MITSUBISHI
KM 177

INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP
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INTRODUCTION
MITSUBISHI KM-177

This manual covers the procedures necessary to disassemble, inspect, assemble and repair the KM-177 transaxle found in both the Mitsubishi and Hyundai vehicles. Also included are some of the electrical diagnosis procedures necessary for some of the sensors. We also show some of the differences between the converter clutch models and the open converter models. This unit is very similiar to the KM-175 and KM-176 units. The designation of these units are dependant on the vehicle engine size.

We wish to thank Mitsubishi Corporation for the information and illustrations that have made this booklet possible.

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IDENTIFICATION

KM-175 Has a damper clutch, a separate end clutch housing (4 cylinder engine application) Valve body has four solenoids. The lock-up valve is in the valve body. Inner pump gear has a center seal and **12 Bolt Pan** has an aluminum Low Reverse clutch housing.

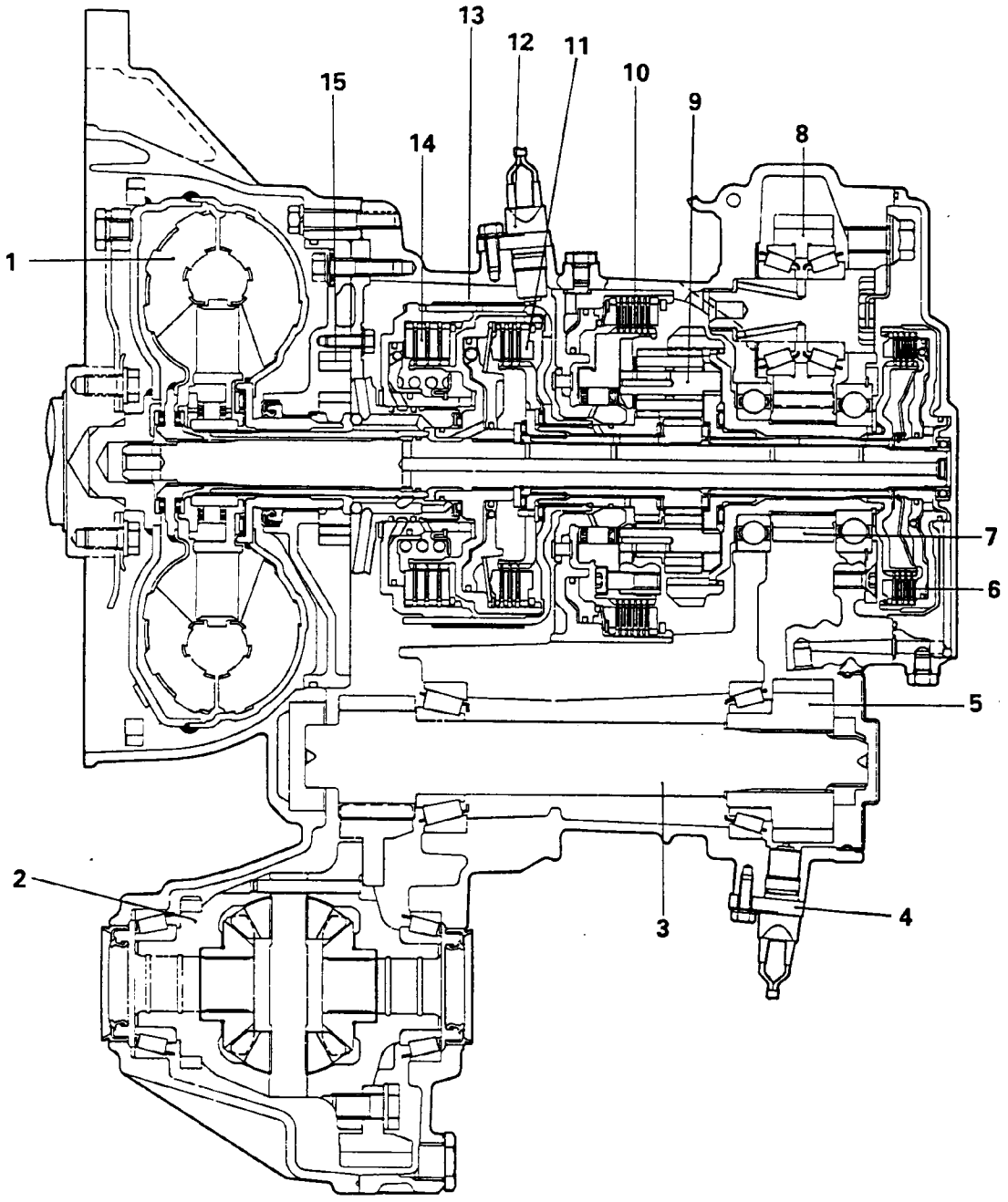
KM-175-5 Has a damper clutch, round end clutch housing cas as part of the case (1 piece) (4 cylinder engine) valve body has four solenoids, the lock-up valves are in the valve body The seal in the inner pump gear is retained by a snap ring **12 Bolt pan** and has a steel Low Reverse clutch housing.

KM-176-5 Light duty version of KM-175-5 has a damper clutch, 1 piece oblong end clutch housing found on small 4 cylinder engines4 solenoid valve body with lock-up valve in the valve body. The seal in the pump inner gear is retained by a snap ring **12 Bolt Pan** has steel Low Reverse housing.

KM-177 Heavier duty version of the KM-175-5 **No Damper Clutch** 3 soleniods on the valve body, i piece end clutch housing, center seal on inner pump gear. (Sigma, 1988 Gallant & Sonata) plug in valve body, V-6 Engines **13 Bolt Pan** has aluminum Low Reverse clutch housing.

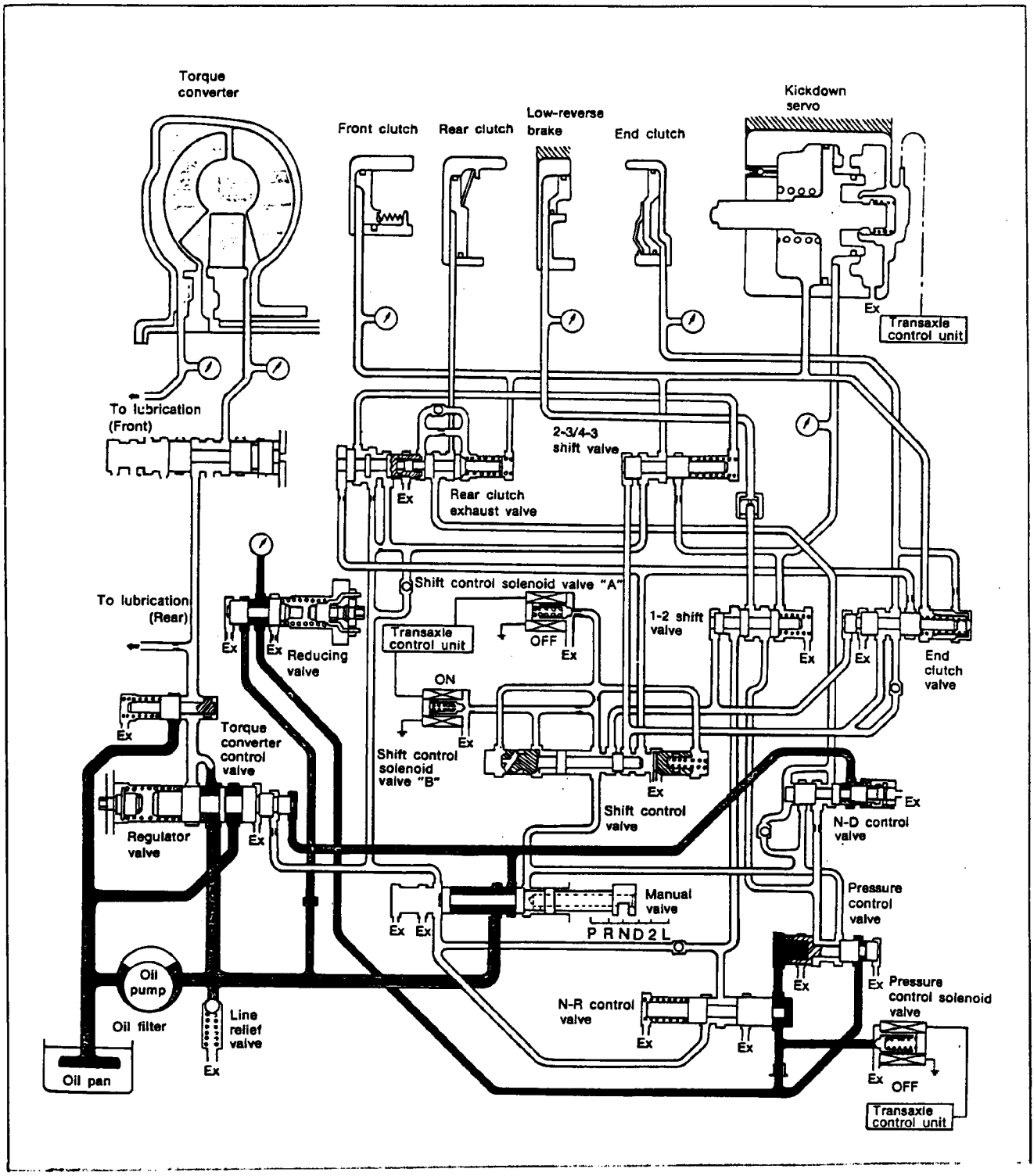
KM-177 Has damper clutch, (89-92 Gallant) 4 solenoids, Lock-up valve in valve body, seal retained by snap ring in inner pump gear V-6 engines **13 Bolt Pan** has a steel Low Reverse clutch housing.

KM-177-8 Heavy duty version of the KM-177 large V-6 engine NO Damper Clutch (Sinata and Sigma) 3 solenoids, plug in valve body, **NO** seal on inner pump gear **13 Bolt Pan** has steel Low Reverse clutch housing.

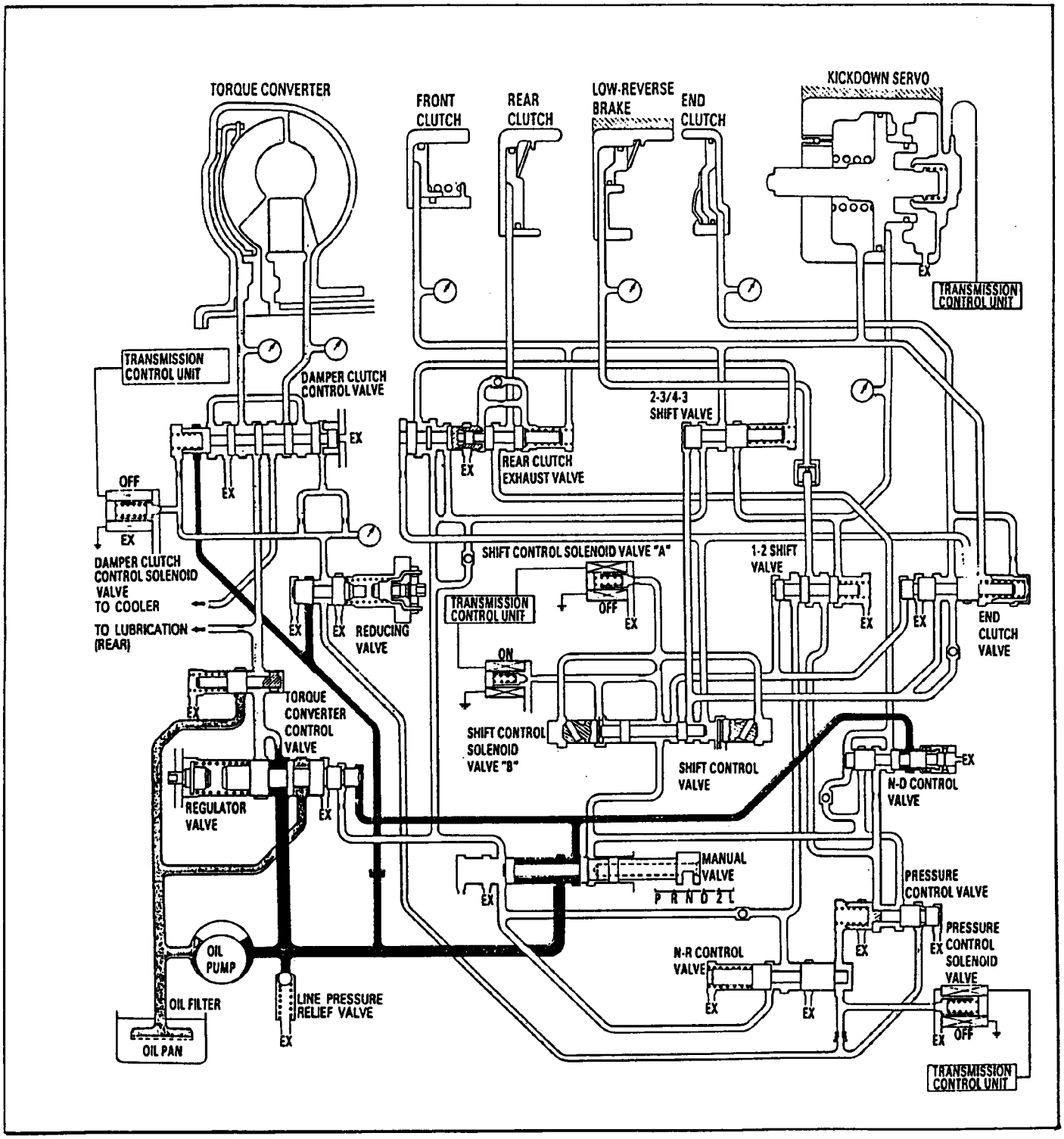


1. Torque converter
2. Differential
3. Transfer shaft
4. Pulse generator B
5. Transfer driven gear
6. End clutch
7. Transfer drive gear
8. Transfer idler gear
9. Planetary gear set
10. Low/reverse brake
11. Rear clutch
12. Pulse generator
13. Kickdown band
14. Front clutch
15. Oil pump

KM-177


Torque converter
Front clutch
Rear clutch
Low-reverse brake
End clutch
Kickdown servo
Ex
Transaxle control unit
To lubrication (Front)
2-3/4-3 shift valve
Ex
Rear clutch exhaust valve
Shift control solenoid valve "A"
To lubrication (Rear)
Transaxle control unit
OFF
Ex
1-2 shift valve
Ex
Ex
End clutch valve
Ex
Reducing valve
ON
Ex
Torque converter control valve
Shift control solenoid valve "B"
Ex
Shift control valve
Ex
N-D control valve
Regulator valve
Ex
Manual valve
P R N D 2 L
Pressure control valve
Ex Ex
Oil pump
Oil filter
Line relief valve
N-R control valve
Ex
Ex
Ex
Pressure control solenoid valve
Oil pan
Ex
Ex
OFF
Transaxle control unit

KM-175


TORQUE CONVERTER
FRONT CLUTCH
REAR CLUTCH
LOW-REVERSE BRAKE
END CLUTCH
KICKDOWN SERVO
TRANSMISSION CONTROL UNIT
DAMPER CLUTCH CONTROL VALVE
2-3/4-3 SHIFT VALVE
REAR CLUTCH EXHAUST VALVE
OFF
EX
DAMPER CLUTCH CONTROL SOLENOID VALVE
TO COOLER
TO LUBRICATION (REAR)
REDUCING VALVE
SHIFT CONTROL SOLENOID VALVE "A"
1-2 SHIFT VALVE
END CLUTCH VALVE
ON
TORQUE CONVERTER CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
N-D CONTROL VALVE
REGULATOR VALVE
MANUAL VALVE
P R N D 2 L
PRESSURE CONTROL VALVE
PRESSURE CONTROL SOLENOID VALVE
N-R CONTROL VALVE
OIL PUMP
OIL FILTER
OIL PAN
LINE PRESSURE RELIEF VALVE

GENERAL

SPECIFICATIONS

Type	Automatic four speed and integral differential—KM177
Torque converter	
Type	Without damper clutch
Engine stall speed	2,400 ± 200 rpm
Transaxle	
Type	Electronically controlled 4-speed full-automatic
Gear ratio	
First	2.551
Second	1.488
Third	1.000
Fourth	0.685
Reverse	2.176
Final gear ratio	3.705
Speedometer gear ratio	Drive 36/Driven 29

SERVICE SPECIFICATIONS

Input shaft end play	0.3—1.0 mm (0.012—0.039 in.)
Transfer shaft end play	0—0.025 mm (0—0.0010 in.)
Oil pump gear side clearance	0.01—0.048 mm (0.0004—0.0019 in.)
Front clutch snap ring clearance	0.7—0.9 mm (0.028—0.035 in.)
Rear clutch snap ring clearance	0.4—0.6 mm (0.016—0.024 in.)
End clutch snap ring clearance	0.6—0.85 mm (0.024—0.033 in.)
Low reverse brake snap ring clearance	0.975—1.287 mm (0.039—0.050 in.)
Differential case end play	0.08—0.13 mm (0.0032—0.0051 in.)
Differential side gear and pinion backlash	0.025—0.150 mm (0.0010—0.0059 in.)
Transfer idler gear preload	1.5 Nm (15 Kg.cm, 1 lb.ft)
Transfer drive gear end play	0—0.06 mm (0—0.236 in.)

	Nm	Kg.cm	lb.ft
Air cleaner mounting bolt	8—10	80—100	6—7
Tie rod end to knuckle	24—34	240—340	17—25
Lower arm ball joint to knuckle	60—72	600—720	43—52
Transaxle mounting bracket to transaxle	60—80	600—800	43—57
Transaxle mounting bracket to body	40—50	400—500	29—36
Selector lever mounting nut	14—20	140—200	10—14
Starter motor mounting bolt	27—34	270—340	20—24
Drive shaft nut	200—260	2000—2600	145—188
Bearing bracket to engine	40—50	400—500	29—36
Transaxle stay to engine	65—85	650—850	47—61
Transaxle stay to transaxle	30—42	300—420	22—30
Bell housing cover to engine	8—10	80—100	6—7
Transaxle mounting bolt [12 mm (0.47 in.) diameter bolt] (flange bolt)	80—100	800—1000	58—72
Transaxle mounting bolt [12 mm (0.47 in.) diameter bolt] (bolt washer assembly)	65—85	650—850	47—61
Drive plate-to-converter tightening bolt	46—53	460—530	34—38
Drain plug	30—35	300—350	22—25
Pressure check plug	8—10	80—100	6—7
Pulse generator mounting bolt	10—12	100—120	7.5—9
Bearing retainer screw	17—22	170—220	12—15
Lock plate bolt	48—60	480—600	35—43
Oil cooler connector	15—22	150—220	11—15
Converter housing bolt	19—23	190—230	14—16
Oil pan bolt	10—12	100—120	7.5—9
Kickdown servo piston plate screw	6—8	60—80	5—6
One-way clutch outer race bolt	25—35	250—350	18—25
Differential drive gear bolt	130—140	1300—1400	94—101
Manual control lever nut	17—21	170—210	13—15
Manual control shaft set screw	8—10	80—100	6—7
Inhibitor switch	10—12	100—120	7.5—9
Sprag rod support bolt	20—27	200—270	15—19
Pump housing-to-reaction shaft support bolt	10—12	100—120	7.5—9
Oil pump assembly mounting bolt	15—22	150—220	11—15
Valve body bolt	4—6	40—60	3—4
Valve body assembly mounting bolt	10—12	100—120	7.5—9
Oil filter bolt	5—7	50—70	4—5
Speedometer sleeve locking plate bolt	3—5	30—50	2.5—3.5
Kickdown servo lock nut	25—32	250—320	18—23
Transfer shaft lock nut	200—230	2000—2300	145—166

	Transaxle malfunction of shift-shock (after start-off)														Abnormal noise, other				
	Won't shift from 2nd to 3rd	Won't shift to 4th	OD switch doesn't function	Doesn't shift according to shift pattern (shifting is possible)	Improper start-off (starts off from 2nd, etc.)	Excessive creeping or idling vibration	Excessive vibration-shock when shift 1-2 or 3-4	Excessive vibration-shock when shift 2-3 or 4-3	Excessive vibration-shock during upshift	Excessive vibration-shock during D-2 downshift	Sudden engine rpm increase during upshift	Sudden engine rpm increase during 3-2 shift, excessive vibration	Excessive vibration shock only when cold	Excessive vibration-shock (other than already described)	Abnormal vibration in high-load region in low gear (approx. 1 Hz)	Abnormal noise from converter housing together with engine rpm	Mechanical noise (clatter noise) from converter housing	Abnormal noise inside transaxle case	Locked in 3rd gear or 2nd gear
1						X													
2					X		X	X	X	X			X	X	X				
3		X			X														X
4					X										X				
5												X				X			
6																			
7																		X	
8																			
9																	X		
10	X	X									X	X							X
11												X							X
12											X	X		X					X
13	X			X	X		X	X	X	X	X	X	X	X	X				X
14	X							X	X		X								X
15																			X
16							X				X	X							X
17							X				X	X		X					
18										X									X
19																			X
20		X					X				X								X
21		X			X														X
22				X			X	X	X	X	X	X		X	X				
23							X	X	X	X	X	X		X	X				X
24				X											X				X
25							X					X							X
26																			X
27							X	X	X	X	X	X		X					
28																			X
29																			X
30	X	X									X	X							X
31		X	X																
32					X	X													
33														X	X				
34																			X
35				X															X
36	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X

PSCV = Pressure control solenoid valve

TROUBLESHOOTING GUIDE

		Problem / Presumed cause	Driving impossible or abnormal (before start-off)												
			Starter motor won't function	Forward/backward movement impossible	Forward movement impossible	Backward movement impossible	Engine stalls when N → D or R	Clutch slips at D (stall rpm too high)	Clutch slips at R (stall rpm too high)	Stall rpm too low	Vehicle moves at P or N	Engine starts, or vehicle moves, between NR or ND	Parking doesn't hold	Abnormal vibration-shock when shift to D-2-L-R
Engine	1	Abnormal idling rpm					X							X
	2	Performance malfunction					X			X				
Transaxle (power train)	3	Improper adjustment of manual linkage	X	X	X	X		X	X		X	X	X	X
	4	Malfunction of torque converter		X	X	X				X				
	5	Operation malfunction of oil pump		X	X	X		X	X					
	6	Malfunction of one-way clutch			X			X						
	7	Damaged or worn gear or other rotating part, or improper adjustment of the preload												
	8	Malfunction of parking mechanism									X		X	
	9	Cracked drive plate, or loose bolt		X										
	10	Worn inside diameter of front clutch retainer				X			X					
Oil pressure system (including friction elements)	11	Low fluid level		X	X	X		X	X					
	12	Line pressure too low (seal damaged, leakage, looseness, etc.)		X	X	X		X	X					
	13	Malfunction of valve body (sticking valve, working cavity, adjustment, etc.)		X	X	X	X	X	X		X	X		X
	14	Malfunction of front clutch or piston				X			X					X
	15	Malfunction of rear clutch or piston			X			X						X
	16	Malfunction of kickdown band or piston												
	17	Improper adjustment of kickdown servo												
	18	Malfunction of low-reverse brake or piston		X		X			X					X
	19	O-ring of low-reverse brake circuit between valve body and case not installed				X			X					
	20	Malfunction of end clutch or piston (check ball hole, other)												
Electronic-control system	21	Malfunction of inhibitors switch, damaged or disconnected wiring, or improper adjustment	X								X	X		X
	22	Malfunction of TPS, or improper adjustment												X
	23	Pulse generator (A) damaged or disconnected wiring, or short-circuit												
	24	Pulse generator (B) damaged or disconnected wiring, or short-circuit				X								
	25	Malfunction of kickdown servo switch												
	26	SCSV-A or B damaged or disconnected wiring, or short-circuit or sticking (valve open)												
	27	Malfunction of ignition signal system												
	28	Incorrectly grounded ground strap												
	29	PCSV damaged or disconnected wiring, or short-circuit												
	30	PCSV damaged or disconnected wiring (valve open)		X	X	X		X	X					
	31	Malfunction of OD switch												
	32	Malfunction of accelerator switch, or improper adjustment												X
	33	Malfunction of oil-temperature sensor												
	34	Malfunction of lead switch												
	35	Poor contact of ignition switch												
	36	Malfunction of transaxle control unit												X

NOTE: X indicates items of high priority during inspection.

Abbreviations: TPS = Throttle position sensor SCSV = Shift control solenoid valve

TROUBLESHOOTING

Malfunctions of the ELC-4A/T can lead to other problems, such as those described below:

1. Improper maintenance and/or adjustments
2. Malfunctions of the electronic control functions
3. Malfunctions of mechanical functions
4. Malfunctions of hydraulic control functions
5. Malfunctions of engine performance

etc.

In order to properly determine ("troubleshoot") the source of these malfunctions, it is essential to question the user concerning the details of the problem, such as the condition of the problem, the situation at the time the problem occurred, and any other relevant information, all in as much detail as possible. The user should also be asked whether or not the problem has occurred more than once, and under what conditions.

Tests should be conducted in a certain order, as described at the right.

Based upon use of the troubleshooting guide, the probable location of the problem should be estimated.

↓

Checks should be made of fluid levels and the condition of the ATF, as well as the condition of the manual control cables; adjustments should then be made if found to be necessary.

↓

If a presumption has been made that there is an abnormal condition somewhere in the electronic-control system, the diagnosis tester should be used to estimate the probable location by checking the malfunction-indication pattern.

↓

When the abnormal system is discovered during the road test, check each element (sensors, etc.) one by one, and make repairs as necessary.

↓

When the abnormal condition is presumed to be in the oil-pressure-control system, check by making an oil-pressure test.

↓

When the result of the oil-pressure test does not satisfy the specified pressure, check each system at places related to the valve body, check the oil-pressure passages for leakage, etc.

↓

If the problem is unusually dirty ATF, abnormal noises, oil leakage, or slippage of the clutch or brakes, or an abnormal condition of the transaxle itself, disassemble and repair the transaxle.

MANUAL CONTROL CABLE

Manual linkage adjustment can be verified by checking operation of the inhibitor switch.

1. Apply the parking brake and service brakes.
2. Place the selector lever in the "R" range.
3. Set ignition key to the "ST" position.
4. Slowly move the selector lever upward until it clicks as it fits into the notch of the "P" range. If the starter motor operates when the lever makes a click, the "P" position is correct.
5. Then, slowly move the selector lever to the "N" range by the same procedure. If the starter motor operates when the selector lever fits into "N", the "N" position is correct.
6. Also, check that the vehicle doesn't begin to move and the lever doesn't stop between P-R-N-D.
7. The manual-control cable is properly adjusted if, as described above, the starter motor starts at both the "P" range and the "N" range.

