

# AUTOMATIC TRANSMISSION

## SECTION **AT**

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# PREPARATION

## Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 ( — ) Oil pressure gauge ② ST25052000 ( — ) Hose ③ ST25053000 ( — ) Joint pipe ④ ST25054000 ( — ) Adapter ⑤ ST25055000 ( — ) Adapter	<p>The diagram shows five components of the oil pressure gauge set: 1. The main gauge unit with a needle and scale. 2. A circular hose fitting. 3. A long joint pipe with a threaded end. 4. A 90-degree elbow adapter. 5. A shorter joint pipe with a different fitting.</p>	Measuring line pressure
ST07870000 (J37068) Transmission case stand	<p>The diagram shows a simple metal stand with two vertical supports and a horizontal base, used for holding a transmission case.</p>	Disassembling and assembling A/T
KV31102100 (J37065) Torque converter one-way clutch check tool	<p>The diagram shows a long, thin metal rod with a flat, rectangular head at one end, used for testing the one-way clutch in a torque converter.</p>	Checking one-way clutch in torque converter
ST25850000 (J25721-A) Sliding hammer	<p>The diagram shows two sliding hammers, which are long metal rods with a sliding sleeve and a pointed end, used for driving or pulling out components.</p>	Removing oil pump assembly
KV31102400 (J34285 and J34285-87) Clutch spring compressor	<p>The diagram shows a clutch spring compressor, which consists of a central threaded rod with a handle and a sliding sleeve, used to compress clutch return springs.</p>	Removing and installing clutch return springs
ST33200000 (J26082) Drift	<p>The diagram shows a drift tool, which is a cylindrical metal sleeve with a mesh or textured surface on the inside, used for installing seals.</p>	Installing oil pump housing oil seal Installing rear oil seal
(J34291) Shim setting gauge set	<p>The diagram shows a shim setting gauge set, which includes a gauge and several shims of different thicknesses, used for setting the clearance between components.</p>	Selecting oil pump cover bearing race and oil pump thrust washer

# PRECAUTIONS

## Service Notice

- 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.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- 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 order on a parts rack so they can be put back in the valve body in the same 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 their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. 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 A.T.F.

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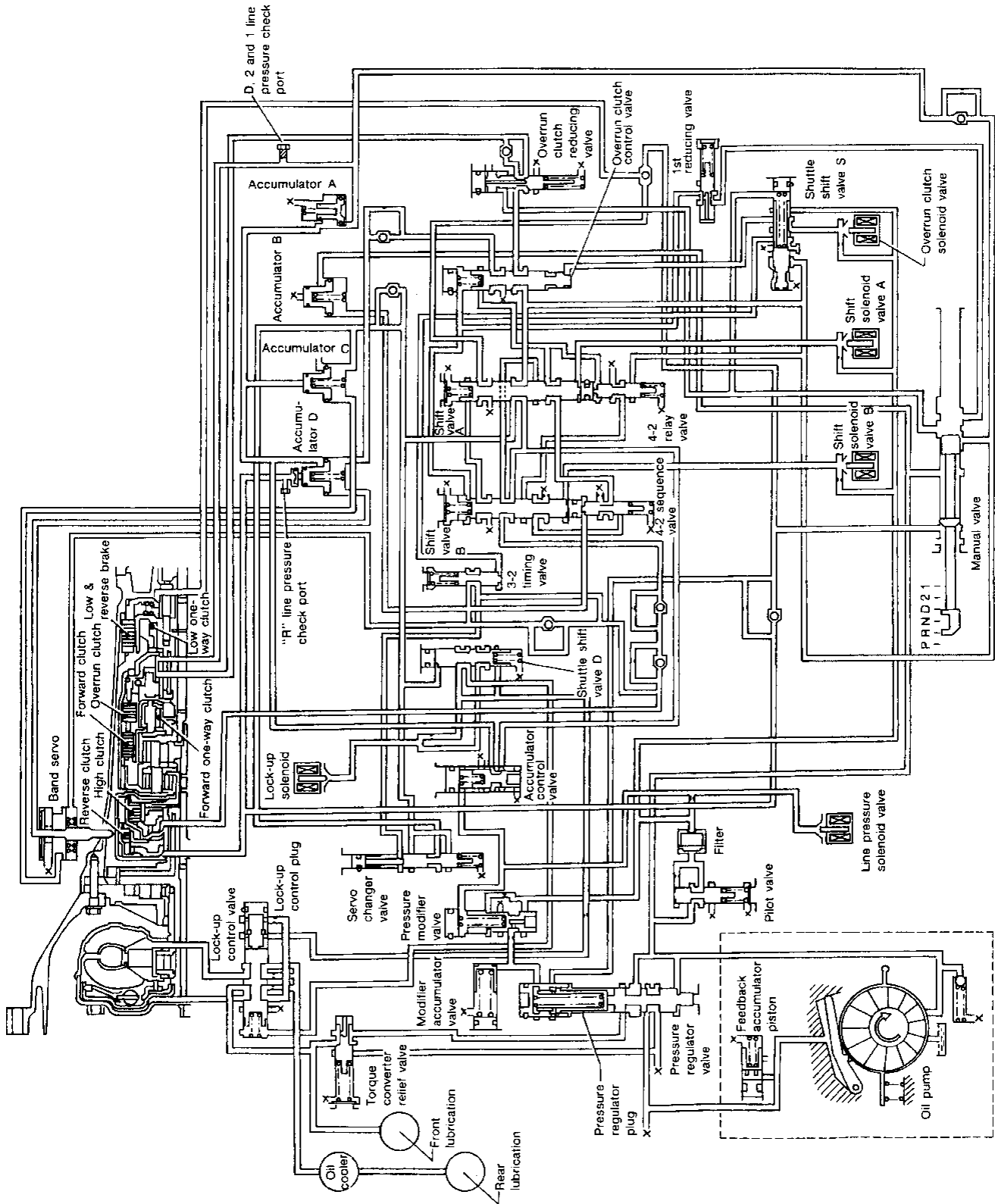
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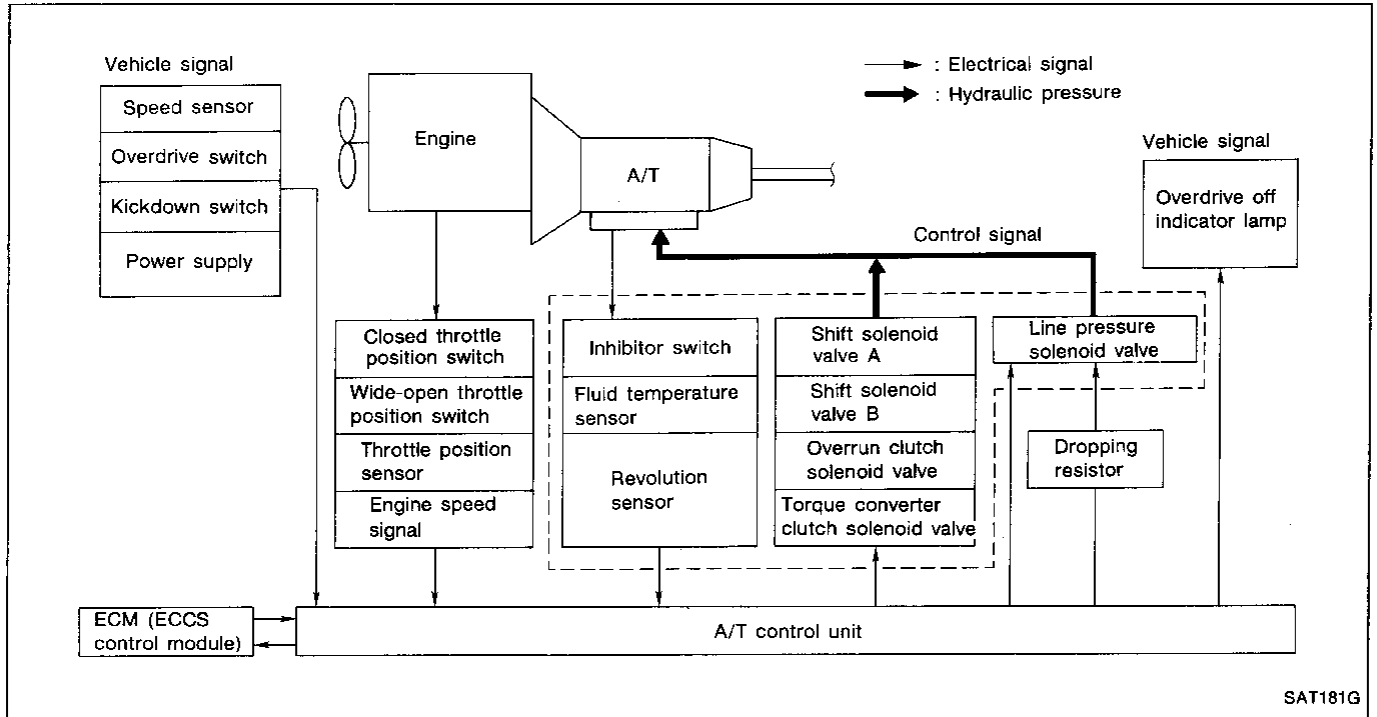
# A/T CONTROL DIAGRAM

## Hydraulic Control Circuits



# A/T CONTROL DIAGRAM

## Electrical Control Chart



## Mechanical Operation

Shift position	Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo			Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
					2nd apply	3rd release	4th apply					
P												PARK POSITION
R	○									○		REVERSE POSITION
N												NEUTRAL POSITION
D*4	1st		○	⊗				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd		○	⊗ <sup>*1</sup>	○			●				
	3rd		○	○	⊗ <sup>*2</sup>	⊗		●				
	4th		○	⊗	⊗ <sup>*3</sup>	⊗	○				○	
2	1st		○	⊗				●	●			Automatic shift 1 ↔ 2
	2nd		○	⊗	○			●				
1	1st		○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd		○	○	○			●				

\*1. Operates when overdrive switch is set in "OFF" position.

\*2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.

\*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 switch is set in "OFF" position.

○: Operates

⊗: Operates when throttle opening is less than 1/16. Engine brake activates.

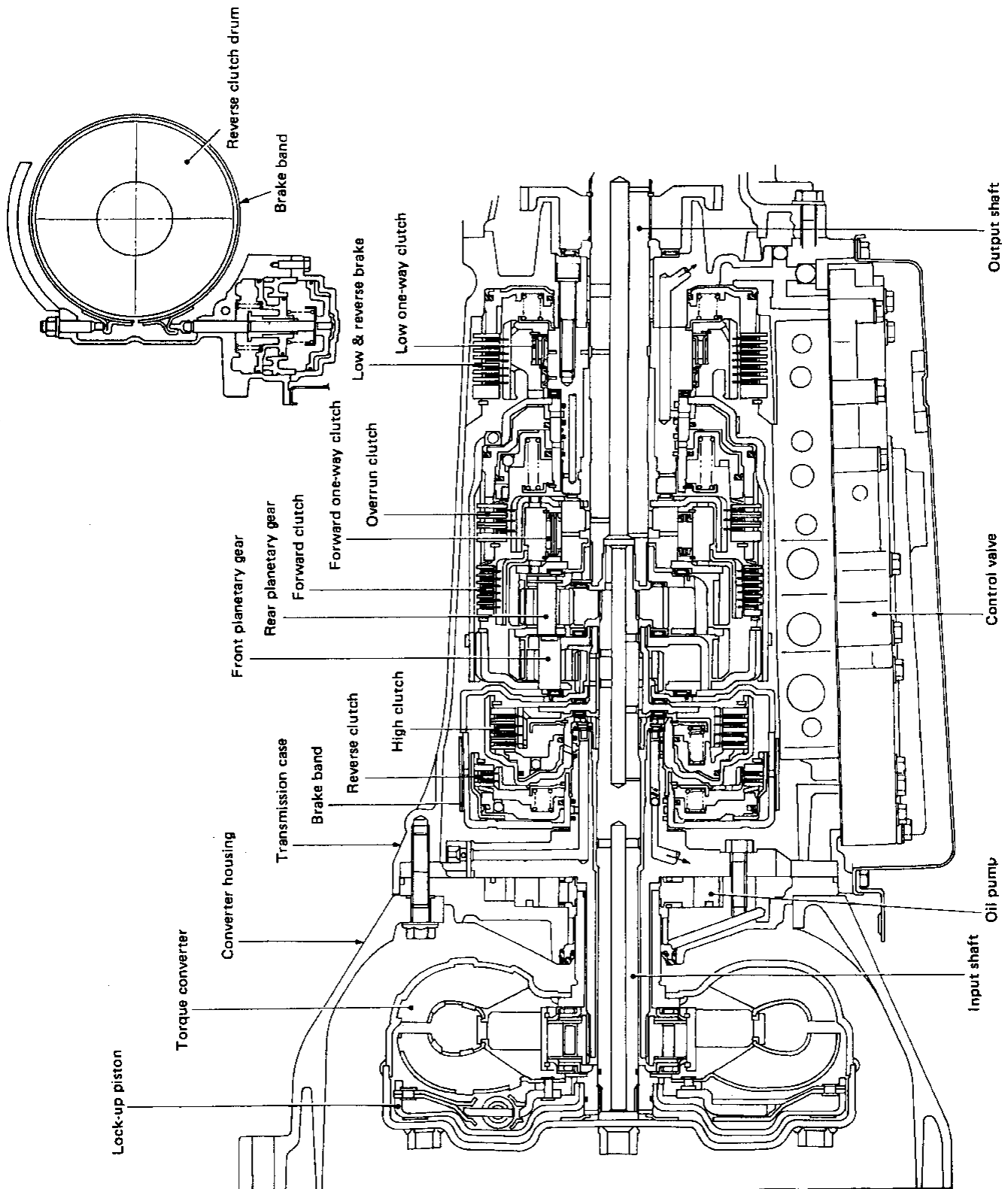
●: Operates during "progressive" acceleration.

⊗: Operates but does not affect power transmission.

⊗: Operates when throttle opening is less than 1/16 but does not affect engine brake.

# A/T CONTROL DIAGRAM

## Cross-Sectional View



# TROUBLE DIAGNOSES

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# TROUBLE DIAGNOSES

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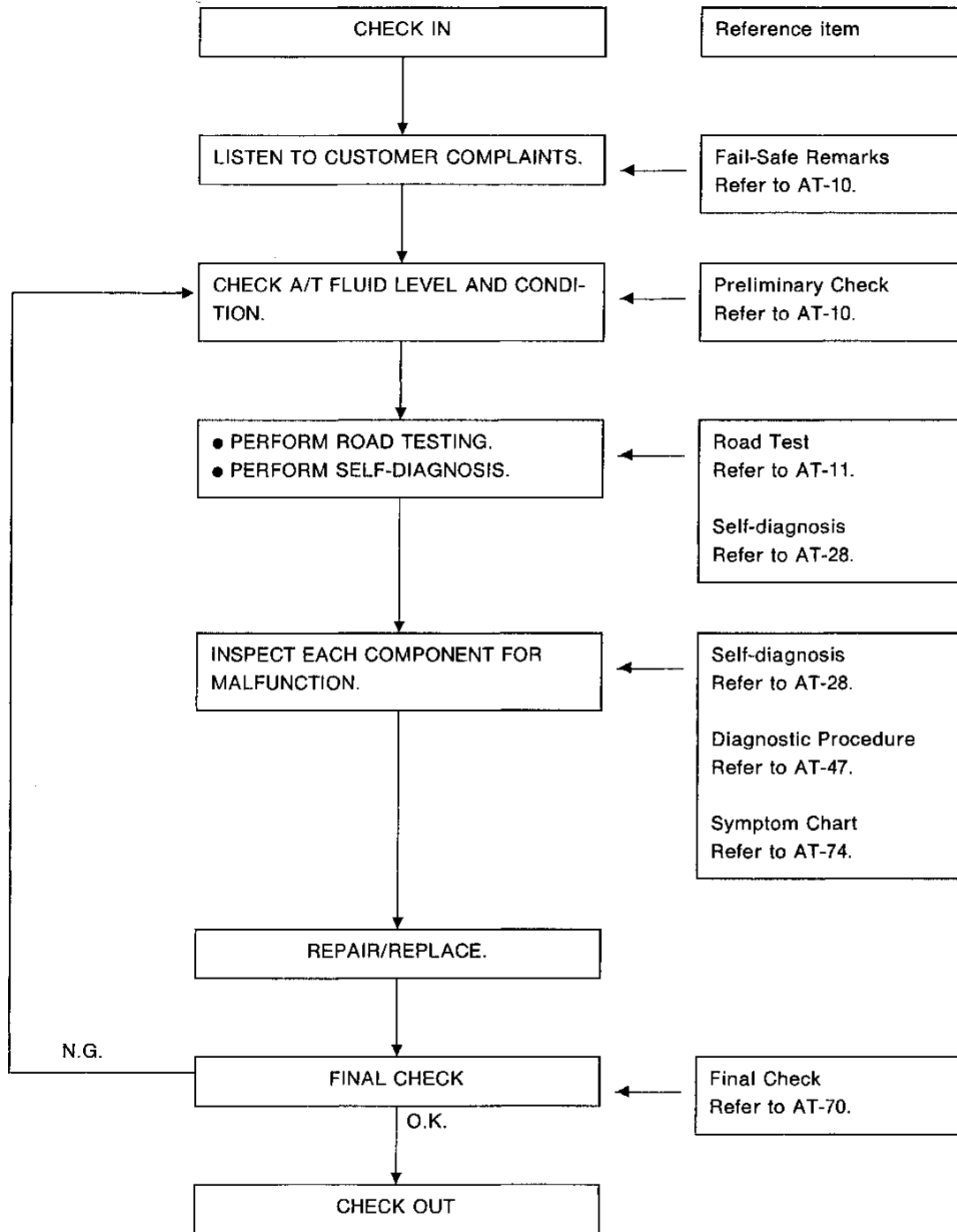
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# TROUBLE DIAGNOSES

## How to Perform Trouble Diagnoses for Quick and Accurate Repair

### WORK FLOW



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## Fail-Safe Remarks

The A/T control unit has an electronic Fail-Safe (limp home mode) to allow the vehicle to be driven even in the event of damage of a major electrical input or output device circuit.

In this condition, the vehicle runs in third gear in positions 1, 2 or D and will not upshift. Customer may say "Sluggish, poor acceleration".

When Fail-safe operation occurs the next time the key is turned to the ON position, the O.D. OFF indicator lamp will blink for about 8 seconds. (For diagnosis, refer to AT-11.)

### Remarks

If the vehicle is driven under extreme conditions such as excessive wheel spinning and emergency braking suddenly after, Fail-Safe may be activated even if all electrical circuits are undamaged.

In this case, normal shift pattern can be returned by turning key OFF for 3 seconds and then back ON.

The blinking of the O.D. OFF indicator lamp for about 8 seconds will appear only once and be cleared.

The customer may resume normal driving conditions by chance.

Always follow the "WORK FLOW" (see the previous page).

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.

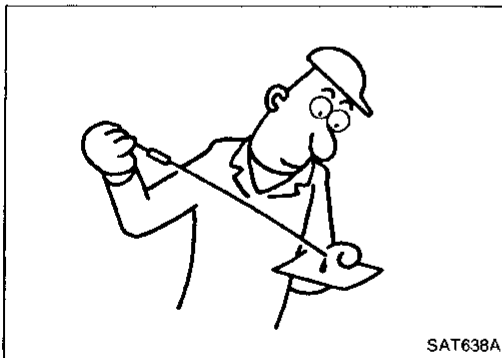
During the next SELF-DIAGNOSIS performed after checking the sensor, no damages will be indicated.

## Preliminary Check

### 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 section MA.**

# TROUBLE DIAGNOSES

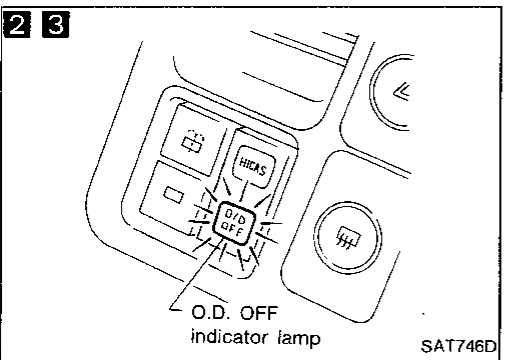
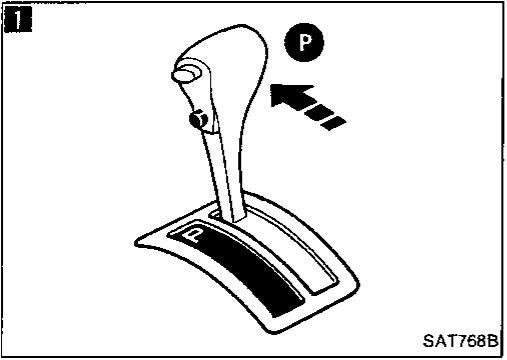
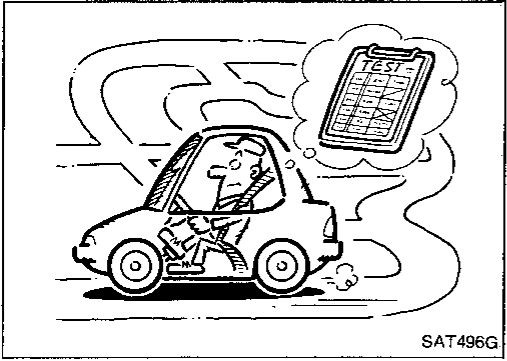
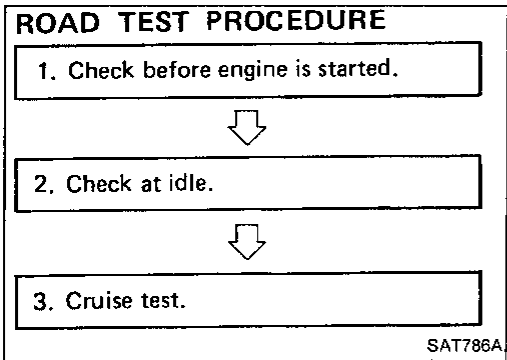
## Preliminary Check (Cont'd)

### ROAD TESTING

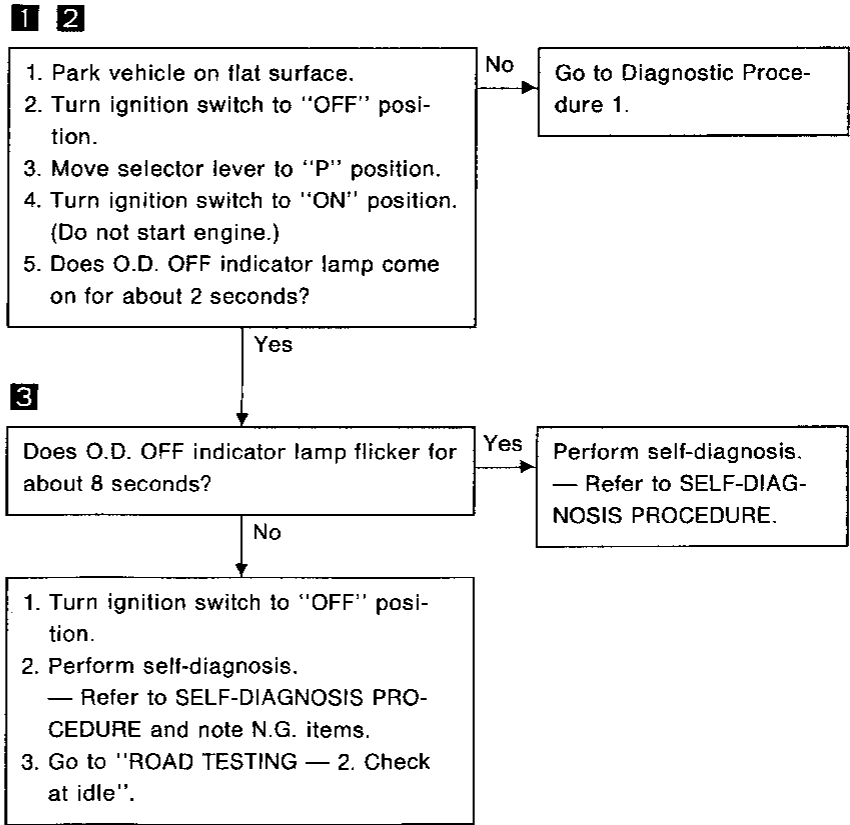
#### Description

- The purpose of this road test is to determine overall performance of automatic transmission 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. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".

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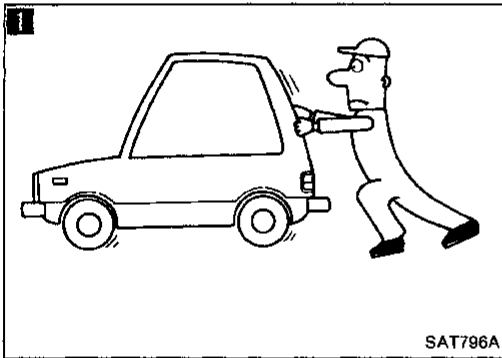
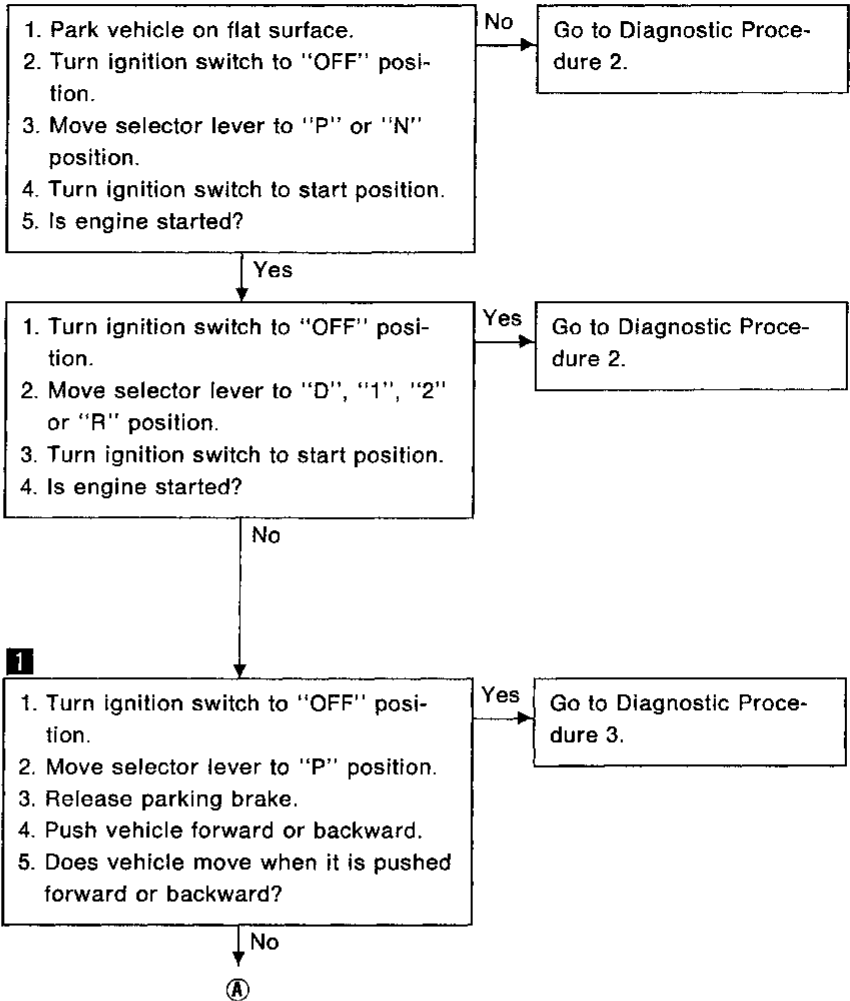
#### 1. Check before engine is started



# TROUBLE DIAGNOSES

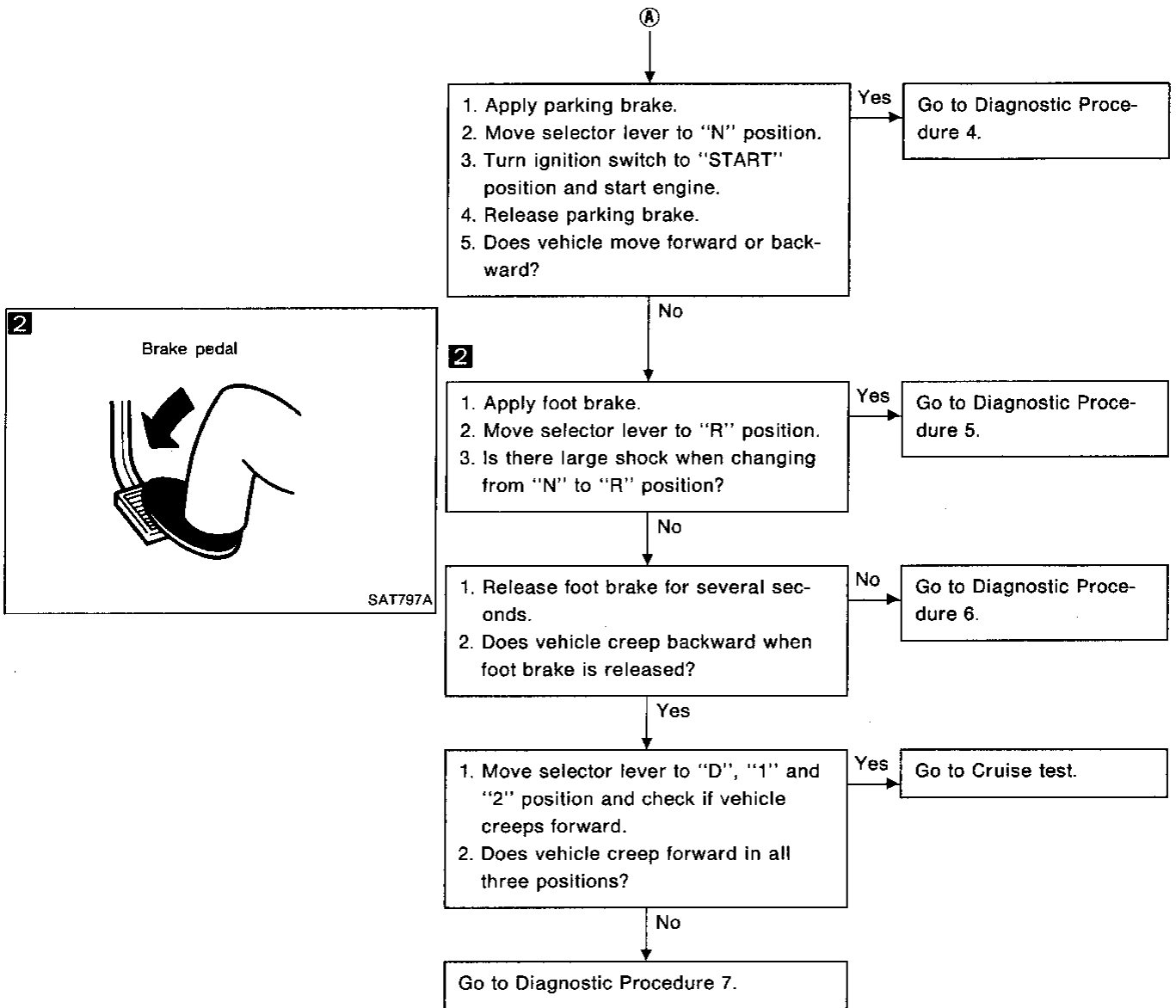
## Preliminary Check (Cont'd)

### 2. Check at idle



# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)



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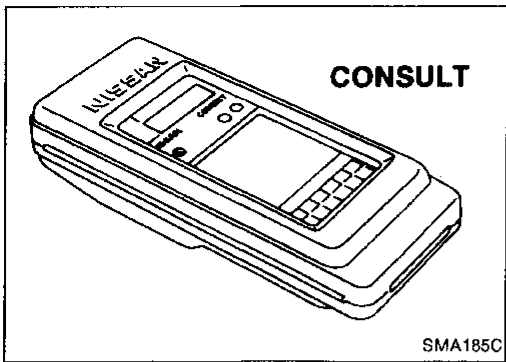
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# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)



### 3. Cruise test

- Check all items listed in Parts 1 through 3.

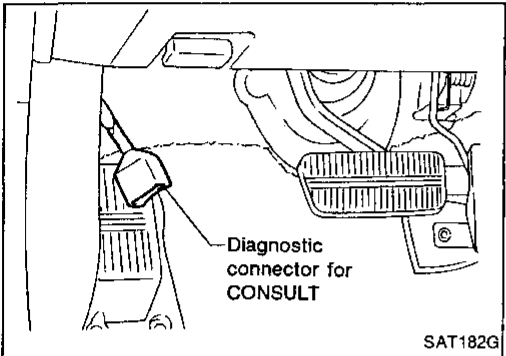


#### With CONSULT

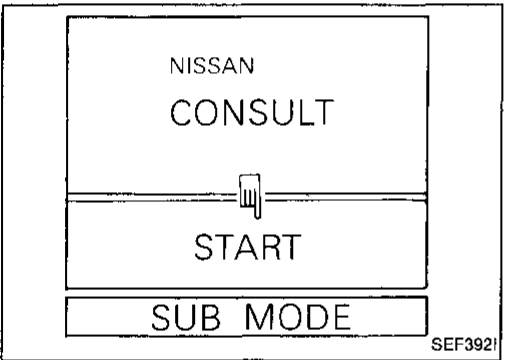
- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."

### CONSULT setting procedure

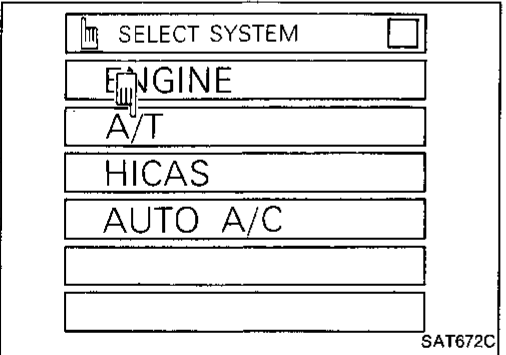
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located in left dash side panel.)



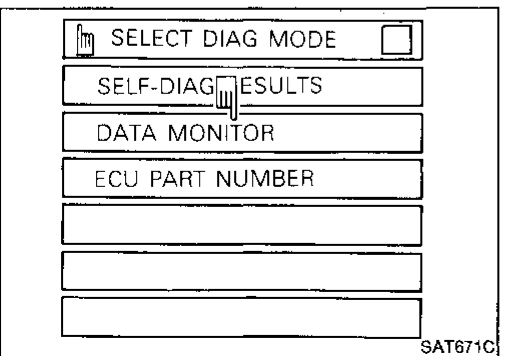
3. Turn on ignition switch.
4. Touch "START".



5. Touch "A/T".

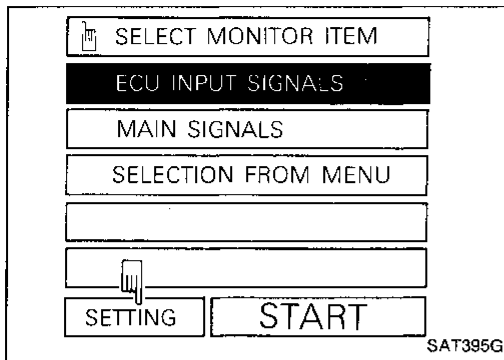


6. Touch "DATA MONITOR".

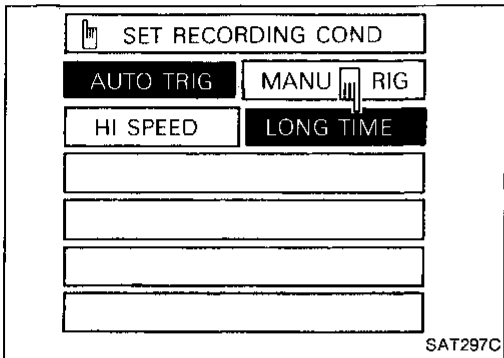


# TROUBLE DIAGNOSES

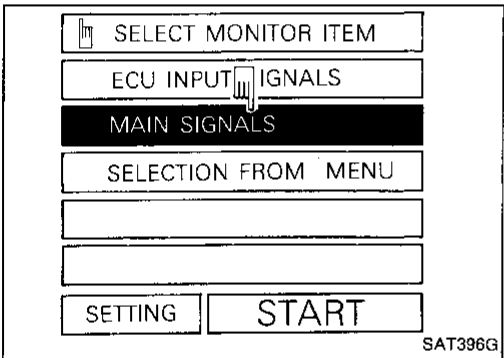
## Preliminary Check (Cont'd)



7. Touch "SETTING" to set recording condition.

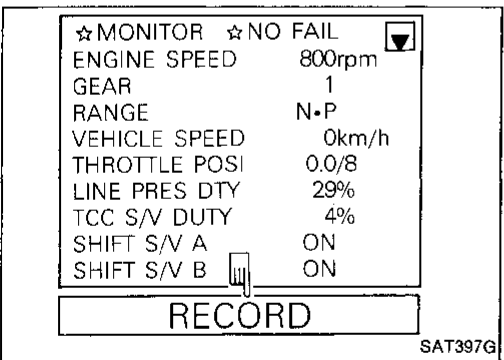


8. Touch "LONG TIME" and "ENTER" key.

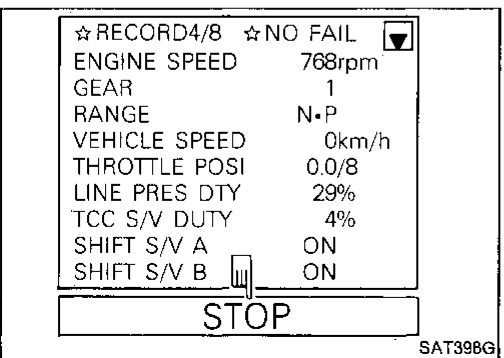


9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".

10. Touch "START".



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



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

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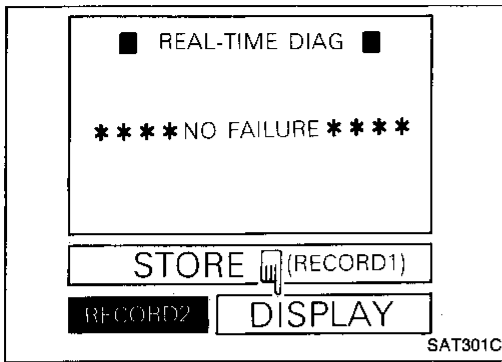
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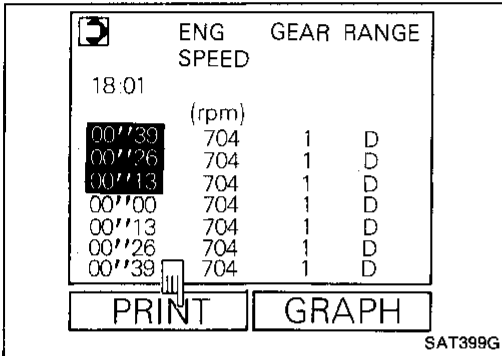
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# TROUBLE DIAGNOSES

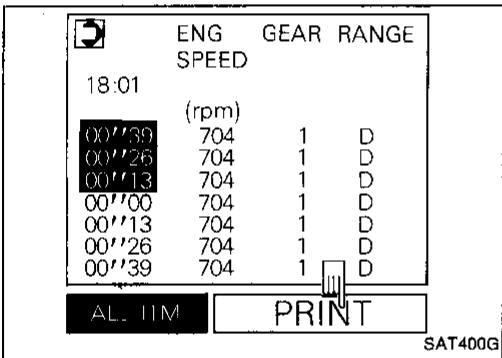
## Preliminary Check (Cont'd)



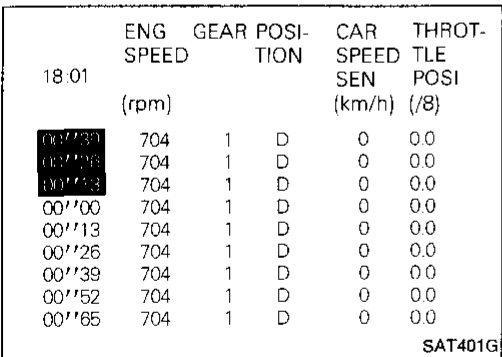
13. Touch "DISPLAY".



14. Touch "PRINT".

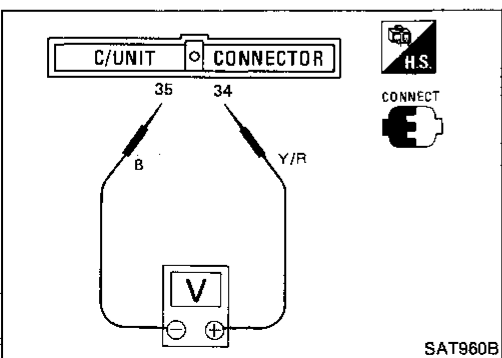


15. Touch "PRINT" again.



16. Check the monitor data printed out.

17. Continue cruise test part 2 and 3.



### Without CONSULT

- Throttle position can be controlled by voltage across terminals ③④ and ③⑤ of A/T control unit.



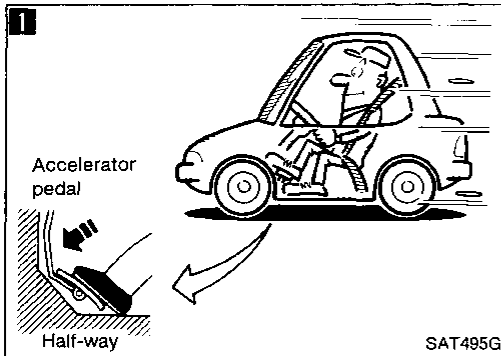
# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### Cruise test — Part 1

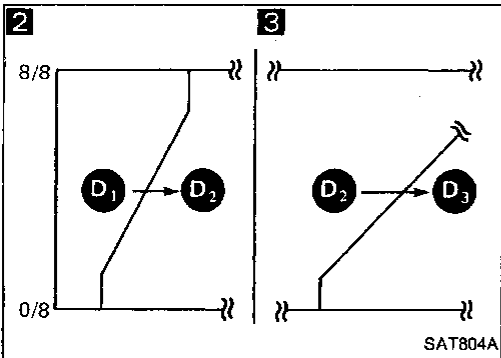
Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**  
50 - 80°C (122 - 176°F)



**1**

1. Park vehicle on flat surface.
2. Set overdrive switch in "ON" position.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position and start engine.
5. Move selector lever to "D" position.
6. Accelerate vehicle to half throttle.



**2**

Does vehicle start from D<sub>1</sub>?  
**Read gear position.**

No → Go to Diagnostic Procedure 8.

Yes

**3**

Does A/T shift from D<sub>1</sub> to D<sub>2</sub> at the specified speed?

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

**Specified speed when shifting from D<sub>1</sub> to D<sub>2</sub>:**  
Refer to Shift schedule.

No → Go to Diagnostic Procedure 9.

Yes

Does A/T shift from D<sub>2</sub> to D<sub>3</sub> at the specified speed?

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

**Specified speed when shifting from D<sub>2</sub> to D<sub>3</sub>:**  
Refer to Shift schedule.

No → Go to Diagnostic Procedure 10.

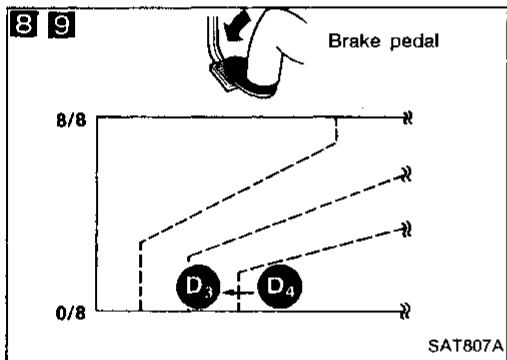
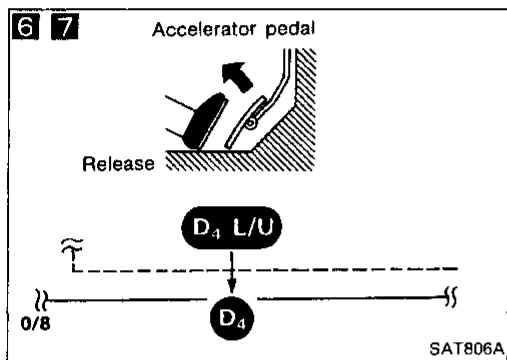
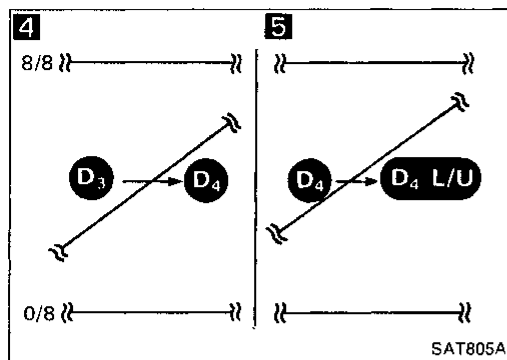
Yes

**A**

GI  
MA  
EM  
LC  
EF & EC  
FE  
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MT  
**AT**  
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EL

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)



A

**4**

Does A/T shift from D<sub>3</sub> to D<sub>4</sub> at the specified speed?  
 Read gear position, throttle opening and vehicle speed.  
 Specified speed when shifting from D<sub>3</sub> to D<sub>4</sub>:  
 Refer to Shift schedule.

No → Go to Diagnostic Procedure 11.

Yes

**5**

Does A/T perform lock-up at the specified speed?  
 Read vehicle speed, throttle opening when lock-up duty becomes 94%.  
 Specified speed when lock-up occurs:  
 Refer to Shift schedule.

No → Go to Diagnostic Procedure 12.

Yes

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

No → Go to Diagnostic Procedure 13.

Yes

**6 7**

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

No → Go to Diagnostic Procedure 14.

Yes

**8 9**

1. Decelerate vehicle by applying foot brake lightly.  
 2. Does engine speed return to idle smoothly when A/T is shifted from D<sub>4</sub> to D<sub>3</sub>?  
 Read gear position and engine speed.

No → Go to Diagnostic Procedure 15.

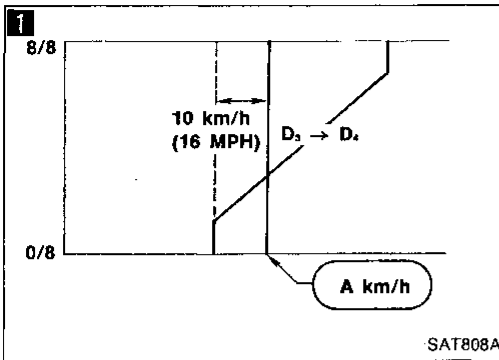
Yes

1. Stop vehicle.  
 2. Go to "Cruise test — Part 2".

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

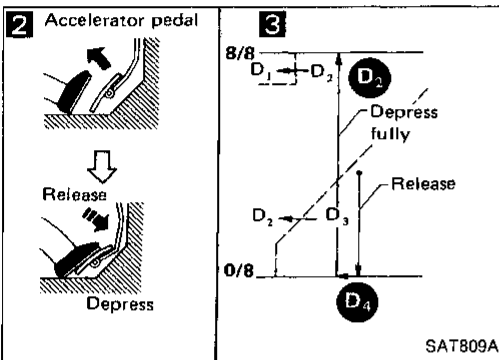
### Cruise test — Part 2



1. Confirm overdrive switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerator vehicle to half throttle again.

Does vehicle shift from D<sub>1</sub>?  
 Read gear position.

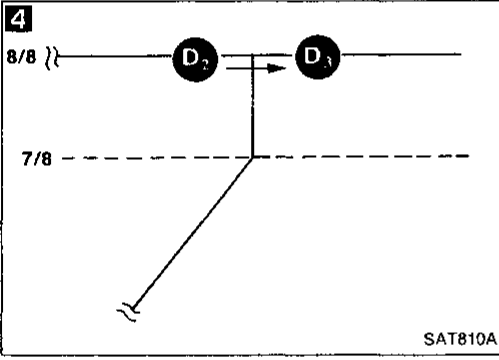
No → Go to Diagnostic Procedure 16.



Yes

1. Accelerate vehicle to A km/h as shown in illustration.  
 2. Release accelerator pedal and then quickly depress it fully.  
 3. Does A/T shift from D<sub>4</sub> to D<sub>2</sub> as soon as accelerator pedal is depressed fully?  
 Read gear position and throttle opening.

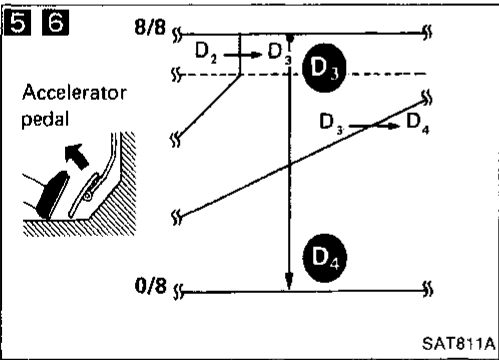
No → Go to Diagnostic Procedure 9.



Yes

4 Does A/T shift from D<sub>2</sub> to D<sub>3</sub> at the specified speed?  
 Read gear position, throttle opening and vehicle speed.  
 Specified speed when shifting from D<sub>2</sub> to D<sub>3</sub>:  
 Refer to Shift schedule.

No → Go to Diagnostic Procedure 10.



Yes

5 6 1. Release accelerator pedal after shifting from D<sub>2</sub> to D<sub>3</sub>.  
 2. Does A/T shift from D<sub>3</sub> to D<sub>4</sub> and does vehicle decelerate by engine brake?  
 Read gear position, throttle opening and vehicle speed.

No → Go to Diagnostic Procedure 11.

Yes

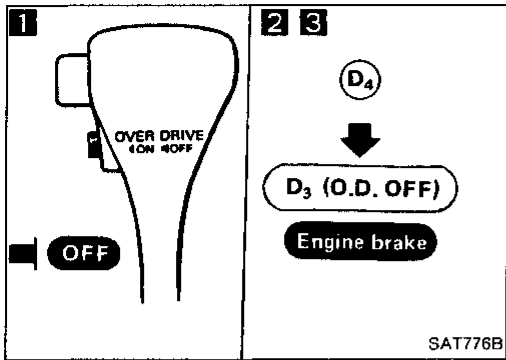
1. Stop vehicle.  
 2. Go to "Cruise test — Part 3".

GI  
 MA  
 EM  
 LC  
 EF & EC  
 FE  
 CL  
 MT  
**AT**  
 PD  
 FA  
 RA  
 BR  
 ST  
 BF  
 HA  
 EL

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### Cruise test — Part 3



**1 2**

1. Confirm overdrive switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerate vehicle, using half-throttle, to D<sub>4</sub>.
4. Release accelerator pedal.
5. Set overdrive switch to "OFF" position while driving in D<sub>4</sub> position.
6. Does A/T shift from D<sub>4</sub> to D<sub>3</sub>?

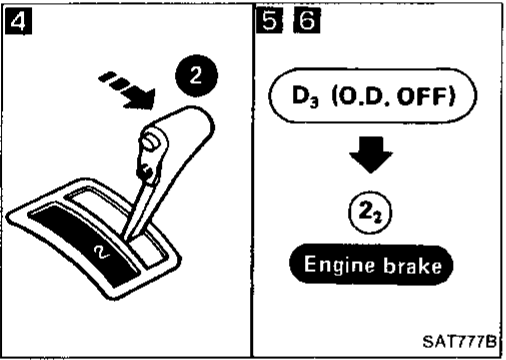
**Read gear position and vehicle speed.**

No → Go to Diagnostic Procedure 17.

**3**

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.



**4 5**

1. Move selector lever from "D" to "2" position while driving in D<sub>3</sub>.
2. Does A/T shift from D<sub>3</sub> to 2<sub>2</sub>?

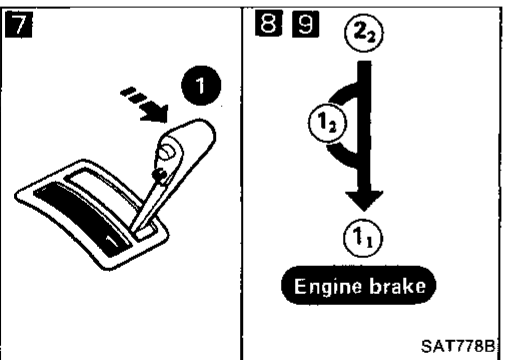
**Read gear position.**

No → Go to Diagnostic Procedure 18.

**6**

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.



**7 8**

1. Move selector lever from "2" to "1" position while driving in 2<sub>2</sub>.
2. Does A/T shift from 2<sub>2</sub> to 1<sub>1</sub> position?

**Read gear position.**

No → Go to Diagnostic Procedure 19.

**9**

Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 20.

**10**

1. Stop vehicle.
2. Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

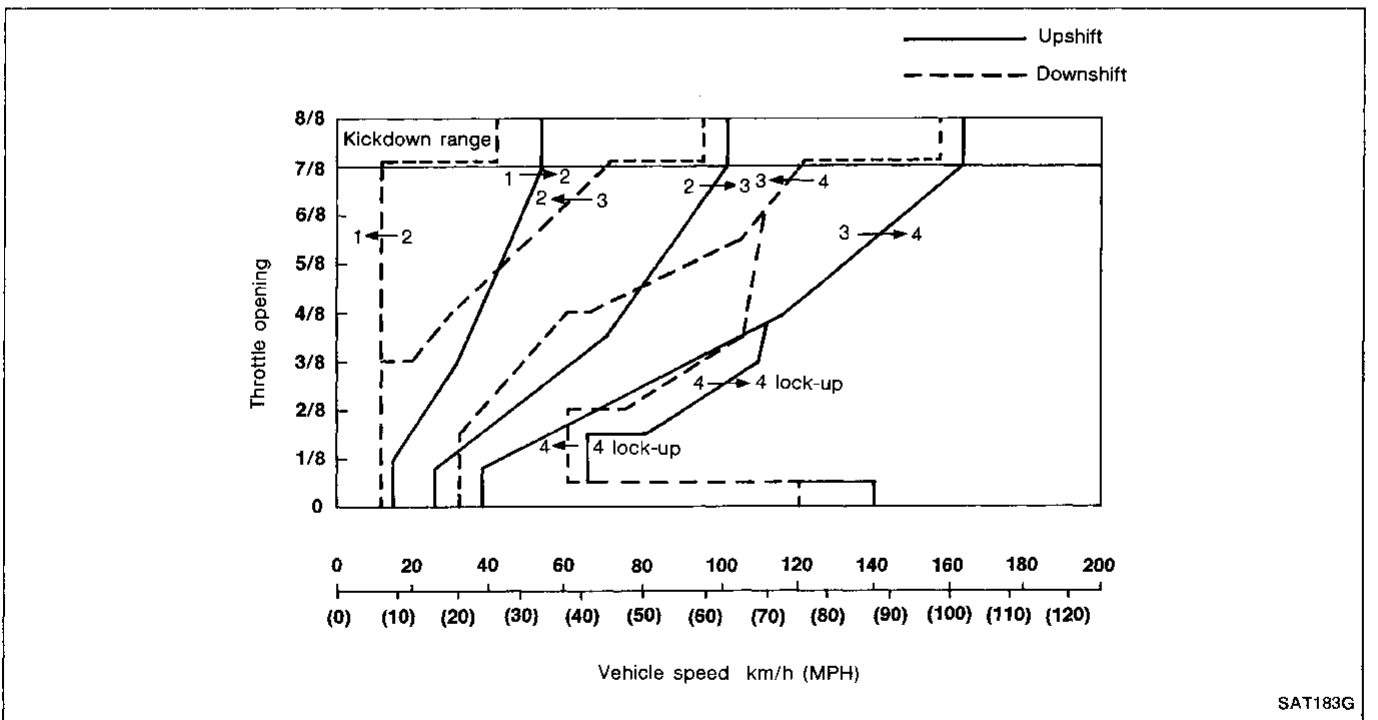
### Vehicle speed when shifting gears

Throttle position	Vehicle speed km/h (MPH)						
	D <sub>1</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>4</sub>	D <sub>4</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>1</sub>	1 <sub>2</sub> → 1 <sub>1</sub>
Full throttle	56 - 60 (35 - 37)	101 - 109 (63 - 68)	158 - 168 (98 - 104)	152 - 162 (94 - 101)	91 - 99 (57 - 62)	40 - 44 (25 - 27)	53 - 57 (33 - 35)
Half throttle	39 - 43 (24 - 27)	74 - 80 (46 - 50)	112 - 120 (70 - 75)	56 - 64 (35 - 40)	27 - 33 (17 - 21)	10 - 14 (6 - 9)	53 - 57 (33 - 35)

### Vehicle speed when performing and releasing lock-up

Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D <sub>4</sub> ]	159 - 167 (99 - 104)	153 - 161 (95 - 100)
	OFF [D <sub>3</sub> ]	101 - 109 (63 - 68)	91 - 99 (57 - 62)
Half throttle	ON [D <sub>4</sub> ]	112 - 120 (70 - 75)	101 - 109 (63 - 68)
	OFF [D <sub>3</sub> ]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

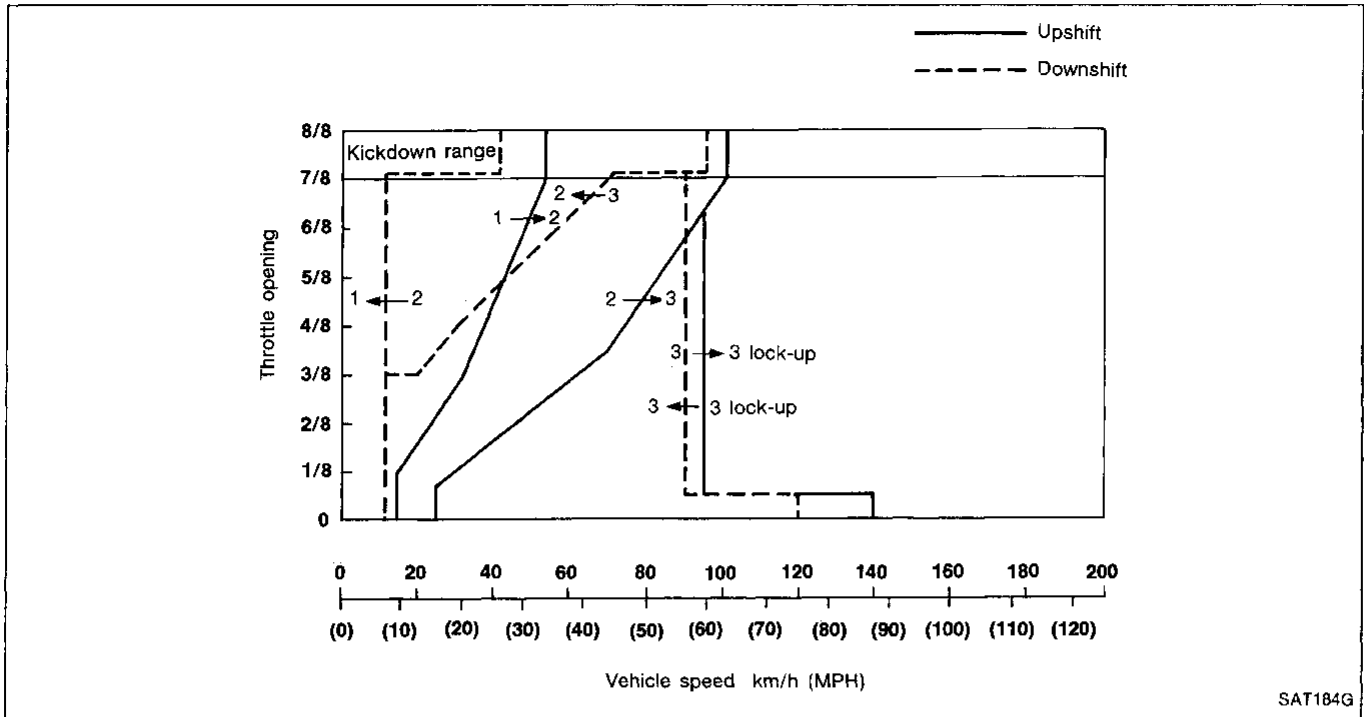
### Shift schedule (Overdrive ON)



# TROUBLE DIAGNOSES

## Preliminary Check (Cont'd)

### Shift schedule (Overdrive OFF)



SAT184G

## Diagnosis by CONSULT

### NOTICE

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

# TROUBLE DIAGNOSES

## Diagnosis by CONSULT (Cont'd)

### DATA MONITOR APPLICATION

Item	Application
Vehicle speed sensor 1 (A/T)	X
Vehicle speed sensor 2 (meter)	X
Throttle position sensor	X
Fluid temperature sensor	X
Battery voltage	X
Engine speed	X
Selector lever switch (O.D. switch)	X
A.S.C.D. — cruise signal	X
A.S.C.D. — O.D. cut signal	X
Kickdown switch	X
Power shift switch	—
Closed throttle position switch	X
Wide open throttle position switch	X
Shift solenoid valve A	X
Shift solenoid valve B	X
Overrun clutch solenoid valve	X
*Shift solenoid valve A (feedback)	X
*Shift solenoid valve B (feedback)	X
*Overrun clutch solenoid valve (feedback)	X
Hold mode switch	—
1 position switch	X
2 position switch	X
D position switch	X
N position switch	X
R position switch	X
Gear position	X
Position position	X
Vehicle speed	X
Throttle opening	X
Line-pressure solenoid valve	X
Torque converter clutch solenoid valve	X

X: Applicable —: Not applicable

### DATA ANALYSIS

Item	Display	Condition
Lock-up duty	Approximately 4%	Lock-up "OFF"
	↓	↓
	Approximately 94%	Lock-up "ON"
Line pressure duty	Approximately 29%	Low line-pressure (Small throttle opening)
	↓	↓
	Approximately 94%	High line-pressure (Large throttle opening)
Throttle position sensor	Approximately 0.5V	Fully-closed throttle
	Approximately 4V	Fully-open throttle
Fluid temperature sensor	Approximately 1.5V	Cold [20°C (68°F)]
	↓	↓
	Approximately 0.5V	Hot [80°C (176°F)]

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

GI

MA

EM

LC

EF &  
EC

FE

CL

MT

AT

PD

FA

RA

BR

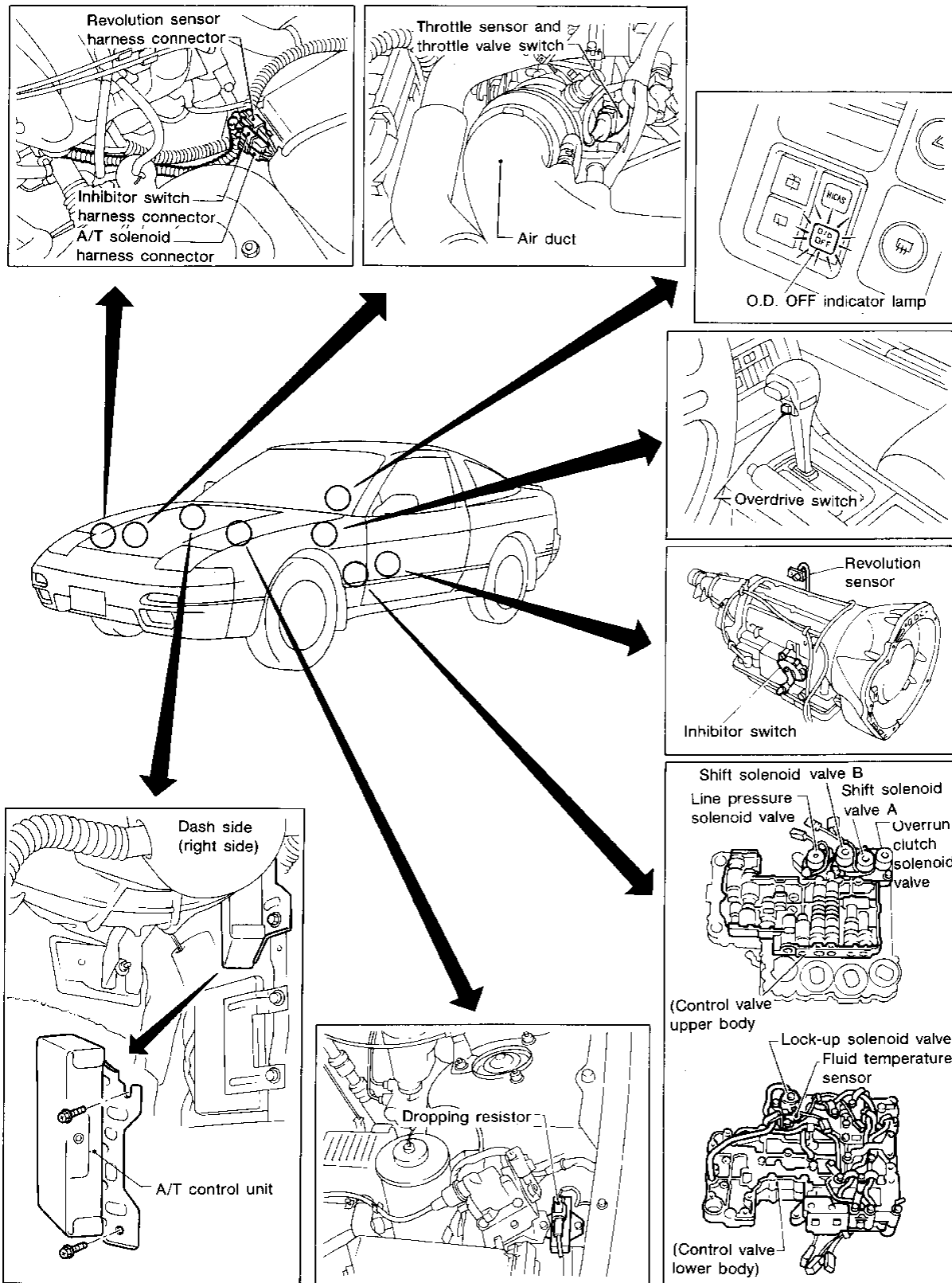
ST

BF

HA

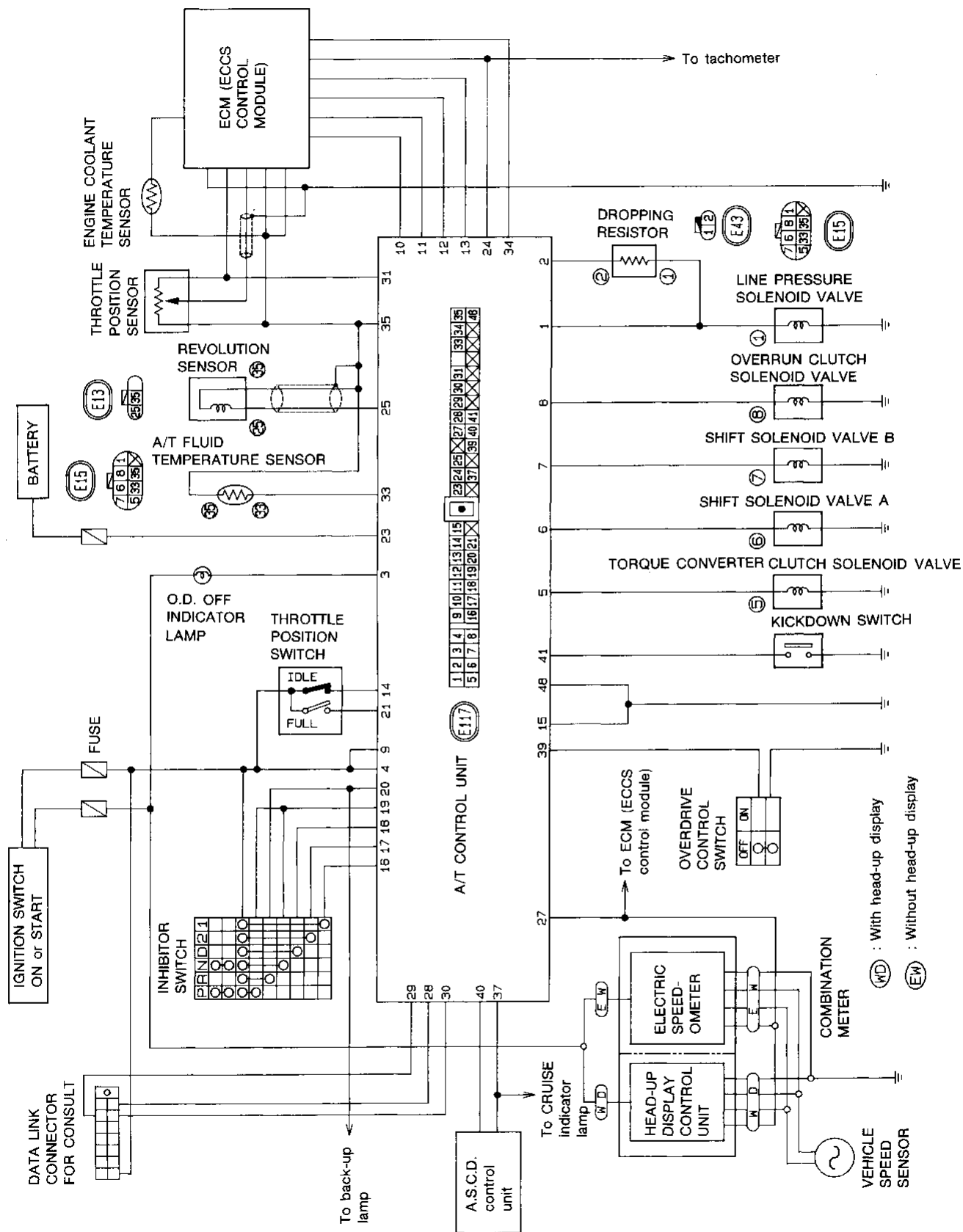
EL

**A/T Electrical Parts Location**





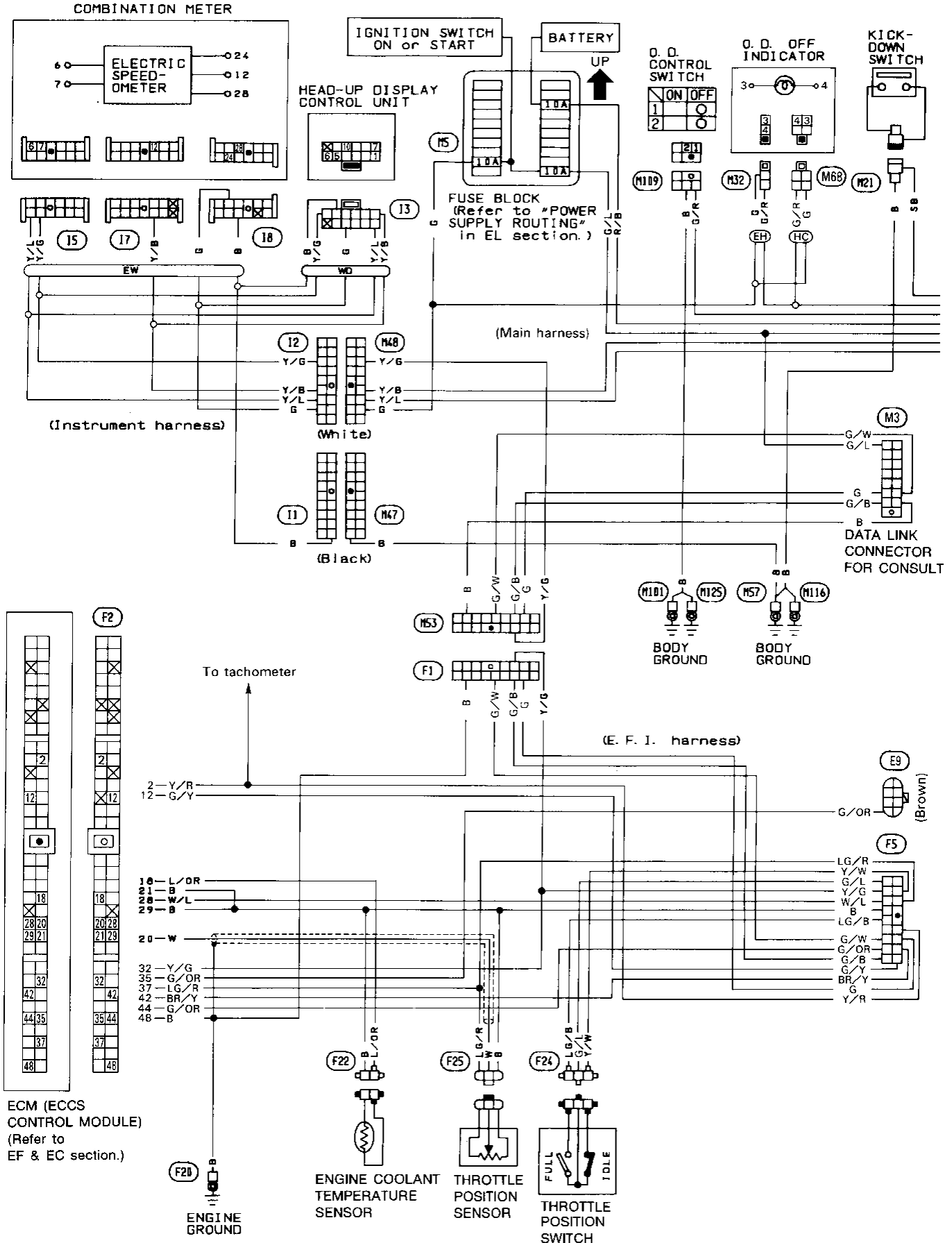
Circuit Diagram for Quick Pinpoint Check



