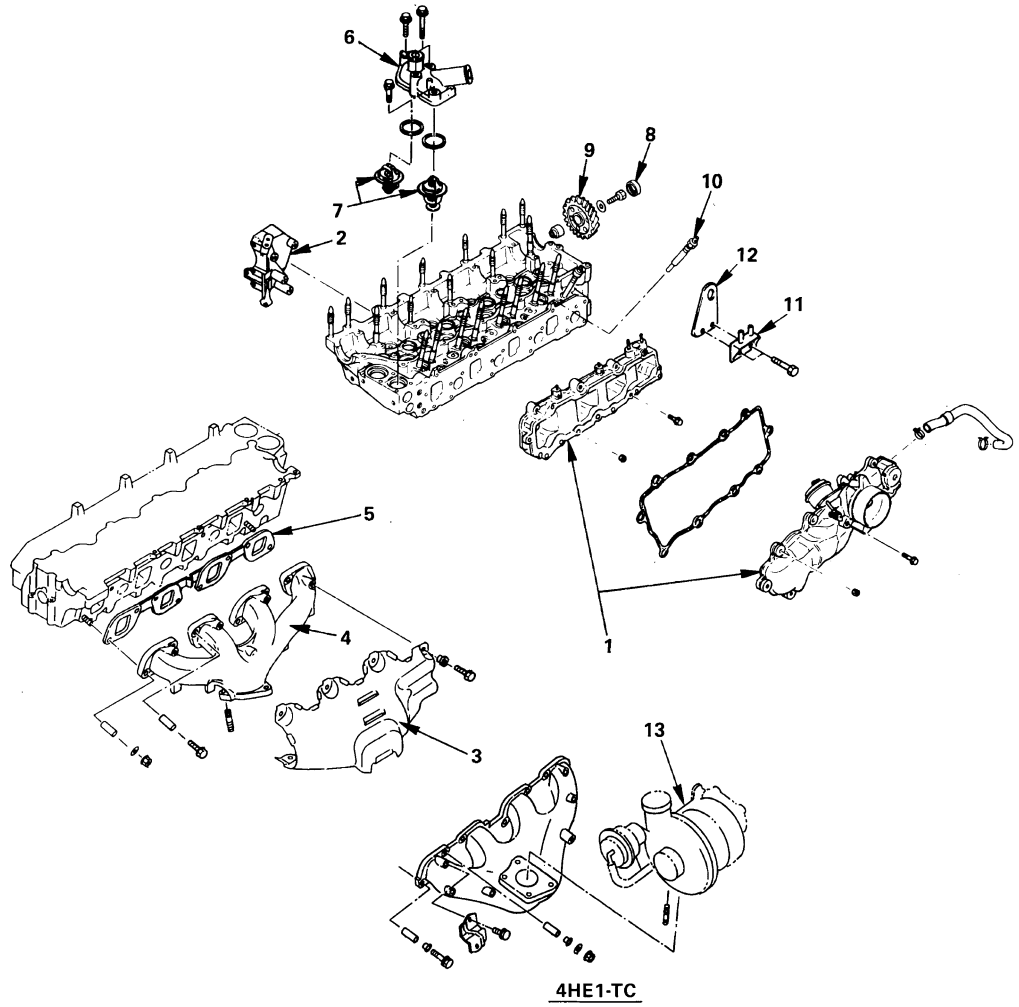
1. Nozzle Cover
2. Cylinder Head Cover
3. Cylinder Head Cover Gasket
4. Rocker Arm Shaft Assembly
   1) Loosen the rocker arm shaft bracket nuts and bolts in numerical order a little at a time and remove the rocker arm shaft assembly with the camshaft brackets.
   2) Leave the (1) indicated bolt unremoved on this occasion, since it is the rocker arm fixing bolt.

**Caution:**
Failure to loosen the rocker arm shaft bracket nuts and bolts in numerical order a little at a time will adversely affect the rocker arm shaft.



# CIRCUMFERENCE PARTS OF CYLINDER HEAD

## Component




N6A0499E

**Legend**

1. Inlet cover/inlet case
2. A/C compressor bracket (If equipped with A/C)
3. Heat protector
4. Exhaust manifold
5. Exhaust gasket
6. Water outlet pipe
7. Idle gear C cover
8. Idle gear C cover
9. Idle gear C
10. Glow plug
11. Fuel filter bracket
12. Engine hanger
13. Turbocharger

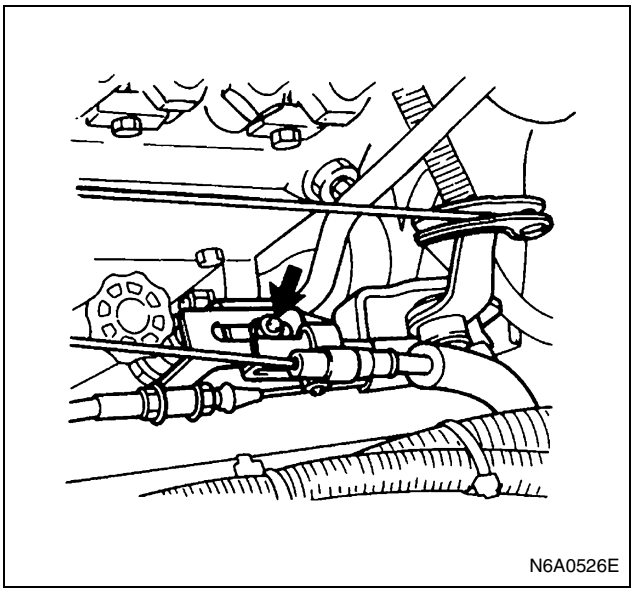
## Removal

**Preparation**

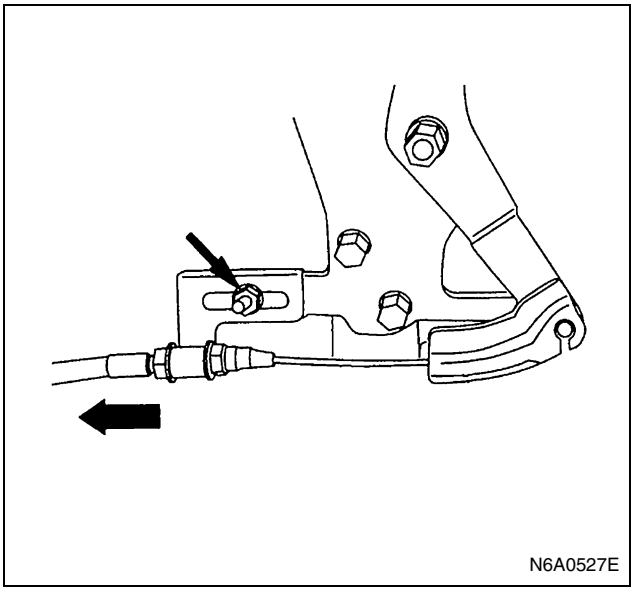
- Disconnect battery ground cable
- Tilt the cab
- Drain coolant
- Remove each part from the cylinder head assembly.
  For details, refer to the “CYLINDER HEAD” in this section.

1. Inlet Cover/Inlet Case
2. Air Conditioning (A/C) Compressor Bracket (If equipped with A/C)

2) Install the end tip of the cable to the engine control lever.
3) With the outer cable pulled toward the front of the vehicle, provide the engine control wire and the inner cable with the appropriate play. Then, fasten the clamp with a nut.

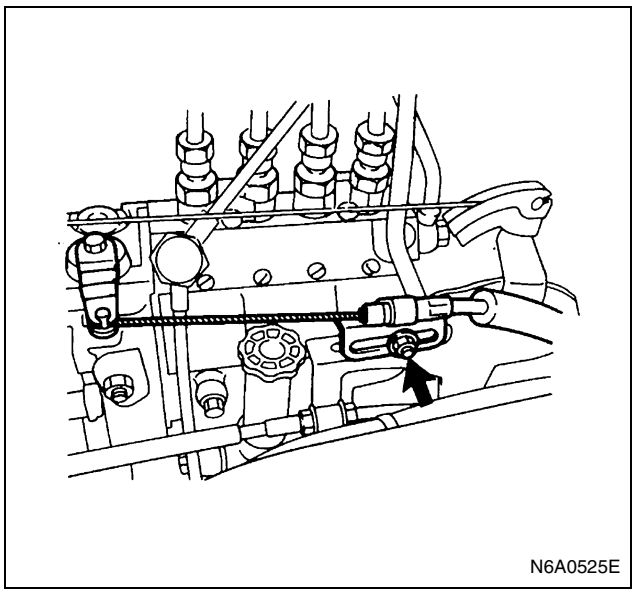

N6A0526E

**For 4HE1-TC**

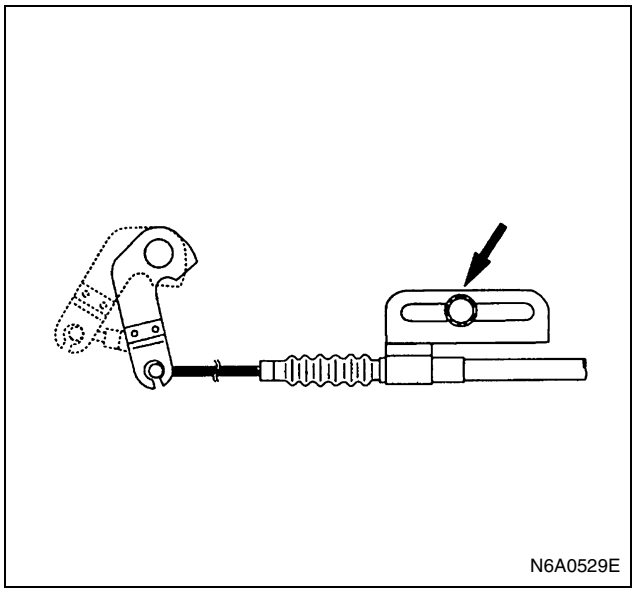

N6A0527E

4) Check to see if the control lever of the injection pump is set at the idling position (with the lever attached to the stopper bolt).

23. Engine Stop Cable
    1) Install the end tip of the cable to the engine stop lever.
    2) Pull the cable toward the rear of the vehicle, and fasten the clamp with a nut at the position where the lever stops.


N6A0525E

**For 4HE1-TC**

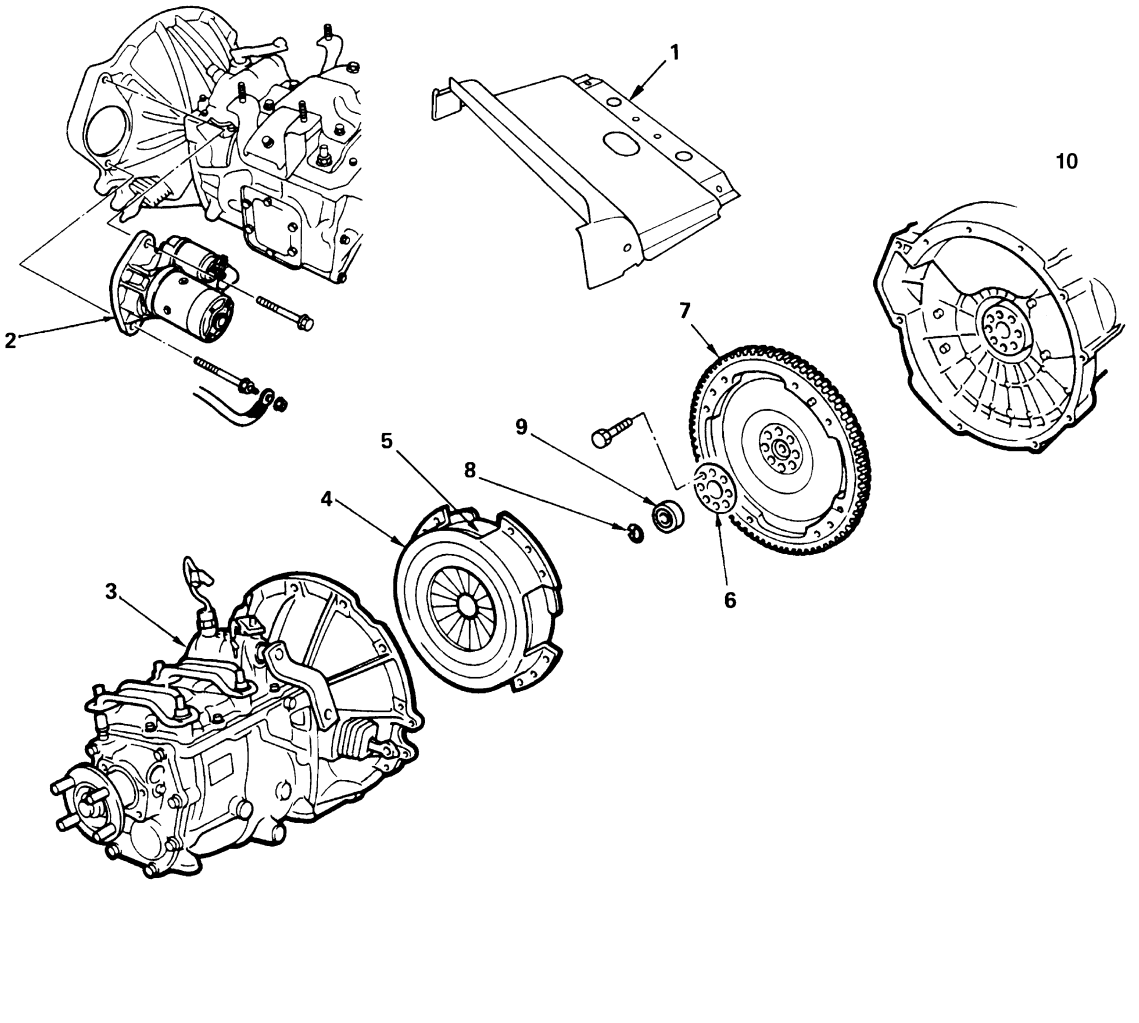

N6A0529E

24. Intake Air Duct
25. Oil Level Gauge Guide Tube
    1) Install the O-rings to the guide tube lower portion and insert the guide tube completely to the cylinder body.
    2) Tighten the guide tube bolt to the specified torque.

**Tighten:**
Guide tube bolt to 13 N·m (1.3 kg·m/113 lb·in)

# FLYWHEEL AND PILOT BEARING

## Component




**Legend**

1. Transmission panel
2. Starter
3. Transmission assembly
4. Clutch pressure plate assembly
5. Driven plate
6. Washer
7. Flywheel assembly
8. Snap ring
9. Pilot bearing
10. Engine side

## Removal

**Preparation**

- Disconnect battery ground cable.

1. Transmission Panel
2. Starter
   1) Disconnect the battery cable at the starter motor.
   2) Remove the starter assembly from flywheel housing.

**Legend**

1. Engine cover
2. Nozzle cover
3. Cylinder head cover
4. Cylinder head cover gasket
5. Rocker arm shaft assembly
6. Valve cap
7. Camshaft bearing cap
8. Camshaft bearing upper
9. Camshaft assembly
10. Camshaft bearing lower
11. Cylinder head assembly
12. Cylinder head gasket
13. Clutch pressure plate assembly
14. Driven plate
15. Engine control wire
16. Engine control lever assembly
17. Oil pipe
18. Oil filter assembly
19. Vacuum pump oil pipe
20. Vacuum pump rubber hose
21. Fan belt
22. Generator
23. Engine foot
24. Injection pump assembly
25. Fan belt adjust plate
26. Generator bracket
27. Crankshaft pulley
28. Crankshaft front oil seal
29. Crankshaft front slinger
30. Flywheel
31. Crankshaft rear oil seal
32. Crankshaft rear slinger
33. Spacer rubber
34. Oil pan
35. Oil pump strainer
36. Water pump pulley
37. Water pump
38. Front retainer
39. Oil thermo valve
40. Power steering pump idle gear cover
41. Power steering pump idle gear
42. Flywheel housing
43. Idle gear A
44. Oil pump assembly
45. Connecting rod cap assembly
46. Connecting rod lower bearing
47. Piston and connecting rod assembly
48. Crankcase
49. Thrust bearing lower
50. Crankshaft bearing lower
51. Crankshaft assembly
52. Thrust bearing upper
53. Crankshaft bearing upper
54. Crankshaft gear
55. Crankshaft

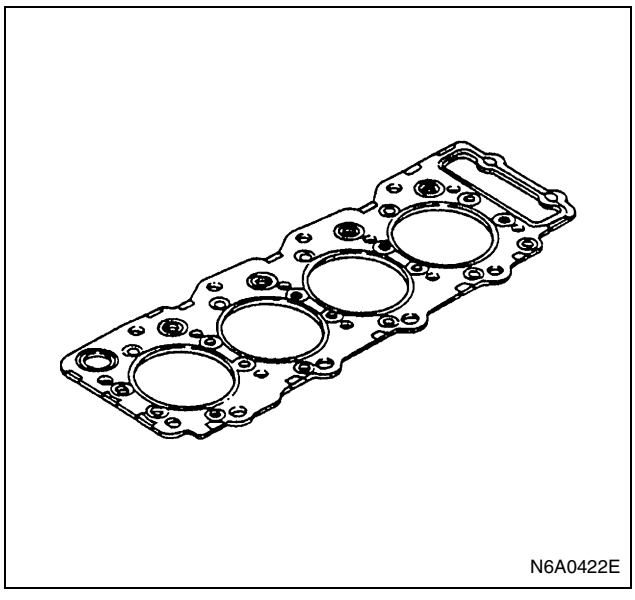
## Removal

**Preparation**

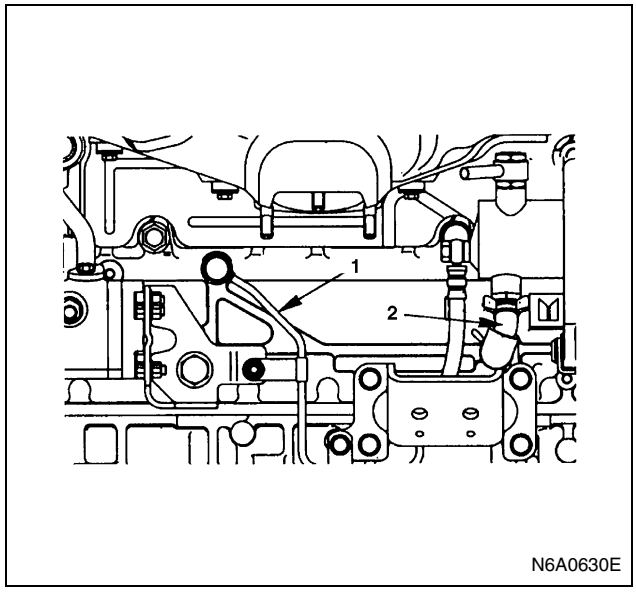
- Disconnect battery ground cable.
- Tilt the cab
- Drain coolant and engine oil

1. Engine Assembly
   Above works refer to “ENGINE ASSEMBLY” section in this manual.
2. Nozzle Cover
3. Cylinder Head Cover
4. Cylinder Head Cover Gasket
5. Rocker Arm Shaft Assembly
   Above works refer to “ROCKER ARM SHAFT ASSEMBLY” section in this manual.
6. Valve Cap
7. Camshaft Bearing Cap
8. Camshaft Bearing Upper
9. Camshaft Assembly
10. Camshaft Bearing Lower
    Above works refer to “CAMSHAFT ASSEMBLY” section in this manual.
11. Cylinder Head Assembly
    Above works refer to “CYLINDER HEAD” section in this manual.
12. Cylinder Head Gasket

**Caution:**
Do not reuse the cylinder head gasket.



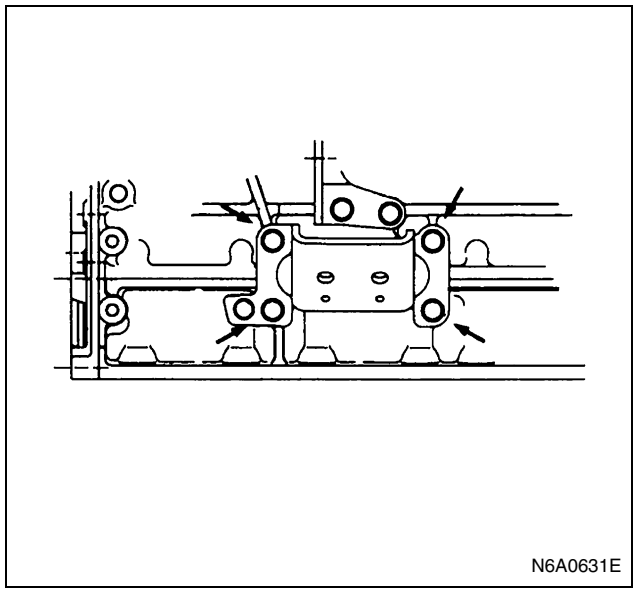

13. Clutch Pressure Plate Assembly
14. Driven Plate



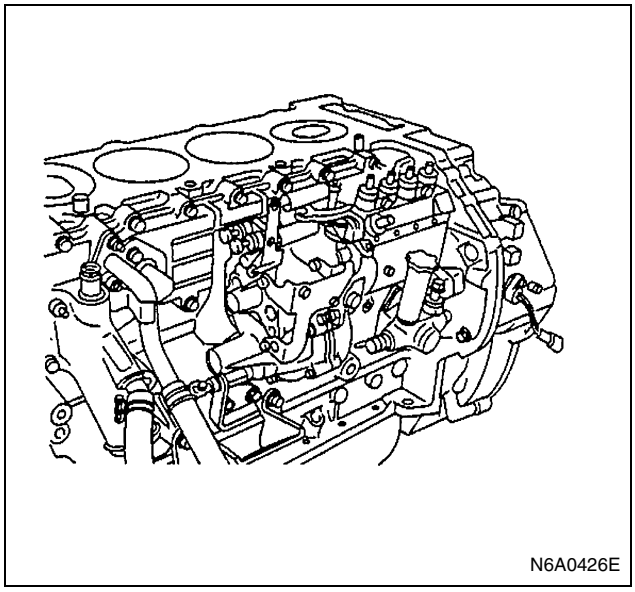

**Legend**

1. Vacuum pump oil pipe
2. Vacuum pump rubber hose

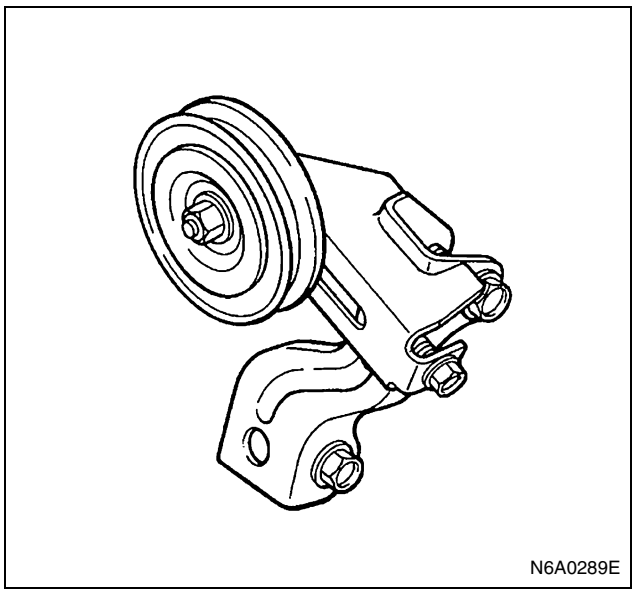
23. Fan Belt
24. Generator
25. Engine Foot




26. Injection Pump Assembly
    1) Remove the injection pump bracket bolts and the injection pump rear bracket bolts.
    2) Then remove the injection pump assembly.




27. Injection Pump Rubber Spacer
28. Idle Pulley Bracket (If equipped with A/C)

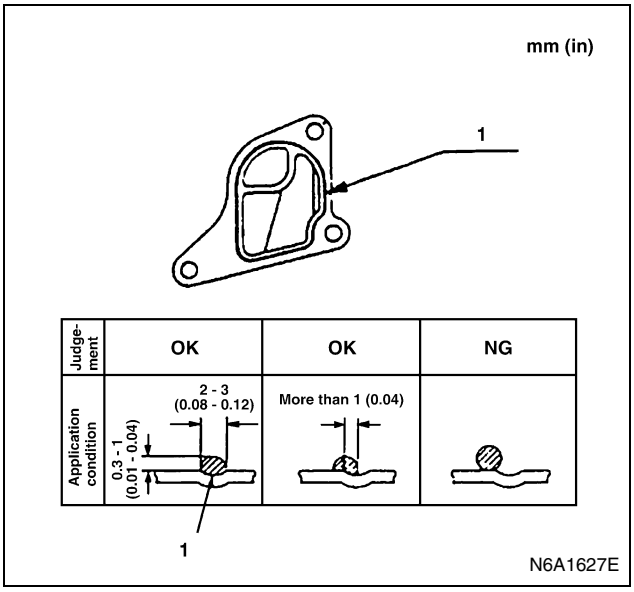



29. Heater Pipe

1207C) or its equivalent on the groove of the water suction pipe fitting surface.

2) Install the water suction pipe to the oil cooler.

• For the dislocation of liquid gasket, refer to the illustration.




**Legend**

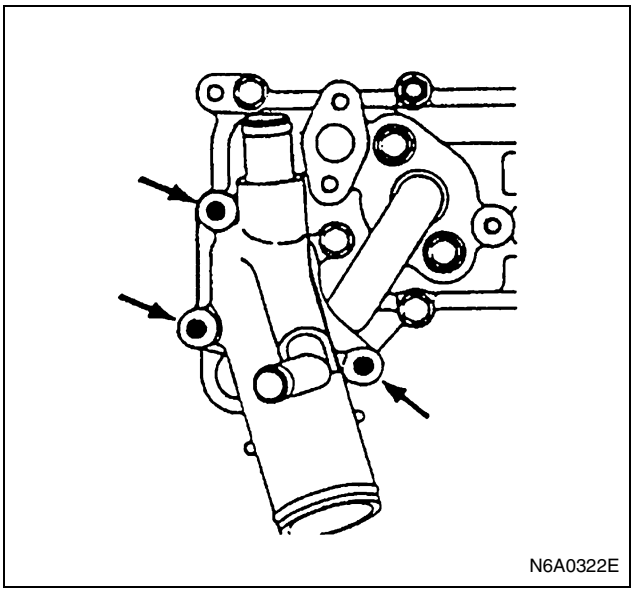
1. Liquid gasket

**Tighten:**

Water suction pipe bolt and nuts to 24 N·m (2.4 kg·m/17 lb·ft)

**Notice:**

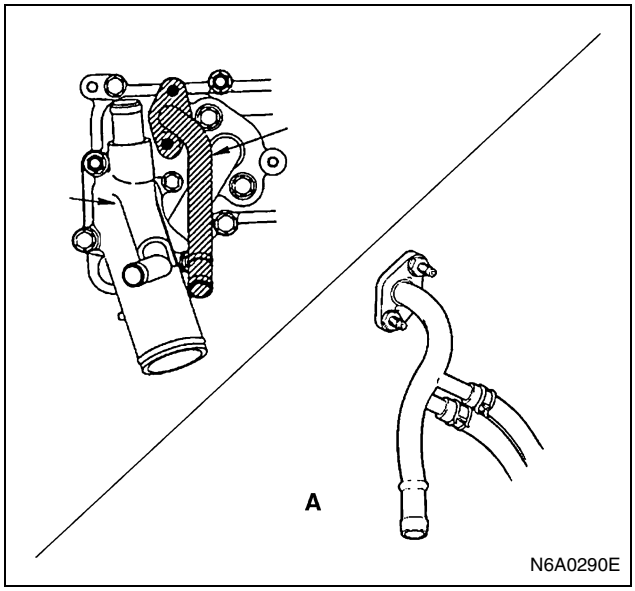
Install the water suction pipe immediately after the installation of the oil cooler.




38. Heater Pipe
    1) Install the O-ring to the heater pipe.
    2) Install the heater pipe to the oil cooler.

**Tighten:**

Heater pipe bolt to 24 N·m (2.4 kg·m/17 lb·ft)



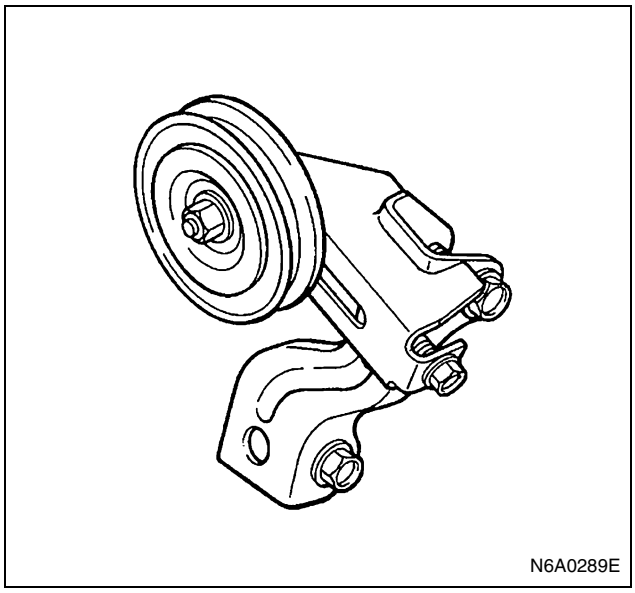

**Legend**

A. 4HF1-2

39. Idle Pulley Bracket (If equipped with A/C)

**Tighten:**

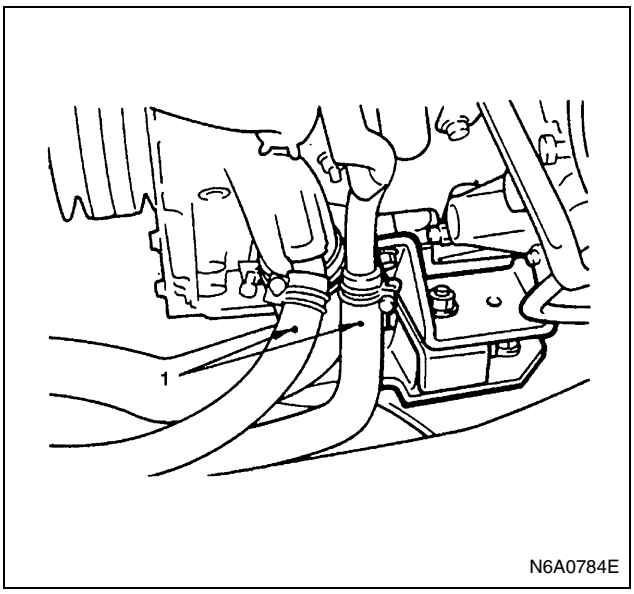
Idle pulley bracket bolt to 48 N·m (4.9 kg·m/35 lb·ft)




40. Injection Pump Rubber Spacer
41. Injection Pump Assembly
    Above works refer to “INJECTION PUMP ASSEMBLY” section in this manual.
42. Engine Foot

**Tighten:**

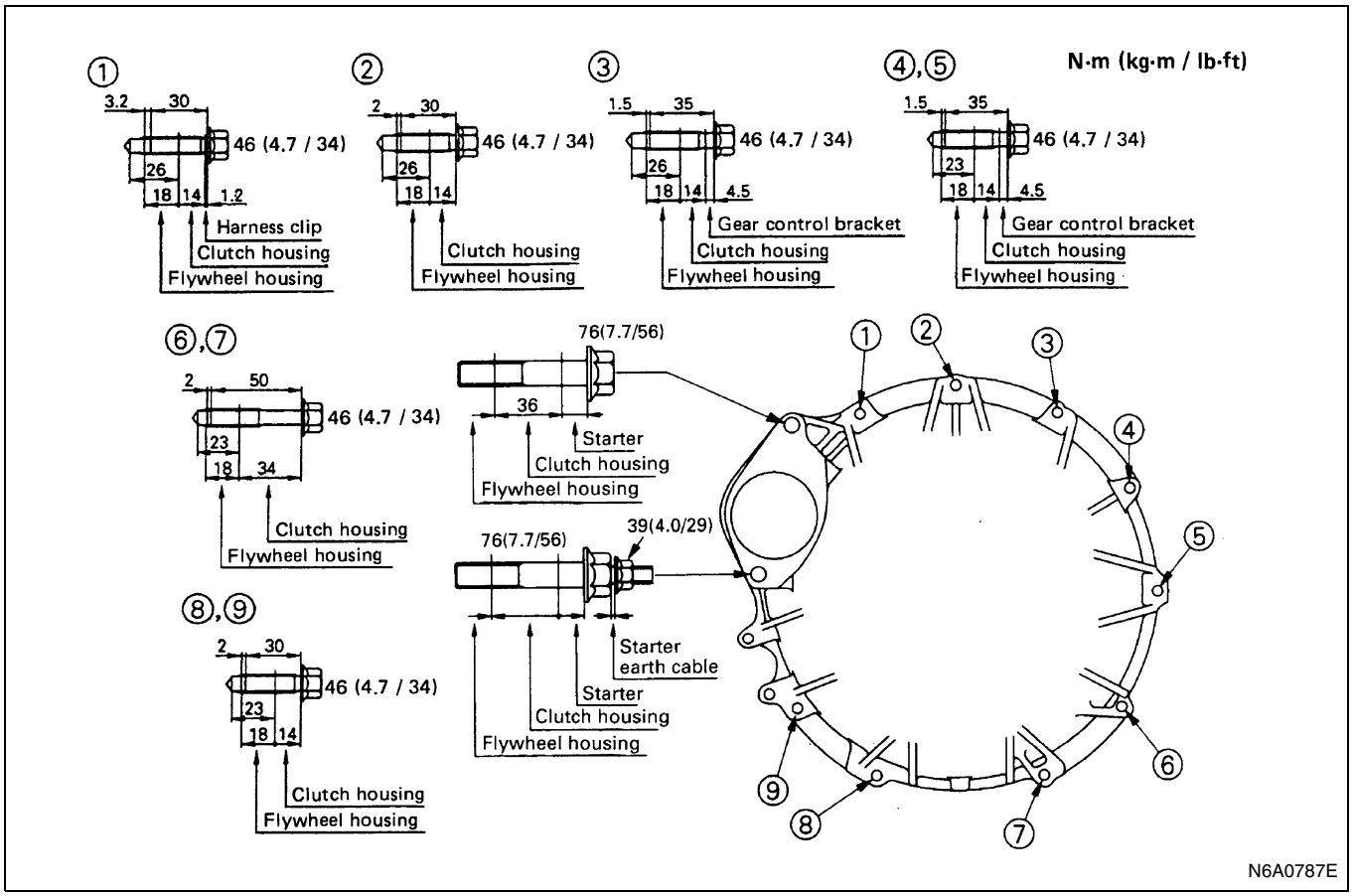
Engine foot bolt to 51 N·m (5.2 kg·m/38 lb·ft)




7. Intake Air Duct

### Transmission Side

1. Transmission Assembly
   Fasten the transmission to the transmission jack with a chain in the same manner as when dismounting it, and tighten the clutch housing clamping bolt to the specified torque.
   (Refer to the illustration below.)




