# AUTOMATIC TRANSMISSION

# SECTION AT

# CONTENTS

# CONTENTS (Cont'd)



**When you read wiring diagrams:**
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

**When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".**

# Alphabetical & P No. Index for DTC

## ALPHABETICAL INDEX FOR DTC

| Items (CONSULT screen terms) | DTC | | Reference page |
|---|---|---|---|
| | ECM*1 | CONSULT GST*2 | |
| A/T 1ST GR FNCTN | 1103 | P0731 | AT-92 |
| A/T 2ND GR FNCTN | 1104 | P0732 | AT-97 |
| A/T 3RD GR FNCTN | 1105 | P0733 | AT-101 |
| A/T 4TH GR FNCTN | 1106 | P0734 | AT-105 |
| A/T TCC S/V FNCTN | 1107 | P0744 | AT-117 |
| ENGINE SPEED SIG*4 | 1207 | P0725 | AT-89 |
| ATF TEMP SEN/CIRC | 1208 | P0710 | AT-82 |
| INHIBITOR CIRC | 1101 | P0705 | AT-78 |
| L/PRESS SOL/CIRC | 1205 | P0745 | AT-124 |
| O/R CLTCH SOL/CIRC | 1203 | P1760 | AT-142 |
| SFT SOL A/CIRC*3 | 1108 | P0750 | AT-128 |
| SFT SOL B/CIRC*3 | 1201 | P0755 | AT-132 |
| TP SEN/CIRC A/T*3 | 1206 | P1705 | AT-136 |
| TCC SOLENOID/CIRC | 1204 | P0740 | AT-113 |
| VEH SPD SEN/CIR AT*4 | 1102 | P0720 | AT-86 |

*1: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: When the fail-safe operation occurs, the MIL illuminates.
*4: The MIL illuminates after TCM enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.

## P NO. INDEX FOR DTC

| DTC | | Items (CONSULT screen terms) | Reference page |
|---|---|---|---|
| CONSULT GST*2 | ECM*1 | | |
| P0705 | 1101 | INHIBITOR SW/CIRC | AT-78 |
| P0710 | 1208 | ATF TEMP SEN/CIRC | AT-82 |
| P0720 | 1102 | VEH SPD SEN/CIR AT*4 | AT-86 |
| P0725 | 1207 | ENGINE SPEED SIG*4 | AT-89 |
| P0731 | 1103 | A/T 1ST GR FNCTN | AT-92 |
| P0732 | 1104 | A/T 2ND GR FNCTN | AT-97 |
| P0733 | 1105 | A/T 3RD GR FNCTN | AT-101 |
| P0734 | 1106 | A/T 4TH GR FNCTN | AT-105 |
| P0740 | 1204 | TCC SOLENOID/CIRC | AT-113 |
| P0744 | 1107 | A/T TCC S/V FNCTN | AT-117 |
| P0745 | 1205 | L/PRESS SOL/CIRC | AT-124 |
| P0750 | 1108 | SFT SOL A/CIRC*3 | AT-128 |
| P0755 | 1201 | SFT SOL B/CIRC*3 | AT-132 |
| P1705 | 1206 | TP SEN/CIRC A/T*3 | AT-136 |
| P1760 | 1203 | O/R CLTCH SOL/CIRC | AT-142 |

## Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "AIR BAG" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (which is one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (which is one of components of supplemental air bags for a frontal collision). Information necessary to service the system safely is included in the **RS section** of this Service Manual.

**WARNING:**

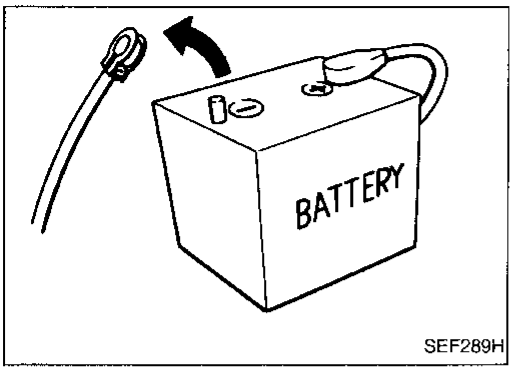
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (except "Seat Belt Pre-tensioner" connector) can be identified with yellow harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).**

## Precautions for On Board Diagnostic (OBD) System of A/T and Engine

The ECM (ECCS control module) has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

**CAUTION:**

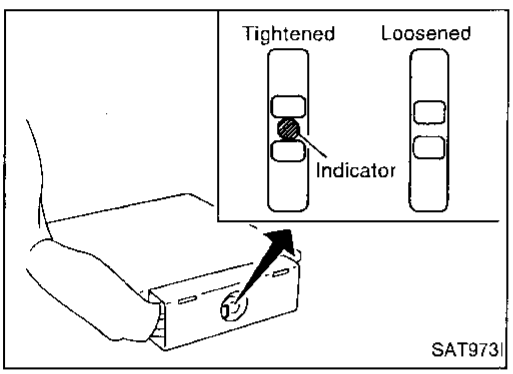
- **Be sure to turn the ignition switch OFF and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to an open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Be sure to route and secure the harnesses properly after work. Interference of the harness with a bracket, etc. may cause the MIL to light up due to a short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to a malfunction of the EGR system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the TCM and ECM before returning the vehicle to the customer.**



SEF289H

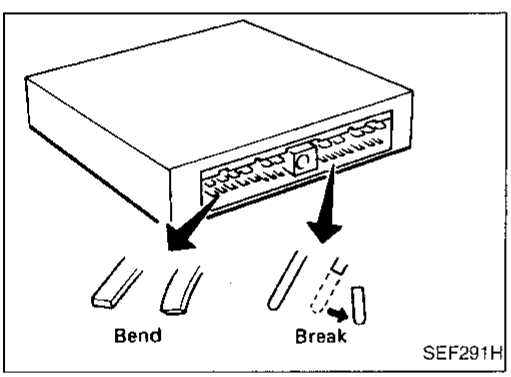
## Precautions

- Before connecting or disconnecting the TCM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the TCM. Because battery voltage is applied to TCM even if ignition switch is turned off.



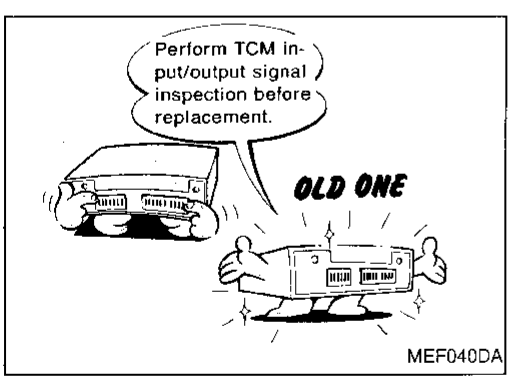
SAT973I

- When connecting TCM harness connector, tighten securing bolt until the orange indicator appears.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



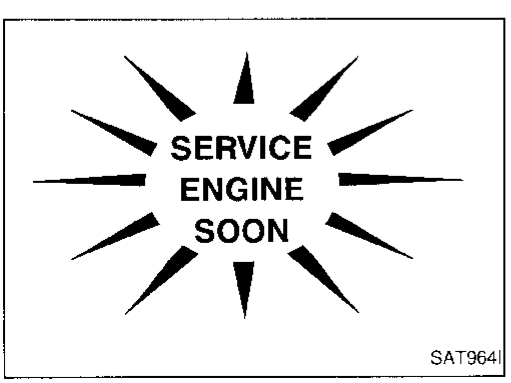
SEF291H

- When connecting or disconnecting pin connectors into or from TCM, take care not to damage pin terminals (bend or break).
  Make sure that there are not any bends or breaks on TCM pin terminal, when connecting pin connectors.



MEF040DA

- Before replacing TCM, perform TCM input/output signal inspection and make sure whether TCM functions properly or not. (See page AT-74.)



SAT964I

- After performing each TROUBLE DIAGNOSIS, perform "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed.

## Precautions (Cont'd)

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place disassembled valve body parts in order for easier and proper assembly. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along bores in valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Apply petroleum jelly to protect O-rings and seals, or hold bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer. Refer to "ATF COOLER SERVICE" (Refer to AT-6).
- After overhaul, refill the transmission with new ATF.
- When the A/T drain plug is removed, only some of the fluid is drained. Old A/T fluid will remain in torque converter and ATF cooling system.
  Always follow the procedures under "Changing A/T Fluid" in the MA section when changing A/T fluid.

## Service Notice or Precautions

### FAIL-SAFE

The TCM has an electronic Fail-Safe (limp home mode). This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged.
Under Fail-Safe, the vehicle always runs in third gear, even with a shift lever position of "1", "2" or "D". The customer may complain of sluggish or poor acceleration.
When the ignition key is turned "ON" following Fail-Safe operation, O/D OFF indicator lamp blinks for about 8 seconds. (For "TCM SELF-DIAGNOSTIC PROCEDURE (No Tools)", refer to AT-47.)
Fail-Safe may occur without electrical circuit damage if the vehicle is driven under extreme conditions (such as excessive wheel spin followed by sudden braking). To recover normal shift pattern, turn the ignition key "OFF" for 5 seconds, then "ON".
The blinking of the O/D OFF indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions.
Always follow the "Work Flow" (Refer to AT-55).
The SELF-DIAGNOSIS results will be as follows:

The first SELF-DIAGNOSIS will indicate damage to the vehicle speed sensor or the revolution sensor.
During the next SELF-DIAGNOSIS, performed after checking the sensor, no damages will be indicated.

### TORQUE CONVERTER SERVICE

The torque converter should be replaced under any of the following conditions:

- External leaks in the hub weld area.
- Converter hub is scored or damaged.
- Converter pilot is broken, damaged or fits poorly into crankshaft.
- Steel particles are found after flushing the cooler and cooler lines.
- Pump is damaged or steel particles are found in the converter.
- Vehicle has TCC shudder and/or no TCC apply. Replace only after all hydraulic and electrical diagnoses have been made. (Converter clutch material may be glazed.)
- Converter is contaminated with engine coolant containing antifreeze.
- Internal failure of stator roller clutch.
- Heavy clutch debris due to overheating (blue converter).
- Steel particles or clutch lining material found in fluid filter or on magnet when no internal parts in unit are worn or damaged — indicates that lining material came from converter.

The torque converter should not be replaced if:

- The oil has an odor, is discolored, and there is no evidence of metal or clutch facing particles.
- The threads in one or more of the converter bolt holes are damaged.

## Service Notice or Precautions (Cont'd)

- Transaxle failure did not display evidence of damaged or worn internal parts, steel particles or clutch plate lining material in unit and inside the fluid filter.
- Vehicle has been exposed to high mileage (only). The exception may be where the torque converter clutch dampener plate lining has seen excess wear by vehicles operated in heavy and/or constant traffic, such as taxi, delivery or police use.

### ATF COOLER SERVICE

Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer.

Replace radiator lower tank (which includes ATF cooler) with a new one and flush cooler line using cleaning solvent and compressed air.

### OBD-II SELF-DIAGNOSIS

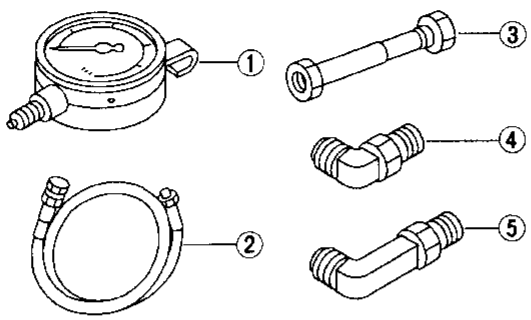
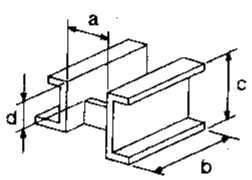
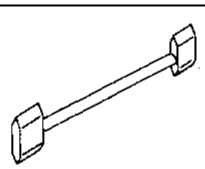
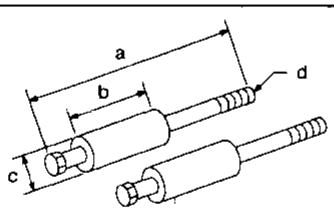
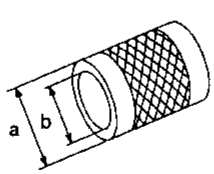
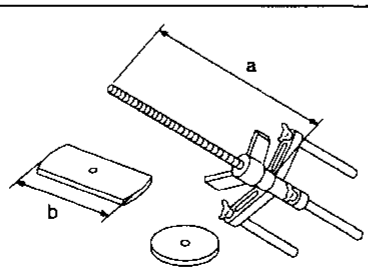
- A/T self-diagnosis is performed by the TCM in combination with the ECM. The results can be read through the blinking pattern of the O/D OFF indicator or the malfunction indicator lamp (MIL). Refer to the table on AT-41 for the indicator used to display each self-diagnostic result.
- The self-diagnostic results indicated by the MIL are automatically stored in both the ECM and TCM memories.

  **Always perform the procedure "HOW TO ERASE DTC" on AT-38 to complete the repair and avoid unnecessary blinking of the MIL.**
- The following self-diagnostic items can be detected using ECM self-diagnostic results mode* only when the O/D OFF indicator lamp does not indicate any malfunctions.
  –Inhibitor switch
  –A/T 1st, 2nd, 3rd, or 4th gear function
  –A/T TCC S/V function (lock-up).

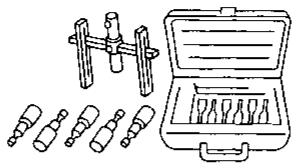
*: For details of OBD-II, refer to EC section ("ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").

## Special Service Tools

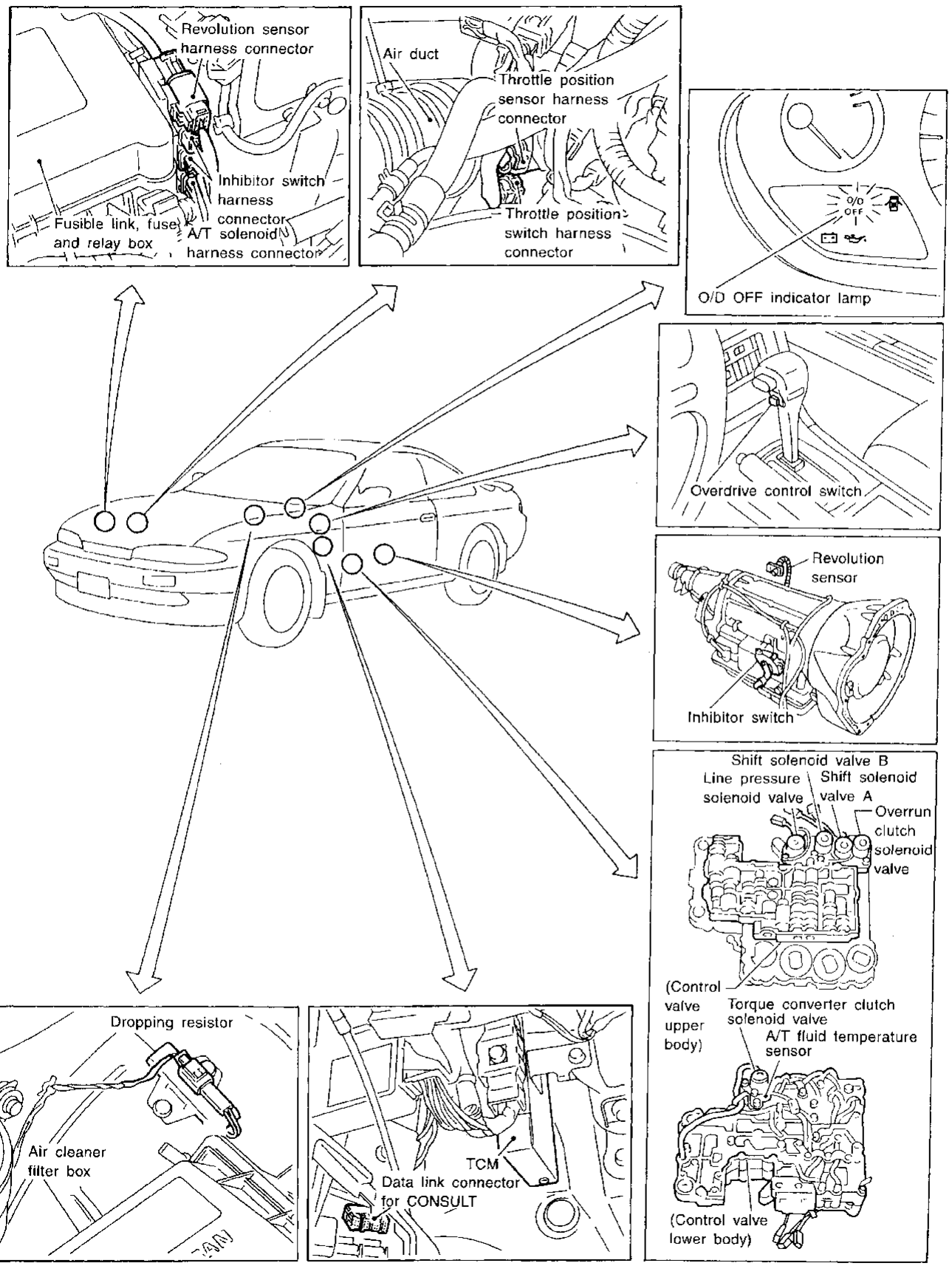
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number (Kent-Moore No.) Tool name | Description | |
|---|---|---|
| ST2505S001 (J34301-C) Oil pressure gauge set ① ST25051001 ( — ) Oil pressure gauge ② ST25052000 ( — ) Hose ③ ST25053000 ( — ) Joint pipe ④ ST25054000 ( — ) Adapter ⑤ ST25055000 ( — ) Adapter |  NT097 | Measuring line pressure |
| ST07870000 (J37068) Transmission case stand |  NT421 | Disassembling and assembling A/T **a: 182 mm (7.17 in) b: 282 mm (11.10 in) c: 230 mm (9.06 in) d: 100 mm (3.94 in)** |
| KV31102100 (J37065) Torque converter one-way clutch check tool |  NT098 | Checking one-way clutch in torque converter |
| ST25850000 (J25721-A) Sliding hammer |  NT422 | Removing oil pump assembly **a: 179 mm (7.05 in) b: 70 mm (2.76 in) c: 40 mm (1.57 in) dia. d: M12 x 1.75P** |
| ST33200000 (J26082) Drift |  NT091 | Installing oil pump housing oil seal Installing rear oil seal **a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.** |
| KV31102400 (J34285 and J34285-87) Clutch spring compressor |  NT423 | Removing and installing clutch return springs **a: 320 mm (12.60 in) b: 174 mm (6.85 in)** |

## Special Service Tools (Cont'd)

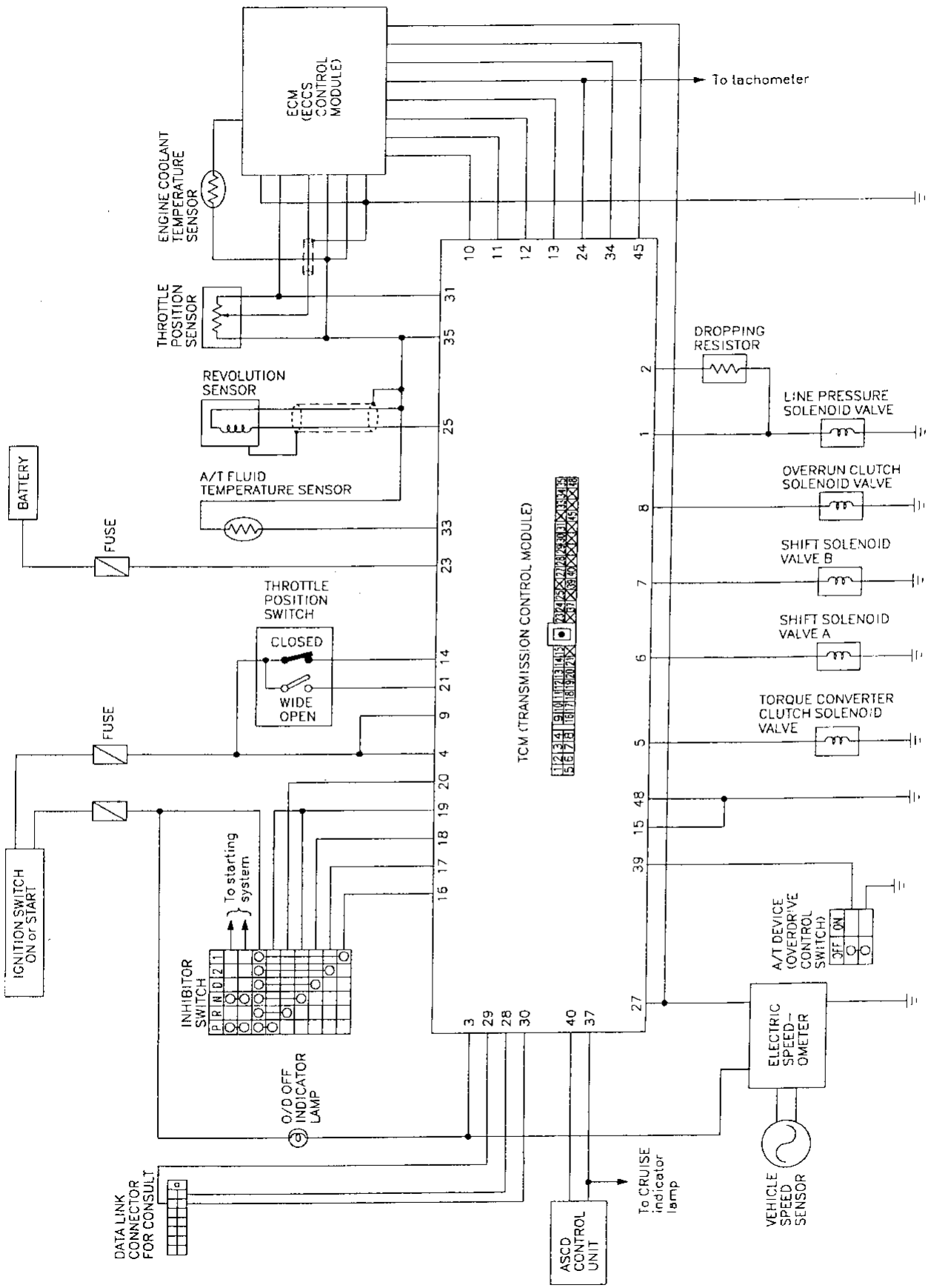
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description | |
|---|---|---|
| (J34291)<br>Shim setting gauge set |  <br>NT101 | Selecting oil pump cover bearing race and oil pump thrust washer |

## A/T Electrical Parts Location



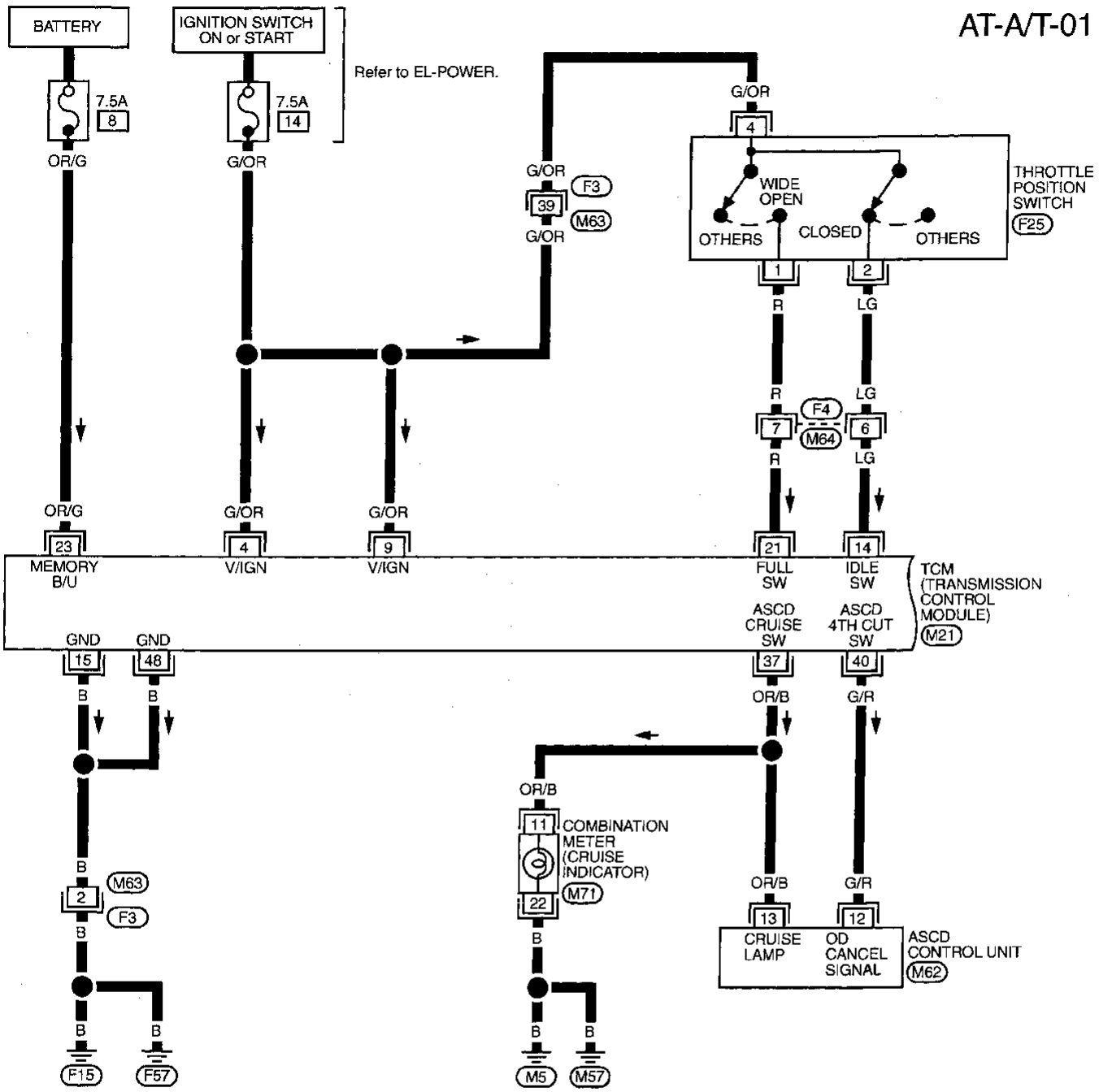

SAT205J

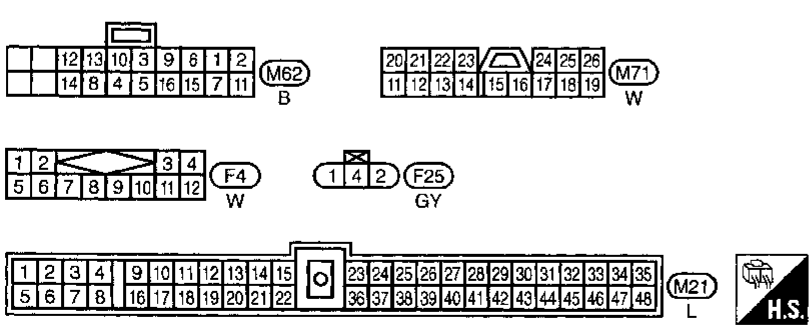
## Circuit Diagram




MAT639A

## Wiring Diagram

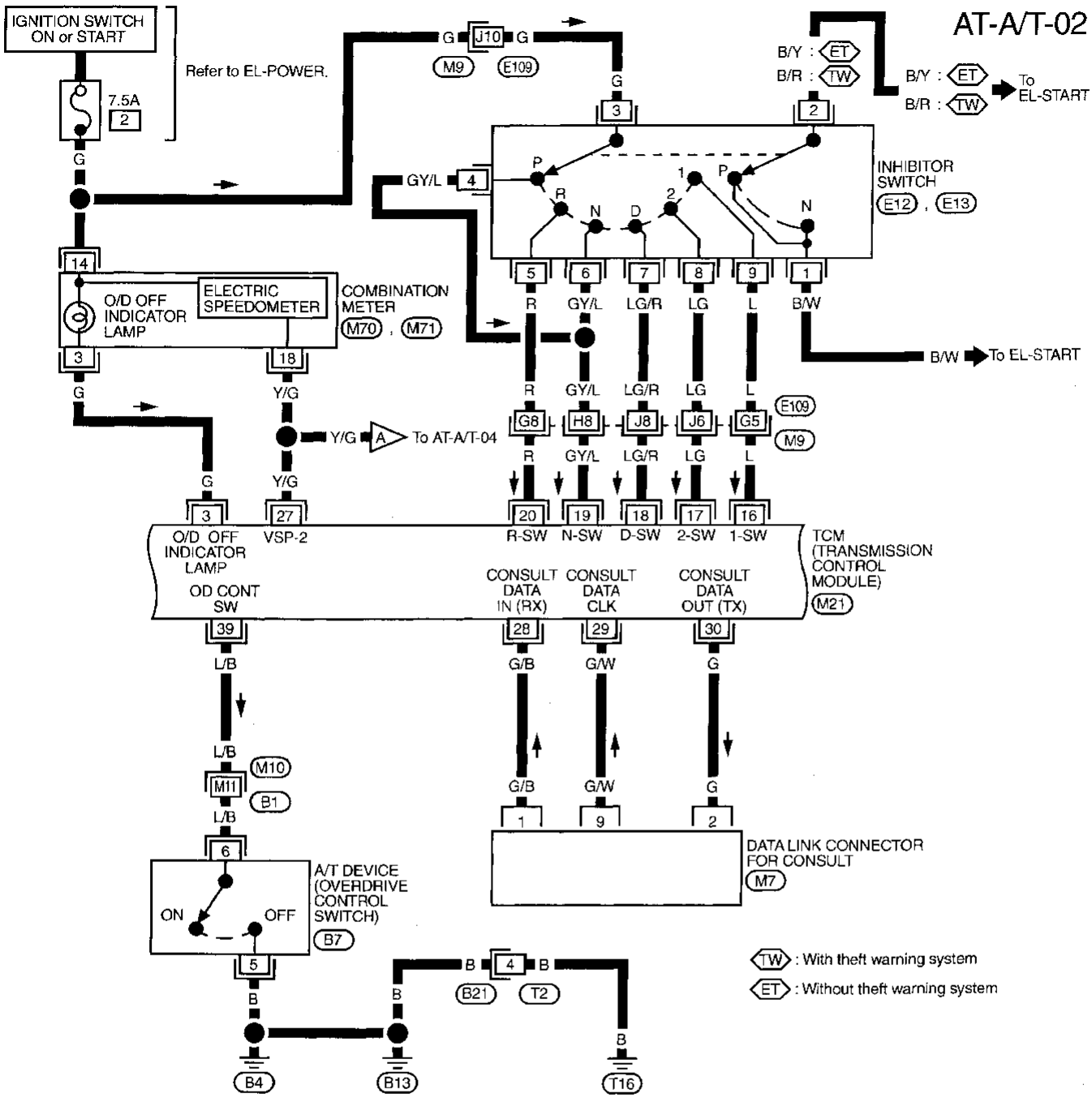


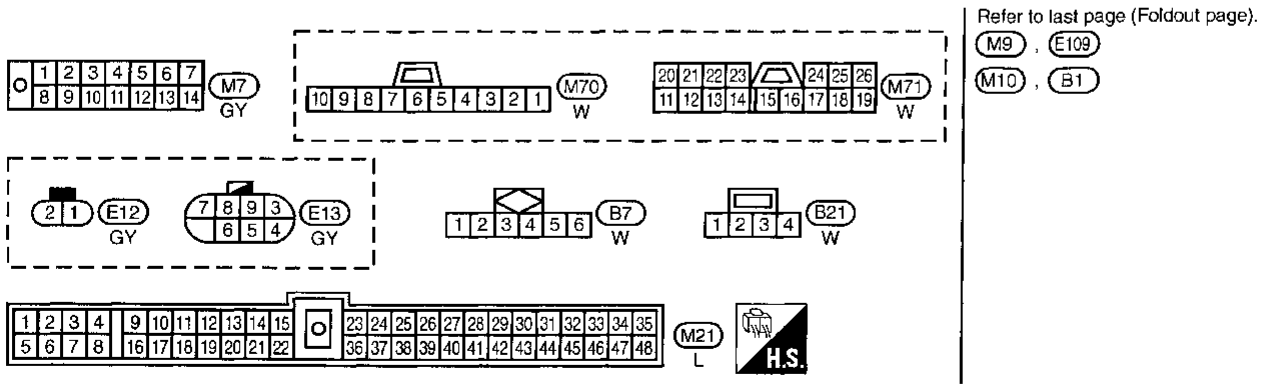




Refer to last page (Foldout page).
F3 , M63

MAT640A

## Wiring Diagram (Cont'd)



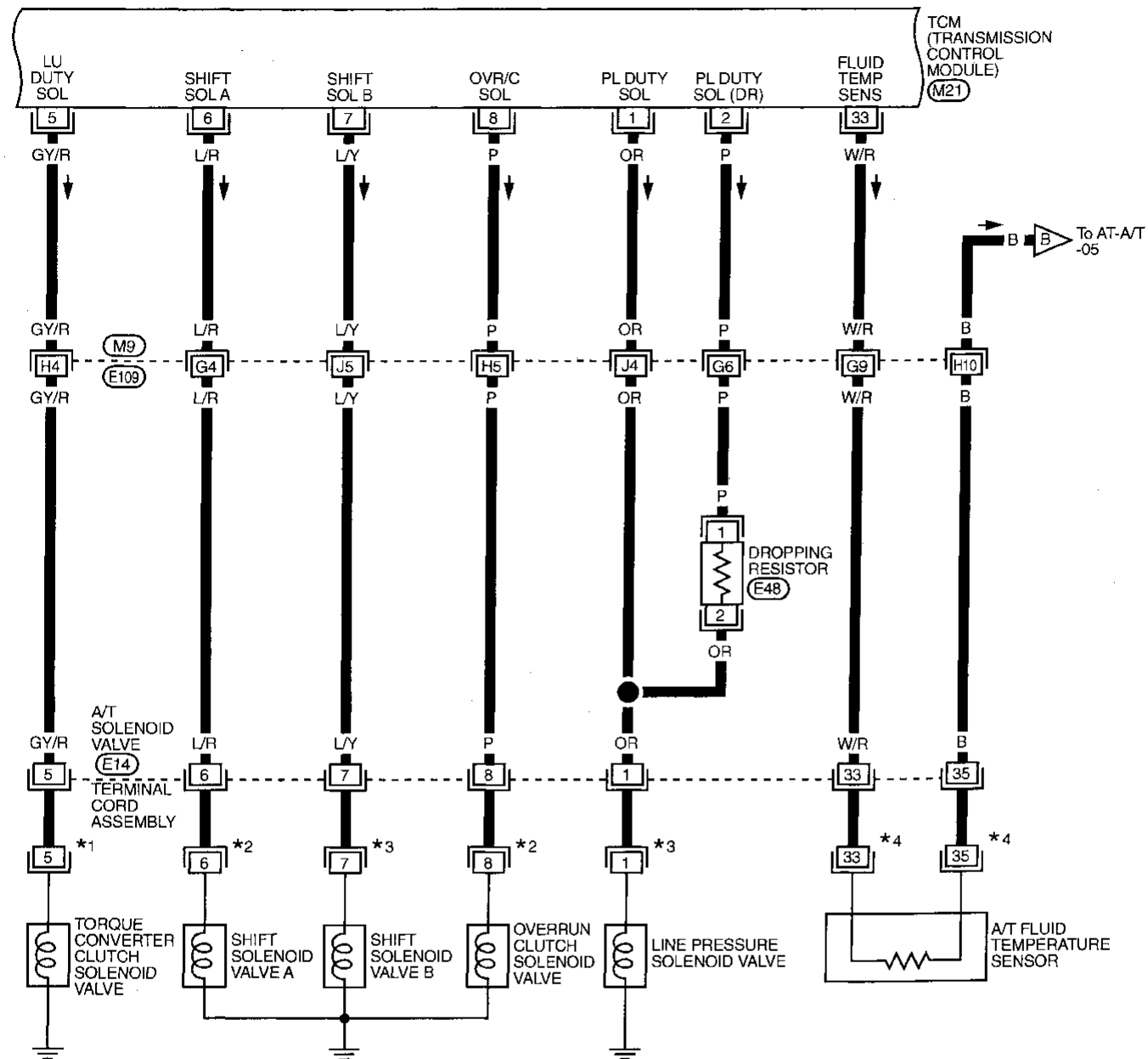



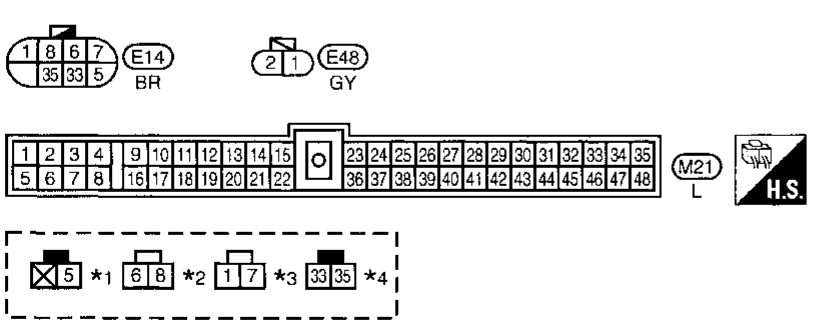

Refer to last page (Foldout page).
M9 , E109
M10 , B1

MAT641A

## Wiring Diagram (Cont'd)

AT-A/T-03



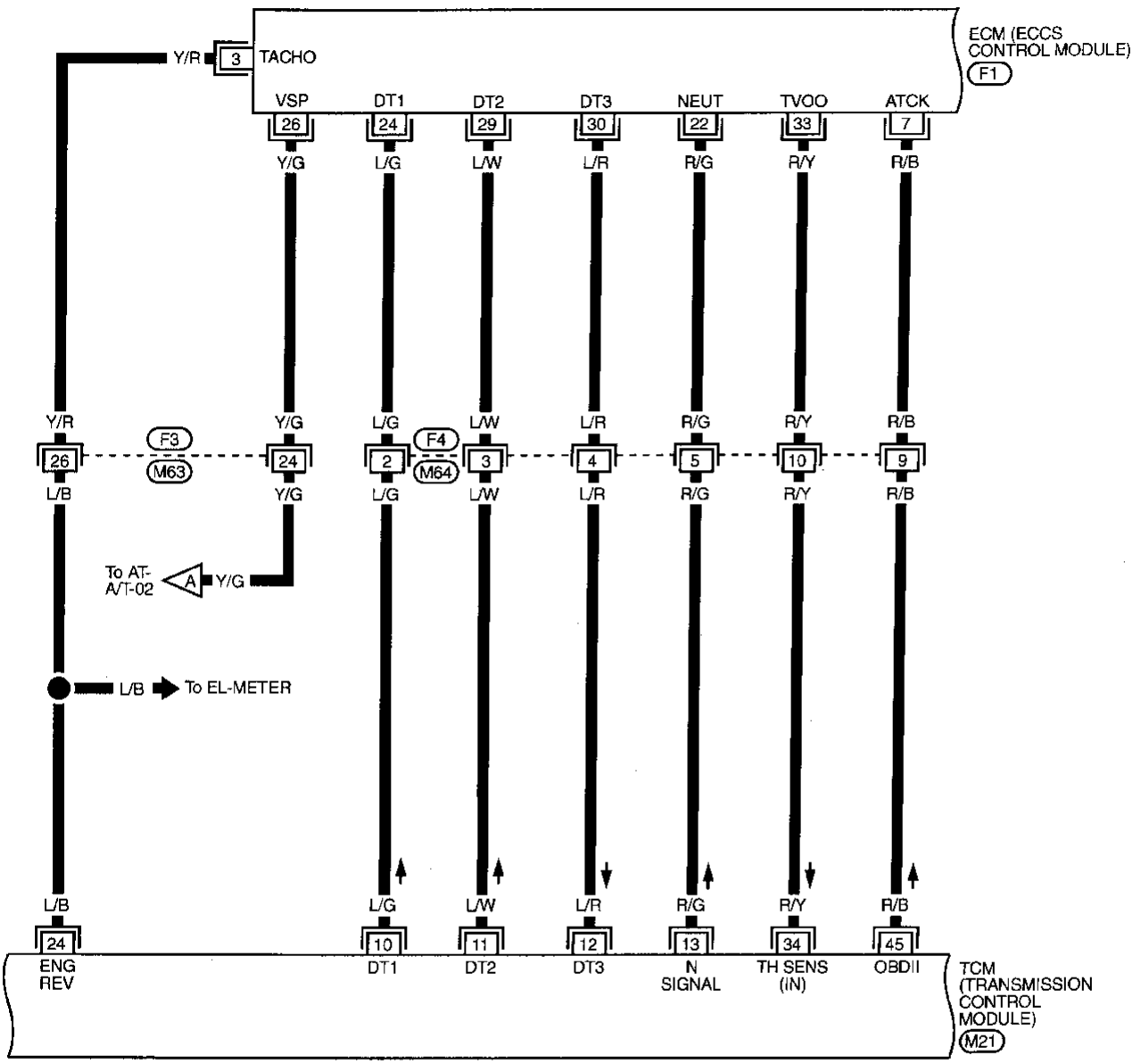

Refer to last page (Foldout page).
M9 , E109

★ : This connector is not shown in "HARNESS LAYOUT", EL section.

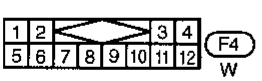
MAT642A

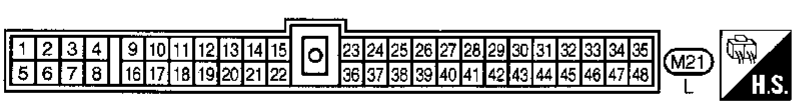
## Wiring Diagram (Cont'd)

AT-A/T-04




Refer to last page (Foldout page).
M63 , F3
F1

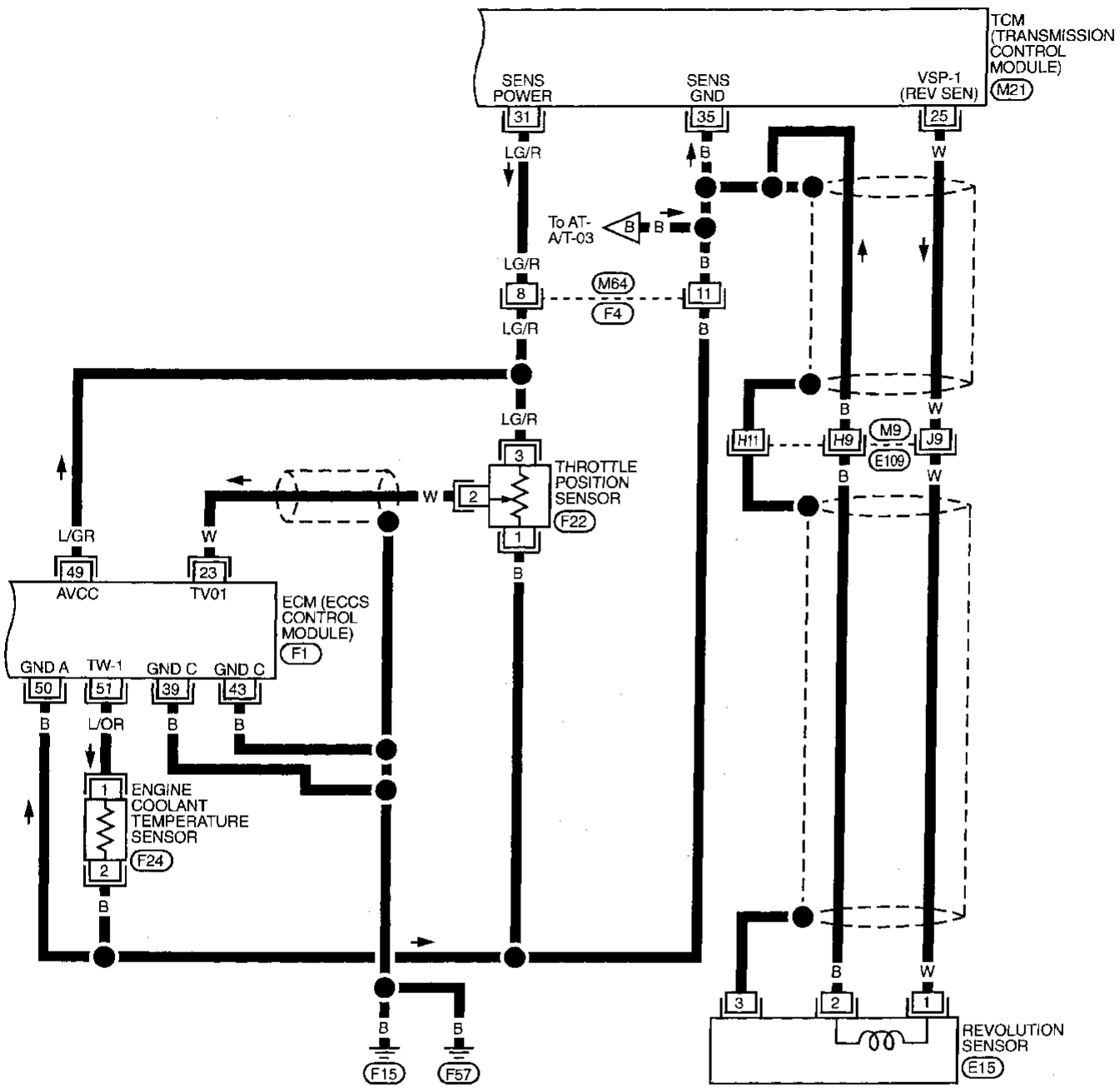


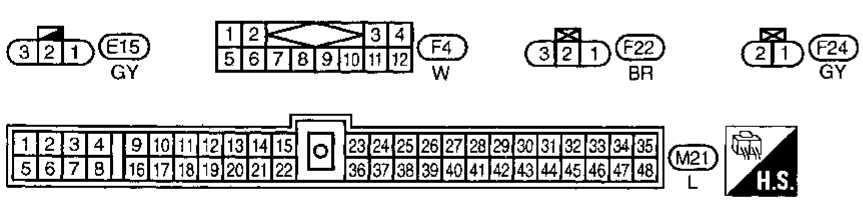




MAT643A

## Wiring Diagram (Cont'd)

AT-A/T-05



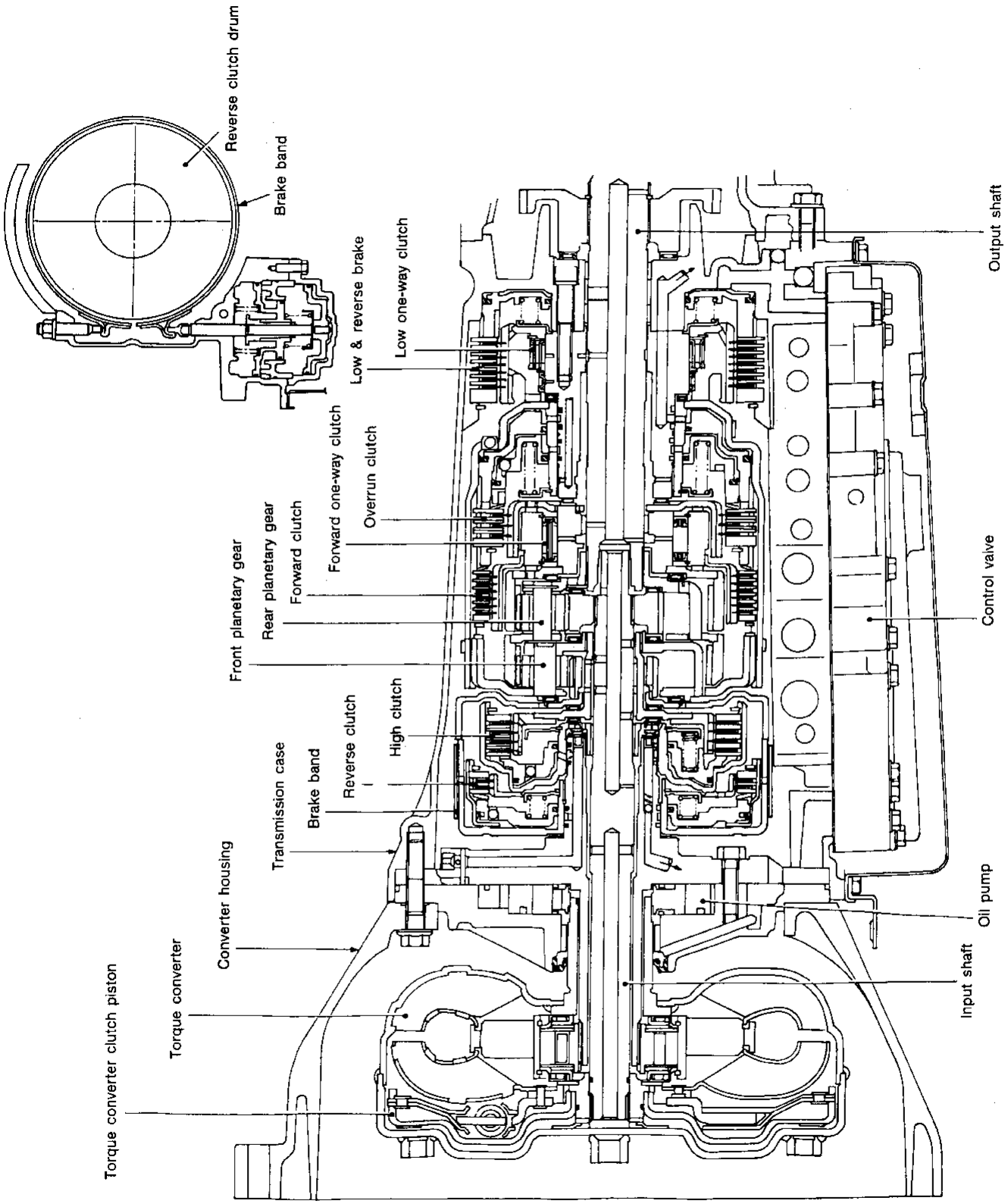




Refer to last page (Foldout page).
M9, E109
F1



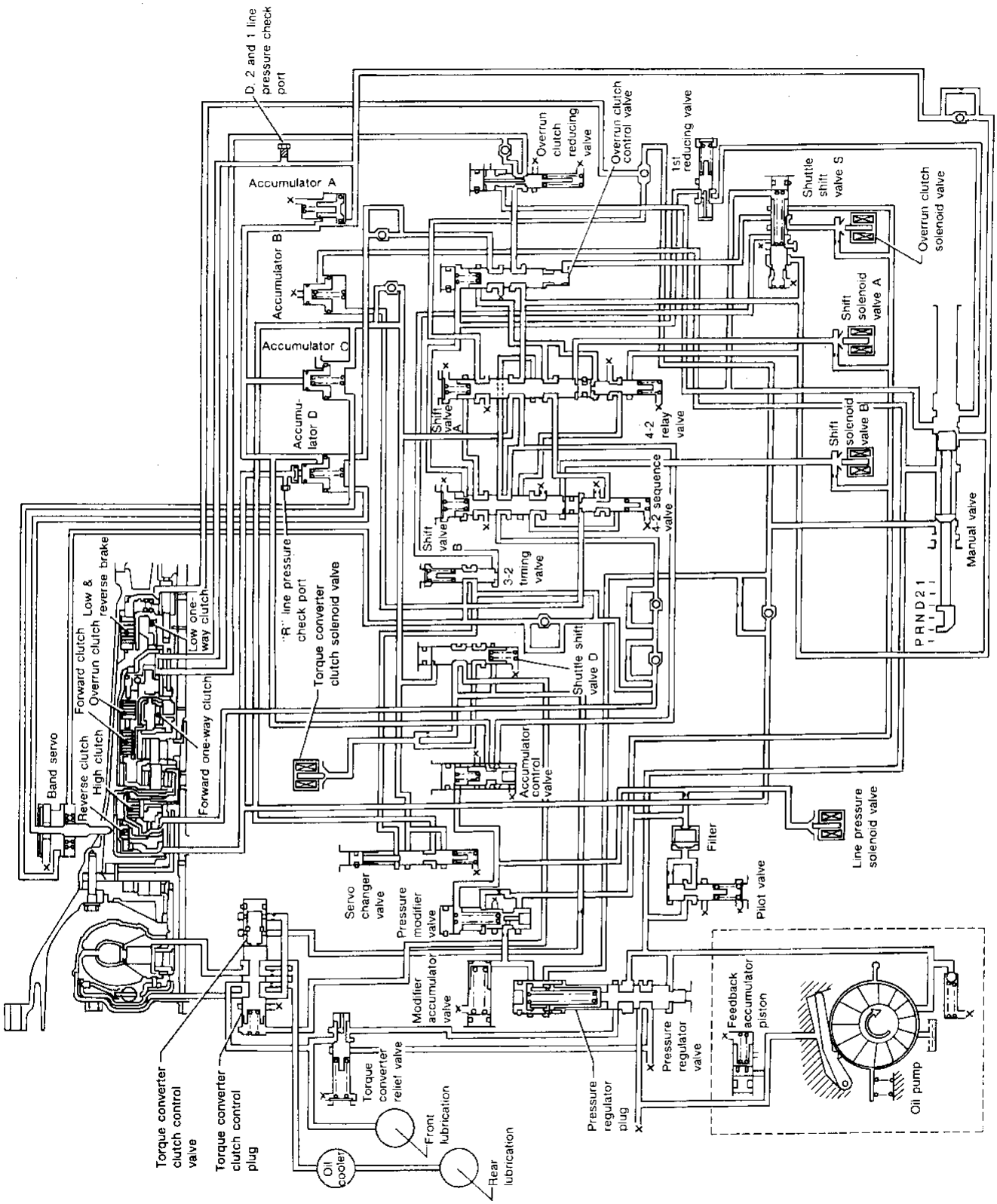
MAT644A

## Cross-sectional View




SAT125BA

## Hydraulic Control Circuits

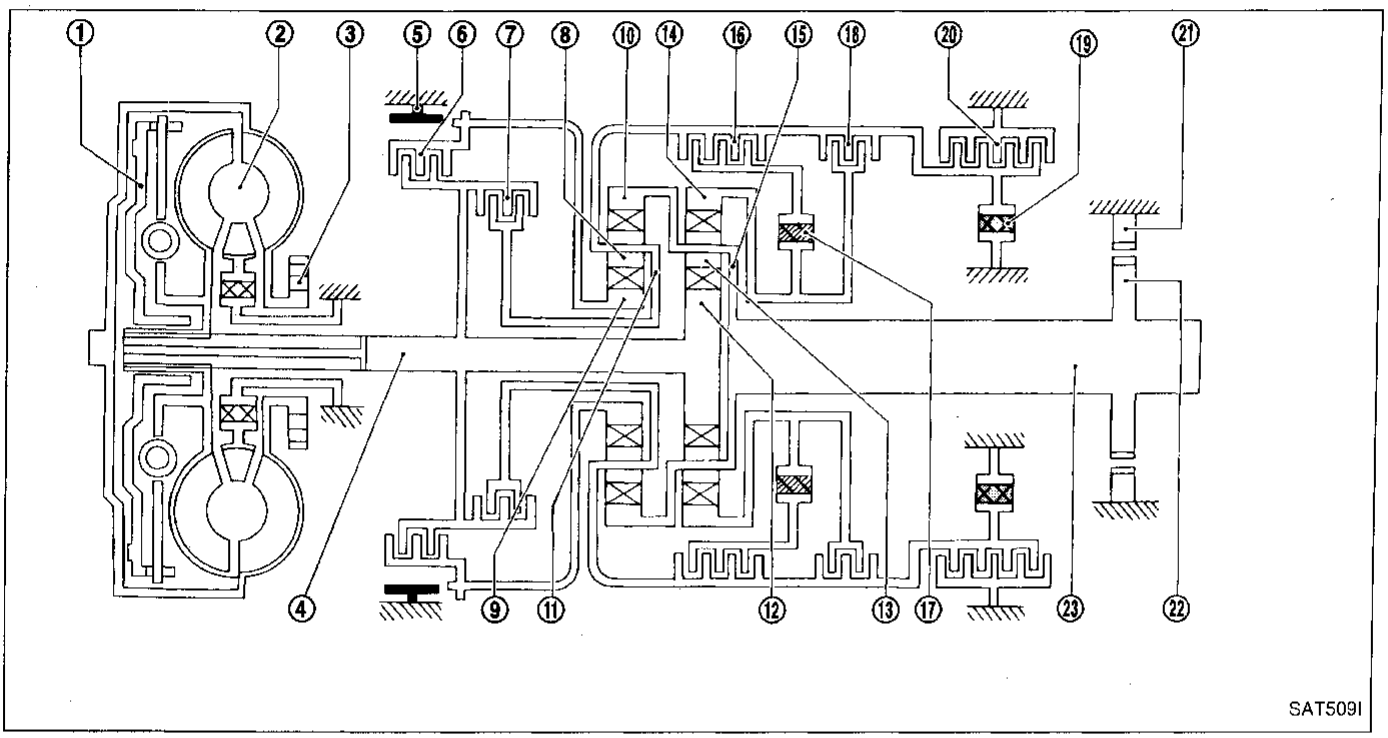



SAT624GA

## Shift Mechanism

The automatic transmission uses compact, dual planetary gear systems to improve power-transmission efficiency, simplify construction and reduce weight.
It also employs an optimum shift control and superwide gear ratios. They improve starting performance and acceleration during medium and high-speed operation.
Two one-way clutches are also employed: one is used for the forward clutch and the other for the low clutch. These one-way clutches, combined with four accumulators, reduce shifting shock to a minimum.

### CONSTRUCTION



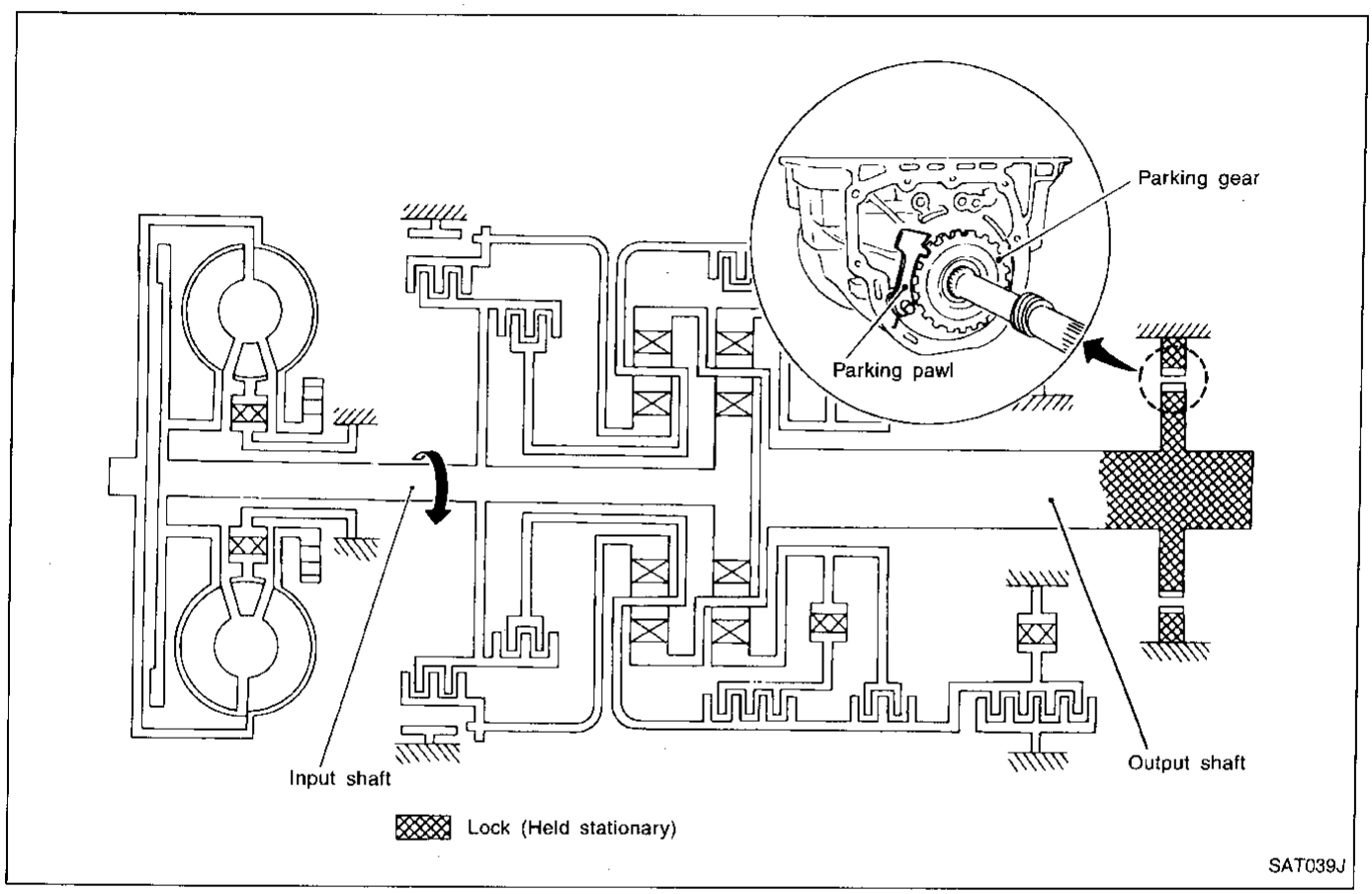

① Torque converter clutch piston
② Torque converter
③ Oil pump
④ Input shaft
⑤ Brake band
⑥ Reverse clutch
⑦ High clutch
⑧ Front pinion gear
⑨ Front sun gear
⑩ Front internal gear
⑪ Front planetary carrier
⑫ Rear sun gear
⑬ Rear pinion gear
⑭ Rear internal gear
⑮ Rear planetary carrier
⑯ Forward clutch
⑰ Forward one-way clutch
⑱ Overrun clutch
⑲ Low one-way clutch
⑳ Low & reverse brake
㉑ Parking pawl
㉒ Parking gear
㉓ Output shaft

## Shift Mechanism (Cont'd)

### POWER TRANSMISSION

#### "N" and "P" positions

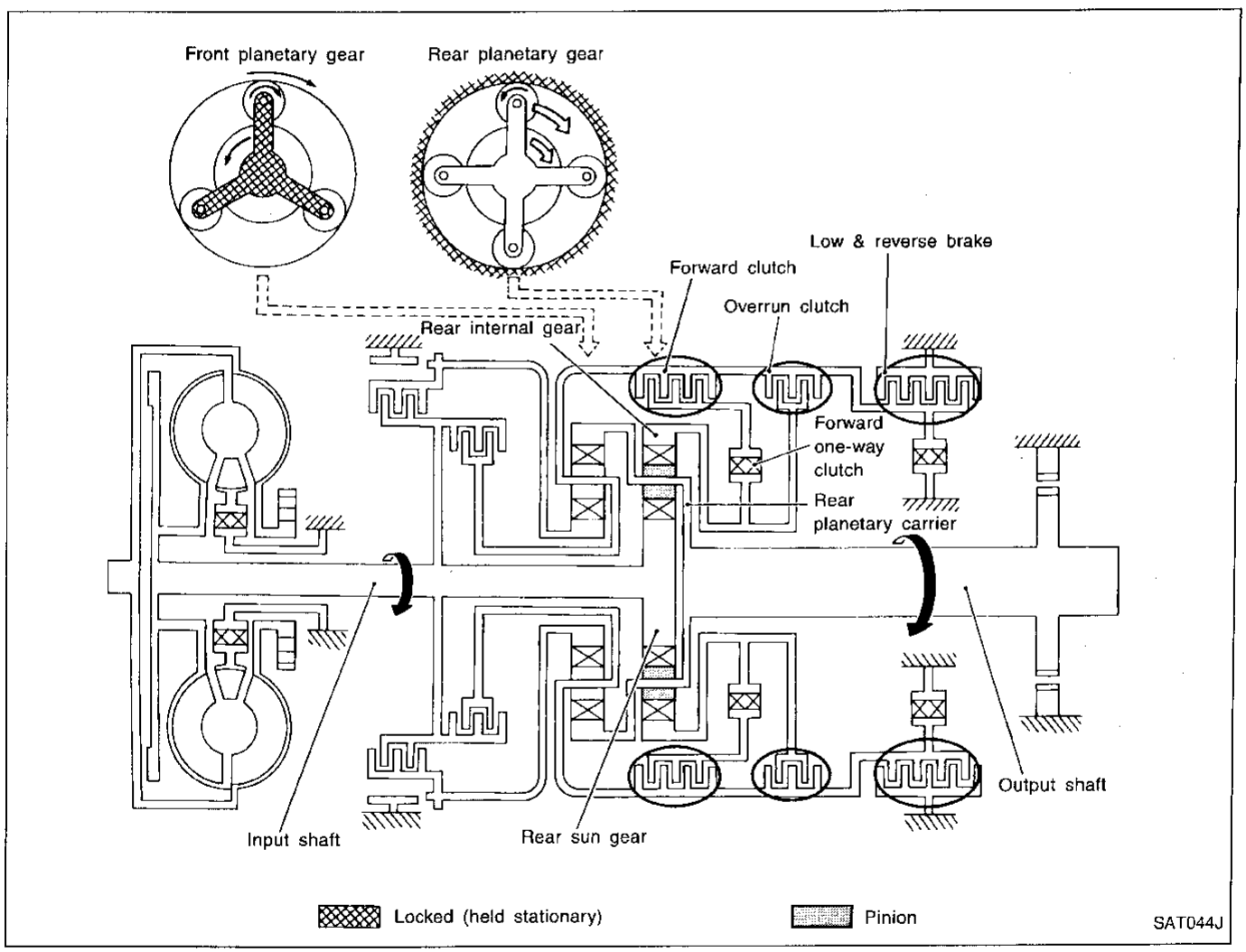
- "N" position
  No control members operate. Power from the input shaft is not transmitted to the output shaft since the clutch does not operate.
- "P" position
  Similar to the "N" position, no control members operate. The parking pawl interconnected with the select lever engages with the parking gear to mechanically hold the output shaft so that the powertrain is locked.



## Shift Mechanism (Cont'd)

### "$1_1$" position

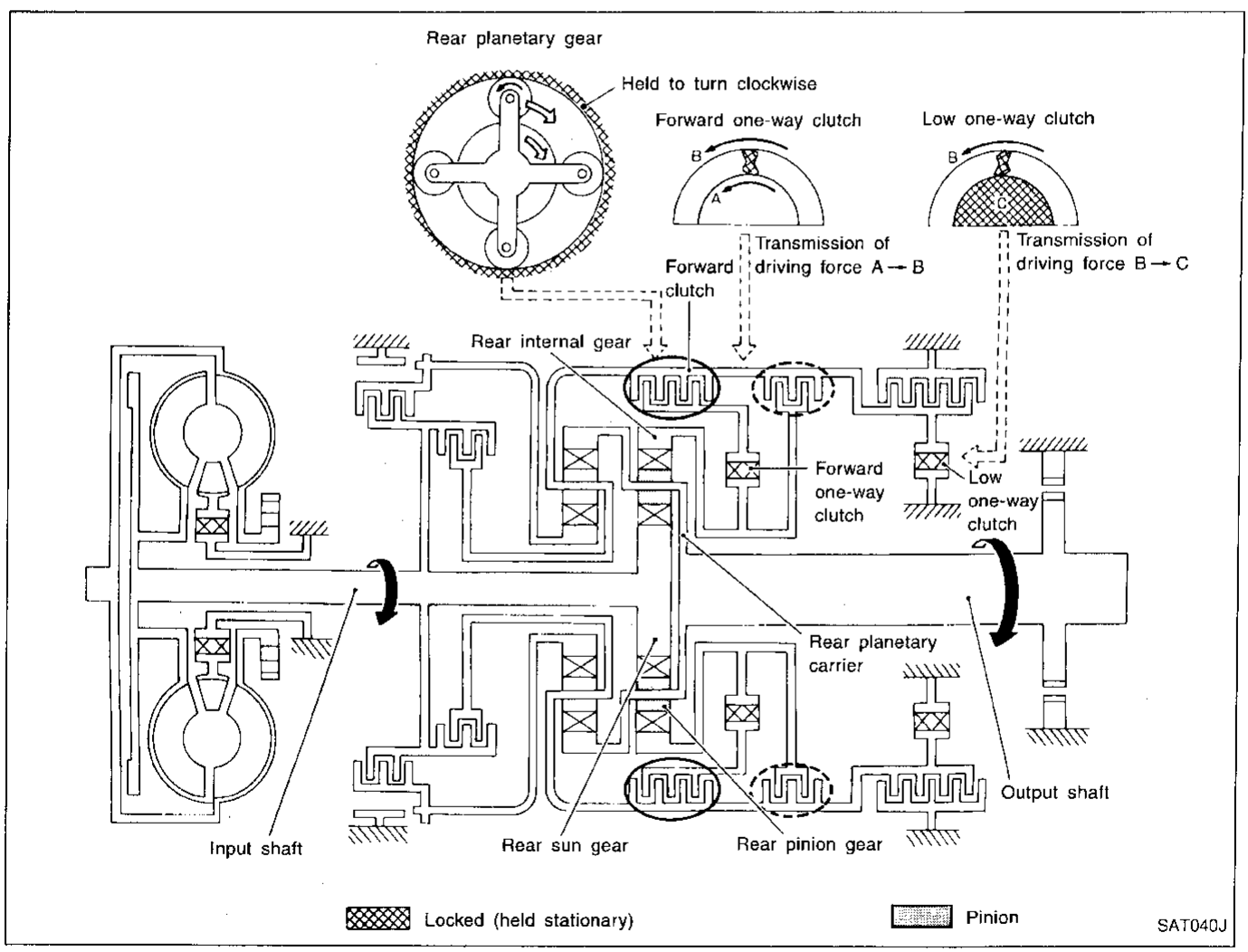
| | |
|---|---|
| **Forward clutch**<br>**Forward one-way clutch**<br>**Overrun clutch**<br>**Low and reverse brake** | As overrun clutch engages, rear internal gear is locked by the operation of low and reverse brake.<br>This is different from that of $D_1$ and $2_1$. |
| Engine brake | Overrun clutch always engages, therefore engine brake can be obtained when decelerating. |
| Power flow | Input shaft<br>↓<br>Rear sun gear<br>↓<br>Rear planetary gear → Output shaft |



## Shift Mechanism (Cont'd)

### "$D_1$" and "$2_1$" positions

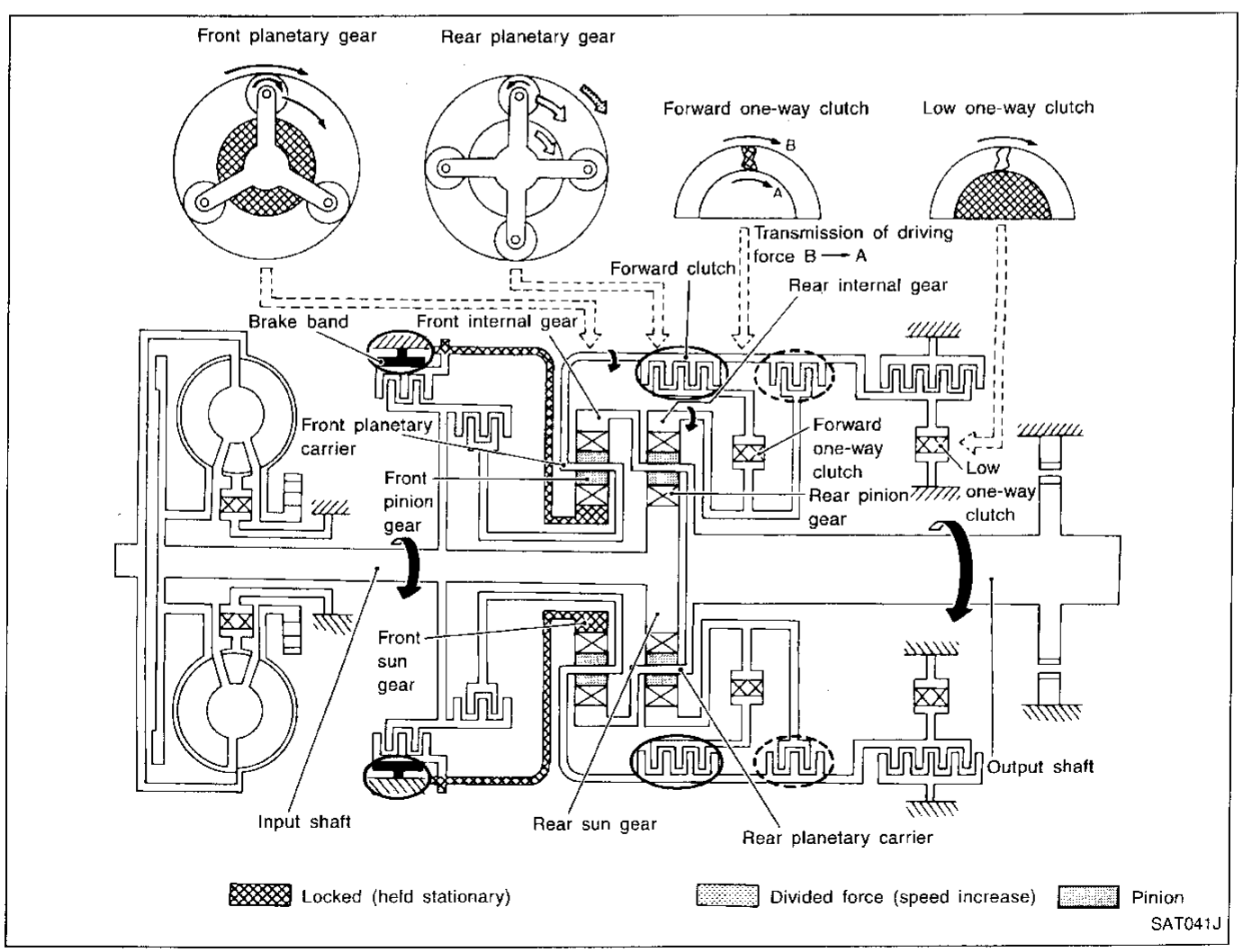
| | |
|---|---|
| **Forward one-way clutch**<br>**Forward clutch**<br>**Low one-way clutch** | Rear internal gear is locked to rotate counterclockwise because of the functioning of these three clutches. (Start-up at $D_1$) |
| **Overrun clutch**<br>engagement conditions<br><br>(Engine brake) | $D_1$: Overdrive control switch in "OFF"<br>Throttle opening less than 3/16<br>$2_1$: Throttle opening less than 3/16<br>At $D_1$ and $2_1$ positions, engine brake is not activated due to free turning of low one-way clutch. |
| Power flow | Input shaft<br>↓<br>Rear sun gear<br>↓<br>Rear pinion gear<br>↓<br>Rear planetary carrier ➡ Output shaft |



## Shift Mechanism (Cont'd)

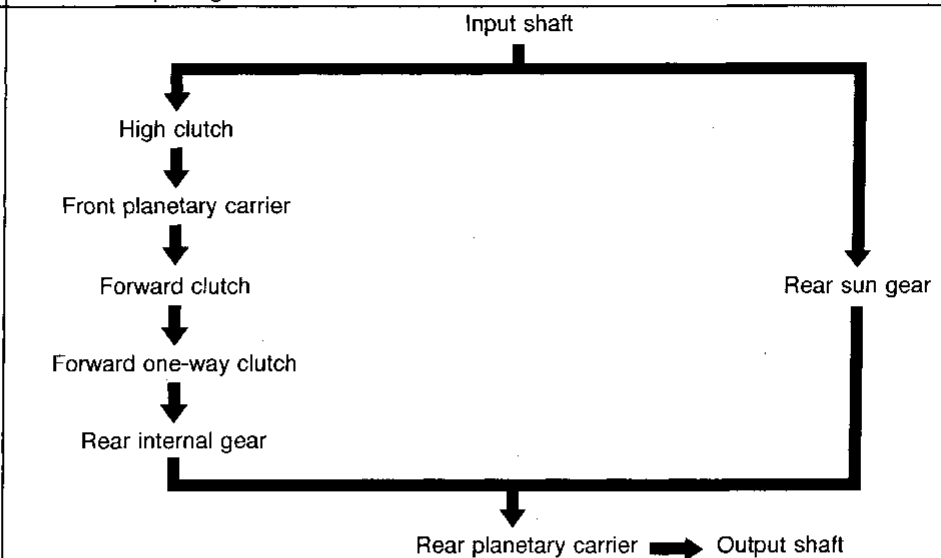
### "$D_2$", "$2_2$" and "$1_2$" positions

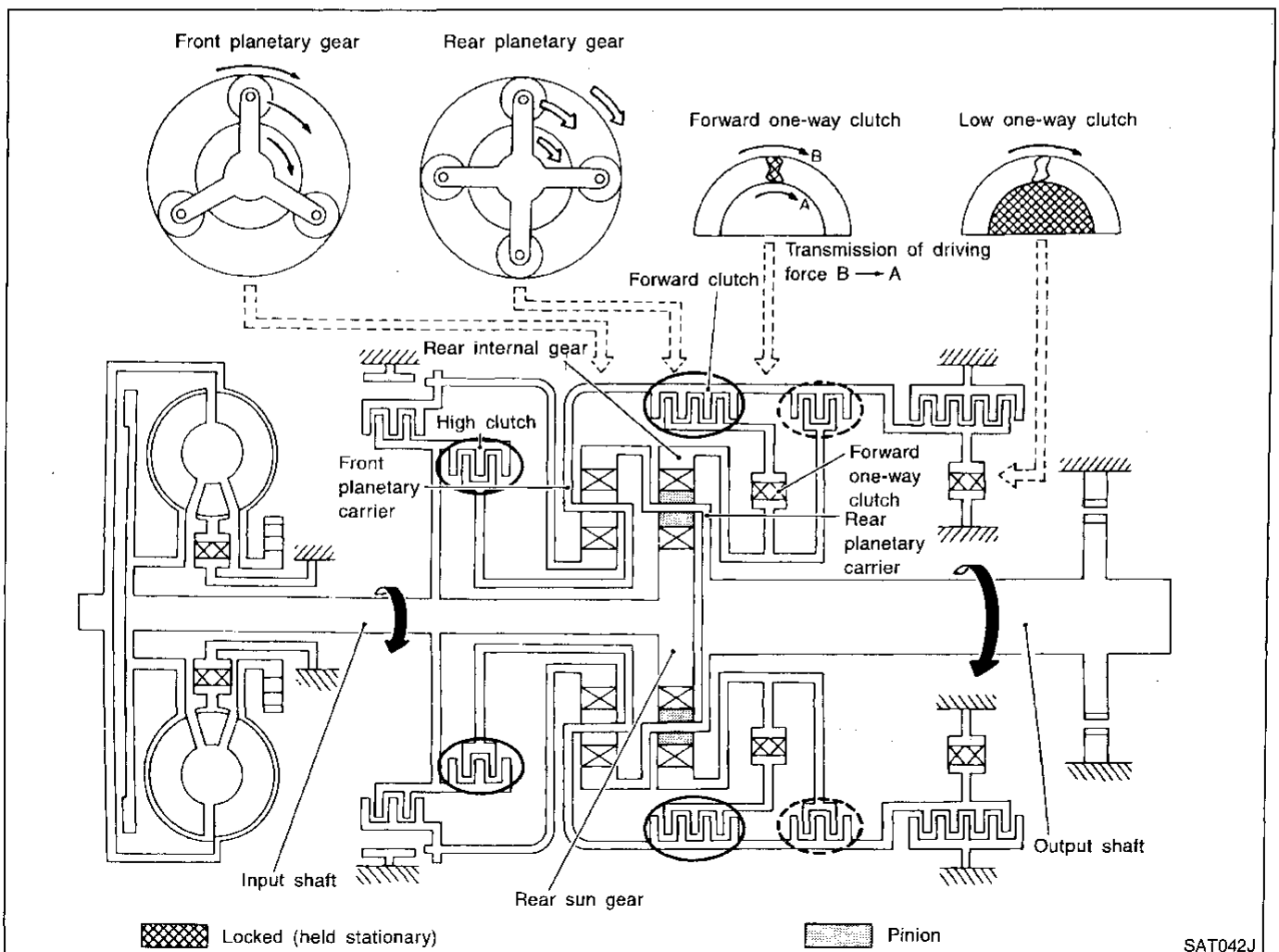
| | |
|---|---|
| **Forward clutch**<br>**Forward one-way clutch**<br>**Brake band** | Rear sun gear drives rear planetary carrier and combined front internal gear. Front internal gear now rotates around front sun gear accompanying front planetary carrier.<br>As front planetary carrier transfers the power to rear internal gear through forward clutch and forward one-way clutch, this rotation of rear internal gear increases the speed of rear planetary carrier compared with that of the 1st speed. |
| **Overrun clutch**<br>engagement conditions | $D_2$: Overdrive control switch in "OFF"<br>Throttle opening less than 3/16<br>$2_2$: Throttle opening less than 3/16<br>$1_2$: Always engaged |
| Power flow | Input shaft → Rear sun gear<br>Front internal gear →<br>Rear planetary carrier, Front internal gear → Output shaft<br>Front planetary carrier<br>Rear internal gear |



## Shift Mechanism (Cont'd)

### "$D_3$" position

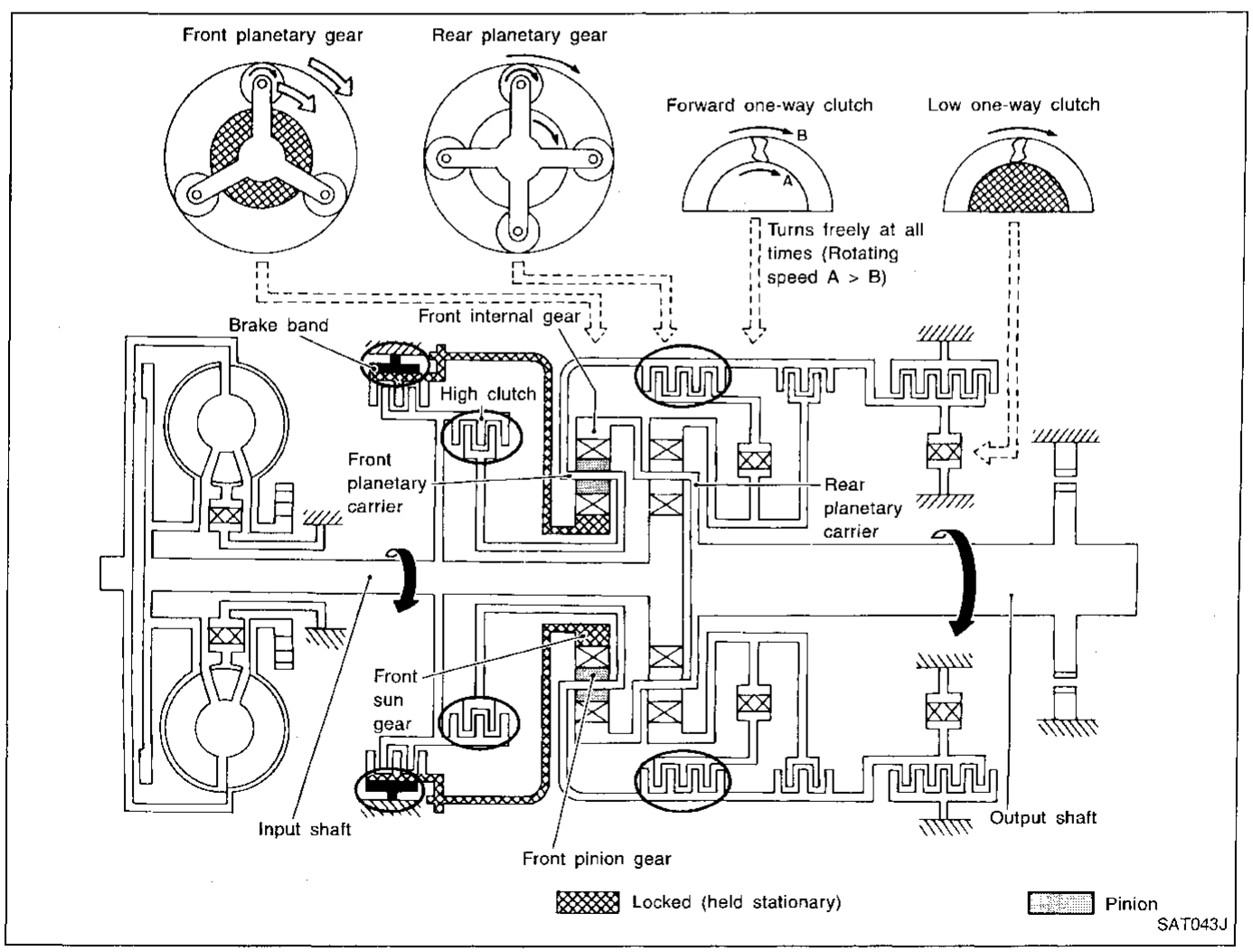
| | |
|---|---|
| **High clutch**<br>**Forward clutch**<br>**Forward one-way clutch** | Input power is transmitted to front planetary carrier through high clutch. And front planetary carrier is connected to rear internal gear by operation of forward clutch and forward one-way clutch. This rear internal gear rotation and another input (the rear sun gear) accompany rear planetary carrier to turn at the same speed. |
| **Overrun clutch**<br>engagement conditions | $D_3$: Overdrive control switch in "OFF"<br>Throttle opening less than 3/16 |
| Power flow |  |



## Shift Mechanism (Cont'd)

### "$D_4$" (OD) position

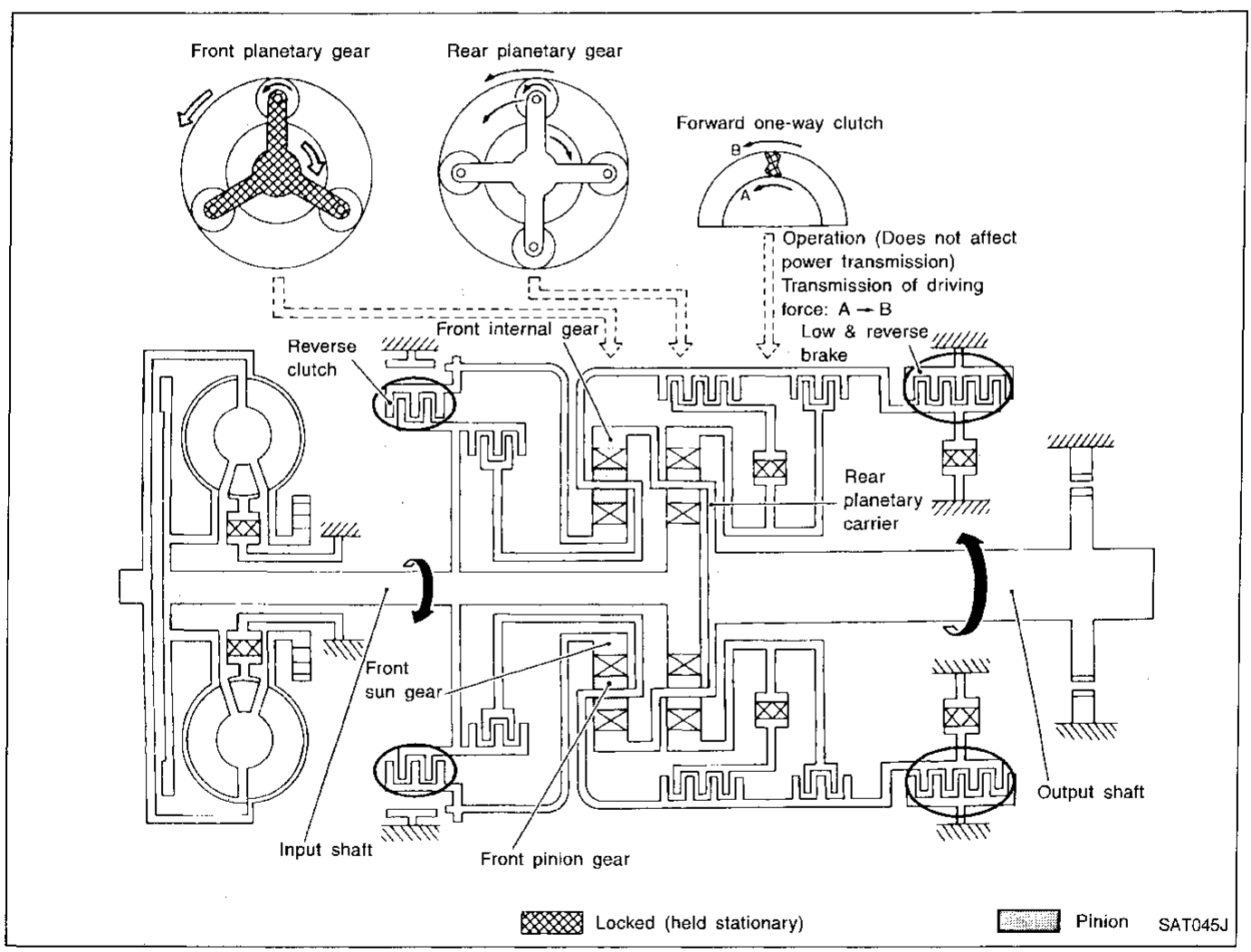
| | |
|---|---|
| **High clutch**<br>**Brake band**<br>**Forward clutch**<br>(Does not affect power transmission) | Input power is transmitted to front carrier through high clutch.<br>This front planetary carrier turns around the sun gear which is fixed by brake band and makes front internal gear (output) turn faster. |
| Engine brake | At $D_4$ position, there is no one-way clutch in the power transmission line and engine brake can be obtained when decelerating. |
| Power flow | Input shaft → High clutch → Front planetary carrier → Front pinion gear → Front internal gear → Rear planetary carrier → Output shaft |



## Shift Mechanism (Cont'd)

### "R" position

| | |
|---|---|
| **Reverse clutch**<br>**Low and reverse brake** | Front planetary carrier is stationary because of the operation of low and reverse brake.<br>Input power is transmitted to front sun gear through reverse clutch, which drives front internal gear in the opposite direction. |
| Engine brake | As there is no one-way clutch in the power transmission line, engine brake can be obtained when decelerating. |
| Power flow | Input shaft<br>↓<br>Reverse clutch<br>↓<br>Front pinion gear ← Front sun gear<br>↓<br>Front internal gear → Output shaft |



## Shift Mechanism (Cont'd)

### FUNCTION OF CLUTCH AND BRAKE

| Control members | Abbr. | Function |
|---|---|---|
| ⑥ Reverse clutch | R/C | To transmit input power to front sun gear ⑨. |
| ⑦ High clutch | H/C | To transmit input power to front planetary carrier ⑪. |
| ⑯ Forward clutch | F/C | To connect front planetary carrier ⑪ with forward one-way clutch ⑰. |
| ⑱ Overrun clutch | O/C | To connect front planetary carrier ⑪ with rear internal gear ⑭. |
| ⑤ Brake band | B/B | To lock front sun gear ⑨. |
| ⑰ Forward one-way clutch | F/O.C | When forward clutch is engaged, to stop rear internal gear ⑭ from rotating in opposite direction. |
| ⑲ Low one-way clutch | L/O.C | At $D_1$ position, to prevent rear internal gear ⑭ from rotating in opposite direction. |
| ⑳ Low & reverse brake | L & R/B | To lock rear internal gear ⑭ (2, $1_2$ and $1_1$), to lock front planetary carrier ⑪ (R position). |

### CLUTCH AND BAND CHART

| Shift position | | Reverse clutch ⑥ | High clutch ⑦ | Forward clutch ⑯ | Overrun clutch ⑱ | Band servo 2nd apply | Band servo 3rd release | Band servo 4th apply | Forward one-way clutch ⑰ | Low one-way clutch ⑲ | Low & reverse brake ⑳ | Lock-up | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | | | | | | | | | | | PARK POSITION |
| R | | ○ | | | | | | | | | ○ | | REVERSE POSITION |
| N | | | | | | | | | | | | | NEUTRAL POSITION |
| D*4 | 1st | | | ○ | *1Ⓧ | | | | ● | ● | | | Automatic shift 1 ↔ 2 ↔ 3 ↔ 4 |
| | 2nd | | | ○ | *1◎ | ○ | | | ● | | | | |
| | 3rd | | ○ | ○ | *1◎ | *2⊗ | ⊗ | | ● | | | *5○ | |
| | 4th | | ○ | ⊗ | | *3⊗ | ⊗ | ○ | | | | ○ | |
| 2 | 1st | | | ○ | Ⓧ | | | | ● | ● | | | Automatic shift 1 ↔ 2 |
| | 2nd | | | ○ | ◎ | ○ | | | ● | | | | |
| 1 | 1st | | | ○ | ○ | | | | ● | | ○ | | Locks (held stationary) in 1st speed 1 ← 2 |
| | 2nd | | | ○ | ○ | ○ | | | ● | | | | |

*1: Operates when overdrive control switch is being set in "OFF" position.
*2: Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.
*3: Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
*4: A/T will not shift to 4th when overdrive control switch is set in "OFF" position.
*5: Operates when overdrive control switch is "OFF".

○ : Operates.
◎ : Operates when throttle opening is less than 3/16, activating engine brake.
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.
Ⓧ : Operates when throttle opening is less than 3/16, but does not affect engine brake.

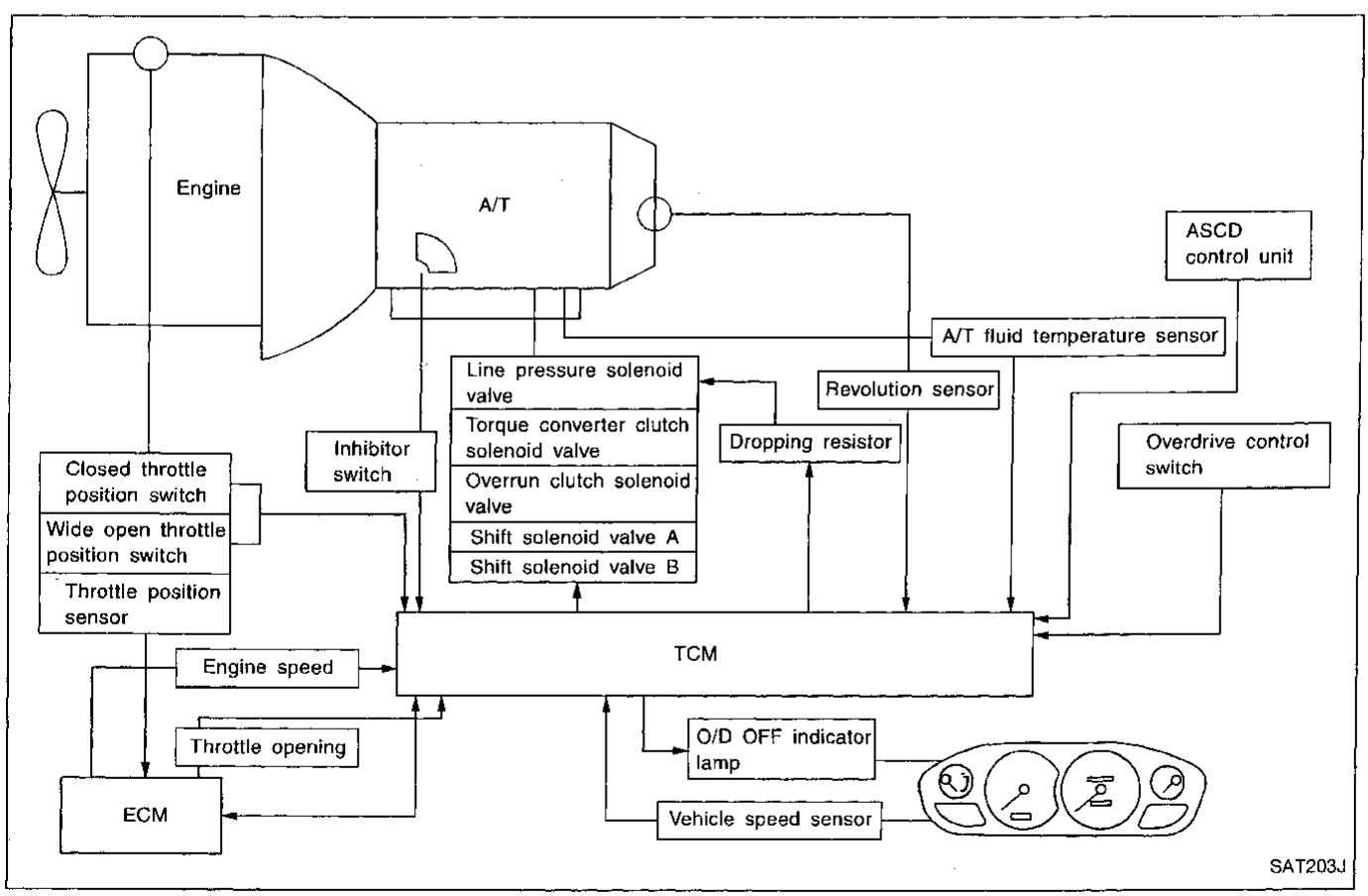
## Control System

### OUTLINE

The automatic transmission senses vehicle operating conditions through various sensors. It always controls the optimum shaft position and reduces shifting and lock-up shocks.

| SENSORS | CONTROL UNIT | ACTUATORS |
|---|---|---|
| Inhibitor switch<br>Throttle position sensor<br>Closed throttle position switch<br>Wide open throttle position switch<br>Engine speed signal<br>A/T fluid temperature sensor<br>Revolution sensor<br>Vehicle speed sensor<br>Turbine revolution sensor<br>Overdrive control switch<br>ASCD control unit | Shift control<br>Line pressure control<br>Lock-up control<br>Overrun clutch control<br>Timing control<br>Fail-safe control<br>Self-diagnosis<br>CONSULT communication line control<br>Duet-EU control | Shift solenoid valve A<br>Shift solenoid valve B<br>Overrun clutch solenoid valve<br>Torque converter clutch solenoid valve<br>Line pressure solenoid valve<br>O/D OFF indicator lamp |

### CONTROL SYSTEM



## TCM FUNCTION

The function of the TCM is to:

- Receive input signals sent from various switches and sensors.
- Determine required line pressure, shifting point, lock-up operation, and engine brake operation.
- Send required output signals to the respective solenoids.

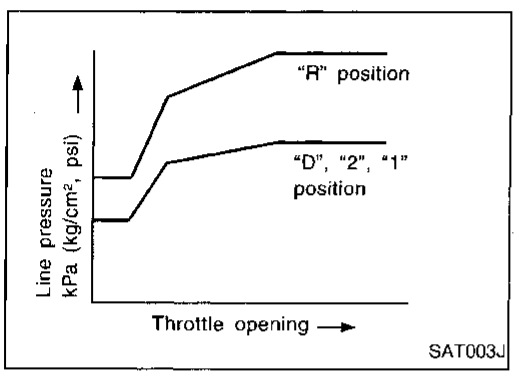
## INPUT/OUTPUT SIGNAL OF TCM

| | Sensors and solenoid valves | Function |
|---|---|---|
| Input | Inhibitor switch | Detects select lever position and sends a signal to TCM. |
| | Throttle position sensor | Detects throttle valve position and sends a signal to TCM. |
| | Closed throttle position switch | Detects throttle valve's fully-closed position and sends a signal to TCM. |
| | Wide open throttle position switch | Detects a throttle valve position of greater than 1/2 of full throttle and sends a signal to TCM. |
| | Engine speed signal | From ECM (ECCS control module) |
| | A/T fluid temperature sensor | Detects transmission fluid temperature and sends a signal to TCM. |
| | Revolution sensor | Detects output shaft rpm and sends a signal to TCM. |
| | Vehicle speed sensor | Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunctions. |
| | Overdrive control switch | Sends a signal, which prohibits a shift to "$D_4$" (overdrive) position, to the TCM. |
| | ASCD control unit | Sends a cruise signal or "$D_4$" (overdrive) cancel signal to TCM. |
| Output | Shift solenoid valve A/B | Selects shifting point suited to driving conditions in relation to a signal sent from TCM. |
| | Line pressure solenoid valve | Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from TCM. |
| | Torque converter clutch solenoid valve | Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from TCM. |
| | Overrun clutch solenoid valve | Controls an "engine brake" effect suited to driving conditions in relation to a signal sent from TCM. |
| | O/D OFF indicator lamp | Shows TCM faults, when A/T control components malfunction. |

## Control Mechanism

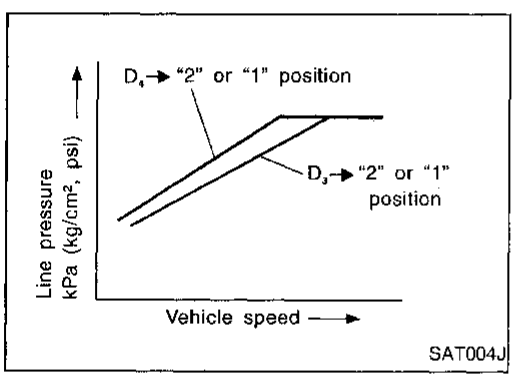
### LINE PRESSURE CONTROL

TCM has the various line pressure control characteristics to meet the driving conditions.
An ON-OFF duty signal is sent to the line pressure solenoid valve based on TCM characteristics.
Hydraulic pressure on the clutch and brake is electronically controlled through the line pressure solenoid valve to accommodate engine torque. This results in smooth shift operation.



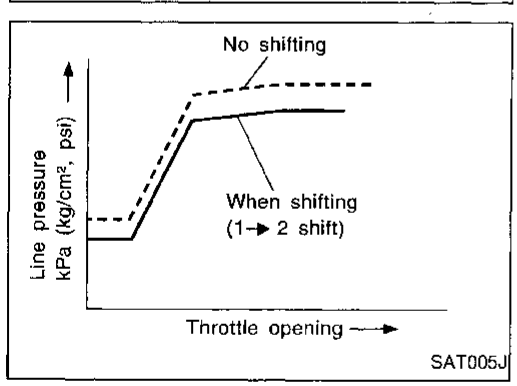

#### Normal control

The line pressure to throttle opening characteristics is set for suitable clutch operation.




#### Back-up control (Engine brake)

If the selector lever is shifted to "2" position while driving in $D_4$ (OD) or $D_3$, great driving force is applied to the clutch inside the transmission. Clutch operating pressure (line pressure) must be increased to deal with this driving force.



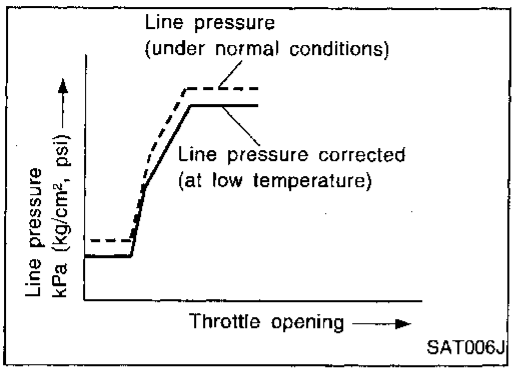

#### During shift change

The line pressure is temporarily reduced corresponding to a change in engine torque when shifting gears (that is, when the shift solenoid valve is switched for clutch operation) to reduce shifting shock.

