

## SECTION **AT**

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**When you read wiring diagrams:**

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

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## PRECAUTIONS AND PREPARATION

### Supplemental Restraint System (SRS) “AIR BAG”

The Supplemental Restraint System “AIR BAG”, used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

#### **WARNING:**

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or on the complete harness, for easy identification.

#### **Precautions**

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- 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 ATF to all parts. Apply petroleum jelly to protect O-rings and seals, hold small bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- Replace ATF cooler if excessive foreign material is found in oil pan or is clogging strainer. Refer to “ATF COOLER SERVICE” below.
- After overhaul, refill the transaxle with new ATF.
- When the A/T drain plug is removed, only some of the fluid is drained. Old A/T fluid will remain in torque converter and ATF cooling system.  
Always follow the procedures under “Changing A/T Fluid” in the MA section when changing A/T fluid.

#### **Service Notice or Precautions**

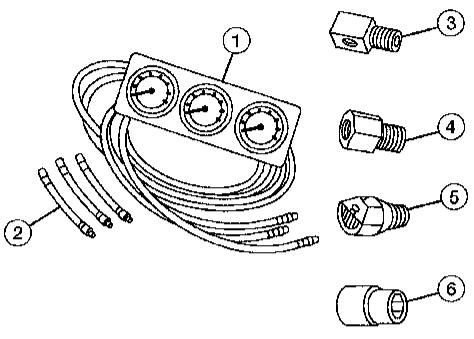
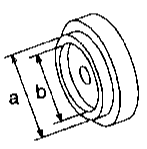
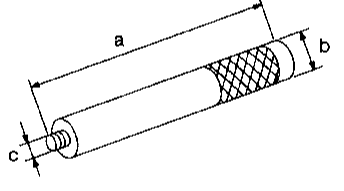
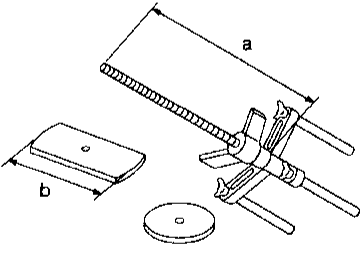
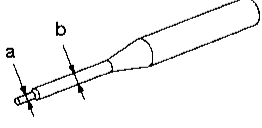
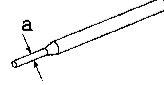
##### **ATF COOLER SERVICE**

Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer. Replace radiator assembly with a new one. Flush cooler lines using cleaning solvent and compressed air.

# PRECAUTIONS AND PREPARATION



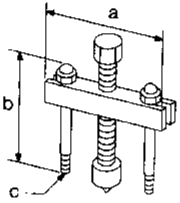
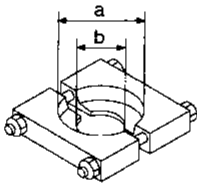
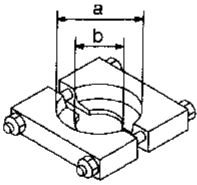
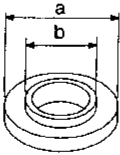
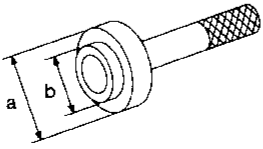
## Special Service Tools

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

Tool number (Kent-Moore No.) Tool name	Description		
(J34301-C) Oil pressure gauge set ① (J34301-1) Oil pressure gauge ② (J34301-2) Hoses ③ (J34298) Adapter ④ (J34282-2) Adapter ⑤ (790-301-1230-A) 60° Adapter ⑥ (J34301-15) Square socket	 <p>AAT896</p>	Measuring line pressure and governor pressure	GI MA EM LC EC FE CL
KV31103000 (J38982) Drift	 <p>NT105</p>	Installing differential oil seal (Use with ST35325000.)  <b>a: 59 mm (2.32 in) dia.</b> <b>b: 49 mm (1.93 in) dia.</b>	MT <b>AT</b>
ST35325000 ( — ) Drift	 <p>NT417</p>	Installing differential oil seal (Use with KV31103000.)  <b>a: 215 mm (8.46 in)</b> <b>b: 25 mm (0.98 in) dia.</b> <b>c: M12 x 1.5P</b>	FA RA BR
KV31103200 (J34285-A and J34285-87) Clutch spring compressor	 <p>NT423</p>	Removing and installing clutch return spring  <b>a: 320 mm (12.60 in)</b> <b>b: 174 mm (6.85 in)</b>	ST RS BT
ST23540000 (J25689-A) Pin punch	 <p>NT442</p>	Removing and installing parking rod plate, manual plate and differential pinion mate shaft retaining pins  <b>a: 2.3 mm (0.091 in) dia.</b> <b>b: 4 mm (0.16 in) dia.</b>	HA EL
KV32101000 (J25689-A) Pin punch	 <p>NT410</p>	Installing throttle lever and manual shaft retaining pins  <b>a: 4 mm (0.16 in) dia.</b>	10X

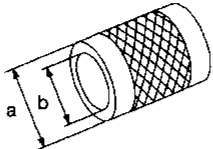
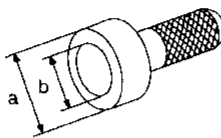
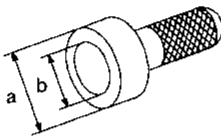
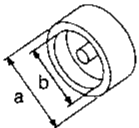
# PRECAUTIONS AND PREPARATION

## Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description
ST25710000 ( — ) Pin punch	 <p>Aligning groove of manual shaft and hole of transmission case</p> <p><b>a: 2 mm (0.08 in) dia.</b></p>
KV381054S0 (J34286) Puller	 <ul style="list-style-type: none"> <li>● Removing idler gear bearing outer race</li> <li>● Removing differential side oil seals</li> <li>● Removing output shaft bearing outer race from bearing retainer</li> <li>● Removing output gear bearing outer race from bearing retainer</li> </ul> <p><b>a: 250 mm (9.84 in)</b> <b>b: 160 mm (6.30 in)</b></p>
ST27180001 (J25726-A) Puller	 <ul style="list-style-type: none"> <li>● Removing idler gear</li> <li>● Removing output gear</li> </ul> <p><b>a: 100 mm (3.94 in)</b> <b>b: 110 mm (4.33 in)</b> <b>c: M8 x 1.25P</b></p>
ST30031000 (J22912-1) Puller	 <p>Removing reduction gear bearing inner race</p> <p><b>a: 90 mm (3.54 in) dia.</b> <b>b: 50 mm (1.97 in) dia.</b></p>
ST30021000 (J22912-1) Puller	 <p>Removing differential side bearing</p> <p><b>a: 110 mm (4.33 in) dia.</b> <b>b: 68 mm (2.68 in) dia.</b></p>
ST35272000 (J26092) Drift	 <ul style="list-style-type: none"> <li>● Installing reduction gear bearing inner race</li> <li>● Installing idler gear bearing inner race</li> <li>● Installing output gear bearing inner race</li> </ul> <p><b>a: 72 mm (2.83 in) dia.</b> <b>b: 35.5 mm (1.398 in) dia.</b></p>
ST37830000 ( — ) Drift	 <p>Installing idler gear bearing outer race</p> <p><b>a: 62 mm (2.44 in) dia.</b> <b>b: 39 mm (1.54 in) dia.</b></p>

# PRECAUTIONS AND PREPARATION

## Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
ST33200000 (J37067) Drift	 <p>NT091</p>	Installing differential side bearing  <b>a: 60 mm (2.36 in) dia.</b> <b>b: 44.5 mm (1.752 in) dia.</b>
ST35271000 (J26091) Drift	 <p>NT115</p>	<ul style="list-style-type: none"> <li>● Installing idler gear</li> <li>● Installing output gear</li> </ul> <b>a: 72 mm (2.83 in) dia.</b> <b>b: 63 mm (2.48 in) dia.</b>
ST33400001 (J26082) Drift	 <p>NT115</p>	<ul style="list-style-type: none"> <li>● Installing oil pump housing oil seal</li> <li>● Installing output gear bearing outer race onto bearing retainer</li> </ul> <b>a: 60 mm (2.36 in) dia.</b> <b>b: 47 mm (1.85 in) dia.</b>
KV40104840 ( — ) Drift	 <p>NT108</p>	Installing output shaft bearing outer race onto bearing retainer  <b>a: 49 mm (1.93 in) dia.</b> <b>b: 42 mm (1.65 in) dia.</b>

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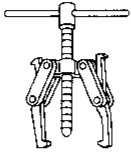
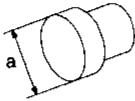
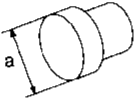
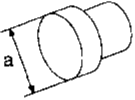

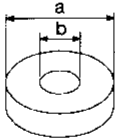
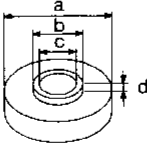
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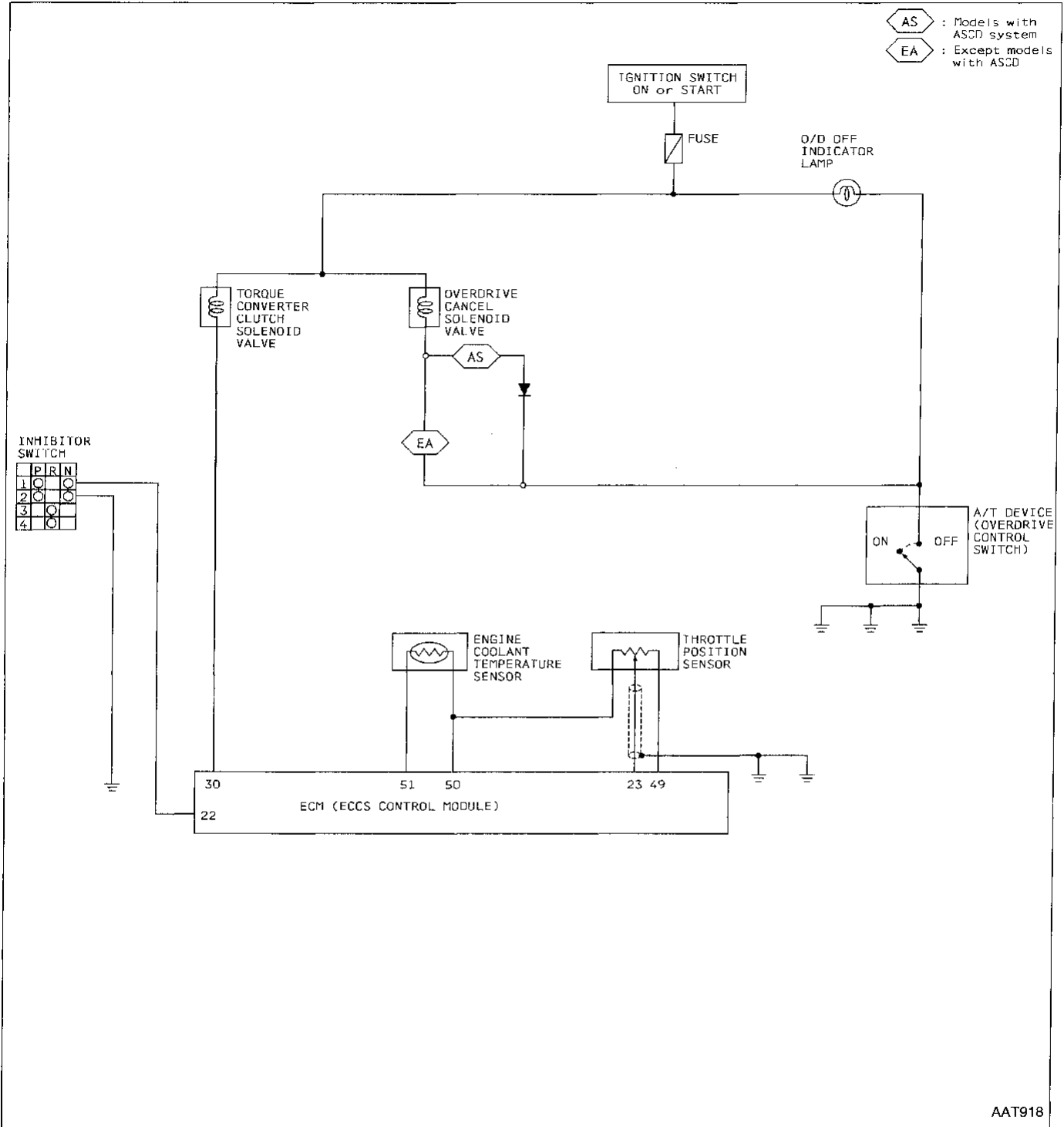
# PRECAUTIONS AND PREPARATION

## Commercial Service Tools

Tool name	Description
Puller	<div style="display: flex; align-items: center;">  <ul style="list-style-type: none"> <li>● Removing idler gear bearing inner race</li> <li>● Removing and installing band servo piston snap ring</li> <li>● Removing output gear bearing inner race</li> <li>● Removing differential side bearing</li> </ul> </div> <p>NT077</p>
Drift	<div style="display: flex; align-items: center;">  <p>Removing idler gear bearing inner race</p> </div> <p>NT109</p> <p><b>a: 34 mm (1.34 in) dia.</b></p>
Drift	<div style="display: flex; align-items: center;">  <p>Installing needle bearing onto bearing retainer</p> </div> <p>NT109</p> <p><b>a: 36 mm (1.42 in) dia.</b></p>
Drift	<div style="display: flex; align-items: center;">  <ul style="list-style-type: none"> <li>● Installing output shaft bearing</li> <li>● Removing output shaft bearing</li> <li>● Removing output gear bearing inner race</li> </ul> </div> <p>NT109</p> <p><b>a: 33 mm (1.30 in) dia.</b></p>
Drift	<div style="display: flex; align-items: center;">  <p>Removing differential side bearing</p> </div> <p>NT109</p> <p><b>a: 38 mm (1.50 in) dia.</b></p>
Drift	<div style="display: flex; align-items: center;">  <p>Removing output shaft bearing inner race</p> </div> <p>NT110</p> <p><b>a: 70 mm (2.76 in) dia.</b> <b>b: 35 mm (1.38 in) dia.</b></p>
Drift	<div style="display: flex; align-items: center;">  <p>Installing output shaft bearing inner race</p> </div> <p>NT111</p> <p><b>a: 70 mm (2.76 in) dia.</b> <b>b: 34 mm (1.34 in) dia.</b> <b>c: 30 mm (1.18 in) dia.</b> <b>d: 2 mm (0.08 in)</b></p>

# OVERALL SYSTEM

## Circuit Diagram



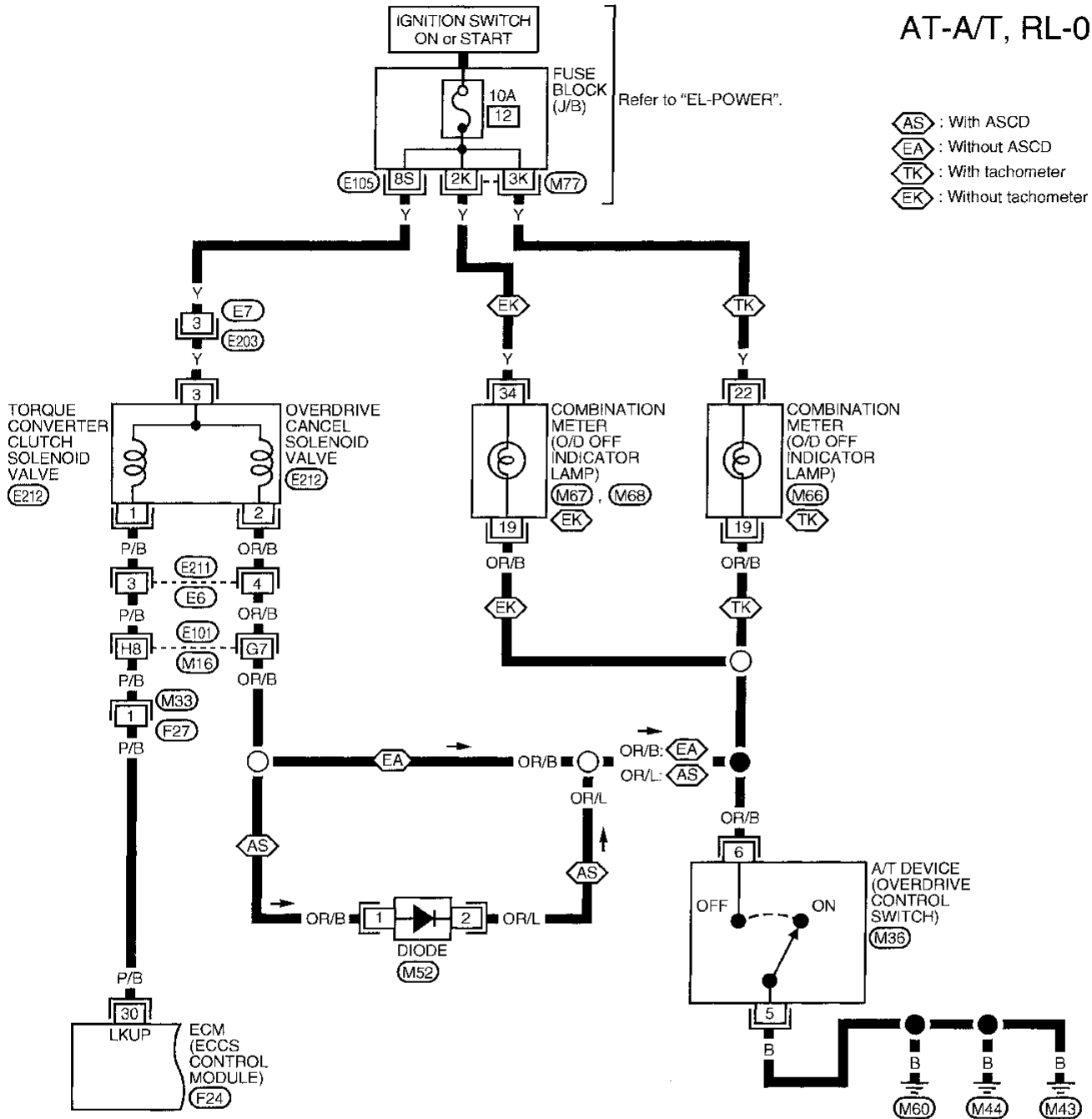
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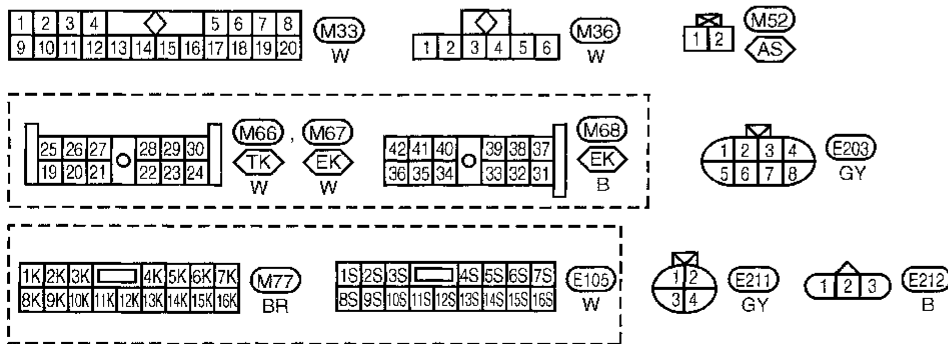
# OVERALL SYSTEM

## Wiring Diagram -A/T, RL-

AT-A/T, RL-01



- AS : With ASCD
- EA : Without ASCD
- TK : With tachometer
- EK : Without tachometer



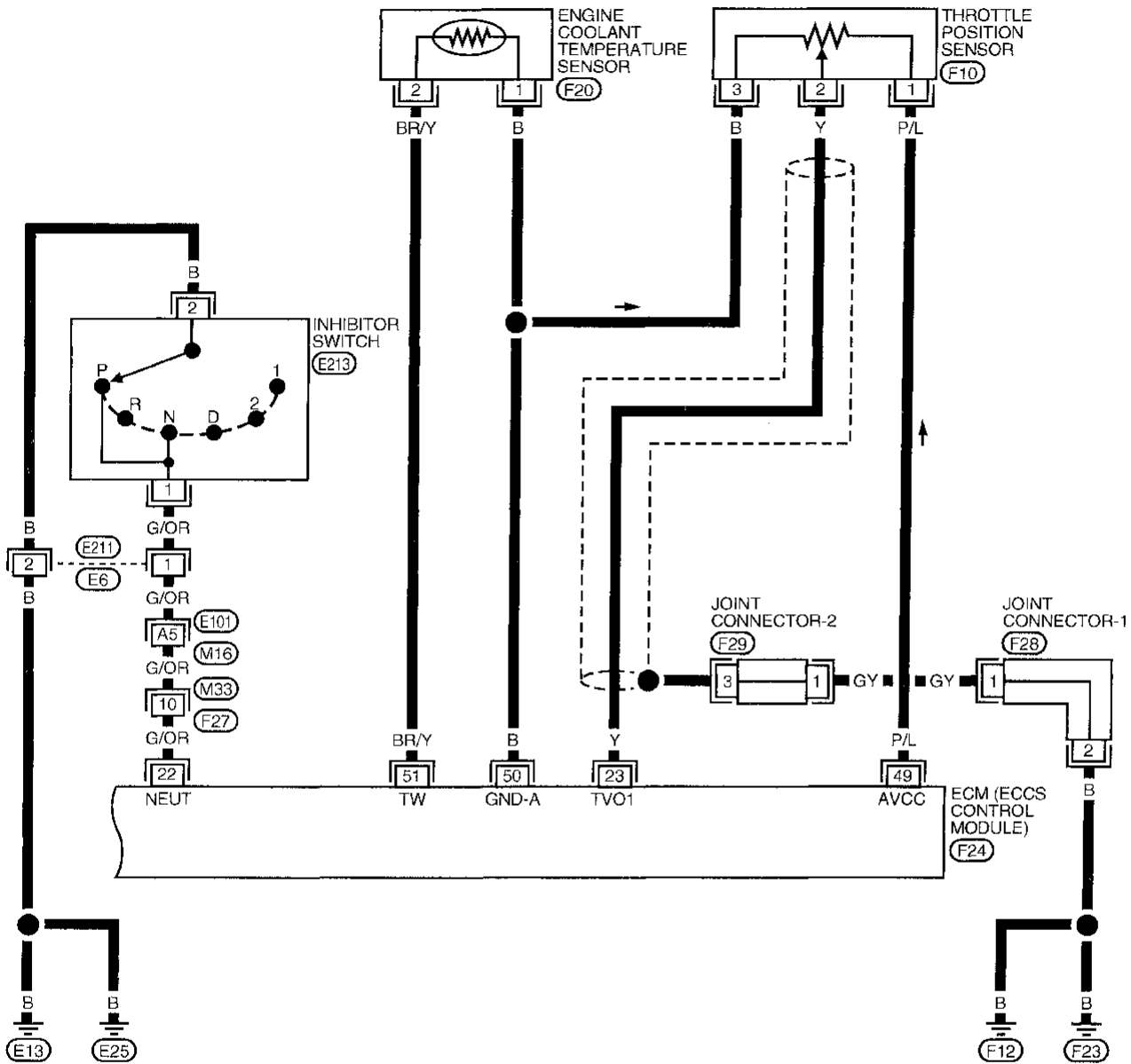
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M16, E101, F24

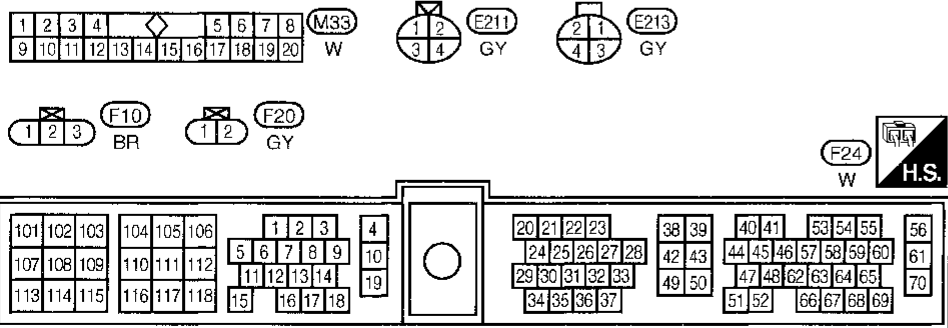
# OVERALL SYSTEM

## Wiring Diagram -A/T, RL- (Cont'd)

AT-A/T, RL-02



- GI
- MA
- EM
- LC
- EC
- FE
- CL
- MT
- AT**
- FA
- RA
- BR
- ST
- RS
- BT
- HA
- EL
- IDX

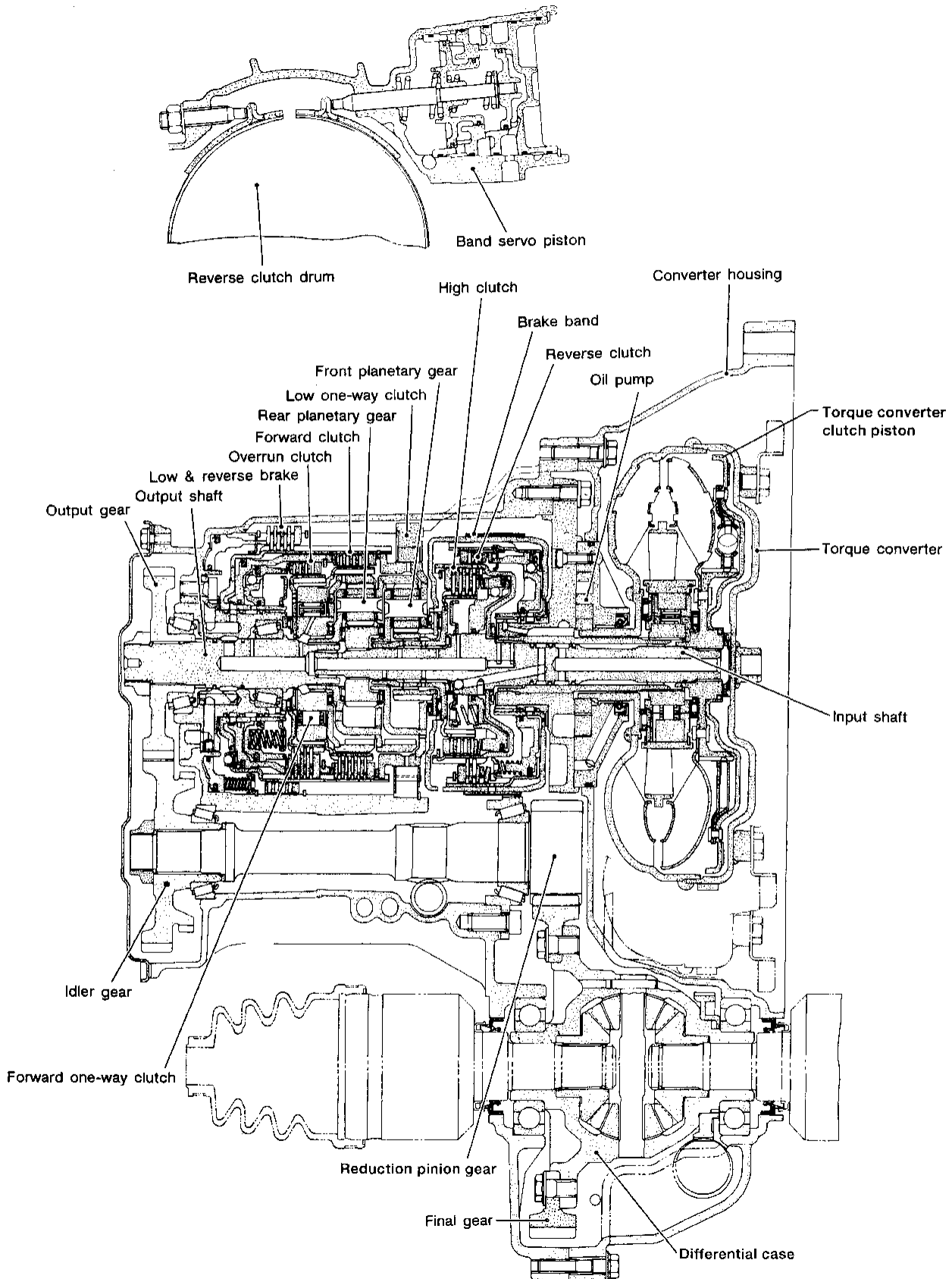


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- (M16) (E101)
- (F28)
- (F29)

# OVERALL SYSTEM

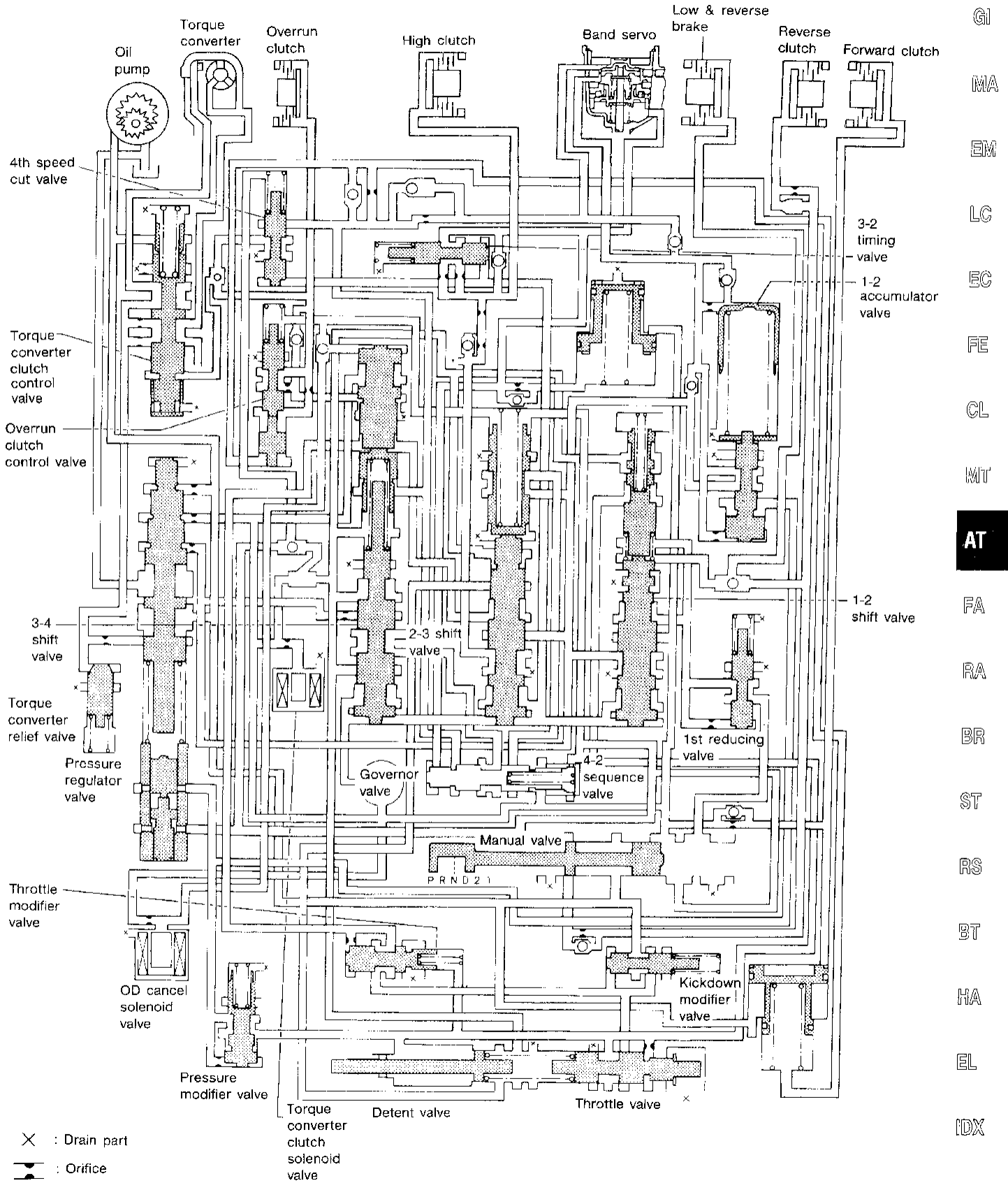
## Cross-sectional View



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# OVERALL SYSTEM

## Hydraulic Control Circuit



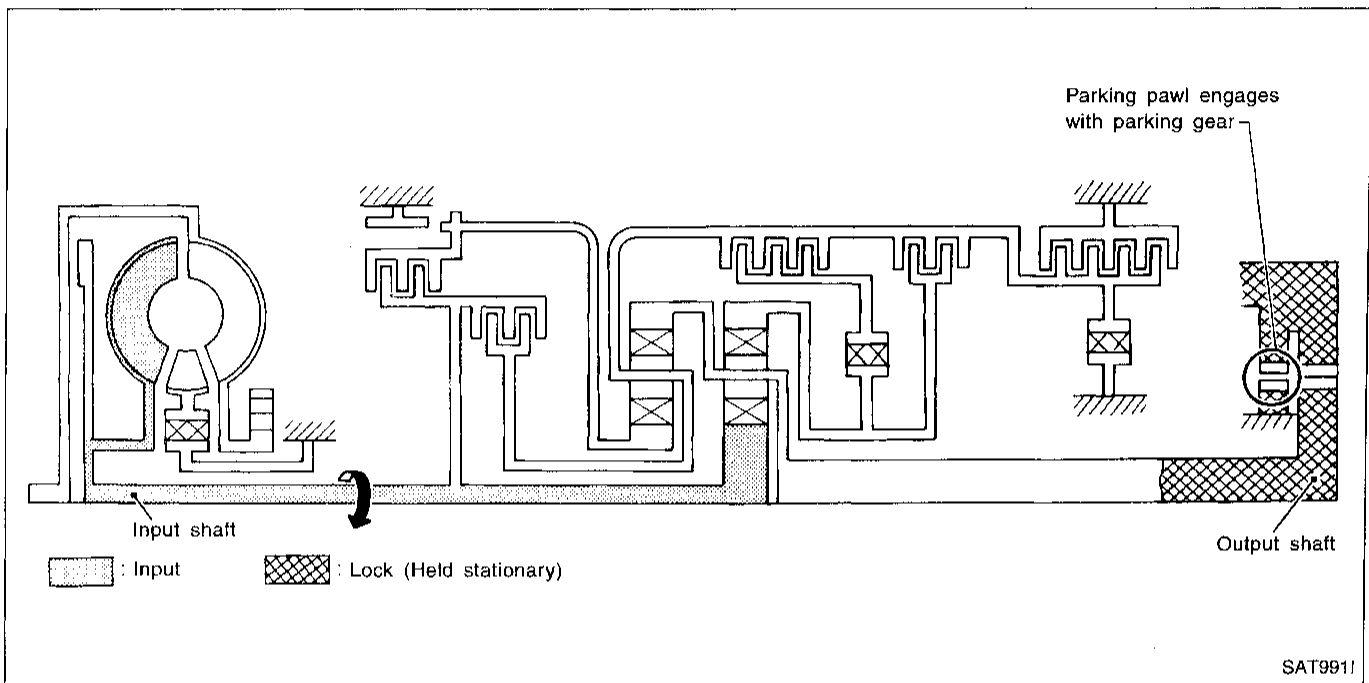
# OVERALL SYSTEM

## Shift Mechanism

### POWER TRANSMISSION

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

- "N" position  
Power from the input shaft is not transmitted to the output shaft because the clutches do not operate.
- "P" position  
Similar to the "N" position, the clutches do not operate. The parking pawl engages with the parking gear to mechanically hold the output shaft so that the power train is locked.

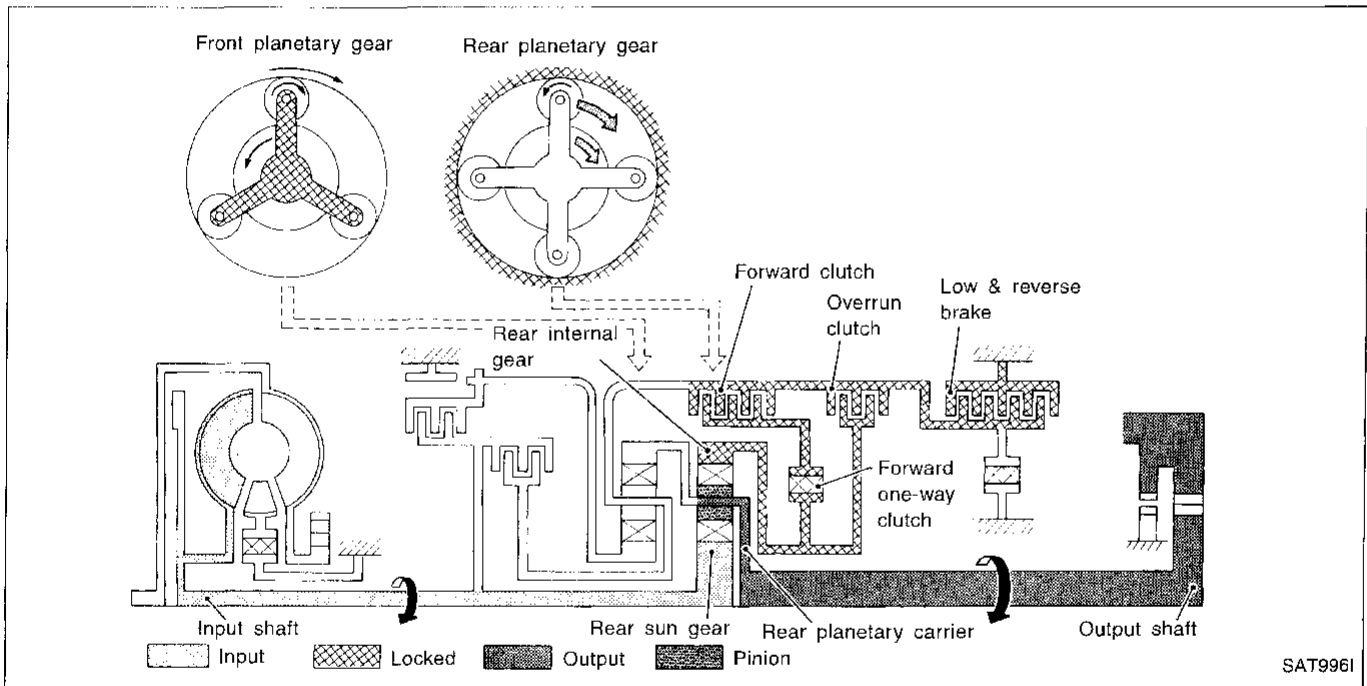


# OVERALL SYSTEM

## Shift Mechanism (Cont'd)

### "1<sub>1</sub>" position

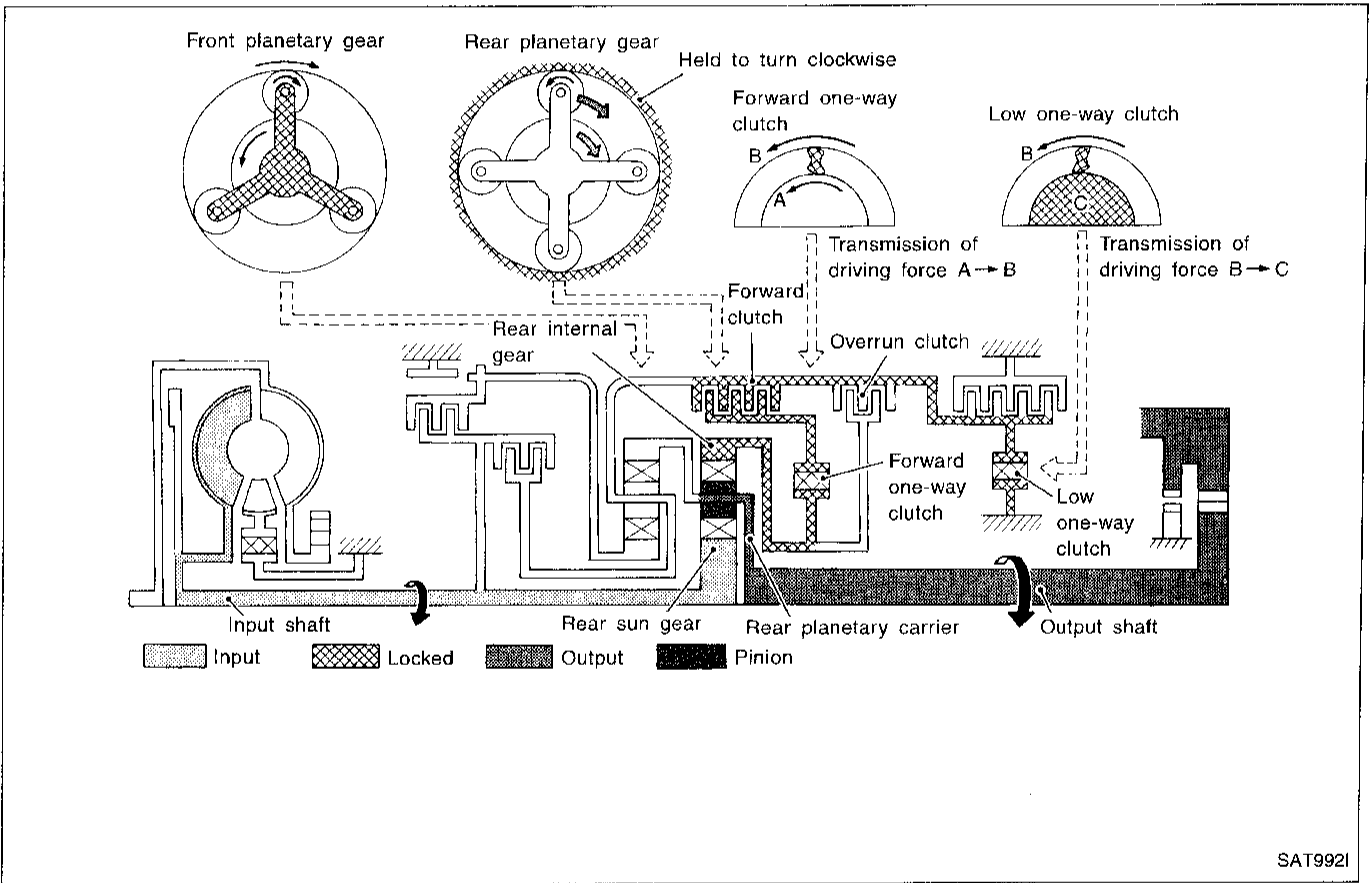
<ul style="list-style-type: none"> <li>● Forward clutch</li> <li>● Forward one-way clutch</li> <li>● Overrun clutch</li> <li>● Low and reverse brake</li> </ul>	<p>As overrun clutch engages, rear internal gear is locked by the operation of low and reverse brake.</p> <p>This is different from that of D<sub>1</sub> and 2<sub>1</sub>.</p>
<p>Engine brake</p>	<p>Overrun clutch always engages, therefore engine brake can be obtained when decelerating.</p>
<p>Power flow</p>	<pre style="text-align: center;">             Input shaft             ↓             Rear sun gear             ↓             Rear pinion gear             ↓             Rear planetary carrier             ↓             Output shaft         </pre>



# OVERALL SYSTEM Shift Mechanism (Cont'd)

## "D<sub>1</sub>" and "2<sub>1</sub>" positions

<ul style="list-style-type: none"> <li>● Forward one-way clutch</li> <li>● Forward clutch</li> <li>● Low one-way clutch</li> </ul>	<p>Rear internal gear is locked to rotate counterclockwise because of the functioning of these three clutches.</p>
<p><b>Overrun clutch</b> engagement conditions (Engine brake)</p>	<p>D<sub>1</sub>: Overdrive control switch "OFF" and throttle opening is less than 3/16 2<sub>1</sub>: Always engaged At D<sub>1</sub> and 2<sub>1</sub> positions, engine brake is not activated due to free turning of low one-way clutch.</p>
<p>Power flow</p>	<div style="text-align: center;"> <p>Input shaft</p> <p>↓</p> <p>Rear sun gear</p> <p>↓</p> <p>Rear planetary carrier</p> <p>↓</p> <p>Output shaft</p> </div>

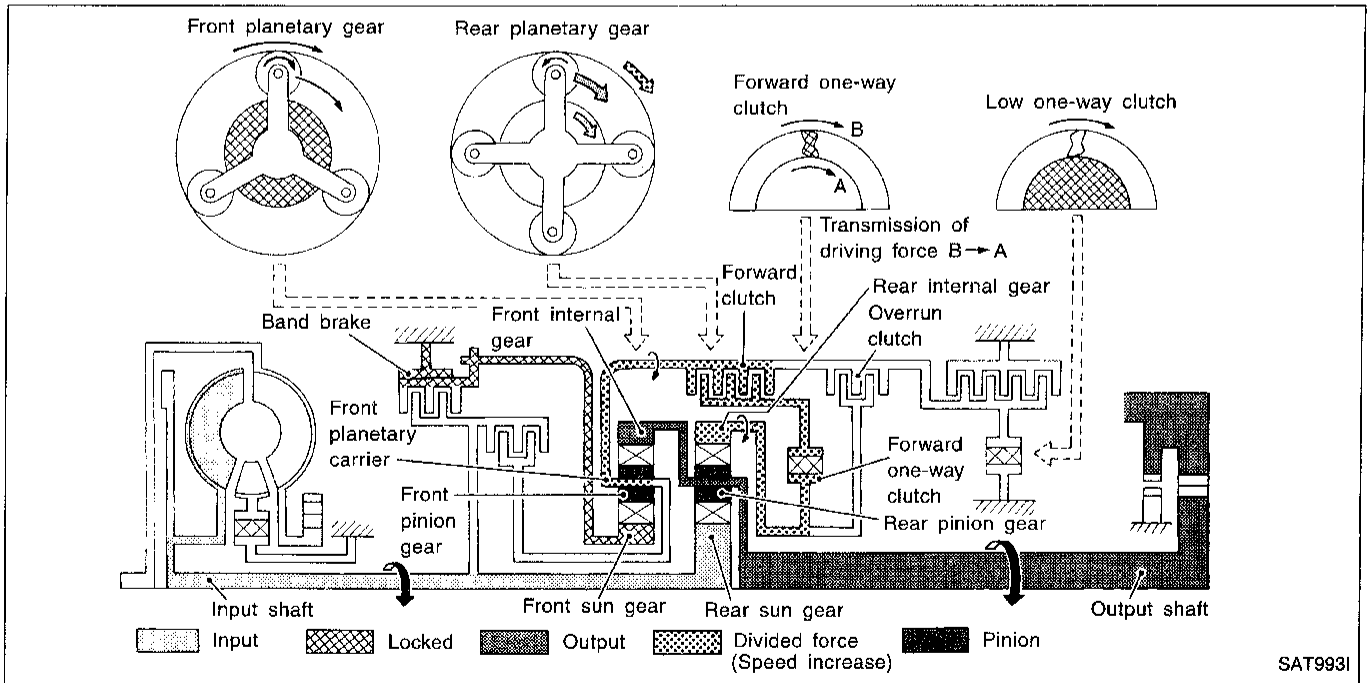


SAT992I

# OVERALL SYSTEM Shift Mechanism (Cont'd)

## “D<sub>2</sub>”, “2<sub>2</sub>” and “1<sub>2</sub>” positions

<ul style="list-style-type: none"> <li>● Forward clutch</li> <li>● Forward one-way clutch</li> <li>● Brake band</li> </ul>	<p>Rear sun gear drives rear planetary carrier and combined front internal gear. Front internal gear now rotates around front sun gear accompanying front planetary carrier.</p> <p>As front planetary carrier transfers the power to rear internal gear through forward clutch and forward one-way clutch, this rotation of rear internal gear increases the speed of rear planetary carrier compared with that of the 1st speed.</p>
<p><b>Overrun clutch engagement conditions</b></p>	<p>D<sub>2</sub>: Overdrive control switch “OFF” and throttle opening is less than 3/16</p> <p>2<sub>2</sub> and 1<sub>2</sub>: Always engaged</p>
<p>Power flow</p>	<pre> graph TD     IS[Input shaft] --&gt; RS[Rear sun gear]     RS --&gt; RP[Rear pinion gear]     RP --&gt; RPL[Rear planetary carrier]     RPL --&gt; OS[Output shaft]     RPL --&gt; FI[Front internal gear]     FI --&gt; FP[Front pinion gear]     FP --&gt; FPC[Front planetary carrier]     FPC --&gt; FC[Forward clutch]     FC --&gt; FOC[Forward one-way clutch]     FOC --&gt; RI[Rear internal gear]     RI --&gt; RP     </pre>



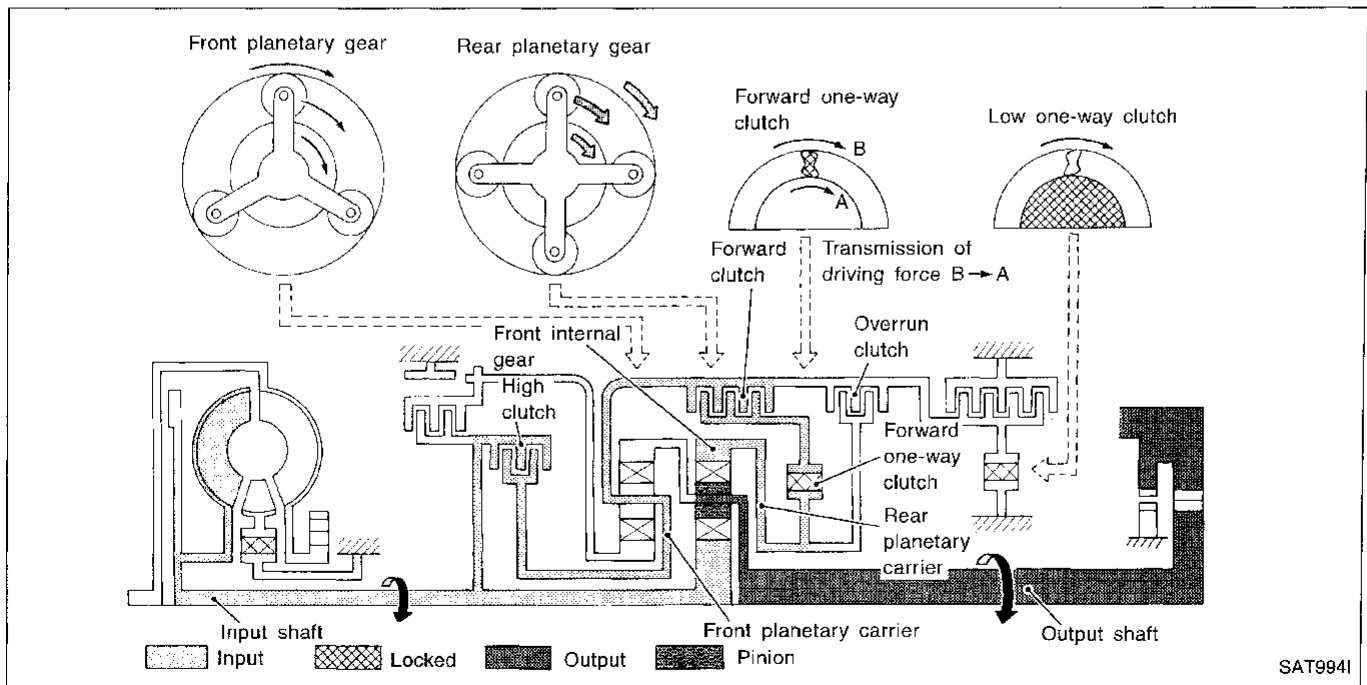


# OVERALL SYSTEM

## Shift Mechanism (Cont'd)

### "D<sub>3</sub>" position

<ul style="list-style-type: none"> <li>● High clutch</li> <li>● Forward clutch</li> <li>● Forward one-way clutch</li> </ul>	<p>Input power is transmitted to front planetary carrier through high clutch. And front planetary carrier is connected to rear internal gear by operation of forward clutch and forward one-way clutch. This rear internal gear rotation and another input (the rear sun gear) accompany rear planetary carrier to turn at the same speed.</p>
<p>Overrun clutch engagement conditions</p>	<p>D<sub>3</sub>: Overdrive control switch "OFF" and throttle opening is less than 3/16</p>
<p>Power flow</p>	<pre> graph TD     IS[Input shaft] --&gt; HC[High clutch]     HC --&gt; FC[Front carrier]     FC --&gt; FW[Forward clutch]     FW --&gt; FOWC[Forward one-way clutch]     FOWC --&gt; RIG[Rear internal gear]     RIG --&gt; RSG[Rear sun gear]     RSG --&gt; RIG     RIG --&gt; RPG[Rear pinion gear]     RSG --&gt; RPG     RPG --&gt; RPC[Rear planetary carrier]     RPC --&gt; OS[Output shaft]     </pre>

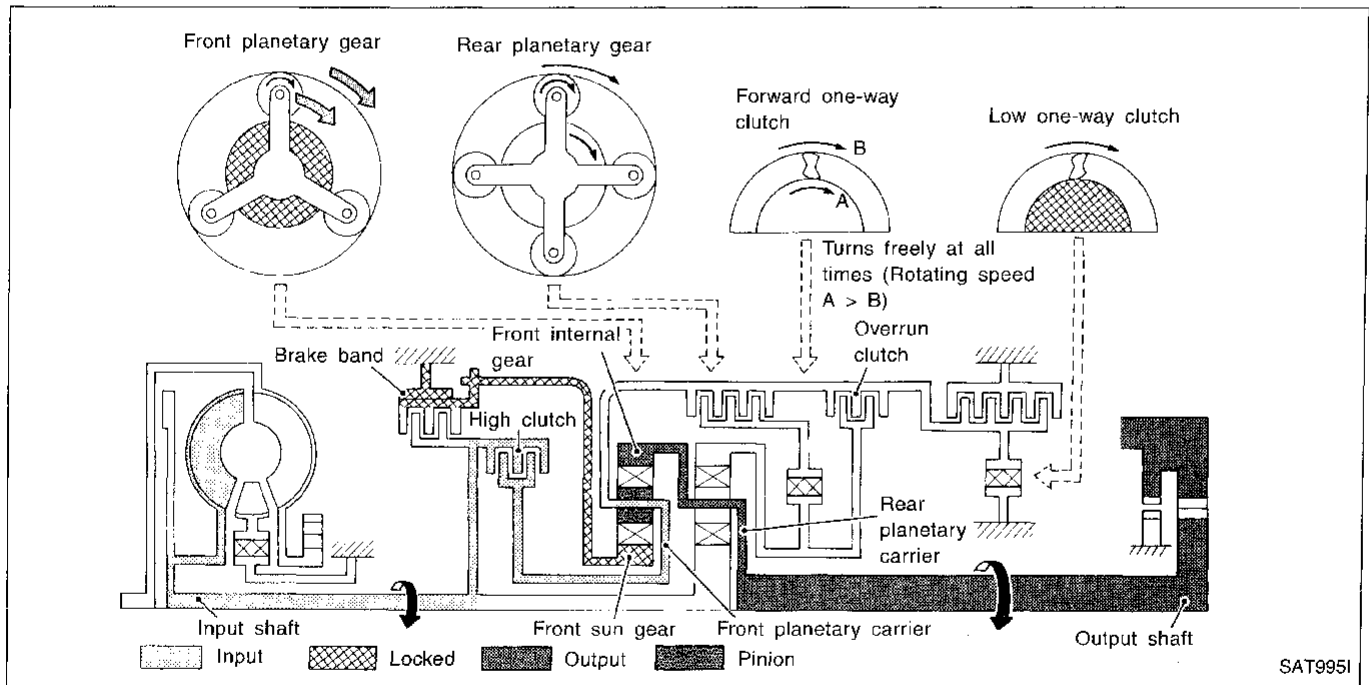


# OVERALL SYSTEM

## Shift Mechanism (Cont'd)

### "D<sub>4</sub>" (OD) position

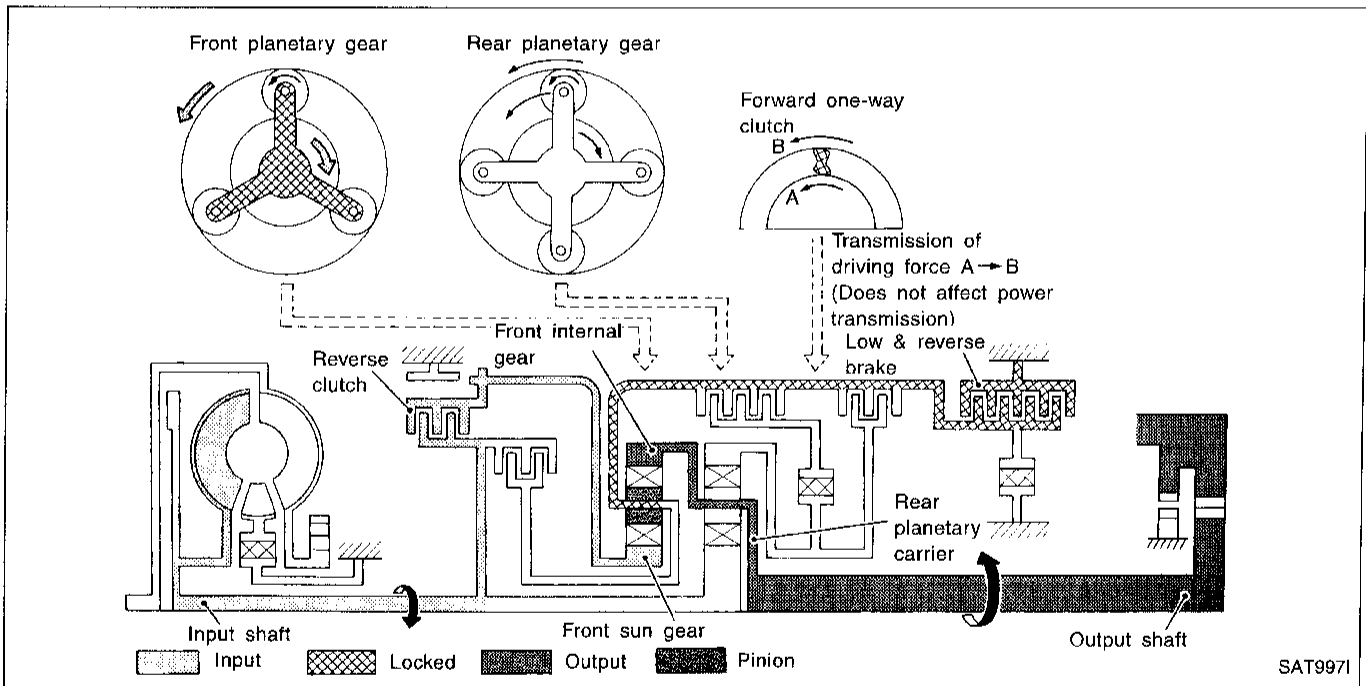
<ul style="list-style-type: none"> <li>● <b>High clutch</b></li> <li>● <b>Brake band</b></li> <li>● <b>Forward clutch</b> (Does not affect power transmission)</li> </ul>	<p>Input power is transmitted to front carrier through high clutch. This front carrier turns around the sun gear which is fixed by brake band and makes front internal gear (output) turn faster.</p>
<p>Engine brake</p>	<p>At D<sub>4</sub> position, there is no one-way clutch in the power transmission line and engine brake can be obtained when decelerating.</p>
<p>Power flow</p>	<pre style="text-align: center;">             Input shaft             ↓             High clutch             ↓             Front planetary carrier             ↓             Front pinion gear             ↓             Front internal gear             ↓             Rear planetary carrier             ↓             Output shaft         </pre>



# OVERALL SYSTEM Shift Mechanism (Cont'd)

## "R" position

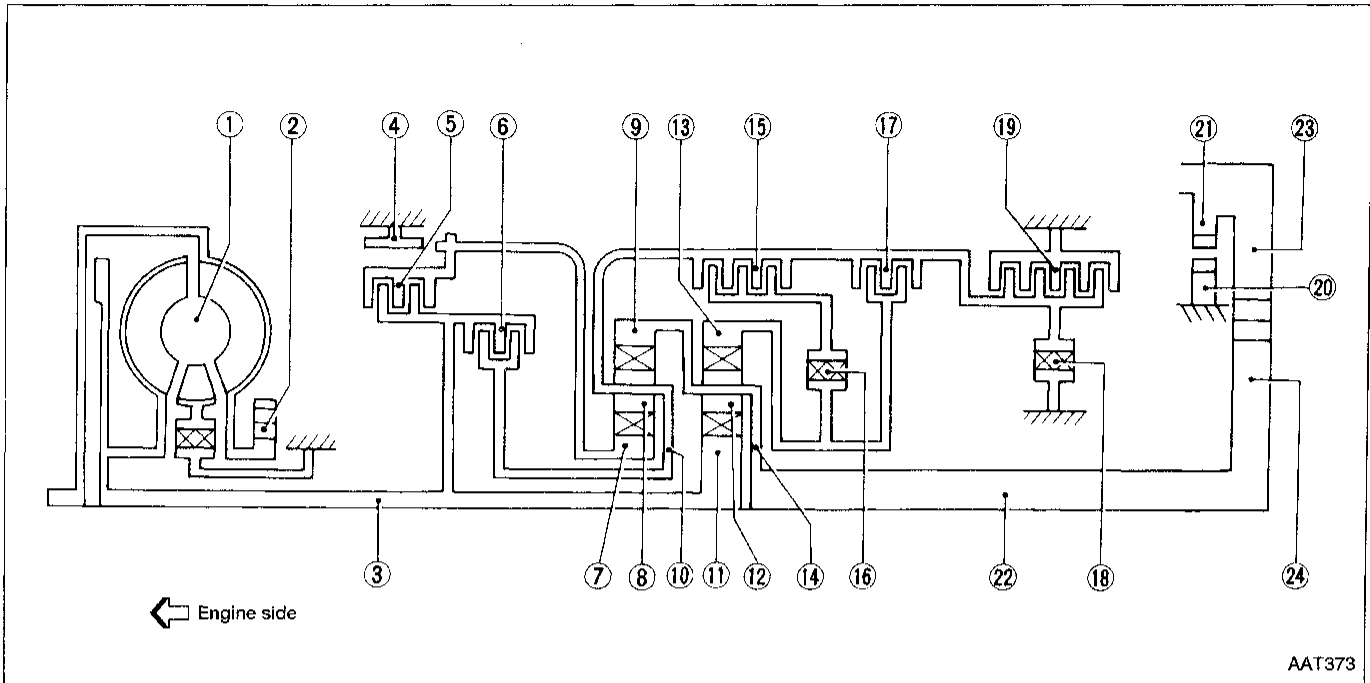
<ul style="list-style-type: none"> <li>● Reverse clutch</li> <li>● Low and reverse brake</li> </ul>	<p>Front planetary carrier is stationary because of the operation of low and reverse brake.</p> <p>Input power is transmitted to front sun gear through reverse clutch, which drives front internal gear in the opposite direction.</p>
<p>Engine brake</p>	<p>As there is no one-way clutch in the power transmission line, engine brake can be obtained when decelerating.</p>
<p>Power flow</p>	<pre style="text-align: center;">             Input shaft             ↓             Reverse clutch             ↓             Front sun gear             ↓             Front pinion gear             ↓             Front internal gear             ↓             Output shaft         </pre>



# OVERALL SYSTEM

## Shift Mechanism (Cont'd)

### CONSTRUCTION



- |                     |                           |                       |
|---------------------|---------------------------|-----------------------|
| ① Torque converter  | ⑨ Front internal gear     | ⑰ Overrun clutch      |
| ② Oil pump          | ⑩ Front planetary carrier | ⑱ Low one-way clutch  |
| ③ Input shaft       | ⑪ Rear sun gear           | ⑲ Low & reverse brake |
| ④ Brake band        | ⑫ Rear pinion gear        | ⑳ Parking pawl        |
| ⑤ Reverse clutch    | ⑬ Rear internal gear      | ㉑ Parking gear        |
| ⑥ High clutch       | ⑭ Rear planetary carrier  | ㉒ Output shaft        |
| ⑦ Front sun gear    | ⑮ Forward clutch          | ㉓ Idle gear           |
| ⑧ Front pinion gear | ⑯ Forward one-way clutch  | ㉔ Output gear         |

### FUNCTION OF CLUTCH AND BRAKE

Clutch and brake components	Abbr.	Function
⑤ Reverse clutch	R/C	To transmit input power to front sun gear ⑦.
⑥ High clutch	H/C	To transmit input power to front planetary carrier ⑩.
⑮ Forward clutch	F/C	To connect front planetary carrier ⑩ with forward one-way clutch ⑯.
⑰ Overrun clutch	O/C	To connect front planetary carrier ⑩ with rear internal gear ⑬.
④ Brake band	B/B	To lock front sun gear ⑦.
⑯ Forward one-way clutch	F/O.C	When forward clutch ⑮ is engaged, to stop rear internal gear ⑬ from rotating in opposite direction against engine revolution.
⑱ Low one-way clutch	L/O.C	To stop front planetary carrier ⑩ from rotating in opposite direction against engine revolution.
⑲ Low & reverse brake	L & R/B	To lock front planetary carrier ⑩.

GI  
 MA  
 EM  
 LC  
 EC  
 FE  
 CL  
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**AT**  
 FA  
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 EL  
 IDX

# OVERALL SYSTEM

## Shift Mechanism (Cont'd)

### CLUTCH AND BAND CHART

Shift position	Reverse clutch ⑤	High clutch ⑥	Forward clutch ⑮	Overrun clutch ⑰	Band servo			Forward one-way clutch ⑯	Low one-way clutch ⑱	Low & reverse brake ⑲	Lock-up	Remarks
					2nd apply	3rd release	4th apply					
P												PARK POSITION
R	○									○		REVERSE POSITION
N												NEUTRAL POSITION
D*4	1st		○	*1●				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd		○	*1○	○			●				
	3rd		○	○	*1○	*2⊗	⊗	●			*5○	
	4th		○	⊗		*3⊗	⊗	○			○	
2	1st		○	○				●	●			Automatic shift 1 ↔ 2 ↔ 3
	2nd		○	○	○			●				
1	1st		○	○				●	●	○		Locks (held stationary) in 1st speed 1 ← 2 ← 3
	2nd		○	○	○			●				

\*1: Operates when overdrive control 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, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.

\*3: Oil pressure is applied to 4th "apply" side in condition \*2 above, and brake band contracts.

\*4: A/T will not shift to 4th when overdrive control switch is set in OFF position.

\*5: Operates when overdrive control switch is OFF.

○ : Operates.

○ : Operates when throttle opening is less than 3/16, activating engine brake.

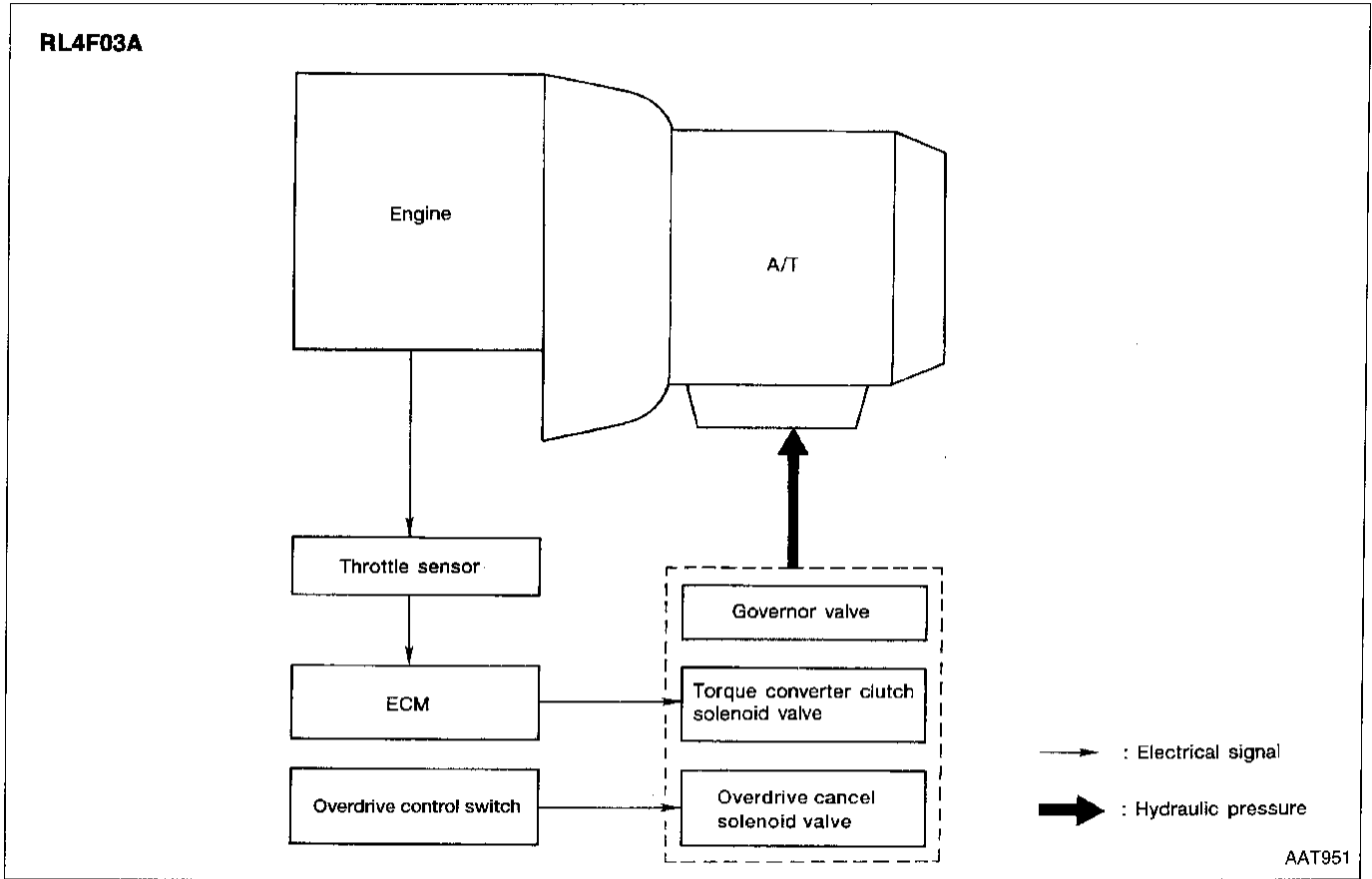
● : Operates during "progressive" acceleration.

⊗ : Operates but does not affect power transmission.

● : Operates when throttle opening is less than 3/16, but does not affect engine brake.