2. Transmission Mounting Nut

**Tighten:**
Transmission mounting nut to 40 N·m (4.1 kg·m/30 lb·ft)

3. Starter
4. Starter Earth Cable
   Refer to the preceding page.
5. Clutch Slave Cylinder
   1) Install the clutch slave cylinder.

**Tighten:**
Slave cylinder bolts to 16 N·m (1.6 kg·m/12 lb·ft)

   2) Install the clutch return spring to the clutch shift fork.
6. Select Cable
7. Shift Cable
8. Parking Brake Cable
   1) With the lock nut (1) of the parking brake side cable tightened to the limit, rotate the nut (2) to connect it with the front side cable.
   2) After tightening the front side nut (2) to the limit, fasten the parking brake cable with the lock nut (1).

# FUEL SYSTEM

## GENERAL DESCRIPTION

### Caution

When working on the fuel system, there are several things to keep in mind:

- Any time the fuel system is being worked on, disconnect the negative battery cable except for those tests where battery voltage is required.
- Always keep a dry chemical (Class B) fire extinguisher near the work area.
- Replace all pipes with the same pipe and fittings that were removed.
- Clean and inspect “O” rings. Replace where required.
- Always relieve the line pressure before servicing any fuel system components.
- Do not attempt repairs on the fuel system until you have read the instructions and checked the pictures relating to that repair.

### Description

**Fuel Filters**

The Purpose of the fuel filters is to clean the fuel of any dirt particles that can cause wear on the fuel injection nozzle’s sliding surface; and to separate any water from the fuel, which is ever-present from the condensation in the fuel tank. The pre-fuel filter (water separator) is located between the fuel tank and the injection pump. The secondary fuel filter is located between the fuel pump and the injection pump.

**Pre-Fuel Filter**

When the condensed water in the pre-fuel filter (water separator) comes to the warning level indicated on its plastic body, drain the fluid immediately from the drain plug located bottom of water separator.

**Injection Pump**

The fuel injection system includes a fuel tank, fuel hoses and lines, a fuel/water separator, fuel filters, a fuel pump, a Bosch-type in-line fuel injection pump with an internal governor, delivery valves, fuel injection lines and for fuel injection nozzles.

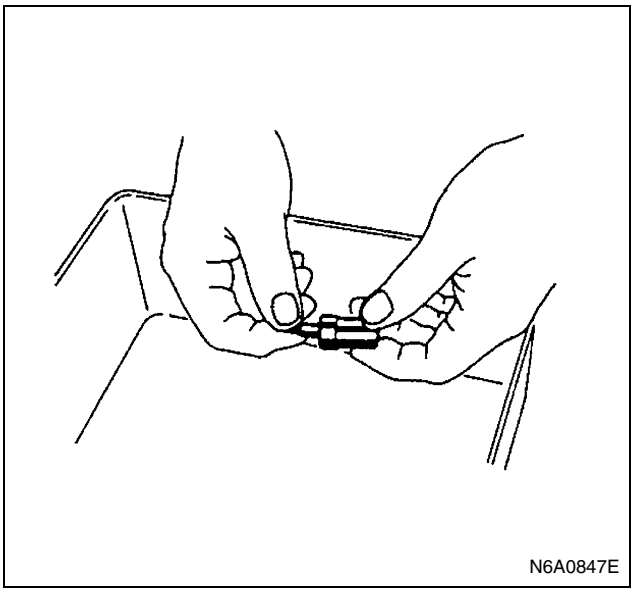
The fuel pump, injection pump and the nozzle are manufactured by Bosch AS corporation, but serviced by Bosch.

Remove the injection pump and governor assembly as a unit to have it services. Do not open or break any seals on the pump or the warranty is void. The injection pump has an identification plate attached to the pump body.

## Inspection

### Injection Nozzle Needle

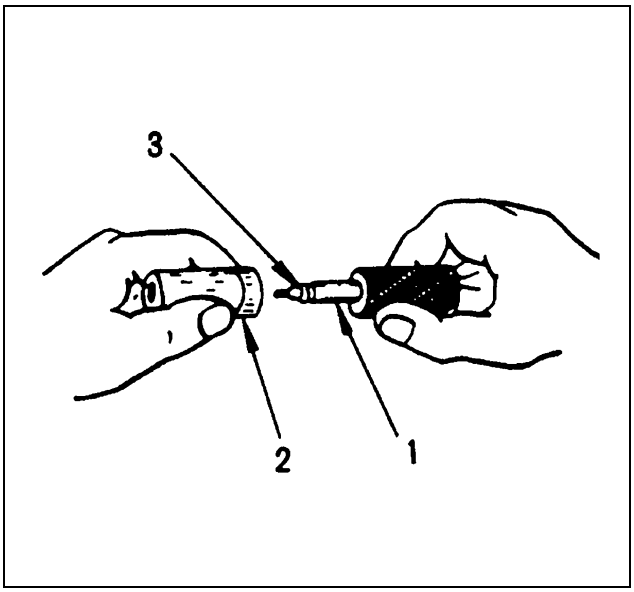
1. Remove the nozzle from the nozzle body.
2. Carefully wash the nozzle needle and the nozzle body in clean diesel fuel.
3. Check that the nozzle needle moves smoothly inside the injection nozzle body.
   If the nozzle does not move smoothly, it must be repaired (See “Nozzle Lapping Procedure” below).


N6A0847E

### Nozzle Lapping Procedure

1. Lap the nozzle needle (1) and the nozzle body (2) by applying a compound of oxidized chrome and animal oil (3).

**Notice:**
Do not apply an excessive amount of the oxidized chrome and animal oil compound to the injection needle valve seat area.



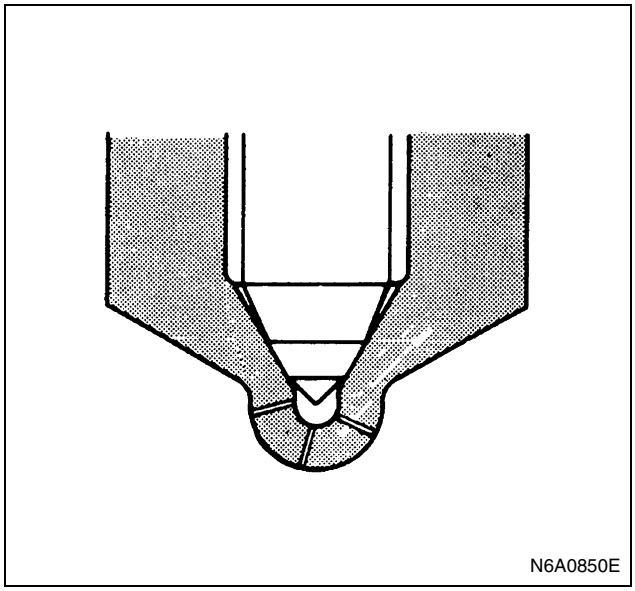

2. Carefully wash the needle valve and the nozzle body in clean diesel fuel after lapping.

### Nozzle Body and Needle Valve

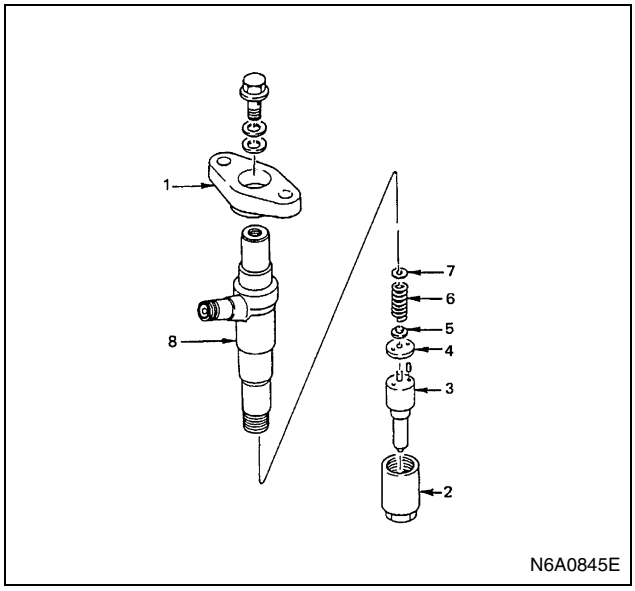
Check the nozzle body and the needle valve for damage and deformation.
The nozzle and body assembly must be replaced if either of these two conditions are discovered during inspection.

**Notice:**
New nozzles must be cleaned in a solvent to remove protective coating.

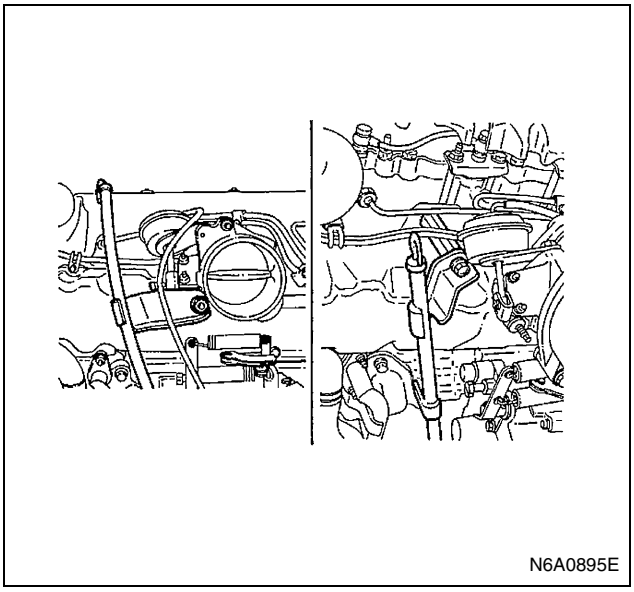
The nozzle body and needle must always be replace as an assembly.


N6A0850E

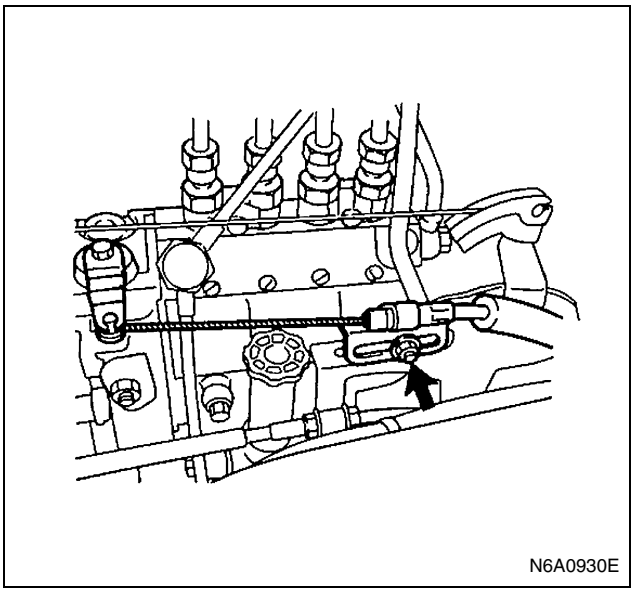
## Reassembly



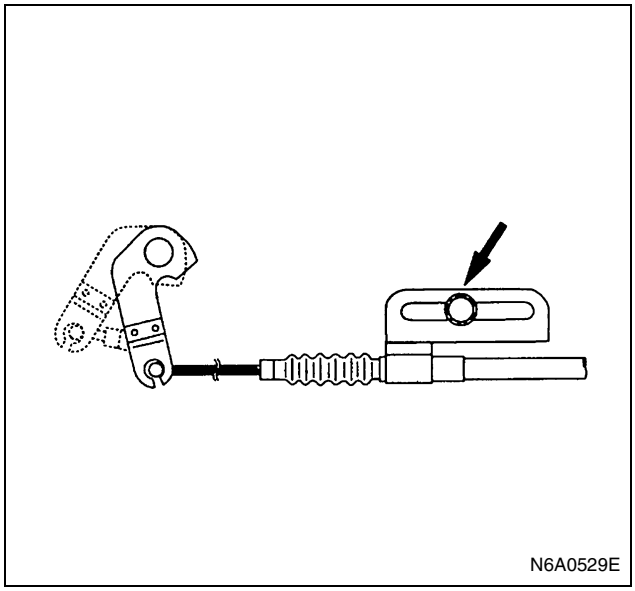
N6A0845E


N6A0895E

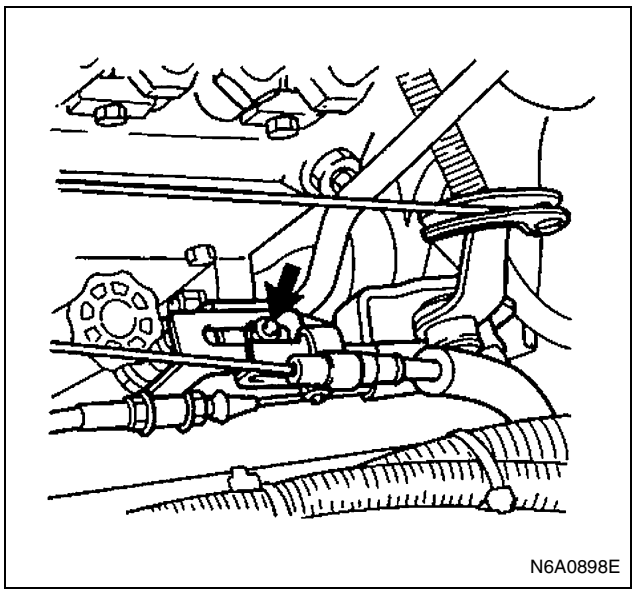
4. Engine Stop Cable
   - Loosen the locking nut at bracket and disconnect engine stop cable from the injection pump stop lever.


N6A0930E

For 4HE1-TC


N6A0529E

5. Accelerator Control Cable
   - Loosen the locking nut at bracket and disconnect the accelerator control cable from the injection pump control lever.


N6A0898E

## Injection Volume and Governor Performance Diagram

Identification Numbers : 101401-7070/101401-7060

[4HF1 Engine]

Pre-stroke : No. 1 plunger 4.1±0.05 mm (0.1614±0.0020 in)

Injection order : 1 — 3 — 4 — 2 (interval 90°±30′) Plungers are numbered from the Governor side

Tappet clearance : Bolt adjustment type : More than 0.3 mm (0.0118 in) for all cylinders.

: Shim adjustment type : Manually rotate the camshaft 2 — 3 times and confirm that it rotates smoothly.

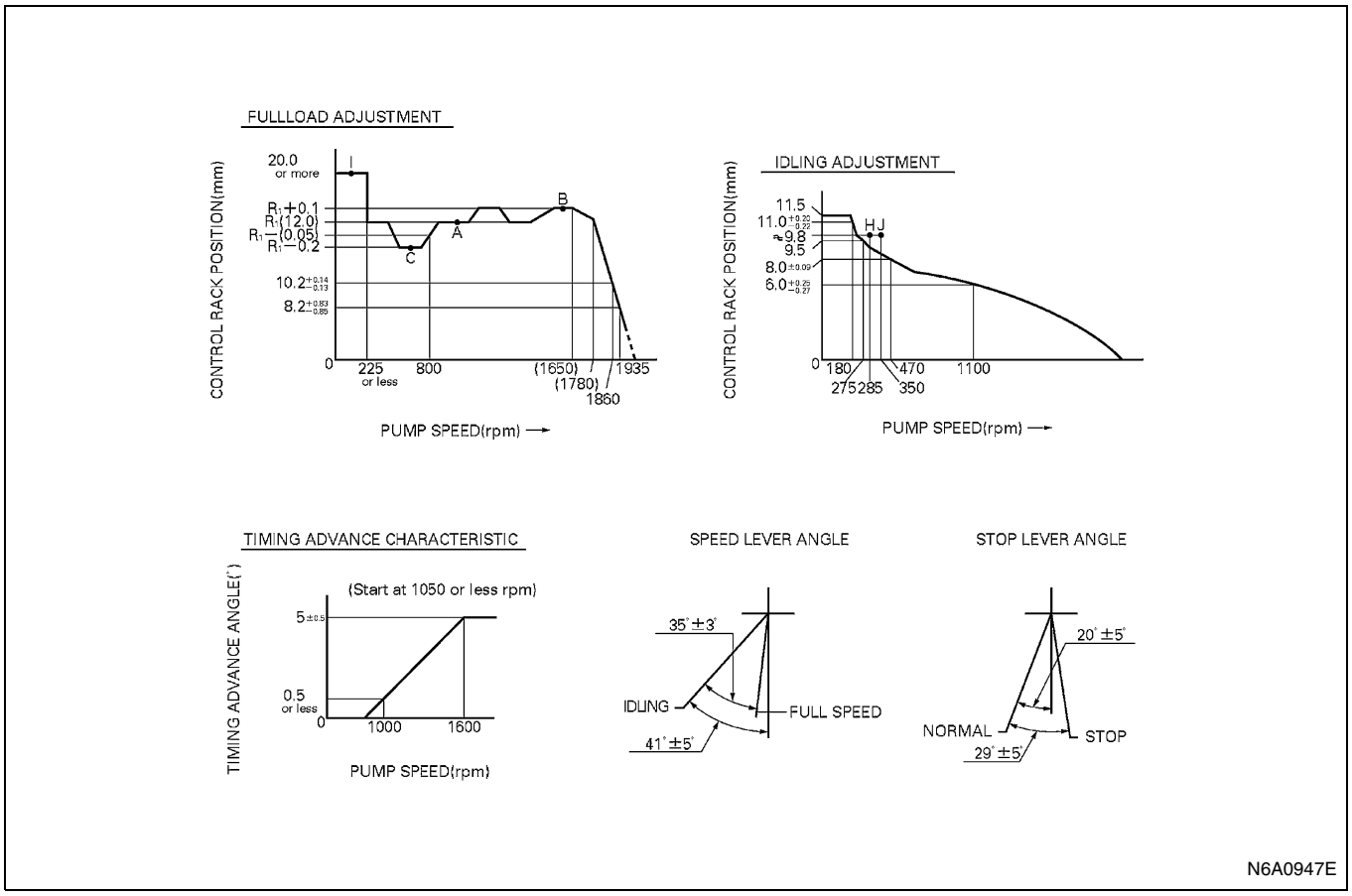
### Injection Volume

| Adjusting point | Pump speed (r.p.m.) | Injection volume (cc/ 1000 strokes) | Variance (%) | Remarks |
|---|---|---|---|---|
| | 960 | 61±1.6 | ±4 | Basic |
| H | 285 | 16±1.3 | ±10.0 | |
| A | 960 | 61±1 | — | Basic |
| B | 1,600 | (62)±2 | — | |
| C | 500 | (60.5)±2 | — | |
| I | 150 | $(82)^{+16}_{-0}$ | — | |

### Timing Advance Specification

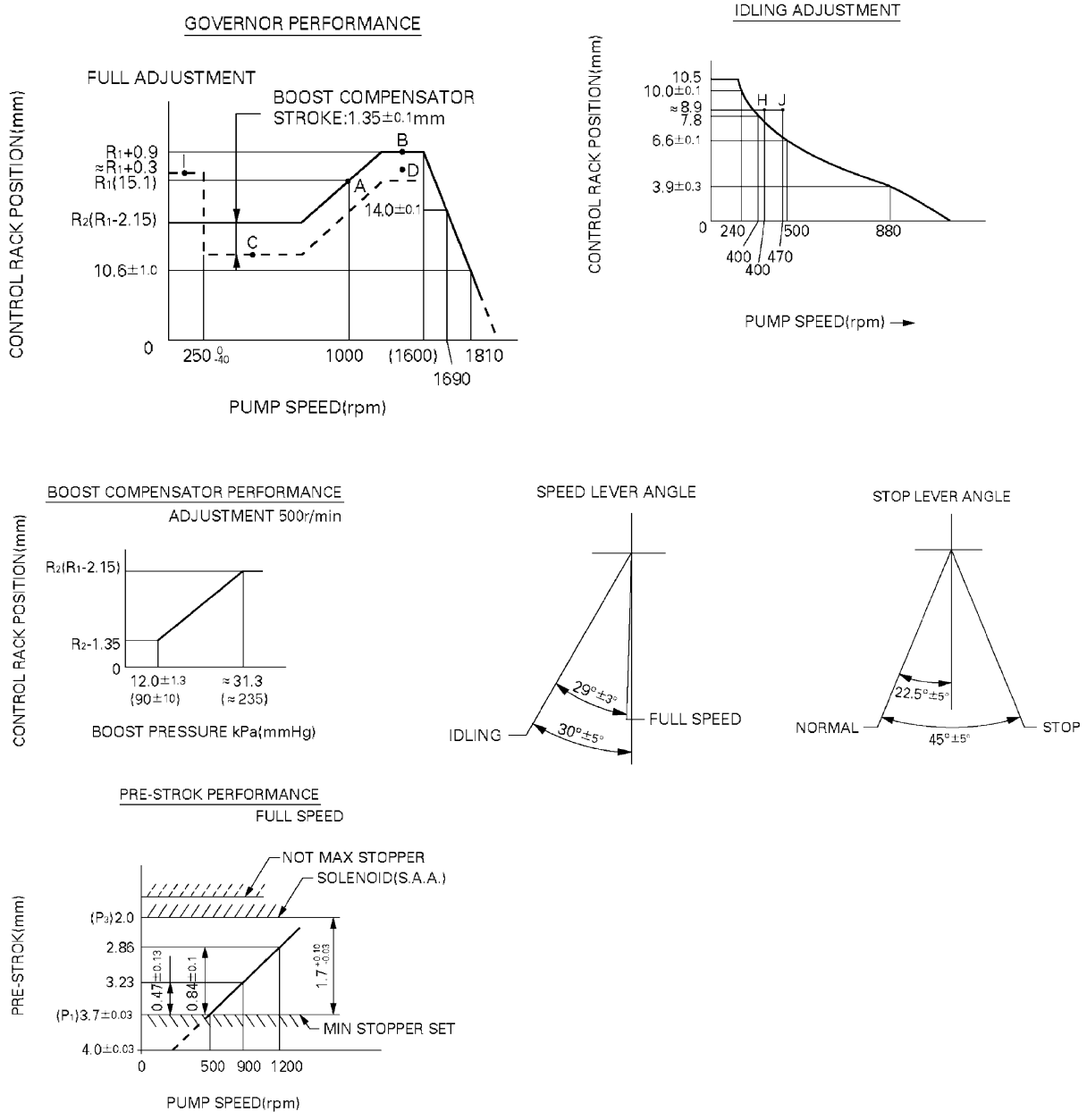
| Pump Speed (r.p.m.) | 1,050 or less | 1,000 | 1,600 or more |
|---|---|---|---|
| Degree for Angle of Lead (deg.) | Start | 0.5 or less | Finish 5±0.5 |

### Governor Adjustment




N6A0947E

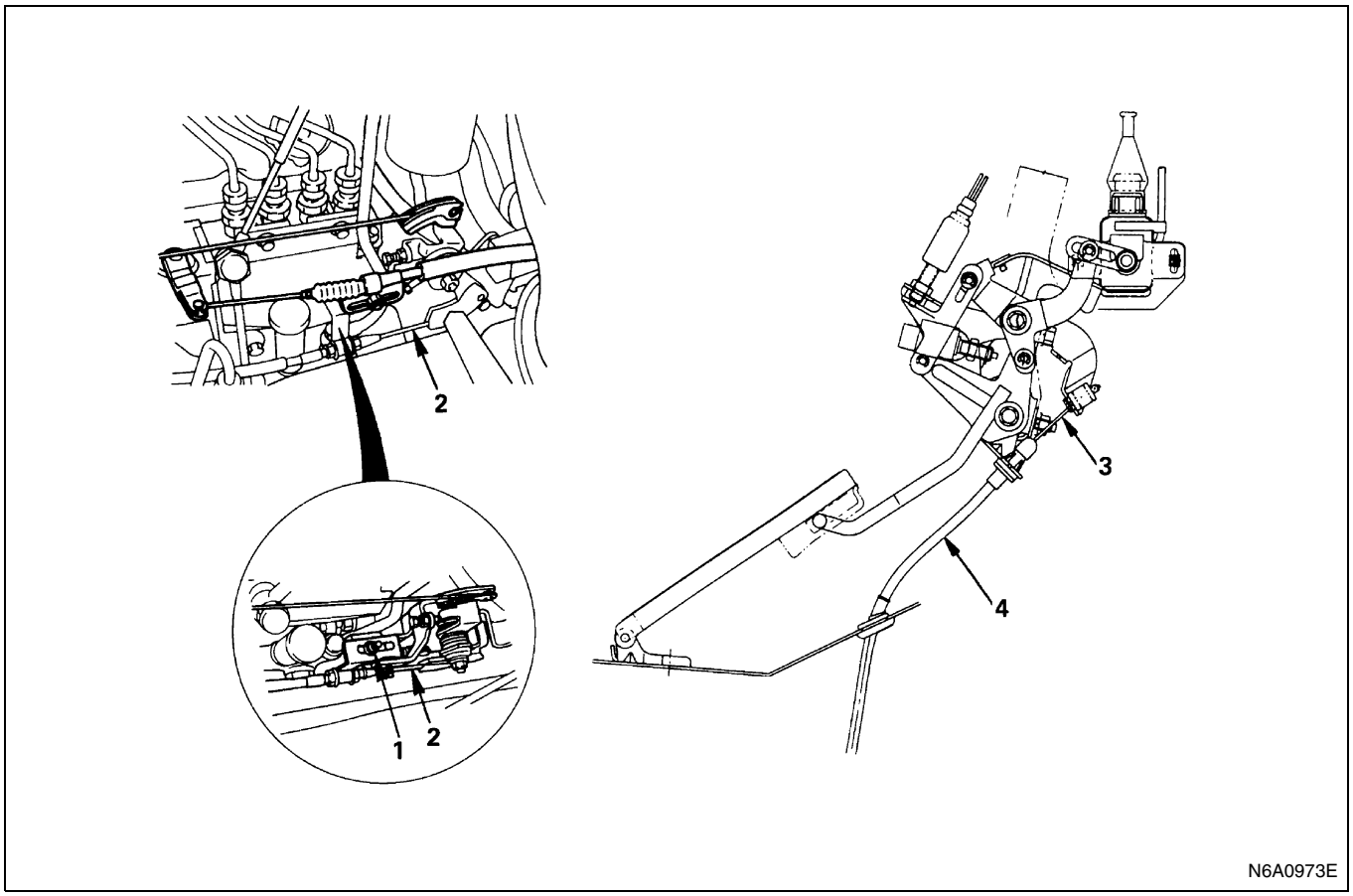
## Governor Adjustment




N6A1659E

# ACCELERATOR CONTROL CABLE

## Component




**Legend**

1. Adjust nut
2. Accelerator control wire (Injection pump side)
3. Accelerator control wire (Accelerator pedal side)
4. Accelerator control cable

## Removal

1. Adjust Nut
   - Loosen the adjust nut on the cable bracket mounted.
2. Accelerator Control Wire (Injection pump side)
   - Remove the control wire from injection pump control lever.
3. Accelerator Control Wire (Accelerator pedal side)
   - Remove the Accelerator control wire from accelerator pedal.
4. Accelerator Control Cable
   - Pull out the wire to the chassis side through the grommet hole of the floor board, and remove the control cable.

## Inspection

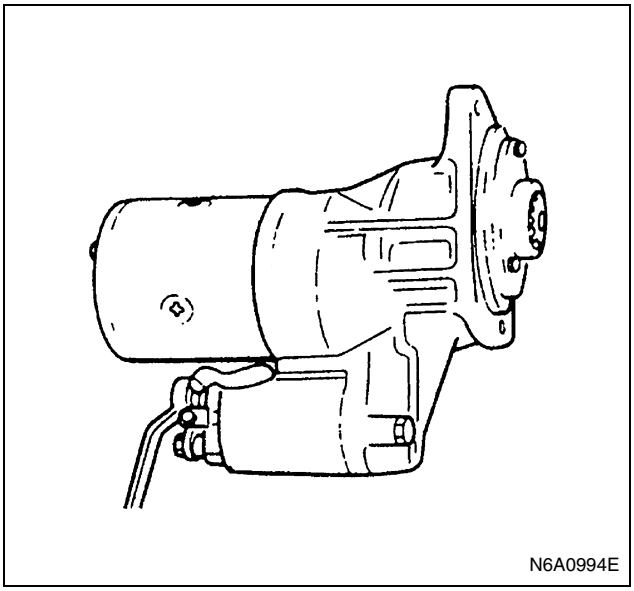
Check the following items, and replace the control cable if any abnormality is found.

- The control cable should move smoothly.
- The control cable should not be bent or kinked.
- The control cable should be free of damage and corrosion.

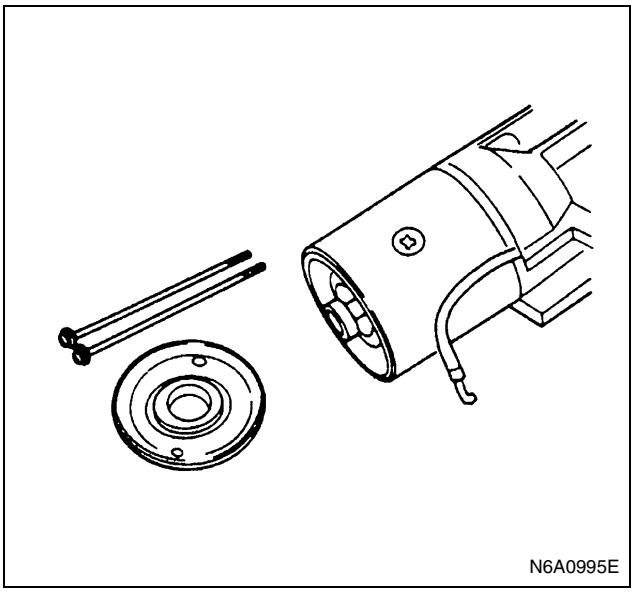
## Installation

1. Accelerator Control Cable
   - Take care that the core wire of the cable does not get damaged or inded.
   - Put the cable through the grommet hole from under the floor.
   - Set the groove of the grommet securely into the floor panel.
2. Accelerator Control Wire (Accelerator Pedal side)
   - Connect the accelerator control wire to Accelerator pedal.
3. Cable Clips
   - Install the cable clip to chassis frame.
   - Tighten the cable clips to 16 N·m (1.6 kg·m / 12 lb·ft)
4. Accelerator Control Wire

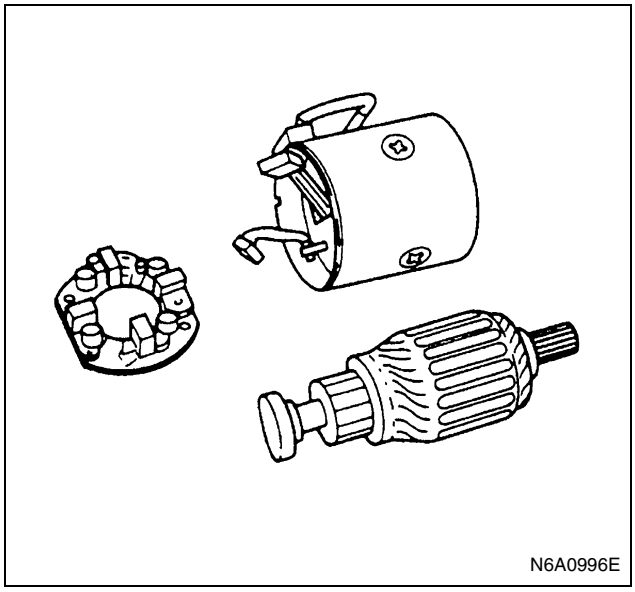
## Disassembly


N6A0994E

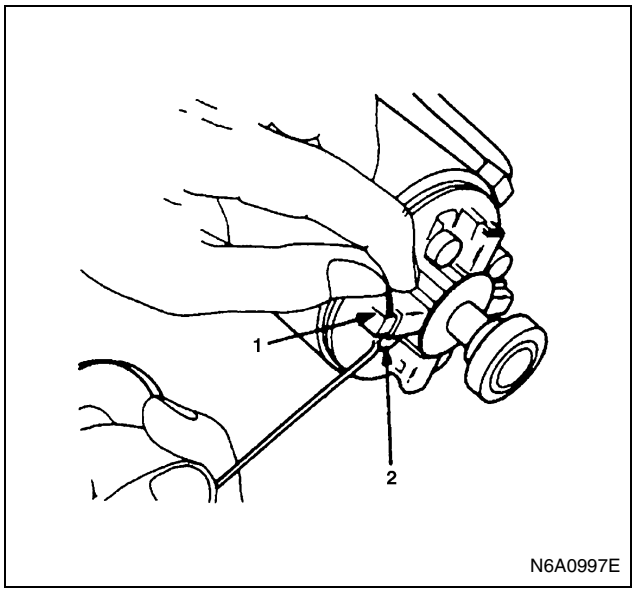
1. Lead Wire Nut
   Disconnect the lead wire at the magnetic switch.
2. Through Bolt


N6A0995E

3. Rear Cover
   Remove the through bolts, then remove the rear cover.
4. Brush Holder


N6A0996E

5. Armature
6. Yoke
   Remove the brush holder and pull the armature assembly from the yoke.
   Remove the four brushes from the brush holders.