DIAGNOSIS AND TEST

FLUID LEVEL AND CONDITION

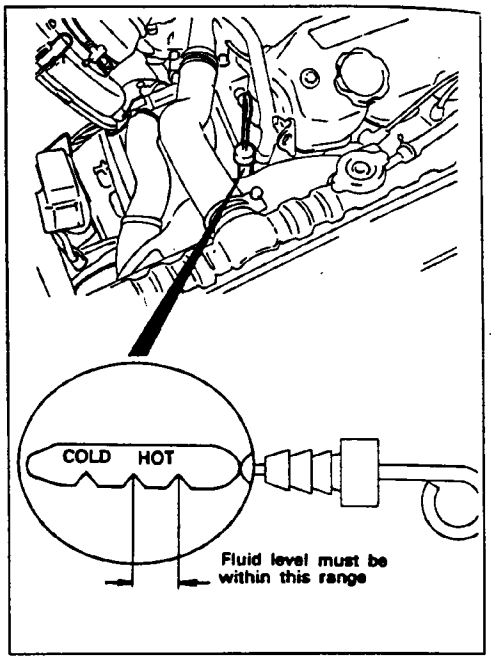
1. Place the vehicle on a level surface.
2. Before removing the dipstick, wipe all dirt from the area around the dipstick.
3. With the selector lever in "P" (Park) and the parking brake applied, start the engine.
4. The engine should be running at idle speed. Fluid should be at normal operating temperature [70—80°C (158—176°F)].
5. Move the selector lever to every position to fill the torque converter and hydraulic circuit with fluid, then place the lever in the "N" (Neutral) position. This operation is necessary to be sure that the fluid level check is accurate.
6. Check if the fluid level is in the "HOT" range on the dipstick. If the fluid is low, add automatic transaxle fluid until the level reaches the "HOT" range.

   Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. Air trapped in the hydraulic circuit forms bubbles which will aerate the fluid, causing pressures to be erratic.

   When the transaxle has too much fluid, the gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid.

   In either case, air bubbles can cause overheating, fluid oxidation, and varnishing, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

   Along with fluid level, it is important to check the condition of the fluid. When fluid smells burned, and is contaminated with metal bushing or friction material particles, a complete transaxle overhaul is needed. Be sure to examine the fluid on the dipstick closely. If there is any doubt about its conditions, drain out a sample to verify. After the fluid has been checked, seat dipstick fully to seal out water and dirt.

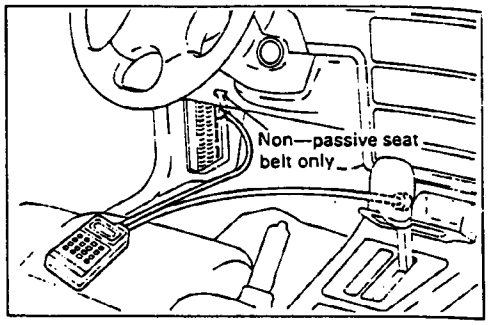


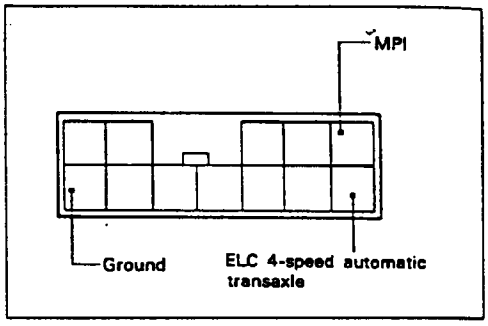
Hyundai

OBTAINING FAULT CODES

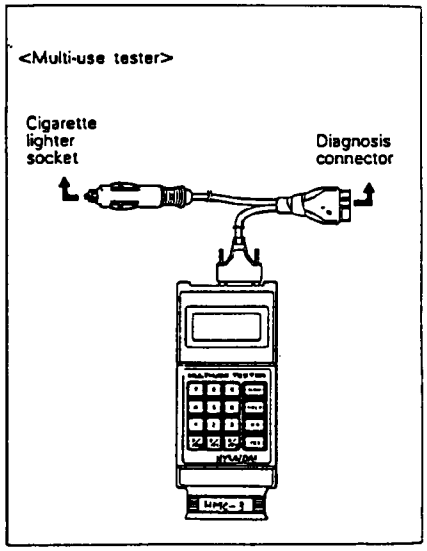
1. Connect the voltmeter or multi-use tester to the connector for diagnosis.
2. Read the output fault codes.
   Then follow the remedy procedures according to the "FAULT CODE DESCRIPTION" on the following page.

   NOTE
   - **As many as ten fault codes, in the sequence of occurrence, can be stored in the Random Access Memory (RAM) incorporated within the control unit.**
   - **The same fault code can be stored as many as three times.**
   - **If the number of stored fault codes or fault patterns exceeds ten, already stored fault codes will be erased, in sequence beginning with the oldest.**
   - **Do not disconnect the battery until all fault codes or fault patterns have been read out, because all stored fault codes or fault patterns will be canceled when the battery is disconnected.**





3. If the fail-safe system is activated and the transaxle is locked in 3rd gear, the fault code in the Fail-Safe Code Description will be stored in the RAM.
   Three of these fault codes can be stored.
4. The cancelation will occur if, with the transaxle locked in 3rd gear, the ignition key is turned to the OFF position, but the fault code is stored in the RAM.



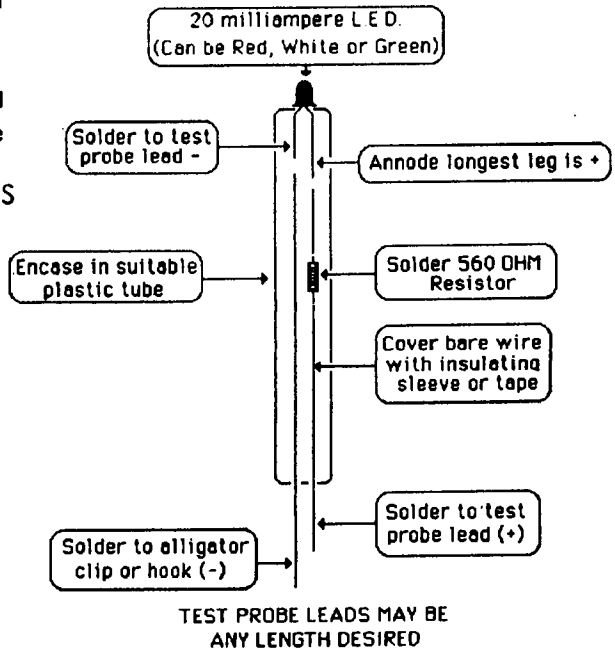
COMPUTER SCANNERS CAN BE USED.

"OTC"

and

"Snap-On"

MAKE YOUR OWN AUTOMOTIVE ELECTRONICS 12 VOLT L.E.D. TESTER

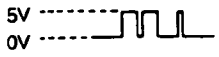


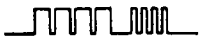
TEST PROBE LEADS MAY BE ANY LENGTH DESIRED

FAIL-SAFE ITEM

Output code		Description	Fail-safe	Note (relation to fault code)
Code No.	Output pattern (for voltmeter)			
11		Malfunction of the microprocessor	Locked in 3rd gear	When code No.31 is generated 4th time.
12		First gear command during high speed driving	Locked in 3rd (D) or 2nd (2, L) gear	When code No.32 is generated 4th time.
13		Damaged or disconnected wiring of the pulse generator B system	Locked in 3rd (D) or 2nd (2, L) gear	When code No.33 is generated 4th time.
14		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve A	Locked in 3rd gear	When code No.41 or 42 is generated 4th time.
15		Damaged or disconnected wiring, or short circuit, of shift control solenoid valve B	Locked in 3rd gear	When code No.43 or 44 is generated 4th time.
16		Damaged or disconnected wiring, or short circuit, of the pressure control solenoid valve	Locked in 3rd (D) or 2nd (2, L) gear	When code No.45 or 46 is generated 4th time.
17		Shift steps non-synchronous	Locked in 3rd (D) or 2nd (2, L) gear	When either code No.51, 52 53 or 54 is generated 4th time.

FAULT CODE DESCRIPTION

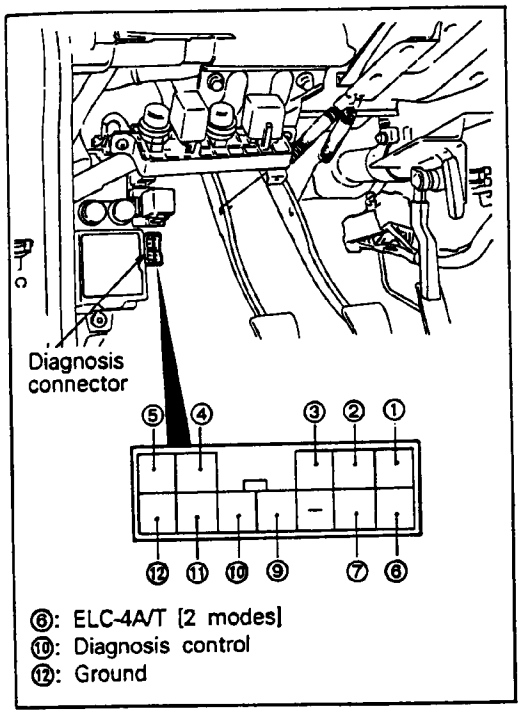
Fault code	Fault code (for voltmeter)	Cause	Remedy
21		Abnormal increase of TPS output	o Check the throttle position sensor connector. o Check the throttle position sensor itself. o Adjust the throttle position sensor. o Check the accelerator switch (No.28: output or not). o Check the throttle position sensor output circuit harness.
22		Abnormal decrease of TPS output	
23		Incorrect adjustment of the throttle-position sensor system	
24		Damaged or disconnected wiring of the oil temperature sensor system	o Check the oil temperature sensor circuit harness. o Check the oil temperature sensor connector. o Check the oil temperature sensor itself.
25		Damaged or disconnected wiring of the kickdown servo switch system, or improper contact	o Check the kickdown servo switch output circuit harness. o Check the kickdown servo switch connector. o Check the kickdown servo switch itself
26		Short circuit of the kickdown servo switch system	
27		Damaged or disconnected wiring of the ignition pulse pick-up cable system	o Check the ignition pulse signal line.
28		Short circuit of the accelerator switch system or improper adjustment	o Check the accelerator switch output circuit harness. o Check the accelerator switch connector. o Check the accelerator switch itself. o Adjust the accelerator switch.

Fault code	Fault code (for voltmeter)	Cause	Remedy
31		Malfunction of the microprocessor	o Replace the control unit.
32		First gear command during high-speed driving	o Replace the control unit.
33		Damaged or disconnected wiring of the pulse generator B system	o Check the pulse generator B output circuit harness. o Check pulse generator B itself. o Check the vehicle speed reed switch (for chattering).
41		Damaged or disconnected wiring of the shift control solenoid valve A system	o Check the solenoid valve connector. o Check shift control solenoid valve A itself. o Check the shift control solenoid valve A drive circuit harness.
42		Short circuit of the shift control solenoid valve A system	
43		Damaged or disconnected wiring of the shift control solenoid valve B system	o Check the solenoid valve connector. o Check shift control solenoid valve B itself. o Check the shift control solenoid valve B drive circuit harness.
44		Short circuit of the shift control solenoid valve B system	
45		Damaged or disconnected wiring of the pressure control solenoid valve system	o Check the solenoid valve connector. o Check the pressure control solenoid valve itself. o Check the pressure control solenoid valve drive circuit harness.
46		Short circuit of the pressure control solenoid valve system	

Fault code	Fault code (for voltmeter)	Cause	Remedy
32		First gear command during high-speed driving	o Replace the control unit
33		Damaged or disconnected wiring of the pulse generator B system	o Check the pulse generator B output circuit harness. o Check pulse generator B itself. o Check the vehicle speed reed switch (for chattering).
41		Damaged or disconnected wiring of the shift control solenoid valve A system	o Check the solenoid valve connector. o Check shift control solenoid valve A itself. o Check the shift control solenoid valve A drive circuit harness
42		Short circuit of the shift-control solenoid valve A system	
43		Damaged or disconnected wiring of the shift control solenoid valve B system	o Check the solenoid valve connector. o Check shift control solenoid valve B itself. o Check the shift control solenoid valve B drive circuit harness.
44		Short circuit of the shift control solenoid valve B system	
45		Damaged or disconnected wiring of the pressure control solenoid valve system	o Check the solenoid valve connector. o Check the pressure control solenoid valve itself. o Check the pressure control solenoid valve drive circuit harness.
46		Short circuit of the pressure control solenoid valve system	
47		Damaged or disconnected wiring of the damper clutch control solenoid valve system	o Check the solenoid valve connector. o Check the damper clutch control solenoid valve itself. o Check the damper clutch control solenoid valve drive circuit harness.
48		Short circuit op the damper clutch control solenoid valve system	

Fault code	Fault code (for voltmeter)	Cause	Remedy
49		Malfunction of the damper clutch system	o Check the damper clutch control solenoid valve drive circuit harness. o Check the damper clutch hydraulic pressure system. o Check the damper clutch control solenoid valve itself. o Replace the control unit.
51		First gear non-synchronous	o Check the pulse generator output circuit harness. o Check the pulse generator connector. o Check pulse generator A and pulse generator B themselves. o Kickdown brake slippage.
52		Second gear non-synchronous	o Check the pulse generator A output circuit harness. o Check the pulse generator A connector. o Check pulse generator A itself. o Kickdown brake slippage.
53		Third gear non-synchronous	o Check the pulse generator A output circuit harness. o Check the pulse generator connector. o Check pulse generator A and pulse generator B themselves. o Front clutch slippage. o Rear clutch slippage.
54		Fourth gear non-synchronous	o Check the pulse generator A output circuit harness. o Check the pulse generator A connector. o Check pulse generator A itself. o Kickdown brake slippage.

Mitsubishi



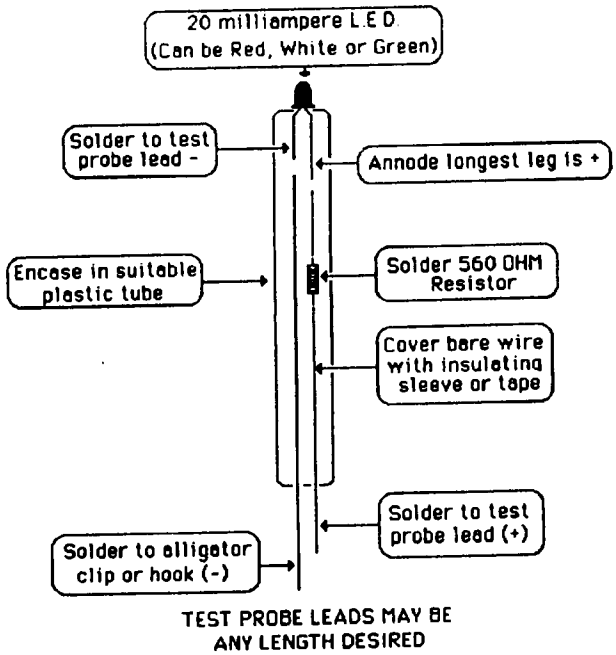
READ OUT OF FAULT CODES

(1) Connect the voltmeter or multi-use tester to the connector for diagnosis.
(2) Read the output fault codes.
Then follow the remedy procedures according to the "Fault Code Description" on the following page.

NOTE
- As many as a maximum of ten fault codes, in the sequence of occurrence, can be stored in the Random Access Memory (RAM) incorporated within the control unit.
- The same fault code can be stored as many as three times.
- If the number of stored fault codes or fault patterns exceeds ten, already stored fault codes will be erased, in sequence beginning with the oldest.
- Do not disconnect the battery until all fault codes or fault patterns have been read out, because all stored fault codes or fault patterns will be canceled when the battery is disconnected.

(3) If the fail-safe system is activated and the transaxle is locked in 3rd gear, the fault code in the Fail-Safe Code Description will be stored in the RAM.
Three of these fault codes can be stored.
(4) The cancelation will occur if, with the transaxle locked in 3rd gear, the ignition key is turned to the OFF position, but the fault code is stored in the RAM.

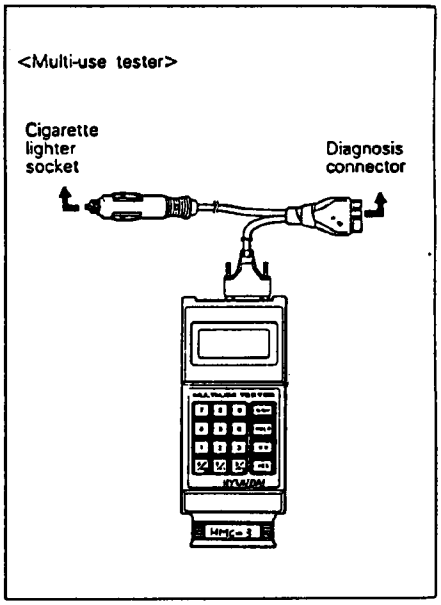
MAKE YOUR OWN AUTOMOTIVE ELECTRONICS 12 VOLT L.E.D. TESTER



TEST PROBE LEADS MAY BE ANY LENGTH DESIRED

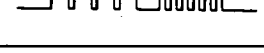
Computer Scanners can be used.

OTC and Snap-On



Fault Code Description for 1989 and 1990 model

Fault code	Fault code (for voltmeter)	Cause	Remedy
21		Abnormal increase of TPS output	• Check the throttle position sensor connector. • Check the throttle position sensor itself. • Adjust the throttle position sensor. • Check the accelerator switch (No. 28: output or not). • Check the throttle position sensor output circuit harness.
22		Abnormal decrease of TPS output	
23		Incorrect adjustment of the throttle-position sensor system	
24		Damaged or disconnected wiring of the oil temperature sensor system	• Check the oil temperature sensor circuit harness. • Check the oil temperature sensor connector. • Check the oil temperature sensor itself.
25		Damaged or disconnected wiring of the kickdown servo switch system, or improper contact	• Check the kickdown servo switch output circuit harness. • Check the kickdown servo switch connector. • Check the kickdown servo switch itself.
26		Short circuit of the kickdown servo switch system	
27		Damaged or disconnected wiring of the ignition pulse pick-up cable system	• Check the ignition pulse signal line.
28		Short circuit of the accelerator switch system or improper adjustment	• Check the accelerator switch output circuit harness. • Check the accelerator switch connector. • Check the accelerator switch itself. • Adjust the accelerator switch.
31		Malfunction of the microprocessor	• Replace the control unit.
32		First gear command during high-speed driving	• Replace the control unit.
33		Damaged or disconnected wiring of the pulse generator B system	• Check the pulse generator B output circuit harness. • Check pulse generator B itself. • Check the vehicle speed reed switch (for chattering).

Fault code	Fault code (for voltmeter)	Cause	Remedy
41		Damaged or disconnected wiring of the shift control solenoid valve A system	• Check the solenoid valve connector. • Check shift control solenoid valve A itself. • Check the shift control solenoid valve A drive circuit harness
42		Short circuit of the shift-control solenoid valve A system	
43		Damaged or disconnected wiring of the shift control solenoid valve B system	• Check the solenoid valve connector. • Check shift control solenoid valve B itself. • Check the shift control solenoid valve B drive circuit harness.
44		Short circuit of the shift control solenoid valve B system	
45		Damaged or disconnected wiring of the pressure control solenoid valve system	• Check the solenoid valve connector. • Check the pressure control solenoid valve itself. • Check the pressure control solenoid valve drive circuit harness.
46		Short circuit of the pressure control solenoid valve system	
47		Damaged or disconnected wiring of the damper clutch control solenoid valve system	• Check the solenoid valve connector. • Check the damper clutch control solenoid valve itself. • Check the damper clutch control solenoid valve drive circuit harness.
48		Short circuit of the damper clutch control solenoid valve system	
49		Malfunction of the damper clutch system	• Check the damper clutch control solenoid valve drive circuit harness. • Check the damper clutch hydraulic pressure system. • Check the damper clutch control solenoid valve itself. • Replace the control unit
51		First gear non-synchronous	• Check the pulse generator output circuit harness. • Check the pulse generator connector. • Check pulse generator A and pulse generator B themselves. • Kickdown brake slippage.
52		Second gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator A connector. • Check pulse generator A itself. • Kickdown brake slippage.

Fault code	Fault code (for voltmeter)	Cause	Remedy
53		Third gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator connector. • Check pulse generator A and pulse generator B themselves. • Front clutch slippage. • Rear clutch slippage.
54		Fourth gear non-synchronous	• Check the pulse generator A output circuit harness. • Check the pulse generator A connector. • Check pulse generator A itself. • Kickdown brake slippage.

CHECKING THE CONTROL SYSTEM (WHEN A MULTI-USE TESTER IS USED)

Check items	Check procedures		Probable cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Pulse generator B	D range; stopped.	0 rpm	o Pulse generator B or circuit harness malfunction. o Pulse generator B shielded line malfunction. o Intrusion of external noise.
	D range; driving at 50 km/h (31 mph) in 4th gear.	1600—2000 rpm	
Pulse generator A	D range; driving at 30 km/h (19 mph) in 2nd gear.	0 rpm	o Pulse generator A or circuit harness malfunction. o Pulse generator A shielded line malfunction. o Intrusion of external noise. o Kickdown brake slippage.
	D range; driving at 50 km/h (31 mph) in 3rd gear.	1400—1800 rpm	
	D range; driving at 50 km/h (31 mph) in 4th gear.	0 rpm	
Throttle position sensor (TPS)	Accelerator completely closed.	0.5—0.6V	o TPS is correctly adjusted if voltage is high during fully closed or fully open. o TPS or circuit harness malfunction if there is no change. o TPS or accelerator wire malfunction if the change is not smooth.
	Accelerator slowly depressed.	Changes occur according to degree of opening.	
	Accelerator completely open.	4.5—5.0V	
Oil temperature sensor	Engine cold (before starting).	Corresponding to outside air temperature.	o Oil-temperature sensor or circuit harness malfunction
	Engine warming up (during driving).	Gradual increase.	
	After engine warmed up.	80—110°C	
Kickdown servo switch	L range; idling.	ON	o Kickdown servo improperly adjusted. o Kickdown servo switch or circuit harness malfunction. o Kickdown servo malfunction.
	D range; 1st or 3rd gear.	ON	
	D range; 2nd or 4th gear.	OFF	
Ignition signal line	N range; idling.	650—750 rpm	o Ignition system malfunction. o Ignition signal pick-up circuit harness malfunction.
	N range; 2,500 rpm (tachometer reading).	2400—2600 rpm	
Accelerator switch	Accelerator fully closed.	OFF	o Accelerator switch incorrectly adjusted. o Accelerator switch or circuit harness malfunction.
	Accelerator slightly depressed.	ON	
Vehicle-speed reed switch	Vehicle stopped.	0 km/h	o Vehicle-speed reed switch malfunction if high-speed signals emitted while vehicle is stopped. o Otherwise, vehicle-speed reed switch or circuit harness malfunction.
	Driving at 30 km/h (19 mph).	30 km/h (19 mph)	
	Driving at 50 km/h (31 mph).	50 km/h (31 mph)	
Inhibitor switch	Shift to P range.	P	o Inhibitor switch improperly adjusted. o Inhibitor switch or circuit harness malfunction. o Manual control cable malfunction. o If the shift lever does not move, check the parking shift lock mechanism.
	Shift to R range.	R	
	Shift to N range.	N	
	Shift to D range.	D	
	Shift to 2 range.	2	
	Shift to L range.	L	

Check items	Check procedures		Probable cause (or remedy) if a malfunction is found
	Check conditions	Normal value	
Overdrive switch	Overdrive switch ON.	OD	o Overdrive switch or circuit harness malfunction.
	Overdrive switch OFF.	OD—OFF	
Power/Economy select switch	Selection of the Power pattern. (including during E pattern control when oil temperature is low)	Power	o Power/Economy select switch or circuit harness malfunction.
	Selection of the Economy pattern.	Economy	
Air conditioner relay signals	D range; air conditioner idling speed increased.	ON	o Air conditioner power relay ON signal-detection circuit harness malfunction.
	D range; air conditioner switch OFF.	OFF	
T/A gear position	D range; idling.	C	o TCU malfunction. o Accelerator switch system malfunction. o Inhibitor switch system malfunction. o TPS system malfunction.
	L range; idling.	1ST	
	2 range; 2nd gear.	2ND	
	D range; overdrive—OFF; 3rd gear.	3RD	
	D range; overdrive—ON; 4th gear.	4TH	
PCSV duty	D range; idling.	50—70 %	o Duty should become 100% when, while idling in D range, accelerator is pressed even slightly. o TCU malfunction. o TPS system malfunction. o Accelerator switch system malfunction.
	D range; 1st gear.	100 %	
	D range; during shift.	Changes occur according to conditions.	

ELEMENT IN USE AT EACH POSITION OF SELECTOR LEVER

Selector lever position	Overdrive control switch	Shifting gear	Gear ratio	Engine start	Parking mechanism	Clutch				Brake	
						C1	C2	C3	OWC	B1	B2
P	—	Neutral	—	Possible	●						
R	—	Reverse	2.176			●					●
N	—	Neutral	—	Possible							
D	ON	1st	2.551				●		●		
		2nd	1.488				●			●	
		3rd	1.000			●	●	●			
		OD	0.685					●		●	
D	OFF	1st	2.551				●		●		
		2nd	1.488				●			●	
		3rd	1.000			●	●	●			
2	—	1st	2.551				●		●		
		2nd	1.488				●			●	
L	—	1st	2.551				●				●

C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low & reverse brake

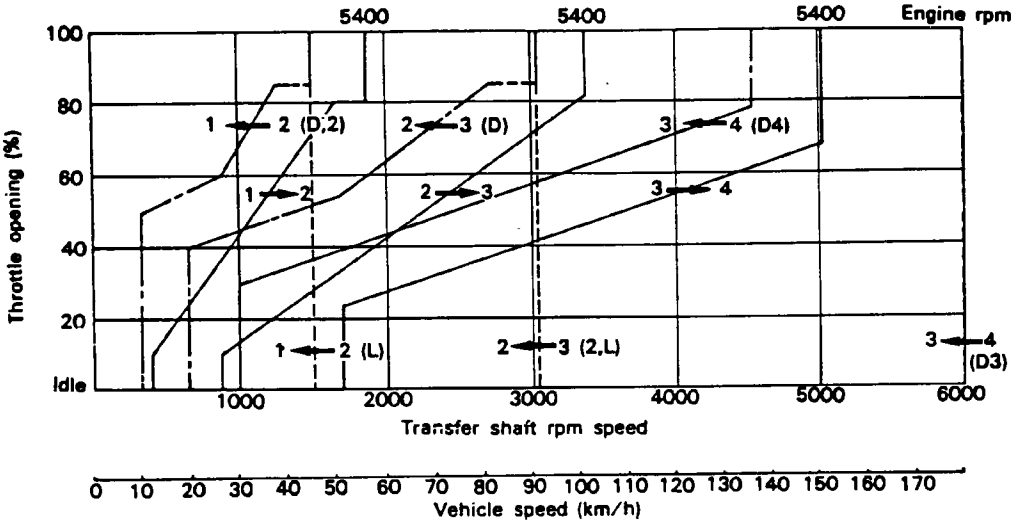
SHIFT PATTERNS

Two shift patterns are pre-stored in the control unit of this transaxle. One is the power pattern (for more powerful performance), and the other is the normal pattern (for improved fuel consumption and quieter operation). Refer to the diagram next page. The driver can select and switch to the desired pattern by using the power/normal select switch on the center console. The solid lines shown in these shift patterns indicate up-shifts, and the broken lines indicate down-shifts.