# OVERALL SYSTEM

## Control System



CI

MA

EM

LC

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FA

RA

BR

ST

RS

BT

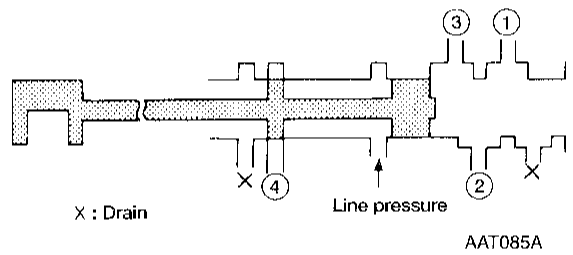
HA

EL

IDX

# OVERALL SYSTEM

## Function of Control Valves

Valve name	Function																																										
Detent valve	Serves as an auxiliary throttle valve which transmits piston stroke (proportional to throttle position) to throttle valve via spring. Throttle greater than 7/8 of full throttle requires higher line pressure so detent valve pushes throttle valve directly.																																										
Throttle valve	Regulates line pressure to throttle pressure (proportional to throttle position), that is, a reduced pressure which matches engine torque.																																										
Manual valve	<p>Directs line pressure to oil circuits corresponding to select positions.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 15%;">Position</th> <th style="width: 15%;">Circuit</th> <th style="width: 15%;">①</th> <th style="width: 15%;">②</th> <th style="width: 15%;">③</th> <th style="width: 15%;">④</th> </tr> </thead> <tbody> <tr> <td>P</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>R</td> <td></td> <td></td> <td></td> <td></td> <td>○</td> </tr> <tr> <td>N</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td></td> <td></td> <td></td> <td>○</td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td>○</td> <td>○</td> <td></td> </tr> <tr> <td>1</td> <td></td> <td>○</td> <td>○</td> <td>○</td> <td></td> </tr> </tbody> </table>  <p style="text-align: center;">X : Drain      Line pressure      AAT085A</p> <p>Hydraulic pressure drains when the selector lever is in N and P positions.</p>	Position	Circuit	①	②	③	④	P						R					○	N						D				○		2			○	○		1		○	○	○	
Position	Circuit	①	②	③	④																																						
P																																											
R					○																																						
N																																											
D				○																																							
2			○	○																																							
1		○	○	○																																							
Pressure regulator valve	Regulates oil under pressure discharged from oil pump to provide optimum line pressure in relation to driving conditions.																																										
<ul style="list-style-type: none"> <li>● 1-2 shift valve</li> <li>● 2-3 shift valve</li> <li>● 3-4 shift valve</li> </ul>	Switch oil circuits to engage or disengage clutches, brakes, etc., as well as to tighten or release brake bands, thereby providing automatic shifting.																																										
Overrun clutch control valve	Activates overrun clutch during "1" position driving.																																										
Pressure modifier valve	Serves as a signal supplementary valve to pressure regulator valve. Regulates pressure-modifier pressure (signal pressure) which controls optimum line pressure for all driving conditions.																																										
Kickdown modifier valve	Regulates (Decreases) line pressure to direct it to both throttle valve and throttle modifier valve.																																										
1-2 accumulator valve	Dampens the shock encountered when 2nd gear band servo contracts, and provides smooth shifting.																																										
3-2 timing valve	In downshifting from D <sub>3</sub> to D <sub>2</sub> , engine speed rapidly increases at low vehicle speeds but not at high vehicle speeds. When downshifting from D <sub>3</sub> to D <sub>2</sub> while operating above a specified speed, 3-2 timing valve delays draining speed of band servo 3rd release pressure. This creates a temporary neutral state to provide smooth downshifting.																																										
1st reducing valve	Regulates low & reverse brake pressure to dampen engine brake shocks when downshifting from 2nd gear to 1st gear in "1" position.																																										
Torque converter relief valve	Prevents an excessive increase in torque converter pressure.																																										
Throttle modifier valve	Regulates (Reduces) kickdown modifier pressure and directs it to both 3-4 and 2-3 shift valves, thereby dampening shift shocks.																																										
4th speed cut valve	Determines lock-up speed during 4th gear driving.																																										

# OVERALL SYSTEM

## Function of Control Valves (Cont'd)

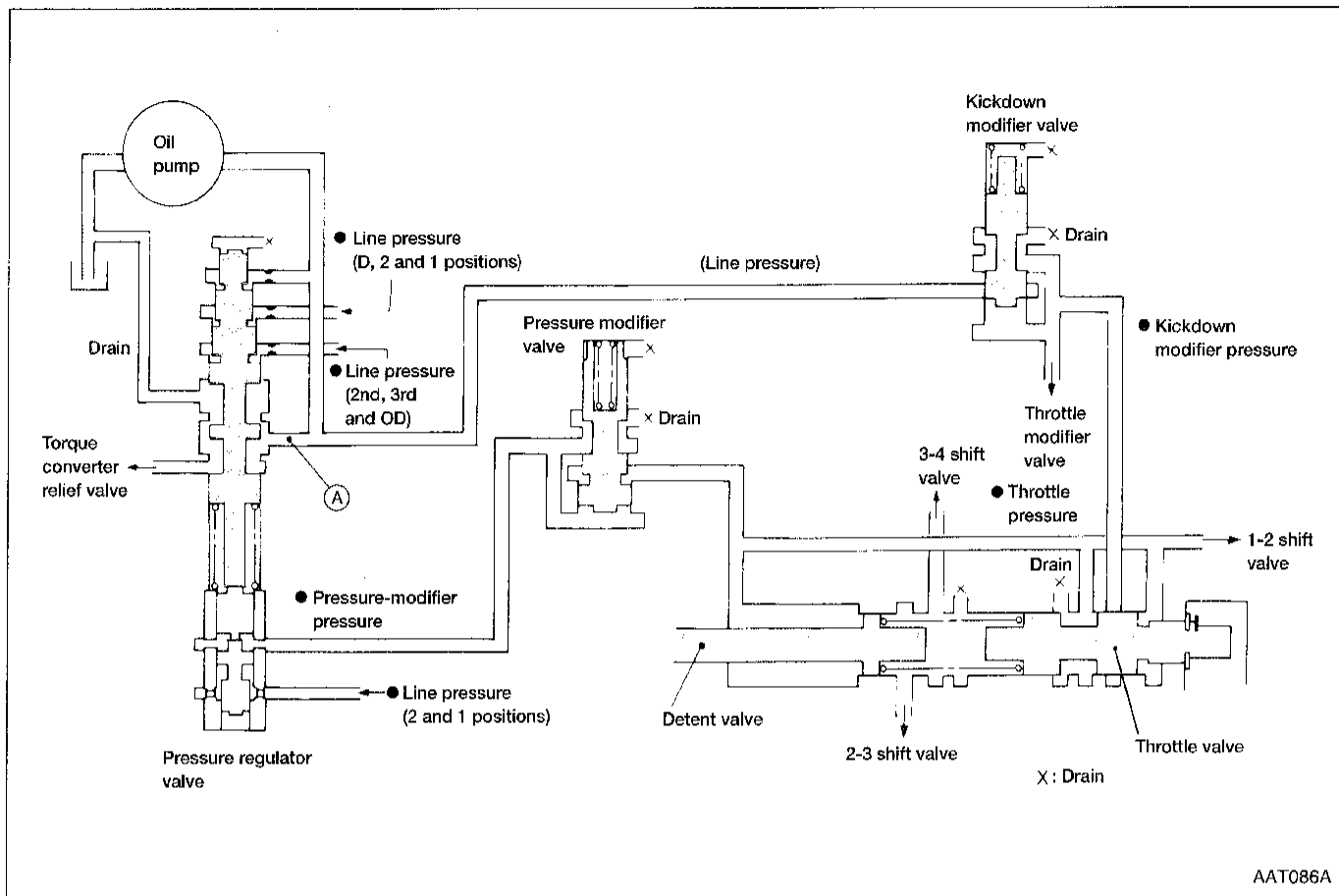
Valve name	Function	
Torque converter clutch control valve	Activates or deactivates lock-up function.	GI
4-2 sequence valve	Prevents band servo pressure from draining before high clutch pressure and band servo release pressure drain (from same circuit) during downshifting from 4th to 2nd gear.	MA
		EM
		LC
		EC
		FE
		CL
		MT
		<b>AT</b>
		FA
		RA
		BR
		ST
		RS
		BT
		HA
		EL
		IDX



# OVERALL SYSTEM

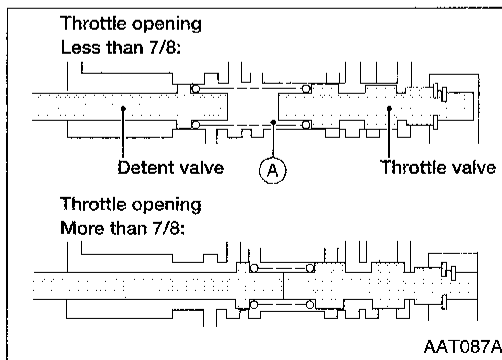
## Hydraulic Control System

### LINE PRESSURE CONTROL



#### Operation

The oil pump is driven by the engine. The pressure of oil discharged from the oil pump increases in response to engine speed. It is directed to point (A) of the pressure regulator valve so that the valve moves down. At the same time, it is applied to the kickdown modifier valve which regulates kickdown modifier pressure. Kickdown modifier pressure is then directed to the throttle valve which regulates throttle pressure. Throttle pressure is then directed to the pressure modifier valve which regulates pressure-modifier pressure. The pressure-modifier pressure is used as a signal pressure to the plug of the pressure regulator valve.



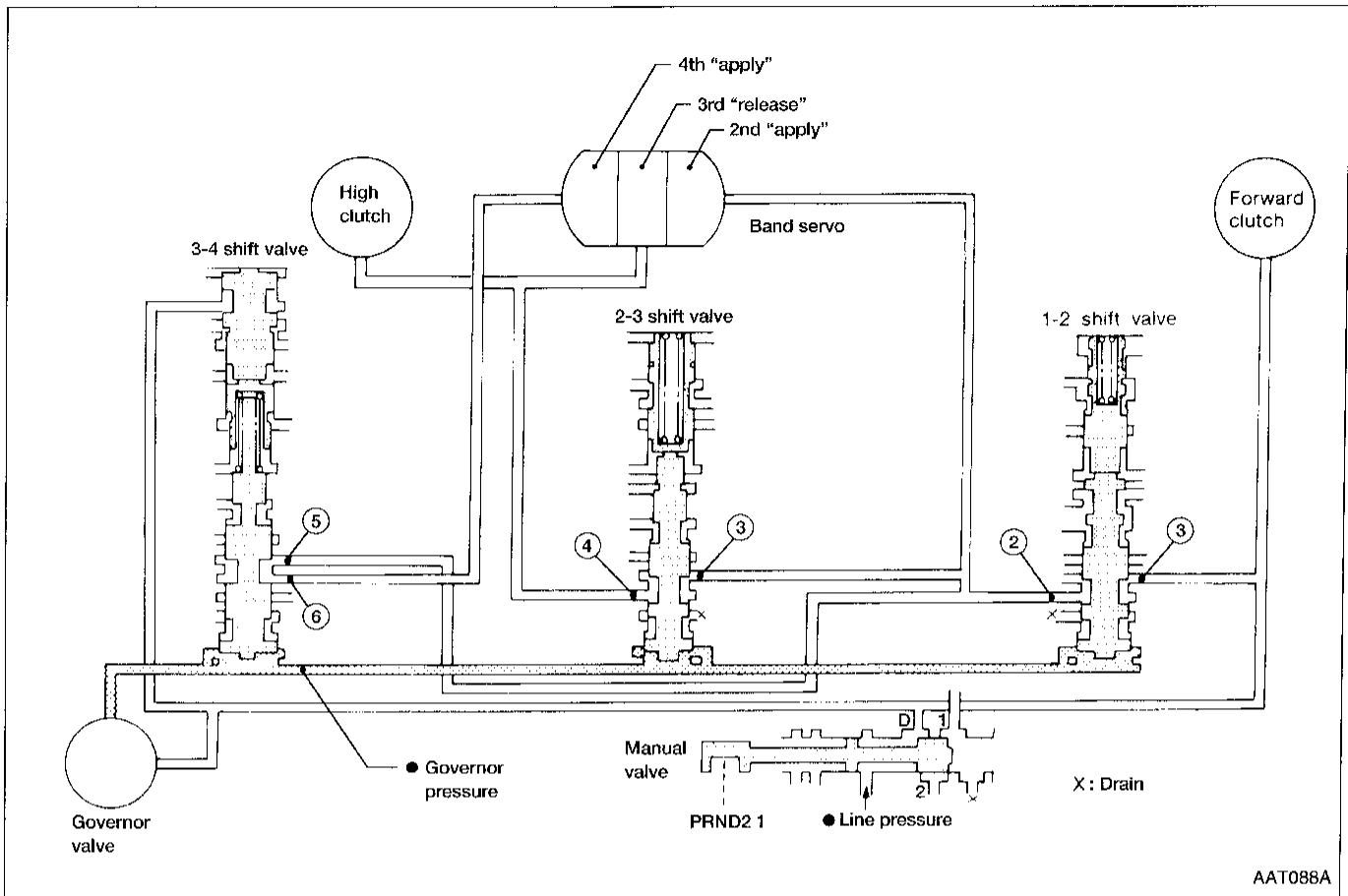
- The detent valve acts on the throttle valve via spring (A) in relation to the throttle (opening) position. As the accelerator pedal is depressed, the spring also pushes the throttle valve.
- When throttle (opening) position is greater than 7/8 of full throttle, the detent valve directly attempts to push the throttle valve. At this point, throttle pressure control does not occur so that only kickdown modifier pressure is directed to each valve.

# OVERALL SYSTEM

## Hydraulic Control System (Cont'd)

### SHIFT CONTROL

"D" position



In the D position, the 1-2 shift valve, 2-3 shift valve and 3-4 shift valve are moved up or down by pressure discharged from the governor valve which monitors vehicle speeds.

When the vehicle attains the specified speed, the 1-2 shift valve moves upward. Oil passage ① is then opened to oil passage ② to permit the flow of the band servo 2nd "apply" pressure (as a line pressure). As vehicle speed increases beyond the specified speed, the 2-3 shift valve moves upward. Oil passage ③ is then opened to oil passage ④ to permit the flow of both high clutch pressure and band servo 3rd "release" pressure (as a line pressure). As vehicle speed increases further, the 3-4 shift valve moves upward. Oil passage ⑤ is then opened to oil passage ⑥ to permit the flow of the band servo 4th "apply" pressure (as a line pressure).

In this way, the respective valves operate to provide automatic shifts from 1st, 2nd, 3rd, and then 4th gears, and vice versa.

GI

MA

EM

LC

EC

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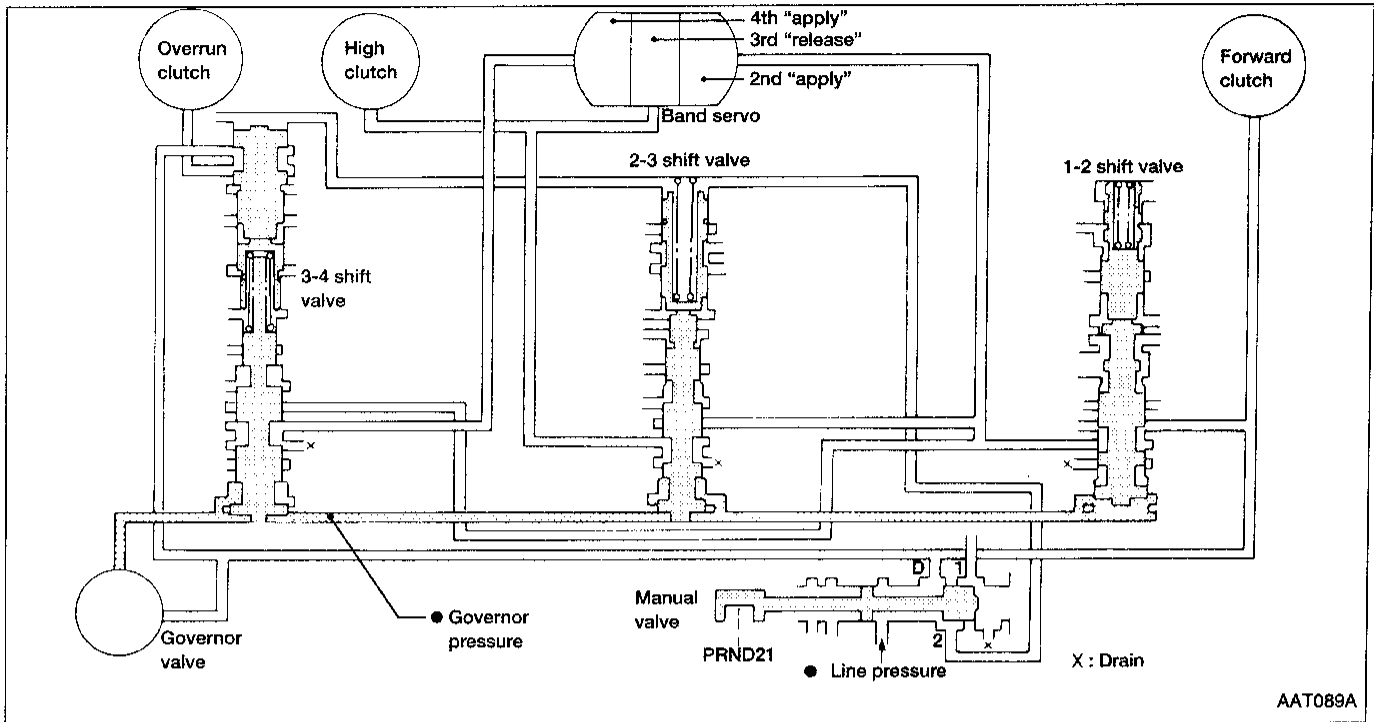
EL

IDX

# OVERALL SYSTEM

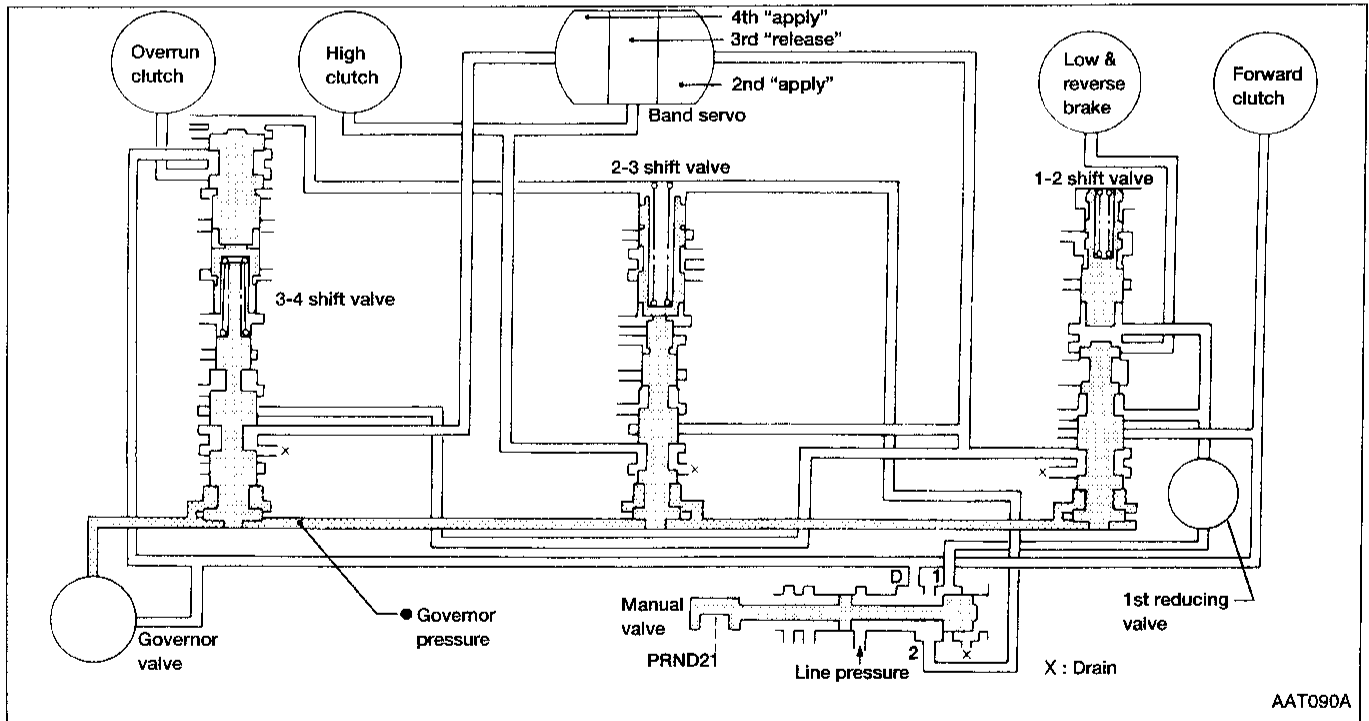
## Hydraulic Control System (Cont'd)

### "2" position



The overrun clutch is engaged but does not affect power transmission. It activates while the engine "brake" is in operation.

### "1" position

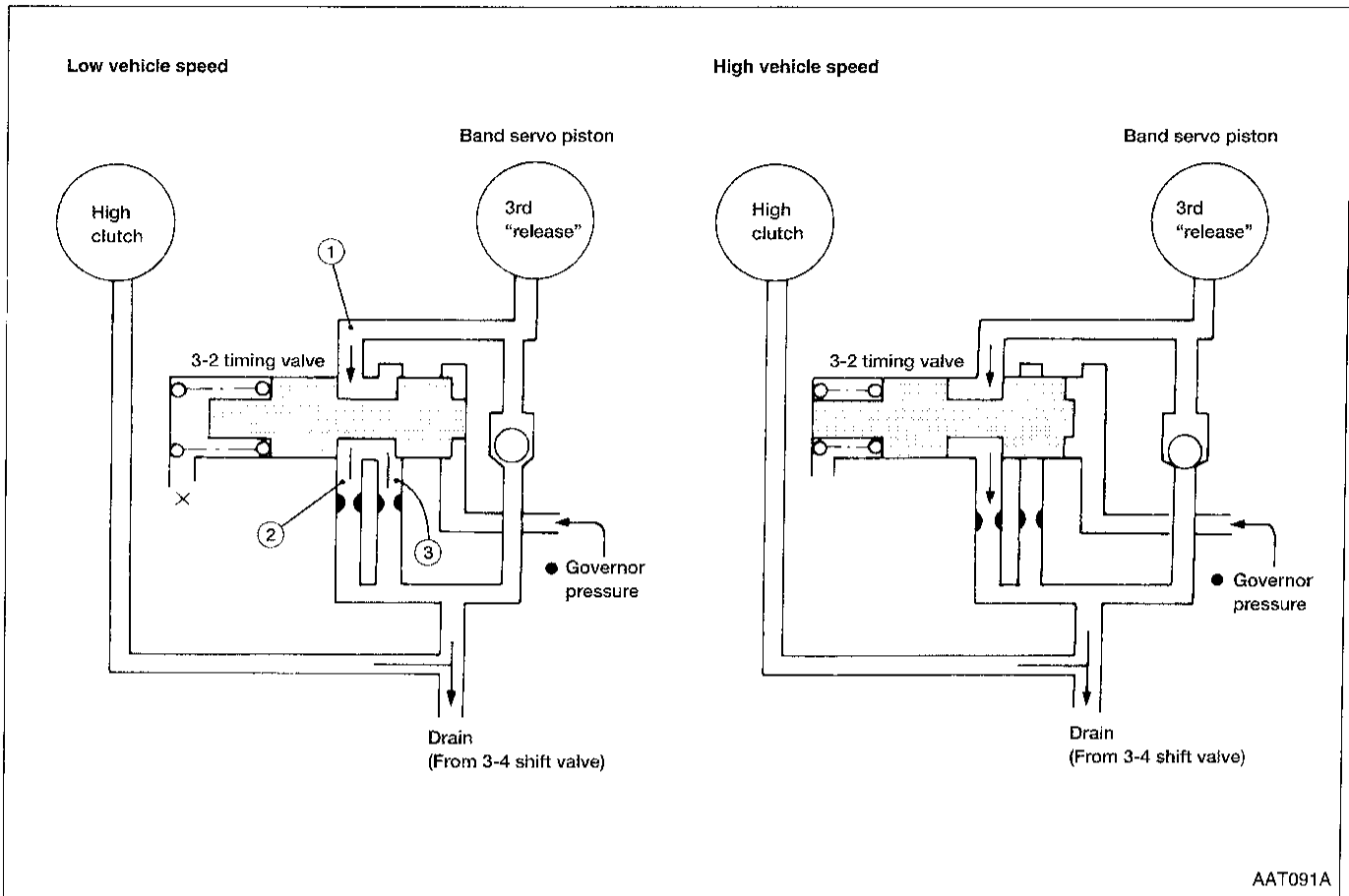


In the 1 position, the low & reverse brake is engaged but does not affect power transmission. It activates while the engine "brake" is in operation.

# OVERALL SYSTEM

## Hydraulic Control System (Cont'd)

### SHIFT TIMING CONTROL



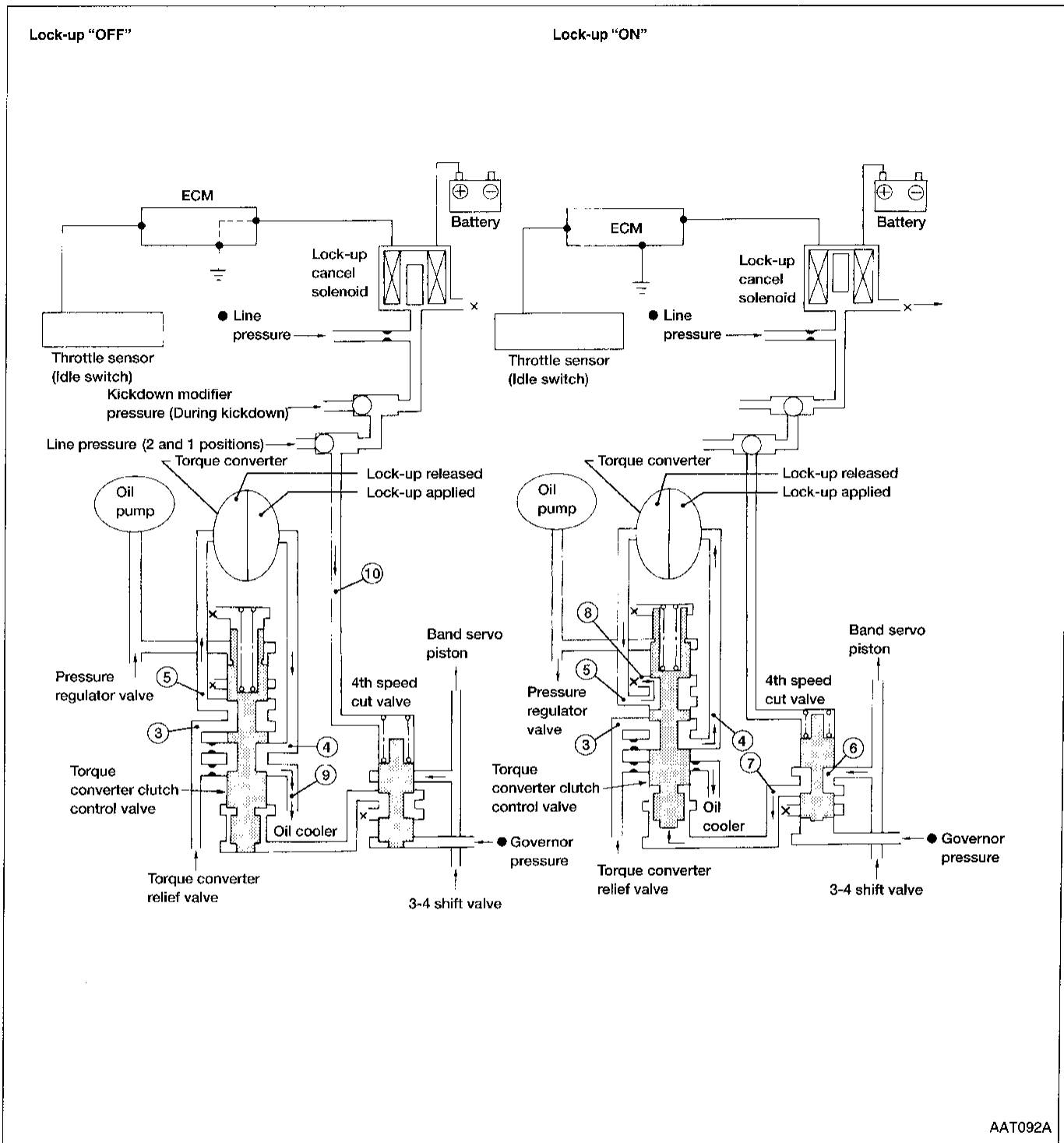
#### Operation of 3-2 timing valve

- When governor pressure is low at low vehicle speeds, the 3-2 timing valve is held at the right position and oil passage ① is opened to oil passages ② and ③.
- When shifts are made from 3rd to 2nd gear with the 3-2 timing valve held in that position, the band servo 3rd "release" pressure flows through passages ② and ③ and is drained quickly.
- The 3-2 timing valve is held at the left position by governor pressure at high vehicle speeds. Oil passage ① is then opened to oil passage ②, and oil passage ③ is closed. The band servo 3rd "release" pressure is drained via oil passage ② more slowly than at low vehicle speeds.
- Engine speed increases quickly while shifting from 3rd to 2nd gear at low vehicle speeds. Engine speed increases slowly at high vehicle speeds. For this reason, the 3-2 timing valve changes the drain speed of the band servo 3rd "release" pressure to accommodate engine speed during high vehicle speeds.

# OVERALL SYSTEM

## Hydraulic Control System (Cont'd)

### LOCK-UP CONTROL



AAT092A

# OVERALL SYSTEM

## Hydraulic Control System (Cont'd)

### Lock-up "OFF"

- When the "lock-up" is released, the torque converter clutch control valve is moved downward by both oil pump discharge pressure and spring force. Torque converter relief pressure then flows through oil passages ③ and ⑤, and is directed to the oil cooler via the torque converter and oil passages ④ and ⑨. Since "release" pressure within the torque converter is equal to or greater than the "apply" pressure, the "lock-up" is released. GI
- The following pressures attempt to move the 4th speed cut valve downward via oil passage ⑩. MA
- a) Torque converter clutch solenoid pressure [when throttle is fully closed (idle switch is in "ON" position)] EM
- b) Line pressure (when the selector lever is set to the "2" or "1" position)
- c) Kickdown modifier pressure (when kickdown occurs)
- As the 4th speed cut valve is moved downward, the "lock-up" is released. LC

### Lock-up "ON" (D<sub>4</sub>)

- The "lock-up" is applied when the specified vehicle speed is exceeded. EC
  - When the specified vehicle speed is exceeded while driving in the D<sub>4</sub> position, governor pressure attempts to move the 4th speed cut valve upward. As the valve moves upward, oil passage ⑥ is opened to oil passage ⑦. 3-4 shift valve output pressure (line pressure) is then applied to the lower end of the torque converter clutch control valve. The torque converter clutch control valve then moves upward to close oil passages ③ and ⑤ and to open oil passage ⑤ to drain oil passage ⑧. FE
  - Torque converter relief pressure, which was applied to the lock-up "release" side, passes through oil passages ③ and ④, and is applied to the torque converter. Since the "release" pressure is then drained, the "lock-up" is applied. CL
- MT

### Torque converter clutch solenoid valve operation

- The torque converter clutch solenoid valve is installed on the control valve body. AT
  - The torque converter clutch solenoid valve is connected to the ECM and is controlled by an ON or OFF signal sent from the idle switch (throttle sensor).
- (1) Throttle (opening) position is less than 1/8:
- The idle switch turns "ON" to send an ON signal to the ECM. The ECM then turns the torque converter clutch solenoid valve "ON". FA
  - This causes torque converter clutch solenoid valve pressure (line pressure) to pass through oil passage ⑩ and act on the 4th speed cut valve. Both the 4th speed cut valve and torque converter clutch control valve function in the same way as in the lock-up "release" state. RA
- (2) Throttle opening is more than 1/8:
- As the idle switch is turned "OFF", the torque converter clutch solenoid valve is also "OFF". BR
  - Both the 4th speed cut valve and torque converter clutch control valve function in the same way as in the lock-up "apply" state. ST

RS

BT

HA

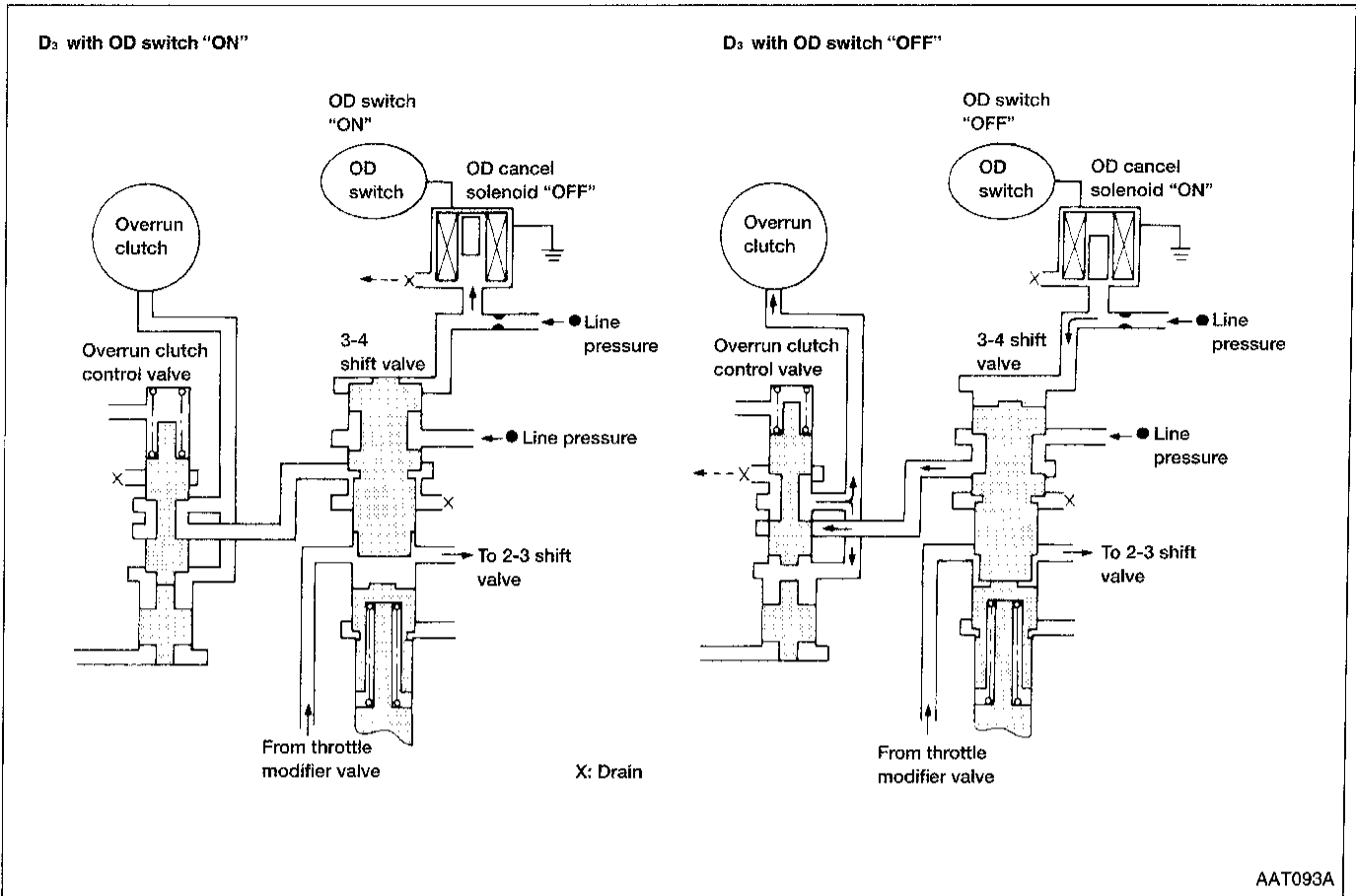
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# OVERALL SYSTEM

## Hydraulic Control System (Cont'd)

### OVERDRIVE CONTROL



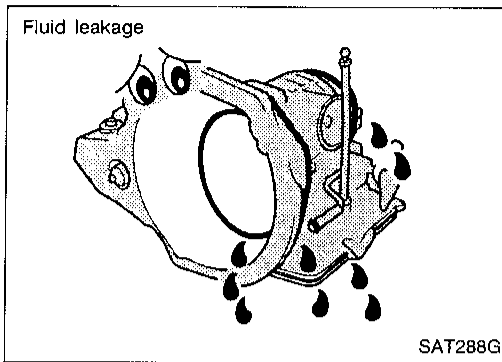
- The overdrive is controlled by the overdrive control switch located on the selector lever to provide shifts from "D<sub>3</sub>" to "D<sub>4</sub>" or vice versa.
- When the overdrive control switch is set to "ON", "D<sub>4</sub>" shift occurs.

#### Overdrive control switch in "ON":

The OD cancel solenoid valve is set in "OFF" and line pressure is drained. As a result, the 3-4 shift valve moves upward. When governor pressure acting on the lower end of the 3-4 shift valve exceeds the specified value, "D<sub>4</sub>" shift occurs.

#### Overdrive control switch in "OFF":

The OD release solenoid is set in "ON" and line pressure is directed to the upper end of the 3-4 shift valve. This moves the 3-4 shift valve downward. The 3-4 shift valve is held downward even when governor pressure increases. At this point, "D<sub>4</sub>" shift does not occur.

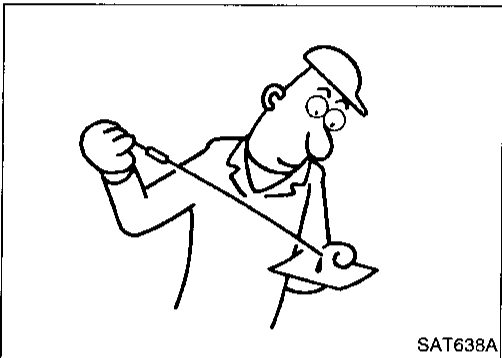


## A/T Fluid Check

### 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.

GI  
MA  
EM



### 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

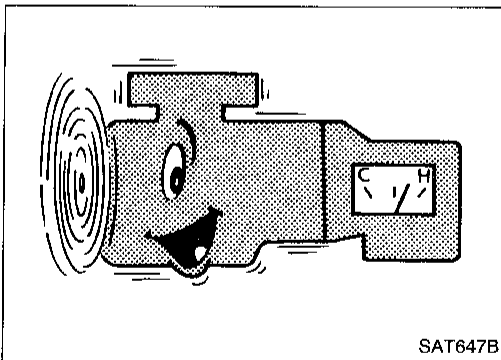
LC  
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MT

### FLUID LEVEL CHECK

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

AT

FA  
RA  
BR



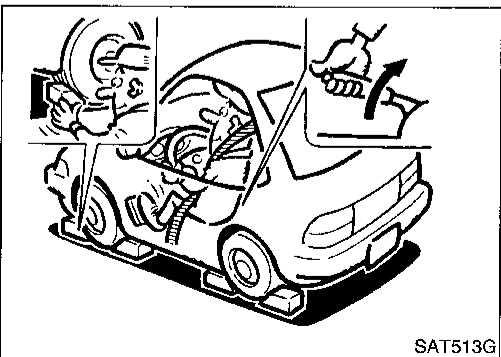
## Stall Test

### STALL TEST PROCEDURE

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

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

ST  
RS  
BT



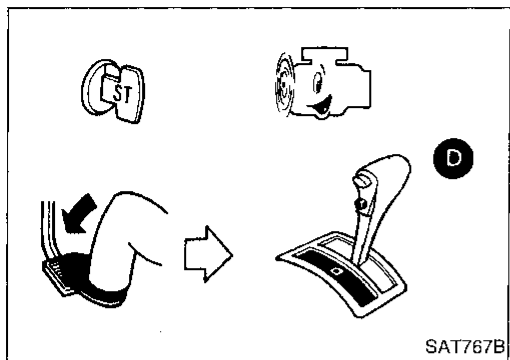
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

HA  
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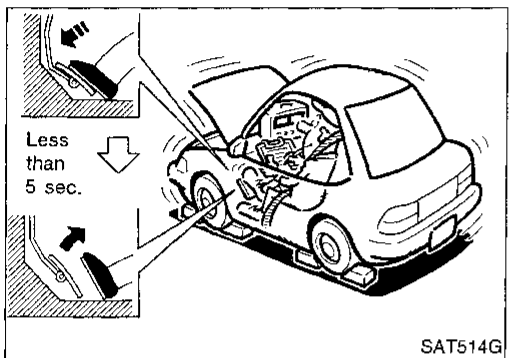


## TROUBLE DIAGNOSIS—Basic Inspection

### Stall Test (Cont'd)

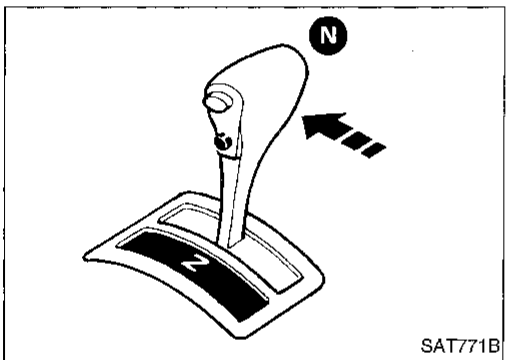


5. Start engine, apply foot brake, and place selector lever in "D" position.



6. Accelerate to wide open throttle gradually while applying foot brake.
  - **During test, never hold throttle wide open for more than 5 seconds.**
7. Quickly note the engine stall revolution and immediately release throttle.

**Stall revolution standard:  
2,450 - 2,750 rpm**



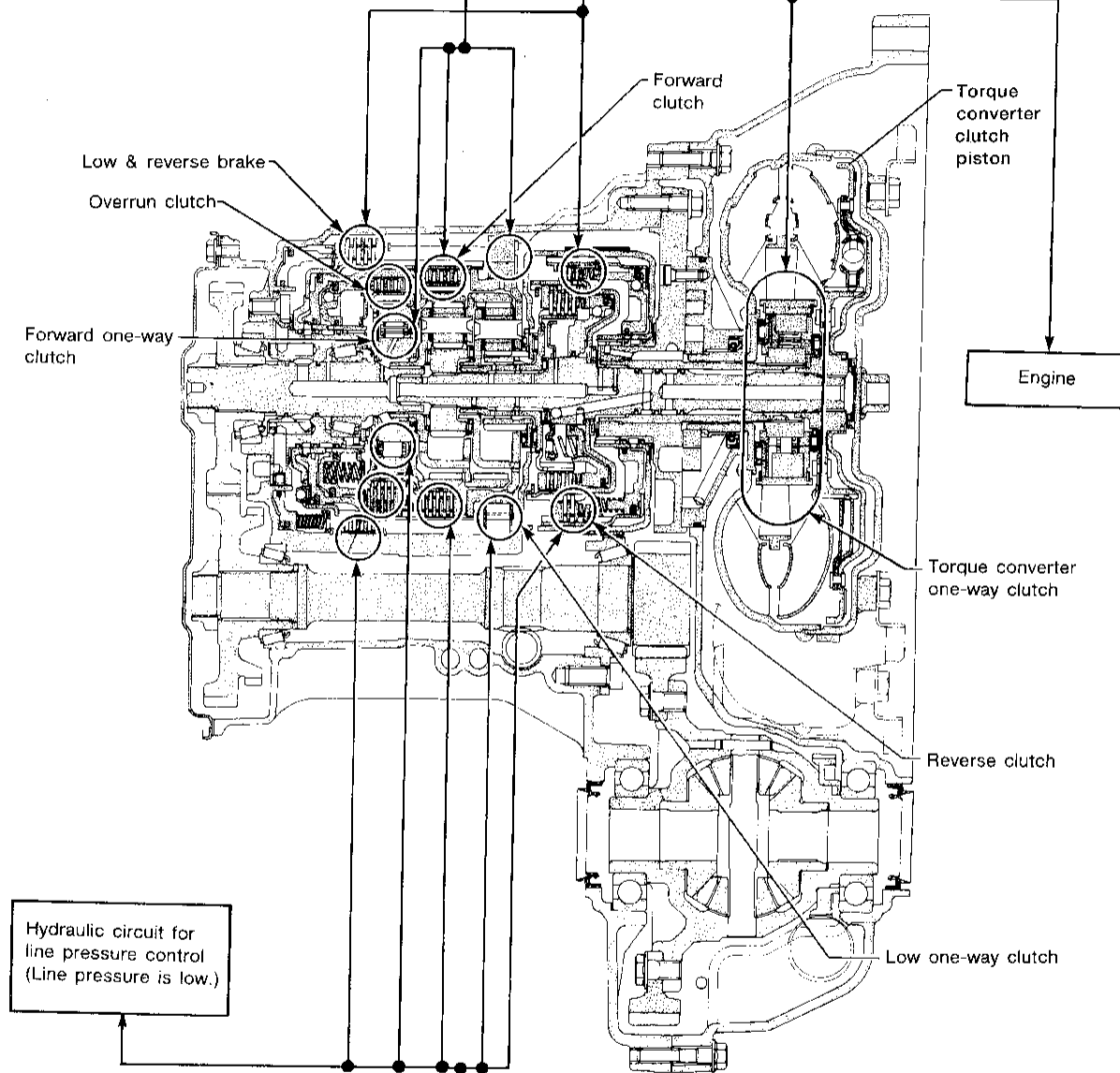
8. Shift selector lever to "N" position.
9. Cool off ATF.
  - **Run engine at idle for at least one minute.**
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

## Judgement of Stall Test

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

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

Damaged components



Hydraulic circuit for line pressure control  
(Line pressure is low.)

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

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

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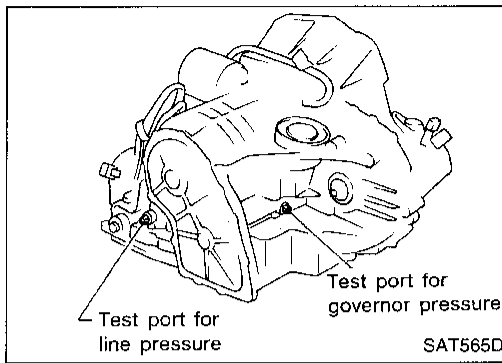
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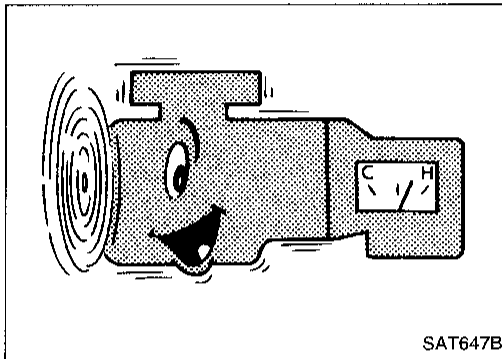
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## Pressure Test

### PRESSURE TEST PORTS

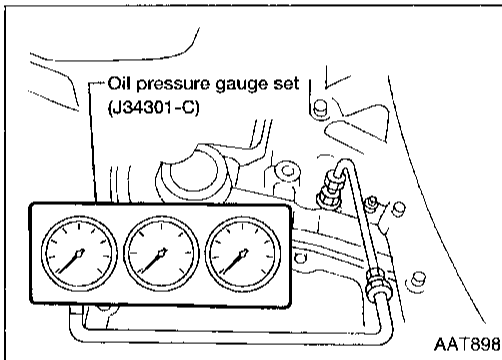
- Location of pressure test port.
- **Always replace pressure plugs as they are self-sealing bolts.**



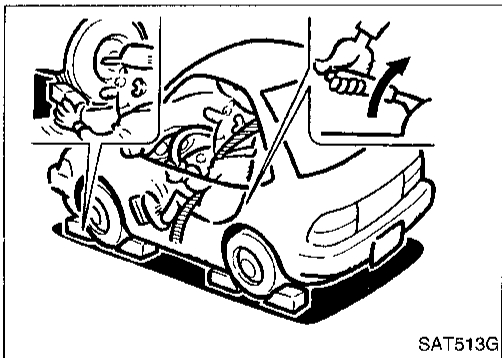
### LINE PRESSURE TEST PROCEDURE

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

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

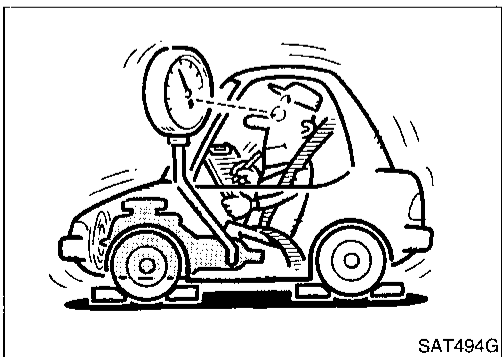


3. Install pressure gauge and Tool to line pressure port.



4. Set parking brake and block wheels.

**Continue to depress brake pedal fully while performing line pressure test at stall speed.**



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

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

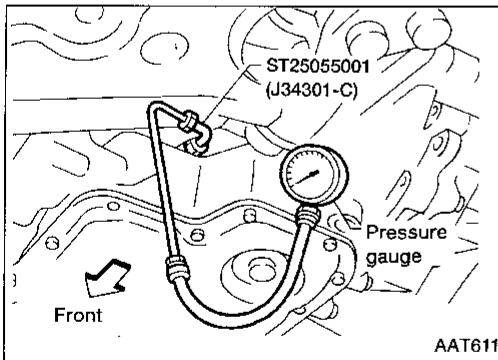
**Line pressure: Refer to SDS, AT-164.**

# TROUBLE DIAGNOSIS—Basic Inspection

## Pressure Test (Cont'd)

### 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> <li>● Clogged strainer</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, line pressure is:                             <ul style="list-style-type: none"> <li>– Low in "R" and "1" positions, but</li> <li>– Normal in "D" and "2" positions.</li> </ul>                             Therefore, fluid leakage exists at or around low and reverse brake circuit.                         </li> </ul> Refer to "CLUTCH AND BRAKE CHART", AT-19.
	Line pressure is high.	<ul style="list-style-type: none"> <li>● Maladjustment of throttle position sensor</li> <li>● A/T 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> <li>● Open in dropping resistor circuit</li> </ul>
At stall speed	Line pressure is low.	<ul style="list-style-type: none"> <li>● Maladjustment of throttle position sensor</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>



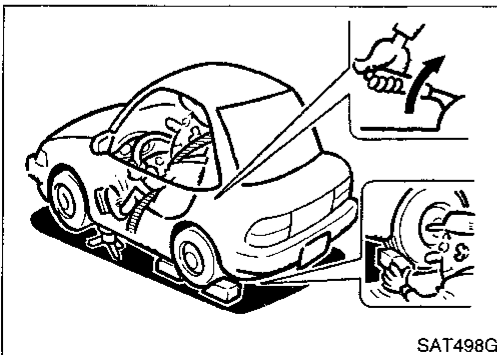
### GOVERNOR PRESSURE TESTING

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

#### ATF operating temperature:

50 - 80°C (122 - 176°F)

3. Install pressure gauge to governor pressure port.

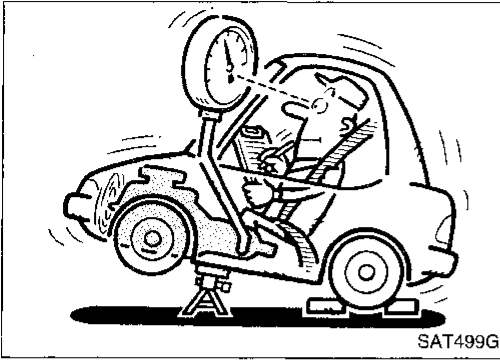


4. Set parking brake and block rear wheels.
5. Jack up front wheels.
6. Set selector lever in "D" position and gradually depress accelerator pedal.

**Be careful of rotating wheels.**

## TROUBLE DIAGNOSIS—Basic Inspection

### Pressure Test (Cont'd)



#### Governor pressure:

- Governor pressure is not generated when vehicle is stopped. (Front wheels are not rotating.)
- Governor pressure rises gradually in response to vehicle speed. (Front wheel rotating speed.)

Vehicle speed	Governor pressure kPa (kg/cm <sup>2</sup> psi)
0 km/h (0 MPH)	0 ( 0, 0)
16 km/h (10 MPH)	59 - 69 (0.6 - 0.7, 9 - 10)
32 km/h (20 MPH)	108 - 127 (1.1 - 1.3, 16 - 18)
80 km/h (50 MPH)	284 - 343 (2.9 - 3.5, 41 - 50)

If not within specification, check governor valve assembly. Refer to AT-79.

### Road Test

Perform road tests using “Symptom” chart. Refer to AT-40.

#### “P” POSITION

1. Place selector lever in “P” position and start engine. Stop engine and repeat the procedure in all positions, including “N” position.
2. Stop vehicle on a slight upgrade and place selector lever in “P” position. Release parking brake to make sure vehicle remains locked.

#### “R” POSITION

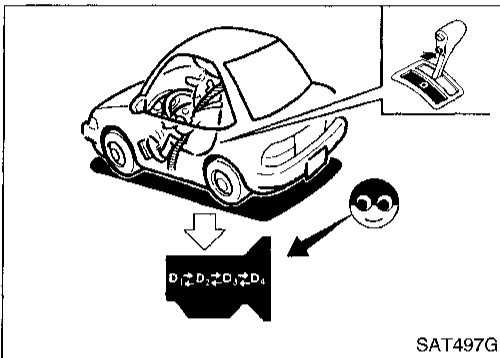
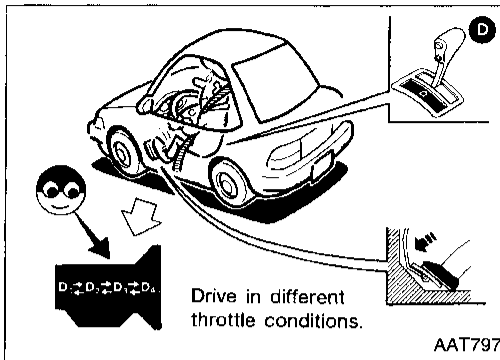
1. Manually move selector lever from “P” to “R”, and note shift quality.
2. Drive vehicle in reverse long enough to detect slippage or other abnormalities.

#### “N” POSITION

1. Manually move selector lever from “R” and “D” to “N” and note shift quality.
2. Release parking brake with selector lever in “N” position. Lightly depress accelerator pedal to make sure vehicle does not move. (When vehicle is new or soon after clutches have been replaced, vehicle may move slightly. This is not a problem.)

## Road Test (Cont'd)

### “D” POSITION



1. Manually shift selector lever from “N” to “D” position, and note shift quality.
2. Using the shift schedule as a reference, drive vehicle in “D” position. Record, on Symptom Chart, respective vehicle speeds at which up-shifting and down-shifting occur. These speeds are to be read at three different throttle positions (light, half and full), respectively. Also determine the timing at which shocks are encountered during shifting and which clutches are engaged.
3. Determine whether lock-up properly occurs while driving vehicle in proper gear position and at proper vehicle speed.
4. Check to determine if shifting to overdrive gear cannot be made while overdrive control switch is OFF.
5. Drive vehicle at 60 to 70 km/h (37 to 43 MPH) with half to light throttle position (D<sub>3</sub> position). Fully depress accelerator pedal to make sure transaxle downshifts from 3rd to 2nd gear.
6. Drive vehicle at 25 to 35 km/h (16 to 22 MPH) with half to light throttle position (D<sub>2</sub> position). Fully depress accelerator pedal to make sure transaxle downshifts from 2nd to 1st gear.

### “2” POSITION

1. Shift to “2” position and make sure vehicle starts in 1st gear.
2. Increase vehicle speed to make sure transaxle upshifts from 1st to 2nd gear.
3. Further increase vehicle speed. Make sure transaxle does not upshift to 3rd gear.
4. Drive vehicle at 25 to 35 km/h (16 to 22 MPH) with half to light throttle position (2<sub>2</sub> position). Fully depress accelerator pedal to make sure transaxle downshifts from 2nd to 1st gear.
5. Allow vehicle to run idle while in “2” position to make sure that transaxle downshifts to 1st gear.
6. Move selector lever to “D” position and drive vehicle at 30 to 40 km/h (19 to 25 MPH). Then, move selector lever to “2” position to make sure transaxle downshifts to 2nd gear.

### “1” POSITION

1. Place selector lever in “1” position and accelerate. Make sure transaxle does not shift from 1st to 2nd gear although vehicle speed increases.
2. While driving vehicle in “1” position, release accelerator pedal to make sure that engine compression acts as a brake.
3. Move selector lever to “D” or “2” position and drive vehicle at 15 to 25 km/h (9 to 16 MPH). Then, move selector lever to “1” position to make sure transaxle downshifts to 1st gear.

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## Shift Schedule

### VEHICLE SPEED WITH SHIFTING GEARS

This check should be carried out when ATF temperature is between 50 and 80°C (122 and 176°F) after the vehicle has been driven approx. 10 minutes.

#### 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	51 - 59 (32 - 37)	97 - 105 (60 - 65)	—	142 - 150 (88 - 93)	88 - 96 (50 - 60)	39 - 47 (24 - 29)	48 - 56 (30 - 35)
Half throttle	29 - 37 (18 - 23)	52 - 60 (32 - 37)	101 - 109 (63 - 68)	67 - 75 (42 - 47)	41 - 49 (25 - 30)	8 - 16 (5 - 10)	48 - 56 (30 - 35)

#### Vehicle speed when performing lock-up

Throttle opening	Gear position	Vehicle speed km/h (MPH)	
		Lock-up ON	Lock-up OFF
2/8	ON (D <sub>4</sub> )	106 - 114 (66 - 71)	68 - 76 (42 - 47)
	OFF (D <sub>3</sub> )	106 - 114 (66 - 71)	68 - 76 (42 - 47)

# TROUBLE DIAGNOSIS—Basic Inspection

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## NOTES

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# TROUBLE DIAGNOSIS—General Description

## Symptom Chart

### DESCRIPTION

Numbers are arranged in order of probability. Perform inspections starting with number one and work up.

Numbers in OFF VEHICLE columns indicate that the transaxle must be removed from the vehicle to perform the inspection.

8 40 24  
5 30 05  
1 2 3 4 5  
1 2 3 4 5  
1 2 3 4 5  
1 2 3 4 5  
: Valve expected to be malfunctioning

	ON VEHICLE														
	Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling speed	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Sharp shocks in shifting from "N" to "D" position	1	2	.	5	3	4	7								
Shift shocks	When shifting from 1st to 2nd or 2nd to 3rd		.	4	.	3	6								
	When shifting from 3rd to 4th		.	4	.	3	5								
	When shifting from "D" to "2" and "1" position. When overdrive control switch is set from ON to OFF		.	4	.	3	5								
	When shifting from 2nd to 1st in "1" position		.	4	.	3	5								
Shift slippage when upshifting	When shifting from 1st to 2nd		.	4	.	3	5								
	When shifting from 2nd to 3rd		.	4	.	3	6								
	When shifting from 3rd to 4th		.	4	.	3	5								
Shift slippage with accelerator pedal depressed	When shifting from 4th to 2nd		.	5	.	3	6								
	When shifting from 4th to 3rd		.	4	.	3	6								
	When shifting from 4th to 1st and shifting from 3rd to 1st		.	5	.	3	6								
Poor power/acceleration	When vehicle starts		.	4	.	3	6								
	When upshifting		.	4	.	3	7								
No engine braking	When shifting from "D" to "2" and "1" position		.	4	.	3	5								
	When overdrive control switch is set from ON to OFF		.	4	.	3	7								
	When shifting from 2nd to 1st in "1" position		.	4	.	3	5								
Shift quality	Too low a gear change point from 2nd to 3rd and from 3rd to 2nd		.	3	.	2	6								
	Too high a gear change point from 2nd to 3rd and from 3rd to 2nd		.	3	.	2	6								
	Too low a gear change point from 2nd to 1st in "1" position		.	3	.	2	6								
	Too high a gear change point from 2nd to 1st in "1" position		.	3	.	2	6								

# TROUBLE DIAGNOSIS-General Description

## Symptom Chart (Cont'd)

ON VEHICLE															OFF VEHICLE														
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Torque converter clutch control valve	4-2 sequence valve	Governor pressure	Governor valve	Overdrive cancel solenoid valve	Torque converter clutch solenoid valve	Accumulator servo release	Accumulator N-D	Ignition switch and starter motor	Overdrive control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components		
													6				9		8										
													5				8										7		
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# TROUBLE DIAGNOSIS—General Description

## Symptom Chart (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and work up.  
 Numbers in OFF VEHICLE columns indicate that the transaxle must be removed from the vehicle to perform the inspection.

① : Valve expected to be malfunctioning

		← ON VEHICLE →														
		Oil level and oil quality	Control cable	Inhibitor switch and wiring	Throttle wire	Engine idling speed	Line pressure	Control valve	Throttle valve & detent valve	Manual valve	Pressure regulator valve	3-4 shift valve	2-3 shift valve	1-2 shift valve	Overrun clutch control valve	Pressure modifier valve
Shift quality	Failure to change gear from 4th to 2nd with accelerator pedal depressed	1	.	.	3	.	2	6								
	Failure to change gear from 3rd to 2nd with accelerator pedal depressed	1	.	.	3	.	2	6								
	Failure to change gear from 1st to 2nd in "D" and "2" position	1	.	.	3	.	2	6								
	Vehicle does not start from 1st in "D" and "2" position	1	.	.	3	.	2	6								
	Failure to change gear to 3rd and 4th in "D" position	1	.	.	3	.	2	6								
	Changes gear to 1st directly when selector lever is set from "D" to "1" position	1	.	.	3	.	2	6								
	Changes gear to 2nd in "1" position	1	.	.	3	.	2	6								
Lock-up quality	Lock-up point is extremely high or low	1	.	.	3	.	2	6								
	Torque converter does not lock-up	1	.	.	3	.	2	7								
	Lock-up is not released when accelerator pedal is released	1	.	.	.	.	.	2								
Engine does not start in "P" and "N" positions or engine starts in positions other than "P" and "N" positions		.	2	3	.	.	.	.								
Vehicle moves with selector lever in "P" position		.	1	.	.	.	.	.								

# TROUBLE DIAGNOSIS—General Description

## Symptom Chart (Cont'd)

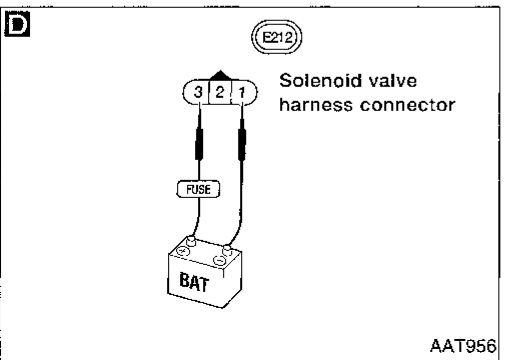
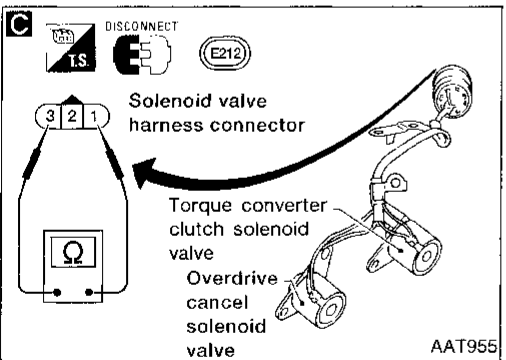
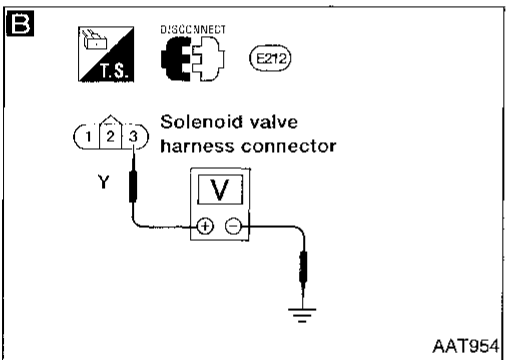
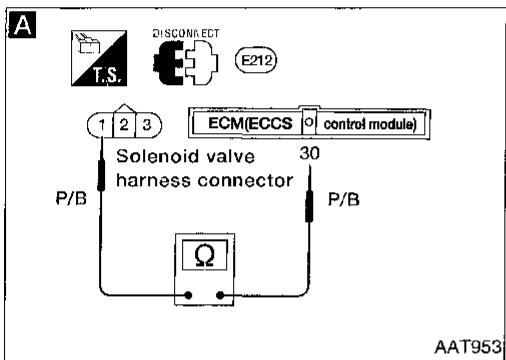
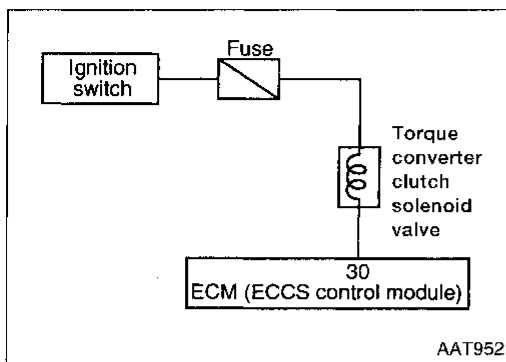
ON VEHICLE												OFF VEHICLE																
Kickdown modifier valve	1-2 accumulator valve	3-2 timing valve	1st reducing valve	Torque converter relief valve	Throttle modifier valve	4th speed cut valve	Torque converter clutch control valve	4-2 sequence valve	Governor pressure	Governor valve	Overdrive cancel solenoid valve	Torque converter clutch solenoid valve	Accumulator servo release	Accumulator N-D	Ignition switch and starter motor	Overdrive control switch and wiring	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse clutch	Brake band	Parking components	
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## Component Inspection

### TORQUE CONVERTER CLUTCH SOLENOID VALVE

When the malfunction indicator lamp indicates DTC (0904) P1550, perform "TROUBLE DIAGNOSIS FOR DTC P1550" in EC section.



**A**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to OFF position.
2. Disconnect ECM harness connector and torque converter clutch solenoid valve harness connector.
3. Check resistance between terminals ① and ③.

**Resistance:**  
Approximately 0Ω

NG → Repair or replace harness between ECM and torque converter clutch solenoid valve.

**B**

**CHECK POWER SOURCE CIRCUIT.**

1. Turn ignition switch to ON position.
2. Check voltage between terminal ③ and ground.

**Voltage:**  
Battery voltage

NG → Check the following items:

- Ignition switch and fuse Refer to EL section ("POWER SUPPLY ROUTING").
- Harness continuity between fuse and torque converter clutch solenoid valve

**C**

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE (RESISTANCE).**

Check resistance between torque converter clutch solenoid valve terminals ① and ③.

**Resistance:**  
Approximately 25Ω

NG → Replace torque converter clutch solenoid valve.

**D**

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE (OPERATION).**

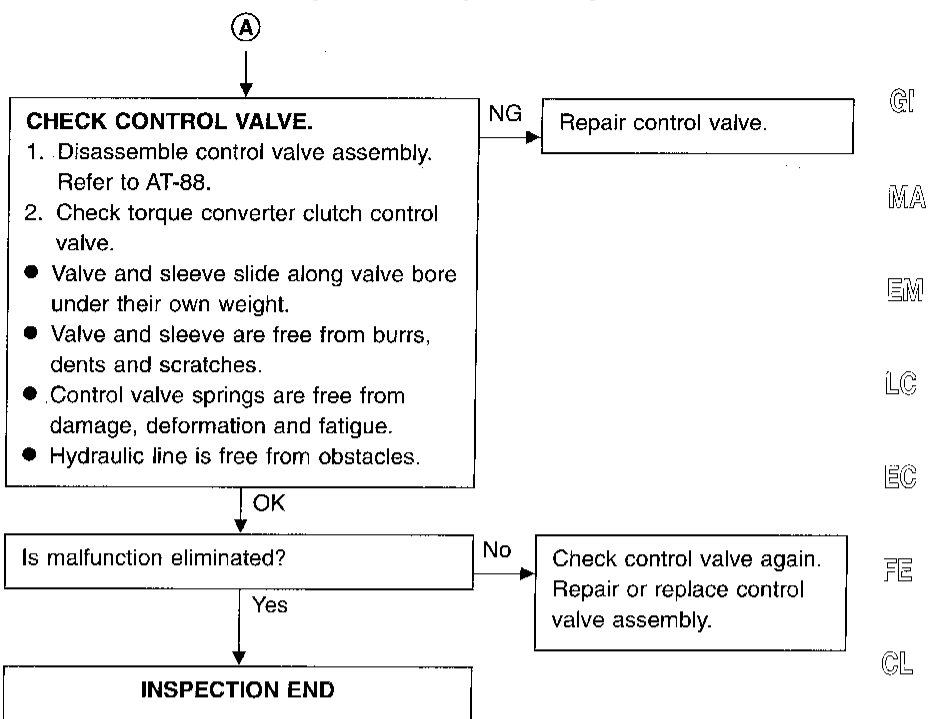
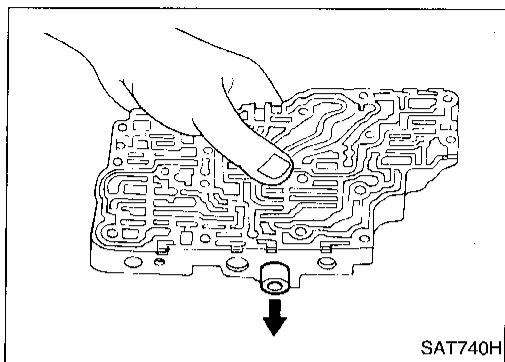
1. Remove torque converter clutch solenoid valve. Refer to AT-55.
2. Check torque converter clutch solenoid valve operation.

NG → Replace torque converter clutch solenoid valve.

OK  
A  
(Go to next page.)

# TROUBLE DIAGNOSIS

## Component Inspection (Cont'd)

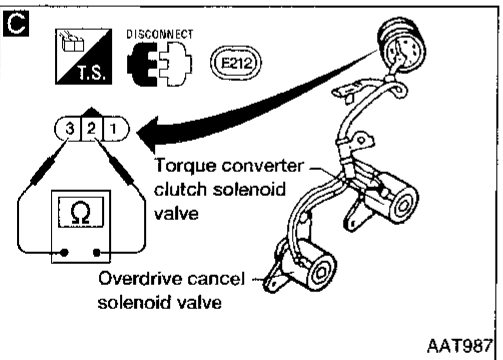
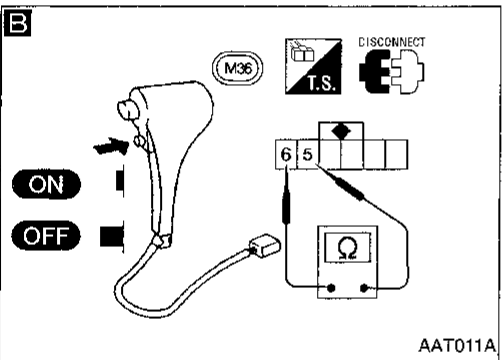
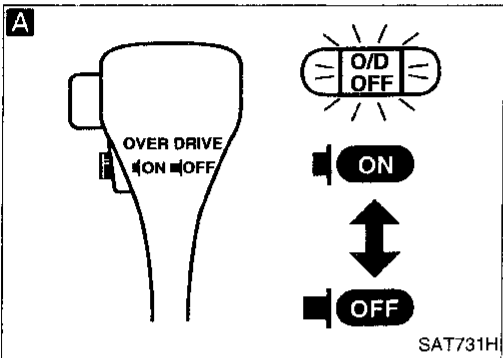
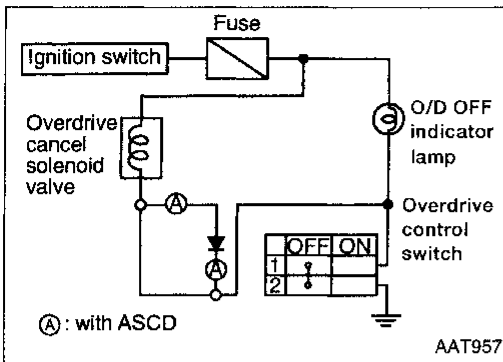


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# TROUBLE DIAGNOSIS

## Component Inspection (Cont'd)

### OVERDRIVE CONTROL SWITCH AND OVERDRIVE CANCEL SOLENOID VALVE



**A**  
**CHECK OD OFF INDICATOR LAMP CIRCUIT.**  
 1. Turn ignition switch to ON.  
 (Do not start engine.)  
 2. Set overdrive control switch to OFF position.  
**O/D OFF indicator lamp should come on.**

Check the following items:  
 ● O/D OFF indicator lamp  
 Refer to EL section ("METER AND GAUGES").  
 ● Ignition switch and fuse  
 Refer to EL section ("POWER SUPPLY ROUTING").