N6A0997E

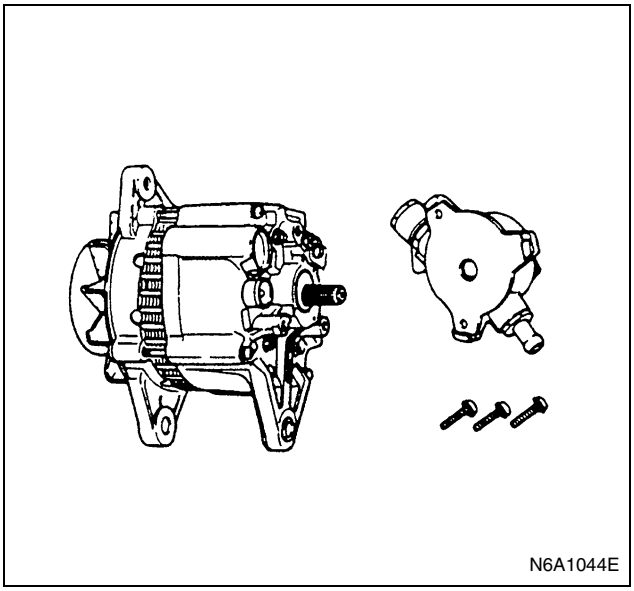
**Legend**

1. Brush
2. Brush spring

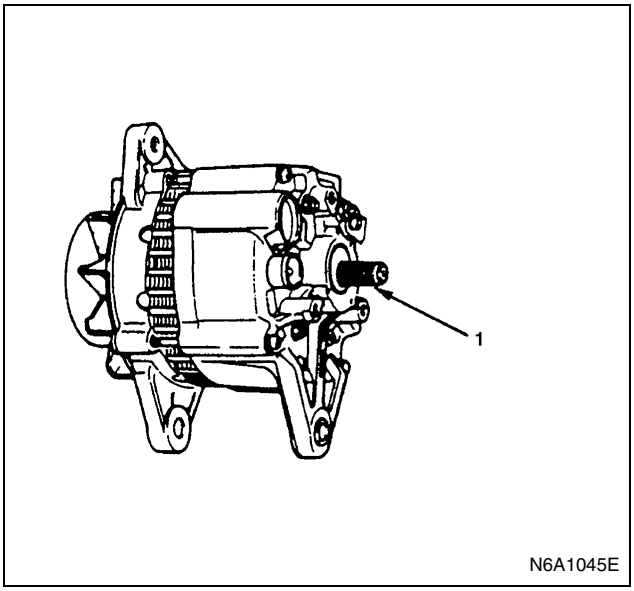
Remove the yoke along with the armature and the brush holder from the drive housing.

## Disassembly

1. Vacuum Pump Assembly


N6A1044E

   1) Loosen the vacuum pump fixing bolts.
   2) Support the vacuum pump center plate.
   3) Carefully remove the vacuum pump.
2. Through Bolt
3. Rotor and Front Cover Assembly
4. Stator and Rear Cover Assembly
   1) Loosen the through bolts.
   2) Remove the rotor and front cover assembly from the stator and rear cover assembly.
      Do not allow the stator to separate from the rear cover.
      Take care not to damage the oil seal.
      Tape the rotor splines to protect them from damage.

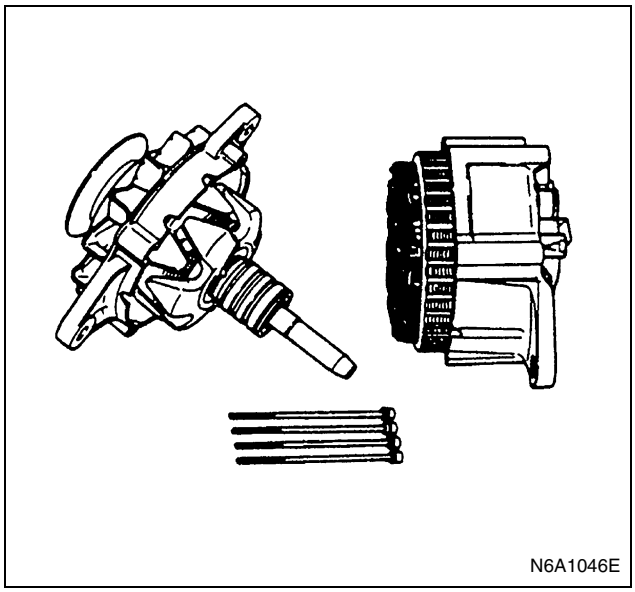


N6A1045E

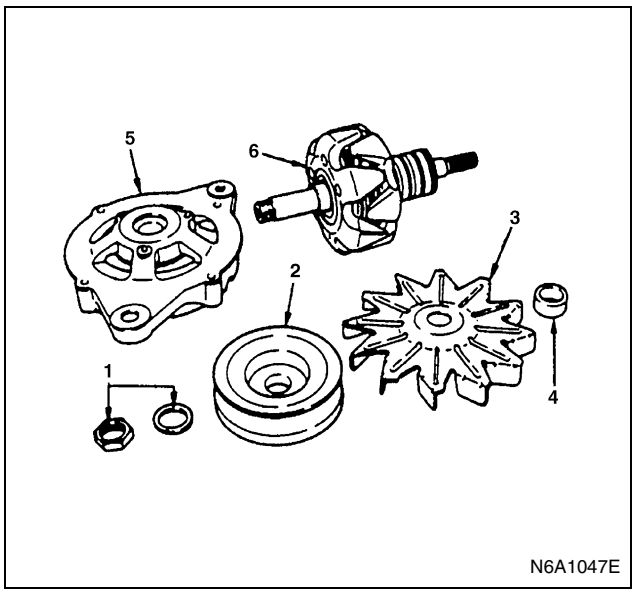
**Legend**

1. Taping

5. Pulley Nut
6. Pulley
7. Fan
8. Spacer
9. Rotor


N6A1046E

   1) Carefully clamp the rotor assembly in a vice.



N6A1047E

   2) Loosen the pulley nut (1).
   3) Remove the pulley (2), the fan (3), the spacer (4), the front cover (5) and the rotor (6).
10. Front Cover
11. Bearing Retainer
12. Front Ball Bearing
13. Rear Ball Bearing
14. Terminal Nut and Bolt
15. Stator

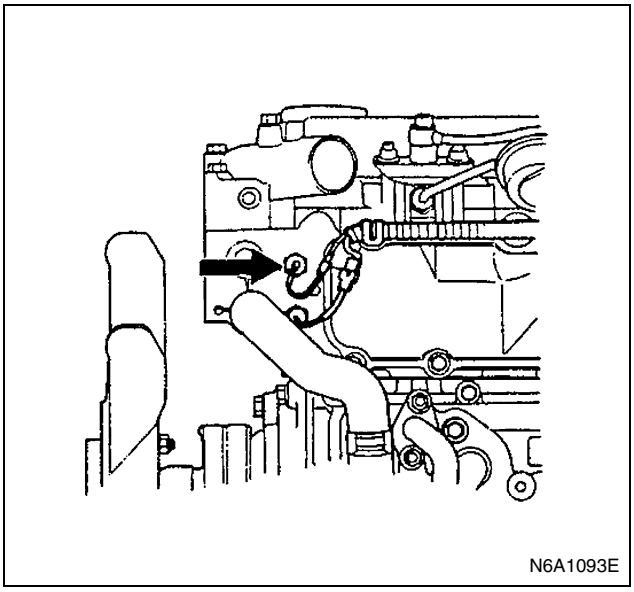
## Inspection and Repair

Make the necessary adjustments, repairs, and part replacements if excessive wear or damage is discovered during inspection.

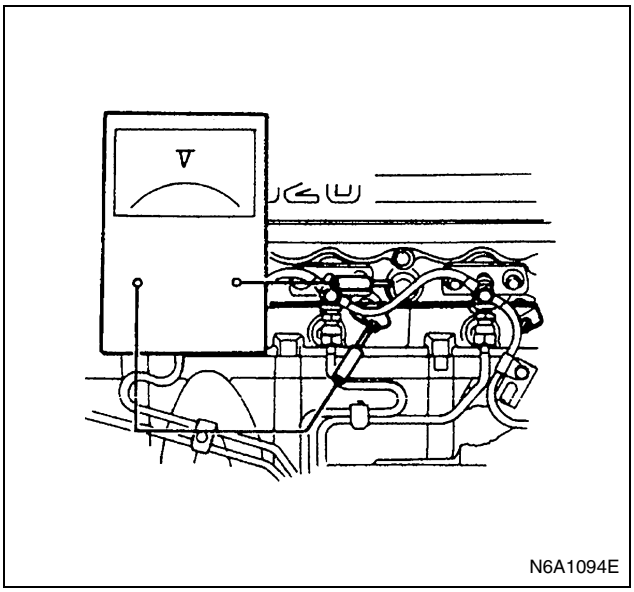
### Quick-On-Start II (QOS II)

**System**

1. Disconnect the connector of the thermo switch.


N6A1093E

2. Set the voltage meter in connection as shown in the illustration.



N6A1094E

3. Turn the key switch to “ON” position without engine turned and check the following items.

| Glow Indicator Lighting Time | Seconds |
|---|---|
| Standard | 3.5 |

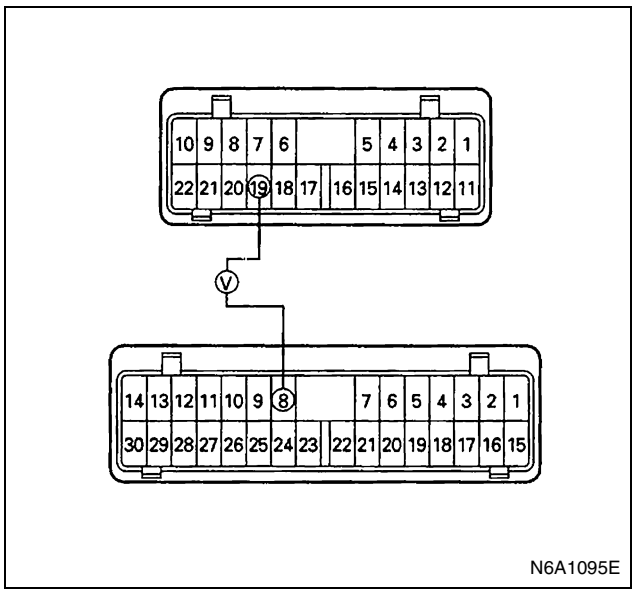
| Power Source Voltage Indicating Time | Seconds |
|---|---|
| Standard | 18 |

When abnormal, check the QOS timer, the glow relay and the thermo switch.

When normal, check the glow plug.

**Timer**

1. Disconnect the connector of the thermo switch.
2. Set the voltage meter in connection as shown the illustration with connector connected.



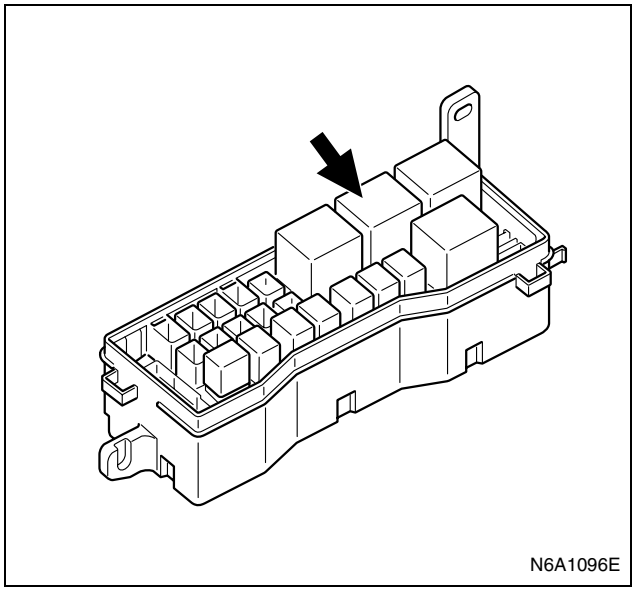
N6A1095E

3. Turn the key switch to “ON” position without engine turned, and check the following.

| 0 Volts Indicating Time | Seconds |
|---|---|
| Standard | 18 |

### Glow Plug Relay

**Location**


N6A1096E

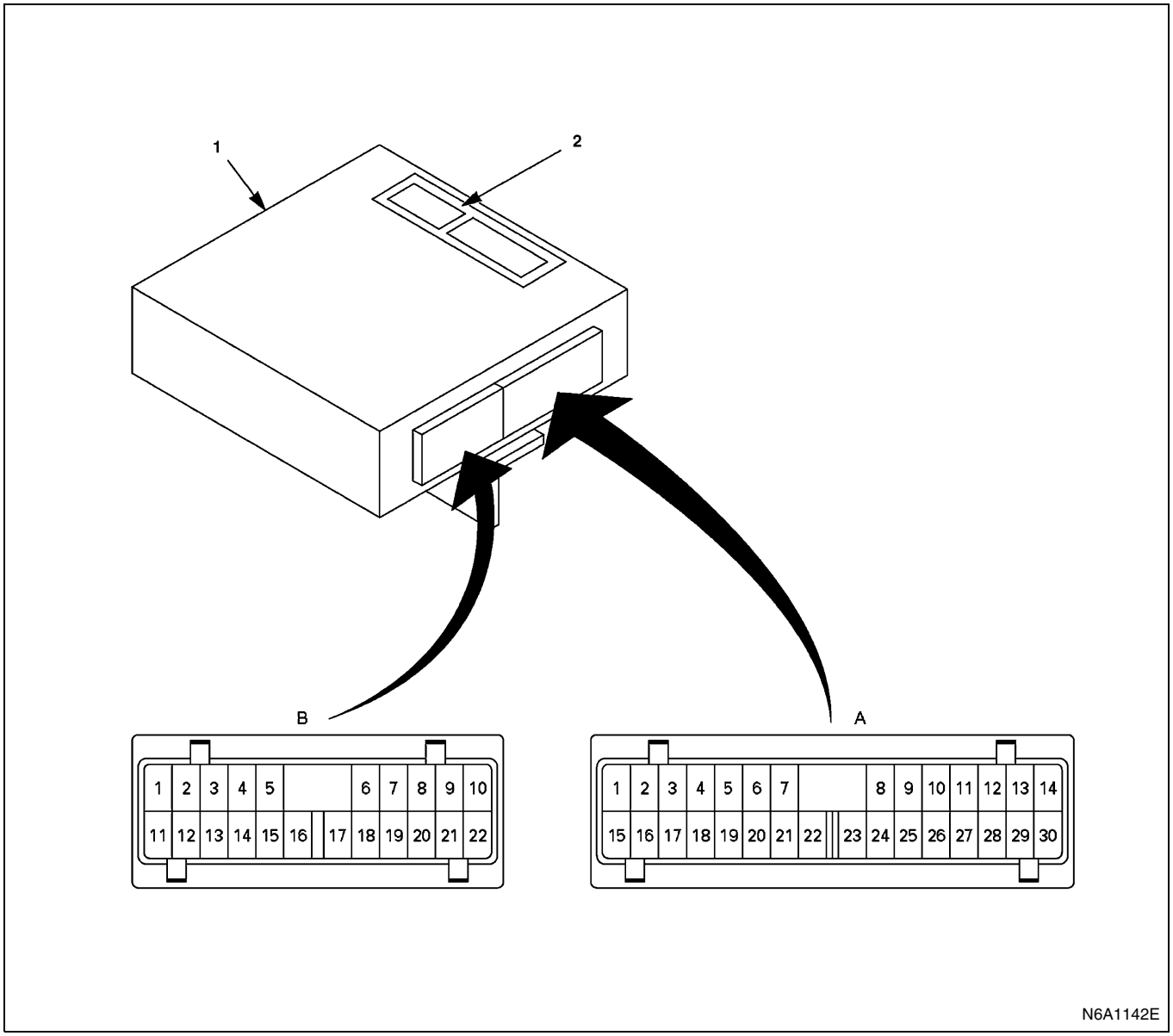
**Specification**

Measure the glow relay resistance between the terminal (4) and the (5) with a circuit tester.

| Nominal size (mm) | Cross sectional area ($mm^2$) | Outside diameter (mm) | Allowable current (A) |
|---|---|---|---|
| 0.3 | 0.372 | 1.8 | 9 |
| 0.5 | 0.563 | 2 | 12 |
| 0.85 | 0.885 | 2.2 | 16 |
| 1.25 | 1.287 | 2.5 | 21 |
| 2 | 2.091 | 2.9 | 28 |
| 3 | 3.296 | 3.6 | 37.5 |
| 5 | 5.227 | 4.4 | 53 |
| 8 | 7.952 | 5.5 | 67 |
| 15 | 13.36 | 7 | 75 |
| 20 | 20.61 | 8.2 | 97 |

## Engine Control Module (ECM)

### Appearance of ECM

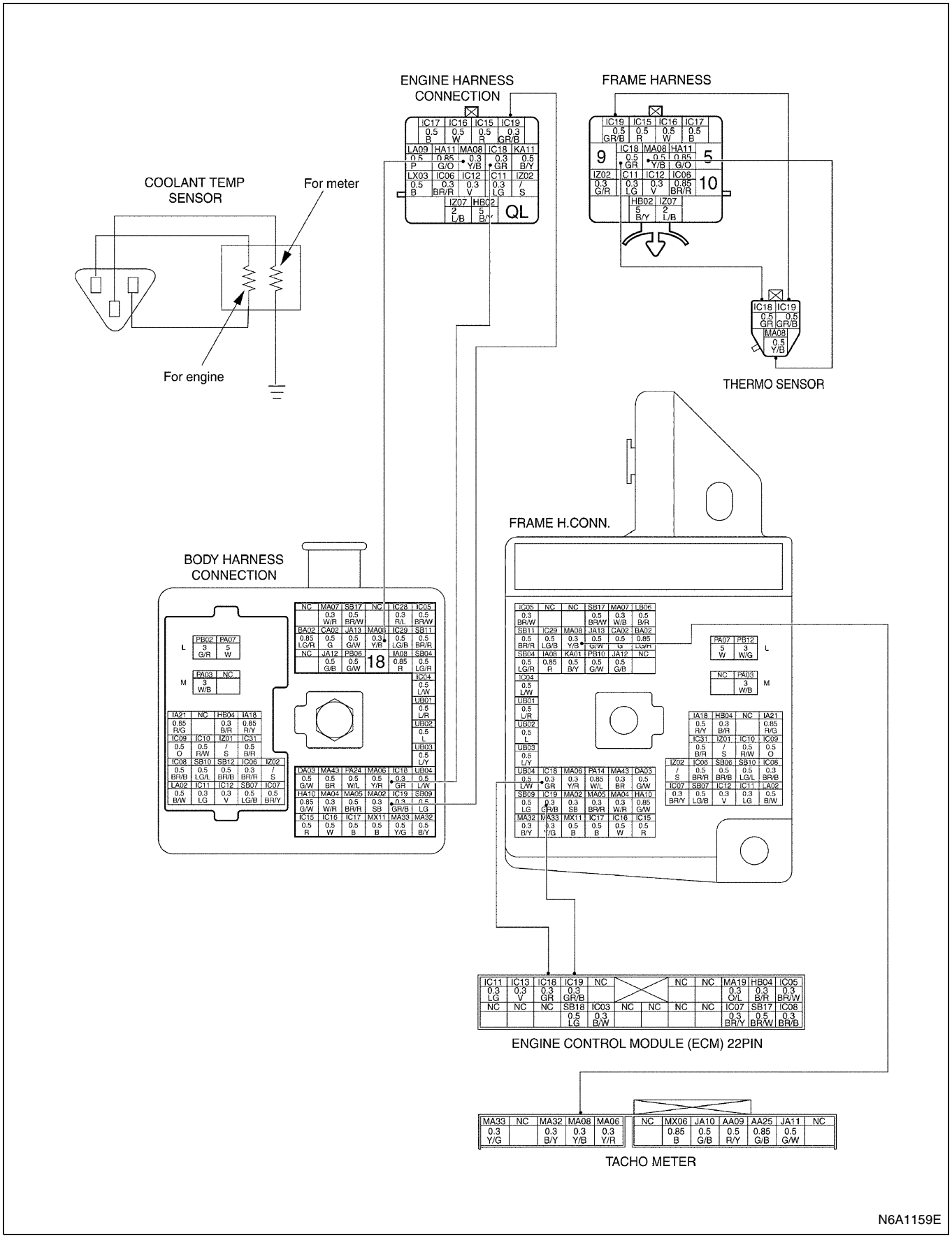


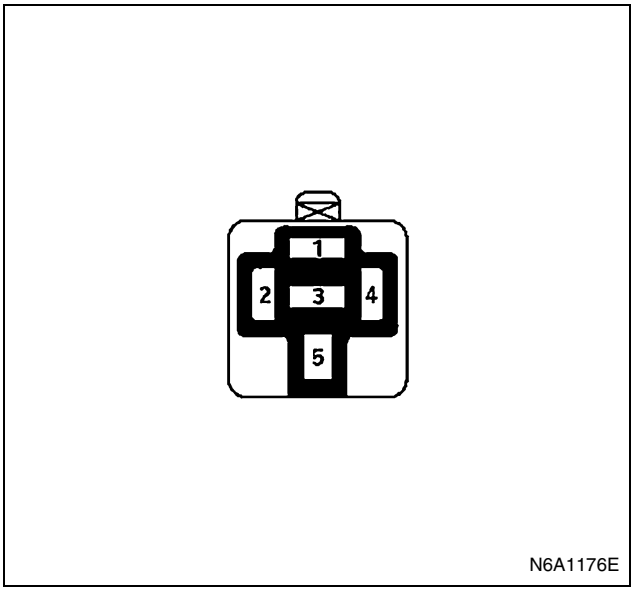

**Legend**

1. ECM
2. Name plate

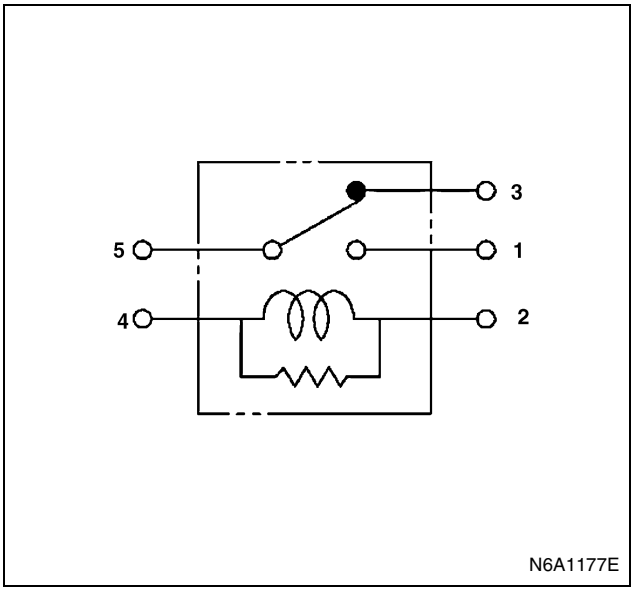
A. Detail of 30 pins connector
B. Detail of 22 pins connector

## DTC-P13 Engine Coolant Temperature (ECT) Sensor Circuit High Voltage





N6A1176E



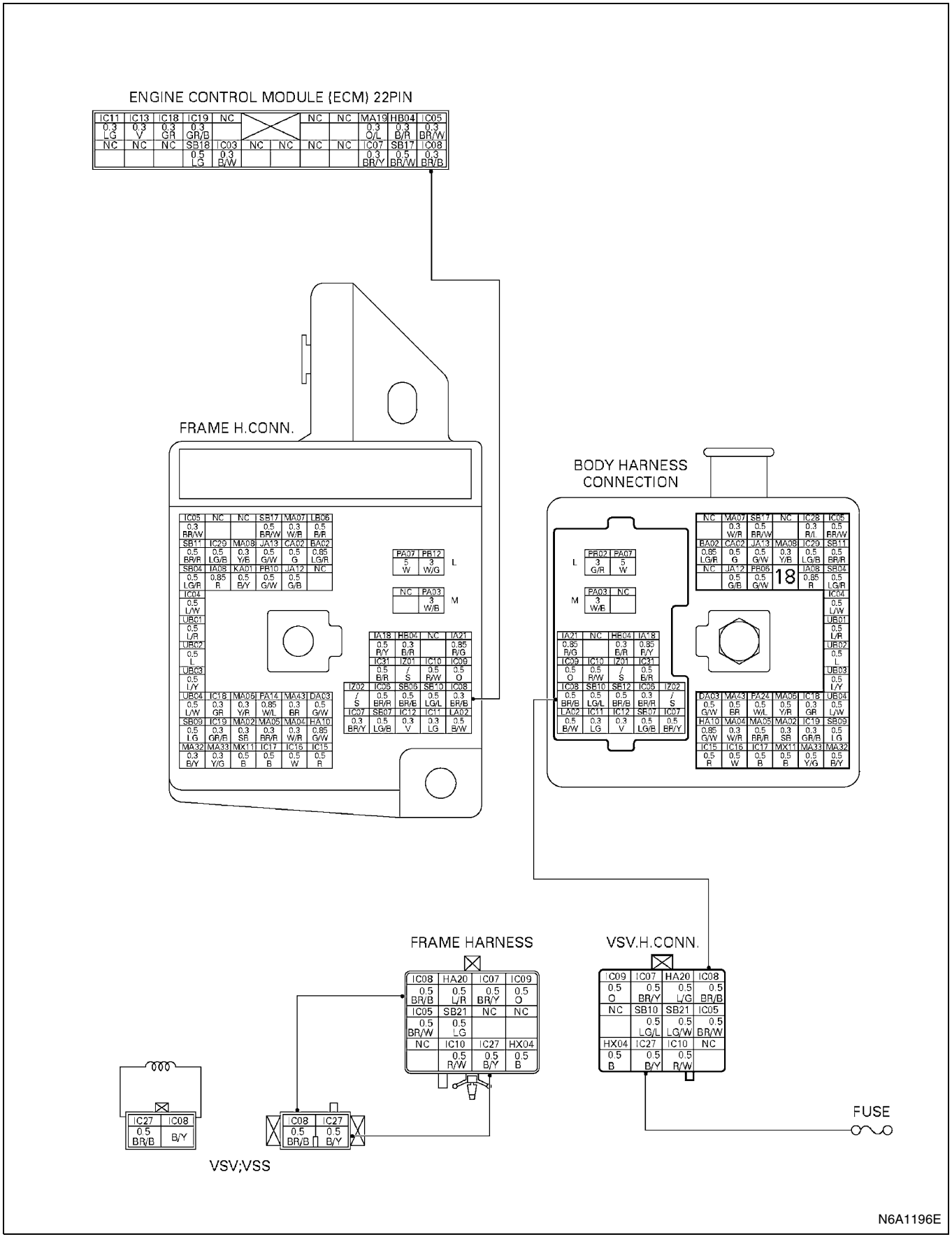
N6A1177E

**Resistance value**

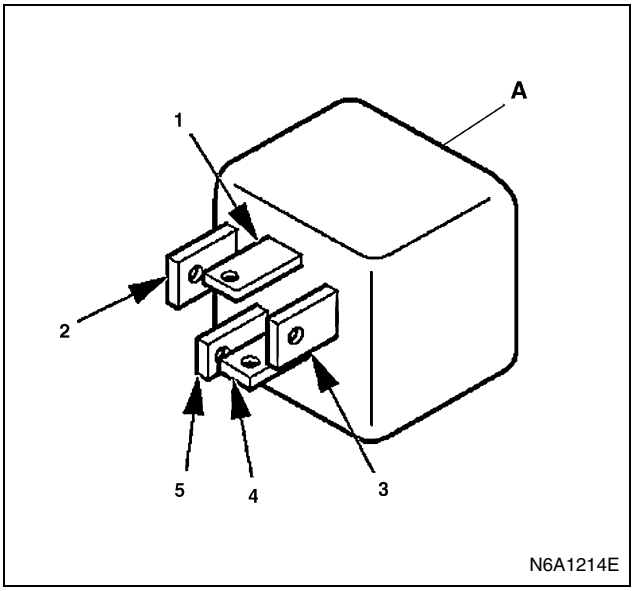
| Inspection Point | | Resistance | Reference |
|---|---|---|---|
| Inspection relay unit | 2 ←→ 4 | 240 to 290 (Ω) (for 12 volt)<br>256 to 276 (Ω) (for 24 volt) | |
| | 1 ←→ 5 | ∞ | Not be supplied electricity |
| | | Below 0.5 (Ω) | Be supplied electricity |
| | 3 ←→ 5 | Below 0.5 (Ω) | Be supplied electricity |
| | | ∞ | Not be supplied electricity |

| Step | Action | Value | YES | NO |
|---|---|---|---|---|
| 1 | Was the “on-board diagnostic (OBD) system check” performed? | — | Go to Step 2 | Go to self diag system check |
| 2 | 1. Ignition “OFF”, Engine “ON”.<br>2. Jumper the magnetic switch Relay ground circuit at the Relay connector to chassis ground.<br>3. Observe the “Relay; solenoid switch” circuit open status on the scan tool.<br>Has DTC23 been corrected? | — | Go to Step 4 | Go to Step 3 |
| 3 | 1. Check for poor connector at the Relay connector and replace the terminals if necessary.<br>Did any terminals require replacement? | — | Go to Step 11 | Go to Step 5 |
| 4 | 1. Check the Relay ground circuit for an open.<br>2. If the Relay ground circuit is open, repair it as necessary.<br>Was the Relay ground circuit open? | — | Go to Step 11 | Go to Step 2 |

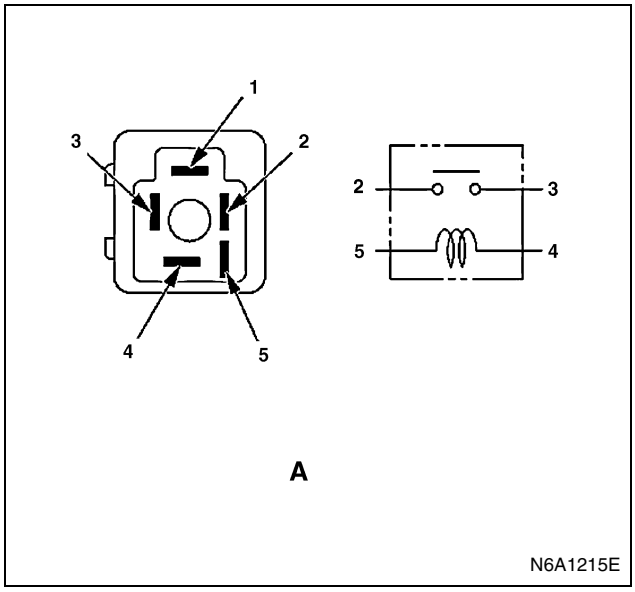
## DTC-P33 Variable Swirl System (VSS) Control Circuit Low Voltage



**Inspection for quick on start (QOS) power cut relay**




**Legend**
A. QOS relay




**Legend**
A. QOS relay

**Resistance value**

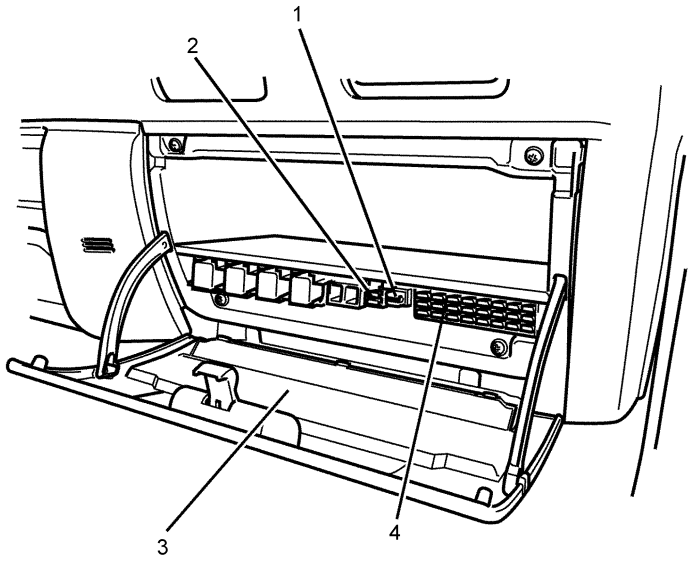
| Inspection Point | | Resistance | Reference |
|---|---|---|---|
| Inspection relay unit | 4 ⟷ 5 | 23 (Ω) (for 12 volt)<br>100 (Ω) (for 24 volt) | |
| | 2 ⟷ 3 | ∞ | Not be supplied electricity to coil |
| | | Below 0.5 (Ω) | Be supplied electricity to coil |

