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## INTRODUCTION HONDA CIVIC 3 SHAFT M24A

This Booklet covers the 3 shaft Honda unit that is found in the Civic models. Although at first glance you will see solenoids on this unit, it is not a computer controlled shifting model. The solenoids are for the converter clutch engagement. This unit is hydraulically controlled. This manual covers the remove and replace of the unit from the vehicle. The tear-down and assembly and a trouble shooting section. Again it is important to know which model you are working on. In the area on the transmission where the serial number is located it will show the model number, which is M24A. We thank HONDA for the illustrations and information that have made this booklet possible.

This information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee the accuracy.

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# Technical Service Information

## Description

The automatic transmission is a combination of a 3-element torque converter and triple-shaft automatic transmission which provides 4 speeds forward and 1 reverse. The entire unit is positioned in line with the engine.

### Torque Converter, Gears and Clutches

The torque converter consists of a pump, turbine and stator assembly in a single unit. The torque converter is connected to the engine crankshaft so they turn together as a unit as the engine turns. Around the outside of the torque converter is a ring gear which meshes with the starter pinion when the engine is being started. The entire torque converter assembly serves as a flywheel while transmitting power to the transmission mainshaft.

The transmission has three parallel shafts, the mainshaft, countershaft and sub-shaft. The mainshaft is in line with the engine crankshaft.

The mainshaft includes the clutches for 1st, and 2nd/4th, and gears for 3rd, 2nd, 4th, reverse and 1st (3rd gear is integral with the mainshaft, while reverse gear is integral with the 4th gear).

The countershaft includes the 3rd clutch and gears for 3rd, 2nd, 4th, reverse, 1st and parking. Reverse and 4th gears can be locked to the countershaft at its center, providing 4th gear or reverse, depending on which way the selector is moved.

The sub-shaft includes the 1st-hold clutch and gears for 1st and 4th.

The gears on the mainshaft are in constant mesh with those on the countershaft and sub-shaft. When certain combinations of gears in the transmission are engaged by the clutches, power is transmitted from the mainshaft to the countershaft via the sub-shaft to provide **D4**, **D3**, **2**, **1** and **R** position.

### Hydraulic Control

The valve bodies include the main valve body, secondary valve body, regulator valve body, servo body, modulator valve body, lock-up valve body, and governor body, through the respective separator plates.

They are bolted on the torque converter housing.

The main valve body contains the manual valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve, 3-2 timing valve, 4th exhaust valve, relief valve, and oil pump gears.

The secondary valve body contains the 4-3 kick-down valve, 3-2 kick-down valve, 2-3 orifice control valve, 2-1 timing valve, Clutch Pressure Control (CPC) valve, servo control valve, reverse control valve, and governor cut valve.

The regulator valve body contains the pressure regulator valve, lock-up control valve, torque converter check valve, and cooler check valve.

The servo body contains the servo valve which is integrated with the reverse shift fork, throttle valves A and B, 2/3-4 orifice control valve, and accumulators.

The modulator valve body, which is bolted on the servo body, contains the modulator valve.

The lock-up valve body contains the lock-up shift valve and lock-up timing B valve, and is bolted on the secondary valve body.

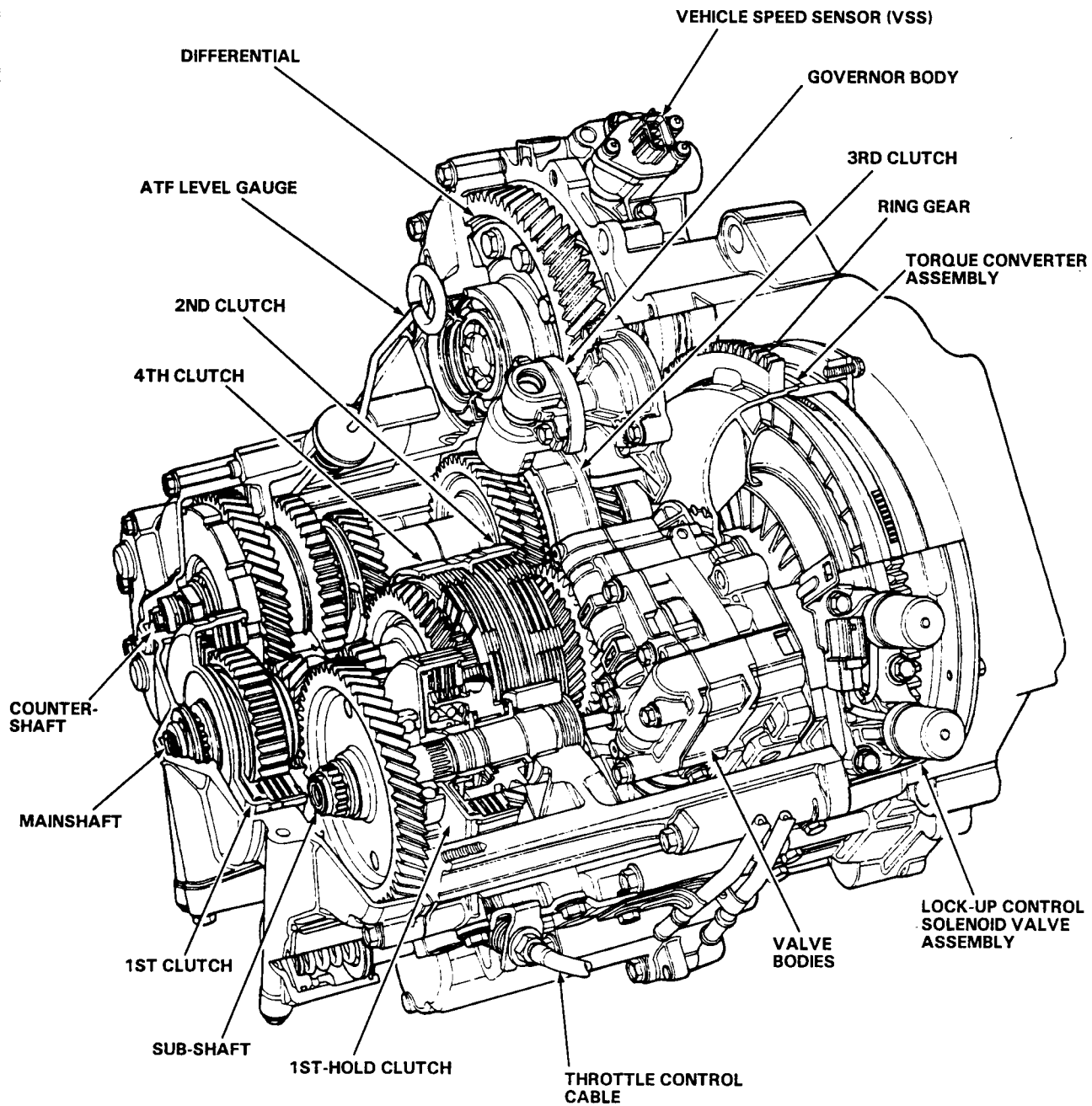
The governor body is bolted on the torque converter housing near the differential.

Fluid from the regulator passes through the manual valve to the various control valves.

### Lock-up Mechanism

In **D4**, in 2nd, 3rd and 4th, and **D3** in 3rd, pressurized fluid is drained from the back of the torque converter through an oil passage, causing the lock-up piston to be held against the torque converter cover. As this takes place, the mainshaft rotates at the same speed as the engine crankshaft. Together with hydraulic control, the engine control module (ECM) optimizes the timing of the lock-up mechanism.

The lock-up shift valve controls the range of lock-up according to the lock-up control solenoid valves A and B, and throttle valve B. The lock-up control solenoid valves A and B are mounted on the torque converter housing, and are controlled by the ECM.



## Clutches

The four speed automatic transmission uses hydraulically actuated clutches to engage or disengage the transmission gears. When clutch pressure is introduced into the clutch drum, the clutch piston is applied. This presses the friction discs and steel plates together, locking them so they don't slip. Power is then transmitted through the engaged clutch pack to its hub-mounted gear.

Likewise, when clutch pressure is bled from the clutch pack, the piston releases the friction discs and steel plates, and they are free to slide past each other while disengaged. This allows the gear to spin independently of its shaft, transmitting no power.

### 1st Clutch

The 1st clutch engages/disengages 1st gear, and is located at the end of the mainshaft, just behind the right side cover. The 1st clutch is supplied clutch pressure by its oil feed pipe within the mainshaft.

### 1st-hold Clutch

The 1st-hold clutch engages/disengages 1st-hold or **1** position, and is located at the center of the sub-shaft. The 1st-hold clutch is supplied clutch pressure by its oil feed pipe within the sub-shaft.

### 2nd Clutch

The 2nd clutch engages/disengages 2nd gear, and is located at the center of the mainshaft. The 2nd clutch is joined back-to-back to the 4th clutch. The 2nd clutch is supplied clutch pressure through the mainshaft by a circuit connected to the regulator valve body.

### 3rd Clutch

The 3rd clutch engages/disengages 3rd gear, and is located at the end of the countershaft, opposite the right side cover. The 3rd clutch is supplied clutch pressure by its oil feed pipe within the countershaft.

### 4th Clutch

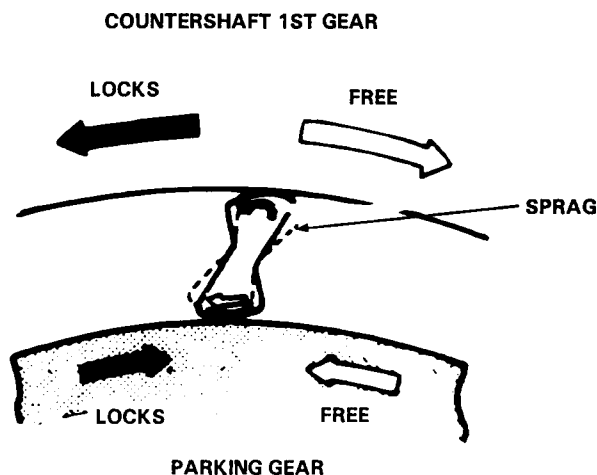
The 4th clutch engages/disengages 4th gear, as well as reverse gear, and is located at the center of the mainshaft. The 4th clutch is joined back-to-back to the 2nd clutch. The 4th clutch is supplied clutch pressure by its oil feed pipe within the mainshaft.

### One-way Clutch

The one-way clutch is positioned between the parking gear and 1st gear, with the parking gear splined to the countershaft. The 1st gear provides the outer race, and the parking gear provides the inner race surface. The one-way clutch locks up when power is transmitted from the mainshaft 1st gear to the countershaft 1st gear.

The 1st clutch and gears remain engaged in the 1st, 2nd, 3rd, and 4th gear ranges in the **D4**, **D3** or **2** position.

However, the one-way clutch disengages when the 2nd, 3rd, or 4th clutches/gears are applied in the **D4**, **D3** or **2** position. This is because the increased rotational speed of the gears on the countershaft over-ride the locking "speed range" of the one-way clutch. Thereafter, the one-way clutch free-wheels with the 1st clutch still engaged.



NOTE:  
View from right side cover side.

(cont'd)

## Gear Selection

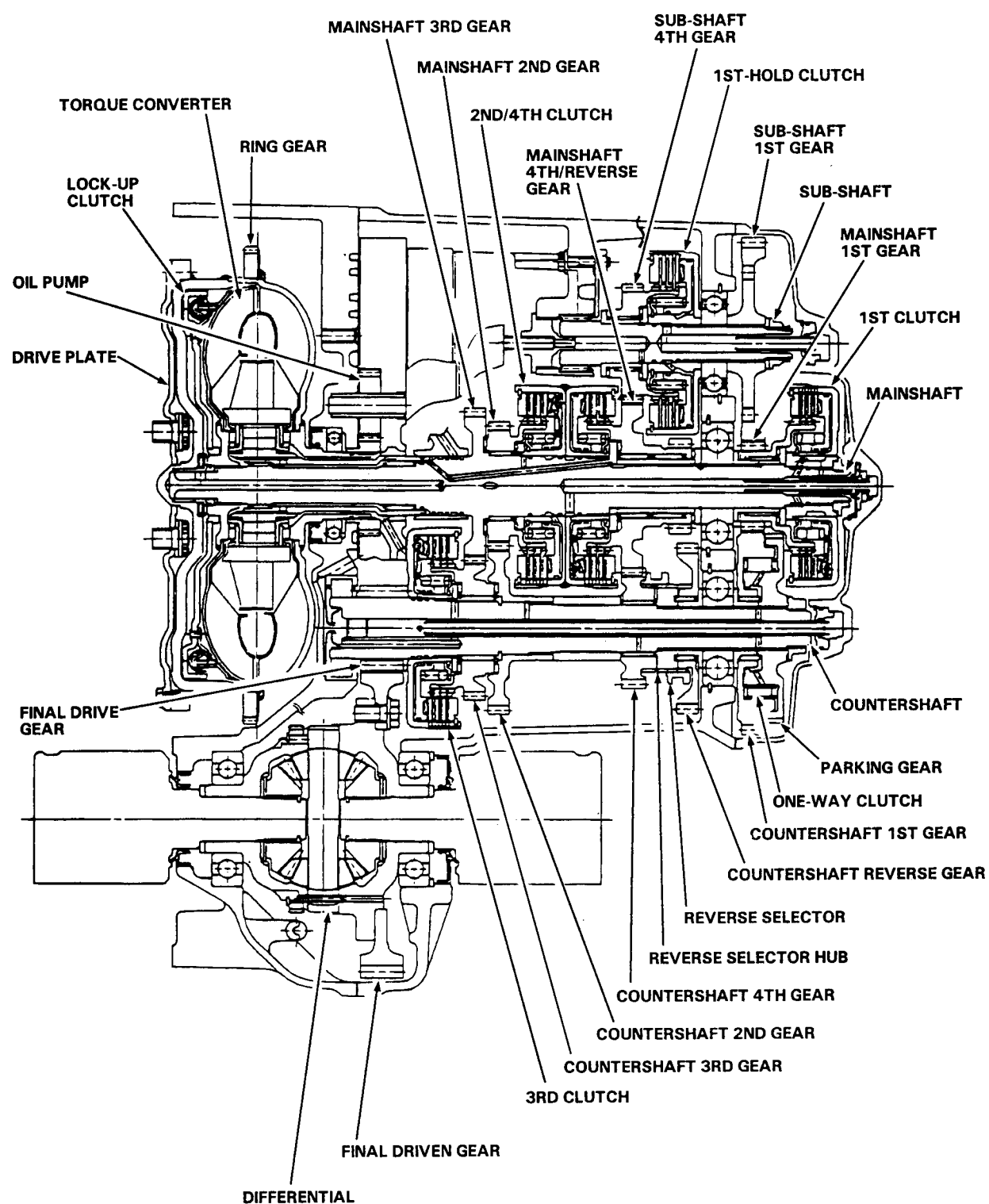
The selector lever has seven positions; **P** PARK, **R** REVERSE, **N** NEUTRAL, **D<sub>4</sub>** 1st through 4th positions, **D<sub>3</sub>** 1st through 3rd positions, **2** 2nd gear and **1** 1st gear.

Position	Description
<b>P</b> PARK	Front wheels locked; parking pawl engaged with parking gear on countershaft. All clutches released.
<b>R</b> REVERSE	Reverse; reverse selector engaged with countershaft reverse gear and 4th clutch locked.
<b>N</b> NEUTRAL	All clutches released.
<b>D<sub>4</sub></b> DRIVE (1st through 4th)	General driving; starts off in 1st, shifts automatically to 2nd, 3rd, then 4th, depending on vehicle speed and throttle position. Downshifts through 3rd, 2nd and 1st on deceleration to stop. The lock-up mechanism comes into operation in 2nd, 3rd and 4th when the transmission is in <b>D<sub>4</sub></b> position.
<b>D<sub>3</sub></b> DRIVE (1st through 3rd)	For rapid acceleration at highway speeds and general driving; starts off in 1st, shifts automatically to 2nd then 3rd, depending on vehicle speed and throttle position. Downshifts through lower gears on deceleration to stop. The lock-up mechanism comes into operation in 3rd.
<b>2</b> SECOND	Driving in 2nd gear; stays in 2nd gear, does not shift up and down. For engine braking or better traction starting off on loose or slippery surface.
<b>1</b> FIRST	Driving in 1st gear; stays in 1st gear, does not shift up. For engine braking.

## Power Flow

POSITION \ PART	TORQUE CON- VERTER	1ST- HOLD CLUTCH	1ST GEAR 1ST CLUTCH	2ND GEAR 2ND CLUTCH	3RD GEAR 3RD CLUTCH	4TH		REVERSE GEAR	PARKING GEAR
						GEAR	CLUTCH		
<b>P</b>	○	×	×	×	×	×	×	×	○
<b>R</b>	○	×	×	×	×	×	○	○	×
<b>N</b>	○	×	×	×	×	×	×	×	×
<b>D<sub>4</sub></b>	1ST	○	×	○	×	×	×	×	×
	2ND	○	×	*○	○	×	×	×	×
	3RD	○	×	*○	○	×	×	×	×
	4TH	○	×	*○	×	○	○	×	×
<b>D<sub>3</sub></b>	1ST	○	×	○	×	×	×	×	×
	2ND	○	×	*○	○	×	×	×	×
	3RD	○	×	*○	○	×	×	×	×
<b>2</b>	○	×	*○	○	×	×	×	×	×
<b>1</b>	○	○	○	×	×	×	×	×	×

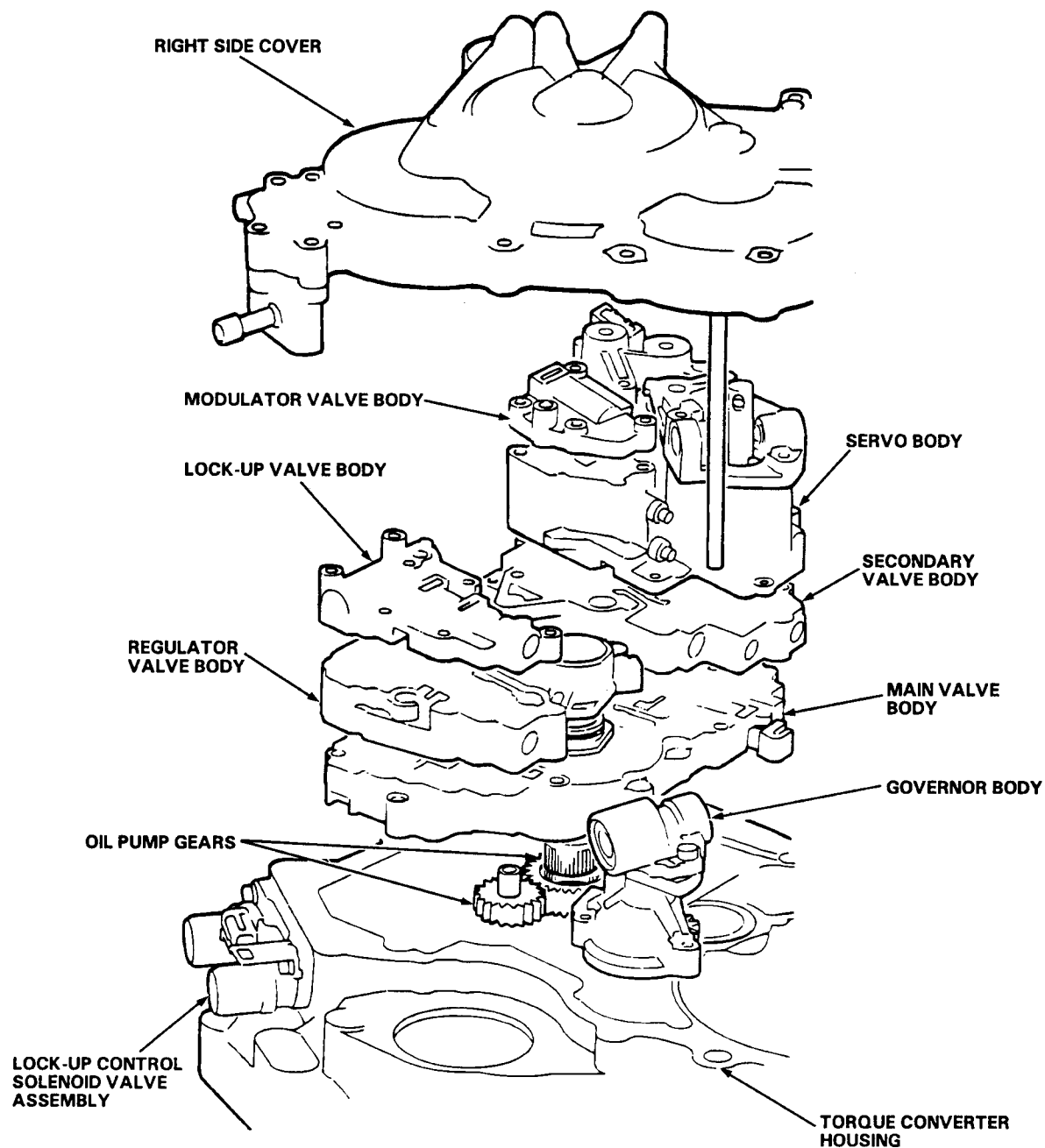
○: Operates, ×: Doesn't operate, \*: Although the 1st clutch engages, driving power is not transmitted as the one-way clutch slips.



## Hydraulic Control

The valve bodies include the main valve body, secondary valve body, regulator valve body, servo body, lock-up valve body, governor body and modulator valve body.

The oil pump is driven by splines behind the torque converter which is attached to the engine. Oil flows through the regulator valve to maintain specified pressure through the main valve body to the manual valve, directing pressure to each of the clutches.

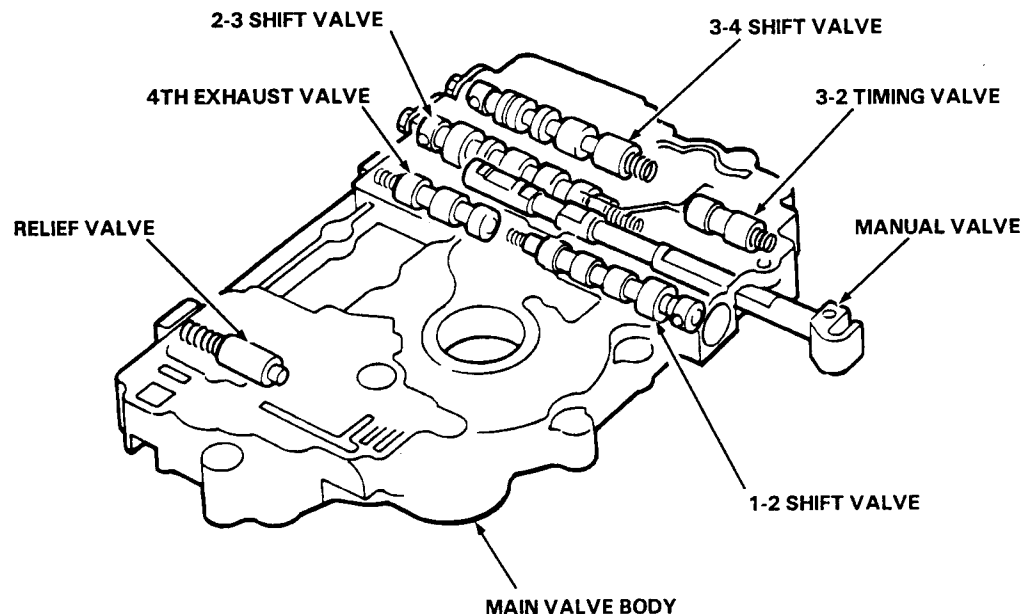




## Main Valve Body

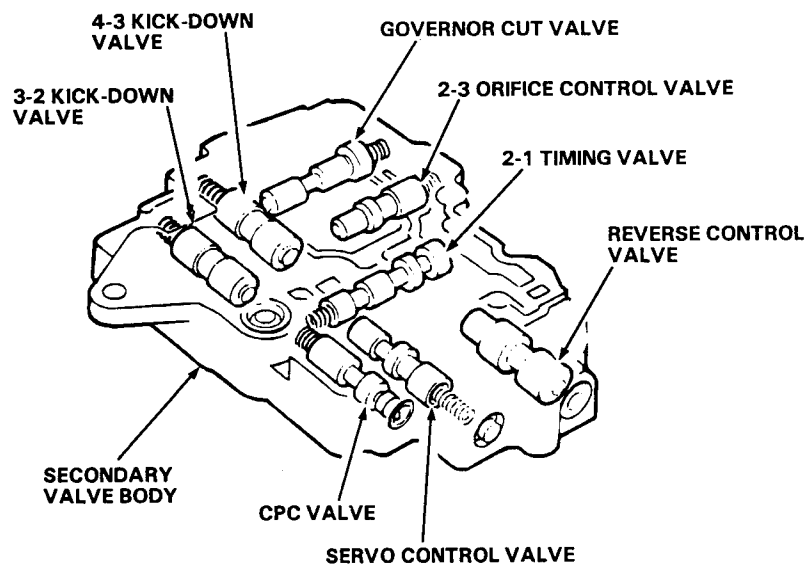
The manual valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve, 4th exhaust valve, 3-2 timing valve, and relief valve are all assembled in the main valve body.

The primary function of this valve body is switching oil passages on and off and controlling the hydraulic pressure going to the hydraulic control system.



## Secondary Valve Body

The secondary valve body is located on the main valve body. The 3-2 kick-down valve, 4-3 kick-down valve, 2-3 orifice control valve, governor cut valve, 2-1 timing valve, reverse control valve, servo control valve, and clutch pressure control (CPC) valve are assembled in the secondary valve body.



(cont'd)

## Hydraulic Control (cont'd)

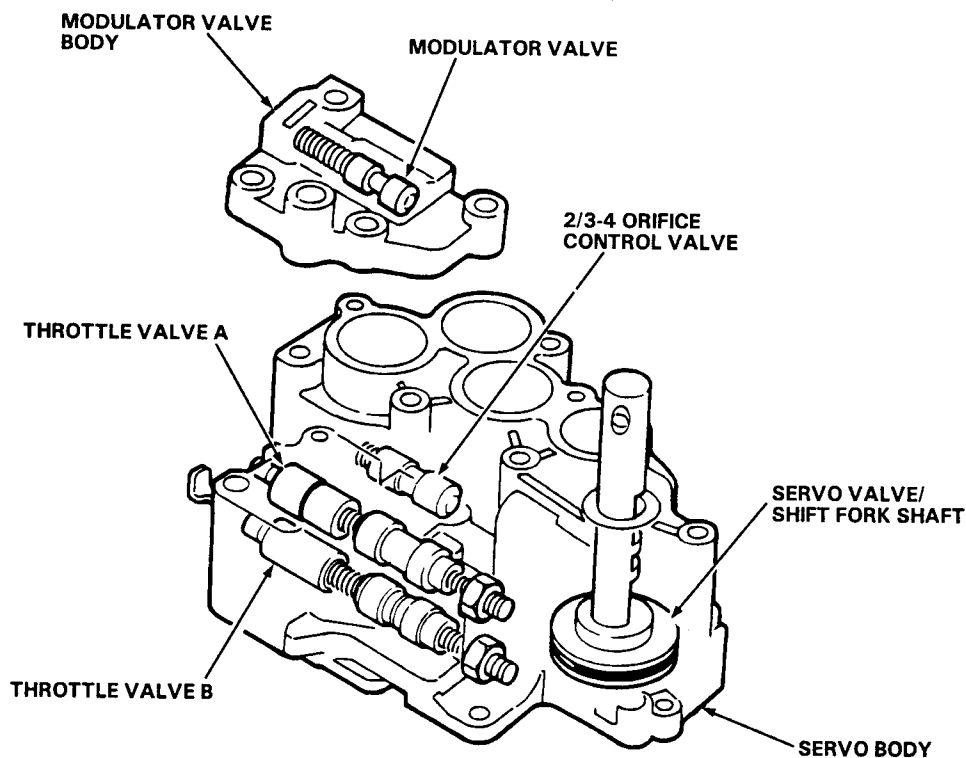
### Servo Body

The servo body is located on the secondary valve body.

The servo valve which is integrated with the shift fork shaft, throttle valve A and B, 2/3-4 orifice control valve, and accumulator pistons are all assembled in the servo body.

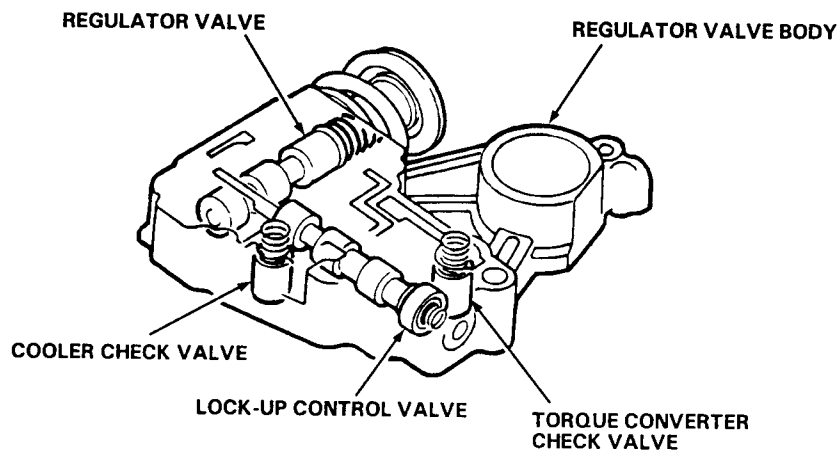
### Modulator Valve Body

The modulator valve body with the modulator valve is located on the servo body.



### Regulator Valve Body

The regulator valve body is located on the main valve body. The regulator valve body consists of the regulator valve, torque converter check valve, cooler check valve, and lock-up control valve.

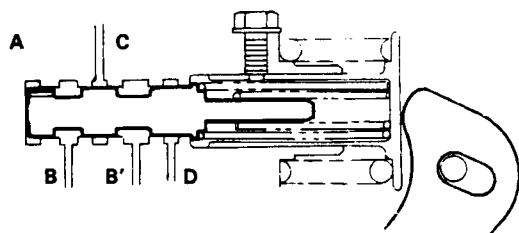


## Regulator Valve

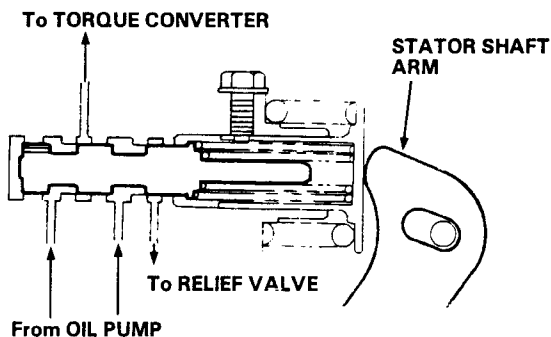
The regulator valve maintains a constant hydraulic pressure from the oil pump to the hydraulic control system, while also furnishing oil to the lubricating system and torque converter.

Oil flows through B and B'. The oil which enters through B flows through the valve orifice to A, pushing the regulator valve to the right. According to the level of hydraulic pressure through B, the position of the valve changes, and the amount of the oil through B' from D thus changes. This operation is continued, thus maintaining the line pressure.

(ENGINE NOT RUNNING)

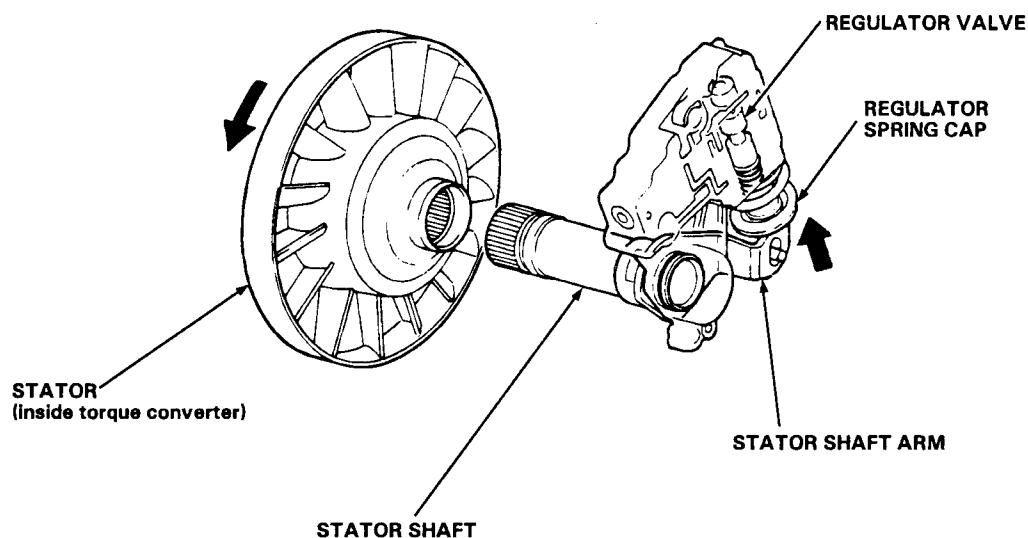


(ENGINE RUNNING)



## Stator Reaction Hydraulic Pressure Control

Hydraulic pressure increase, according to torque, is performed by the regulator valve using stator torque reaction. The stator shaft is splined to the stator and its arm end contacts the regulator spring cap. When the car is accelerating or climbing (Torque Converter Range), stator torque reaction acts on the stator shaft and the stator shaft arm pushes the regulator spring cap in this → direction in proportion to the reaction. The spring compresses and the regulator valve moves to increase the regulated control pressure or line pressure. Line pressure is maximum when the stator reaction is maximum.

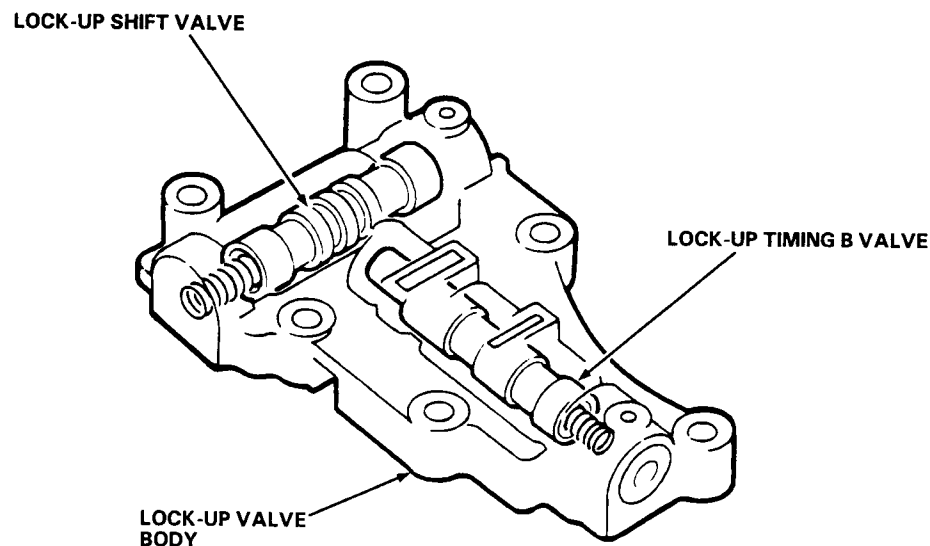


(cont'd)

## Hydraulic Control (cont'd)

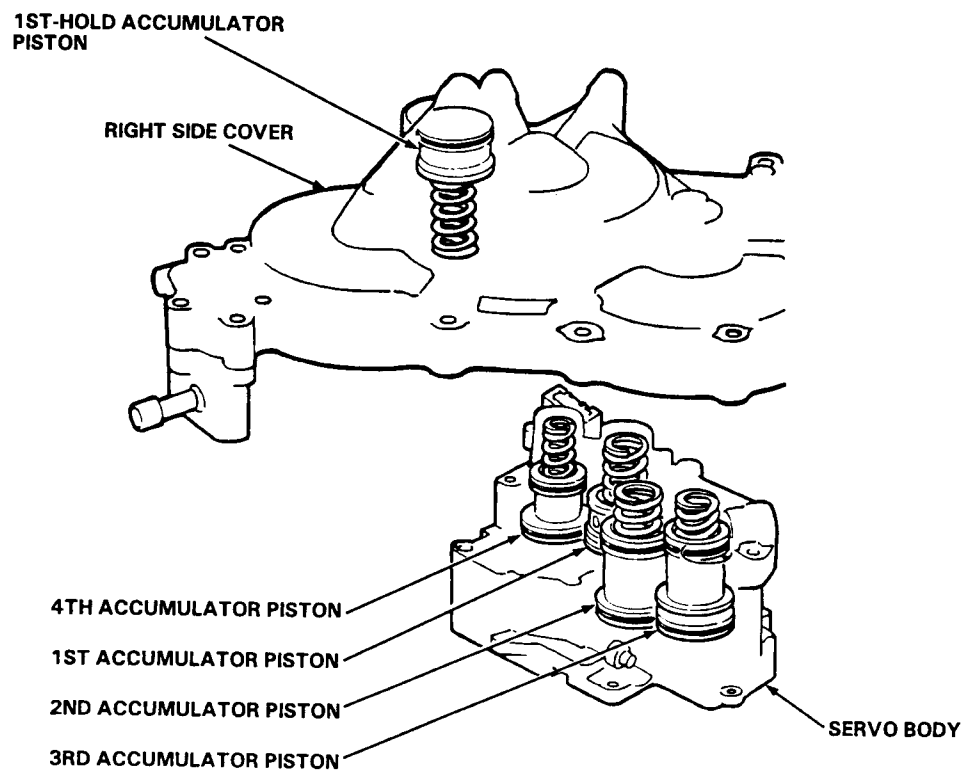
### Lock-up Valve Body

The lock-up valve body with the lock-up shift valve and lock-up timing B valve is located on the regulator valve body.



### Accumulator Pistons

The accumulator pistons are assembled in the servo body and right side cover. The 1st-hold clutch accumulator piston is in the right side cover, and the 1st, 2nd, 3rd, and 4th accumulator pistons are assembled in the servo body.



## Hydraulic Flow

### General Chart of Hydraulic Pressure

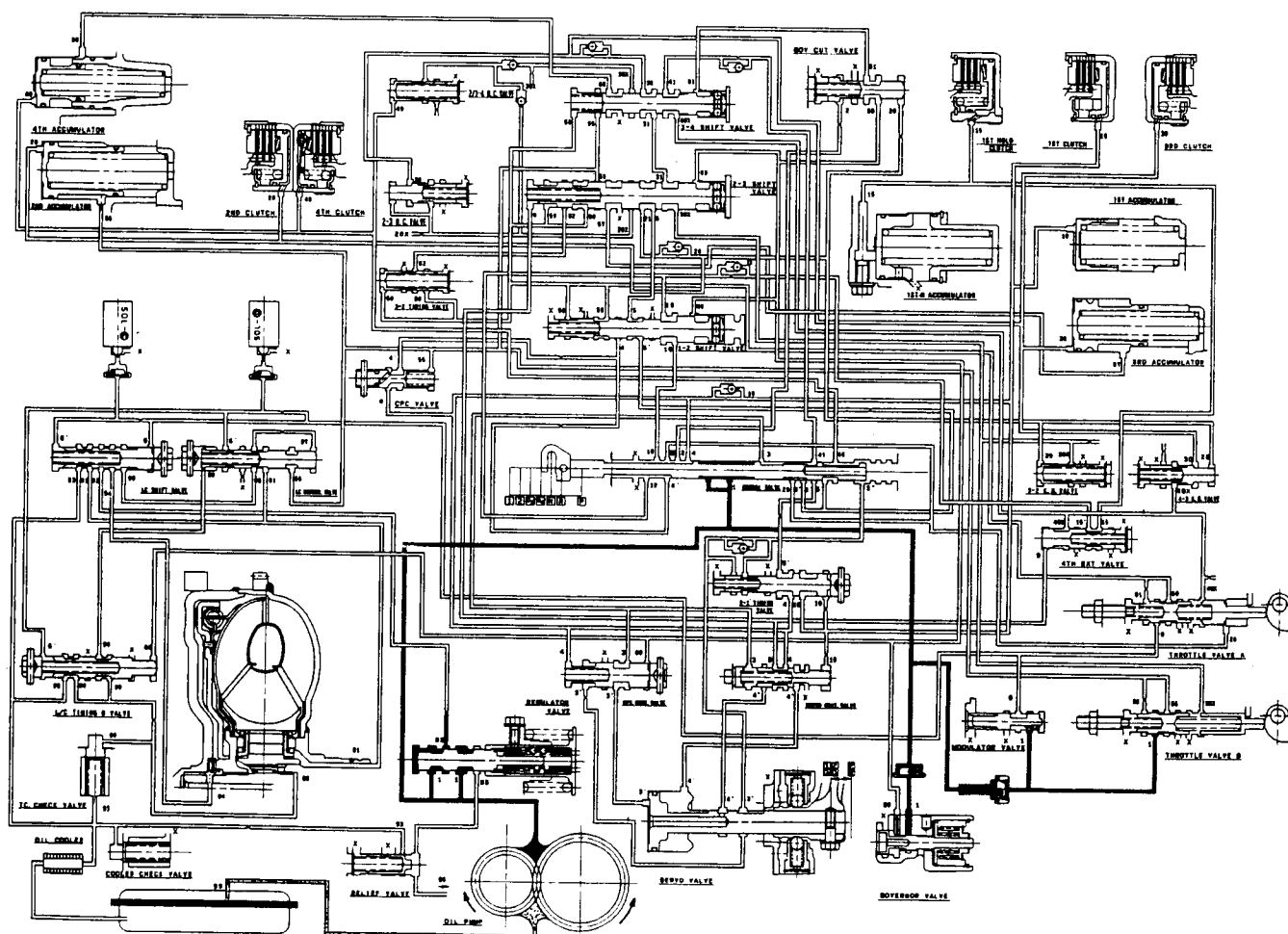
Oil Pump → Regulator Valve → Line Pressure  
Torque Converter Pressure  
Lubrication Pressure

### Distribution of Hydraulic Pressure

- Regulator Valve → Line Pressure  
Torque Converter Pressure  
Lubrication Pressure
- Manual Valve → To Select Line Pressure
- Modulator Valve → Modulator Pressure
- 1-2 Shift Valve
  - 2-3 Shift Valve
  - 3-4 Shift Valve → Clutch Pressure
- Throttle Valve A → Throttle A Pressure
- Throttle Valve B → Throttle B Pressure
- Governor Valve → Governor Pressure

NO.	DESCRIPTION OF PRESSURE	NO.	DESCRIPTION OF PRESSURE	NO.	DESCRIPTION OF PRESSURE
1	LINE	16	1ST-HOLD CLUTCH	57	THROTTLE B
2	LINE	18	LINE	58	THROTTLE B
3	LINE	20	2ND CLUTCH	60	GOVERNOR
3'	LINE	21	2ND CLUTCH	61	GOVERNOR
3''	LINE	25	LINE	90	TORQUE CONVERTER
4	LINE	30	3RD CLUTCH	91	TORQUE CONVERTER
4'	LINE	31	3RD CLUTCH	92	TORQUE CONVERTER
5	LINE	40	4TH CLUTCH	93	OIL COOLER
5'	LINE	41	4TH CLUTCH	94	TORQUE CONVERTER
5''	LINE	50	THROTTLE A	95	LUBRICATION
6	MODULATOR	51	THROTTLE A	96	TORQUE CONVERTER
6'	MODULATOR	52	THROTTLE A	97	TORQUE CONVERTER
10	1ST CLUTCH	55	THROTTLE B	99	SUCTION
15	1ST-HOLD CLUTCH	56	THROTTLE B	×	BLEED

(cont'd)



## Lock-up System

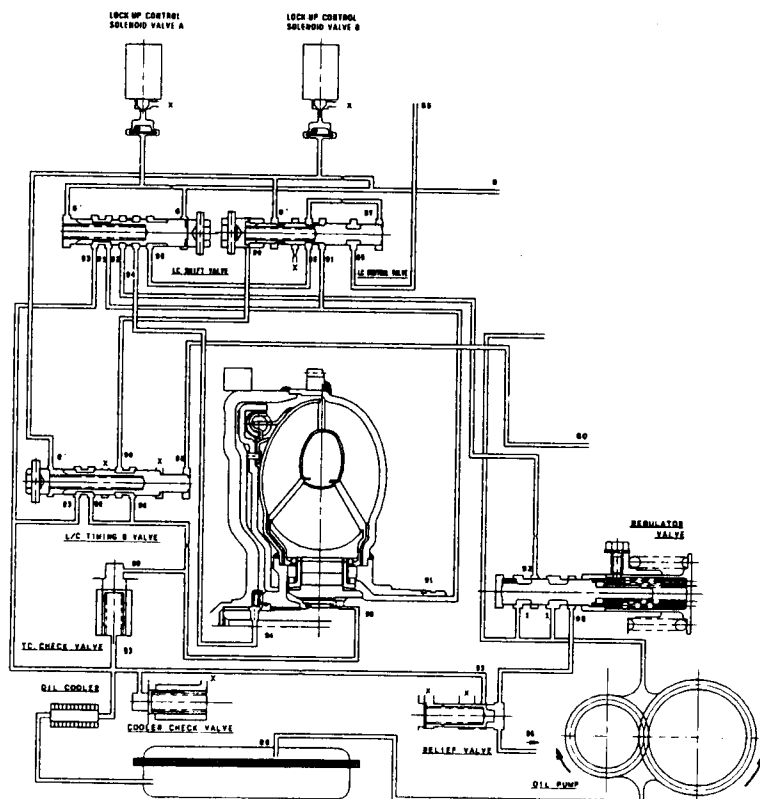
In **D4** or **D3** in 2nd, 3rd and 4th, pressurized fluid is drained from the back of the torque converter through an oil passage, causing the lock-up piston to be held against the torque converter cover. As this takes place, the mainshaft rotates at the same speed as the engine crankshaft. Together with hydraulic control, the ECM optimizes the timing of the lock-up system. Under certain conditions, the lock-up operation is applied during deceleration, in 2nd, 3rd and 4th speed.

The lock-up shift valve controls the range of lock-up according to lock-up control solenoid valves A and B, and the throttle valve. When lock-up control solenoid valves A and B activate, modulator pressure changes. Lock-up control solenoid valves A and B are mounted on the torque converter housing and are controlled by the ECM.

From sensor input signals, the ECM detects whether to turn the lock-up ON or OFF and activates lock-up control solenoid valve A and/or B accordingly.

The combination of driving signals to lock-up control solenoid valves A and B is shown in the table below.

Solenoid valve	A	B
Lock-up condition		
Lock-up OFF	OFF	OFF
Lock-up, slight	ON	Duty operation OFF ⇄ ON
Lock-up, half	ON	ON
Lock-up, full	ON	ON
Lock-up during deceleration	ON	Duty operation OFF ⇄ ON



## Troubleshooting

If the lock-up control system is suspected to be faulty, do the following:

1. If the Malfunction Indicator Lamp (MIL)/ Check Engine Light comes on, check and inspect PGM-FI system according to PGM-FI Troubleshooting

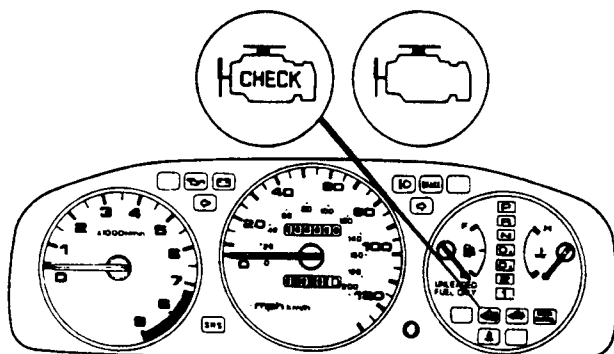
**NOTE:**

PGM-FI system

The PGM-FI system on this model is a sequential multiport fuel injection system.

USA  
MALFUNCTION  
INDICATOR LAMP (MIL)

CANADA  
CHECK ENGINE LIGHT



2. If the Malfunction Indicator Lamp (MIL)/ Check Engine Light does not come on or it blinks other than nineteen times (while connecting the Service Check Connector terminals with a jumper wire), check and inspect according to the Symptom-to-Component Chart
3. Check the lock-up control solenoid valve



### Test

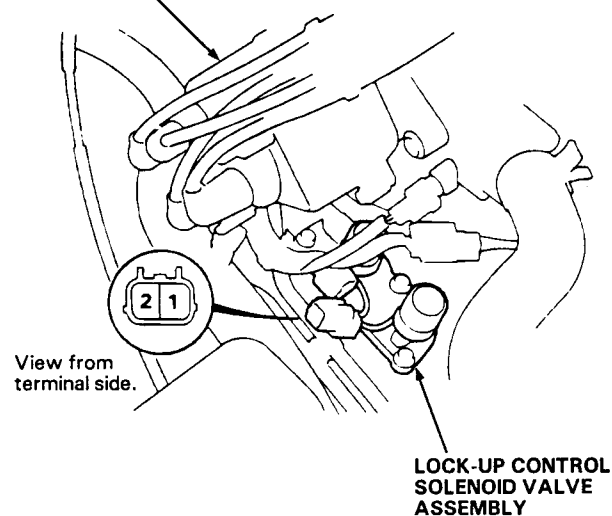
#### NOTE:

Lock-up control solenoid valves A and B must be removed/replaced as an assembly.

1. Disconnect the connector from the lock-up control solenoid valve A/B.
2. Measure the resistance between the No. 1 terminal (solenoid valve A) of the lock-up control solenoid valve connector and body ground, and between the No. 2 terminal (solenoid valve B) and body ground.

**STANDARD: 14–25  $\Omega$**

#### DISTRIBUTOR



3. Replace the lock-up control solenoid valve assembly if the resistance is out of specification.
4. If the resistance is within standard, connect the No. 1 terminal of the lock-up control solenoid valve connector to the battery positive terminal and body ground. A clicking sound should be heard. Connect the No. 2 terminal to the battery positive terminal and body ground. A clicking sound should be heard.
5. Replace the lock-up control solenoid valve assembly if no clicking sound is heard.

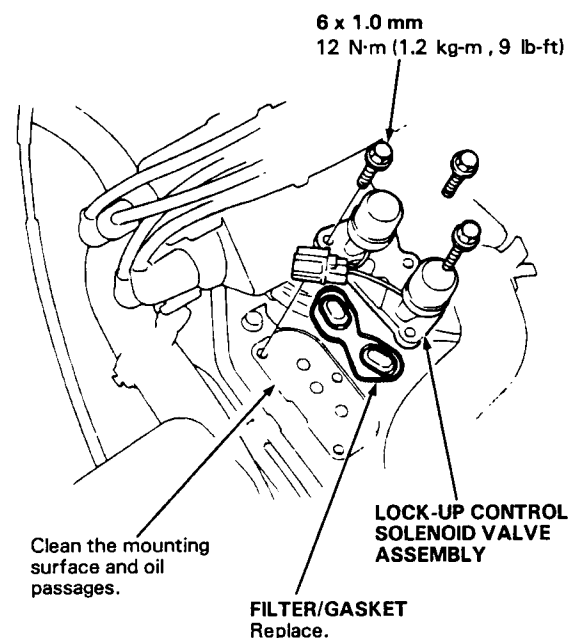
### Replacement

1. Remove the mounting bolts and lock-up control solenoid valve assembly.

#### NOTE:

Be sure to remove or replace the lock-up control solenoid valves A and B as an assembly.

2. Check the lock-up control solenoid valve oil passages for dust or dirt, and replace as an assembly, if necessary.



3. Clean the mounting surface and oil passages of the lock-up control solenoid valve assembly and install a new filter/gasket.
4. Check the connector for rust, dirt or oil and reconnect it securely.