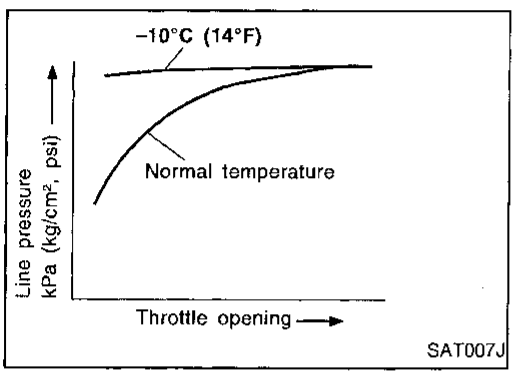
#### At low fluid temperature

- Fluid viscosity and frictional characteristics of the clutch facing change with fluid temperature. Clutch engaging or band-contacting pressure is compensated for, according to fluid temperature, to stabilize shifting quality.

## Control Mechanism (Cont'd)



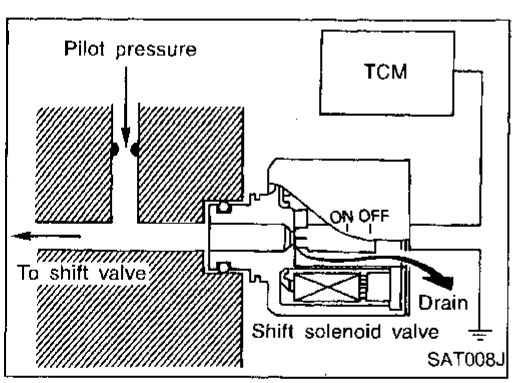

- The line pressure is reduced below 60°C (140°F) to prevent shifting shock due to low viscosity of automatic transmission fluid when temperature is low.




- Line pressure is increased to a maximum irrespective of the throttle opening when fluid temperature drops to −10°C (14°F). This pressure rise is adopted to prevent a delay in clutch and brake operation due to extreme drop of fluid viscosity at low temperature.

### SHIFT CONTROL

The shift is regulated entirely by electronic control to accommodate vehicle speed and varying engine operations. This is accomplished by electrical signals transmitted by the revolution sensor and throttle position sensor. This results in improved acceleration performance and fuel economy.




### Control of shift solenoid valves A and B

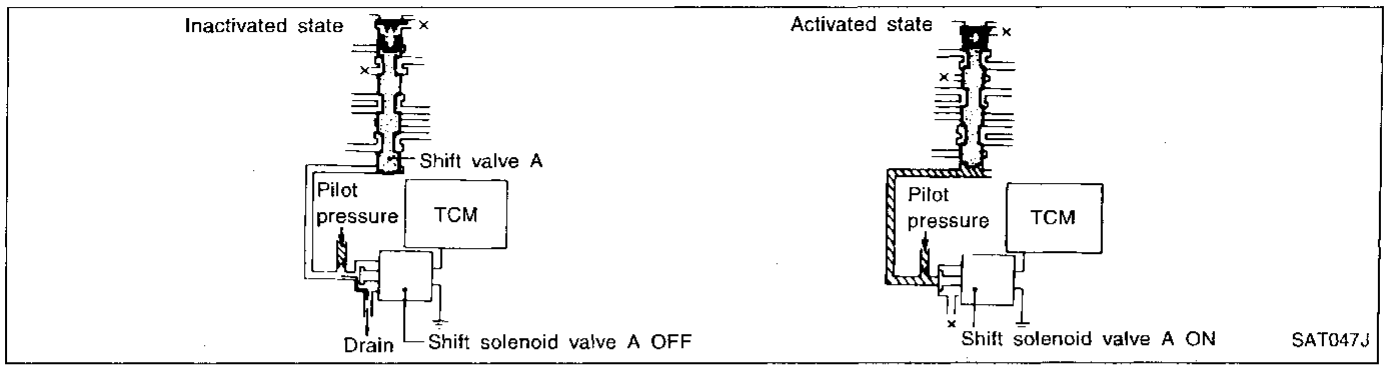
The TCM activates shift solenoid valves A and B according to signals from the throttle position sensor and revolution sensor to select the optimum gear position on the basis of the shift schedule memorized in the TCM.
The shift solenoid valve performs simple ON-OFF operation. When set to "ON", the drain circuit closes and pilot pressure is applied to the shift valve.

**Relation between shift solenoid valves A and B and gear positions**

| Gear position / Shift solenoid valve | $D_1$, $2_1$, $1_1$ | $D_2$, $2_2$, $1_2$ | $D_3$ | $D_4$ (OD) | N-P |
|---|---|---|---|---|---|
| A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) | ON (Closed) |
| B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |

## Control Mechanism (Cont'd)

### Control of shift valves A and B




Pilot pressure generated by the operation of shift solenoid valves A and B is applied to the end face of shift valves A and B.
The drawing above shows the operation of shift valve B. When the shift solenoid valve is "ON", pilot pressure applied to the end face of the shift valve overcomes spring force, moving the valve upward.

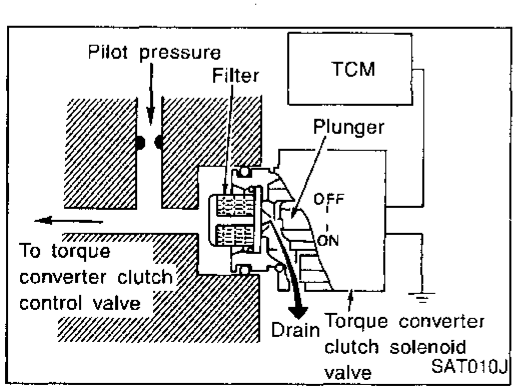
### LOCK-UP CONTROL

The torque converter clutch piston in the torque converter is locked to eliminate torque converter slip to increase power transmission efficiency. The solenoid valve is controlled by an ON-OFF duty signal sent from the TCM. The signal is converted to oil pressure signal which controls the torque converter clutch piston.

### Conditions for lock-up operation

When vehicle is driven in 4th gear position, vehicle speed and throttle opening are detected. If the detected values fall within the lock-up zone memorized in the TCM, lock-up is performed.

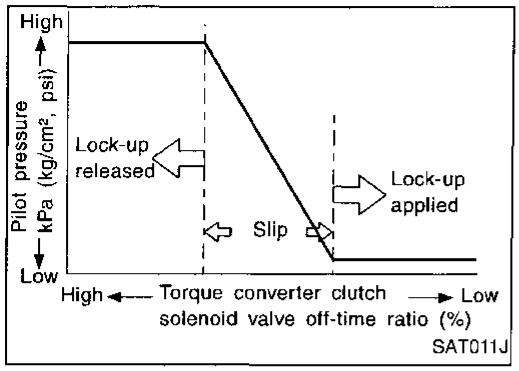
| | | |
|---|---|---|
| Overdrive control switch | ON | OFF |
| Selector lever | "D" position | |
| Gear position | $D_4$ | $D_3$ |
| Vehicle speed sensor | More than set value | |
| Throttle position sensor | Less than set opening | |
| Closed throttle position switch | OFF | |
| A/T fluid temperature sensor | More than 40°C (104°F) | |

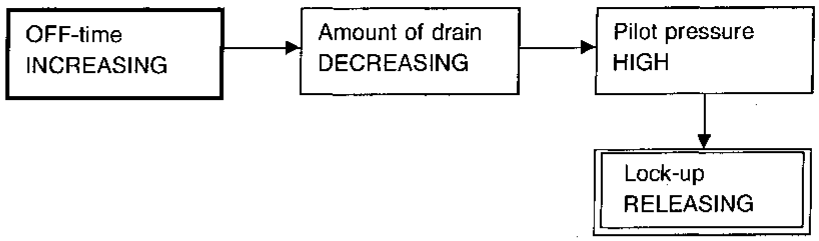



### Torque converter clutch solenoid valve control

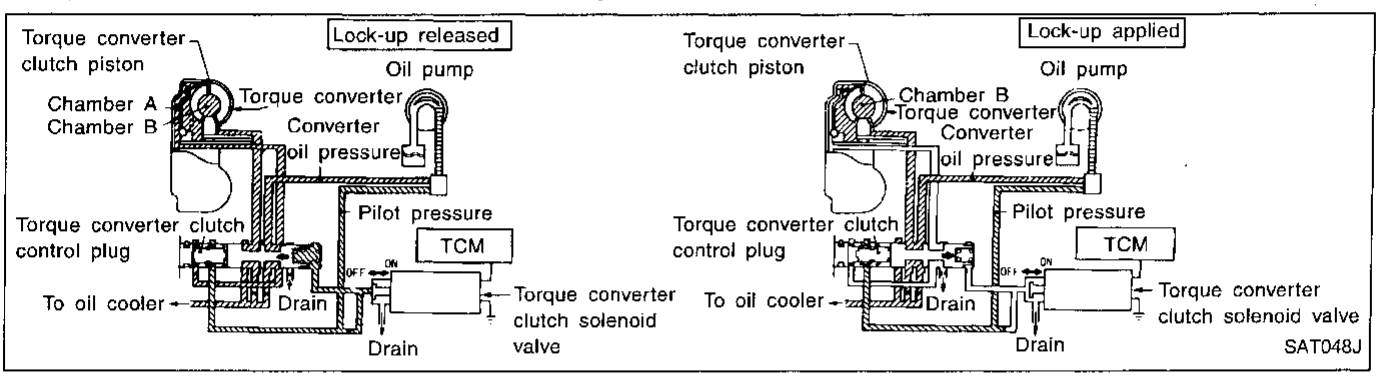
The torque converter clutch solenoid valve is controlled by the TCM. The plunger closes the drain circuit during the "OFF" period, and opens the circuit during the "ON" period. If the percentage of OFF-time increases in one cycle, the pilot pressure drain time is reduced and pilot pressure remains high.
The torque converter clutch piston is designed to slip to adjust the ratio of ON-OFF, thereby reducing lock-up shock.

## Control Mechanism (Cont'd)




### Torque converter clutch control valve operation




**Lock-up released**

The OFF-duration of the torque converter clutch solenoid valve is long, and pilot pressure is high. The pilot pressure pushes the end face of the torque converter clutch control valve in combination with spring force to move the valve to the left. As a result, converter pressure is applied to chamber A (torque converter clutch piston release side). Accordingly, the torque converter clutch piston remains unlocked.

**Lock-up applied**

When the OFF-duration of the torque converter clutch solenoid valve is short, pilot pressure drains and becomes low. Accordingly, the control valve moves to the right by the pilot pressure of the other circuit and converter pressure. As a result, converter pressure is applied to chamber B, keeping the torque converter clutch piston applied.

Also smooth lock-up is provided by transient application and release of the lock-up.

## OVERRUN CLUTCH CONTROL (ENGINE BRAKE CONTROL)

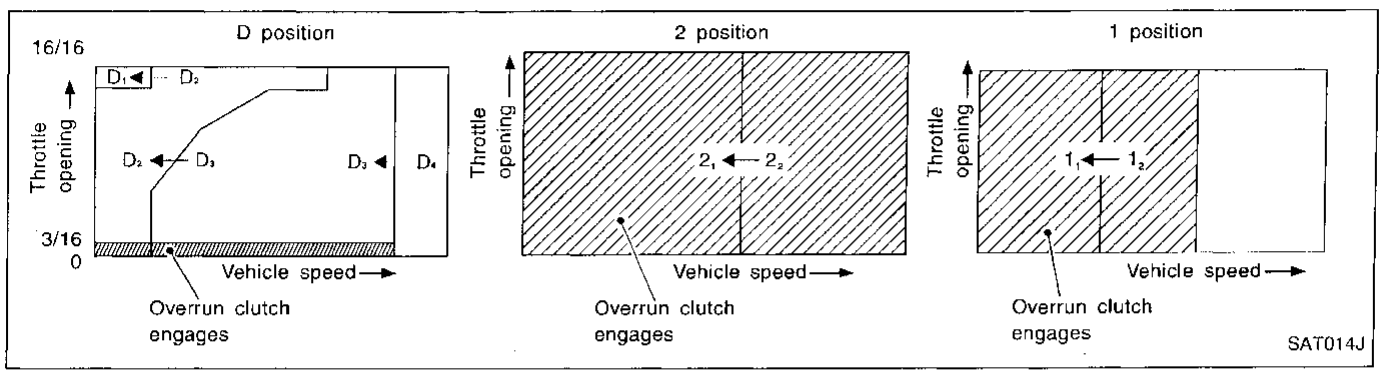
Forward one-way clutch is used to reduce shifting shocks in downshifting operations. This clutch transmits engine torque to the wheels. However, drive force from the wheels is not transmitted to the engine because the one-way clutch rotates idle. This means the engine brake is not effective.

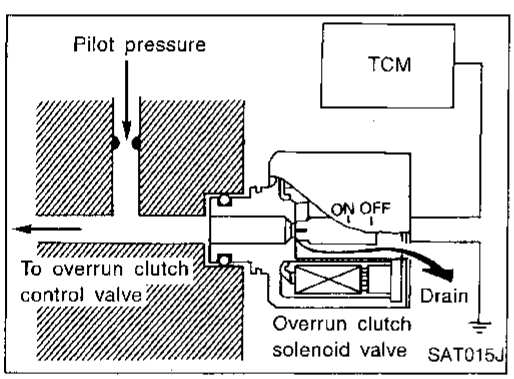
The overrun clutch operates when the engine brake is needed.

## Control Mechanism (Cont'd)

### Overrun clutch operating conditions

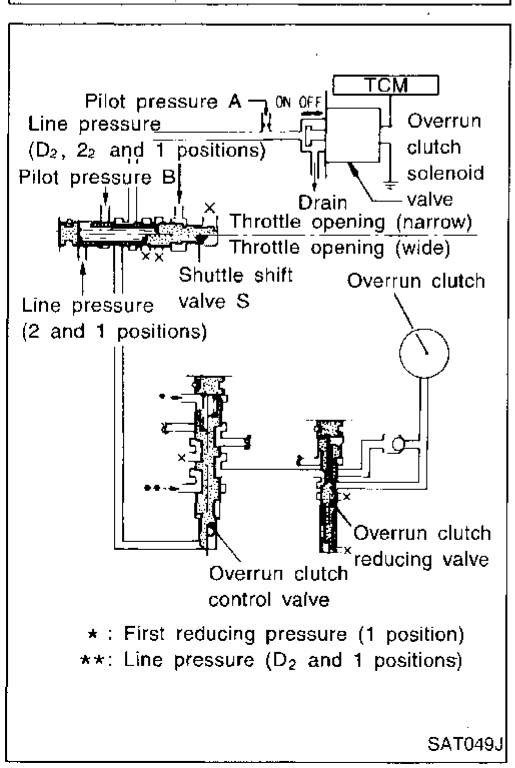
| | Gear position | Throttle opening |
|---|---|---|
| "D" position | $D_1$, $D_2$, $D_3$ gear position | Less than 3/16 |
| "2" position | $2_1$, $2_2$ gear position | |
| "1" position | $1_1$, $1_2$ gear position | At any position |




### Overrun clutch solenoid valve control

The overrun clutch solenoid valve is operated by an ON-OFF signal transmitted by the TCM to provide overrun clutch control (engine brake control).
When this solenoid valve is "ON", the pilot pressure drain port closes. When it is "OFF", the drain port opens.
During the solenoid valve ON pilot pressure is applied to the end face of the overrun clutch control valve.

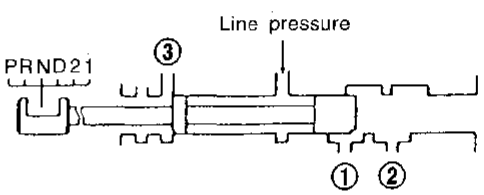



### Overrun clutch control valve operation

When the solenoid valve is "ON", pilot pressure A is applied to the overrun clutch control valve through shuttle shift valve S. This pushes up the overrun clutch control valve. The line pressure, which is routed by the overrun clutch reducing valve, is then shut off so that the clutch does not engage.
When the solenoid valve is "OFF", pilot pressure A is not generated. At this point, the overrun clutch control valve moves downward by spring force. As a result, overrun clutch operation pressure is provided by the overrun clutch reducing valve. This causes the overrun clutch to engage.
In the "1" position, the overrun clutch control valve remains pushed down so that the overrun clutch is engaged at all times.

# Control Valve

## FUNCTION OF CONTROL VALVES

<table>
<tr><th>Valve name</th><th>Function</th></tr>
<tr><td>Pressure regulator valve<br>Pressure regulator plug<br>Pressure regulator sleeve plug</td><td>Regulate oil discharged from the oil pump to provide optimum line pressure for all driving conditions.</td></tr>
<tr><td>Pressure modifier valve</td><td>Used as a signal supplementary valve to the pressure regulator valve. Regulates pressure-modifier pressure (signal pressure) which controls optimum line pressure for all driving conditions.</td></tr>
<tr><td>Modifier accumulator piston</td><td>Smooths hydraulic pressure regulated by the pressure modifier valve to prevent pulsations.</td></tr>
<tr><td>Pilot valve</td><td>Regulates line pressure to maintain a constant pilot pressure level which controls lock-up mechanism, overrun clutch, 3-2 timing required for shifting.</td></tr>
<tr><td>Accumulator control valve<br>Accumulator control sleeve</td><td>Regulate accumulator backpressure to pressure suited to driving conditions.</td></tr>
<tr><td>Manual valve</td><td>Directs line pressure to oil circuits corresponding to select positions.
<table>
<tr><th rowspan="2">Position</th><th colspan="3">Circuit</th></tr>
<tr><th>①</th><th>②</th><th>③</th></tr>
<tr><td>P</td><td></td><td></td><td></td></tr>
<tr><td>R</td><td></td><td></td><td>○</td></tr>
<tr><td>N</td><td></td><td></td><td></td></tr>
<tr><td>D</td><td>○</td><td></td><td></td></tr>
<tr><td>2</td><td>○</td><td>○</td><td></td></tr>
<tr><td>1</td><td>○</td><td>○</td><td></td></tr>
</table>


Hydraulic pressure drains when the shift lever is in Neutral.</td></tr>
<tr><td>Shift valve A</td><td>Simultaneously switches three oil circuits using output pressure of shift solenoid valve A to meet driving conditions (vehicle speed, throttle opening, etc.).<br>Provides automatic downshifting and up-shifting (1st→2nd→3rd→4th gears/4th→3rd→2nd→1st gears) in combination with shift valve B.</td></tr>
<tr><td>Shift valve B</td><td>Simultaneously switches three oil circuits using output pressure of shift solenoid valve B in relation to driving conditions (vehicle speed, throttle opening, etc.).<br>Provides automatic downshifting and up-shifting (1st→2nd→3rd→4th gears/4th→3rd→2nd→1st gears) in combination with shift valve A.</td></tr>
<tr><td>Shuttle shift valve S</td><td>Switches hydraulic circuits to provide 3-2 timing control and overrun clutch control in relation to the throttle opening.<br>Inactivates the overrun clutch to prevent interlocking in "D" ($D_4$) position when the throttle is wide open.</td></tr>
<tr><td>Overrun clutch control valve</td><td>Switches hydraulic circuits to prevent engagement of the overrun clutch simultaneously with application of the brake band in "D" position. (Interlocking occurs if the overrun clutch engages during $D_4$ operation.)</td></tr>
<tr><td>4-2 relay valve</td><td>Memorizes that the transmission is in "D" ($D_4$) position. Prevents the transmission from downshifting from "D" ($D_4$) to "2" position in combination with 4-2 sequence valve and shift valves A and B when downshifting from "D" ($D_4$) to "2" position.</td></tr>
<tr><td>4-2 sequence valve</td><td>Prevents band servo pressure from draining before high clutch operating pressure and band servo releasing pressure drain (from the same circuit) during downshifting from "D" ($D_4$) to "2" position.</td></tr>
<tr><td>Servo charger valve</td><td>An accumulator and a one-way orifice are used in the "2" position band servo oil circuit to dampen shifting shock when shifting from "1" to "2" position.<br>To maintain adequate flowrate when downshifting from "D" position to "2" position, the servo charger valve directs "2" position band servo hydraulic pressure to the circuit without going through the one-way orifice when downshifting from "D" position.</td></tr>
</table>

## Control Valve (Cont'd)

| Valve name | Function |
|---|---|
| 3-2 timing valve | Prevents a late operation of the brake band when shifting selector lever from "D" to "1" or "2" position while driving in $D_3$. |
| "1" reducing valve | Reduces low & reverse brake pressure to dampen engine-brake shock when downshifting from the "1" position $1_2$ to $1_1$. |
| Overrun clutch reducing valve | Reduces oil pressure directed to the overrun clutch and prevents engine-brake shock.<br>In "1" and "2" positions, line pressure acts on the overrun clutch reducing valve to increase the pressure-regulating point, with resultant engine brake capability. |
| Torque converter relief valve | Prevents an excessive rise in torque converter pressure. |
| Torque converter clutch control valve<br>Torque converter clutch control plug<br>Torque converter clutch control sleeve | Activate or inactivate the lock-up function.<br>Also provide smooth lock-up through transient application and release of the lock-up system. |
| Shuttle shift valve D | Switches hydraulic circuits so that output pressure of the torque converter clutch solenoid valve acts on the lock-up valve in the "D" position of $D_2$, $D_3$ and $D_4$. ("1" or "R" position, lock-up is inhibited.)<br>Lock-up control is not affected in "D" position $D_2$, $D_3$ or $D_4$, unless output pressure of the torque converter clutch solenoid valve is generated by a signal from the TCM. |

## Introduction

The A/T system has two self-diagnostic systems.
The first is the emission-related on board diagnostic system (OBD-II) performed by the TCM in combination with the ECM (ECCS control module). The malfunction is indicated by the MIL (malfunction indicator lamp) and is stored as a DTC in the ECM memory but not the TCM memory.
The second is the TCM original self-diagnosis indicated by the O/D OFF indicator lamp. The malfunction is stored in the TCM memory. The detected items are overlapped with OBD-II self-diagnostic items. For detail, refer to AT-49.

## OBD-II Function for A/T System

The ECM (ECCS control module) provides emission-related on board diagnostic (OBD-II) functions for the A/T system. One function is to receive a signal from the TCM used with OBD-related parts of the A/T system. The signal is sent to the ECM when a malfunction occurs in the corresponding OBD-related part. The other function is to indicate a diagnostic result by means of the MIL (malfunction indicator lamp) on the instrument panel. Sensors, switches and solenoid valves are used as sensing elements.
The MIL automatically illuminates in One or Two Trip Detection Logic when a malfunction is sensed in relation to A/T system parts.

## One or Two Trip Detection Logic of OBD-II

### ONE TRIP DETECTION LOGIC

If a malfunction is sensed during the first test drive, the MIL will illuminate and the malfunction will be stored in the ECM memory as a DTC. The TCM is not provided with such a memory function.

### TWO TRIP DETECTION LOGIC

When a malfunction is sensed during the first test drive, it is stored in the ECM memory as a 1st trip DTC (diagnostic trouble code) or 1st trip freeze frame data. At this point, the MIL will not illuminate. — First Trip
If the same malfunction as that experienced during the first test drive is sensed during the second test drive, the MIL will illuminate. — Second Trip
A/T-related parts for which the MIL illuminates during the first or second test drive are listed below.

| Items | MIL | |
|---|---|---|
| | One trip detection | Two trip detection |
| Shift solenoid valve A — DTC: P0750 (1108) | X | |
| Shift solenoid valve B — DTC: P0755 (1201) | X | |
| Throttle position sensor or switch — DTC: P1705 (1206) | X | |
| Except above | | X |

The "trip" in the "One or Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation.

## OBD-II Diagnostic Trouble Code (DTC)

### How to read DTC and 1st trip DTC

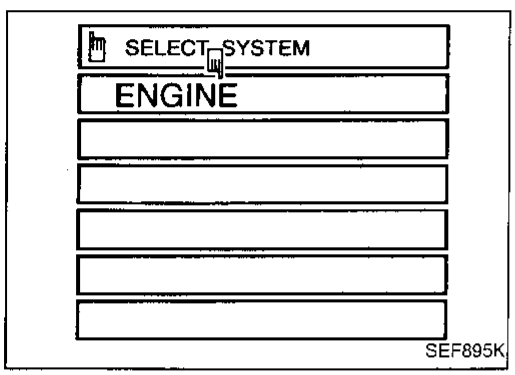
DTC and 1st trip DTC can be read by the following methods.

(NO TOOLS) 1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 1101, 1102, 1103, 1104, etc. For details, refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].
These DTCs are controlled by NISSAN.

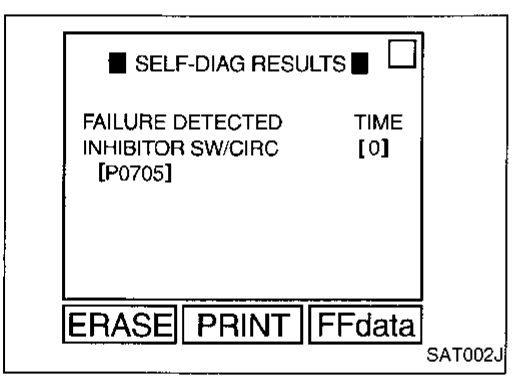
2. CONSULT or GST (Generic Scan Tool) Examples: P0705, P0710, P0720, P0725, etc.
These DTCs are prescribed by SAE J2012.

(CONSULT GST) (CONSULT also displays the malfunctioning component or system.)

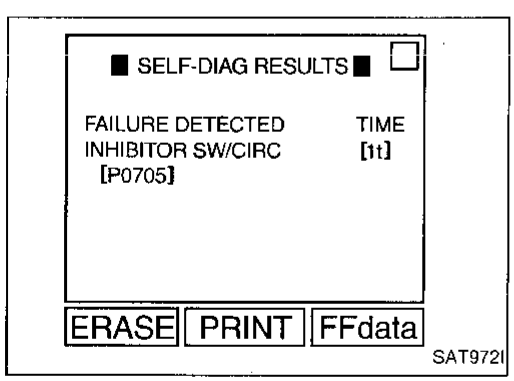
- **1st trip DTC No. is the same as DTC No.**
- **Output of the diagnostic trouble code indicates that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  **CONSULT can identify them as shown below. Therefore, using CONSULT (if available) is recommended.**




A sample of CONSULT display for DTC is shown at left. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode for "ENGINE" with CONSULT. Time data indicates how many times the vehicle was driven after the last detection of a DTC.




If the DTC is being detected currently, the time data will be "0".




If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

## FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM has a memory function, which stores the driving condition such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed and vehicle speed at the moment the ECM detects a malfunction.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data, and the data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For detail, refer to EC section ("CONSULT", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").
Only one set of freeze frame data (either 1st trip freeze frame data of freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items | |
|---|---|---|
| 1 | Freeze frame data | Misfire — DTC: P0300 - P0306 (0701, 0603 - 0608)<br>Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114), P0174 (0209), P0175 (0210) |
| 2 | | Except the above items (Includes A/T related items) |
| 3 | 1st trip freeze frame data | |

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

## HOW TO ERASE DTC

The diagnostic trouble code can be erased by CONSULT, GST or ECM DIAGNOSTIC TEST MODE as described following.

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.**
- **When you erase the DTC, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.**

The following emission-related diagnostic information is cleared from the ECM memory when erasing DTC related to OBD-II. For details, refer to EC section ("Emission-related Diagnostic Information", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").

- **Diagnostic trouble codes (DTC)**
- **1st trip diagnostic trouble codes (1st trip DTC)**
- **Freeze frame data**
- **1st trip freeze frame data**
- **System readiness test (SRT) codes**
- **Test values**

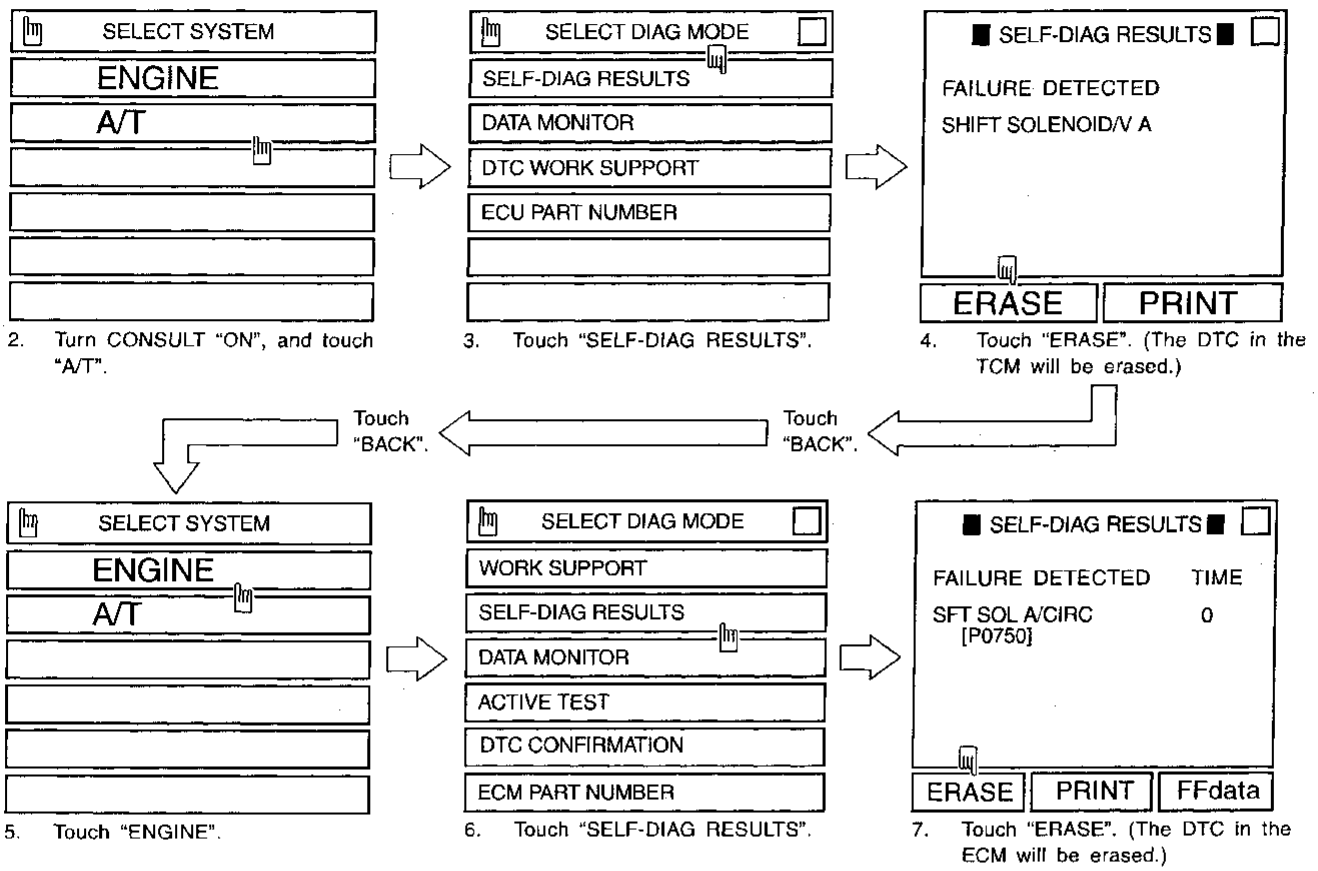
### HOW TO ERASE DTC (With CONSULT)

- **If a DTC is displayed for both ECM and TCM, it needs to be erased for both ECM and TCM.**

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT "ON" and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the TCM will be erased.) Then touch "BACK" twice.
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

**How to erase DTC (With CONSULT)**

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.




2. Turn CONSULT "ON", and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the TCM will be erased.)
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

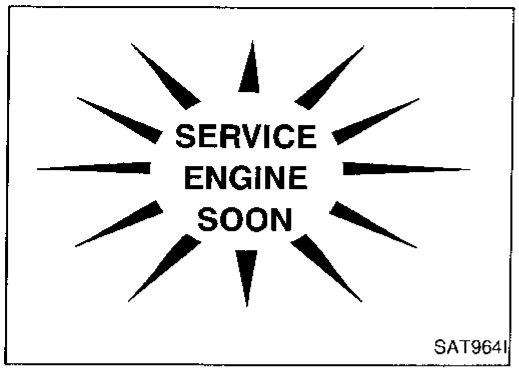
SAT904I

## HOW TO ERASE DTC (With GST)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Perform "OBD-II SELF-DIAGNOSTIC PROCEDURE (No Tools)". Refer to AT-47. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with Generic Scan Tool (GST). For details, refer to EC section ["Generic Scan Tool (GST)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## HOW TO ERASE DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Perform "TCM SELF-DIAGNOSTIC PROCEDURE (No Tools)". Refer to AT-47. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. Refer to EC section ["HOW TO SWITCH DIAGNOSTIC TEST MODES", "Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].



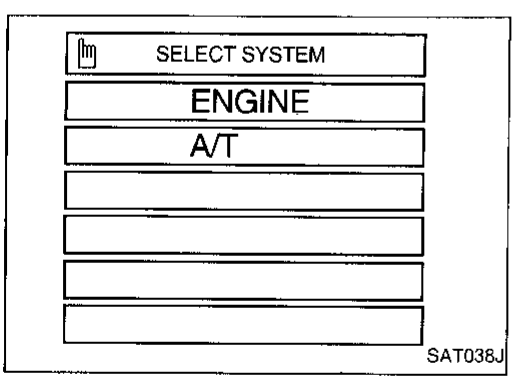

## Malfunction Indicator Lamp (MIL)

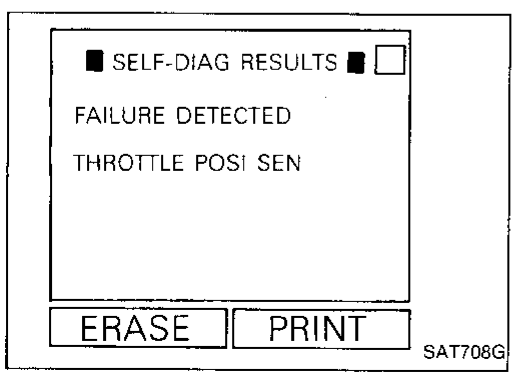
1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the blown lamp.
   - If the malfunction indicator lamp does not light up, refer to EL section ("Warning Lamps/System Description", "WARNING LAMPS").
     (Or see MIL & Data Link Connectors in EC section.)
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an emission-related (OBD-II) malfunction. For detail, refer to EC section ("ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").

## CONSULT

### NOTICE

1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   Check for time difference between actual shift timing and the CONSULT display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
   - Actual shift schedule has more or less tolerance or allowance,
   - Shift schedule indicated in Service Manual refers to the point where shifts start, and
   - Gear position displayed on CONSULT indicates the point where shifts are completed.
3. Shift solenoid valve "A" or "B" is displayed on CONSULT at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by TCM).
4. Additional CONSULT information can be found in the Operation Manual supplied with the CONSULT unit.




### SELF-DIAGNOSIS

After performing this procedure, place check marks for results on the "DIAGNOSTIC WORKSHEET", AT-53. Reference pages are provided following the items.

### SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

1. Turn on CONSULT and touch "ENGINE" for OBD-II detected items or touch "A/T" for TCM self-diagnosis.
   If A/T is not displayed, check TCM power supply and ground circuit. Refer to AT-74. If result is NG, refer to EL section ("POWER SUPPLY ROUTING").
2. Touch "SELF-DIAG RESULTS".
   Display shows malfunction experienced since the last erasing operation.
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.
   Also, any malfunction detected while in this mode will be displayed at real time.

## CONSULT (Cont'd)

### SELF-DIAGNOSTIC RESULT TEST MODE

| Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" test mode) "A/T" | Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" test mode) "ENGINE" | Malfunction is detected when ... | TCM self-diagnosis O/D OFF indicator lamp Available by O/D OFF indicator lamp or "A/T" on CONSULT | OBD-II (DTC) SERVICE ENGINE SOON Available by malfunction indicator lamp*2, "ENGINE" on CONSULT or GST |
|---|---|---|---|---|
| Inhibitor switch circuit | | • TCM does not receive the correct voltage signal (based on the gear position) from the switch. | — | P0705 |
| — | INHIBITOR SW/CIRC | | | |
| Revolution sensor | | • TCM does not receive the proper voltage signal from the sensor. | X | P0720 |
| VHCL SPEED SEN-A/T | VEH SPD SEN/CIR AT | | | |
| Vehicle speed sensor (Meter) | | • TCM does not receive the proper voltage signal from the sensor. | X | — |
| VHCL SPEED SEN-MTR | — | | | |
| A/T 1st gear function | | • A/T cannot be shifted to the 1st gear position even if electrical circuit is good. | — | P0731*1 |
| — | A/T 1ST GR FNCTN | | | |
| A/T 2nd gear function | | • A/T cannot be shifted to the 2nd gear position even if electrical circuit is good. | — | P0732*1 |
| — | A/T 2ND GR FNCTN | | | |
| A/T 3rd gear function | | • A/T cannot be shifted to the 3rd gear position even if electrical circuit is good. | — | P0733*1 |
| — | A/T 3RD GR FNCTN | | | |
| A/T 4th gear function | | • A/T cannot be shifted to the 4th gear position even if electrical circuit is good. | — | P0734*1 |
| — | A/T 4TH GR FNCTN | | | |
| A/T TCC S/V function (Lock-up) | | • A/T cannot perform lock-up even if electrical circuit is good. | — | P0744*1 |
| — | A/T TCC S/V FNCTN | | | |
| Shift solenoid valve A | | • TCM detects an improper voltage drop when it tries to operate the solenoid valve. | X | P0750 |
| SHIFT SOLENOID/V A | SFT SOL A/CIRC | | | |
| Shift solenoid valve B | | • TCM detects an improper voltage drop when it tries to operate the solenoid valve. | X | P0755 |
| SHIFT SOLENOID/V B | SFT SOL B/CIRC | | | |
| Overrun clutch solenoid valve | | • TCM detects an improper voltage drop when it tries to operate the solenoid valve. | X | P1760 |
| OVERRUN CLUTCH S/V | O/R CLUCH SOL/CIRC | | | |
| T/C clutch solenoid valve | | • TCM detects an improper voltage drop when it tries to operate the solenoid valve. | X | P0740 |
| T/C CLUTCH SOL/V | TCC SOLENOID/CIRC | | | |
| Line pressure solenoid valve | | • TCM detects an improper voltage drop when it tries to operate the solenoid valve. | X | P0745 |
| LINE PRESSURE S/V | L/PRESS SOL/CIRC | | | |
| Throttle position sensor Throttle position switch | | • TCM receives an excessively low or high voltage from the sensor. | X | P1705 |
| THROTTLE POSI SEN | TP SEN/CIRC A/T | | | |
| Engine speed signal | | • TCM does not receive the proper voltage signal from the ECM. | X | P0725 |
| ENGINE SPEED SIG | | | | |
| A/T fluid temperature sensor | | • TCM receives an excessively low or high voltage from the sensor. | X | P0710 |
| BATT/FLUID TEMP SEN | ATF TEMP SEN/CIRC | | | |
| Initial start | | • This is not a malfunction message (Whenever shutting off a power supply to the TCM, this message appears on the screen.) | X | — |
| INITIAL START | — | | | |
| No failure (NO SELF DIAGNOSTIC FAILURE INDICATED FURTHER TESTING MAY BE REQUIRED**) | | • No failure has been detected. | X | X |

X : Applicable

— : Not applicable

*1 : These malfunctions cannot be displayed by MIL (SERVICE ENGINE SOON) if another malfunction is assigned to MIL.

*2 : Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## CONSULT (Cont'd)

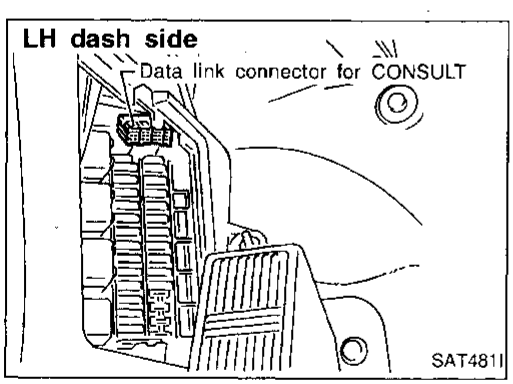
### DATA MONITOR MODE (A/T)

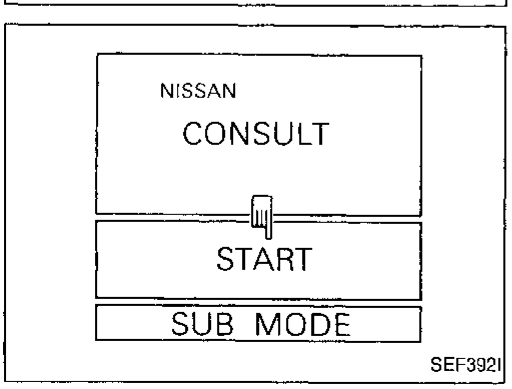
| Item | Display | Monitor item | | Description | Remarks |
|---|---|---|---|---|---|
| | | ECU input signals | Main signals | | |
| Vehicle speed sensor 1 (A/T) (Revolution sensor) | VHCL/S SE·A/T [km/h] or [mph] | X | — | • Vehicle speed computed from signal of revolution sensor is displayed. | When racing engine in "N" or "P" position with vehicle stationary, CONSULT data may not indicate 0 km/h (0 mph). |
| Vehicle speed sensor 2 (Meter) | VHCL/S SE·MTR [km/h] or [mph] | X | — | • Vehicle speed computed from signal of vehicle speed sensor is displayed. | Vehicle speed display may not be accurate under approx. 10 km/h (6 mph). It may not indicate 0 km/h (0 mph) when vehicle is stationary. |
| Throttle position sensor | THRTL POS SEN [V] | X | — | • Throttle position sensor signal voltage is displayed. | |
| A/T fluid temperature sensor | FLUID TEMP SE [V] | X | — | • A/T fluid temperature sensor signal voltage is displayed.<br>• Signal voltage lowers as fluid temperature rises. | |
| Battery voltage | BATTERY VOLT [V] | X | — | • Source voltage of TCM is displayed. | |
| Engine speed | ENGINE SPEED [rpm] | X | X | • Engine speed, computed from engine speed signal, is displayed. | Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running. |
| Overdrive control switch | OVERDRIVE SW [ON/OFF] | X | — | • ON/OFF state computed from signal of overdrive control SW is displayed. | |
| P/N position switch | P/N POSI SW [ON/OFF] | X | — | • ON/OFF state computed from signal of P/N position SW is displayed. | |
| R position switch | R POSITION SW [ON/OFF] | X | — | • ON/OFF state computed from signal of R position SW is displayed. | |
| D position switch | D POSITION SW [ON/OFF] | X | — | • ON/OFF state computed from signal of D position SW is displayed. | |
| 2 position switch | 2 POSITION SW [ON/OFF] | X | — | • ON/OFF status, computed from signal of 2 position SW, is displayed. | |
| 1 position switch | 1 POSITION SW [ON/OFF] | X | — | • ON/OFF status, computed from signal of 1 position SW, is displayed. | |
| ASCD cruise signal | ASCD-CRUISE [ON/OFF] | X | — | • Status of ASCD cruise signal is displayed.<br>ON ... Cruising state<br>OFF ... Normal running state | • This is displayed even when no ASCD is mounted. |
| ASCD OD cut signal | ASCD-OD CUT [ON/OFF] | X | — | • Status of ASCD OD release signal is displayed.<br>ON ... OD released<br>OFF ... OD not released | • This is displayed even when no ASCD is mounted. |
| Kickdown switch | KICKDOWN SW [ON/OFF] | X | — | • ON/OFF status, computed from signal of kickdown SW, is displayed. | • This is displayed even when no kickdown switch is equipped. |
| Closed throttle position switch | CLOSED THL/SW [ON/OFF] | X | — | • ON/OFF status, computed from signal of closed throttle position SW, is displayed. | |
| Wide open throttle position switch | W/O THRL/P-SW [ON/OFF] | X | — | • ON/OFF status, computed from signal of wide open throttle position SW, is displayed. | |
| Gear position | GEAR | — | X | • Gear position data used for computation by TCM, is displayed. | |
| Selector lever position | SLCT LVR POSI | — | X | • Selector lever position data, used for computation by TCM, is displayed. | • A specific value used for control is displayed if fail-safe is activated due to error. |

## CONSULT (Cont'd)

| Item | Display | Monitor item | | Description | Remarks |
|---|---|---|---|---|---|
| | | ECU input signals | Main signals | | |
| Vehicle speed | VEHICLE SPEED [km/h] or [mph] | — | X | • Vehicle speed data, used for computation by TCM, is displayed. | |
| Throttle position | THROTTLE POSI [/8] | — | X | • Throttle position data, used for computation by TCM, is displayed. | • A specific value used for control is displayed if fail-safe is activated due to error. |
| Line pressure duty | LINE PRES DTY [%] | — | X | • Control value of line pressure solenoid valve, computed by TCM from each input signal, is displayed. | |
| Torque converter clutch solenoid valve duty | TCC S/V DUTY [%] | — | X | • Control value of torque converter clutch solenoid valve, computed by TCM from each input signal, is displayed. | |
| Shift solenoid valve A | SHIFT S/V A [ON/OFF] | — | X | • Control value of shift solenoid valve A, computed by TCM from each input signal, is displayed. | Control value of solenoid is displayed even if solenoid circuit is disconnected. The "OFF" signal is displayed if solenoid circuit is shorted. |
| Shift solenoid valve B | SHIFT S/V B [ON/OFF] | — | X | • Control value of shift solenoid valve B, computed by TCM from each input signal, is displayed. | |
| Overrun clutch solenoid valve | OVERRUN/C S/V [ON/OFF] | — | X | • Control value of overrun clutch solenoid valve computed by TCM from each input signal is displayed. | |
| Self-diagnosis display lamp (O/D OFF indicator lamp) | SELF-D DP LMP [ON/OFF] | — | X | • Control status of O/D OFF indicator lamp is displayed. | |

X: Applicable
—: Not applicable



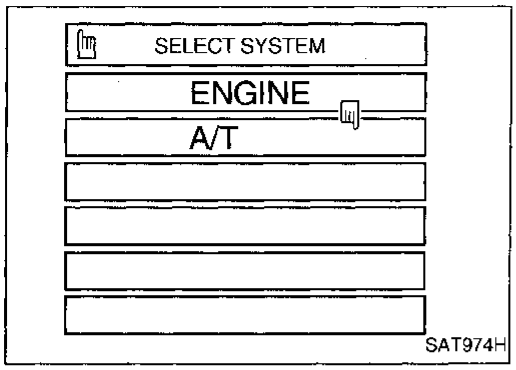




### DTC WORK SUPPORT MODE WITH CONSULT

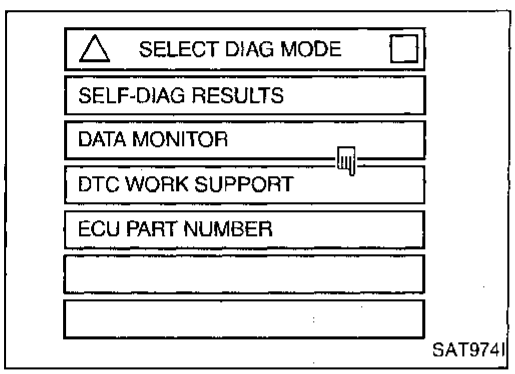
#### CONSULT setting procedure

1. Turn ignition switch "OFF".
2. Connect CONSULT to Data link connector for CONSULT. Data link connector for CONSULT is located behind the cover.
3. Turn ignition switch "ON".
4. Touch "START".

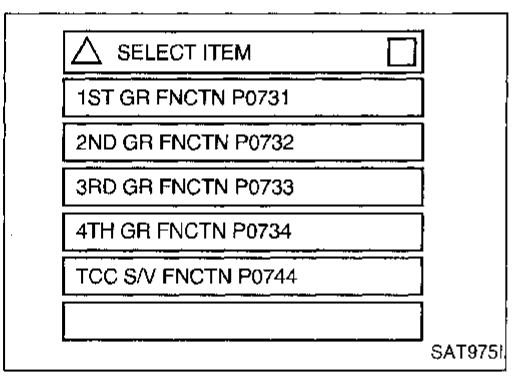
## CONSULT (Cont'd)



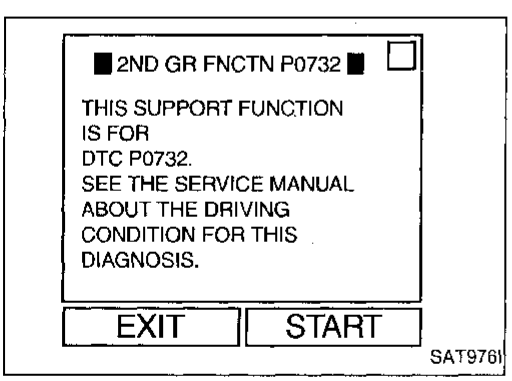

5. Touch "A/T".



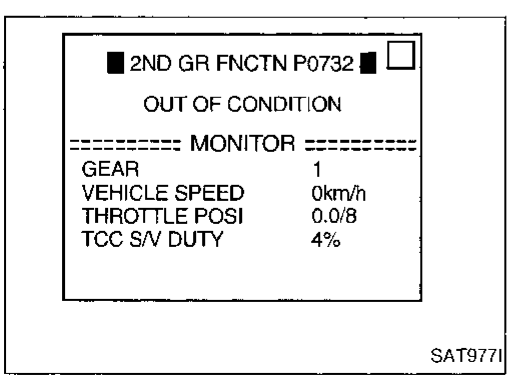

6. Touch "DTC WORK SUPPORT".




7. Touch select item menu (1ST, 2ND, etc.).

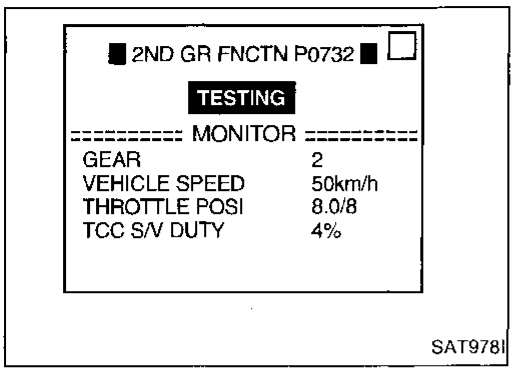



8. Touch "START".

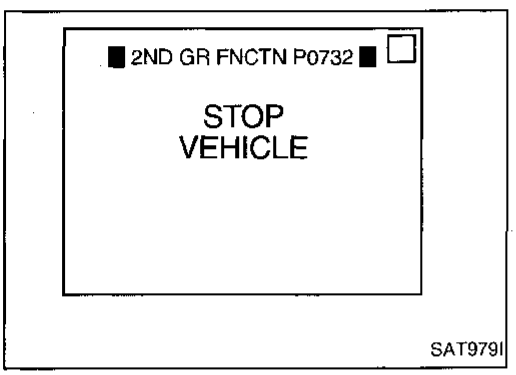



9. Perform driving test according to "DTC CONFIRMATION PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC".

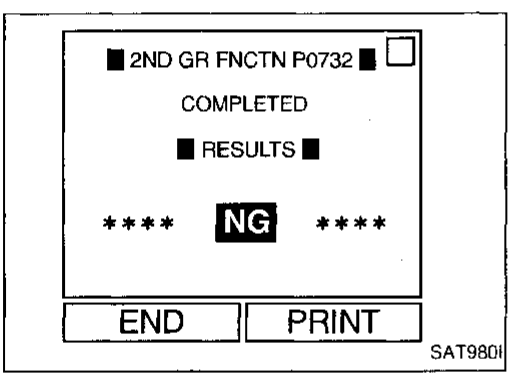
## CONSULT (Cont'd)

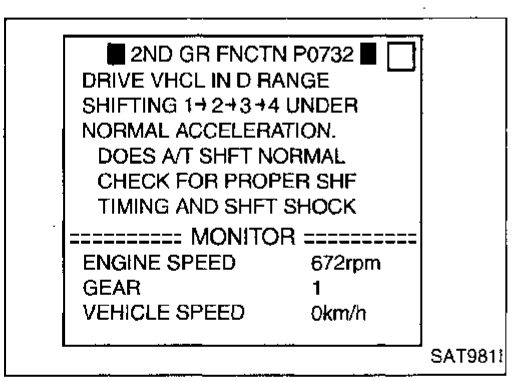



- **When testing conditions are satisfied, CONSULT screen changes from "OUT OF CONDITION" to "TESTING".**

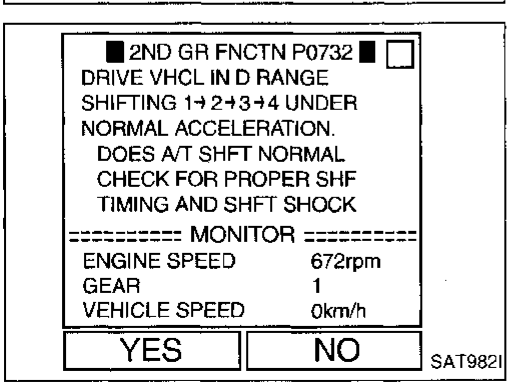



10. Stop vehicle. If "NG" appears on the screen, malfunction may exist. Go to "DIAGNOSTIC PROCEDURE".



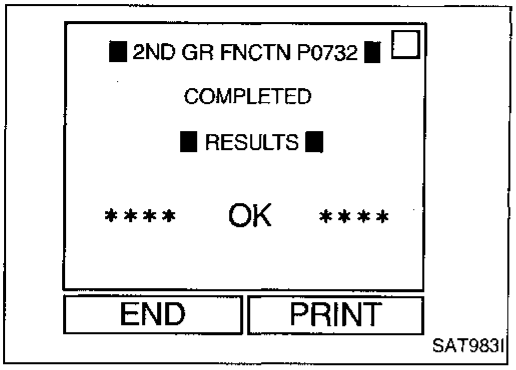




11. Perform test drive to check gear shift feeling in accordance with instructions displayed.

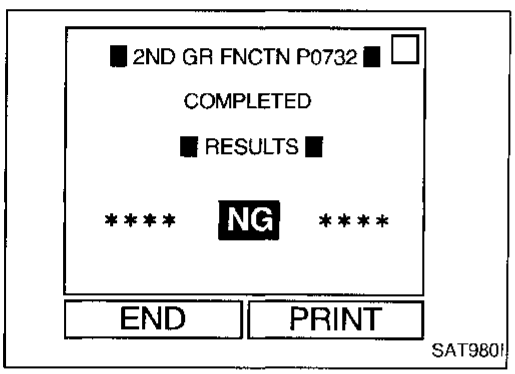



12. Touch "YES" or "NO".

## CONSULT (Cont'd)

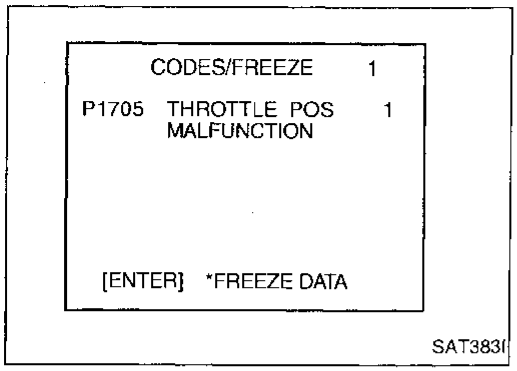



13. CONSULT procedure ended.
    If "NG" appears on the screen, a malfunction may exist. Go to "DIAGNOSTIC PROCEDURE".




### DTC WORK SUPPORT MODE

| DTC work support item | Description | Check item |
|---|---|---|
| 1ST GR FNCTN P0731 | Following items for "A/T 1st gear function (P0731)" can be confirmed.<br>• Self-diagnosis status (whether the diagnosis is being conducted or not)<br>• Self-diagnosis result (OK or NG) | • Shift solenoid valve A<br>• Shift solenoid valve B<br>• Each clutch<br>• Hydraulic control circuit |
| 2ND GR FNCTN P0732 | Following items for "A/T 2nd gear function (P0732)" can be confirmed.<br>• Self-diagnosis status (whether the diagnosis is being conducted or not)<br>• Self-diagnosis result (OK or NG) | • Shift solenoid valve B<br>• Each clutch<br>• Hydraulic control circuit |
| 3RD GR FNCTN P0733 | Following items for "A/T 3rd gear function (P0733)" can be confirmed.<br>• Self-diagnosis status (whether the diagnosis is being conducted or not)<br>• Self-diagnosis result (OK or NG) | • Shift solenoid valve A<br>• Each clutch<br>• Hydraulic control circuit |
| 4TH GR FNCTN P0734 | Following items for "A/T 4th gear function (P0734)" can be confirmed.<br>• Self-diagnosis status (whether the diagnosis is being conducted or not)<br>• Self-diagnosis result (OK or NG) | • Shift solenoid valve A<br>• Shift solenoid valve B<br>• Overrun clutch solenoid valve<br>• Line pressure solenoid valve<br>• Each clutch<br>• Hydraulic control circuit |
| TCC S/V FNCTN P0744 | Following items for "A/T TCC S/V function (lock-up)" can be confirmed.<br>• Self-diagnosis status (whether the diagnosis is being conducted or not)<br>• Self-diagnosis result (OK or NG) | • Torque converter clutch solenoid valve<br>• Each clutch<br>• Hydraulic control circuit |



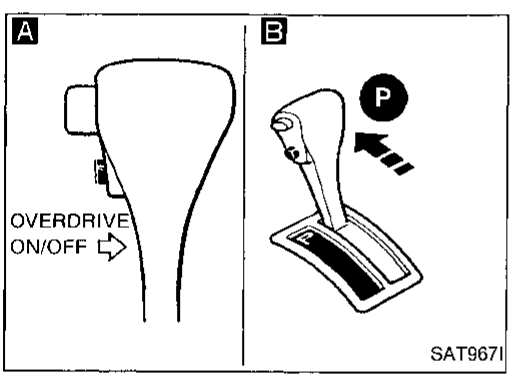

## Diagnostic Procedure without CONSULT

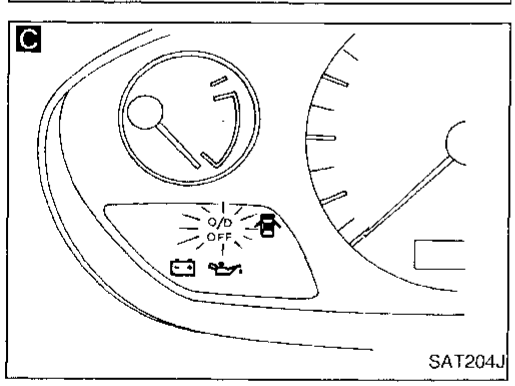
### OBD-II SELF-DIAGNOSTIC PROCEDURE (With GST)

Refer to EC section ["Generic Scan Tool (GST)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

### OBD-II SELF-DIAGNOSTIC PROCEDURE (No Tools)

Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].




### TCM SELF-DIAGNOSTIC PROCEDURE (No Tools)

DIAGNOSIS START

A B C

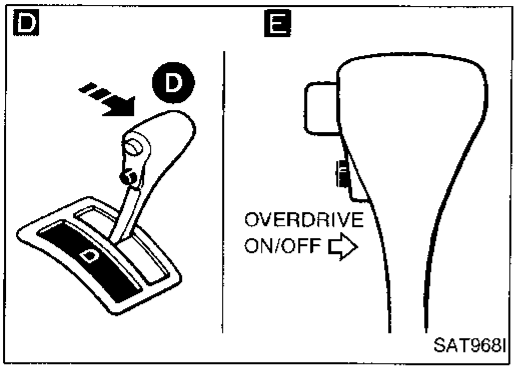
1. Start engine and warm it up to normal engine operating temperature.
2. Turn ignition switch to "OFF" position. Wait at least 5 seconds.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Does O/D OFF indicator lamp come on for about 2 seconds?

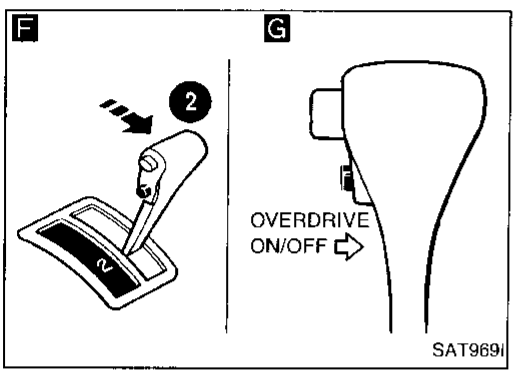
No → Go to "1. O/D OFF Indicator Lamp Does Not Come On", AT-153.

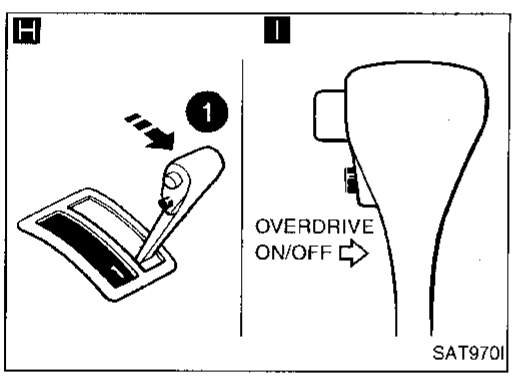
Yes

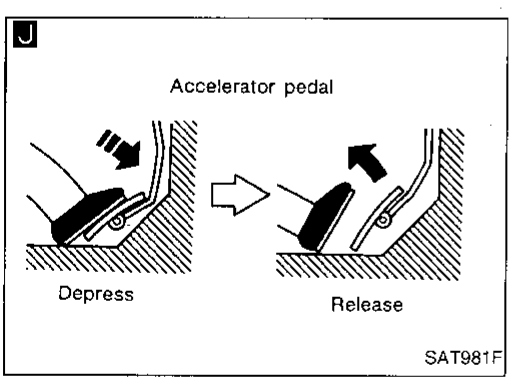
Ⓐ

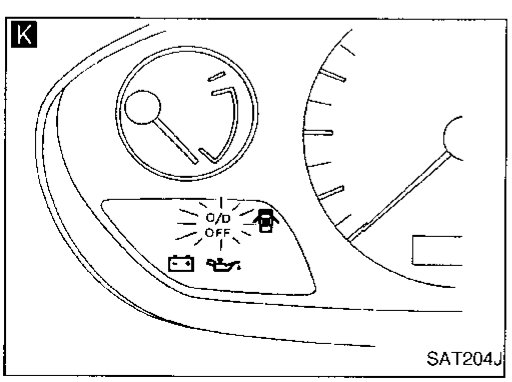
## Diagnostic Procedure without CONSULT (Cont'd)




Ⓐ

**D E**

1. Turn ignition switch to "OFF" position.
2. Turn ignition switch to "ACC" position.
3. Move selector lever to "D" position.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Depress and hold overdrive control switch in "OFF" position until the next step is completed.
6. Turn ignition switch to "OFF" position.
7. Turn ignition switch to "ON" position. (Do not start engine.)

- Wait more than 2 seconds after ignition switch "ON".

**F G**

1. Move selector lever to "2" position.
2. Depress and hold overdrive control switch in "ON" position until the next step is completed.

**H I**

1. Move selector lever to "1" position.
2. Cycle overdrive control switch from "OFF" to "ON" position, depress and hold in "OFF" position until the next step is completed.

**J**

Depress accelerator pedal fully and release it.

**K**

Check O/D OFF indicator lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE, AT-49.

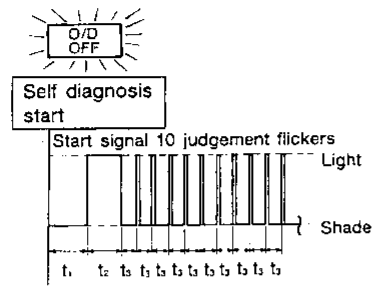
DIAGNOSIS END

## Diagnostic Procedure without CONSULT (Cont'd)

### JUDGEMENT OF SELF-DIAGNOSIS CODE

O/D OFF indicator lamp:

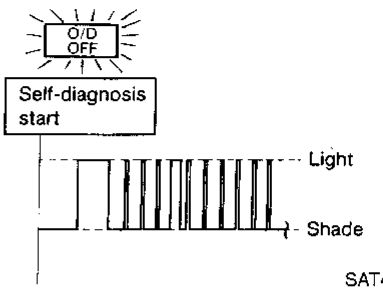
All judgement flickers are same.




SAT436F

All circuits that can be confirmed by self-diagnosis are OK.

4th judgement flicker is longer than others.

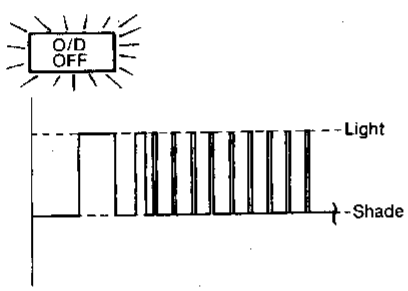



SAT443F

Shift solenoid valve A circuit is short-circuited or disconnected.

➡ **Go to SHIFT SOLENOID VALVE A (DTC: 1108), AT-128.**

1st judgement flicker is longer than others.

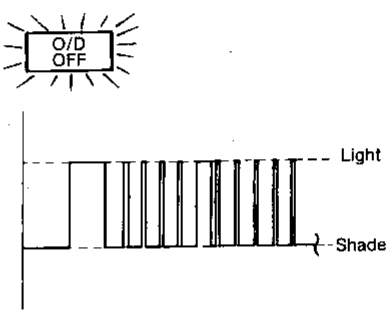



SAT437F

Revolution sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR) (DTC: 1102), AT-86.**

5th judgement flicker is longer than others.

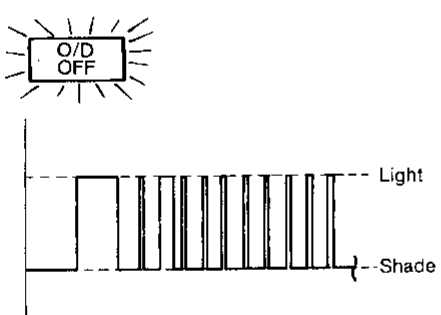



SAT445F

Shift solenoid valve B circuit is short-circuited or disconnected.

➡ **Go to SHIFT SOLENOID VALVE B (DTC: 1201), AT-132.**

2nd judgement flicker is longer than others.

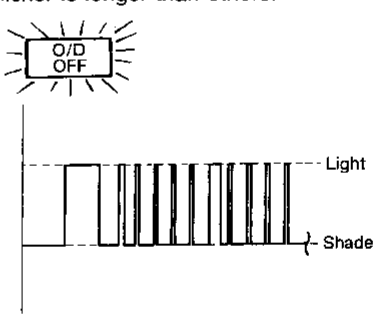



SAT439F

Vehicle speed sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·MTR, AT-150.**

6th judgement flicker is longer than others.

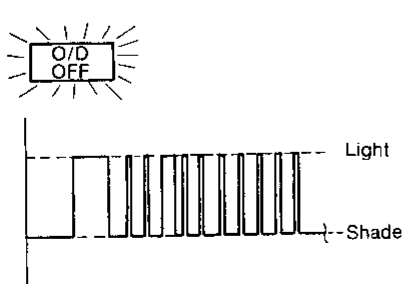



SAT447F

Overrun clutch solenoid valve circuit is short-circuited or disconnected.

➡ **Go to OVERRUN CLUTCH SOLENOID VALVE (DTC: 1203), AT-142.**

3rd judgement flicker is longer than others.

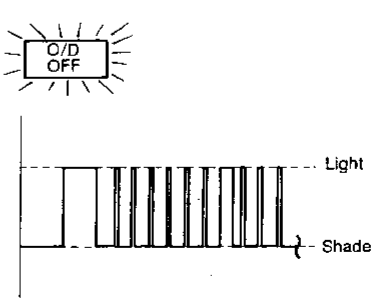



SAT441F

Throttle position sensor circuit is short-circuited or disconnected.

➡ **Go to THROTTLE POSITION SENSOR (DTC: 1206), AT-136.**

7th judgement flicker is longer than others.




SAT449F

Torque converter clutch solenoid valve circuit is short-circuited or disconnected.

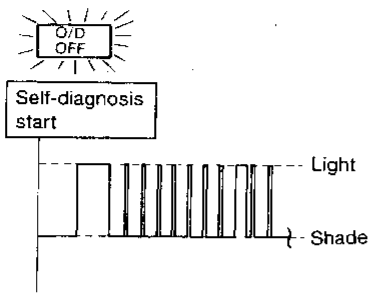
➡ **Go to TORQUE CONVERTER CLUTCH SOLENOID VALVE (DTC: 1204), AT-113.**

$t_1$ = 2.5 seconds $t_2$ = 2.0 seconds $t_3$ = 1.0 second

## Diagnostic Procedure without CONSULT (Cont'd)

O/D OFF indicator lamp:

8th judgement flicker is longer than others.

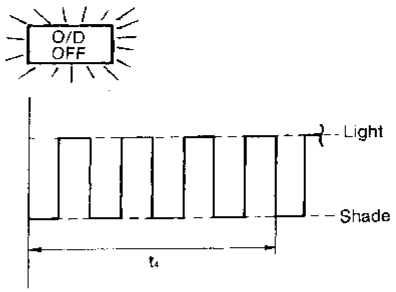



SAT451F

A/T fluid temperature sensor is disconnected or TCM power source circuit is damaged.

➡ **Go to A/T FLUID TEMPERATURE SENSOR AND TCM POWER SOURCE (DTC: 1208), AT-146.**

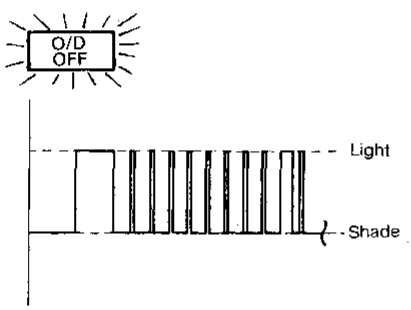
Flickers as shown below.




SAT457F

Battery power is low.
Battery has been disconnected for a long time.
Battery is connected conversely.
(When reconnecting TCM connectors. — This is not a problem.)

9th judgement flicker is longer than others.

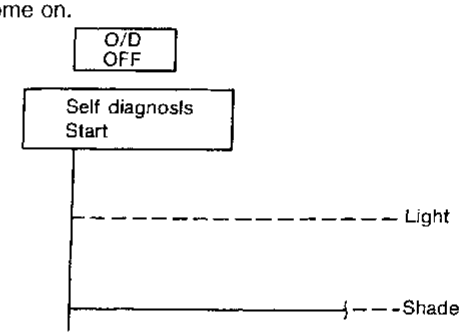



SAT453F

Engine speed signal circuit is short-circuited or disconnected.

➡ **Go to ENGINE SPEED SIGNAL (DTC: 1207), AT-89.**

Does not come on.

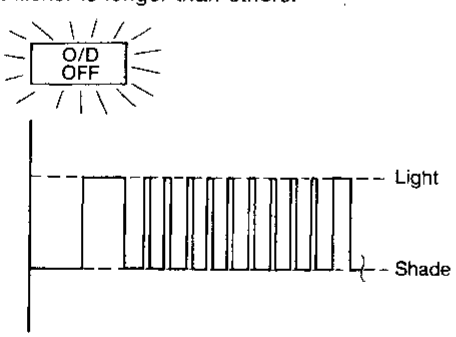



SAT414G

Inhibitor switch, overdrive control switch or throttle position switch circuit is disconnected or TCM is damaged.

➡ **Go to 21. TCM Self-diagnosis Does Not Activate (INHIBITOR, OVERDRIVE CONTROL AND THROTTLE POSITION SWITCHES), AT-168.**

10th judgement flicker is longer than others.

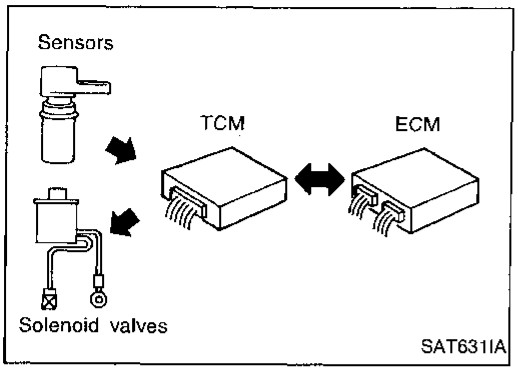


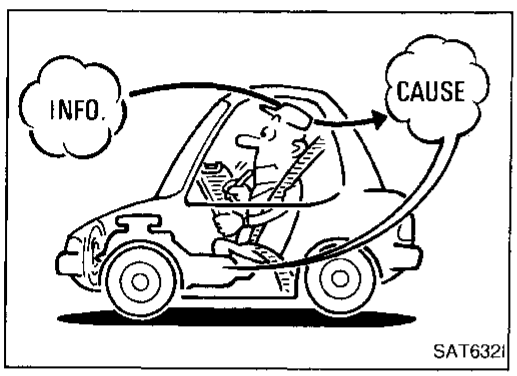

SAT455F

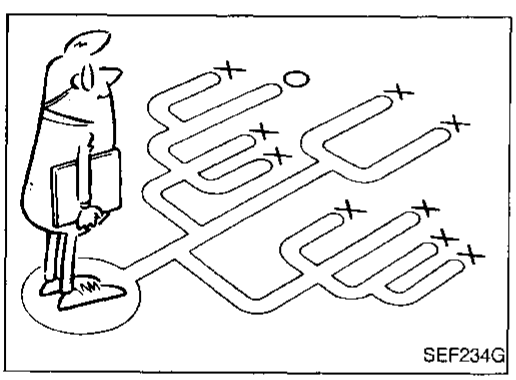
Line pressure solenoid valve circuit is short-circuited or disconnected.

➡ **Go to LINE PRESSURE SOLENOID VALVE (DTC: 1205), AT-124.**

$t_4$ = 1.0 second




## Introduction

The TCM receives a signal from the vehicle speed sensor, throttle position sensor or inhibitor switch and provides shift control or lock-up control via A/T solenoid valves.

The TCM also communicates with the ECM by means of a signal sent from sensing elements used with the OBD-related parts of the A/T system for malfunction-diagnostic purposes. The TCM is capable of diagnosing malfunctioning parts while the ECM can store malfunctions in its memory.

Input and output signals must always be correct and stable in the operation of the A/T system. The A/T system must be in good operating condition and be free of valve seizure, solenoid valve malfunction, etc.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow". Refer to AT-55.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example (AT-52) should be used.

Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

Also check related Service bulletins.

## Diagnostic Worksheet

### INFORMATION FROM CUSTOMER

**KEY POINTS**
**WHAT** ..... Vehicle & A/T model
**WHEN** ..... Date, Frequencies
**WHERE** ..... Road conditions
**HOW** ..... Operating conditions, Symptoms

| | | |
|---|---|---|
| Customer name MR/MS | Model & Year | VIN |
| Trans. model | Engine | Mileage |
| Incident Date | Manuf. Date | In Service Date |
| Frequency | □ Continuous □ Intermittent ( times a day) | |
| Symptoms | □ Vehicle does not move. (□ Any position □ Particular position) | |
| | □ No up-shift (□ 1st → 2nd □ 2nd → 3rd □ 3rd → O/D) | |
| | □ No down-shift (□ O/D → 3rd □ 3rd → 2nd □ 2nd → 1st) | |
| | □ Lockup malfunction | |
| | □ Shift point too high or too low. | |
| | □ Shift shock or slip (□ N → D □ Lockup □ Any drive position) | |
| | □ Noise or vibration | |
| | □ No kickdown | |
| | □ No pattern select | |
| | □ Others ( ) | |
| O/D OFF indicator lamp | Blinks for about 8 seconds. | |
| | □ Continuously lit | □ Not lit |
| Malfunction indicator lamp (MIL) | □ Continuously lit | □ Not lit |

## Diagnostic Worksheet (Cont'd)

### DIAGNOSTIC WORKSHEET

| | | |
|---|---|---|
| 1. | ☐ Read the Fail-safe and listen to customer complaints. | AT-5 |
| 2. | ☐ CHECK A/T FLUID<br>☐ Leakage (Follow specified procedure)<br>☐ Fluid condition<br>☐ Fluid level | AT-56 |
| 3. | ☐ Perform STALL TEST and LINE PRESSURE TEST.<br>☐ Stall test — Mark possible damaged components/others.<br>☐ Torque converter one-way clutch<br>☐ Reverse clutch<br>☐ Forward clutch<br>☐ Overrun clutch<br>☐ Forward one-way clutch<br>☐ Low & reverse brake<br>☐ Low one-way clutch<br>☐ Engine<br>☐ Line pressure is low<br>☐ Clutches and brakes except high clutch and brake band are OK<br>☐ Pressure test — Suspected parts: | AT-56, 59 |
| 4. | ☐ Perform all ROAD TEST and mark required procedures. | AT-61 |
| | 4-1. Check before engine is started<br>☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.<br>☐ Inhibitor switch, AT-78.<br>☐ A/T fluid temperature sensor, AT-82.<br>☐ Vehicle speed sensor·A/T (Revolution sensor), AT-86.<br>☐ Engine speed signal, AT-89.<br>☐ Torque converter clutch solenoid valve, AT-113.<br>☐ Line pressure solenoid valve, AT-124.<br>☐ Shift solenoid valve A, AT-128.<br>☐ Shift solenoid valve B, AT-132.<br>☐ Throttle position sensor, AT-136.<br>☐ Overrun clutch solenoid valve, AT-142.<br>☐ Inhibitor, overdrive control and throttle position switches, AT-168.<br>☐ A/T fluid temperature sensor and TCM power source, AT-146.<br>☐ Vehicle speed sensor·MTR, AT-150.<br>☐ Battery<br>☐ Others | AT-61 |
| | 4-2. Check at idle<br>☐ 1. O/D OFF Indicator Lamp Does Not Come On, AT-153.<br>☐ 2. Engine Cannot Be Started In "P" And "N" Position, AT-154.<br>☐ 3. In "P" Position, Vehicle Moves Forward Or Backward When Pushed, AT-154.<br>☐ 4. In "N" Position, Vehicle Moves, AT-155.<br>☐ 5. Large Shock. "N" → "R" Position, AT-156.<br>☐ 6. Vehicle Does Not Creep Backward In "R" Position, AT-157.<br>☐ 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position, AT-158. | AT-62 |
| | 4-3. Cruise test<br>Part-1<br>☐ 8. Vehicle Cannot Be Started From $D_1$, AT-159.<br>☐ 9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-160.<br>☐ 10. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-161.<br>☐ 11. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-162.<br>☐ 12. A/T Does Not Perform Lock-up, AT-163.<br>☐ 13. A/T Does Not Hold Lock-up Condition, AT-164.<br>☐ 14. Lock-up Is Not Released, AT-164.<br>☐ 15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$), AT-165. | AT-64, AT-67 |

## Diagnostic Worksheet (Cont'd)

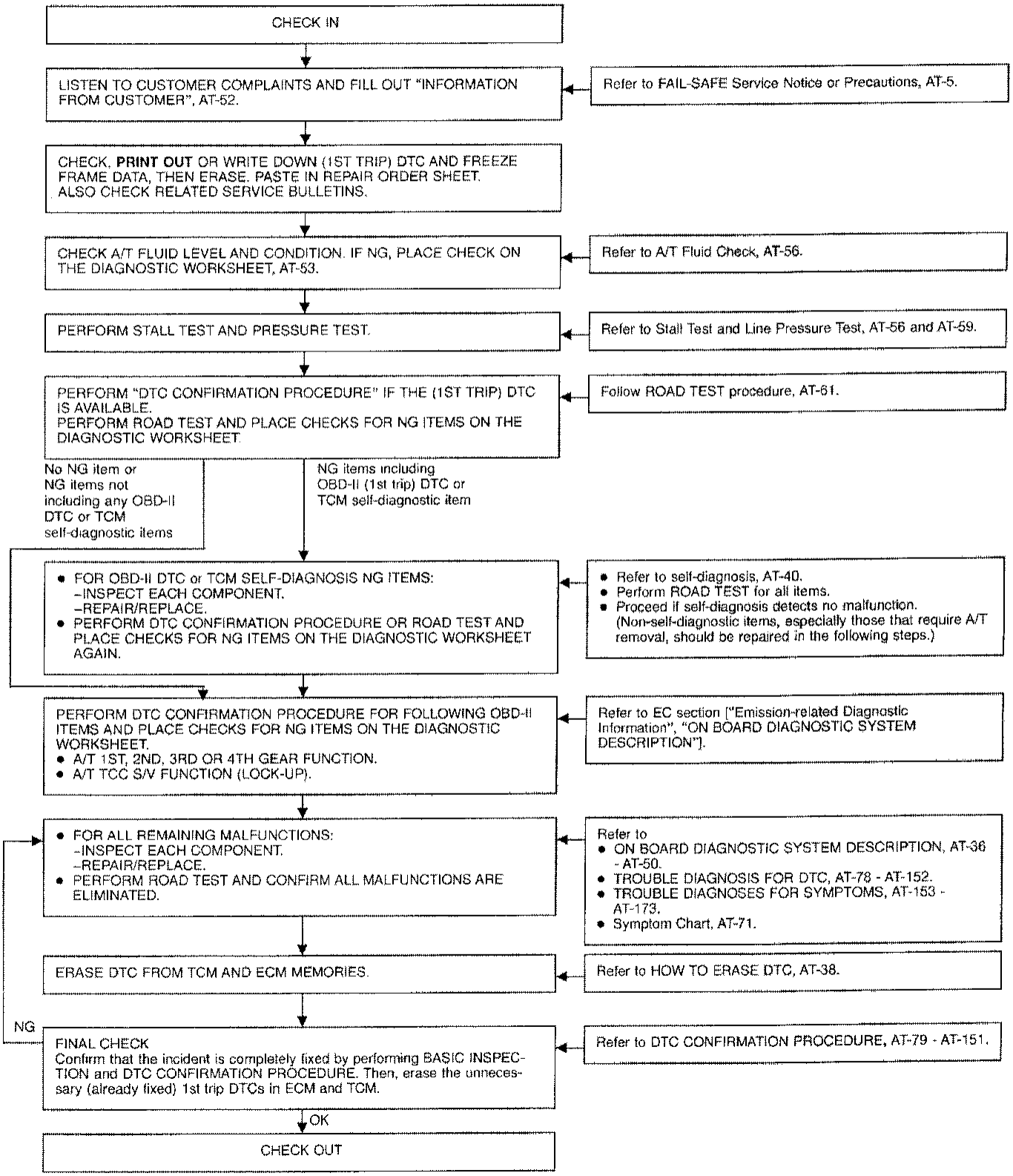
| | | |
|---|---|---|
| 4. | Part-2<br>☐ 16. Vehicle Does Not Start From $D_1$, AT-166.<br>☐ 9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-160.<br>☐ 10. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-161.<br>☐ 11. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-162. | AT-69 |
| | Part-3<br>☐ 17. A/T Does Not Shift: $D_4 \rightarrow D_3$ When Overdrive Control Switch "ON" → "OFF", AT-166.<br>☐ 15. Engine Speed Does Not Return To Idle (Engine Brake In $D_3$), AT-165.<br>☐ 18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" → "2" Position, AT-167.<br>☐ 15. Engine Speed Does Not Return To Idle (Engine Brake In $2_2$), AT-165.<br>☐ 19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position, AT-167.<br>☐ 20. Vehicle Does Not Decelerate By Engine Brake, AT-168.<br>☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.<br>☐ Inhibitor switch, AT-78.<br>☐ A/T fluid temperature sensor, AT-82.<br>☐ Vehicle speed sensor·A/T (Revolution sensor), AT-86.<br>☐ Engine speed signal, AT-89.<br>☐ Torque converter clutch solenoid valve, AT-113.<br>☐ Line pressure solenoid valve, AT-124.<br>☐ Shift solenoid valve A, AT-128.<br>☐ Shift solenoid valve B, AT-132.<br>☐ Throttle position sensor, AT-136.<br>☐ Overrun clutch solenoid valve, AT-142.<br>☐ Inhibitor, overdrive control and throttle position switches, AT-168.<br>☐ A/T fluid temperature sensor and TCM power source, AT-146.<br>☐ Vehicle speed sensor·MTR, AT-150.<br>☐ Battery<br>☐ Others | AT-70 |
| 5. | ☐ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts. | AT-41 |
| 6. | ☐ Perform all ROAD TEST and re-mark required procedures. | AT-61 |
| 7. | ☐ Perform DTC CONFIRMATION PROCEDURE for following MIL indicating items and check out NG items.<br>Refer to EC section ["Emission-related Diagnostic Information", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].<br>☐ DTC (P0731, 1103) A/T 1st gear function, AT-92.<br>☐ DTC (P0732, 1104) A/T 2nd gear function, AT-97.<br>☐ DTC (P0733, 1105) A/T 3rd gear function, AT-101.<br>☐ DTC (P0734, 1106) A/T 4th gear function, AT-105.<br>☐ DTC (P0744, 1107) A/T TCC S/V function (lock-up), AT-117. | EC section |
| 8. | ☐ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts.<br>Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.) | AT-74<br>AT-71 |
| 9. | ☐ Erase DTC from TCM and ECM memories. | AT-38 |

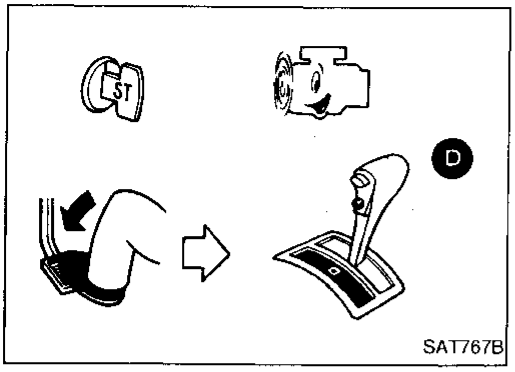
## Work Flow

### HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate. In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Make good use of the two sheets provided, "INFORMATION FROM CUSTOMER" (AT-52) and "DIAGNOSTIC WORKSHEET" (AT-53), to perform the best troubleshooting possible.

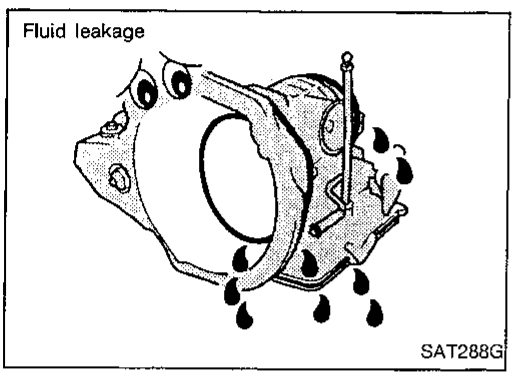




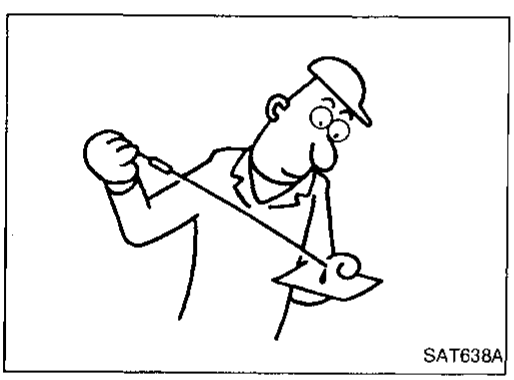

## A/T Fluid Check

### FLUID LEAKAGE CHECK

1. Clean area suspected of leaking — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" position and wait a few minutes.
3. Stop engine.




4. Check for fresh leakage.

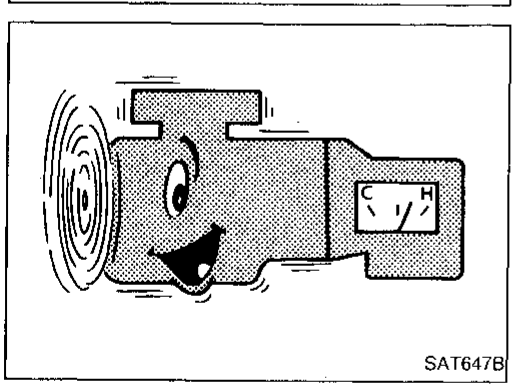



### FLUID CONDITION CHECK

| Fluid color | Suspected problem |
|---|---|
| Dark or black with burned odor | Wear of frictional material |
| Milky pink | Water contamination — Road water entering through filler tube or breather |
| Varnished fluid, light to dark brown and tacky | Oxidation — Over or under filling, — Overheating |

### FLUID LEVEL CHECK

Refer to MA section ("Checking A/T Fluid", "CHASSIS AND BODY MAINTENANCE").

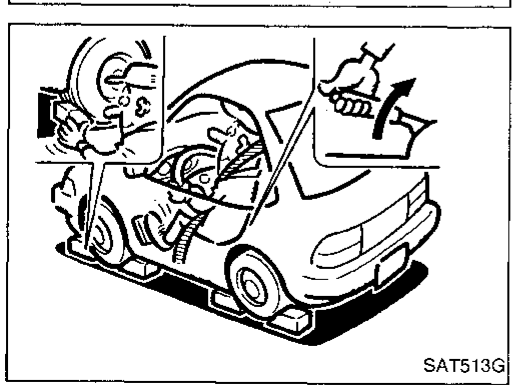



## Stall Test

### STALL TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

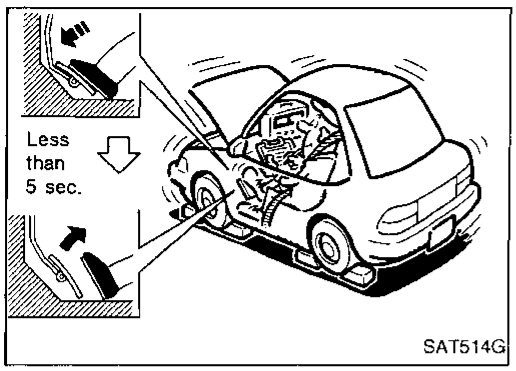
**ATF operating temperature:**
**50 - 80°C (122 - 176°F)**




3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to mark the point of specified engine rpm on indicator.**

## Stall Test (Cont'd)

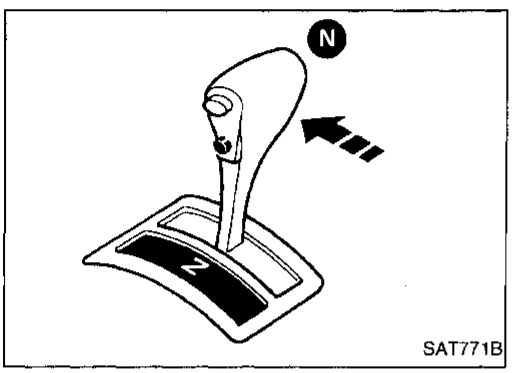


SAT514G

5. Start engine, apply foot brake, and place selector lever in *D* position.
6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide open for more than 5 seconds.**

**Stall revolution:**
**2,050 - 2,250 rpm**



SAT771B

8. Move selector lever to "N" position.
9. Cool off ATF.

- **Run engine at idle for at least one minute.**

10. Repeat steps 5 through 9 with selector lever in "2", "1" and "R" positions.

### JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustration.
In order to pinpoint the possible damaged components, follow the Work Flow shown in AT-55.

**Note**

**Stall revolution is too high in "D" or "2" position:**

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. ..... Low one-way clutch slippage
- Slippage occurs at the following gears:
  1st through 3rd gears in "D" position and engine brake functions.
  1st and 2nd gears in "2" position and engine brake functions with accelerator pedal released (fully closed throttle). ..... Forward clutch or forward one-way clutch slippage

**Stall revolution is too high in "R" position:**

- Engine brake does not function in "1" position. ..... Low & reverse brake slippage
- Engine brake functions in "1" position. ..... Reverse clutch slippage

**Stall revolution within specifications:**

- Vehicle does not achieve speed of more than 80 km/h (50 MPH). ..... One-way clutch seizure in torque converter housing

**CAUTION:**
**Be careful since automatic fluid temperature increases abnormally.**

- Slippage occurs in 3rd and 4th gears in "D" position. ..... High clutch slippage
- Slippage occurs in 2nd and 4th gear in "D" position. ..... Brake band slippage

**Stall revolution less than specifications:**

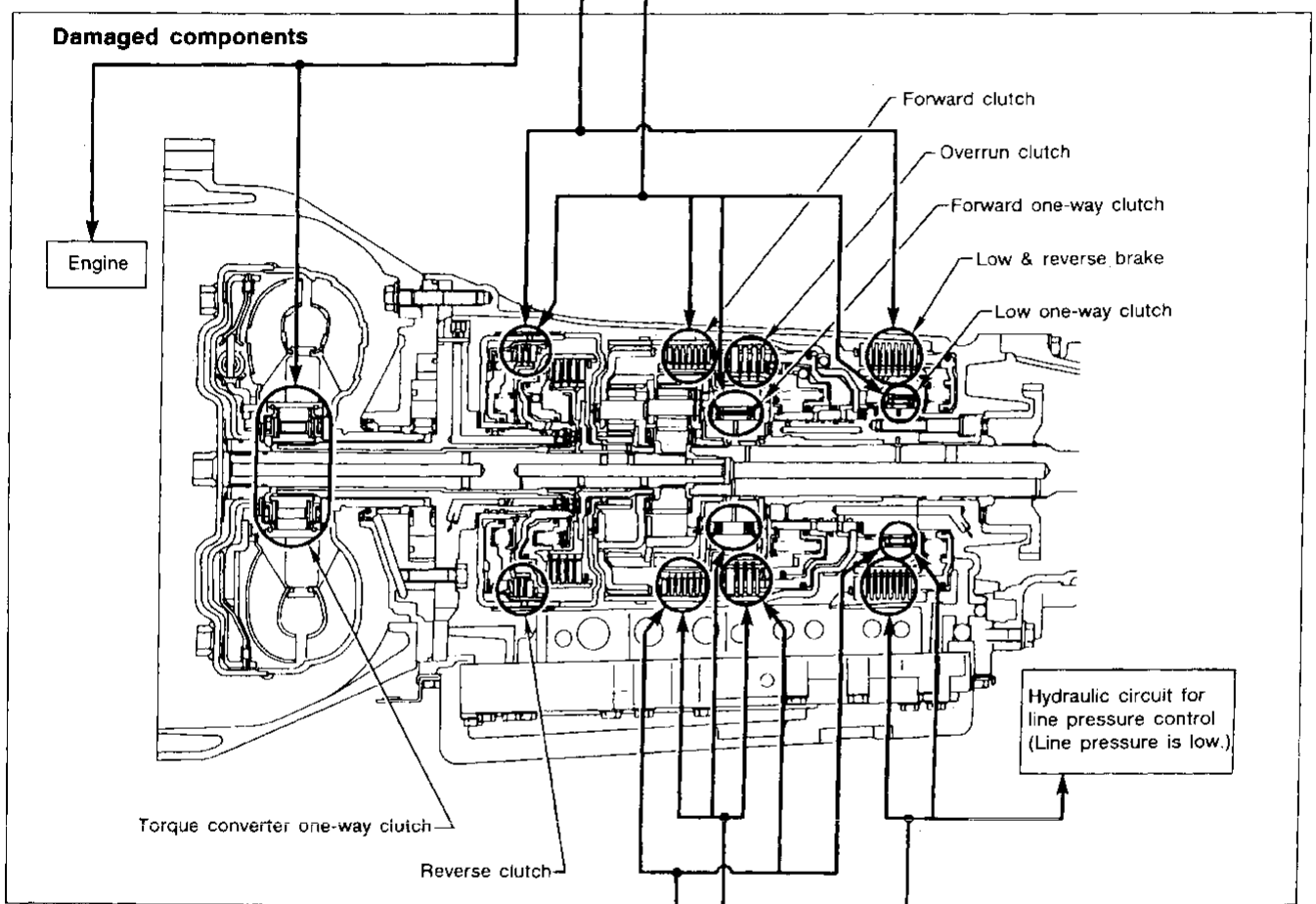
- Poor acceleration during starts. ..... One-way clutch seizure in torque converter

## Stall Test (Cont'd)

### JUDGEMENT OF STALL TEST

| Selector lever position | Judgement | | |
|---|---|---|---|
| D | L | O | H |
| 2 | L | O | H |
| 1 | L | O | O |
| R | L | H | H |

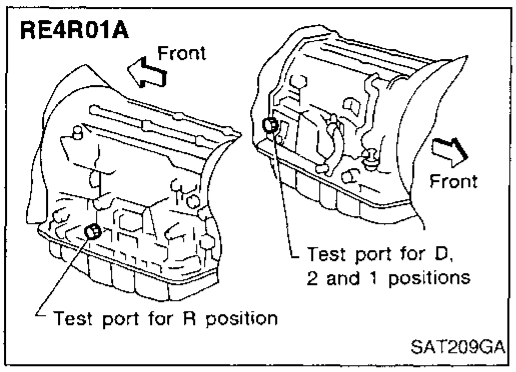
O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.




Clutches and brakes except high clutch and brake band are OK. (Condition of high clutch and brake band cannot be confirmed by stall test.)

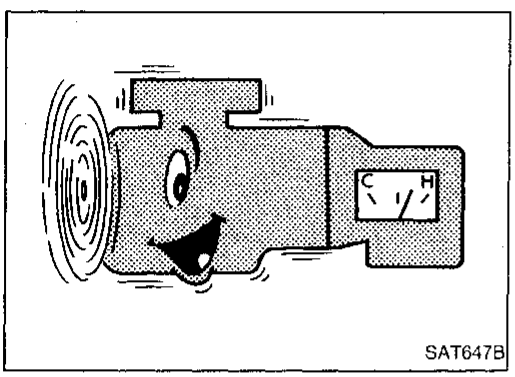
| Selector lever position | Judgement | | | |
|---|---|---|---|---|
| D | H | H | H | O |
| 2 | H | H | H | O |
| 1 | O | H | H | O |
| R | O | O | H | O |

SAT392H



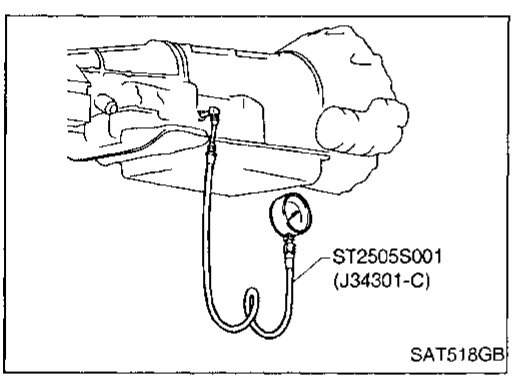

## Line Pressure Test

- Location of pressure test ports.
- **Always replace line pressure plugs as they are self-sealing bolts.**

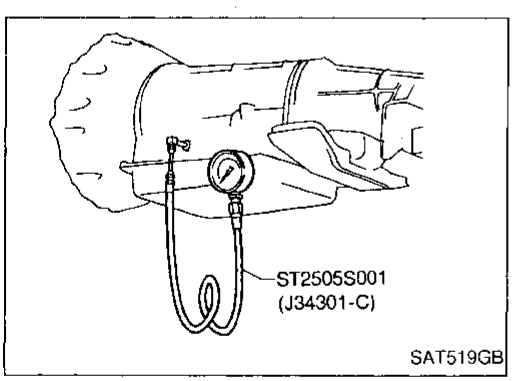


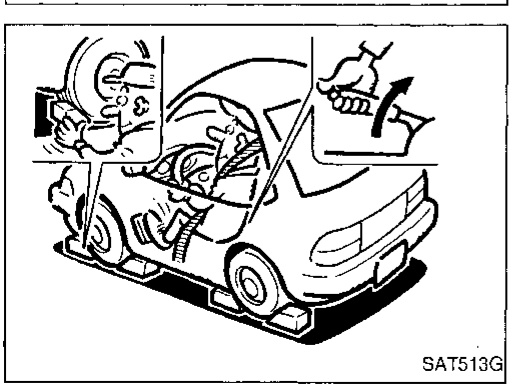

### LINE PRESSURE TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.
   **ATF operating temperature:**
   **50 - 80°C (122 - 176°F)**



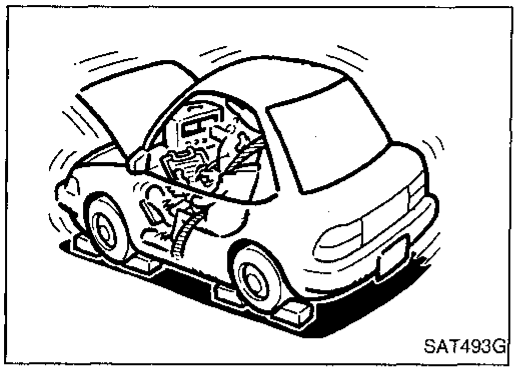

3. Install pressure gauge to corresponding line pressure port.




4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test is being performed at stall speed.**

## Line Pressure Test (Cont'd)


SAT493G

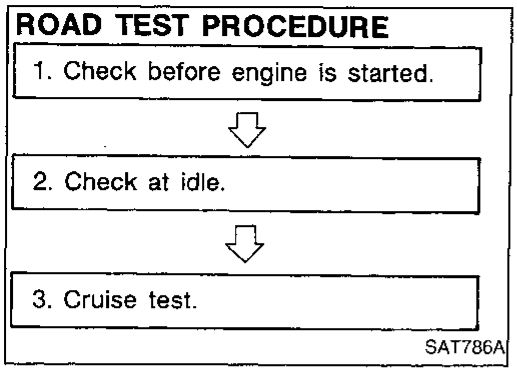
5. Start engine and measure line pressure at idle and stall speed.

- **When measuring line pressure at stall speed, follow the stall test procedure.**

**Line pressure:**
**Refer to SDS, AT-262.**

### JUDGEMENT OF LINE PRESSURE TEST

| Judgement | | Suspected parts |
|---|---|---|
| At idle | Line pressure is low in all positions. | • Oil pump wear<br>• Control piston damage<br>• Pressure regulator valve or plug sticking<br>• Spring for pressure regulator valve damaged<br>• Fluid pressure leakage between oil strainer and pressure regulator valve<br>• Clogged strainer |
| | Line pressure is low in particular position. | • Fluid pressure leakage between manual valve and particular clutch<br>• For example, line pressure is:<br>– Low in "R" and "1" positions, but<br>– Normal in "D" and "2" positions.<br>Therefore, fluid leakage exists at or around low and reverse brake circuit.<br>Refer to "CLUTCH AND BAND CHART", AT-26. |
| | Line pressure is high. | • Maladjustment of throttle position sensor<br>• A/T fluid temperature sensor damaged<br>• Line pressure solenoid valve sticking<br>• Short circuit of line pressure solenoid valve circuit<br>• Pressure modifier valve sticking<br>• Pressure regulator valve or plug sticking<br>• Open in dropping resistor circuit |
| At stall speed | Line pressure is low. | • Maladjustment of throttle position sensor<br>• Line pressure solenoid valve sticking<br>• Short circuit of line pressure solenoid valve circuit<br>• Pressure regulator valve or plug sticking<br>• Pressure modifier valve sticking<br>• Pilot valve sticking |

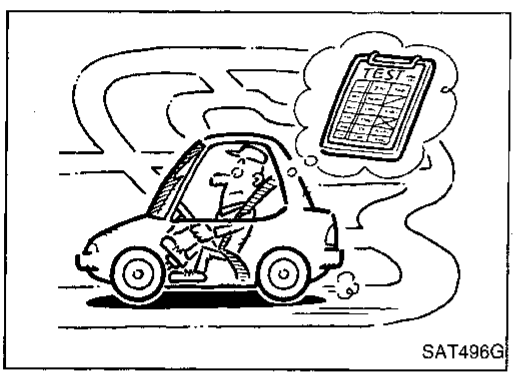



## Road Test

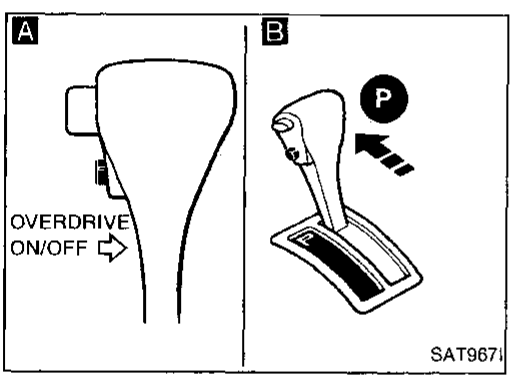
### DESCRIPTION

- The purpose of the test is to determine overall performance of A/T and analyze causes of problems.
- The road test consists of the following three parts:

1. Check before engine is started
2. Check at idle
3. Cruise test




- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items until specified symptom is found. Troubleshoot items which check out No Good after road test. Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and "TROUBLE DIAGNOSES FOR SYMPTOMS", AT-36 - AT-50 and AT-153 - AT-173.



