AUTOMATIC TRANSMISSION

SECTION AT

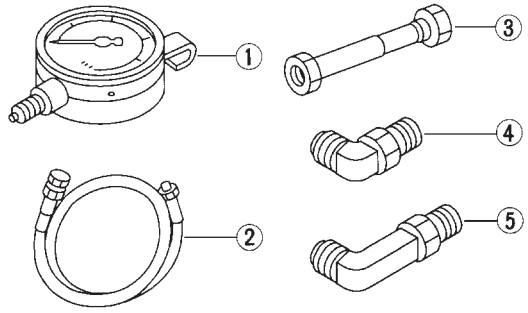
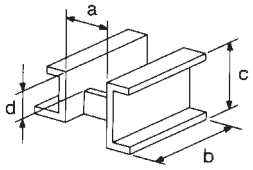
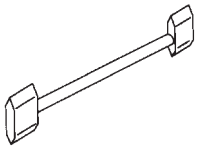
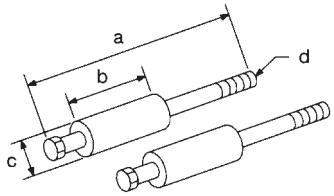
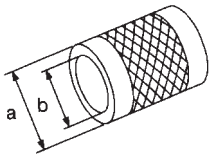
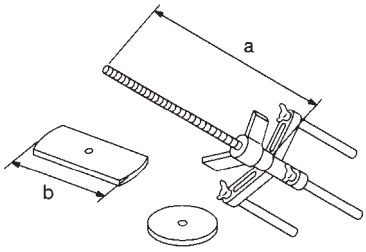
CONTENTS

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" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

Special Service Tools

Tool number Tool name	Description	
ST2505S001 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 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 Torque converter one-way clutch check tool	 NT098	Checking one-way clutch in torque converter
ST25850000 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 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 Clutch spring compressor	 NT423	Removing and installing clutch return springs **a: 320 mm (12.60 in)** **b: 174 mm (6.85 in)**

Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The SRS system composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination.):
Driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
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. For removal of Spiral Cable and Air Bag Module, see the RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation either just before the harness connectors or for the complete harness are related to the SRS.**

Precautions

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. 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 transmission.
- 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 transmission 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 removed parts in a parts rack in order to replace them in correct positions and sequences. 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, and to 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.
- 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.

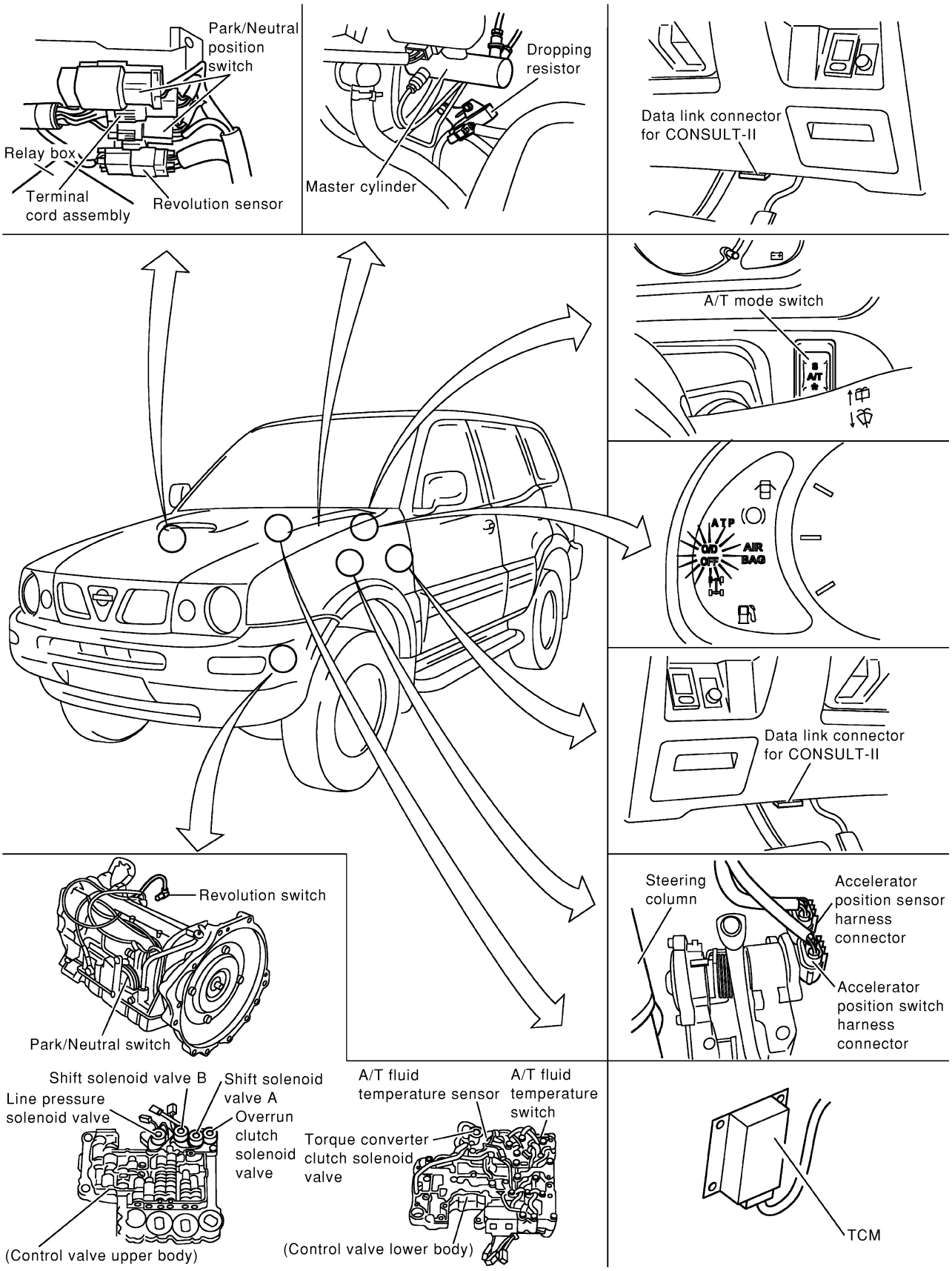
Service Notice or Precautions

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”. Customer may complain of “sluggish or poor acceleration”.
When the Fail-Safe operation occurs the next time the key is turned to the “ON” position, the SPORT indicator lamp will blink for about 8 seconds. (For diagnosis, refer to AT-33.)
Fail-Safe may activate without electrical circuit damages if the vehicle is driven under extreme conditions (such as excessive wheel spins and emergency braking immediately afterwards). In this case, turn the ignition key “OFF” for 5 seconds and then “ON” to recover normal shift pattern.
The blinking of the SPORT indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance.
Always follow the “WORK FLOW” (Refer to AT-26).
The SELF-DIAGNOSIS results will be as follows:

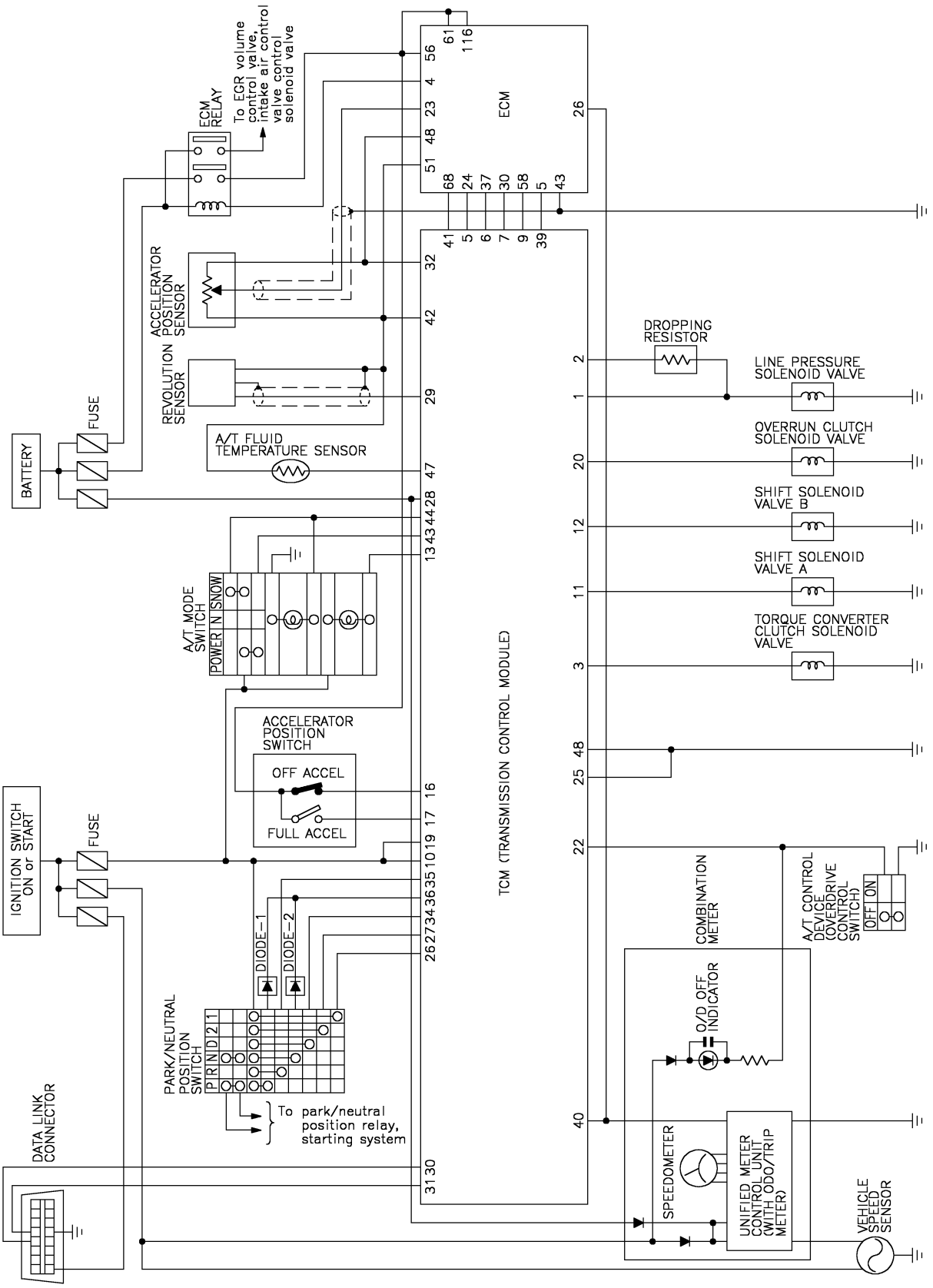
The first SELF-DIAGNOSIS will indicate the damage of the vehicle speed sensor or the revolution sensor. During the next SELF-DIAGNOSIS performed after checking the sensor, no damages will be indicated.

A/T Electrical Parts Location



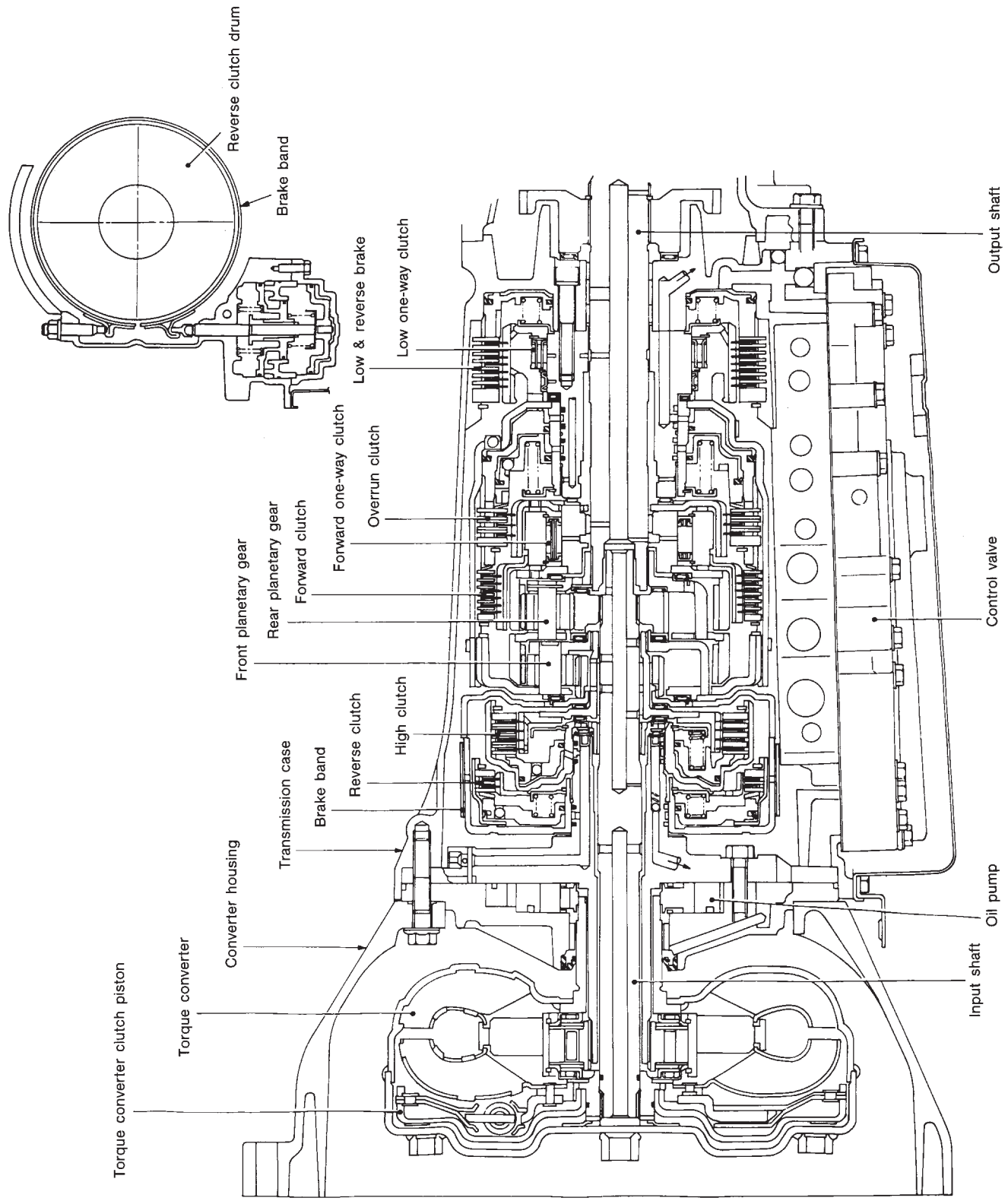
YAT352

Wiring Diagram — A/T —



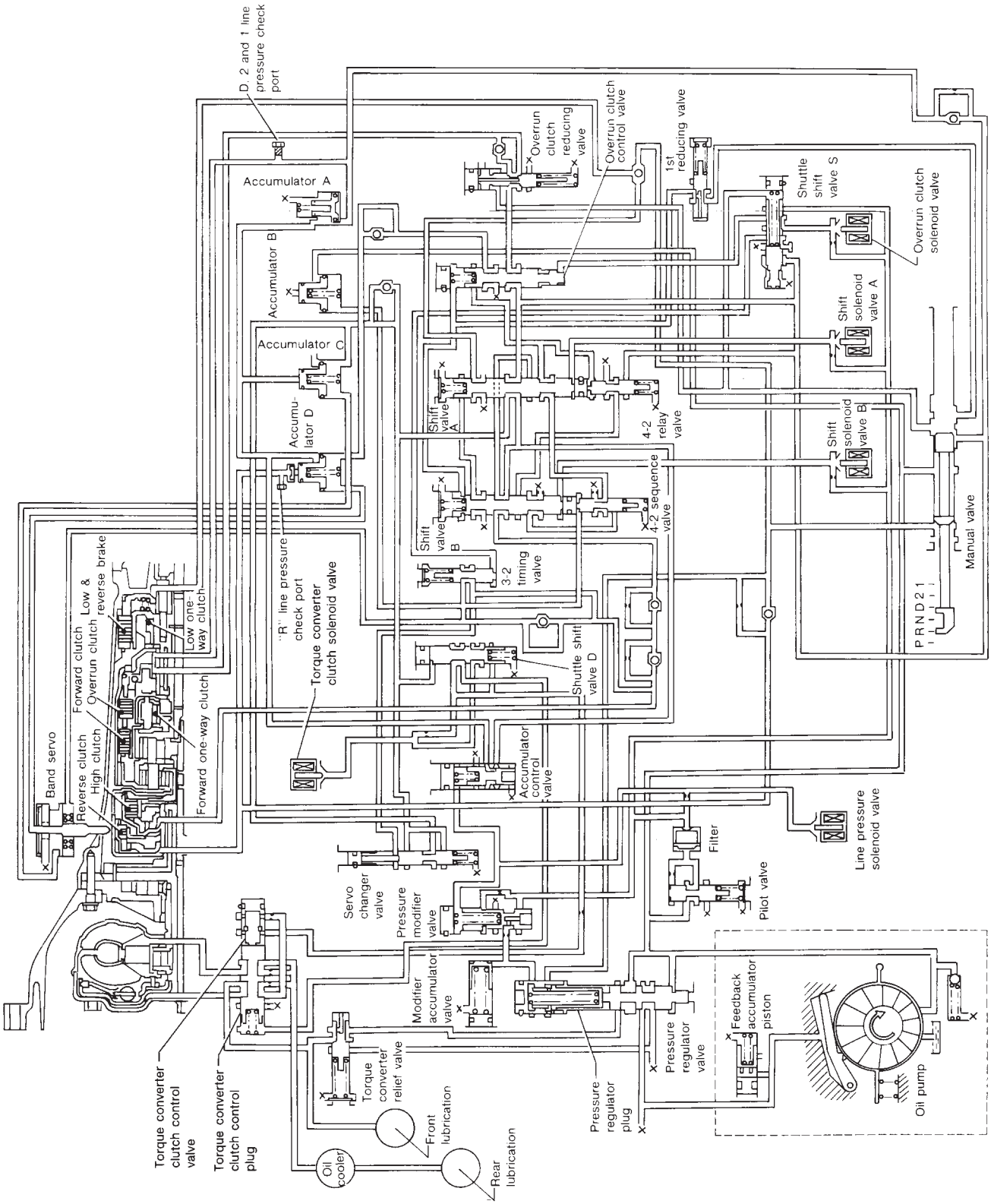
YAT260

Cross-sectional View



SAT125BA

Hydraulic Control Circuits

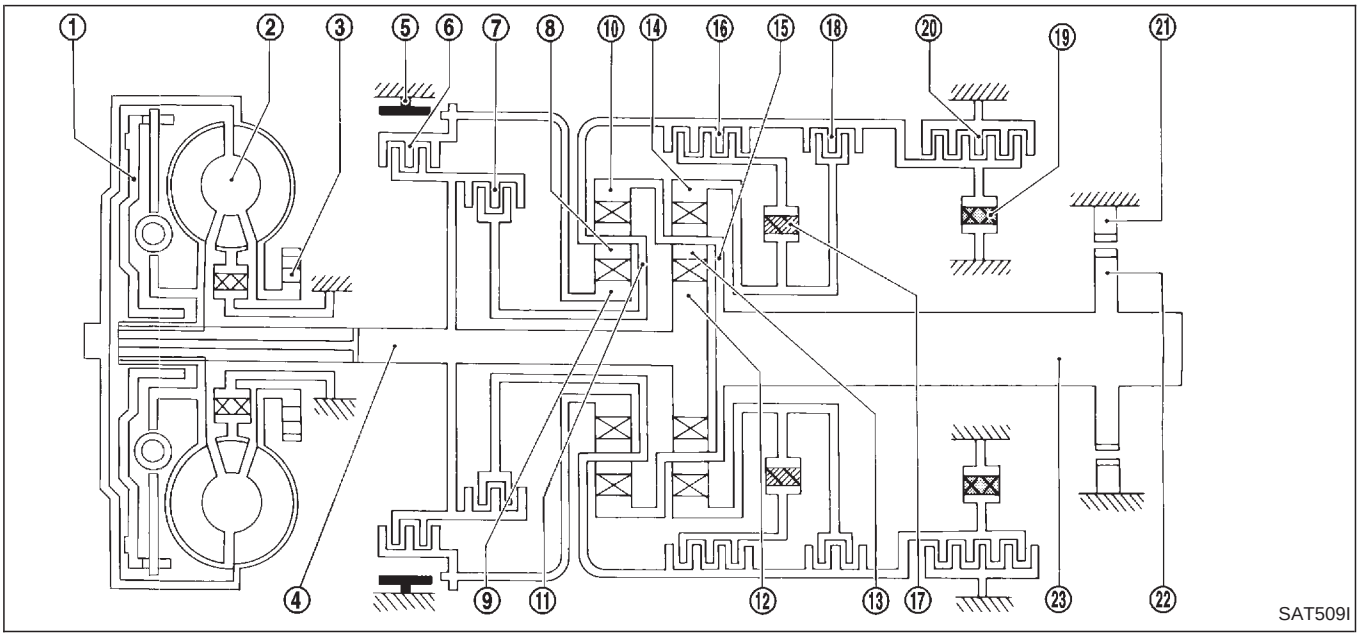


SAT624GA

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

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).

Shift Mechanism (Cont'd)

CLUTCH AND BAND CHART

Shift position		⑥ Reverse clutch	⑦ High clutch	⑯ Forward clutch	⑱ Overrun clutch	Band servo			⑰ Forward one-way clutch	⑲ Low one-way clutch	⑳ Low & reverse brake	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK POSITION
R		○									○		REVERSE POSITION
N													NEUTRAL POSITION
D*4	1st			○	*1⊗				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd			○	*1◎	○			●				
	3rd		○	○	*1◎	*2⊗	⊗		●				
	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 or A/T mode switch is being set in "OFF" or "SPORT" 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 or A/T mode switch is set in "OFF" or "SPORT" position.

○ : 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.

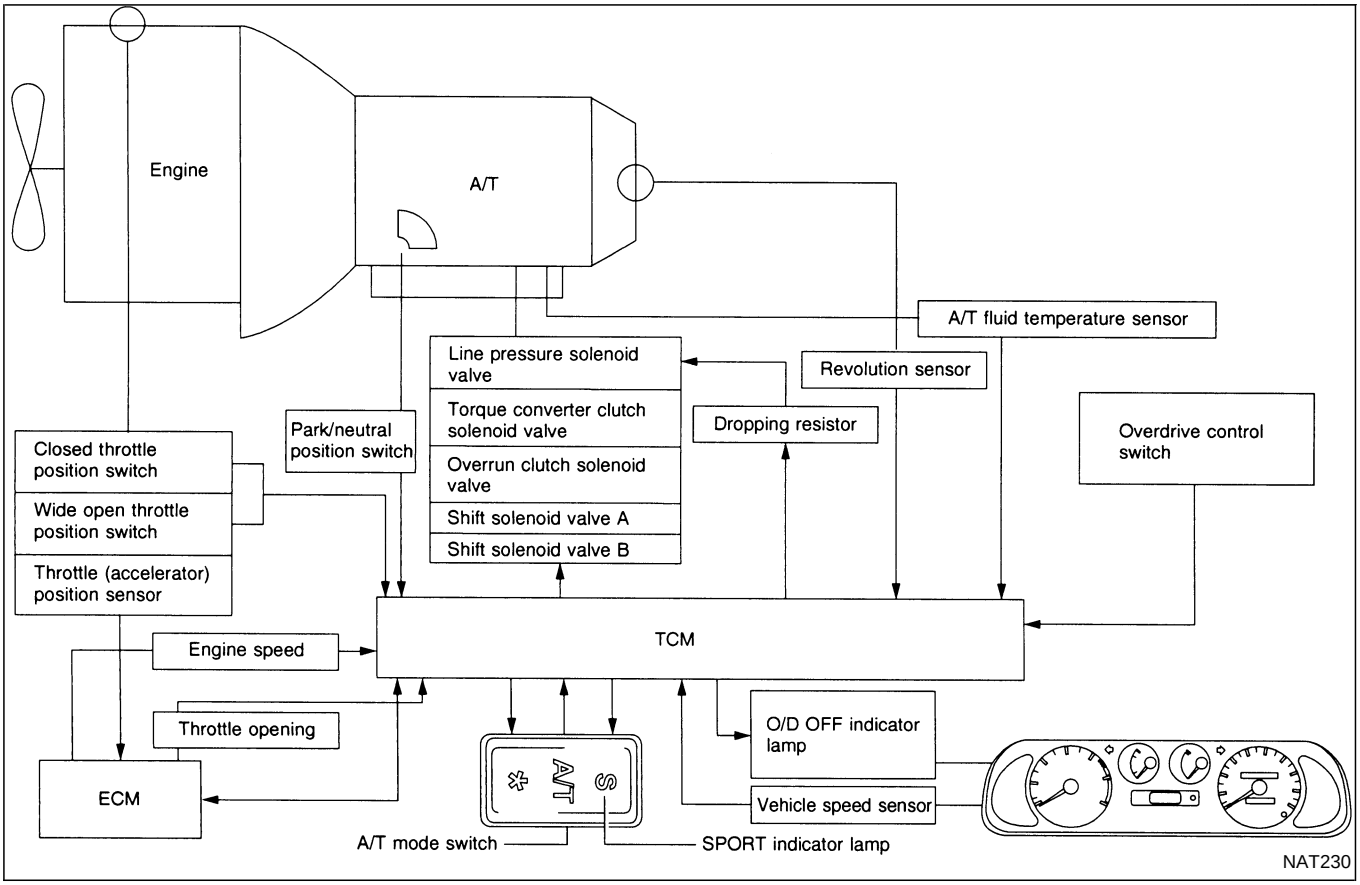
Control System

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	TCM	ACTUATORS
Park/neutral position switch Throttle (accelerator) position sensor Closed throttle position switch Wide open throttle position switch Engine speed signal A/T fluid temperature sensor Revolution sensor Vehicle speed sensor Overdrive control switch A/T mode switch	Shift control Line pressure control Lock-up control Overrun clutch control Timing control Fail-safe control Self-diagnosis Duet-EU control CONSULT-II communication line control	Shift solenoid valve A Shift solenoid valve B Overrun clutch solenoid valve Torque converter clutch solenoid valve Line pressure solenoid valve O/D OFF or SPORT indicator lamp

CONTROL SYSTEM



Control System (Cont'd)

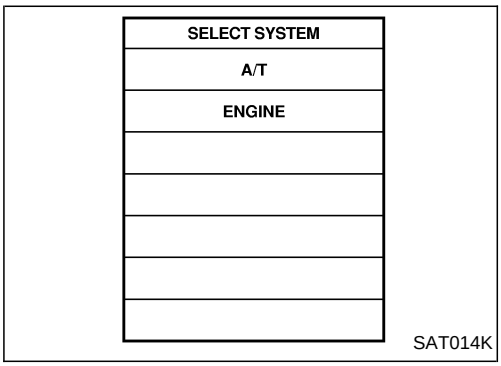
TCM FUNCTION

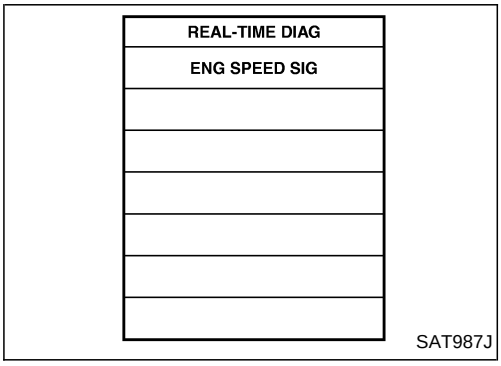
The function of the TCM is to:

- 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	Park/neutral position switch	Detects select lever position and sends a signal to TCM.
	Throttle (accelerator) 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.
	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 A/T mode switch	Sends a signal, which prohibits a shift to "D_4" (overdrive) position, to the 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 SPORT indicator lamp	Shows TCM malfunctions, when A/T control components malfunction.





Self-diagnosis

After performing this procedure, place check marks for results on the "DIAGNOSTIC WORKSHEET", AT-24. Reference pages are provided following the items.

SELF-DIAGNOSTIC PROCEDURE (With CONSULT-II)

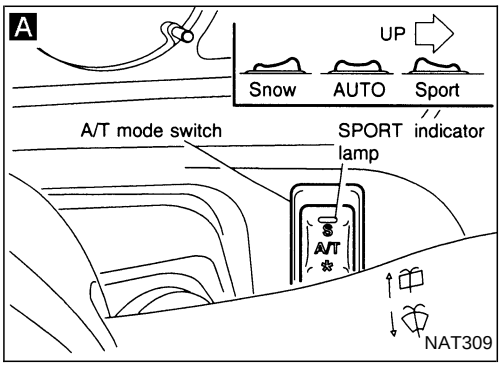
1. Turn on CONSULT-II and touch "A/T".
   If A/T is not displayed, check TCM power supply and ground circuit. Refer to AT-46. If result is NG, refer to EL section ("POWER SUPPLY ROUTING").

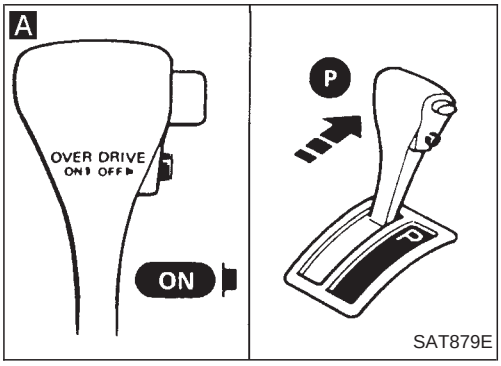
2. Touch "SELF-DIAG RESULTS".
   Display shows malfunction experienced since the last erasing operation.
   CONSULT-II performs REAL-TIME SELF-DIAGNOSIS.
   Also, any malfunction detected while in this mode will be displayed at real time.

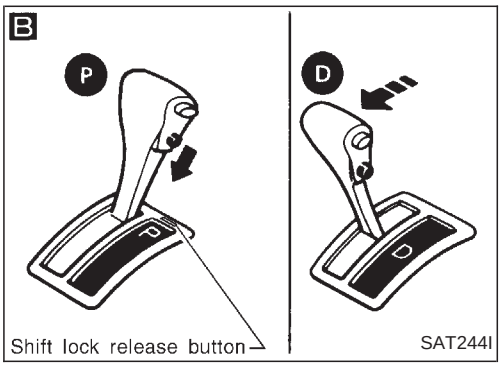
Item	Display	Description	Remarks
No failure	****NO FAILURE****	● No failure has been detected.	
Initial start	*INITIAL START*	● This is NOT a malfunction message. [Whenever shutting off a power supply to the TCM, this message appears on the screen.]	
Vehicle speed sensor·A/T (Revolution sensor)	VHCL SPEED SEN·A/T	● No signal input from vehicle speed sensor·A/T (revolution sensor) during traveling due to disconnection, or input of abnormal signal.	
Vehicle speed sensor·MTR (Meter)	VHCL SPEED SEN·MTR	● No signal input from vehicle speed sensor·MTR during traveling due to disconnection, or input of abnormal signal.	
Throttle (accelerator) position sensor	THROTTLE POSI SEN	● Throttle (accelerator) position sensor signal voltage is abnormally high. ● Throttle (accelerator) position sensor signal voltage is abnormally low with closed throttle position switch "OFF" or wide open throttle position switch "ON".	
Shift solenoid valve A	SHIFT SOLENOID/V A	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
Shift solenoid valve B	SHIFT SOLENOID/V B	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
Overrun clutch solenoid valve	OVERRUN CLUTCH S/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
T/C clutch solenoid valve	T/C CLUTCH SOL/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
A/T fluid temperature sensor/TCM power source	BATT/FLUID TEMP SEN	● Supply voltage to TCM is abnormally low during traveling. ● Fluid temperature signal voltage is abnormally high (fluid temperature is low) during traveling.	To be displayed in case of abnormality and no recording is made
Engine speed signal	ENGINE SPEED SIG	● Engine RPM is abnormally low during traveling.	
Line pressure solenoid valve	LINE PRESSURE S/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
TCM (ROM)	CONTROL UNIT (ROM)	● TCM memory (ROM) is malfunctioning.	
TCM (RAM)	CONTROL UNIT (RAM)	● TCM memory (RAM) is malfunctioning.	

Self-diagnosis (Cont'd)

SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)







DIAGNOSIS START

1. Start engine and warm it up to normal engine operating temperature.
2. Turn ignition switch to "OFF" position. Wait at least 5 seconds.

A

1. Set A/T mode switch to "AUTO" position.
2. Set overdrive control switch in "ON" position.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Does SPORT indicator lamp come on for about 2 seconds?

No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-92.

Yes

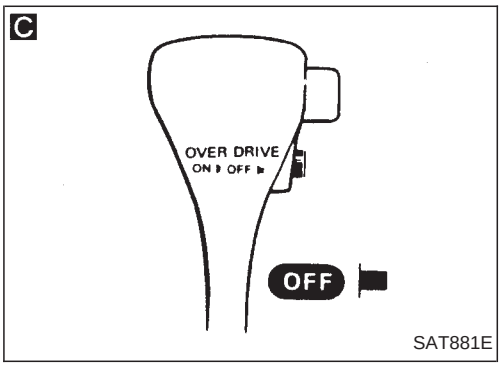
B

1. Turn ignition switch to "ACC" position.
2. Move selector lever to "D" position.

Ⓐ

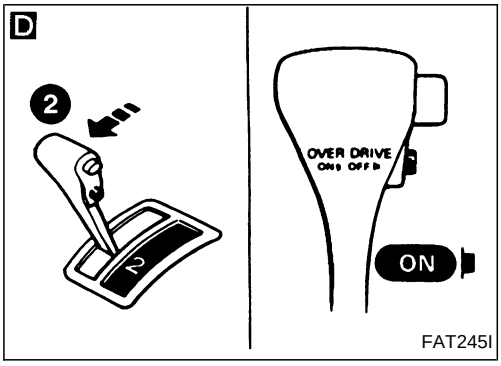
Self-diagnosis (Cont'd)

C



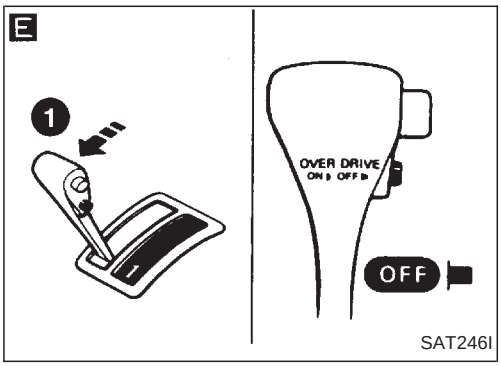
SAT881E

D



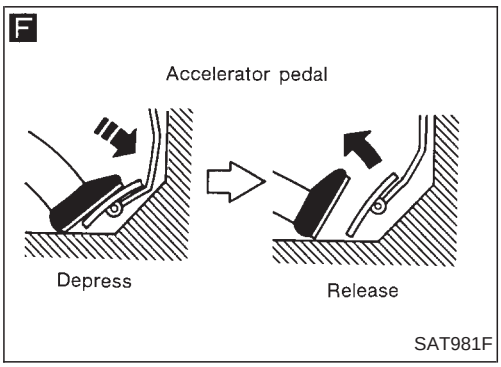
FAT245I

E



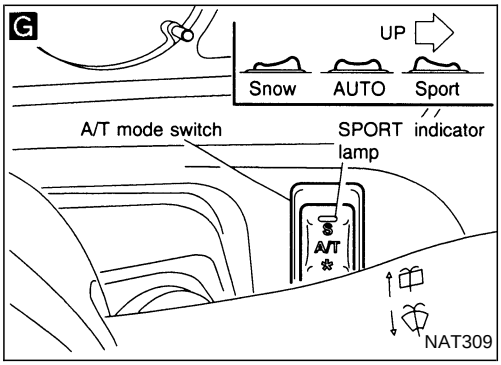
SAT246I

F



SAT981F

G



NAT309

Ⓐ

C

1. Set overdrive control switch in "OFF" position.
2. Depress accelerator pedal fully and release it.
3. Turn ignition switch "ON". (Do not start engine.)

D

1. Move selector lever to "2" position.
2. Set overdrive control switch in "ON" position.

E

1. Move selector lever to "1" position.
2. Set overdrive control switch in "OFF" position.

F

Depress accelerator pedal fully and release it.

G

Check SPORT indicator lamp.
Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE, AT-17.

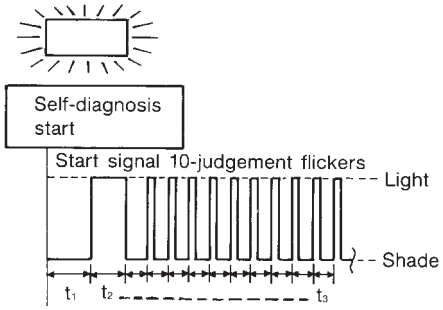
DIAGNOSIS END

Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

SPORT indicator lamps

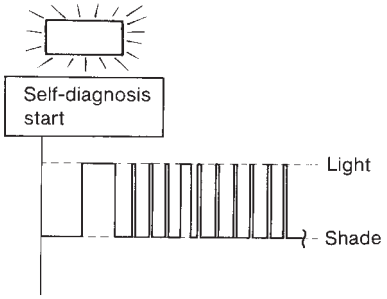
All judgement flickers are same.



SAT819H

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

4th judgement flicker is longer than others.

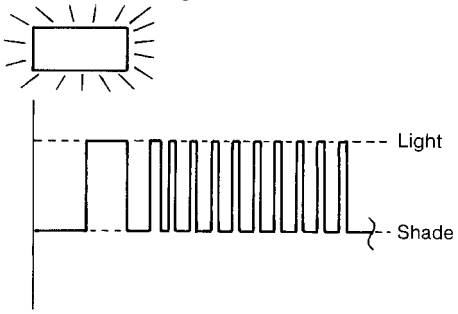


SAT797H

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

➡ **Go to SHIFT SOLENOID VALVE A, AT-63.**

1st judgement flicker is longer than others.

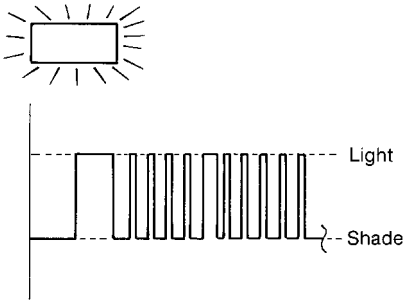


SAT794H

Revolution sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR), AT-50.**

5th judgement flicker is longer than others.

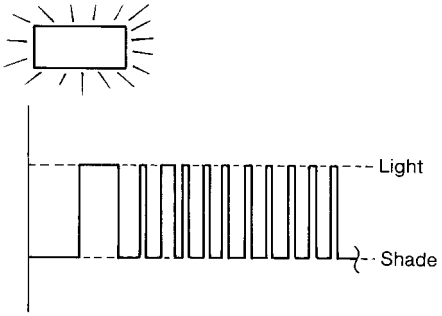


SAT798H

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

➡ **Go to SHIFT SOLENOID VALVE B, AT-66.**

2nd judgement flicker is longer than others.

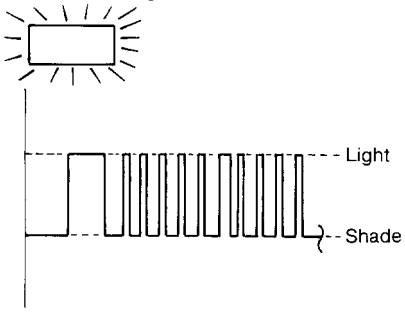


SAT795H

Vehicle speed sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·MTR, AT-54.**

6th judgement flicker is longer than others.

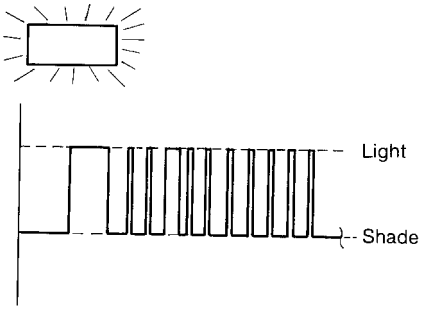


SAT799H

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

➡ **Go to OVERRUN CLUTCH SOLENOID VALVE, AT-69.**

3rd judgement flicker is longer than others.

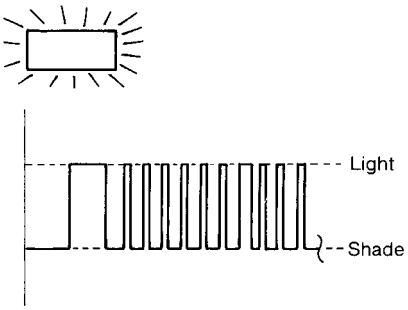


SAT796H

Throttle (accelerator) position sensor circuit is short-circuited or disconnected.

➡ **Go to THROTTLE (ACCELERATOR) POSITION SENSOR, AT-60.**

7th judgement flicker is longer than others.



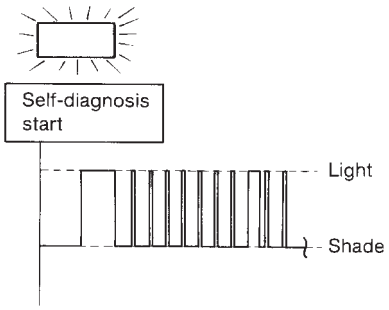
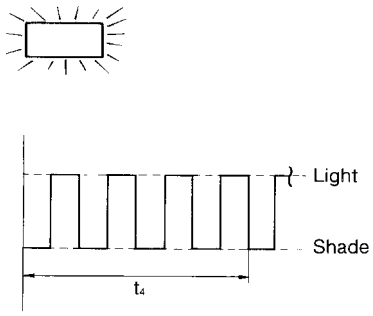
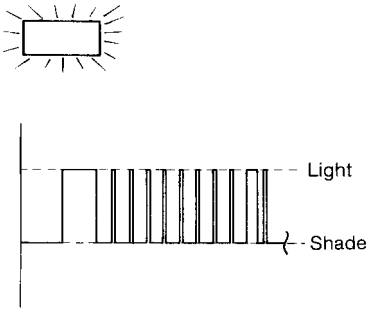
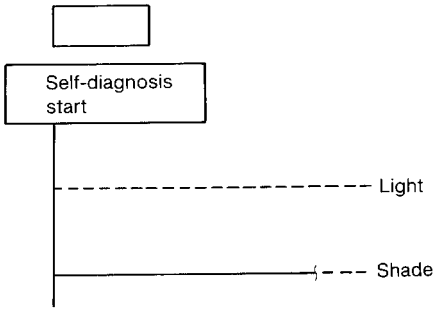
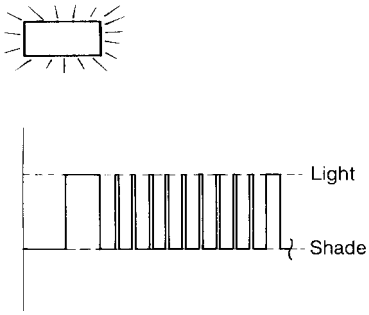
SAT800H

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

➡ **Go to TORQUE CONVERTER CLUTCH SOLENOID VALVE, AT-72.**

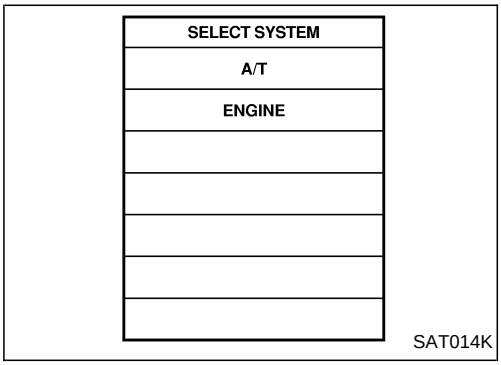
t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

Self-diagnosis (Cont'd)

SPORT indicator lamps	
8th judgement flicker is longer than others.  SAT801H 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, AT-76.**	Flickers as shown below.  SAT804H 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.  SAT802H Engine speed signal circuit is short-circuited or disconnected. ➡ **Go to ENGINE SPEED SIGNAL, AT-80.**	Does not come on.  SAT805H Park/neutral position, overdrive control or throttle (accelerator) position switches circuit is disconnected or TCM is damaged. ➡ **Go to PARK/NEUTRAL POSITION, OVERDRIVE CONTROL AND THROTTLE (ACCELERATOR) POSITION SWITCHES, AT-88.**
10th judgement flicker is longer than others.  SAT803H Line pressure solenoid valve circuit is short-circuited or disconnected. ➡ **Go to LINE PRESSURE SOLENOID VALVE, AT-84.**	

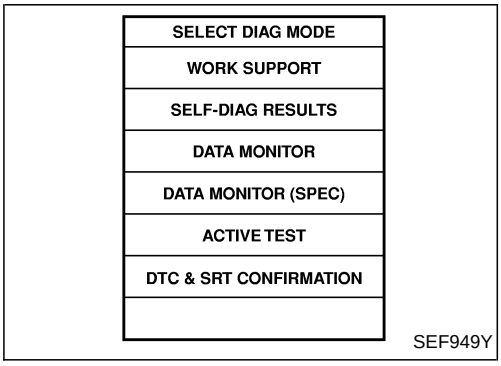
t_4 = 1.0 second

Self-diagnosis (Cont'd)

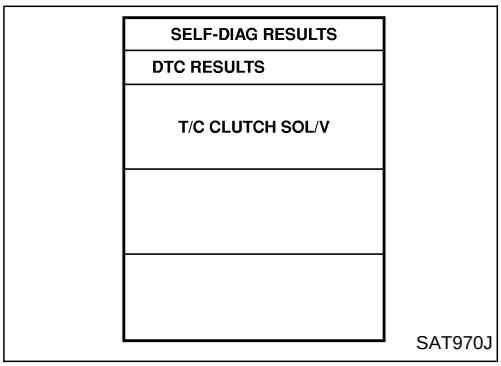


HOW TO ERASE SELF-DIAGNOSTIC RESULTS (With CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait for at least 5 seconds and then turn it "ON" again.
2. Turn CONSULT-II "ON", and touch "A/T".



3. Touch "SELF-DIAG RESULTS".



4. Touch "ERASE". (The self-diagnostic results will be erased.)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Without CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait for at least 5 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)". Refer to AT-15.
3. Turn ignition switch "OFF". (The self-diagnostic results will be erased.)

Diagnosis by CONSULT-II

NOTICE

1. The CONSULT-II 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-II 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-II 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. Gear position displayed on CONSULT-II indicates the point where shifts are completed.
3. Shift solenoid valve “A” or “B” is displayed on CONSULT-II at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by TCM).
4. Additional CONSULT-II information can be found in the Operation Manual supplied with the CONSULT-II unit.

SELF-DIAGNOSTIC RESULT TEST MODE

Refer to AT-14.

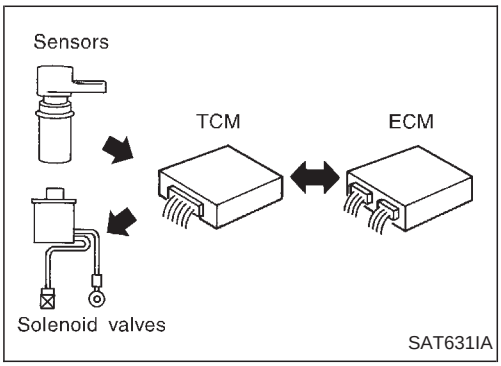
DATA MONITOR DIAGNOSTIC TEST MODE

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-II 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 (accelerator) position sensor	THRTL POS SEN [V]	X	—	• Throttle (accelerator) 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. • 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. ON ... Cruising state OFF ... Normal running state	• This is displayed even when no ASCD is mounted.

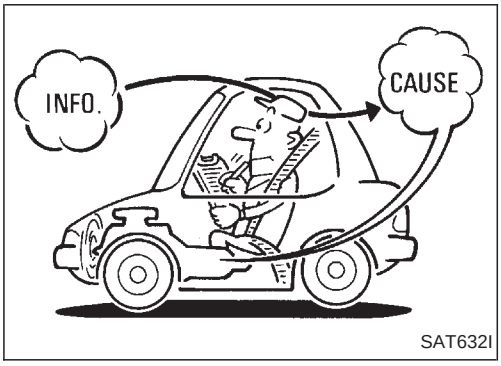
Diagnosis by CONSULT-II (Cont'd)

Item	Display	Monitor item		Description	Remarks
		ECU input signals	Main signals		
ASCD-OD cut signal	ASCD·OD CUT [ON/OFF]	X	—	● Status of ASCD·OD release signal is displayed. ON ... OD released 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.
A/T mode switch	POWER SHIFT SW [ON/OFF]	X	—	● ON/OFF state computed from signal of SPORT shift SW is displayed.	
Closed throttle position switch	CLOSED THL/SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of closed throttle (accelerator) 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 (accelerator) position SW, is displayed.	
A/T mode switch	HOLD SW [ON/OFF]	X	—	● ON/OFF status, computed from signal of SNOW shift 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.
Vehicle speed	VEHICLE SPEED [km/h] or [mph]	—	X	● Vehicle speed data, used for computation by TCM, is displayed.	
Throttle (accelerator) position	THROTTLE POSI [/8]	—	X	● Throttle (accelerator) 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 (SPORT indicator lamp)	SELF-D DP LMP [ON/OFF]	—	X	● Control status of SPORT indicator lamp is displayed.	

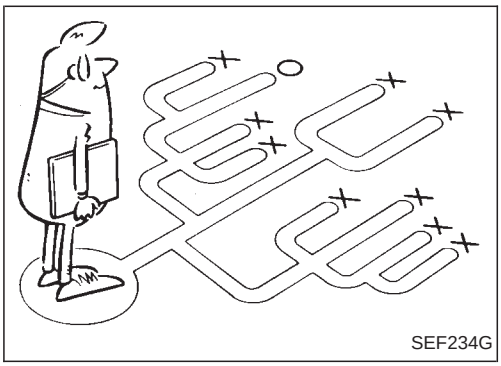
X: Applicable
—: Not applicable



SAT631IA



SAT632I


SEF234G

Introduction

The TCM receives a signal from the vehicle-speed sensor, throttle (accelerator) position sensor or park/neutral position switch and provides shift control or lock-up control via solenoid valves.

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-II or a circuit tester connected should be performed. Follow the “Work Flow”. Refer to AT-26.

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-24) should be used.

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

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 ( )	
SPORT 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.	☐ A/T FLUID CHECK ☐ Leakage (Follow specified procedure) ☐ Fluid condition ☐ Fluid level	AT-27
3.	☐ Perform STALL TEST and LINE PRESSURE TEST. ☐ Stall test — Mark possible damaged components/others. ☐ Torque converter one-way clutch ☐ Reverse clutch ☐ Forward clutch ☐ Overrun clutch ☐ Forward one-way clutch ☐ Low & reverse brake ☐ Low one-way clutch ☐ Engine ☐ Line pressure is low ☐ Clutches and brakes except high clutch and brake band are OK ☐ Line pressure test — Suspected parts:	AT-27, AT-30
4.	☐ Perform all ROAD TEST and mark required procedures.	AT-32
	4-1. Check before engine is started. ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. ☐ Vehicle speed sensor·A/T (Revolution sensor), AT-50. ☐ Vehicle speed sensor·MTR, AT-54. ☐ Throttle (accelerator) position sensor, AT-60. ☐ Shift solenoid valve A, AT-63. ☐ Shift solenoid valve B, AT-66. ☐ Overrun clutch solenoid valve, AT-69. ☐ Torque converter clutch solenoid valve, AT-88. ☐ A/T fluid temperature sensor and TCM power source, AT-76. ☐ Engine speed signal, AT-80. ☐ Line pressure solenoid valve, AT-84. ☐ Park/neutral position, overdrive control, A/T check and throttle (accelerator) position switches, AT-88. ☐ Battery ☐ Others	AT-33
	4-2. Check at idle ☐ 1. SPORT Indicator Lamp Does Not Come On, AT-92. ☐ 2. SPORT or SNOW Indicator Lamp Does Not Come On, AT-95. ☐ 3. O/D OFF Indicator Lamp Does Not Come On, AT-95. ☐ 4. SPORT Indicator Lamp Does Not Come On, AT-96. ☐ 5. Engine Cannot Be Started In "P" And "N" Position, AT-97. ☐ 6. In "P" Position, Vehicle Moves Forward Or Backward When Pushed, AT-97. ☐ 7. In "N" Position, Vehicle Moves, AT-98. ☐ 8. Large Shock. "N" → "R" Position, AT-99. ☐ 9. Vehicle Does Not Creep Backward In "R" Position, AT-100. ☐ 10. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position, AT-101.	AT-35
	4-3. Cruise test Part-1 ☐ 11. Vehicle Cannot Be Started From D_1, AT-102. ☐ 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-103. ☐ 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-104. ☐ 14. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-105. ☐ 15. A/T Does Not Perform Lock-up, AT-106. ☐ 16. A/T Does Not Hold Lock-up Condition, AT-107. ☐ 17. Lock-up Is Not Released, AT-107. ☐ 18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$), AT-108.	AT-36, AT-39

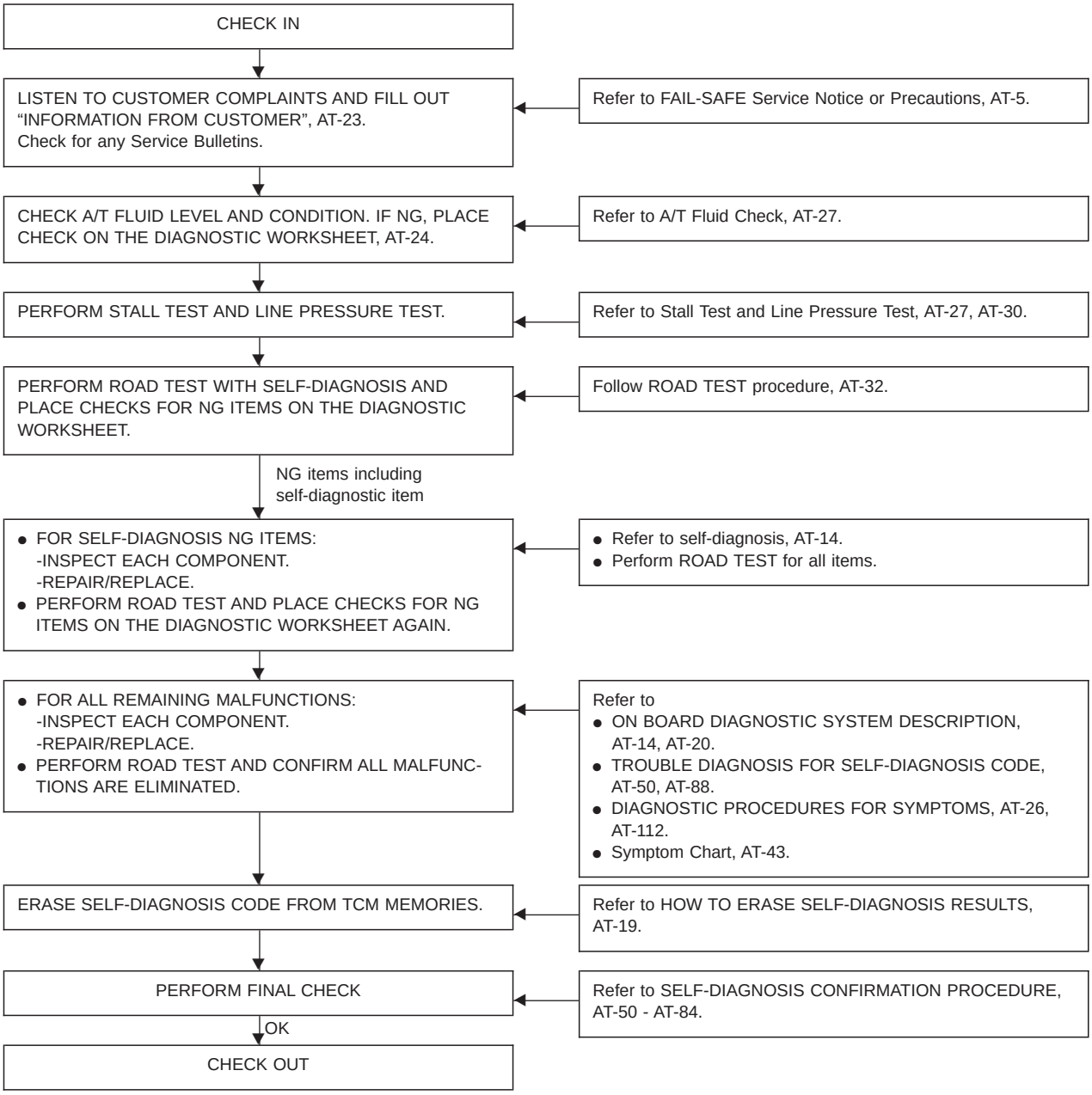
Diagnostic Worksheet (Cont'd)

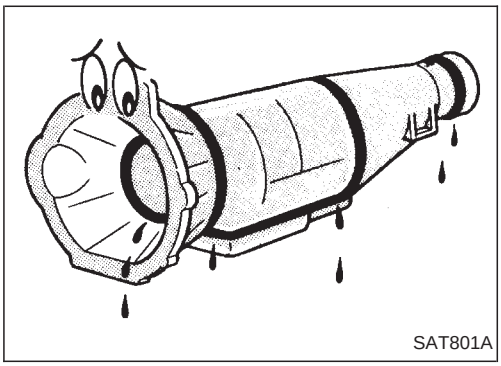
4.	Part-2 ☐ 19. Vehicle Does Not Start From D_1, AT-109. ☐ 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-103. ☐ 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-104. ☐ 14. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-105.	AT-41
	Part-3 ☐ 20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal, AT-5. ☐ 21. A/T Does Not Shift: $D_4 \rightarrow D_3$ When Overdrive Control Switch "ON" → "OFF", AT-111. ☐ 18. Engine Speed Does Not Return To Idle (Engine Brake In D_3), AT-108. ☐ 22. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" → "2" Position, AT-111. ☐ 18. Engine Speed Does Not Return To Idle (Engine Brake In 2_2), AT-108. ☐ 23. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position, AT-5. ☐ 24. Vehicle Does Not Decelerate By Engine Brake, AT-112. ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. ☐ Vehicle speed sensor·A/T (Revolution sensor), AT-50. ☐ Vehicle speed sensor·MTR, AT-54. ☐ Throttle (accelerator) position sensor, AT-60. ☐ Shift solenoid valve A, AT-63. ☐ Shift solenoid valve B, AT-66. ☐ Overrun clutch solenoid valve, AT-69. ☐ Torque converter clutch solenoid valve, AT-69. ☐ A/T fluid temperature sensor and TCM power source, AT-76. ☐ Engine speed signal, AT-80. ☐ Line pressure solenoid valve, AT-84. ☐ Park/neutral position, overdrive control, A/T check and throttle (accelerator) position switches, AT-88. ☐ Battery ☐ Others	AT-42
5.	☐ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts.	AT-14
6.	☐ Perform all ROAD TEST and re-mark required procedures.	AT-32
7.	☐ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)	AT-46 AT-43
8.	☐ Erase self-diagnosis code from TCM memories.	AT-19

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” and “DIAGNOSTIC WORKSHEET”, to perform the best troubleshooting possible.




SAT801A

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.

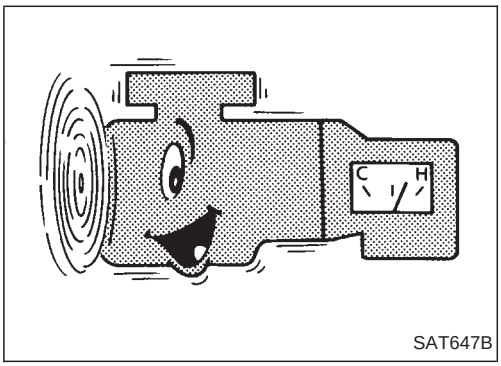

SAT638A

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”).



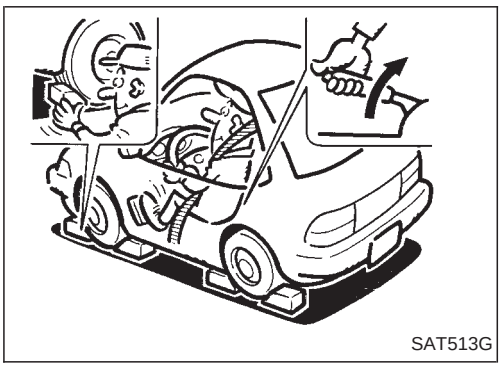
SAT647B

Stall Test

STALL TEST PROCEDURE

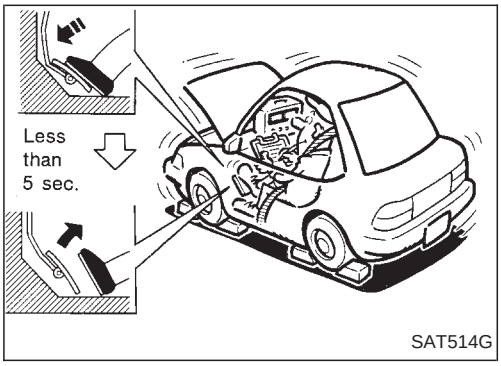
1. Check A/T and engine fluid levels. If necessary, add.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

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


SAT513G

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 put a mark on point of specified engine rpm on indicator.**



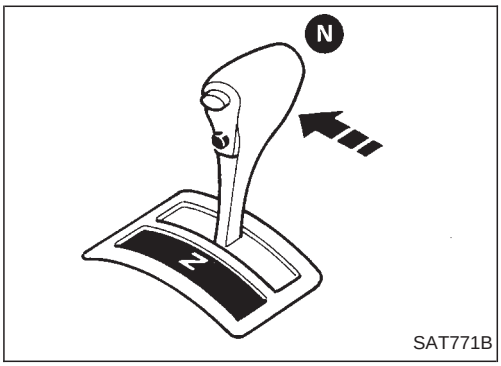
SAT514G

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:
2,450 - 2,700 rpm

Stall Test (Cont'd)



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 as shown in AT-26.

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 gears in "D" position. ..... Brake band slippage

Stall revolution less than specifications:

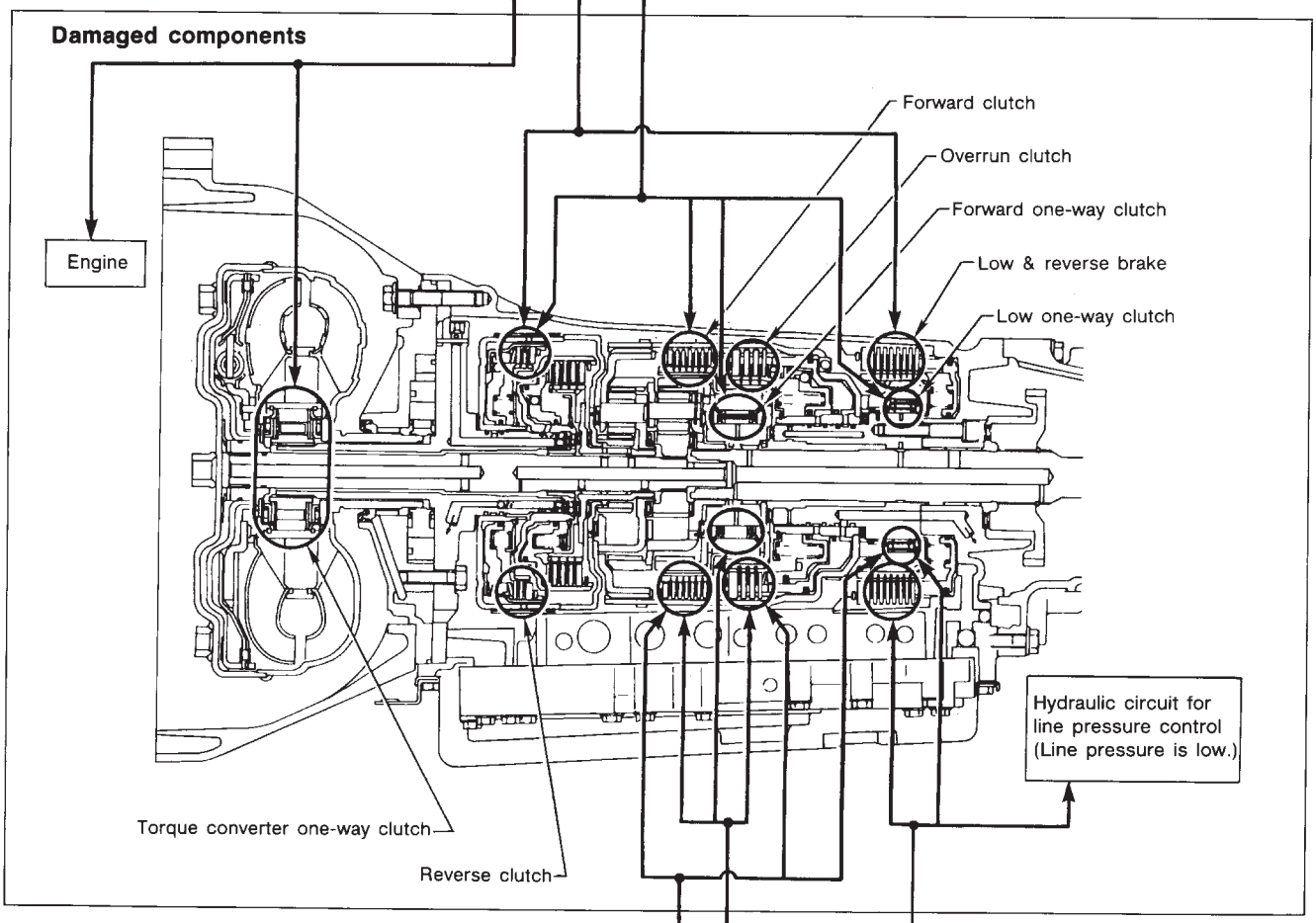
- Poor acceleration during starts. ..... One-way clutch seizure in torque converter

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

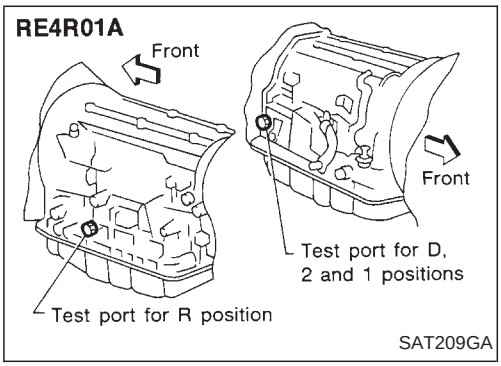
O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.



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

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

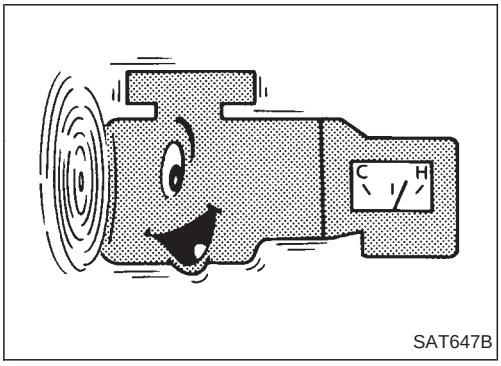
SAT392H



Line Pressure Test

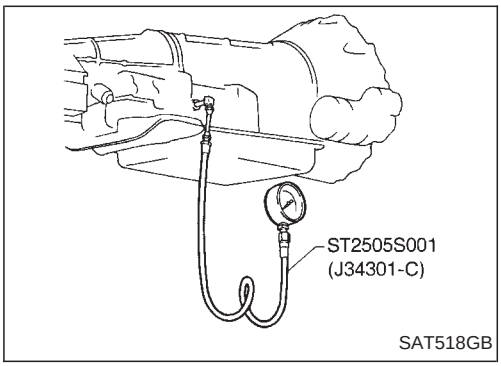
LINE PRESSURE TEST PORTS

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

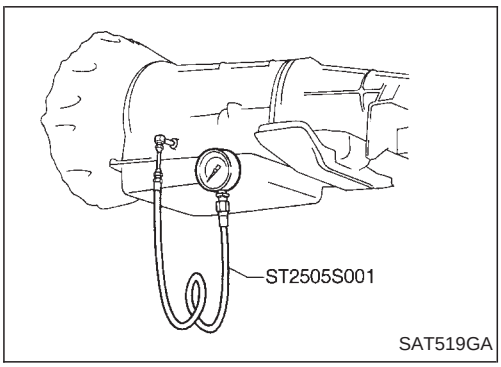


LINE PRESSURE TEST PROCEDURE

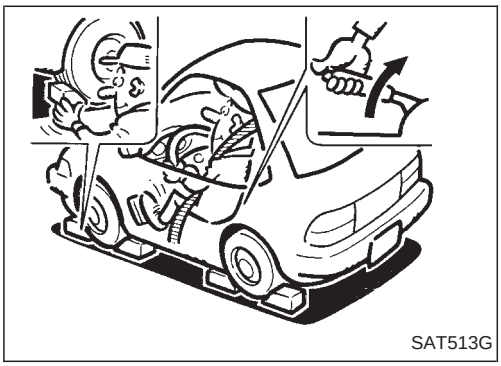
1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.
   ATF operating temperature:
   50 - 80°C (122 - 176°F)



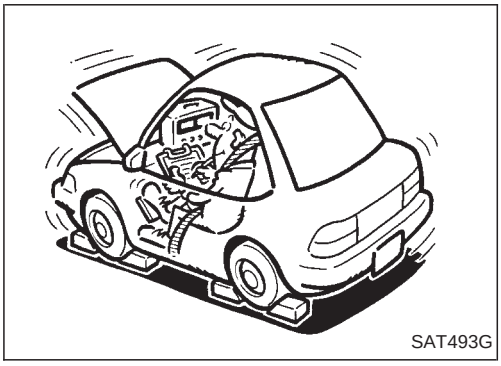
3. Install pressure gauge to corresponding line pressure port.