**B**  
**CHECK OVERDRIVE CONTROL SWITCH.**  
 Check continuity between overdrive control switch terminals (5) and (6).

Overdrive control switch position	Continuity
ON	No
OFF	Yes

**C**  
**CHECK OVERDRIVE CANCEL SOLENOID VALVE.**  
 Check resistance between overdrive cancel solenoid valve terminals (2) and (3).  
**Resistance:**  
**Approximately 25Ω**

Check the following items:  
 ● Harness continuity between fuse and overdrive cancel solenoid valve.  
 ● Harness continuity between overdrive cancel solenoid valve and overdrive control switch.  
 ● Condition of diode (Only models with ASCD).

**INSPECTION END**

OK → Go to **C**

NG

OK

NG

Replace overdrive control switch.

OK

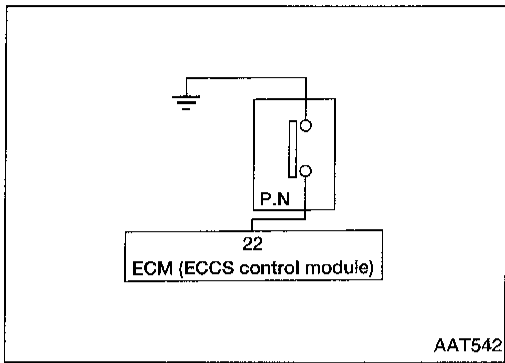
NG

Replace overdrive cancel solenoid valve.

# TROUBLE DIAGNOSIS

## Component Inspection (Cont'd)

### INHIBITOR SWITCH



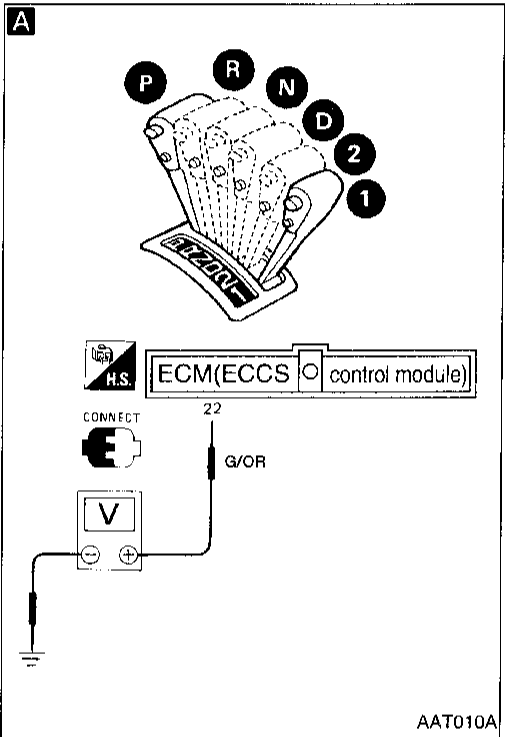
**A**

**CHECK INHIBITOR SWITCH CIRCUIT.**

1. Turn ignition switch to ON position. (Do not start engine.)
2. Check voltage between ECM terminal ②② and ground while moving selector lever through each position.

“P”, “N” position: 0V  
 “R”, “D”, “2”, “1” position: Battery voltage

OK → INSPECTION END



NG

**B**

**CHECK INHIBITOR SWITCH.**

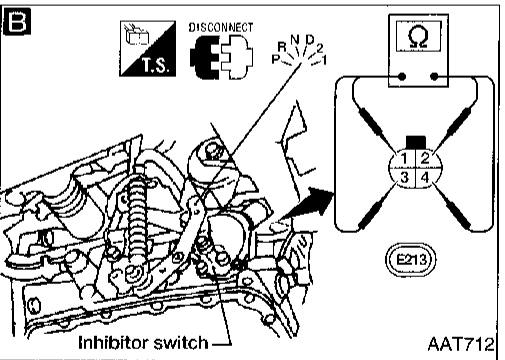
- Check continuity in “N”, “P” and “R” positions.
- With manual lever held in each position, turn manual shaft 1.5° in both directions. (When manual lever is in each position, continuity normally exists within 1.5° range.) If continuity does not exist equally in either direction, properly adjust inhibitor switch. Refer to AT-56.

Position	Terminal No.			
	①	②	③	④
Park/neutral position	○	○		
R			○	○

NG → Check the following items:

- Harness continuity between ground and inhibitor switch
- Harness continuity between inhibitor switch and ECM
- Harness continuity between inhibitor switch and back-up lamp.

OK → INSPECTION END



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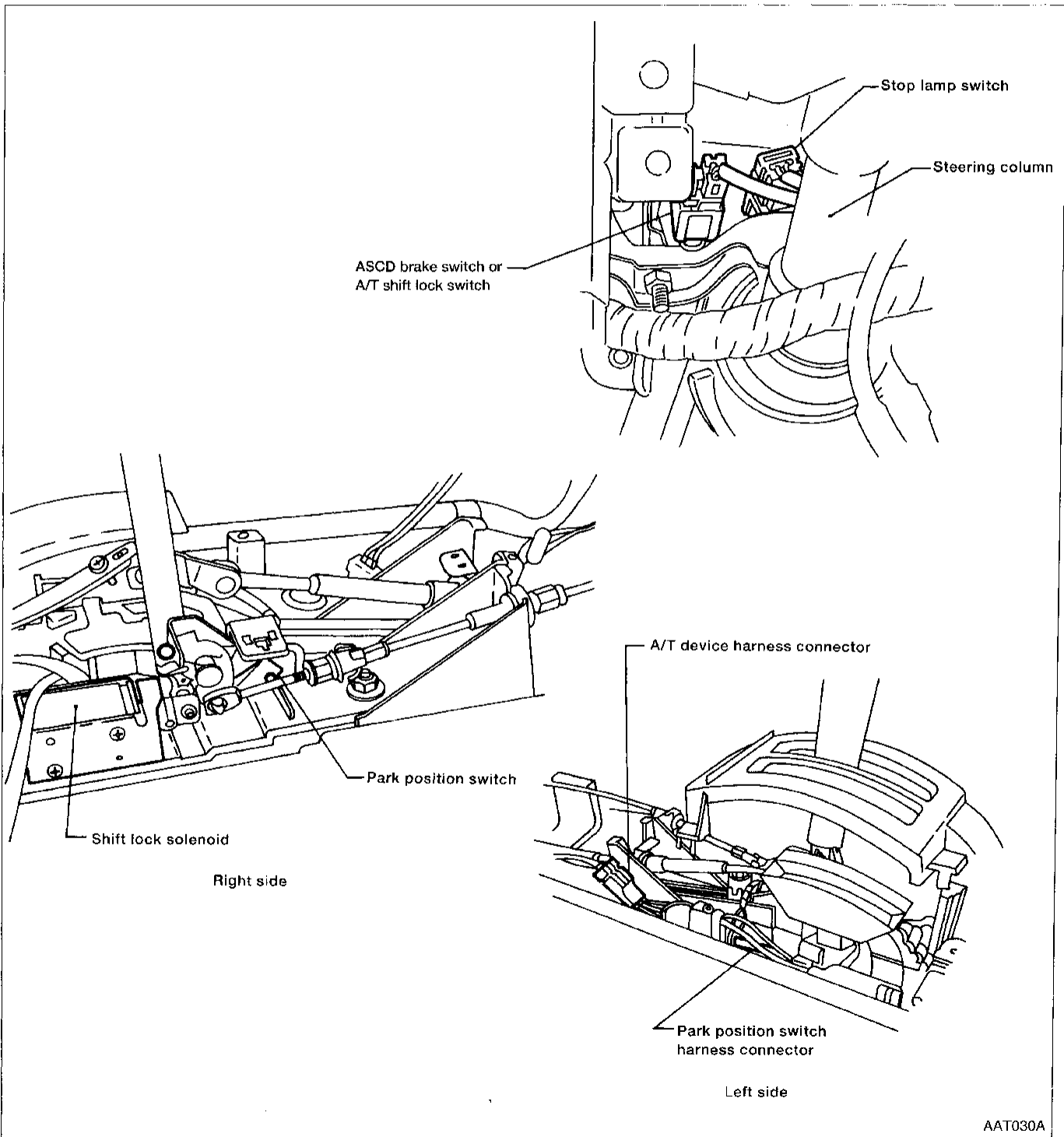
## Description

The mechanical key interlock mechanism also operates as a shift lock:

- With the key switch turned to ON, the selector lever cannot be shifted from "P" (parking) to any other position unless the brake pedal is depressed.
- With the key removed, the selector lever cannot be shifted from "P" to any other position.
- The key cannot be removed unless the selector lever is placed in "P".

The shift lock and key interlock mechanisms are controlled by the ON-OFF operation of the shift lock solenoid and by the operation of the rotator and slider located inside the key cylinder.

## Shift Lock System Electrical Parts Location



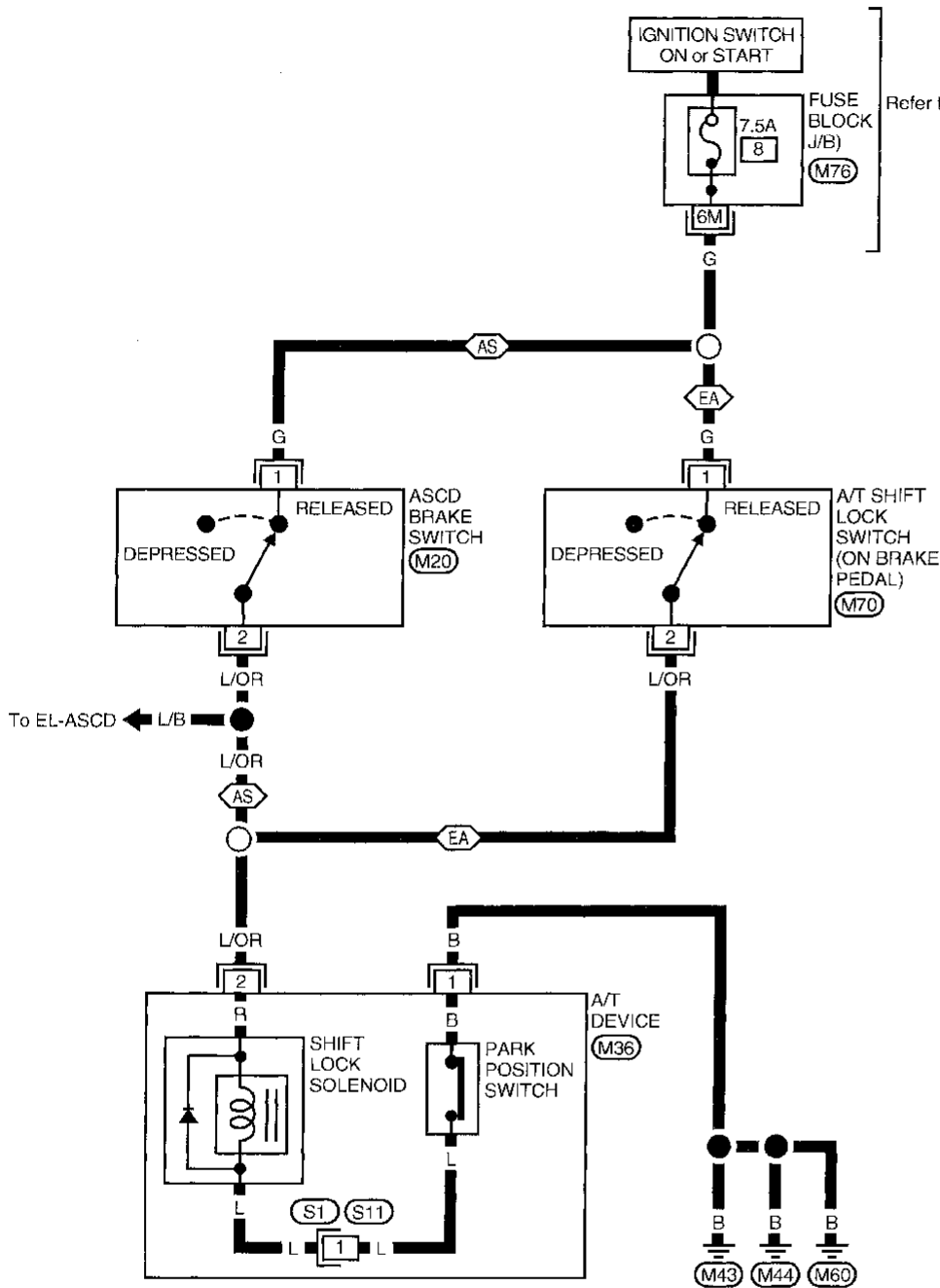
# TROUBLE DIAGNOSES — A/T Shift Lock System

## Wiring Diagram — SFT, RL —

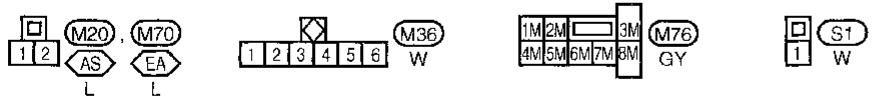
AT-SFT,RL-01

Refer to "EL-POWER".

AS : With ASCD  
EA : Without ASCD



- GI
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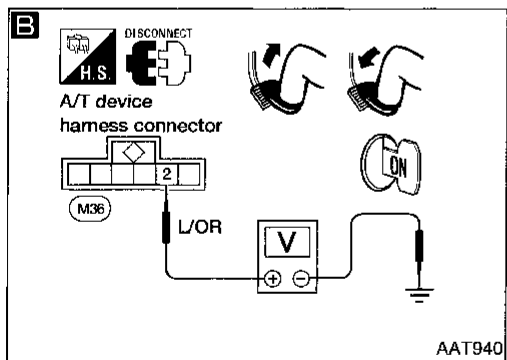
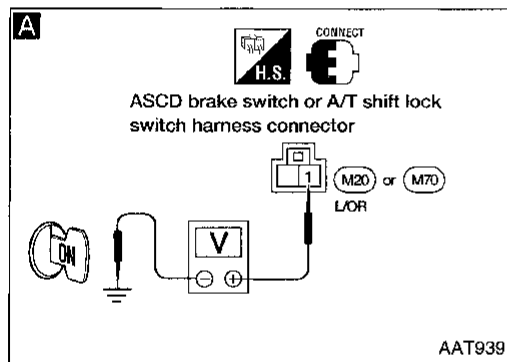
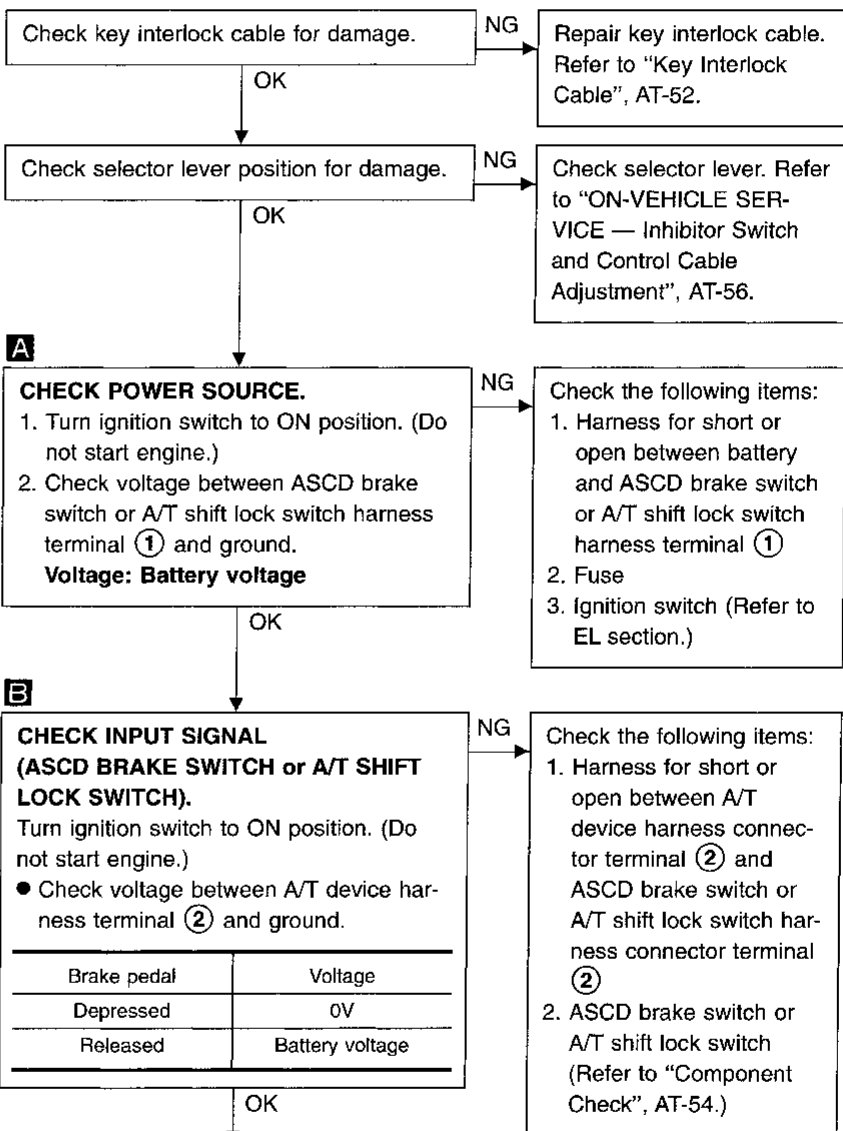
## Diagnostic Procedure

### SYMPTOM 1:

- Selector lever cannot be moved from “P” position with key in ON position and brake pedal applied.
- Selector lever can be moved from “P” position with key in ON position and brake pedal released.
- Selector lever can be moved from “P” position when key is removed from key cylinder.

### SYMPTOM 2:

- Ignition key cannot be removed when selector lever is set to “P” position.
- It can be removed when selector lever is set to any position except “P”.

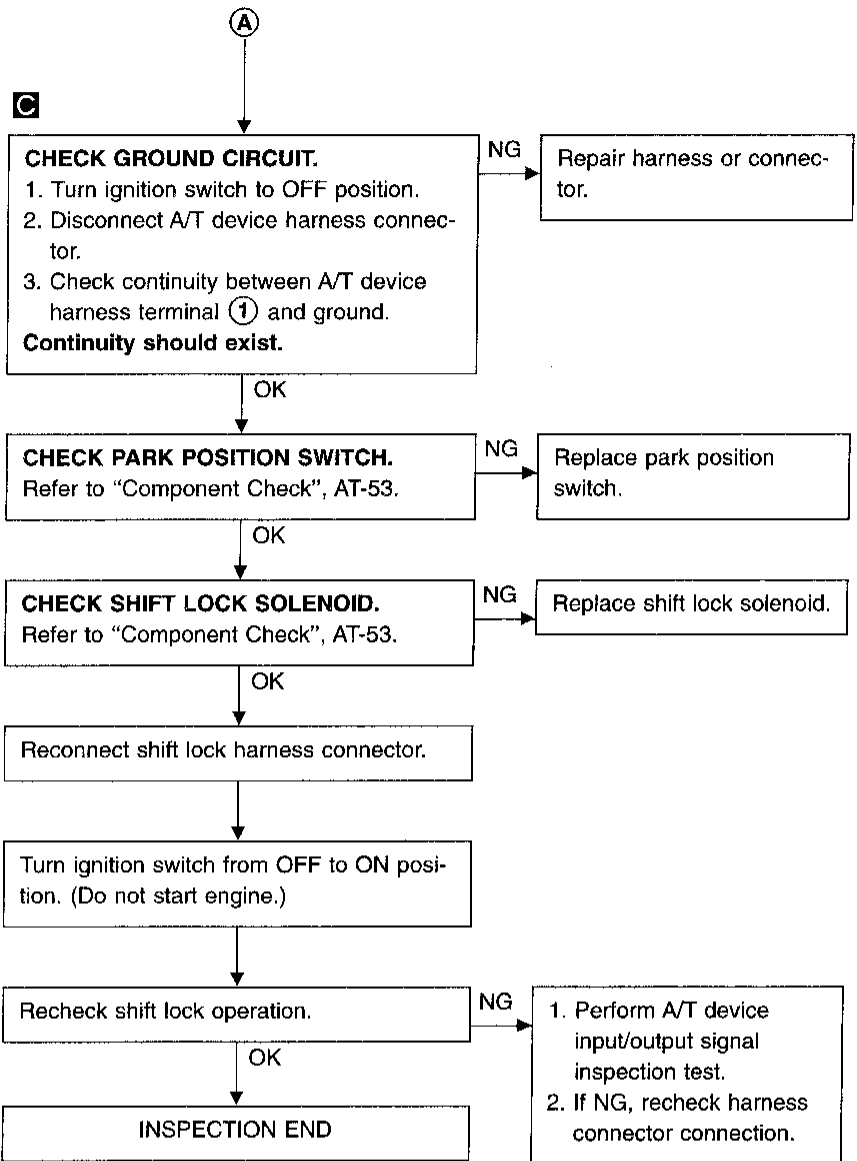
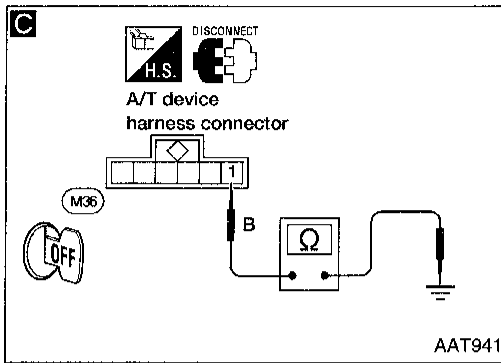


Brake pedal	Voltage
Depressed	0V
Released	Battery voltage

(Go to next page.)

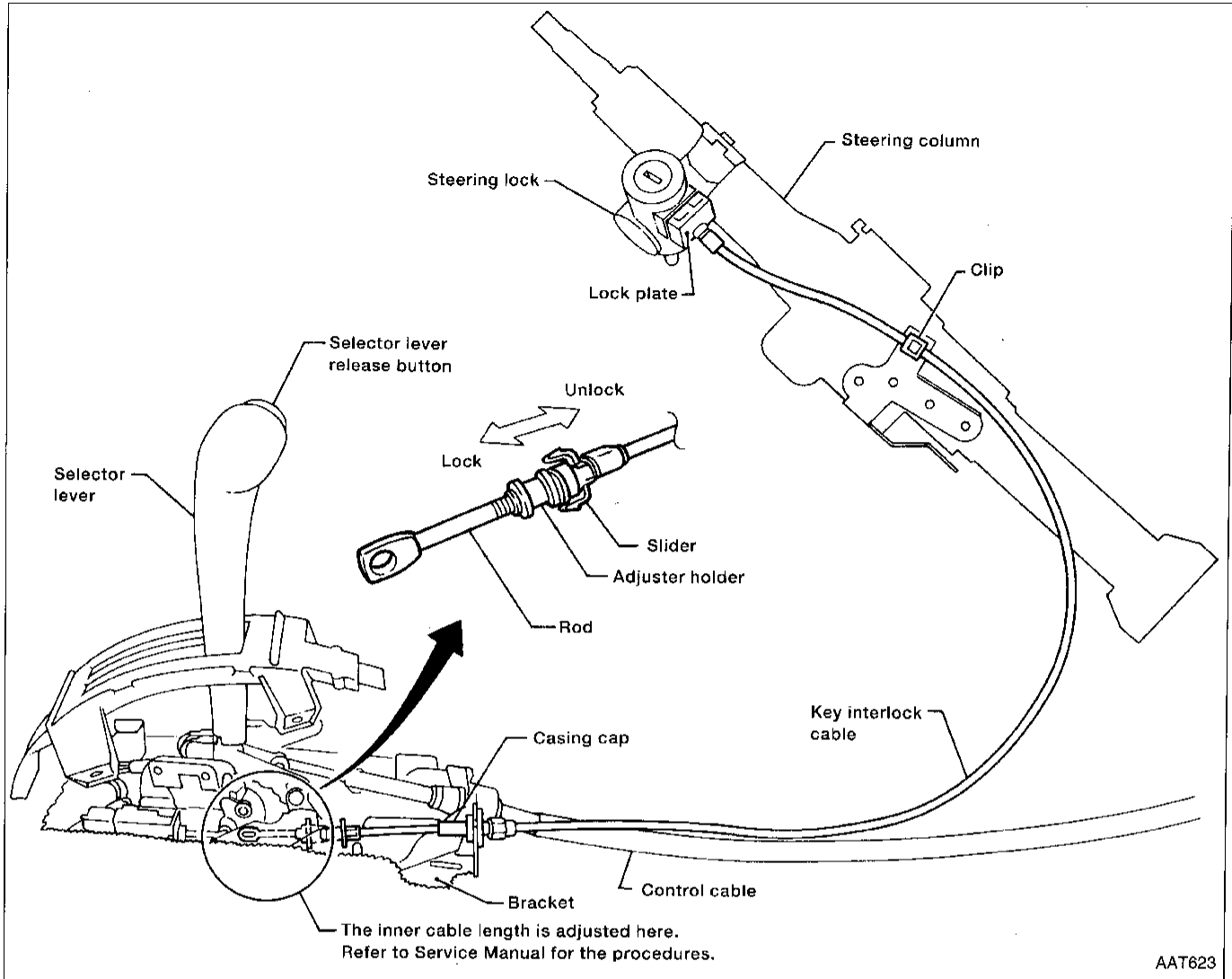
# TROUBLE DIAGNOSES — A/T Shift Lock System

## Diagnostic Procedure (Cont'd)



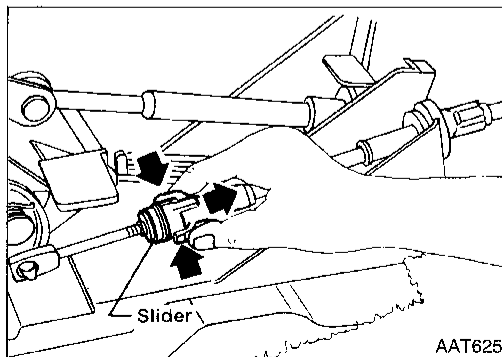
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IDX

**Key Interlock Cable**



**CAUTION:**

- Install key interlock cable in such a way that it will not be damaged by sharp bends, twists or interference with adjacent parts.
- After installing key interlock cable to control device, make sure that casing cap and bracket are firmly secured in their positions. If casing cap can be removed with an external load of less than 39.2 N (4.0 kg, 8.8 lb), replace key interlock cable with new one.



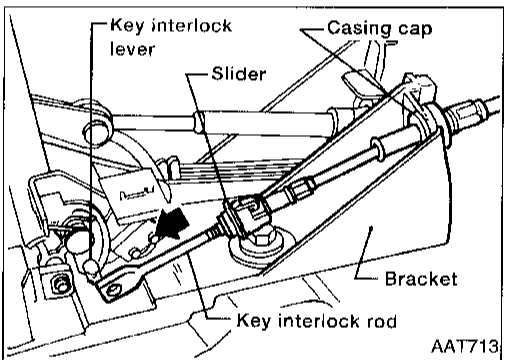
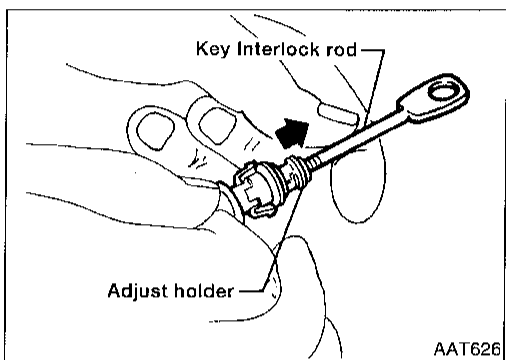
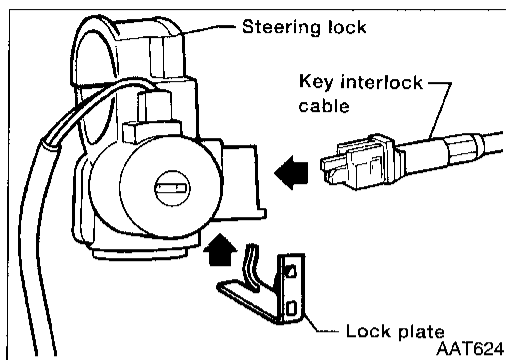
**REMOVAL**

Unlock slider from adjuster holder and remove rod from cable.

# TROUBLE DIAGNOSES — A/T Shift Lock System

## Key Interlock Cable (Cont'd)

### INSTALLATION



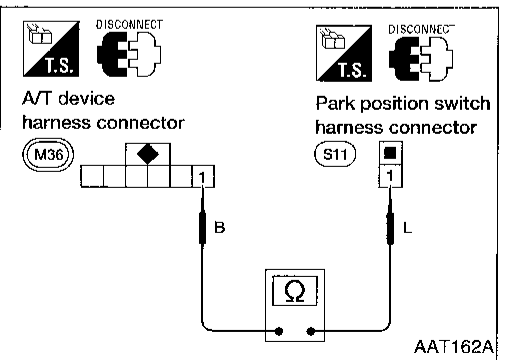
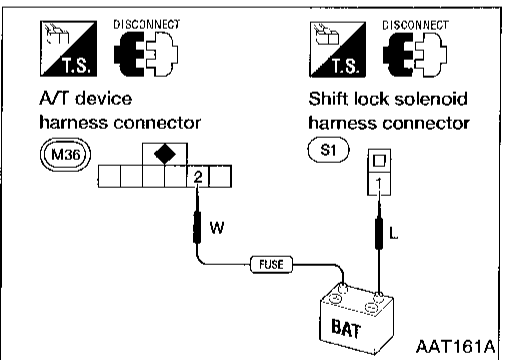
1. Remove key from key cylinder.
2. Set key interlock cable to steering lock assembly and install lock plate.
3. Clamp cable to steering column and fix to control cable with band.
4. Set control lever to "P" position.
5. Insert interlock rod into adjuster holder.
6. Install casing cap to bracket.
7. Install key interlock rod to key interlock lever.
8. Move slider in order to fix adjuster holder to interlock rod.

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### Component Check

#### SHIFT LOCK SOLENOID

- Check operation by applying battery voltage to A/T device and shift lock solenoid harness terminal.



#### PARK POSITION SWITCH

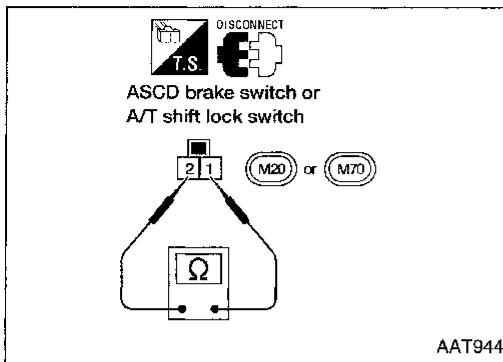
- Check continuity between A/T device harness terminal ① and park position switch harness terminal ①.

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

IDX

# TROUBLE DIAGNOSES — A/T Shift Lock System

## Component Check (Cont'd)

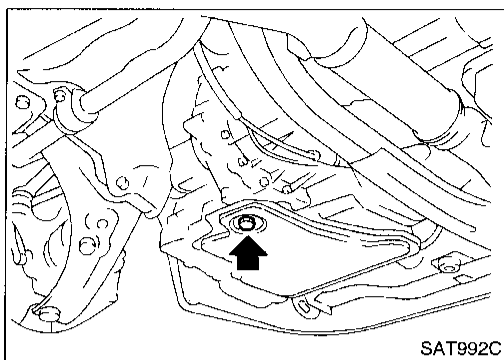


### ASC D BRAKE SWITCH OR A/T SHIFT LOCK SWITCH

- Check continuity between terminals ① and ②.

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

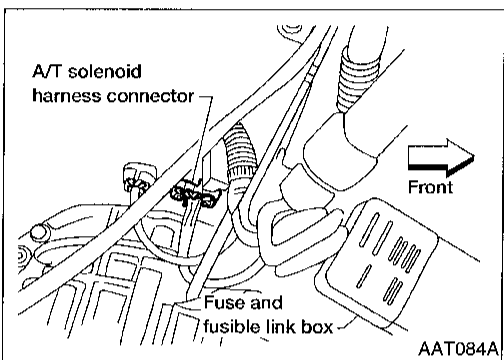
**Check ASC D brake switch or A/T shift lock switch after adjusting brake pedal — refer to BR section.**



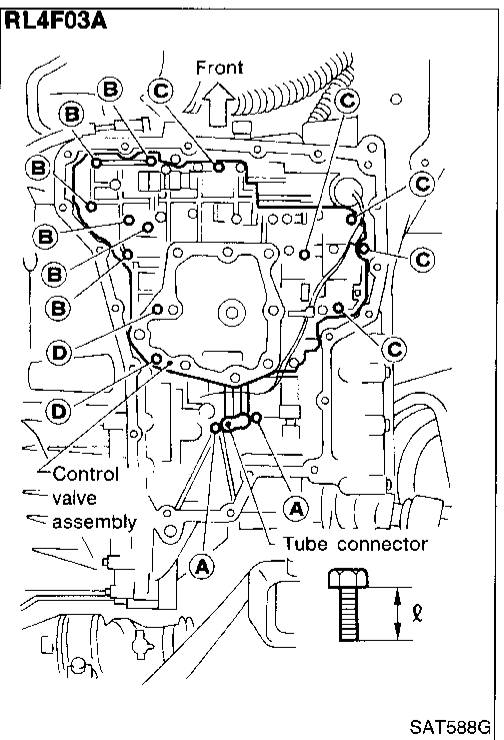
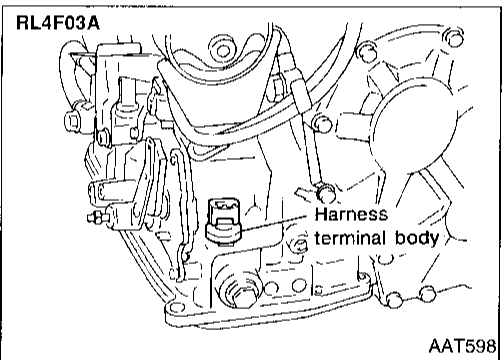
## Control Valve Assembly and Accumulator

### REMOVAL

1. Drain ATF from transaxle.
2. Remove oil pan and gasket.



3. Disconnect A/T solenoid harness connector.



4. Remove control valve assembly by removing fixing bolts.
- Bolt length, number and location:**

Bolt symbol	(A)	(B)	(C)	(D)
Bolt length "ℓ" mm (in)	25.0 (0.984)	33.0 (1.299)	40.0 (1.575)	43.5 (1.713)
Number of bolts	2	6	5	2

- Be careful not to drop manual valve, tube connector, tubes and servo release accumulator return spring.
5. Disassemble and inspect control valve assembly if necessary. Refer to AT-88.

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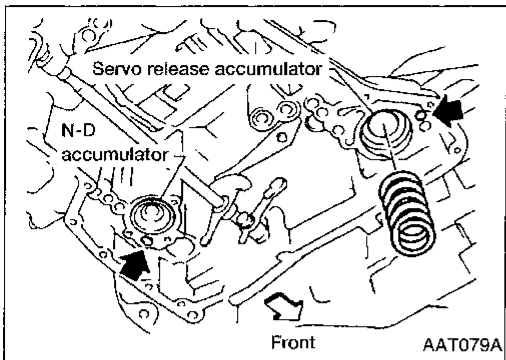
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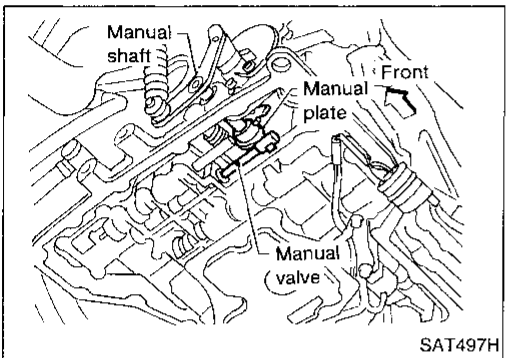


## ON-VEHICLE SERVICE

### Control Valve Assembly and Accumulator (Cont'd)



6. Remove servo release and N-D accumulators by applying compressed air if necessary.
- Hold each piston with a rag.



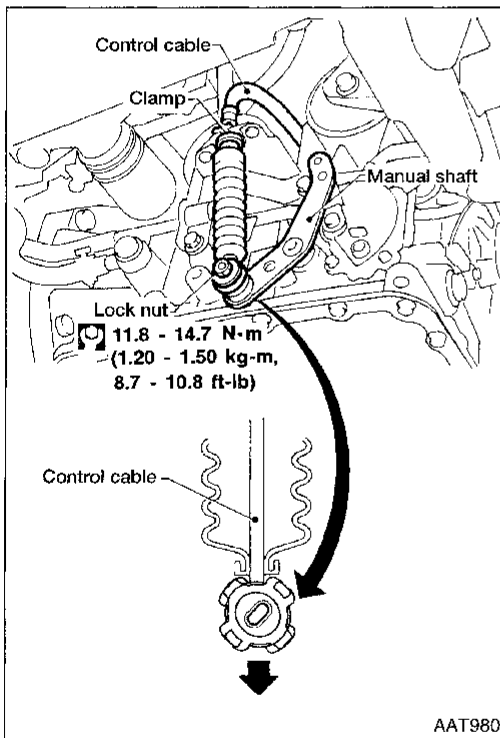
### INSTALLATION

- Tighten fixing bolts to specification.  
☞ : 7 - 9 N·m (0.7 - 0.9 kg·m, 61 - 78 in·lb)
- Set manual shaft in Neutral position, then align manual plate with groove in manual valve.
- After installing control valve assembly, make sure that selector lever can be moved to all positions.

### Control Cable Adjustment

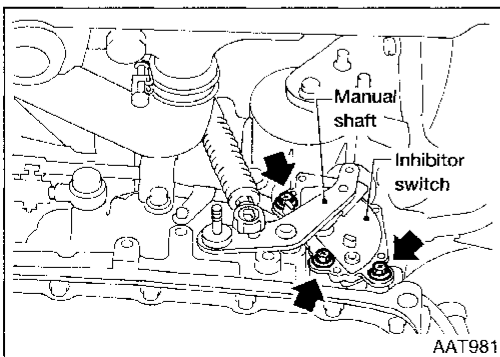
Move selector lever from the "P" position to the "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or if the pointer indicating the position is improperly aligned, the control cable needs adjustment.

1. Place selector lever in "P" position.
2. Loosen control cable lock nut and place manual shaft in "P" position.
3. Pull control cable, by specified force, in the direction of the arrow shown in the illustration.  
**Specified force: 6.9 N (0.7 kg, 1.5 lb)**
4. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
5. Tighten control cable lock nut.
6. Move selector lever from "P" to "1" position again. Make sure that selector lever moves smoothly.
7. Apply grease to contacting areas of selector lever and control cable. Install any part removed.



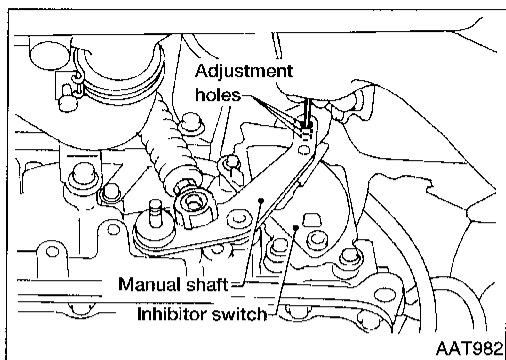
### Inhibitor Switch Adjustment

1. Remove control cable end from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.



# ON-VEHICLE SERVICE

## Inhibitor Switch Adjustment (Cont'd)



4. Use a 4mm (0.157 in) pin for this adjustment.
  - a) Insert the pin straight into the manual shaft adjustment hole.
  - b) Rotate inhibitor switch until the pin can also be inserted straight into hole in inhibitor switch.
5. Tighten inhibitor switch fixing bolts.
6. Remove pin from adjustment hole after adjusting inhibitor switch.
7. Reinstall any part removed.
8. Adjust control cable. Refer to "Control Cable Adjustment".
9. Check continuity of inhibitor switch. Refer to AT-56.

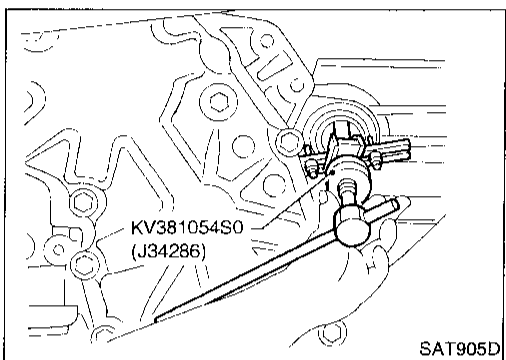
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## Differential Side Oil Seal Replacement

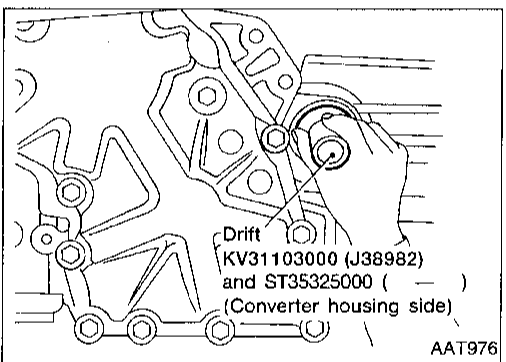


1. Remove drive shaft assemblies. Refer to FA section ("Drive Shaft", "FRONT AXLE").
2. Remove oil seals.

EC

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3. Install oil seals.
  - **Apply ATF before installing.**

MT

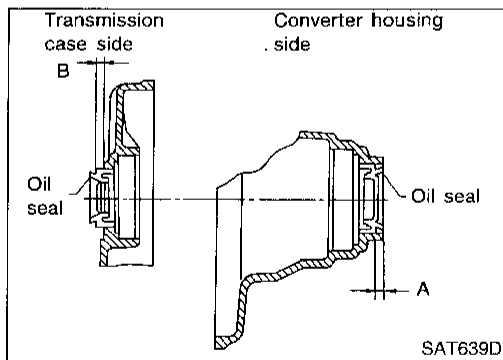
AT

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- **Install oil seals so that dimensions "A" and "B" are within specification.**



Unit: mm (in)

A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less

ST

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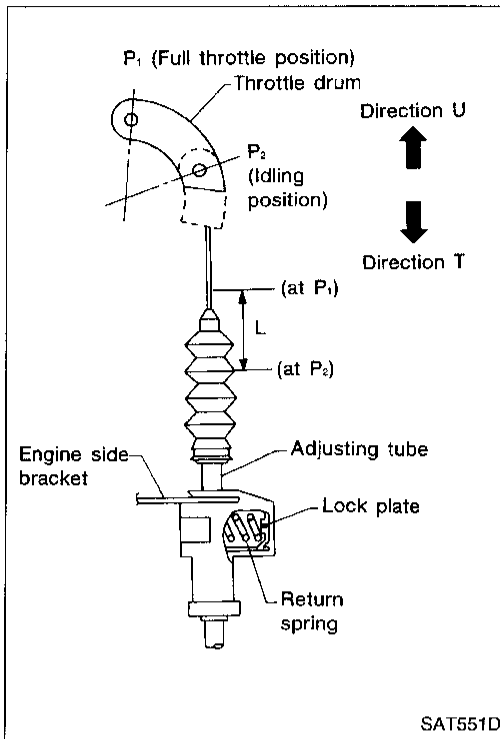
4. Reinstall any part removed.

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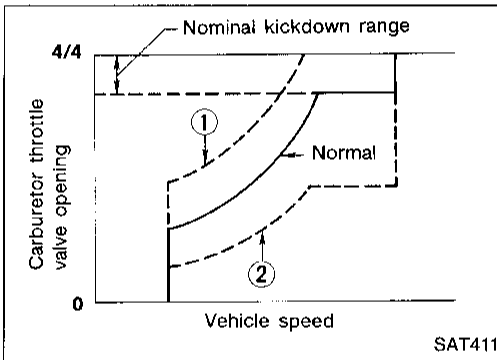
## Throttle Wire Adjustment

1. Turn ignition switch OFF.
2. While pressing lock plate, move adjusting tube in Direction T.
3. Release lock plate. (Adjusting tube is locked at this time.)
4. Move throttle drum from P<sub>2</sub> (Idling position) to P<sub>1</sub> (Full throttle position) quickly and release.
5. Ensure that throttle wire stroke "L" is within the specified range, between full throttle and idle.

### Throttle wire stroke "L":

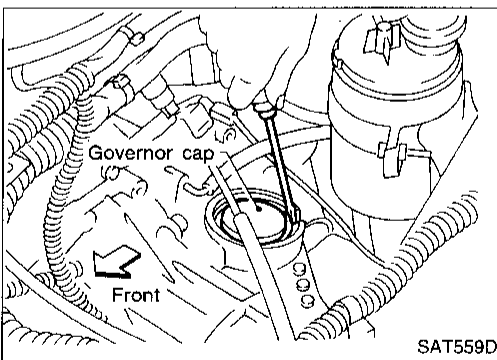
40 - 42 mm (1.57 - 1.65 in)

- Adjust throttle wire stroke after accelerator wire is installed and adjusted.
- When connecting throttle wire to throttle drum, do not use tools. Manually hook wire.
- Put mark on throttle wire for measuring wire stroke.



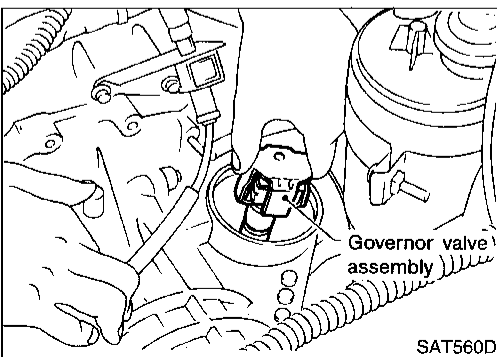
If throttle wire stroke is improperly adjusted the following problems may arise.

- When the throttle drum fully-open position "P<sub>1</sub>" is too far toward Direction T, the shift schedule will be as shown by ② in the figure, and the kickdown range will greatly increase.
- When the throttle drum fully-open position "P<sub>1</sub>" is too far toward Direction U, the shift schedule will be as shown by ① in the figure, and kickdown will not occur.



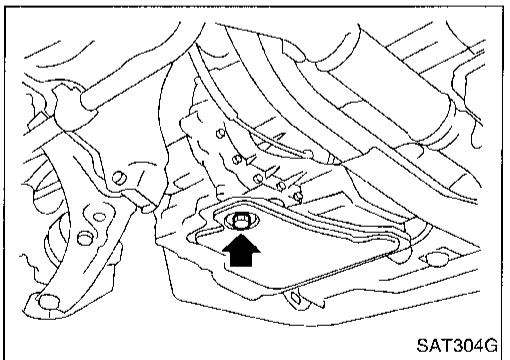
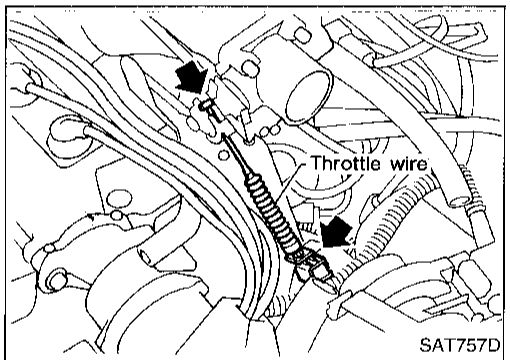
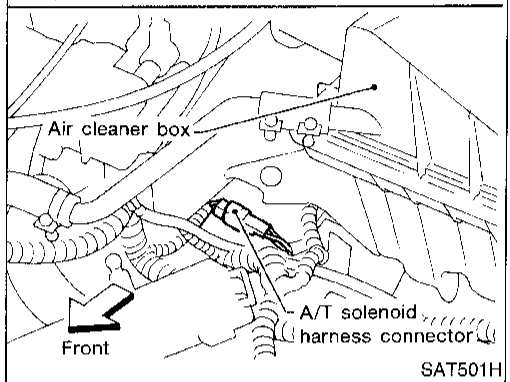
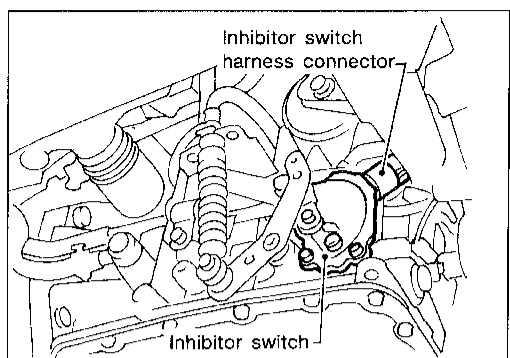
## Governor Valve

1. Remove governor cap snap ring.
2. Remove governor cap.



3. Remove governor valve assembly from transaxle.
4. Check governor valve assembly for damage or wear.

# REMOVAL AND INSTALLATION




## Removal

### CAUTION:

Before separating transaxle from engine, remove the crankshaft position sensor (OBD) from transaxle. Be careful not to damage sensor.

1. Remove battery and bracket.
2. Remove air duct between throttle body and air cleaner.
3. Remove torque converter clutch solenoid valve harness connector, inhibitor switch harness connector and vehicle speed sensor harness connector.
4. Remove crankshaft position sensor (OBD) from transaxle.

5. Disconnect throttle wire at engine side.

6. Drain ATF from transaxle.
  7. Disconnect control cable from transaxle.
  8. Disconnect oil cooler hoses.
  9. Remove drive shafts. Refer to FA section ("Drive Shaft", "FRONT AXLE").
  10. Remove the intake manifold support bracket. Refer to EM section ("OUTER COMPONENT PARTS").
  11. Remove starter motor from transaxle.
- Tighten bolts to specified torque.**  
: 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)
12. Remove upper bolts fixing transaxle to engine.
  13. Support transaxle with a jack.

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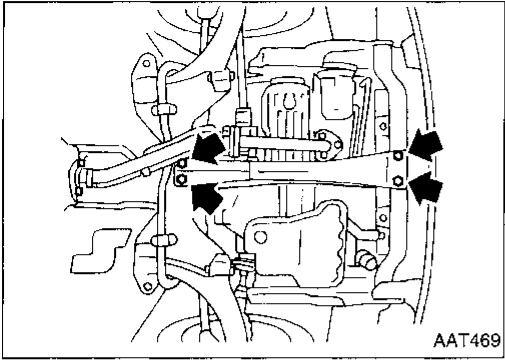
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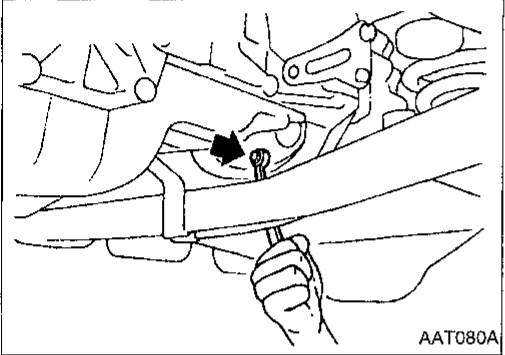
## REMOVAL AND INSTALLATION

### Removal (Cont'd)



14. Remove center member.

- Tighten center member fixing bolts to specified torque, Refer to EM section ("ENGINE REMOVAL").



15. Remove front and rear gussets and engine rear plate.

16. Remove torque converter bolts.

Rotate crankshaft to gain access to securing bolts.

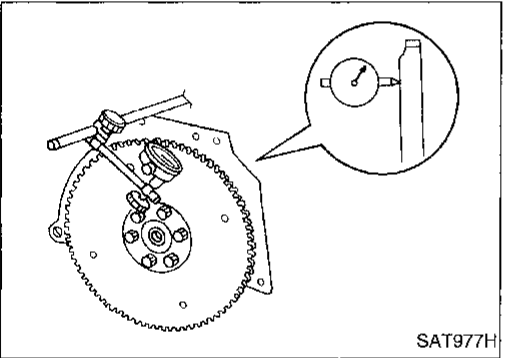
17. Remove rear transaxle to engine bracket. Refer to EM section ("ENGINE REMOVAL").

18. Support engine with a jack.

19. Remove rear transaxle mount. Refer to EM section ("ENGINE REMOVAL").

20. Remove lower bolts fixing transaxle to engine.

21. Lower transaxle with an A/T jack.



### Installation

1. Check drive plate runout.

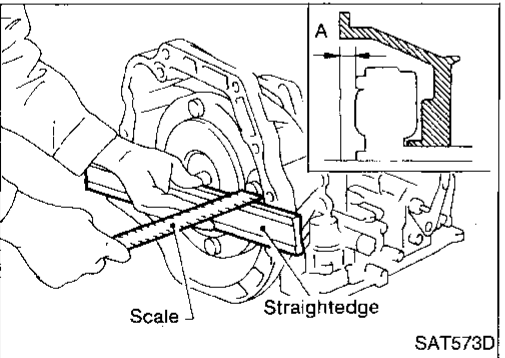
#### CAUTION:

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

**Maximum allowable runout:**

**Refer to EM section ("Inspection", "CYLINDER BLOCK").**

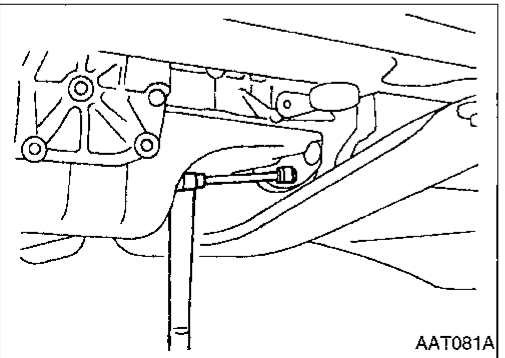
If this runout is out of allowance, replace drive plate with ring gear.



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

**Distance "A":**

**21.1 mm (0.831 in) or more**

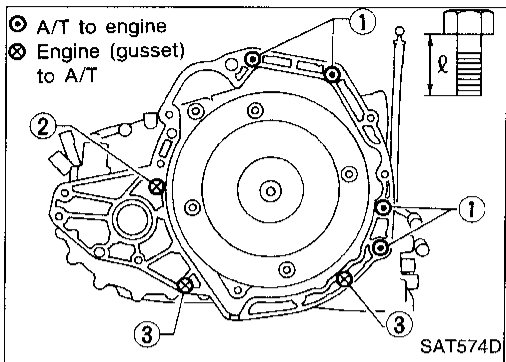


3. Install torque converter to drive plate.

- **With converter installed, rotate crankshaft several turns to check that transaxle rotates freely without binding.**

# REMOVAL AND INSTALLATION

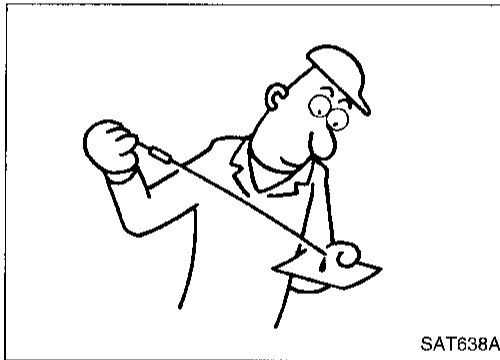
## Installation (Cont'd)



### 4. Tighten bolts fixing transaxle

Bolt No.	Tightening torque N-m (kg-m, ft-lb)	Bolt length "L" mm (in)
①	30 - 40 (3.1 - 4.1, 22 - 30)	50 (1.97)
②	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
③	16 - 21 (1.6 - 2.1, 12 - 15)	25 (0.98)
Front gusset to engine	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)
Rear gusset to engine	16 - 21 (1.6 - 2.1, 12 - 15)	16 (0.63)

### 5. Reinstall any part removed.



6. Adjust control cable. Refer to AT-56.
7. Adjust throttle wire. Refer to AT-58.
8. Check continuity of inhibitor switch. Refer to AT-47 (RL4F03A).
9. Refill transaxle with ATF and check fluid level.
10. Move selector lever through all positions to be sure that transaxle operates correctly. With parking brake applied, idle engine. Move selector lever through "N" to "D", to "2", to "1" and "R" positions. A slight shock should be felt through the hand gripping the selector each time the transaxle is shifted.
11. Perform road test. Refer to AT-36.

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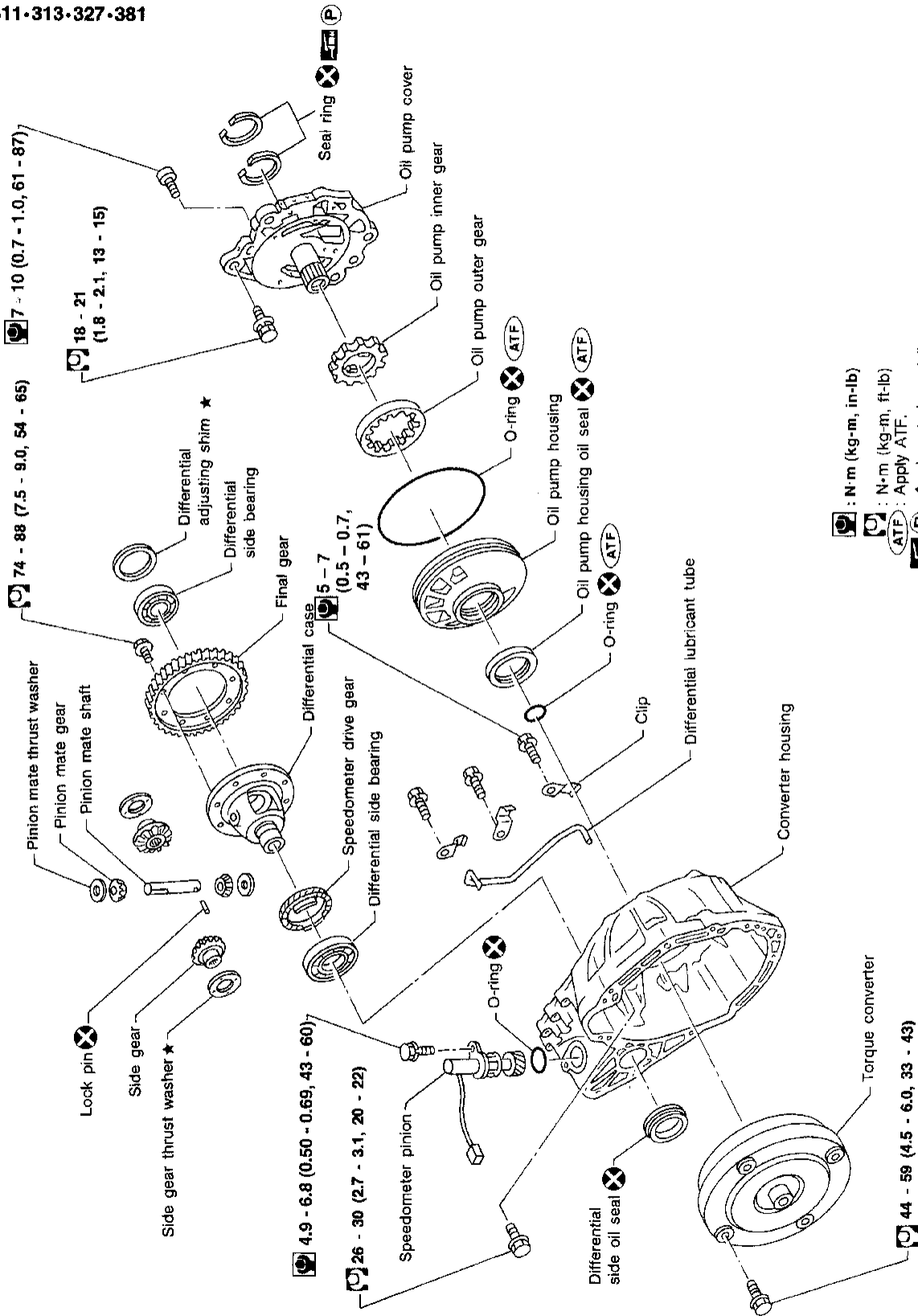
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# MAJOR OVERHAUL

SEC. 311-313-327-381



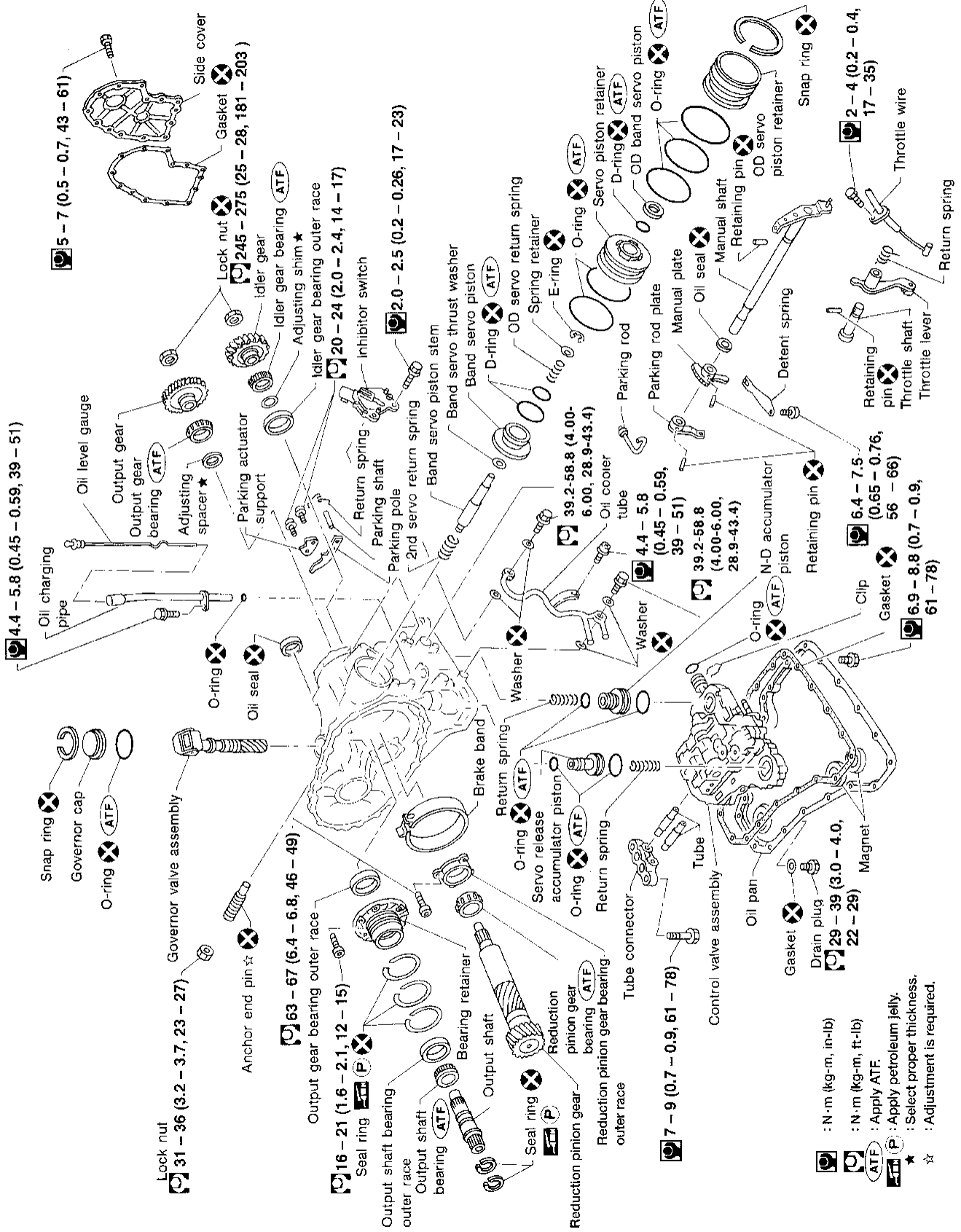
- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- : Apply ATF.
- : Apply petroleum jelly
- : Select proper thickness.





# MAJOR OVERHAUL

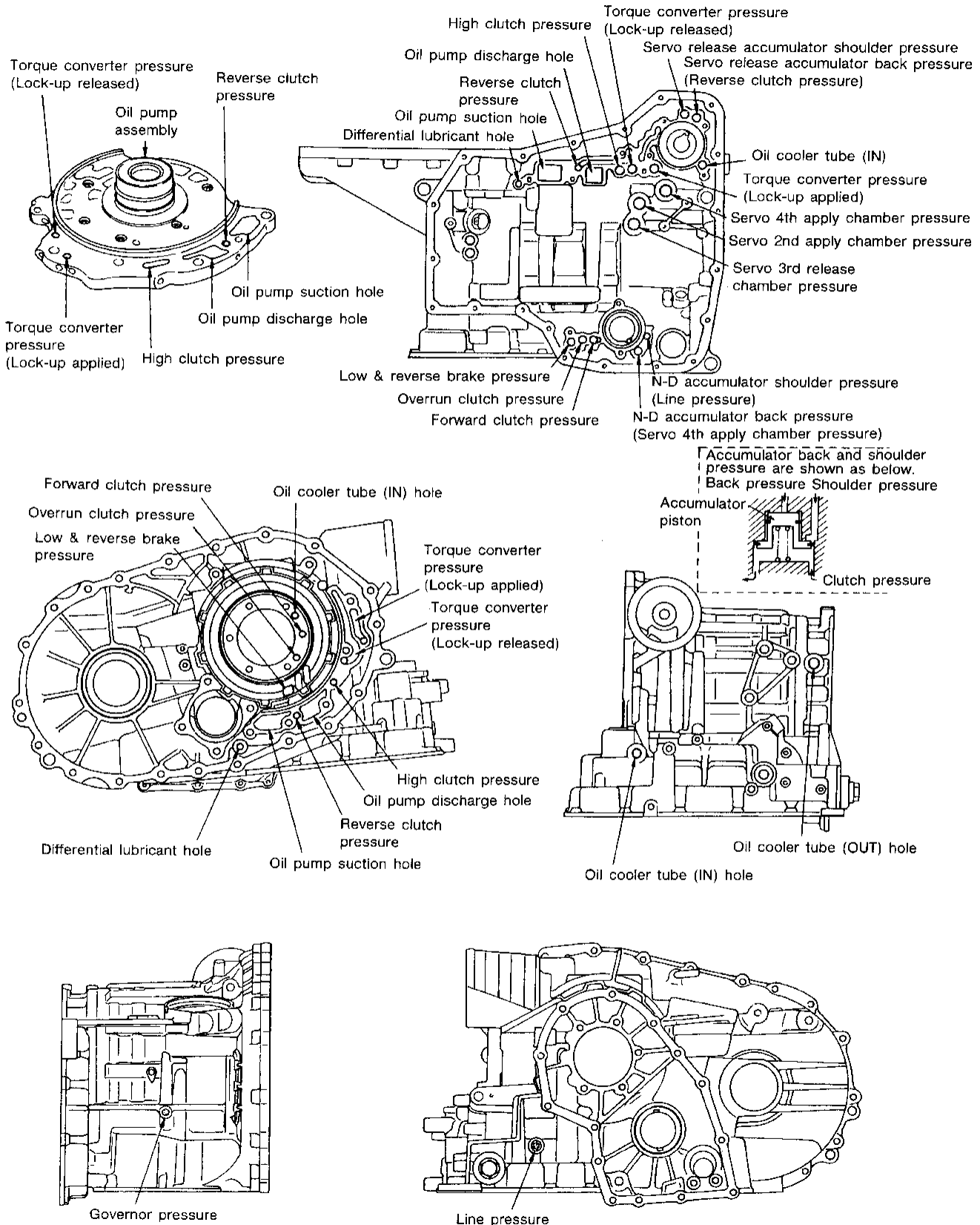
## SEC. 310-311-312-314-315-317-319



- : N·m (kg-m, in-lb)
- : N·m (kg-m, ft-lb)
- (ATF) : Apply ATF.
- ★ : Select proper thickness.
- ☆ : Adjustment is required.