GI  
MA  
EM  
LC  
EF & EC  
FE  
CL  
MT  
**AT**  
PD  
FA  
RA  
BR  
ST  
BF  
HA  
EL

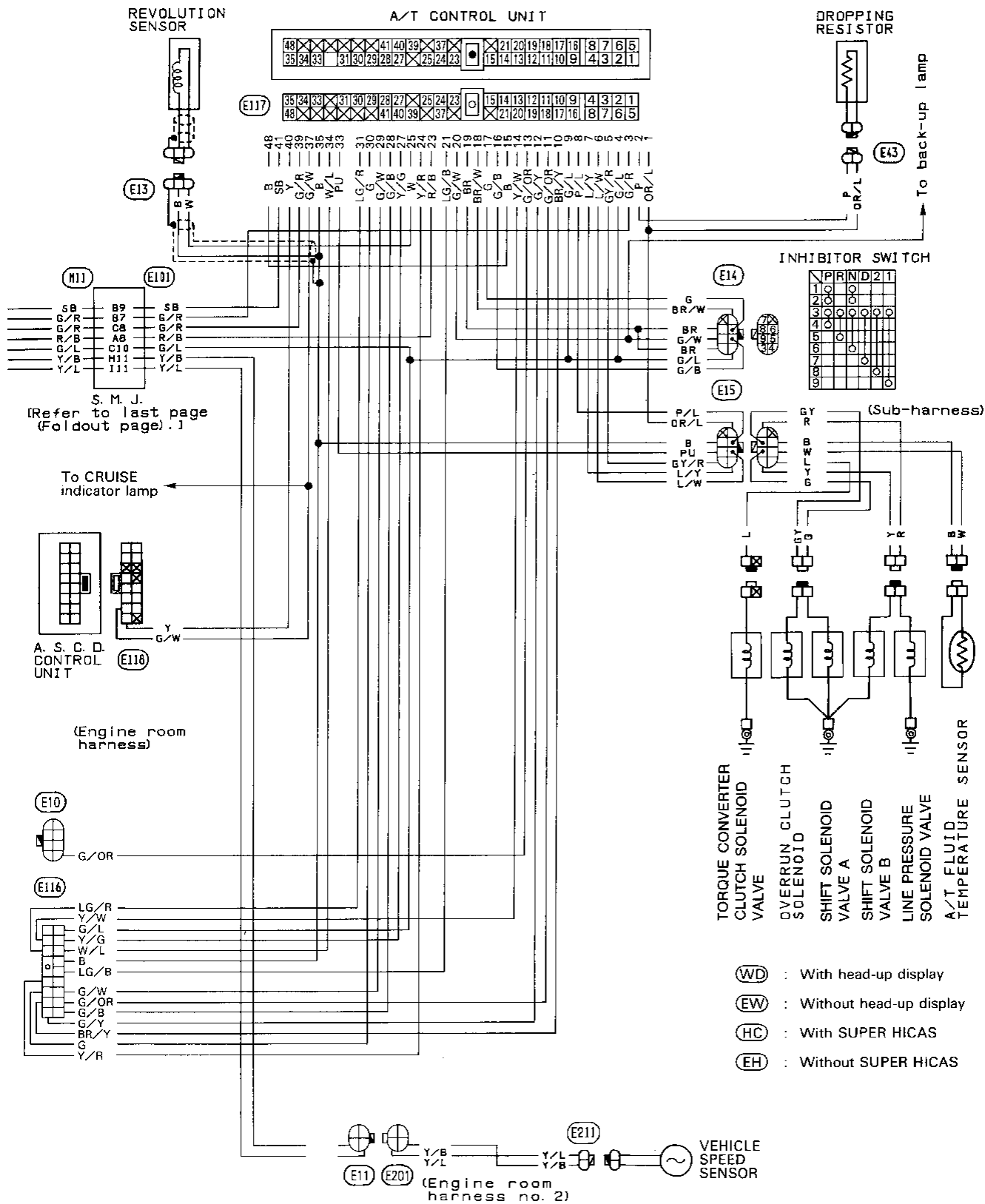
# TROUBLE DIAGNOSES

## Wiring Diagram



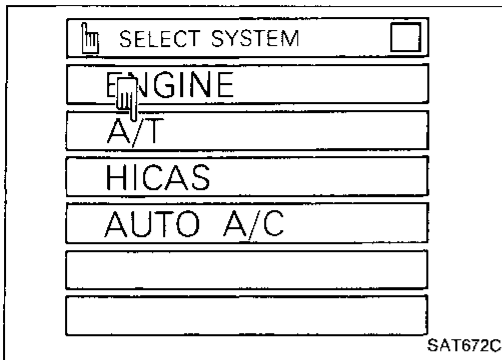
# TROUBLE DIAGNOSES

## Wiring Diagram (Cont'd)



GI  
MA  
EM  
LC  
EF & EC  
FE  
CL  
MT  
**AT**  
PD  
FA  
RA  
BR  
ST  
BF  
HA  
EL

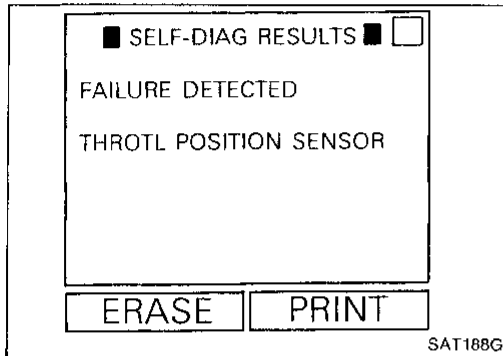
# TROUBLE DIAGNOSES



## Self-diagnosis

### SELF-DIAGNOSTIC PROCEDURE (📱 With CONSULT)

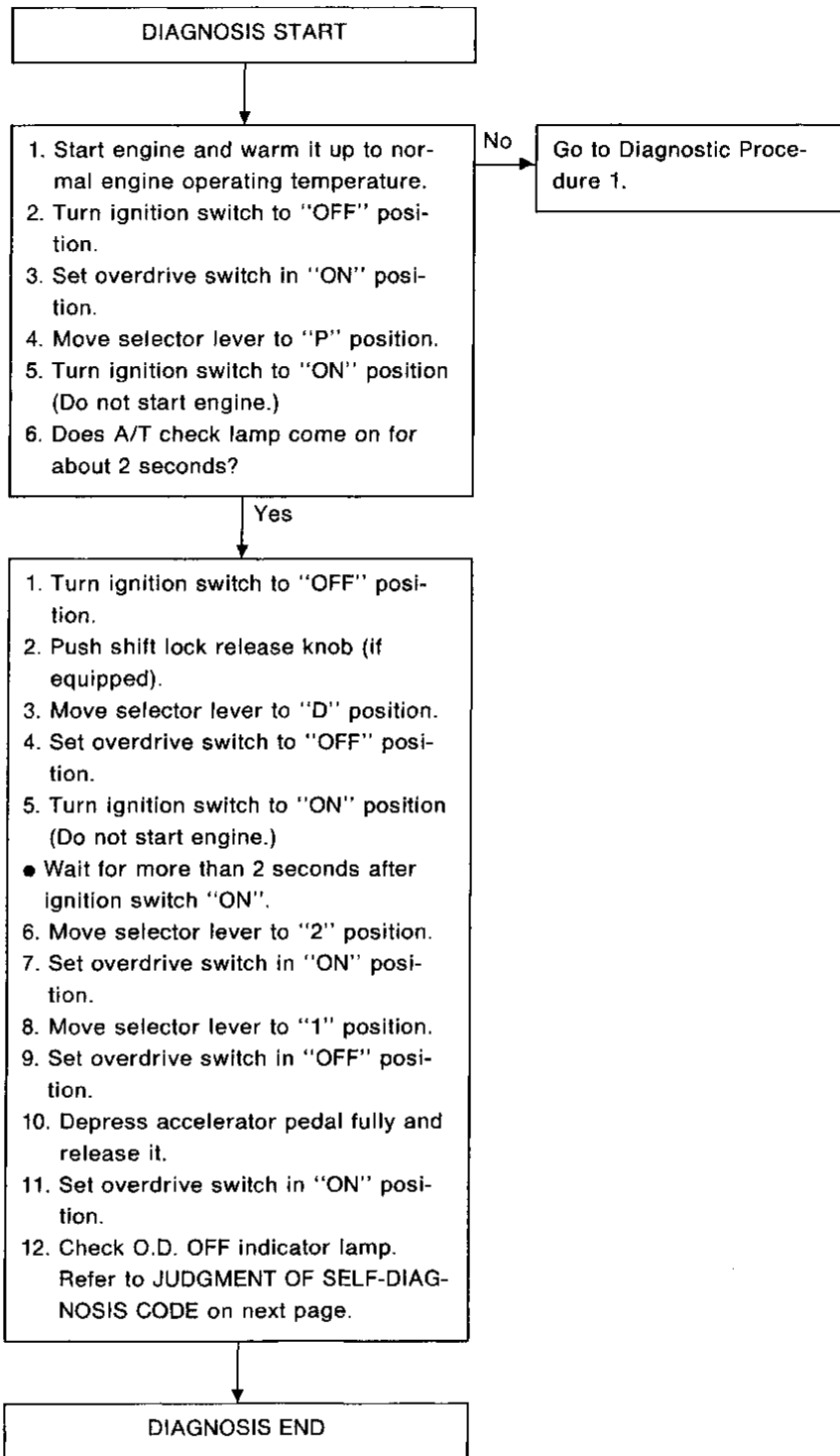
1. Turn on CONSULT.
2. Touch "A/T".
3. Touch "SELF-DIAGNOSIS".  
CONSULT performs REAL-TIME SELF-DIAGNOSIS.



# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SELF-DIAGNOSTIC PROCEDURE (⌚) Without CONSULT



GI

MA

EM

LC

EF &  
EC

FE

CL

MT

AT

PD

FA

RA

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EL

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

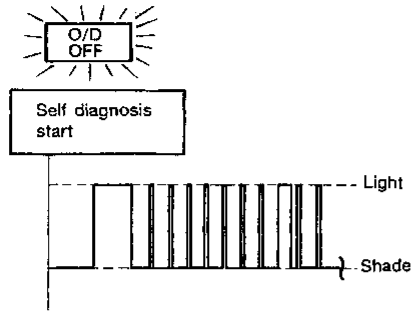
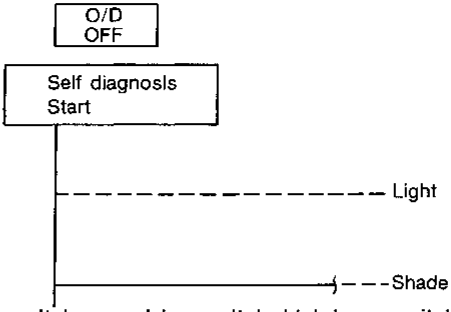
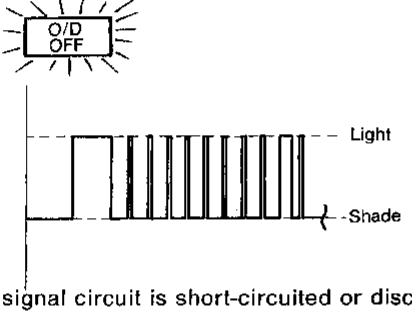
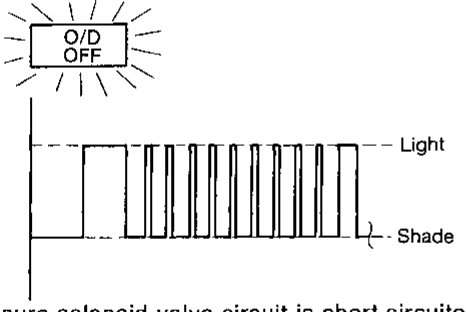
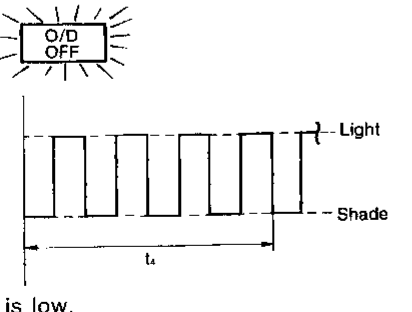
### JUDGEMENT OF SELF-DIAGNOSIS CODE

Flickers of O.D. OFF indicator lamp: Damaged circuit	
<p>All judgement flickers are same.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT436F</p> <p>All circuits that can be confirmed by self-diagnosis are O.K.</p>	<p>4th judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT443F</p> <p>Shift solenoid valve A circuit is short-circuited or disconnected.  <b>➡Go to SHIFT SOLENOID VALVE A CIRCUIT CHECK.</b></p>
<p>1st judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT437F</p> <p>Revolution sensor circuit is short-circuited or disconnected.  <b>➡Go to REVOLUTION SENSOR CIRCUIT CHECK.</b></p>	<p>5th judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT445F</p> <p>Shift solenoid valve B circuit is short-circuited or disconnected.  <b>➡Go to SHIFT SOLENOID VALVE B CIRCUIT CHECK.</b></p>
<p>2nd judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT439F</p> <p>Vehicle speed sensor circuit is short-circuited or disconnected.  <b>➡Go to VEHICLE SPEED SENSOR CIRCUIT CHECK.</b></p>	<p>6th judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT447F</p> <p>Overrun clutch solenoid valve circuit is short-circuited or disconnected.  <b>➡Go to OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK.</b></p>
<p>3rd judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT441F</p> <p>Throttle position sensor circuit is short-circuited or disconnected.  <b>➡Go to THROTTLE POSITION SENSOR CIRCUIT CHECK.</b></p>	<p>7th judgement flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT449F</p> <p>Torque converter clutch solenoid valve circuit is short-circuited or disconnected.  <b>➡Go to TORQUE CONVERTER CLUTCH SOLENOID VALVE CIRCUIT CHECK.</b></p>

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

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

Flickers of O.D. OFF indicator lamp: Damaged circuit	
<p>8th judgement flicker is longer than others.</p>  <p>SAT451F</p> <p>Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.  <b>➔Go to FLUID TEMPERATURE SENSOR AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS.</b></p>	<p>Does not come on.</p>  <p>SAT414G</p> <p>Inhibitor switch, overdrive switch, kickdown switch or closed throttle position switch circuit is disconnected or A/T control unit is damaged.  <b>➔Go to INHIBITOR SWITCH, OVERDRIVE SWITCH AND THROTTLE POSITION SWITCH CIRCUIT CHECKS.</b></p>
<p>9th judgement flicker is longer than others.</p>  <p>SAT453F</p> <p>Engine speed signal circuit is short-circuited or disconnected.  <b>➔Go to ENGINE SPEED SIGNAL CIRCUIT CHECK.</b></p>	
<p>10th judgement flicker is longer than others.</p>  <p>SAT455F</p> <p>Line pressure solenoid valve circuit is short-circuited or disconnected.  <b>➔Go to LINE PRESSURE SOLENOID VALVE CIRCUIT CHECK.</b></p>	
<p>Flickers as shown below.</p>  <p>SAT457F</p> <p>Battery power is low.          Battery has been disconnected for a long time.          Battery is conversely connected.          (When reconnecting A/T control unit connectors. — This is not a problem.)</p>	

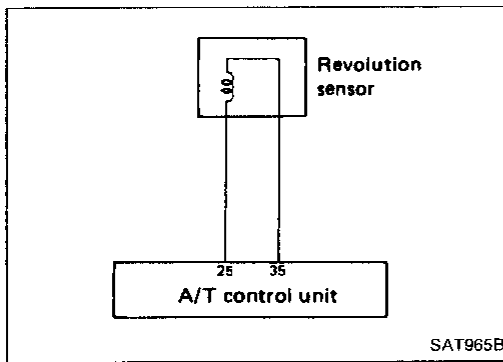
$t_4 = 1.0$  second

GI  
MA  
EM  
LC  
EF & EC  
FE  
CL  
MT  
AT  
PD  
FA  
RA  
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ST  
BF  
HA  
EL

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### REVOLUTION SENSOR CIRCUIT CHECK



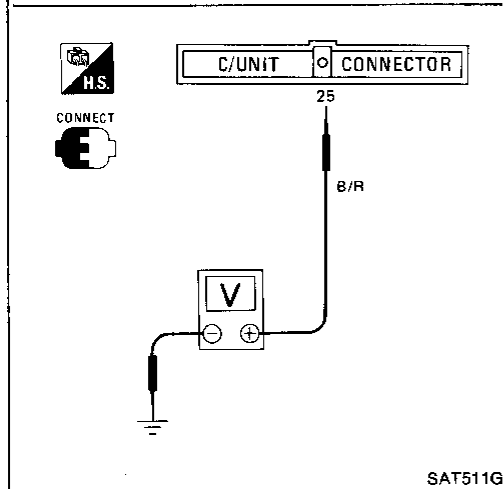
**A**

☆MONITOR ☆NO FAIL	▼
VHCL/S SE·A/T	0km/h
VHCL/S SE·MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

**RECORD**

SAT416G

**A**



**CHECK REVOLUTION SENSOR.**  
— Refer to "Electrical Components Inspection".

N.G. Repair or replace revolution sensor.

O.K.

**A**

**CHECK INPUT SIGNAL.**

- Turn ignition switch to "START" position and start engine.
- Select "ECU INPUT SIGNALS".
  - Read out the value of "VHCL/S SE·A/T" while driving.
  - Check the value changes according to driving speed.

N.G. Check harness continuity between A/T control unit and revolution sensor.

OR

⊘ Check voltage between A/T control unit terminal 25 and ground while driving.  
(Measure with A.C. position.)

**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.)**

O.K.

Perform self-diagnosis again after driving for a while.

N.G. 1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

**INSPECTION END**

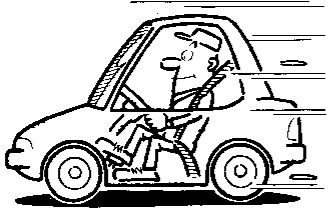


# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SPEED SENSOR CIRCUIT CHECK

**A**



☆MONITOR ☆NO FAIL	▼
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

**RECORD**

SAT416G

**A**

**CHECK INPUT SIGNAL.**

- Turn ignition switch to "START" position and start engine.
- Select "ECU INPUT SIGNALS".
  - Read out the value of "VHCL/S SE•MTR" while driving.
  - Check the value changes according to driving speed.

OR

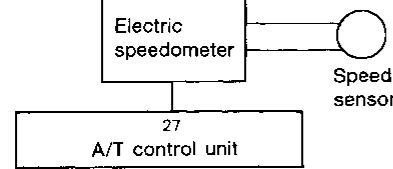
- Check voltage between A/T control unit terminal 27 and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

**Voltage:**  
Varies from 0V to 5V

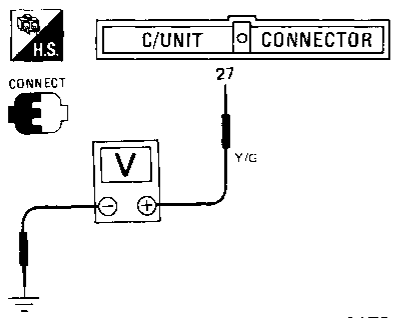
N.G. → Check the following items.

- Speed sensor and ground circuit for speed sensor — Refer to section EL.
- Harness continuity between A/T control unit and speed sensor

**A**



At 2 - 3 km/h (1 - 2 MPH)



SAT512G

Perform self-diagnosis again after driving for a while.

O.K. → **INSPECTION END**

N.G. →

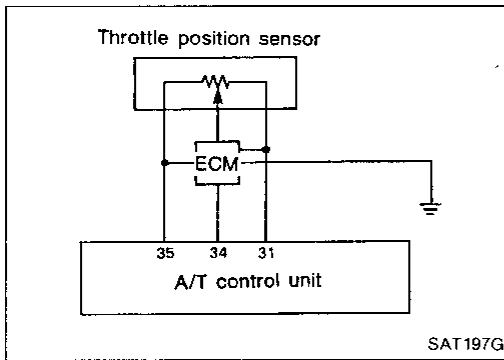
- Perform A/T control unit input/output signal inspection.
- If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### THROTTLE POSITION SENSOR CIRCUIT CHECK



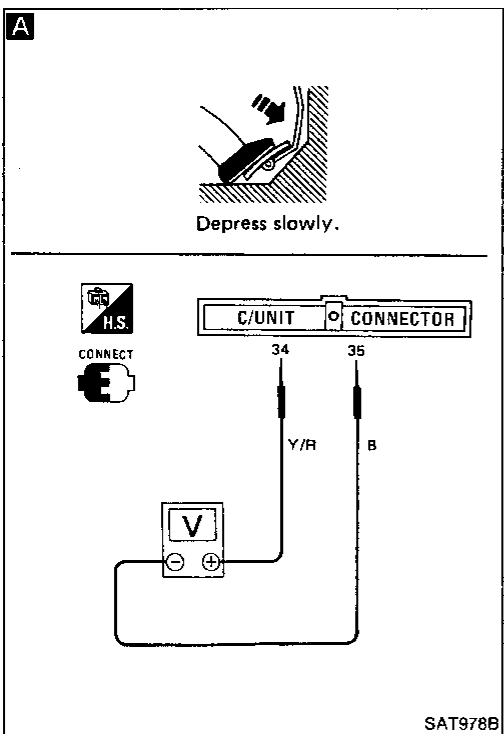
**A**

Depress slowly.

☆ MONITOR ☆ NO FAIL	
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

**RECORD**

SAT417G



Perform self-diagnosis (Mode III) for engine control.

N.G. Check throttle position sensor circuit for engine control. — Refer to section EF & EC.

O.K.

**A**

**CHECK INPUT SIGNAL.**

1. Turn ignition switch to "ON" position. (Do not start engine.)

- 2.
- Select "ECU INPUT SIGNALS".
  - Read out the value of "THROTTLE POSITION SENSOR".

**Voltage:**

**Fully-closed throttle:**  
0.2 - 0.6V

**Fully-open throttle:**  
2.9 - 3.9V

OR

- Check voltage between A/T control unit terminals ④ and ⑤ while accelerator pedal is depressed slowly.

**Voltage:**

**Fully-closed throttle:**  
0.2 - 0.6V

**Fully-open throttle:**  
2.9 - 3.9V

(Voltage rises gradually in response to throttle valve opening.)

N.G. Check harness continuity between ECM and A/T control unit regarding throttle position sensor circuit.

O.K.

Perform self-diagnosis again after driving for a while.

N.G. 1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

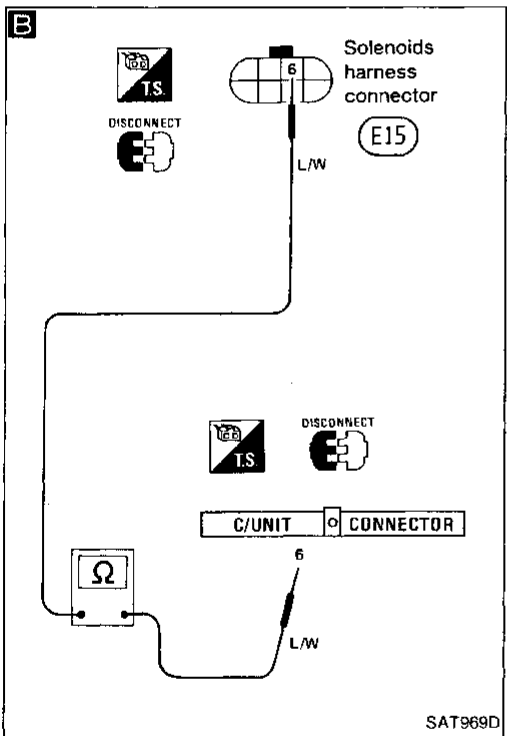
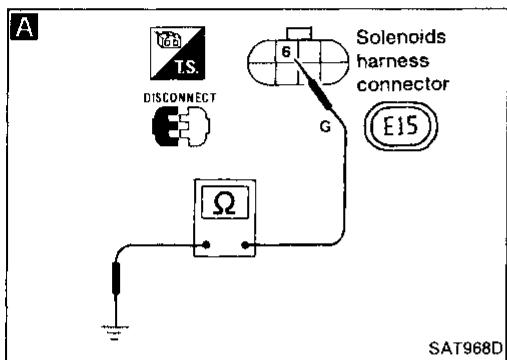
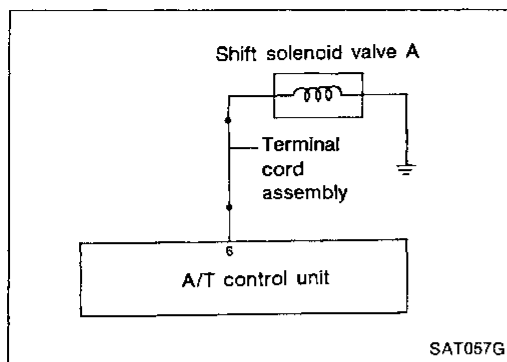
O.K.

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SHIFT SOLENOID VALVE A CIRCUIT CHECK



**A**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly in engine compartment.
3. Check resistance between terminal ⑥ and ground.  
**Resistance: 20 - 30Ω**

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Shift solenoid valve A — Refer to "Electrical Components Inspection".
  - Harness continuity of terminal cord assembly

O.K. ↓

**B**

**CHECK POWER SOURCE CIRCUIT.**

1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑥ and A/T control unit terminal ⑥.  
**Resistance: Approximately 0Ω**
4. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

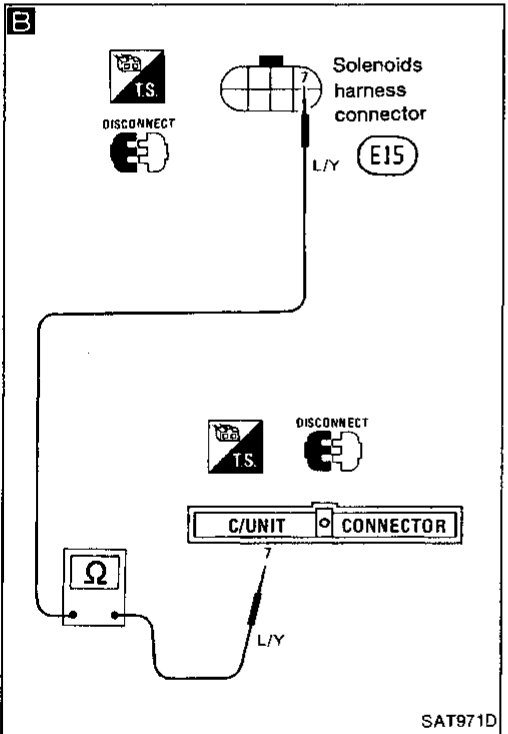
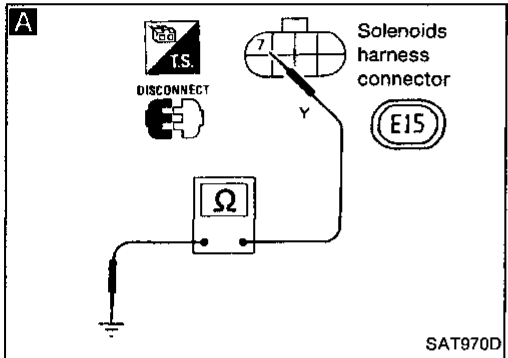
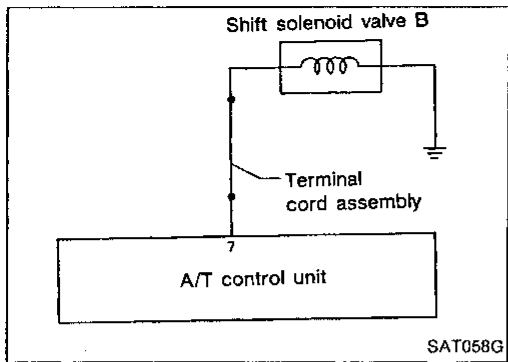
**INSPECTION END**

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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### SHIFT SOLENOID VALVE B CIRCUIT CHECK



**A**

#### CHECK GROUND CIRCUIT.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.

**Resistance: 20 - 40Ω**

N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Shift solenoid valve B — Refer to "Electrical Components Inspection".
  - Harness continuity of terminal cord assembly

O.K.

**B**

#### CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑦ and A/T control unit terminal ⑦.

**Resistance: Approximately 0Ω**

N.G.

1. Repair or replace harness between A/T control unit and terminal cord assembly.

O.K.

Perform self-diagnosis after driving for a while.

N.G.

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

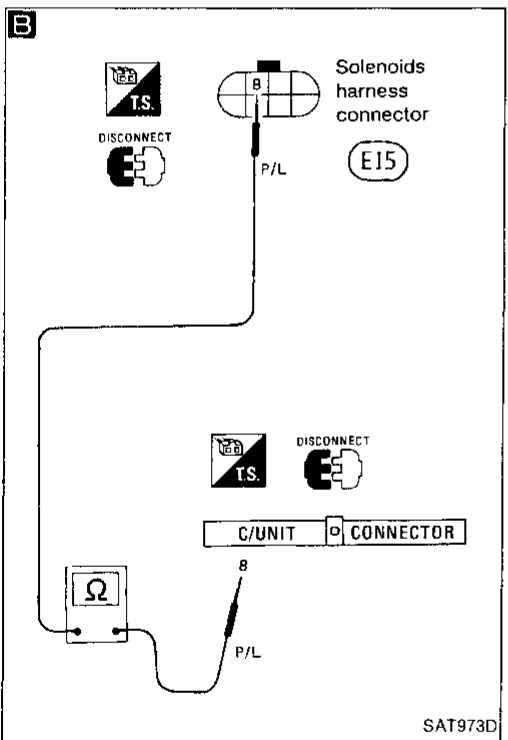
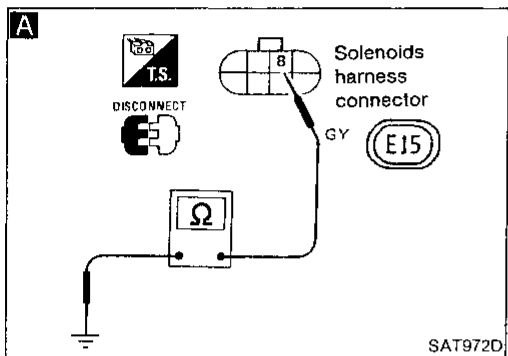
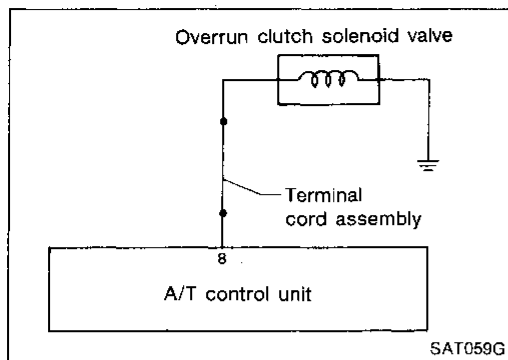
O.K.

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### OVERRUN CLUTCH SOLENOID VALVE CIRCUIT CHECK



**A**

#### CHECK GROUND CIRCUIT.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly in engine compartment.
3. Check resistance between terminal ⑧ and ground.

**Resistance: 20 - 30Ω**

N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Overrun clutch solenoid valve. — Refer to "Electrical Components Inspection".
  - Harness continuity of terminal cord assembly

O.K.

**B**

#### CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "OFF" position.
  2. Disconnect A/T control unit connector.
  3. Check resistance between terminal ⑧ and A/T control unit terminal ⑧.
- Resistance: Approximately 0Ω**
4. Reinstall any part removed.

N.G.

1. Repair or replace harness between A/T control unit and terminal cord assembly.

O.K.

Perform self-diagnosis after driving for a while.

N.G.

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

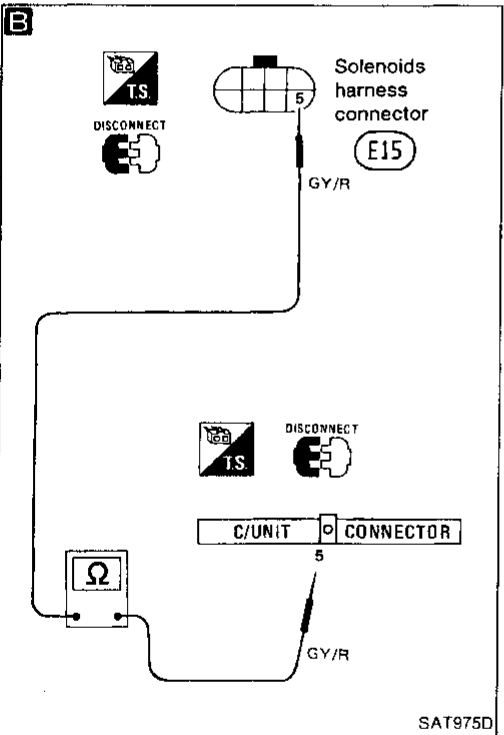
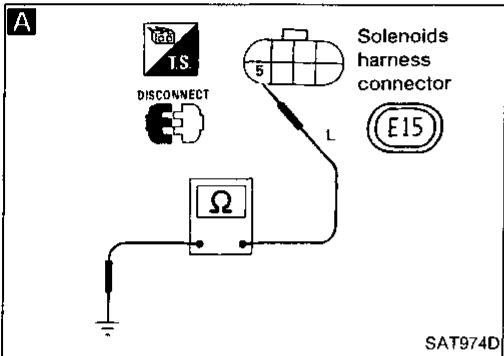
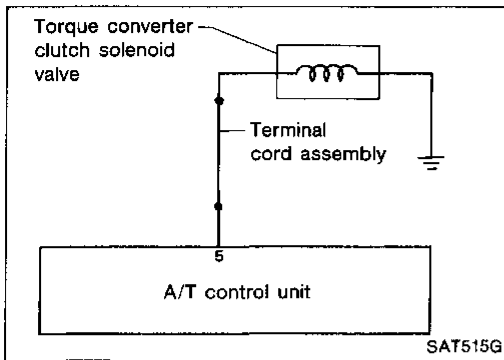
**INSPECTION END**

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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### TORQUE CONVERTER CLUTCH SOLENOID VALVE CIRCUIT CHECK



**A**

#### CHECK GROUND CIRCUIT.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.

**Resistance: 10 - 20Ω**

N.G.

1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Torque converter clutch solenoid valve — Refer to "Electrical Components Inspection".
  - Harness continuity of terminal cord assembly

O.K.

**B**

#### CHECK POWER SOURCE CIRCUIT.

1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑤ and A/T control unit terminal ⑤.

**Resistance: Approximately 0Ω**

4. Reinstall any part removed.

N.G.

1. Repair or replace harness between A/T control unit and terminal cord assembly.

O.K.

Perform self-diagnosis after driving for a while.

N.G.

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

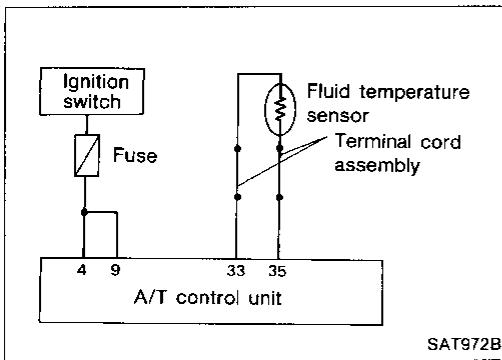
O.K.

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS



**A**

#### CHECK A/T CONTROL UNIT POWER SOURCE.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between A/T control unit terminals ④, ⑨ and ground. **Battery voltage should exist.**

N.G.

Check the following items.

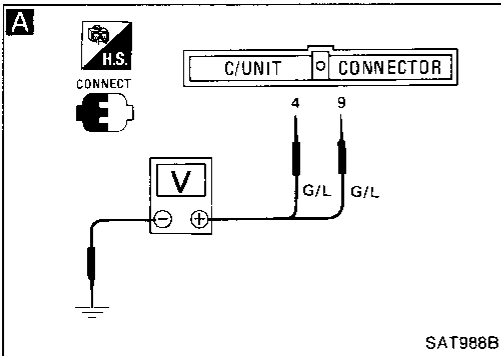
- Harness continuity between ignition switch and A/T control unit
- Ignition switch and fuse — Refer to section EL.

GI

MA

EM

LC



**B**

#### CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ③③ and ③⑤ when A/T is cold.

N.G.

1. Remove control valve cover.
2. Check the following items.

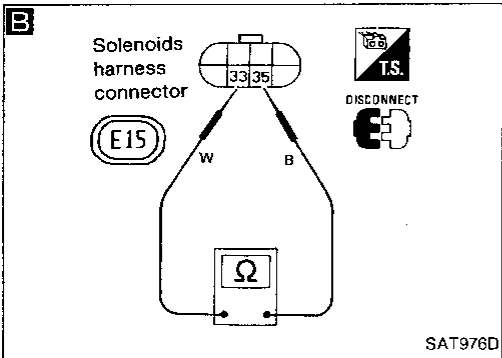
- Fluid temperature sensor — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

EF & EC

FE

CL

MT



#### Resistance:

**Cold [20°C (68°F)]**

**Approximately 2.5 kΩ**

4. Reinstall any part removed.

O.K.

Ⓐ

AT

PD

FA

RA

BR

ST

BF

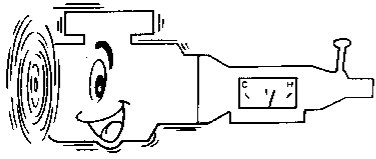
HA

EL

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**C**

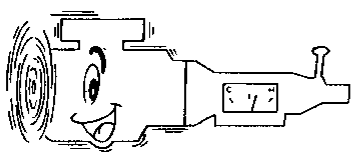
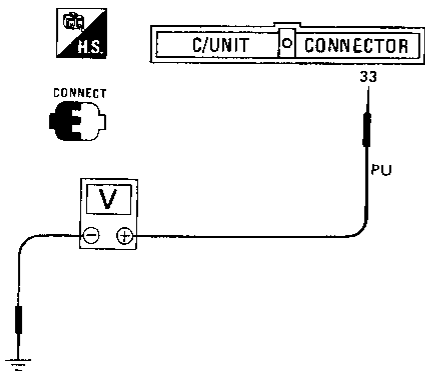


☆ MONITOR ☆ NO FAIL ▾	
VHCL/S SE·A/T	0km/h
VHCL/S SE·MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

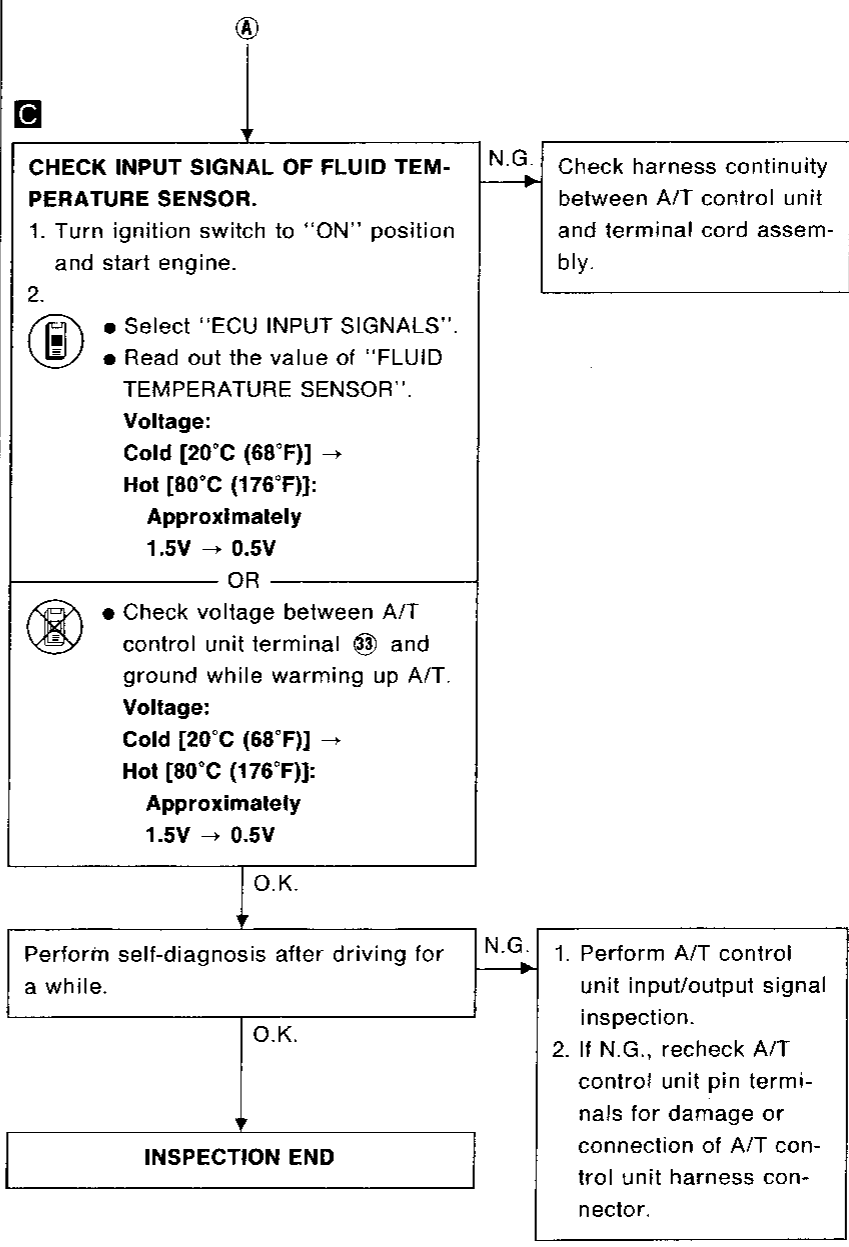
**RECORD**

SAT418G

**C**

SAT990B

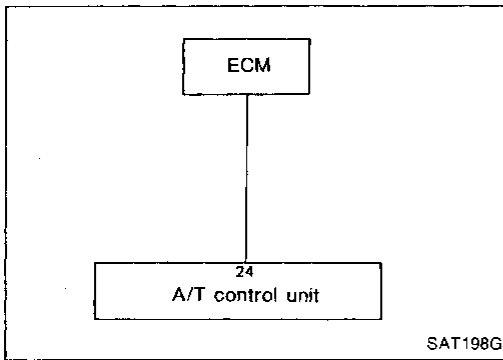




# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### ENGINE SPEED SIGNAL CIRCUIT CHECK

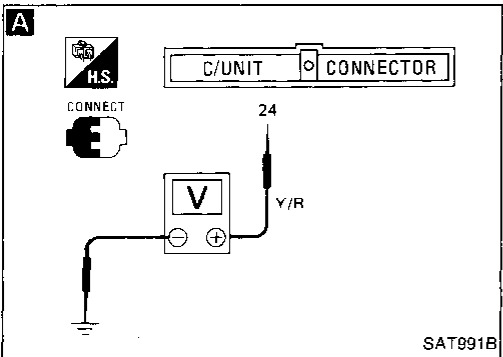
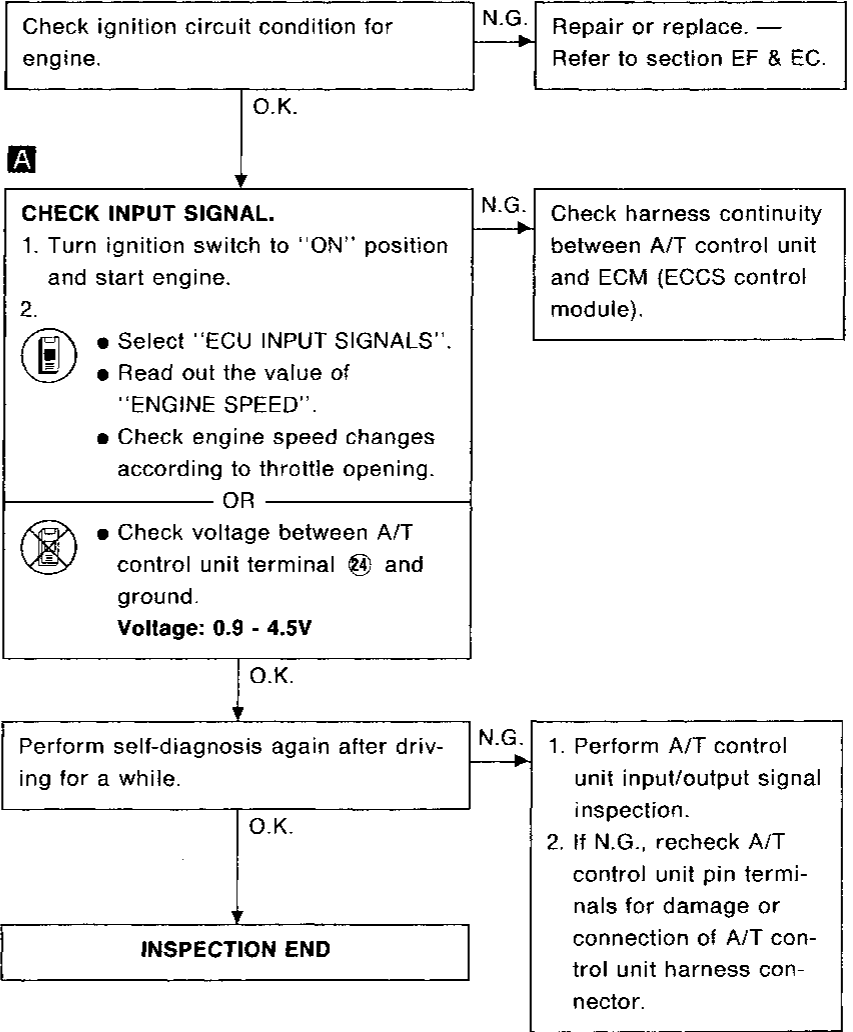


**A**

☆ MONITOR ☆ NO FAIL	<input type="checkbox"/>
VHCL/S SE-A/T	0km/h
VHCL/S SE-MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

**RECORD**

SAT419G

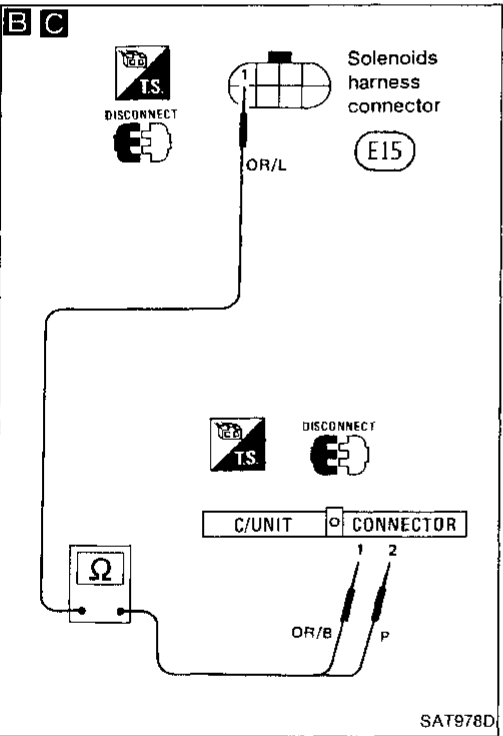
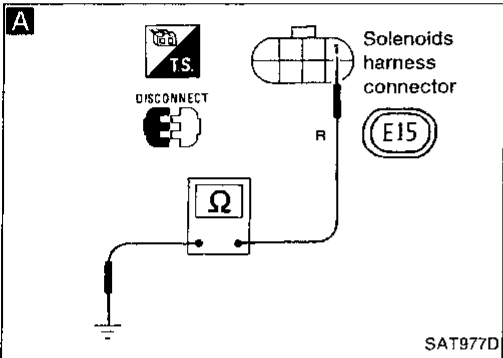
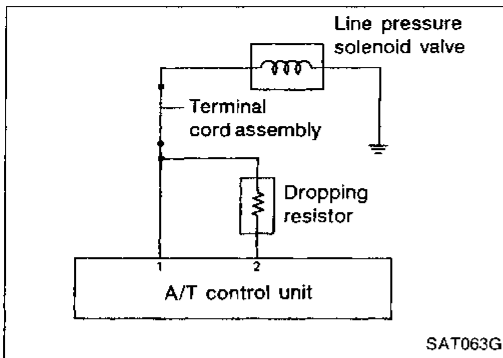


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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### LINE PRESSURE SOLENOID VALVE CIRCUIT CHECK



**A**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly in engine compartment.
3. Check resistance between terminal ① and ground.

**Resistance: 2.5 - 5Ω**

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Line pressure solenoid valve — Refer to "Electrical Components Inspection".
  - Harness continuity of terminal cord assembly

O.K. ↓

**B**

**CHECK POWER SOURCE CIRCUIT.**

1. Turn ignition switch to "OFF" position.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ① and A/T control unit terminal ②.

**Resistance: 11.2 - 12.8Ω**

N.G. →

Check the following items.

- Dropping resistor — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit ② and terminal cord assembly

O.K. ↓

**C**

**CHECK POWER SOURCE CIRCUIT.**

1. Turn ignition switch to "OFF" position.
2. Check resistance between terminal ① and A/T control unit terminal ①.

**Resistance: Approximately 0Ω**

3. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit ① and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

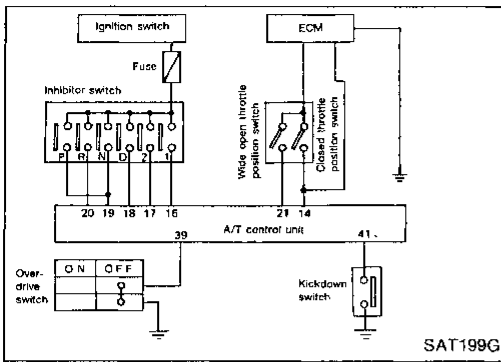
O.K. ↓

**INSPECTION END**

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

### INHIBITOR, OVERDRIVE, KICKDOWN AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECKS



SAT199G

**A**

☆ MONITOR ☆ NO FAIL	
VHCL/S SE-A/T	0km/h
VHCL/S SE-MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	O N
R POSITION SW	OFF
P/N POSI SW	O N

**RECORD**

SAT420G

**A**

#### CHECK INHIBITOR SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position.  
(Do not start engine.)

- 2.
- Select "ECU INPUT SIGNALS".
  - Read out "R, N, D, 1 and 2 position switches" moving selector lever to each position.
  - Check the selector lever position is indicated properly.



OR



Check voltage between A/T control unit terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each position.

**Voltage:**

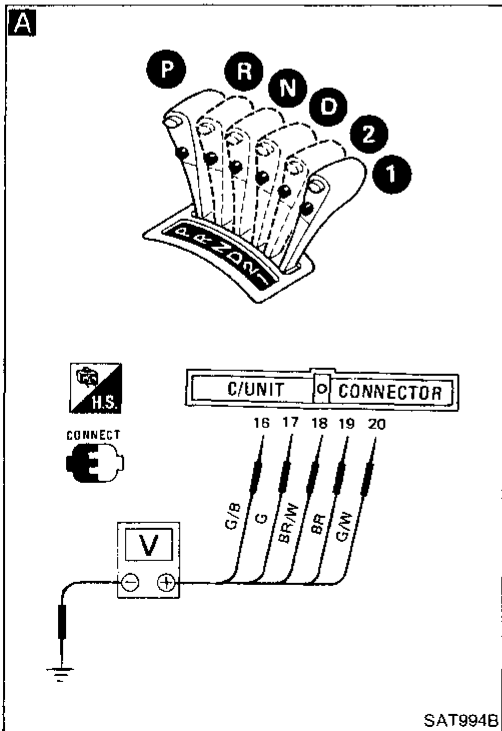
**B: Battery voltage**

**0: 0V**

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

O.K.

**A**



N.G.

Check the following items.

- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch
- Harness continuity between inhibitor switch and A/T control unit

GI

MA

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LC

EF & EC

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FA

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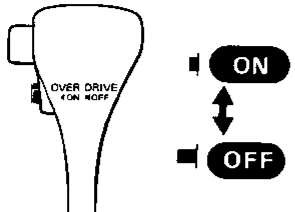
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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**B**

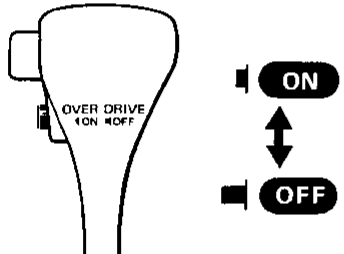
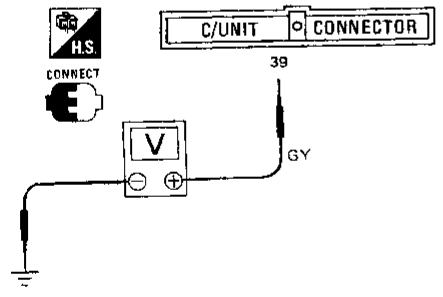


☆MONITOR ☆NO FAIL	
VHCL/S SE•A/T	0km/h
VHCL/S SE•MTR	5km/h
THRTL POS SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENGINE SPEED	1024rpm
SLCT LEVER SW	ON
R POSITION SW	OFF
P/N POSI SW	ON

RECORD

SAT421G

**B**

SAT995B

A

**B**

**CHECK OVERDRIVE SWITCH CIRCUIT.**

- Turn ignition switch to "ON" position. (Do not start engine.)
- Select "ECU INPUT SIGNALS".
  - Read out "SELECTOR LEVER SWITCH (Overdrive switch)".
  - Check the selector lever switch position is indicated properly. (Selector lever switch "ON" displayed on CONSULT means overdrive "OFF".)

OR

- Check voltage between A/T control unit terminal 39 and ground when overdrive switch is in "ON" position and in "OFF" position.

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

O.K.

B

N.G.


Check the following items.

- Overdrive switch — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**C**


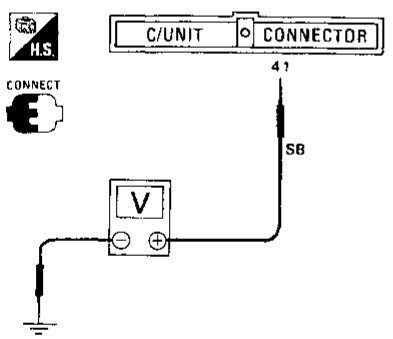


☆ MONITOR	☆ NO FAIL	
D POSITION SW	OFF	
1 POSITION SW	OFF	
2 POSITION SW	OFF	
ASCD·CRUISE	OFF	
ASCD·OD OUT	OFF	
KICKDOWN SW	OFF	
POWERSHIFT SW	OFF	
CLOSED THL/SW	ON	
W/O THRL/P-SW	OFF	

**RECORD**

SAT422G

**C**

SAT337C

**B**

**C**

**CHECK KICKDOWN SWITCH CIRCUIT.**

1. Turn ignition switch to "ON" position.  
(Do not start engine.)
2.
  - Select "ECU INPUT SIGNALS".
  - Read out "KICKDOWN SWITCH" depressing accelerator pedal fully.
  - Check kickdown switch position is indicated properly.

OR

- Check voltage between A/T control unit terminal ④1 and ground while depressing accelerator pedal slowly.  
(after warming up engine)

**Voltage:**

- When releasing accelerator pedal: 3 - 8V**
- When depressing accelerator pedal fully: 1V or less**

N.G. →

Check the following items.

- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch
- Harness continuity of ground circuit for kickdown switch
- Adjust kickdown switch — Refer to "ON-VEHICLE SERVICE".

O.K. ↓

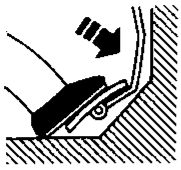
**C**

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# TROUBLE DIAGNOSES

## Self-diagnosis (Cont'd)

**D**


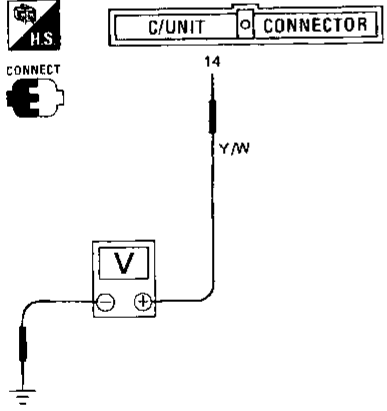


☆ MONITOR	☆ NO FAIL	
D POSITION SW	OFF	
1 POSITION SW	OFF	
2 POSITION SW	OFF	
ASCD•CRUISE	OFF	
ASCD•OD OUT	OFF	
KICKDOWN SW	OFF	
POWERSHIFT SW	OFF	
CLOSED THL/SW	ON	
W/O THRL/P-SW	OFF	

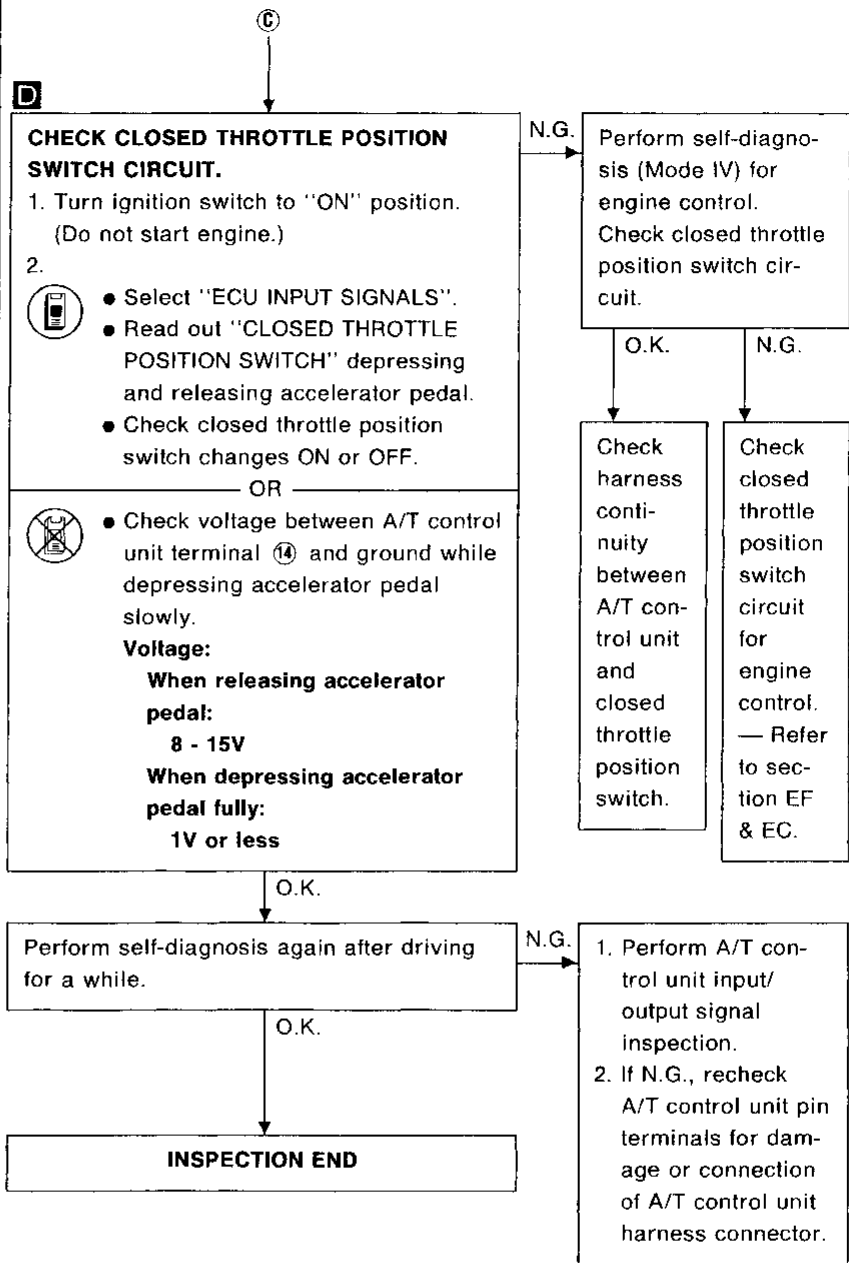
**RECORD**

SAT423G

**D**

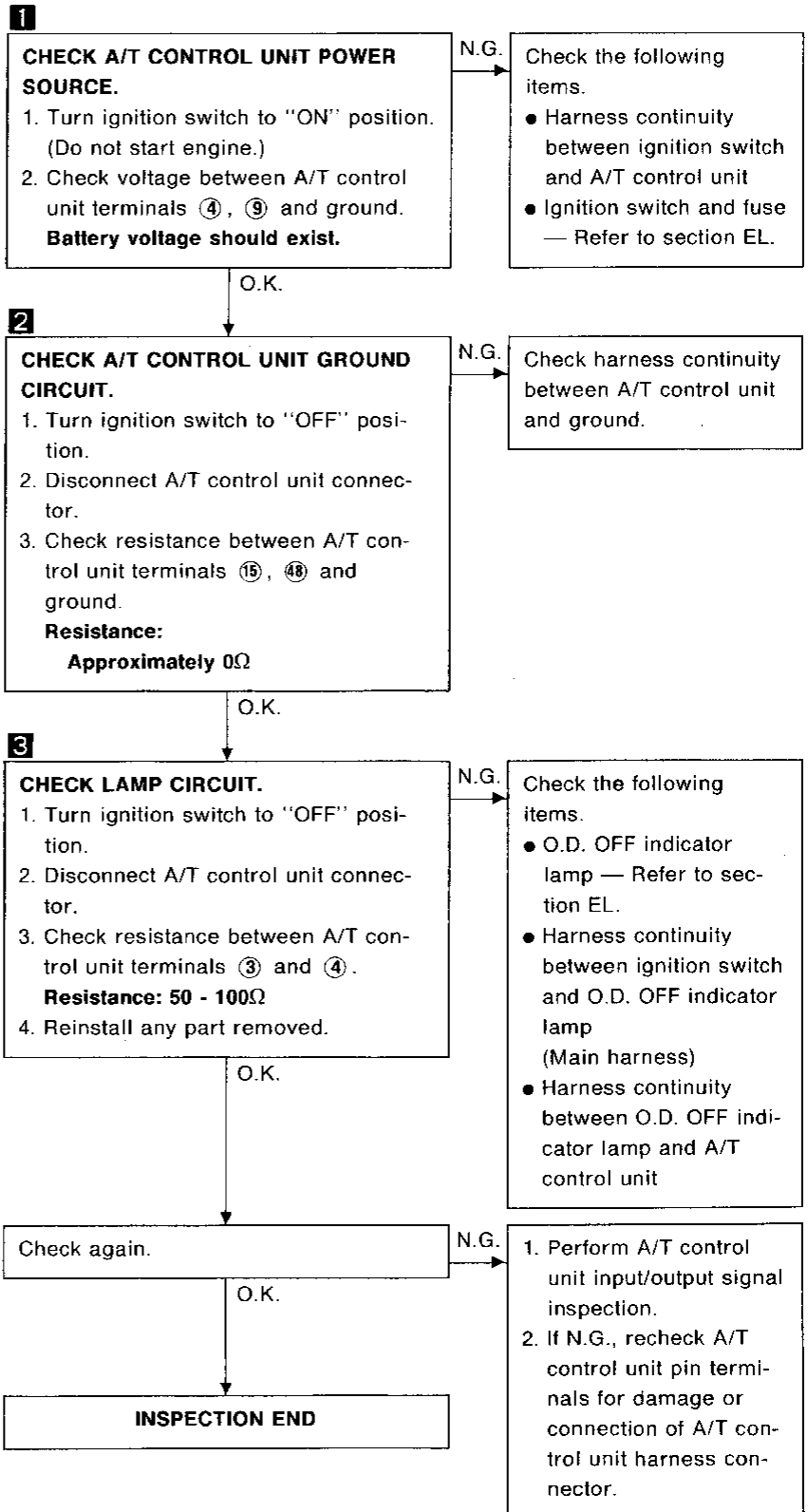
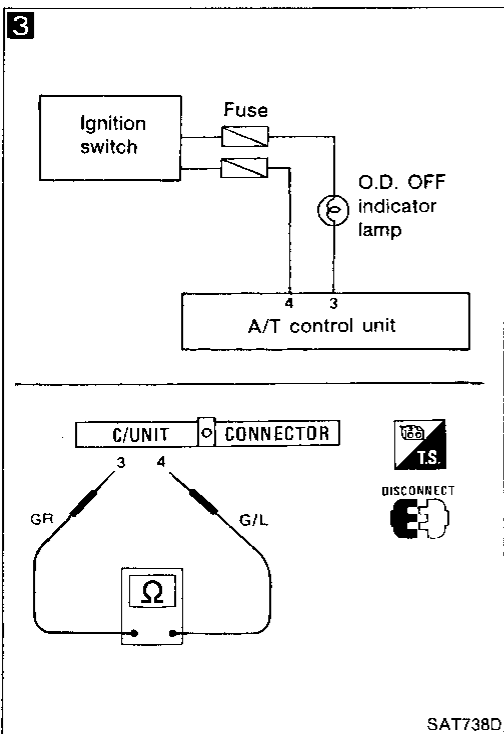
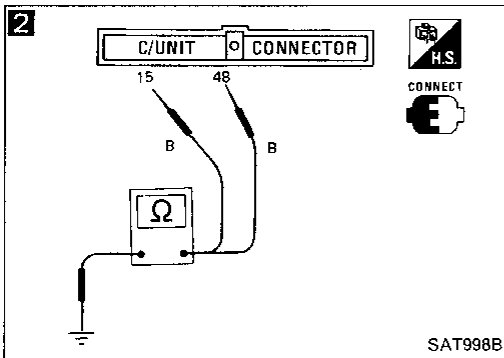
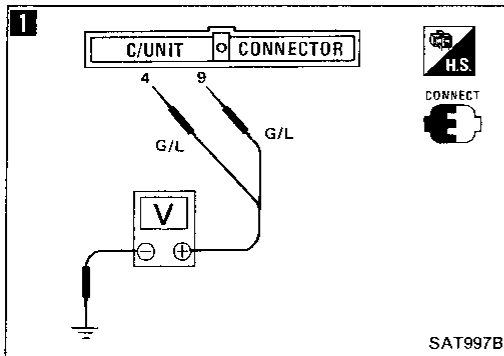
SAT979D



# TROUBLE DIAGNOSES

## Diagnostic Procedure 1

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

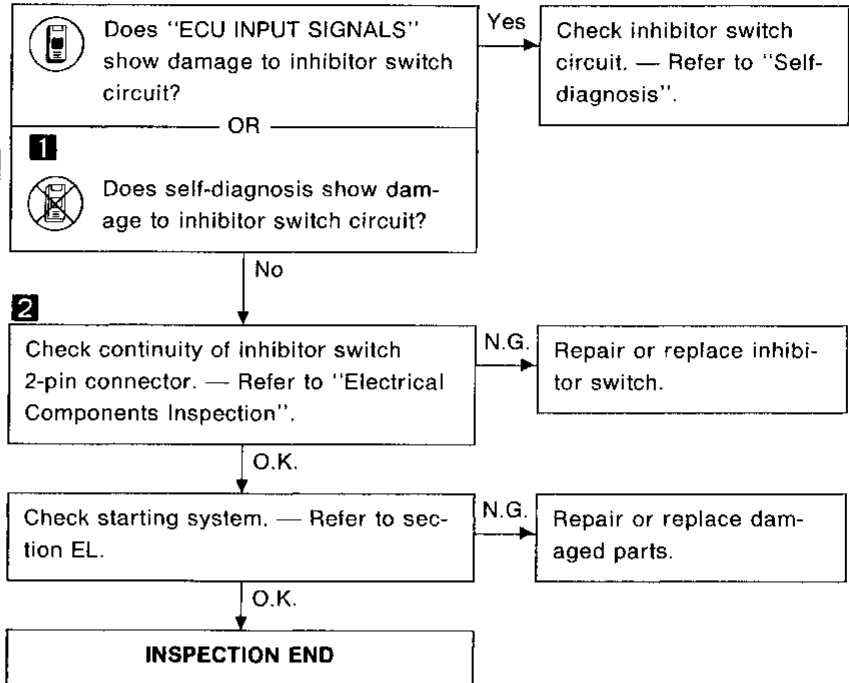
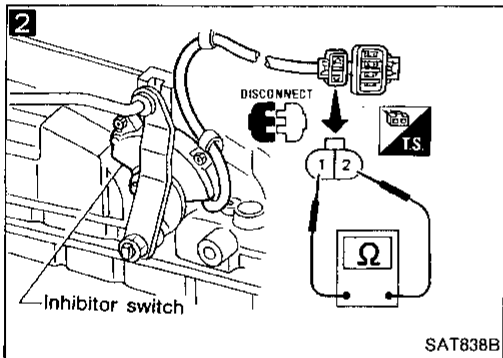
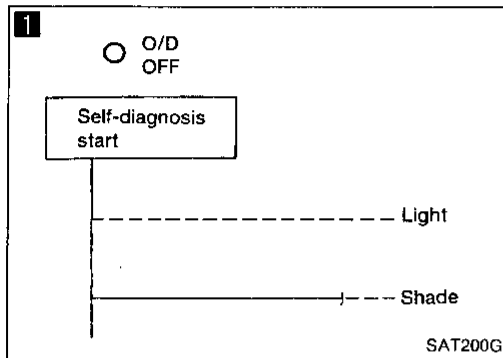


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# TROUBLE DIAGNOSES

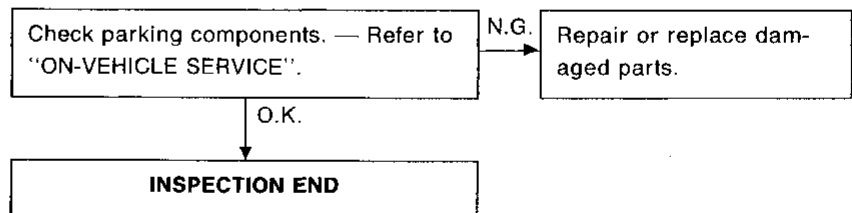
## Diagnostic Procedure 2

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



## Diagnostic Procedure 3

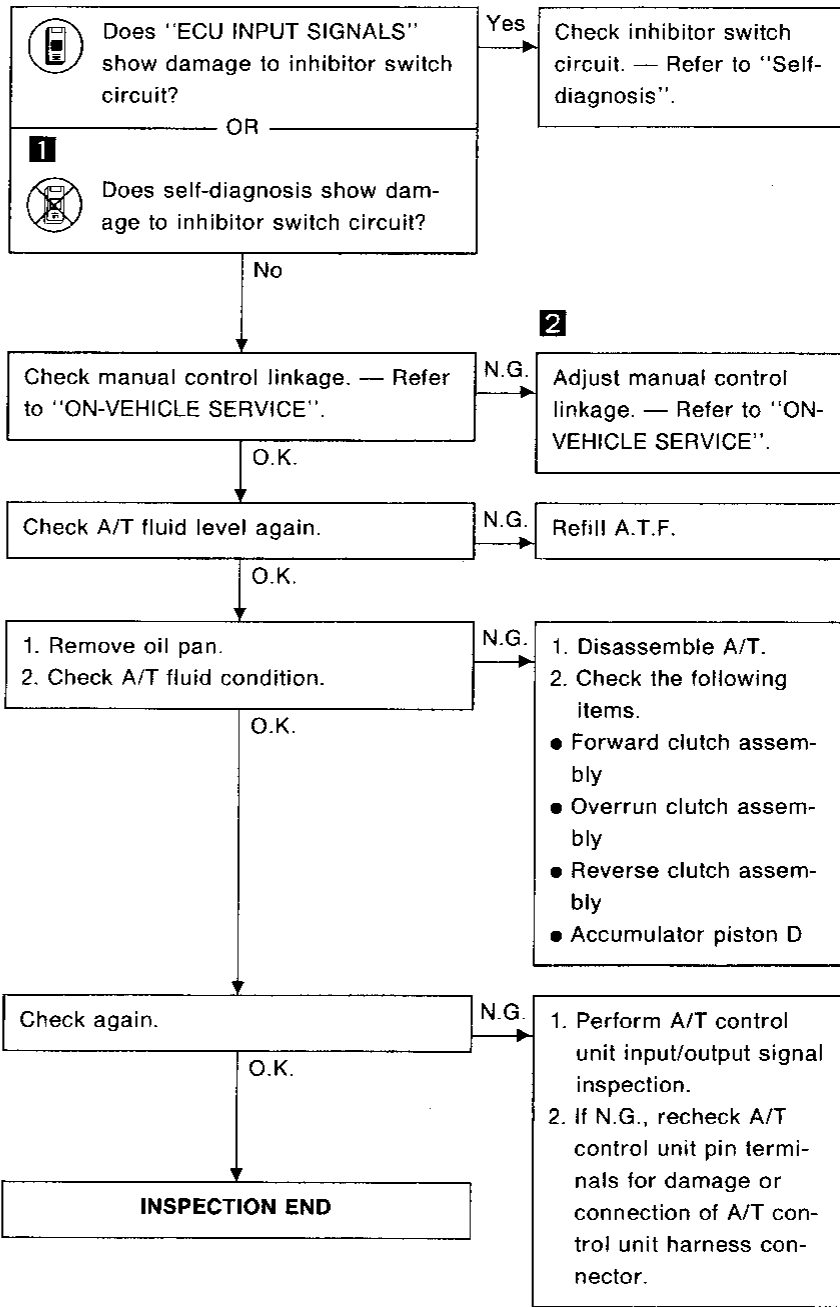
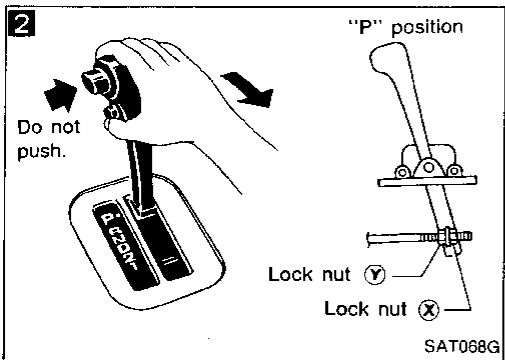
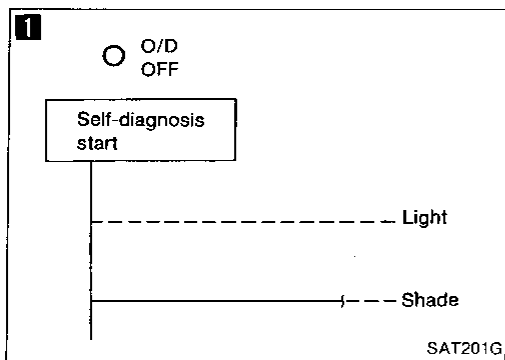
**SYMPTOM:** Vehicle moves when it is pushed forward or backward with selector lever in "P" position.