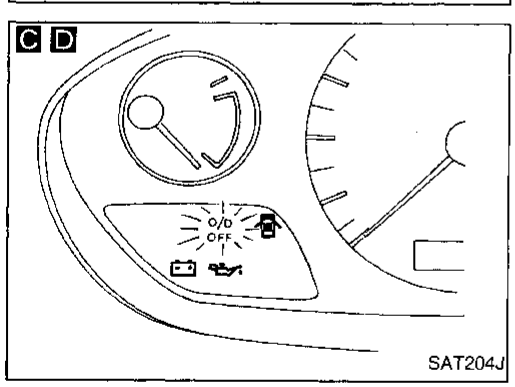

### 1. CHECK BEFORE ENGINE IS STARTED

A B C

1. Park vehicle on flat surface.
2. Move selector lever to "P" position.
3. Turn ignition switch to "OFF" position. Wait at least 5 seconds.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Does O/D OFF indicator lamp come on for about 2 seconds?

No → Stop ROAD TEST. Go to "1. O/D OFF Indicator Lamp Does Not Come On", AT-153.

Yes ↓




D

Does O/D OFF indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis and check NG items on the DIAGNOSTIC WORKSHEET, AT-53. Refer to SELF-DIAGNOSIS PROCEDURE, AT-40.

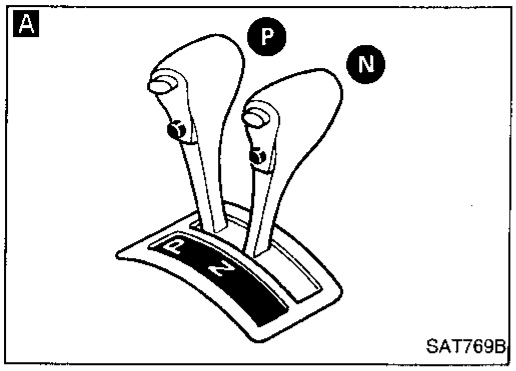
No ↓

1. Turn ignition switch to "OFF" position.
2. Perform self-diagnosis and note NG items.
   Refer to SELF-DIAGNOSIS PROCEDURE, AT-47.
3. Go to "2. CHECK AT IDLE", AT-62.

## Road Test (Cont'd)

### 2. CHECK AT IDLE

A



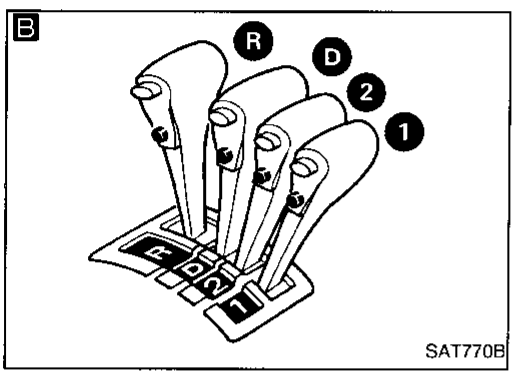

1. Park vehicle on flat surface.
2. Move selector lever to "P" position.
3. Turn ignition switch to "OFF" position.
4. Turn ignition switch to "START" position.
5. Is engine started?

No → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "2. Engine Cannot Be Started In "P" and "N" Position", AT-154. Continue ROAD TEST.

Yes ↓

Turn ignition switch to "ACC" position. ↓

B

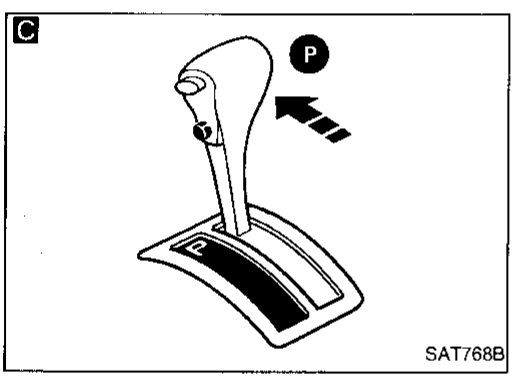



1. Move selector lever to "D", "1", "2" or "R" position.
2. Turn ignition switch to "START" position.
3. Is engine started?

Yes → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "2. Engine Cannot Be Started In "P" and "N" Position", AT-154. Continue ROAD TEST.

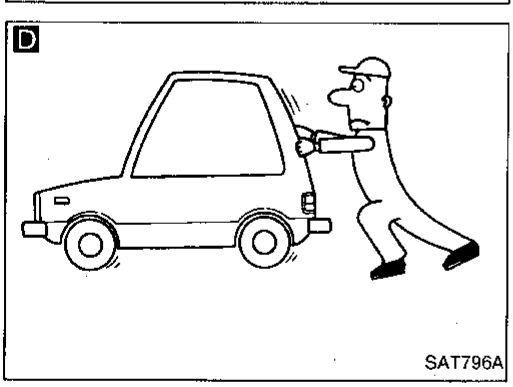
No ↓

C




1. Move selector lever to "P" position.
2. Turn ignition switch to "OFF" position.
3. Release parking brake. ↓

D

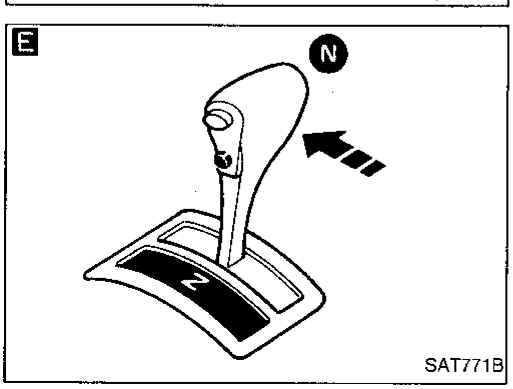



1. Push vehicle forward or backward.
2. Does vehicle move when it is pushed forward or backward?
3. Apply parking brake.

Yes → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "3. In "P" Position, Vehicle Moves Forward Or Backward When Pushed", AT-154. Continue ROAD TEST.

No ↓

E




1. Start engine.
2. Move selector lever to "N" position.
3. Release parking brake.
4. Does vehicle move forward or backward?

Yes → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "4. In "N" Position, Vehicle Moves", AT-155. Continue ROAD TEST.

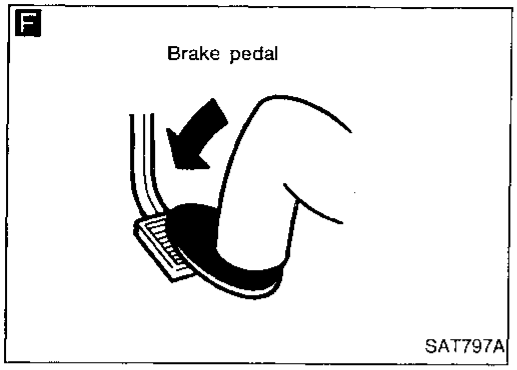
No ↓

Ⓐ

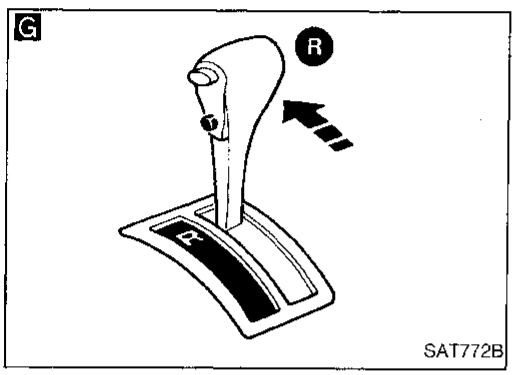
(Go to next page.)

## Road Test (Cont'd)

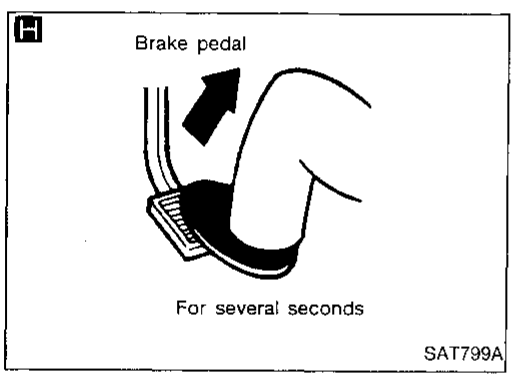
F



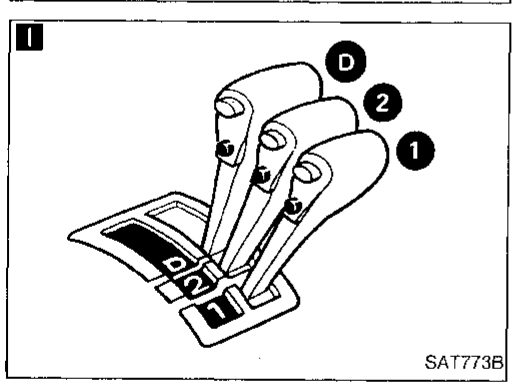

G




H




I




Ⓐ

**F** Apply foot brake.

**G** 1. Move selector lever to "R" position.
2. Is there large shock when changing from "N" to "R" position?

Yes → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "5. Large Shock "N" → "R" Position", AT-156. Continue ROAD TEST.

No

**H** 1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

No → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "6. Vehicle Does Not Creep Backward In "R" Position", AT-157. Continue ROAD TEST.

Yes

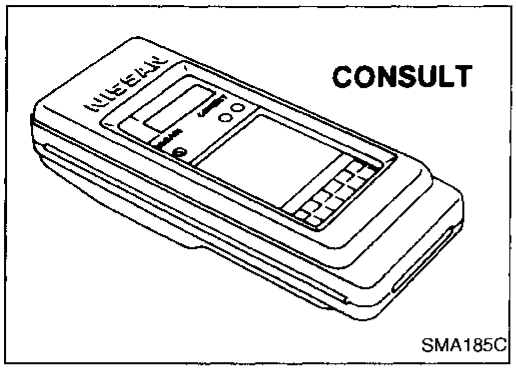
**I** 1. Move selector lever to "D", "2" and "1" positions and check if vehicle creeps forward.
2. Does vehicle creep forward in all three positions?

No → Mark the box on the DIAGNOSTIC WORKSHEET. Go to "7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position", AT-158. Continue ROAD TEST.

Yes

Go to 3. CRUISE TEST, AT-64.

## Road Test (Cont'd)

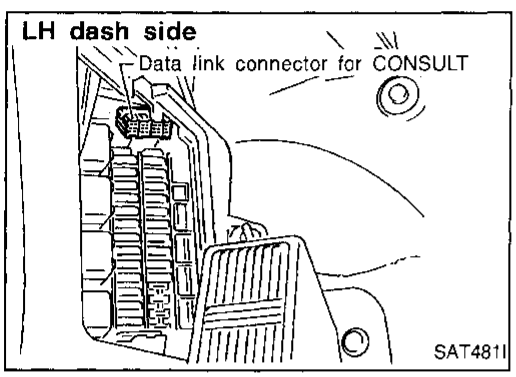



### 3. CRUISE TEST

- Check all items listed in Parts 1 through 3.

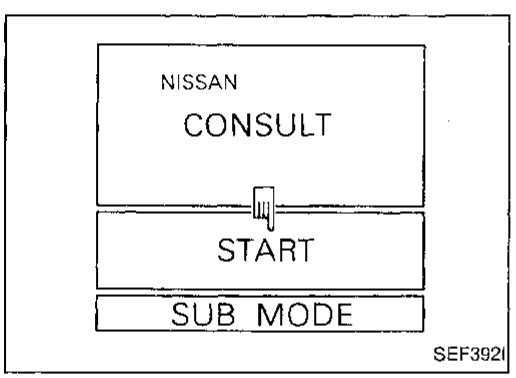
**With CONSULT**

- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per Shift Schedule.

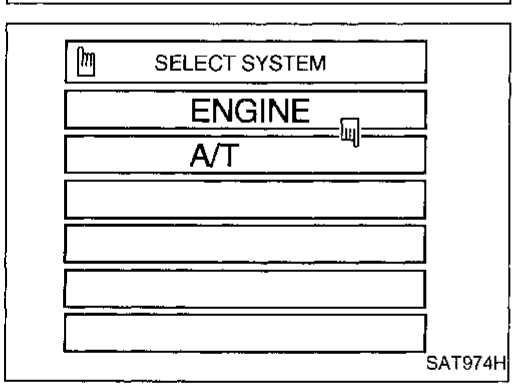



**CONSULT setting procedure**

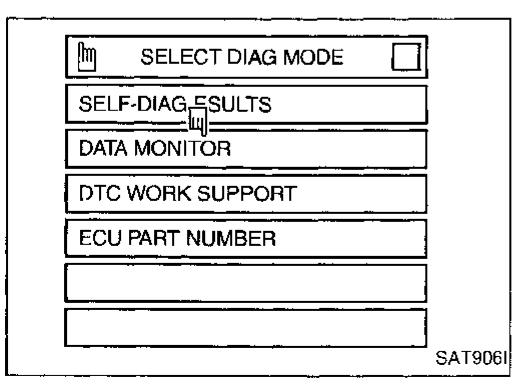
1. Turn ignition switch "OFF".
2. Connect CONSULT to Data link connector for CONSULT. Data link connector for CONSULT is located behind the cover.




3. Turn ignition switch "ON".
4. Touch "START".

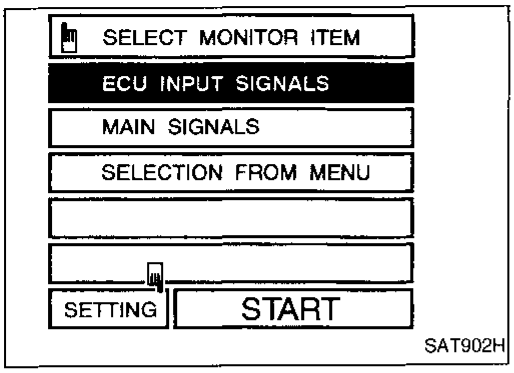



5. Touch "A/T".

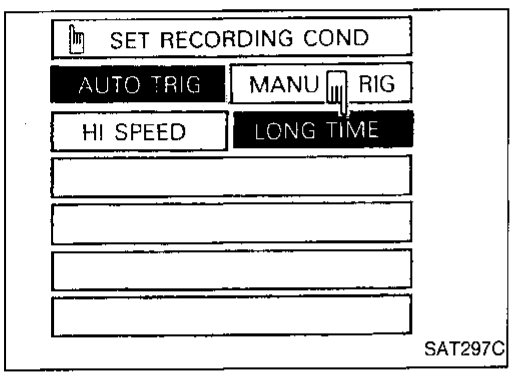



6. Touch "DATA MONITOR".

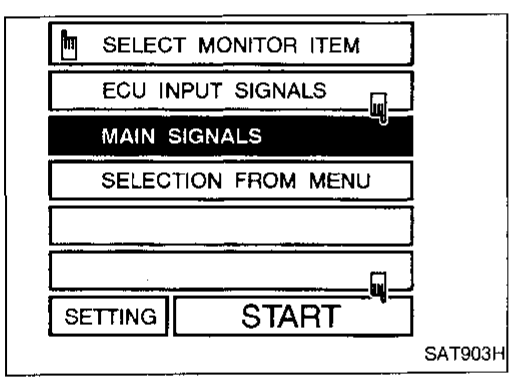
## Road Test (Cont'd)



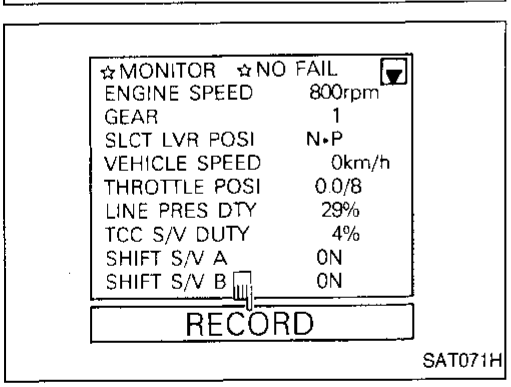

7. Touch "SETTING" to set recording condition.



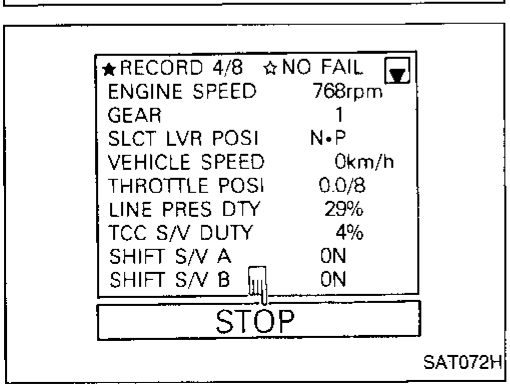

8. Touch "LONG TIME" and "ENTER" key.




9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".

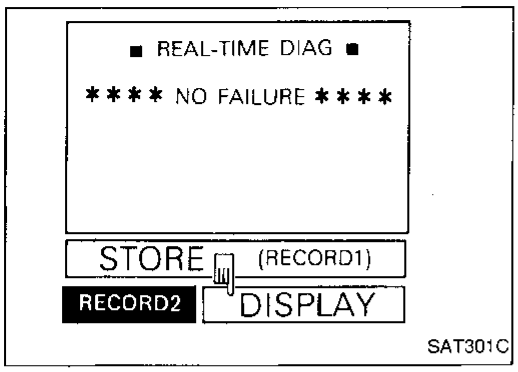



11. When performing cruise test, touch "RECORD".

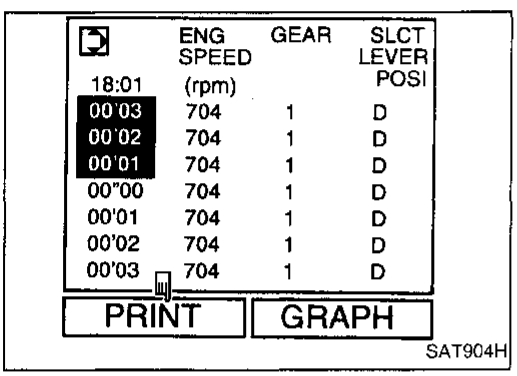



12. After finishing cruise test part 1, touch "STOP".

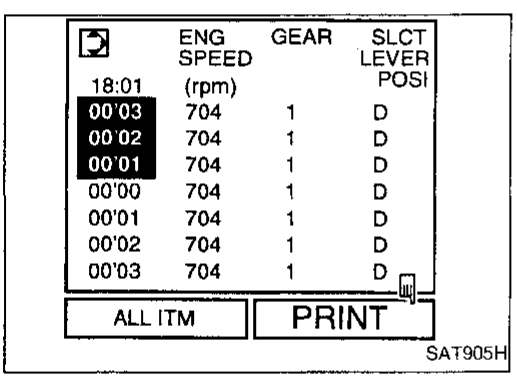
## Road Test (Cont'd)



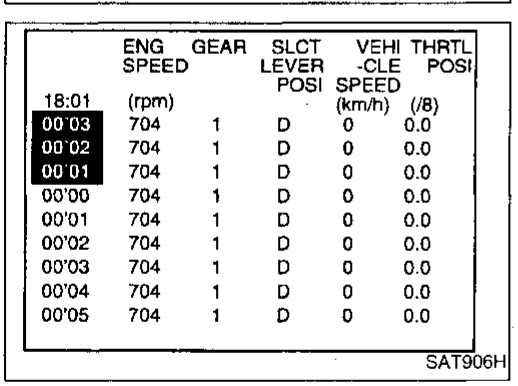

13. Touch "DISPLAY".



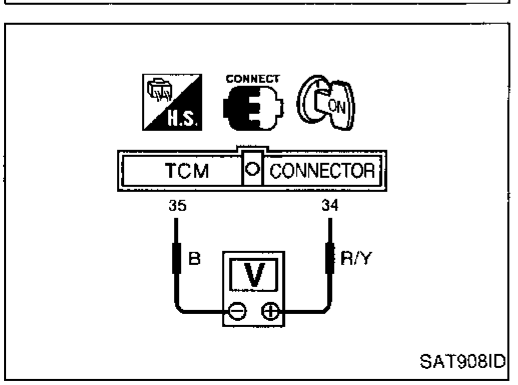

14. Touch "PRINT".




15. Touch "PRINT" again.




16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.

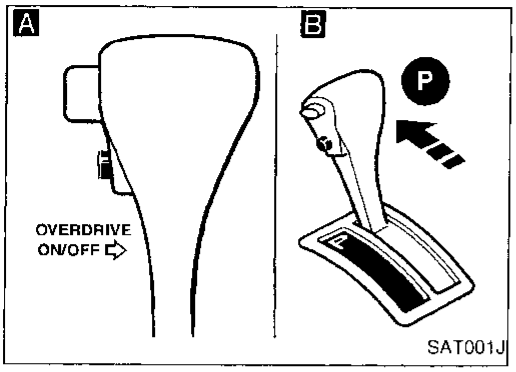



**Without CONSULT**

- Throttle position can be checked by voltage across terminals ㉞ and ㉟ of TCM.

# Road Test (Cont'd)

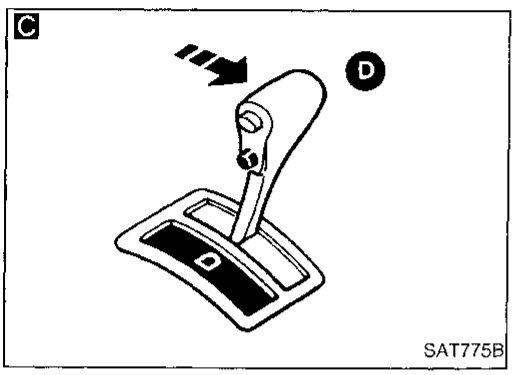
## CRUISE TEST — Part 1




1. Drive vehicle for approx. 10 minutes to warm engine oil and ATF up to operating temperature.
   **ATF operating temperature:**
   **50 - 80°C (122 - 176°F)**

**A** **B**

1. Park vehicle on flat surface.
2. Set overdrive control switch to "ON" position.
3. Move selector lever to "P" position.
4. Start engine.

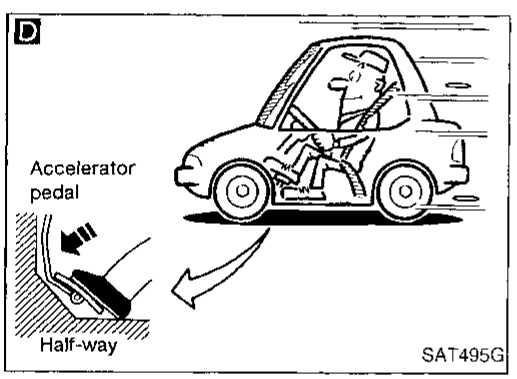



**C**

Move selector lever to "D" position.

**D**

Accelerate vehicle by constantly depressing accelerator pedal half-way.




Does vehicle start from "$D_1$"?
**Read gear position.**

No → Go to "8. Vehicle Cannot Be Started From $D_1$", AT-159. Continue ROAD TEST.

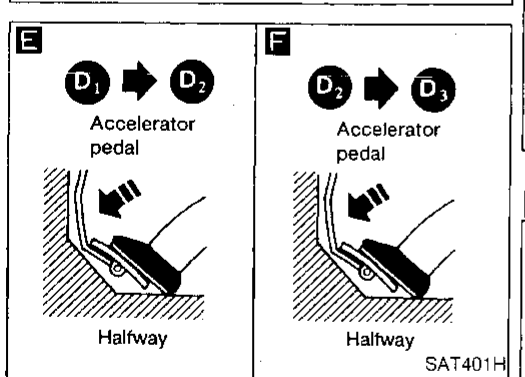
Yes

**E**

Does A/T shift from "$D_1$" to "$D_2$" at the specified speed?
**Read gear position, throttle opening and vehicle speed.**
**Specified speed when shifting from "$D_1$" to "$D_2$":**
**Refer to Shift schedule, AT-262.**

No → Go to "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-160. Continue ROAD TEST.

Yes




**F**

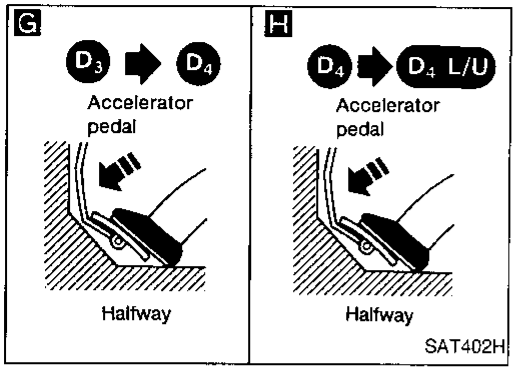
Does A/T shift from "$D_2$" to "$D_3$" at the specified speed?
**Read gear position, throttle position and vehicle speed.**
**Specified speed when shifting from "$D_2$" to "$D_3$":**
**Refer to Shift schedule, AT-262.**

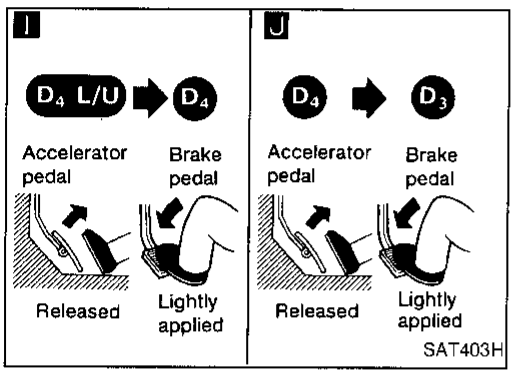
No → Go to "10. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-161. Continue ROAD TEST.

Yes

Ⓐ

## Road Test (Cont'd)




Ⓐ

**G**

Does A/T shift from "$D_3$" to "$D_4$" at the specified speed?

**Read gear position, throttle position and vehicle speed.**

**Specified speed when shifting from $D_3$ to $D_4$:**

**Refer to Shift schedule, AT-262.**

No → Go to "11. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-162. Continue ROAD TEST.

Yes ↓

**H**

Does A/T perform lock-up at the specified speed?

**Read vehicle speed, throttle position when lock-up duty becomes 94%.**

**Specified speed when lock-up occurs:**

**Refer to Shift schedule, AT-262.**

No → Go to "12. A/T Does Not Perform Lock-up", AT-163. Continue ROAD TEST.

Yes ↓

Does A/T hold lock-up condition for more than 30 seconds?

No → Go to "13. A/T Does Not Hold Lock-up Condition", AT-164.

Yes ↓

**I**

1. Release accelerator pedal.
2. Is lock-up released when accelerator pedal is released?

No → Go to "14. Lock-up Is Not Released", AT-164. Continue ROAD TEST.

Yes ↓

**J**

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from "$D_4$" to "$D_3$"?

**Read gear position and engine speed.**

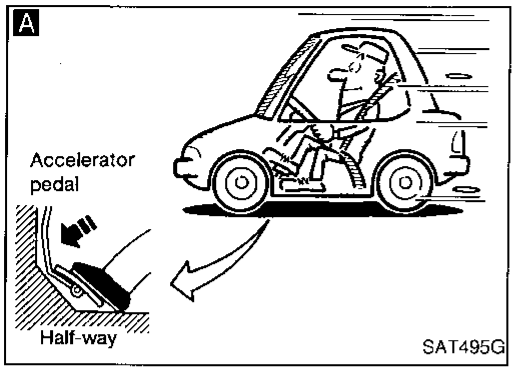
No → Go to "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-165. Continue ROAD TEST.

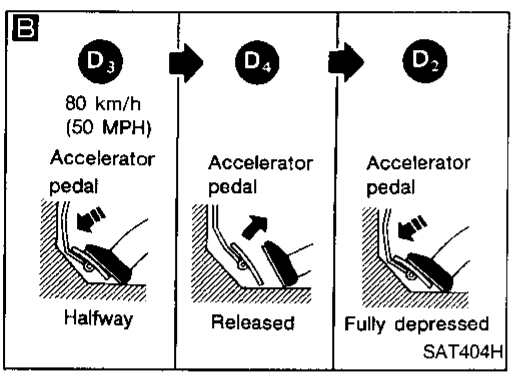
Yes ↓

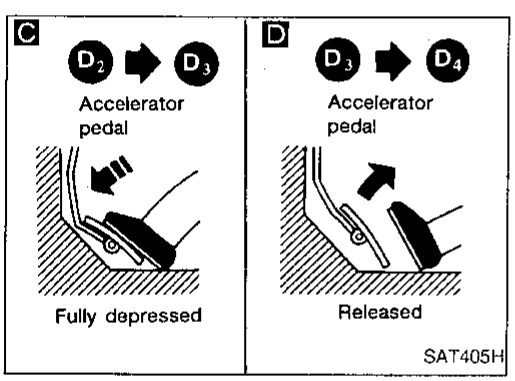
1. Stop vehicle.
2. Go to "CRUISE TEST — Part 2", AT-69.

# Road Test (Cont'd)

## CRUISE TEST — Part 2




1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.

↓

**A**

1. Accelerate vehicle by half throttle again.
2. Does vehicle start from "$D_1$"?

**Read gear position.**

No → Go to "16. Vehicle Does Not Start From $D_1$", AT-166. Continue ROAD TEST.

↓ Yes

**B**

1. Accelerate vehicle to 80 km/h (50 MPH) as shown in illustration.
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from "$D_4$" to "$D_2$" as soon as accelerator pedal is depressed fully?

**Read gear position and throttle position.**

No → Go to "9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-160. Continue ROAD TEST.

↓ Yes

**C**

Does A/T shift from "$D_2$" to "$D_3$" at the specified speed?

**Read gear position, throttle position and vehicle speed.**

**Specified speed when shifting from "$D_2$" to "$D_3$":**
**Refer to Shift schedule, AT-262.**

No → Go to "10. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-161. Continue ROAD TEST.

↓ Yes

**D**

Release accelerator pedal after shifting from "$D_2$" to "$D_3$".
Does A/T shift from "$D_3$" to "$D_4$" and does vehicle decelerate by engine brake?

**Read gear position, throttle position and vehicle speed.**

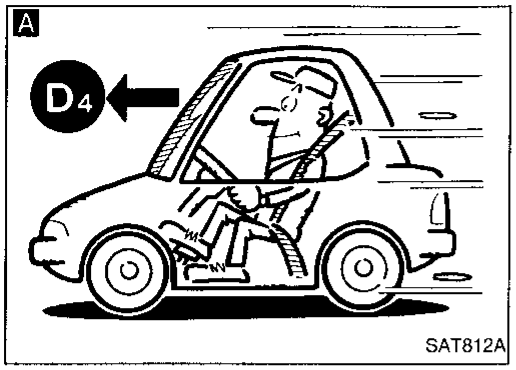
No → Go to "11. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-162. Continue ROAD TEST.

↓ Yes

1. Stop vehicle.
2. Go to "CRUISE TEST — Part 3", AT-70.

# Road Test (Cont'd)

## CRUISE TEST — Part 3



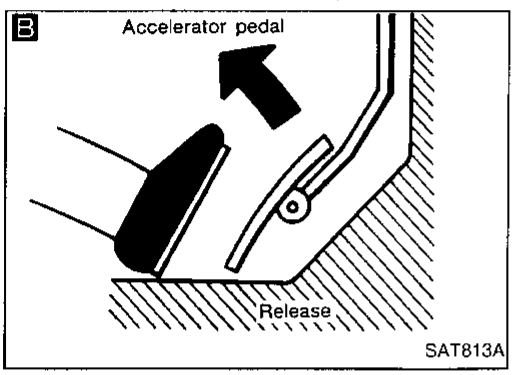

1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.

A

Accelerate vehicle using half-throttle to "$D_4$".

B

Release accelerator pedal.




C

Set overdrive control switch to "OFF" position while driving in "$D_4$".

D

Does A/T shift from "$D_4$" to "$D_3$" (O/D OFF)?

**Read gear position and vehicle speed.**

No → Go to "17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" → "OFF", AT-166. Continue ROAD TEST.

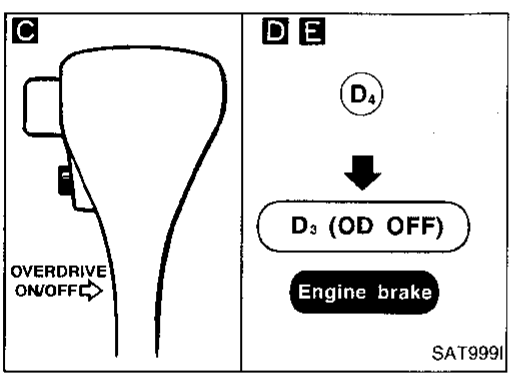
Yes

E

Does vehicle decelerate by engine brake?

No → Go to "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-165. Continue ROAD TEST.

Yes




F

Move selector lever from "D" to "2" position while driving in "$D_3$" (O/D OFF).

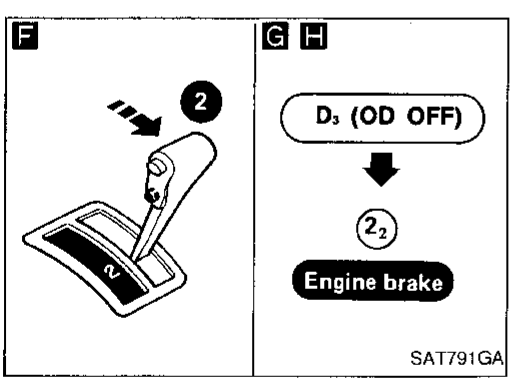
G

Does A/T shift from "$D_3$" (O/D OFF) to "$2_2$"?

**Read gear position.**

No → Go to "18. A/T Does Not Shift: $D_3 \rightarrow D_2$, When Selector Lever "D" → "2" Position", AT-167. Continue ROAD TEST.

Yes




H

Does vehicle decelerate by engine brake?

No → Go to "15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-165. Continue ROAD TEST.

Yes

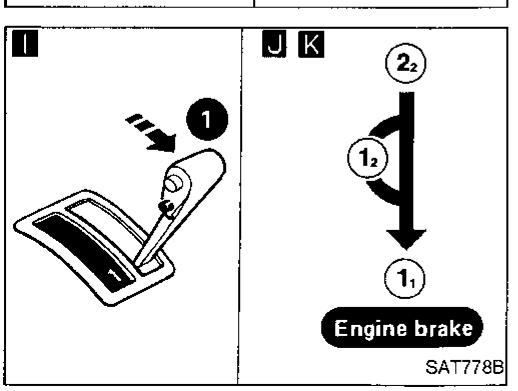
I J

1. Move selector lever from "2" to "1" position while driving in "$2_2$".
2. Does A/T shift from "$2_2$" to "$1_1$" position?

**Read gear position.**

No → Go to "19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position", AT-167. Continue ROAD TEST.

Yes




K

Does vehicle decelerate by engine brake?

No → Go to "20. Vehicle Does Not Decelerate By Engine Brake", AT-168. Continue ROAD TEST.

Yes

1. Stop vehicle.
2. Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE, AT-40.

## Symptom Chart

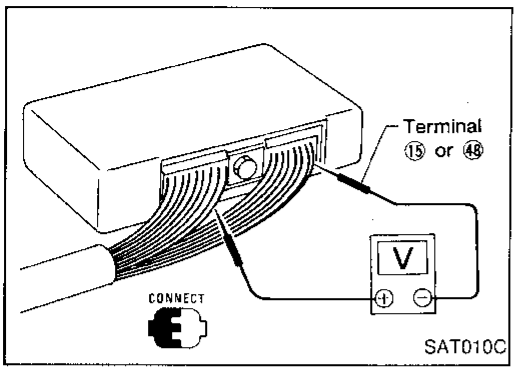
| Reference page (AT- ) | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 56, 183 | 183, 136 | 86, 89 150 | 59 | 128, 181 | 132, 124 | 113, 142 | 82, 181 | 181 | 181 | 191, 202 | 219, 223 | 225, 235 | 225, 233 | 195, 229 | 242 |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level<br>Control linkage adjustment | Inhibitor switch adjustment<br>Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor<br>Engine speed signal | Engine idling speed<br>Line pressure | Control valve assembly<br>Shift solenoid valve A | Shift solenoid valve B<br>Line pressure solenoid valve | Torque converter clutch solenoid valve<br>Overrun clutch solenoid valve | A/T fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>Brake band | Parking components |
| 154 | Engine does not start in "N", "P" positions. | 2 | 3 | | | | | | | | 1 | | | | | | |
| 154 | Engine starts in position other than "N" and "P". | 1 | 2 | | | | | | | | | | | | | | |
| — | Transmission noise in "P" and "N" positions. | 1 | 3 | 4 5 | 2 | | | | | | | ⑦ ⑥ | | | | | |
| 154 | Vehicle moves when changing into "P" position or parking gear does not disengage when shifted out of "P" position. | 1 | | | | | | | | | | | | | | | ② |
| 155 | Vehicle runs in "N" position. | 1 | | | | | | | | | 2 | | ④ | ③ | ⑤ | | |
| 157 | Vehicle will not run in "R" position (but runs in "D", "2" and "1" positions). Clutch slips. Very poor acceleration. | 1 | | | 2 | 4 | 3 | | | | | | ⑤ ⑥ | ⑦ | ⑧ | ⑨ | |
| — | Vehicle braked when shifting into "R" position. | 1 2 | | | 3 | 5 | 4 | | | | | | ⑥ | ⑧ | ⑨ | ⑦ | |
| — | Sharp shock in shifting from "N" to "D" position. | | 2 | 5 | 1 3 | 7 | 6 | | 4 8 | | | | | ⑩ | | | |
| — | Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" position). | 1 | | | | | | | | | | | | | ② | | |
| 158 | Vehicle will not run in "D", "1" and "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration. | 1 | | | 2 | 4 | 3 | | 5 | | | | ⑥ ⑦ | ⑧ ⑨ | ⑩ | | |
| — | Clutches or brakes slip somewhat in starting. | 1 2 | 3 | | 4 | 6 | 5 | | 7 | | 8 | ⑬ ⑫ | ⑪ | ⑨ | | ⑪ | |
| — | Excessive creep. | | | | 1 | | | | | | | | | | | | |
| 157 - 158 | No creep at all. | 1 | | | 2 | 3 | | | | | | ⑥ ⑤ | | ④ | | | |
| — | Failure to change gear from $D_1$ to $D_2$. | 2 | 1 | 5 | | 4 3 | | | | | | | | | | ⑥ | |
| — | Failure to change gear from $D_2$ to $D_3$. | 2 | 1 | 5 | | 4 | 3 | | | | | | ⑥ | | | ⑦ | |
| — | Failure to change gear from $D_3$ to $D_4$. | 2 | 1 | 4 | | 3 | | | 5 | | | | | | | ⑥ | |
| 160 - 161, 162 | Too high a gear change point from $D_1$ to $D_2$, from $D_2$ to $D_3$, from $D_3$ to $D_4$. | | 1 | 2 | | 3 | 4 | | | | | | | | | | |
| — | Gear change directly from $D_1$ to $D_3$ occurs. | 1 | | | | | | | | 2 | | | | | | ③ | |
| — | Engine stops when shifting lever into "R", "D", "2" and "1". | | | | 1 | 3 | | 2 | | | | ④ | | | | | |
| — | Too sharp a shock in change from $D_1$ to $D_2$. | | 1 | | 2 | 4 | | | 5 | 3 | | | | | | ⑥ | |
| — | Too sharp a shock in change from $D_2$ to $D_3$. | | 1 | | 2 | 4 | | | | 3 | | | ⑤ | | | ⑥ | |

## Symptom Chart (Cont'd)

| | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference page (AT- ) | | 56, 183 | 183, 136 | 86, 89, 150 | 59 | 128, 181 | 132, 124 | 113, 142 | 82, 181 | 181 | 181 | 191, 202 | 219, 223 | 225, 235 | 225, 233 | 195, 229 | 242 |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level<br>Control linkage adjustment | Inhibitor switch adjustment<br>Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor<br>Engine speed signal | Engine idling speed<br>Line pressure | Control valve assembly<br>Shift solenoid valve A | Shift solenoid valve B<br>Line pressure solenoid valve | Torque converter clutch solenoid valve<br>Overrun clutch solenoid valve | A/T fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>Brake band | Parking components |
| — | Too sharp a shock in change from "$D_3$" to "$D_4$". | . . | . 1 | . . | . 2 | 4 . | . . | . . | . . | . . | 3 . | . . | . . | . . | ⑥ . | . ⑤ | . |
| — | Almost no shock or clutches slipping in change from "$D_1$" to "$D_2$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | 4 . | . . | . . | . . | . . | . . | . ⑥ | . |
| — | Almost no shock or slipping in change from "$D_2$" to "$D_3$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | . 4 | . . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Almost no shock or slipping in change from "$D_3$" to "$D_4$". | 1 . | . 2 | . . | . 3 | 5 . | . . | . . | . . | . . | 4 . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Vehicle braked by gear change from "$D_1$" to "$D_2$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | ② ④ | . . | . ⑤ | ③ . | . |
| — | Vehicle braked by gear change from "$D_2$" to "$D_3$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . ② | . |
| — | Vehicle braked by gear change from "$D_3$" to "$D_4$". | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | ④ . | . ③ | ② . | . . | . |
| — | Maximum speed not attained. Acceleration poor. | 1 . | 2 . | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | ⑪ ⑲ | ⑥ ⑦ | . . | . . | ⑨ ⑧ | . |
| — | Failure to change gear from "$D_4$" to "$D_3$". | 1 . | . 2 | . . | . . | 6 4 | . 5 | . 3 | . . | . . | . . | . . | . . | . . | ⑧ . | ⑦ . | . |
| — | Failure to change gear from "$D_3$" to "$D_2$" or from "$D_4$" to "$D_2$". | 1 . | . 2 | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | . . | . ⑥ | . . | . . | . ⑦ | . |
| — | Failure to change gear from "$D_2$" to "$D_1$" or from "$D_3$" to "$D_1$". | 1 . | . 2 | . . | . . | 5 3 | 4 . | . . | . . | . . | . . | . . | . ⑦ | . . | . ⑥ | . ⑧ | . |
| — | Gear change shock felt during deceleration by releasing accelerator pedal. | . . | . 1 | . . | . 2 | 4 . | . . | . 3 | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Too high a change point from "$D_4$" to "$D_3$", from "$D_3$" to "$D_2$", from "$D_2$" to "$D_1$". | . . | . 1 | 2 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Kickdown does not operate when depressing pedal in "$D_4$" within kickdown vehicle speed. | . . | . 1 | 2 . | . . | . 3 | 4 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Kickdown operates or engine overruns when depressing pedal in "$D_4$" beyond kickdown vehicle speed limit. | . . | . 2 | 1 . | . . | . 3 | 4 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | . |
| — | Races extremely fast or slips in changing from "$D_4$" to "$D_3$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | . . | . . | . . | . . | . ⑥ | ⑦ . | . . | . . | . |
| — | Races extremely fast or slips in changing from "$D_4$" to "$D_2$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 6 5 | . 4 | . . | . . | . . | . . | . . | . . | ⑧ . | . . | . ⑦ | . |
| — | Races extremely fast or slips in changing from "$D_3$" to "$D_2$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | 6 . | . 7 | . . | . . | . ⑩ | ⑨ . | . . | . ⑧ | . |
| — | Races extremely fast or slips in changing from "$D_4$" or "$D_3$" to "$D_1$" when depressing pedal. | 1 . | . 2 | . . | . 3 | 5 . | . 4 | . . | . . | . . | . . | . . | . . | ⑥ ⑦ | . ⑧ | . . | . |
| — | Vehicle will not run in any position. | 1 2 | . . | . . | . 3 | . . | . 4 | . . | . . | . . | . . | ⑨ ⑤ | . ⑥ | . . | . . | ⑧ ⑦ | ⑩ |
| — | Transmission noise in "D", "2", "1" and "R" positions. | 1 . | . . | . . | . . | . . | . . | . . | . . | . . | . . | ② . | . . | . . | . . | . . | . |

## Symptom Chart (Cont'd)

| | | ON vehicle | | | | | | | | | | OFF vehicle | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reference page (AT- ) | | 56, 183 | 183, 136 | 86, 89, 150 | 59 | 128, 181 | 132, 124 | 113, 142 | 82, 181 | 181 | 181 | 181, 202 | 219, 223 | 225, 235 | 225, 233 | 195, 229 | 242 |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle. | Fluid level<br>Control linkage adjustment | Inhibitor switch adjustment<br>Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor<br>Engine speed signal | Engine idling speed<br>Line pressure | Control valve assembly<br>Shift solenoid valve A | Shift solenoid valve B<br>Line pressure solenoid valve | Torque converter clutch solenoid valve<br>Overrun clutch solenoid valve | A/T fluid temperature sensor<br>Accumulator N-D | Accumulator 1-2<br>Accumulator 2-3 | Accumulator 3-4 (N-R)<br>Ignition switch and starter | Torque converter<br>Oil pump | Reverse clutch<br>High clutch | Forward clutch<br>Forward one-way clutch | Overrun clutch<br>Low one-way clutch | Low & reverse brake<br>Brake band | Parking components |
| 165 | Failure to change from "$D_3$" to "2" when changing lever into "2" position. | 7 | 1 2 | | | 6 5 | 4 | 3 | | | | | | | ⑨ | ⑧ | |
| — | Gear change from "$2_2$" to "$2_3$" in "2" position. | | 1 | | | | | | | | | | | | | | |
| 166 | Engine brake does not operate in "1" position. | 2 | 1 3 | 4 | | 6 5 | | 7 | | | | | | | ⑧ | ⑨ | |
| — | Gear change from "$1_1$" to "$1_2$" in "1" position. | 2 | 1 | | | | | | | | | | | | | | |
| — | Does not change from "$1_2$" to "$1_1$" in "1" position. | | 1 | 2 | | 4 3 | | 5 | | | | | | | ⑥ | ⑦ | |
| — | Large shock changing from "$1_2$" to "$1_1$" in "1" position. | | | | | 1 | | | | | | | | | | ② | |
| — | Transmission overheats. | 1 | 3 | | 2 4 | 6 | 5 | | | | | ⑭ ⑦ | ⑧ ⑨ | ⑪ | ⑫ | ⑬ ⑩ | |
| — | ATF shoots out during operation.<br>White smoke emitted from exhaust pipe during operation. | 1 | | | | | | | | | | | ② ③ | ⑤ | ⑥ | ⑦ ④ | |
| — | Offensive smell at fluid charging pipe. | 1 | | | | | | | | | | ② ③ | ④ ⑤ | ⑦ | ⑧ | ⑨ ⑥ | |
| — | Torque converter is not locked up. | | 3 1 | 2 4 | 6 | 8 | | 7 | 5 | | | ⑨ | | | | | |
| — | Torque converter clutch piston slip | 1 | 2 | | 3 | 6 | 5 | 4 | | | | ⑦ | | | | | |
| 163 | Lock-up point is extremely high or low. | | 1 | 2 | | 4 | | 3 | | | | | | | | | |
| — | A/T does not shift to "$D_4$" when driving with overdrive control switch "ON". | | 2 1 | 3 | 8 | 6 4 | | 5 | 7 | | | | | | ⑩ | ⑨ | |
| — | Engine is stopped at "R", "D", "2" and "1" positions. | 1 | | | | 5 4 | 3 | 2 | | | | | | | | | |

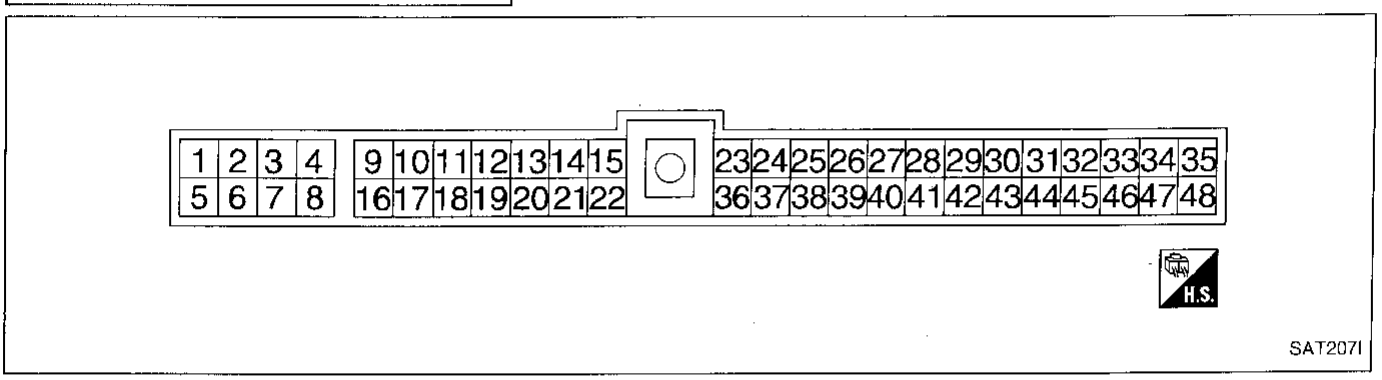



## TCM Terminals and Reference Value

### PREPARATION

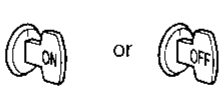
- Measure voltage between each terminal and terminal ⑮ or ㊽ by following "TCM INSPECTION TABLE".

### TCM HARNESS CONNECTOR TERMINAL LAYOUT




### TCM INSPECTION TABLE

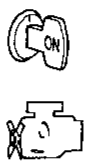
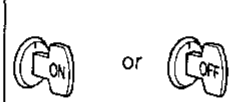
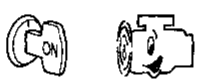
**(Data are reference values.)**

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 1 | OR | Line pressure solenoid valve |  | When releasing accelerator pedal after warming up engine. | 1.5 - 2.5V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 2 | P | Line pressure solenoid valve (with dropping resistor) | | When releasing accelerator pedal after warming up engine. | 5 - 14V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 3 | G | O/D OFF indicator lamp |  | When setting overdrive control switch in "OFF" position. | 1V or less |
| | | | | When setting overdrive control switch in "ON" position. | Battery voltage |
| 4 | G/OR | Power source |  | When turning ignition switch to "ON". | Battery voltage |
| | | | | When turning ignition switch to "OFF". | 1V or less |

## TCM Terminals and Reference Value (Cont'd)

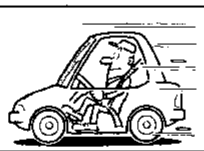
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 5 | GY/R | Torque converter clutch solenoid valve |  | When A/T performs lock-up. | 8 - 15V |
| | | | | When A/T does not perform lock-up. | 1V or less |
| 6 | L/R | Shift solenoid valve A | | When shift solenoid valve A operates. (When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate. (When driving in "$D_2$" or "$D_3$".) | 1V or less |
| 7 | L/Y | Shift solenoid valve B | | When shift solenoid valve B operates. (When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate. (When driving in "$D_3$" or "$D_4$".) | 1V or less |
| 8 | P | Overrun clutch solenoid valve | | When overrun clutch solenoid valve operates. | Battery voltage |
| | | | | When overrun clutch solenoid valve does not operate. | 1V or less |
| 9 | G/OR | Power source | | Same as No. 4 | |
| 10 | L/G | DT1 | | — | — |
| 11 | L/W | DT2 | | — | — |
| 12 | L/R | DT3 | | — | — |
| 13 | R/G | "N" position signal | | When setting selector lever to "N" or "P" position. | 1V or less |
| | | | | When setting selector lever to other position. | Approximately 5V |
| 14 | L/G | Closed throttle position switch (in throttle position switch) |  | When releasing accelerator pedal after warming up engine. | Battery voltage |
| | | | | When depressing accelerator pedal after warming up engine. | 1V or less |
| 15 | B | Ground | | — | — |
| 16 | L | Inhibitor "1" position switch |  | When setting selector lever to "1" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 17 | LG | Inhibitor "2" position switch | | When setting selector lever to "2" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 18 | LG/R | Inhibitor "D" position switch | | When setting selector lever to "D" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |

## TCM Terminals and Reference Value (Cont'd)

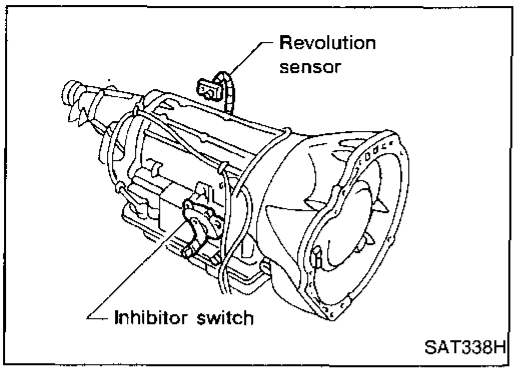
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 19 | GY/L | Inhibitor "N" or "P" position switch |  | When setting selector lever to "N" or "P" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 20 | R | Inhibitor "R" position switch | | When setting selector lever to "R" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 21 | R | Wide open throttle position switch (in throttle position switch) | | When depressing accelerator pedal more than half-way after warming up engine. | Battery voltage |
| | | | | When releasing accelerator pedal after warming up engine. | 1V or less |
| 22 | — | — | | — | — |
| 23 | OR/G | Power source (Memory back-up) |  | When turning ignition switch to "OFF". | Battery voltage |
| | | | | When turning ignition switch to "ON". | Battery voltage |
| 24 | L/B | Engine speed signal |  | When engine runs at idle speed. | 0.5 - 1.5V |
| 25 | W | Revolution sensor (Measure in AC range) |  | When vehicle cruises at 30 km/h (19 MPH). | 1V or more Voltage rises gradually in response to vehicle speed. |
| | | | | When vehicle parks. | 0V |
| 26 | — | — | | — | — |
| 27 | Y/G | Vehicle speed sensor | | When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more. | Voltage varies between less than 1V and more than 4.5V |
| 28* | G/B | — |  | — | — |
| 29* | G/W | — | | — | — |
| 30* | G | — | | — | — |
| 31 | LG/R | Throttle position sensor (Power source) |  | — | 4.5 - 5.5V |
| 32 | — | — | | — | — |

*: These terminals are connected to the Data link connector for CONSULT.

## TCM Terminals and Reference Value (Cont'd)

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 33 | W/R | A/T fluid temperature sensor | | When ATF temperature is 20°C (68°F). | Approximately 1.5V |
| | | | | When ATF temperature is 80°C (176°F). | Approximately 0.5V |
| 34 | R/Y | Throttle position sensor |  | When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.) | Fully-closed throttle: Approximately 0.5V<br>Fully-open throttle: Approximately 4V |
| 35 | B | Throttle position sensor (Ground) | | — | — |
| 36 | — | — | | — | — |
| 37 | OR/B | ASCD cruise signal |  | When ASCD cruise is being performed. ("CRUISE" light comes on.) | Battery voltage |
| | | | | When ASCD cruise is not being performed. ("CRUISE" light does not comes on.) | 1V or less |
| 38 | — | — |  | — | — |
| 39 | L/B | Overdrive control switch | | When setting overdrive control switch in "ON" position | Battery voltage |
| | | | | When setting overdrive control switch in "OFF" position | 1V or less |
| 40 | G/R | ASCD OD cut signal |  | When "ACCEL" set switch on ASCD cruise is released. | 5 - 8V |
| | | | | When "ACCEL" set switch on ASCD cruise is applied. | 1V or less |
| 41 | — | — |  | — | — |
| 42 | — | — | | — | — |
| 43 | — | — | | — | — |
| 44 | — | — | | — | — |
| 45* | R/B | OBD-II | | — | — |
| 46 | — | — |  | — | — |
| 47 | — | — | | — | — |
| 48 | B | Ground | | — | — |

* This terminal is connected to the ECM (ECCS control module).




## Inhibitor Switch

### DESCRIPTION

Detects the selector lever position and sends a signal to the TCM.

### TCM TERMINALS AND REFERENCE VALUE

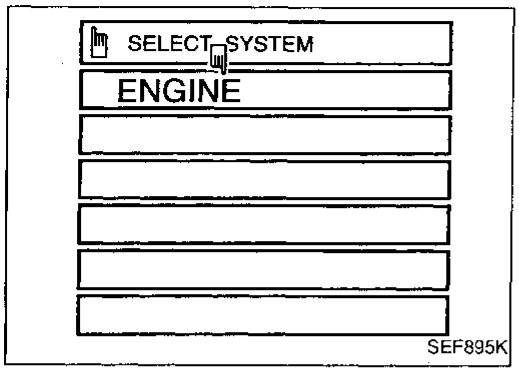
Remarks: Specification data are reference values.

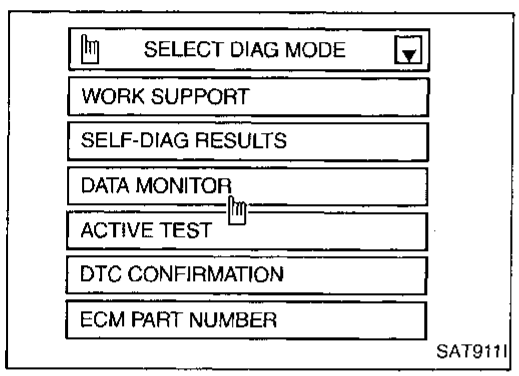
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 16 | L | Inhibitor "1" position switch |  | When setting selector lever to "1" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 17 | LG | Inhibitor "2" position switch | | When setting selector lever to "2" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 18 | LG/R | Inhibitor "D" position switch | | When setting selector lever to "D" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 19 | GY/L | Inhibitor "N" or "P" position switch | | When setting selector lever to "N" or "P" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |
| 20 | R | Inhibitor "R" position switch | | When setting selector lever to "R" position. | Battery voltage |
| | | | | When setting selector lever to other positions. | 1V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : INHIBITOR SW/CIRC<br>: P0705<br>: MIL Code No. 1101 | TCM does not receive the correct voltage signal from the switch based on the gear position. | • Harness or connectors (The inhibitor switch circuit is open or shorted.)<br>• Inhibitor switch |

## Inhibitor Switch (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode for "ENGINE" with CONSULT.
3) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   **VHCL SPEED SE: 10 km/h (6 MPH) or more**
   **THRTL POS SEN: More than 1.3V**
   **Selector lever: D position (OD "ON" or "OFF")**

OR

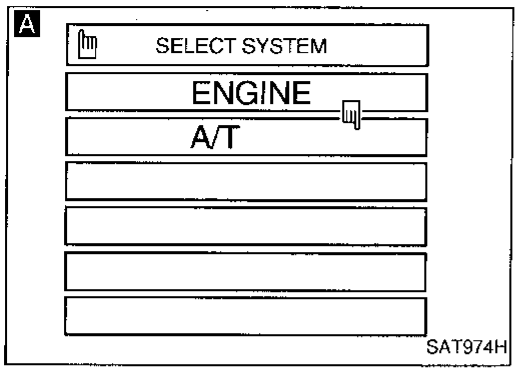
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position, overdrive control switch in "ON" or "OFF" position, vehicle speed higher than 10 km/h (6 MPH), throttle position sensor more than 1.3V and driving for more than 5 seconds.
3) Select "MODE 7" with GST.

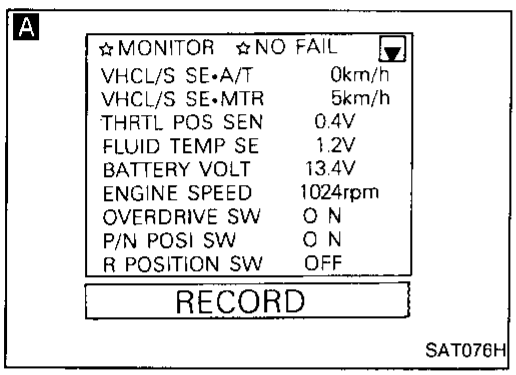
OR

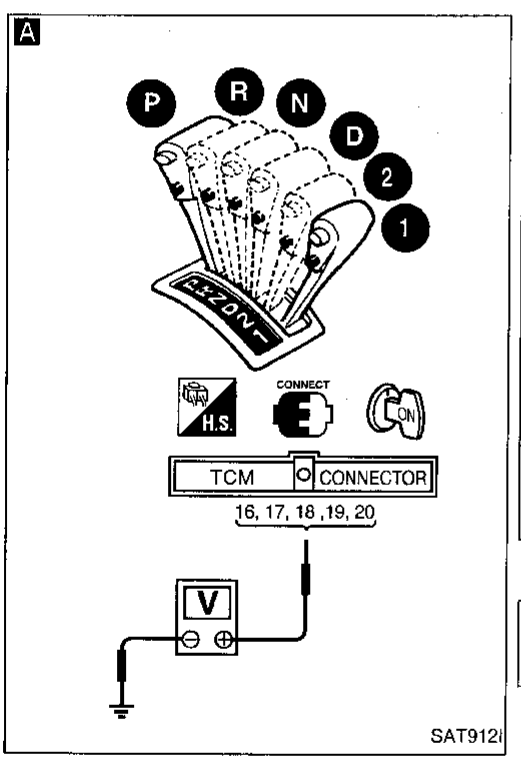
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position, overdrive control switch in "ON" or "OFF" position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 5 seconds.
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Inhibitor Switch (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK INHIBITOR SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out "P/N", "R", "D", "2" and "1" position switches moving selector lever to each position. Check the signal of the selector lever position is indicated properly.

NG → Check the following items:
- 10A fuse [No. 18, located in the fuse block (J/B)]
- Inhibitor switch Refer to "Component Inspection", AT-81.
- Harness for short or open between ignition switch and inhibitor switch (Main harness)
- Harness for short or open between inhibitor switch and TCM (Main harness)
- Ignition switch Refer to EL section ("POWER SUPPLY ROUTING").

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each position.

**Voltage:**
**B: Battery voltage**
**0: 0V**

| Lever position | Terminal No. | | | | |
|---|---|---|---|---|---|
| | ⑲ | ⑳ | ⑱ | ⑰ | ⑯ |
| P, N | **B** | 0 | 0 | 0 | 0 |
| R | 0 | **B** | 0 | 0 | 0 |
| D | 0 | 0 | **B** | 0 | 0 |
| 2 | 0 | 0 | 0 | **B** | 0 |
| 1 | 0 | 0 | 0 | 0 | **B** |

OK

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-79.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

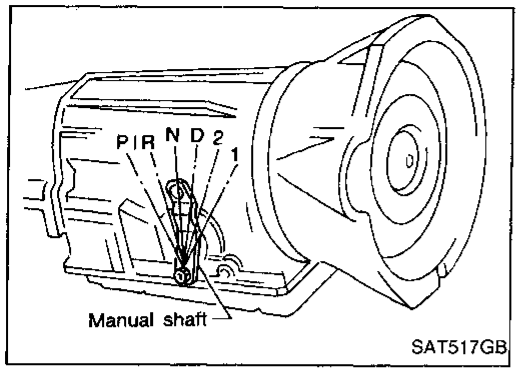
OK

**INSPECTION END**

## Inhibitor Switch (Cont'd)

### COMPONENT INSPECTION

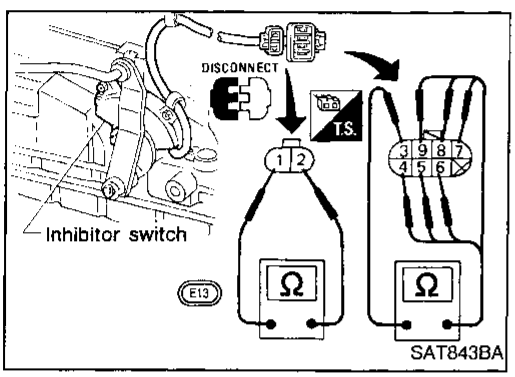
#### Inhibitor switch



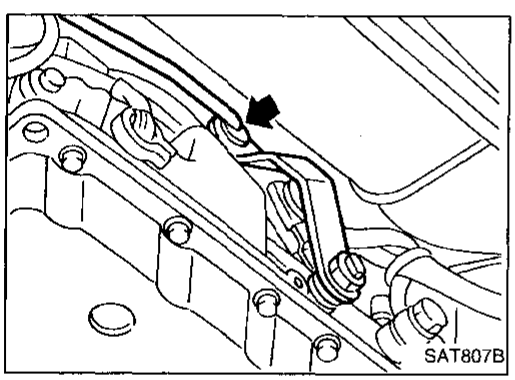
SAT517GB

1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving manual shaft through each position.

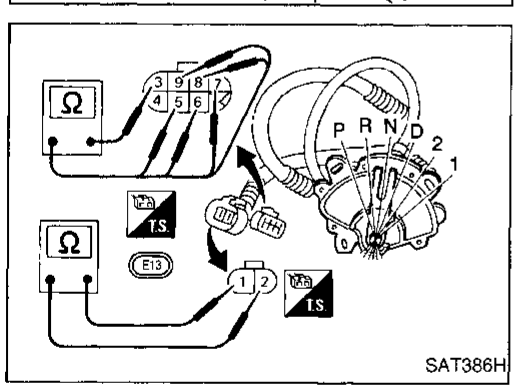
| Lever position | Terminal No. | |
|---|---|---|
| P | ① — ② | ③ — ④ |
| R | ③ — ⑤ | |
| N | ① — ② | ③ — ⑥ |
| D | ③ — ⑦ | |
| 2 | ③ — ⑧ | |
| 1 | ③ — ⑨ | |



SAT843BA

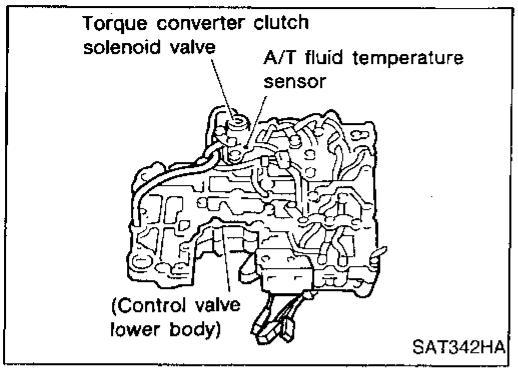

SAT807B

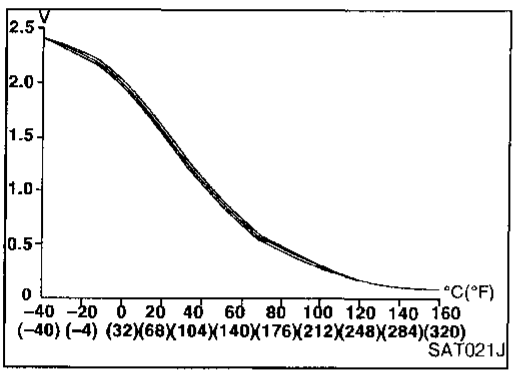
2. If NG, check again with manual control linkage disconnected from manual shaft of A/T assembly. Refer to step 1.
3. If OK on step 2, adjust manual control linkage. Refer to AT-183.



SAT386H

4. If NG on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminals. Refer to step 1.
5. If OK on step 4, adjust inhibitor switch. Refer to AT-183.
6. If NG on step 4, replace inhibitor switch.




## A/T Fluid Temperature Sensor

### DESCRIPTION

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| A/T fluid temperature sensor | Cold [20°C (68°F)]<br>↓<br>Hot [80°C (176°F)] | Approximately 1.5V<br>↓<br>Approximately 0.5V |

### TCM TERMINALS AND REFERENCE VALUE

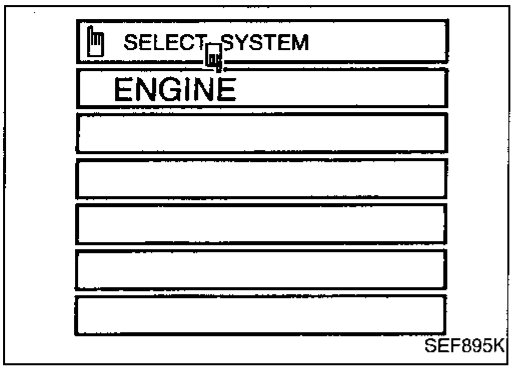
Remarks: Specification data are reference values.

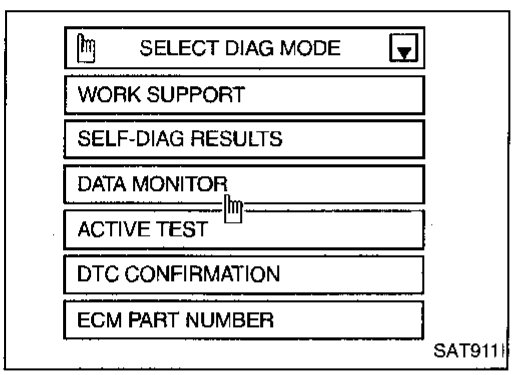
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 33 | W/R | A/T fluid temperature sensor |  | When ATF temperature is 20°C (68°F). | Approximately 1.5V |
| | | | | When ATF temperature is 80°C (176°F). | Approximately 0.5V |
| 35 | B | Throttle position sensor (Ground) |  | — | — |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : ATF TEMP SEN/CIRC<br>: P0710<br>: MIL Code No. 1208 | TCM receives an excessively low or high voltage from the sensor. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• A/T fluid temperature sensor |

## A/T Fluid Temperature Sensor (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Start engine and maintain the following conditions for at least 10 minutes (Total). (It is not necessary to maintain continuously.)
   **CMPS·RPM (REF): 450 rpm or more**
   **VHCL SPEED SE: 10 km/h (6 MPH) or more**
   **THRTL POS SEN: More than 1.2V**
   **Selector lever: D position (OD "ON")**

OR

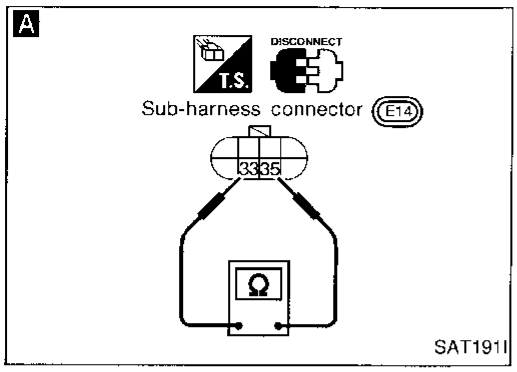
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes (Total).
3) Select "MODE 7" with GST.

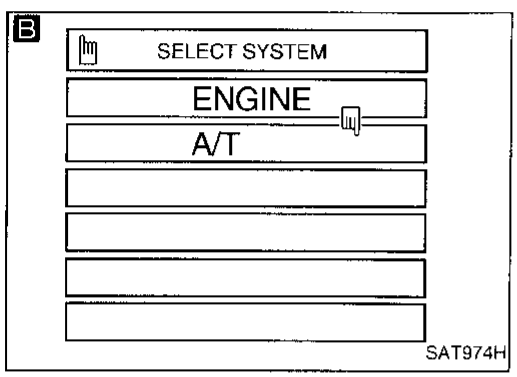
OR

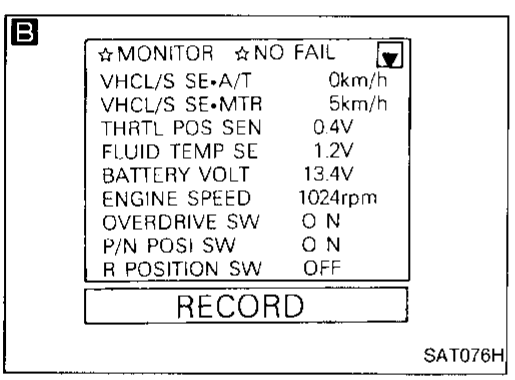
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes (Total).
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

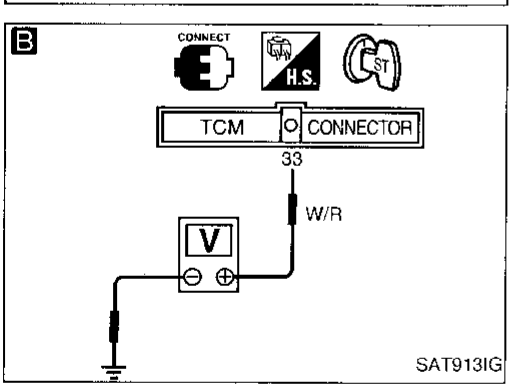
## A/T Fluid Temperature Sensor (Cont'd)

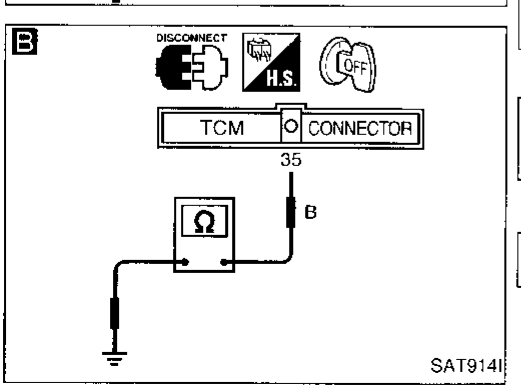
### DIAGNOSTIC PROCEDURE




INSPECTION START

**A**

**CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.**

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ㉝ and ㉟ when A/T is cold.
   **Resistance:**
   **Cold [20°C (68°F)]**
   **Approximately 2.5 kΩ**
4. Reinstall any part removed.

NG →
1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor
  Refer to "Component Inspection", AT-85.
- Harness of terminal cord assembly for short or open

OK ↓

**B**

**CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR.**

1. Start engine.
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out the value of "FLUID TEMP SE".
   **Voltage:**
   **Cold [20°C (68°F)] →**
   **Hot [80°C (176°F)]:**
   **Approximately**
   **1.5V → 0.5V**

NG →
Check the following items:
- Harness for short to ground or short to power or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM
  Refer to EC section ("TROUBLE DIAGNOSIS FOR POWER SUPPLY").

OR

1. Start engine.
2. Check voltage between TCM terminal ㉝ and ground while warming up A/T.
   **Voltage:**
   **Cold [20°C (68°F)] →**
   **Hot [80°C (176°F)]:**
   **Approximately**
   **1.5V → 0.5V**
3. Turn ignition switch to "OFF" position.
4. Disconnect TCM harness connector.
5. Check continuity between terminal ㉟ and ground.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.

OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-83.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

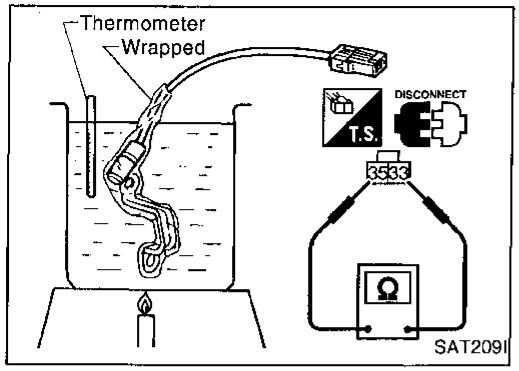
OK ↓

**INSPECTION END**

## A/T Fluid Temperature Sensor (Cont'd)

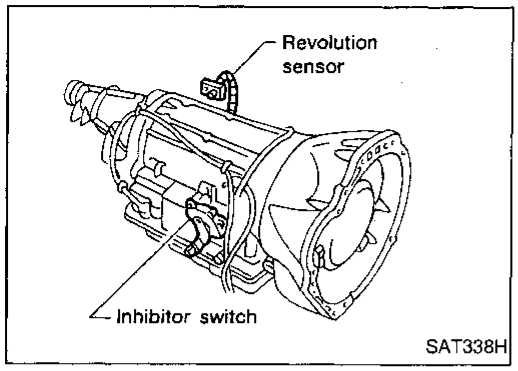
### COMPONENT INSPECTION

#### A/T fluid temperature sensor




- For removal, refer to AT-181.
- Check resistance between terminals ㉝ and ㉟ while changing temperature as shown at left.

| Temperature °C (°F) | Resistance |
|---|---|
| 20 (68) | Approximately 2.5 kΩ |
| 80 (176) | Approximately 0.3 kΩ |



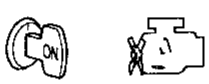

## Vehicle Speed Sensor·A/T (Revolution sensor)

### DESCRIPTION

The revolution sensor detects the revolution of the output shaft parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the TCM which converts it into vehicle speed.

### TCM TERMINALS AND REFERENCE VALUE

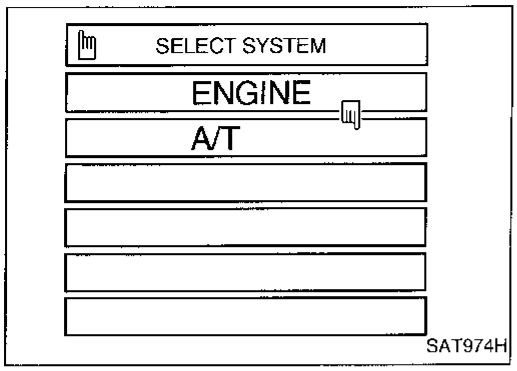
Remarks: Specification data are reference values.

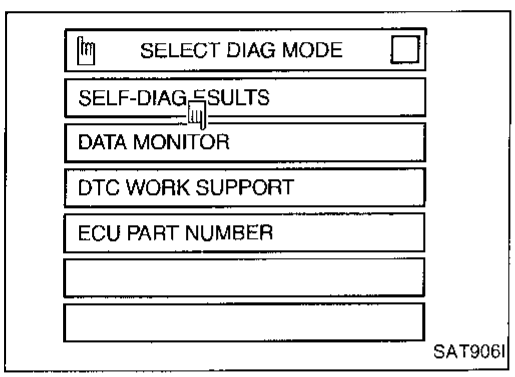
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 25 | W | Revolution sensor (Measure in AC range) |  | When vehicle cruises at 30 km/h (19 MPH). | 1V or more Voltage rises gradually in response to vehicle speed. |
| | | | | When vehicle parks. | 0V |
| 35 | B | Throttle position sensor (Ground) |  | — | — |

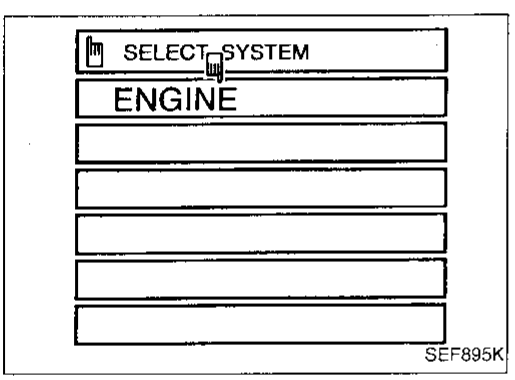
### ON BOARD DIAGNOSIS LOGIC

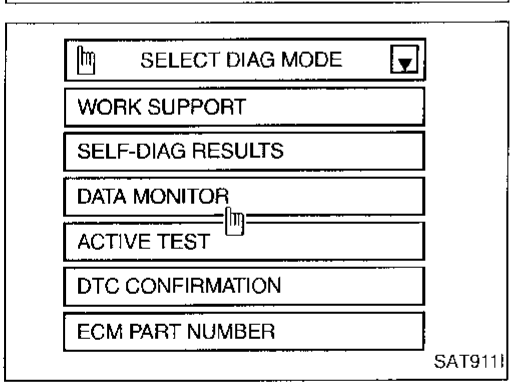
| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : VEH SPD SEN/CIR AT<br>: P0720<br>: MIL Code No. 1102 | TCM does not receive the proper voltage signal from the sensor. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Revolution sensor |

## Vehicle Speed Sensor·A/T (Revolution sensor) (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION CONFIRMATION PROCEDURE

**CAUTION:**
- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Drive vehicle and check for an increase of "VHCL/S SE·A/T" value in response to "VHCL/S SE·MTR" value increase.
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", AT-152.
   If the check result is OK, go to following step.
3) Select "DATA MONITOR" mode for "ENGINE" with CONSULT.
4) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   **VHCL SPEED SE: 30 km/h (19 MPH) or more**
   **THRTL POS SEN: More than 1.2V**
   **Selector lever: D position (OD "ON")**
   **Driving pattern: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.**
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", AT-88.
   If the check result is OK, go to following step.
5) Maintain the following conditions for at least 5 consecutive seconds.
   **CMPS·RPM (REF): 3,500 rpm or more**
   **THRTL POS SEN: More than 1.2V**
   **Selector lever: D position (OD "ON")**
   **Driving pattern: Driving the vehicle uphill (increased engine load) will help maintain the driving conditions required for this test.**

OR

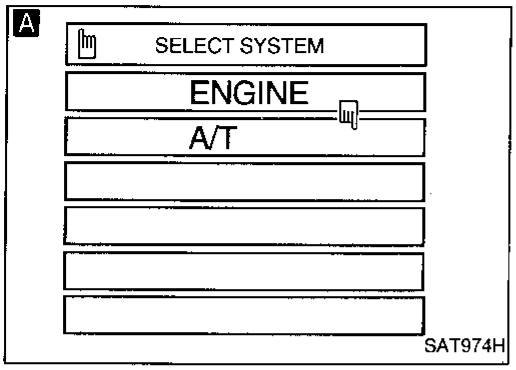
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
3) Select "MODE 7" with GST.

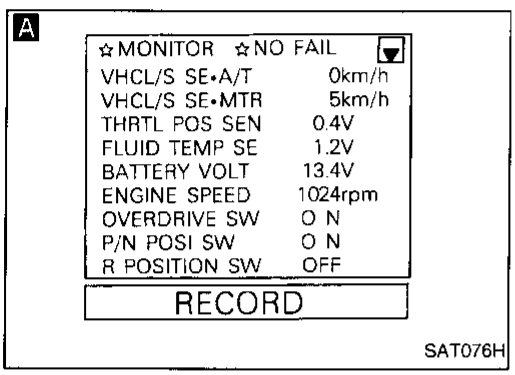
OR

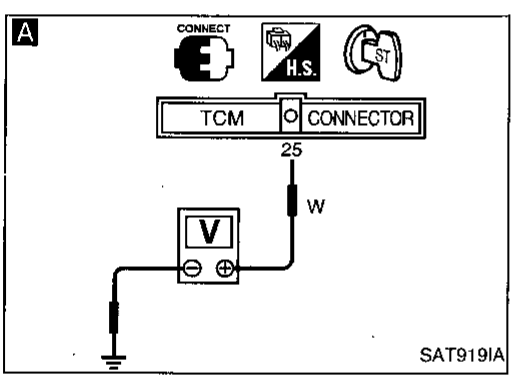
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Vehicle Speed Sensor·A/T (Revolution sensor) (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

CHECK REVOLUTION SENSOR.
Refer to "Component Inspection" below.

NG → Repair or replace revolution sensor.

OK

A

**CHECK INPUT SIGNAL.**

1. Start engine.
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out the value of "VHCL/S SE·A/T" while driving. Check the value changes according to driving speed.

NG → Check the following items:
- Harness for short or open between TCM, ECM and revolution sensor (Main harness)
- Ground circuit for ECM Refer to EC section ("TROUBLE DIAGNOSIS FOR POWER SUPPLY").

OR

1. Start engine.
2. Check voltage between TCM terminal ㉕ and ground while driving. (Measure with AC range.)

**Voltage:**
**At 0 km/h (0 MPH):**
**0V**
**At 30 km/h (19 MPH):**
**1V or more**
**(Voltage rises gradually in response to vehicle speed.)**

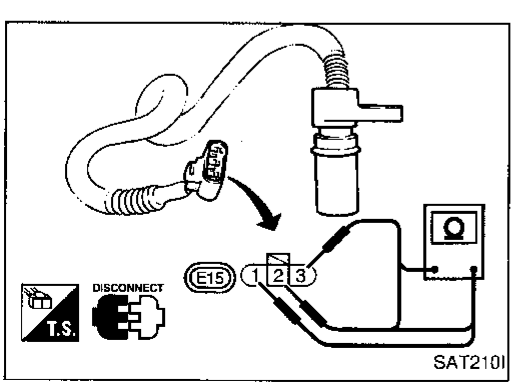
OK

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-87.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

**INSPECTION END**




### COMPONENT INSPECTION

#### Revolution sensor

- For removal, refer to AT-181.
- Check resistance between terminals ①, ② and ③.

| Terminal No. | | Resistance |
|---|---|---|
| ① | ② | 500 - 650Ω |
| ② | ③ | No continuity |
| ① | ③ | No continuity |

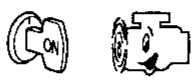
## Engine Speed Signal

### DESCRIPTION

The engine speed signal is sent from the ECM to the TCM.

### TCM TERMINALS AND REFERENCE VALUE

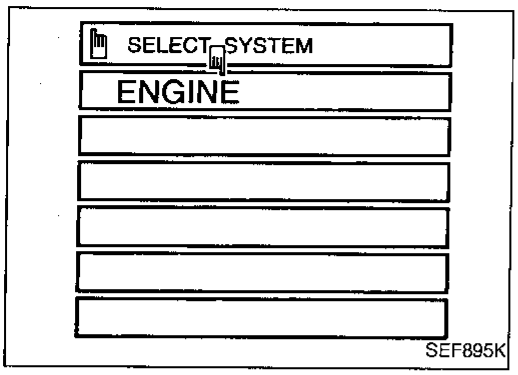
Remarks: Specification data are reference values.

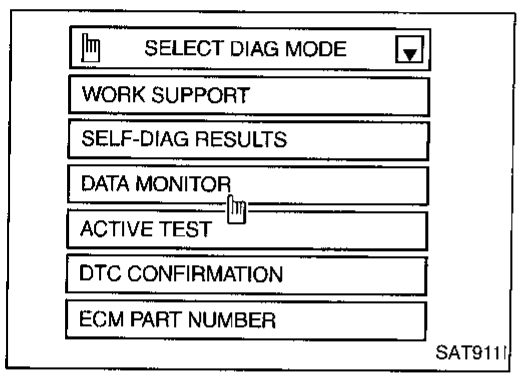
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 24 | L/B | Engine speed signal |  | When engine runs at idle speed. | 0.5 - 1.5V |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : ENGINE SPEED SIG<br>: P0725<br>: MIL Code No. 1207 | TCM does not receive the proper voltage signal from ECM. | • Harness or connectors (The sensor circuit is open or shorted.) |

## Engine Speed Signal (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Start engine and maintain the following conditions for at least 10 consecutive seconds.
   **VHCL SPEED SE: 10 km/h (6 MPH) or more**
   **THRTL POS SEN: More than 1.2V**
   **Selector lever: D position (OD "ON")**

OR

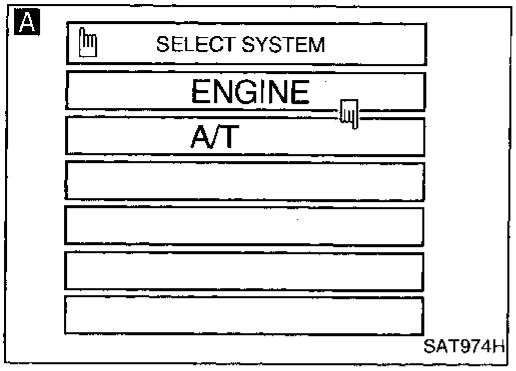
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 consecutive seconds.
3) Select "MODE 7" with GST.

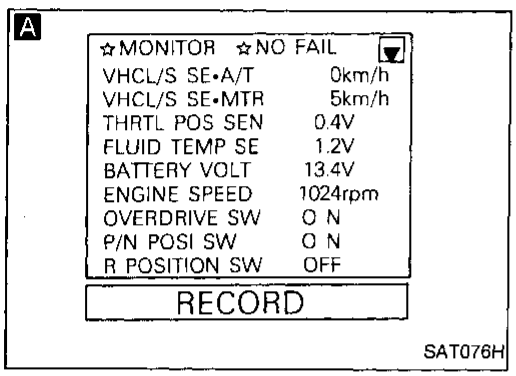
OR

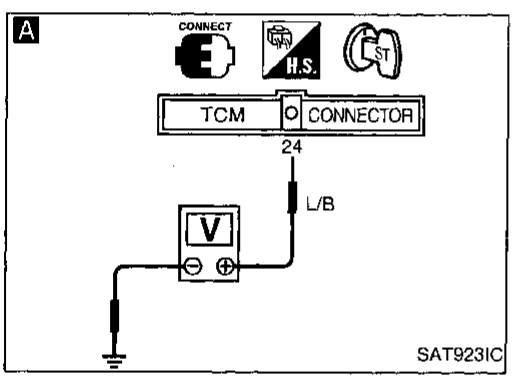
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 consecutive seconds.
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Engine Speed Signal (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

Perform diagnostic test mode II (self-diagnostic results) for engine control. Check ignition signal circuit condition.

NG → Check ignition signal circuit for engine control. Refer to EC section ["Ignition Signal (DTC: 0201)", TROUBLE DIAGNOSIS FOR DTC P1320"].

OK

A

**CHECK INPUT SIGNAL.**

1. Start engine.
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out the value of "ENGINE SPEED".
   Check engine speed changes according to throttle position.

NG → Check the following items:
- Harness for short or open between TCM and ECM
- Resistor and ignition coil
  Refer to EC section ["Ignition Signal (DTC: 0201)", "TROUBLE DIAGNOSIS FOR DTC P1320"].

OR

1. Start engine.
2. Check voltage between TCM terminal ㉔ and ground.
   **Voltage: (idle speed) 0.5 - 1.5V**

OK

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-90.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

**INSPECTION END**

## A/T 1st Gear Function

### DESCRIPTION

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into first gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### TCM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 6 | L/R | Shift solenoid valve A |  | When shift solenoid valve A operates. (When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate. (When driving in "$D_2$" or "$D_3$".) | 1V or less |
| 7 | L/Y | Shift solenoid valve B | | When shift solenoid valve B operates. (When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate. (When driving in "$D_3$" or "$D_4$".) | 1V or less |

### ON BOARD DIAGNOSTIC LOGIC

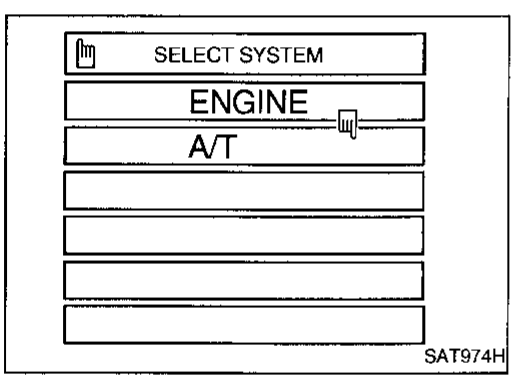
This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (1st) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when either shift solenoid valve A is stuck open or shift solenoid valve B is stuck open.

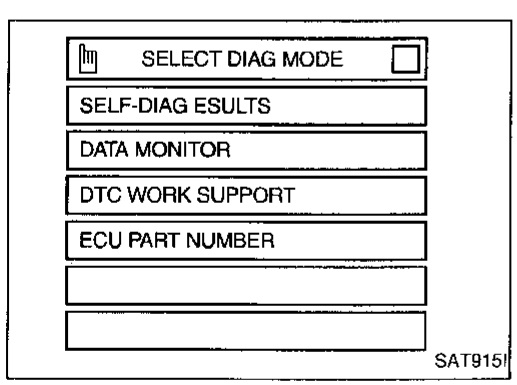
## A/T 1st Gear Function (Cont'd)

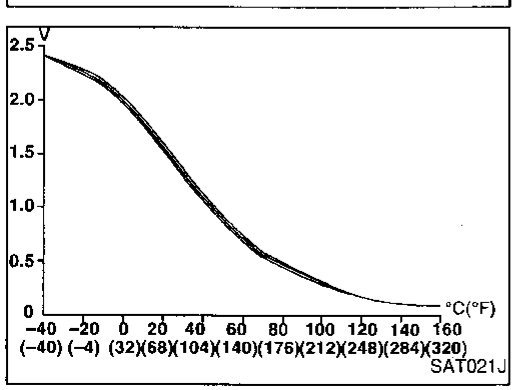
| Gear position supposed by TCM | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| In case of gear position with no malfunctions | 1 | 2 | 3 | 4 |
| In case of gear position with shift solenoid valve A stuck open | ② | 2 | 3 | 3 |
| In case of gear position with shift solenoid valve B stuck open | ④ | 3 | 3 | 4 |

○: P0731 is detected.

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : A/T 1ST GR FNCTN<br>: P0731<br>: MIL Code No. 1103 | A/T cannot be shifted to the 1st gear position even if electrical circuit is good. | • Shift solenoid valve A<br>• Shift solenoid valve B<br>• Each clutch<br>• Hydraulic control circuit |




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

**NOTE:**

**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

**TESTING CONDITION:**

**Always drive vehicle on a level road to improve the accuracy of test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   **FLUID TEMP SEN: 0.4 - 1.5V**
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3) Select "1ST GR FNCTN P0731" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT and touch "START".
4) Accelerate vehicle to 20 to 25 km/h (12 to 16 MPH) under the following condition and release the accelerator pedal completely.
   **THROTTLE POSI: Less than 1/8 (at all times during step 4)**
   **Selector lever: D position (OD "ON")**

- **Check that "GEAR" shows "2" after releasing pedal.**

## A/T 1st Gear Function (Cont'd)

5) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 20 to 25 km/h (12 to 16 MPH) until "TESTING" changes to "STOP VEHICLE" or "COMPLETED". (It will take approximately 3 seconds.)
If the check result NG appears on CONSULT screen, go to "DIAGNOSTIC PROCEDURE", AT-95.
If "STOP VEHICLE" appears on CONSULT screen, go to the following step.
- **Check that "GEAR" shows "1" when depressing accelerator pedal to WOT.**
- **If "TESTING" does not appear on CONSULT for a long time, select "SELF-DIAG RESULTS" for "ENGINE". In case a 1st trip DTC other than P0731 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**

6) Stop vehicle.
7) Follow the instruction displayed. (Check for normal shifting referring to the table below.)

| Vehicle condition | Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4 |
|---|---|
| No malfunction exists | 1 → 2 → 3 → 4 |
| Malfunction for P0731 exists. | 2 → 2 → 3 → 3 |
| | 4 → 3 → 3 → 4 |

8) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-95.
Refer to shift schedule, AT-262.

OR

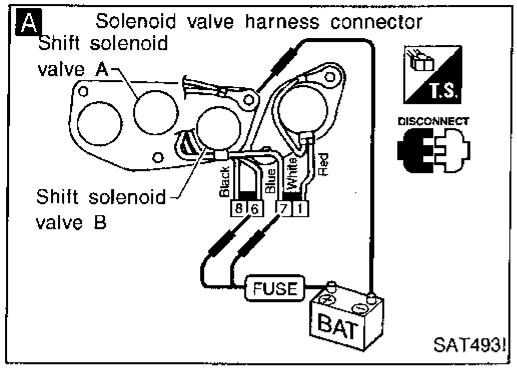
1) Start engine and warm up ATF.
2) Accelerate vehicle to 20 to 25 km/h (12 to 16 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 20 to 25 km/h (12 to 16 MPH). (It will take approximately 3 seconds.)
4) Select "MODE 7" with GST.

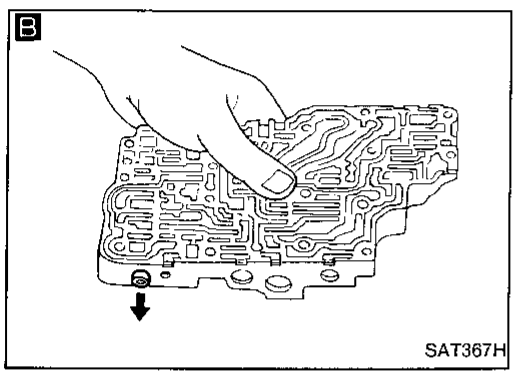
OR

1) Start engine and warm up ATF.
2) Accelerate vehicle to 20 to 25 km/h (12 to 16 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 20 to 25 km/h (12 to 16 MPH). (It will take approximately 3 seconds.)
4) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## A/T 1st Gear Function (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK SHIFT SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Check shift solenoid valve operation.
   - Shift solenoid valve A
   - Shift solenoid valve B

   Refer to "Component Inspection" below.

NG → Repair or replace shift solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to "Control Valve Assembly", AT-206.
2. Check to ensure that:
   - Valve, sleeve and plug slide along valve bore under their own weight.
   - Valve, sleeve and plug are free from burrs, dents and scratches.
   - Control valve springs are free from damage, deformation and fatigue.
   - Hydraulic line is free from obstacles.

NG → Repair control valve assembly.

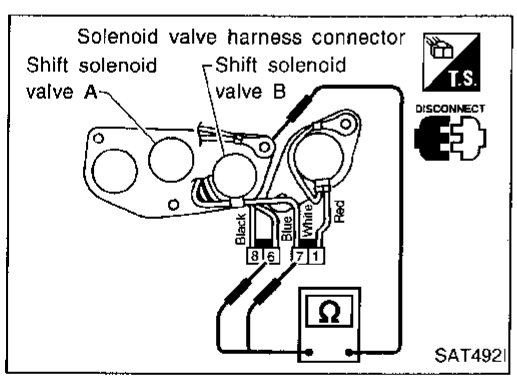
OK

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-93.

NG → Check control valve again. Repair or replace control valve assembly.

OK

**INSPECTION END**




### COMPONENT INSPECTION

#### Shift solenoid valve A and B

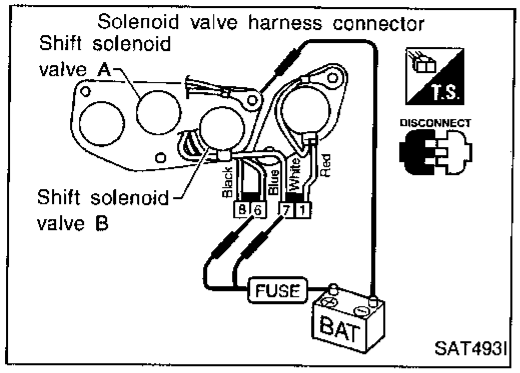
- For removal, refer to AT-181.

#### Resistance check

- Check resistance between terminals (⑥ or ⑦) and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve A | ⑥ | Ground | 20 - 40Ω |
| Shift solenoid valve B | ⑦ | | |

## A/T 1st Gear Function (Cont'd)




### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminals (⑥ or ⑦) and ground.

## A/T 2nd Gear Function

### DESCRIPTION

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into second gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### TCM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 7 | L/Y | Shift solenoid valve B |  | When shift solenoid valve B operates. (When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate. (When driving in "$D_3$" or "$D_4$".) | 1V or less |

### ON BOARD DIAGNOSTIC LOGIC

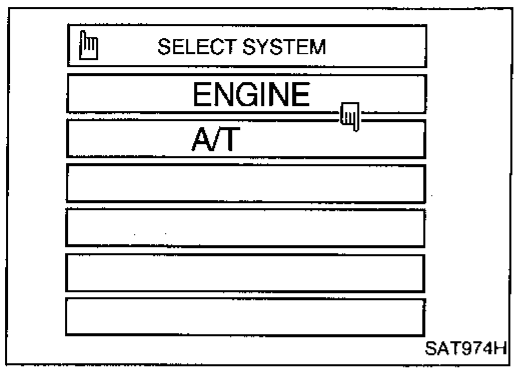
This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (2nd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve B is stuck open.

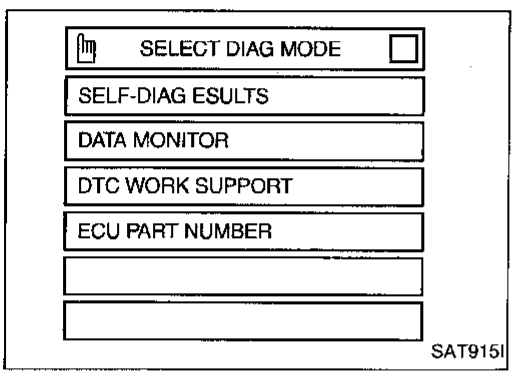
| Gear position supposed by TCM | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| In case of gear position with no malfunctions | 1 | 2 | 3 | 4 |
| In case of gear position with shift solenoid valve B stuck open | 4 | ③ | 3 | 4 |

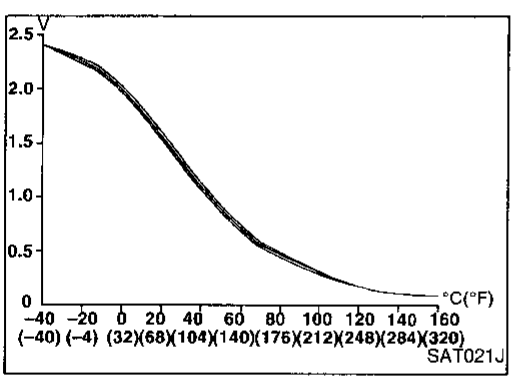
○: P0732 is detected.

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : A/T 2ND GR FNCTN<br>: P0732<br>: MIL Code No. 1104 | A/T cannot be shifted to the 2nd gear position even if electrical circuit is good. | • Shift solenoid valve B<br>• Each clutch<br>• Hydraulic control circuit |

## A/T 2nd Gear Function (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

**NOTE:**

**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

**TESTING CONDITION:**

**Always drive vehicle on a level road to improve the accuracy of test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   **FLUID TEMP SEN: 0.4 - 1.5V**
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3) Select "2ND GR FNCTN P0732" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT and touch "START".
4) Accelerate vehicle to 52 to 57 km/h (32 to 35 MPH) under the following condition and release the accelerator pedal completely.
   **THROTTLE POSI: Less than 1/8 (at all times during step 4)**
   **Selector lever: D position (OD "ON")**
   - **Check that "GEAR" shows "3" or "4" after releasing pedal.**
5) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 52 to 57 km/h (32 to 35 MPH) until "TESTING" changes to "STOP VEHICLE" or "COMPLETED". (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT screen, go to "DIAGNOSTIC PROCEDURE", AT-100.
   If "STOP VEHICLE" appears on CONSULT screen, go to following step.
   - **Check that "GEAR" shows "2" when depressing accelerator pedal to WOT.**
   - **If "TESTING" does not appear on CONSULT for a long time, select "SELF-DIAG RESULTS" for "ENGINE". In case a 1st trip DTC other than P0732 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**
6) Stop vehicle.
7) Follow the instruction displayed. (Check for normal shifting referring to the table below.)

| Vehicle condition | Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4 |
|---|---|
| No malfunction exists | 1 → 2 → 3 → 4 |
| Malfunction for P0732 exists. | 4 → 3 → 3 → 4 |

## A/T 2nd Gear Function (Cont'd)

8) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-100.
Refer to shift schedule, AT-262.