### Symptom-to-Component Chart

SYMPTOM	Check these items on the PROBABLE CAUSE LIST	Check these items on the NOTES CHART
Engine runs, but car does not move in any gear.	1, 6, 7, 16	K, L, R, S
Car moves in R and 2, but not in D <sub>3</sub> , D <sub>4</sub> or 1.	8, 29, 44, 48	C, M, O
Car moves in D <sub>3</sub> , D <sub>4</sub> , 1, R, but not in 2.	9, 30, 49	C, L
Car moves in D <sub>3</sub> , D <sub>4</sub> , 2, 1, but not in R.	1, 11, 22, 34, 38, 39, 40	C, L, Q,
Car moves in N.	1, 8, 9, 10, 11, 46, 47	C, D
Excessive idle vibration.	5, 17	B, K, L
Slips in all gears.	6, 7, 16	C, L, U
No engine braking in 1 position.	12	C, D, L
Slips in 1st gear.	8, 29, 44, 48	C, N, O, U
Slips in 2nd gear.	9, 20, 23, 30, 49	C, L, U
Slips in 3rd gear.	10, 21, 23, 31, 44	C, L, U
Slips in 4th gear.	11, 23, 32	C, L, U
Slips in reverse gear.	11, 32, 34	C
Flares on 1-2 upshift.	3, 15	E, L, V
Flares on 2-3 upshift.	3, 15, 24, 44	E, L, V
Flares on 3-4 upshift.	3, 15, 25, 44	E, L, V
No upshift, transmission stays in 1st gear.	14, 19, 23	G, L
No downshift to low gear.	12, 19	G, L
Late upshift.	14	L, V
Erratic shifting.	2, 14, 26	V
Harsh shift (up and down shifting).	2, 4, 15, 23, 24, 27, 47	A, E, H, I, L, V
Harsh shift (1-2).	2, 9	C, D, V
Harsh shift (2-3).	2, 10, 23, 24	C, D, H, L, V
Harsh shift (3-4).	2, 11, 23, 25	C, D, I, L, V
Harsh kick-down shifts.	2, 23, 27, 28	L, V, Q
Harsh kick-down shift (2-1).	48	O
Harsh downshift at closed throttle.	15	E, T
Harsh shift when manually shifting to 1.	33	L
Axle(s) slips out of transmission on turns.	43, 50	L, P, Q
Axle(s) stuck in transmission.	43	L, Q
Ratcheting noise when shifting into R.	6, 7, 38, 39, 40	K, L, Q
Loud popping noise when taking off in R.	38, 39, 40	L, Q
Ratcheting noise when shifting from R to P or from R to N.	38, 39, 40, 45	L, Q
Noise from transmission in all selector lever positions.	6, 17	K, L, Q
Noise from transmission only when wheels are rolling.	39, 42	L, Q
Gear whine, rpm related (pitch changes with shifts).	8, 41	K, L, Q
Gear whine, speed related (pitch changes with speed).	38, 42	L, Q
Transmission will not shift into 4th gear in D <sub>4</sub> .	1, 21, 28, 32	L
Lock-up clutch does not lock-up smoothly.	17, 36, 37	L
Lock-up clutch does not operate properly.	2, 3, 15, 18, 35, 36, 37	E, L, V
Transmission has multitude of problems shifting.	43	L, Q
At disassembly, large particles of metal are found on magnet.		

## PROBABLE CAUSE

1.	Shift cable broken/out of adjustment.
2.	Throttle cable too short.
3.	Throttle cable too long.
4.	Wrong type ATF.
5.	Idle rpm too low/high.
6.	Oil pump worn or binding.
7.	Regulator valve stuck.
8.	1st clutch defective.
9.	2nd clutch defective.
10.	3rd clutch defective.
11.	4th clutch defective.
12.	1st-hold clutch defective.
14.	Modulator valve stuck.
15.	Throttle valve B stuck.
16.	ATF strainer clogged.
17.	Torque converter defective.
18.	Torque converter check valve stuck.
19.	1-2 shift valve stuck.
20.	2-3 shift valve stuck.
21.	3-4 shift valve stuck.
22.	Servo control valve stuck.
23.	Clutch pressure control (CPC) valve stuck.
24.	2-3 orifice control valve stuck.
25.	2/3-4 orifice control valve stuck.
26.	3-2 kick-down valve stuck.
27.	4-3 kick-down valve stuck.
28.	4th exhaust valve stuck.
29.	1st accumulator defective.
30.	2nd accumulator defective.
31.	3rd accumulator defective.
32.	4th accumulator defective.
33.	1st-hold accumulator defective.
34.	Servo valve stuck.
35.	Lock-up timing valve stuck.
36.	Lock-up shift valve stuck.
37.	Lock-up control valve stuck.
38.	Shift fork bent.
39.	Reverse gears worn/damaged (3 gears).
40.	Reverse selector worn.
41.	3rd gears worn/damaged (2 gears).
42.	Final gears worn/damaged (2 gears).
43.	Differential pinion shaft worn.
44.	Feedpipe O-ring broken.
45.	4th gears worn/damaged (2 gears).
46.	Gear clearance incorrect.
47.	Clutch clearance incorrect.
48.	One-way (sprag) clutch defective.
49.	Sealing rings/guide worn.
50.	Axle-inboard joint clip missing.

(cont'd)

## Symptom-to-Component Chart (cont'd)

The following symptoms can be caused by improper repair or assembly.	Check these items on the PROBABLE CAUSE DUE TO IMPROPER REPAIR	Items on the NOTES CHART
Car creeps in N.	R1, R2	
Car does not move in D3 or D4.	R4	
Transmission locks up in R.	R3, R12	
Excessive drag in transmission.	R6	K, R
Excessive vibration, rpm related.	R7	
Noise with wheels moving only.	R5	
Main seal pops out.	R8	S
Various shifting problems.	R9, R10	
Harsh upshifts.	R11	

### PROBABLE CAUSE DUE TO IMPROPER REPAIR

R1.	Improper clutch clearance.
R2.	Improper gear clearance.
R3.	Parking brake lever installed upside down.
R4.	One-way (sprag) clutch installed upside down.
R5.	Reverse selector hub installed upside down.
R6.	Oil pump binding.
R7.	Torque converter not fully seated in oil pump.
R8.	Main seal improperly installed.
R9.	Springs improperly installed.
R10.	Valves improperly installed.
R11.	Ball check valves not installed.
R12.	Shift fork bolt not installed.

## NOTES

A.	See flushing procedure, page
B.	Set idle rpm in gear to specified idle speed. If still no good, adjust motor mounts as outlined in engine section of service manual.
C.	If the large clutch piston O-ring is broken, inspect the piston groove for rough machining.
D.	If the clutch pack is seized or is excessively worn, inspect the other clutches for wear and check the orifice control valves and throttle valves for free movement.
E.	If throttle valve B is stuck, inspect the clutches for wear.
G.	If the 1-2 shift valve is stuck closed, the transmission will not upshift. If stuck open, the transmission has no 1st gear.
H.	If the 2-3 orifice control valve is stuck, inspect the 2nd and 3rd clutch packs for wear.
I.	If the 2/3-4 orifice control valve is stuck, inspect the 3rd and 4th clutch packs for wear.
J.	If the clutch pressure control valve (CPC) is stuck closed, the transmission will not shift out of 1st gear.
K.	Improper alignment of main valve body and torque converter housing may cause oil pump seizure. The symptoms are mostly an rpm-related ticking noise or a high pitched squeak.
L.	If the ATF strainer is clogged with particles of steel or aluminum, inspect the oil pump and differential pinion shaft. If both are OK and no cause for the contamination is found, replace the torque converter.
M.	If the 1st clutch feedpipe guide in the right side cover is scored by the mainshaft, inspect the ball bearing for excessive movement in the transmission housing. If OK, replace the right side cover as it is dented. The O-ring under the guide is probably worn.
N.	Replace the mainshaft if the bushings for the 1st and 4th feedpipe are loose or damaged. If the 1st feedpipe is damaged or out of round, replace it. If the 4th feedpipe is damaged or out of round, replace the right side cover.
O.	A worn or damaged one-way (sprag) clutch is mostly a result of shifting the transmission in D3 or D4 while the wheels rotate in reverse, such as rocking the car in snow.
P.	Inspect the frame for collision damage.
Q.	Inspect for damage or wear: 1. Reverse selector gear teeth chamfers. 2. Engagement teeth chamfers of countershaft 4th and reverse gear. 3. Shift fork for scuff marks in center. 4. Differential pinion shaft for wear under pinion gears. 5. Bottom of 3rd clutch for swirl marks. Replace items 1, 2, and 4 if worn or damaged. If transmission makes clicking, grinding or whirring noise, also replace mainshaft 4th gear and reverse idler gear and countershaft 4th gear in addition to 1, 2, 3 or 4. If differential pinion shaft is worn, overhaul differential assembly and replace ATF strainer and thoroughly clean transmission, flush torque converter, cooler and lines. If bottom of 3rd clutch is swirled and transmission makes gear noise, replace the countershaft and final driven gear.
R.	Be very careful not to damage the torque converter housing when replacing the main ball bearing. You may also damage the oil pump when you torque down the main valve body. This will result in oil pump seizure if not detected. Use proper tools.
S.	Install the main seal flush with the torque converter housing. If you push it into the torque converter housing until it bottoms out, it will block the oil return passage and result in damage.
T.	Harsh downshifts when coasting to a stop with zero throttle may be caused by a bent-in throttle valve retainer/cam stopper. Throttle cable adjustment may clear this problem.
U.	Check if separator plate is installed. If it was not installed, the servo valve may have been pushed out by hydraulic pressure causing a leak (internal) affecting all forward gears.
V.	Throttle cable adjustment is essential for proper operation of the transmission. Not only does it affect the shift points if misadjusted, but also the shift quality and lock-up clutch operation. A cable adjusted too long will result in throttle pressure being too low for the amount of engine torque input into the transmission and may cause clutch slippage. A cable adjusted too short will result in too high throttle pressures which may cause harsh shifts, erratic shifts and torque converter hunting.

**NOTE:**

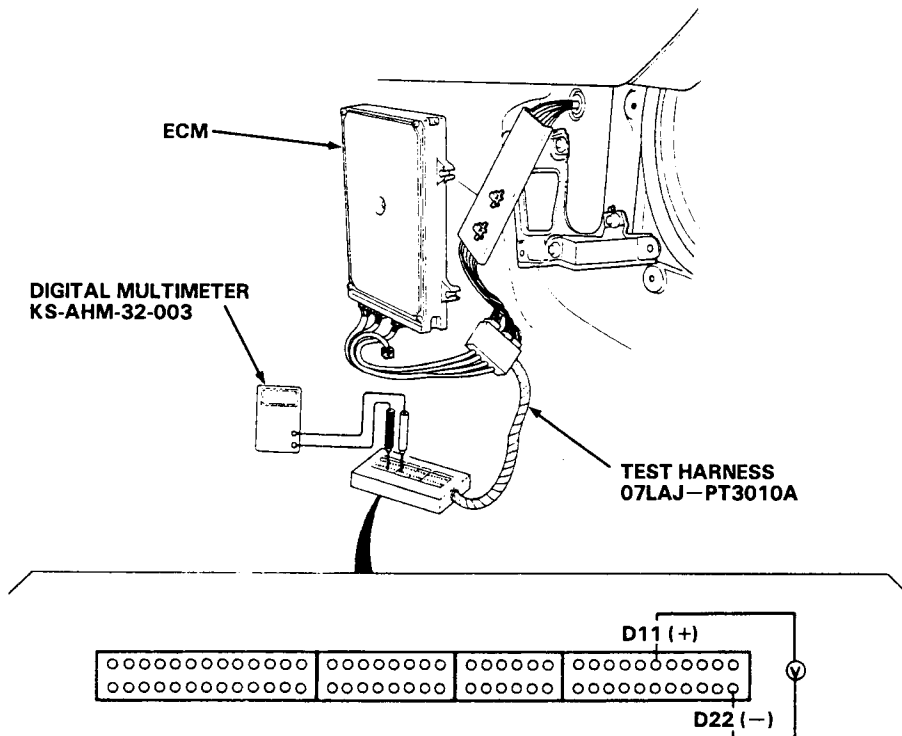
Warm up the engine to operating temperature (the cooling fan comes on).

1. Apply parking brake and block the wheels. Start the engine, then move the selector lever to **D4** position while depressing the brake pedal. Depress the accelerator pedal, and release it suddenly. Engine should not stall.
2. Repeat same test in **D3** position.
3. Shift the selector lever to **D4** position and check that the shift points occur at approximate speeds shown. Also check for abnormal noise and clutch slippage.

**NOTE:**

Throttle position sensor voltage represents the throttle opening.

- 1. Connect the Test Harness between the ECM and connector (see section 11).
- 2. Set the digital multimeter to check voltage between D11 (+) terminal and D22 (–) terminal for the throttle position sensor.



D15B7 engine: ☐ D4 or ☐ D3 Position

• Upshift

Throttle Opening	Unit of speed	1st → 2nd	2nd → 3rd	3rd → 4th
Full-closed throttle	Km/h	15–19	35–39	49–53
	mph	9–12	22–24	30–33
Throttle position sensor voltage: 1.27V	Km/h	20–24	45–49	63–69
	mph	12–15	28–30	39–43
Throttle position sensor voltage: 2.03V	Km/h	25–33	57–69	80–92
	mph	16–21	35–43	50–57
Full-opened throttle	Km/h	49–53	92–99	146–157
	mph	30–33	57–62	91–98

• Downshift

Throttle Opening	Unit of speed	4th → 3rd	3rd → 2nd	2nd → 1st
Full-closed throttle	Km/h	—	29–33	9–13
	mph	—	18–21	6–8
Full-opened throttle	Km/h	124–135	85–92	42–46
	mph	77–84	53–57	26–29

• Lock-up

Throttle Opening	Unit of speed	D4 Position		D3 Position	
		Lock-up ON	Lock-up OFF	Lock-up ON	Lock-up OFF
Full-closed throttle	Km/h	24–27	23–26	97–103	92–98
	mph	15–17	14–16	60–64	57–61
Throttle position sensor voltage: 2.03V	Km/h	107–113	87–93	107–113	92–98
	mph	66–70	54–58	66–70	57–61
Full-opened throttle	Km/h	141–147	136–142	132–138	126–132
	mph	88–91	85–88	82–86	78–82

(cont'd)

(cont'd)

D16Z6 engine: ☐ D4 or ☐ D3 Position

• Upshift

Throttle Opening	Unit of speed	1st → 2nd	2nd → 3rd	3rd → 4th
Full-closed throttle	Km/h	15–19	35–39	49–53
	mph	9–12	22–24	30–33
Throttle position sensor voltage: 1.27V	Km/h	21–25	48–52	64–70
	mph	13–16	30–32	40–43
Throttle position sensor voltage: 2.03V	Km/h	26–34	62–74	83–95
	mph	16–21	39–46	52–59
Full-opened throttle	Km/h	57–62	106–113	155–165
	mph	35–39	66–70	96–103

• Downshift

Throttle Opening	Unit of speed	4th → 3rd	3rd → 2nd	2nd → 1st
Full-closed throttle	Km/h	—	29–33	9–13
	mph	—	18–21	6–8
Full-opened throttle	Km/h	134–154	94–102	40–44
	mph	83–90	58–63	25–27

• Lock-up

Throttle Opening	Unit of speed	D4 Position		D3 Position	
		Lock-up ON	Lock-up OFF	Lock-up ON	Lock-up OFF
Full-closed throttle	Km/h	24–27	23–26	97–103	92–98
	mph	15–17	14–16	60–64	57–61
Throttle position sensor voltage: 2.03V	Km/h	107–113	87–93	107–113	92–98
	mph	66–70	54–58	66–70	57–61
Full-opened throttle	Km/h	151–157	145–151	132–138	127–133
	mph	94–98	90–94	82–86	79–83

4. Accelerate to about 35 mph (57 km/h) so the transmission is in 4th, then shift ☐ D4 to ☐ 2 . The car should immediately begin slowing down from engine braking.

**CAUTION:**

Do not shift from ☐ D4 or ☐ D3 to ☐ 2 or ☐ 1 at speeds over 100 mph (160 km/h); you may damage the transmission.

5. Check for abnormal noise and clutch slippage in the following positions.

☐ 1 (1st Gear) Position

- 1. Accelerate from a stop at full throttle. Check that there is no abnormal noise or clutch slippage.
- 2. Upshifts should not occur with the selector in this position.

☐ 2 (2nd Gear) Position

- 1. Accelerate from a stop at full throttle. Check that there is no abnormal noise or clutch slippage.
- 2. Upshifts and downshifts should not occur with the selector in this position.

☐ R (Reverse) Position

Accelerate from a stop at full throttle, and check for abnormal noise and clutch slippage.

6. Test in ☐ P (Parking) Position

Park car on slope (approx. 16°), apply the parking brake, and shift into ☐ P position. Release the brake; the car should not move.



### Test

**CAUTION:**

- To prevent transmission damage, do not test stall speed for more than 10 seconds at a time.
- Do not shift the lever while raising the engine speed.
- Be sure to remove the pressure gauge before testing stall speed.

1. Engage the parking brake and block all four wheels.
2. Connect the tachometer, and start the engine.
3. Make sure the A/C switch is OFF.
4. After the engine has warmed up to normal operating temperature (the cooling fan comes on), shift into **2** position.
5. Fully depress the brake pedal and accelerator for 6 to 8 seconds, and note engine speed.
6. Allow 2 minutes for cooling, then repeat the test in **1**, **D4** and **R** positions.

**NOTE:**

- Stall speed tests should be used for diagnostic pressure only.
- Stall speed should be the same in **D4**, **2**, **1** and **R** positions.

**Stall Speed RPM: rpm**
**Specification:** 2,600 rpm

**Service Limit:** 2,400 – 2,800 rpm

TROUBLE	PROBABLE CAUSE
Stall rpm high in <b>D4</b> , <b>2</b> , <b>1</b> and <b>R</b> position	<ul style="list-style-type: none"> <li>• Low fluid level or oil pump output</li> <li>• Clogged ATF strainer</li> <li>• Pressure regulator valve stuck closed</li> <li>• Slipping clutch</li> </ul>
Stall rpm high in <b>1</b> position	<ul style="list-style-type: none"> <li>• Slippage of 1st clutch, 1st-hold clutch or 1st gear one-way clutch</li> </ul>
Stall rpm high in <b>2</b> position	<ul style="list-style-type: none"> <li>• Slippage of 2nd clutch.</li> </ul>
Stall rpm high in <b>D4</b> position	<ul style="list-style-type: none"> <li>• Slippage of 1st clutch, 1st gear one-way clutch</li> </ul>
Stall rpm high in <b>R</b> position	<ul style="list-style-type: none"> <li>• Slippage of 4th clutch</li> </ul>
Stall rpm low in <b>D4</b> , <b>2</b> , <b>1</b> and <b>R</b> position	<ul style="list-style-type: none"> <li>• Engine output low</li> <li>• Torque converter one-way clutch slipping</li> </ul>

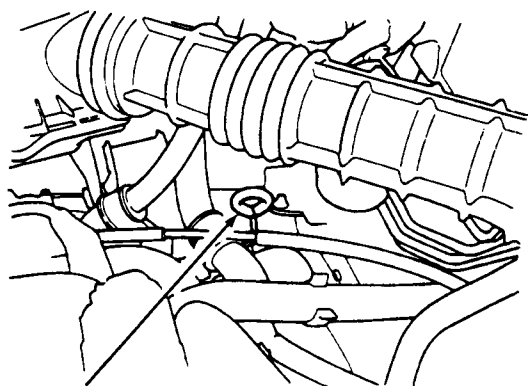
### Checking/Changing

#### Checking

##### NOTE:

Check the fluid level with the engine at normal operating temperature (the cooling fan comes on).

1. Park the car on level ground. Shut off the engine.
2. Remove the dipstick (yellow loop) from the transmission and wipe it with a clean cloth.
3. Insert the dipstick into the transmission.



DIPSTICK (YELLOW LOOP)

4. Remove the dipstick and check the fluid level. It should be between the upper and lower marks.



UPPER MARK  
LOWER MARK

5. If the level is below the lower mark, add fluid into the tube to bring it to the upper mark. Use Honda Premium Formula Automatic Transmission Fluid or an equivalent DEXRON® II Automatic Transmission Fluid (ATF) only.
6. Insert the dipstick back into the transmission.

#### Changing

1. Bring the transmission up to operating temperature by driving the car. Park the car on level ground, turn the engine off, then remove drain plug.  
NOTE:

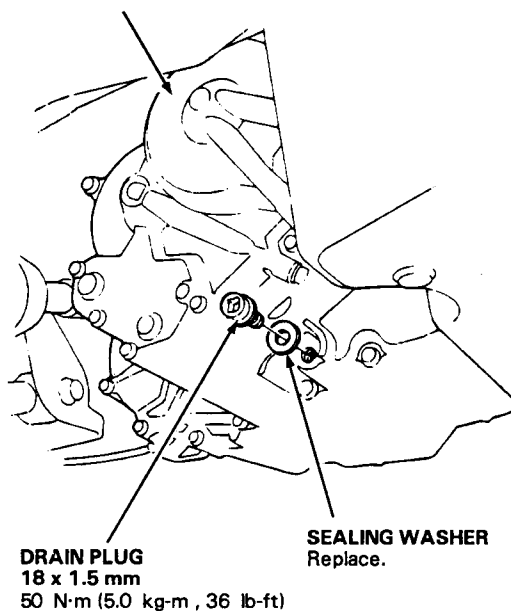
If a cooler flusher is to be used, see page 14-126 and 127.

2. Reinstall the drain plug with a new washer, then refill the transmission to the upper mark on the dipstick.

##### Automatic Transmission Fluid Capacity:

2.7 l (2.9 US qt, 2.4 Imp qt) at change  
5.9 l (6.2 US qt, 5.2 Imp qt) at overhaul

##### TRANSMISSION RIGHT SIDE COVER



DRAIN PLUG  
18 x 1.5 mm  
50 N·m (5.0 kg-m, 36 lb-ft)

SEALING WASHER  
Replace.

### ▲ WARNING

- While testing, be careful of the rotating front wheels.
- Make sure lifts, jacks, and safety stands are placed properly

### CAUTION:

Before testing, be sure the transmission fluid is filled to the proper level.

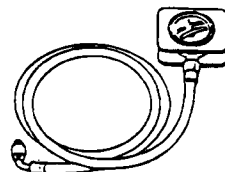
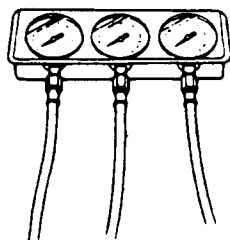
1. Raise the car
2. Warm up the engine (the cooling fan comes on), then stop the engine and connect a tachometer.
3. Connect the oil pressure gauge to each inspection hole (s).

**TORQUE:** 18 N·m (1.8 kg-m , 13 lb-ft)

### CAUTION:

Connect the oil pressure gauge securely; be sure not to allow dust and other foreign particles to enter the inspection hole.

A/T OIL PRESSURE GAUGE SET  
07406-0020003



A/T LOW PRESSURE GAUGE  
07406-0070000

4. Start the engine and measure the respective pressure as follows.
  - Line Pressure
  - Clutch Pressure
  - Clutch Low/High Pressure
  - Throttle A/Throttle B Pressure
  - Governor Pressure
5. Install a new washer and the sealing bolt in the inspection hole and tighten to the specified torque.

**TORQUE:** 18 N·m (1.8 kg-m , 13 lb-ft)

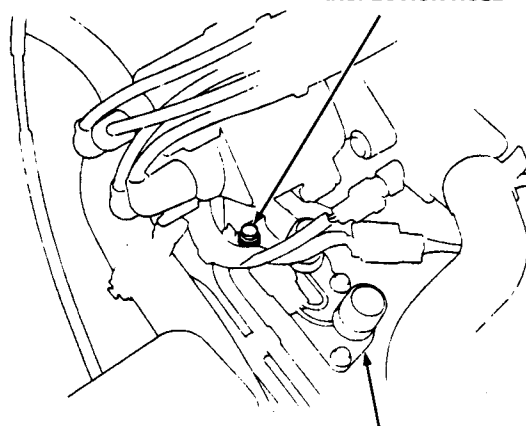
### NOTE:

Do not reuse old aluminum washers.

### • Line Pressure

- 1. Set the parking brake and block both rear wheels securely.
- 2. Run the engine at 2,000 rpm.
- 3. Shift the select lever to **N** or **P** position.
- 4. Measure line pressure.

LINE PRESSURE  
INSPECTION HOLE



LOCK-UP CONTROL  
SOLENOID VALVE ASSEMBLY

PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE		
					Standard	Service Limit
Line	<b>N</b> or <b>P</b>	No (or low) line pressure	Torque converter, oil pump pressure regulator, torque converter check valve, oil pump.	D15B7 engine	800—850 kPa (8.0—8.5 kg/cm <sup>2</sup> , 114—121 psi)	750 kPa (7.5 kg/cm <sup>2</sup> , 107 psi)
				D16Z6 engine	850—900 kPa (8.5—9.0 kg/cm <sup>2</sup> , 121—128 psi)	800 kPa (8.0 kg/cm <sup>2</sup> , 114 psi)

### NOTE:

Higher pressures may be indicated if measurements are made in selector positions other than **N** or **P** position.

(cont'd)

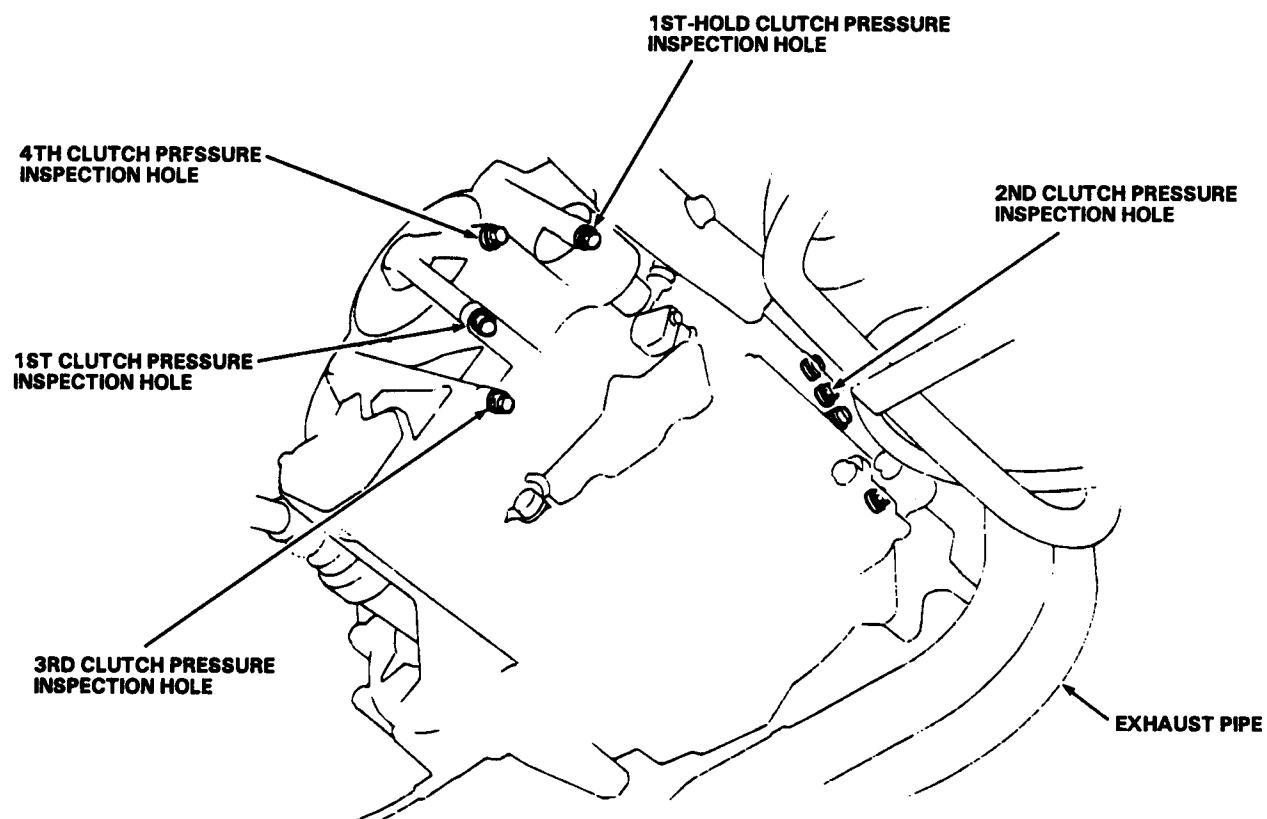
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## • Clutch Pressure Measurement

### ▲WARNING:

While testing, be careful of the rotating front wheels.

- 1. Set the parking brake and block both rear wheels securely.
- 2. Raise the front of the car and support with safety stands.
- 3. Allow the front wheels to rotate freely.
- 4. Run the engine at 2,000 rpm.
- 5. Measure each clutch pressure.



## • D15B7 engine

PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
1st Clutch	1 or D4	No or low 1st pressure	1st Clutch	800—850 kPa (8.0—8.5 kg/cm <sup>2</sup> , 114—121 psi)	750 kPa (7.5 kg/cm <sup>2</sup> , 107 psi)
1st-hold Clutch	1	No or low 1st-hold pressure	1st-hold Clutch		
2nd Clutch	2	No or low 2nd pressure	2nd Clutch		
2nd Clutch	D4	No or low 2nd pressure	2nd Clutch	400 kPa (4.0 kg/cm <sup>2</sup> , 57 psi) (throttle fully closed) 800—850 kPa (8.0—8.5 kg/cm <sup>2</sup> , 114—121 psi) (throttle more than 1/8 opened)	350 kPa (3.5 kg/cm <sup>2</sup> , 50 psi) (throttle fully closed) 750 kPa (7.5 kg/cm <sup>2</sup> , 107 psi) (throttle more than 1/8 opened)
3rd Clutch		No or low 3rd pressure	3rd Clutch		
4th Clutch		No or low 4th pressure	4th Clutch		
	R		Servo Valve or 4th Clutch	800—850 kPa (8.0—8.5 kg/cm <sup>2</sup> , 114—121 psi)	750 kPa (7.5 kg/cm <sup>2</sup> , 107 psi)

## • D16Z6 engine

PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
1st Clutch	1 or D4	No or low 1st pressure	1st Clutch	850—900 kPa (8.5—9.0 kg/cm <sup>2</sup> , 121—128 psi)	800 kPa (8.0 kg/cm <sup>2</sup> , 114 psi)
1st-hold Clutch	1	No or low 1st-hold pressure	1st-hold Clutch		
2nd Clutch	2	No or low 2nd pressure	2nd Clutch		
2nd Clutch	D4	No or low 2nd pressure	2nd Clutch	400 kPa (4.0 kg/cm <sup>2</sup> , 57 psi) (throttle fully closed) 850—900 kPa (8.5—9.0 kg/cm <sup>2</sup> , 121—128 psi) (throttle more than 1/8 opened)	350 kPa (3.5 kg/cm <sup>2</sup> , 50 psi) (throttle fully closed) 800 kPa (8.0 kg/cm <sup>2</sup> , 114 psi) (throttle more than 1/8 opened)
3rd Clutch		No or low 3rd pressure	3rd Clutch		
4th Clutch		No or low 4th pressure	4th Clutch		
	R		Servo Valve or 4th Clutch	850—900 kPa (8.5—9.0 kg/cm <sup>2</sup> , 121—128 psi)	800 kPa (8.0 kg/cm <sup>2</sup> , 114 psi)

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## • Clutch Low/High Pressure Measurement

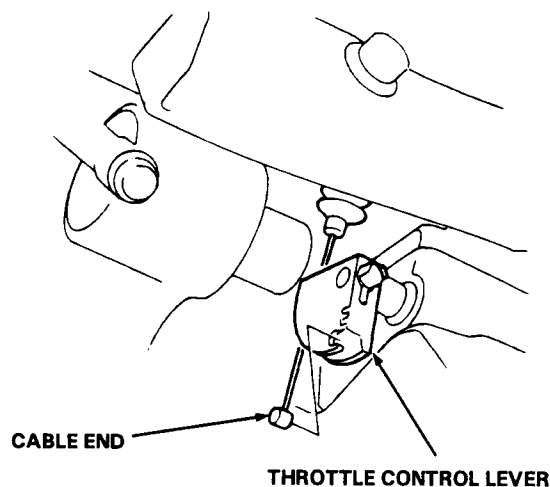
### ▲ WARNING

While testing, be careful of the rotating front wheels.

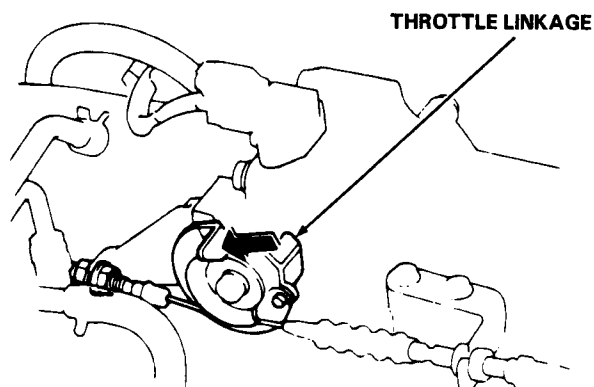
- 1. Allow the front wheels to rotate freely.
- 2. Remove the cable end of the throttle control cable from the throttle control lever.

### NOTE:

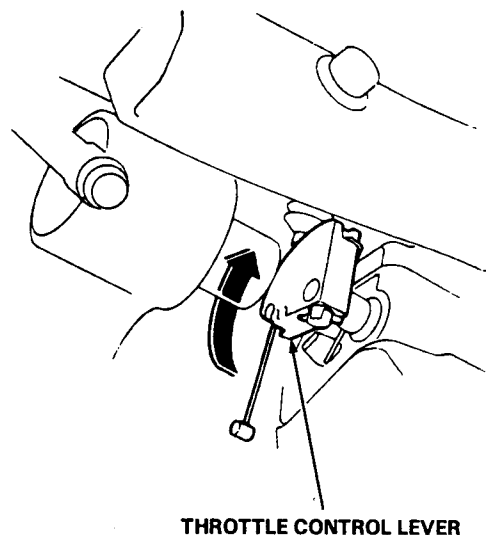
Do not loosen the locknuts, simply unhook the cable end.

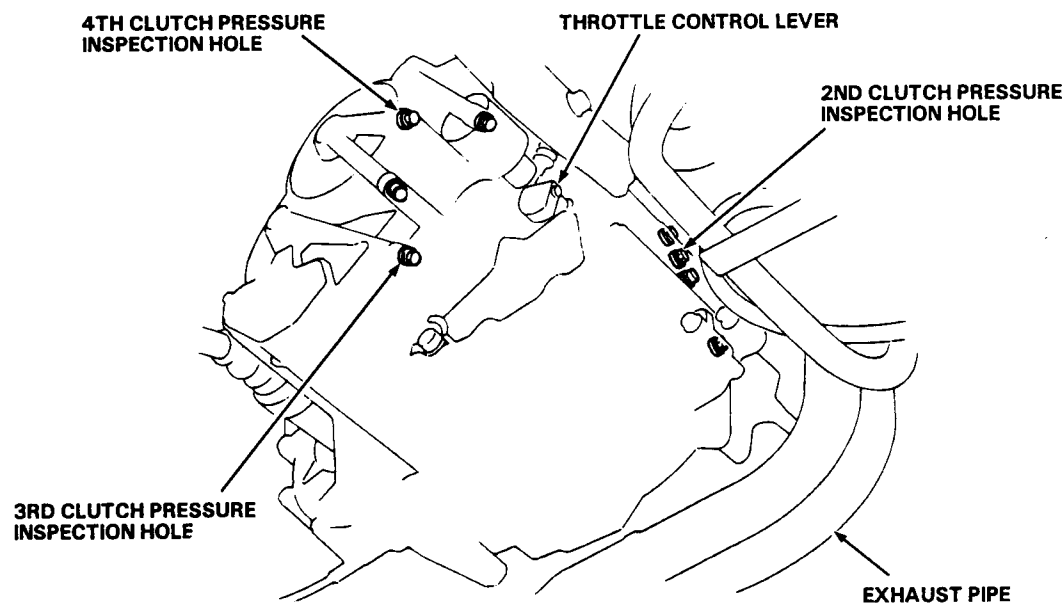


- 3. Start the engine and let it idle.
- 4. Shift the select lever to **D<sub>4</sub>** position.
- 5. Slowly move the throttle linkage to increase engine rpm until pressure is indicated on the oil pressure gauge. Then release the throttle linkage, allowing the engine to return to an idle, and measure the pressure reading.



- 6. With the engine idling, lift the throttle control lever up approximately 1/2 of its possible travel and increase the engine rpm until pressure is indicated on the gauge, then measure the highest pressure reading obtained.
- 7. Repeat steps 5 and 6 for each clutch pressure being inspected.





## • D15B7 engine

PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
2nd Clutch	D4	No or low 2nd pressure	2nd Clutch	400—850 kPa (4.0—8.5 kg/cm <sup>2</sup> , 57—121 psi) varies with throttle opening	350 kPa (3.5 kg/cm <sup>2</sup> , 50 psi) with throttle control lever released 750 kPa (7.5 kg/cm <sup>2</sup> , 107 psi) with throttle control lever more than 1/8 opened
3rd Clutch		No or low 3rd pressure	3rd Clutch		
4th Clutch		No or low 4th pressure	4th Clutch		

## • D16Z6 engine

PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
2nd Clutch	D4	No or low 2nd pressure	2nd Clutch	400—900 kPa (4.0—9.0 kg/cm <sup>2</sup> , 57—128 psi) varies with throttle opening	350 kPa (3.5 kg/cm <sup>2</sup> , 50 psi) with throttle control lever released 800 kPa (8.0 kg/cm <sup>2</sup> , 114 psi) with throttle control lever more than 1/8 opened
3rd Clutch		No or low 3rd pressure	3rd Clutch		
4th Clutch		No or low 4th pressure	4th Clutch		

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## • Throttle A/Throttle B Pressure Measurement

### ▲ WARNING

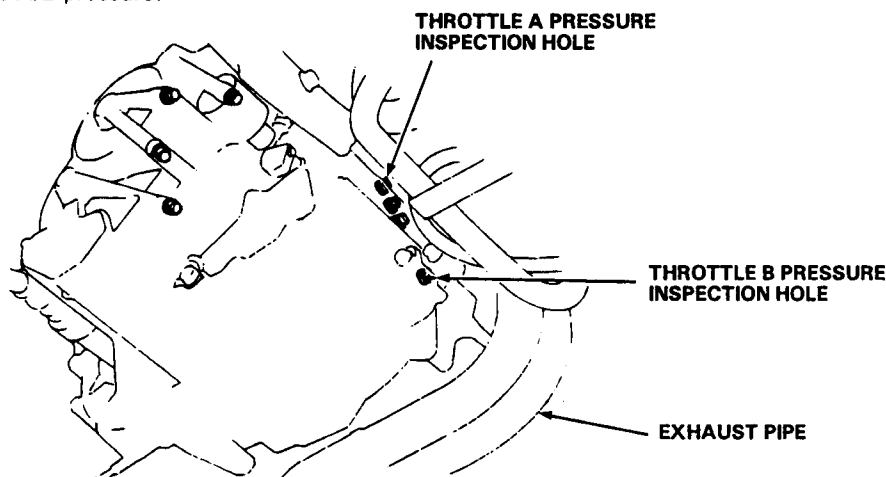
While testing, be careful of the rotating front wheels.

- 1. Allow the front wheels to rotate freely.
- 2. Remove the cable end of the throttle control cable from the throttle control lever.

### NOTE:

Do not loosen the locknuts, simply unhook the cable end.

- 3. Shift the selector lever to **D4** or **D3** position.
- 4. Run the engine at 1,000 rpm.
- 5. Measure full-closed throttle A/B pressure.
- 6. Move the throttle control lever to full-opened throttle position.
- 7. Measure full-opened throttle A/B pressure.



PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
Throttle A	D4 or D3	Pressure too high	Throttle Valve A Modulator valve	0 — 5 kPa (0.05 kg/cm <sup>2</sup> , 0.7 psi) throttle full closed	
		No or low Throttle A pressure		485—500 kPa (4.85—5.0 kg/cm <sup>2</sup> , 69—71 psi) throttle full opened	
Throttle B	D4 or D3	Pressure too high	Throttle Valve B	0 — 15 kPa (0.15 kg/cm <sup>2</sup> , 2.1 psi) throttle full closed	
		No or low Throttle B pressure		D15B7 engine	800—850 kPa (8.0—8.5 kg/cm <sup>2</sup> , 114—121 psi) throttle full opened
				D16Z6 engine	850—900 kPa (8.5—9.0 kg/cm <sup>2</sup> , 121—128 psi) throttle full opened

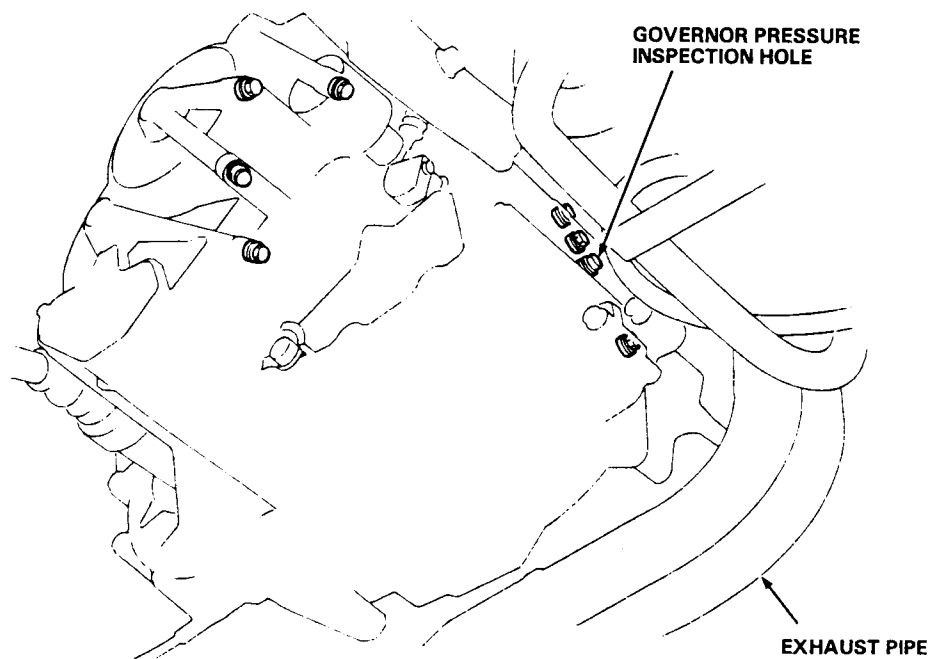


## • Governor Pressure Measurement

### ⚠ WARNING

While testing, be careful of the rotating front wheels.

- 1. Allow the front wheels to rotate freely.
- 2. Run the vehicle at 38 mph (60 km/h).
- 3. Measure the governor pressure.



PRESSURE	SELECTOR POSITION	SYMPTOM	PROBABLE CAUSE	FLUID PRESSURE	
				Standard	Service Limit
Governor	D4 or D3	No or low governor pressure	Governor Valve	182—192 kPa (1.82—1.92 kg/cm <sup>2</sup> , 26—27 psi)	177 kPa (1.77 kg/cm <sup>2</sup> , 25 psi)

## Removal

## Transmission

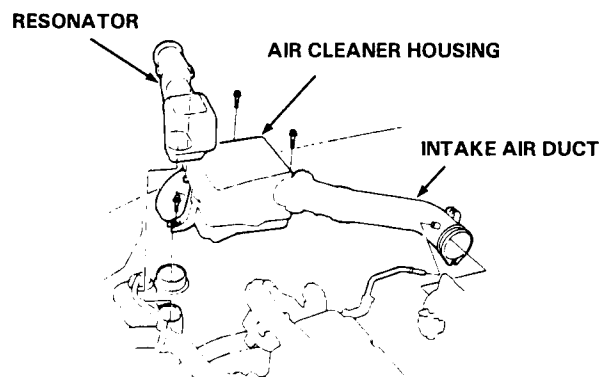
### ▲WARNING

- Make sure lifts, jacks and safety stands are placed properly, and hoist brackets are attached to the correct position on the engine
- Apply parking brake and block rear wheels, so car will not roll off stands and fall on you while working under it.

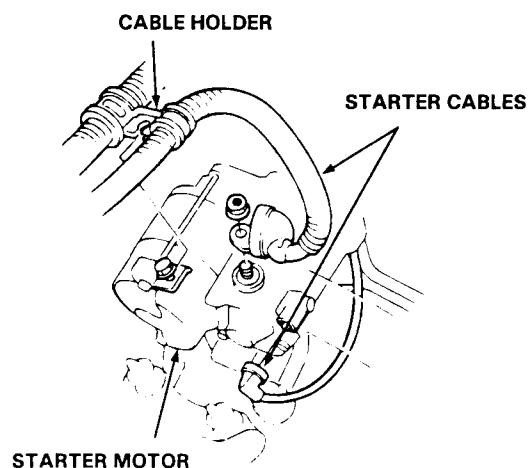
### CAUTION:

Use fender covers to avoid damaging painted surfaces.

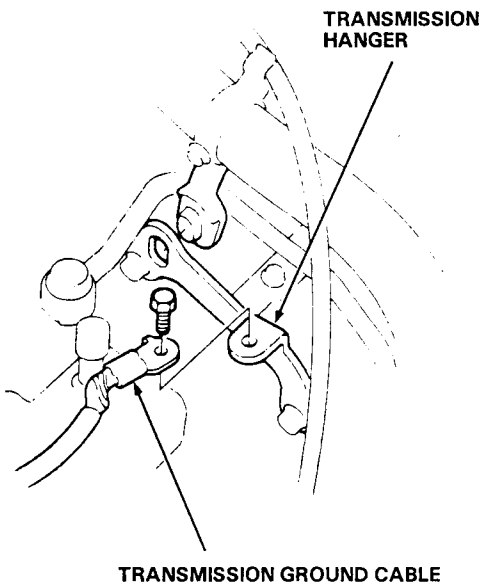
1. Disconnect the battery negative (–) and positive (+) cables from the battery.
2. Remove the resonator, intake air duct and air cleaner housing.



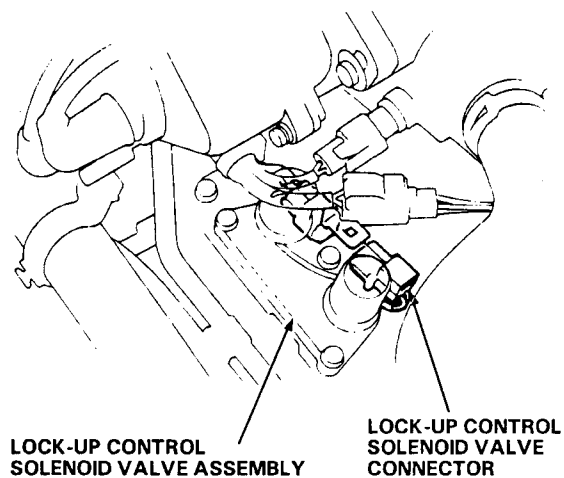
3. Remove the starter motor cables and cable holder from the starter motor.



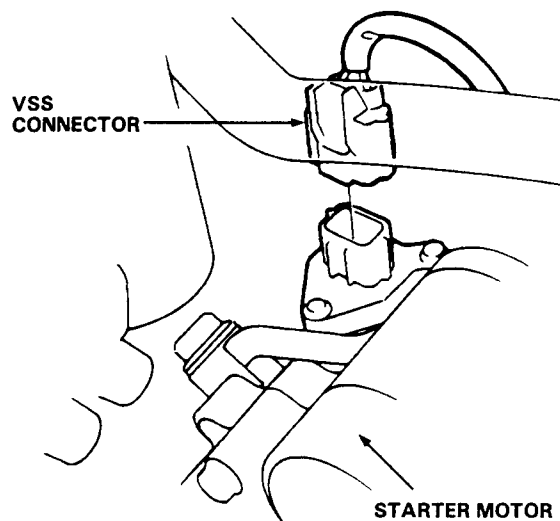
4. Remove the transmission ground cable from the transmission hanger.



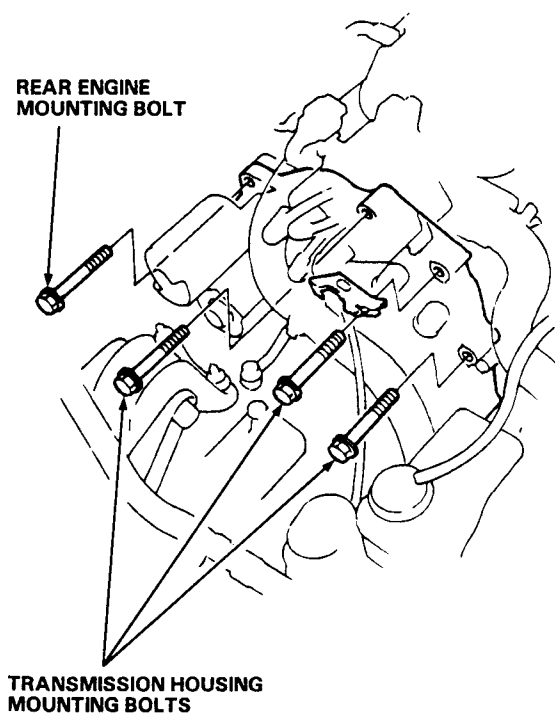
5. Disconnect the lock-up control solenoid valve connector.



6. Disconnect the vehicle speed sensor (VSS) connector.

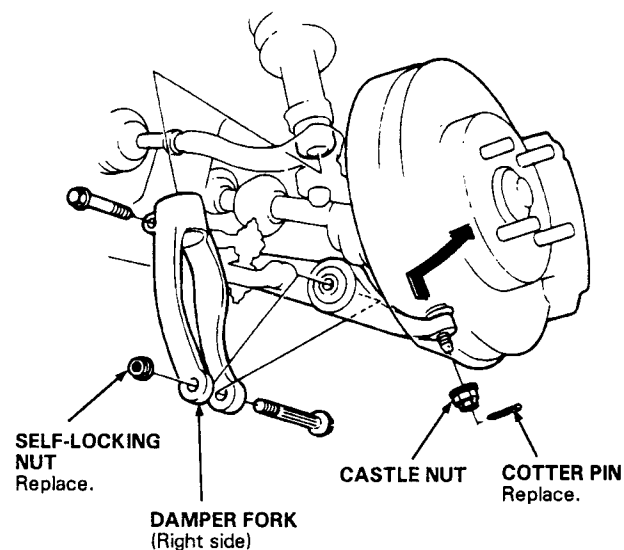


7. Remove the transmission housing mounting bolts and rear engine mounting bolt.



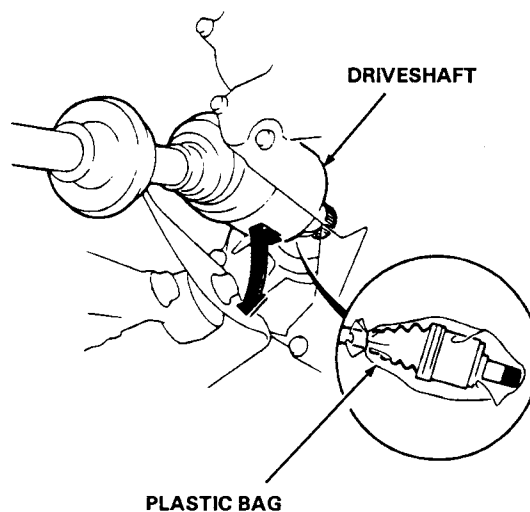
8. Remove the drain plug and drain the automatic transmission fluid (ATF). Reinstall the drain plug with a new sealing washer (see page 14-50).

9. Remove the cotter pins and castle nuts, then separate the ball joints from the lower arm (see section 18).
10. Remove right damper fork bolt, then separate right damper fork and damper.



11. Pry the right and left driveshafts out of the differential.
12. Pull on the inboard joint and remove the right and left driveshafts (see section 16).
13. Tie plastic bags over the driveshaft ends.

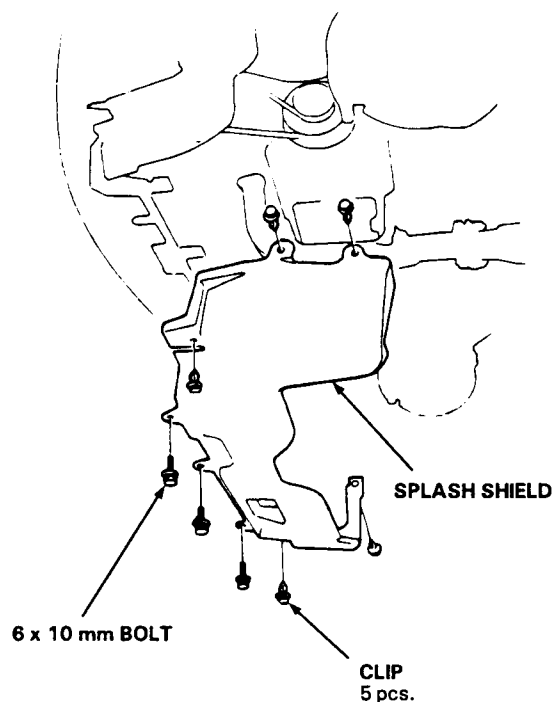
**NOTE:**  
Coat all precision finished surfaces with clean engine oil or grease.