**Diagnostic Procedure 4**

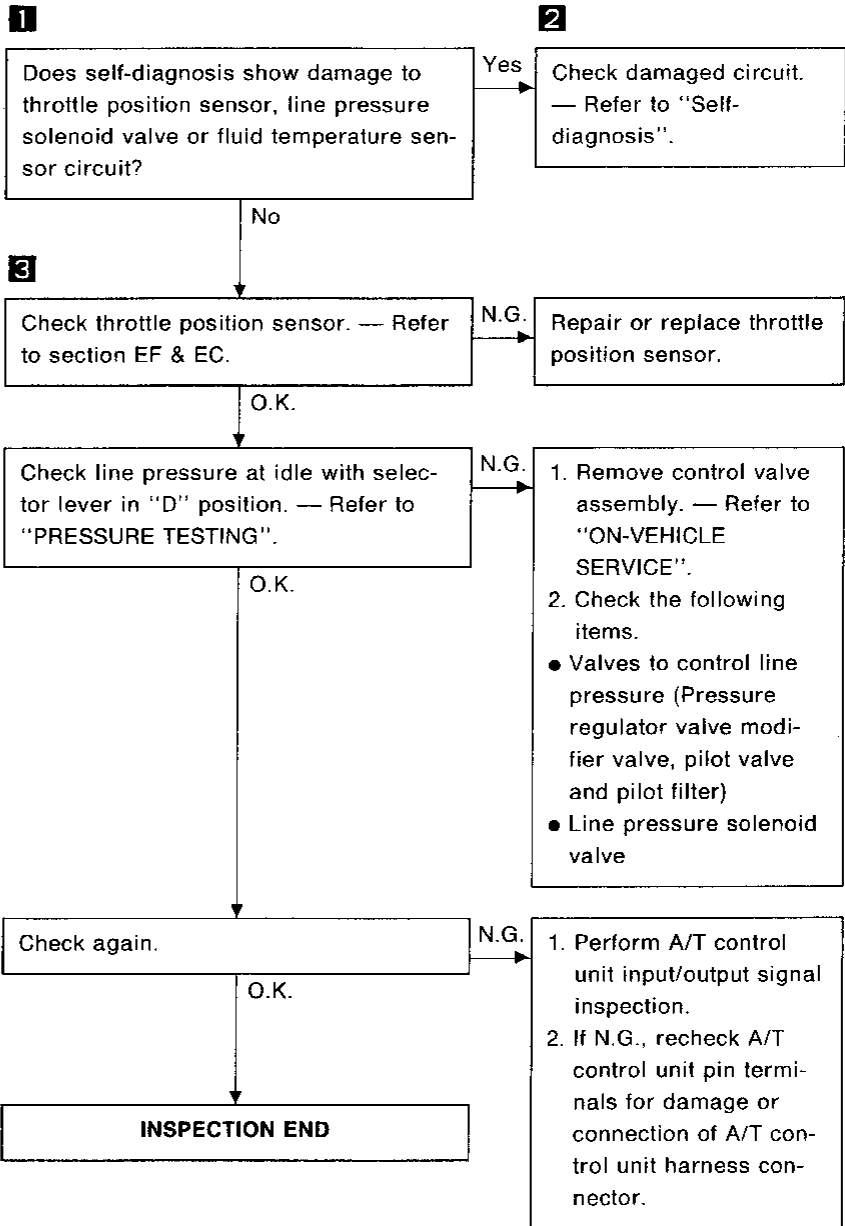
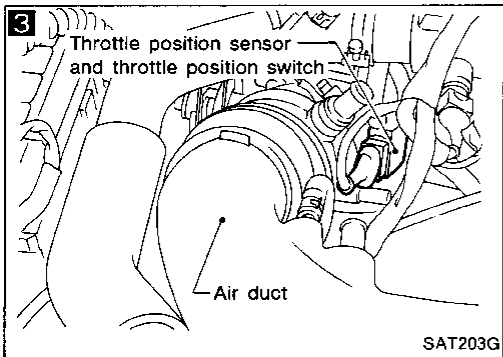
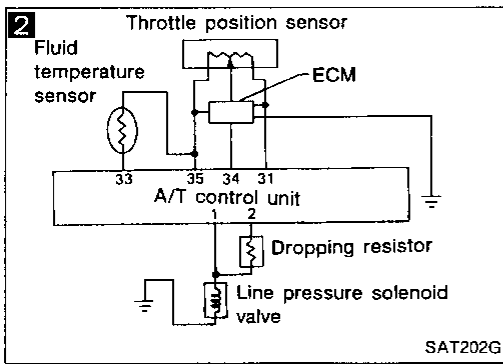
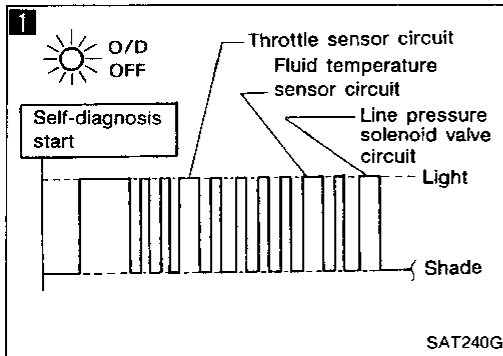
**SYMPTOM: Vehicle moves forward or backward when selecting "N" position.**



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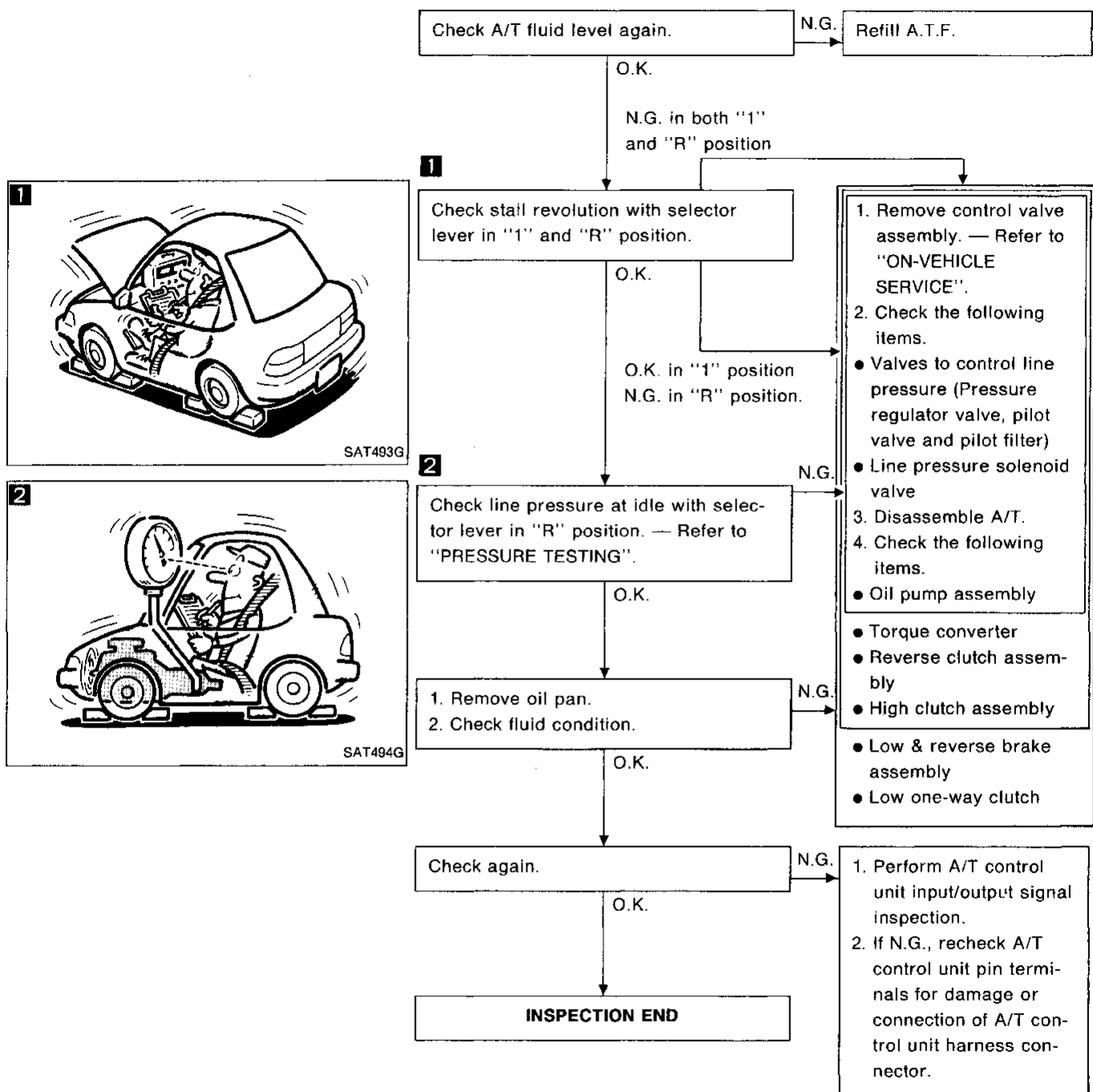
**Diagnostic Procedure 5**

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



**Diagnostic Procedure 6**

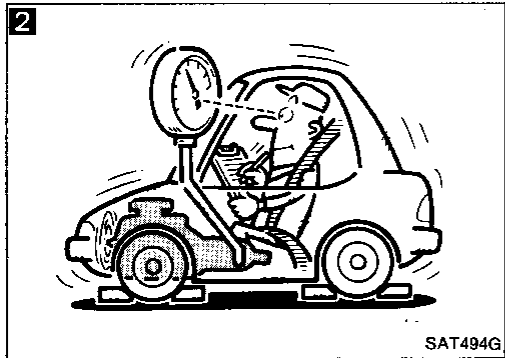
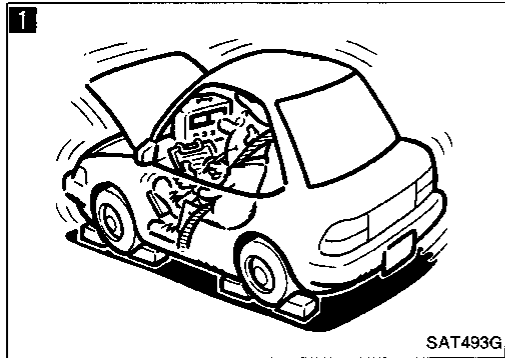
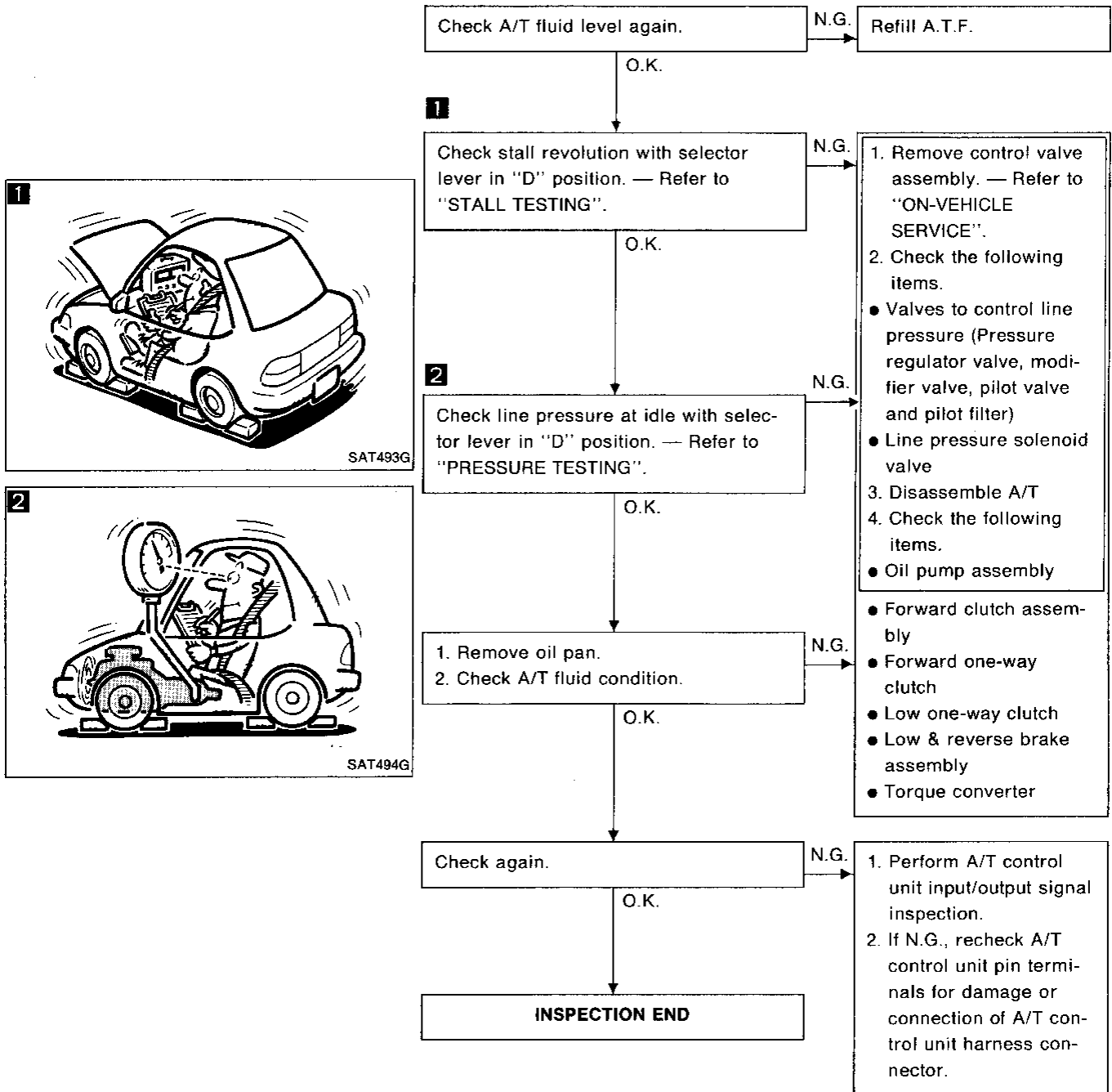
**SYMPTOM: Vehicle does not creep backward when selecting "R" position.**



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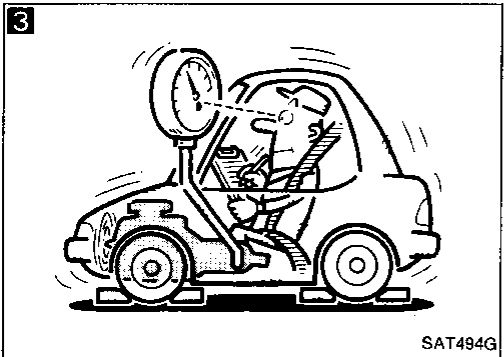
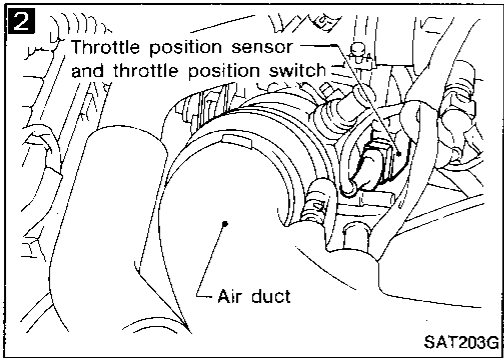
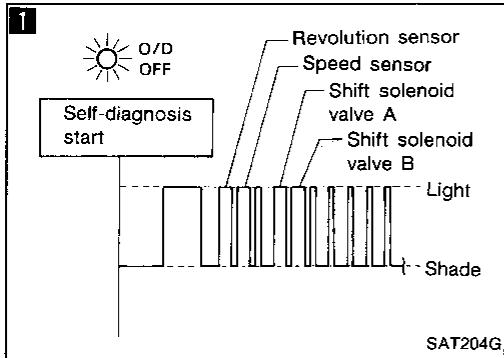
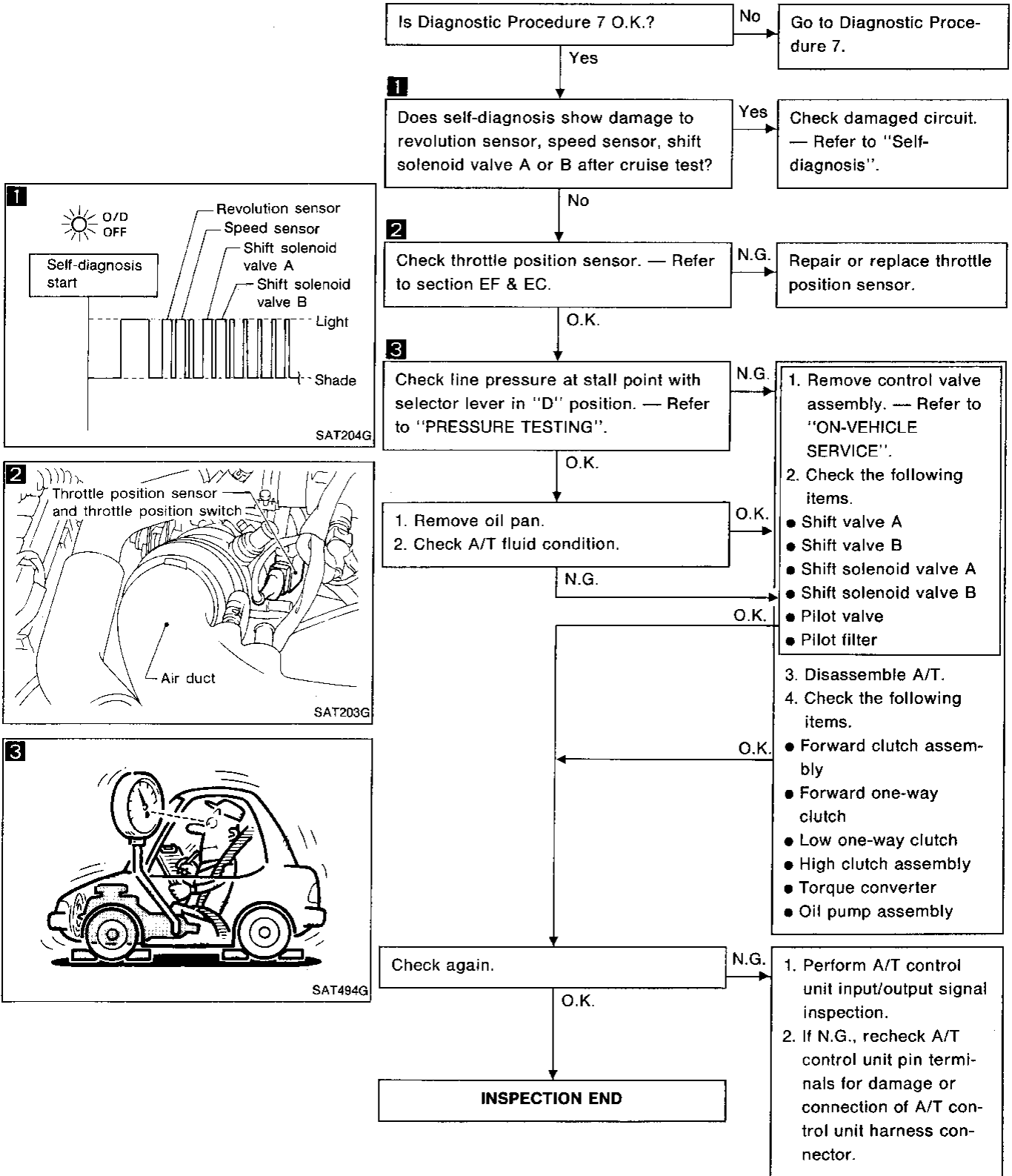
## Diagnostic Procedure 7

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



**Diagnostic Procedure 8**

**SYMPTOM: Vehicle cannot be started from D<sub>1</sub> on Cruise test — Part 1.**



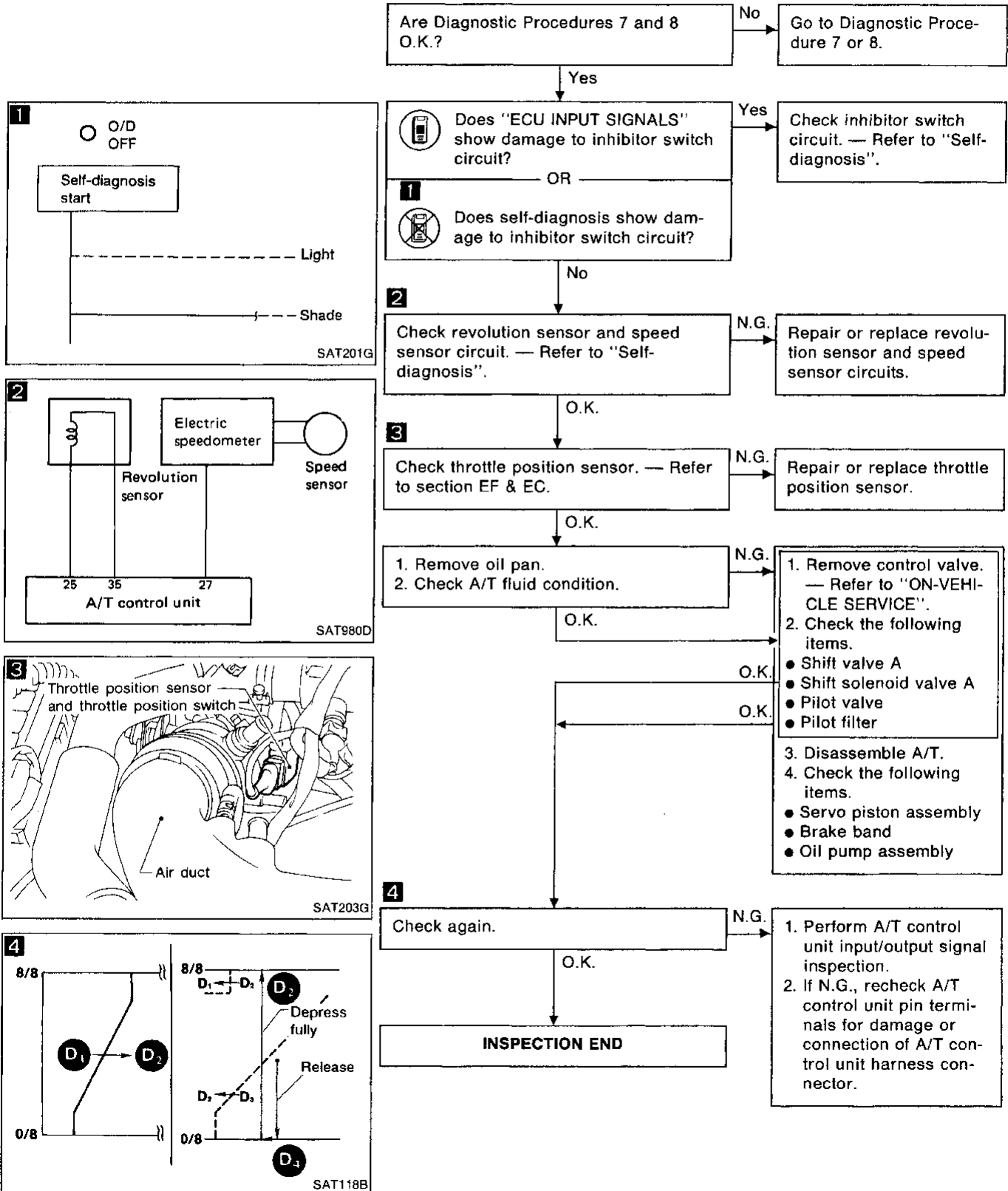
GI  
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# TROUBLE DIAGNOSES

## Diagnostic Procedure 9

**SYMPTOM: A/T does not shift from D<sub>1</sub> to D<sub>2</sub> at the specified speed.**

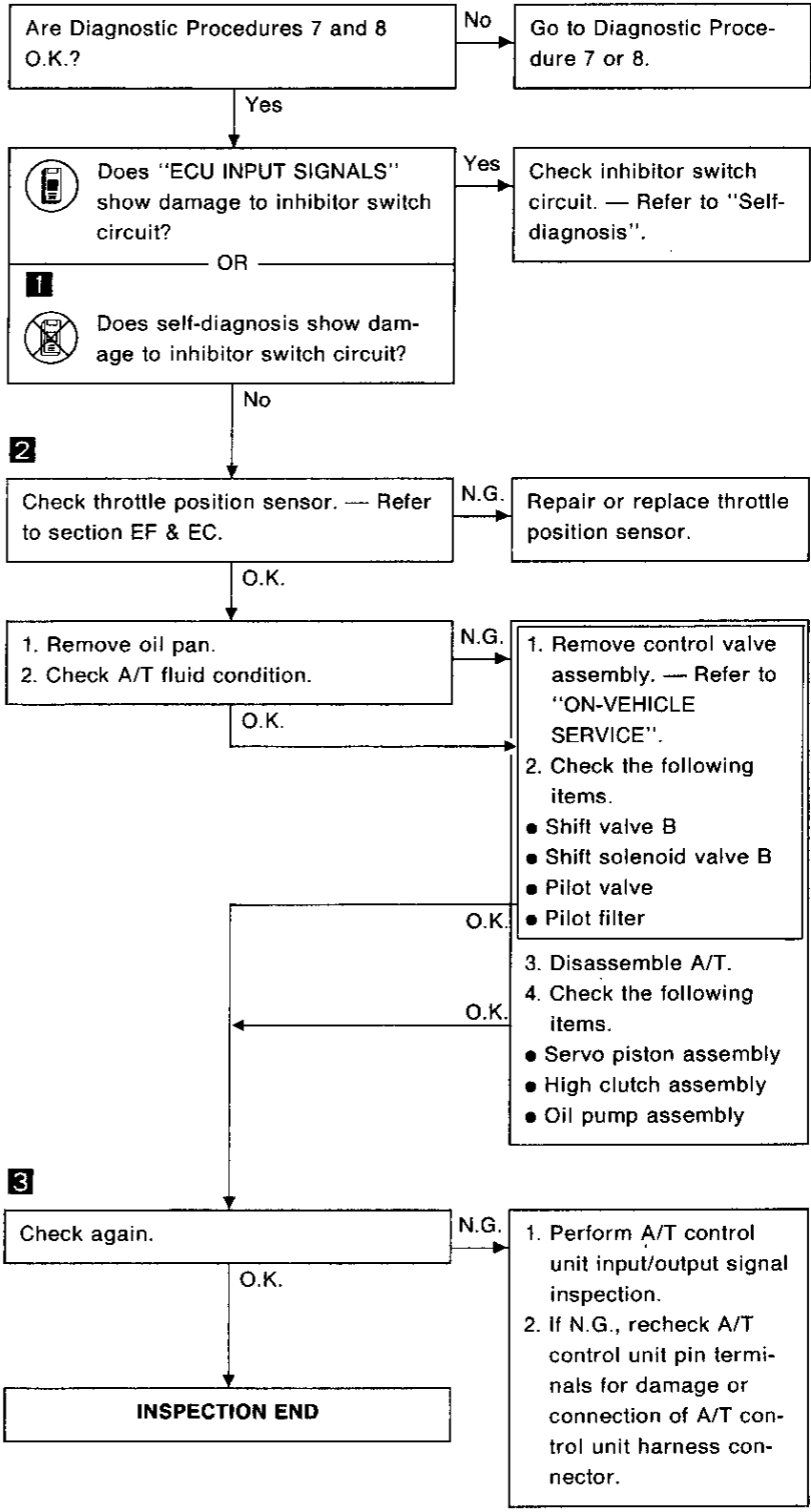
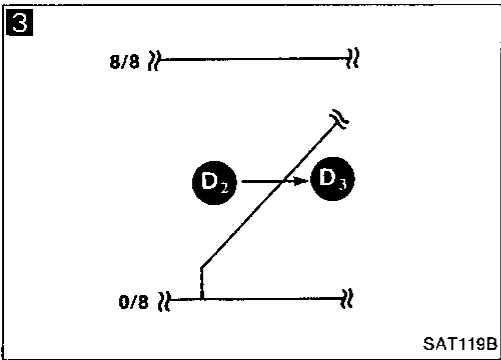
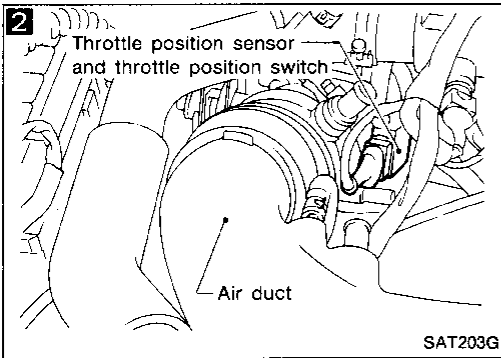
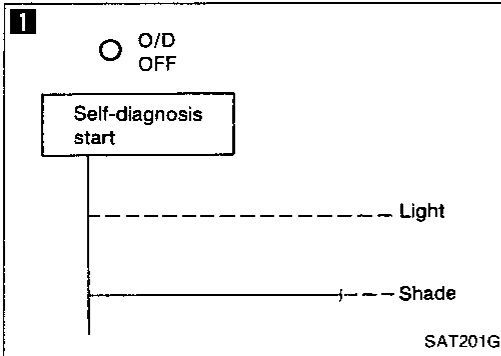
**A/T does not shift from D<sub>4</sub> to D<sub>2</sub> when depressing accelerator pedal fully at the specified speed.**



# TROUBLE DIAGNOSES

## Diagnostic Procedure 10

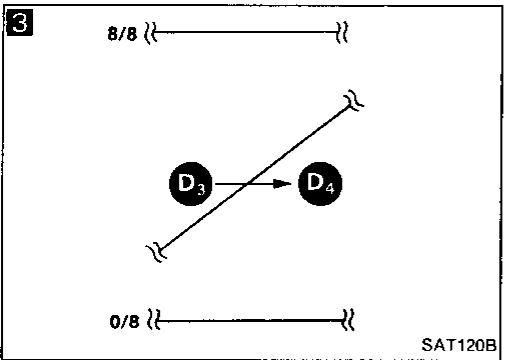
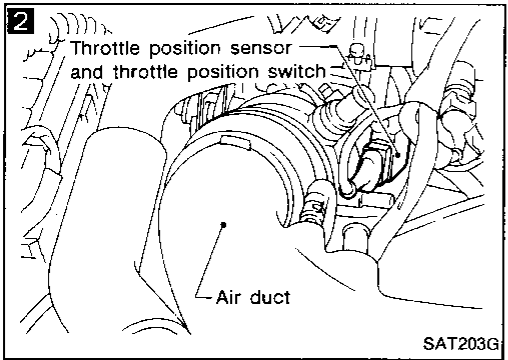
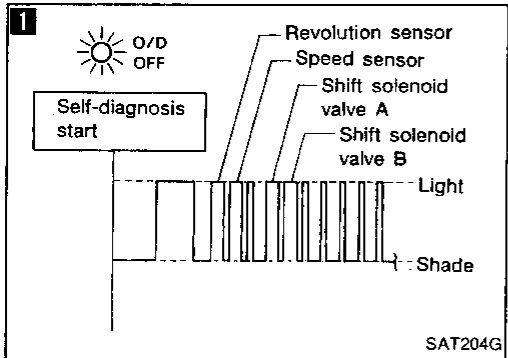
**SYMPTOM: A/T does not shift from D<sub>2</sub> to D<sub>3</sub> at the specified speed.**



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**Diagnostic Procedure 11**

**SYMPTOM: A/T does not shift from D<sub>3</sub> to D<sub>4</sub> at the specified speed.**



```

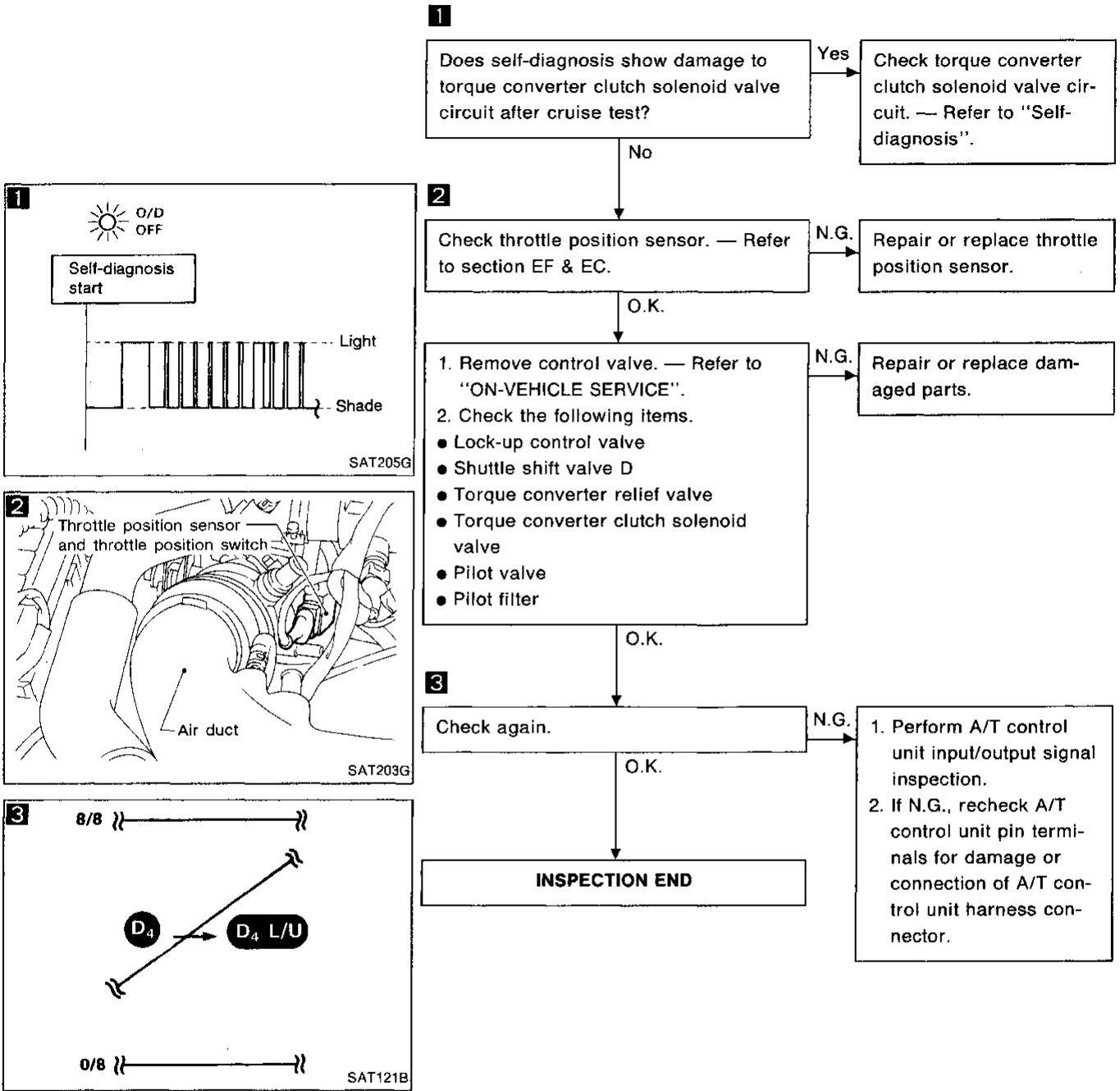
    graph TD
        Q1[Are Diagnostic Procedures 7 and 8 O.K.?] -- No --> A7[Go to Diagnostic Procedure 7 or 8.]
        Q1 -- Yes --> Q1_1[1 Does self-diagnosis show damage to inhibitor switch, overdrive switch, shift solenoid valve A, B, revolution sensor, speed sensor or fluid temperature sensor circuit after cruise test?]
        
        Q1_1 -- Yes --> A1_1[Check damaged circuit. — Refer to "Self-diagnosis".]
        Q1_1 -- No --> Q2[2 Check throttle position sensor. — Refer to section EF & EC.]
        
        Q2 -- N.G. --> A2_1[Repair or replace throttle position sensor.]
        Q2 -- O.K. --> Q3_1[1. Remove oil pan.  
2. Check A/T fluid condition.]
        
        Q3_1 -- N.G. --> A3_1[1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".  
2. Check the following items.  
• Shift valve B  
• Overrun clutch control valve  
• Shift solenoid valve B  
• Pilot valve  
• Pilot filter]
        Q3_1 -- O.K. --> A3_2[3. Disassemble A/T.  
4. Check the following items.  
• Servo piston assembly  
• Brake band  
• Torque converter  
• Oil pump assembly]
        
        A3_1 --> Q3_2[3 Check again.]
        A3_2 --> Q3_2
        
        Q3_2 -- N.G. --> A3_3[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q3_2 -- O.K. --> END[INSPECTION END]
    
```



# TROUBLE DIAGNOSES

## Diagnostic Procedure 12

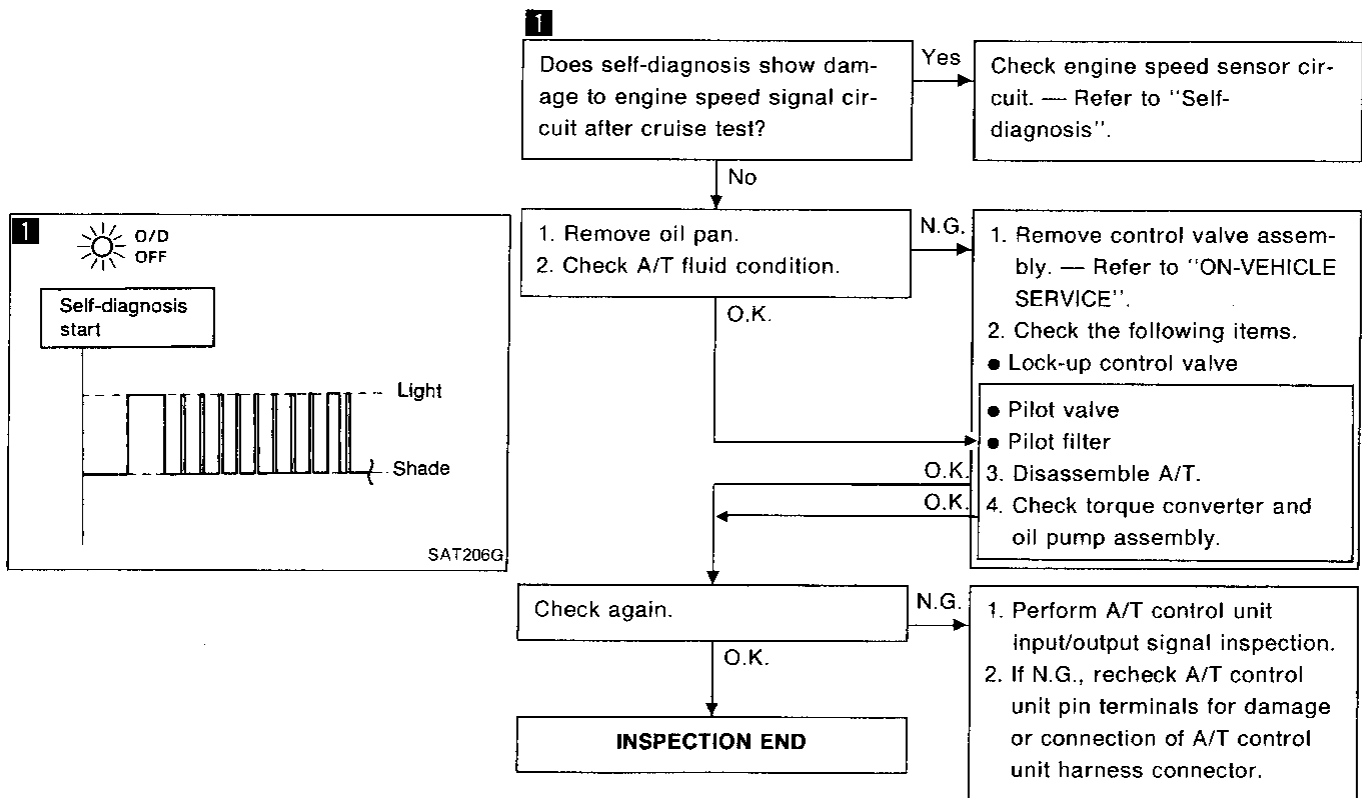
**SYMPTOM: A/T does not perform lock-up at the specified speed.**



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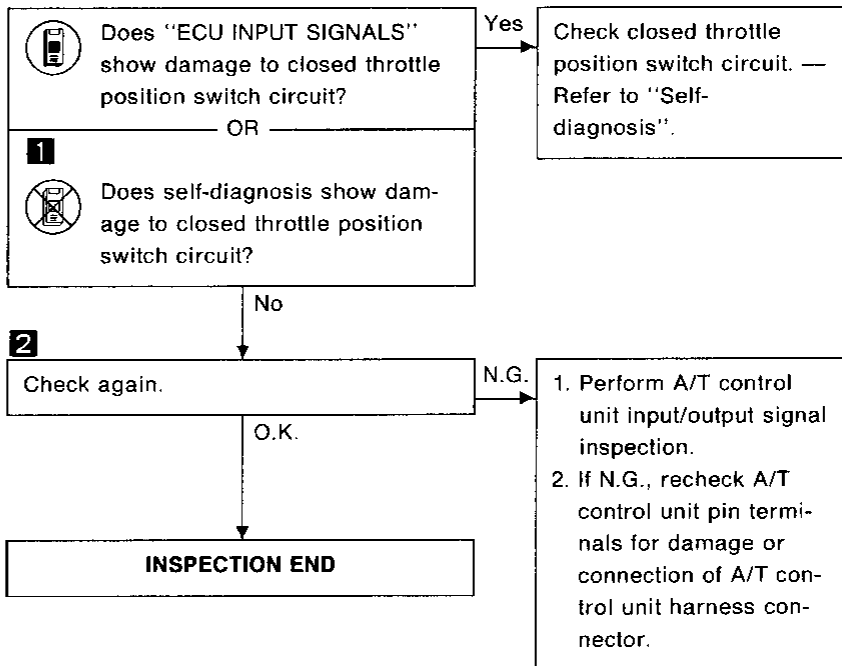
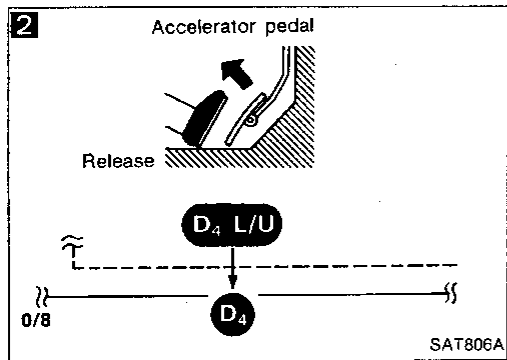
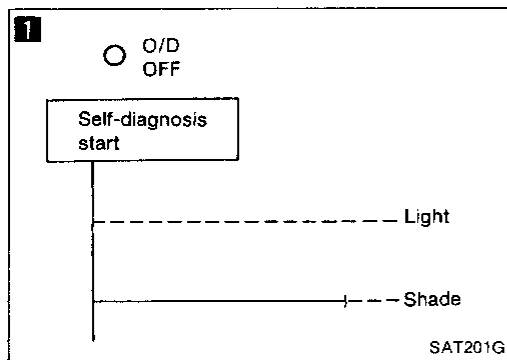
## Diagnostic Procedure 13

**SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.**



**Diagnostic Procedure 14**

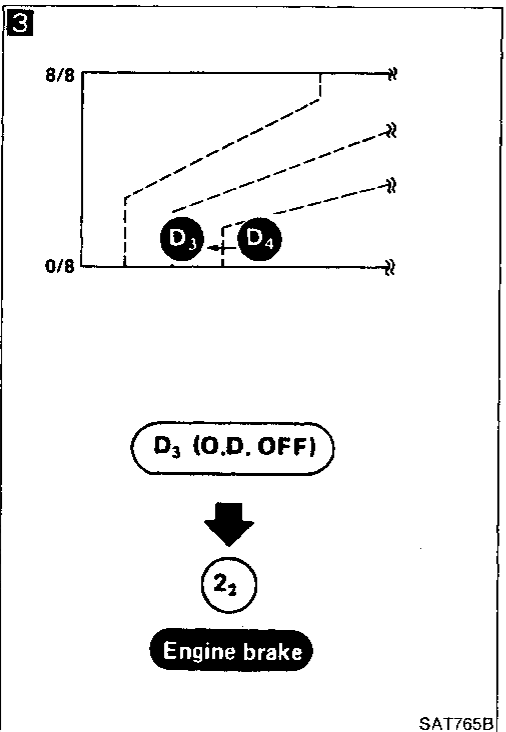
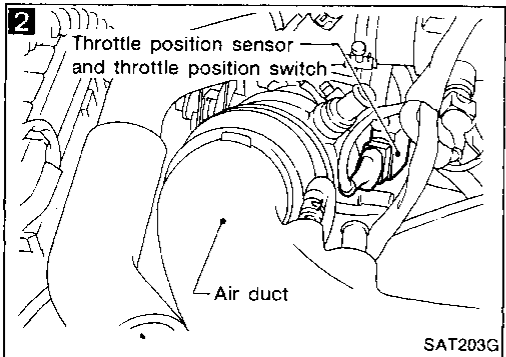
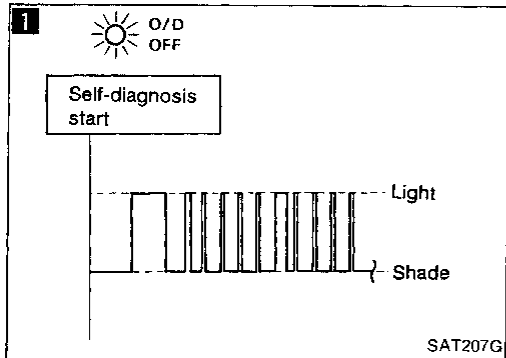
**SYMPTOM: Lock-up is not released when accelerator pedal is released.**



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**Diagnostic Procedure 15**

**SYMPTOM:** Engine speed does not return to idle smoothly when A/T is shifted from D<sub>4</sub> to D<sub>3</sub> with accelerator pedal released. Vehicle does not decelerate by engine brake when changing overdrive switch to "OFF" position with accelerator pedal released. Vehicle does not decelerate by engine brake when changing selector lever from "D" to "2" position with accelerator pedal released.



**1** Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

Yes → Check overrun clutch solenoid valve circuit. — Refer to "Self-diagnosis".

No →

**2** Check throttle position sensor. — Refer to section EF & EC.

N.G. → Repair or replace throttle position sensor.

O.K. →

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

N.G. →

O.K. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".  
2. Check the following items.

- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

O.K. →

O.K. →

3. Disassemble A/T.  
4. Check the following items.

- Overrun clutch assembly
- Oil pump assembly

**3** Check again.

N.G. → 1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

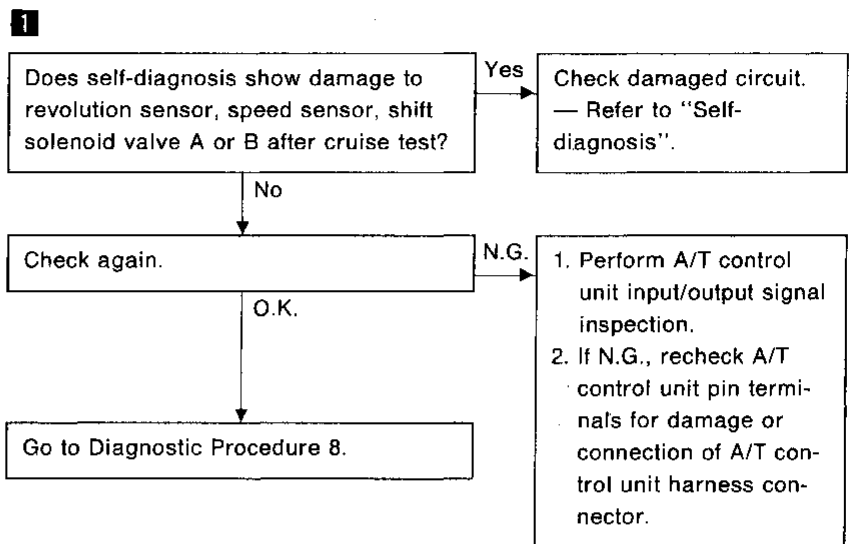
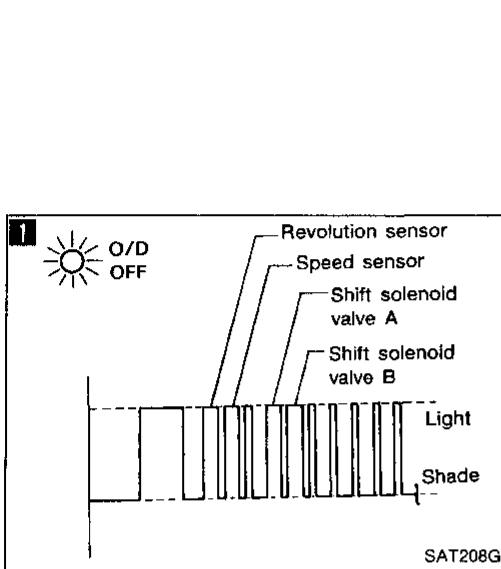
O.K. →

**INSPECTION END**

# TROUBLE DIAGNOSES

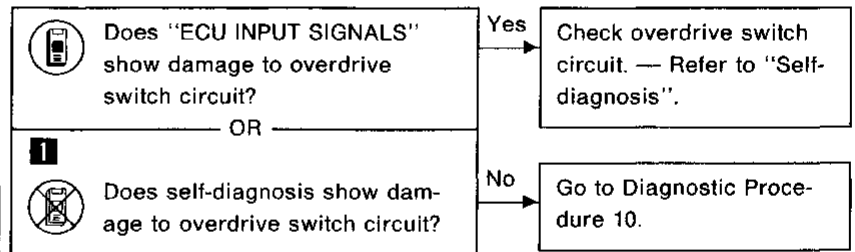
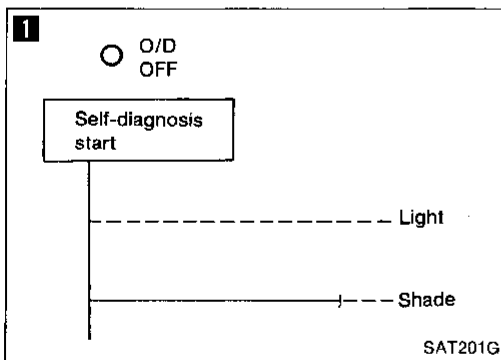
## Diagnostic Procedure 16

**SYMPTOM: Vehicle does not start from D<sub>1</sub> on Cruise test  
— Part 2.**



## Diagnostic Procedure 17

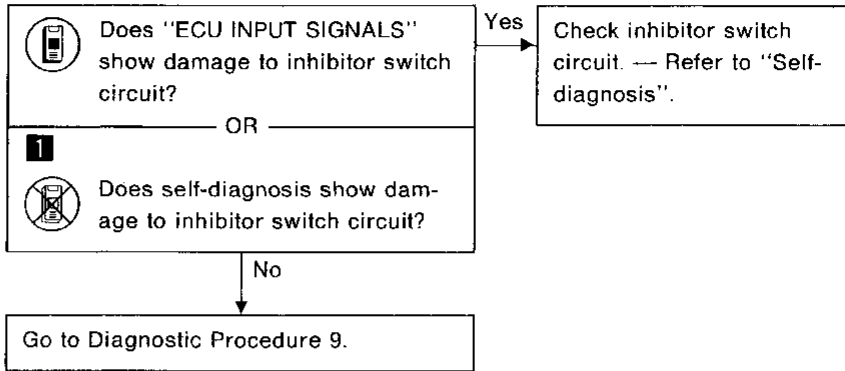
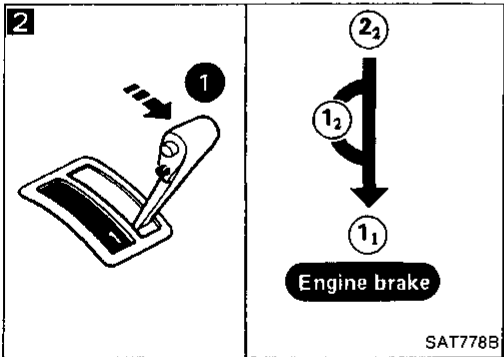
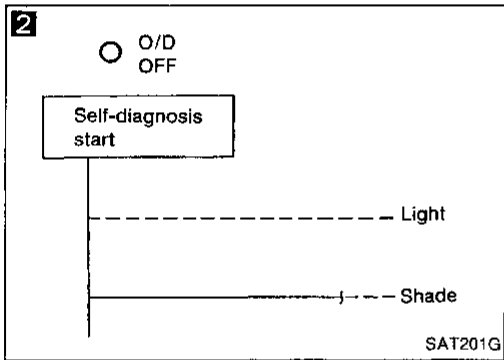
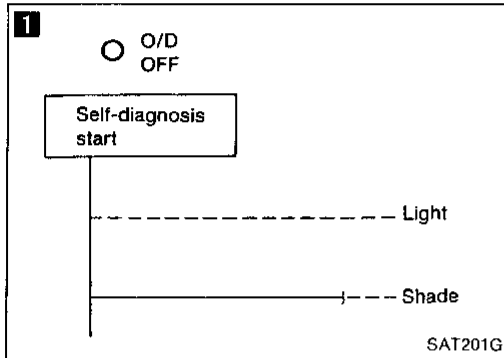
**SYMPTOM: A/T does not shift from D<sub>4</sub> to D<sub>3</sub> when changing overdrive switch to "OFF" position.**



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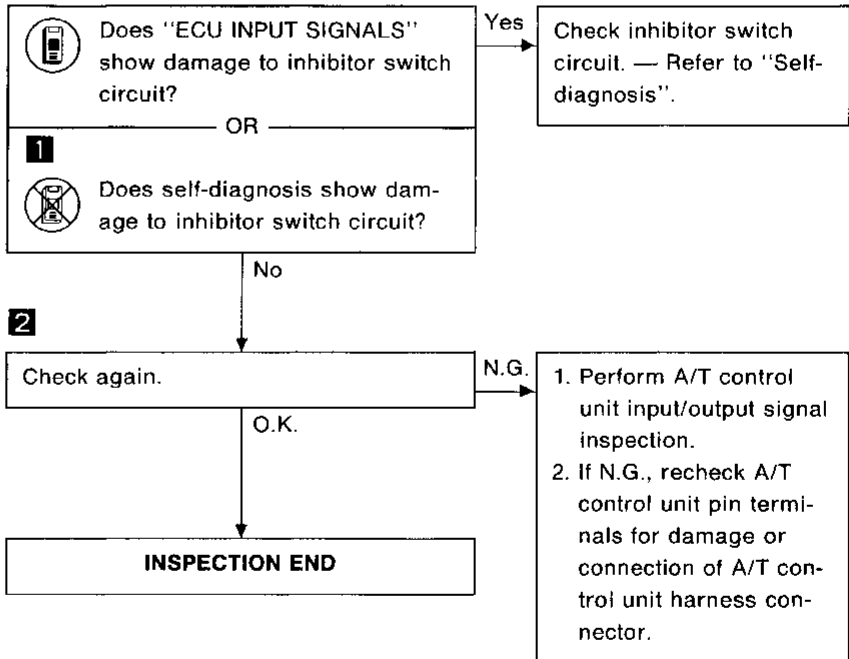
## Diagnostic Procedure 18

**SYMPTOM: A/T does not shift from D<sub>3</sub> to 2<sub>2</sub> when changing selector lever from "D" to "2" position.**



## Diagnostic Procedure 19

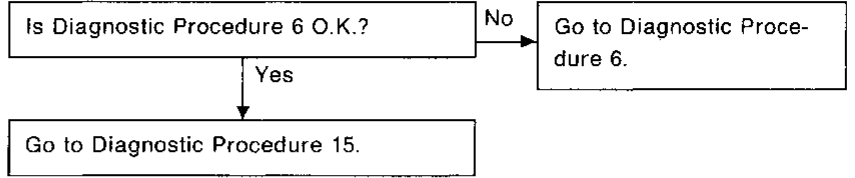
**SYMPTOM: A/T does not shift from 2<sub>2</sub> to 1<sub>1</sub> when changing selector lever from "2" to "1" position.**



# TROUBLE DIAGNOSES

## Diagnostic Procedure 20

**SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2<sub>2</sub> (1<sub>2</sub>) to 1<sub>1</sub>.**

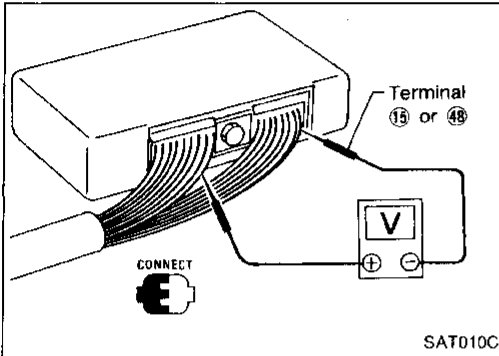


GI

MA

EM

LC



SAT010C

## Electrical Components Inspection

### INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal ⑮ or ④⑧ by following "A/T CONTROL UNIT INSPECTION TABLE".

EF &  
EC

FE

- Pin connector terminal layout.

CL

MT

1	2	3	4	9	10	11	12	13	14	15	23	24	25	27	28	29	30	31	33	34	35		
5	6	7	8	16	17	18	19	20	21	22	26	37	38	39	40	41	42	43	44	45	46	47	48



SAT981D

AT

PD

FA

RA

BR

ST

BF

HA

EL

# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

### A/T CONTROL UNIT INSPECTION TABLE

(Data are reference values.)



Terminal No.	Item	Condition	Judgement standard
1	Line pressure solenoid valve	When accelerator pedal is released after warming up engine.	1.5 - 2.5V
		When accelerator pedal is depressed fully after warming up engine.	0.5V or less
2	Line pressure solenoid valve (with dropping resistor)	When accelerator pedal is released after warming up engine.	5 - 14V
		When accelerator pedal is depressed fully after warming up engine.	0.5V or less
3	O.D. OFF indicator lamp	When A/T check lamp is on.	1V or less
		When A/T check lamp is not on.	Battery voltage
4	Power source	When ignition switch is turned to "ON".	Battery voltage
		When ignition switch is turned to "OFF".	1V or less
5	Torque converter clutch solenoid valve	When A/T is performing lock-up.	8 - 15V
		When A/T is not performing lock-up.	1V or less
6	Shift solenoid valve A	When shift solenoid valve A is operating. (When driving in "D <sub>1</sub> " or "D <sub>4</sub> ".)	Battery voltage
		When shift solenoid valve A is not operating. (When driving in "D <sub>2</sub> " or "D <sub>3</sub> ".)	1V or less
7	Shift solenoid valve B	When shift solenoid valve B is operating. (When driving in "D <sub>1</sub> " or "D <sub>2</sub> ".)	Battery voltage
		When shift solenoid valve B is not operating. (When driving in "D <sub>3</sub> " or "D <sub>4</sub> ".)	1V or less
8	Overrun clutch solenoid valve	When timing solenoid is operating. (When driving in "D <sub>1</sub> " or "D <sub>4</sub> ".)	Battery voltage
		When timing solenoid is not operating. (When driving in "D <sub>2</sub> " or "D <sub>3</sub> ".)	1V or less





# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition	Judgement standard		
9	Power source	  	Same as No. 4		
10*	—		—	—	GI
11	—		—	—	MA
12	—		—	—	EM
13	—		—	—	EM
14	Closed throttle position switch (in throttle position switch)		When accelerator pedal is released after warming up engine.	8 - 15V	LC
			When accelerator pedal is depressed after warming up engine.	1V or less	EF & EC
15	Ground		—	—	
16	Inhibitor "1" position switch		When selector lever is set to "1" position.	Battery voltage	FE
			When selector lever is set to other positions.	1V or less	CL
17	Inhibitor "2" position switch		When selector lever is set to "2" position.	Battery voltage	MT
			When selector lever is set to other positions.	1V or less	AT
18	Inhibitor "D" position switch		When selector lever is set to "D" position.	Battery voltage	AT
		When selector lever is set to other positions.	1V or less	PD	
19	Inhibitor "N" or "P" position switch	When selector lever is set to "N" position.	Battery voltage	FA	
		When selector lever is set to other positions.	1V or less	RA	
20	Inhibitor "R" position switch	When selector lever is set to "R" position.	Battery voltage	RA	
		When selector lever is set to other positions.	1V or less	BR	
21	Wide open throttle position switch (in throttle position switch)	When accelerator pedal is depressed more than half-way after warming up engine.	8 - 15V	ST	
		When accelerator pedal is released after warming up engine.	1V or less	BF	
22	—	—	—	HA	











\*: This terminal is connected to terminal No. 42 of ECM (ECCS control module).

When code No. 54 appears during engine self-diagnosis, check line between above terminals for proper continuity.

EL

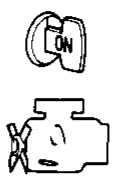



## TROUBLE DIAGNOSES

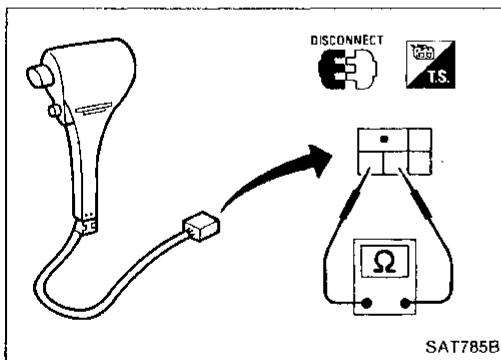
### Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition	Judgement standard	
23	Power source (Back-up)	 or 	When ignition switch is turned to "OFF".	Battery voltage
			When ignition switch is turned to "ON".	Battery voltage
24	Engine speed signal	 	When engine is running at idle speed.	0.9V
			When engine is running at 3,000 rpm.	Approximately 3.7V
25	Revolution sensor (Measure in AC position)		When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle is parked.	0V
26	—	—	—	
27	Speed sensor	—	—	
28	—	—	—	
29	—	—	—	
30	—	—	—	
31	Throttle position sensor (Power source)	—	—	
32	—	—	—	
33	Fluid temperature sensor	 	When A.T.F. temperature is 20°C (68°F).	Approximately 1.5V
			When A.T.F. temperature is 80°C (176°F).	Approximately 0.5V
34	Throttle position sensor	—	—	
34	Throttle position sensor	 	When accelerator pedal is depressed slowly after warming up engine.	Fully-closed throttle: Approximately 0.5V
			Voltage rises gradually in response to throttle opening angle.	Fully-open throttle: Approximately 4V
35	Throttle position sensor (Ground)	—	—	
36	—	—	—	
37	A.S.C.D. cruise signal		When A.S.C.D. cruise is being performed. ("CRUISE" light comes on.)	Battery voltage
			When A.S.C.D. cruise is not being performed. ("CRUISE" light does not come on.)	1V or less

# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

Terminal No.	Item		Condition	Judgement standard	
38	—		—	—	
39	Overdrive switch		When overdrive switch is set in "ON" position	Battery voltage	GI
			When overdrive switch is set in "OFF" position	1V or less	MA
40	A.S.C.D. O.D. cut signal		When "ACCEL" set switch on A.S.C.D. cruise is released.	5 - 8V	EM
			When "ACCEL" set switch on A.S.C.D. cruise is applied.	1V or less	LC
41	Kickdown switch		When accelerator pedal is released after warming up engine.	3 - 8V	EF & EC
			When accelerator pedal is depressed fully after warming up engine.	1V or less	FE
42	—		—	—	CL
43	—		—	—	
44	—		—	—	MT
45	—		—	—	AT
46	—		—	—	
47	—		—	—	PD
48	Ground		—	—	FA



### OVERDRIVE SWITCH

- Check continuity between two terminals.

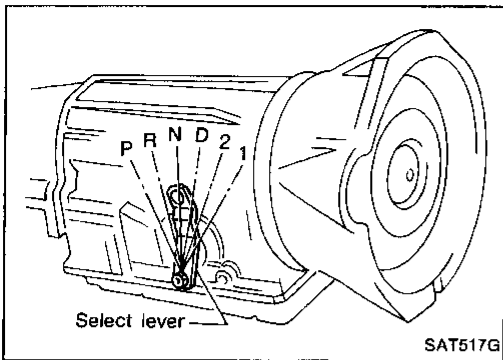
O.D. switch position	Continuity
ON	No
OFF	Yes

### THROTTLE POSITION SWITCH (Idle position)

Refer to Electrical Components Inspection in EF & EC section.

# TROUBLE DIAGNOSES

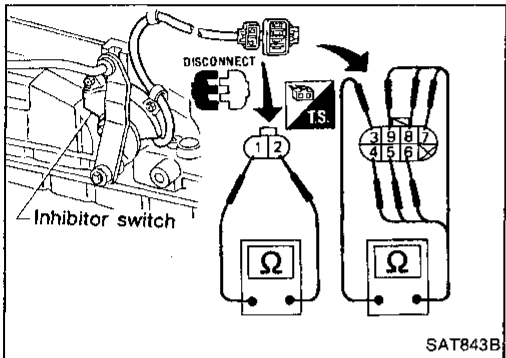
## Electrical Components Inspection (Cont'd)



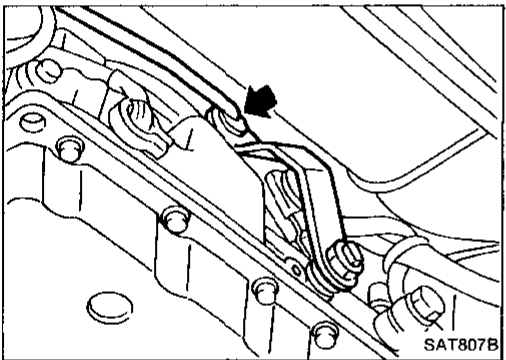
### INHIBITOR SWITCH

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

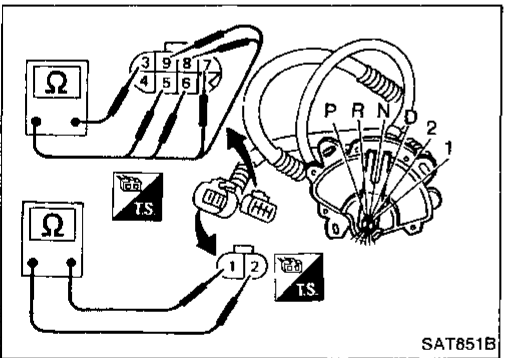
Lever position	Terminal No.								
	①	②	③	④	⑤	⑥	⑦	⑧	⑨
P	○	○	○	○					
R			○	○	○				
N	○	○	○			○			
D			○				○		
2			○					○	
1			○						○



2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".



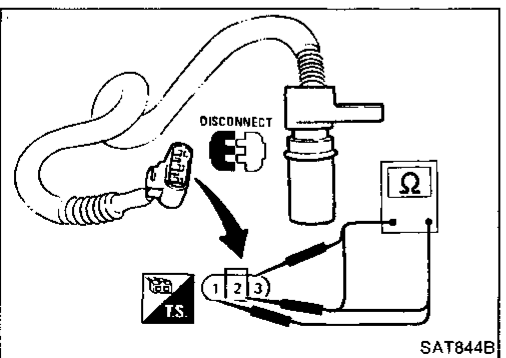
4. If N.G. on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. — Refer to step 1.
5. If O.K. on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
6. If N.G. on step 4, replace inhibitor switch.