OR

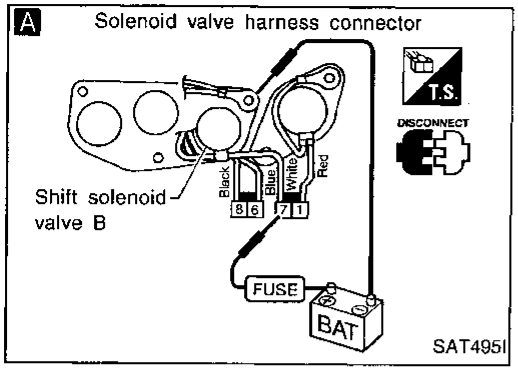
(GST) 1) Start engine and warm up ATF.
2) Accelerate vehicle to 52 to 57 km/h (32 to 35 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 52 to 57 km/h (32 to 35 MPH). (It will take approximately 3 seconds.)
4) Select "MODE 7" with GST.

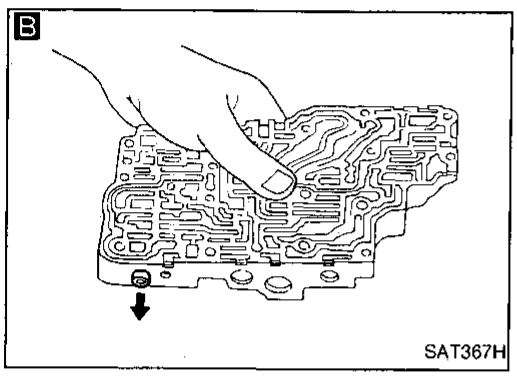
OR

(NO TOOLS) 1) Start engine and warm up ATF.
2) Accelerate vehicle to 52 to 57 km/h (32 to 35 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal to WOT (more than 7/8 of "THROTTLE POSI") quickly from a speed of 52 to 57 km/h (32 to 35 MPH). (It will take approximately 3 seconds.)
4) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## A/T 2nd Gear Function (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK SHIFT SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Check shift solenoid valve operation.
   - Shift solenoid valve B

   Refer to "Component Inspection" below.

NG → Repair or replace shift solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to "Control Valve Assembly", AT-206.
2. Check to ensure that:
   - Valve, sleeve and plug slide along valve bore under their own weight.
   - Valve, sleeve and plug are free from burrs, dents and scratches.
   - Control valve springs are free from damage, deformation and fatigue.
   - Hydraulic line is free from obstacles.

NG → Repair control valve assembly.

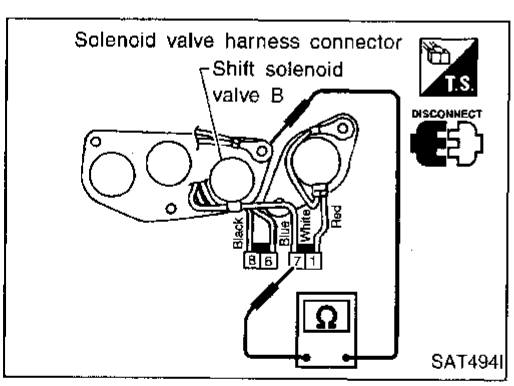
OK

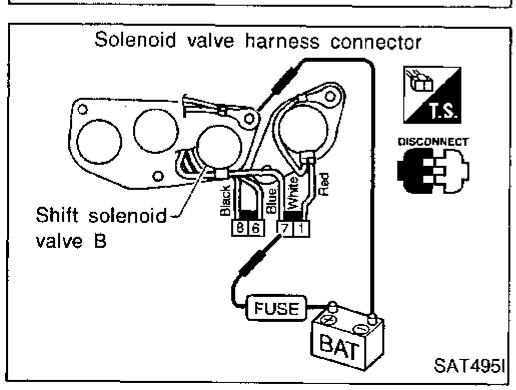
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-98.

NG → Check control valve again. Repair or replace control valve assembly.

OK

**INSPECTION END**




### COMPONENT INSPECTION

#### Shift solenoid valve B

- For removal, refer to AT-181.

#### Resistance check

- Check resistance between terminals ⑦ and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve B | ⑦ | Ground | 20 - 40Ω |

#### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑦ and ground.

## A/T 3rd Gear Function

### DESCRIPTION

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into third gear position as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning servo piston or brake band, etc.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### TCM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 6 | L/R | Shift solenoid valve A |  | When shift solenoid valve A operates.<br>(When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate.<br>(When driving in "$D_2$" or "$D_3$".) | 1V or less |

### ON BOARD DIAGNOSTIC LOGIC

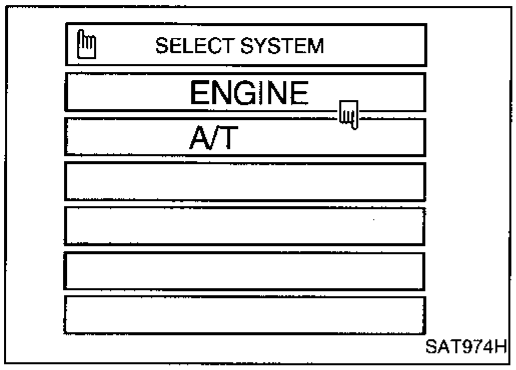
This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is higher than the position (3rd) supposed by TCM, the slip ratio will be more than normal. In case the ratio exceeds the specified value, TCM judges this diagnosis malfunction.
This malfunction will be caused when shift solenoid valve A is stuck closed.

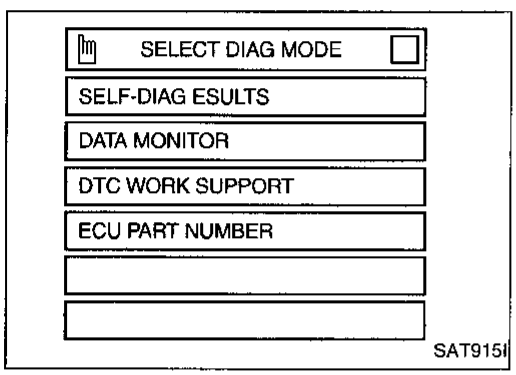
| Gear position supposed by TCM | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| In case of gear position with no malfunctions | 1 | 2 | 3 | 4 |
| In case of gear position with shift solenoid valve A stuck closed | 1 | 1 | ④ | 4 |

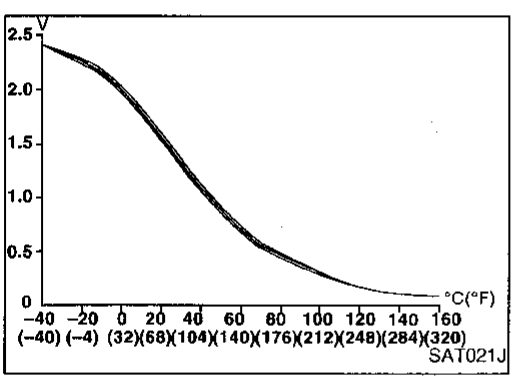
○: P0733 is detected.

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : A/T 3RD GR FNCTN<br>: P0733<br>: MIL Code No. 1105 | A/T cannot be shifted to the 3rd gear position even if electrical circuit is good. | • Shift solenoid valve A<br>• Each clutch<br>• Hydraulic control circuit |

## A/T 3rd Gear Function (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**

- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

**NOTE:**

**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

**TESTING CONDITION:**

**Always drive vehicle on a level road to improve the accuracy of test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   **FLUID TEMP SEN: 0.4 - 1.5V**
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3) Select "3RD GR FNCTN P0733" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT and touch "START".
4) Accelerate vehicle to 78 to 93 km/h (48 to 58 MPH) under the following condition and release the accelerator pedal completely.
   **THROTTLE POSI: Less than 1/8 (at all times during step 4)**
   **Selector lever: D position (OD "ON")**
   - **Check that "GEAR" shows "4" after releasing pedal.**
5) Depress accelerator pedal steadily with 3.5/8 - 4.5/8 of "THROTTLE POSI" from a speed of 78 to 93 km/h (48 to 58 MPH) until "TESTING" changes to "STOP VEHICLE" or "COMPLETED". (It will take approximately 3 seconds.)
   If the check result NG appears on CONSULT screen, go to "DIAGNOSTIC PROCEDURE", AT-104.
   If "STOP VEHICLE" appears on CONSULT screen, go to following step.
   - **Check that "GEAR" shows "3" when depressing accelerator pedal with 3.5/8 - 4.5/8 of "THROTTLE POSI".**
   - **If "TESTING" does not appear on CONSULT for a long time, select "SELF-DIAG RESULTS" for "ENGINE". In case a 1st trip DTC other than P0733 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**
6) Stop vehicle.
7) Follow the instruction displayed. (Check for normal shifting referring to the table below.)

| Vehicle condition | Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4 |
|---|---|
| No malfunction exists. | 1 → 2 → 3 → 4 |
| Malfunction for P0733 exists. | 1 → 1 → 4 → 4 |

## A/T 3rd Gear Function (Cont'd)

8) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-104.
Refer to shift schedule, AT-262.

OR

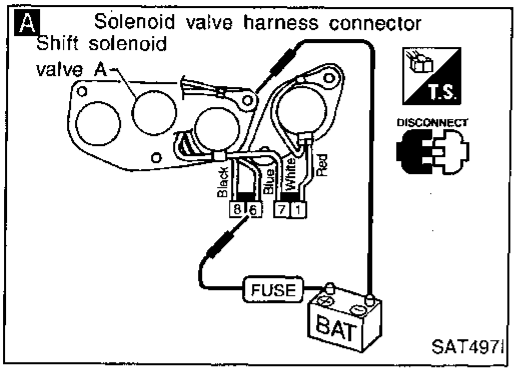
(GST)
1) Start engine and warm up ATF.
2) Accelerate vehicle to 78 to 93 km/h (48 to 58 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal with 3.5/8 - 4.5/8 of "THROTTLE POSI" from a speed of 78 to 93 km/h (48 to 58 MPH). (It will take approximately 3 seconds.)
4) Select "MODE 7" with GST.

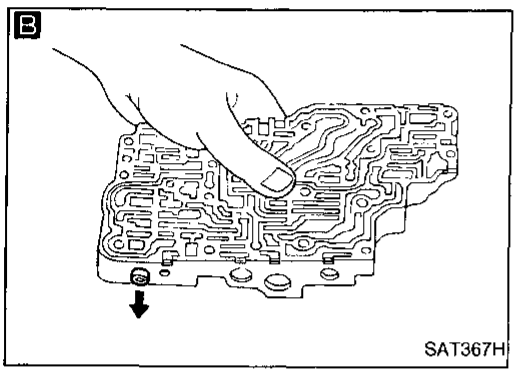
OR

(NO TOOLS)
1) Start engine and warm up ATF.
2) Accelerate vehicle to 78 to 93 km/h (48 to 58 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 1/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal with 3.5/8 - 4.5/8 of "THROTTLE POSI" from a speed of 78 to 93 km/h (48 to 58 MPH). (It will take approximately 3 seconds.)
4) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## A/T 3rd Gear Function (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK SHIFT SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Check shift solenoid valve operation.
   - Shift solenoid valve A

   Refer to "Component Inspection" below.

NG → Repair or replace shift solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to "Control Valve Assembly", AT-206.
2. Check to ensure that:
   - Valve, sleeve and plug slide along valve bore under their own weight.
   - Valve, sleeve and plug are free from burrs, dents and scratches.
   - Control valve springs are free from damage, deformation and fatigue.
   - Hydraulic line is free from obstacles.

NG → Repair control valve assembly.

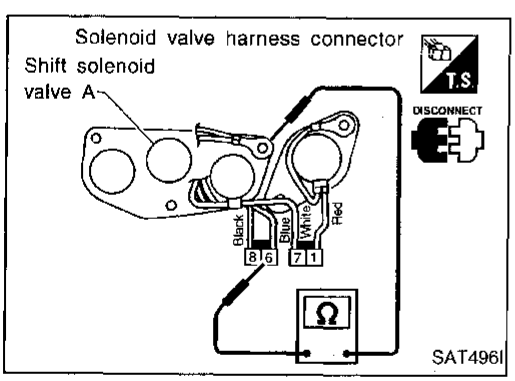
OK

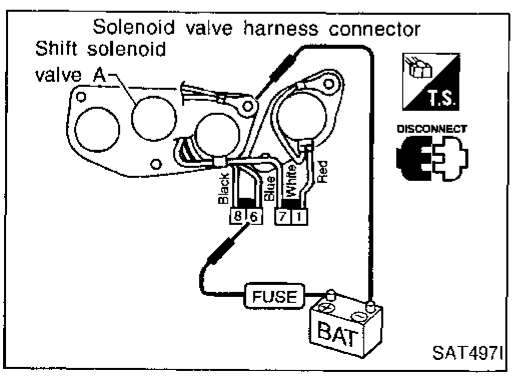
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-102.

NG → Check control valve again. Repair or replace control valve assembly.

OK

**INSPECTION END**




### COMPONENT INSPECTION

#### Shift solenoid valve A

- For removal, refer to AT-181.

#### Resistance check

- Check resistance between terminals ⑥ and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve A | ⑥ | Ground | 20 - 40Ω |

#### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑥ and ground.

## A/T 4th Gear Function

### DESCRIPTION

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| Torque converter clutch solenoid valve duty | Lock-up "OFF"<br>↓<br>Lock-up "ON" | Approximately 4%<br>↓<br>Approximately 94% |
| Line pressure solenoid valve duty | Small throttle opening (Low line pressure)<br>↓<br>Large throttle opening (High line pressure) | Approximately 29%<br>↓<br>Approximately 95% |

### TCM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 1 | OR | Line pressure solenoid valve |  | When releasing accelerator pedal after warming up engine. | 1.5 - 2.5V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 2 | P | Line pressure solenoid valve (with dropping resistor) |  | When releasing accelerator pedal after warming up engine. | 5 - 14V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 5 | GY/R | Torque converter clutch solenoid valve |  | When A/T performs lock-up. | 8 - 15V |
| | | | | When A/T does not perform lock-up. | 1V or less |
| 6 | L/R | Shift solenoid valve A | | When shift solenoid valve A operates. (When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate. (When driving in "$D_2$" or "$D_3$".) | 1V or less |
| 7 | L/Y | Shift solenoid valve B | | When shift solenoid valve B operates. (When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate. (When driving in "$D_3$" or "$D_4$".) | 1V or less |
| 8 | P | Overrun clutch solenoid valve | | When overrun clutch solenoid valve operates. | Battery voltage |
| | | | | When overrun clutch solenoid valve does not operate. | 1V or less |

## A/T 4th Gear Function (Cont'd)

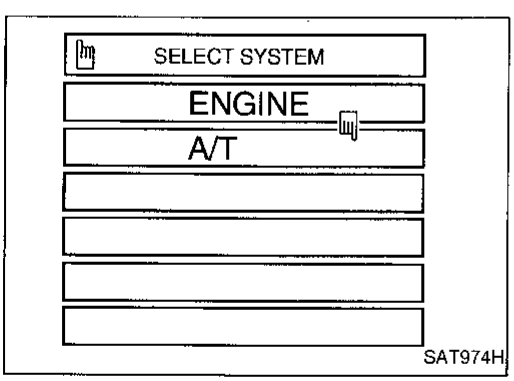
### ON BOARD DIAGNOSTIC LOGIC

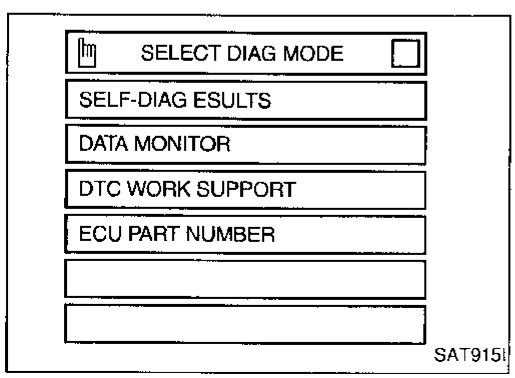
This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.

| Gear position supposed by TCM | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| In case of gear position with no malfunctions | 1 | 2 | 3 | 4 |
| In case of gear position with shift solenoid valve B stuck closed | 1 | 2 | 2 | ① |

○: P0734 is detected.

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : A/T 4TH GR FNCTN<br>: P0734<br>: MIL Code No. 1106 | A/T cannot be shifted to the 4th gear position even if electrical circuit is good. | • Shift solenoid valve A<br>• Shift solenoid valve B<br>• Overrun clutch solenoid valve<br>• Line pressure solenoid valve<br>• Each clutch<br>• Hydraulic control circuit<br>• Torque converter clutch solenoid valve |




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
- **Always drive vehicle at a safe speed.**
- **Be careful not to rev engine into the red zone on the tachometer.**

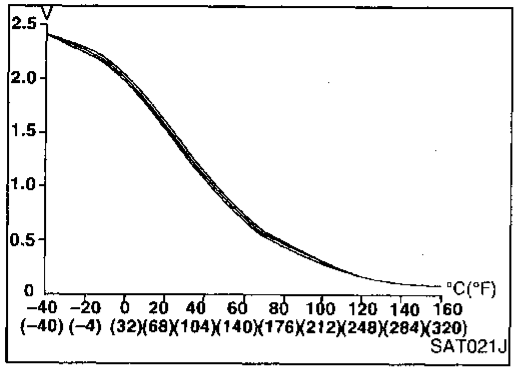
**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

**TESTING CONDITION:**
**Always drive vehicle on a level road to improve the accuracy of test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   **FLUID TEMP SEN: 0.4 - 1.5V**
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).

## A/T 4th Gear Function (Cont'd)




3) Select "4TH GR FNCTN P0734" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT and touch "START".
4) Accelerate vehicle to 45 to 55 km/h (28 to 34 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 5.5/8 (at all times during step 4)**
**Selector lever: D position (OD "ON")**
- **Check that "GEAR" shows "3" after releasing pedal.**

5) Depress accelerator pedal steadily with 1/8 - 2/8 of "THROTTLE POSI" from a speed of 45 to 55 km/h (28 to 34 MPH) until "TESTING" has turned to "STOP VEHICLE" or "COMPLETED". (It will take approximately 3 seconds.)
If the check result NG appears on CONSULT screen, go to "DIAGNOSTIC PROCEDURE", AT-109.
If "STOP VEHICLE" appears on CONSULT screen, go to following step.
- **Check that "GEAR" shows "4" when depressing accelerator pedal with 1/8 - 2/8 of "THROTTLE POSI".**
- **If "TESTING" does not appear on CONSULT for a long time, select "SELF-DIAG RESULTS" for "ENGINE". In case a 1st trip DTC other than P0734 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**

6) Stop vehicle.
7) Follow the instruction displayed. (Check for normal shifting referring to the table below.)

| Vehicle condition | Gear on actual transmission shift pattern when screen is changed to 1 → 2 → 3 → 4 |
|---|---|
| No malfunction exists | 1 → 2 → 3 → 4 |
| Malfunction for P0734 exists. | 1 → 2 → 2 → 1 |

8) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-109.
Refer to shift schedule, AT-262.

OR

1) Start engine and warm up ATF.
2) Accelerate vehicle to 45 to 55 km/h (28 to 34 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 5.5/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.
3) Depress accelerator pedal with 1/8 - 2/8 of "THROTTLE POSI" from a speed of 45 to 55 km/h (28 to 34 MPH). (It will take approximately 3 seconds.)
4) Select "MODE 7" with GST.

OR

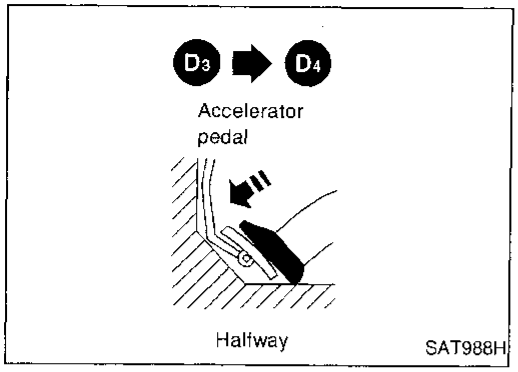
1) Start engine and warm up ATF.
2) Accelerate vehicle to 45 to 55 km/h (28 to 34 MPH) under the following condition and release the accelerator pedal completely.
**THROTTLE POSI: Less than 5.5/8**
**Selector lever: D position (OD "ON")**
Refer to shift schedule, AT-262.

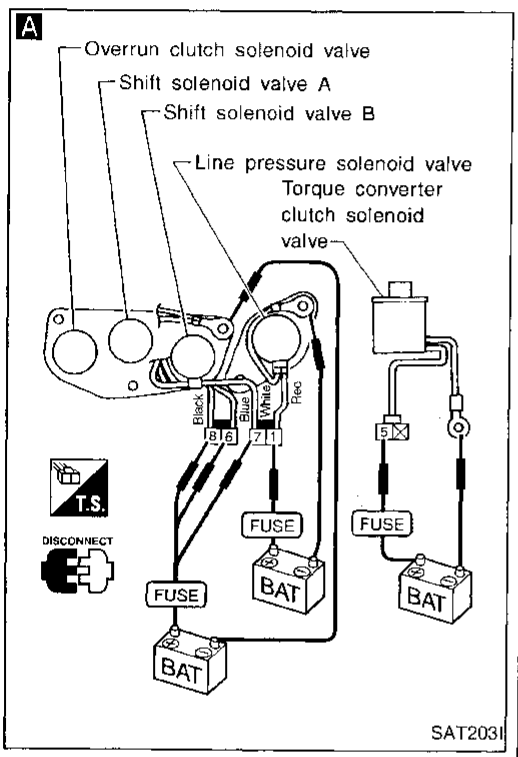
## A/T 4th Gear Function (Cont'd)

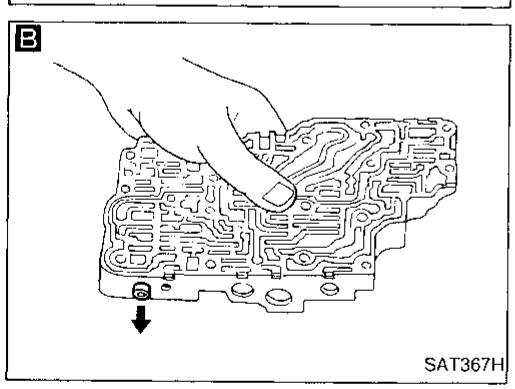
3) Depress accelerator pedal with 1/8 - 2/8 of "THROTTLE POSI" from a speed of 45 to 55 km/h (28 to 34 MPH). (It will take approximately 3 seconds.)
4) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## A/T 4th Gear Function (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

During "Cruise test — Part 1" (AT-67), does A/T shift from $D_3$ to $D_4$ at the specified speed?

Yes → Go to Ⓑ and check for proper lock-up, AT-111.

No

Perform line pressure test. Refer to AT-59.

NG → Go to Ⓐ, AT-110.

OK

A

**CHECK SOLENOID VALVES.**
1. Remove control valve assembly. Refer to AT-181.
2. Refer to "Component Inspection", AT-112.

NG → Replace solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to AT-206.
2. Check to ensure that:
- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.

NG → Repair control valve.

OK

Does A/T shift from $D_3$ to $D_4$ at the specified speed?

NG → Check control valve again. Repair or replace control valve assembly.

OK

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-106.

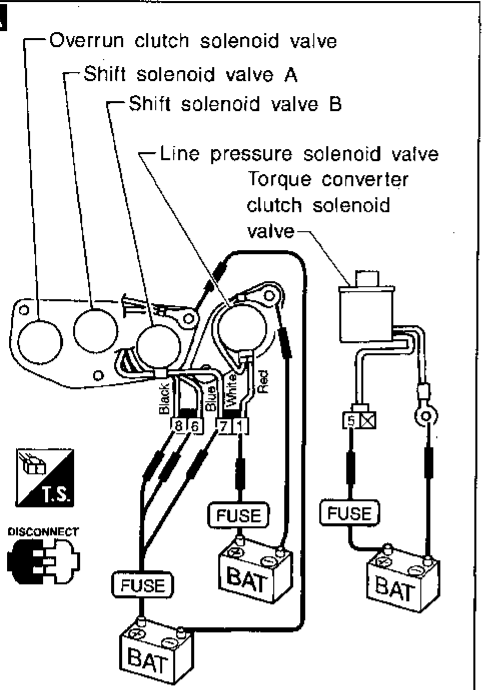
NG → Go to Ⓑ and check for proper lock-up, AT-111.

OK

**INSPECTION END**

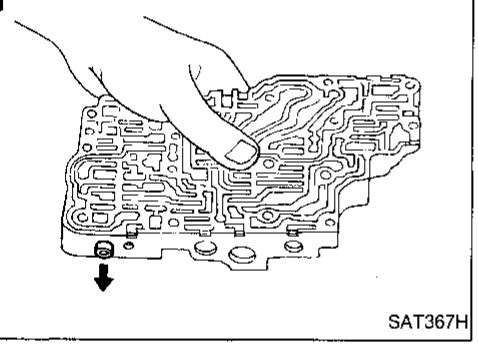
## A/T 4th Gear Function (Cont'd)

A




SAT203I

B



SAT367H

Ⓐ

A

**CHECK LINE PRESSURE SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Refer to "Component Inspection", AT-112.

NG → Replace solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to AT-206.
2. Check line pressure circuit valves for sticking.
- Pressure regulator valve
- Pilot valve
- Pressure modifier valve

NG → Repair control valve.

OK

Does A/T shift from $D_3$ to $D_4$ at the specified speed?

NG → Check control valve again. Repair or replace control valve assembly.

OK

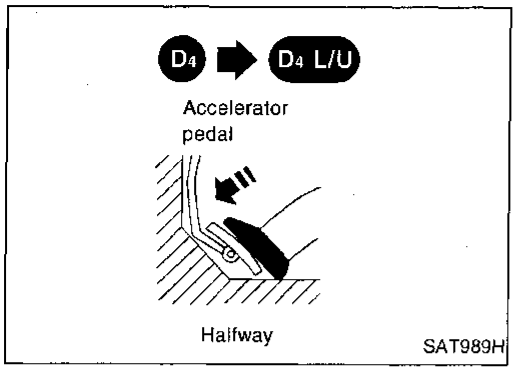
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-106.

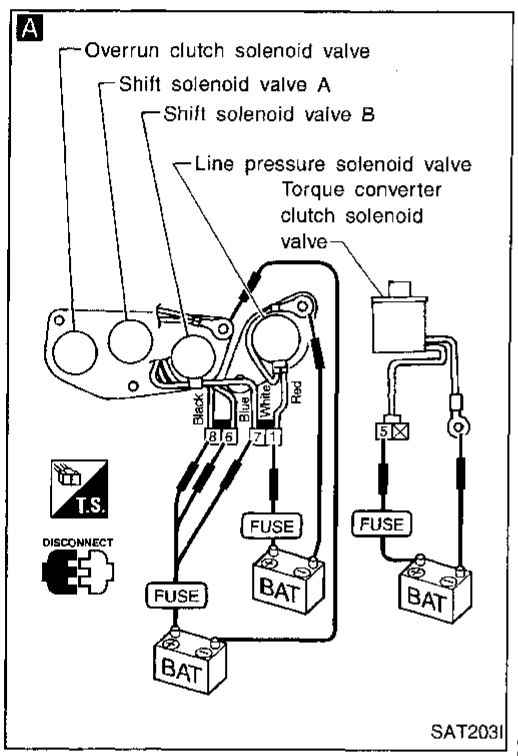
NG → Go to Ⓑ and check for proper lock-up, AT-111.

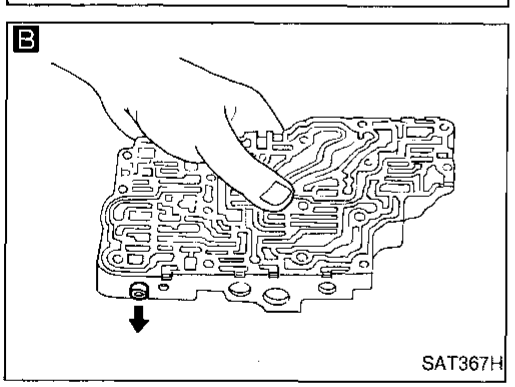
OK

**INSPECTION END**

## A/T 4th Gear Function (Cont'd)




Ⓑ

During "Cruise test — Part 1" (AT-67), does A/T perform lock-up at the specified speed?

Yes → Perform "Cruise test — Part 1" again and return to the start point of this flow chart.

No

A

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Refer to "Component Inspection", AT-112.

NG → Replace solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to AT-206.
2. Check control valves for sticking.
- Torque converter clutch control valve
- Torque converter clutch relief valve

NG → Repair control valve.

OK

Does A/T perform lock-up at the specified speed?

No → Check control valve again. Repair or replace control valve assembly.

Yes

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-106.

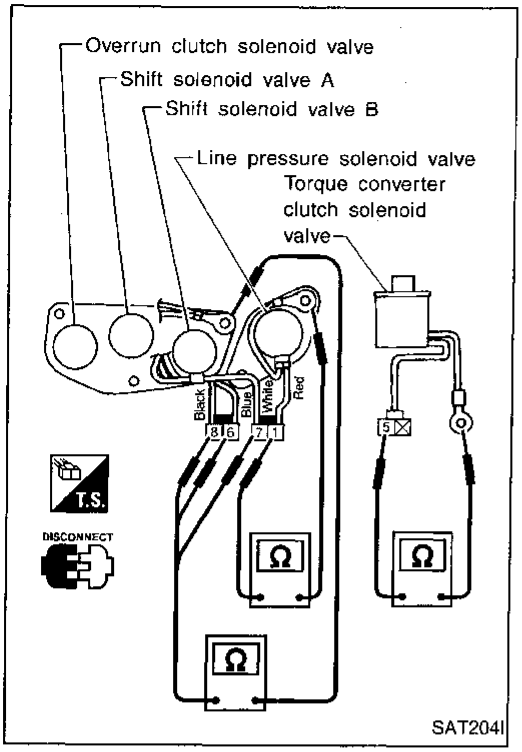
NG → Perform "Cruise test — Part 1" again and return to the start point of this flow chart.

OK

**INSPECTION END**

## A/T 4th Gear Function (Cont'd)

### COMPONENT INSPECTION



SAT204I

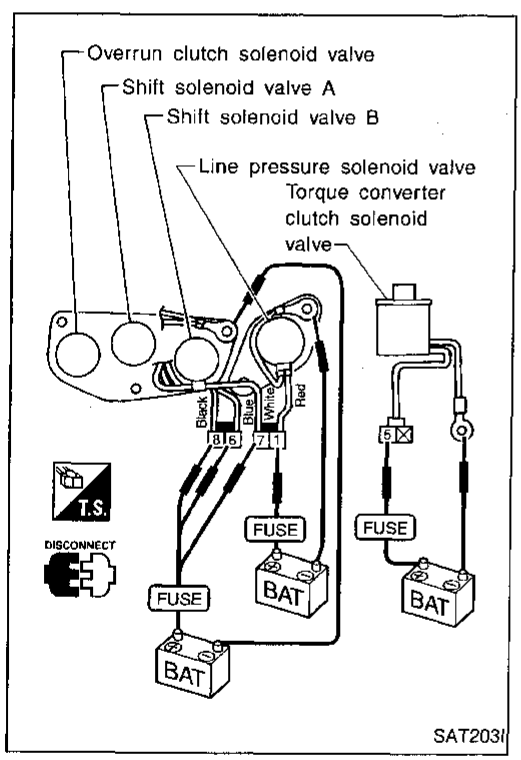
### Solenoid valves

- For removal, refer to AT-181.

**Resistance check**

- Check resistance between terminals (⑥, ⑦, ⑧, ① or ⑤) and ground.

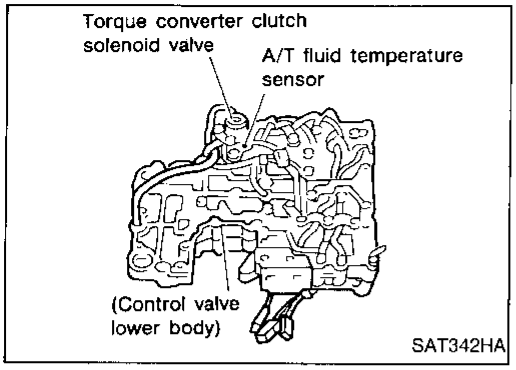
| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve A | ⑥ | Ground | 20 - 40Ω |
| Shift solenoid valve B | ⑦ | | |
| Overrun clutch solenoid valve | ⑧ | | |
| Line pressure solenoid valve | ① | | 2.5 - 5Ω |
| Torque converter clutch solenoid valve | ⑤ | | 10 - 16Ω |



SAT203I

**Operation check**

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminals (⑥, ⑦, ⑧, ① or ⑤) and ground.




## Torque Converter Clutch Solenoid Valve

### DESCRIPTION

The torque converter clutch solenoid valve is activated, with the gear in "$D_4$", by the TCM in response to signals sent from the vehicle speed and throttle position sensors. Lock-up piston operation will then be controlled.
Lock-up operation, however, is prohibited when A/T fluid temperature is too low.
When the accelerator pedal is depressed (less than 2/8) in lock-up condition, the engine speed should not change abruptly. If there is a big jump in engine speed, there is no lock-up.

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| Torque converter clutch solenoid valve duty | Lock-up "OFF"<br>↓<br>Lock-up "ON" | Approximately 4%<br>↓<br>Approximately 94% |

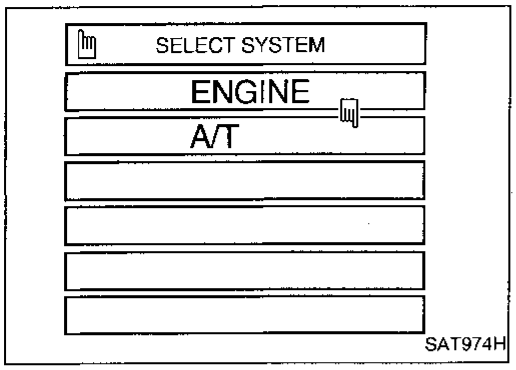
### TCM TERMINALS AND REFERENCE VALUE

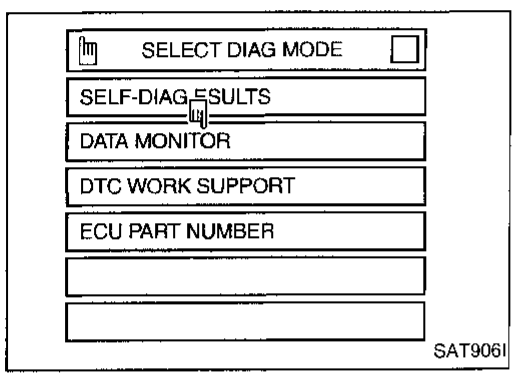
Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 5 | L/R | Torque converter clutch solenoid valve |  | When A/T performs lock-up. | 8 - 15V |
| | | | | When A/T does not perform lock-up. | 1V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : TCC SOLENOID/CIRC<br>: P0740<br>: MIL Code No. 1204 | TCM detects an improper voltage drop when it tries to operate the solenoid valve. | • Harness or connectors (The solenoid circuit is open or shorted.)<br>• T/C clutch solenoid valve |




## Torque Converter Clutch Solenoid Valve (Cont'd)

### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode for "ENGINE" with CONSULT and wait at least 1 second.

OR

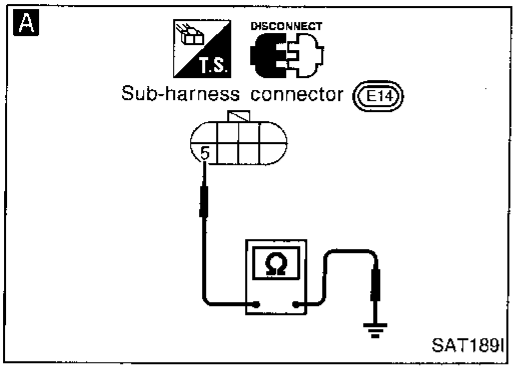
1) Turn ignition switch "ON".
2) Select "MODE 7" with GST.

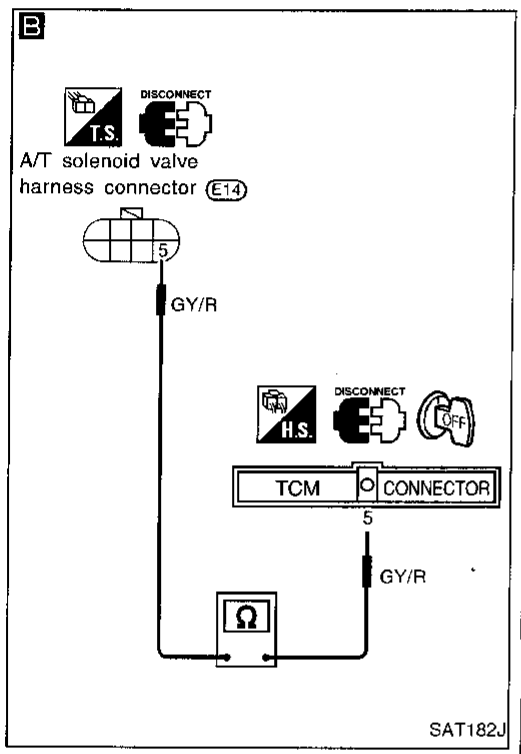
OR

1) Turn ignition switch "ON".
2) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Torque Converter Clutch Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
   **Resistance: 10 - 20Ω**

NG →
1. Remove oil pan. Refer to AT-181.
2. Check the following items:
   - Torque converter clutch solenoid valve
     Refer to "Component Inspection", AT-116.
   - Harness of terminal cord assembly for short or open

OK ↓

B

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal ⑤ and TCM harness connector terminal ⑤.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connectors.

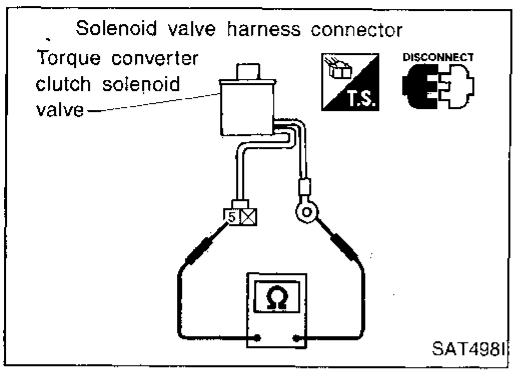
OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-114.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## Torque Converter Clutch Solenoid Valve (Cont'd)

### COMPONENT INSPECTION

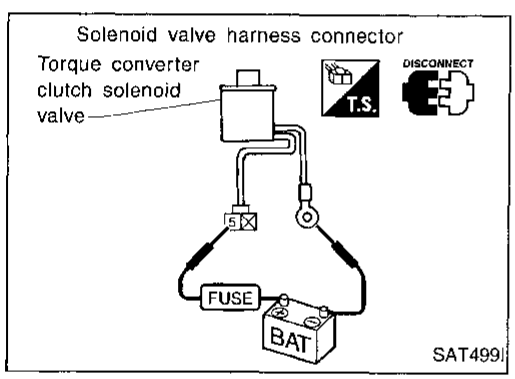
#### Torque converter clutch solenoid valve

- For removal, refer to AT-181.

**Resistance check**

- Check resistance between terminal ⑤ and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Torque converter clutch solenoid valve | ⑤ | Ground | 10 - 16Ω |




**Operation check**

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑤ and ground.

## A/T TCC S/V Function (Lock-up)

### DESCRIPTION

- This is an OBD-II self-diagnostic item and not available in TCM self-diagnosis.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the TCM. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| Torque converter clutch solenoid valve duty | Lock-up "OFF"<br>↓<br>Lock-up "ON" | Approximately 4%<br>↓<br>Approximately 94% |

### TCM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values.

| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 1 | OR | Line pressure solenoid valve |  | When releasing accelerator pedal after warming up engine. | 1.5 - 2.5V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 2 | P | Line pressure solenoid valve (with dropping resistor) |  | When releasing accelerator pedal after warming up engine. | 5 - 14V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 5 | GY/R | Torque converter clutch solenoid valve |  | When A/T performs lock-up. | 8 - 15V |
| | | | | When A/T does not perform lock-up. | 1V or less |
| 6 | L/R | Shift solenoid valve A | | When shift solenoid valve A operates.<br>(When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate.<br>(When driving in "$D_2$" or "$D_3$".) | 1V or less |
| 7 | L/Y | Shift solenoid valve B | | When shift solenoid valve B operates.<br>(When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate.<br>(When driving in "$D_3$" or "$D_4$".) | 1V or less |
| 8 | P | Overrun clutch solenoid valve | | When overrun clutch solenoid valve operates. | Battery voltage |
| | | | | When overrun clutch solenoid valve does not operate. | 1V or less |

## A/T TCC S/V Function (Lock-up) (Cont'd)

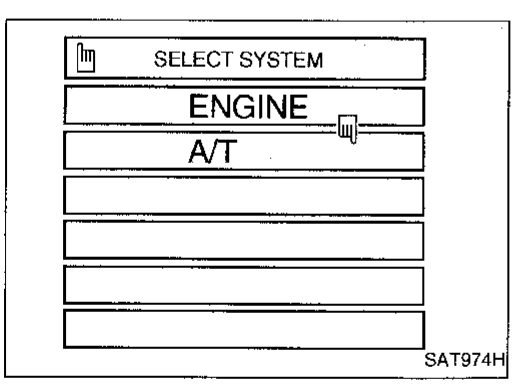
### ON BOARD DIAGNOSTIC LOGIC

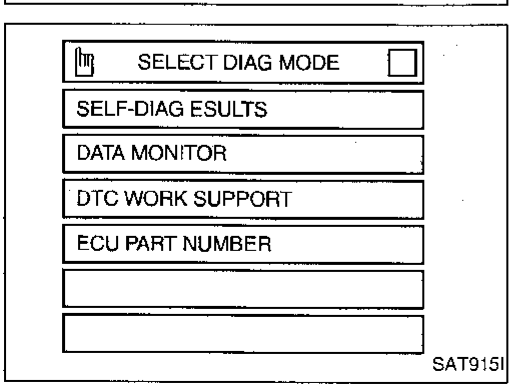
This diagnosis monitors actual gear position by checking the torque converter slip ratio calculated by TCM as follows:
Torque converter slip ratio = A x C/B
A: Output shaft revolution signal from revolution sensor
B: Engine speed signal from ECM
C: Gear ratio determined as gear position which TCM supposes
If the actual gear position is much lower than the position (4th) supposed by TCM, the slip ratio will be much less than normal. In case the ratio does not reach the specified value, TCM judges this diagnosis malfunction. This malfunction will be caused when shift solenoid valve B is stuck closed.

| Gear position supposed by TCM | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| In case of gear position with no malfunctions | 1 | 2 | 3 | 4 |
| In case of gear position with shift solenoid valve B stuck closed | 1 | 2 | 2 | ① |

○: P0744 is detected.

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : A/T TCC S/V FNCTN<br>: P0744<br>: MIL Code No. 1107 | A/T cannot perform lock-up even if electrical circuit is good. | • Torque converter clutch solenoid valve<br>• Each clutch<br>• Hydraulic control circuit |




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

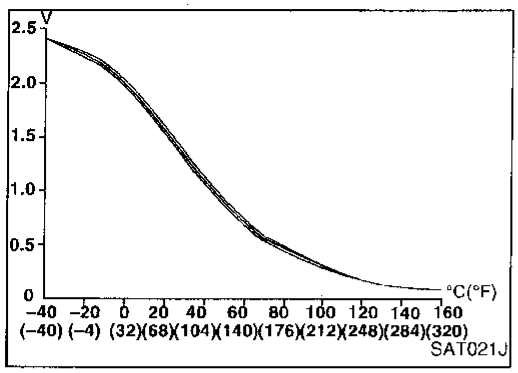
**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Make sure that output voltage of A/T fluid temperature sensor is within the range below.
   **FLUID TEMP SEN: 0.4 - 1.5V**
   If out of range, drive the vehicle to decrease the voltage (warm up the fluid) or stop engine to increase the voltage (cool down the fluid).
3) Select "TCC S/V FNCTN P0744" of "DTC WORK SUPPORT" mode for "A/T" with CONSULT and touch "START".

## A/T TCC S/V Function (Lock-up) (Cont'd)




4) Accelerate vehicle to more than 70 km/h (43 MPH) and maintain the following condition continuously until "TESTING" has turned to "COMPLETED". (It will take approximately 30 seconds after "TESTING" shows.)
**THROTTLE POSI: 1/8 - 2/8 (at all times during step 4)**
**Selector lever: D position (OD "ON")**
**TCC S/V DUTY: More than 94%**
**VHCL/S SE·A/T: Constant speed of more than 70 km/h (43 MPH)**

- **Check that "GEAR" shows "4".**
- **For shift schedule, refer to SDS, AT-262.**
- **If "TESTING" does not appear on CONSULT for a long time, select "SELF-DIAG RESULTS". In case a 1st trip DTC other than P0744 is shown, refer to applicable "TROUBLE DIAGNOSIS FOR DTC".**

5) Make sure that "OK" is displayed. (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
Refer to "DIAGNOSTIC PROCEDURE", AT-120.
Refer to shift schedule, AT-262.

OR

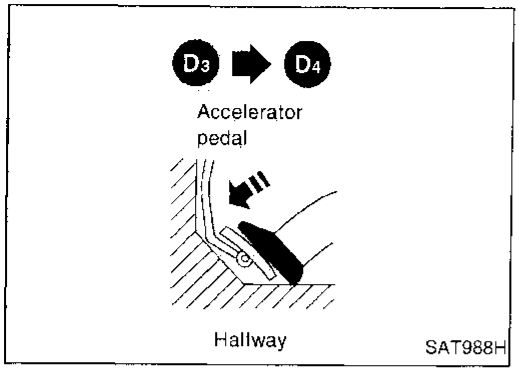
1) Start engine and warm up ATF.
2) Start vehicle with selector lever in "D" position (OD "ON"), throttle position 1/8 - 2/8 and $D_4$ lock-up position for approximately 30 seconds. Check that vehicle runs through gear shift of $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up, in accordance with shift schedule. Refer to shift schedule, AT-262.
3) Select "MODE 7" with GST.

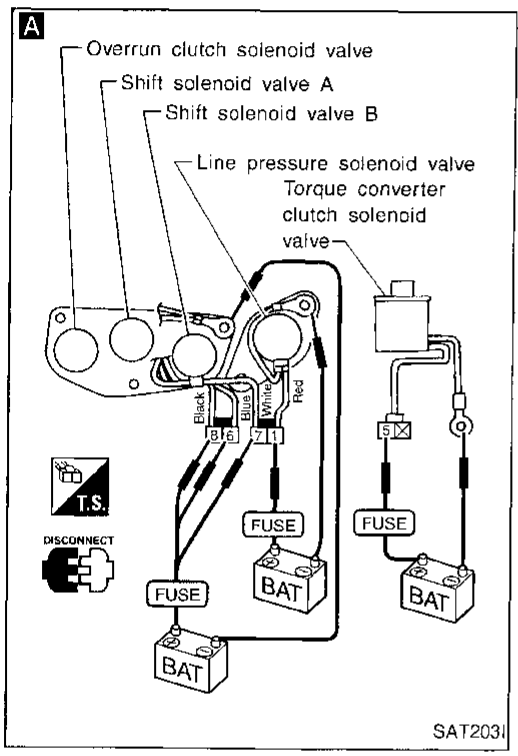
OR

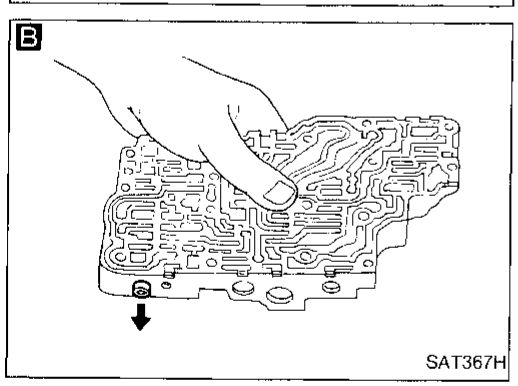
1) Start engine and warm up ATF.
2) Start vehicle with selector lever in "D" position (OD "ON"), throttle position 1/8 - 2/8 and $D_4$ lock-up position for approximately 30 seconds. Check that vehicle runs through gear shift of $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up, in accordance with shift schedule. Refer to shift schedule, AT-262.
3) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## A/T TCC S/V Function (Lock-up) (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

During "Cruise test — Part 1" (AT-67), does A/T shift from $D_3$ to $D_4$ at the specified speed?

Yes → Go to Ⓑ and check for proper lock-up, AT-122.

No

Perform line pressure test. Refer to AT-59.

NG → Go to Ⓐ, AT-121.

OK

A

**CHECK SOLENOID VALVES.**

1. Remove control valve assembly. Refer to AT-181.
2. Check solenoid valve assembly operation. Refer to AT-123.

NG → Replace solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**

1. Disassemble control valve assembly. Refer to AT-206.
2. Check to ensure that:
- Valve, sleeve and plug slide along valve bore under their own weight.
- Valve, sleeve and plug are free from burrs, dents and scratches.
- Control valve springs are free from damage, deformation and fatigue.
- Hydraulic line is free from obstacles.

NG → Repair control valve.

OK

Does A/T shift from $D_3$ to $D_4$ at the specified speed?

NG → Check control valve again. Repair or replace control valve assembly.

OK

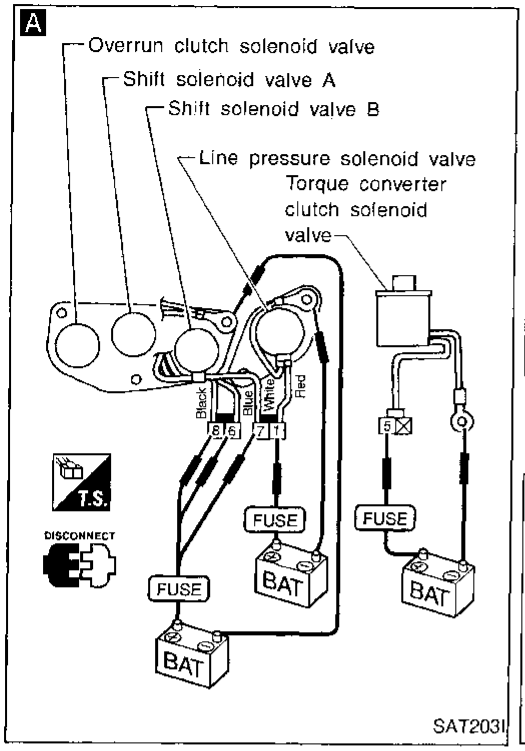
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-118.

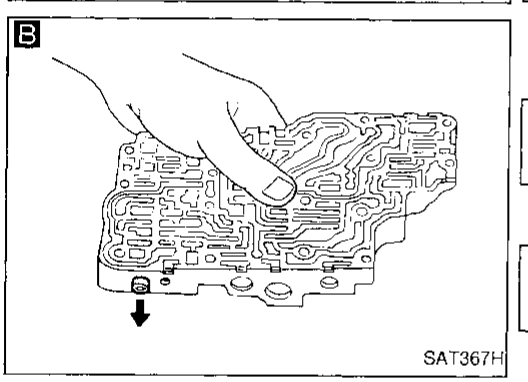
NG → Go to Ⓑ and check for proper lock-up, AT-122.

OK

**INSPECTION END**

## A/T TCC S/V Function (Lock-up) (Cont'd)




Ⓐ

**A**

**CHECK LINE PRESSURE SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Check line pressure solenoid valve operation. Refer to AT-123.

NG → Replace solenoid valve assembly.

OK ↓

**B**

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to AT-206.
2. Check line pressure circuit valves for sticking.
- Pressure regulator valve
- Pilot valve
- Pressure modifier valve

NG → Repair control valve.

OK ↓

Does A/T shift from $D_3$ to $D_4$ at the specified speed?

NG → Check control valve again. Repair or replace control valve assembly.

OK ↓

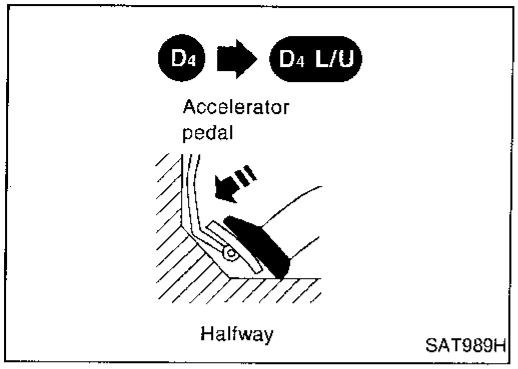
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-118.

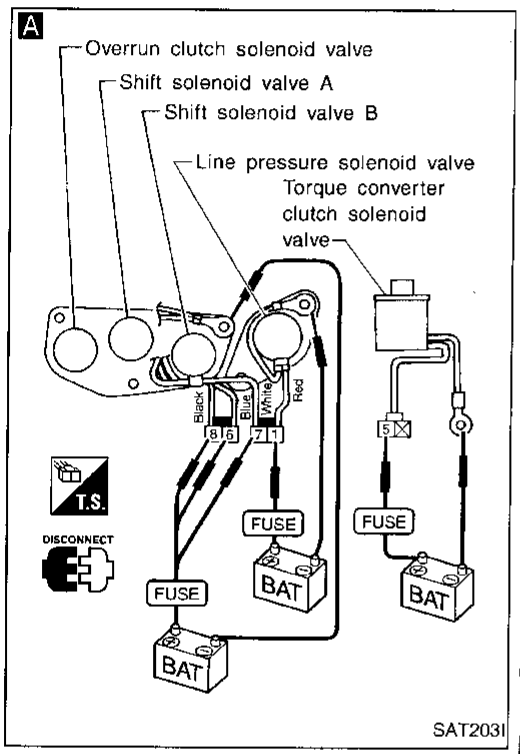
NG → Go to Ⓑ and check for proper lock-up, AT-122.

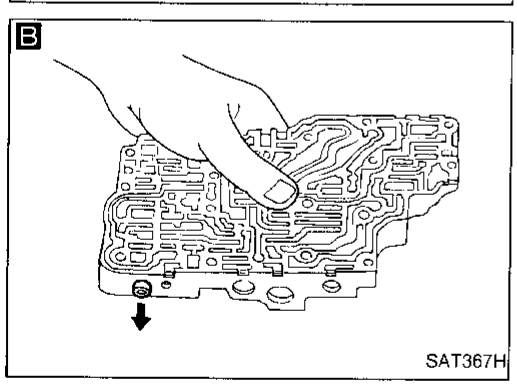
OK ↓

**INSPECTION END**

## A/T TCC S/V Function (Lock-up) (Cont'd)




Ⓑ

During "Cruise test — Part 1" (AT-67), does A/T perform lock-up at the specified speed?

Yes → Perform "Cruise test — Part 1" again and return to the start point of this flow chart.

No

A

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE.**
1. Remove control valve assembly. Refer to AT-181.
2. Check torque converter clutch solenoid valve operation. Refer to AT-123.

NG → Replace solenoid valve assembly.

OK

B

**CHECK CONTROL VALVE.**
1. Disassemble control valve assembly. Refer to AT-206.
2. Check control valves for sticking.
- Torque converter clutch control valve
- Torque converter clutch relief valve

NG → Repair control valve.

OK

Does A/T perform lock-up at the specified speed?

No → Check control valve again. Repair or replace control valve assembly.

Yes

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-118.

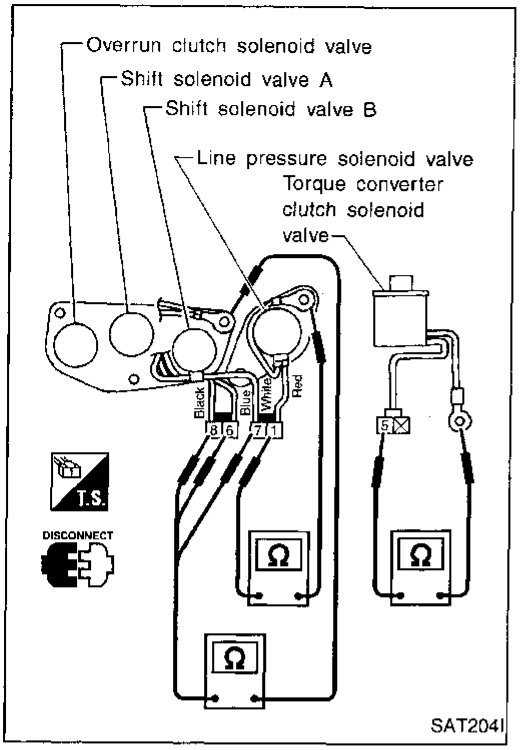
NG → Perform "Cruise test — Part 1" again and return to the start point of this flow chart.

OK

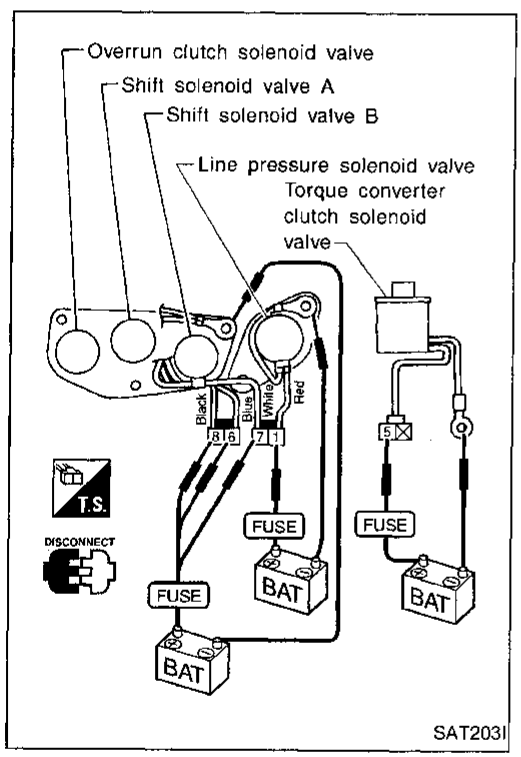
**INSPECTION END**

## A/T TCC S/V Function (Lock-up) (Cont'd)

### COMPONENT INSPECTION



SAT204I



SAT203I

### Solenoid valves

- For removal, refer to AT-181.

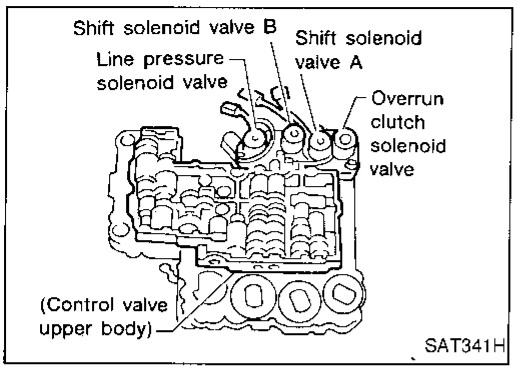
**Resistance check**

- Check resistance between terminals (⑥, ⑦, ⑧, ① or ⑤) and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve A | ⑥ | Ground | 20 - 40Ω |
| Shift solenoid valve B | ⑦ | | |
| Overrun clutch solenoid valve | ⑧ | | |
| Line pressure solenoid valve | ① | | 2.5 - 5Ω |
| Torque converter clutch solenoid valve | ⑤ | | 10 - 16Ω |

**Operation check**

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminals (⑥, ⑦, ⑧, ① or ⑤) and ground.




## Line Pressure Solenoid Valve

### DESCRIPTION

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the TCM.

**The line pressure duty cycle value is not consistent when the closed throttle position switch is "ON". To confirm the line pressure duty cycle at low pressure, the accelerator (throttle) should be open until the closed throttle position switch is "OFF".**

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| Line pressure solenoid valve duty | Small throttle opening (Low line pressure) ↓ Large throttle opening (High line pressure) | Approximately 29% ↓ Approximately 95% |

Note: The line pressure duty cycle value is not consistent when the closed throttle position switch is "ON". To confirm the line pressure duty cycle at low pressure, the accelerator (throttle) should be open until the closed throttle position switch is "OFF".

### TCM TERMINALS AND REFERENCE VALUE

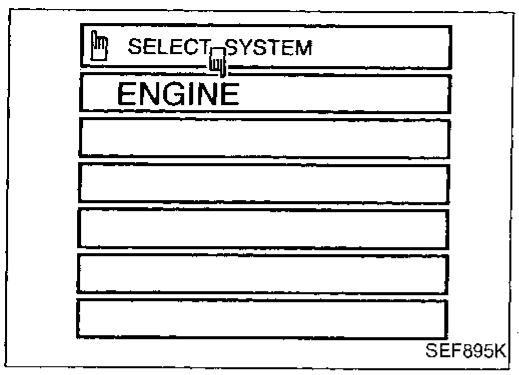
Remarks: Specification data are reference values.

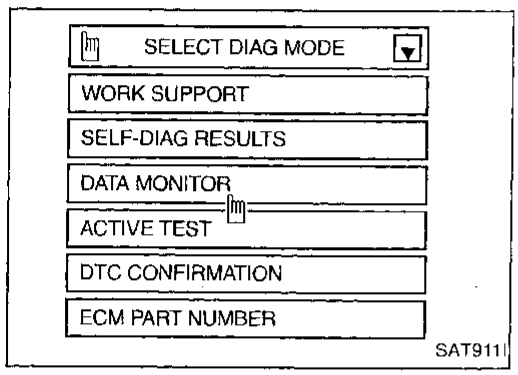
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 1 | OR | Line pressure solenoid valve |  | When releasing accelerator pedal after warming up engine. | 1.5 - 2.5V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |
| 2 | P | Line pressure solenoid valve (with dropping resistor) |  | When releasing accelerator pedal after warming up engine. | 5 - 14V |
| | | | | When depressing accelerator pedal fully after warming up engine. | 0.5V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : L/PRESS SOL/CIRC<br>: P0745<br>: MIL Code No. 1205 | TCM detects an improper voltage drop when it tries to operate the solenoid valve. | • Harness or connectors (The solenoid circuit is open or shorted.)<br>• Line pressure solenoid valve |

## Line Pressure Solenoid Valve (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**NOTE:**

**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Depress accelerator pedal completely and wait at least 1 second.

OR

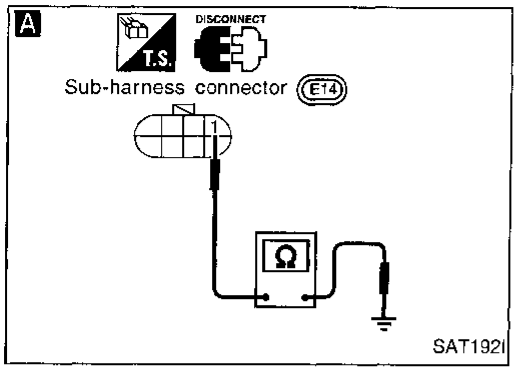
1) Turn ignition switch "ON".
2) Depress accelerator pedal completely and wait at least 1 second.
3) Select "MODE 7" with GST.

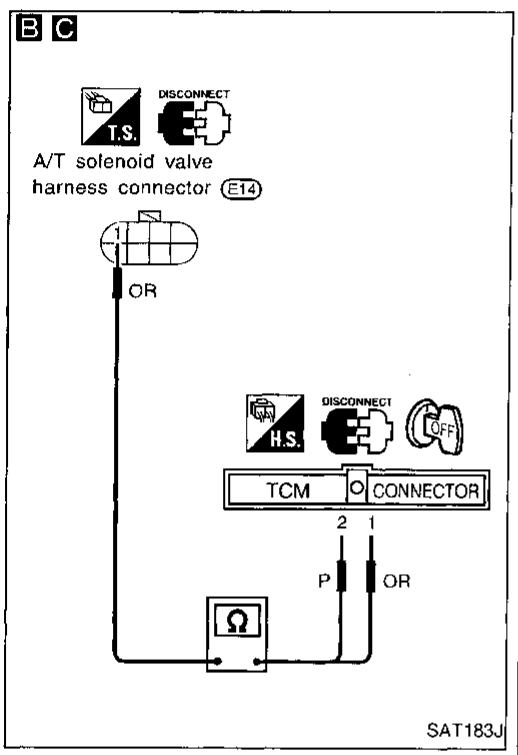
OR

1) Turn ignition switch "ON".
2) Depress accelerator pedal completely and wait at least 1 second.
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Line Pressure Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

**A**

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   **Resistance: 2.5 - 5Ω**

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Line pressure solenoid valve
     Refer to "Component Inspection", AT-127.
   - Harness of terminal cord assembly for short or open

OK ↓

**B**

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ① and TCM harness connector terminal ②.
   **Resistance: 11.2 - 12.8Ω**

NG →
Check the following items:
- Dropping resistor
  Refer to "Component Inspection", AT-127.
- Harness for short or open between TCM terminal ② and terminal cord assembly (Main harness)

OK ↓

**C**

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Check continuity between terminal ① and TCM harness connector terminal ①.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.
3. Reinstall any part removed.

NG →
Repair open circuit or short to ground or short to power in harness or connectors.

OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-125.

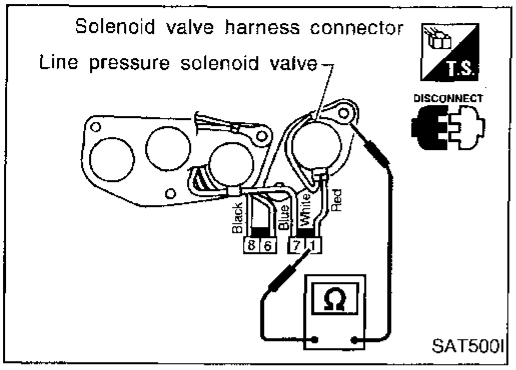
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**

## Line Pressure Solenoid Valve (Cont'd)

### COMPONENT INSPECTION



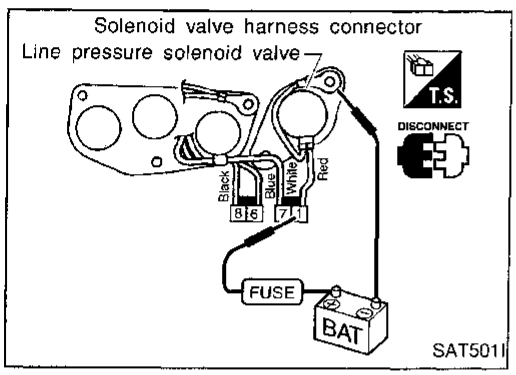

### Line pressure solenoid valve

- For removal, refer to AT-181.

**Resistance check**

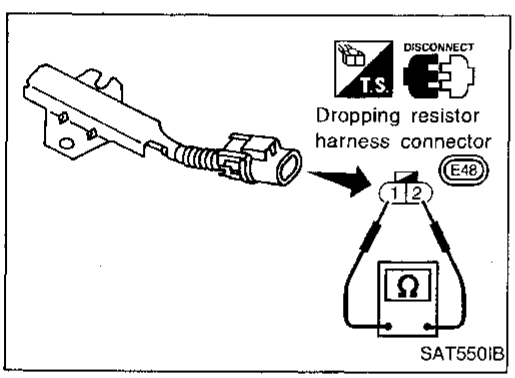
- Check resistance between terminal ① and ground.

| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Line pressure solenoid valve | ① | Ground | 2.5 - 5Ω |



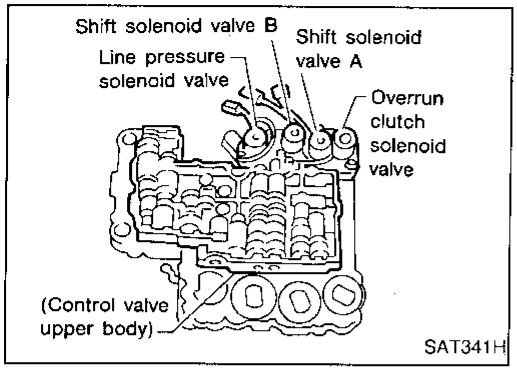

**Operation check**

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ① and ground.




**Dropping resistor**

- Check resistance between terminals ① and ② .
  **Resistance: 11.2 - 12.8Ω**




## Shift Solenoid Valve A

### DESCRIPTION

Shift solenoid valves A and B are turned "ON" or "OFF" by the TCM in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### TCM TERMINALS AND REFERENCE VALUE

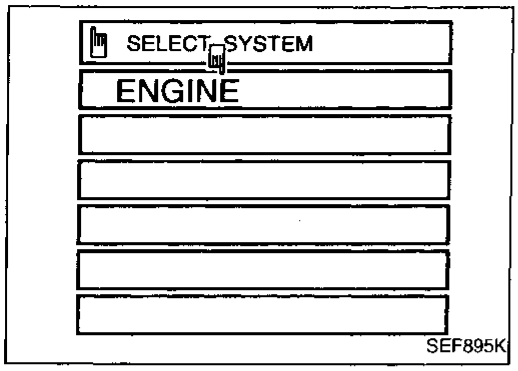
Remarks: Specification data are reference values.

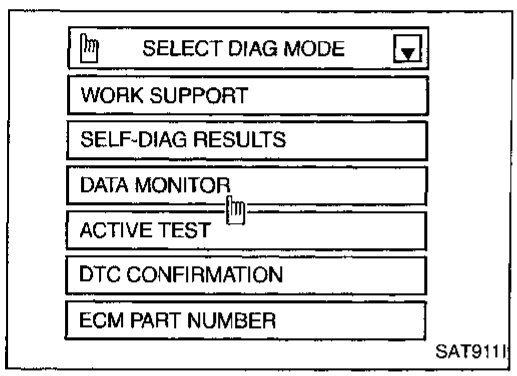
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 6 | L/R | Shift solenoid valve A |  | When shift solenoid valve A operates.<br>(When driving in "$D_1$" or "$D_4$".) | Battery voltage |
| | | | | When shift solenoid valve A does not operate.<br>(When driving in "$D_2$" or "$D_3$".) | 1V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : SFT SOL A/CIRC<br>: P0750<br>: MIL Code No. 1108 | TCM detects an improper voltage drop when it tries to operate the solenoid valve. | • Harness or connectors (The solenoid circuit is open or shorted.)<br>• Shift solenoid valve A |

## Shift Solenoid Valve A (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Start engine.
3) Drive vehicle in "D" position and allow the transmission to shift "1" → "2" ("GEAR").

OR

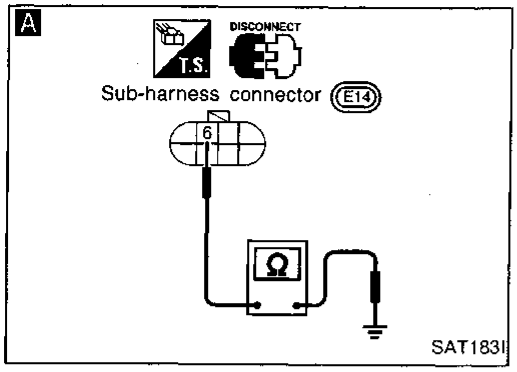
1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2$ position.
3) Select "MODE 7" with GST.

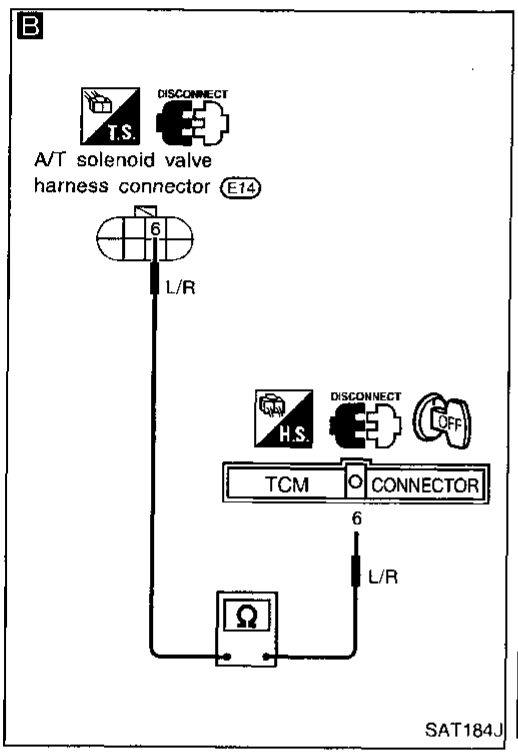
OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2$ position.
3) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Shift Solenoid Valve A (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   **Resistance: 20 - 40Ω**

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift solenoid valve A Refer to "Component Inspection", AT-130.
- Harness of terminal cord assembly for short or open

OK ↓

B

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal ⑥ and TCM harness connector terminal ⑥.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connectors.

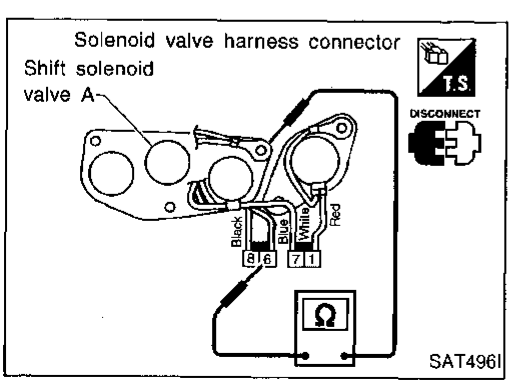
OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-129.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




### COMPONENT INSPECTION

#### Shift solenoid valve A

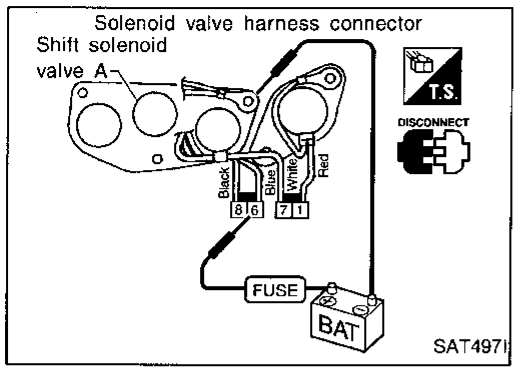
- For removal, refer to AT-181.

**Resistance check**

- Check resistance between terminal ⑥ and ground.

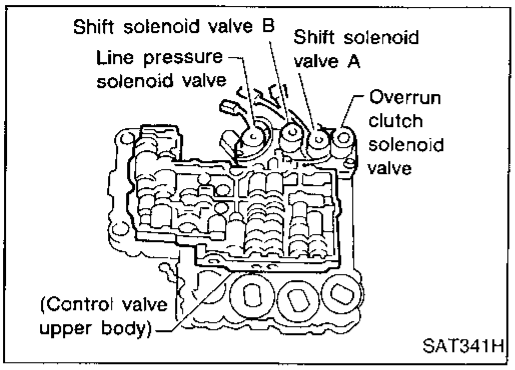
| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve A | ⑥ | Ground | 20 - 40Ω |

## Shift Solenoid Valve A (Cont'd)




### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑥ and ground.




## Shift Solenoid Valve B

### DESCRIPTION

Shift solenoid valves A and B are turned "ON" or "OFF" by the TCM in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

| Gear position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Shift solenoid valve A | ON (Closed) | OFF (Open) | OFF (Open) | ON (Closed) |
| Shift solenoid valve B | ON (Closed) | ON (Closed) | OFF (Open) | OFF (Open) |

### TCM TERMINALS AND REFERENCE VALUE

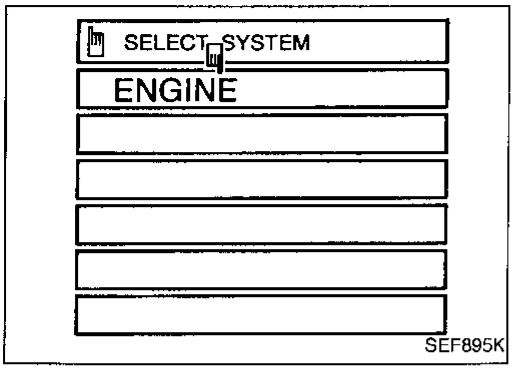
Remarks: Specification data are reference values.

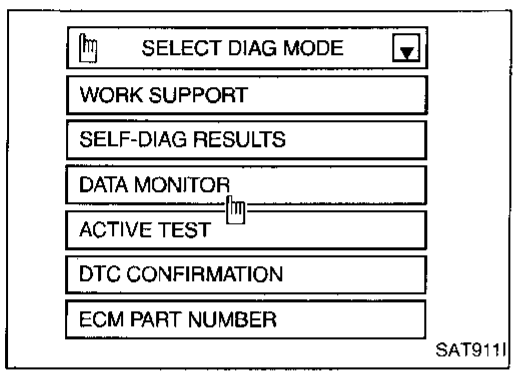
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 7 | L/Y | Shift solenoid valve B |  | When shift solenoid valve B operates. (When driving in "$D_1$" or "$D_2$".) | Battery voltage |
| | | | | When shift solenoid valve B does not operate. (When driving in "$D_3$" or "$D_4$".) | 1V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : SFT SOL B/CIRC<br>: P0755<br>: MIL Code No. 1201 | TCM detects an improper voltage drop when it tries to operate the solenoid valve. | • Harness or connectors (The solenoid circuit is open or shorted.)<br>• Shift solenoid valve B |

## Shift Solenoid Valve B (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Start engine.
3) Drive vehicle in "D" position and allow the transmission to shift 1 → 2 → 3 ("GEAR").

OR

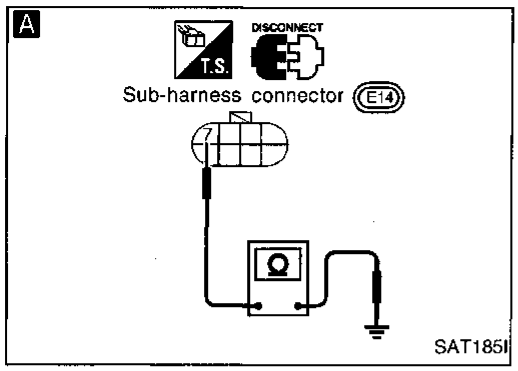
1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.
3) Select "MODE 7" with GST.

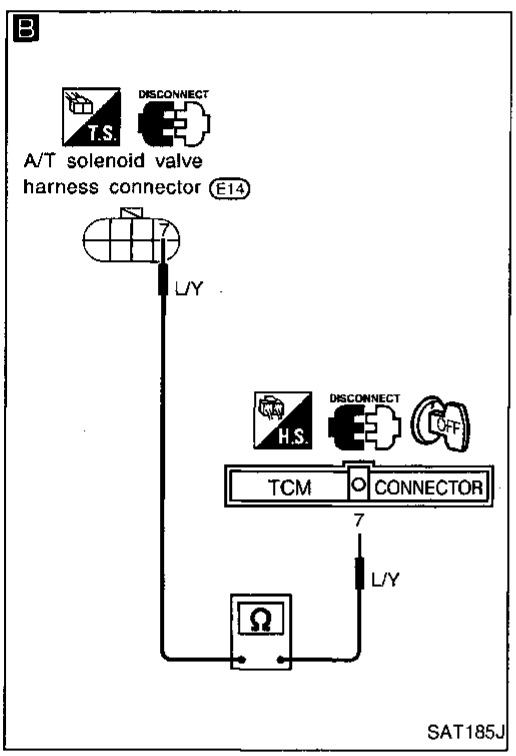
OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Shift Solenoid Valve B (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.
   **Resistance: 20 - 40Ω**

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift solenoid valve B Refer to "Component Inspection", AT-134.
- Harness of terminal cord assembly for short or open

OK ↓

B

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal ⑦ and TCM harness connector terminal ⑦.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connectors.

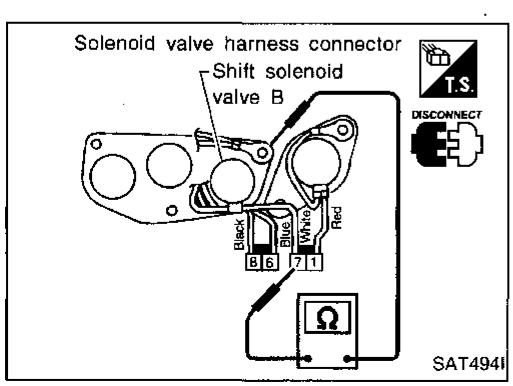
OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-133.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




### COMPONENT INSPECTION

#### Shift solenoid valve B

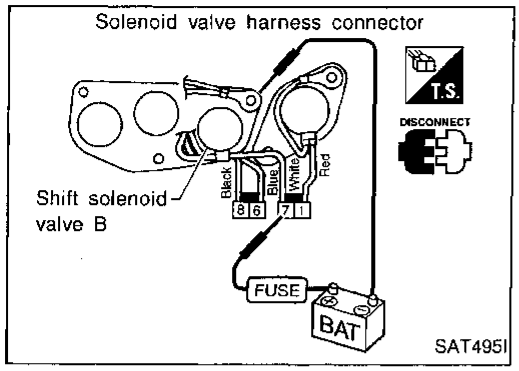
- For removal, refer to AT-181.

**Resistance check**

- Check resistance between terminal ⑦ and ground.

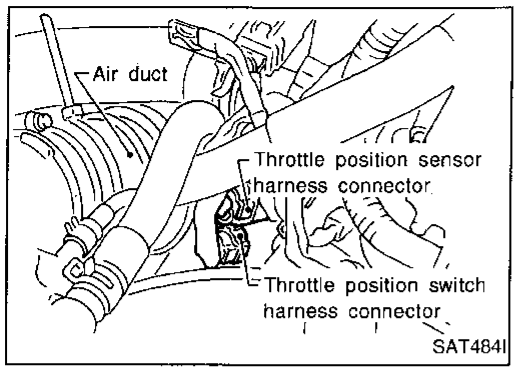
| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Shift solenoid valve B | ⑦ | Ground | 20 - 40Ω |

## Shift Solenoid Valve B (Cont'd)




### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑦ and ground.




## Throttle Position Sensor

### DESCRIPTION

- Throttle position sensor
  The throttle position sensor detects the throttle valve position and sends a signal to the TCM.
- Throttle position switch
  Consists of a wide open throttle position switch and a closed throttle position switch.
  The wide open throttle position switch sends a signal to the TCM when the throttle valve is open at least 1/2 of the full throttle position. The closed throttle position switch sends a signal to the TCM when the throttle valve is fully closed.

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| Throttle position sensor | Fully-closed throttle | Approximately 0.5V |
| | Fully-open throttle | Approximately 4V |

### TCM TERMINALS AND REFERENCE VALUE

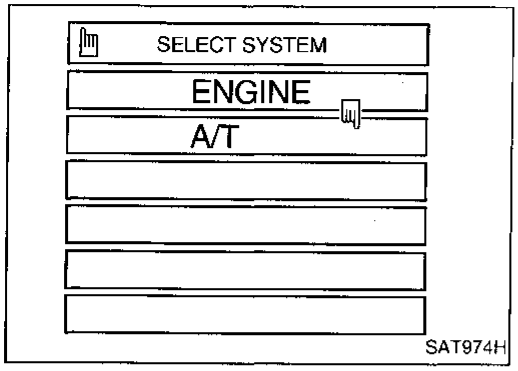
Remarks: Specification data are reference values.

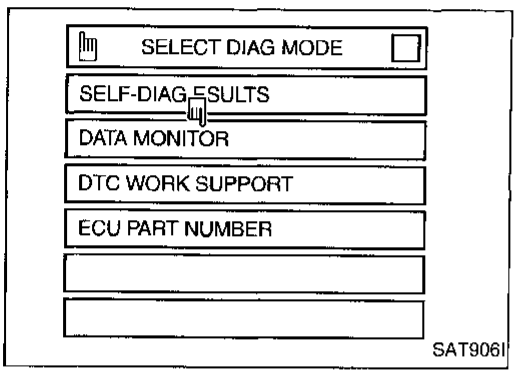
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 14 | L/G | Closed throttle position switch (in throttle position switch) |  | When releasing accelerator pedal after warming up engine. | Battery voltage |
| | | | | When depressing accelerator pedal after warming up engine. | 1V or less |
| 21 | R | Wide open throttle position switch (in throttle position switch) | | When depressing accelerator pedal more than half-way after warming up engine. | Battery voltage |
| | | | | When releasing accelerator pedal after warming up engine. | 1V or less |
| 31 | LG/R | Throttle position sensor (Power source) | | — | 4.5 - 5.5V |
| 34 | R/Y | Throttle position sensor |  | When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.) | Fully-closed throttle: Approximately 0.5V<br>Fully-open throttle: Approximately 4V |
| 35 | B | Throttle position sensor (Ground) | | — | — |

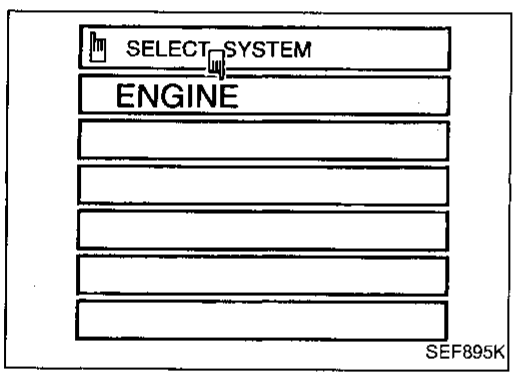
## ON BOARD DIAGNOSIS LOGIC

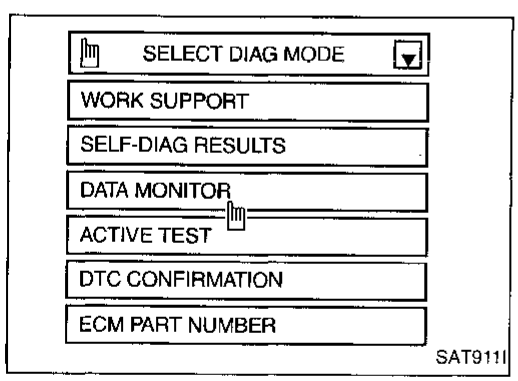
| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : TP SEN/CIRC A/T<br>: P1705<br>: MIL Code No. 1206 | TCM receives an excessively low or high voltage from the sensor. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Throttle position sensor<br>• Throttle position switch |

## Throttle Position Sensor (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Check the following.

| Accelerator pedal condition | THRTL POS SEN | CLOSED THL/SW | W/O THRL/P·SW |
|---|---|---|---|
| Fully released | Less than 4.7V | ON | OFF |
| Partially depressed | 0.1 - 4.6V | OFF | OFF |
| Fully depressed | 1.9 - 4.6V | OFF | ON |

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", AT-139.
If the check result is OK, go to following step.

3) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
4) Start engine and maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.
**VHCL SPEED SE: 10 km/h (6 MPH) or more**
**THRTL POS SEN: Approximately 3V or less**
**Selector lever: D position (OD "ON")**
If the check result is NG, go to "DIAGNOSTIC PROCEDURE", AT-139.
If the check result is OK, go to following step.
5) Maintain the following conditions for at least 3 consecutive seconds. Then release accelerator pedal completely.
**VHCL SPEED SE: 10 km/h (6 MPH) or more**
**Accelerator pedal: Wide open throttle**
**Selector lever: D position (OD "ON")**

OR

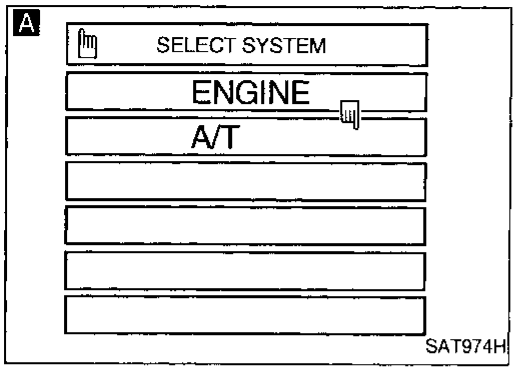
1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
3) Select "MODE 7" with GST.

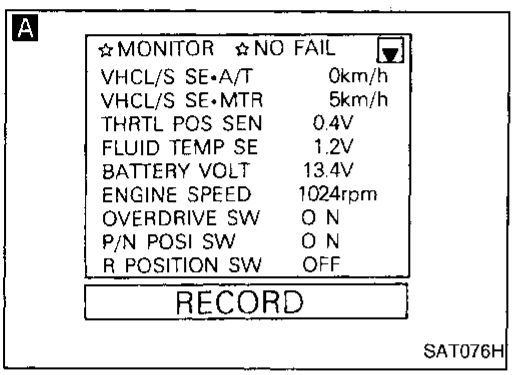
OR

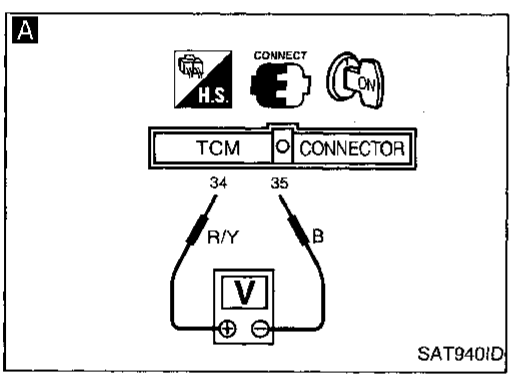
1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in "D" position (OD "ON"), vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
3) Perform self-diagnosis for ECM.
Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Throttle Position Sensor (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

Perform diagnostic test mode II (self-diagnostic results) for engine control. Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

NG → Check throttle position sensor circuit for engine control. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

OK

A

**CHECK INPUT SIGNAL.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out the value of "THRTL POS SEN".

**Voltage:**
**Fully-closed throttle:**
**Approximately 0.5V**
**Fully-open throttle:**
**Approximately 4V**

NG → Check harness for short or open between ECM and TCM regarding throttle position sensor circuit. (Main harness)

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ㉞ and ㉟ while accelerator pedal is depressed slowly.

**Voltage:**
**Fully-closed throttle valve:**
**Approximately 0.5V**
**Fully-open throttle valve:**
**Approximately 4V**
**(Voltage rises gradually in response to throttle position.)**

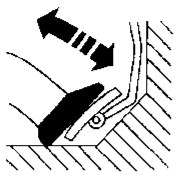
OK

Ⓐ

(Go to next page.)

## Throttle Position Sensor (Cont'd)

B

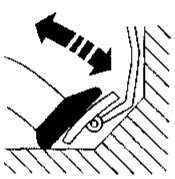


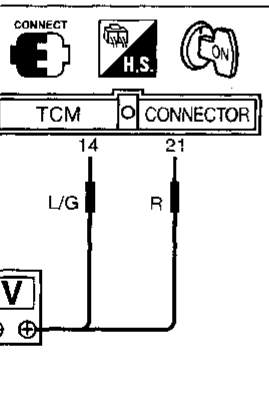
| ☆ MONITOR | ☆ NO FAIL |
|---|---|
| D POSITION SW | OFF |
| 2 POSITION SW | OFF |
| 1 POSITION SW | OFF |
| ASCD • CRUISE | OFF |
| ASCD • OD CUT | OFF |
| KICKDOWN SW | OFF |
| POWERSHIFT SW | OFF |
| CLOSED THL/SW | ON |
| W/O THRL/P-SW | OFF |

RECORD

SAT963H

B






SAT945ID

Ⓐ

B

**CHECK THROTTLE POSITION SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for A/T with CONSULT.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal.
   Check the signal of throttle position switch is indicated properly.

| Accelerator pedal condition | Data monitor | |
|---|---|---|
| | CLOSED THL/SW | W/O THRL/P-SW |
| Released | ON | OFF |
| Fully depressed | OFF | ON |

NG → Check the following items:
- Throttle position switch Refer to "Component Inspection", AT-141.
- Harness for short or open between ignition switch and throttle position switch (Main harness)
- Harness for short or open between throttle position switch and TCM (Main harness)

OR

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Check voltage between TCM terminals ⑭, ㉑ and ground while depressing, and releasing accelerator pedal slowly. (After warming up engine)

| Accelerator pedal condition | Voltage | |
|---|---|---|
| | Terminal No. ⑭ | Terminal No. ㉑ |
| Released | Battery voltage | 1V or less |
| Fully depressed | 1V or less | Battery voltage |

OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-138.

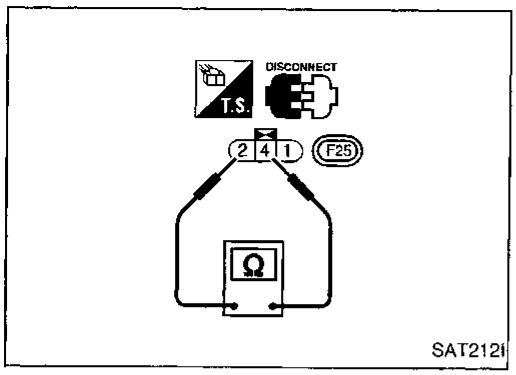
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**

## Throttle Position Sensor (Cont'd)

### COMPONENT INSPECTION



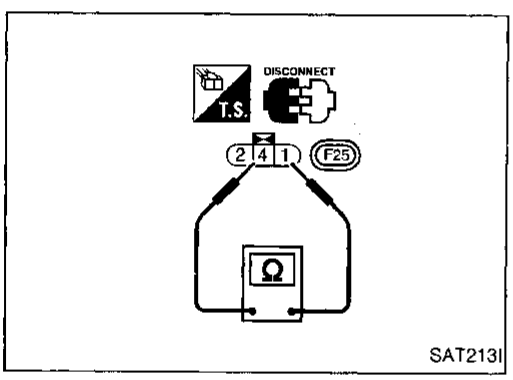

### Throttle position switch

#### Closed throttle position switch (idle position)

- Check continuity between terminals ② and ④.

| Accelerator pedal condition | Continuity |
|---|---|
| Released | Yes |
| Depressed | No |

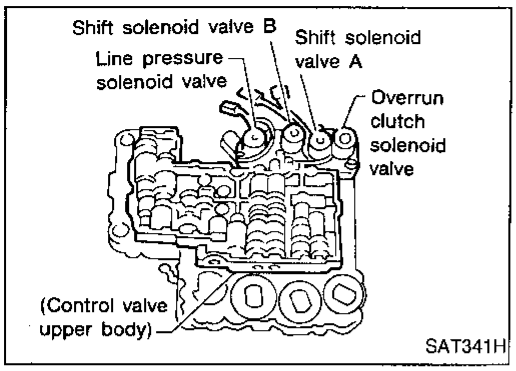
- To adjust closed throttle position switch, refer to EC section ("Basic Inspection", "TROUBLE DIAGNOSIS — Basic Inspection").




#### Wide open throttle position switch

- Check continuity between terminals ① and ④.

| Accelerator pedal condition | Continuity |
|---|---|
| Released | No |
| Depressed | Yes |




## Overrun Clutch Solenoid Valve

### DESCRIPTION

The overrun clutch solenoid valve is activated by the TCM in response to signals sent from the inhibitor switch, overdrive control switch, vehicle speed and throttle position sensors. The overrun clutch operation will then be controlled.

### TCM TERMINALS AND REFERENCE VALUE

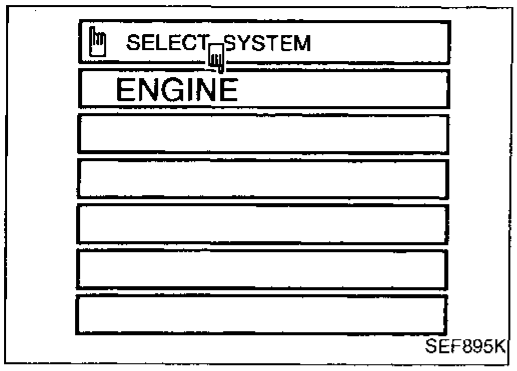
Remarks: Specification data are reference values.

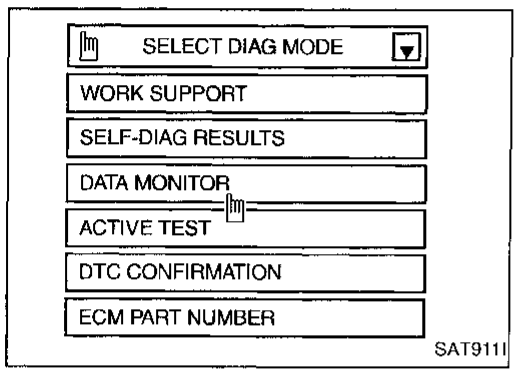
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 8 | P | Overrun clutch solenoid valve |  | When overrun clutch solenoid valve operates. | Battery voltage |
| | | | | When overrun clutch solenoid valve does not operate. | 1V or less |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : O/R CLTCH SOL/CIRC<br>: P1760<br>: MIL Code No. 1203 | TCM detects an improper voltage drop when it tries to operate the solenoid valve. | • Harness or connectors (The solenoid circuit is open or shorted.)<br>• Overrun clutch solenoid valve |

## Overrun Clutch Solenoid Valve (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**
**Always drive vehicle at a safe speed.**

**NOTE:**
**If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

**TESTING CONDITION:**
**Always drive vehicle on a level road to improve accuracy of test.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "ENGINE" with CONSULT.
2) Start engine.
3) Accelerate vehicle to a speed of more than 10 km/h (6 MPH) in "D" position (OD "ON").
4) Release accelerator pedal completely in "D" position (OD "OFF").

OR

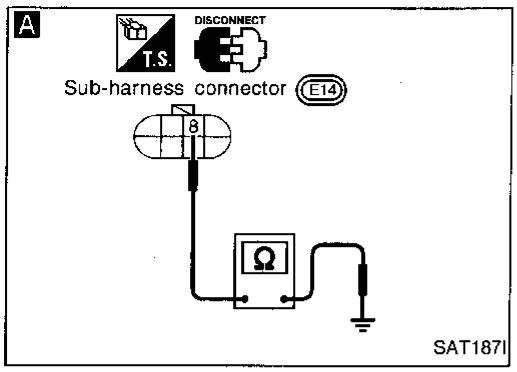
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position, overdrive control switch in "ON" or "OFF" position and vehicle speed higher than 10 km/h (6 MPH).
3) Select "MODE 7" with GST.

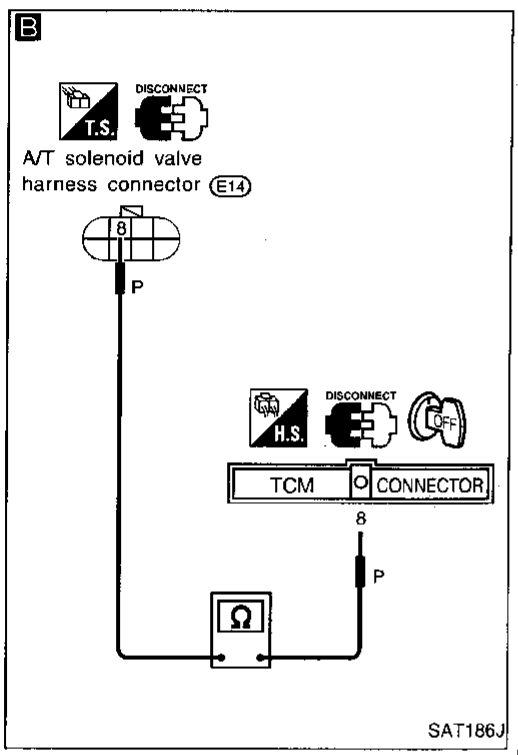
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position, overdrive control switch in "ON" or "OFF" position and vehicle speed higher than 10 km/h (6 MPH).
3) Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

## Overrun Clutch Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑧ and ground.
   **Resistance: 20 - 40Ω**

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Overrun clutch solenoid valve
  Refer to "Component Inspection", AT-144.
- Harness of terminal cord assembly for short or open

OK ↓

B

**CHECK POWER SOURCE CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check continuity between terminal ⑧ and TCM harness connector terminal ⑧.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connectors.

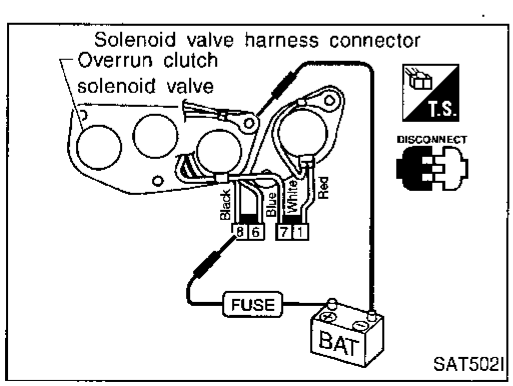
OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-143.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




### COMPONENT INSPECTION

#### Overrun clutch solenoid valve

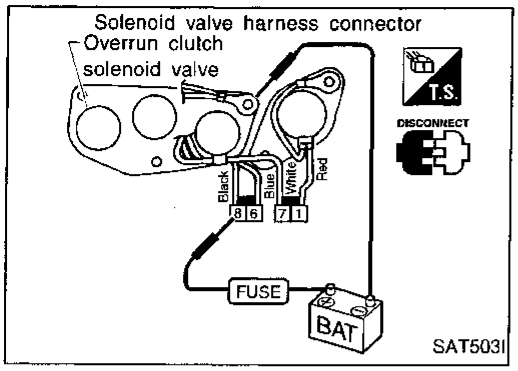
- For removal, refer to AT-181.

**Resistance check**

- Check resistance between terminal ⑧ and ground.

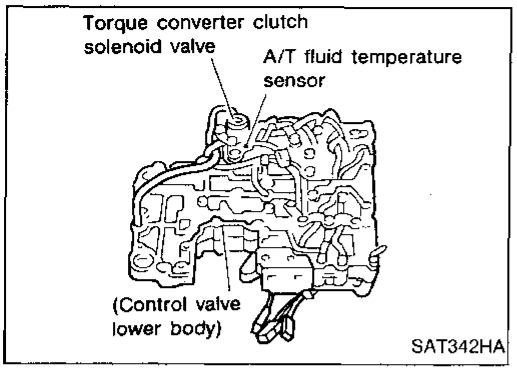
| Solenoid valve | Terminal No. | | Resistance (Approx.) |
|---|---|---|---|
| Overrun clutch solenoid valve | ⑧ | Ground | 20 - 40Ω |

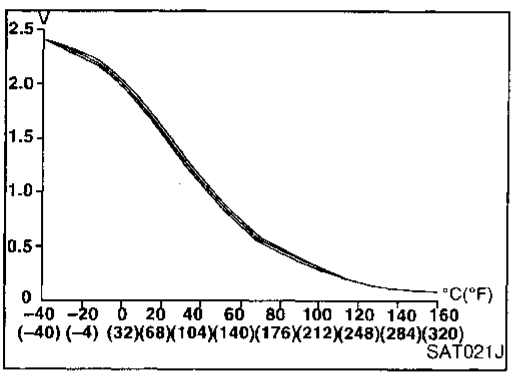
## Overrun Clutch Solenoid Valve (Cont'd)




### Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑧ and ground.




## A/T Fluid Temperature Sensor Circuit and TCM Power Source

### DESCRIPTION

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| Monitor item | Condition | Specification |
|---|---|---|
| A/T fluid temperature sensor | Cold [20°C (68°F)]<br>↓<br>Hot [80°C (176°F)] | Approximately 1.5V<br>↓<br>Approximately 0.5V |

### TCM TERMINALS AND REFERENCE VALUE

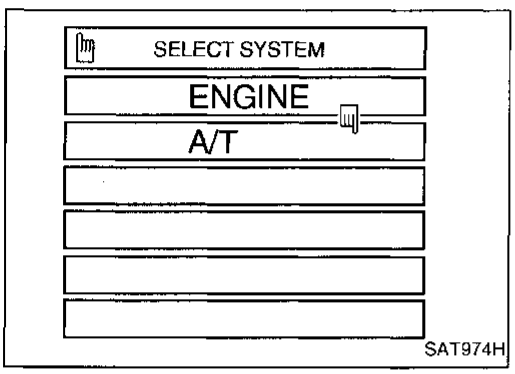
Remarks: Specification data are reference values.