# MAJOR OVERHAUL

## Oil Channel



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# MAJOR OVERHAUL

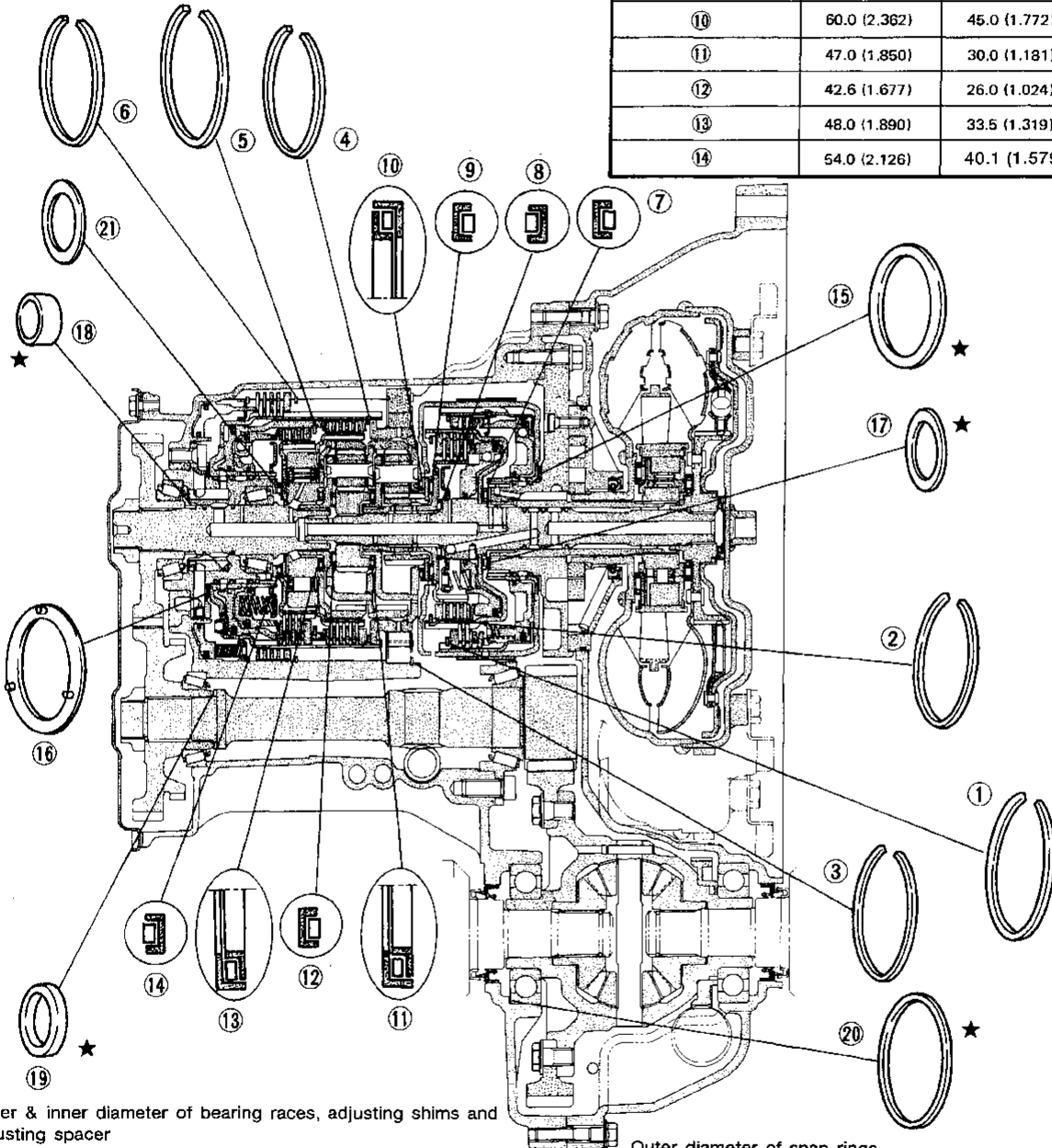
## Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings

Outer diameter and color of thrust washers

Item number	Outer diameter mm (in)	Color
⑬	72.0 (2.835)	black
⑭	78.5 (3.091)	

Outer and inner diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑦	47.0 (1.850)	32.0 (1.260)
⑧	35.0 (1.378)	20.1 (0.791)
⑨	60.0 (2.362)	42.0 (1.654)
⑩	60.0 (2.362)	45.0 (1.772)
⑪	47.0 (1.850)	30.0 (1.181)
⑫	42.6 (1.677)	26.0 (1.024)
⑬	48.0 (1.890)	33.5 (1.319)
⑭	54.0 (2.126)	40.1 (1.579)



Outer & inner diameter of bearing races, adjusting shims and adjusting spacer

Item number	Outer diameter mm (in)	Inner diameter mm (in)
⑰	48.0 (1.890)	33 (1.30)
⑱	29.0 (1.142)	25.0 (0.984)
⑲	34.5 (1.358)	26.1 (1.028)
⑳	79.5 (3.130)	72.0 (2.835)
㉑	55.0 (2.165)	42.0 (1.654)

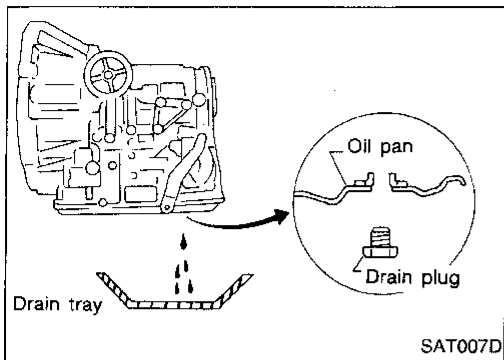
★ : Select proper thickness

Outer diameter of snap rings

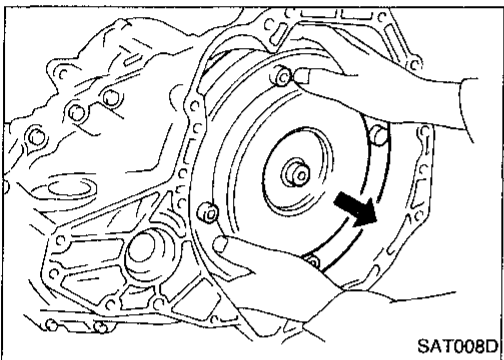
Item number	Outer diameter mm (in)
①	142.0 (5.59)
②	113.0 (4.45)
③	162.4 (6.39)
④	135.4 (5.33)
⑤	126.0 (4.96)
⑥	161.5 (6.36)

AAT678

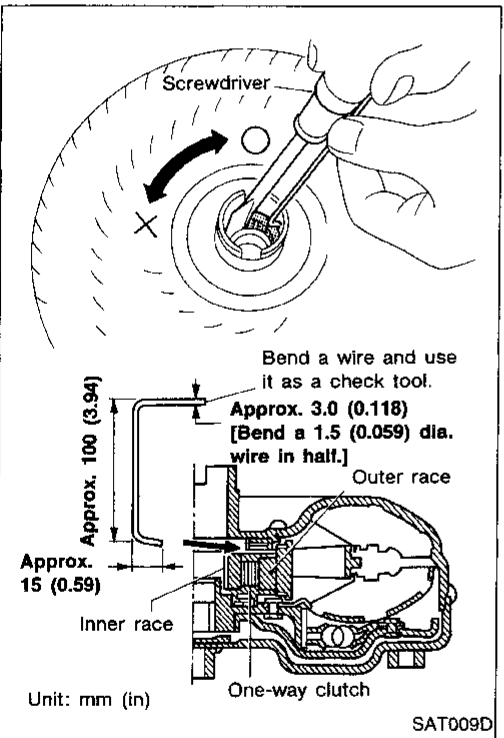
# DISASSEMBLY



1. Drain ATF through drain plug.

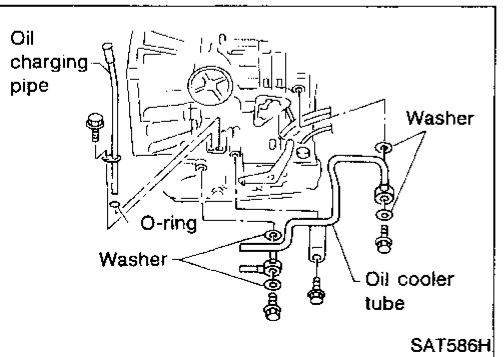


2. Remove torque converter.



3. Check torque converter one-way clutch using check tool as shown at left.

- Insert check tool into the groove of bearing support built into one-way clutch outer race.
- While fixing bearing support with check tool, rotate one-way clutch spline using flat-bladed screwdriver.
- Check inner race rotates clockwise only. If not, replace torque converter assembly.



4. Remove oil charging pipe and oil cooler tube.

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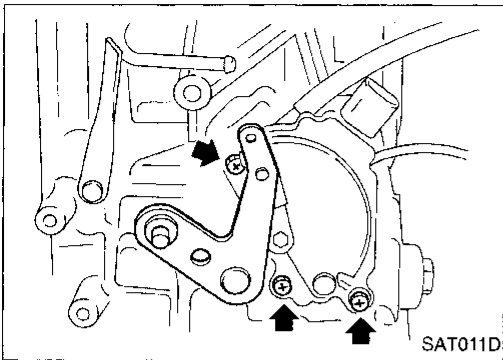
BT

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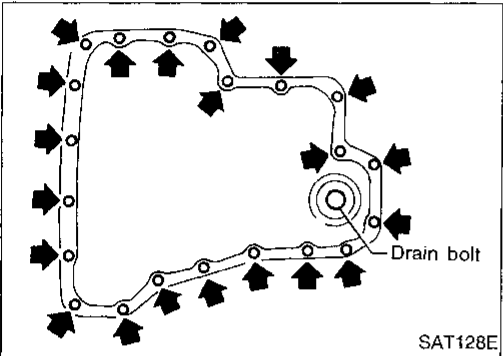
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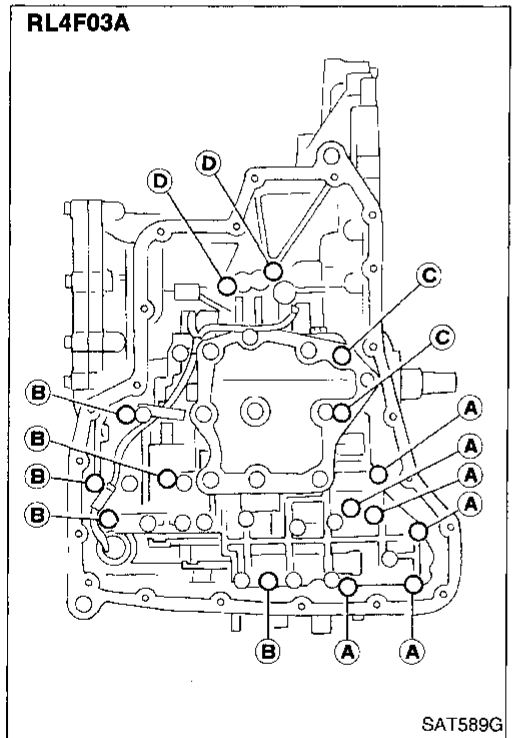
## DISASSEMBLY



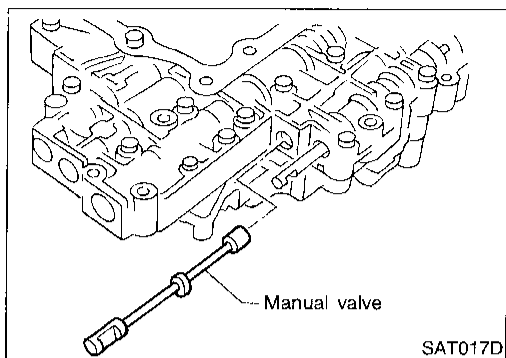
5. Set manual shaft to "P" position.
6. Remove inhibitor switch.



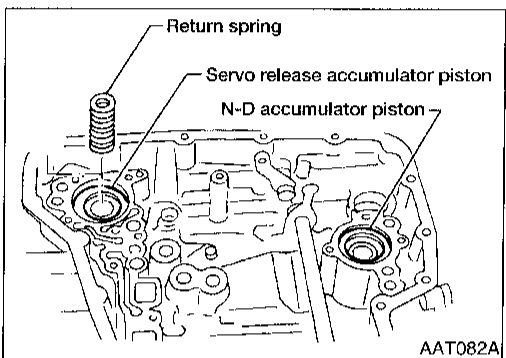
7. Remove oil pan and oil pan gasket.
  - **Do not reuse oil pan bolts.**
8. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and may inhibit pump pressure.
  - **If frictional material is detected, replace radiator after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").**
9. Remove control valve assembly mounting bolts (A), (B), (C) and (D).



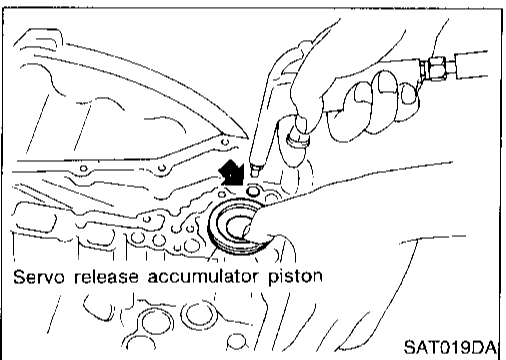
# DISASSEMBLY



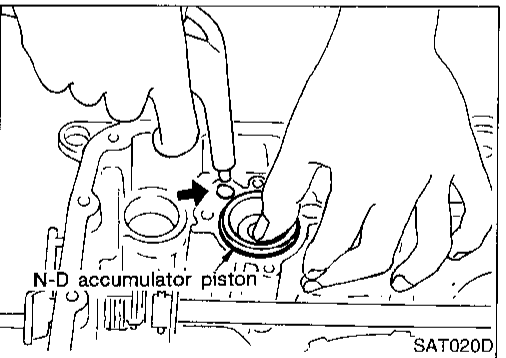
10. Remove manual valve from control valve assembly as a precaution.



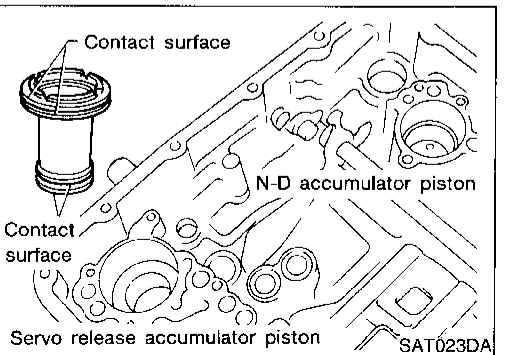
11. Remove return spring from servo release accumulator piston.



12. Remove servo release accumulator piston with compressed air.  
13. Remove O-rings from servo release accumulator piston.



14. Remove N-D accumulator piston and return spring with compressed air.  
15. Remove O-rings from N-D accumulator piston.



16. Check accumulator pistons and contact surface of transmission case for damage.  
17. Check accumulator return springs for damage and free length.

**Return springs:**  
Refer to SDS, AT-171.

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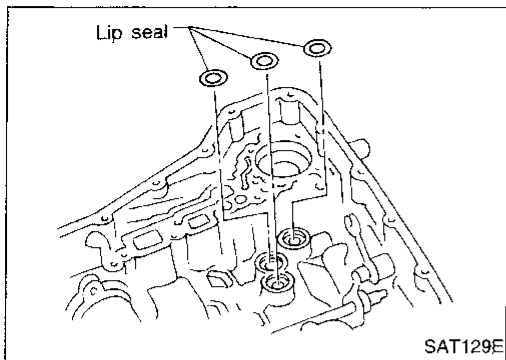
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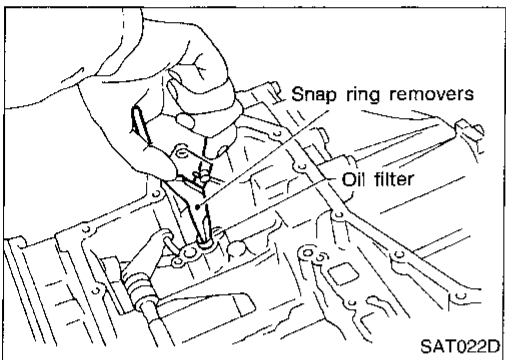
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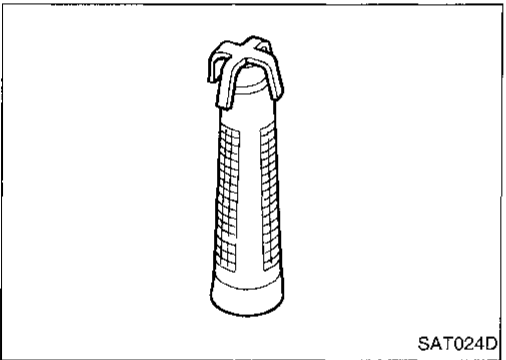
## DISASSEMBLY



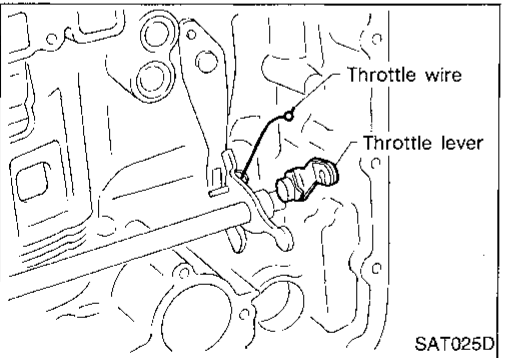
18. Remove lip seals from band servo oil port.



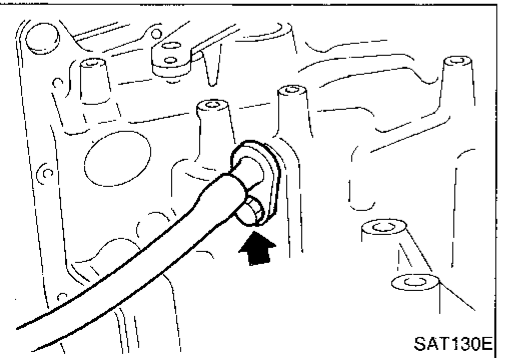
19. Remove oil filter for governor.



20. Check oil filter for governor for damage or clogging.



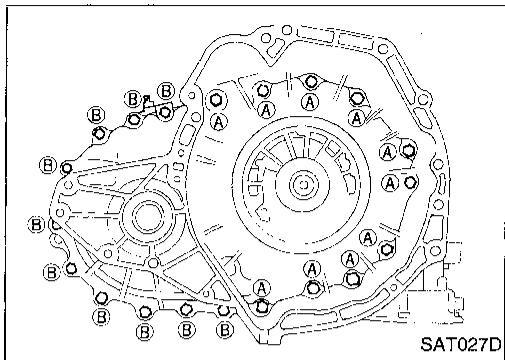
21. Remove throttle wire from throttle lever.



22. Remove throttle wire mounting bolt.

23. Draw out throttle wire from transmission case.

# DISASSEMBLY



24. Remove converter housing according to the following procedures.
- Remove converter housing mounting bolts (A) and (B).

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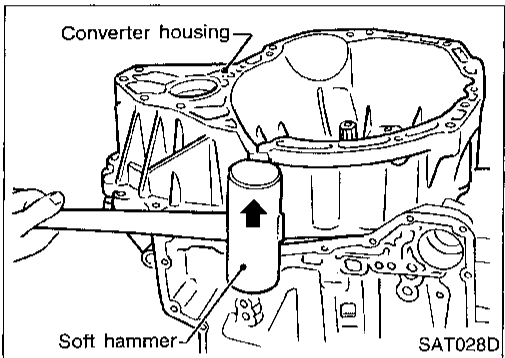
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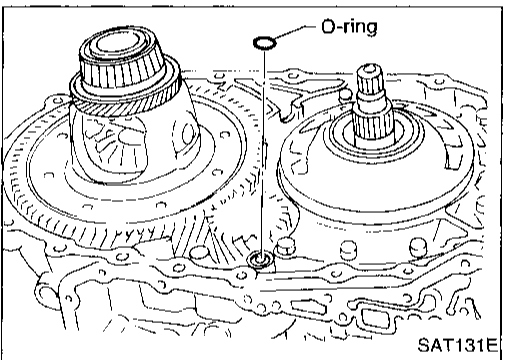
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- Remove converter housing by tapping lightly.

AT

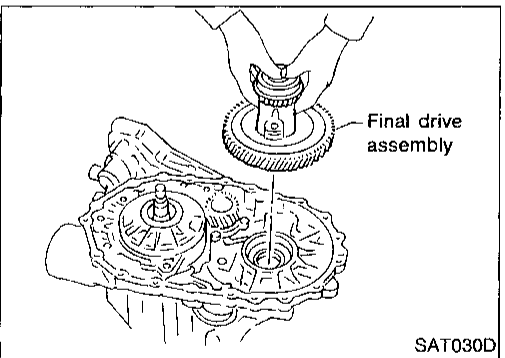


- Remove O-ring from differential oil port.

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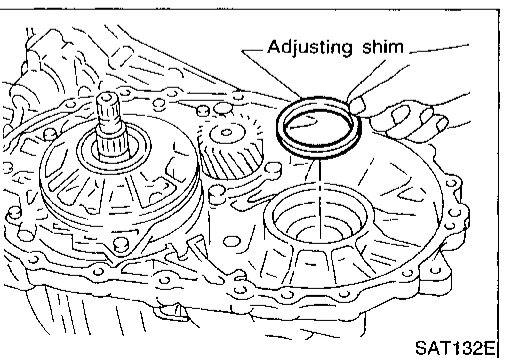
25. Remove final drive assembly from transmission case.  
If it is difficult to lift up by hand, tap final drive slightly with a soft hammer.

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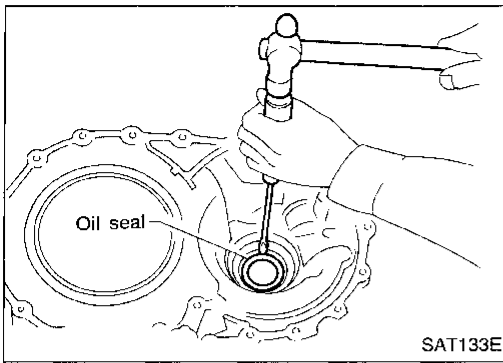
26. Remove differential side bearing adjusting shim from transmission case.

EL

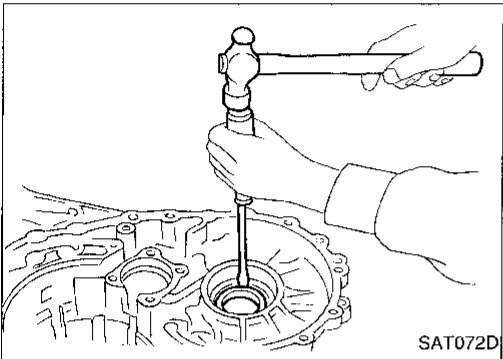
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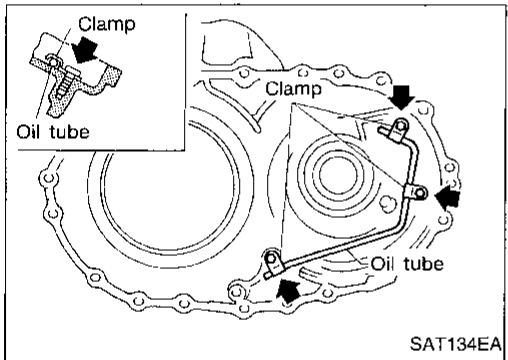
## DISASSEMBLY



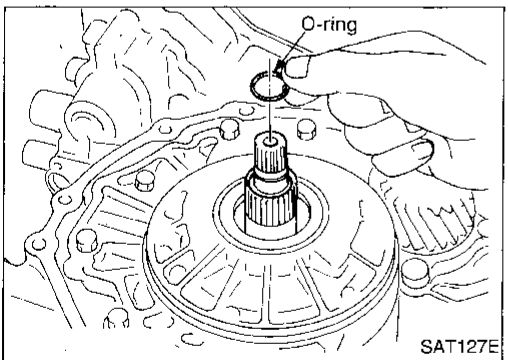
27. Remove oil seal from converter housing using a screwdriver.
- **Be careful not to damage case.**



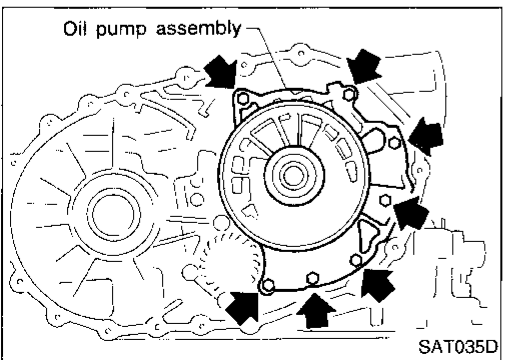
28. Remove side oil seal from transmission case using a screwdriver.



29. Remove oil tube from converter housing.

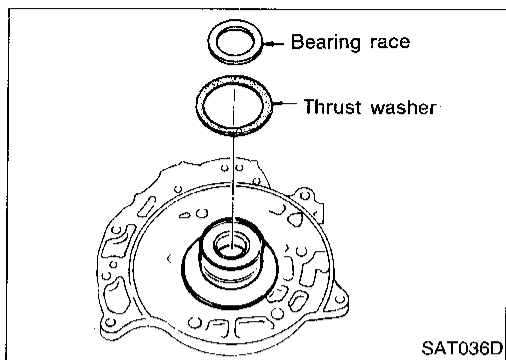


30. Remove oil pump according to the following procedures.
- Remove O-ring from input shaft.



- Remove oil pump assembly from transmission case.

# DISASSEMBLY



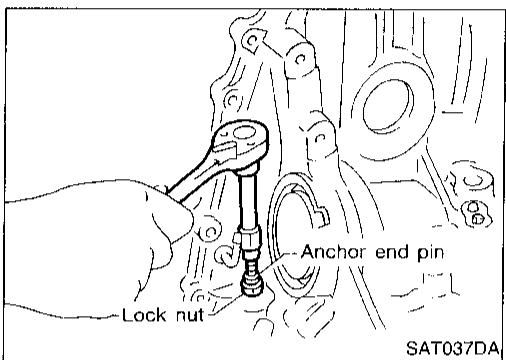
- c. Remove thrust washer and bearing race from oil pump assembly.

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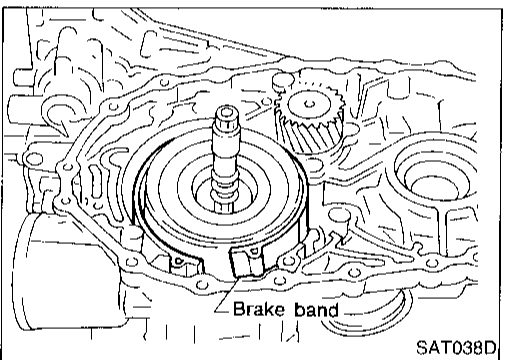


31. Remove brake band according to the following procedures.  
 a. Loosen lock nut, then back off anchor end pin.  
 • Do not reuse anchor end pin.

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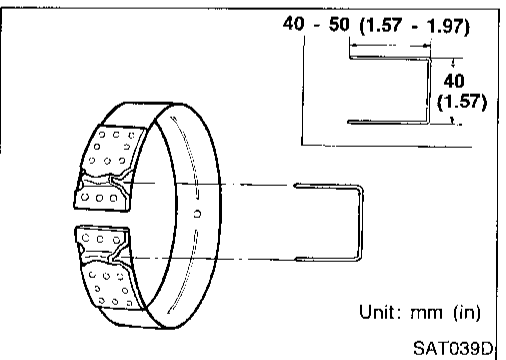
- b. Remove brake band from transmission case.

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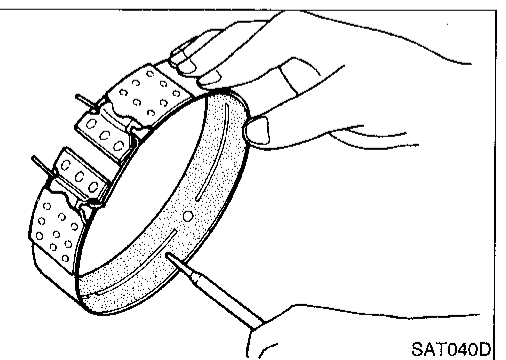
- To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown in the figure at left. Leave the clip in position after removing the brake band.

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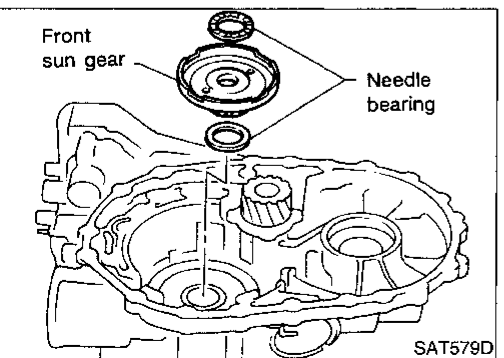
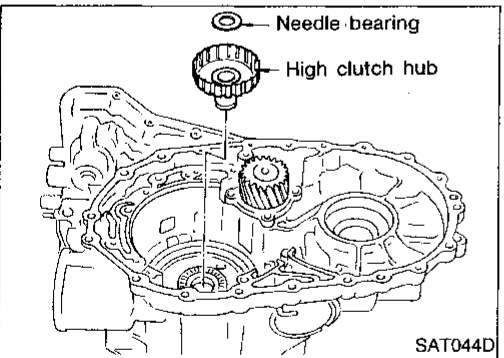
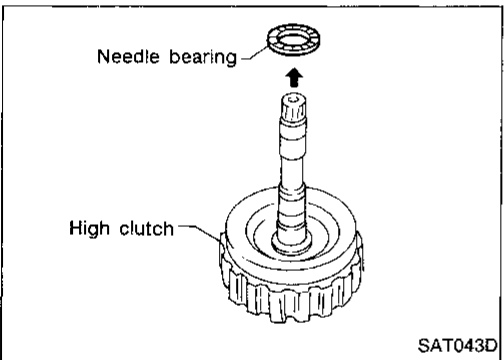
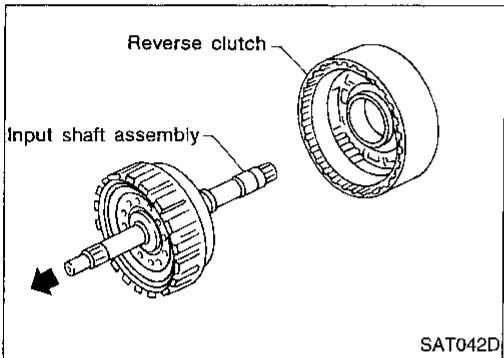
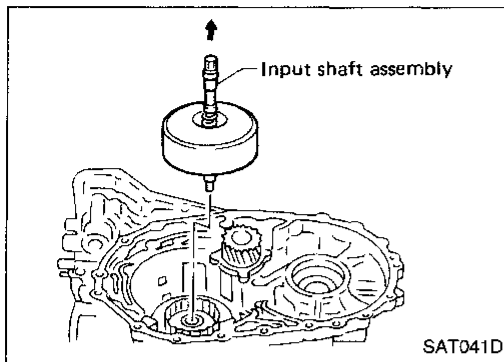
- c. Check brake band facing for damage, cracks, wear or burns.

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## DISASSEMBLY



32. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.

a. Remove input shaft assembly (high clutch) with reverse clutch.

b. Remove input shaft assembly (high clutch) from reverse clutch.

c. Remove needle bearing from high clutch drum.

d. Check input shaft assembly and needle bearing for damage or wear.

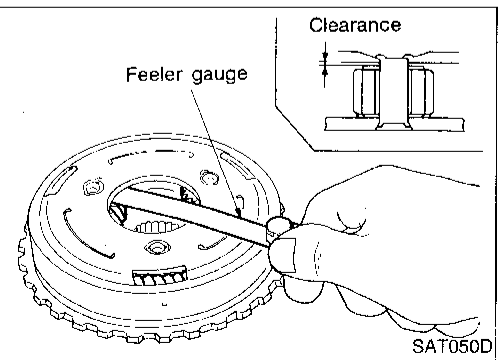
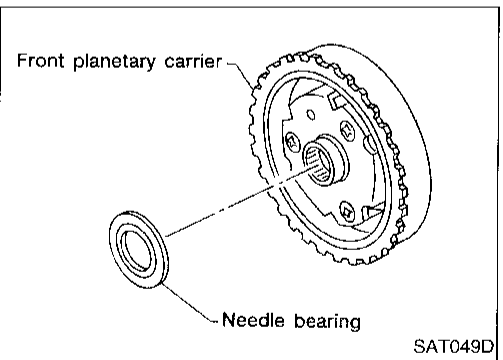
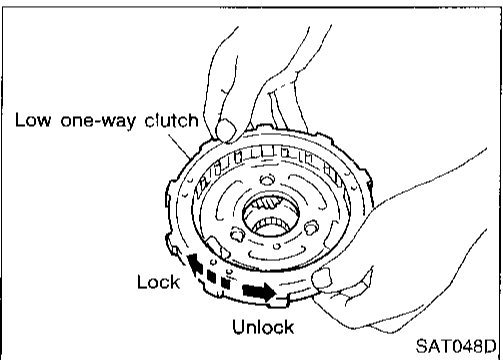
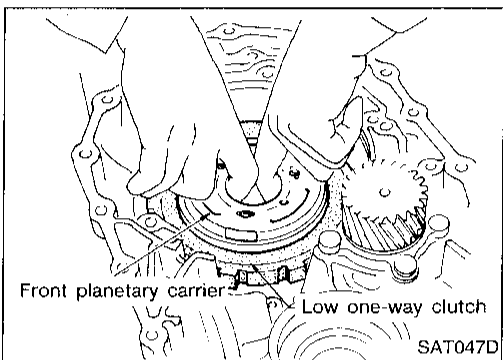
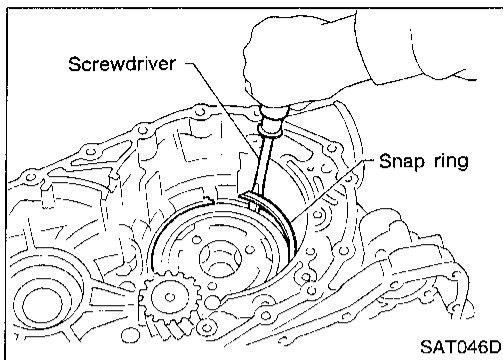
33. Remove high clutch hub and needle bearing from transmission case.

34. Check high clutch hub and needle bearing for damage or wear.

35. Remove front sun gear and needle bearings from transmission case.

36. Check front sun gear and needle bearings for damage or wear.

# DISASSEMBLY



37. Remove front planetary carrier assembly and low one-way clutch according to the following procedures.
- a. Remove snap ring using a screwdriver.

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- b. Remove front planetary carrier with low one-way clutch.

- c. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.
- d. Remove low one-way clutch from front planetary carrier by rotating it in the direction of unlock.

- e. Remove needle bearing from front planetary carrier.

- f. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.
- g. Check clearance between pinion washer and planetary carrier using feeler gauge.

**Standard clearance:**

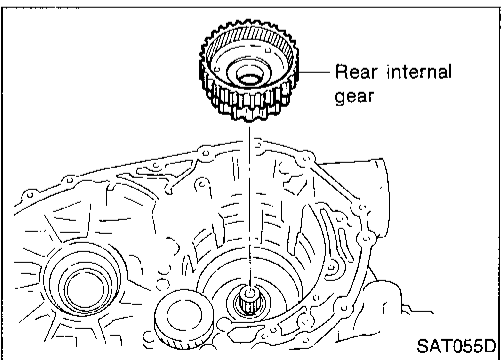
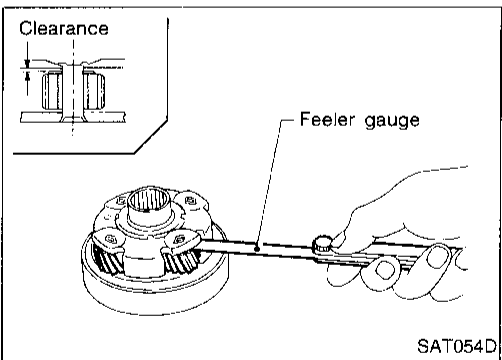
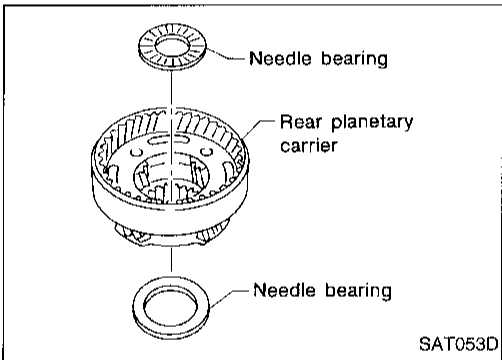
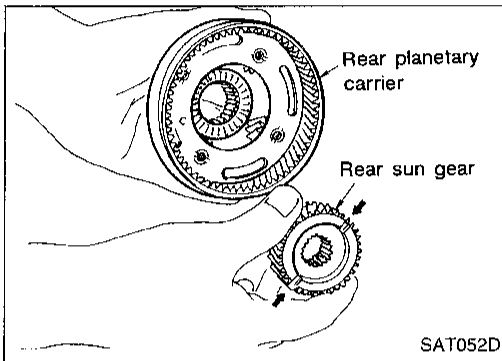
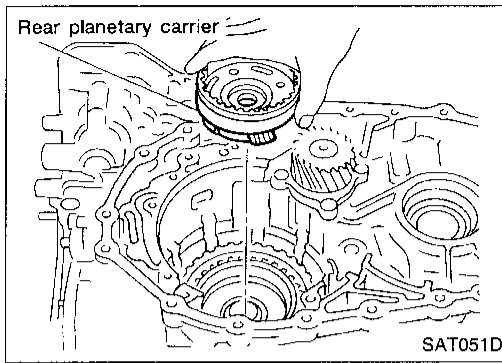
**0.15 - 0.70 mm (0.0059 - 0.0276 in)**

**Allowable limit:**

**0.80 mm (0.0315 in)**

Replace front planetary carrier if the clearance exceeds allowable limit.

## DISASSEMBLY



38. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.
- Remove rear planetary carrier assembly from transmission case.

- Remove rear sun gear from rear planetary carrier.

- Remove needle bearings from rear planetary carrier assembly.

- Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.
- Check clearance between pinion washer and rear planetary carrier using feeler gauge.

**Standard clearance:**

**0.15 - 0.70 mm (0.0059 - 0.0276 in)**

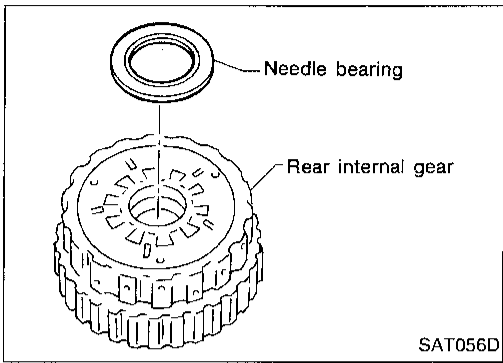
**Allowable limit:**

**0.80 mm (0.0315 in)**

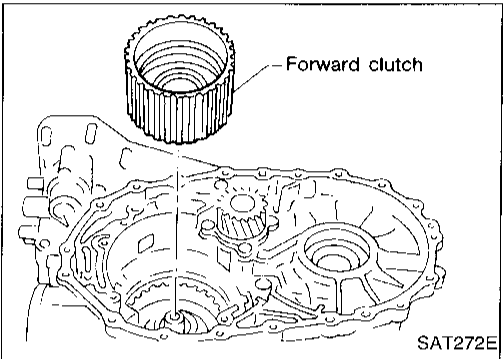
Replace rear planetary carrier if the clearance exceeds allowable limit.

39. Remove rear internal gear from transmission case.

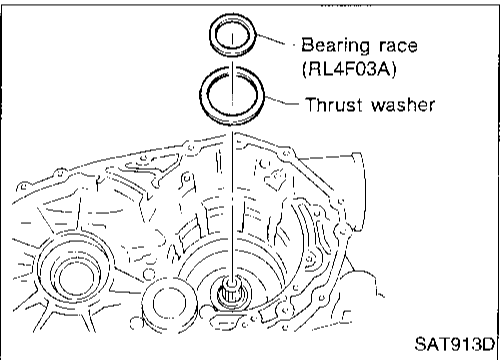
# DISASSEMBLY



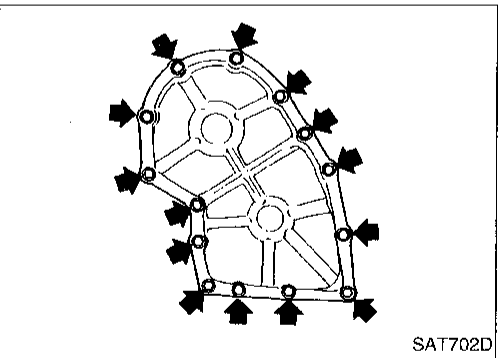
40. Remove needle bearing from rear internal gear.
- Check needle bearing for damage or wear.



41. Remove forward clutch assembly from transmission case.

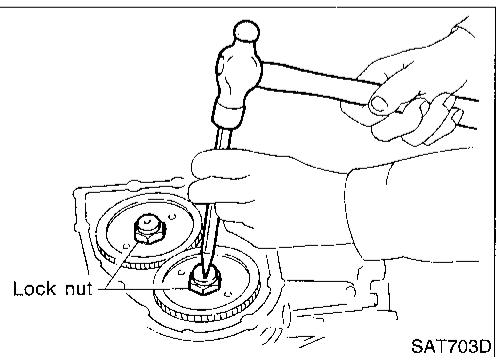


42. Remove thrust washer and bearing race from transmission case.



43. Remove output shaft, output gear and reduction pinion gear according to the following procedures.

- a. Remove side cover and gasket.
- **Do not reuse side cover bolts.**



- b. Set manual shaft to "P" position to fix idler gear and output gear.
- c. Unlock both idler gear and output gear lock nuts using a pin punch.

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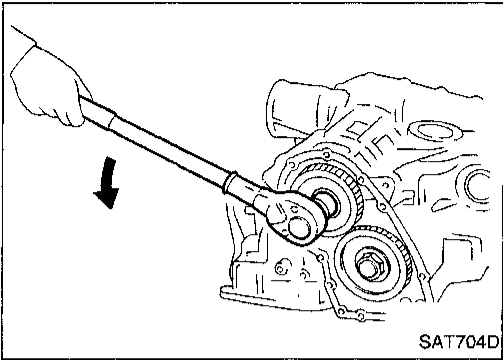
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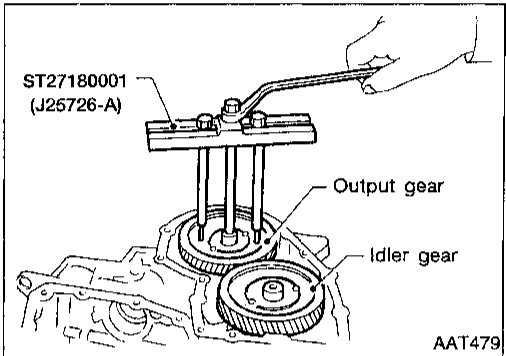
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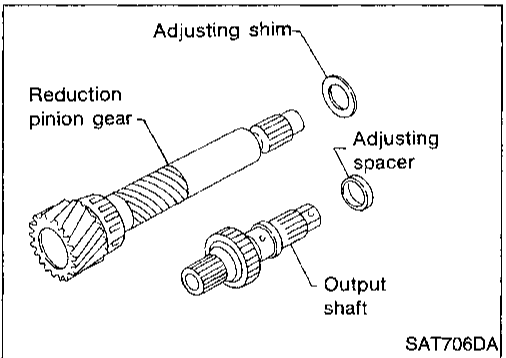
## DISASSEMBLY



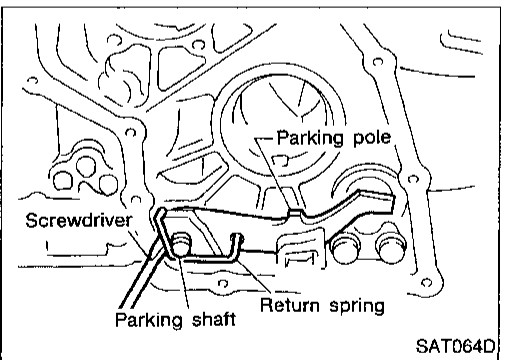
- d. Remove idler gear and output gear lock nuts.
  - Do not reuse idler gear and output gear lock nuts.



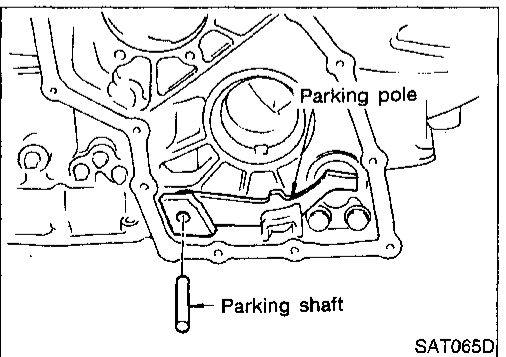
- e. Remove idler gear and output gear using a puller.



- f. Remove reduction pinion gear and output shaft.
- g. Remove adjusting shim from reduction pinion gear.
- h. Remove adjusting spacer from output shaft.

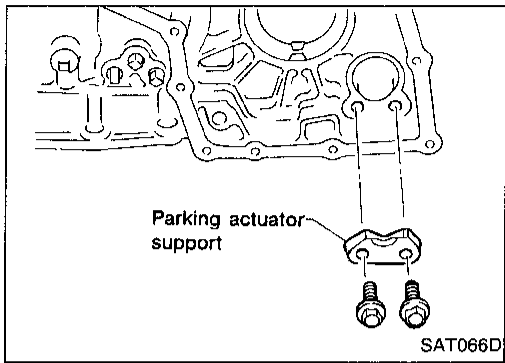


- 44. Remove return spring from parking shaft using a screwdriver.

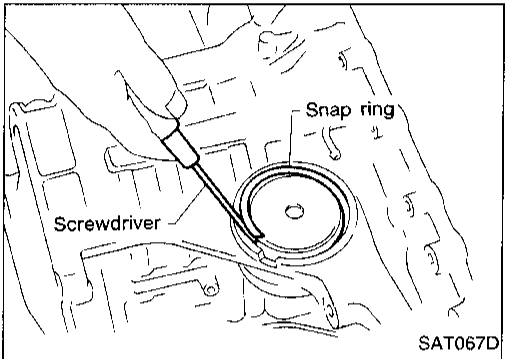


- 45. Draw out parking shaft and remove parking pole from transmission case.
- 46. Check parking pole and shaft for damage or wear.

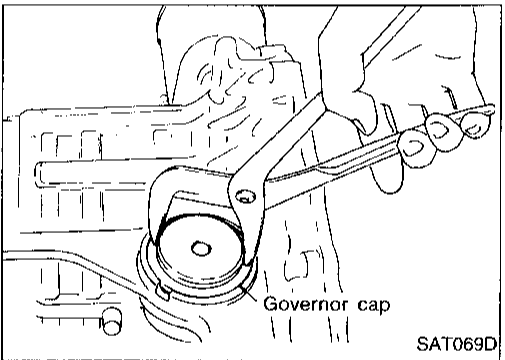
# DISASSEMBLY



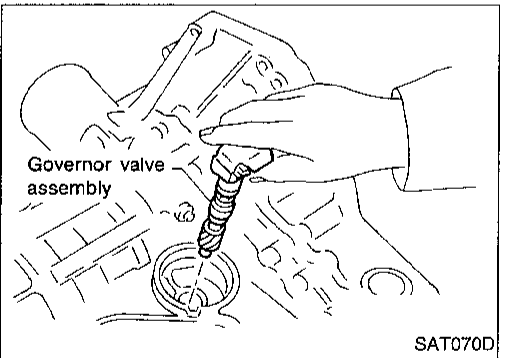
47. Remove parking actuator support from transmission case.
- Check parking actuator support for damage or wear.



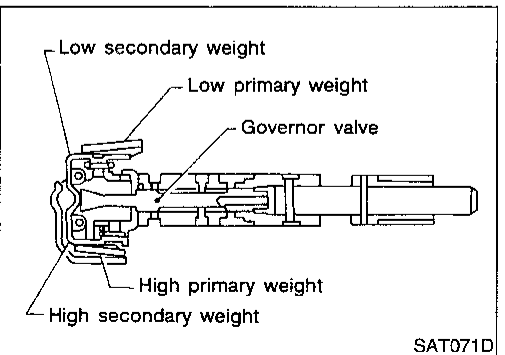
48. Remove governor valve assembly according to the following procedures.
- a. Remove snap ring using a screwdriver.



- b. Remove governor cap using pliers.
- c. Remove O-ring from governor cap.



- d. Remove governor valve assembly.



- e. With low primary weight closed, place top of governor valve assembly down. Make sure governor valve properly lowers easily.
- f. Place top of governor assembly down. Operate both low and high secondary weights to make sure governor valve functions properly.

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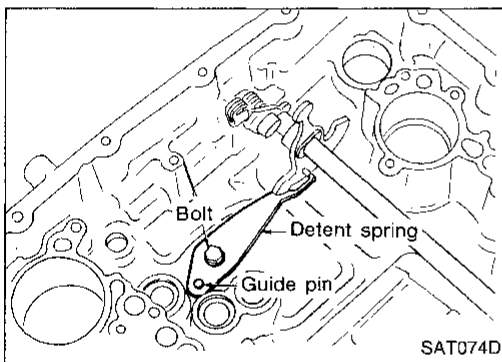
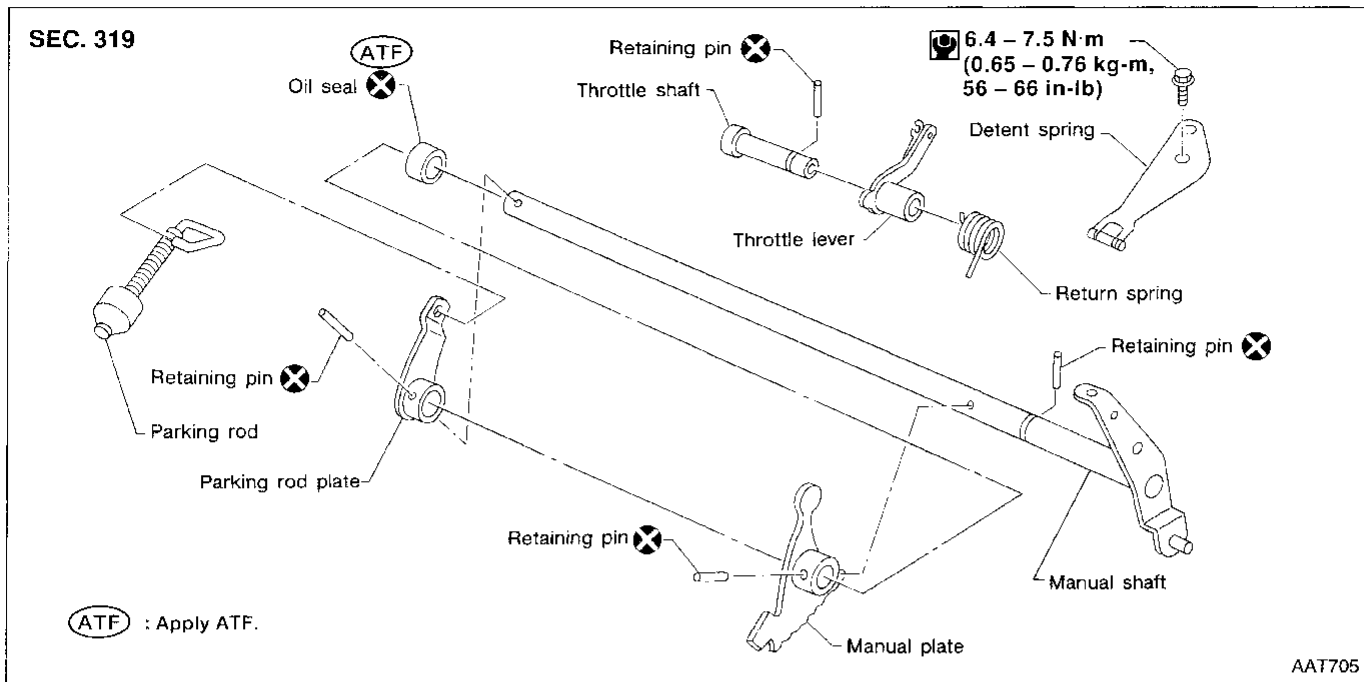
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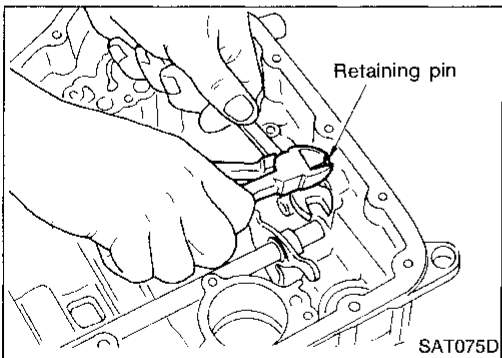


## Manual Shaft and Throttle Lever

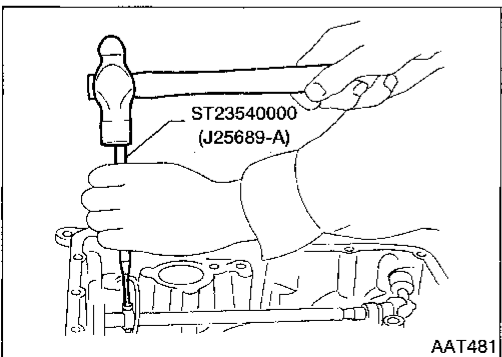


### REMOVAL

1. Remove detent spring from transmission case.



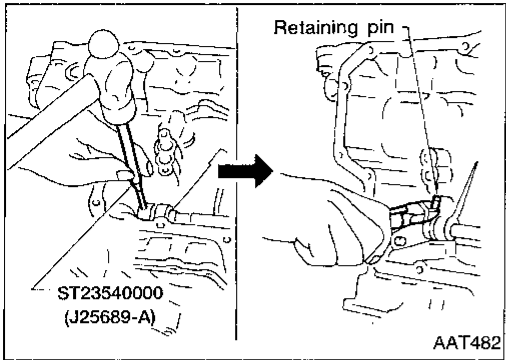
2. Pull out throttle shaft retaining pin, then draw out throttle shaft from transmission case.



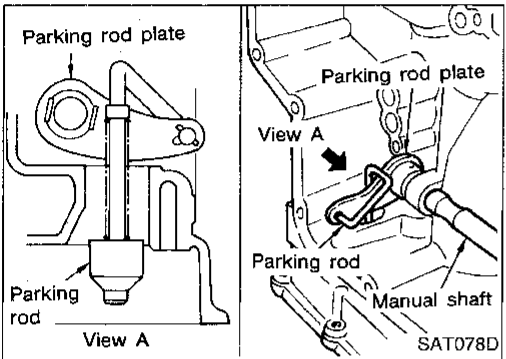
3. Drive out manual plate retaining pin.

## REPAIR FOR COMPONENT PARTS

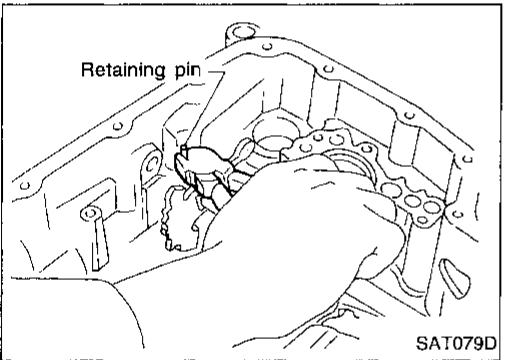
### Manual Shaft and Throttle Lever (Cont'd)



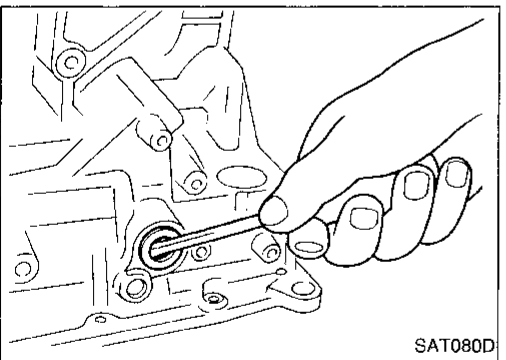
4. Drive and then pull out parking rod plate retaining pin.



5. Remove parking rod plate from manual shaft.
6. Draw out parking rod from transmission case.



7. Pull out manual shaft retaining pin.
8. Remove manual shaft and manual plate from transmission case.



9. Remove manual shaft oil seal.

### INSPECTION

- Check component parts for wear or damage. Replace if necessary.

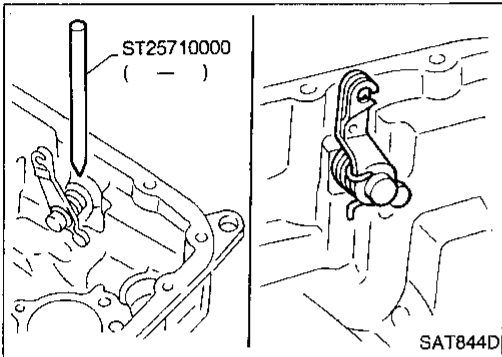
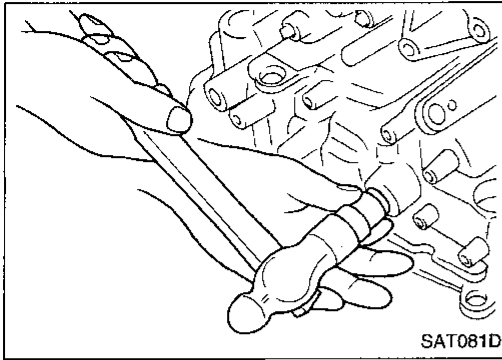
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## REPAIR FOR COMPONENT PARTS

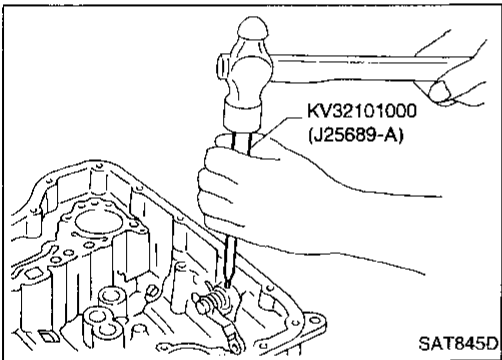
### Manual Shaft and Throttle Lever (Cont'd)

#### INSTALLATION

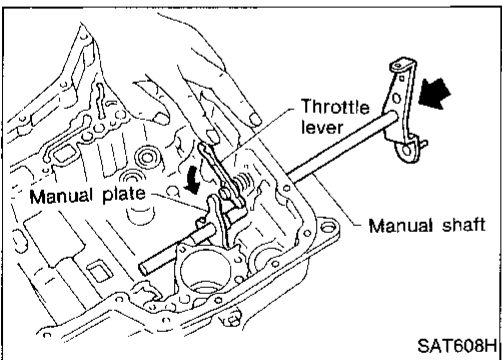
1. Install manual shaft oil seal.
  - Apply ATF to outer surface of oil seal.



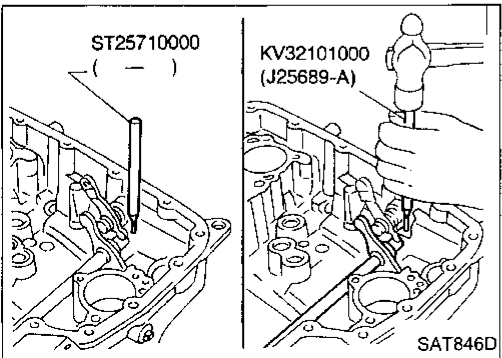
2. Install throttle lever and return spring on throttle shaft.
3. Install throttle lever assembly on transmission case.



4. Align groove of throttle shaft and hole of transmission case.
5. Install throttle shaft retaining pin.



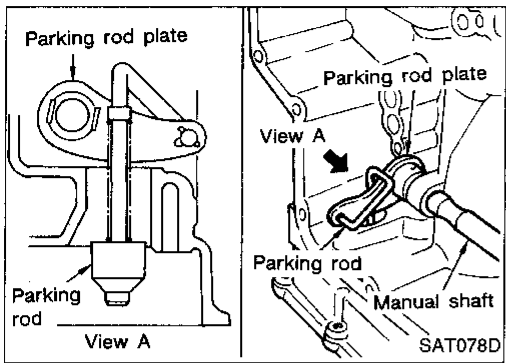
6. Move throttle lever in the direction of the arrow.
7. Install manual shaft and manual plate.



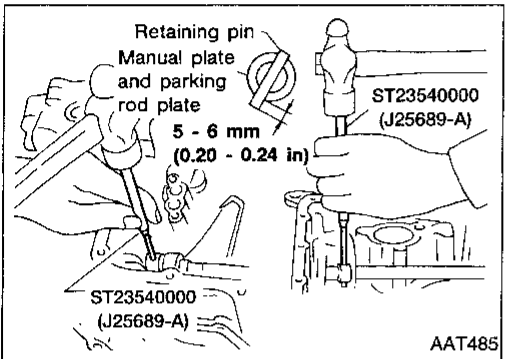
8. Align groove of manual shaft and hole of transmission case.
9. Install manual shaft retaining pin.

# REPAIR FOR COMPONENT PARTS

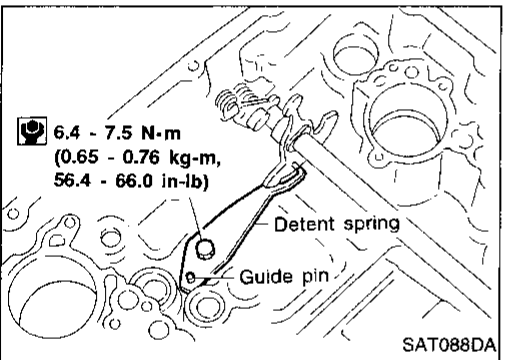
## Manual Shaft and Throttle Lever (Cont'd)



10. Install parking rod to parking rod plate.
11. Install parking rod assembly to manual shaft.



12. Install manual plate retaining pin and parking rod plate retaining pin.



13. Install detent spring.

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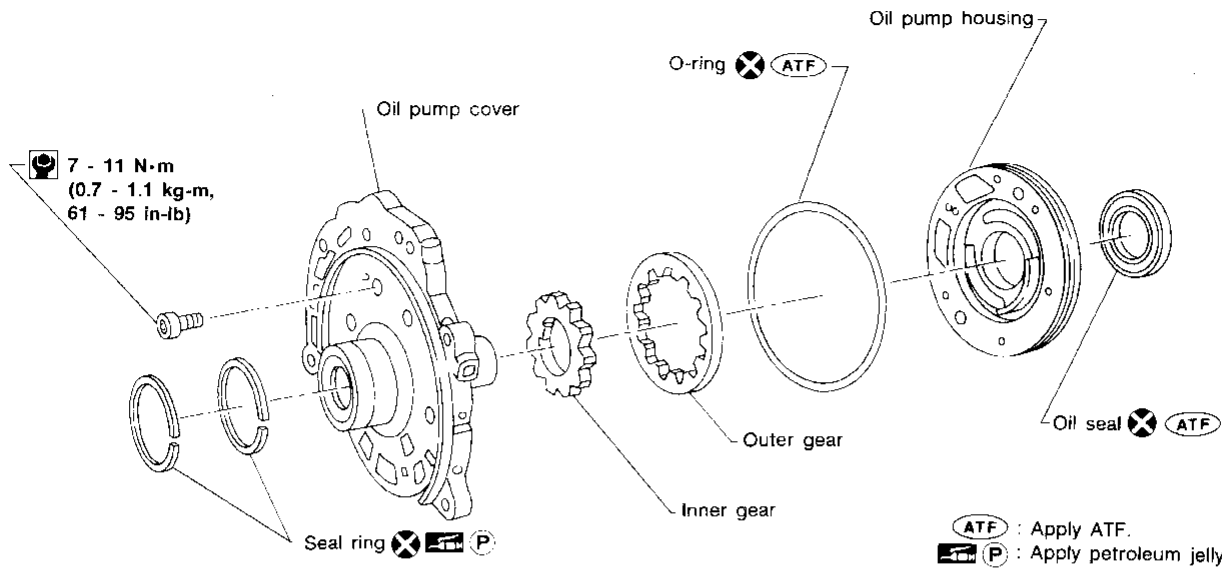
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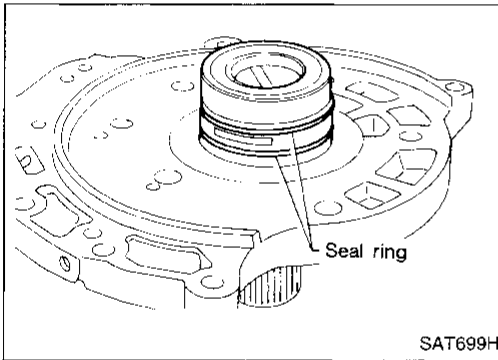
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## Oil Pump

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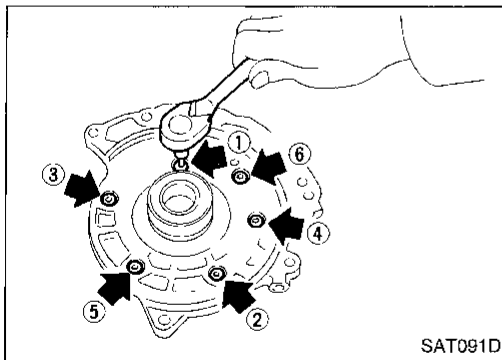


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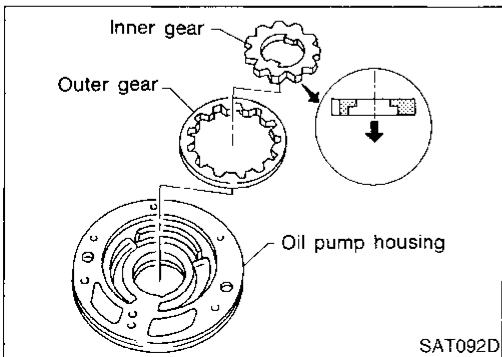


### DISASSEMBLY

1. Remove seal rings.



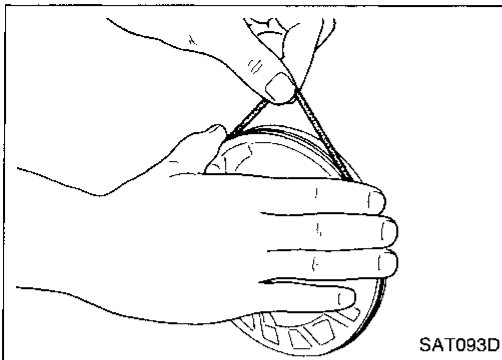
2. Loosen bolts in numerical order and remove oil pump cover.



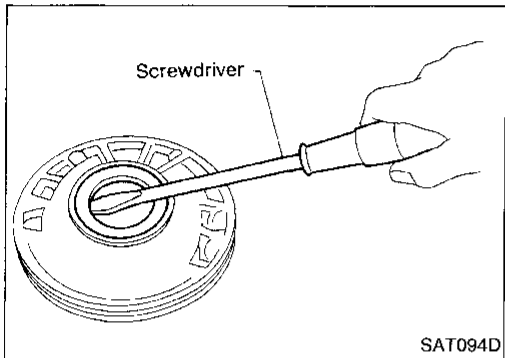
3. Remove inner and outer gear from oil pump housing.

## REPAIR FOR COMPONENT PARTS

### Oil Pump (Cont'd)



4. Remove O-ring from oil pump housing.

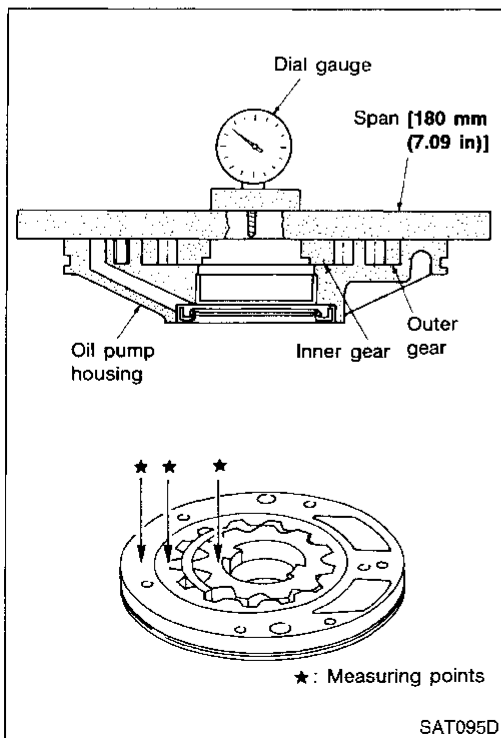


5. Remove oil pump housing oil seal.

### INSPECTION

#### Oil pump housing, oil pump cover, inner gear and outer gear

- Check for wear or damage.



#### Side clearance

- Measure side clearance of inner and outer gears in at least four places around each outside edge. Maximum measured values should be within specified range.

##### Standard clearance:

**0.02 - 0.04 mm (0.0008 - 0.0016 in)**

- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

##### Inner and outer gear:

**Refer to SDS, AT-167.**

- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.

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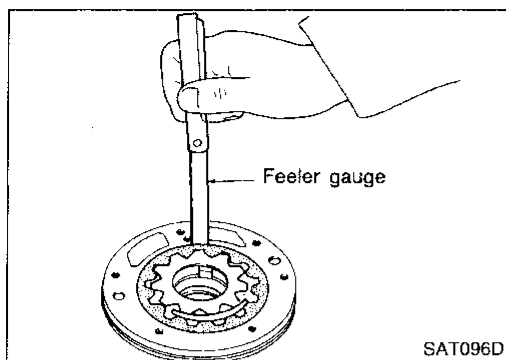
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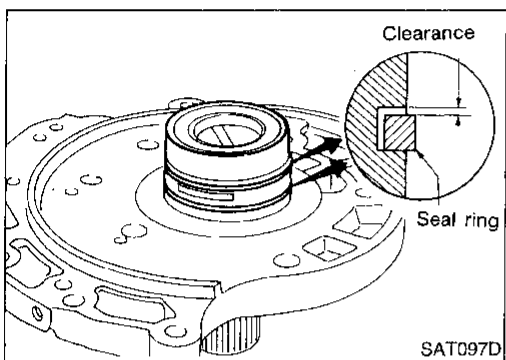
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## REPAIR FOR COMPONENT PARTS

### Oil Pump (Cont'd)

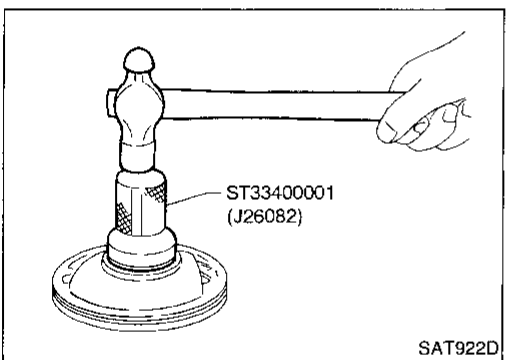


- Measure clearance between outer gear and oil pump housing.  
**Standard clearance:**  
0.08 - 0.15 mm (0.0031 - 0.0059 in)  
**Allowable limit:**  
0.15 mm (0.0059 in)
- If not within allowable limit, replace whole oil pump assembly except oil pump cover.



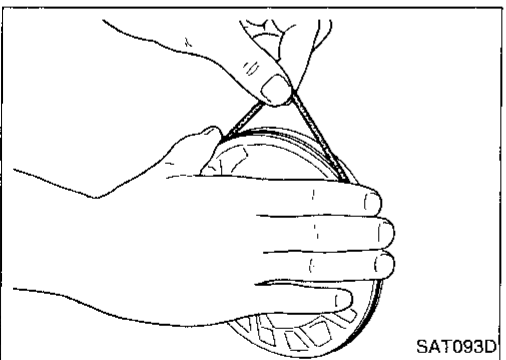
### Seal ring clearance

- Install new seal rings onto oil pump cover.
- Measure clearance between seal ring and ring groove.  
**Standard clearance:**  
0.1 - 0.25 mm (0.0039 - 0.0098 in)  
**Allowable limit:**  
0.25 mm (0.0098 in)
- If not within allowable limit, replace oil pump cover assembly.

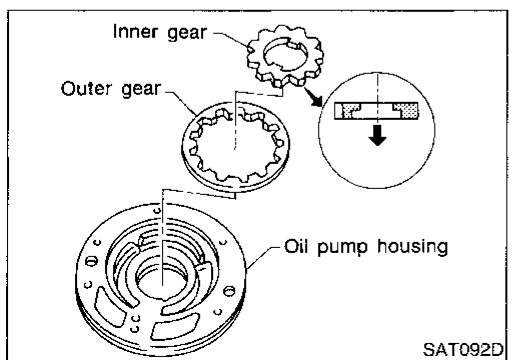


### ASSEMBLY

1. Install oil seal on oil pump housing.



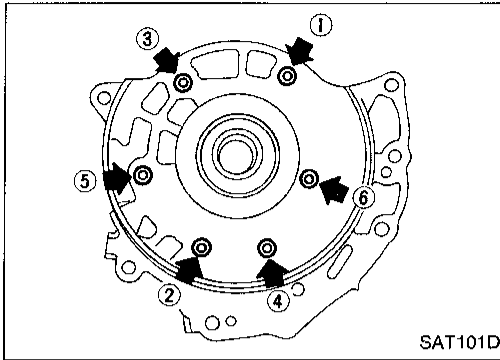
2. Install O-ring on oil pump housing.
  - **Apply ATF to O-ring.**




3. Install inner and outer gears on oil pump housing.
  - **Take care with the direction of the inner gear.**

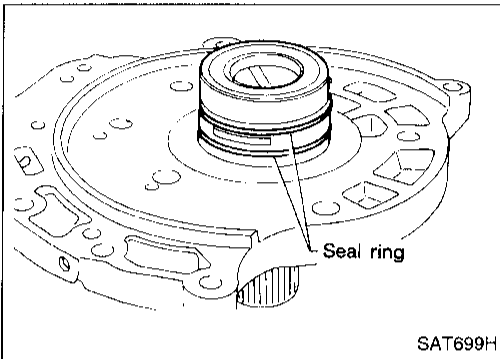
## REPAIR FOR COMPONENT PARTS

### Oil Pump (Cont'd)



4. Install oil pump cover on oil pump housing.
  - a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
  - b. Tighten bolts in numerical order.