Line Pressure Test (Cont'd)


SAT513G

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


SAT493G

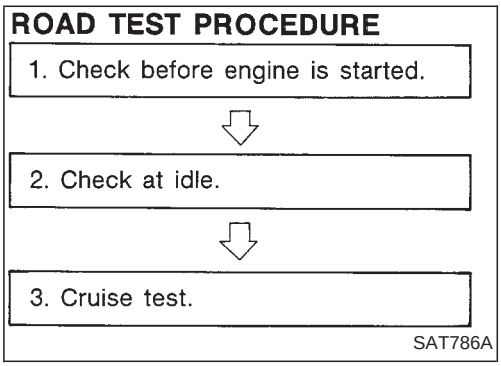
5. Start engine and measure line pressure at idle and stall speed.
- **When measuring line pressure at stall speed, follow the stall test procedure.**

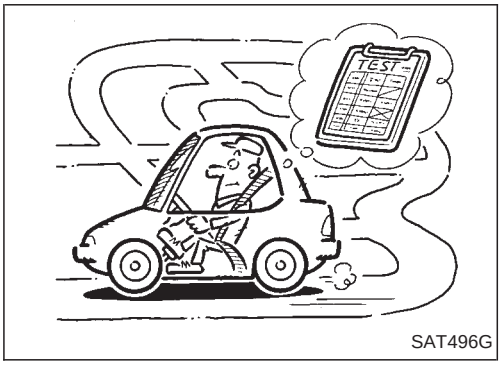
Line pressure:

Refer to SDS, AT-196.

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all positions.	• Oil pump wear • Control piston damage • Pressure regulator valve or plug sticking • Spring for pressure regulator valve damaged • A/T fluid pressure leakage between oil strainer and pressure regulator valve • Clogged strainer
	Line pressure is low in particular position.	• Fluid pressure leakage between manual valve and particular clutch • For example, line pressure is: — Low in "R" and "1" positions, — Normal in "D" and "2" positions. Then, fluid leakage exists at or around low and reverse brake circuit. Refer to "CLUTCH AND BAND CHART", AT-11.
	Line pressure is high.	• Mal-adjustment of throttle position sensor • A/T fluid temperature sensor damaged • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure modifier valve sticking • Pressure regulator valve or plug sticking • Open in dropping resistor circuit
At stall speed	Line pressure is low.	• Mal-adjustment of throttle position sensor • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure regulator valve or plug sticking • Pressure modifier valve sticking • 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:

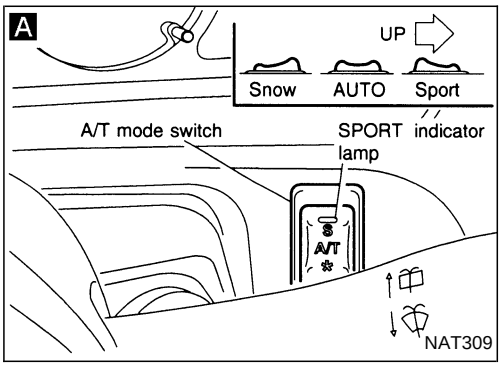
1. Check before engine is started
2. Check at idle
3. Cruise test

- 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 “DIAGNOSTIC PROCEDURES FOR SYMPTOMS”, AT-14 - AT-20 and AT-92 - AT-112.

Road Test (Cont'd)

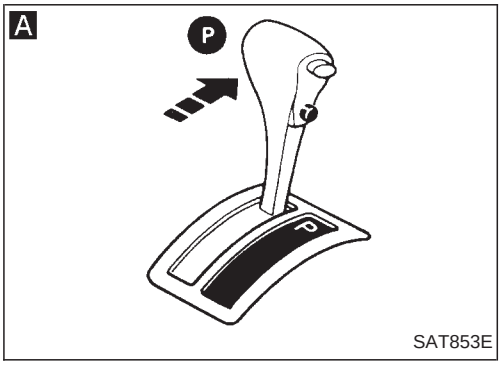
1. CHECK BEFORE ENGINE IS STARTED

A



1. Park vehicle on flat surface.
2. Turn ignition switch to "OFF" position.

A

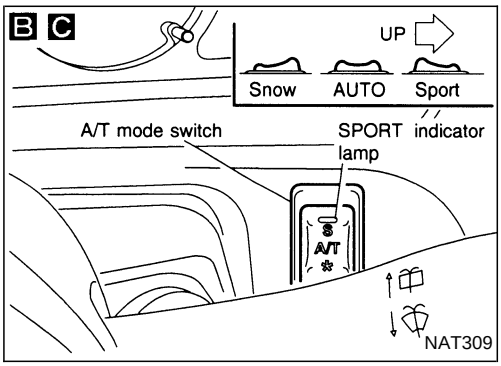


1. Set A/T mode switch to "AUTO" position.
2. Move selector lever to "P" position.
3. Turn ignition switch to "ON" position. (Do not start engine.)
4. Does SPORT indicator lamp come on for about 2 seconds?

No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-92.

Yes

B C



B

Does SPORT indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. Refer to SELF-DIAGNOSIS PROCEDURE, AT-14.

No

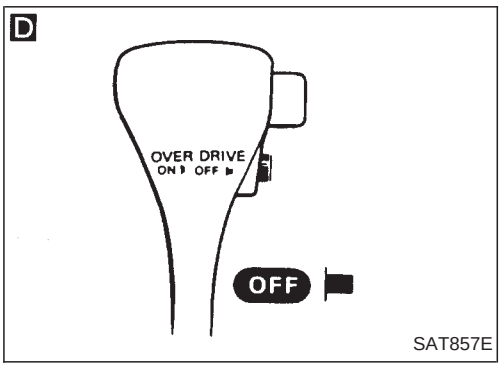
C

1. Set A/T mode switch to "SPORT" position.
2. Does SPORT indicator lamp come on?

No → Go to 2. SPORT or SNOW (*) Indicator Lamp Does Not Come On, AT-95.

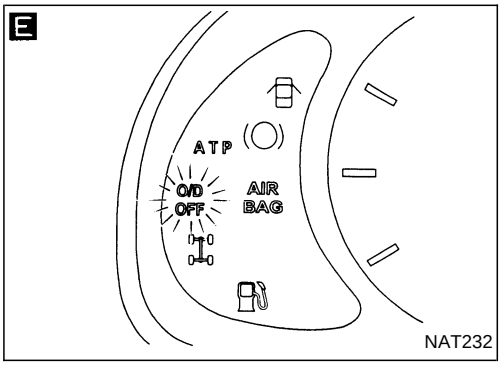
Yes

D



Set overdrive control switch to "OFF" position.

E



Does O/D OFF indicator lamp come on?

No → Go to 3. O/D OFF Indicator Lamp Does Not Come On, AT-95.

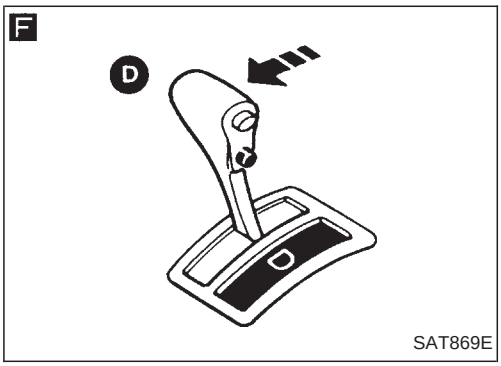
Yes

Ⓐ

(Go to next page.)

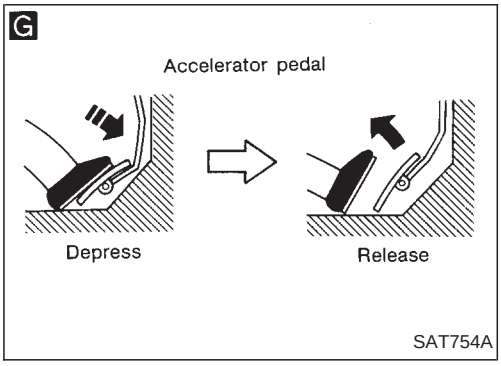
Road Test (Cont'd)

F



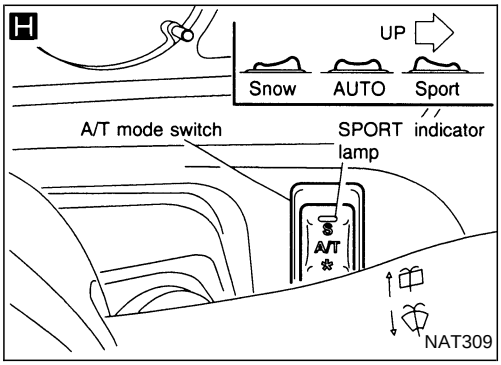
SAT869E

G



SAT754A

H



NAT309

Ⓐ

F

Depress brake pedal and move selector lever to "D" position.

G

1. Set A/T mode switch to "AUTO" position.
2. Depress and release accelerator pedal quickly.

H

Does SPORT indicator lamp come on for about 3 seconds after accelerator pedal is depressed?

No → Go to 4. SPORT Indicator Lamp Does Not Come On, AT-96.

Yes

Turn ignition switch to "OFF" position.

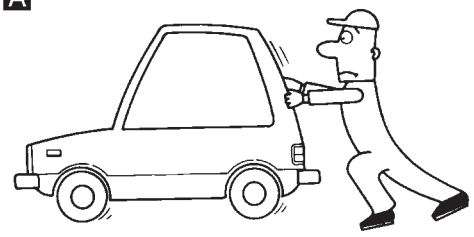
Perform self-diagnosis and note NG items:
Refer to SELF-DIAGNOSIS PROCEDURE, AT-14.

Go to "2. Check at idle", AT-35.

Road Test (Cont'd)

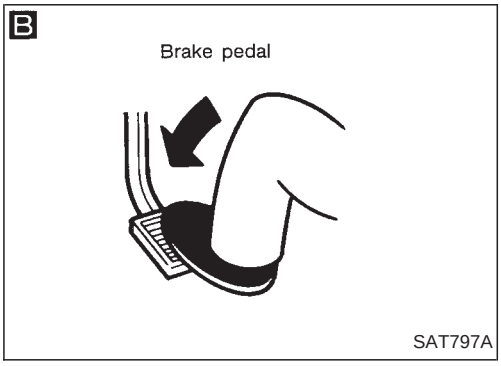
2. CHECK AT IDLE

A



SAT796A

B



SAT797A

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

No → Go to "5. Engine Cannot Be Started In "P" and "N" Position", AT-97.

Yes ↓

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

Yes → Go to "5. Engine Cannot Be Started In "P" and "N" Position", AT-97.

No ↓

A

1. Turn ignition switch to "OFF" position.
2. Move selector lever to "P" position.
3. Release parking brake.
4. Push vehicle forward or backward.
5. Does vehicle move when it is pushed forward or backward?

Yes → Go to "6. In "P" Position, Vehicle Moves Forward Or Backward When Pushed", AT-112.

No ↓

1. Apply parking brake.
2. Move selector lever to "N" position.
3. Turn ignition switch to "START" position and start engine.
4. Release parking brake.
5. Does vehicle move forward or backward?

Yes → Go to "7. In "N" Position, Vehicle Moves", AT-98.

No ↓

B

1. Apply foot brake.
2. Move selector lever to "R" position.
3. Is there large shock when changing from "N" to "R" position?

Yes → Go to "8. Large Shock. "N" → "R" Position", AT-99.

No ↓

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

No → Go to "9. Vehicle Does Not Creep Backward In "R" Position", AT-100.

Yes ↓

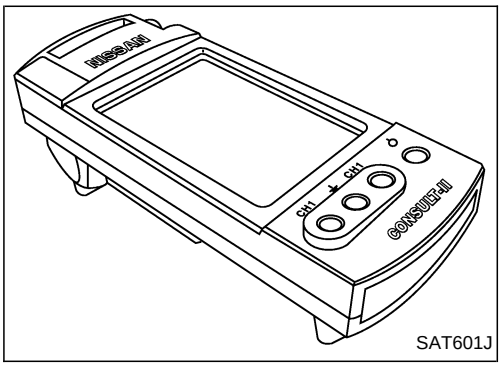
1. Move selector lever to "D", "1" and "2" position and check if vehicle creeps forward.
2. Does vehicle creep forward in all three positions?

No → Go to "10. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position", AT-101.

Yes ↓

Go to "3. Cruise test", AT-36.

Road Test (Cont'd)

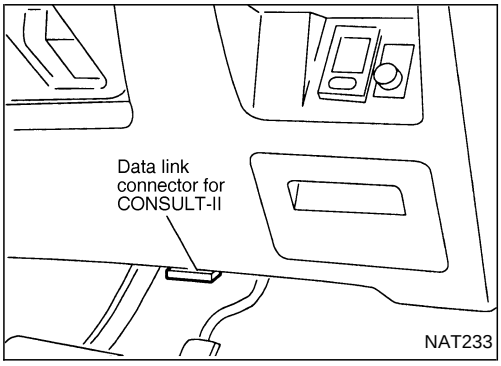


3. CRUISE TEST

- Check all items listed in Parts 1 through 3.

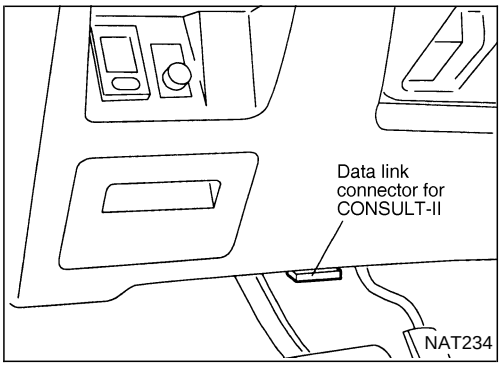
With CONSULT-II

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

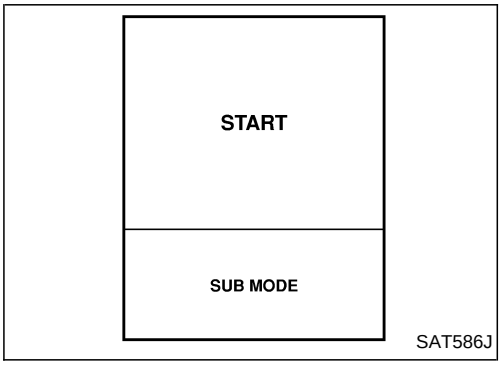


CONSULT-II setting procedure

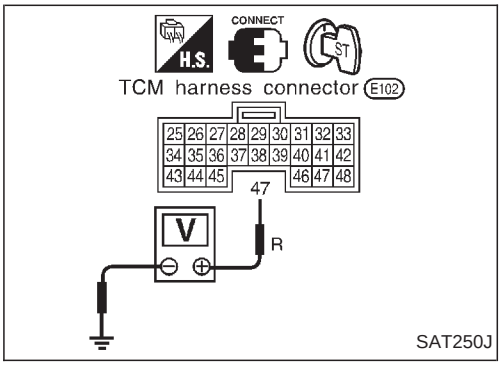
1. Turn off ignition switch.
2. Connect "CONSULT-II" to Data link connector for CONSULT-II. Data link connector for CONSULT-II is located in instrument lower panel on driver side.



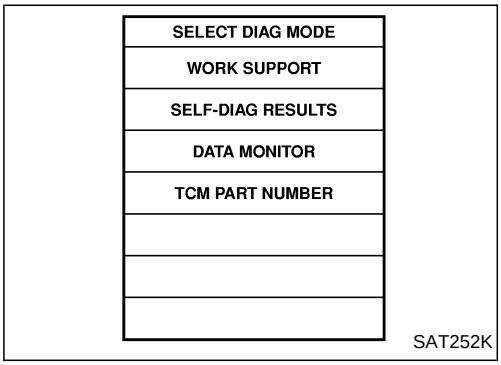
3. Turn on ignition switch.
4. Touch "START".



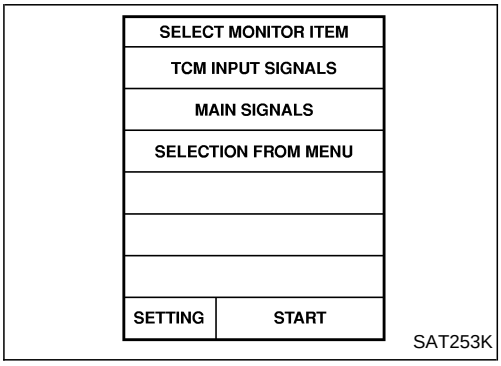
5. Touch "A/T".



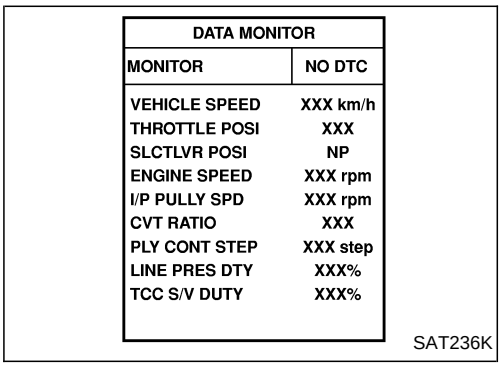
Road Test (Cont'd)



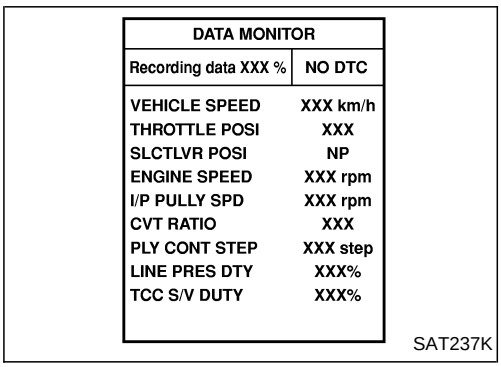
6. Touch "DATA MONITOR".



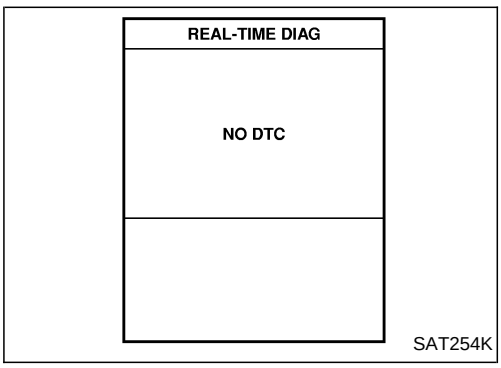
7. Touch "MAIN SIGNALS" to set recording condition.
8. See "Numerical Display", "Barchart Display" or "Line Graph Display".
9. Touch "START".



10. When performing cruise test, touch "Store Data".



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



12. Touch "STORE".

Road Test (Cont'd)

SAVE DATA	
NOT FOUND SAVE REC DATA	
A/T	1999/1/30 19:59:18
A/T	1999/1/30 19:59:42
A/T	1999/1/30 20:01:04

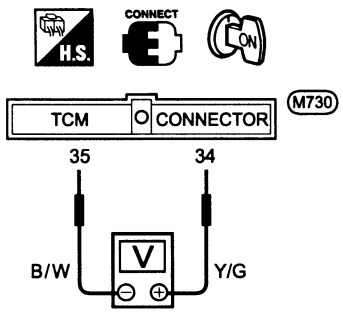
SAT608J

13. Touch "DISPLAY".

STORE	
SYSTEM	SAVE REC DATA
ENGINE	04/15/1999, 10:34:29
ENGINE	07/15/1999, 15:10:33

SAT238K

14. Touch "PRINT".
15. Check the monitor data printed out.
16. Continue cruise test part 2 and 3.



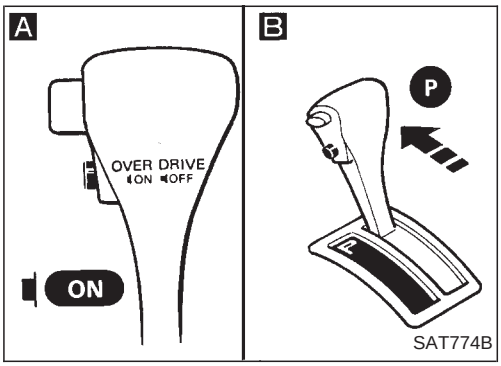
NAT235

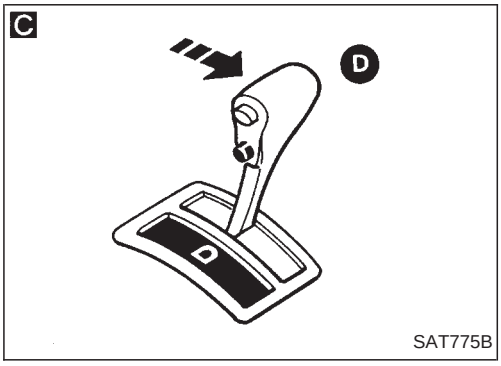
Without CONSULT-II

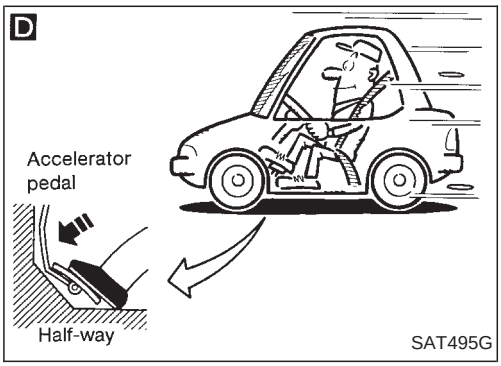
- Throttle (accelerator) position can be checked by voltage across terminals ㉞ and ㉟ of TCM.

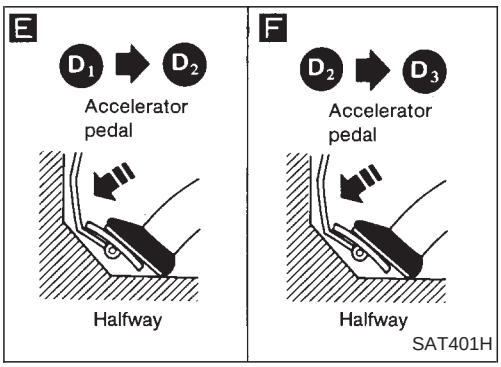
Road Test (Cont'd)

CRUISE TEST — Part 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 halfway.

Does vehicle start from D_1?

Read gear position.

No → Go to "11. Vehicle Cannot Be Started From D_1", AT-102.

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-196.

No → Go to "12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-196.

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-104.

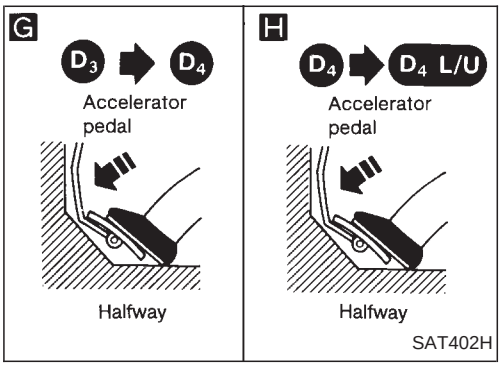
No → Go to "13. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-104.

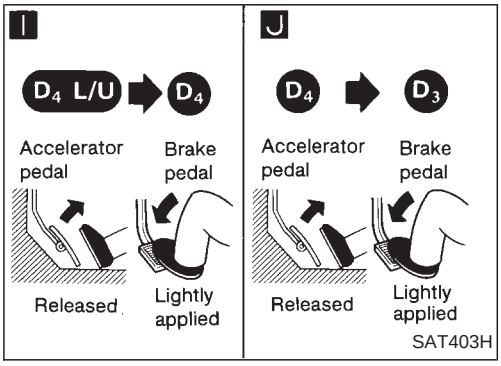
Yes

Ⓐ

(Go to next page.)

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-196.

No → Go to "14. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-105.

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-196.

No → Go to "15. A/T Does Not Perform Lock-up", AT-106.

Yes ↓

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

No → Go to "16. A/T Does Not Hold Lock-up Condition", AT-107.

Yes ↓

I

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

No → Go to "17. Lock-up Is Not Released", AT-107.

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.

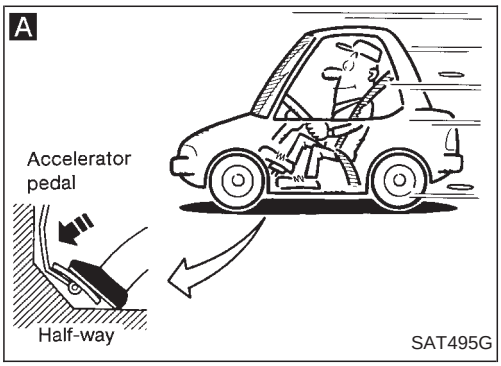
No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-108.

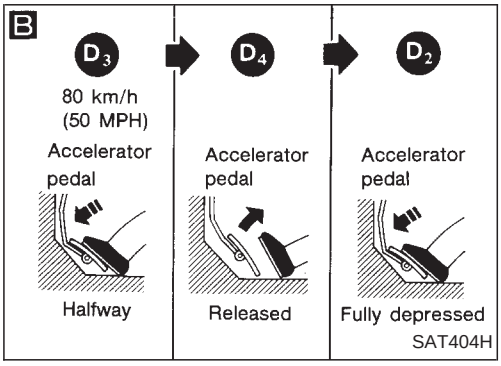
Yes ↓

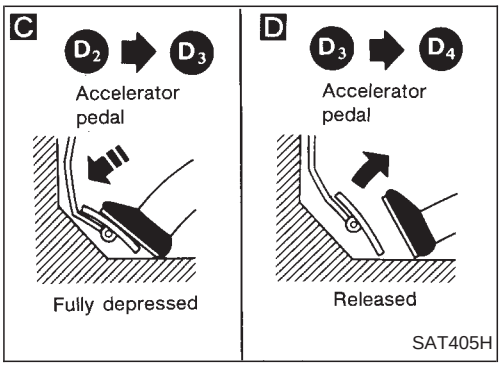
1. Stop vehicle.
2. Go to "Cruise test — Part 2", AT-41.

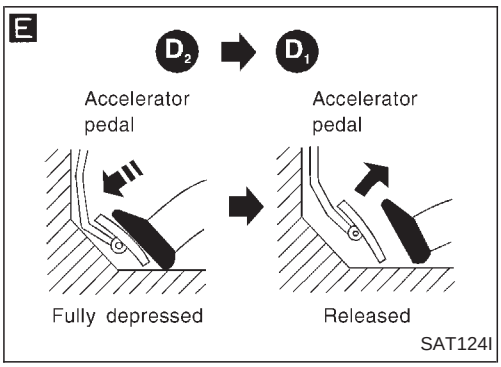
Road Test (Cont'd)

CRUISE TEST — Part 2









A

1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerate vehicle by half throttle again.
4. Does vehicle start from D_1?

Read gear position.

No → Go to "19. Vehicle Does Not Start From D_1", AT-109.

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 "12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-103.

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-196.

No → Go to "13. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-104.

Yes ↓

D

1. Release accelerator pedal after shifting from D_2 to D_3.
2. 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 "14. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-105.

Yes ↓

E

1. Decelerate to 10 km/h (6 MPH) with accelerator pedal released and then quickly depress it fully.
2. Does A/T shift from D_2 to D_1 as soon as accelerator pedal is depressed fully?

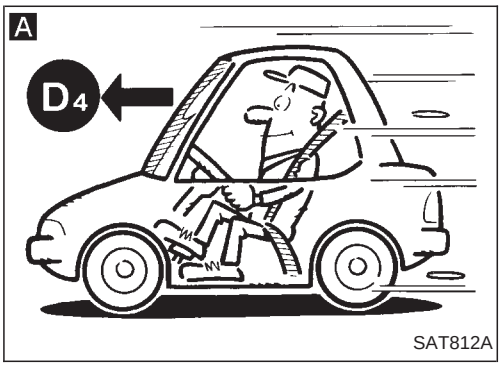
No → Go to "20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal", AT-110.

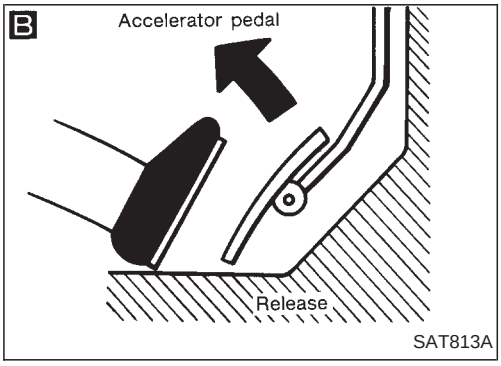
Yes ↓

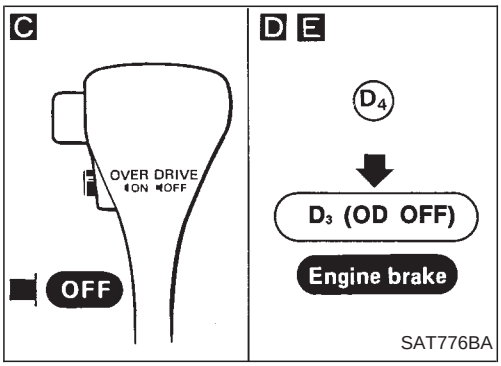
1. Stop vehicle.
2. Go to "Cruise test — Part 3", AT-42.

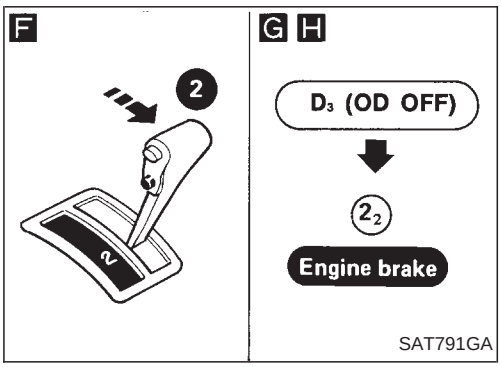
Road Test (Cont'd)

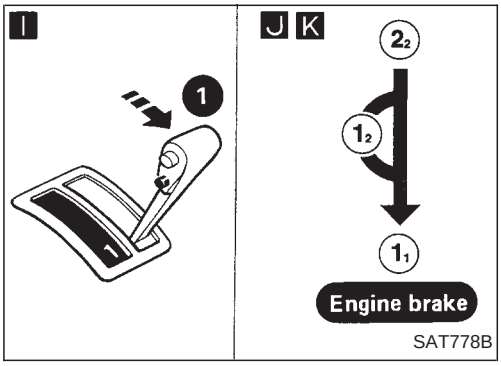
CRUISE TEST — Part 3











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 "21. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" → "OFF"", AT-111.

Yes

E

Does vehicle decelerate by engine brake?

No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-108.

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 "22. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" → "2" Position", AT-111.

Yes

H

Does vehicle decelerate by engine brake?

No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-108.

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 "23. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position", AT-112.

Yes

K

Does vehicle decelerate by engine brake?

No → Go to "24. Vehicle Does Not Decelerate By Engine Brake", AT-112.

Yes

1. Stop vehicle.
2. Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE, AT-14.

Symptom Chart

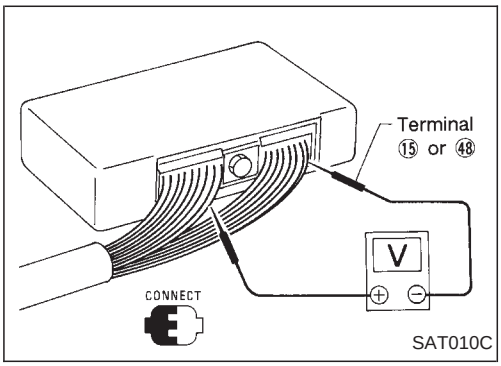
	ON vehicle										OFF vehicle					
Reference page (AT-)	27, 115	114	54, 60, 80	30	63, 139	66, 84	69, 72	76, 113	113	113	69, 123	151, 155	157	157, 165	161, 171	175
Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl components
Engine does not start in “N”, “P” positions.	2	3								1						
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					
Vehicle moves when changing into “P” position or parking gear does not disengage when shifted out of “P” position.	1															②
Vehicle runs in “N” position.	1									2		④	③	⑤		
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		
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	⑩	⑨		⑪	
Excessive creep.				1												
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	
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-)	27, 115	114	54, 60, 80	30	63, 139	66, 84	69, 72	76, 113	113	113	69, 123	151, 155	157	157, 165	161, 171	175
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 Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl 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 ⑩	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-)	27, 115	114	54, 60, 80	30	63, 139	66, 84	69, 72	76, 113	113	113	139, 123	151, 155	157	157, 165	161, 171	175
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 Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl components
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_1" to "2_2" in "2" position.		1														
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 ⑱	
ATF shoots out during operation. 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					
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						⑱	⑨	
Engine is stopped at "R", "D", "2" and "1" positions.	1				5 4	3	2									

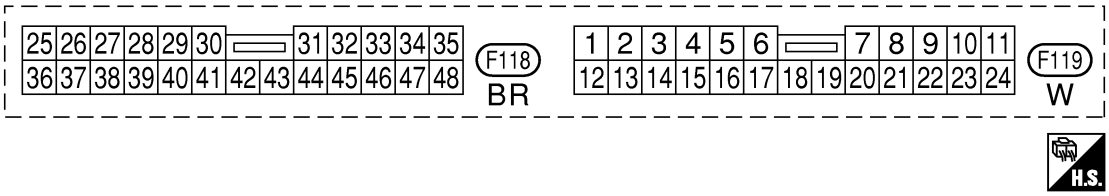


TCM Terminals and Reference Value

PREPARATION

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

TCM HARNESS CONNECTOR TERMINAL LAYOUT



YAT296

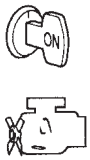
TCM INSPECTION TABLE

(Data are reference values.)

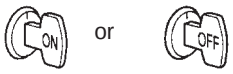
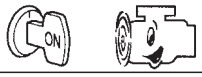
Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid valve		When releasing accelerator pedal after warming up engine.	1.5 - 3.0V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
2	Line pressure solenoid valve (with dropping resistor)		When releasing accelerator pedal after warming up engine.	4 - 14V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
3	Torque converter clutch solenoid valve		When A/T performs lock-up.	8 - 15V
			When A/T does not perform lock- up.	Approximately 0V
5*	DT1		—	—
6*	DT2		—	—
7*	DT3		—	—
9	—		—	—
			—	—

*: These terminals are connected to the ECM.

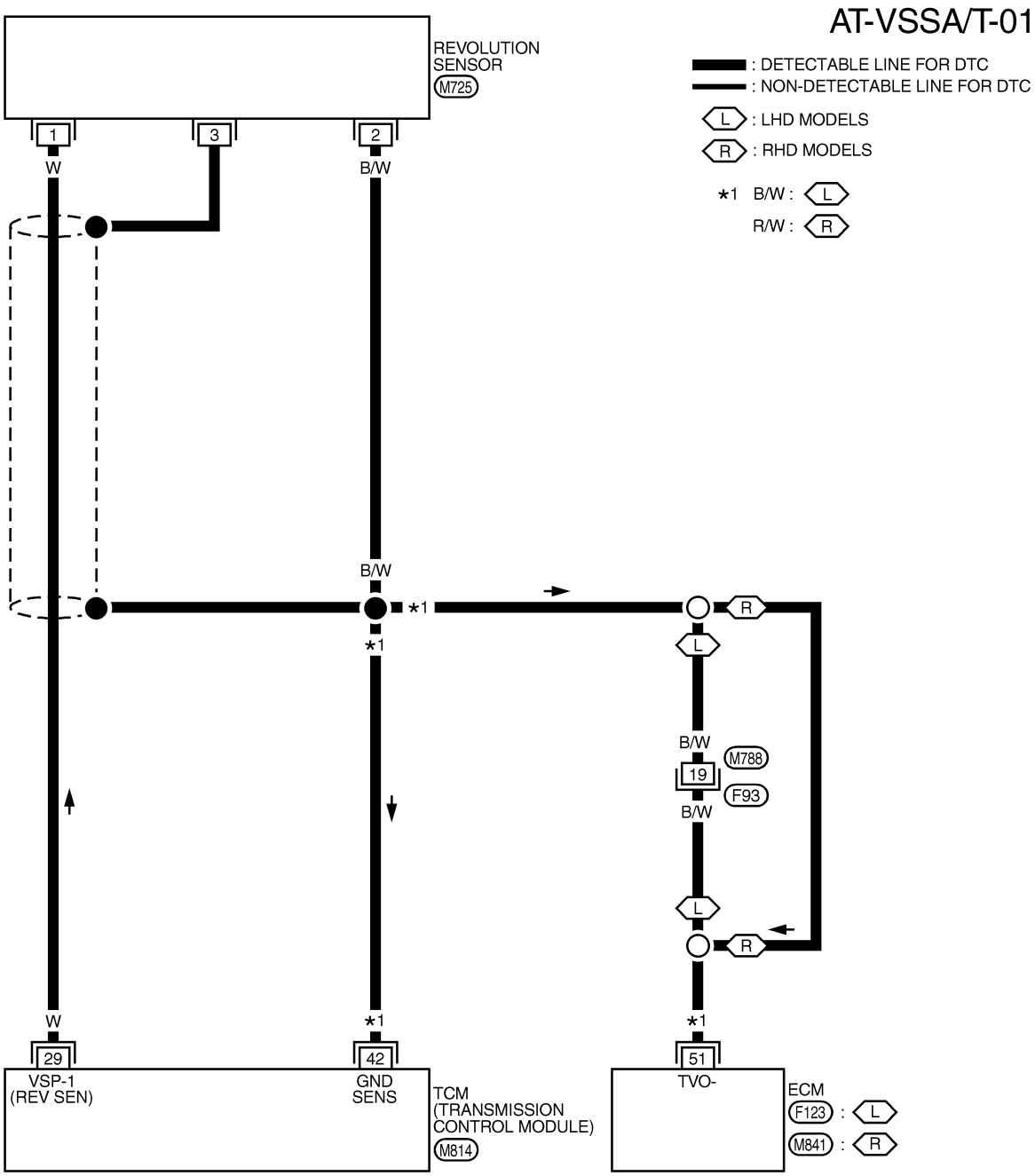
TCM Terminals and Reference Value (Cont'd)

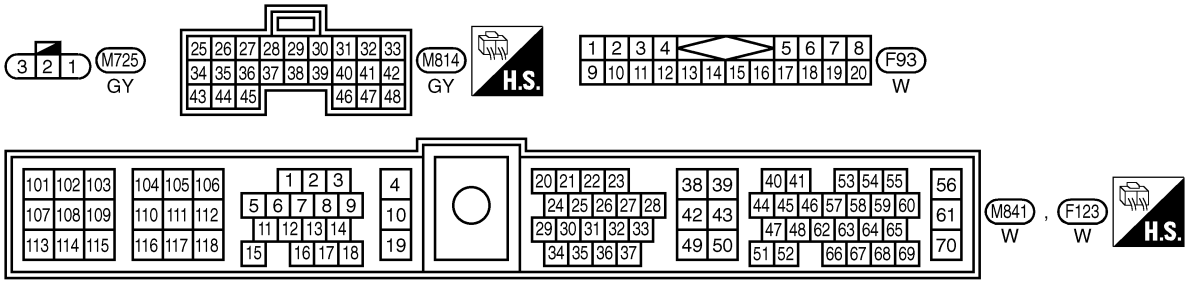
Terminal No.	Item	Condition		Judgement standard
10	Power source		When turning ignition switch to "ON".	Battery voltage
			When turning ignition switch to "OFF".	Approximately 0V
11	Shift solenoid valve A		When shift solenoid valve A operates. (When driving in "D_1" or "D_4".)	Battery voltage
			When shift solenoid valve A does not operate. (When driving in "D_2" or "D_3".)	Approximately 0V
12	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".)	Approximately 0V
16	Closed throttle position switch [in throttle (accelerator) position switch]		When releasing accelerator pedal after warming up engine.	Battery voltage
			When depressing accelerator pedal after warming up engine.	Approximately 0V
17	Wide open throttle position switch [in throttle (accelerator) position switch]		When depressing accelerator pedal more than half-way after warming up engine.	Battery voltage
			When releasing accelerator pedal after warming up engine.	Approximately 0V
18	A/T mode switch "SNOW"		When setting A/T mode switch in "SNOW" position.	Battery voltage
			When setting A/T mode switch in other position.	Approximately 0V
19	Power source		Same as No. 104	
20	Overrun clutch solenoid valve		When overrun clutch solenoid valve operates.	Battery voltage
			When overrun clutch solenoid valve does not operate.	Approximately 0V
22	Overdrive control switch		When setting overdrive control switch in "ON" position	Battery voltage
			When setting overdrive control switch in "OFF" position	1V or less
26	Park/neutral "1" position switch		When setting selector lever to "1" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
27	Park/neutral "2" position switch		When setting selector lever to "2" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
28	Ground		—	—

TCM Terminals and Reference Value (Cont'd)

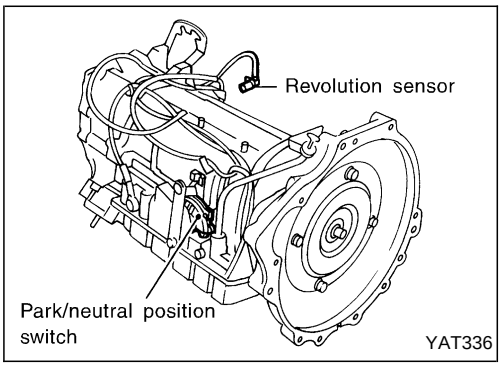
Terminal No.	Item	Condition		Judgement standard
28	Power source (Back-up)		When turning ignition switch to "OFF".	Battery voltage
			When turning ignition switch to "ON".	Battery voltage
29	Revolution sensor (Measure in AC rang)		When vehicle cruises at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle parks.	0V
34	Park/neutral "D" position switch		When setting selector lever to "D" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
35	Park/neutral "R" position switch		When setting selector lever to "R" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
36	Park/neutral "N" or "P" position switch		When setting selector lever to "N" or "P" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
39	Engine speed signal		When engine runs at idle speed.	0.8V
			When engine runs at 2,000 rpm.	Approximately 2.2V
40	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
42	Throttle (accelerator) position sensor (Power source)		—	4.5 - 5.5V
42	Ground		—	—
43	SPORT indicator lamp		When setting A/T mode switch in "SPORT" position.	Approximately 0V
			When setting A/T mode switch in other position.	Battery voltage
44	A/T mode switch "SPORT"		When setting A/T mode switch in "SPORT" position.	Battery voltage
			When setting A/T mode switch in other position.	Approximately 0V
47	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

Wiring Diagram — AT — VSSA/T





YAT262



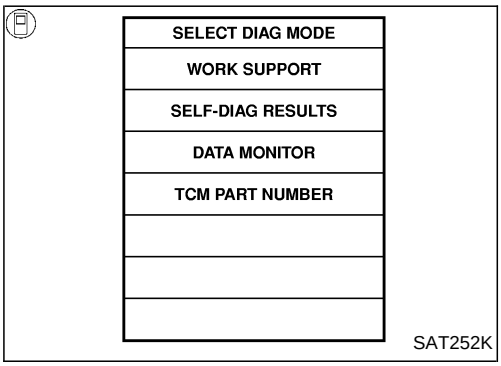
Vehicle Speed Sensor·A/T (Revolution sensor)

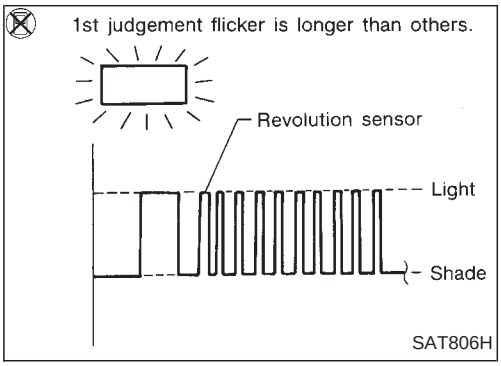
DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: VHCL SPEED SEN·A/T : 1st judgement flicker	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Revolution sensor





SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

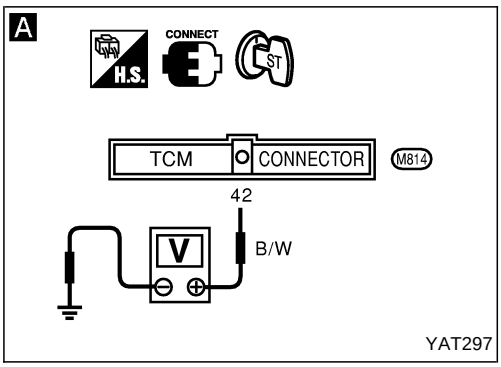
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, 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.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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

DIAGNOSTIC PROCEDURE



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.
3. Read out the value of "VHCL/S SE·A/T" while driving.
   Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between TCM terminal ㊷ and ground while driving. (Measure in 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.)

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

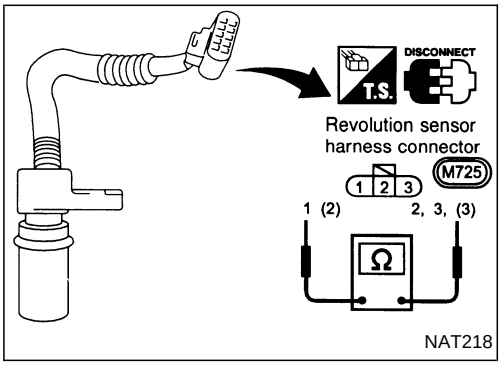
OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE".

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

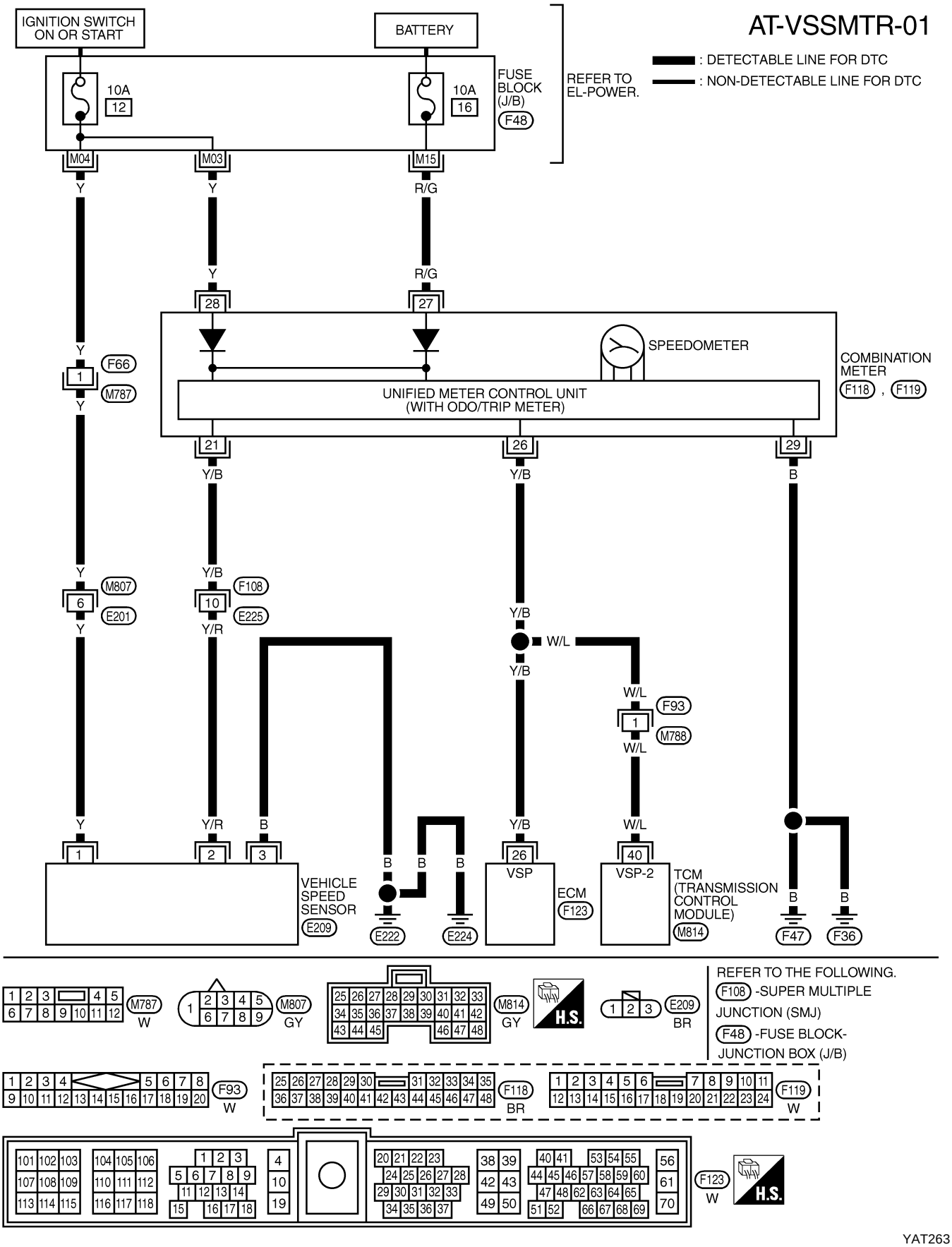
Revolution sensor

- For removal, refer to AT-114.
- Check resistance between terminals ①, ② and ③.

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

Wiring Diagram — AT — VSSMTR

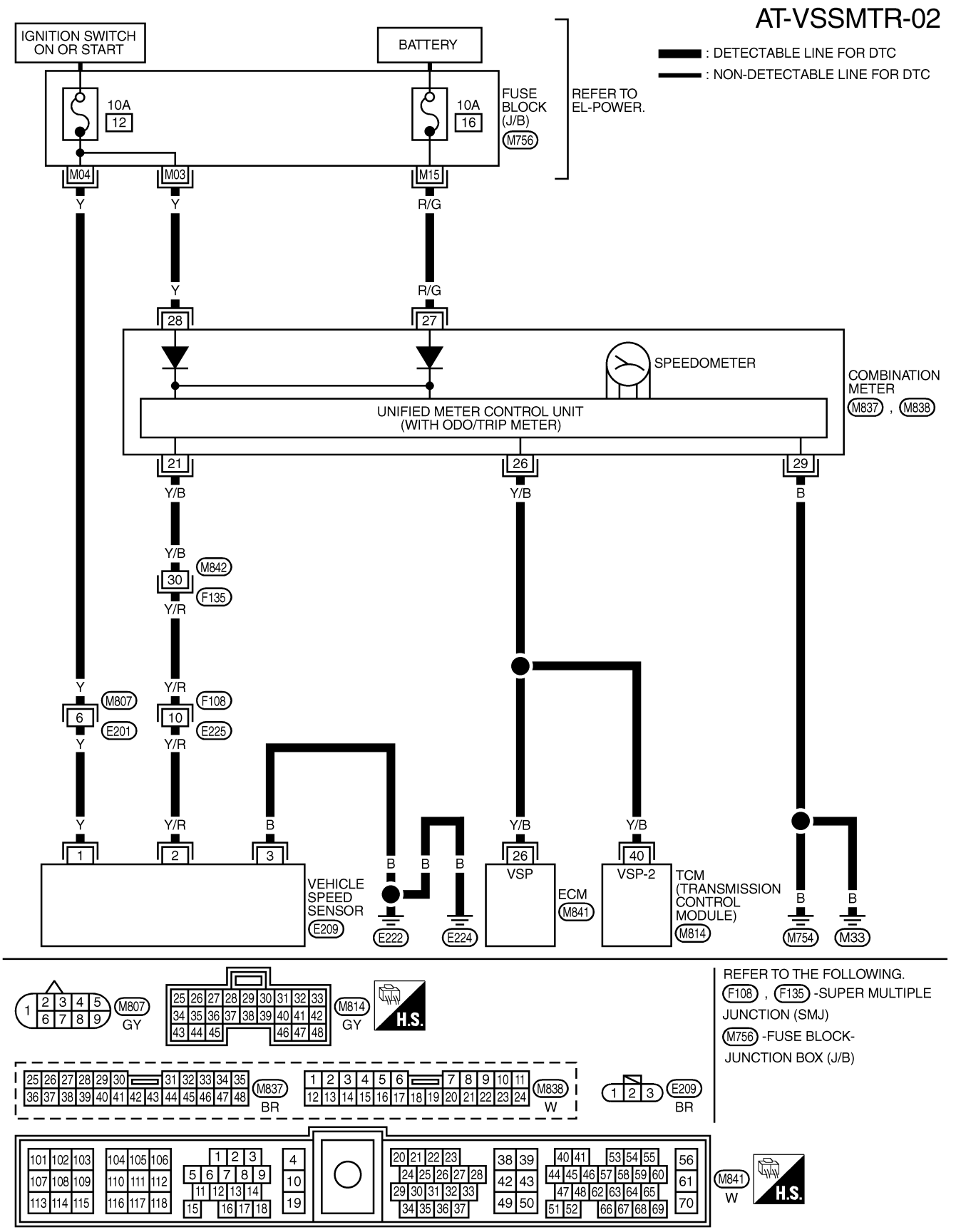
LHD MODELS



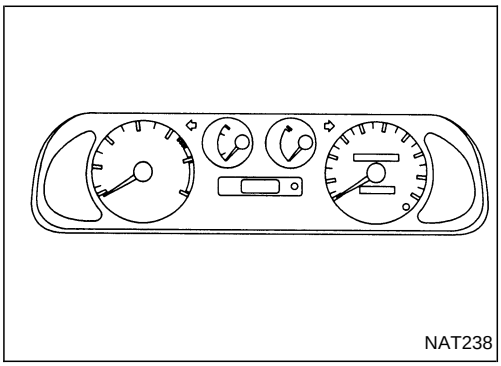
YAT263

Wiring Diagram — AT — VSSMTR (Cont'd)

RHD MODELS



YAT264


NAT238

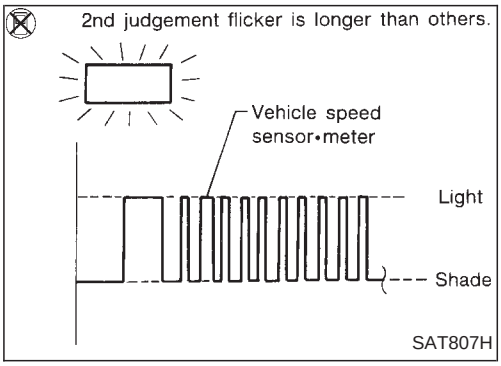
Vehicle Speed Sensor·MTR

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.

ON BOARD DIAGNOSIS LOGIC

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



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position and vehicle speed higher than 20 km/h (12 MPH).

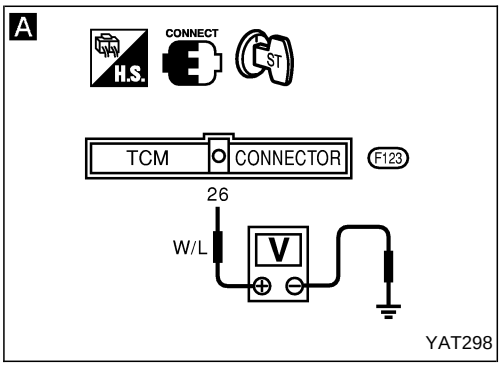
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position and vehicle speed higher than 20 km/h (12 MPH).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Vehicle Speed Sensor·MTR (Cont'd)

DIAGNOSTIC PROCEDURE

A



CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE·MTR" while driving.
   Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between TCM terminal (26) 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.

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)

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-54.

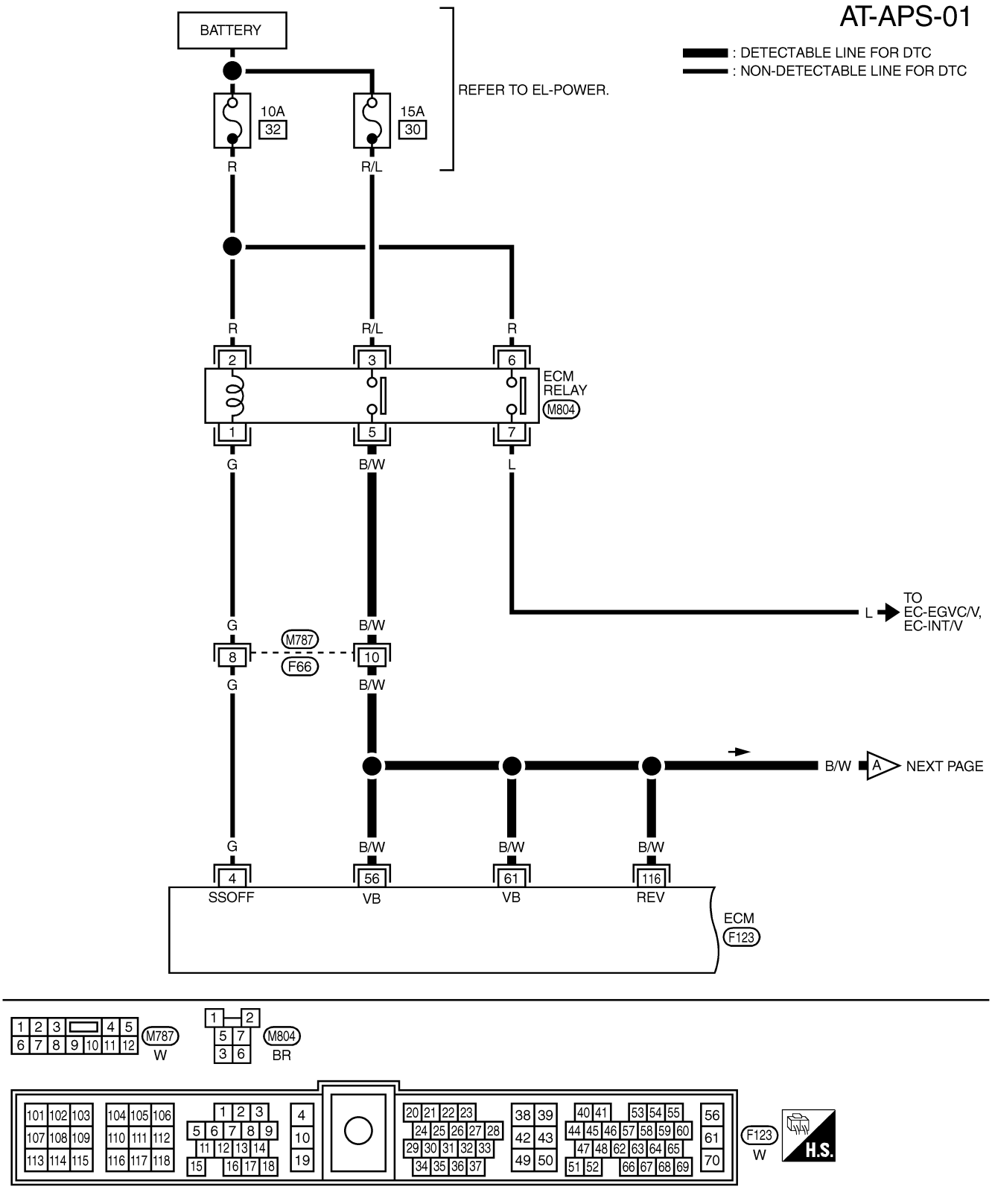
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

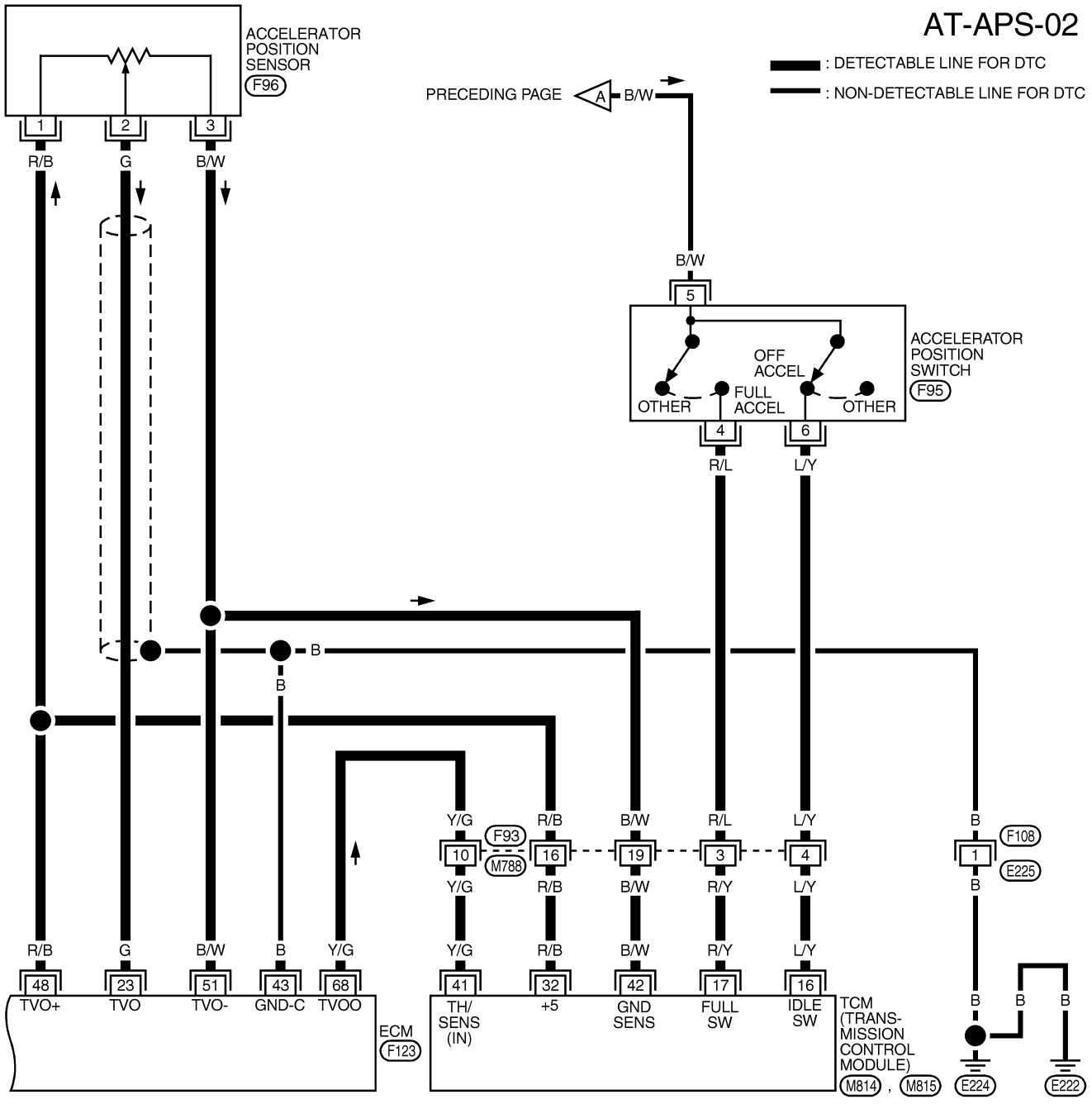
Wiring Diagram — AT — TPS

LHD MODELS



Wiring Diagram — AT — TPS (Cont'd)

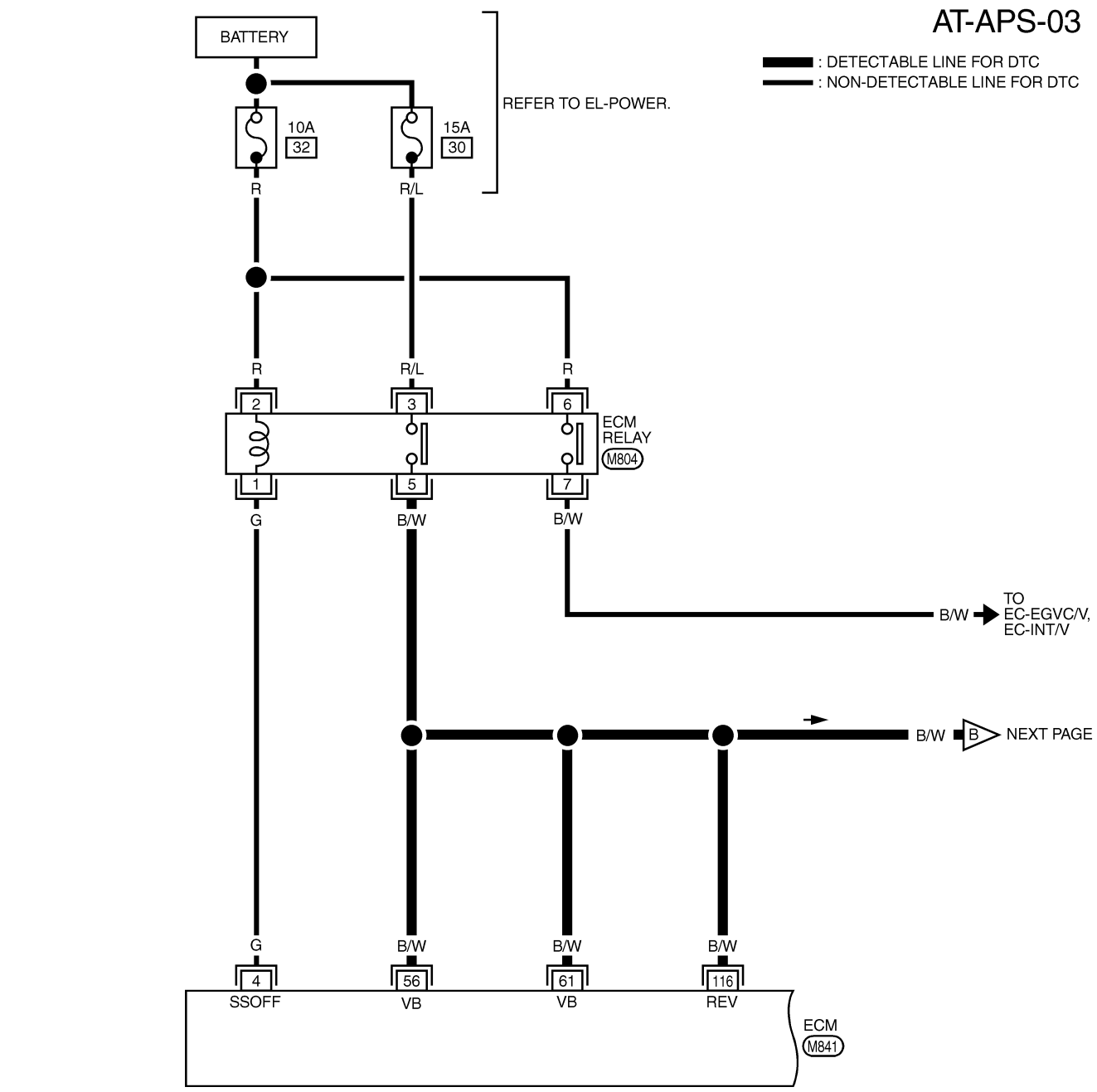
LHD MODELS

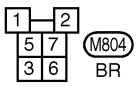


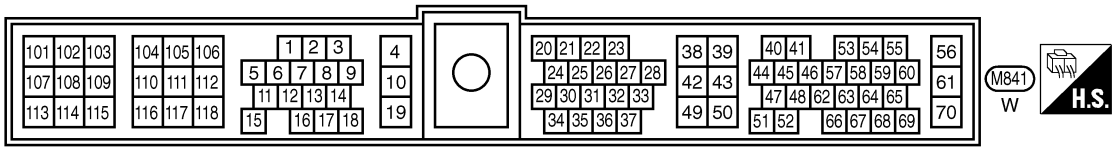
YAT266

Wiring Diagram — AT — TPS (Cont'd)

RHD MODELS



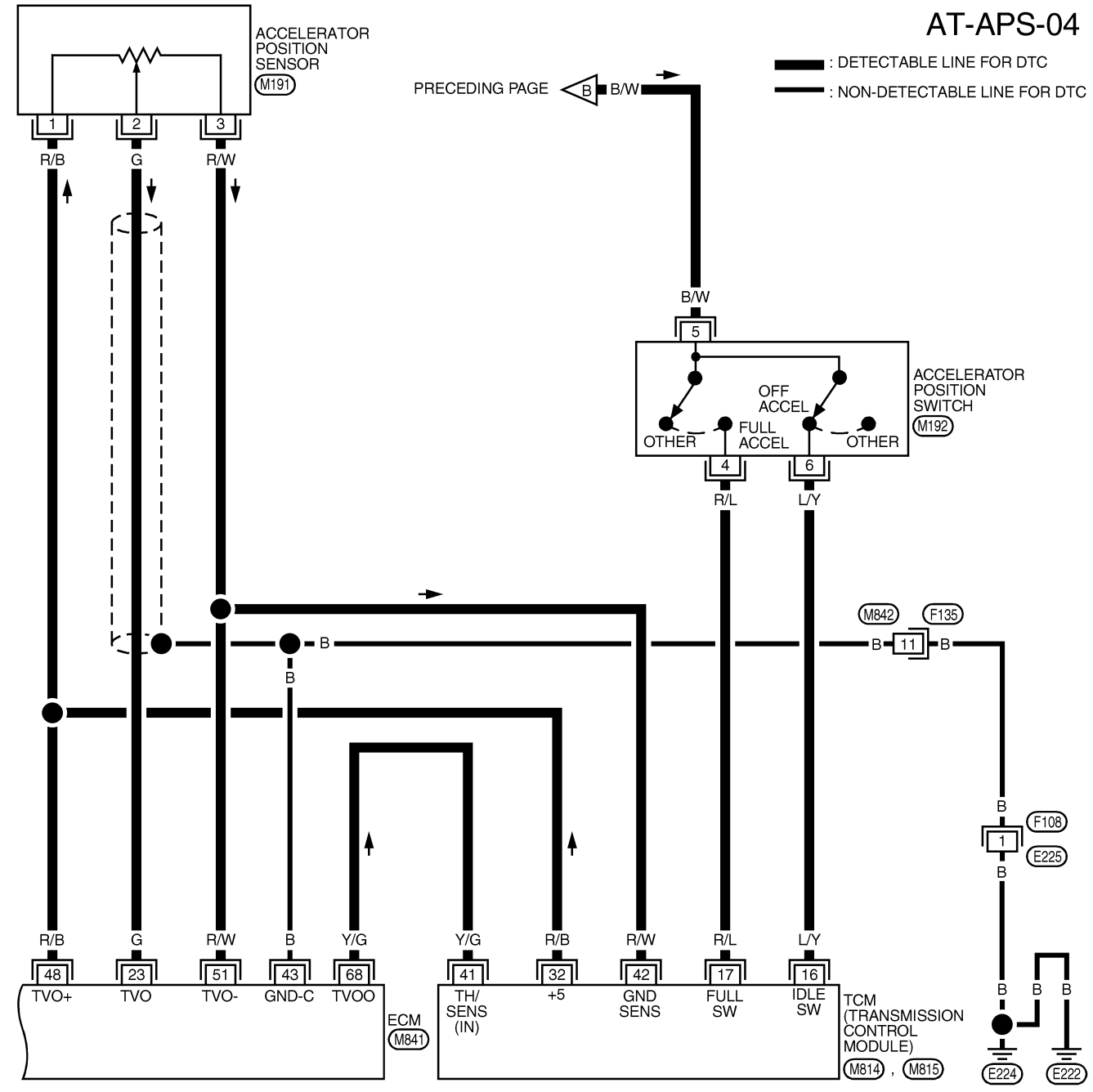




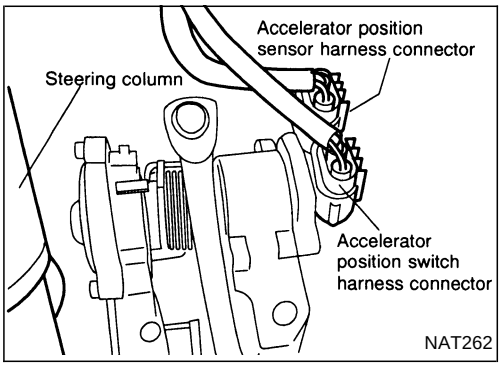
YAT267

Wiring Diagram — AT — TPS (Cont'd)

RHD MODELS



YAT268



Throttle (Accelerator) Position Sensor

DESCRIPTION

The throttle (accelerator) position sensor detects the throttle valve position and sends a signal to the TCM.