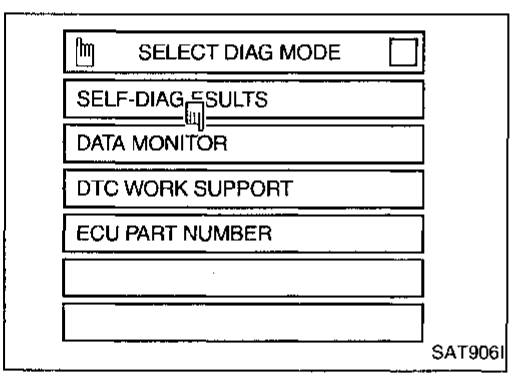
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 4 | G/OR | Power source |  | When turning ignition switch to "ON". | Battery voltage |
| | | |  | When turning ignition switch to "OFF". | 1V or less |
| 9 | G/OR | Power source | | Same as No. 4 | |
| 23 | OR/G | Power source (Memory back-up) |  or  | When turning ignition switch to "OFF". | Battery voltage |
| | | | | When turning ignition switch to "ON". | Battery voltage |
| 33 | W/R | A/T fluid temperature sensor |  | When ATF temperature is 20°C (68°F). | Approximately 1.5V |
| | | | | When ATF temperature is 80°C (176°F). | Approximately 0.5V |
| 35 | B | Throttle position sensor (Ground) |  | — | — |

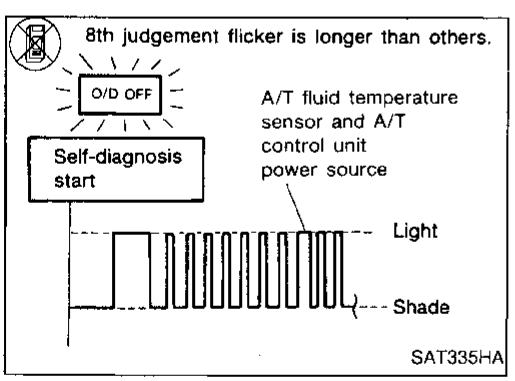
# A/T Fluid Temperature Sensor Circuit and TCM Power Source (Cont'd)

## ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : BATT/FLUID SEN TEMP<br>(NO TOOLS) : 8th judgement flicker | TCM receives an excessively low or high voltage from the sensor. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• A/T fluid temperature sensor |




## DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

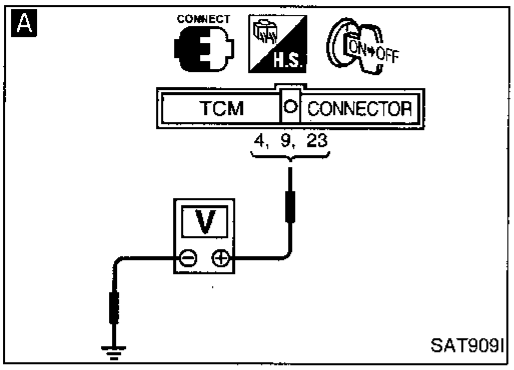
1) Start engine.
2) Select "DATA MONITOR" mode for "A/T" with CONSULT.
3) Drive vehicle under the following conditions:
Selector lever in "D" position, vehicle speed higher than 20 km/h (12 MPH).

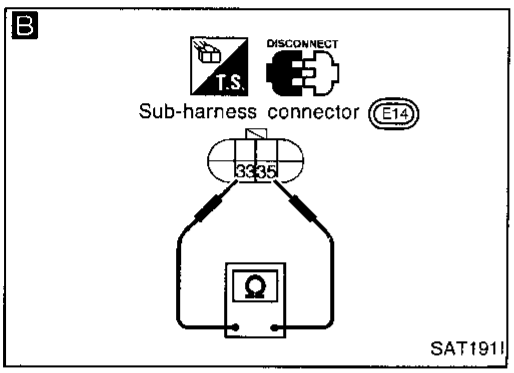
OR

1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in "D" position, vehicle speed higher than 20 km/h (12 MPH).
3) Perform self-diagnosis.
Refer to TCM SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-47.

# A/T Fluid Temperature Sensor Circuit and TCM Power Source (Cont'd)

## DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK TCM POWER SOURCE.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ④, ⑨, ㉓ and ground.
   **Voltage: Battery voltage**
3. Turn ignition switch to "OFF" position.
4. Check voltage between TCM terminal ㉓ and ground.
   **Voltage: Battery voltage**

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- 10A fuse [No. 28], located in the fuse block (J/B)]
- Ignition switch
  Refer to EL section ("POWER SUPPLY ROUTING").

OK ↓

B

**CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.**

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ㉝ and ㉟ when A/T is cold.
   **Resistance:**
   **Cold [20°C (68°F)]**
   **Approximately 2.5 kΩ**
4. Reinstall any part removed.

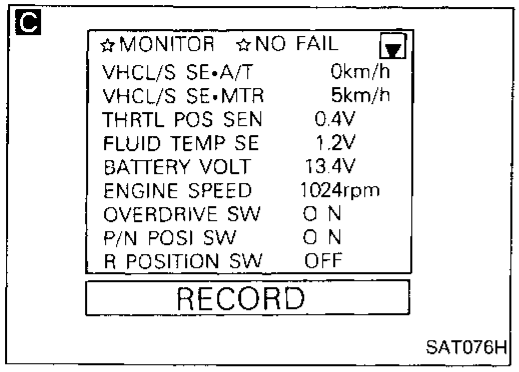
NG → 1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor
  Refer to "Component Inspection", AT-149.
- Harness of terminal cord assembly for short or open

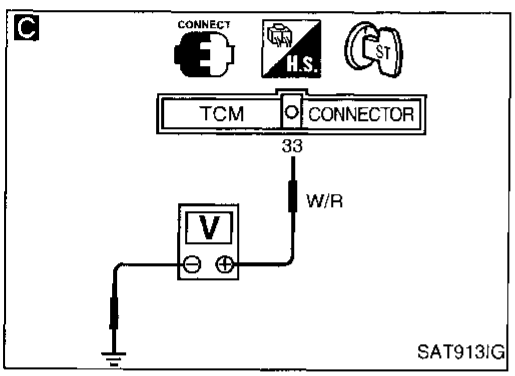
OK ↓

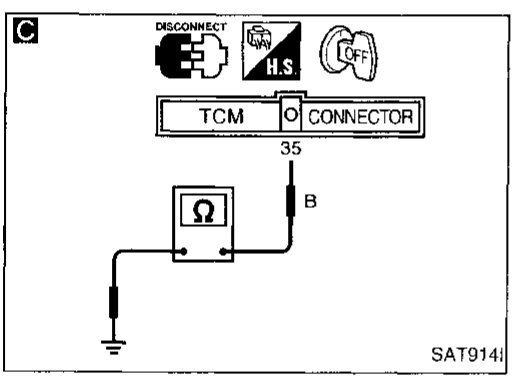
Ⓐ

(Go to next page.)

## A/T Fluid Temperature Sensor Circuit and TCM Power Source (Cont'd)




Ⓐ

**CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR.**

1. Start engine.
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for A/T with CONSULT.
3. Read out the value of "FLUID TEMP SE".
   **Voltage:**
   **Cold [20°C (68°F)] → Hot [80°C (176°F)]:**
   **Approximately 1.5V → 0.5V**

NG → Check the following items:
- Harness for short or open between TCM, ECM and terminal cord assembly (Main harness)
- Ground circuit for ECM Refer to EC section ("TROUBLE DIAGNOSIS FOR POWER SUPPLY").

OR

1. Start engine.
2. Check voltage between TCM terminal ㉝ and ground while warming up A/T.
   **Voltage:**
   **Cold [20°C (68°F)] → Hot [80°C (176°F)]:**
   **Approximately 1.5V → 0.5V**
3. Turn ignition switch to "OFF" position.
4. Disconnect TCM harness connector.
5. Check resistance between terminal ㉟ and ground.
   **Continuity should exist.**

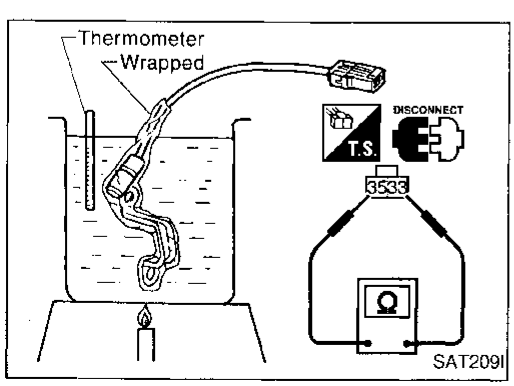
OK ↓

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-147.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**

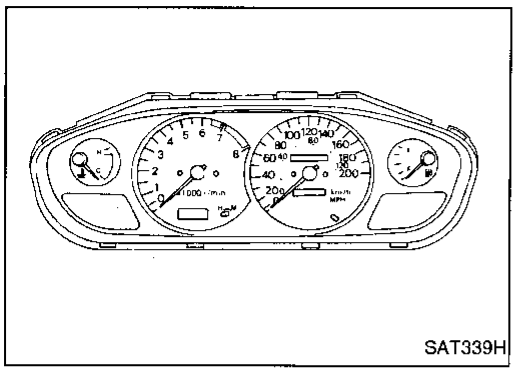



## COMPONENT INSPECTION

### A/T fluid temperature sensor

- For removal, refer to AT-181.
- Check resistance between terminals ㉝ and ㉟ while changing temperature as shown at left.

| Temperature °C (°F) | Resistance |
|---|---|
| 20 (68) | Approximately 2.5 kΩ |
| 80 (176) | Approximately 0.3 kΩ |


SAT339H

## Vehicle Speed Sensor·MTR

### DESCRIPTION

The vehicle speed sensor·MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The TCM will then use a signal sent from the vehicle speed sensor·MTR.

### TCM TERMINALS AND REFERENCE VALUE

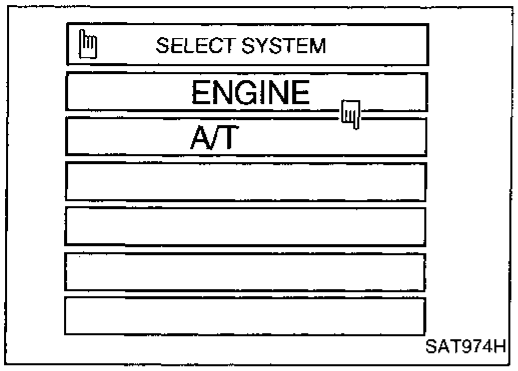
Remarks: Specification data are reference values.

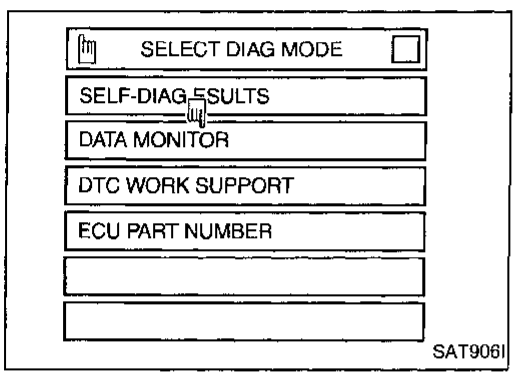
| Terminal No. | Wire color | Item | Condition | | Judgement standard |
|---|---|---|---|---|---|
| 27 | Y/G | Vehicle speed sensor |  | When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more. | Voltage varies between less than 1V and more than 4.5V |

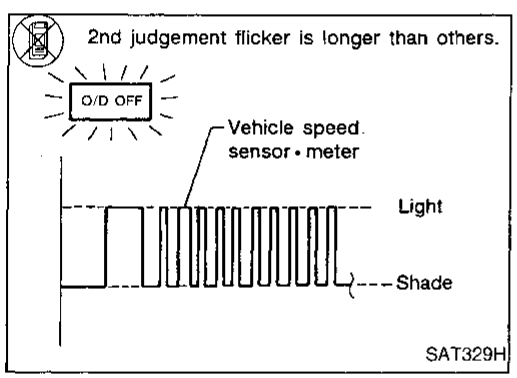
### ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code | Malfunction is detected when ... | Check item (Possible cause) |
|---|---|---|
| : VHCL SPEED SEN·MTR<br>: 2nd judgement flicker | TCM does not receive the proper voltage signal from the sensor. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Vehicle speed sensor |

## Vehicle Speed Sensor·MTR (Cont'd)




### DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

**CAUTION:**

- **Always drive vehicle at a safe speed.**
- **If conducting this "DTC CONFIRMATION PROCEDURE" again, always turn ignition switch "OFF" and wait at least 5 seconds before continuing.**

After the repair, perform the following procedure to confirm the malfunction is eliminated.

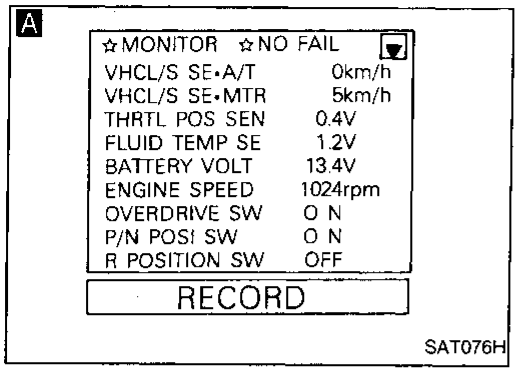
1) Turn ignition switch "ON" and select "DATA MONITOR" mode for "A/T" with CONSULT.
2) Start engine and accelerate vehicle from 0 to 25 km/h (0 to 16 MPH).

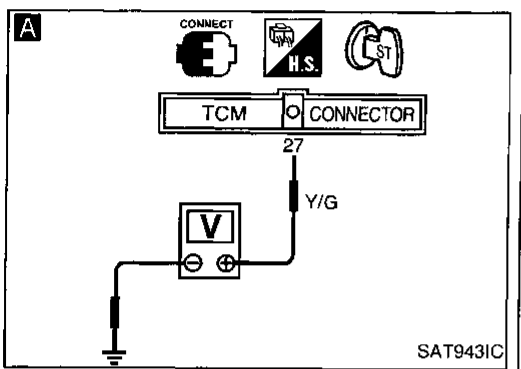
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in "D" position and vehicle speed higher than 25 km/h (16 MPH).
3) Perform self-diagnosis.
   Refer to TCM SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-47.

## Vehicle Speed Sensor·MTR (Cont'd)

### DIAGNOSTIC PROCEDURE




INSPECTION START

A

**CHECK INPUT SIGNAL.**

1. Start engine.
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out the value of "VHCL/S SE·MTR" while driving. Check the value changes according to driving speed.

NG → Check the following items:
- Vehicle speed sensor and ground circuit for vehicle speed sensor Refer to EL section ("METERS AND GAUGES").
- Harness for short or open between TCM and vehicle speed sensor (Main harness)

OR

1. Start engine.
2. Check voltage between TCM terminal ㉗ and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

**Voltage:**

**Voltage varies between less than 1V and more than 4.5V.**

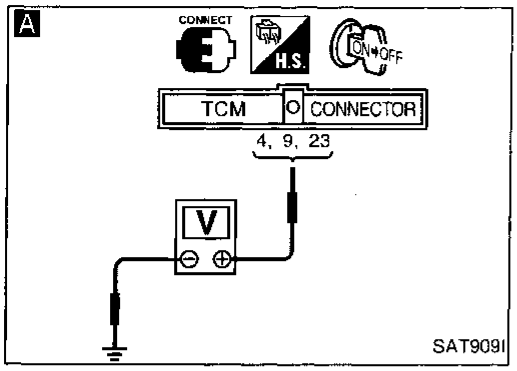
OK

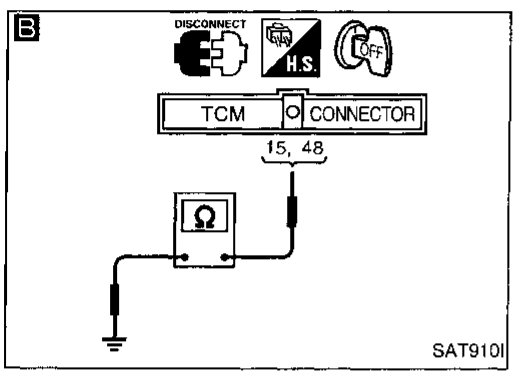
Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-151.

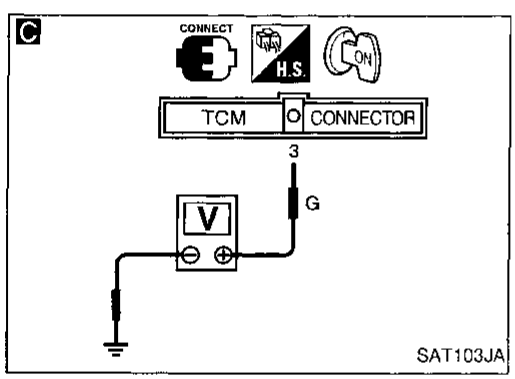
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

**INSPECTION END**




## 1. O/D OFF Indicator Lamp Does Not Come On

**SYMPTOM:**

**O/D OFF indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".**

A

**CHECK TCM POWER SOURCE.**
1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ④, ⑨, ㉓ and ground.
   **Voltage: Battery voltage**
3. Turn ignition switch to "OFF" position.
4. Check voltage between TCM terminal ㉓ and ground.
   **Voltage: Battery voltage**

NG → Check the following items:
- 10A fuse [No. 18 and 28, located in the fuse block (J/B)]
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch
  Refer to EL section ("POWER SUPPLY ROUTING").

OK ↓

B

**CHECK TCM GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check continuity between TCM terminals ⑮, ㊽ and ground.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.

NG → Repair open circuit or short to ground or short to power in harness or connectors.

OK ↓

C

**CHECK LAMP CIRCUIT.**
1. Turn ignition switch to "ON" position.
2. Set overdrive control switch to "ON" position.
3. Check voltage between TCM terminal ③ and ground.
   **Voltage: Battery voltage**

NG → Check the following items:
- 7.5A fuse [No. 4, located in the fuse block (J/B)]
- O/D OFF indicator lamp
  Refer to EL section ("WARNING LAMPS").
- Harness for short or open between ignition switch and O/D OFF indicator lamp (Main harness)
  Refer to EL section ("POWER SUPPLY ROUTING").
- Harness for short or open between O/D OFF indicator lamp and TCM

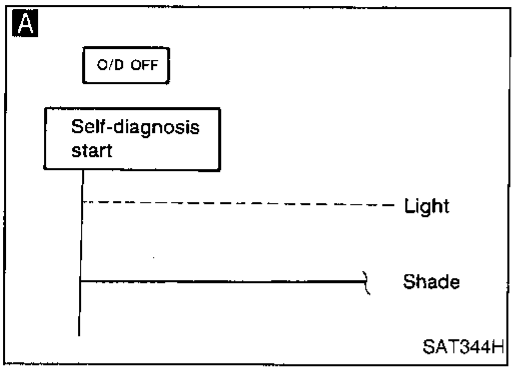
OK ↓

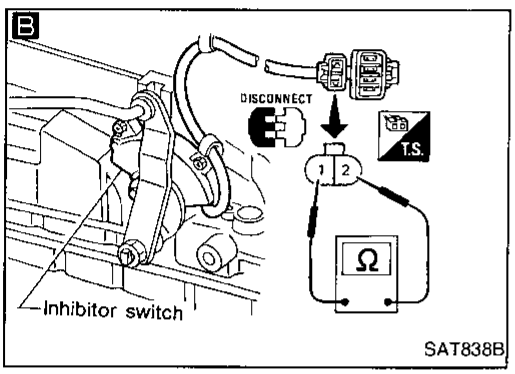
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 2. Engine Cannot Be Started In "P" and "N" Position

### SYMPTOM:

- **Engine cannot be started with selector lever in "P" or "N" position.**
- **Engine can be started with selector lever in "D", "2", "1" or "R" position.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit? → Yes → Check inhibitor switch circuit. Refer to "DTC P0705", AT-78.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No

B

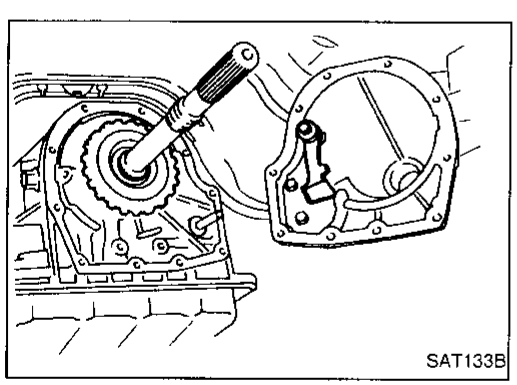
Check for short or open of inhibitor switch 2-pin connector terminals ① and ②. Refer to "COMPONENT INSPECTION", AT-81. → NG → Repair or replace inhibitor switch.

OK

Check starting system. Refer to EL section ("System Description", "STARTING SYSTEM"). → NG → Repair or replace damaged parts.

OK

**INSPECTION END**




## 3. In "P" Position, Vehicle Moves Forward Or Backward When Pushed

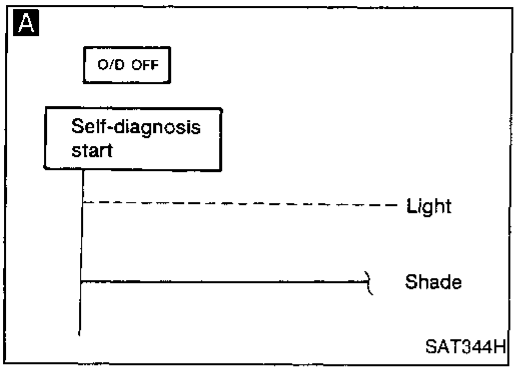
### SYMPTOM:

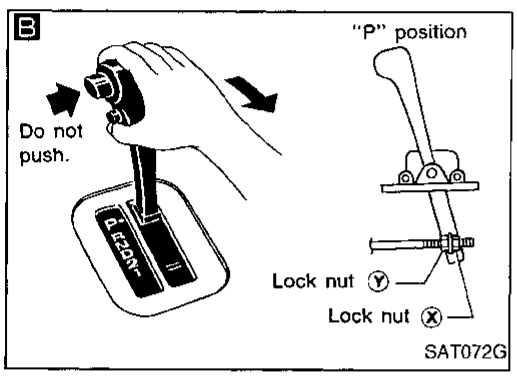
**Vehicle moves when it is pushed forward or backward with selector lever in "P" position.**

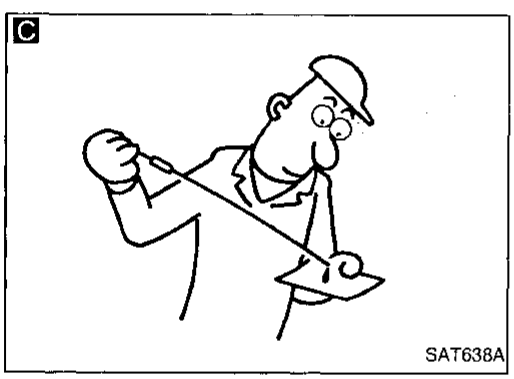
Check parking components. Refer to "Parking Pawl Components", AT-242. → NG → Repair or replace damaged parts.

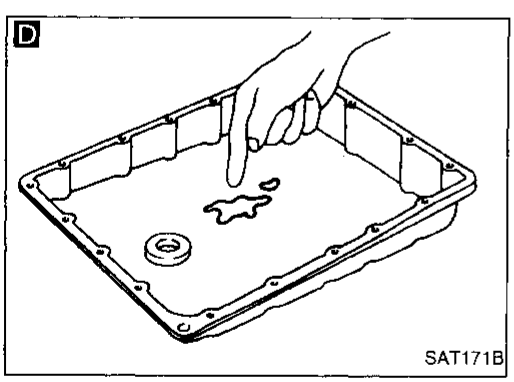
OK

**INSPECTION END**




## 4. In "N" Position, Vehicle Moves

**SYMPTOM:**

**Vehicle moves forward or backward when selecting "N" position.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit? —Yes→ Check inhibitor switch circuit. Refer to "DTC P0705", AT-78.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

Check control linkage. Refer to AT-183. —NG→ B Adjust control linkage. Refer to AT-183.

OK ↓

C

Check A/T fluid level again. —NG→ Refill ATF.

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

—NG→
1. Disassemble A/T.
2. Check the following items:
   - Forward clutch assembly
   - Overrun clutch assembly
   - Reverse clutch assembly

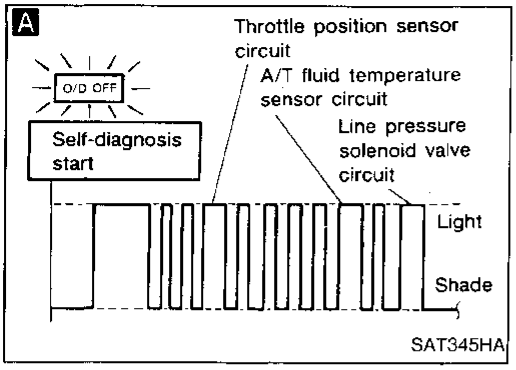
OK ↓

Check again. —NG→
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

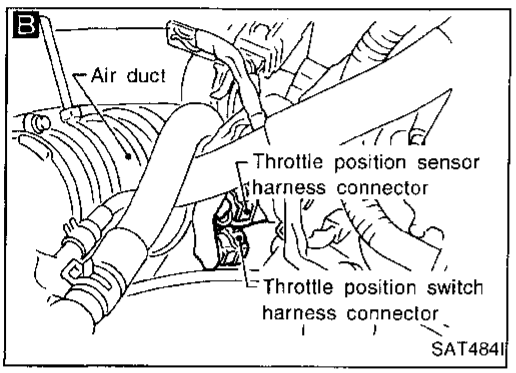
OK ↓

**INSPECTION END**

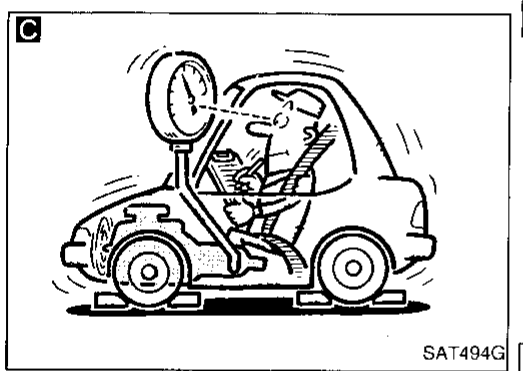
A




B




C




## 5. Large Shock. "N" → "R" Position

**SYMPTOM:**

**There is large shock when changing from "N" to "R" position.**

A

Does self-diagnosis show damage to A/T fluid temperature sensor, line pressure solenoid valve or throttle position sensor circuit?

Yes → Check damaged circuit. Refer to "DTC P0710, P0745 or P1705", AT-82, 124 or 136.

No ↓

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK ↓

C

Check line pressure at idle with selector lever in "D" position. Refer to "LINE PRESSURE TEST", AT-59.

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

OK ↓

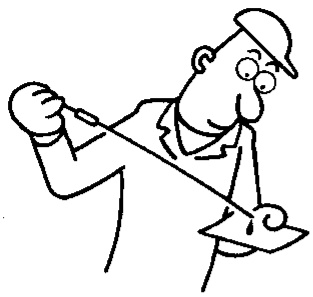
Check again.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

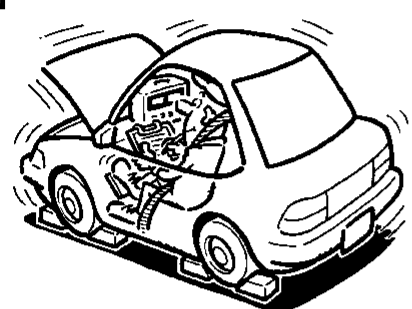
**INSPECTION END**

A



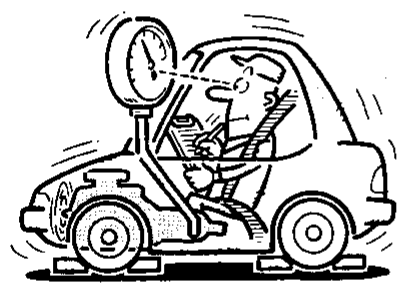
SAT638A

B



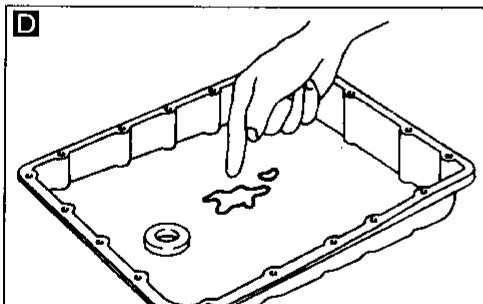
SAT493G

C



SAT494G

D



SAT171B

## 6. Vehicle Does Not Creep Backward In "R" Position

### SYMPTOM:

**Vehicle does not creep backward when selecting "R" position.**

A

Check A/T fluid level again.

NG → Refill ATF.

OK ↓

Refill ATF. → Ⓐ

NG in both "1" and "R" positions ↓

B

Check stall revolution with selector lever in "1" and "R" positions.

OK ↓

OK in "1" position, NG in "R" position →

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
   - Oil pump assembly
   - Torque converter
   - Reverse clutch assembly
   - High clutch assembly

NG in both "1" and "R" positions →

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
   - Oil pump assembly
   - Torque converter
   - Reverse clutch assembly
   - High clutch assembly
   - Low & reverse brake assembly
   - Low one-way clutch

C

Check line pressure at idle with selector lever in "R" position. Refer to "LINE PRESSURE TEST", AT-59.

NG →

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
   - Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following item:
   - Oil pump assembly

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → Ⓐ

OK ↓

Check again.

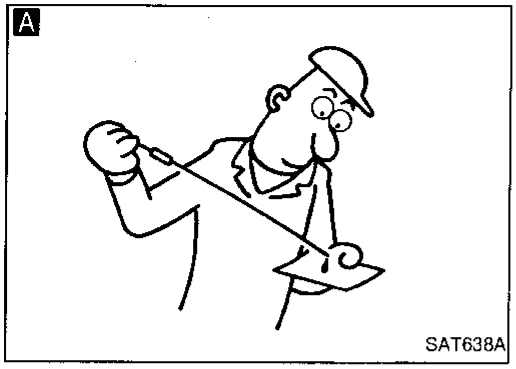
NG →

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**

A



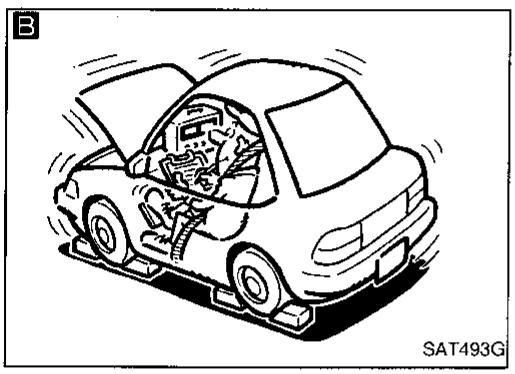
SAT638A

## 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position

**SYMPTOM:**

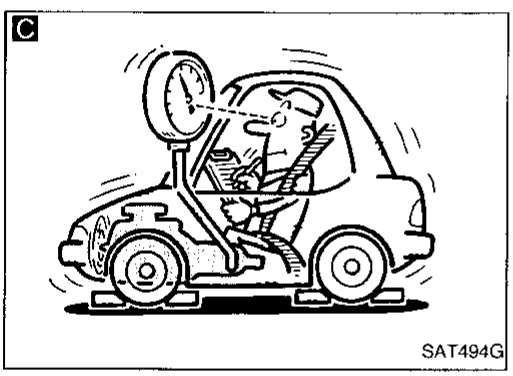
**Vehicle does not creep forward when selecting "D", "2" or "1" position.**

B



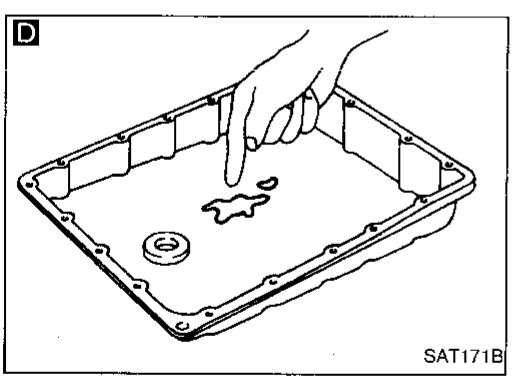
SAT493G

C



SAT494G

D



SAT171B

A

Check A/T fluid level again. — NG → Refill ATF.

OK

B

Check stall revolution with selector lever in "D" position. Refer to "STALL TEST", AT-56. — NG → 1. Remove control valve assembly. Refer to AT-181. 2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T. 4. Check the following items:
- Oil pump assembly
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Low & reverse brake assembly
- Torque converter

OK

C

Check line pressure at idle with selector lever in "D" position. Refer to "LINE PRESSURE TEST", AT-59.

OK / NG

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → Ⓐ

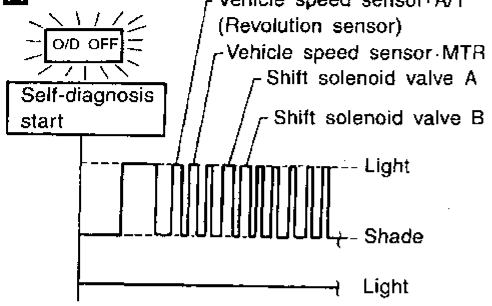
OK

Check again. — NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

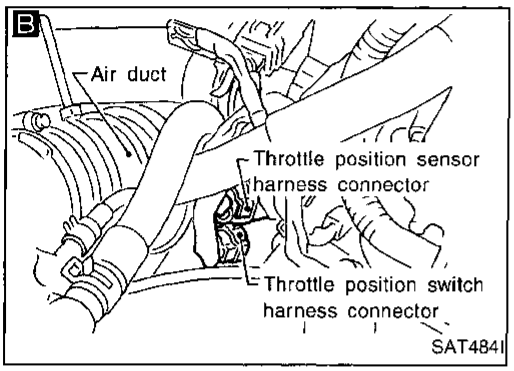
OK

**INSPECTION END**

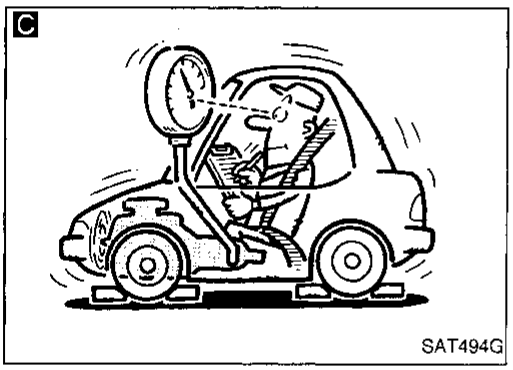
A



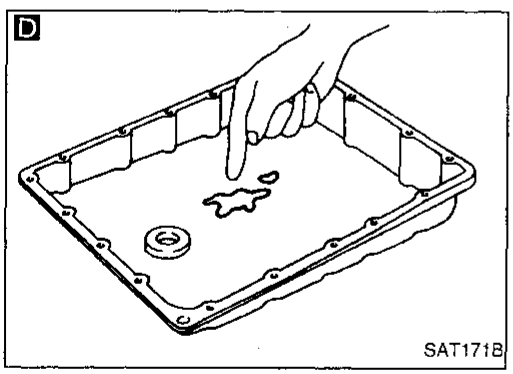

B




C




D




## 8. Vehicle Cannot Be Started From $D_1$

### SYMPTOM:

**Vehicle cannot be started from $D_1$ on Cruise test — Part 1.**

Is 6. Vehicle Does Not Creep Backward In "R" Position OK?
- No → Go to 6. Vehicle Does Not Creep Backward In "R" Position, AT-157.
- Yes ↓

A

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?
- Yes → Check damaged circuit. Refer to "DTC P0720, P0750, P0755 or VHCL SPEED SEN·MTR", AT-86, 128, 132 or 150.
- No ↓

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].
- NG → Repair or replace throttle position sensor.
- OK ↓

C

Check line pressure at stall point with selector lever in "D" position. Refer to "LINE PRESSURE TEST", AT-59.
- NG →
  1. Remove control valve assembly. Refer to AT-181.
  2. Check the following items:
  - Shift valve A
  - Shift valve B
  - Shift solenoid valve A
  - Shift solenoid valve B
  - Pilot valve
  - Pilot filter
  3. Disassemble A/T.
  4. Check the following items:
  - Forward clutch assembly
  - Forward one-way clutch
  - Low one-way clutch
  - High clutch assembly
  - Torque converter
  - Oil pump assembly
- OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.
- NG → (same as C NG)
- OK ↓

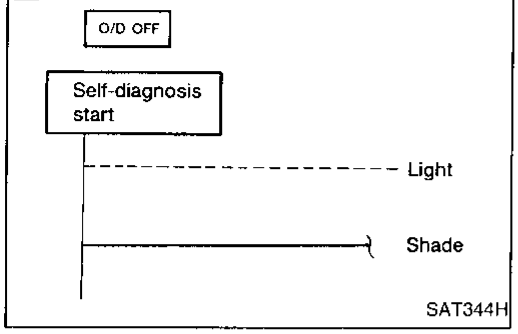
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓ / OK ←

Check again.
- NG →
  1. Perform TCM input/output signal inspection.
  2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.
- OK ↓

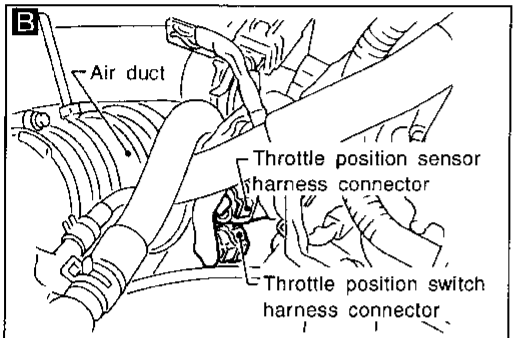
**INSPECTION END**

A



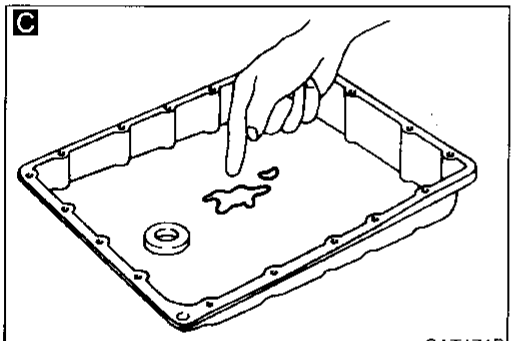

SAT344H

B




SAT484I

C



SAT171B

## 9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$

**SYMPTOM:**

**A/T does not shift from $D_1$ to $D_2$ at the specified speed.**
**A/T does not shift from $D_4$ to $D_2$ when depressing accelerator pedal fully at the specified speed.**

Are 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$ OK?

No → Go to 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$, AT-158, 159.

Yes

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit?

Yes → Check inhibitor switch circuit. Refer to "DTC P0705", AT-78.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuit. Refer to "DTC P0720 and VHCL SPEED SEN·MTR", AT-86, 150.

NG → Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR circuits.

OK

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG →
1. Remove control valve. Refer to AT-181.
2. Check the following items:
   - Shift valve A
   - Shift solenoid valve A
   - Pilot valve
   - Pilot filter
3. Disassemble A/T.
4. Check the following items:
   - Servo piston assembly
   - Brake band
   - Oil pump assembly

OK

1. Remove control valve. Refer to AT-181.
2. Check the following items:
   - Shift valve A
   - Shift solenoid valve A
   - Pilot valve
   - Pilot filter

OK

OK

Check again.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

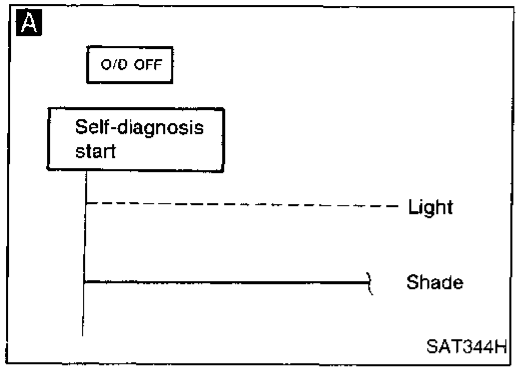
OK

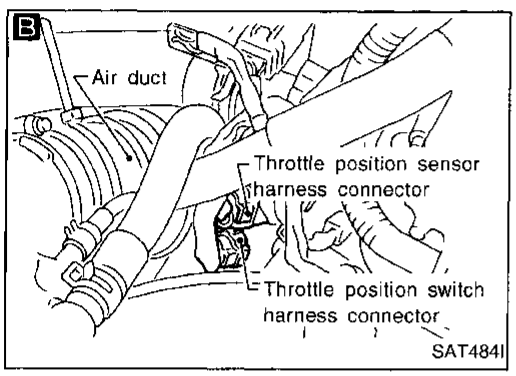
**INSPECTION END**

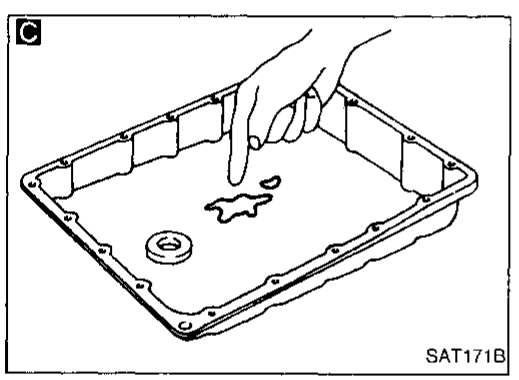
## 10. A/T Does Not Shift: $D_2 \rightarrow D_3$

**SYMPTOM:**

**A/T does not shift from $D_2$ to $D_3$ at the specified speed.**




Are 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$ OK?

No → Go to 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$, AT-158, 159.

Yes ↓

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit?

Yes → Check inhibitor switch circuit. Refer to "DTC P0705", AT-78.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- High clutch assembly
- Oil pump assembly

OK ↓

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

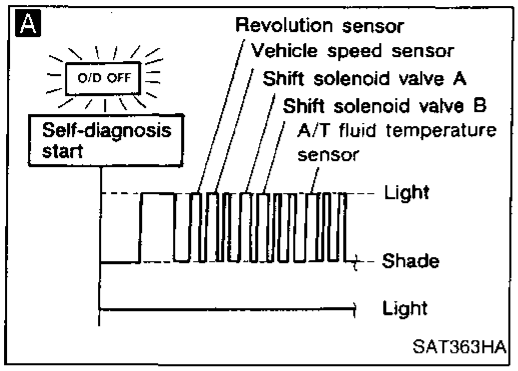
OK ↓

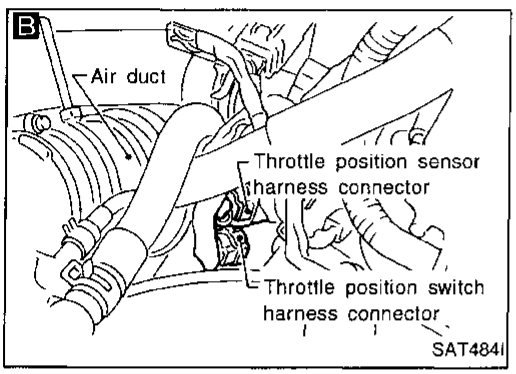
Check again.

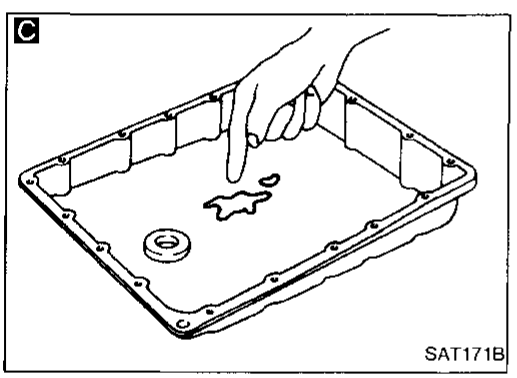
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 11. A/T Does Not Shift: $D_3 \rightarrow D_4$

**SYMPTOM:**

- **A/T does not shift from $D_3$ to $D_4$ at the specified speed.**
- **A/T must be warm before $D_3$ to $D_4$ shift will occur.**

Are 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$ OK?

No → Go to 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position and 8. Vehicle Cannot Be Started From $D_1$, AT-158, 159.

Yes ↓

A

Does self-diagnosis, after cruise test, show damage to any of the following circuits?
- Inhibitor switch
- Overdrive control switch
- A/T fluid temperature sensor
- Revolution sensor
- Shift solenoid valve A or B
- Vehicle speed sensor

Yes → Check damaged circuit. Refer to "DTC P0705, P0710, P0720, P0750, P0755 or VHCL SPEED SEN·MTR", AT-78, 82, 86, 128, 132, 150 or 172.

No ↓

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- Brake band
- Torque converter
- Oil pump assembly

OK ↓

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

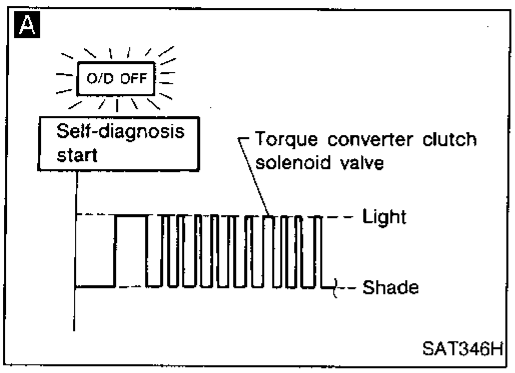
OK ↓

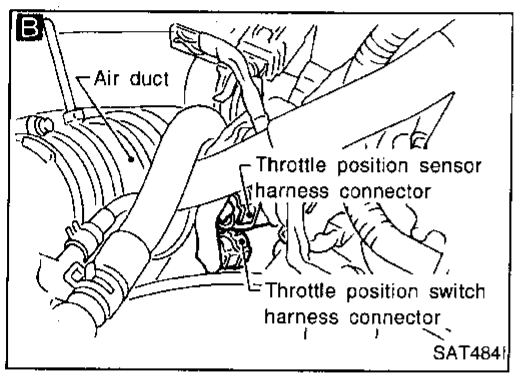
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 12. A/T Does Not Perform Lock-up

**SYMPTOM:**

**A/T does not perform lock-up at the specified speed.**

A

Does self-diagnosis show damage to torque converter clutch solenoid valve circuit after cruise test?

Yes → Check torque converter clutch solenoid valve circuit. Refer to "DTC P0740", AT-113.

No ↓

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK ↓

1. Remove control valve. Refer to AT-181.
2. Check following items:
   - Torque converter clutch control valve
   - Torque converter relief valve
   - Torque converter clutch solenoid valve
   - Pilot valve
   - Pilot filter

NG → Repair or replace damaged parts.

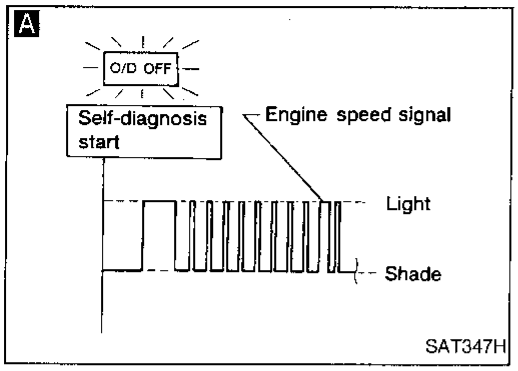
OK ↓

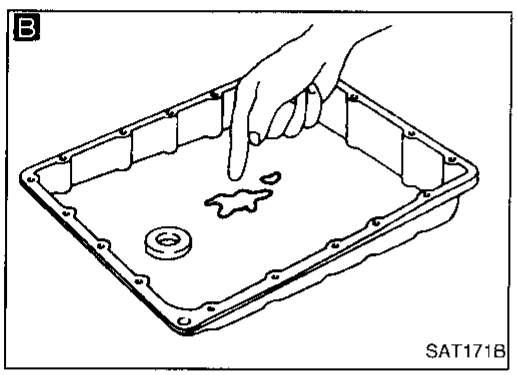
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 13. A/T Does Not Hold Lock-up Condition

**SYMPTOM:**

**A/T does not hold lock-up condition for more than 30 seconds.**

A

Does self-diagnosis show damage to engine speed signal circuit after cruise test?

Yes → Check engine speed signal circuit. Refer to "DTC P0725", AT-89.

No ↓

B

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check torque converter and oil pump assembly.

OK ↓

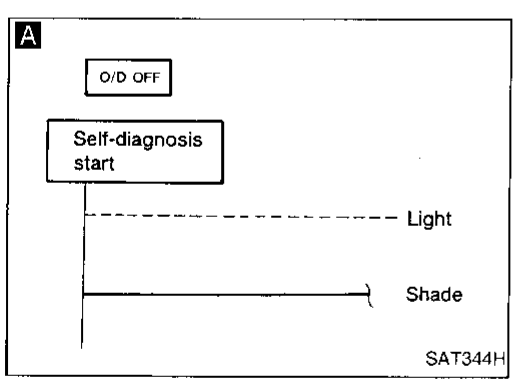
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter

OK → Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 14. Lock-up Is Not Released

**SYMPTOM:**

**Lock-up is not released when accelerator pedal is released.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to closed throttle position switch circuit?

Yes → Check closed throttle position switch circuit. Refer to "DTC P1705", AT-136.

OR

A

Does self-diagnosis show damage to closed throttle position switch circuit?

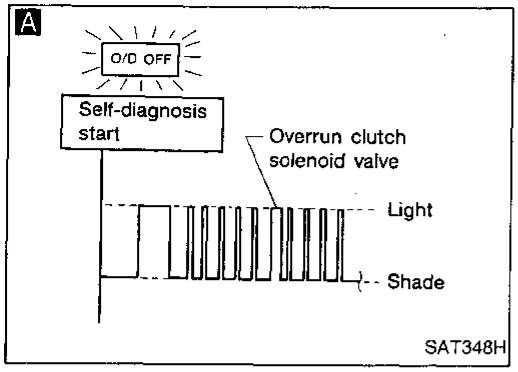
No ↓

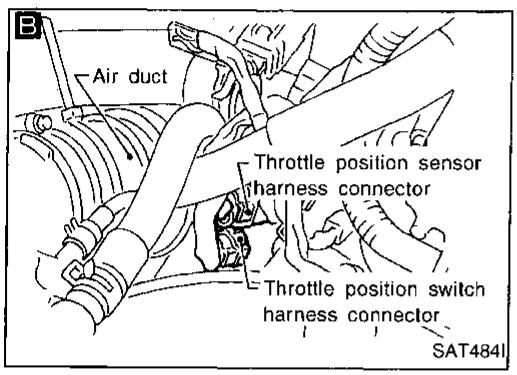
Check again.

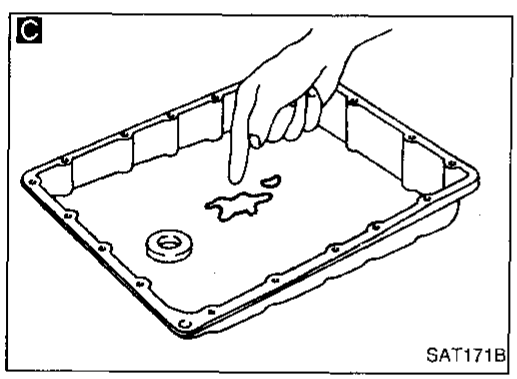
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

**INSPECTION END**




## 15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)

**SYMPTOM:**

- **Engine speed does not smoothly return to idle when A/T shifts from $D_4$ to $D_3$.**
- **Vehicle does not decelerate by engine brake when turning overdrive control switch OFF.**
- **Vehicle does not decelerate by engine brake when shifting A/T from "D" to "2" position.**

A

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

Yes → Check overrun clutch solenoid valve circuit. Refer to "DTC P1760", AT-142.

No

B

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"].

NG → Repair or replace throttle position sensor.

OK

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG →
1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve
3. Disassemble A/T.
4. Check the following items:
   - Overrun clutch assembly
   - Oil pump assembly

OK

1. Remove control valve assembly. Refer to AT-181.
2. Check the following items:
   - Overrun clutch control valve
   - Overrun clutch reducing valve
   - Overrun clutch solenoid valve

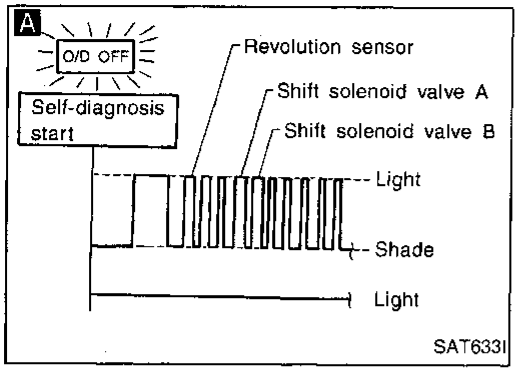
OK

Check again.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

**INSPECTION END**




## 16. Vehicle Does Not Start From $D_1$

**SYMPTOM:**

**Vehicle does not start from $D_1$ on Cruise test — Part 2.**

A

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

Yes → Check damaged circuit. Refer to "DTC P0720, P0750, P0755 or VHCL SPEED SEN·MTR", AT-86, 128, 132 or 150.

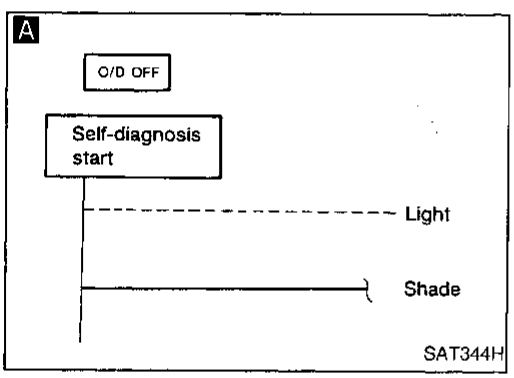
No ↓

Check again.

NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

Go to 8. Vehicle Cannot Be Started From $D_1$, AT-159.




## 17. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" → "OFF"

**SYMPTOM:**

**A/T does not shift from $D_4$ to $D_3$ when changing overdrive control switch to "OFF" position.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to overdrive control switch circuit?

Yes → Check overdrive control switch circuit. Refer to AT-168.

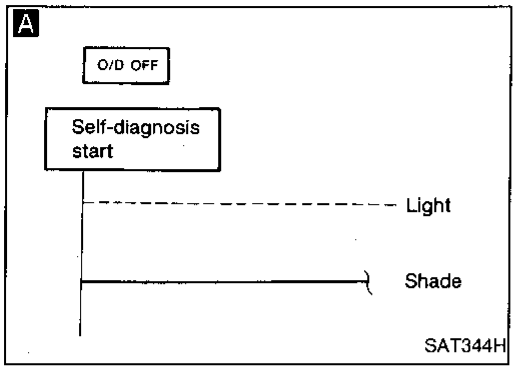
OR

A

Does self-diagnosis show damage to overdrive control switch circuit?

No ↓

Go to 10. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-161.




## 18. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" $\rightarrow$ "2" Position

**SYMPTOM:**

**A/T does not shift from $D_3$ to $2_2$ when changing selector lever from "D" to "2" position.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit?

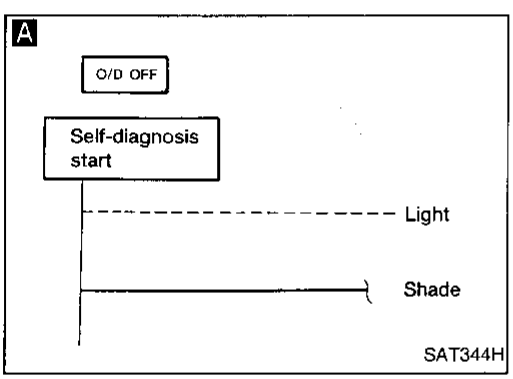
Yes → Check inhibitor switch circuit. Refer to "FOR DTC P0705", AT-78.

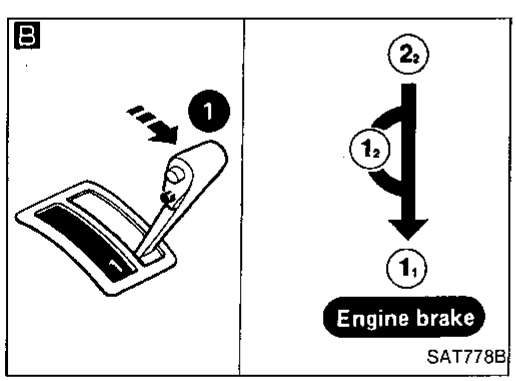
OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No → Go to 9. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-160.




## 19. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" $\rightarrow$ "1" Position

**SYMPTOM:**

**A/T does not shift from $2_2$ to $1_1$ when changing selector lever from "2" to "1" position.**

Does "ECU INPUT SIGNALS" in "DATA MONITOR" show damage to inhibitor switch circuit?

Yes → Check inhibitor switch circuit. Refer to "DTC P0705", AT-78.

OR

A

Does self-diagnosis show damage to inhibitor switch circuit?

No

B

Check again.

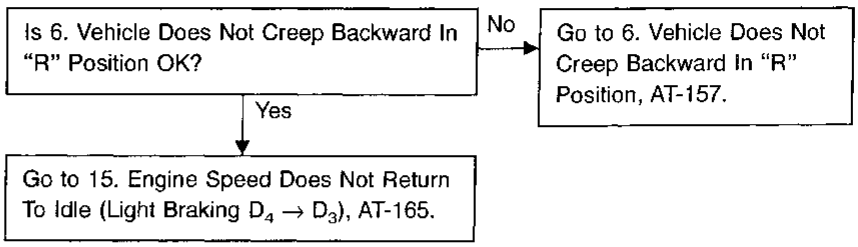
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

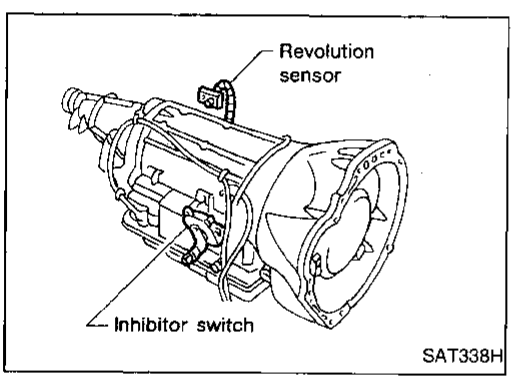
OK → **INSPECTION END**

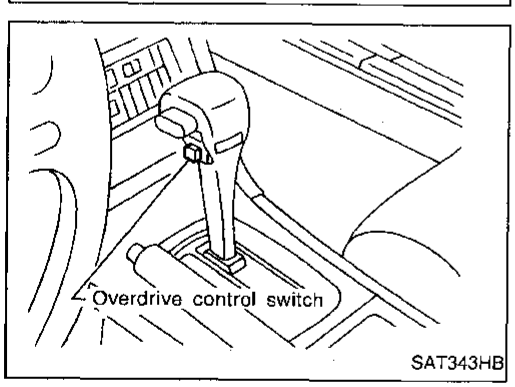
## 20. Vehicle Does Not Decelerate By Engine Brake

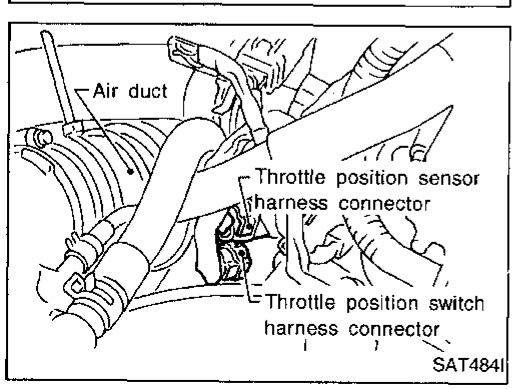
### SYMPTOM:

**Vehicle does not decelerate by engine brake when shifting from $2_2$ ($1_2$) to $1_1$.**




## 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks)

### SYMPTOM:

**O/D OFF indicator lamp does not come on in TCM self-diagnostic procedure even the lamp circuit is good.**

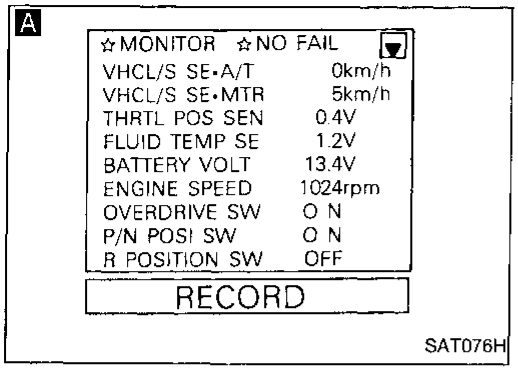
### DESCRIPTION

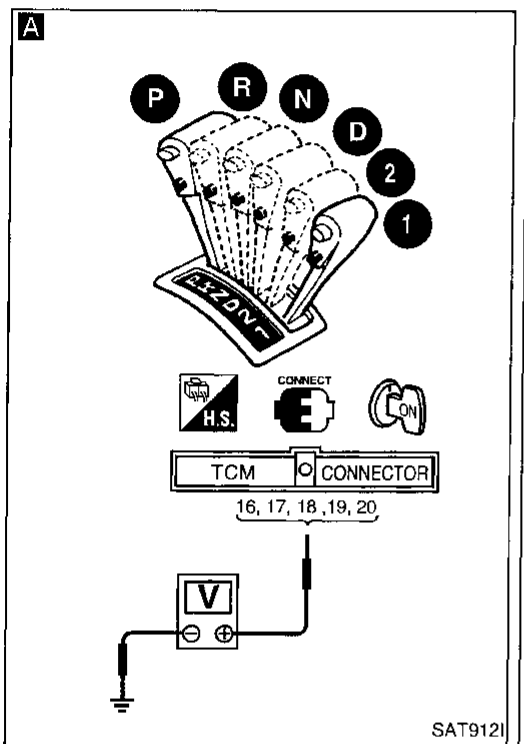
- Inhibitor switch
  Detects the selector lever position and sends a signal to the TCM.
- Overdrive control switch
  Detects the overdrive control switch position (ON or OFF) and sends a signal to the TCM.
- Throttle position switch
  Consists of a wide open throttle position switch and a closed throttle position switch.
  The wide open throttle position switch sends a signal to the TCM when the throttle valve is open at least 1/2 of the full throttle position. The closed throttle position switch sends a signal to the TCM when the throttle valve is fully closed.

# 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks) (Cont'd)

## DIAGNOSTIC PROCEDURE

A




**CHECK INHIBITOR SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR".
3. Read out "P/N", "R", "D", "2" and "1" position switches moving selector lever to each position.
   Check that the signal of the selector lever position is indicated properly.

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each position.

**Voltage:**
**B: Battery voltage**
**0: 0V**

| Lever position | Terminal No. | | | | |
|---|---|---|---|---|---|
| | ⑲ | ⑳ | ⑯ | ⑰ | ⑱ |
| P, N | **B** | 0 | 0 | 0 | 0 |
| R | 0 | **B** | 0 | 0 | 0 |
| D | 0 | 0 | **B** | 0 | 0 |
| 2 | 0 | 0 | 0 | **B** | 0 |
| 1 | 0 | 0 | 0 | 0 | **B** |

NG →

Check the following items:
- 10A fuse [No. 18, located in the fuse block (J/B)]
- Inhibitor switch (Refer to "Components Inspection", AT-172.)
- Harness for short or open between ignition switch and inhibitor switch (Main harness)
- Harness for short or open between inhibitor switch and TCM (Main harness)
- Ignition switch
  Refer to EL section ("POWER SUPPLY ROUTING").

OK ↓

Ⓐ

(Go to next page.)

## 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks) (Cont'd)

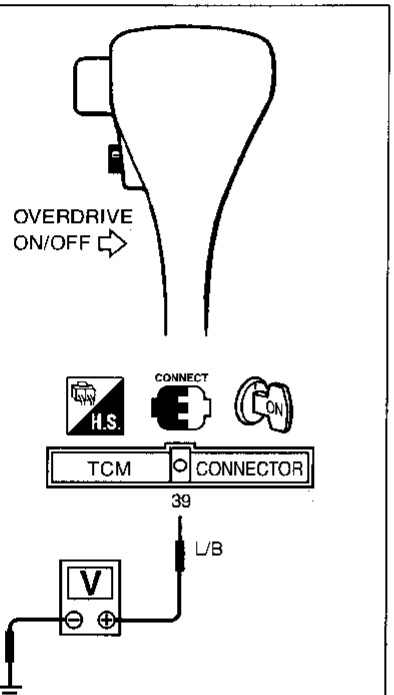
B

| ☆MONITOR | ☆NO FAIL |
|---|---|
| VHCL/S SE•A/T | 0km/h |
| VHCL/S SE•MTR | 5km/h |
| THRTL POS SEN | 0.4V |
| FLUID TEMP SE | 1.2V |
| BATTERY VOLT | 13.4V |
| ENGINE SPEED | 1024rpm |
| OVERDRIVE SW | O N |
| P/N POSI SW | O N |
| R POSITION SW | OFF |

RECORD

SAT076H

B




SAT944IC

Ⓐ

B

**CHECK OVERDRIVE CONTROL SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out "OVERDRIVE SWITCH".
   Check the signal of the overdrive control switch is indicated properly.
   (Overdrive control switch "ON" displayed on CONSULT means overdrive "OFF".)

NG → Check the following items:
- Overdrive control switch Refer to "Component Inspection", AT-172.
- Harness for short or open between TCM and overdrive control switch (Main harness)
- Harness of ground circuit for overdrive control switch (Main harness) for short or open

OR

1. Turn ignition switch to "ON" position.
   (Do not start engine.)
2. Check voltage between TCM terminal ㊴ and ground when overdrive control switch is "ON" and "OFF".

| Switch position | Voltage |
|---|---|
| ON | Battery voltage |
| OFF | 1V or less |

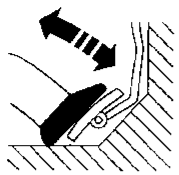
OK

Ⓑ

(Go to next page.)

# 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks) (Cont'd)

C

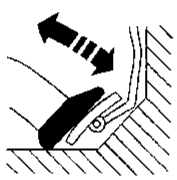


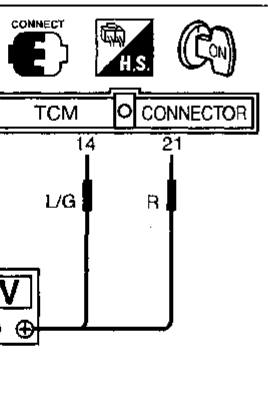
| ☆ MONITOR | ☆ NO FAIL |
|---|---|
| D POSITION SW | OFF |
| 2 POSITION SW | OFF |
| 1 POSITION SW | OFF |
| ASCD • CRUISE | OFF |
| ASCD • OD CUT | OFF |
| KICKDOWN SW | OFF |
| POWERSHIFT SW | OFF |
| CLOSED THL/SW | ON |
| W/O THRL/P-SW | OFF |

RECORD

SAT963H

C






SAT945ID

Ⓑ

C

**CHECK THROTTLE POSITION SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in "DATA MONITOR" mode for "A/T" with CONSULT.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal. Check the signal of throttle position switch is indicated properly.

| Accelerator pedal condition | Data monitor | |
|---|---|---|
| | CLOSED THL/SW | W/O THRL/P-SW |
| Released | ON | OFF |
| Fully depressed | OFF | ON |

NG → Check the following items:
- 10A fuse [No. 18, located in the fuse block (J/B)]
- Throttle position switch Refer to "Component Inspection", AT-173.
- Harness for short or open between ignition switch and throttle position switch (Main harness)
- Harness for short or open between throttle position switch and TCM (Main harness)
- Ignition switch Refer to EL section ("POWER SUPPLY ROUTING").

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑭, ㉑ and ground while depressing, and releasing accelerator pedal slowly. (After warming up engine)

| Accelerator pedal condition | Voltage | |
|---|---|---|
| | Terminal No. ⑭ | Terminal No. ㉑ |
| Released | Battery voltage | 1V or less |
| Fully depressed | 1V or less | Battery voltage |

OK

Perform self-diagnosis again after driving for a while.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

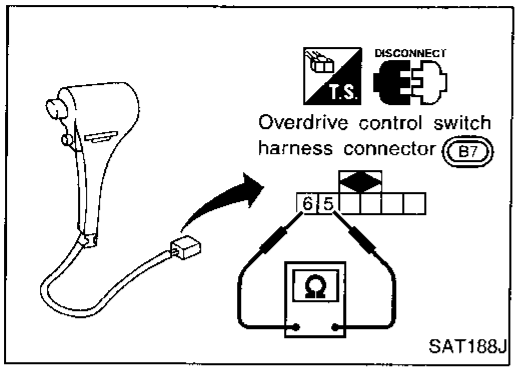
OK

**INSPECTION END**

## 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks) (Cont'd)

### COMPONENT INSPECTION

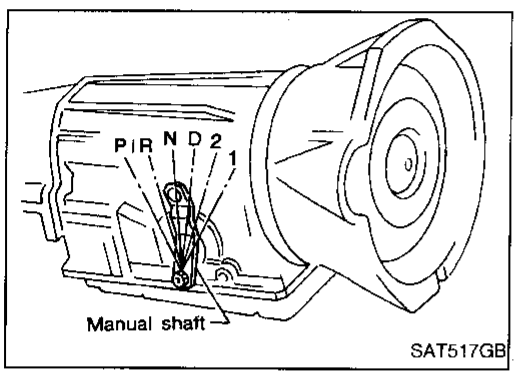
### Overdrive control switch




- Check continuity between terminals ⑤ and ⑥.

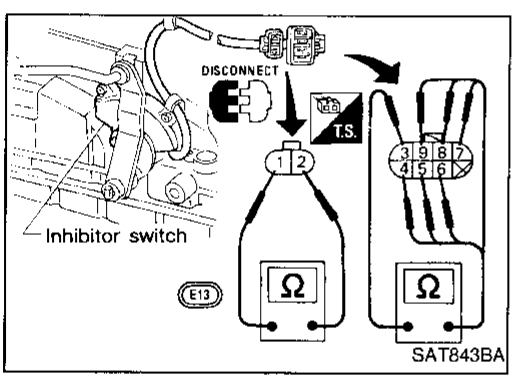
| Switch position | Continuity |
|---|---|
| ON | No |
| OFF | Yes |

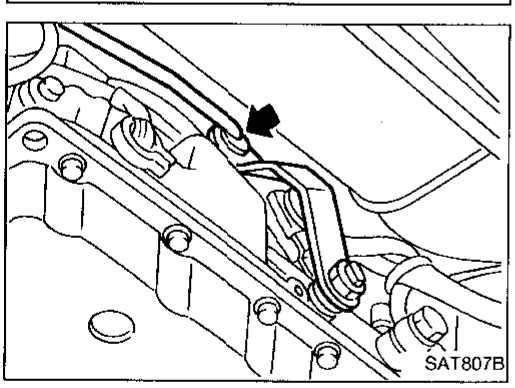
### Inhibitor switch



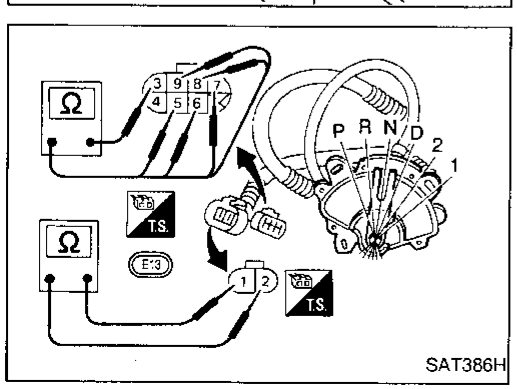

1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving manual shaft through each position.

| Lever position | Terminal No. | |
|---|---|---|
| P | ① — ② | ③ — ④ |
| R | ③ — ⑤ | |
| N | ① — ② | ③ — ⑥ |
| D | ③ — ⑦ | |
| 2 | ③ — ⑧ | |
| 1 | ③ — ⑨ | |



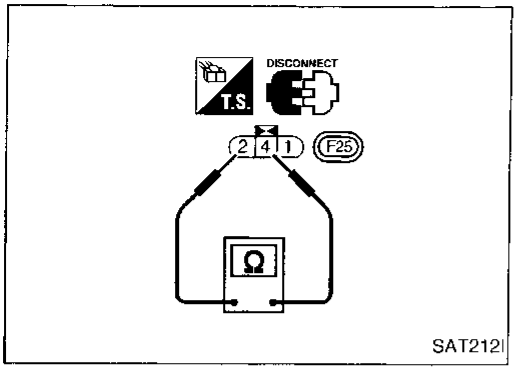




2. If NG, check again with manual control cable disconnected from manual shaft of A/T assembly. Refer to step 1.
3. If OK on step 2, adjust manual control cable. Refer to AT-183.




4. If NG on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminals. Refer to step 1.
5. If OK on step 4, adjust inhibitor switch. Refer to AT-183.
6. If NG on step 4, replace inhibitor switch.

## 21. TCM Self-diagnosis Does Not Activate (Inhibitor, Overdrive Control and Throttle Position Switch Circuit Checks) (Cont'd)



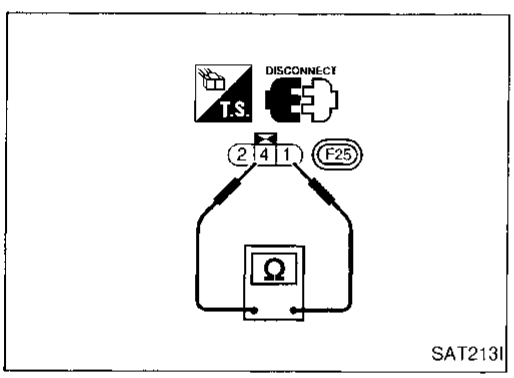

### Throttle position switch

**Closed throttle position switch (idle position)**

- Check continuity between terminals ② and ④.

| Accelerator pedal condition | Continuity |
|---|---|
| Released | Yes |
| Depressed | No |

- To adjust closed throttle position switch, refer to EC section ("Basic Inspection", "TROUBLE DIAGNOSIS — Basic Inspection").



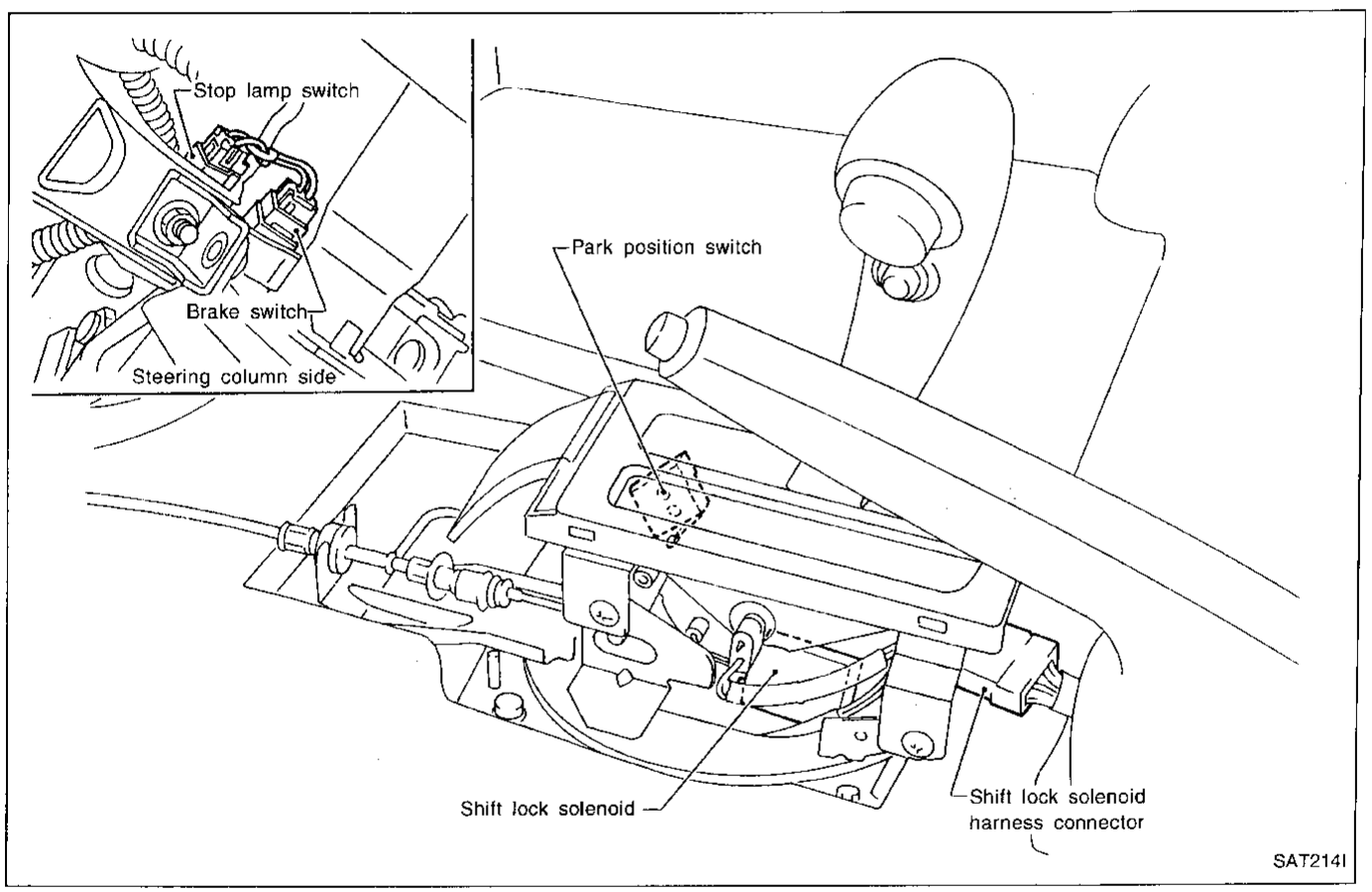

**Wide open throttle position switch**

- Check continuity between terminals ① and ④.

| Accelerator pedal condition | Continuity |
|---|---|
| Released | No |
| Depressed | Yes |

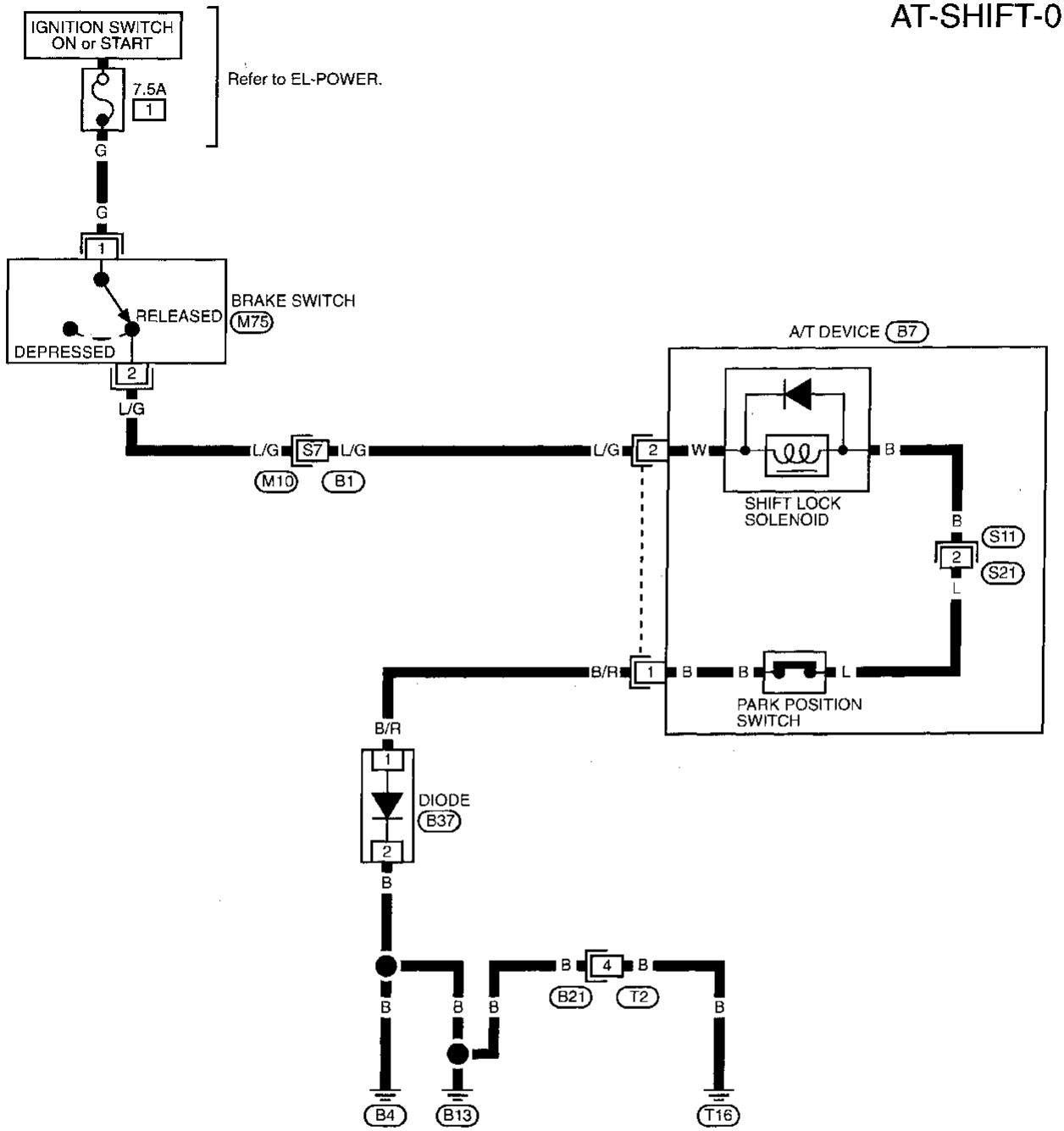
## Description

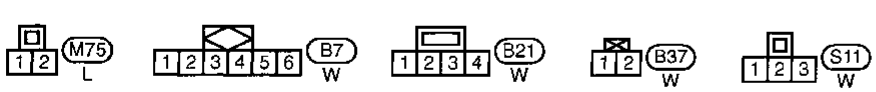
- The mechanical key interlock mechanism also operates as a shift lock:
  With the key switch turned to "ON", the selector lever cannot be shifted from "P" (parking) to any other position unless the brake pedal is depressed.
  With the key removed, the selector lever cannot be shifted from "P" to any other position.
  The key cannot be removed unless the selector lever is placed in "P".
- The shift lock and key interlock mechanisms are controlled by the ON-OFF operation of the shift lock solenoid and by the operation of the rotator and slider located inside the key cylinder, respectively.



## Wiring Diagram — SHIFT —

AT-SHIFT-01




Refer to last page (Foldout page).
M10 , B1

MAT441A

## Diagnostic Procedure

**SYMPTOM 1:**

- **Selector lever cannot be moved from "P" position with key in "ON" position and brake pedal applied.**
- **Selector lever can be moved from "P" position with key in "ON" position and brake pedal released.**
- **Selector lever can be moved from "P" position when key is removed from key cylinder.**

**SYMPTOM 2:**

**Ignition key cannot be removed when selector lever is set to "P" position. It can be removed when selector lever is set to any position except "P".**

Check key interlock cable for damage.
- NG → Repair key interlock cable. Refer to "Key Interlock Cable", AT-178.
- OK ↓

Check selector lever position for damage.
- NG → Check selector lever. Refer to "ON-VEHICLE SERVICE — Inhibitor Switch and Manual Control Linkage Adjustment", AT-183.
- OK ↓

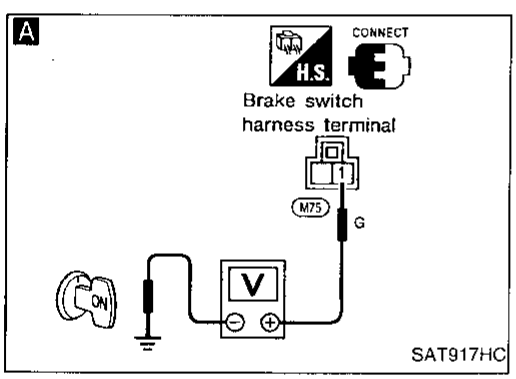
A

**CHECK POWER SOURCE.**

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between brake switch harness terminal ① and ground.

**Voltage: Battery voltage**

- NG → Check the following items:
  1. Harness for short or open between battery and brake switch harness terminal ①
  2. Fuse
  3. Ignition switch (Refer to EL section.)
- OK ↓




B

**CHECK INPUT SIGNAL (BRAKE SWITCH).**

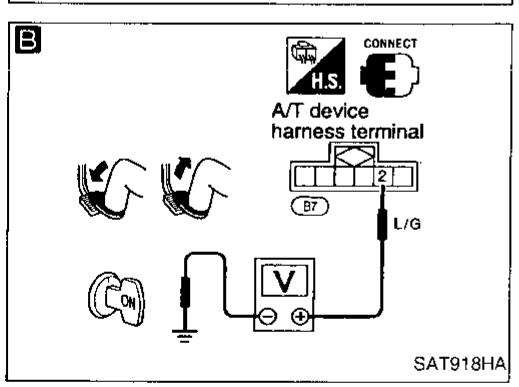
Turn ignition switch to "ON" position. (Do not start engine.)

- Check voltage between A/T device harness terminal ② and ground.

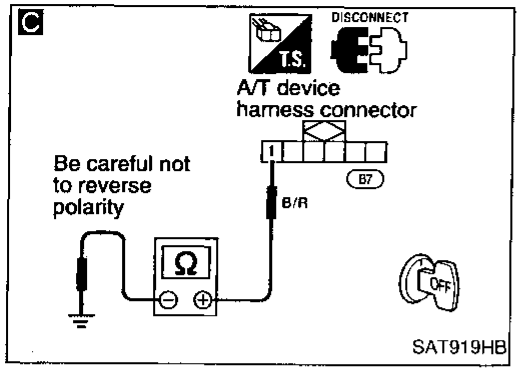
| Brake pedal | Voltage |
|---|---|
| Depressed | 0V |
| Released | Battery voltage |

- NG → Check the following items:
  1. Harness for short or open between A/T device harness connector ② and brake switch harness connector ②
  2. Brake switch (Refer to "Component Check", AT-180.)
- OK ↓

Ⓐ



## Diagnostic Procedure (Cont'd)




Ⓐ

C

**CHECK GROUND CIRCUIT.**
1. Turn ignition switch to "OFF" position.
2. Disconnect A/T device harness connector.
3. Check continuity between A/T device harness terminal ① and ground.

| Polarity | Continuity |
|---|---|
| ① (+) | NO |
| ① (−) | YES |

NG → 1. Repair harness or connector. 2. Diode

OK ↓

**CHECK PARK POSITION SWITCH.**
(Refer to "Component Check", AT-179.)

NG → Replace park position switch.

OK ↓

**CHECK SHIFT LOCK SOLENOID.**
(Refer to "Component Check", AT-179.)

NG → Replace shift lock solenoid.

OK ↓

Reconnect shift lock harness connector.

↓

Turn ignition switch from "OFF" to "ON" position. (Do not start engine.)

↓

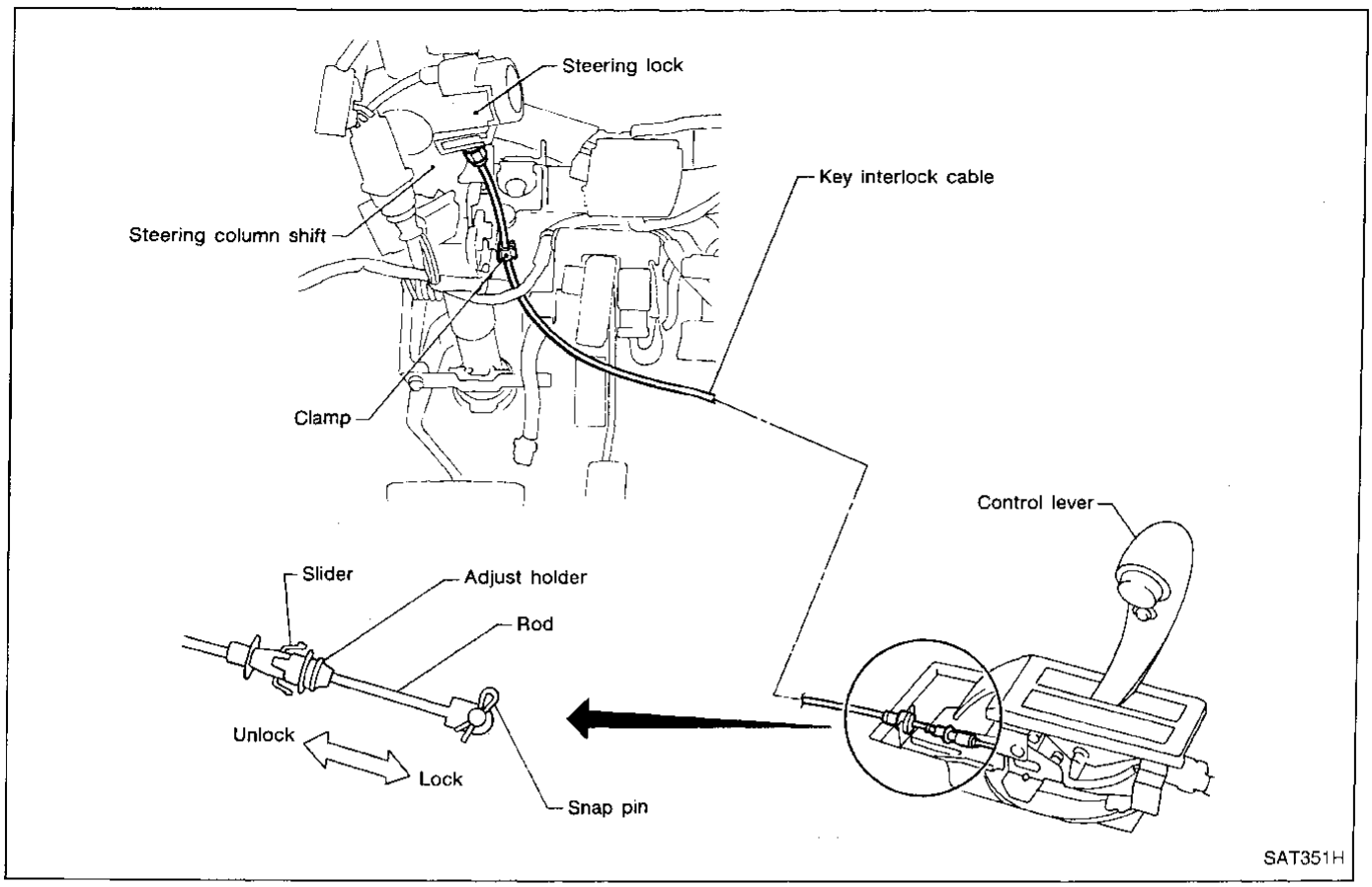
Recheck shift lock operation.

NG → 1. Perform A/T device input/output signal inspection test. 2. If NG, recheck harness connector connection.

OK ↓

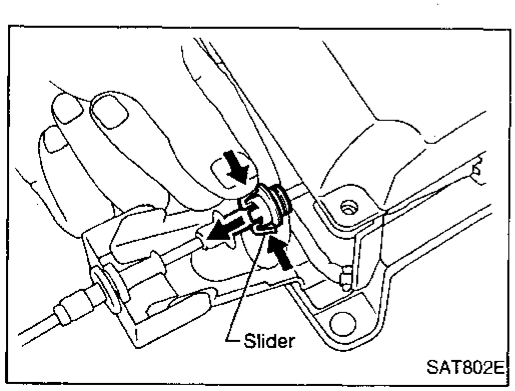
INSPECTION END

## Key Interlock Cable




**CAUTION:**

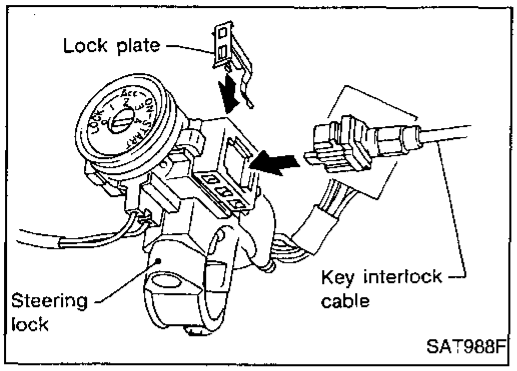
- **Install key interlock cable in such a way that it will not be damaged by sharp bends, twists or interference with adjacent parts.**
- **After installing key interlock cable to control device, make sure that casing cap and bracket are firmly secured in their positions. If casing cap can be removed with an external load of less than 39.2 N (4.0 kg, 8.8 lb), replace key interlock cable with new one.**




### REMOVAL

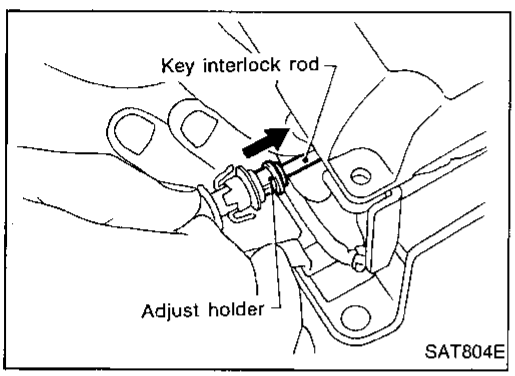
Unlock slider from adjuster holder and remove rod from cable.

## Key Interlock Cable (Cont'd)

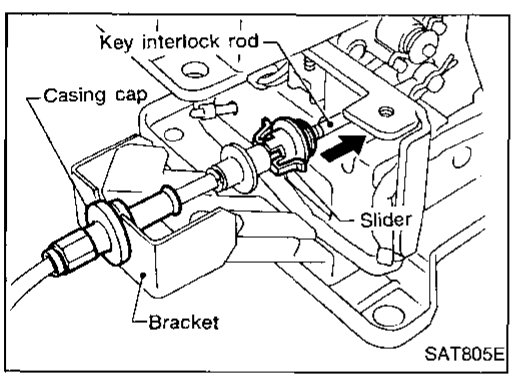



### INSTALLATION

1. Set key interlock cable to steering lock assembly and install lock plate.
2. Clamp cable to steering column and fix to control cable with band.
3. Set control lever to "P" position.



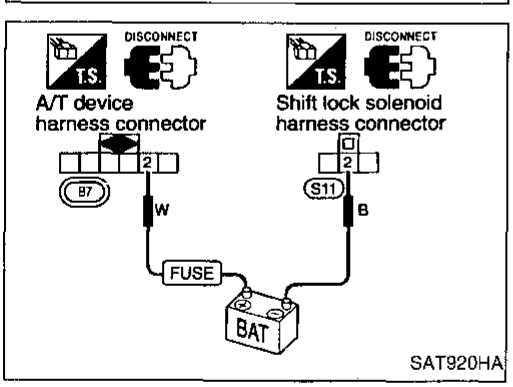

4. Insert interlock rod into adjuster holder.




5. Install casing cap to bracket.
6. Move slider in order to fix adjuster holder to interlock rod.

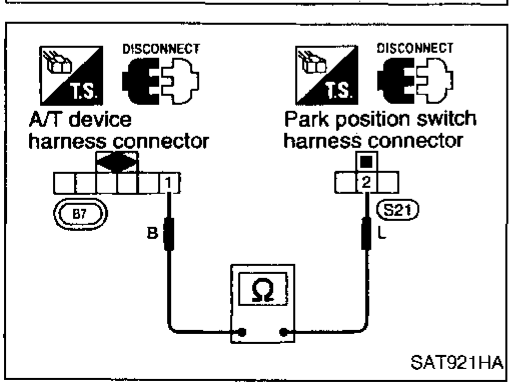
## Component Check

### SHIFT LOCK SOLENOID




- Check operation by applying battery voltage between shift lock solenoid harness connector terminal ② and A/T device harness connector terminal ② .

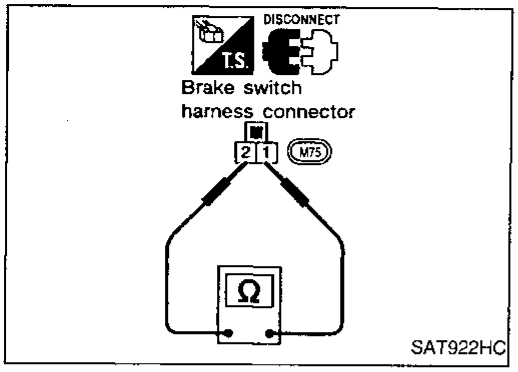
### PARK POSITION SWITCH




- Check continuity between park position switch harness connector terminal ② and A/T device harness connector terminal ① .

| Condition | Continuity |
|---|---|
| When selector lever is set in "P" position and selector lever button is released | No |
| Except above | Yes |

## Component Check (Cont'd)

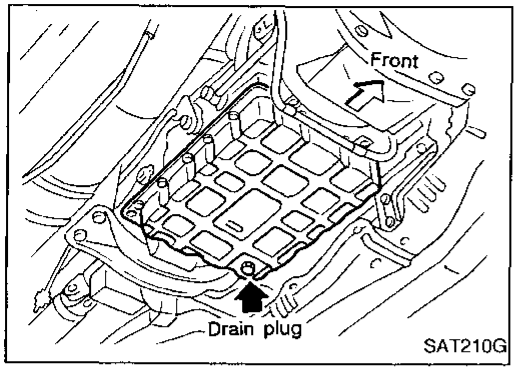



### BRAKE SWITCH

- Check continuity between brake switch harness connector terminals ① and ② .

| Condition | Continuity |
|---|---|
| When brake pedal is depressed | Yes |
| When brake pedal is released | No |

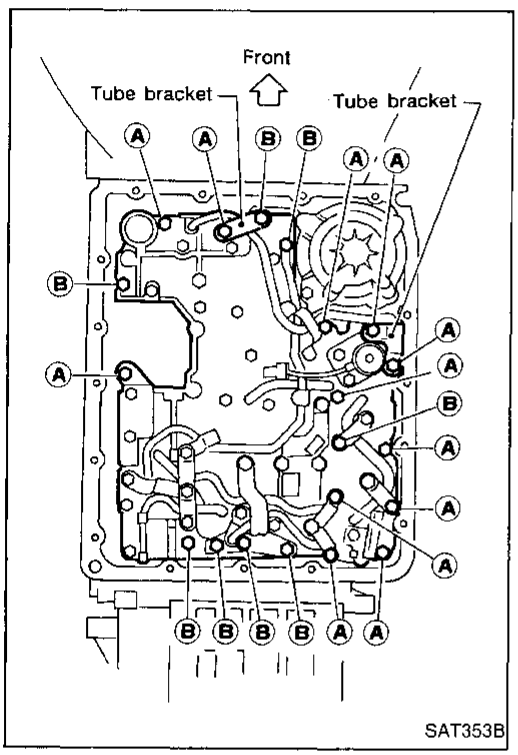
**Check brake switch after adjusting brake pedal — refer to BR section ("Adjustment", "BRAKE PEDAL AND BRACKET").**




## Control Valve Assembly and Accumulators

### REMOVAL

1. Drain fluid from drain plug.
2. Remove oil pan and gasket.
3. Remove oil strainer.

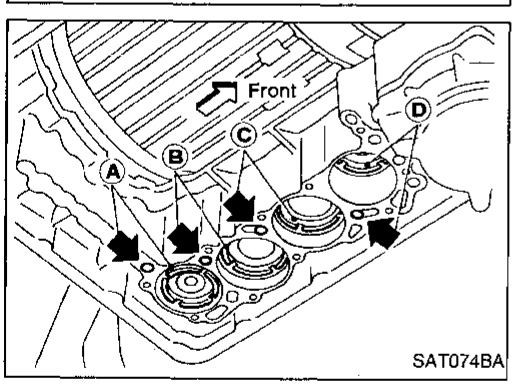



4. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

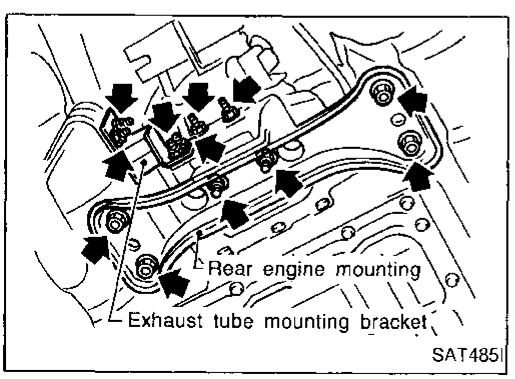
**Bolt length and location**

| Bolt symbol | ℓmm (in) ℓ |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

5. Remove solenoid valves and valves from valve body if necessary.
6. Remove terminal cord assembly if necessary.



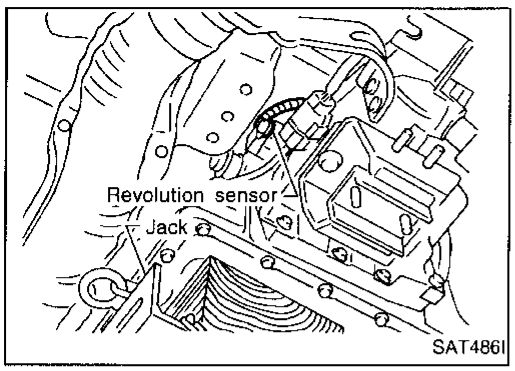

7. Remove accumulator Ⓐ, Ⓑ, Ⓒ and Ⓓ by applying compressed air if necessary.
- **Hold each piston with rag.**
8. Reinstall any part removed.
- **Always use new sealing parts.**




## Revolution Sensor Replacement

1. Remove exhaust tube mounting bracket. Refer to FE section ("EXHAUST SYSTEM").
2. Remove rear engine mounting member from body panel while supporting A/T with jack. Tighten rear engine mounting member bolts to the specified torque. Refer to EM section ("ENGINE REMOVAL").
3. Lower A/T assembly as much as possible.