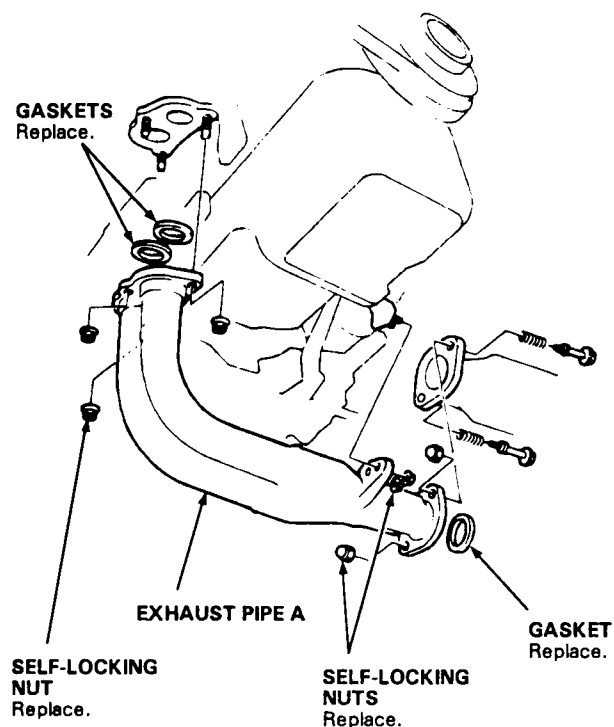
(cont'd)

## Removal (cont'd)

14. Remove the splash shield.



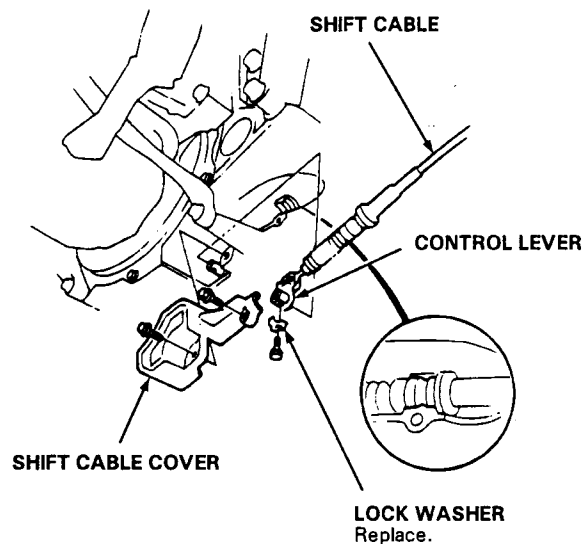
15. Remove the exhaust pipe A.



16. Remove the shift cable cover, then remove the shift cable by removing the control lever.

### CAUTION:

Take care not to bend the shift control cable while removing it.

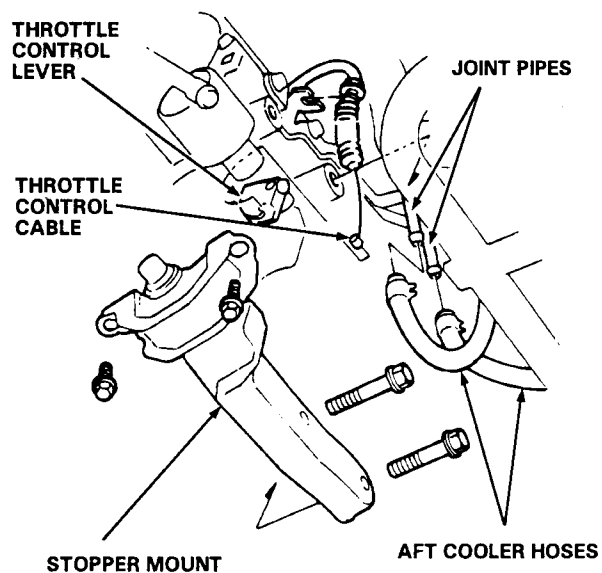


17. Remove the stopper mount, then remove the end of the throttle control cable from the throttle control lever.

18. Remove the ATF cooler hoses at the joint pipes. Turn the ends of the cooler hoses up to prevent ATF from flowing out, then plug the joint pipes.

### NOTE:

Check for any signs of leakage at the hose joints.

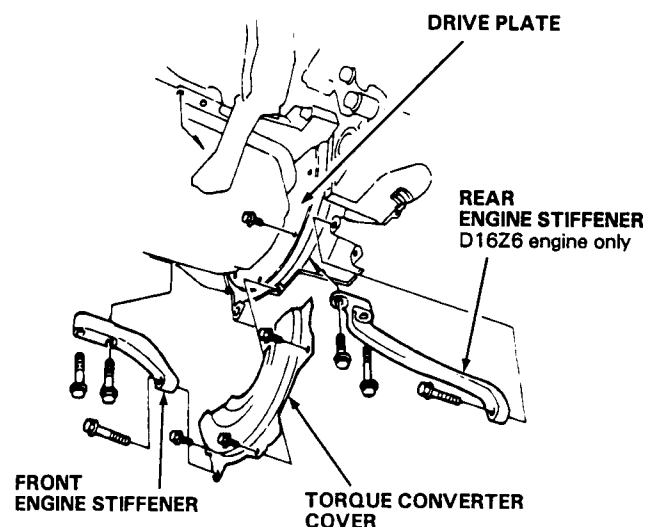


19. Remove the engine stiffeners and torque converter cover.

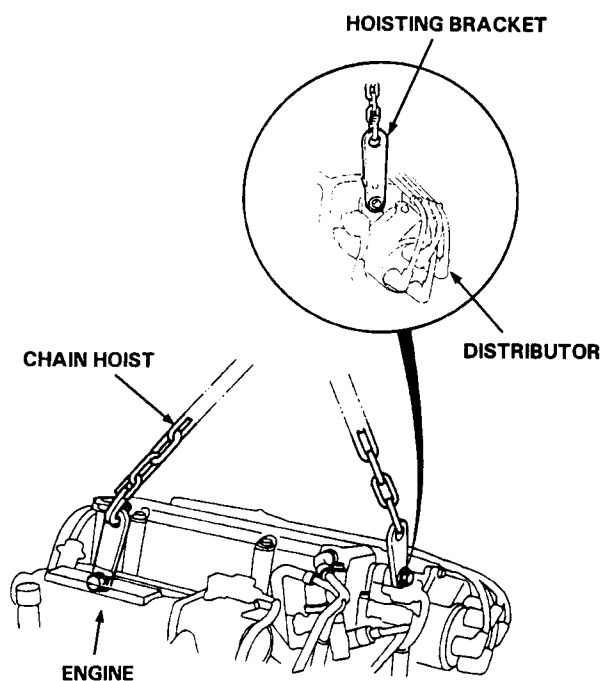
**NOTE:**

Only the D16Z6 engine uses a rear engine stiffener.

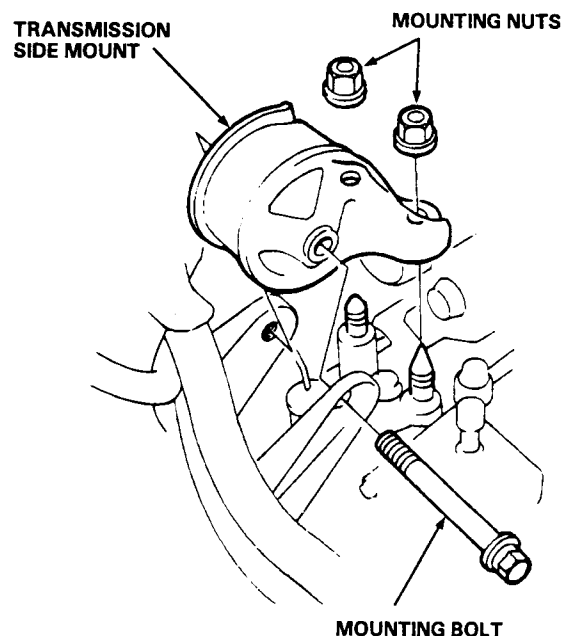
20. Remove the 8 drive plate bolts one at a time while rotating the crankshaft pulley.



21. Attach a hoisting bracket to the engine using the distributor mounting bolt, then lift the engine slightly.

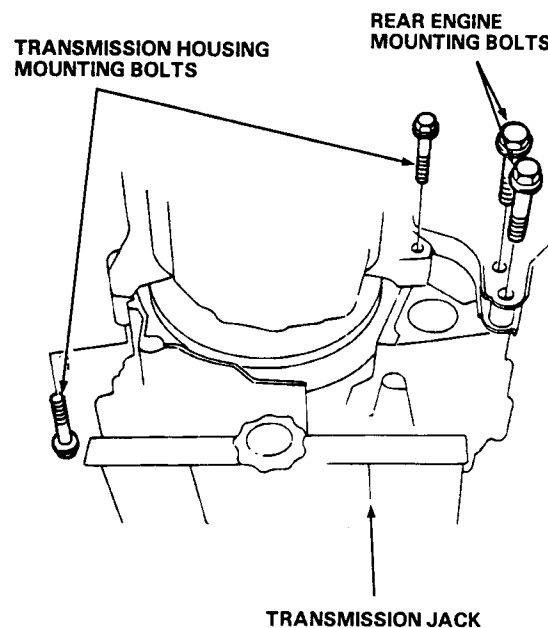


22. Place a jack under the transmission and raise the transmission just enough to take weight off of the mounts, then remove the transmission side mount.



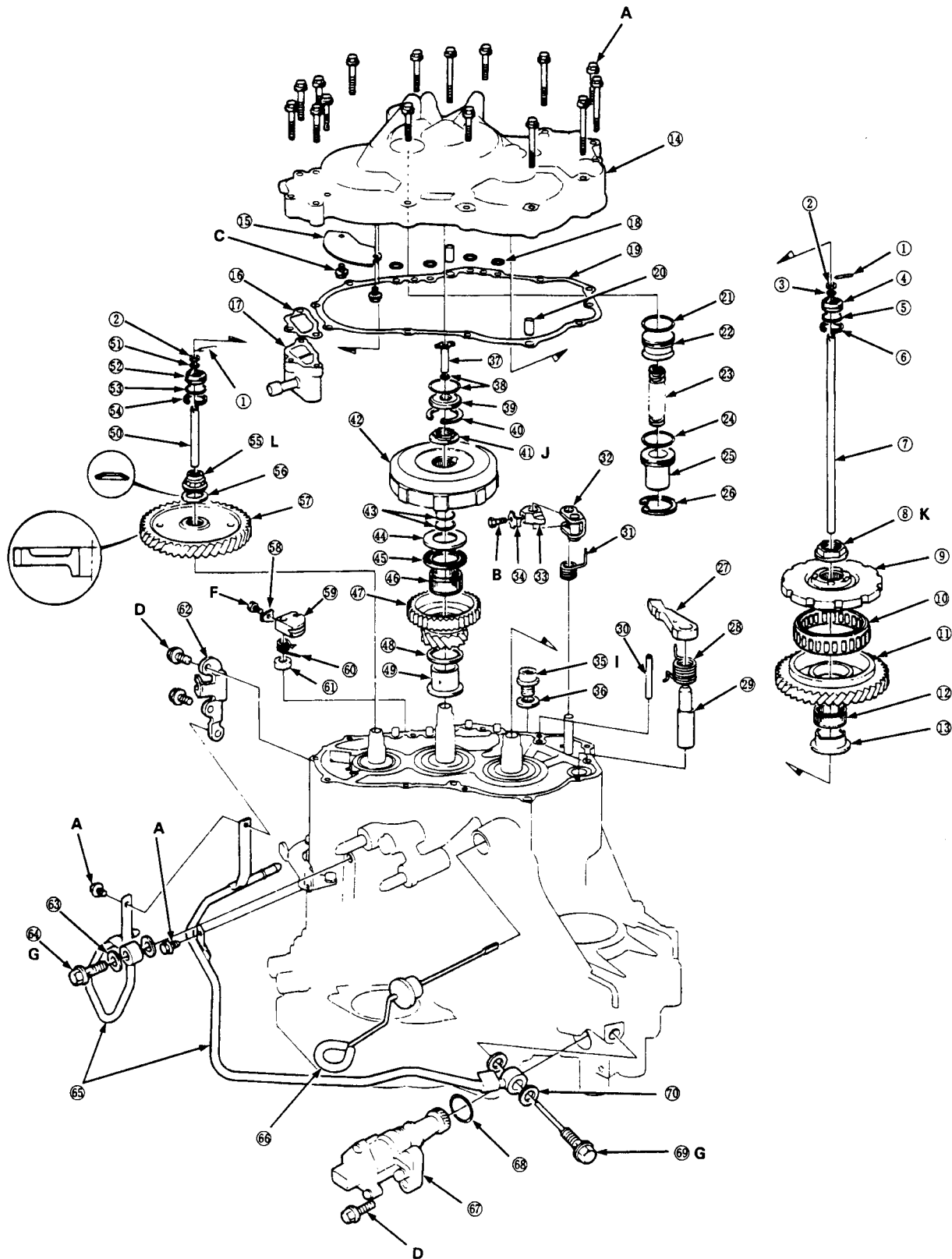
23. Remove the transmission housing mounting bolts and rear engine mounting bolts.

24. Pull the transmission away from the engine until it clears the 14 mm dowel pins, then lower it on the transmission jack.



## Illustrated Index

### Right Side Cover

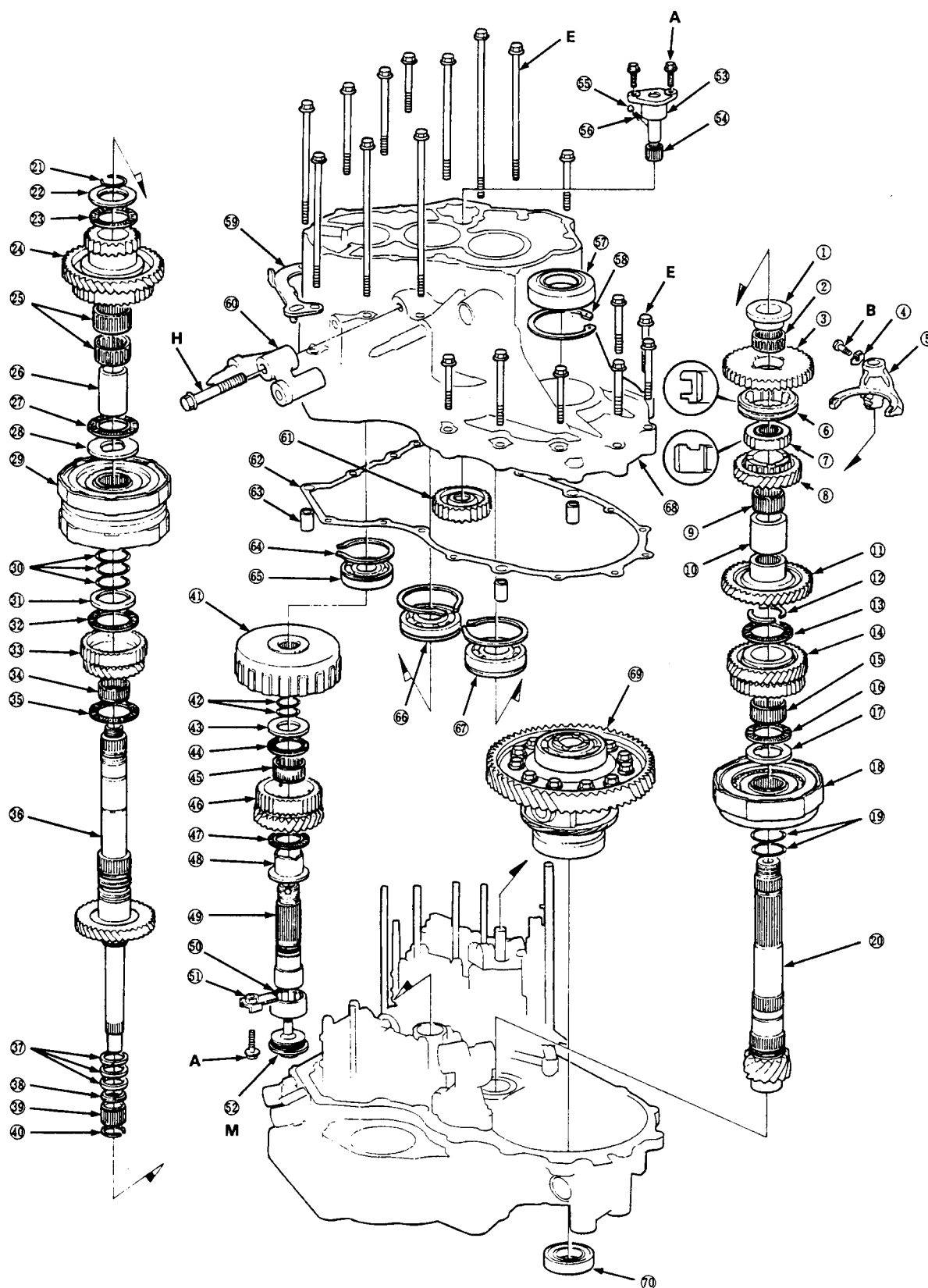


- |   |  |   |  |   |   |
|---|--|---|--|---|---|
| ① | ROLLER                                     | ③ | O-RING Replace.                            | ③ | 1ST CLUTCH FEED PIPE                    |
| ② | COLLAR                                     | ④ | FEED PIPE FLANGE                           | ④ | O-RINGS Replace.                        |
| ③ | O-RING Replace.                            | ⑤ | O-RING Replace.                            | ⑤ | FEED PIPE GUIDE                         |
| ④ | FEED PIPE FLANGE                           | ⑥ | CIRCLIP                                    | ⑥ | CIRCLIP                                 |
| ⑤ | O-RING Replace.                            | ⑦ | 3RD CLUTCH FEED PIPE                       | ⑦ | MAINSHAFT LOCKNUT (FLANGE NUT) Replace. |
| ⑥ | CIRCLIP                                    | ⑧ | COUNTERSHAFT LOCKNUT (FLANGE NUT) Replace. | ⑧ | 1ST CLUTCH ASSEMBLY                     |
| ⑦ | 3RD CLUTCH FEED PIPE                       | ⑨ | PARKING GEAR                               | ⑨ | O-RINGS Replace.                        |
| ⑧ | COUNTERSHAFT LOCKNUT (FLANGE NUT) Replace. | ⑩ | ONE-WAY CLUTCH ASSEMBLY                    | ⑩ | THRUST WASHER                           |
| ⑨ | PARKING GEAR                               | ⑪ | COUNTERSHAFT 1ST GEAR                      | ⑪ | THRUST NEEDLE BEARING                   |
| ⑩ | ONE-WAY CLUTCH ASSEMBLY                    | ⑫ | NEEDLE BEARING                             | ⑫ | NEEDLE BEARING                          |
| ⑪ | COUNTERSHAFT 1ST GEAR                      | ⑬ | COUNTERSHAFT 1ST GEAR COLLAR               | ⑬ | MAINSHAFT 1ST GEAR                      |
| ⑫ | NEEDLE BEARING                             | ⑭ | RIGHT SIDE COVER                           | ⑭ | THRUST WASHER                           |
| ⑬ | COUNTERSHAFT 1ST GEAR COLLAR               | ⑮ | BREATHER COVER                             | ⑮ | MAINSHAFT 1ST GEAR COLLAR               |
| ⑭ | RIGHT SIDE COVER                           | ⑯ | BREATHER CHAMBER GASKET Replace.           | ⑯ | 1ST-HOLD CLUTCH FEED PIPE               |
| ⑮ | BREATHER COVER                             | ⑰ | BREATHER CHAMBER                           | ⑰ | O-RING Replace.                         |
| ⑯ | BREATHER CHAMBER GASKET Replace.           | ⑱ | O-RINGS Replace.                           | ⑱ | FEED PIPE GUIDE                         |
| ⑰ | BREATHER CHAMBER                           | ⑲ | RIGHT SIDE COVER GASKET Replace.           | ⑲ | O-RING Replace.                         |
| ⑱ | O-RINGS Replace.                           | ⑳ | DOWEL PINS                                 | ⑳ | CIRCLIP                                 |
| ⑲ | RIGHT SIDE COVER GASKET Replace.           | ㉑ | O-RING Replace.                            | ㉑ | SUB-SHAFT LOCKNUT (FLANGE NUT) Replace. |
| ⑳ | DOWEL PINS                                 | ㉒ | 1ST-HOLD ACCUMULATOR PISTON                | ㉒ | SUB-SHAFT DISC SPRING Replace.          |
| ㉑ | O-RING Replace.                            | ㉓ | 1ST-HOLD ACCUMULATOR SPRING                | ㉓ | SUB-SHAFT 1ST GEAR                      |
| ㉒ | 1ST-HOLD ACCUMULATOR PISTON                | ㉔ | O-RING Replace.                            | ㉔ | LOCK WASHER Replace.                    |
| ㉓ | 1ST-HOLD ACCUMULATOR SPRING                | ㉕ | 1ST-HOLD ACCUMULATOR COVER                 | ㉕ | THROTTLE CONTROL LEVER                  |
| ㉔ | O-RING Replace.                            | ㉖ | SNAP RING                                  | ㉖ | THROTTLE CONTROL LEVER SPRING           |
| ㉕ | 1ST-HOLD ACCUMULATOR COVER                 | ㉗ | PARKING BRAKE PAWL                         | ㉗ | OIL SEAL Replace.                       |
| ㉖ | SNAP RING                                  | ㉘ | PARKING BRAKE PAWL SPRING                  | ㉘ | THROTTLE CONTROL CABLE HOLDER           |
| ㉗ | PARKING BRAKE PAWL                         | ㉙ | PARKING BRAKE PAWL SHAFT                   | ㉙ | SEALING WASHERS Replace.                |
| ㉘ | PARKING BRAKE PAWL SPRING                  | ㉚ | PARKING BRAKE PAWL STOPPER                 | ㉚ | ATF COOLER PIPE JOINT BOLT              |
| ㉙ | PARKING BRAKE PAWL SHAFT                   | ㉛ | PARKING BRAKE LEVER SPRING                 | ㉛ | ATF COOLER PIPES                        |
| ㉚ | PARKING BRAKE PAWL STOPPER                 | ㉜ | PARKING BRAKE LEVER                        | ㉜ | ATF LEVEL GAUGE                         |
| ㉛ | PARKING BRAKE LEVER SPRING                 | ㉝ | PARKING BRAKE STOPPER                      | ㉝ | VEHICLE SPEED SENSOR                    |
| ㉜ | PARKING BRAKE LEVER                        | ㉞ | LOCK WASHER Replace.                       | ㉞ | O-RING Replace.                         |
| ㉝ | PARKING BRAKE STOPPER                      | ㉟ | DRAIN PLUG                                 | ㉟ | ATF COOLER PIPE JOINT BOLT              |
| ㉞ | LOCK WASHER Replace.                       | ㊱ | SEALING WASHER Replace.                    | ㊱ | SEALING WASHERS Replace.                |
| ㉟ | DRAIN PLUG                                 |   |  |   |   |
| ㊱ | SEALING WASHER Replace.                    |   |  |   |   |

## TORQUE SPECIFICATIONS

Ref No.	Torque Value	Bolt Size	Remarks
A	12 N·m (1.2 kg-m , 9 lb-ft)	6 x 1.0 mm	Special bolt
B	14 N·m (1.4 kg-m , 10 lb-ft)	6 x 1.0 mm	
C	11 N·m (1.1 kg-m , 8 lb-ft)	6 x 1.0 mm	
D	22 N·m (2.2 kg-m , 16 lb-ft)	8 x 1.25 mm	
F	8 N·m (0.8 kg-m , 5.8 lb-ft)	5 x 0.8 mm	ATF cooler pipe joint bolt
G	29 N·m (2.9 kg-m , 21 lb-ft)	12 x 1.25 mm	
I	50 N·m (5.0 kg-m , 36 lb-ft)	18 x 1.5 mm	
J	95 N·m (9.5 kg-m , 69 lb-ft)	19 x 1.25 mm	
K	140 N·m (14.0 kg-m , 101 lb-ft) → 0 →	23 x 1.25 mm	Left-hand threads
L	140 N·m (14.0 kg-m , 101 lb-ft)	19 x 1.25 mm	Countershaft locknut (flange nut)
	95 N·m (9.5 kg-m , 69 lb-ft)		Sub-shaft locknut (flange nut)

## Transmission Housing



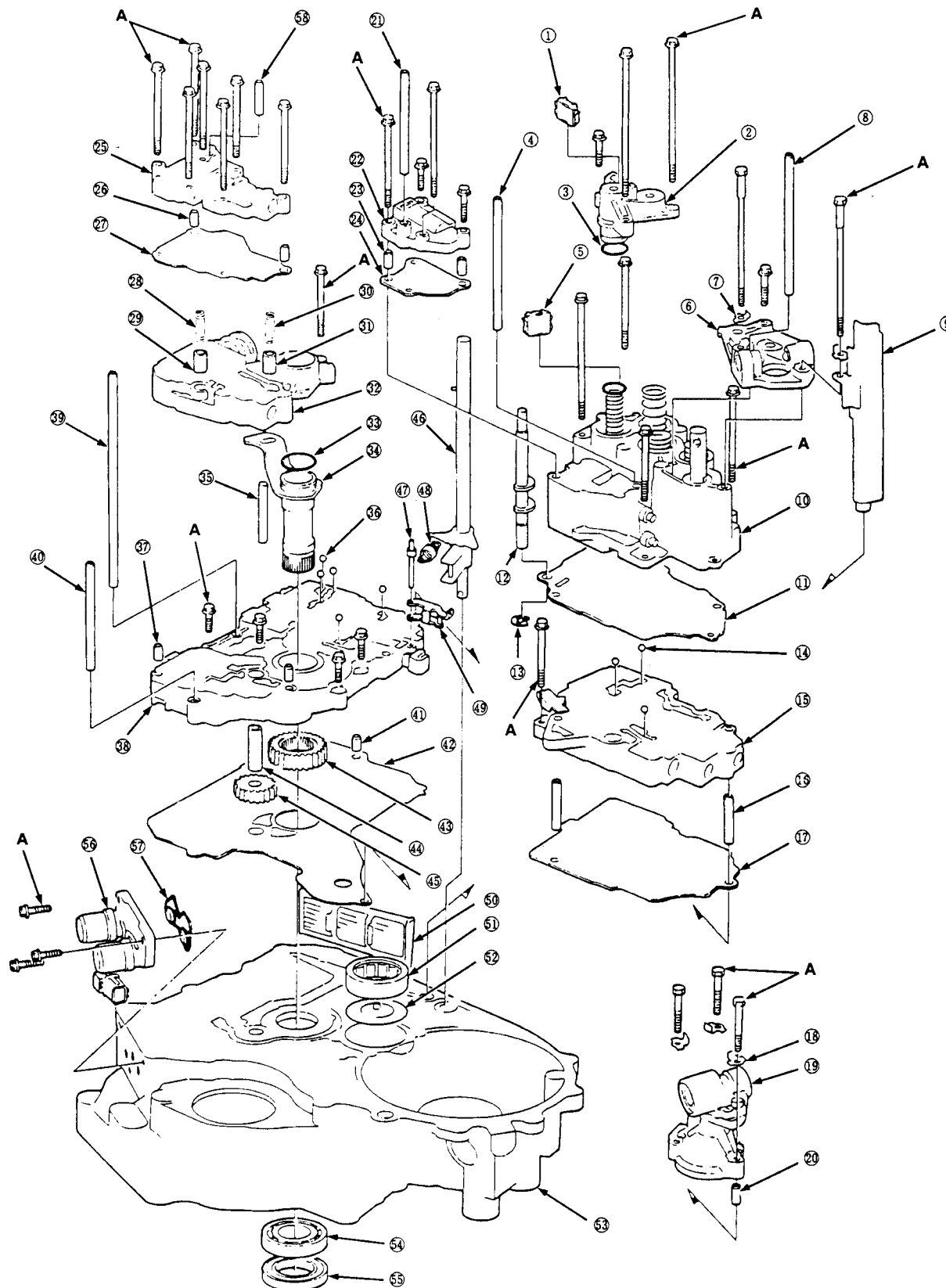


- |   |                                  |    |   |
|---|----------------------------------|----|---|
| ① | COUNTERSHAFT REVERSE GEAR COLLAR | ③⑥ | MAINSHAFT                                 |
| ② | NEEDLE BEARING                   | ③⑦ | SEALING RINGS, 35 mm                      |
| ③ | COUNTERSHAFT REVERSE GEAR        | ③⑧ | SEALING RING, 29 mm                       |
| ④ | LOCK WASHER Replace.             | ③⑨ | NEEDLE BEARING                            |
| ⑤ | REVERSE SHIFT FORK               | ④① | SET RING                                  |
| ⑥ | REVERSE SELECTOR                 | ④② | 1ST-HOLD CLUTCH ASSEMBLY                  |
| ⑦ | REVERSE SELECTOR HUB             | ④③ | O-RINGS Replace.                          |
| ⑧ | COUNTERSHAFT 4TH GEAR            | ④④ | THRUST SHIM                               |
| ⑨ | NEEDLE BEARING                   | ④⑤ | THRUST NEEDLE BEARING                     |
| ⑩ | DISTANCE COLLAR, 28 mm           | ④⑥ | NEEDLE BEARING                            |
| ⑪ | COUNTERSHAFT 2ND GEAR            | ④⑦ | SUB-SHAFT 4TH GEAR                        |
| ⑫ | COTTERS                          | ④⑧ | THRUST NEEDLE BEARING                     |
| ⑬ | THRUST NEEDLE BEARING            | ④⑨ | SUB-SHAFT 4TH GEAR COLLAR                 |
| ⑭ | COUNTERSHAFT 3RD GEAR            | ⑤① | SUB-SHAFT                                 |
| ⑮ | NEEDLE BEARING                   | ⑤② | NEEDLE BEARING                            |
| ⑯ | THRUST NEEDLE BEARING            | ⑤③ | NEEDLE BEARING STOPPER                    |
| ⑰ | SPLINED WASHER Selective part    | ⑤④ | OIL GUIDE CAP                             |
| ⑱ | 3RD CLUTCH ASSEMBLY              | ⑤⑤ | REVERSE IDLER GEAR SHAFT/HOLDER           |
| ⑲ | O-RINGS Replace.                 | ⑤⑥ | NEEDLE BEARING                            |
| ⑳ | COUNTERSHAFT                     | ⑤⑦ | STEEL BALL                                |
| ㉑ | CIRCLIP                          | ⑤⑧ | REVERSE IDLER GEAR SHAFT SPRING           |
| ㉒ | THRUST SHIM                      | ⑤⑨ | OIL SEAL Replace.                         |
| ㉓ | THRUST NEEDLE BEARING            | ⑤⑩ | THRUST SHIM, 80 mm Selective part         |
| ㉔ | MAINSHAFT 4TH/REVERSE GEAR       | ⑤⑪ | TRANSMISSION HANGER                       |
| ㉕ | NEEDLE BEARINGS                  | ⑤⑫ | TRANSMISSION MOUNT BRACKET                |
| ㉖ | 4TH/REVERSE GEAR COLLAR          | ⑤⑬ | REVERSE IDLER GEAR                        |
| ㉗ | THRUST NEEDLE BEARING            | ⑤⑭ | TRANSMISSION HOUSING GASKET Replace.      |
| ㉘ | THRUST SHIM                      | ⑤⑮ | DOWEL PIN                                 |
| ㉙ | 2ND/4TH CLUTCH ASSEMBLY          | ⑤⑯ | SNAP RINGS                                |
| ㉚ | O-RINGS Replace.                 | ⑤⑰ | TRANSMISSION HOUSING SUB-SHAFT BEARING    |
| ㉛ | THRUST WASHER, 36.5 x 51 mm      | ⑤⑱ | TRANSMISSION HOUSING MAINSHAFT BEARING    |
| ㉜ | Selective part                   | ⑤⑲ | TRANSMISSION HOUSING COUNTERSHAFT BEARING |
| ㉝ | THRUST NEEDLE BEARING            | ⑤⑳ | TRANSMISSION HOUSING                      |
| ㉞ | MAINSHAFT 2ND GEAR               | ⑤㉑ | DIFFERENTIAL ASSEMBLY                     |
| ㉟ | NEEDLE BEARING                   | ⑤㉒ | OIL SEAL Replace.                         |
| ㊱ | THRUST NEEDLE BEARING            |    |   |

## TORQUE SPECIFICATIONS

Ref No.	Torque Value	Bolt Size	Remarks
A	12 N·m (1.2 kg-m , 9 lb-ft)	6 x 1.0 mm	Special bolt
B	14 N·m (1.4 kg-m , 10 lb-ft)	6 x 1.0 mm	
E	34 N·m (3.4 kg-m , 25 lb-ft)	8 x 1.25 mm	
H	50 N·m (5.0 kg-m , 36 lb-ft)	12 x 1.25 mm	Oil guide cap
M	40 N·m (4.0 kg-m , 29 lb-ft)	30 x 1.5 mm	

## Torque Converter Housing/Valve Body



- |                                       |  |
|---------------------------------------|--|
| ① ATF MAGNET Clean.                   | ③② REGULATOR VALVE BODY                    |
| ② ACCUMULATOR COVER                   | ③③ O-RING Replace.                         |
| ③ O-RING Replace.                     | ③④ STATOR SHAFT                            |
| ④ OIL FEED PIPE                       | ③⑤ STOPPER SHAFT                           |
| ⑤ ATF MAGNET Clean.                   | ③⑥ CHECK BALLS                             |
| ⑥ SERVO DETENT BASE                   | ③⑦ DOWEL PINS                              |
| ⑦ LOCK WASHERS Replace.               | ③⑧ MAIN VALVE BODY                         |
| ⑧ OIL FEED PIPE                       | ③⑨ OIL FEED PIPE                           |
| ⑨ BAFFLE PLATE                        | ④① OIL FEED PIPE                           |
| ⑩ SERVO BODY                          | ④② DOWEL PIN                               |
| ⑪ SERVO SEPARATOR PLATE               | ④③ MAIN SEPARATOR PLATE                    |
| ⑫ THROTTLE CONTROL SHAFT              | ④④ OIL PUMP DRIVE GEAR                     |
| ⑬ E-RING                              | ④⑤ OIL PUMP DRIVEN GEAR SHAFT              |
| ⑭ CHECK BALLS                         | ④⑥ OIL PUMP DRIVEN GEAR                    |
| ⑮ SECONDARY VALVE BODY                | ④⑦ CONTROL SHAFT                           |
| ⑯ DOWEL PINS                          | ④⑧ DETENT SPRING                           |
| ⑰ SECONDARY SEPARATOR PLATE           | ④⑨ DETENT ARM SHAFT                        |
| ⑱ LOCK WASHERS Replace.               | ④⑩ DETENT ARM                              |
| ⑲ GOVERNOR BODY                       | ⑤① ATF STRAINER Clean or replace.          |
| ⑳ DOWEL PIN                           | ⑤② TORQUE CONVERTER HOUSING COUNTERSHAFT   |
| ㉑ OIL FEED PIPE                       | NEEDLE BEARING                             |
| ㉒ MODULATOR VALVE BODY                | ⑤③ OIL GUIDE PLATE                         |
| ㉓ DOWEL PINS                          | ⑤④ TORQUE CONVERTER HOUSING                |
| ㉔ MODULATOR SEPARATOR PLATE           | TORQUE CONVERTER HOUSING MAINSHAFT         |
| ㉕ LOCK-UP VALVE BODY                  | BALL BEARING                               |
| ㉖ DOWEL PINS                          | ⑤⑤ OIL SEAL Replace.                       |
| ㉗ LOCK-UP SEPARATOR PLATE             | ⑤⑥ LOCK-UP CONTROL SOLENOID VALVE ASSEMBLY |
| ㉘ TORQUE CONVERTER CHECK VALVE SPRING | ⑤⑦ LOCK-UP CONTROL SOLENOID FILTER/GASKET  |
| ㉙ TORQUE CONVERTER CHECK VALVE        | Replace.                                   |
| ㉚ COOLER CHECK VALVE SPRING           | ⑤⑧ OIL FEED PIPE                           |
| ㉛ COOLER CHECK VALVE                  |  |

## TORQUE SPECIFICATIONS

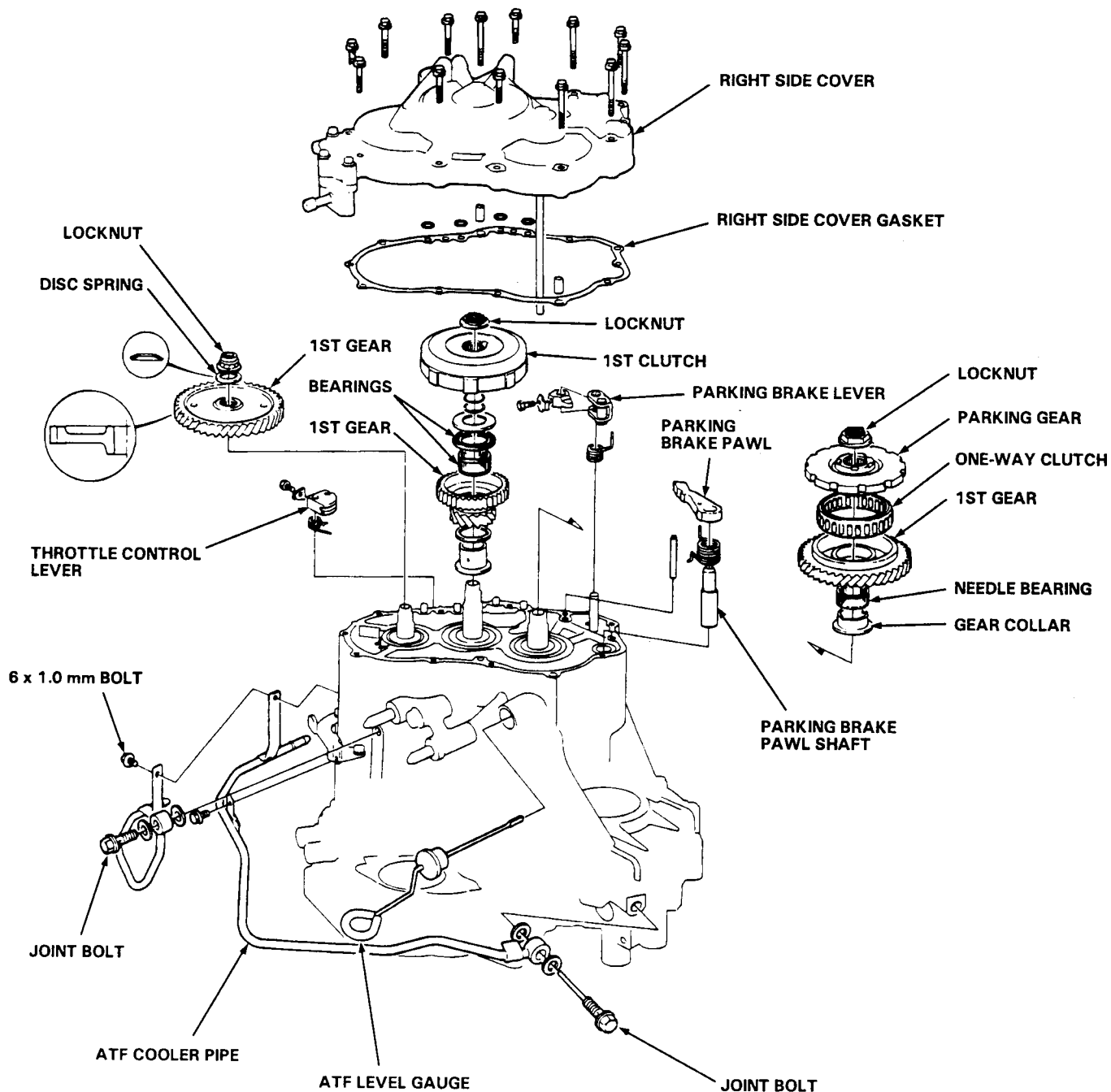
Ref No.	Torque Value	Bolt Size	Remarks
A	12 N·m (1.2 kg-m , 9 lb-ft)	6 x 1.0 mm	

## Right Side Cover

### Removal

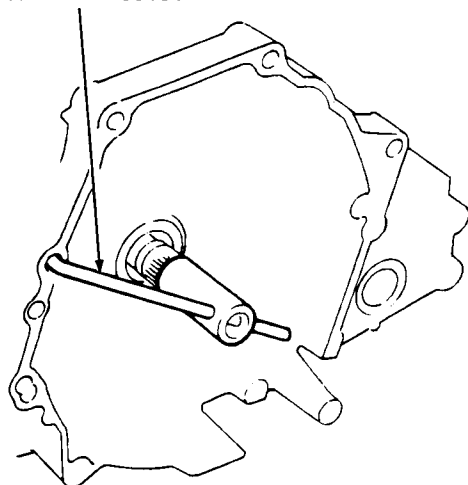
#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- When removing the transmission right side cover, replace the following:
  - Right side cover gasket
  - Lock washers
  - O-rings
  - Each shaft locknut
  - Disc spring
  - Sealing washers

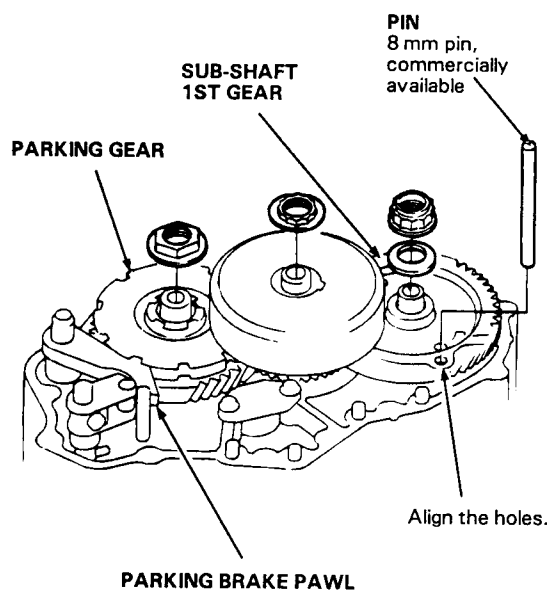


1. Remove the 13 bolts securing the right side cover, then remove the cover.
2. Slip the special tool onto the mainshaft.

**MAINSHAFT HOLDER**  
07GAB-PF50101



3. Engage the parking brake pawl with the parking gear.
4. Align the hole of the sub-shaft 1st gear with the hole of the transmission housing, then insert a pin to lock the sub-shaft while removing the sub-shaft locknut.



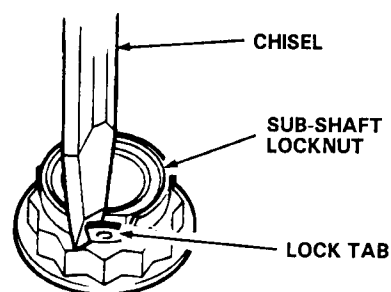
5. Pry the lock tabs of the mainshaft and countershaft locknuts.
6. Cut the lock tab of the sub-shaft locknut using a chisel as shown. Then remove the locknut from each shaft.

**NOTE:**

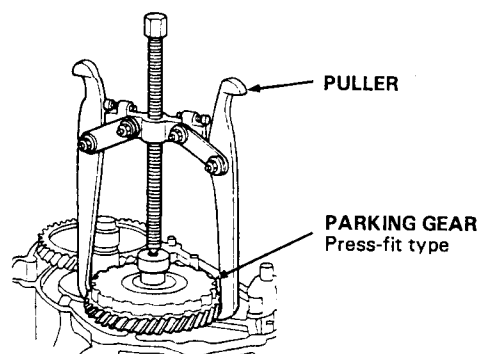
- Mainshaft locknut has left-hand threads.
- Clean the old countershaft locknut, it is used to install the "press fit" parking gear on the countershaft.
- Always wear safety glasses.

**CAUTION:**

Keep all of the chiseled particles out of the transmission.

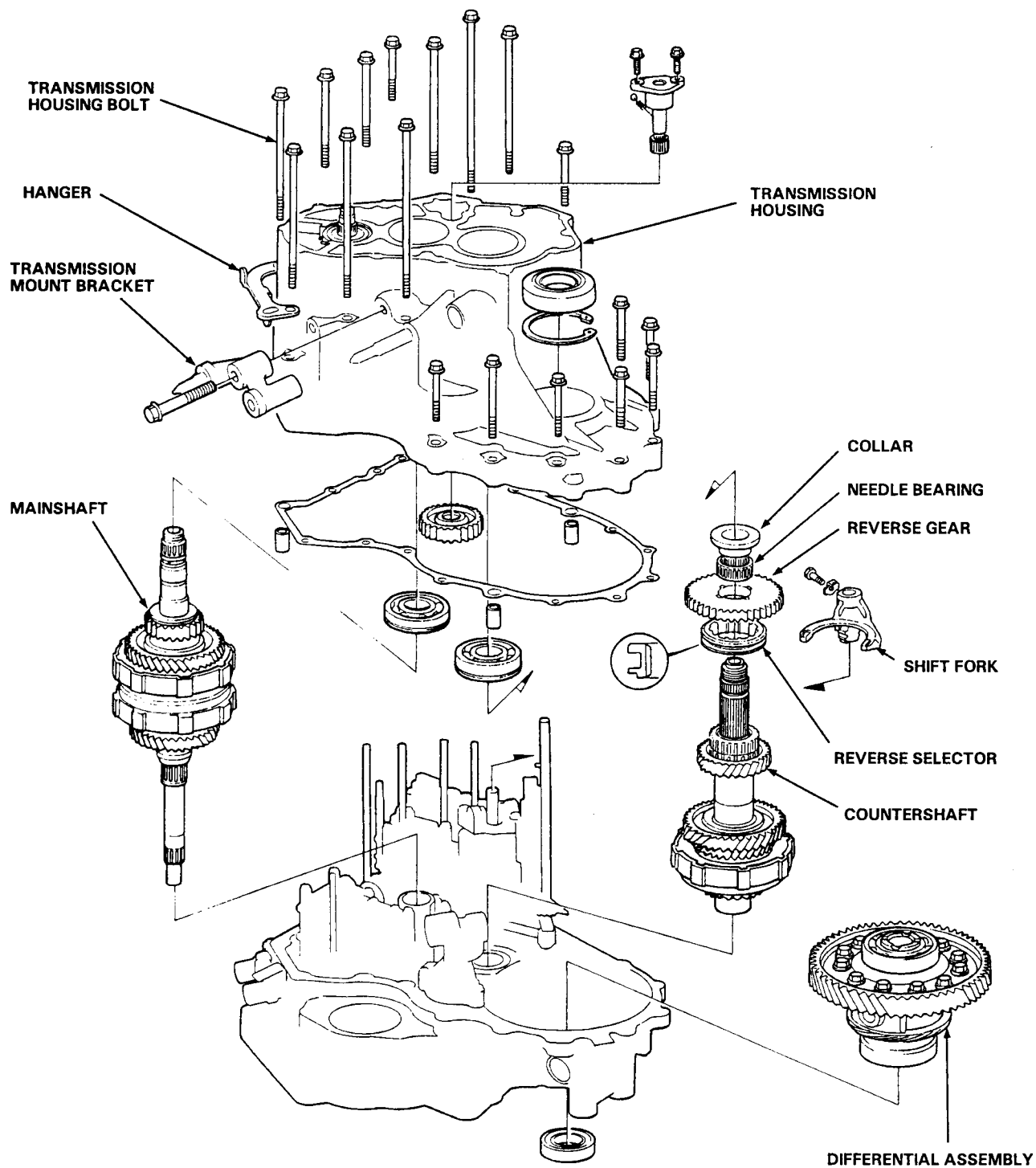


7. Remove the special tool from the mainshaft after removing the locknut.
8. Remove the 1st clutch and mainshaft 1st gear assembly from the mainshaft.
9. Remove the sub-shaft 1st gear.
10. Remove the parking brake pawl.
11. Using a universal two jaw puller, remove the parking gear, one-way clutch and countershaft 1st gear assembly.



12. Remove the parking brake lever from the control shaft.
13. Remove the throttle control lever from the throttle control shaft.
14. Remove the ATF cooler pipes.
15. Remove the ATF lever gauge.

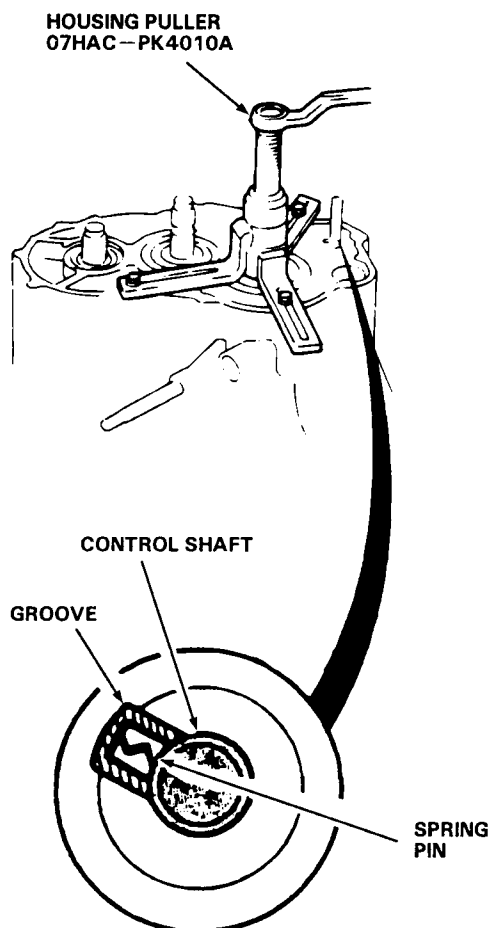
### Removal



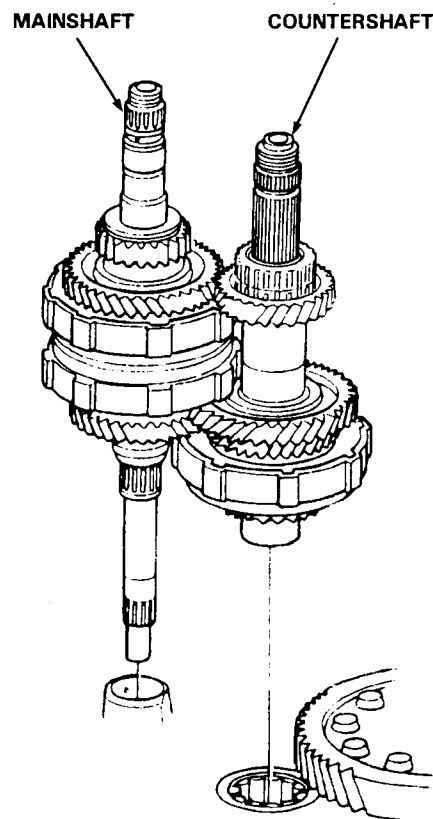
**NOTE:**

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- When removing the transmission housing, replace the following:
  - Transmission housing gasket
  - Lock washer

1. Remove the transmission mount bracket.
2. Remove the transmission housing mounting bolts and hanger.
3. Align the spring pin of the control shaft with the transmission housing groove by turning the control shaft.
4. Install the special tool on the transmission housing, then remove the housing as shown.