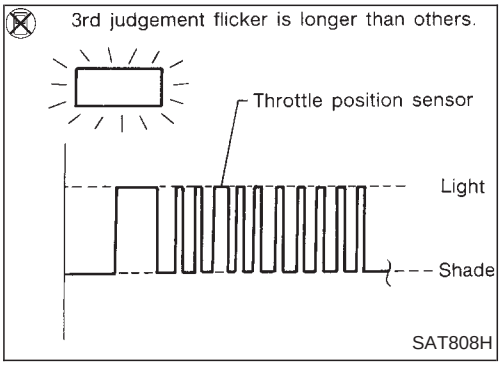
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: THROTTLE POSI SEN : 3rd judgement flicker	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle (accelerator) position sensor

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

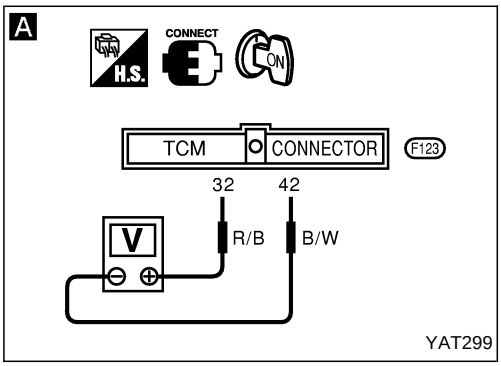
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in “D” 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 3 seconds.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Throttle (Accelerator) Position Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



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 (accelerator) position sensor circuit for engine control. Refer to EC section ["TROUBLE DIAGNOSIS FOR "THRTL (ACCEL) POSI SEN"].

OK ↓

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "THRTL POS SEN".

Voltage:

Fully-closed throttle:
Approximately 0.5V

Fully-open throttle:
Approximately 4V

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ㉜ and ㊷ while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle valve:
Approximately 0.4V

Fully-open throttle valve:
Approximately 4V

(Voltage rises gradually in response to throttle position)

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

OK ↓

CHECK THROTTLE (ACCELERATOR) POSITION SWITCH.
Refer to "CHECK THROTTLE (ACCELERATOR) POSITION SWITCH", AT-88.

NG → Repair or replace damaged parts.

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-60.

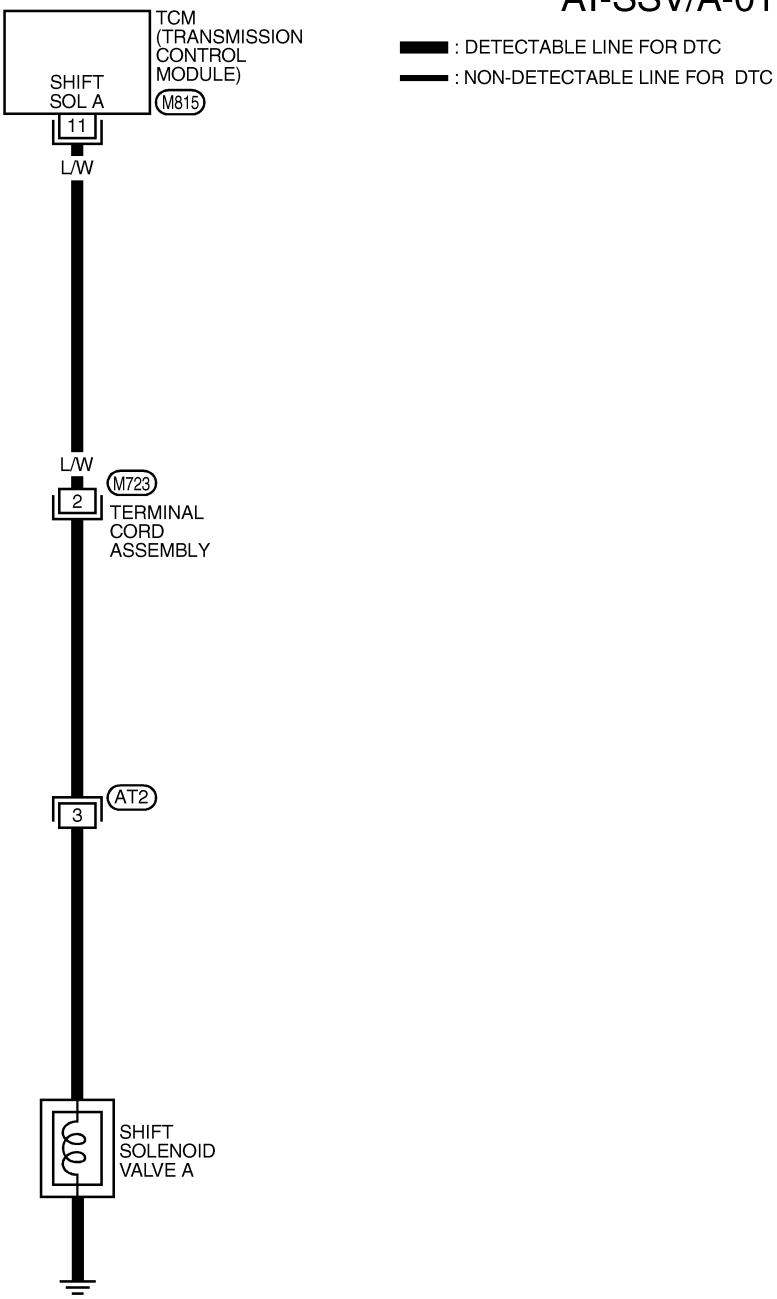
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

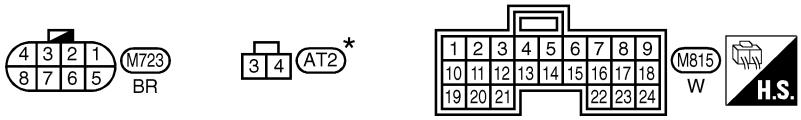
OK ↓

INSPECTION END

Wiring Diagram — AT — SSV/A

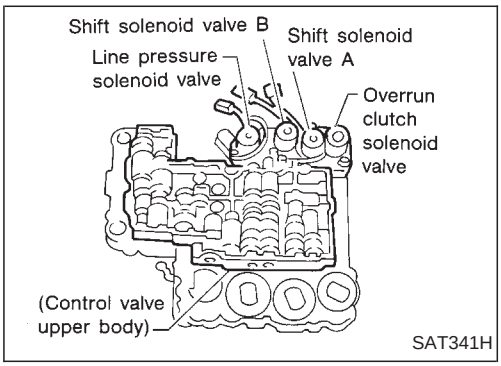
AT-SSV/A-01





*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT280



Shift Solenoid Valve A

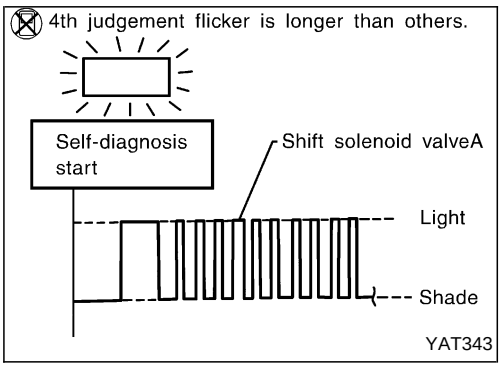
DESCRIPTION

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the park/neutral position 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	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SHIFT SOLENOID/V A : 4th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Shift solenoid valve A



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

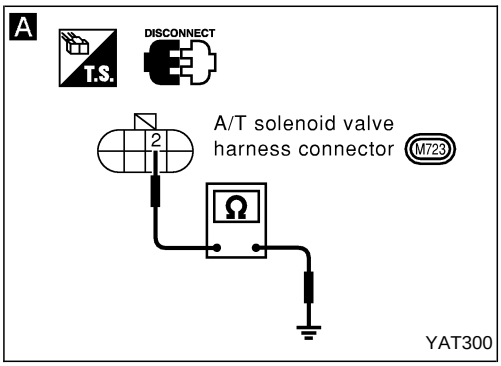
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2$ position.

OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Shift Solenoid Valve A (Cont'd)

DIAGNOSTIC PROCEDURE

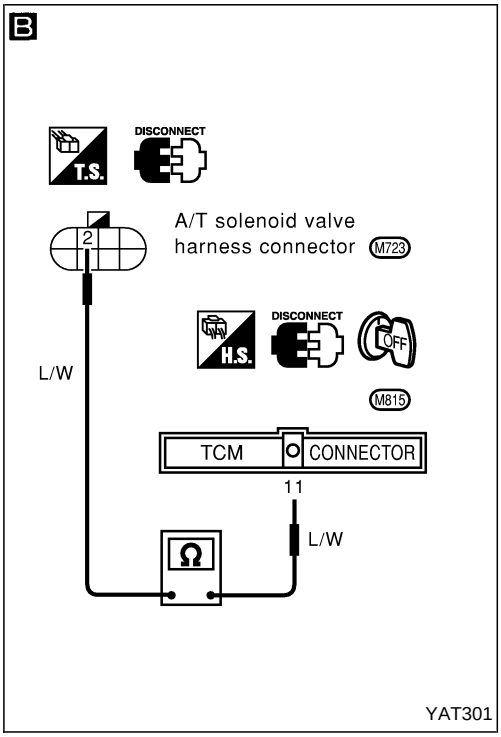


A

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

NG →
1. Remove control valve assembly. Refer to AT-113.
2. Check the following items:
- Shift solenoid valve A Refer to "COMPONENT INSPECTION" below.
- 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 ② and TCM harness connector terminal ⑪.
   Resistance:
   Approximately 0Ω
   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 connector.

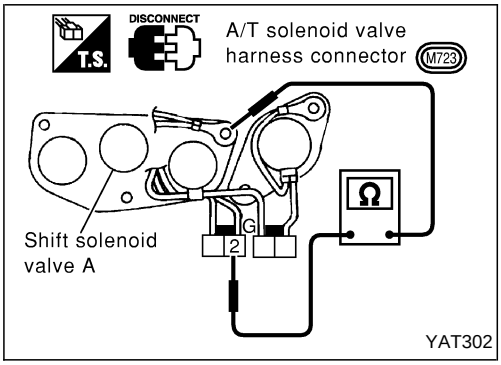
OK ↓

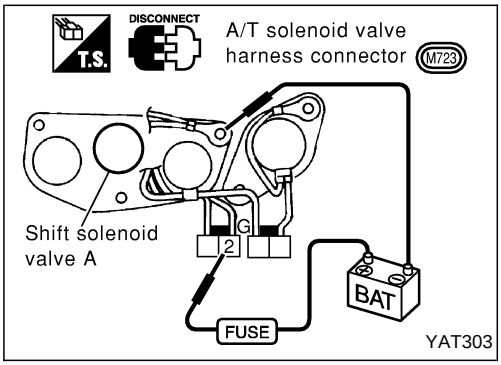
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-63.

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-139.

Resistance check

- Check resistance between terminal ② and ground.

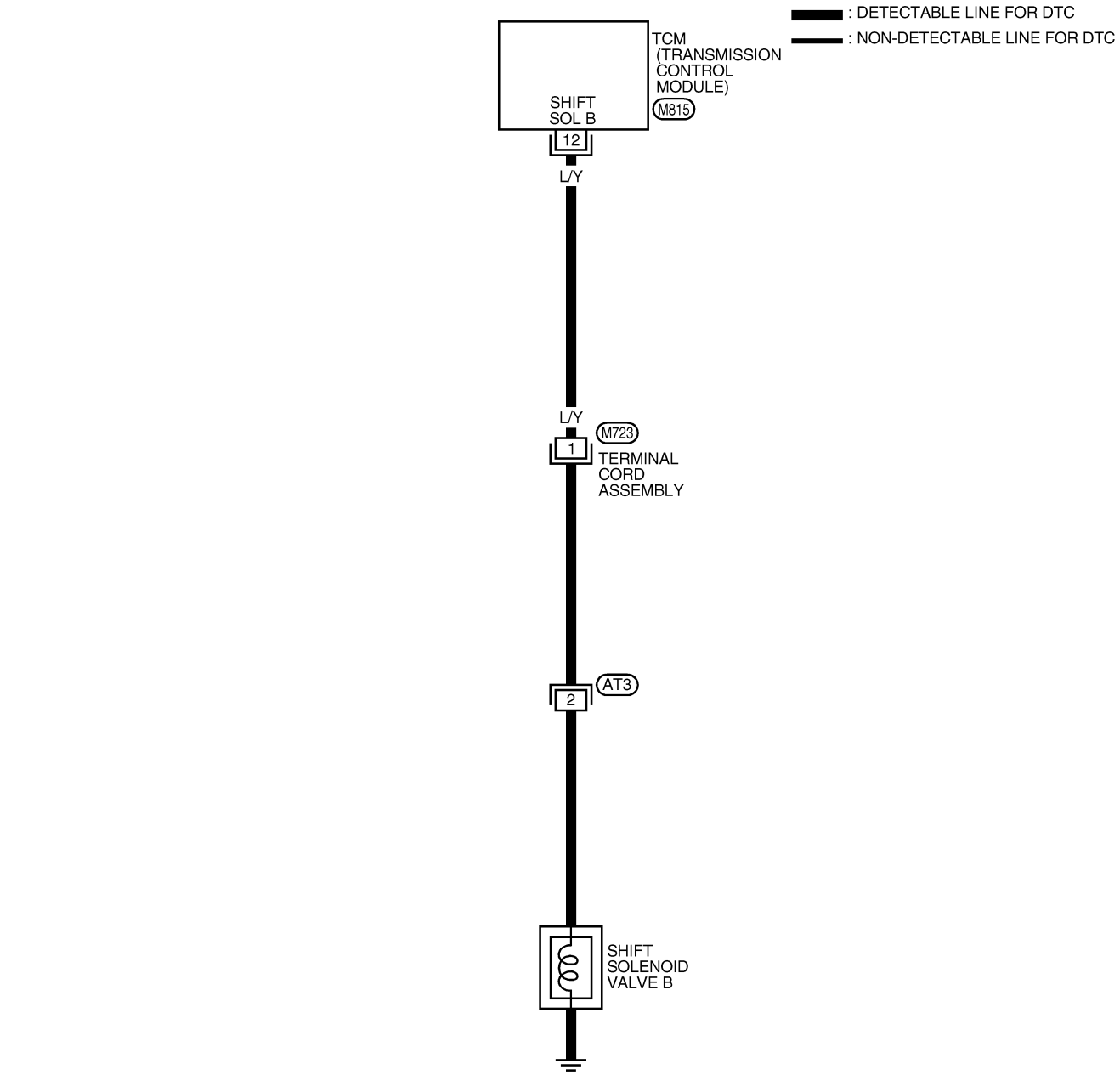
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	②	Ground	20 - 40Ω

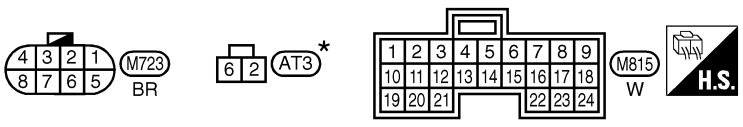
Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ② and ground.

Wiring Diagram — AT — SSV/B

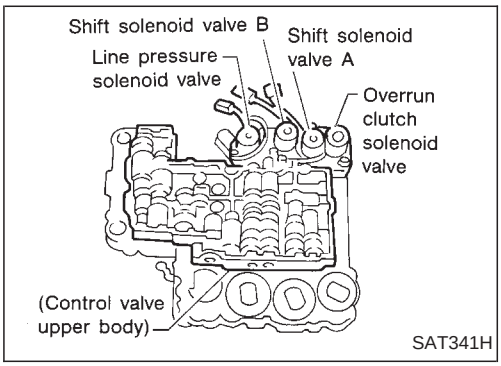
AT-SSV/B-01





*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT281



Shift Solenoid Valve B

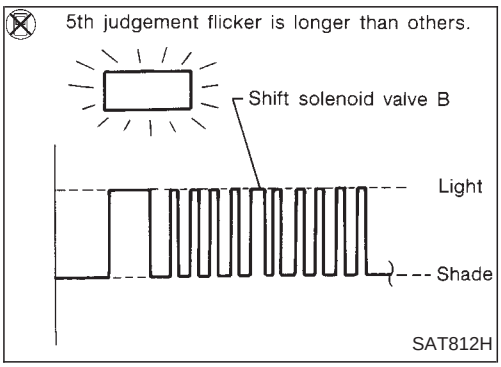
DESCRIPTION

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the park/neutral position switch, vehicle speed and throttle (accelerator) position sensors. Gears will then be shifted to the optimum position.

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SHIFT SOLENOID/V B : 5th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Shift solenoid valve B



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

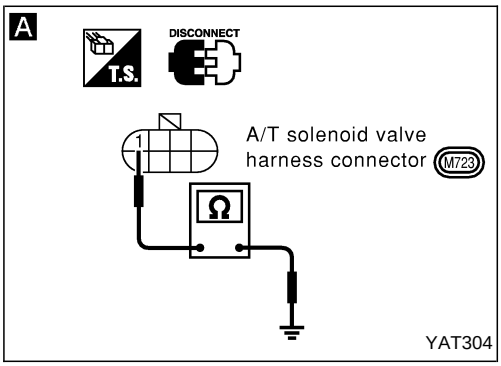
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.

OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Shift Solenoid Valve B (Cont'd)

DIAGNOSTIC PROCEDURE

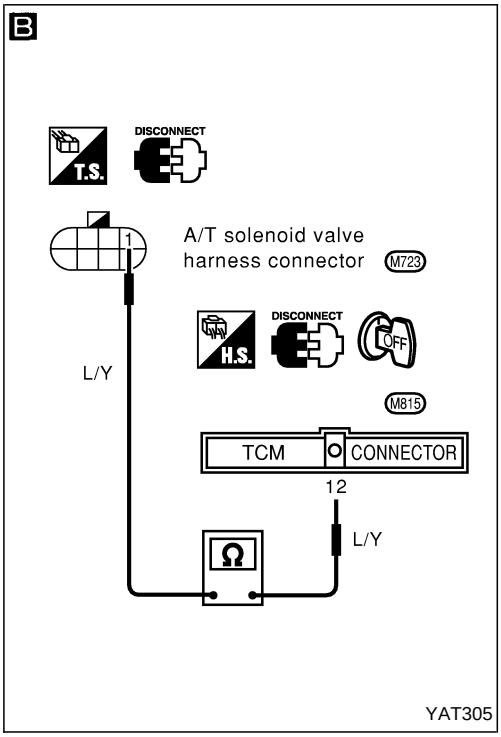


A

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

NG →
1. Remove control valve assembly. Refer to AT-139.
2. Check the following items:
- Shift solenoid valve B
  Refer to "COMPONENT INSPECTION" below.
- 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 ⑫.
   Resistance:
   Approximately 0Ω
   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 connector.

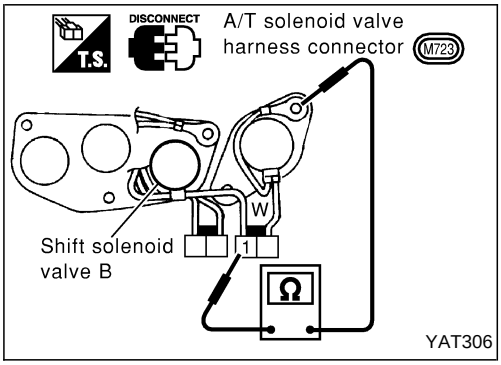
OK ↓

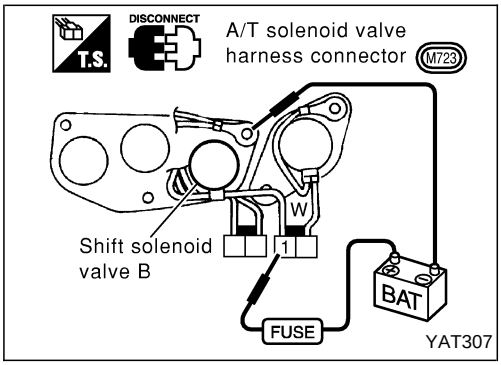
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-66.

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-139.

Resistance check

- Check resistance between terminal ① and ground.

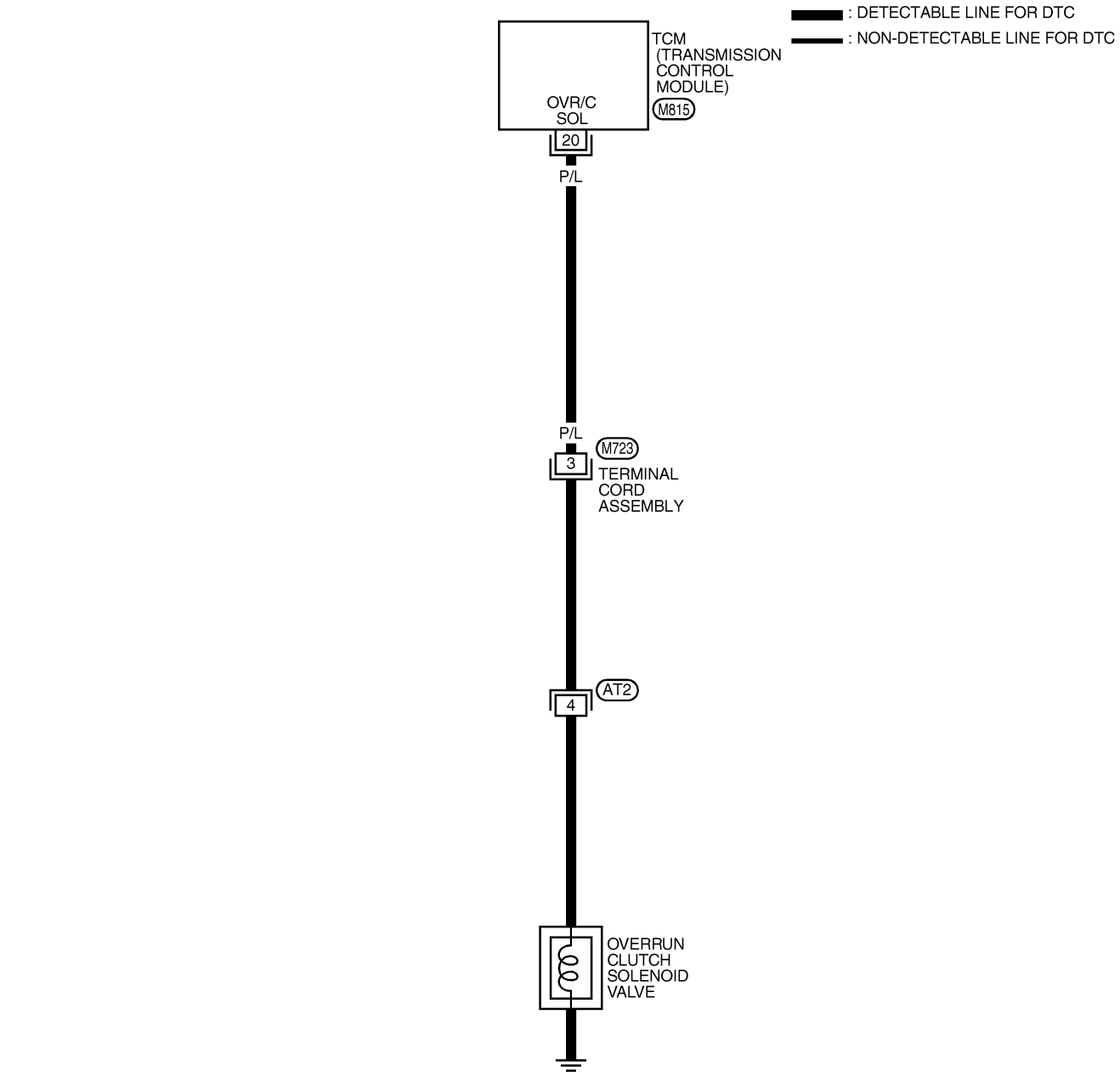
Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve B	①	Ground	20 - 40Ω

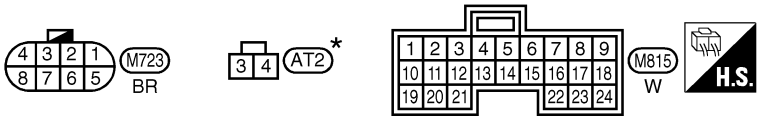
Operation check

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

Wiring Diagram — AT — OVRCSV

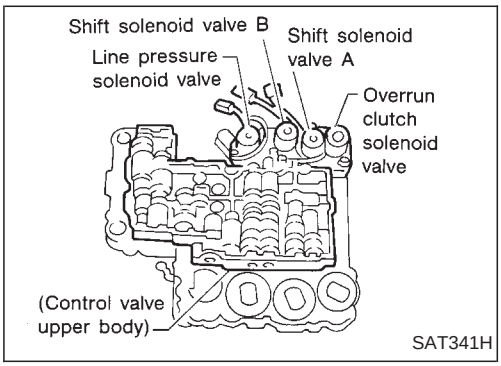
AT-OVRCSV-01





*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT282



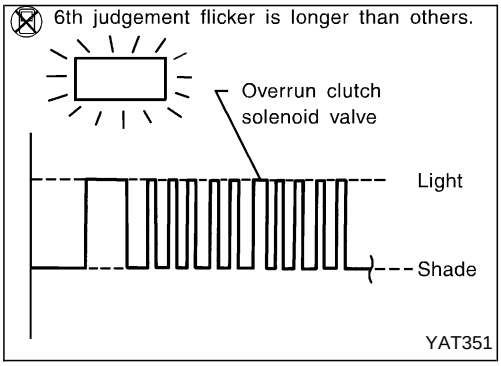
Overrun Clutch Solenoid Valve

DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: OVERRUN CLUTCH S/V : 6th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Overrun clutch solenoid valve



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

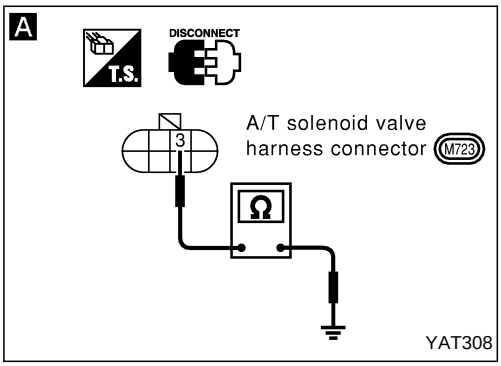
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, overdrive control switch in “OFF” position and vehicle speed higher than 10 km/h (6 MPH).

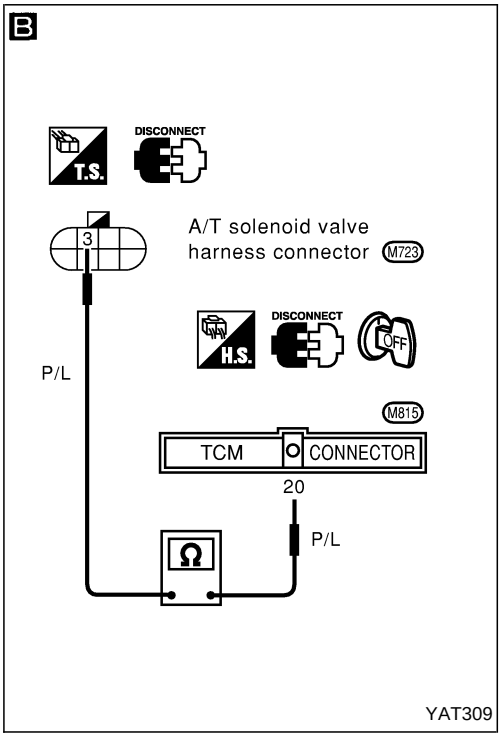
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, overdrive control switch in “OFF” position and vehicle speed higher than 10 km/h (6 MPH).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Overrun Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





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 ③ and ground.
   Resistance: 20 - 40Ω

NG →
1. Remove control valve assembly. Refer to AT-113.
2. Check the following items:
- Overrun clutch solenoid valve
  Refer to "COMPONENT INSPECTION" below.
- 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 ③ and TCM harness connector terminal ⑳.
   Resistance:
   Approximately 0Ω
   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 connector.

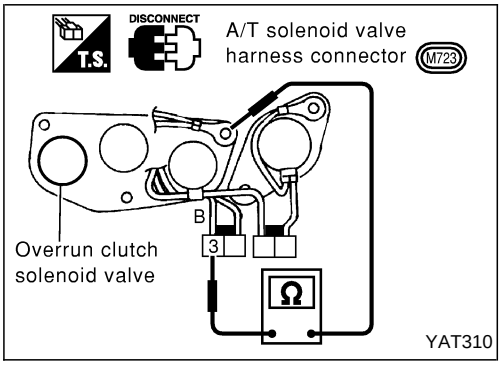
OK ↓

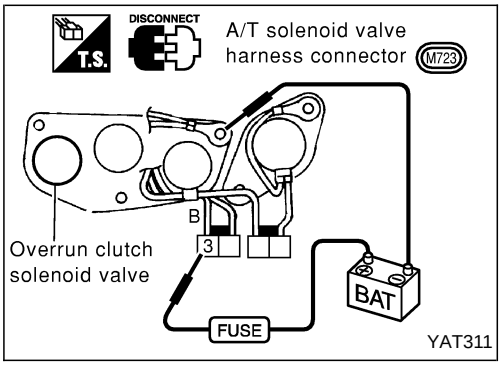
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-69.

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-113.

Resistance check

- Check resistance between terminal ③ and ground.

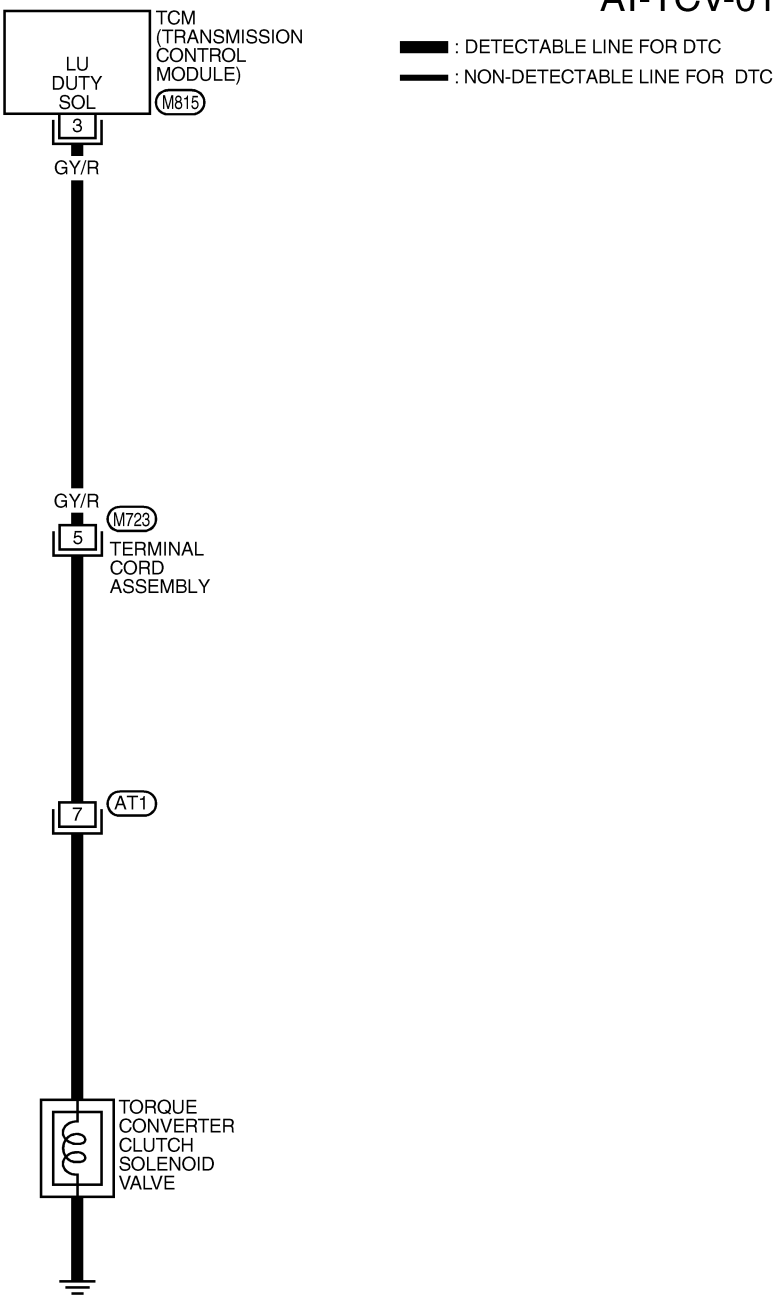
Solenoid valve	Terminal No.		Resistance (Approx.)
Overrun clutch solenoid valve	③	Ground	20 - 40Ω

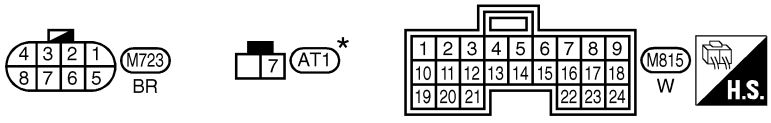
Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ③ and ground.

Wiring Diagram — AT — TCV

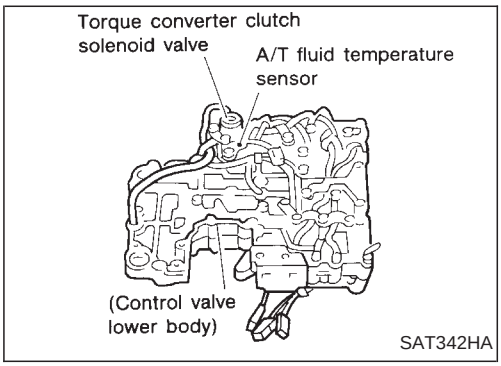
AT-TCV-01





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YAT277



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 (accelerator) position sensors. Torque converter clutch piston operation will then be controlled.
Lock-up operation, however, is prohibited when A/T fluid temperature is too low.

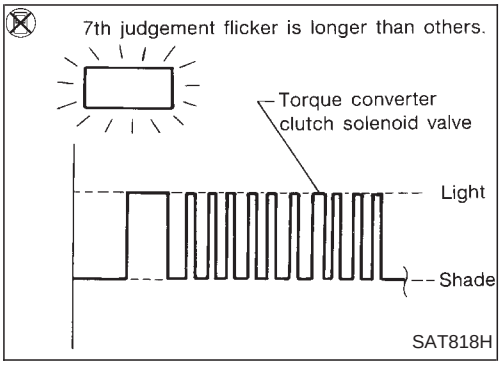
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: T/C CLUTCH SOL/V : 7th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● T/C clutch solenoid valve

CONSULT-II 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” ↓ Lock-up “ON”	Approximately 4% ↓ Approximately 94%



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

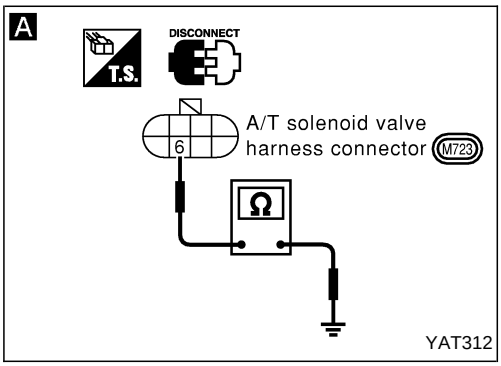
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.

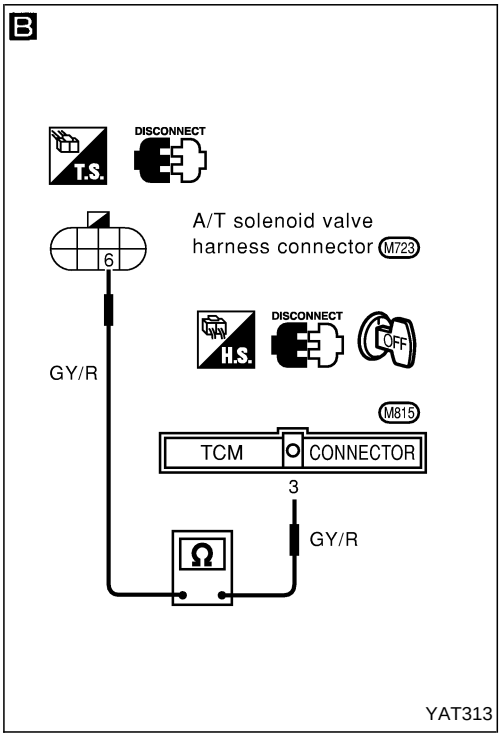
OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





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: 10 - 20Ω

NG →
1. Remove oil pan. Refer to AT-123.
2. Check the following items:
- Torque converter clutch solenoid valve
  Refer to "COMPONENT INSPECTION" on next page.
- 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 ⑥ and TCM harness connector terminal ③ .
   Resistance:
   Approximately 0Ω
   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 connector.

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-72.

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)

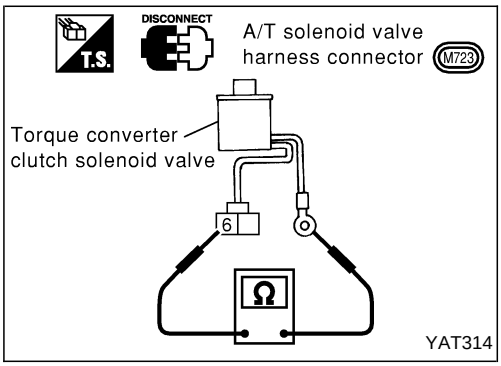
COMPONENT INSPECTION

Torque converter clutch solenoid valve

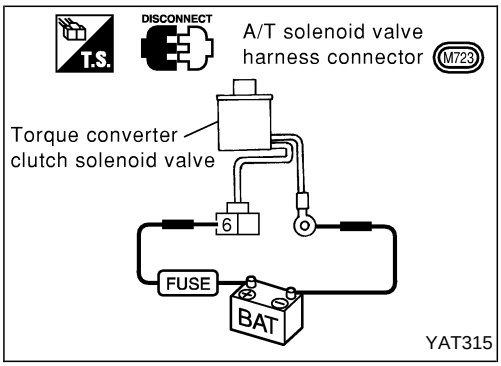
- For removal, refer to AT-139.

Resistance check

- Check resistance between terminal ⑥ and ground.



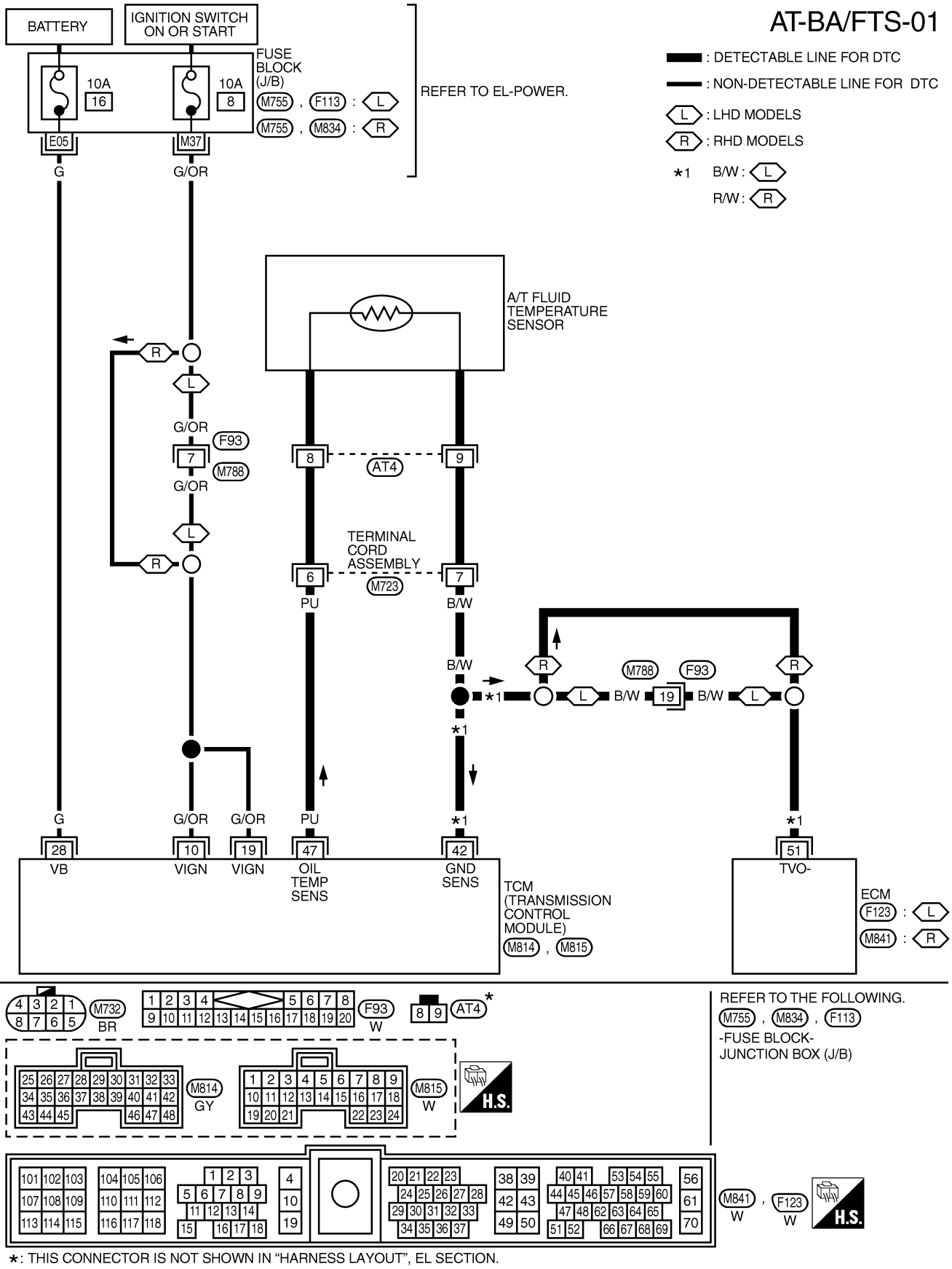
Solenoid valve	Terminal No.		Resistance (Approx.)
Torque converter clutch solenoid valve	⑥	Ground	10 - 20Ω



Operation check

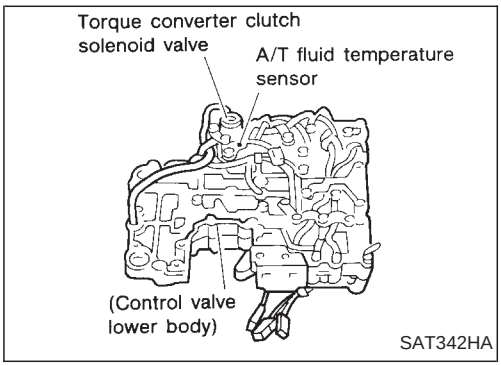
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑥ and ground.

Wiring Diagram — AT — BA/FTS



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YAT283



A/T Fluid Temperature Sensor and TCM Power Source

DESCRIPTION

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

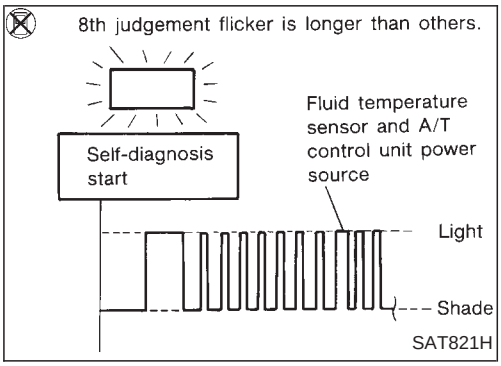
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: BATT/FLUID TEMP SEN : 8th judgement flicker	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● A/T fluid temperature sensor

CONSULT-II 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)] ↓ Hot [80°C (176°F)]	Approximately 1.5V ↓ Approximately 0.5V



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
Selector lever in “D” position, 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.

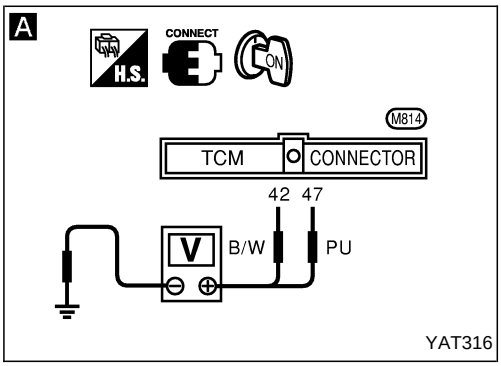
OR

1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in “D” position, 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.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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

DIAGNOSTIC PROCEDURE

A



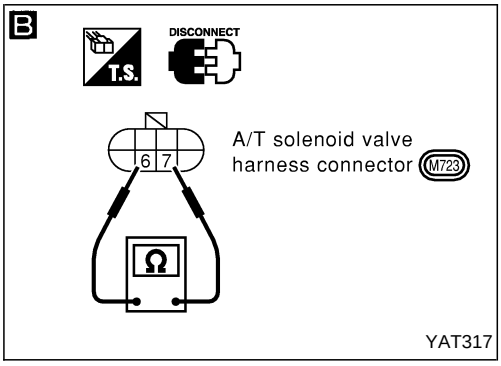
CHECK TCM POWER SOURCE.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ㊷, ㊼ and ground.
   Battery voltage should exist.

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch and fuse 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 ⑥ and ⑦ when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
4. Reinstall any part removed.

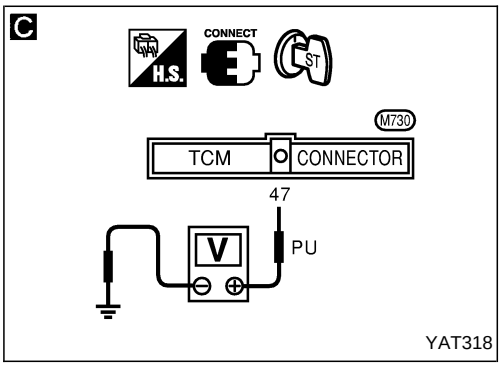
NG →
1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor Refer to "COMPONENT INSPECTION" on next page.
- Harness of terminal cord assembly for short or open

OK ↓

Ⓐ

(Go to next page.)

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



Ⓐ

C

CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
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

OR

1. Start engine.
2. Check voltage between TCM terminal ㊼ and ground while warming up A/T.

Voltage:
Cold [20°C (68°F)] →
Hot [80°C (176°F)]:
Approximately
1.5V → 0.5V

NG → Check the following item:
- Harness for short or open between TCM and terminal cord assembly (Main harness)

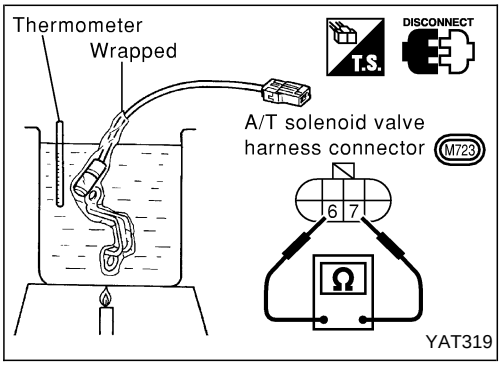
OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-76.

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

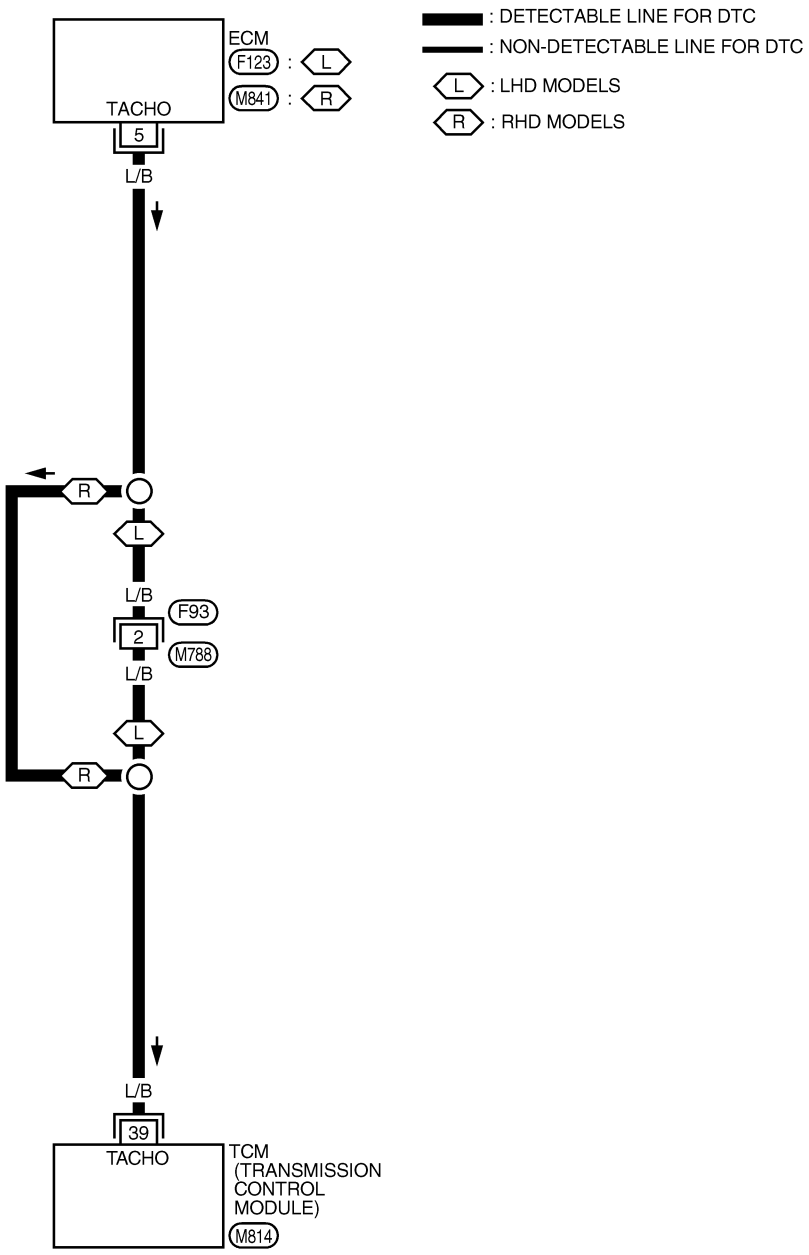
A/T fluid temperature sensor

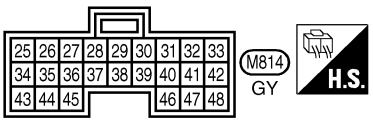
- For removal, refer to AT-113.
- Check resistance between terminals ⑥ and ⑦ while changing temperature as shown at left.

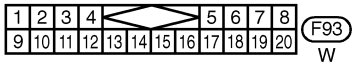
Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

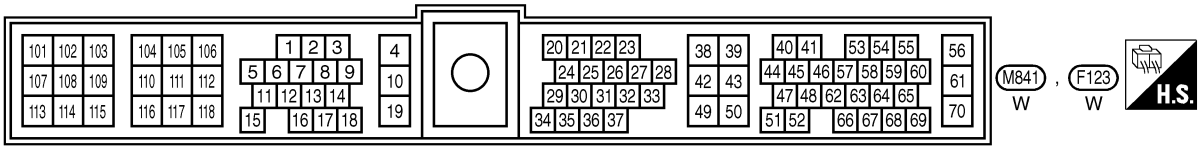
Wiring Diagram — AT — ENGSS

AT-ENGSS-01









YAT271

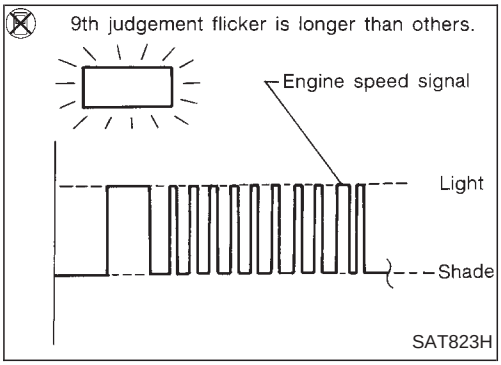
Engine Speed Signal

DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: ENGINE SPEED SIG : 9th judgement flicker	TCM does not receive the proper voltage signal from ECM.	● Harness or connectors (The sensor circuit is open or shorted.)



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

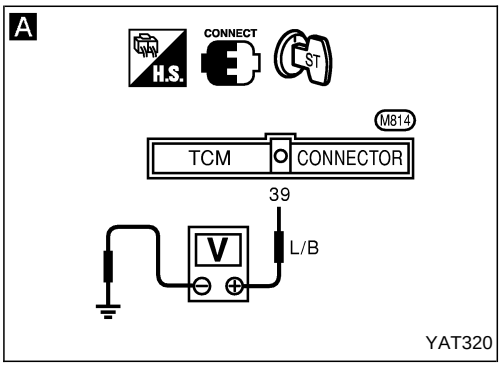
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, 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 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Engine Speed Signal (Cont'd)

DIAGNOSTIC PROCEDURE



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 [TROUBLE DIAGNOSIS FOR "IGN SIGNAL-PRIMARY" (DTC 21)].

OK ↓

A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "ENGINE SPEED".
   Check engine speed changes according to throttle position.

OR

1. Start engine.
2. Check voltage between TCM terminal ㊴ and ground.
   Voltage (Idle speed):
   Approximately 0.8V
   Voltage (2,000 rpm):
   Approximately 2.2V

NG → Check the following items:
- Harness for short or open between TCM and ECM
- Resistor

Refer to EC section [TROUBLE DIAGNOSIS FOR "IGN SIGNAL-PRIMARY" (DTC 21)].

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-80.

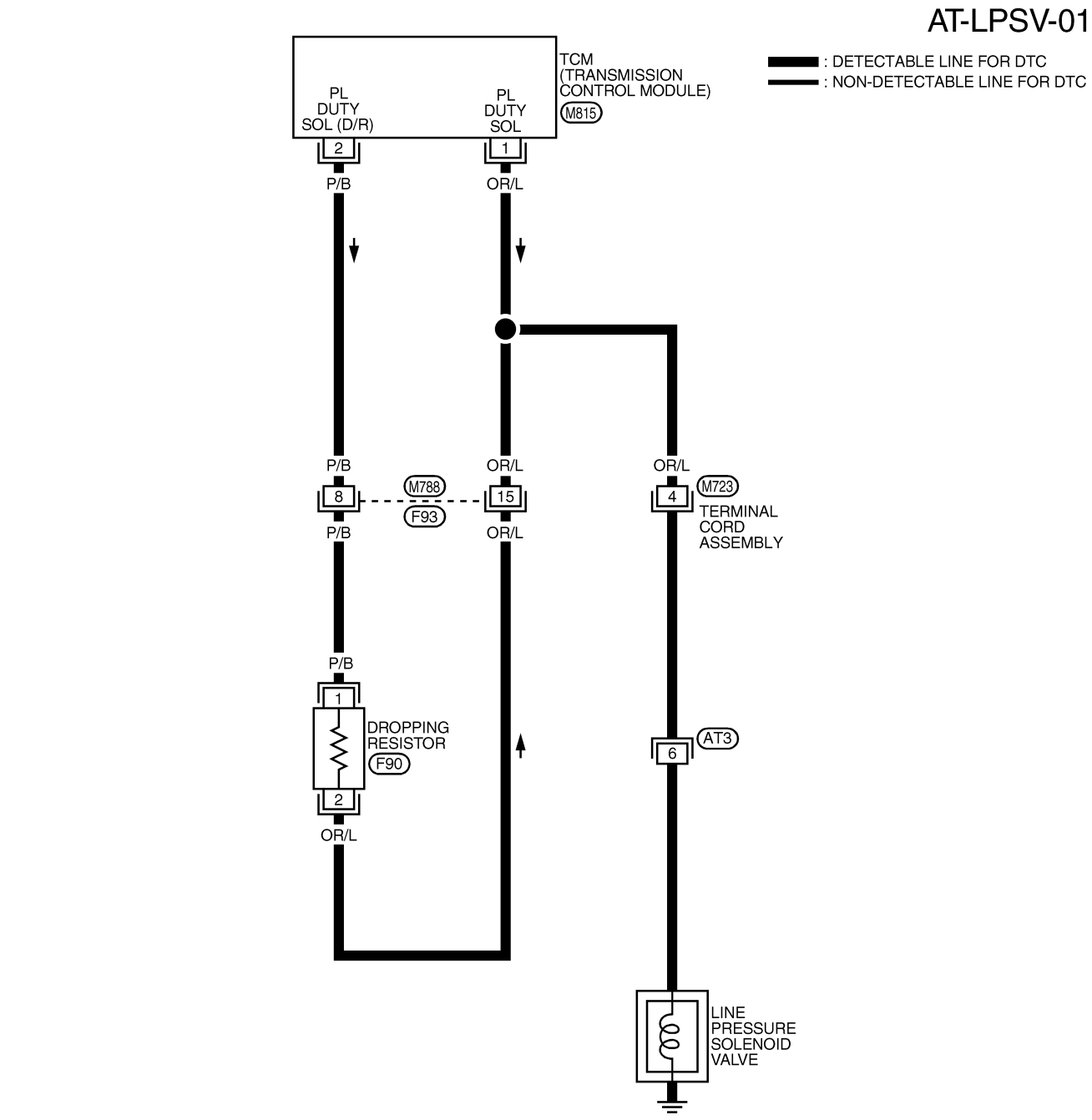
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

Wiring Diagram — AT — LPSV

LHD MODELS



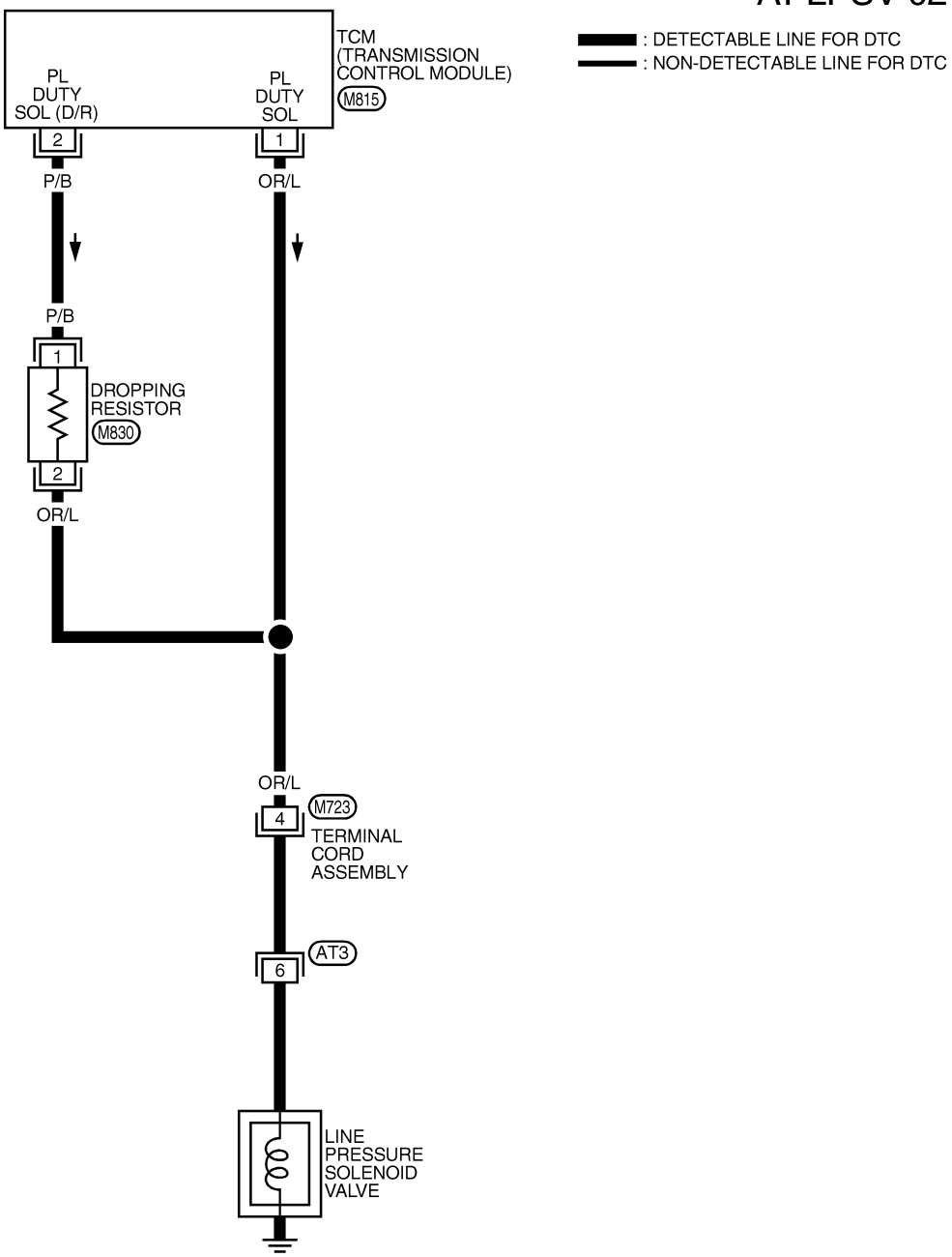
*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT278

Wiring Diagram — AT — LPSV (Cont'd)

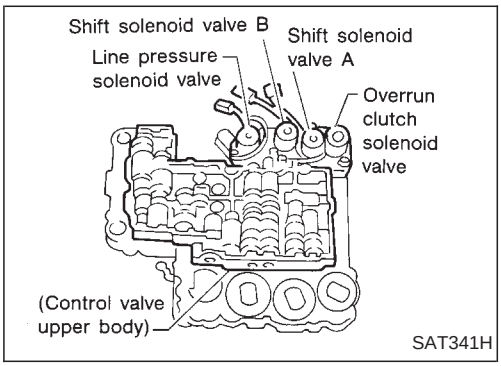
RHD MODELS

AT-LPSV-02



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YAT279



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.

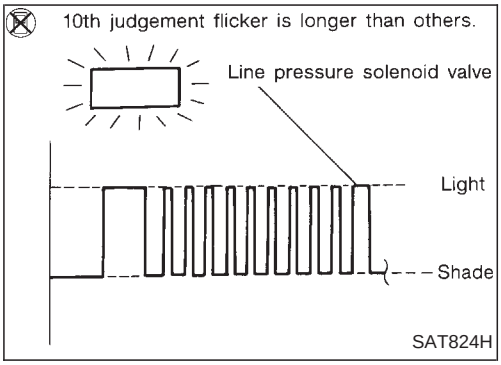
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
(H) : LINE PRESSURE S/V (X) : 10th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Line pressure solenoid valve

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Line pressure solenoid valve duty	Low line-pressure (Small throttle opening) ↓ High line-pressure (Large throttle opening)	Approximately 29% ↓ Approximately 94%



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

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

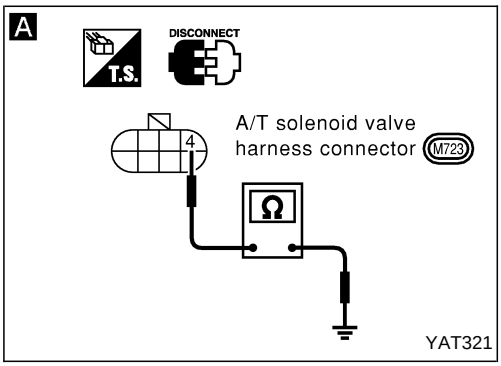
(H)
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) With brake pedal depressed, shift the lever from “P” → “N” → “D” → “N” → “P” positions.

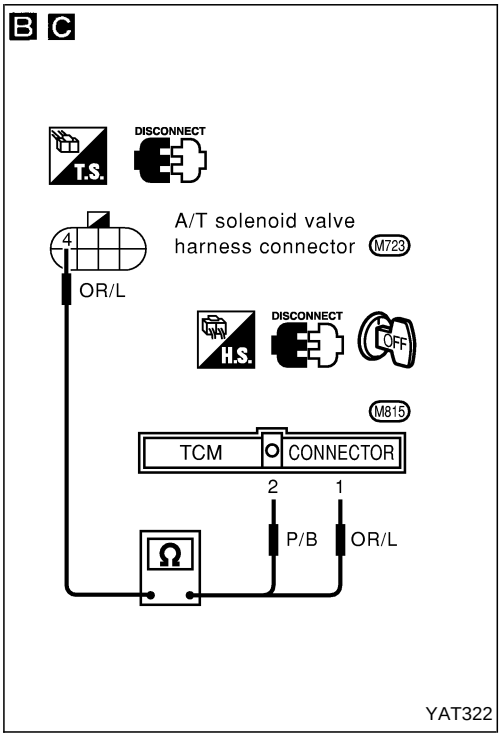
OR

(X)
1) Start engine.
2) With brake pedal depressed, shift the lever from “P” → “N” → “D” → “N” → “P” positions.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

Line Pressure Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





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 ④ and ground.
   Resistance: 2.5 - 5Ω

NG →
1. Remove control valve assembly. Refer to AT-113.
2. Check the following items:
   - Line pressure solenoid valve
     Refer to "COMPONENT INSPECTION" on next page.
   - 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 ④ and TCM harness connector terminal ② .
   Resistance: 11.2 - 12.8Ω

NG →
Check the following items:
- Dropping resistor
  Refer to "COMPONENT INSPECTION" on next page.
- 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 resistance between terminal ⑥ and TCM harness connector terminal ① .
   Resistance:
   Approximately 0Ω
   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 connector.

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-84.