### REVOLUTION SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals ①, ② and ③.

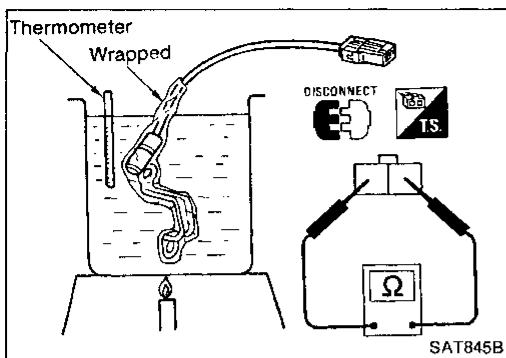
Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity



# TROUBLE DIAGNOSES

## Electrical Components Inspection (Cont'd)

### FLUID TEMPERATURE SENSOR



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals while changing temperature as shown at left.

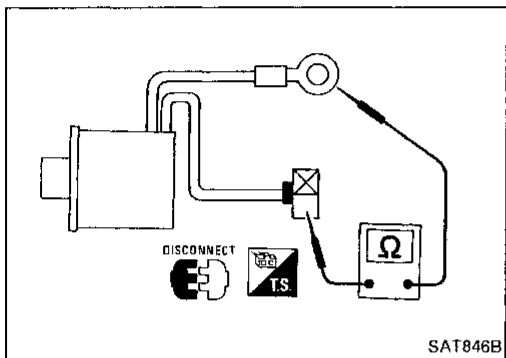
Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

GI

MA

EM

### TORQUE CONVERTER CLUTCH SOLENOID VALVE



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

#### Resistance:

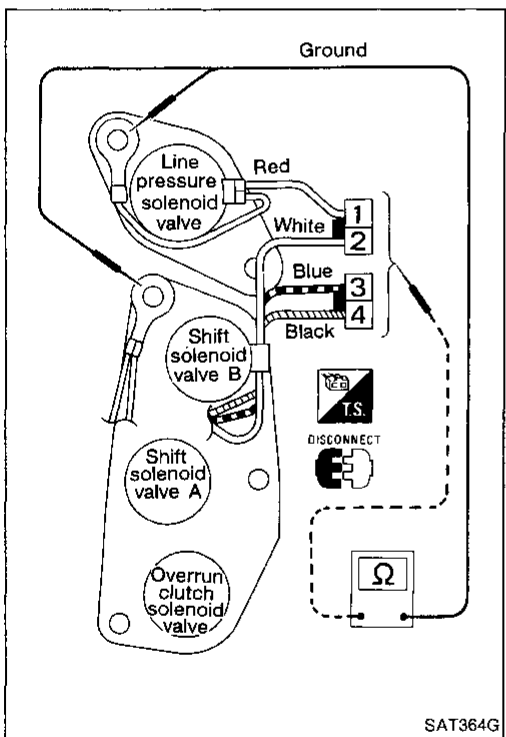
Torque converter clutch solenoid valve 10 - 20Ω

LC

EF &  
EC

FE

### 3-UNIT SOLENOID ASSEMBLY (Shift solenoid valve A, B and overrun clutch solenoid valve) AND LINE PRESSURE SOLENOID VALVE



- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

Solenoid	Terminal No.	Resistance
Shift solenoid valve A	③	20 - 40Ω
Shift solenoid valve B	②	
Overrun clutch solenoid valve	④	
Line pressure solenoid valve	①	2.5 - 5Ω

CL

MT

AT

PD

FA

RA

BR

ST

BF

HA

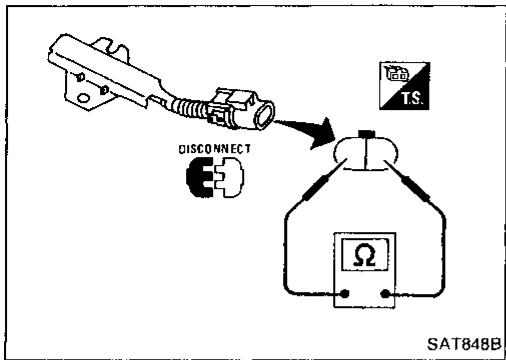
EL

## TROUBLE DIAGNOSES

### Electrical Components Inspection (Cont'd)

#### DROPPING RESISTOR

- Check resistance between two terminals.  
**Resistance: 11.2 - 12.8Ω**



#### Final Check

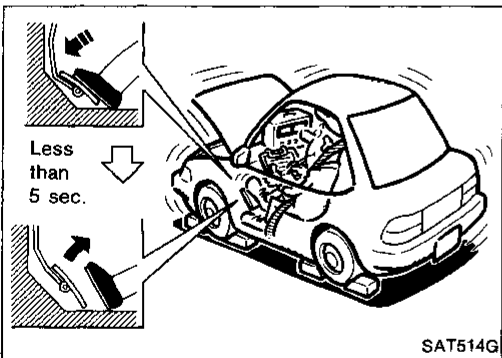
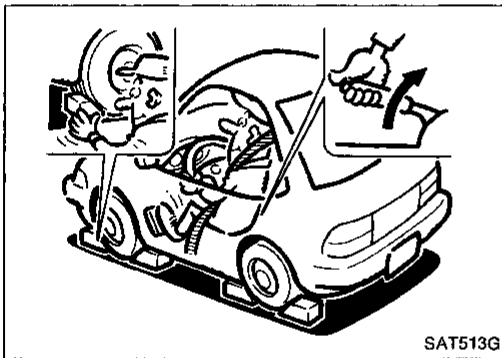
#### STALL TESTING

##### Stall test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**

**50 - 80°C (122 - 176°F)**



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

- **It is good practice to put a mark on point of specified engine speed on indicator.**

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

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

**Stall revolution:**

**2,050 - 2,250 rpm**

8. Shift selector lever to "N".
9. Cool off A.T.F.

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

10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

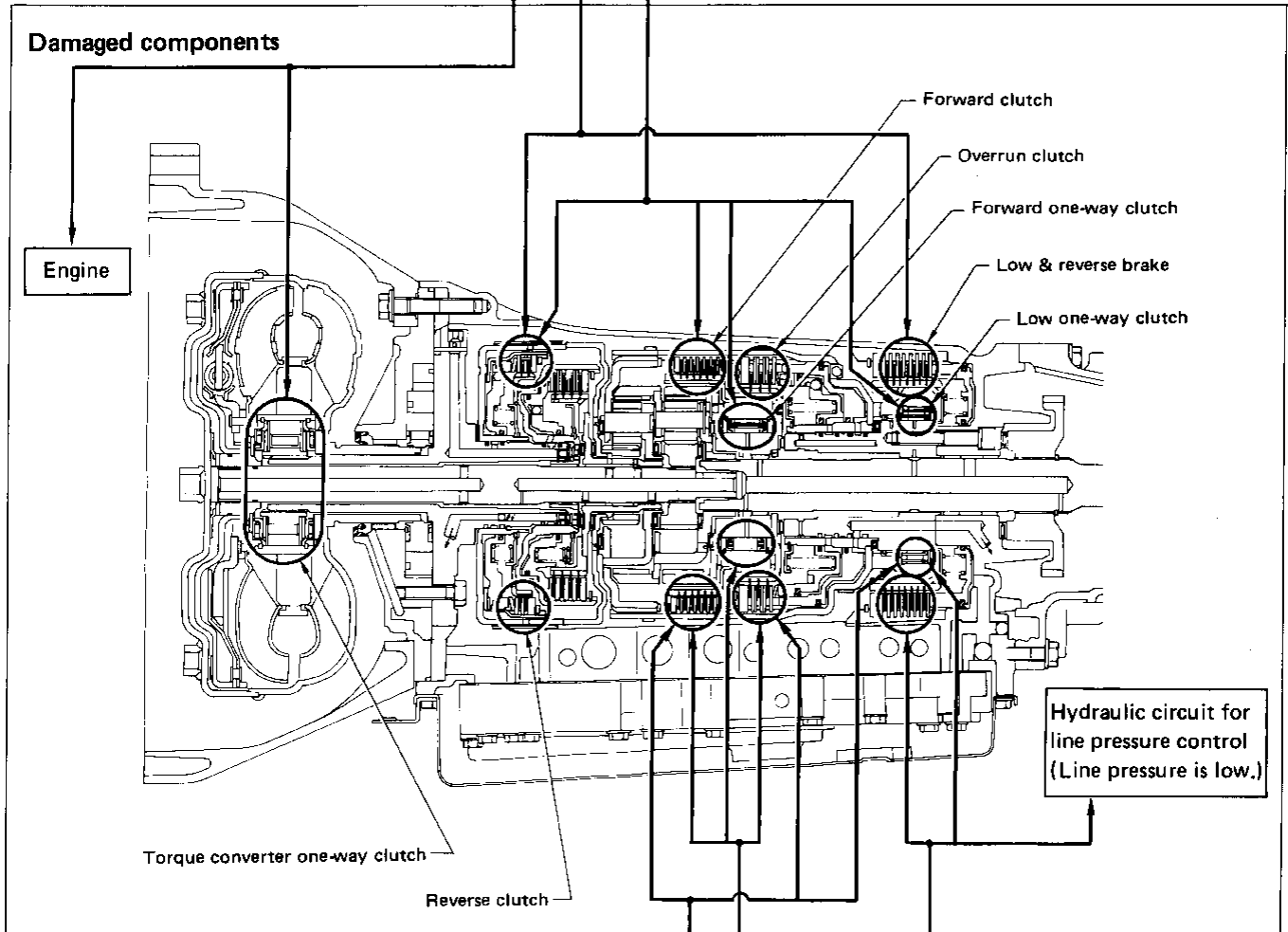
# TROUBLE DIAGNOSES

## Final Check (Cont'd)

### Judgement of stall test

Selector lever position	Judgement		
	L	O	H
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.



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

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

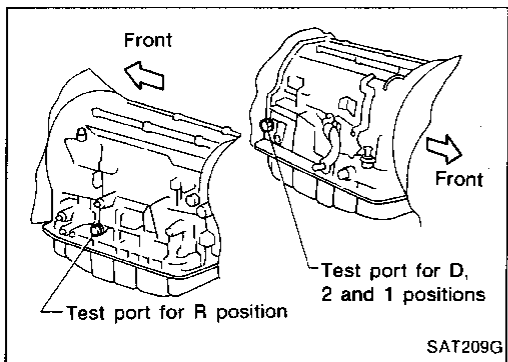
GI  
 MA  
 EM  
 LC  
 EF & EC  
 FE  
 CL  
 MT  
**AT**  
 PD  
 FA  
 RA  
 BR  
 ST  
 BF  
 HA  
 EL

## TROUBLE DIAGNOSES

### Final Check (Cont'd)

#### PRESSURE TESTING

- Location of line pressure test port
- **Line pressure plugs are hexagon headed bolts.**
- **Always replace line pressure plugs as they are self-sealing bolts.**

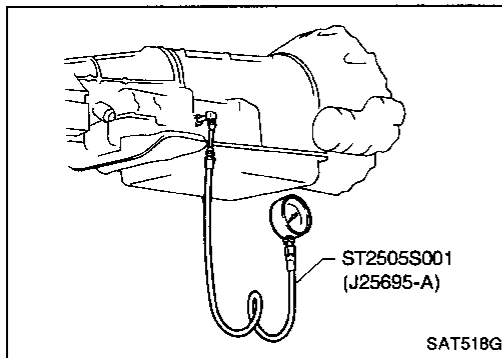


#### Line pressure test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**

**50 - 80°C (122 - 176°F)**

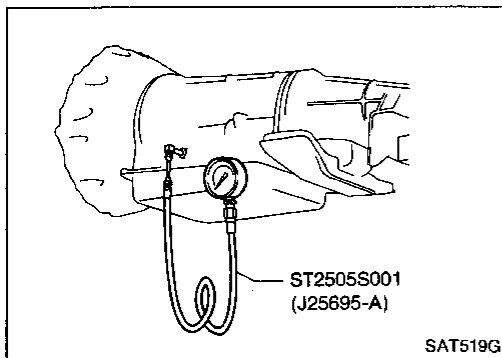


3. Install pressure gauge to line pressure port.

— **D, 2 and 1 positions** —

4. Set parking brake and block wheels.

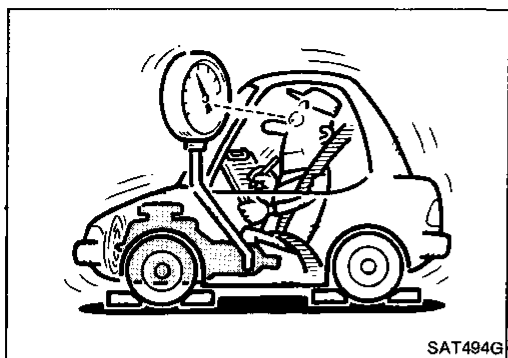
- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**





# TROUBLE DIAGNOSES

## Final Check (Cont'd)



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:

Engine speed rpm	Line pressure kPa (kg/cm <sup>2</sup> , psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	588 - 628 (6.0 - 6.4, 85 - 91)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)

## JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all positions.	<ul style="list-style-type: none"> <li>● Oil pump wear</li> <li>● Control piston damage</li> <li>● Pressure regulator valve or plug sticking</li> <li>● Spring for pressure regulator valve damaged</li> <li>● Fluid pressure leakage between oil strainer and pressure regulator valve</li> </ul>
	Line pressure is low in particular position.	<ul style="list-style-type: none"> <li>● Fluid pressure leakage between manual valve and particular clutch.</li> <li>● For example: If line pressure is low in "R" and "1" positions but is normal in "D" and "2" position, fluid leakage exists at or around low &amp; reverse brake circuit.</li> </ul>
	Line pressure is high.	<ul style="list-style-type: none"> <li>● Mal-adjustment of throttle position sensor</li> <li>● Fluid temperature sensor damaged</li> <li>● Line pressure solenoid valve sticking</li> <li>● Short circuit of line pressure solenoid valve circuit</li> <li>● Pressure modifier valve sticking</li> <li>● Pressure regulator valve or plug sticking</li> </ul>
At stall speed	Line pressure is low.	<ul style="list-style-type: none"> <li>● Mal-adjustment of throttle position sensor</li> <li>● Control piston damaged</li> <li>● Line pressure solenoid valve sticking</li> <li>● Short circuit of line pressure solenoid valve circuit</li> <li>● Pressure regulator valve or plug sticking</li> <li>● Pressure modifier valve sticking</li> <li>● Pilot valve sticking</li> </ul>

# TROUBLE DIAGNOSES

## Symptom Chart

Reference page (AT- )	Reference page (AT- )	ON vehicle										OFF vehicle																							
		10	68	68	72	69, 117	69	69	69	92	92	102, 113	131, 135	137, 147	137, 145	141	154																		
Reference page (AT- )		Fluid level	Control linkage	Inhibitor switch	Throttle position sensor (Adjustment)	Revolution sensor and speed sensor	Engine speed signal	Engine idling rpm	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	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 components			
48	Engine does not start in "N", "P" positions.	2	3																	1															
48	Engine starts in position other than "N" and "P" positions.	1	2																																
—	Transmission noise in "P" and "N" positions.	1		3	4	5		2														7	6												
48	Vehicle moves when changing into "P" position or parking gear does not disengage when shifted out of "P" position.	1																															2		
49	Vehicle runs in "N" position.	1																		4				3		2		5							
49	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								9										
—	Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" positions).	1																										2							
52	Vehicle will not run in "D", "1", "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration.	1					2		4			3												6	7	8	9		10						
—	Clutches or brakes slip somewhat in starting.	1	2		3		4		6		5									8			18	12	10		9			11					
—	Excessive creep.					1																													
51, 52	No creep at all.	1					2	3															6	5		4									
—	Failure to change gear from "D <sub>1</sub> " to "D <sub>2</sub> ".	2	1		5			4	3																							6			
—	Failure to change gear from "D <sub>2</sub> " to "D <sub>3</sub> ".	2	1		5			4	3															6								7			
—	Failure to change gear from "D <sub>3</sub> " to "D <sub>4</sub> ".	2	1		4					3						5																	6		
54, 55, 56	Too high a gear change point from "D <sub>1</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>4</sub> ".			1	2					3	4																								
—	Gear change directly from "D <sub>1</sub> " to "D <sub>3</sub> " 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 <sub>1</sub> " to "D <sub>2</sub> ".			1			2	4								5		3															6		
—	Too sharp a shock in change from "D <sub>2</sub> " to "D <sub>3</sub> ".			1			2	4												3													6		

# TROUBLE DIAGNOSES

## Symptom Chart (Cont'd)

Reference page (AT- )	Reference page (AT- )	ON vehicle										OFF vehicle																					
		10	68	68	72	69, 117	69	69	69	92	92	102, 113	131, 135	137, 147	137, 145	141	154																
Reference page (AT- )		Fluid level	Control linkage inhibitor switch	Throttle position sensor (Adjustment)	Revolution sensor and speed sensor	Engine speed signal	Engine idling rpm	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	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 components		
—	Too sharp a shock in change from "D <sub>3</sub> " to "D <sub>4</sub> ".		1			2	4											3									5		5				
—	Almost no shock or clutches slipping in change from "D <sub>1</sub> " to "D <sub>2</sub> ".	1		2		3	5										4													6			
—	Almost no shock or slipping in change from "D <sub>2</sub> " to "D <sub>3</sub> ".	1		2		3	5											4						6						7			
—	Almost no shock or slipping in change from "D <sub>3</sub> " to "D <sub>4</sub> ".	1		2		3	5												4					6						7			
—	Vehicle braked by gear change from "D <sub>1</sub> " to "D <sub>2</sub> ".	1																					2	4			5	3					
—	Vehicle braked by gear change from "D <sub>2</sub> " to "D <sub>3</sub> ".	1																											2				
—	Vehicle braked by gear change from "D <sub>3</sub> " to "D <sub>4</sub> ".	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 <sub>4</sub> " to "D <sub>3</sub> ".	1		2			6	4	5	3																8	7						
—	Failure to change gear from "D <sub>3</sub> " to "D <sub>2</sub> " or from "D <sub>4</sub> " to "D <sub>2</sub> ".	1		2			5	3	4															6					7				
—	Failure to change gear from "D <sub>2</sub> " to "D <sub>1</sub> " or from "D <sub>3</sub> " to "D <sub>1</sub> ".	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 <sub>4</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>1</sub> ".			1	2																												
—	Kickdown does not operate when depressing pedal in "D <sub>4</sub> " within kickdown vehicle speed.			1	2				3	4																							
—	Kickdown operates or engine overruns when depressing pedal in "D <sub>4</sub> " beyond kickdown vehicle speed limit.			2	1				3	4																							
—	Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>3</sub> " when depressing pedal.	1		2		3	5		4															6	7								
—	Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>2</sub> " when depressing pedal.	1		2		3	6	5	4																8				7				
—	Races extremely fast or slips in changing from "D <sub>3</sub> " to "D <sub>2</sub> " when depressing pedal.	1		2		3	5		4				8		0									9	7				6				
—	Races extremely fast or slips in changing from "D <sub>4</sub> " or "D <sub>3</sub> " to "D <sub>1</sub> " 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				3	7	10			
—	Transmission noise in "D", "2", "1" and "R" positions.	1																				2											

GI  
 MA  
 EM  
 LC  
 EF & EC  
 FE  
 CL  
 MT  
**AT**  
 PD  
 FA  
 RA  
 BR  
 ST  
 BF  
 HA  
 EL

# TROUBLE DIAGNOSES

## Symptom Chart (Cont'd)

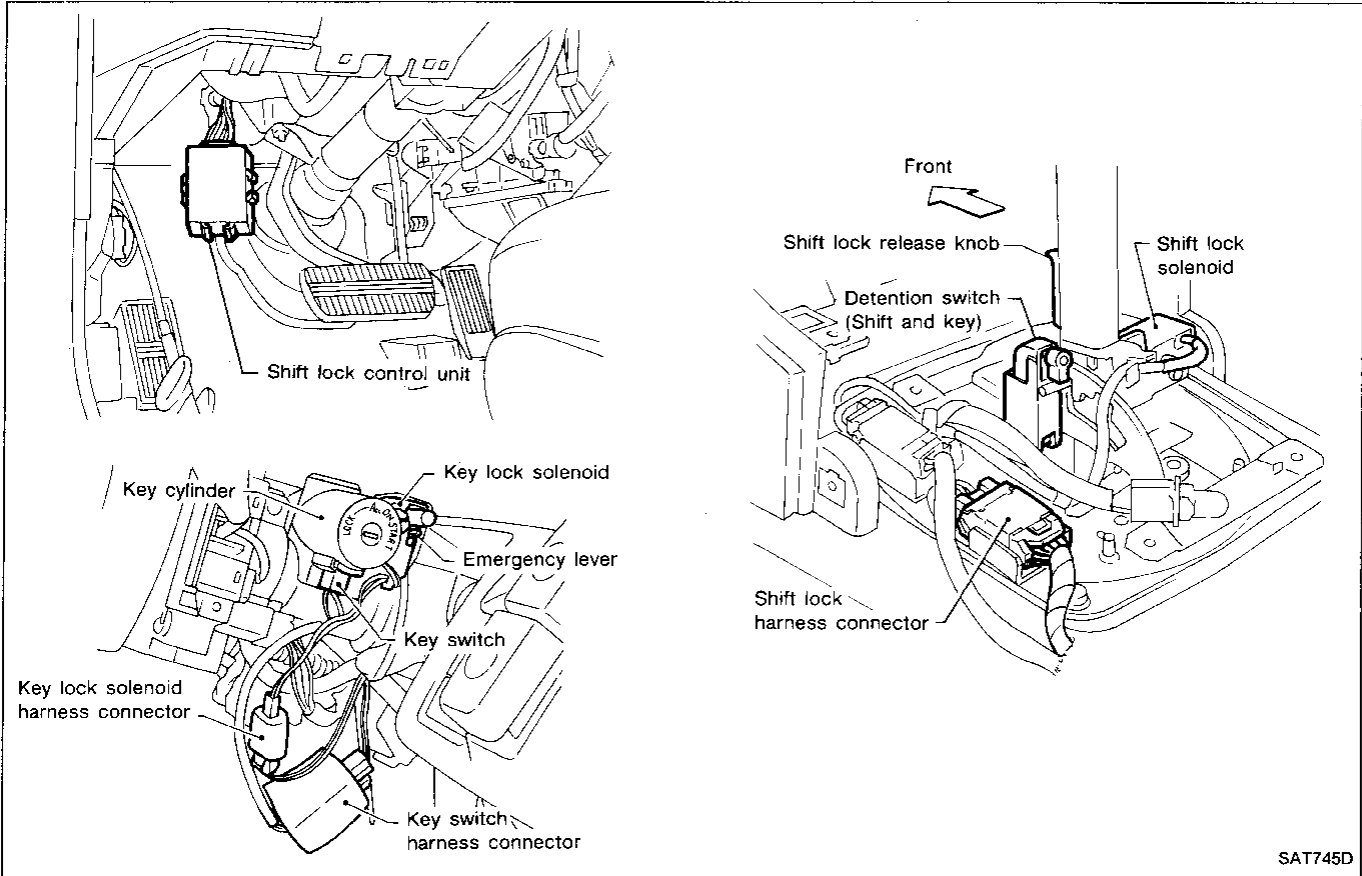
Reference page (AT- )	Reference page (AT- )	ON vehicle											OFF vehicle																							
		10	68	68	72	69, 117	69	63	69	92	92	102, 113	131, 135	137, 147	137, 145	141	154																			
Reference page (AT- )		Fluid level	Control linkage	Inhibitor switch	Throttle position sensor (Adjustment)	Revolution sensor and speed sensor	Engine speed signal	Engine idling rpm	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	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 components				
61	Failure to change from "D <sub>3</sub> " to "2" when changing lever into "2" position.	7	1	2						6	5	4		3																						
—	Gear change from "2 <sub>2</sub> " to "2 <sub>3</sub> " in "2" position.		1																																	
62	Engine brake does not operate in "1" position.	2	1	3	4					6	5			7																						
—	Gear change from "1 <sub>1</sub> " to "1 <sub>2</sub> " in "1" position.	2	1																																	
—	Does not change from "1 <sub>2</sub> " to "1 <sub>1</sub> " in "1" position.		1		2					4	3			5																						
—	Large shock changing from "1 <sub>2</sub> " to "1 <sub>1</sub> " in "1" position.									1																										
—	Transmission overheats.	1		3			2	4	6		5											11	7	8	9	11		12		13	14					
—	A.T.F. 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														
—	Lock-up piston slip.	1		2			3	6		5	4											7														
57	Lock-up point is extremely high or low.			1	2				4				3																							
—	A/T does not shift to "D <sub>4</sub> " when driving with overdrive switch "ON".		2	1	3		8	6	4				5	7																						
—	Engine is stopped at "R", "D", "2" and "1" positions.	1						5	4	3	2																									

# TROUBLE DIAGNOSES — A/T Shift Lock System

## Contents

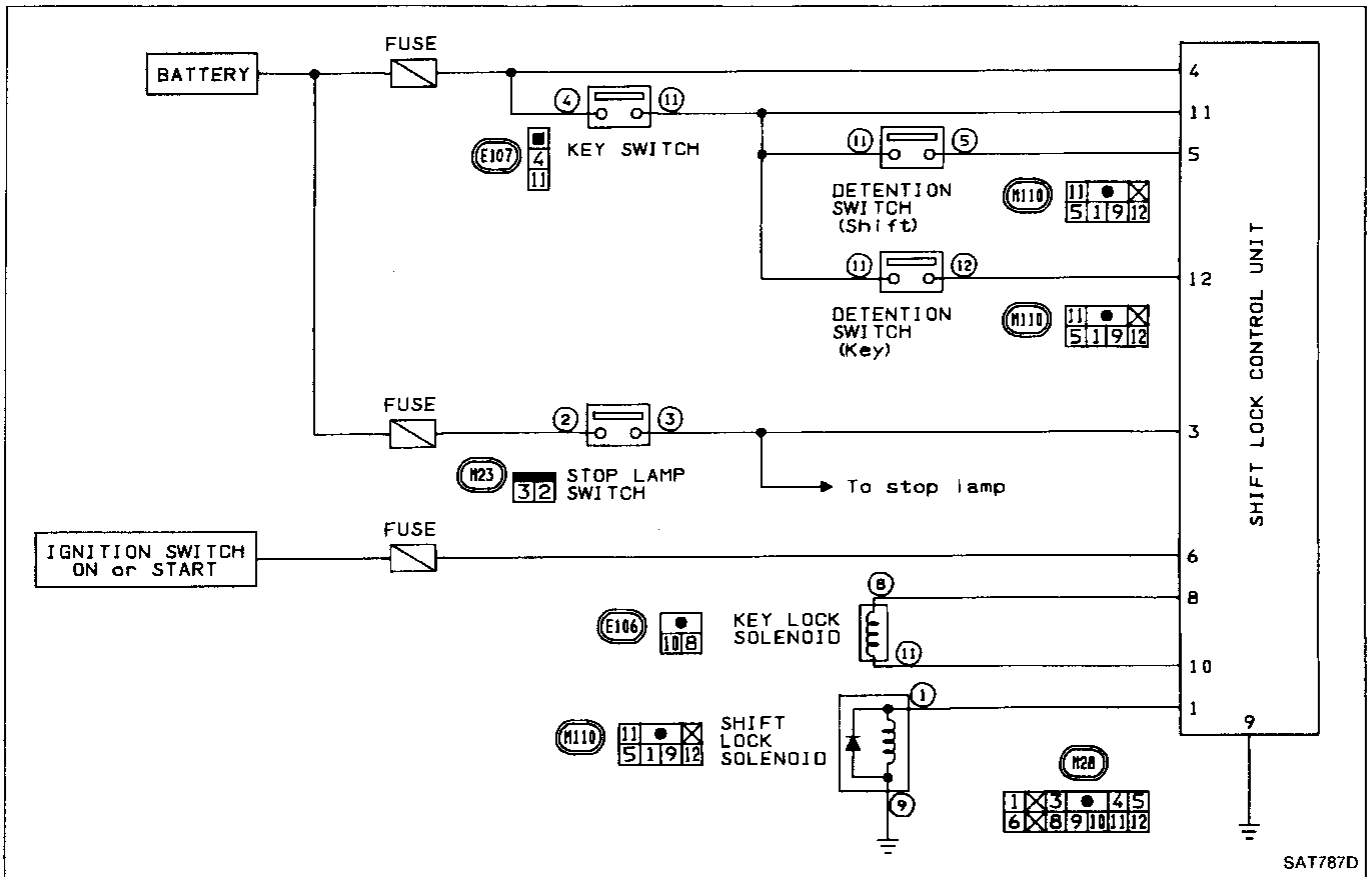
<b>Shift Lock System Electrical Parts Location</b> .....	AT-78	
<b>Circuit Diagram for Quick Pinpoint Check</b> .....	AT-78	
<b>Wiring Diagram</b> .....	AT-79	
<b>Diagnostic Procedure</b> .....	AT-80	GI
SYMPTOM 1: Selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal.		
Selector lever can be moved from "P" position when key is removed from key cylinder.		MA
SYMPTOM 2: Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".)		
<b>Shift Lock Control Unit Inspection</b> .....	AT-88	EM
<b>Shift Lock Control Unit Inspection Table</b> .....	AT-89	
<b>Component Check</b> .....	AT-90	LC
		EF & EC
		FE
		CL
		MT
		<b>AT</b>
		PD
		FA
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		BR
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		HA
		EL

Shift Lock System Electrical Parts Location



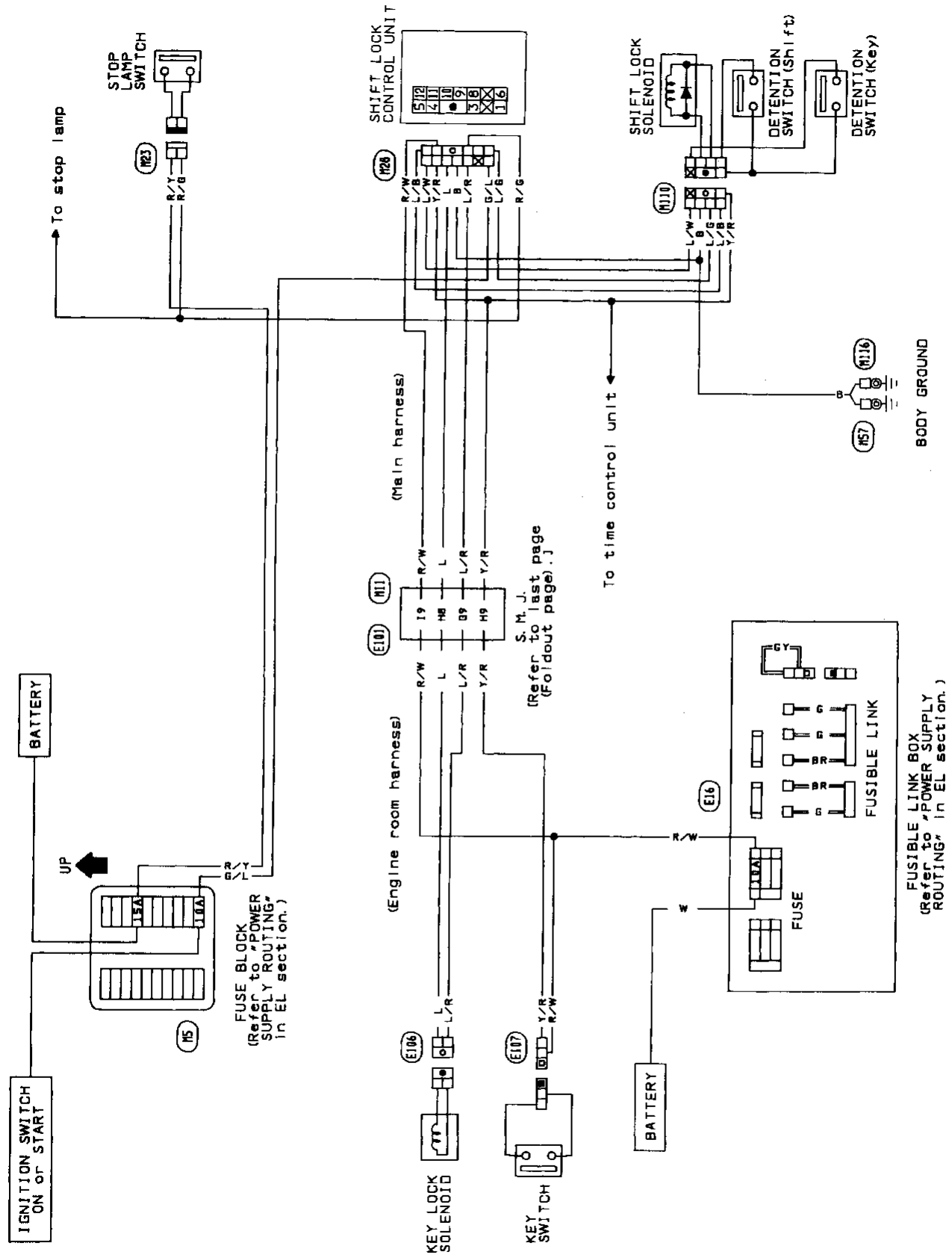
SAT745D

Circuit Diagram For Quick Pinpoint Check



SAT787D

Wiring Diagram

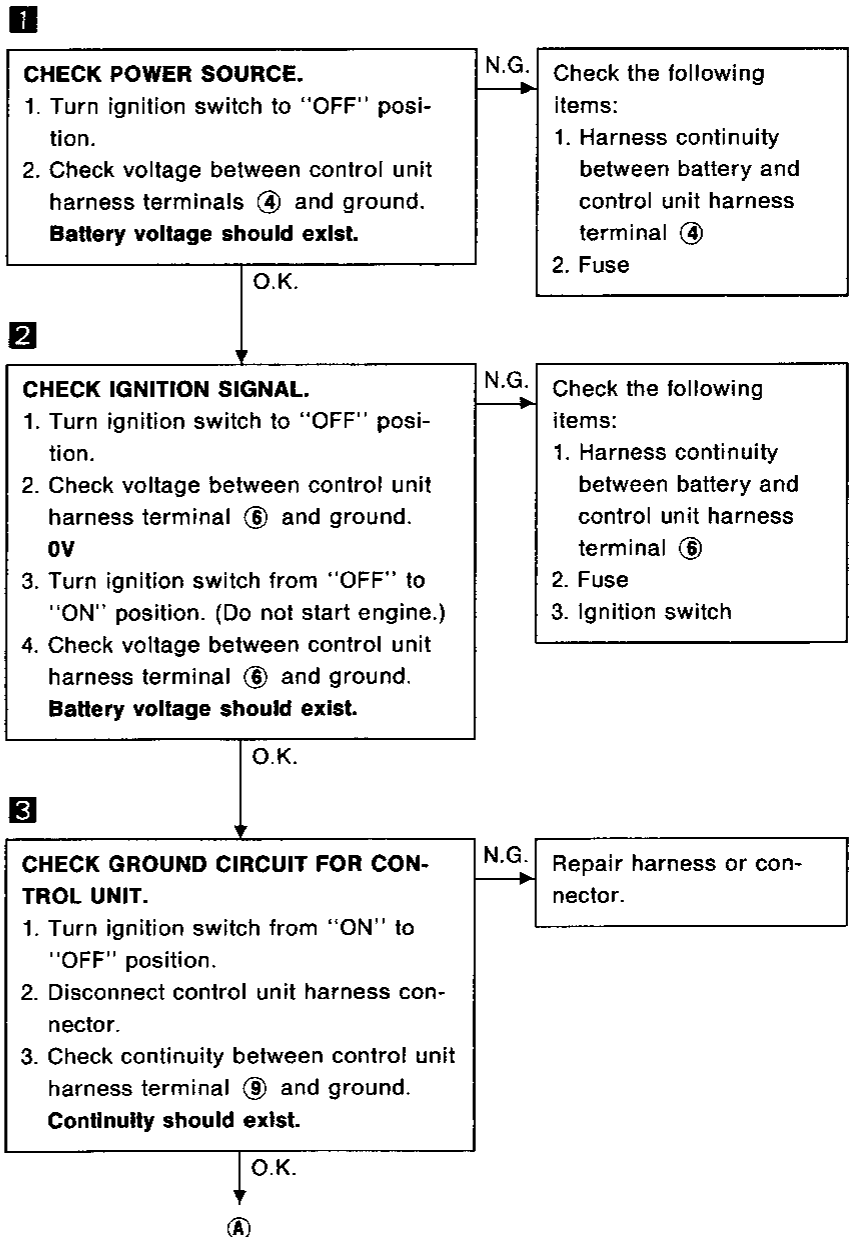
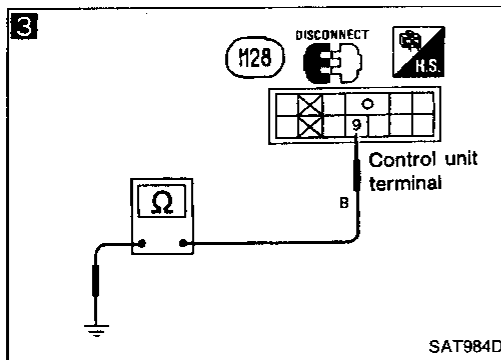
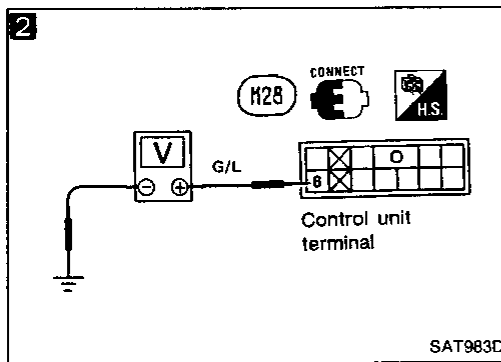
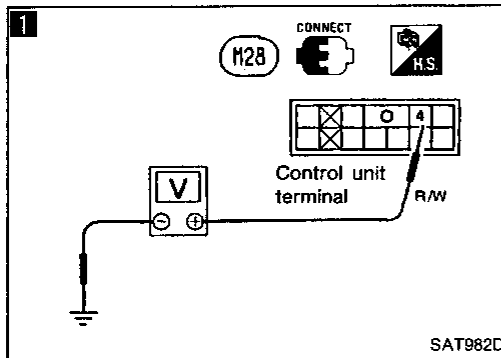


GI  
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EL

## Diagnostic Procedure

### SYMPTOM 1:

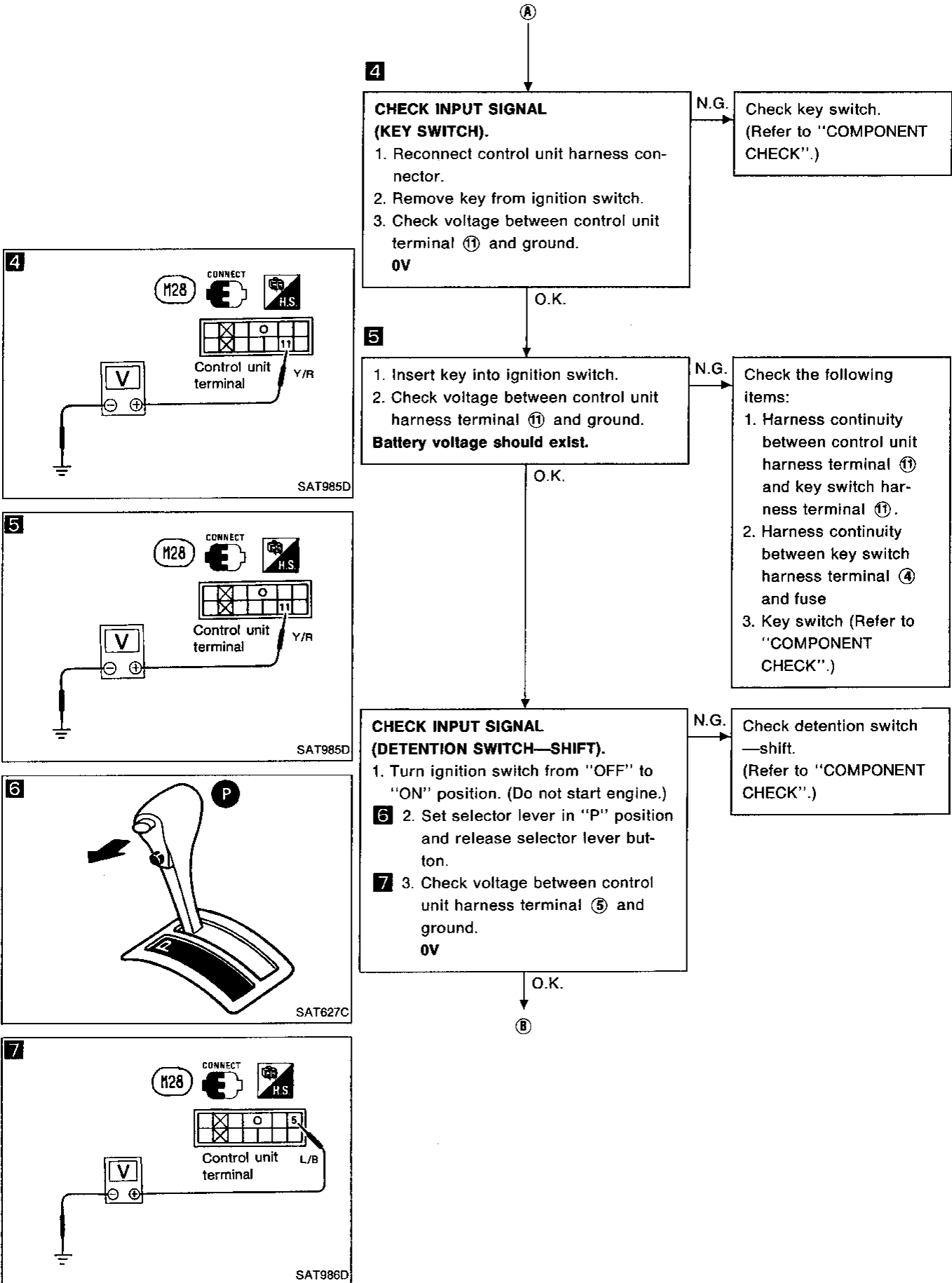
**Selector lever cannot be moved from "P" position when applying brake pedal or can be moved when releasing brake pedal. Selector lever can be moved from "P" position when key is removed from key cylinder.**





# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



GI  
MA  
EM  
LC  
EF & EC  
FE  
CL  
MT  
AT  
PD  
FA  
RA  
BR  
ST  
BF  
HA  
EL

# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)

8

### CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1. Turn ignition switch to "ON" position.  
(Do not start engine.)

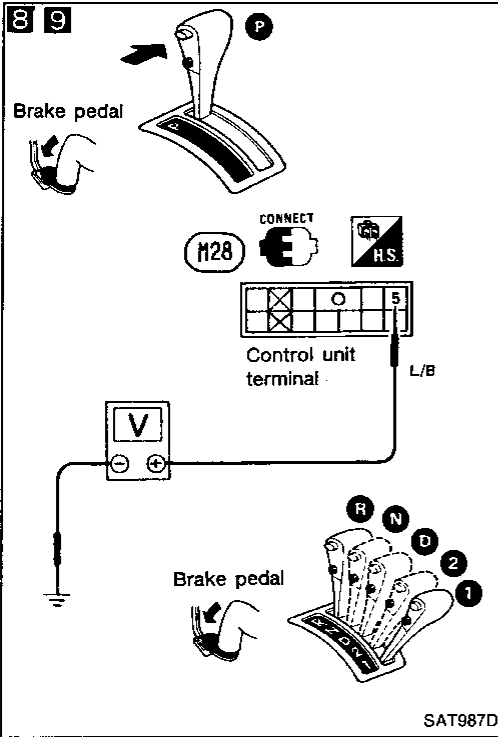
2. Check voltage between control unit harness terminal 5 and ground with brake pedal depressed and selector lever button pushed.  
**Battery voltage should exist.**

3. Check voltage between control unit harness terminal 5 and ground with selector lever set in any position except "P".  
**When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.**  
**Battery voltage should exist.**

N.G.

Check the following items:

1. Harness continuity between control unit harness terminal 5 and detention switch harness terminal 5
2. Harness continuity between detention switch harness terminal 11 and key switch harness terminal 11
3. Detention switch—shift (Refer to "COMPONENT CHECK".)



O.K.

10

### CHECK INPUT SIGNAL (STOP LAMP SWITCH).

Turn ignition switch to "ON" position.  
(Do not start engine.)

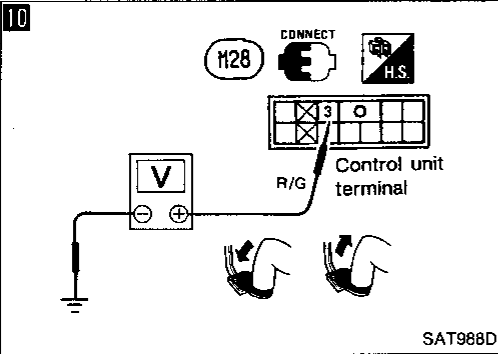
• Check voltage between control unit harness terminal 3 and ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

N.G.

Check the following items:

1. Harness continuity between control unit harness terminal 3 and stop lamp switch harness terminal 3
2. Stop lamp switch (Refer to "COMPONENT CHECK".)

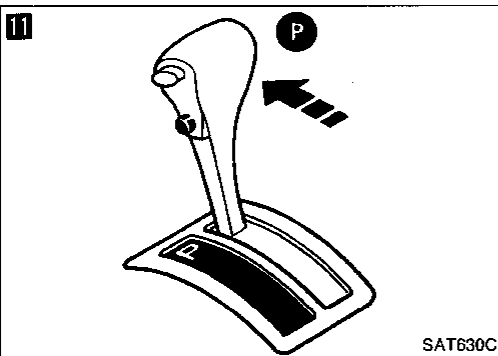


O.K.

11

Set selector lever in "P" position.

9



# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)

C

### CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

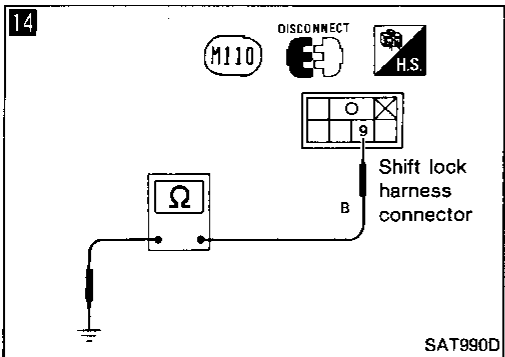
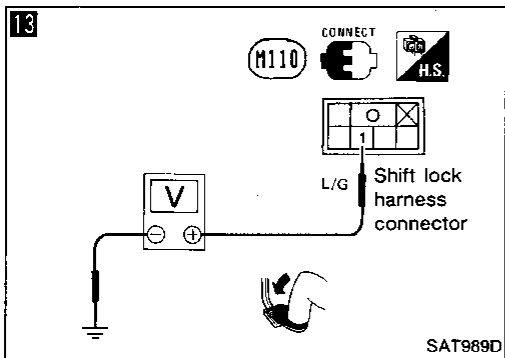
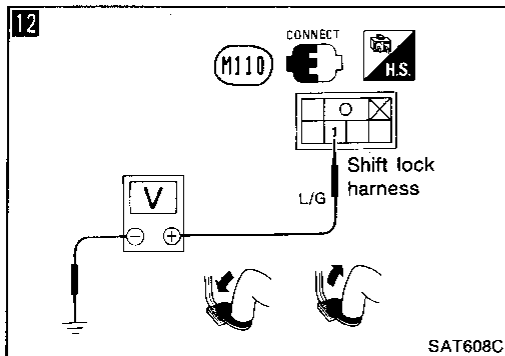
1. Turn ignition switch to "ON" position. (Do not start engine.)
- 12** 2. Check voltage between shift lock harness connector terminal ① and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

3. Turn ignition switch from "ON" to "OFF" position.

- 13** 4. Check voltage between shift lock harness connector terminal ① and ground with brake pedal depressed. **0V**

N.G. Check harness continuity between control unit harness terminal ① and shift lock solenoid harness terminal ①.



### CHECK GROUND CIRCUIT FOR SHIFT LOCK SOLENOID.

1. Disconnect shift lock harness connector.
2. Check continuity between shift lock harness terminal ⑨ and ground. **Continuity should exist.**

N.G. Repair harness or connector.

Check shift lock solenoid. (Refer to "COMPONENT CHECK".)

N.G. Replace A/T shift lock control device assembly.

1. Reconnect shift lock harness connector.
2. Turn ignition switch from "OFF" to "ON" position. (Do not start engine.)
3. Recheck shift lock operation.

N.G. 1. Perform control unit input/output signal inspection test.  
2. If N.G., recheck harness connector connection.

INSPECTION END

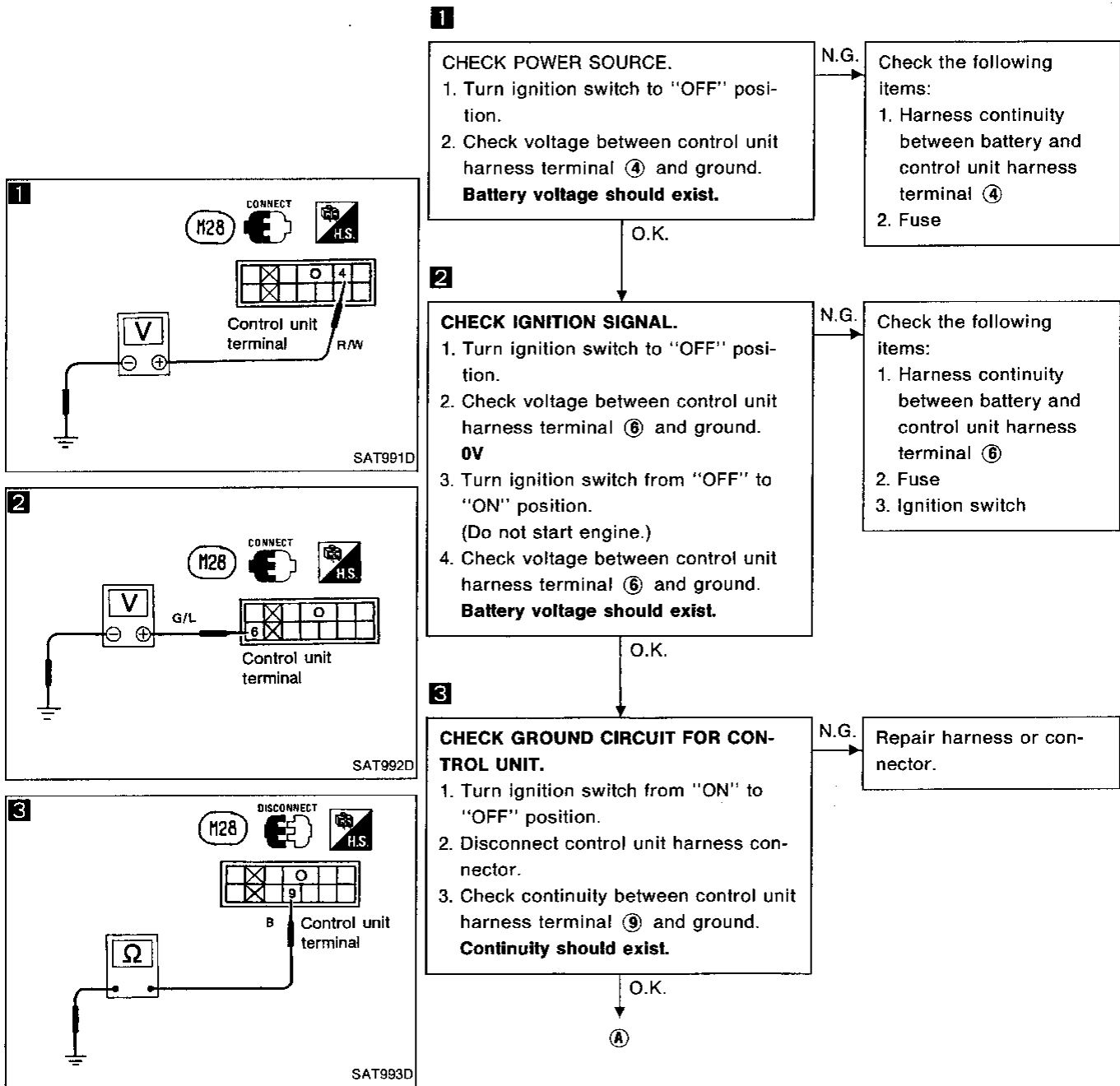
GI  
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# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)

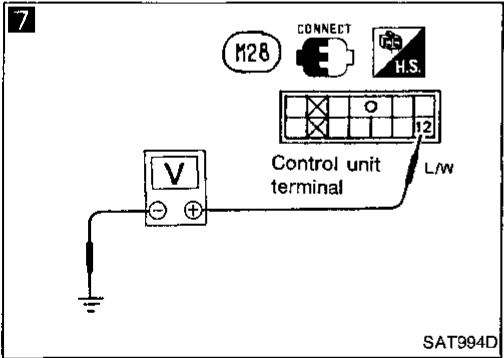
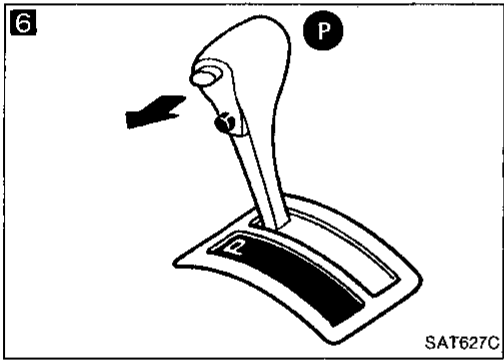
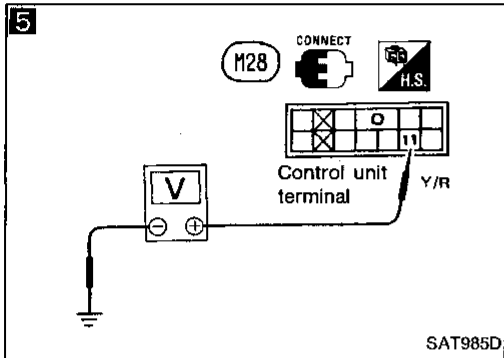
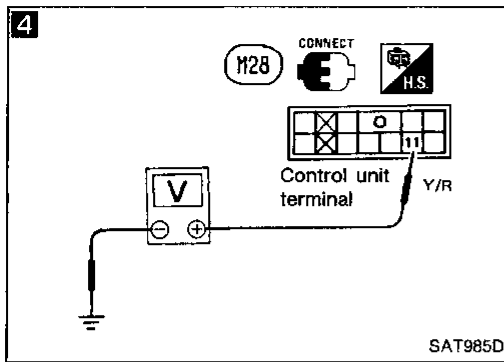
### SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".



# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



**4**

**CHECK INPUT SIGNAL (KEY SWITCH).**

1. Reconnect control unit harness connector.
2. Remove key from ignition switch.

**When ignition key cannot be removed, even if selector lever is in "P" position, use emergency lever.**

3. Check voltage between control unit terminal ⑪ and ground.

**0V**

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K.

**5**

1. Insert key into ignition switch.
2. Check voltage between control unit harness terminal ⑪ and ground.

**Battery voltage should exist.**

N.G. → Check the following items:

1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪.
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K.

**CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).**

1. Turn ignition switch from "ON" to "OFF" position. (Do not start engine.)

**6** 2. Set selector lever in "P" position and release selector lever button.

**7** 3. Check voltage between control unit harness terminal ⑫ and ground.

**0V**

N.G. → Check detention switch—key. (Refer to "COMPONENT CHECK".)

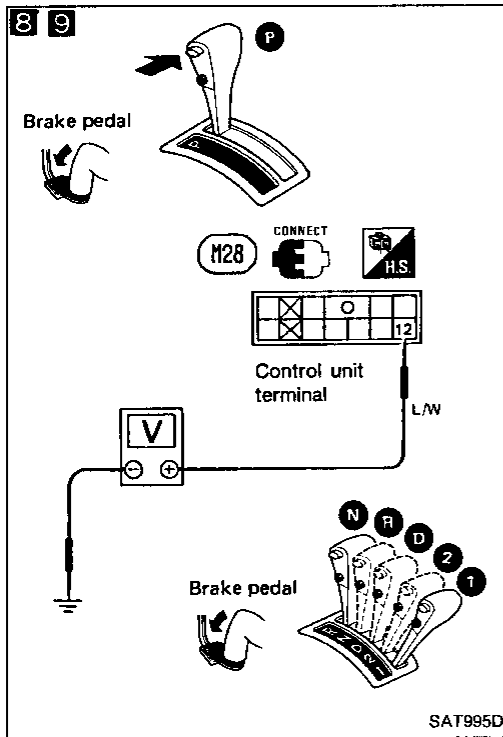
O.K.

Ⓑ

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BR  
ST  
BF  
HA  
EL

# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



### CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).

Turn ignition switch to "ON" position.  
(Do not start engine.)

**8** 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.  
**Battery voltage should exist.**

**9** 2. Check voltage between control unit harness terminal ⑫ and ground with selector lever set in any position except "P".  
**Battery voltage should exist.**

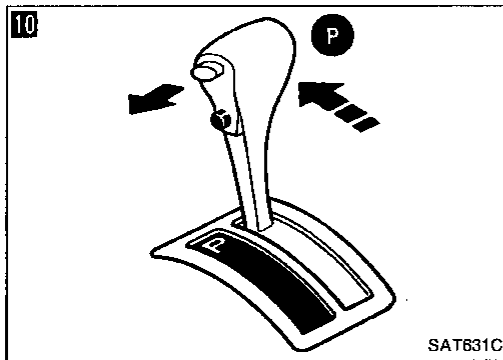
N.G. Check the following items:

1. Harness continuity between control unit harness terminal ⑫ and detention switch harness terminal ⑫
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—key (Refer to "COMPONENT CHECK".)

O.K.

**10**

1. Set selector lever in "P" position and release selector lever button.
2. Turn ignition switch from "ON" to "OFF" position.



### CHECK OUTPUT SIGNAL (KEY LOCK SIGNAL).

1. Turn ignition switch from "OFF" position to "ON" position. (Do not start engine.)

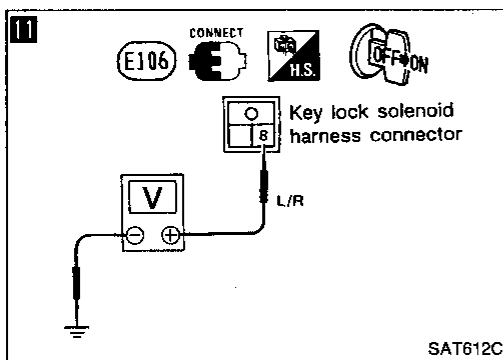
2. Check voltage between key lock solenoid harness terminal ⑧ and ground at the moment ignition key is turned from OFF to ON.  
**Battery voltage should exist for approximately 0.1 seconds.**

N.G. Check harness continuity between shift lock solenoid harness terminal ⑧ and control unit harness terminal ⑧.

Repair harness or connector.

Replace control unit.

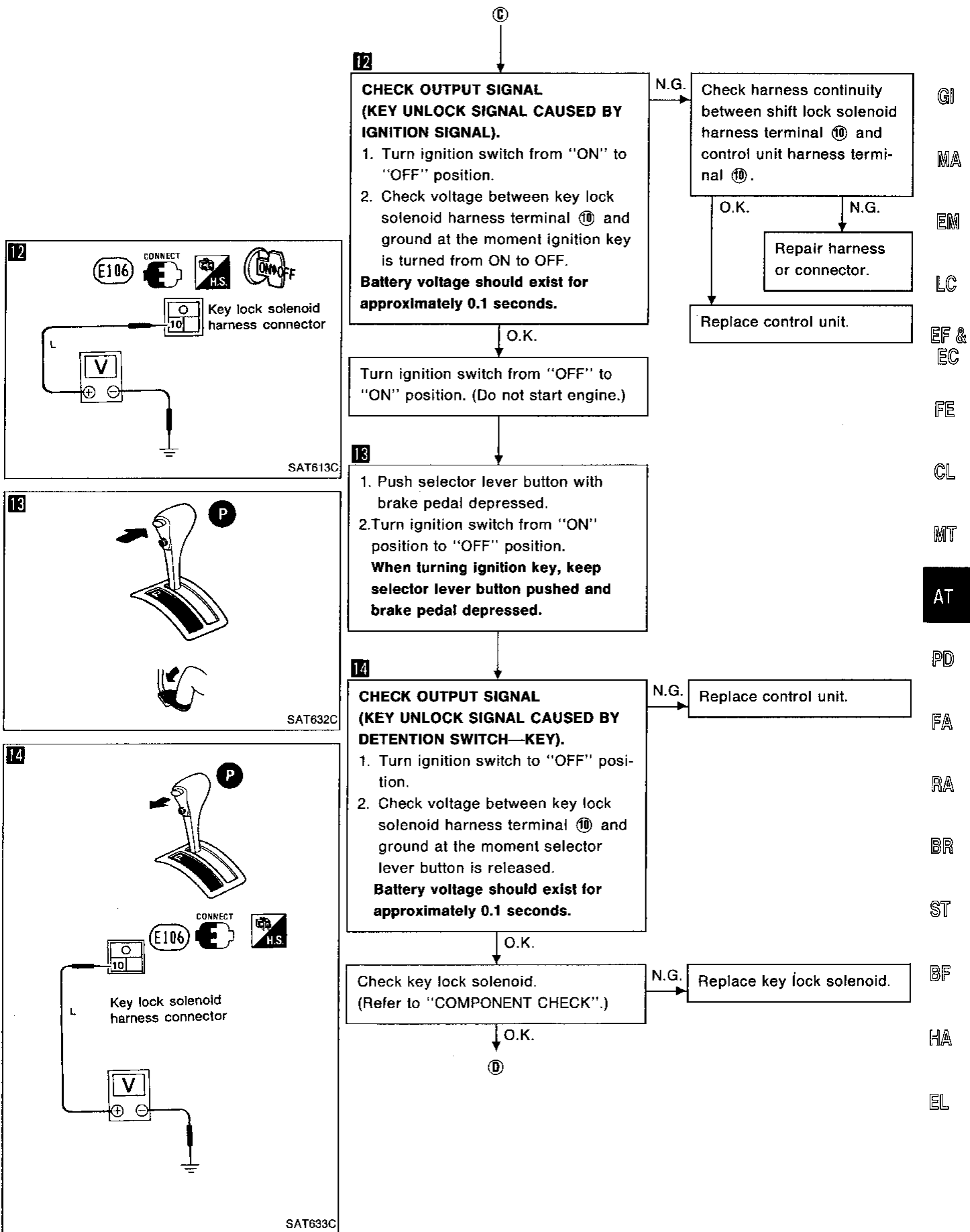
O.K.



ⓐ

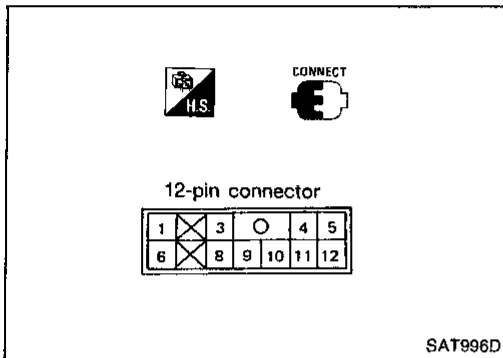
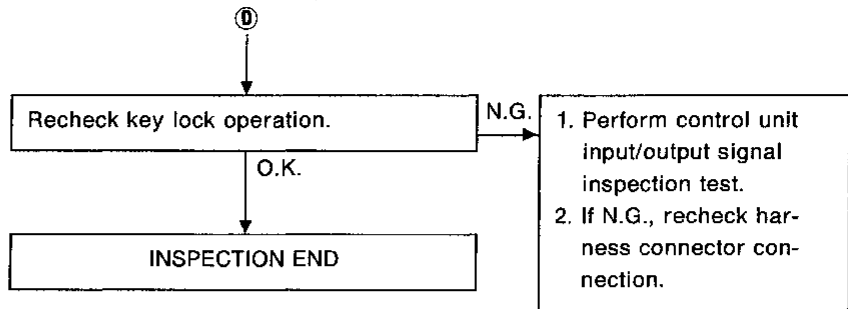
# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



### Shift Lock Control Unit Inspection

- Measure voltage between each terminal and terminal ⑨ by following "SHIFT LOCK CONTROL UNIT INSPECTION TABLE".
- Pin connector terminal layout.



# TROUBLE DIAGNOSES — A/T Shift Lock System

## Shift Lock Control Unit Inspection Table

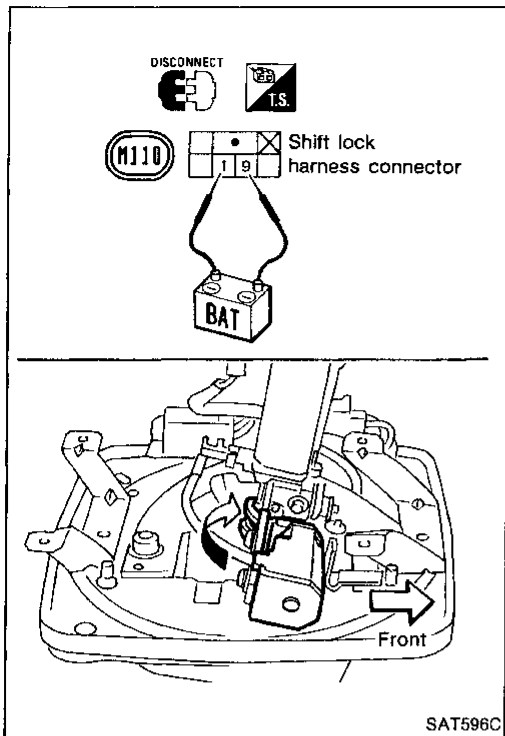
(Data are reference values.)

Terminal No.		Item	Condition	Judgement standard	
⊕	⊖				
1		Shift lock signal	Turn ignition switch to "ON" position. When selector lever is set in "P" position and brake pedal is depressed	Battery voltage	GI
			Except above	0V	MA
3		Stop lamp switch	When brake pedal is depressed	Battery voltage	EM
			When brake pedal is released	0V	LC
4	9	Power source	Turn ignition switch to "OFF" position.	Battery voltage	EF & EC
5		Detention switch (Shift)	When key is inserted into key cylinder, selector lever is set in "P" position and selector lever button is released	0V	FE
			Except above	Battery voltage	CL
6		Ignition signal	Turn ignition switch to "ON" position.	Battery voltage	MT
8	10	Key lock signal	When ignition switch is turned from LOCK, OFF or ACC to ON.	Battery voltage (Approximately 0.1 seconds)	AT
			Except above	0V	PD
9	—	Ground	—	—	FA
10	8	Key unlock signal	When ignition switch is turned from ON to LOCK, OFF, or ACC, selector lever is set in "P" position and selector lever button is released	Battery voltage (Approximately 0.1 seconds)	RA
			Except above	0V	BR
11		Key switch	When key is inserted into key cylinder	Battery voltage	ST
			When key is removed from key cylinder	0V	BF
12	9	Detention switch (Key)	When key is inserted into key cylinder, selector lever is set in "P" position and selector lever button is released	0V	HA
			Except above	Battery voltage	EL

## Component Check

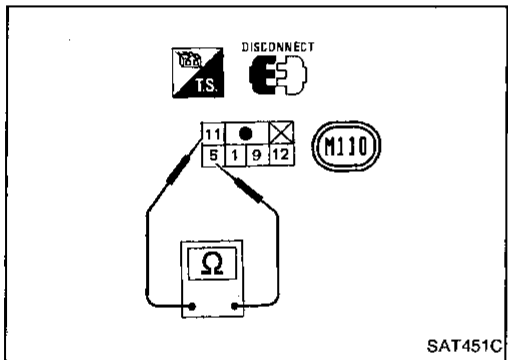
### SHIFT LOCK SOLENOID

- Check operation by applying battery voltage to shift lock harness connector.



### DETENTION SWITCH—SHIFT

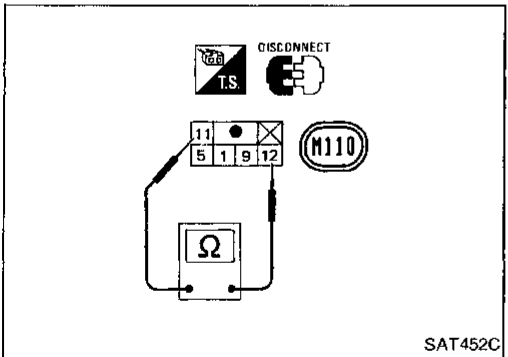
- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.



Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except the above	Yes

### DETENTION SWITCH—KEY

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

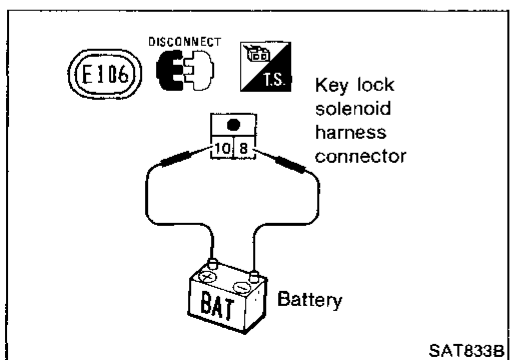


Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except the above	Yes

### KEY LOCK SOLENOID

- Check operation by applying battery voltage to key lock solenoid harness connector.

**Operating sound must be emitted.**



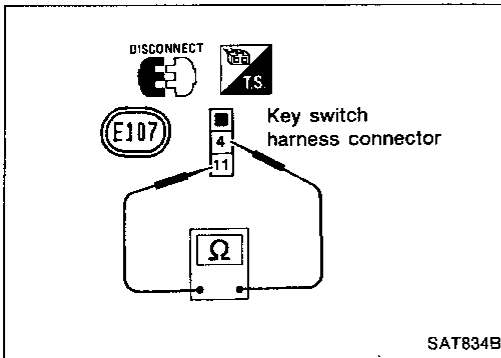
# TROUBLE DIAGNOSES — A/T Shift Lock System

## Component Check (Cont'd)

### KEY SWITCH

- Check continuity between terminals ④ and ① of key switch harness connector.

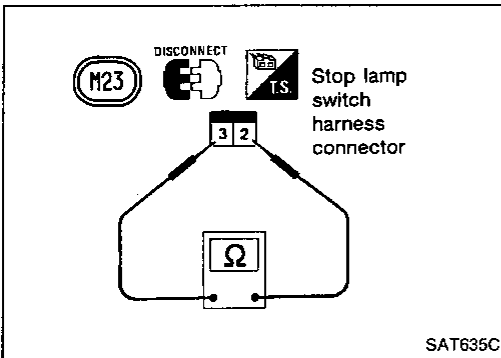
Condition	Continuity
When key is inserted into key cylinder	Yes
When key is removed from key cylinder	Yes



### STOP LAMP SWITCH

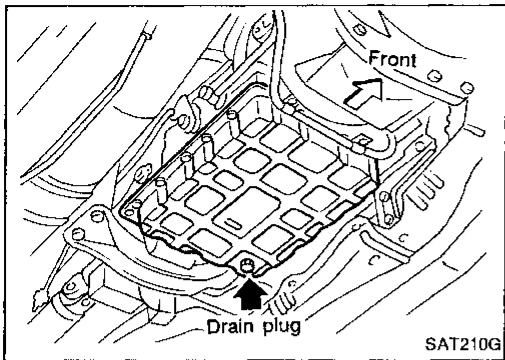
- Check continuity between terminals ② and ③ of stop lamp switch harness connector.