**Resistance value**

| Inspection Point | | Resistance Value (kΩ) | Reference |
|---|---|---|---|
| Connector | Pin No. | | |
| 2 pin Black | 2 ←→ 1 | 840±20% | SIG ←→ GND |
| | 2 ←→ Body | ∞ | SIG ←→ Body |

**Notice:**
Resistance value is difference according to the engine temperature (condition of engine warming up).

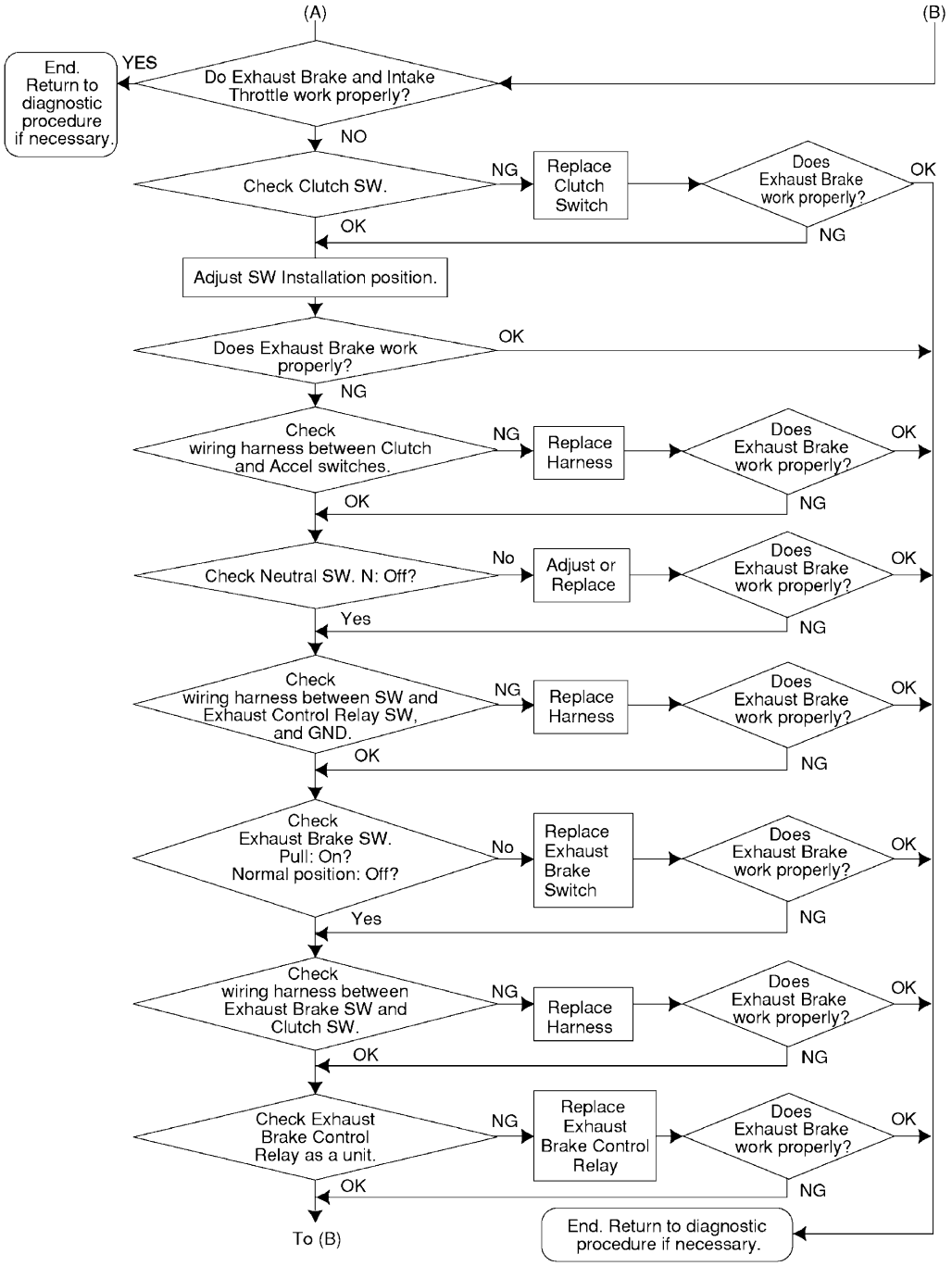
**Location of Fuse**




N6A1232E

**Legend**

1. Fuse puller
2. Spare fuses
3. Label
4. Fuses (F-1 — F-24)


(A)
(B)
End. Return to diagnostic procedure if necessary.
YES
Do Exhaust Brake and Intake Throttle work properly?
NO
Check Clutch SW.
NG
Replace Clutch Switch
Does Exhaust Brake work properly?
OK
NG
OK
Adjust SW Installation position.
Does Exhaust Brake work properly?
OK
NG
Check wiring harness between Clutch and Accel switches.
NG
Replace Harness
Does Exhaust Brake work properly?
OK
NG
OK
Check Neutral SW. N: Off?
No
Adjust or Replace
Does Exhaust Brake work properly?
OK
NG
Yes
Check wiring harness between SW and Exhaust Control Relay SW, and GND.
NG
Replace Harness
Does Exhaust Brake work properly?
OK
NG
OK
Check Exhaust Brake SW. Pull: On? Normal position: Off?
No
Replace Exhaust Brake Switch
Does Exhaust Brake work properly?
OK
NG
Yes
Check wiring harness between Exhaust Brake SW and Clutch SW.
NG
Replace Harness
Does Exhaust Brake work properly?
OK
NG
OK
Check Exhaust Brake Control Relay as a unit.
NG
Replace Exhaust Brake Control Relay
Does Exhaust Brake work properly?
OK
NG
OK
To (B)
End. Return to diagnostic procedure if necessary.

N6A1245E

## Inspection

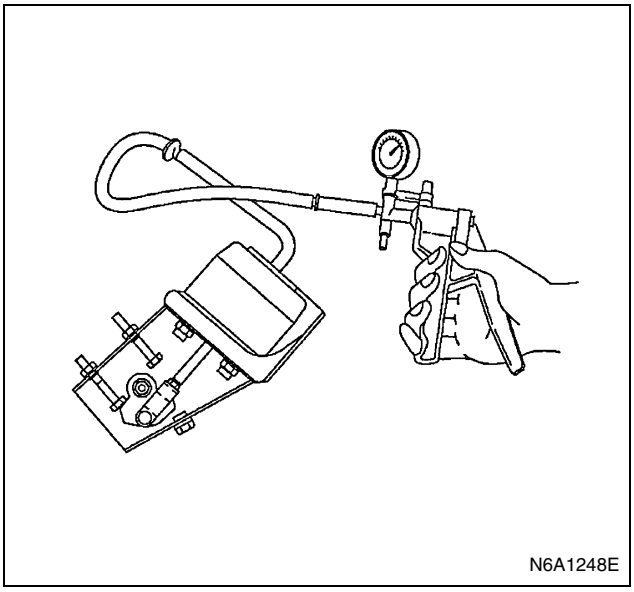
1. Exhaust Throttle Valve

**Working Check**

Actuate the exhaust brake with the engine idling and make sure that you hear the valve strike on the stopper.

**Airtight Check**

Apply a negative pressure of -53.3 — -93.3 kPa (-400 — -700 mmHg/-7.73 — -13.54 psi) to the power chamber by means of a vacuum pump and make sure of the smooth opening/closing of the exhaust brake valve.

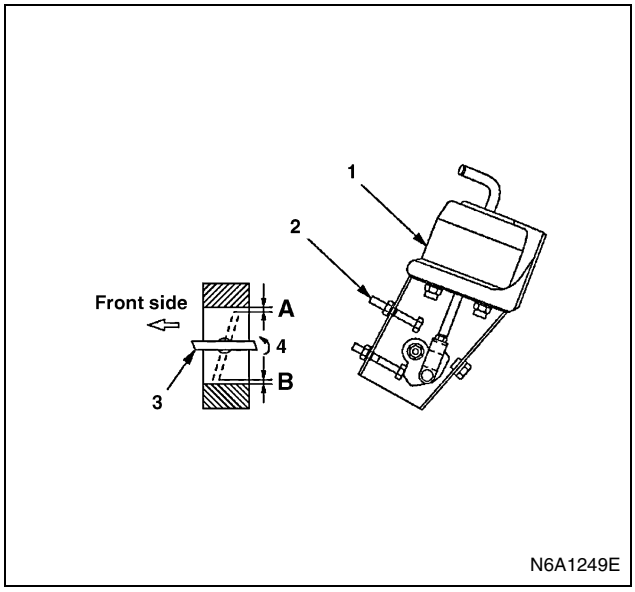


N6A1248E

Apply a negative pressure of -86.7 — -93.3 kPa (-650 — -700 mmHg/-12.57 — -13.54 psi) to the power chamber using a vacuum pump and make sure the average of measurements at Point A and Point B of the clearance between valve and body is as follows:

0.4 — 0.6 mm (0.016 — 0.024 in) (Minimum: 0.4 mm/0.016 in)

If the clearance is out of this range adjust with the adjusting bolt.




N6A1249E

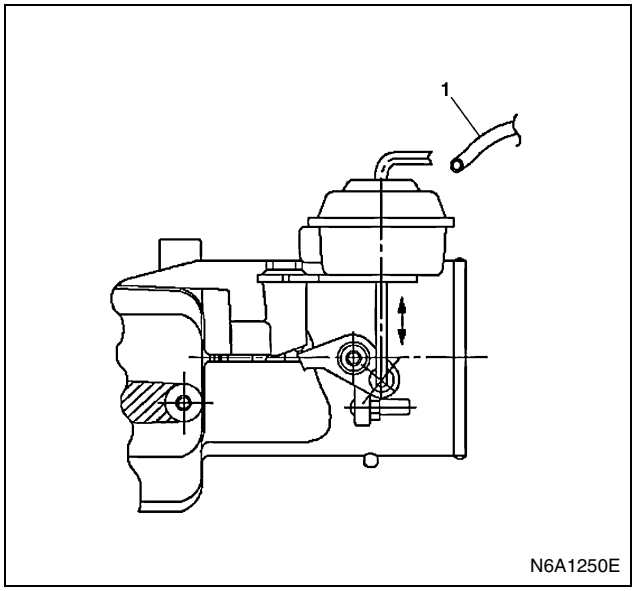
**Legend**

1. Power chamber
2. Adjust bolt
3. Valve
4. Close

2. Intake Throttle Valve

**Working Check**

Disconnect the vacuum hose from the actuator and try to move the rod by hand, making sure of the smooth move of the rod.




N6A1250E

**Legend**

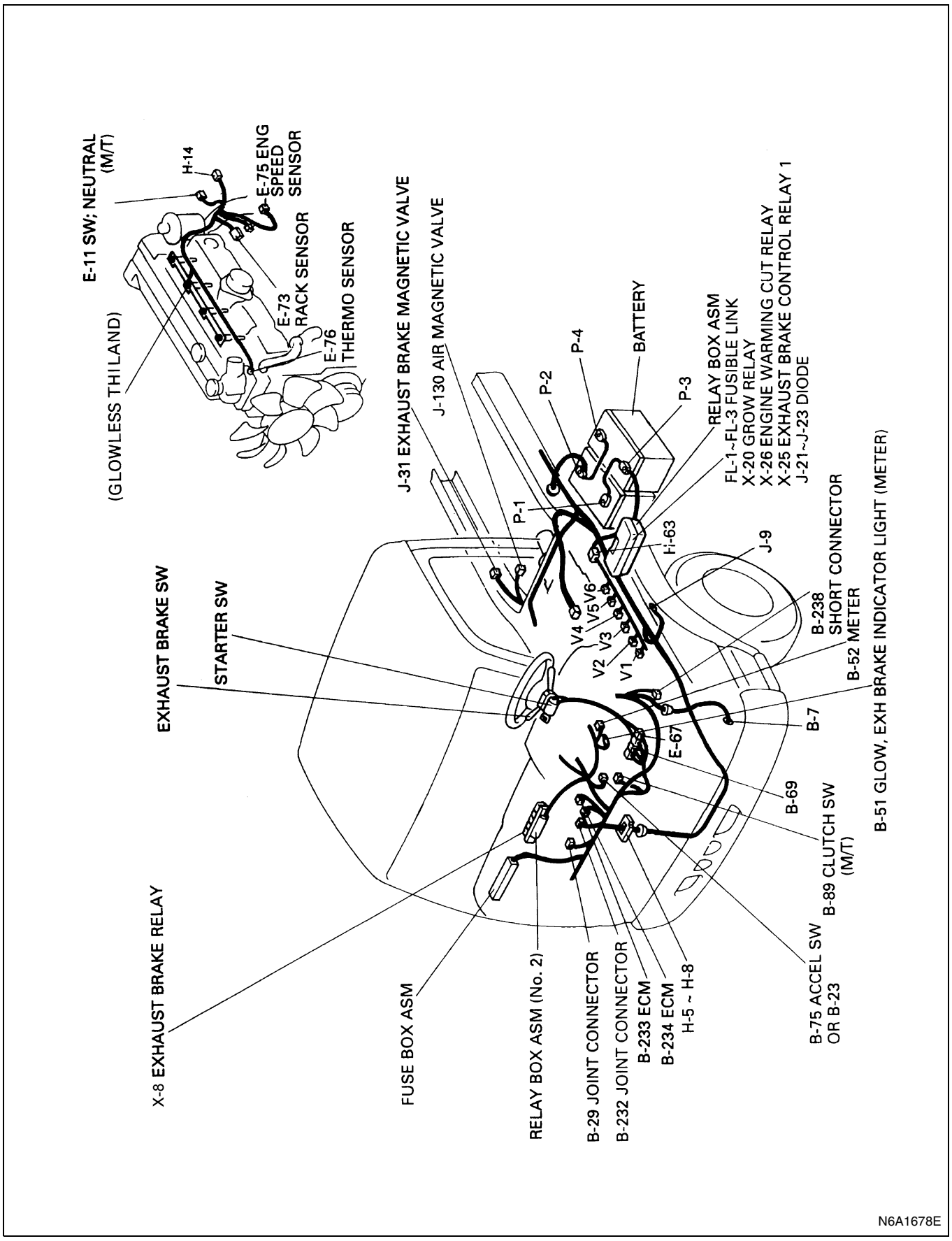
1. Vacuum hose

3. Exhaust Brake Magnetic Valve

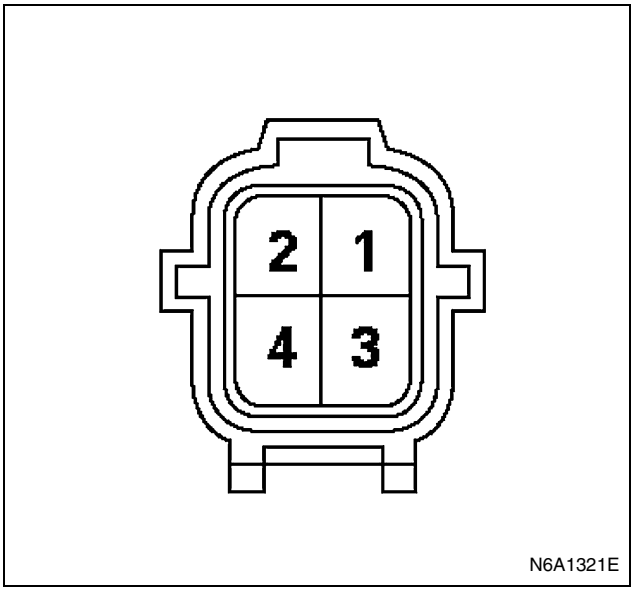
**Inspection**

Connect the magnetic valve connector terminal No.1 and No.2 to (+) terminal and (-) terminal of battery respectively, and check the continuity between the ports.

## Parts Location



**Connector Name of Rack Sensor**

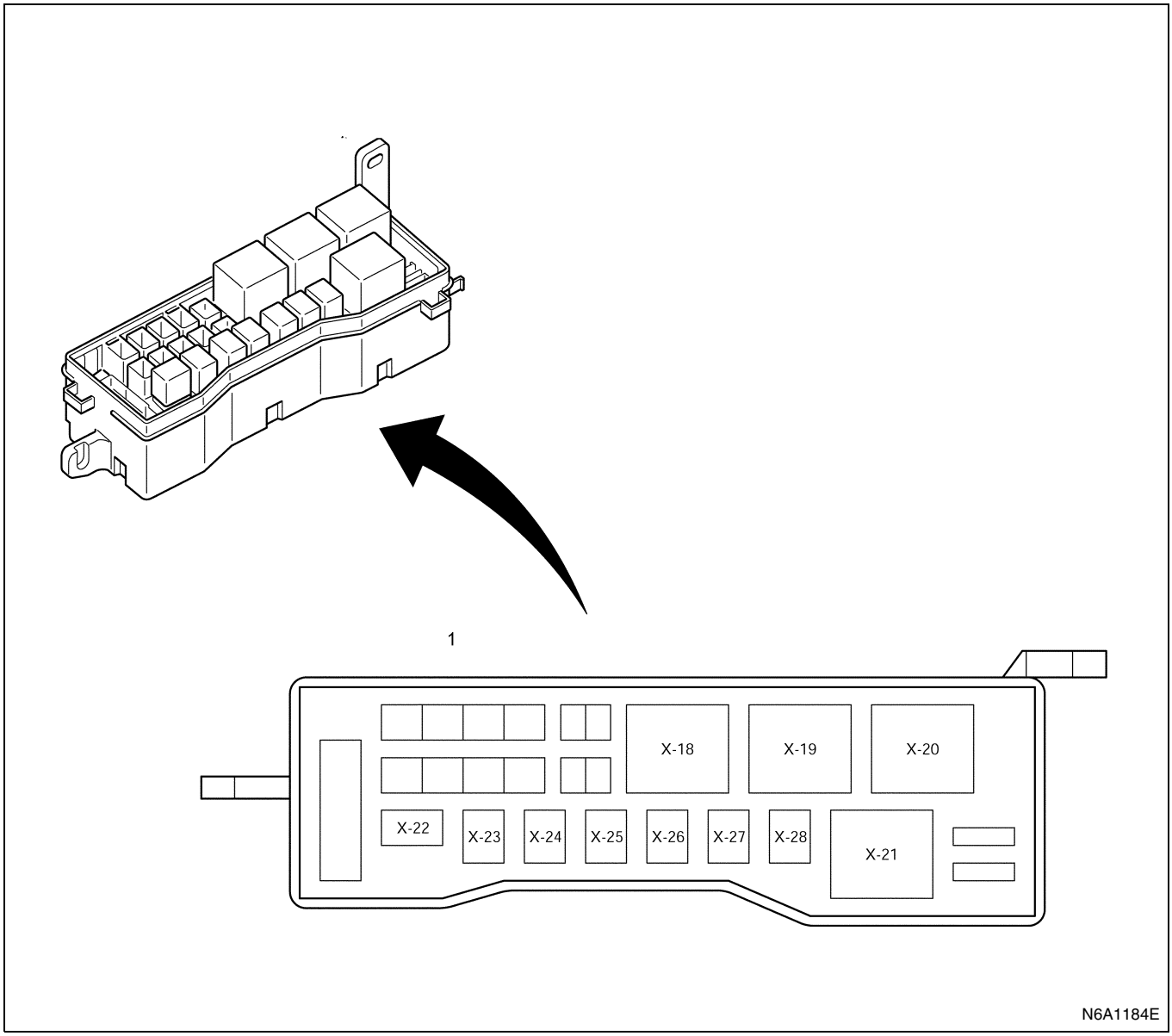



**Notice:**
Mark "___" on connector which is plugged, therefore, should be confirmed to be played.

**Relation Between Connector Number and Signal Name**

| Connector No | Signal name | Wire color |
|---|---|---|
| 1 | Rack sensor (OSC) | R |
| 2 | Rack sensor (GND) | W |
| 4 | Rack sensor (MDL) | B |

**Location of Relay**

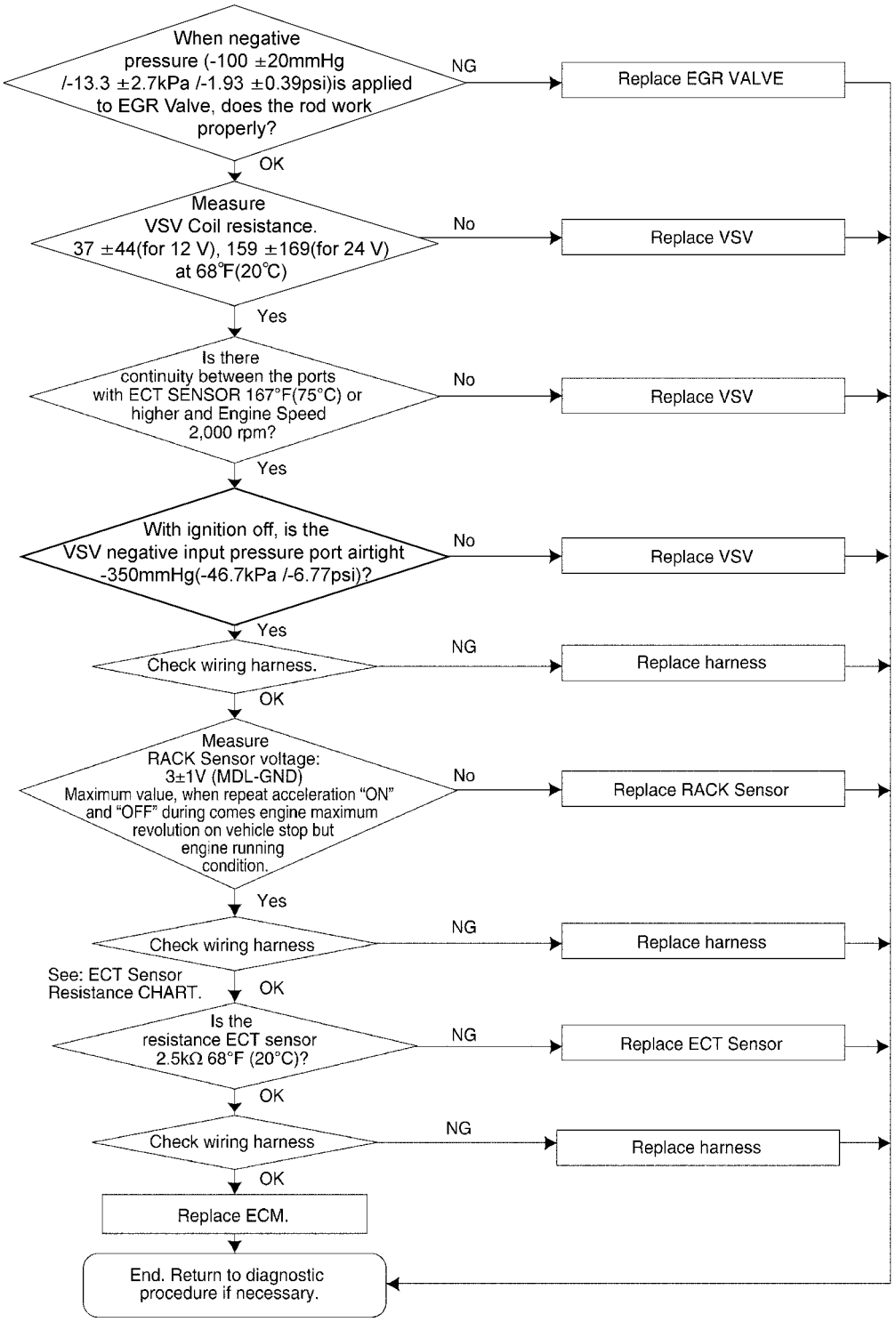



**Legend**

1. Relay box (Installed on the left side rear of the cab)

| NO | RELAY NAME |
|---|---|
| X-20 | Glow plug |
| X-21 | Starter |
| X-22 | Marker lamp |
| X-23 | Rear fog |
| X-24 | A/C COMP, 4WD ind. lamp |
| X-25 | Exh, Brake control |
| X-26 | CSD, A/C ON SIGNAL |
| X-27 | Condenser fan |
| X-28 | Exh. Brake cut |

## Exhaust Gas Recirculation (EGR) System Malfunction




N6A1680E

## Cleaning

Thoroughly clean off the oil and carbon from abutting surfaces, the oil passages, flange surfaces, air and exhaust ducts, etc. Always air-dry the parts after cleaning.

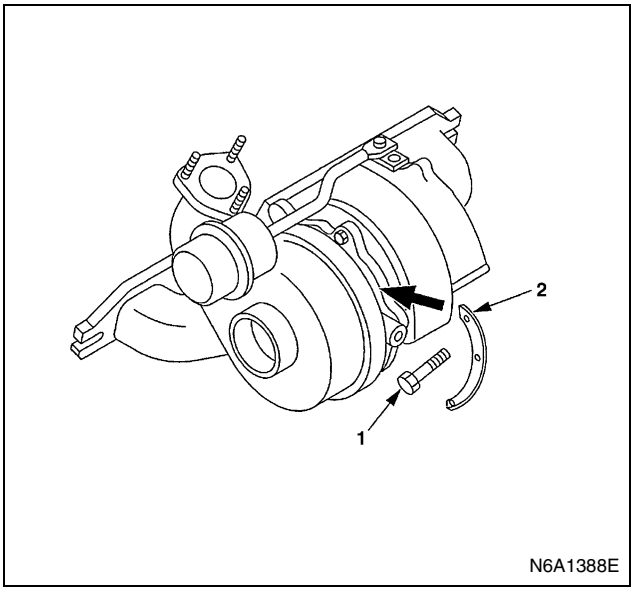
## Assembly

1. Insert the sensor housing into the turbine housing.

**Notice:**

- When inserting the sensor housing, make sure it will not impede the movement of the turbine blades.

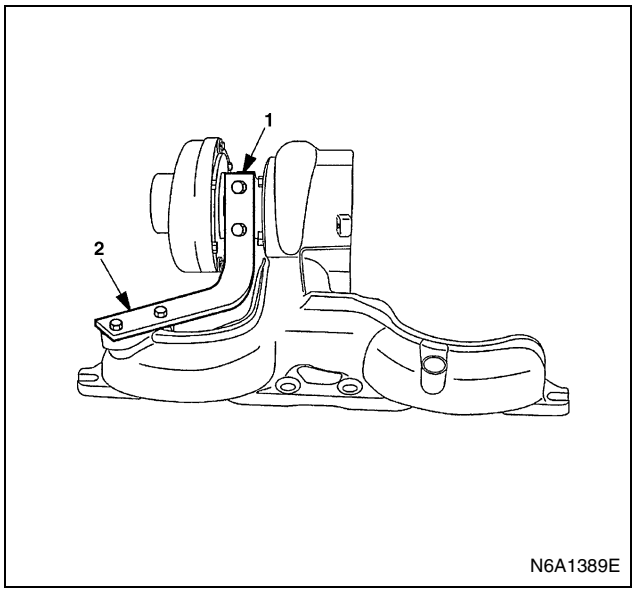
2. Apply molybdenum disulfide to the thread and underside of the head of each bolt (1).
3. Temporarily secure the sensor housing in place with the clamp (2).




4. Connect the oil side of the sensor housing (1) and the EGR-connection side of the exhaust manifold (2) to the angle setting gauge, then tighten the bolt to secure the gauge in place. (The angle of the sensor housing and turbine housing will be set with the use of this gauge).

Turbocharger housing setting gauge: 5-8840-2673-0
(1) M6 × P = 1.00
(2) M8 × P = 1.25

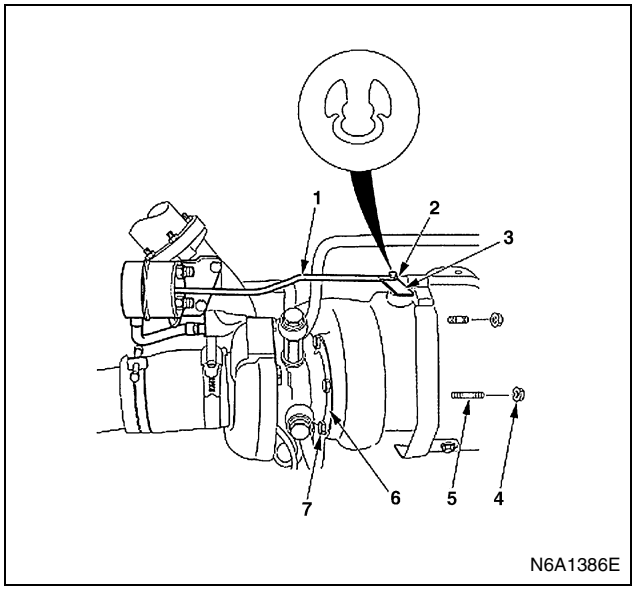
5. To give the sensor housing some slack, loosen the bolt on side (1) by half a turn.




6. Tighten the turbine housing tie-down bolts to the specified torque.

**Tighten:**
Housing tie-down bolts to 22 N·m (2.2 kg·m/ 16 lb·ft)

7. Remove the bolt that secures the pressure gauge, then remove the gauge.
8. Manually turn the rotor clockwise to be sure it it rotates smoothly. Check for abnormal noise, drag, etc.
9. Attach the end of the actuator rod (1) to the crank at the waste gate (3), and secure with the E Ring (2).

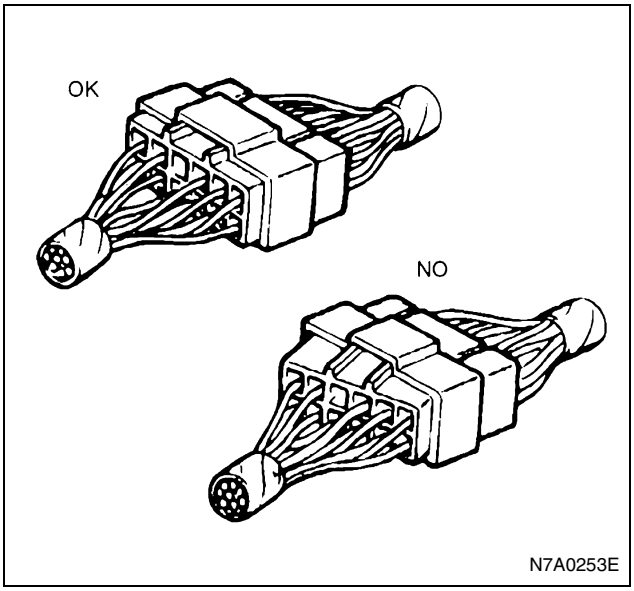



10. (Indicate on the nameplate that parts were replaced.)

**Connecting The Connector**

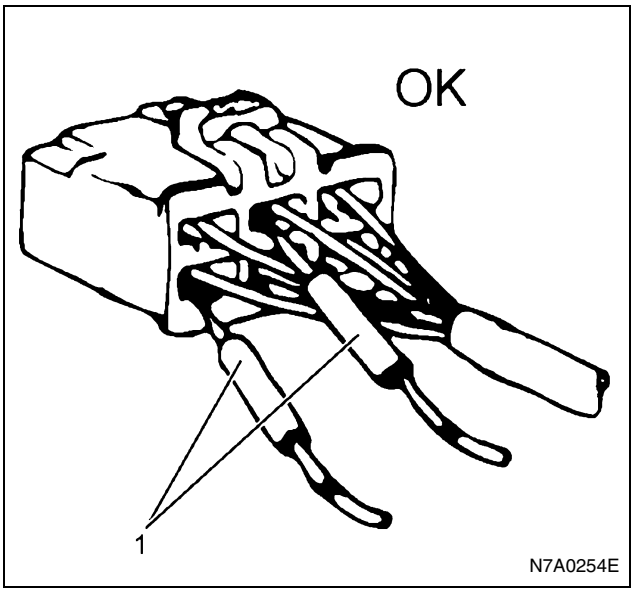
Firmly grasp both sides (male and female) of the connector.

Firmly but carefully push the two sides of the connector together until a distinct click is heard.

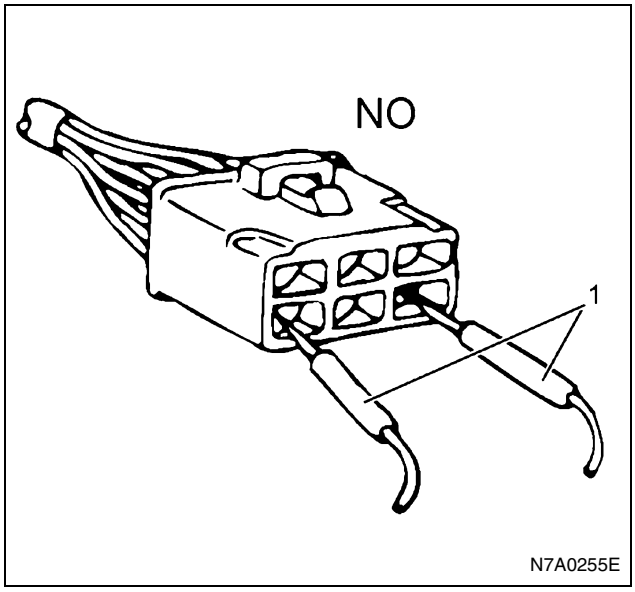



**Connector Inspection**

Use a circuit tester to check the connector for continuity. Insert the test probes (1) from the connector harness side.