 : 7 - 11 N·m (0.7 - 1.1 kg-m, 61 - 95 in-lb)



5. Install new seal rings carefully after packing ring groove with petroleum jelly.
  - **Do not spread gap of seal ring excessively while installing. It may deform the ring.**

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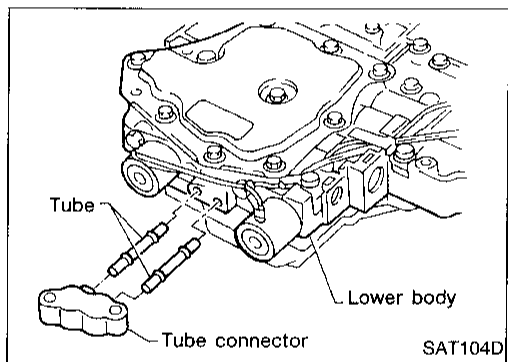
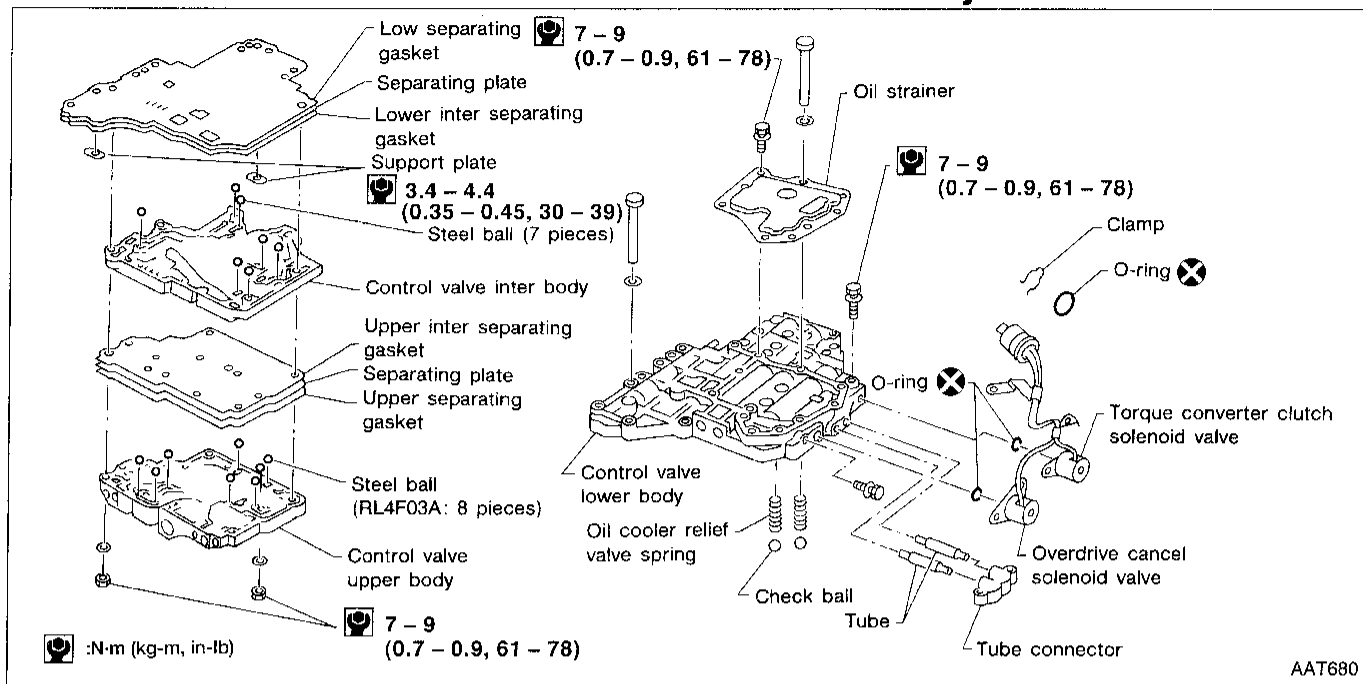
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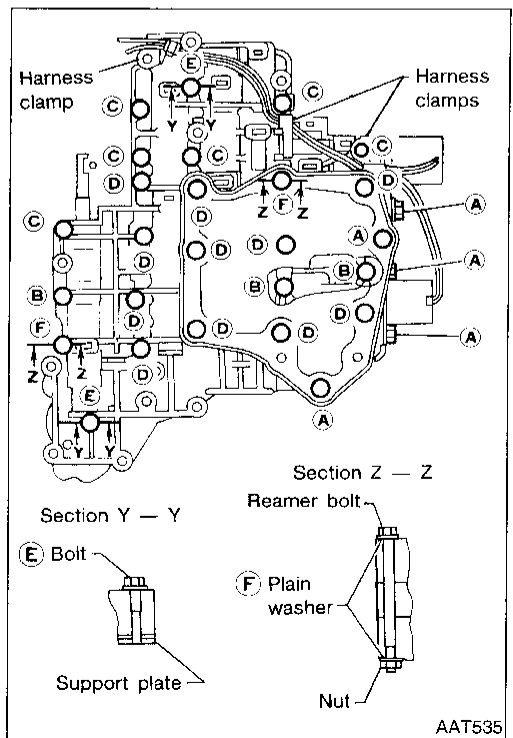


## Control Valve Assembly



### DISASSEMBLY

1. Remove tube connector and tube from control valve lower body.



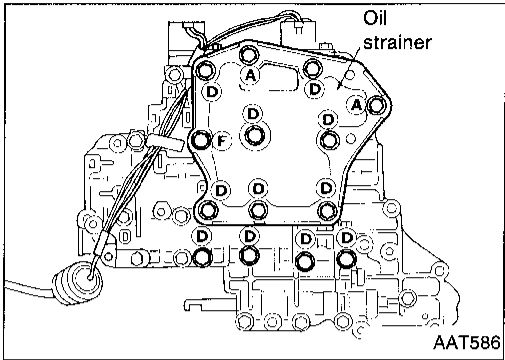
2. Disassemble upper, inter and lower bodies.

### Bolt length, number and location:

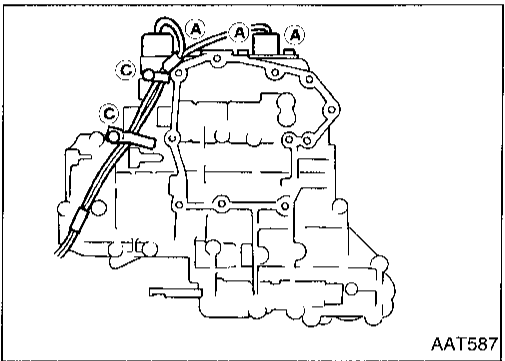
Bolt symbol	(A)	(B)	(C)	(D)	(E)	(F)
Bolt length "l" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	5	3	6	11	2	2

# REPAIR FOR COMPONENT PARTS

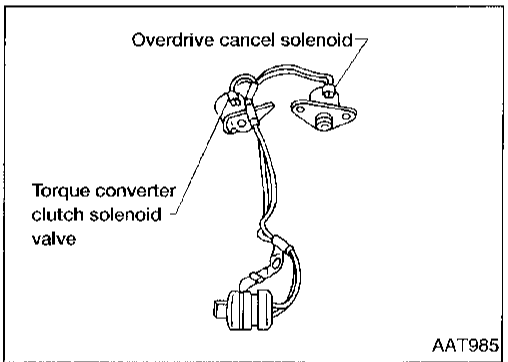
## Control Valve Assembly (Cont'd)



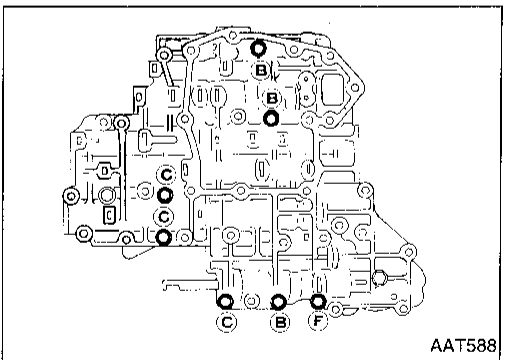
- a. Remove bolts (A), (D) and (F) and remove oil strainer from control valve assembly.



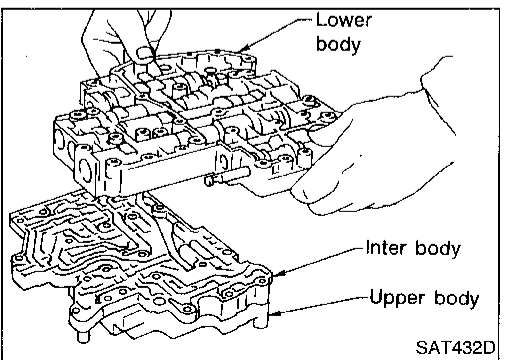
- b. Remove overdrive cancel solenoid valve and torque converter clutch solenoid valve from control valve assembly.



- c. Remove O-rings from overdrive cancel solenoid valve, torque converter clutch solenoid valve and harness terminal body.



- d. Place upper body facedown, and remove bolts (B), (C) and (F).



- e. Remove lower body from inter and upper body.

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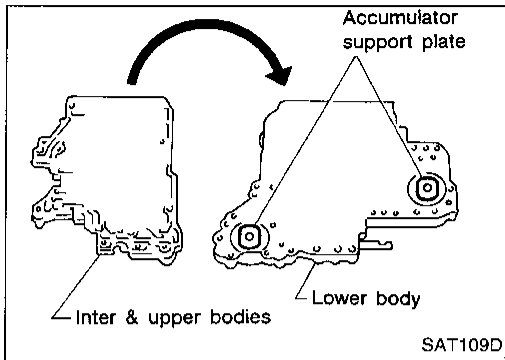
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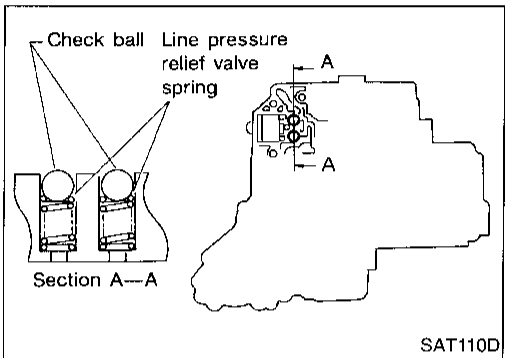
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## REPAIR FOR COMPONENT PARTS

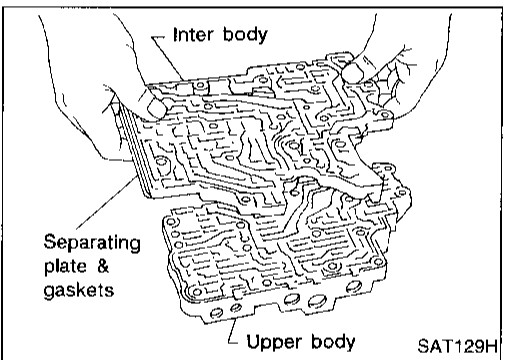
### Control Valve Assembly (Cont'd)



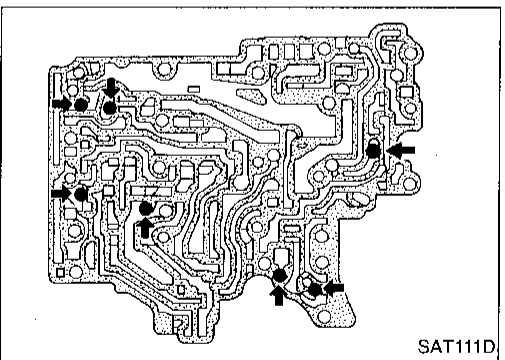
- f. Turn over lower body, and remove accumulator support plate.



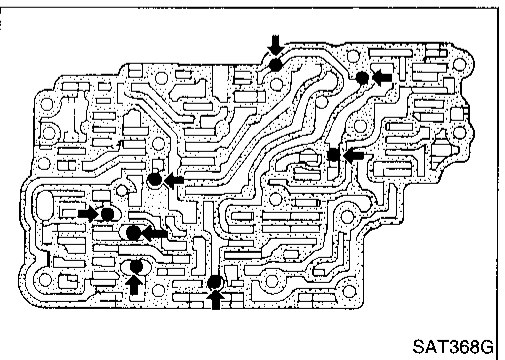
- g. Remove separating plate and separating gasket from lower body.  
h. Remove check balls and relief valve springs from lower body.
- **Be careful not to lose check balls and relief valve springs.**



- i. Remove inter body with separating plate and separating gasket from upper body.



- j. Check to see that check balls are properly positioned in inter body and then remove them.
- **Be careful not to lose check balls.**



- k. Check to see that check balls are properly positioned in upper body and then remove them.
- **Be careful not to lose check balls.**

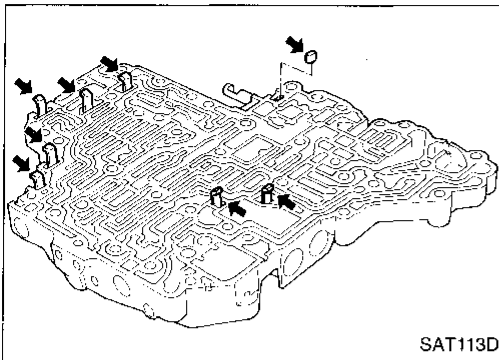
# REPAIR FOR COMPONENT PARTS

## Control Valve Assembly (Cont'd)

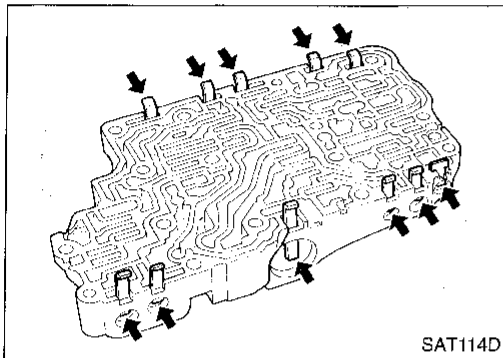
### INSPECTION

#### Lower and upper bodies

- Check to see that retainer plates are properly positioned in lower body.

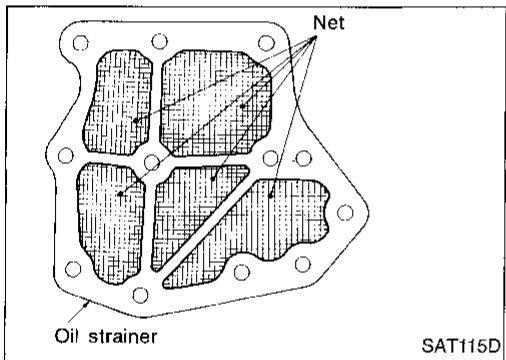


- Check to see that retainer plates are properly positioned in upper body.
- **Be careful not to lose these parts.**



#### Oil strainer

- Check wire netting of oil strainer for damage.

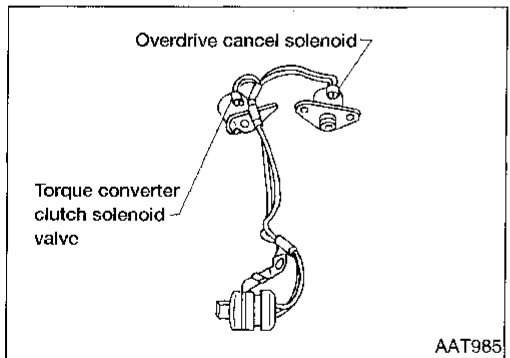


#### Overdrive cancel solenoid valve

- Measure resistance. Refer to AT-46.

#### Torque converter clutch solenoid valve

- Measure resistance. Refer to AT-44.

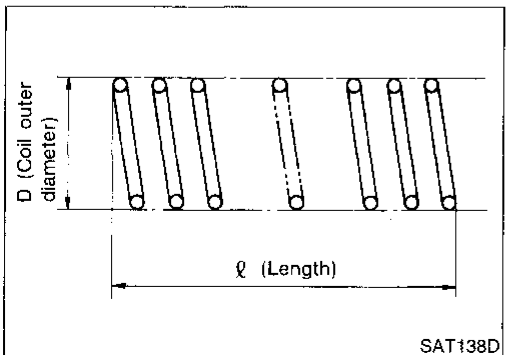


#### Oil cooler relief valve spring.

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

#### Inspection standard:

Refer to SDS, AT-165.



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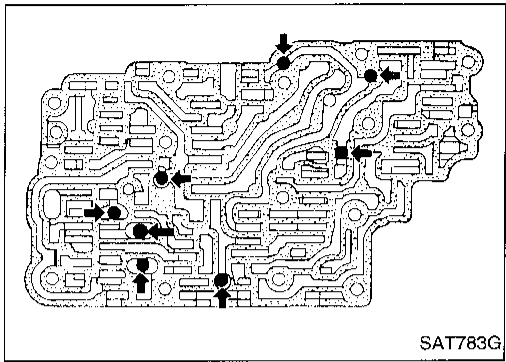
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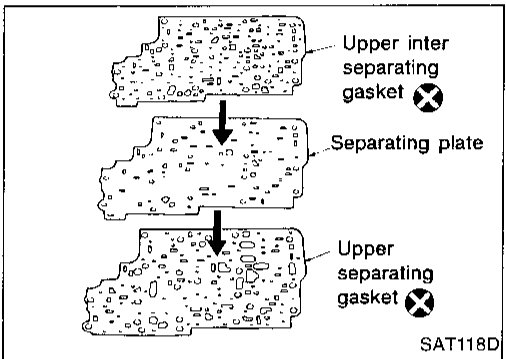
## REPAIR FOR COMPONENT PARTS

### Control Valve Assembly (Cont'd)

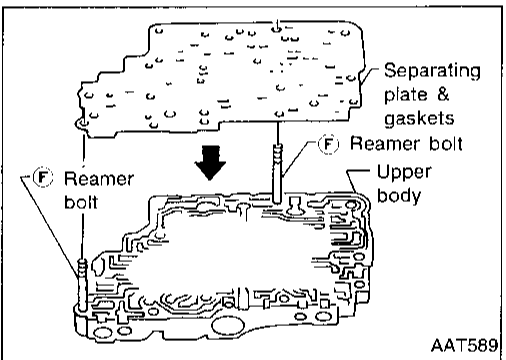
#### ASSEMBLY



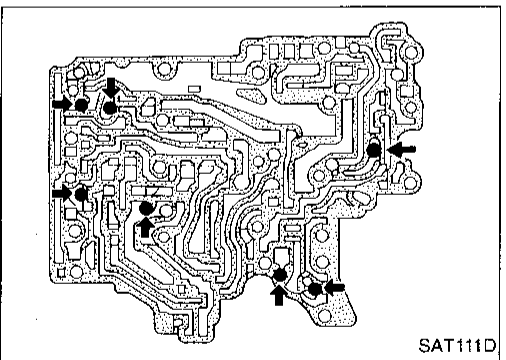
1. Install upper, inter and lower body.
  - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



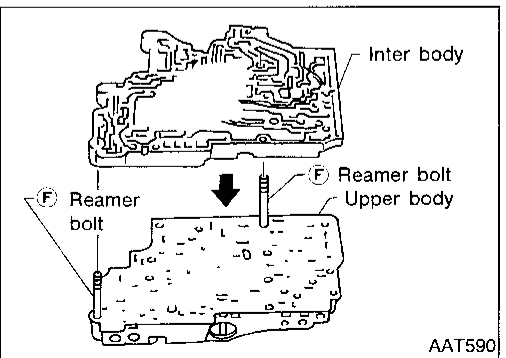
- b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.



- c. Install reamer bolts (F) from bottom of upper body. Using reamer bolts as guides, install separating plate and gaskets as a set.



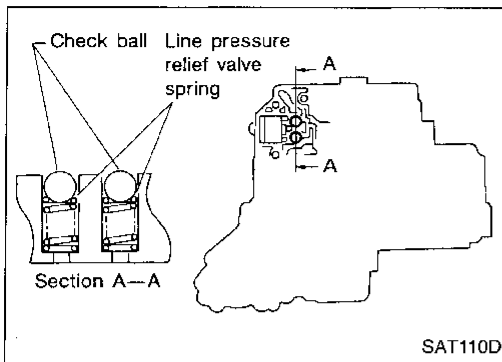
- d. Place lower body side of inter body face up. Install steel balls in their proper positions.



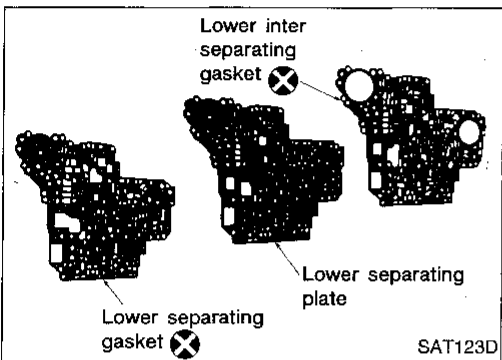
- e. Install inter body on upper body using reamer bolts (F) as guides.
    - Be careful not to dislocate or drop check balls.

# REPAIR FOR COMPONENT PARTS

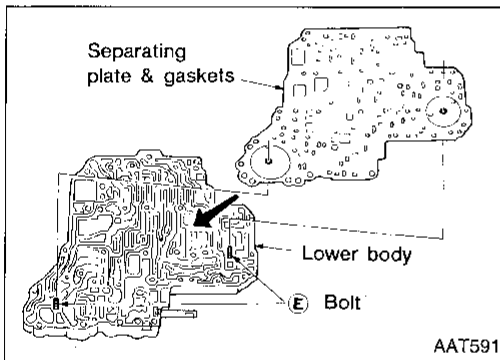
## Control Valve Assembly (Cont'd)



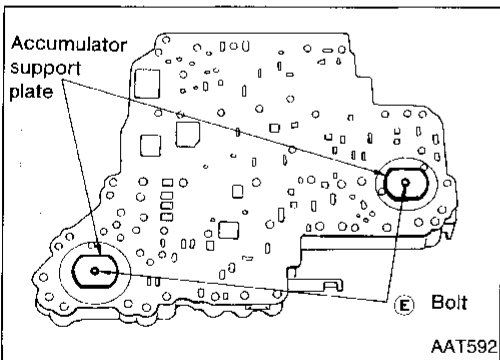
- f. Install check balls and relief valve springs in their proper positions in lower body.



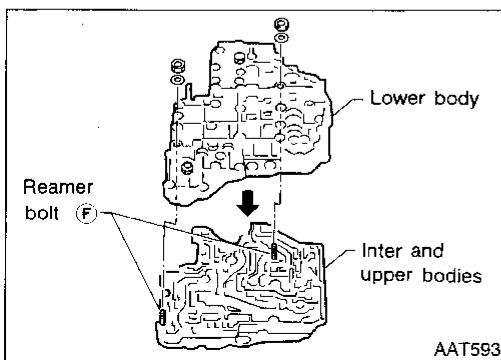
- g. Install lower separating gasket, inter separating gasket and lower separating plate in order shown in illustration.



- h. Install bolts (E) from bottom of lower body. Using bolts (E) as guides, install separating plate and gaskets as a set.



- i. Temporarily install support plates on lower body.



- j. Install lower body on inter body using reamer bolts (F) as guides and tighten reamer bolts (F) slightly.

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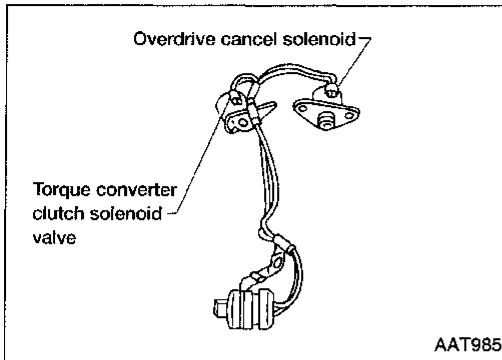
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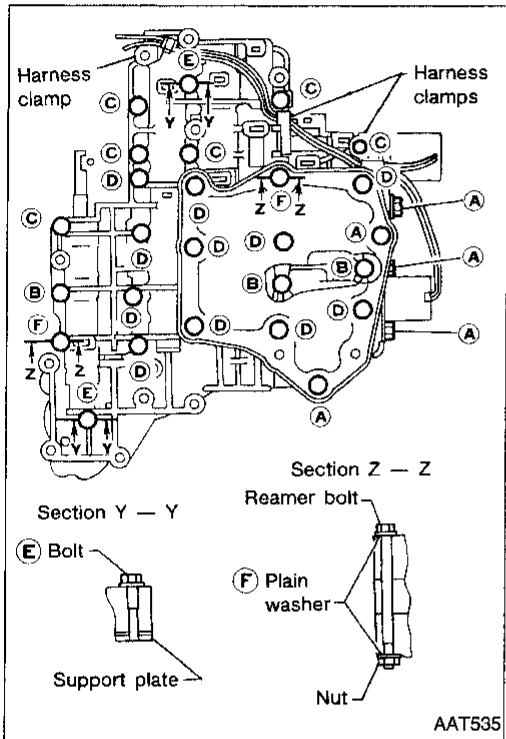
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# REPAIR FOR COMPONENT PARTS

## Control Valve Assembly (Cont'd)

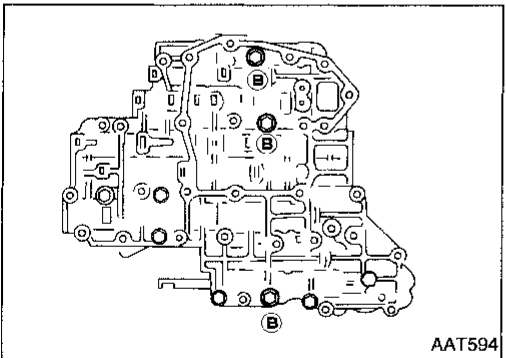


2. Install O-rings to overdrive cancel solenoid valve, torque converter clutch solenoid valve and harness connector.
  - Apply ATF to O-rings.

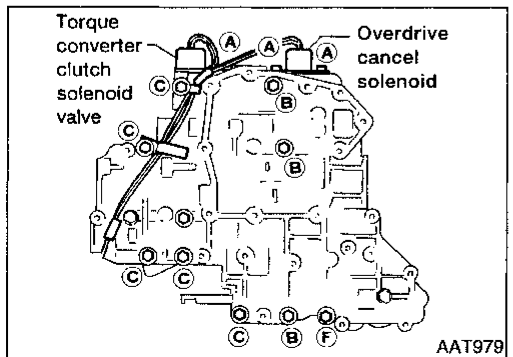


3. Install and tighten bolts as follows.
- Bolt length, number and location:**

Bolt symbol	(A)	(B)	(C)	(D)	(E)	(F)
Bolt length "ℓ" mm (in)	13.5 (0.531)	58.0 (2.283)	40.0 (1.575)	66.0 (2.598)	33.0 (1.299)	78.0 (3.071)
Number of bolts	5	3	6	11	2	2



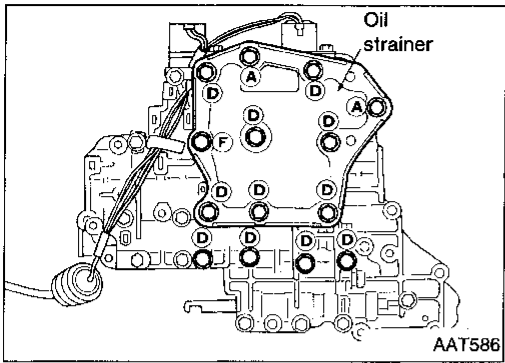
- a. Install and tighten bolts (B) slightly.



- b. Install overdrive cancel solenoid valve and torque converter clutch solenoid valve to lower body.
- c. Install and tighten bolts (A) and (C) slightly.
- d. Remove both reamer bolts (F) previously installed as guides. Install one reamer bolt (F) (marked in illustration) from lower body side.
- e. Tighten bolts (A), (B), (C) and (F) to specified torque.
  - ☛ : 7 - 9 N·m (0.7 - 0.9 kg·m, 61 - 78 in-lb)

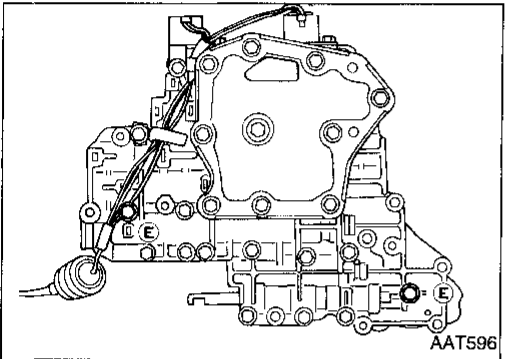
# REPAIR FOR COMPONENT PARTS

## Control Valve Assembly (Cont'd)



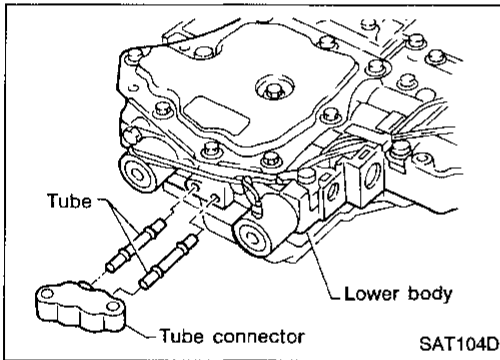
- f. Install oil strainer and the other reamer bolt (F) (marked in illustration), then tighten bolts (A), (D) and (F) to specified torque.

☞ : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)



- g. Install support plates and tighten bolts (E) to specified torque.

☞ : 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 30.4 - 39.1 in-lb)



- h. Install tube connector and tubes to lower body.

- Install oil circuit side of tube connector face up.

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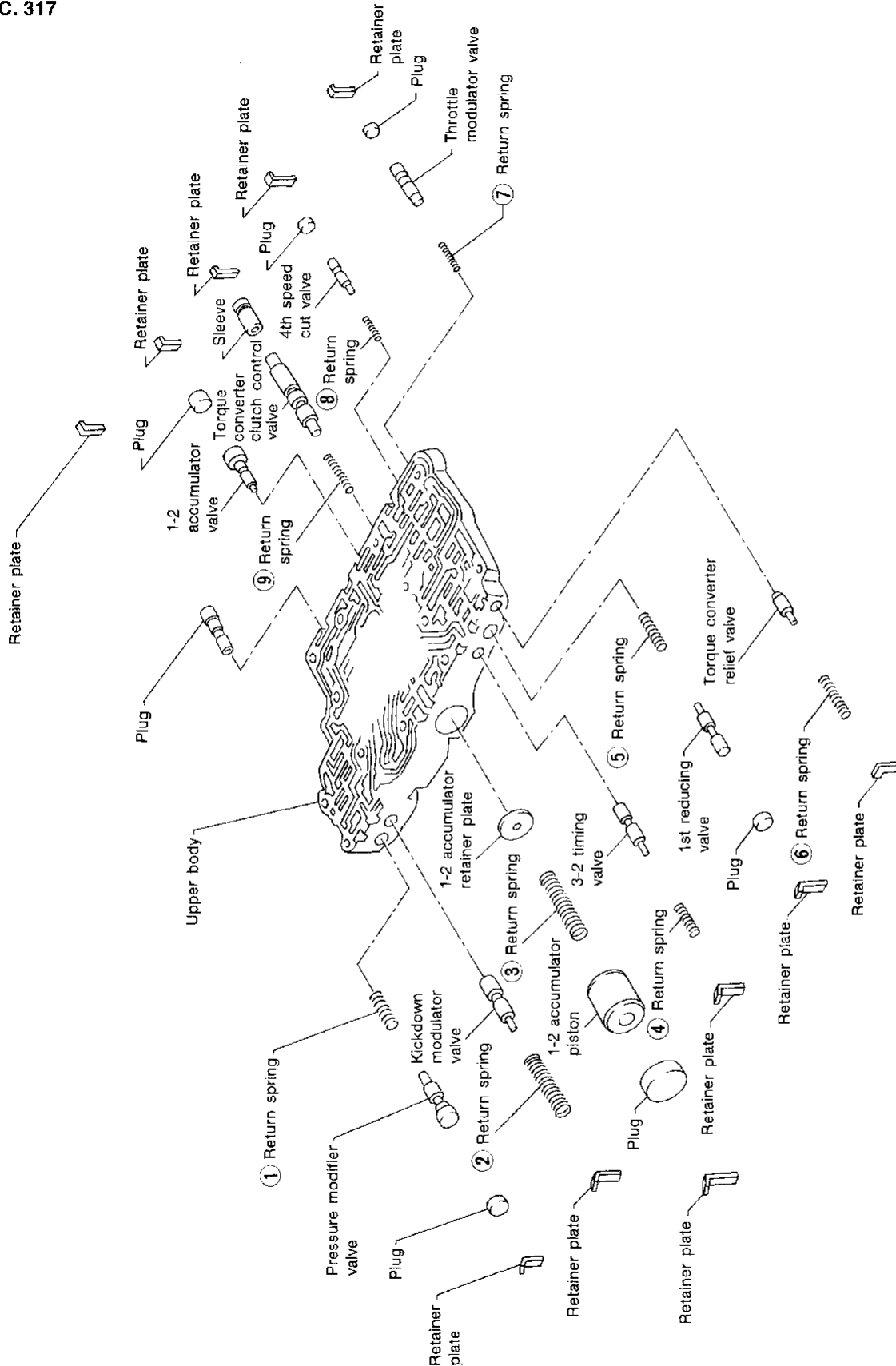
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Control Valve Upper Body

SEC. 317



Apply ATF to all components before their installation.

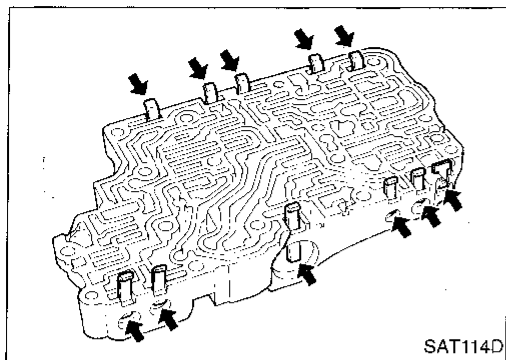
Numbers preceding valve springs correspond with those shown in SDS table on page AT-165.

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# REPAIR FOR COMPONENT PARTS

## Control Valve Upper Body (Cont'd)

### DISASSEMBLY



1. Remove valves at retainer plates.

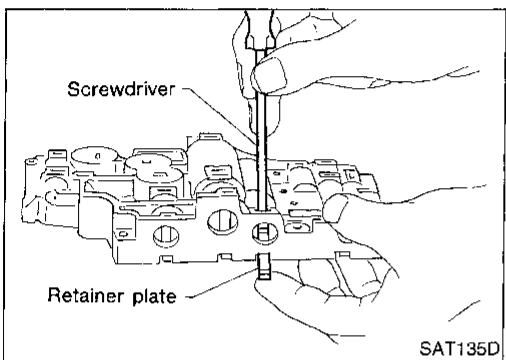
- Do not use a magnetic "hand".

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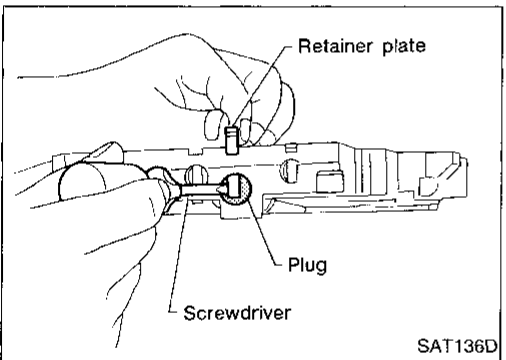


a. Use a screwdriver to remove retainer plates.

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b. Remove retainer plates while holding spring, plugs and sleeves.

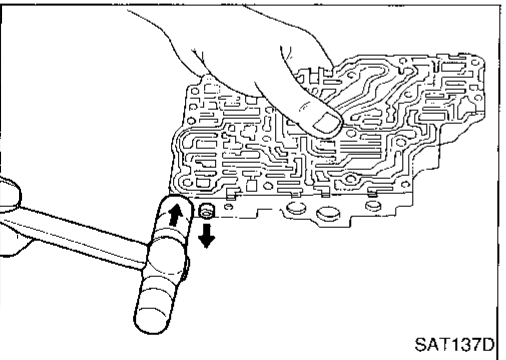
- Remove plug slowly to prevent internal parts from jumping out.

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

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

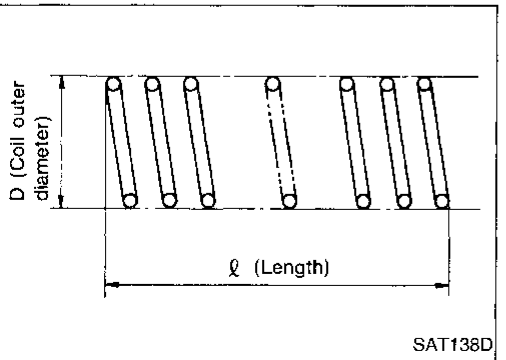
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### INSPECTION

#### Valve spring

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

**Inspection standard:**

**Refer to SDS, AT-165.**

- Replace valve springs if deformed or fatigued.

#### Control valves

- Check sliding surfaces of valves, sleeves and plugs.

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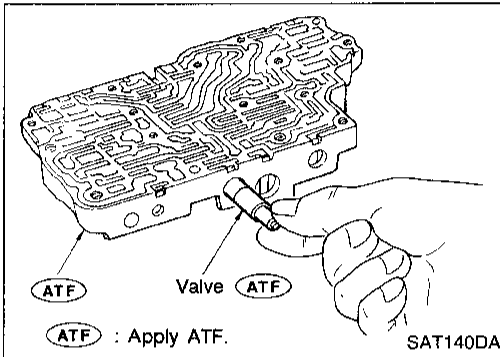
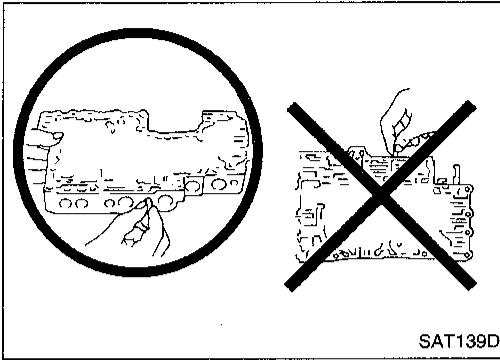
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## REPAIR FOR COMPONENT PARTS

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

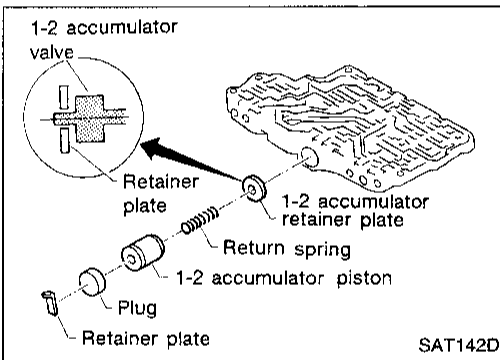
#### ASSEMBLY

- Lay the control valve body down when installing valves. Do not stand the control valve body on edge.



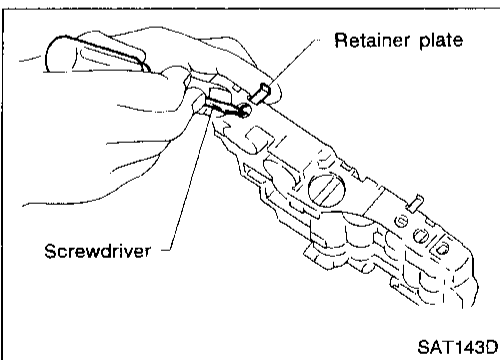
1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.

- Be careful not to scratch or damage valve body.
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.



#### 1-2 accumulator valve

- Install 1-2 accumulator valve. Align 1-2 accumulator retainer plate from opposite side of control valve body.
- Install return spring and 1-2 accumulator piston.

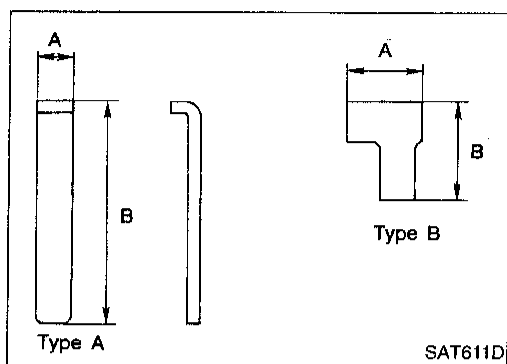


2. Install retainer plates
- While pushing plug or return spring, install retainer plate.

# REPAIR FOR COMPONENT PARTS

## Control Valve Upper Body (Cont'd)

### Retainer plate:



Unit: mm (in)

Name of control valves	Length A	Length B	Type
Pressure modifier valve	6.0 (0.236)	27.0 (1.063)	A
Torque converter clutch control valve			
Plug			
Kickdown modulator valve	6.0 (0.236)	21.5 (0.846)	
3-2 timing valve			
1st reducing valve			
Throttle modulator valve			
4th speed cut valve	6.0 (0.236)	38.5 (1.516)	
1-2 accumulator valve			
Torque converter relief valve	13.0 (0.512)	17.0 (0.669)	

- Install proper retainer plates.

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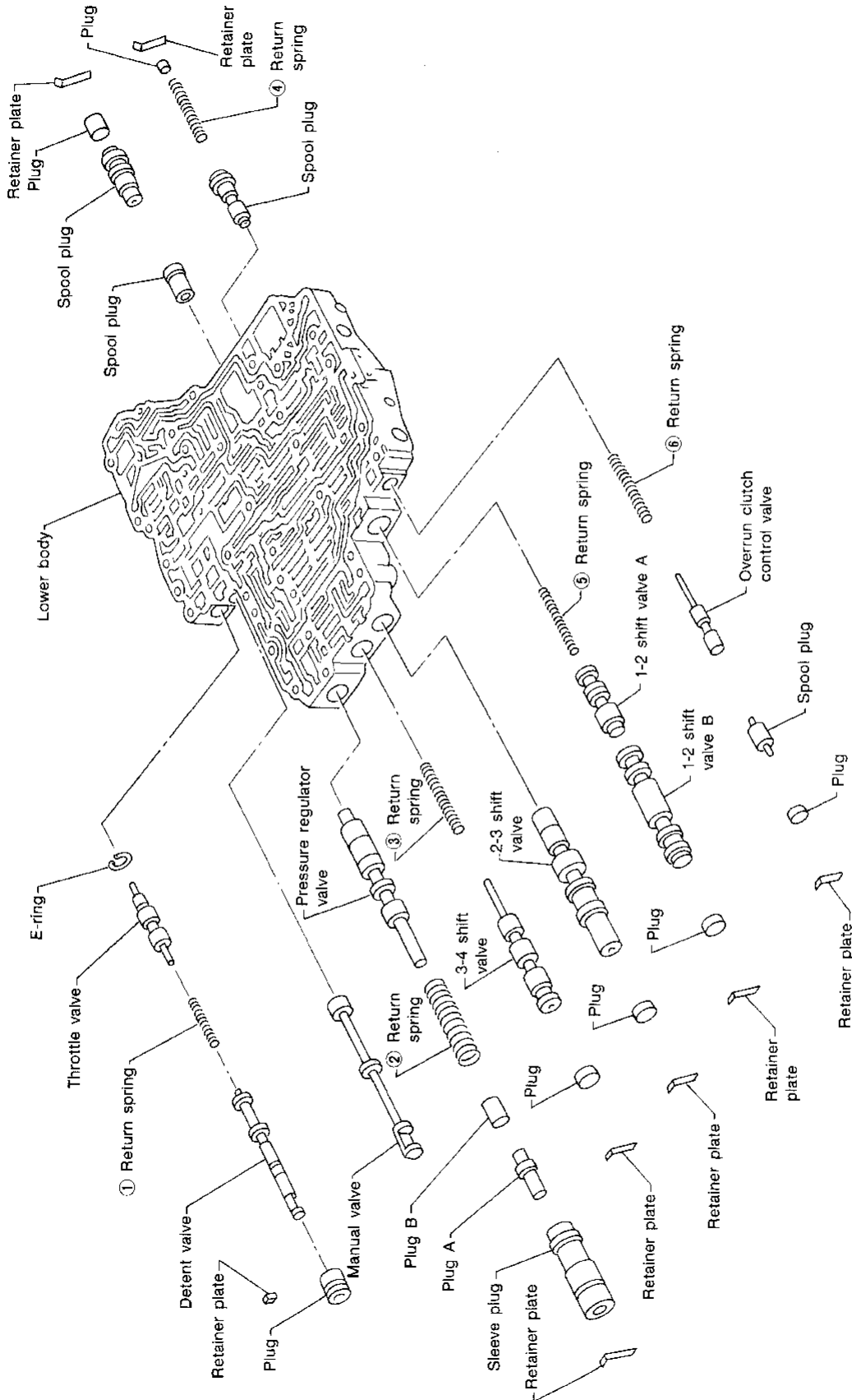
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Control Valve Lower Body

SEC. 317



Apply ATF to all components before installation.

Numbers preceding valve springs correspond with those shown in SDS table on page AT-165.

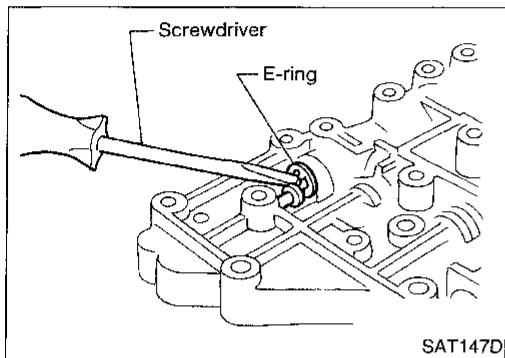
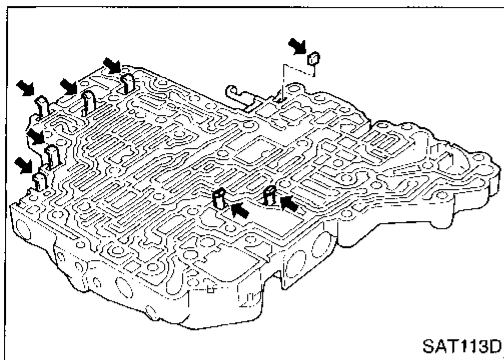
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# REPAIR FOR COMPONENT PARTS

## Control Valve Lower Body (Cont'd)

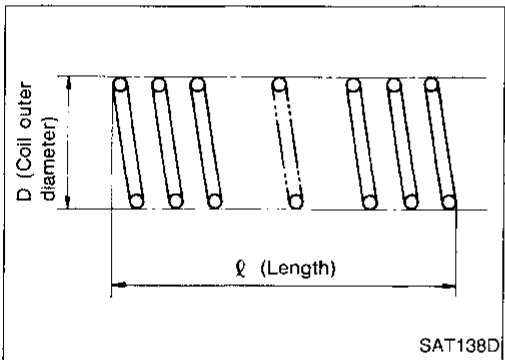
### DISASSEMBLY

1. Remove valves at retainer plate.  
For removal procedures, Refer to AT-97.



### Throttle valve

- Remove throttle valve at E-ring.



### INSPECTION

#### Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.

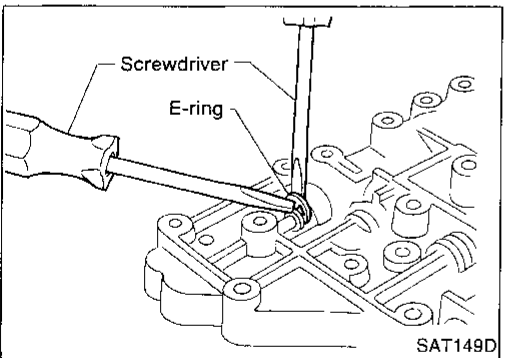
#### Inspection standard:

Refer to SDS, AT-165.

- Replace valve springs if deformed or fatigued.

#### Control valves

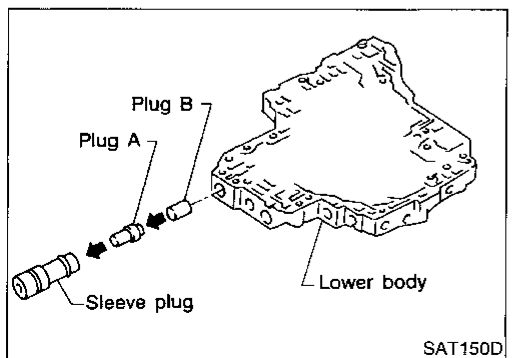
- Check sliding surfaces of control valves, sleeves and plugs for damage.



### ASSEMBLY

#### Throttle valve

- Insert throttle valve to control valve body and then install E-ring to throttle valve.



#### Pressure regulator valve

- Install pressure regulator valve after assembling sleeve plug, plug A and plug B.

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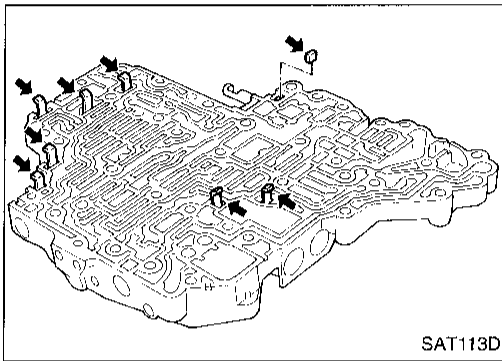
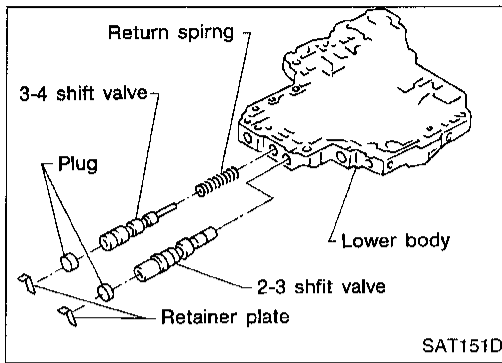
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# REPAIR FOR COMPONENT PARTS

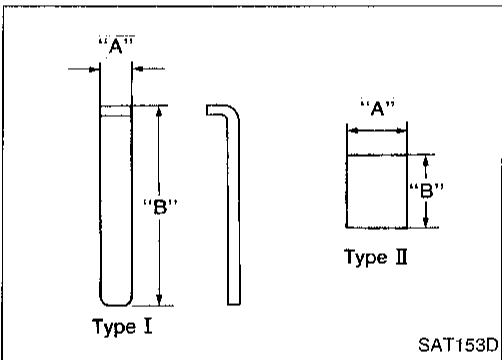
## Control Valve Lower Body (Cont'd)

### 3-4 shift valve and 2-3 shift valve

- Install 3-4 shift valve and 2-3 shift valve after fixing plugs to retainer plates on the opposite side.



- Install control valves.  
For installation procedures, refer to AT-98.



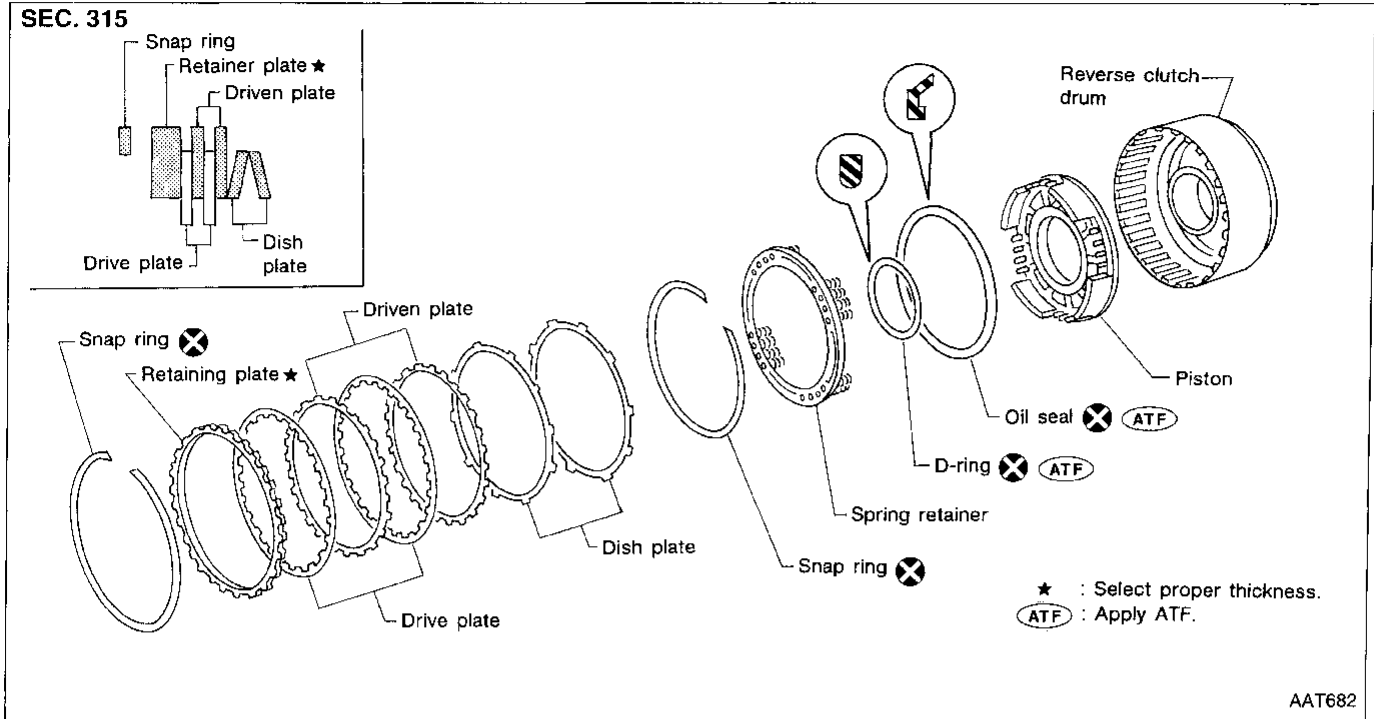
### Retainer plate:

Unit: mm (in)

Name of control valve	Length A	Length B	Type
Throttle valve & detent valve	6.0 (0.236)	7.2 (0.283)	II
Pressure regulator valve	6.0 (0.236)	27.0 (1.063)	I
3-4 shift valve			
2-3 shift valve			
1-2 shift valve			
Overrun clutch control valve			

- Install proper retainer plates

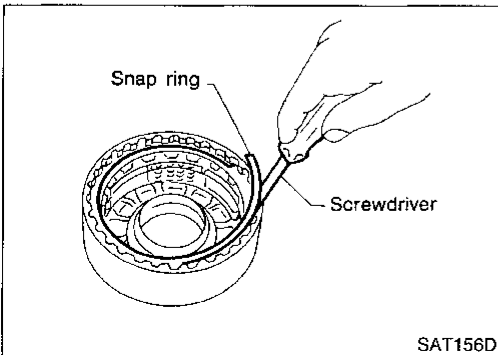
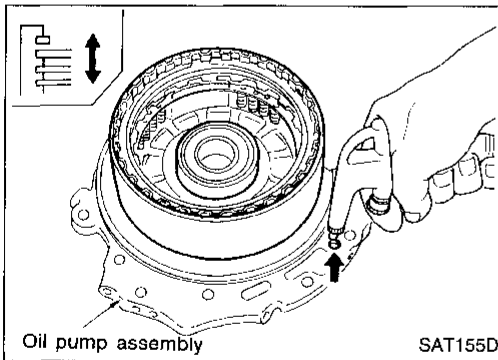
## Reverse Clutch



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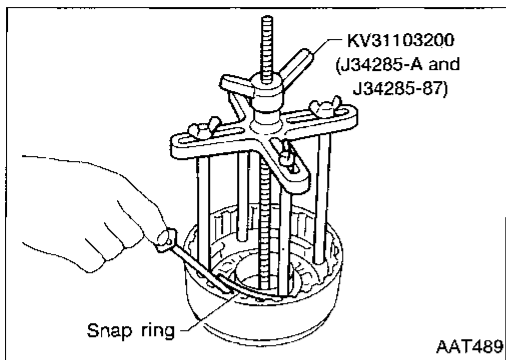
### DISASSEMBLY

1. Check operation of reverse clutch.
  - a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.
  - b. Check to see that retaining plate moves to snap ring.
  - c. If retaining plate does not contact snap ring:
    - D-ring might be damaged.
    - Oil seal might be damaged.
    - Fluid might be leaking past piston check ball.
2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.

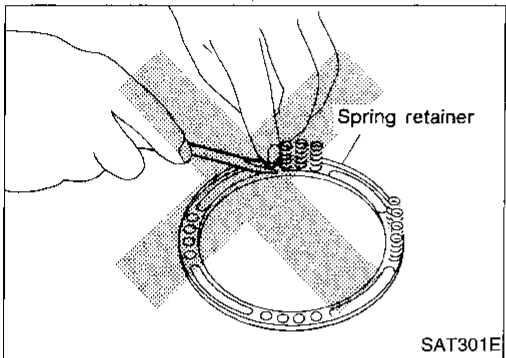


## REPAIR FOR COMPONENT PARTS

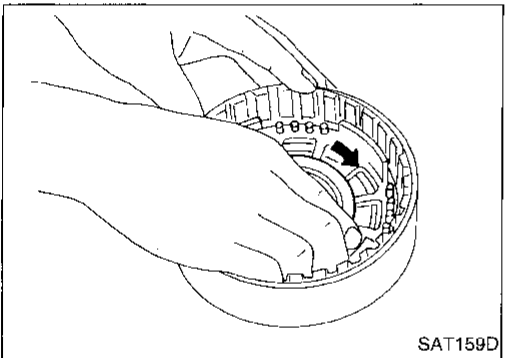
### Reverse Clutch (Cont'd)



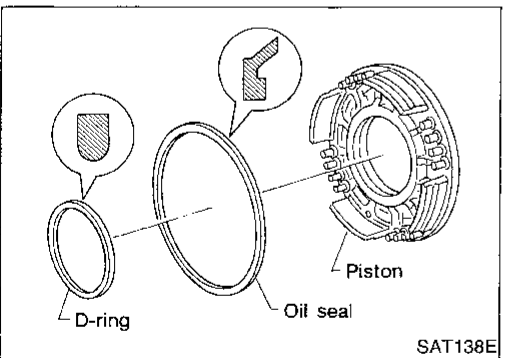
4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
- **Set Tool directly above springs.**
- **Do not expand snap ring excessively.**
5. Remove spring retainer and return springs.



- **Do not remove return springs from spring retainer.**



6. Remove piston from reverse clutch drum by turning it.



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

### INSPECTION

#### Reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- **When replacing spring retainer and return springs, replace them as a set.**

# REPAIR FOR COMPONENT PARTS

## Reverse Clutch (Cont'd)

### Reverse clutch drive plates

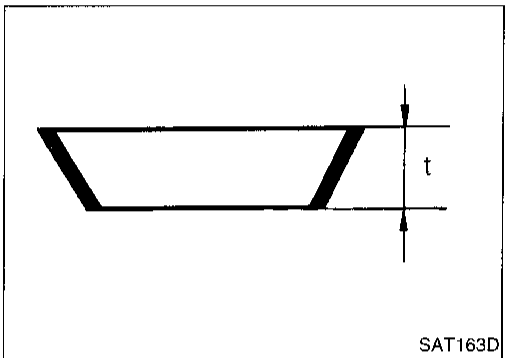
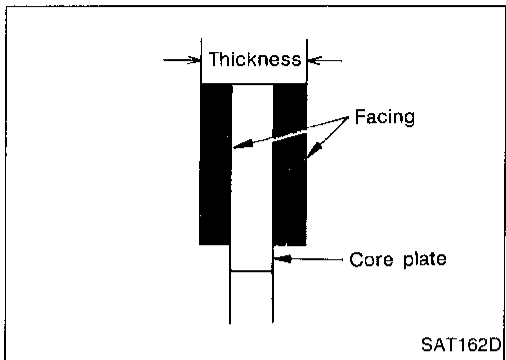
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

**Thickness of drive plate:**

**Standard value: 2.0 mm (0.079 in)**

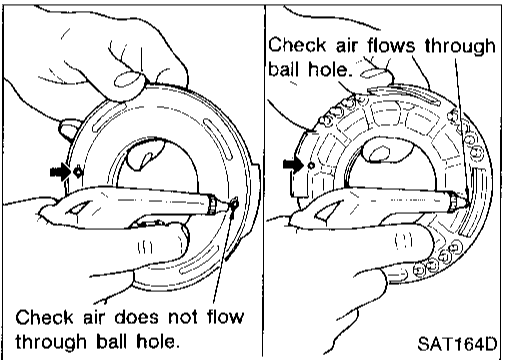
**Wear limit: 1.8 mm (0.071 in)**

- If not within wear limit, replace.



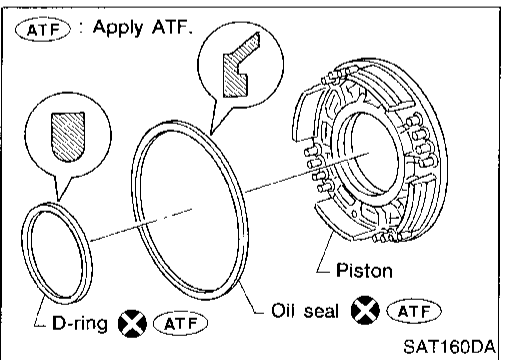
### Reverse clutch dish plates

- Check for deformation or damage.
  - Measure thickness of dish plate.
- Thickness of dish plate "t": 2.8 mm (0.110 in)**
- If deformed or fatigued, replace.



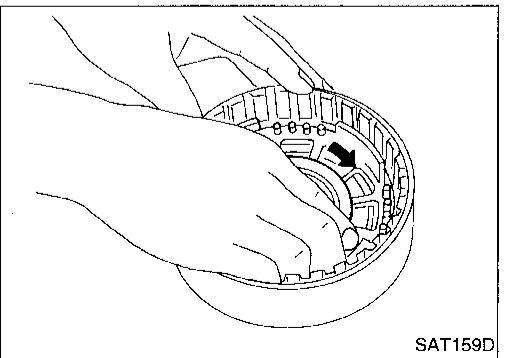
### Reverse clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure that there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.



### ASSEMBLY

1. Install D-ring and oil seal on piston.
  - Take care with the direction of the oil seal.
  - Apply ATF to both parts.



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

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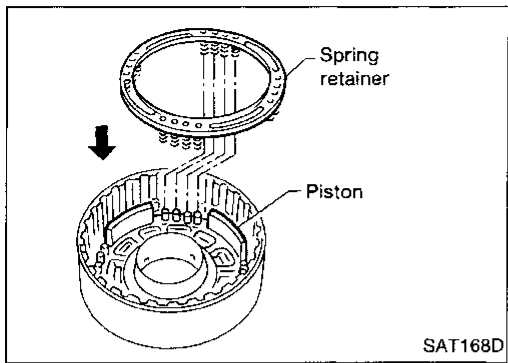
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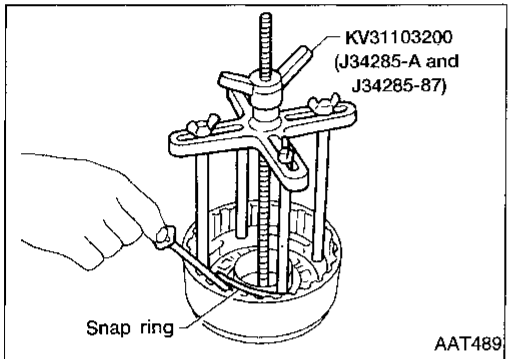
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## REPAIR FOR COMPONENT PARTS

### Reverse Clutch (Cont'd)

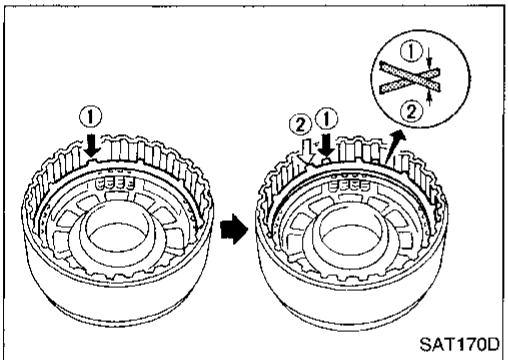


3. Install return springs and spring retainer on piston.



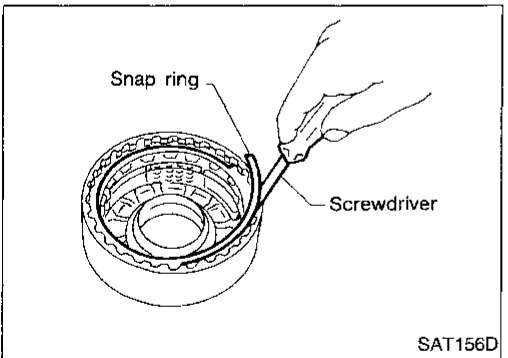
4. Set Tool on spring retainer and install snap ring while compressing return springs.

- **Set Tool directly above return springs.**

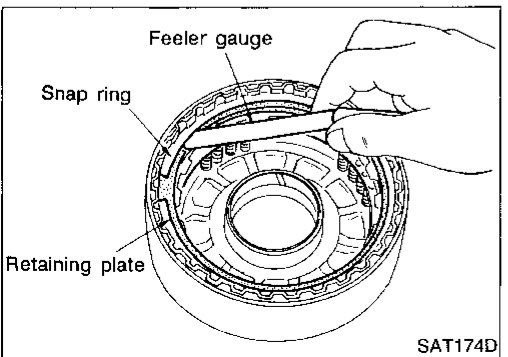


5. Install drive plates, driven plates, retaining plate and dish plates.

- **Do not align the projections of any two dish plates.**
- **Take care with the order and direction of plates.**



6. Install snap ring.



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

#### **Specified clearance:**

**Standard: 0.5 - 0.8 mm (0.020 - 0.031 in)**

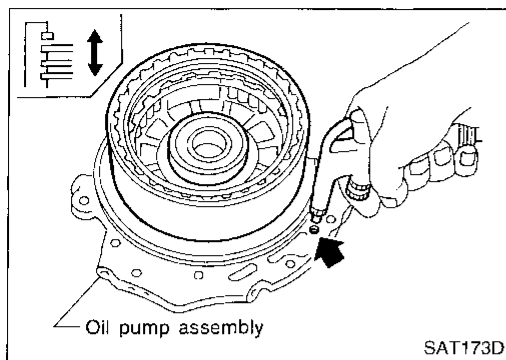
**Allowable limit: 1.2 mm (0.047 in)**

**Retaining plate: Refer to SDS, AT-166.**

# REPAIR FOR COMPONENT PARTS

## Reverse Clutch (Cont'd)

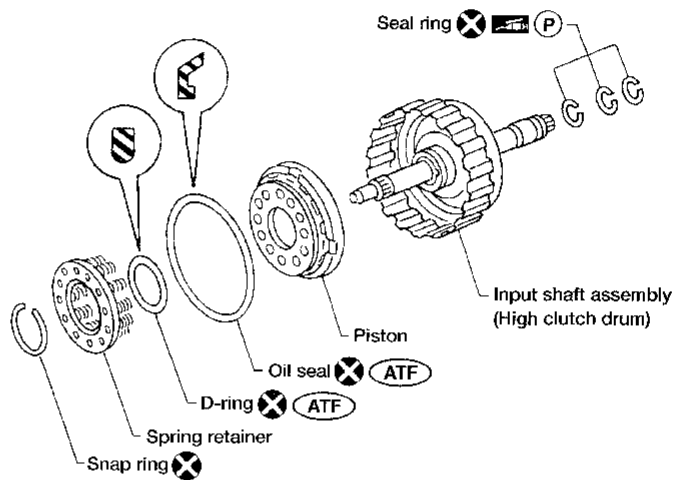
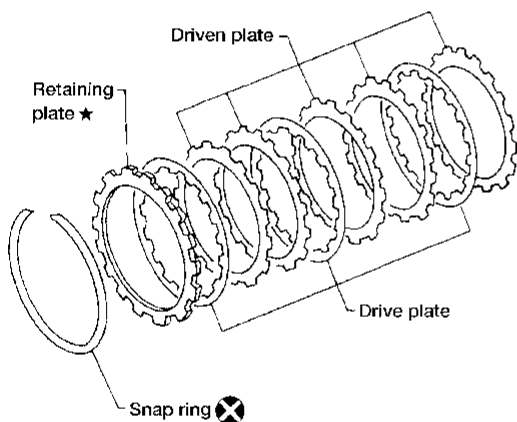
8. Check operation of reverse clutch.  
Refer to AT-103.



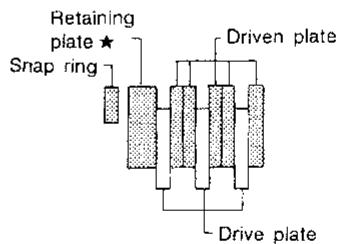
## High Clutch

### SEC. 315

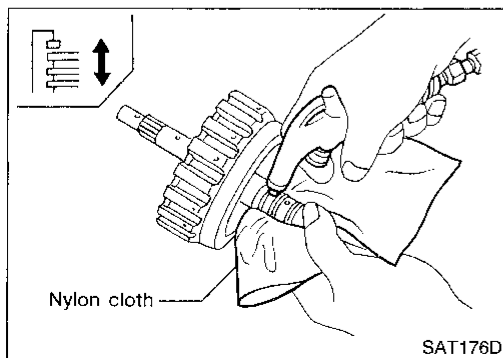
For the number of clutch sheets (drive plates and driven plates), refer to the below cross-section.



- (P) : Apply petroleum jelly.
- (ATF) : Apply ATF.
- ★ : Select proper thickness.



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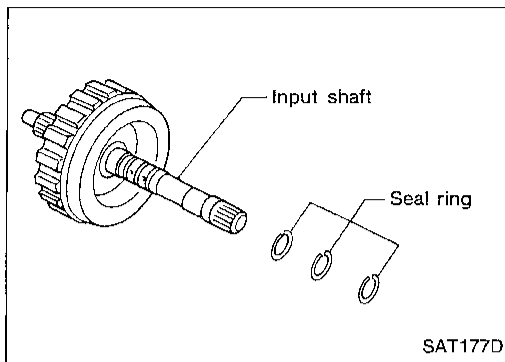


## DISASSEMBLY

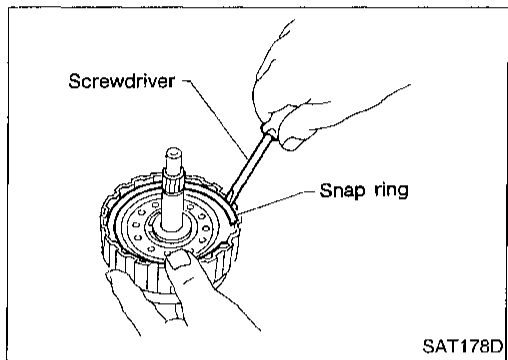
1. Check operation of high clutch.
  - a. Apply compressed air to oil hole of input shaft.
    - Stop up a hole on opposite side of input shaft.
  - b. Check to see that retaining plate moves to snap ring.
  - c. If retaining plate does not contact snap ring:
    - D-ring might be damaged.
    - Oil seal might be damaged.
    - Fluid might be leaking past piston check ball.