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No



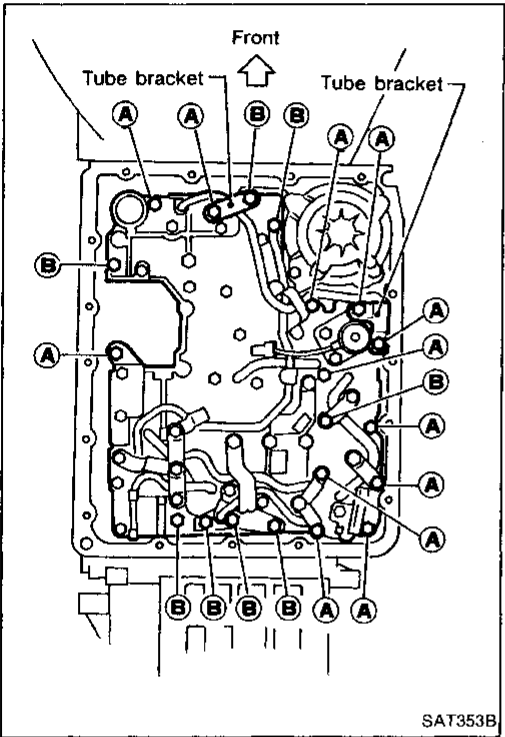
**Check stop lamp switch after adjusting brake pedal — refer to section BR.**

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## Control Valve Assembly and Accumulators Inspection

1. Drain fluid from drain plug.
2. Remove oil pan and gasket.
3. Remove oil strainer.

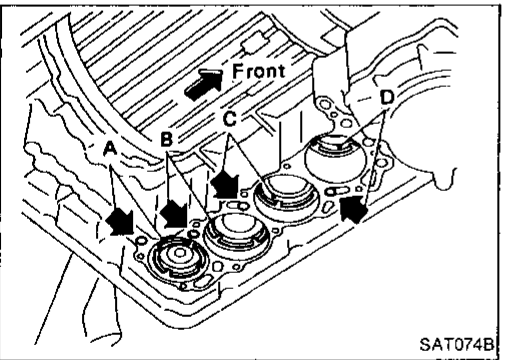


4. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

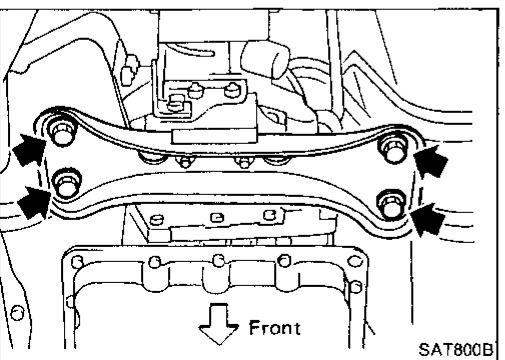
### Bolt length and location

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

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



7. Remove accumulator A, B, C and D by applying compressed air if necessary.
  - Hold each piston with rag.
8. Reinstall any part removed.
  - Always use new sealing parts.

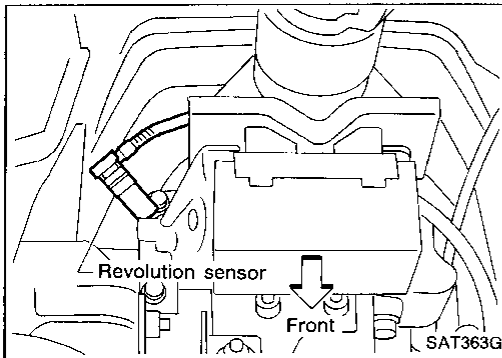


## Revolution Sensor Replacement

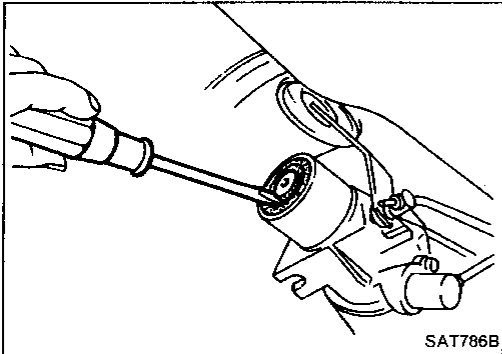
1. Remove rear engine mounting member from body panel while supporting A/T with jack.
2. Lower A/T assembly as much as possible.

## ON-VEHICLE SERVICE

### Revolution Sensor Replacement (Cont'd)

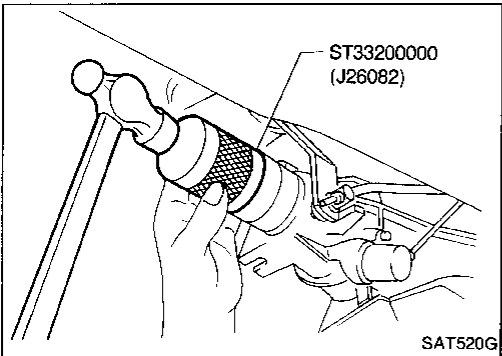


3. Remove revolution sensor from A/T assembly.
  4. Reinstall any part removed.
- **Always use new sealing parts.**

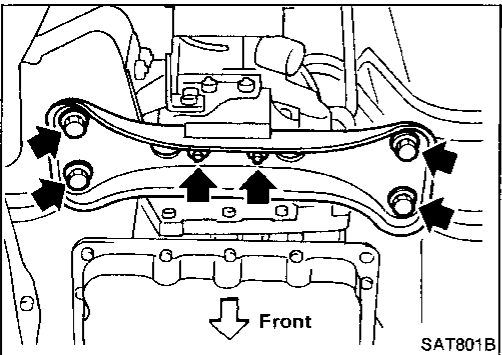


### Rear Oil Seal Replacement

1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.

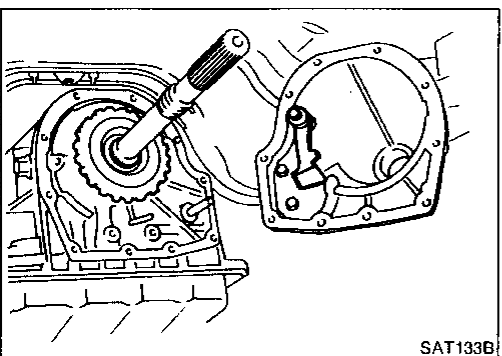


3. Install rear oil seal.
  4. Reinstall any part removed.
- **Apply A.T.F. before installing.**



### Parking Components Inspection

1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear engine mounting member from A/T assembly.



3. Remove rear extension from transmission case.
  4. Replace parking components if necessary.
  5. Reinstall any part removed.
- **Always use new sealing parts.**

GI

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EC

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MT

AT

PD

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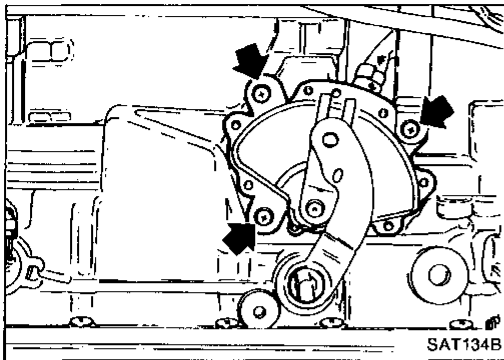
BR

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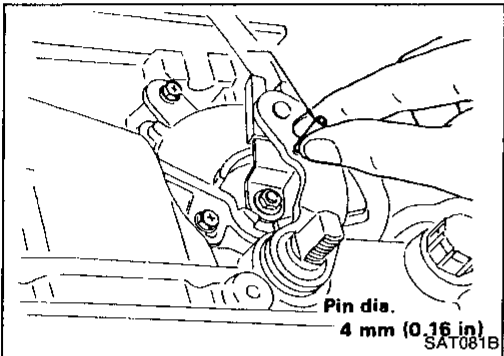
HA

EL

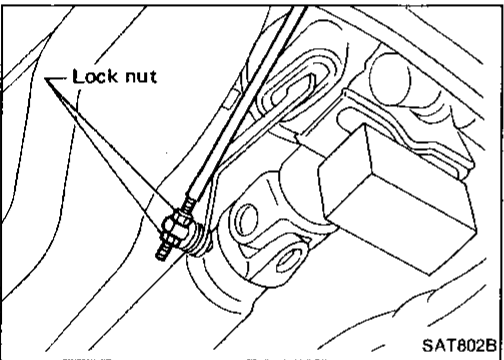


## Inhibitor Switch Adjustment

1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".

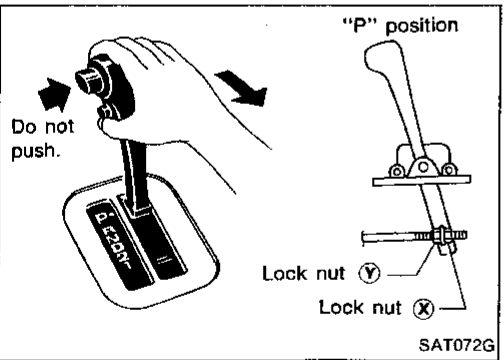


## Manual Control Linkage Adjustment

Move selector lever from "P" position to "1" position. You should be able to feel the detentes in each position.

If the detentes 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.

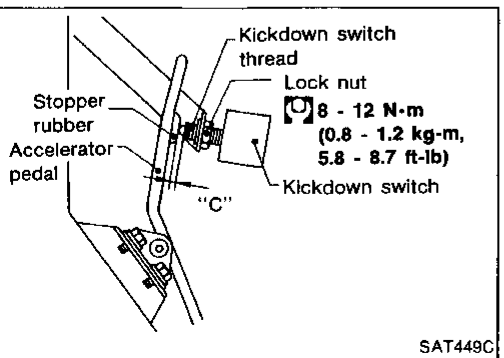


3. Tighten lock nut (X) until it touches trunnion pulling selector lever toward "R" position side without pushing button.
4. Back off lock nut (X) 1 turn and tighten lock nut (Y) to the specified torque.

### Lock nut:

**Y:** 11 - 15 N·m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)

5. Move selector lever from "P" position to "1" position. Make sure that selector lever can move smoothly.

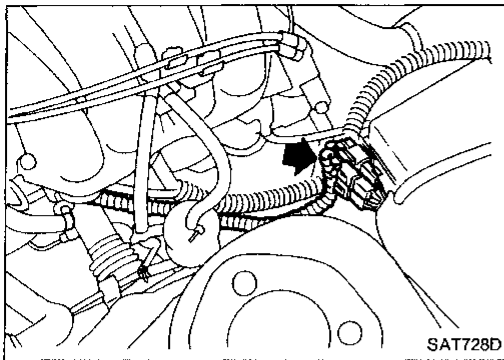


## Kickdown Switch Adjustment

1. Adjust accelerator cable — Refer to section FE.
2. Adjust clearance "C" between stopper rubber and end of kickdown switch thread while depressing accelerator pedal fully.

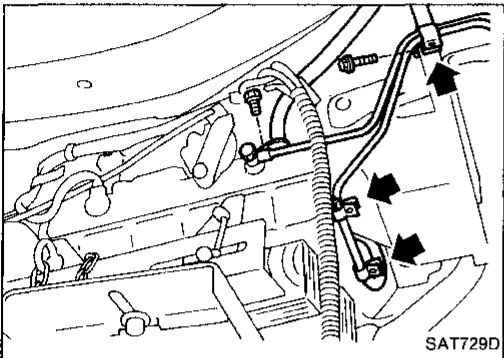
**Clearance "C":** 0.3 - 1.0 mm (0.012 - 0.039 in)

# REMOVAL AND INSTALLATION



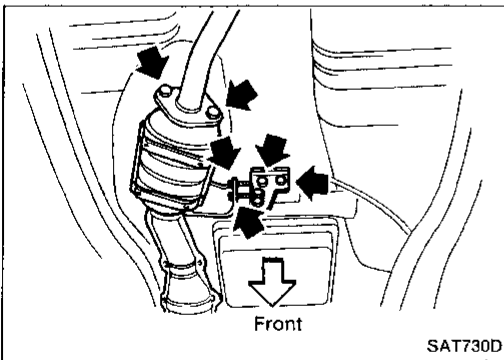
## Removal

- Disconnect A/T harness connector and clamps.

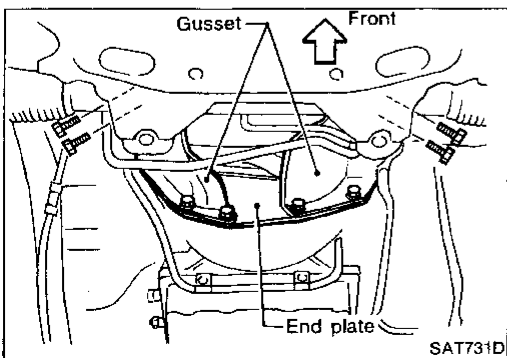


- Remove fluid charging pipe and oil cooler pipe at right side of A/T assembly. Plug up openings.
- Remove oil cooler pipe clamp at engine oil pan.
- Disconnect speed sensor harness connector.
- Remove control linkage from selector lever.

- Remove propeller shaft — Refer to section PD.  
**Insert plug into rear oil seal after removing propeller shaft. Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**



- Remove heat insulator from catalytic converter.
- Remove exhaust tube bracket and separate rear exhaust tube from converter.
- Remove starter motor.



- Remove gussets and end plate.

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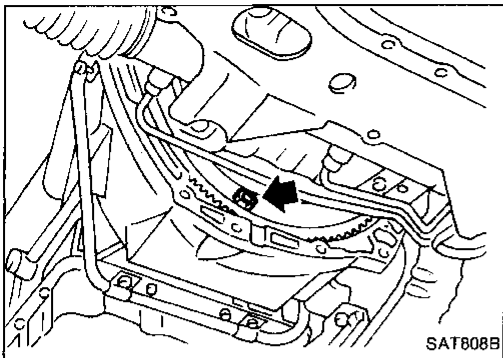
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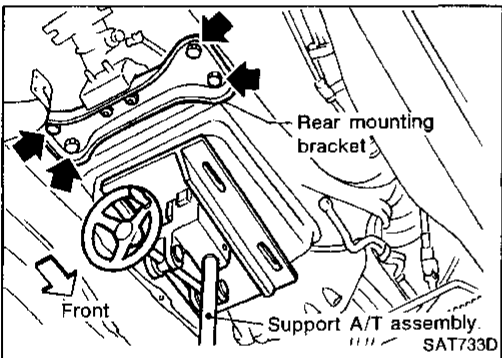
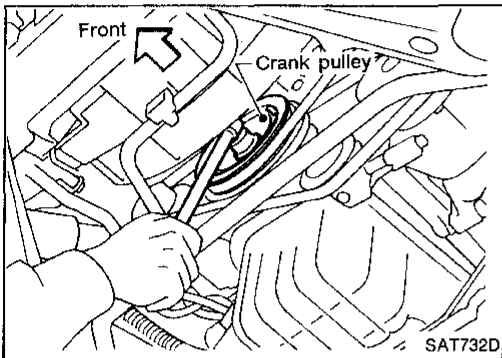
EL

## REMOVAL AND INSTALLATION

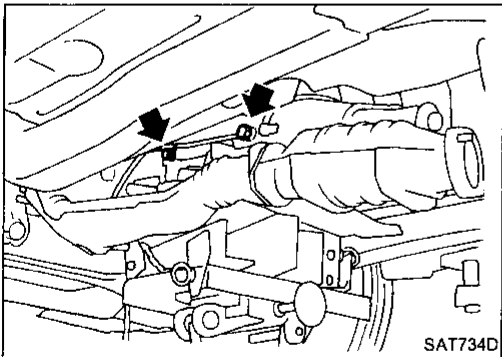
### Removal (Cont'd)



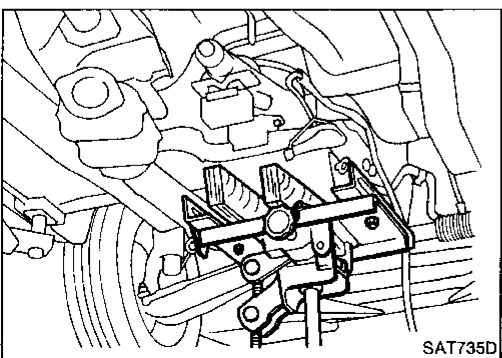
- Remove bolts securing torque converter to drive plate. Gain access to bolts by turning crankshaft.



- Support A/T assembly by placing a jack under oil pan.
- Remove rear mounting bracket from body.



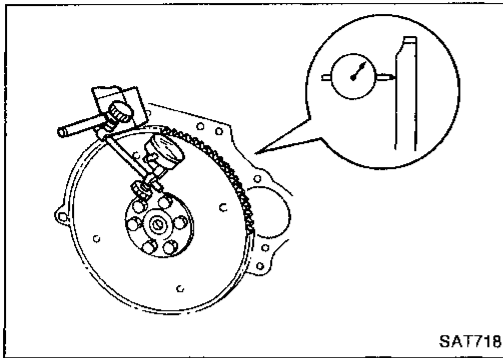
- Lower A/T assembly as much as possible.
- Remove oil cooler pipe from left side of A/T assembly. Plug up openings.



- Remove bolts securing A/T assembly to engine.
- Remove and lower A/T assembly. Be careful not to damage steering gear and tubes.



# REMOVAL AND INSTALLATION



## Installation

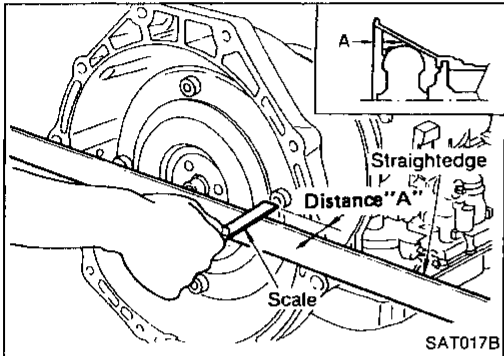
- Drive plate runout  
**Maximum allowable runout:  
 0.5 mm (0.020 in)**  
 If this runout is out of allowance, replace drive plate with ring gear.

GI

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

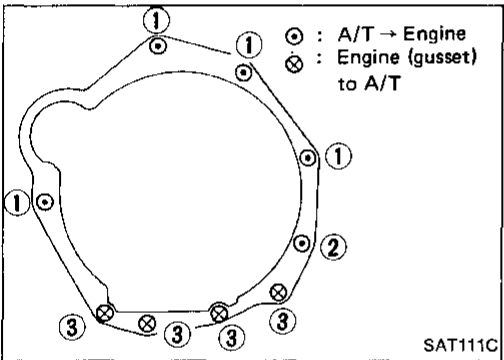
**Distance "A":  
 26.0 mm (1.024 in) or more**

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

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CL



- Tighten bolts securing transmission.

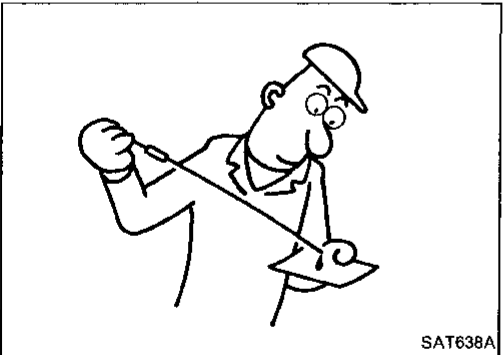
Bolt No.	Tightening torque N·m (kg·m, ft·lb)	Bolt length "L" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	40 (1.57)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
Gusset to engine (4 bolts)	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

MT

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FA



- 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". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

RA

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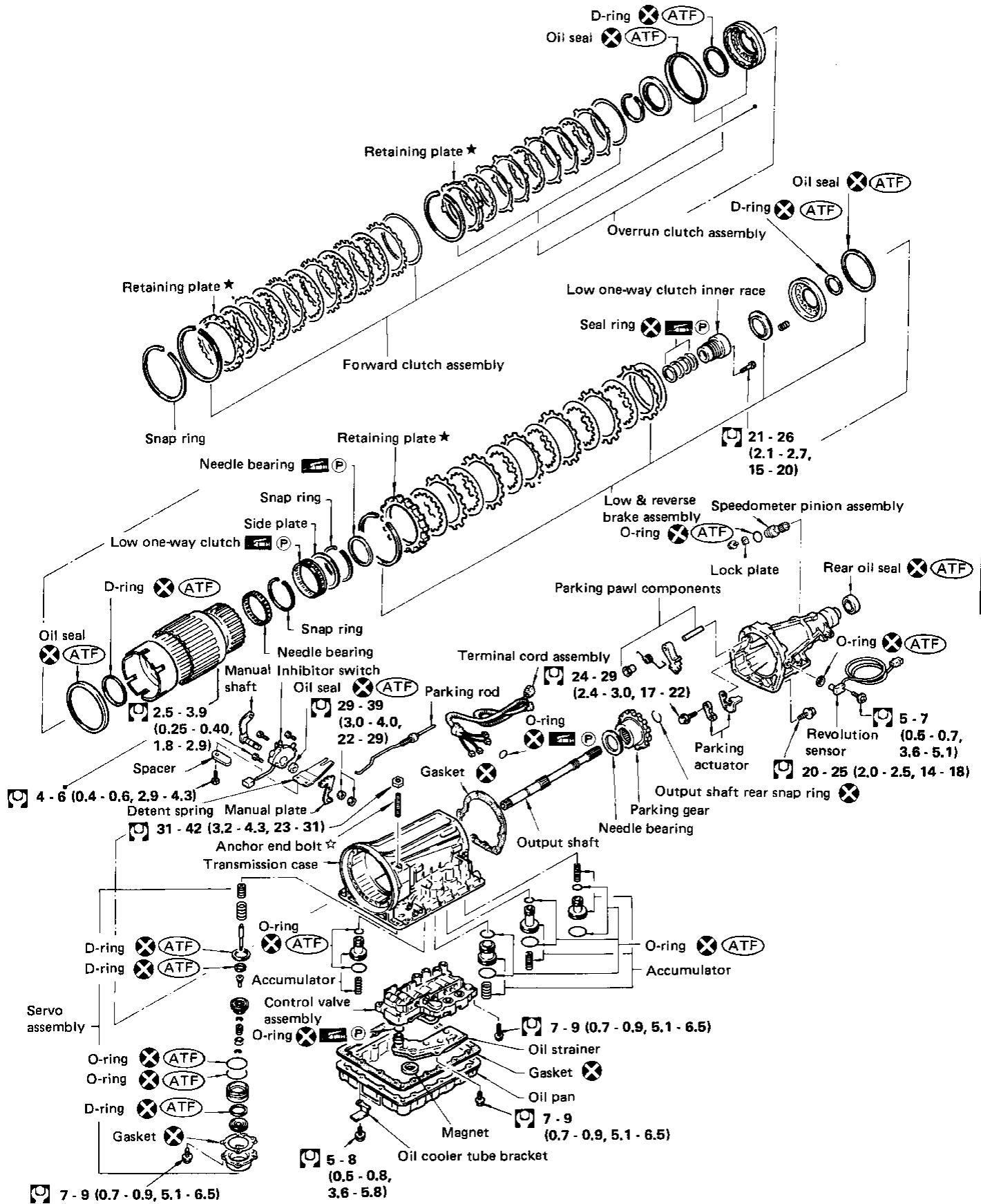
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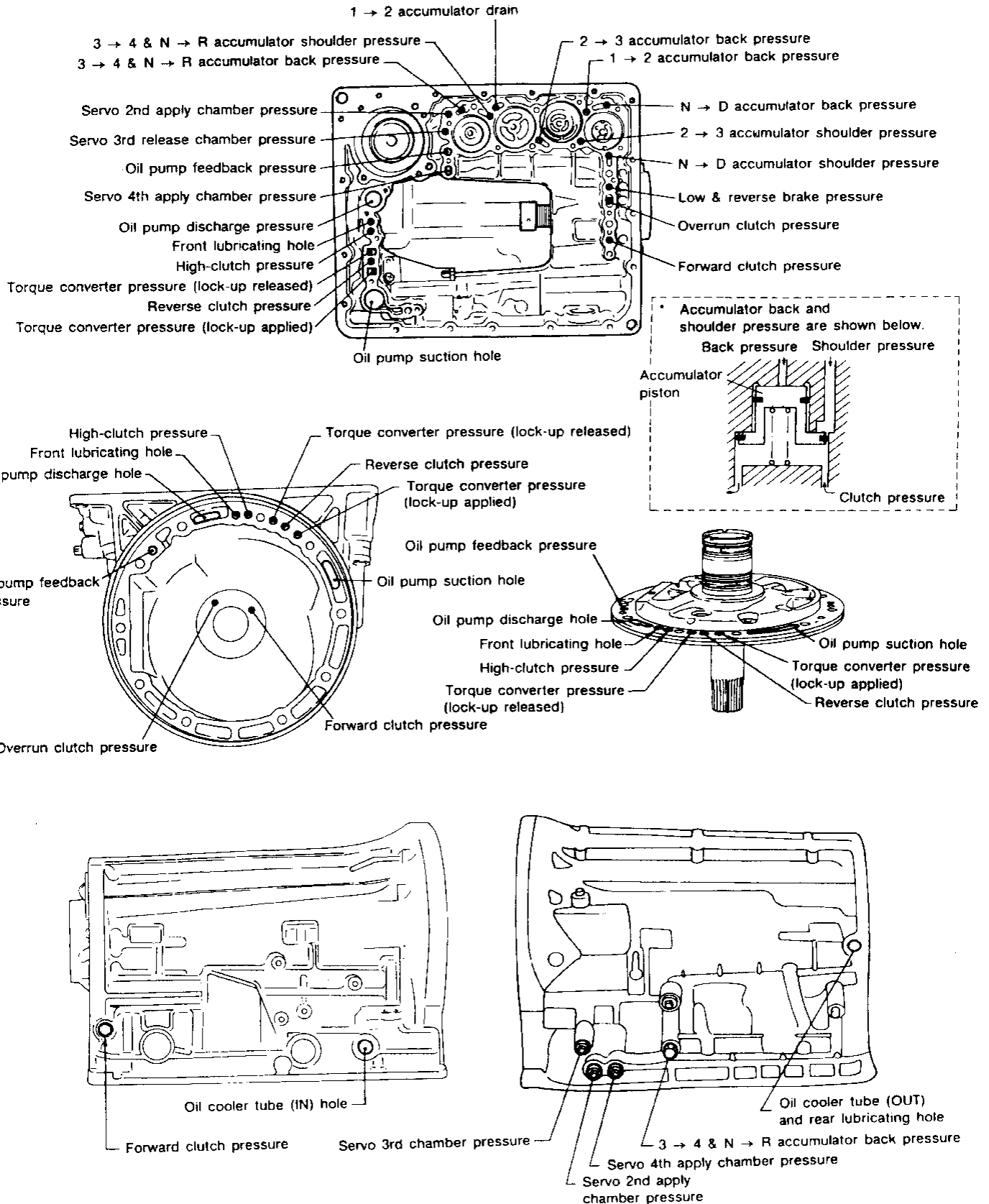
# MAJOR OVERHAUL



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# MAJOR OVERHAUL

## Oil Channel



## 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

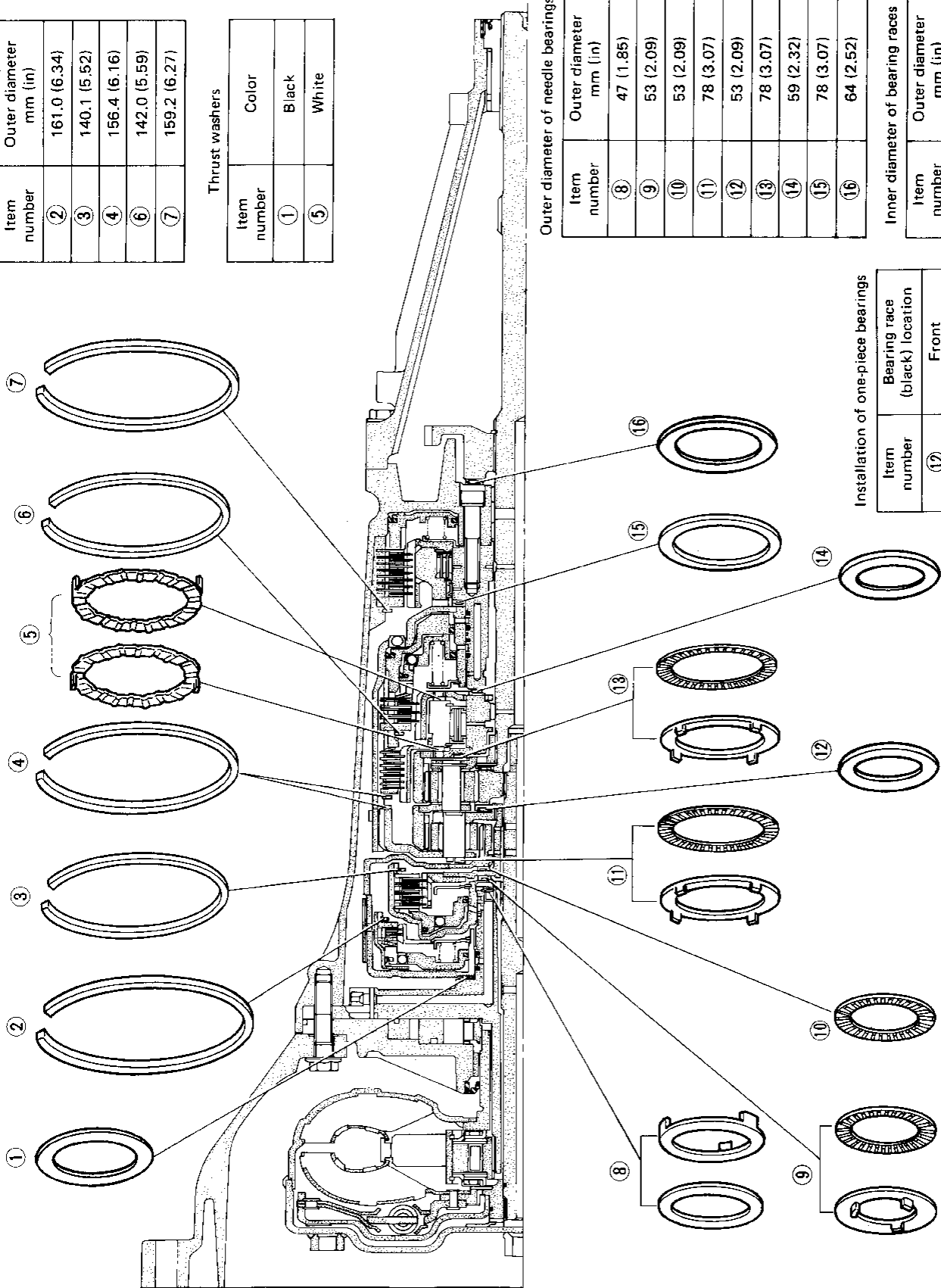
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	59 (2.32)
⑮	78 (3.07)
⑯	64 (2.52)

Inner diameter of bearing races

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

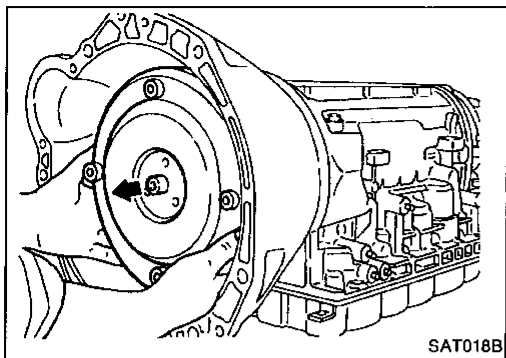
Installation of one-piece bearings

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



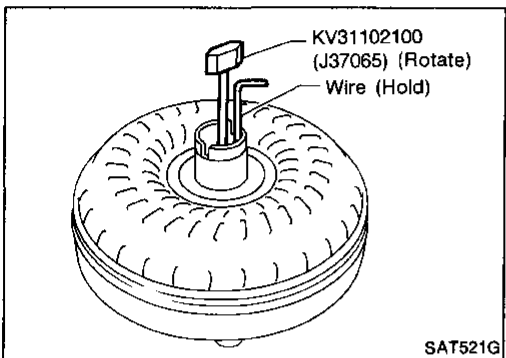
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EF & EC  
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## DISASSEMBLY

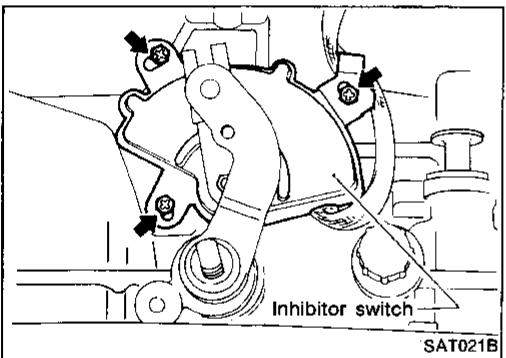


### Disassembly

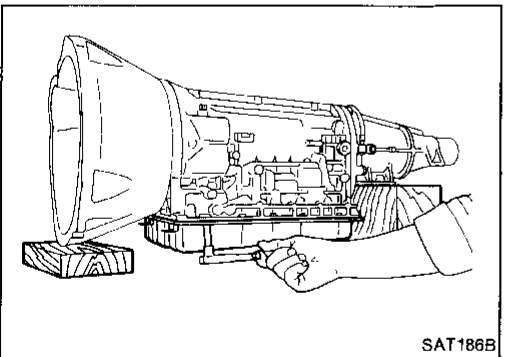
1. Remove torque converter by holding it firmly and turning while pulling straight out.



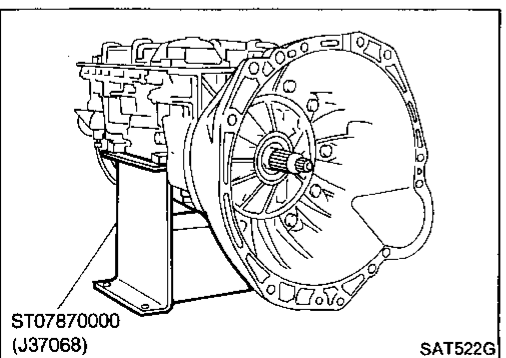
2. Check torque converter one-way clutch.
  - a. Insert Tool into spline of one-way clutch inner race.
  - b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
  - c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.



3. Remove inhibitor switch from transmission case.



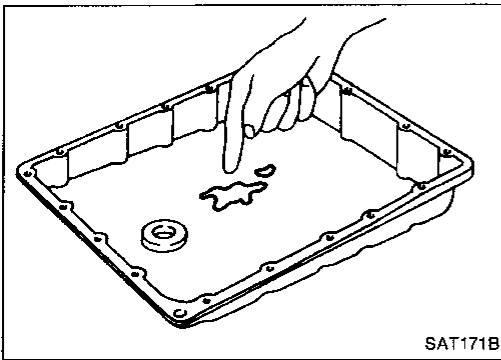
4. Remove oil pan.
  - a. Drain A.T.F. from rear extension.
  - b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
  - c. Separate the oil pan and transmission case.
  - **Always place oil pan straight down so that foreign particles inside will not move.**



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

# DISASSEMBLY

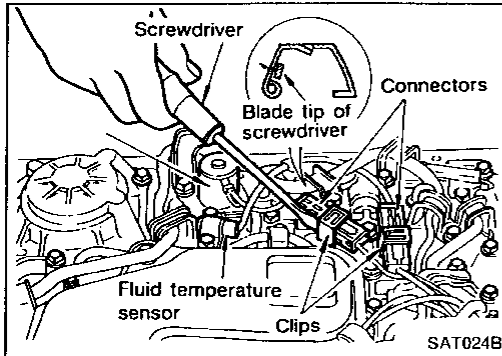
## Disassembly (Cont'd)



6. Check oil pan and oil strainer for accumulation of foreign particles.
  - If materials of clutch facing are found, clutch plates may be worn.
  - If metal filings are found, clutch plates, brake bands, etc. may be worn.
  - If aluminum filings are found, bushings or aluminum cast parts may be worn.

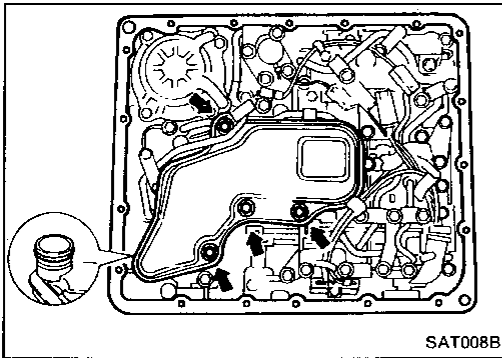
In above cases, replace torque converter and check unit for cause of particle accumulation.

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7. Remove torque converter clutch solenoid valve and fluid temperature sensor connectors.
  - **Be careful not to damage connector.**

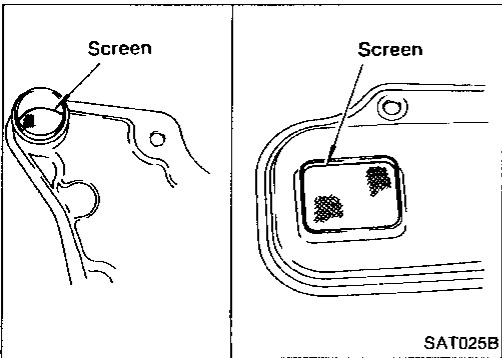
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8. Remove oil strainer.
  - a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.

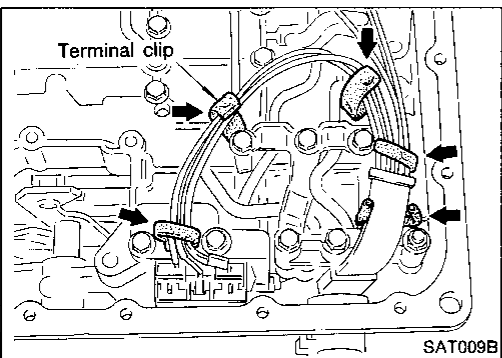
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- b. Check oil strainer screen for damage.

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9. Remove control valve assembly.
  - a. Straighten terminal clips to free terminal cords then remove terminal clips.

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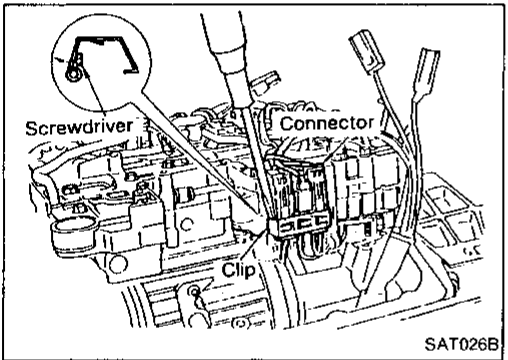
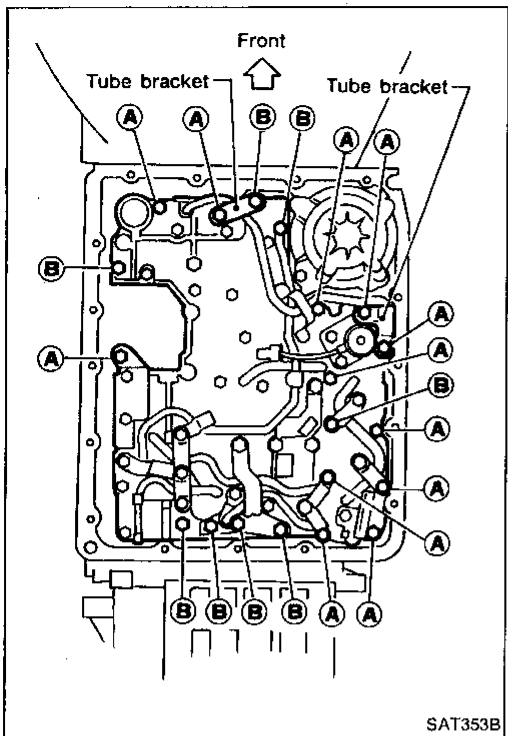
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## DISASSEMBLY

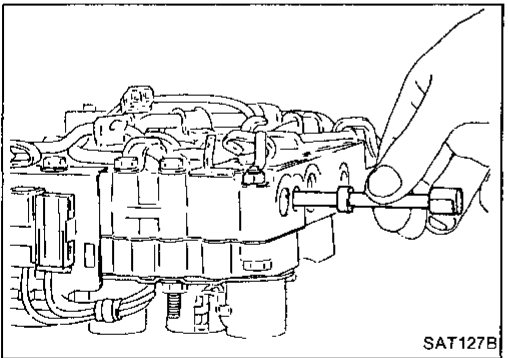
### Disassembly (Cont'd)

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

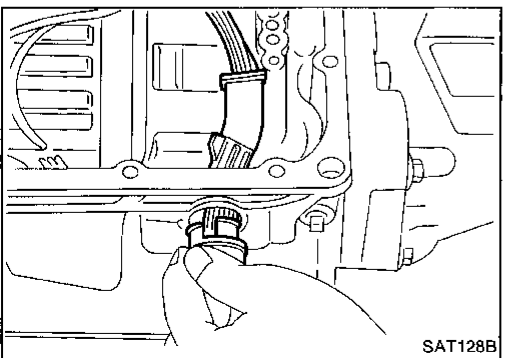
Bolt symbol	ℓ mm (in) xxx
(A)	33 (1.30)
(B)	45 (1.77)



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



- d. Remove manual valve from control valve assembly.

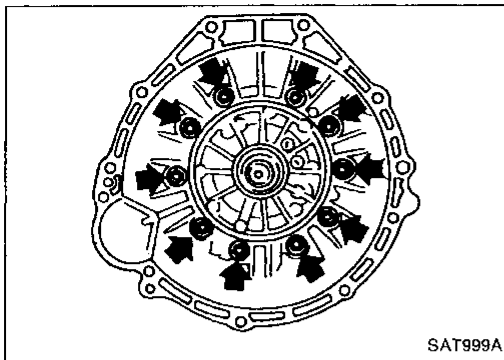


10. Remove terminal cord assembly from transmission case while pushing on stopper.
- **Be careful not to damage cord.**
  - **Do not remove terminal cord assembly unless it is damaged.**



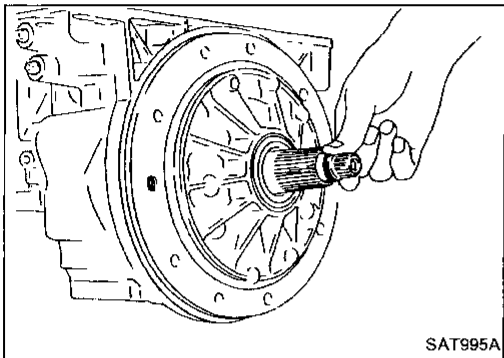
# DISASSEMBLY

## Disassembly (Cont'd)

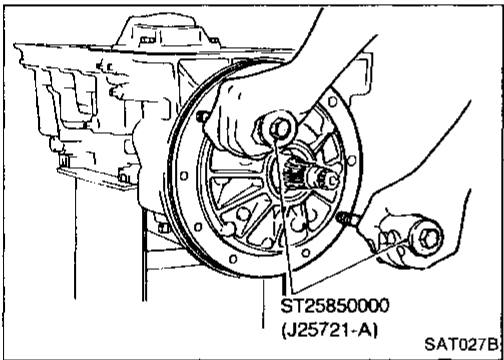


11. Remove converter housing from transmission case.

- Be careful not to scratch converter housing.

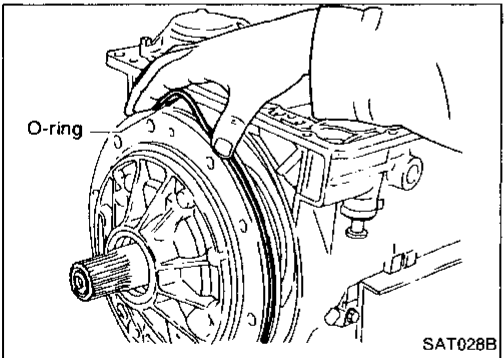


12. Remove O-ring from input shaft.



13. Remove oil pump assembly.

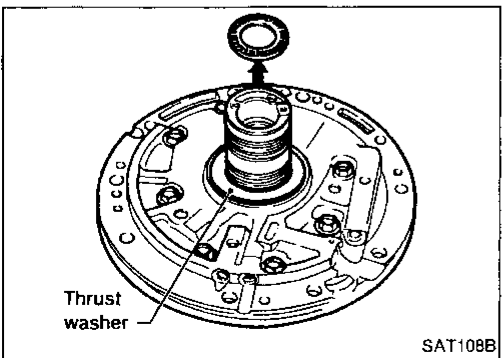
- a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



b. Remove O-ring from oil pump assembly.

c. Remove traces of sealant from oil pump housing.

- Be careful not to scratch pump housing.



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

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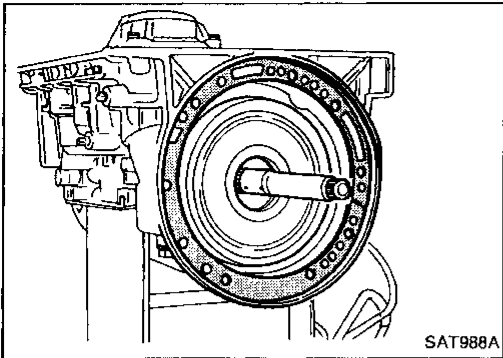
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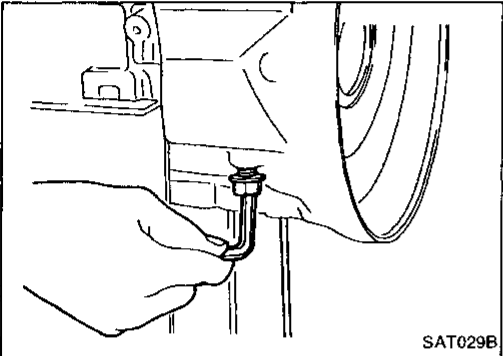
EL

## DISASSEMBLY

### Disassembly (Cont'd)

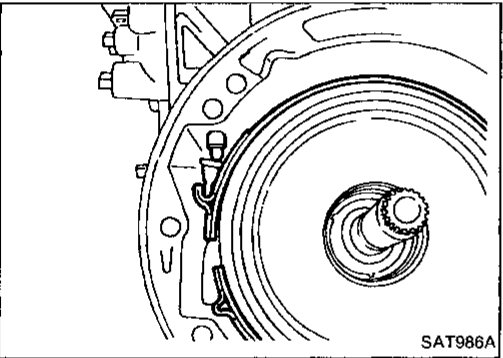


14. Remove input shaft and oil pump gasket.

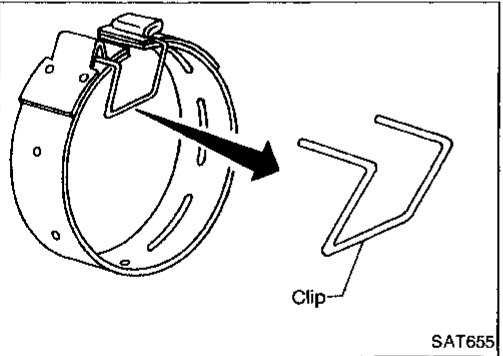


15. Remove brake band and band strut.

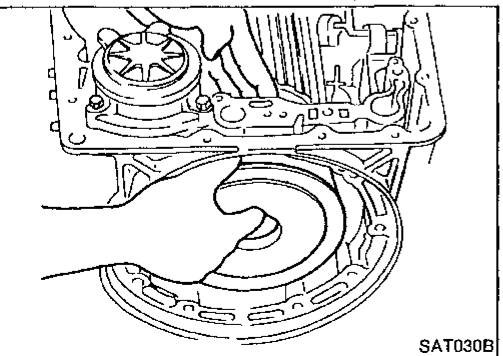
a. Loosen lock nut and remove band servo anchor end pin from transmission case.



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



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

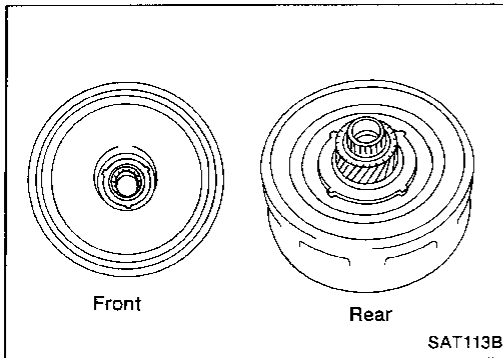


16. Remove front side clutch and gear components.

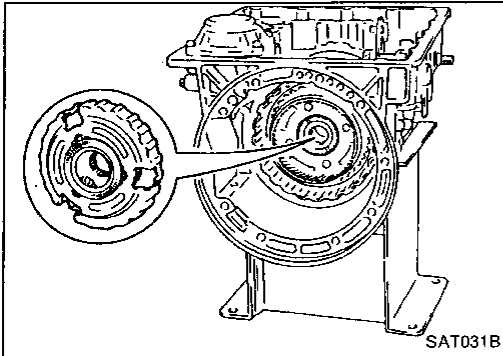
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

# DISASSEMBLY

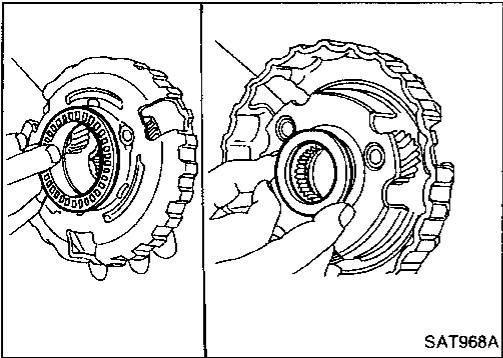
## Disassembly (Cont'd)



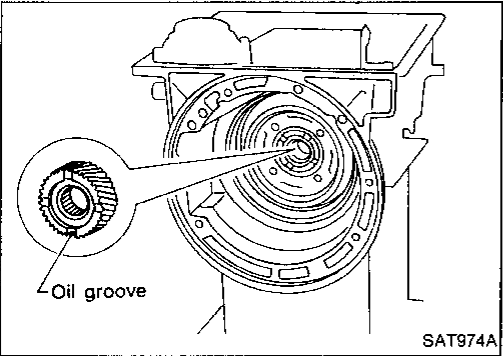
- b. Remove front bearing race from clutch pack.
- c. Remove rear bearing race from clutch pack.



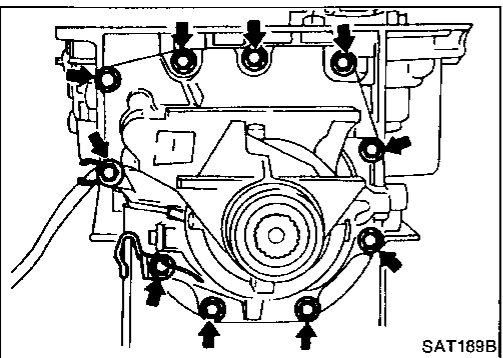
- d. Remove front planetary carrier from transmission case.



- 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.



- 17. Remove rear extension.
  - a. Remove rear extension from transmission case.
  - b. Remove rear extension gasket from transmission case.

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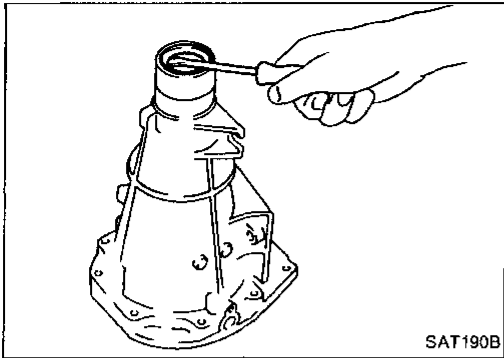
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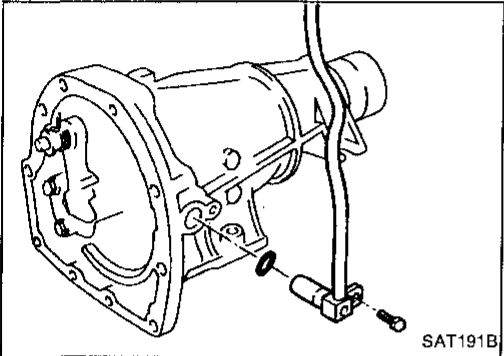
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## DISASSEMBLY

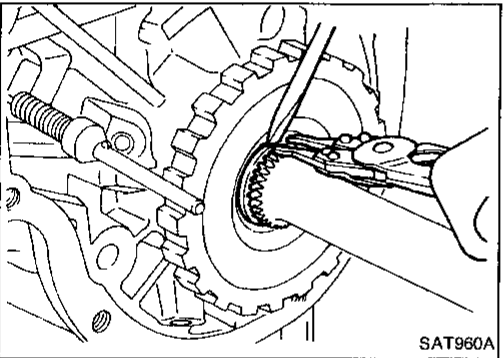
### Disassembly (Cont'd)



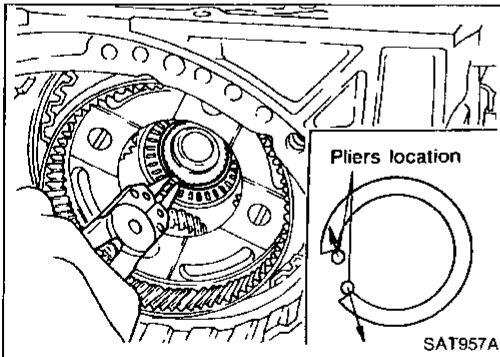
- c. Remove oil seal from rear extension.
- **Do not remove oil seal unless it is to be replaced.**



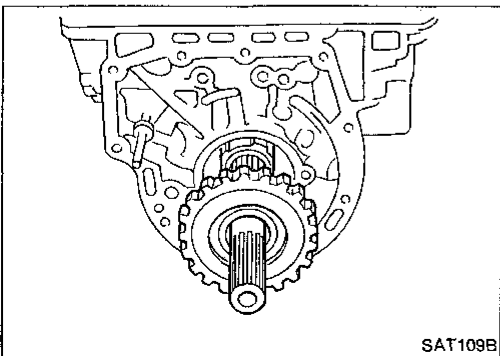
- d. Remove revolution sensor from rear extension.
- e. Remove O-ring from revolution sensor.



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



- b. Slowly push output shaft all the way forward.
- **Do not use excessive force.**
- c. Remove snap ring from output shaft.

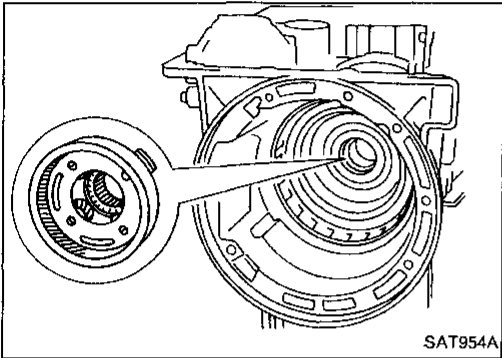
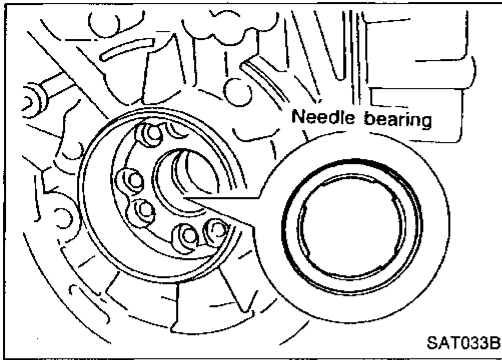


- d. Remove output shaft and parking gear as a unit from transmission case.
- e. Remove parking gear from output shaft.

# DISASSEMBLY

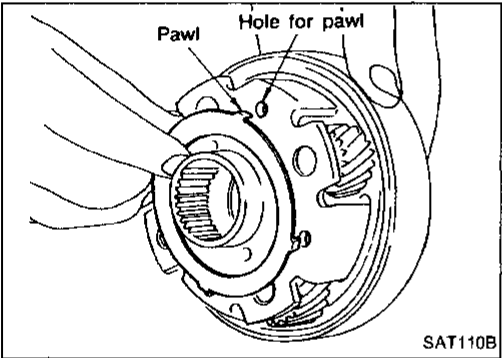
## Disassembly (Cont'd)

f. Remove needle bearing from transmission case.

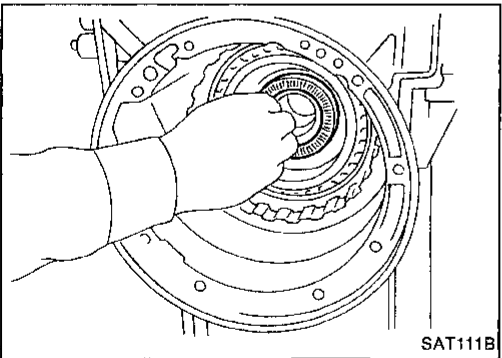


19. Remove rear side clutch and gear components.

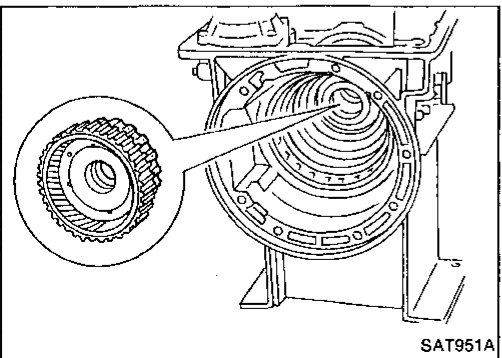
a. Remove front internal gear.



b. Remove bearing race from front internal gear.



c. Remove needle bearing from rear internal gear.



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

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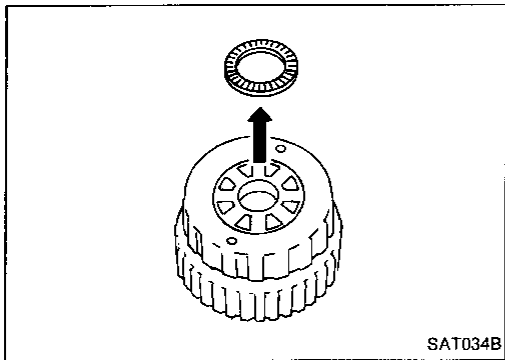
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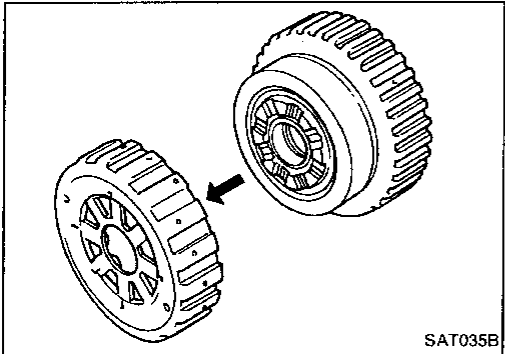
EL

## DISASSEMBLY

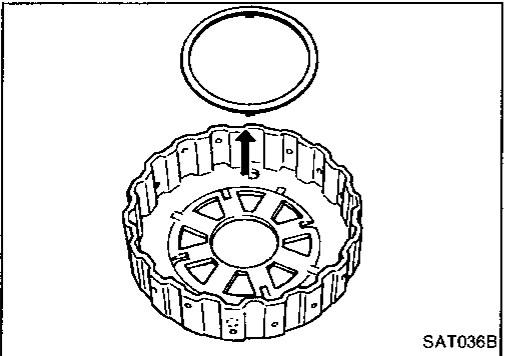
### Disassembly (Cont'd)



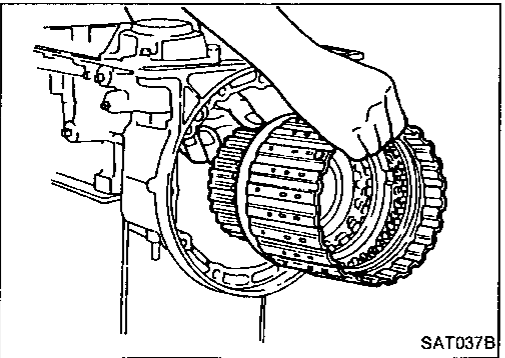
e. Remove needle bearing from overrun clutch hub.



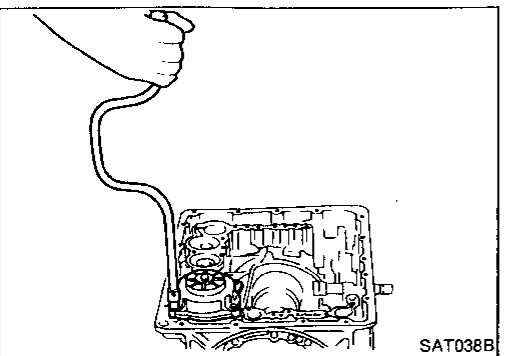
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.



g. Remove thrust washer from overrun clutch hub.



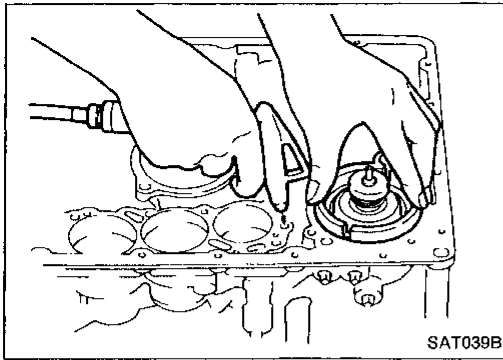
h. Remove forward clutch assembly from transmission case.



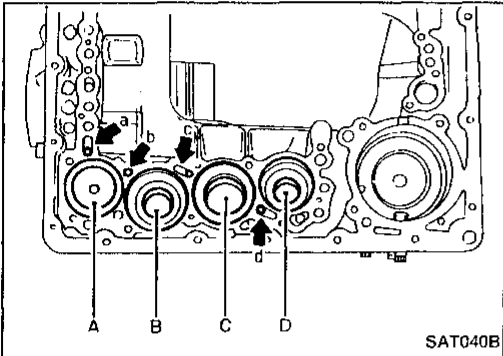
20. Remove band servo and accumulator components.  
a. Remove band servo retainer from transmission case.

# DISASSEMBLY

## Disassembly (Cont'd)

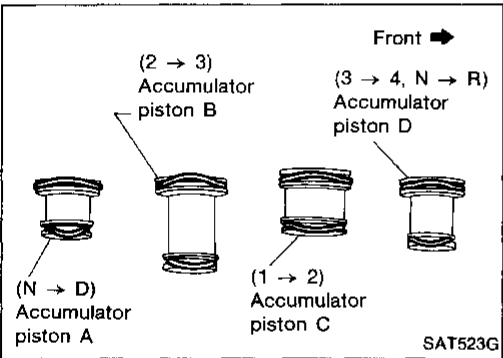


- b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
- **Hold piston with a rag and gradually direct air to oil hole.**
- c. Remove return springs.

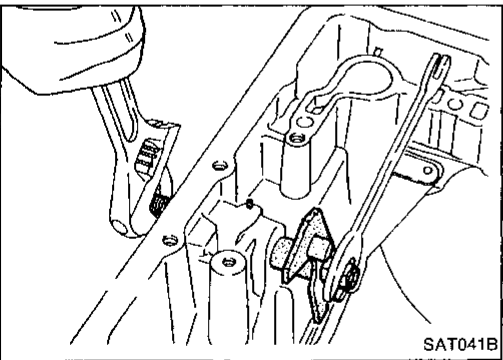


- d. Remove springs from accumulator pistons B, C and D.
- e. Apply compressed air to each oil hole until piston comes out.
- **Hold piston with a rag and gradually direct air to oil hole.**

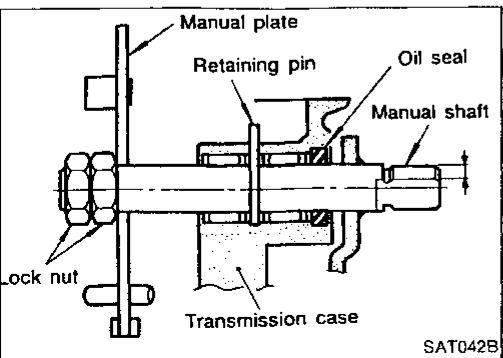
Identification of accumulator pistons	A	B	C	D
Identification of oil holes	a	b	c	d



- f. Remove O-ring from each piston.



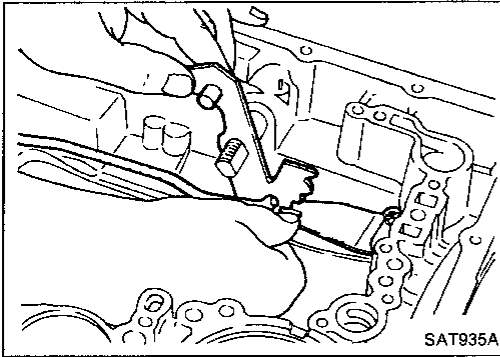
- 21. Remove manual shaft components, if necessary.
- a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.



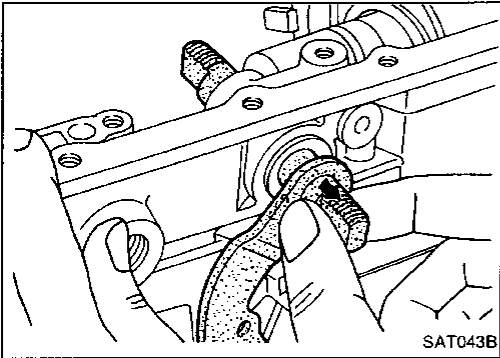
- b. Remove retaining pin from transmission case.

## DISASSEMBLY

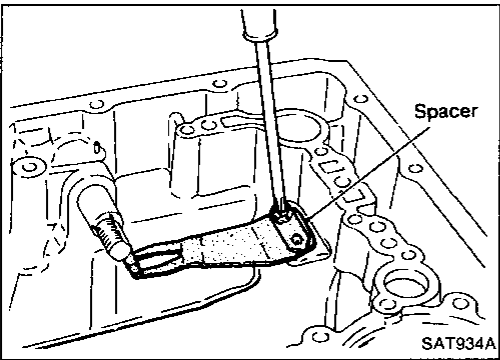
### Disassembly (Cont'd)



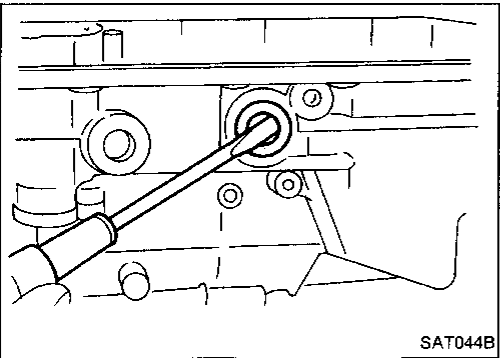
- c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



- d. Remove manual shaft from transmission case.



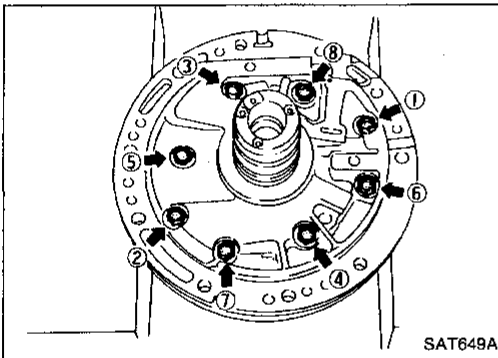
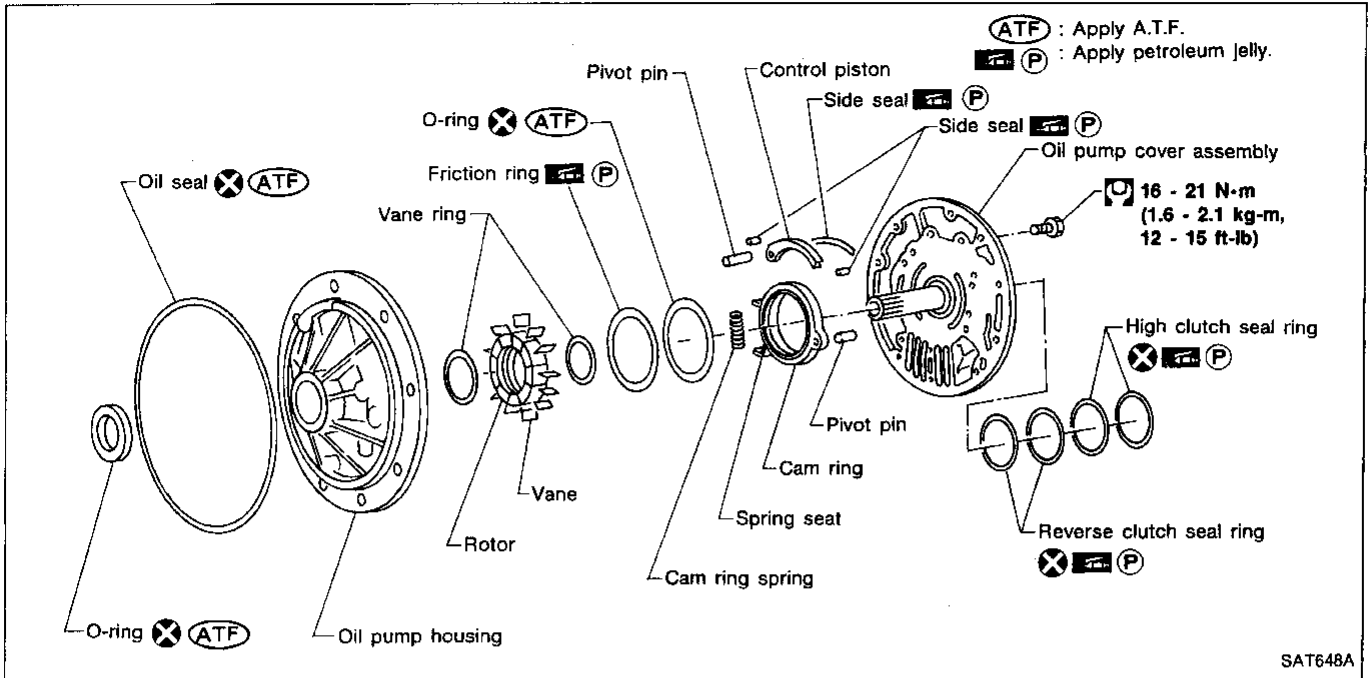
- e. Remove spacer and detent spring from transmission case.



- f. Remove oil seal from transmission case.

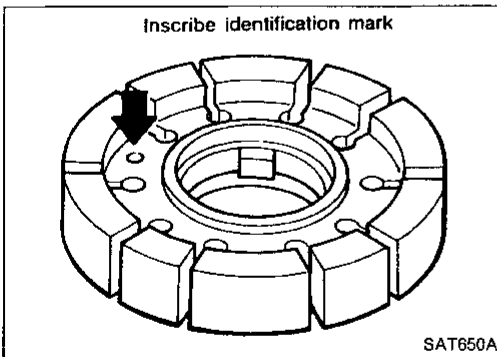


## Oil Pump

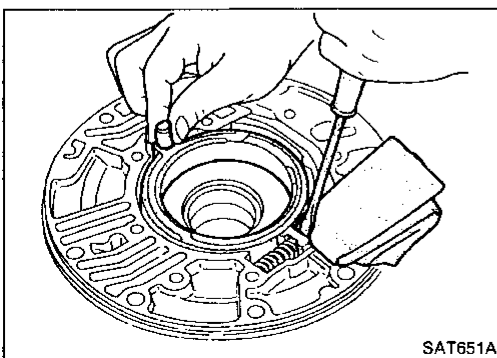


### DISASSEMBLY

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



- 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.