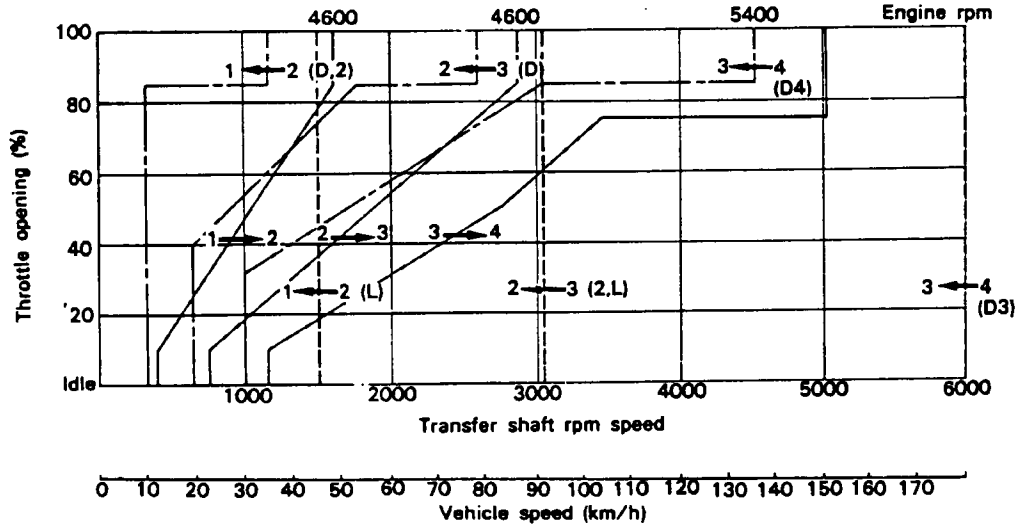
The reason why there is a difference between the shift points for up-shifts and for down-shifts is so that up-shifts and down-shifts will not occur frequently when driving at a speed in the vicinity of the shift point.

When the vehicle is stopped, there is a shift to 2nd gear in order to obtain a suitable "creeping", but when the accelerator pedal is then depressed the vehicle starts off in 1st gear.

POWER RANGE



NORMAL RANGE



INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

1. Wiring

Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.

- No continuity → Improper connection of connector, damaged or disconnected harness, or incorrect wiring connection. → Reconnect the connector; repair or replace the harness.
- Continuity → Normal

2. Oil-temperature sensor

Sensor side connector terminal

1: (—) side
2: (+) side

Very the termo-sensitive part from low temperature to high temperature and check the resistance between the positive (+) and negative (—) sides of the connector terminal.

- No continuity (resistance: ∞) → Damaged or disconnected wiring → Replace the oil temperature sensor.
- Changes of the resistance continuous and smooth. → Normal

3. Throttle-position sensor (TPS)

Sensor side connector terminal

1: Idle switch
2: ground
4: output
3: power supply

Check the resistance between terminals 2 and 3 of the TPS.

- Resistance: high or infinite → Damaged or disconnected wiring → Replace the TPS.
- 3.5—6.5 KΩ/20°C (68°F)

Check the resistance between terminals 2 and 4 with the engine idling after throttle-valve opening warm-up.

- Resistance: more or less than 0.4 KΩ at 20°C (68°F) → Improper adjustment → Readjust the TPS installation.
- Resistance (actual measurement) between terminals 2-4: approx. 0.4 KΩ at 20°C (68°F)

Check for changes of the resistance between terminals 2 and 4 when the throttle valve is operated from the idling position to the fully open position.

- Changes of the resistance are not continuous. → Poor contact → Replace the TPS.
- Changes of the resistance continuous and smooth. → Normal

4. Pulse generator A or B

Pulse generator side connector terminals
1—2: pulse generator A
3—4: pulse generator B

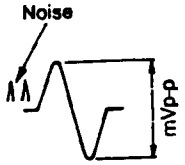
Check the resistance between terminals 1 and 2 or 3 and 4.

- Resistance: very low or very high → Short-circuit, or damaged or disconnected wiring → Replace the pulse generator.
- 215—275 Ω/20°C (68°F) → Normal

5. Pulse generator A or B (checking by an oscilloscope)

Connect the pulse generator and body harness, and connect an oscilloscope. Check with the chassis on a dynamotor with the front wheels raised.

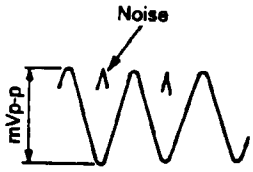
Oscilloscope waveform
Noise



With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.

- Very low voltage → Incorrect installation of the pulse generator, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.
- Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.
- 1,000 mVp-p or higher

Noise



With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.

- Very low voltage → Incorrect installation of the pulse generator, or malfunction of the pulse generator. → Correct the installation condition, or replace the pulse generator.
- Noise in the waveform → Improper grounding of the pulse generator circuit's shielded wiring. → Replace the pulse generator.
- 500 mVp-p or higher → Normal

6. Pressure-control solenoid valve (PCSV)

Solenoid valve side connector terminals

1: —
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 2 of the solenoid valve connector and the transaxle case.

- Resistance; too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the PCSV.
- 2.9 ± 0.3Ω/20°C (68°F)

Connect 12V between the transaxle case and terminal 2; switch ON and OFF and check for operation noise.

- No operation noise. (stroke: 0.3 mm (0.012 in. or less) → Foreign material caught between the valve and guide → Replace the PCSV.
- Noise exists → Normal

7. Shift-control solenoid valve (SCSV) A or B

Solenoid valve side connector terminals

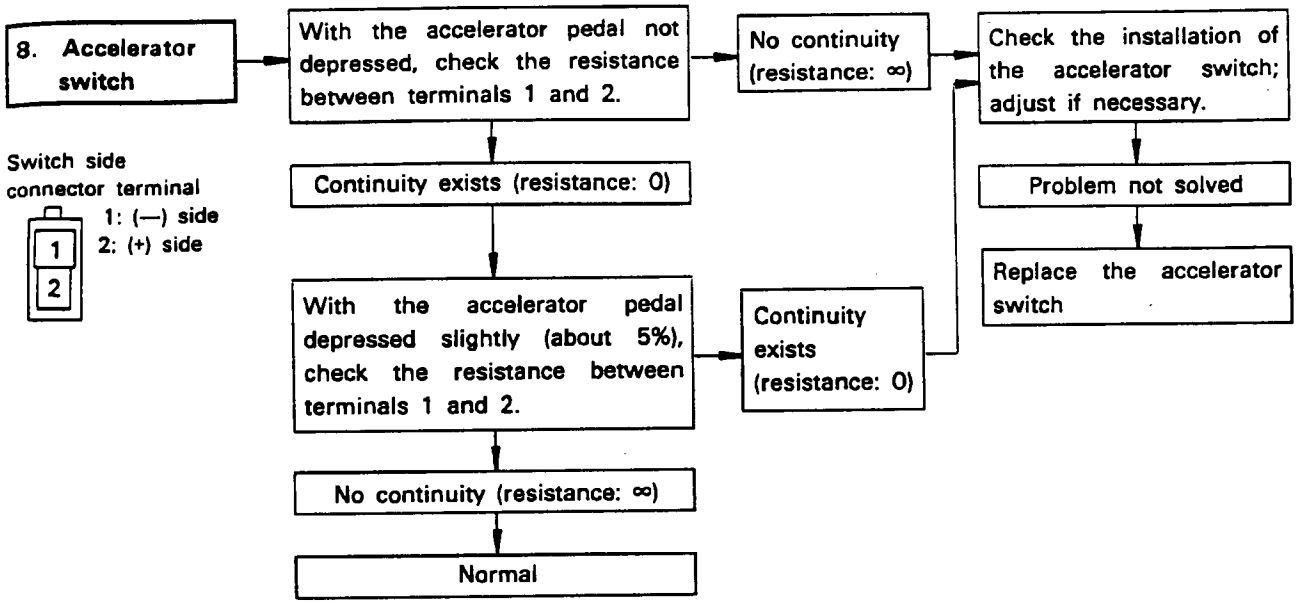
1: —
2: PCSV
3: SCSV-B
4: SCSV-A

Check the resistance between terminal 3 or 4 of the solenoid valve connector and the transaxle case.

- Resistance: too low or too high → Short-circuit, or damaged or disconnected wiring → Replace the SCSV.
- 22.3 ± 1.5Ω/20°C (68°F)

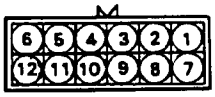
Connect 12V between the transaxle case and terminal 3 or 4; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.

- No operation noise.(stroke: 0.25 mm (0.010 in. or less) → Residue accumulated in valve and core. → Replace the SCSV.
- Noise exists.
- Normal


8. Accelerator switch
With the accelerator pedal not depressed, check the resistance between terminals 1 and 2.
No continuity (resistance: ∞)
Check the installation of the accelerator switch; adjust if necessary.
Problem not solved
Replace the accelerator switch
Continuity exists (resistance: 0)
With the accelerator pedal depressed slightly (about 5%), check the resistance between terminals 1 and 2.
Continuity exists (resistance: 0)
No continuity (resistance: ∞)
Normal
Switch side connector terminal
1: (—) side
2: (+) side
1
2

9. Inhibitor switch

Switch side connector terminal



In the "P" range, check for continuity between terminals 3 and 4, and terminals 10 and 11.

Continuity exists

In the "R" range, check for continuity between terminals 3 and 12, and terminals 8 and 9.

Continuity exists

In the "N" range, check for continuity between terminals 3 and 5, and terminals 10 and 11.

Continuity exist

In the "D" range, check for continuity between terminals 1 and 3.

Continuity exists

In the "2" range, check for continuity between terminals 3 and 6.

Continuity exists

In the "L" range, check for continuity between terminals 2 and 3.

Continuity exists

Normal

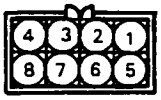
No continuity

Poor contact, damaged or disconnected wiring.

Replace the inhibitor switch

10. Kickdown (K/D) servo switch

Harness side connector terminal(E06)



Check for continuity between the kickdown servo switch terminal 7 and the transaxle case.

- No continuity → Poor contact, or damaged or disconnected wiring → Replace the K/D servo switch.
- Continuity → Start the engine, set to the "L" range, and let the engine idle; check for continuity between the kickdown servo switch terminal and the transaxle case.
  NOTE: Be sure the brakes are applied during this check.
  - Continuity exists → Poor contact (sticking) → Replace the K/D servo switch.
  - No continuity → Normal

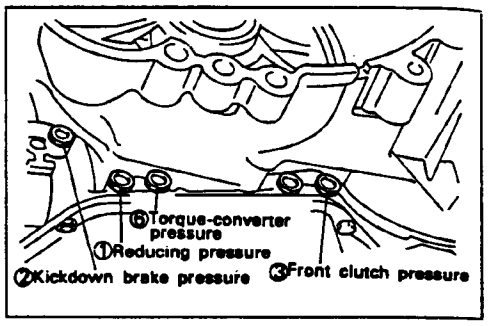
11. Transaxle control unit (TCU)

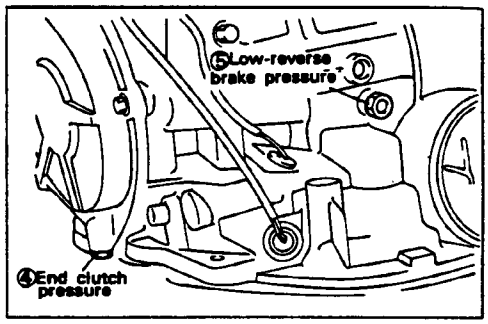
Disconnect the harness (both A and B connectors) from the vehicles TCU. Then connect, a new TCU to this harness and make a road test.

- The problem does not occur → Malfunction of the original TCU → Install a new TCU.
- Consider the original TCU to be normal, and again check the sensors, wiring, etc.

OIL PRESSURE TESTS

1. Completely warm up the transaxle.
2. Raise the vehicle by using a jack so that the front wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.
4. Attach the special oil-pressure gauge 30 kg/cm² (3,000 KPa, 400 psi) (09452—21500) and the adaptor (09452—21001, 09452—21002) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 30 kg/cm² (3,000 KPa, 400 psi)type of gauge should be used.
5. Measure the oil pressure under various conditions, and check that the measured results are within the standard value range shown in the "Standard oil pressure table" below.
   If the oil pressure is not within the specified range, check and repair as described in the section "Remedial steps if oil pressure is not normal" on the next page.





Standard Oil Pressure Table

No.	Conditions				Standard oil pressure KPa (psi)				
	Selector lever position	Engine speed rpm	Shift position	① Reducing pressure	② Kickdown brake pressure	③ Front clutch pressure	④ End clutch pressure	⑤ Low-reverse brake pressure	⑥ Torque-converter pressure
1	N	Idling	Neutral	370—490 (52—69)	—	—	—	—	☆
2	D	Idling	2nd gear	370—490 (52—69)	100—210 (14—30)	—	—	—	☆
3	D (SW-ON)	Approx. 2500	4th gear	370—490 (52—69)	830—900 (118—128)	—	830—900 (118—128)	—	400—600 (56—84)
4	D (SW-OFF)	Approx. 2500	3rd gear	370—490 (52—69)	830—900 (118—128)	800—900 (118—128)	830—900 (118—128)	—	400—600 (56—84)
5	2	Approx. 2500	2nd gear	370—490 (52—69)	830—900 (118—128)	—	—	—	400—600 (56—84)
6	L	Approx. 1000	1st gear	370—490 (52—69)	—	—	—	300—450 (43—63)	☆
7	R	Approx. 2500	Reverse	370—490 (52—69)	—	1,640—2,240 (233—318)	—	1,640—2,240 (233—319)	400—600 (56—84)
		Approx. 1000				1,500 (213) or more		1,500 (213) or more	

NOTE:

— must be 0.1 kg/cm² (10 KPa, 1.4 psi) or less.

SW-ON : Switch ON the overdrive control switch.

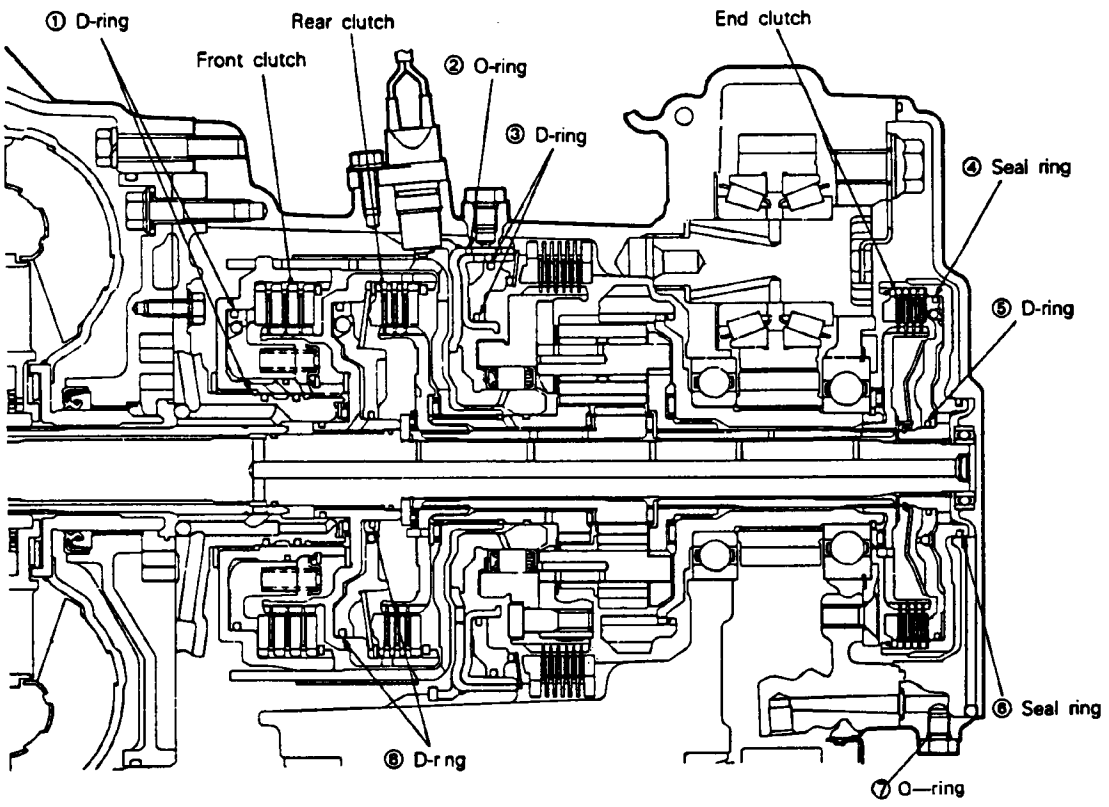
SW-OFF : Switch OFF the overdrive control switch.

☆ : Hydraulic pressure is generated, but not the standard value.

Remedial Steps If Oil Pressure Is Not Normal

Trouble symptom	Probable cause	Remedy
1. *Line pressures are all low (or high). NOTE *"Line pressures" refers to oil pressures 2, 3, 4 and 5 in the "Standard oil pressure table" on the previous page.	a. Clogging of oil filter	a. Visually inspect the oil filter; replace the oil filter if it is clogged.
	b. Improper adjustment of oil pressure (line pressure) of regulator valve	b. Measure line pressure ② (kickdown brake pressure); if the pressure is not the standard value, readjust the line pressure, or, if necessary, replace the valve body assembly.
	c. Sticking of regulator valve	c. Check the operation of the regulator valve; repair if necessary, or replace the valve body assembly.
	d. Looseness of valve body	d. Tighten the valve body bolt and installation bolt.
	e. Improper oil pump discharge pressure	e. Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
2. Improper reducing pressure	a. Improper line pressure	a. Check the ② kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above.
	b. Clogging of the filter of the reducing pressure circuit	b. Disassemble the valve body assembly and check the filter; replace the filter if it is clogged.
	c. Improper reducing pressure adjustment	c. Measure the ① reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.
	d. Sticking reducing valve	d. Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly.
	e. Looseness of valve body	e. Tighten the valve body bolt and installation bolt.
3. Improper kick-down brake pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction in the valve body assembly	c. Replace the valve body assembly.

Trouble symptom	Probable cause	Remedy
4. Improper front clutch pressure	a. Malfunction of the D-ring or seal ring of the sleeve or kickdown servo piston.	a. Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring.
	b. Looseness of valve body	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction in the valve body assembly	c. Replace the valve body assembly.
	d. Wear of the front clutch piston or retainer, or malfunction of the ① D-ring. (Refer to the figure on the next page.)	d. Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring or seal ring. If there is any wear or damage, replace the piston, retainer, D-ring and/or seal ring.
5. Improper end clutch pressure	a. Malfunction of a seal ring ④ or ⑥ D-ring ⑤ of the end clutch or O-ring ⑦ of the pipe (Refer to the following figure.)	a. Disassemble the end clutch and check the seal ring, D-ring of the piston, seal ring of the retainer, o-ring of the pipe, etc.; replace if there are cuts, scars, scratches or damage.
	b. Looseness of valve body	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction in the valve body assembly	c. Replace the valve body assembly.
6. Improper low-reverse brake pressure	a. O-ring between valve body and transaxle damaged or missing	a. Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary.
	b. Looseness of valve body	b. Tighten the valve body tightening bolt and installation bolt.
	c. Malfunction in the valve body assembly	c. Replace the valve body assembly.
	d. Malfunction of the D-ring ③ of the low-reverse brake piston or the O-ring ② of the retainer (Refer to the figure on the next page)	d. Disassemble the transaxle itself and check the D-ring and O-ring for damage; replace if there are cuts, scars, scratches or damage.
7. Improper torque converter pressure	a. Clogging or leaking of the oil cooler and/or piping	a. Repair or replace, as necessary, the cooler and/or piping.
	b. Malfunction of the torque converter	b. Replace the torque converter.


① D-ring
Rear clutch
Front clutch
② O-ring
③ D-ring
End clutch
④ Seal ring
⑤ D-ring
⑧ Seal ring
⑥ D-ring
⑦ O—ring

CONVERTER STALL TEST

Y45CV1A

A stall test consists of determining maximum engine speed obtained at full throttle in "D" and "R" positions. This test checks torque converter stator overrunning clutch operation, and holding ability of the transaxle clutches and the low-reverse brake.

Warning:
During this test, make sure that no one stands in front of or behind vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [70—80°C (158—176°F)]. Engine coolant should also be at normal operating temperature [80—95°C (176—205°F)].
2. Apply chocks to both rear wheels.
3. Attach engine tachometer.
4. Apply parking and service brakes fully.
5. Start engine.
6. With the selector lever in the "D" position, depress the accelerator pedal fully to read engine maximum rpm. Do not hold throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate engine at approximately 1,000 rpm in neutral for 2 minutes to cool transaxle fluid between tests.

   Stall speed : 2,400 ± 200 rpm

7. Place the selector lever in the "R" position and perform the stall test by using the same procedure as above.

Stall Speed Above Specification in "D"

If the stall speed is higher than the specification, the rear clutch or the overrunning clutch of the transaxle is slipping. Perform a hydraulic test.

Stall Speed Above Specification in "R"

If the stall speed is higher than the specification, the front clutch of the transaxle or the low-reverse brake is slipping. Perform a hydraulic test.

Stall Speed Below Specification in "D" and "R"

If the stall speed is lower than the specification, insufficient engine output or a faulty torque converter can be suspected. Check for engine misfiring, improper ignition timing, valve clearance etc. If these are good, the torque converter is faulty.

FLUID LEAKAGE-TRANSAXLE CONVERTER HOUSING AREA

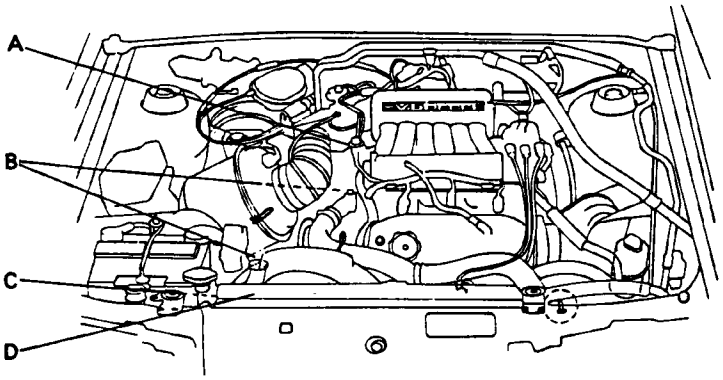
1. Check for any source of leakage. Since fluid leakage at or around the converter area may originate from an engine oil leak, the area should be examined closely. Transaxle factory fill fluid is red and, can be distinguished from engine oil.
2. Prior to removing the transaxle, perform the following checks: When leakage is determined to originate from the transaxle, check the fluid level prior to the removal of the transaxle and torque converter. High oil level can result in oil leakage out of the vent located in the top of the oil pump. If the fluid level is high, adjust to the proper level and recheck for leakage.
3. After completing these steps, recheck once more for leakage.