## REPAIR FOR COMPONENT PARTS

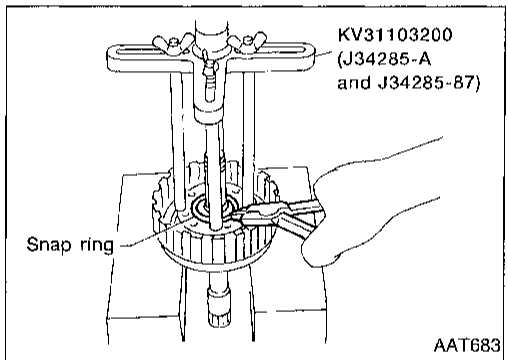
### High Clutch (Cont'd)



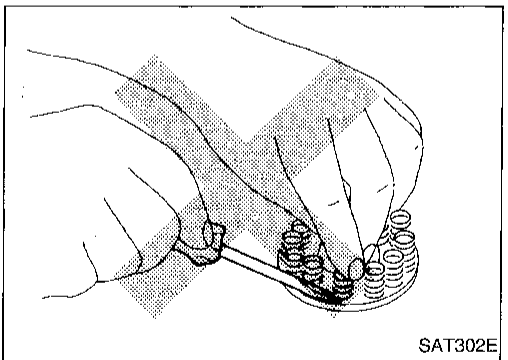
2. Remove seal rings from input shaft.



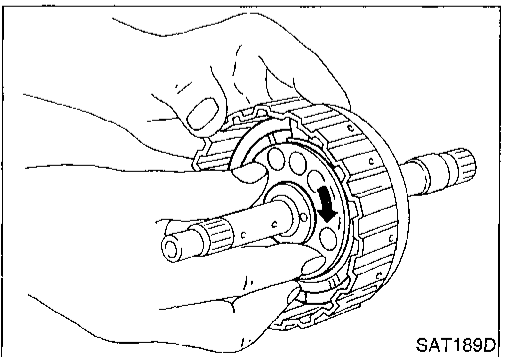
3. Remove snap ring.
4. Remove drive plates, driven plates and retaining plate.



5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- **Set Tool directly above springs.**
  - **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.



- **Do not remove return spring from spring retainer.**

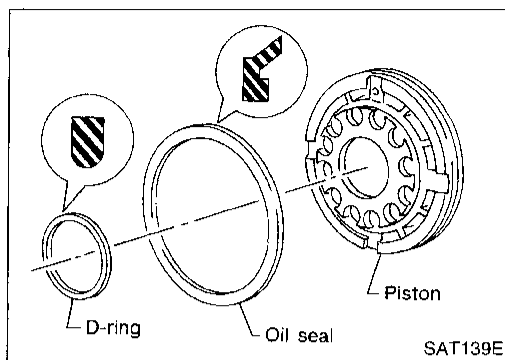


7. Remove piston from high clutch drum by turning it.

## REPAIR FOR COMPONENT PARTS

### High Clutch (Cont'd)

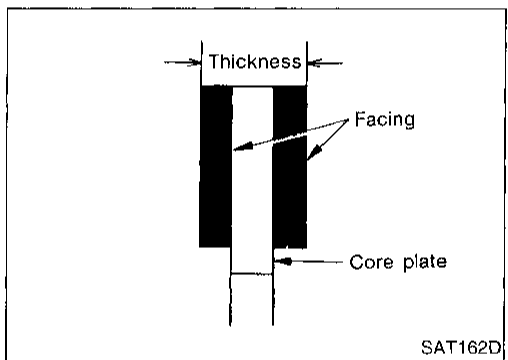
- Remove D-ring and oil seal from piston.



### INSPECTION

#### Reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- When replacing spring retainer and return springs, replace them as a set.**



#### High clutch drive plates

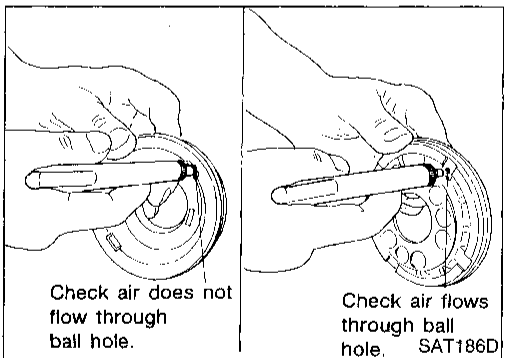
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

##### Thickness of drive plate:

**Standard value: 2.0 mm (0.079 in)**

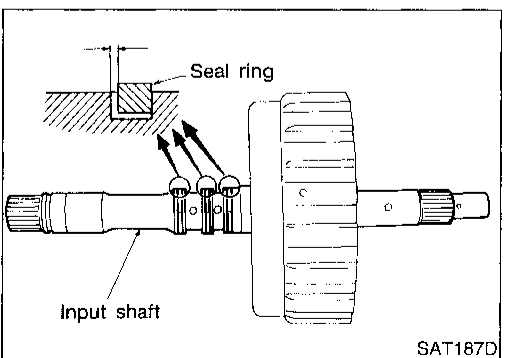
**Wear limit: 1.8 mm (0.071 in)**

- If not within wear limit, replace.



#### High clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure air leaks past ball.



#### Seal ring clearance

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.

##### Standard clearance:

**0.08 - 0.23 mm (0.0031 - 0.0091 in)**

##### Allowable limit:

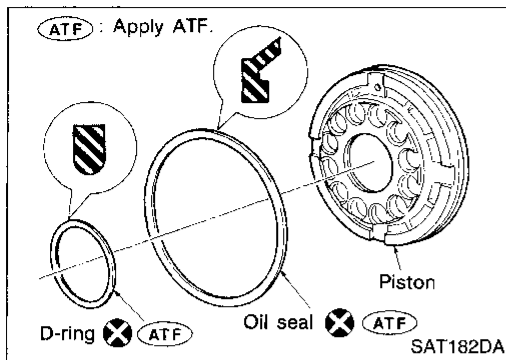
**0.23 mm (0.0091 in)**

- If not within wear limit, replace input shaft assembly.

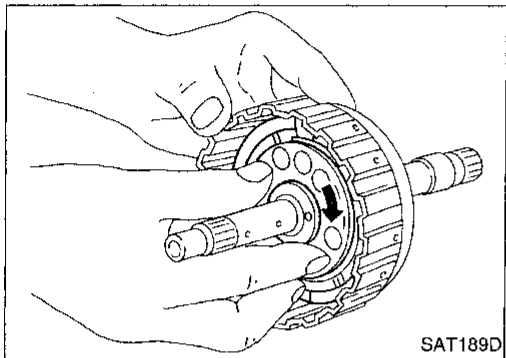
## REPAIR FOR COMPONENT PARTS

### High Clutch (Cont'd)

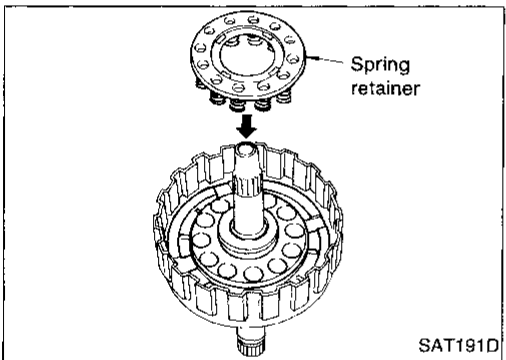
#### ASSEMBLY



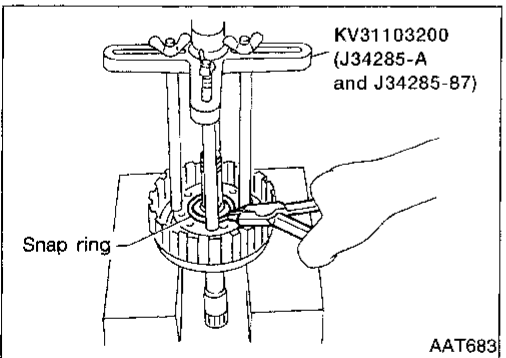
1. Install D-ring and oil seal on piston.
  - Take care with the direction of the oil seal.
  - Apply ATF to both parts.



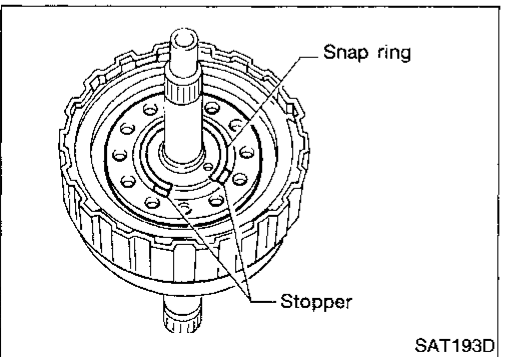
2. Install piston assembly by turning it slowly.
  - Apply ATF to inner surface of drum.



3. Install return springs and spring retainer on piston.



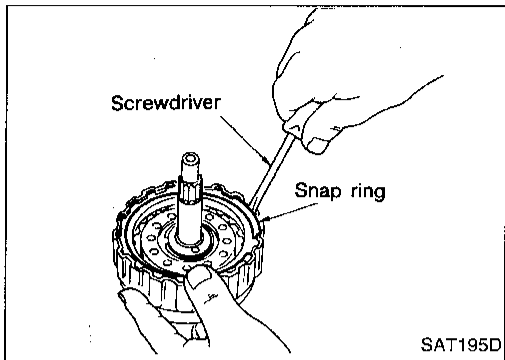
4. Set Tool on spring retainer and install snap ring while compressing return springs.
  - Set Tool directly above return springs.



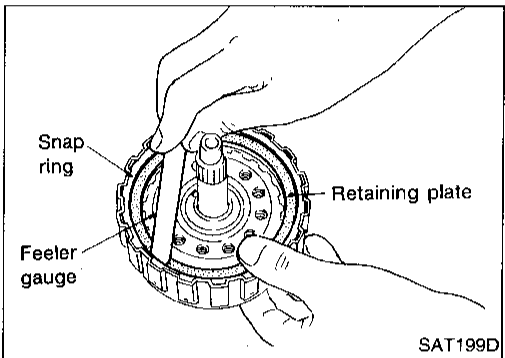
- Do not align snap ring gap with spring retainer stopper.

# REPAIR FOR COMPONENT PARTS

## High Clutch (Cont'd)



5. Install drive plates, driven plates and retaining plate. **Take care with the order and direction of plates.**
6. Install snap ring.



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

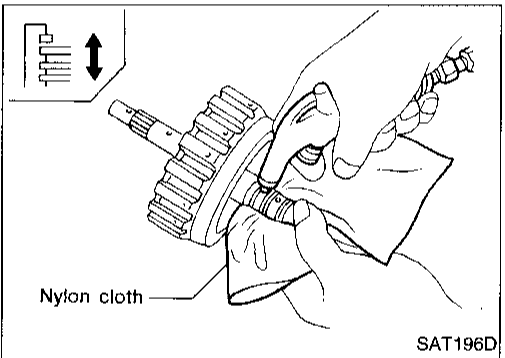
**Specified clearance:**

**Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)**

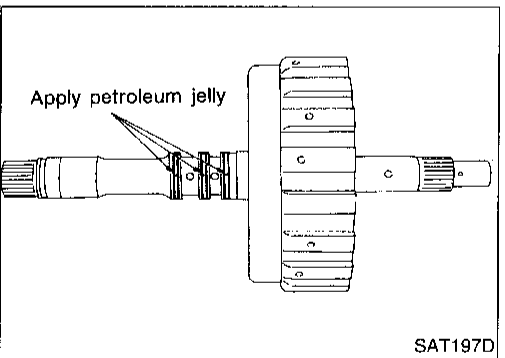
**Allowable limit:  
2.4 mm (0.094 in)**

**Retaining plate:**

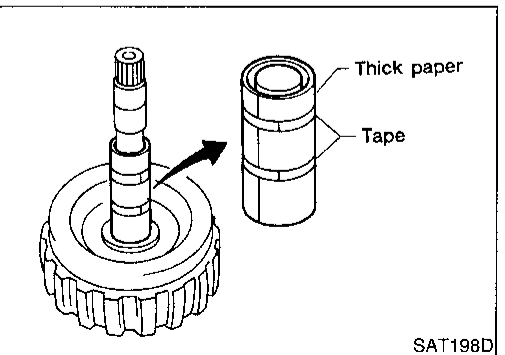
**Refer to SDS, AT-166.**



8. Check operation of high clutch. Refer to "DISASSEMBLY", "High Clutch", AT-107.



9. Install seal rings to input shaft.
  - **Apply petroleum jelly to seal rings.**

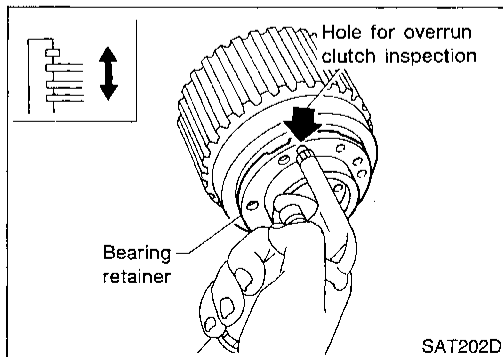
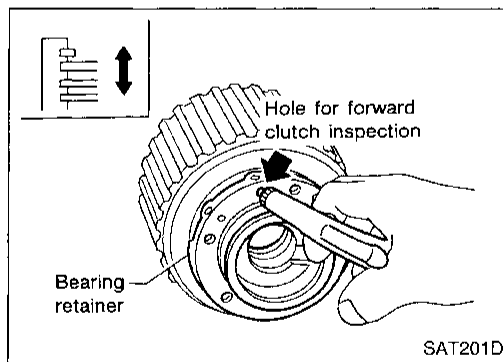
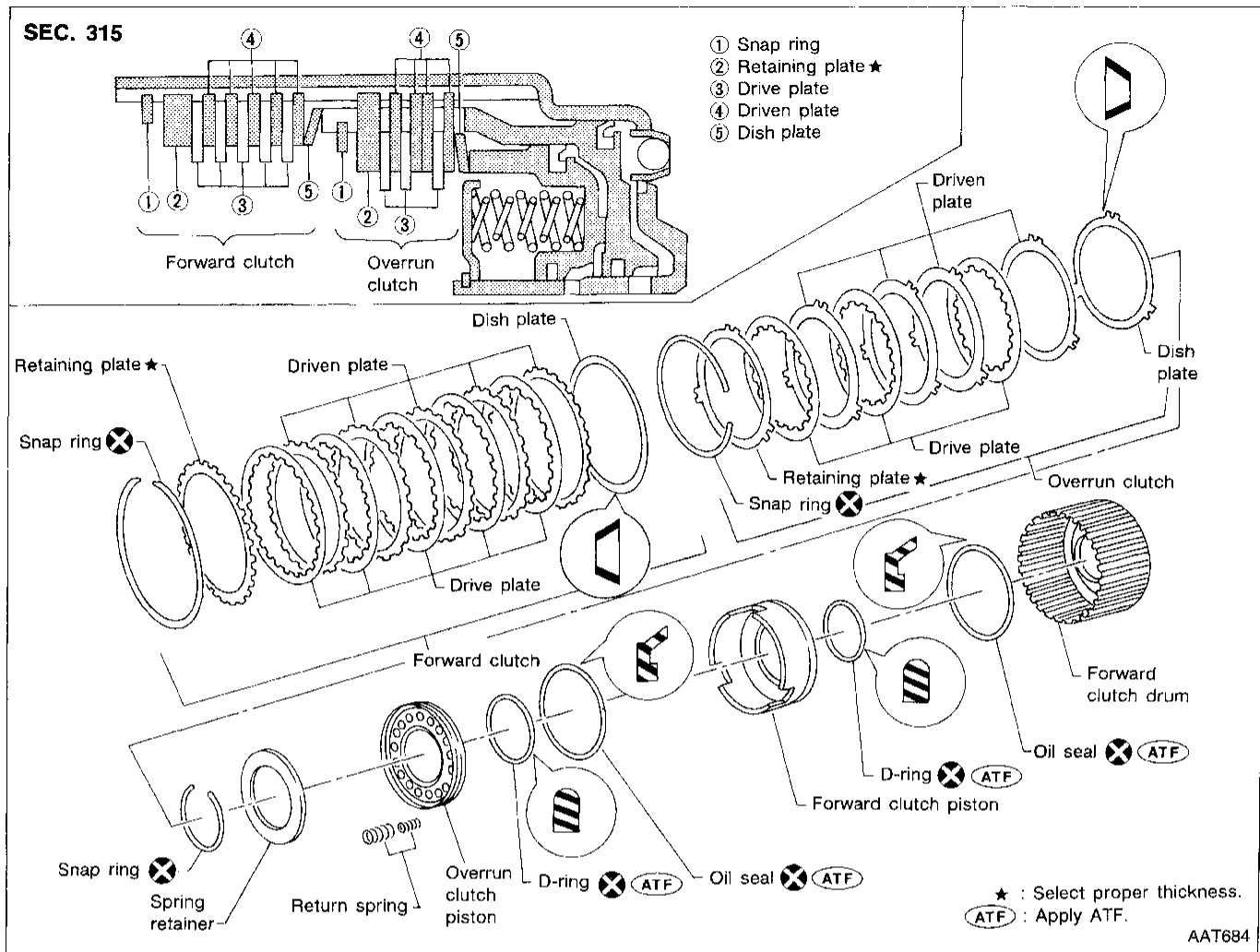


- **Roll paper around seal rings to prevent seal rings from spreading.**

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## Forward Clutch and Overrun Clutch

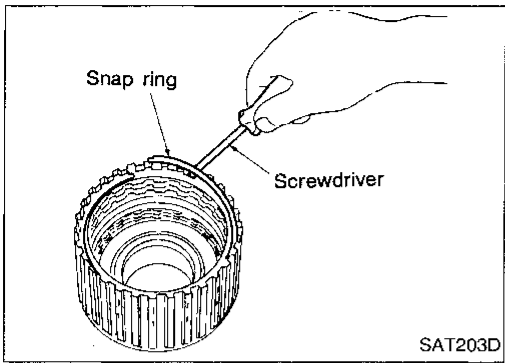


### DISASSEMBLY

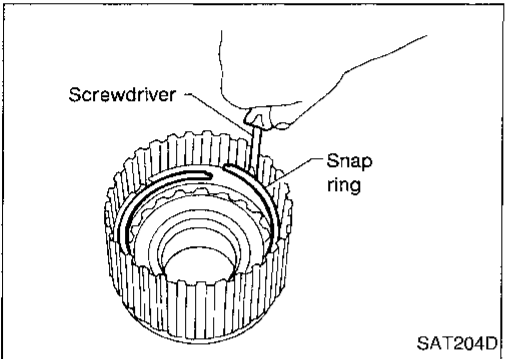
1. Check operation of forward clutch and overrun clutch.
  - a. Install bearing retainer on forward clutch drum.
  - b. Apply compressed air to oil hole of forward clutch drum.
  - c. Check to see that retaining plate moves to snap ring.
- d. If retaining plate does not contact snap ring:
  - D-ring might be damaged.
  - Oil seal might be damaged.
  - Fluid might be leaking past piston check ball.

## REPAIR FOR COMPONENT PARTS

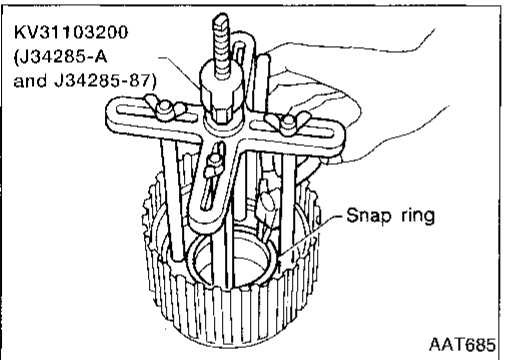
### Forward Clutch and Overrun Clutch (Cont'd)



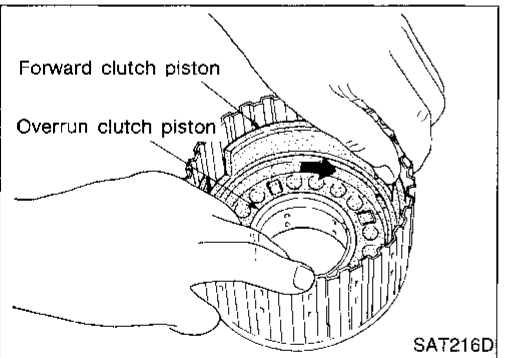
2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



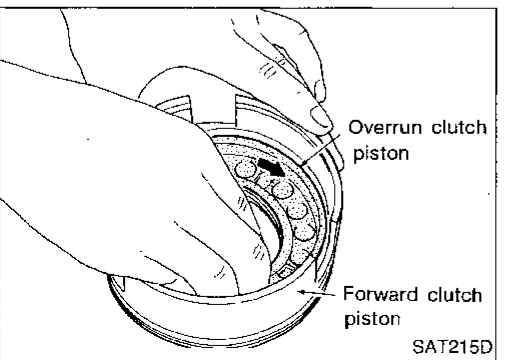
4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.



6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
  - **Set Tool directly above return springs.**
  - **Do not expand snap ring excessively.**
7. Remove spring retainer and return springs.



8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.



9. Remove overrun clutch piston from forward clutch piston by turning it.

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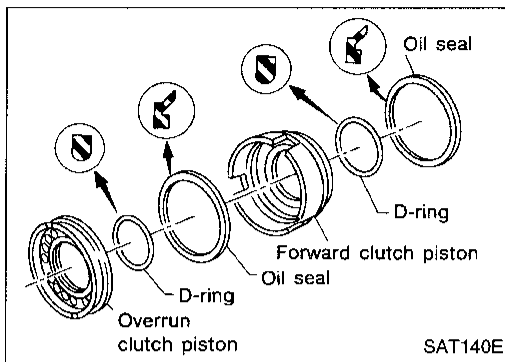
EL

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## REPAIR FOR COMPONENT PARTS

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

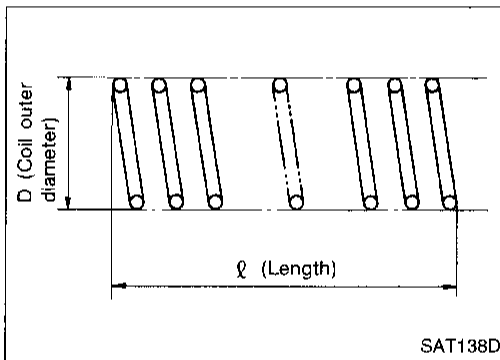
10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.



### INSPECTION

#### Snap rings and spring retainer

- Check for deformation, fatigue or damage.



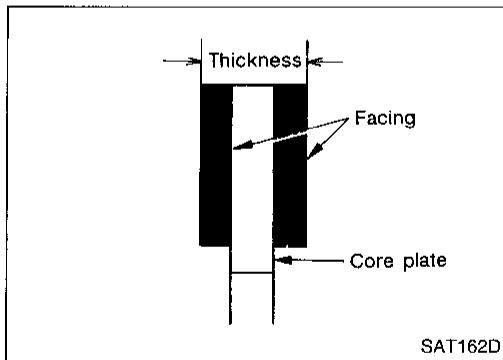
#### Forward clutch and overrun clutch return springs

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

##### Inspection standard:

Refer to SDS, AT-167.

- Replace if deformed or fatigued.



#### Forward clutch and overrun clutch drive plates

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

##### Thickness of drive plate:

##### Forward clutch

Standard value: 1.8 mm (0.071 in)

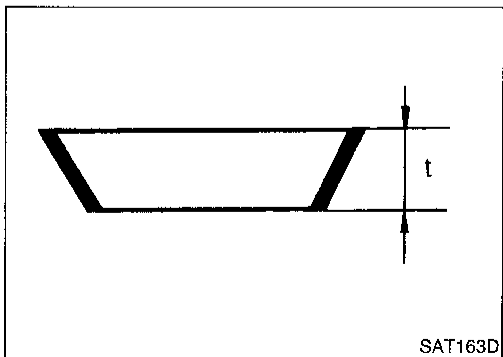
Wear limit: 1.6 mm (0.063 in)

##### Overrun clutch

Standard value: 1.6 mm (0.063 in)

Wear limit: 1.4 mm (0.055 in)

- If not within wear limit, replace.



#### Forward clutch and overrun clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.

##### Thickness of dish plate "t":

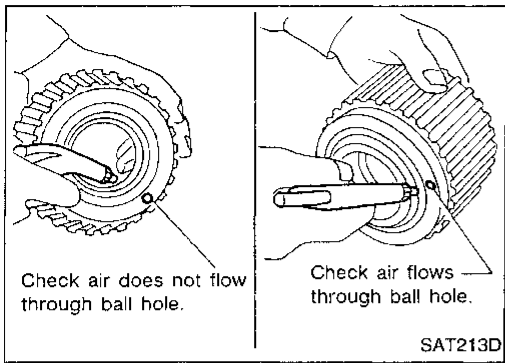
Forward clutch: 2.5 mm (0.098 in)

Overrun clutch: 2.15 mm (0.0846 in)

- If deformed or fatigued, replace.

# REPAIR FOR COMPONENT PARTS

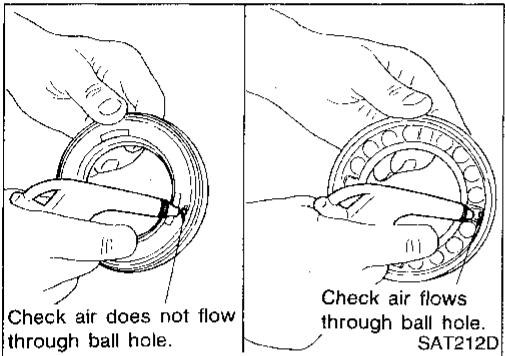
## Forward Clutch and Overrun Clutch (Cont'd)



### Forward clutch drum

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum. Make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum. Make sure there is no air leakage.

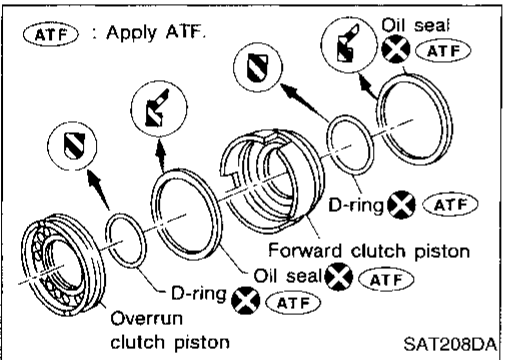
GI  
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### Overrun clutch piston

- Make sure check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side. Make sure air leaks past ball.

EC  
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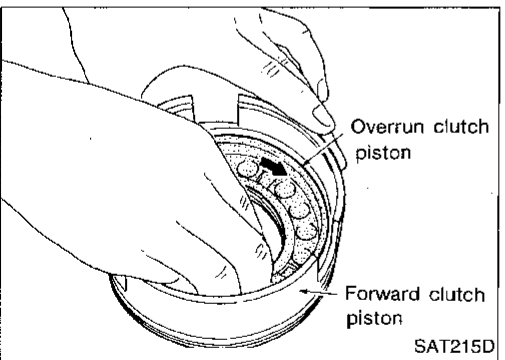


### ASSEMBLY

1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.

- Take care with direction of oil seal.
- Apply ATF to both parts.

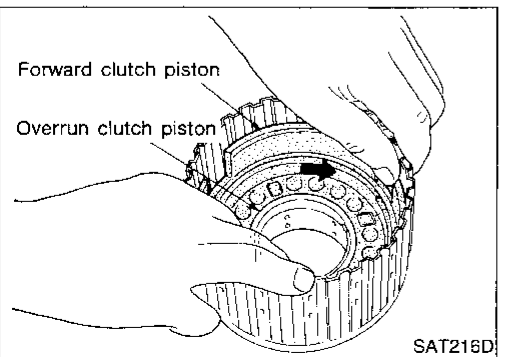
AT  
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2. Install overrun clutch piston assembly on forward clutch piston while turning it slowly.

- Apply ATF to inner surface of forward clutch piston.

BR  
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RS



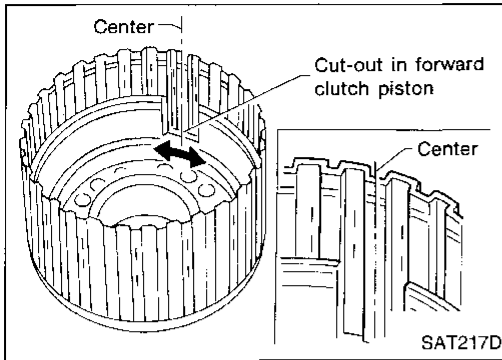
3. Install forward clutch piston assembly on forward clutch drum while turning it slowly.

- Apply ATF to inner surface of drum.

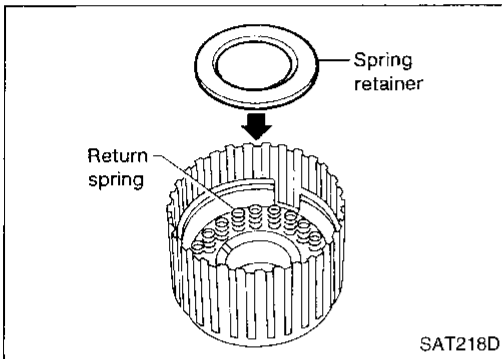
BT  
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IDX

## REPAIR FOR COMPONENT PARTS

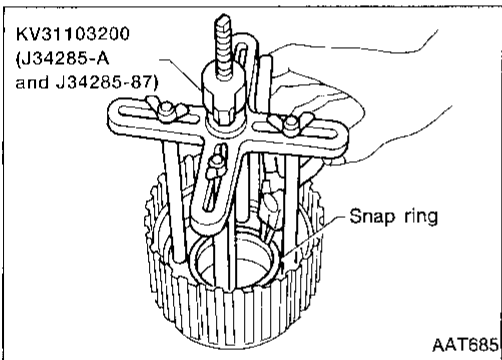
### Forward Clutch and Overrun Clutch (Cont'd)



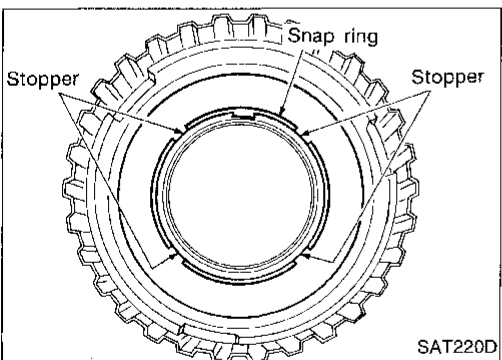
- Align notch in forward clutch piston with groove in forward clutch drum.



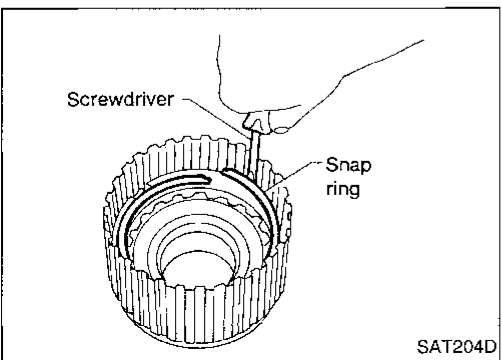
- Install return spring on piston.
- Install spring retainer on return springs.



- Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly above return springs.



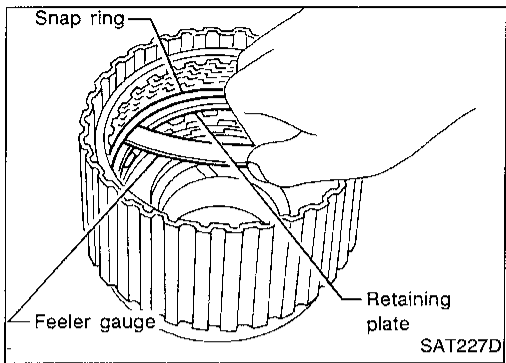
- Do not align snap ring gap with spring retainer stopper.



- Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
- Install snap ring for overrun clutch.

# REPAIR FOR COMPONENT PARTS

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



10. Measure clearance between overrun clutch retaining plate and snap ring.

If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard: 1.0 - 1.4 mm (0.039 - 0.055 in)**

**Allowable limit: 2.0 mm (0.079 in)**

**Overrun clutch retaining plate:**

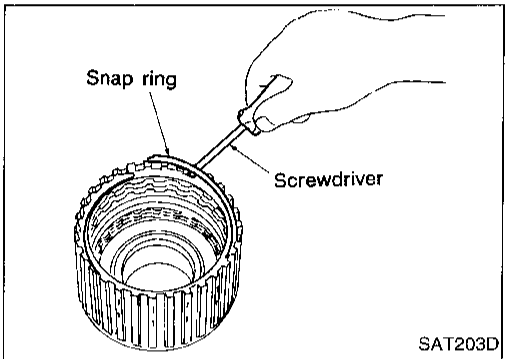
**Refer to SDS, AT-166.**

CI

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11. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.

**Take care with the order and direction of plates.**

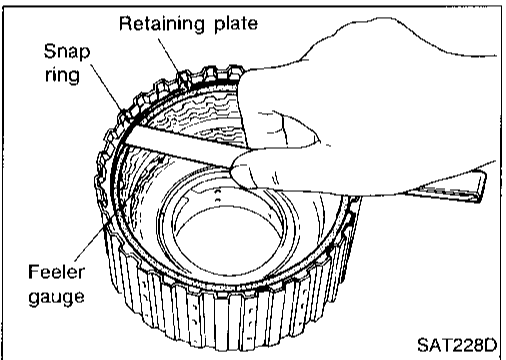
12. Install snap ring for forward clutch.

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13. Measure clearance between forward clutch retaining plate and snap ring.

If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard: 0.45 - 0.85 mm (0.0177 - 0.0335 in)**

**Allowable limit: 1.85 mm (0.0728 in)**

**Forward clutch retaining plate:**

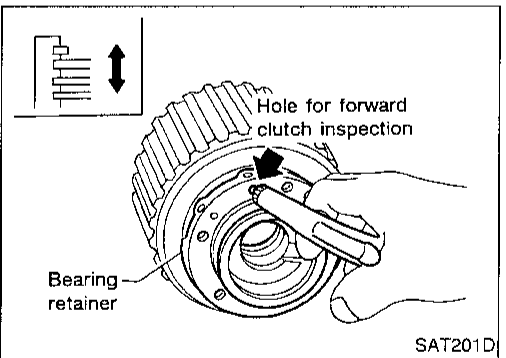
**Refer to SDS, AT-166.**

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14. Check operation of forward clutch.

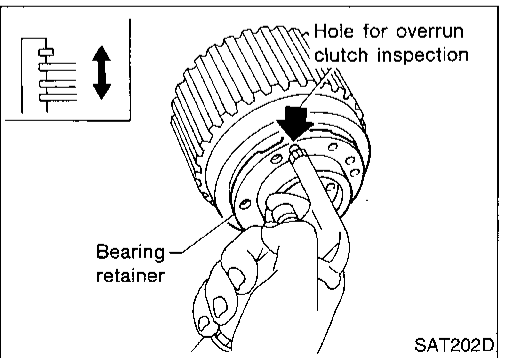
Refer to AT-112.

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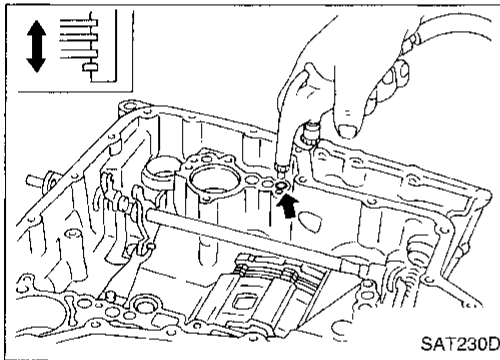
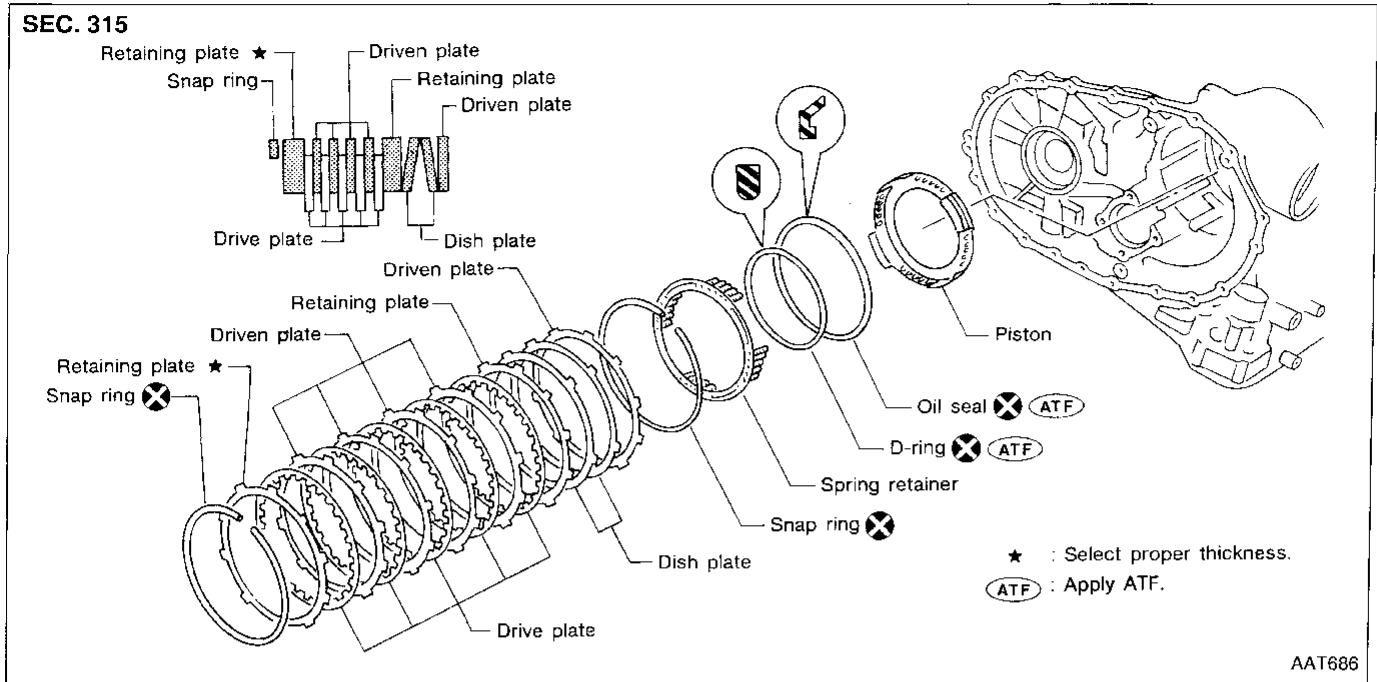
15. Check operation of overrun clutch.

Refer to "DISASSEMBLY" in "Forward Clutch and Overrun Clutch", AT-112.

EL

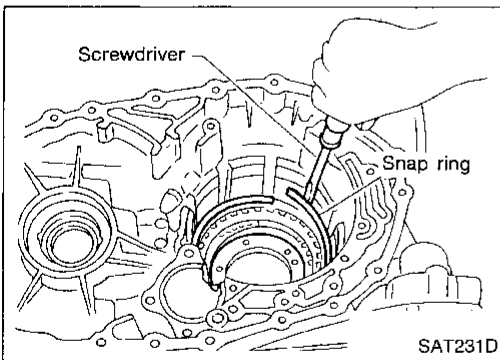
IDX

## Low & Reverse Brake

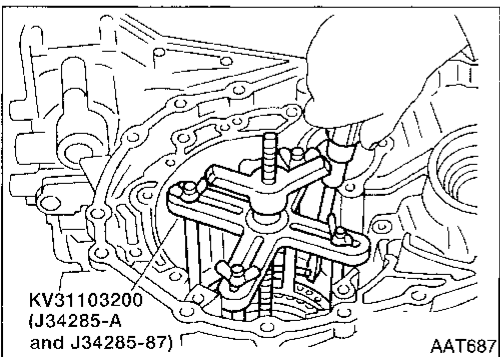


### DISASSEMBLY

1. Check operation of low & reverse brake.
  - a. Apply compressed air to oil hole of transmission case.
  - b. Check to see that retaining plate moves to snap ring.
  - c. If retaining plate does not contact snap ring:
    - D-ring might be damaged.
    - Oil seal might be damaged.
    - Fluid might be leaking past piston check ball.



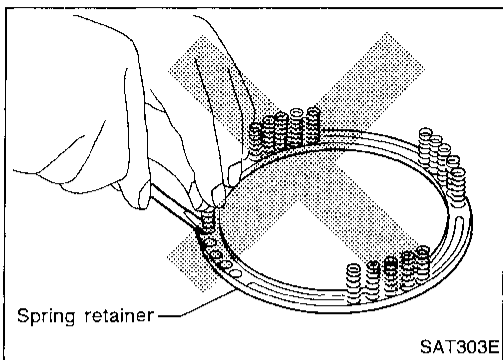
2. Stand transmission case.
3. Remove snap ring.
4. Remove drive plates, driven plates, retaining plate from transmission case.



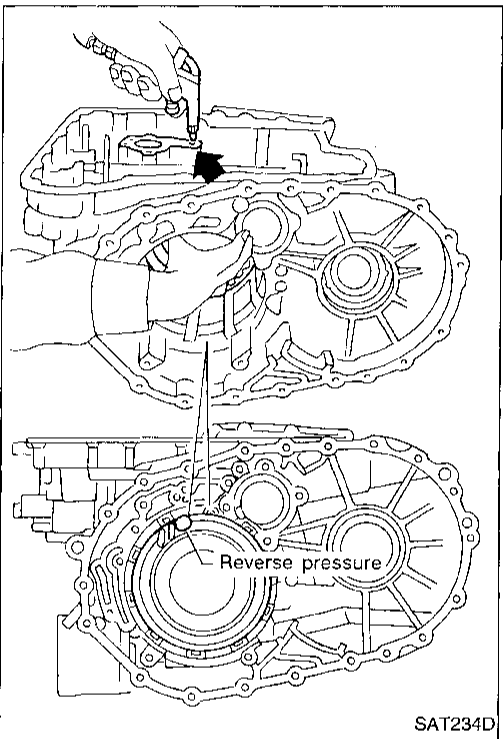
5. Set Tool on spring retainer and remove snap ring while compressing return springs.
  - **Set Tool directly above return springs.**
  - **Do not expand snap ring excessively.**
6. Remove spring retainer and return springs.

## REPAIR FOR COMPONENT PARTS

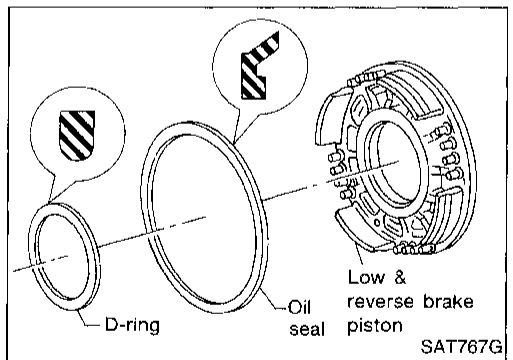
### Low & Reverse Brake (Cont'd)



- Do not remove return springs from spring retainer.



7. Apply compressed air to oil hole of transmission case while holding piston.
8. Remove piston from transmission case by turning it.



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

### INSPECTION

#### Low & reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.
- When replacing spring retainer and return springs, replace them as a set.

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## REPAIR FOR COMPONENT PARTS

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

#### Low & reverse brake drive plate

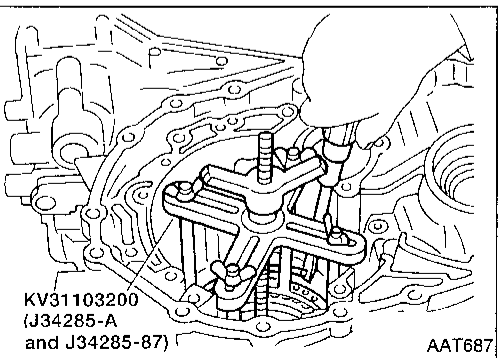
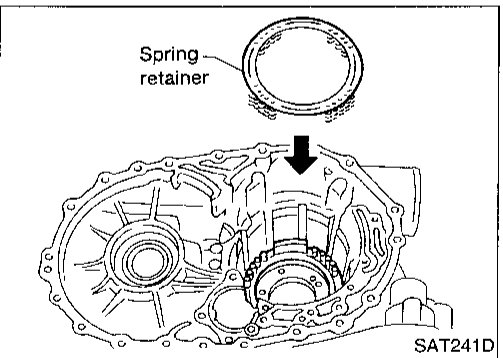
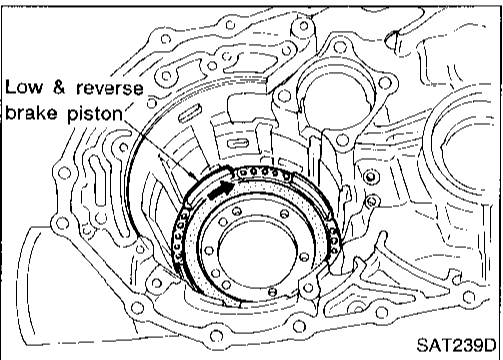
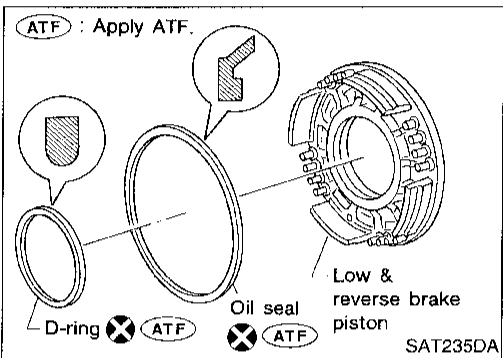
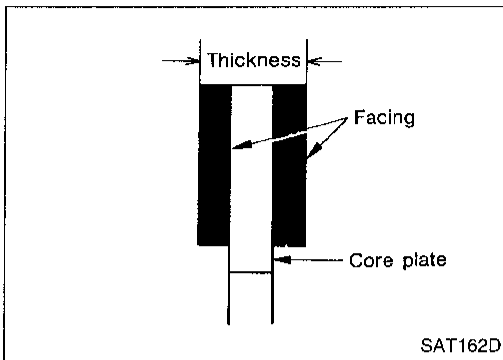
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

#### 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.

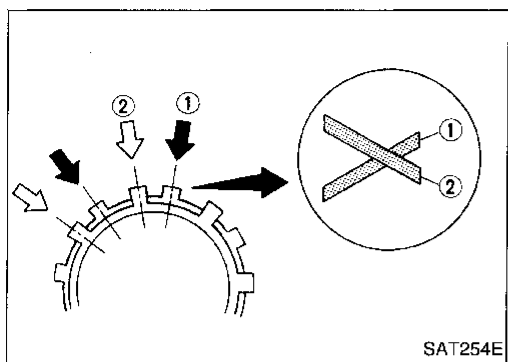


#### ASSEMBLY

1. Install D-ring and oil seal on piston.
  - Take care with the direction of the oil seal.
  - Apply ATF to both parts.
2. Stand transmission case.
3. Install piston assembly on transmission case while turning it slowly.
  - Apply ATF to inner surface of transmission case.
4. Install return springs and spring retainer on piston.
5. Install snap ring while compressing return springs.
  - Set Tool directly above return springs.

## REPAIR FOR COMPONENT PARTS

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



6. Install drive plates, driven plates, retaining plates and dished plates.

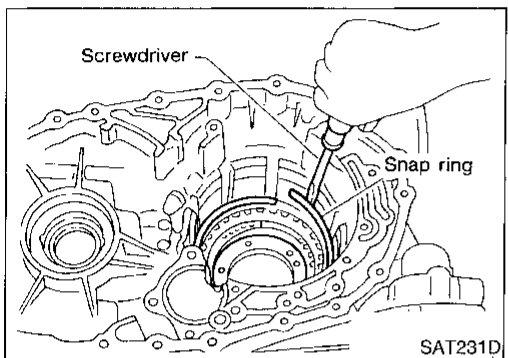
- Do not align the projections on the two dished plates.
- Make sure to put the plates in the correct order and direction.

GI

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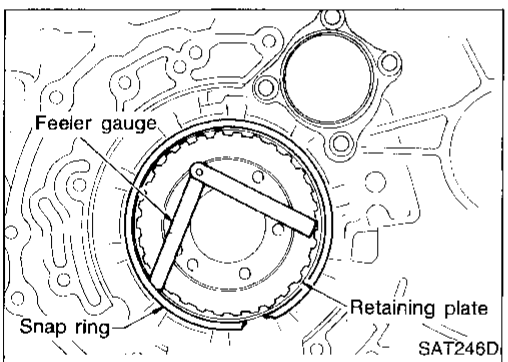


7. Install snap ring.

EC

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

**Specified clearance:**

**Standard: 1.4 - 1.8 mm (0.055 - 0.071 in)**

**Allowable limit:**

**2.8 mm (0.110 in)**

**Retaining plate:**

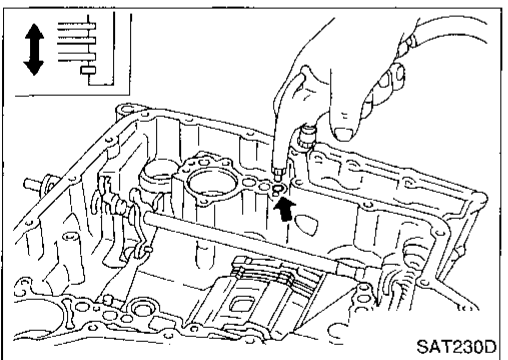
**Refer to SDS, AT-167.**

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9. Check operation of low & reverse brake.

Refer to "DISASSEMBLY", "Low & Reverse Brake", AT-118.

BR

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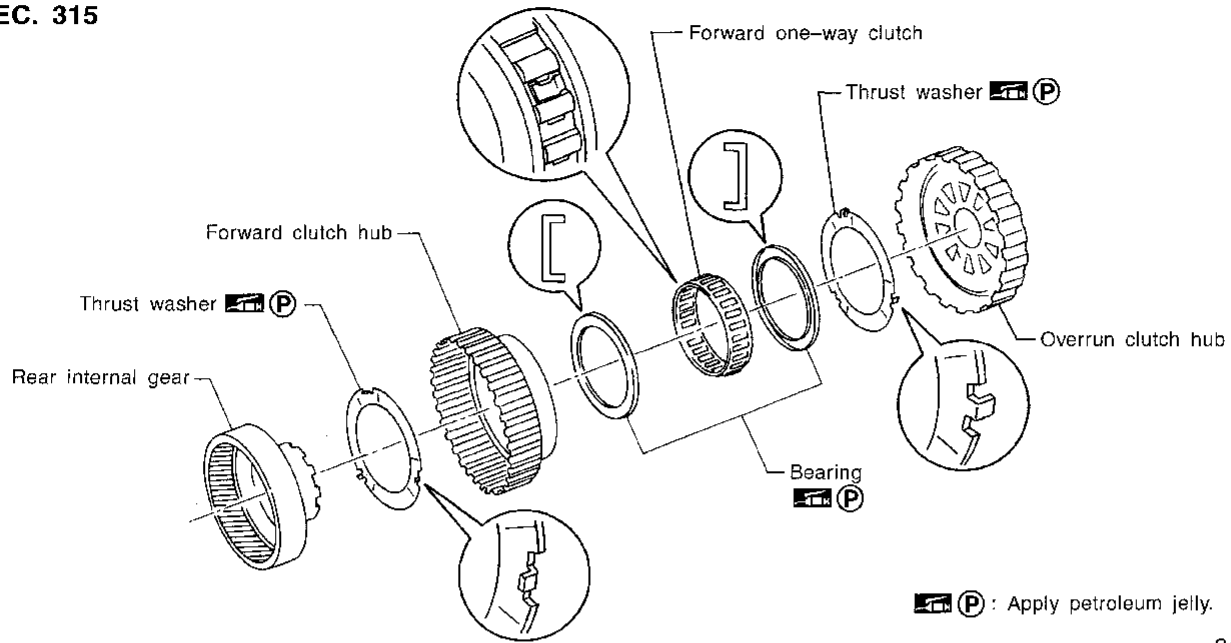
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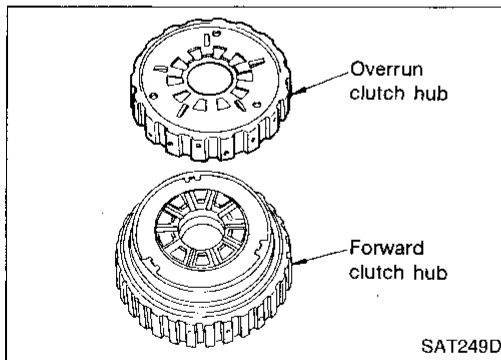
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Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub

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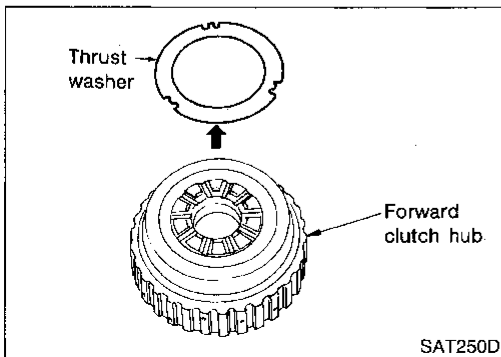


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DISASSEMBLY

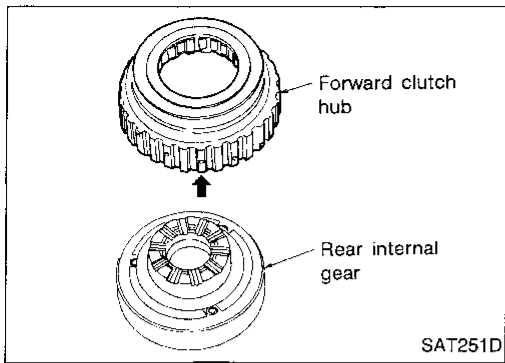
1. Remove snap ring from overrun clutch hub.
2. Remove overrun clutch hub from forward clutch hub.



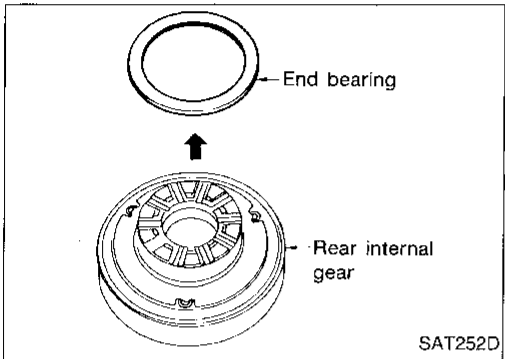
3. Remove thrust washer from forward clutch hub.

# REPAIR FOR COMPONENT PARTS

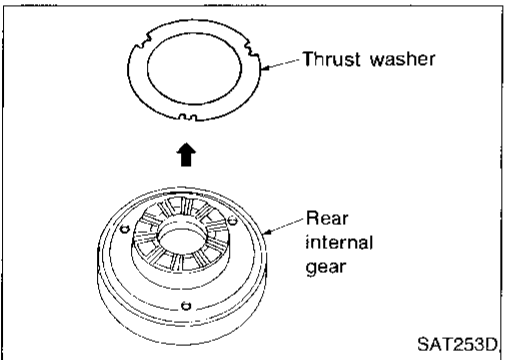
## Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



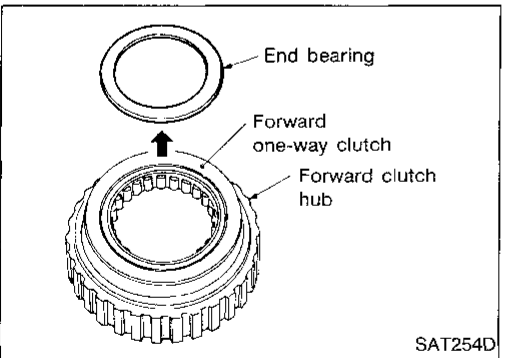
4. Remove forward clutch hub from rear internal gear.



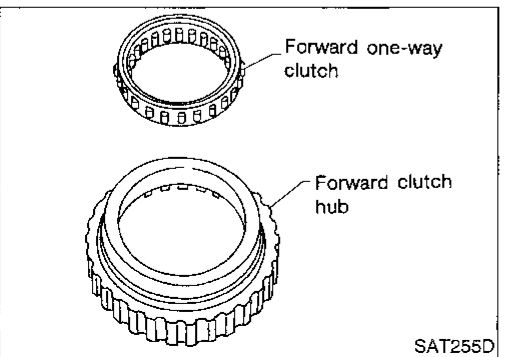
5. Remove end bearing from rear internal gear.



6. Remove thrust washer from rear internal gear.



7. Remove end bearing from forward one-way clutch.



8. Remove one-way clutch from forward clutch hub.

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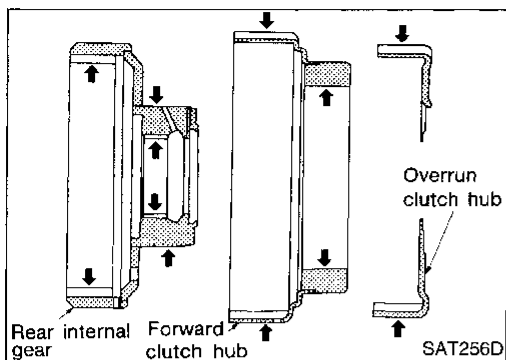
## REPAIR FOR COMPONENT PARTS

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

#### INSPECTION

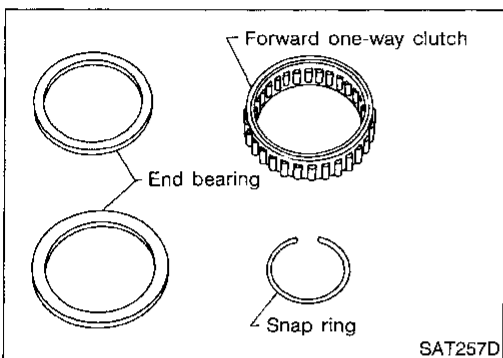
#### Rear internal gear, forward clutch hub and overrun clutch hub

- Check rubbing surfaces for wear or damage.



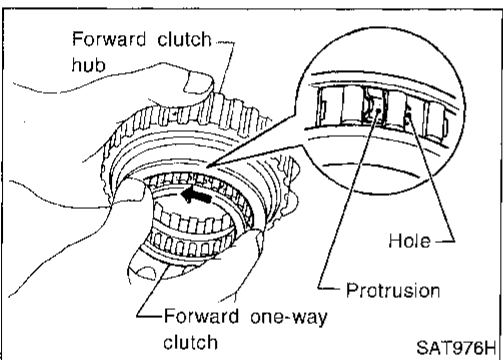
#### Snap ring, end bearings and forward one-way clutch

- Check snap ring and end bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.

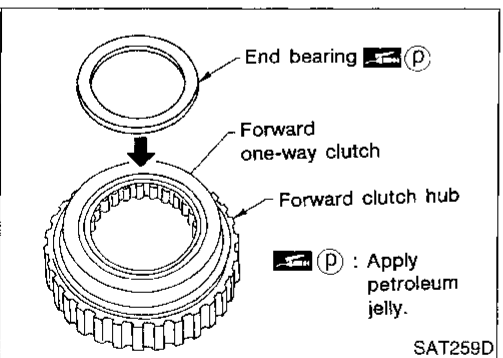


#### ASSEMBLY

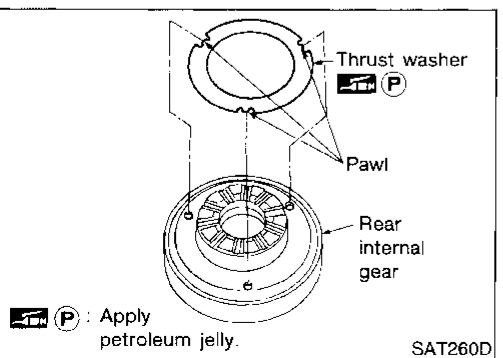
1. Install forward one-way clutch on forward clutch.
- **Take care with the direction of forward one-way clutch.**



2. Install end bearing on forward one-way clutch.
- **Apply petroleum jelly to end bearing.**

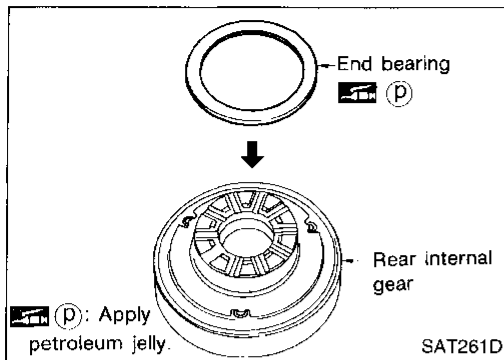


3. Install thrust washer on rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Align pawls of thrust washer with holes of rear internal gear.**

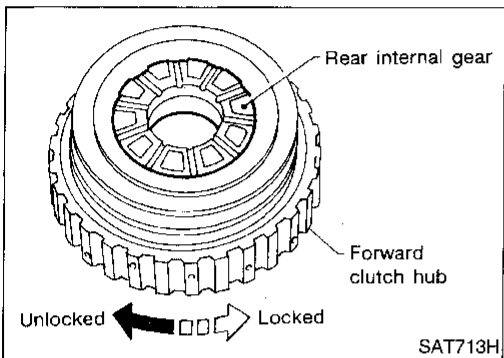


## REPAIR FOR COMPONENT PARTS

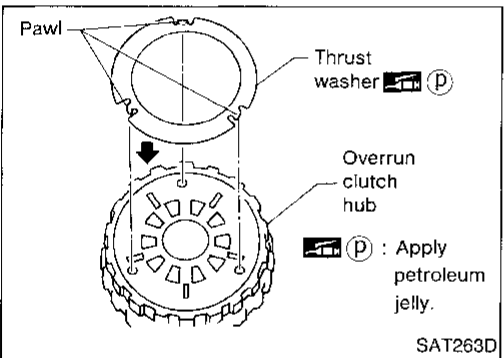
### Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)



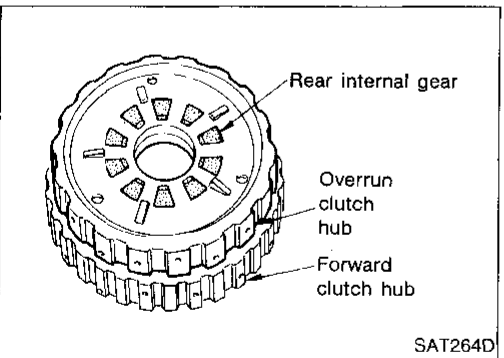
4. Install end bearing on rear internal gear.
  - Apply petroleum jelly to end bearing.



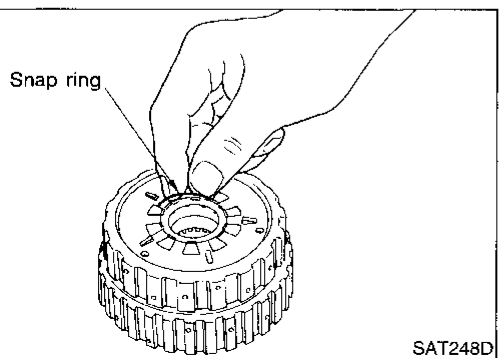
5. Install forward clutch hub on rear internal gear.
  - Check operation of forward one-way clutch. Hold rear internal gear and turn forward clutch hub. Check forward clutch hub for correct locking and unlocking directions.
  - If not as shown in illustration, check installation direction of forward one-way clutch.



6. Install thrust washer and overrun clutch hub.
  - Apply petroleum jelly to thrust washer.
  - Align pawls of thrust washer with holes of overrun clutch hub.



7. Install overrun clutch hub on rear internal gear.
  - Align projections of rear internal gear with holes of overrun clutch hub.



8. Install snap ring to groove of rear internal gear.

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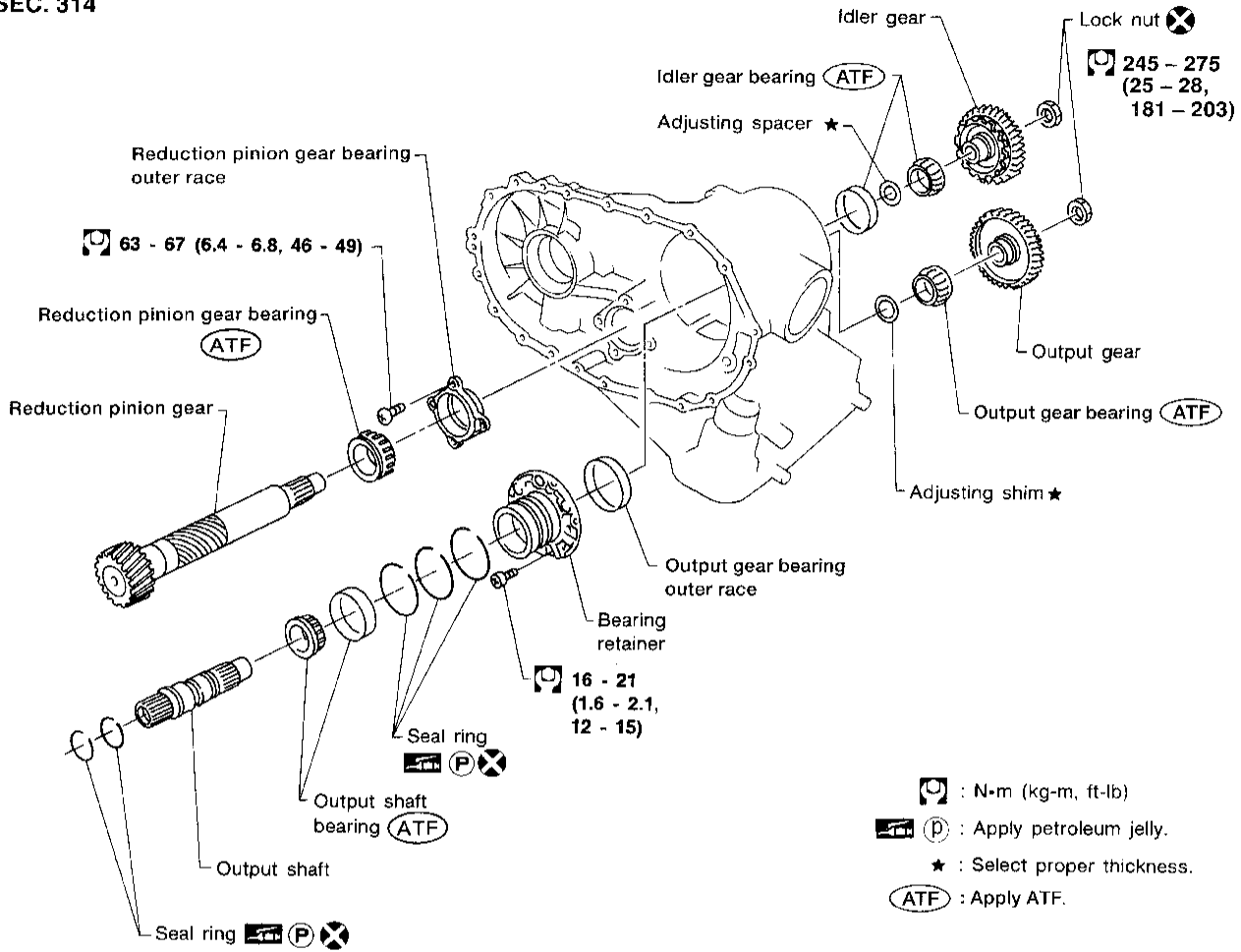
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Output Shaft, Output Gear, Idler Gear, Reduction Pinion Gear and Bearing Retainer

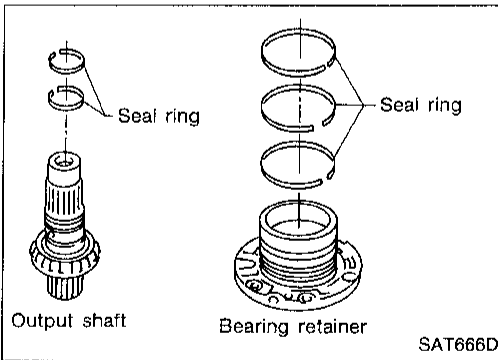
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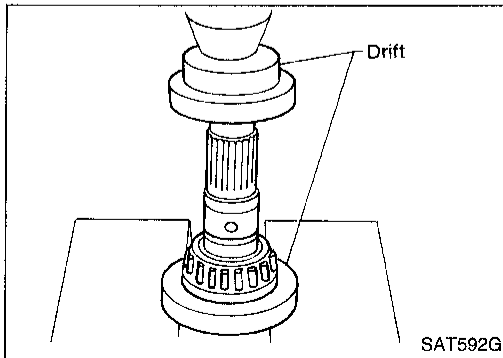
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DISASSEMBLY

1. Remove seal rings from output shaft and bearing retainer.

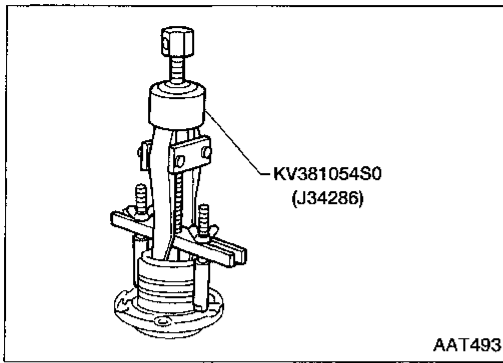


2. Press out output shaft bearing inner race.



# REPAIR FOR COMPONENT PARTS

## Output Shaft, Output Gear, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)



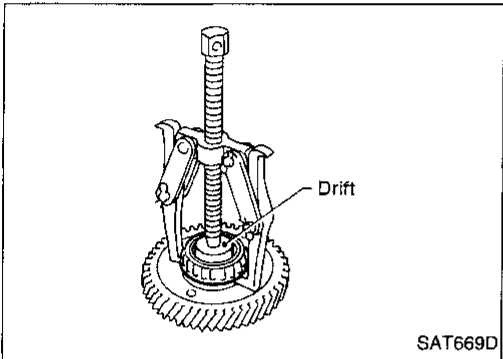
3. Remove output shaft bearing outer race from bearing retainer.

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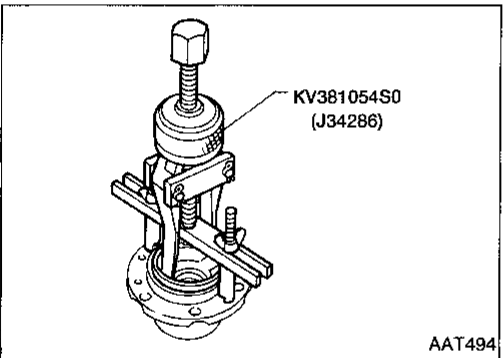


4. Remove output gear bearing inner race.

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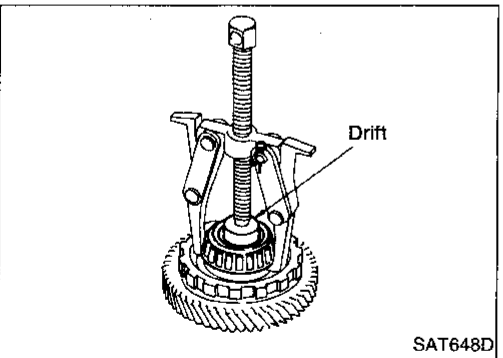
5. Remove output gear bearing outer race from bearing retainer.