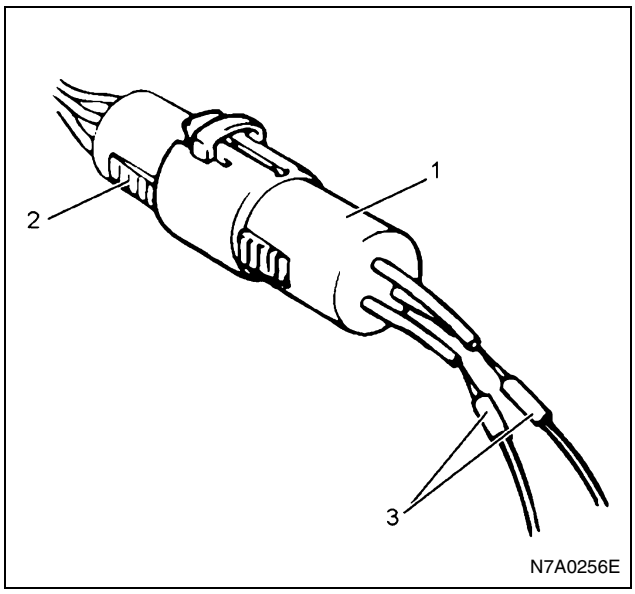



Never insert the circuit tester test probes (1) into the connector open end to test the continuity. Broken connector terminals will result.




**Waterproof Connector Inspection**

It is not possible to insert the test probes into the connector wire side of a waterproof connector. Use a previously made connector (1) with its wires cut to carry out the test. Connect the test connector (2) to the connector to be tested. Connect the test probes (3) to the cut wires to check the connector continuity.



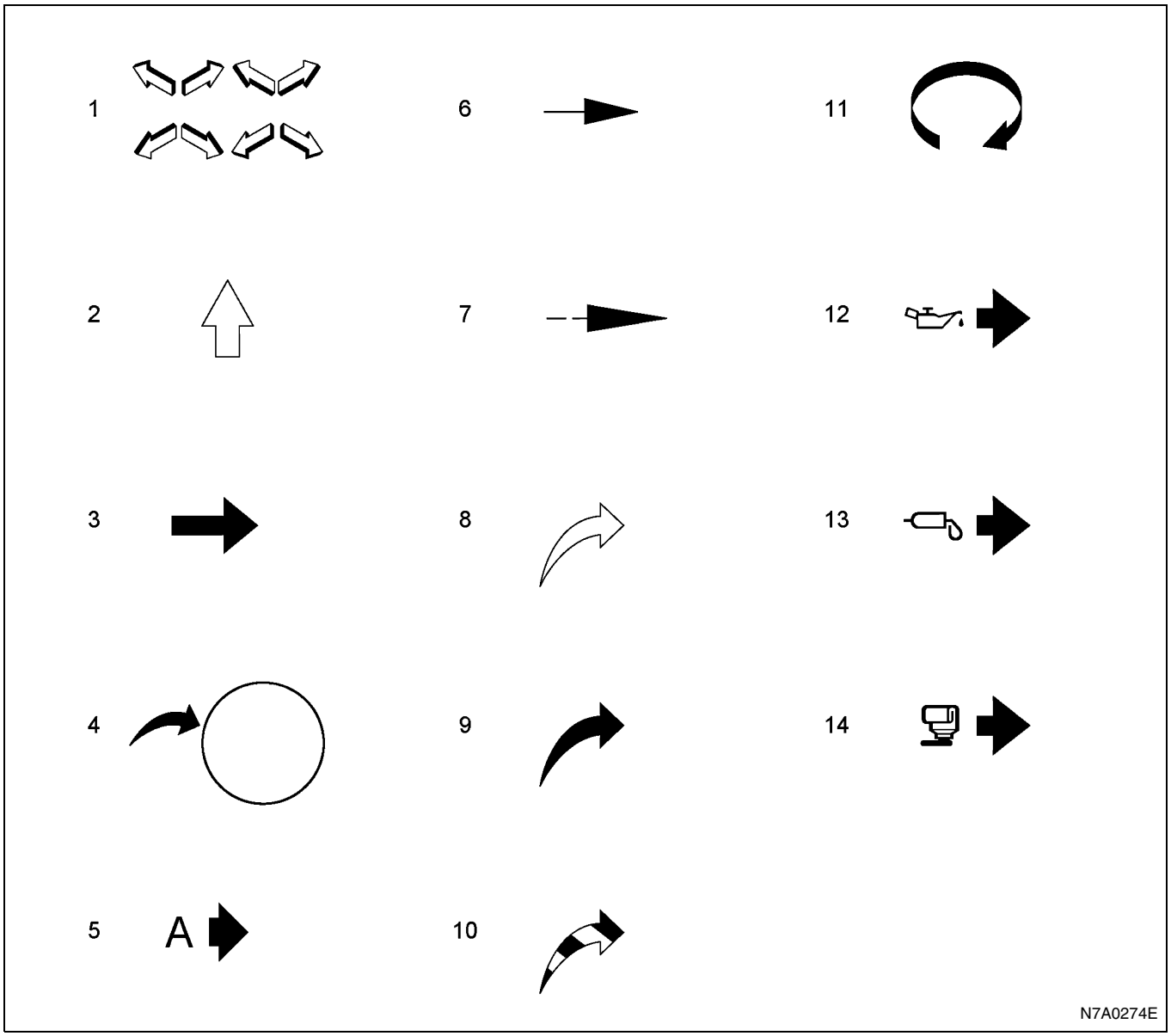

**Connector Pin Removal**

**Connector Housing Tang Lock Type**

1. Insert a thin flat-tip screwdriver or equivalent (1) into the connector housing open end (5).
2. Push the tang lock (2) up (in the direction of the arrow in the figure). Pull the wire (3) with pin (4) free from the wire side of the connector.

# ARROWS USED IN FIGURES

## Arrows Descriptions

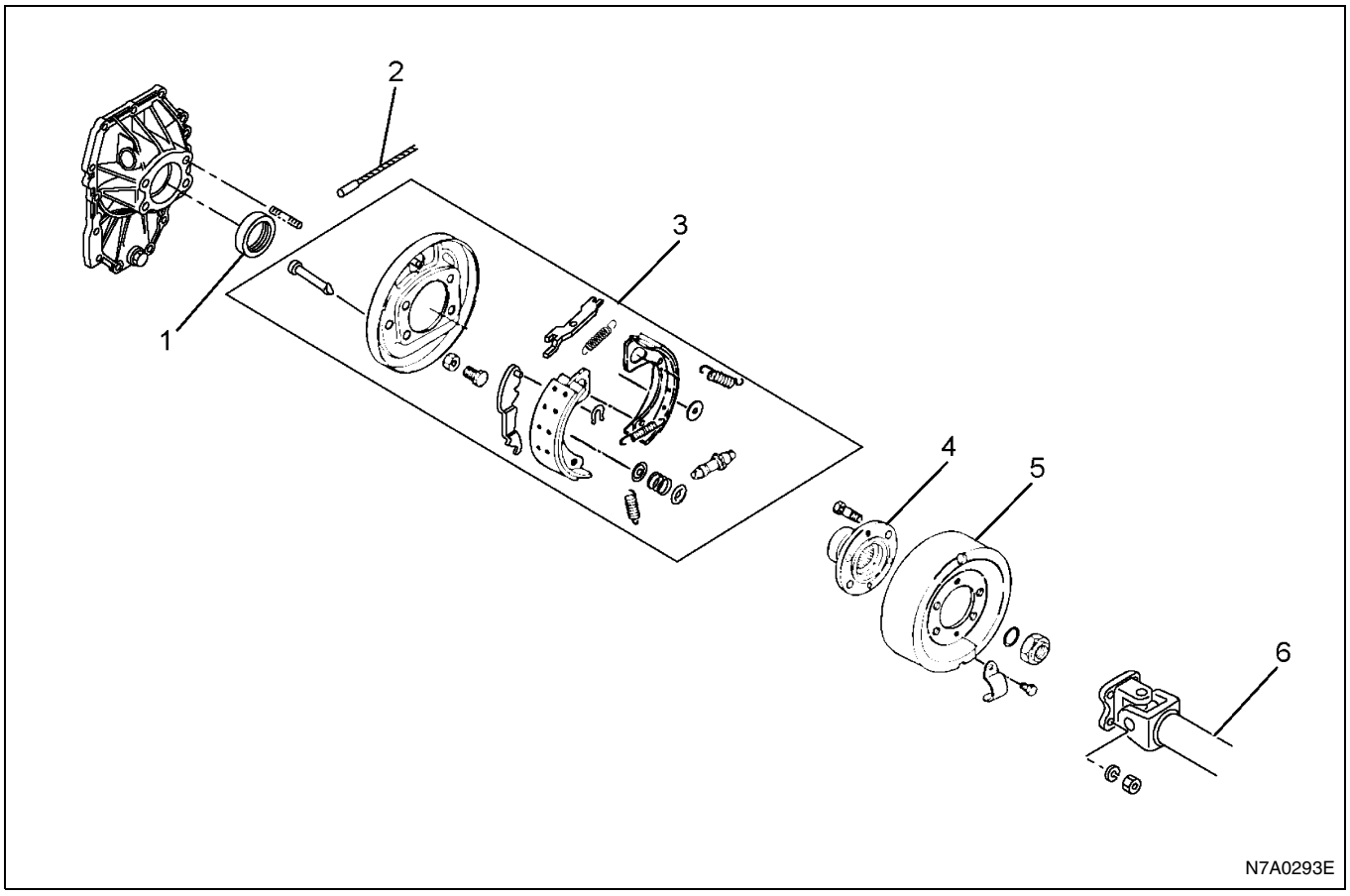



**Legend**

1. Front side of the vehicle
2. Upper side
3. Servicing part, or servicing direction
4. Detail of a part
5. Detail from the point of view A
6. Arrow meaning dimension
7. Arrow meaning a cross section
8. External air or cool air flow (Used to indicate an air flow)
9. Gas or warm air flow
10. Mixture of air and gas, or mixture of cool air and warm air flow
11. Rotation direction
12. Fuel supply
13. Lubrication supply
14. Application of liquid gasket

## Rear Oil Seal (5MT)

### Components

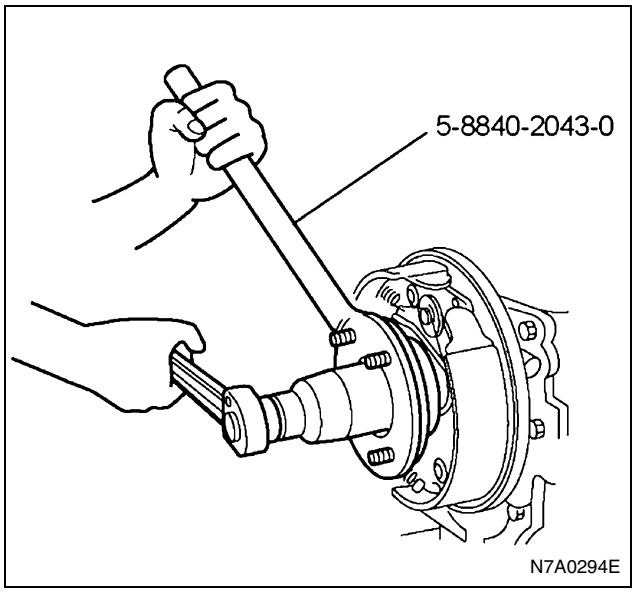



**Legend**

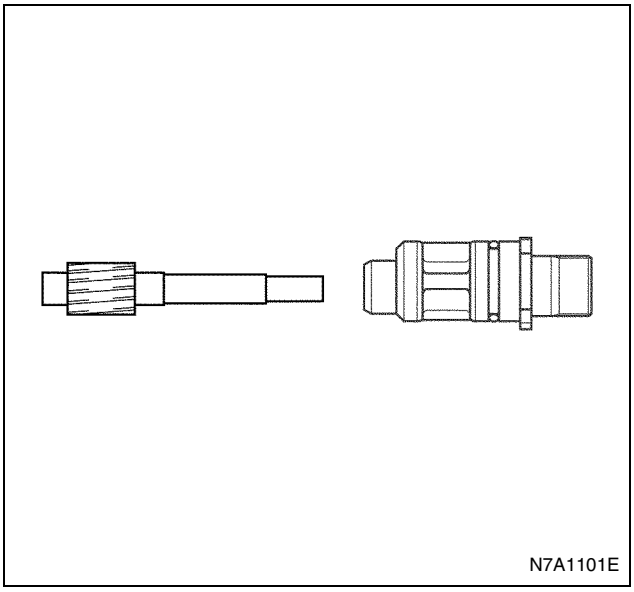
1. Oil seal
2. Parking brake cable
3. Parking brake assembly
4. Coupling driver
5. Parking brake drum
6. Rear propeller shaft assembly

### Removal

1. Remove the rear propeller shaft assembly.
   - Refer to REAR PROPELLER SHAFT ASSEMBLY.
2. Remove the parking brake cable.
   - Refer to PARKING BRAKE CABLE.
3. Remove the parking brake drum.
   - Refer to PARKING BRAKE ASSEMBLY.
4. Remove the coupling driver and O-ring.
   - Raise the lock nut caulking portion (two parts) securely, and then remove the lock nut using the flange holder 5-8840-2043-0.



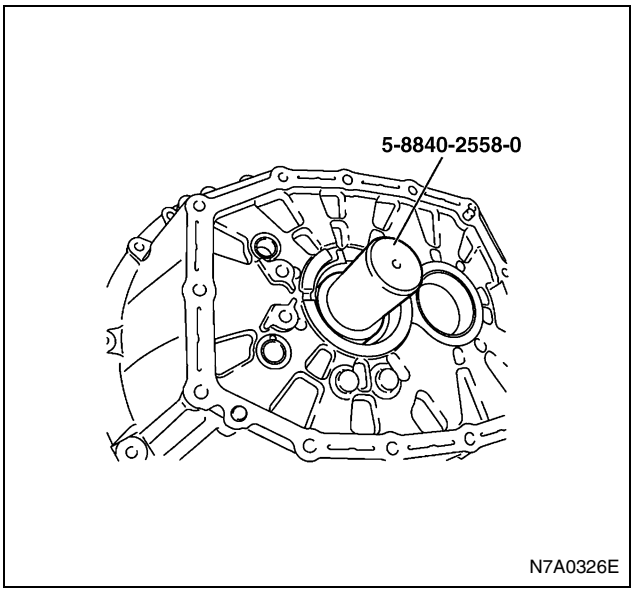

5. Remove the parking brake assembly.
   - Refer to PARKING BRAKE ASSEMBLY.


N7A1101E

## Assembly

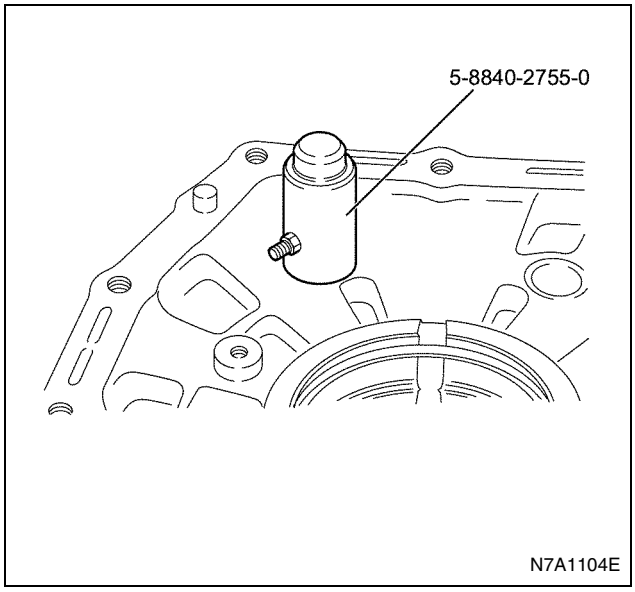
1. When finding the oil seal worn and damaged after the check and replacing it with a new one, apply engine oil 5W-30 around the oil seal, and then press in the oil seal into the clutch housing using the installer 5-8840-2558-0, or when the front PTO is equipped, using the installer 5-8840-2754-0 and the grip 5-8840-0007-0.
   - Apply Besco L2 grease on the oil seal lip portion.

**Caution:**
Be careful not to damage the oil seal lip portion.



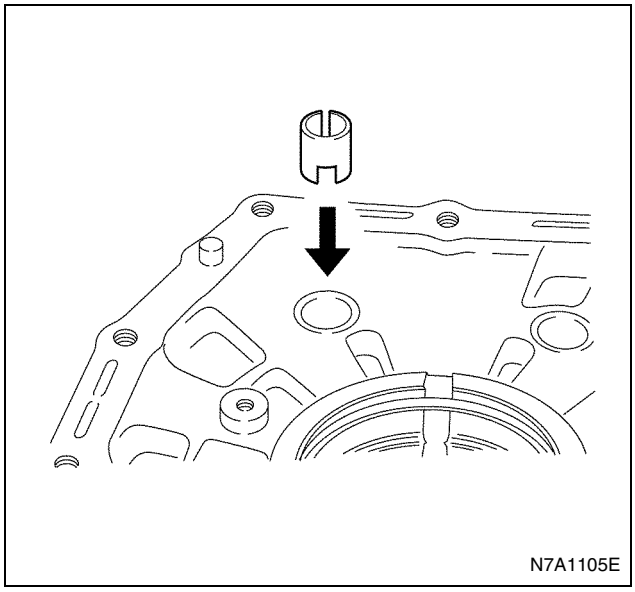
N7A0326E

2. When the clutch housing bush is replaced with a new one after checking it for wear and damage, press it in using the installer 5-8840-2755-0.
   - During installation, caulk three portions securely except older caulking portions and grooves.

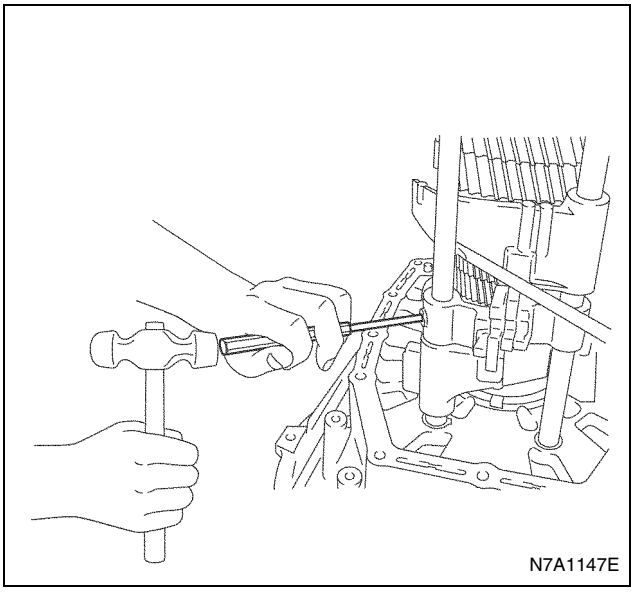


N7A1104E

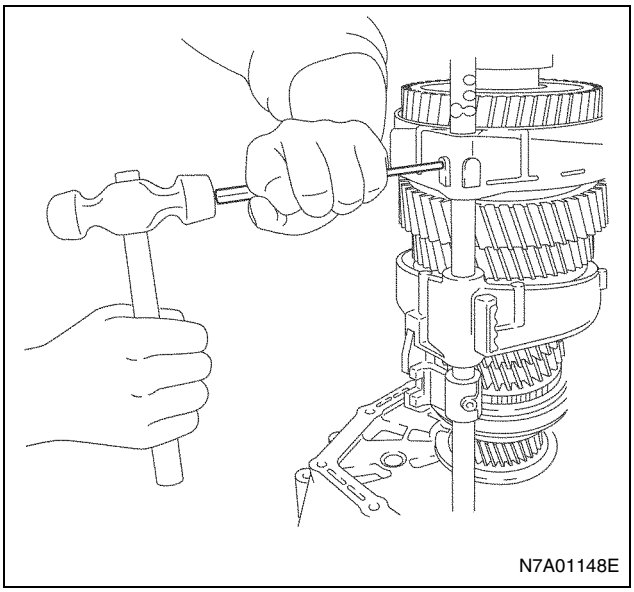
   - For the bush pressing in for the second time and onwards, press in the bush facing its notched portion to the clutch housing.


N7A1105E

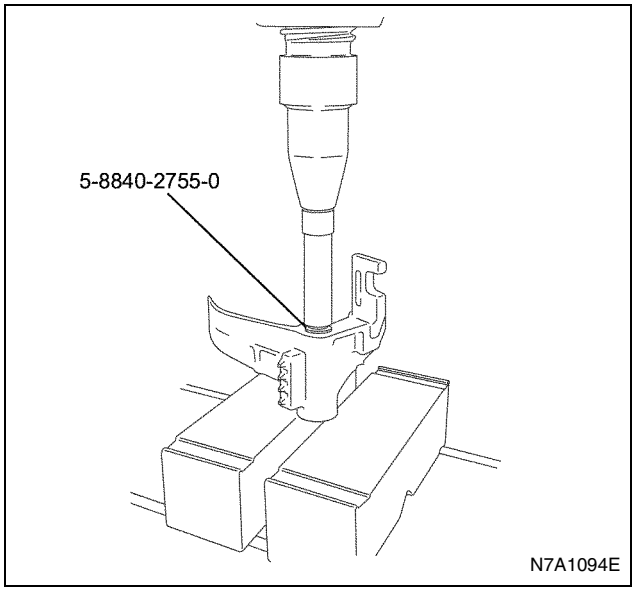
3. Install the main shaft assembly, the top gear shaft assembly and the counter shaft assembly.
   a. Tie the main shaft assembly, the counter shaft assembly and the top gear shaft at the two positions not to let them come apart using a lashing belt or other belts with a fixing function, and then fix them securely. Be careful not to drop the top gear shaft while lifting up.



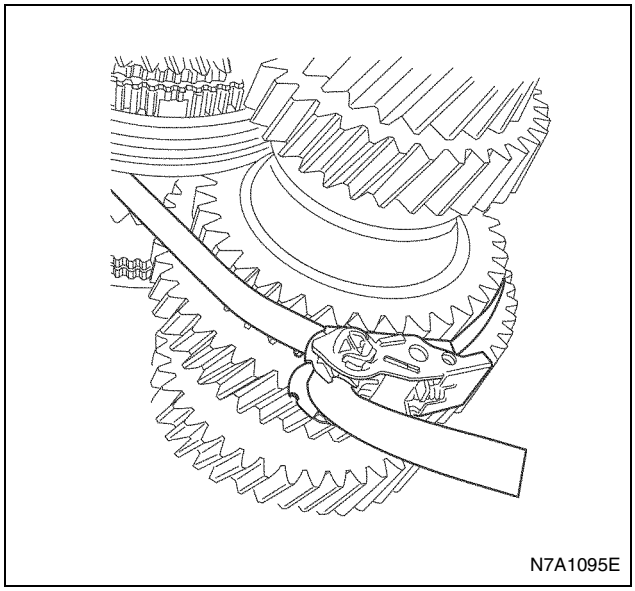

33. Remove the 1st-reverse and 2nd-3rd shift rod, the 1st-reverse shift arm, the 3rd-2nd shift arm, the 1st-reverse and 6th shift block.
    - When driving out the spring pin, put a round pole on the opposite side of the shift rod not to damage other parts, and then remove the spring pin using the spring pin remover.




34. Remove the bush from the 4th-5th shift arm using the remover 5-8840-2755-0.
35. Remove the bush from the 1st-reverse shift arm using the remover 5-8840-2755-0.
36. Remove the bush from the 3rd-2nd shift arm using the remover 5-8840-2755-0.
    - Use a round pole whose length is enough to push the remover to the end.




37. Remove the magnet from the clutch housing.
38. Remove the mail shaft assembly, the top gear shaft assembly and the counter shaft assembly.
    a. Tie the main shaft assembly, the counter shaft assembly and the top gear shaft assembly at the two positions not to let them come apart using a lashing belt or other belts with a fixing function, and then fix them securely.



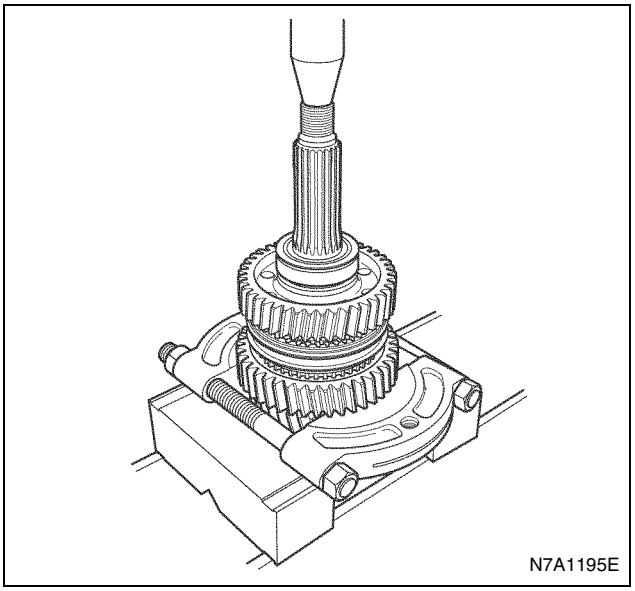

    b. Install the bearing remover to the main shaft and secure it with a lock nut, hang them with a hoist and a wire, and then remove the top gear shaft assembly, the main shaft assembly, the counter shaft assembly from the clutch housing as a unit while spreading the top gear shaft bearing outer snap ring installed to the clutch housing.

**Legend**

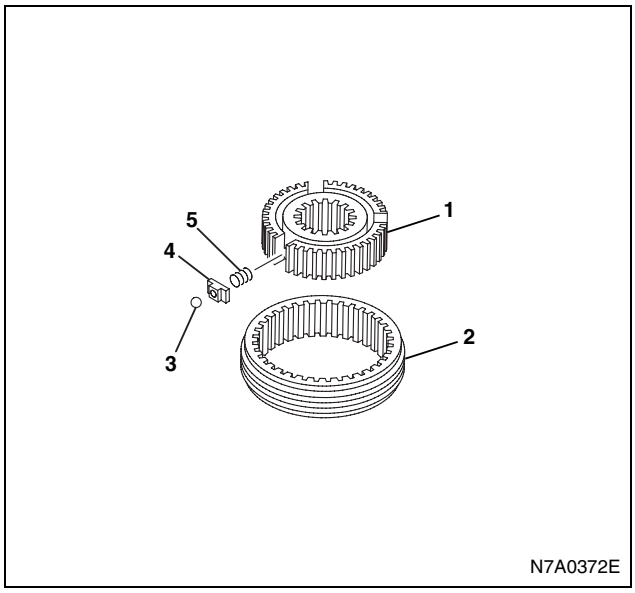
1. Snap ring
2. 4th-5th clutch hub assembly and sleeve
3. 5th block ring
4. 5th gear
5. Needle bearing
6. Snap ring
7. Collar
8. Needle bearing
9. 3rd gear
10. Needle bearing
11. 2nd gear
12. 2nd inside ring
13. 2nd outside ring
14. 2nd block ring
15. 2nd-3rd clutch hub assembly and sleeve
16. 3rd block ring
17. 3rd outside ring
18. 3rd inside ring
19. Main shaft
20. Needle bearing
21. 1st gear
22. 1st inside ring
23. 1st outside ring
24. 1st block ring
25. Bearing
26. Spacer
27. Collar
28. Needle bearing
29. Reverse gear
20. Reverse block ring
31. 1st-reverse clutch hub assembly & sleeve

## Disassembly

1. Remove simultaneously the following parts with a press using a bearing remover; the bearing, spacer, collar, reverse gear, needle bearing, reverse block ring, 1st-reverse clutch hub assembly & sleeve, 1st block ring, 1st outside ring, 1st inside ring, 1st gear, and needle bearing.



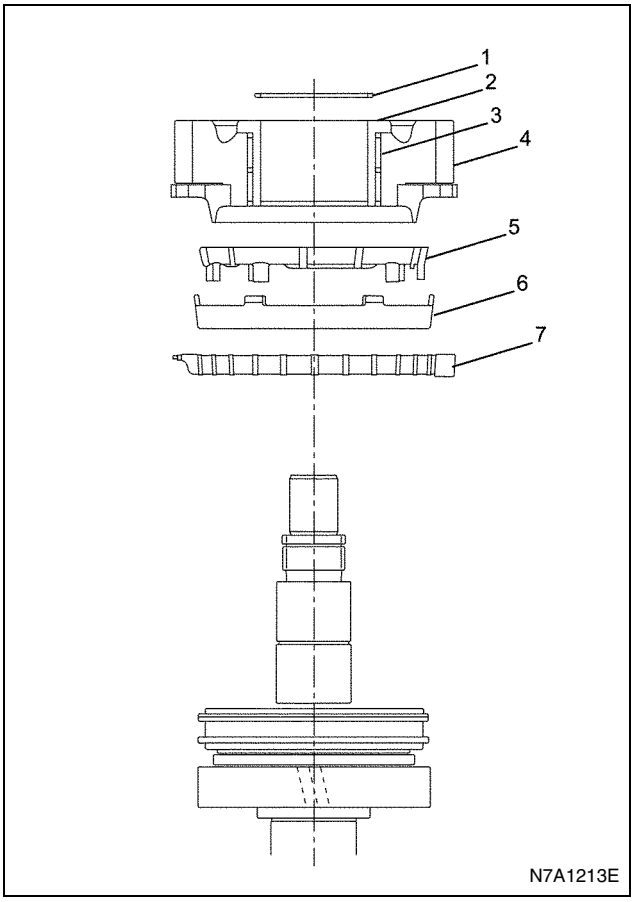

2. Disassemble the 1st-reverse clutch hub & sleeve.




**Legend**

1. Clutch hub
2. Sleeve
3. Ball
4. Block
5. Spring

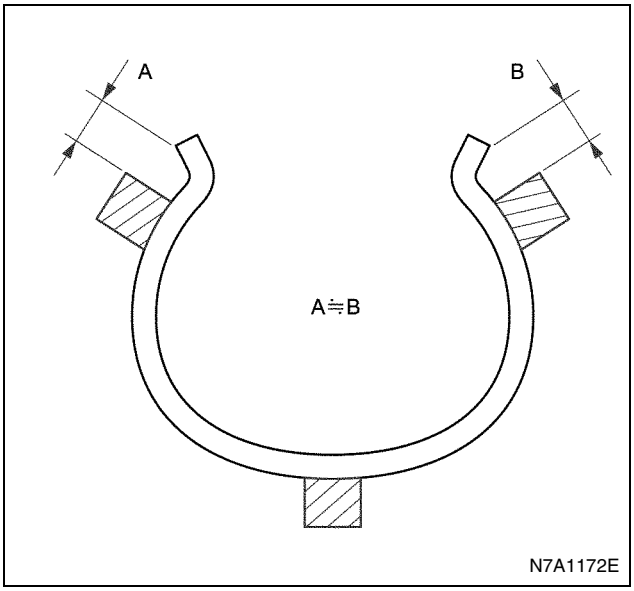
3. Remove the 4th-5the clutch hub assembly fixing snap ring using snap ring pliers.
4. Remove simultaneously the following parts with a press using a bearing remover; the 4th-5th clutch hub assembly & sleeve, 5th block ring, 5th gear, needle bearing.



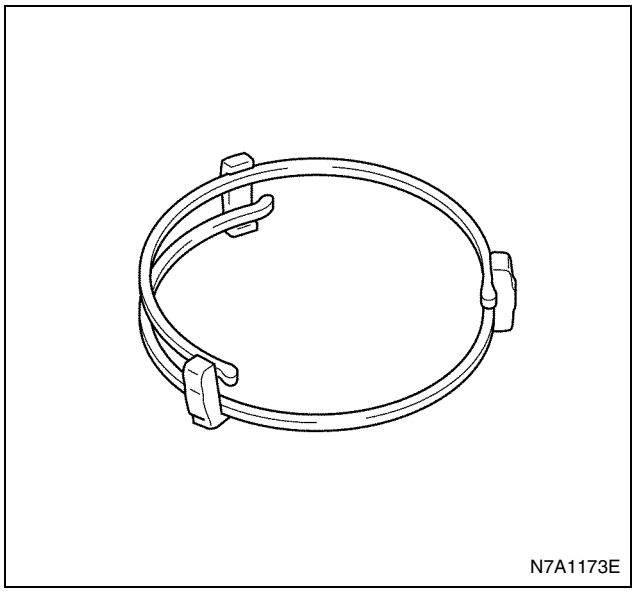

8. Assemble the 4th-5th clutch hub assembly & sleeve following the procedure below.
   a. Assemble securely the insert (2) to the insert groove of the block ring.
   b. Install the insert spring (3) to the insert.