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

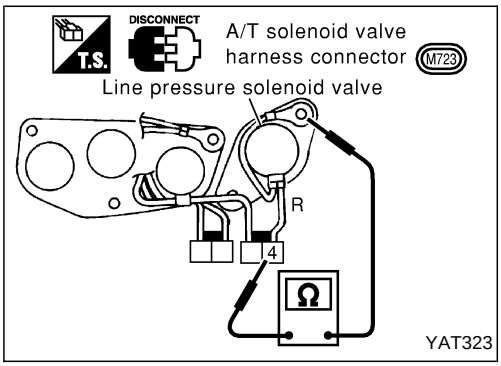
OK ↓

INSPECTION END

Line Pressure Solenoid Valve (Cont'd)

COMPONENT INSPECTION

Line pressure solenoid valve

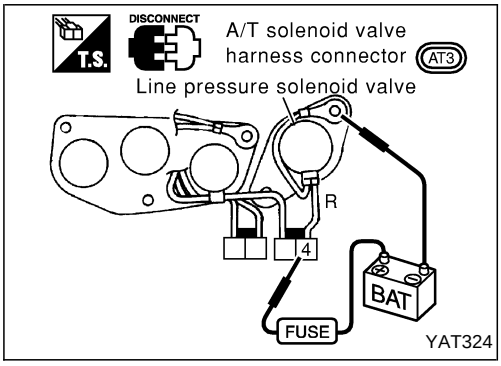


- For removal, refer to AT-113.

Resistance check

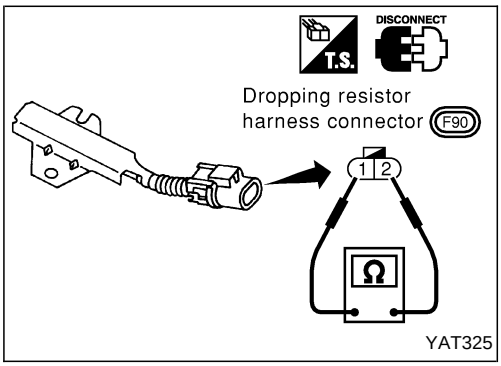
- Check resistance between terminal ⑥ and ground.

Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	④	Ground	2.5 - 5Ω



Operation check

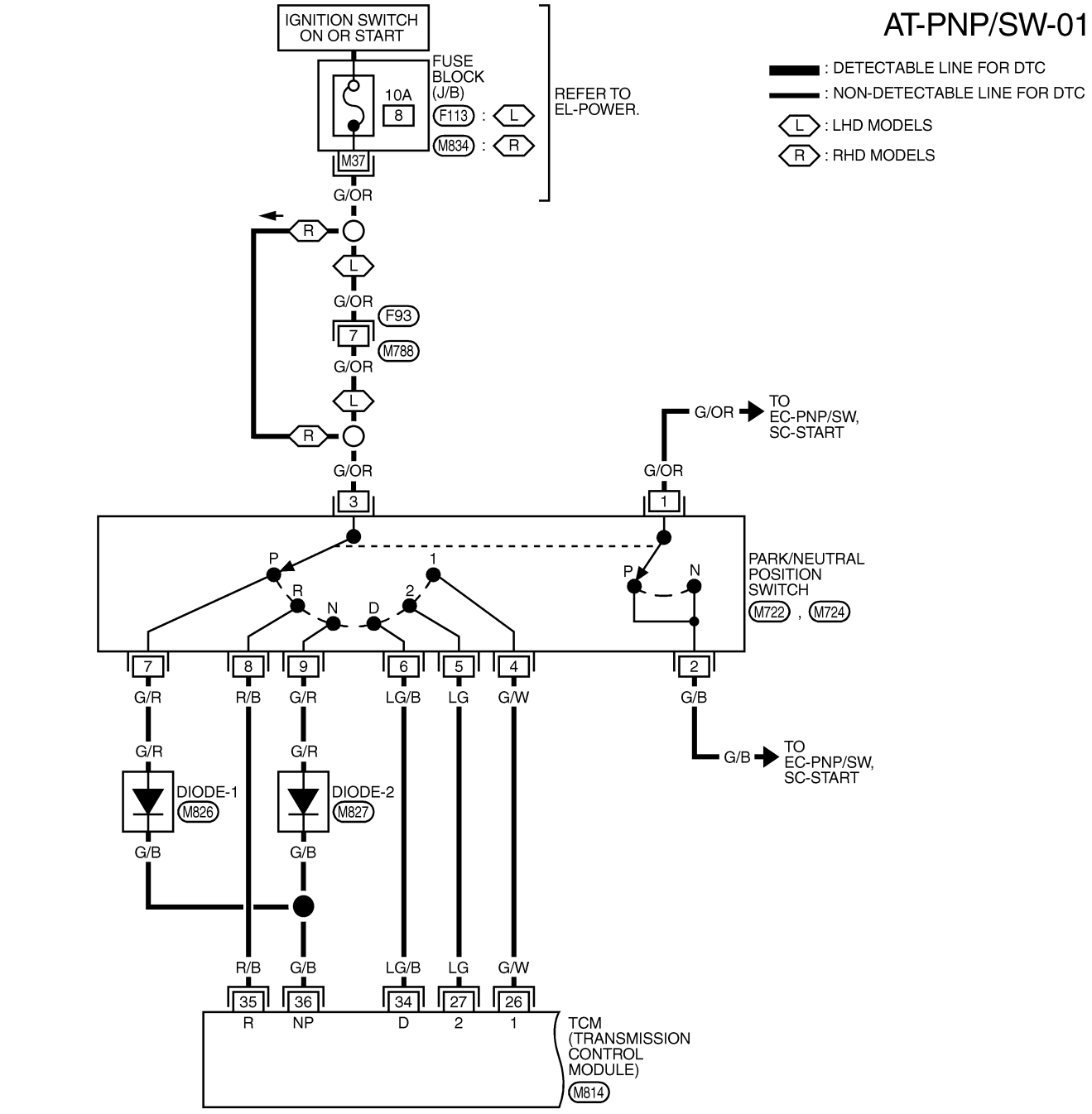
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ④ and ground.



Dropping resistor

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

Wiring Diagram — AT — PNP/SW



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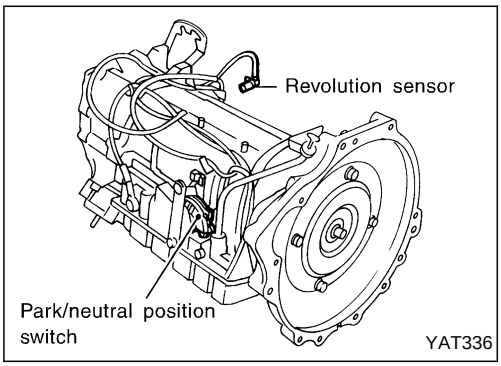
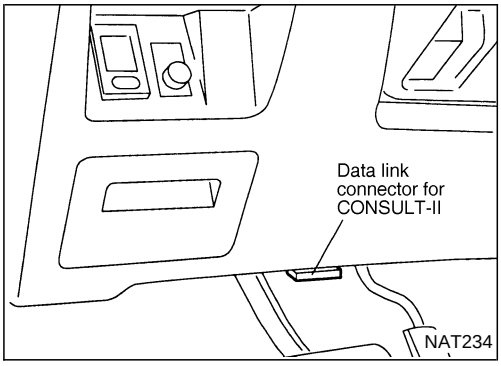
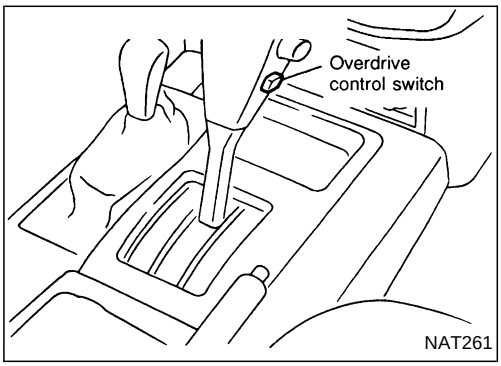
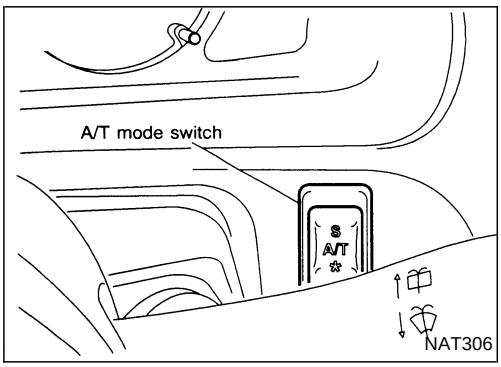
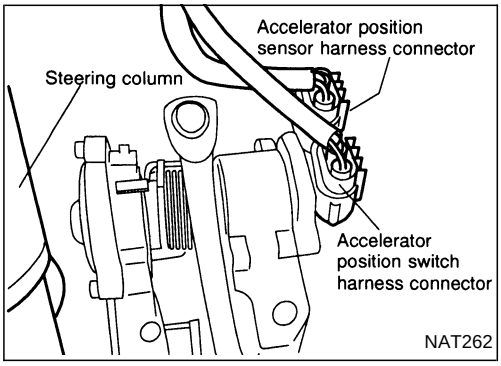










Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches

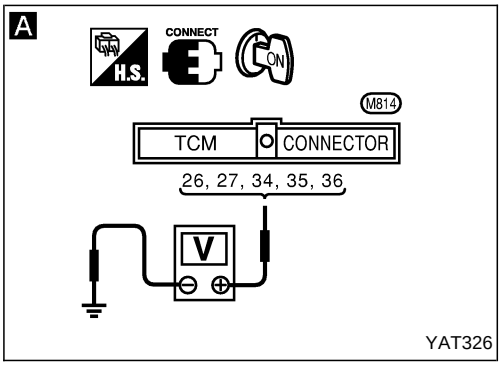
DESCRIPTION

- Park/neutral position 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 (accelerator) position switch
  Consists of a wide open throttle position switch and a closed throttle (accelerator) 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.

Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

DIAGNOSTIC PROCEDURE

A



CHECK PARK/NEUTRAL POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "R, N, D, 2 and 1 position switches" moving selector lever to each position. Check 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 ㉖, ㉗, ㉞, ㉟, ㊱ and ground while moving selector lever through each position.

Voltage:

B: Battery voltage

0: 0V

Lever position	Terminal No.				
	㊱	㉟	㉞	㉗	㉖
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**

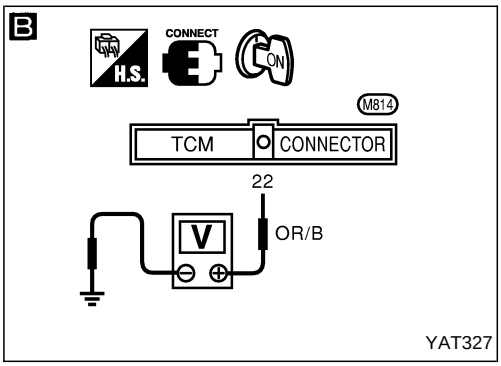
NG → Check the following items:
- Park/neutral position switch
  Refer to "COMPONENT INSPECTION", AT-114.
- Harness for short or open between ignition switch and park/neutral position switch (Main harness)
- Harness for short or open between park/neutral position switch and TCM (Main harness)
- Diode

OK

Ⓐ

(Go to next page.)

Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)



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B

CHECK OVERDRIVE CONTROL SWITCH CIRCUIT.

With CONSULT-II

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "OVERDRIVE SWITCH". Check the signal of the overdrive control switch is indicated properly. (Overdrive control switch "ON" displayed on CONSULT-II means overdrive "OFF".)

OR

Without CONSULT-II

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminal Ⓒ22 and ground when overdrive control switch is "ON" and "OFF".

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

NG → Check the following items.
- Overdrive control switch Refer to "COMPONENT INSPECTION", AT-114.
- Harness for short or open between TCM and overdrive control switch (Main harness)
- Harness for short or open of ground circuit for overdrive control switch (Main harness)

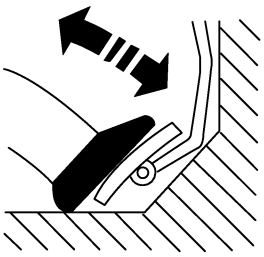
OK

Ⓑ

(Go to next page.)

Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

C



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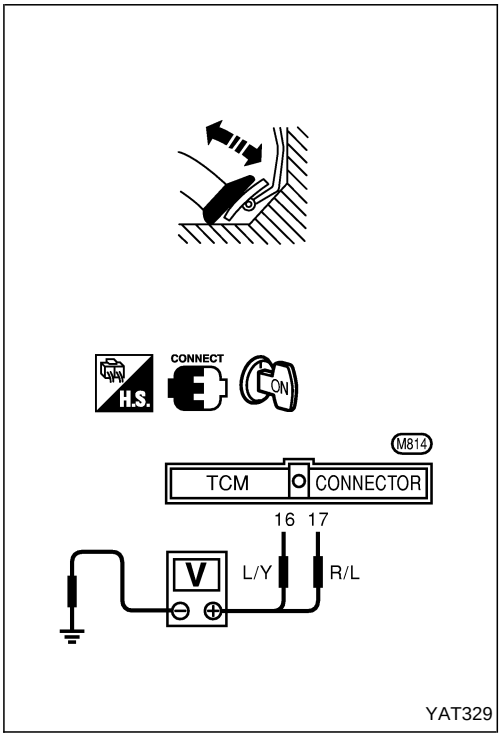

YAT329

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C

CHECK THROTTLE (ACCELERATOR) POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal. Check the signal of throttle (accelerator) 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

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑯, ⑰ and ground while depressing, and releasing accelerator pedal slowly. (after warming up engine)

Accelerator pedal condition	Voltage	
	Terminal No. ⑯	Terminal No. ⑰
Released	Battery voltage	1V or less
Fully depressed	1V or less	Battery voltage

NG → Check the following items:
- Throttle (accelerator) position switch Refer to "COMPONENT INSPECTION", AT-114.
- Harness for short or open between ignition switch and throttle (accelerator) position switch (Main harness)
- Harness for short or open between throttle (accelerator) position switch and TCM (Main harness)

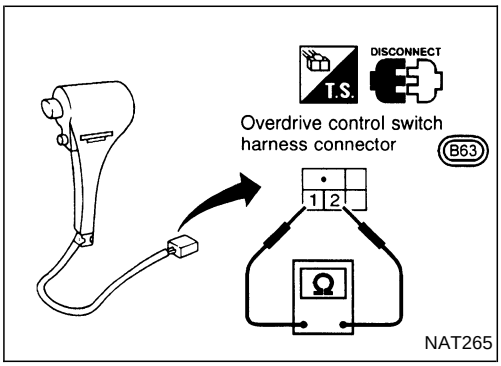
OK ↓

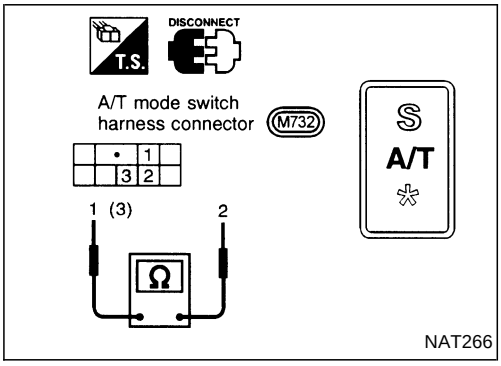
Perform "DIAGNOSTIC PROCEDURE", AT-89.

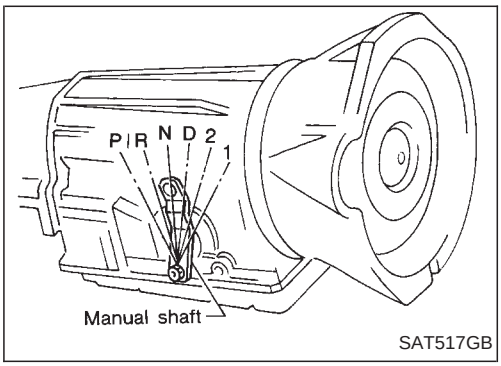
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

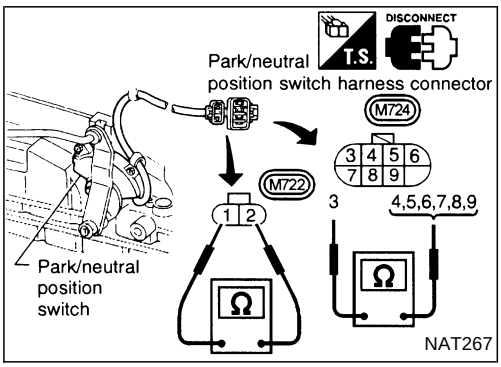
OK ↓

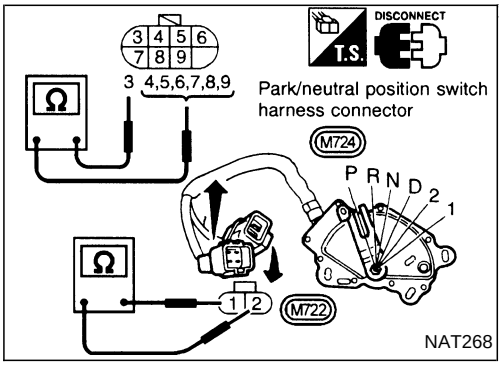
INSPECTION END











Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

COMPONENT INSPECTION

Overdrive control switch

- Check continuity between terminals ① and ② .

Switch position	Continuity
ON	No
OFF	Yes

A/T mode switch

- Check continuity between terminals ① , (③) and ② .

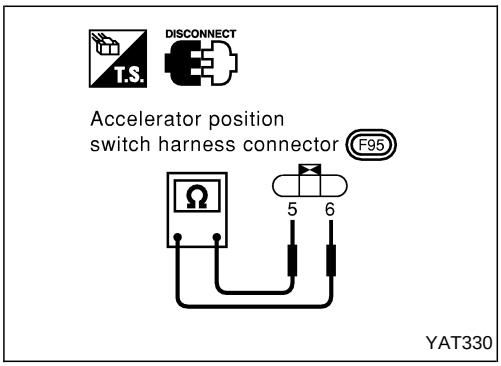
Switch position		Terminal No.	Continuity
S	ON	① — ②	Yes
	OFF		No
*	ON	② — ③	Yes
	OFF		No

Park/neutral position 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 — ⑦
R	③ — ⑧	
N	① — ②	③ — ⑨
D	③ — ⑥	
2	③ — ⑤	
1	③ — ④	

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-112.
4. If NG on step 2, remove park/neutral position switch from A/T and check continuity of park/neutral position switch terminals. Refer to step 1.
5. If OK on step 4, adjust park/neutral position switch. Refer to AT-114.
6. If NG on step 4, replace park/neutral position switch.



Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

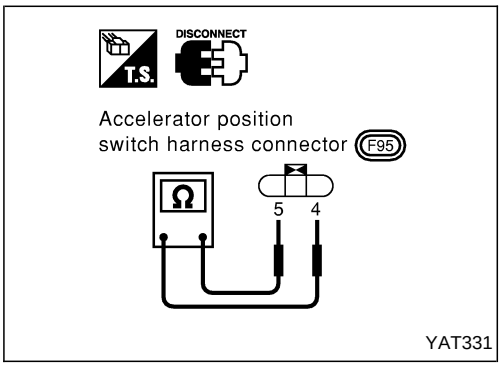
Throttle (accelerator) position switch

Closed throttle position switch (idle position)

- Check continuity between terminals ⑤ and ⑥.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

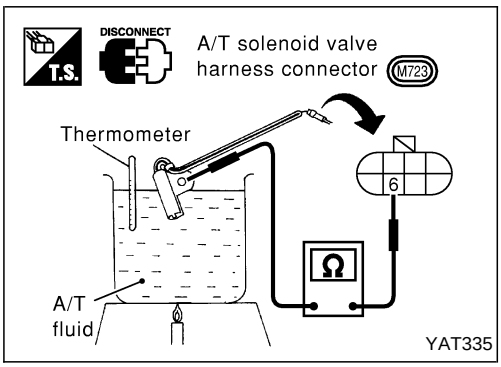
- To adjust closed throttle (accelerator) position switch, refer to EC section ("Basic Inspection", "TROUBLE DIAGNOSIS — Basic Inspection").



Wide open throttle position switch

- Check continuity between terminals ④ and ⑤.

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes



A/T fluid temperature switch

1. Make sure the A/T fluid warning lamp lights when the key is inserted and turned to "ON".
2. Make sure the A/T fluid warning lamp goes off when turning the ignition switch to "ON".
3. For removal, refer to AT-113.
4. Check resistance between terminal ⑥ and ground while changing temperature as shown at left.

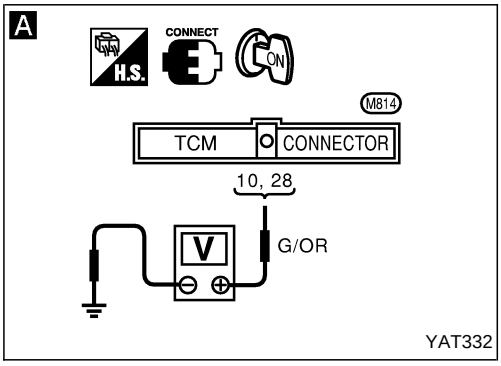
Temperature °C (°F)	Continuity
140 (284) or more	Yes
140 (284) or less	No

1. SPORT Indicator Lamp Does Not Come On

SYMPTOM:

POWER indicator lamp does not come on for about 2 seconds when turning ignition switch to “ON”.

A



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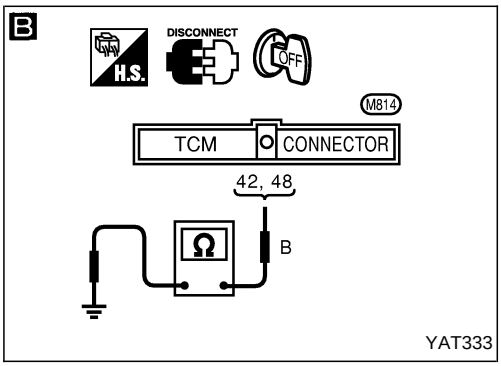

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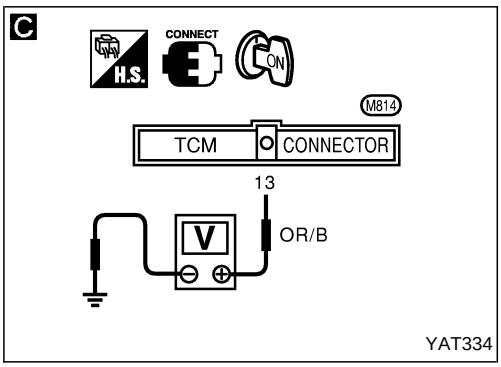


A

CHECK TCM POWER SOURCE.
1. Turn ignition switch to “ON” position. (Do not start engine.)
2. Check voltage between TCM terminals ④ , ⑨ and ground.
   Battery voltage should exist.

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch and fuse 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 resistance between TCM terminals ⑮, ㊽ and ground.
   Resistance:
   Approximately 0Ω

   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 connector.

OK ↓

C

CHECK LAMP CIRCUIT.
1. Turn ignition switch to “ON” position.
2. Set overdrive control, A/T check or power switch to “ON” position.
3. Check voltage between TCM terminal ㊴ and ground.
   Voltage: Battery voltage
4. Reinstall any part removed.

NG → Check the following items:
- Fuse (7.5A)
- SPORT indicator lamp Refer to EL section (“WARNING LAMPS”).
- Harness for short or open between ignition switch and SPORT indicator lamp (Main harness) Refer to EL section (“POWER SUPPLY ROUTING”).
- Harness for short or open between SPORT indicator lamp and TCM

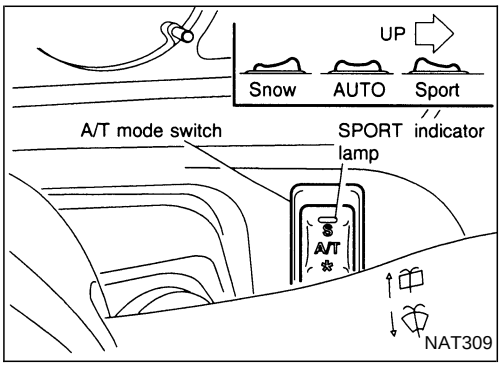
OK ↓

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. SPORT or SNOW Indicator Lamp Does Not Come On

SYMPTOM:

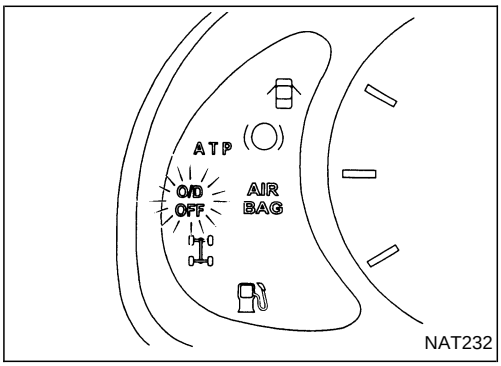
SPORT or SNOW indicator lamp does not come on when turning A/T mode switch to the appropriate position.

Is 1. O/D OFF, SPORT or A/T CHECK Indicator Lamp Does Not Come On OK? — No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-92.

Yes ↓

Check the following items:
- A/T mode switch
  Refer to AT-92.
- SNOW indicator lamp
- Harness continuity between ignition switch and A/T mode switch
- Harness continuity between A/T mode switch and TCM

NG → Repair or replace damaged parts.



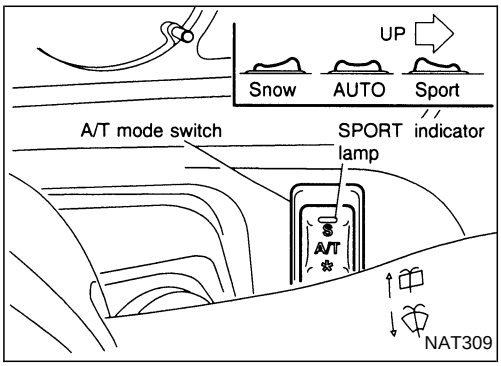
3. O/D OFF Indicator Lamp Does Not Come On

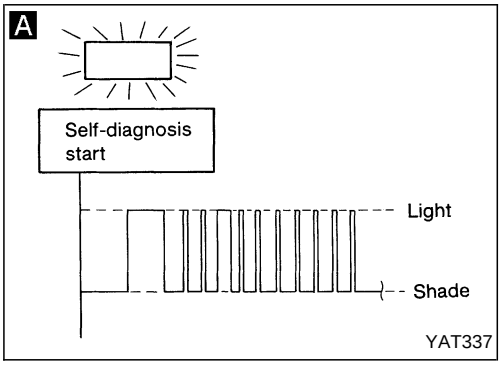
SYMPTOM:

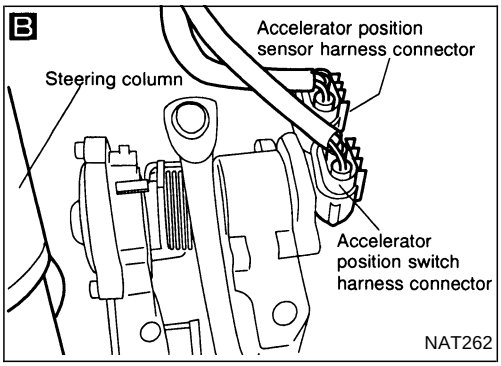
O/D OFF indicator lamp does not come on when setting overdrive control switch to “OFF” position.

Check the following items:
- Overdrive control switch
- O/D OFF indicator lamp
- Harness continuity between ignition switch and O/D OFF indicator lamp

NG → Repair or replace damaged parts.







4. SPORT Indicator Lamp Does Not Come On

SYMPTOM:

SPORT indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.

A

Does self-diagnosis show damage to throttle (accelerator) position sensor circuit?

No → Check throttle (accelerator) position sensor. Refer to AT-60.

Yes ↓

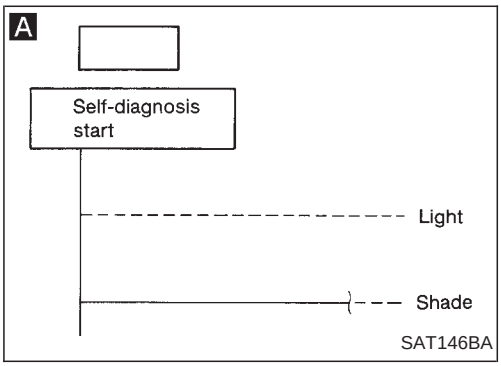
B

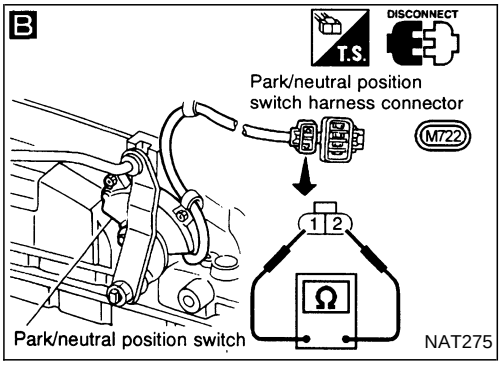
Check throttle (accelerator) position sensor. — Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

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





5. 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 park/neutral position switch circuit? — Yes → Check park/neutral position switch. Refer to AT-88.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No

B

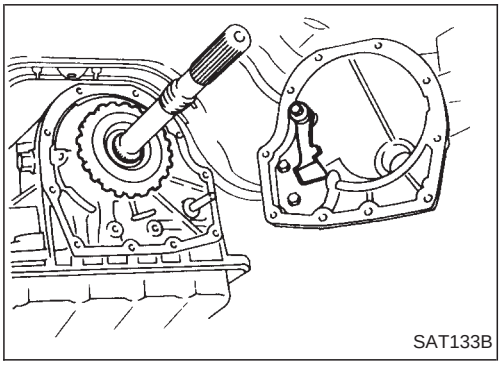
Check for short or open of park/neutral position switch 2-pin connector. Refer to AT-88. — NG → Repair or replace park/neutral position switch.

OK

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

OK

INSPECTION END



6. In “P” Position, Vehicle Moves Forward Or Backward When Pushed

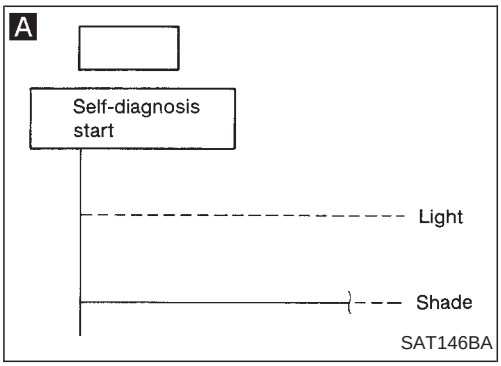
SYMPTOM:

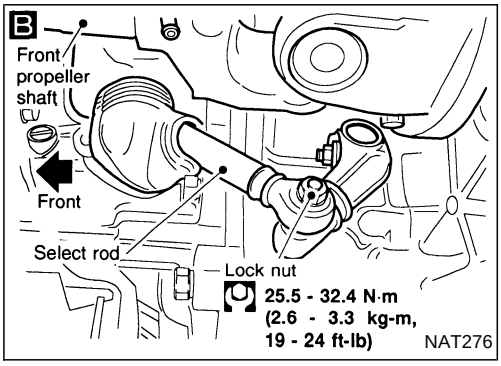
Vehicle moves when it is pushed forward or backward with selector lever in “P” position.

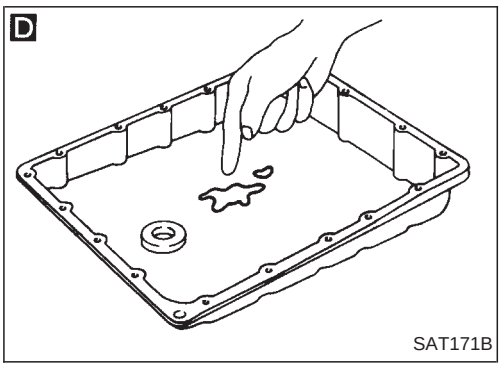
Check parking pawl components. Refer to AT-175. — NG → Repair or replace damaged parts.

OK

INSPECTION END







7. 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 park/neutral position switch circuit? — Yes → Check park/neutral position switch. Refer to AT-92.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit? — No →

Check control linkage. Refer to AT-115. — NG → B Adjust control linkage. Refer to AT-115.

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

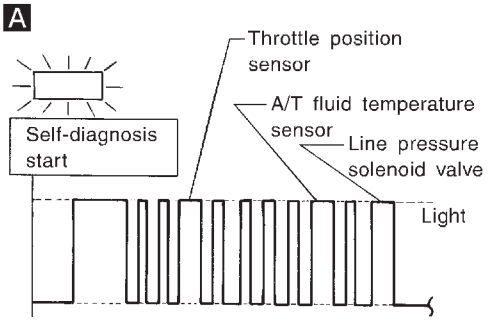
OK ↓

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 ↓

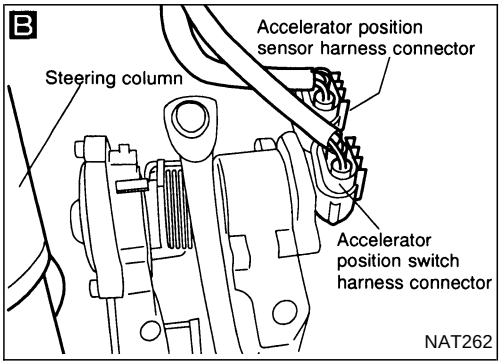
INSPECTION END

A



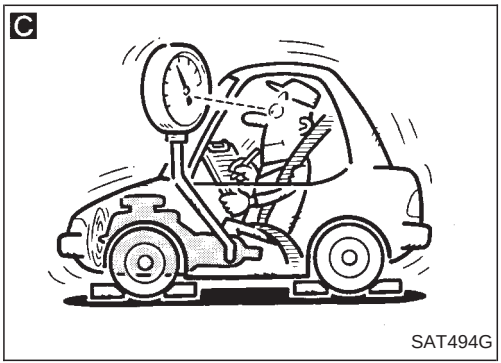
SAT831HA

B



NAT262

C



SAT494G

8. Large Shock. “N” → “R” Position

SYMPTOM:

There is large shock when changing from “N” to “R” position.

A

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

Yes → Check damaged circuit. Refer to AT-60, AT-76 or AT-84.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK

C

Check line pressure at idle with selector lever in “D” position. Refer to “Line Pressure Test”, AT-30.

NG →
1. Remove control valve assembly. Refer to AT-113.
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.

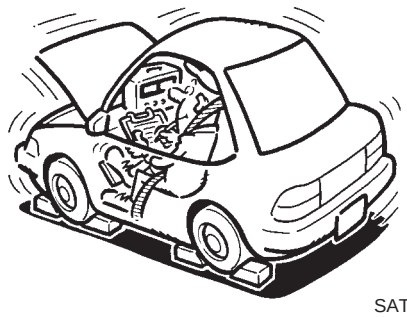
OK

INSPECTION END

A

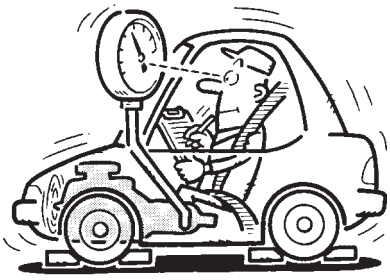
SAT638A

B



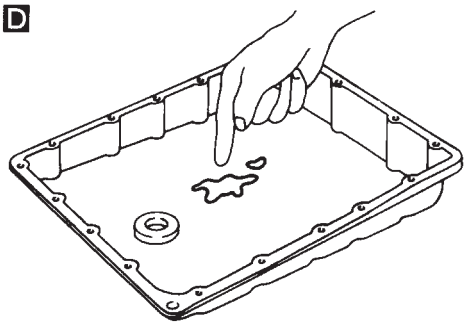
SAT493G

C



SAT494G

D



SAT171B

9. 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 ↓

B

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

NG in both “1” and “R” positions → Ⓐ

1. Remove control valve assembly. Refer to AT-113.
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

OK ↓

OK in “1” position
NG in “R” position →

1. Remove control valve assembly. Refer to AT-113.
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

C

Check line pressure at idle with selector lever in “R” position. Refer to “Line Pressure Test”, AT-30.

NG →

1. Remove control valve assembly. Refer to AT-113.
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.

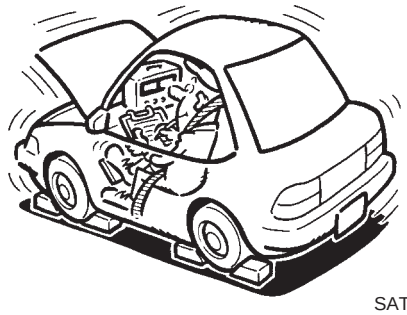
OK ↓

INSPECTION END

A

SAT638A

B



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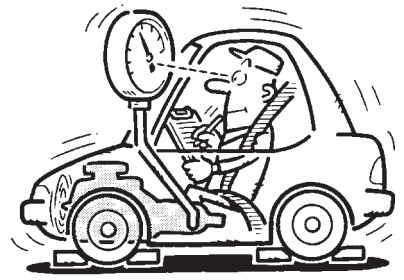
C



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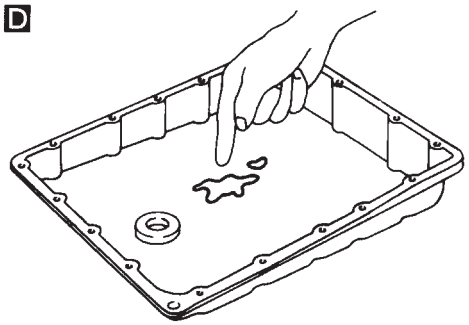


SAT171B

10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position

SYMPTOM:

Vehicle does not creep forward when selecting “D”, “2” or “1” position.

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-27.

NG →

1. Remove control valve assembly. Refer to AT-113.
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-30.

OK ↓

NG →

1. Remove control valve assembly. Refer to AT-113.
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.

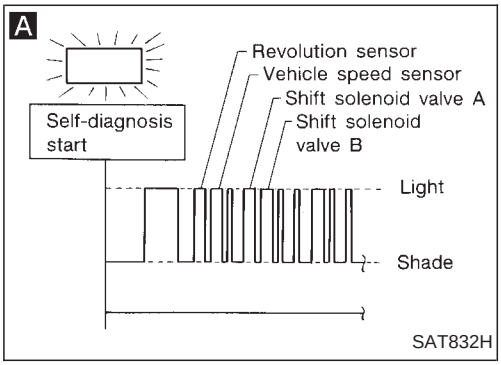
NG →

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

OK ↓

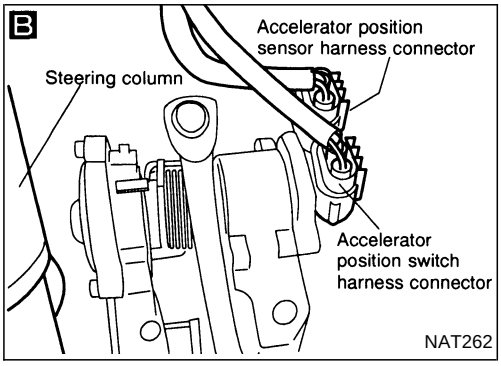
INSPECTION END

A



SAT832H

B



NAT262

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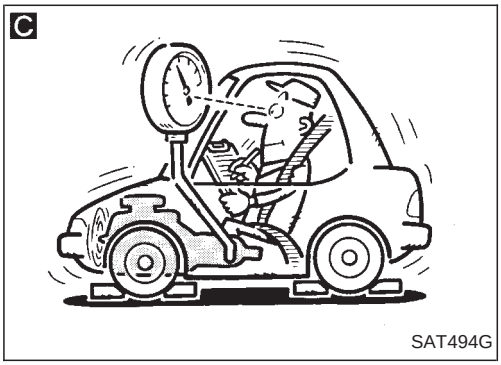
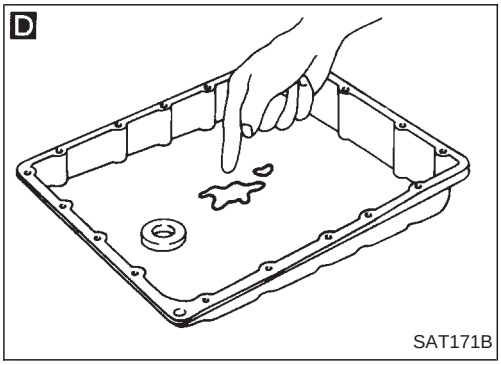


SAT494G

D



SAT171B

11. Vehicle Cannot Be Started From D_1

SYMPTOM:

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

Is 9. Vehicle Does Not Creep Backward In "R" Position OK?

No → Go to 9. Vehicle Does Not Creep Backward In "R" Position, AT-100.

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 AT-50, AT-54, AT-63 or AT-66.

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR "THROTTLE (ACCEL) POSI SEN"].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

Check line pressure at stall point with selector lever in "D" position. Refer to "Line Pressure Test", AT-30.

NG →
1. Remove control valve assembly. Refer to AT-113.
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 →
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

1. Remove control valve assembly. Refer to AT-113.
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 ←

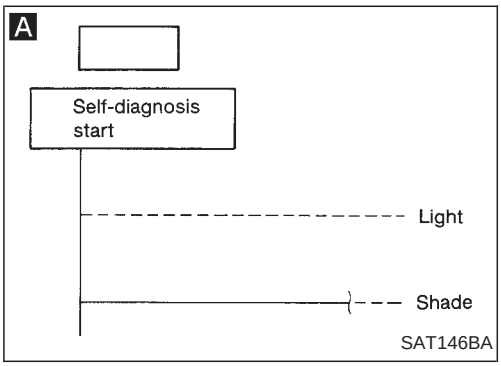
Check again.

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



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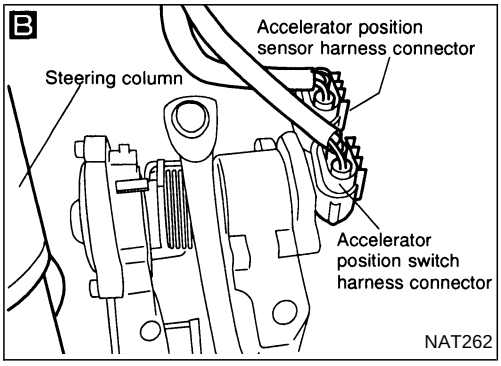

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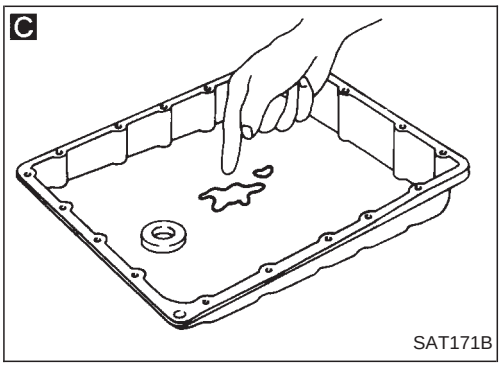


12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$

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 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-101, AT-102.

Yes ↓

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-92.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No ↓

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-50, AT-54.

NG → Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-50, AT-54.

OK ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

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

NG → 1. Remove control valve. Refer to AT-113.
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-113.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK ↓

OK ←

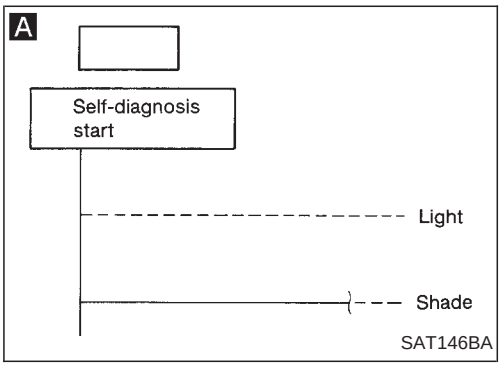
Check again.

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

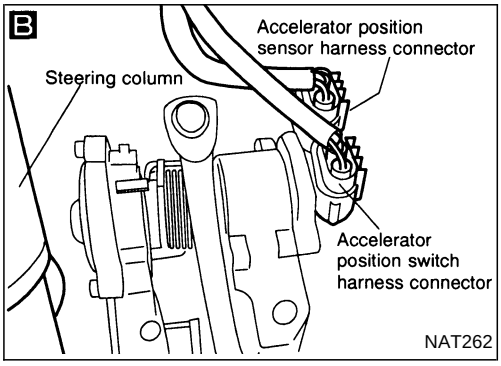
OK ↓

INSPECTION END

A



B



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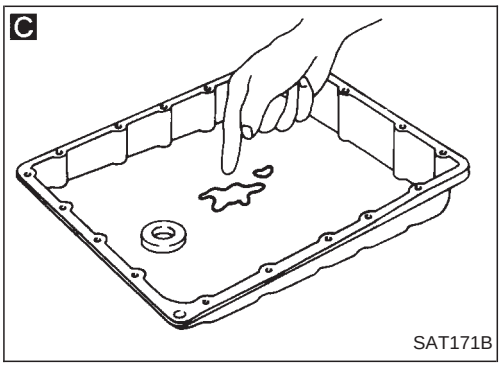


13. A/T Does Not Shift: $D_2 \rightarrow D_3$

SYMPTOM:

A/T does not shift from D_2 to D_3 at the specified speed.

Are 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-101, AT-102.

Yes ↓

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-92.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

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

NG → 1. Remove control valve assembly. Refer to AT-113.
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-113.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

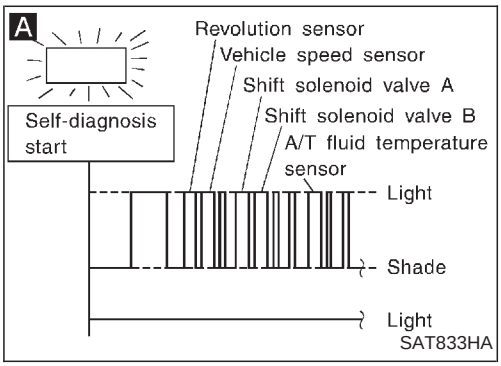
OK ←

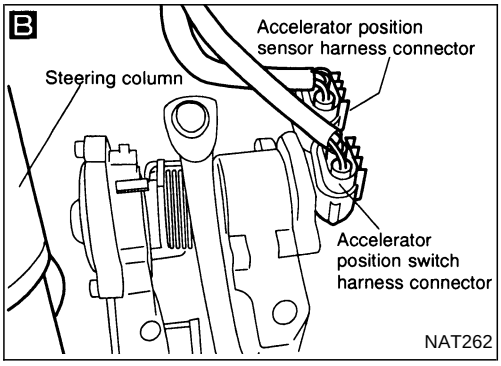
Check again.

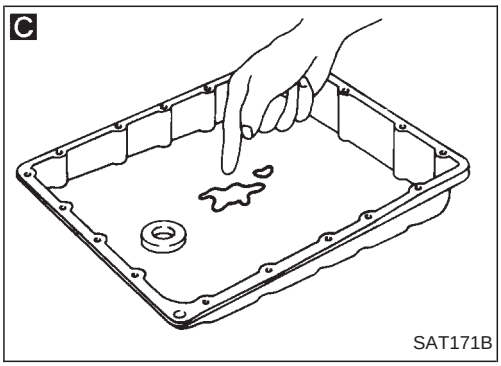
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END







14. 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 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-101, AT-102.

Yes ↓

A

Does self-diagnosis, after cruise test, show damage to any of the following circuits?
- Park/neutral position switch
- Overdrive control switch
- A/T fluid temperature sensor
- Vehicle speed sensor·A/T (Revolution sensor)
- Shift solenoid valve A or B
- Vehicle speed sensor·MTR

Yes → Check damaged circuit. Refer to AT-50, AT-54, AT-63, AT-66 or AT-88.

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

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

NG → 1. Remove control valve assembly. Refer to AT-113.
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-113.
2. Check the following items:
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

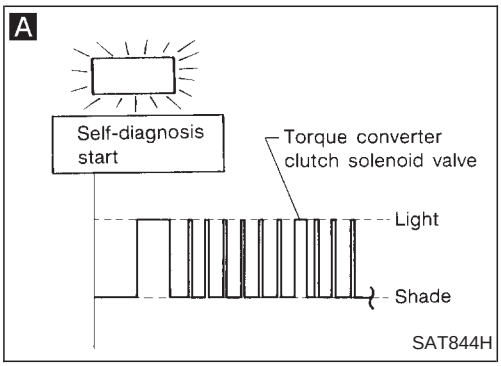
OK ← (from 4. Check the following items)

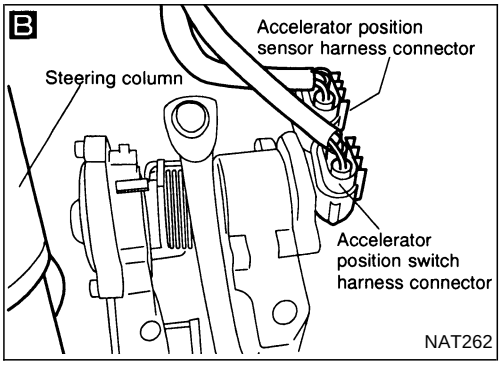
Check again.

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. 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 after cruise test?

Yes → Check torque converter clutch solenoid valve. Refer to AT-72.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK

1. Remove control valve. Refer to AT-113.
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.

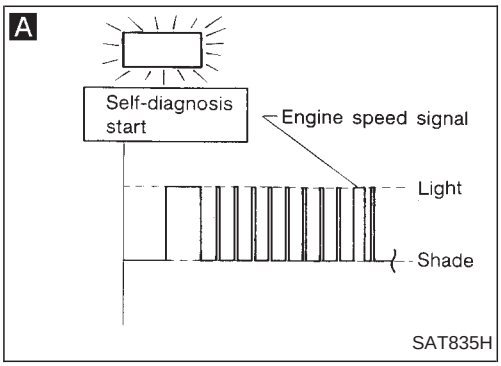
OK

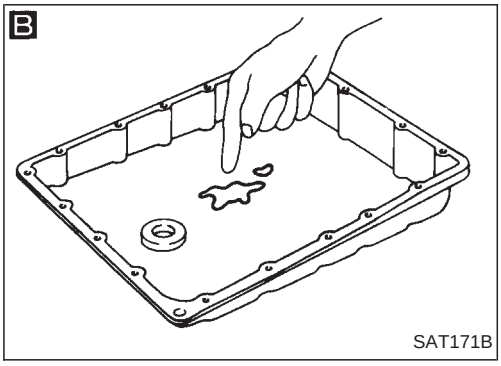
Check again.

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





16. A/T Does Not Hold Lock-up Condition

SYMPTOM:

A/T does not hold lock-up condition for more than 36 seconds.

A

Does self-diagnosis show damage to engine speed signal circuit after cruise test? — Yes → Check engine speed signal. Refer to AT-80.

No ↓

B

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

NG → 1. Remove control valve assembly. Refer to AT-113.
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-113.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter

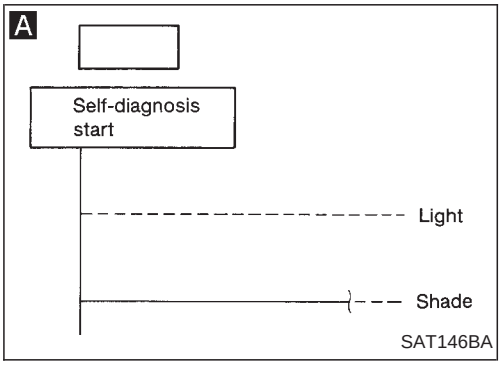
OK ↓

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



17. 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. Refer to AT-88.

OR

A

Does self-diagnosis show damage to closed throttle position switch circuit?

No ↓

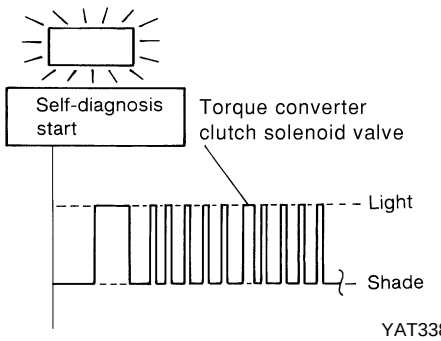
Check again.

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

OK ↓

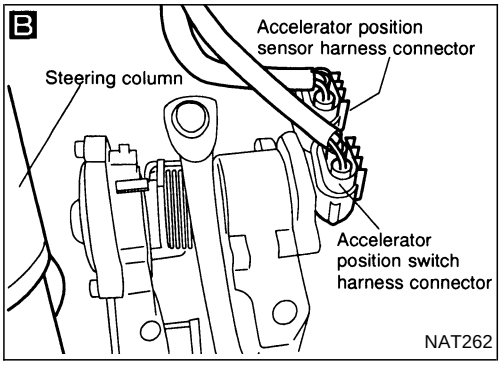
INSPECTION END

A



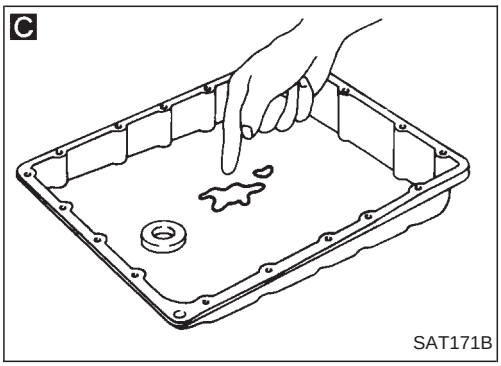
YAT338

B



NAT262

C



SAT171B

18. 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. Refer to AT-69.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR "THROTTLE (ACCEL) POSI SEN"].

NG → Repair or replace throttle (accelerator) position sensor.

OK

C

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

NG → 1. Remove control valve assembly. Refer to AT-113.
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-113.
2. Check the following items:
- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

OK

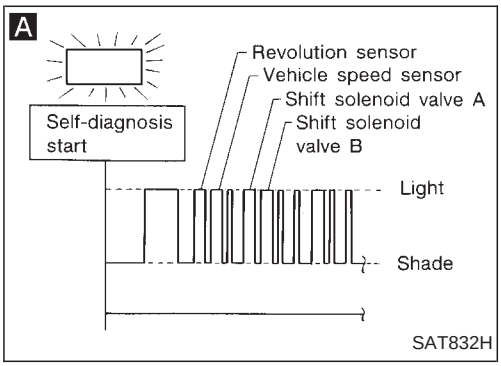
OK

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



19. 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 AT-50, AT-54, AT-63 or AT-66.

No ↓

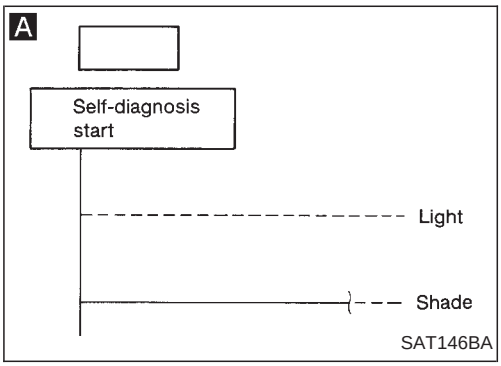
Check again.

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

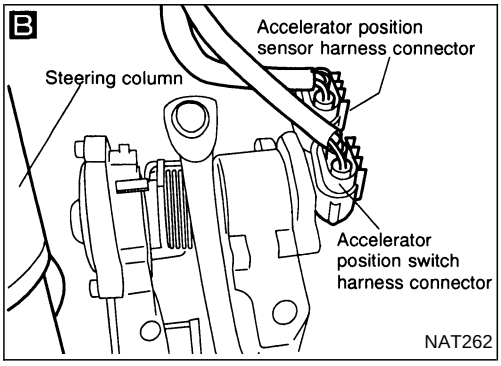
OK ↓

Go to 11. Vehicle Cannot Be Started From D_1, AT-102.

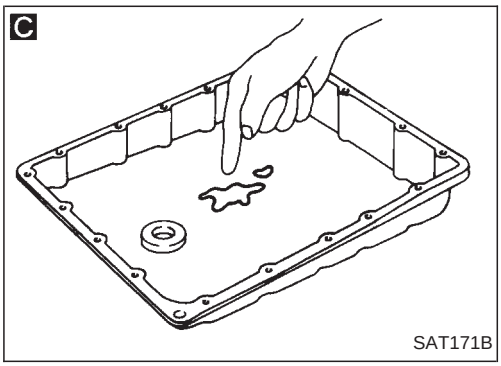
A



B



C



20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal

SYMPTOM:

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

Are 9. Vehicle Does Not Creep Backward In “R” Position and 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position OK?

No → Go to 9. Vehicle Does Not Creep Backward In “R” Position and 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position, AT-100, AT-101.

Yes ↓

Does “ECU INPUT SIGNAL” show damage to park/neutral position switch circuit?

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-88.

No ↓

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-50, AT-54.

NG → Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR.

OK ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

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

NG → 1. Remove control valve. Refer to AT-113.
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-113.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK ↓

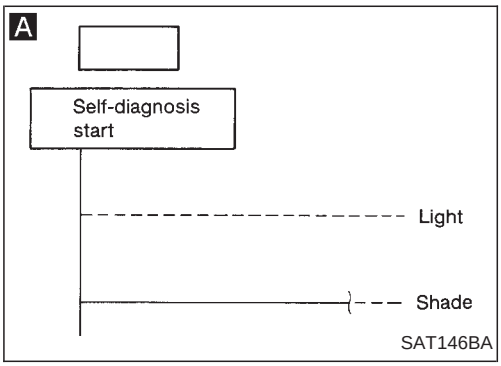
OK ←

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



21. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" $\rightarrow$ "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?

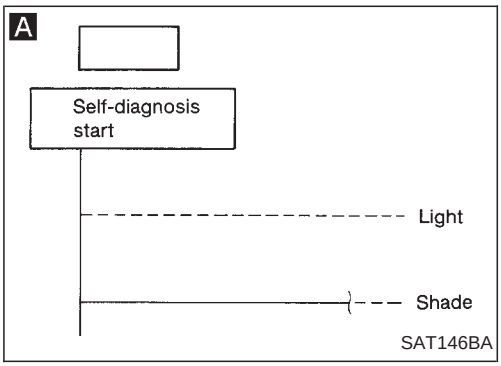
Yes → Check overdrive control switch circuit. Refer to AT-92.

OR

A

Does self-diagnosis show damage to overdrive control switch circuit?

No → Go to 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-104.



22. 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 park/neutral position switch circuit?

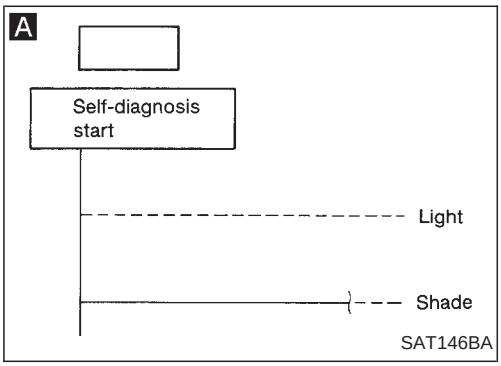
Yes → Check park/neutral position switch circuit. Refer to AT-92.

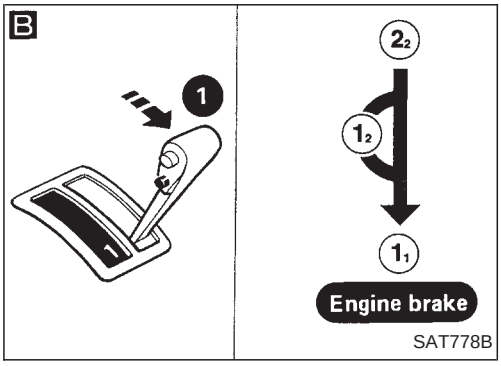
OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No → Go to 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-103.





23. 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 park/neutral position switch circuit?
→ Yes → Check park/neutral position switch circuit. Refer to AT-92.

OR

A
Does self-diagnosis show damage to park/neutral position switch circuit?
→ No

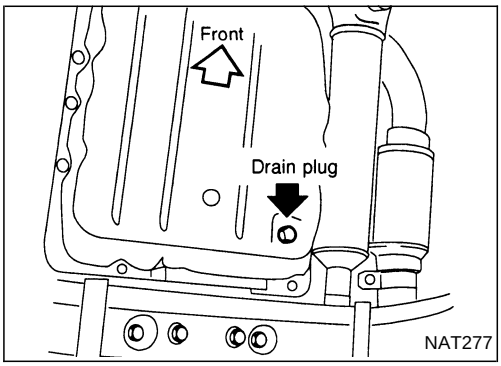
B
Check again.
→ NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.
→ OK → **INSPECTION END**

24. 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.

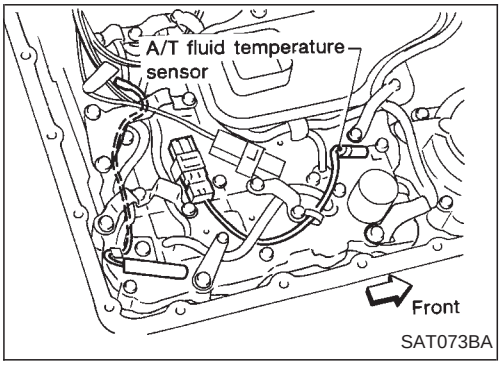
Is 9. Vehicle Does Not Creep Backward In "R" Position OK?
→ No → Go to 9. Vehicle Does Not Creep Backward In "R" Position, AT-100.
→ Yes → Go to 18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$), AT-108.



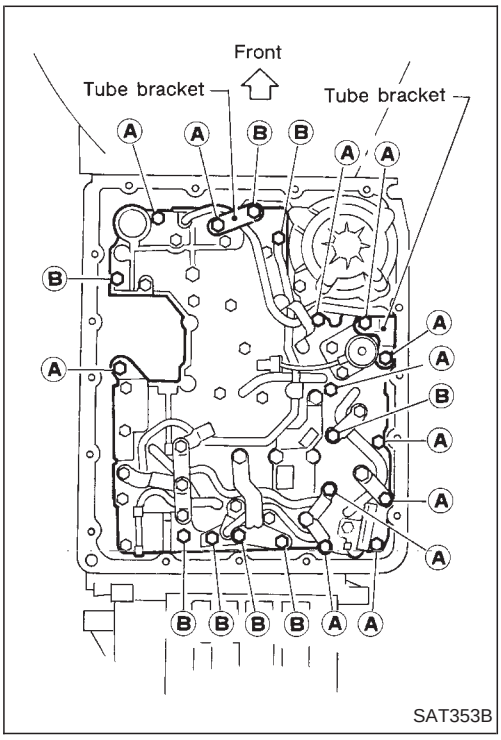
Control Valve Assembly and Accumulators

REMOVAL

1. Remove exhaust front tube.
2. Remove oil pan and gasket and drain ATF.



3. Remove A/T fluid temperature sensor if necessary.
4. Remove oil strainer.

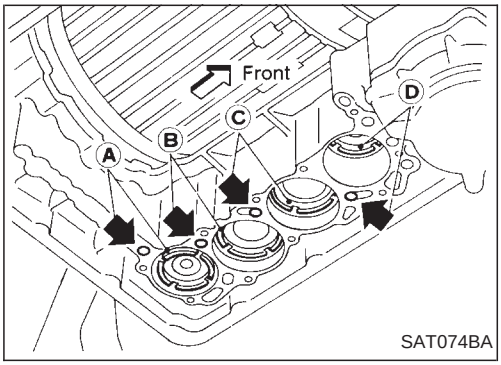


5. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Bolt length and location

Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

6. Remove solenoids and valves from valve body if necessary.
7. Remove terminal cord assembly if necessary.

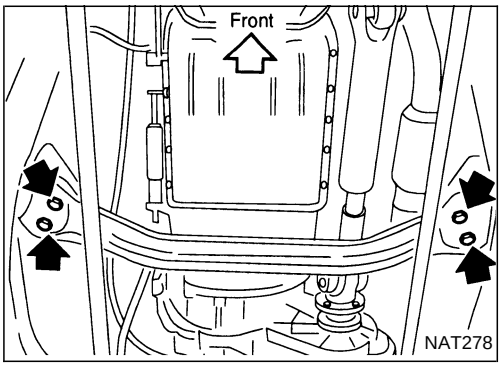


8. Remove accumulator Ⓐ, Ⓑ, Ⓒ and Ⓓ by applying compressed air if necessary.

- **Hold each piston with rag.**

9. Reinstall any part removed.

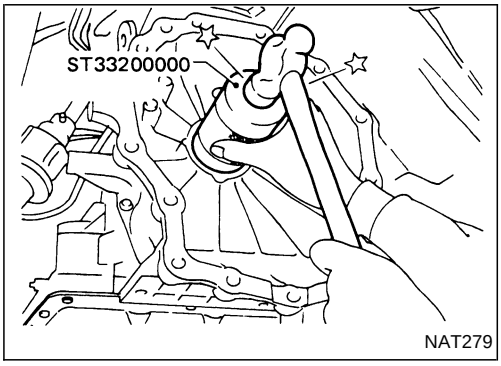
- **Always use new sealing parts.**



Revolution Sensor Replacement

1. Remove rear engine mounting member from side member while supporting A/T with transfer case with jack. Tighten rear engine mounting member to the specified torque. Refer to EM section (“ENGINE REMOVAL”).
2. Lower A/T with transfer case as much as possible.
3. Remove revolution sensor from A/T.
4. Reinstall any part removed.

- **Always use new sealing parts.**

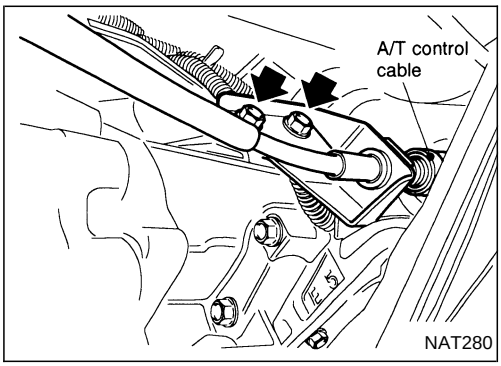


Rear Oil Seal Replacement

1. Remove transfer case from vehicle. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
2. Remove rear oil seal.
3. Install rear oil seal.

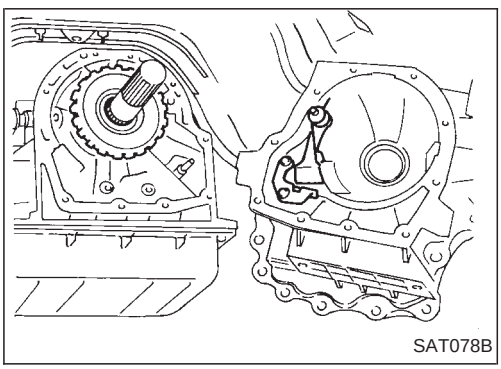
- **Apply ATF before installing.**

4. Reinstall any part removed.



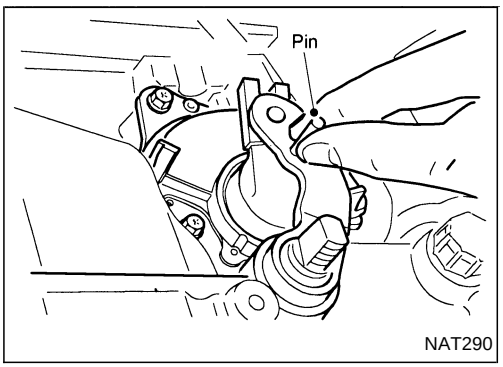
Parking Components Inspection

1. Remove propeller shaft. Refer to PD section (“Removal”, “PROPELLER SHAFT”).
2. Remove transfer case from vehicle. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
3. Remove manual control linkage bracket from adapter case.



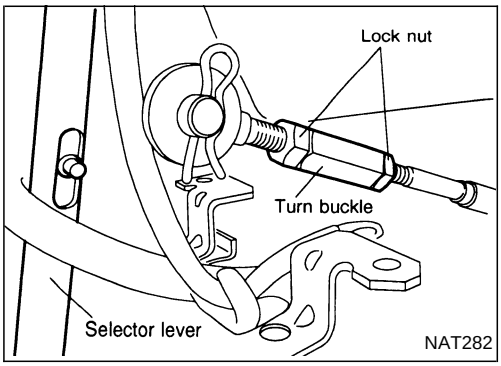
4. Support A/T assembly with a jack.
5. Remove adapter case from transmission case.
6. Replace parking components if necessary.
7. Reinstall any part removed.

- **Always use new sealing parts.**



Park/neutral Position Switch Adjustment

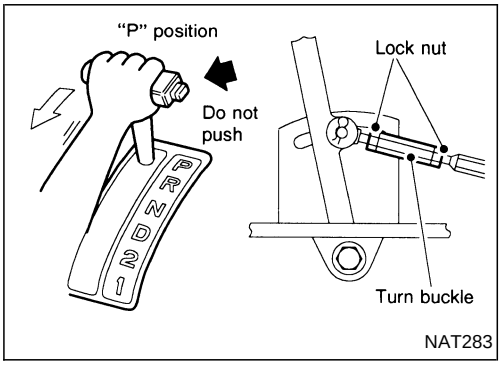
1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in “N” position.
3. Loosen park/neutral position switch fixing bolts.
4. Insert pin into adjustment holes in both park/neutral position switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of park/neutral position switch. Refer to “Components Inspection”, AT-92.