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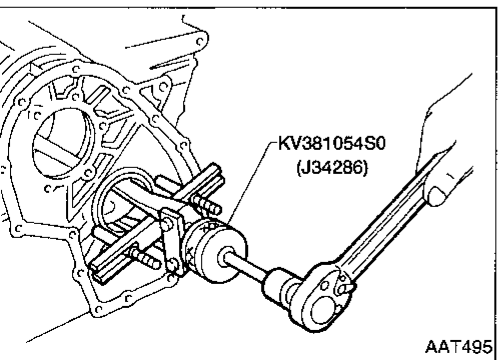
6. Remove idler gear bearing inner race.

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7. Remove idler gear bearing outer race from transmission case.

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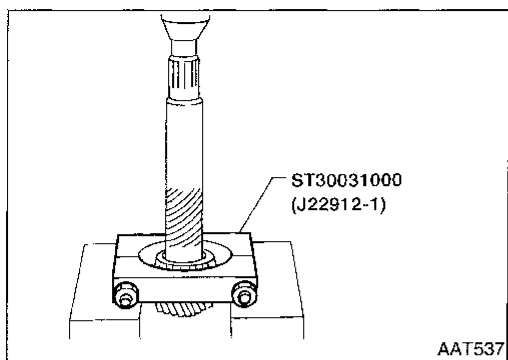
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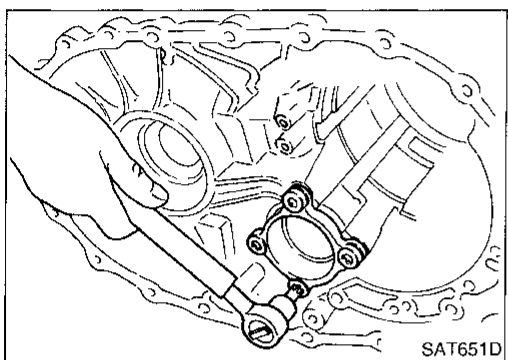


## REPAIR FOR COMPONENT PARTS

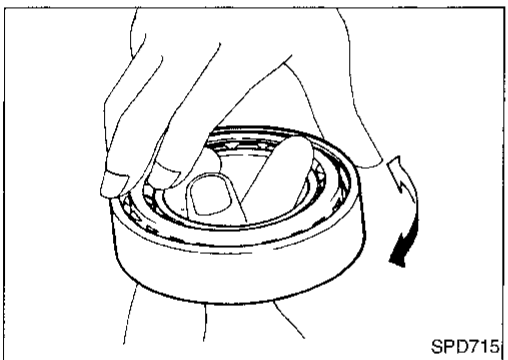
### Output Shaft, Output Gear, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)



8. Press out reduction pinion gear bearing from reduction pinion gear.



9. Remove reduction pinion gear bearing outer race from transmission case.



### INSPECTION

#### Output shaft, output gear, idler gear and reduction pinion gear

- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.

#### Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace inner and outer race as a set.**

#### Seal ring clearance

- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.

##### 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 output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.

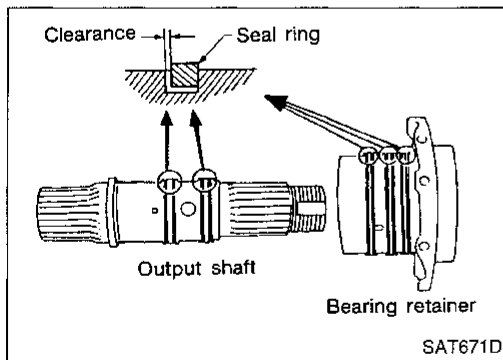
##### Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

##### Wear limit:

0.25 mm (0.0098 in)

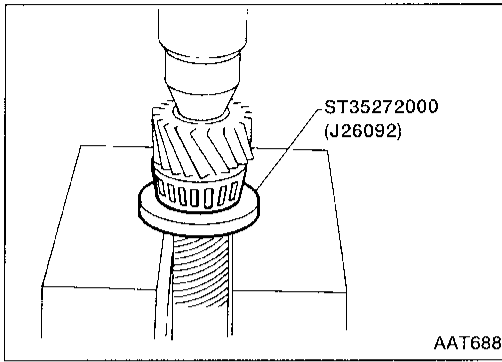
- If not within wear limit, replace bearing retainer.



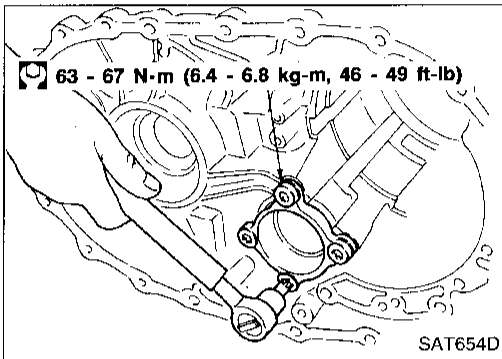
# REPAIR FOR COMPONENT PARTS

## Output Shaft, Output Gear, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

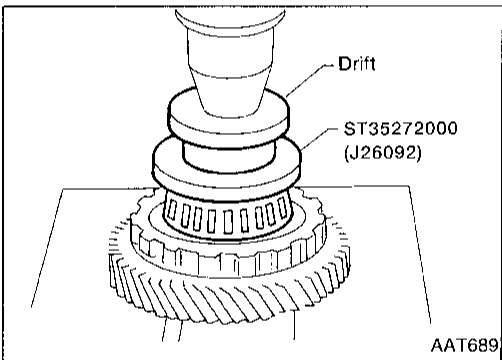
### ASSEMBLY



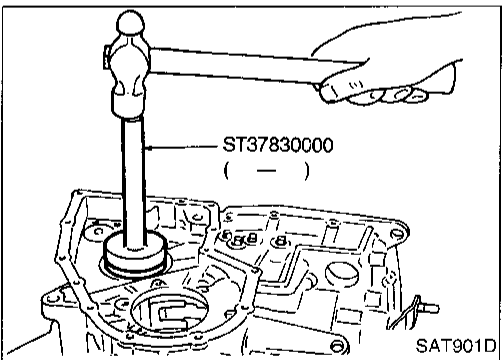
1. Press reduction pinion gear bearing on reduction pinion gear.



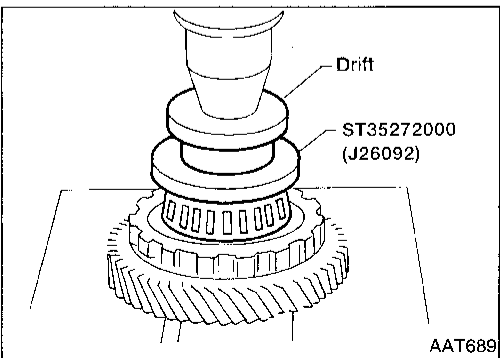
2. Install reduction pinion gear bearing outer race on transmission case.



3. Press idler gear bearing inner race on idler gear.



4. Install idler gear bearing outer race on transmission case.



5. Press output gear bearing inner race on output gear.

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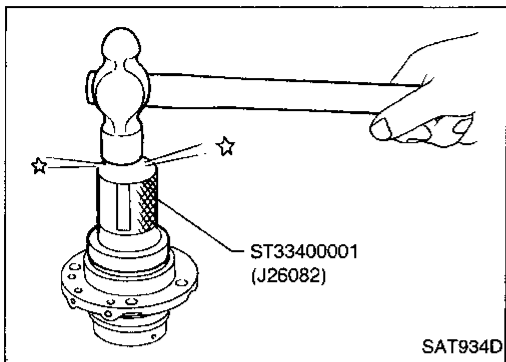
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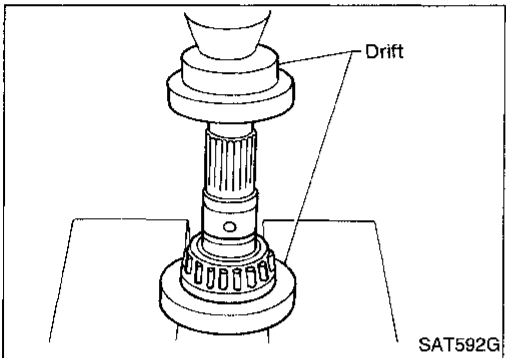
## REPAIR FOR COMPONENT PARTS

### Output Shaft, Output Gear, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

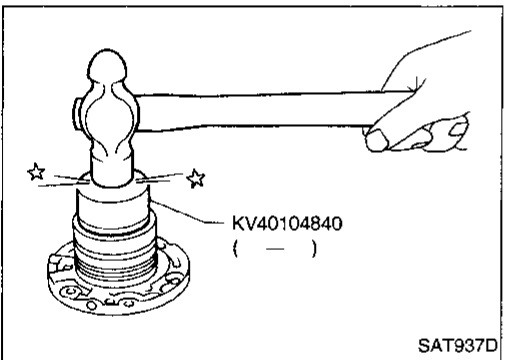
6. Install output gear bearing outer race on bearing retainer.



7. Press output shaft bearing inner race on output shaft.

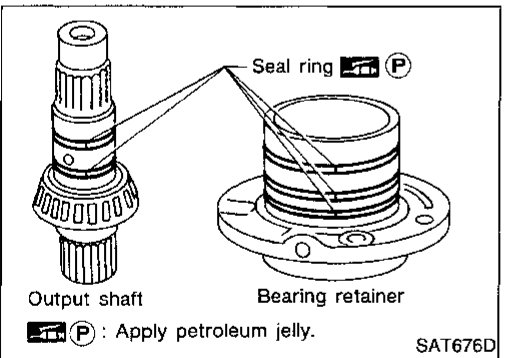


8. Install output shaft bearing outer race on bearing retainer.

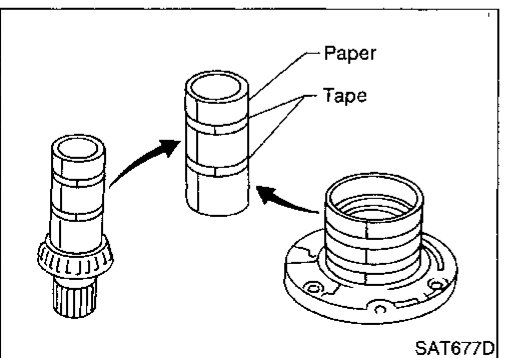


9. Install new seal rings onto output shaft and bearing retainer.

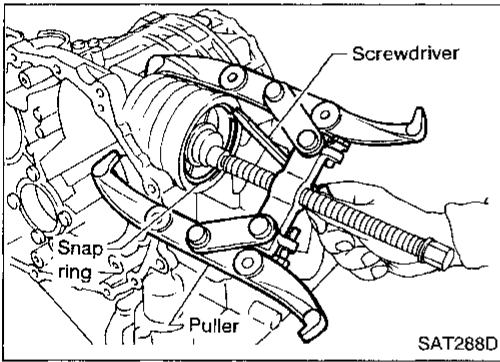
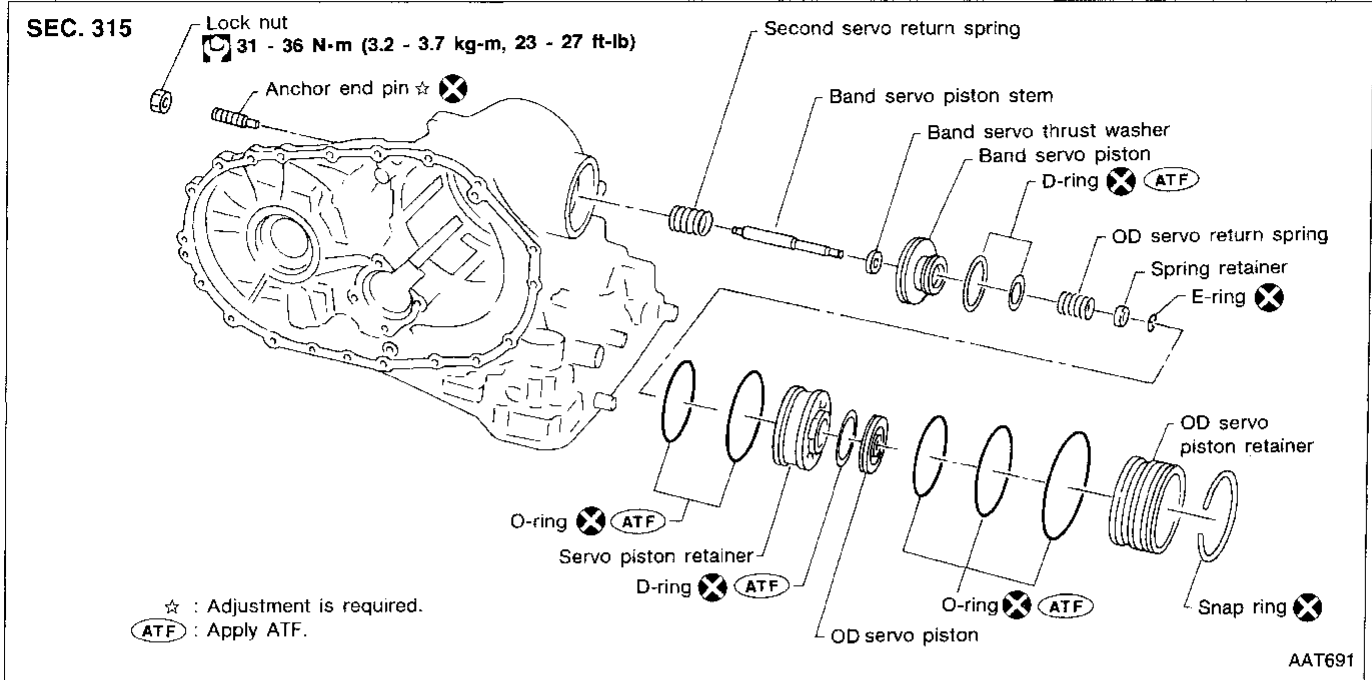
- **Apply petroleum jelly to seal rings.**



10. Roll paper around seal rings to prevent seal rings from spreading.

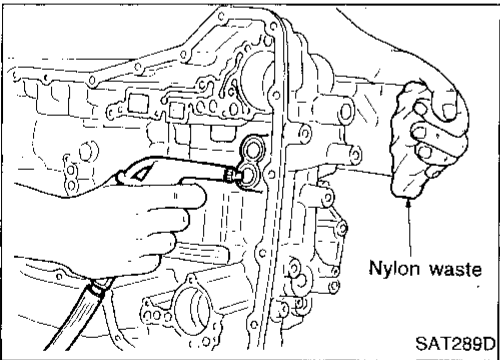


Band Servo Piston Assembly

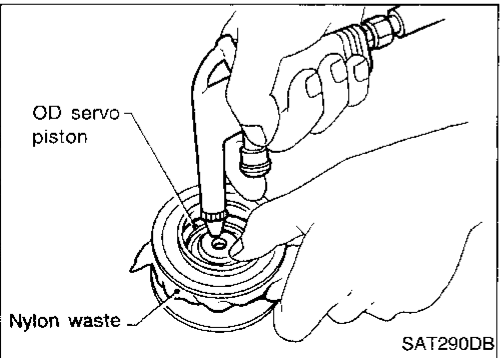


DISASSEMBLY

1. Remove band servo piston snap ring.



2. Apply compressed air to oil hole in transmission case to remove OD servo piston retainer and band servo piston assembly.
  - Hold band servo piston assembly with a rag or nylon waste.

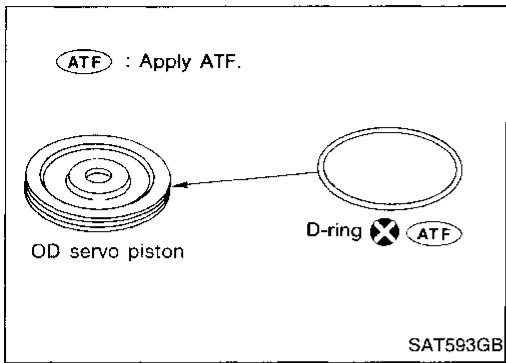


3. Apply compressed air to oil hole in OD servo piston retainer to remove OD servo piston from retainer.
  - Hold OD servo piston while applying compressed air.

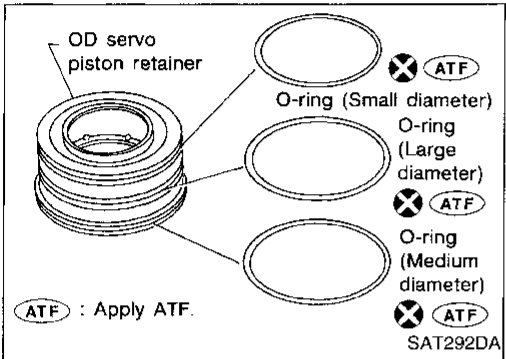
# REPAIR FOR COMPONENT PARTS

## Band Servo Piston Assembly (Cont'd)

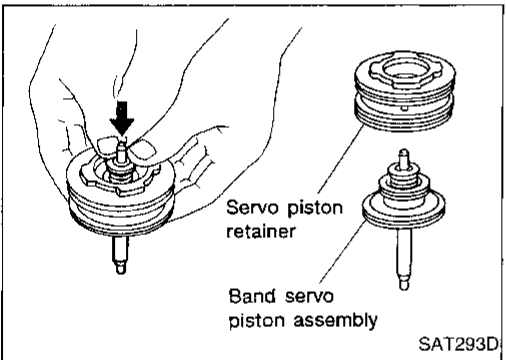
4. Remove D-ring from OD servo piston.



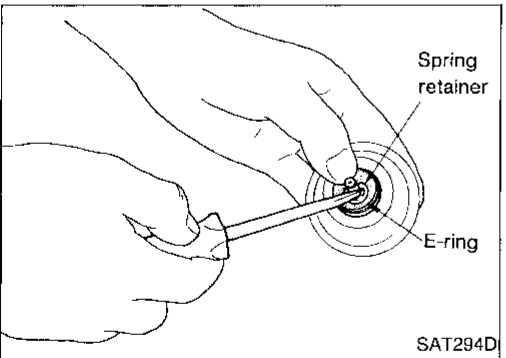
5. Remove O-rings from OD servo piston retainer.



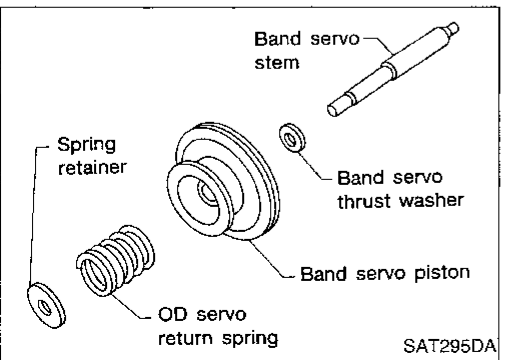
6. Remove band servo piston assembly from servo piston retainer by pushing it forward.



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

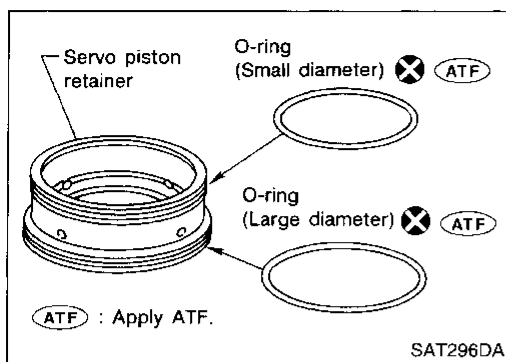


8. Remove OD servo return spring, band servo thrust washer and band servo piston stem from band servo piston.

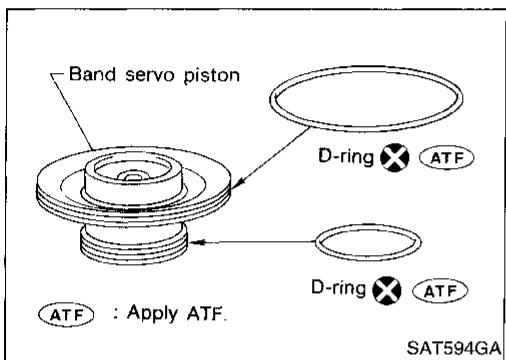


# REPAIR FOR COMPONENT PARTS

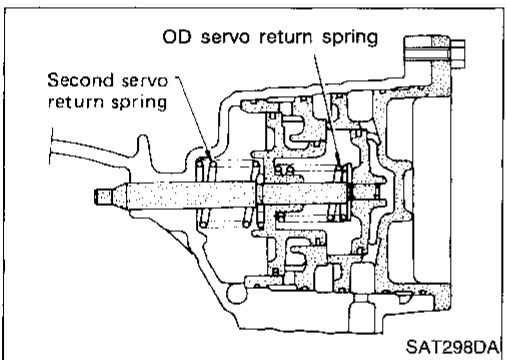
## Band Servo Piston Assembly (Cont'd)



9. Remove O-rings from servo piston retainer.



10. Remove D-rings from band servo piston.



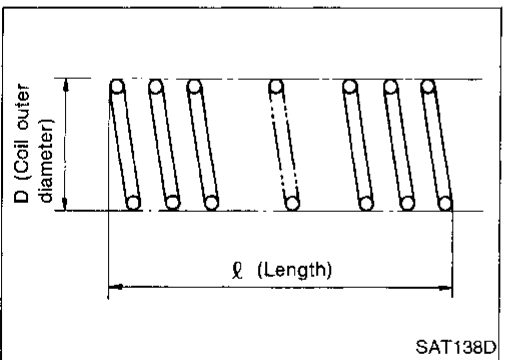
### INSPECTION

#### Pistons, retainers and piston stem

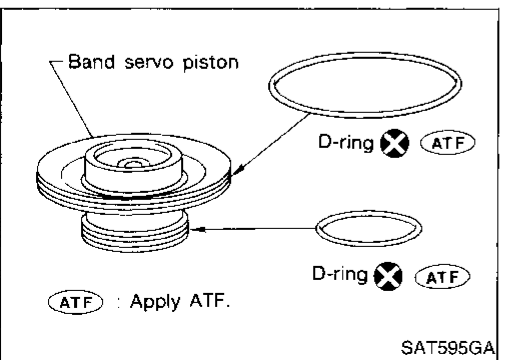
- Check frictional surfaces for abnormal wear or damage.

#### Return springs

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



Inspection standard:  
Refer to SDS, AT-171.



### ASSEMBLY

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

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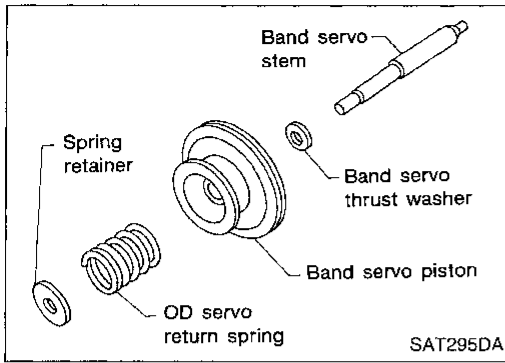
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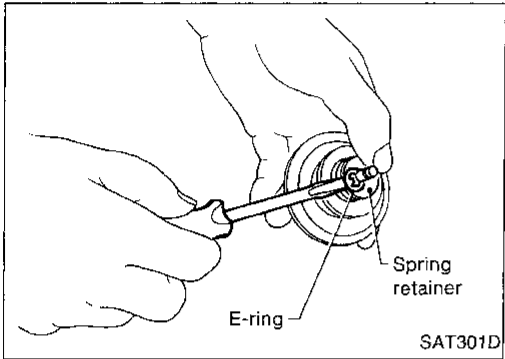
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# REPAIR FOR COMPONENT PARTS

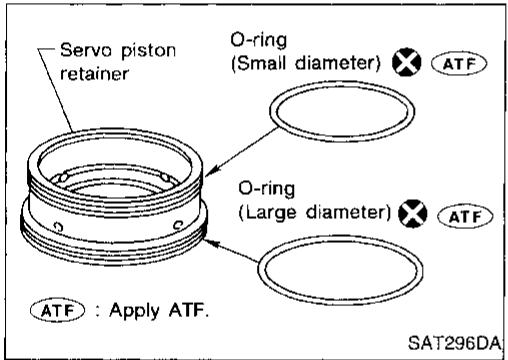
## Band Servo Piston Assembly (Cont'd)



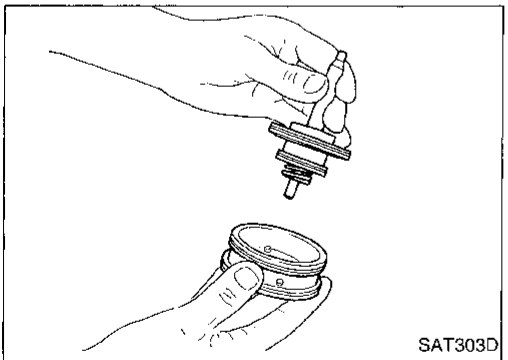
2. Install band servo piston stem, band servo thrust washer, OD servo return spring and spring retainer to band servo piston.



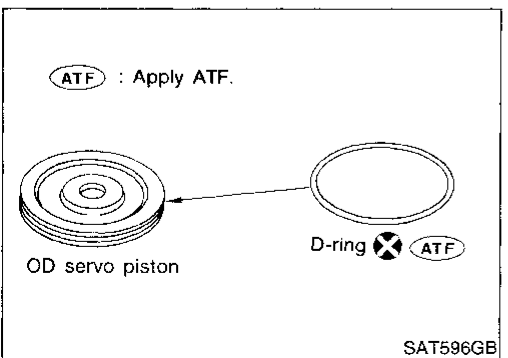
3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



4. Install O-rings to servo piston retainer.
  - **Apply ATF to O-rings.**
  - **Pay attention to the positions of the O-rings.**



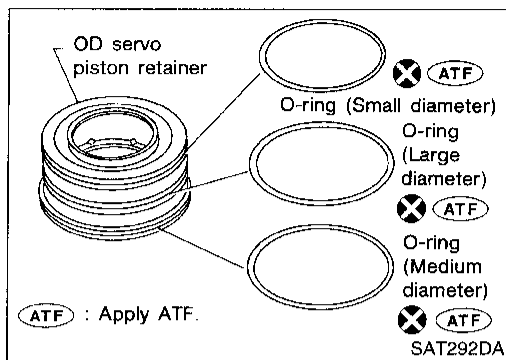
5. Install band servo piston assembly to servo piston retainer by pushing it inward.



6. Install D-ring to OD servo piston.
  - **Apply ATF to D-ring.**

# REPAIR FOR COMPONENT PARTS

## Band Servo Piston Assembly (Cont'd)



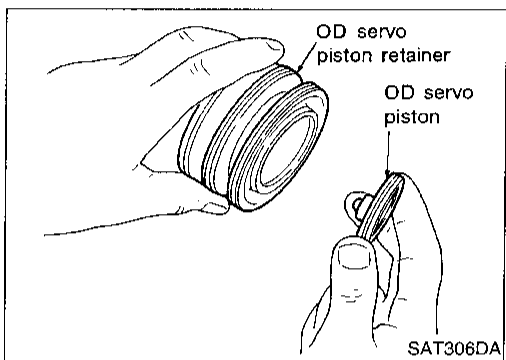
7. Install O-rings to OD servo piston retainer.
  - **Apply ATF to O-rings.**
  - **Pay attention to the positions of the O-rings.**

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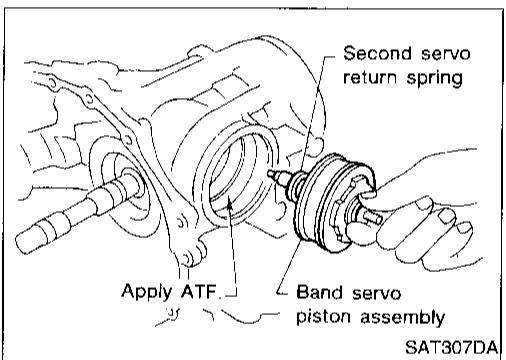


8. Install OD servo piston to OD servo piston retainer.

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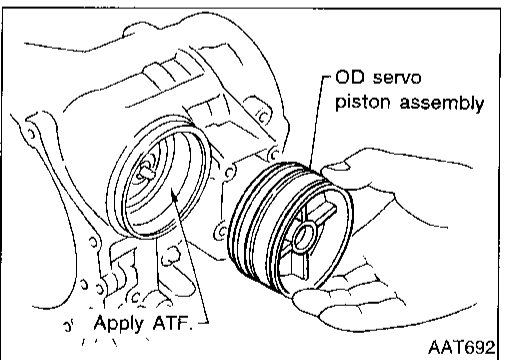
9. Install band servo piston assembly and 2nd servo return spring to transmission case.
  - **Apply ATF to O-ring of band servo piston and transmission case.**

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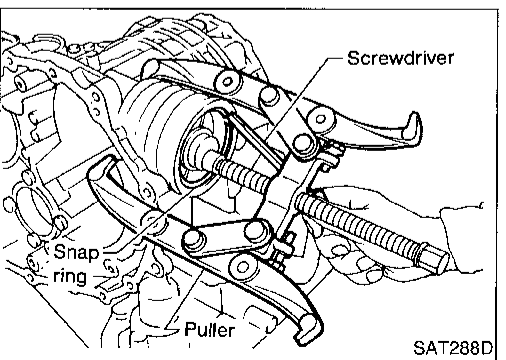


10. Install OD servo piston assembly to transmission case.
  - **Apply ATF to O-ring of band servo piston and transmission case.**

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11. Install band servo piston snap ring to transmission case.

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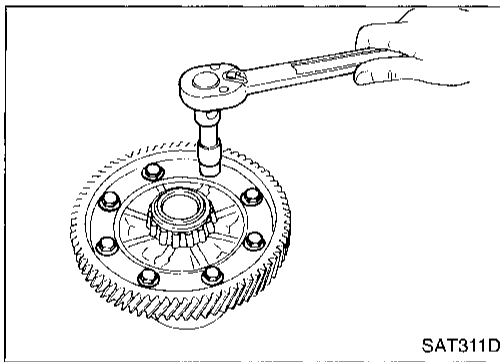
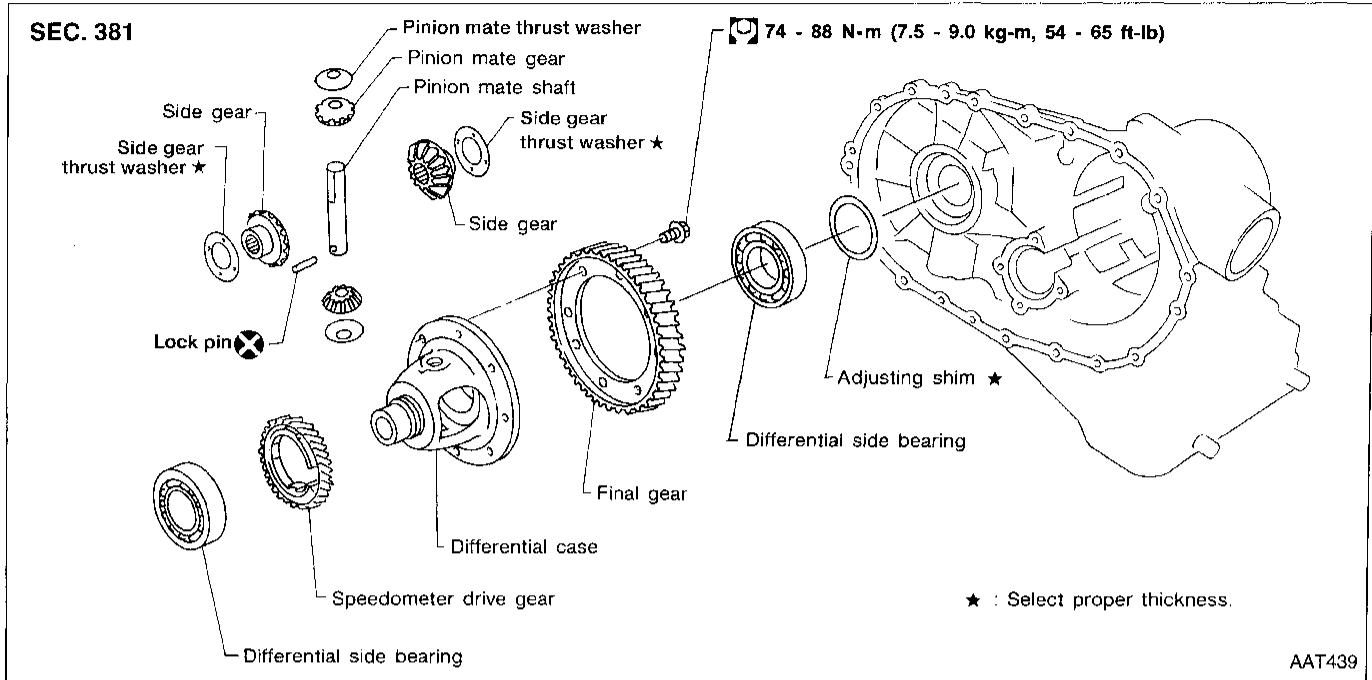
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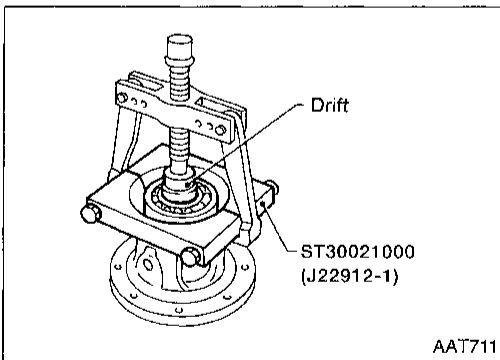


Final Drive

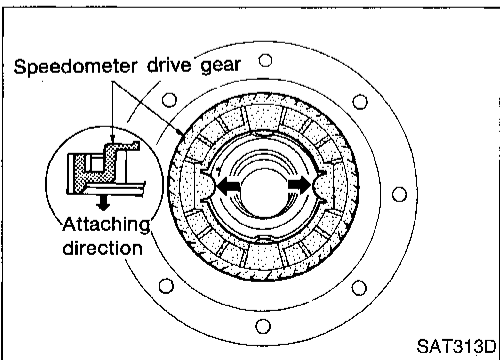


**DISASSEMBLY**

1. Remove final gear.



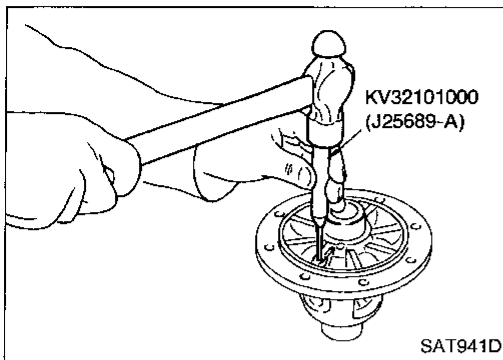
2. Press out differential side bearings.



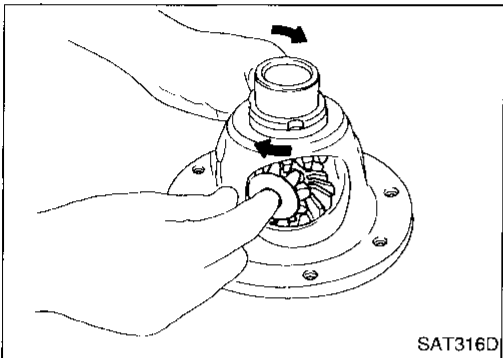
3. Remove speedometer drive gear.

# REPAIR FOR COMPONENT PARTS

## Final Drive (Cont'd)

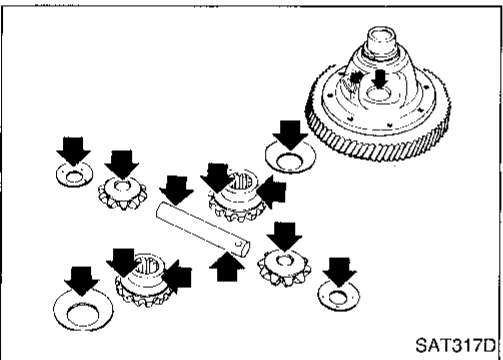


4. Drive out pinion mate shaft retaining pin.



5. Draw out pinion mate shaft from differential case.

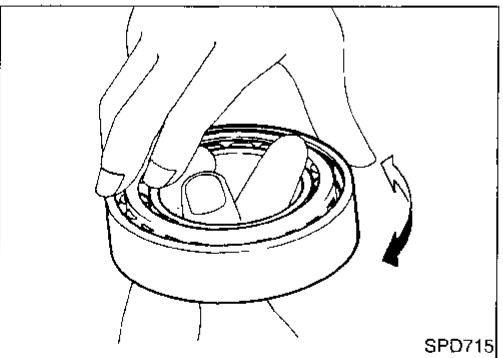
6. Remove pinion mate gears and side gears.



### INSPECTION

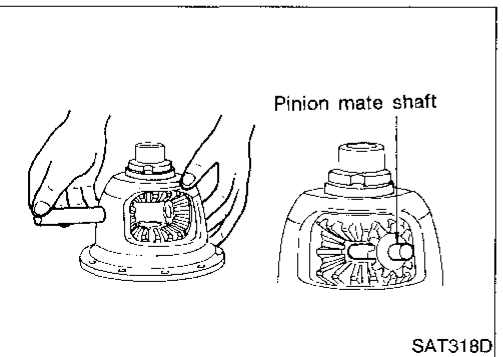
#### Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



#### Bearings

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



### ASSEMBLY

1. Install side gears and thrust washers in differential case.
2. Install pinion mate gears and thrust washers in the differential case while rotating them.

- **Apply ATF to all parts.**

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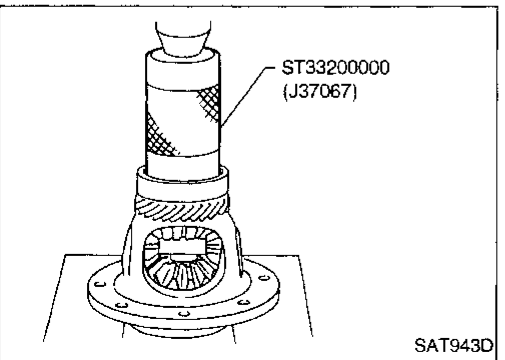
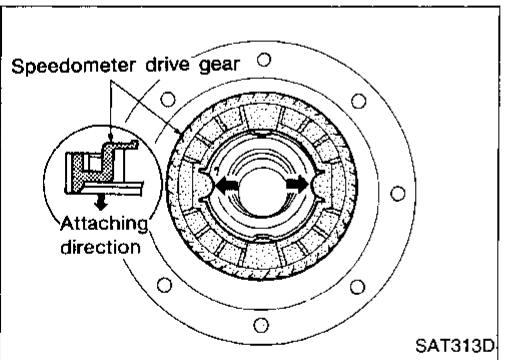
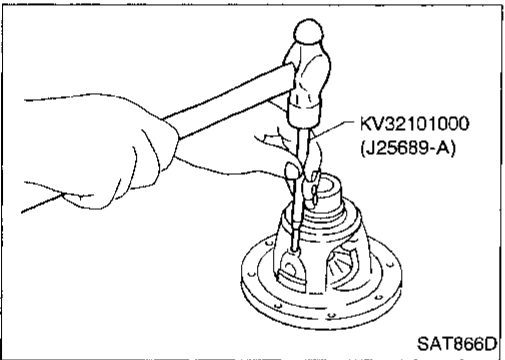
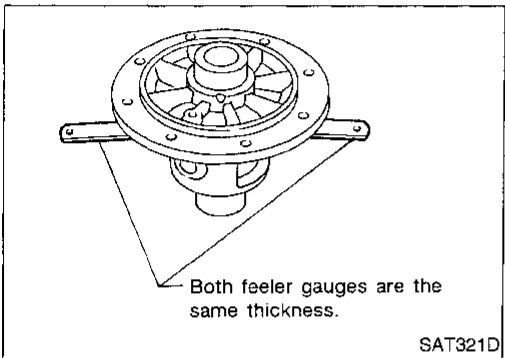
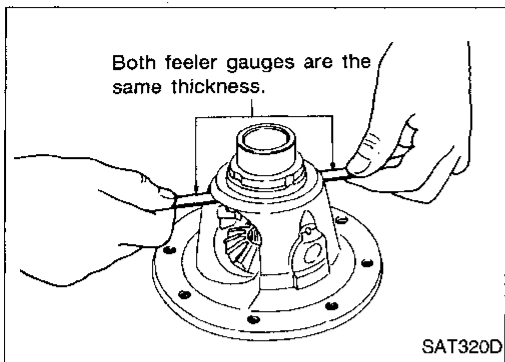
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## REPAIR FOR COMPONENT PARTS

### Final Drive (Cont'd)



3. Measure clearance between side gear and differential case with washers.

**Clearance between side gear and differential case with washers:**

**0.1 - 0.2 mm (0.004 - 0.008 in)**

- If not within specification, adjust clearance by changing thickness of side gear thrust washers.

**Side gear thrust washer:  
Refer to SDS, AT-168.**

4. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

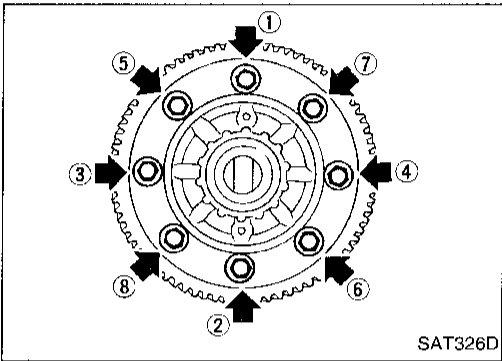
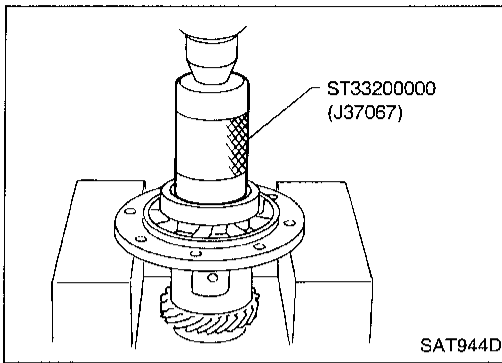
5. Install speedometer drive gear on differential case.

- **Align projection of speedometer drive gear with groove of differential case.**

6. Press differential side bearings on differential case.

# REPAIR FOR COMPONENT PARTS

## Final Drive (Cont'd)



7. Install final gear and tighten fixing bolts in numerical order.

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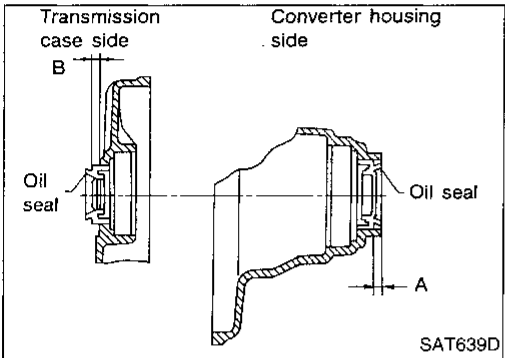
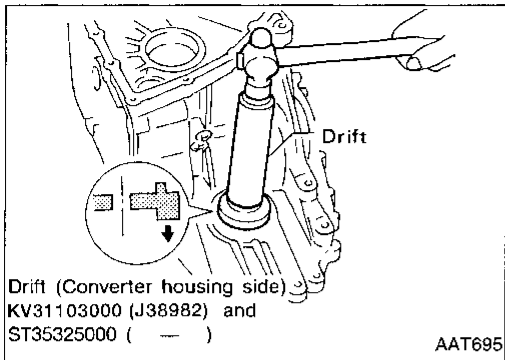
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# ASSEMBLY

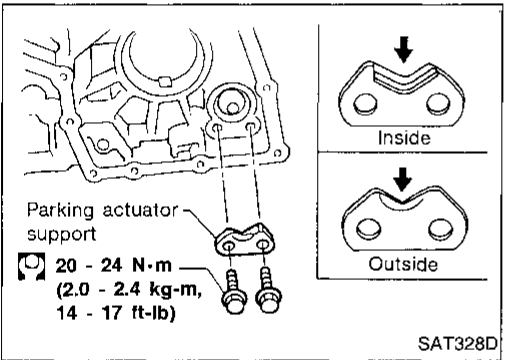
## Assembly 1

1. Install differential side oil seals on transmission case and converter housing, so that "A" and "B" are within specifications.

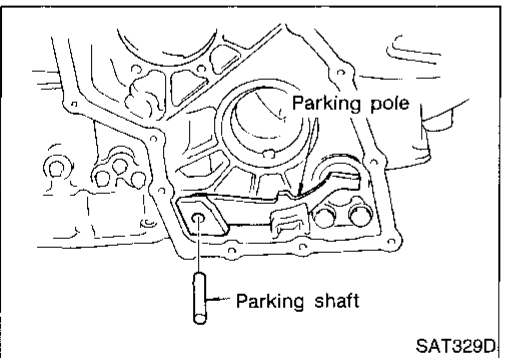


Unit: mm (in)

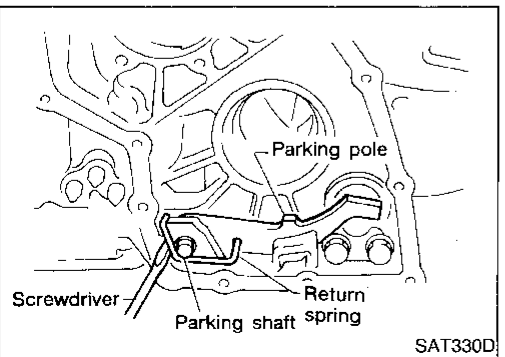
A	B
5.5 - 6.5 (0.217 - 0.256)	0.5 (0.020) or less



2. Install parking actuator support to transmission case.
  - Pay attention to direction of parking actuator support.



3. Install parking pawl on transmission case and fix it with parking shaft.

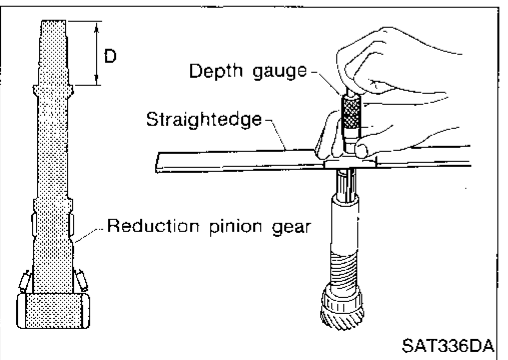
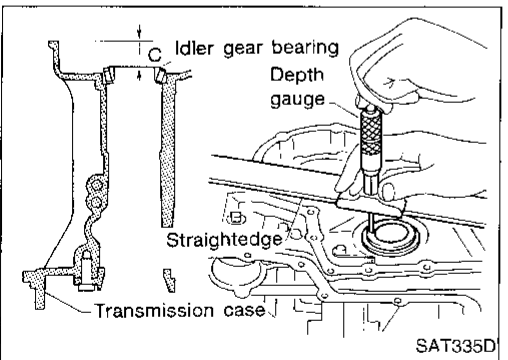
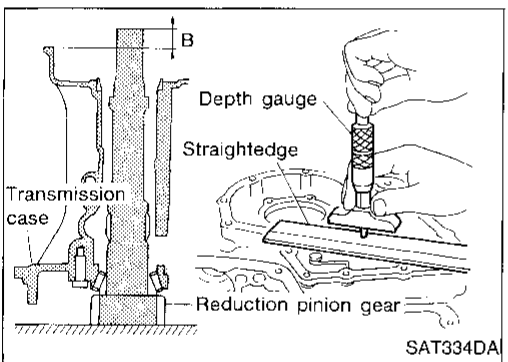
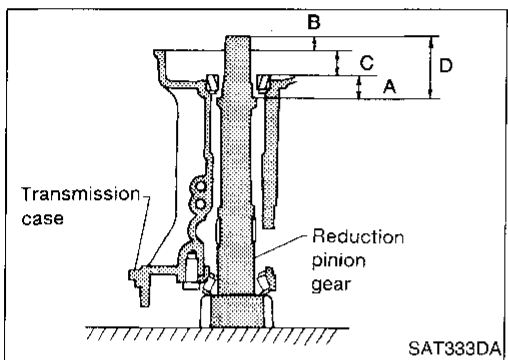
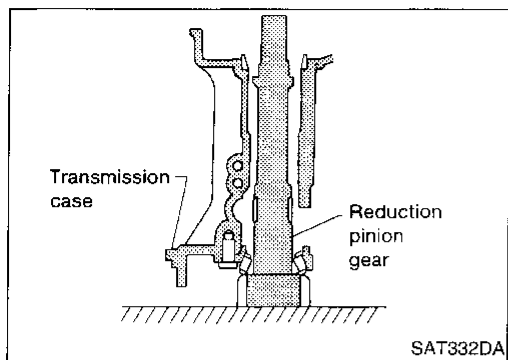


4. Install return spring.

# ASSEMBLY

## Assembly 1 (Cont'd)

### REDUCTION PINION GEAR BEARING PRELOAD



1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction pinion gear bearing adjusting shim using the following procedures.
  - a. Place reduction pinion gear on transmission case as shown.

- b. Place idler gear bearing on transmission case.
- c. Measure dimensions "B" "C" and "D" and calculate dimension "A".

$$A = D - (B + C)$$

"A": Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction pinion gear.

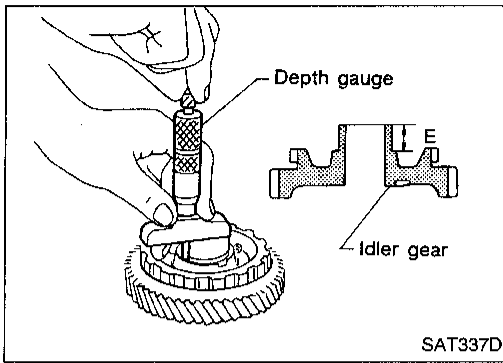
- Measure dimension "B" between the end of reduction pinion gear and the surface of transmission case.
- Measure dimension "B" in at least two places.

- Measure dimension "C" between the surface of idler gear bearing inner race and the surface of transmission case.
- Measure dimension "C" in at least two places.

- Measure dimension "D" between the end of reduction pinion gear and the adjusting shim mating surface of reduction pinion gear.
  - Measure dimension "D" in at least two places.
  - Calculate dimension "A"
- $$A = D - (B + C)$$

# ASSEMBLY

## Assembly 1 (Cont'd)



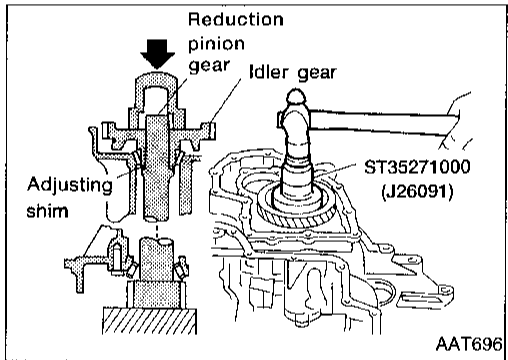
- d. Measure dimension "E" between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
  - Measure dimension "E" in at least two places.

- e. Calculate "T" and select proper thickness of reduction pinion gear bearing adjusting shim using SDS table as a guide.

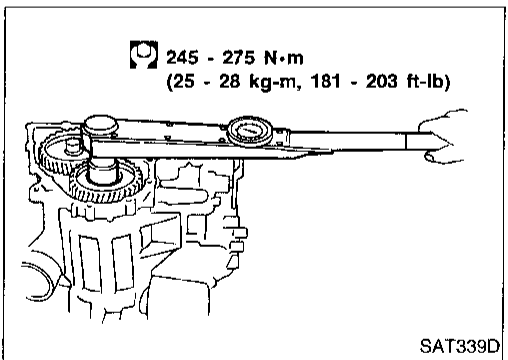
$$T = A - E$$

Reduction pinion gear bearing adjusting shim:

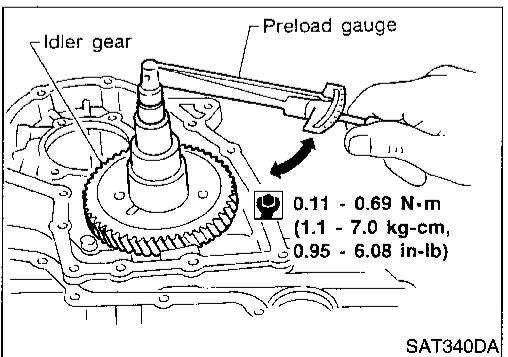
Refer to SDS, AT-169.



3. Install reduction pinion gear and reduction pinion gear bearing adjusting shim selected in step 2-e on transmission case.
4. Press idler gear bearing inner race on idler gear.
5. Press idler gear on reduction pinion gear.
  - Press idler gear so that idler gear can be locked by parking pawl.



6. Tighten idler gear lock nut to the specified torque.
  - Lock idler gear with parking pawl when tightening lock nut.



7. Measure turning torque of reduction pinion gear.
  - When measuring turning torque, turn reduction pinion gear in both directions several times to seat bearing rollers correctly.

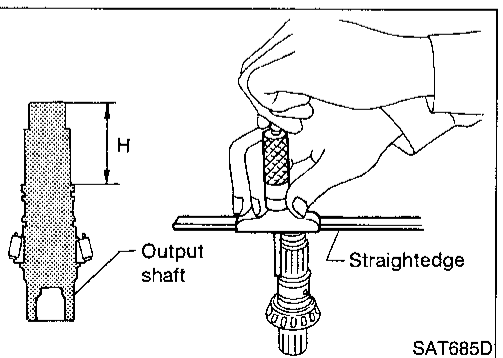
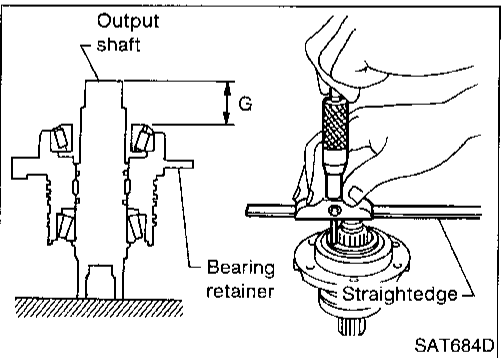
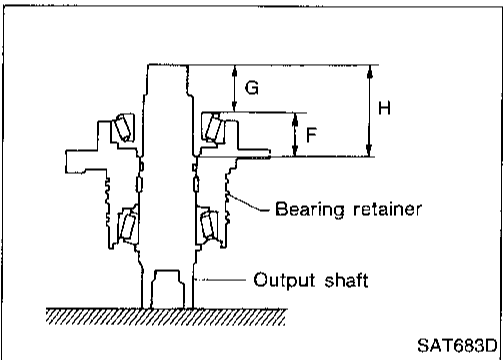
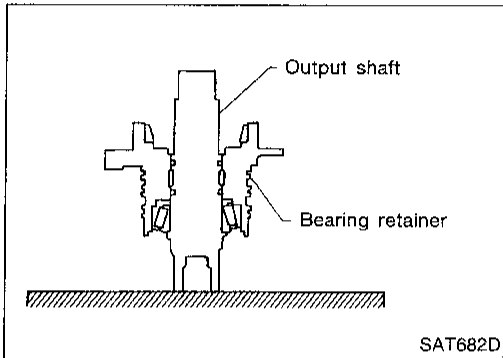
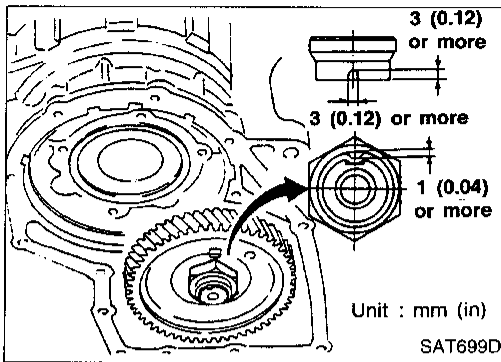
Turning torque of reduction pinion gear:

0.11 - 0.69 N·m (1.1 - 7.0 kg-cm, 0.95 - 6.08 in-lb)

# ASSEMBLY

## Assembly 1 (Cont'd)

8. After properly adjusting turning torque, clinch idler gear lock nut as shown (only RL4F03V).



### OUTPUT SHAFT BEARING PRELOAD

1. Select proper thickness of output shaft bearing adjusting spacer using the following procedures.
  - a. Remove paper rolled around output shaft.
  - b. Place bearing retainer on output shaft.

- c. Place output gear bearing inner race on bearing retainer.
- d. Measure dimensions "G" and "H" and calculate dimension "F".

**"F": Distance between the surface of output gear bearing inner race and adjusting shim mating surface of output shaft.**

$$F = H - G$$

- Measure dimension "G" between end of output shaft and surface of output gear bearing inner race.
- **Measure in at least two places.**

- Measure dimension "H" between end of output shaft and adjusting spacer mating surface of output shaft.
- **Measure in at least two places.**
- Calculate dimension "F".

$$F = H - G$$

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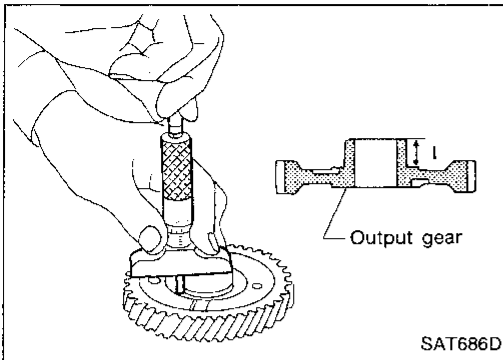
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## ASSEMBLY

### Assembly 1 (Cont'd)



- e. Measure distance "I" between end of output gear (adjusting spacer mating surface) and bearing inner race fitting surface.

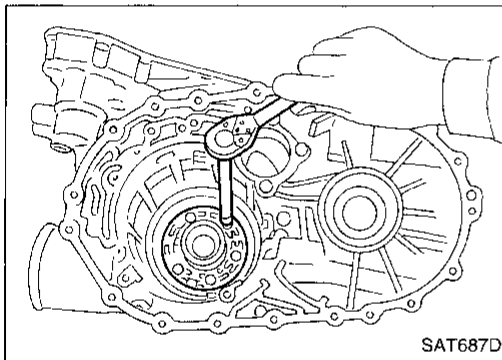
- f. Calculate dimension " $T_2$ ".

**" $T_2$ ": Distance between adjusting spacer mating surface of output gear and output shaft**

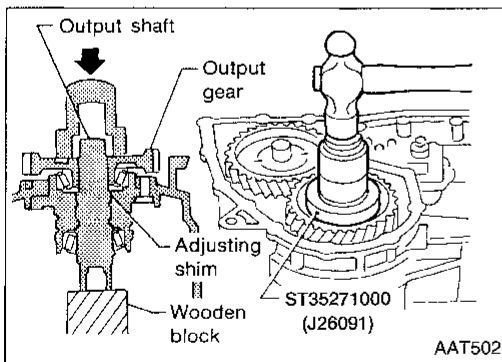
$$T_2 = F - I$$

- g. Select proper thickness of output shaft bearing adjusting spacer using SDS table as a guide.

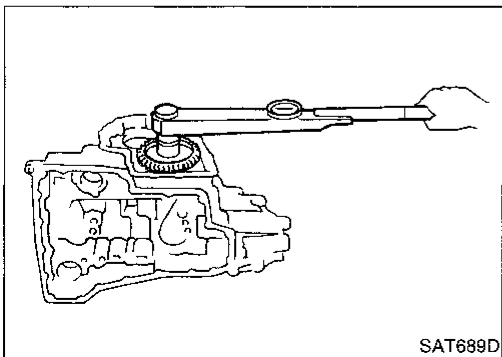
**Output shaft bearing adjusting spacer:  
Refer to SDS, AT-170.**



2. Install bearing retainer on transmission case.



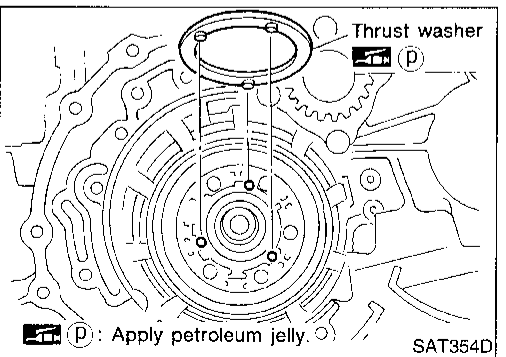
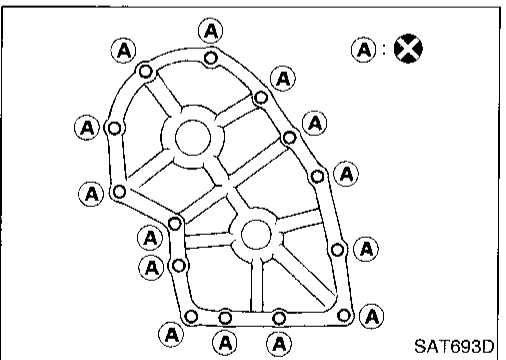
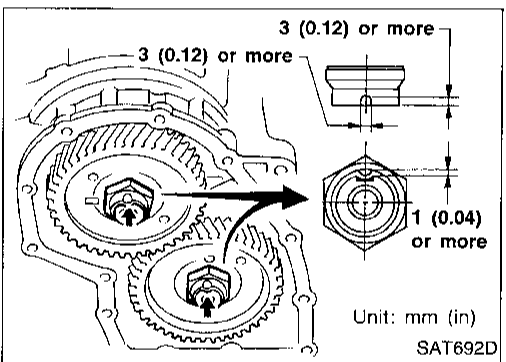
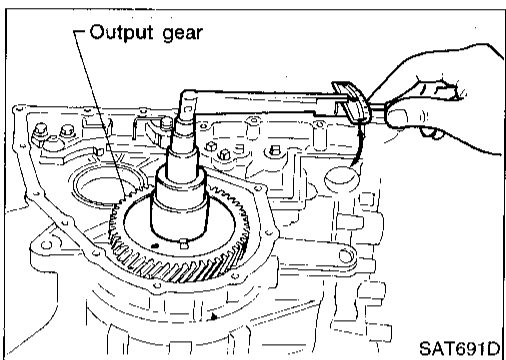
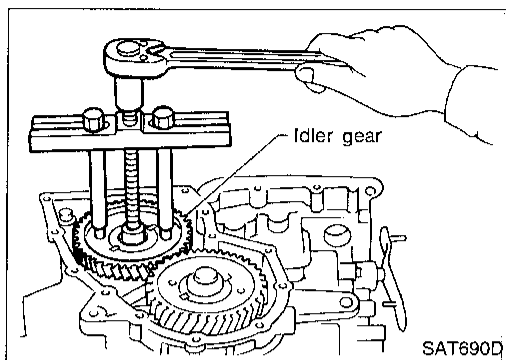
3. Place output shaft on bearing retainer.  
4. Place output shaft bearing adjusting spacer selected in step 1-g on output shaft.  
5. Press output gear bearing inner race on output gear.  
6. Press output gear on output shaft.



7. Tighten output gear lock nut to specified torque.

# ASSEMBLY

## Assembly 1 (Cont'd)



8. Remove idler gear to measure output shaft preload.

9. Measure turning torque of output shaft.

- When measuring turning torque, turn output shaft in both directions several times to seat bearing rollers correctly.

Turning torque of output shaft:

0.25 - 0.88 N·m

(2.5 - 9.0 kg-cm, 2.2 - 7.8 in-lb)

10. Install idler gear and tighten lock nut to specified torque.

11. After properly adjusting "turning" torque, clinch idler gear and output gear lock nuts as shown.

12. Install new gasket and side cover on transmission case.

## Assembly 2

1. Remove paper rolled around bearing retainer.
  2. Install thrust washer on bearing retainer.
- Apply petroleum jelly to thrust washer.

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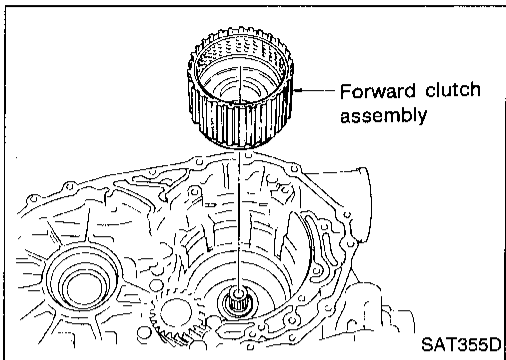
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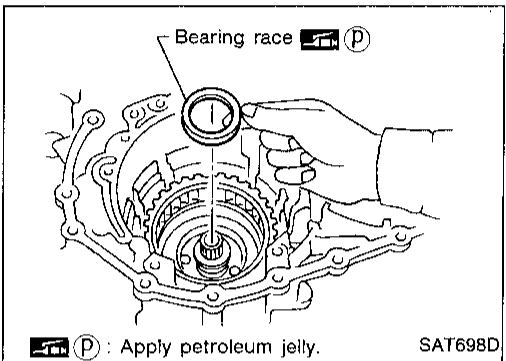
IDX

## ASSEMBLY

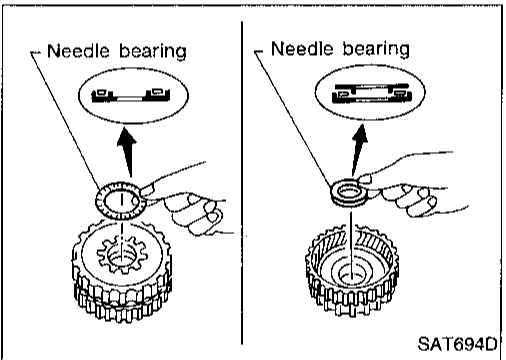
### Assembly 2 (Cont'd)



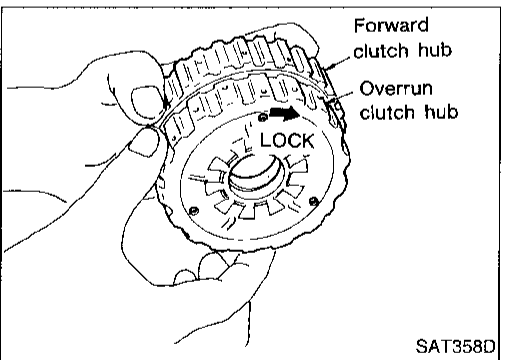
3. Install forward clutch assembly.
  - **Align teeth of low & reverse brake drive plates before installing.**
  - **Make sure that bearing retainer seal rings are not spread.**



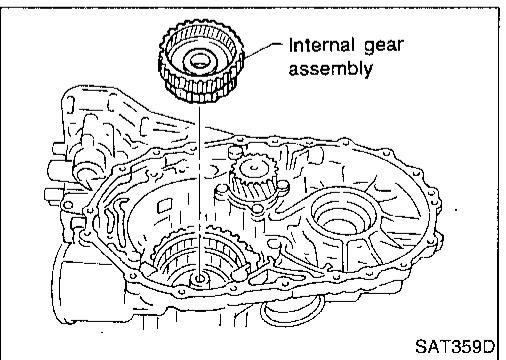
4. Install bearing race on bearing retainer.
  - **Apply petroleum jelly to bearing race.**



5. Install needle bearings on rear internal gear.
  - **Apply petroleum jelly to needle bearings.**
  - **Pay attention to direction of needle bearing.**



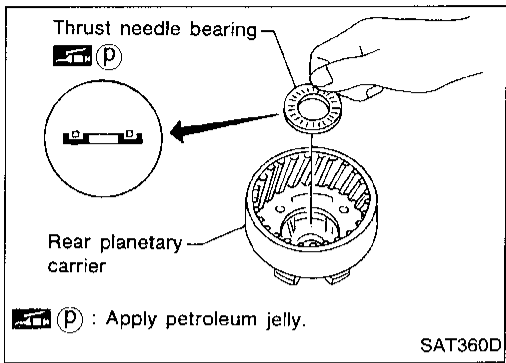
6. Hold forward clutch hub and turn overrun clutch hub.
  - Check overrun clutch hub for directions of lock and unlock.
  - If not as shown in illustration, check installed direction of forward one-way clutch.



7. Install rear internal gear assembly.
  - **Align teeth of forward clutch and overrun clutch drive plate.**

# ASSEMBLY

## Assembly 2 (Cont'd)



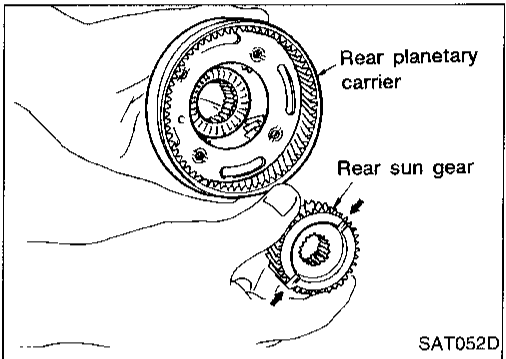
8. Install needle bearing on rear planetary carrier.
  - Apply petroleum jelly to needle bearing.
  - Pay attention to direction of needle bearing.

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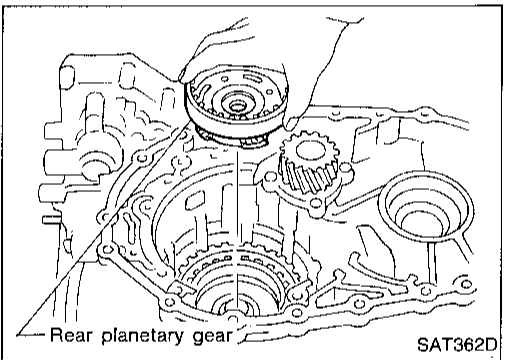


9. Install rear sun gear on rear planetary carrier.
  - Pay attention to direction of rear sun gear.

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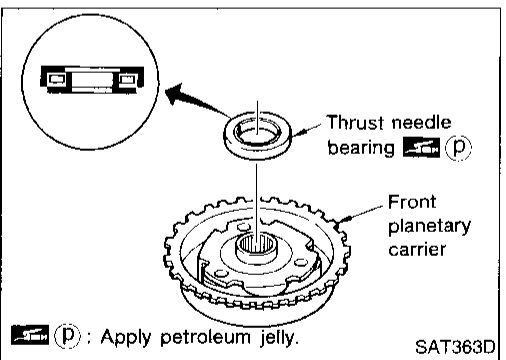
10. Install rear planetary carrier on transmission case.

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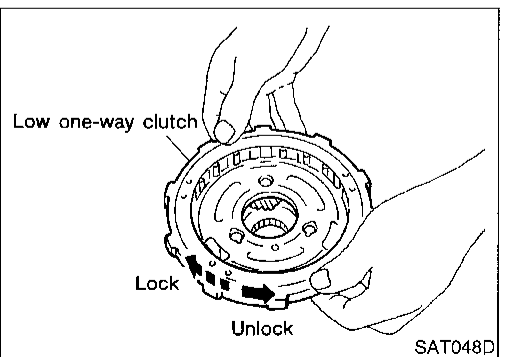


11. Install thrust needle bearing on front planetary carrier.
  - Apply petroleum jelly to thrust needle bearing.
  - Pay attention to direction of thrust needle bearing.