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

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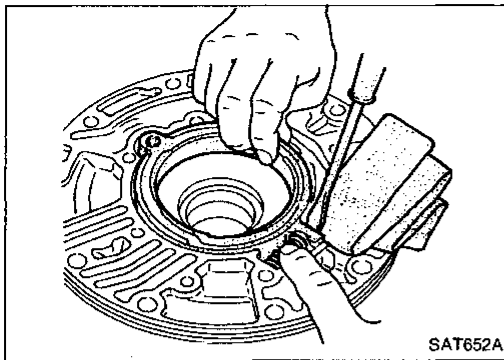
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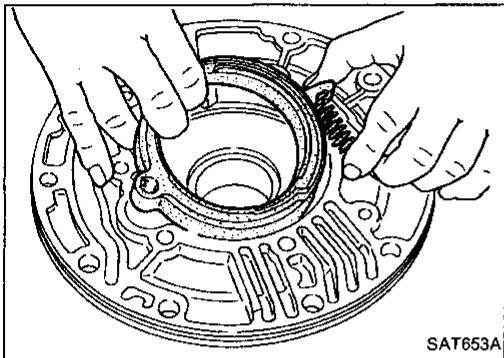
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 EL

## REPAIR FOR COMPONENT PARTS

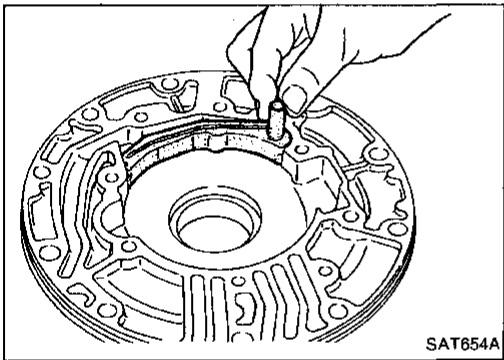
### Oil Pump (Cont'd)



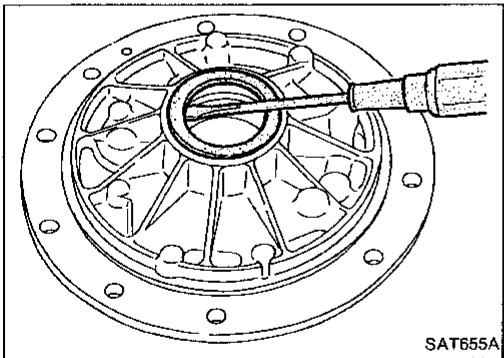
4. While holding cam ring and spring lift out cam ring spring.
  - Be careful not to damage oil pump housing.
  - Hold cam ring spring to prevent it from jumping.



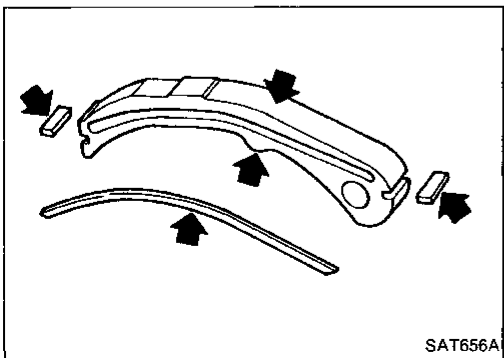
5. Remove cam ring and cam ring spring from oil pump housing.



6. Remove pivot pin from control piston and remove control piston assembly.



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



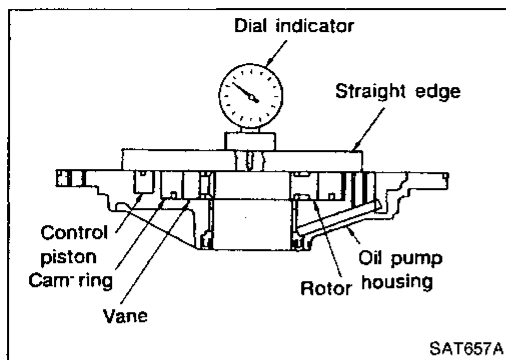
### INSPECTION

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

- Check for wear or damage.

# REPAIR FOR COMPONENT PARTS

## Oil Pump (Cont'd)



### Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified positions.
- **Before measuring side clearance, 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 S.D.S.**

- 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.

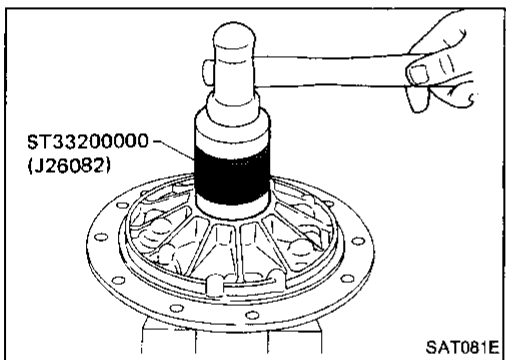
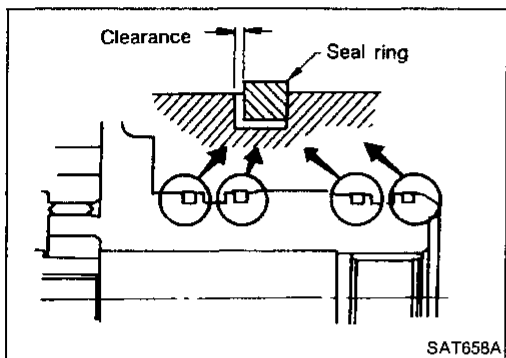
**Standard clearance:**

**0.10 - 0.25 mm (0.0039 - 0.0098 in)**

**Wear limit:**

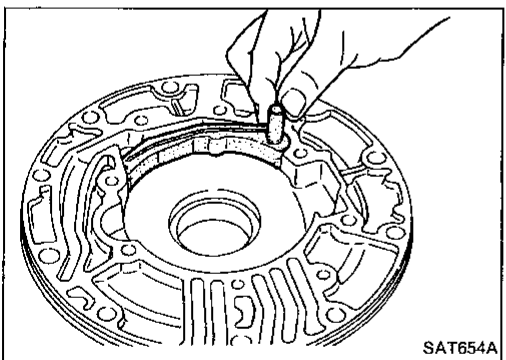
**0.25 mm (0.0098 in)**

- If not within wear limit, replace oil pump cover assembly.

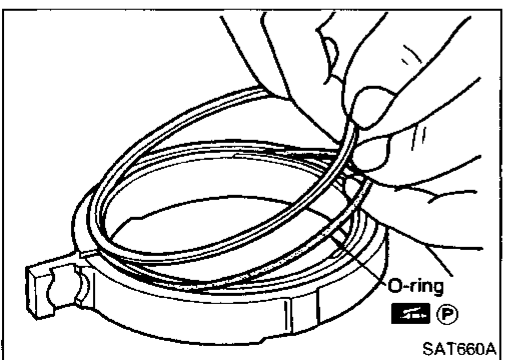


## ASSEMBLY

1. Drive oil seal into oil pump housing.
  - **Apply A.T.F. 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.

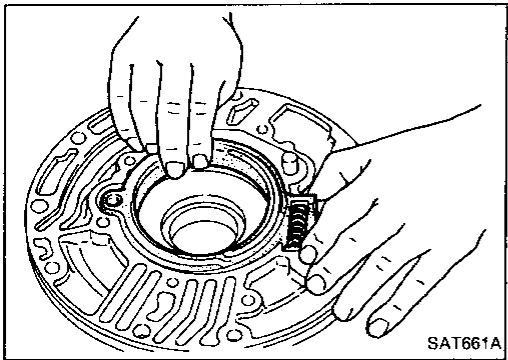


- c. Install O-ring and friction ring on cam ring.
  - **Apply petroleum jelly to O-ring.**

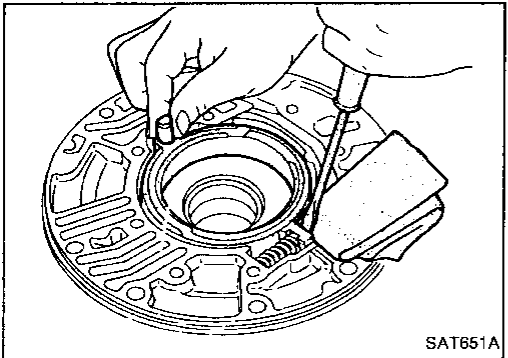
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## REPAIR FOR COMPONENT PARTS

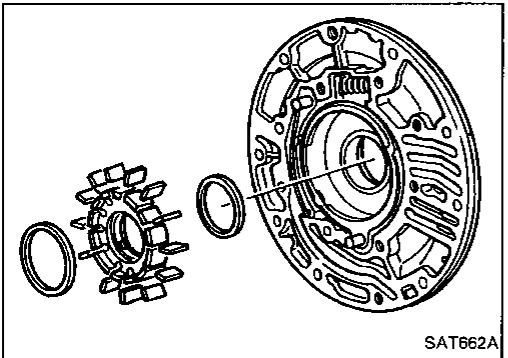
### Oil Pump (Cont'd)



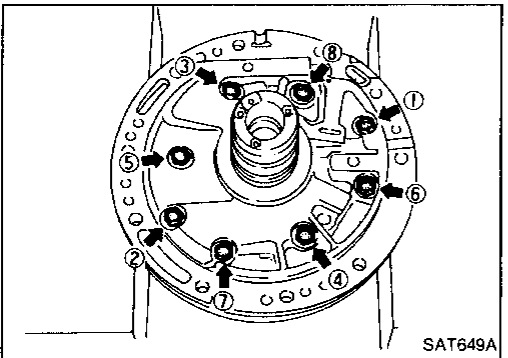
- d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.



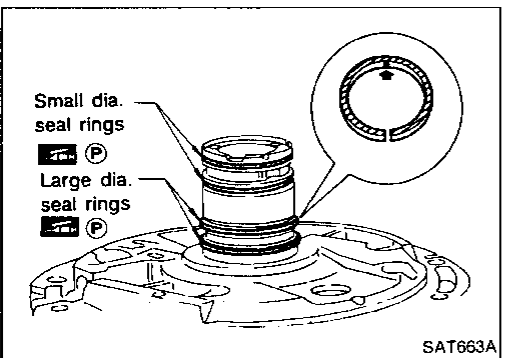
- e. While pushing on cam ring install pivot pin.



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



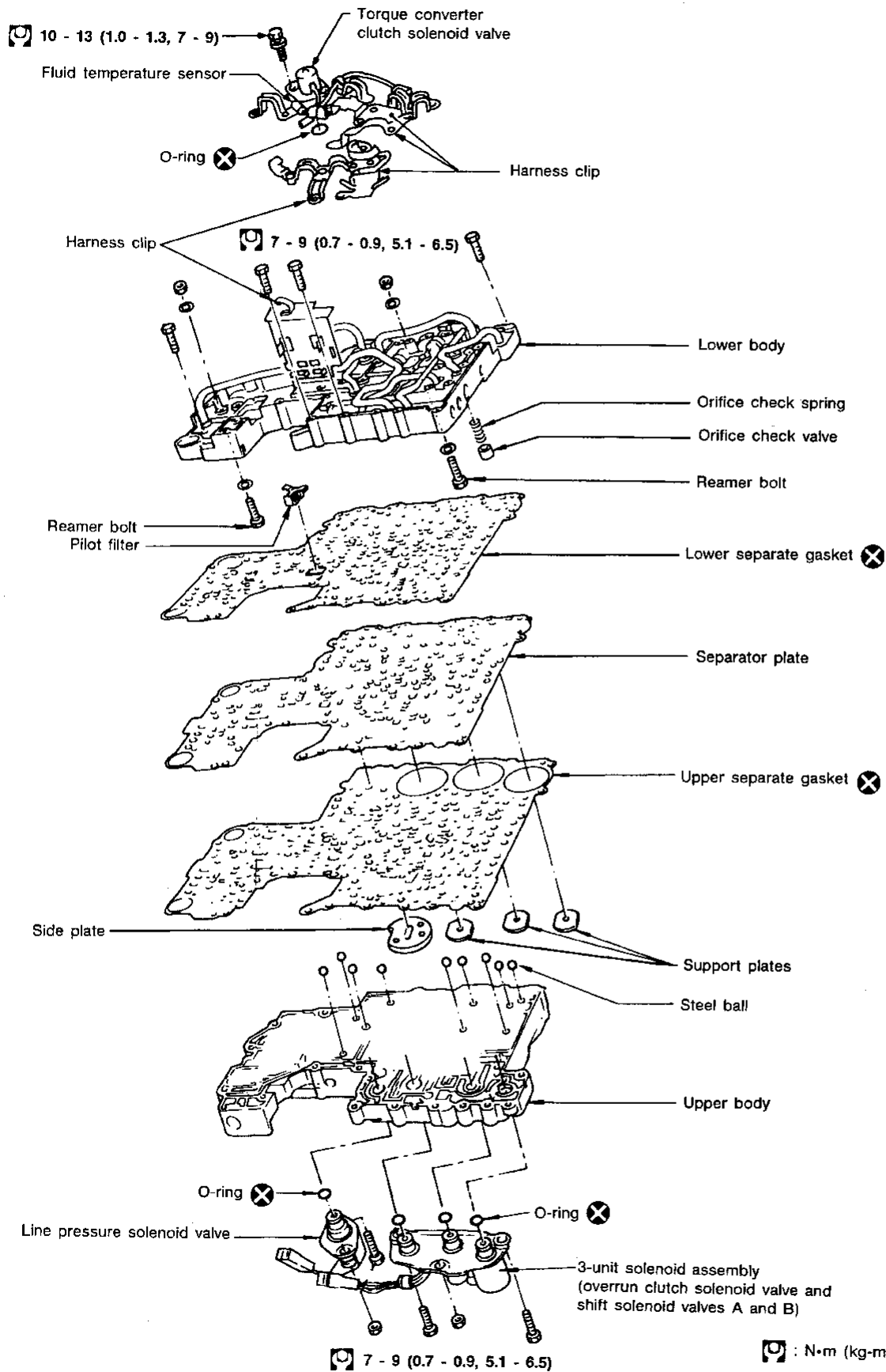
4. Install oil pump housing and oil pump cover.  
 a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.  
 b. Tighten bolts in a criss-cross pattern.



5. Install 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.  
 ● Do not spread gap of seal ring excessively while installing. It may deform ring.

# REPAIR FOR COMPONENT PARTS

## Control Valve Assembly



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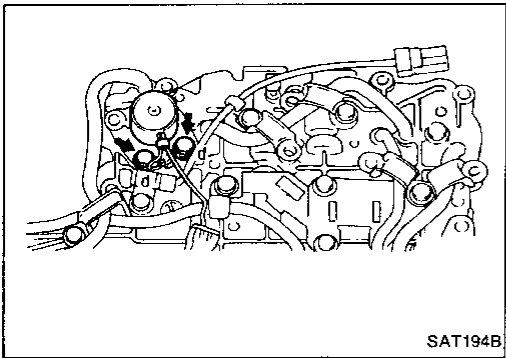
HA

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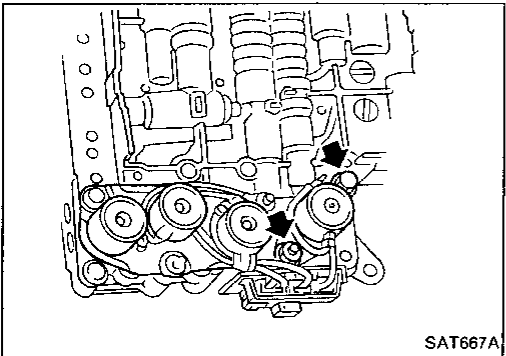
## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)

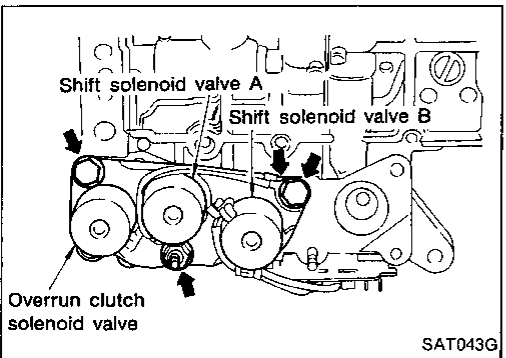
#### DISASSEMBLY



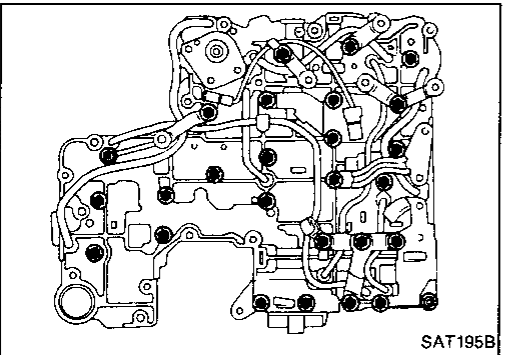
1. Remove solenoids.
  - a. Remove torque converter clutch solenoid valve and side plate from lower body.
  - b. Remove O-ring from solenoid.



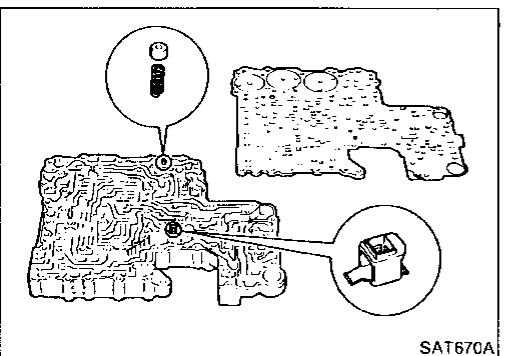
- c. Remove line pressure solenoid valve from upper body.
  - d. Remove O-ring from solenoid.



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



2. Disassemble upper and lower bodies.
  - a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
  - b. Remove lower body, separator plate and separate gasket as a unit from upper body.
  - **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**

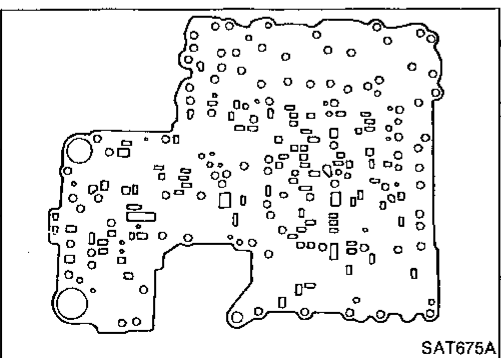
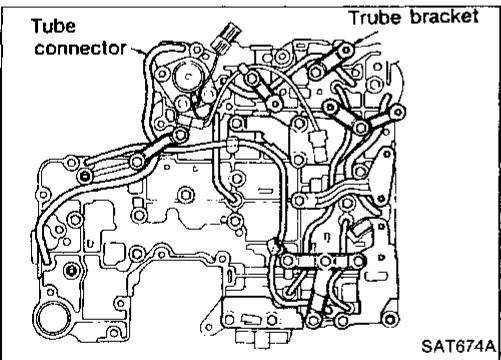
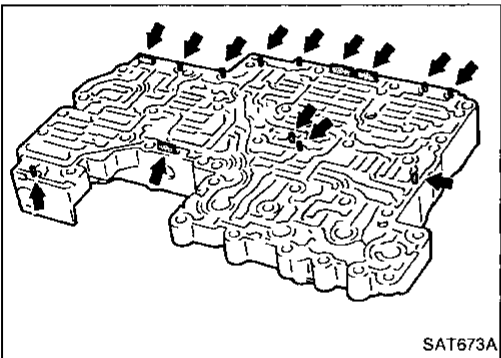
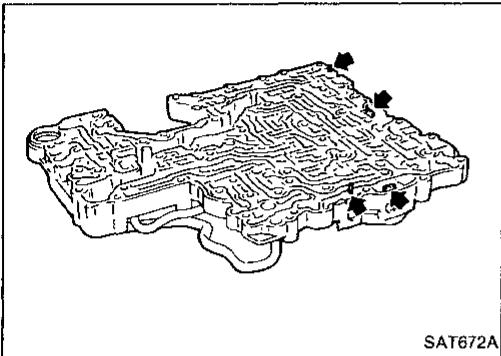
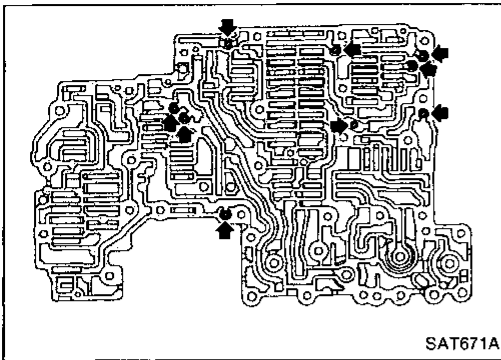


- c. Place lower body facedown, and remove separate gasket and separator plate.
  - d. Remove pilot filter, orifice check valve and orifice check spring.

## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)

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



### INSPECTION

#### Lower and upper bodies

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

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

- **Be careful not to lose these parts.**

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

#### Separator plates

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

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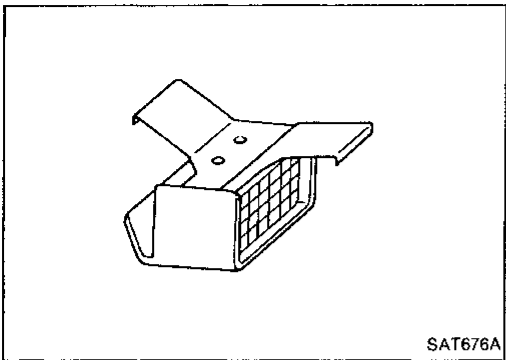
EL

## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)

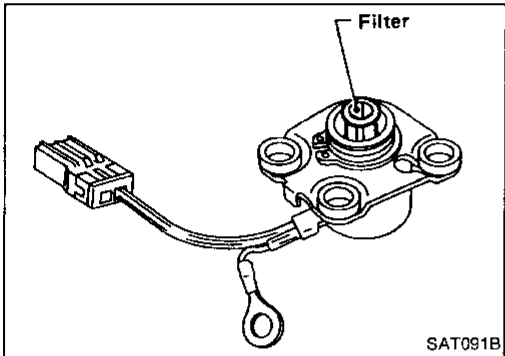
#### Pilot filter

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



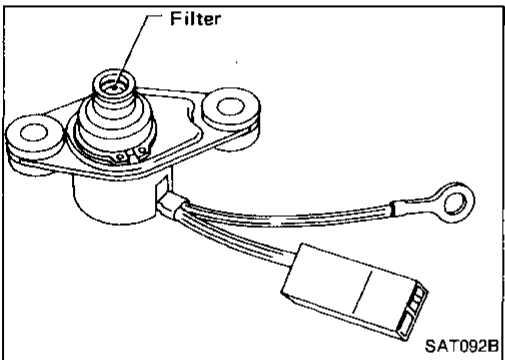
#### Torque converter clutch solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



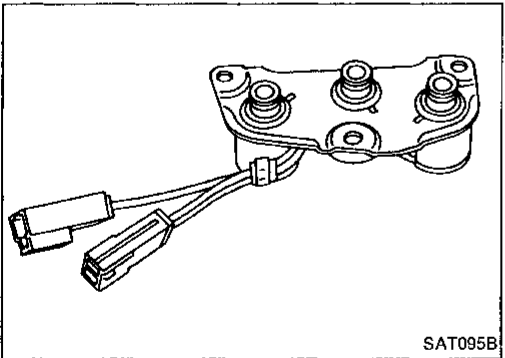
#### Line pressure solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



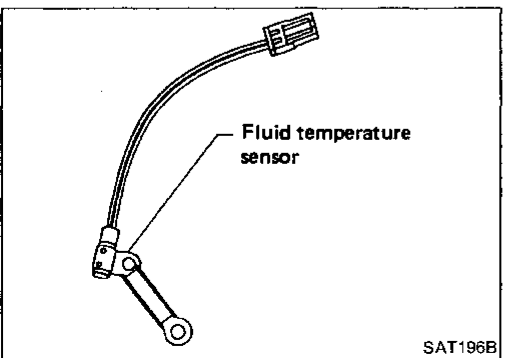
#### 3-unit solenoid assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

- Measure resistance of each solenoid. — Refer to "Electrical Components Inspection".



#### Fluid temperature sensor

- Measure resistance. — Refer to "Electrical Components Inspection".

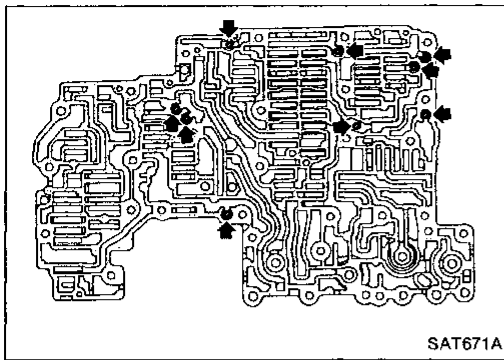




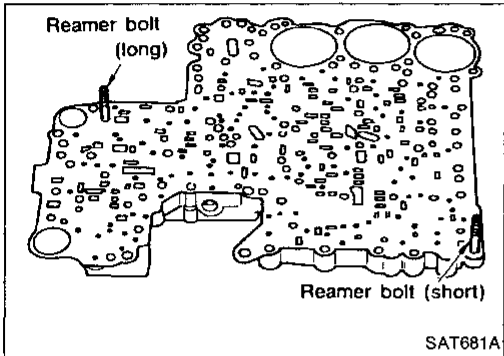
# REPAIR FOR COMPONENT PARTS

## Control Valve Assembly (Cont'd)

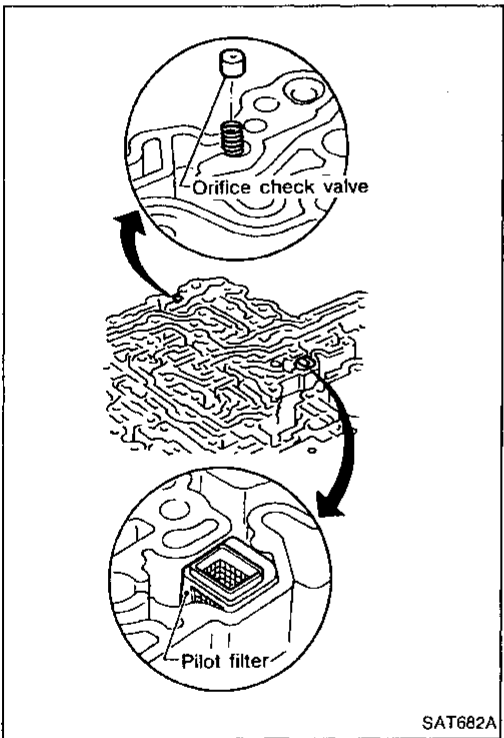
### ASSEMBLY



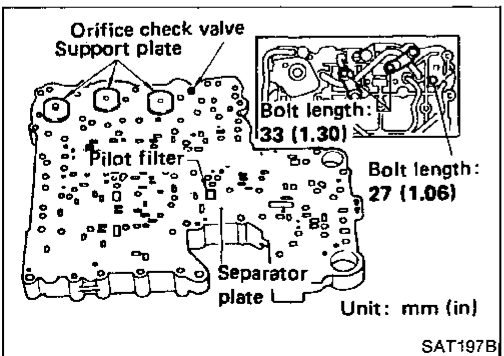
1. Install upper and lower bodies.
  - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



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



- c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



- d. Install lower separate gaskets and separator plates on lower body.
  - e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

GI

MA

EM

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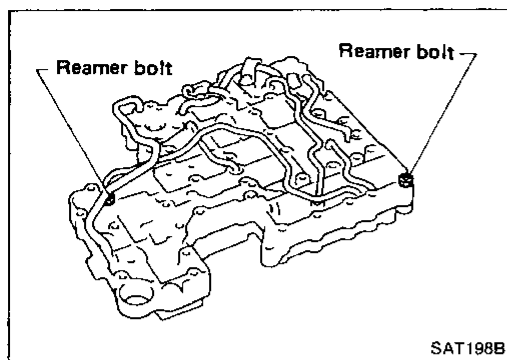
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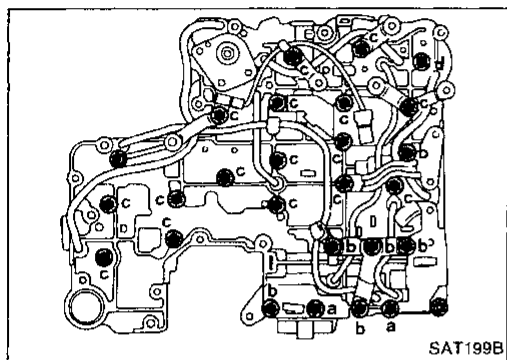
## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)



f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

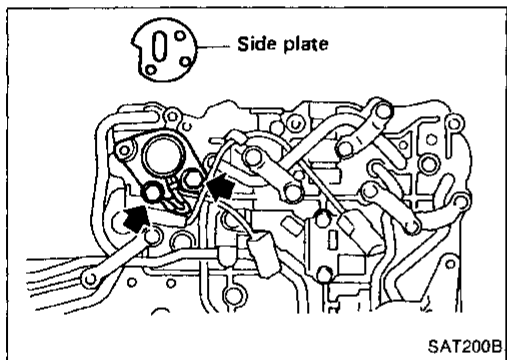
- Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.



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

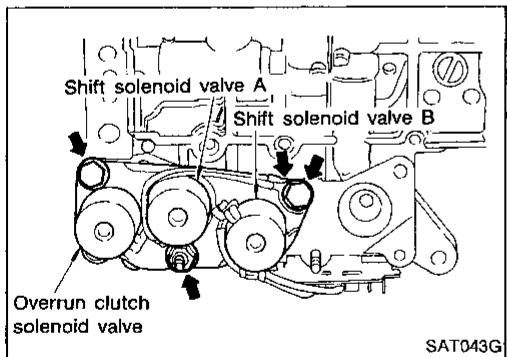
#### Bolt length and location:

Bolt symbol	a	b	c	d
Bolt length	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)

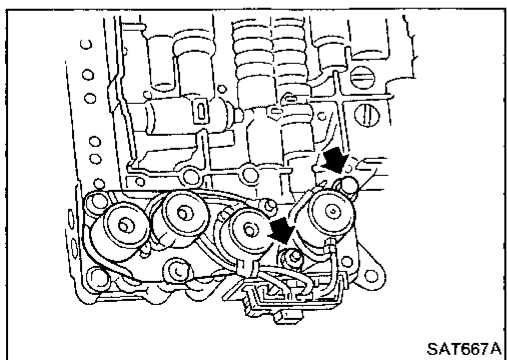


2. Install solenoids.

- a. Attach O-ring and install torque converter clutch solenoid valve and side plates onto lower body.



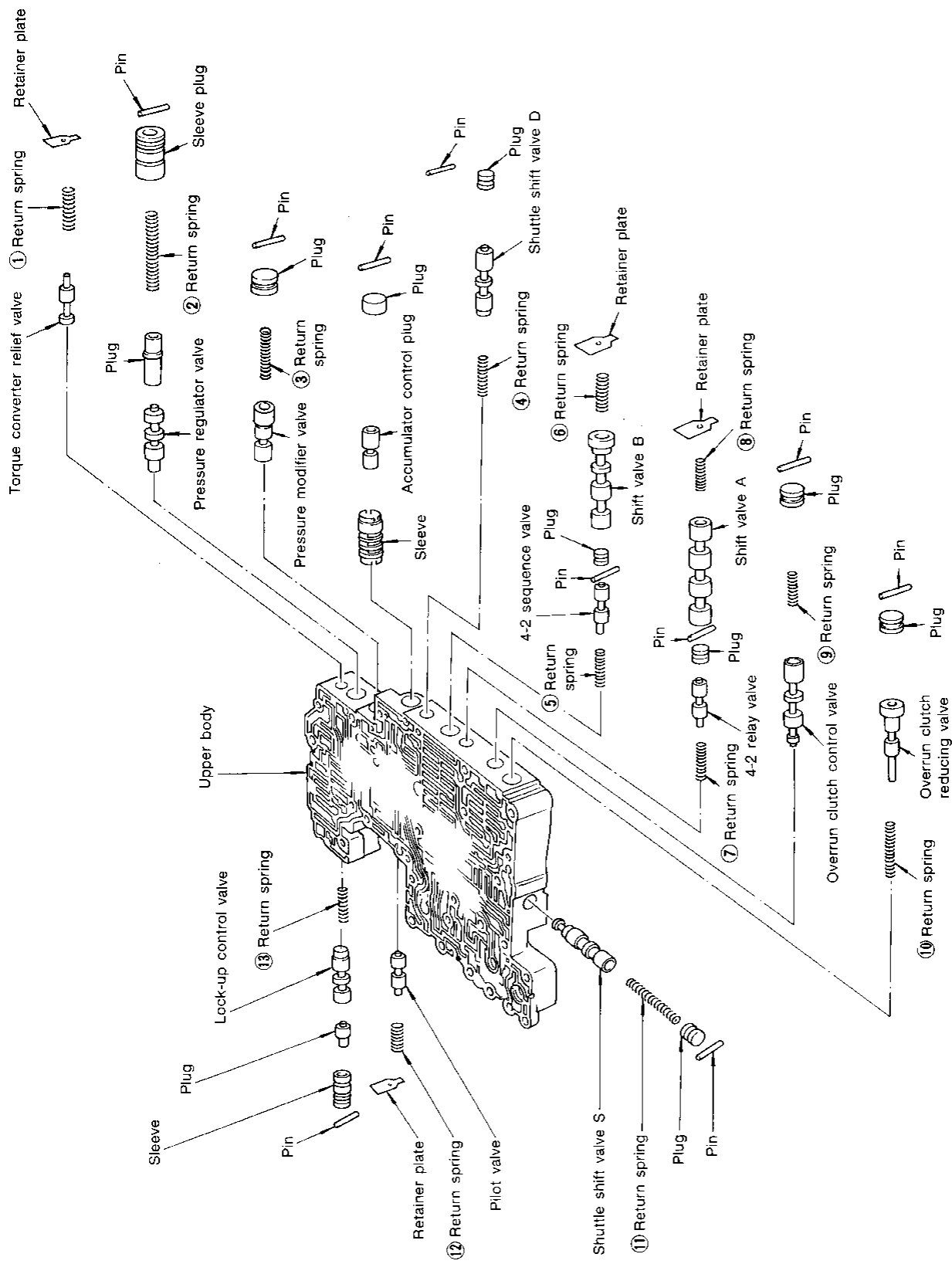
- b. Attach O-rings and install 3-unit solenoids assembly onto upper body.



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

3. Tighten all bolts.

Control Valve Upper Body



Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-126.

Apply A.T.F. to all components before their installation.

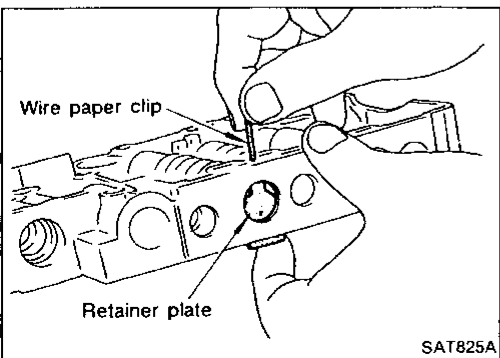
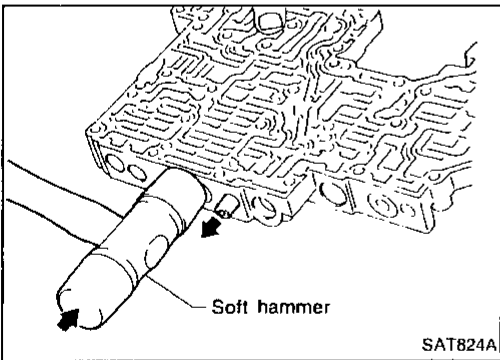
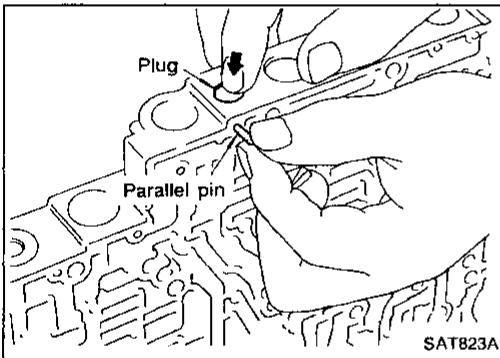
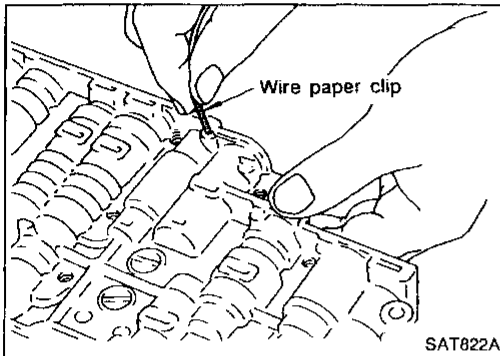
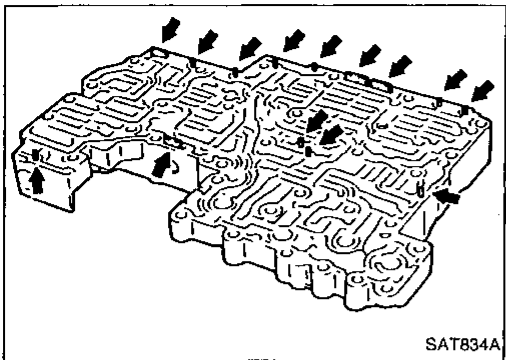
- GI
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## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

#### DISASSEMBLY

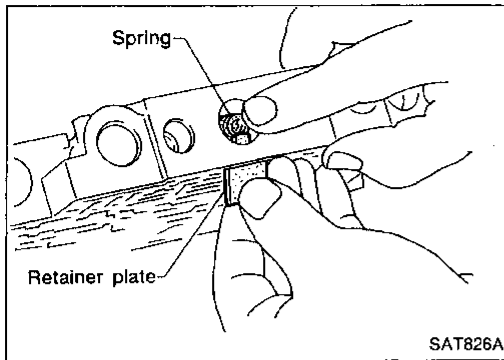
1. Remove valves at parallel pins.
  - Do not use a magnetic hand.



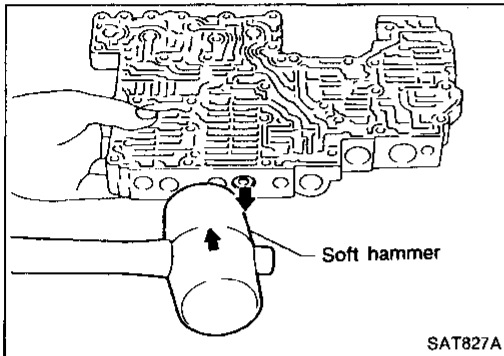
- a. Use a wire paper clip to push out parallel pins.
  - b. Remove parallel pins while pressing their corresponding plugs and sleeves.
    - Remove plug slowly to prevent internal parts from jumping out.
  - c. Place mating surface of valve facedown, and remove internal parts.
    - If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
    - Be careful not to drop or damage valves and sleeves.
2. Remove valves at retainer plates.
    - a. Pry out retainer plate with wire paper clip.

## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

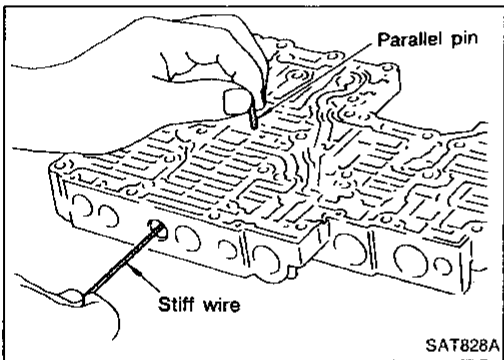


b. Remove retainer plates while holding spring.



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

- If a valve is hard to remove, lightly tap valve body with a soft hammer.
- Be careful not to drop or damage valves, sleeves, etc.



- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- Be careful not to scratch sliding surface of valve with wire.

GI

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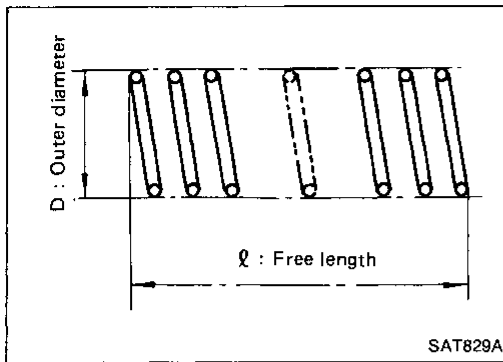
## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

#### INSPECTION

##### Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-125.



#### Inspection standard

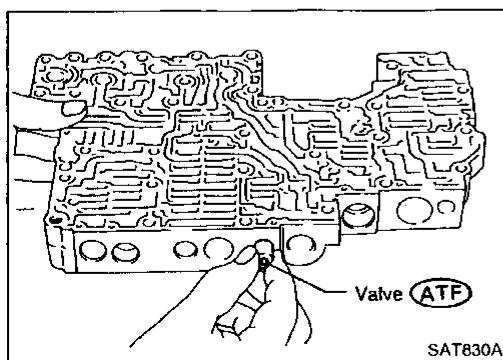
Unit: mm (in)

	Parts	Part No.	ℓ	D
①	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
②	Pressure regulator valve spring	31742-41X24	44.0 (1.732)	14.0 (0.551)
③	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
④	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
⑤	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑥	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑦	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑧	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑨	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
⑩	Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
⑪	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
⑫	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
⑬	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)

- Replace valve springs if deformed or fatigued.

#### Control valves

- Check sliding surfaces of valves, sleeves and plugs.

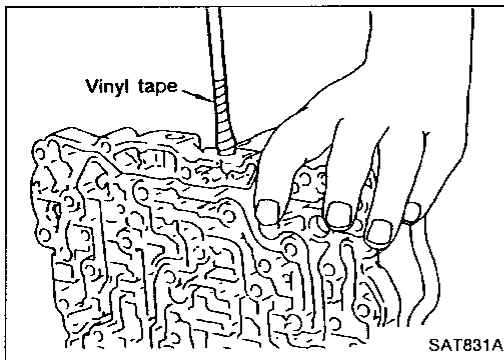


#### ASSEMBLY

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.
- Be careful not to scratch or damage valve body.

## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

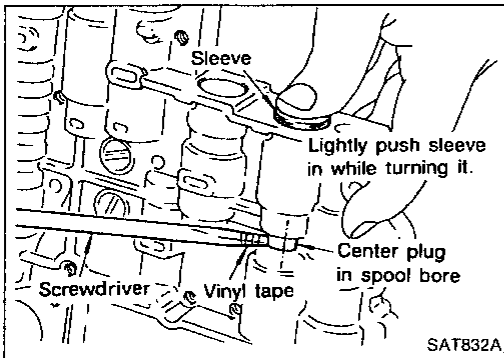


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

GI

MA

EM



### Pressure regulator valve

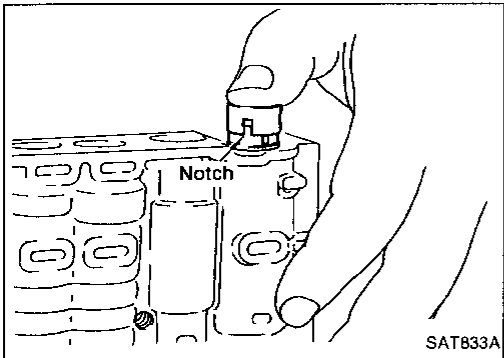
- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body. If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

LC

EF &  
EC

FE

CL



### Accumulator control plug

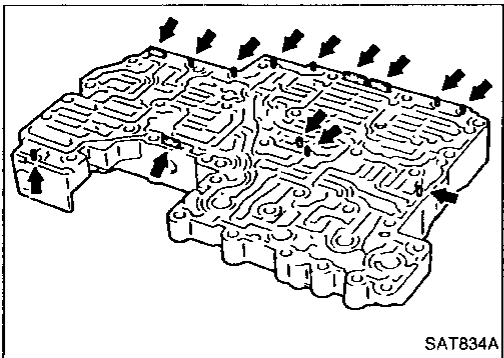
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.

MT

AT

PD

FA



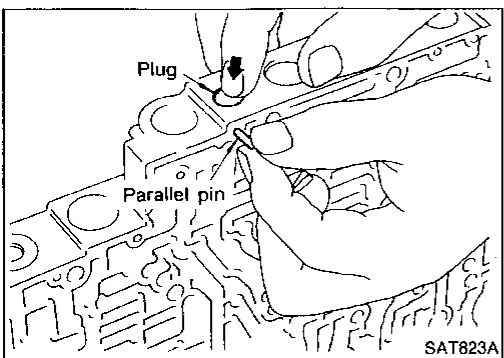
2. Install parallel pins and retainer plates.

RA

BR

ST

BF



- While pushing plug, install parallel pin.

HA

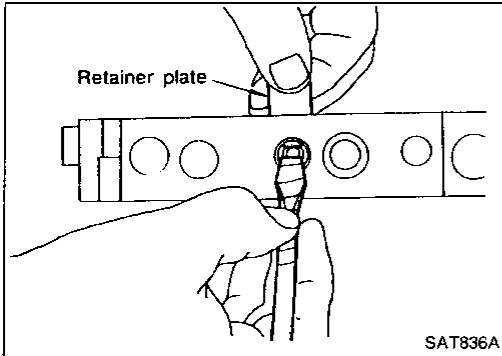
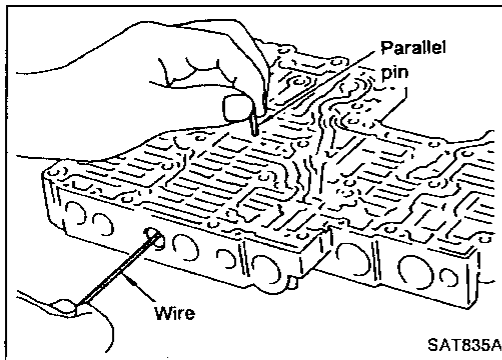
EL

## REPAIR FOR COMPONENT PARTS

### Control Valve Upper Body (Cont'd)

#### 4-2 sequence valve and relay valve

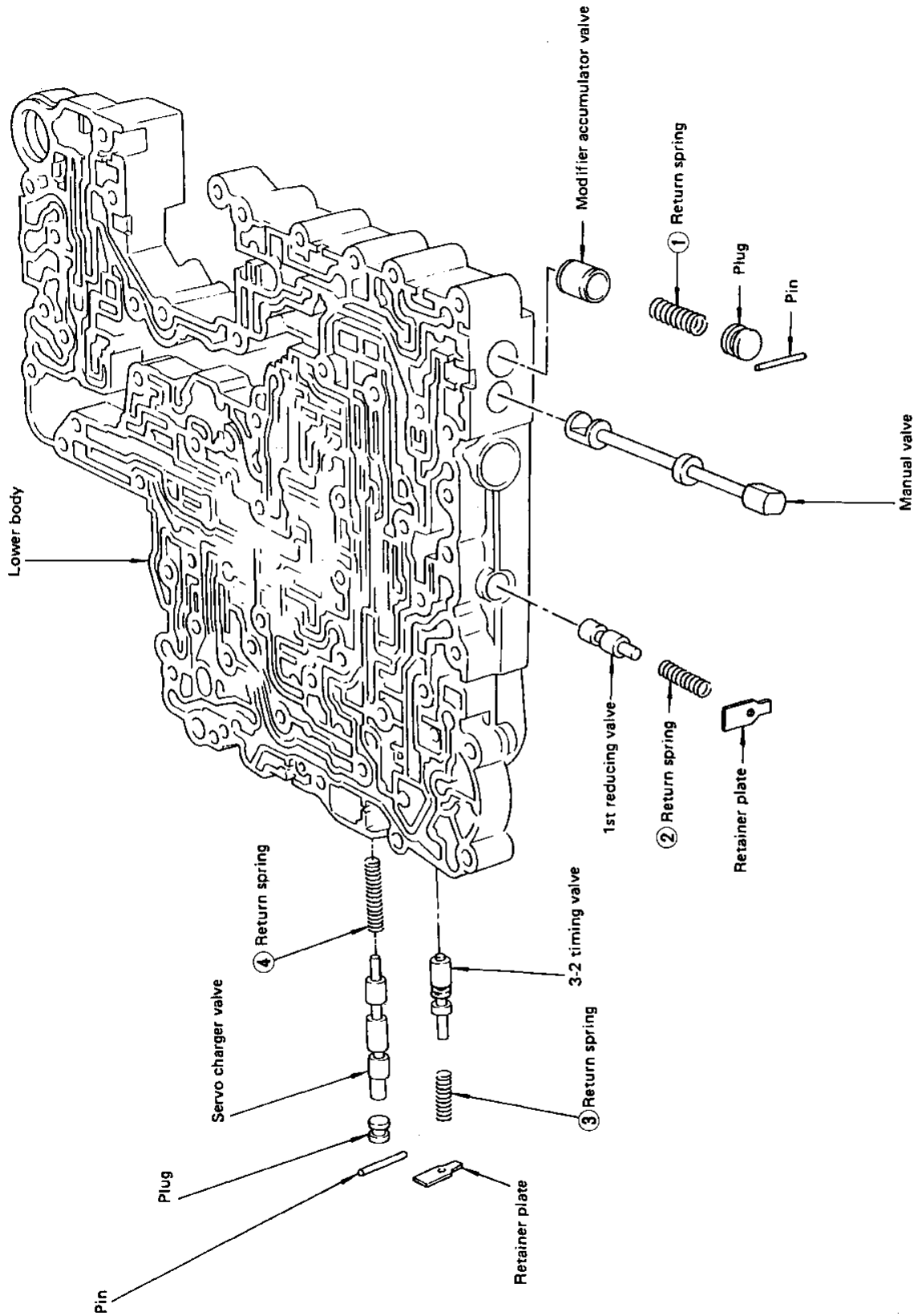
- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.



Control Valve Lower Body



Numbers preceding valve springs correspond with those shown in Spring Chart on next page.

- GI
- MA
- EM
- LC
- EF & EC
- FE
- CL
- MT
- AT**
- PD
- FA
- RA
- BR
- ST
- BF
- HA
- EL

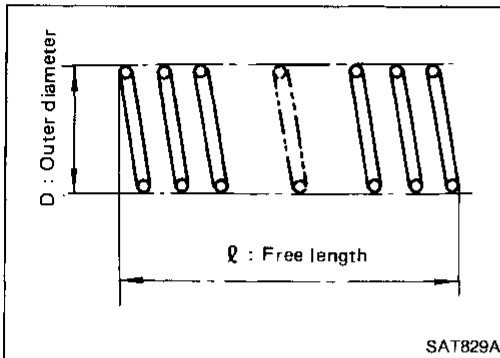
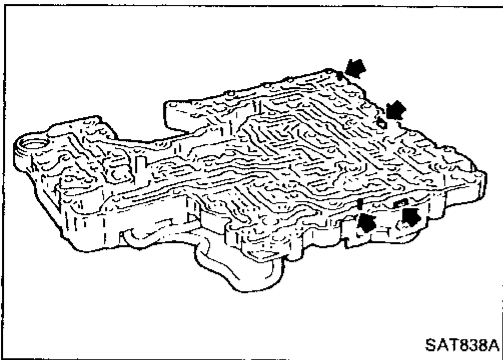
Apply A.T.F. to all components before their installation.

## REPAIR FOR COMPONENT PARTS

### Control Valve Lower Body (Cont'd)

#### DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.  
For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



#### INSPECTION

##### Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-131.

#### Inspection standard:

Unit: mm (in)

Parts	Part No.	ℓ	D
① Modifier accumulator piston spring	31742-27X70	31.4 (1.236)	9.8 (0.386)
② 1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
③ 3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
④ Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)

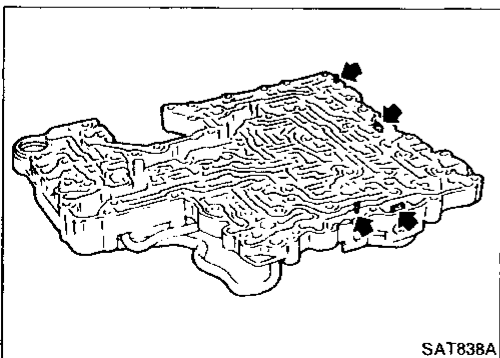
- Replace valve springs if deformed or fatigued.

#### Control valves

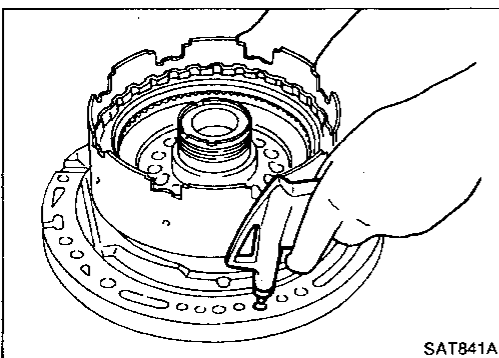
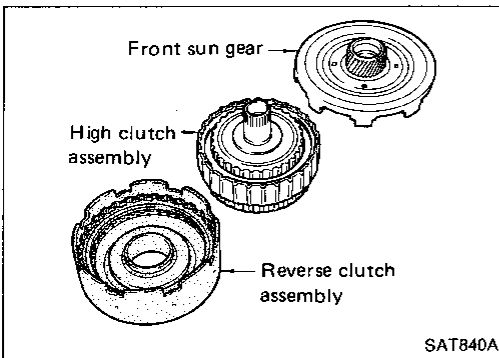
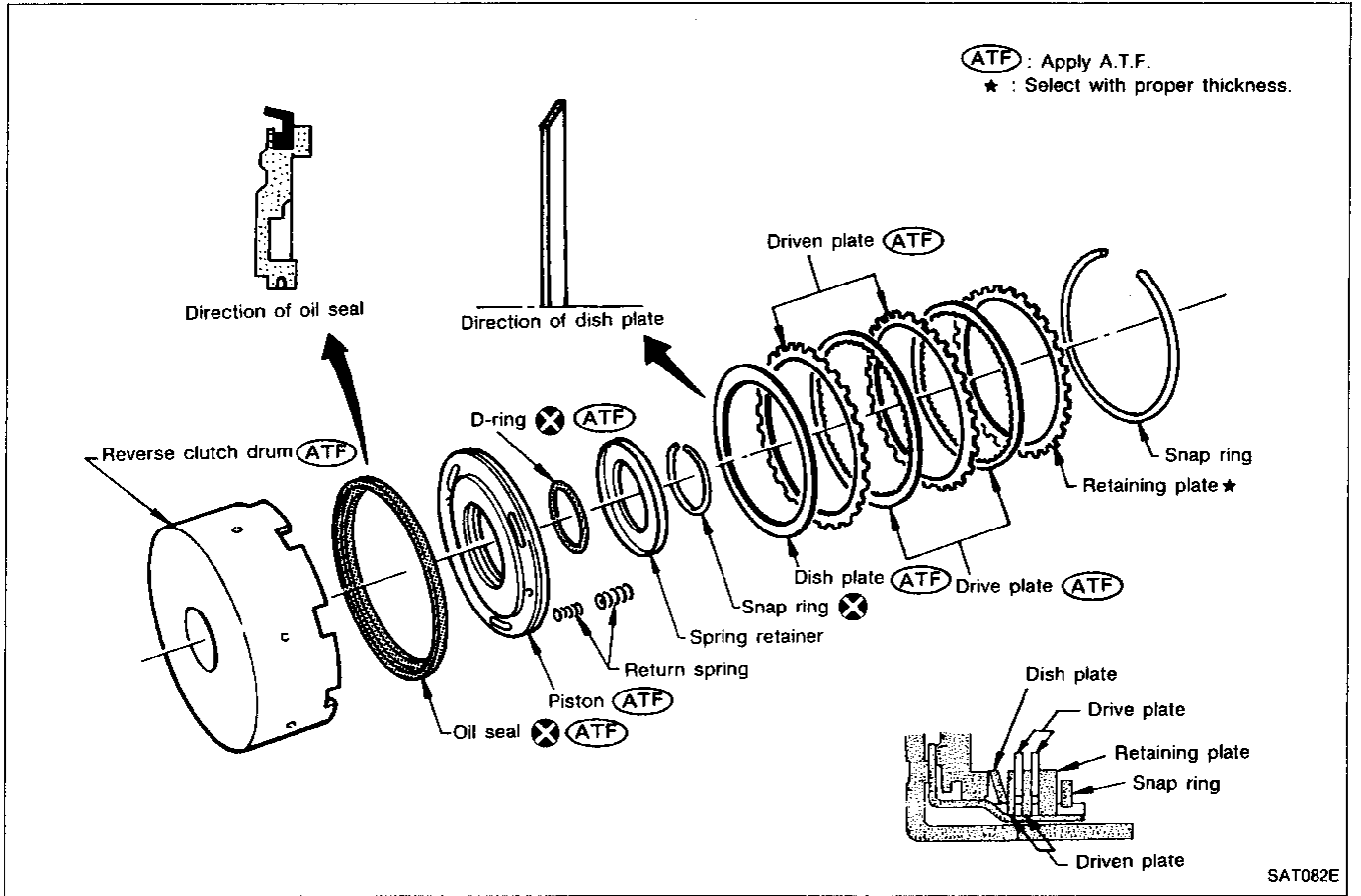
- Check sliding surfaces of control valves, sleeves and plugs for damage.

#### ASSEMBLY

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



Reverse Clutch



DISASSEMBLY

1. Remove reverse clutch assembly from clutch pack.

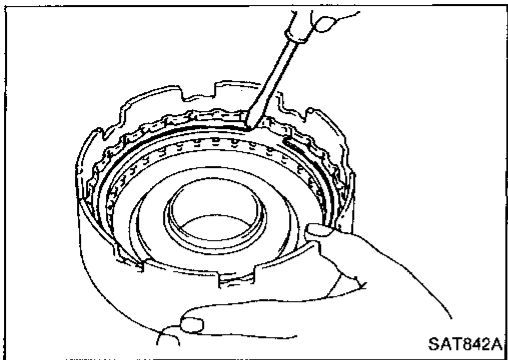
2. Check operation of reverse clutch.

- 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 move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.

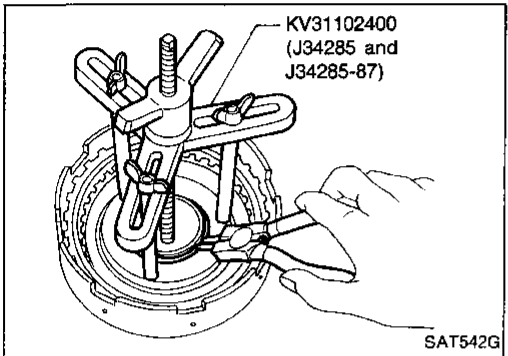
GI  
MA  
EM  
LC  
EF & EC  
FE  
CL  
MT  
AT  
PD  
FA  
RA  
BR  
ST  
BF  
HA  
EL

## REPAIR FOR COMPONENT PARTS

### Reverse Clutch (Cont'd)

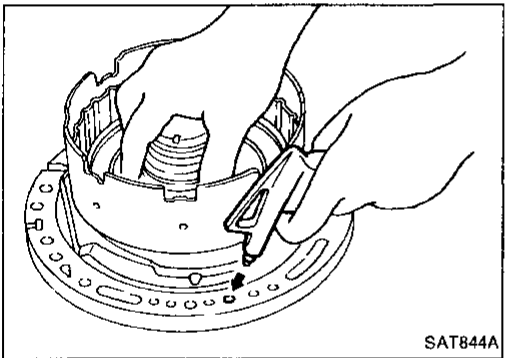


- Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



- Remove snap ring from clutch drum while compressing clutch springs.

- Do not expand snap ring excessively.
- Remove spring retainer and return spring.



- 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.
- Remove D-ring and oil seal from piston.

### INSPECTION

#### Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

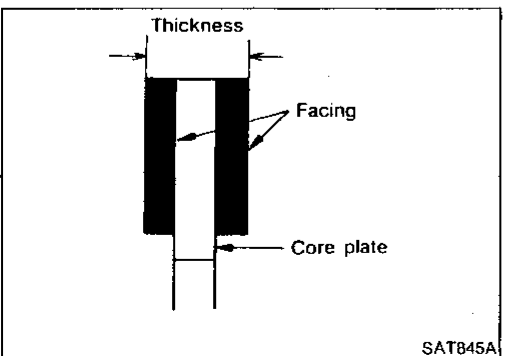
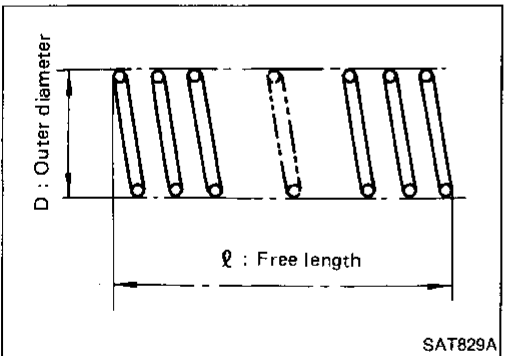
#### Reverse clutch return springs

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

#### Inspection standard:

Unit: mm (in)

Parts	Part No.	ℓ	D
Spring	31505-41X02	19.69 (0.7752)	11.6 (0.457)



#### Reverse clutch drive plates

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

#### Thickness of drive plate:

Standard value: 2.0 mm (0.079 in)

Wear limit: 1.8 mm (0.071 in)

- If not within wear limit, replace.

#### Reverse clutch dish plate

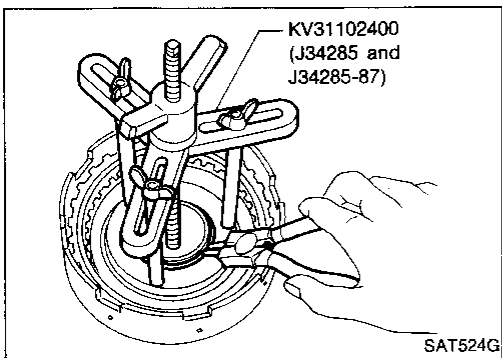
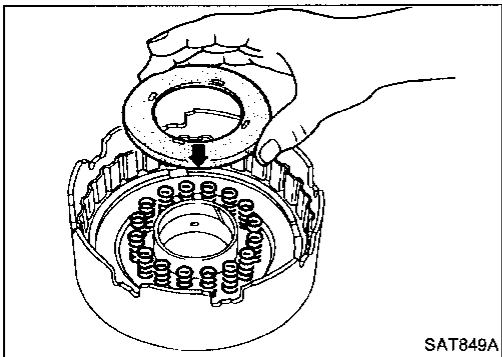
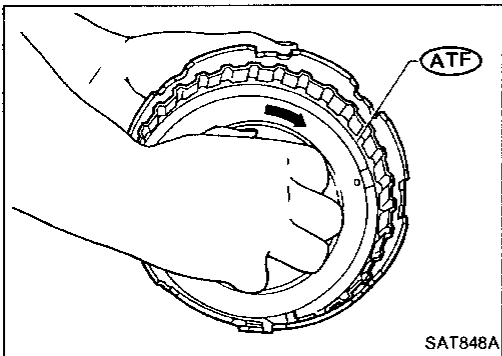
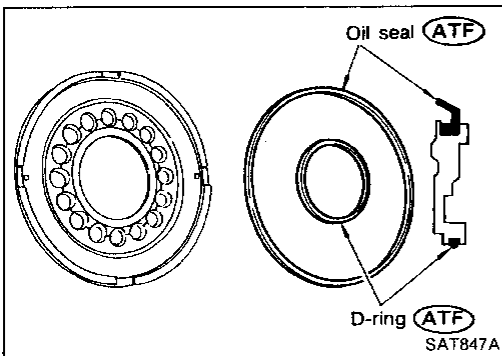
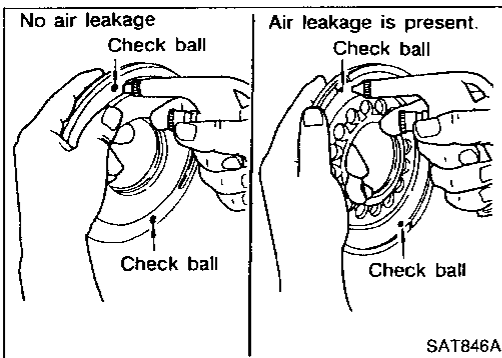
- Check for deformation or damage.

# REPAIR FOR COMPONENT PARTS

## 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 to assure that 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 A.T.F. to both parts.
2. Install piston assembly by turning it slowly and evenly.
  - Apply A.T.F. to inner surface of drum.

3. Install return springs and spring retainer.

4. Install snap ring while compressing clutch springs.

GI

MA

EM

LC

EF &  
EC

FE

CL

MT

AT

PD

FA

RA

BR

ST

BF

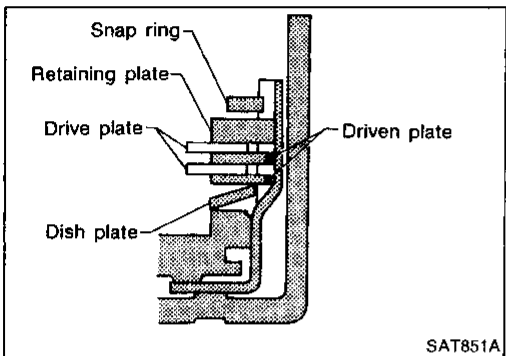
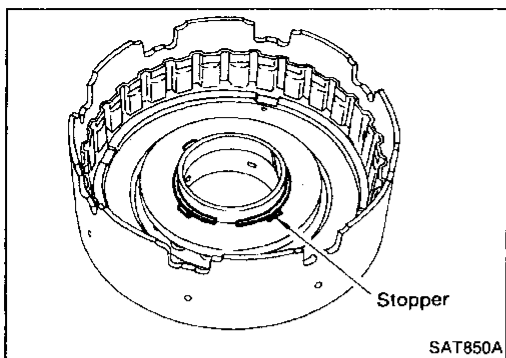
HA

EL

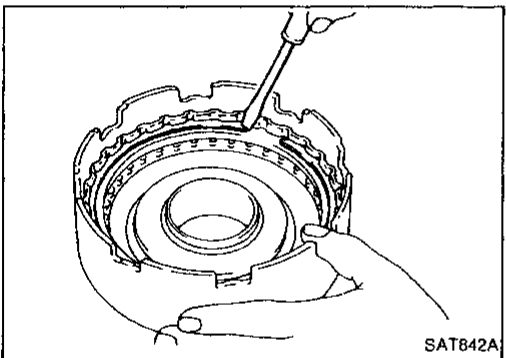
## REPAIR FOR COMPONENT PARTS

### Reverse Clutch (Cont'd)

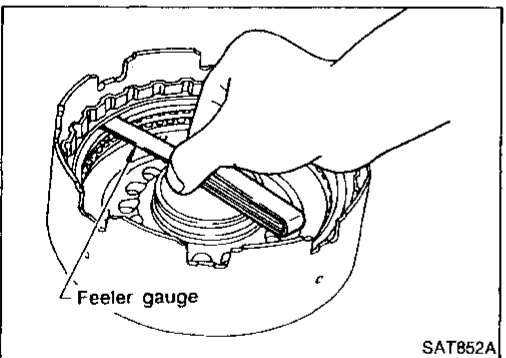
- Do not align snap ring gap with spring retainer stopper.



5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard**

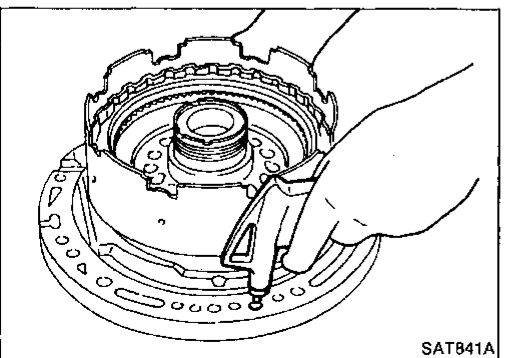
0.5 - 0.8 mm (0.020 - 0.031 in)

**Allowable limit**

1.2 mm (0.047 in)

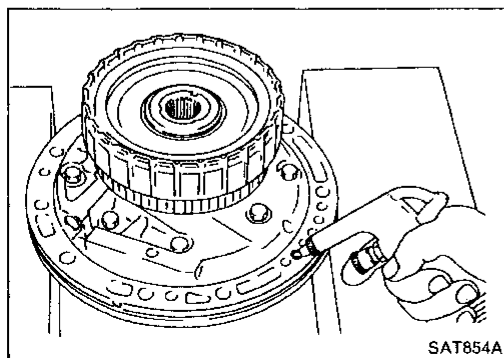
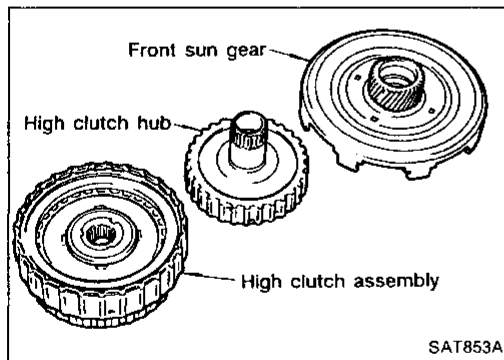
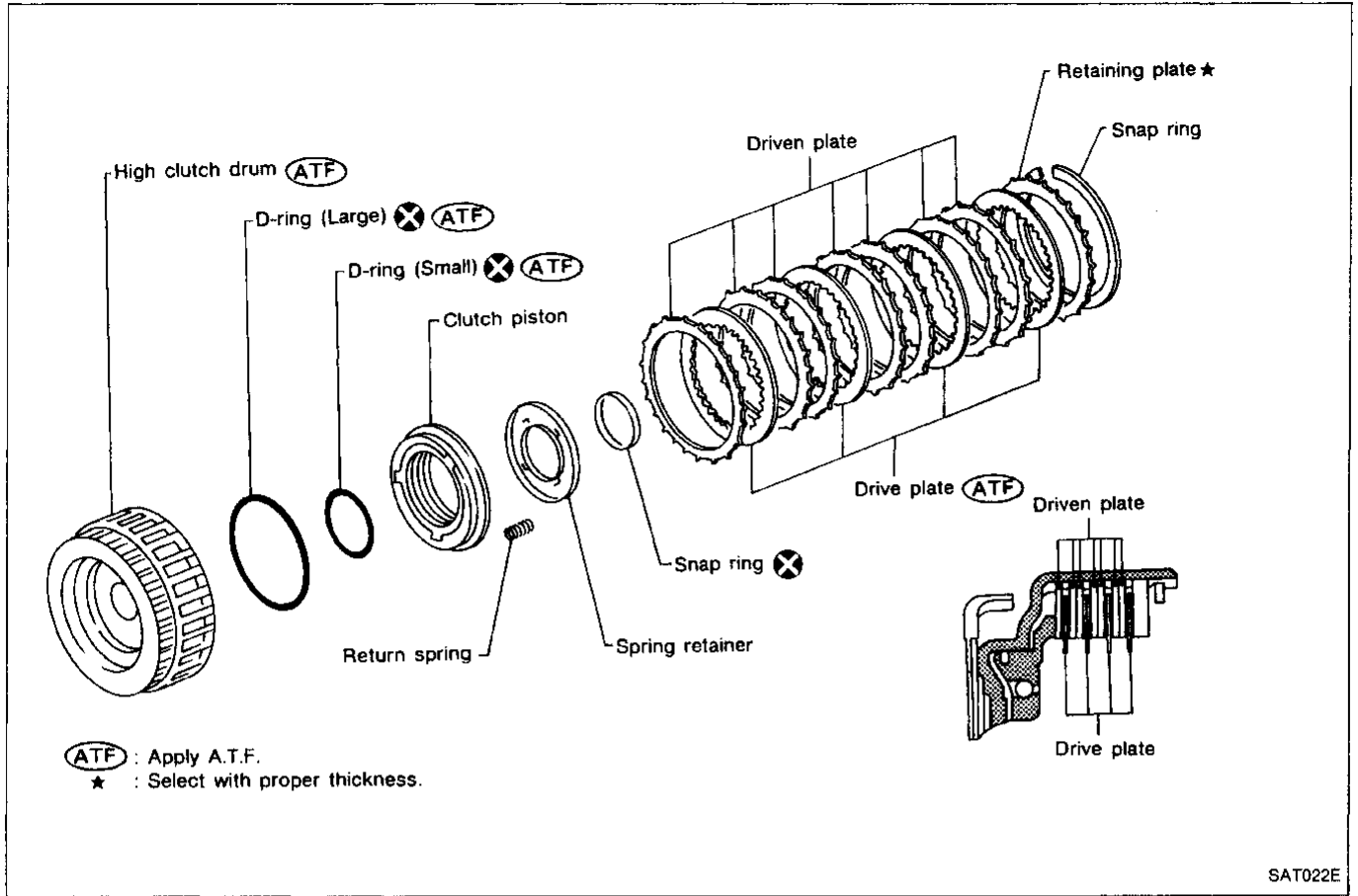
**Retaining plate:**

Refer to S.D.S.