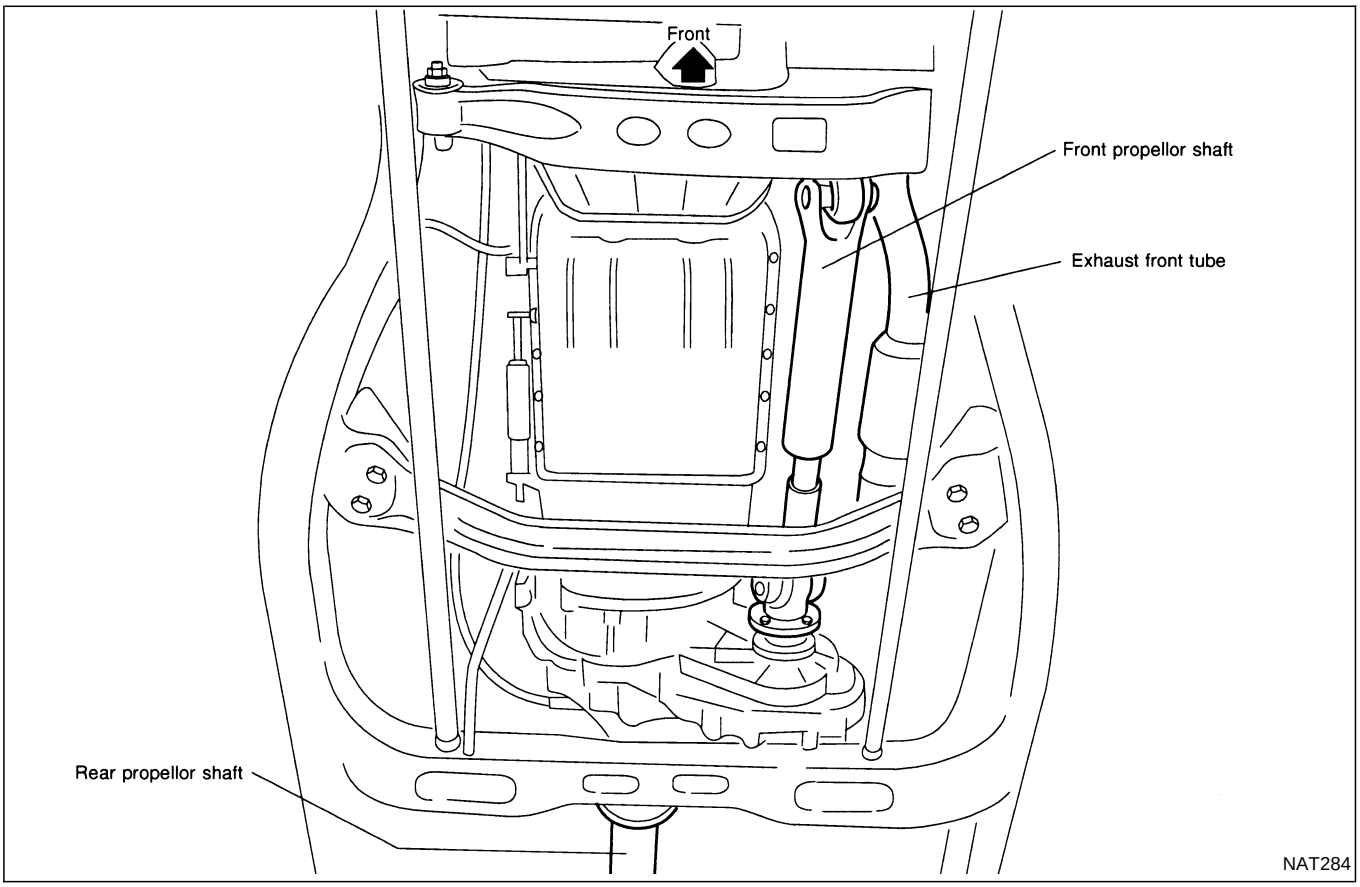
Manual Control Linkage Adjustment

Move selector lever from “P” position to “1” position. You should be able to feel the detents in each position.
If the detents cannot be felt or the pointer indicating the position is improperly aligned, the linkage needs adjustment.

1. Place selector lever in “P” position.
2. Loosen lock nuts.



3. Tighten turn buckle until aligns with inner cable, pulling selector lever toward “R” position side without pushing button.
4. Back off turn buckle 1 turn and tighten lock nuts to the specified torque.
   Lock nut
   : 4.4 - 5.9 N·m
   (0.45 - 0.60 kg-m, 39.1 - 52.1 in-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.

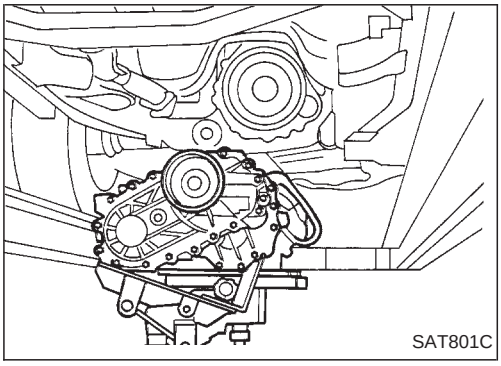
Be careful not to damage sensor edge.

1. Remove battery negative terminal.
2. Remove exhaust front tube.
3. Remove fluid charging pipe from A/T assembly.
4. Remove oil cooler pipe from A/T assembly.
5. Plug up openings such as the fluid charging pipe hole, etc.
6. Remove propeller shaft. Refer to PD section (“Removal”, “PROPELLER SHAFT”).
7. Remove transfer control linkage from transfer. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
8. Remove A/T control cable from A/T assembly.
9. Disconnect A/T and speedometer sensor harness connectors.

Removal (Cont'd)

10. Remove starter motor.
11. Remove gusset and rear plate cover securing engine to A/T assembly.
12. Remove bolts securing torque converter to drive plate.

- **Remove the bolts by turning crankshaft.**


SAT801C

13. Support A/T and transfer assembly with a jack.
14. Remove rear engine mounting member from body and A/T assembly. Tighten rear engine mounting member to the specified torque. Refer to EM section ("ENGINE REMOVAL").
15. Remove bolts securing A/T assembly to engine.

- **Secure torque converter to prevent it from dropping.**
- **Secure A/T assembly with transfer to a jack.**

16. Lower A/T assembly with transfer.

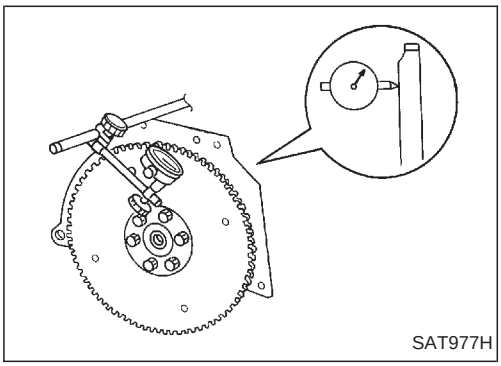
Installation

- Drive plate runout

Do not allow any magnetic materials to contact the ring gear teeth.

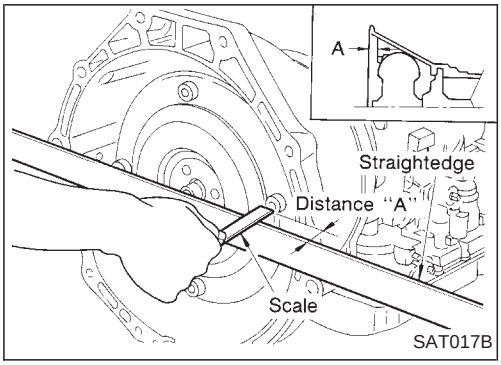
Maximum allowable runout:
Refer to EM section ("Inspection", CYLINDER BLOCK).

If this runout is out of specification, replace drive plate with ring gear.


SAT977H

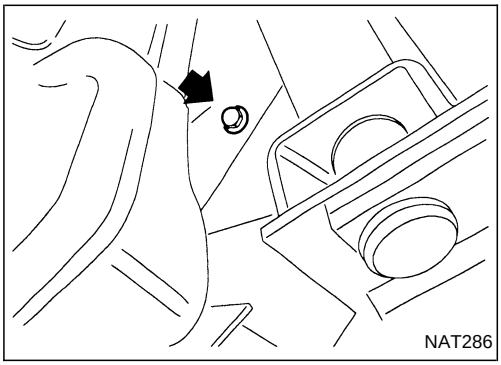
- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
26.0 mm (1.024 in) or more

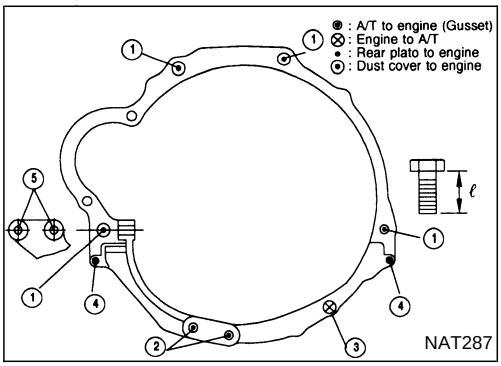


SAT017B

- Install converter to drive plate.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**


NAT286

Installation (Cont'd)



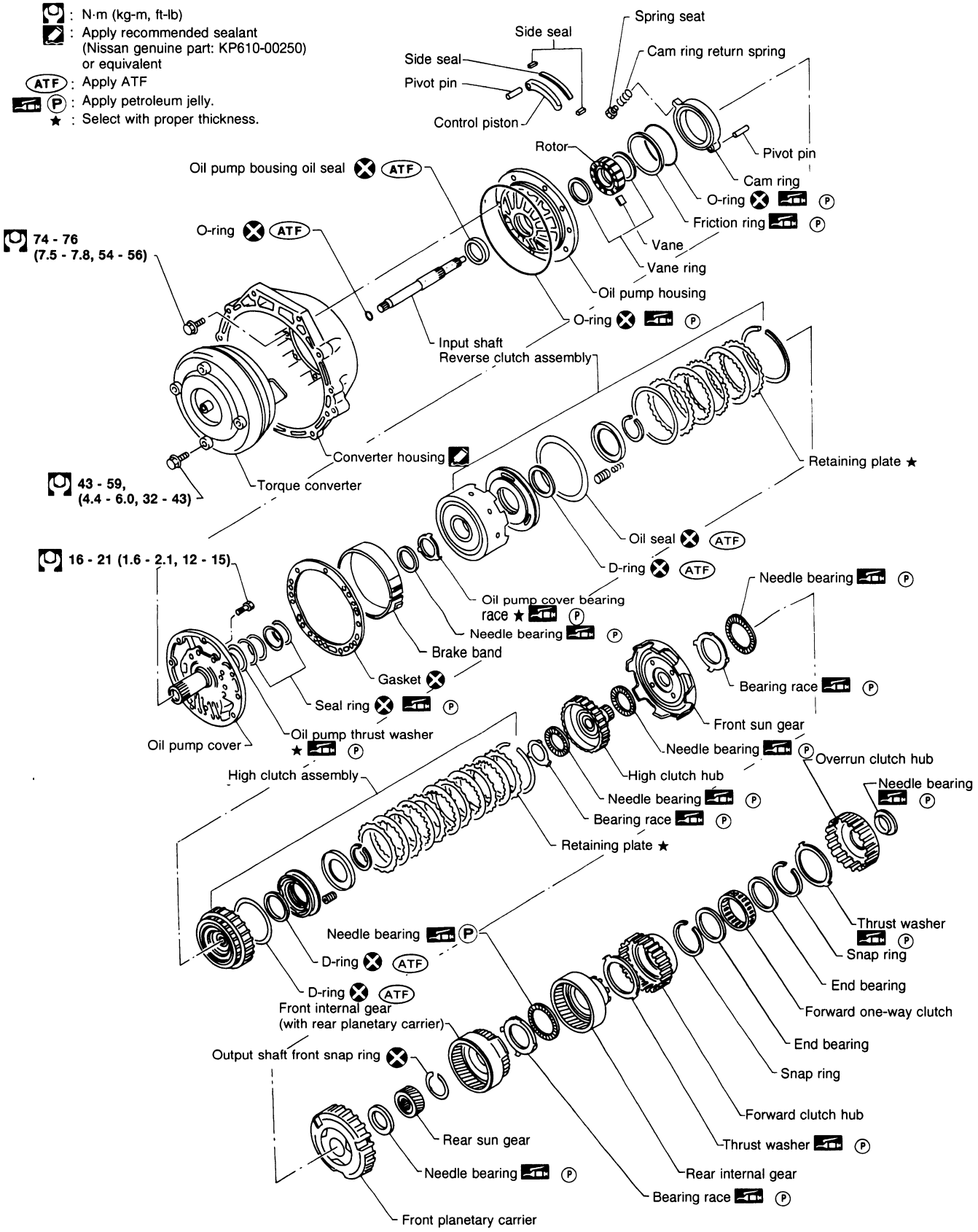
- Tighten bolts securing transmission.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	39 - 49 (4.0 - 5.0, 29 - 36)	58.0 (2.28)
②	29 - 39 (3.0 - 4.0, 22 - 29)	90.0 (3.54)
③	18 - 22 (1.8 - 2.2, 13 - 16)	16.0 (0.63)
④	3 - 4 (0.3 - 0.4, 2.2 - 2.9)	12.0 (0.47)
⑤	29 - 39 (3.0 - 4.0, 22 - 29)	35.0 (1.38)

- Reinstall any part removed.
- 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-32.

SEC. 311•313•315

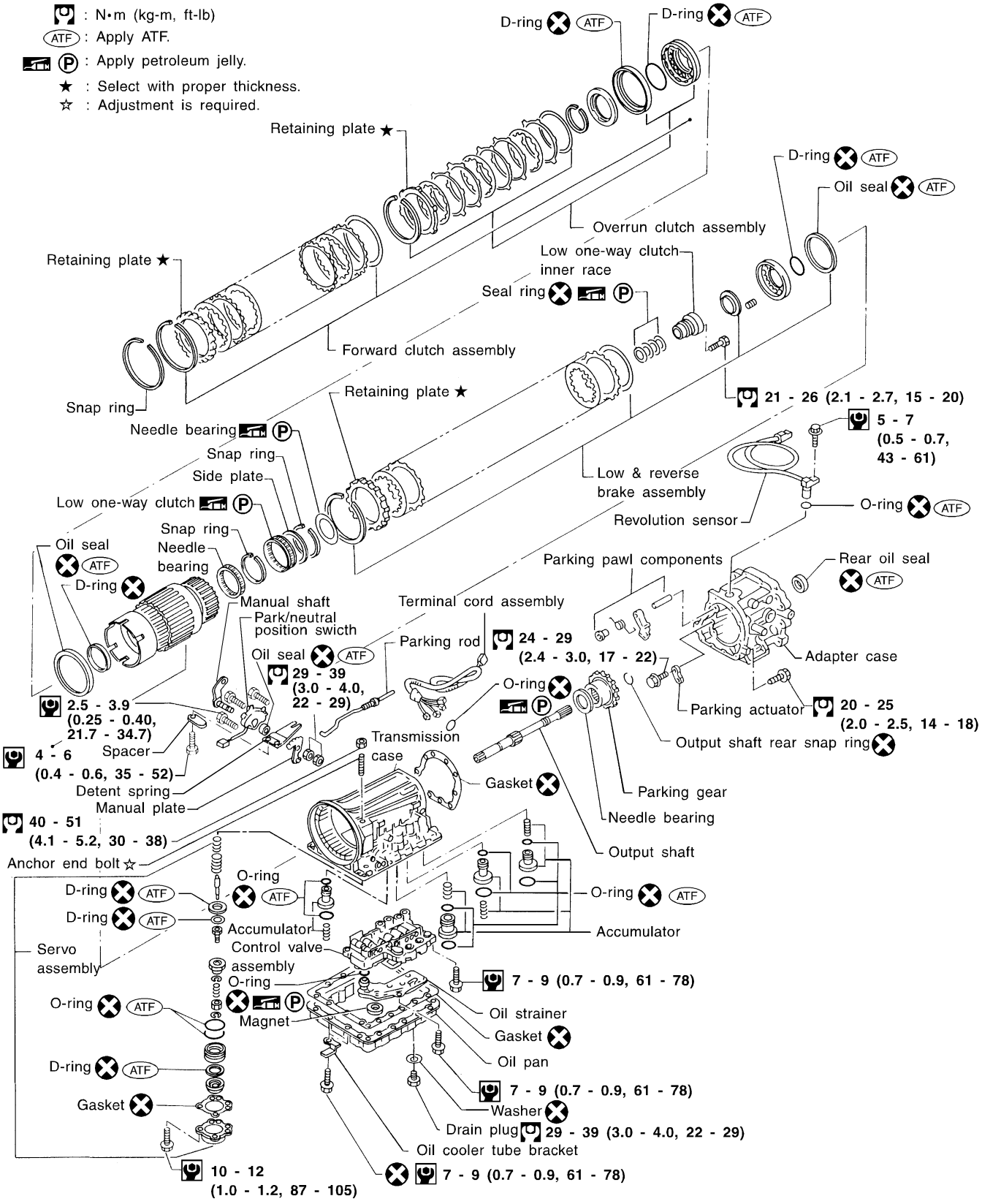
: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent
ATF : Apply ATF
P : Apply petroleum jelly.
★ : Select with proper thickness.



NAT223

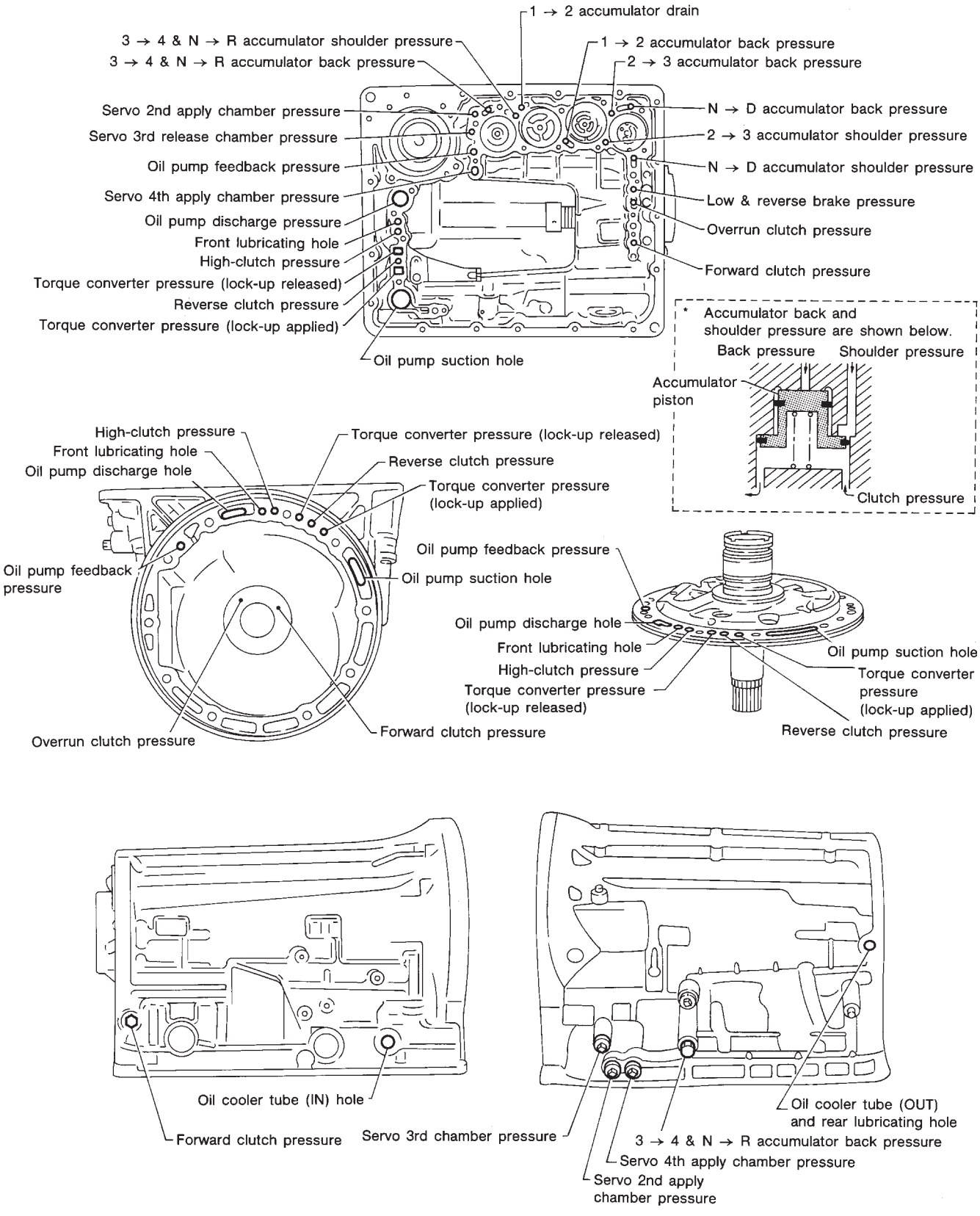
SEC. 311•315•317

: 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.



YAT342

Oil Channel



SAT185B

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)

Thrust washers

Item number	Color
①	Black
⑤	White

Outer diameter of needle bearings

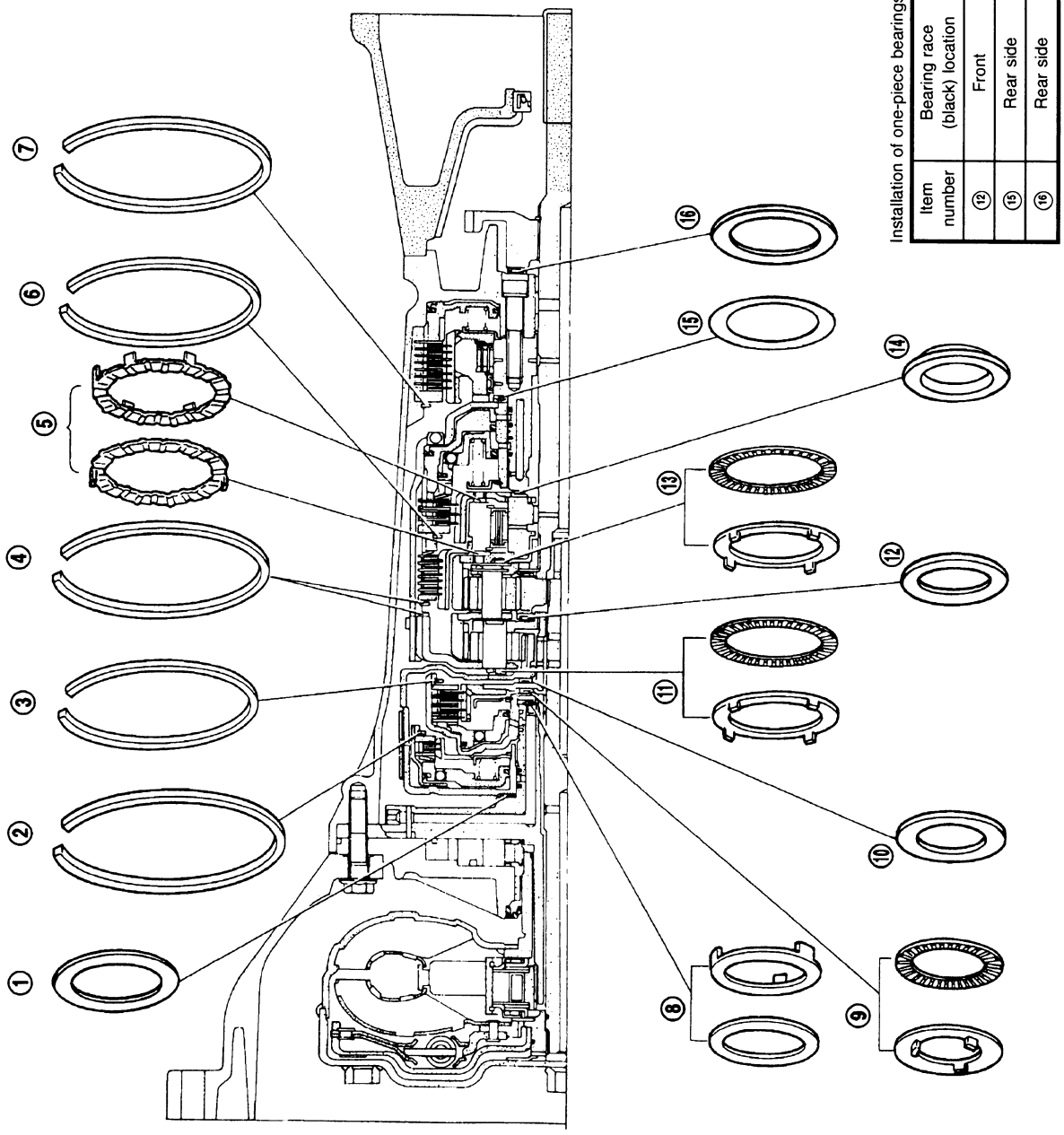
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	57 (2.24)
⑮	78.1 (3.075)
⑯	64 (2.52)

Outer diameter of bearing races

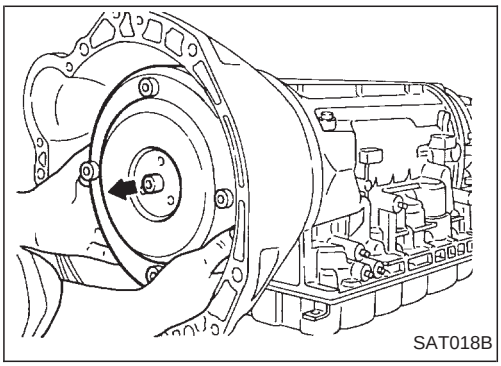
Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)

Installation of one-piece bearings

Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side

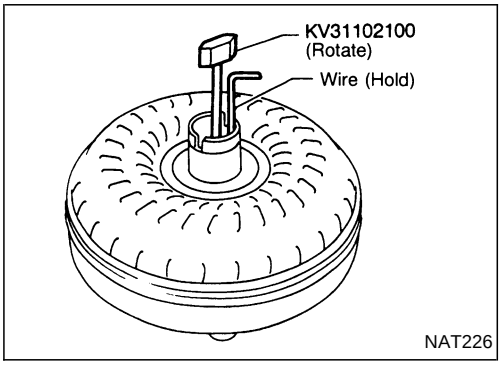


NAT225


SAT018B

Disassembly

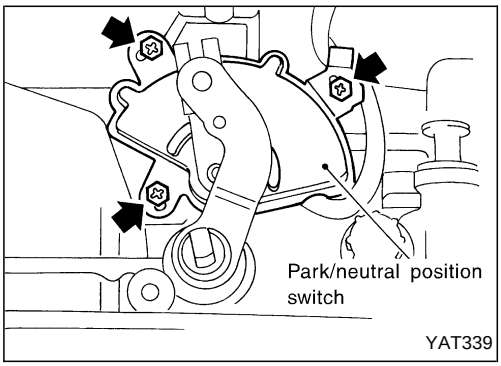
1. Drain ATF through drain plug.
2. Remove torque converter by holding it firmly and turning while pulling straight out.



NAT226

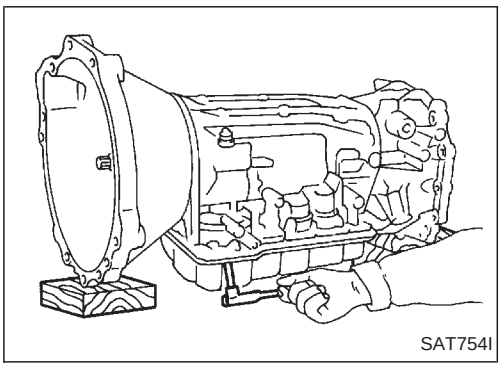
3. Check torque converter one-way clutch.

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.



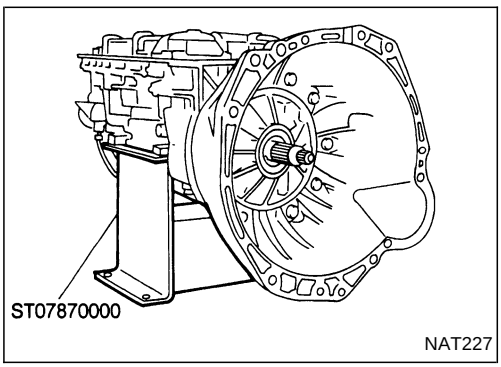
YAT339

4. Remove park/neutral position switch from transmission case.


SAT754I

5. Remove oil pan.

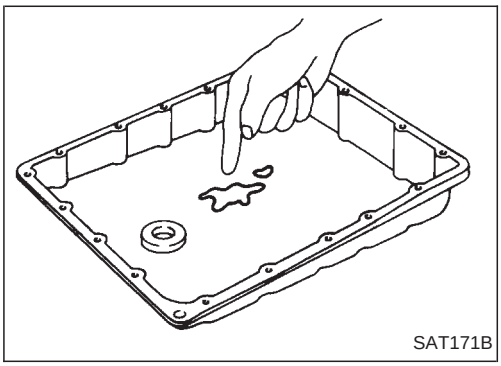
- **Always place oil pan straight down so that foreign particles inside will not move.**



NAT227

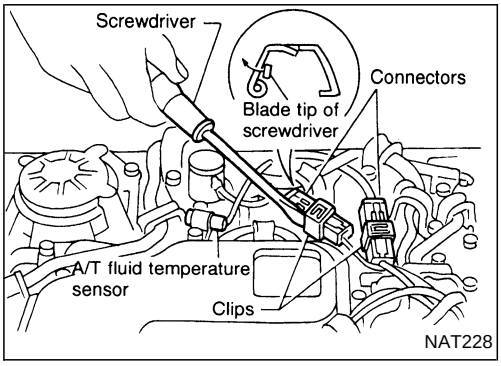
6. Place transmission into Tool with the control valve facing up.

Disassembly (Cont'd)


SAT171B

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.

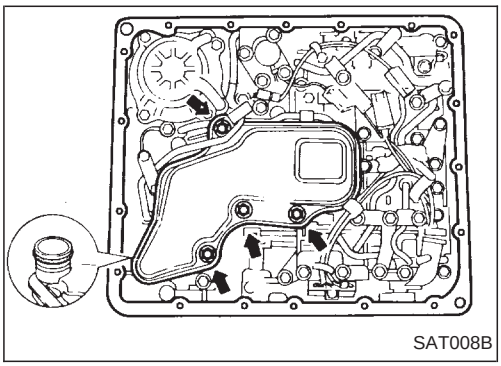
- **If frictional material is detected, replace radiator after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").**



NAT228

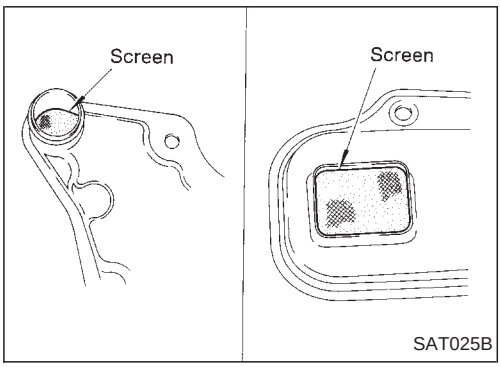
8. Remove torque converter clutch solenoid valve and A/T fluid temperature sensor connectors.

- **Be careful not to damage connector.**


SAT008B

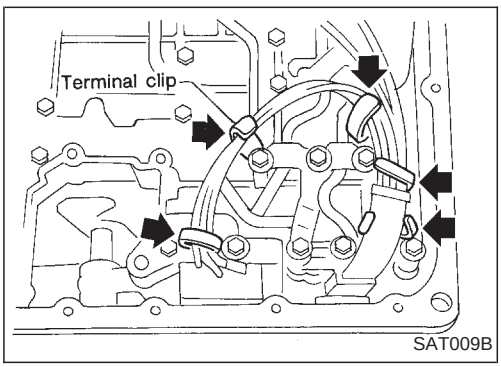
9. Remove oil strainer.

a. Remove oil strainer from control valve assembly then remove O-ring from oil strainer.



SAT025B

b. Check oil strainer screen for damage.

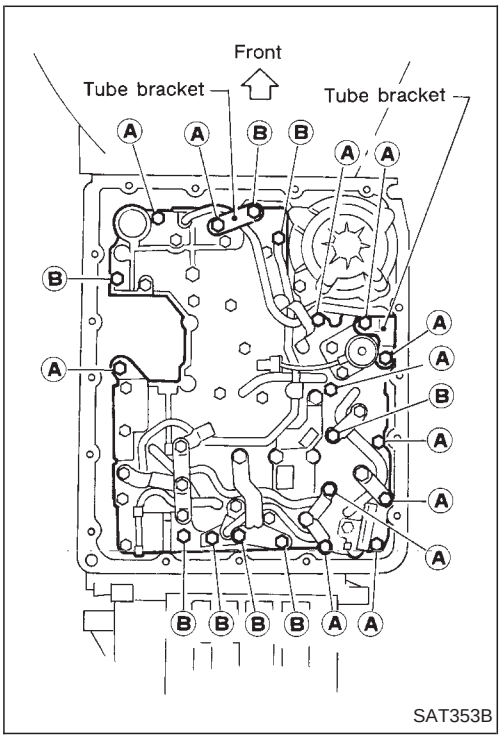


SAT009B

10. Remove control valve assembly.

a. Straighten terminal clips to free terminal cords then remove terminal clips.

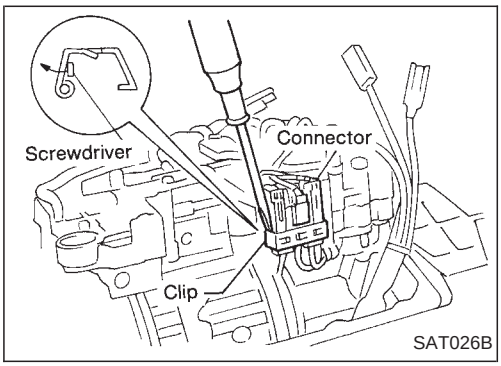
Disassembly (Cont'd)



SAT353B

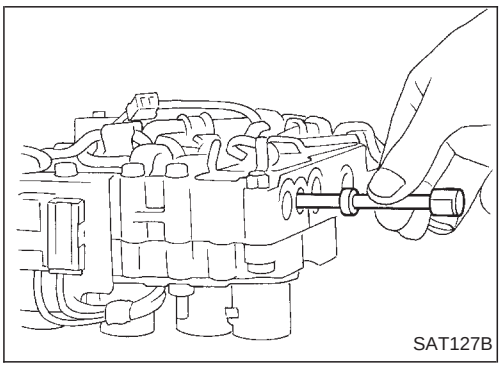
b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

Bolt symbol	Length mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

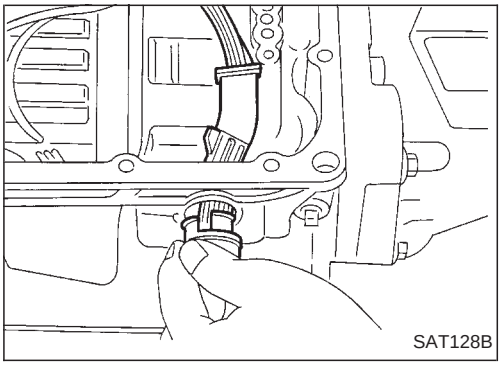


SAT026B

c. Remove solenoid connector.
- **Be careful not to damage connector.**

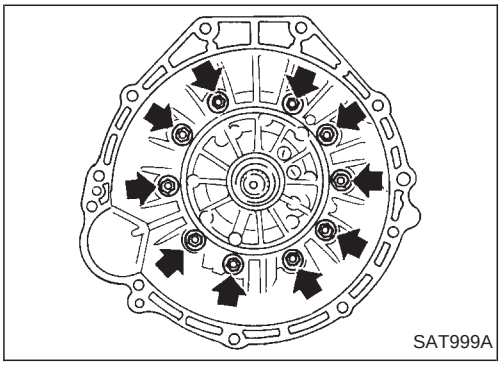

SAT127B

d. Remove manual valve from control valve assembly.

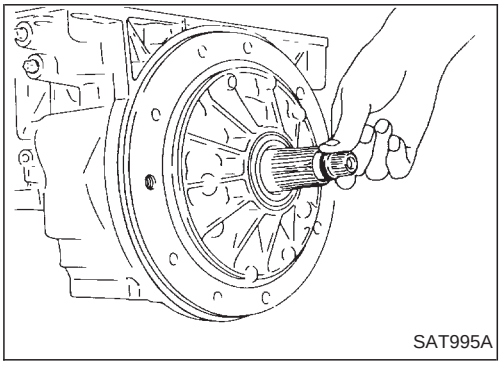

SAT128B

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.**

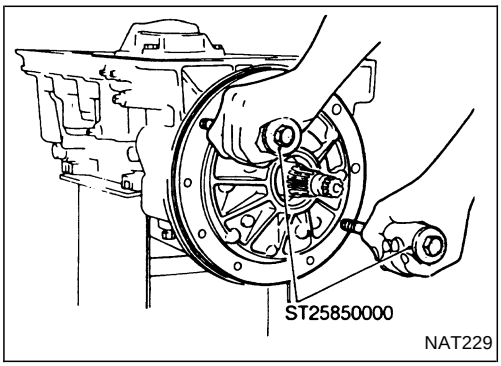
Disassembly (Cont'd)


SAT999A

12. Remove converter housing from transmission case.
- **Be careful not to scratch converter housing.**

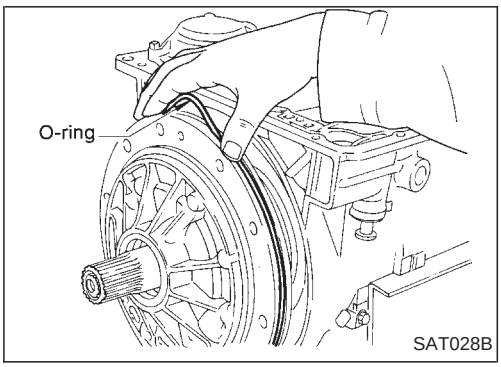

SAT995A

13. Remove O-ring from input shaft.



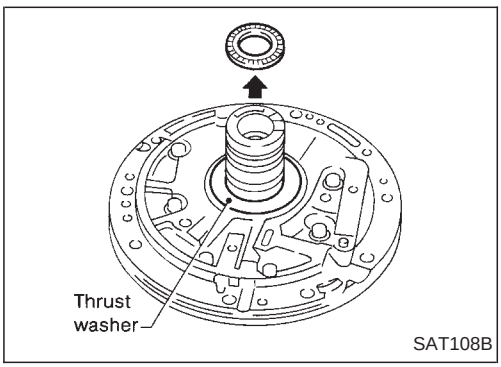
NAT229

14. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



SAT028B

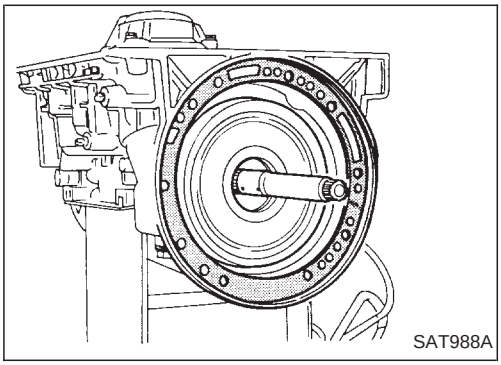
b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**



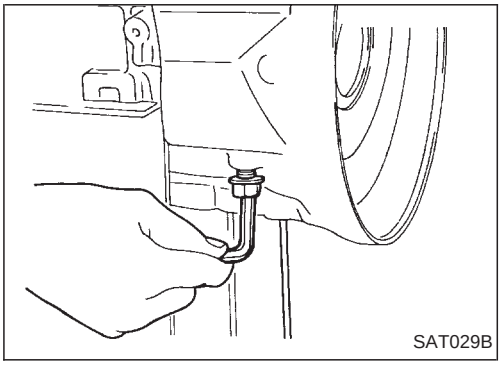
SAT108B

d. Remove needle bearing and thrust washer from oil pump assembly.

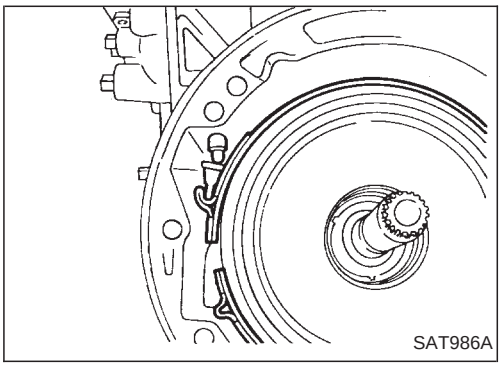
Disassembly (Cont'd)


SAT988A

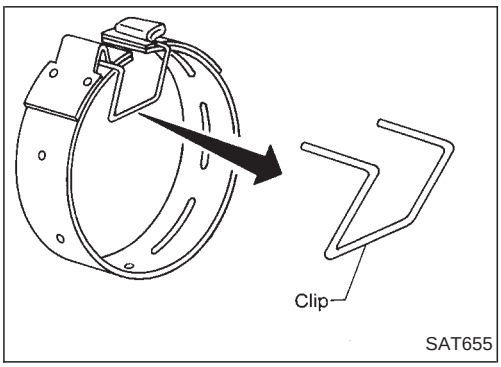
15. Remove input shaft and oil pump gasket.


SAT029B

16. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.

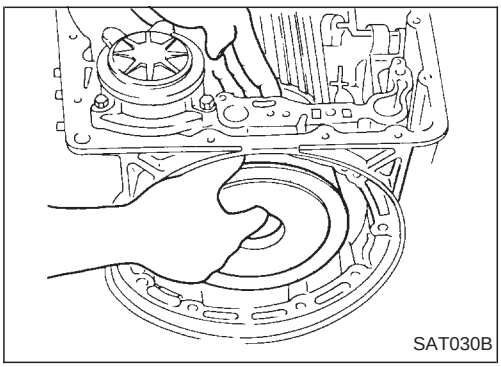

SAT986A

b. Remove brake band and band strut from transmission case.



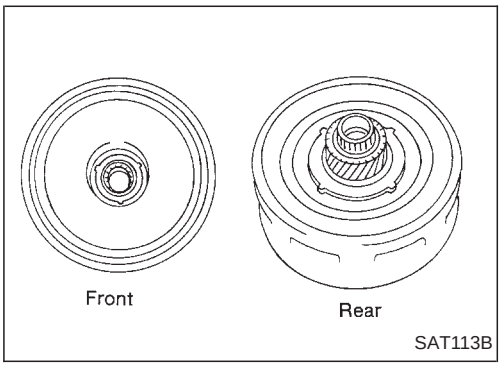
SAT655

c. Hold brake band in a circular shape with clip.

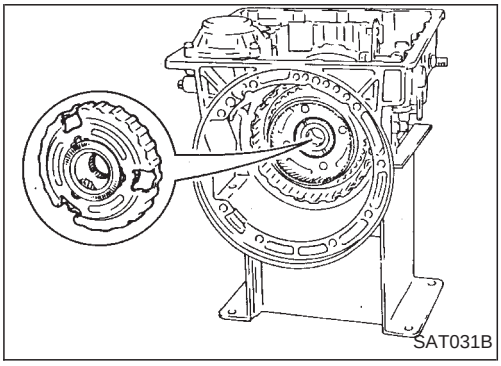

SAT030B

17. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

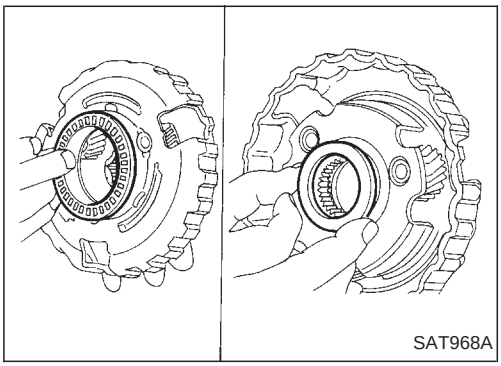
Disassembly (Cont'd)



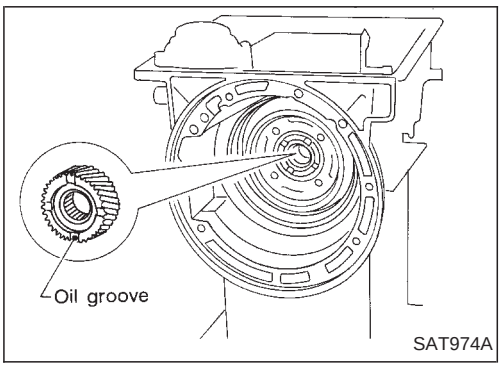
b. Remove front bearing race from clutch pack.
c. Remove rear bearing race from clutch pack.



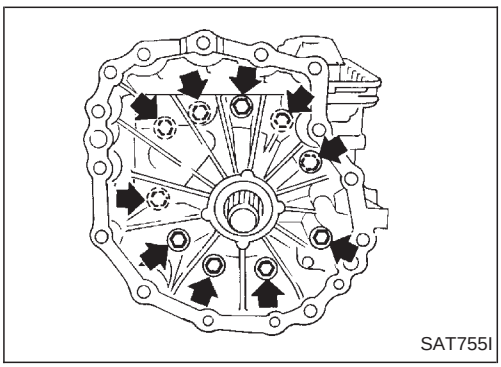
d. Remove front planetary carrier from transmission case.



e. Remove front needle bearing from front planetary carrier.
f. Remove rear bearing from front planetary carrier.

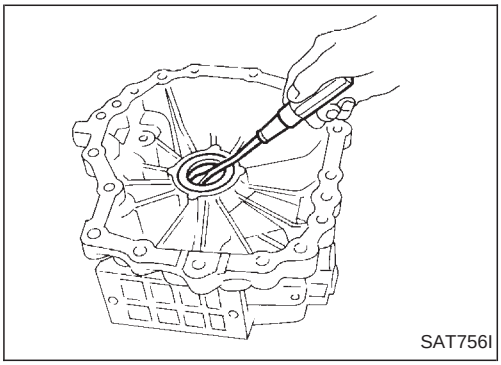


g. Remove rear sun gear from transmission case.

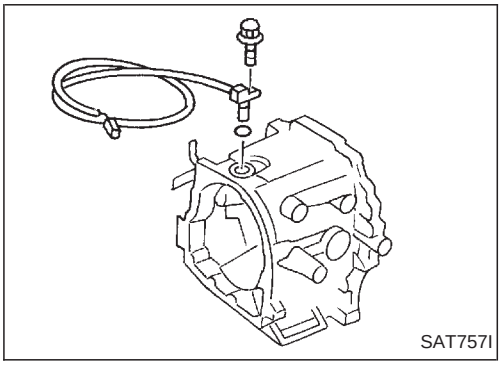


18. Remove adapter case.
a. Remove adapter case from transmission case.
b. Remove adapter case gasket from transmission case.

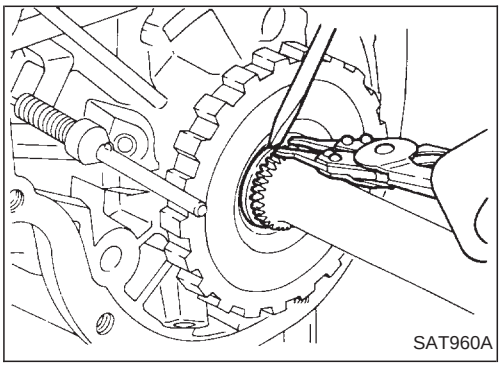
Disassembly (Cont'd)


SAT756I

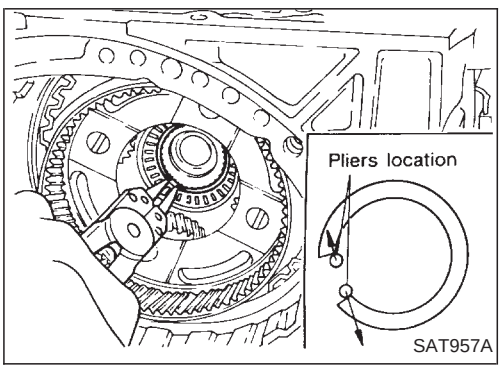
c. Remove oil seal from adapter case.
- **Do not remove oil seal unless it is to be replaced.**


SAT757I

d. Remove revolution sensor from adapter case.
e. Remove O-ring from revolution sensor.


SAT960A

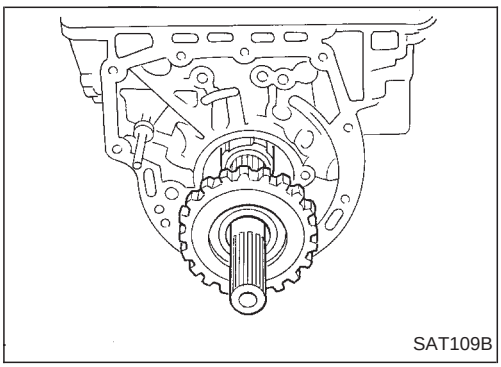
19. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.



SAT957A

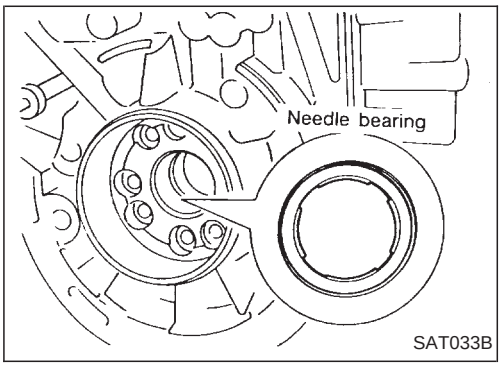
b. Slowly push output shaft all the way forward.
- **Do not use excessive force.**

c. Remove snap ring from output shaft.


SAT109B

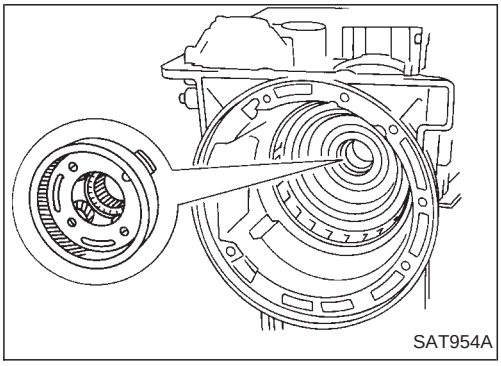
d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

Disassembly (Cont'd)

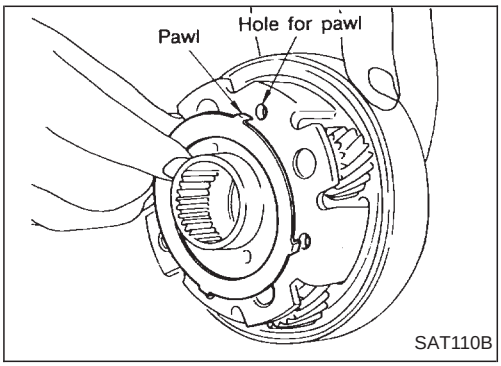


SAT033B

f. Remove needle bearing from transmission case.

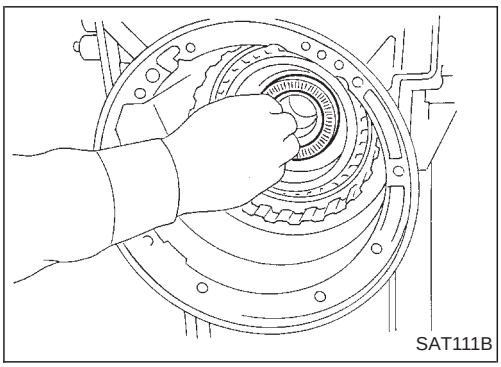

SAT954A

20. Remove rear side clutch and gear components.
a. Remove front internal gear.

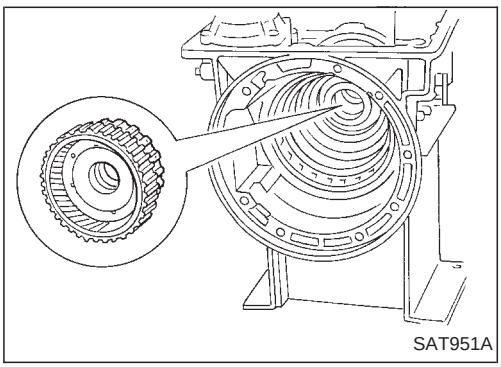


SAT110B

b. Remove bearing race from front internal gear.

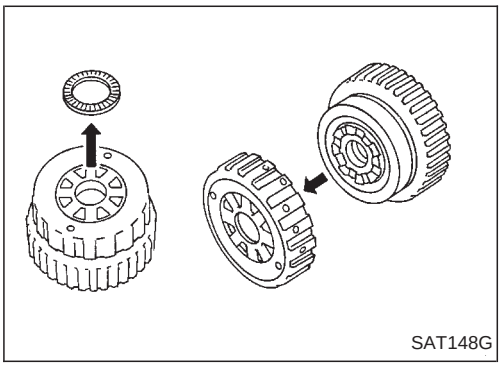

SAT111B

c. Remove needle bearing from rear internal gear.

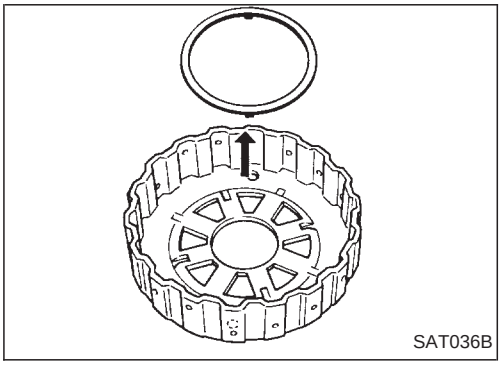

SAT951A

d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.

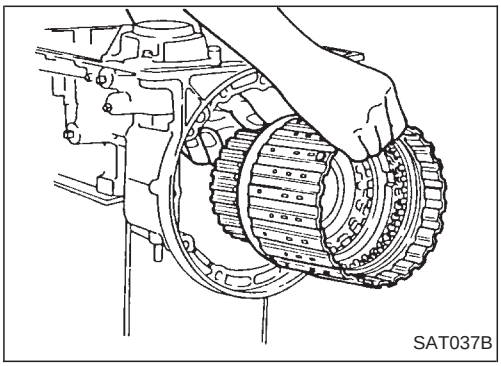
Disassembly (Cont'd)


SAT148G

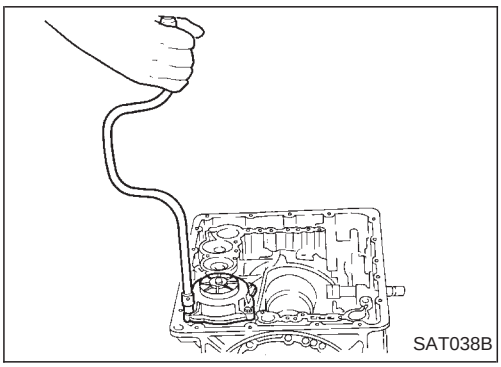
e. Remove needle bearing from overrun clutch hub.
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.


SAT036B

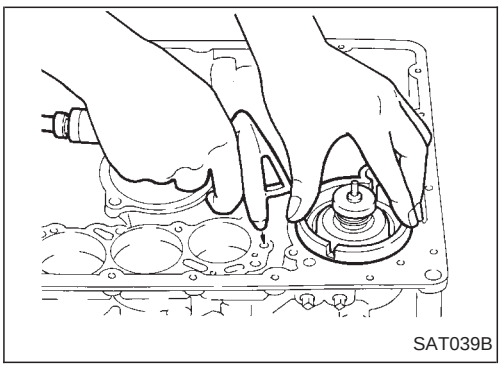
g. Remove thrust washer from overrun clutch hub.


SAT037B

h. Remove forward clutch assembly from transmission case.


SAT038B

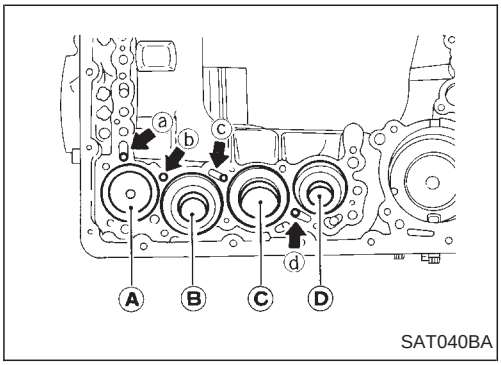
21. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.


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.

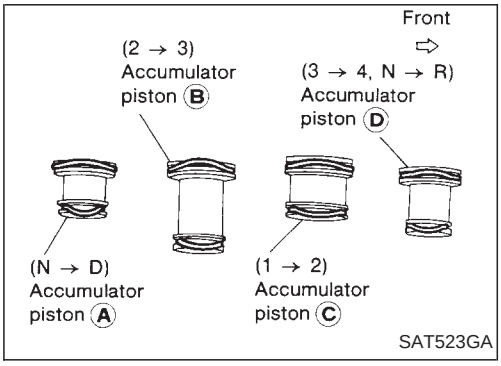
Disassembly (Cont'd)



SAT040BA

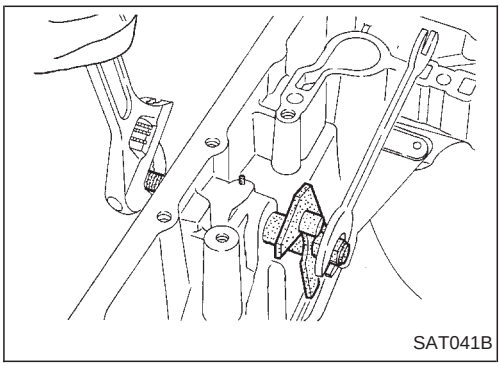
d. Remove springs from accumulator pistons Ⓑ, Ⓒ and Ⓓ.
e. Apply compressed air to each oil hole until piston comes out.
- **Hold piston with a rag and gradually direct air to oil hole.**

Identification of accumulator pistons	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Identification of oil holes	ⓐ	ⓑ	ⓒ	ⓓ

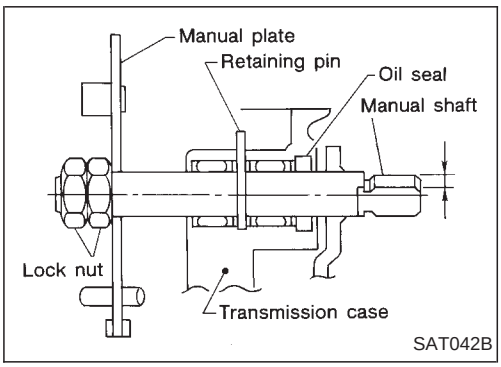


SAT523GA

f. Remove O-ring from each piston.

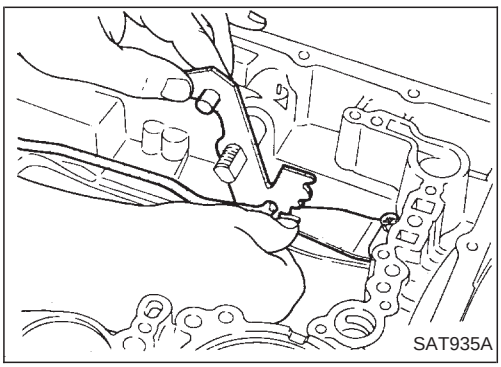

SAT041B

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.



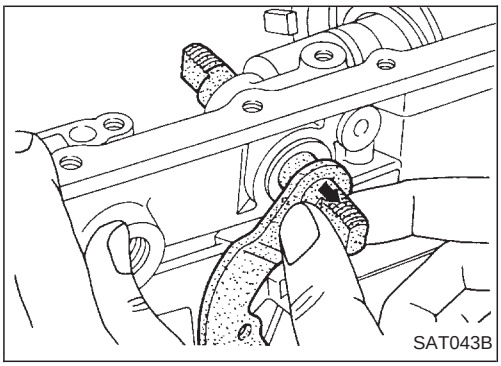
SAT042B

b. Remove retaining pin from transmission case.

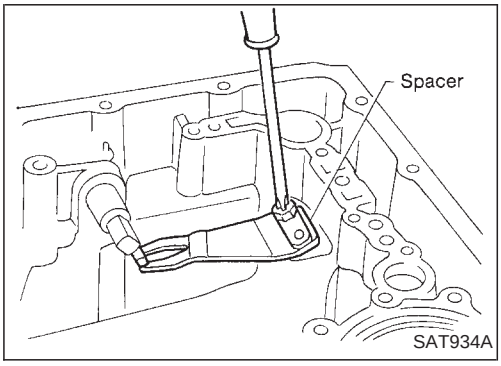

SAT935A

c. While pushing detent spring down, remove manual plate and parking rod from transmission case.

Disassembly (Cont'd)

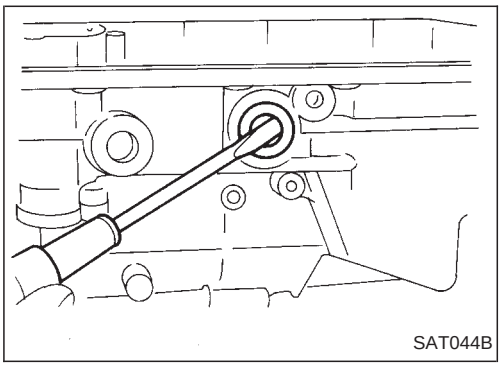

SAT043B

d. Remove manual shaft from transmission case.



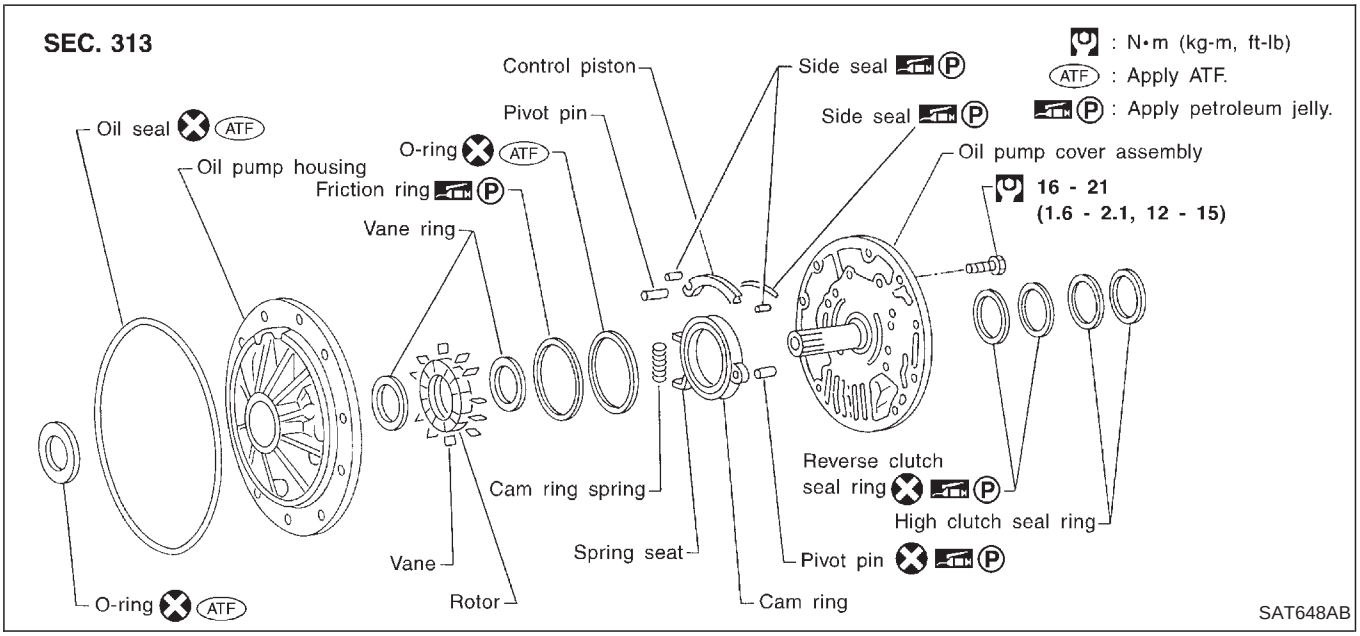
SAT934A

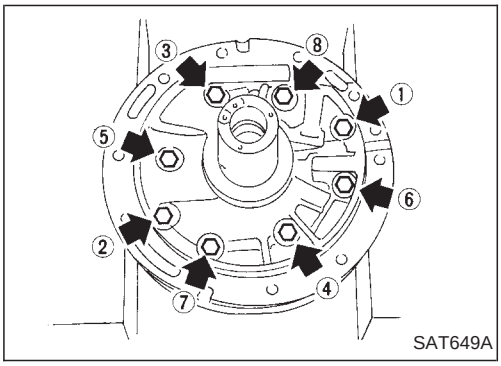
e. Remove spacer and detent spring from transmission case.


SAT044B

f. Remove oil seal from transmission case.

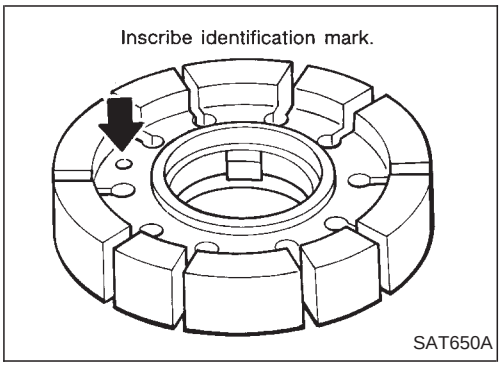
Oil Pump



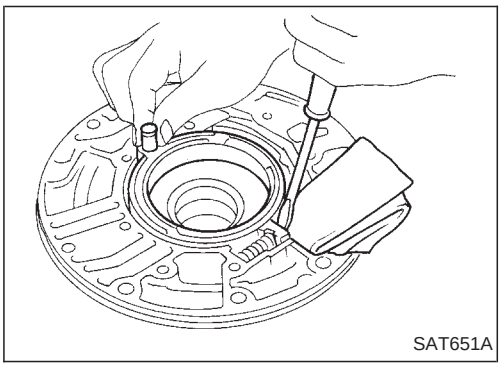


DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.

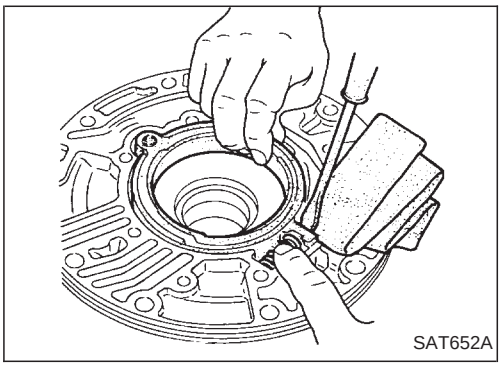


2. Remove rotor, vane rings and vanes.
- **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**

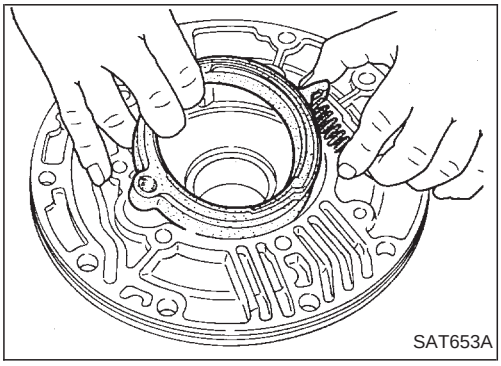


3. While pushing on cam ring remove pivot pin.
- **Be careful not to scratch oil pump housing.**

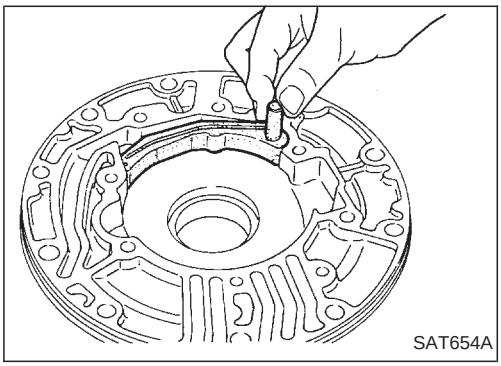
Oil Pump (Cont'd)


SAT652A

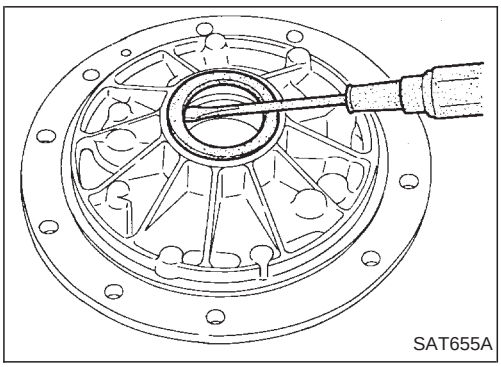
4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**


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.