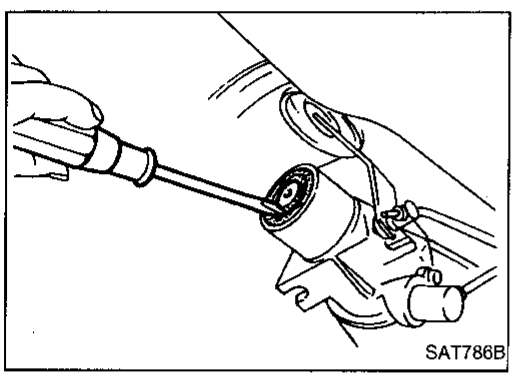
## Revolution Sensor Replacement (Cont'd)



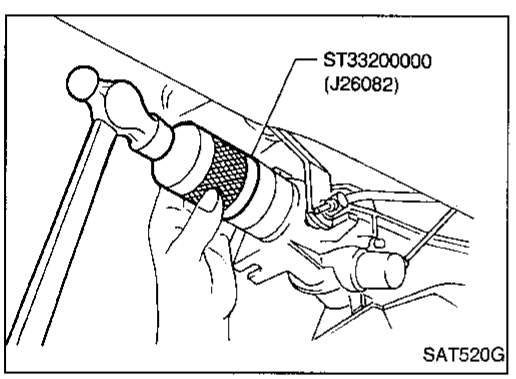

4. Remove revolution sensor from A/T assembly.
5. Reinstall any part removed.

- **Always use new sealing parts.**

## Rear Oil Seal Replacement




1. Remove propeller shaft from vehicle. Refer to PD section ("Removal", "PROPELLER SHAFT").
2. Remove rear oil seal.

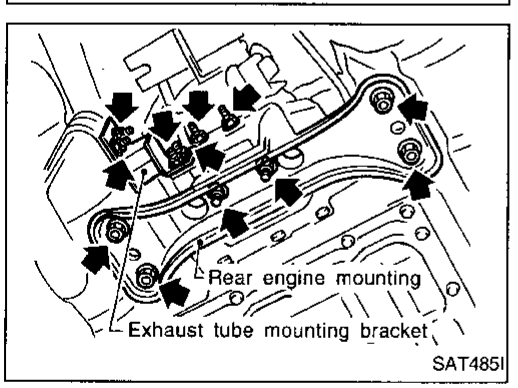



3. Install rear oil seal.

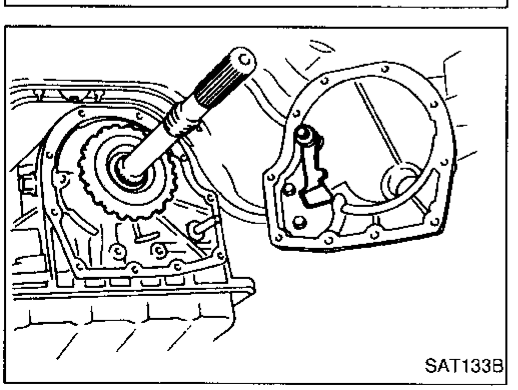
- **Apply ATF before installing.**

4. Reinstall any part removed.

## Parking Components Inspection

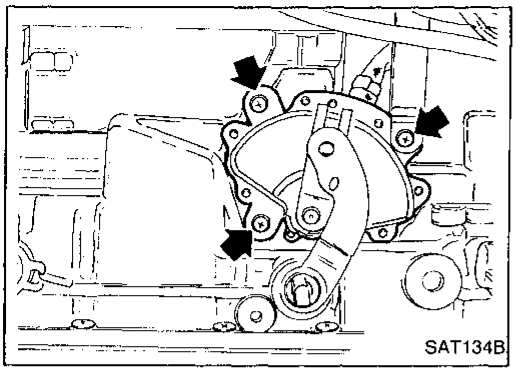



1. Remove propeller shaft from vehicle. Refer to PD section ("Removal", "PROPELLER SHAFT").
2. Remove exhaust tube mounting bracket. Refer to FE section ("EXHAUST SYSTEM").
3. Remove rear engine mounting member from body panel and A/T assembly while supporting A/T with jack. Tighten rear engine mounting member bolts to the specified torque. Refer to EM section ("ENGINE REMOVAL").



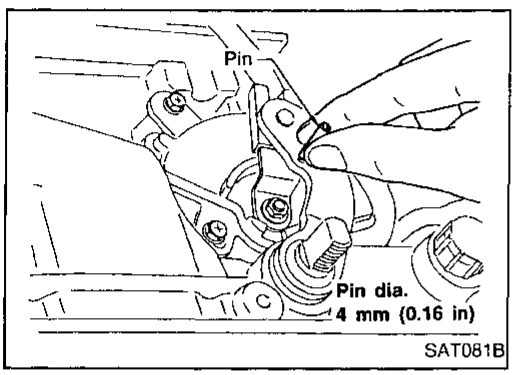

4. Remove rear extension from transmission case.
5. Replace parking components if necessary.
6. Reinstall any part removed.

- **Always use new sealing parts.**


SAT134B

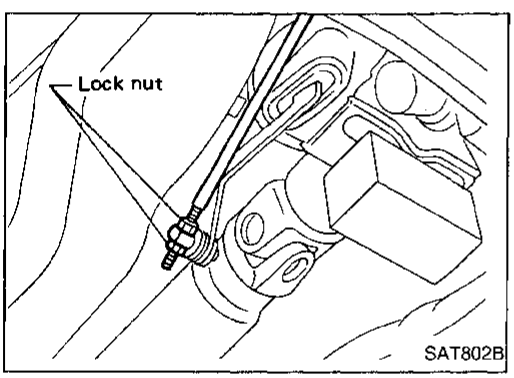
## Inhibitor Switch Adjustment

1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



SAT081B

4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly. Be sure to insert as vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. Refer to "Component Inspection", AT-81.

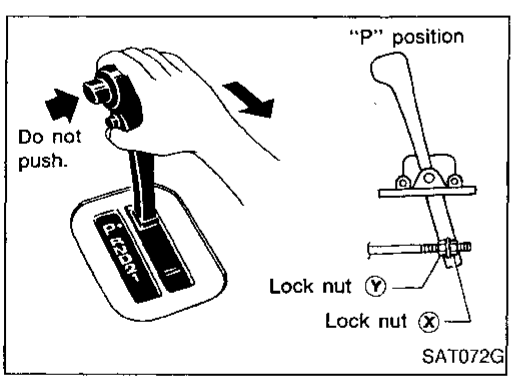


SAT802B

## Manual Control Linkage Adjustment

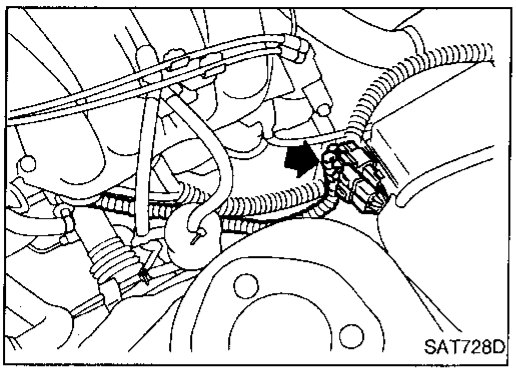
Move selector lever from "P" position to "1" position. You should be able to feel the detentes in each position.
If no detentes are felt or the position pointer is not aligned properly, adjust the linkage.

1. Place selector lever in "P" position.
2. Loosen lock nuts.



SAT072G

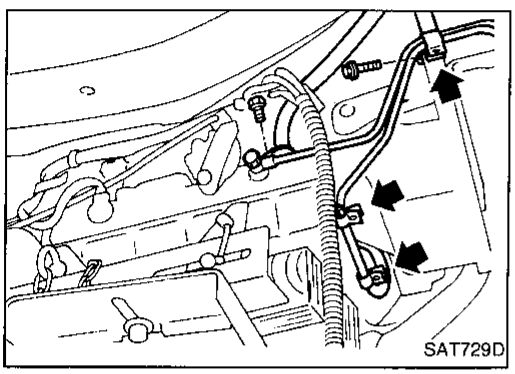
3. Tighten lock nut Ⓧ until it touches trunnion pulling selector lever toward "R" position side without pushing button.
4. Back off lock nut Ⓧ 1 turn and tighten lock nut Ⓨ to the specified torque.
   **Lock nut:**
   **: 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)**
5. Move selector lever from "P" position to "1" position. Make sure that selector lever can move smoothly.




## Removal

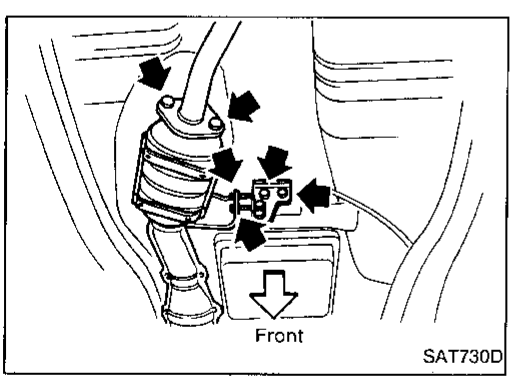
**CAUTION:**
**When removing the A/T assembly from engine, first remove the crankshaft position sensor (OBD) from the A/T assembly upper side.**
**Be careful not to damage sensor edge.**

1. Disconnect A/T harness connector and clamps.

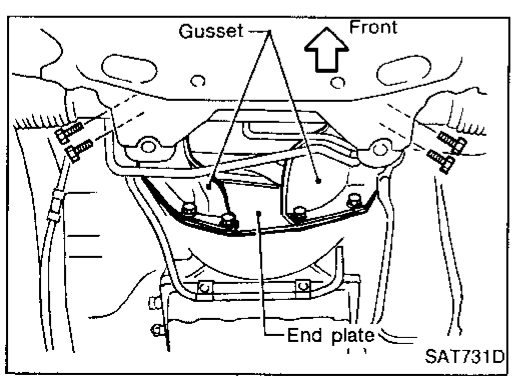



2. Remove fluid charging pipe and oil cooler pipe at right side of A/T assembly. Plug up openings.
3. Remove oil cooler pipe clamp at engine oil pan.
4. Disconnect speed sensor harness connector.
5. Remove control linkage from selector lever.

6. Remove propeller shaft. Refer to PD section ("Removal", "PROPELLER SHAFT").
   **Insert plug into rear oil seal after removing propeller shaft. Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**

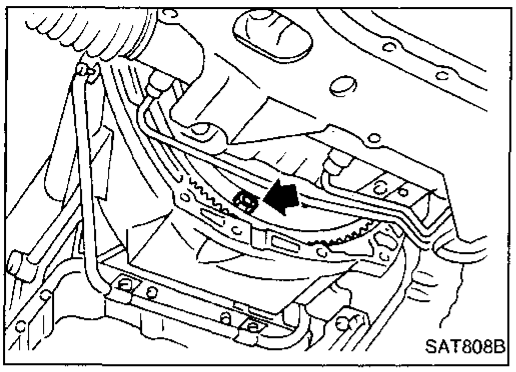



7. Remove heat insulator from catalytic converter. Refer to FE section ("EXHAUST SYSTEM").
8. Remove exhaust tube bracket and separate rear exhaust tube from converter. Refer to FE section ("EXHAUST SYSTEM").
9. Remove starter motor.
   **: 30 - 41 N·m (3.1 - 4.2 kg-m, 22 - 30 ft-lb)**

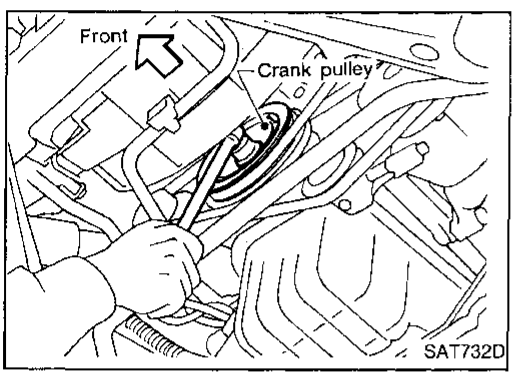


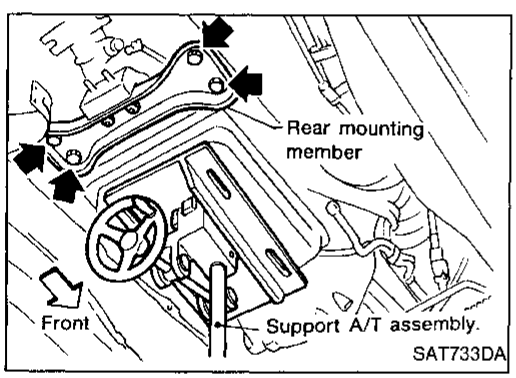

10. Remove gussets and end plate.

## Removal (Cont'd)

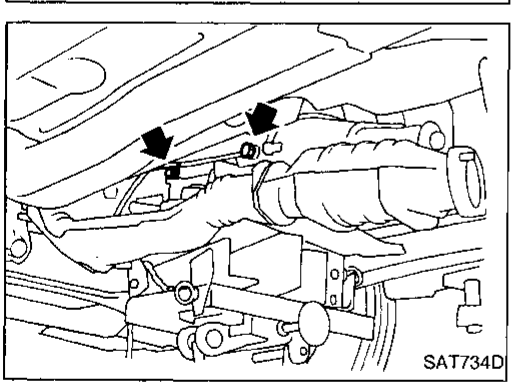



11. Remove bolts securing torque converter to drive plate. Gain access to bolts by turning crankshaft.

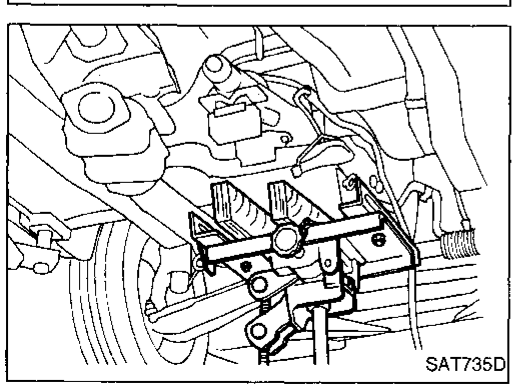


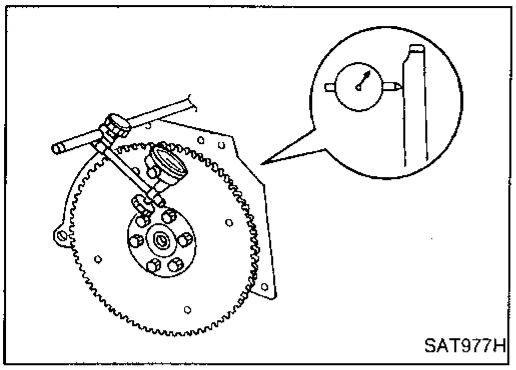

12. Support A/T assembly by placing a jack under oil pan.
13. Remove rear mounting member from body. Tighten rear mounting member bolts to the specified torque. Refer to EM section ("ENGINE REMOVAL").




14. Lower A/T assembly as much as possible.
15. Remove oil cooler pipe from left side of A/T assembly. Plug up openings.




16. Remove bolts securing A/T assembly to engine.
17. Remove and lower A/T assembly.
    **Be careful not to damage steering gear and tubes.**


SAT977H

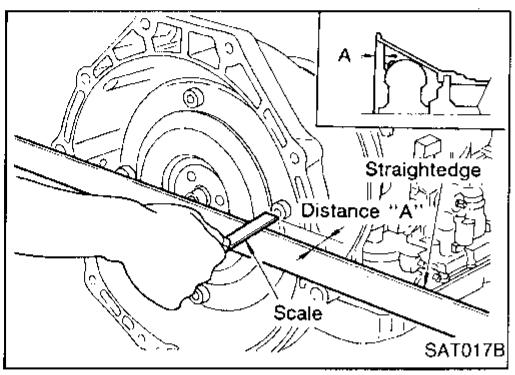
## Installation

- Drive plate runout

**CAUTION:**
**Do not allow any magnetic materials to contact the ring gear teeth.**

**Maximum allowable runout:**
**Refer to EM section ("Inspection", "CYLINDER BLOCK").**

If this runout is out of allowance, replace drive plate with ring gear.

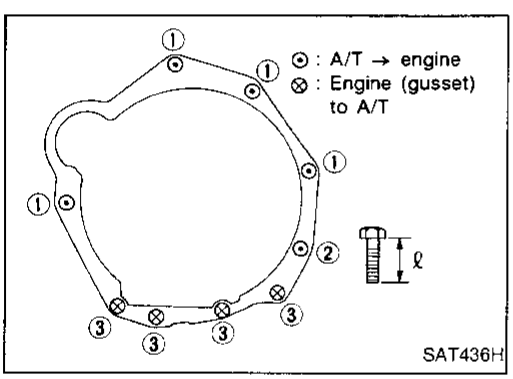


SAT017B

- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

**Distance "A":**
**26.0 mm (1.024 in) or more**

- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**

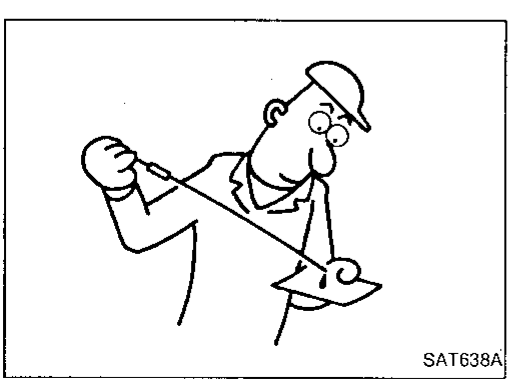


SAT436H

- Tighten bolts securing transmission.

| Bolt No. | Tightening torque N·m (kg-m, ft-lb) | Bolt length "ℓ" mm (in) |
|---|---|---|
| ① | 39 - 49 (4.0 - 5.0, 29 - 36) | 40 (1.57) |
| ② | 39 - 49 (4.0 - 5.0, 29 - 36) | 50 (1.97) |
| ③ | 29 - 39 (3.0 - 4.0, 22 - 29) | 25 (0.98) |
| Gusset to engine (4 bolts) | 29 - 39 (3.0 - 4.0, 22 - 29) | 20 (0.79) |

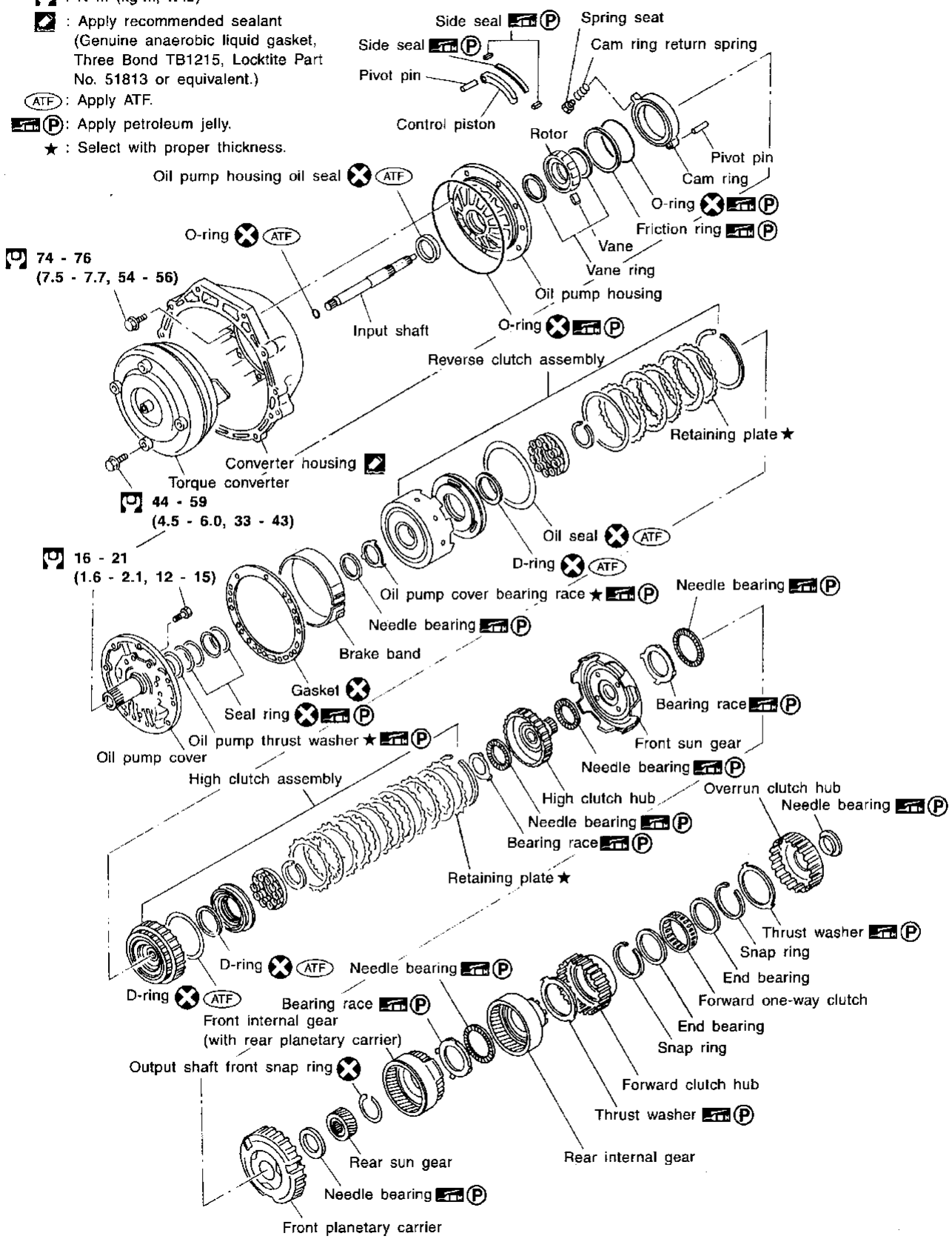
- Reinstall any part removed.


SAT638A

- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R" positions. A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. Refer to "ROAD TEST", AT-61.

**SEC. 311•313•315**

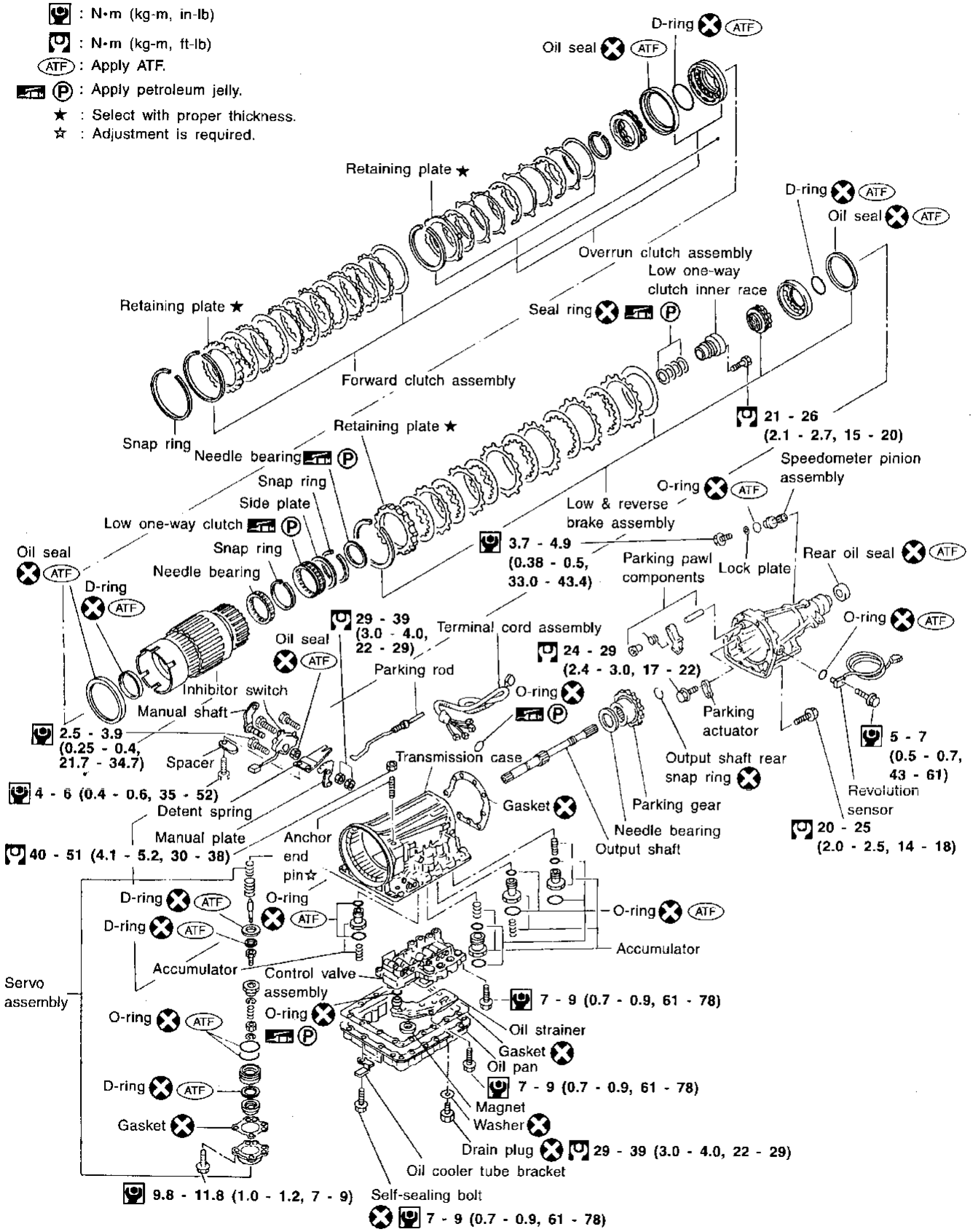
: N·m (kg-m, ft-lb)
: Apply recommended sealant (Genuine anaerobic liquid gasket, Three Bond TB1215, Locktite Part No. 51813 or equivalent.)
(ATF): Apply ATF.
(P): Apply petroleum jelly.
★ : Select with proper thickness.




SAT189J

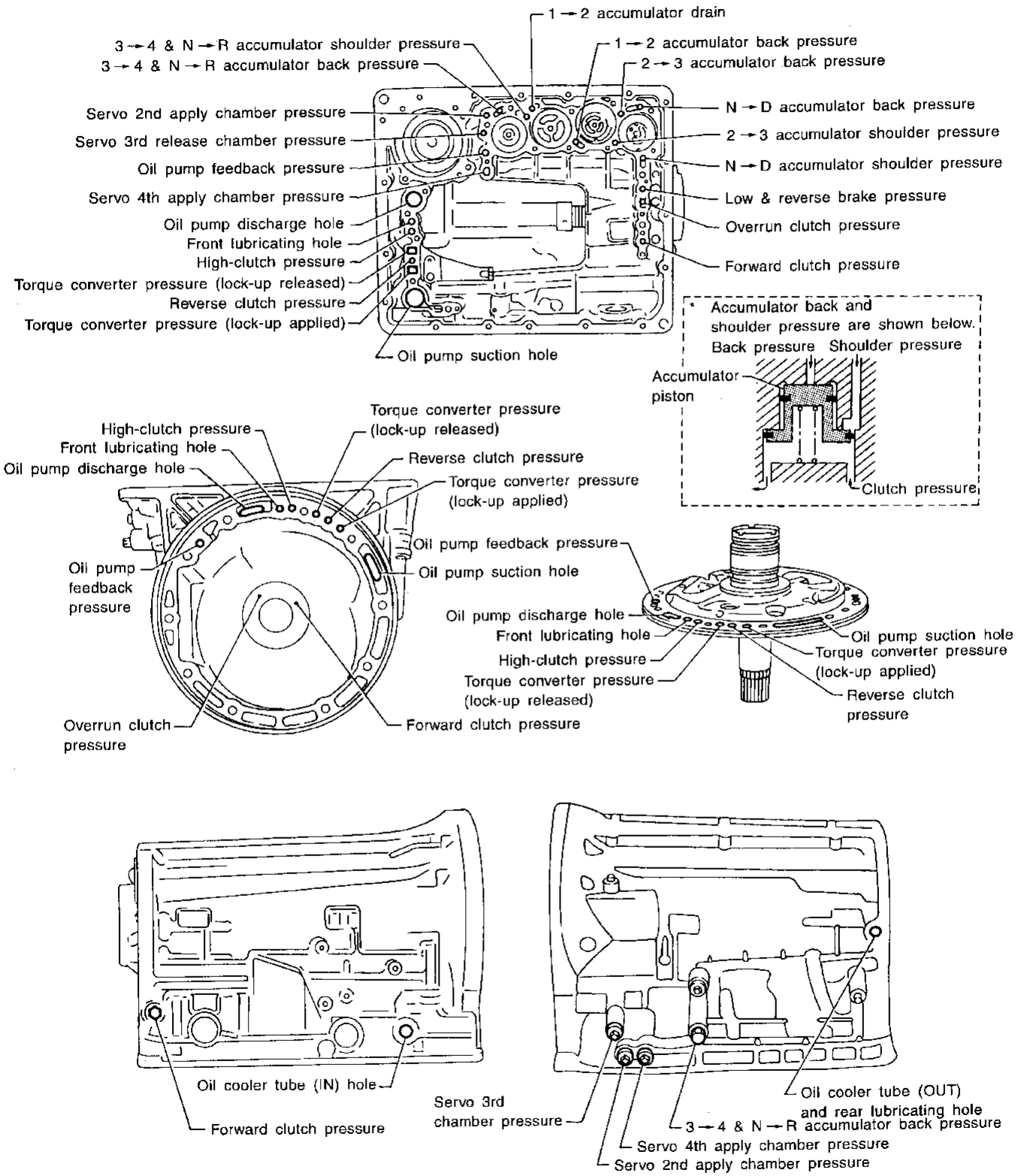
**SEC. 311•315•317**

: N•m (kg-m, in-lb)
: N•m (kg-m, ft-lb)
ATF : Apply ATF.
Ⓟ : Apply petroleum jelly.
★ : Select with proper thickness.
☆ : Adjustment is required.




SAT190J

## Oil Channel




SAT185BA

## Locations of Needle Bearings, Thrust Washers and Snap Rings

Outer diameter of snap rings

| Item number | Outer diameter mm (in) |
|---|---|
| ② | 161.0 (6.34) |
| ③ | 140.1 (5.52) |
| ④ | 156.4 (6.16) |
| ⑥ | 142.0 (5.59) |
| ⑦ | 159.2 (6.27) |

Inner diameter of thrust washers

| Item number | Color | Inner diameter mm (in) |
|---|---|---|
| ① | Black | 52.8 (2.08) |
| ⑤ | White | 84.5 (3.33) |

Outer diameter of needle bearings

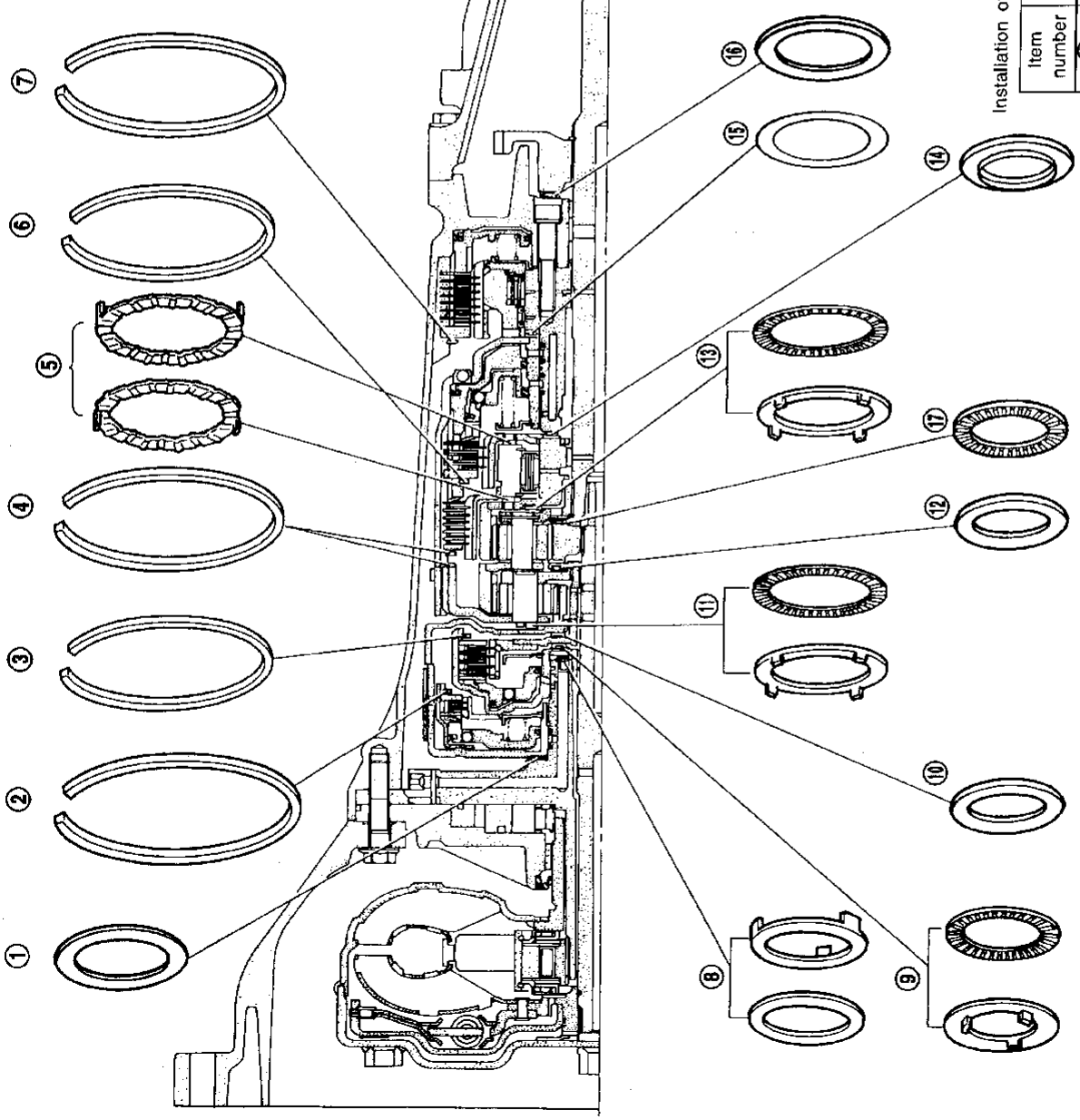
| Item number | Outer diameter mm (in) |
|---|---|
| ⑧ | 47 (1.85) |
| ⑨ | 53 (2.09) |
| ⑩ | 53 (2.09) |
| ⑪ | 78 (3.07) |
| ⑫ | 53 (2.09) |
| ⑬ | 78 (3.07) |
| ⑭ | 57 (2.24) |
| ⑮ | 78.1 (3.07) |
| ⑯ | 64 (2.52) |
| ⑰ | 53 (2.09) |

Inner diameter of bearing races

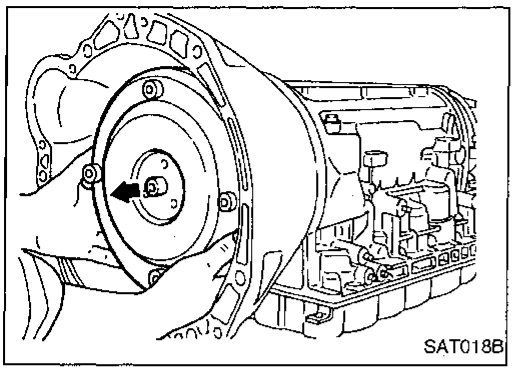
| Item number | Outer diameter mm (in) |
|---|---|
| ⑪ | 58.8 (2.315) |
| ⑬ | 58.8 (2.315) |

Installation of one-piece bearings

| Item number | Bearing race (black) location |
|---|---|
| ⑩ | Front |
| ⑫ | Front |
| ⑮ | Rear side |
| ⑯ | Rear side |

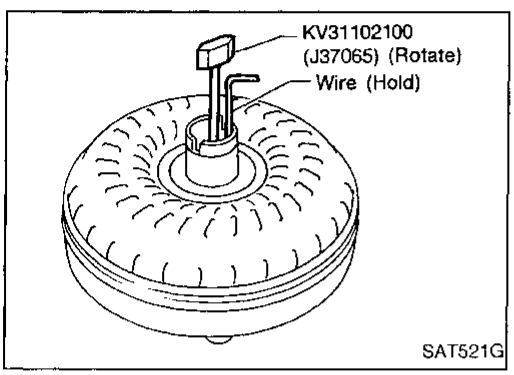


SAT206J


SAT018B

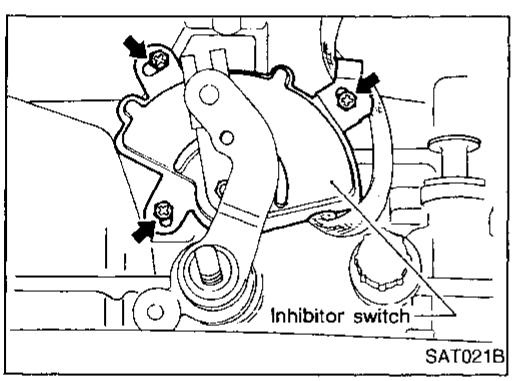
## Disassembly

1. Drain ATF through drain plug.
2. Remove torque converter by holding it firmly and turning while pulling straight out.



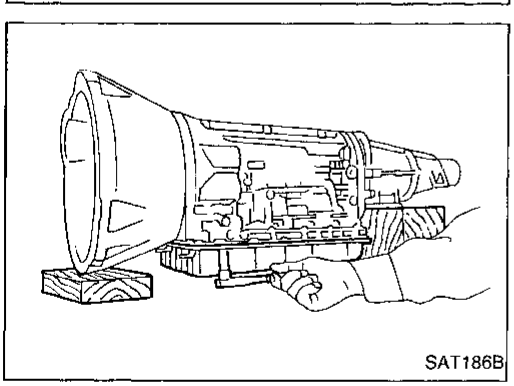
SAT521G

3. Check torque converter one-way clutch.
a. Insert Tool into spline of one-way clutch inner race.
b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.

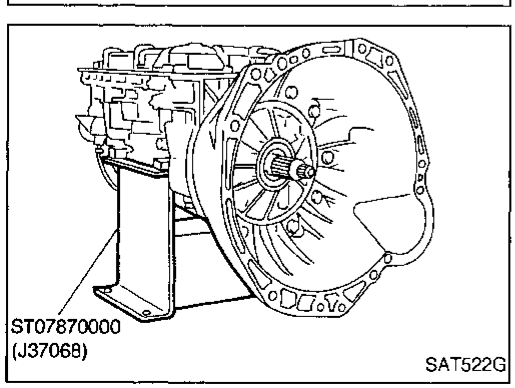


SAT021B

4. Remove inhibitor switch from transmission case.


SAT186B

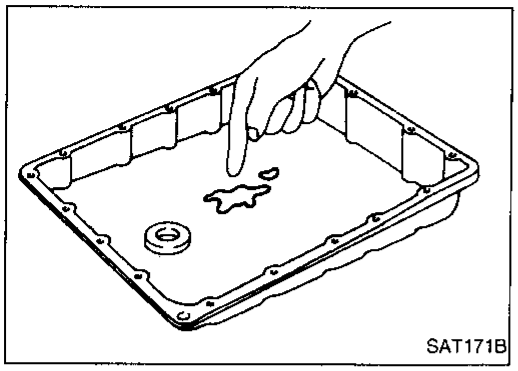
5. Remove oil pan.
- **Always place oil pan straight down so that foreign particles inside will not move.**



SAT522G

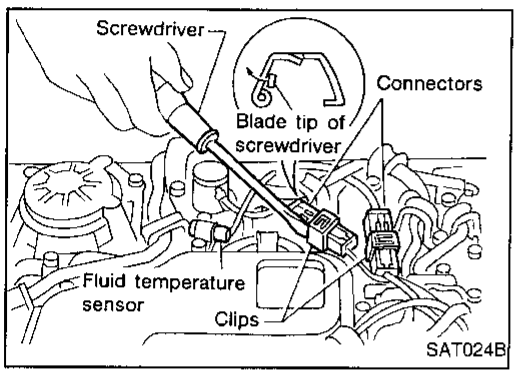
6. Place transmission into Tool with the control valve facing up.

## Disassembly (Cont'd)



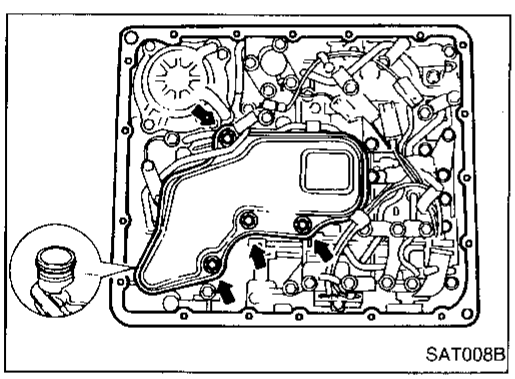

7. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and may inhibit pump pressure.

- **If frictional material is detected, replace radiator after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").**



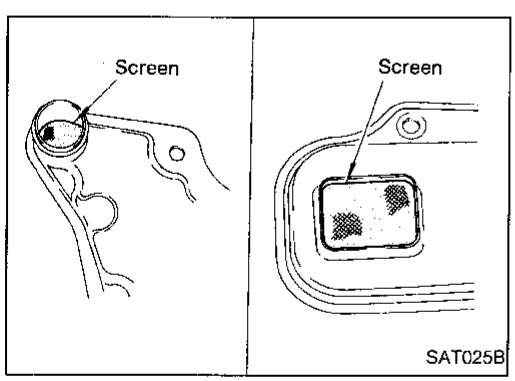

8. Remove torque converter clutch solenoid valve and A/T fluid temperature sensor connectors.

- **Be careful not to damage connector.**

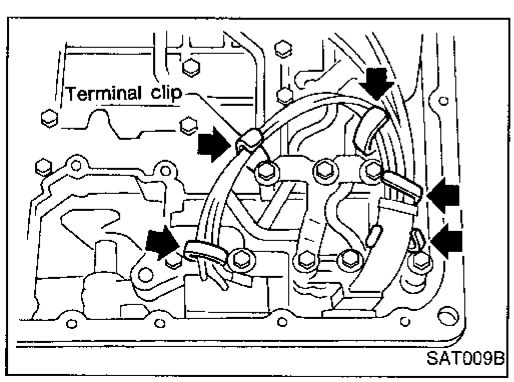



9. Remove oil strainer.

a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



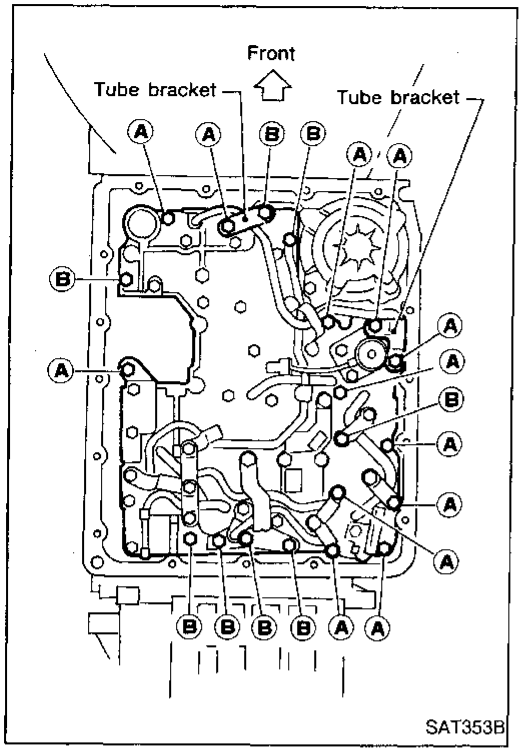

b. Check oil strainer screen for damage.




10. Remove control valve assembly.

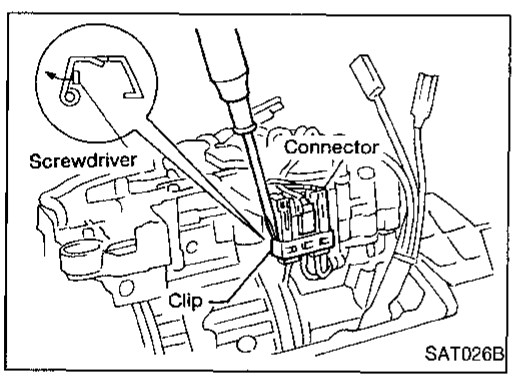
a. Straighten terminal clips to free terminal cords then remove terminal clips.

## Disassembly (Cont'd)



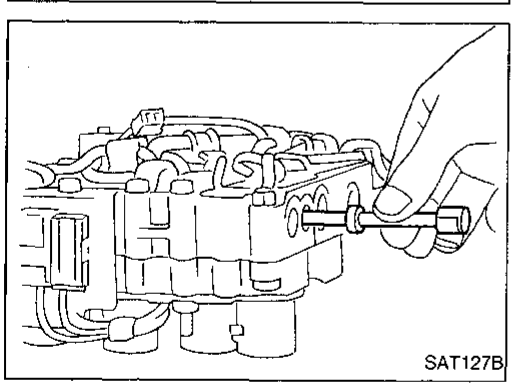

b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

| Bolt symbol | Length mm (in) |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

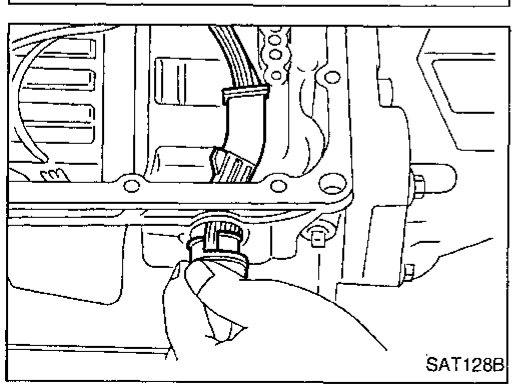



c. Remove solenoid connector.

- **Be careful not to damage connector.**



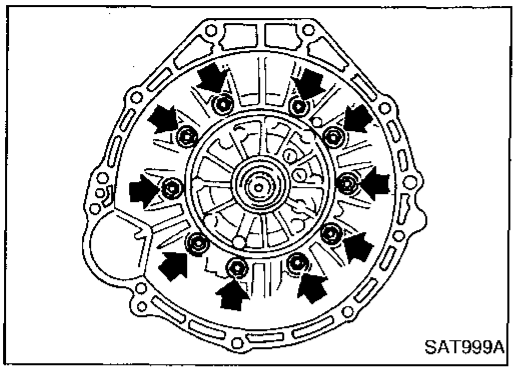

d. Remove manual valve from control valve assembly.



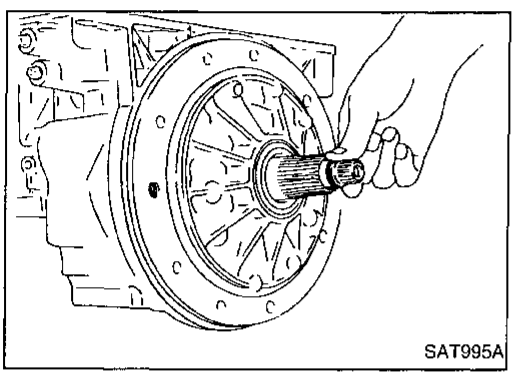

11. Remove terminal cord assembly from transmission case while pushing on stopper.

- **Be careful not to damage cord.**
- **Do not remove terminal cord assembly unless it is damaged.**

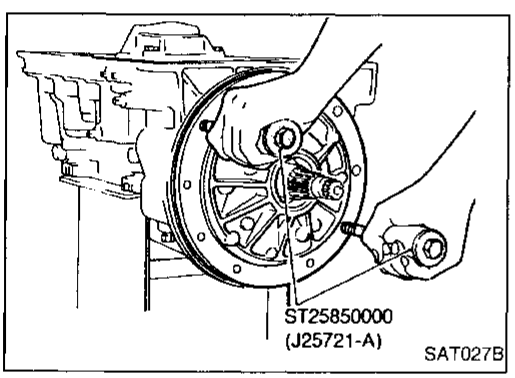
## Disassembly (Cont'd)



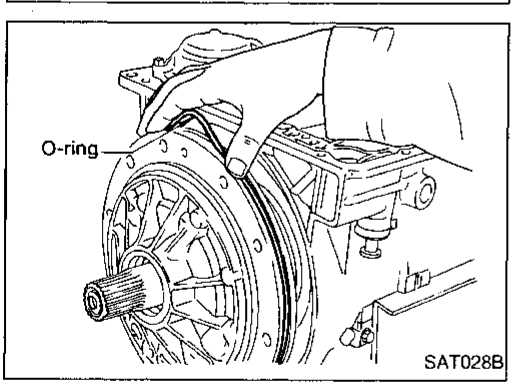

12. Remove converter housing from transmission case.
- **Be careful not to scratch converter housing.**



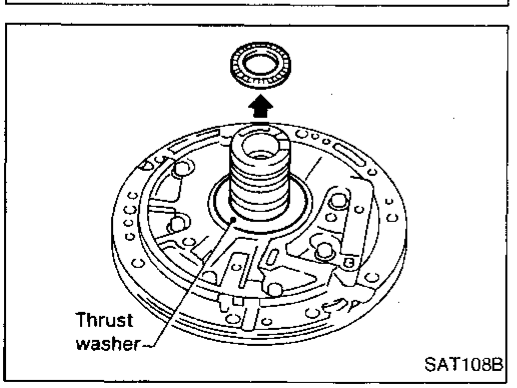

13. Remove O-ring from input shaft.




14. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.

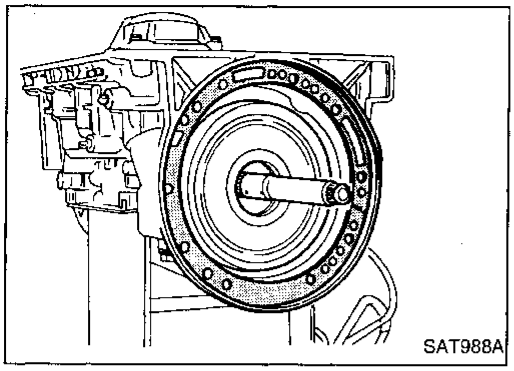



b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**

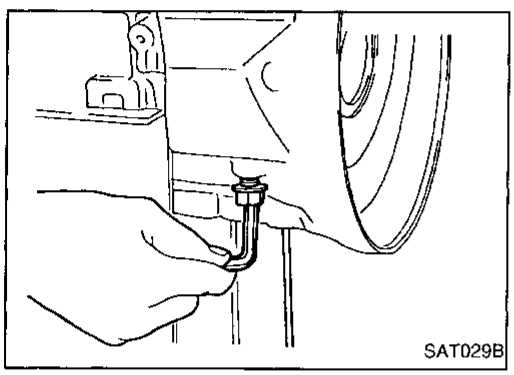



d. Remove needle bearing and thrust washer from oil pump assembly.

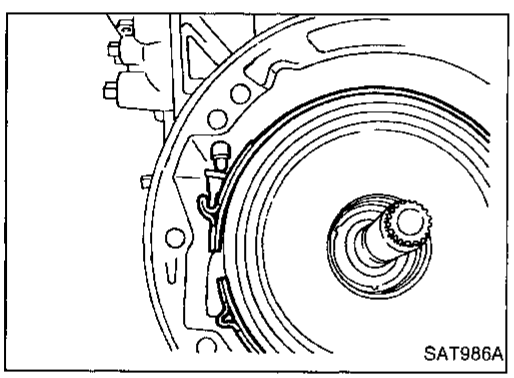
## Disassembly (Cont'd)


SAT988A

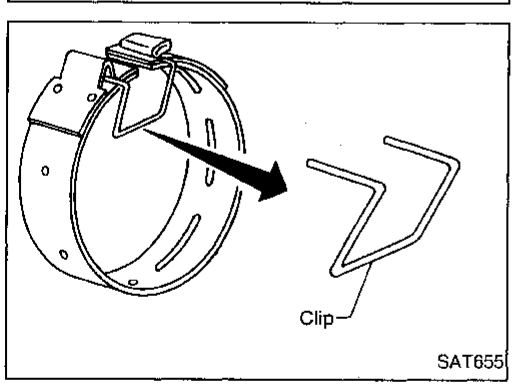
15. Remove input shaft and oil pump gasket.


SAT029B

16. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.

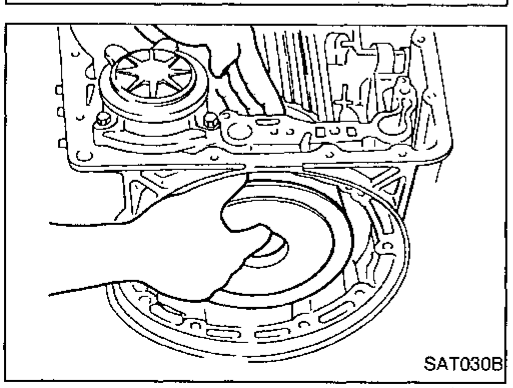

SAT986A

b. Remove brake band and band strut from transmission case.



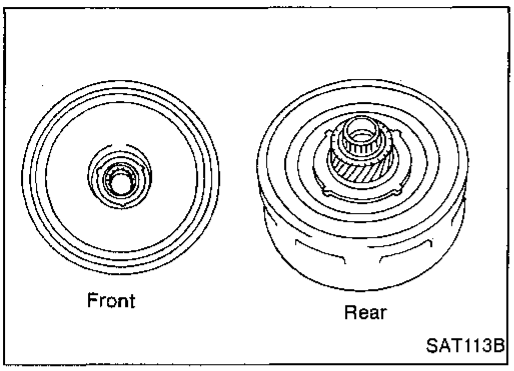
SAT655

c. Hold brake band in a circular shape with clip.

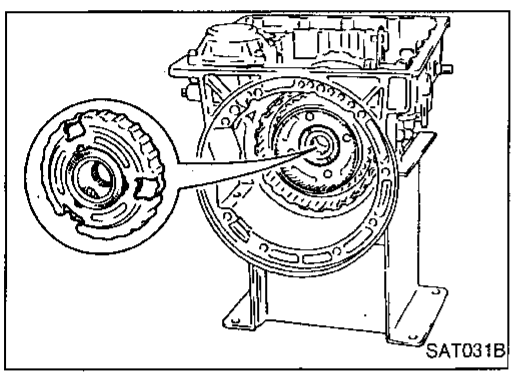

SAT030B

17. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

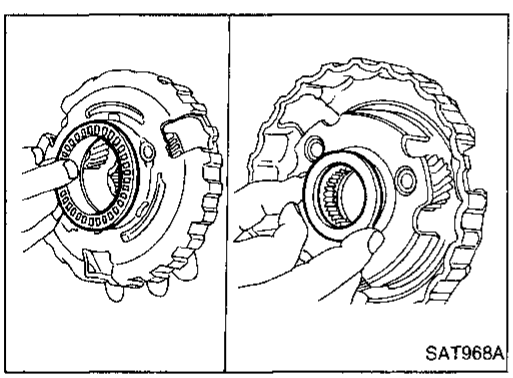
## Disassembly (Cont'd)



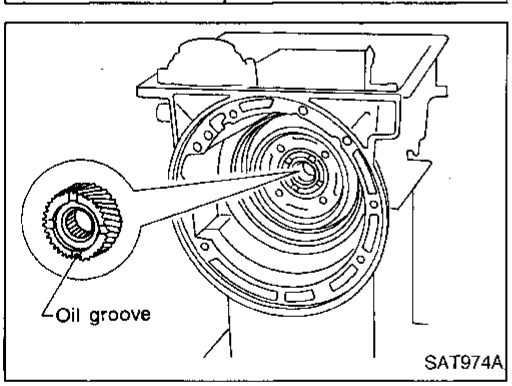

b. Remove front bearing race from clutch pack.
c. Remove rear bearing race from clutch pack.



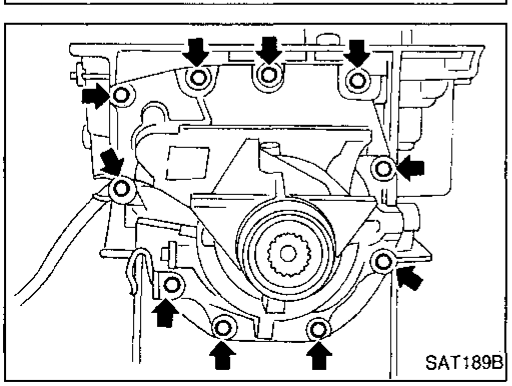

d. Remove front planetary carrier from transmission case.




e. Remove front needle bearing from front planetary carrier.
f. Remove rear bearing from front planetary carrier.

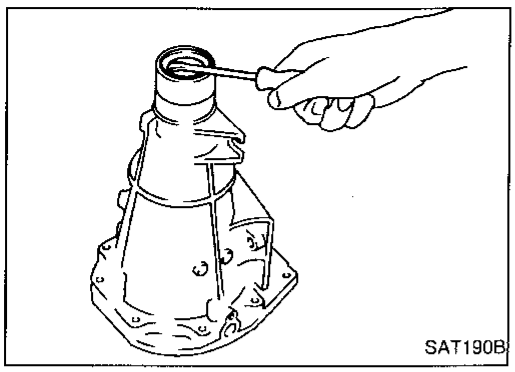



g. Remove rear sun gear from transmission case.



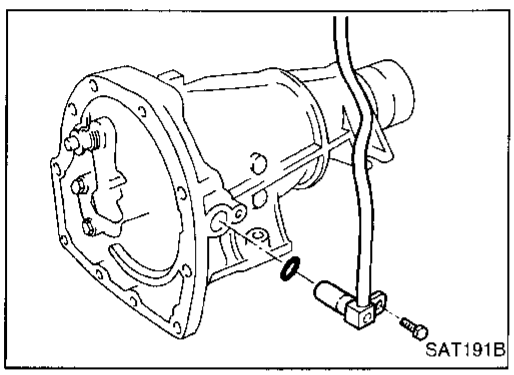

18. Remove rear extension.
a. Remove rear extension from transmission case.
b. Remove rear extension gasket from transmission case.

## Disassembly (Cont'd)

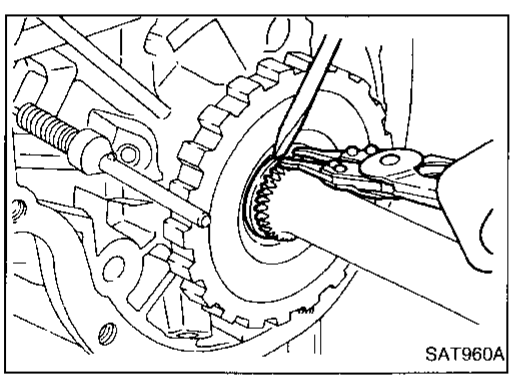

SAT190B

c. Remove oil seal from rear extension.

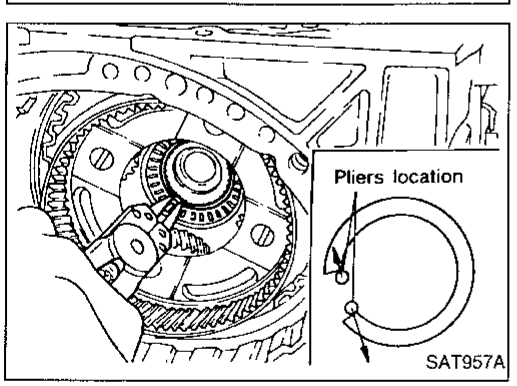
- **Do not remove oil seal unless it is to be replaced.**


SAT191B

d. Remove revolution sensor from rear extension.
e. Remove O-ring from revolution sensor.


SAT960A

19. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.

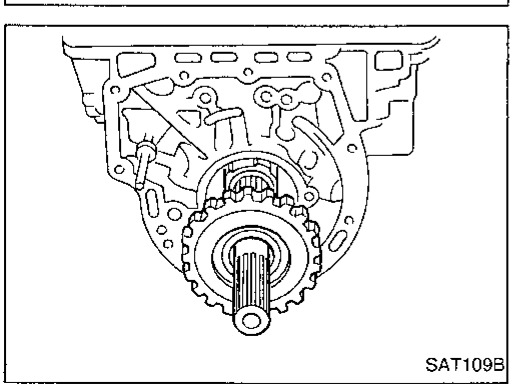


SAT957A

b. Slowly push output shaft all the way forward.

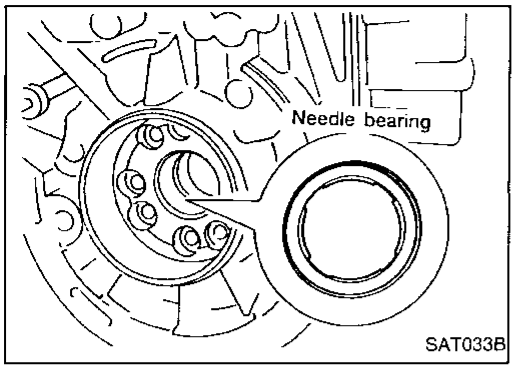
- **Do not use excessive force.**

c. Remove snap ring from output shaft.

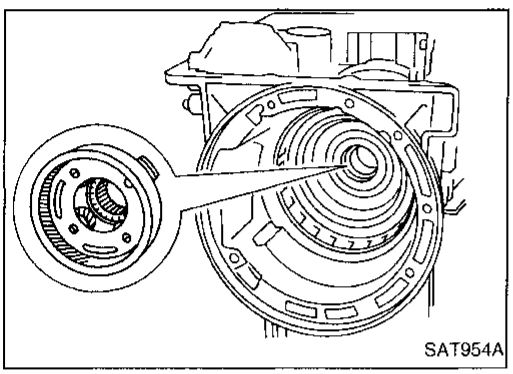

SAT109B

d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

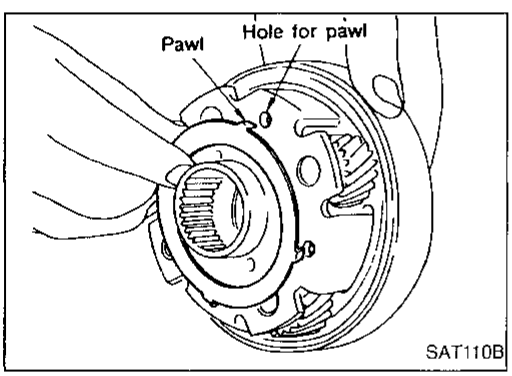
## Disassembly (Cont'd)



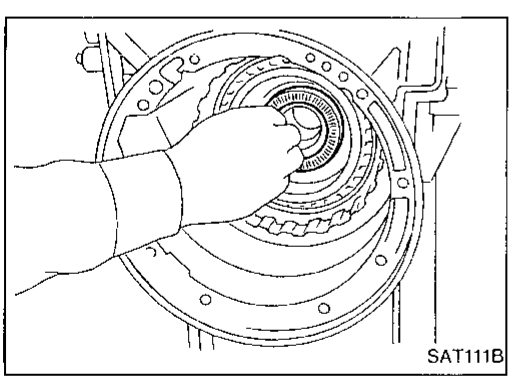

f. Remove needle bearing from transmission case.



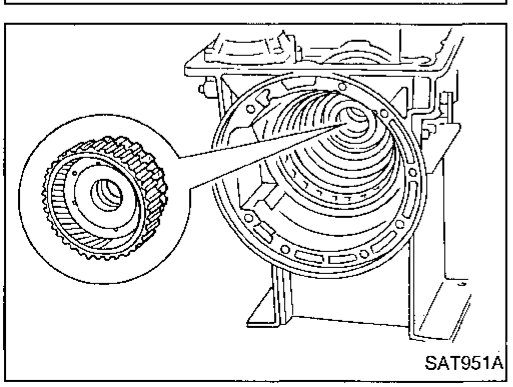

20. Remove rear side clutch and gear components.
a. Remove front internal gear.




b. Remove bearing race from front internal gear.

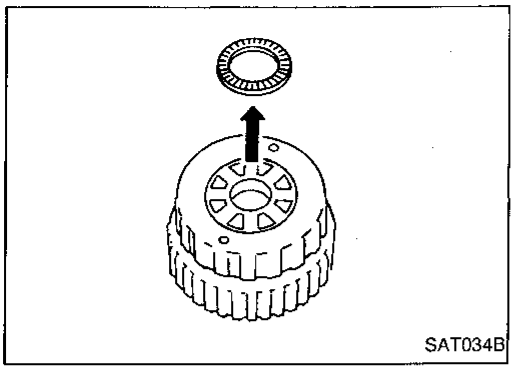



c. Remove needle bearing from rear internal gear.

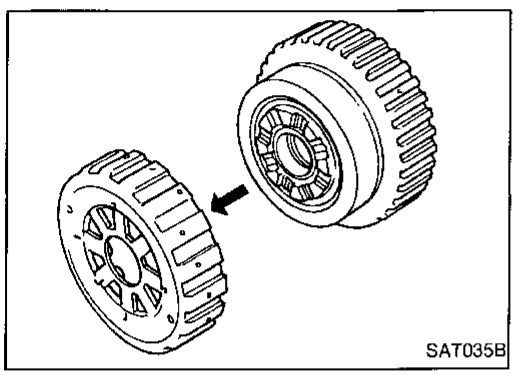



d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.

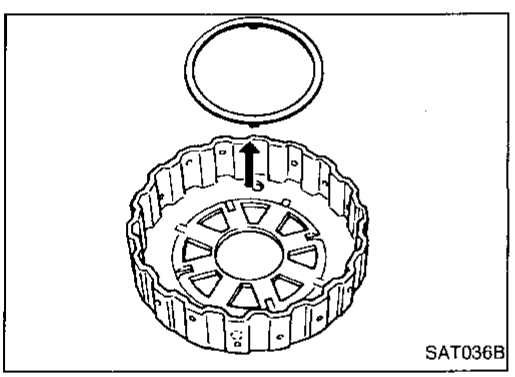
## Disassembly (Cont'd)


SAT034B

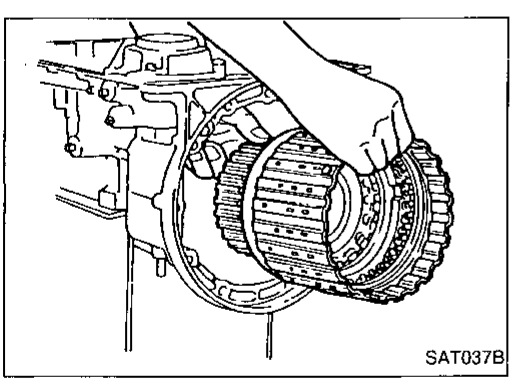
e. Remove needle bearing from overrun clutch hub.


SAT035B

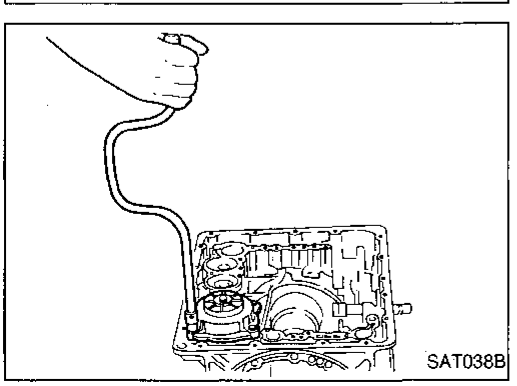
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.


SAT036B

g. Remove thrust washer from overrun clutch hub.

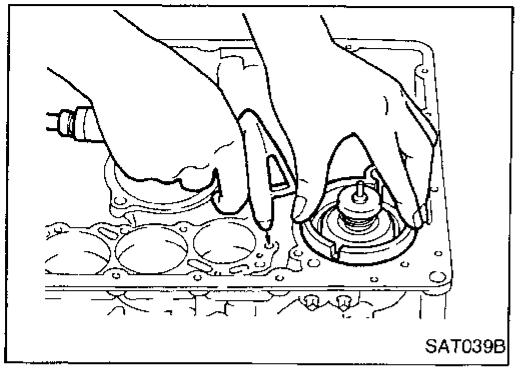

SAT037B

h. Remove forward clutch assembly from transmission case.


SAT038B

21. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.

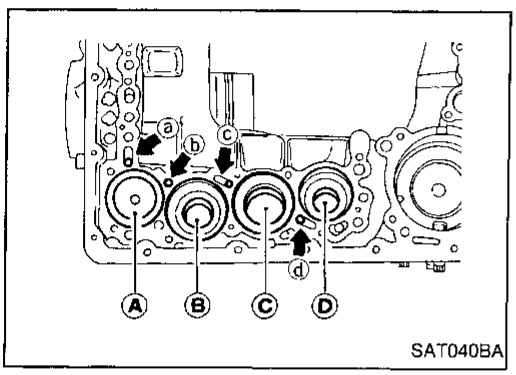
## Disassembly (Cont'd)


SAT039B

b. Apply compressed air to oil hole until band servo piston comes out of transmission case.

- **Hold piston with a rag and gradually direct air to oil hole.**

c. Remove return springs.

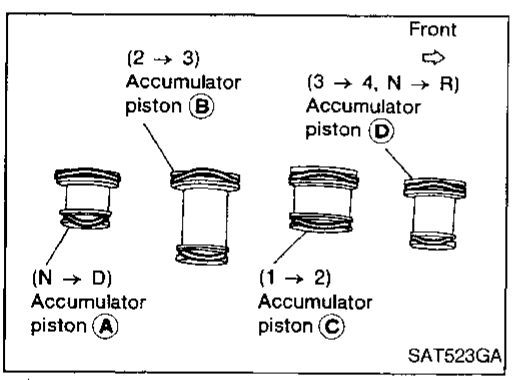


SAT040BA

d. Remove springs from accumulator pistons Ⓑ, Ⓒ and Ⓓ.
e. Apply compressed air to each oil hole until piston comes out.

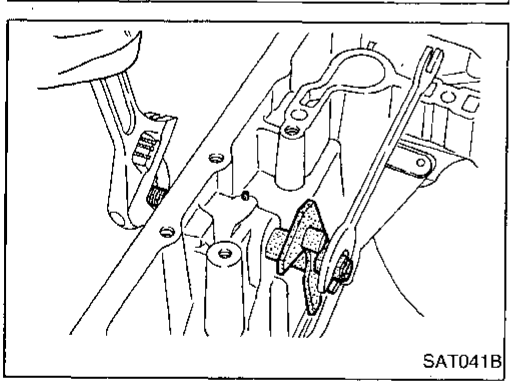
- **Hold piston with a rag and gradually direct air to oil hole.**

| Identification of accumulator pistons | Ⓐ | Ⓑ | Ⓒ | Ⓓ |
|---|---|---|---|---|
| Identification of oil holes | ⓐ | ⓑ | ⓒ | ⓓ |

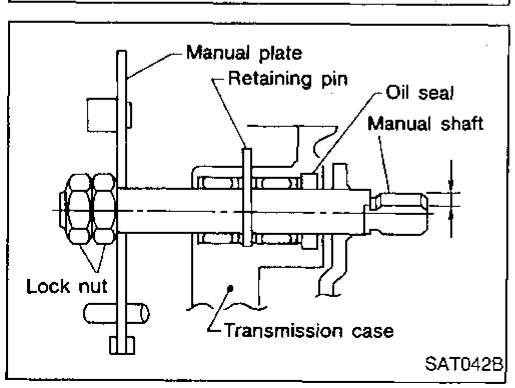


SAT523GA

f. Remove O-ring from each piston.


SAT041B

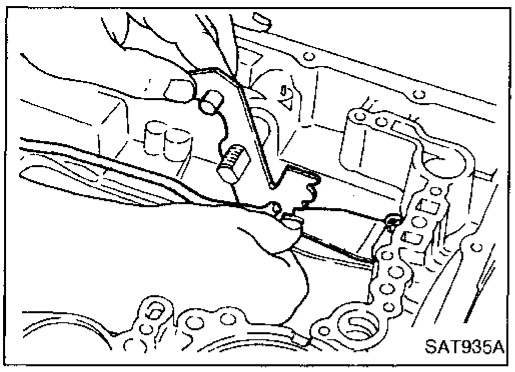
22. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.



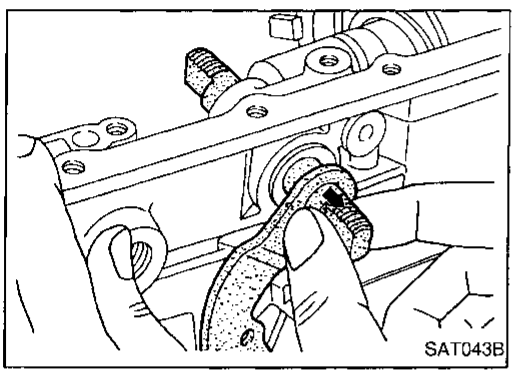
SAT042B

b. Remove retaining pin from transmission case.

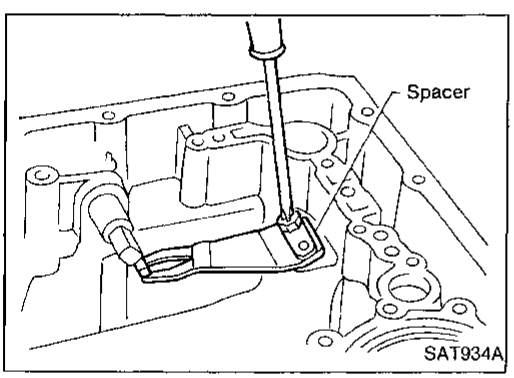
## Disassembly (Cont'd)



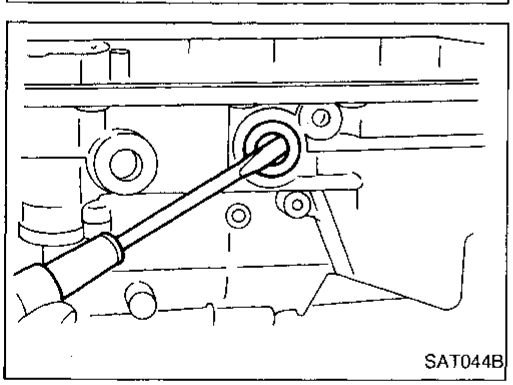

c. While pushing detent spring down, remove manual plate and parking rod from transmission case.




d. Remove manual shaft from transmission case.

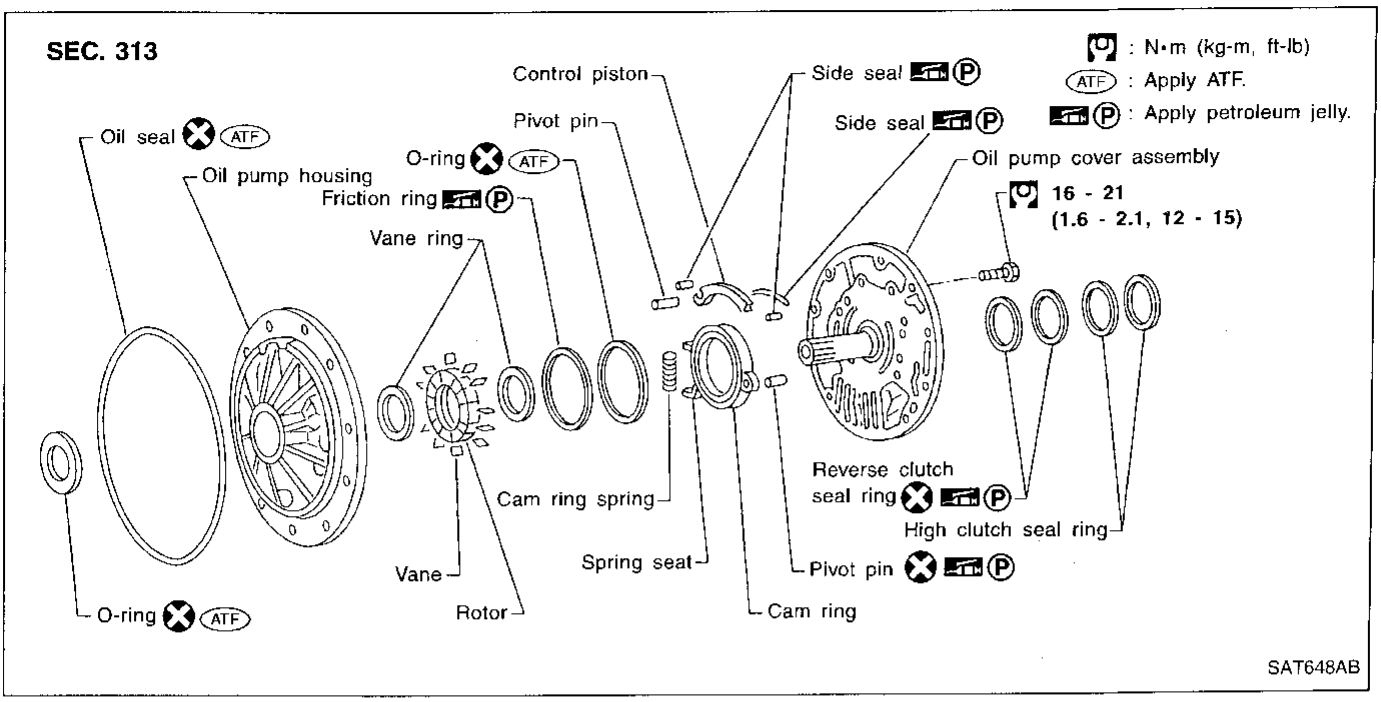


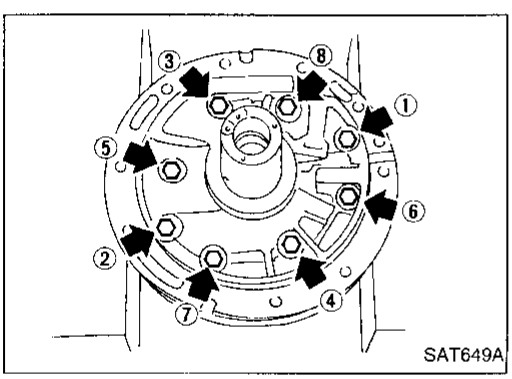

e. Remove spacer and detent spring from transmission case.




f. Remove oil seal from transmission case.

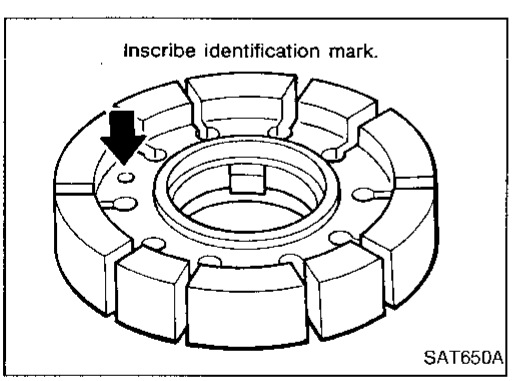
## Oil Pump



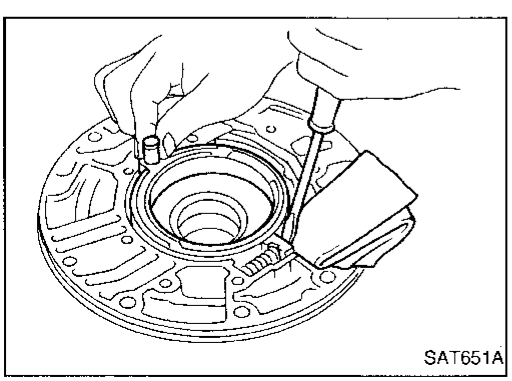




### DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.

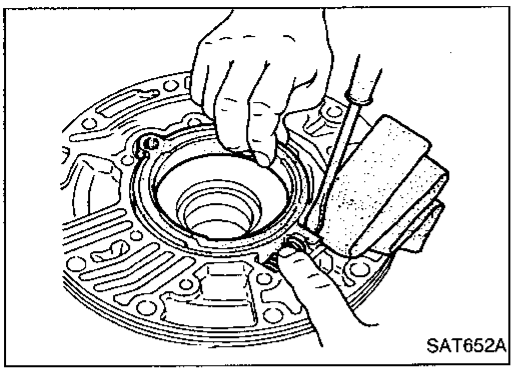



2. Remove rotor, vane rings and vanes.
- **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**

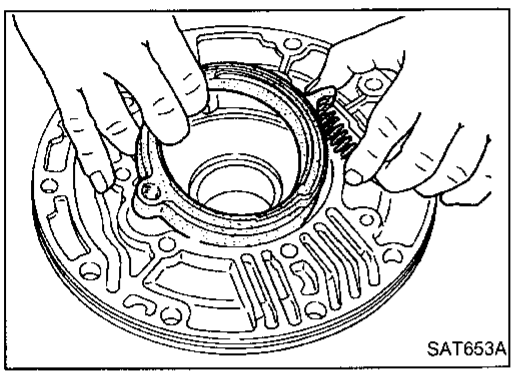



3. While pushing on cam ring remove pivot pin.
- **Be careful not to scratch oil pump housing.**

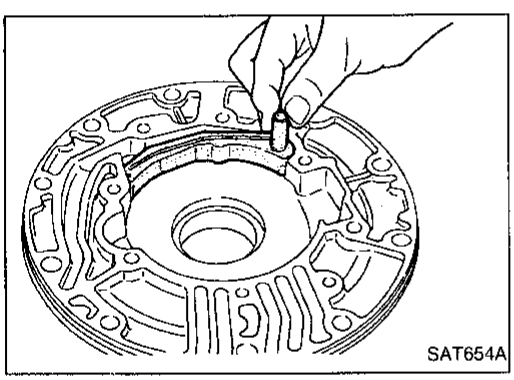
## Oil Pump (Cont'd)


SAT652A

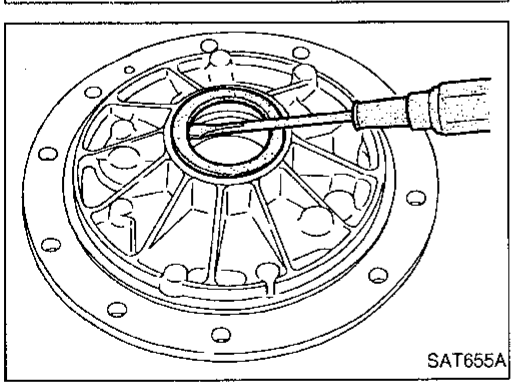
4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**


SAT653A

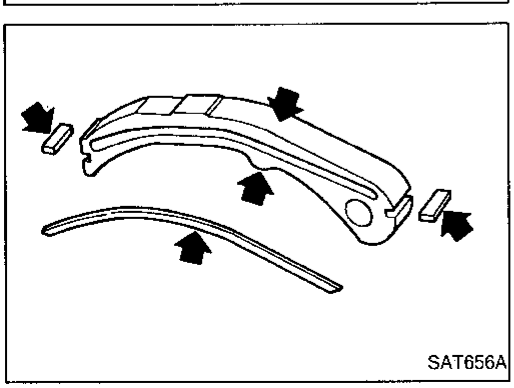
5. Remove cam ring and cam ring spring from oil pump housing.


SAT654A

6. Remove pivot pin from control piston and remove control piston assembly.


SAT655A

7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**

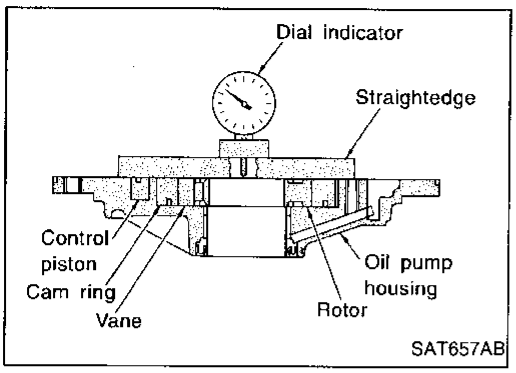

SAT656A

### INSPECTION

**Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring**

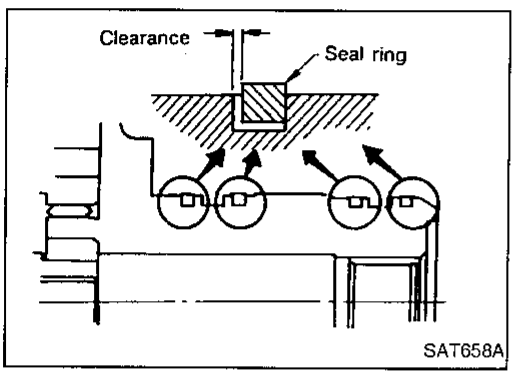
- Check for wear or damage.

## Oil Pump (Cont'd)




### Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston. Measure in at least four places along their circumferences. Maximum measured values should be within specified positions.
- **Before measurement, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.**
  **Standard clearance (Cam ring, rotor, vanes and control piston):**
  **Refer to SDS, AT-265.**
- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.

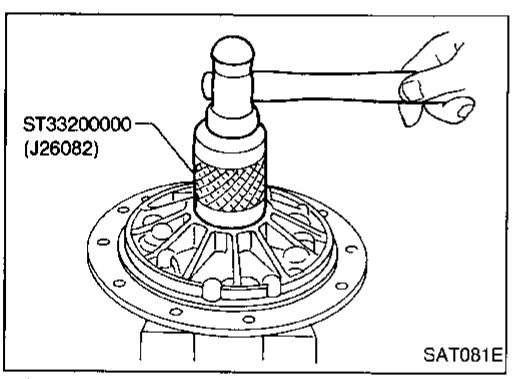



### Seal ring clearance

- Measure clearance between seal ring and ring groove.
  **Standard clearance:**
  **0.10 - 0.25 mm (0.0039 - 0.0098 in)**
  **Wear limit:**
  **0.25 mm (0.0098 in)**
- If not within wear limit, replace oil pump cover assembly.

### ASSEMBLY

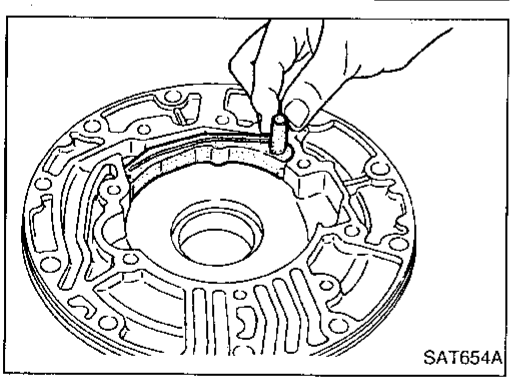
1. Drive oil seal into oil pump housing.
- **Apply ATF to outer periphery and lip surface.**



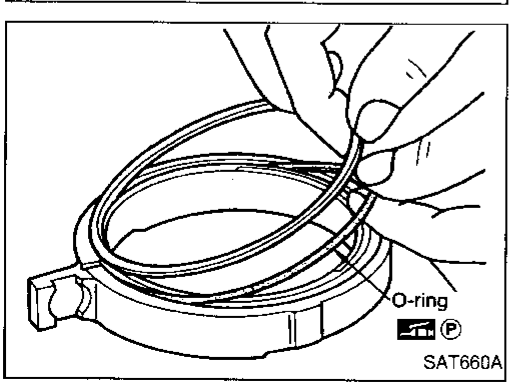

2. Install cam ring in oil pump housing by the following steps.

a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

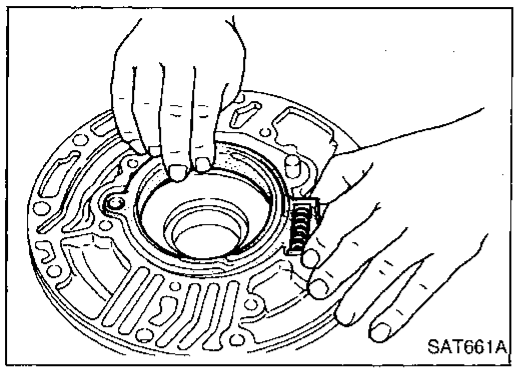
b. Install control piston on oil pump.



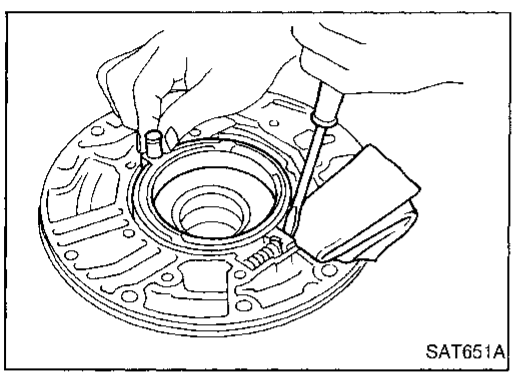

c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**



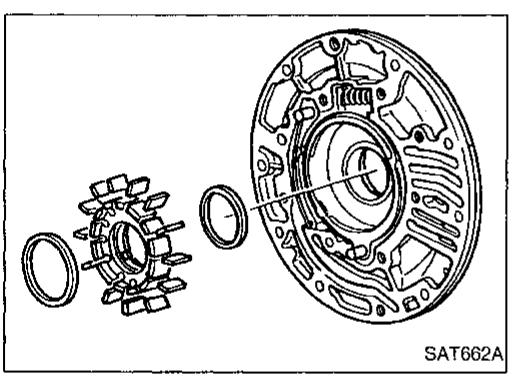
## Oil Pump (Cont'd)



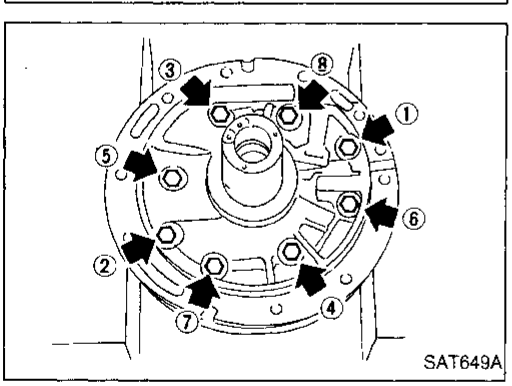

d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.



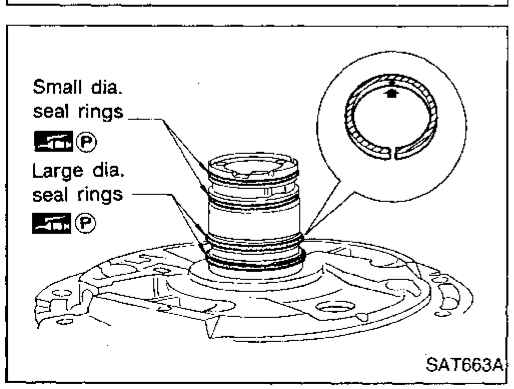

e. While pushing on cam ring install pivot pin.




3. Install rotor, vanes and vane rings.
- **Pay attention to direction of rotor.**



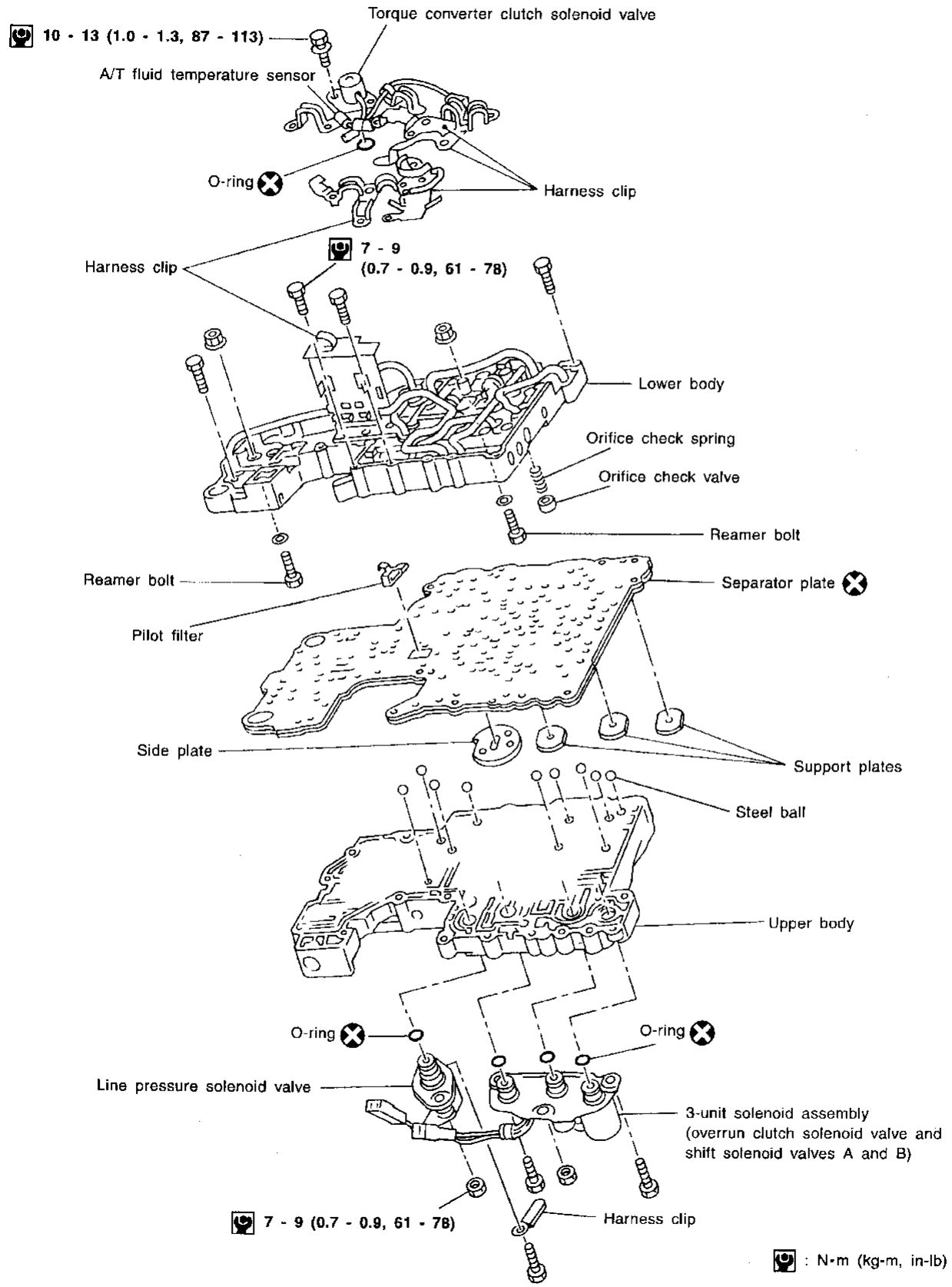

4. Install oil pump housing and oil pump cover.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
b. Tighten bolts in a criss-cross pattern.




5. Install new seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.
- **Seal rings come in two different diameters. Check fit carefully in each groove.**
  **Small dia. seal ring:**
  **No mark**
  **Large dia. seal ring:**
  **Yellow mark in area shown by arrow**
- **Do not spread gap of seal ring excessively while installing. It may deform ring.**

## Control Valve Assembly

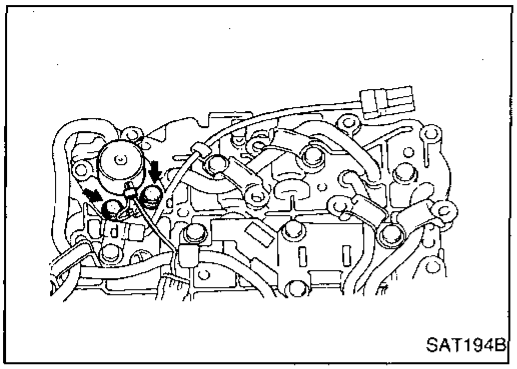
SEC. 317



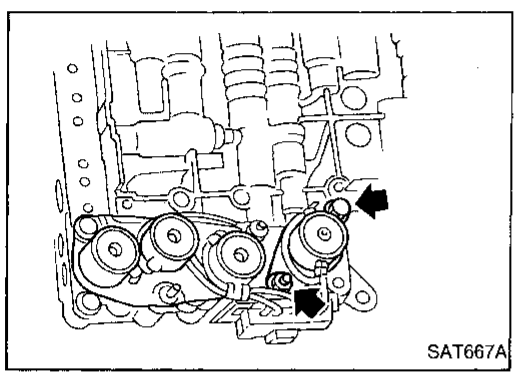

SAT191J

## Control Valve Assembly (Cont'd)

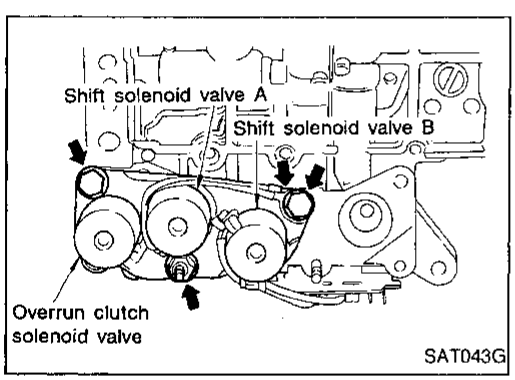
### DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove torque converter clutch solenoid valve and side plate from lower body.
b. Remove O-ring from solenoid.

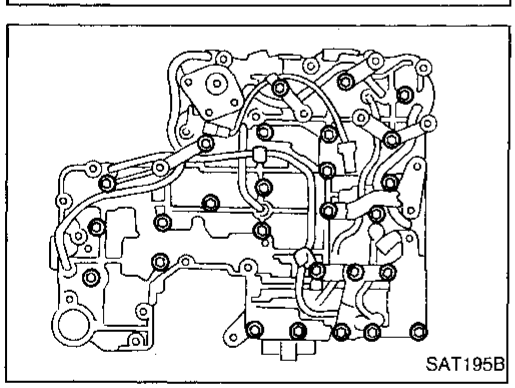

SAT667A

c. Remove line pressure solenoid valve from upper body.
d. Remove O-ring from solenoid.



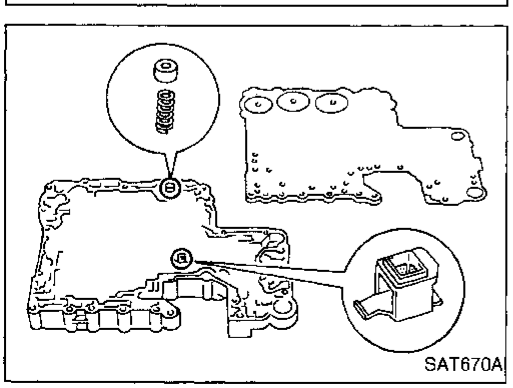
SAT043G

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

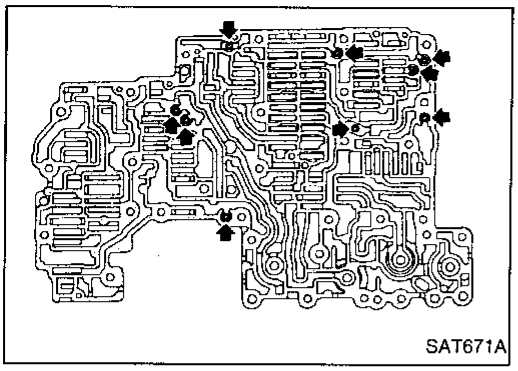
2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

- **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**


SAT670A

c. Place lower body facedown, and remove separate gasket and separator plate.
d. Remove pilot filter, orifice check valve and orifice check spring.

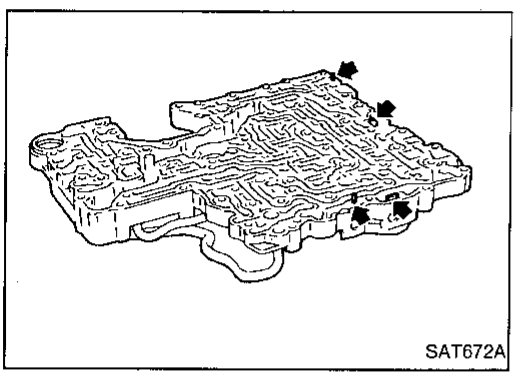
## Control Valve Assembly (Cont'd)


SAT671A

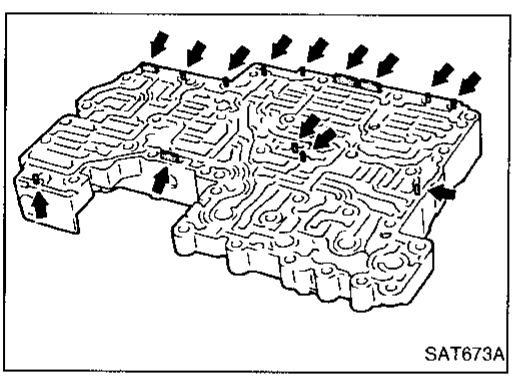
e. Check to see that steel balls are properly positioned in upper body. Then remove them from upper body.

### INSPECTION

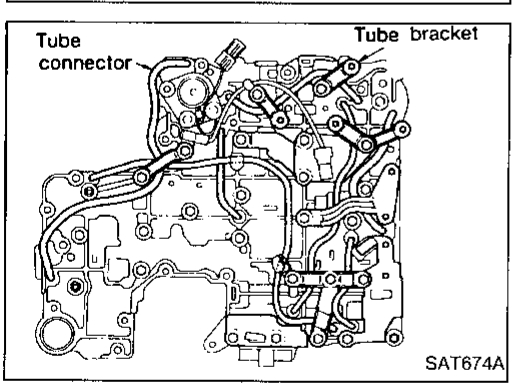
#### Lower and upper bodies


SAT672A

- Check to see that there are pins and retainer plates in lower body.


SAT673A

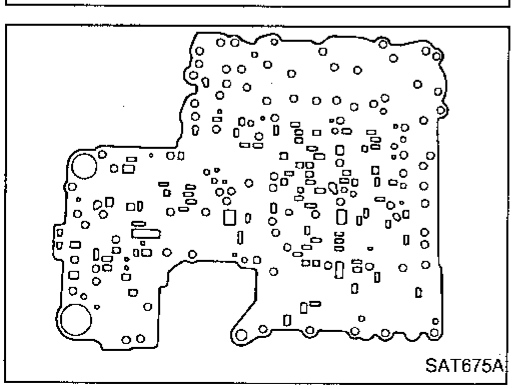
- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

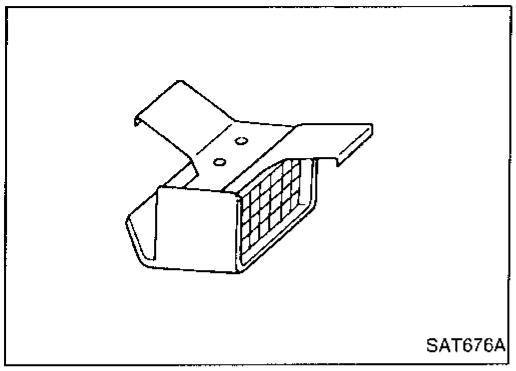
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.

#### Separator plates


SAT675A

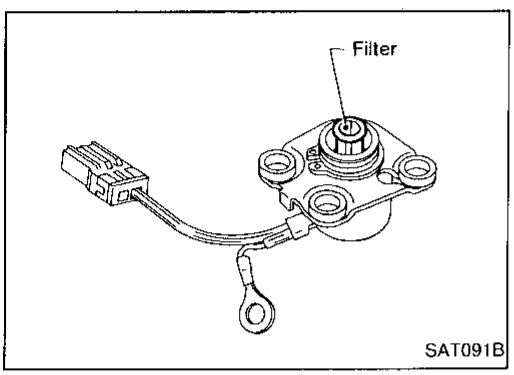
- Make sure that separator plate is free of damage and not deformed and oil holes are clean.

## Control Valve Assembly (Cont'd)


SAT676A

### Pilot filter

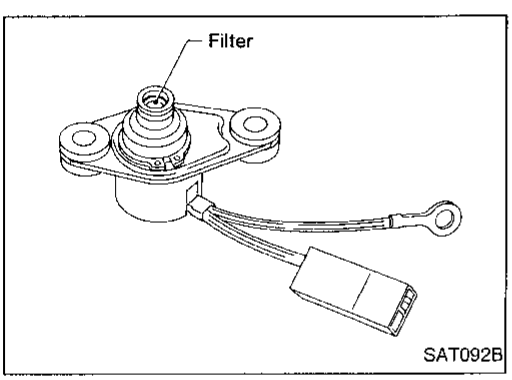
- Check to make sure that filter is not clogged or damaged.



SAT091B

### Torque converter clutch solenoid valve

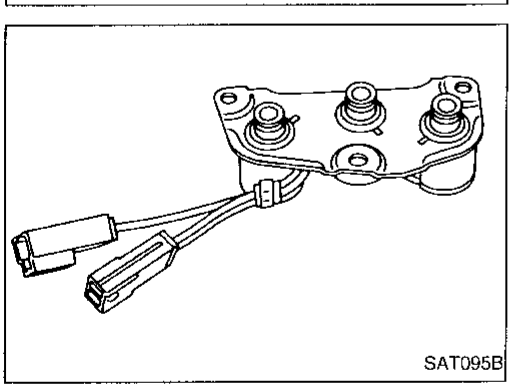
- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-112.