**Caution:**

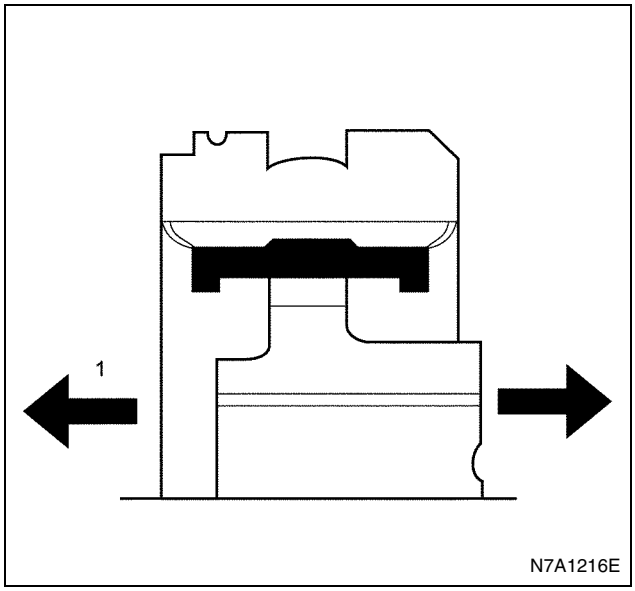
- When assembling the insert spring, equalize the length of the both edges of the spring not to adversely interfere with the inside diameter of the hub.




- Make sure that the open part of the insert spring assembled on the reverse side, is not aligned with the open part of the front side.




   c. Check that the clutch hub (5) and sleeve (4) are smoothly sliding.
      - The arrow (1) indicates the front side of the transmission.



**Special Tools**

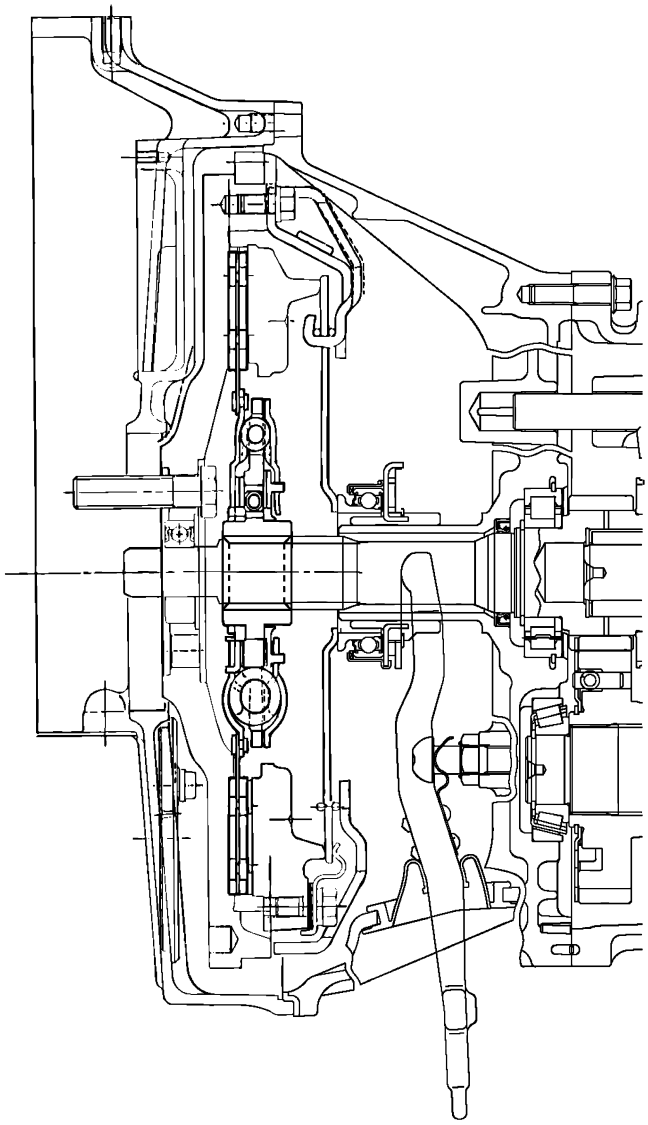
| Illustration | Tool Number / Description / Remarks |
|---|---|
|  5884022450 | 5-8840-2245-0 / Control Box Oil Seal Installer |

# CLUTCH

## GENERAL DESCRIPTION

### Clutch System

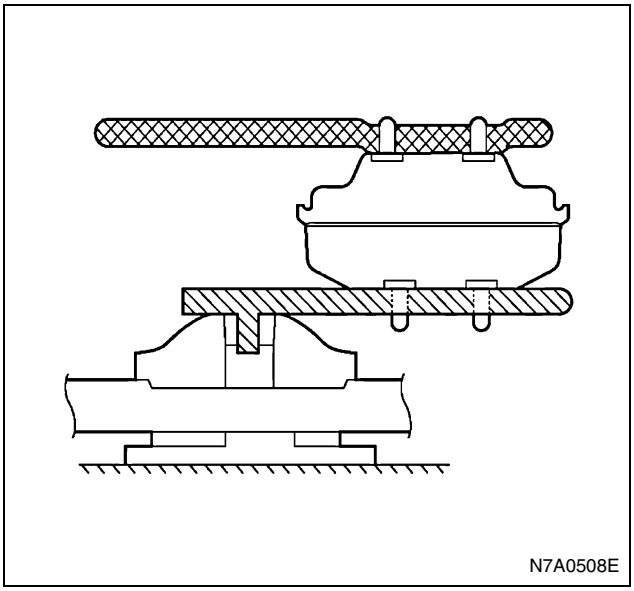
#### Clutch



N7A0481E

- Separate the rear shell from the front shell using handle 9-8523-1733-0 and support plate 5-8840-2056-0.

**Caution:**
Make sure to prevent the diaphragm spring from jumping out.




6. Remove the body assembly booster No. 1 (front shell).
7. Remove the spring booster piston return.
8. Remove the retainer rod.
9. Remove the rod sub assembly booster piston.
10. Remove the disk reaction.
11. Remove the diaphragm booster.
12. Remove the key valve stopper.
13. Remove the valve sub assembly booster air.
14. Remove the piston sub assembly booster.
15. Remove the link circular.
16. Remove the seal booster body No. 2.
17. Remove the seal booster body No. 1.

## Inspection

Inspect the parts by washing and drying. Replace the damaged parts with new ones.

**Caution:**
Use trichlene or metachlene (commercial product) for metal parts, and clean alcohol for rubber and resin parts, respectively.

## Installation

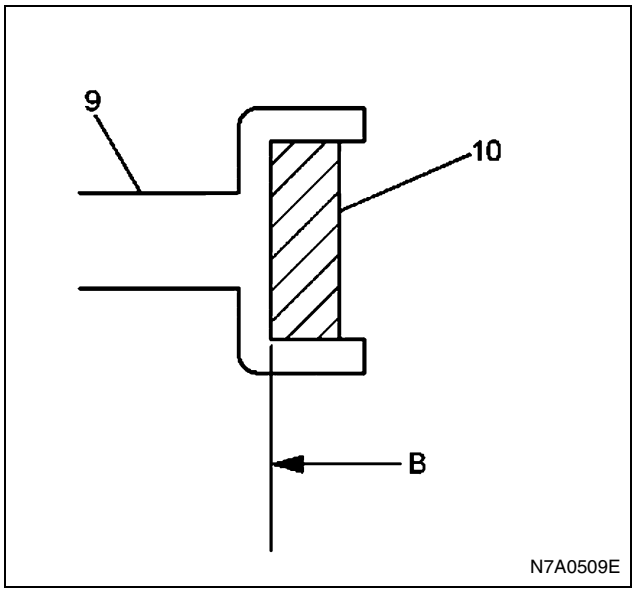
Apply silicone grease to each sliding part.

- Seal mating part and lip part of the rear shell
- Internal & external surface of the diaphragm plate, and outer circumference of the valve body
- Seal of the front shell, sliding surface of the push rod and outer circumference of the valve booster control

1. Install seal booster body No. 1.
2. Install body assembly booster No. 2.
3. Install the piston sub assembly booster.
4. Install the valve sub assembly booster air.
5. Install the key valve stopper.
6. Install the diaphragm booster.

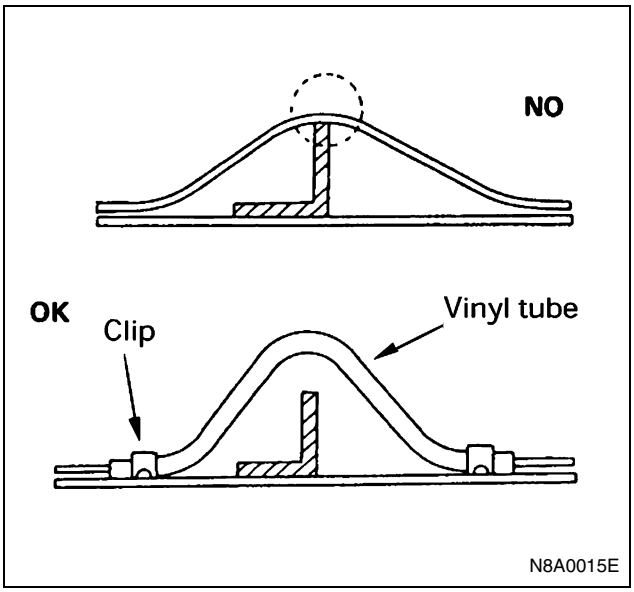
**Caution:**
Never tear the diaphragm. Make sure that the reaction disk is securely inserted to the surface B. (Bleed the air from the outer circumference.)

7. Install the disk reaction (10).

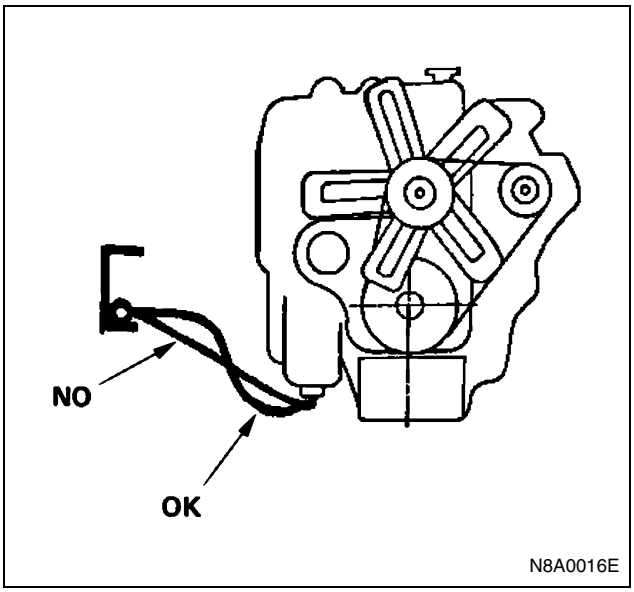



8. Install the rod sub assembly booster piston (9).
9. Install the retainer rod.
10. Install the spring booster piston return.
11. Install seal booster body No. 1.
12. Install the link circular.
13. Install body assembly booster No. 1 (front shell).
    - Installation has to be done using handle 9-8523-1733-0 and support plate 5-8840-2056-0.
    - When installing, the marks on the rear shell and the front shell, which were put when disassembling, has to mate with each other.

Position the wiring harness with a enough clearance from the other parts and guard the wiring harness with a vinyl tube and clips to avoid direct contact.

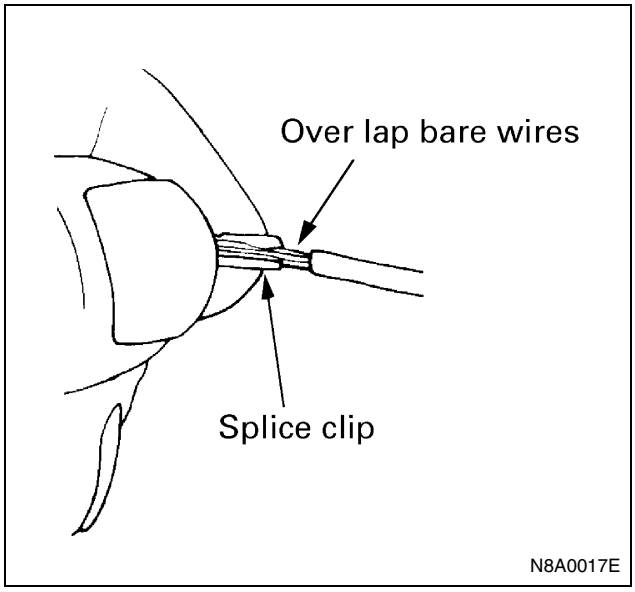



The wiring harness between engine and chassis should be long enough to prevent chafing or damage due to various vibrations.




### Splicing Wire

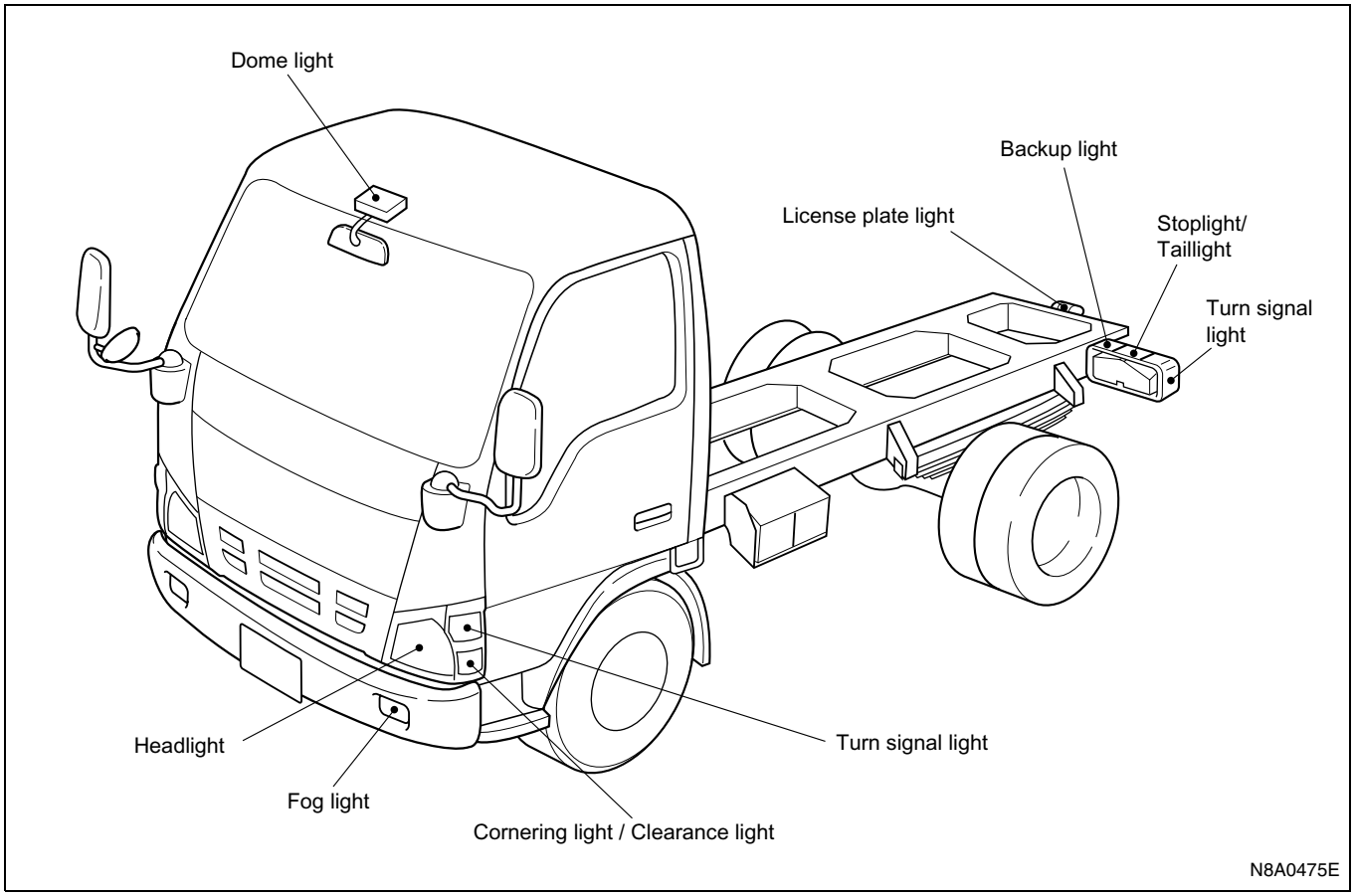
1. Open the Harness
   If the harness is taped, remove the tape. To avoid wire insulation damage, use a sewing “seam ripper” (available from sewing supply stores) to cut open the harness.
   If the harness has a block plastic conduit, simply pull out the desired wire.
2. Cut the wire
   Begin by cutting as little wire off the harness as possible. You may need the extra length of wire later if you decide to cut more wire off to change the location of a splice. You may have to adjust splice locations to make certain that each splice is at least 1-2/2″ (40 mm) away from other splices, harness branches, or connectors.
3. Strip the insulation
   When replacing a wire, use a wire of the same size as the original wire. Check the stripped wire for nicks or cut stands. If the wire is damaged, repeat the procedure on a new section of wire. The two stripped wire ends should be equal in length.
4. Crimp the Wires
   Select the proper clip to secure the splice. To determine the proper clip size for the wire being spliced, follow the directions included with your clips.
   Select the correct anvil on the crimper. (On most crimpers your choice is limited to either a small or large anvil.) Overlap the two stripped wire ends and hold them between your thumb and forefinger.
   Then, center the splice clip under the stripped wires and hold it in place.




- Open the crimping tool to its full width and rest one handle on a firm flat surface.
- Center the back of the splice clip on the proper anvil and close the crimping tool to the point where the back of the splice clip touches the wings of the clip.
- Make sure that the clip and wires are still in the correct position. Then, apply steady pressure until the crimping tool closes.

# MAIN DATA AND SPECIFICATIONS

## Bulb Specifications




| Light Name | | Rated Power | No. of Bulb | Lens Color | Remarks |
|---|---|---|---|---|---|
| Halogen Headlight | | 60 W / 55 W | 2 | Clear | 12 V |
| | | 75 W / 70 W | 2 | | 24 V |
| Front combination light | Turn signal light | 21 W | 2 | Amber | 12 V, 24 V |
| | Cornering light / Clearance light | 21 W / 5 W | 2 | Clear | 12 V, 24 V |
| Fog light | Front | 55 W | 2 | Clear | 12 V |
| | | 70 W | | | 24 V |
| | Rear | 21 W | 1 | Red | 12 V, 24 V |
| Rear combination light | Stoplight / Taillight | 21 W / 5 W | 2 | Red | 12 V, 24 V |
| | Turn signal light | 21 W | 2 | Amber | 12 V, 24 V |
| | Backup light | 21 W | 2 | Clear | 12 V, 24 V |
| License plate light | | 5 W | 1 | Clear | 12 V, 24 V |
| Dome light | | 10 W | 1 | White | 12 V, 24 V |
| Roof marker light | | 5 W | 2 | White | 24 V |
| Side turn signal light | | 21 W | 2 | Amber | 24 V |

| Fuse No. | Capacity | Indication on label | Main parts (Load) |
|---|---|---|---|
| F-26 | — | — | — |
| F-27 | 10 A | RR FOG | Rear fog light switch, Rear fog light relay |
| F-28 | — | — | — |

**12 Volt 4JH1 Engine**

| Fuse No. | Capacity | Indication on label | Main parts (Load) |
|---|---|---|---|
| F-1 | 10 A | AIR CON | A/C switch, A/C thermo relay, Pressure switch, Magnetic clutch, VSV: FICD, Electronic thermostat |
| F-2 | 15 A | FUEL HEATER | Fuel heater |
| F-3 | 15 A | REAR HEATER | Rear heater, Rear heater switch |
| F-4 | 15 A | AUDIO (B), DOOR LOCK | Radio & clock, Dome light switch, Dome light, Door switch (RH & LH), Door lock switch, Door lock actuator, Door lock controller, Speedometer, Key cylinder switch, Key remind buzzer |
| F-5 | 10 A | STOP LIGHT | Stoplight switch, Stoplight |
| F-6 | 10 A | FRT FOG LIGHT, CORNERING LAMP | Fog light switch, Fog light, Lighting switch, Cornering light relay, Cornering light, Cornering light switch |
| F-7 | 10 A | TAIL LIGHT | Tail relay, Illumination light(s), Clearance light(s), Tail light(s) |
| F-8 | 15 A | ENG. (B1) | ECM battery |
| F-9 | 15 A | ENG. (B2) | ECM battery |
| F-10 | 15 A | FRONT WIPER & WASHER | Wiper & Washer switch, Wiper motor, Washer motor, Intermittent relay |
| F-11 | 10 A | TURN LIGHT | Flasher unit, Front turn signal light, Rear turn signal light, Turn signal light switch, Hazard warning switch |
| F-12 | 10 A | H/LAMP LEVEL | Headlight leveling switch, Headlight leveling motor (actuator) |
| F-13 | — | — | — |
| F-14 | — | — | — |
| F-15 | 15 A | AUDIO (IG), CIGAR LIGHTER | Radio, Cigar lighter |
| F-16 | 10 A | METER | Exhaust brake control relay, CSD Relay, Key remind buzzer, Backup light switch, Backup light, Neutral switch, Starter relay, QOS-II controller, QOS-III controller, Glow relay, Glow-1 relay, Glow-2 relay, Glow indicator (Meter), Coolant temperature gauge, Thermo unit, Vehicle speed sensor (Installed on the meter assembly & Transmission), Meter assembly, Power window relay, Cornering light relay |
| F-17 | — | — | — |
| F-18 | — | — | — |
| F-19 | 15 A | HORN, HAZARD | Horn, Horn relay, Horn switch, Flasher unit, Hazard warning switch |
| F-20 | 10 A | ABS (IG) | ABS |
| F-21 | — | — | — |
| F-22 | 10 A | STARTER | Starter relay, QOS-II controller, QOS-III controller |
| F-23 | 10 A | HEAD LIGHT RH | Headlight (RH), Dimmer relay, High beam indicator light |
| F-24 | 10 A | HEAD LIGHT LH | Headlight (LH), Dimmer relay |
| F-25 | 15 A | MARKER LAMP | Marker light, Marker light relay |

# SYSTEM REPAIR

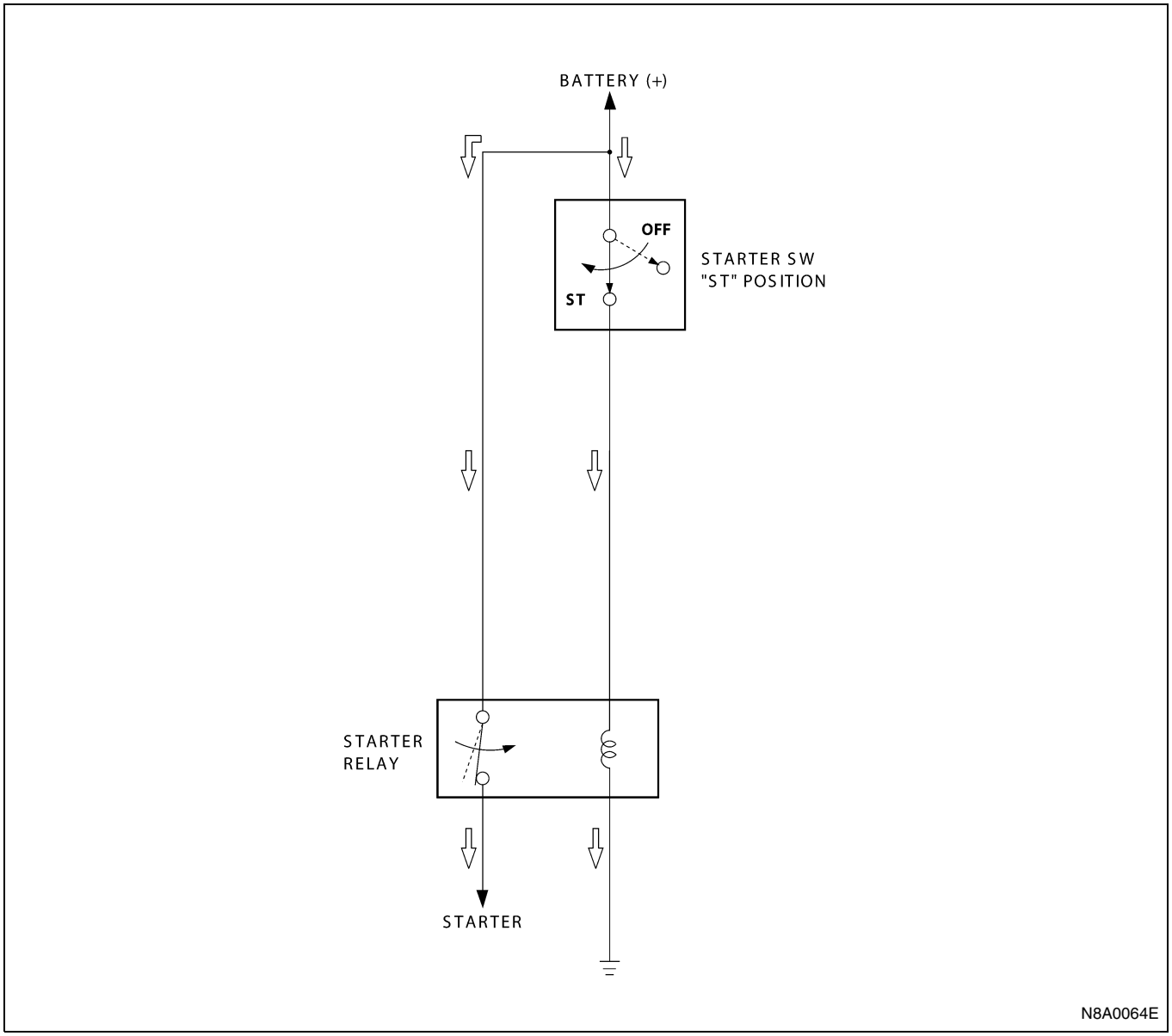
## Start and Charging

### General Description

The system consists of the starter switch, starter, AC generator, starter relay, charge relay and heater and A/C relay. When the starter SW is set to the “ST” position, the battery voltage is applied to the starter solenoid coil through the starter relay to start the starter.

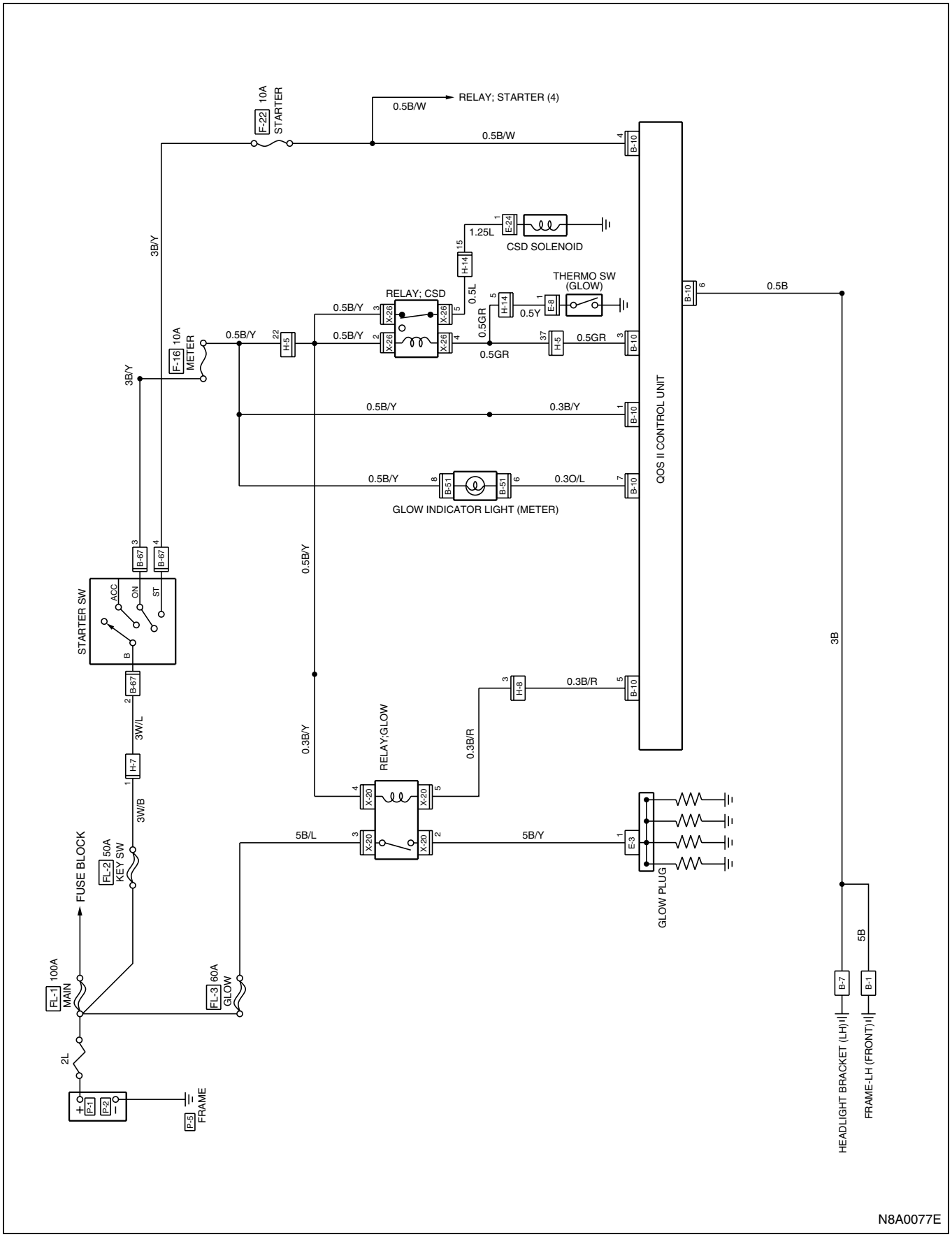
- On the 4HK1 engine, the function that ECM controls STARTER RELAY is added.