TRANSAXLE CONTROL

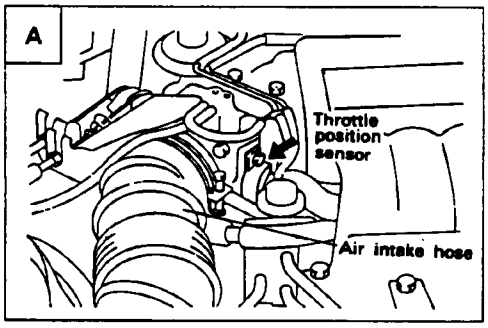
Symptom	Probable cause	Remedy
Selector lever operation is stiff	Incorrect adjustment of sleeve	Adjust
	Incorrect adjustment of control cable	Adjust
	Excessive wear of detent plate	Replace
	Excessive wear of pin at end of selector lever	Replace
	Worn contact surfaces of pushbutton and sleeve	Replace
Starter motor does not operate with the selector lever in the "N" or "P" position	Malfunction in inhibitor switch	Replace
	Incorrect adjustment of control cable	Adjust
	Malfunction of starter relay	Replace
Will not shift to 4-speed	Malfunction of OD switch	Replace

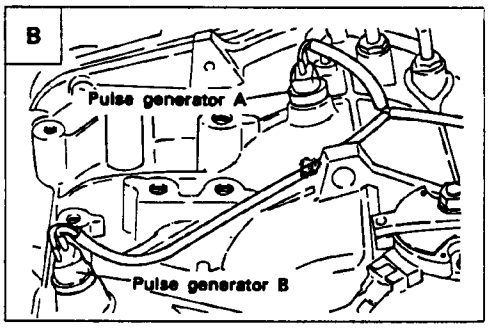
E.L.C. 4-SPEED AUTOMATIC TRANSAXLE CONTROL COMPONENTS LAYOUT

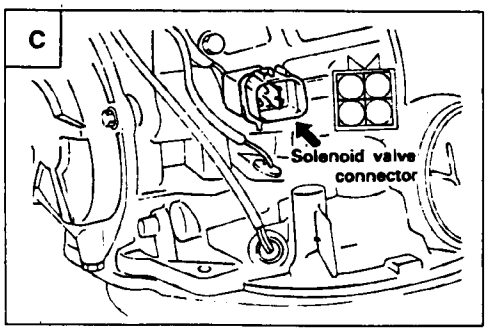
[Engine compartment]

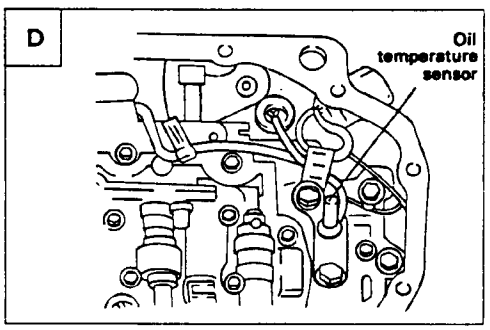


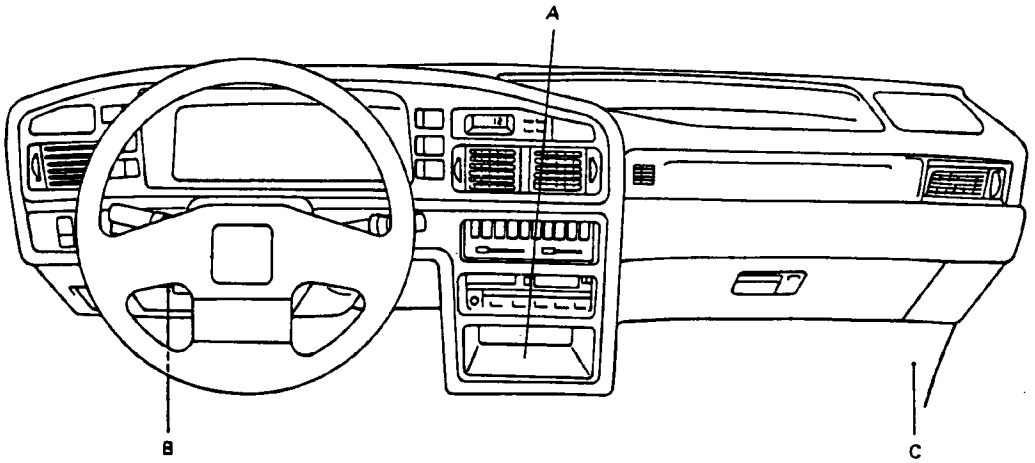
Name	Symbol	Name	Symbol
Throttle position sensor	A	Solenoid valve connect	C
Pulse generator A	B	Oil temperature sensor	D
Pulse generator B	B		



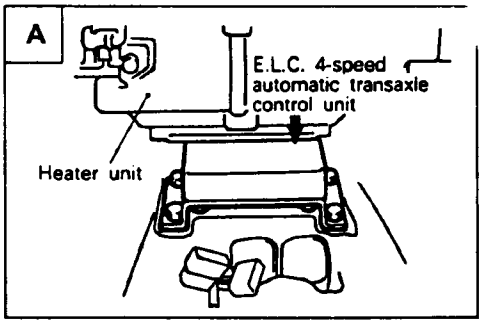


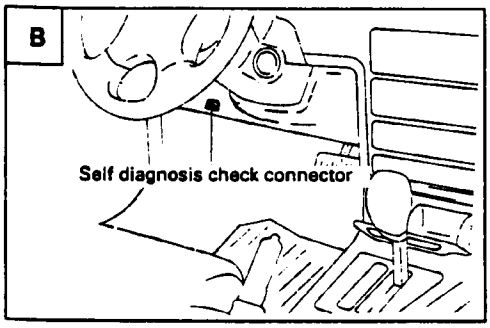


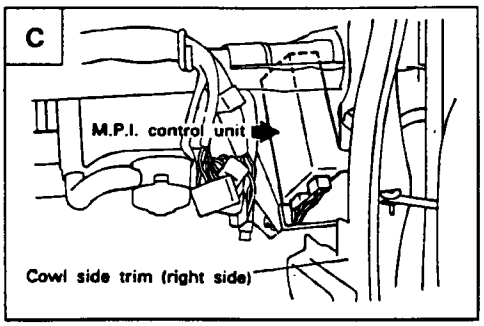




Name	Symbol
E.L.C. 4-speed automatic transaxle control unit	A
Self diagnosis check connector	B
M.P.I. control unit	C



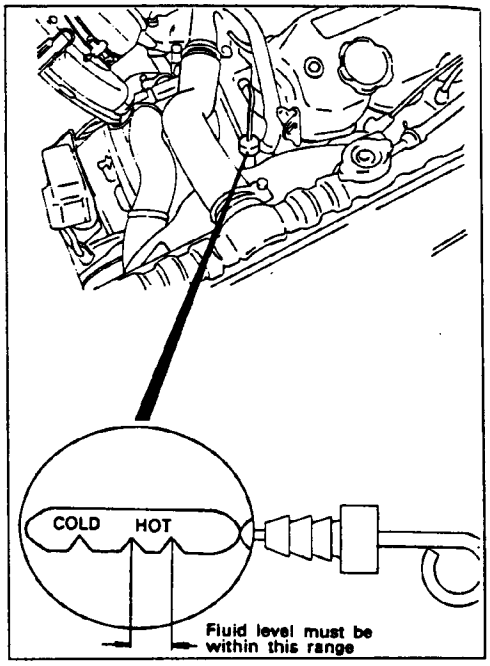




SERVICE ADJUSTMENT PROCEDURES

INSPECTION OF TRANSAXLE FLUID QUANTITY

1. Place the vehicle on a level surface.
2. Before removing the dipstick, wipe all dirt from the area around the dipstick.
3. With the selector lever in "P" (Park) and the parking brake applied, start the engine.
4. The engine should be running at idle speed. Fluid should be at normal operating temperature [70—80°C (158—176°F)].
5. Move the selector lever to every position to fill the torque converter and hydraulic circuit with fluid, then place the lever in the "N" (Neutral) position. This operation is necessary to be sure that the fluid level check is accurate.
6. Check if the fluid level is in the "HOT" range on the dipstick. If the fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" range.



Transaxle fluid :
GENUINE HYUNDAI ATF AUTOMATIC TRANSMISSION FLUID, *MOPAR ATF PLUS TYPE 7176, DIAMOND ATF SP, AUTRAN MM SP (For Australia).
*** : MOPAR ATF PLUS TYPE 7176 is recommended lubricant.**

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. Air trapped in the hydraulic circuit forms bubbles which will aerate the fluid, causing pressures to be erratic.
When the transaxle has too much fluid, the gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid.
In either case, air bubbles can cause overheating, fluid oxidation, and varnishing, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak. Along with fluid level, it is necessary to check conditions of fluid. When fluid smells burned, indicating contamination with metal bushing or friction material particles, a complete transaxle overhaul is needed. Be sure to examine the fluid on the dipstick closely. If there is any doubt about its condition, drain out a sample to verify. After the fluid has been checked, seat dipstick fully to seal out water and dirt.

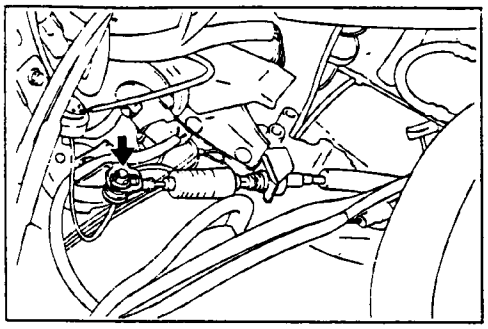
REPLACEMENT OF TRANSAXLE FLUID

Refer to GROUP 10— LUBRICATION AND MAINTENANCE.

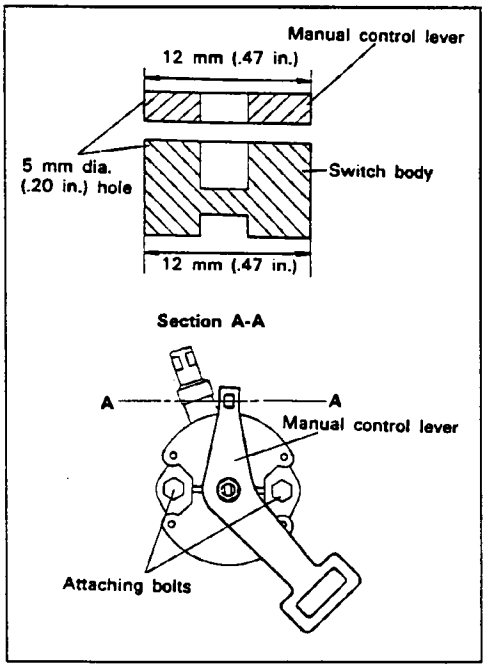
INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

Y45CZ1A

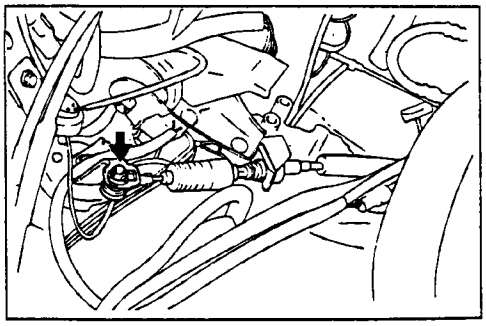
1. Place the selector lever in the "N" (Neutral) position.
2. Loosen the control cable to the manual control lever. Seperate the cable and lever.
3. Place the manual control lever in the "N" (Neutral) position.



4. Turn the inhibitor switch body until the 12 mm (0.47 in.) wide end of the manual control lever aligns with the switch body flange [12 mm (0.47 in.) wide portion]. Or, turn the switch body until the 5 mm (0.20 in.) hole in the manual control lever aligns with the 5 mm (0.20 in.) hole in the switch body.
5. Tighten the attaching bolts (2 pcs.) carefully so that the switch body does not move.

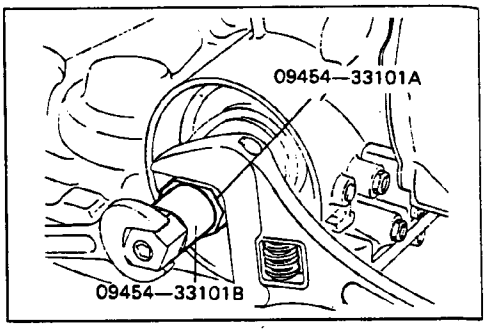


6. Make sure that the selector lever is in the "N" (Neutral) position.
7. Remove any slack in the control cable by adjusting the nut and then check that the selector lever moves smoothly.
8. Check that the control cable has been adjusted correctly.



ADJUSTMENT OF KICKDOWN SERVO

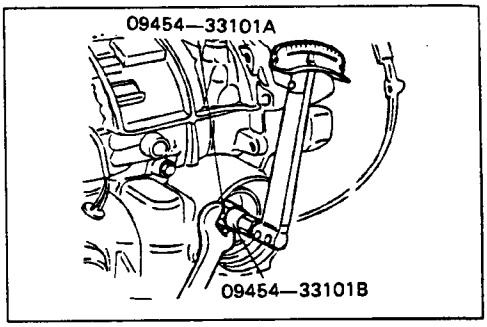
1. Completely remove any dirt and other foreign material around the kickdown servo cover.
2. Remove the kickdown servo switch.
3. Remove the snap ring and cover.
4. Loosen the lock nut.

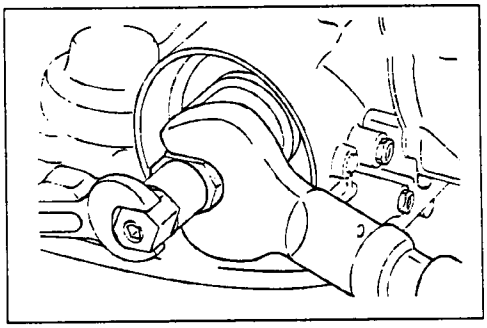


5. While holding with the special tool(09454—33101A) so that the kickdown servo piston won't turn, use a kickdown servo socket wrench—B (09454—33101B) to "tighten", the adjustment screw at 10 Nm (7.2 lb.ft).Loosen and tighten the adjustment screw two turns, and then finish tighten at a torque of 5 Nm (3.6 lb.ft). Again loosen the adjustment screw 2 to 2-1/4 turns.
6. While holding with special tool (09454—33101B) so that the kickdown servo piston won't turn, tighten the lock nut to the specified torque use special tool (09454—33101A).

   Lock nut : 25—32 Nm (250—320 kg.cm, 18—23 lb.ft)

7. After fitting a new D-ring in the groove surrounding the kickdown servo switch, arrange the O-ring so that it is not twisted. Install the kickdown servo switch into the case, and then install the snap ring.



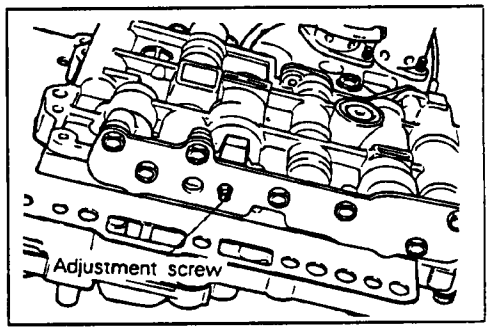


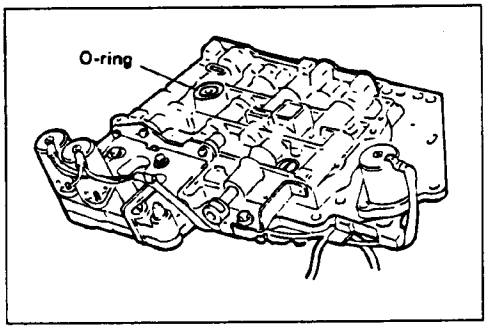
ADJUSTMENT OF LINE PRESSURE

1. Drain out the ATF.
2. Remove the oil pan and oil filter.
3. Remove the oil-temperature sensor.
4. Press the tab of the solenoid valve harness grommet and push in.
5. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.
6. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) becomes the standard value.
   When the adjustment screw is turned to the right, the line pressure becomes lower; when it is turned to the left, it becomes higher.

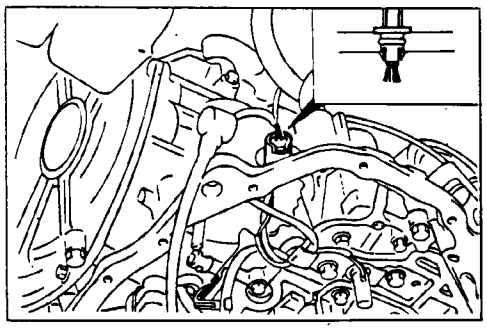
   Standard value : 870—890 kPa (124—126 psi, 8.9—9.1 kg/cm²)
   Oil pressure change for each turn of adjustment screw : 38 kPa (4.6 psi, 0.39 kg/cm²)

7. Check to be sure that the O-ring is installed on the upper surface of the valve body at the place shown in the figure.



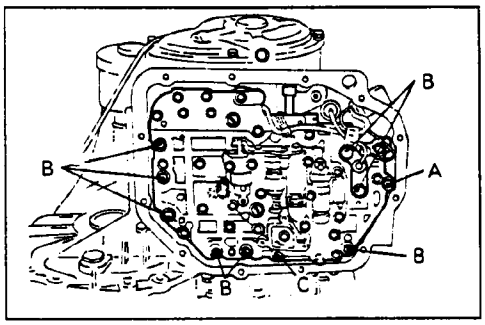


8. Replace the O-ring of the solenoid valve connector with a new one.
9. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure.
   Also be careful that the lead wiring isn't caught.



10. Tighten the valve body assembly mounting bolts (10 pieces) to 10—12 Nm (100—120 kg.cm, 7.5—9 lb.ft).

    A: 18 mm (0.709 in.) long
    B: 25 mm (0.984 in.) long
    C: 40 mm (1.575 in.) long

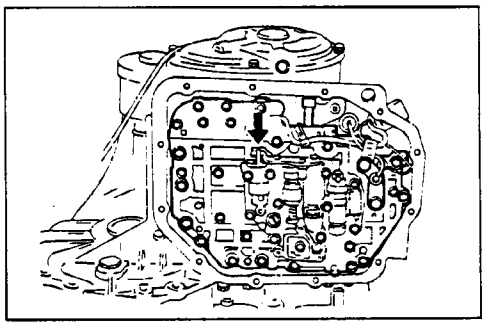


11. Install the oil filter.
12. Install a new oil pan gasket and oil pan, and tighten the bolts.
13. Pour in the specified amount of ATF.
14. Make the oil pressure test. Readjust if necessary.

ADJUSTMENT OF REDUCING PRESSURE

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
2. Turn the adjustment screw of the lower valve body and adjust it so that the reducing pressure is within specifications. When the adjustment screw is turned to the right, the reducing pressure becomes lower; when it is turned to the left, it becomes higher.

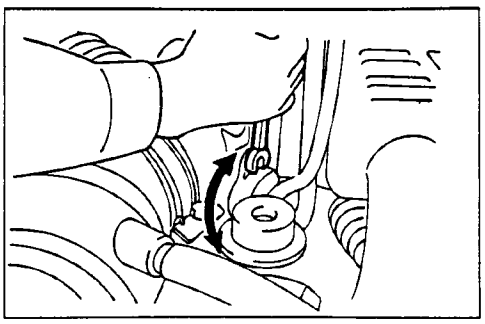
   Standard value : 425 ± 10 KPa (60 ± 1 psi, 4.3 ± 1 kg/cm²)
   Oil pressure change for each turn of adjustment screw : 30 KPa (4.3 psi, 0.3 kg/cm²)



3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.

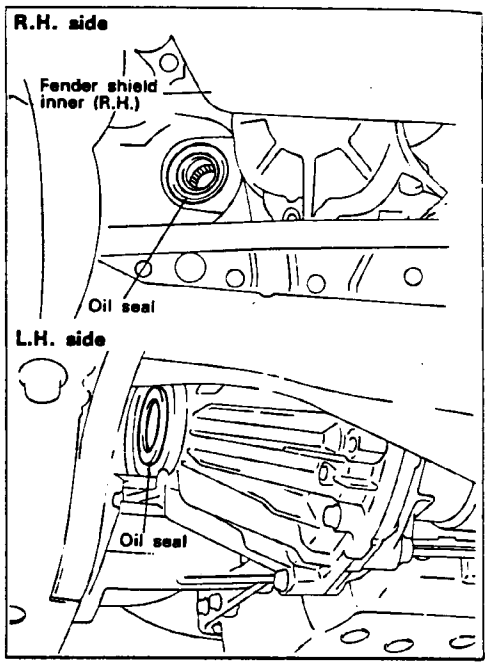
ADJUSTMENT OF THROTTLE-POSITION SENSOR (TPS)

Refer to GROUP 31—FUEL SYSTEM

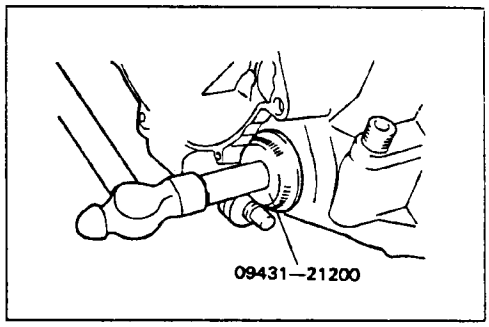


REPLACEMENT OF DRIVESHAFT OIL SEALS

1. Disconnect the drive shaft from the transaxle. (Refer to GROUP 49—DRIVE SHAFT & FRONT AXLE)
2. Using a flat-tip screwdriver, remove the oil seal.

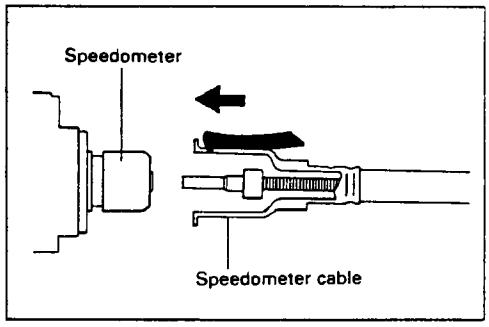


3. Using the special tool (09431—21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of the automatic transaxle fluid to the lip of the oil seal.



REPLACEMENT OF SPEEDOMETER CABLE

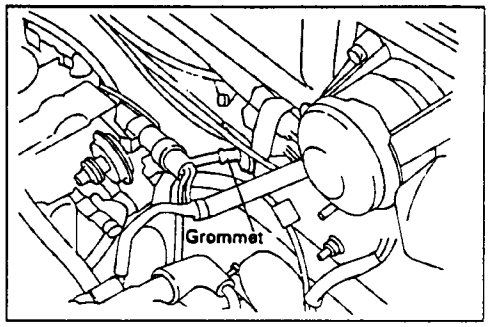
1. Replace the cable assembly if there is a malfunction.
2. When connecting the cable to the gauge, insert the cable until its stopper properly fits to the gauge side groove.



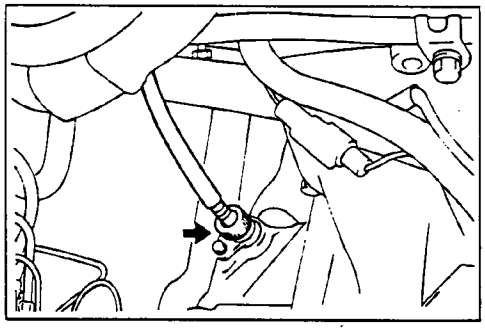
3. Install the grommet so that, the cable attachment part and the projecting part are horizontal.

CAUTION

The cable arrangement should be made so that the radius of the cable bends is 150 mm (5.9 in.) or more.



4. At the transaxle end of the speedometer cable, the key joint should be inserted into the transaxle, and the nut should be securely tightened.



NOTE
If the cable is not correctly and securely connected, it may cause incorrect indication by the speedometer, or abnormal noise. Be sure to connect it correctly.

ACCELERATOR SWITCH CHECK AND ADJUSTMENT

1. After warming up the engine, confirm that the accelerator switch is on with the accelerator pedal in the free state.

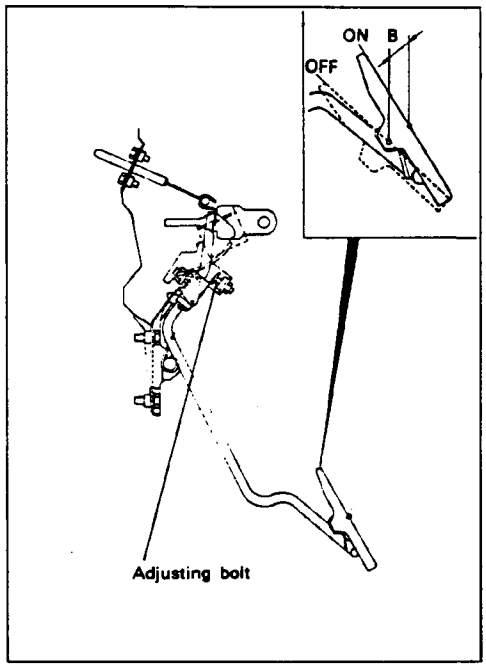
NOTE
Check that the accelerator switch is on or off by checking the voltage between the G wire and the ground wire at the accelerator switch connector (2-pin).

When the accelerator switch is ON: 0V
When the accelerator switch is OFF: 12V

2. Measure stroke B, shown in the illustration of the accelerator pedal, at the point when the accelerator switch goes from ON to OFF when the pedal is depressed.

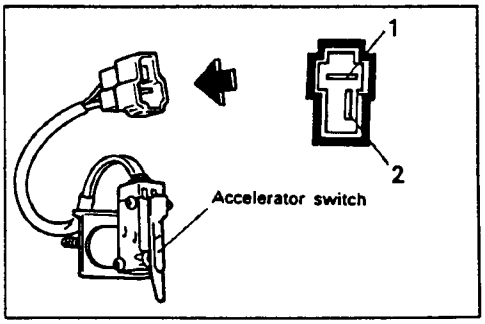
Standard value: 4—8 mm (0.16—0.31 in.)

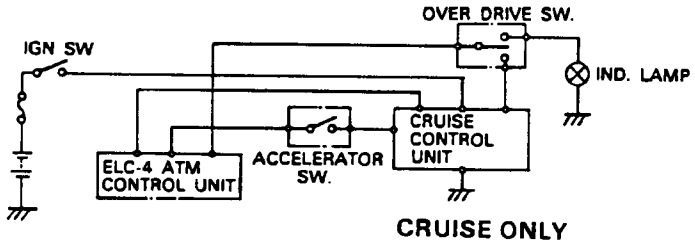
3. If the figured stroke B deviates from the standard value, adjust it by the adjusting bolt.



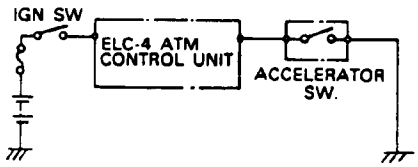
O—O : Continuity

Terminal / Position	1	2
OFF (FREE)		
ON (PUSH)	O———	———O





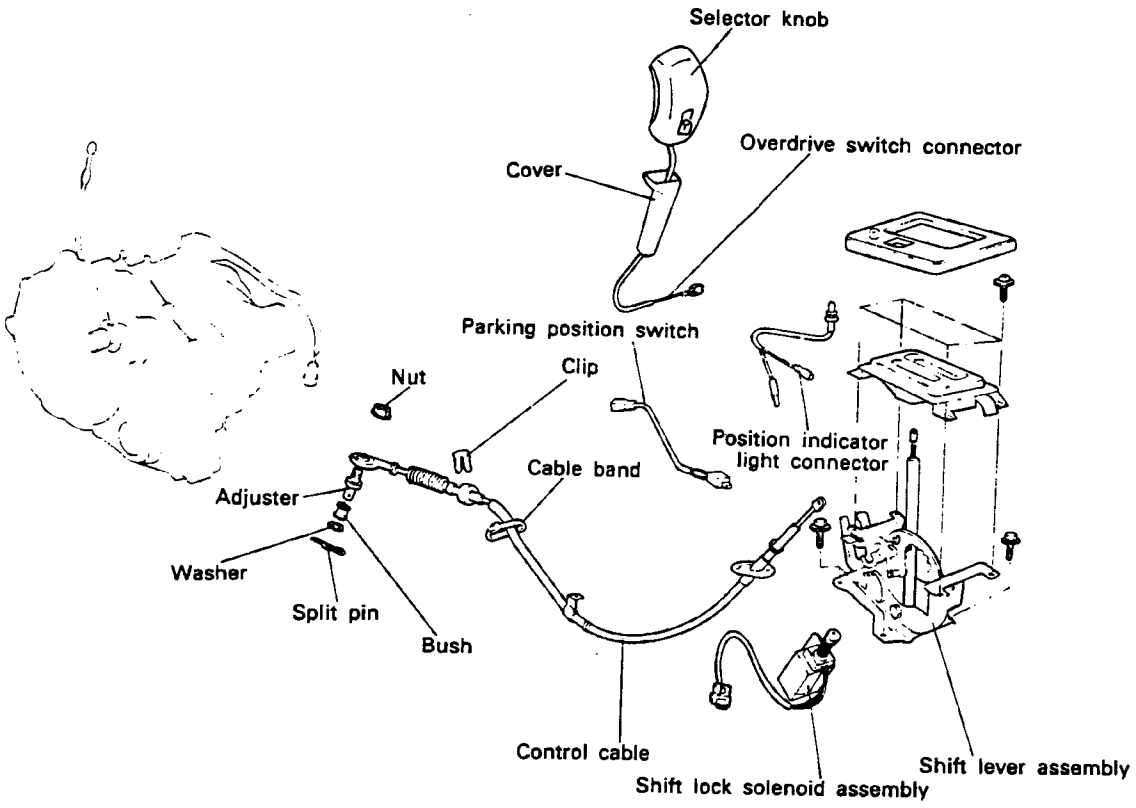
CRUISE ONLY



EXCEPT CRUISE

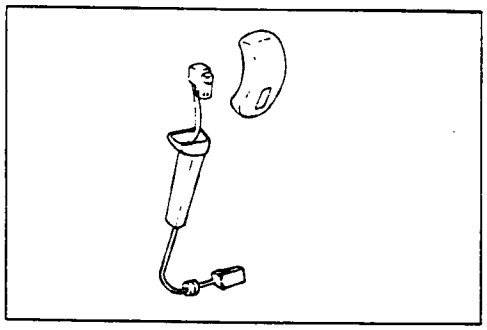
TRANSAXLE CONTROL

COMPONENTS

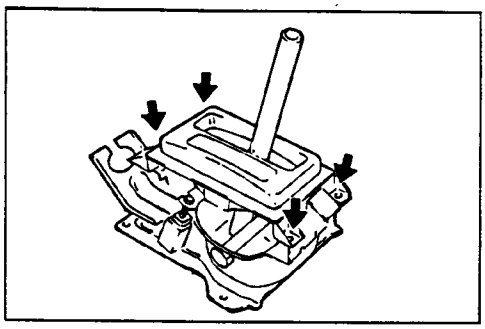


REMOVAL

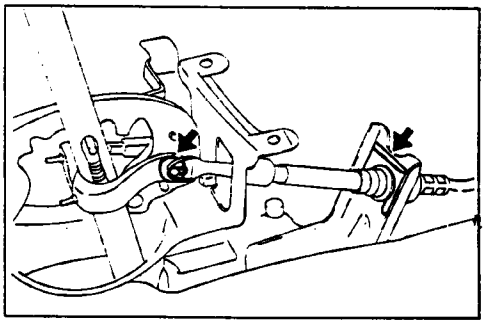
1. Remove the consol box assembly. (Refer to BODY GROUP).
2. After pushing down the cover, remove the screw, knob and overdrive switch connector.