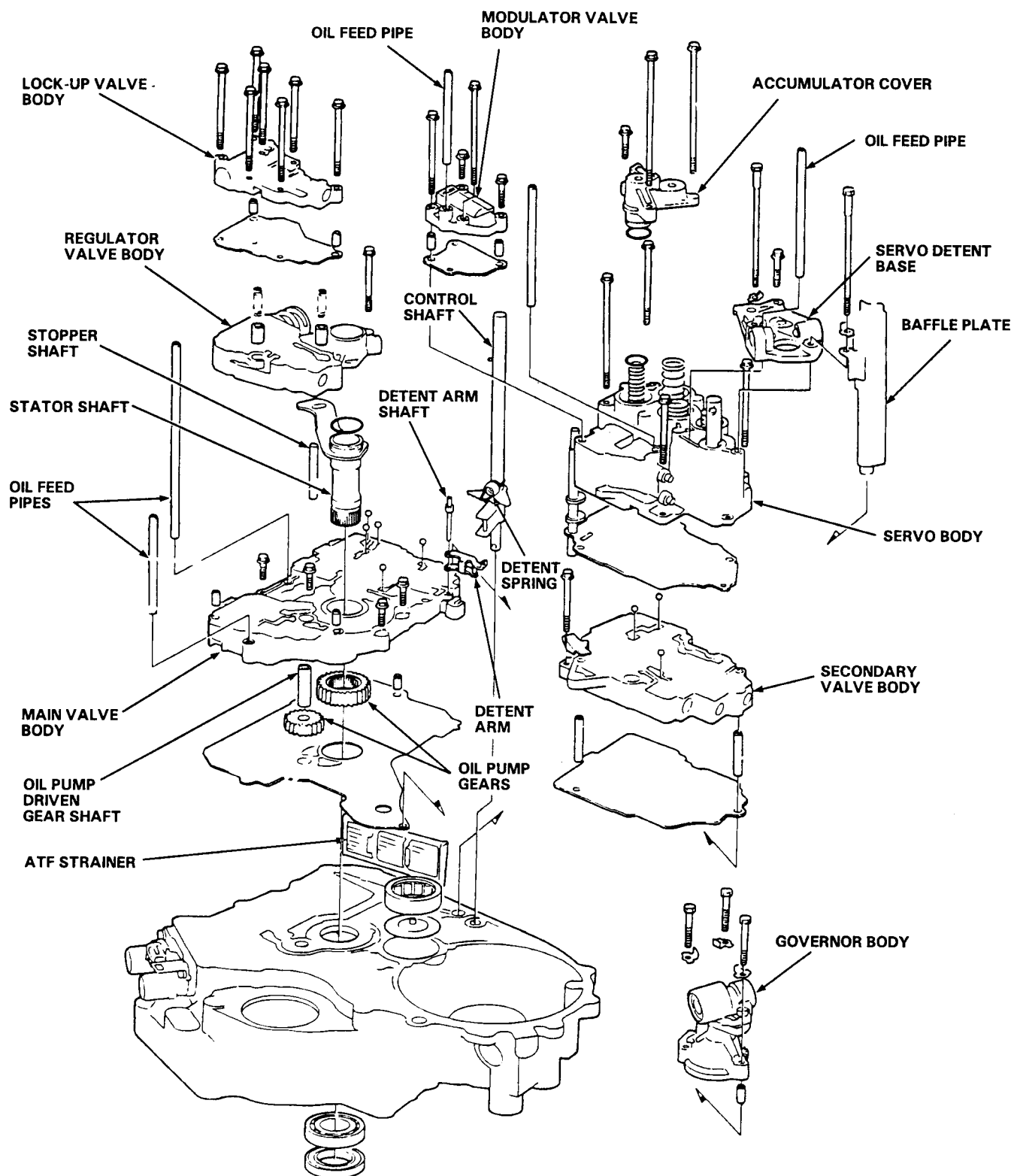


5. Remove the countershaft reverse gear with the collar and needle bearing.
6. Remove the lock bolt securing the shift fork, then remove the fork with the reverse selector from the countershaft.
7. Remove the countershaft and mainshaft sub-assembly together.



8. Remove the differential assembly.

### Removal





## NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.

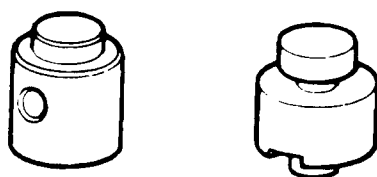
- When removing the valve body replace the following:
  - O-rings
  - Lock washers

1. Remove the oil feed pipes from the servo body, modulator valve body and main valve body.
2. Remove the three bolts securing the accumulator cover, then remove the accumulator cover.
3. Remove the three bolts securing the servo detent base, then remove the servo detent base and baffle plate.
4. Remove the four bolts securing the modulator valve body, then remove the modulator valve body and separator plate.
5. Remove the four bolts securing the servo body, then remove the servo body and separator plate.
6. Remove the bolt securing the secondary valve body, then remove the secondary valve body and separator plate.
7. Remove the seven bolts securing the lock-up valve body, then remove the lock-up valve body and separator plate.
8. Remove the bolt securing the regulator valve body, then remove the regulator valve body.
9. Remove the stator shaft and stopper shaft.
10. Remove the detent spring from the detent arm, then remove the control shaft from the torque converter housing.
11. Remove the detent arm and detent arm shaft from the main valve body.
12. Remove the four bolts securing the main valve body, then remove the main valve body.
13. Remove the oil pump driven gear shaft, then remove the oil pump gears.
14. Remove the three bolts securing the governor body, then remove the governor body.
15. Remove the main separator plate with two dowel pins.
16. Remove the ATF strainer.

### Description

- Caps with one projected tip and one flat end are installed with the flat end toward the inside of the valve body.
- Caps with a projected tip on each end are installed with the smaller tip toward the inside of the valve body. The small tip is a spring guide.

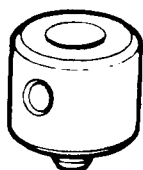
Toward outside of valve body.



Toward inside of valve body.

- Caps with one projected tip and hollow end are installed with the tip toward the inside of the valve body. The tip is a spring guide.

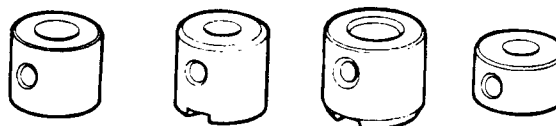
Toward outside of valve body.



Toward inside of valve body.

- Caps with hollow ends are installed with the hollow end away from the inside of the valve body.
- Caps with notched ends are installed with the notch toward the inside of the valve body.
- Caps with flat ends and a hole through the center are installed with the smaller hole toward the inside of the valve body.

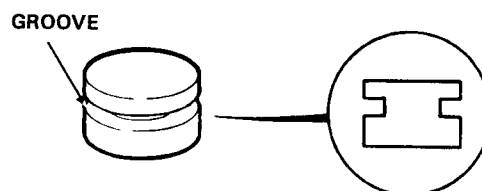
Toward outside of valve body.



Toward inside of valve body.

- Caps with flat ends and a groove around the cap are installed with the groove side toward the outside of the valve body.

Toward outside of valve body.



Sectional view.

Toward inside of valve body.

## Valve Body

### Repair

#### NOTE:

This repair is only necessary if one or more of the valves in a valve body do not slide smoothly in their bores. You may use this procedure to free the valves in the valve bodies.

1. Soak a sheet of #600 abrasive paper in ATF for about 30 minutes.
2. Carefully tap the valve body so the sticking valve drops out of its bore.

#### CAUTION:

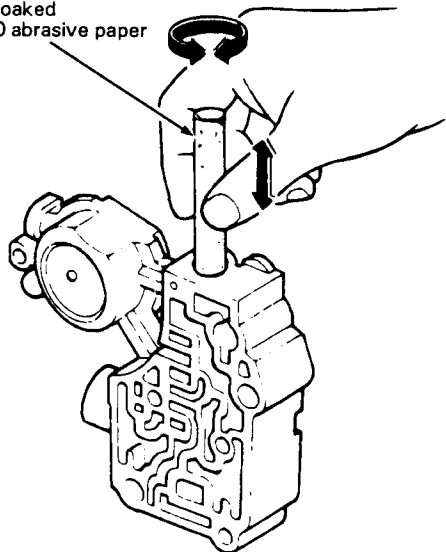
It may be necessary to use a small screwdriver to pry the valve free. Be careful not to scratch the bore with the screwdriver.

3. Inspect the valve for any scuff marks. Use the ATF-soaked #600 paper to polish off any burrs that are on the valve, then wash the valve in solvent and dry it with compressed air.
4. Roll up half a sheet of ATF-soaked paper and insert it in the valve bore of the sticking valve. Twist the paper slightly, so that it unrolls and fits the bore tightly, then polish the bore by twisting the paper as you push it in and out.

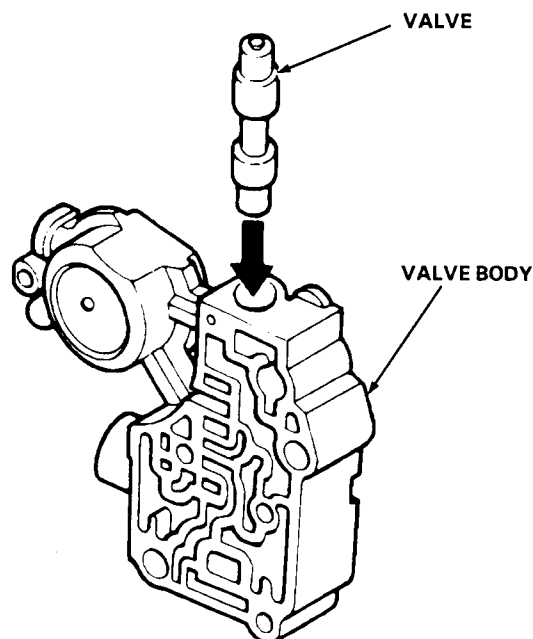
#### CAUTION:

The valve body is aluminum and doesn't require much polishing to remove any burrs.

ATF-soaked  
# 600 abrasive paper



5. Remove the #600 paper and thoroughly wash the entire valve body in solvent, then dry with compressed air.
6. Coat the valve with ATF then drop it into its bore. It should drop to the bottom of the bore under its own weight. If not, repeat step 4, then retest.



7. Remove the valve and thoroughly clean it and the valve body with solvent. Dry all parts with compressed air, then reassemble using ATF as a lubricant.

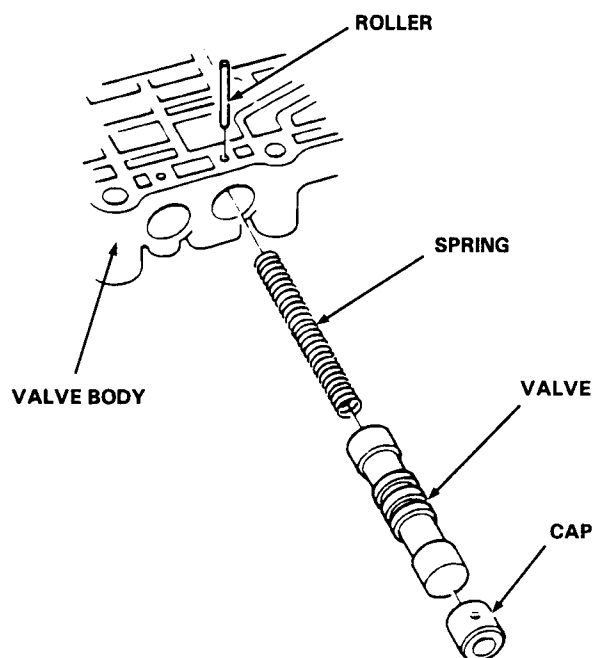
## Assembly

## Valve

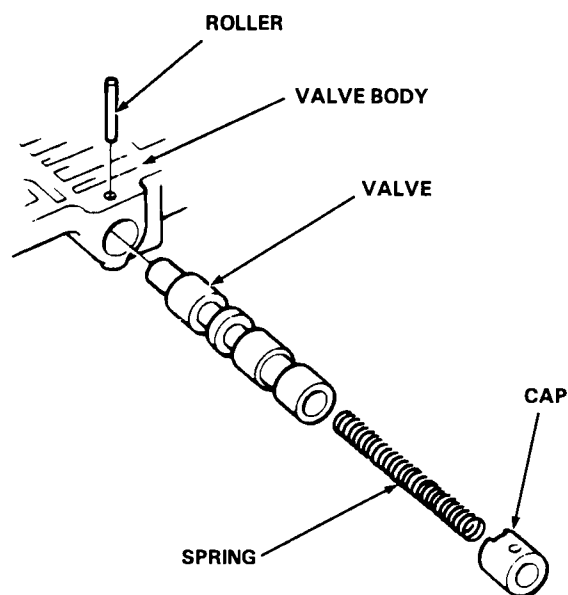
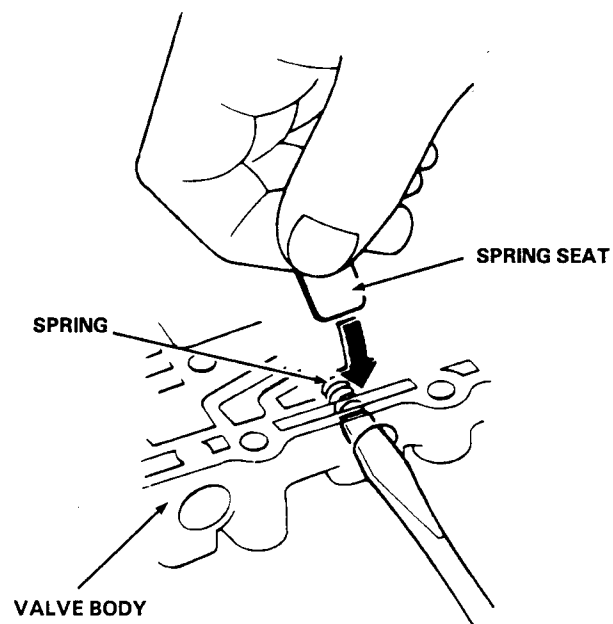
### NOTE:

Coat all parts with ATF before assembly.

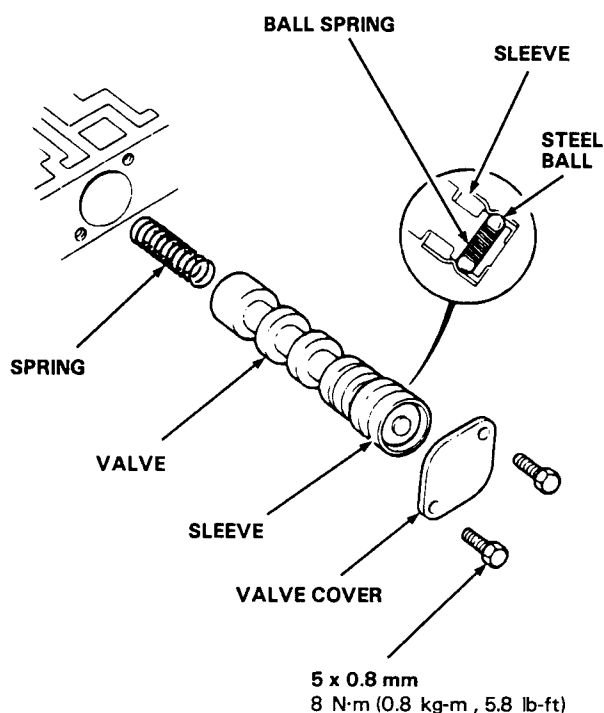
- Install the valve, valve spring and cap in the valve body and secure with the roller.



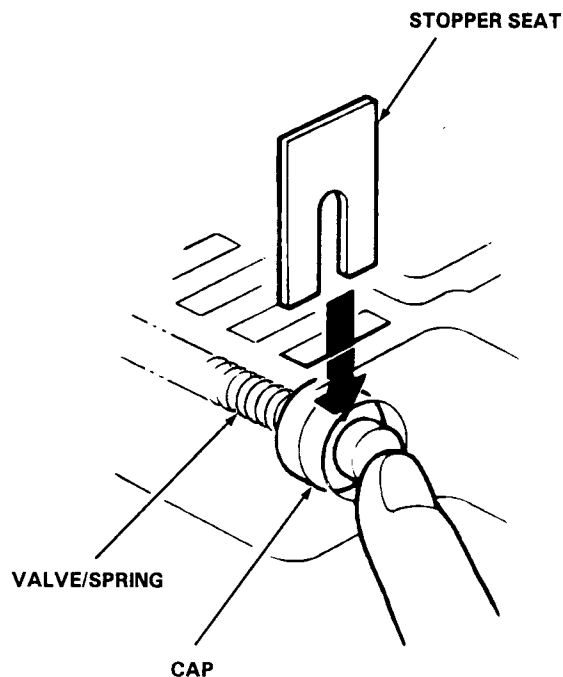
- Set the spring in the valve and install it in the valve body. Push the spring in with a screwdriver, then install the spring seat.



- Slide the spring into the hole in the big end of the shift valve. While holding the steel balls with the tips of your fingers, put the sleeve over the shift valve. Place the shift spring in the shift valve, then slip it into the valve body and install the valve cover.



- Install the valve, spring and cap in the valve body. Push the cap, then install the stopper seat.



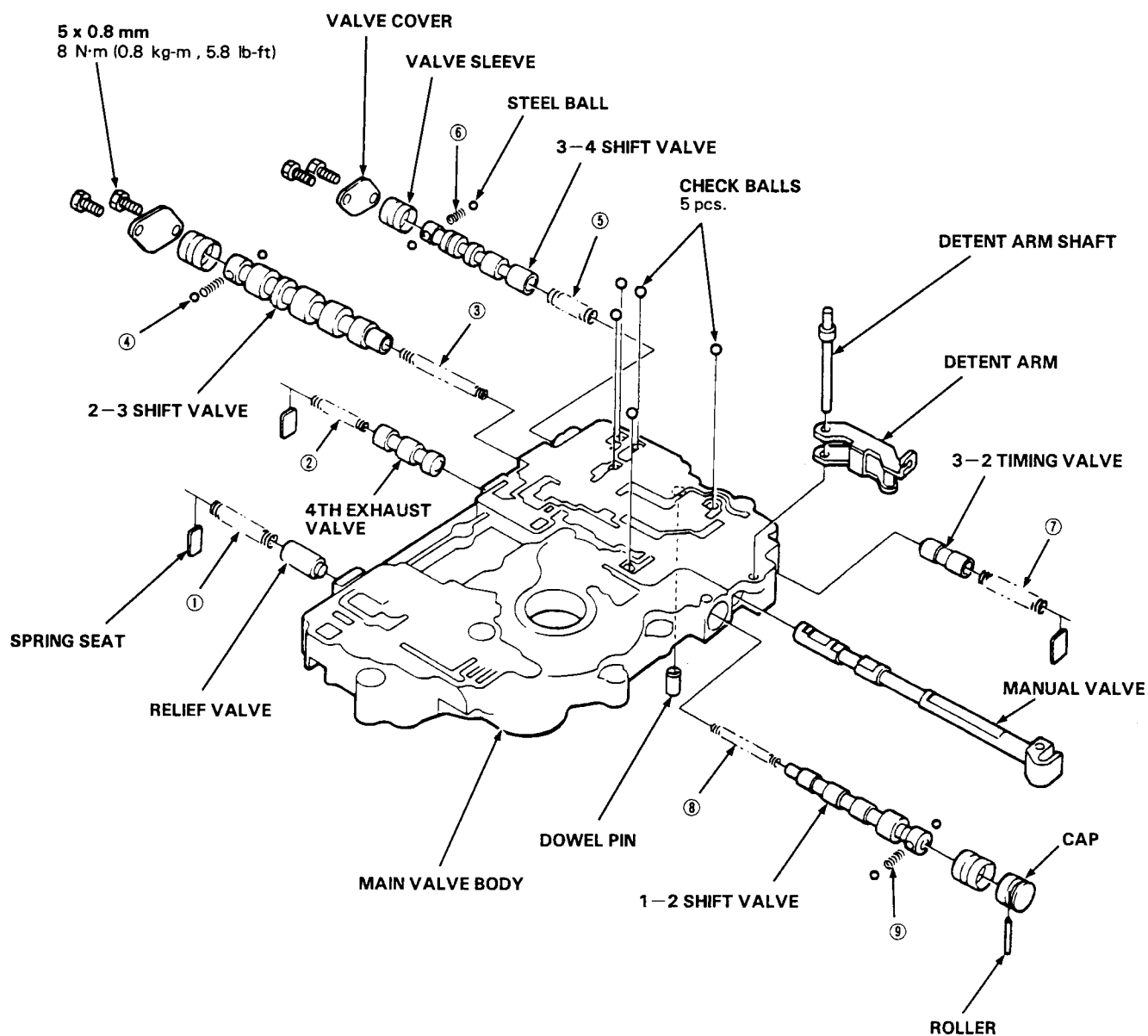
### Disassembly/Inspection/Reassembly

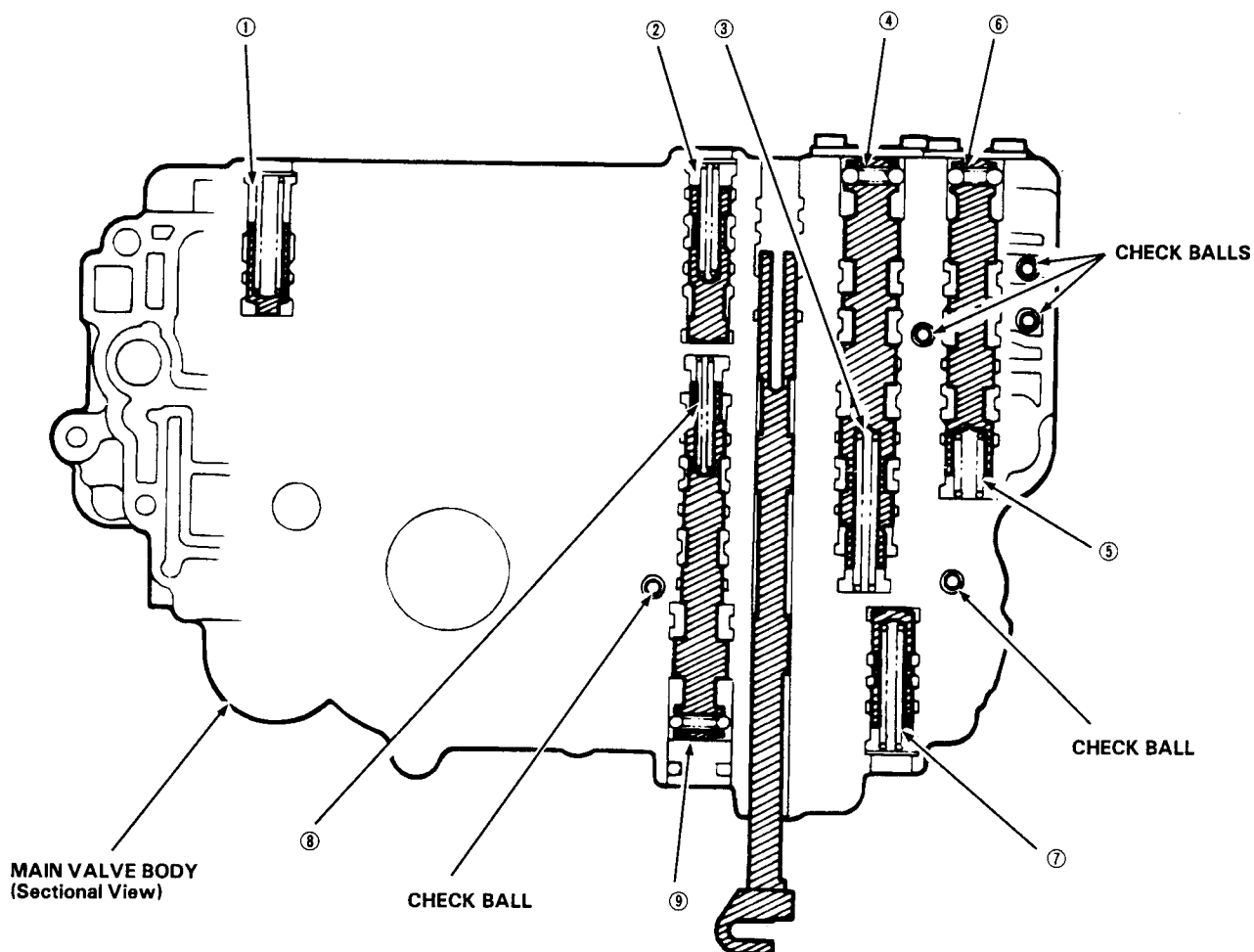
#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Replace valve body as an assembly if any parts are worn or damaged.
- Check all valves for free movement. If any fail to slide freely, see Valve Body Repair
- Coat all parts with ATF before reassembly.

#### CAUTION:

Do not use a magnet to remove the check balls; it may magnetize the balls.





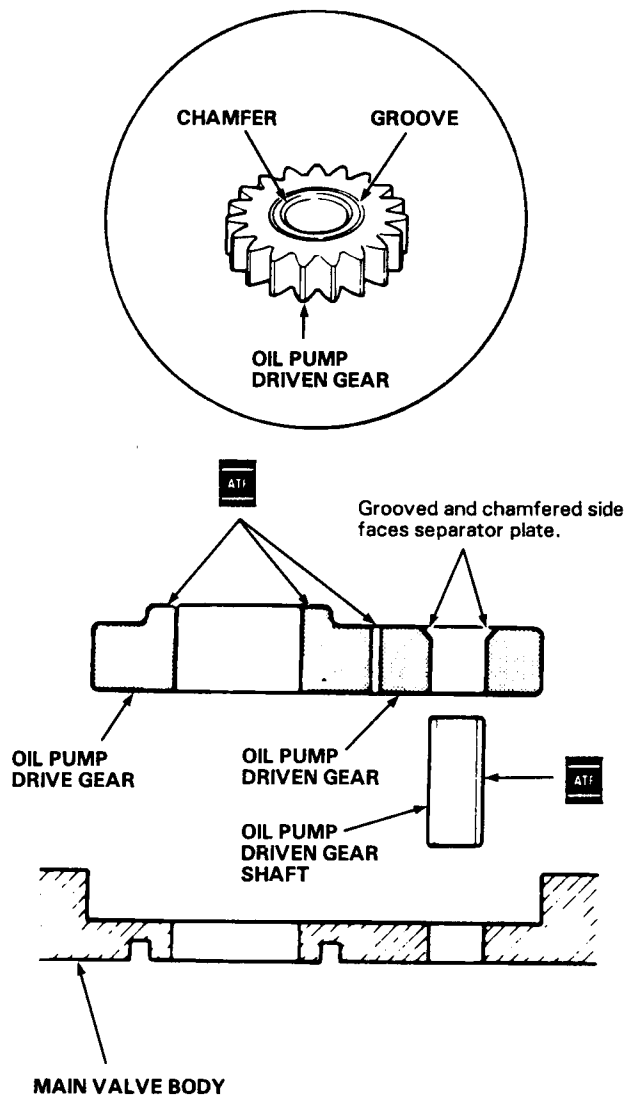
## SPRING SPECIFICATIONS

Unit of length : mm (in)

No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	Relief valve spring	1.10 (0.043)	8.60 (0.339)	37.10 (1.461)	13.4
②	4th exhaust valve spring	0.90 (0.035)	6.60 (0.260)	43.30 (1.705)	22.0
③	2-3 shift valve spring	0.90 (0.035)	7.10 (0.280)	64.70 (2.547)	32.1
④	2-3 shift ball spring	0.40 (0.016)	4.50 (0.177)	14.70 (0.579)	7.3
⑤	3-4 shift valve spring	0.90 (0.035)	9.60 (0.378)	32.50 (1.280)	10.3
⑥	3-4 shift ball spring	0.50 (0.020)	4.50 (0.177)	11.30 (0.445)	7.4
⑦	3-2 timing valve spring	1.20 (0.047)	8.60 (0.339)	46.90 (1.846)	15.2
⑧	1-2 shift valve spring	0.45 (0.018)	5.10 (0.201)	52.80 (2.079)	29.0
⑨	1-2 shift ball spring	0.45 (0.018)	4.50 (0.177)	10.70 (0.421)	12.7

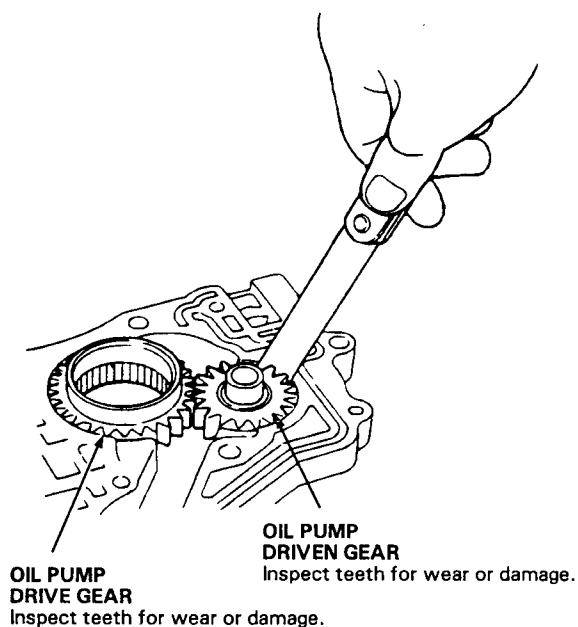
### Inspection

1. Install the oil pump gears and oil pump driven gear shaft in the main valve body.



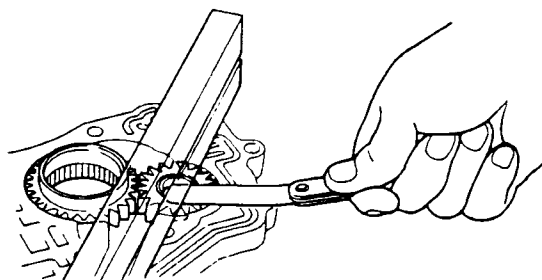
2. Measure the side clearance of the oil pump drive and driven gears.

**Oil Pump Gears Side (Radial) Clearance :**  
**Standard (New) : Drive gear**  
 0.210—0.265 mm (0.0083—0.0104 in)  
**Driven gear**  
 0.070—0.125 mm (0.0028—0.0049 in)



3. Remove the oil pump driven gear shaft and measure the thrust clearance of the oil pump driven gear-to-main valve body.

**Oil pump Drive/Driven Gear thrust (Axial) Clearance :**  
**Standard (New) :**  
 0.03—0.05 mm (0.001—0.002 in)  
**Service Limit :**  
 0.070 mm (0.0028 in)





### Disassembly/Inspection/Reassembly

#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Replace valve body as an assembly if any parts are worn or damaged.
- Check all valves for free movement. If any fail to slide freely, see Valve Body Repair

1. Hold the regulator spring cap in place while removing the lock bolt. Once the bolt is removed, release the spring cap slowly.

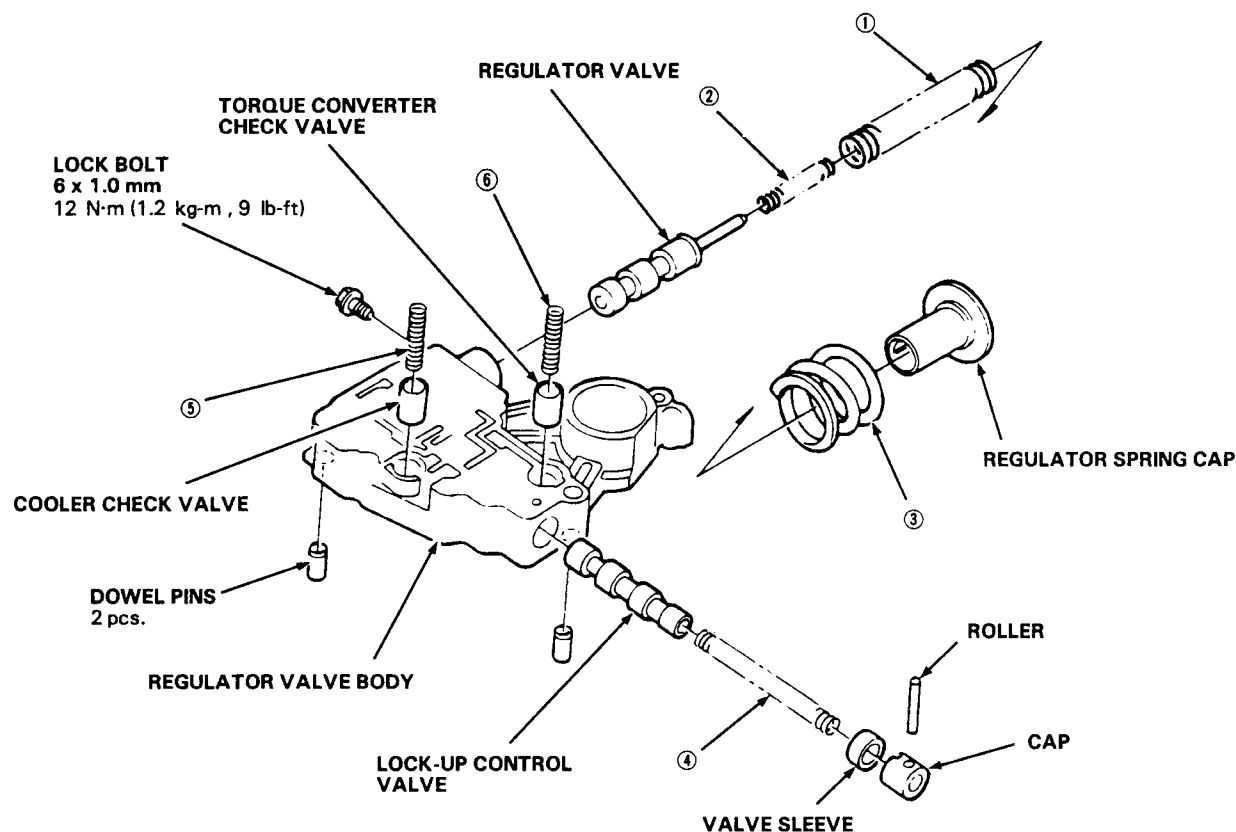
#### CAUTION:

The regulator spring cap can pop out when the lock bolt is removed.

2. Reassembly is in the reverse order of the disassembly procedure.

#### NOTE:

- Coat all parts with ATF.
- Align the hole in the regulator spring cap with the hole in the valve body, press the spring cap into the body and tighten the lock bolt.



### SPRING SPECIFICATIONS

Unit of length : mm (in)

No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	Regulator valve spring A	1.80 (0.071)	14.70 (0.579)	88.60 (3.488)	16.5
②	Regulator valve spring B	1.80 (0.071)	9.60 (0.378)	44.00 (1.732)	7.5
③	Stator reaction spring	5.50 (0.217)	*26.40 (1.039)	30.30 (1.193)	2.1
④	Lock-up control valve spring	0.80 (0.031)	6.60 (0.260)	50.60 (1.992)	24.6
⑤	Cooler check valve spring	1.10 (0.043)	8.40 (0.331)	33.80 (1.331)	12.5
⑥	Torque converter check valve spring	1.10 (0.043)	8.40 (0.331)	33.80 (1.331)	12.5

\* : Inside Diameter

## Secondary Valve Body

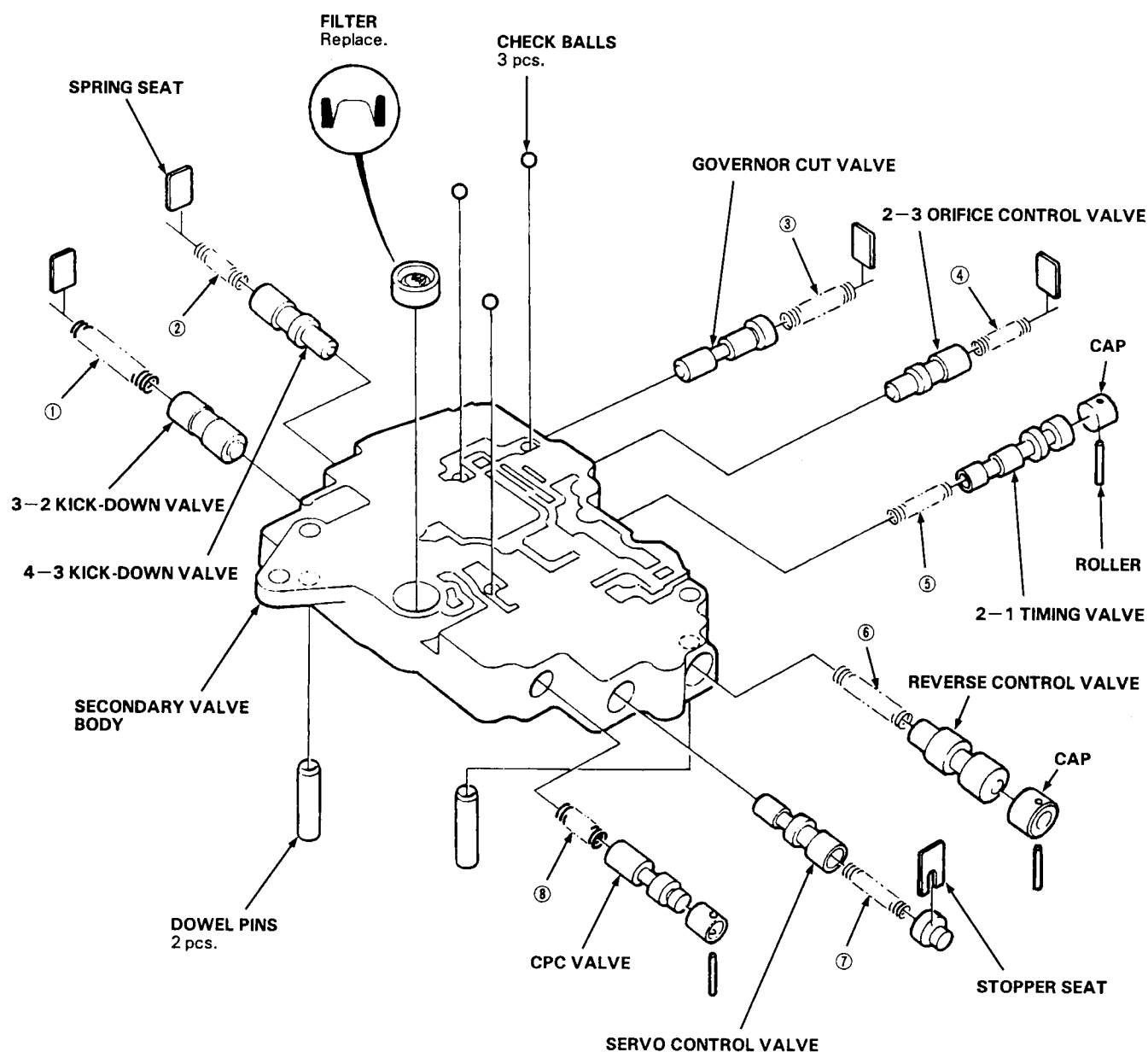
### Disassembly/Inspection/Reassembly

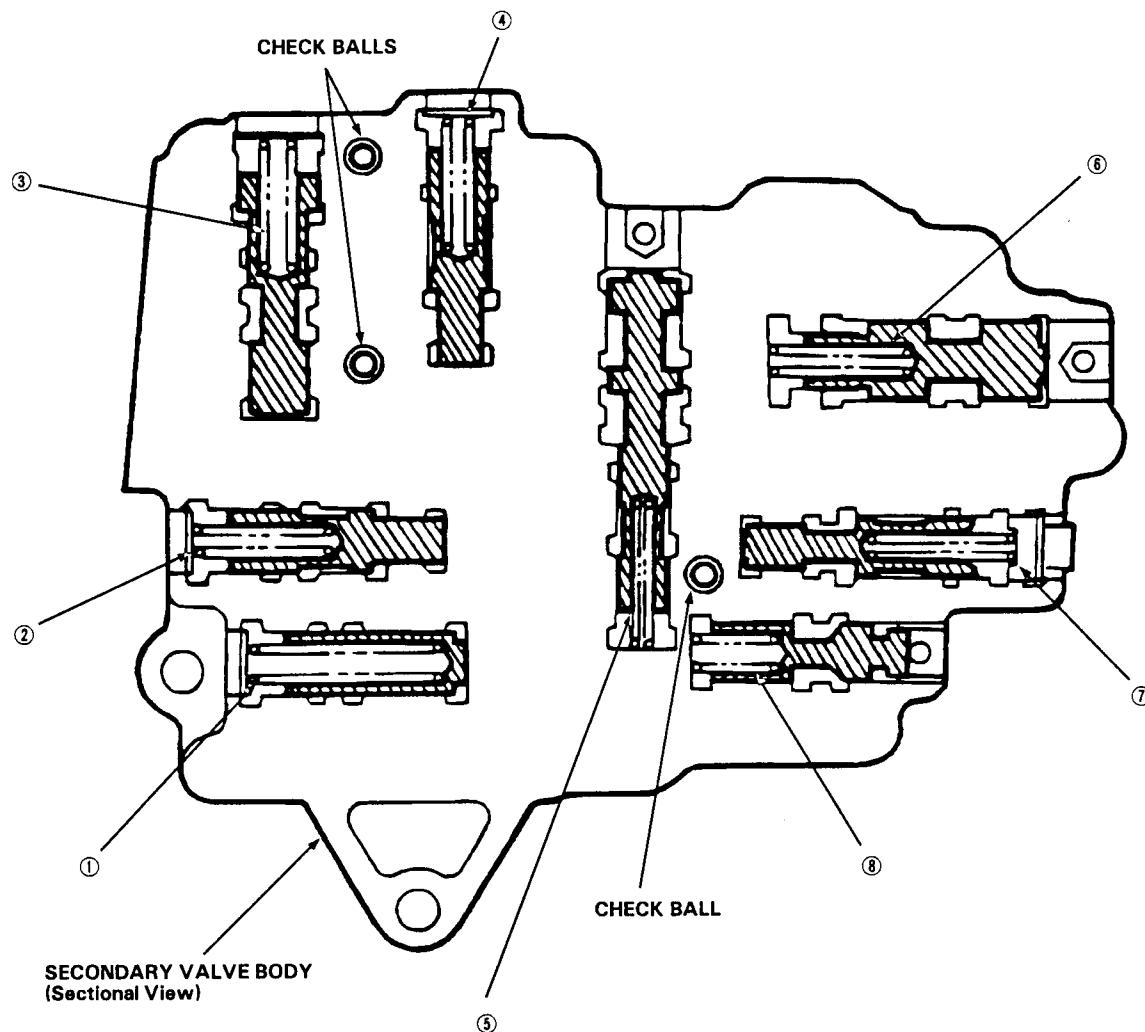
#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Replace valve body as an assembly if any parts are worn or damaged.
- Check all valves for free movement. If any fail to slide freely, see Valve Body Repair
- Coat all parts with ATF before reassembly.

#### CAUTION:

Do not use a magnet to remove the check balls; it may magnetize the balls.





## SPRING SPECIFICATIONS

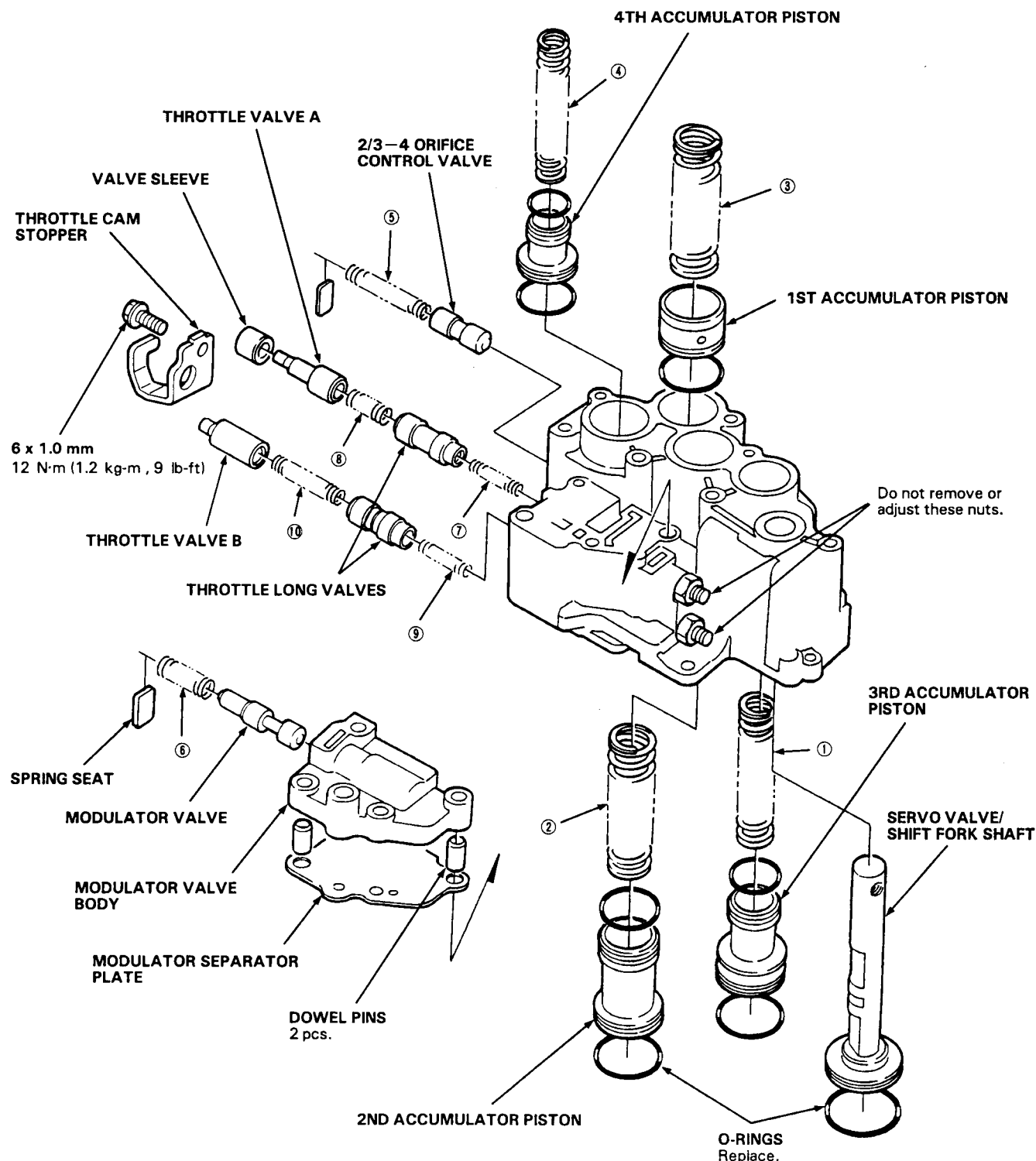
Unit of length : mm (in)

No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	3—2 kick-down valve spring	1.30 (0.051)	8.60 (0.339)	45.60 (1.795)	17.0
②	4—3 kick-down valve spring	1.00 (0.039)	6.60 (0.260)	29.90 (1.177)	14.7
③	Governor cut valve spring	0.80 (0.031)	7.60 (0.299)	44.50 (1.752)	17.0
④	2—3 orifice control valve spring	1.00 (0.039)	6.60 (0.260)	29.90 (1.177)	14.7
⑤	2—1 timing valve spring	0.70 (0.028)	5.60 (0.220)	33.00 (1.299)	21.7
⑥	Reverse control valve spring	0.70 (0.028)	7.10 (0.280)	40.00 (1.575)	20.8
⑦	Servo control valve spring	0.90 (0.035)	6.40 (0.252)	34.10 (1.343)	17.5
⑧	CPC (Clutch Pressure Control) valve spring	0.80 (0.031)	8.40 (0.331)	25.50 (1.004)	8.1

### Disassembly/Inspection/Reassembly

#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Replace valve body as an assembly if any parts are worn or damaged.
- Coat all parts with ATF before reassembly.
- Replace the O-rings and filters.



## SPRING SPECIFICATIONS

Unit of length : mm (in)

No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	3rd accumulator spring	2.90 (0.114)	17.50 (0.689)	81.50 (3.209)	13.9
②	2nd accumulator spring	3.50 (0.138)	22.00 (0.866)	75.40 (2.968)	8.7
③	1st accumulator spring	2.60 (0.102)	24.30 (0.957)	79.80 (3.142)	8.5
④	4th accumulator spring	2.80 (0.110)	16.00 (0.630)	85.00 (3.346)	15.8
⑤	2/3—4 orifice control valve spring	1.00 (0.039)	8.60 (0.339)	52.20 (2.055)	18.2
⑥	Modulator valve spring	1.20 (0.047)	* 7.00 (0.276)	27.20 (1.071)	8.0
⑦	Throttle valve A adjusting spring	0.80 (0.031)	6.20 (0.244)	27.00 (1.063)	8.5
⑧	Throttle valve A spring	1.10 (0.043)	8.50 (0.335)	22.30 (0.878)	8.1
		1.00 (0.039)	8.50 (0.335)	22.20 (0.874)	6.0
		1.10 (0.043)	8.50 (0.335)	22.30 (0.878)	7.6
		1.00 (0.039)	8.50 (0.335)	22.10 (0.870)	5.5
⑨	Throttle valve B adjusting spring	0.80 (0.031)	6.20 (0.244)	30.00 (1.181)	8.0
⑩	Throttle valve B spring	1.40 (0.055)	8.50 (0.335)	41.50 (1.634)	10.5
		1.40 (0.055)	8.50 (0.335)	41.50 (1.634)	11.2
		1.40 (0.055)	8.50 (0.335)	41.60 (1.638)	12.4

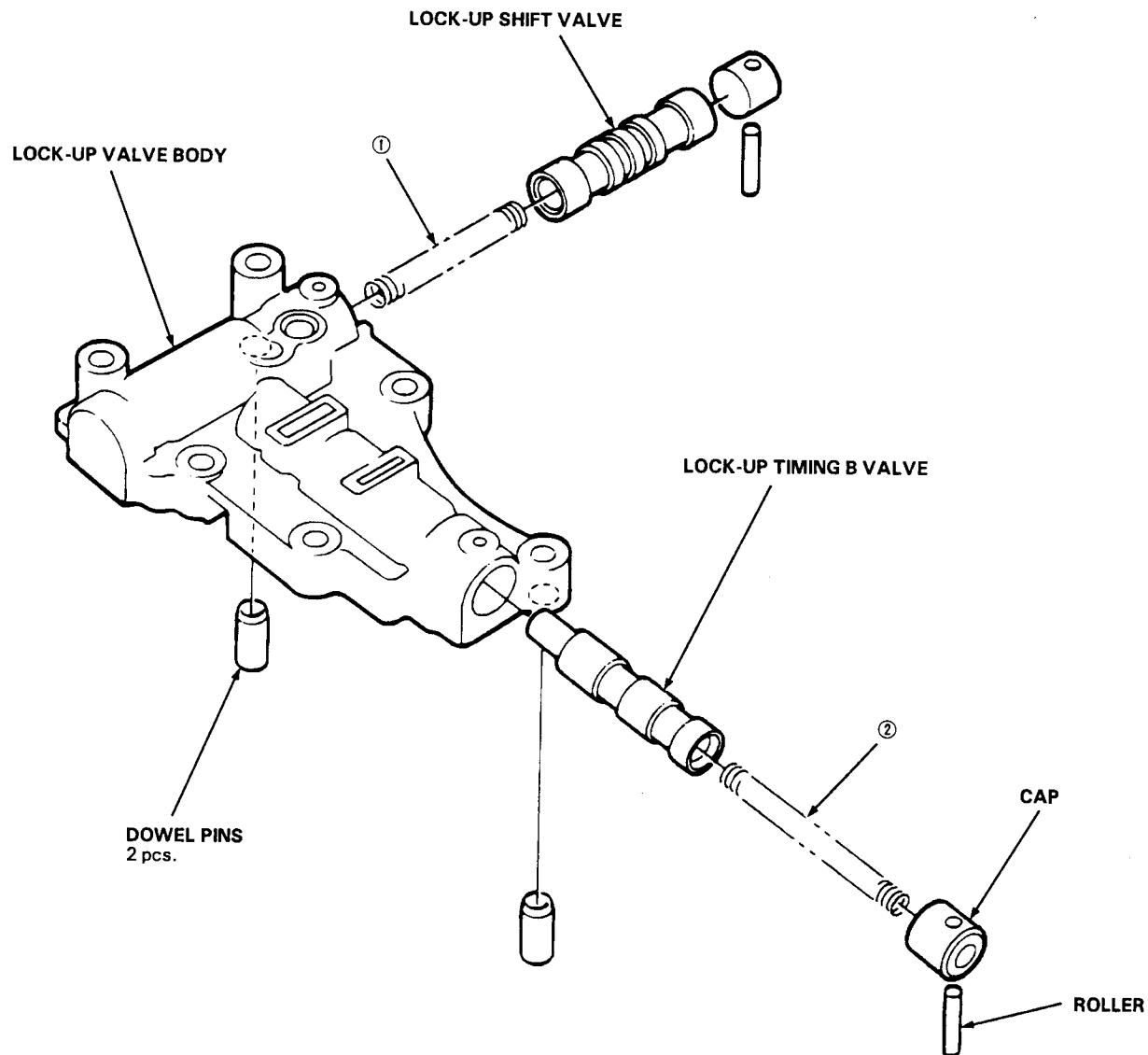
\*: Inside diameter

## Lock-up Valve Body

### Disassembly/Inspection/Reassembly

#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Replace valve body as an assembly if any parts are worn or damaged.
- Check all valves for free movement. If any fail to slide freely, see Valve Body Repair
- Coat all parts with ATF before reassembly.