SAT092B

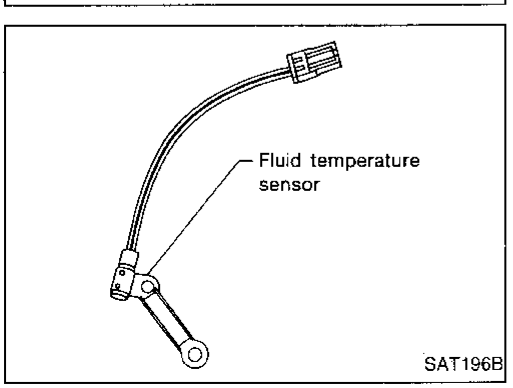
### Line pressure solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-112.


SAT095B

### 3-unit solenoid assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

- Measure resistance of each solenoid. Refer to "Component Inspection", AT-112.



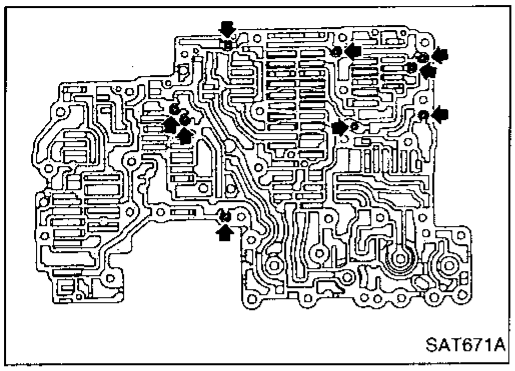
SAT196B

### A/T fluid temperature sensor

- Measure resistance. Refer to "Component Inspection", AT-149.

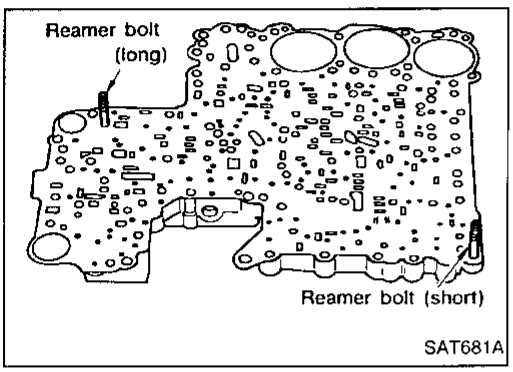
## Control Valve Assembly (Cont'd)

### ASSEMBLY


SAT671A

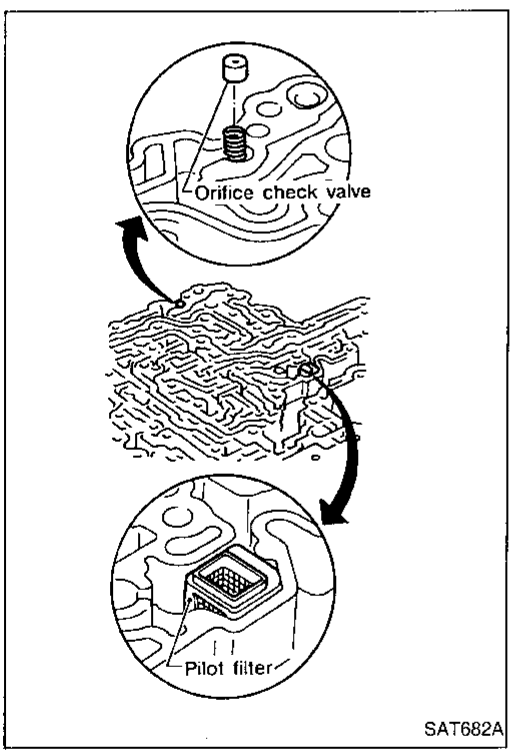
1. Install upper and lower bodies.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



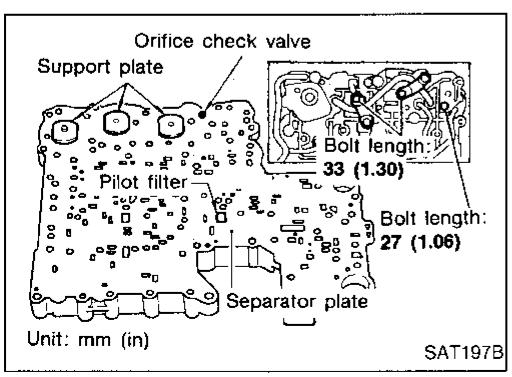
SAT681A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



SAT682A

c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.

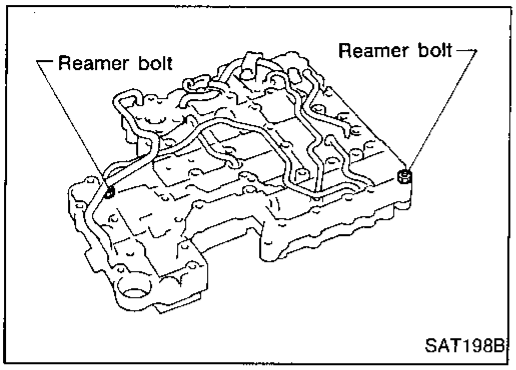


SAT197B

d. Install lower separate gaskets and separator plates on lower body.

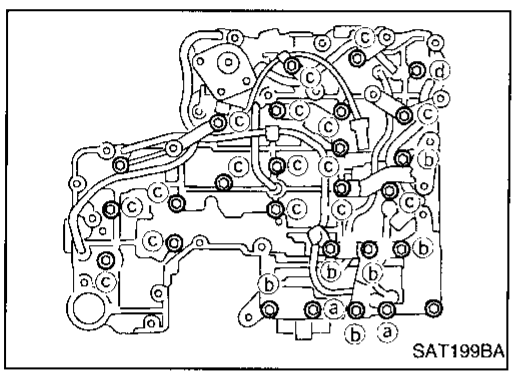
e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

## Control Valve Assembly (Cont'd)




f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

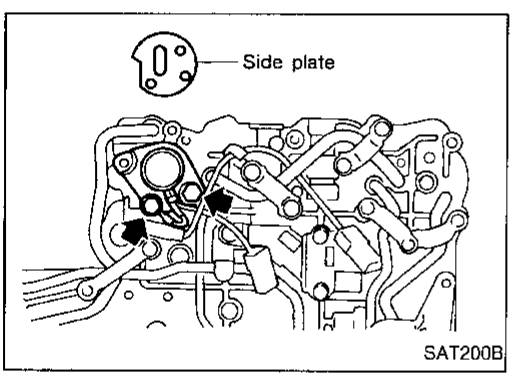
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**




g. Install and temporarily tighten bolts and tube brackets in their proper locations.

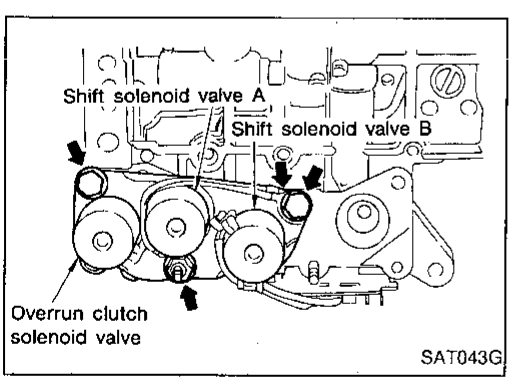
**Bolt length and location:**

| Bolt symbol | | ⓐ | ⓑ | ⓒ | ⓓ |
|---|---|---|---|---|---|
| Bolt length | mm (in) | 70 (2.76) | 50 (1.97) | 33 (1.30) | 27 (1.06) |

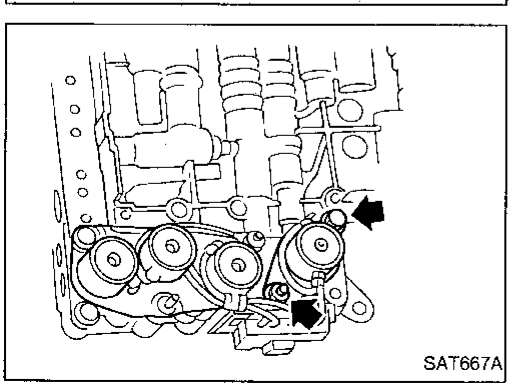



2. Install solenoids.

a. Attach O-ring and install torque converter clutch solenoid valve and side plates onto lower body.



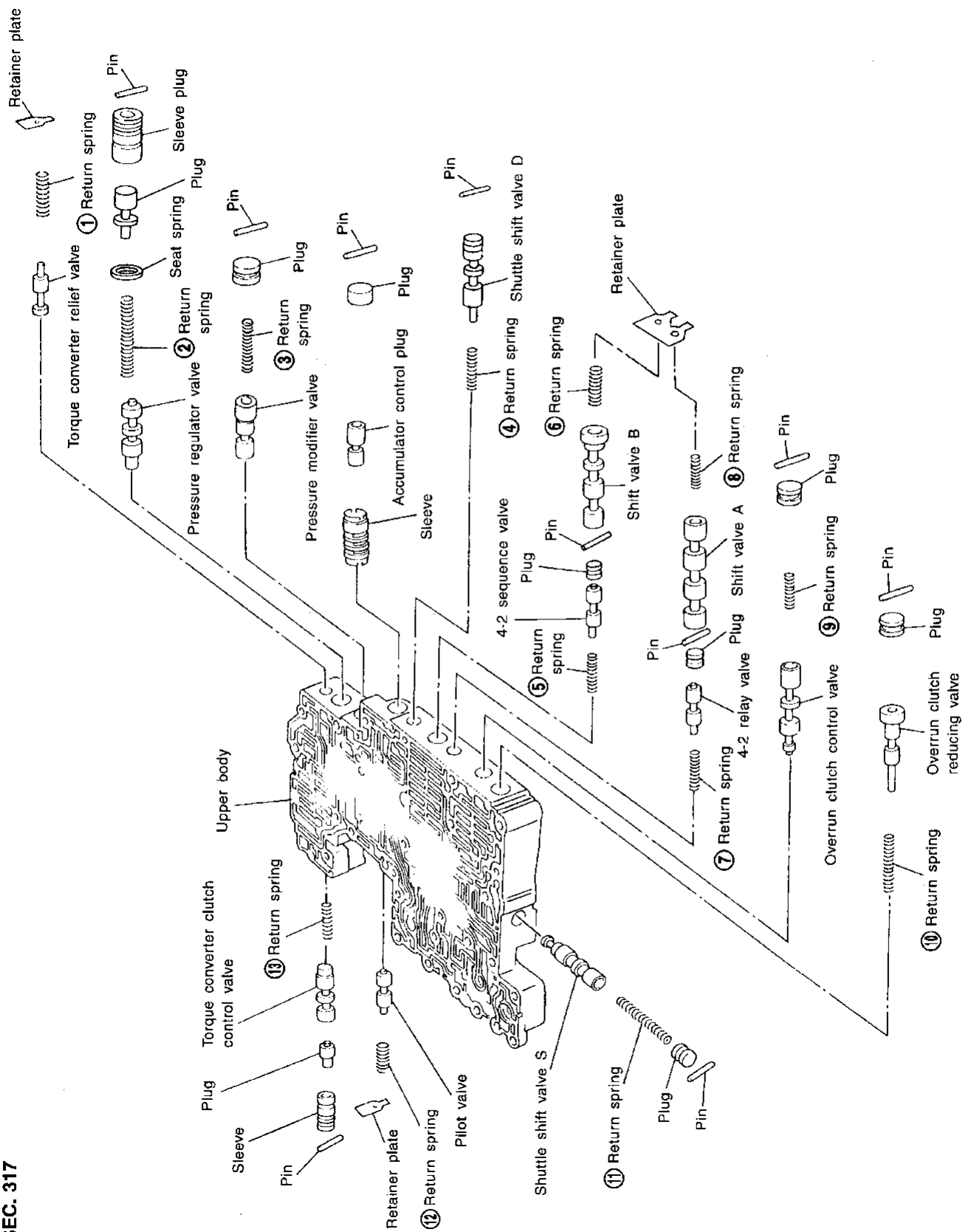

b. Attach O-rings and install 3-unit solenoids assembly onto upper body.




c. Attach O-ring and install line pressure solenoid valve onto upper body.

3. Tighten all bolts.

## Control Valve Upper Body




SEC. 317

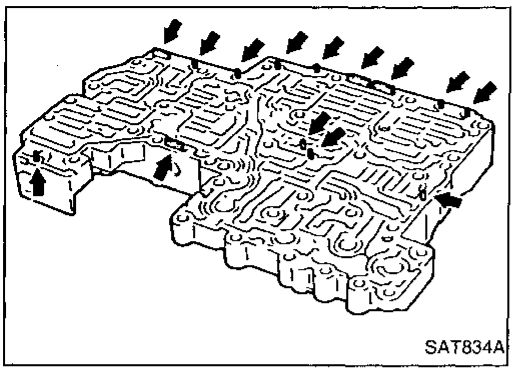
Apply ATF to all components before their installation.

Numbers preceding valve springs correspond with those shown in SDS on page AT-263.

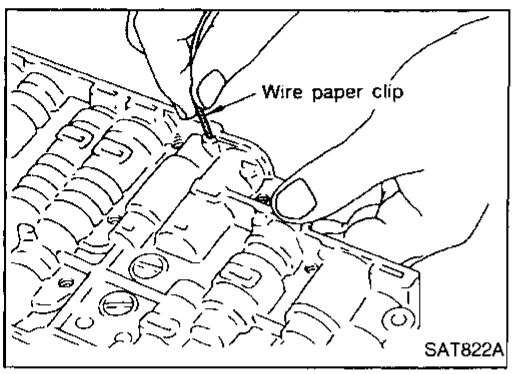
SAT192J

## Control Valve Upper Body (Cont'd)

### DISASSEMBLY

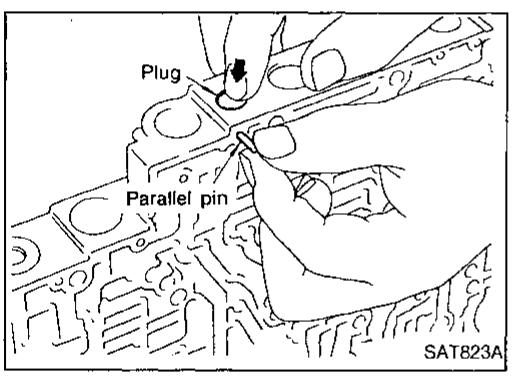

SAT834A

1. Remove valves at parallel pins.
- **Do not use a magnetic hand.**



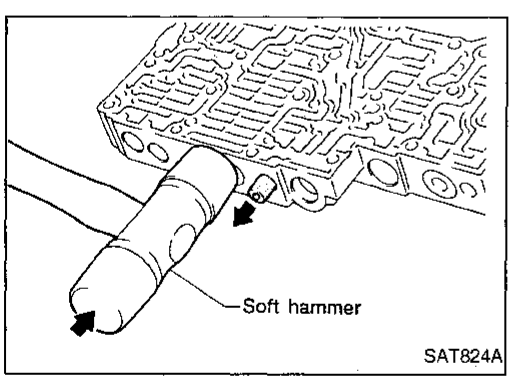
SAT822A

a. Use a wire paper clip to push out parallel pins.



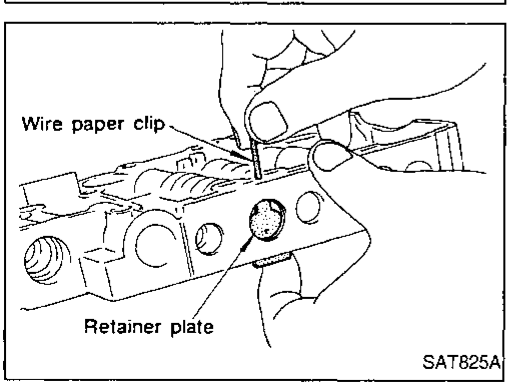
SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

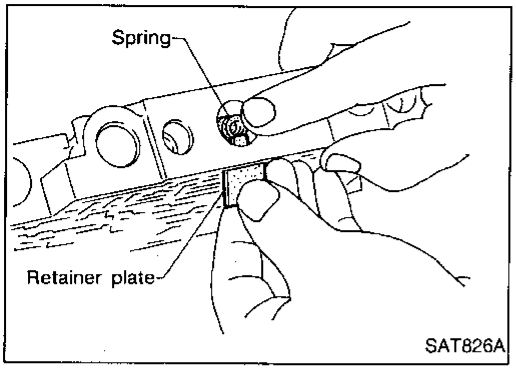
c. Place mating surface of valve facedown, and remove internal parts.
- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**



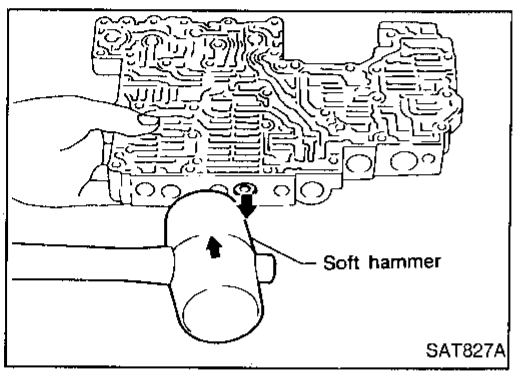
SAT825A

2. Remove valves at retainer plates.
a. Pry out retainer plate with wire paper clip.

## Control Valve Upper Body (Cont'd)

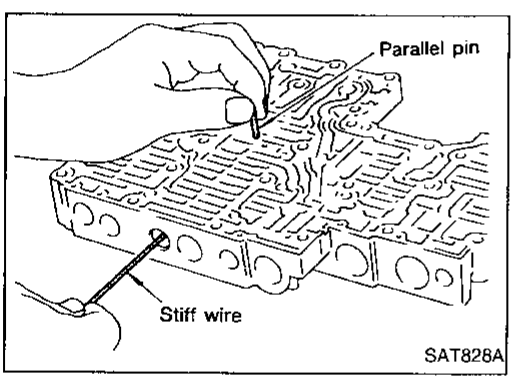



b. Remove retainer plates while holding spring.

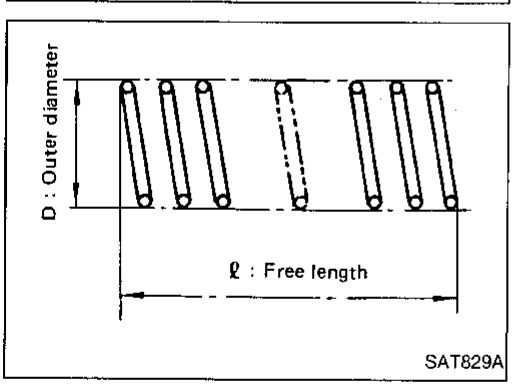



c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, lightly tap valve body with a soft hammer.**
- **Be careful not to drop or damage valves, sleeves, etc.**




- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- **Be careful not to scratch sliding surface of valve with wire.**



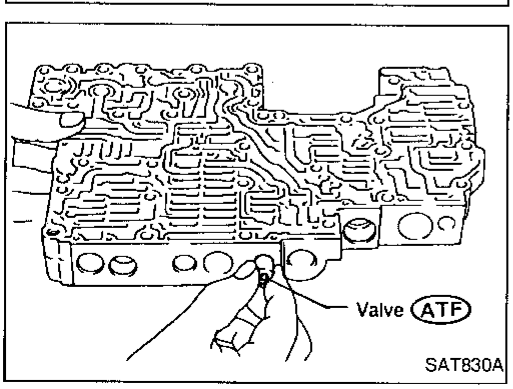

### INSPECTION

#### Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
  **Inspection standard:**
  **Refer to SDS, AT-263.**
- Replace valve springs if deformed or fatigued.

#### Control valves

- Check sliding surfaces of valves, sleeves and plugs.

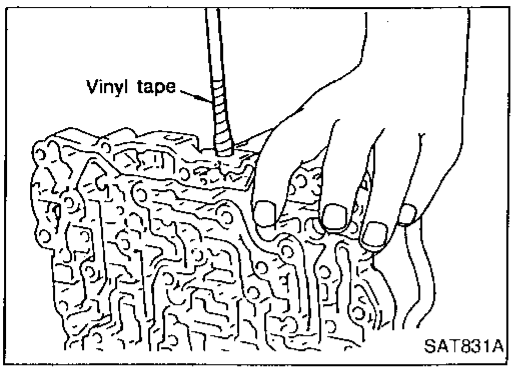



### ASSEMBLY

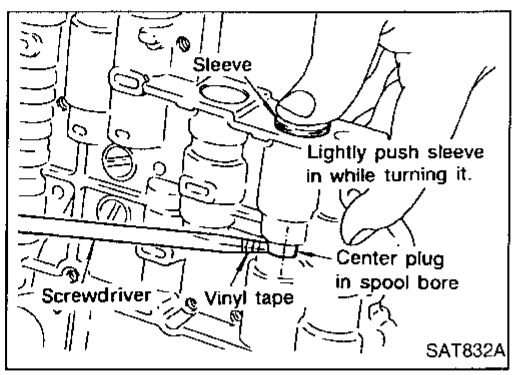
1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.

- **Be careful not to scratch or damage valve body.**

## Control Valve Upper Body (Cont'd)

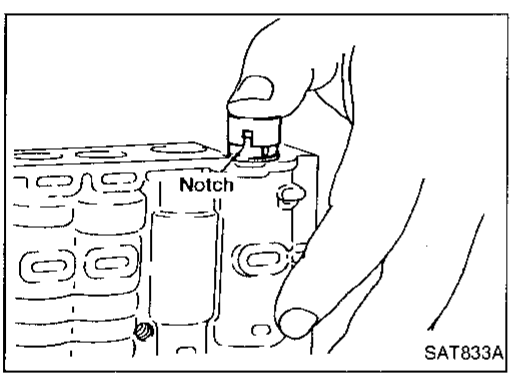



- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



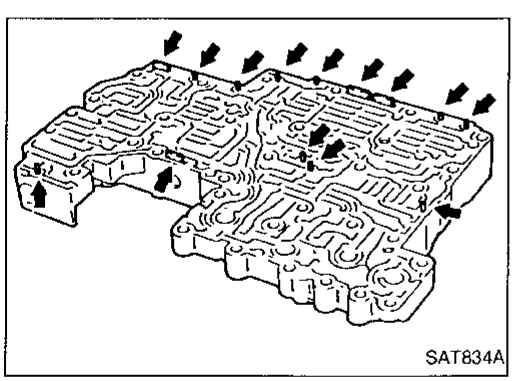

### Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body.
  If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

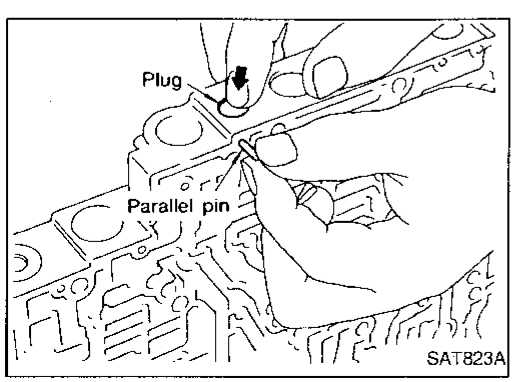



### Accumulator control valve

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



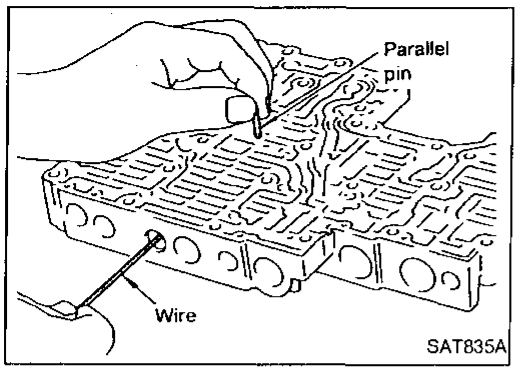

2. Install parallel pins and retainer plates.



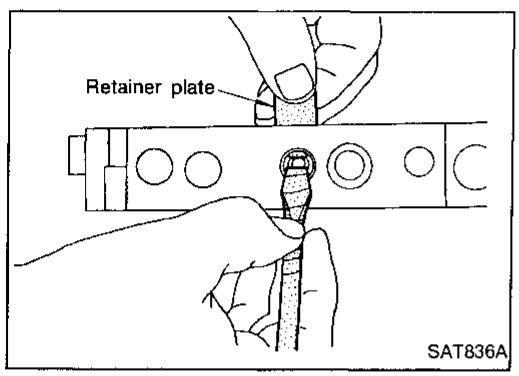

- **While pushing plug, install parallel pin.**

## Control Valve Upper Body (Cont'd)

### 4-2 sequence valve and relay valve

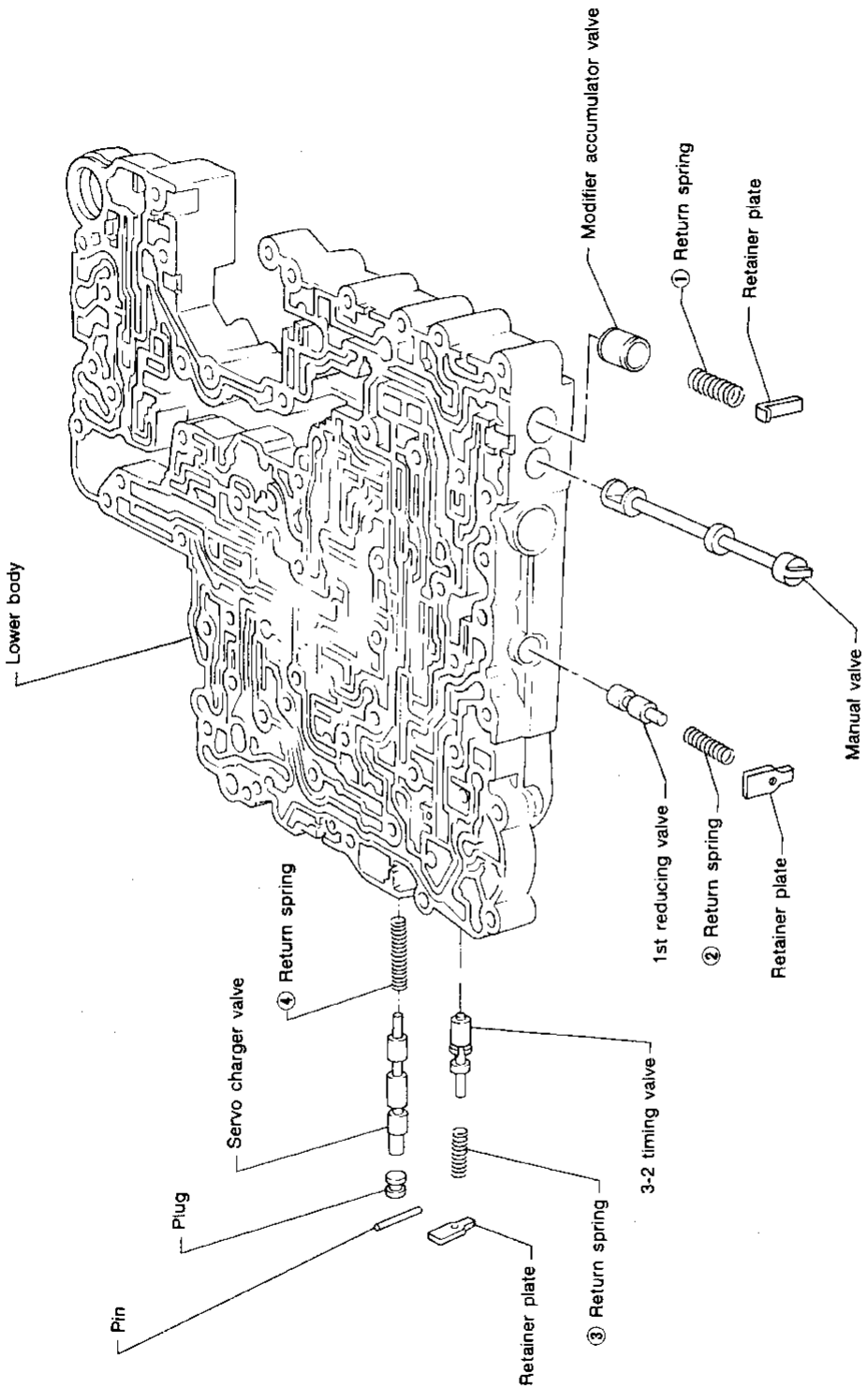



- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.




- Insert retainer plate while pushing spring.

## Control Valve Lower Body

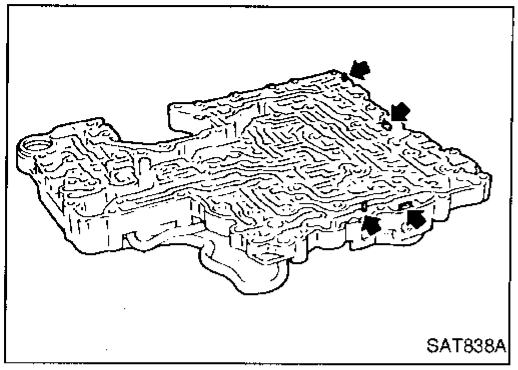



SEC. 317

Apply ATF to all components before their installation.
Numbers preceding valve springs correspond with those shown in SDS on page AT-263.

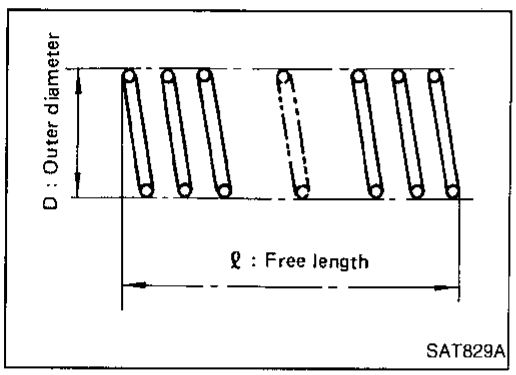
SAT112GB

## Control Valve Lower Body (Cont'd)


SAT838A

### DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body, AT-213.



SAT829A

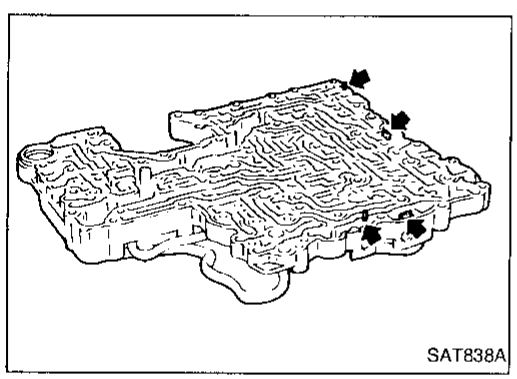
### INSPECTION

#### Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
  **Inspection standard:**
  **Refer to SDS, AT-263.**
- Replace valve springs if deformed or fatigued.

#### Control valves

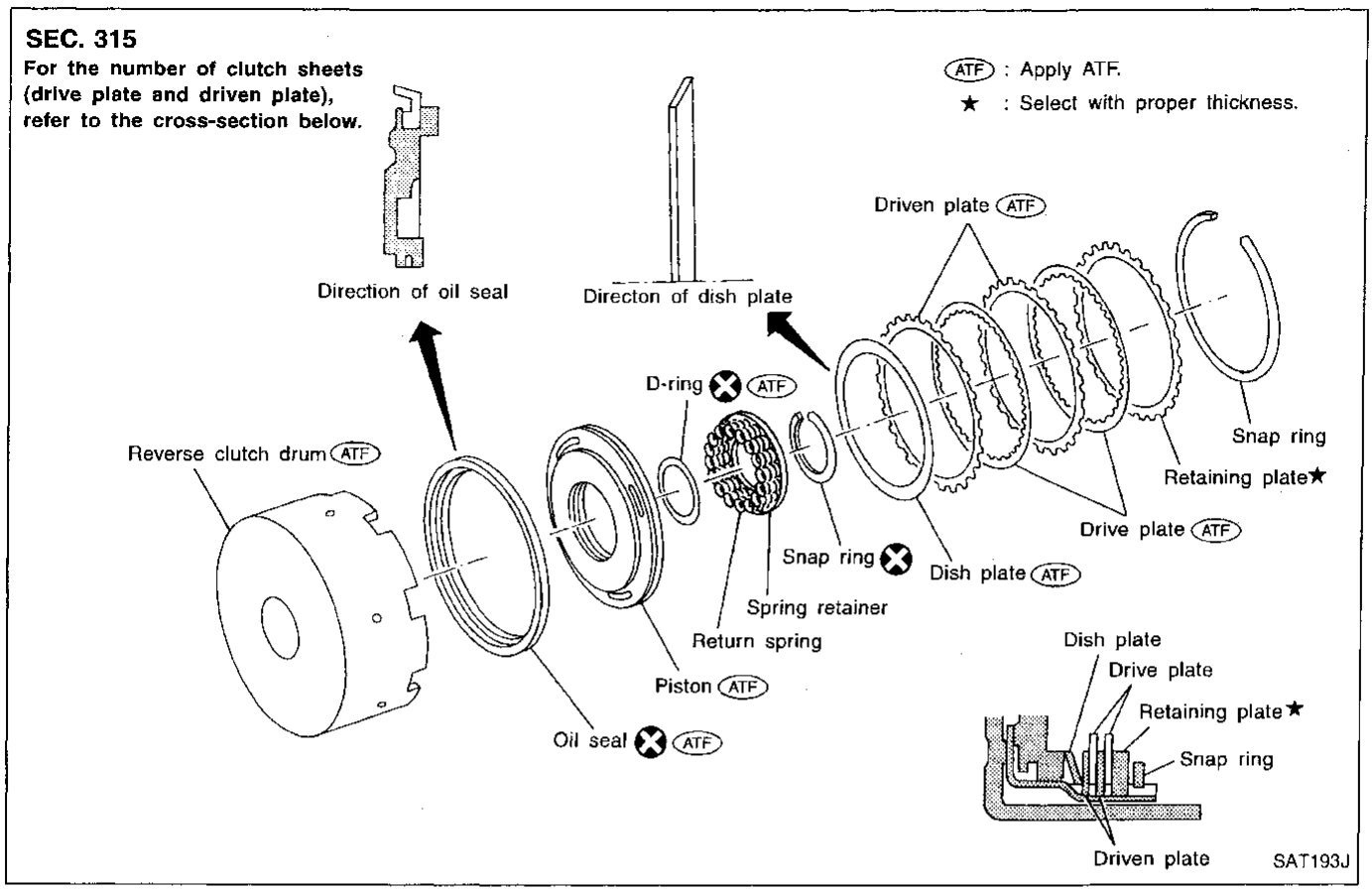
- Check sliding surfaces of control valves, sleeves and plugs for damage.


SAT838A

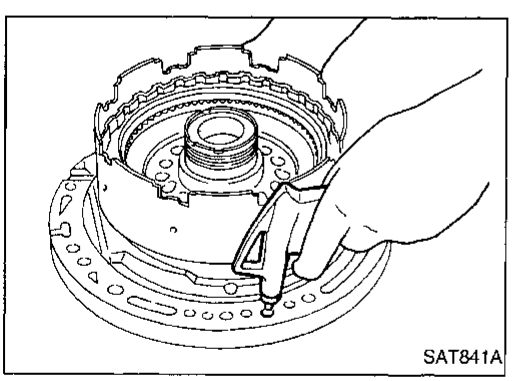
### ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body, AT-214.

## Reverse Clutch

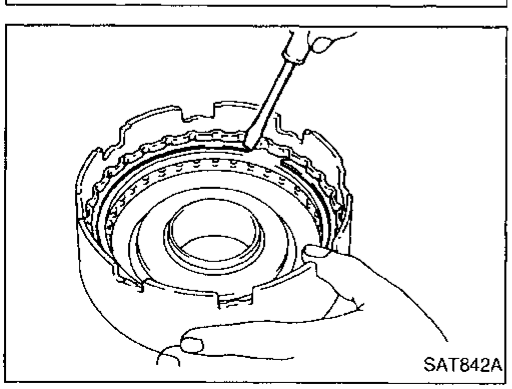




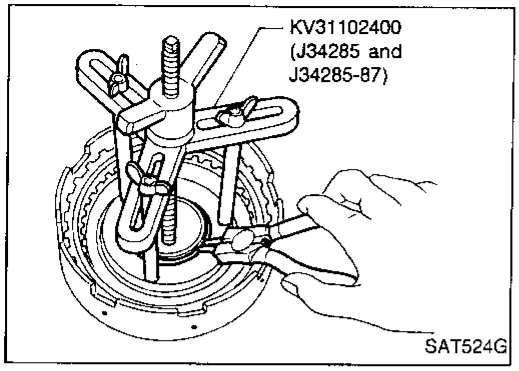

### DISASSEMBLY

1. Check operation of reverse clutch.
a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not contact snap ring,
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

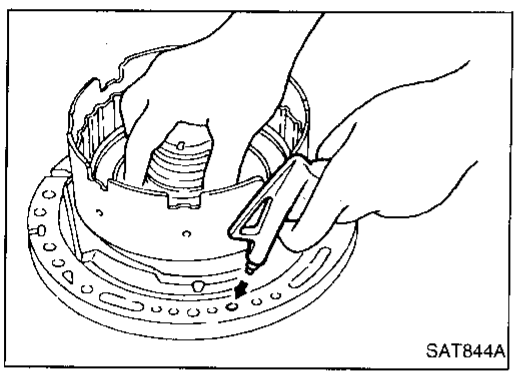



2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.

## Reverse Clutch (Cont'd)




3. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**
4. Remove spring retainer and return spring.

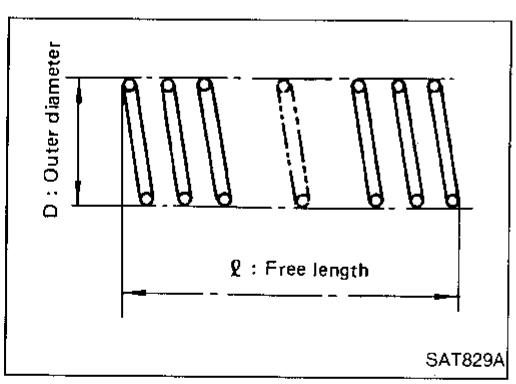



5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**
6. Remove D-ring and oil seal from piston.

### INSPECTION

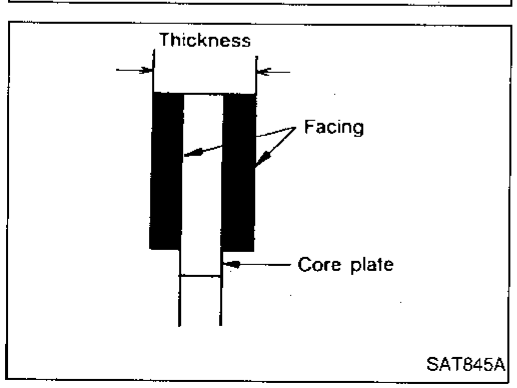
#### Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.




#### Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.
  **Inspection standard:**
  **Refer to SDS, AT-263.**




#### Reverse clutch drive plates

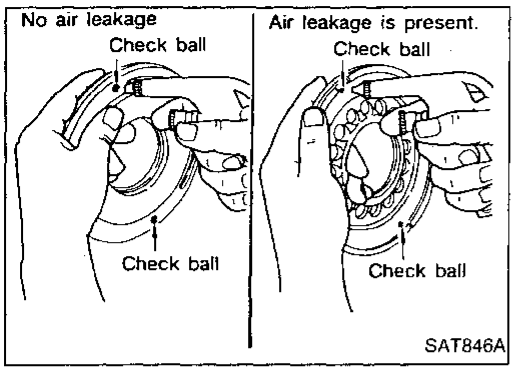
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  **Thickness of drive plate:**
  **Standard value 2.0 mm (0.079 in)**
  **Wear limit 1.8 mm (0.071 in)**
- If not within wear limit, replace.

#### Reverse clutch dish plate

- Check for deformation or damage.

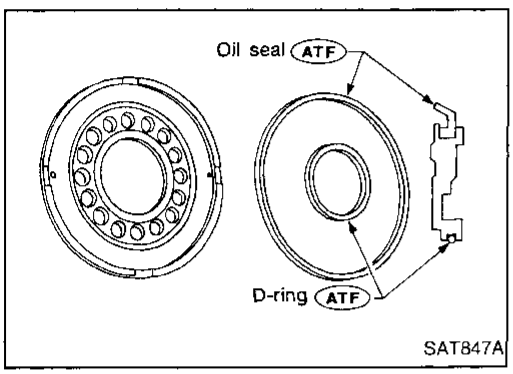
## Reverse Clutch (Cont'd)

### Reverse clutch piston

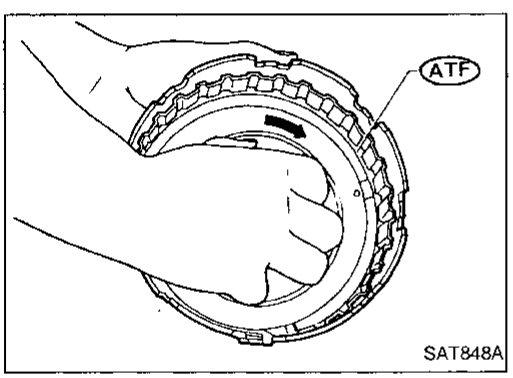



- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

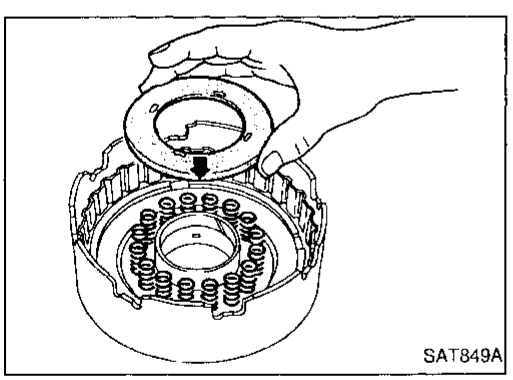
### ASSEMBLY



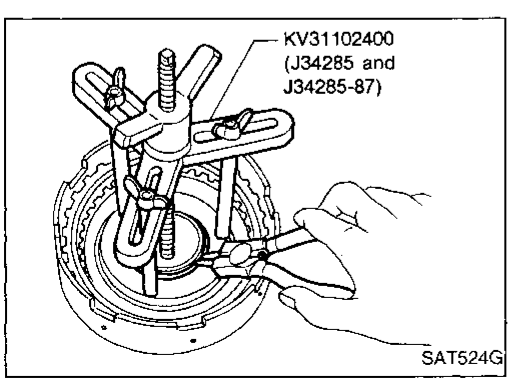

1. Install D-ring and oil seal on piston.
- **Apply ATF to both parts.**




2. Install piston assembly by turning it slowly and evenly.
- **Apply ATF to inner surface of drum.**

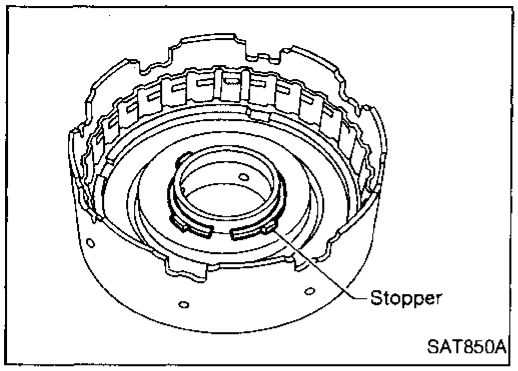



3. Install return springs and spring retainer.

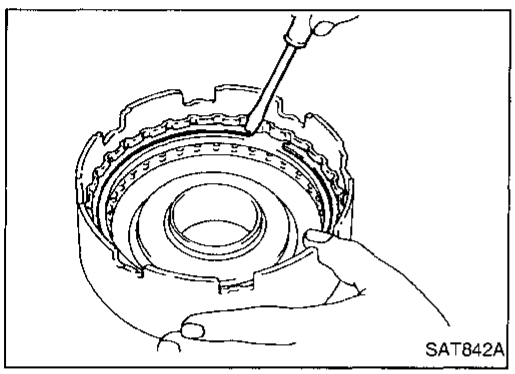



4. Install snap ring while compressing clutch springs.

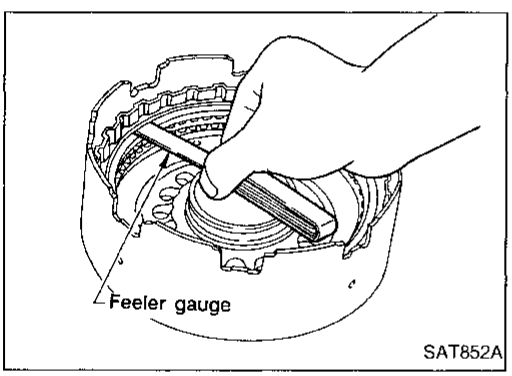
## Reverse Clutch (Cont'd)



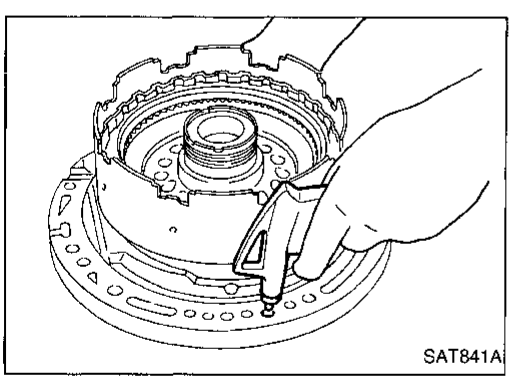

- **Do not align snap ring gap with spring retainer stopper.**




5. Install drive plates, driven plates, retaining plate and dish plate.
6. Install snap ring.




7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   **Specified clearance:**
   **Standard**
   **0.5 - 0.8 mm (0.020 - 0.031 in)**
   **Allowable limit**
   **1.2 mm (0.047 in)**
   **Retaining plate:**
   **Refer to SDS, AT-264.**

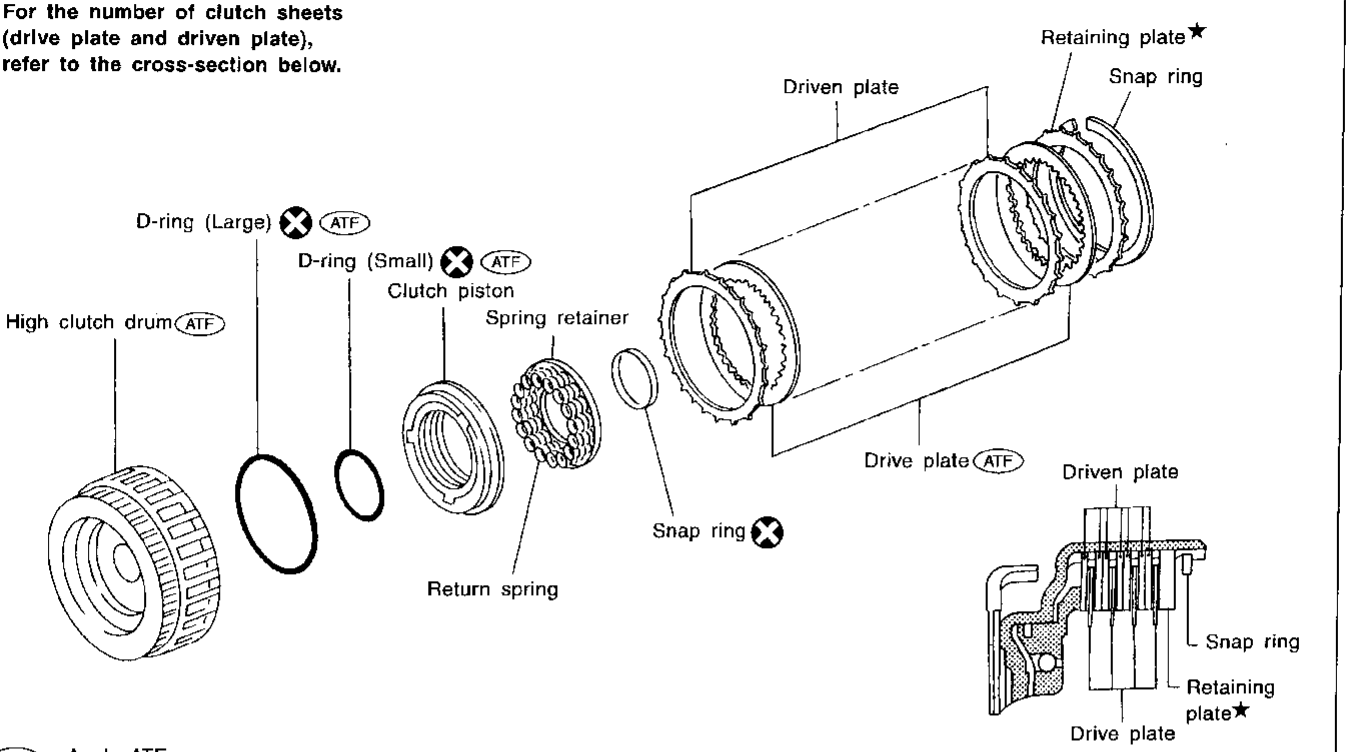



8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch, AT-219.

## High Clutch

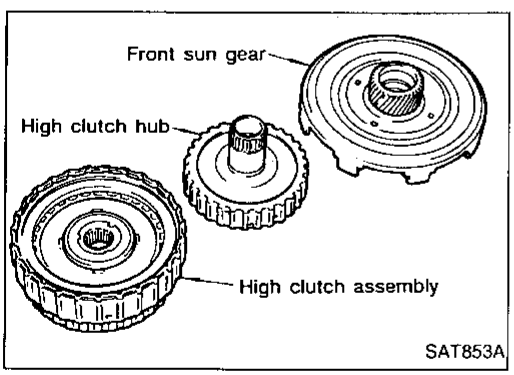
**SEC. 315**

**For the number of clutch sheets (drive plate and driven plate), refer to the cross-section below.**




(ATF) : Apply ATF.
★ : Select with proper thickness.

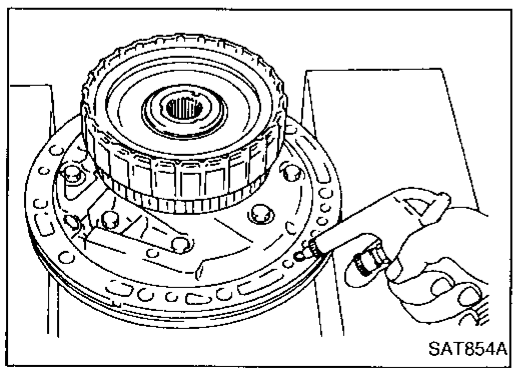
SAT194J




SAT853A

### DISASSEMBLY AND ASSEMBLY

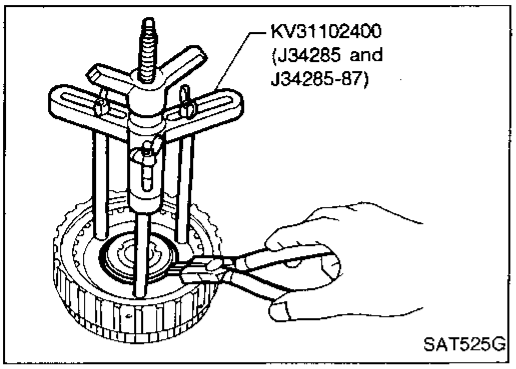
Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:



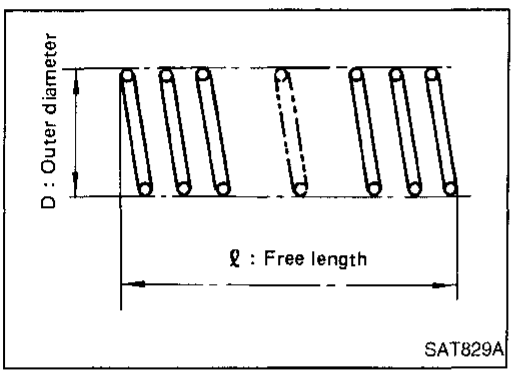
SAT854A

- Check of high clutch operation

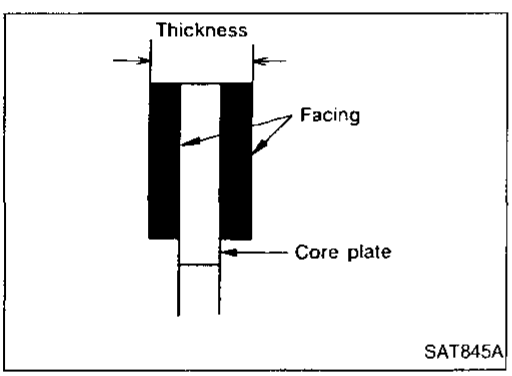
## High Clutch (Cont'd)



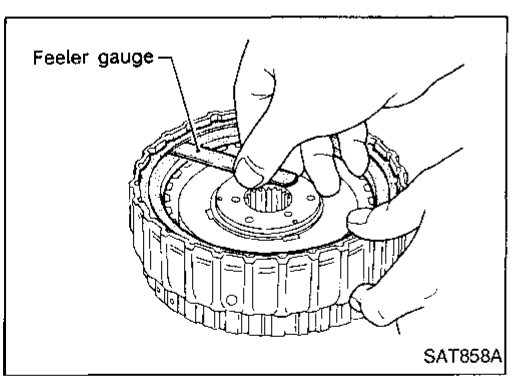

- Removal and installation of return spring




- Inspection of high clutch return springs
  **Inspection standard:**
  **Refer to SDS, AT-263.**




- Inspection of high clutch drive plate
  **Thickness of drive plate:**
  **Standard**
  **1.6 mm (0.063 in)**
  **Wear limit**
  **1.4 mm (0.055 in)**

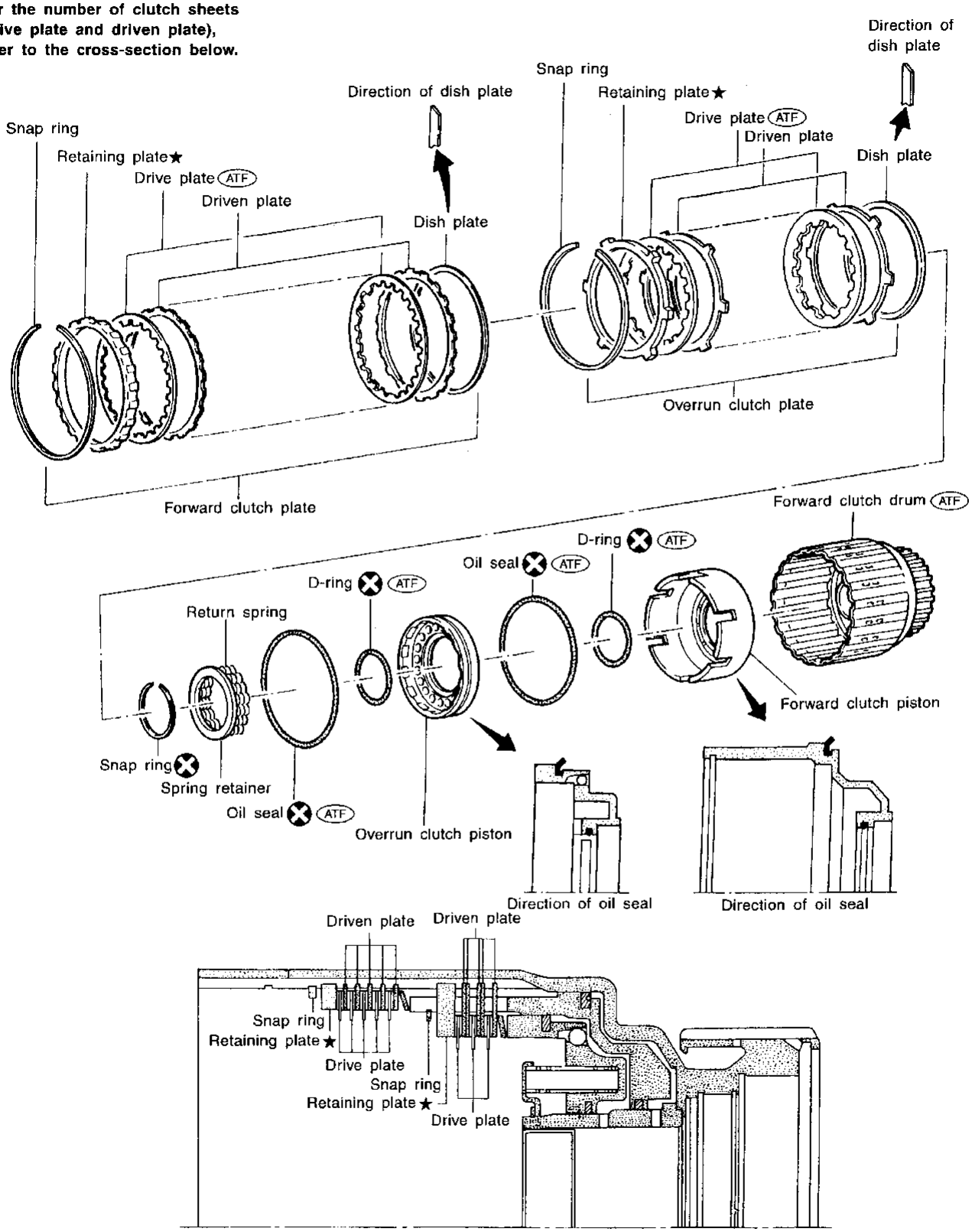



- Measurement of clearance between retaining plate and snap ring
  **Specified clearance:**
  **Standard**
  **1.8 - 2.2 mm (0.071 - 0.087 in)**
  **Allowable limit**
  **3.0 mm (0.118 in)**
  **Retaining plate:**
  **Refer to SDS, AT-264.**

## Forward and Overrun Clutches

**SEC. 315**

**For the number of clutch sheets (drive plate and driven plate), refer to the cross-section below.**




(ATF) : Apply ATF.

★ : Select with proper thickness.

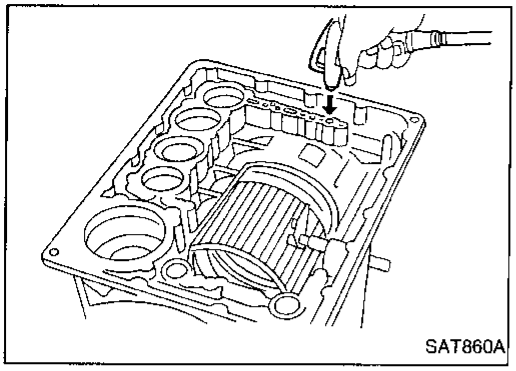
SAT195J

## Forward and Overrun Clutches (Cont'd)

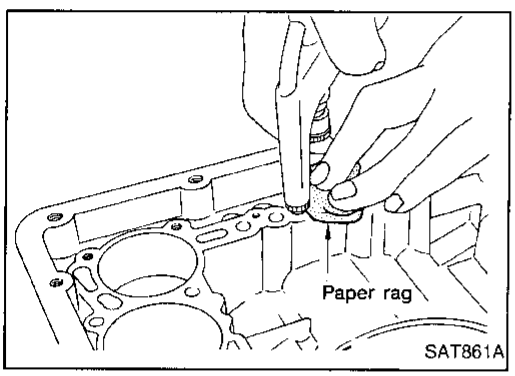
### DISASSEMBLY AND ASSEMBLY

Forward and overrun clutches are serviced essentially the same way as reverse clutch is serviced. However, note the following exceptions.

- Check of forward clutch operation.

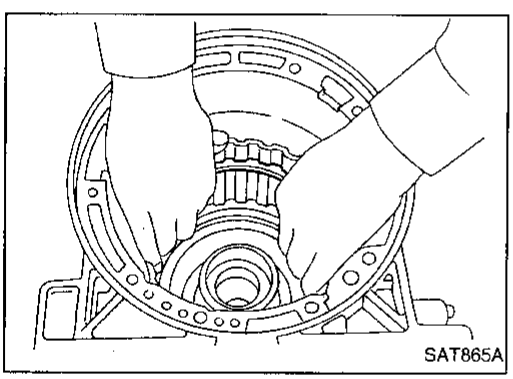

SAT860A

- Check of overrun clutch operation.



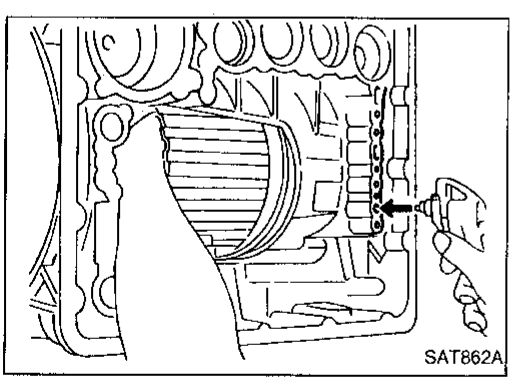
SAT861A

- Removal of forward clutch drum
  Remove forward clutch drum from transmission case by holding snap ring.

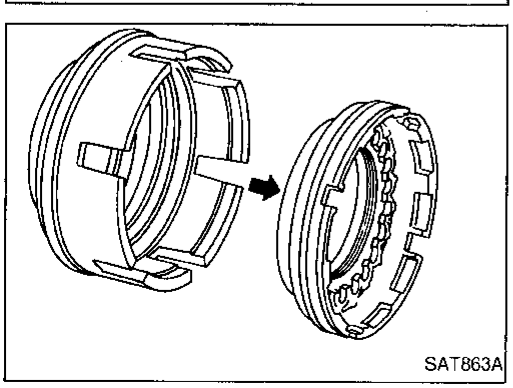

SAT865A

- Removal of forward clutch and overrun clutch pistons

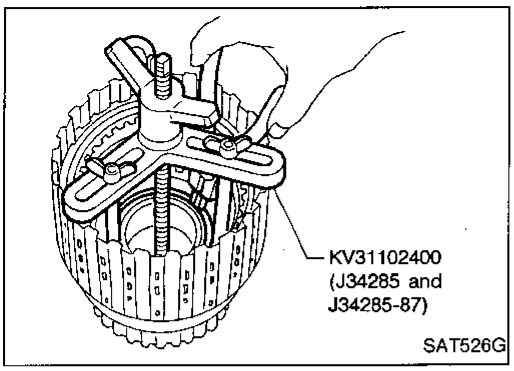
1. While holding overrun clutch piston, gradually apply compressed air to oil hole.


SAT862A

2. Remove overrun clutch from forward clutch.

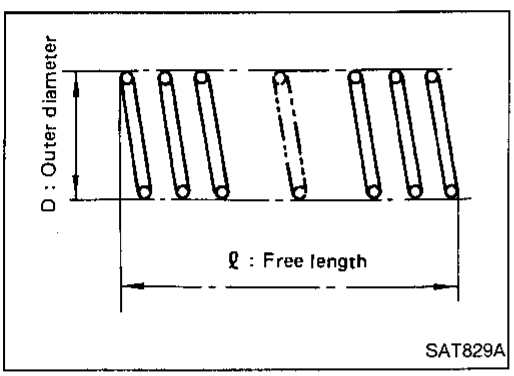

SAT863A

## Forward and Overrun Clutches (Cont'd)



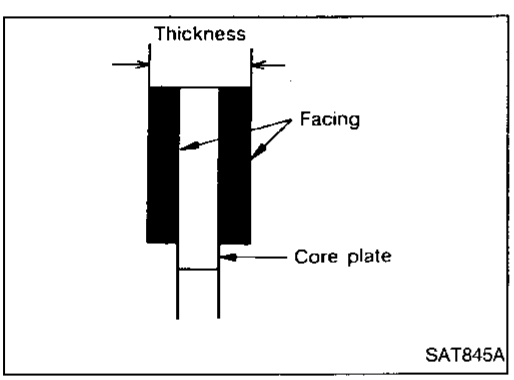
SAT526G

- Removal and installation of return springs



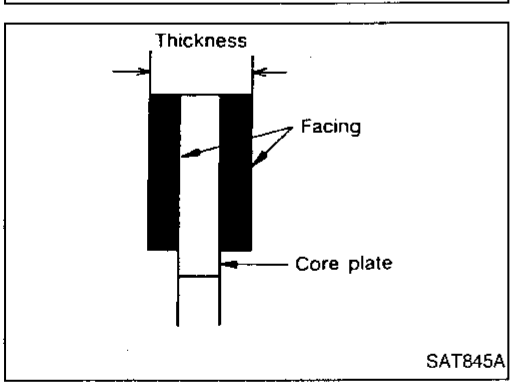
SAT829A

- Inspection of forward clutch and overrun clutch return springs
  **Inspection standard:**
  **Refer to SDS, AT-263.**



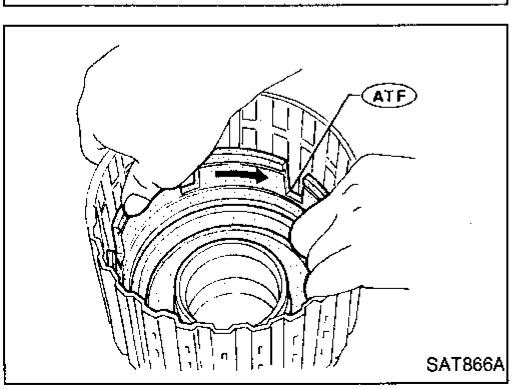
SAT845A

- Inspection of forward clutch drive plates
  **Thickness of drive plate:**
  **Standard**
  **1.6 mm (0.063 in)**
  **Wear limit**
  **1.4 mm (0.055 in)**



SAT845A

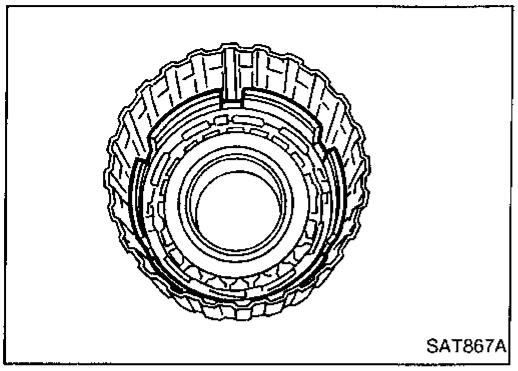
- Inspection of overrun clutch drive plates
  **Thickness of drive plate:**
  **Standard**
  **2.0 mm (0.079 in)**
  **Wear limit**
  **1.8 mm (0.071 in)**



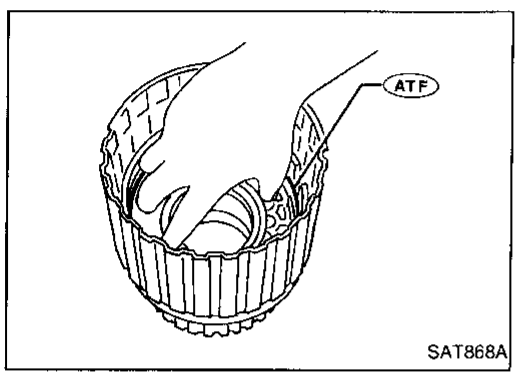
SAT866A

- Installation of forward clutch piston and overrun clutch piston
1. Install forward clutch piston by turning it slowly and evenly.
- **Apply ATF to inner surface of clutch drum.**

## Forward and Overrun Clutches (Cont'd)

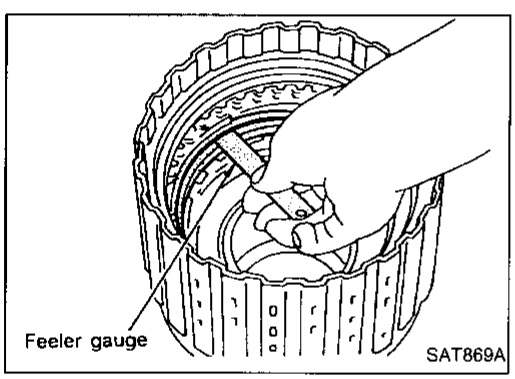

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



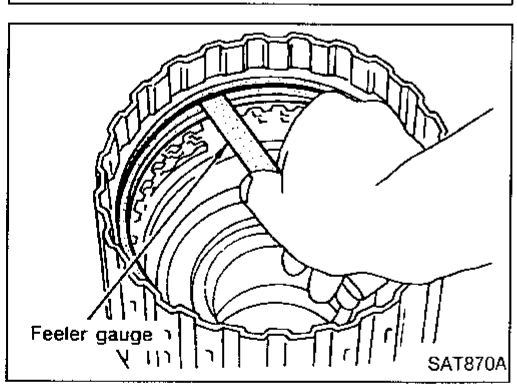
SAT868A

2. Install overrun clutch by turning it slowly and evenly.
- **Apply ATF to inner surface of forward clutch piston.**



SAT869A

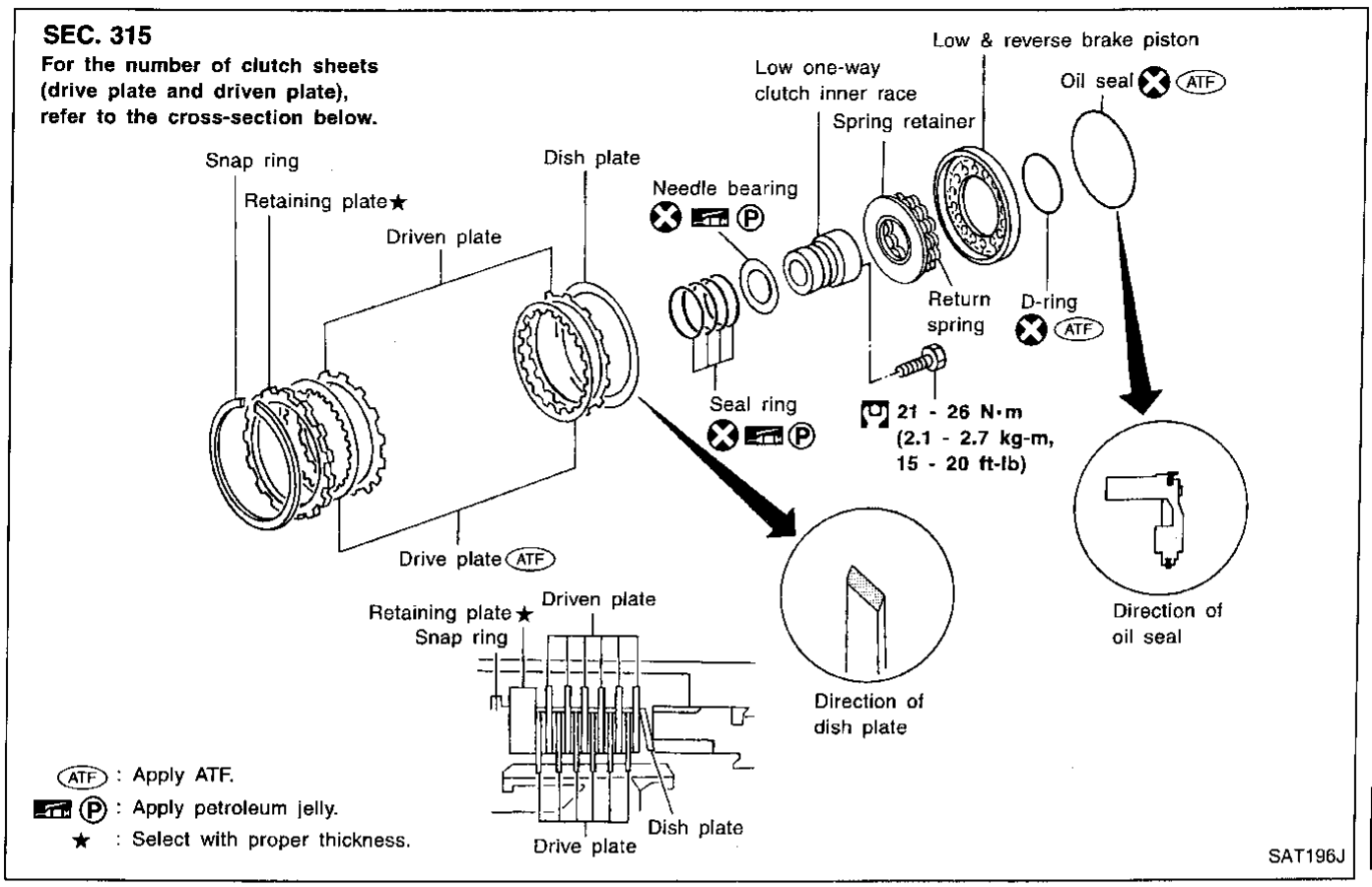
- Measurement of clearance between retaining plate and snap ring of overrun clutch
  **Specified clearance:**
  **Standard**
  **1.0 - 1.4 mm (0.039 - 0.055 in)**
  **Allowable limit**
  **2.0 mm (0.079 in)**
  **Retaining plate:**
  **Refer to SDS, AT-264.**

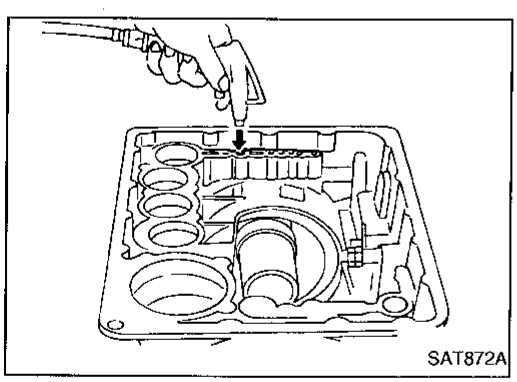


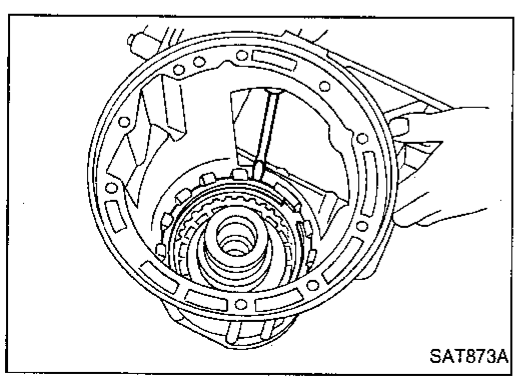
SAT870A

- Measurement of clearance between retaining plate and snap ring of forward clutch
  **Specified clearance:**
  **Standard**
  **0.35 - 0.75 mm (0.0138 - 0.0295 in)**
  **Allowable limit**
  **1.85 mm (0.0728 in)**
  **Retaining plate:**
  **Refer to SDS, AT-264.**

## Low & Reverse Brake



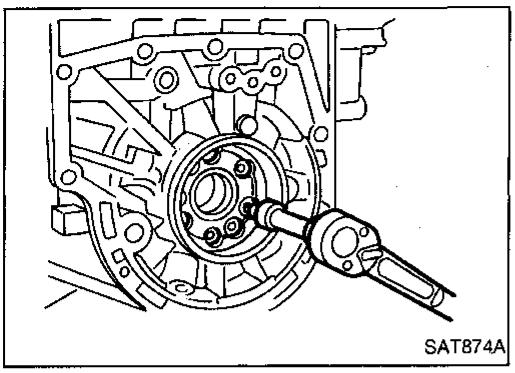




### DISASSEMBLY

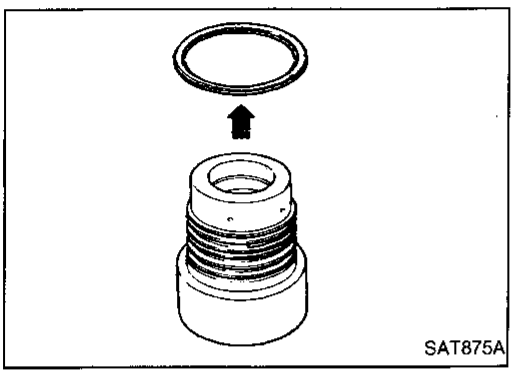
1. Check operation of low and reverse brake.
a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not contact snap ring,
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

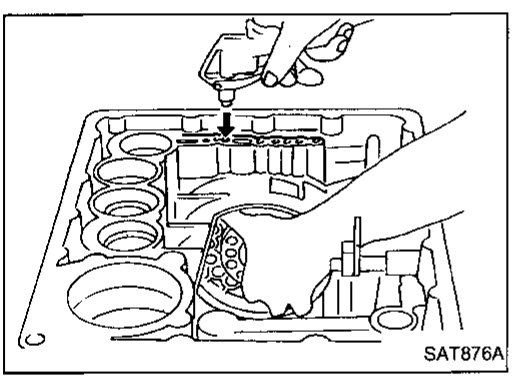
## Low & Reverse Brake (Cont'd)


SAT874A

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.


SAT875A

4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

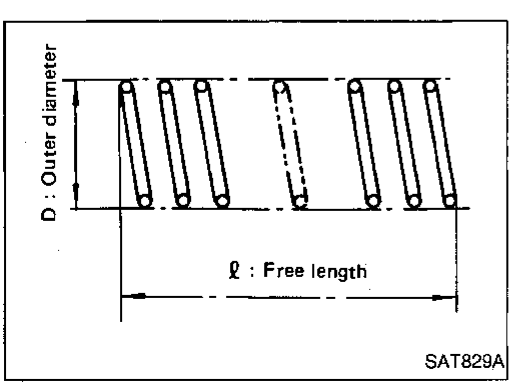

SAT876A

6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

### INSPECTION

#### Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.



SAT829A

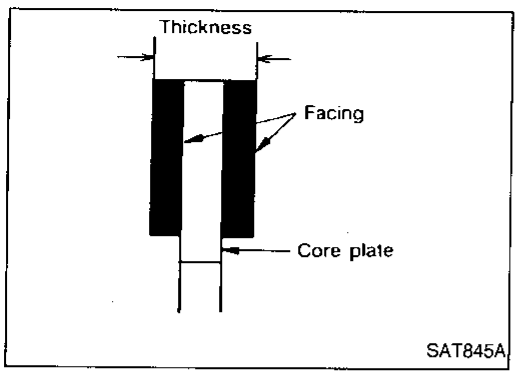
#### Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

  **Inspection standard:**

  **Refer to SDS, AT-263.**

## Low & Reverse Brake (Cont'd)

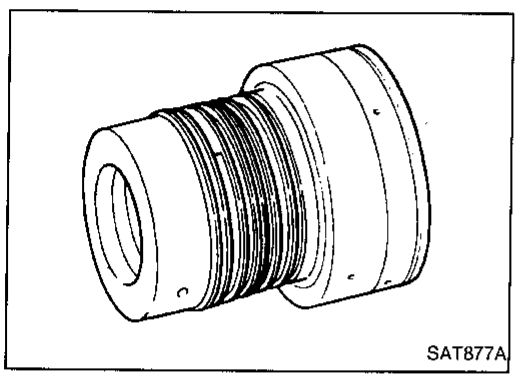



### Low and reverse brake drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

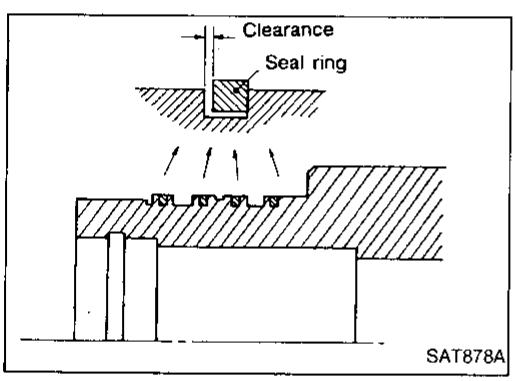
**Thickness of drive plate:**
**Standard value**
**1.6 mm (0.063 in)**
**Wear limit**
**1.4 mm (0.055 in)**

- If not within wear limit, replace.




### Low one-way clutch inner race

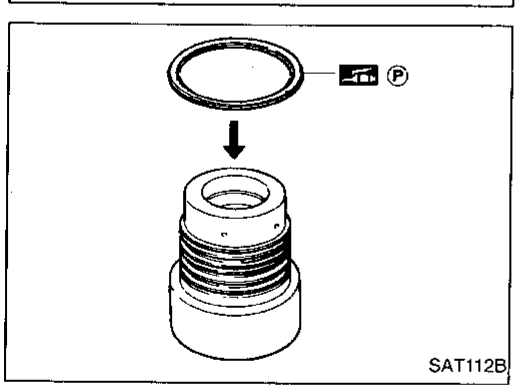
- Check frictional surface of inner race for wear or damage.




- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

**Inspection standard:**
**Standard value**
**0.10 - 0.25 mm (0.0039 - 0.0098 in)**
**Allowable limit**
**0.25 mm (0.0098 in)**

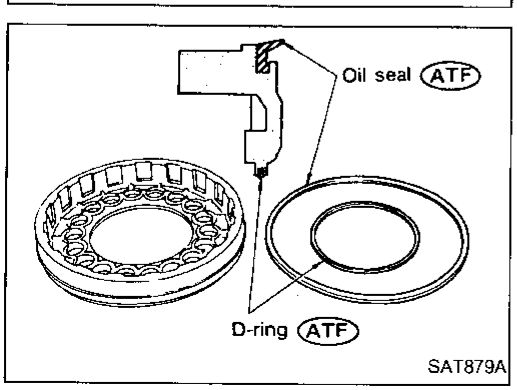
- If not within allowable limit, replace low one-way clutch inner race.




### ASSEMBLY

1. Install bearing onto one-way clutch inner race.

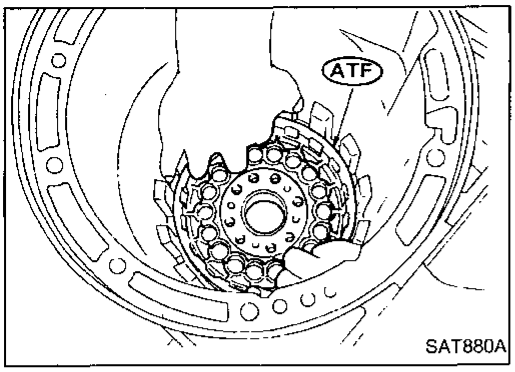
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**



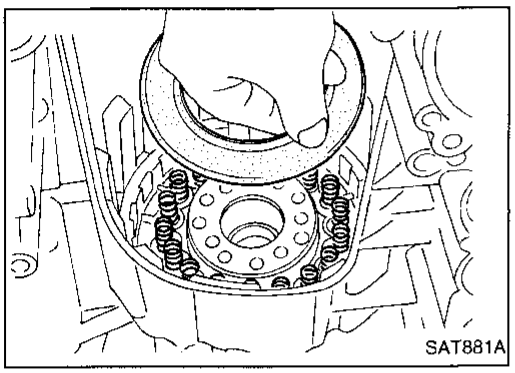

2. Install oil seal and D-ring onto piston.

- **Apply ATF to oil seal and D-ring.**

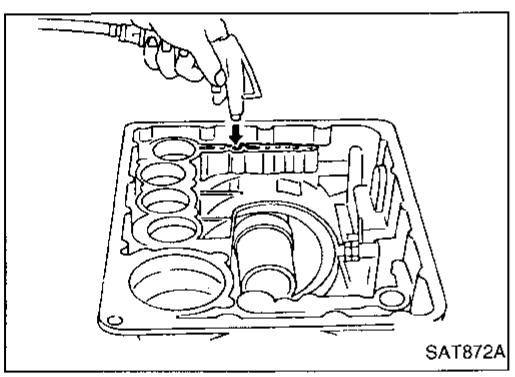
## Low & Reverse Brake (Cont'd)



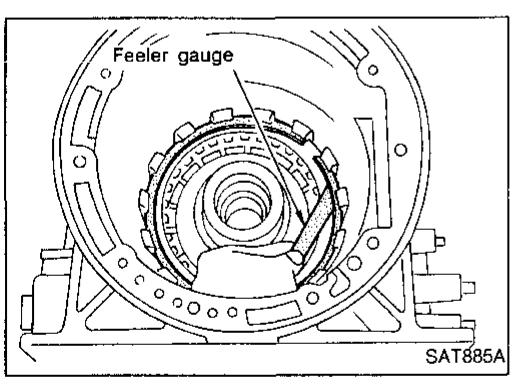

3. Install piston by rotating it slowly and evenly.
- **Apply ATF to inner surface of transmission case.**




4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.
5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.

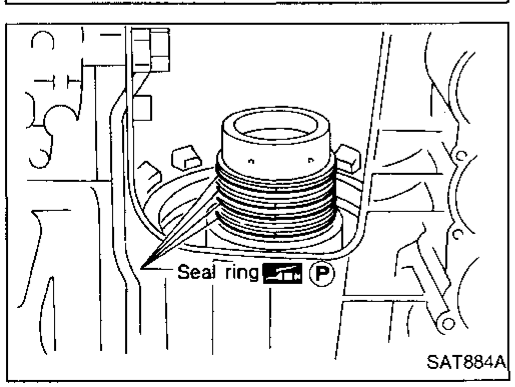



7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY", AT-229.




8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

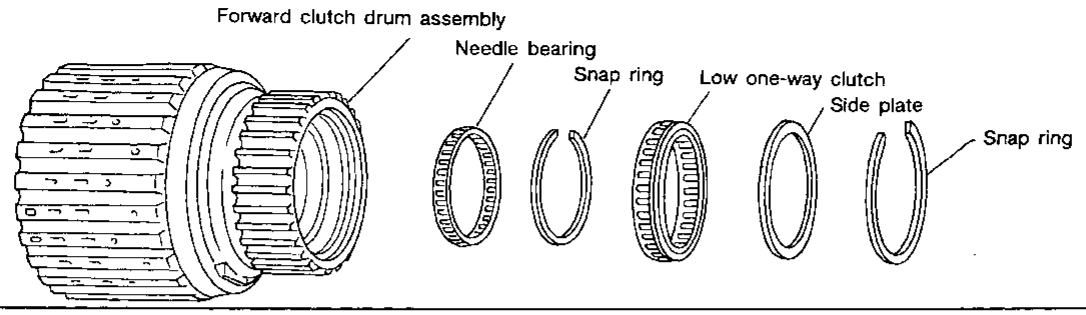
**Specified clearance:**
**Standard**
**0.8 - 1.1 mm (0.031 - 0.043 in)**
**Allowable limit**
**2.3 mm (0.091 in)**
**Retaining plate:**
**Refer to SDS, AT-265.**

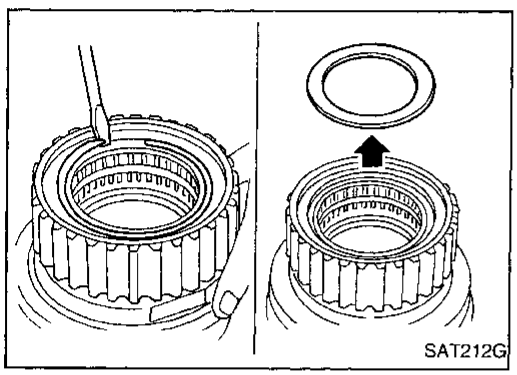



9. Install low one-way clutch inner race seal ring.
- **Apply petroleum jelly to seal ring.**
- **Make sure seal rings are pressed firmly into place and held by petroleum jelly.**

## Forward Clutch Drum Assembly

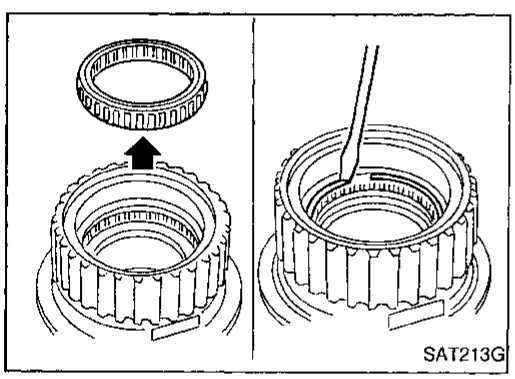
SEC. 315



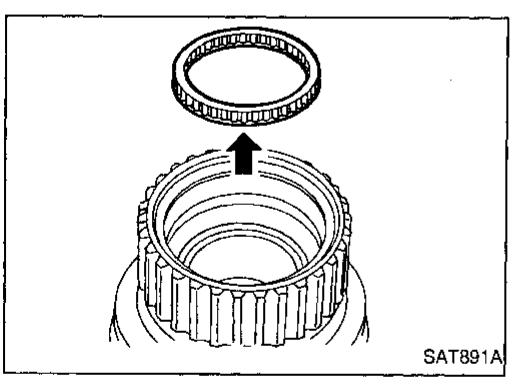




### DISASSEMBLY

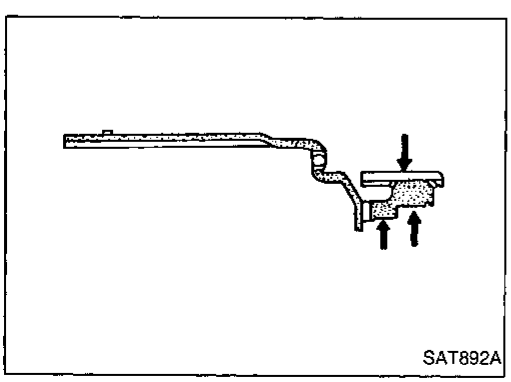
1. Remove snap ring from forward clutch drum.
2. Remove side plate from forward clutch drum.




3. Remove low one-way clutch from forward clutch drum.
4. Remove snap ring from forward clutch drum.




5. Remove needle bearing from forward clutch drum.

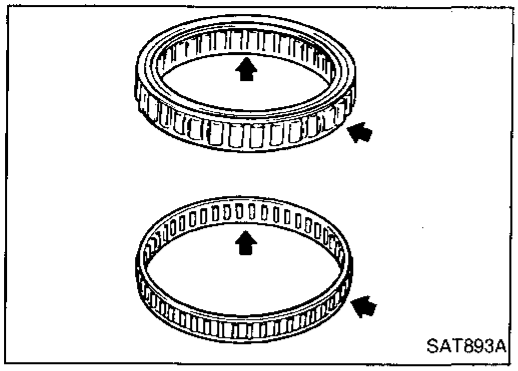



### INSPECTION

#### Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.

## Forward Clutch Drum Assembly (Cont'd)

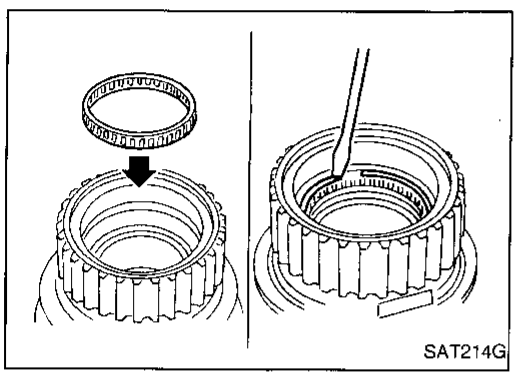

SAT893A

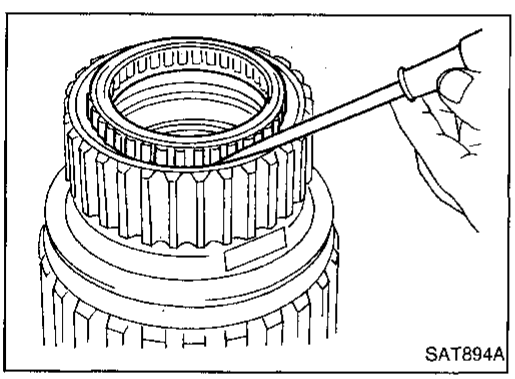
### Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.

### ASSEMBLY

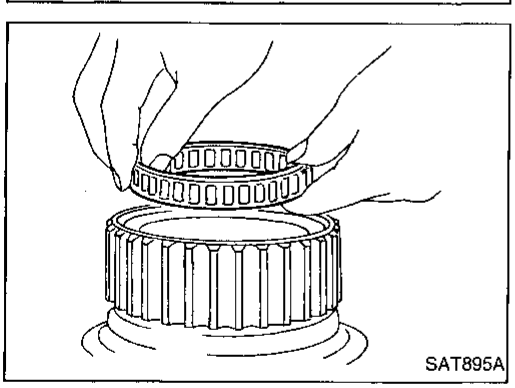
1. Install needle bearing in forward clutch drum.
2. Install snap ring onto forward clutch drum.

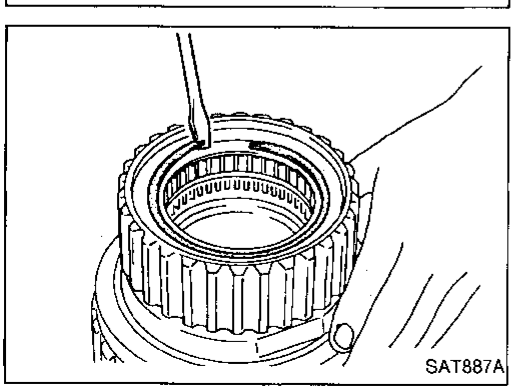

SAT214G


SAT894A

3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

- **Install low one-way clutch with flange facing rearward.**

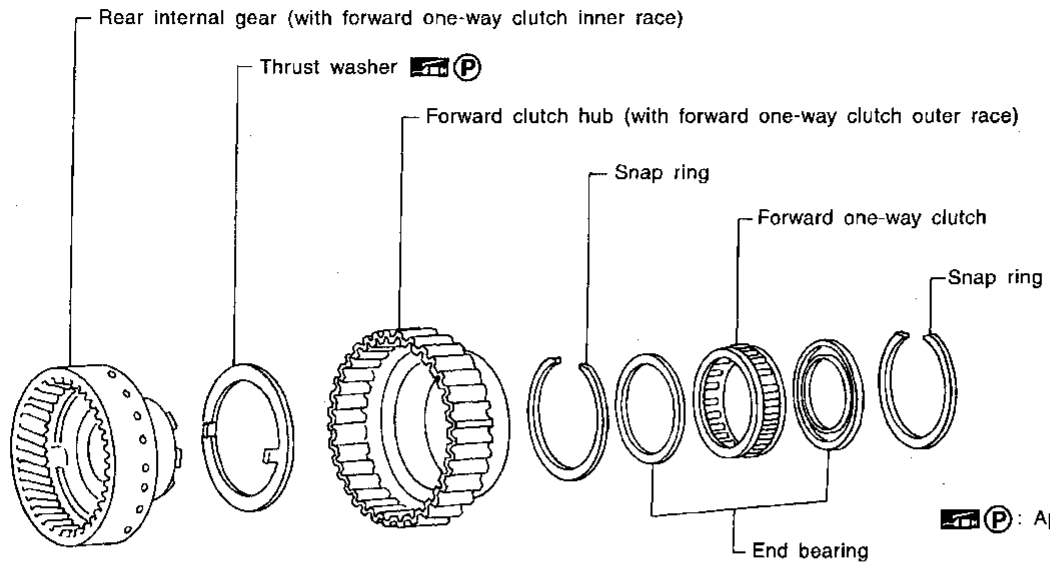

SAT895A

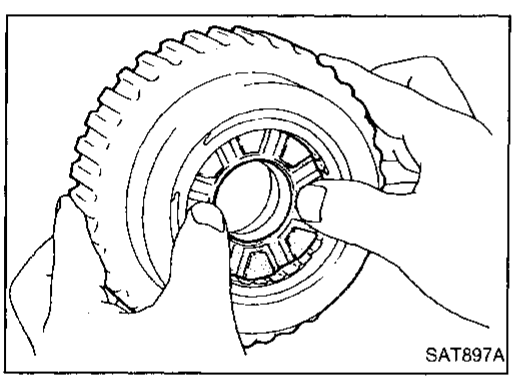

SAT887A

4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

## Rear Internal Gear and Forward Clutch Hub

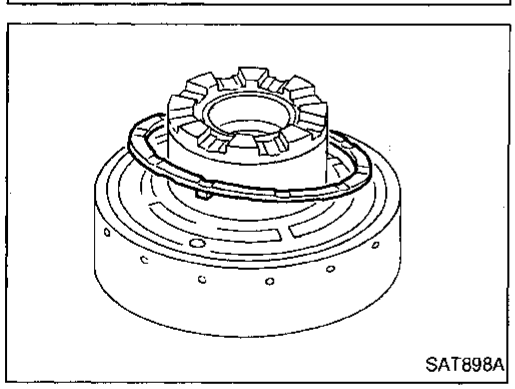
SEC. 315



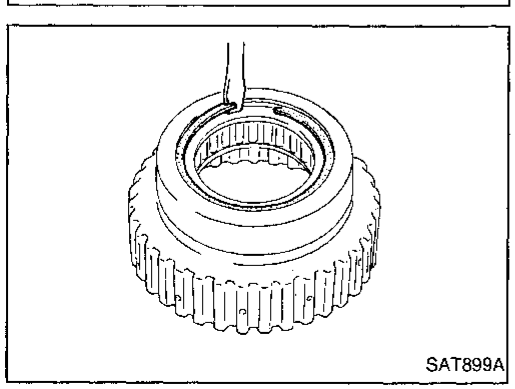




### DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

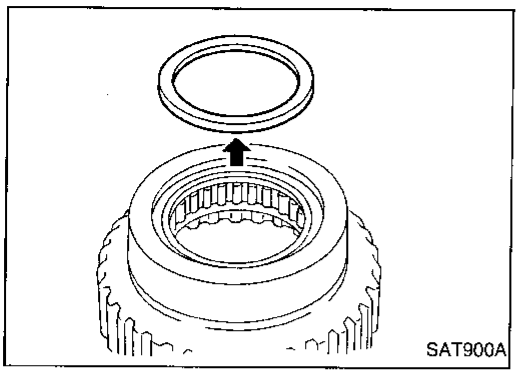



2. Remove thrust washer from rear internal gear.

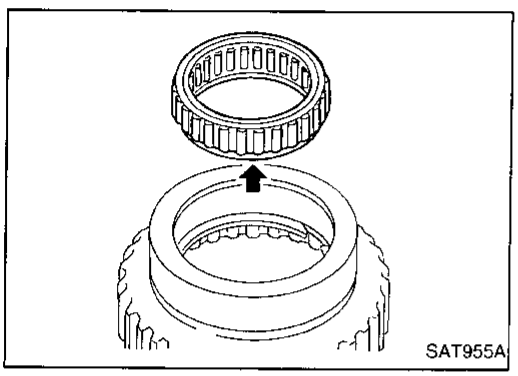



3. Remove snap ring from forward clutch hub.

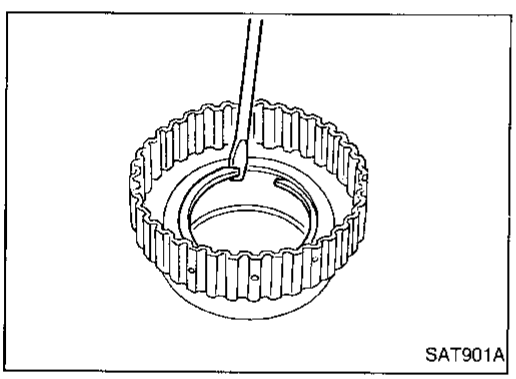
## Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

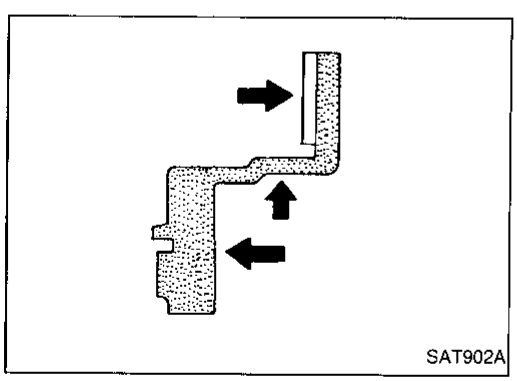
4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.


SAT901A

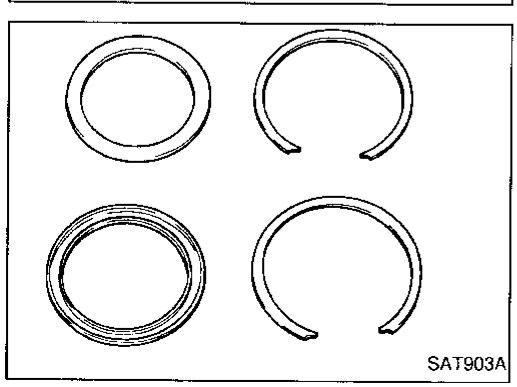
6. Remove snap ring from forward clutch hub.


SAT902A

### INSPECTION

**Rear internal gear and forward clutch hub**

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.

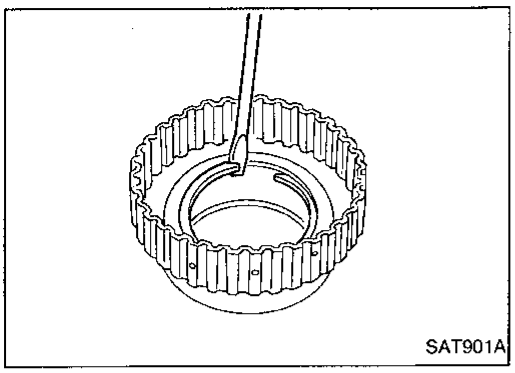

SAT903A

**Snap ring and end bearing**

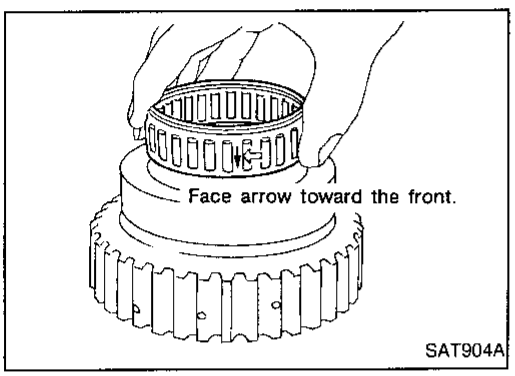
- Check for deformation or damage.