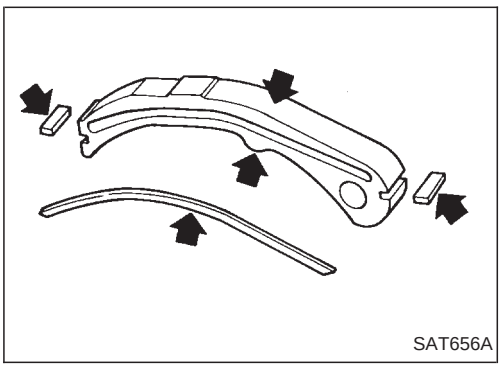

SAT655A

7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**

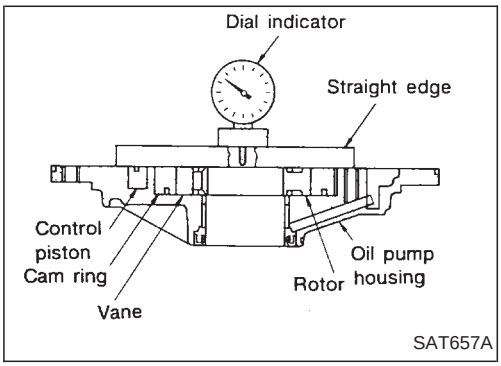
INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.

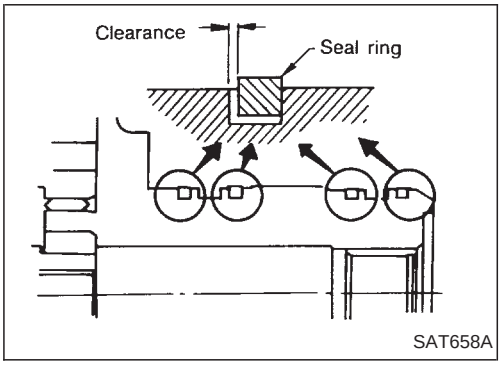

SAT656A

Oil Pump (Cont'd)



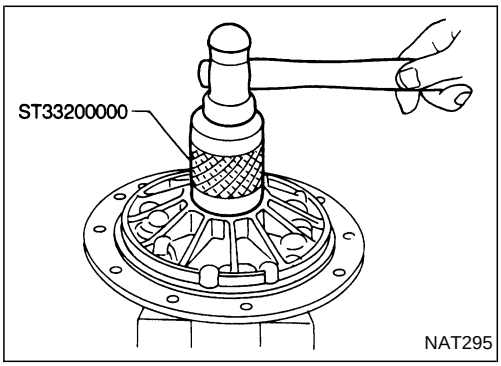
Side clearances

- 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-199.
- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



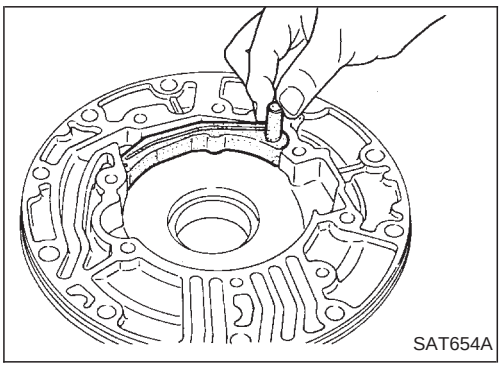
Seal ring clearance

- 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

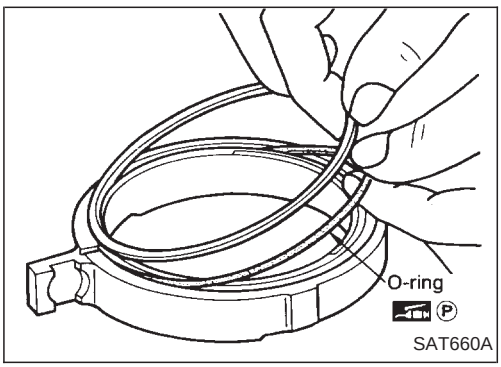
1. Drive oil seal into oil pump housing.
- **Apply ATF to outer periphery and lip surface.**



2. Install cam ring in oil pump housing by the following steps.

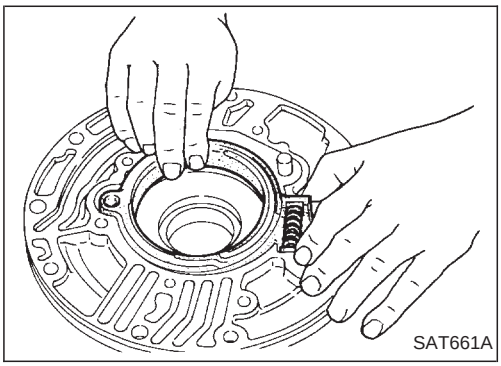
a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

b. Install control piston on oil pump.

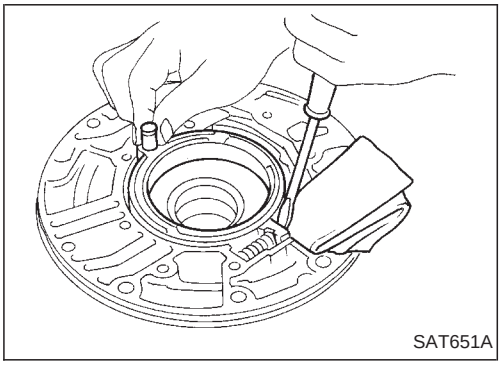


c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**

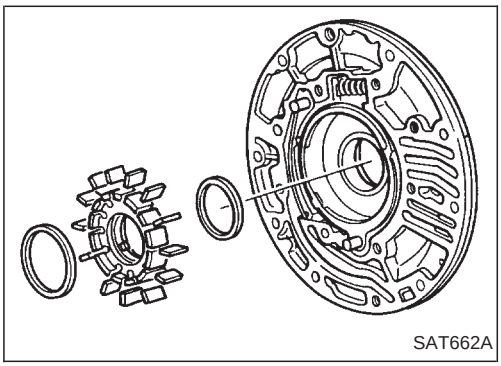
Oil Pump (Cont'd)


SAT661A

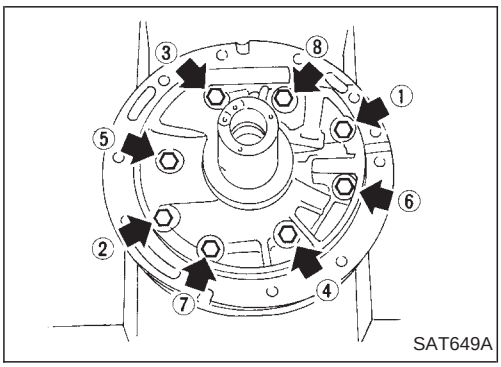
d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.


SAT651A

e. While pushing on cam ring install pivot pin.

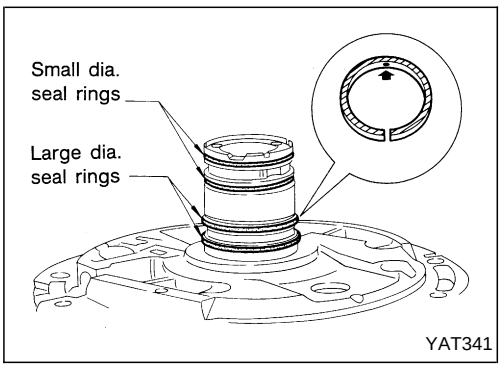

SAT662A

3. Install rotor, vanes and vane rings.
- **Pay attention to direction of rotor.**



SAT649A

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.

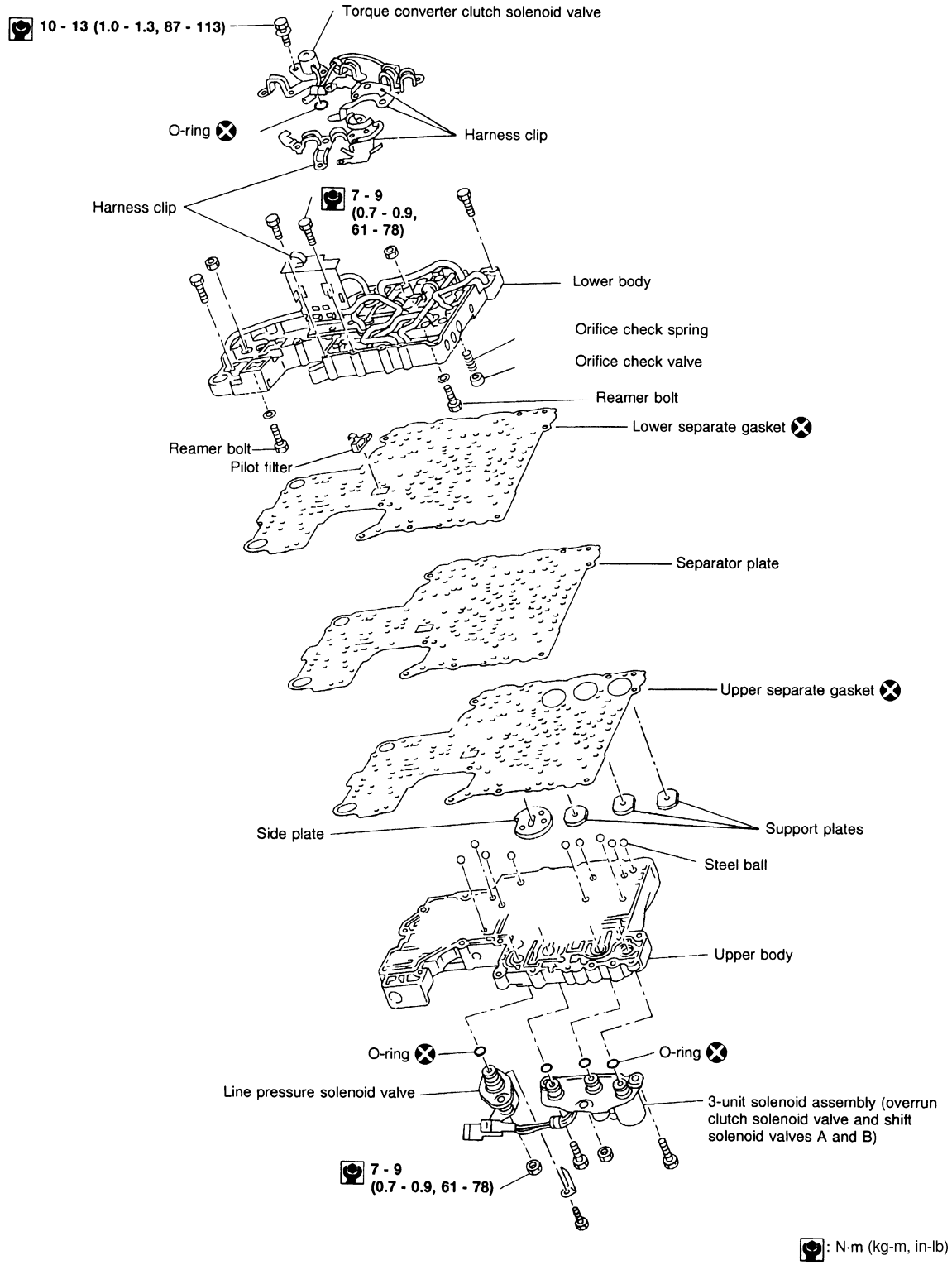


YAT341

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

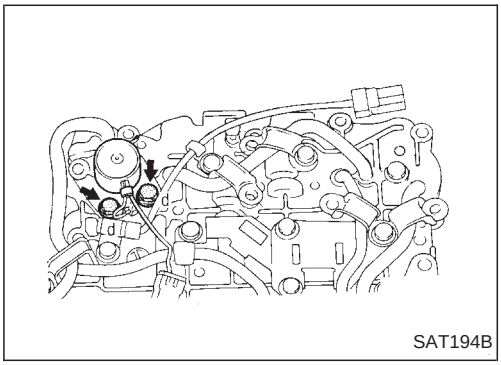
SEC. 317



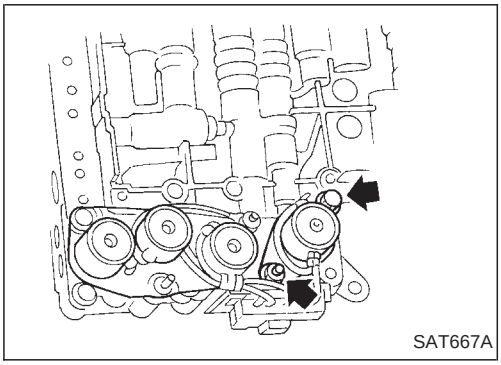
NAT294

Control Valve Assembly (Cont'd)

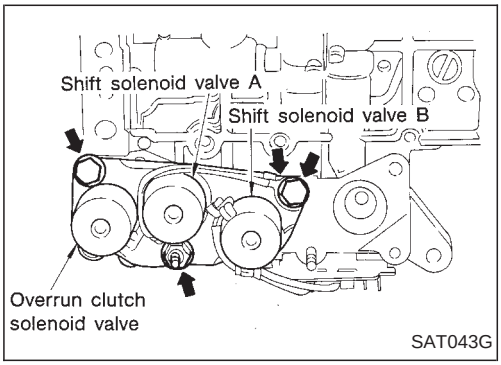
DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove torque converter clutch solenoid valve and side plate from lower body.
b. Remove O-ring from solenoid.

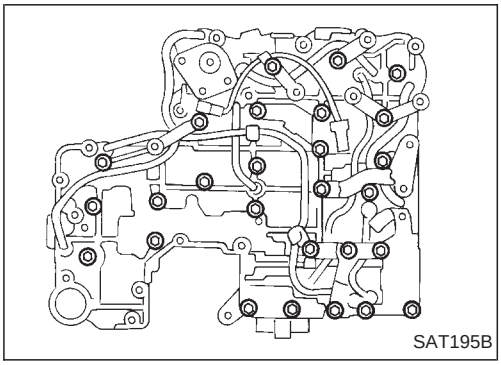

SAT667A

c. Remove line pressure solenoid valve from upper body.
d. Remove O-ring from solenoid.



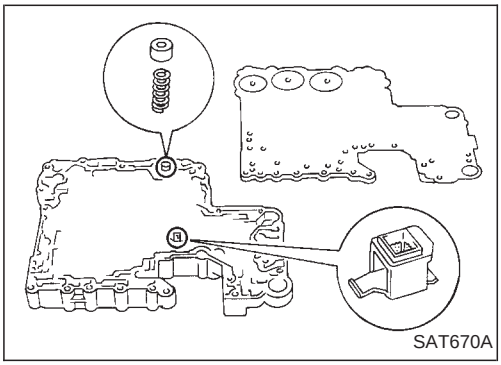
SAT043G

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

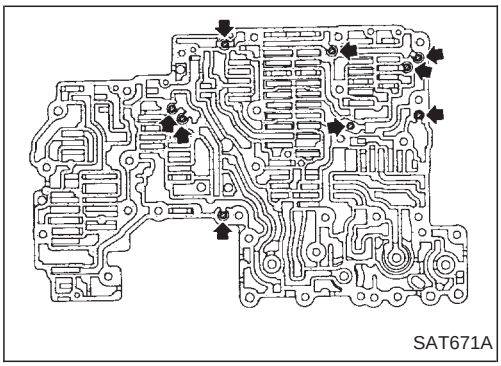
2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

- **Be careful not to drop pilot filter, orience 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.

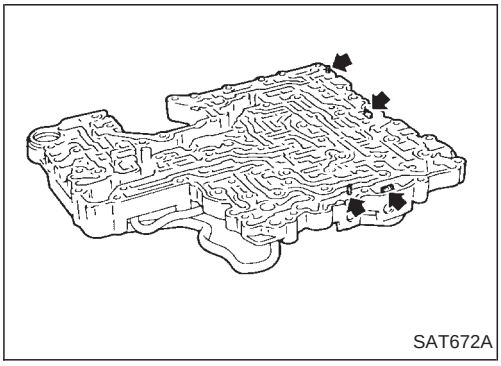
Control Valve Assembly (Cont'd)


SAT671A

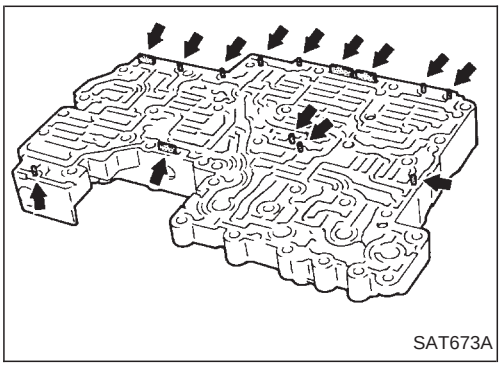
e. Check to see that steel balls are properly positioned in upper body. Then remove them from upper body.

INSPECTION

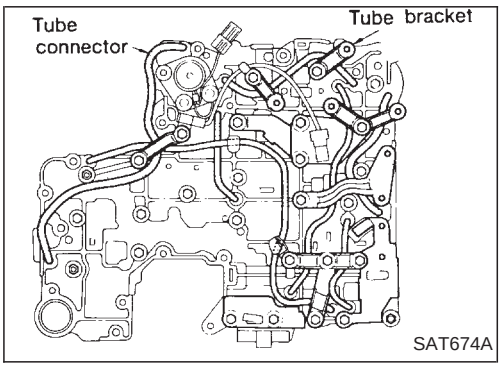
Lower and upper bodies


SAT672A

- Check to see that there are pins and retainer plates in lower body.


SAT673A

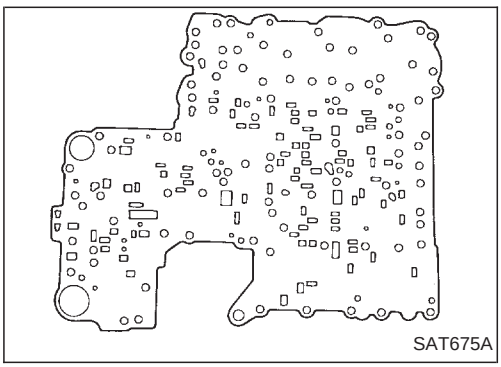
- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

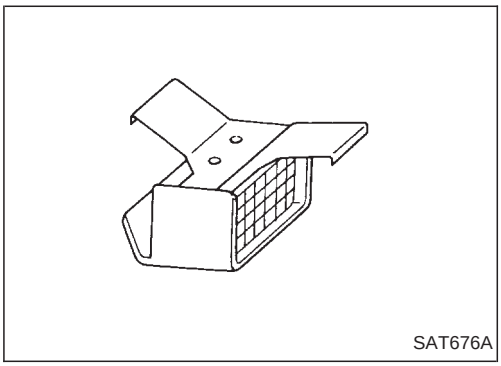
- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.

Separator plates


SAT675A

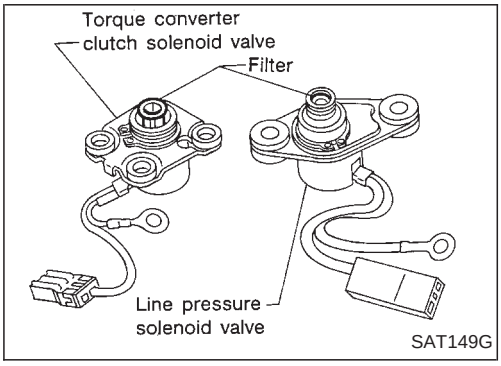
- Make sure that separator plate is free of damage and not deformed and oil holes are clean.

Control Valve Assembly (Cont'd)


SAT676A

Pilot filter

- Check to make sure that filter is not clogged or damaged.



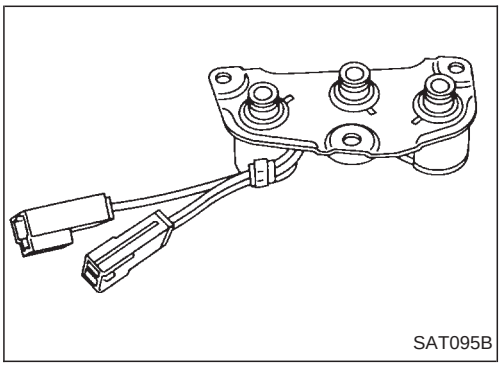
SAT149G

Torque converter clutch solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-84.

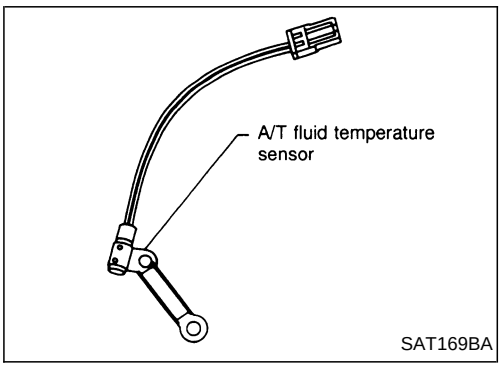
Line pressure solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-86.


SAT095B

3-unit solenoid assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

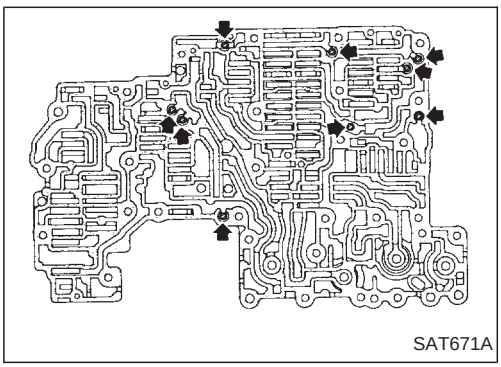
- Measure resistance of each solenoid. Refer to "Component Inspection", AT-64, AT-67, AT-70.



SAT169BA

A/T fluid temperature sensor

- Measure resistance. Refer to "Component Inspection", AT-78.

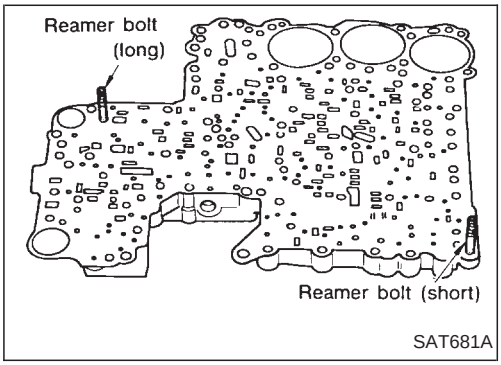

SAT671A

ASSEMBLY

1. Install upper and lower bodies.

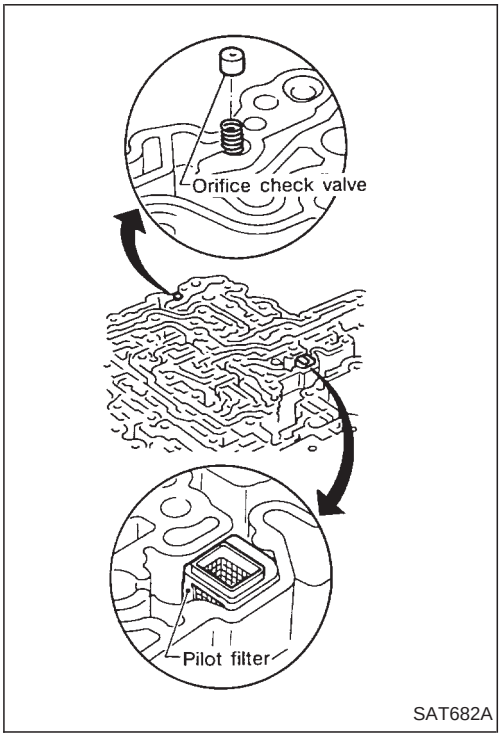
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

Control Valve Assembly (Cont'd)



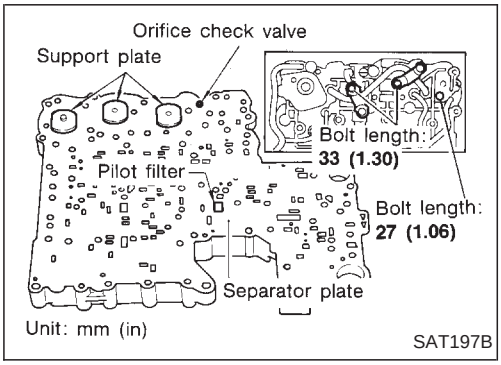
SAT681A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



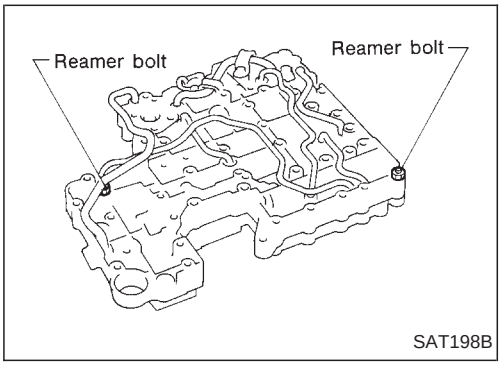
SAT682A

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.

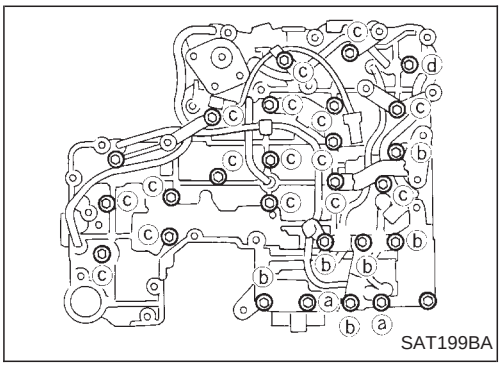


SAT198B

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.**

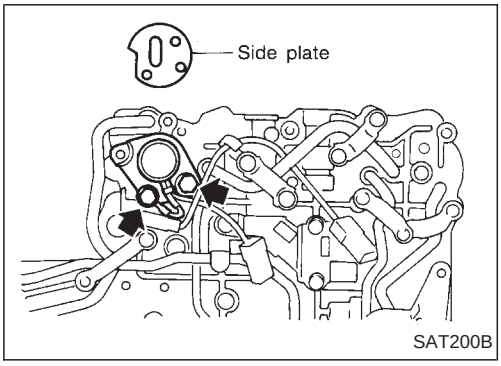
Control Valve Assembly (Cont'd)



g. Install and temporarily tighten bolts and tube brackets in their proper locations.

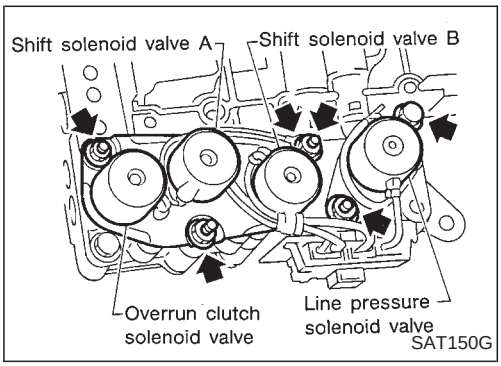
Bolt length and location:

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.

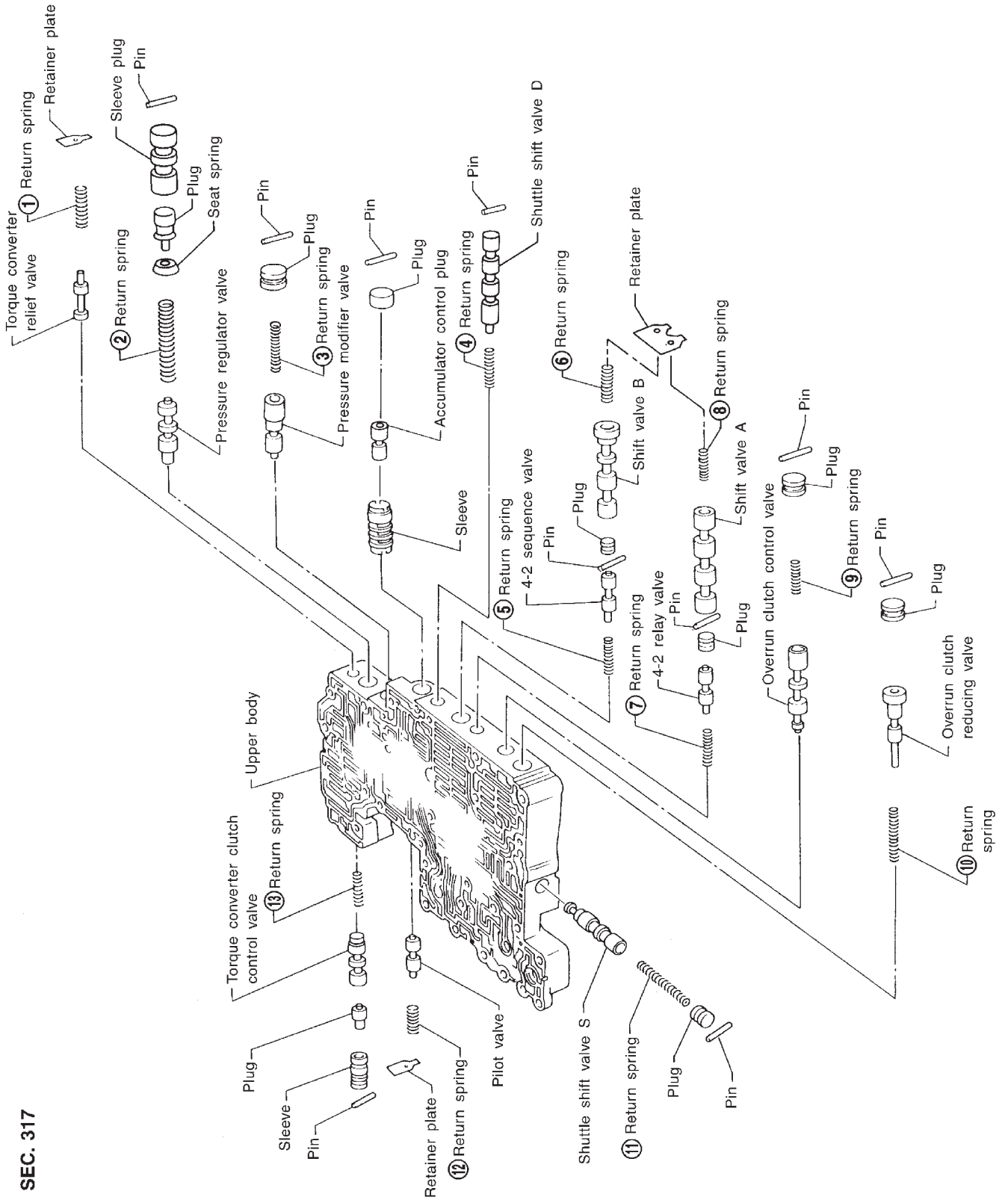


b. Attach O-rings and install 3-unit solenoids assembly onto upper body.

c. Attach O-ring and install line pressure solenoid valve onto upper body.

3. Tighten all bolts.

Control Valve Upper Body



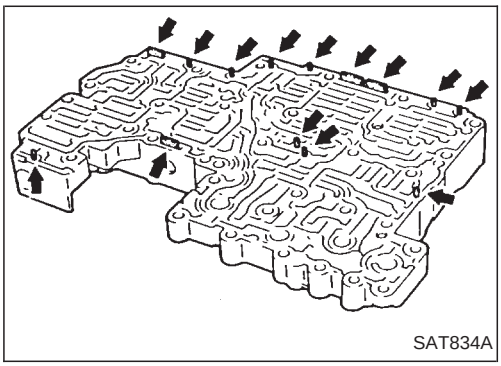
Apply ATF to all components before their installation.

SAT665I

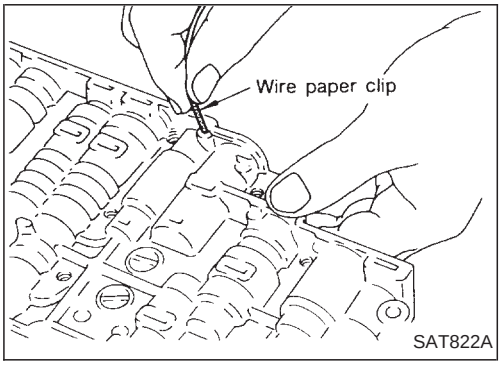
Numbers preceding valve springs correspond with those shown in SDS on page AT-197.

Control Valve Upper Body (Cont'd)

DISASSEMBLY

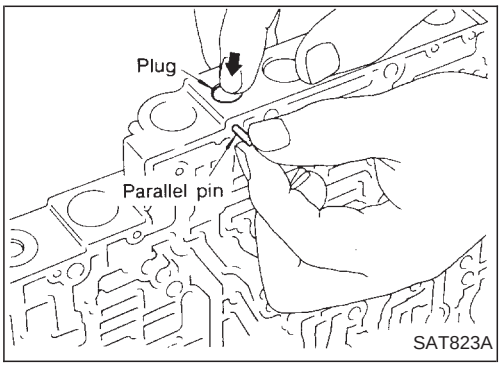

SAT834A

1. Remove valves at parallel pins.
- **Do not use a magnetic hand.**



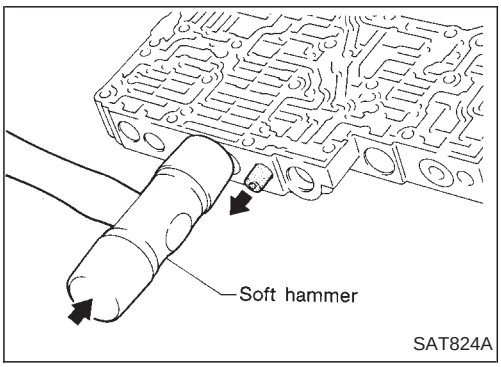
SAT822A

a. Use a wire paper clip to push out parallel pins.



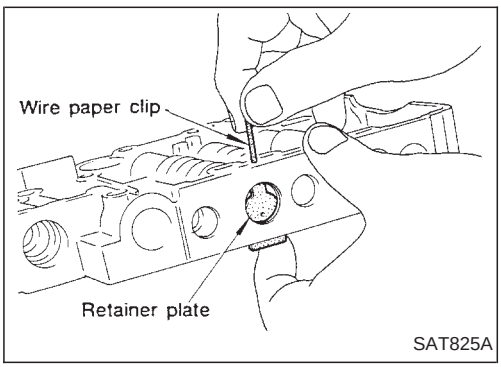
SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

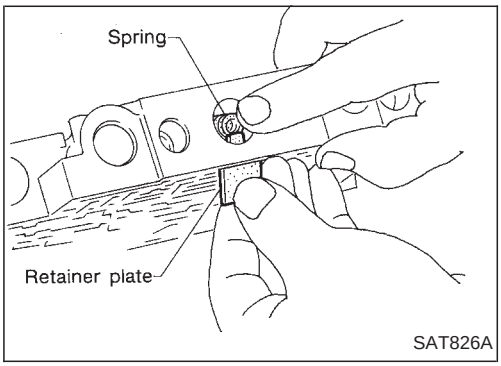
c. Place mating surface of valve facedown, and remove internal parts.
- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**



SAT825A

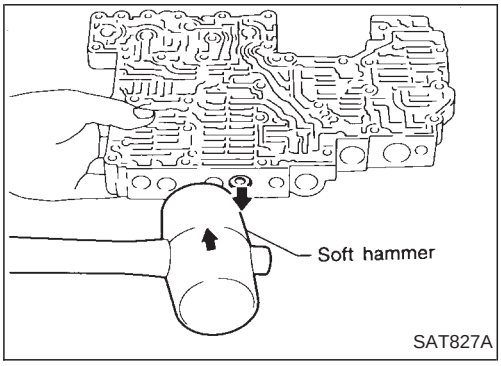
2. Remove valves at retainer plates.
a. Pry out retainer plate with wire paper clip.

Control Valve Upper Body (Cont'd)



SAT826A

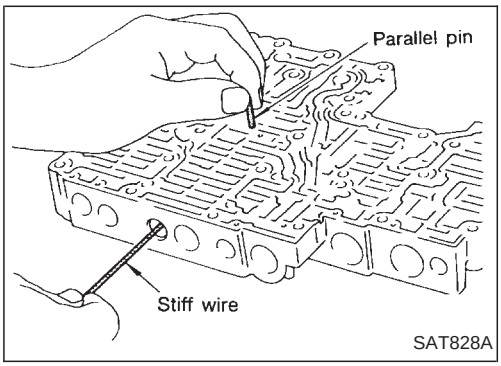
b. Remove retainer plates while holding spring.



SAT827A

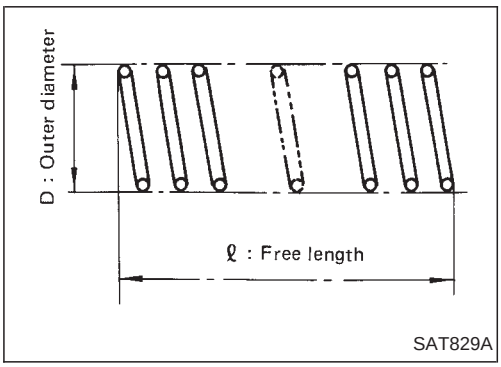
c. Place mating surface of valve facedown, and remove internal parts.

- **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.**



SAT828A

- 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.**



SAT829A

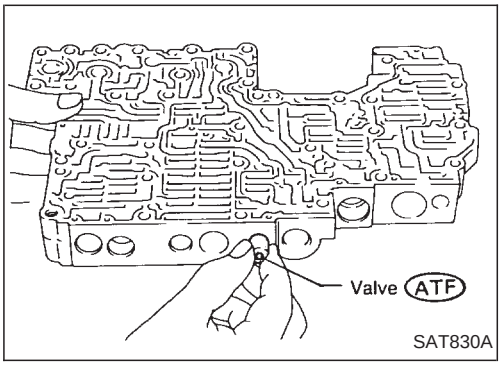
INSPECTION

Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
  Inspection standard:
  Refer to SDS, AT-197.
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of valves, sleeves and plugs.



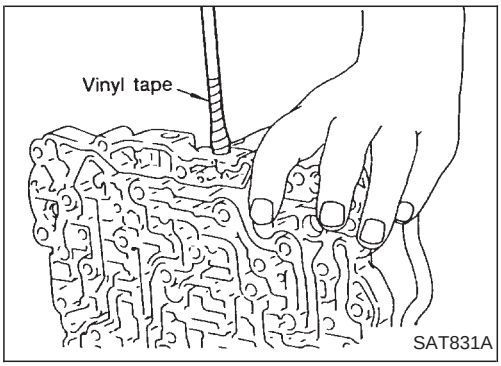
SAT830A

ASSEMBLY

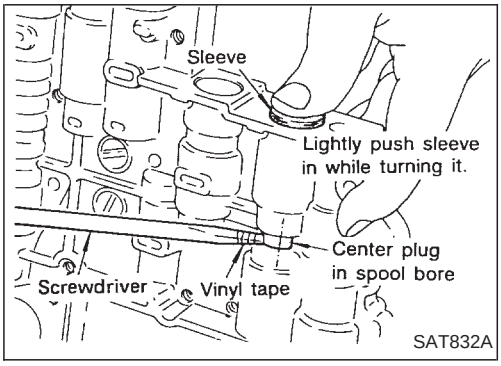
1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.

- **Be careful not to scratch or damage valve body.**

Control Valve Upper Body (Cont'd)

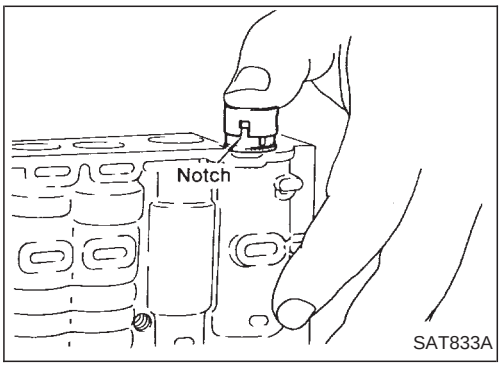


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



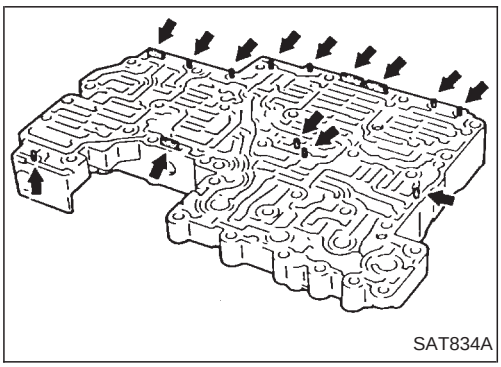
Pressure regulator valve

- 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.

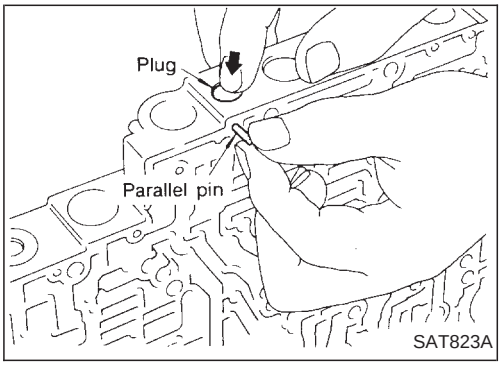


Accumulator control plug

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



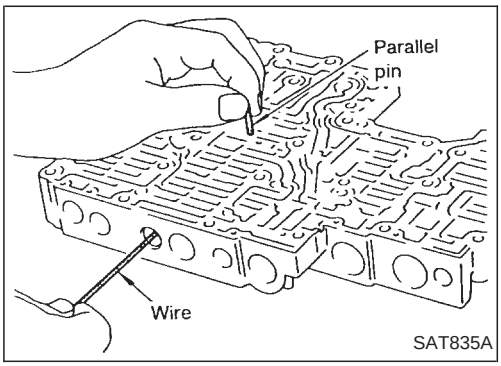
2. Install parallel pins and retainer plates.



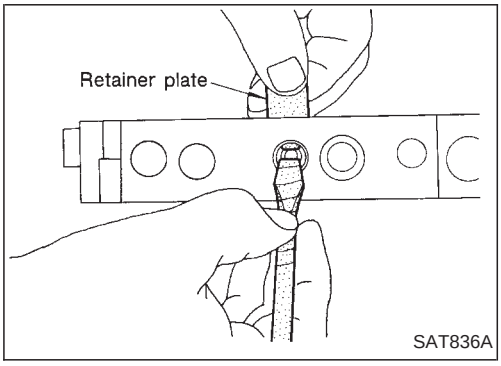
- **While pushing plug, install parallel pin.**

Control Valve Upper Body (Cont'd)

4-2 sequence valve and relay valve

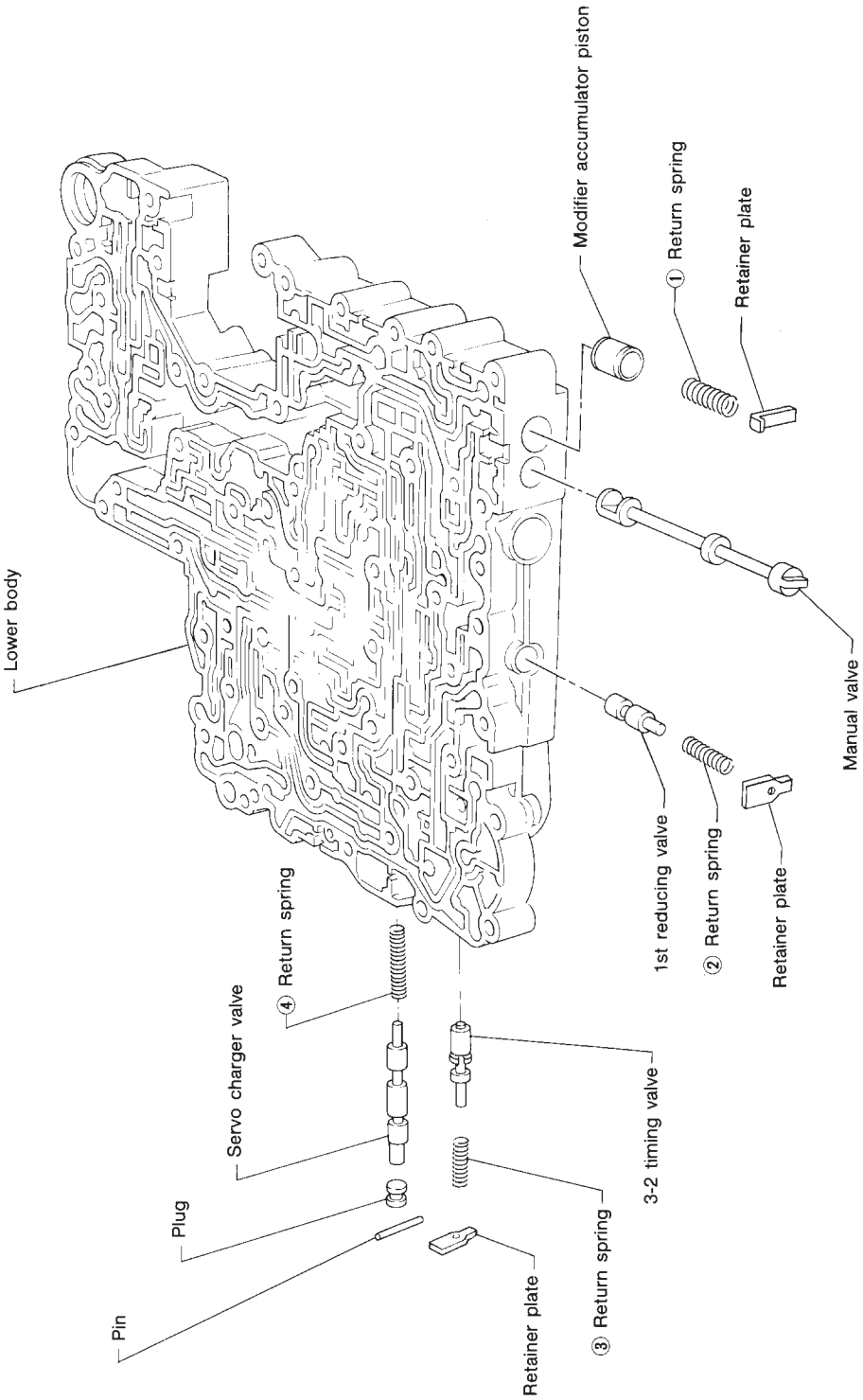


- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.

Control Valve Lower Body

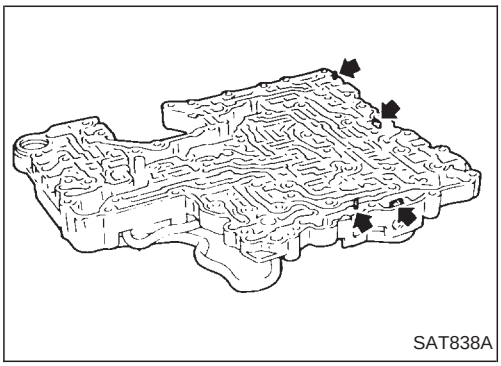


SEC. 317

SAT112GA

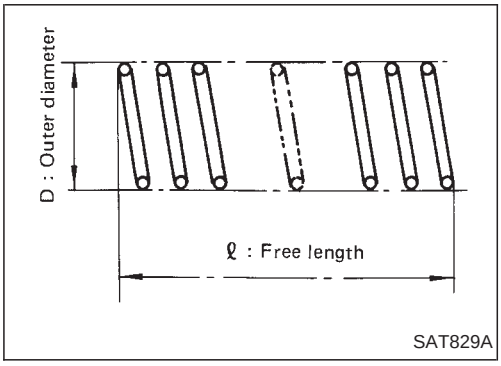
Apply ATF to all components before their installation.
Numbers preceding valve springs correspond with those shown in SDS on page AT-197.

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.



SAT829A

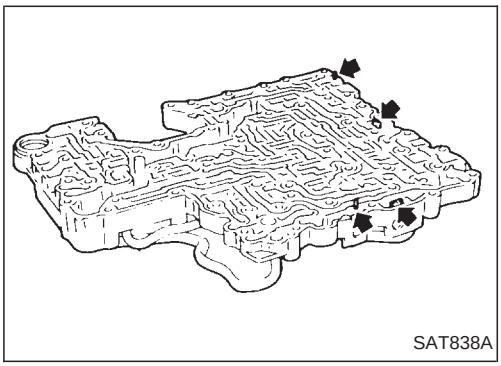
INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
  Inspection standard:
  Refer to SDS, AT-197.
- Replace valve springs if deformed or fatigued.

Control valves

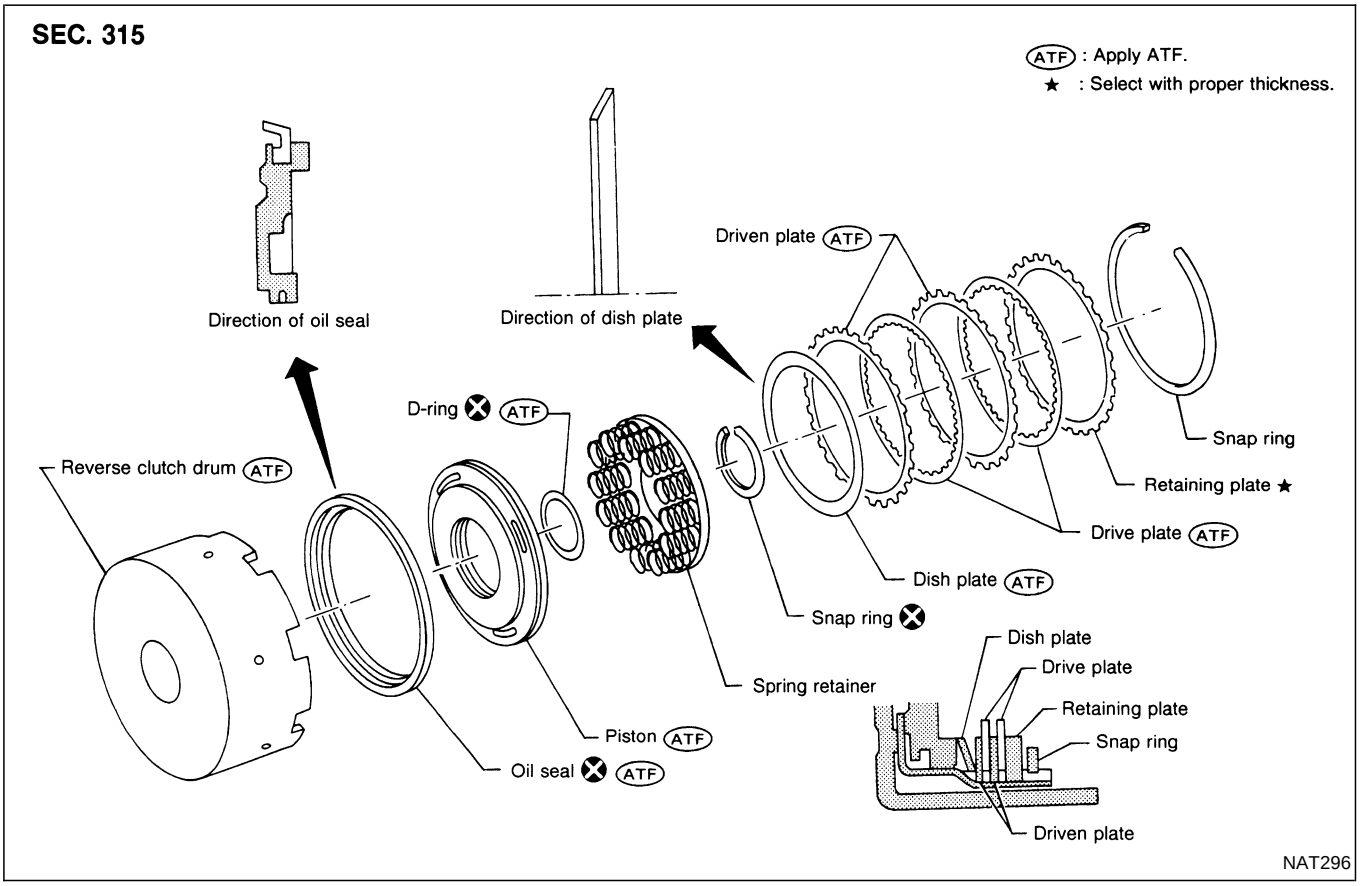
- Check sliding surfaces of control valves, sleeves and plugs for damage.

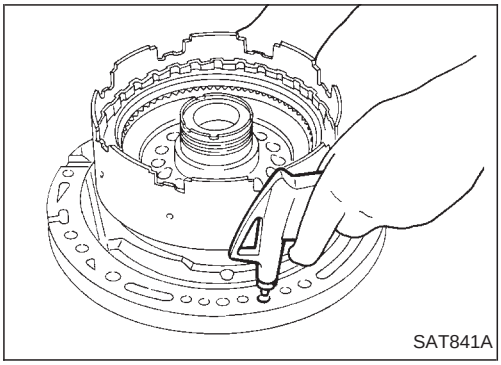

SAT838A

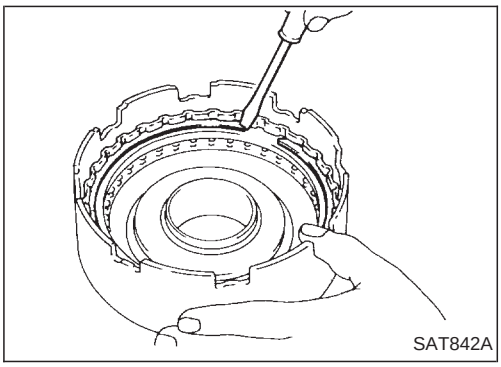
ASSEMBLY

- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body, AT-146.

Reverse Clutch




SAT841A


SAT842A

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.

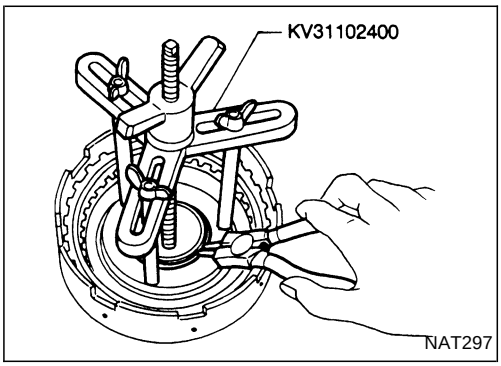
b. Check to see that retaining plate moves to snap ring.

c. If retaining plate does not contact snap ring,

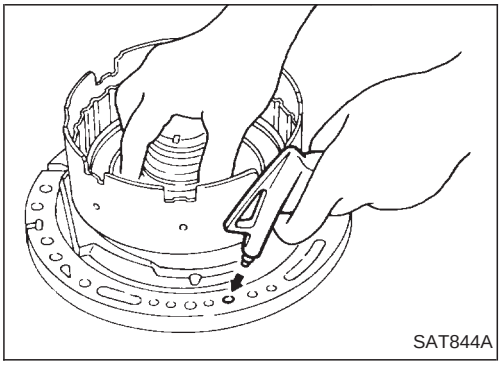
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

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.

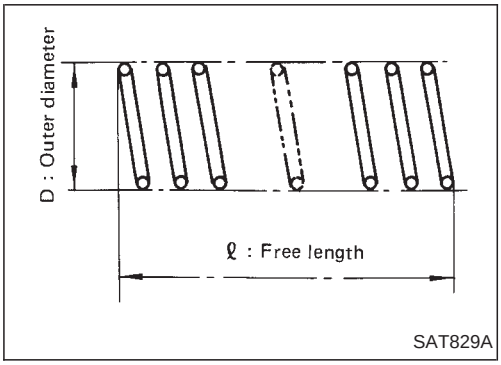


5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**
6. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

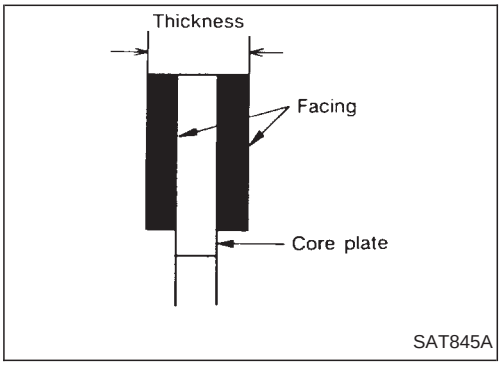


Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Refer to SDS, AT-197.



Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value: 1.90 - 2.05 mm (0.0748 - 0.0807 in)

Wear limit: 1.80 mm (0.0709 in)

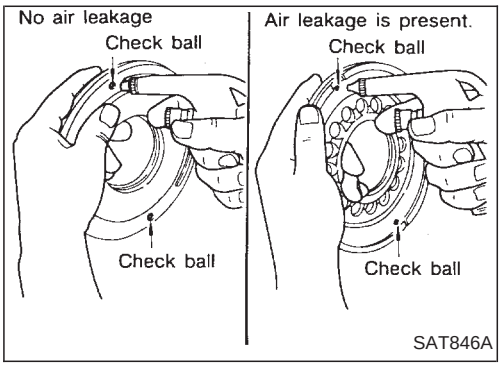
- If not within wear limit, replace.

Reverse clutch dish plate

- Check for deformation or damage.

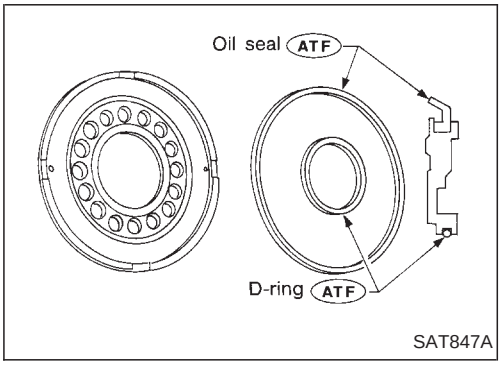
Reverse Clutch (Cont'd)

Reverse clutch piston

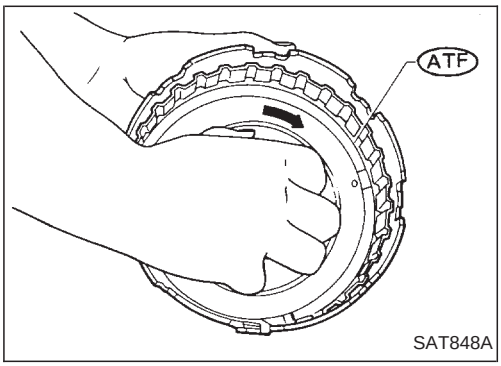


- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

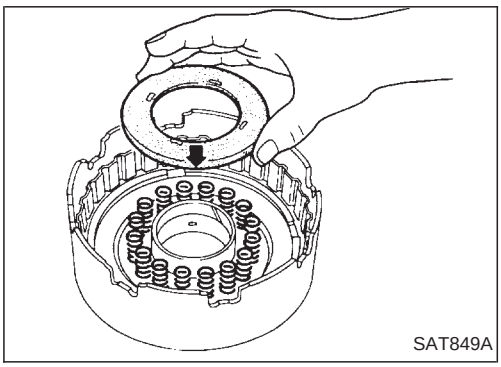
ASSEMBLY



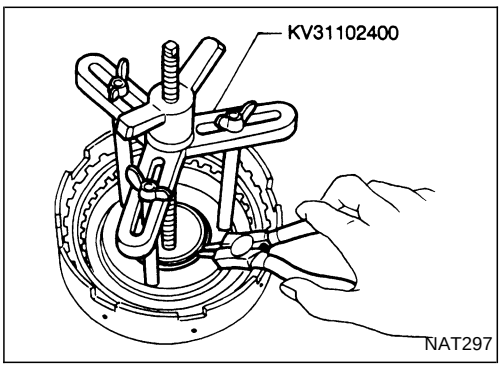
1. Install D-ring and oil seal on piston.
- **Apply ATF to both parts.**



2. Install piston assembly by turning it slowly and evenly.
- **Apply ATF to inner surface of drum.**

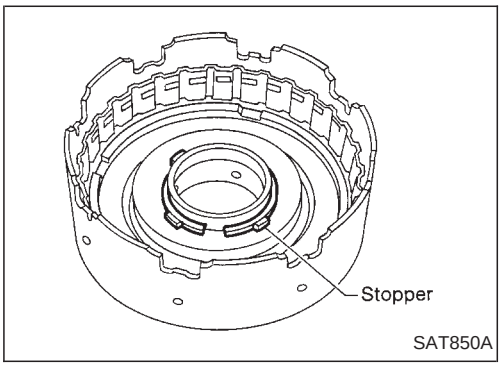


3. Install return springs and spring retainer.



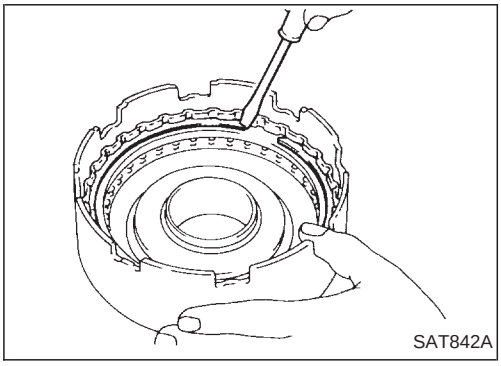
4. Install snap ring while compressing clutch springs.

Reverse Clutch (Cont'd)

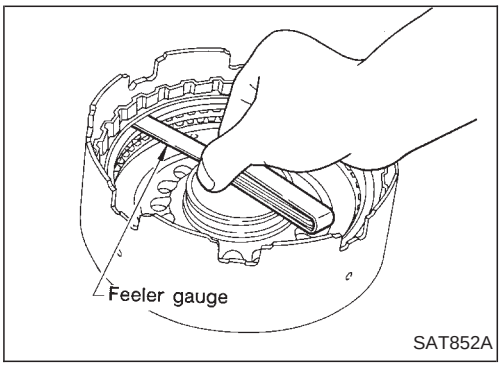


SAT850A

- **Do not align snap ring gap with spring retainer stopper.**

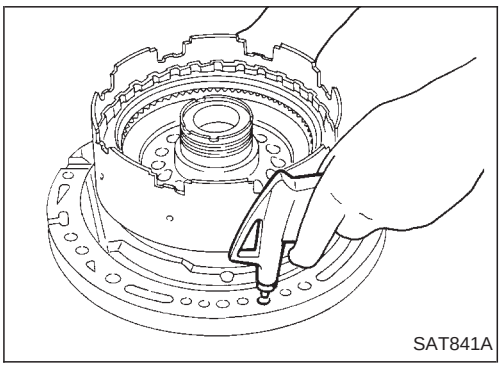

SAT842A

5. Install drive plates, driven plates, retaining plate and dish plate.
6. Install snap ring.



SAT852A

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-198.

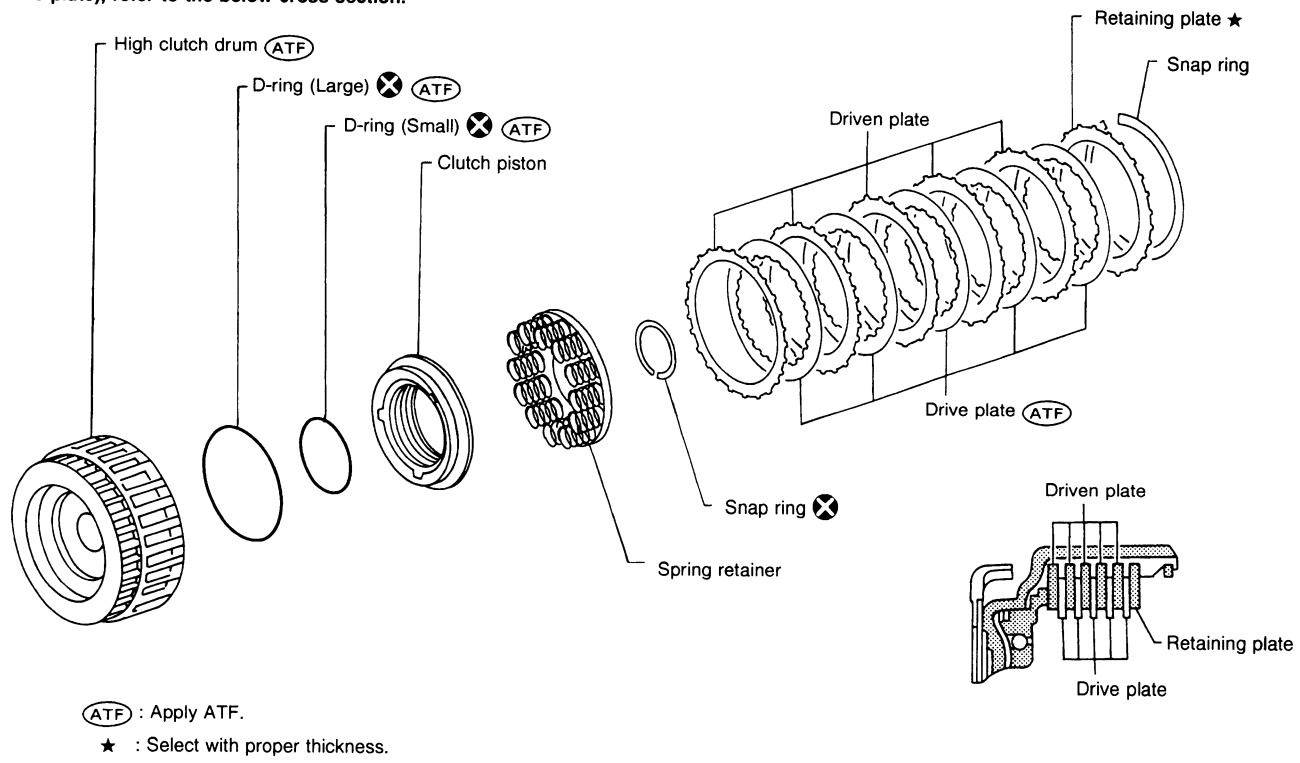

SAT841A

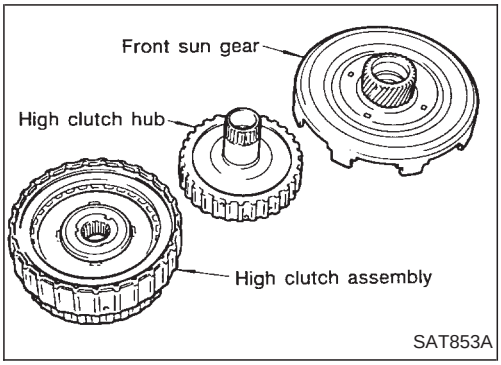
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch, AT-151.

High Clutch

SEC. 315

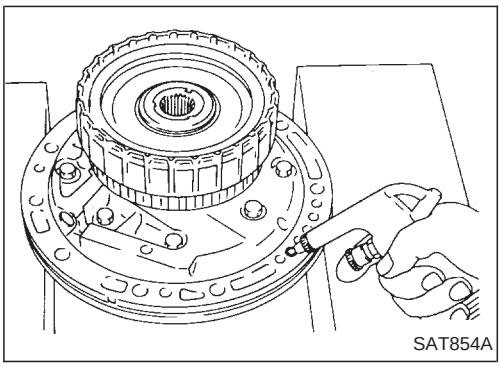
For the number of clutch sheets (drive plate and drive plate), refer to the below cross-section.





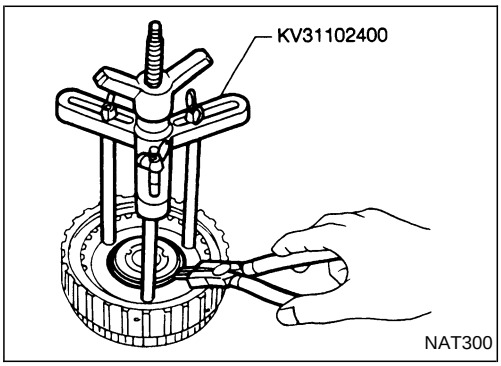
DISASSEMBLY AND ASSEMBLY

Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

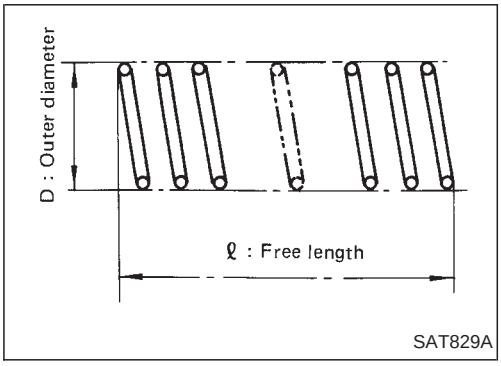


- Check of high clutch operation

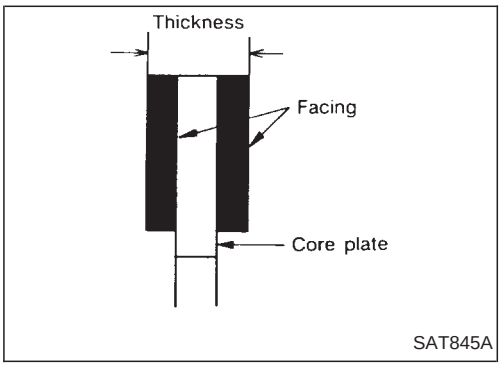
High Clutch (Cont'd)



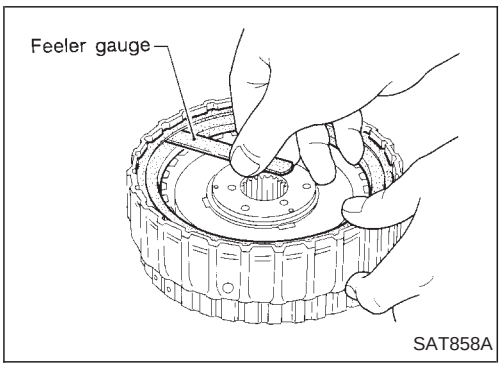
- Removal and installation of return spring



- Inspection of high clutch return springs
  Inspection standard:
  Refer to SDS, AT-197.