#### SPRING SPECIFICATIONS

Unit of length : mm (in)

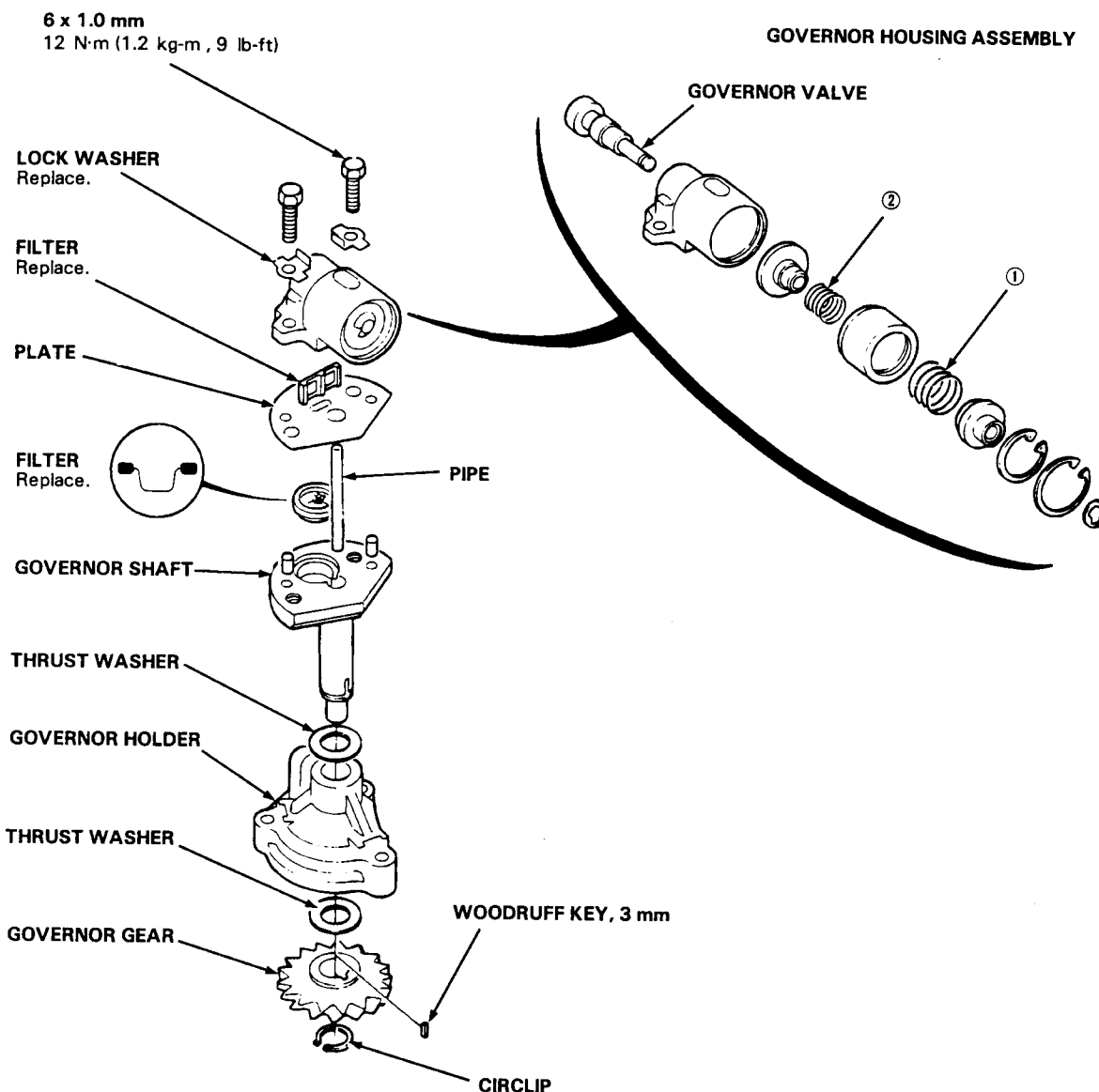
No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	Lock-up shift valve spring	0.90 (0.035)	7.60 (0.299)	73.70 (2.902)	32.0
②	Lock-up timing B valve spring	0.80 (0.031)	6.60 (0.260)	61.50 (2.421)	27.6

## Governor Body

### Disassembly/Inspection/Reassembly

#### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
- Blow out all passages.
- Check that the governor works smoothly; replace it if it does not.
- Coat all parts with ATF before reassembly.



#### SPRING SPECIFICATIONS

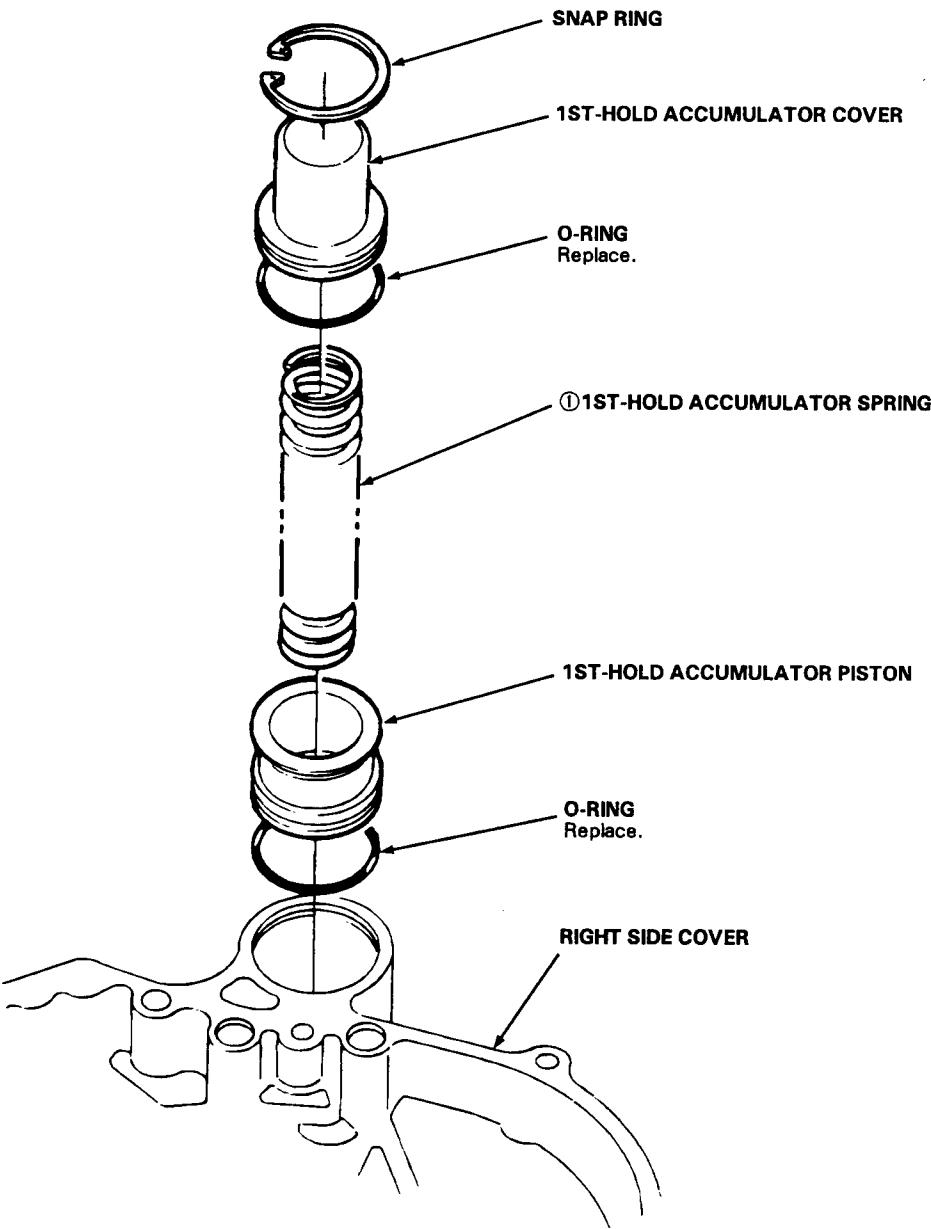
Unit of length : mm (in)

No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	Governor spring A	1.00 (0.039)	18.80 (0.740)	32.90 (1.295)	4.1
②	Governor spring B	0.90 (0.035)	11.80 (0.465)	27.80 (1.094)	6.0
		0.90 (0.035)	11.80 (0.465)	29.10 (1.146)	6.0

## 1st-hold Accumulator/Right Side Cover

### Disassembly/Inspection/Reassembly

- NOTE:
- Clean all parts thoroughly in solvent or carburetor cleaner and dry with compressed air.
  - Blow out all passages.
  - Coat all parts with ATF before reassembly.



### SPRING SPECIFICATIONS

Unit of length : mm (in)

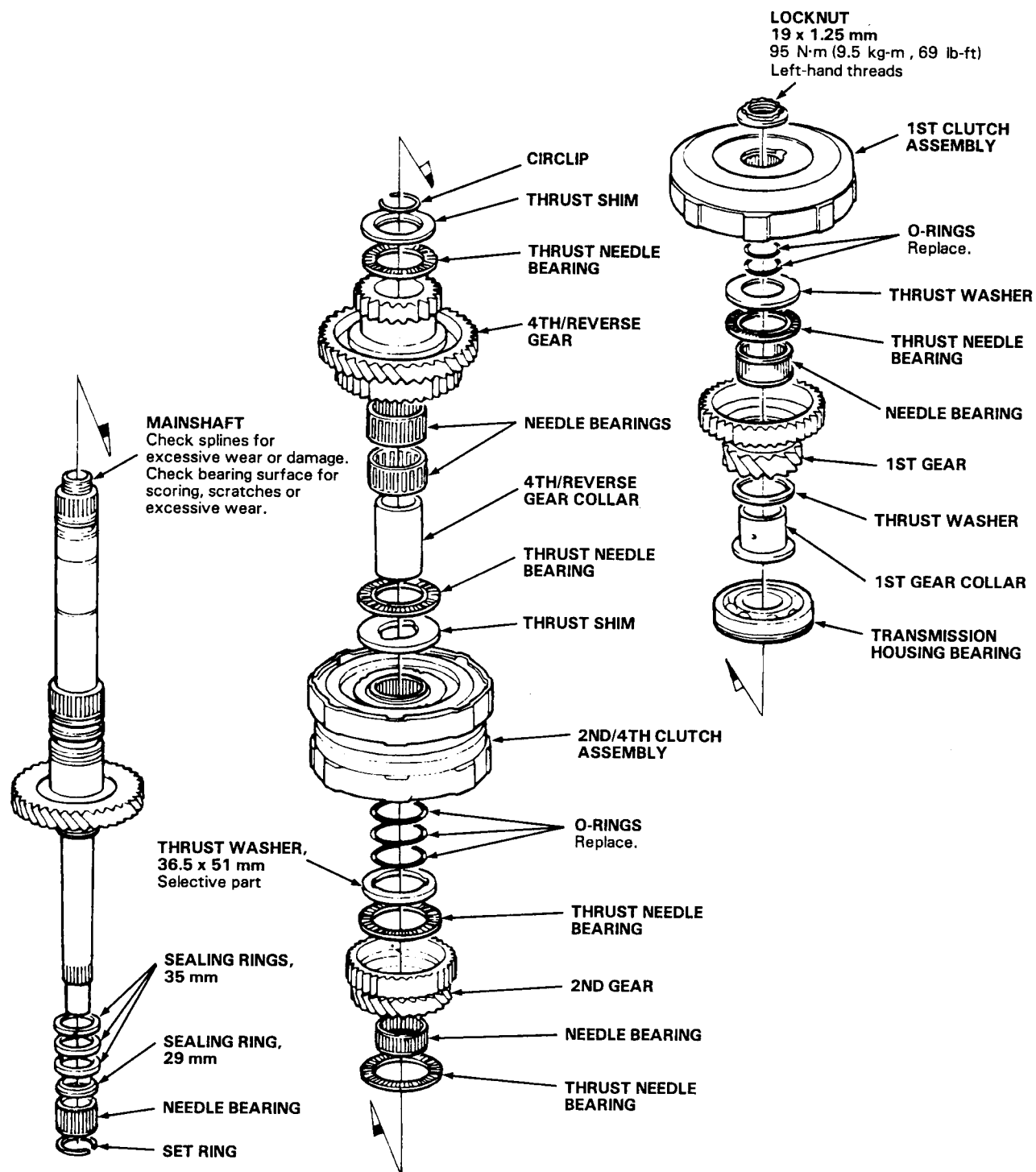
No.	Spring	Standard (New)			
		Wire Dia.	O.D.	Free Length	No. of Coils
①	1st-hold accumulator spring	4.00 (0.157)	21.50 (0.846)	71.70 (2.823)	8.3



### Disassembly/Inspection/Reassembly

#### NOTE:

- Lubricate all parts with ATF during reassembly.
- Install the thrust needle bearings with unrolled edge of bearing retainer facing washer.
- Inspect the thrust needle bearings and the needle bearings for galling and rough movement.
- Before installing the O-rings, wrap the shaft splines with tape to prevent damaging the O-rings.
- Locknut has left-hand threads.



## Inspection

### • Clearance Measurement

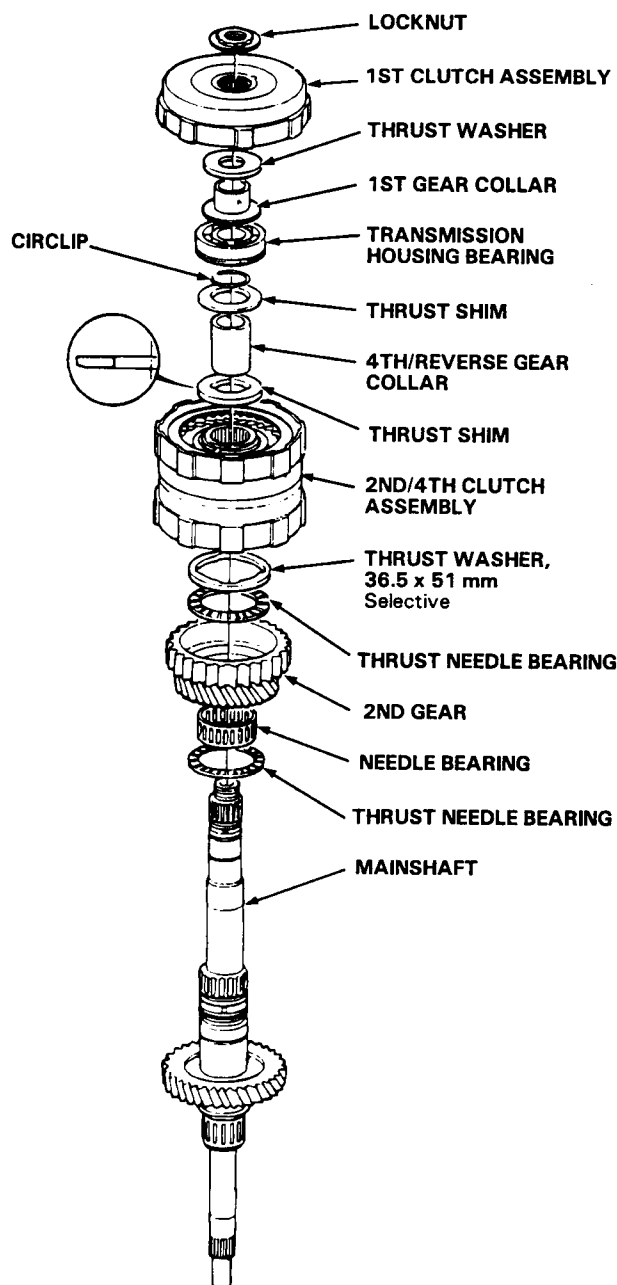
#### NOTE:

Lubricate all parts with ATF during assembly.

1. Remove the mainshaft bearing from the transmission housing
2. Assemble the parts below on the mainshaft.

#### NOTE:

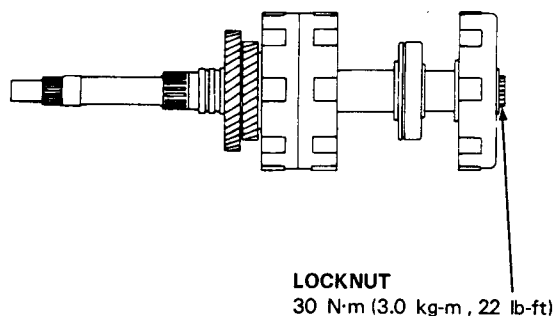
Do not assemble the O-rings while inspecting.



3. Torque the mainshaft locknut to 30 N·m (3.0 kg-m, 22 lb-ft).

#### NOTE:

Mainshaft locknut has left-hand threads.

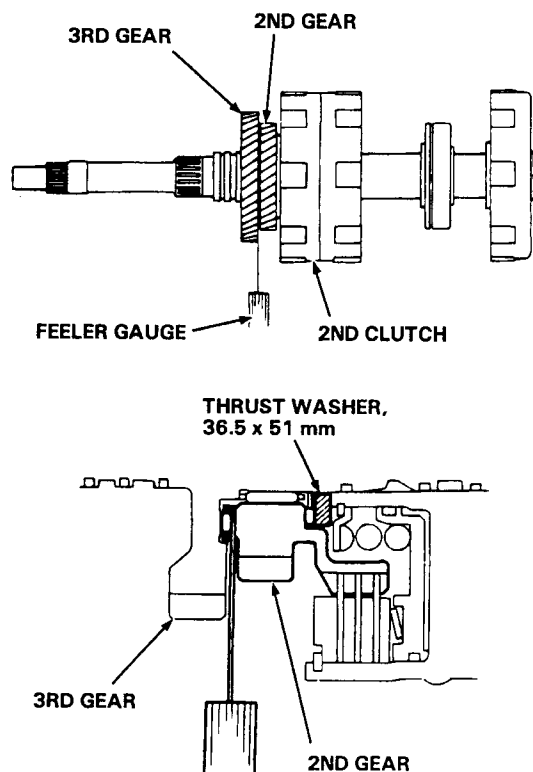


4. Hold 2nd gear against the 2nd clutch, then measure the clearance between 2nd gear and 3rd gear with a feeler gauge.

#### NOTE:

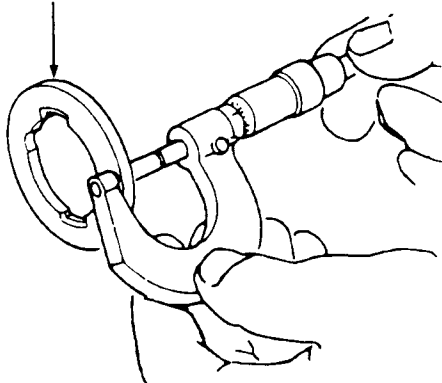
Take measurements in at least three places and take the average as the actual clearance.

**STANDARD:** 0.05—0.13 mm (0.002—0.005 in)



5. If the clearance is out of tolerance, remove the thrust washer and measure the thickness.

THRUST WASHER



6. Select and install a new washer then recheck.

**THRUST WASHER 36.5 x 51 mm**

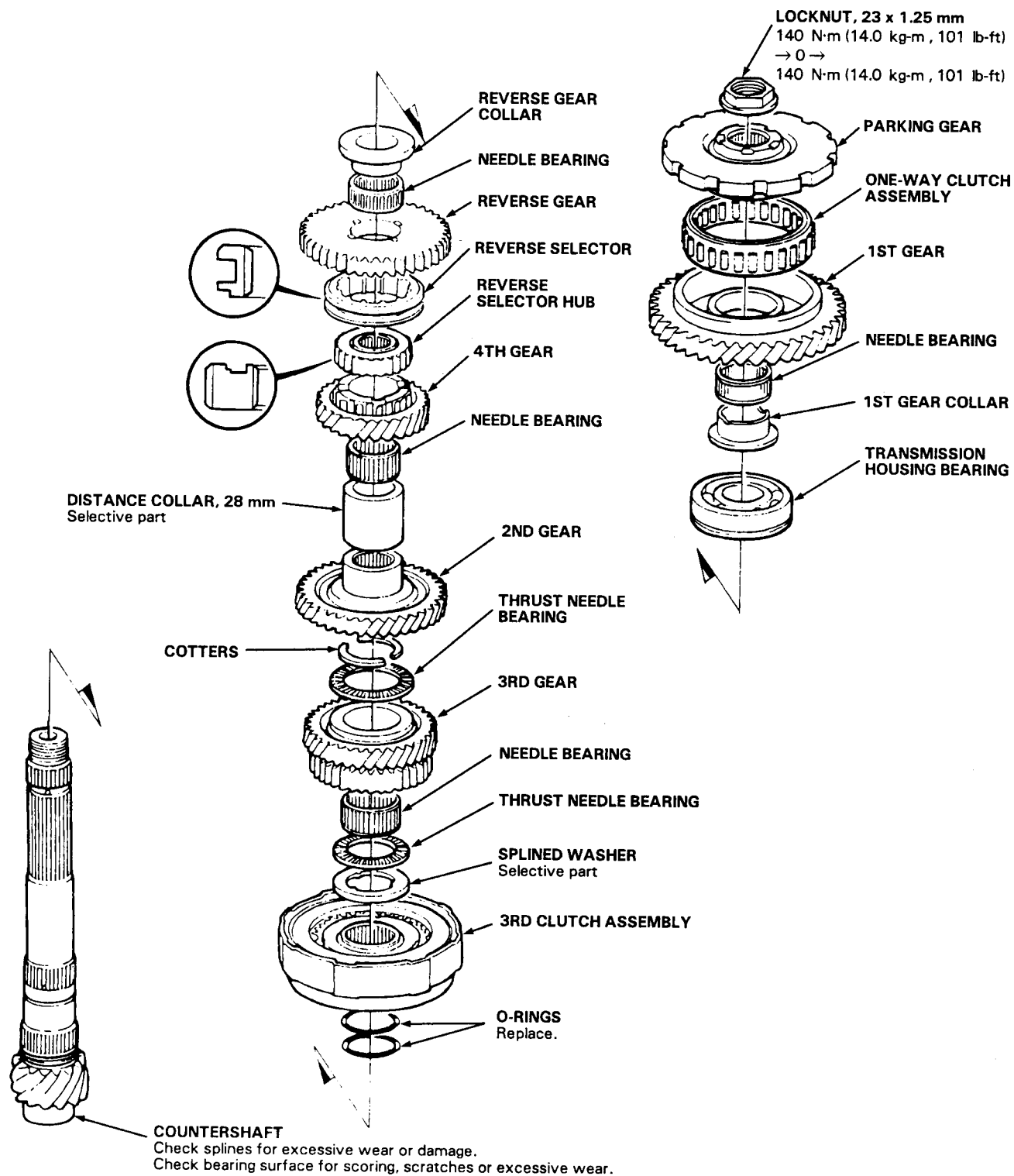
No.	Part Number	Thickness
1	90441-PC9-010	3.50 mm (0.138 in)
2	90442-PC9-010	3.55 mm (0.140 in)
3	90443-PC9-010	3.60 mm (0.142 in)
4	90444-PC9-010	3.65 mm (0.144 in)
5	90445-PC9-010	3.70 mm (0.146 in)
6	90446-PC9-010	3.75 mm (0.148 in)
7	90447-PC9-010	3.80 mm (0.150 in)
8	90448-PC9-010	3.85 mm (0.152 in)
9	90449-PC9-010	3.90 mm (0.154 in)

7. After replacing the thrust washer, make sure the clearance is within tolerance.

### Disassembly/Inspection/Reassembly

#### NOTE:

- Lubricate all parts with ATF before reassembly.
- Install the thrust needle bearings with unrolled edge of bearing retainer facing washer.
- Inspect the thrust needle bearings and the needle bearings for galling and rough movement.
- Before installing the O-rings, wrap the shaft splines with tape to prevent damaging the O-rings.



## Disassembly/Reassembly

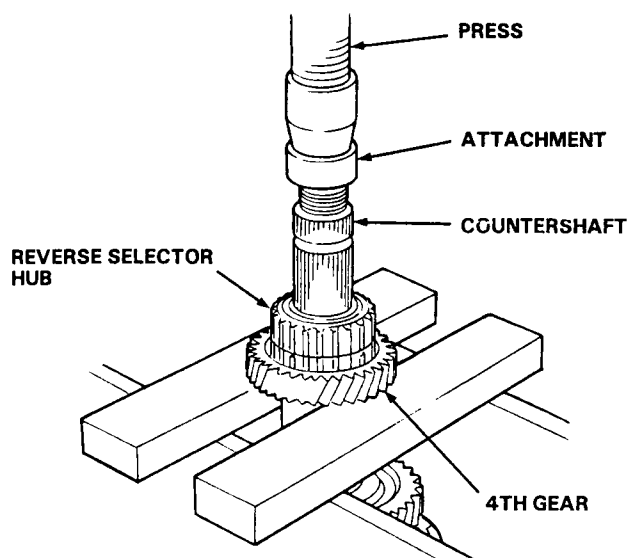
- Using a hydraulic press, press out the countershaft while supporting 4th gear.

### NOTE:

Place an attachment between the press and the countershaft to prevent damage to the shaft.

### CAUTION:

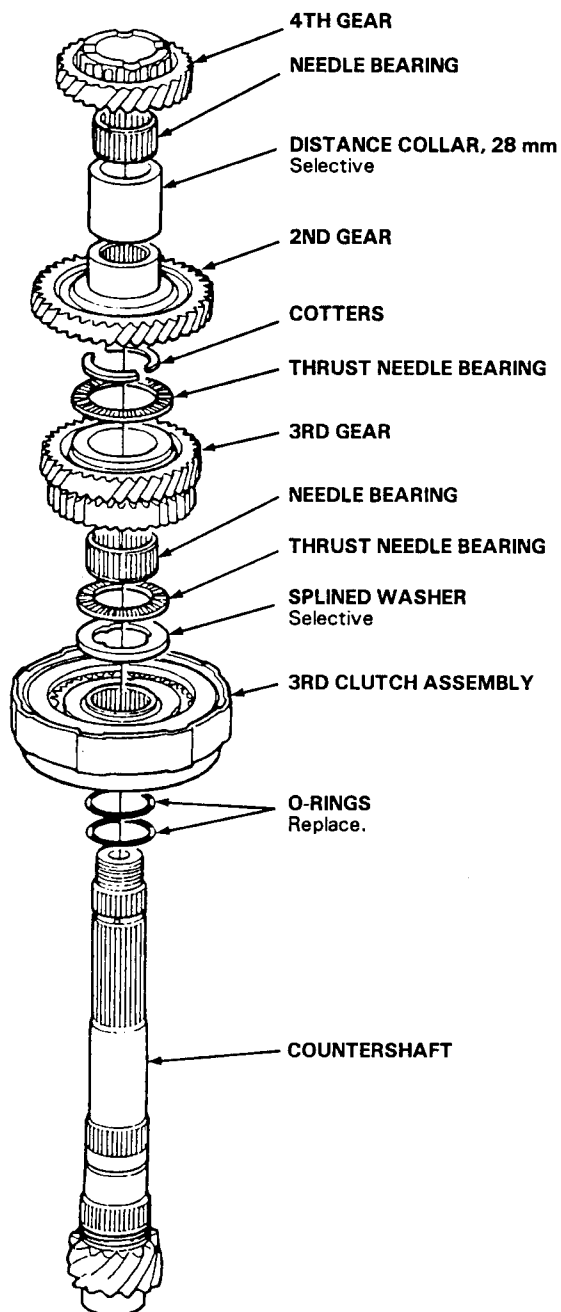
Do not allow the countershaft to fall and hit the ground.



- Assemble the parts on the countershaft as shown below.

### NOTE:

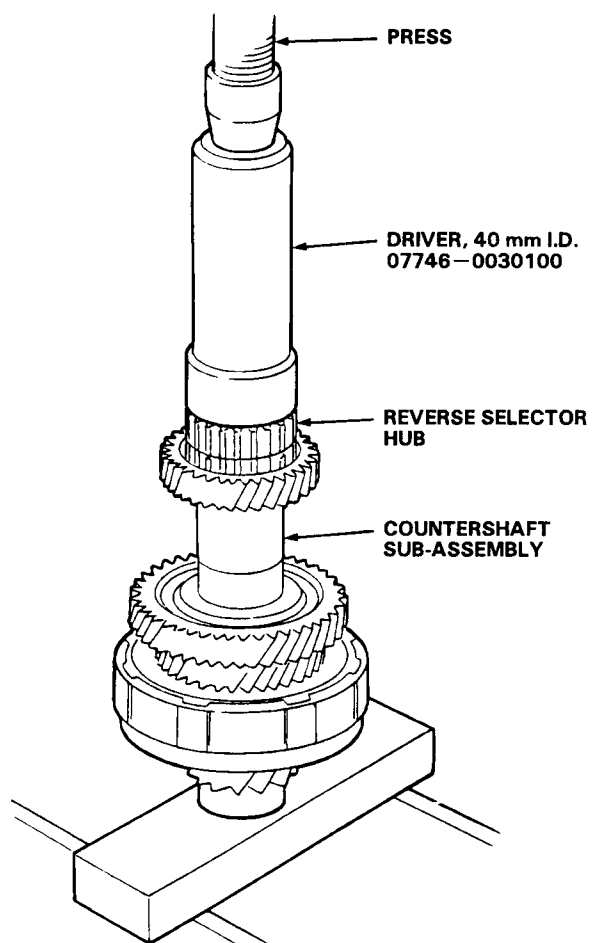
- Lubricate all parts with ATF during assembling.
- Before installing the O-rings, wrap the shaft splines with tape to prevent damaging the O-rings.



(cont'd)

### Disassembly/Reassembly (cont'd)

3. Install the reverse selector hub on the countershaft sub-assembly, and then press the reverse selector hub using the special tool and a press as shown.



### Inspection

- Clearance Measurement

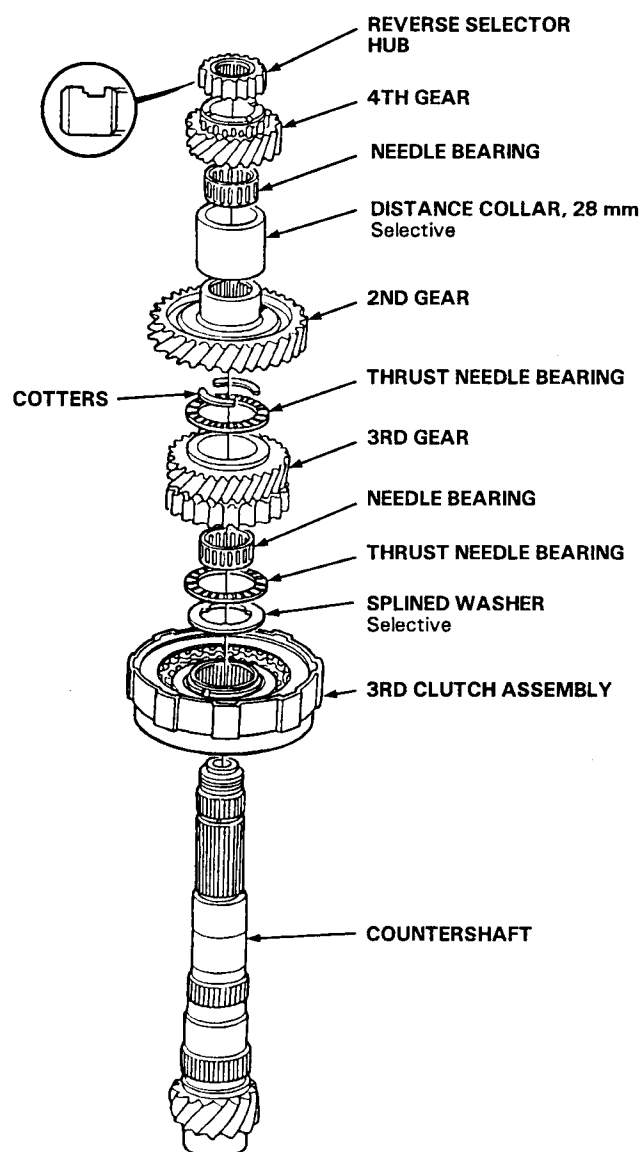
#### NOTE:

Lubricate all parts with ATF during assembly.

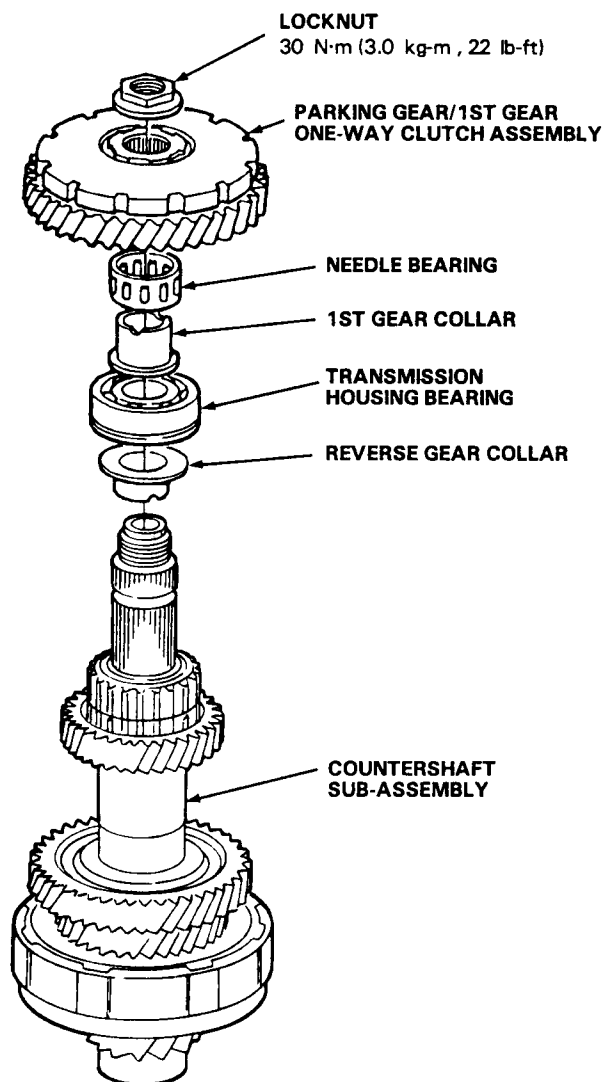
1. Remove the countershaft bearing from the transmission housing
2. Install the parts below on the countershaft using the special tool and a press as described on this page.

#### NOTE:

Do not assemble the O-rings while inspecting.



3. Install the parts below on the countershaft sub-assembly, then torque the locknut to 30 N·m (3.0 kg-m, 22 lb-ft).

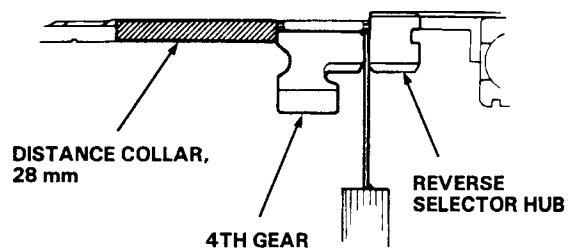
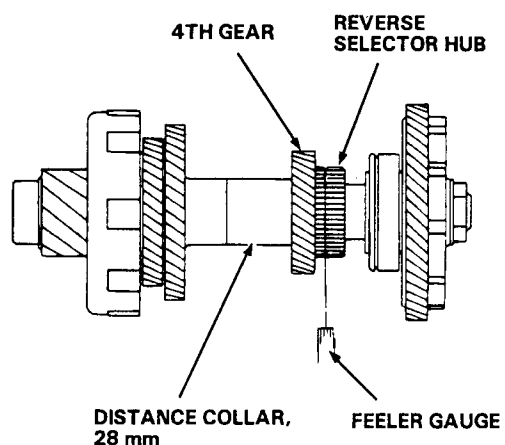


4. Measure the clearance between the 4th gear and the reverse selector hub with a feeler gauge.

## NOTE:

Take measurements in at least three places and take the average as the actual clearance.

**STANDARD:** 0.05—0.13 mm (0.002—0.005 in)



(cont'd)

### Inspection (cont'd)

5. Measure the clearance between 3rd gear and 2nd gear with a feeler gauge, with the feeler gauge from step 4 between 4th gear and reverse selector hub.

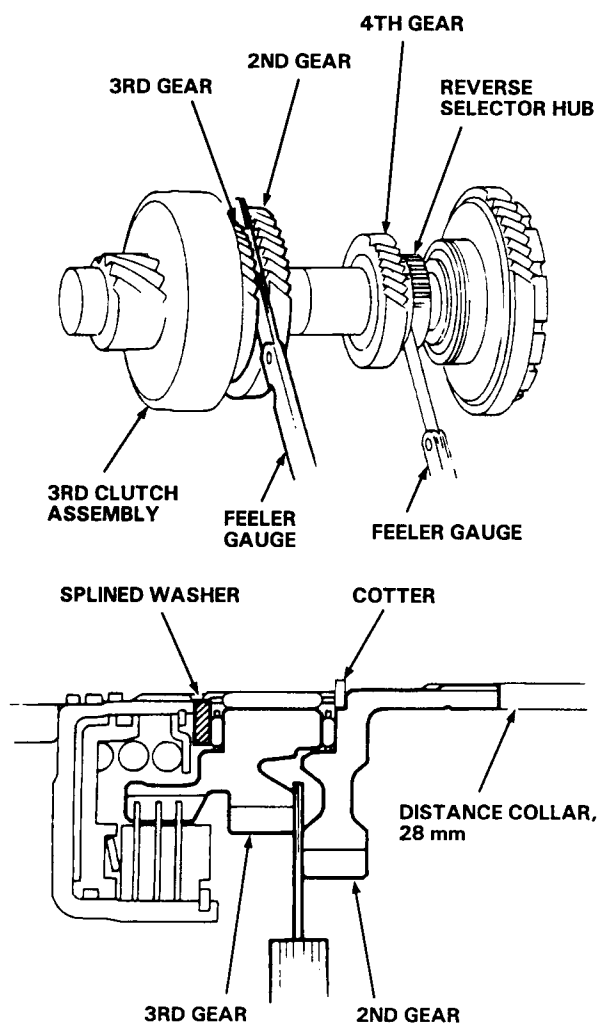
- 1. Measure the clearance with 3rd gear pushed towards 3rd clutch.
- 2. Measure the clearance with 3rd gear pushed towards 2nd gear.

#### NOTE:

Take measurements in at least three places and take the average as the actual clearance.

- 3. Subtract the measurements of step 2 from step 3 and you have the clearance between 3rd gear and 2nd gear.

**STANDARD:** 0.05–0.13 mm (0.002–0.005 in)



6. If the clearance is out of tolerance, remove the splined washer and/or distance collar and measure the thickness and/or the width.

7. Select and install a new distance collar, then recheck.

#### DISTANCE COLLAR 28 mm

No.	Part Number	Thickness
1	90503-PC9-000	39.00 mm (1.535 in)
2	90504-PC9-000	39.10 mm (1.539 in)
3	90505-PC9-000	39.20 mm (1.543 in)
4	90507-PC9-000	39.30 mm (1.547 in)
5	90508-PC9-000	39.05 mm (1.537 in)
6	90509-PC9-000	39.15 mm (1.541 in)
7	90510-PC9-000	39.25 mm (1.545 in)
8	90511-PC9-000	38.90 mm (1.531 in)
9	90512-PC9-000	38.95 mm (1.533 in)

8. After replacing the distance collar, make sure the clearance is within tolerance.

9. Select and install a new splined washer, then recheck.

#### SPLINED WASHER 35 x 52 mm

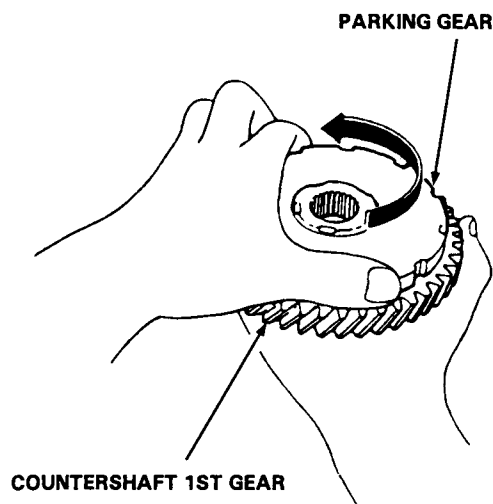
No.	Part Number	Thickness
1	90411-PF4-000	3.00 mm (0.118 in)
2	90412-PF4-000	3.05 mm (0.120 in)
3	90413-PF4-000	3.10 mm (0.122 in)
4	90414-PF4-000	3.15 mm (0.124 in)
5	90415-PF4-000	3.20 mm (0.126 in)
6	90416-PF4-000	3.25 mm (0.128 in)
7	90417-PF4-000	3.30 mm (0.130 in)
8	90418-PF4-000	3.35 mm (0.132 in)
9	90419-PF4-000	3.40 mm (0.134 in)
10	90411-P24-J00	3.45 mm (0.136 in)
11	90412-P24-J00	3.50 mm (0.138 in)

10. After replacing the splined washer, make sure the clearance is within tolerance.

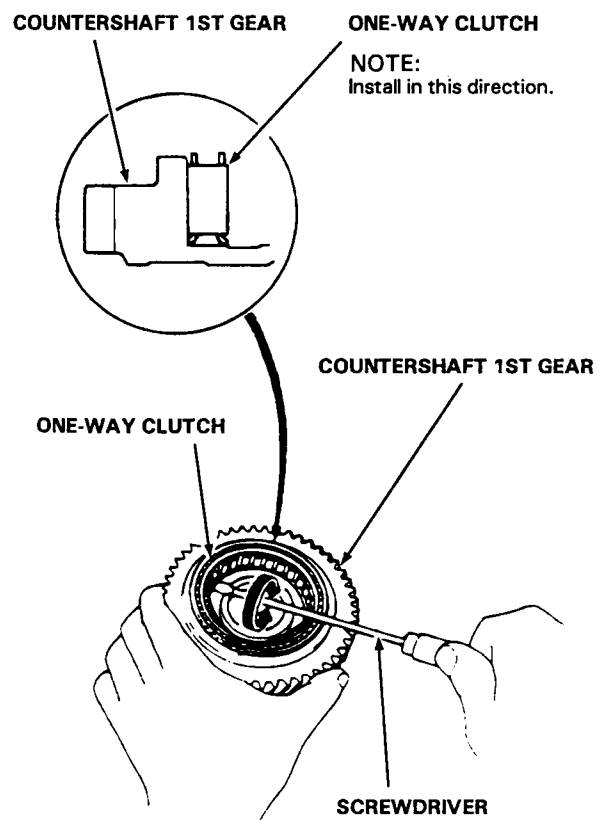


### Disassembly and Inspection

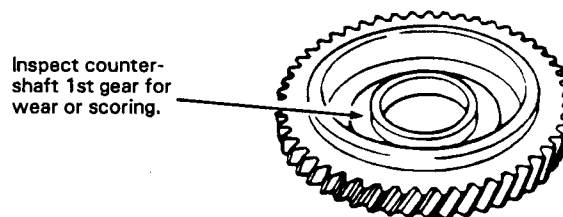
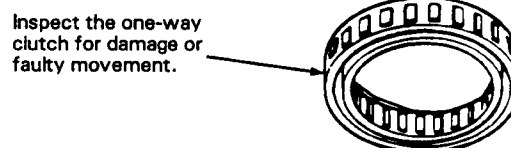
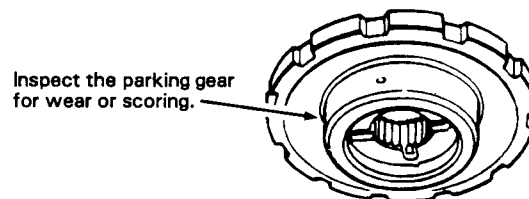
1. Separate countershaft 1st gear from the parking gear by turning the parking gear in the direction shown.



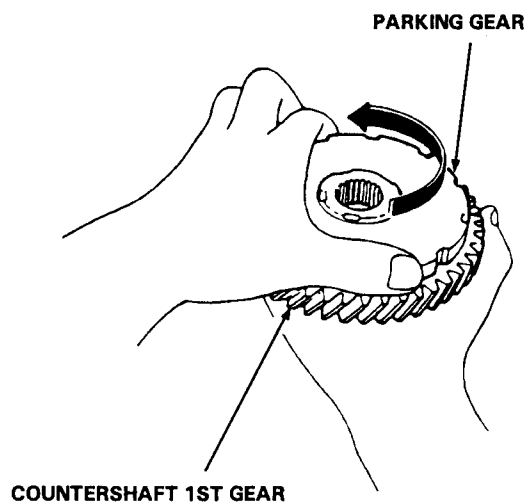
2. Remove the one-way clutch by prying it up with the end of a screwdriver.



### Inspect the parts as follows:



3. After the parts are assembled, hold countershaft 1st gear and turn the parking gear in the direction shown to be sure it turns freely.

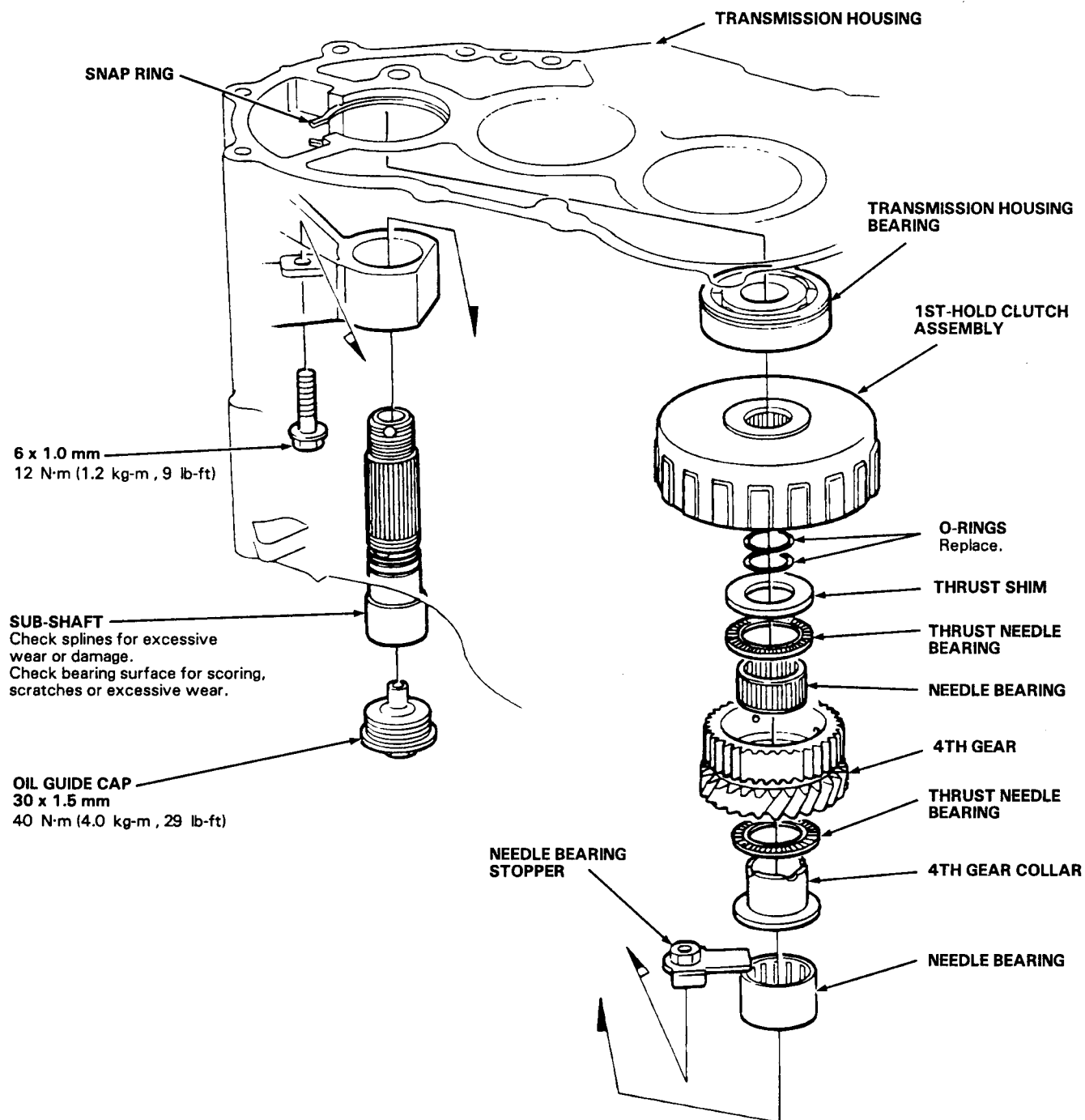


### Disassembly/Inspection/Reassembly

#### NOTE:

- Lubricate all parts with ATF before reassembly.
- Install the thrust needle bearings with unrolled edge of bearing retainer facing washer.
- Inspect the thrust needle bearings and the needle bearings for galling and rough movement.
- Before installing the O-rings, wrap the shaft splines with tape to prevent damaging the O-rings.

1. Remove the oil guide cap.
2. Remove the sub-shaft, 1st-hold clutch assembly and 4th gear assembly.
3. Assemble the sub-shaft in the reverse order of removal.

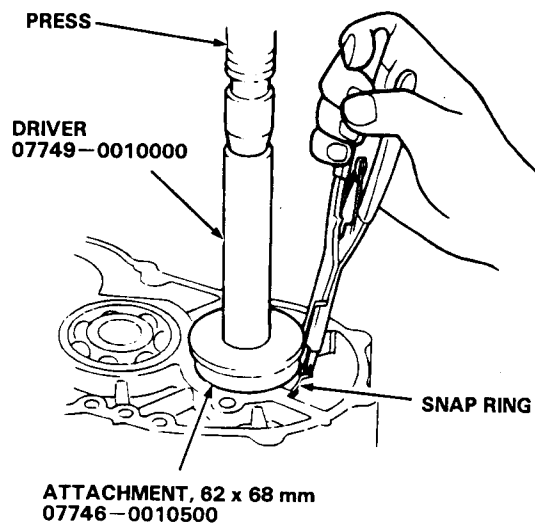


### Replacement

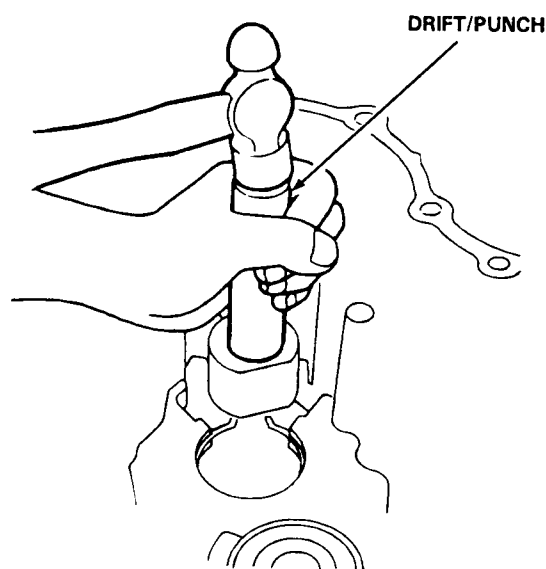
#### NOTE:

Lubricate all parts with ATF before reassembly.

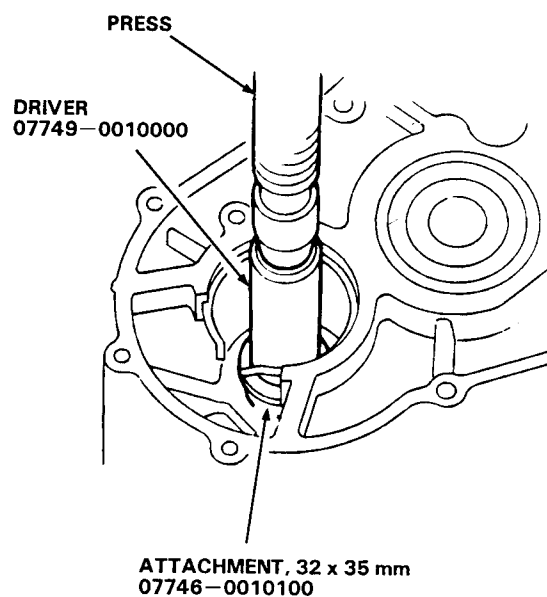
1. To remove the sub-shaft ball bearing from the transmission housing, expand the snap ring with snap ring pliers, then push the bearing out using the special tools and a press as shown.