## Rear Internal Gear and Forward Clutch Hub (Cont'd)

### ASSEMBLY

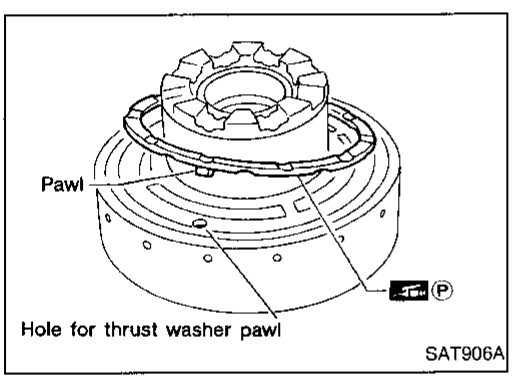

SAT901A

1. Install snap ring onto forward clutch hub.
2. Install end bearing.



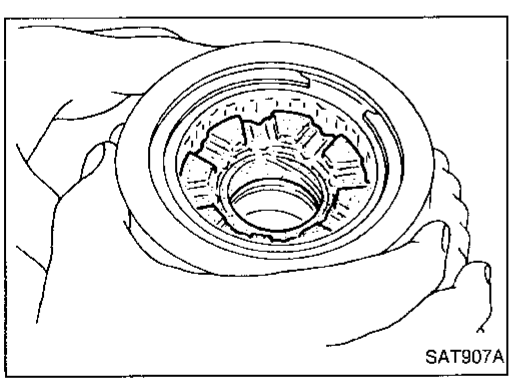
SAT904A

3. Install forward one-way clutch onto clutch hub.
- **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.

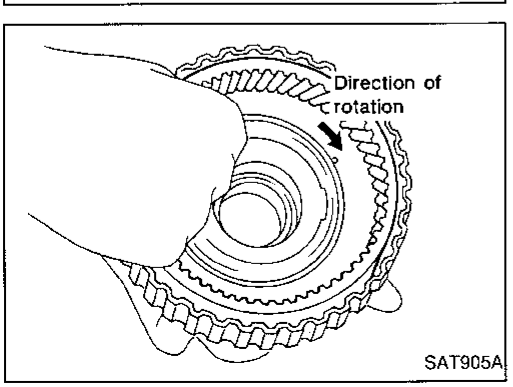


SAT906A

6. Install thrust washer onto rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Securely insert pawls of thrust washer into holes in rear internal gear.**


SAT907A

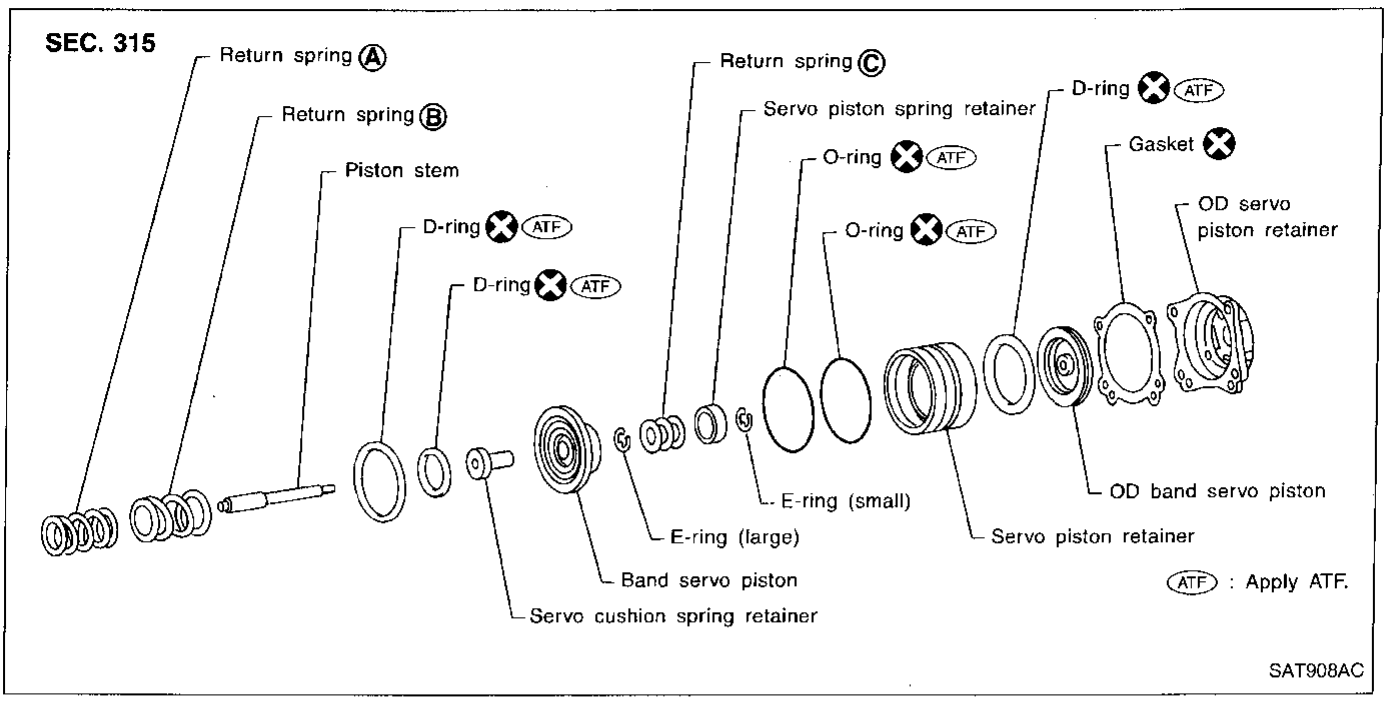
7. Position forward clutch hub in rear internal gear.

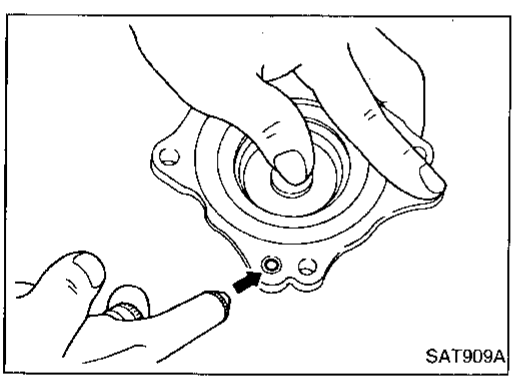


SAT905A

8. After installing, check to assure that forward clutch hub rotates clockwise.

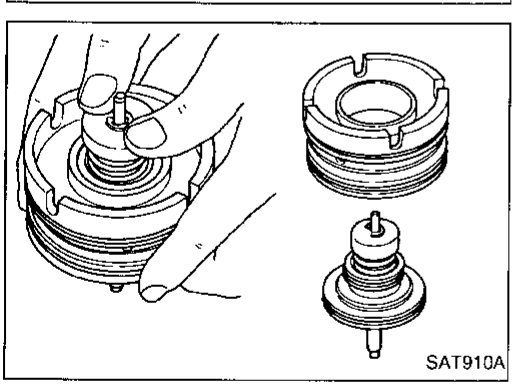
## Band Servo Piston Assembly



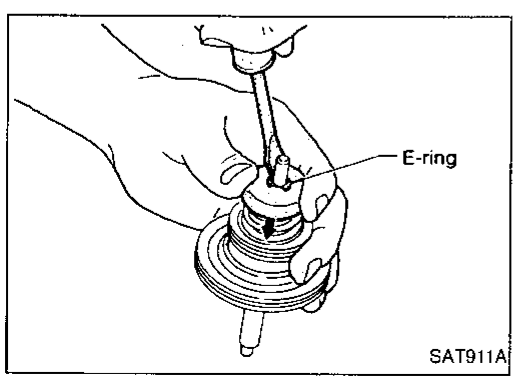




### DISASSEMBLY

1. Block one oil hole in OD servo piston retainer and the center hole in OD band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove OD band servo piston from retainer.
3. Remove D-ring from OD band servo piston.

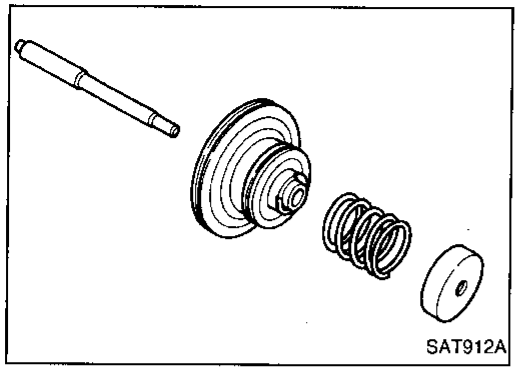



4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

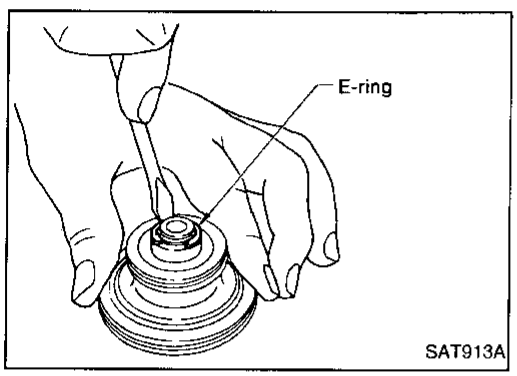



5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

## Band Servo Piston Assembly (Cont'd)

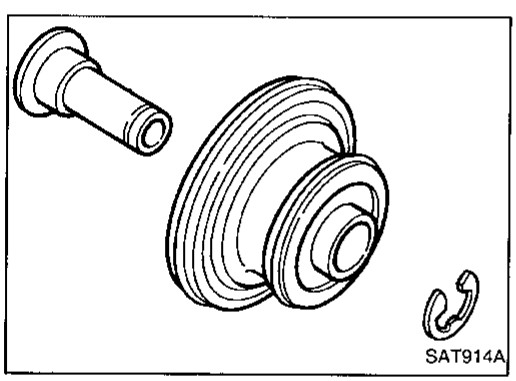

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

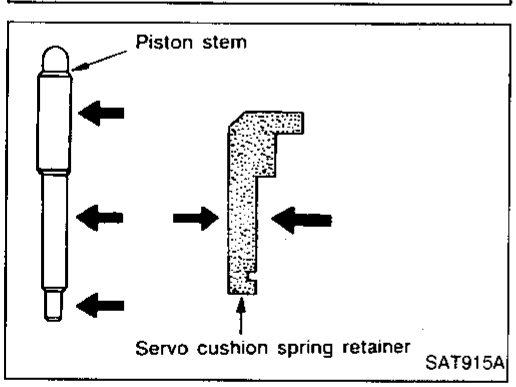


SAT913A

7. Remove E-ring from band servo piston.


SAT914A

8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.

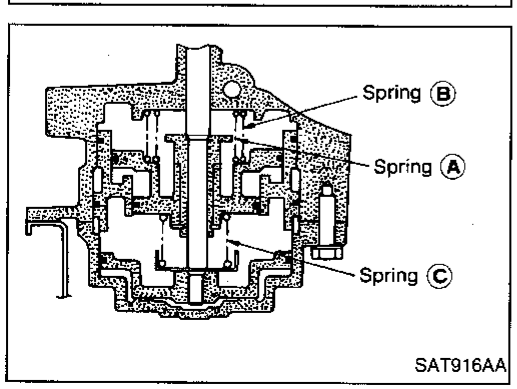


SAT915A

### INSPECTION

#### Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



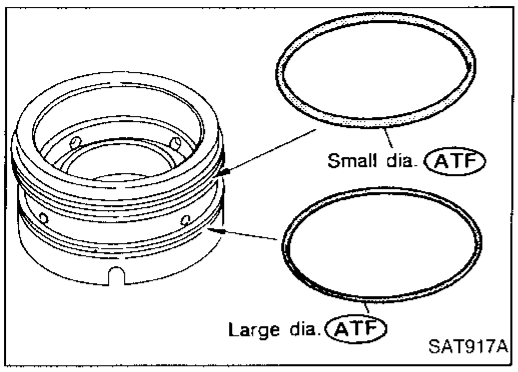
SAT916AA

#### Return springs

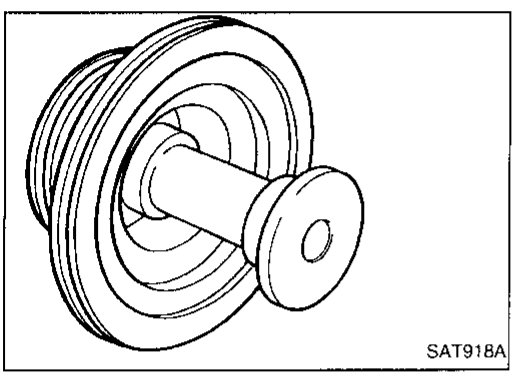
- Check for deformation or damage. Measure free length and outer diameter.
  **Inspection standard:**
  **Refer to SDS, AT-263.**

## Band Servo Piston Assembly (Cont'd)

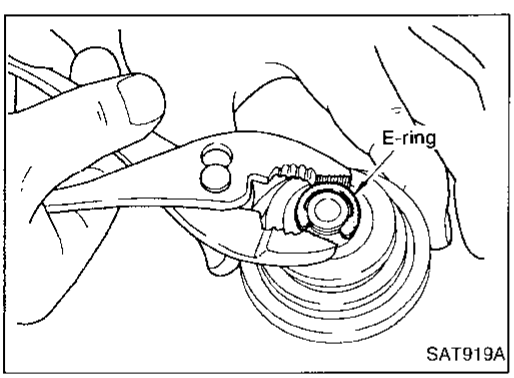
### ASSEMBLY



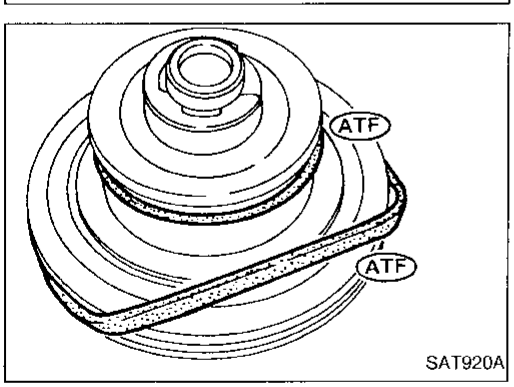

1. Install O-rings onto servo piston retainer.
- **Apply ATF to O-rings.**
- **Pay attention to position of each O-ring.**



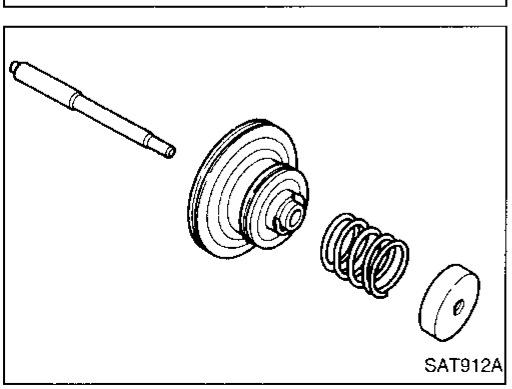

2. Install servo cushion spring retainer onto band servo piston.




3. Install E-ring onto servo cushion spring retainer.

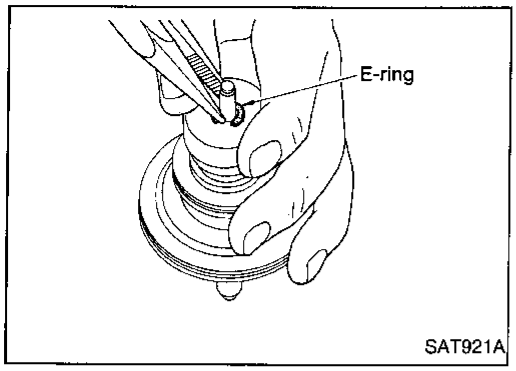



4. Install D-rings onto band servo piston.
- **Apply ATF to D-rings.**

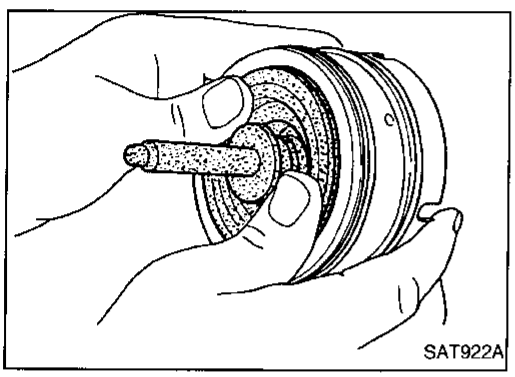



5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

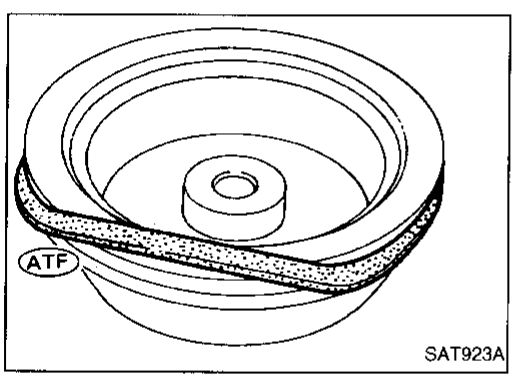
## Band Servo Piston Assembly (Cont'd)



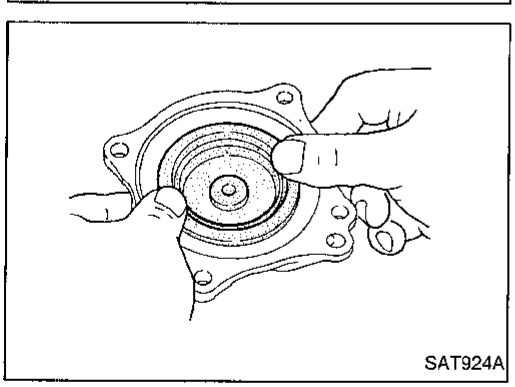

6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.




7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

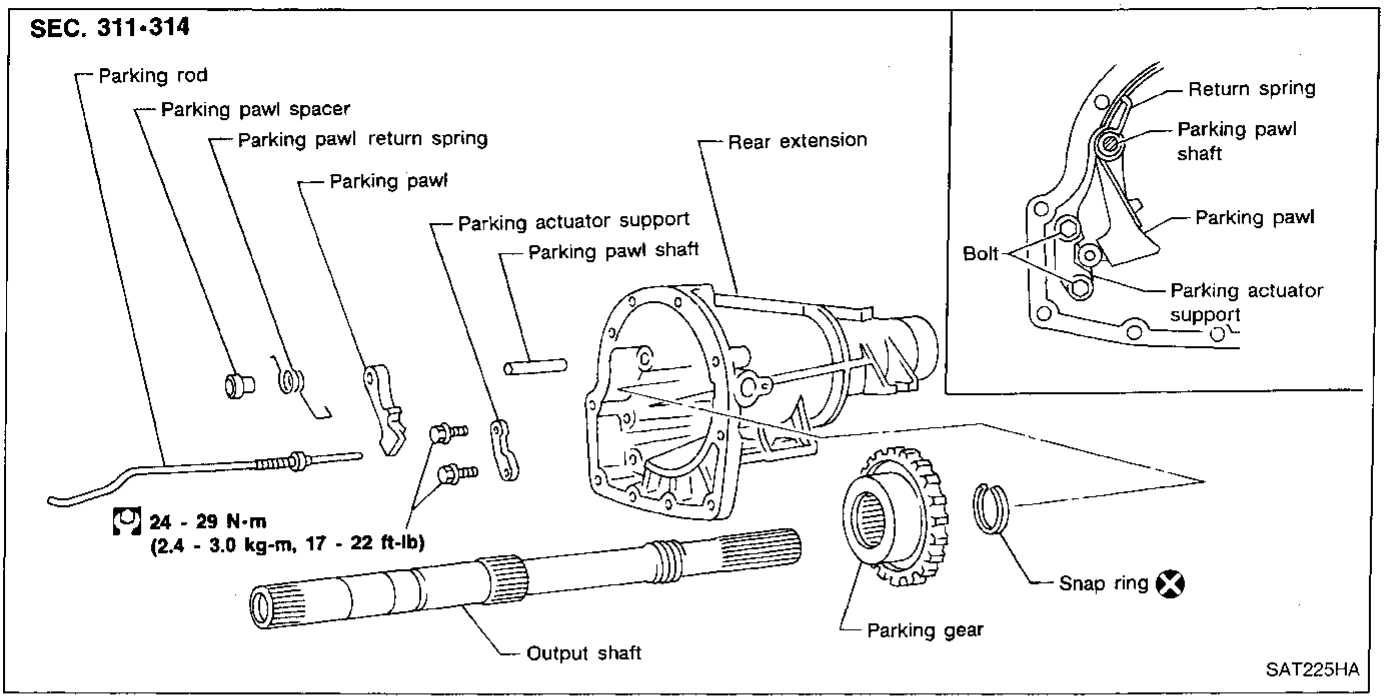


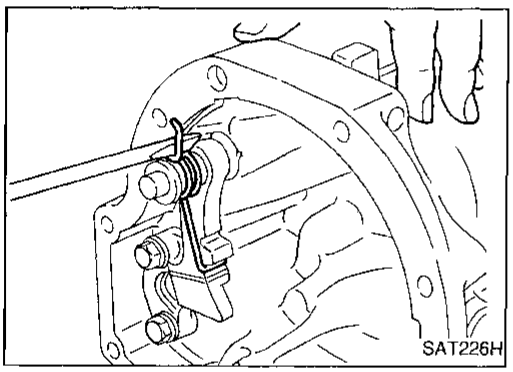

8. Install D-ring on OD band servo piston.
- **Apply ATF to D-ring.**




9. Install OD band servo piston onto servo piston retainer by pushing it inward.

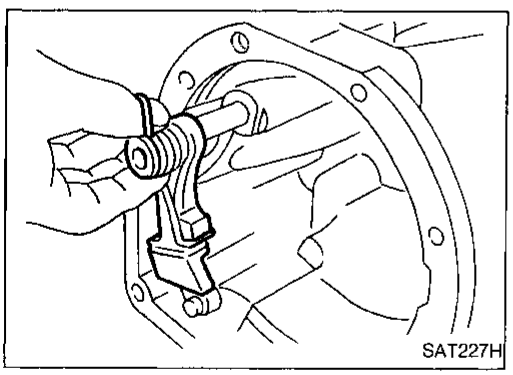
## Parking Pawl Components



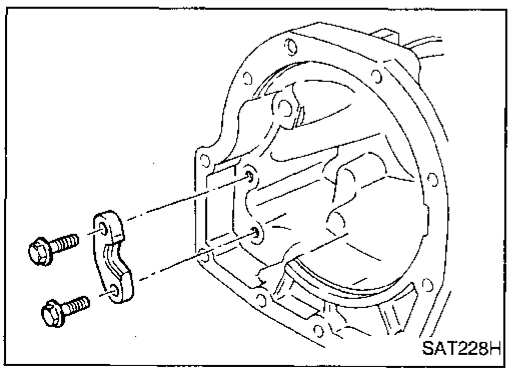




### DISASSEMBLY

1. Slide return spring to the front of rear extension flange.




2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



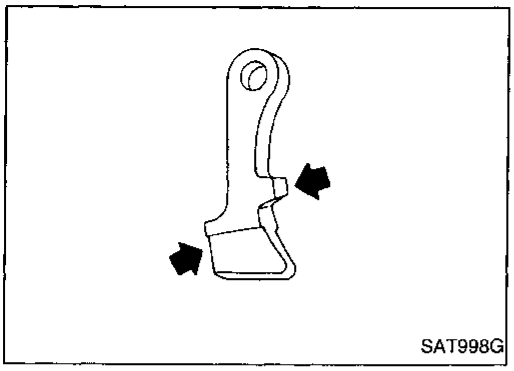

4. Remove parking actuator support and rod guide from rear extension.

## Parking Pawl Components (Cont'd)

### INSPECTION

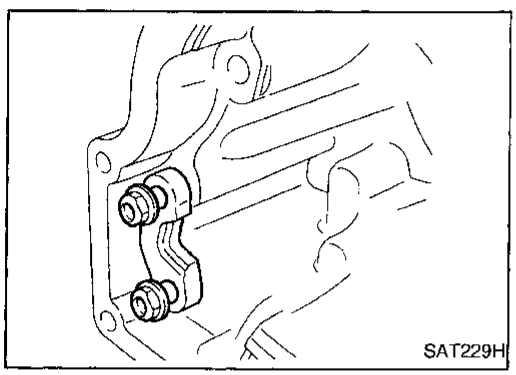
#### Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

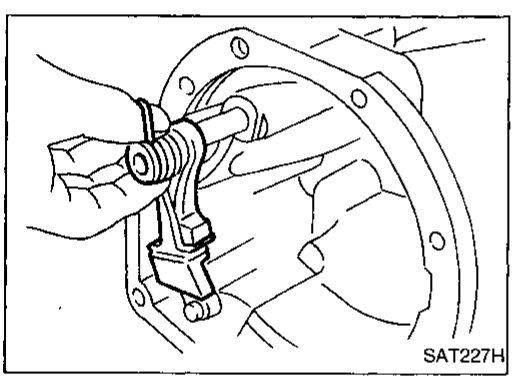

SAT998G

### ASSEMBLY

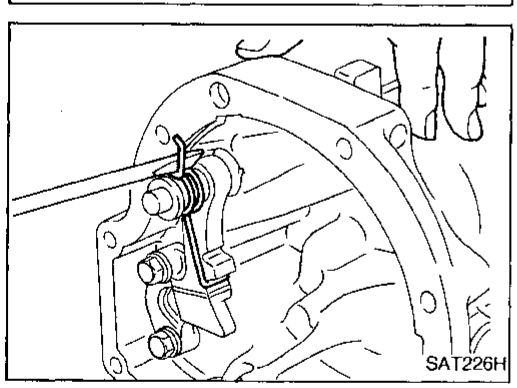
1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

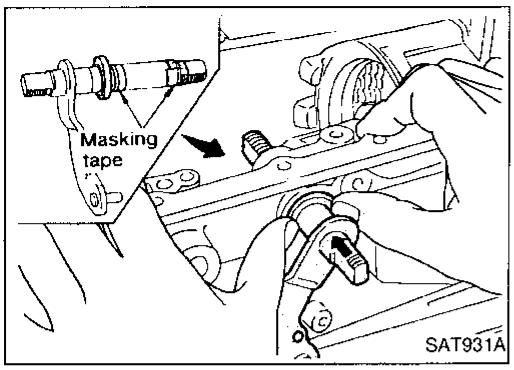

SAT229H

3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.


SAT227H

4. Bend return spring upward and install it onto rear extension.

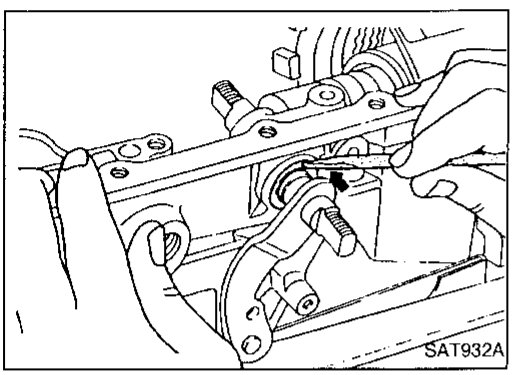

SAT226H



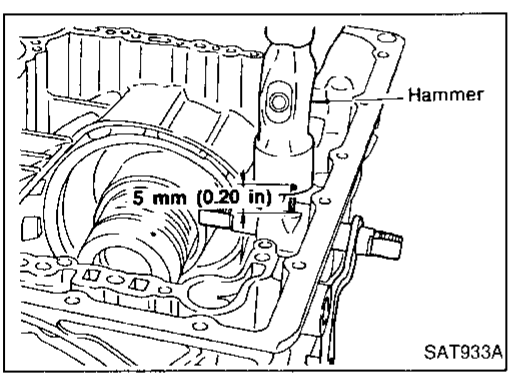

## Assembly (1)

1. Install manual shaft components.
a. Install oil seal onto manual shaft.
- **Apply ATF to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

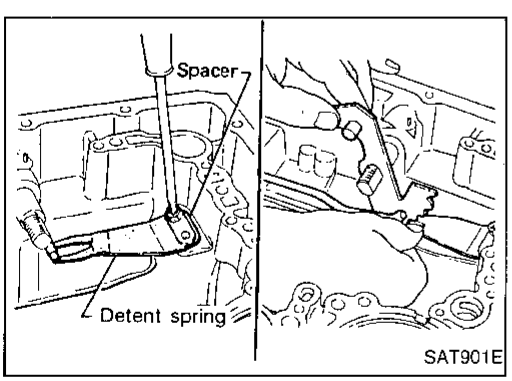
b. Insert manual shaft and oil seal as a unit into transmission case.
c. Remove masking tape.



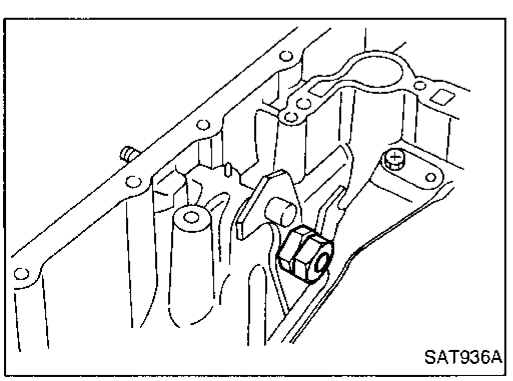

d. Push oil seal evenly and install it onto transmission case.




e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.

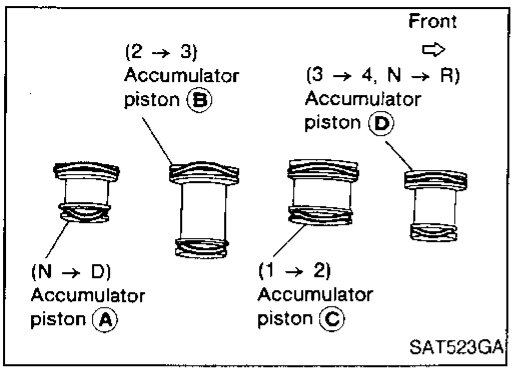



f. Install detent spring and spacer.
g. While pushing detent spring down, install manual plate onto manual shaft.




h. Install lock nuts onto manual shaft.

## Assembly (1) (Cont'd)



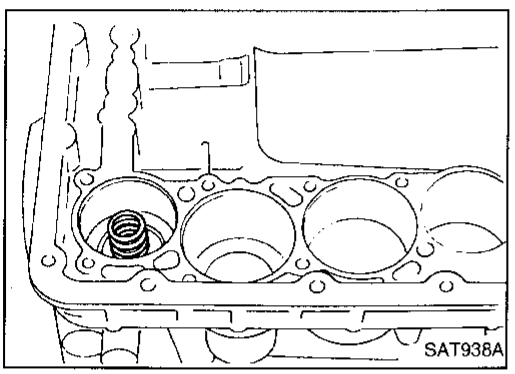

2. Install accumulator piston.
a. Install O-rings onto accumulator piston.

- **Apply ATF to O-rings.**

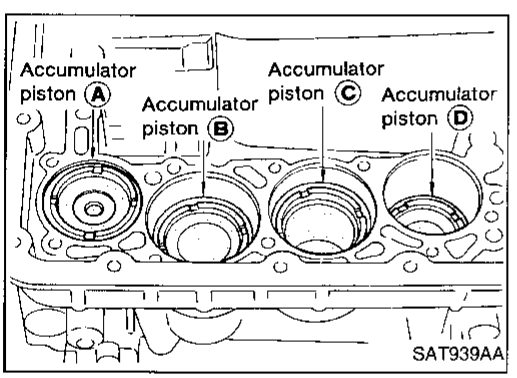
**Accumulator piston O-rings**

Unit: mm (in)

| Accumulator | Ⓐ | Ⓑ | Ⓒ | Ⓓ |
|---|---|---|---|---|
| Small diameter end | 29 (1.14) | 32 (1.26) | 45 (1.77) | 29 (1.14) |
| Large diameter end | 45 (1.77) | 50 (1.97) | 50 (1.97) | 45 (1.77) |

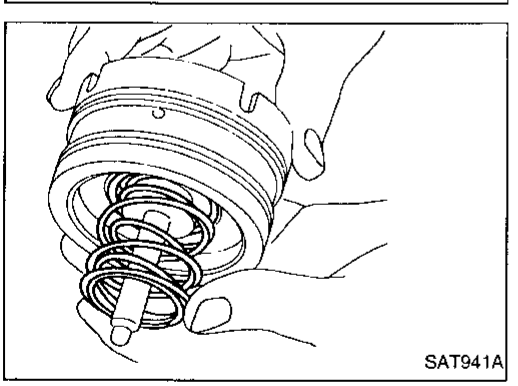



b. Install return spring for accumulator A onto transmission case.
**Free length of return spring:**
**Refer to SDS, AT-263.**

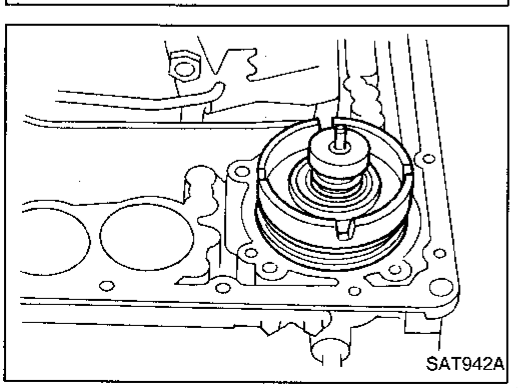



c. Install accumulator pistons Ⓐ, Ⓑ, Ⓒ and Ⓓ.

- **Apply ATF to transmission case.**




3. Install band servo piston.
a. Install return springs onto servo piston.

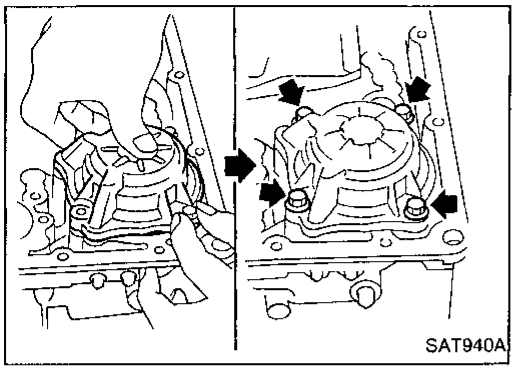



b. Install band servo piston onto transmission case.

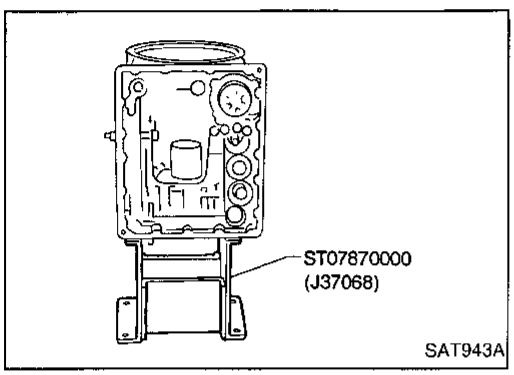
- **Apply ATF to O-ring of band servo piston and transmission case.**

c. Install gasket for band servo onto transmission case.

## Assembly (1) (Cont'd)

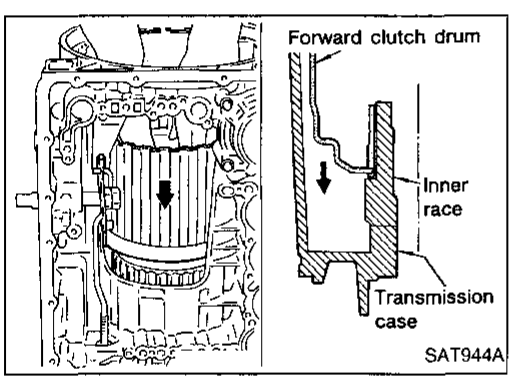

SAT940A

d. Install band servo retainer onto transmission case.



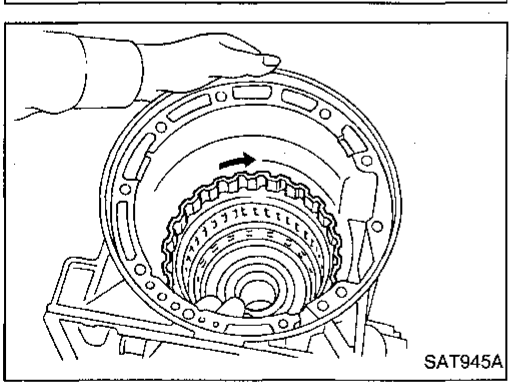
SAT943A

4. Install rear side clutch and gear components.
a. Place transmission case in vertical position.

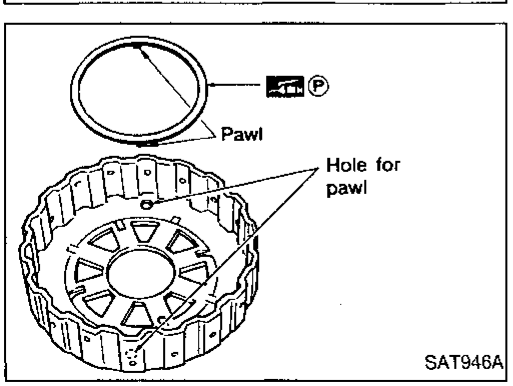


SAT944A

b. Slightly lift forward clutch drum assembly. Then slowly rotate it clockwise until its hub passes fully over clutch inner race inside transmission case.


SAT945A

c. Check to be sure that rotation direction of forward clutch assembly is correct.

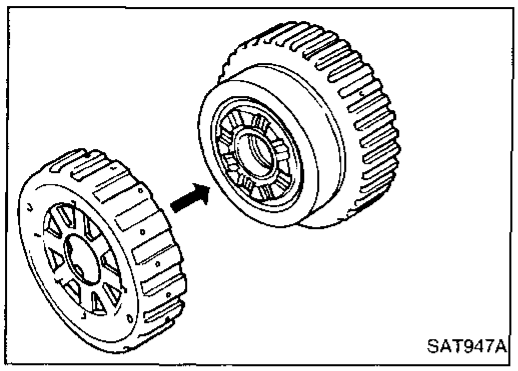


SAT946A

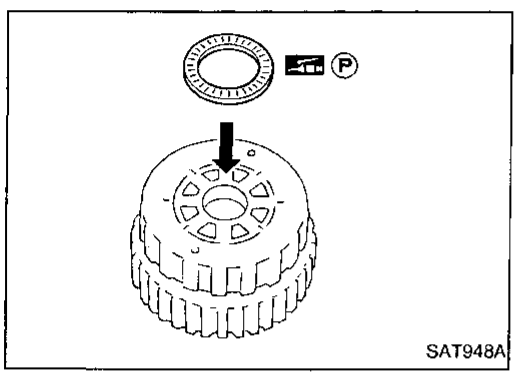
d. Install thrust washer onto front of overrun clutch hub.

- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**

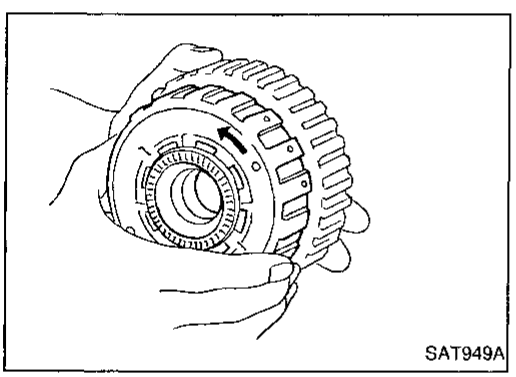
## Assembly (1) (Cont'd)



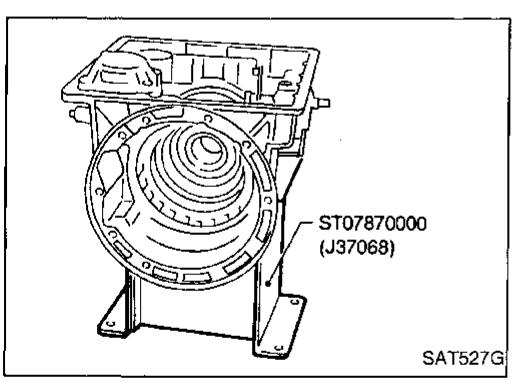

e. Install overrun clutch hub onto rear internal gear assembly.



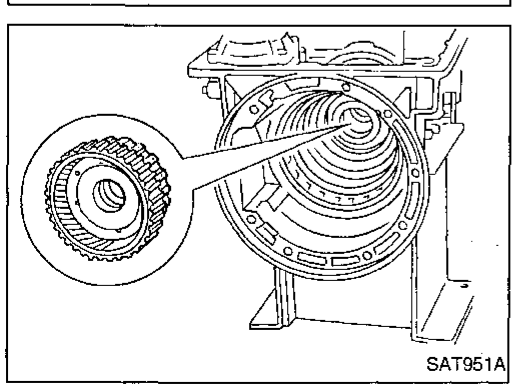

f. Install needle bearing onto rear of overrun clutch hub.
- **Apply petroleum jelly to needle bearing.**




g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.

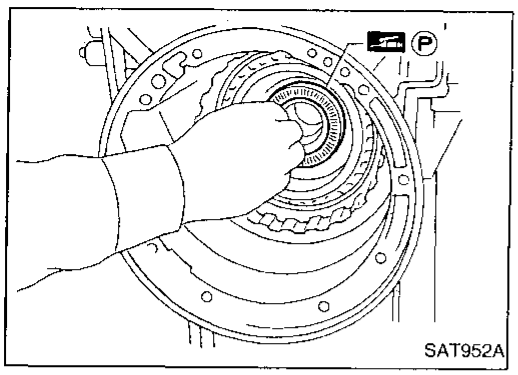



h. Place transmission case into horizontal position.

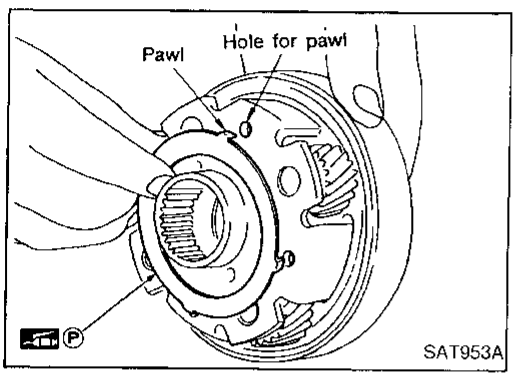



i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.

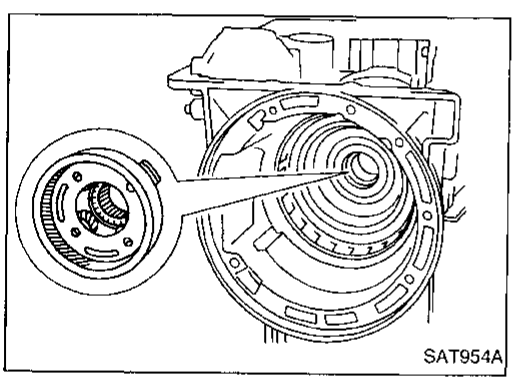
## Assembly (1) (Cont'd)




j. Install needle bearing onto rear internal gear.
- **Apply petroleum jelly to needle bearing.**




k. Install bearing race onto rear of front internal gear.
- **Apply petroleum jelly to bearing race.**
- **Securely engage pawls of bearing race with holes in front internal gear.**



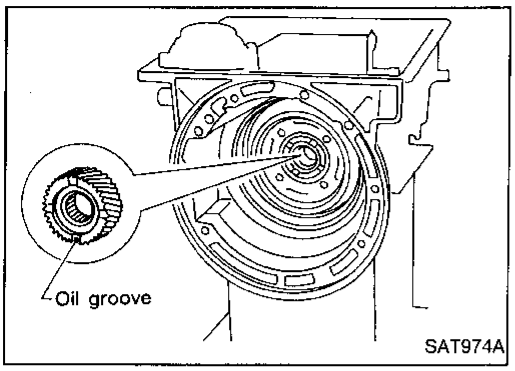

l. Install front internal gear on transmission case.

## Adjustment

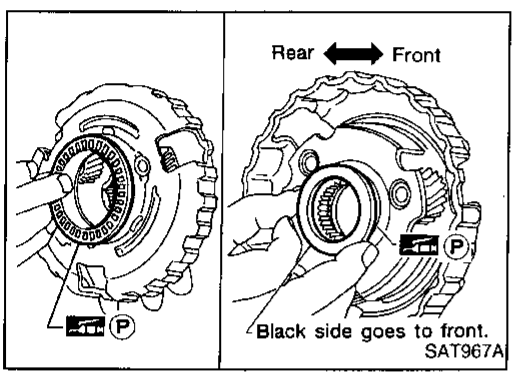
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

| Part name | Total end play | Reverse clutch end play |
|---|---|---|
| Transmission case | • | • |
| Low one-way clutch inner race | • | • |
| Overrun clutch hub | • | • |
| Rear internal gear | • | • |
| Rear planetary carrier | • | • |
| Rear sun gear | • | • |
| Front planetary carrier | • | • |
| Front sun gear | • | • |
| High clutch hub | • | • |
| High clutch drum | • | • |
| Oil pump cover | • | • |
| Reverse clutch drum | — | • |

## Adjustment (Cont'd)

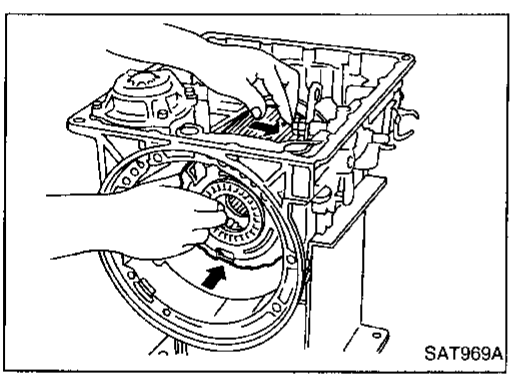



1. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**

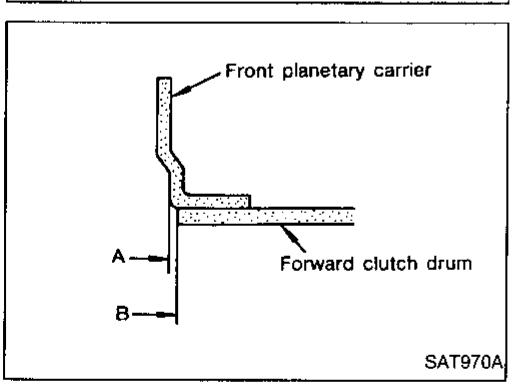



b. Install needle bearing on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

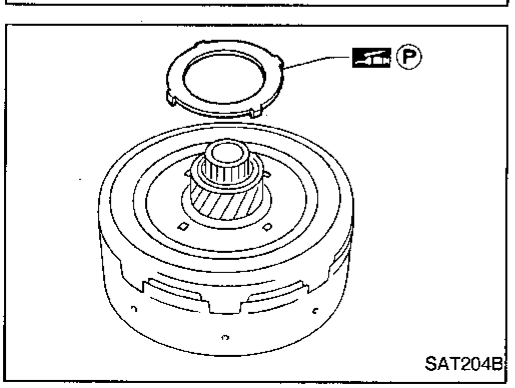
c. Install needle bearing on rear of front planetary carrier.
- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**




d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

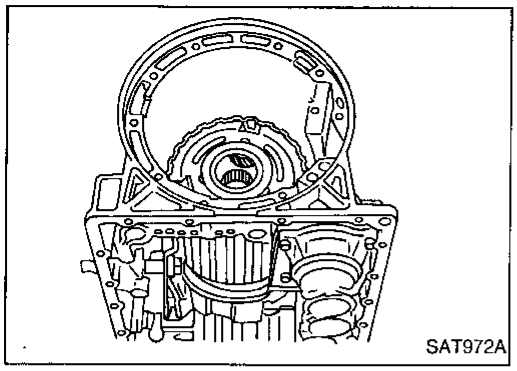



- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**

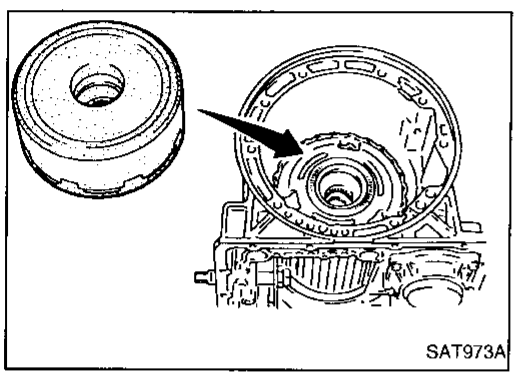



e. Install bearing races on rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing race with hole in clutch pack.**

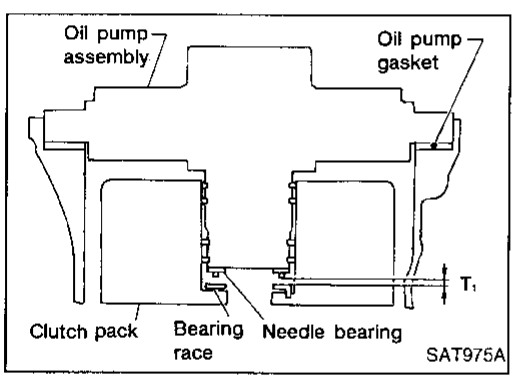
## Adjustment (Cont'd)



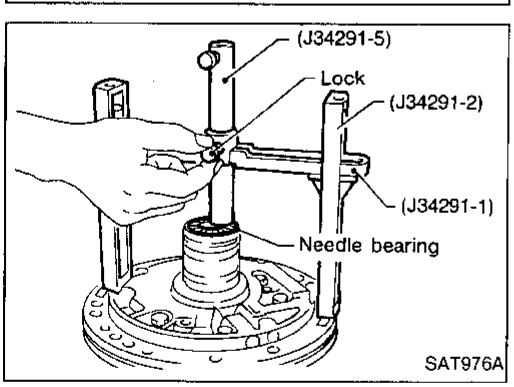

f. Place transmission case in vertical position.



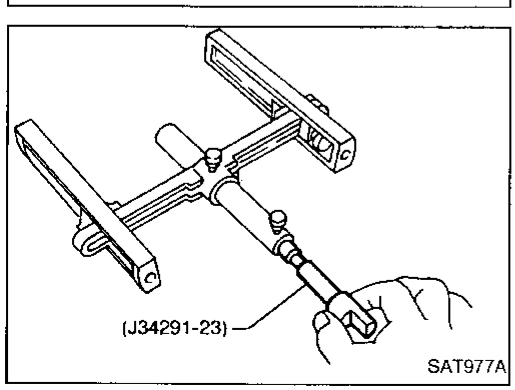

g. Install clutch pack into transmission case.




2. Adjust total end play.
   **Total end play "$T_1$":**
   **0.25 - 0.55 mm (0.0098 - 0.0217 in)**

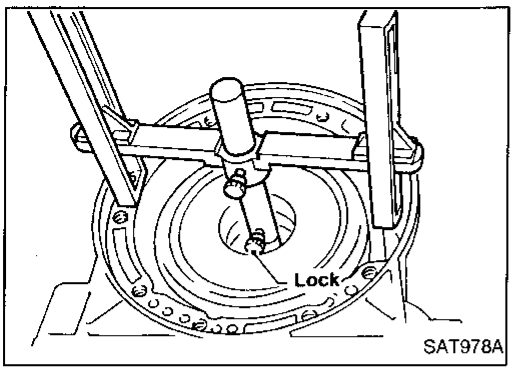



a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly. The gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.

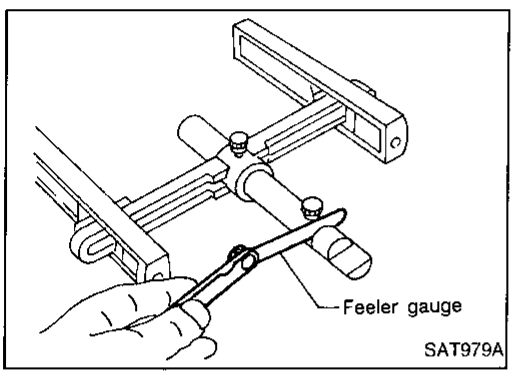



b. Install J34291-23 (gauging plunger) into gauging cylinder.

## Adjustment (Cont'd)




c. Install original bearing race inside reverse clutch drum. Place shim selecting gauge with its legs on machined surface of transmission case (no gasket). Allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.

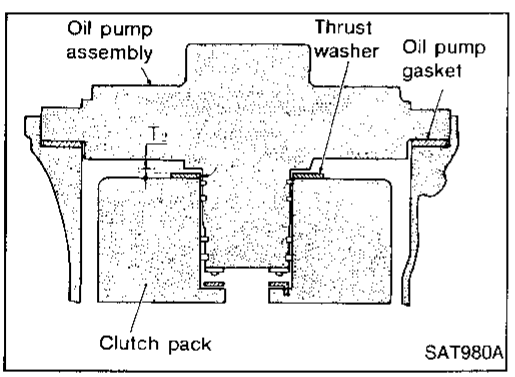



d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

**Total end play "$T_1$":**
**0.25 - 0.55 mm (0.0098 - 0.0217 in)**

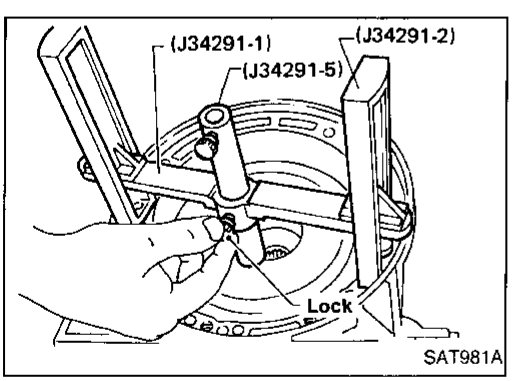
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

**Available oil pump cover bearing race:**
**Refer to SDS, AT-265.**

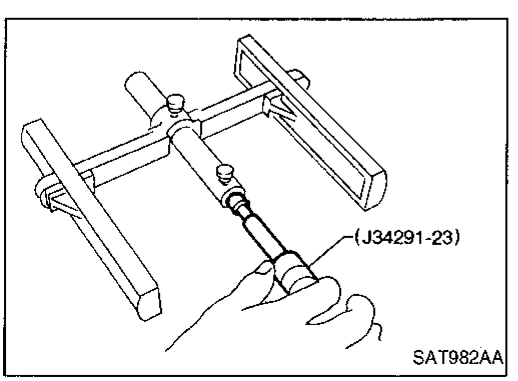



3. Adjust reverse clutch drum end play.

**Reverse clutch drum end play "$T_2$":**
**0.55 - 0.90 mm (0.0217 - 0.0354 in)**

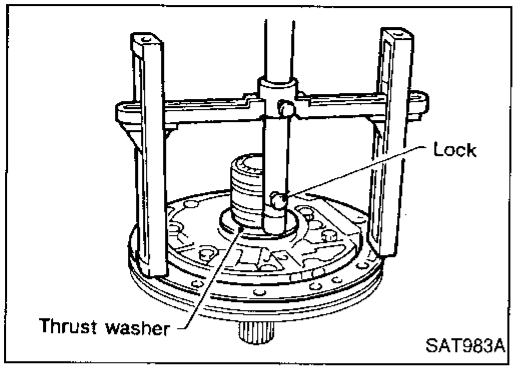



a. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket). Allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.

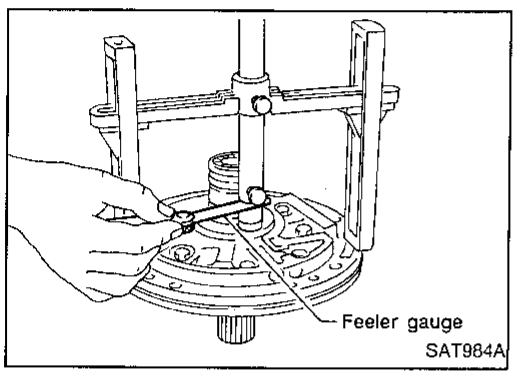



b. Install J34291-23 (gauging plunger) into gauging cylinder.

## Adjustment (Cont'd)




c. Install original thrust washer on oil pump. Place shim setting gauge legs onto machined surface of oil pump assembly. Allow gauging plunger to rest on thrust washer. Lock plunger in place with set screw.



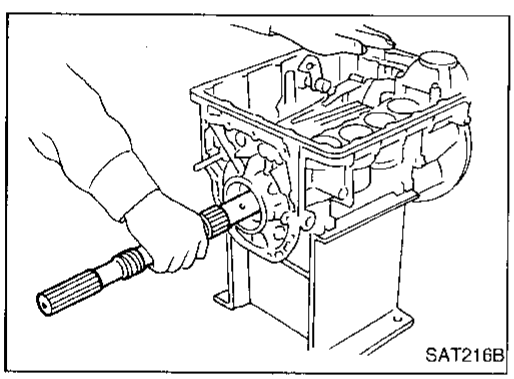

d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum end play.

**Reverse clutch drum end play "$T_2$":**
**0.55 - 0.90 mm (0.0217 - 0.0354 in)**

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

**Available oil pump thrust washer:**
**Refer to SDS, AT-265.**

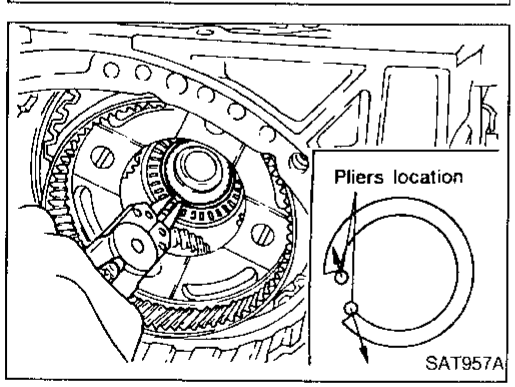
## Assembly (2)




1. Install output shaft and parking gear.

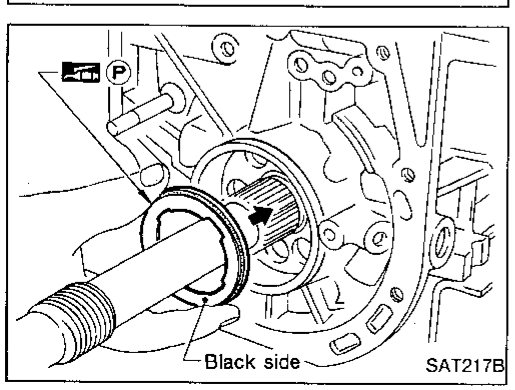
a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.

- **Do not force output shaft against front of transmission case.**




b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

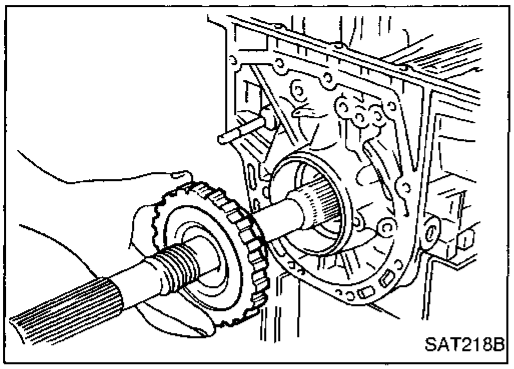
- **Check to be sure output shaft cannot be removed in rear direction.**



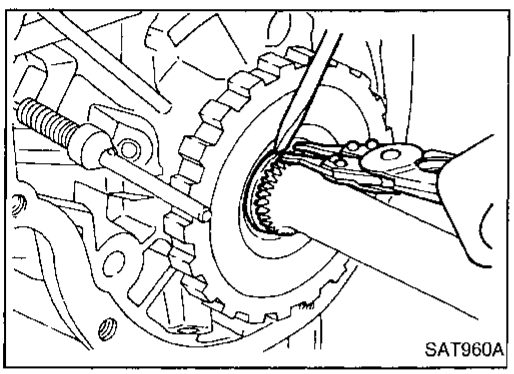

c. Install needle bearing on transmission case.

- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**

## Assembly (2) (Cont'd)

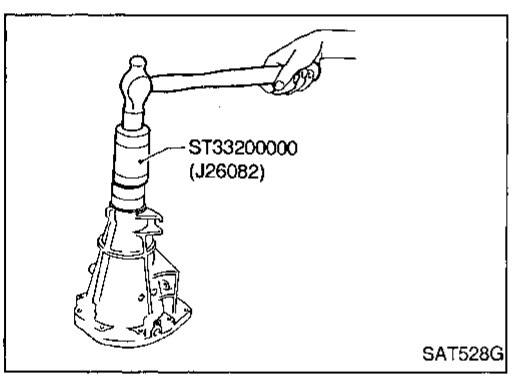



d. Install parking gear on transmission case.




e. Install snap ring on rear of output shaft.

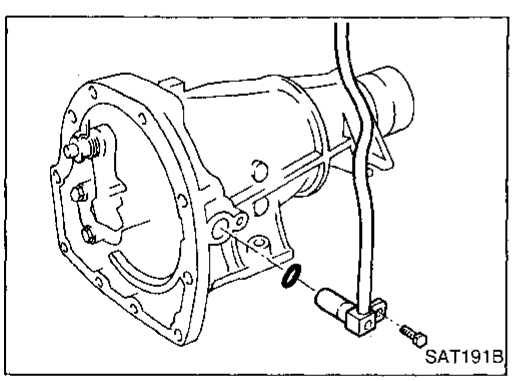
- **Check to be sure output shaft cannot be removed in forward direction.**




2. Install rear extension.

a. Install oil seal on rear extension.

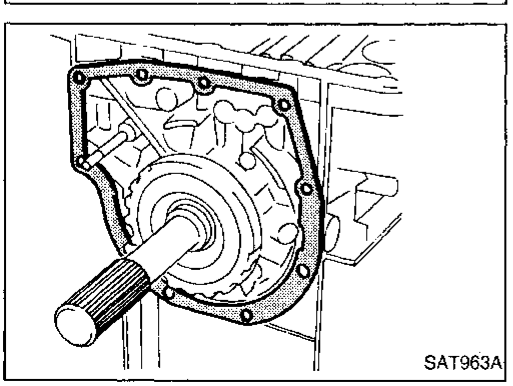
- **Apply ATF to oil seal.**




b. Install O-ring on revolution sensor.

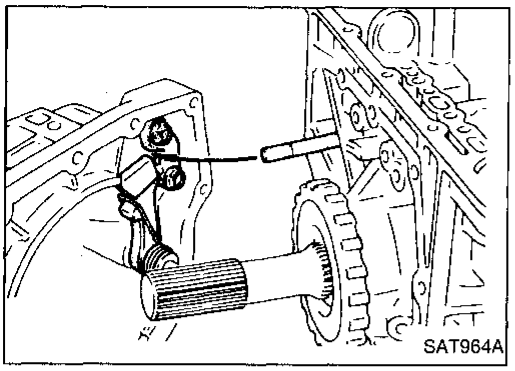
- **Apply ATF to O-ring.**

c. Install revolution sensor on rear extension.

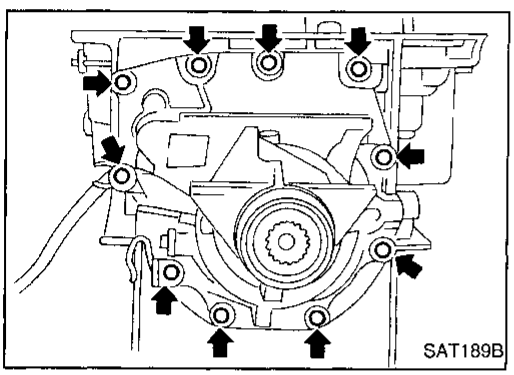



d. Install rear extension gasket on transmission case.

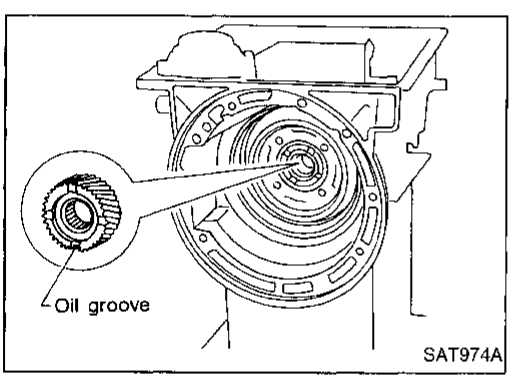
## Assembly (2) (Cont'd)



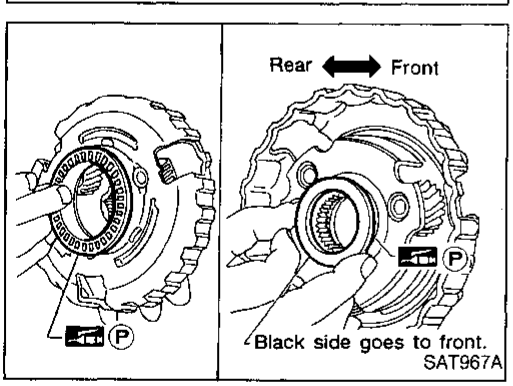

e. Install parking rod on transmission case.




f. Install rear extension on transmission case.

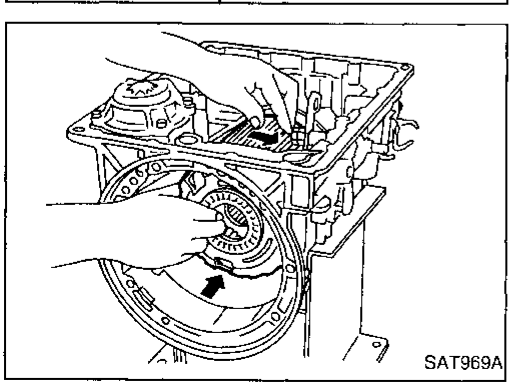



3. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**



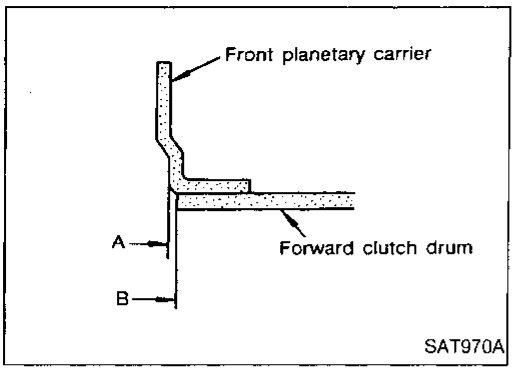

b. Make sure needle bearing is on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

c. Make sure needle bearing is on rear of front planetary carrier.
- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**

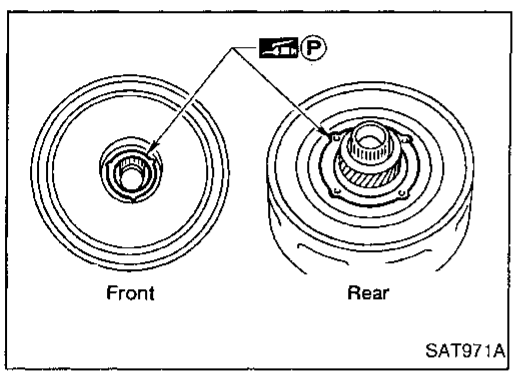



d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

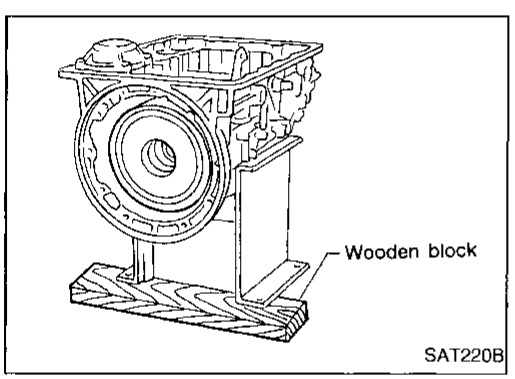
## Assembly (2) (Cont'd)



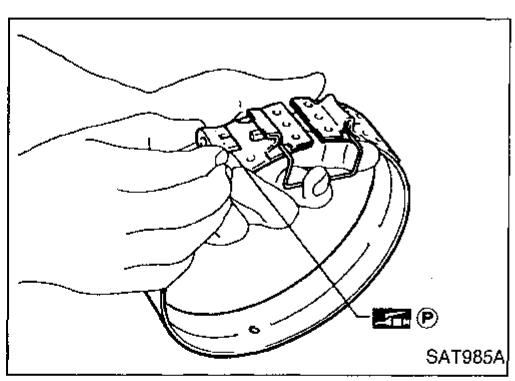

- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**



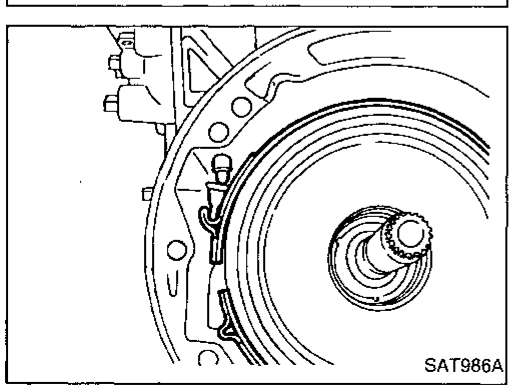

e. Make sure bearing races are on front and rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing races with holes in clutch pack.**




f. Install clutch pack into transmission case.

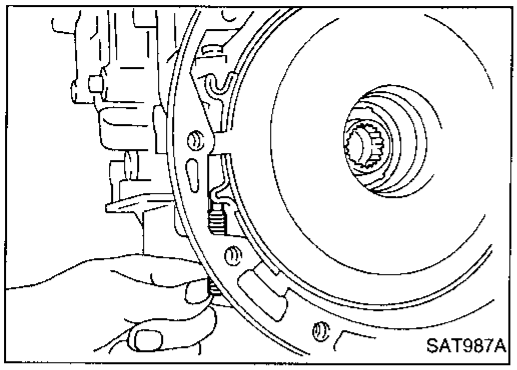



4. Install brake band and band strut.
a. Install band strut on brake band.
- **Apply petroleum jelly to band strut.**

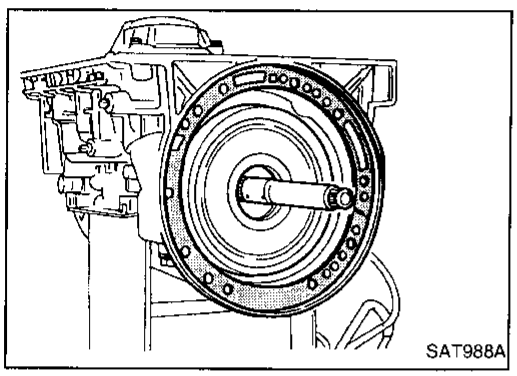



b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.

## Assembly (2) (Cont'd)

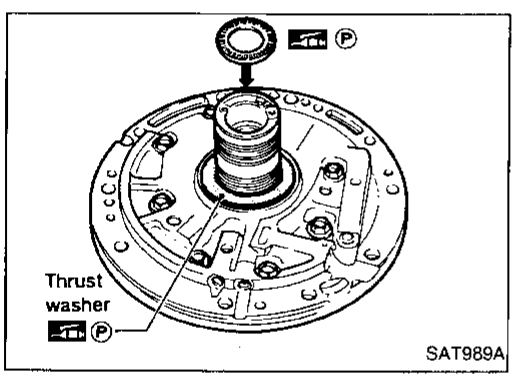



c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



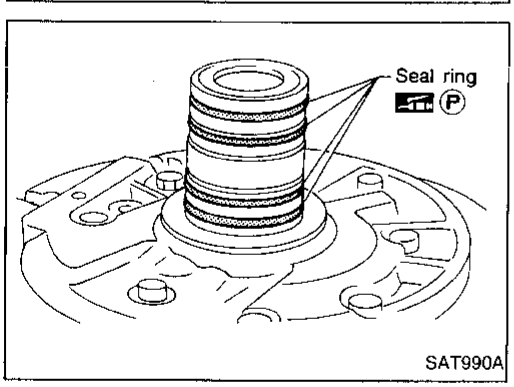

5. Install input shaft on transmission case.
- **Pay attention to its direction — O-ring groove side is front.**

6. Install gasket on transmission case.

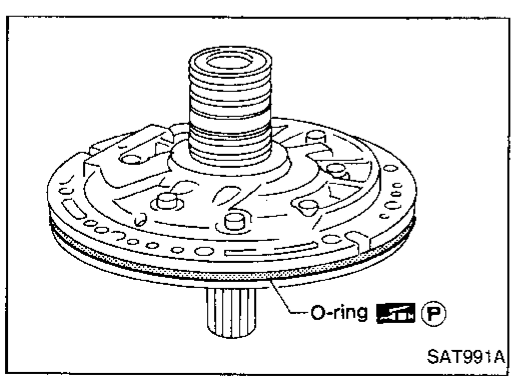



7. Install oil pump assembly.
a. Install needle bearing on oil pump assembly.
- **Apply petroleum jelly to the needle bearing.**

b. Install selected thrust washer on oil pump assembly.
- **Apply petroleum jelly to thrust washer.**

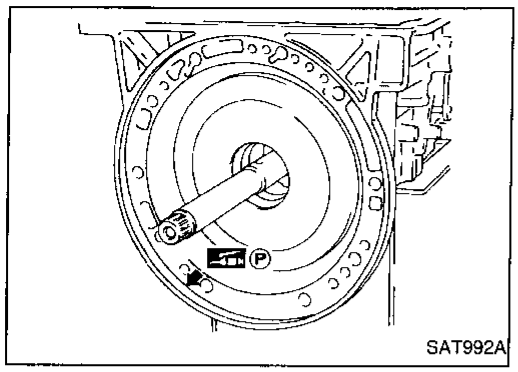



c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.

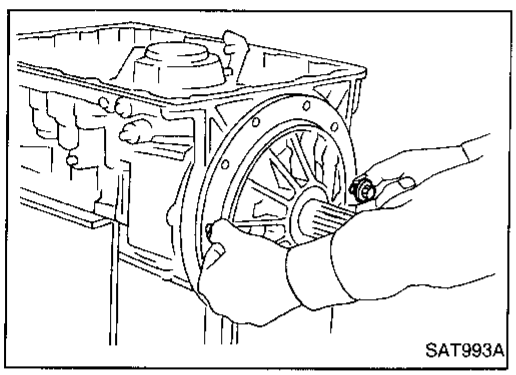



d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**

## Assembly (2) (Cont'd)

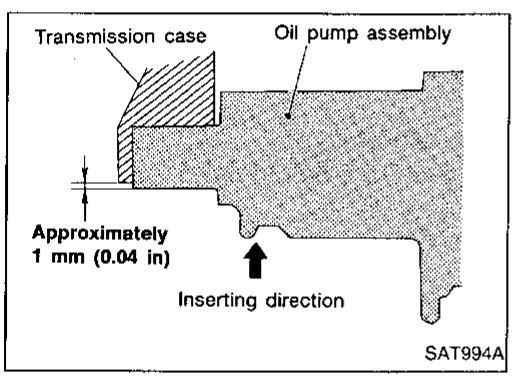



e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

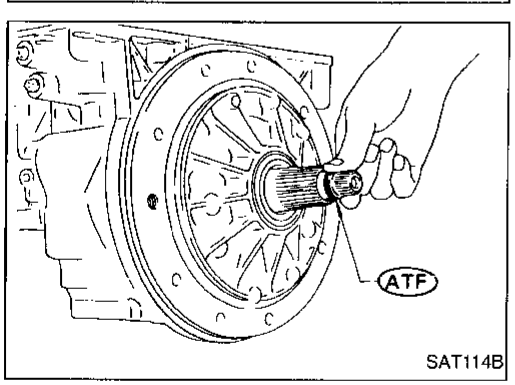



f. Install oil pump assembly.

- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

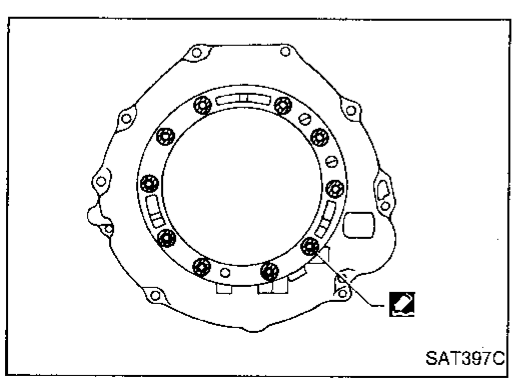



- **Insert oil pump assembly to the specified position in transmission, as shown at left.**




8. Install O-ring on input shaft.

- **Apply ATF to O-rings.**

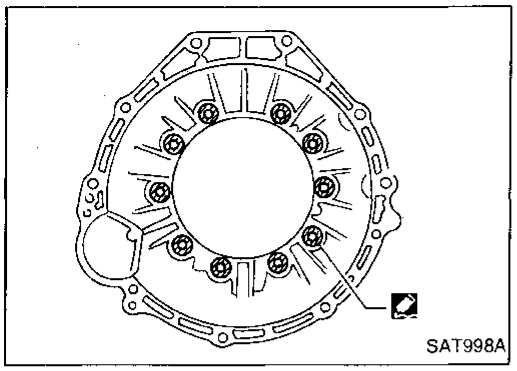



9. Install converter housing.

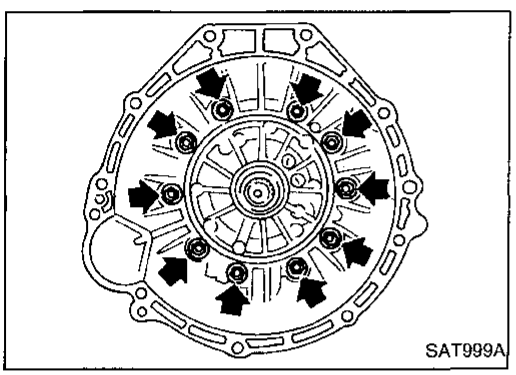
a. Apply recommended sealant (Genuine anaerobic liquid gasket, Three Bond TB1215, Locktite Part No. 51813 or equivalent) to outer periphery of bolt holes in converter housing.

- **Do not apply too much sealant.**

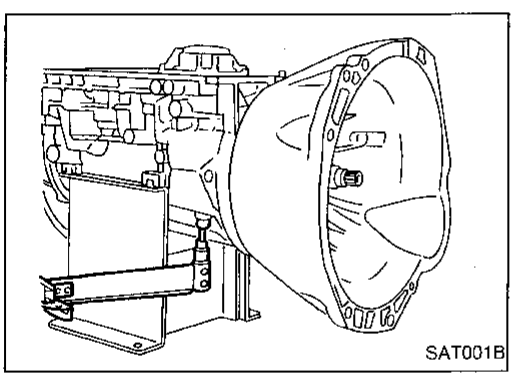
## Assembly (2) (Cont'd)



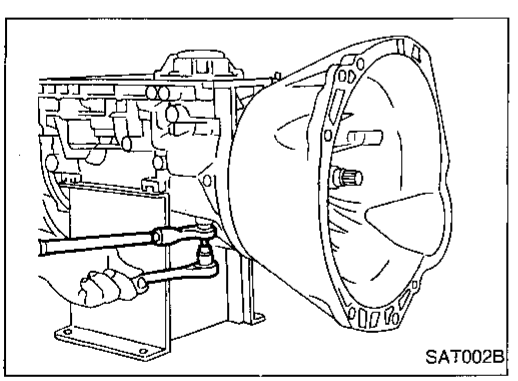

b. Apply recommended sealant (Genuine anaerobic liquid gasket, Three Bond TB1215, Locktite Part No. 51813 or equivalent) to seating surfaces of bolts that secure front of converter housing.



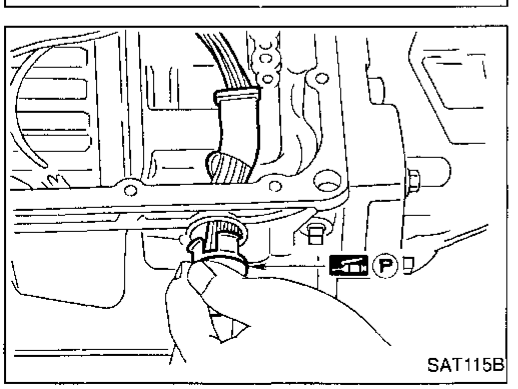

c. Install converter housing on transmission case.




10. Adjust brake band.
a. Tighten anchor end bolt to specified torque.
**Anchor end bolt:**
**: 4 - 6 N·m**
**(0.4 - 0.6 kg-m, 35 - 52 in-lb)**
b. Back off anchor end bolt two and a half turns.



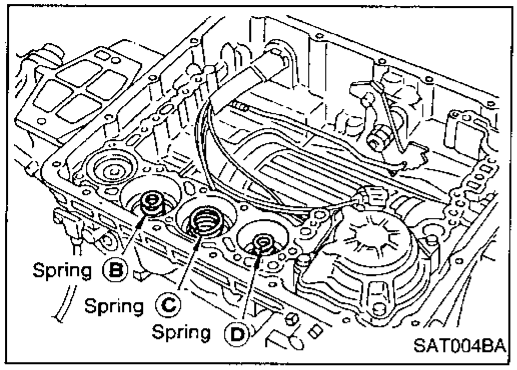

c. While holding anchor end pin, tighten lock nut.



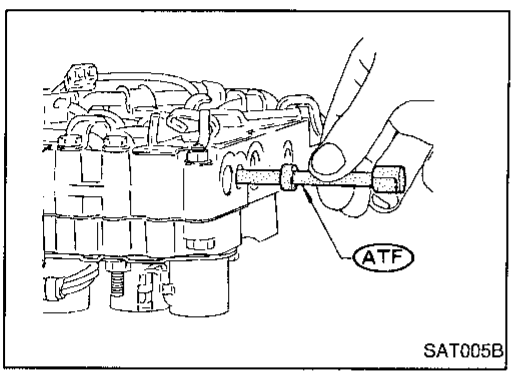

11. Install terminal cord assembly.
a. Install O-ring on terminal cord assembly.
- **Apply petroleum jelly to O-ring.**

b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.

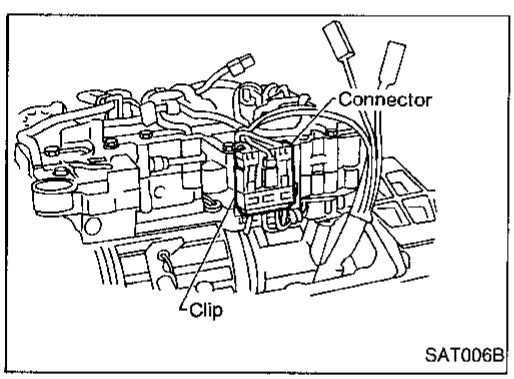
## Assembly (2) (Cont'd)



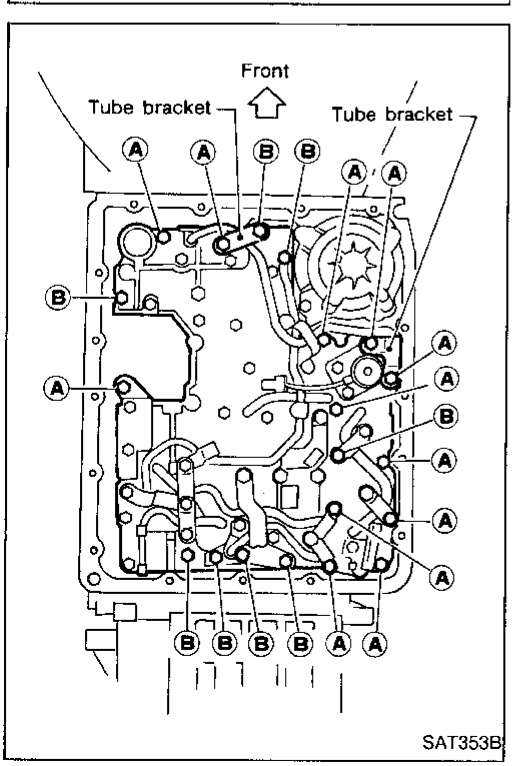

12. Install control valve assembly.
a. Install accumulator piston return springs Ⓑ, Ⓒ and Ⓓ.
**Free length of return springs:**
**Refer to SDS, AT-263.**




b. Install manual valve on control valve.
- **Apply ATF to manual valve.**



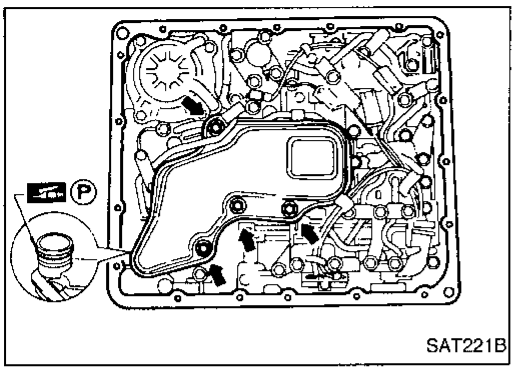

c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.




e. Install control valve assembly on transmission case.
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.
- **Check that terminal assembly does not catch.**

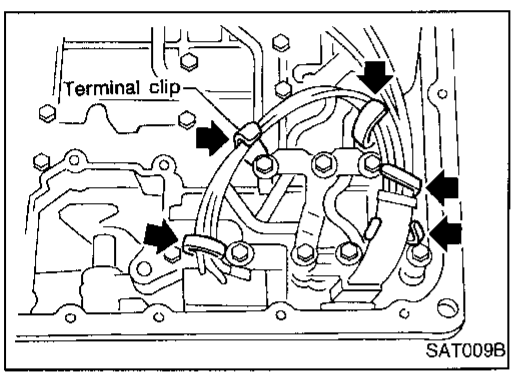
| Bolt symbol | ℓmm (in) ℓ |
|---|---|
| Ⓐ | 33 (1.30) |
| Ⓑ | 45 (1.77) |

## Assembly (2) (Cont'd)

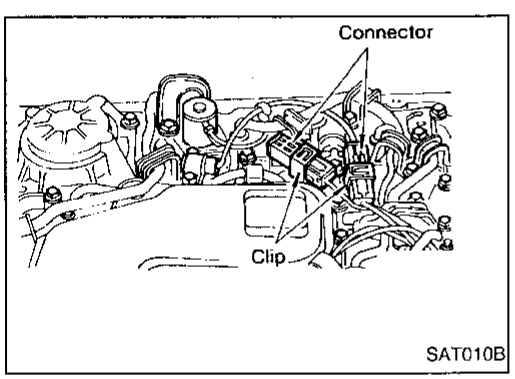



g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**

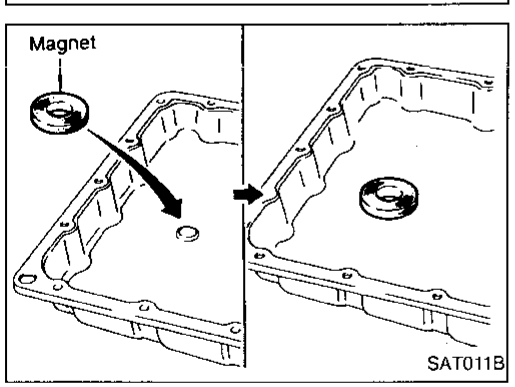
h. Install oil strainer on control valve.



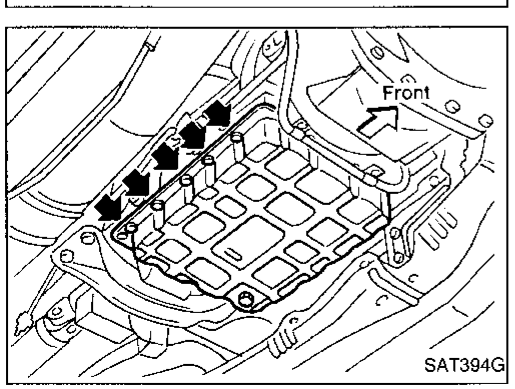

i. Securely fasten terminal harness with clips.




j. Install torque converter clutch solenoid valve and A/T fluid temperature sensor connectors.



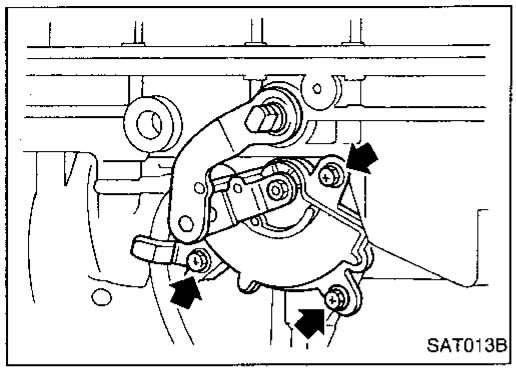

13. Install oil pan.
a. Attach a magnet to oil pan.



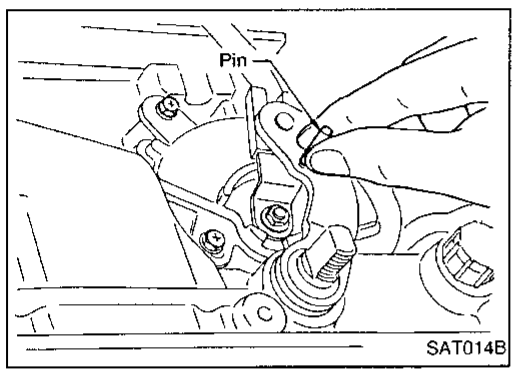

b. Install new oil pan gasket on transmission case.
c. Install oil pan and bracket on transmission case.
- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Before installing bolts, remove traces of sealant and oil from mating surface and thread holes.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

d. Tighten drain plug.

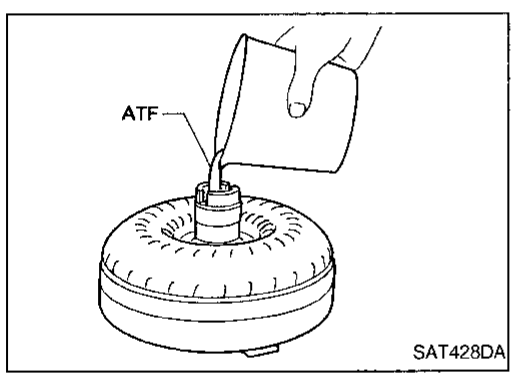
## Assembly (2) (Cont'd)



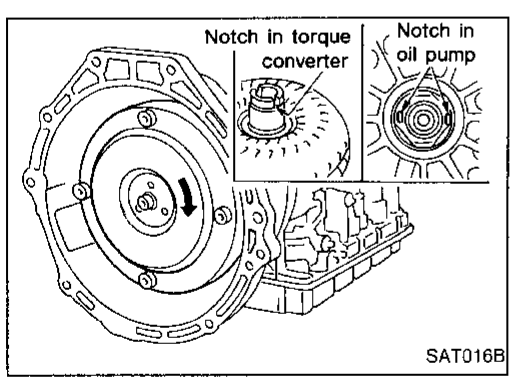

14. Install inhibitor switch.
a. Check that manual shaft is in "1" position.
b. Temporarily install inhibitor switch on manual shaft.
c. Move manual shaft to "N".



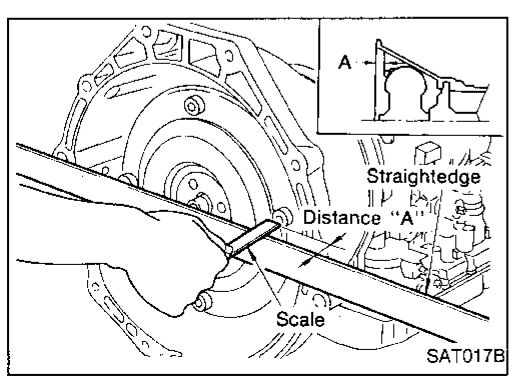

d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.




15. Install torque converter.
a. Pour ATF into torque converter.
- **Approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of fluid are required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**




b. Install torque converter while aligning notches and oil pump.




c. Measure distance A to check that torque converter is in proper position.
**Distance "A":**
**26.0 mm (1.024 in) or more**

# General Specifications

| | |
|---|---|
| Engine | KA24DE |
| Automatic transmission model | RE4R01A |
| Transmission model code number | 44X63 |
| Stall torque ratio | 2.0 : 1 |
| Transmission gear ratio | |
| 1st | 2.785 |
| 2nd | 1.545 |
| Top | 1.000 |
| OD | 0.694 |
| Reverse | 2.272 |
| Recommended oil | Nissan Matic "D" (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)* |
| Oil capacity ℓ (US qt, Imp qt) | 8.3 (8-3/4, 7-1/4) |

*: Refer to MA section ("Fluids and Lubricants", "RECOMMENDED FLUIDS AND LUBRICANTS").

# Specifications and Adjustment

## SHIFT SCHEDULE

### Vehicle speed when shifting gears

| Throttle position | Vehicle speed km/h (MPH) | | | | | | |
|---|---|---|---|---|---|---|---|
| | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$ | $D_3 \rightarrow D_4$ | $D_4 \rightarrow D_3$ | $D_3 \rightarrow D_2$ | $D_2 \rightarrow D_1$ | $1_2 \rightarrow 1_1$ |
| Full throttle | 48 - 52 (30 - 32) | 92 - 100 (57 - 62) | 149 - 159 (93 - 99) | 143 - 153 (89 - 95) | 86 - 94 (53 - 58) | 40 - 44 (25 - 27) | 53 - 57 (33 - 35) |
| Half throttle | 35 - 39 (22 - 24) | 72 - 78 (45 - 48) | 112 - 120 (70 - 75) | 56 - 64 (35 - 40) | 27 - 33 (17 - 21) | 10 - 14 (6 - 9) | 53 - 57 (33 - 35) |

### Vehicle speed when performing and releasing lock-up

| Throttle position | Overdrive control switch [Shift position] | Vehicle speed km/h (MPH) | |
|---|---|---|---|
| | | Lock-up "ON" | Lock-up "OFF" |
| Full throttle | ON [$D_4$] | 112 - 120 (70 - 75) | 107 - 115 (66 - 71) |
| | OFF [$D_3$] | 91 - 99 (57 - 62) | 86 - 94 (53 - 58) |
| Half throttle | ON [$D_4$] | 112 - 120 (70 - 75) | 107 - 115 (66 - 71) |
| | OFF [$D_3$] | 91 - 99 (57 - 62) | 86 - 94 (53 - 58) |

## STALL REVOLUTION

| Stall revolution rpm |
|---|
| 2,050 - 2,250 |

## LINE PRESSURE

| Engine speed rpm | Line pressure kPa (kg/cm², psi) | |
|---|---|---|
| | D, 2 and 1 positions | R position |
| Idle | 431 - 471 (4.40 - 4.80, 62.6 - 68.3) | 588 - 628 (6.0 - 6.4, 85 - 91) |
| Stall | 1,020 - 1,098 (10.4 - 11.2, 148 - 159) | 1,422 - 1,500 (14.5 - 15.3, 206 - 218) |

## Specifications and Adjustment (Cont'd)

### RETURN SPRINGS

Unit: mm (in)

| Parts | | | Part No. | Free length | Outer diameter |
|---|---|---|---|---|---|
| Control valve | Upper body | ① Torque converter relief valve spring | 31742-41X23 | 38.0 (1.496) | 9.0 (0.354) |
| | | ② Pressure regulator valve spring | 31742-41X24 | 44.02 (1.733) | 14.0 (0.551) |
| | | ③ Pressure modifier valve spring | 31742-41X19 | 31.95 (1.2579) | 6.8 (0.268) |
| | | ④ Shuttle shift valve D spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | ⑤ 4-2 sequence valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | ⑥ Shift valve B spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | ⑦ 4-2 relay valve spring | 31756-41X00 | 29.1 (1.146) | 6.95 (0.2736) |
| | | ⑧ Shift valve A spring | 31762-41X01 | 25.0 (0.984) | 7.0 (0.276) |
| | | ⑨ Overrun clutch control valve spring | 31762-41X03 | 23.6 (0.929) | 7.0 (0.276) |
| | | ⑩ Overrun clutch reducing valve spring | 31742-41X20 | 32.5 (1.280) | 7.0 (0.276) |
| | | ⑪ Shuttle shift valve S spring | 31762-41X04 | 51.0 (2.008) | 5.65 (0.2224) |
| | | ⑫ Pilot valve spring | 31742-41X13 | 25.7 (1.012) | 9.1 (0.358) |
| | | ⑬ Torque converter clutch control valve spring | 31742-41X22 | 18.5 (0.728) | 13.0 (0.512) |
| | Lower body | ① Modifier accumulator valve spring | 31742-27X70 | 31.4 (1.236) | 9.8 (0.386) |
| | | ② 1st reducing valve spring | 31756-41X05 | 25.4 (1.000) | 6.75 (0.2657) |
| | | ③ 3-2 timing valve spring | 31742-41X06 | 23.0 (0.906) | 6.7 (0.264) |
| | | ④ Servo charger valve spring | 31742-41X06 | 23.0 (0.906) | 6.7 (0.264) |
| Reverse clutch | | 16 pcs | 31521-41X02 (Assembly) | 19.7 (0.776) | 11.6 (0.457) |
| High clutch | | 10 pcs | 31521-41X03 (Assembly) | 24.2 (0.953) | 11.6 (0.457) |
| Forward clutch (Overrun clutch) | | 20 pcs | 31521-41X00 (Assembly) | 35.77 (1.4083) | 9.7 (0.382) |
| Low & reverse brake | | 18 pcs | 31655-41X00 (Assembly) | 22.3 (0.878) | 11.2 (0.441) |
| Band servo | | Spring Ⓐ | 31605-41X05 | 45.6 (1.795) | 34.3 (1.350) |
| | | Spring Ⓑ | 31605-41X00 | 53.8 (2.118) | 40.3 (1.587) |
| | | Spring Ⓒ | 31605-41X01 | 29.7 (1.169) | 27.6 (1.087) |
| Accumulator | | Accumulator Ⓐ | 31605-41X02 | 43.0 (1.693) | 18.0 (0.709) |
| | | Accumulator Ⓑ | 31605-41X10 | 66.0 (2.598) | 20.0 (0.787) |
| | | Accumulator Ⓒ | 31605-41X09 | 45.0 (1.772) | 29.3 (1.154) |
| | | Accumulator Ⓓ | 31605-41X06 | 58.4 (2.299) | 17.3 (0.681) |

## ACCUMULATOR O-RING

| Accumulator | Diameter mm (in) | | | |
|---|---|---|---|---|
| | Ⓐ | Ⓑ | Ⓒ | Ⓓ |
| Small diameter end | 29 (1.14) | 32 (1.26) | 45 (1.77) | 29 (1.14) |
| Large diameter end | 45 (1.77) | 50 (1.97) | 50 (1.97) | 45 (1.77) |

## CLUTCHES AND BRAKES

**Reverse clutch**

| | |
|---|---|
| Number of drive plates | 2 |
| Number of driven plates | 2 |
| Thickness of drive plate mm (in) | |
| Standard | 2.0 (0.079) |
| Wear limit | 1.8 (0.071) |
| Clearance mm (in) | |
| Standard | 0.5 - 0.8 (0.020 - 0.031) |
| Allowable limit | 1.2 (0.047) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 4.8 (0.189) | 31537-42X02 |
| | 5.0 (0.197) | 31537-42X03 |
| | 5.2 (0.205) | 31537-42X04 |
| | 5.4 (0.213) | 31537-42X05 |
| | 5.6 (0.220) | 31537-42X06 |

**High clutch**

| | |
|---|---|
| Number of drive plates | 4 |
| Number of driven plates | 7 |
| Thickness of drive plate mm (in) | |
| Standard | 1.6 (0.063) |
| Wear limit | 1.4 (0.055) |
| Clearance mm (in) | |
| Standard | 1.8 - 2.2 (0.071 - 0.087) |
| Allowable limit | 3.0 (0.118) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 3.4 (0.134) | 31537-41X71 |
| | 3.6 (0.142) | 31537-41X61 |
| | 3.8 (0.150) | 31537-41X62 |
| | 4.0 (0.157) | 31537-41X63 |
| | 4.2 (0.165) | 31537-41X64 |

**Forward clutch**

| | |
|---|---|
| Number of drive plates | 5 |
| Number of driven plates | 5 |
| Thickness of drive plate mm (in) | |
| Standard | 1.6 (0.063) |
| Wear limit | 1.4 (0.055) |
| Clearance mm (in) | |
| Standard | 0.35 - 0.75 (0.0138 - 0.0295) |
| Allowable limit | 1.85 (0.0728) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 8.0 (0.315) | 31537-41X00 |
| | 8.1 (0.319) | 31537-42X60 |
| | 8.2 (0.323) | 31537-41X01 |
| | 8.3 (0.327) | 31537-42X61 |
| | 8.4 (0.331) | 31537-41X02 |
| | 8.5 (0.335) | 31537-42X62 |
| | 8.6 (0.339) | 31537-41X03 |
| | 8.7 (0.343) | 31537-42X63 |
| | 8.8 (0.346) | 31537-41X04 |
| | 8.9 (0.350) | 31537-42X64 |
| | 9.0 (0.354) | 31537-41X05 |
| | 9.1 (0.358) | 31537-42X65 |
| | 9.2 (0.362) | 31537-41X06 |

**Overrun clutch**

| | |
|---|---|
| Number of drive plates | 3 |
| Number of driven plates | 5 |
| Thickness of drive plate mm (in) | |
| Standard | 2.0 (0.079) |
| Wear limit | 1.8 (0.071) |
| Clearance mm (in) | |
| Standard | 1.0 - 1.4 (0.039 - 0.055) |
| Allowable limit | 2.0 (0.079) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 4.2 (0.165) | 31537-41X80 |
| | 4.4 (0.173) | 31537-41X81 |
| | 4.6 (0.181) | 31537-41X82 |
| | 4.8 (0.189) | 31537-41X83 |
| | 5.0 (0.197) | 31537-41X84 |

## Specifications and Adjustment (Cont'd)

| | |
|---|---|
| **Low & reverse brake** | |
| Number of drive plates | 6 |
| Number of driven plates | 6 |
| Thickness of drive plate mm (in) | |
| Standard | 1.6 (0.063) |
| Wear limit | 1.4 (0.055) |
| Clearance mm (in) | |
| Standard | 0.8 - 1.1 (0.031 - 0.043) |
| Allowable limit | 2.3 (0.091) |

| Thickness of retaining plate | Thickness mm (in) | Part number |
|---|---|---|
| | 7.0 (0.276) | 31667-41X12 |
| | 7.2 (0.283) | 31667-41X13 |
| | 7.4 (0.291) | 31667-41X14 |
| | 7.6 (0.299) | 31667-41X07 |
| | 7.8 (0.307) | 31667-41X08 |
| | 8.0 (0.315) | 31667-41X00 |
| | 8.2 (0.323) | 31667-41X01 |
| | 8.4 (0.331) | 31667-41X02 |
| | 8.6 (0.339) | 31667-41X03 |
| | 8.8 (0.346) | 31667-41X04 |
| | 9.0 (0.354) | 31667-41X05 |
| | 9.2 (0.362) | 31667-41X06 |

| | |
|---|---|
| **Brake band** | |
| Anchor end bolt tightening torque N·m (kg-m, in-lb) | 4 - 6 (0.4 - 0.6, 35 - 52) |
| Number of returning revolutions for anchor end bolt | 2.5 |

## OIL PUMP AND LOW ONE-WAY CLUTCH

| | |
|---|---|
| Oil pump clearance mm (in) | |
| Cam ring — oil pump housing | |
| Standard | 0.01 - 0.024 (0.0004 - 0.0009) |
| Rotor, vanes and control piston — oil pump housing | |
| Standard | 0.03 - 0.044 (0.0012 - 0.0017) |
| Seal ring clearance mm (in) | |
| Standard | 0.10 - 0.25 (0.0039 - 0.0098) |
| Allowable limit | 0.25 (0.0098) |

## TOTAL END PLAY

| Total end play "$T_1$" | 0.25 - 0.55 mm (0.0098 - 0.0217 in) | |
|---|---|---|
| | Thickness mm (in) | Part number |
| Thickness of oil pump cover bearing race | 0.8 (0.031) | 31435-41X01 |
| | 1.0 (0.039) | 31435-41X02 |
| | 1.2 (0.047) | 31435-41X03 |
| | 1.4 (0.055) | 31435-41X04 |
| | 1.6 (0.063) | 31435-41X05 |
| | 1.8 (0.071) | 31435-41X06 |
| | 2.0 (0.079) | 31435-41X07 |

## REVERSE CLUTCH DRUM END PLAY

| Reverse clutch drum end play "$T_2$" | 0.55 - 0.90 mm (0.0217 - 0.0354 in) | |
|---|---|---|
| | Thickness mm (in) | Part number |
| Thickness of oil pump thrust washer | 0.9 (0.035) | 31528-21X01 |
| | 1.1 (0.043) | 31528-21X02 |
| | 1.3 (0.051) | 31528-21X03 |
| | 1.5 (0.059) | 31528-21X04 |
| | 1.7 (0.067) | 31528-21X05 |
| | 1.9 (0.075) | 31528-21X06 |

## REMOVAL AND INSTALLATION

| | |
|---|---|
| Manual control linkage | |
| Number of returning revolutions for lock nut | 1 |
| Lock nut tightening torque | 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb) |
| Distance between end of clutch housing and torque converter | 26.0 mm (1.024 in) or more |