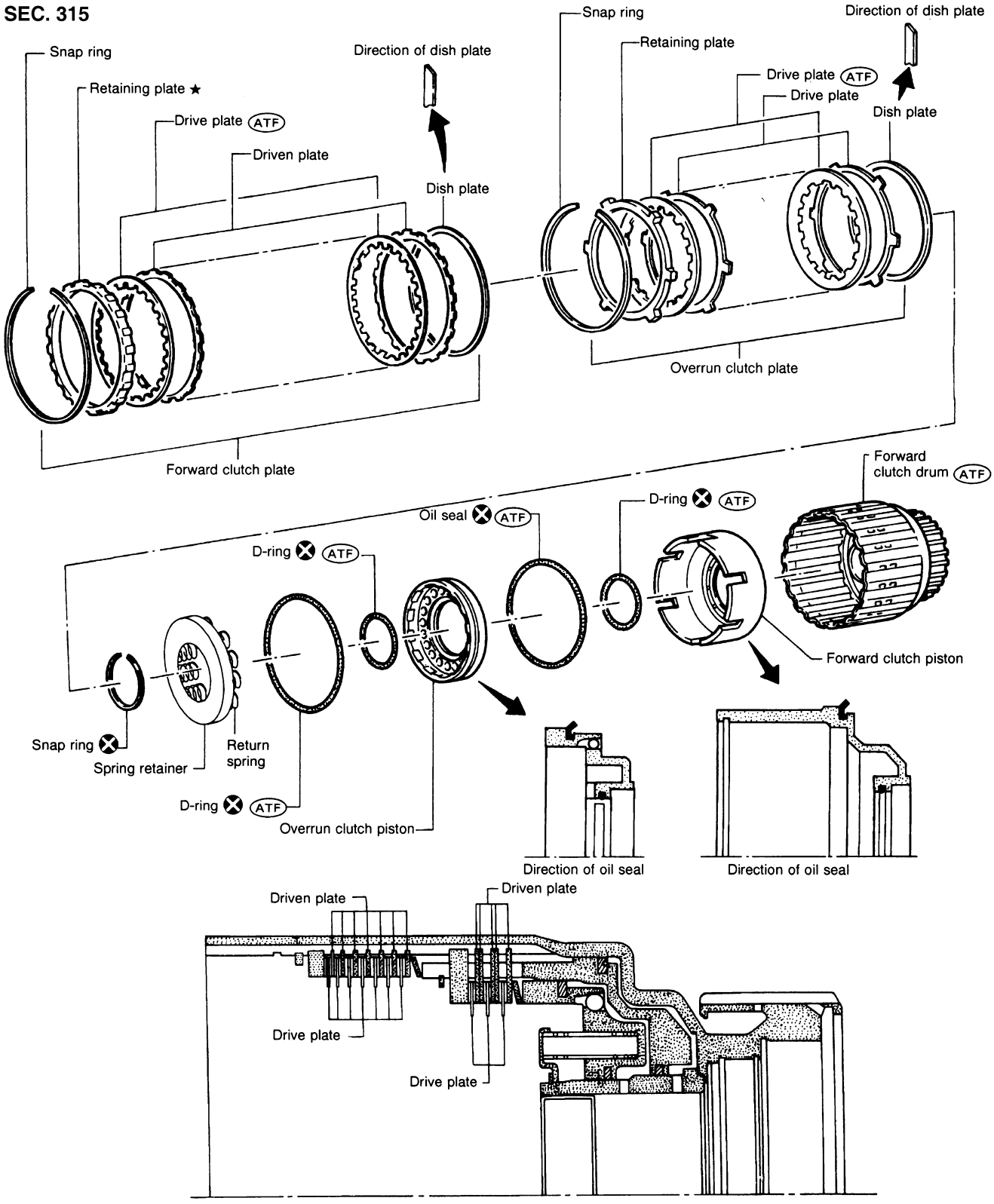
- Inspection of high clutch drive plate
  Thickness of drive plate:
  Standard
  1.52 - 1.67 mm (0.0598 - 0.0657 in)
  Wear limit
  1.40 mm (0.0551 in)



- Measurement of clearance between retaining plate and snap ring
  Specified clearance:
  Standard
  1.8 - 2.2 mm (0.071 - 0.087 in)
  Allowable limit
  3.2 mm (0.126 in)
  Retaining plate:
  Refer to SDS, AT-198.

Forward and Overrun Clutches

SEC. 315



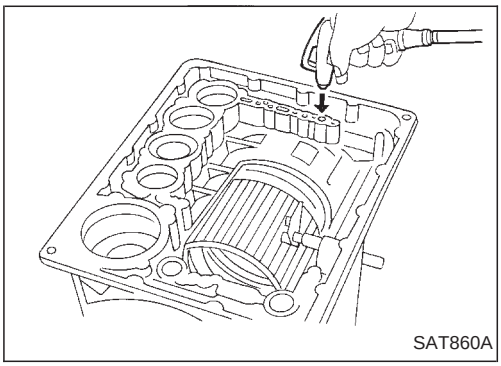
NAT301

Forward and Overrun Clutches (Cont'd)

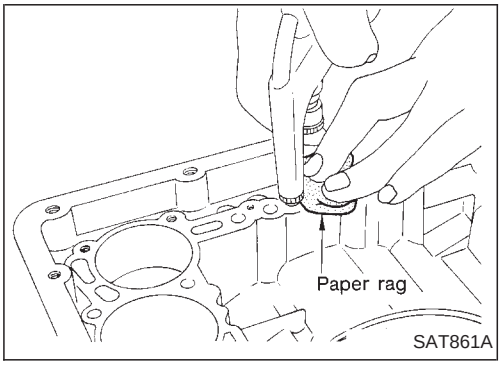
DISASSEMBLY AND ASSEMBLY

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

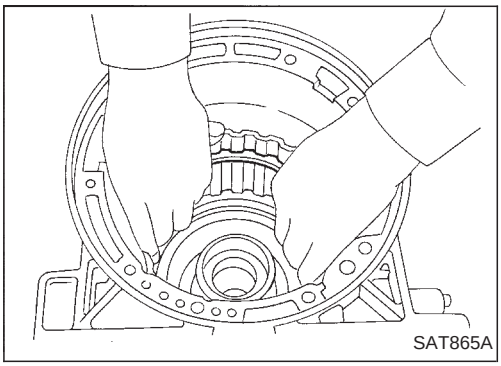
- Check of overrun clutch operation.



SAT861A

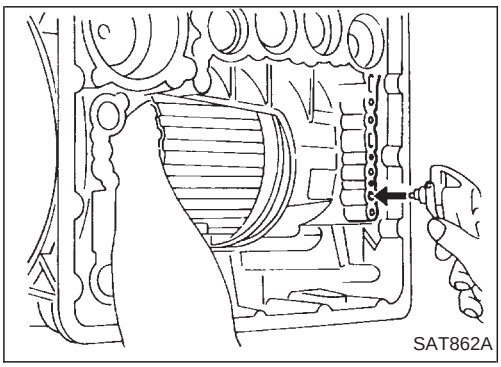
- Removal of forward clutch drum

  Remove forward clutch drum from transmission case by holding snap ring.

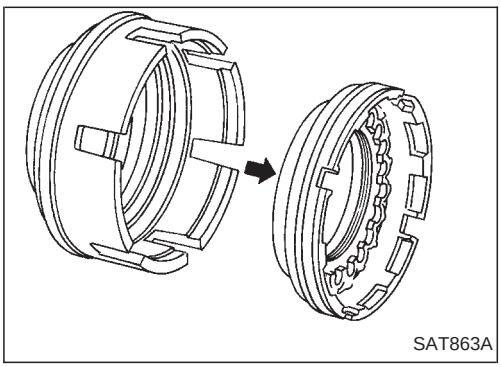

SAT865A

- Removal of forward clutch and overrun clutch pistons

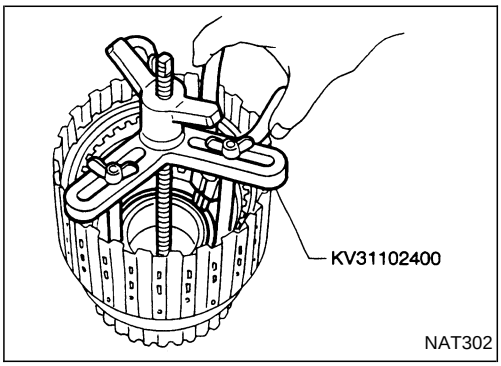
1. While holding overrun clutch piston, gradually apply compressed air to oil hole.


SAT862A

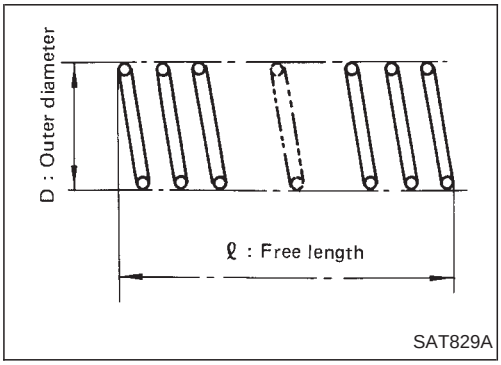
2. Remove overrun clutch from forward clutch.


SAT863A

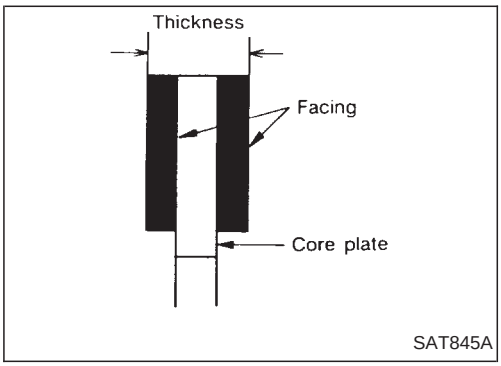
Forward and Overrun Clutches (Cont'd)



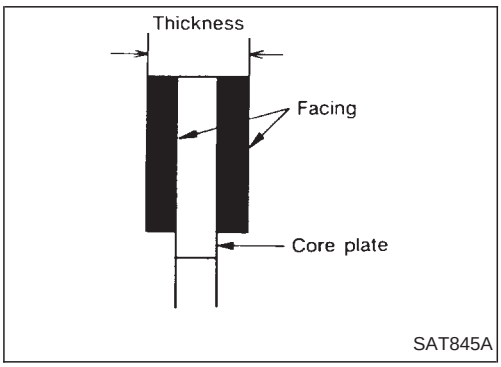
- Removal and installation of return springs



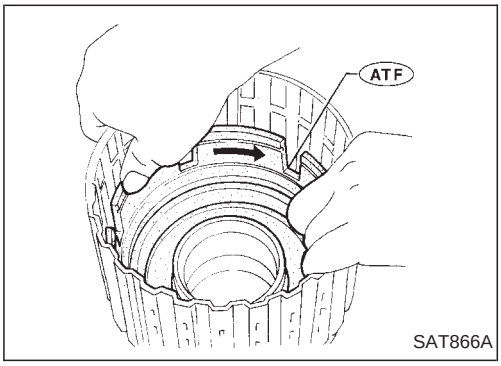
- Inspection of forward clutch and overrun clutch return springs
  Inspection standard:
  Refer to SDS, AT-197.



- Inspection of forward clutch drive plates
  Thickness of drive plate:
  Standard
  1.52 - 1.67 mm (0.0598 - 0.0657 in)
  Wear limit
  1.40 mm (0.0551 in)



- Inspection of overrun clutch drive plates
  Thickness of drive plate:
  Standard
  1.90 - 2.05 mm (0.0748 - 0.0807 in)
  Wear limit
  1.80 mm (0.0709 in)

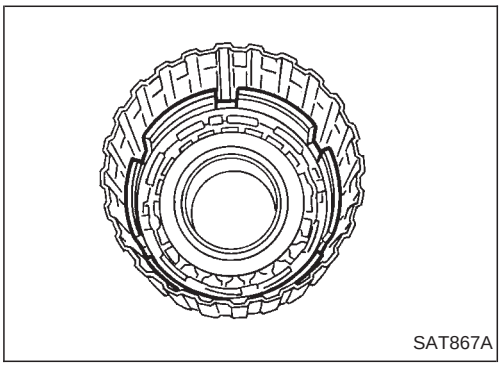


- Installation of forward clutch piston and overrun clutch piston

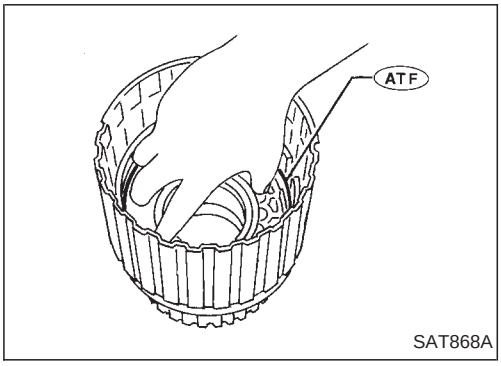
1. Install forward clutch piston by turning it slowly and evenly.

- **Apply ATF to inner surface of clutch drum.**

Forward and Overrun Clutches (Cont'd)

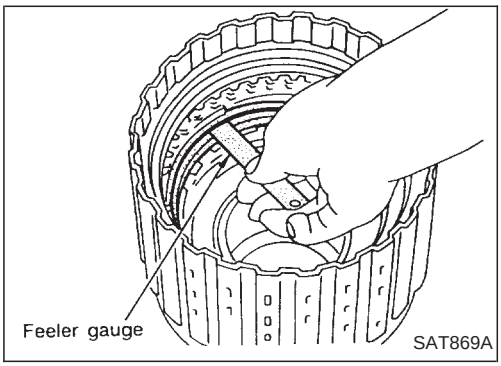

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



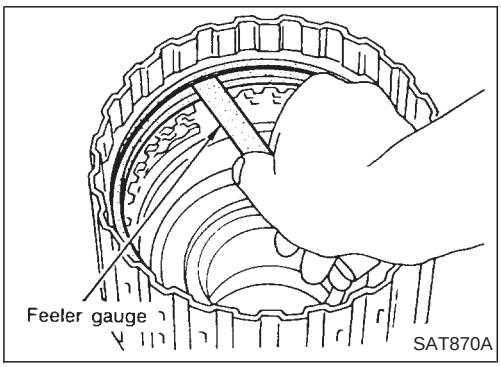
SAT868A

2. Install overrun clutch by turning it slowly and evenly.
- **Apply ATF to inner surface of forward clutch piston.**



SAT869A

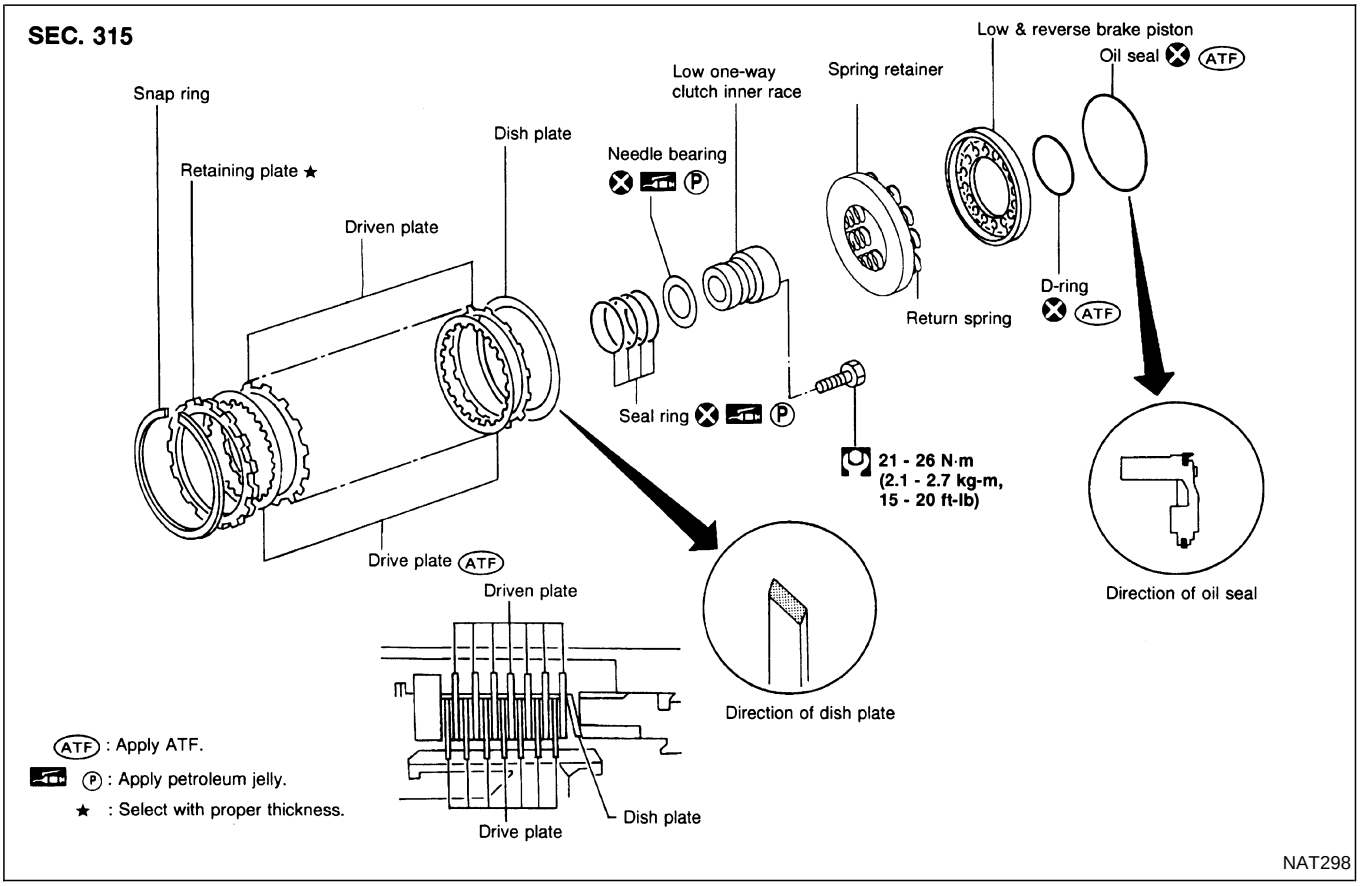
- Measurement of clearance between retaining plate and snap ring of overrun clutch
  Specified clearance:
  Standard
  1.0 - 1.4 mm (0.039 - 0.055 in)
  Allowable limit
  2.0 mm (0.079 in)
  Retaining plate:
  Refer to SDS, AT-198.

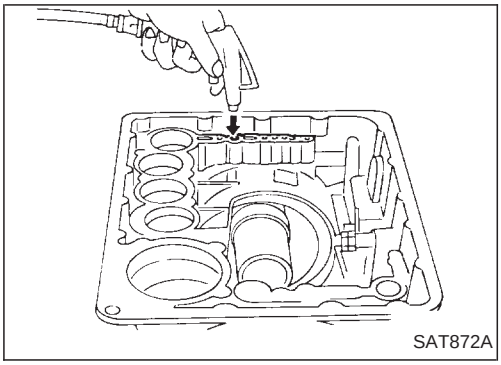


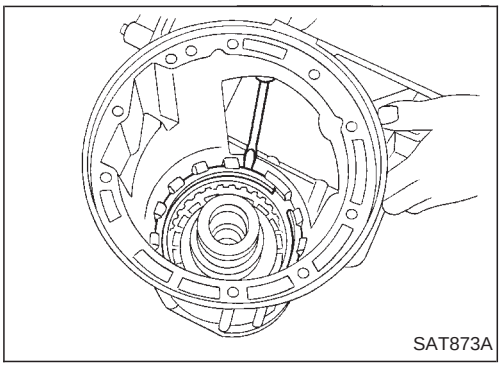
SAT870A

- Measurement of clearance between retaining plate and snap ring of forward clutch
  Specified clearance:
  Standard
  0.45 - 0.75 mm (0.0138 - 0.0295 in)
  Allowable limit
  2.15 mm (0.0846 in)
  Retaining plate:
  Refer to SDS, AT-198.

Low & Reverse Brake







DISASSEMBLY

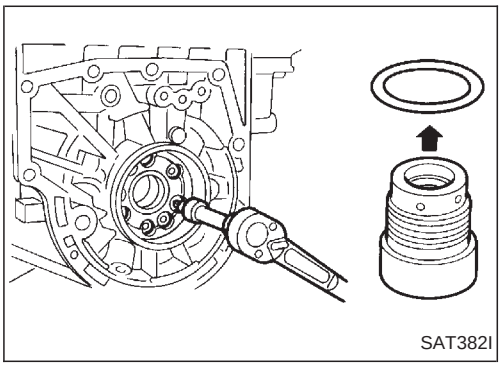
1. Check operation of low and reverse brake.

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,

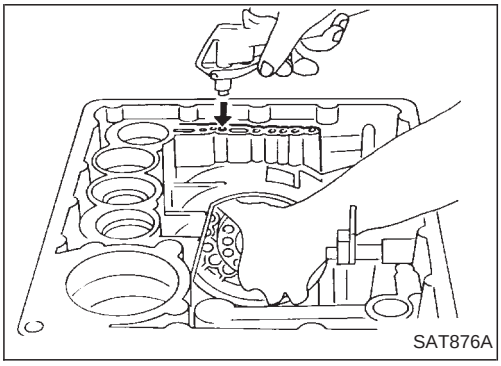
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

Low & Reverse Brake (Cont'd)


SAT382I

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.
4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

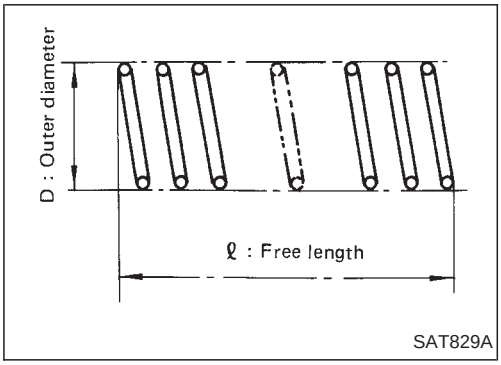

SAT876A

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.



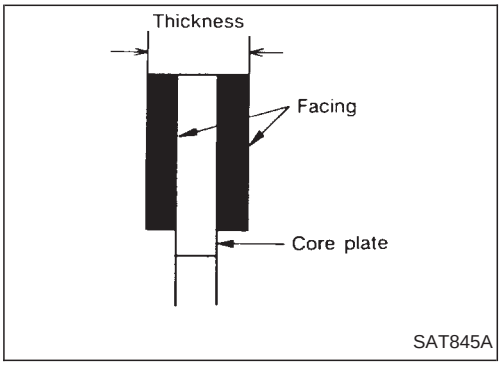
SAT829A

Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

  Inspection standard:

  Refer to SDS, AT-197.



SAT845A

Low and reverse brake drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate:

  Standard value

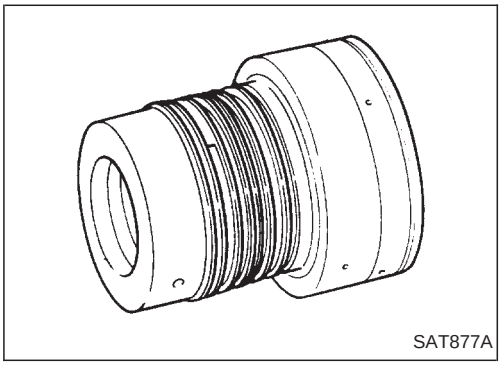
  1.52 - 1.67 mm (0.0598 - 0.0657 in)

  Wear limit

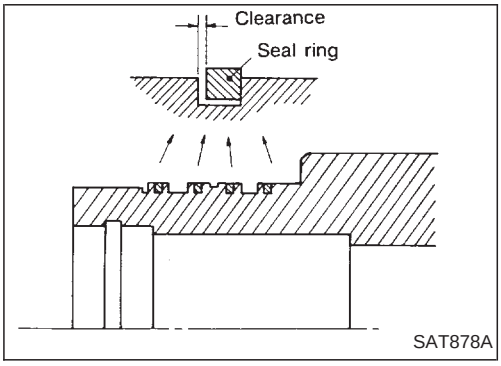
  1.4 mm (0.055 in)
- If not within wear limit, replace.

Low & Reverse Brake (Cont'd)

Low one-way clutch inner race


SAT877A

- Check frictional surface of inner race for wear or damage.



SAT878A

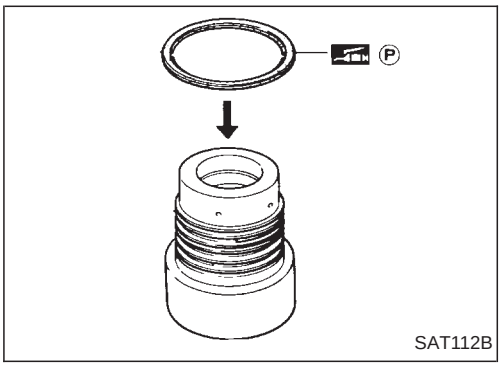
- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

  Inspection standard:

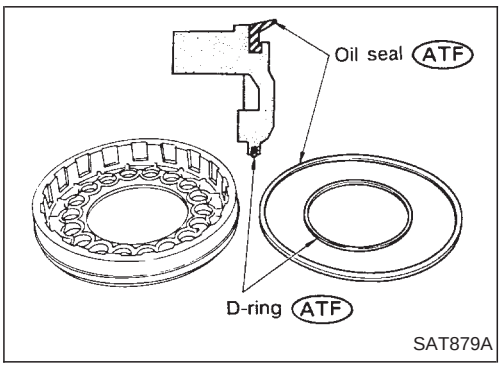
  Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)

  Allowable limit: 0.25 mm (0.0098 in)
- If not within allowable limit, replace low one-way clutch inner race.

ASSEMBLY

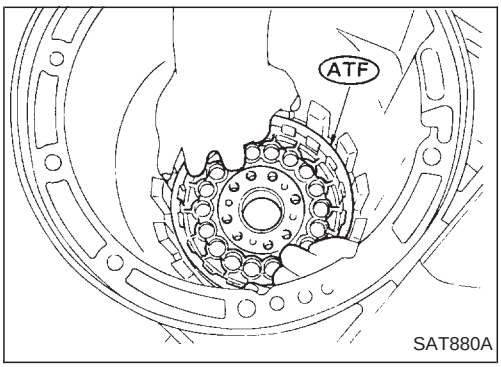

SAT112B

1. Install needle bearing onto one-way clutch inner race.
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**



SAT879A

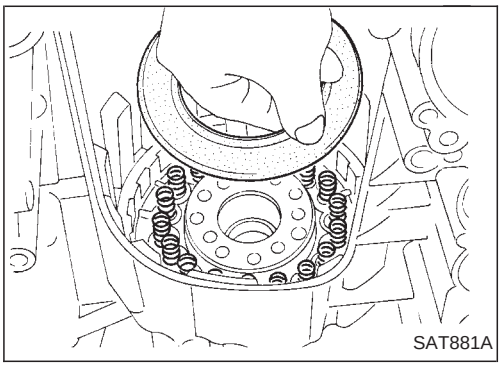
2. Install oil seal and D-ring onto piston.
- **Apply ATF to oil seal and D-ring.**



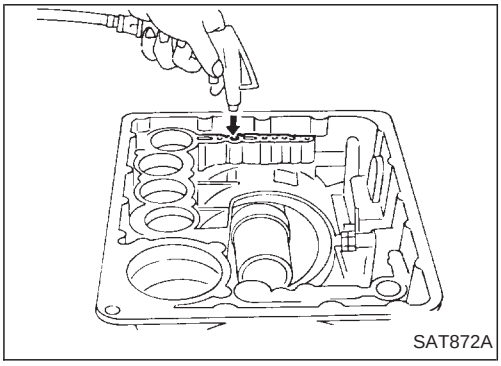
SAT880A

3. Install piston by rotating it slowly and evenly.
- **Apply ATF to inner surface of transmission case.**

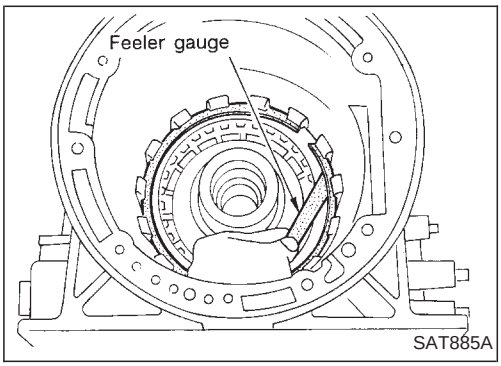
Low & Reverse Brake (Cont'd)


SAT881A

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.

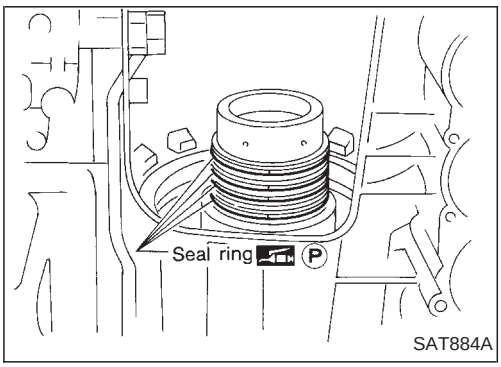

SAT872A

7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY", AT-161.



SAT885A

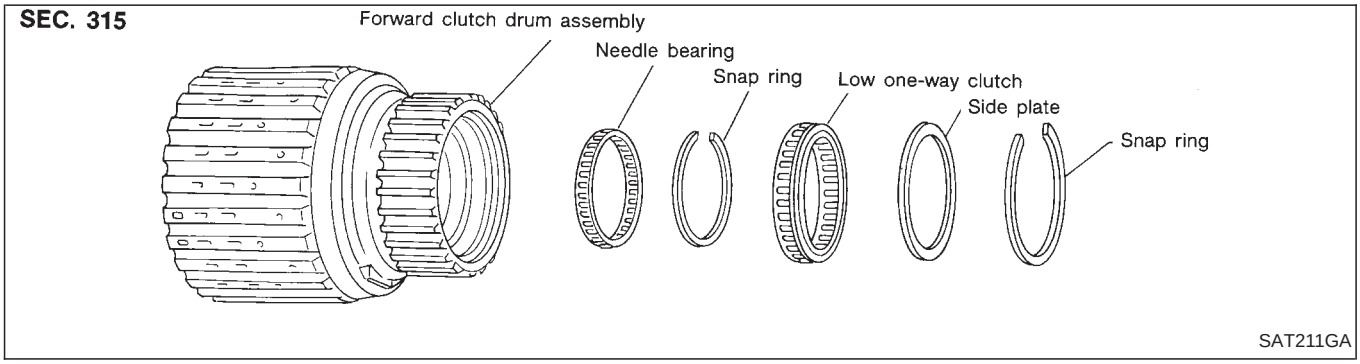
8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.8 - 1.1 mm (0.031 - 0.043 in)
   Allowable limit
   2.5 mm (0.098 in)
   Retaining plate:
   Refer to SDS, AT-198.

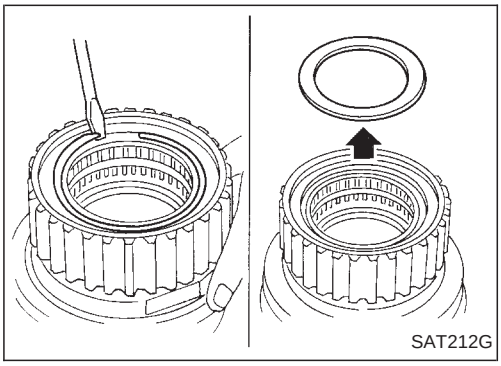


SAT884A

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.**

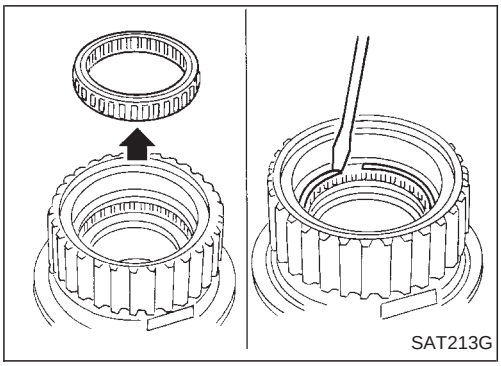
Forward Clutch Drum Assembly



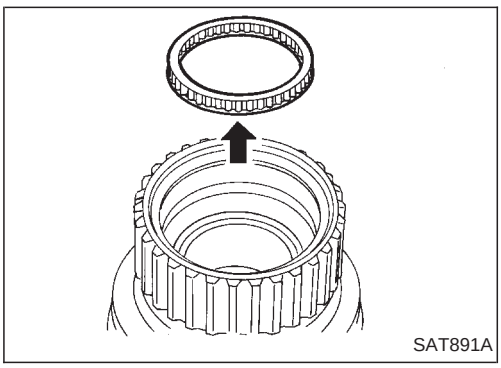


DISASSEMBLY

1. Remove snap ring from forward clutch drum.
2. Remove side plate from forward clutch drum.



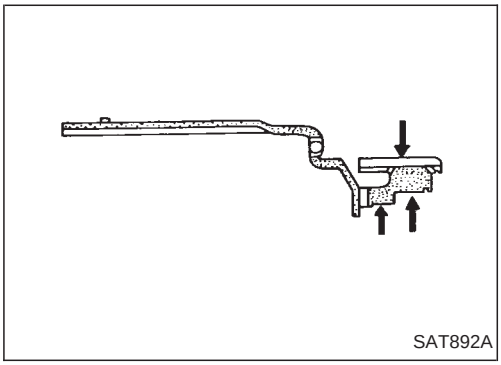
3. Remove low one-way clutch from forward clutch drum.
4. Remove snap ring from forward clutch drum.



5. Remove needle bearing from forward clutch drum.

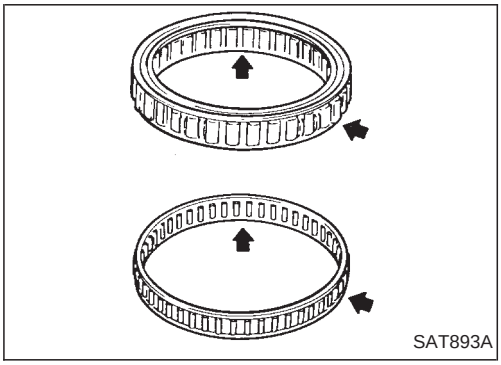
Forward Clutch Drum Assembly (Cont'd)

INSPECTION


SAT892A

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.

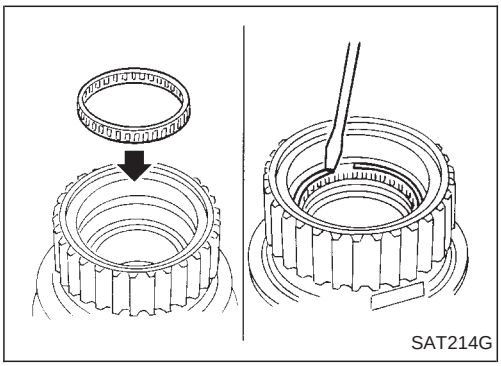

SAT893A

Needle bearing and low one-way clutch

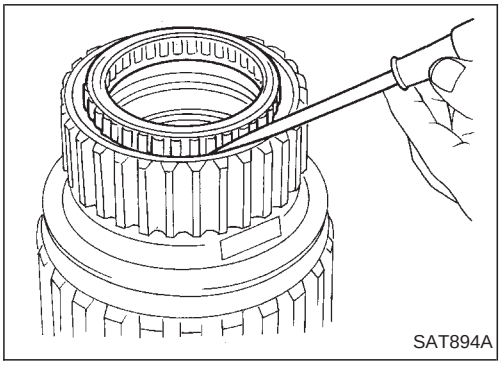
- Check frictional surface for wear or damage.

ASSEMBLY

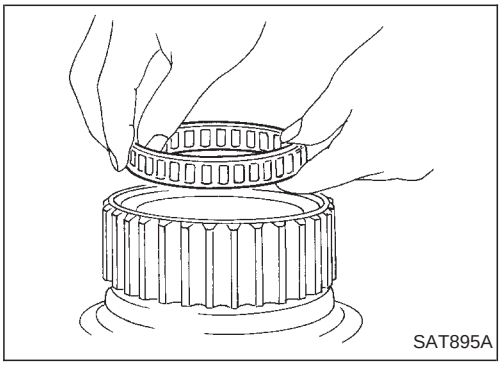
1. Install needle bearing in forward clutch drum.
2. Install snap ring onto forward clutch drum.


SAT214G

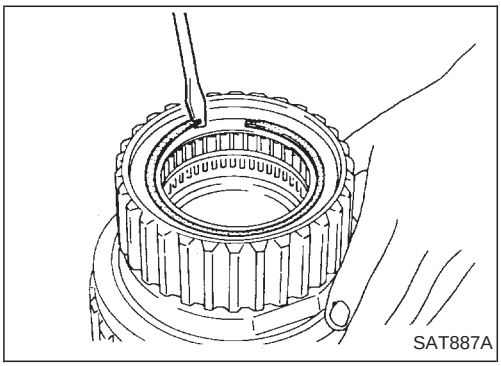
3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.


SAT894A

- **Install low one-way clutch with flange facing rearward.**


SAT895A

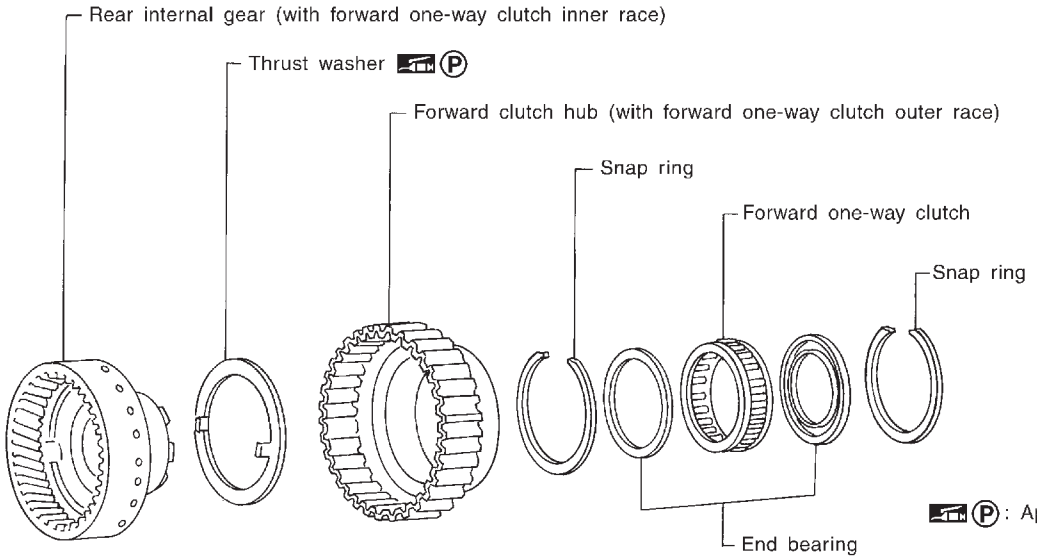
Forward Clutch Drum Assembly (Cont'd)

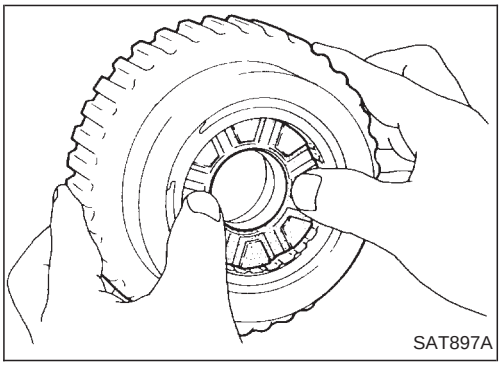

SAT887A

4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

Rear Internal Gear and Forward Clutch Hub

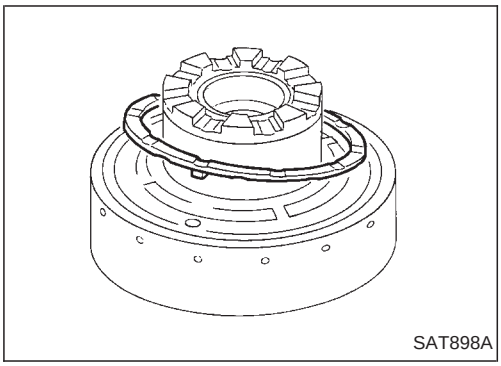
SEC. 315



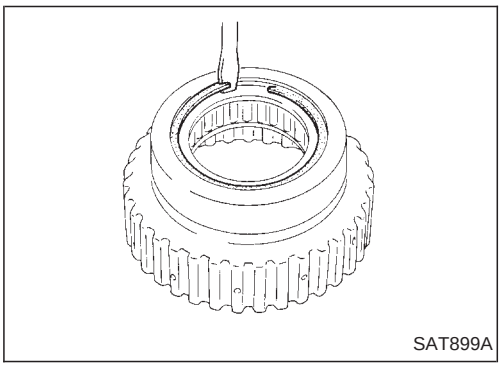


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.

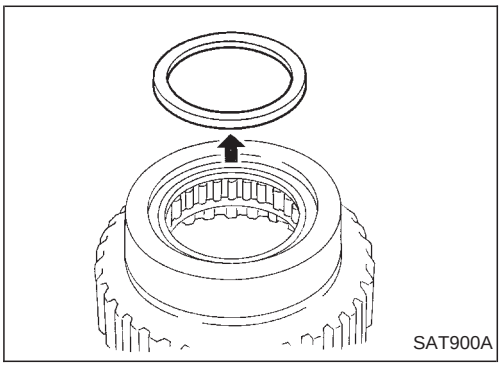


2. Remove thrust washer from rear internal gear.

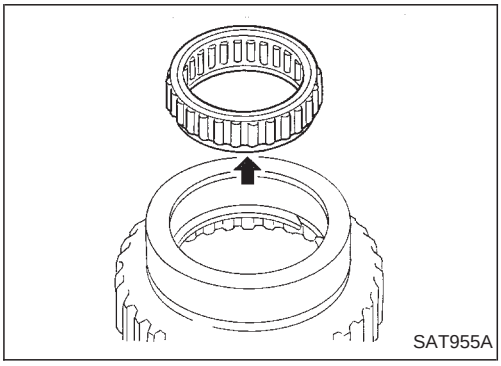


3. Remove snap ring from forward clutch hub.

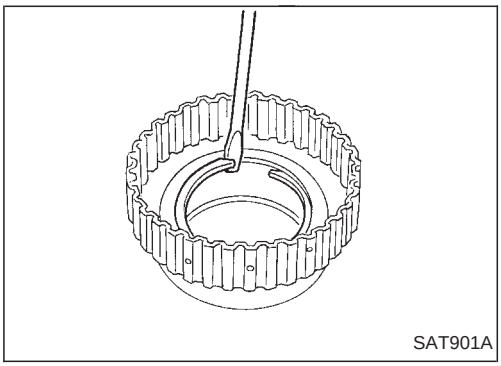
Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

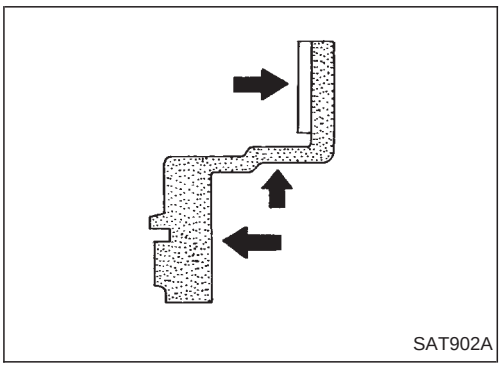

SAT901A

6. Remove snap ring from forward clutch hub.

INSPECTION

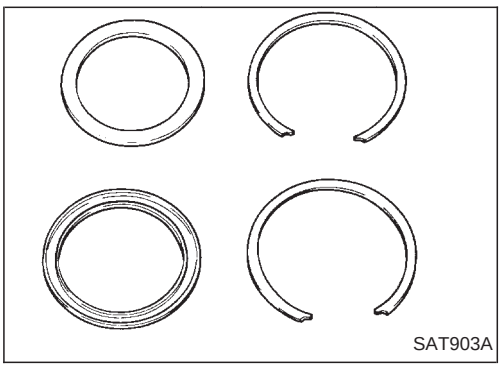
Rear internal gear and forward clutch hub

- 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.

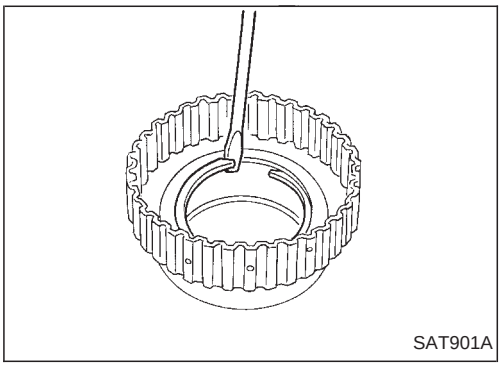

SAT902A

Snap ring and end bearing

- Check for deformation or damage.

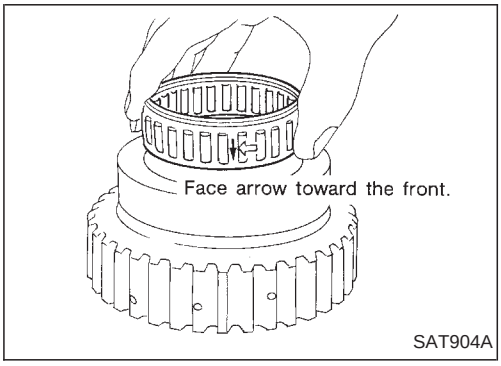

SAT903A

Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT901A

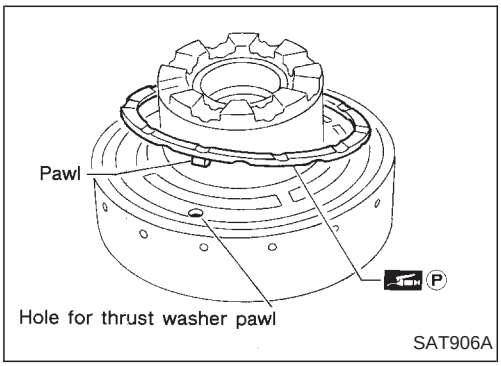
ASSEMBLY

1. Install snap ring onto forward clutch hub.
2. Install end bearing.



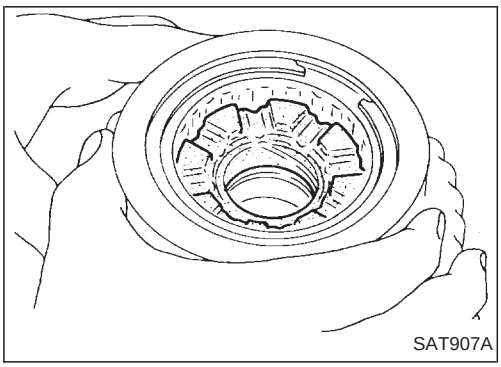
SAT904A

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.

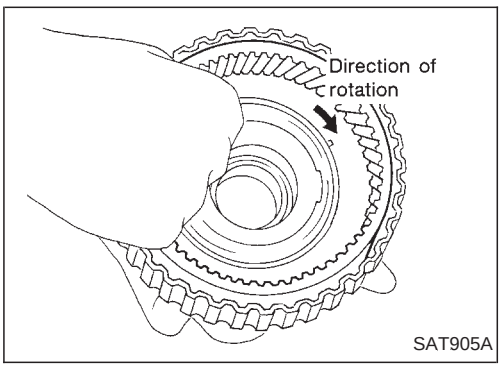


SAT906A

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

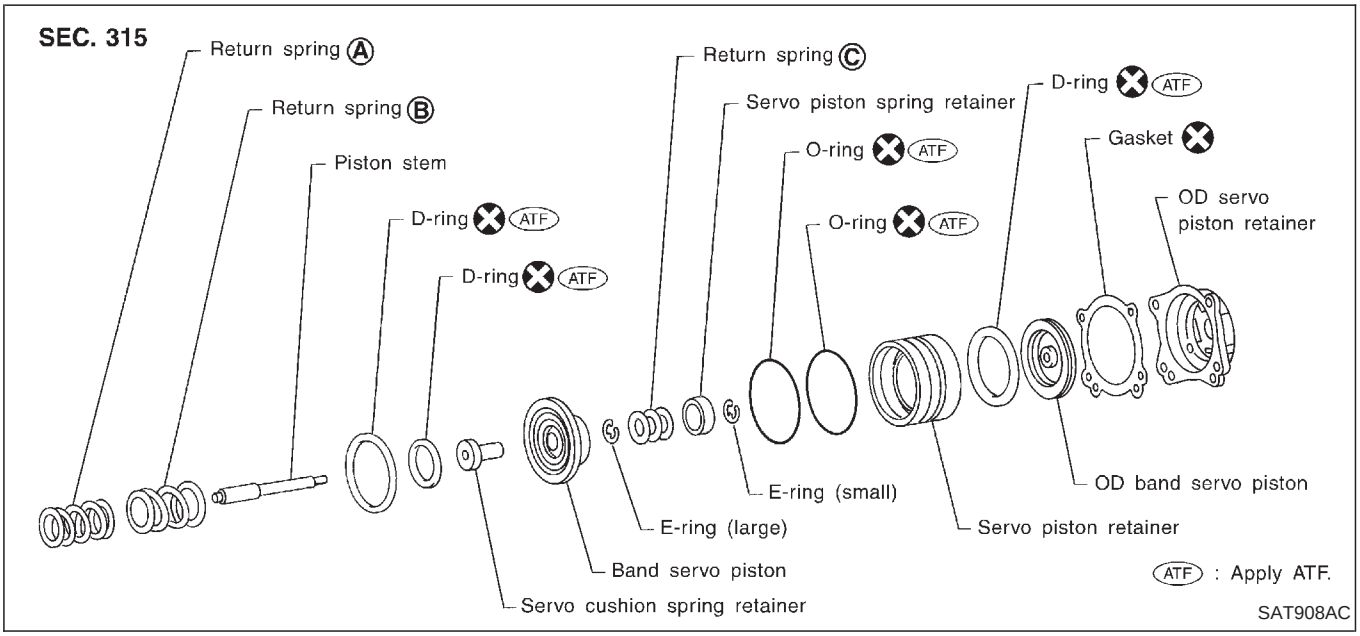
7. Position forward clutch hub in rear internal gear.

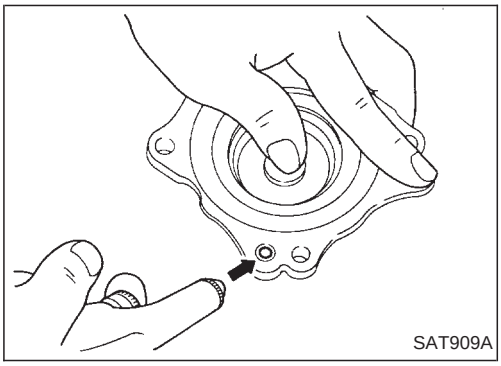


SAT905A

8. After installing, check to assure that forward clutch hub rotates clockwise.

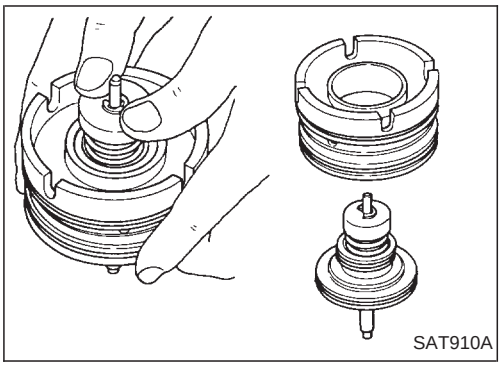
Band Servo Piston Assembly



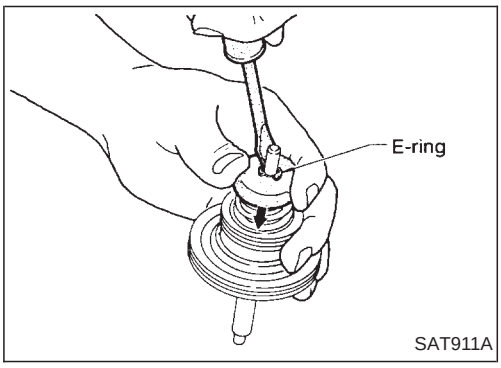


DISASSEMBLY

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.

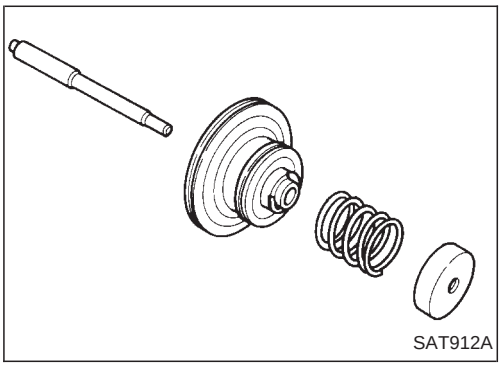


4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

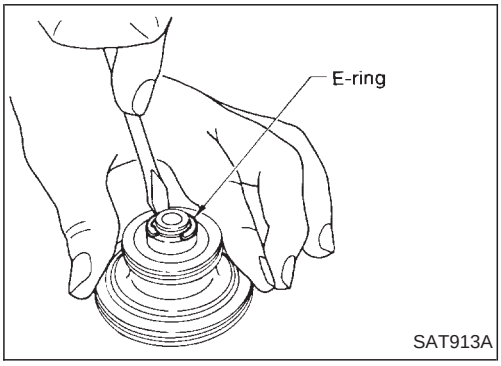


5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

Band Servo Piston Assembly (Cont'd)

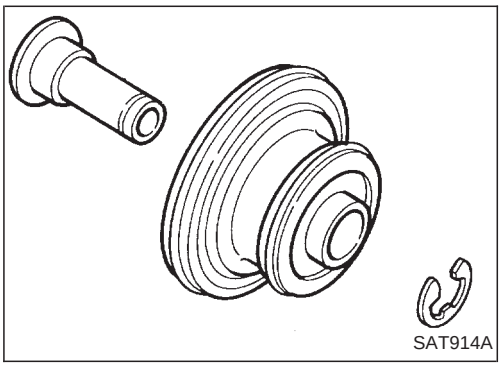

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

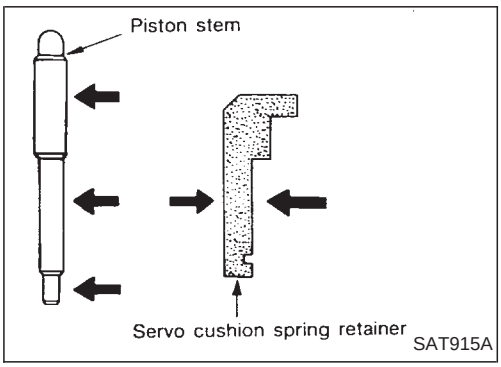


SAT913A

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.

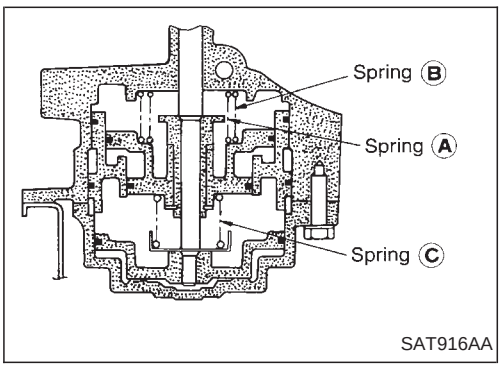


SAT915A

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



SAT916AA

Return springs

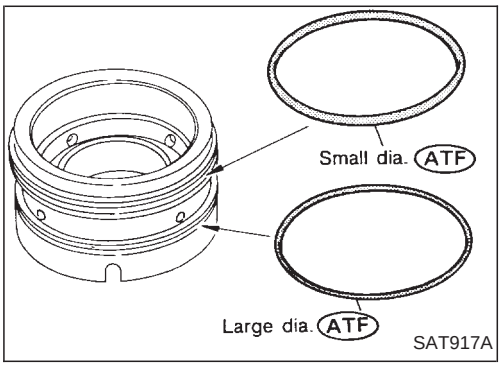
- Check for deformation or damage. Measure free length and outer diameter.

  Inspection standard:

  Refer to SDS, AT-198.

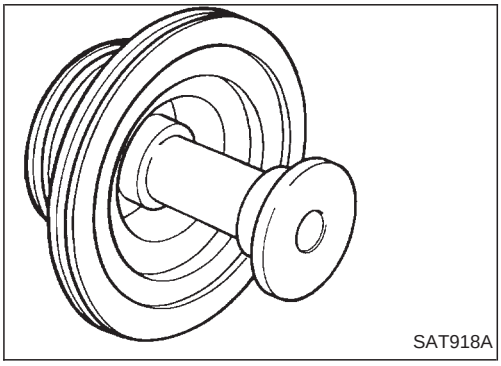
Band Servo Piston Assembly (Cont'd)

ASSEMBLY

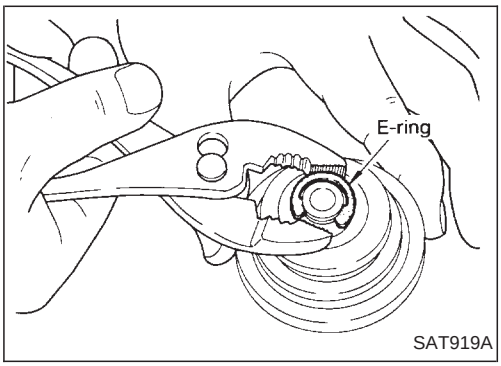


SAT917A

1. Install O-rings onto servo piston retainer.
- **Apply ATF to O-rings.**
- **Pay attention to position of each O-ring.**

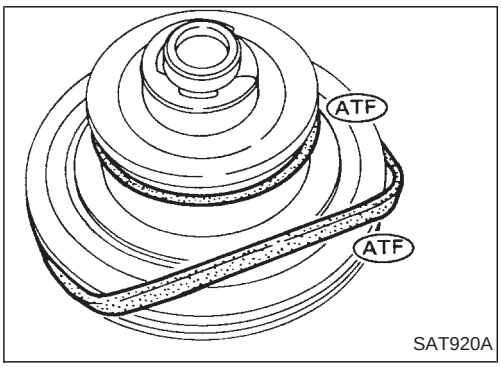

SAT918A

2. Install servo cushion spring retainer onto band servo piston.



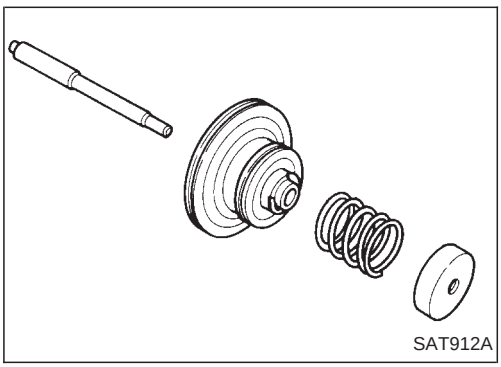
SAT919A

3. Install E-ring onto servo cushion spring retainer.



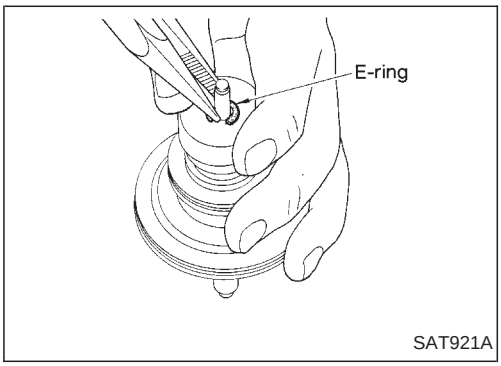
SAT920A

4. Install D-rings onto band servo piston.
- **Apply ATF to D-rings.**


SAT912A

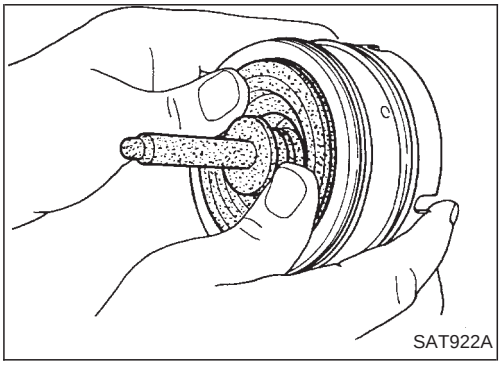
5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

Band Servo Piston Assembly (Cont'd)

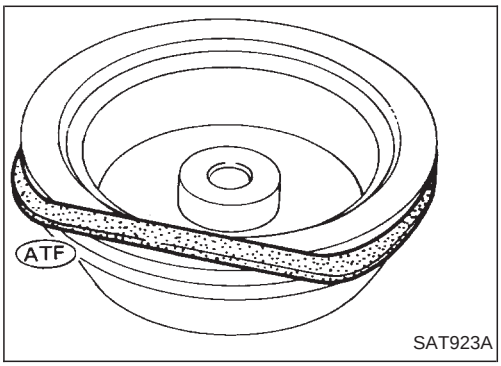


SAT921A

6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.

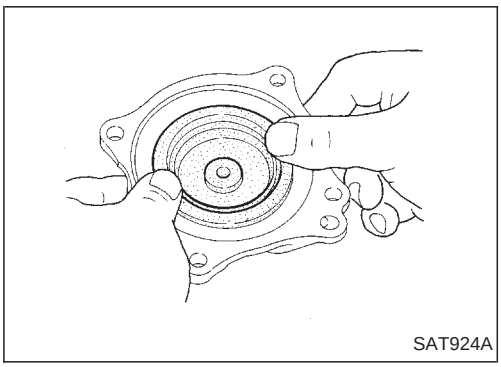

SAT922A

7. Install band servo piston assembly onto servo piston retainer by pushing it inward.



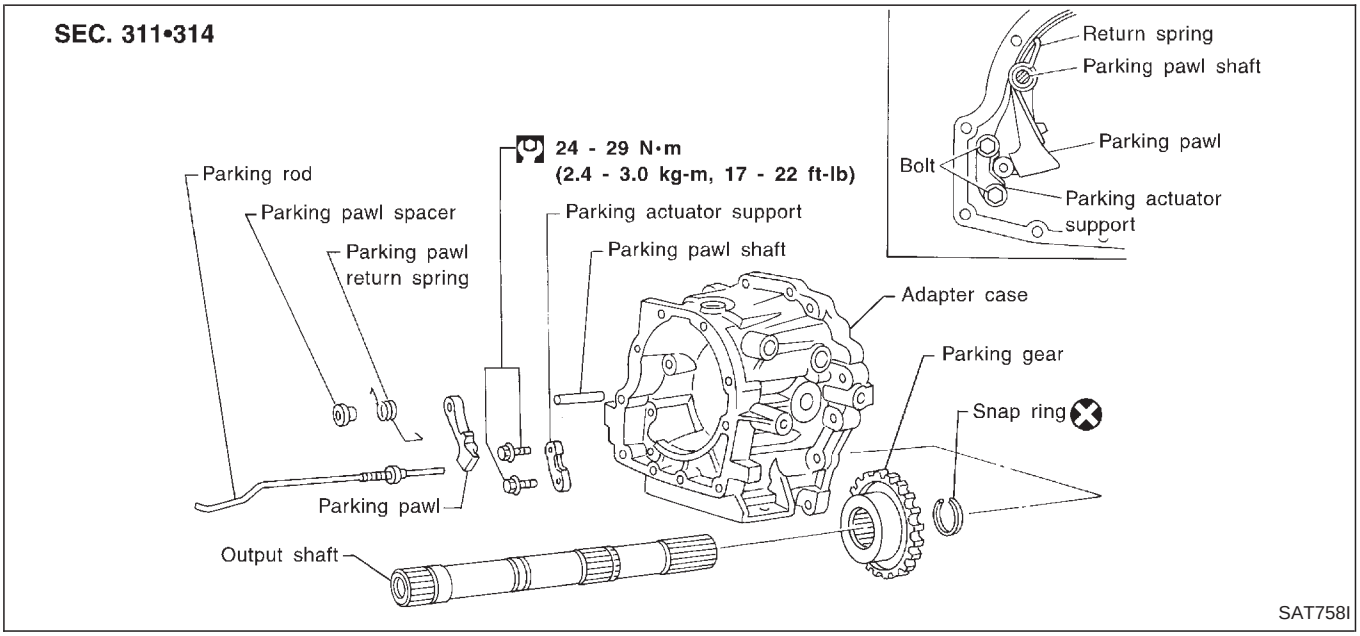
SAT923A

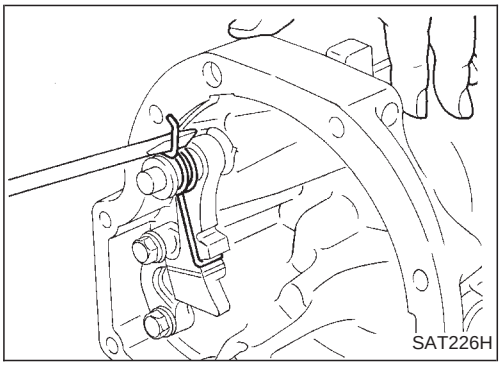
8. Install D-ring on OD band servo piston.
- **Apply ATF to D-ring.**


SAT924A

9. Install OD band servo piston onto servo piston retainer by pushing it inward.

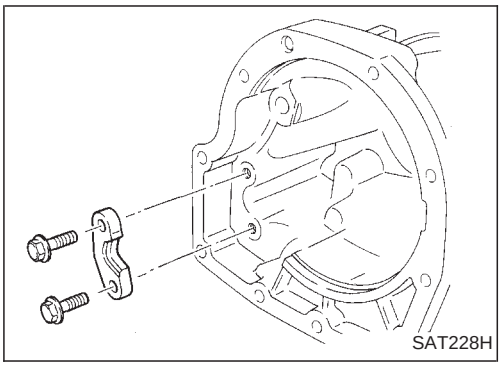
Parking Pawl Components



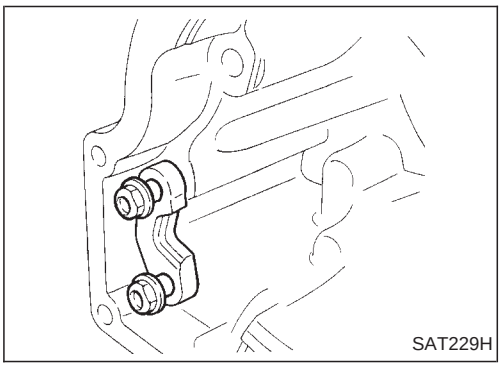


DISASSEMBLY

1. Slide return spring to the front of rear extension case flange or adapter case flange.
2. Remove return spring, pawl spacer and parking pawl from rear extension or adapter case.
3. Remove parking pawl shaft from rear extension or adapter case.



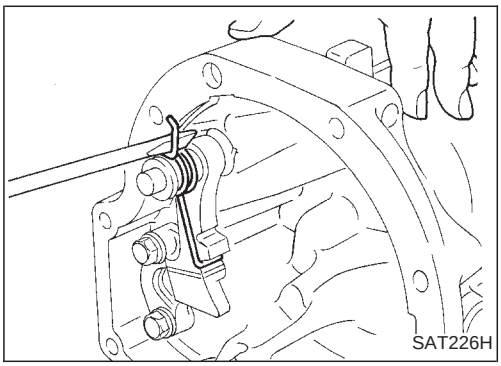
4. Remove parking actuator support from rear extension or adapter case.



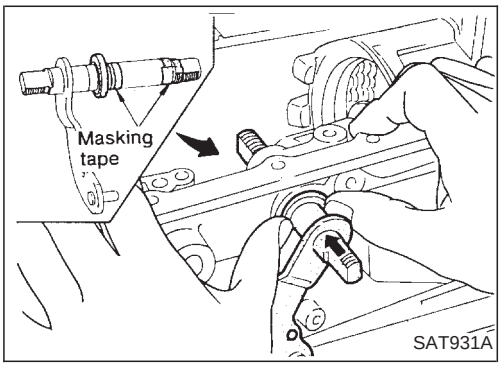
ASSEMBLY

1. Install parking actuator support onto rear extension or adapter case.
2. Insert parking pawl shaft into rear extension or adapter case.
3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.