### Starting Circuit

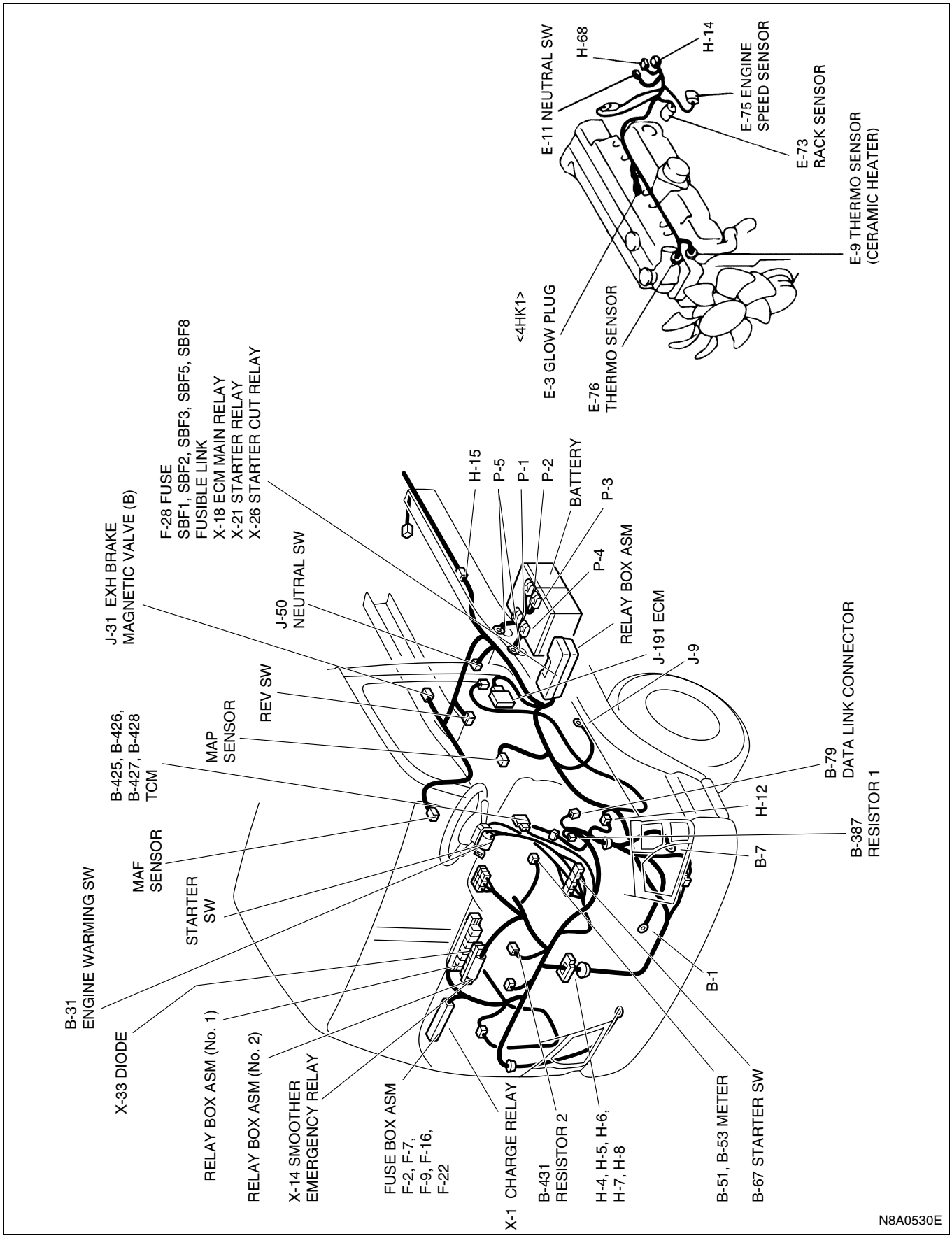


## Circuit Diagram

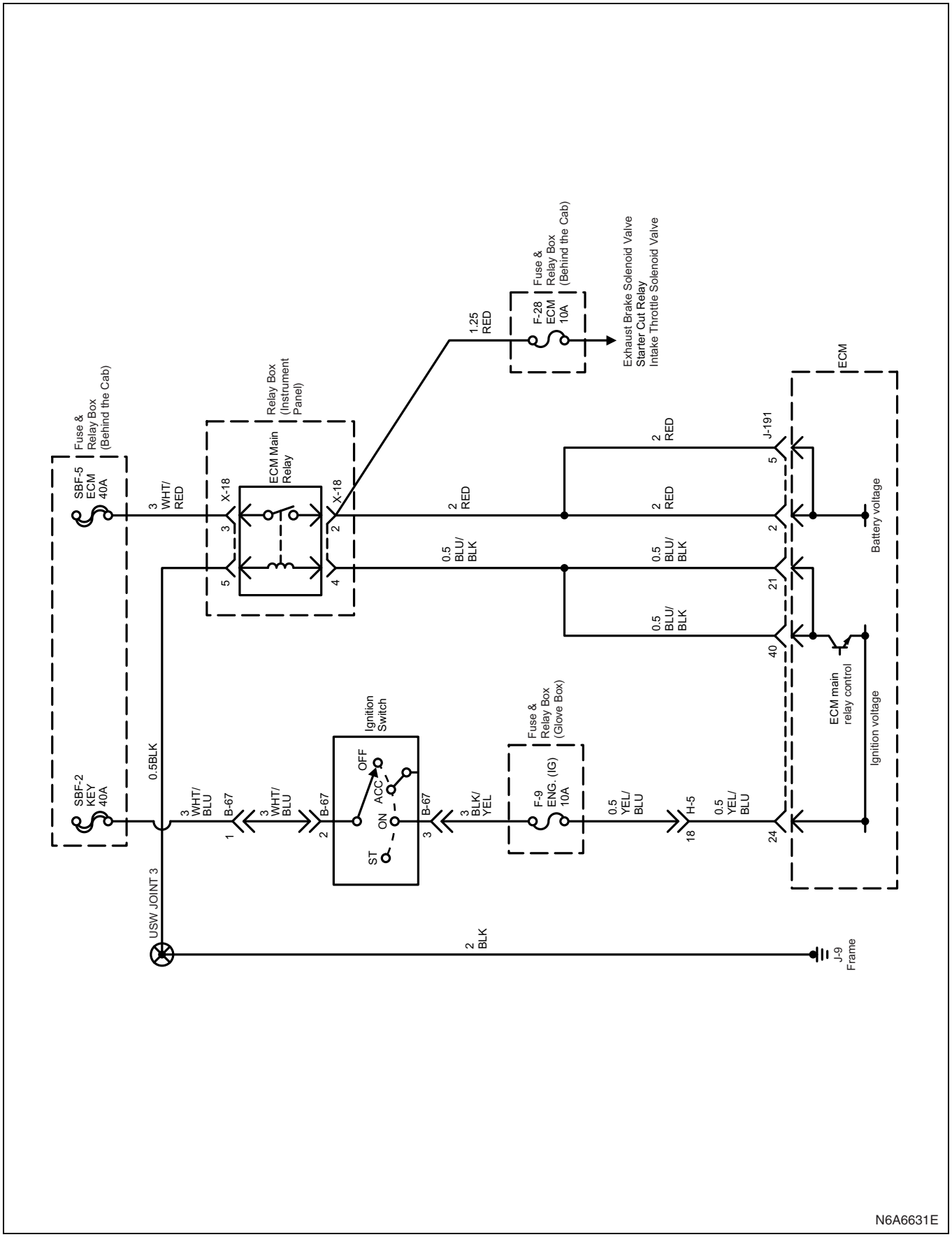
### NHR55, NKR55

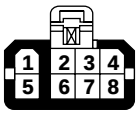
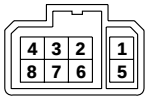
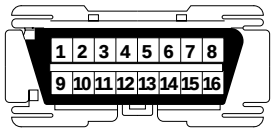
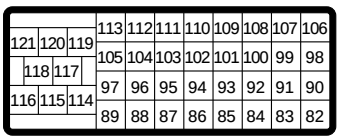
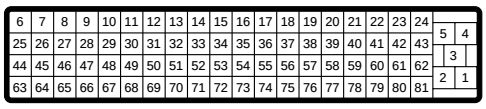


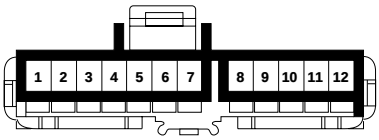
**For 4HK1-TC Engine**



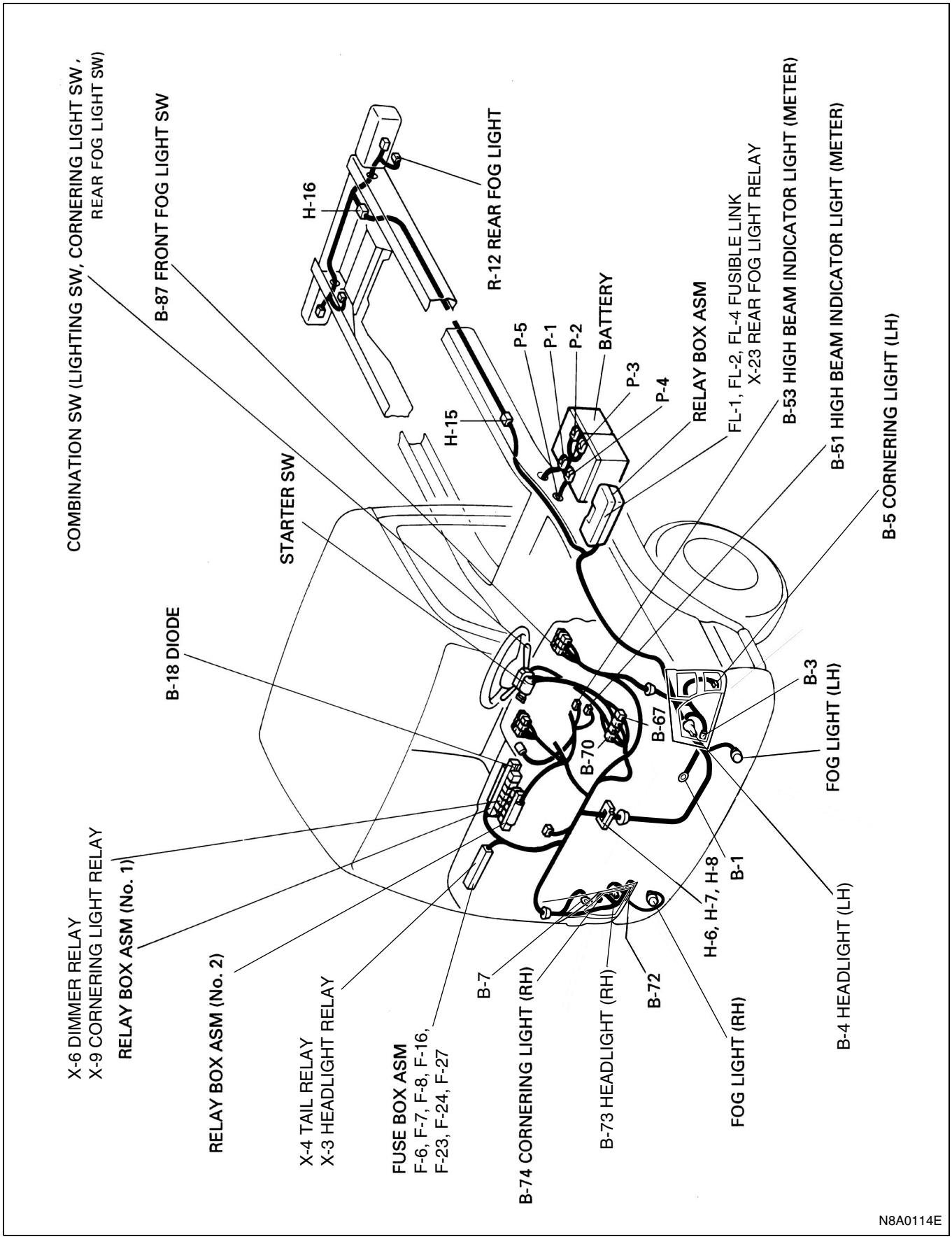
## 4HK1-TC Engine (4)



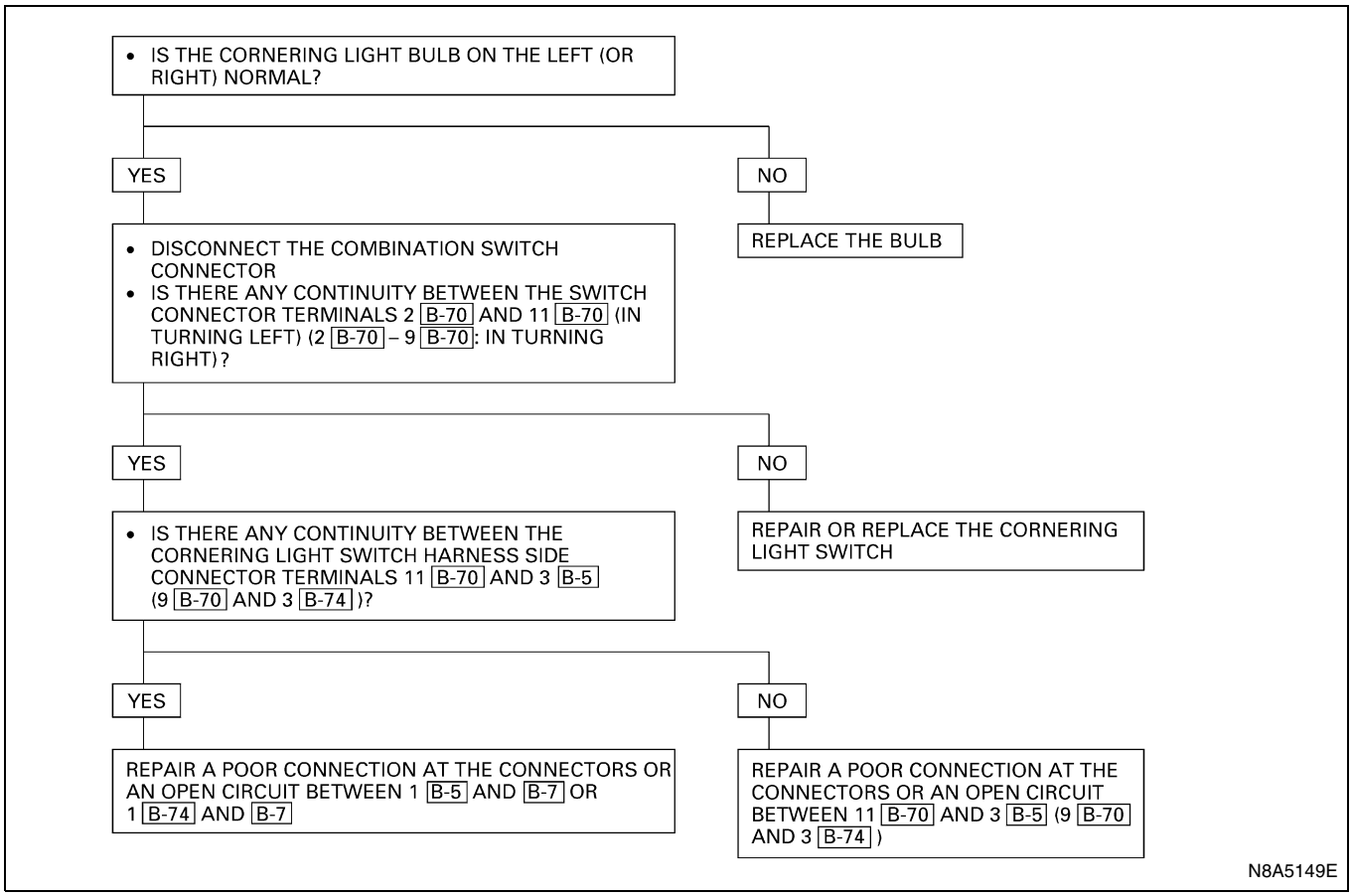
| No. | Connector Face |
|---|---|
| B-67 |  004-001 |
| B-67 |  004-002 |
| B-69 |  008-001 |
| B-69 |  008-002 |
| B-79 |  016-005 |
| B-89 |  002-019 |
| B-233 |  121-002 |
| B-234 |  121-001 |

| No. | Connector Face |
|---|---|
| B-340 |  002-022 |
| B-341 |  002-009 |
| B-342 |  002-009 |
| B-51 |  014-001 |
| B-52 |  012-005 |
| H-14 |  016-003 |
| H-14 |  016-004 |
| H-15 |  008-023 |

## Parts Location

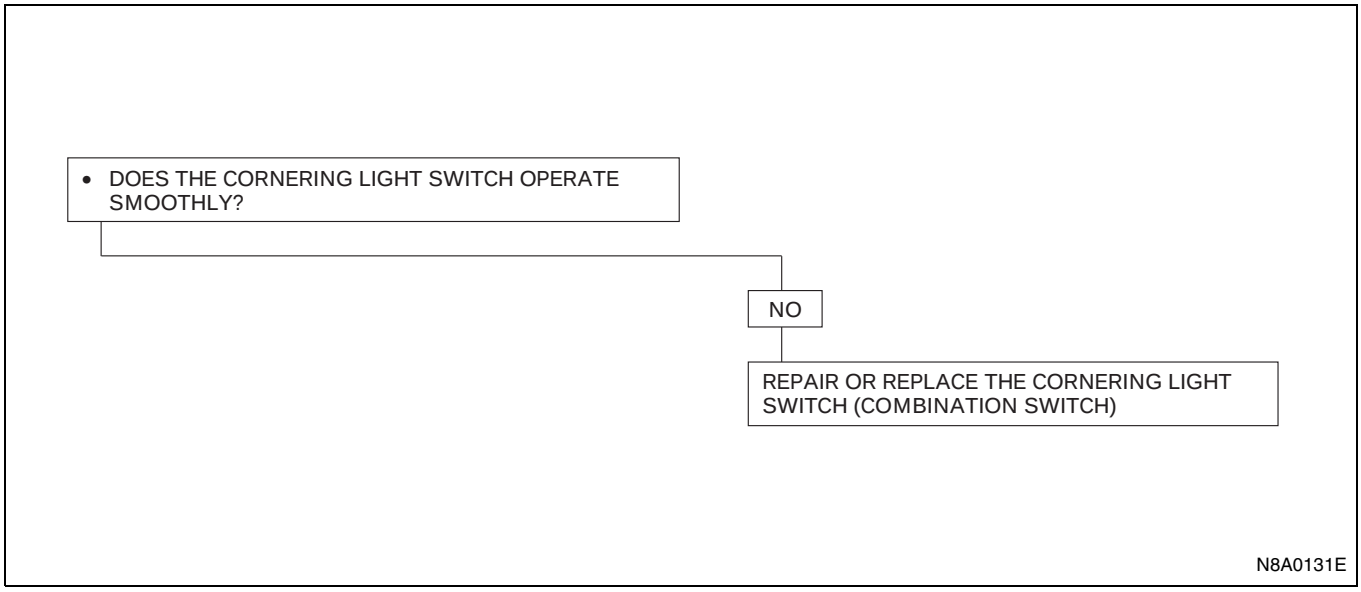


### 3-2. Cornering Light on The Left (or Right) Side Inoperative




**Notice:**
Figures in parenthesis “( )” indicate place of inspection for the cornering light on the right.

### 3-3. Cornering Light Remains on Even when Steering Wheel is in Straight Ahead Position



Inspect and repair the circuit that is corresponding to the headlight leveling switch position where the actuator becomes inoperative.

**Actuator - LH**

| Headlight leveling SW position | Circuit |
|---|---|
| 1 | Between 3 B-156 and 3 B-155 |
| 2 | Between 2 B-156 and 4 B-155 |
| 3 | Between 1 B-156 and 5 B-155 |
| 0 | Between 4 B-156 and 2 B-155 |

**Actuator - RH**

| Headlight leveling SW position | Circuit |
|---|---|
| 1 | Between 3 B-156 and 3 B-152 |
| 2 | Between 2 B-156 and 4 B-152 |
| 3 | Between 1 B-156 and 5 B-152 |
| 0 | Between 4 B-156 and 2 B-152 |

## Starter Switch

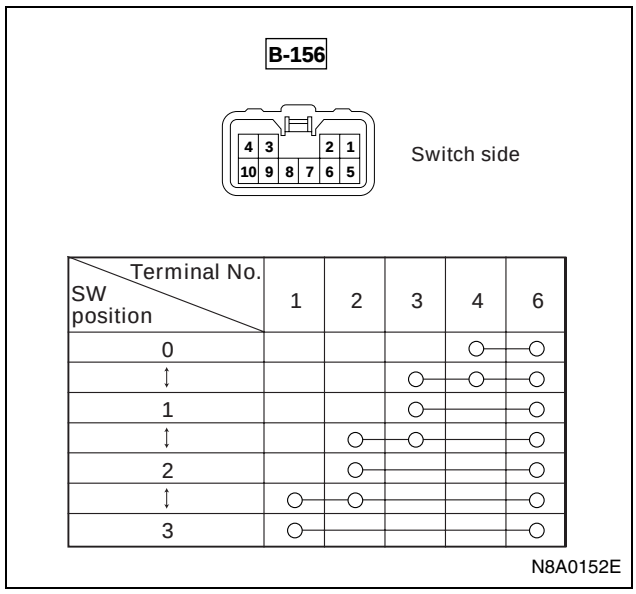
Refer to “START AND CHARGING” in this manual.

## Headlight Leveling Switch

### Inspection

Check the continuity between the switch connector terminals.

Repair or replace the switch when the result of inspection is found abnormal.

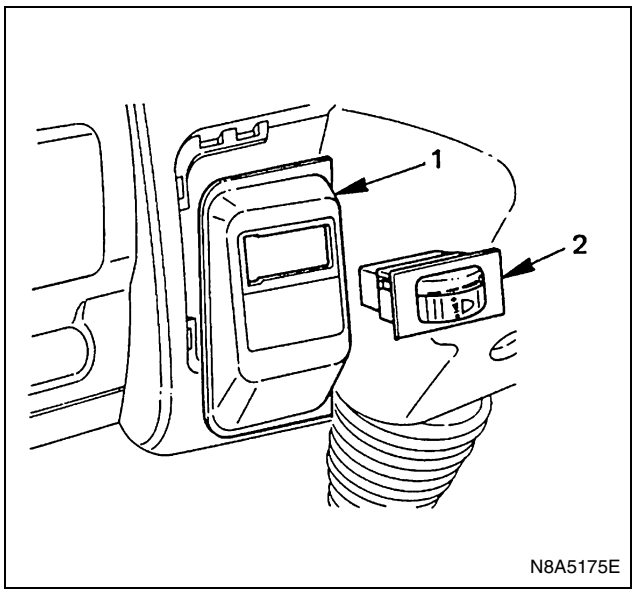



### Removal

**Preparation:**

Disconnect the battery ground cable.

1. Switch Bezel
2. Headlight Leveling Switch
   Disconnect the connector.




### Installation

To install, follow the removal steps in the reverse order.

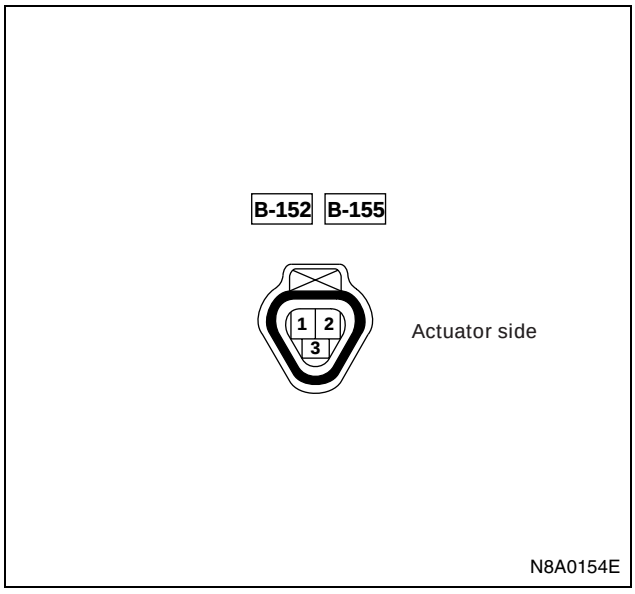
## Headlight Leveling Actuator

### Inspection

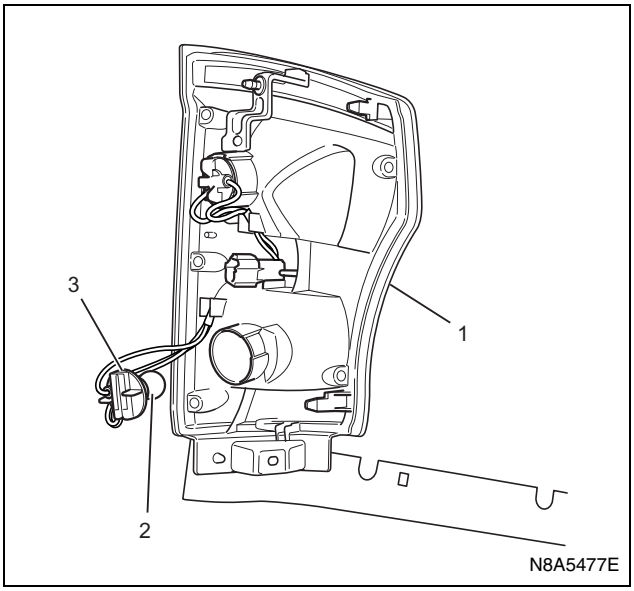
Apply the battery voltage to the connector terminals and check its function.

This actuator has a mechanism that the angle of headlight leveling varies according to input voltage of SIGNAL.

1. Make sure that the voltage specified in table is output to vehicle harness connector which will be connected to actuator.
   If the power supply is not 12 V, the SIGNAL output varies in proportion to its voltage.
2. Connect the connector of actuator and vehicle harness connector.
   Make sure that the reflector of headlight moves to the position indicated by HEAD LAMP LEVELING SW.



- Remove the two catches.
- Remove the front combination light (1) connector.




3. Remove the clearance light bulb.
   - Turn the bulb socket (3) to the left to remove it.
   - Press the bulb (2) in and turn it to the left to remove it from the socket.

**Installation**

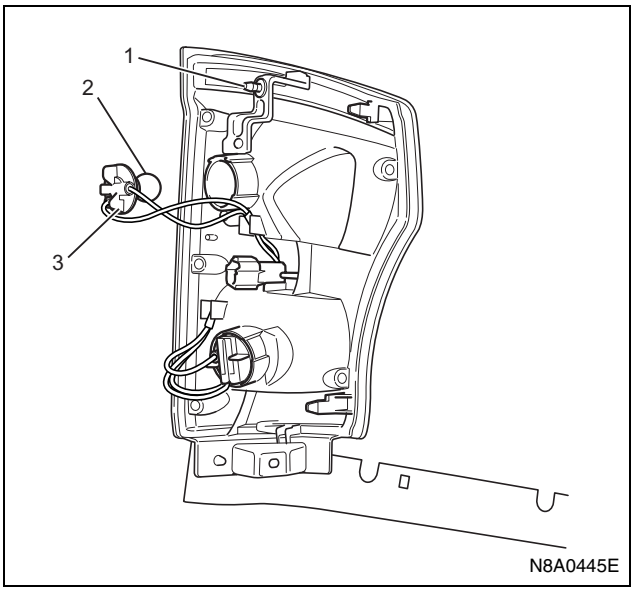
Installation procedure of cornering/clearance light bulb

1. Install the cornering/clearance light bulb.
   - While pressing the bulb (2), turn it clockwise to fit.

**Notice:**

Do not let the glass portion dirty with sebum etc.

- Turn the bulb socket (3) clockwise to fit.




2. Installation procedure of front combination light assembly
   - Connect the connector of the combination light assembly.
   - Position it by aligning two pawls with the groove of H/L.
   - Fit the iron PIN (1) in the upper portion of the side by aligning it with the center of corresponding grommet.

**Notice:**

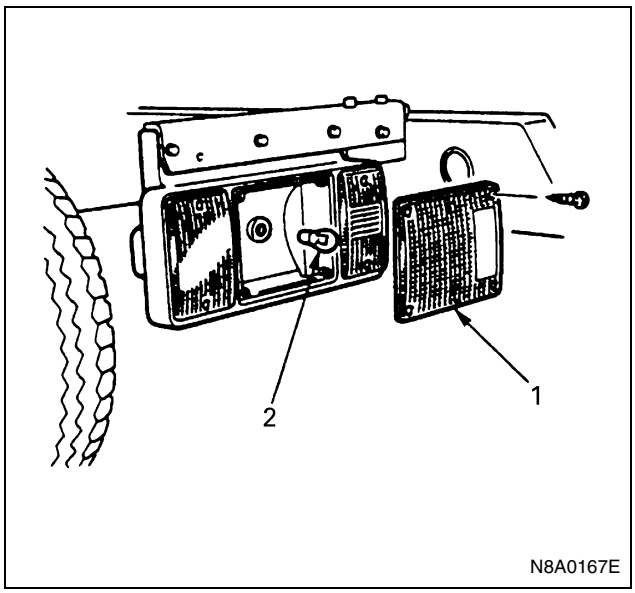
Push it into securely with a force of approx. 250 N (25 kgf) until click is heard.

   - Pull the front combination light assembly lightly toward the front of vehicle to make sure that the PIN and grommet are engaged securely.
   - Tighten one bolt in the lower portion of front combination light assembly.
3. Hook the seal rubber on two projections under H/L.
4. Connect the battery ground cable.
5. Check lighting of each light.

## Taillight Bulb

**Removal**

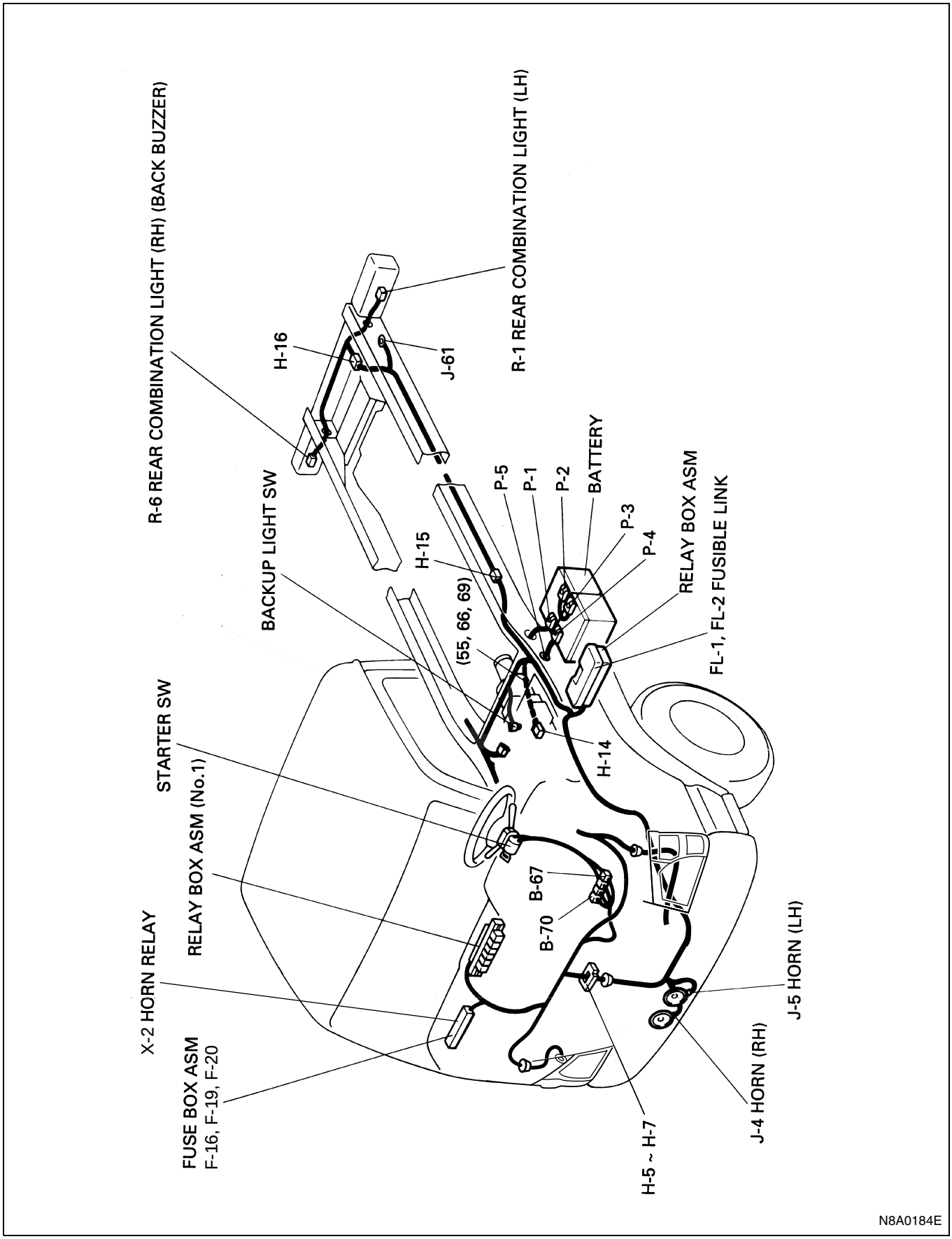
1. Lens
2. Bulb



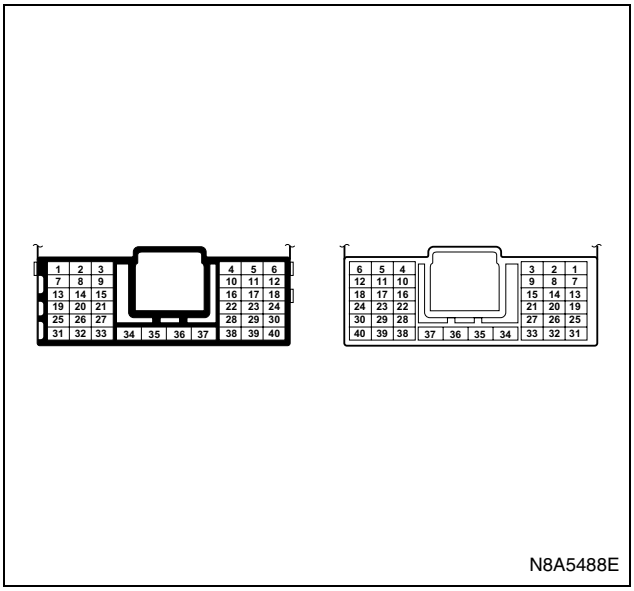

**Installation**

To install, follow the removal steps in the reverse order.

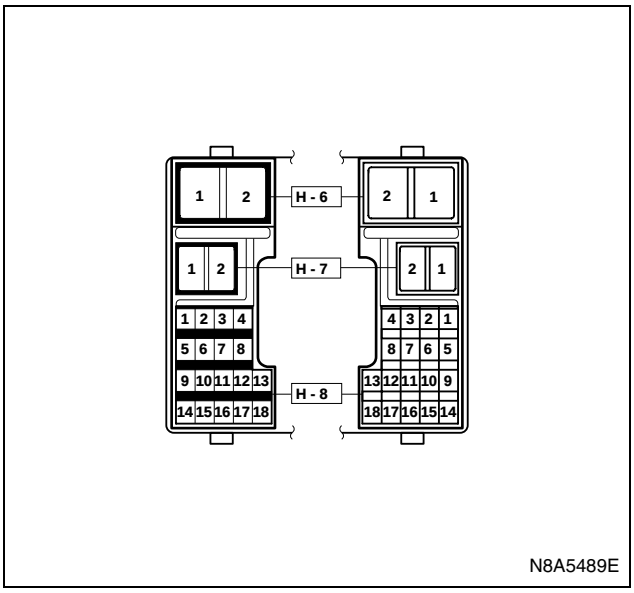
## Parts Location



**H-5**




**H-7**




## Starter Switch

Refer to “START AND CHARGING” in this section.

## Key Cylinder Switch

Refer to “START AND CHARGING” in this section.

## Backup Light Switch

Refer to “HORN, BACKUP LIGHT AND BACKUP BUZZER” in this section.

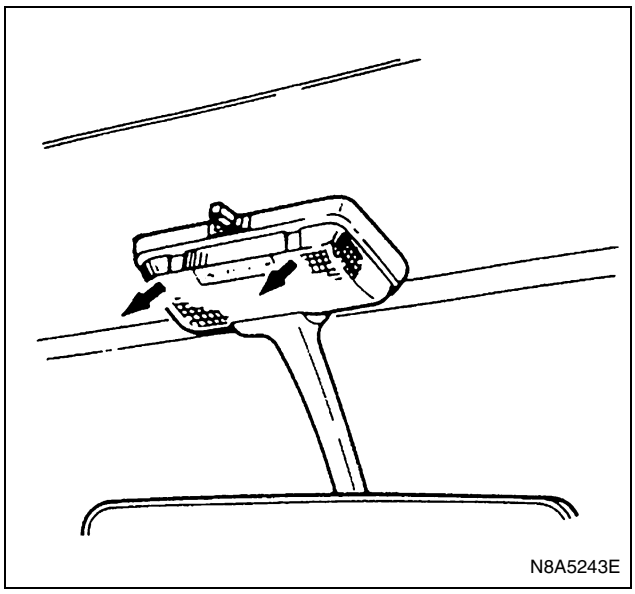
## Dome Light Bulb

**Removal**

**Preparation:**

Disconnect the battery ground cable.