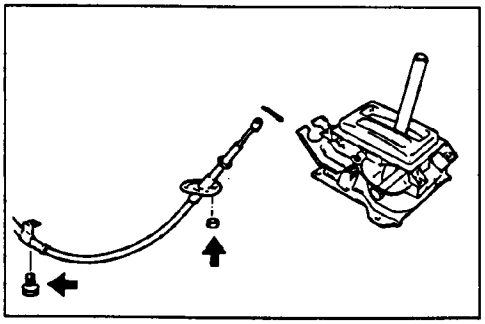
3. Remove the indicator assembly.
4. Disconnect the position indicator light connector.



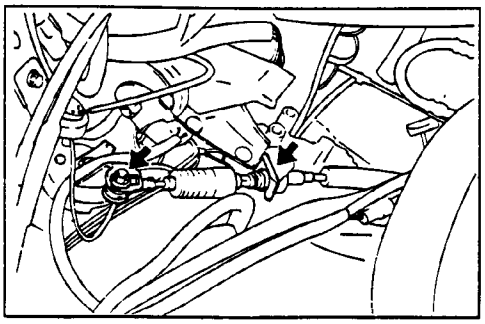
5. Remove the cotter pin, clevis pin and washer.
   And remove, the parking position switch connector and the shift lock solenoid connector.
6. Remove the shift lever mounting bolts.
7. Remove the shift lever assembly.



8. Remove the cable mounting bolts.

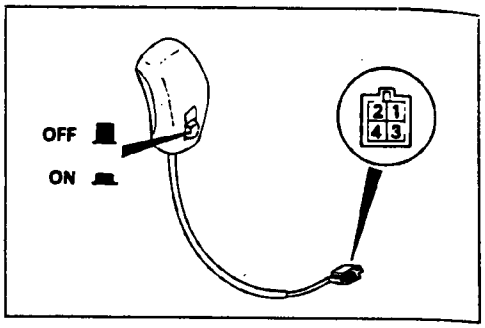


9. Remove the cotter pin, plain washer and bushing.
10. Remove the clip.
11. Remove the transaxle control cable.



INSPECTION

1. Check the control cable for proper operation and damage.
2. Check the bushing for wear or damage.
3. Check the spring for damage or deterioration.
4. Check the overdrive switch for continuity.



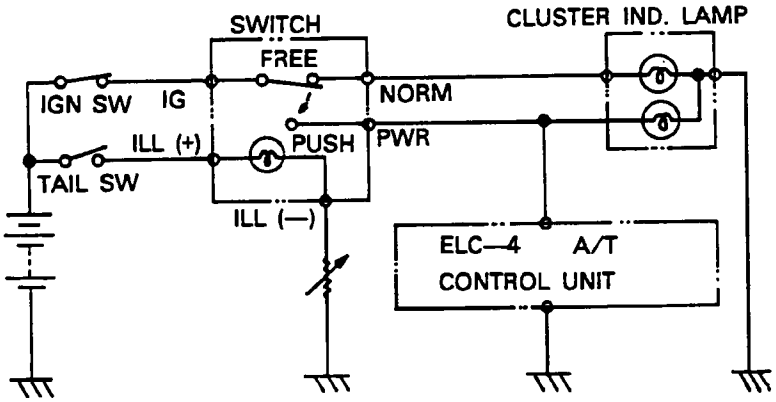
O—O : Continuity

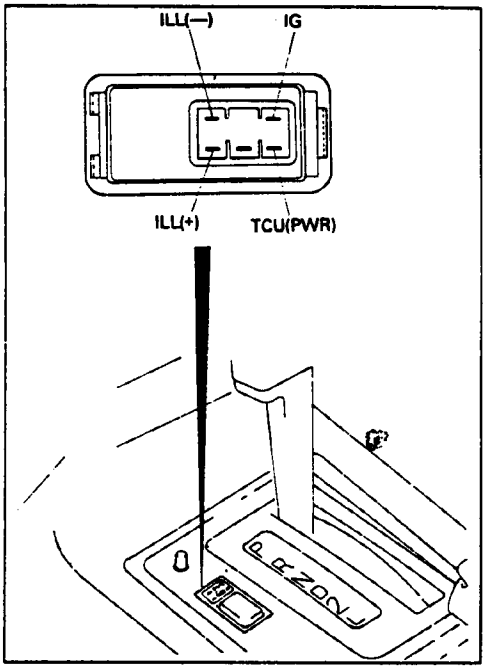
Switch position \ Terminal	1	2	3
Overdrive activation		O—O	
Overdrive non-activation	O—O		

5. Check the P/N switch for continuity.

O—O : Continuity

Position \ Terminal	NORM	IG	PWR	ILL(+)	ILL(—)
NORM (Free)	O—O			O—⊗—O	
PWR (Push)		O—O		O—⊗—O	



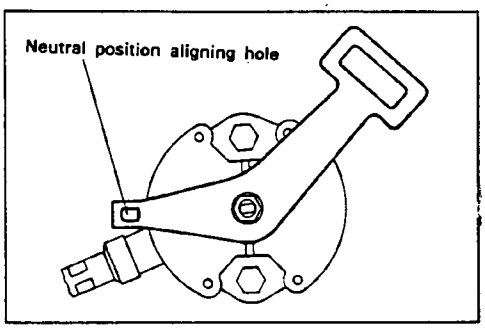


INSTALLATION

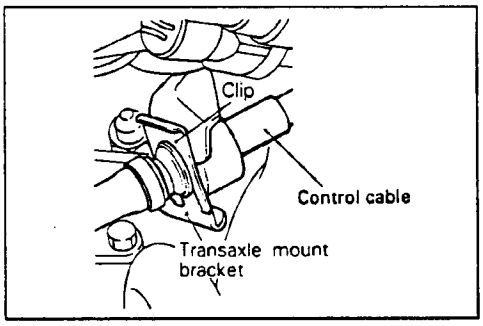
1. Apply a coating of the specified grease to the interior of the adjust bushing.

   Specified grease : Chassis grease SAE J310, NLGI No.0

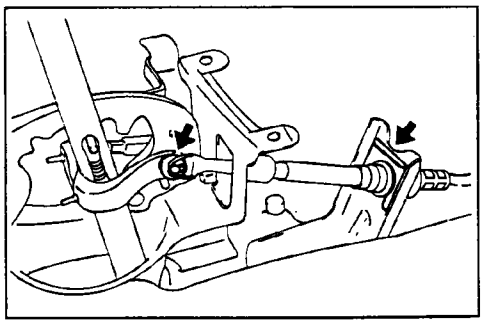
2. Move the shift lever and the inhibitor switch to the "N" position, and install the transaxle control cable.



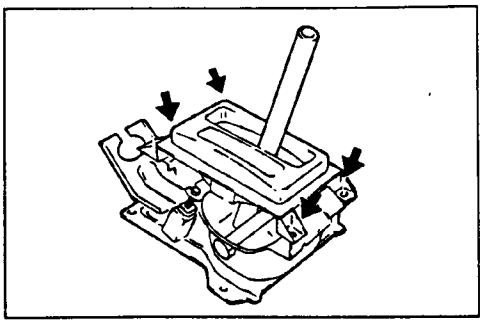
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable, in the position shown in the illustration.
4. When connecting the control cable to the shift lever mounting bracket, install the clip until it contacts the control cable.
5. Install the cable mounting bolts.



6. Install the cotter pin, clevis pin and washer.

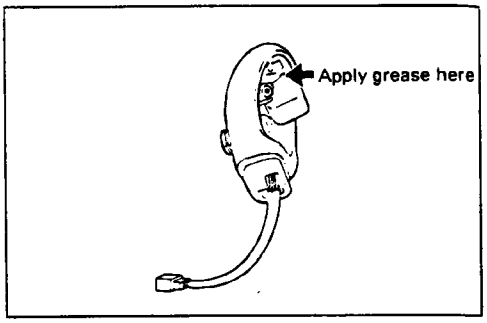


7. Connect the position indicator light connector, the overdrive switch connector, the parking position switch connector, and the shift lock solenoid connector.
8. Install the indicator assembly.



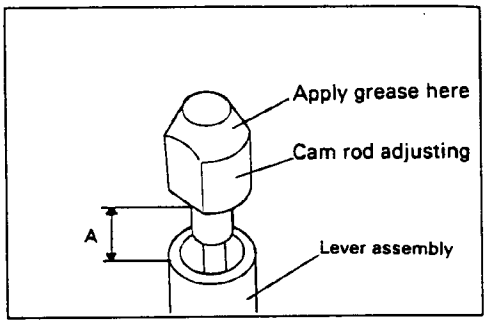
9. Apply the specified grease at the places shown in the figure.

   Specified grease : Multipurpose grease SAE J310 NLGI No.2



10. Place the shift lever in the "N" position, and then turn the cam rod adjusting so that the clearance between the cam rod adjusting and the lever assembly end is within the standard value.

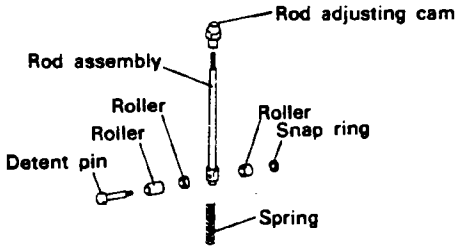
    Standard value (A) : 15.2—15.9 mm (0.598—0.625 in.)

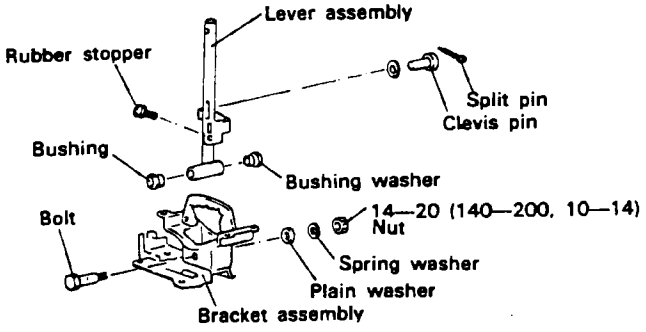


11. Install the selector knob.
12. Install the consol box. (Refer to BODY GROUP).

SHIFT LEVER ASSEMBLY

COMPONENTS





TORQUE : Nm (kg.cm, lb.ft)

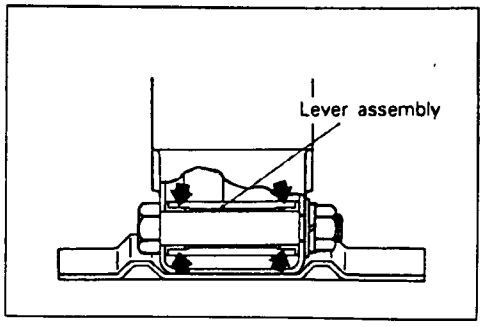
INSPECTION

- Check the detent place for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.
- Check the pin at the end of the rod assembly for wear.

ASSEMBLY

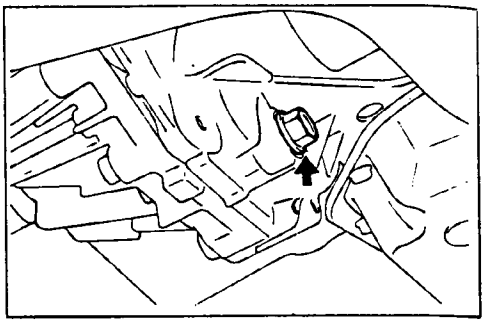
1. Apply a coating of grease to the sliding part of the bushing.

   Specified grease : Chassis grease SAE J310, NLGI No.0



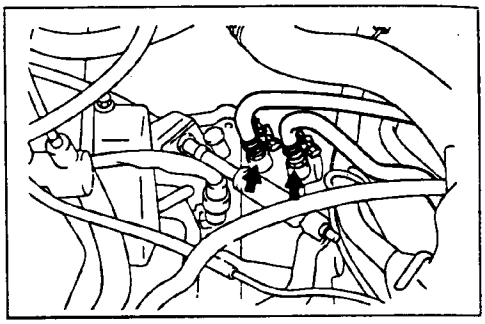
REMOVAL

1. Remove the drain plug and drain the transaxle fluid.
2. Remove the air cleaner assembly and battery.

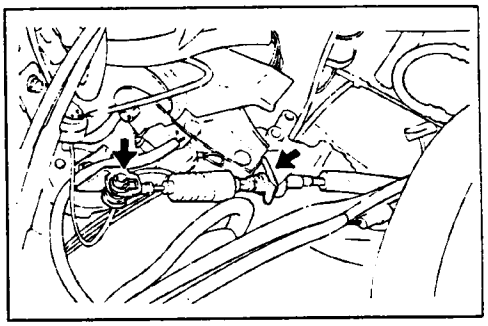


3. Loosen the mounting clamps and disconnect the return and feed hoses.

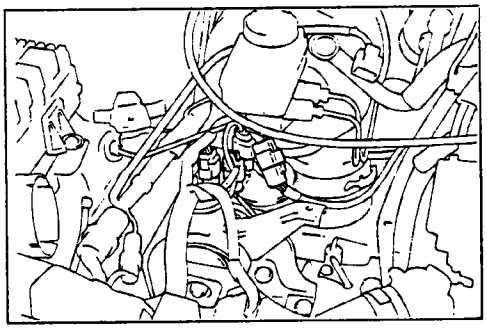
   NOTE
   To prevent entry of dust and foreign matter, plug the disconnected hoses and the transaxle fittings.



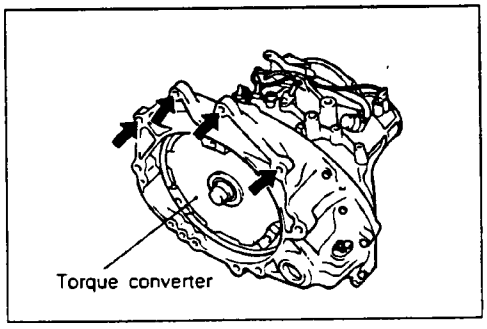
4. Remove the control cable.
5. Remove the speedometer cable.



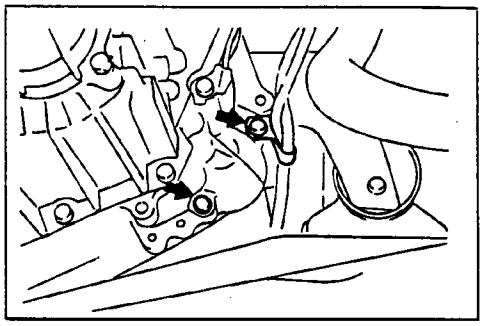
6. Disconnect the pulse generator connector, inhibitor switch connector, kickdown servo switch connector, solenoid connector, and oil temperature sensor connector.



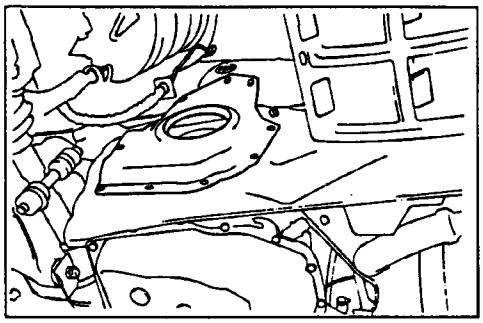
7. Remove the transaxle mounting bolts (4EA).



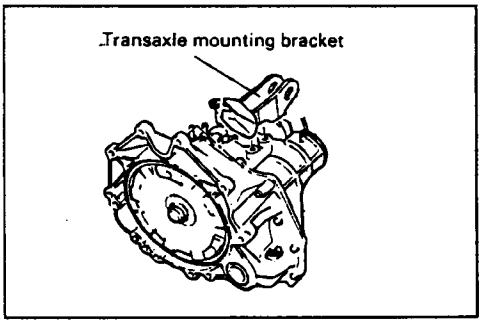
8. Remove the starter motor. (Refer to ENGINE ELECTRICAL SYSTEM GROUP)



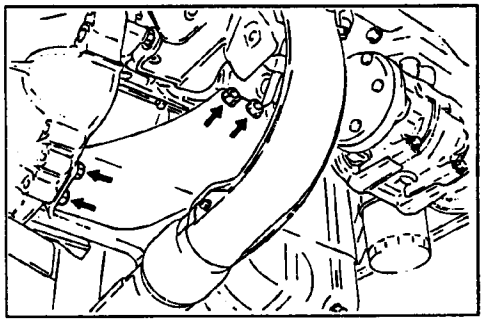
9. Remove the under cover panel, tie rod end, lower arm ball joint drive shaft, bearing bracket.
(Refer to the DRIVE SHAFT AND FRONT AXLE GROUP)



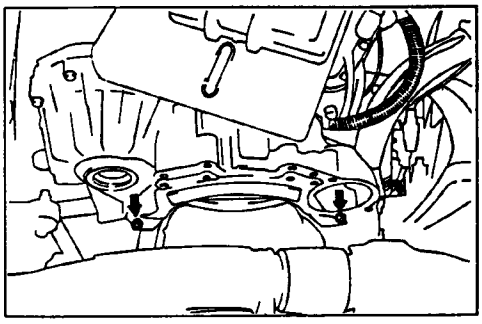
10. Remove the transaxle mounting bracket.



11. Remove the transaxle stay.

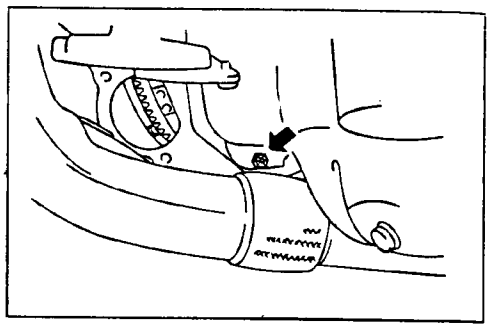


12. Remove the bell housing cover.



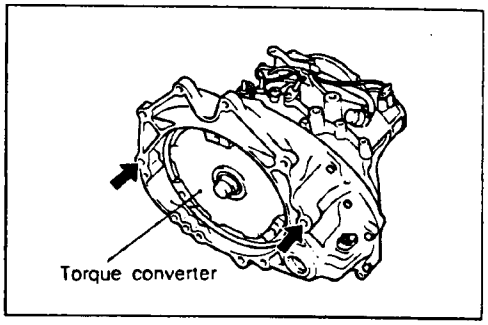
13. To prevent the torque converter from remaining on the engine side, remove the special bolts and press the torque converter to the transaxle side.

    NOTE
    Bring the transaxle into the N (Neutral) position and remove the special bolts by turning the crankshaft.



14. Remove the transaxle mounting bolts (2EA) and then remove the transaxle assembly.

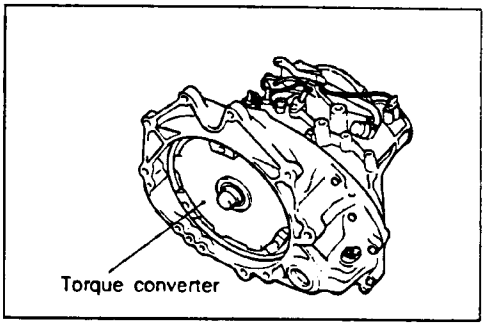
    NOTE
    When supporting the transaxle assembly with the jack, position the jack on a wide area to prevent damage to the transaxle.



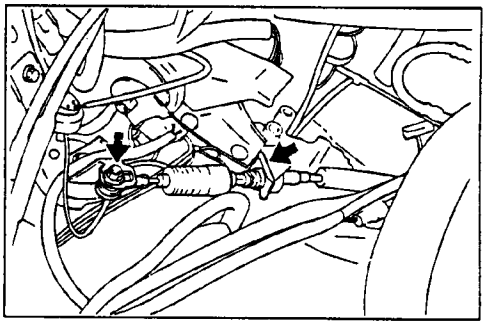
INSTALLATION

1. Attach the torque converter on the transaxle side and mount the transaxle assembly on the engine.

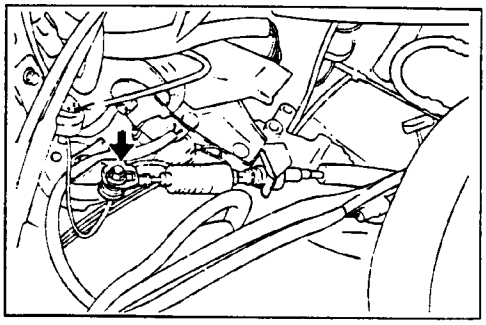
    CAUTION
    If the torque converter is mounted on the engine, first the oil seal on the transaxle side may be damaged. Therefore, be sure to assemble the torque converter on the transaxle side first.



2. Install the transaxle control cable and adjust as follows.
    1) Move the shift lever and the inhibitor switch to the "N" position, and install the control cable.
    2) When connecting the control cable to the transaxle mount bracket, install the clip until it contacts the control cable, in the position shown in the figure.



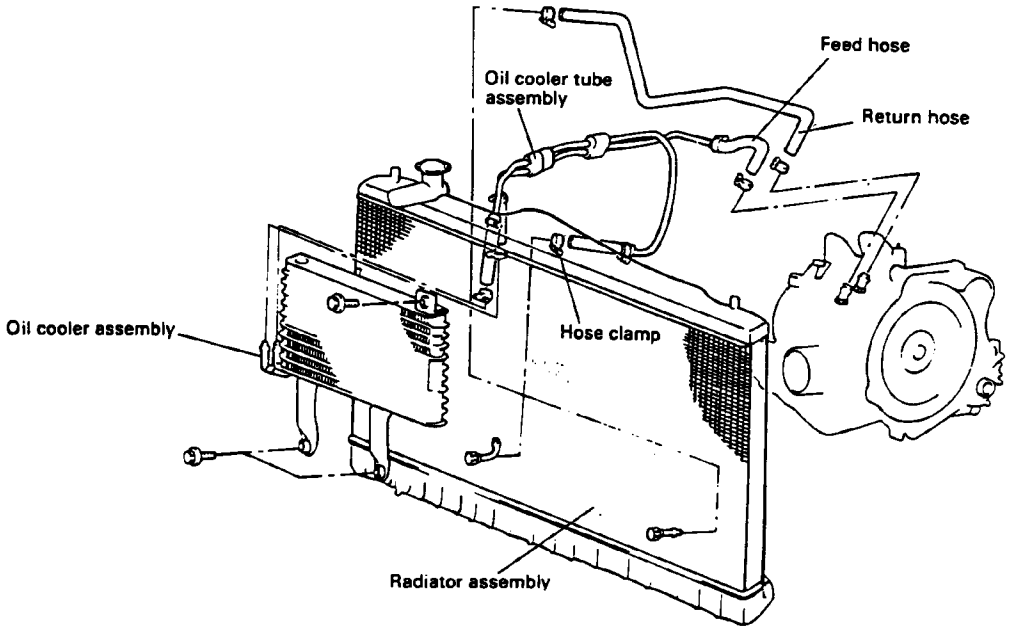
    3) Apply a coating of the specified grease to the interior of the bushing.
    4) Remove the slack from the control cable by adjusting the nut and then check that the selector lever moves smoothly.
    Check that the control cable has been adjusted correctly.



3. Installation of the other parts is the opposite of removal.

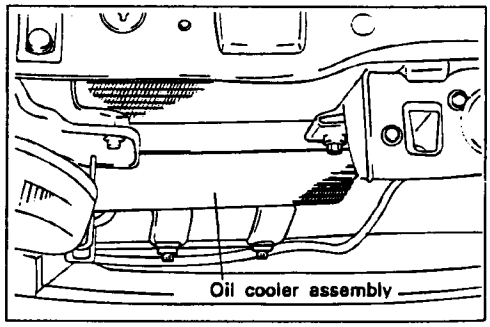
AUTOMATIC TRANSAXLE OIL COOLER ASSEMBLY

COMPONENTS



REMOVAL AND INSTALLATION

1. Remove the battery and air cleaner assembly.
2. Remove the turn signal light assembly, headlight assembly (RH), radiator grill and radiator reservoir tank.
3. Disconnect the transaxle oil cooler hoses from the automatic transaxle.
4. Loosen the hose clamps and then remove the automatic oil cooler assembly.



CAUTION

Plug the ends of the oil cooler hoses and the automatic transaxle port to prevent the transaxle fluid from spilling out and foreign material from getting in.

Plug the nipple at the automatic transaxle in order to prevent entrance of foreign material into the automatic transaxle.

NOTE

When removing each part, avoid spilling the transaxle fluid.

5. Installation is the opposite of removal.

AUTOMATIC TRANSAXLE ASSEMBLY

DISASSEMBLY

CAUTION

Because the automatic transaxle is composed of precision parts should be handled very carefully during disassembly and assembly so as not to scar or scratch them.

A rubber mat should be placed on the workbench, and it should always be kept clean.

During disassembly, cloth gloves or rags should not be used. If such items must be used, use articles made of nylon, or use paper towels.

All disassembled parts must be thoroughly cleaned. Metal parts may be cleaned with ordinary detergents, but must be thoroughly air dried.