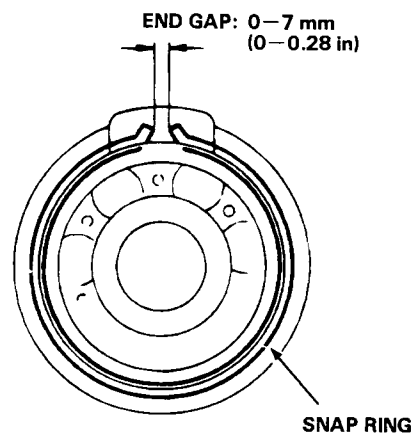
2. Remove the needle bearing stopper.
3. Remove the needle bearing from the transmission housing using a drift punch.



4. Install the new needle bearing in the transmission housing using the special tools and a press as shown.



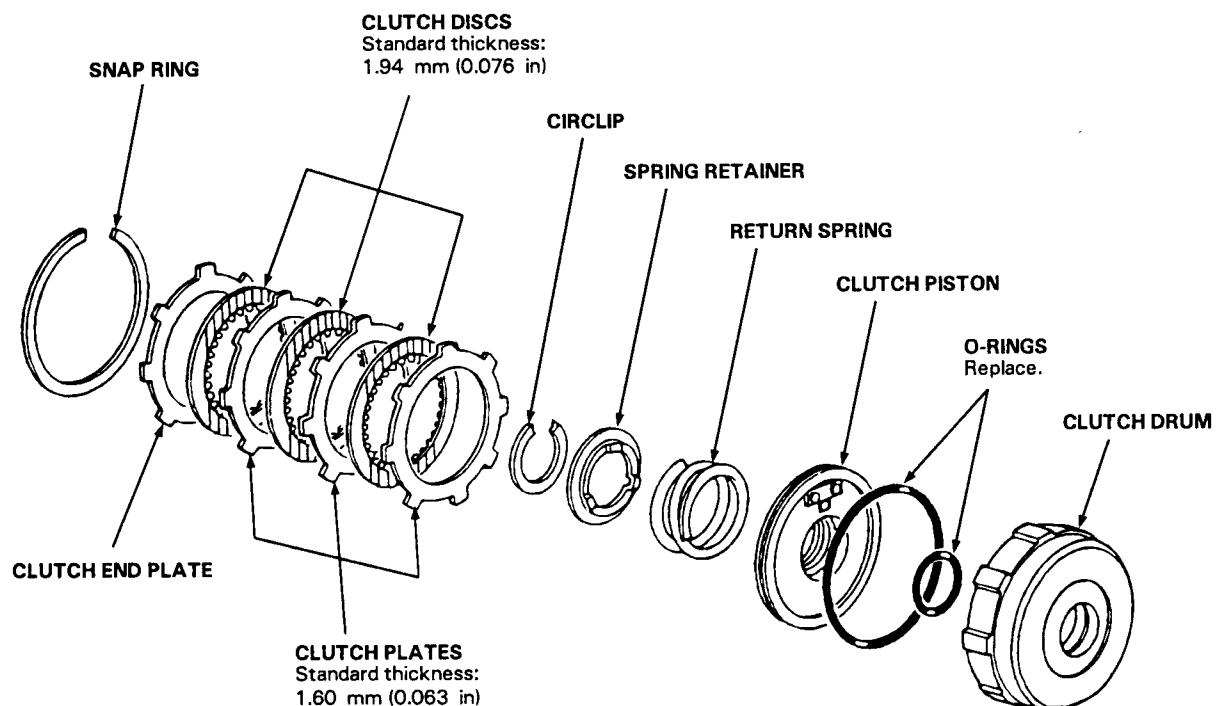
5. Expand the snap ring with snap ring pliers, then insert the ball bearing part-way into the housing using the special tools and a press as described in step 1. Install the bearing with the groove facing outside the housing.
6. Release the pliers, then push the bearing down into the housing until the snap ring snaps in place around it.
7. After installing the ball bearing verify the following:
  - The snap ring is seated in the bearing and housing grooves.
  - The snap ring operates properly.
  - The ring end gap is correct.



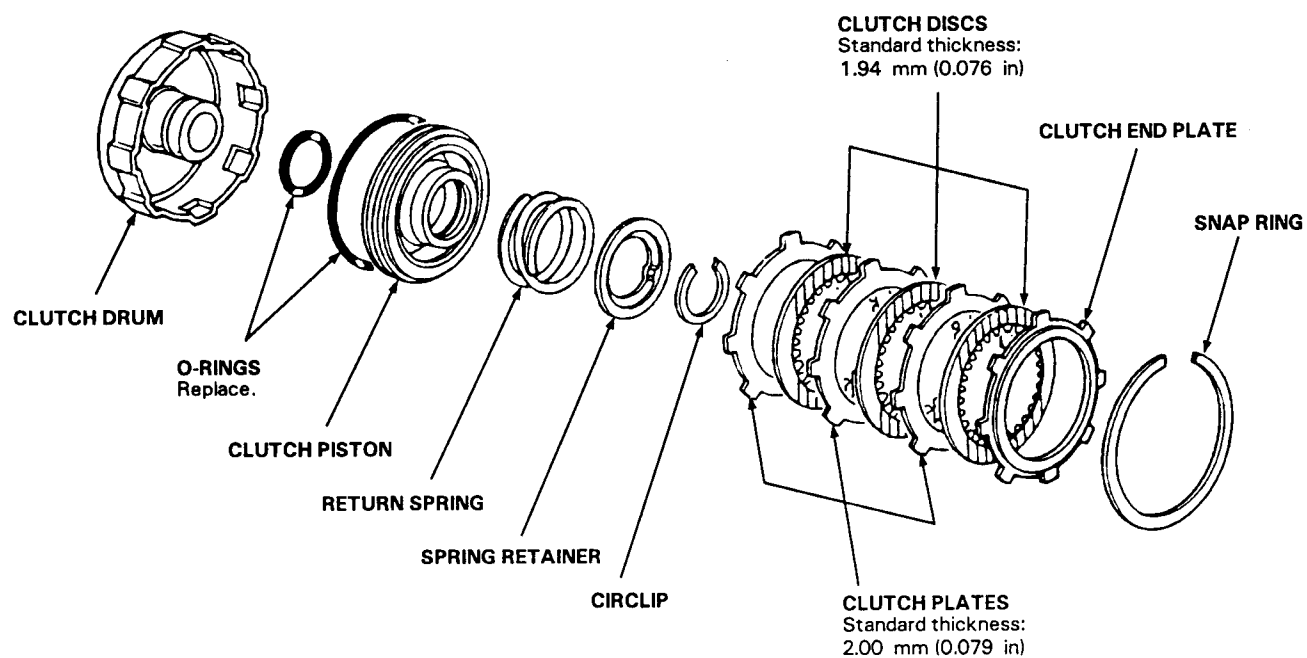
## Clutch

### Illustrated Index

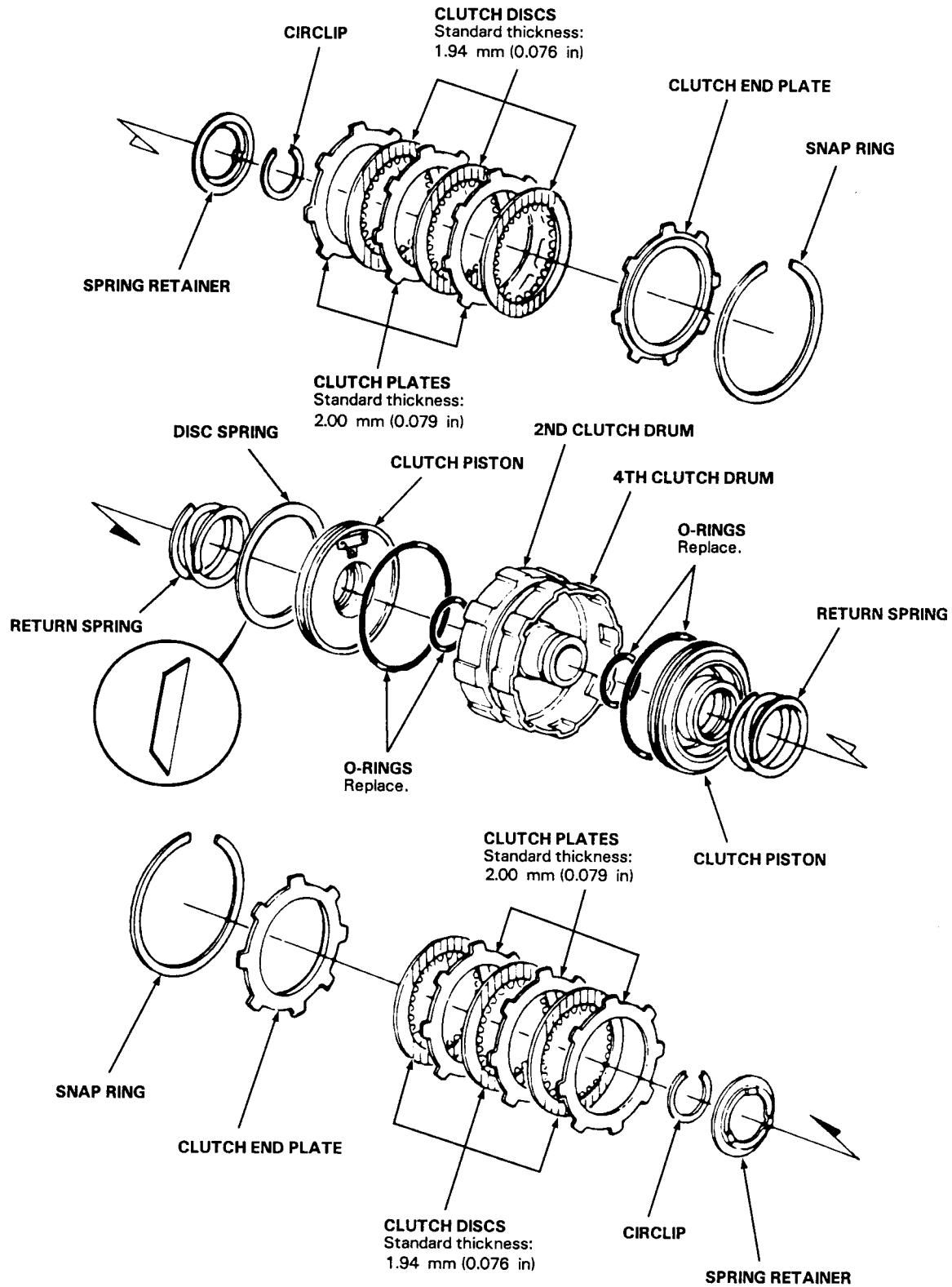
#### 1ST CLUTCH



#### 3RD CLUTCH

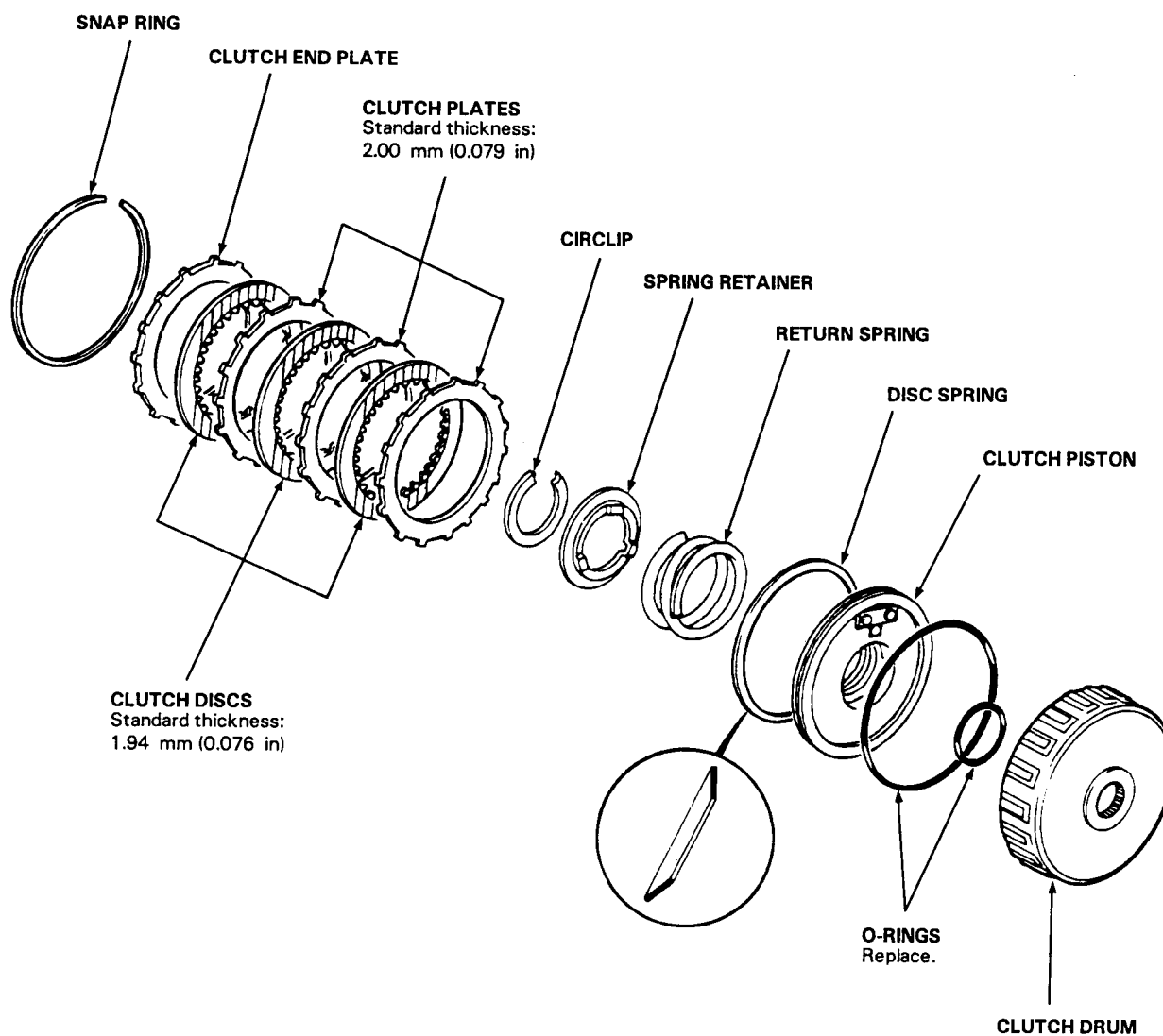


## 2ND/4TH CLUTCH



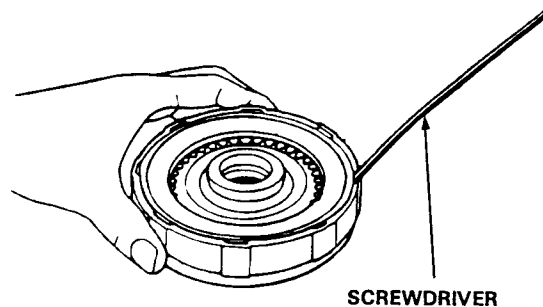
(cont'd)

## 1ST-HOLD CLUTCH



## Disassembly

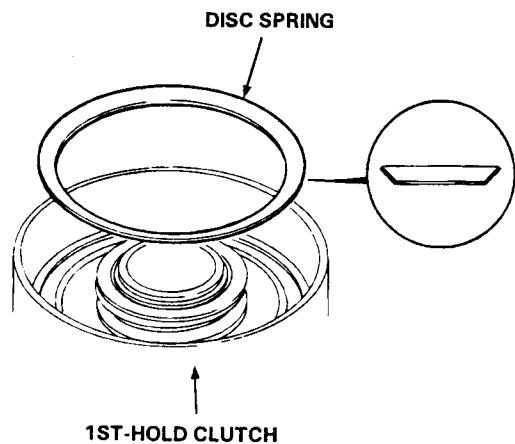
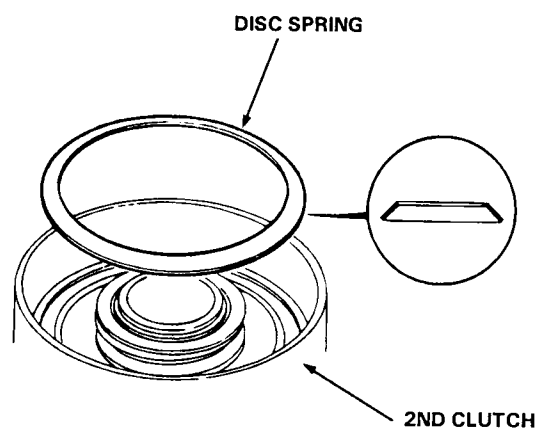
1. Remove the snap ring, then remove the clutch end plate, clutch discs and plates.



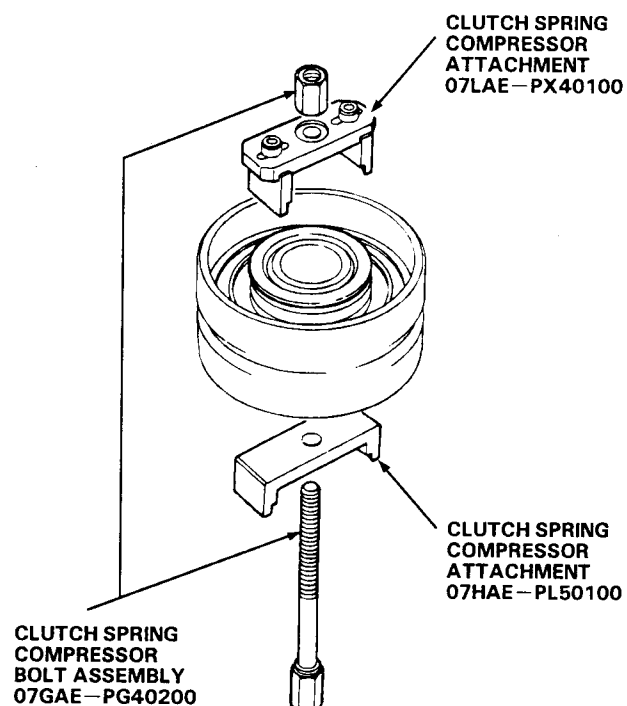
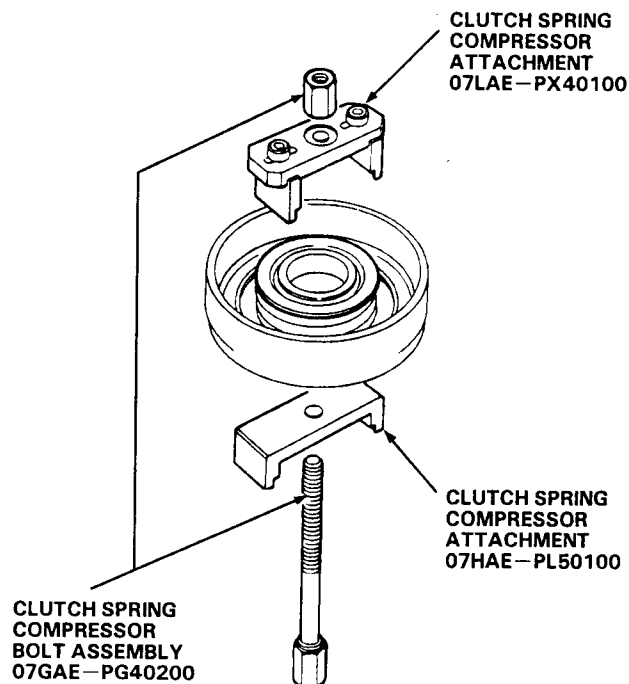
2. Remove the disc spring.

### NOTE:

For 1st-hold, and 2nd clutches



3. Install the special tools as shown.

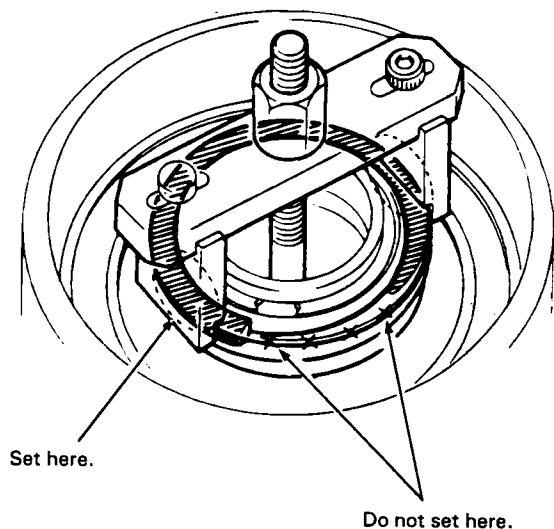


(cont'd)

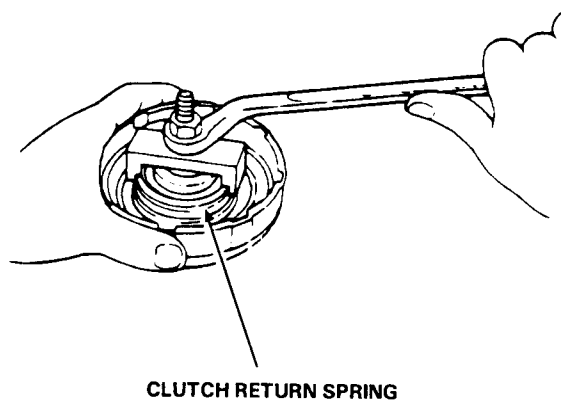
## Disassembly (cont'd)

### CAUTION:

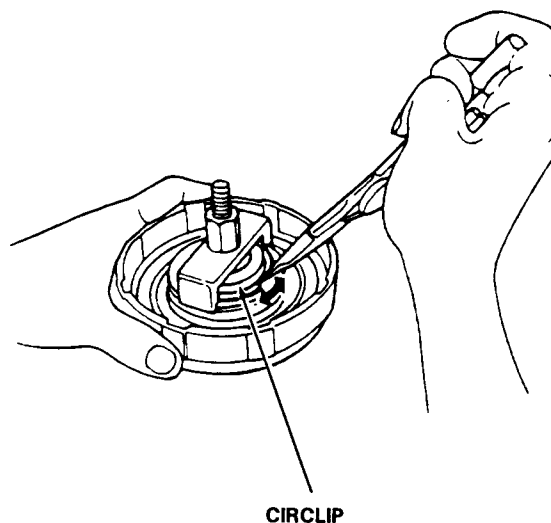
If either end of the compressor attachment is set over an area of the spring retainer which is unsupported by the return spring, the retainer may be damaged.



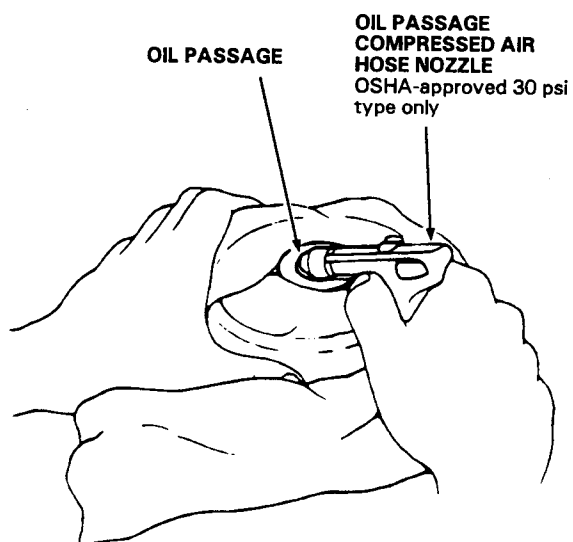
4. Compress the clutch return spring.



5. Remove the circlip. Then remove the special tools, spring retainer and return spring.



6. Wrap a shop towel around the clutch drum and apply air pressure to the oil passage to remove the piston. Place a finger tip on the other end while applying air pressure.





## Reassembly

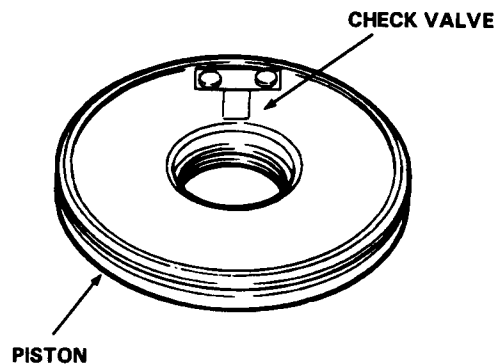
### NOTE:

- Clean all parts thoroughly in solvent or carburetor cleaner, and dry with compressed air.
- Blow out all passages.
- Lubricate all parts with ATF before reassembly.

1. Inspect the check valve; if it's loose replace the piston.

### NOTE:

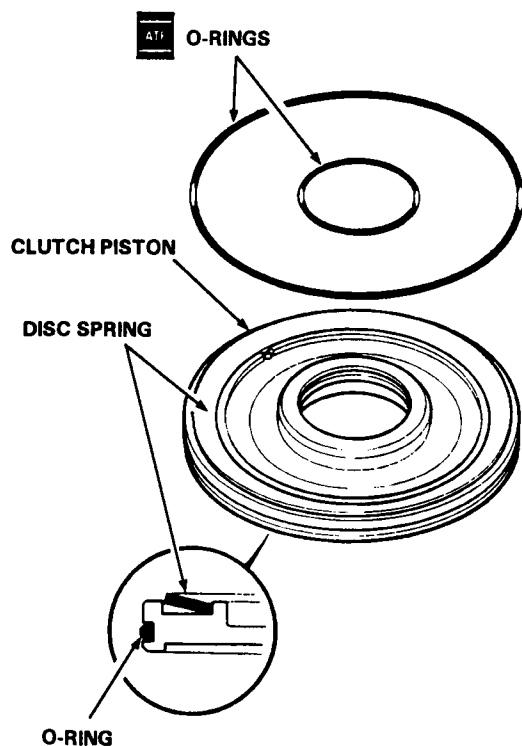
Except 1st-hold clutch.



2. Install new O-rings on the clutch piston.
3. Be sure that the disc spring is securely staked.

### NOTE:

For 1st, 3rd and 4th clutches.



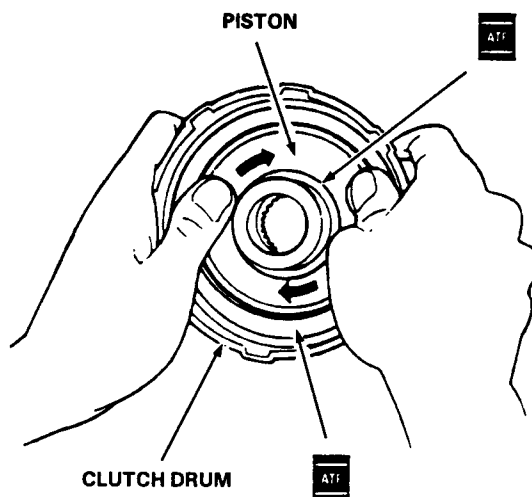
4. Install the piston in the clutch drum. Apply pressure and rotate to ensure proper seating.

### NOTE:

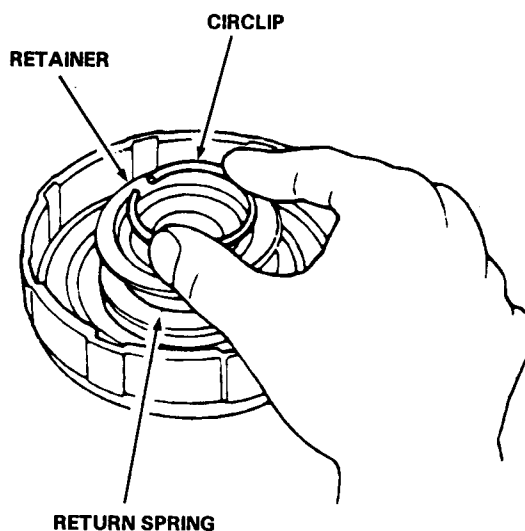
Lubricate the piston O-ring with ATF before installing.

### CAUTION:

Do not pinch O-ring by installing the piston with force.



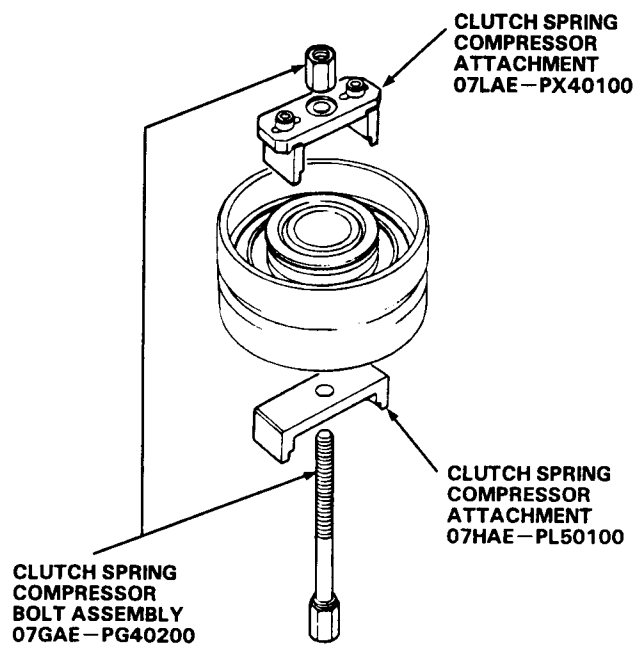
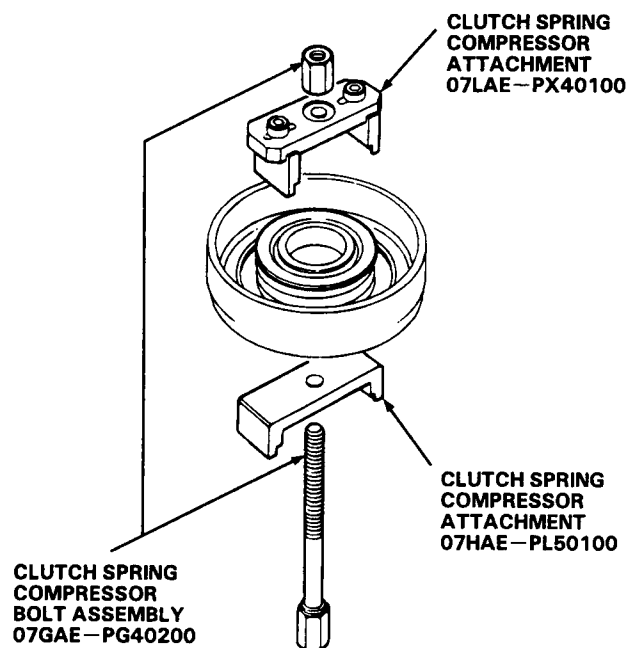
5. Install the return spring and spring retainer and position the circlip on the retainer.



(cont'd)

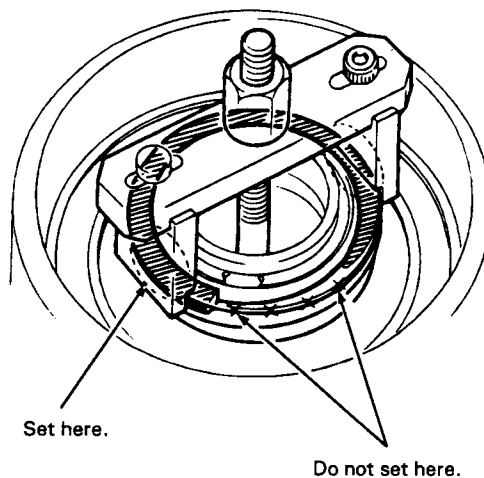
## Reassembly (cont'd)

6. Install the special tools as shown.

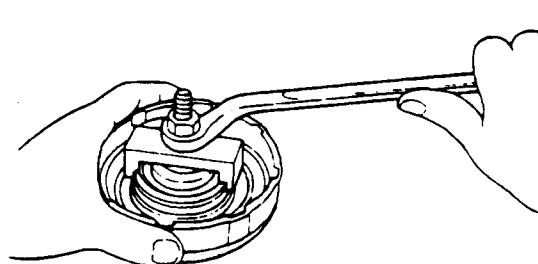


### CAUTION:

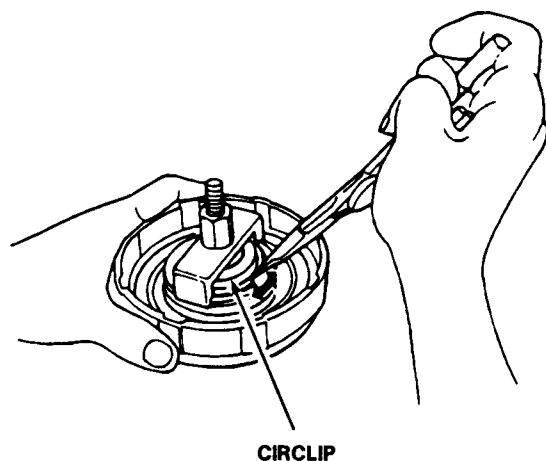
If either end of the compressor attachment is set over an area of the spring retainer which is unsupported by the return spring, the retainer may be damaged.



7. Compress the clutch return spring.



8. Install the circlip.

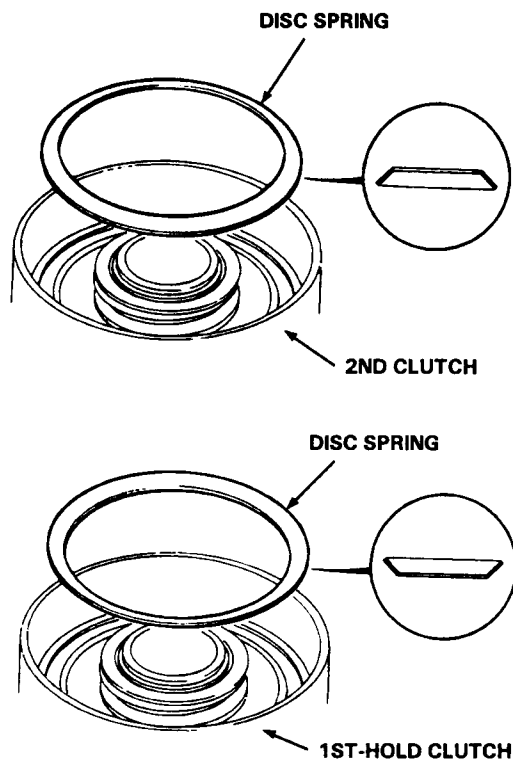


9. Remove the special tools.

10. Install the disc spring.

**NOTE:**

For 1st-hold and 2nd clutches, install the disc spring in the direction shown.

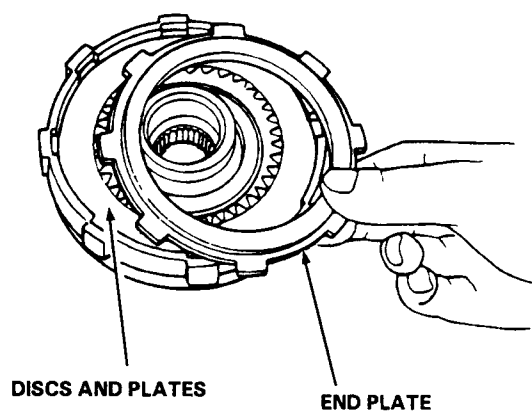


11. Soak the clutch discs thoroughly in ATF for a minimum of 30 minutes.

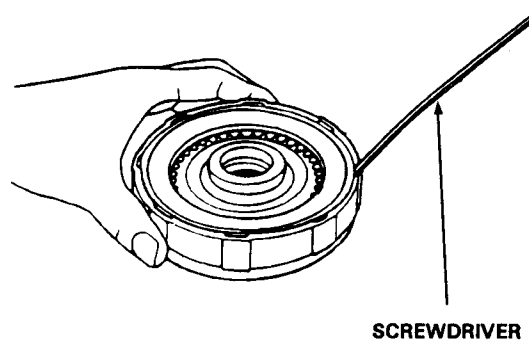
12. Starting with a clutch plate, alternately install the clutch plates and discs. Install the clutch end plate with flat side toward the disc.

**NOTE:**

Before installing the plates and discs, make sure the inside of the clutch drum is free of dirt or other foreign matter.



13. Install the snap ring.



(cont'd)

## Reassembly (cont'd)

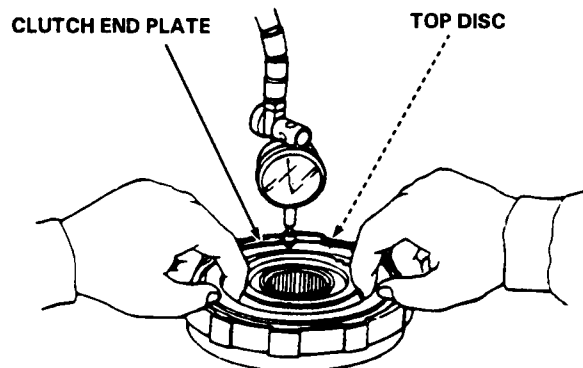
14. Measure the clearance between the clutch end plate and top disc with a dial indicator. Zero the dial indicator with the clutch end plate lowered and lift it up to the snap ring. The distance that the clutch end plate moves is the clearance between the clutch end plate and top disc.

### NOTE:

Measure at three locations.

### Clutch End Plate-to-Top Disc Clearance:

Clutch	Service Limit
1st	0.65—0.85 mm (0.026—0.033 in)
2nd	0.65—0.85 mm (0.026—0.033 in)
3rd	0.40—0.60 mm (0.016—0.024 in)
4th	0.40—0.60 mm (0.016—0.024 in)
1st-Hold	0.50—0.80 mm (0.020—0.031 in)



15. If the clearance is not within the service limits, select a new clutch end plate from the following table.

### NOTE:

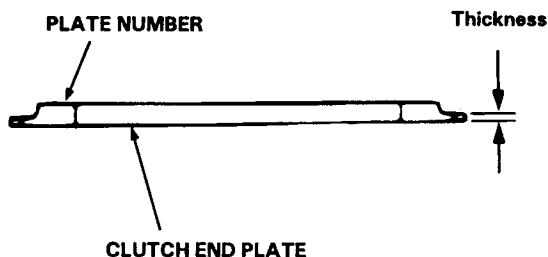
If the thickest clutch end plate is installed, but the clearance is still over the standard, replace the clutch discs and clutch plates.

### 1ST, 2ND, 3RD and 4TH CLUTCH

Plate No.	Part Number	Thickness
1	22551—PC9—000	2.40 mm (0.094 in)
2	22552—PC9—000	2.50 mm (0.098 in)
3	22553—PC9—000	2.60 mm (0.102 in)
4	22554—PC9—000	2.70 mm (0.106 in)
5	22555—PC9—000	2.80 mm (0.110 in)
6	22556—PC9—000	2.90 mm (0.114 in)
7	22557—PC9—000	3.00 mm (0.118 in)
8	22558—PC9—000	3.10 mm (0.122 in)
9	22559—PC9—000	3.20 mm (0.126 in)
10	22560—PC9—000	3.30 mm (0.130 in)
11	22561—PC9—000	2.10 mm (0.083 in)
12	22562—PC9—000	2.20 mm (0.087 in)
13	22563—PC9—000	2.30 mm (0.091 in)

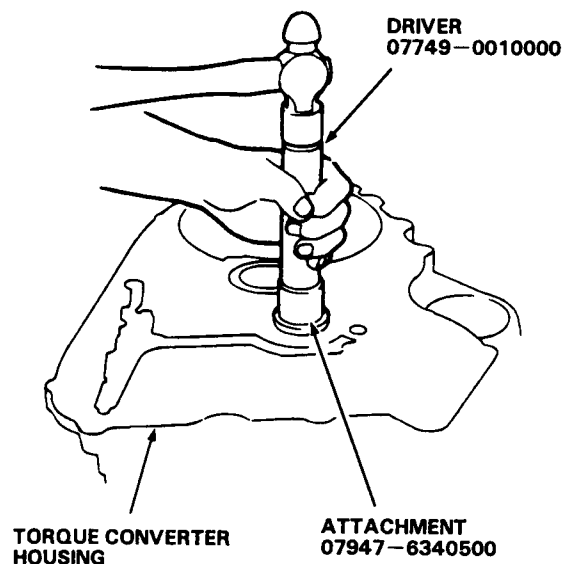
### 1ST-HOLD CLUTCH

Plate No.	Part Number	Thickness
1	22551—PS5—003	2.10 mm (0.083 in)
2	22552—PS5—003	2.20 mm (0.087 in)
3	22553—PS5—003	2.30 mm (0.091 in)
4	22554—PS5—003	2.40 mm (0.094 in)
5 (No mark)	22555—PS5—003	2.50 mm (0.098 in)
6	22556—PS5—003	2.60 mm (0.102 in)
7	22557—PS5—003	2.70 mm (0.106 in)

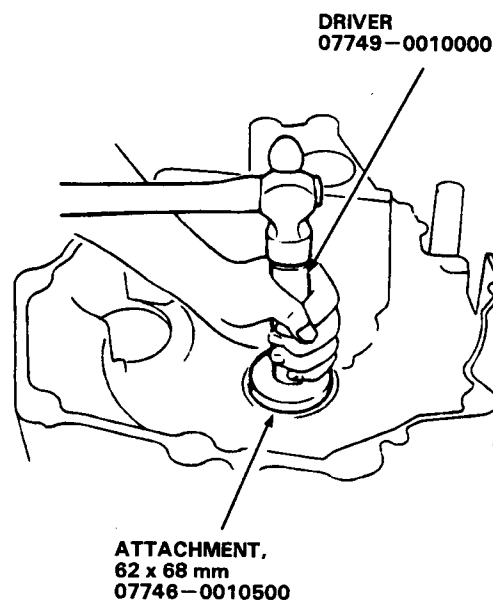


## Mainshaft Bearing Replacement

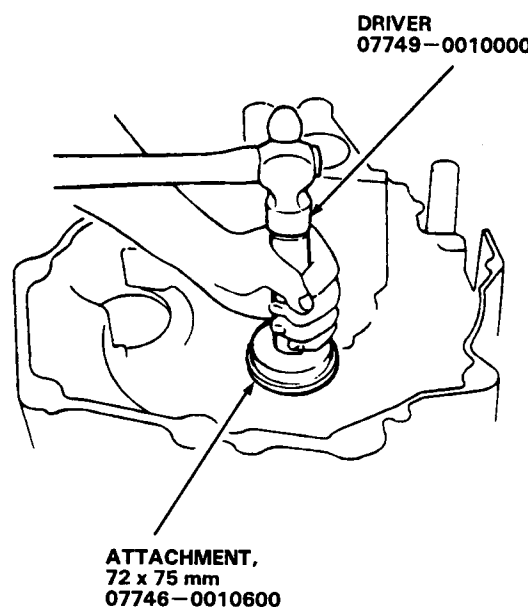
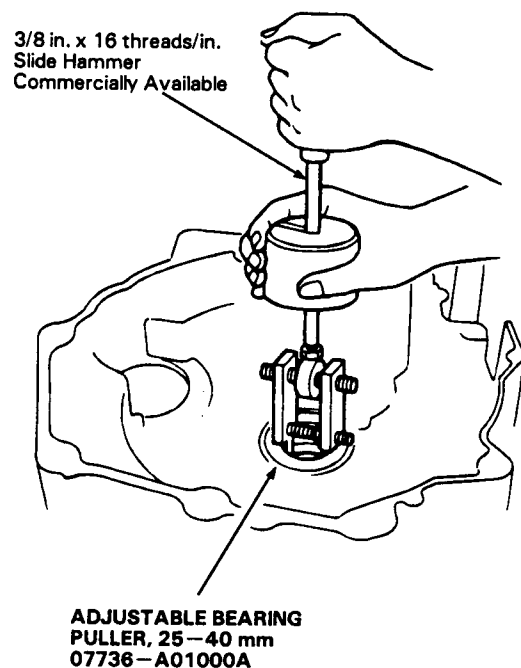
1. Drive out or pull up the mainshaft bearing and oil seal using the special tools as shown.



2. Drive in the new mainshaft bearing until it bottoms in the housing, using the special tools as shown.



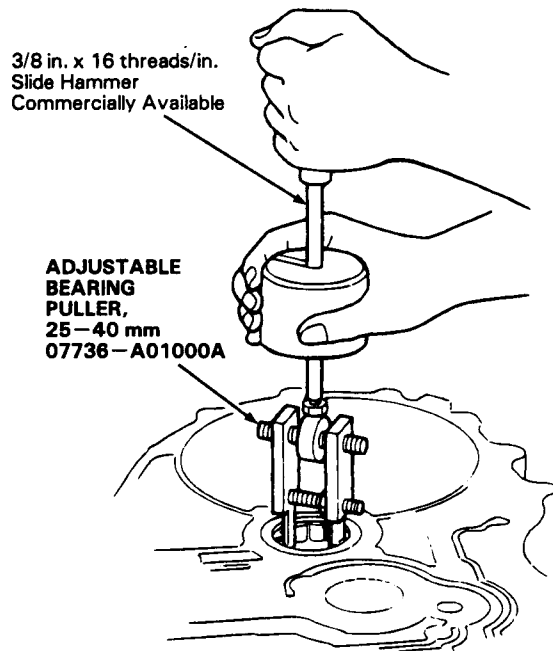
3. Install the new oil seal flush with the housing using the special tools as shown.



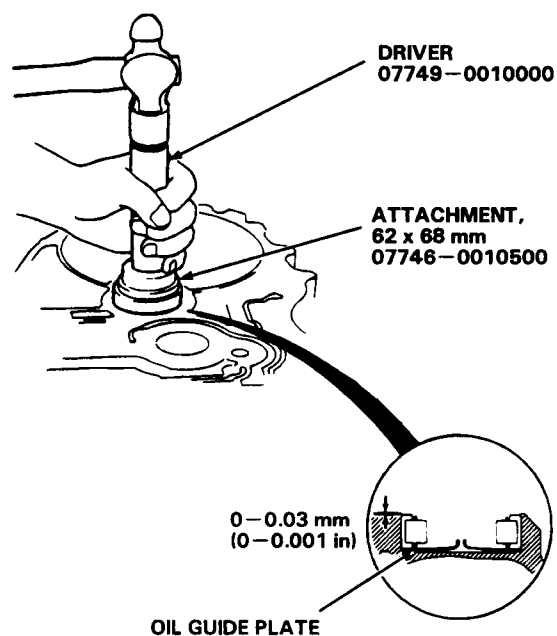
## Torque Converter Housing Bearings

### Countershaft Bearing Replacement

1. Remove the countershaft bearing using the special tool.



2. Install the oil guide plate.
3. Drive the new bearing into the housing using the special tools as shown.



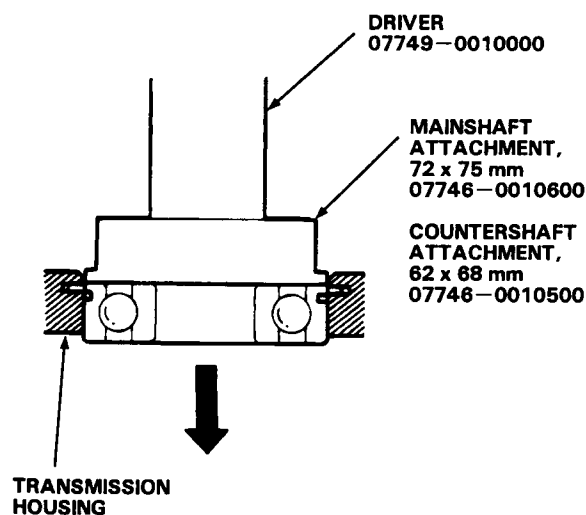
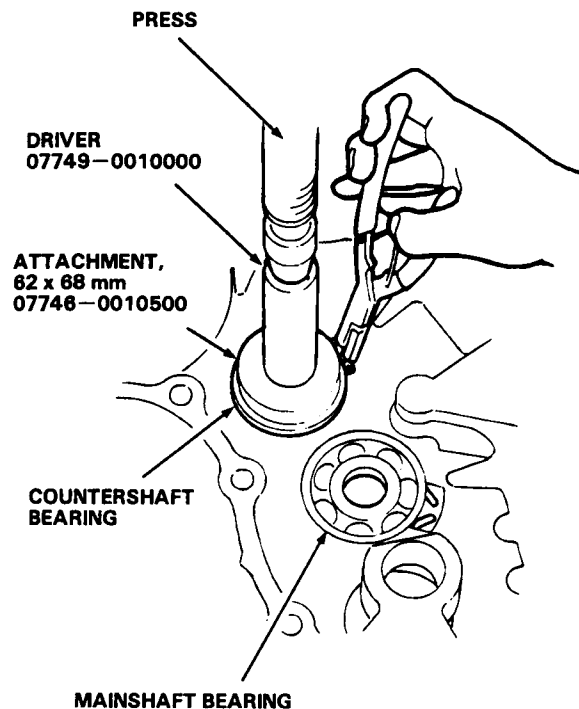
## Transmission Housing Bearings

### Mainshaft/Countershaft Bearing Replacement

1. To remove the mainshaft and countershaft bearings from the transmission housing, expand each snap ring with snap ring pliers, then push the bearing out using the special tools and a press as shown.

#### NOTE:

Do not remove the snap rings unless it's necessary to clean the grooves in the housing.

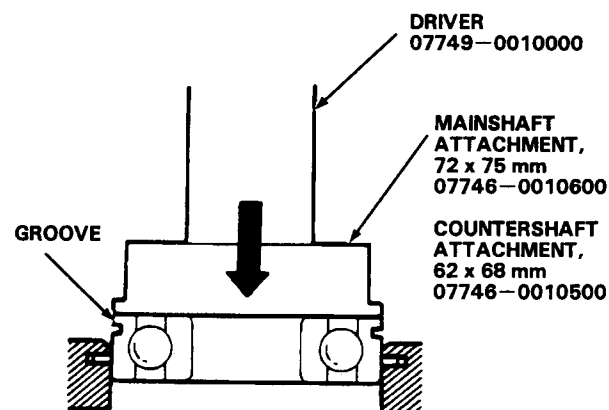


2. Expand each snap ring with snap ring pliers, insert the new bearing part-way into the housing using the special tools and a press as shown. Install the bearing with the groove facing outside the housing.

#### NOTE:

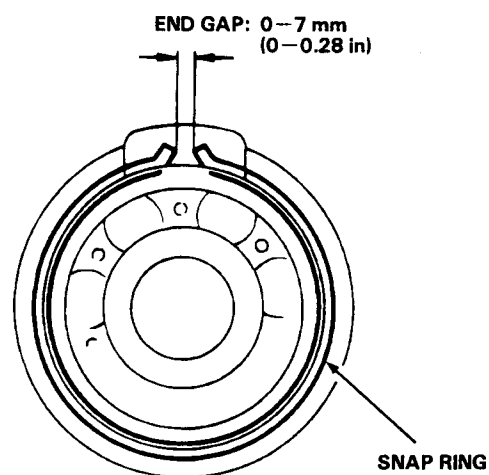
Coat all parts with ATF.

3. Release the pliers, then push the bearing down into the housing until the ring snaps in place around it.



4. After installing the bearing verify the following:

- The snap ring is seated in the bearing and housing grooves.
- The snap ring operates properly.
- The ring end gap is correct.