1. Lens
   Hold the lens and pull it downward.




2. Bulb

**Installation**

To install, follow the removal steps in the reverse order.

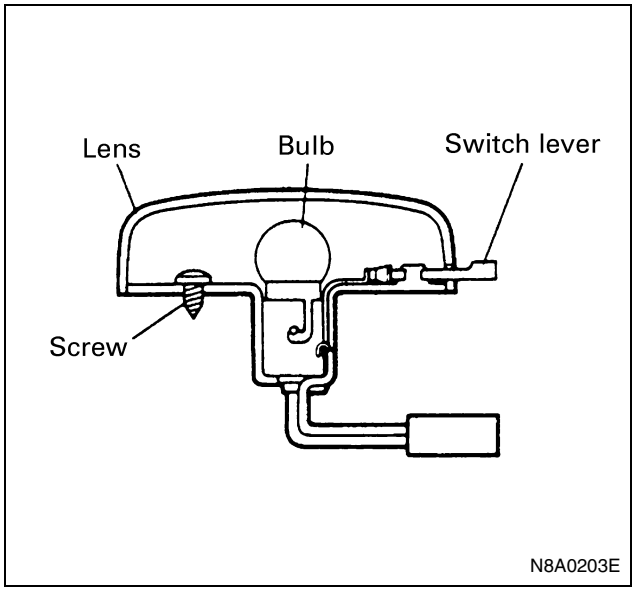
## Dome Light Bulb (for Crew Cab)

**Removal**

**Preparation:**

Disconnect the battery ground cable.

1. Lens
   Hold the lens and pull it down.
2. Bulb




**Installation**

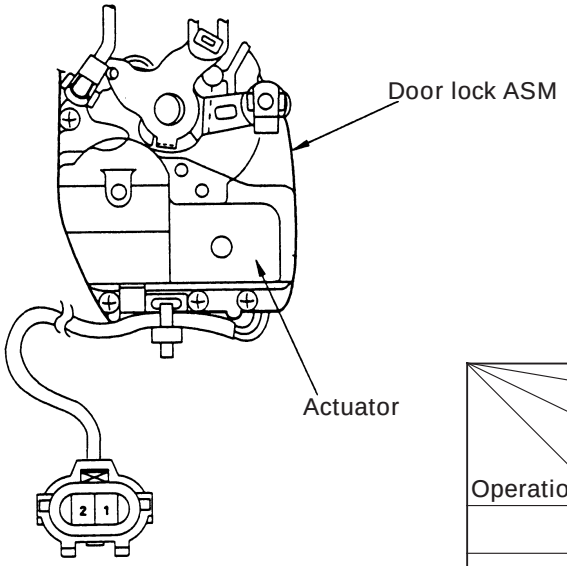
To install, follow the removal steps in the reverse order.

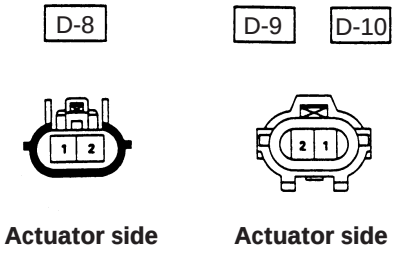
## Dome Light Switch

**Inspection**

Check the continuity between the dome light switch connector terminals.

Repair or replace the switch when the result of inspection is found abnormal.




| Operation \ Door | FRT Passenger | | RR-LH | | RR-RH | |
|---|---|---|---|---|---|---|
| Connector No. | D-8 | | D-9 | | D-10 | |
| Terminal No. | 1 | 2 | 1 | 2 | 1 | 2 |
| Lock | ⊖ | ⊕ | ⊕ | ⊖ | ⊕ | ⊖ |
| Unlock | ⊕ | ⊖ | ⊖ | ⊕ | ⊖ | ⊕ |

N8A0226E

**Removal and Installation**

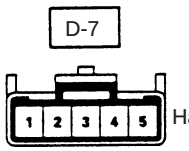
Refer to Section 2 for “DOOR LOCK ASSEMBLY”.

## Front Passenger Seat Side Power Window Motor

### Inspection

Before checking to see if the motor functions correctly, be sure to check the circuit through the front passenger's switch connector D-7 and the driver's power window switch connector D-3.
If the motor does not operate smoothly, either the motor or the circuit between the switch and the motor is defective.

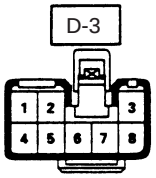
1. Circuit inspection of the front passenger seat side window
   Disconnect the switch connector and apply battery voltage to the harness side connector terminals to check its function.




| Connecting terminal | | Direction of operation |
|---|---|---|
| 3 (L/Y) | 5 (BR/Y) | |
| ⊖ | ⊕ | DOWN |
| ⊕ | ⊖ | UP |

N8A0243E

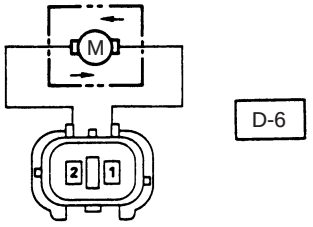
2. Circuit inspection of the driver seat side switch
   Disconnect the switch connector and apply battery voltage to the harness side connector terminals to check its function.




| Connecting terminal | | Direction of operation |
|---|---|---|
| 4 (G/Y) | 5 (R/Y) | |
| ⊕ | ⊖ | DOWN |
| ⊖ | ⊕ | UP |

N8A0244E

3. Inspection of the front passenger window motor
   Disconnect the motor connector and apply battery voltage to the motor side connector terminals to check its function.
   Repair or replace the motor when the result of inspection is found abnormal.



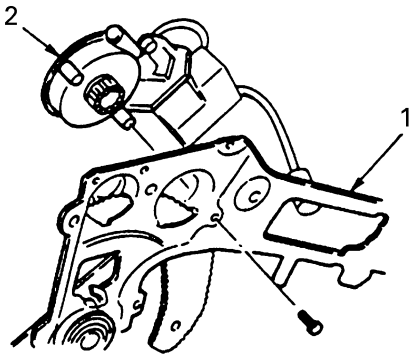

| Direction of operation \ Terminal No. | 1 | 2 |
|---|---|---|
| DOWN | ⊖ | ⊕ |
| UP | ⊕ | ⊖ |

N8A0245E

### Removal

**Preparation:**
Disconnect the battery ground cable.

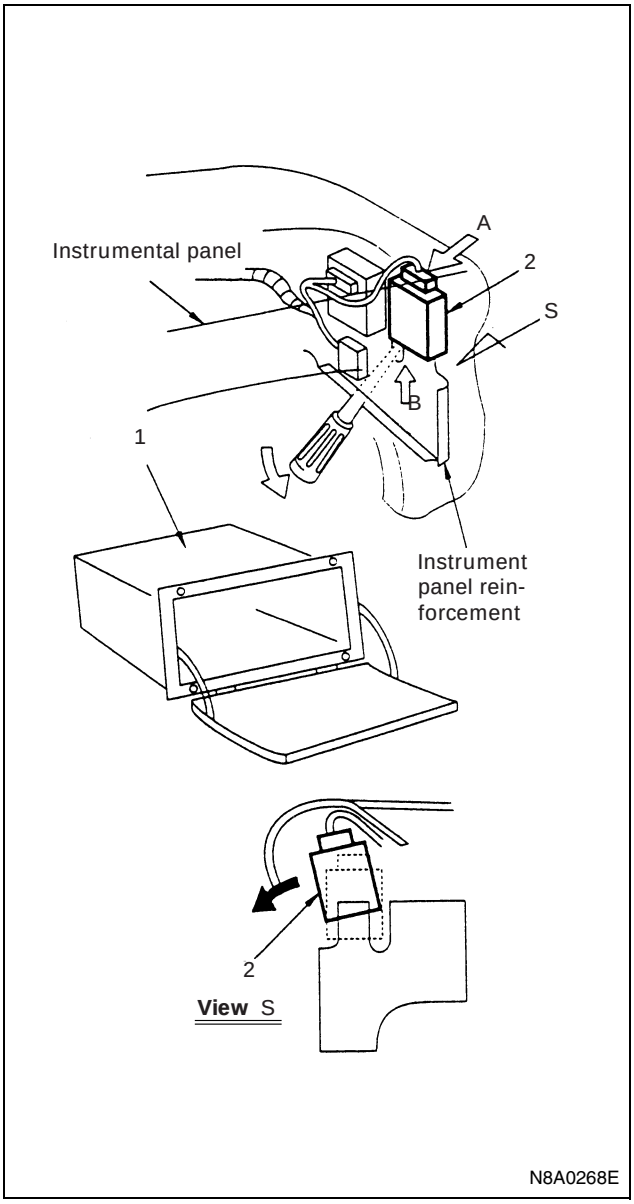
1. Window Regulator Assembly
   Refer to Section 2 for Window Regulator and Glass.
2. Power Window Motor
   Remove three screws.




N8A0246E

### Installation

To install, follow the removal steps in the reverse order.



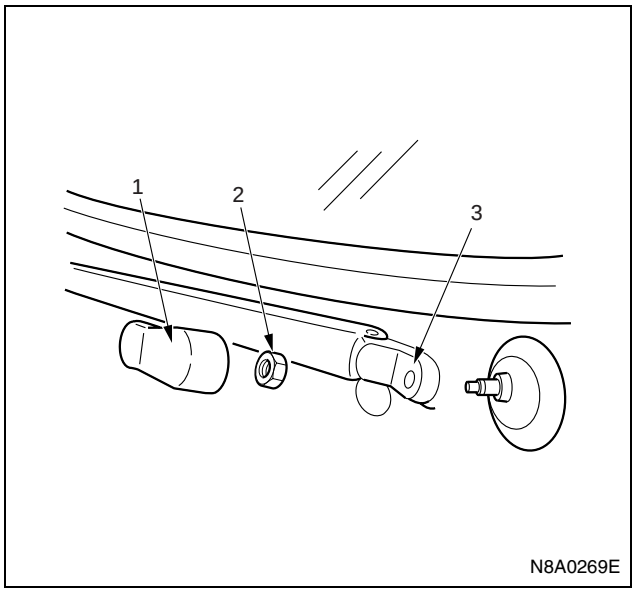

**Installation**

To install, follow the removal steps in the reverse order.

## Windshield Wiper Arm & Blade

**Removal**

1. Cover
2. Wiper Arm Nut
3. Wiper Arm & Blade



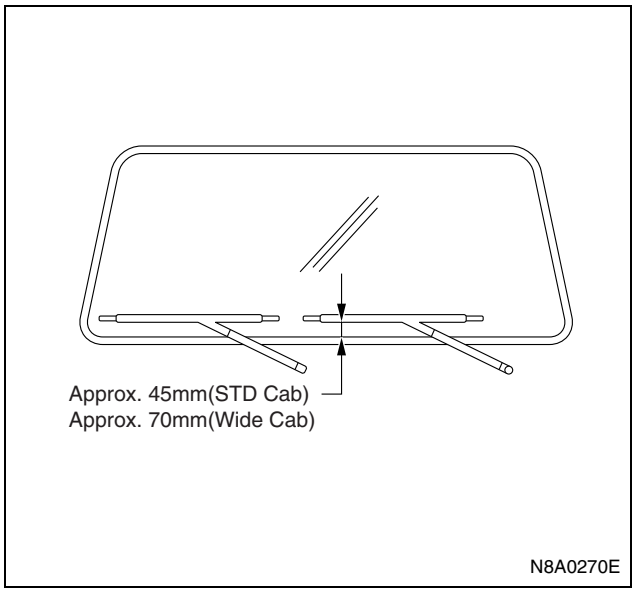

**Installation**

To install, follow the removal steps in the reverse order, noting the following points.

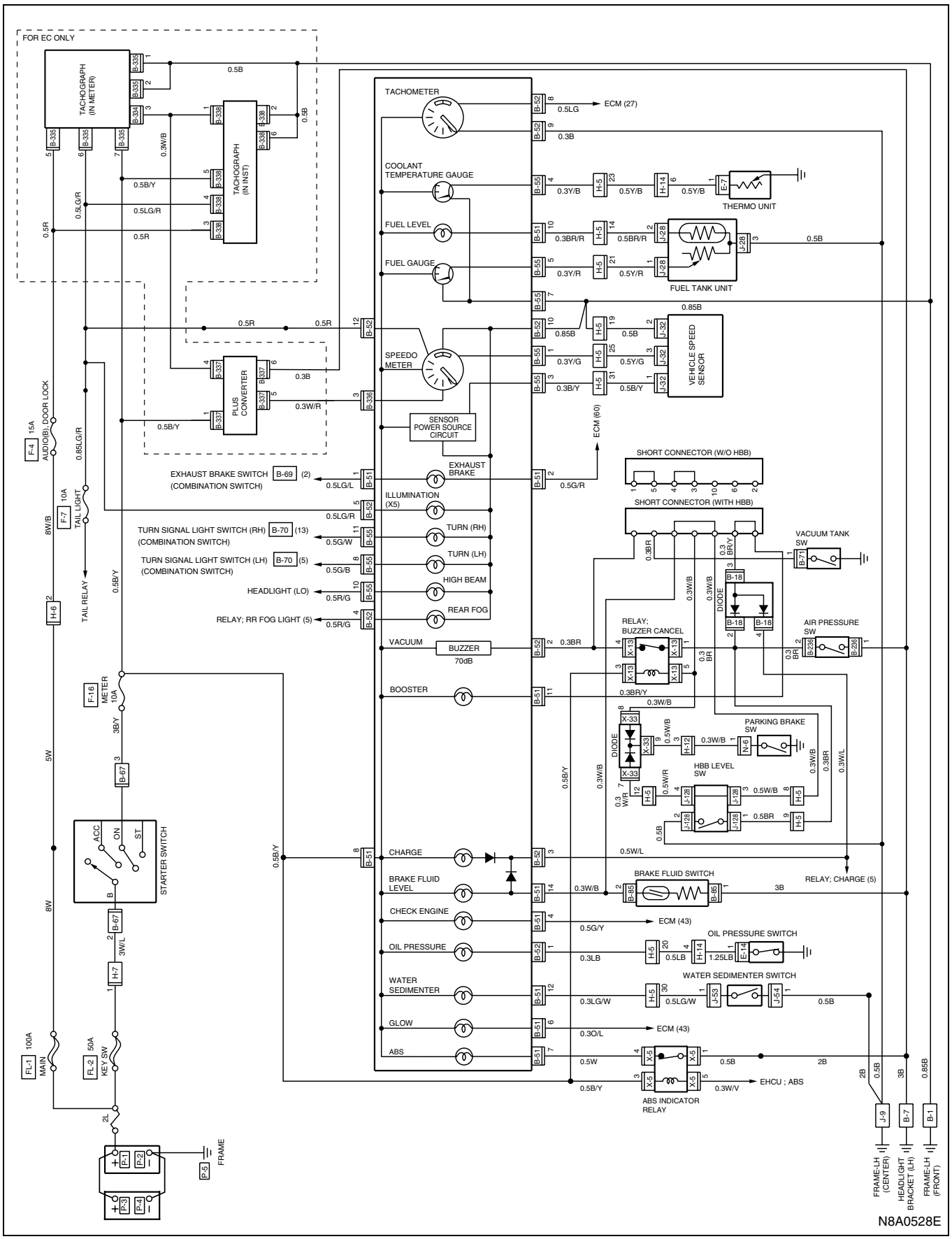
1. Before installing the wiper arm & blade to the shaft, confirm that the motor stops at the auto-stop position.
2. Set the wiper arm & blade so that the tips of both blades are positioned as shown in the illustration.
3. Tighten the wiper arm nut to the specified torque.

**Tighten:**

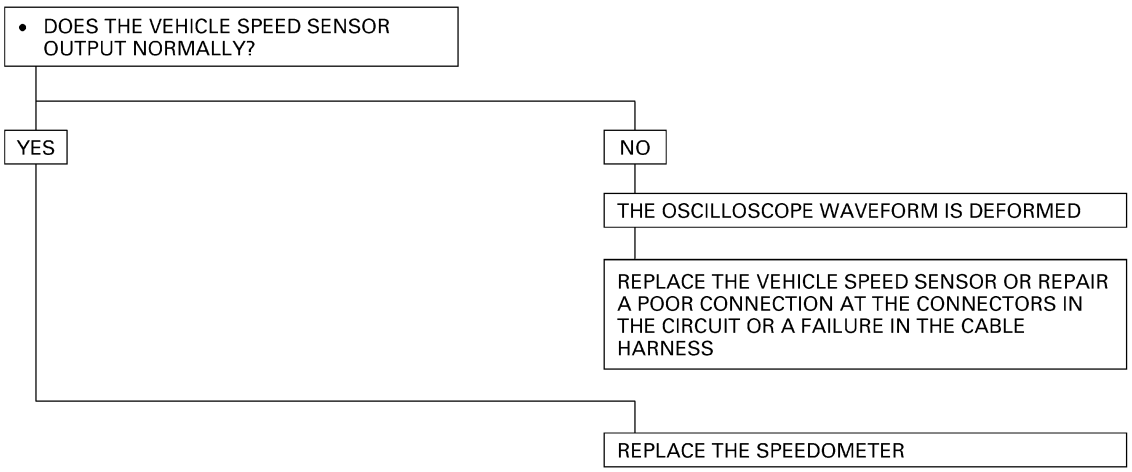
Wiper arm nut to 17 N·m (170 kg·cm/147 lb·in)



## For 4JH1 Engine

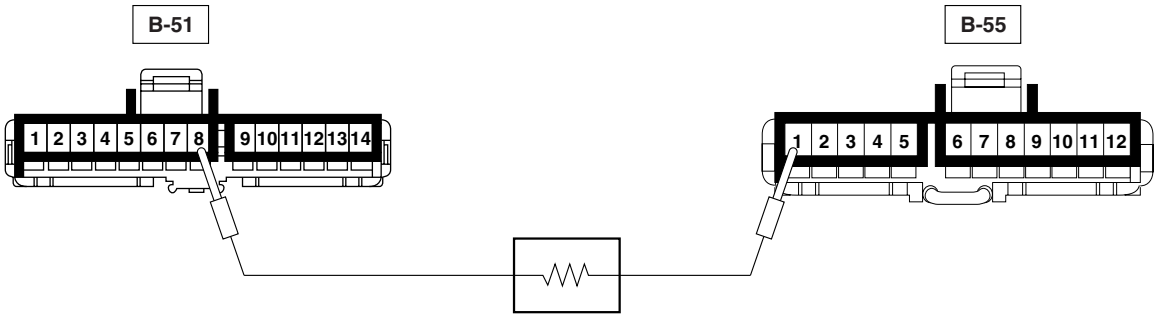


## 1-5. Speedometer Needle Jumps Erratically

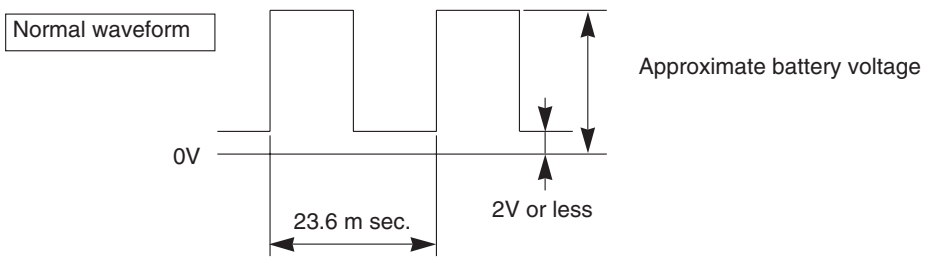



**Inspection of waveform by oscilloscope**

1. Connect a resistance of 1.3 to 5k ohm (1.4W or more) between the harness side connectors 8 B-51 and 1 B-55 of the meter.

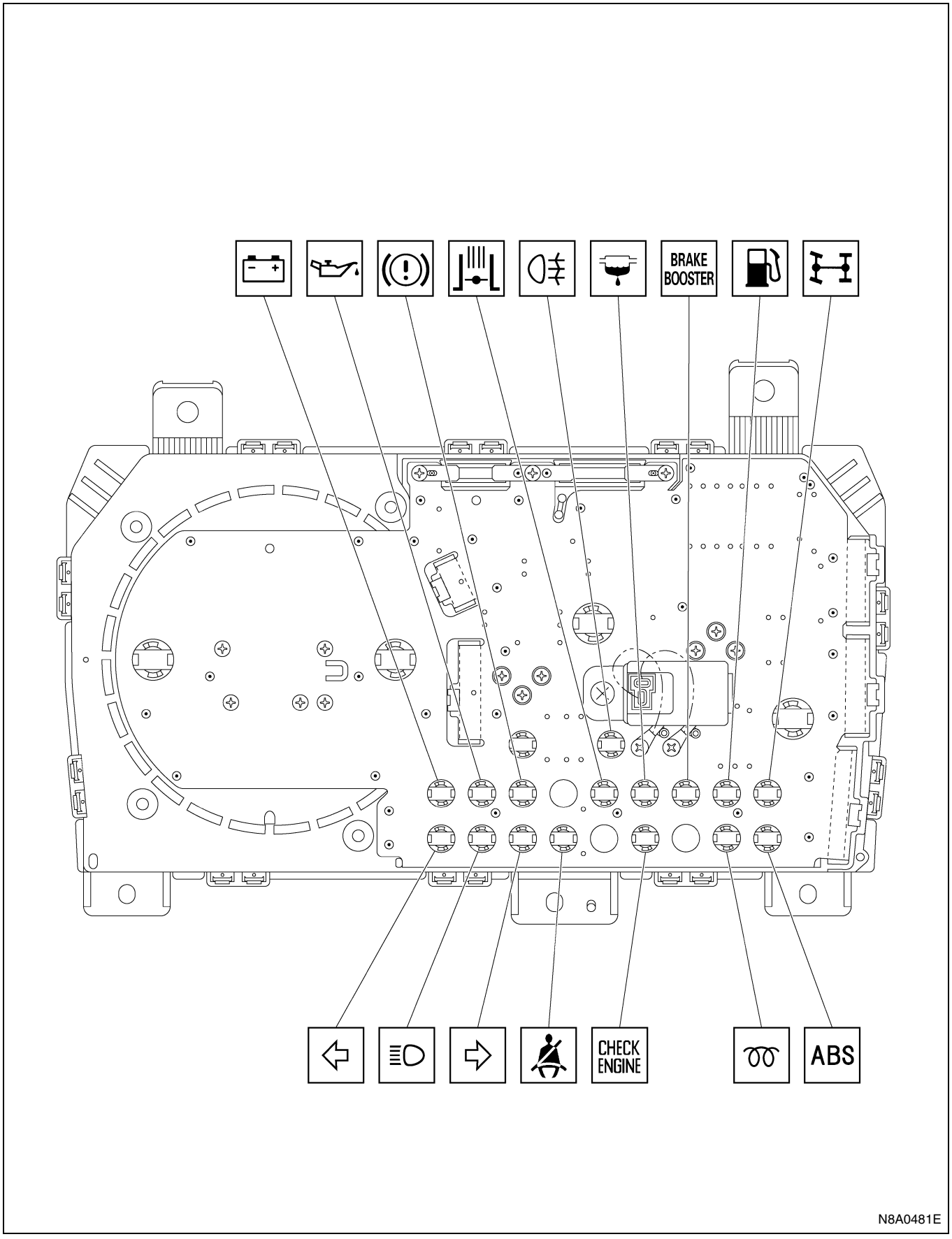


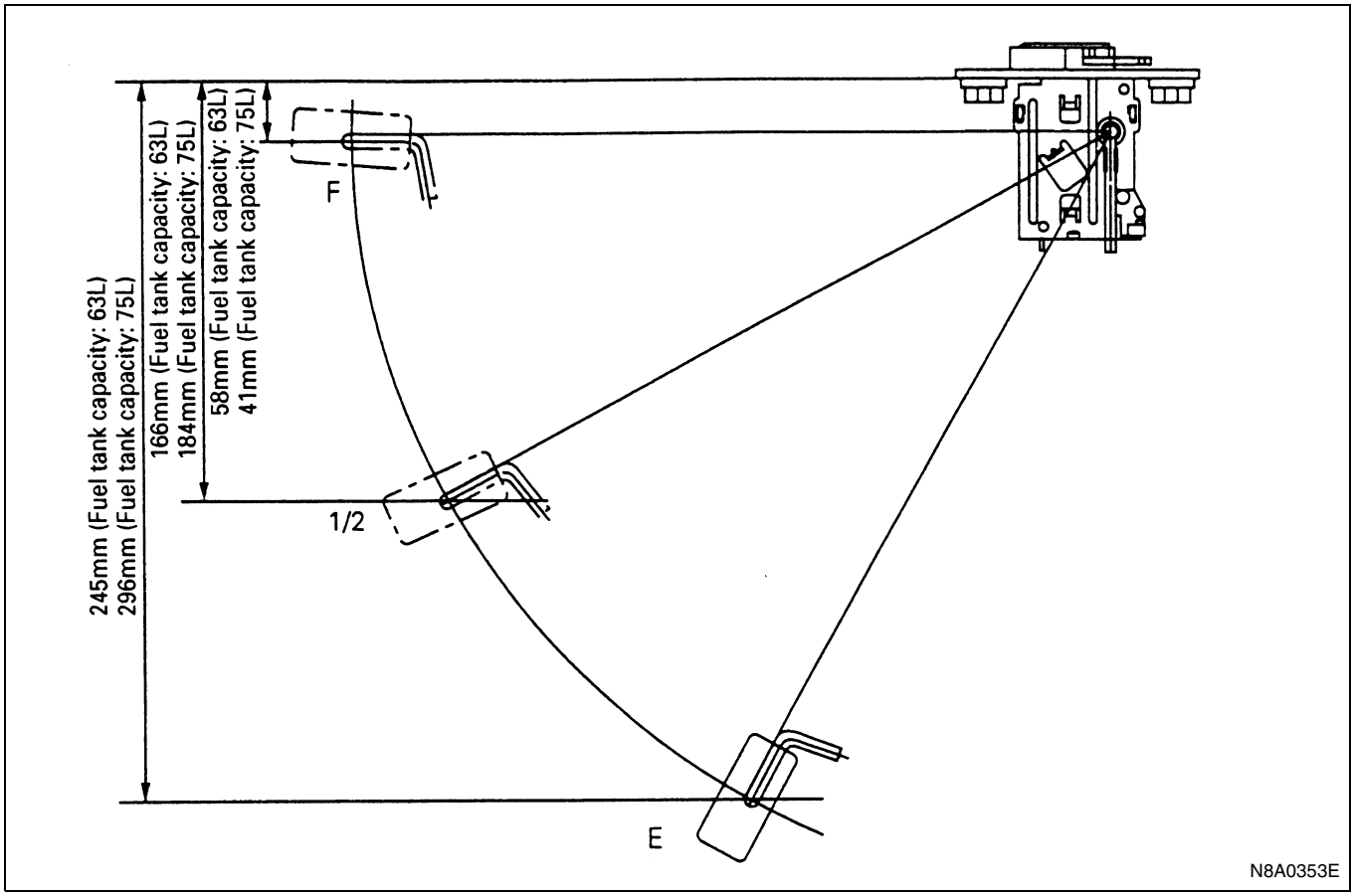

2. Install a speedometer tester.
3. Turn on the starter SW.
4. Check the waveform at the time when the vehicle speed is at 60 Km (37 mph).

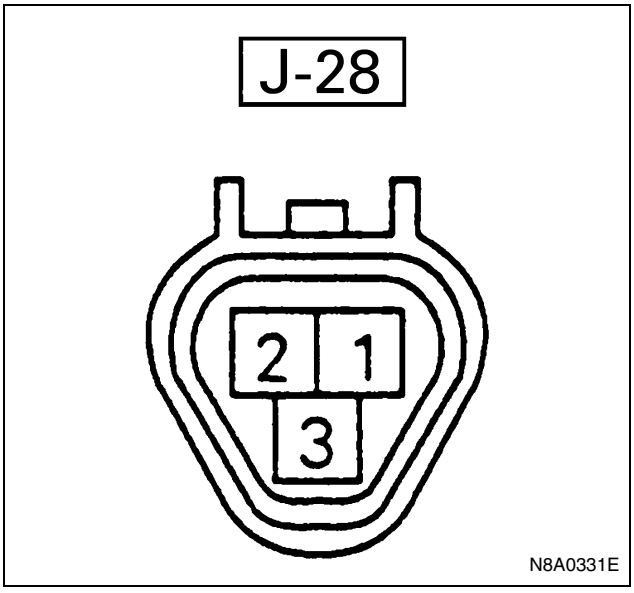


## Bulb Location for Warning Lens

**Except 4HK1-TC**





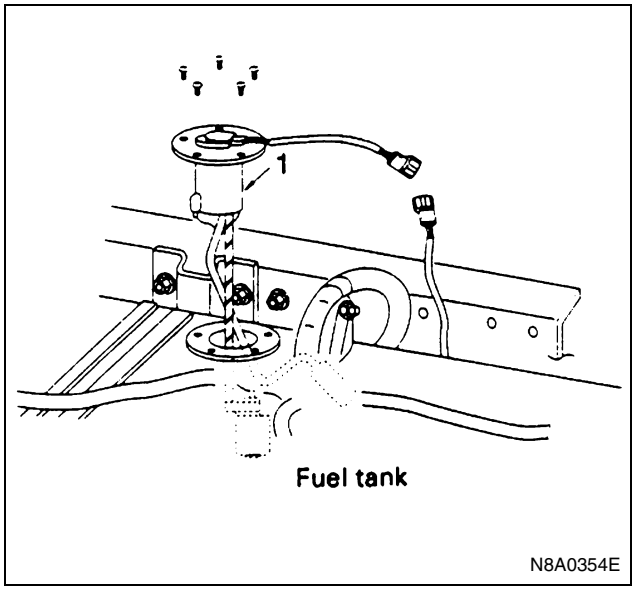

| Float position | Resistance value (Ω) |
|---|---|
| F | 3±2.1 |
| 1/2 | 32.5±4.8 |
| E | 110±7.7 |

**Removal**

**Preparation:**

Disconnect the battery ground cable.

1. Fuel Tank Unit
   1) Disconnect the connector.
   2) Remove five screws.




**Installation**

To install, follow the removal steps in the reverse order.

## Engine Speed Sensor

**Inspection**

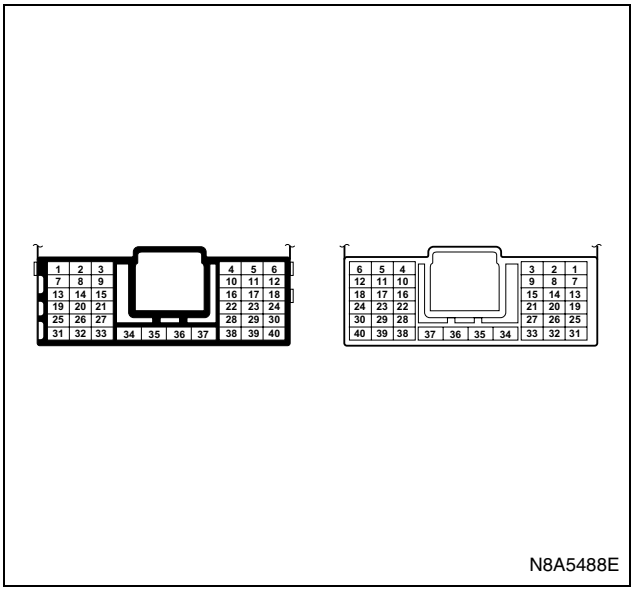
Measure the resistance value between the engine speed sensor connector terminals.

Replace the engine speed sensor when the result of inspection is found abnormal.

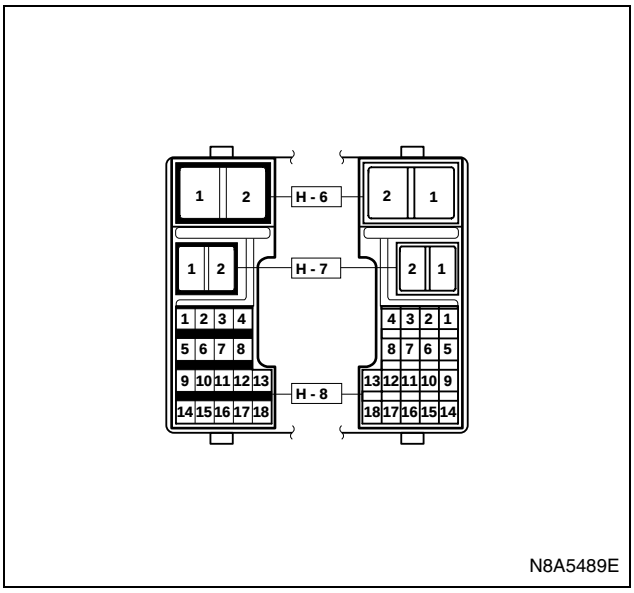
4J Series engine = 1.36 — 1.86 KΩ

4H Series engine = 0.57 — 0.86 KΩ

**H-5**




**H-6**




## Fuel Heater and Rear Heater

### General Description

The circuit consists of fuel heater, rear heater, rear heater switch and the exhaust brake relay.
The fuel heater circuit is always in “ON” position when the generator is charging and its temperature is automatically controlled by the circuit breaker built in the fuel heater.