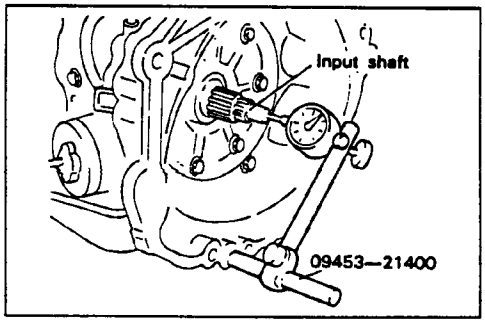
Clean the clutch disc, resin thrust plate and rubber parts by using ATF (automatic transaxle fluid), being careful that dust, dirt, etc. does not adhere.

If the transaxle unit is damaged, also disassemble and clean the cooling system.

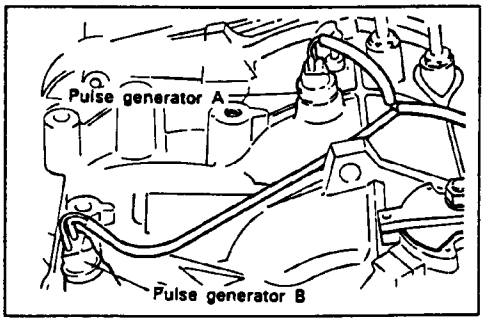
1. Clean away any sand, mud, etc. around the transaxle housing.
2. Place the transaxle assembly on the workbench with the oil pan down.
3. Remove the torque converter.
4. Measuring the input shaft end play before disassembly will usually indicate when a thrust washer change is required (except when major parts are replaced). Thrust washers are located between the reaction shaft support and rear clutch retainer, and between reaction shaft support and front clutch retainer.

   Mount a dial indicator to the converter housing with the Dial Indicator Support. Make sure that the indicator plunger is seated against the end of the input shaft.

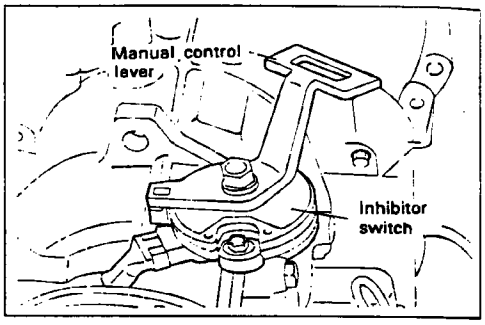
   When checking end play, pull or push on the input shaft with pliers. Be careful not to scratch the input shaft. Record the reading for reference when reassembling the transaxle.



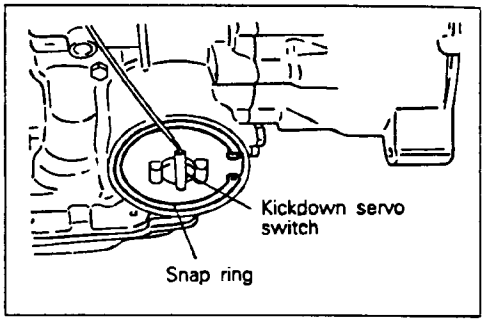
5. Remove pulse generators "A" and "B".



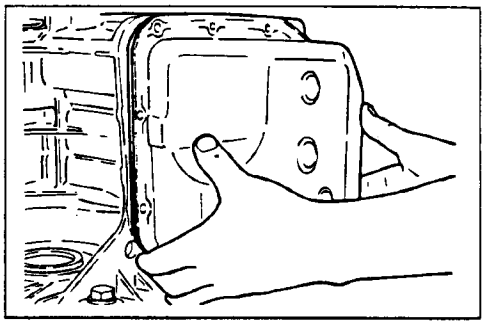
6. Remove the manual control lever, then remove the inhibitor switch.



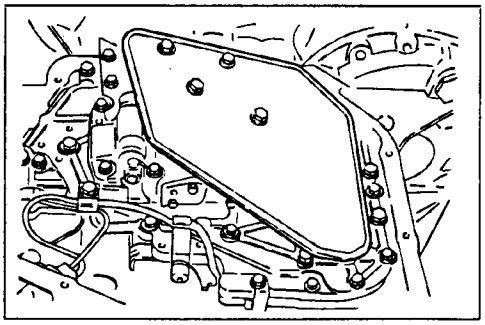
7. Remove the snap ring, then remove the kickdown servo switch.



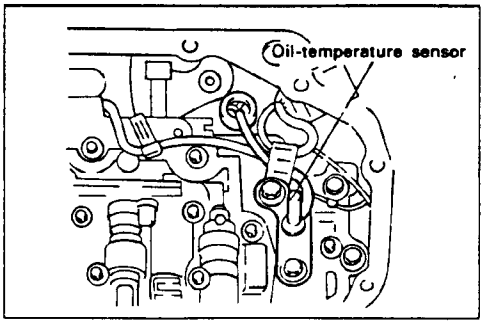
8. Remove the oil pan and gasket.



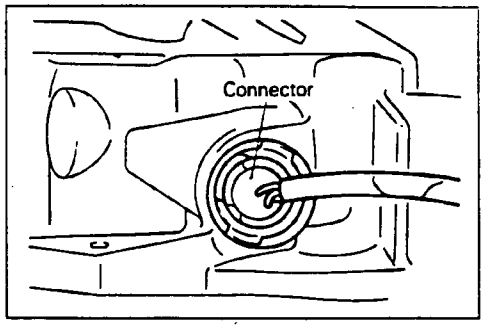
9. Remove the oil filter from the valve body.



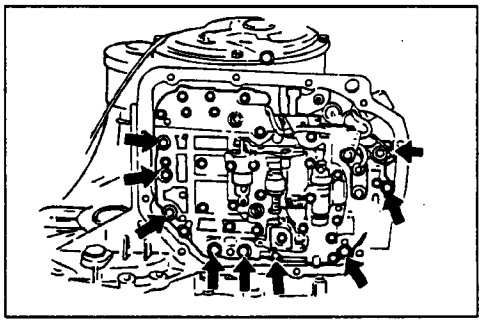
10. Remove the oil-temperature sensor installation bolt; then, after removal from the bracket, pull out from the connector side.



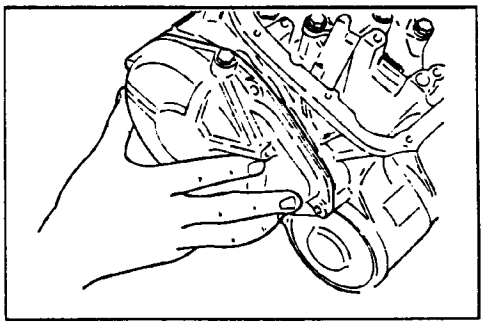
11. Press the tabs of the solenoid valve harness grommet, and then push it into the case and remove.



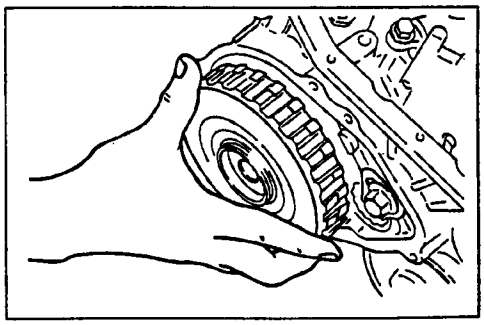
12. Remove the bolts and then remove the valve body.



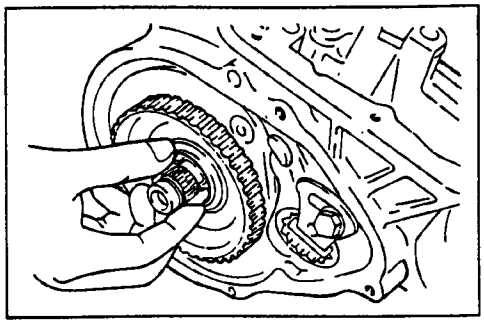
13. Remove the end clutch cover mounting bolt, the cover holder and the end clutch cover.



14. Remove the end clutch assembly.

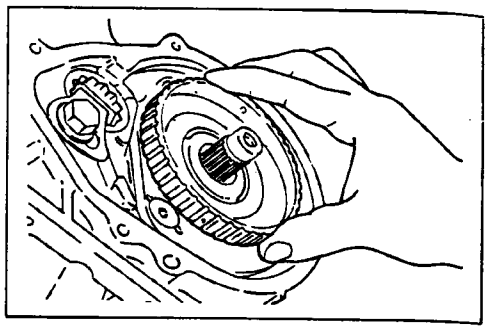


15. Remove the thrust plate.

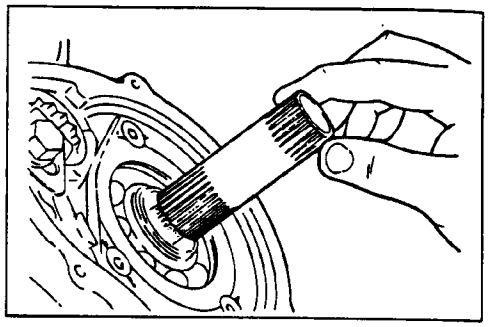


16. Remove the end clutch hub.
17. Remove the thrust bearing.

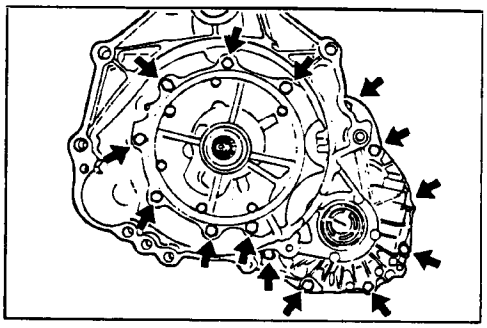
NOTE
The thrust bearing may be stuck to the end clutch hub.



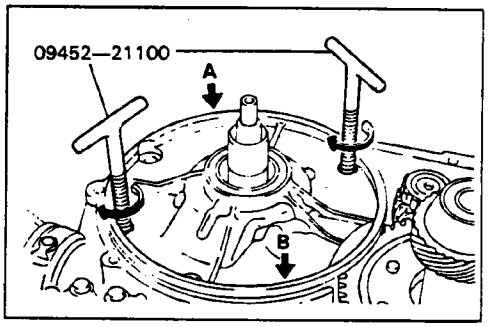
18. Pull out the end clutch shaft.



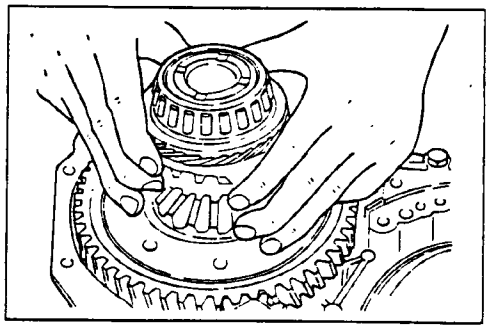
19. Remove the 14 converter housing bolts and remove the converter housing.



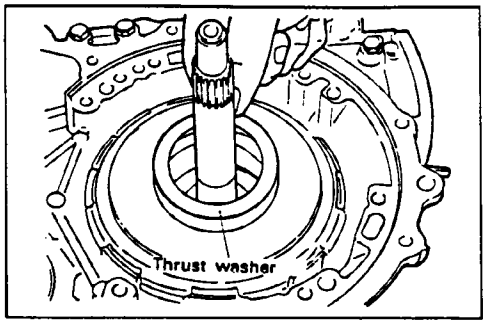
20. Remove the 6 oil pump assembly bolts and remove the assembly with special tool (09452—21100).Screw special tool into two oil pump removing holes in oil pump housing. Turn both removers simultaneously and uniformly to remove oil pump assembly.
    Oil pump may sometimes tilt to A side because straight line connecting oil pump removing holes does not pass center of pump. If this is the case, tap oil pump lightly on B side or tilt removers to B side as pump is removed.



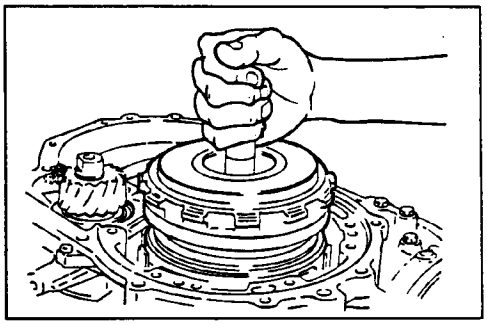
21. Remove the differential assembly.



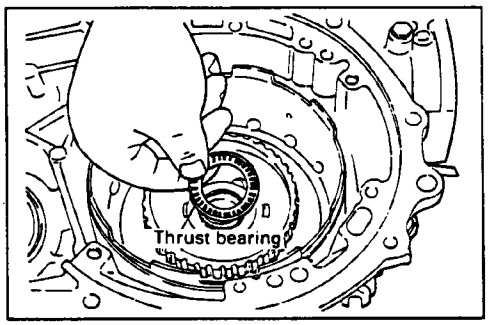
22. Remove the fiber thrust washer.



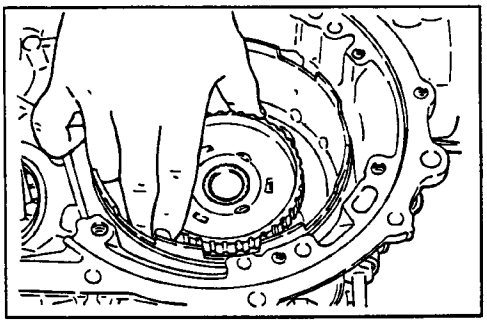
23. Pull the input shaft upward, and then remove the front and rear clutch together.



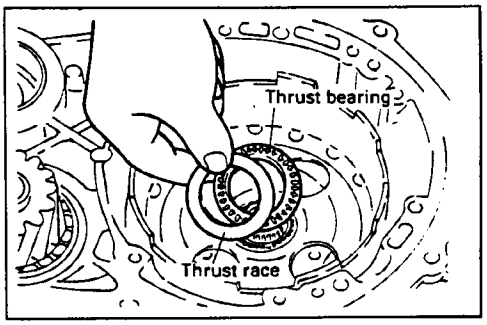
24. Remove the thrust bearing.



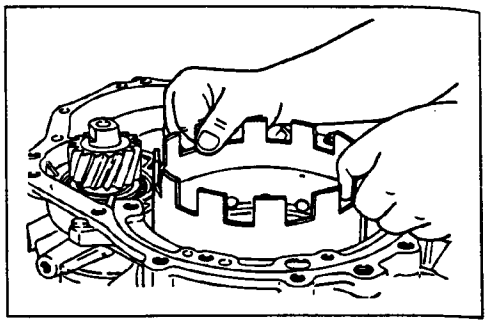
25. Remove the clutch hub.



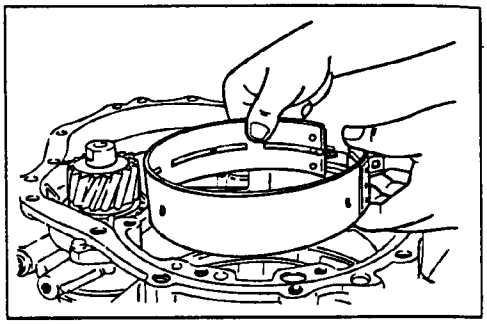
26. Remove the thrust race and bearing.



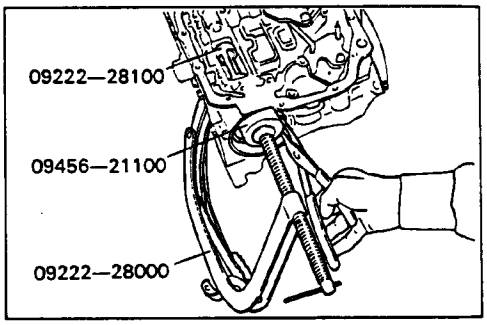
27. Remove the kickdown drum.



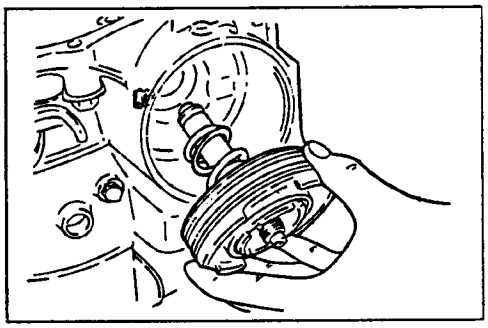
28. Remove the kickdown band.



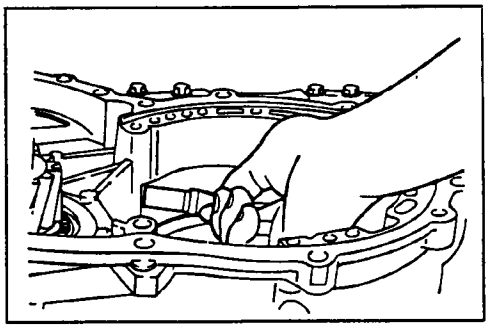
29. Using the special tools (09222—28000, 09222—28100, 09456—21100), push in the kickdown servo and remove the snap ring.



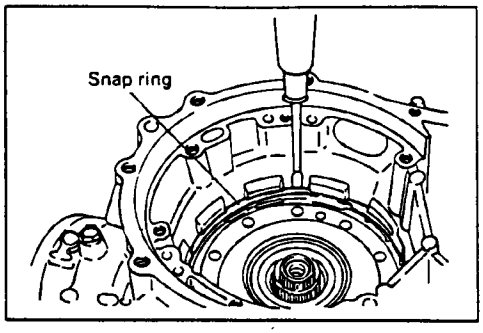
30. Remove the kickdown servo piston and spring.



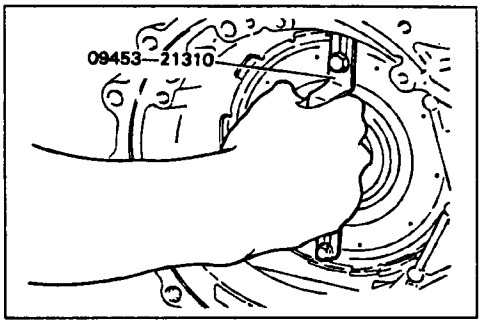
31. Remove the anchor rod.



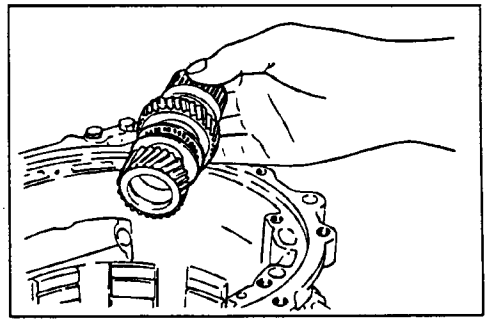
32. Remove the snap ring.



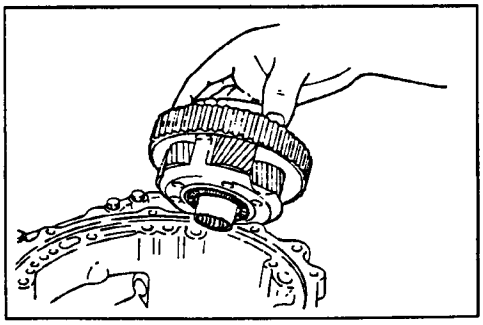
33. Attach special tool (09453—21310) to the center support. Holding the handle of the tool, pull the center support straight upward.



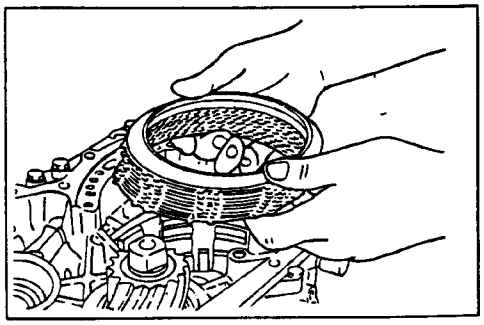
34. Remove the reverse sun gear and forward sun gear together.



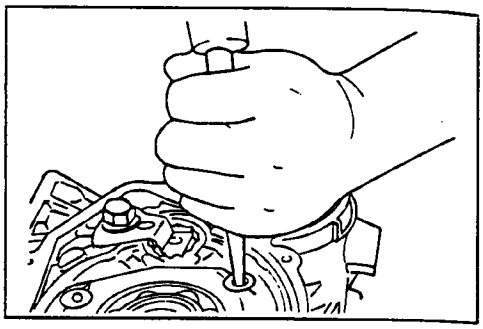
35. Remove the planet carrier assembly.



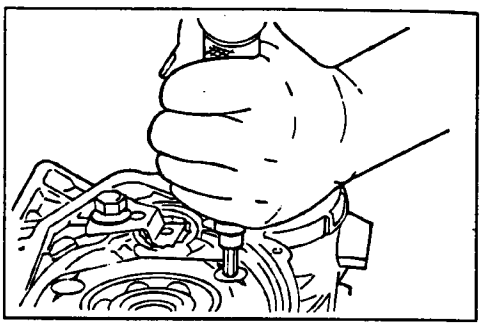
36. Remove the wave spring, return spring, reaction plate, brake disc, and brake plate.



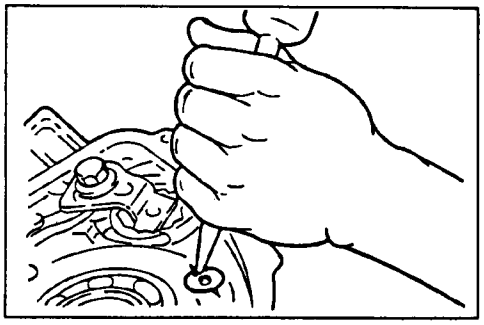
37. Since thread locking compound is applied to the bolt threads, tap the bolt head for easier removal.



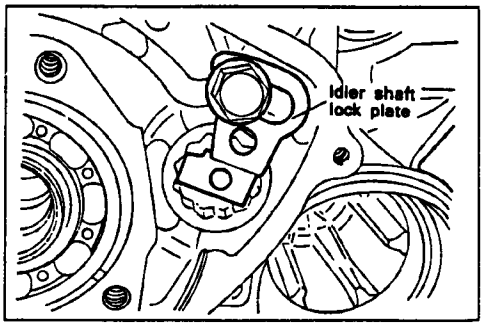
38. Using an impact driver, loosen the bolt.



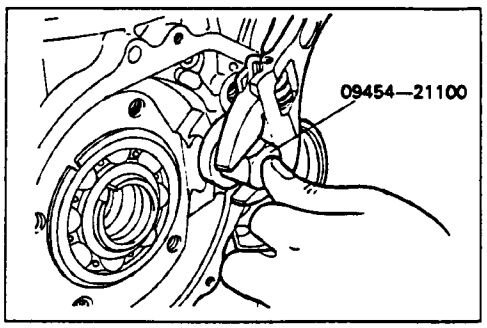
If an impact driver is not available, use a punch or something similar.



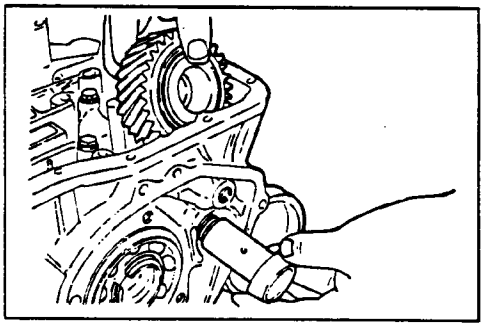
39. Remove idler shaft lock plate.



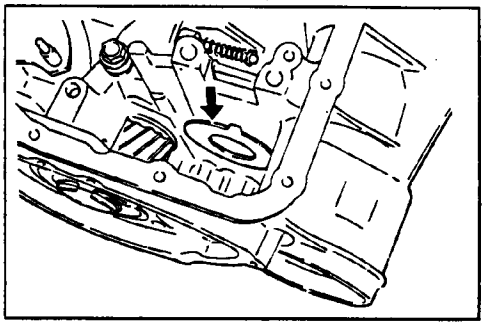
40. Loosen the transfer idler shaft with special tool (09454—21100).



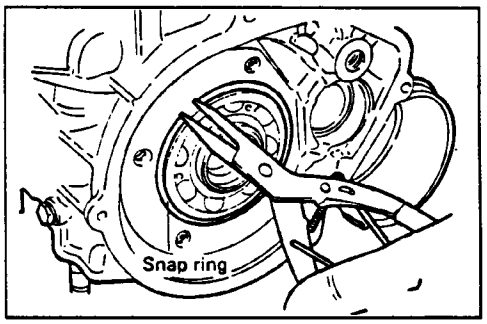
41. Pull out the transfer idler shaft. Remove the transfer idler gear bearing inner races (2 pieces) from inside of case.



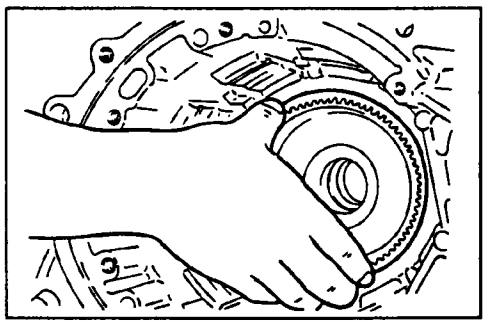
42. Remove the spacer.



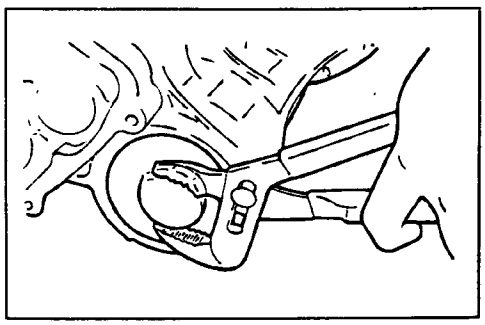
43. Remove the snap ring from the bearing.



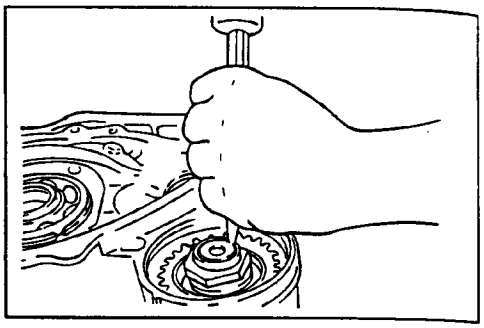
44. Remove the internal gear, output flange, transfer drive gear and bearing as an assembly from the case.



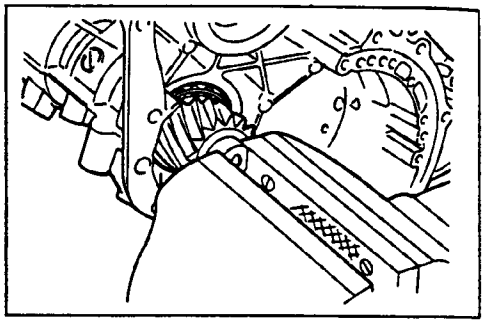
45. Remove the transfer shaft cover.