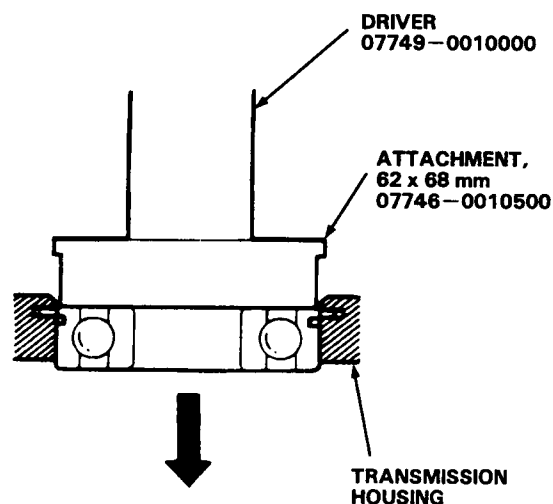
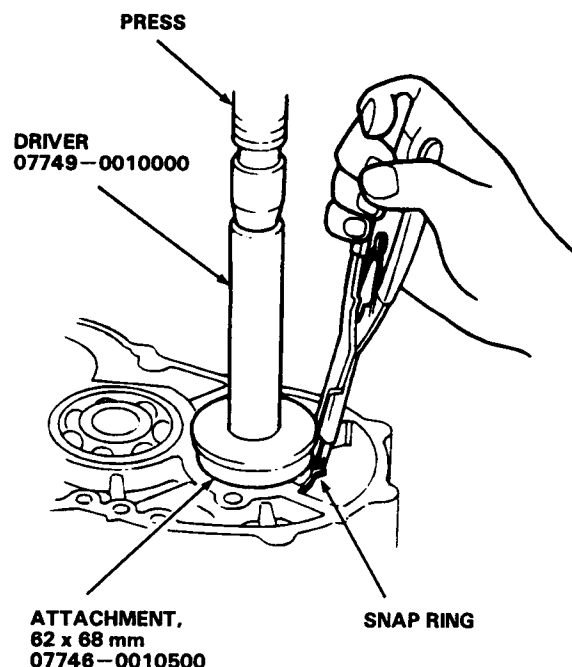


## Sub-shaft Bearing Replacement

1. To remove the sub-shaft bearing from the transmission housing, expand the snap ring with snap ring pliers, then push the bearing out using the special tools and a press as shown.

### NOTE:

Do not remove the snap ring unless it's necessary to clean the groove in the housing.

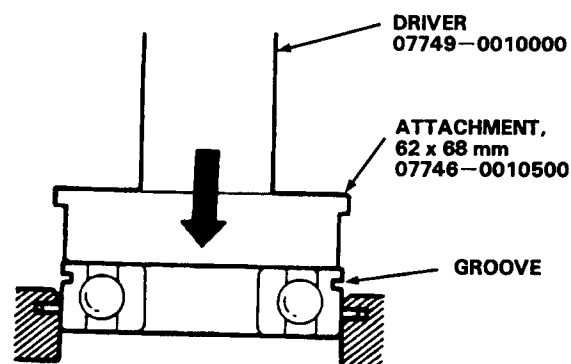


2. Expand the snap ring with snap ring pliers, insert the new bearing part-way into the housing using the special tools and a press as shown. Install the bearing with the groove facing outside the housing.

### NOTE:

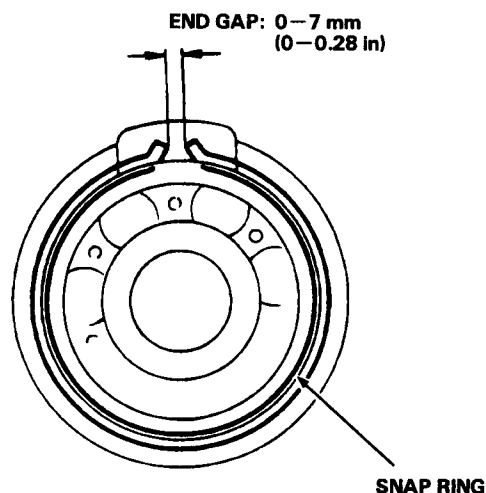
Coat all parts with ATF.

3. Release the pliers, then push the bearing down into the housing until the ring snaps in place around it, using the special tools as shown.



4. After installing the bearing verify the following:

- The snap ring is seated in the bearing and housing grooves.
- The snap ring operates properly.
- The ring end gap is correct.



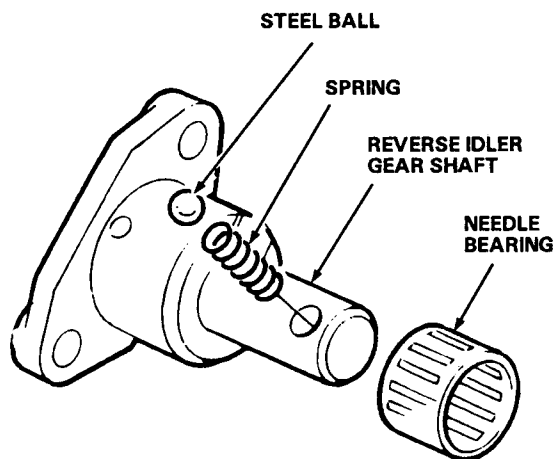


### Installation

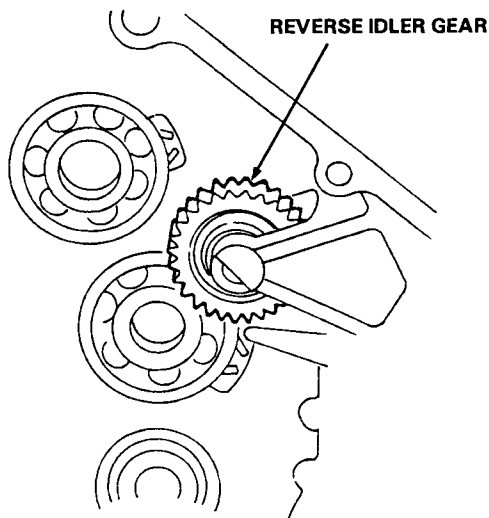
1. Set the spring in the reverse idler gear shaft. Push the spring in with the steel ball, then install the needle bearing.

#### NOTE:

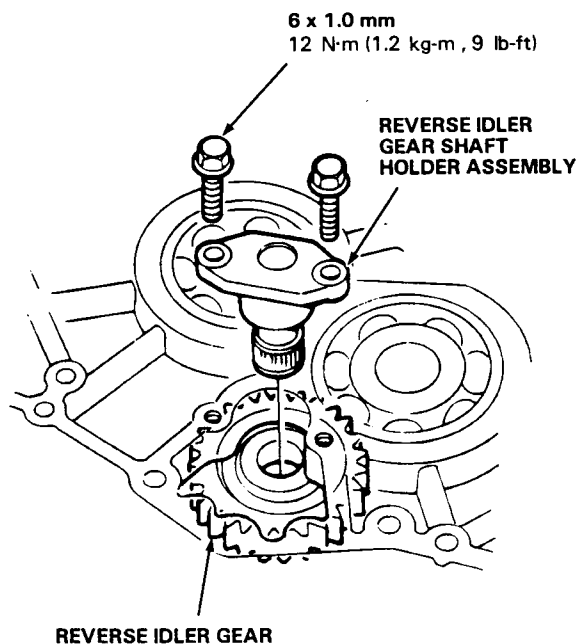
The steel ball is under spring pressure. Take care not to let it pop out.



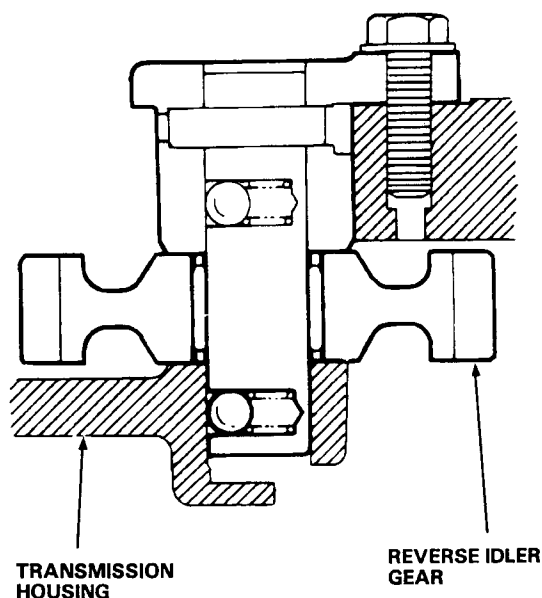
2. Install the reverse idler gear.



3. Install the reverse idler gear shaft holder into the transmission housing, then tighten the bolts.



#### Sectional View



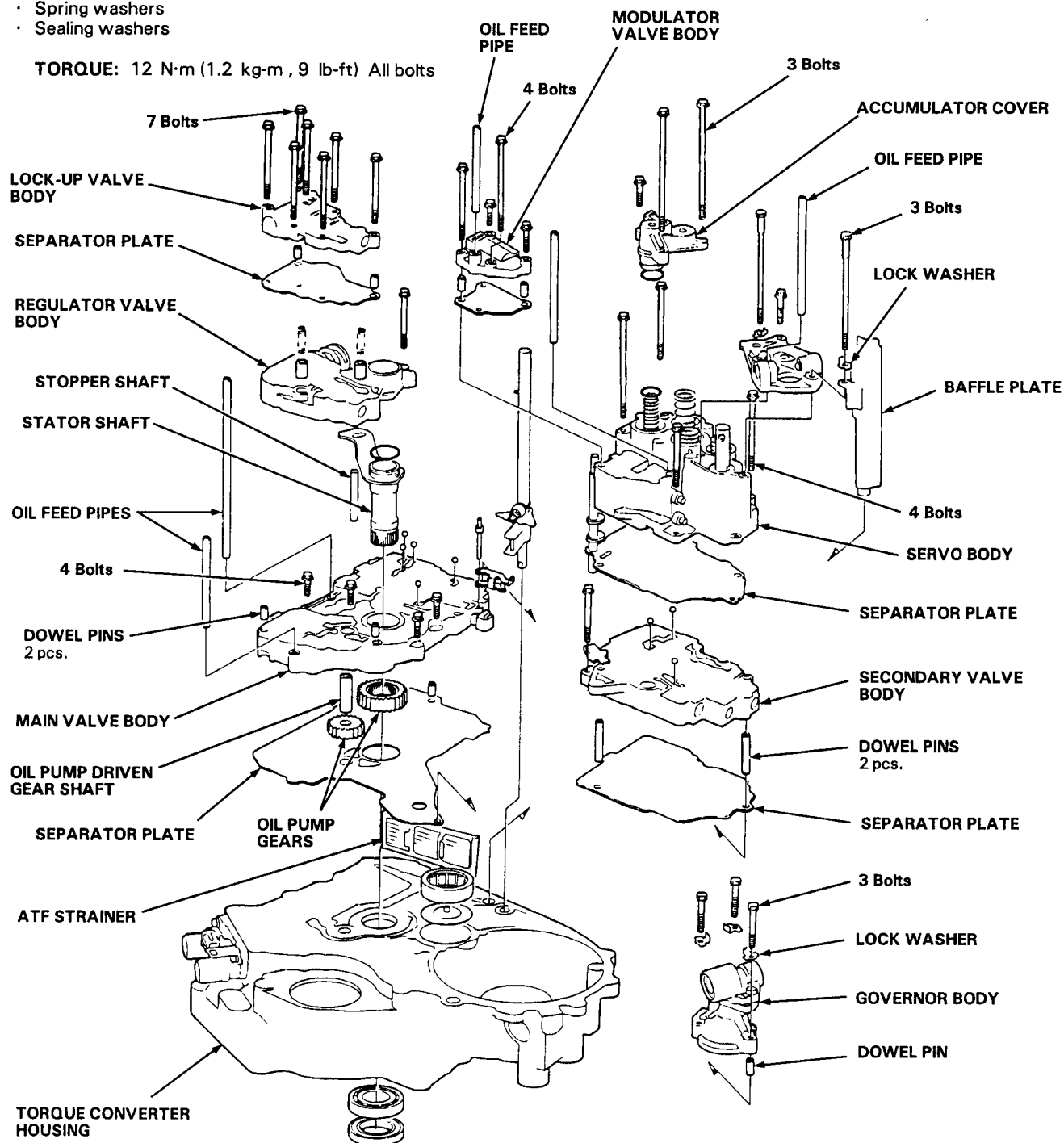
## Transmission/Valve Body

### Reassembly

#### NOTE:

- Coat all parts with ATF.
- Replace the parts below:
  - O-rings
  - Lock washers
  - Gaskets
  - Locknuts
  - Spring washers
  - Sealing washers

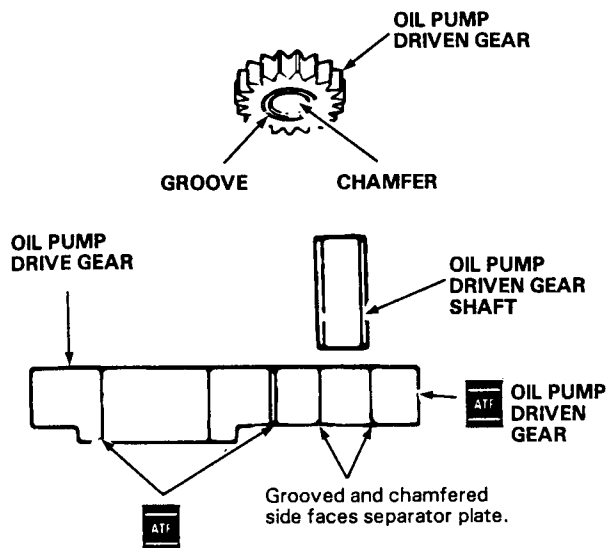
**TORQUE:** 12 N·m (1.2 kg-m, 9 lb-ft) All bolts



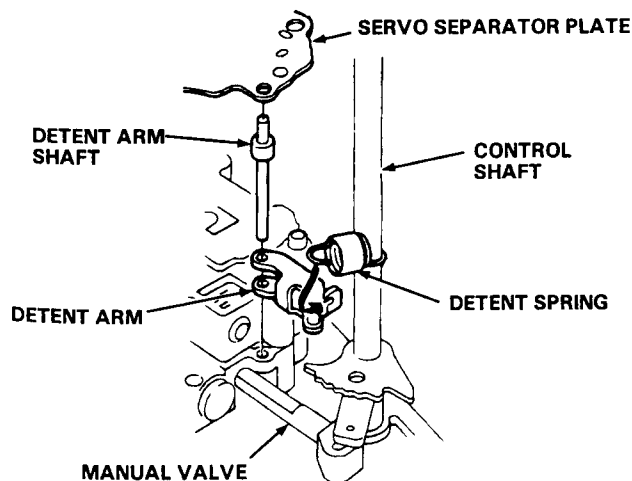
1. Install the ATF strainer in the torque converter housing.
2. Install the main separator plate with two dowel pins on the torque converter housing. Then install the oil pump drive gear, driven gear and driven gear shaft.

## NOTE:

Install the oil pump driven gear with its grooved and chamfered side facing down.



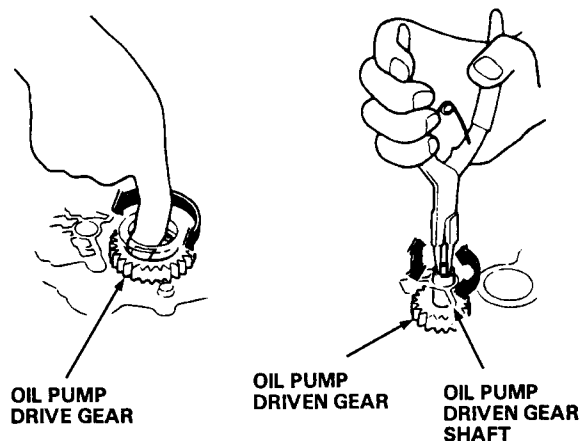
3. Loosely install the main valve body with four bolts. Make sure the oil pump drive gear rotates smoothly in the normal operating direction and the oil pump driven gear shaft moves smoothly in the axial and normal operating directions.
4. Install the secondary valve body, separator plate and two dowel pins with the bolt.
5. Install the control shaft in the housing, with the control shaft and manual valve together.
6. Install the detent arm and arm shaft in the main valve body, then hook the detent spring to the detent arm.



7. Install the servo body and separator plate with four bolts.
8. Install the modulator valve body, separator plate and two dowel pins with four bolts.
9. Install the accumulator cover with three bolts.
10. Install the servo detent base and baffle plate with three bolts and new lock washers.
11. Install the governor body with three bolts and new lock washers.
12. Tighten the four bolts to 12 N·m (1.2 kg-m, 9 lb-ft) on the main valve body. Make sure the oil pump drive gear and oil pump driven gear shaft move smoothly same as in the step 3.
13. If the oil pump drive gear and oil pump driven gear shaft do not move freely, loosen the four bolts on the main valve body and disassemble the valve bodies. Realign the oil pump driven gear shaft and reassemble the valve bodies, then retighten the bolts to the specified torque.

## CAUTION:

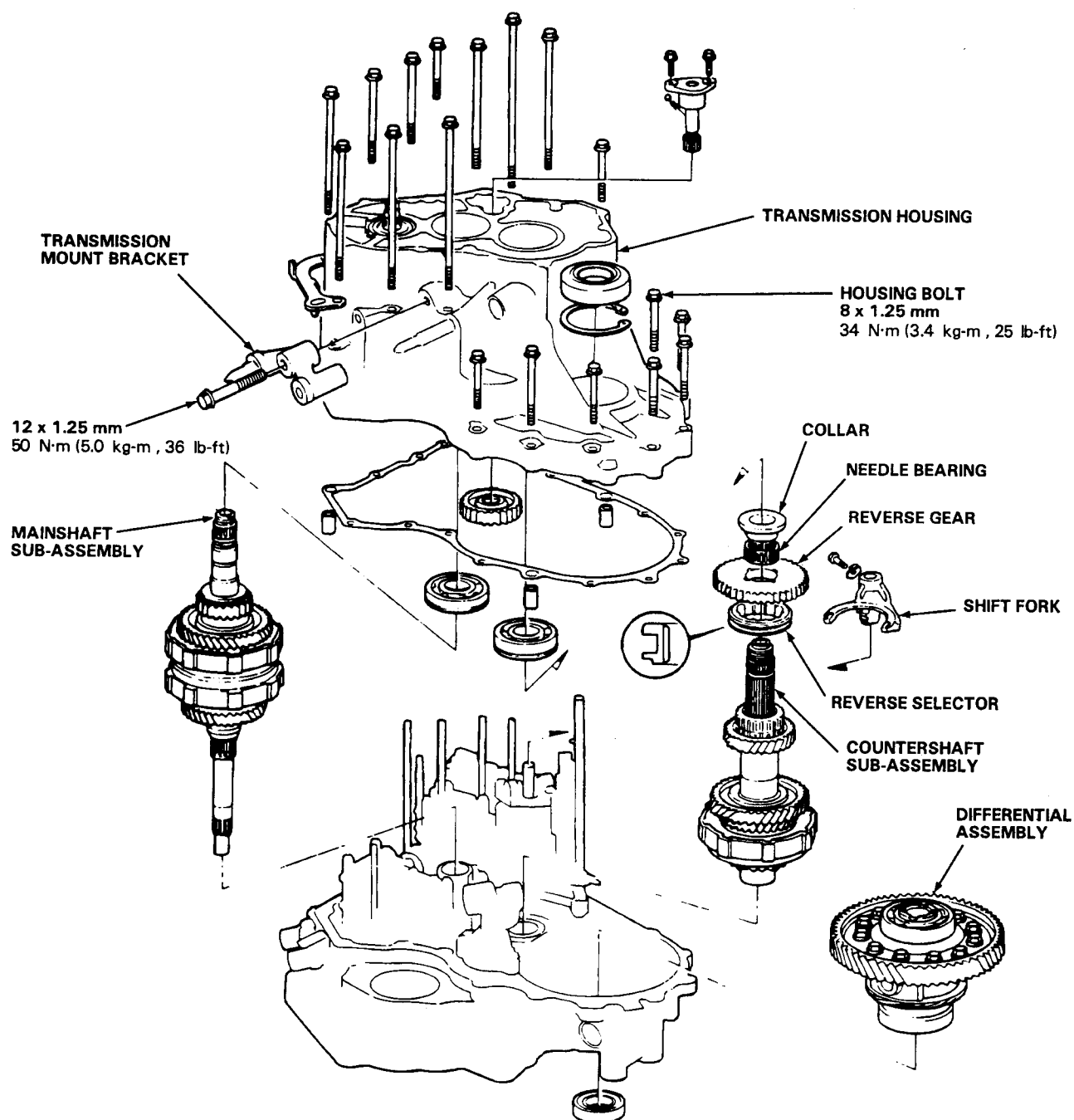
Failure to align the oil pump driven gear shaft correctly will result in a seized oil pump drive gear or oil pump driven gear shaft.



14. Install the stator shaft and stopper shaft.
15. Install the regulator valve body with the bolt.
16. Install the lock-up valve body, separator plate and two dowel pins with seven bolts.
17. Install the oil feed pipes.

(cont'd)

### Reassembly (cont'd)

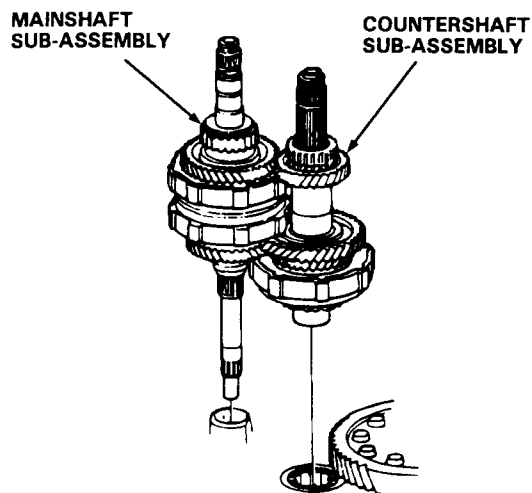


18. Install the sub-shaft assembly in the transmission housing.
19. Install the reverse idler gear and gear shaft holder
20. Install the differential assembly in the torque converter housing.

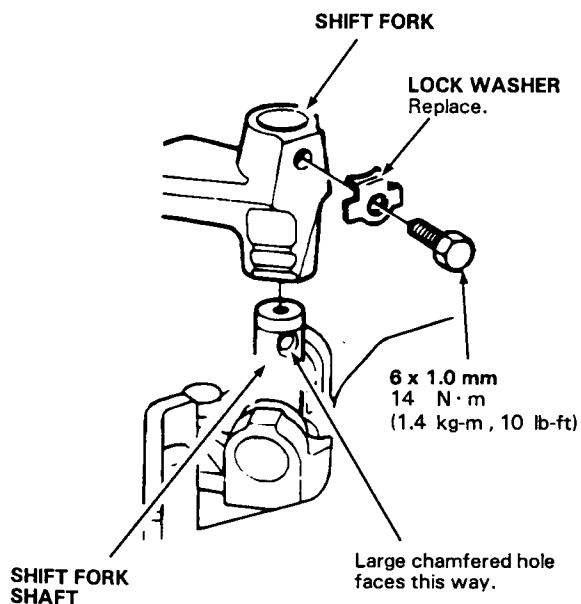
**NOTE:**

Take care not to damage the governor body.

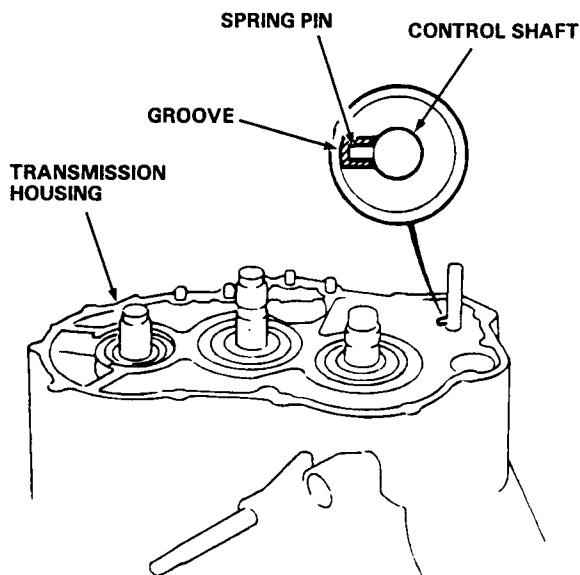
21. Install the mainshaft and countershaft sub-assembly together in the torque converter housing.



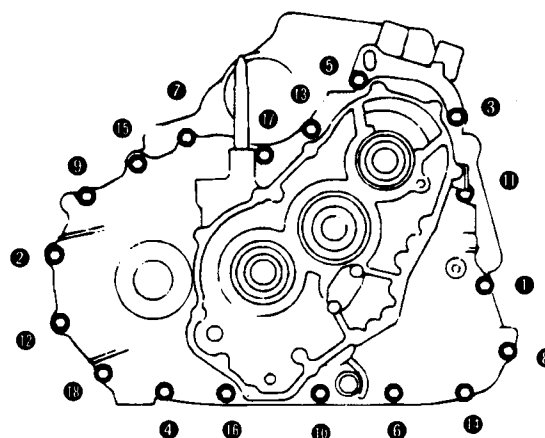
22. Turn the shift fork so the large chamfered hole is facing the fork bolt hole, then install the shift fork with the reverse selector and torque the lock bolt. Bend the lock tab against the bolt head.



23. Install the reverse gear with the collar and needle bearing on the countershaft.
24. Align the spring pin of the control shaft with the transmission housing groove by turning the control shaft.
25. Place the transmission housing on the torque converter housing with a new gasket and the dowel pins.



26. Install the transmission housing bolts and transmission hanger, then torque the bolts to 34 N·m (3.4 kg-m, 25 lb-ft) in two or more steps as shown.



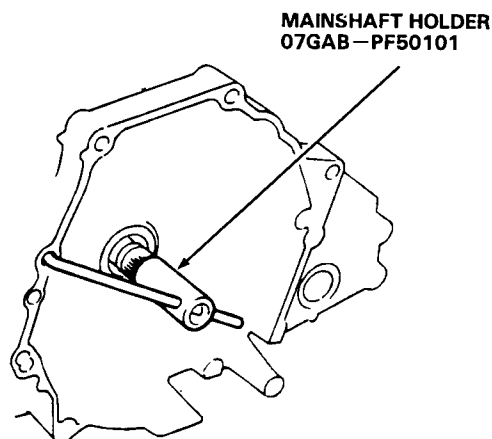
27. Install the transmission mount bracket on the transmission housing.

(cont'd)

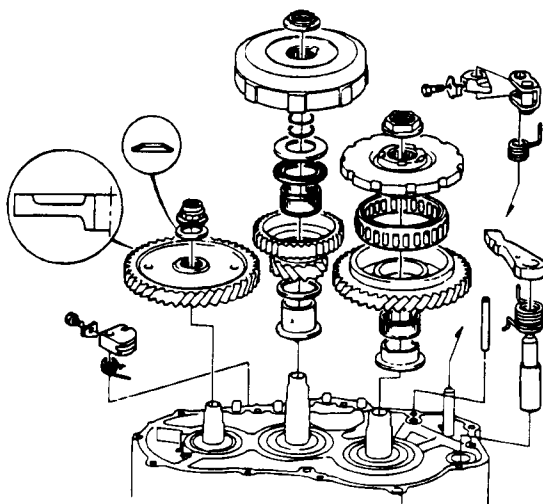
## Transmission/Right Side Cover

### Reassembly (cont'd)

28. Slip the special tool onto the mainshaft.

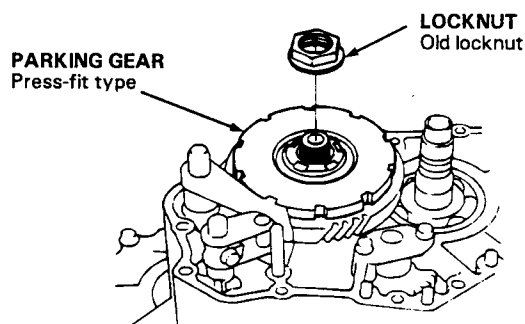


29. Install the parking brake lever on the control shaft.
30. Install the parking gear, countershaft 1st gear and one-way clutch assembly on the countershaft.
31. Install the parking brake pawl in the transmission housing, then engage it with the parking gear.



32. Use the old locknut to tighten the press-fit parking gear to the specified torque, then loosen it.

**TORQUE:** 140 N·m (14.0 kg-m, 101 lb-ft)



33. Install mainshaft 1st gear and 1st clutch assembly on the mainshaft. Then install sub-shaft 1st gear on the sub-shaft.
34. Align the hole of the sub-shaft 1st gear with the hole of the transmission housing, then insert a pin to lock the sub-shaft while tightening the sub-shaft locknut.
35. Install the disc spring on the sub-shaft, and new locknuts on each shaft.

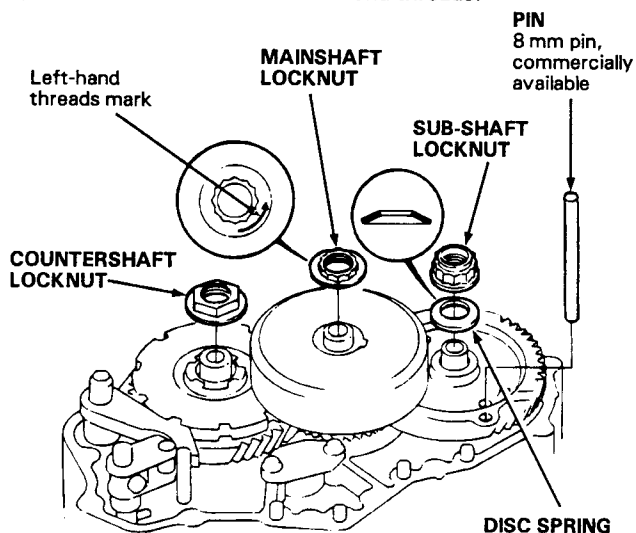
**CAUTION:**  
Install the disc spring in the direction shown.

36. Tighten the locknuts to specified torque.

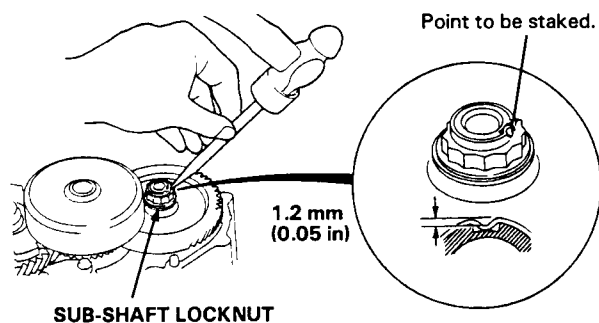
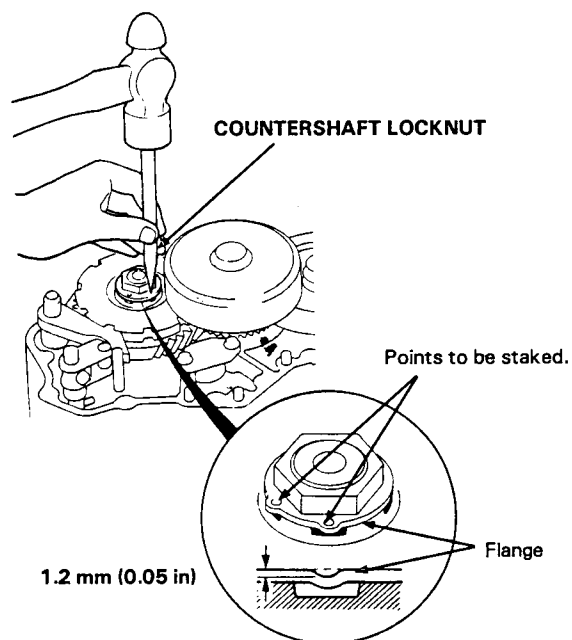
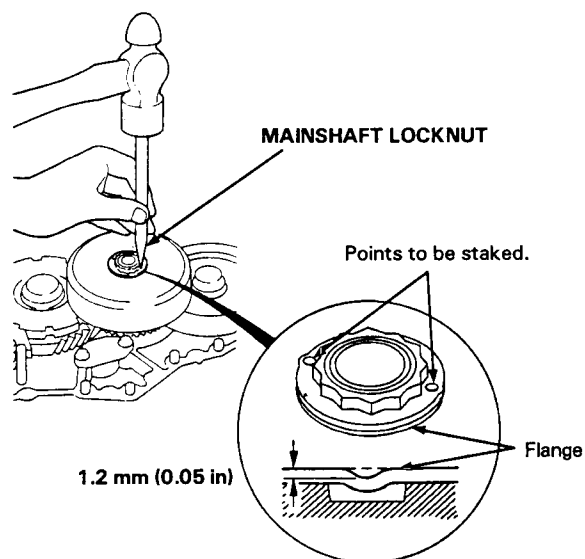
**TORQUE:**

- MAINSHAFT 95 N·m (9.5 kg-m, 69 lb-ft)
- COUNTERSHAFT 140 N·m (14.0 kg-m, 101 lb-ft)
- SUB-SHAFT 95 N·m (9.5 kg-m, 69 lb-ft)

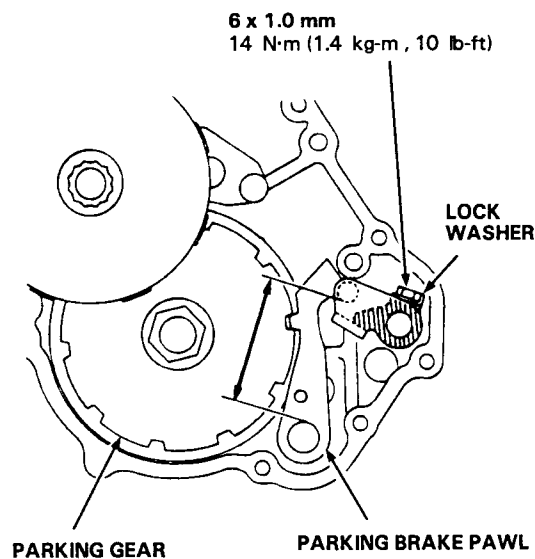
**NOTE:**  
Mainshaft locknut has left-hand threads.



37. Stake each locknut using a 3.5 mm punch.

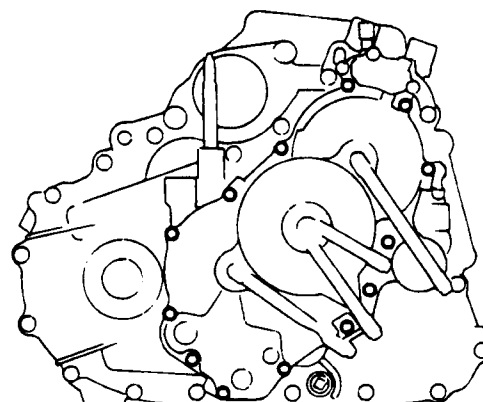


38. Set the parking brake lever in the **P** position, then verify that the parking brake pawl engages to the parking gear.
39. If the pawl does not engage fully, check the parking brake pawl stopper clearance as described.
40. Tighten the lock bolt and bend the lock tab.



41. Install the right side cover.

**TORQUE:** 12 N·m (1.2 kg-m, 9 lb-ft)



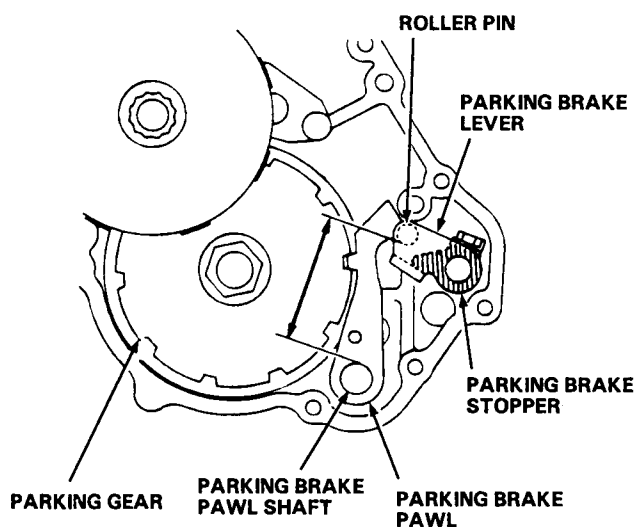
42. Install the ATF cooler pipes and ATF level gauge.

## Parking Brake Stopper

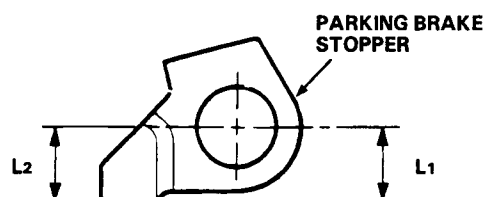
### Inspection/Adjustment

1. Set the parking brake lever in the **P** position.
2. Measure the distance between the face of the parking brake pawl shaft and face of the parking brake lever roller pin as shown.

**STANDARD:** 67.25—68.25 mm (2.648—2.687 in)



3. If the measurement is out of tolerance, select and install the appropriate parking brake stopper from the table below.



#### PARKING BRAKE STOPPER

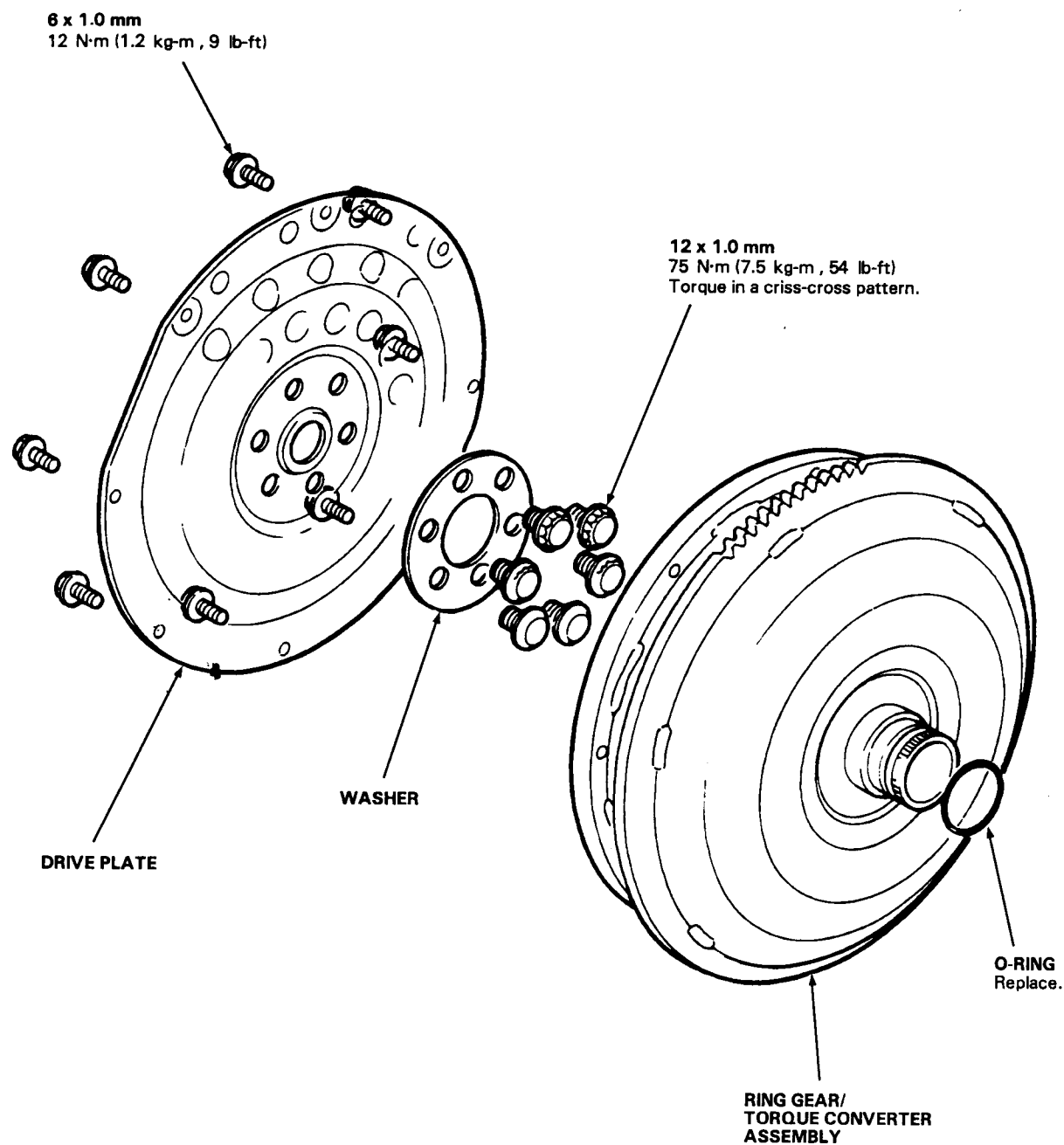
Mark	Part Number	L1	L2
1	24537—PA9—003	11.00 mm (0.433 in)	11.00 mm (0.433 in)
2	24538—PA9—003	10.80 mm (0.425 in)	10.65 mm (0.419 in)
3	24539—PA9—003	10.60 mm (0.417 in)	10.30 mm (0.406 in)

4. After replacing the parking brake stopper, make sure the distance is within tolerance.



## Disassembly

### Torque Converter



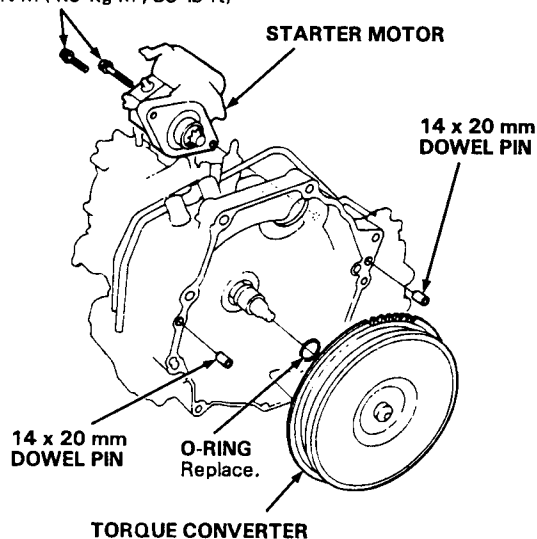
## Transmission

### Installation

1. Flush the ATF cooler as described on pages 14-126 thru 127.
2. Install the starter motor on the torque converter housing, then install the 14 mm dowel pins in the torque converter housing.

#### MOUNTING BOLTS

45 N·m (4.5 kg-m, 33 lb-ft)



3. Place the transmission on a transmission jack, and raise to the engine level.
4. Attach the transmission to the engine, then install two transmission housing mounting bolts and two rear engine mounting bolts.

#### TRANSMISSION HOUSING MOUNTING BOLTS

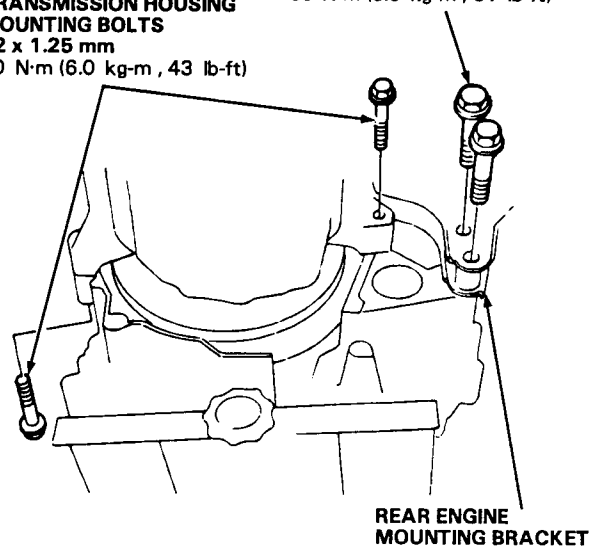
12 x 1.25 mm

60 N·m (6.0 kg-m, 43 lb-ft)

#### REAR ENGINE MOUNTING BOLTS

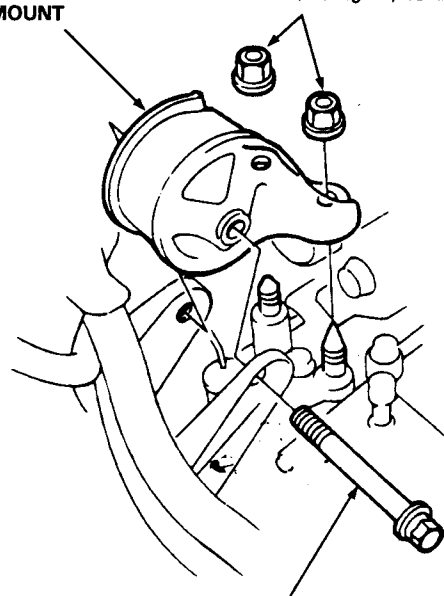
14 x 1.25 mm

85 N·m (8.5 kg-m, 61 lb-ft)



5. Install the transmission side mount.

#### TRANSMISSION SIDE MOUNT

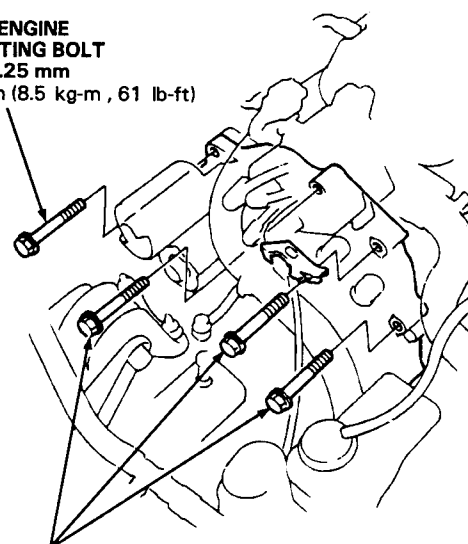
12 x 1.25 mm  
55 N·m (5.5 kg-m, 40 lb-ft)

12 x 1.25 mm  
55 N·m (5.5 kg-m, 40 lb-ft)

6. Install the remaining transmission housing mounting bolts and the remaining rear engine mounting bolt.

#### REAR ENGINE MOUNTING BOLT

14 x 1.25 mm

85 N·m (8.5 kg-m, 61 lb-ft)



#### TRANSMISSION HOUSING MOUNTING BOLTS

12 x 1.25 mm

60 N·m (6.0 kg-m, 43 lb-ft)

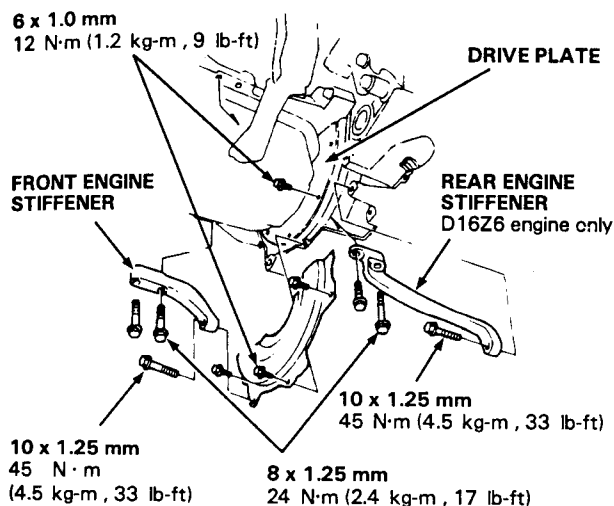
7. Remove the transmission jack and the hoist from the engine.

8. Attach the torque converter to the drive plate with eight bolts and torque to 12 N·m (1.2 kg-m, 9 lb-ft). Rotate the crankshaft as necessary to tighten the bolts to 1/2 of the specified torque, then final torque, in a criss-cross pattern. After tightening the last bolt, check that the crankshaft rotates freely.

9. Install the torque converter cover and engine stiffeners.

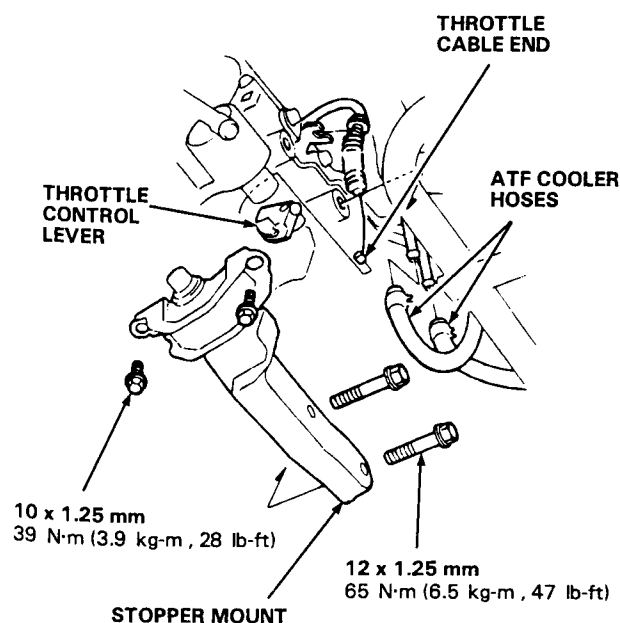
**NOTE:**

Only the D16Z6 engine uses a rear engine stiffener.



10. Connect the ATF cooler hoses to the joint pipes.

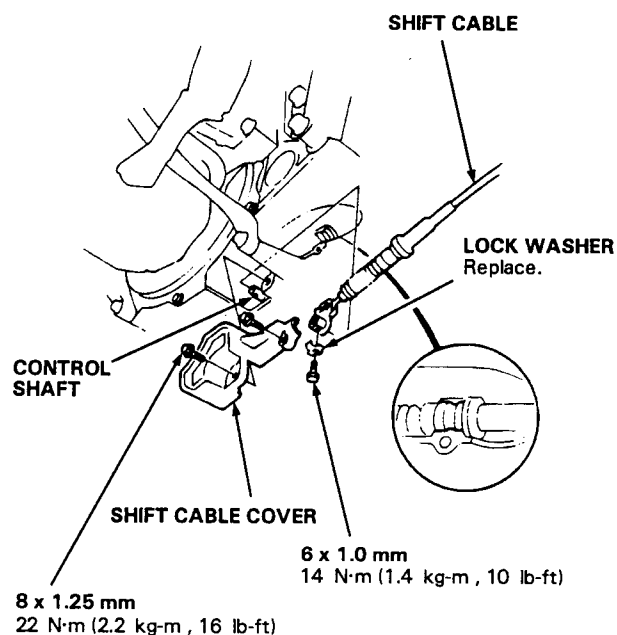
11. Connect the throttle control cable and install the stopper mount.



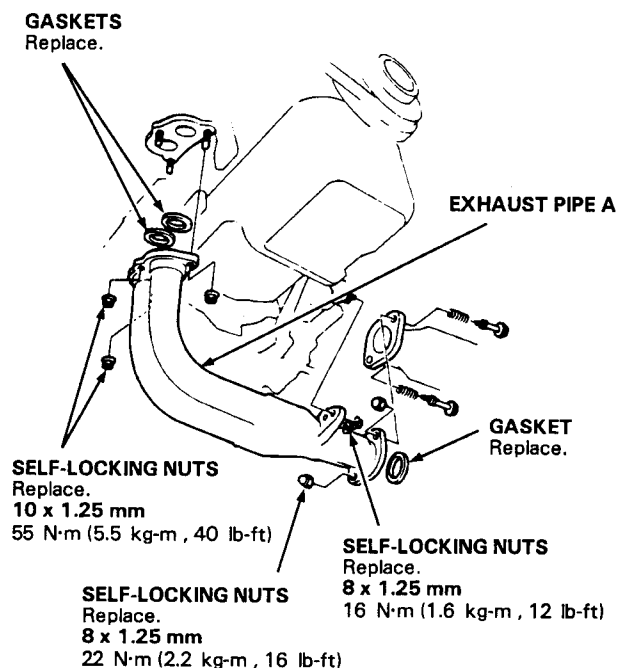
12. Install the control lever with a new lock washer to the control shaft, then install the shift cable cover.

**CAUTION:**

Take care not to bend the shift cable.