8. Check operation of reverse clutch. Refer to "DISASSEMBLY" of Reverse Clutch.

High Clutch



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

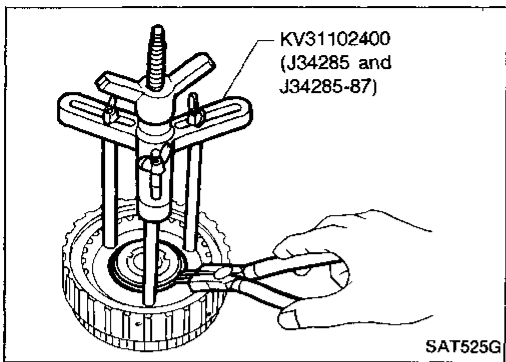
- Check of high clutch operation

GI  
MA  
EM  
LC  
EF &  
EC  
FE  
CL  
MT  
AT  
PD  
FA  
RA  
BR  
ST  
BF  
HA  
EL

# REPAIR FOR COMPONENT PARTS

## High Clutch (Cont'd)

- Removal and installation of return spring

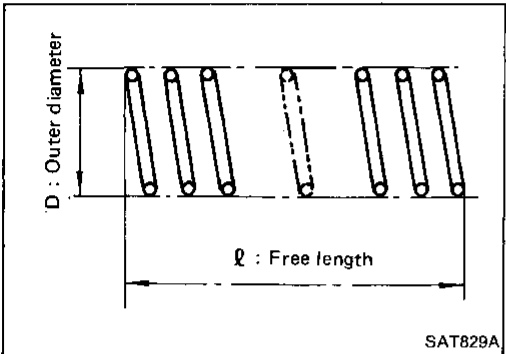


- Inspection of high clutch return springs

**Inspection standard:**

Unit: mm (in)

Part No.	ℓ	D
31505-21X03	22.1 (0.870)	11.6 (0.457)



- Inspection of high clutch drive plate

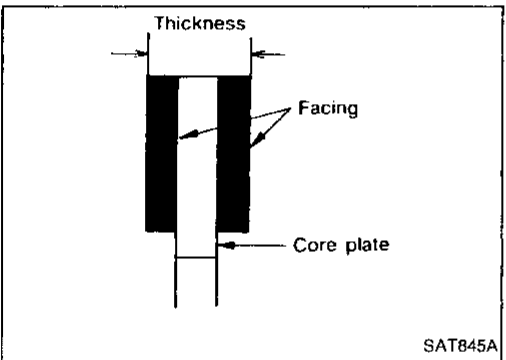
**Thickness of drive plate:**

**Standard**

**1.6 mm (0.063 in)**

**Wear limit**

**1.4 mm (0.055 in)**



- Measurement of clearance between retaining plate and snap ring

**Specified clearance:**

**Standard**

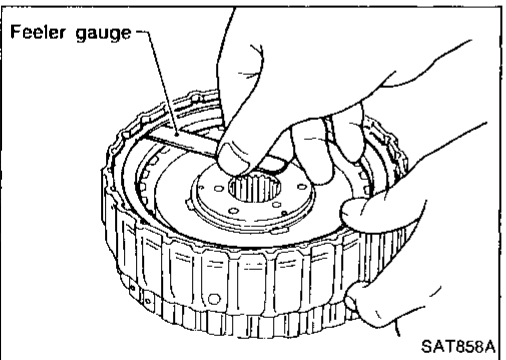
**1.8 - 2.2 mm (0.071 - 0.087 in)**

**Allowable limit**

**3.0 mm (0.118 in)**

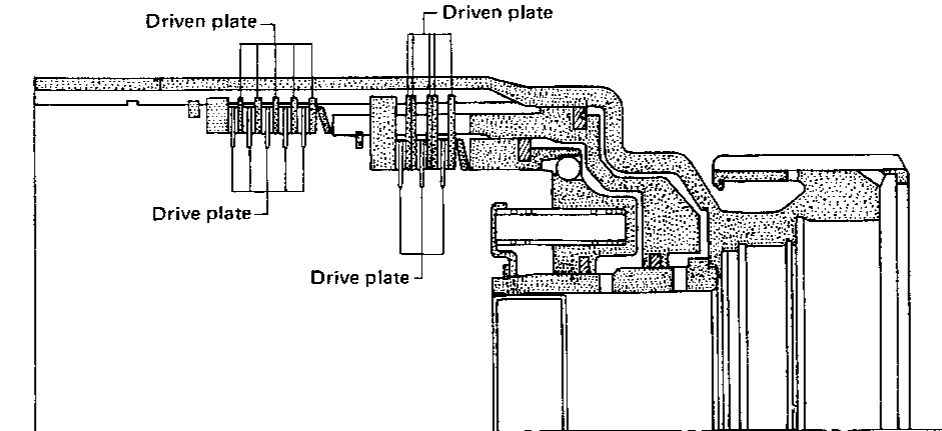
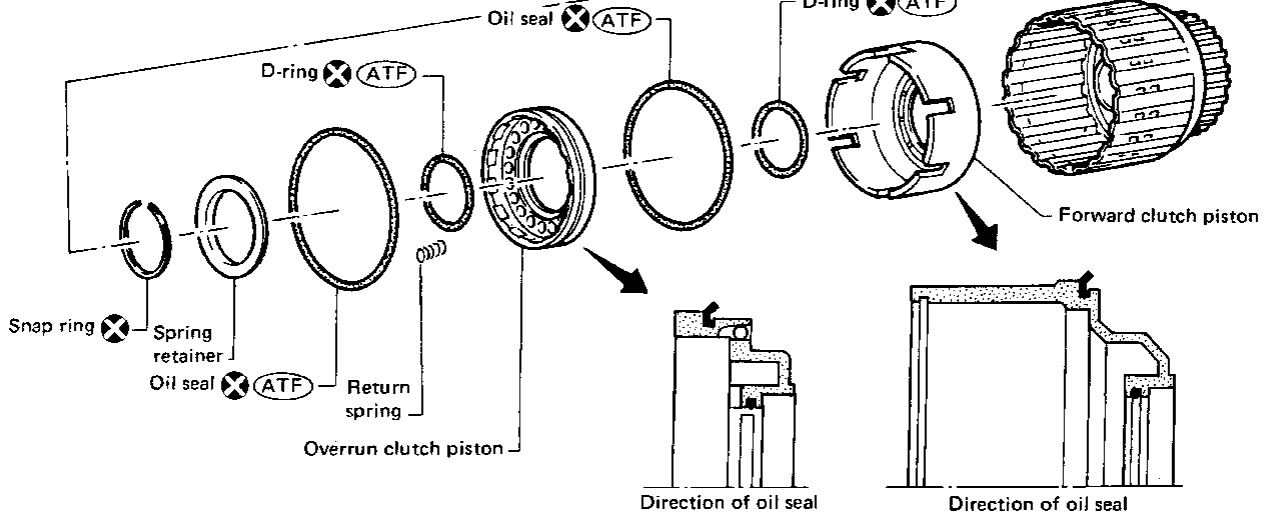
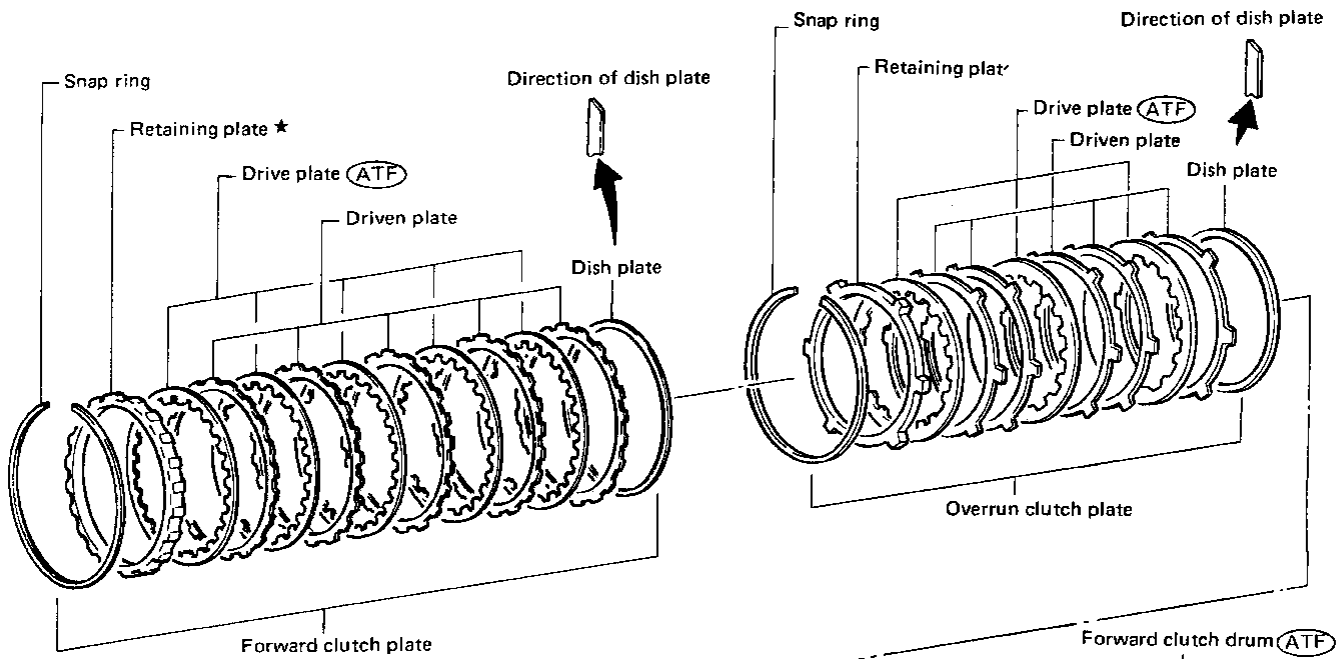
**Retaining plate:**

**Refer to S.D.S.**





Forward and Overrun Clutches



(ATF) : Apply A.T.F.

★ : Select with proper thickness.

GI

MA

EM

LC

EF &  
EC

FE

CL

MT

AT

PD

FA

RA

BR

ST

BF

HA

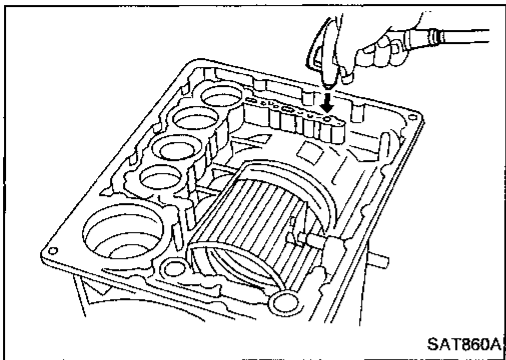
EL

## REPAIR FOR COMPONENT PARTS

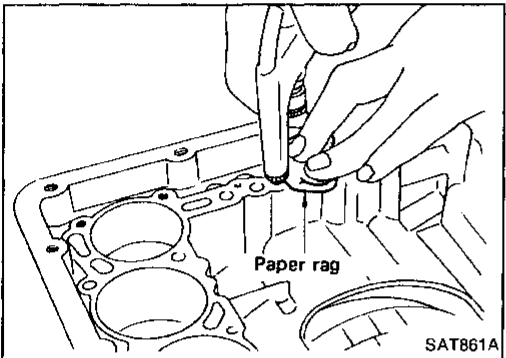
### Forward and Overrun Clutches (Cont'd)

Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

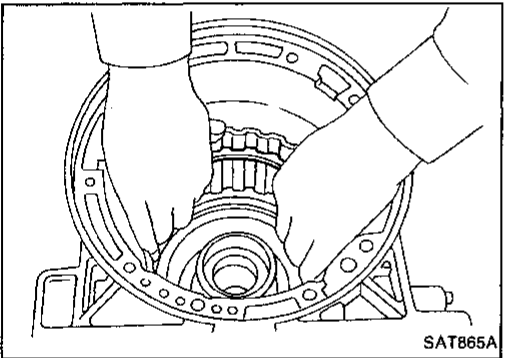
- Check of forward clutch operation.



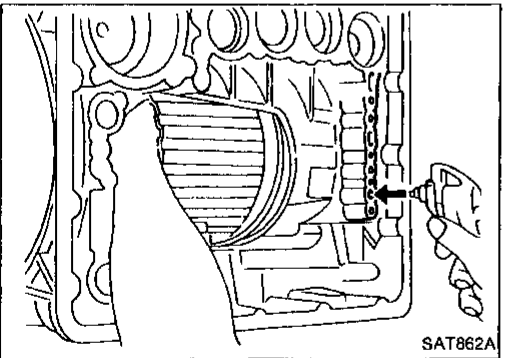
- Check of overrun clutch operation.



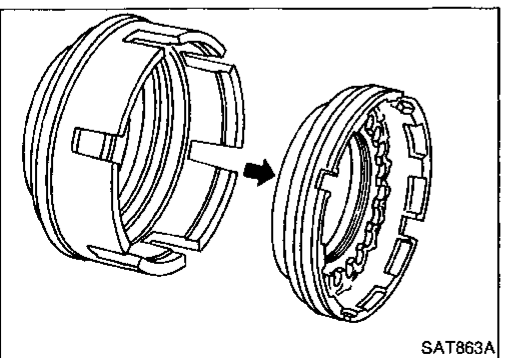
- Removal of forward clutch drum  
Remove forward clutch drum from transmission case by holding snap ring.



- Removal of forward clutch and overrun clutch pistons  
1. While holding overrun clutch piston, gradually apply compressed air to oil hole.

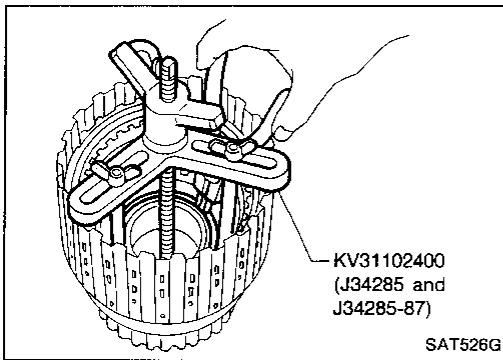


2. Remove overrun clutch from forward clutch.

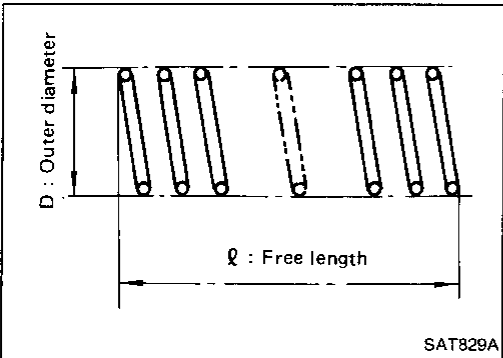


# REPAIR FOR COMPONENT PARTS

## Forward and Overrun Clutches (Cont'd)



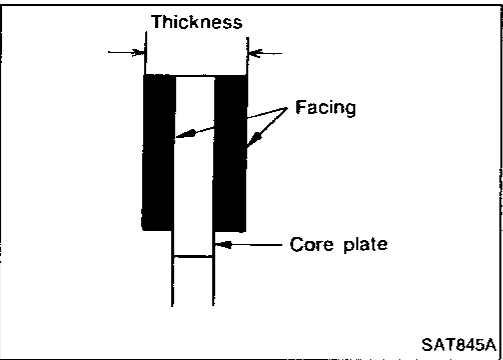
- Removal and installation of return springs



- Inspection of forward clutch and overrun clutch return springs

### Inspection standard:

Part No.	ℓ	Unit: mm (in)	
		D	
31505-41X01	35.77 (1.4083)	9.7 (0.382)	



- Inspection of forward clutch drive plates

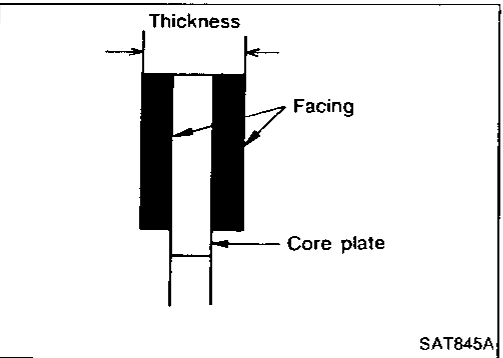
### Thickness of drive plate:

#### Standard

2.0 mm (0.079 in)

#### Wear limit

1.8 mm (0.071 in)



- Inspection of overrun clutch drive plates

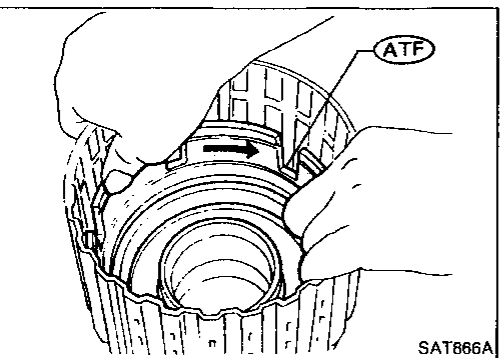
### Thickness of drive plate:

#### Standard

2.0 mm (0.079 in)

#### Wear limit

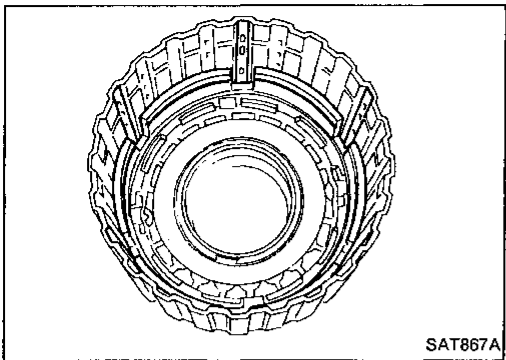
1.8 mm (0.071 in)



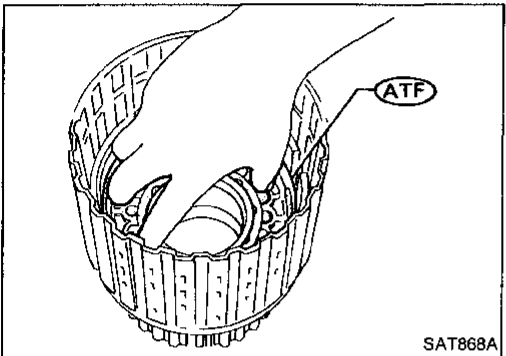
- Installation of forward clutch piston and overrun clutch piston
- 1. Install forward clutch piston by turning it slowly and evenly.
- Apply A.T.F. to inner surface of clutch drum.

## REPAIR FOR COMPONENT PARTS

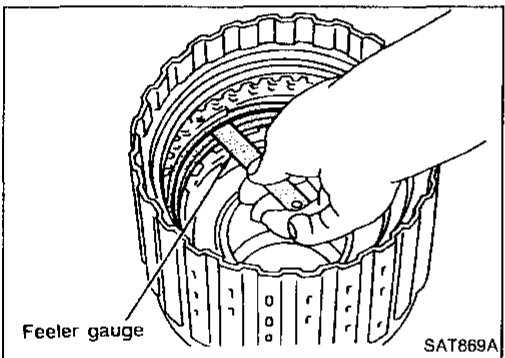
### Forward and Overrun Clutches (Cont'd)



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



2. Install overrun clutch by turning it slowly and evenly.
- Apply A.T.F. to inner surface of forward clutch piston.



- Measurement of clearance between retaining plate and snap ring of overrun clutch

**Specified clearance:**

**Standard**

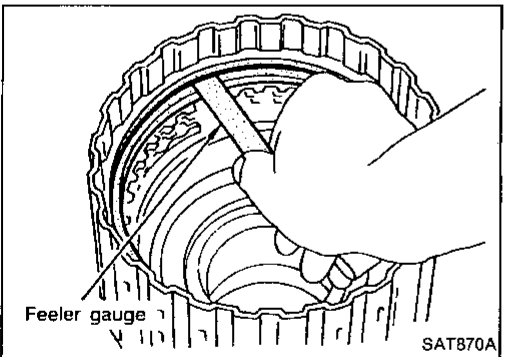
1.0 - 1.4 mm (0.039 - 0.055 in)

**Allowable limit**

2.0 mm (0.079 in)

**Retaining plate:**

Refer to S.D.S.



- Measurement of clearance between retaining plate and snap ring of forward clutch

**Specified clearance:**

**Standard**

0.45 - 0.85 mm (0.0177 - 0.0335 in)

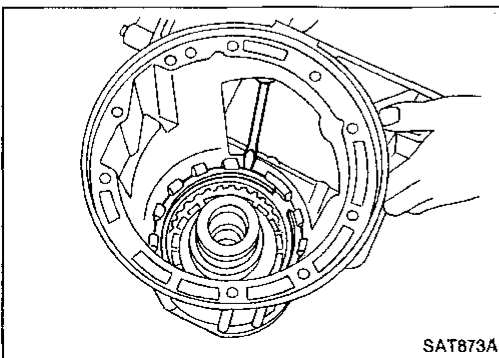
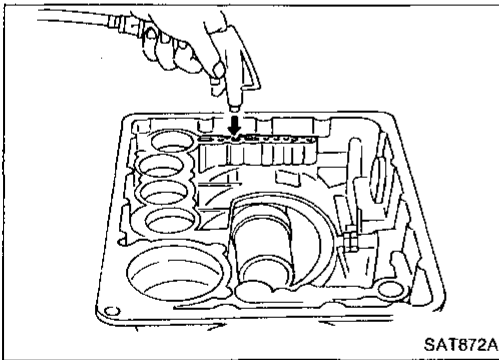
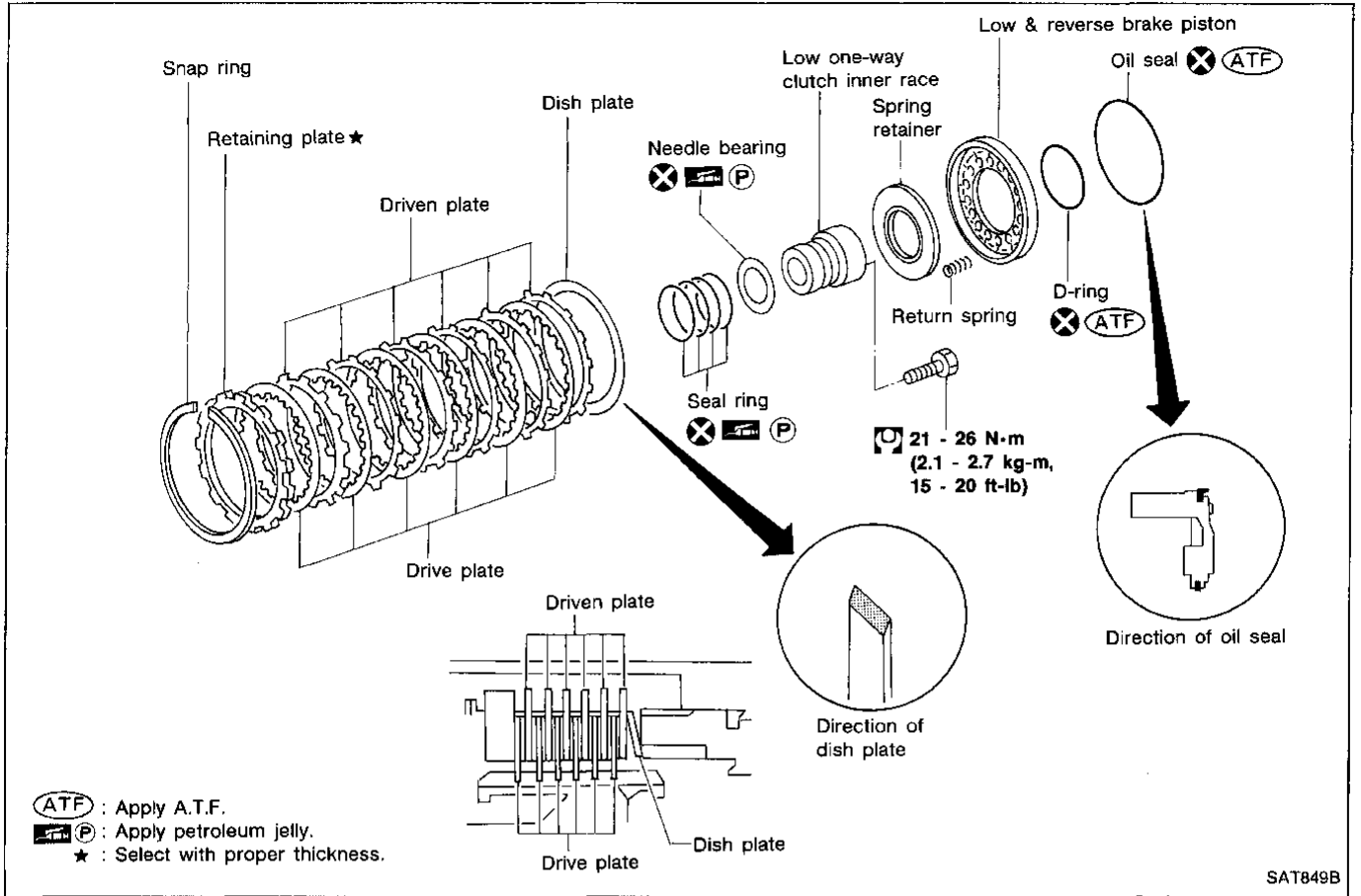
**Allowable limit**

1.85 mm (0.0728 in)

**Retaining plate:**

Refer to S.D.S.

## Low & Reverse Brake



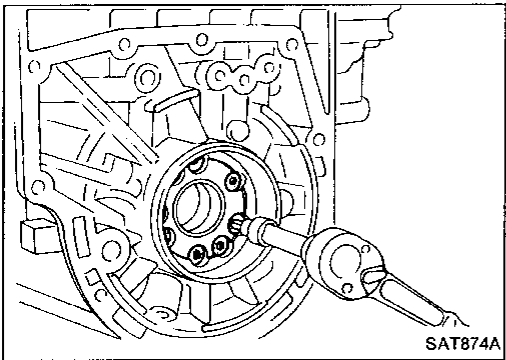
### DISASSEMBLY

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 move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

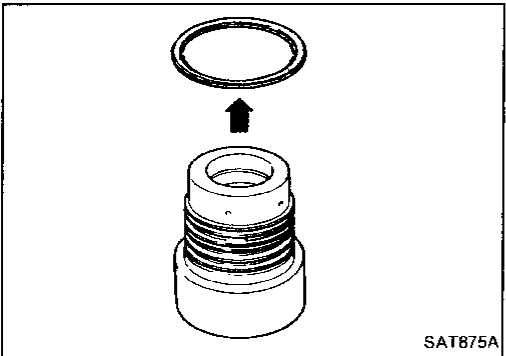
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## REPAIR FOR COMPONENT PARTS

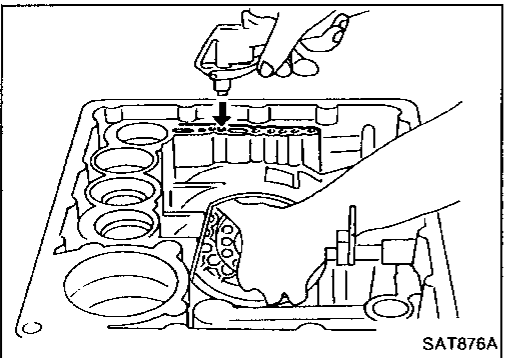
### Low & Reverse Brake (Cont'd)



- Remove low one-way clutch inner race, spring retainer and return spring from transmission case.



- Remove seal rings from low one-way clutch inner race.
- Remove needle bearing from low one-way clutch inner race.

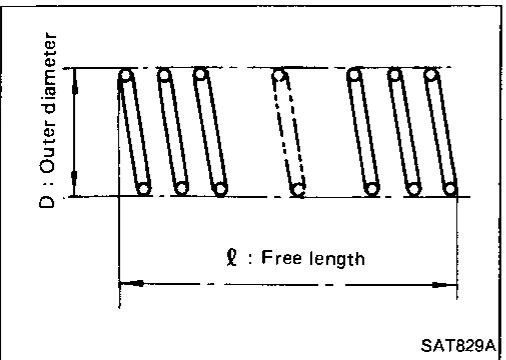


- Remove low and reverse brake piston using compressed air.
- Remove oil seal and D-ring from piston.

### INSPECTION

#### Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.

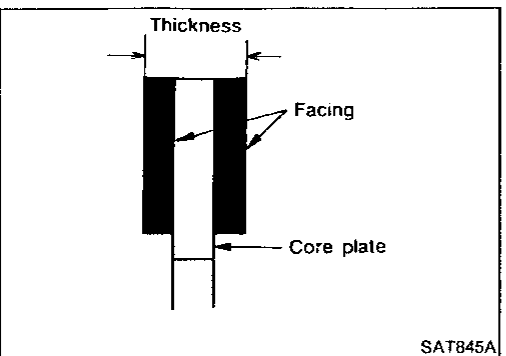


#### Low and reverse brake return springs

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

#### Inspection standard:

Unit: mm (in)		
Part No.	ℓ	D
31521-21X00	23.7 (0.933)	11.6 (0.457)



#### Low and reverse brake drive plates

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

#### Thickness of drive plate:

##### Standard value

2.0 mm (0.079 in)

##### Wear limit

1.8 mm (0.071 in)

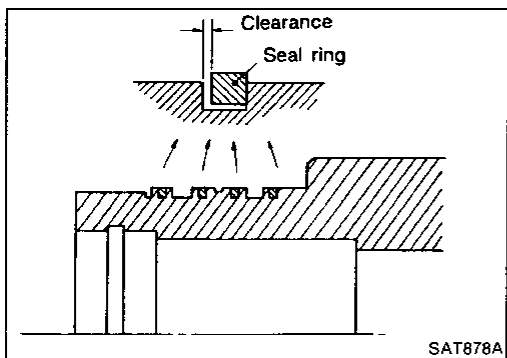
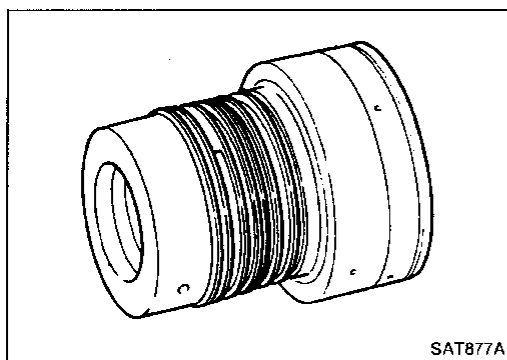
- If not within wear limit, replace.

## REPAIR FOR COMPONENT PARTS

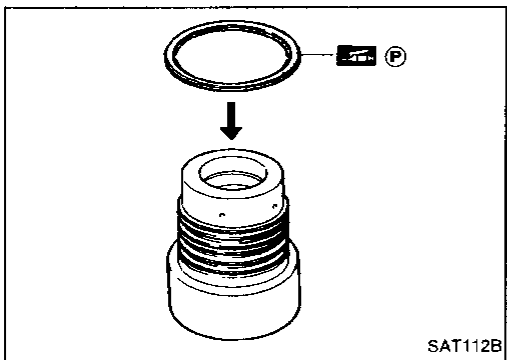
### Low & Reverse Brake (Cont'd)

#### Low one-way clutch inner race

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

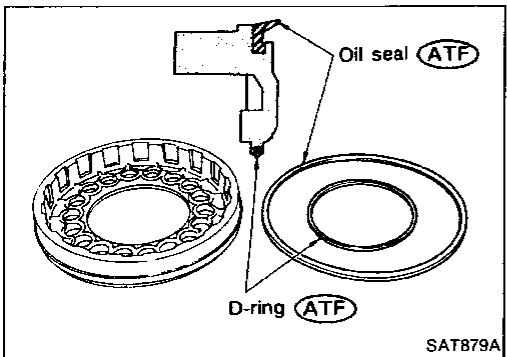


- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.  
**Inspection standard:**  
**Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)**  
**Allowable limit: 0.25 mm (0.0098 in)**
- If not within allowable limit, replace low one-way clutch inner race.

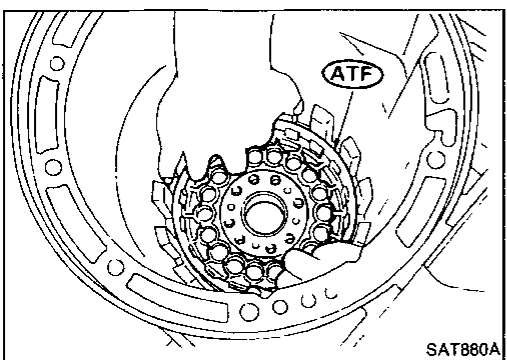


#### ASSEMBLY

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



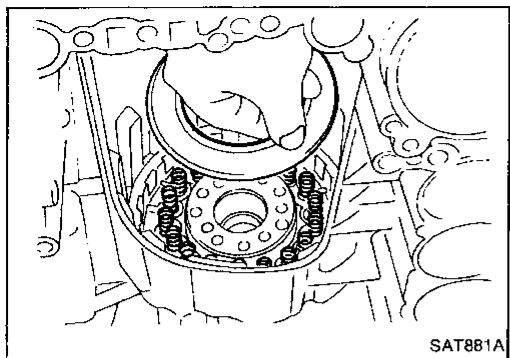
2. Install oil seal and D-ring onto piston.
  - **Apply A.T.F. to oil seal and D-ring.**



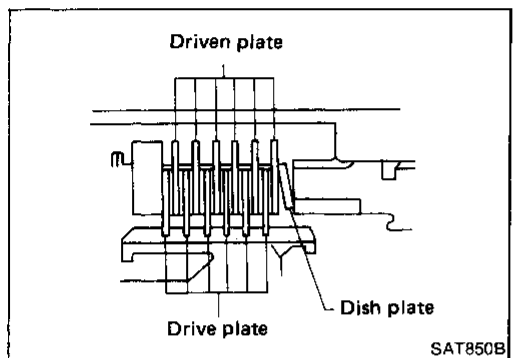
3. Install piston by rotating it slowly and evenly.
  - **Apply A.T.F. to inner surface of transmission case.**

## REPAIR FOR COMPONENT PARTS

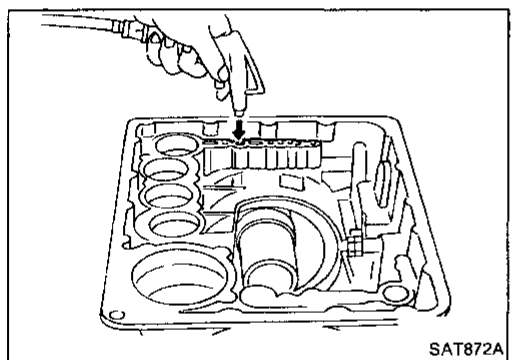
### Low & Reverse Brake (Cont'd)



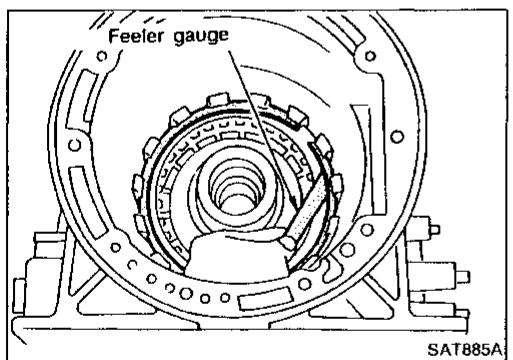
4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.



5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.



7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".



8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

#### Specified clearance:

##### Standard

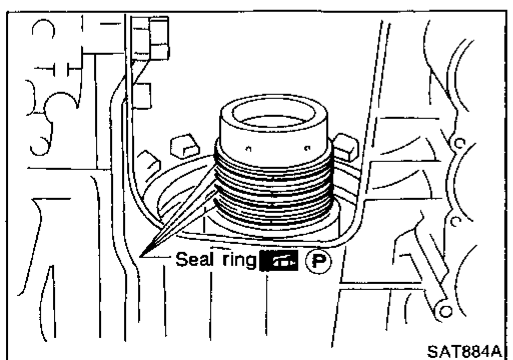
0.7 - 1.1 mm (0.028 - 0.043 in)

##### Allowable limit

2.3 mm (0.091 in)

#### Retaining plate:

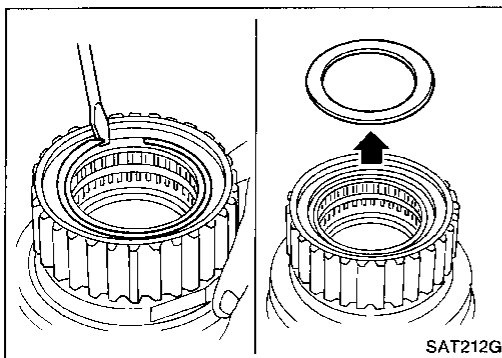
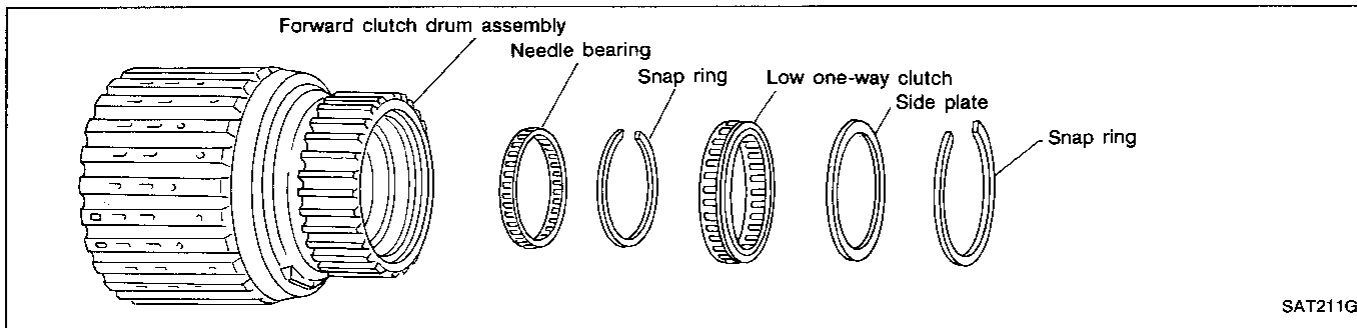
Refer to S.D.S.



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.

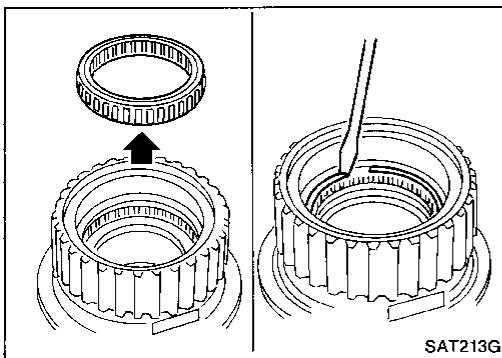


## Forward Clutch Drum Assembly

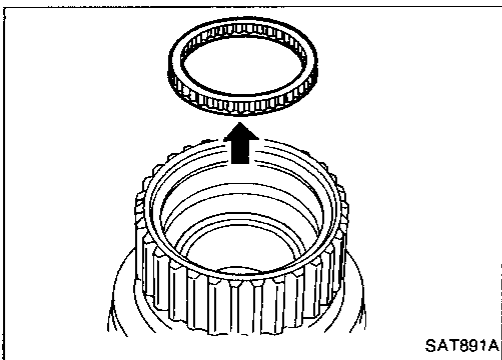


### DISASSEMBLY

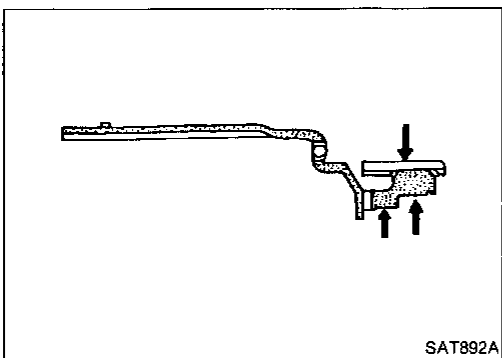
1. Remove snap ring from forward clutch drum.
2. Remove side plate from forward clutch drum.



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.



### INSPECTION

#### Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.

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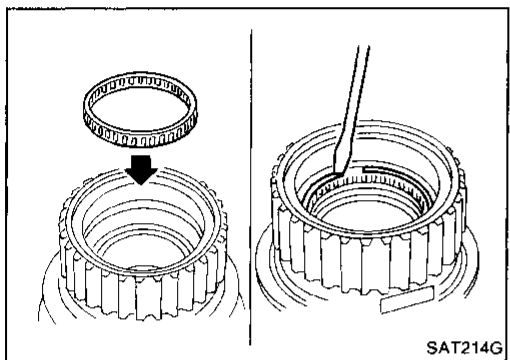
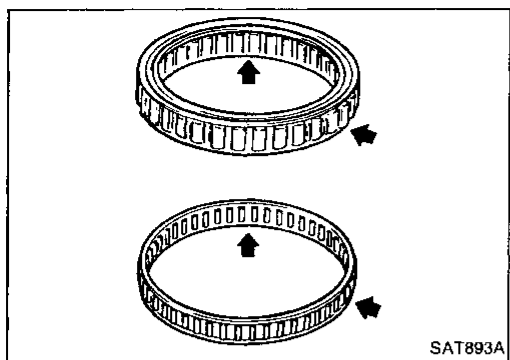
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## REPAIR FOR COMPONENT PARTS

### Forward Clutch Drum Assembly (Cont'd)

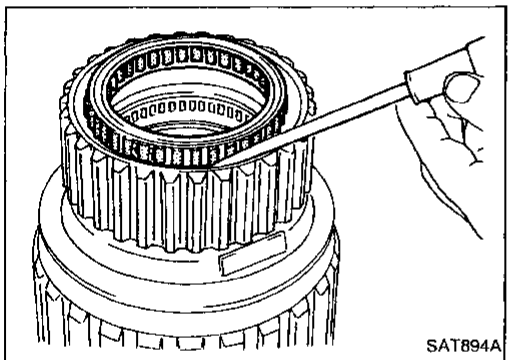
#### Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.

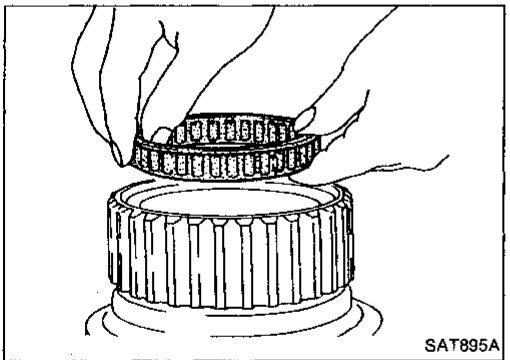


#### ASSEMBLY

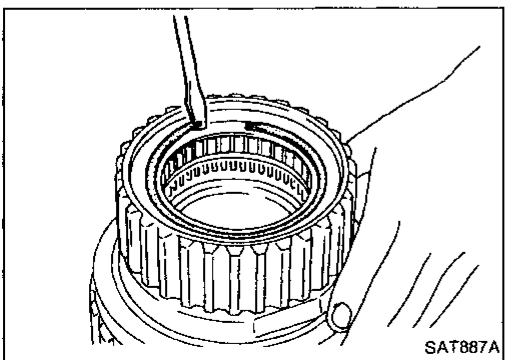
1. Install needle bearing in forward clutch drum.
2. Install snap ring onto forward clutch drum.



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

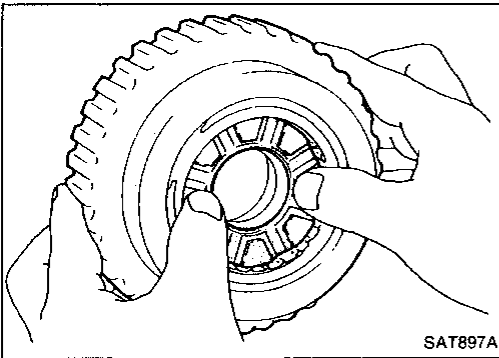
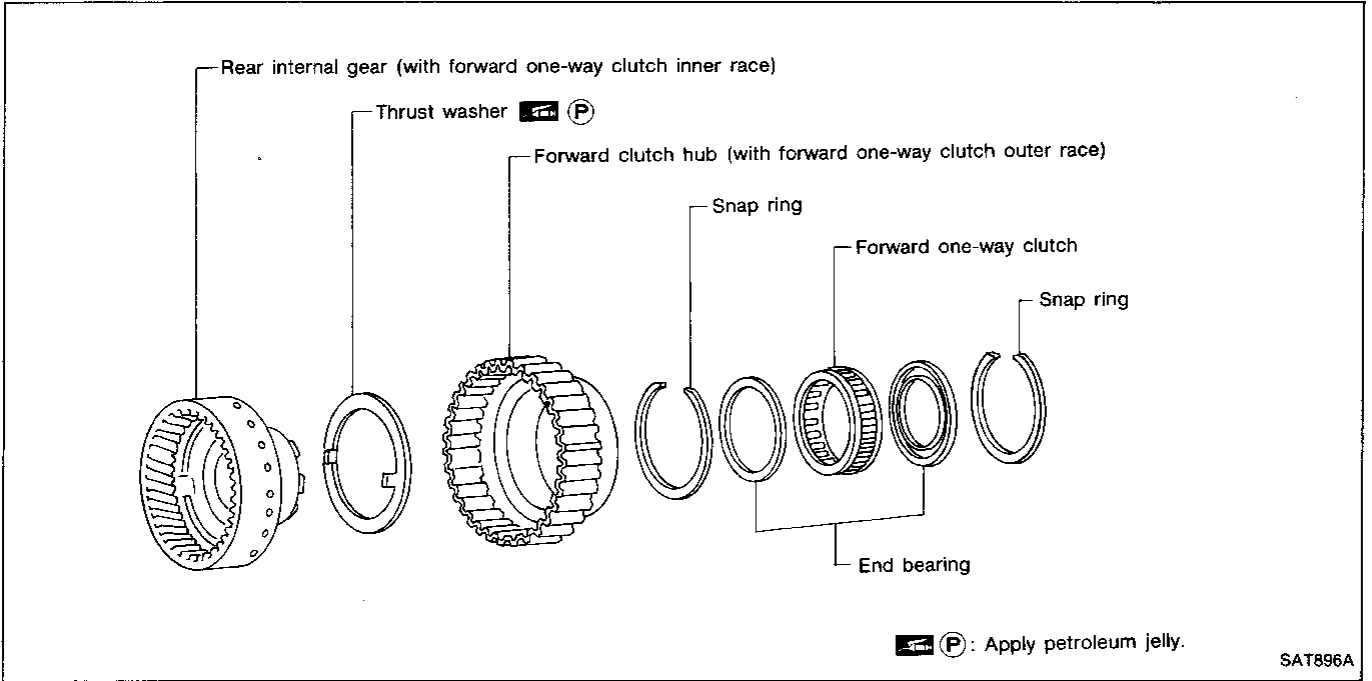


- Install low one-way clutch with flange facing rearward.



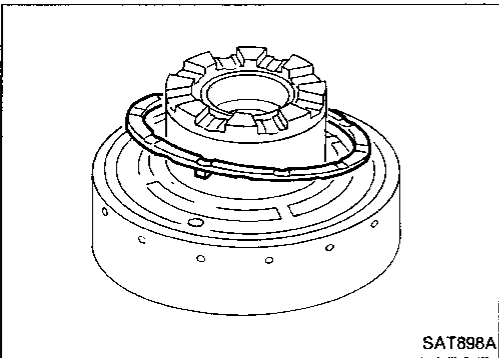
4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

Rear Internal Gear and Forward Clutch Hub

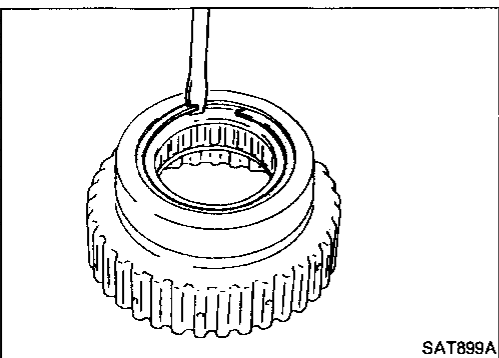


DISASSEMBLY

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.

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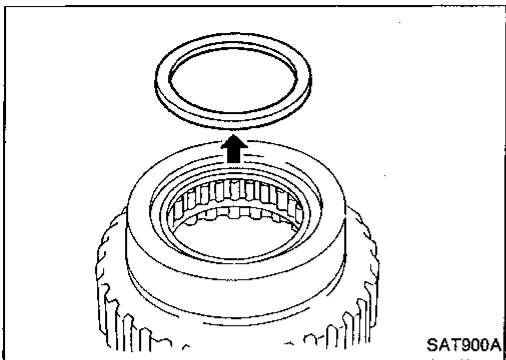
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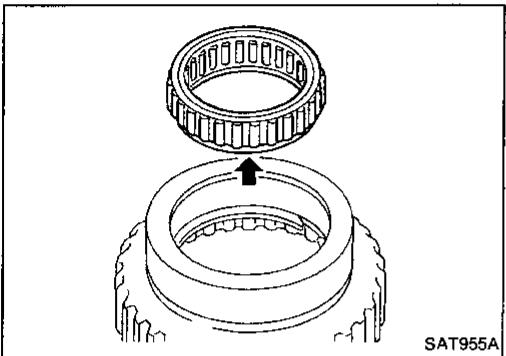
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## REPAIR FOR COMPONENT PARTS

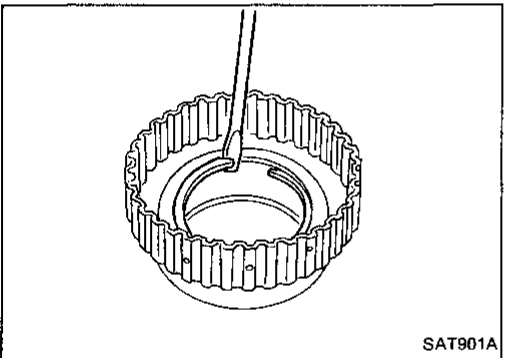
### Rear Internal Gear and Forward Clutch Hub (Cont'd)



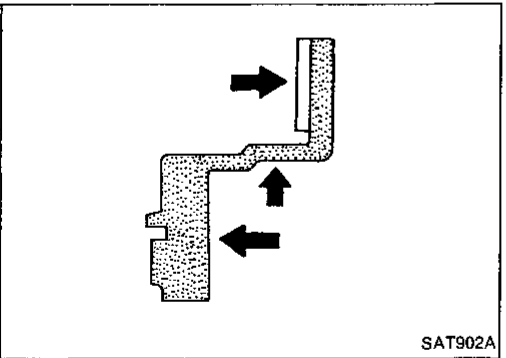
4. Remove end bearing.



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



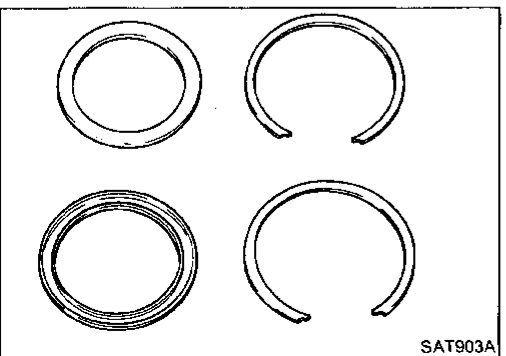
6. Remove snap ring from forward clutch hub.



### 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.



#### Snap ring and end bearing

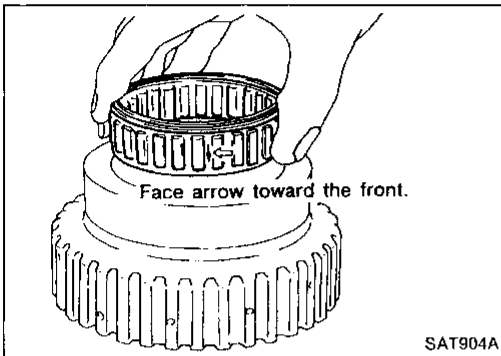
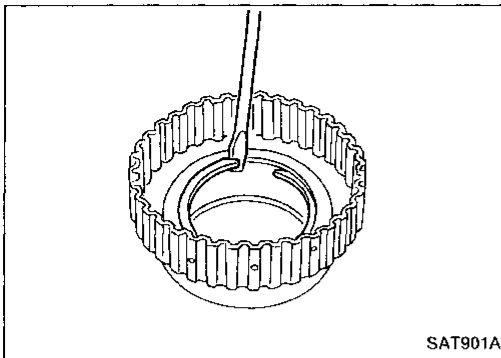
- Check for deformation or damage.

## REPAIR FOR COMPONENT PARTS

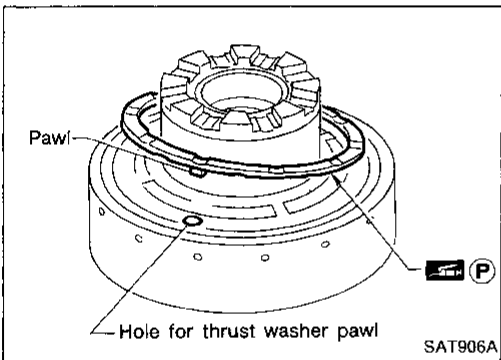
### Rear Internal Gear and Forward Clutch Hub (Cont'd)

#### ASSEMBLY

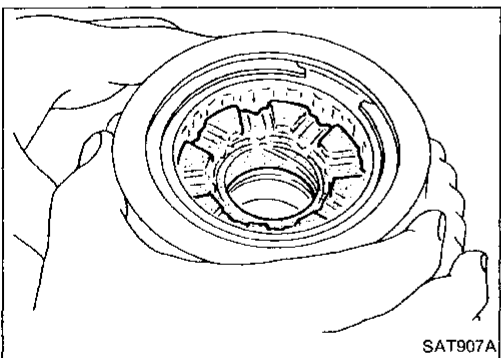
1. Install snap ring onto forward clutch hub.
2. Install end bearing.



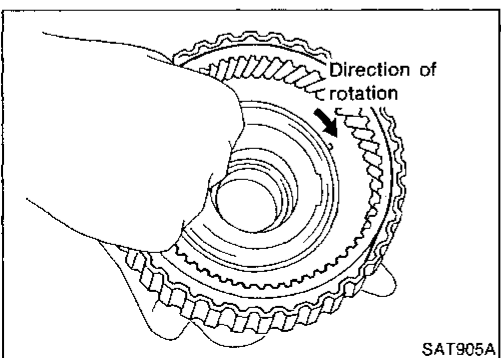
3. Install forward one-way clutch onto clutch hub.
  - **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.



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.**



7. Position forward clutch hub in rear internal gear.



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

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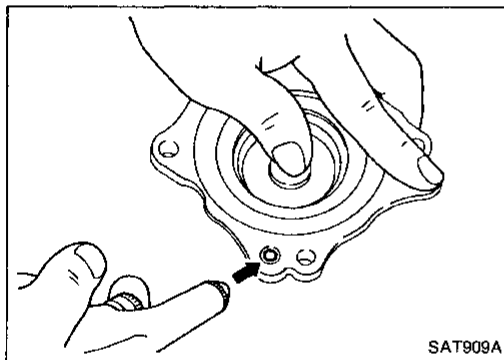
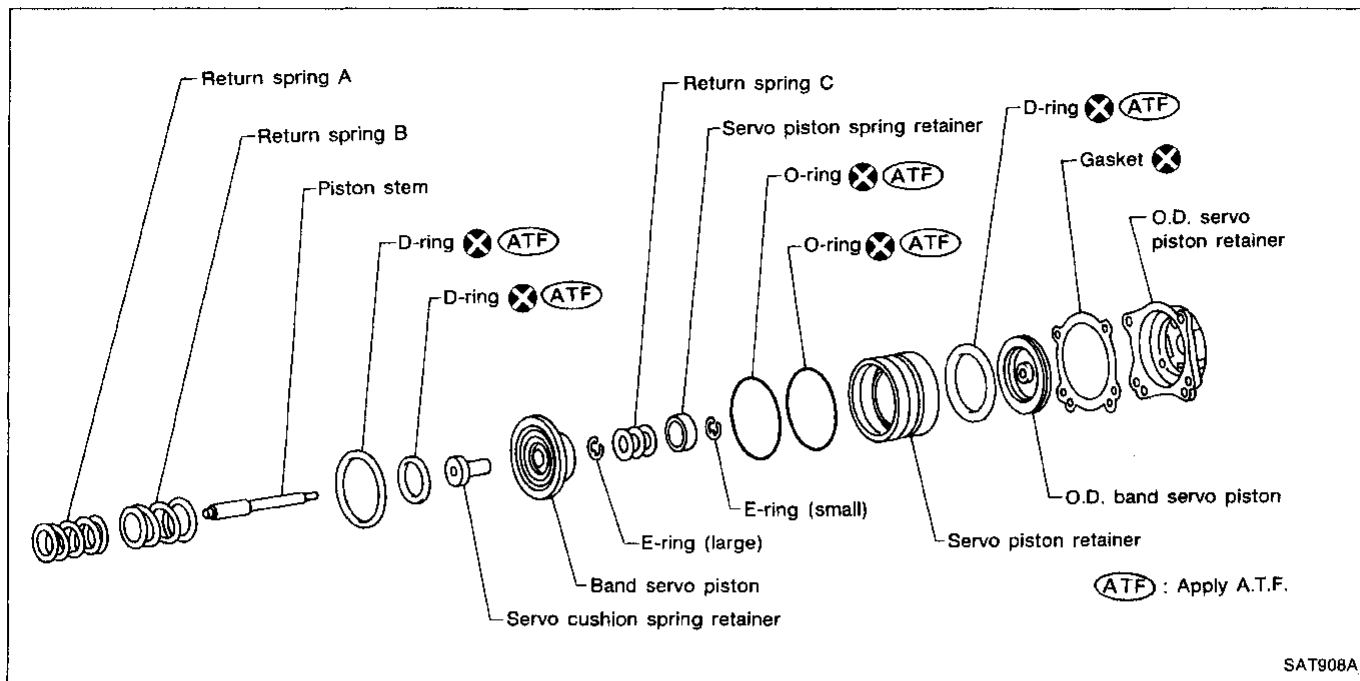
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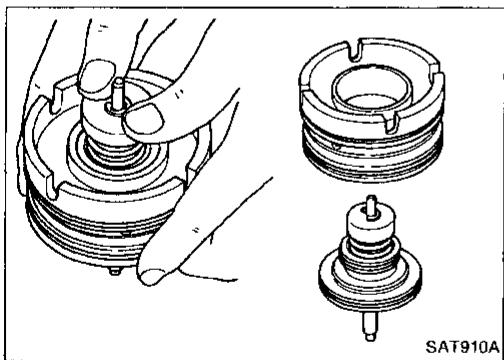
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**Band Servo Piston Assembly**

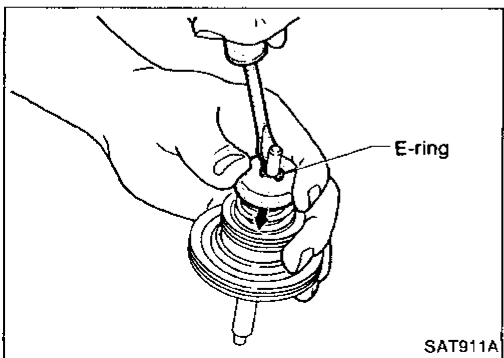


**DISASSEMBLY**

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.



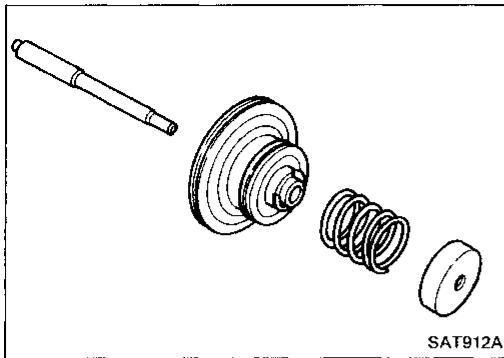
4. Remove band servo piston assembly from servo piston retainer by pushing it forward.



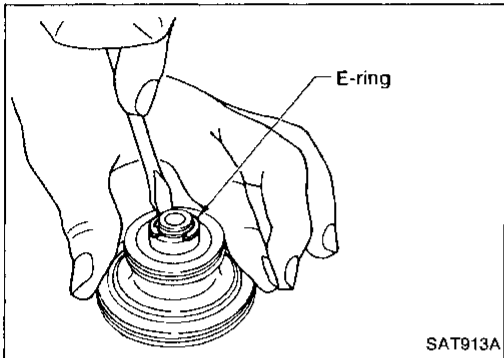
5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

# REPAIR FOR COMPONENT PARTS

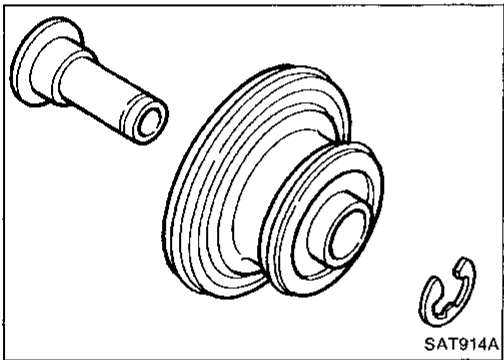
## Band Servo Piston Assembly (Cont'd)



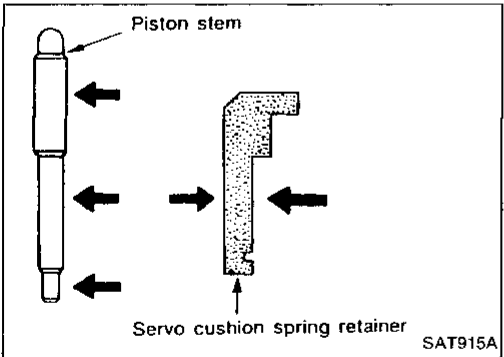
- Remove servo piston spring retainer, return spring C and piston stem from band servo piston.



- Remove E-ring from band servo piston.



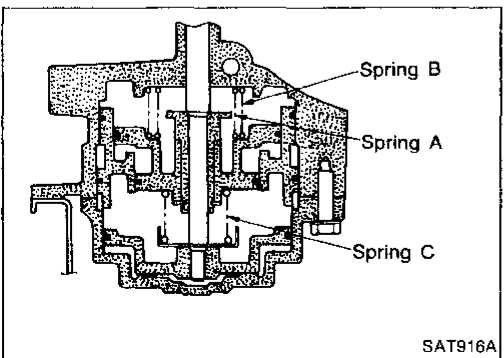
- Remove servo cushion spring retainer from band servo piston.
- Remove D-rings from band servo piston.
- Remove O-rings from servo piston retainer.



### INSPECTION

#### Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



#### Return springs

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

#### Inspection standard:

Parts	Unit: mm (in)	
	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.7 (1.169)	27.6 (1.087)

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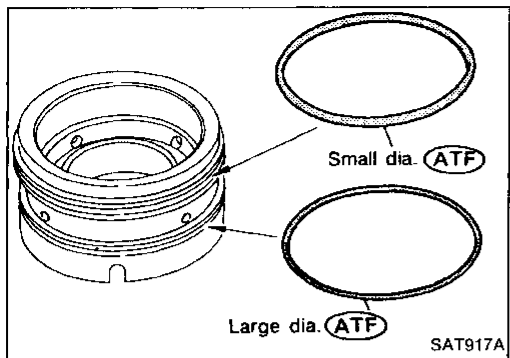
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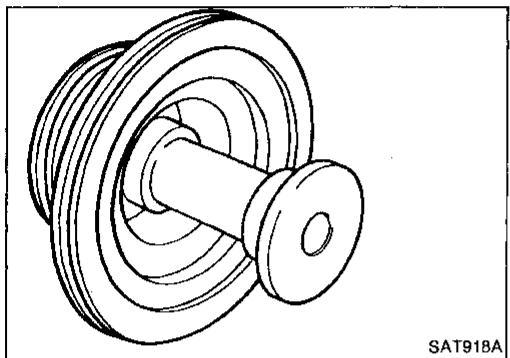
## REPAIR FOR COMPONENT PARTS

### Band Servo Piston Assembly (Cont'd)

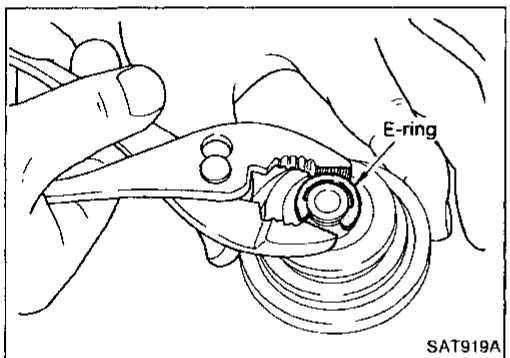
#### ASSEMBLY



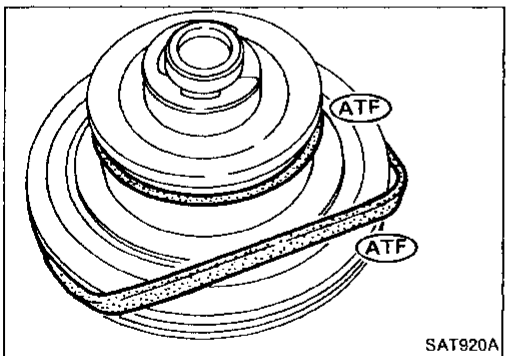
1. Install O-rings onto servo piston retainer.
  - Apply A.T.F. to O-rings.
  - Pay attention to position of each O-ring.



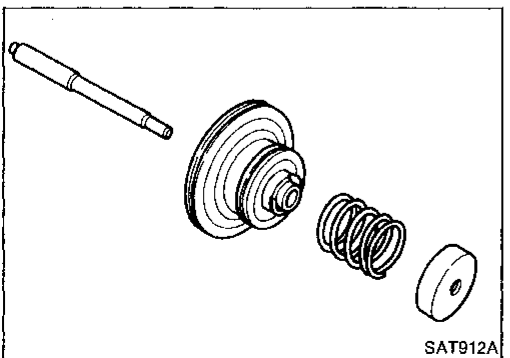
2. Install servo cushion spring retainer onto band servo piston.



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



4. Install D-rings onto band servo piston.
  - Apply A.T.F. to D-rings.

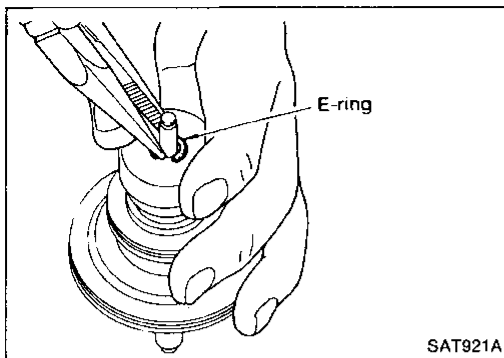


5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

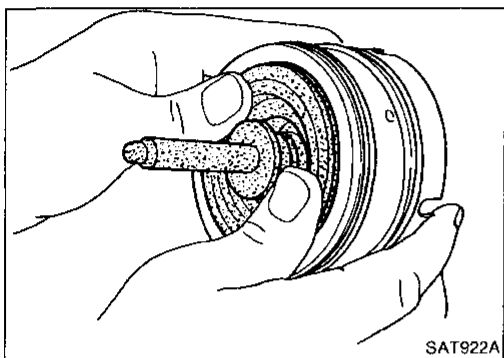


## REPAIR FOR COMPONENT PARTS

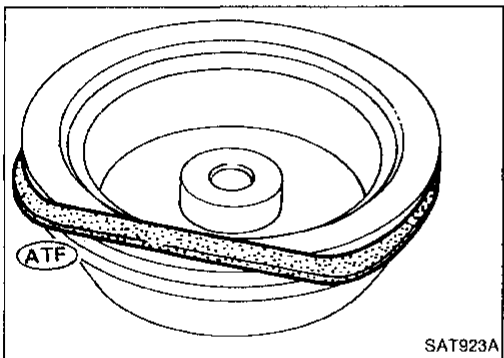
### Band Servo Piston Assembly (Cont'd)



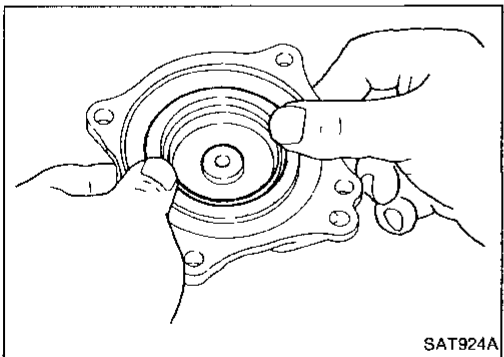
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



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



8. Install D-ring on O.D. band servo piston.  
● **Apply A.T.F. to D-ring.**



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

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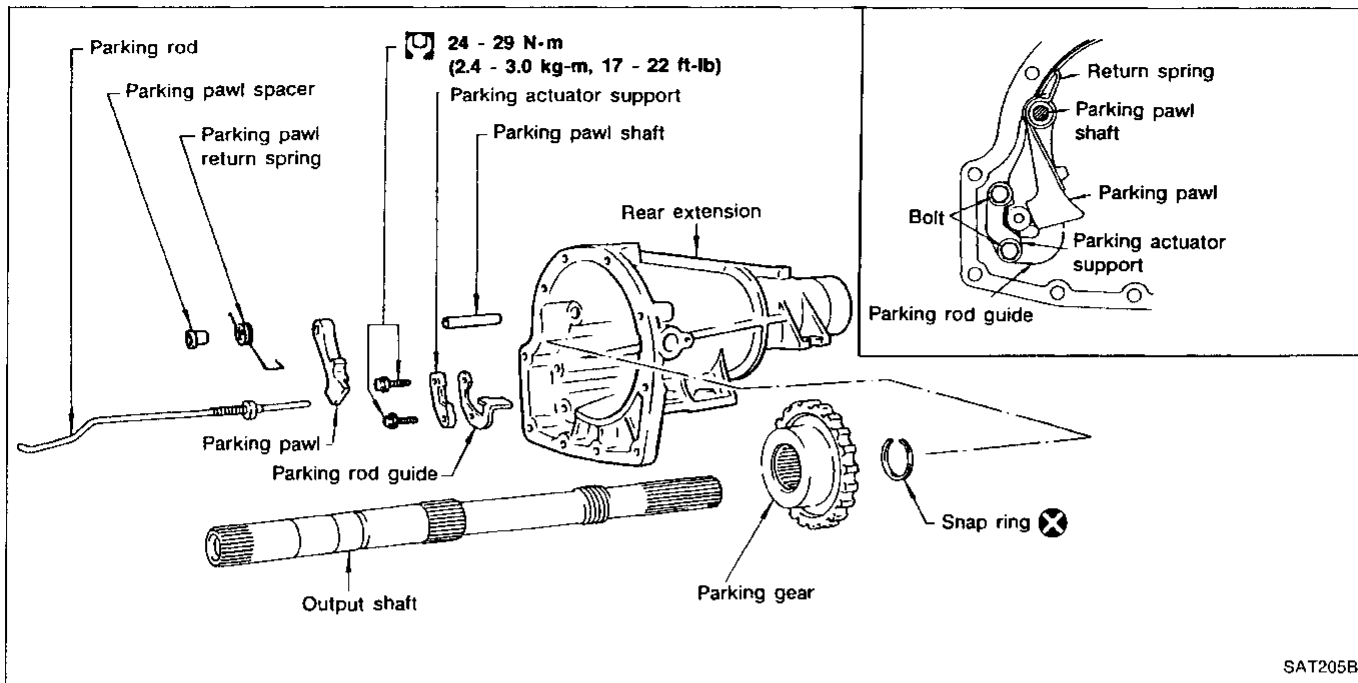
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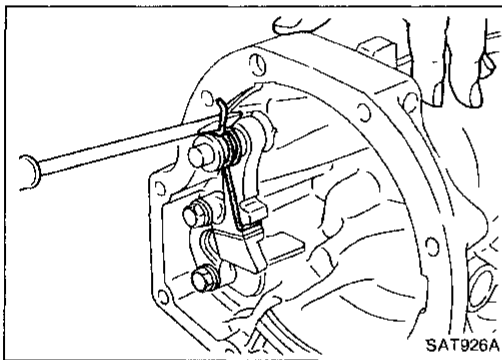
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Parking Pawl Components

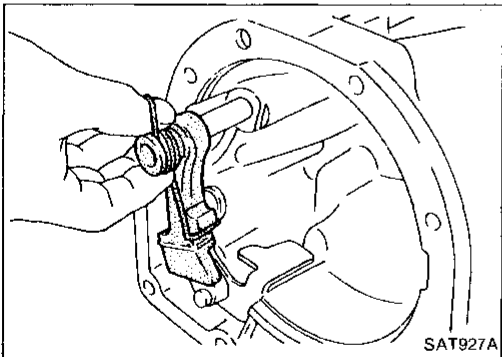


DISASSEMBLY

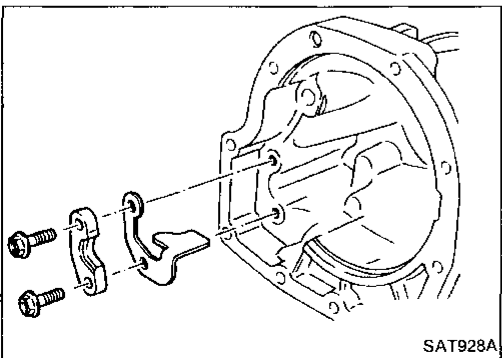
1. Slide return spring to the front of rear extension flange.