46. Secure the transfer shaft lock nut rotation stopper up.

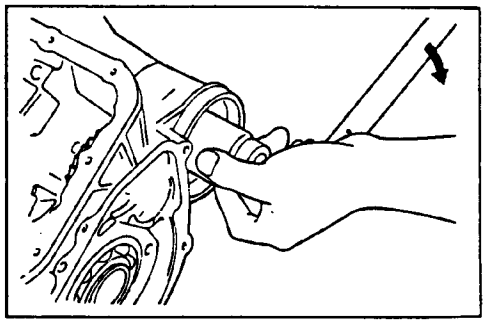


47. Secure the transfer shaft converter housing side.

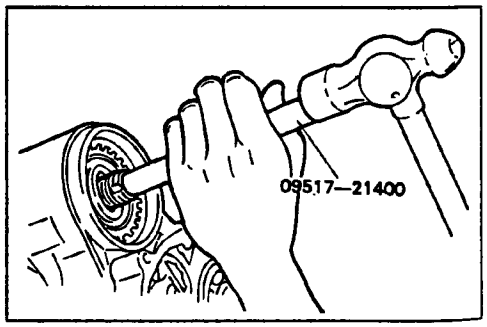


48. Remove the locking nut.

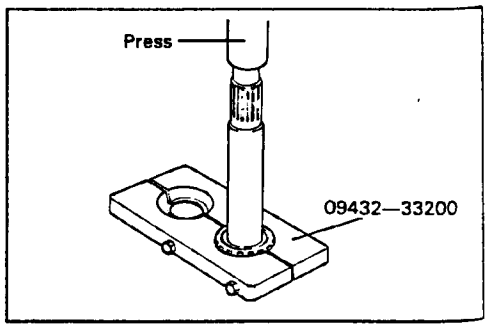
    NOTE
    The lock nut has left-hand threads.



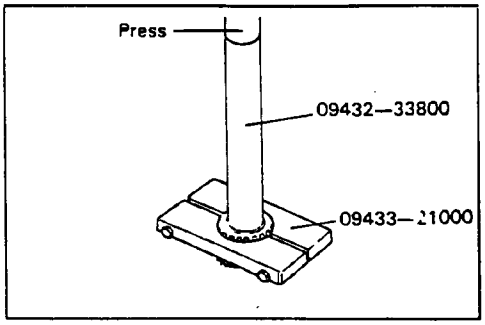
49. Using the special tool (09517—21400) knock out the transfer shaft towards the converter housing side.



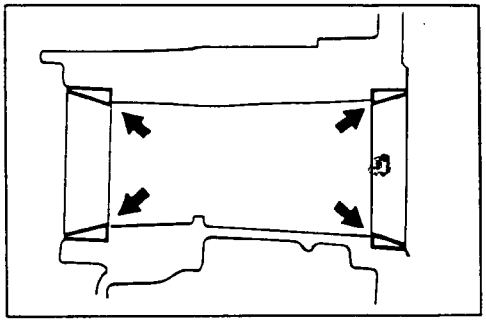
50. Using the special tool (09432—33200), pull the bearing from the transfer shaft.



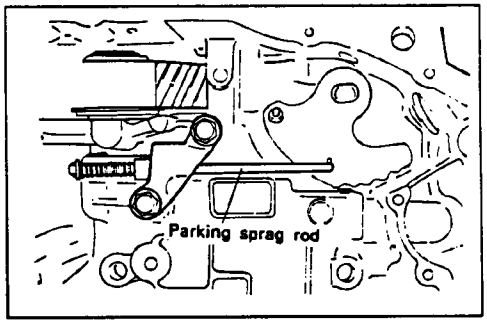
51. Using the special tools (09432—33800, 09433—21000), pull the bearing from the transfer driven gear.



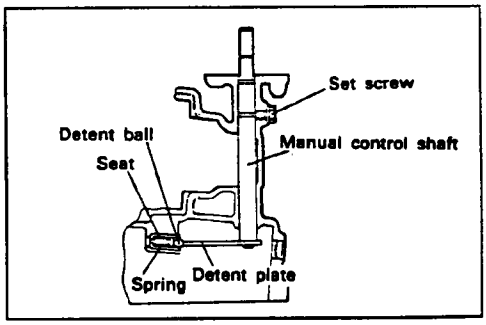
52. Using the special tool (09517—21400), remove the transfer shaft bearing outer race.



53. Remove two bolts and parking sprag rod.



54. Remove the set screw and the manual control shaft assembly. Remove the steel ball, seat and spring together.



REASSEMBLY

CAUTION

Do not reuse gaskets, oil seals and rubber parts. Replace them with new ones at every reassembly. O-ring of oil level dipstick need not be replaced.

Do not use grease other than petrolatum or industrial vaseline.

Apply automatic transaxle fluid to friction element, rotating parts, and sliding parts before installation. Refer to page 45A-4 concerning type automatic transaxle fluid. New clutch disc should be immersed in automatic transaxle fluid for more than two hours before installation.

Do not apply sealer or adhesive to gaskets.

If bushings must be replaced, replace the entire assembly.

Do not use shop towels during disassembly and reassembly operation.

The fluid in the cooler should also be replaced.

1. Before assembly of the transaxle, measure the end play of the low-reverse brake, and select a pressure plate to be used so that the end play will be the standard value.
   1) Install the brake reaction plate, brake plate and brake disc into the transaxle case.

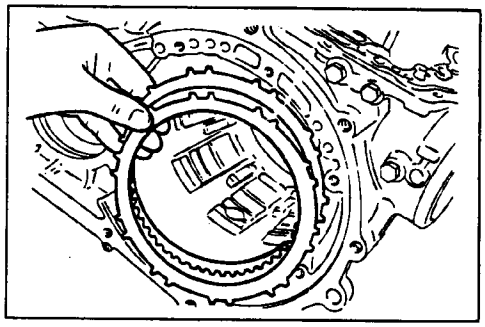
      CAUTION

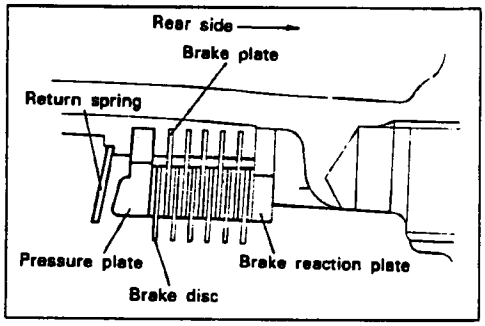
      If new brake discs are used, be sure to immerse them in ATF for two hours or longer.

   2) Install the appropriate pressure plate and return spring.

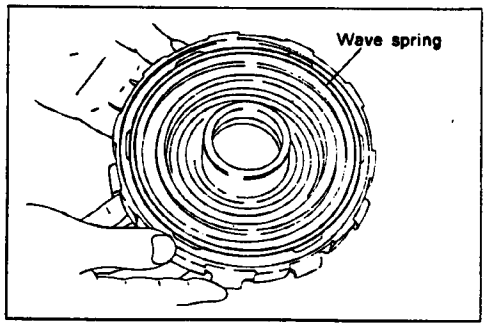
      CAUTION

      Be sure that the return spring is installed so that it faces in the correct direction.

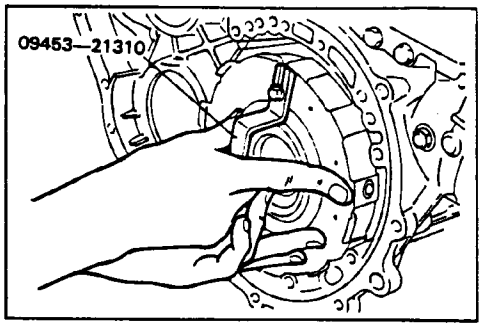




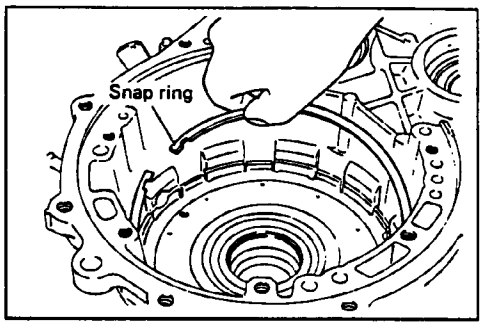
   3) Apply a coating of petroleum grease to the wave spring and attach it to the center support.



4) Install the special tool (09453—21310) to the center support.

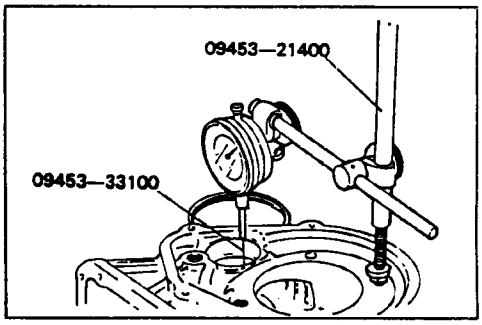


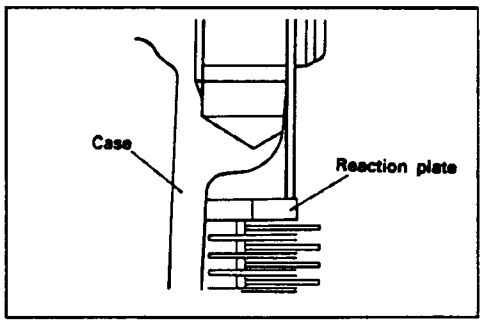
5) Install the snap ring.



6) Install the special tools (09453—21400, 09453—33100) and a dial indicator at the rear side of the transaxle case.

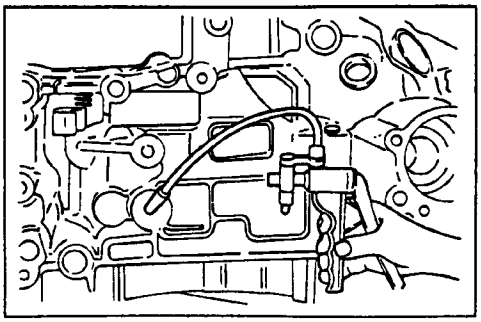
CAUTION
Install the dial indicator so that it contacts the brake reaction plate at a right angle from the transfer idler shaft hole.



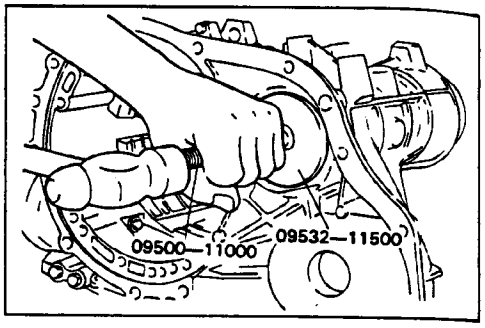


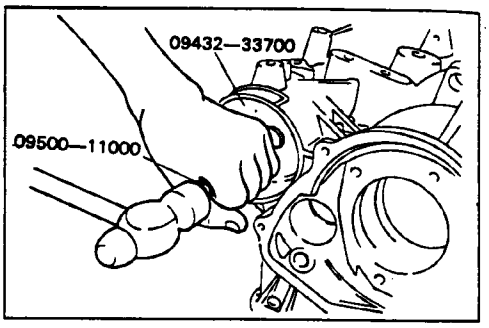
7) Using a manual pump, pump air in from the position shown in the illustration; then read the indication of the dial gauge, and select the pressure plate that will provide the standard value.

Standard value :
0.975—1.287 mm (0.039—0.050 in.)



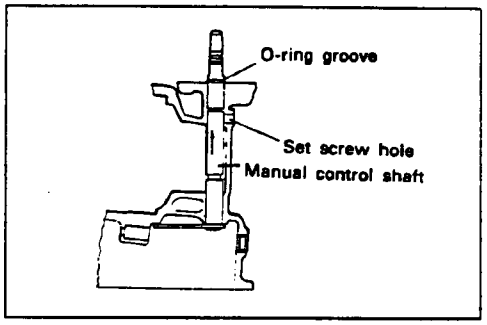
2. Using the special tools (09432—33700, 09500—11000, 09532—11500), tap in the bearing outer race.



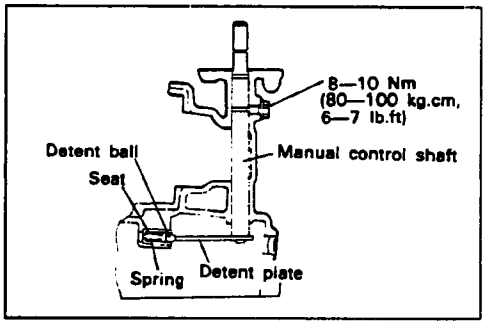


3. Insert the manual control shaft into the transaxle case and push it toward the manual control lever.
   At this time, do not install the O-ring (larger one of two O-rings) on manual control shaft.

   NOTE
   If installed before inserting the shaft, the O-ring will be damaged on the shaft set screw hole.

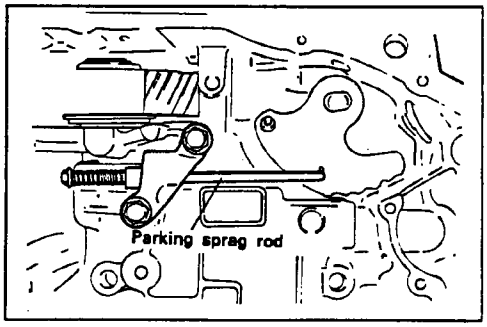


4. After installing the new O-ring on the manual control shaft, draw the shaft back into the case, then install the set screw and gasket. Also install the detent steel ball, seat and spring at the same time.

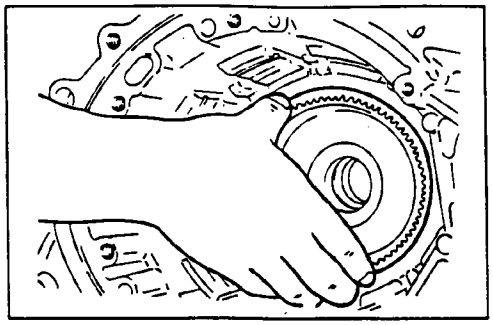


5. Install the parking sprag rod to the detent plate (manual control shaft).
   Install the sprag rod support and tighten the two bolts.

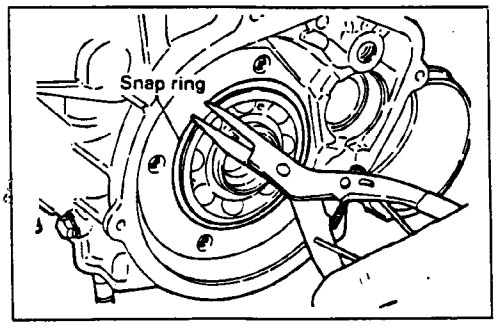
   Sprag rod support bolts :
   20—27 Nm (200—270 kg.cm, 15—19 lb.ft)



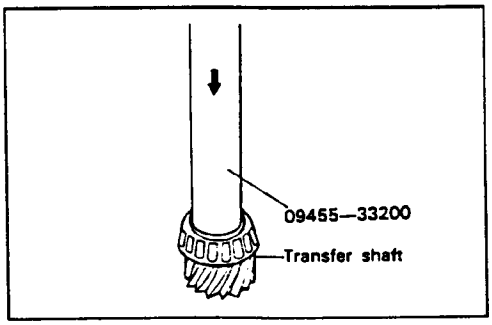
6. Insert the annular gear assembly, output flange, transfer drive gear and bearing into the case.



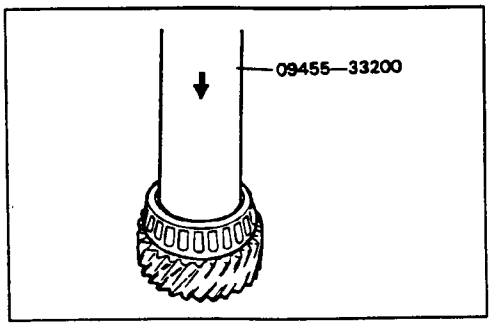
7. Install the snap ring on the output flange rear bearing.



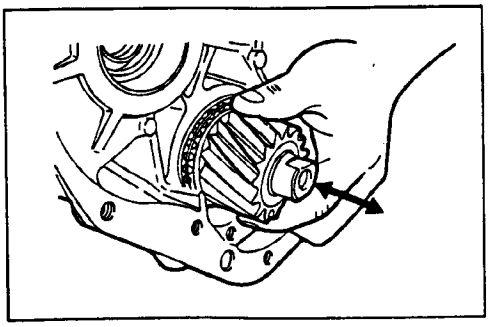
8. Press-fit the bearing inner race to the transfer driven gear and press-fit the bearing outer race to the transaxle end clutch side.



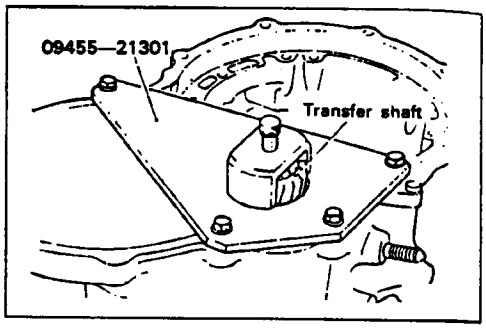
9. Using the special tool (09455—33200) press-fit the bearing inner race to the transfer shaft, and press-fit the bearing outer race to the transaxle case converter housing side.



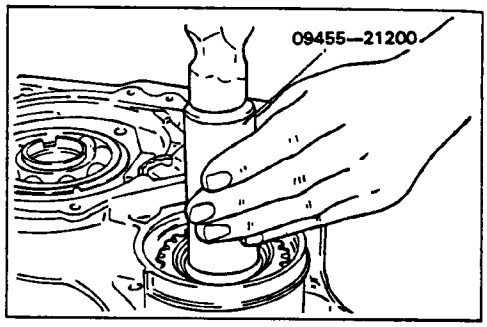
10. Attach the transfer shaft to the transaxle case.



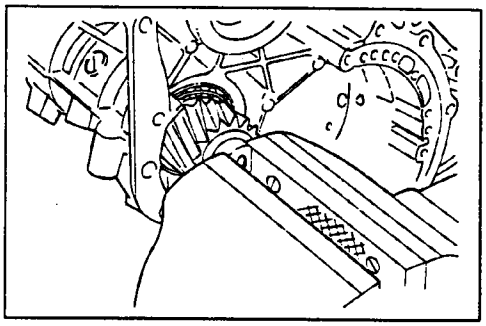
11. Install the special tool (09455—21301) to the transaxle case to support the transfer shaft.



12. Insert the thickest 1.80 mm (0.0709 in.) spacer.
13. Using special tool (09455—21200) attach the transfer driven gear.

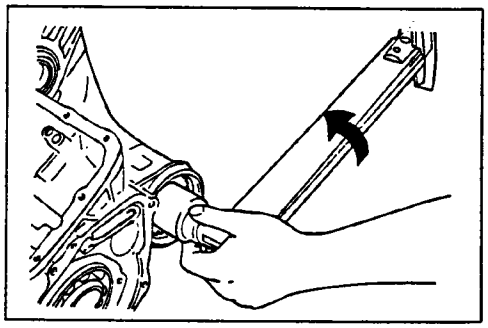


14. After removing the special tool, affix the converter housing side of the transfer shaft.



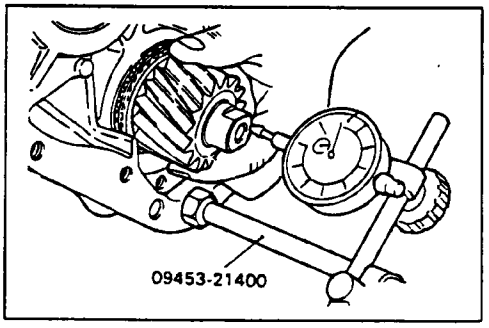
15. Tighten the lock nut to the specified torque.

Transfer lock nut :
200—230 Nm (2,000—2,300 kg.cm, 145—166 lb.ft)

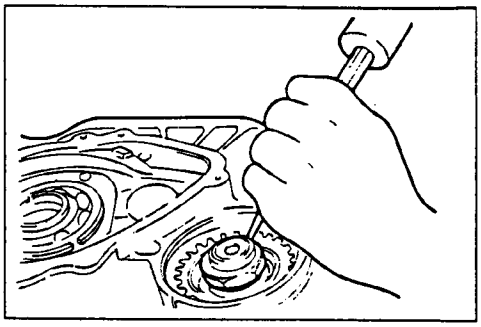


16. After installing the special tool, measure the end play of the transfer shaft, then select the spacer(s) needed the obtain the standard value, and refit.

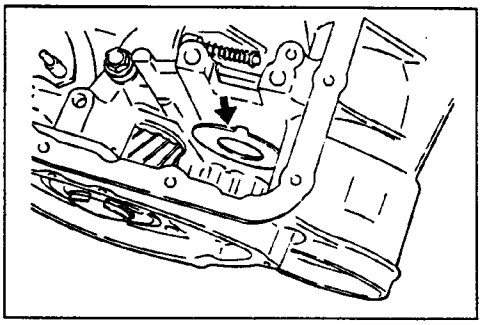
Transfer shaft end play : 0—0.025 mm (0—0.0010 in.)



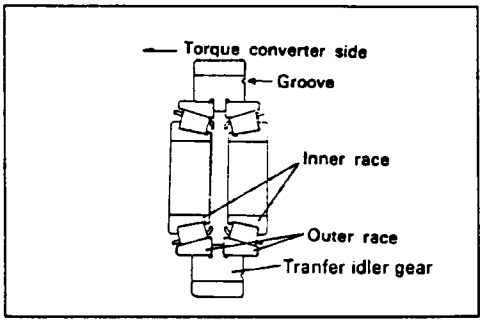
17. Using a punch, lock the lock nut to prevent rotation.
18. Attach the transfer cover.



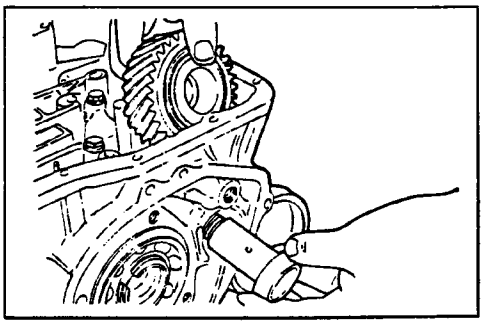
19. Coat petroleum jelly on the spacer and attach it to the transaxle case.



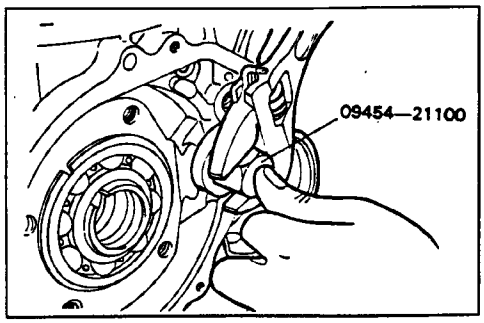
20. Install two taper roller bearings and spacer to transfer idler gear.



21. Place the transfer idler gear (assembled in the preceding section) into the case, and then insert the idler shaft from the outer side of the case and screw it in.

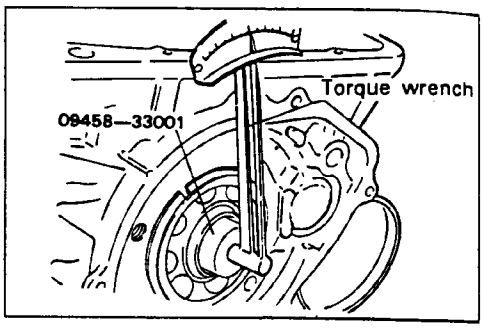


22. Tighten the idler shaft by using special tool (09454—21100).



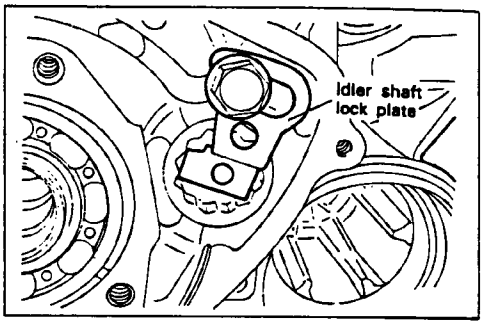
23. Insert special tool (09458—33001) into the output flange and measure the preload using a torque wrench.
Adjust the preload by tightening or loosening the transfer idler shaft.

Preload : 1.5 Nm (15 kg.cm, 1 lb.ft)



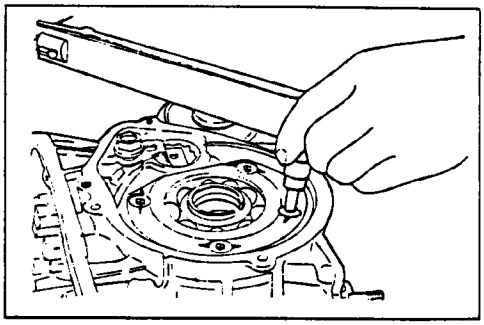
24. After the preload adjustment is completed, eliminate the backlash between the idler shaft and the lock plate by moving the idler shaft in the loosening direction. Attach the lock plate and tighten the lock plate bolt.

Lock plate bolt : 48—60 Nm
(480—600 kg.cm, 35—43 lb.ft)

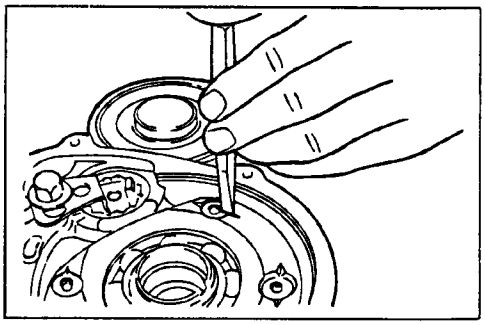


25. Install the bearing retainer, and tighten the screws to the specified torque, apply a 5 mm (0.2 in.) width of sealant (3M Stud Locking No.4176) around the top. The sealant should not protrude out from under the screw head.