Parking Pawl Components (Cont'd)


SAT226H

4. Bend return spring upward and install it onto rear extension or adapter case.



Assembly (1)

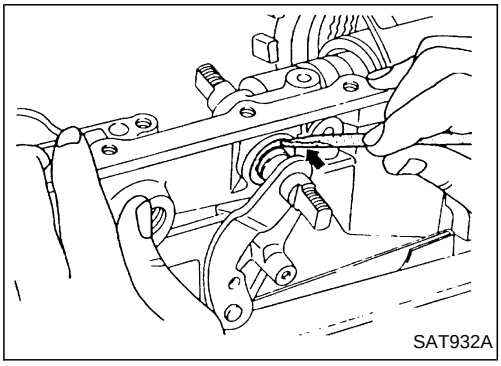
1. Install manual shaft components.

a. Install oil seal onto manual shaft.

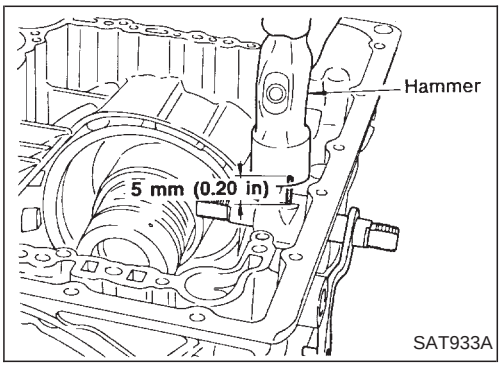
- **Apply ATF to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

b. Insert manual shaft and oil seal as a unit into transmission case.

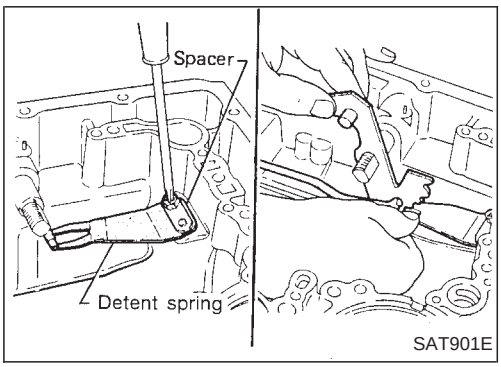
c. Remove masking tape.



d. Push oil seal evenly and install it onto transmission case.

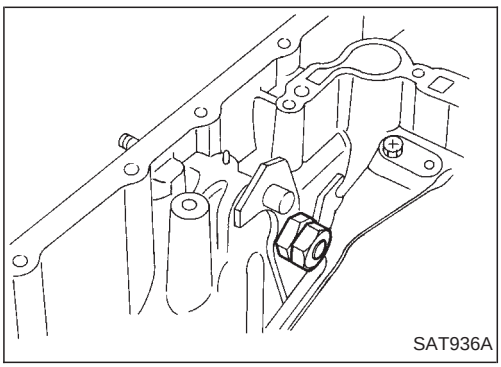


e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



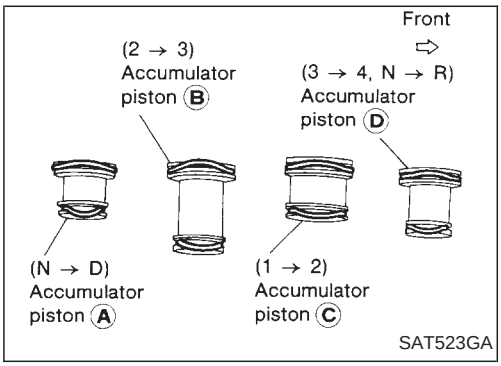
f. Install detent spring and spacer.

g. While pushing detent spring down, install manual plate onto manual shaft.



h. Install lock nuts onto manual shaft.

Assembly (1) (Cont'd)

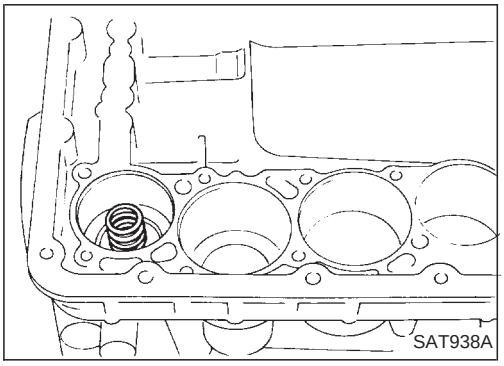


2. Install accumulator piston.
a. Install O-rings onto accumulator piston.
- **Apply ATF to O-rings.**

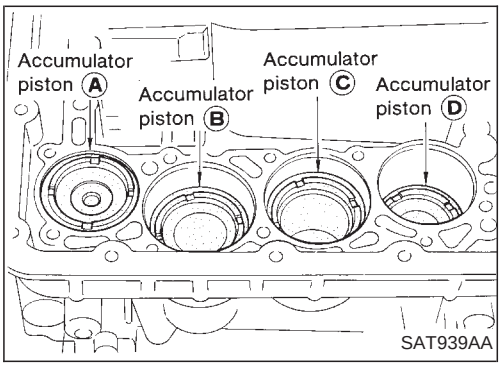
Accumulator piston O-rings

Unit: mm (in)

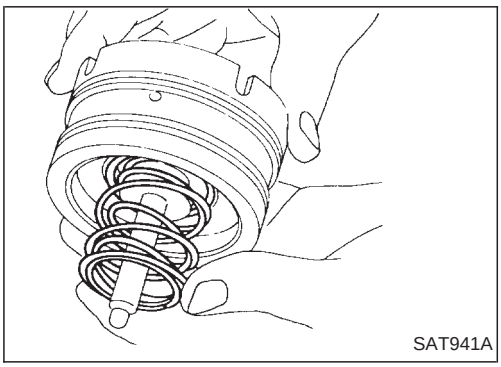
Accumulator	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)



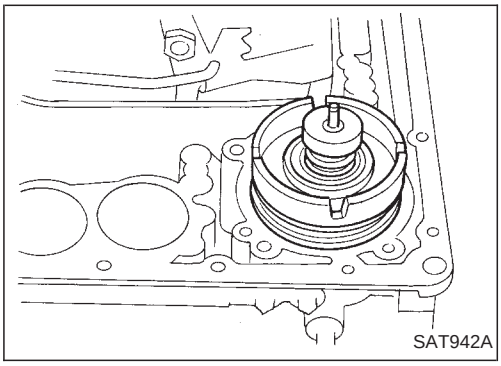
b. Install return spring for accumulator A onto transmission case.
Free length of return spring:
Refer to SDS, AT-197.



c. Install accumulator pistons Ⓐ, Ⓑ, Ⓒ and Ⓓ.
- **Apply ATF to transmission case.**



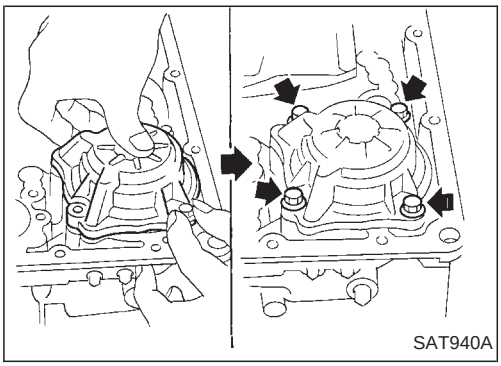
3. Install band servo piston.
a. Install return springs onto servo piston.



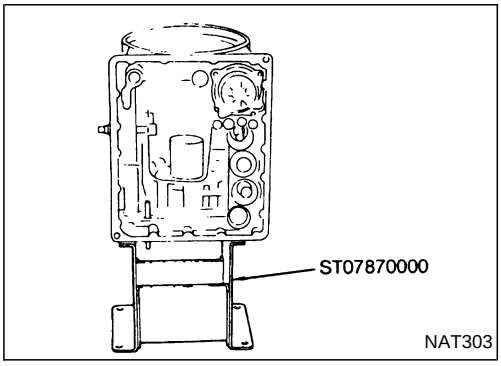
b. Install band servo piston onto transmission case.
- **Apply ATF to O-ring of band servo piston and transmission case.**

c. Install gasket for band servo onto transmission case.

Assembly (1) (Cont'd)

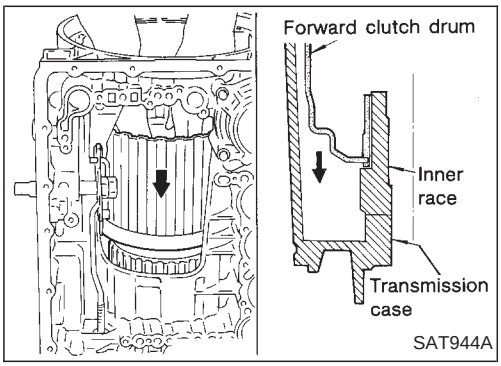

SAT940A

d. Install band servo retainer onto transmission case.



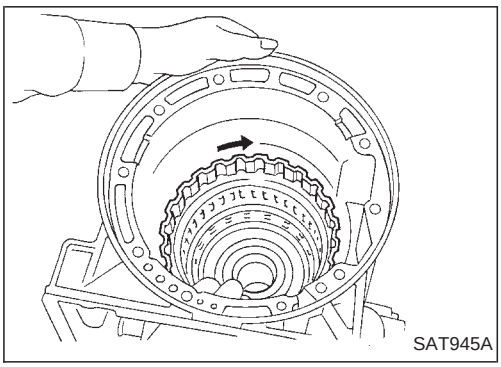
NAT303

4. Install rear side clutch and gear components.
a. Place transmission case in vertical position.

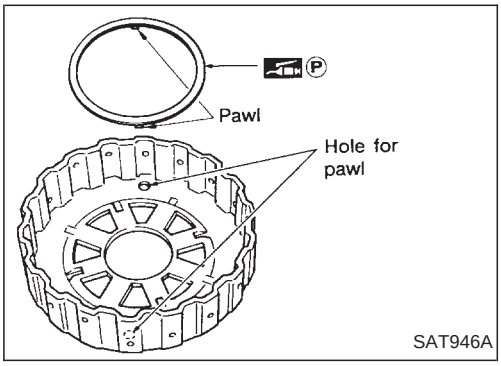


SAT944A

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

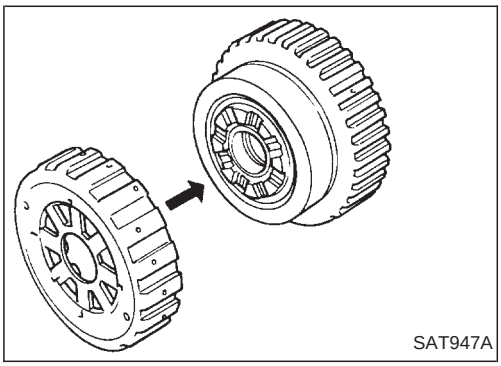
c. Check to be sure that rotation direction of forward clutch assembly is correct.



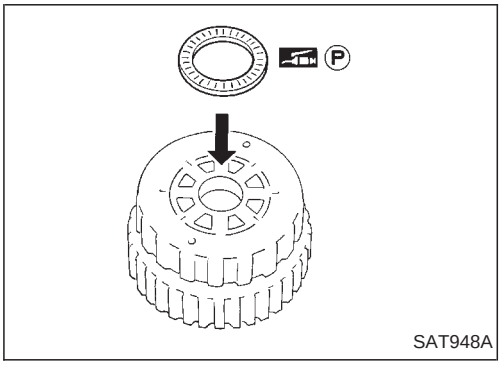
SAT946A

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)

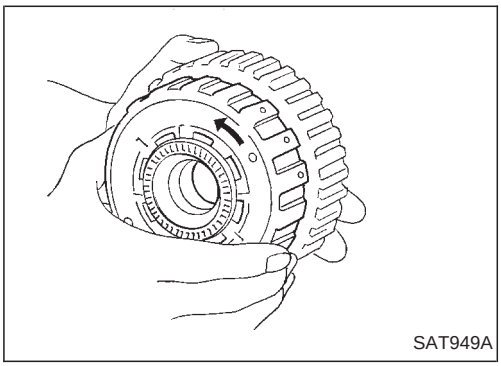

SAT947A

e. Install overrun clutch hub onto rear internal gear assembly.

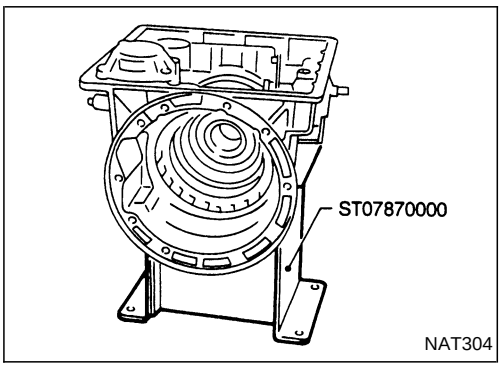


SAT948A

f. Install needle bearing onto rear of overrun clutch hub.
- **Apply petroleum jelly to needle bearing.**

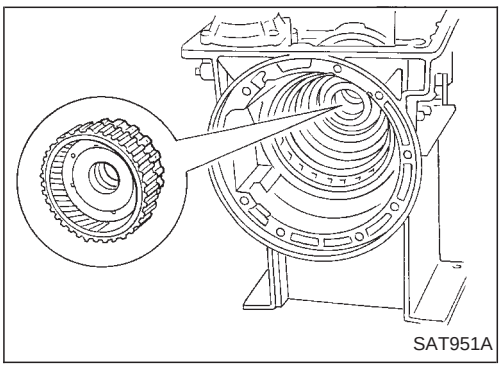

SAT949A

g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.



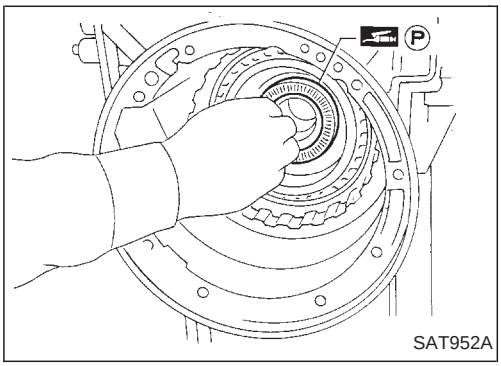
NAT304

h. Place transmission case into horizontal position.

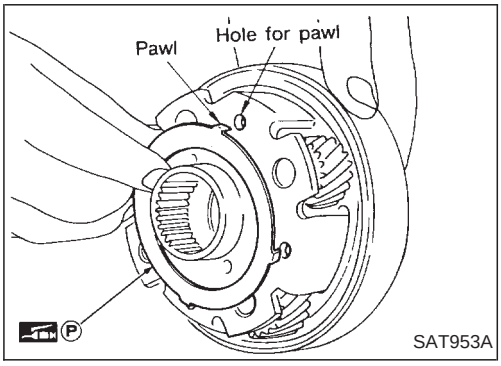

SAT951A

i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.

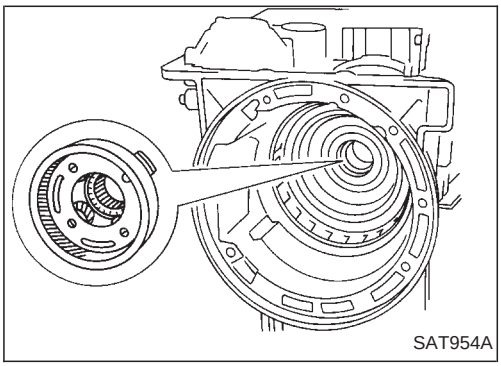
Assembly (1) (Cont'd)



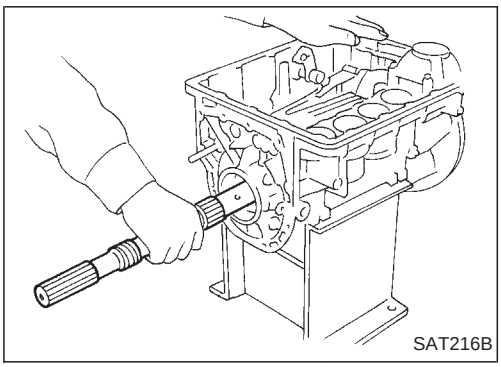
j. Install needle bearing onto rear internal gear.
- **Apply petroleum jelly to needle bearing.**



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.**

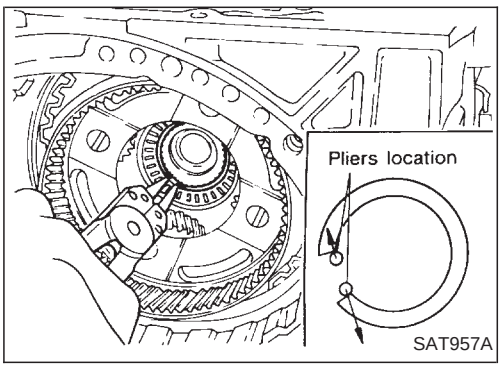


l. Install front internal gear on transmission case.



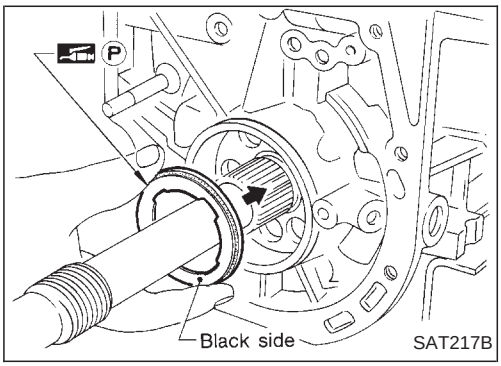
5. Install output shaft and parking gear.

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.**

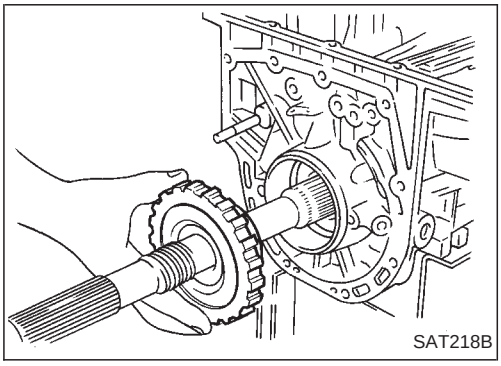


b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
- **Check to be sure output shaft cannot be removed in rear direction.**

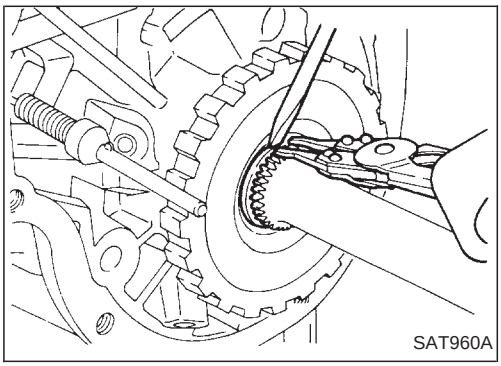
Assembly (1) (Cont'd)



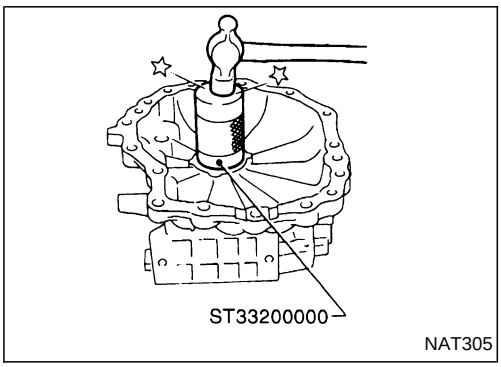
c. Install needle bearing on transmission case.
- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**



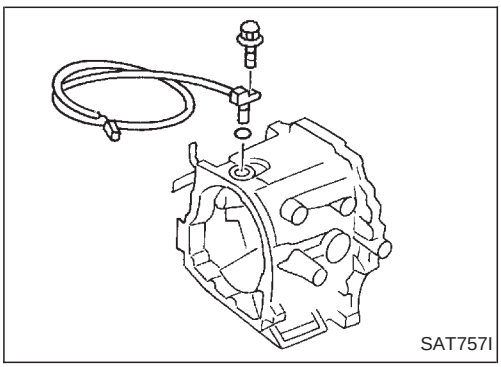
d. Install parking gear on transmission case.



e. Install snap ring on rear of output shaft.
- **Check to be sure output shaft cannot be removed in forward direction.**



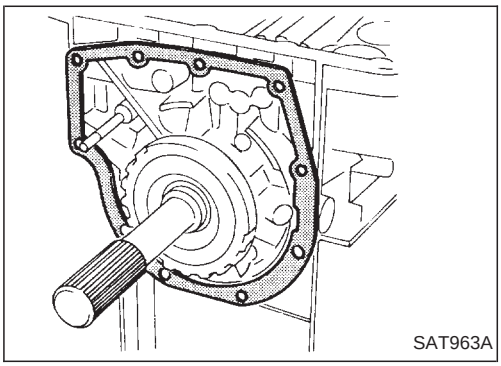
6. Install adapter case.
a. Install oil seal on adapter case.
- **Apply ATF to oil seal.**



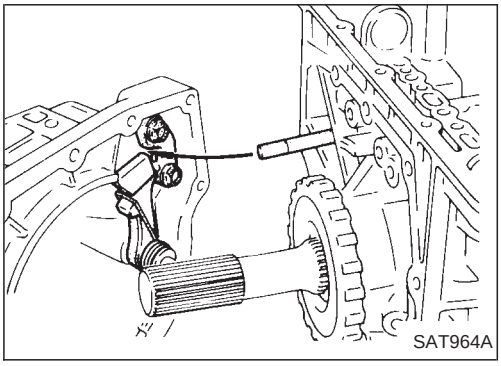
b. Install O-ring on revolution sensor.
- **Apply ATF to O-ring.**

c. Install revolution sensor on adapter case.

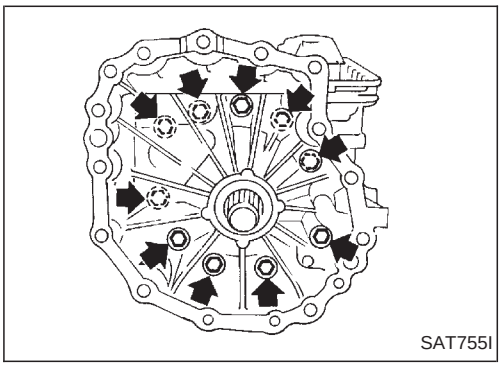
Assembly (1) (Cont'd)


SAT963A

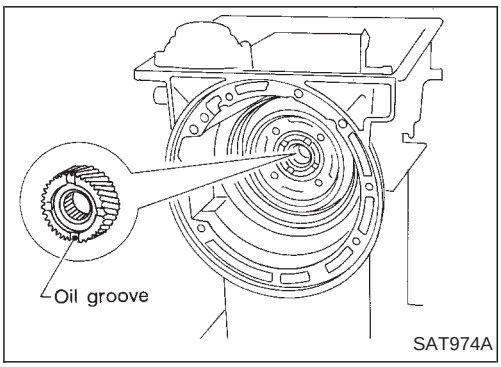
d. Install adapter case gasket on transmission case.


SAT964A

e. Install parking rod on transmission case.

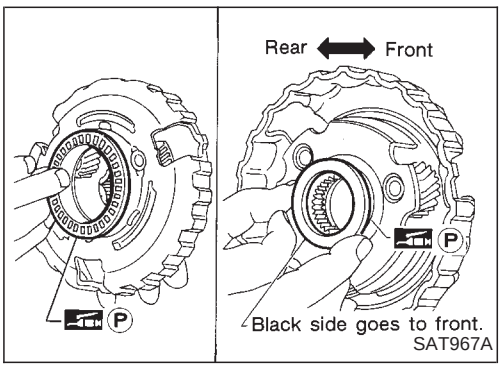

SAT755I

f. Install adapter case on transmission case.



SAT974A

7. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**

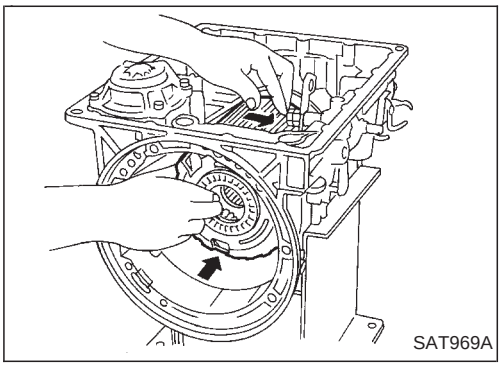


SAT967A

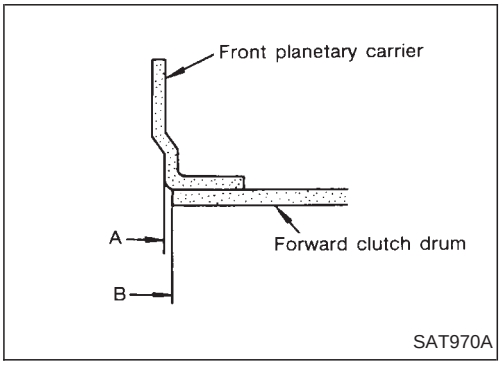
b. Make sure needle bearing is on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

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.**

Assembly (1) (Cont'd)

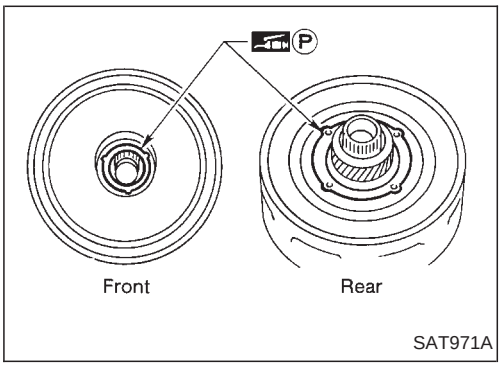

SAT969A

d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



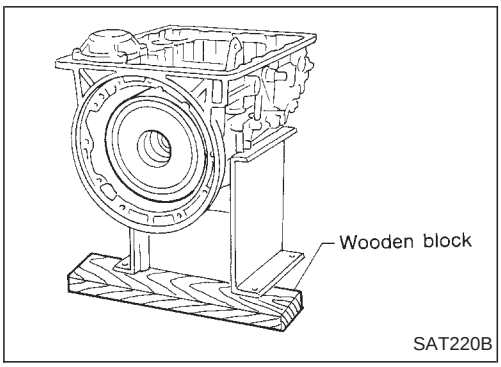
SAT970A

- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**



SAT971A

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.**



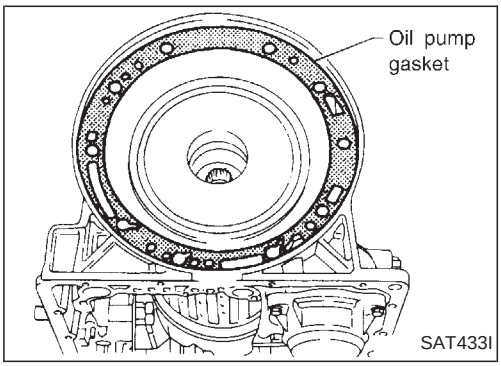
SAT220B

f. Install clutch pack into transmission case.

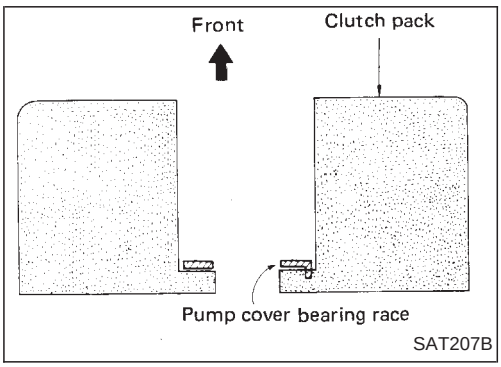
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

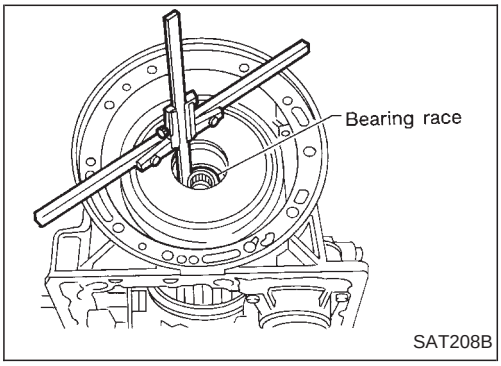
Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Low one-way clutch inner race	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●



1. Adjust total end play.
a. Install new oil pump gasket on transmission case.

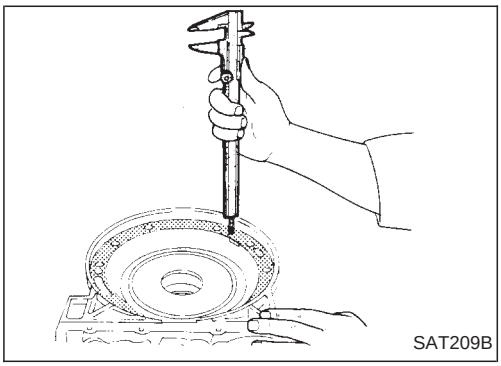


b. Install pump cover bearing race on clutch pack.

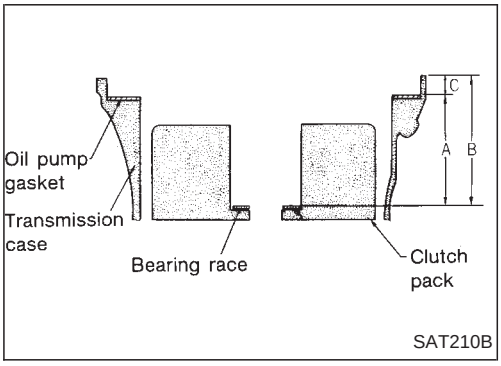


c. Measure distance “B” between front end of transmission case and oil pump cover bearing race.

Adjustment (Cont'd)

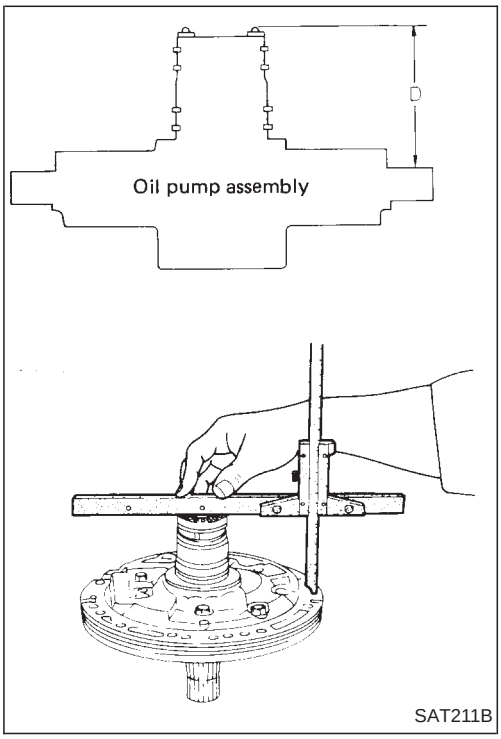

SAT209B

d. Measure distance "C" between front end of transmission case and oil pump cover gasket.



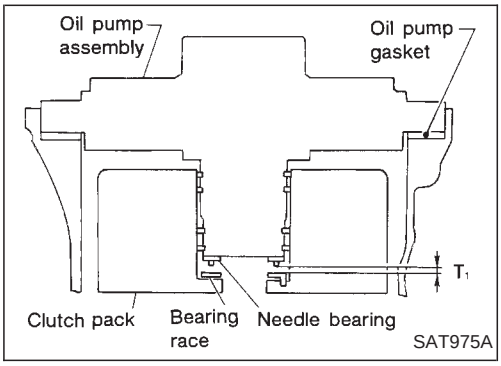
SAT210B

e. Determine dimension "A" by using the following equation.
A = B − C



SAT211B

f. Install needle bearing on oil pump assembly.
g. Measure distance "D" between needle bearing and machined surface of oil pump cover assembly.

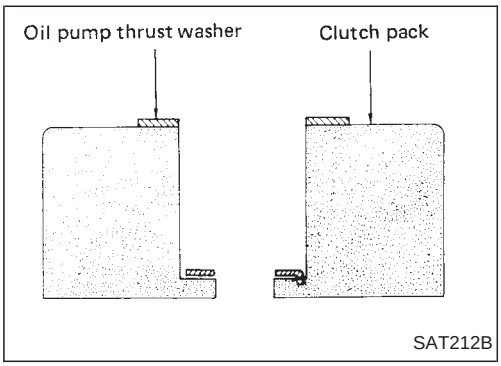


SAT975A

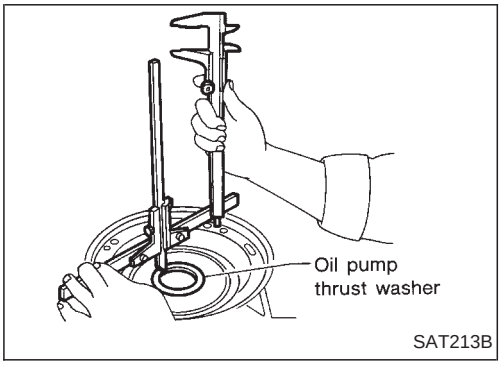
h. Determine total end play "T_1" by using the following equation.
T_1 = A − D − 0.1
Total end play "T_1":
0.25 - 0.55 mm (0.0098 - 0.0217 in)

- 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-199.

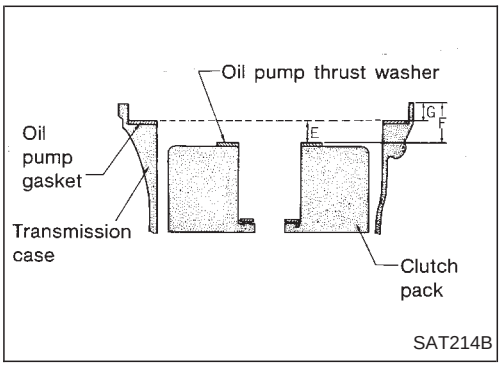
Adjustment (Cont'd)



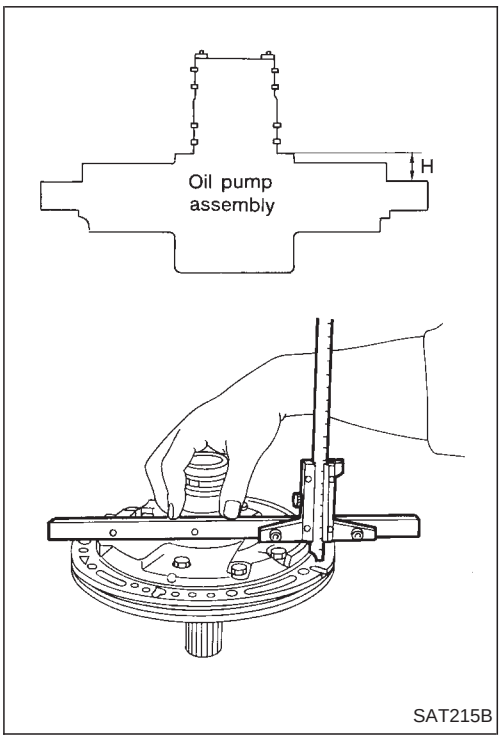
2. Adjust reverse clutch drum end play.
a. Install oil pump thrust washer on clutch pack.



b. Measure distance "F" between front end of transmission case and oil pump thrust washer.
c. Measure distance "G" between front end of transmission case and gasket.

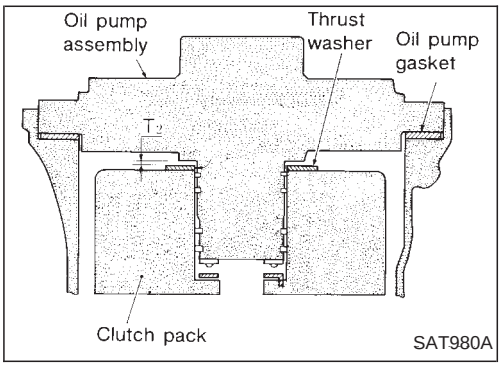


d. Determine dimension "E" by using the following equation.
E = F − G



e. Measure distance "H".

Adjustment (Cont'd)



f. Determine reverse clutch drum end play "T_2" by using the following equation.

T_2 = E − H − 0.1

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:

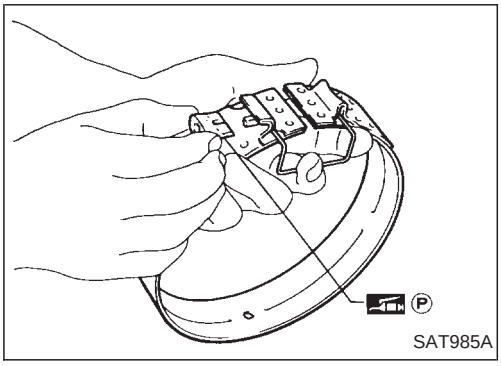
Refer to SDS, AT-199.

Assembly (2)

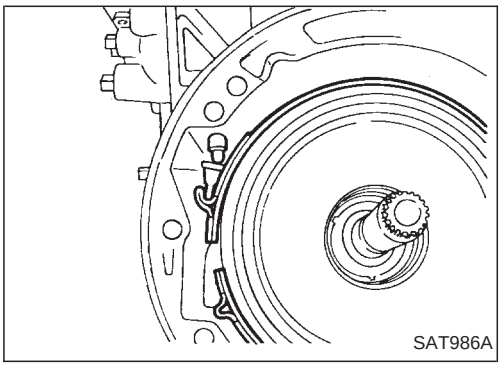
1. Install brake band and band strut.

a. Install band strut on brake band.

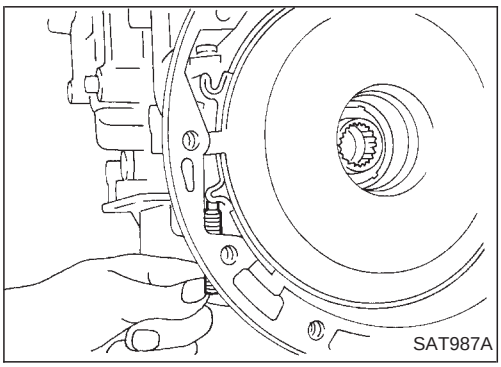
- **Apply petroleum jelly to band strut.**



b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



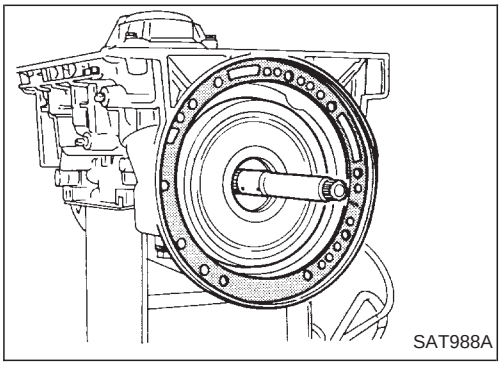
c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



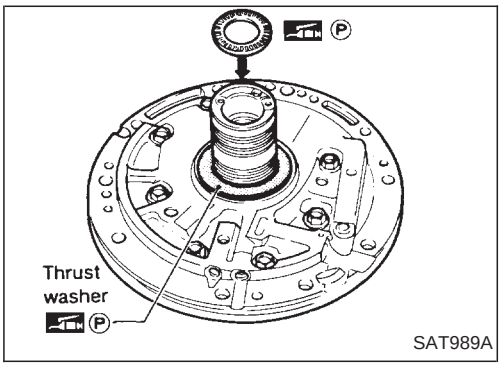
2. Install input shaft on transmission case.

- **Pay attention to its direction — O-ring groove side is front.**

3. Install gasket on transmission case.



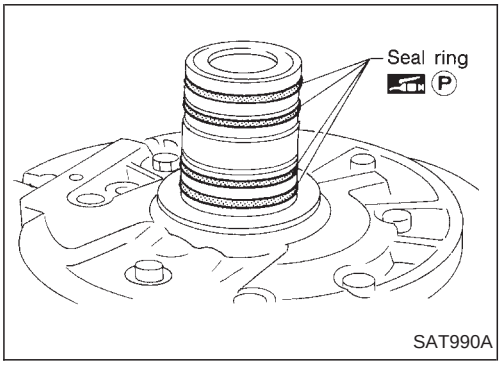
Assembly (2) (Cont'd)



SAT989A

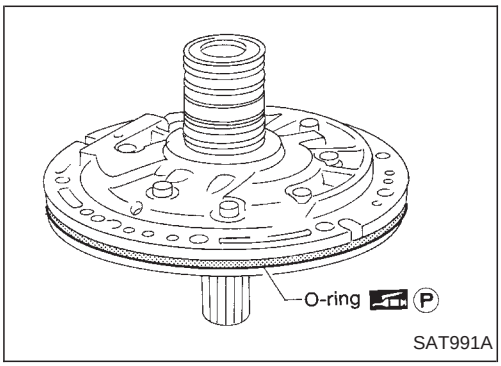
4. Install oil pump assembly.
a. Install needle bearing on oil pump assembly.
- **Apply petroleum jelly to the needle bearing.**

b. Install selected thrust washer on oil pump assembly.
- **Apply petroleum jelly to thrust washer.**



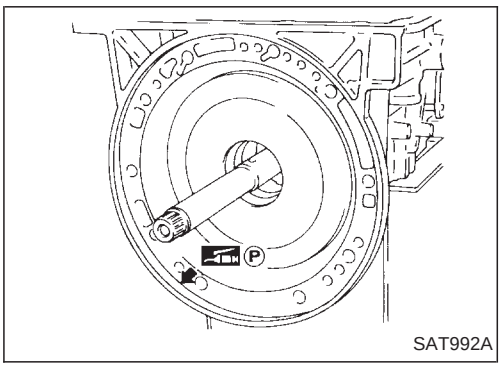
SAT990A

c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



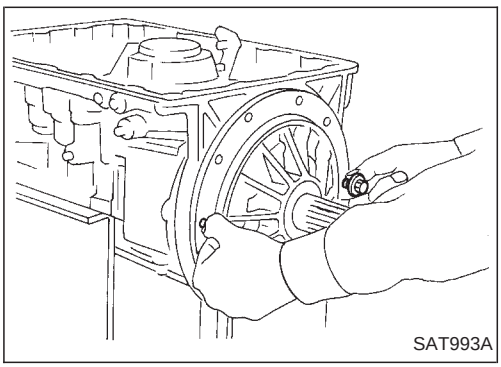
SAT991A

d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**



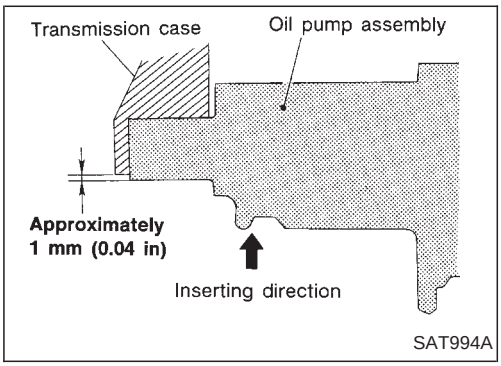
SAT992A

e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.


SAT993A

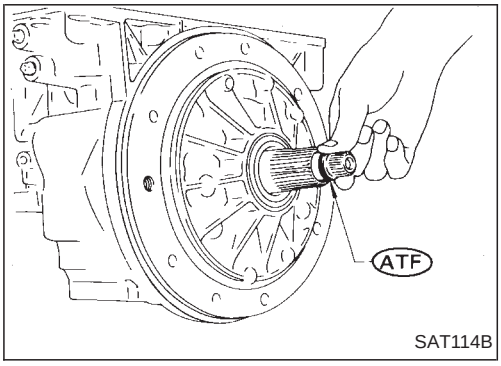
f. Install oil pump assembly.
- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

Assembly (2) (Cont'd)



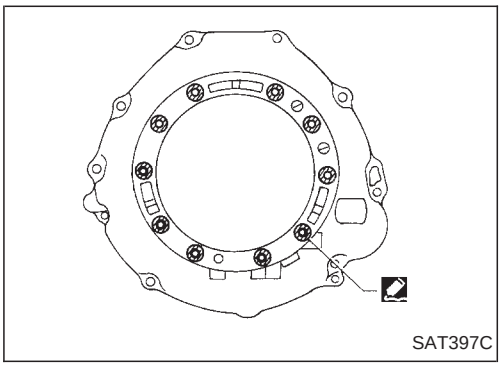
SAT994A

- **Insert oil pump assembly to the specified position in transmission, as shown at left.**

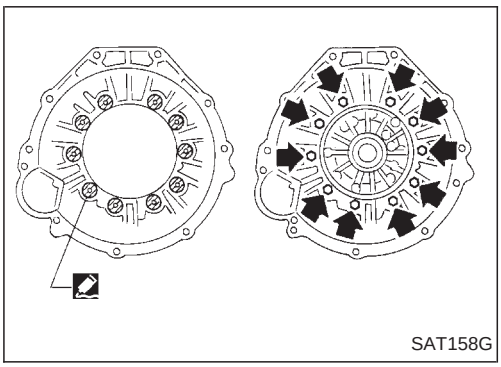


SAT114B

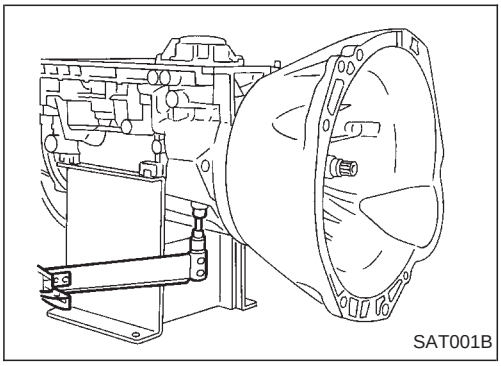
5. Install O-ring on input shaft.
- **Apply ATF to O-rings.**


SAT397C

6. Install converter housing.
a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
- **Do not apply too much sealant.**

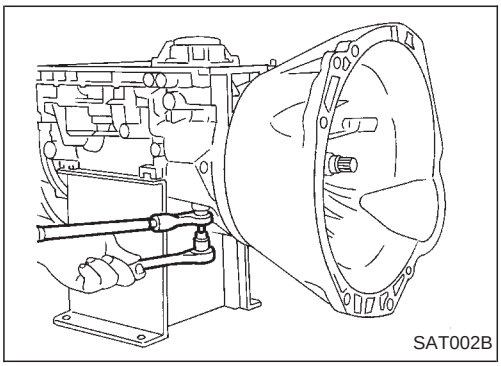

SAT158G

b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.
c. Install converter housing on transmission case.

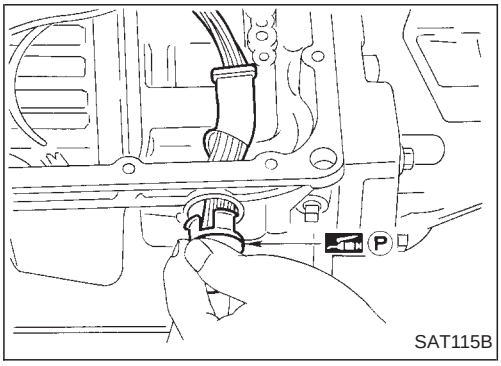

SAT001B

7. 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.

Assembly (2) (Cont'd)


SAT002B

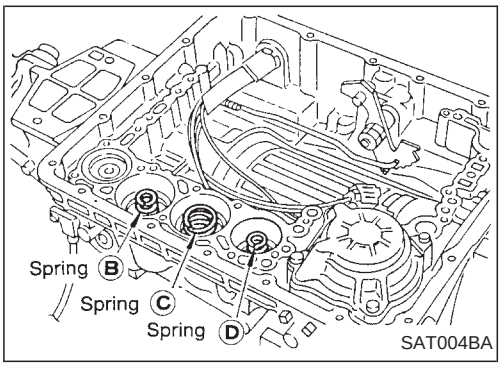
c. While holding anchor end pin, tighten lock nut.



SAT115B

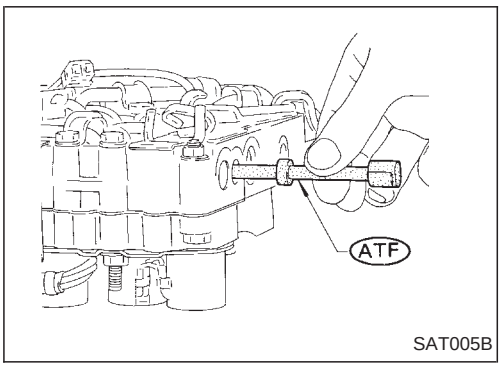
8. Install terminal cord assembly.
a. Install O-ring on terminal cord assembly.
- **Apply petroleum jelly to O-ring.**

b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



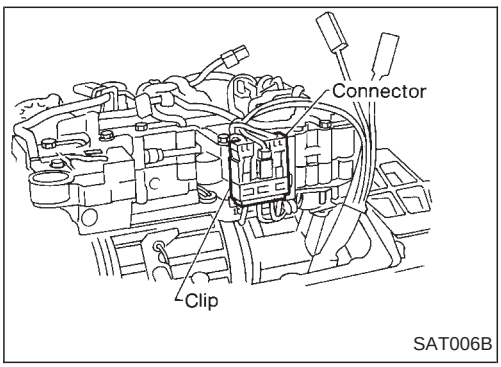
SAT004BA

9. Install control valve assembly.
a. Install accumulator piston return springs Ⓑ, Ⓒ and Ⓓ.
Free length of return springs:
Refer to SDS, AT-197.



SAT005B

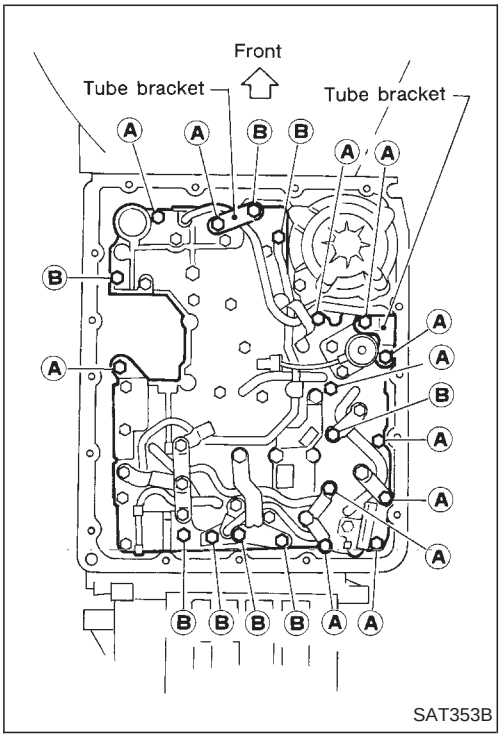
b. Install manual valve on control valve.
- **Apply ATF to manual valve.**



SAT006B

c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.

Assembly (2) (Cont'd)

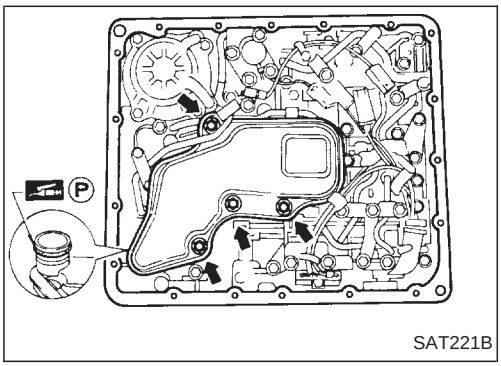


SAT353B

e. Install control valve assembly on transmission case.
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.

- **Check that terminal assembly does not catch.**

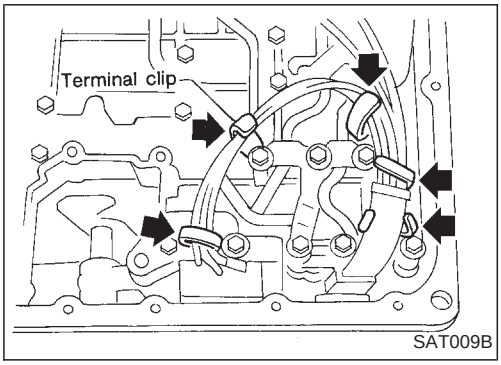
Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)



SAT221B

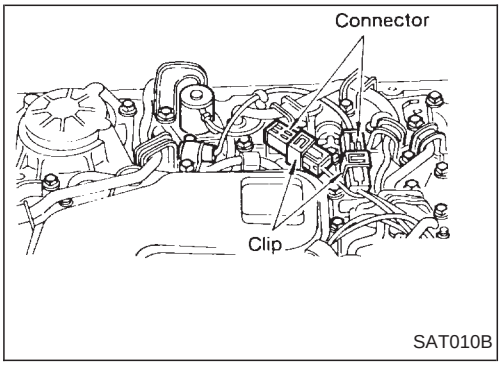
g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**

h. Install oil strainer on control valve.



SAT009B

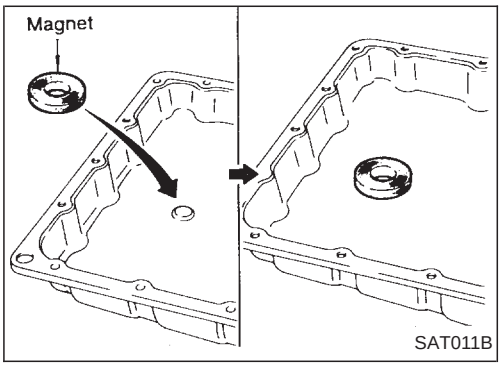
i. Securely fasten terminal harness with clips.



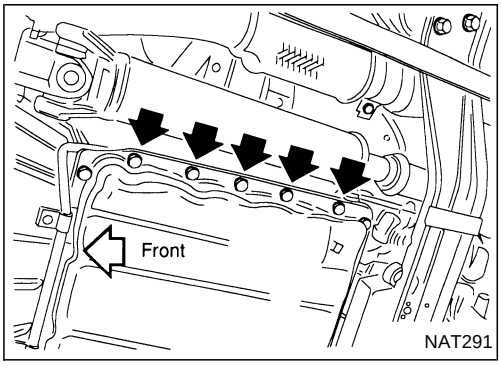
SAT010B

j. Install torque converter clutch solenoid valve and fluid temperature sensor connectors.

Assembly (2) (Cont'd)

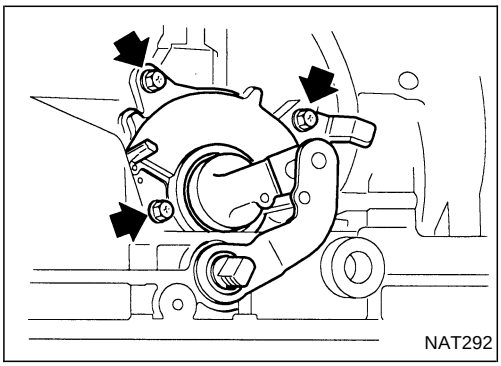


10. Install oil pan.
a. Attach a magnet to oil pan.

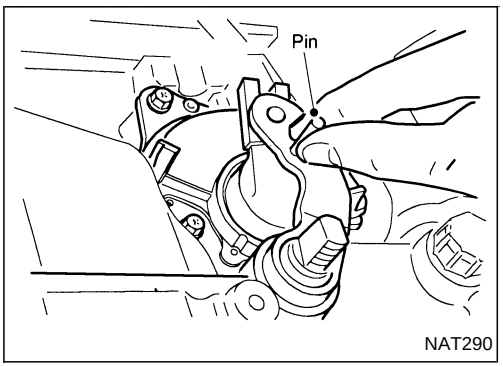


b. Install new oil pan gasket on transmission case.
c. Install oil pan and bracket on transmission case.
- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Before installing bolts, remove traces of sealant and oil from mating surface and thread holes.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

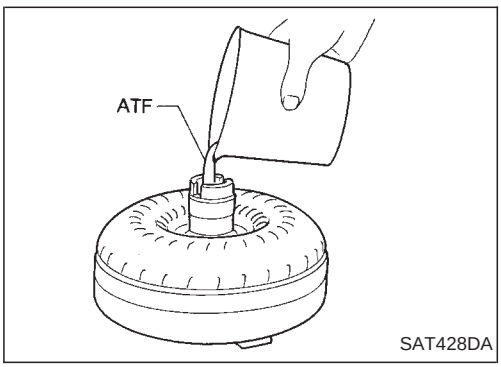
d. Tighten drain plug.



11. Install park/neutral position switch.
a. Check that manual shaft is in "1" position.
b. Temporarily install park/neutral position switch on manual shaft.
c. Move manual shaft to "N".

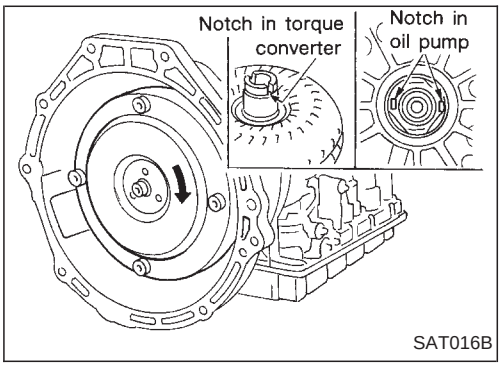


d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in park/neutral position switch and manual shaft.

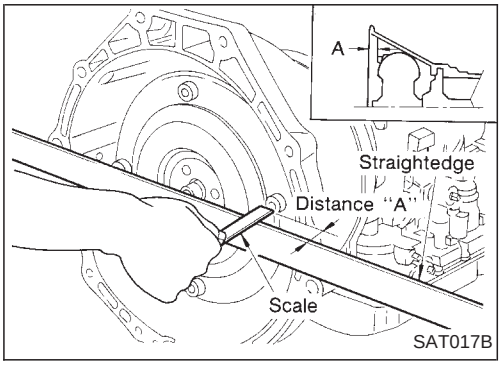


12. Install torque converter.
a. Pour ATF into torque converter.
- **Approximately 2 liters (1-3/4 Imp qt) of fluid are required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**

Assembly (2) (Cont'd)



b. Install torque converter while aligning notches and oil pump.

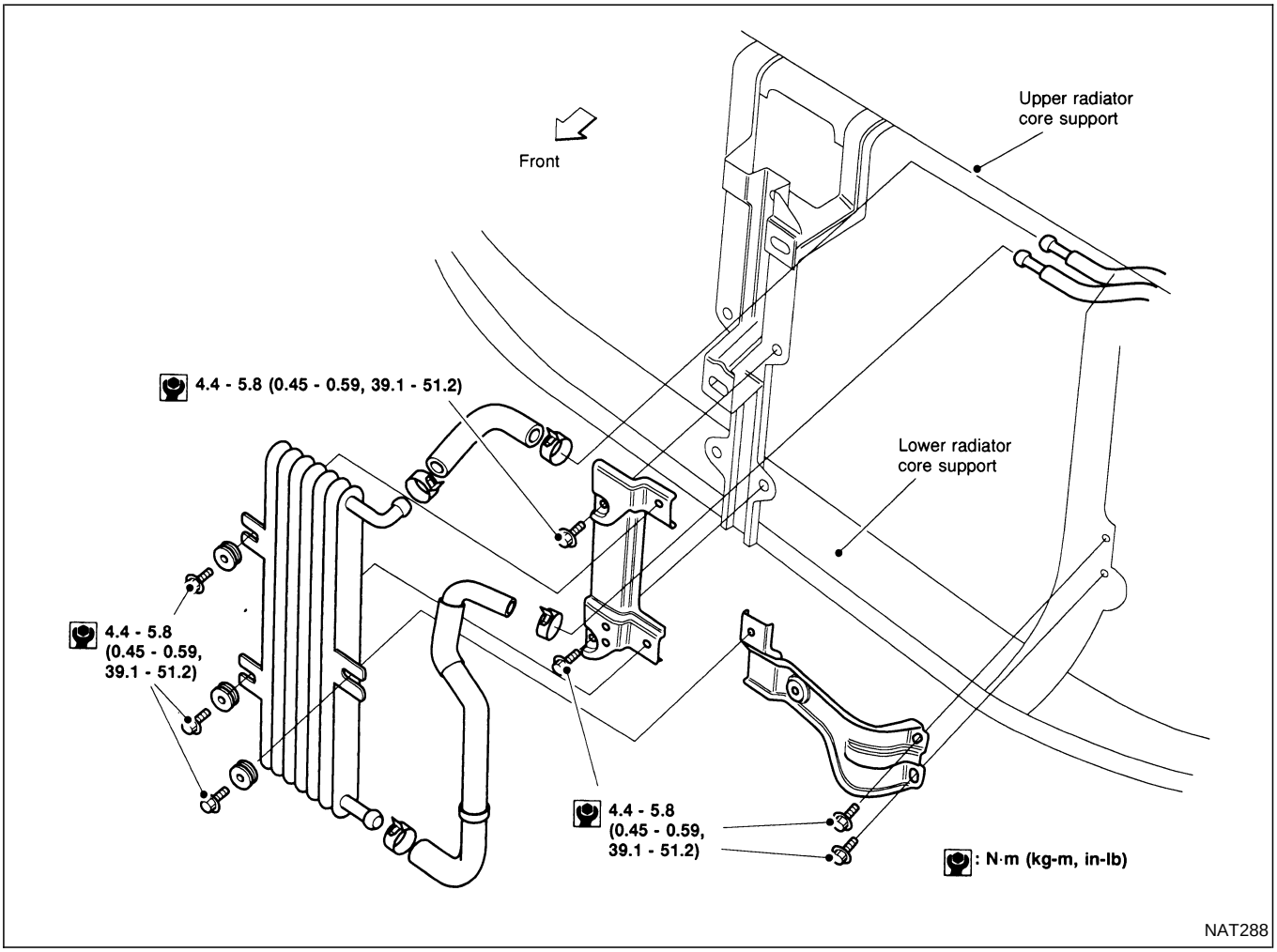


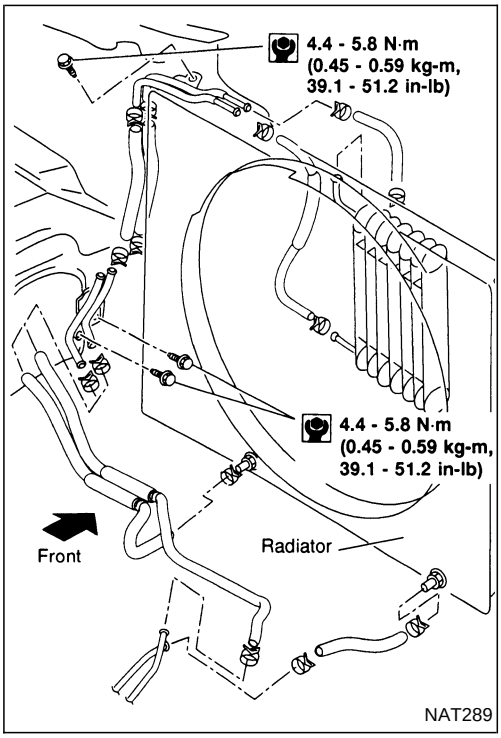
c. Measure distance A to check that torque converter is in proper position.

Distance "A":

26.0 mm (1.024 in) or more

A/T Fluid Cooler





REMOVAL AND INSTALLATION

1. Remove front radiator grill. Refer to BT section (“BODY END”).
2. Disconnect fluid hoses from fluid cooler unit.
3. Remove fluid cooler unit.
4. Remove fluid cooler bracket.
5. Remove clips securing fluid hose (cooler unit to radiator) and loosen hose clamps, then remove the fluid hose.
6. Loosen clamps securing fluid hose (A/T assembly to fluid cooler), then remove the fluid hose.
7. Remove bolts securing fluid cooler tube bracket.
8. Remove fluid hose with bracket.

Reverse the removal procedure to install the A/T fluid cooler unit. Refer to the component drawing and specified tightening torque.

Check A/T fluid level and refill if necessary. Refer to MA section (“CHASSIS AND BODY MAINTENANCE”).

General Specifications

Applied model	TD27ETi engine
Automatic transmission model	RE4R01A
Transmission model code number	4GX07
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 fluid	Genuine Nissan ATF or equivalent*1
Fluid capacity ℓ (Imp qt)	8.5 (7-1/2)

*1: 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	32 - 36 (20 - 23)	66 - 74 (41 - 46)	108 - 118 (68 - 74)	103 - 113 (64 - 71)	61 - 69 (38 - 43)	27 - 31 (17 - 19)	43 - 47 (27 - 29)
Half throttle	30 - 34 (19 - 21)	62 - 68 (39 - 43)	82 - 92 (51 - 58)	67 - 75 (42 - 47)	26 - 32 (16 - 20)	7 - 11 (4 - 7)	43 - 47 (27 - 29)

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]	121 - 129 (76 - 81)	116 - 124 (73 - 78)
	OFF [D_3]	74 - 82 (46 - 51)	74 - 82 (46 - 51)
Half throttle	ON [D_4]	104 - 112 (65 - 70)	93 - 101 (58 - 63)
	OFF [D_3]	74 - 82 (46 - 51)	74 - 82 (46 - 51)

STALL REVOLUTION

Stall revolution	rpm	2,450 - 2,700

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm^2, psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.22 - 4.61, 4.3 - 4.7, 61 - 67)	589 - 627 (5.89 - 6.27, 6.01 - 6.40, 85.4 - 90.9)
Stall	1,020 - 1,098 (10.20 - 10.98, 10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.22 - 15.00, 14.5 - 15.3, 206 - 218)

Specifications and Adjustment (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts				Item		
				Part No.	Free length	Outer diameter
Control valve	Upper body	Torque converter relief valve spring	①	31742-41X23	38.0 (1.496)	9.0 (0.354)
		Pressure regulator valve spring	②	31742-41X24	44.02 (1.7331)	14.0 (0.551)
		Pressure modifier valve spring	③	31742-41X19	31.95 (1.2579)	6.8 (0.268)
		Accumulator control valve spring	—	—	—	—
		Shuttle shift valve D spring	④	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 sequence valve spring	⑤	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve B spring	⑥	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 relay valve spring	⑦	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve A spring	⑧	31762-41X01	25.0 (0.984)	7.0 (0.276)
		Overrun clutch control valve spring	⑨	31762-41X03	23.6 (0.929)	7.0 (0.276)
		Overrun clutch reducing valve spring	⑩	31742-41X20	32.5 (1.280)	7.0 (0.276)
		Shuttle shift valve S spring	⑪	31762-41X04	51.0 (2.008)	5.65 (0.2224)
		Pilot valve spring	⑫	31742-41X13	25.7 (1.012)	9.0 (0.354)
		Torque converter clutch control valve spring	⑬	31742-41X22	18.5 (0.728)	13.0 (0.512)
	Lower body	Modifier accumulator piston spring	①	31742-27X70	31.4 (1.236)	9.8 (0.386)
		1st reducing valve spring	②	31756-41X05	25.4 (1.000)	6.75 (0.2657)
		3-2 timing valve spring	③	31742-41X06	23.0 (0.906)	6.7 (0.264)
		Servo charger valve spring	④	31742-41X06	23.0 (0.906)	6.7 (0.264)
Reverse clutch		16 pcs		31521-41X02 (Assembly)	19.69 (0.7752)	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		32521-41X00 (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)

Specifications and Adjustment (Cont'd)

CLUTCHES AND BRAKES

Code number		4GX07	
Reverse clutch			
Number of drive plates		2	
Number of driven plates		2	
Thickness of drive plate mm (in)	Standard	1.90 - 2.05 (0.0748 - 0.0807)	
	Wear limit	1.80 (0.0709)	
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		5	
Number of driven plates		5	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.40 (0.0551)	
Clearance mm (in)	Standard	1.8 - 2.2 (0.071 - 0.087)	
	Allowable limit	3.2 (0.126)	
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
		4.4 (0.173)	31537-41X65
		4.6 (0.181)	31537-41X66
		4.8 (0.189)	31537-41X67
Forward clutch			
Number of drive plates		7	
Number of driven plates		7	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.40 (0.0551)	
Clearance mm (in)	Standard	0.35 - 0.75 (0.0138 - 0.0295)	
	Allowable limit	2.15 (0.0846)	
Thickness of retaining plate		Thickness mm (in)	Part number
		4.6 (0.181)	31537-42X13
		4.8 (0.189)	31537-42X14
		5.0 (0.197)	31537-42X15
		5.2 (0.205)	31537-4AX00
		5.4 (0.213)	31537-4AX01
		5.6 (0.220)	31537-4AX02

Code number		4GX07	
Overrun clutch			
Number of drive plates		3	
Number of driven plates		5	
Thickness of drive plate mm (in)	Standard	1.90 - 2.05 (0.0748 - 0.0807)	
	Wear limit	1.80 (0.0709)	
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
Low & reverse brake			
Number of drive plates		7	
Number of driven plates		7	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.4 (0.055)	
Clearance mm (in)	Standard	0.8 - 1.1 (0.031 - 0.043)	
	Allowable limit	2.5 (0.098)	
Thickness of retaining plate		Thickness mm (in)	Part number
		6.6 (0.260)	31667-41X17
		6.8 (0.268)	31667-41X11
		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
Brake band			
Anchor end bolt tightening torque N·m (kg-m, in-lb)		4 - 6 (0.4 - 0.6, 35 - 52)	
Number of returning revolution for anchor end bolt		2.5	

Specifications and Adjustment (Cont'd)

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	2
Lock nut tightening torque N·m (kg-m, in-lb)	4.4 - 5.9 (0.45 - 0.60, 39.1 - 52.1)
Distance between end of converter housing and torque converter mm (in)	26.0 (1.024) or more

NOTES