2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



4. Remove parking actuator support and rod guide from rear extension.



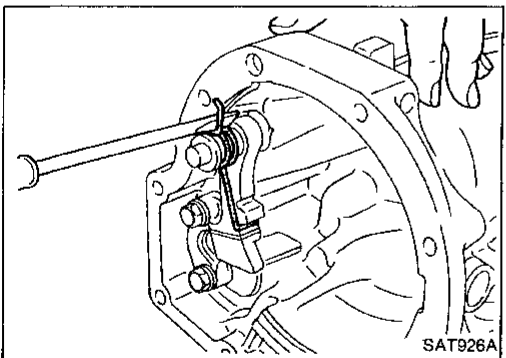
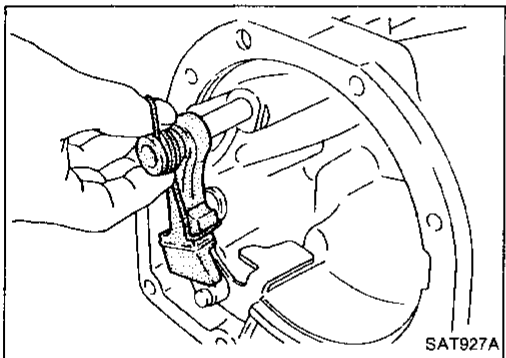
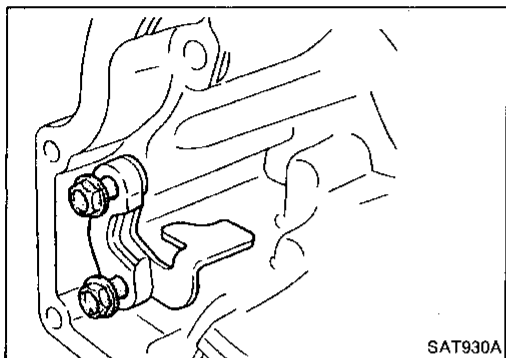
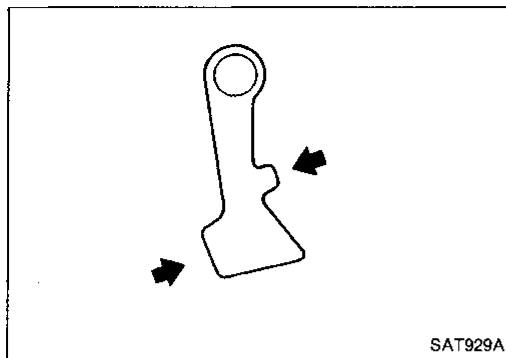
# REPAIR FOR COMPONENT PARTS

## Parking Pawl Components (Cont'd)

### INSPECTION

#### Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.



### ASSEMBLY

1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.

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

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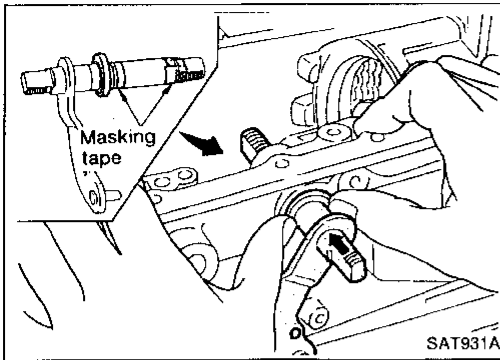
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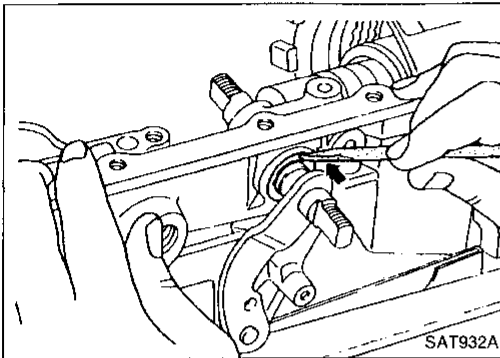
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## ASSEMBLY

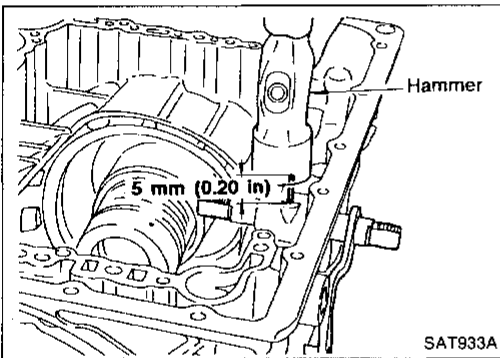


### Assembly

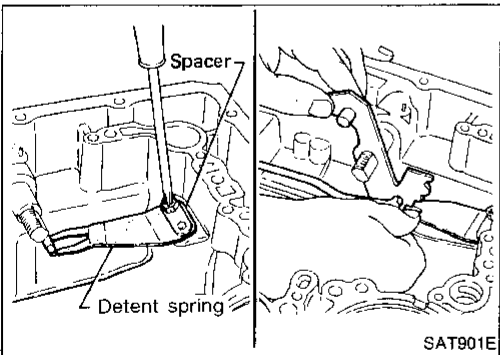
1. Install manual shaft components.
  - a. Install oil seal onto manual shaft.
    - **Apply A.T.F. to oil seal.**
    - **Wrap threads of manual shaft with masking tape.**
  - b. Insert manual shaft and oil seal as a unit into transmission case.
  - c. Remove masking tape.



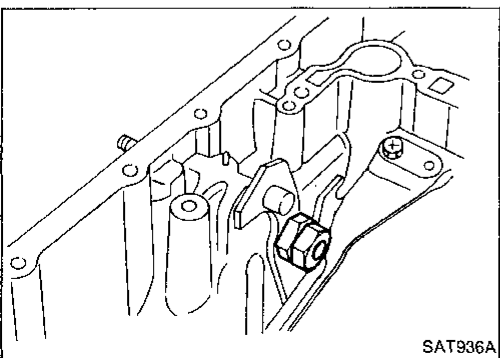
- d. Push oil seal evenly and install it onto transmission case.



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



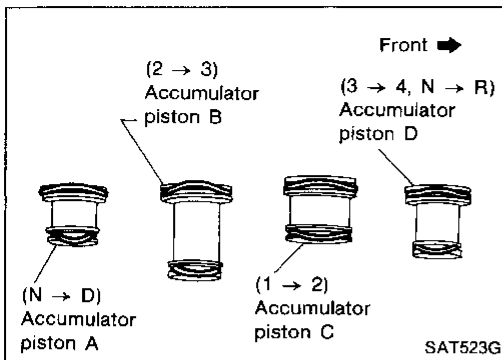
- f. Install detent spring and spacer.
    - g. While pushing detent spring down, install manual plate onto manual shaft.



- h. Install lock nuts onto manual shaft.

# ASSEMBLY

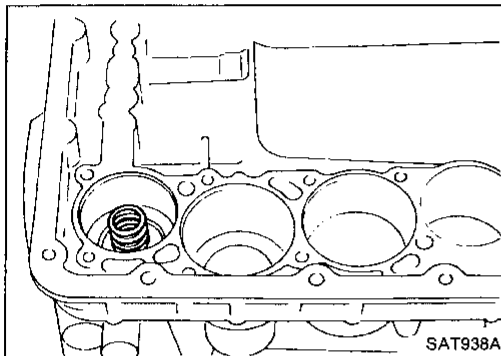
## Assembly (Cont'd)



2. Install accumulator piston.
  - a. Install O-rings onto accumulator piston.

● **Apply A.T.F. to O-rings.**  
**Accumulator piston O-rings**

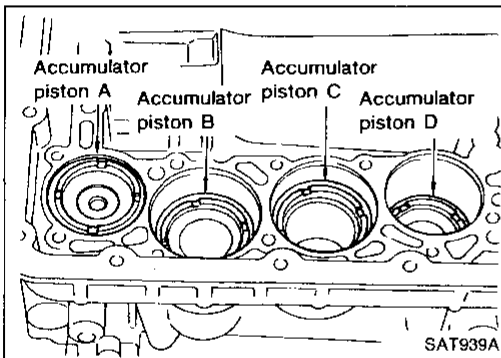
Unit: mm (in)				
Accumulator	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)



- b. Install return spring for accumulator A onto transmission case.

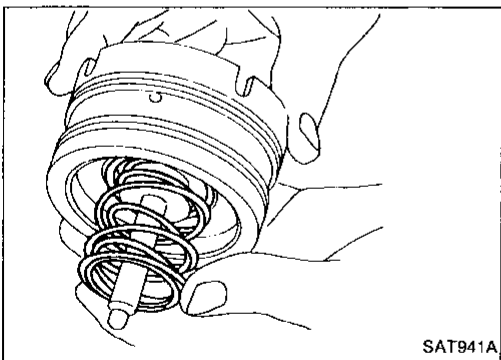
**Free length of return spring**

Unit: mm (in)	
Accumulator	A
Free length	43 (1.69)

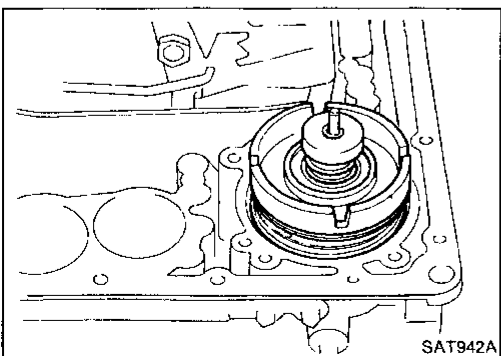


- c. Install accumulator pistons A, B, C and D.

● **Apply A.T.F. to transmission case.**



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



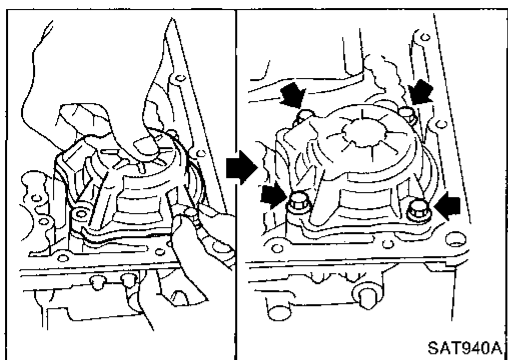
- b. Install band servo piston onto transmission case.

● **Apply A.T.F. to O-ring of band servo piston and transmission case.**

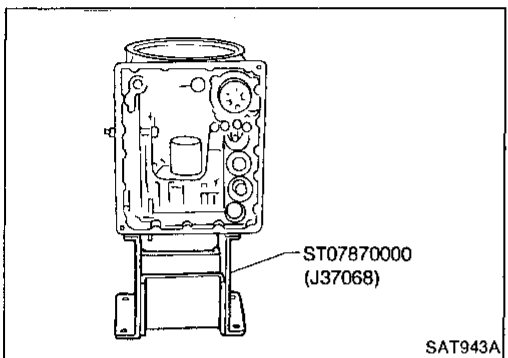
- c. Install gasket for band servo onto transmission case.

## ASSEMBLY

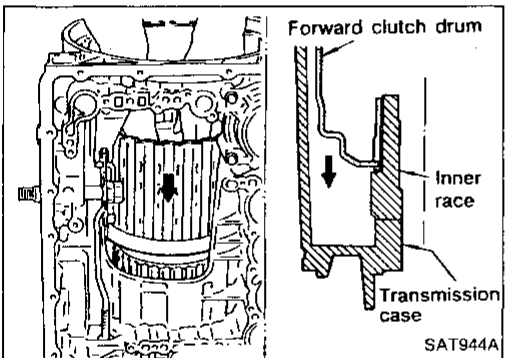
### Assembly (Cont'd)



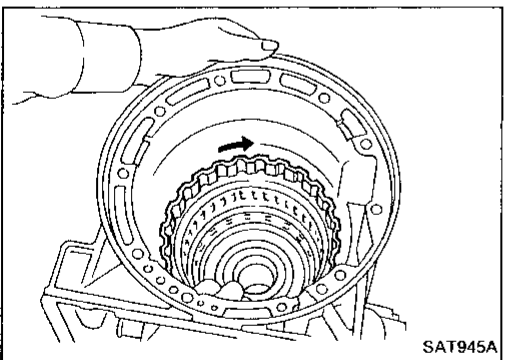
- d. Install band servo retainer onto transmission case.



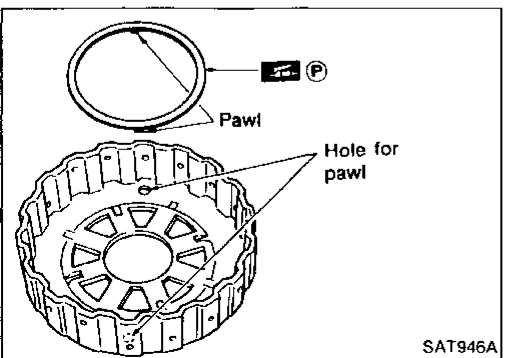
4. Install rear side clutch and gear components.  
a. Place transmission case in vertical position.



- b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.



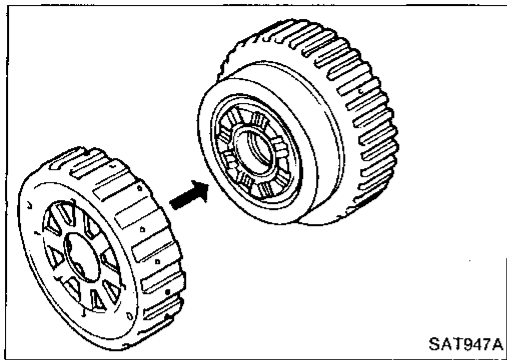
- c. Check to be sure that rotation direction of forward clutch assembly is correct.



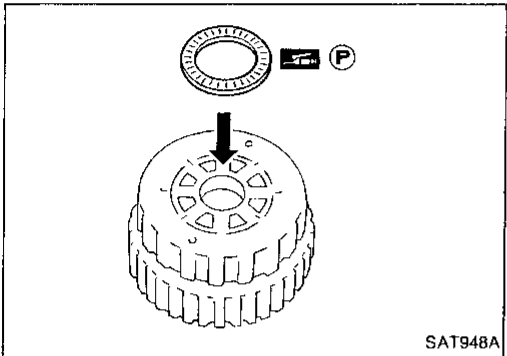
- d. Install thrust washer onto front of overrun clutch hub.  
● Apply petroleum jelly to the thrust washer.  
● Insert pawls of thrust washer securely into holes in overrun clutch hub.

# ASSEMBLY

## Assembly (Cont'd)

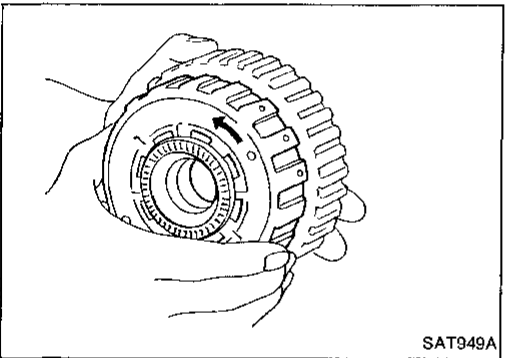


e. Install overrun clutch hub onto rear internal gear assembly.

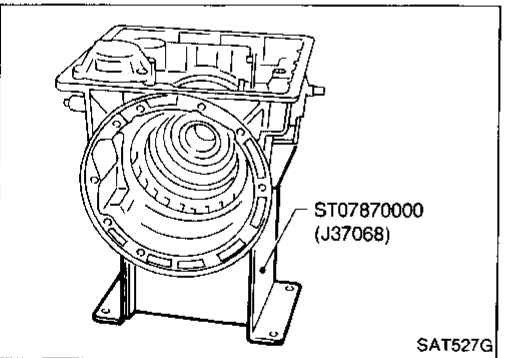


f. Install needle bearing onto rear of overrun clutch hub.

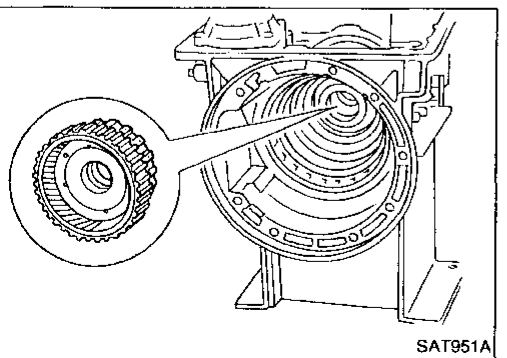
- Apply petroleum jelly to needle bearing.



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



h. Place transmission case into horizontal position.



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

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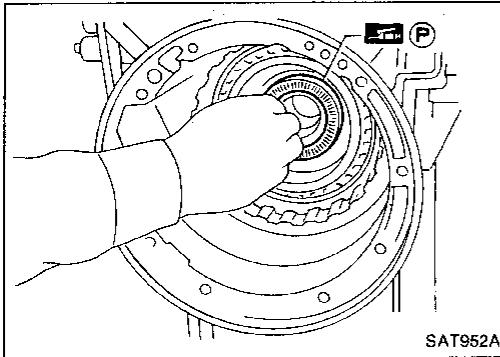
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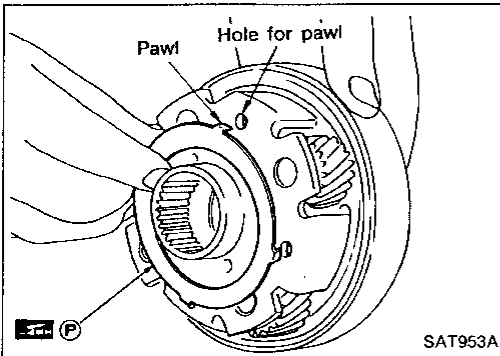
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## ASSEMBLY

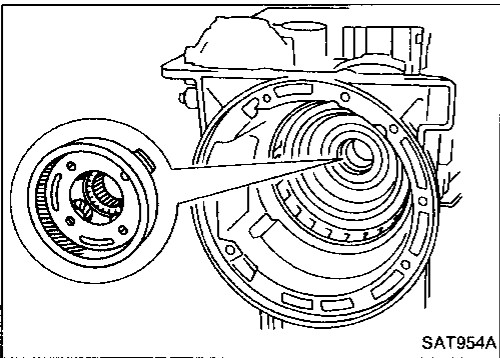
### Assembly (Cont'd)



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



- k. Install bearing race onto rear of front internal gear.
- Apply petroleum jelly to bearing race.
  - Securely engage pawls of bearing race with holes in front internal gear.



- l. Install front internal gear on transmission case.

### Adjustment

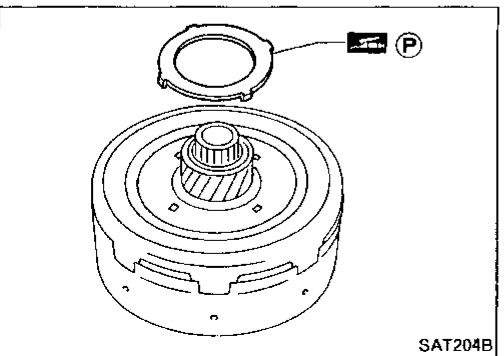
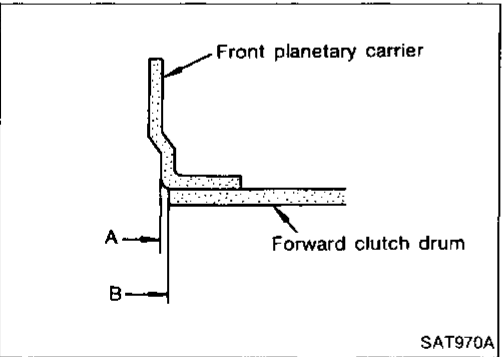
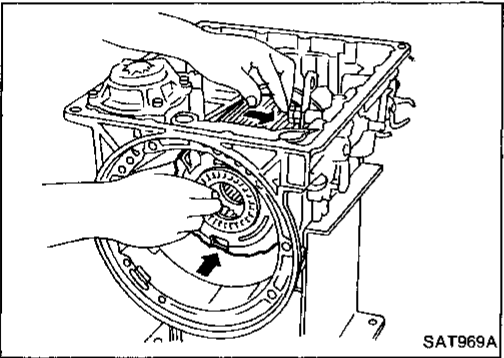
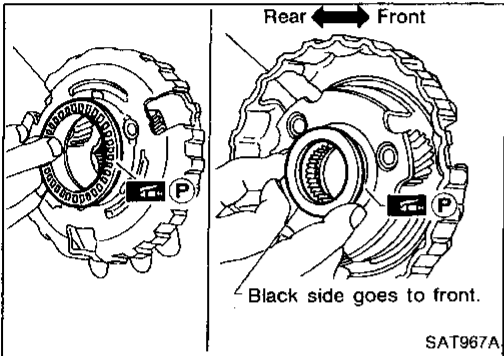
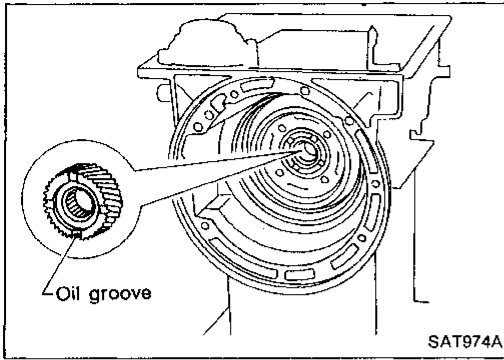
When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

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



# ASSEMBLY

## Adjustment (Cont'd)



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

- b. Install needle bearing on front of front planetary carrier.
  - Apply petroleum jelly to needle bearing.
- c. Install needle bearing on rear of front planetary carrier.
  - Apply petroleum jelly to bearing.
  - Pay attention to its direction — Black side goes to front.

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

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

- e. Install bearing races on rear of clutch pack.
  - Apply petroleum jelly to bearing races.
  - Securely engage pawls of bearing race with hole in clutch pack.

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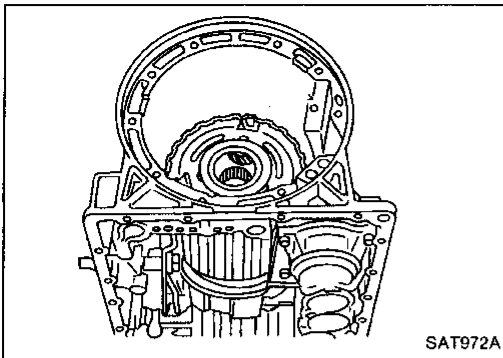
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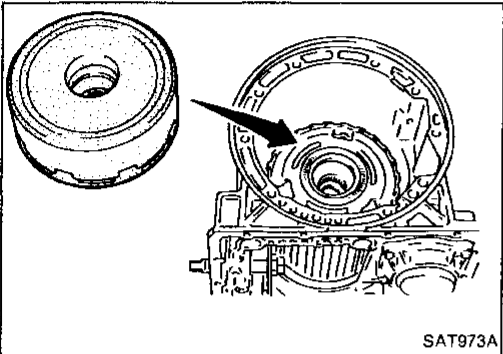
## ASSEMBLY

### Adjustment (Cont'd)

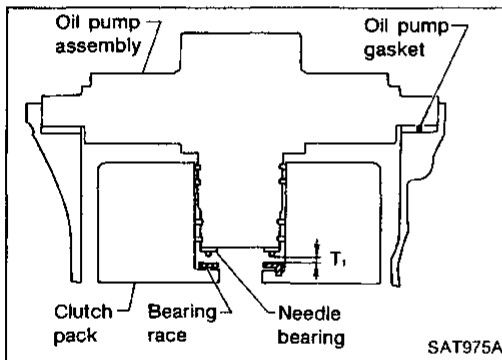
- f. Place transmission case in vertical position.



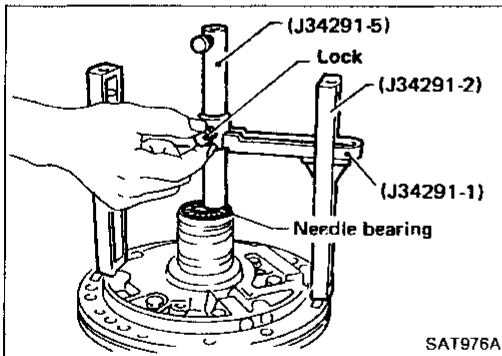
- g. Install clutch pack into transmission case.



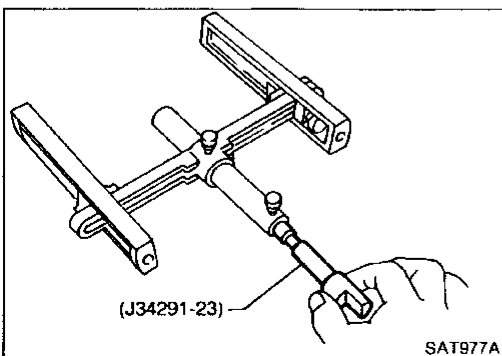
2. Adjust total end play.  
**Total end play "T<sub>1</sub>":**  
**0.25 - 0.55 mm (0.0098 - 0.0217 in)**



- a. With needle bearing installed, place J34291-1 (bridge), J34291-2 (legs) and the J34291-5 (gauging cylinder) onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly and gauging cylinder should rest on top of the needle bearing. Lock gauging cylinder in place with set screw.

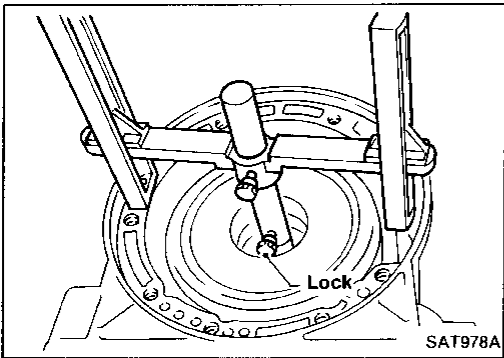


- b. Install J34291-23 (gauging plunger) into gauging cylinder.



# ASSEMBLY

## Adjustment (Cont'd)



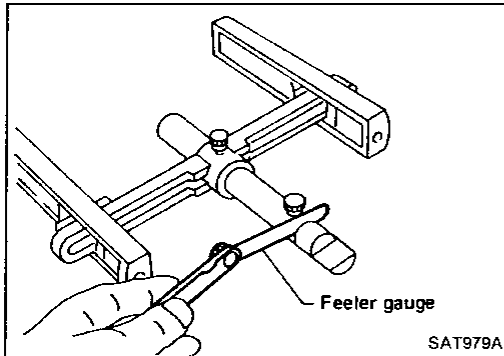
- c. With original bearing race installed inside reverse clutch drum, place shim selecting gauge with its legs on machined surface of transmission case (no gasket) and allow gauging plunger to rest on bearing race. Lock gauging plunger in place with set screw.

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- d. Remove Tool and use feeler gauge to measure gap between gauging cylinder and gauging plunger. This measurement should give exact total end play.

**Total end play "T<sub>1</sub>":**  
**0.25 - 0.55 mm (0.0098 - 0.0217 in)**

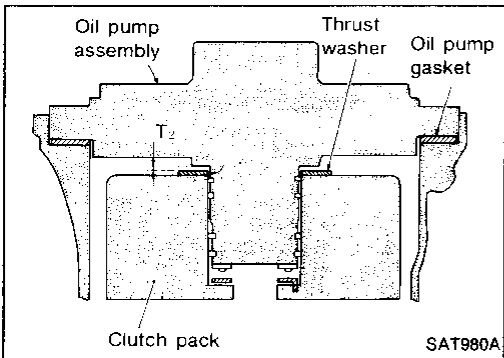
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

**Available oil pump cover bearing race:**  
**Refer to S.D.S.**

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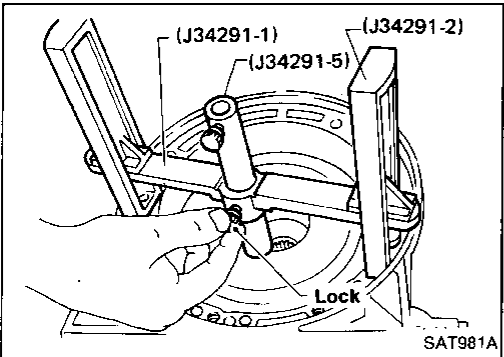
3. Adjust reverse clutch drum end play.  
**Reverse clutch drum end play "T<sub>2</sub>":**  
**0.55 - 0.90 mm (0.0217 - 0.0354 in)**

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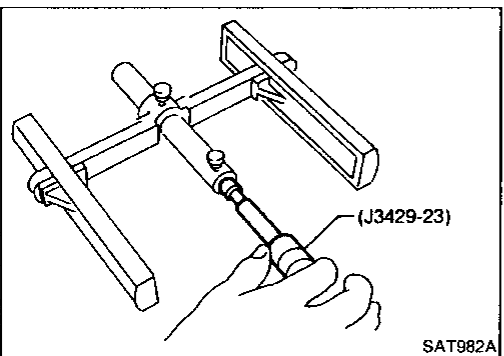
- a. Place J34291-1 (bridge), J34291-2 (legs) and J34291-5 (gauging cylinder) on machined surface of transmission case (no gasket) and allow gauging cylinder to rest on front thrust surface of reverse clutch drum. Lock cylinder in place with set screw.

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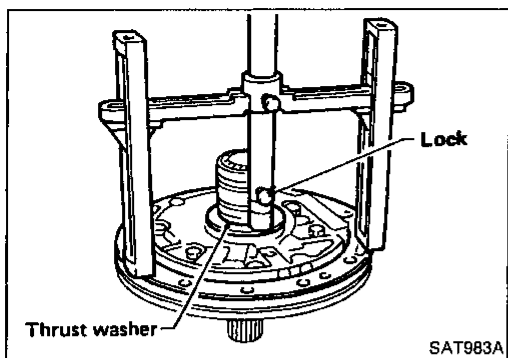
- b. Install J34291-23 (gauging plunger) into gauging cylinder.

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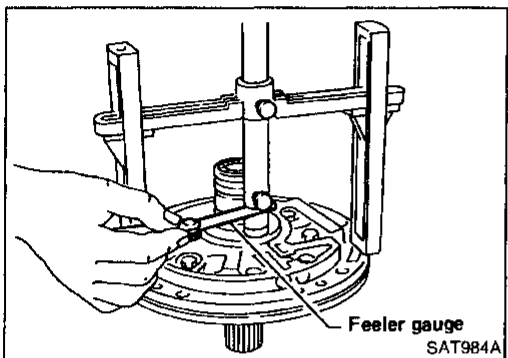
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## ASSEMBLY

### Adjustment (Cont'd)



- c. With original thrust washer installed on oil pump, place shim setting gauge legs onto machined surface of oil pump assembly and allow gauging plunger to rest on thrust washer. Lock plunger in place with set screw.



- d. Use feeler gauge to measure gap between gauging plunger and gauging cylinder. This measurement should give you exact reverse clutch drum end play.

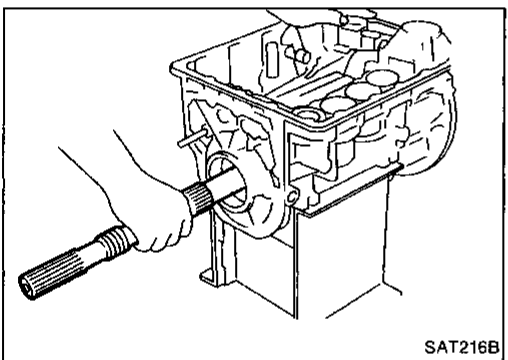
**Reverse clutch drum end play "T<sub>2</sub>":**

**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.

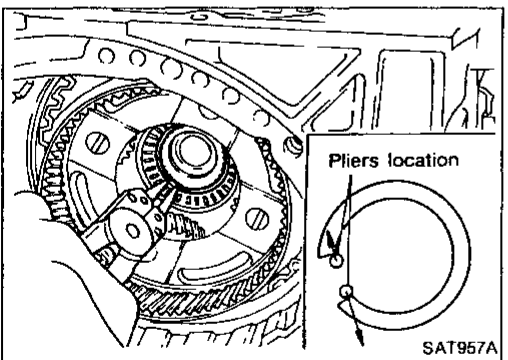
**Available oil pump thrust washer:**

**Refer to S.D.S.**

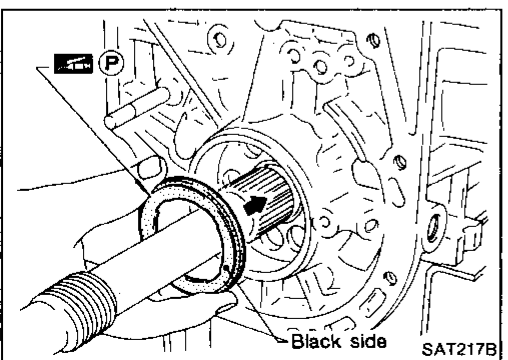


### Assembly

1. Install output shaft and parking gear.
    - a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.
- **Do not force output shaft against front of transmission case.**



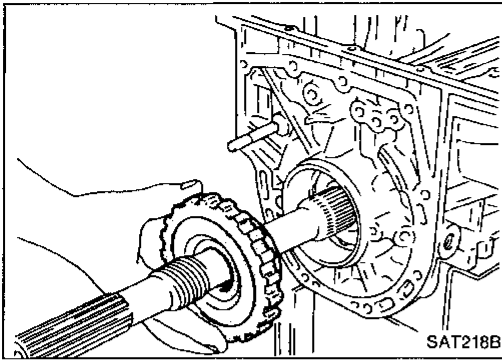
- b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
- **Check to be sure output shaft cannot be removed in rear direction.**



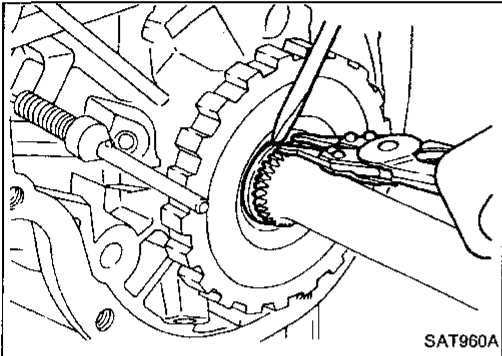
- c. Install needle bearing on transmission case.
- **Pay attention to its direction — Black side goes to rear.**
  - **Apply petroleum jelly to needle bearing.**

# ASSEMBLY

## Assembly (Cont'd)

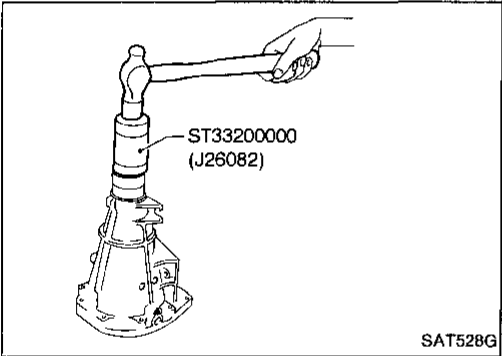


d. Install parking gear on transmission case.



e. Install snap ring on rear of output shaft.

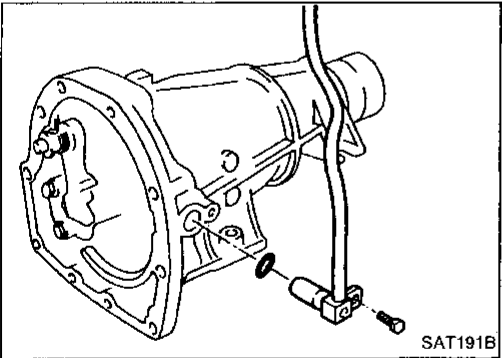
- Check to be sure output shaft cannot be removed in forward direction.



2. Install rear extension.

a. Install oil seal on rear extension.

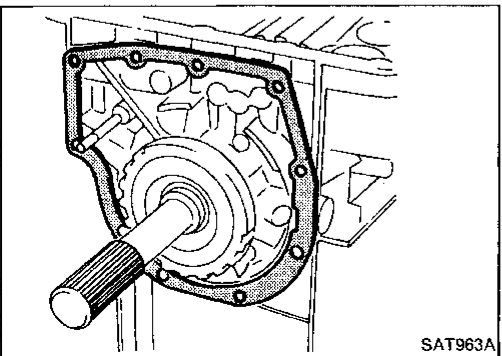
- Apply A.T.F. to oil seal.



b. Install O-ring on revolution sensor.

- Apply A.T.F. to O-ring.

c. Install revolution sensor on rear extension.



d. Install rear extension gasket on transmission case.

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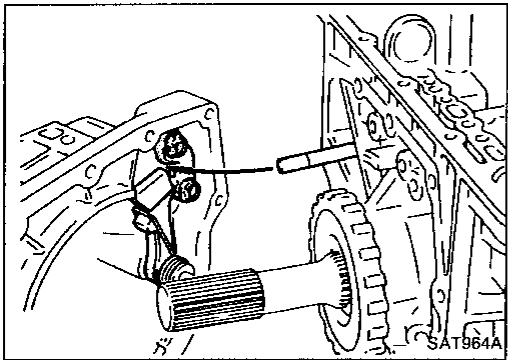
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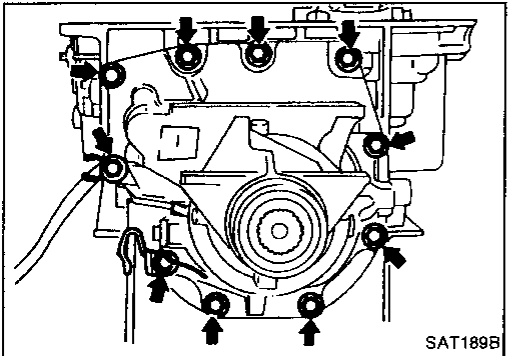
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## ASSEMBLY

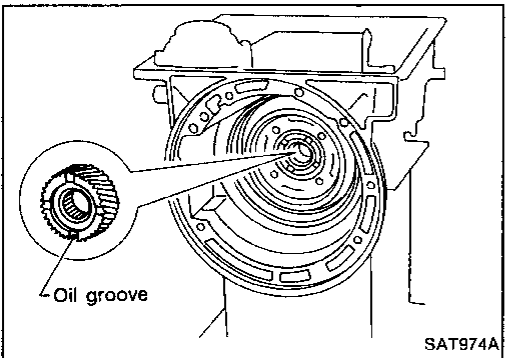
### Assembly (Cont'd)



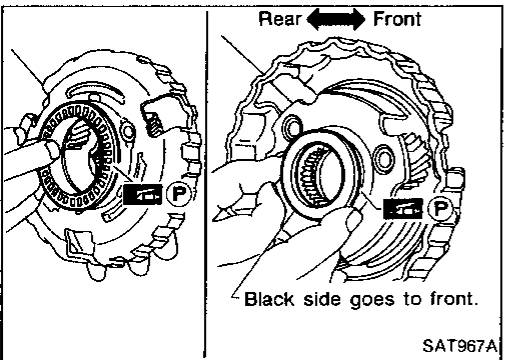
- e. Install parking rod on transmission case.



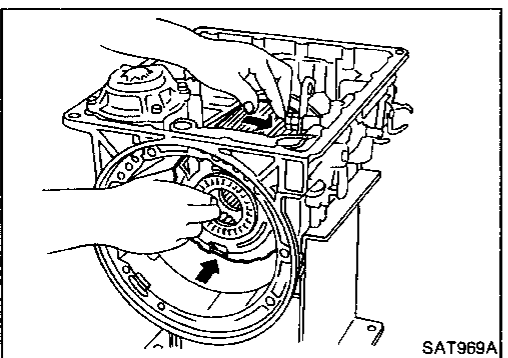
- f. Install rear extension on transmission case.



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



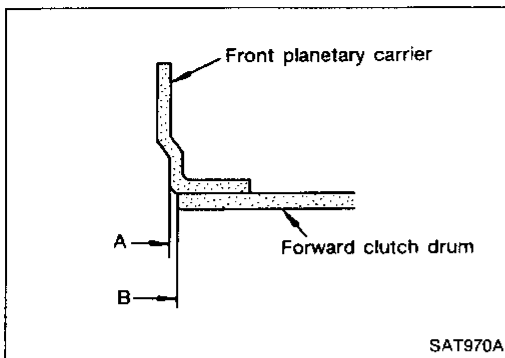
- b. Make sure needle bearing is on front of front planetary carrier.  
● **Apply petroleum jelly to needle bearing.**  
c. Make sure needle bearing is on rear of front planetary carrier.  
● **Apply petroleum jelly to bearing.**  
● **Pay attention to its direction — Black side goes to front.**



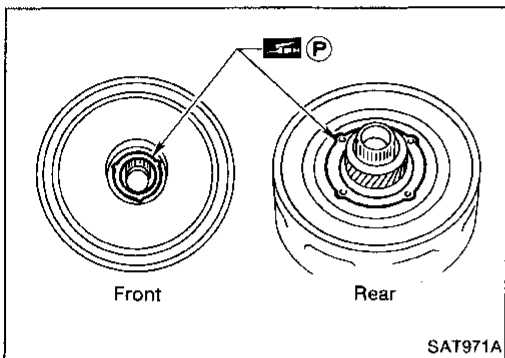
- d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.

# ASSEMBLY

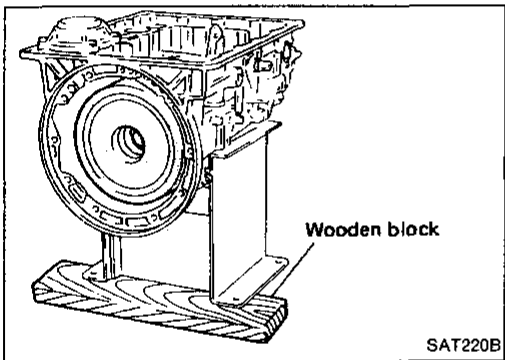
## Assembly (Cont'd)



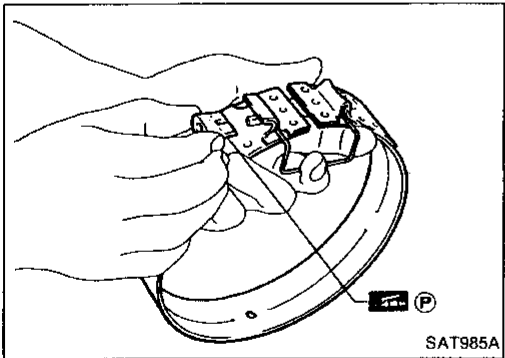
- Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.



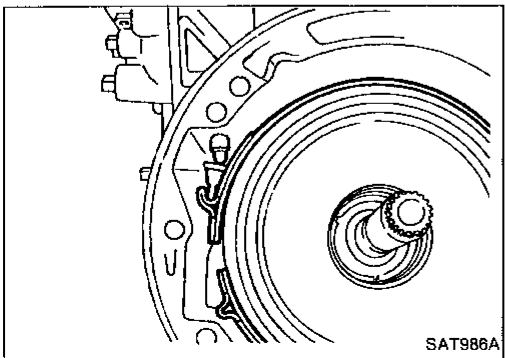
- e. Make sure bearing races are on front and rear of clutch pack.
- Apply petroleum jelly to bearing races.
- Securely engage pawls of bearing races with holes in clutch pack.



- f. Install clutch pack into transmission case.



- 4. Install brake band and band strut.
  - a. Install band strut on brake band.
  - Apply petroleum jelly to band strut.



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

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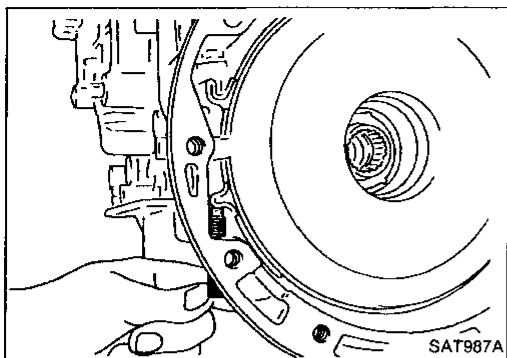
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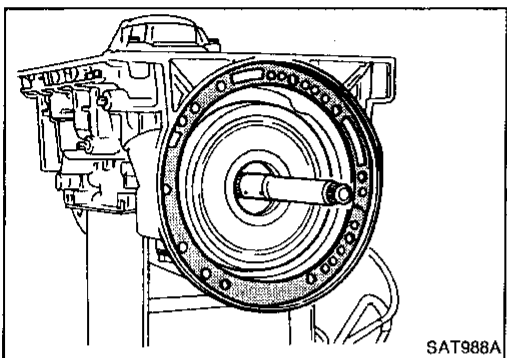
EL

## ASSEMBLY

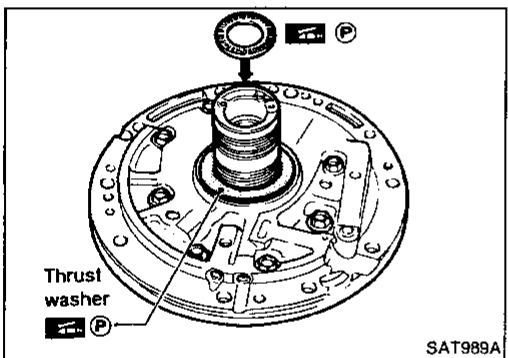
### Assembly (Cont'd)



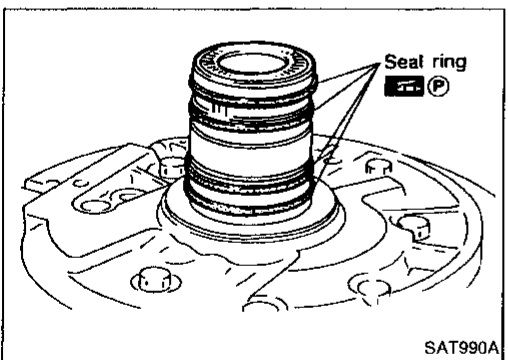
- c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



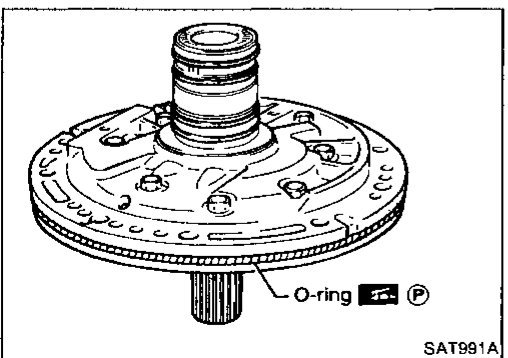
5. Install input shaft on transmission case.
  - **Pay attention to its direction — O-ring groove side is front.**
6. Install gasket on transmission case.



7. Install oil pump assembly.
  - a. Install needle bearing on oil pump assembly.
    - **Apply petroleum jelly to the needle bearing.**
  - b. Install selected thrust washer on oil pump assembly.
    - **Apply petroleum jelly to thrust washer.**



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

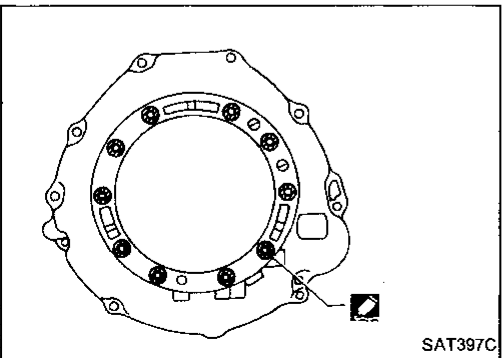
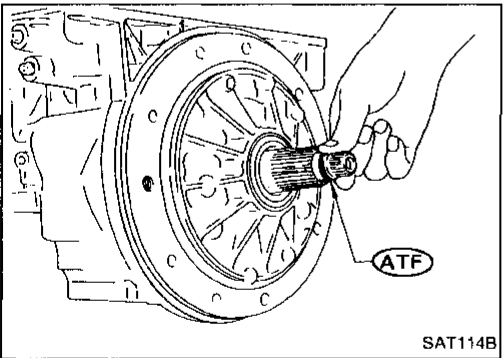
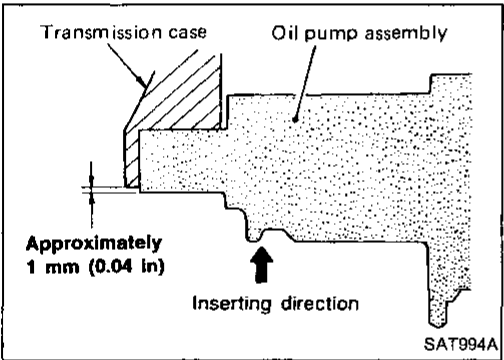
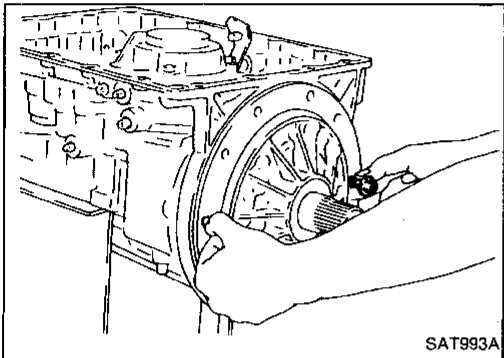
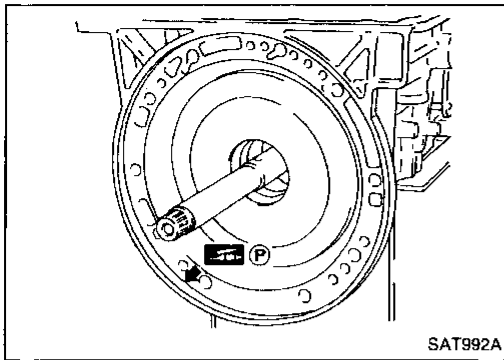


- d. Install O-ring on oil pump assembly.
  - **Apply petroleum jelly to O-ring.**



# ASSEMBLY

## Assembly (Cont'd)



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

f. Install oil pump assembly.

● Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.

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

8. Install O-ring on input shaft.

● Apply A.T.F. to O-rings.

9. 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.

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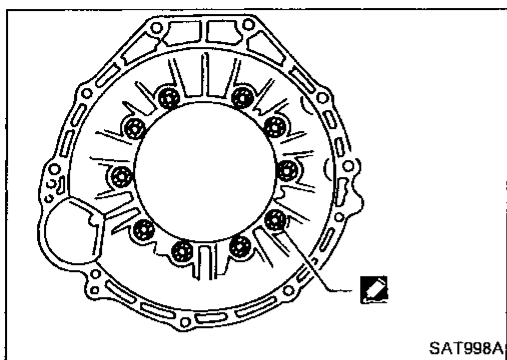
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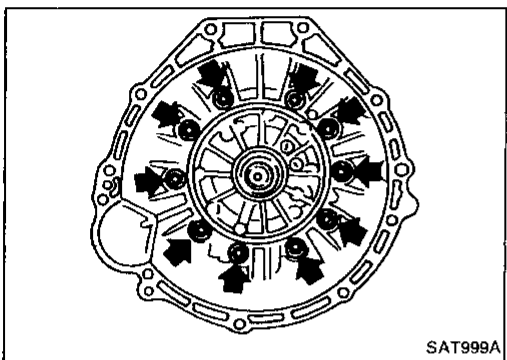
EL

## ASSEMBLY

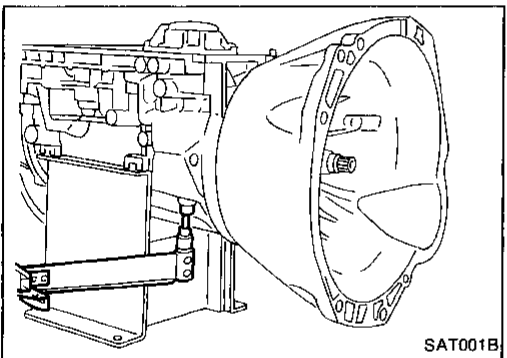
### Assembly (Cont'd)



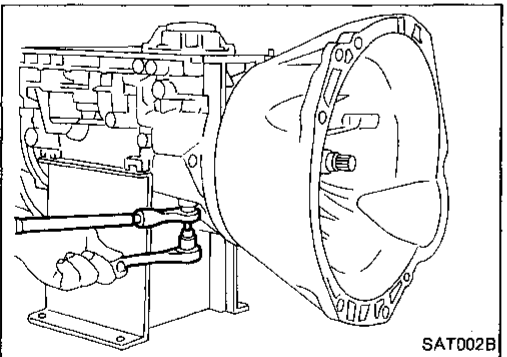
- b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.



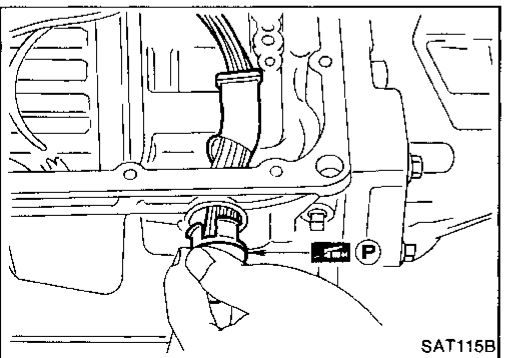
- c. Install converter housing on transmission case.



10. Adjust brake band.
  - a. Tighten anchor end bolt to specified torque.  
**Anchor end bolt:**  
☐: 4 - 6 N·m  
(0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)
  - b. Back off anchor end bolt two and a half turns.



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



11. Install terminal cord assembly.
  - a. Install O-ring on terminal cord assembly.
    - **Apply petroleum jelly to O-ring.**
  - b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.

# ASSEMBLY

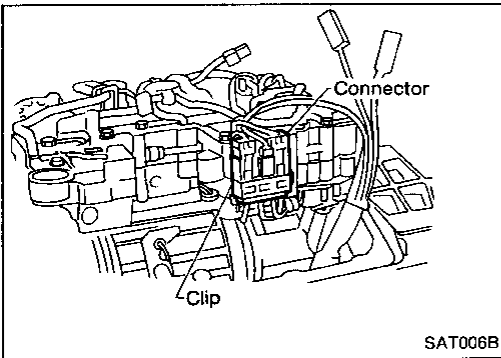
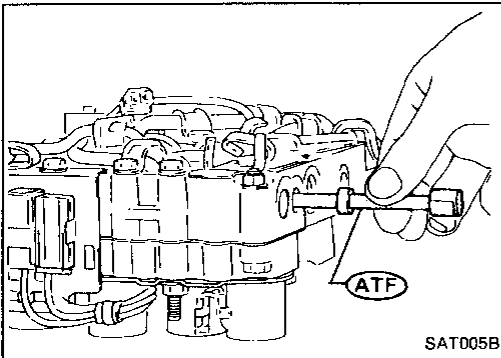
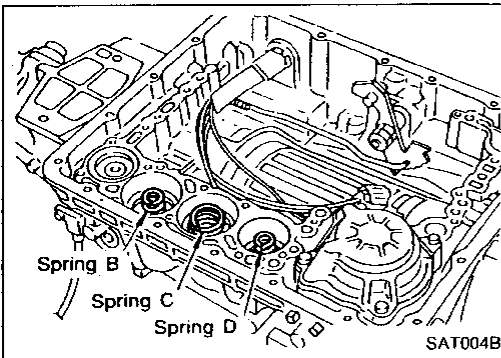
## Assembly (Cont'd)

12. Install control valve assembly.

a. Install accumulator piston return springs B, C and D.

**Free length of return springs:**

Unit: mm (in)			
Accumulator	B	C	D
Free length	66 (2.60)	45 (1.77)	58.4 (2.299)



b. Install manual valve on control valve.

● **Apply A.T.F. to manual valve.**

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

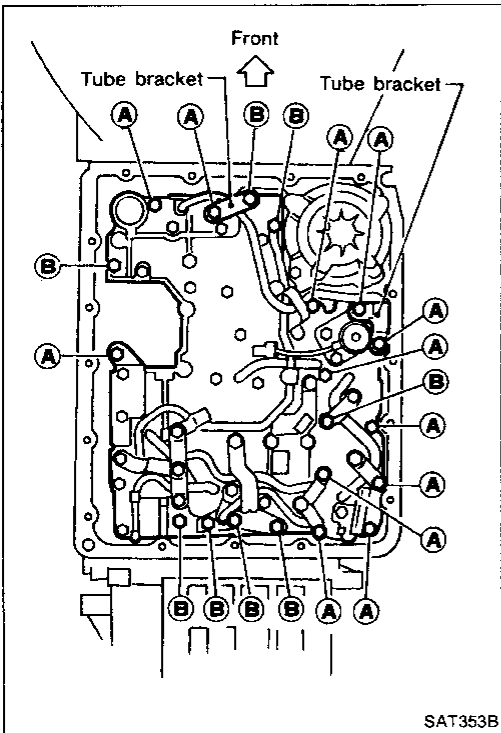
d. Install connector clip.

e. Install control valve assembly on transmission case.

f. Install connector tube brackets and tighten bolts **(A)** and **(B)**.

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

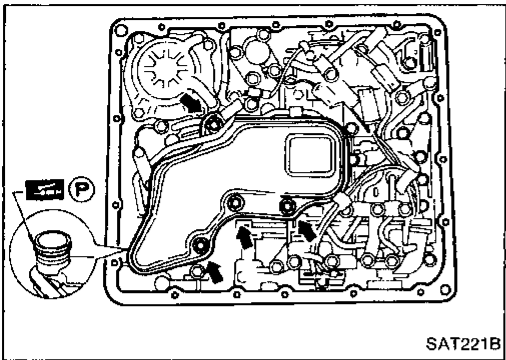
Bolt symbol	ℓ mm (in)	 ℓ
<b>(A)</b>	33 (1.30)	
<b>(B)</b>	45 (1.77)	



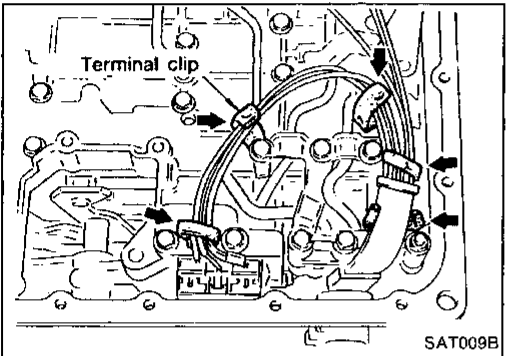
GI  
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## ASSEMBLY

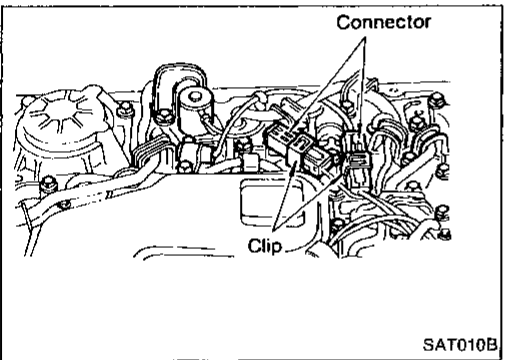
### Assembly (Cont'd)



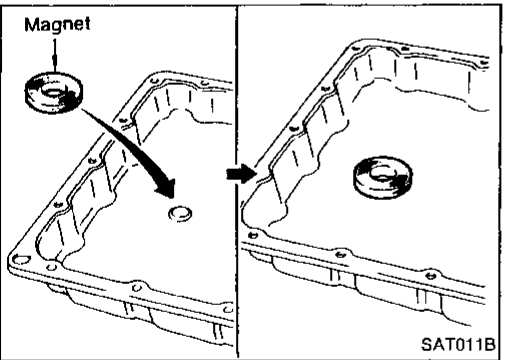
- g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**
- h. Install oil strainer on control valve.



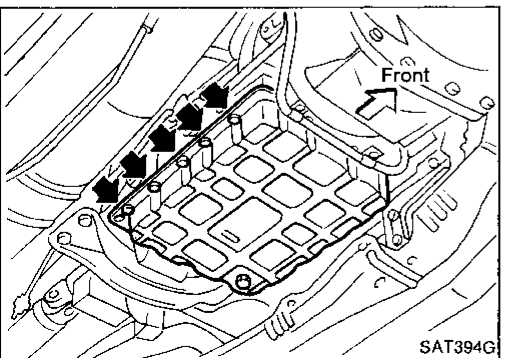
- i. Securely fasten terminal harness with clips.



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



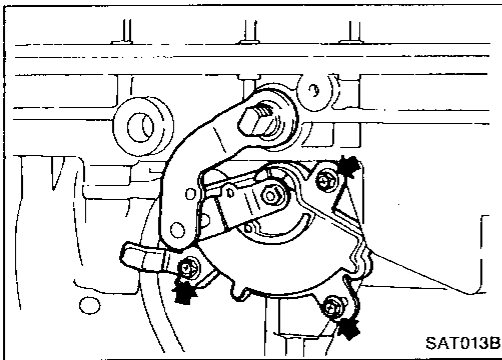
- 13. Install oil pan.
- a. Attach a magnet to oil pan.



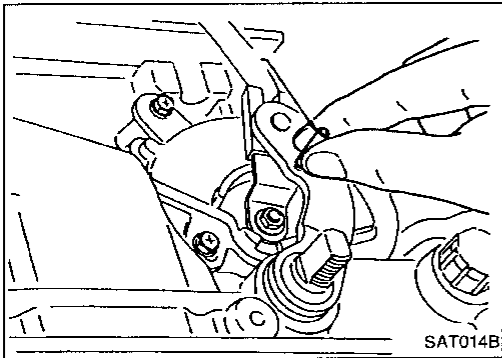
- b. Install oil pan gasket on transmission case.
- c. Install oil pan and bracket on transmission case.
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

## ASSEMBLY

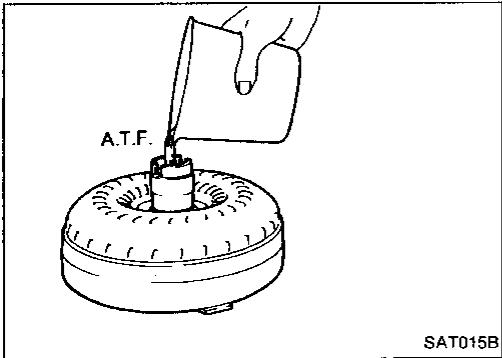
### Assembly (Cont'd)



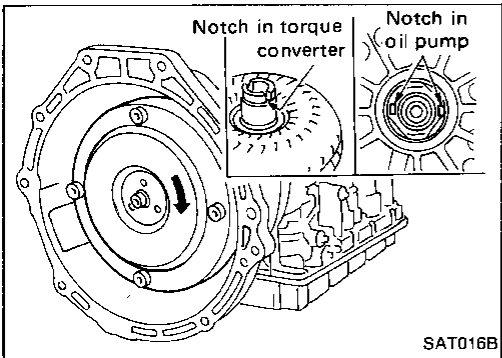
14. Install inhibitor switch.
  - a. Check that manual shaft is in "1" position.
  - b. Temporarily install inhibitor switch on manual shaft.
  - c. Move manual shaft to "N".



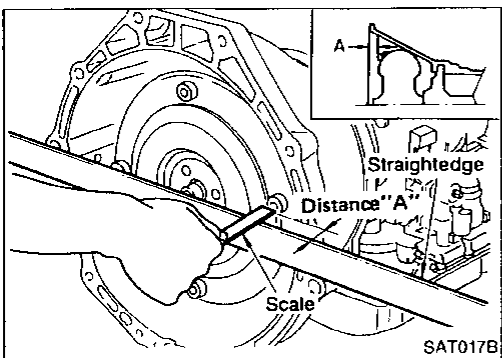
- d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



15. Install torque converter.
  - a. Pour A.T.F. into torque converter.
    - Approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of fluid are required for a new torque converter.
    - When reusing old torque converter, add the same amount of fluid as was drained.



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



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

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

GI

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# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## General Specifications

Engine	KA24DE
Automatic transmission model	RE4R01A
Transmission model code number	45X64
Stall torque ratio	2.0 : 1
Transmission gear ratio	
1st	2.785
2nd	1.545
Top	1.000
O.D.	0.694
Reverse	2.272
Recommended oil	Genuine Nissan ATF or equivalent type DEXRON™II
Oil capacity   ℓ (US qt, Imp qt)	8.3 (8-3/4, 7-1/4)

## Specifications and Adjustment

### VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)						
	D <sub>1</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>4</sub>	D <sub>4</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>1</sub>	1 <sub>2</sub> → 1 <sub>1</sub>
Full throttle	56 - 60 (35 - 37)	101 - 109 (63 - 68)	158 - 168 (98 - 104)	152 - 162 (94 - 101)	91 - 99 (57 - 62)	40 - 44 (25 - 27)	53 - 57 (33 - 35)
Half throttle	39 - 43 (24 - 27)	74 - 80 (46 - 50)	112 - 120 (70 - 75)	56 - 64 (35 - 40)	27 - 33 (17 - 21)	10 - 14 (6 - 9)	53 - 57 (33 - 35)

### VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D <sub>4</sub> ]	159 - 167 (99 - 104)	153 - 161 (95 - 100)
	OFF [D <sub>3</sub> ]	101 - 109 (63 - 68)	91 - 99 (57 - 62)
Half throttle	ON [D <sub>4</sub> ]	112 - 120 (70 - 75)	101 - 109 (63 - 68)
	OFF [D <sub>3</sub> ]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

### STALL REVOLUTION

Stall revolution rpm
2,050 - 2,250

### LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm <sup>2</sup> , psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.3 - 4.7, 61 - 67)	588 - 628 (6.0 - 6.4, 85 - 91)
Stall	1,020 - 1,098 (10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.5 - 15.3, 206 - 218)

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Specifications and Adjustment (Cont'd)

### RETURN SPRINGS

Unit: mm (in)

Parts		Part No.	Free length	Outer diameter		
Control valve	Upper body	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)	GI
		Pressure regulator valve spring	31742-41X24	44.0 (1.732)	14.0 (0.551)	
		Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)	MA
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)	EM
		4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	
		Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	LC
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	EF & EC
		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	
		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)	FE
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)	
		Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)	CL
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)	
		Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)	MT
			Lower body	Modifier accumulator piston spring	31742-27X70	31.4 (1.236)
	1st reducing valve spring	31756-41X05		25.4 (1.000)	6.75 (0.2657)	
	3-2 timing valve spring	31742-41X08		20.55 (0.8091)	6.75 (0.2657)	
	Servo charger valve spring	31742-41X06		23.0 (0.906)	6.7 (0.264)	
Reverse clutch	16 pcs	31505-41X02	19.69 (0.7752)	11.6 (0.457)	AT	
High clutch	16 pcs	31505-21X03	22.1 (0.870)	11.6 (0.457)		
Forward clutch (Overrun clutch)	20 pcs	31505-41X01	35.77 (1.4083)	9.7 (0.382)		
Low & reverse brake	18 pcs	31521-21X00	23.7 (0.933)	11.6 (0.457)		
Band servo	Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)	PD	
	Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)		
	Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)	FA	
Accumulator	Accumulator A	31605-41X02	43.0 (1.693)	—		
	Accumulator B	31605-41X10	66.0 (2.598)	—	RA	
	Accumulator C	31605-41X09	45.0 (1.772)	—		
	Accumulator D	41605-41X06	58.4 (2.299)	—	BR	

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Specifications and Adjustment (Cont'd)

### ACCUMULATOR O-RING

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

### CLUTCHES AND BRAKES

Reverse clutch		
Number of drive plates	2	
Number of driven plates	2	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	1.2 (0.047)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.6 (0.181)	31537-42X01
	4.8 (0.189)	31537-42X02
	5.0 (0.197)	31537-42X03
	5.2 (0.205)	31537-42X04
5.4 (0.213)	31537-42X05	
High clutch		
Number of drive plates	4	
Number of driven plates	7	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.8 - 2.2 (0.071 - 0.087)	
Allowable limit	3.0 (0.118)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.0 (0.118)	31537-41X69
	3.2 (0.126)	31537-41X70
	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	

Forward clutch		
Number of drive plates	5	
Number of driven plates	5	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.45 - 0.85 (0.0177 - 0.0335)	
Allowable limit	1.85 (0.0728)	
Thickness of retaining plate	Thickness mm (in)	Part number
	8.0 (0.315)	31537-41X00
	8.2 (0.323)	31537-41X01
	8.4 (0.331)	31537-41X02
	8.6 (0.339)	31537-41X03
	8.8 (0.346)	31537-41X04
	9.0 (0.354)	31537-41X05
9.2 (0.362)	31537-41X06	
Overrun clutch		
Number of drive plates	3	
Number of driven plates	5	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.0 - 1.4 (0.039 - 0.055)	
Allowable limit	2.0 (0.079)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-41X79
	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
5.2 (0.205)	31537-41X20	



# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## Specifications and Adjustment (Cont'd)

<b>Low &amp; reverse brake</b>		
Number of drive plates		6
Number of driven plates		6
Thickness of drive plate mm (in)		
Standard		2.0 (0.079)
Wear limit		1.8 (0.071)
Clearance mm (in)		
Standard		0.7 - 1.1 (0.028 - 0.043)
Allowable limit		2.3 (0.091)
Thickness of retaining plate	Thickness mm (in)	Part number
	9.0 (0.354)	31667-41X05
	9.2 (0.362)	31667-41X06
	9.4 (0.370)	31667-41X09
	9.6 (0.378)	31667-41X10
	9.8 (0.386)	31667-41X18
	10.0 (0.394)	31667-41X19
<b>Brake band</b>		
Anchor end bolt tightening torque N-m (kg-m, ft-lb)		4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Number of returning revolutions for anchor end bolt		2.5

### OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

### TOTAL END PLAY

Total end play "T <sub>1</sub> "	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06	

### REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T <sub>2</sub> "	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06	

### REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolutions for lock nut	1
Lock nut tightening torque	11 - 15 N-m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)
Distance between end of clutch housing and torque converter	26.0 mm (1.024 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

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