13. Install the exhaust pipe A.

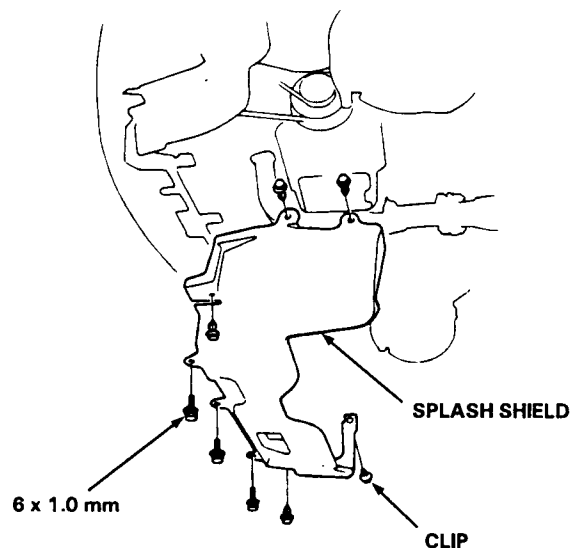


(cont'd)

## Transmission

### Installation (cont'd)

14. Install the splash shield.



15. Install a new set ring on the end of the each driveshaft.

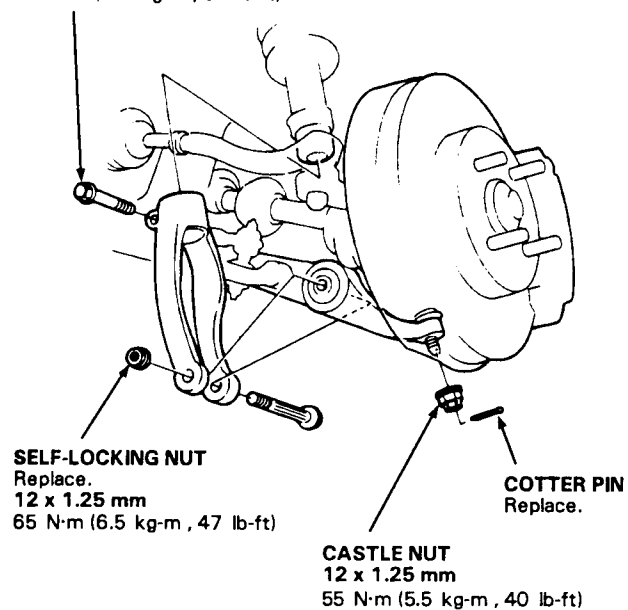
16. Install the right and left driveshafts (see section 16).

#### NOTE:

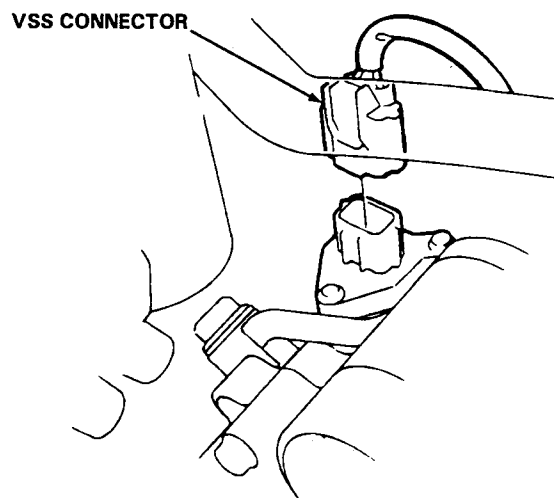
Turn the right and left steering knuckle fully outward, and slide each driveshaft into the differential until you feel its spring clip engage the side gear.

17. Install the damper fork, then install the ball joint to the lower arm with new cotter pins.

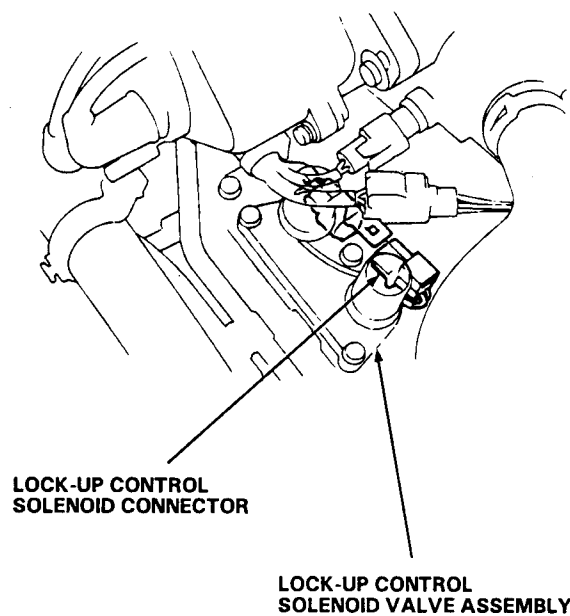
10 x 1.25 mm  
44 N·m (4.4 kg-m, 32 lb-ft)



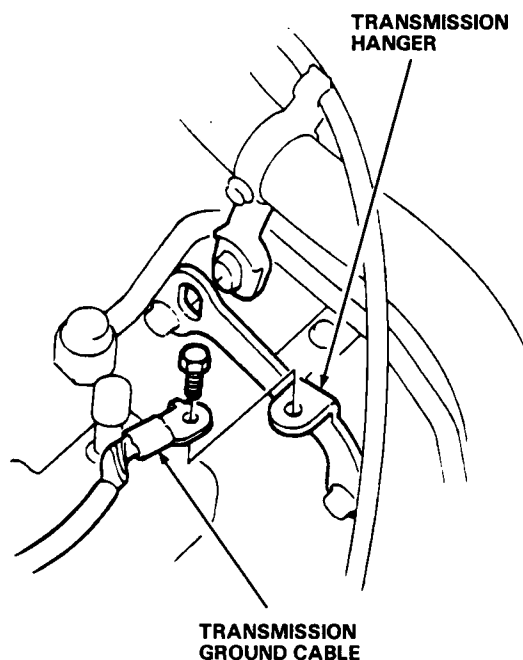
18. Connect the vehicle speed sensor (VSS) connector.



19. Connect the lock-up control solenoid connector, and clamp the harness on the lock-up control solenoid connector stay.



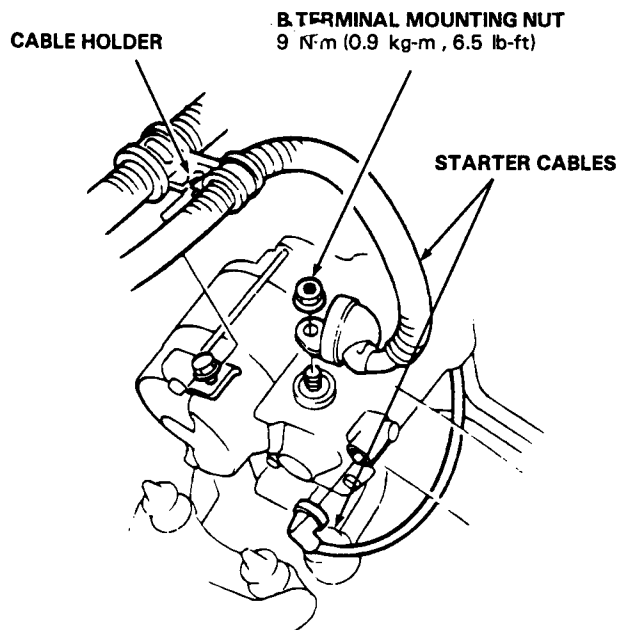
20. Connect the transmission ground cable.



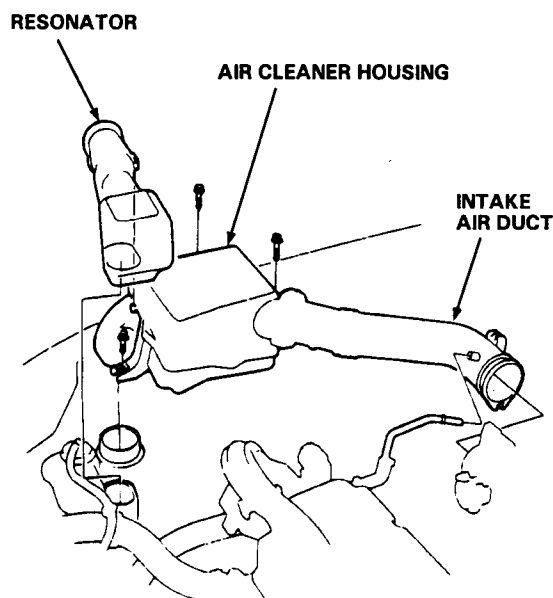
21. Connect the starter motor cables on the starter motor, and install the cable holder.

**NOTE:**

When installing the starter cable, make sure that the crimped side of the ring terminal is facing out (see section 23).



22. Install the air cleaner housing, intake air duct and resonator.



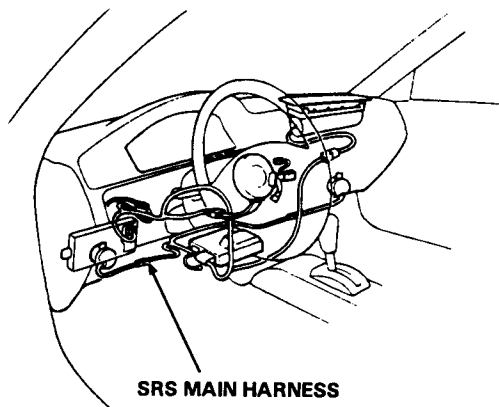
23. Refill the transmission with ATF (see page 14-50).
24. Connect the battery positive (+) and negative (-) cables to the battery.
25. Check the ignition timing (see section 23).
26. Start the engine. Set the parking brake, and shift the transmission through all gears three times. Check for proper shift cable adjustment.
27. Let the engine reach operating temperature (the cooling fan comes on) with the transmission in **N** or **P** position, then turn it off and check fluid level.
28. Road test as described

## Shift Cable

### Removal/Installation

#### CAUTION:

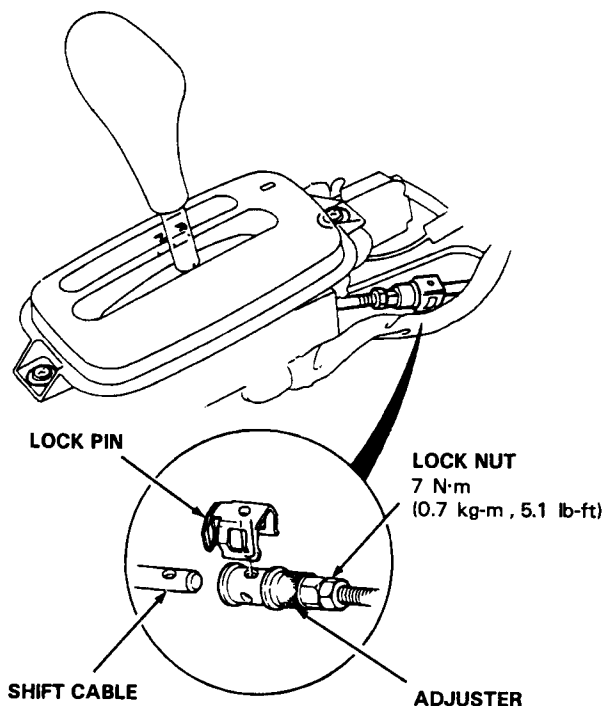
- All SRS electrical wiring harnesses are covered with yellow outer insulation.
- Before disconnecting the SRS wire harness, install the short connector (s) on the airbag (s).
- Replace the entire affected SRS harness assembly if it has an open circuit or damaged wiring.



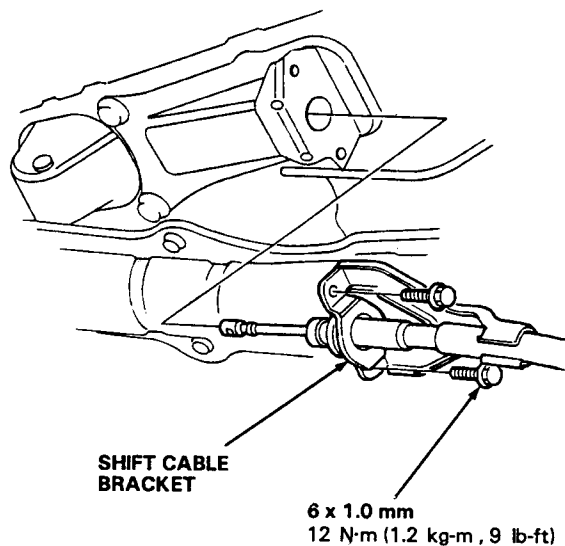
#### ▲ WARNING

Make sure lifts are placed properly

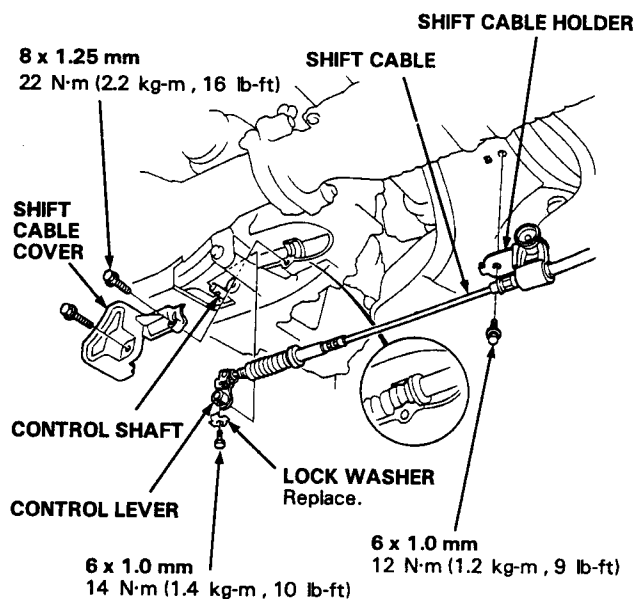
1. Remove the center console
2. Shift to **N** position, then remove the lock pin from the cable adjuster.



3. Remove the shift cable bracket.



4. Remove the shift cable holder.
5. Remove the shift cable cover.
6. Remove the control lever from the control shaft, then remove the shift cable. Take care not to bend the cable when removing/installing it.

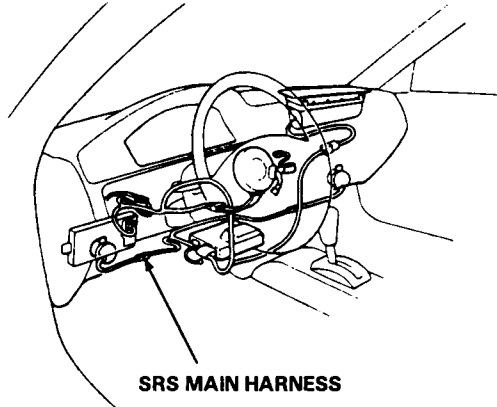


7. Install the shift cable in the reverse order of removal.
8. Check the cable adjustment on reassembly.

## Adjustment

### CAUTION:

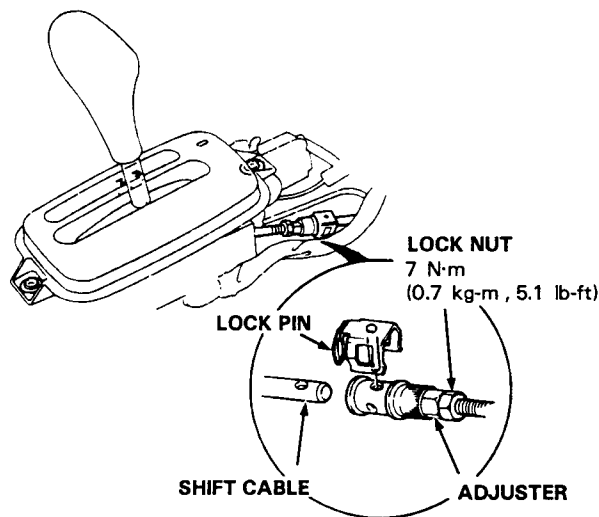
- All SRS electrical wiring harnesses are covered with yellow outer insulation.
- Before disconnecting the SRS wire harness, install the short connector (s) on the airbag (s).
- Replace the entire affected SRS harness assembly if it has an open circuit or damaged wiring.



### ▲ WARNING

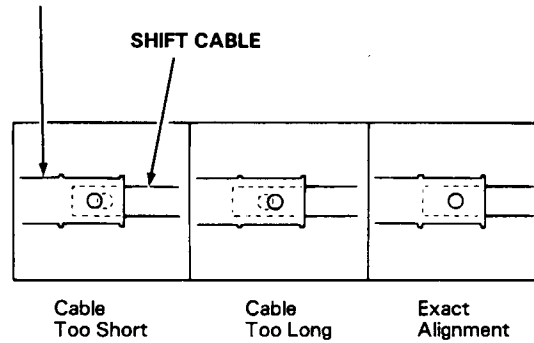
Make sure lifts are placed properly (see section 1).

1. Start the engine. Shift to **P** position to see if the reverse gear engages. If so, refer to troubleshooting
2. With the engine off, remove the center console (see section 20).
3. Shift to **N** position, then remove the lock pin from the cable adjuster.



4. Check that the hole in the adjuster is perfectly aligned with the hole in the shift cable. There are two holes in the end of the shift cable. They are positioned 90° apart to allow cable adjustment in 1/4 turn increments.

### ADJUSTER

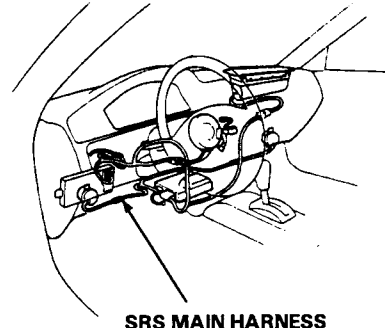


5. If not perfectly aligned, loosen the locknut on the shift cable and adjust as required.
6. Tighten the locknut to 7 N·m (0.7 kg-m, 5 lb-ft).
7. Install the lock pin on the adjuster. If you feel the lock pin binding as you reinstall it, the cable is still out of adjustment and must be readjusted.
8. Move the selector to each gear and verify that the automatic transaxle gear position indicator follows the automatic transaxle gear position switch.
9. Start the engine and check the shift lever in all gears. If any gear does not work properly, refer to troubleshooting
10. Insert the ignition key into the key cylinder on the shift indicator panel, verify that the shift lock lever is released.

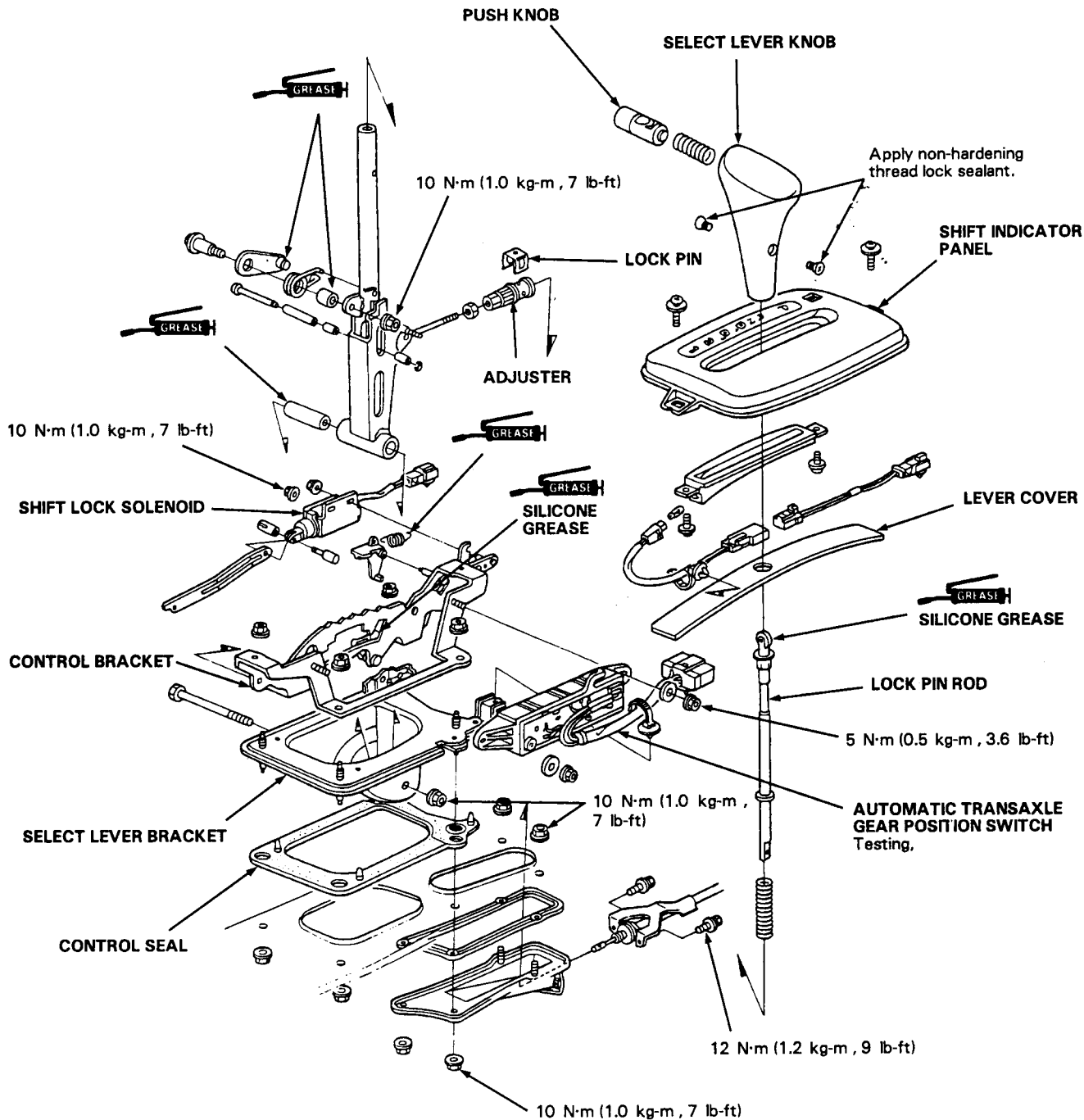
### Disassembly/Reassembly

#### CAUTION:

- All SRS electrical wiring harnesses are covered with yellow outer insulation.
- Before disconnecting the SRS wire harness, install the short connector (s) on the airbag (s).
- Replace the entire affected SRS harness assembly if it has an open circuit or damaged wiring.



SRS MAIN HARNESS



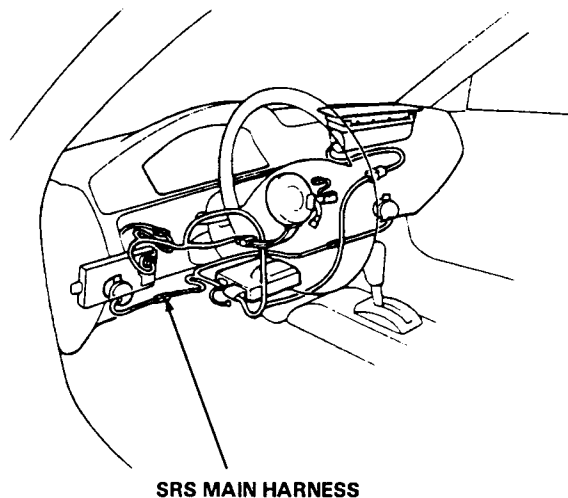


## Shift Indicator Panel

### Adjustment

**CAUTION:**

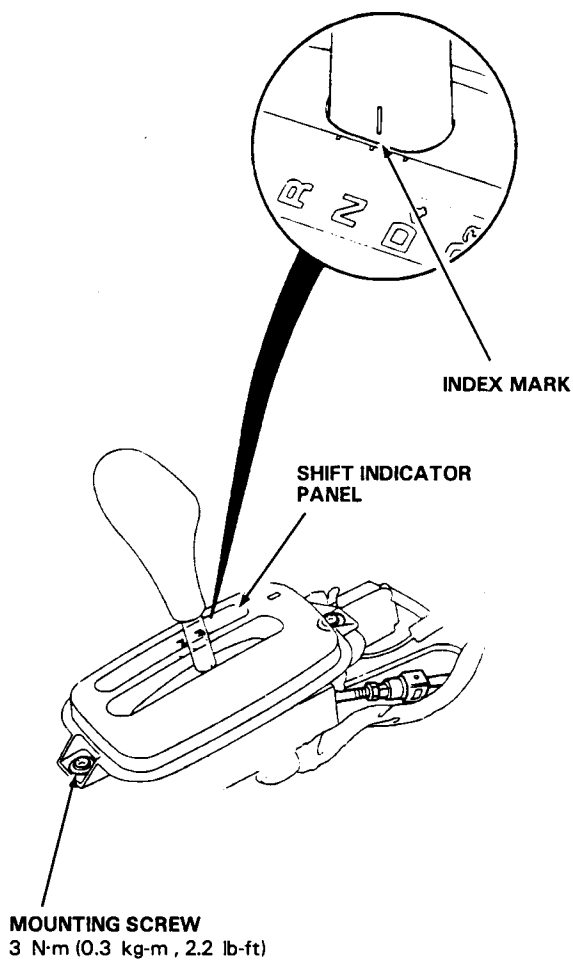
- All SRS electrical wiring harnesses are covered with yellow outer insulation.
- Before disconnecting the SRS wire harness, install the short connector (s) on the airbag (s).
- Replace the entire affected SRS harness assembly if it has an open circuit or damaged wiring.



1. Check that the index mark on the indicator aligns with the **N** mark on the shift indicator panel when the transmission is NEUTRAL.
2. If not aligned, remove the center console. (see section 20).
3. Remove the shift indicator panel mounting screws and adjust by moving the panel.

**NOTE:**

Whenever the shift indicator panel is removed, reinstall the panel as described above.



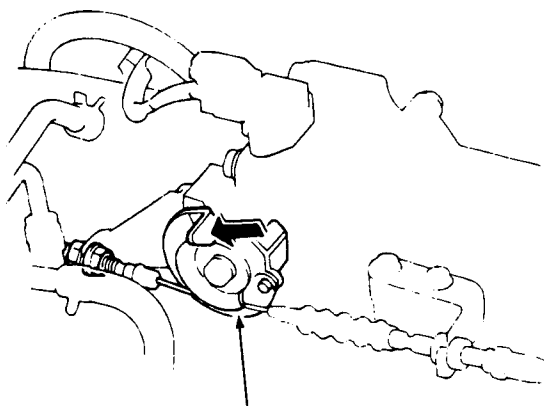
### Inspection

#### NOTE:

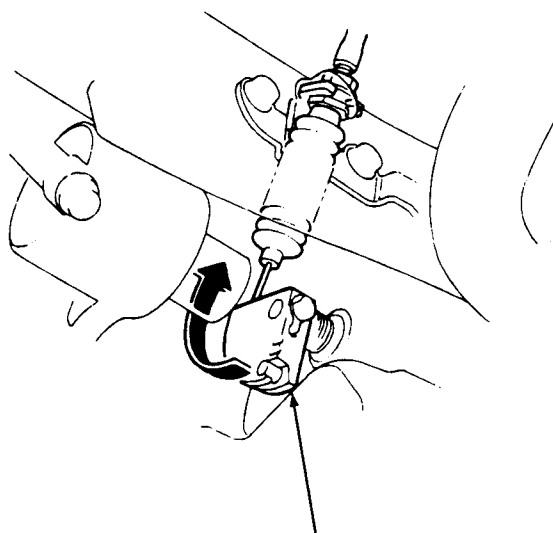
Before inspecting the throttle control cable, make sure:

- Throttle cable free play is correct
- Idle speed is correct
- To warm up the engine to normal operating temperature (the cooling fan comes on).

1. Verify that the throttle control lever is synchronized with the throttle linkage while depressing and releasing the accelerator pedal.
2. If the throttle control lever is not synchronized with the throttle linkage, adjust the throttle control cable.

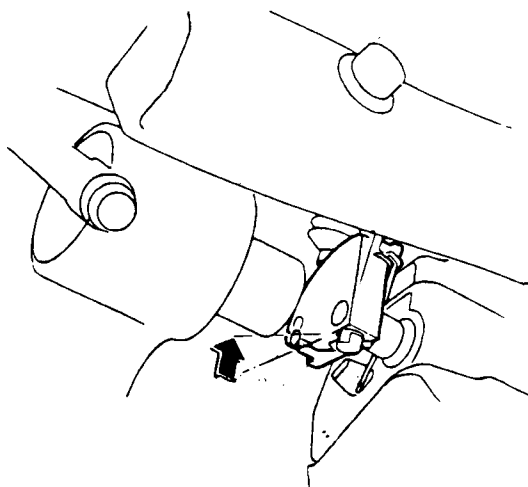


THROTTLE LINKAGE

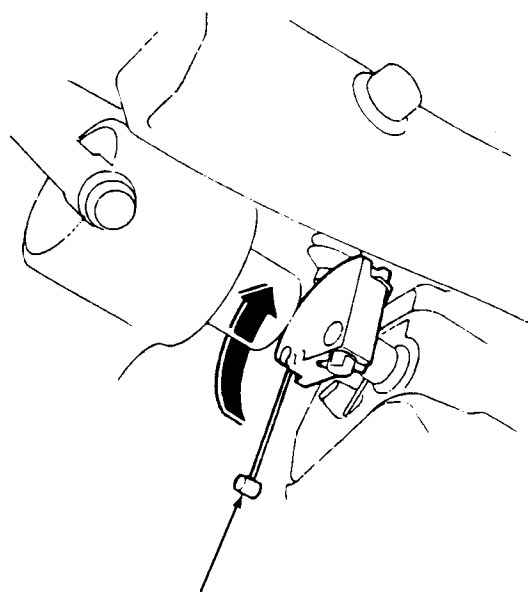


THROTTLE CONTROL LEVER

3. Check that there is play in the throttle control lever while depressing the accelerator pedal to the full throttle position.



4. Remove the cable end of the throttle control cable from the throttle control lever.
5. Check that the throttle control lever moves smoothly.



CABLE END

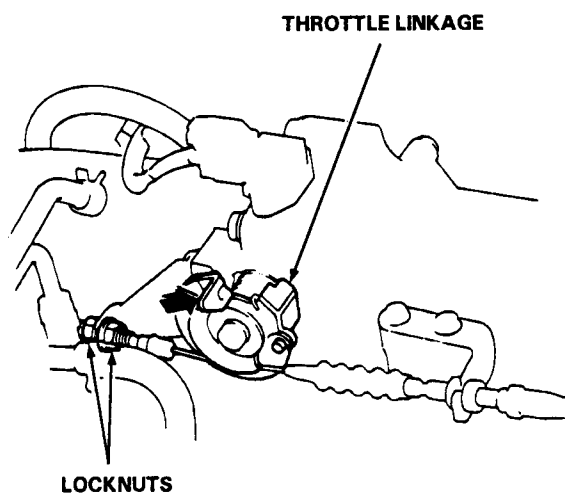
## Adjustment

### NOTE:

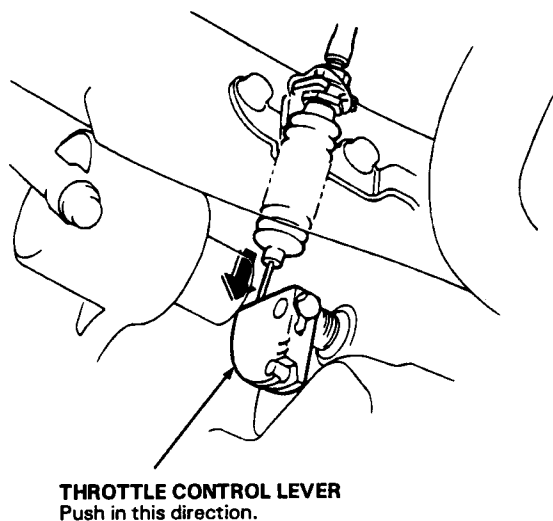
Before adjusting the throttle control cable, make sure:

- Throttle cable free play is correct
- Idle speed is correct
- To warm up the engine to normal operating temperature (the cooling fan comes on).

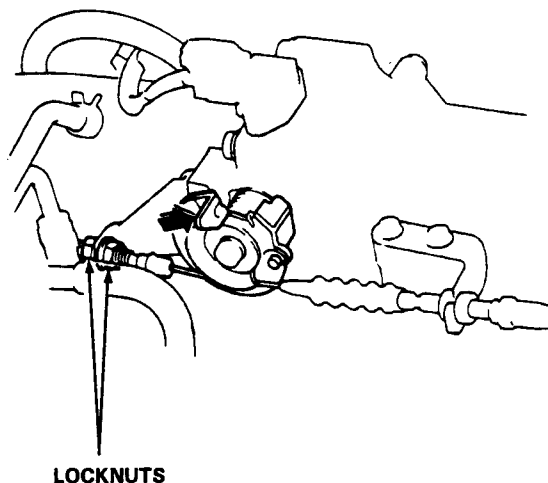
1. Verify that the throttle linkage is in the full-closed position.
2. Loosen the locknut of the throttle control cable at the throttle linkage.



3. Remove the free play of the throttle control cable with the locknut, while pushing the throttle control lever to the full-closed position as shown.



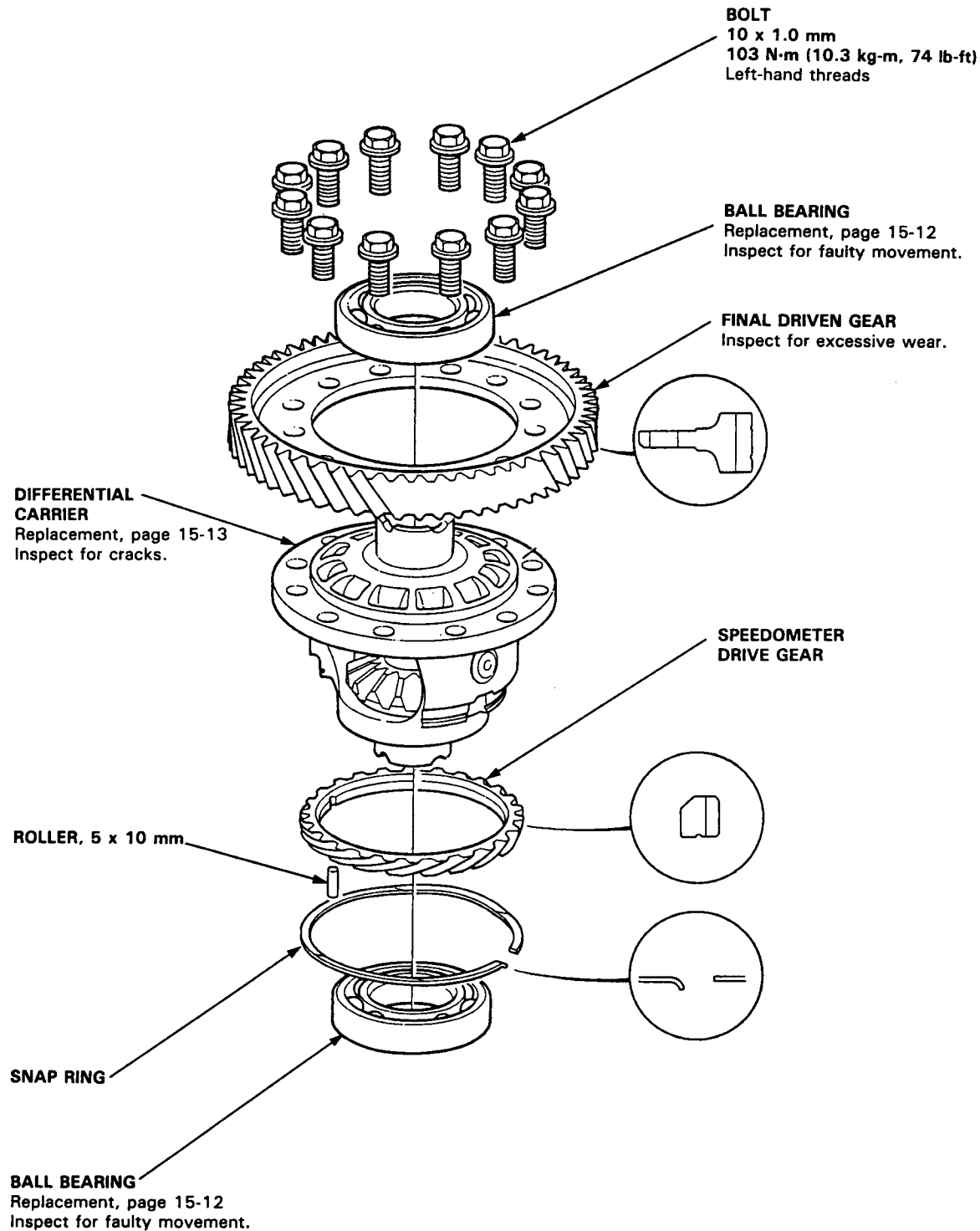
4. Tighten the locknuts.



5. After tightening the locknuts, inspect the synchronization and throttle control lever movement.

## Differential (Automatic Transmission)

### Illustrated Index

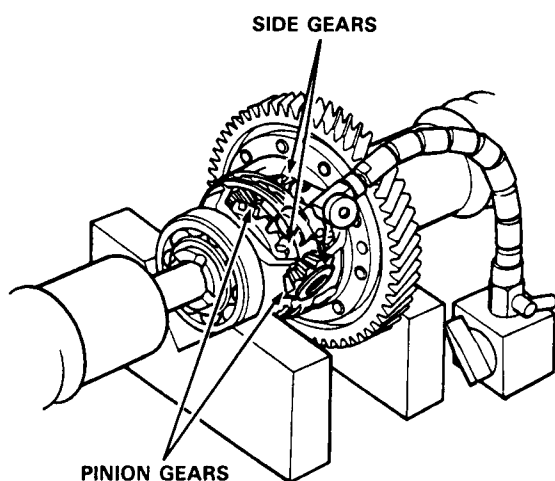


## Differential (Automatic Transmission)

### Backlash Inspection

1. Place the differential assembly on V-blocks and install both axles.
2. Check backlash of both pinion gears.

**Standard (New):** 0.05–0.15 mm (0.002–0.006 in)

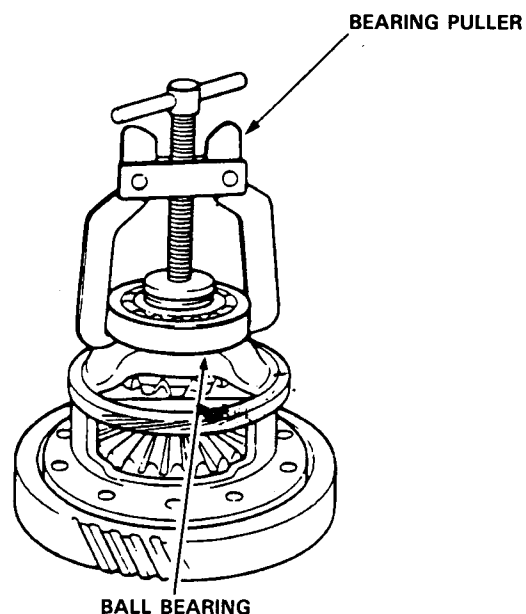


3. If backlash is out of tolerance, replace the differential carrier.

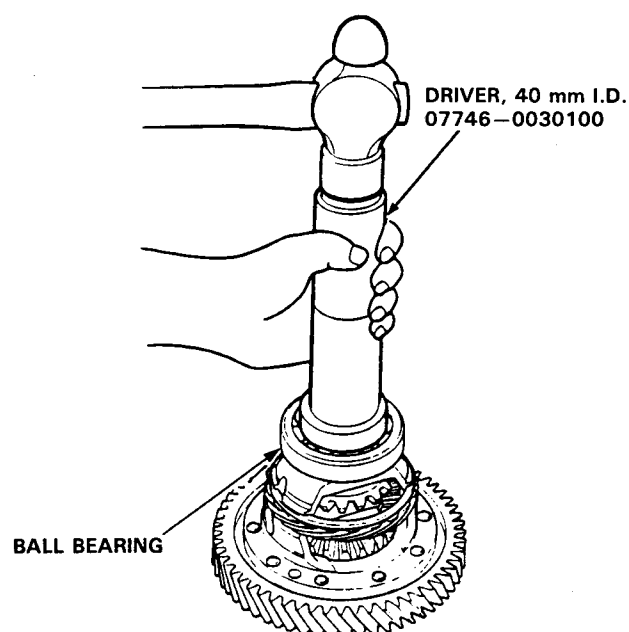
### Bearing Replacement

**NOTE:** Check the bearings for wear and rough rotation. If the bearings are OK, removal is not necessary.

1. Remove the ball bearings using a bearing puller.



2. Install the new ball bearings using the special tool as shown.

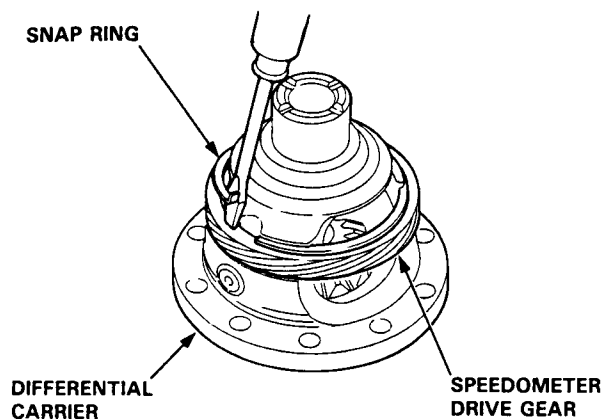


## Differential Carrier Replacement

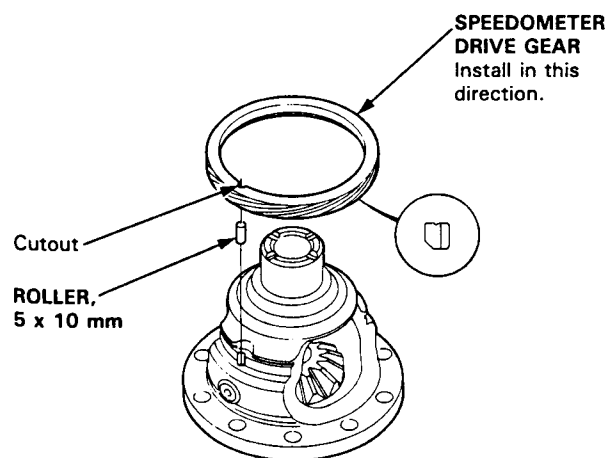
1. Remove the final driven gear from the differential carrier.

**NOTE:** The final driven gear bolts have left-hand threads.

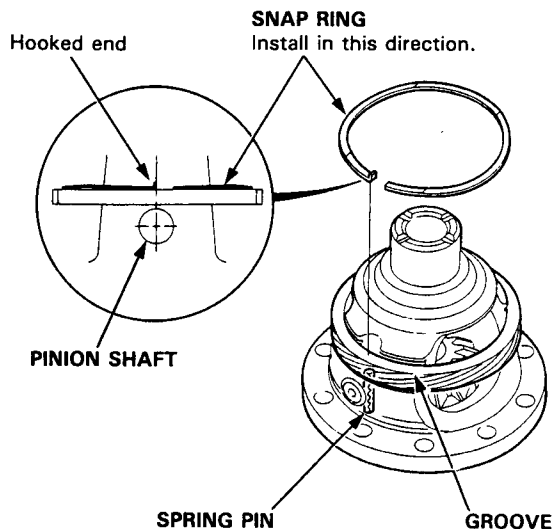
2. Pry the snap ring off differential carrier, then remove the speedometer drive gear and 5 x 10 mm roller.



3. Install the 5 x 10 mm roller in the differential carrier.
4. Install the speedometer drive gear with its chamfered side facing the carrier. Align the cutout on the bore of the speedometer drive gear with the 5 x 10 mm roller.



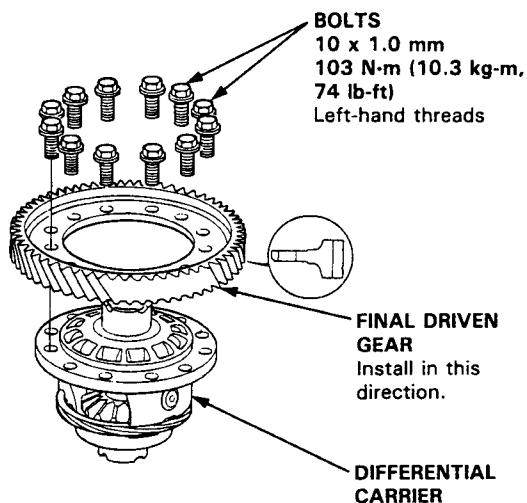
5. Align the hooked end of the snap ring with the pinion shaft as shown, then install the snap ring in the differential carrier groove.



6. Install the final driven gear, then tighten the bolts specified torque.

**TORQUE: 103 N·m (10.3 kg-m, 74 lb-ft)**

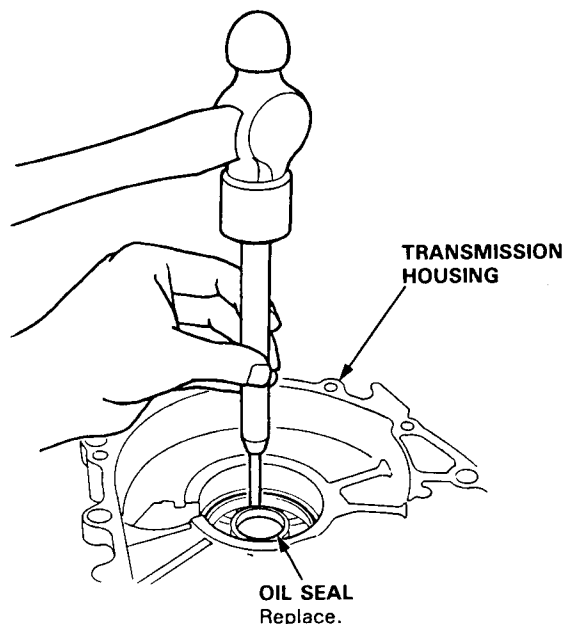
**NOTE:** The final driven gear bolts have left-hand threads.



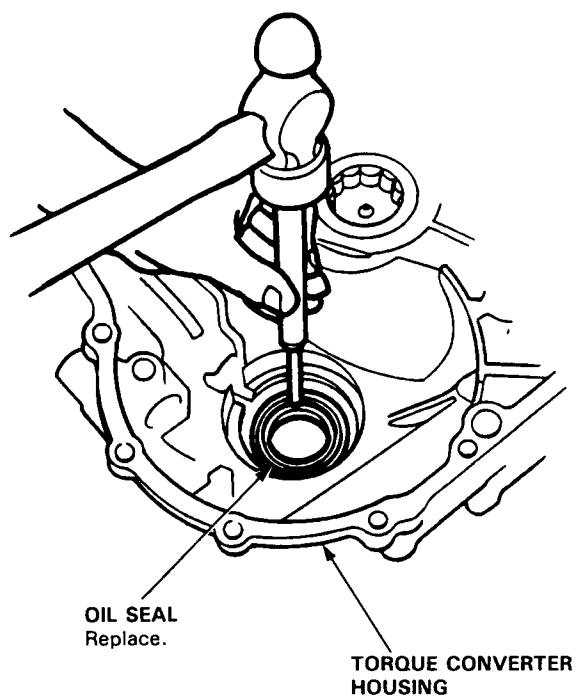
7. Install the ball bearings

## Oil Seal Removal

1. Remove the differential assembly.
2. Remove the oil seal from the transmission housing.



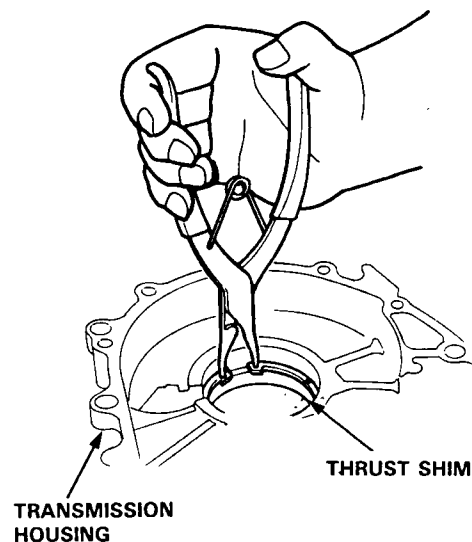
3. Remove the oil seal from the torque converter housing.



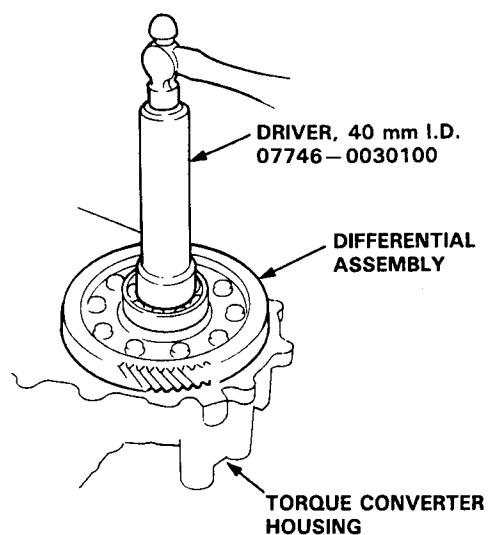
## Oil Seal Installation/Side Clearance

1. Install a 2.50 mm (0.098 in) thrust shim in the transmission housing.

NOTE: Do not install the oil seal yet.

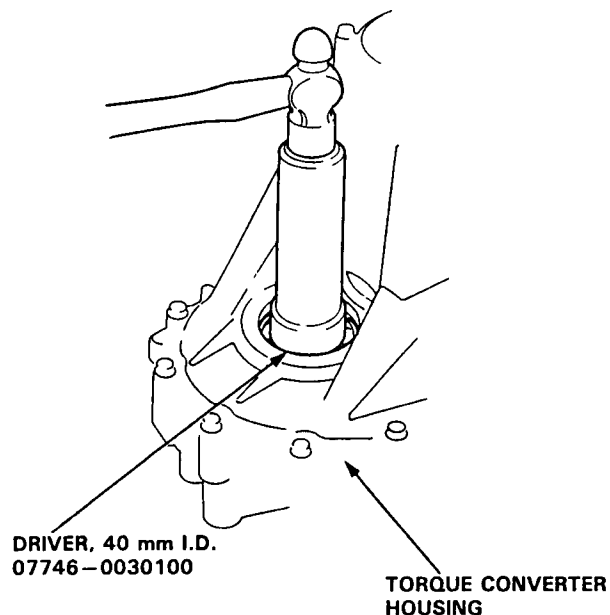


2. Install the differential assembly into the torque converter housing using the special tool as shown.



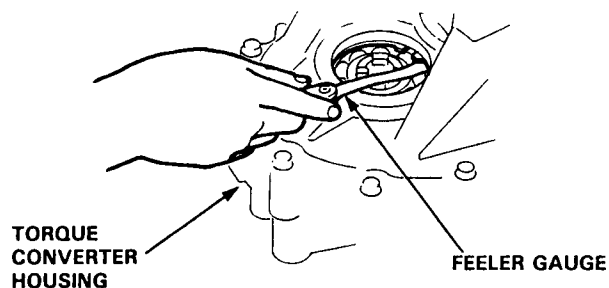
3. Assemble the transmission (see section 14).  
Install the transmission housing and tighten the bolts.

4. Tap on the transmission housing side of the differential assembly with the special tool to seat the differential assembly in the torque converter housing.



5. Measure the clearance between the thrust shim and outer race of the ball bearing in the transmission housing.

**STANDARD: 0-0.15 mm (0-0.006 in)**



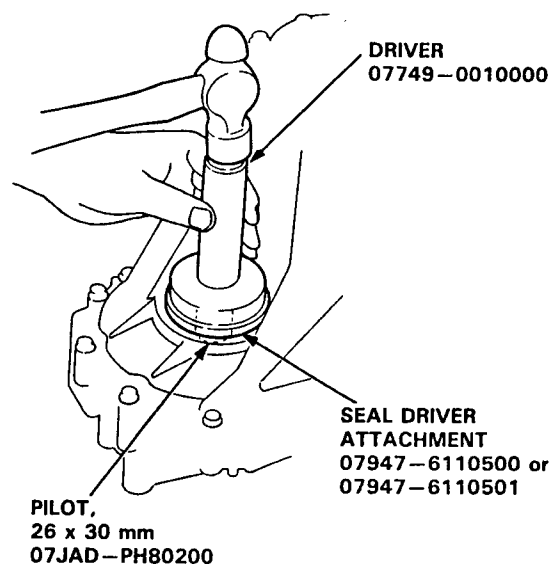
6. If out of limits, select a new thrust shim from the following table and install:

**THRUST SHIM, 80 mm**

Part Number	Thickness
90414-689-000	2.50 mm (0.09843 in)
90415-689-000	2.60 mm (0.10236 in)
90416-689-000	2.70 mm (0.10630 in)
90417-689-000	2.80 mm (0.11024 in)
90418-689-000	2.90 mm (0.11417 in)
90419-PH8-000	3.00 mm (0.11811 in)

**NOTE:** If the thrust shim-to-ball bearing outer race clearance measured in step 5 is less than the specification, it is not necessary to perform steps 7 and 8.

7. Remove the transmission housing.
8. Replace the 2.50 mm (0.098 in) thrust shim with the one of the correct thickness selected in step 5.
9. Install the oil seal in the transmission housing using the special tools as shown.



10. Install the oil seal in the torque converter housing using the special tools as shown.