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12. Install low one-way clutch to front planetary carrier by turning it in the direction of the arrow as shown.
13. While holding front planetary carrier, turn low one-way clutch. Check low one-way clutch for correct directions of lock and unlock.

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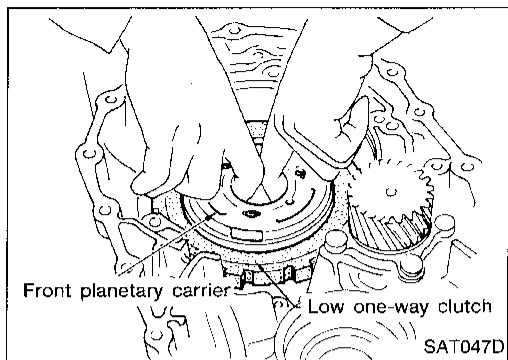
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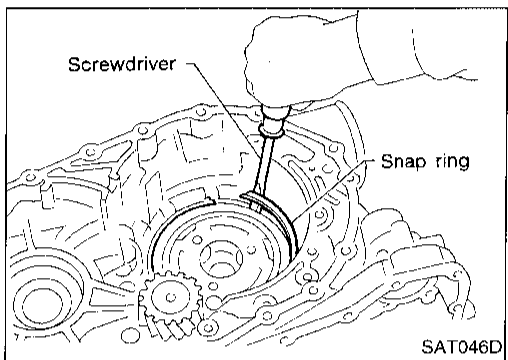
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## ASSEMBLY

### Assembly 2 (Cont'd)

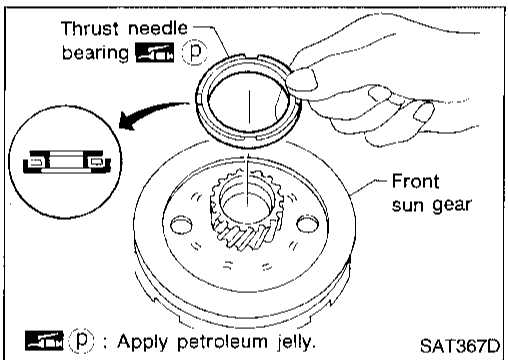


14. Install front planetary carrier assembly on transmission case.



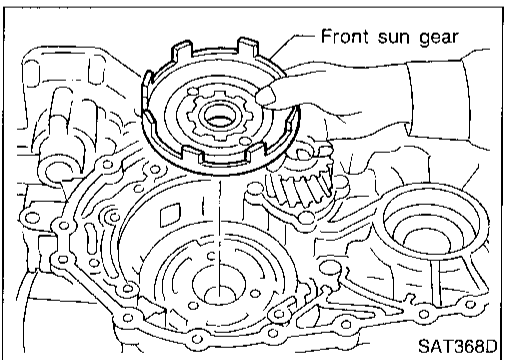
15. Install snap ring with screwdriver.

- **Forward clutch and bearings must be correctly installed for snap ring to fit groove of transmission case.**

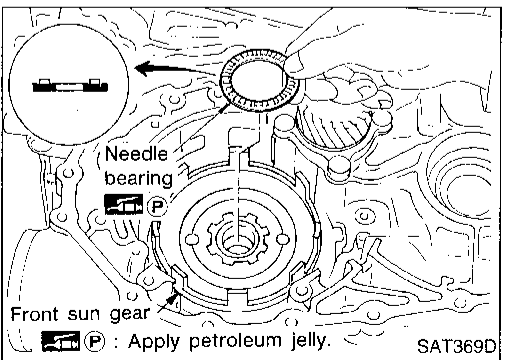


16. Install needle bearing on front sun gear.

- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**



17. Install front sun gear on front planetary carrier.

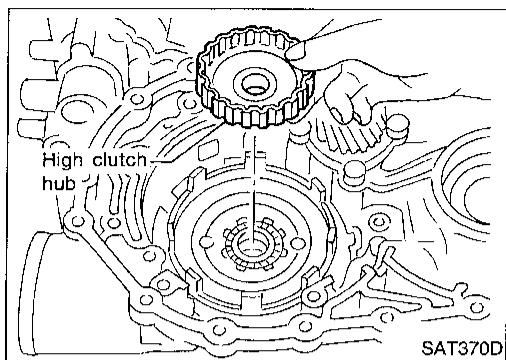


18. Install needle bearing on front sun gear.

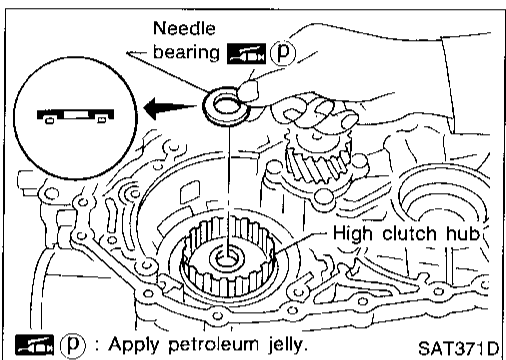
- **Apply petroleum jelly to needle bearing.**
- **Pay attention to direction of needle bearing.**

# ASSEMBLY

## Assembly 2 (Cont'd)

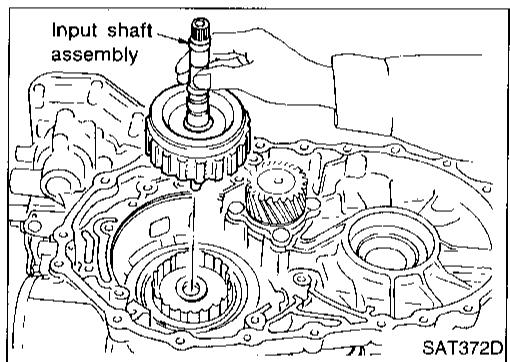


19. Install high clutch hub on front sun gear.



20. Install needle bearing on high clutch hub.

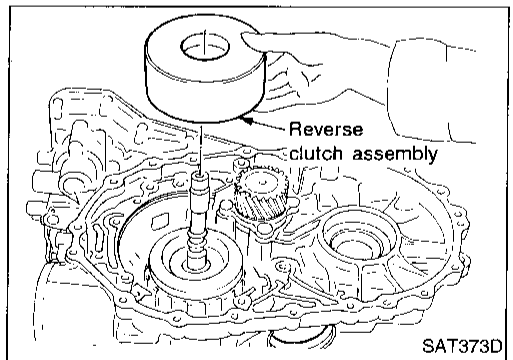
- Apply petroleum jelly to needle bearing.
- Pay attention to direction of needle bearing.



21. Remove paper rolled around input shaft.

22. Install input shaft assembly.

- Align teeth of high clutch drive plates before installing.



23. Install reverse clutch assembly.

- Align teeth of reverse clutch drive plates before installing.

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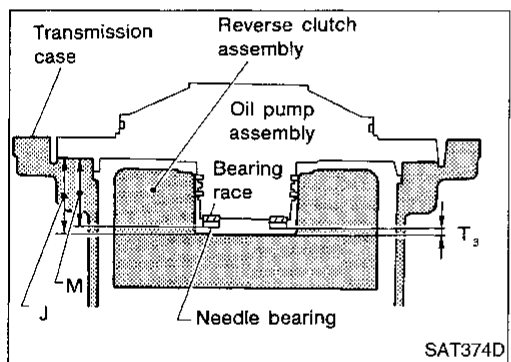
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## Adjustment 2

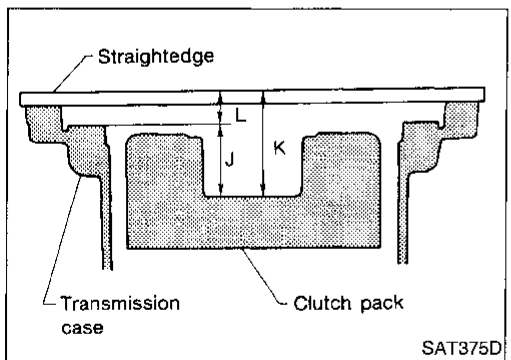
When any parts listed below are replaced, adjust total end play and reverse clutch end play.

Part name	Total end play	Reverse clutch end play
Transmission case	●	●
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	—	●

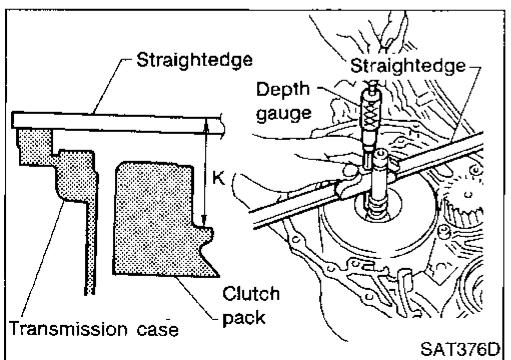


### TOTAL END PLAY

- Measure clearance between reverse clutch drum and needle bearing for oil pump cover.
- Select proper thickness of bearing race so that end play is within specifications.



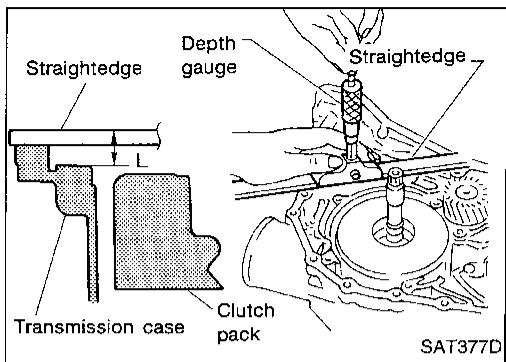
1. Measure dimensions "K" and "L" and then calculate dimension "J".



- a. Measure dimension "K".

# ASSEMBLY

## Adjustment 2 (Cont'd)



- b. Measure dimension "L".
- c. Calculate dimension "J".

"J": Distance between oil pump fitting surface of transmission case and needle bearing mating surface of high clutch drum.

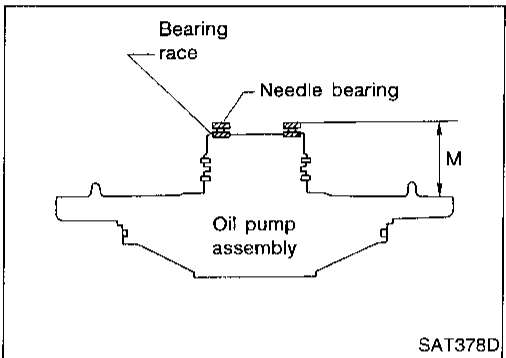
$$J = K - L$$

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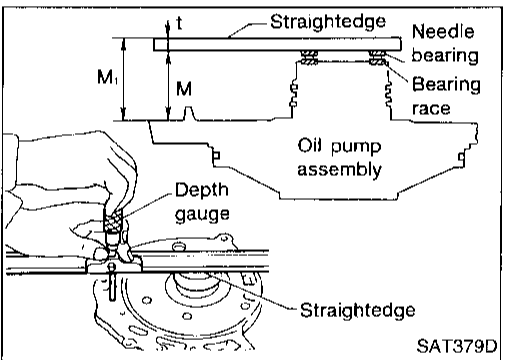


2. Measure dimension "M".
- a. Place bearing race and needle bearing on oil pump assembly.

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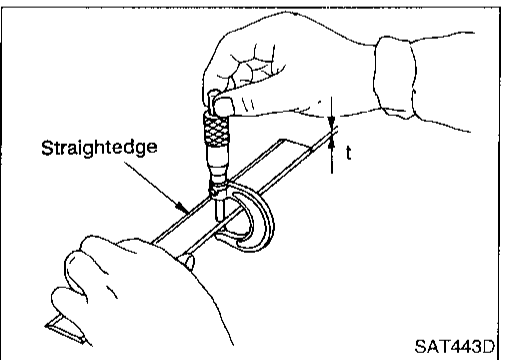
- b. Measure dimension "M".
- "M": Distance between transmission case fitting surface and needle bearing on oil pump cover.
- "M<sub>1</sub>": Indication of gauge.

MT

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- c. Measure thickness of straightedge "t".
- $$M = M_1 - t$$

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3. Adjust total end play "T<sub>3</sub>".

$$T_3 = J - M$$

Total end play "T<sub>3</sub>":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

- Select proper thickness of bearing race so that total end play is within specifications.

Bearing races: Refer to SDS, AT-171.

EL

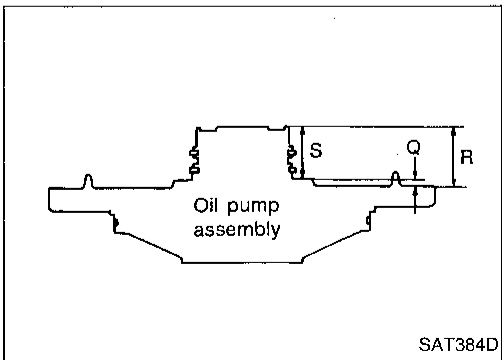
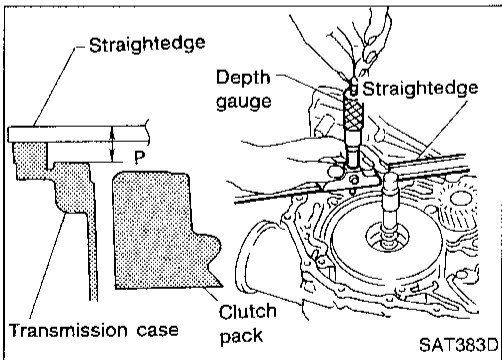
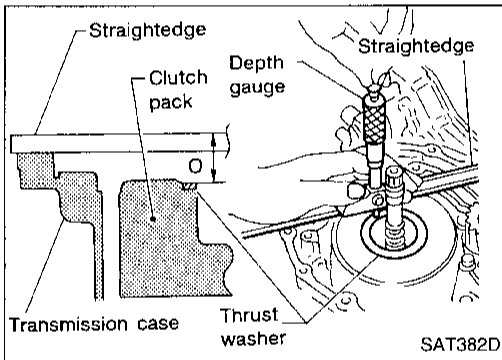
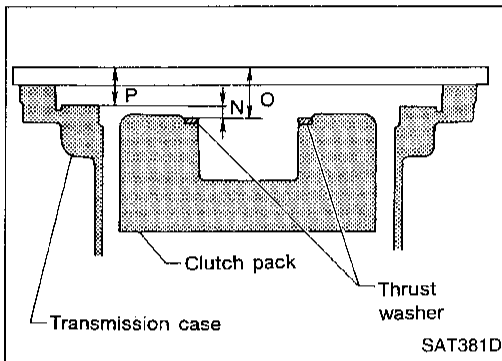
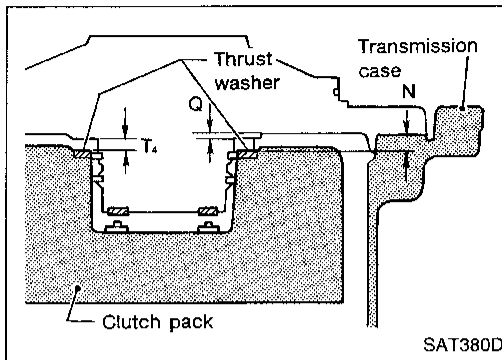
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# ASSEMBLY

## Adjustment 2 (Cont'd)

### REVERSE CLUTCH END PLAY



- Measure clearance between oil pump cover and thrust washer for reverse clutch drum.
- Select proper thickness of thrust washer so that end play is within specifications.

1. Measure dimensions "O" and "P" and then calculate dimension "N".

- Place thrust washer on reverse clutch drum.
- Measure dimension "O".

- Measure dimension "P".
- Calculate dimension "N".

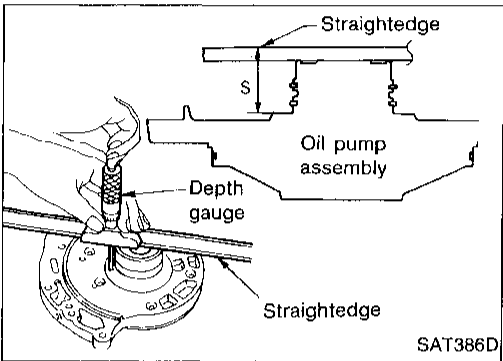
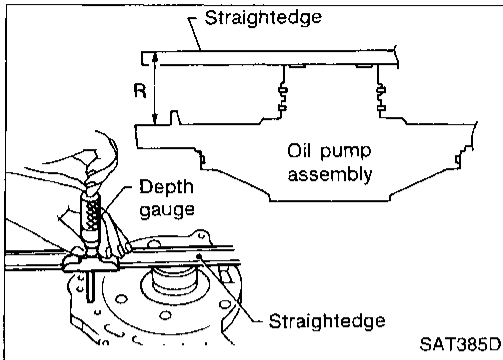
**"N": Distance between oil pump fitting surface of transmission case and thrust washer on reverse clutch drum.**

$$N = O - P$$

2. Measure dimensions "R" and "S" and then calculate dimension "Q".

# ASSEMBLY

## Adjustment 2 (Cont'd)



a. Measure dimension "R".

b. Measure dimension "S".

c. Calculate dimension "Q".

**"Q": Distance between transmission case fitting surface and thrust washer mating surface.**

$$Q = R - S$$

3. Adjust reverse clutch end play "T<sub>4</sub>".

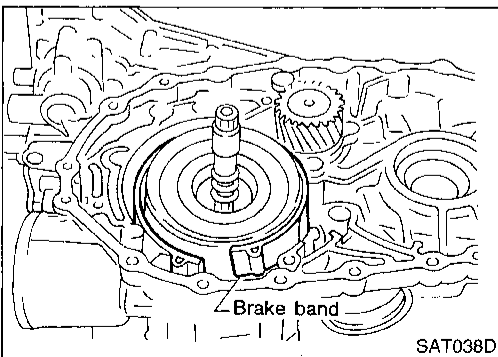
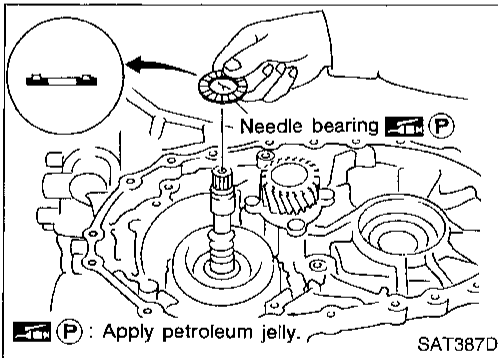
$$T_4 = N - Q$$

**Reverse clutch end play:**

**0.65 - 1.00 mm (0.0256 - 0.0394 in)**

- Select proper thickness of thrust washer so that reverse clutch end play is within specifications.

**Thrust washer: Refer to SDS, AT-171.**



## Assembly 3

1. Remove reverse clutch assembly and install needle bearing on high clutch assembly.

- **Pay attention to direction of needle bearing.**

2. Install reverse clutch assembly.

3. Install anchor end pin and lock nut on transmission case.

4. Place brake band on outside of reverse clutch drum. Tighten anchor end pin just enough so that brake band is evenly fitted on reverse clutch drum.

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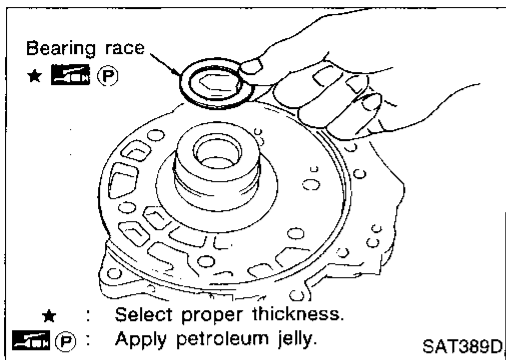
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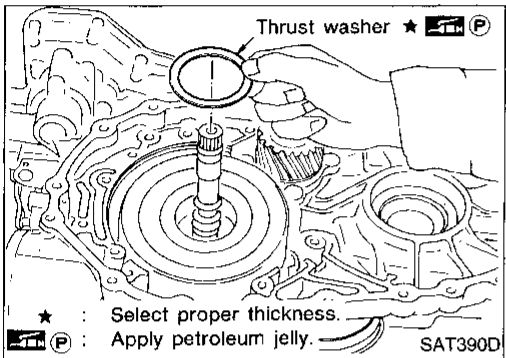
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## ASSEMBLY

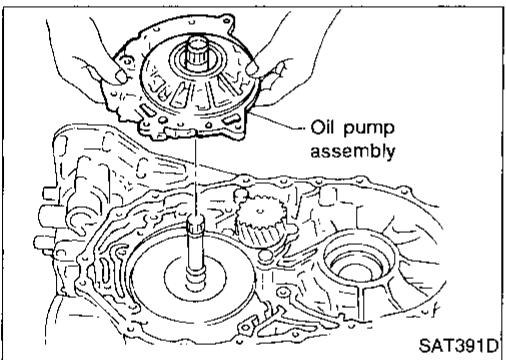
### Assembly 3 (Cont'd)



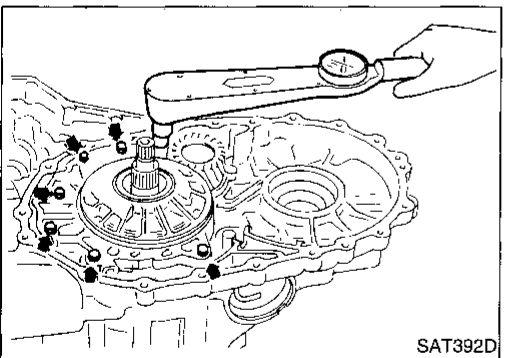
5. Place bearing race selected in total end play adjustment step on oil pump cover.
  - Apply petroleum jelly to bearing race.



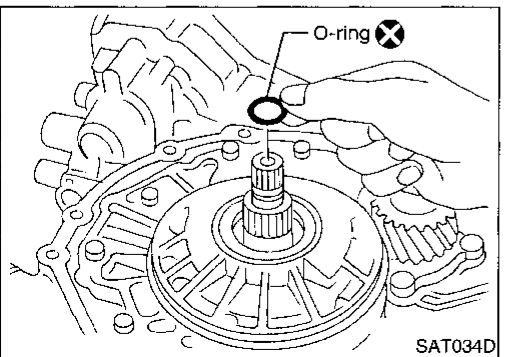
6. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.
  - Apply petroleum jelly to thrust washer.



7. Install oil pump assembly on transmission case.



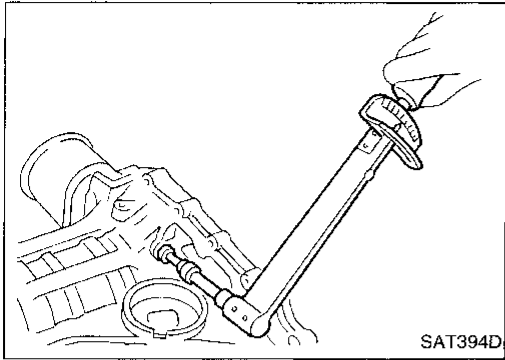
8. Tighten oil pump fixing bolts to specified torque. Refer to AT-62.



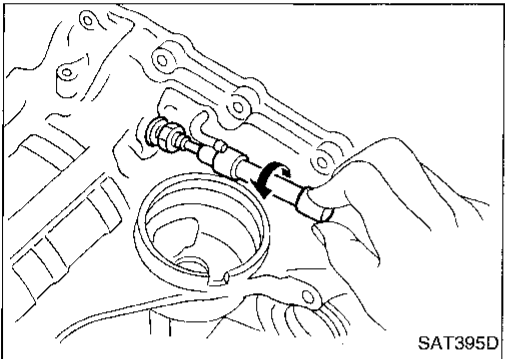
9. Install O-ring to input shaft.
  - Apply ATF to O-ring.

# ASSEMBLY

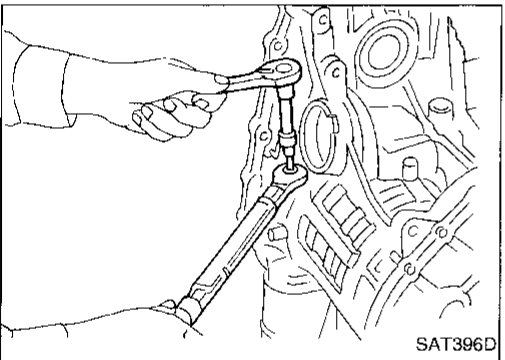
## Assembly 3 (Cont'd)



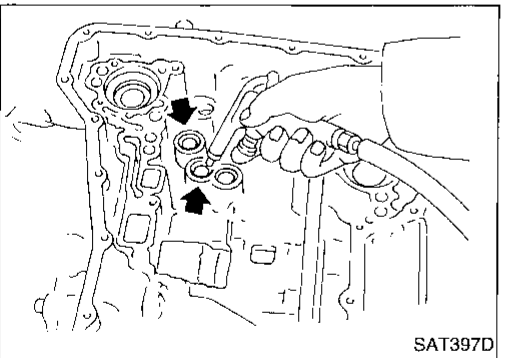
10. Adjust brake band.  
a. Tighten anchor end pin to specified torque.  
**Anchor end pin:**  
🔩 : 3.9 - 5.9 N·m (0.4 - 0.6 kg-m, 35 - 52 in-lb)



- b. Back off anchor end pin two and a half turns.



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



11. Apply compressed air to oil holes of transmission case and check operation of brake band.

## Adjustment 3

### FINAL DRIVE END PLAY

- Measure clearance between differential side bearing and transmission case.
- Select proper thickness of adjusting shim so that end play is within specifications.

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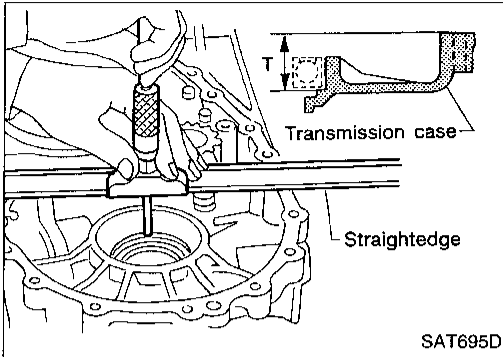
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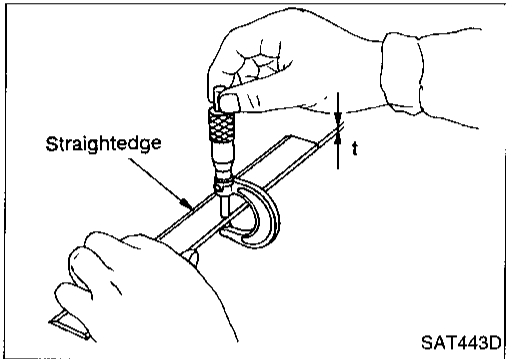
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## ASSEMBLY

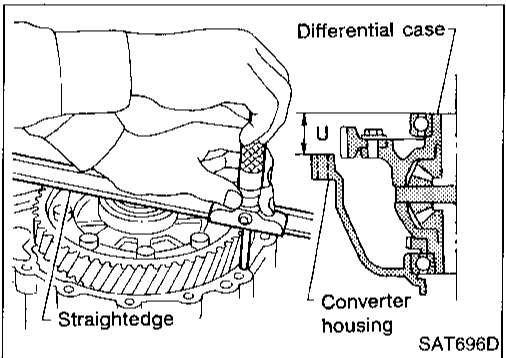
### Adjustment 3 (Cont'd)



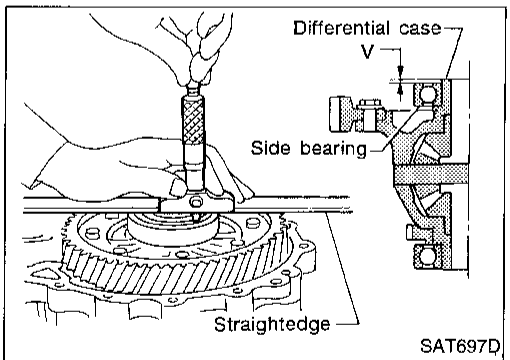
1. Measure dimension "T" between side bearing fitting surface of transmission case and converter housing fitting surface of transmission case.  
"T<sub>1</sub>": indication of gauge



2. Measure thickness of straightedge "t".  
 $T = T_1 - t$



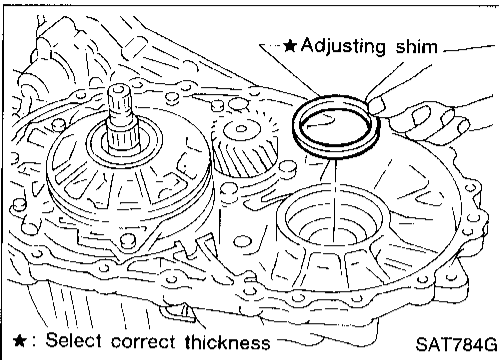
3. Place final drive assembly on converter housing.
4. Measure dimension "U" between end of differential case and transmission case fitting surface of converter housing.



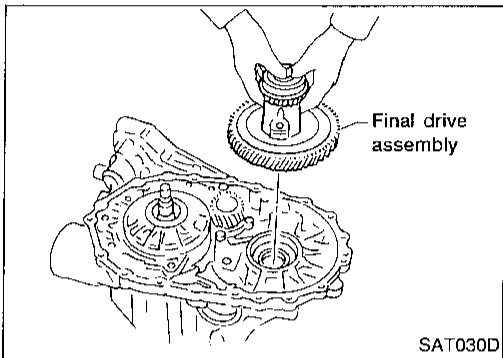
5. Measure dimension "V" between end of differential case and adjusting shim mating surface of differential side bearing.
6. Calculate final drive end play.  
**Final drive end play:**  
 $T - U + V$
7. Select proper thickness of differential side bearing adjusting shim so that final drive end play is within specifications.  
**Final drive end play:**  
0 - 0.15 mm (0 - 0.0059 in)  
**Differential side bearing adjusting shim:**  
Refer to SDS, AT-168.

## Assembly 4

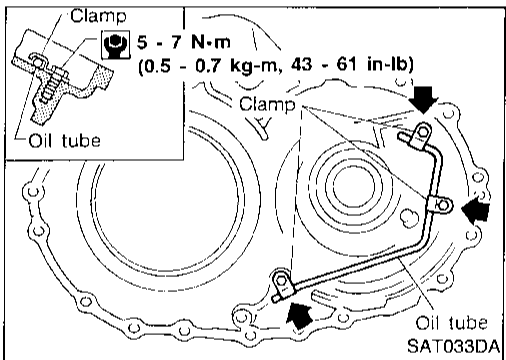
1. Install differential side bearing adjusting shim selected in final drive end play adjustment step on transmission case.



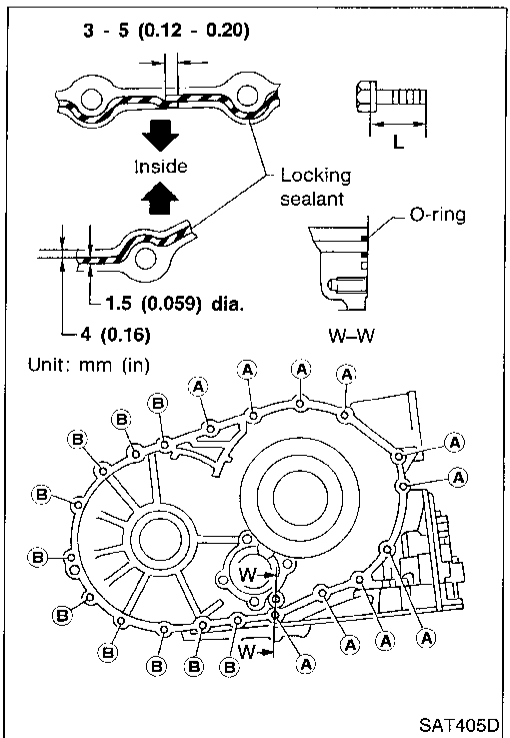
2. Install final drive assembly on transmission case.



3. Install oil tube on converter housing.



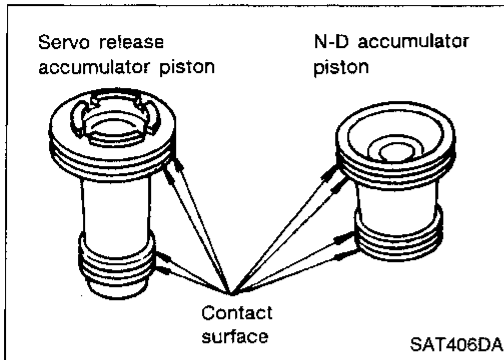
4. Install O-ring on differential oil port of transmission case.
  5. Install converter housing on transmission case.
- Apply locking sealant to mating surface of converter housing.



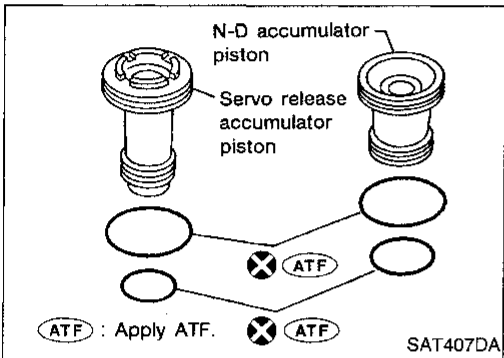
Bolt	Length mm (in)
(A)	32.8 (1.291)
(B)	40 (1.57)

# ASSEMBLY

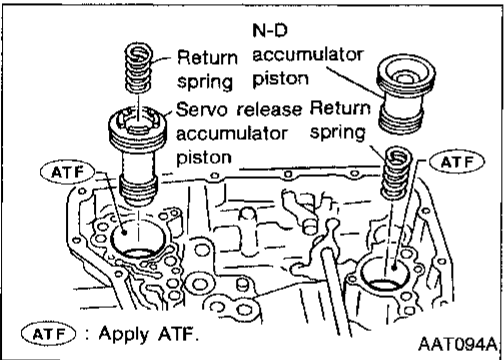
## Assembly 4 (Cont'd)



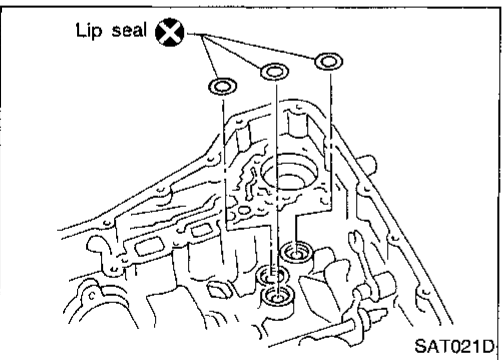
6. Install accumulator piston.
  - a. Check contact surface of accumulator piston for damage.



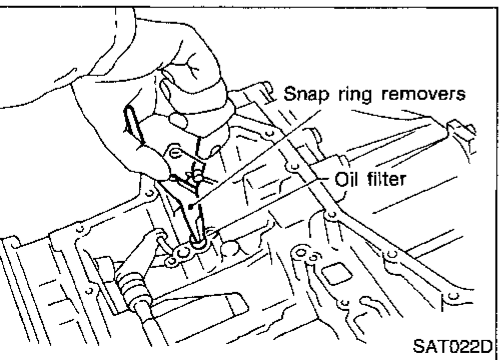
- b. Install O-rings on accumulator piston.
      - Apply ATF to O-rings.
- Accumulator piston O-rings:**  
Refer to SDS, AT-171.



- c. Install accumulator pistons and return springs on transmission case.
      - **Apply ATF to inner surface of transmission case.**
- Return springs:**  
Refer to SDS, AT-171.



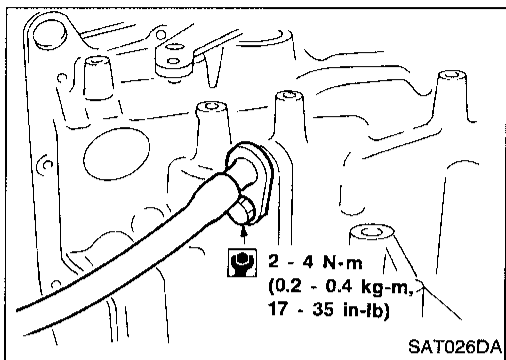
7. Install lip seals for band servo oil holes on transmission case.
    - **Apply petroleum jelly to lip seals.**



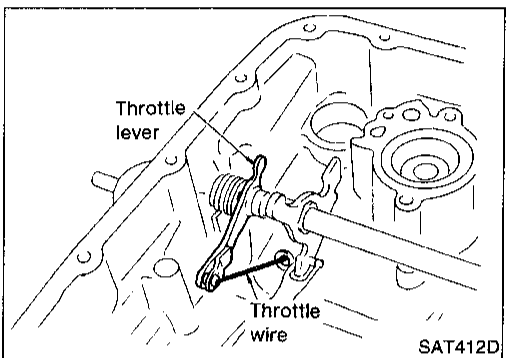
8. Install oil filter for governor valve.
    - **Take care with its direction.**

# ASSEMBLY

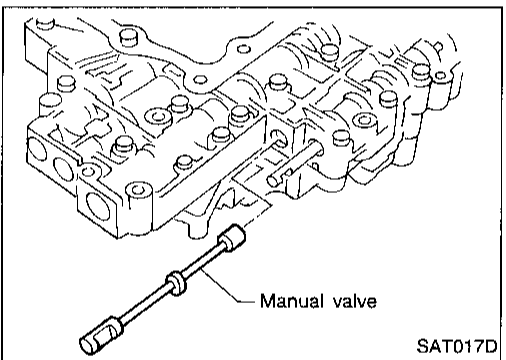
## Assembly 4 (Cont'd)



9. Install throttle wire to transmission case.



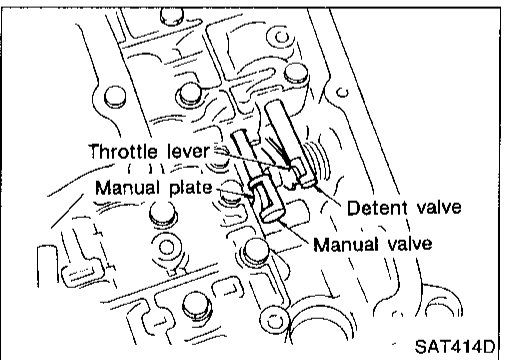
10. Install throttle wire to throttle lever.



11. Install control valve assembly.

a. Insert manual valve into control valve assembly.

- Apply ATF to manual valve.



b. Set manual shaft in Neutral position.

c. Install control valve assembly on transmission case while aligning manual valve with manual plate and detent valve with throttle lever.

d. Pass solenoid harness through transmission case and install terminal body on transmission case by pushing it.

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# ASSEMBLY

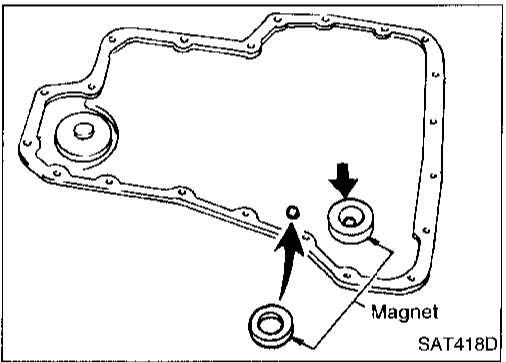
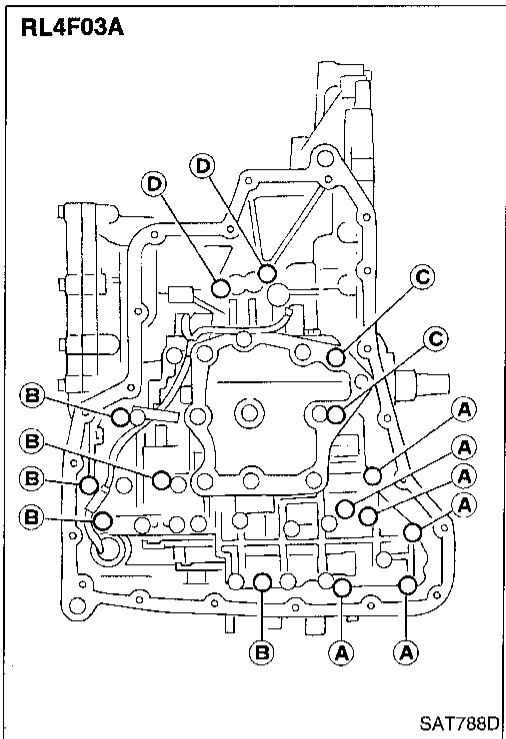
## Assembly 4 (Cont'd)

e. Tighten bolts (A), (B), (C) and (D).

 : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

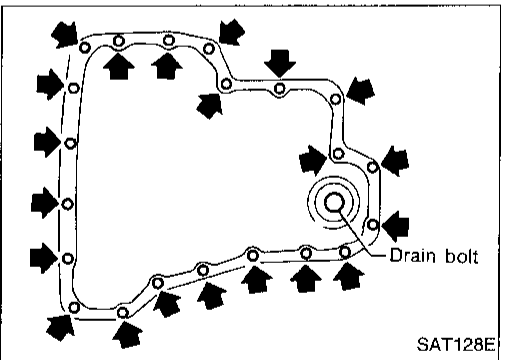
**Bolt length, number and location:**

Bolt symbol	(A)	(B)	(C)	(D)
Bolt length "ℓ"  mm (in)	33.0 (1.299)	40.0 (1.575)	43.5 (1.713)	25.0 (0.984)
Number of bolts	6	5	2	2



12. Install oil pan.

a. Attach magnet to oil pan.



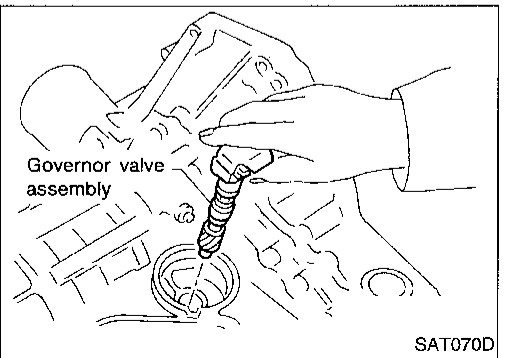
b. Install new oil pan gasket on transmission case.

c. Install oil pan on transmission case.

• **Always replace oil pan bolts as they are self-sealing bolts.**

• **Tighten the four bolts in a criss-cross pattern to prevent dislocation of gasket.**

d. Tighten drain plug to specified torque.

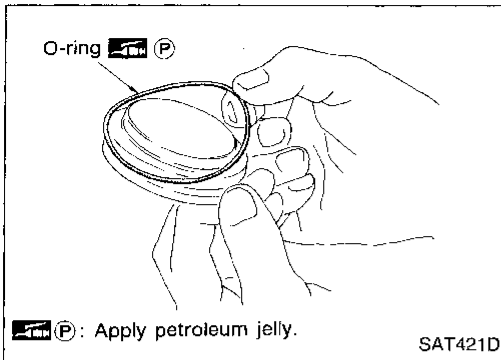


13. Install governor valve.

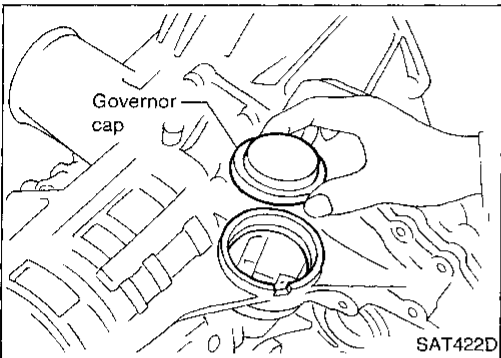
a. Install governor valve assembly into transmission case.

# ASSEMBLY

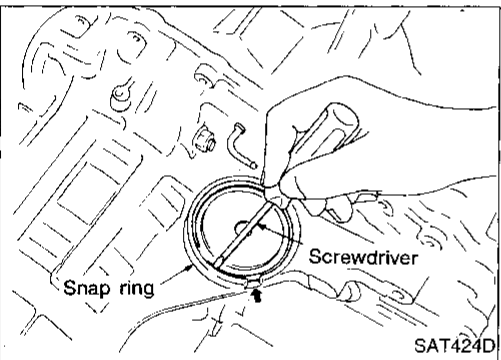
## Assembly 4 (Cont'd)



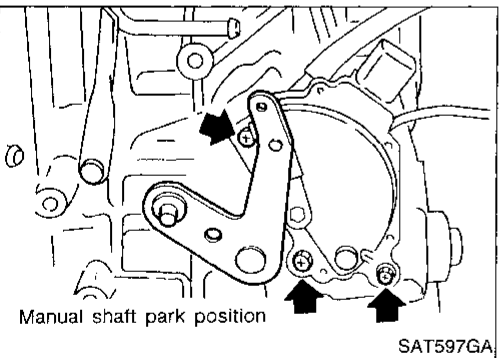
- b. Install O-ring to governor cap.
- Apply ATF to O-ring.



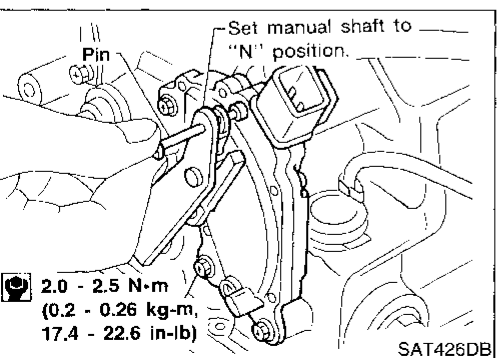
- c. Install governor cap onto transmission case.



- d. Install snap ring onto transmission case with a screwdriver.
- Align snap ring gap with the notch of transmission case.



14. Install inhibitor switch.
- Set manual shaft in "P" position.
  - Temporarily install inhibitor switch on manual shaft.
  - Move selector lever to "N" position.



- Use a 4 mm (0.157 in) pin for this adjustment.
  - 1) Insert the pin straight into the manual shaft adjustment hole.
  - 2) Rotate inhibitor switch until the pin can also be inserted straight into hole in inhibitor switch.
- e. Tighten inhibitor switch fixing bolts.
- f. Remove pin from adjustment hole after adjusting inhibitor switch.

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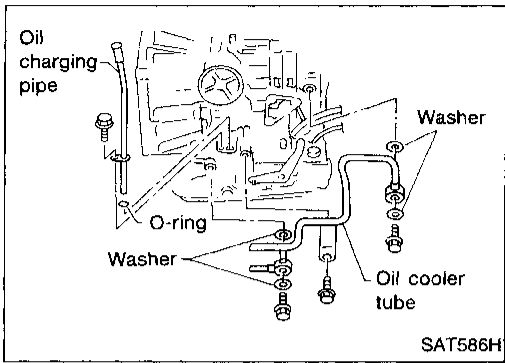
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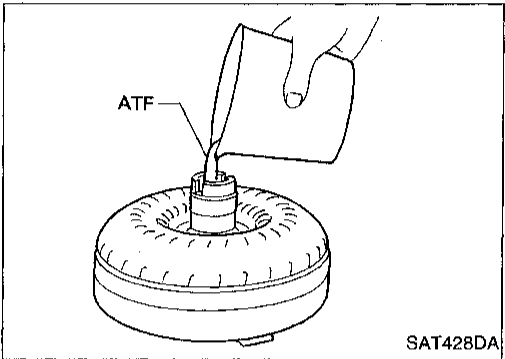
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## ASSEMBLY

### Assembly 4 (Cont'd)



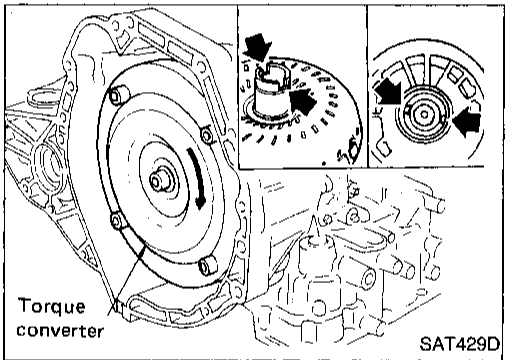
15. Install oil charging pipe and oil cooler tube to transmission case.



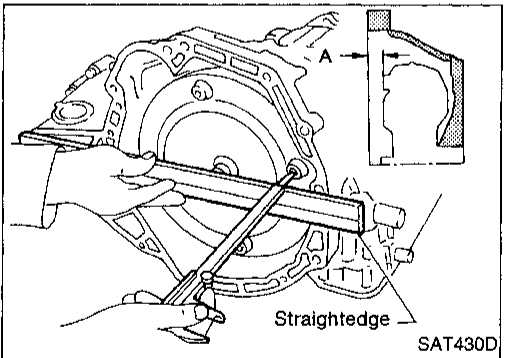
16. Install torque converter.

- a. Pour ATF into torque converter.

- **Approximately 1 liter (1 - 1/8 US qt, 7/8 Imp qt) of fluid is 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 of torque converter with notches of oil pump.



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

**Distance "A":**

**21.1 mm (0.831 in) or more**

# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

Engine	GA16DE	
Automatic transaxle model	RL4F03A	GI
Automatic transaxle assembly		
Model code number	35X61	MA
Transaxle gear ratio		
1st	2.861	EM
2nd	1.562	
3rd	1.000	LC
4th	0.697	
Reverse	2.310	EC
Final drive	3.827	
Recommended fluid	Nissan Matic "D" (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)*1	
Fluid capacity	ℓ (US qt, Imp qt)	FE
	7.0 (7-3/8, 6-1/8)	

\*1: Refer to MA section ("Fluids and Lubricants", "RECOMMENDED FLUIDS AND LUBRICANTS").

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# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments

### 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	51 - 59 (32 - 37)	97 - 105 (60 - 65)	—	142 - 150 (88 - 93)	88 - 96 (55 - 60)	39 - 47 (24 - 29)	48 - 56 (30 - 35)
Half throttle	29 - 37 (18 - 23)	52 - 60 (32 - 37)	101 - 109 (63 - 68)	67 - 75 (42 - 47)	41 - 49 (25 - 30)	8 - 16 (5 - 10)	48 - 56 (30 - 35)

### VEHICLE SPEED WHEN PERFORMING LOCK-UP

Throttle opening	OD switch	Vehicle speed km/h (MPH)	
		Lock-up ON	Lock-up OFF
2/8	ON (D <sub>4</sub> )	106 - 114 (66 - 71)	68 - 76 (42 - 47)
	OFF (D <sub>3</sub> )	106 - 114 (66 - 71)	68 - 76 (42 - 47)

### STALL REVOLUTION

Stall revolution rpm	2,450 - 2,750
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### THROTTLE WIRE ADJUSTMENT

Throttle wire stroke mm (in)	40 - 42 (1.57 - 1.65)
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### LINE PRESSURE

Engine speed rpm	Line pressure kPa (kg/cm <sup>2</sup> , psi)			
	R position	D position	2 position	1 position
Idle	883 (9.0, 128)	637 (6.5, 92)	1,147 (11.7, 166)	1,147 (11.7, 166)
Stall	1,765 (18.0, 256)	1,275 (13.0, 185)	1,275 (13.0, 185)	1,275 (13.0, 185)

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

### CONTROL VALVES

#### Control valve return springs

Unit: mm (in)

Parts		Part No.	Free length	Outer diameter	
Upper body	①	Pressure modifier valve spring	31742-31X64	25.0 (0.984)	7.9 (0.311)
	②	Kickdown modulator valve spring	31742-31X03	40.5 (1.594)	9.0 (0.354)
	③	1-2 accumulator valve spring	31742-31X04	51.14 (2.0134)	17.0 (0.669)
	④	3-2 timing valve spring	31736-21X00	26.3 (1.035)	7.2 (0.283)
	⑤	1st reducing valve spring	31835-21X08	22.6 (0.890)	7.3 (0.287)
	⑥	Torque converter relief valve spring	31742-31X06	23.5 (0.925)	7.4 (0.291)
	⑦	Throttle modulator valve spring	31742-31X18	29.5 (1.161)	5.5 (0.217)
	⑧	4th speed cut valve spring	31756-24X00	30.0 (1.181)	7.0 (0.276)
	⑨	Torque converter clutch control valve spring	31742-31X08	39.5 (1.555)	5.0 (0.197)
	—	Oil cooler relief valve spring	31872-31X00	17.02 (0.6701)	8.0 (0.315)
Lower body	①	Throttle valve and detent valve spring	31802-31X07	33.0 (1.299)	10.0 (0.394)
	②	Pressure regulator valve spring	31742-31X00	52.24 (2.0567)	15.0 (0.591)
	③	3-4 shift valve spring	31762-31X13	52.0 (2.047)	7.45 (0.2933)
	④	2-3 shift valve spring	31762-31X01	52.7 (2.075)	7.0 (0.276)
	⑤	1-2 shift valve spring	31762-31X02	45.9 (1.807)	5.3 (0.209)
	⑥	Overrun clutch control valve spring	31742-31X60	48.9 (1.925)	7.0 (0.276)

GI  
MA  
EM  
LC  
EC  
FE  
CL  
MT  
**AT**  
FA  
RA  
BR  
ST  
RS  
BT  
HA  
EL  
IDX

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

### CLUTCHES AND BRAKES

Reverse clutch		
Number of drive plates	2	
Number of driven plates	2	
Drive plate thickness mm (in)		
Standard	2.0 (0.079)	
Allowable 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 plates	Thickness mm (in)	Part number
	4.4 (0.173)	31537-31X00
	4.6 (0.181)	31537-31X01
	4.8 (0.189)	31537-31X02
	5.0 (0.197)	31537-31X03
	5.2 (0.205)	31537-31X04

High clutch		
Number of drive plates	3	
Number of driven plates	5	
Drive plate thickness mm (in)		
Standard	2.0 (0.079)	
Allowable limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.4 - 1.8 (0.055 - 0.071)	
Allowable limit	2.4 (0.094)	
Thickness of retaining plates	Thickness mm (in)	Part number
	3.8 (0.150)	31537-32X00
	4.0 (0.157)	31537-32X01
	4.2 (0.165)	31537-32X02
	4.4 (0.173)	31537-32X03
	4.6 (0.181)	31537-32X04
4.8 (0.189)	31537-32X05	

Forward clutch		
Number of drive plates	5	
Number of driven plates	5	
Drive plate thickness mm (in)		
Standard	1.8 (0.071)	
Allowable limit	1.6 (0.063)	
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
	3.6 (0.142)	31537-31X60
	3.8 (0.150)	31537-31X61
	4.0 (0.157)	31537-31X62
	4.2 (0.165)	31537-31X63
	4.4 (0.173)	31537-31X64
4.6 (0.181)	31537-31X65	

Overrun clutch		
Number of drive plates	3	
Number of driven plates	4	
Drive plate thickness mm (in)		
Standard	1.6 (0.063)	
Allowable limit	1.4 (0.055)	
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
	3.6 (0.142)	31567-31X79
	3.8 (0.150)	31567-31X80
	4.0 (0.157)	31567-31X81
	4.2 (0.165)	31567-31X82
	4.4 (0.173)	31567-31X83

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

Low & reverse brake	
Number of drive plates	5
Number of driven plates	5
Drive plate thickness mm (in)	
Standard	2.0 (0.079)
Allowable limit	1.8 (0.071)
Clearance mm (in)	
Standard	1.4 - 1.8 (0.055 - 0.071)
Allowable limit	2.8 (0.110)
Thickness of retaining plate	Thickness mm (in)    Part number
	3.6 (0.142)    31667-31X16
	3.8 (0.150)    31667-31X17
	4.0 (0.157)    31667-31X18
	4.2 (0.165)    31667-31X19
	4.4 (0.173)    31667-31X20
4.6 (0.181)    31667-31X21	
Brake band	
Anchor end pin tightening torque N-m (kg-m, in-lb)	3.9 - 5.9 (0.4 - 0.6, 35 - 52)
Number of returning revolutions for anchor end pin	2.5±0.125
Lock nut tightening torque N-m (kg-m, ft-lb)	31 - 36 (3.2 - 3.7, 23 - 27)

### Clutch and brake return springs

Unit: mm (in)

Parts		Free length	Outer diameter
Forward clutch (Over-run clutch) (16 pcs)	Outer	26.6 (1.047)	10.6 (0.417)
	Inner	26.3 (1.035)	7.7 (0.303)
Reverse clutch (16 pcs)		18.6 (0.732)	8.0 (0.315)
High clutch (12 pcs)		19.7 (0.776)	11.1 (0.437)
Low and reverse brake (20 pcs)		25.1 (0.988)	7.6 (0.299)

### OIL PUMP

Oil pump side clearance mm (in)	0.02 - 0.04 (0.0008 - 0.0016)		GI
Thickness of inner gears and outer gears	Inner gear		
	Thickness mm (in)	Part number	MA
	9.99 - 10.00 (0.3933 - 0.3937)	31346-31X00	
	9.98 - 9.99 (0.3929 - 0.3933)	31346-31X01	EM
	9.97 - 9.98 (0.3925 - 0.3929)	31346-31X02	LC
	Outer gear		
	Thickness mm (in)	Part number	EC
	9.99 - 10.00 (0.3933 - 0.3937)	31347-31X00	FE
	9.98 - 9.99 (0.3929 - 0.3933)	31347-31X01	CL
	9.97 - 9.98 (0.3925 - 0.3929)	31347-31X02	
Clearance between oil pump housing and outer gear mm (in)			MT
Standard	0.08 - 0.15 (0.0031 - 0.0059)		AT
Allowable limit	0.15 (0.0059)		
Oil pump cover seal ring clearance mm (in)			FA
Standard	0.1 - 0.25 (0.0039 - 0.0098)		RA
Allowable limit	0.25 (0.0098)		

### INPUT SHAFT

Input shaft seal ring clearance mm (in)			BR
Standard	0.08 - 0.23 (0.0031 - 0.0091)		ST
Allowable limit	0.23 (0.0091)		

### PLANETARY CARRIER

Clearance between planetary carrier and pinion washer mm (in)			RS
Standard	0.15 - 0.70 (0.0059 - 0.0276)		BT
Allowable limit	0.80 (0.0315)		

### FINAL DRIVE

#### Differential side gear clearance

Clearance between side gear and differential case with washer mm (in)	0.1 - 0.2 (0.004 - 0.008)		EL
			IDX



## SERVICE DATA AND SPECIFICATIONS (SDS)

### Specifications and Adjustments (Cont'd)

#### Differential side gear thrust washers

Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-D2111
0.80 - 0.85 (0.0315 - 0.0335)	38424-D2112
0.85 - 0.90 (0.0335 - 0.0354)	38424-D2113
0.90 - 0.95 (0.0354 - 0.0374)	38424-D2114
0.95 - 1.00 (0.0374 - 0.0394)	38424-D2115

#### Differential case end play

Differential case end play mm (in)	0 - 0.15 (0 - 0.0059)
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#### Differential side bearing adjusting shims

Thickness mm (in)	Part number
0.48 (0.0189)	38454-M8001
0.56 (0.0220)	38454-M8003
0.64 (0.0252)	38454-M8005
0.72 (0.0283)	38454-M8007
0.80 (0.0315)	38454-M8009
0.88 (0.0346)	38454-M8011
0.96 (0.0378)	38454-M8013
1.04 (0.0409)	38454-M8015

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

### REDUCTION PINION GEAR

#### Bearing preload

Reduction pinion gear bearing preload mm (in)	0.05 (0.0020)
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#### Turning torque

Turning torque of reduction pinion gear N·m (kg-cm, in-lb)	0.11 - 0.69 (1.1 - 7.0, 0.95 - 6.08)
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#### Reduction pinion gear bearing adjusting shims

Thickness mm (in)	Part number
1.74 (0.0685)	31438-31X16
1.78 (0.0701)	31438-31X17
1.82 (0.0717)	31438-31X18
1.86 (0.0732)	31438-31X19
1.90 (0.0748)	31438-31X20
1.92 (0.0756)	31439-31X60
1.94 (0.0764)	31438-31X21
1.96 (0.0772)	31439-31X61
1.98 (0.0780)	31438-31X22
2.00 (0.0787)	31439-31X62
2.02 (0.0795)	31438-31X23
2.04 (0.0803)	31439-31X63
2.06 (0.0811)	31438-31X24
2.08 (0.0819)	31439-31X64
2.10 (0.0827)	31438-31X60
2.12 (0.0835)	31439-31X65
2.14 (0.0843)	31438-31X61
2.16 (0.0850)	31439-31X66
2.18 (0.0858)	31438-31X62
2.20 (0.0866)	31439-31X67
2.22 (0.0874)	31438-31X63
2.24 (0.0882)	31439-31X68
2.26 (0.0890)	31438-31X64
2.28 (0.0898)	31439-31X69
2.30 (0.0906)	31438-31X65
2.34 (0.0921)	31438-31X66
2.38 (0.0937)	31438-31X67
2.42 (0.0953)	31438-31X68
2.46 (0.0969)	31438-31X69
2.50 (0.0984)	31438-31X70
2.54 (0.1000)	31438-31X71
2.58 (0.1016)	31438-31X72
2.62 (0.1031)	31438-31X73
2.66 (0.1047)	31438-31X74

### Table for selecting reduction pinion gear bearing adjusting shim

Unit: mm (in)		GI
Dimension "T"	Suitable shim(s)	
1.77 - 1.81 (0.0697 - 0.0713)	1.74 (0.0685)	
1.81 - 1.85 (0.0713 - 0.0728)	1.78 (0.0701)	MA
1.85 - 1.89 (0.0728 - 0.0744)	1.82 (0.0717)	
1.89 - 1.93 (0.0744 - 0.0760)	1.86 (0.0732)	EM
1.93 - 1.96 (0.0760 - 0.0772)	1.90 (0.0748)	
1.96 - 1.98 (0.0772 - 0.0780)	1.92 (0.0756)	
1.98 - 2.00 (0.0780 - 0.0787)	1.94 (0.0764)	LC
2.00 - 2.02 (0.0787 - 0.0795)	1.96 (0.0772)	
2.02 - 2.04 (0.0795 - 0.0803)	1.98 (0.0780)	
2.04 - 2.06 (0.0803 - 0.0811)	2.00 (0.0787)	EC
2.06 - 2.08 (0.0811 - 0.0819)	2.02 (0.0795)	
2.08 - 2.10 (0.0819 - 0.0827)	2.04 (0.0803)	FE
2.10 - 2.12 (0.0827 - 0.0835)	2.06 (0.0811)	
2.12 - 2.14 (0.0835 - 0.0843)	2.08 (0.0819)	
2.14 - 2.16 (0.0843 - 0.0850)	2.10 (0.0827)	CL
2.16 - 2.18 (0.0850 - 0.0858)	2.12 (0.0835)	
2.18 - 2.20 (0.0858 - 0.0866)	2.14 (0.0843)	
2.20 - 2.22 (0.0866 - 0.0874)	2.16 (0.0850)	MT
2.22 - 2.24 (0.0874 - 0.0888)	2.18 (0.0858)	
2.24 - 2.26 (0.0882 - 0.0890)	2.20 (0.0866)	<b>AT</b>
2.26 - 2.28 (0.0890 - 0.0898)	2.22 (0.0874)	
2.28 - 2.30 (0.0898 - 0.0906)	2.24 (0.0882)	
2.30 - 2.32 (0.0906 - 0.0913)	2.26 (0.0890)	FA
2.32 - 2.34 (0.0913 - 0.0921)	2.28 (0.0898)	
2.34 - 2.37 (0.0921 - 0.0933)	2.30 (0.0906)	
2.37 - 2.41 (0.0933 - 0.0949)	2.34 (0.0921)	RA
2.41 - 2.45 (0.0949 - 0.0965)	2.38 (0.0937)	
2.45 - 2.49 (0.0965 - 0.0980)	2.42 (0.0953)	BR
2.49 - 2.53 (0.0980 - 0.0996)	2.46 (0.0969)	
2.53 - 2.57 (0.0996 - 0.1012)	2.50 (0.0984)	
2.57 - 2.61 (0.1012 - 0.1028)	2.54 (0.1000)	ST
2.61 - 2.65 (0.1028 - 0.1043)	2.58 (0.1016)	
2.65 - 2.69 (0.1043 - 0.1059)	2.62 (0.1031)	
2.69 - 2.73 (0.1059 - 0.1075)	2.66 (0.1047)	RS

### OUTPUT SHAFT

#### Seal ring clearance

Output shaft seal ring clearance mm (in)		BT
Standard	0.10 - 0.25 (0.0039 - 0.0098)	HA
Allowable limit	0.25 (0.0098)	EL

#### Bearing preload

Output shaft bearing preload mm (in)	0.03 - 0.08 (0.0012 - 0.0031)	IDX
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# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

### Turning torque

Turning torque of output shaft N·m (kg·cm, in·lb)	0.25 - 0.88 (2.5 - 9.0, 2.2 - 7.8)
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### Table for selecting output shaft bearing adjusting spacer

Unit: mm (in)

### Output shaft bearing adjusting spacers

Thickness mm (in)	Part number
6.26 (0.2465)	31437-31X16
6.30 (0.2480)	31437-31X17
6.34 (0.2496)	31437-31X18
6.38 (0.2512)	31437-31X19
6.42 (0.2528)	31437-31X20
6.46 (0.2543)	31437-31X21
6.50 (0.2559)	31437-31X22
6.54 (0.2575)	31437-31X23
6.58 (0.2591)	31437-31X24
6.62 (0.2606)	31437-31X60
6.64 (0.2614)	31437-31X78
6.66 (0.2622)	31437-31X61
6.68 (0.2630)	31437-31X79
6.70 (0.2638)	31437-31X62
6.72 (0.2646)	31437-31X80
6.74 (0.2654)	31437-31X63
6.76 (0.2661)	31437-31X81
6.78 (0.2669)	31437-31X64
6.80 (0.2677)	31437-31X82
6.82 (0.2685)	31437-31X65
6.84 (0.2693)	31437-31X83
6.86 (0.2701)	31437-31X66
6.88 (0.2709)	31437-31X84
6.90 (0.2717)	31437-31X67
6.92 (0.2724)	31437-31X46
6.94 (0.2732)	31437-31X68
6.96 (0.2740)	31437-31X47
6.98 (0.2748)	31437-31X69
7.00 (0.2756)	31437-31X48
7.02 (0.2764)	31437-31X70
7.06 (0.2780)	31437-31X71
7.10 (0.2795)	31437-31X72
7.14 (0.2811)	31437-31X73
7.18 (0.2827)	31437-31X74
7.22 (0.2843)	31437-31X75

Dimension "T"	Suitable spacer
6.29 - 6.33 (0.2476 - 0.2492)	6.26 (0.2465)
6.33 - 6.37 (0.2492 - 0.2508)	6.30 (0.2480)
6.37 - 6.41 (0.2508 - 0.2524)	6.34 (0.2496)
6.41 - 6.45 (0.2524 - 0.2539)	6.38 (0.2512)
6.45 - 6.49 (0.2539 - 0.2555)	6.42 (0.2528)
6.49 - 6.53 (0.2555 - 0.2571)	6.46 (0.2543)
6.53 - 6.57 (0.2571 - 0.2587)	6.50 (0.2559)
6.57 - 6.61 (0.2587 - 0.2602)	6.54 (0.2575)
6.61 - 6.65 (0.2602 - 0.2618)	6.58 (0.2591)
6.65 - 6.68 (0.2618 - 0.2630)	6.62 (0.2606)
6.68 - 6.70 (0.2630 - 0.2638)	6.64 (0.2614)
6.70 - 6.72 (0.2638 - 0.2646)	6.66 (0.2622)
6.72 - 6.74 (0.2646 - 0.2654)	6.68 (0.2630)
6.74 - 6.76 (0.2654 - 0.2661)	6.70 (0.2638)
6.76 - 6.78 (0.2661 - 0.2669)	6.72 (0.2646)
6.78 - 6.80 (0.2669 - 0.2677)	6.74 (0.2654)
6.80 - 6.82 (0.2677 - 0.2685)	6.76 (0.2661)
6.82 - 6.84 (0.2685 - 0.2693)	6.78 (0.2669)
6.84 - 6.86 (0.2693 - 0.2701)	6.80 (0.2677)
6.86 - 6.88 (0.2701 - 0.2709)	6.82 (0.2685)
6.88 - 6.90 (0.2709 - 0.2717)	6.84 (0.2693)
6.90 - 6.92 (0.2717 - 0.2724)	6.86 (0.2701)
6.92 - 6.94 (0.2724 - 0.2732)	6.88 (0.2707)
6.94 - 6.96 (0.2732 - 0.2740)	6.90 (0.2717)
6.96 - 6.98 (0.2740 - 0.2748)	6.92 (0.2724)
6.98 - 7.00 (0.2748 - 0.2756)	6.94 (0.2732)
7.00 - 7.02 (0.2756 - 0.2764)	6.96 (0.2790)
7.02 - 7.04 (0.2764 - 0.2772)	6.98 (0.2748)
7.04 - 7.06 (0.2772 - 0.2780)	7.00 (0.2756)
7.06 - 7.09 (0.2780 - 0.2791)	7.02 (0.2764)
7.09 - 7.13 (0.2791 - 0.2807)	7.06 (0.2780)
7.13 - 7.17 (0.2807 - 0.2823)	7.10 (0.2795)
7.17 - 7.21 (0.2823 - 0.2839)	7.14 (0.2811)
7.21 - 7.25 (0.2839 - 0.2854)	7.18 (0.2827)
7.25 - 7.29 (0.2854 - 0.2870)	7.22 (0.2843)

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Specifications and Adjustments (Cont'd)

### BEARING RETAINER

#### Seal ring clearance

Bearing retainer 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 mm (in)	0.25 - 0.55 (0.0098 - 0.0217)
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#### Bearing race for adjusting total end play

Thickness mm (in)	Part number
0.6 (0.024)	31435-31X01
0.8 (0.031)	31435-31X02
1.0 (0.039)	31435-31X03
1.2 (0.047)	31435-31X04
1.4 (0.055)	31435-31X05
1.6 (0.063)	31435-31X06
1.8 (0.071)	31435-31X07
2.0 (0.079)	31435-31X08

#### REVERSE CLUTCH END PLAY

Reverse clutch end play mm (in)	0.65 - 1.00 (0.0256 - 0.0394)
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#### Thrust washers for adjusting reverse clutch end play

Thickness mm (in)	Part number
0.65 (0.0256)	31508-31X10
0.80 (0.0315)	31508-31X11
0.95 (0.0374)	31508-31X12
1.10 (0.0433)	31508-31X13
1.25 (0.0492)	31508-31X14
1.40 (0.0551)	31508-31X15

### ACCUMULATOR

#### O-ring

	Unit: mm (in)	
Accumulator	Diameter (Small)	Diameter (Large)
Servo release accumulator	26.9 (1.059)	44.2 (1.740)
N-D accumulator	34.6 (1.362)	39.4 (1.551)

#### Return spring

	Unit: mm (in)	
Accumulator	Free length	Outer diameter
Servo release accumulator spring	56.4 (2.220)	21.0 (0.827)
N-D accumulator spring	43.5 (1.713)	28.0 (1.102)

### BAND SERVO

#### Return spring

	Unit: mm (in)	
Return spring	Free length	Outer diameter
2nd servo return spring	32.5 (1.280)	25.9 (1.020)
OD servo return spring	31.0 (1.220)	21.7 (0.854)

### REMOVAL AND INSTALLATION

	Unit: mm (in)	
Distance between end of converter housing and torque converter	21.1 (0.831) or more	

GI

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

HA

EL

IDX