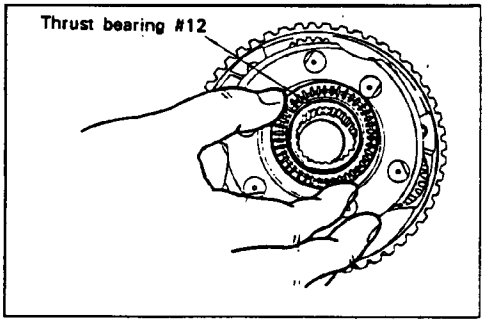
Screw : 17—22 Nm (170—220 kg.cm, 13—15 lb.ft)

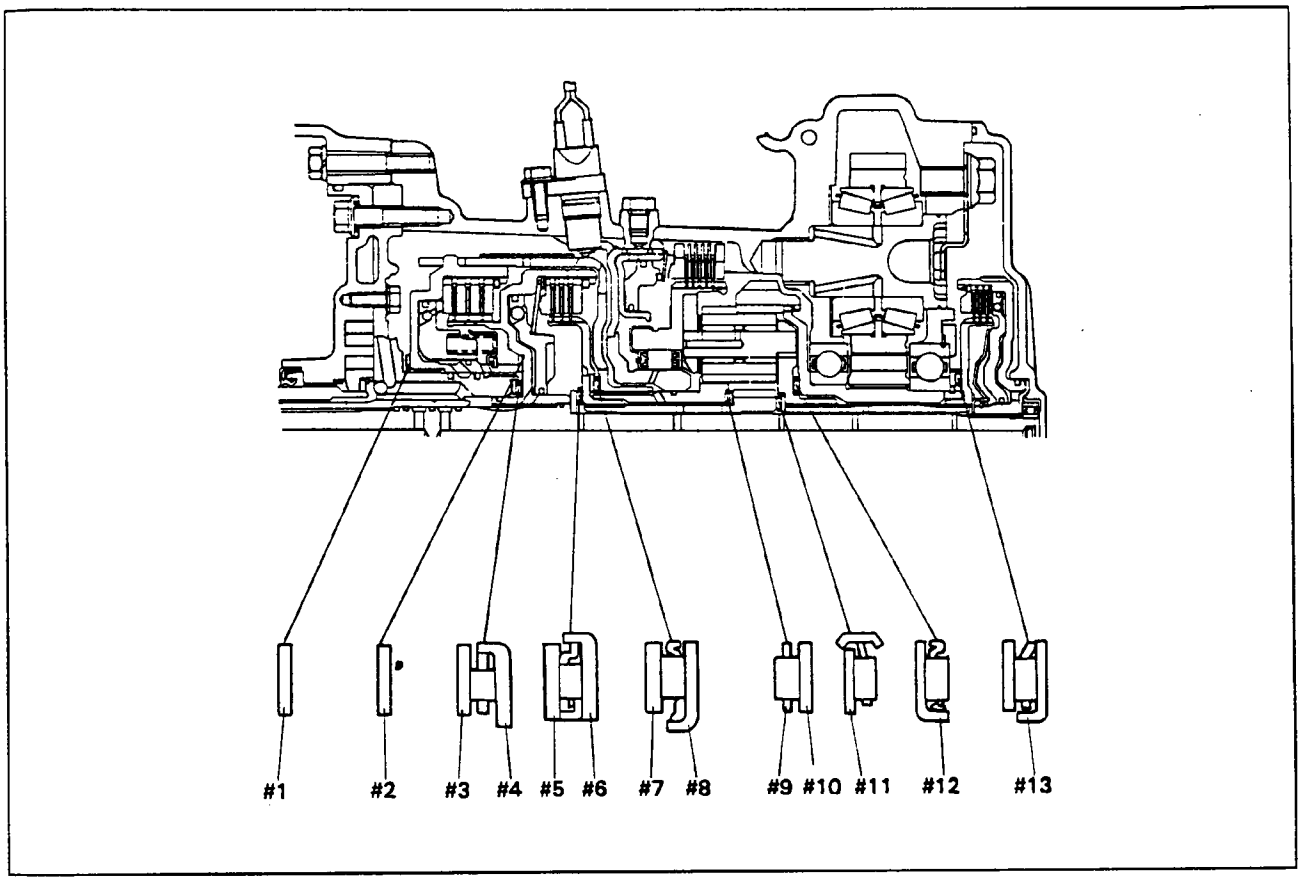


26. Using a punch, lock the flush head screw to prevent rotation.



27. Apply a coating of petroleum grease to thrust bearing #12 and attach to the planetary carrier.





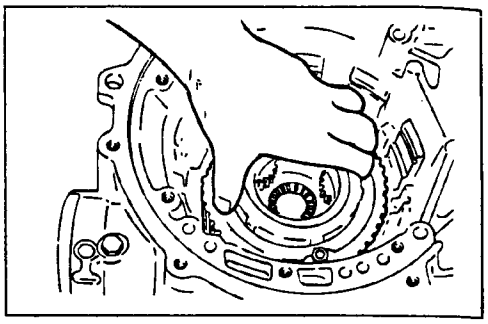
Identification of thrust bearings, thrust races and thrust washers

Unit: mm (in.)

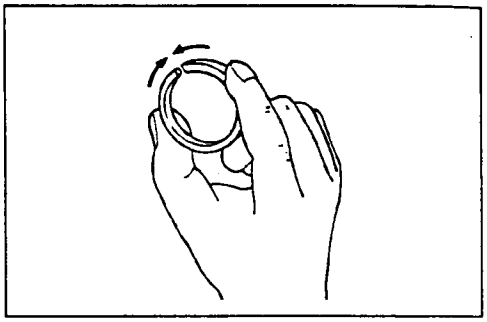
Outer diameter	Inner diameter	Thickness	Code No.
70 (2.756)	55.7 (2.193)	1.4 (0.055)	#1
70 (2.756)	55.7 (2.193)	1.8 (0.071)	
70 (2.756)	55.7 (2.193)	2.2 (0.087)	
70 (2.756)	55.7 (2.193)	2.6 (0.103)	
70 (2.756)	55.7 (2.193)	1.8 (0.071)	#2
48.9 (1.925)	37 (1.457)	1.0 (0.040)	#3
48.9 (1.925)	37 (1.457)	1.2 (0.047)	
48.9 (1.925)	37 (1.457)	1.4 (0.055)	
48.9 (1.925)	37 (1.457)	1.6 (0.063)	
48.9 (1.925)	37 (1.457)	1.8 (0.071)	
48.9 (1.925)	37 (1.457)	2.0 (0.079)	
48.9 (1.925)	37 (1.457)	2.2 (0.087)	
48.9 (1.925)	37 (1.457)	2.4 (0.094)	

Outer diameter	Inner diameter	Thickness	Code No.
48.1 (1.894)	34.4 (1.354)	—	#4
40 (1.575)	21 (0.827)	3.2 (0.126)	#5
42.6 (1.677)	28 (1.102)	—	#6
54 (2.126)	38.7 (1.524)	1.6 (0.063)	#7
52 (2.047)	36.4 (1.433)	—	#8
41 (1.614)	28 (1.102)	—	#9
39 (1.535)	28 (1.102)	1.2 (0.047)	#10
42.4 (1.669)	22.2 (0.874)	—	#11
54 (2.126)	36.4 (1.433)	—	#12
58 (2.283)	44 (1.732)	—	#13

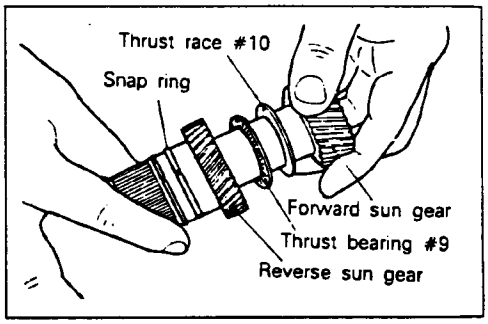
28. Install the planetary carrier to the case.



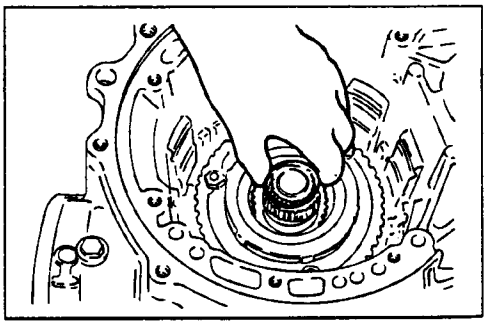
29. Assemble the reverse sun gear and the forward sun gear in the following order:
    1) Attach the seal ring and the snap ring to the reverse sun gear. When attaching, squeeze the seal ring as shown in the figure.
    2) Attach thrust race #10 to the forward sun gear.
    3) Attach thrust bearing #9 to the forward sun gear.



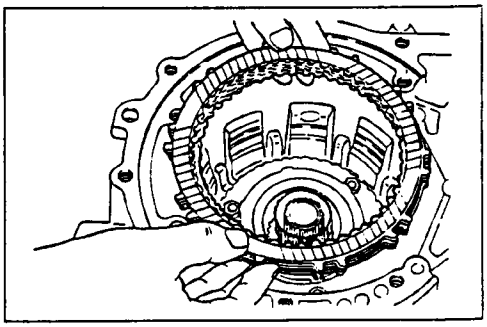
    4) Assemble the reverse sun gear and the forward sun gear.



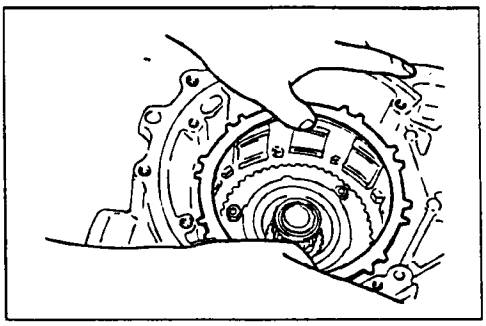
30. Install both of the previously assembled sun gears inside the planetary carrier.



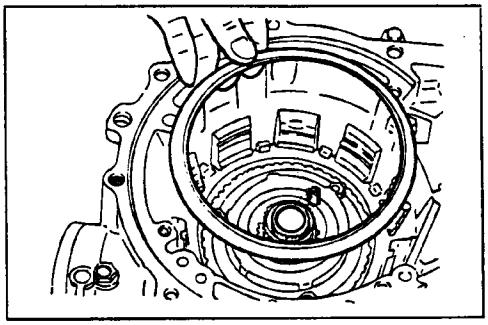
31. Install the brake disc and brake plate.



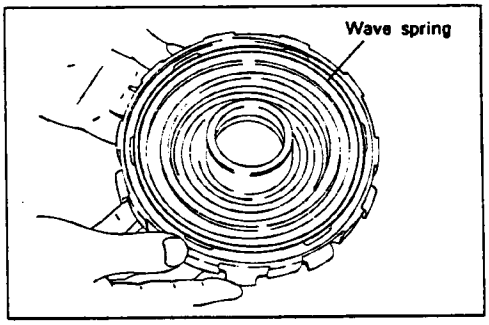
32. Install the selected brake pressure plate.



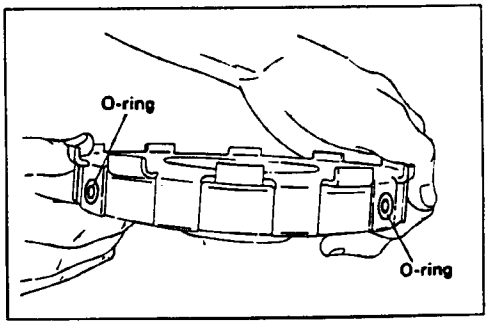
33. Install the return spring.



34. Apply a coating of petroleum grease to the wave spring and attach it to the center support.

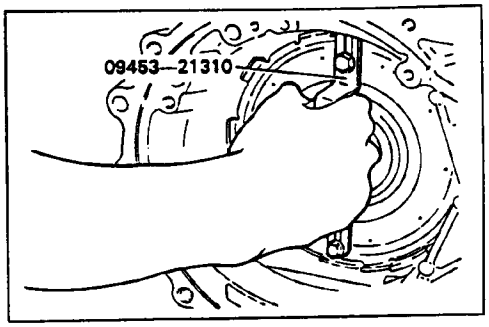


35. Install two new O-rings to the center support.



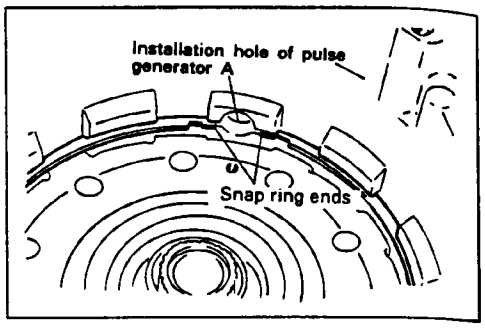
36. After applying a coating of ATF to the O-rings, install the special tool (09453—21310) to the center support, and install within the case.

NOTE
Be sure that the wave spring is not out of position.

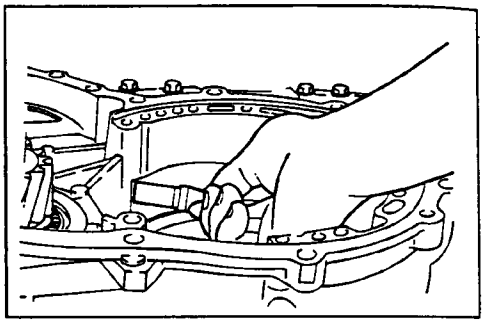


37. Install the snap ring.

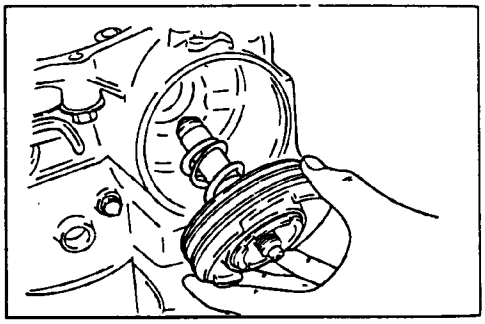
CAUTION
The mating hole of the snap ring must be aligned with the installation hole of pulse generator A.



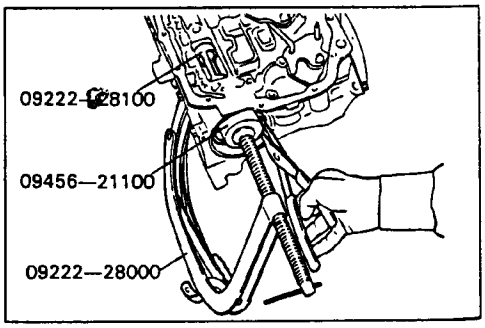
38. Install the anchor rod.



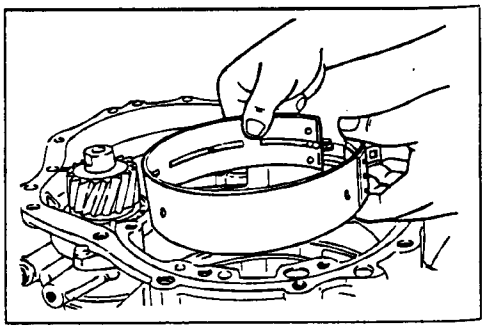
39. Assemble a new seal ring (large diameter) and D-ring (small diameter) to the kickdown servo piston, and install a new O-ring in the groove around the sleeve; then assemble the kickdown servo spring, piston and sleeve in the transaxle case.



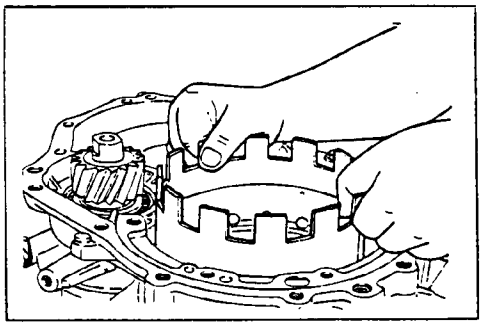
40. Press the kickdown servo and sleeve in by using the special tools (09222—28000, 09222—28100, 09456—21100), and then install the snap ring.



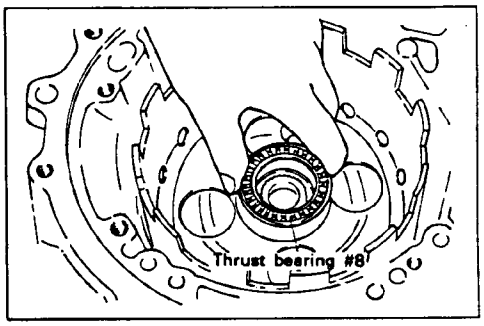
41. Install the kickdown band; attach the ends of the band to the ends of the anchor rod and servo piston rod.



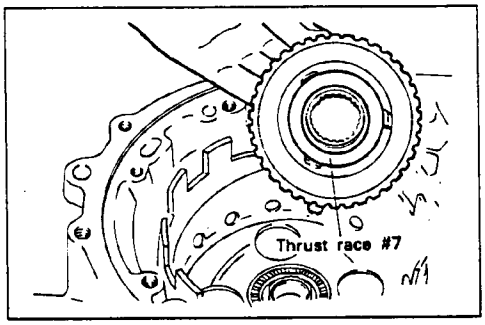
42. Install the kickdown drum with its splines in mesh with the sun gear. Place the kickdown band on the kickdown drum and tighten the kickdown servo adjusting screw to keep the band in position.



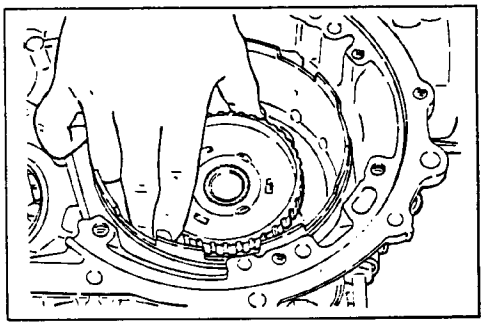
43. Apply a coating of petroleum grease to thrust bearing #8, and then attach to the kickdown drum.



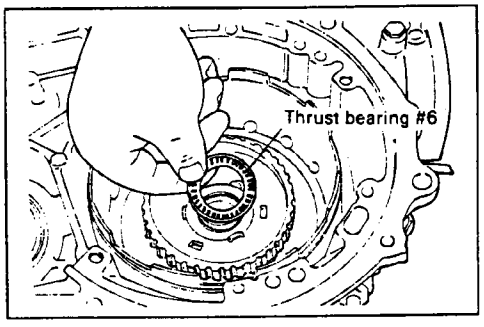
44. Apply a coating of petroleum grease to thrust race #7, and then attach to the rear clutch hub.



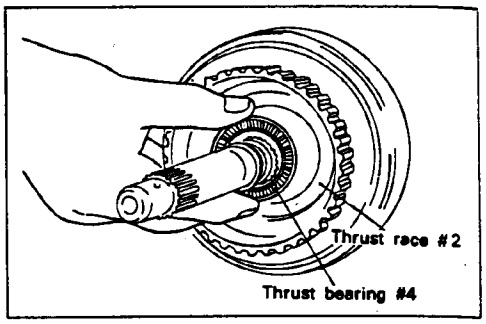
45. Install the clutch hub to the sun gear splines.



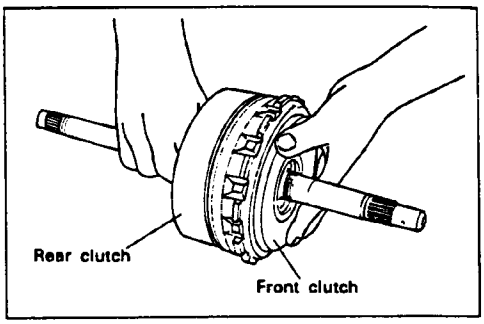
46. Attach thrust bearing #6 onto the hub with petroleum grease.



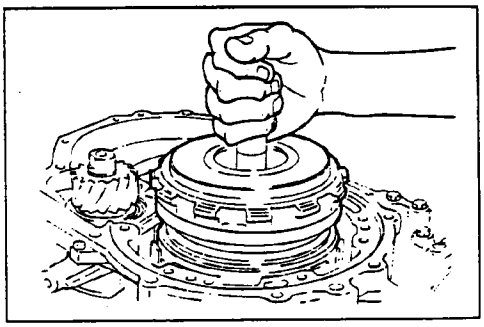
47. Apply a coating of petroleum grease to thrust washer #2 and thrust bearing #4. Attach to the rear clutch assembly.



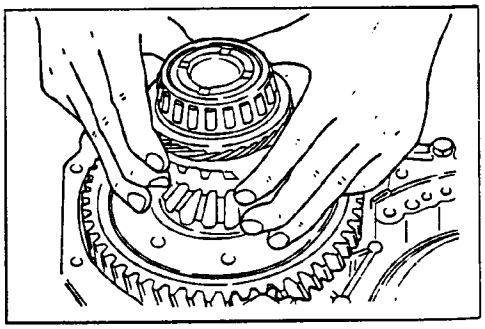
48. Combine the rear clutch assembly and the front clutch assembly.



49. Install the clutch assembly.



50. Install the differential assembly.



51. If the end play, which was measured and recorded at disassembly, is not the standard value, adjust to specification by selecting thrust race #3.

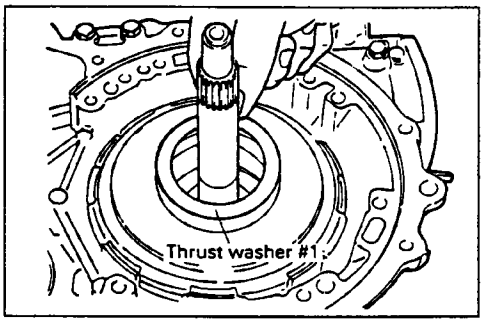
    Standard value : 0.3—1.0 mm (0.012—0.039 in.)

    If the thrust race is replaced with one of a different thickness, the #1 thrust washer (located between the oil pump and the front clutch) must also be replaced.
    Locate the correct pair of thrust races (metal) and thrust washers (fiber) from the following table.

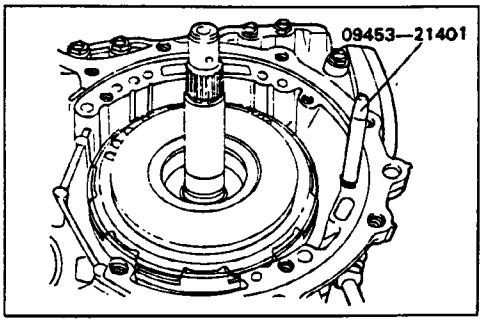
Thrust washer #1 (fiber)	Thrust race #3 (metal)
Thickness mm (in.)	Thickness mm (in.)
1.4 (0.055)	1.0 (0.039)
1.4 (0.055)	1.2 (0.047)
1.8 (0.071)	1.4 (0.055)
1.8 (0.071)	1.6 (0.063)
2.2 (0.087)	1.8 (0.071)
2.2 (0.087)	2.0 (0.079)
2.6 (0.102)	2.2 (0.087)
2.6 (0.102)	2.4 (0.095)

    Example:
    When thick thrust race is selected, thrust washer is one to be paired with it.

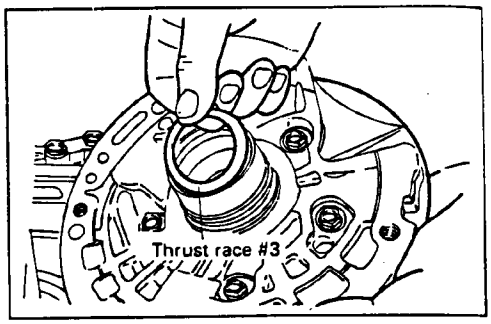
52. Attach the reused thrust washer #1, or the one selected in step 51 to the front clutch by using petroleum grease.



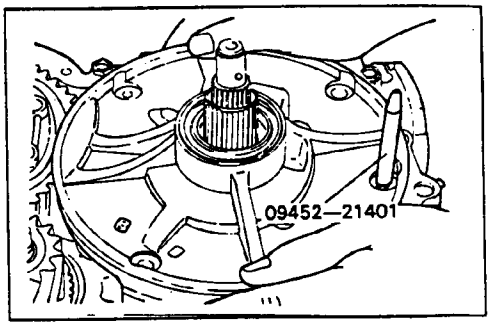
53. Install special tool (09452—21401) into the case.



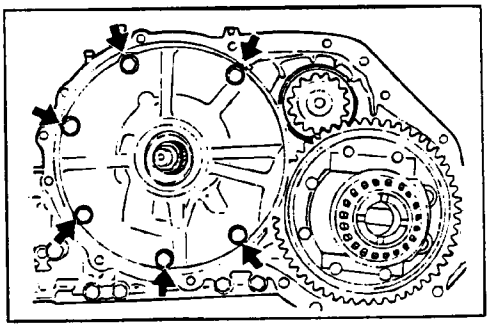
54. Attach the reused thrust race #3 or the one selected in step 51 to the oil pump by using petroleum grease.



55. Install a new oil pump gasket and the oil pump assembly.

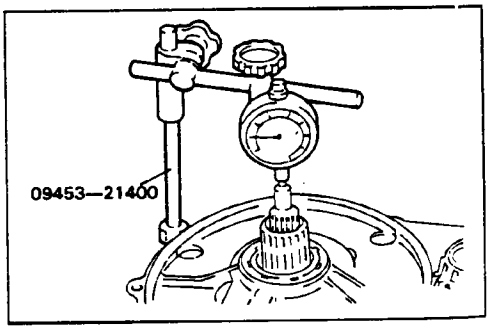


56. Install a new O-ring in the groove of the oil pump housing and apply automatic transaxle fluid lightly to the outside surface of the O-ring.
57. Install the oil pump assembly and tighten the six bolts evenly. When installing the oil pump assembly, be careful that the thrust washer does not fall off.

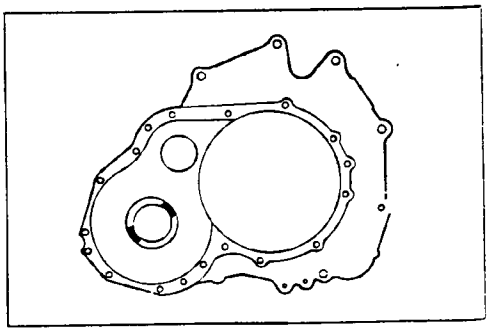


58. Using the special tool (09453—21400) check the input shaft end play. Readjust if necessary (see step 51).

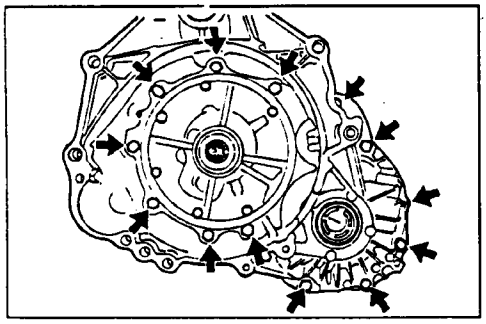
Standard value : 0.3—1.0 mm (0.012—0.039 in.)



59. Place two places of solder, roughly 10 mm (0.4 in.) long and 3 mm (0.12 in.) in diameter, at the position shown on the converter housing and assemble the outer race.

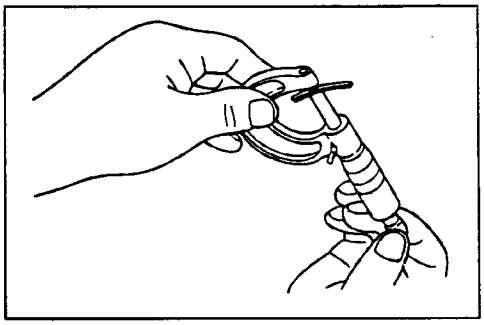


60. Install the converter housing and tighten the 14 bolts to 19—23 Nm (190—230 kg.cm, 14—16 lb.ft)



61. Remove the converter housing.
62. Remove the crushed solder from the outer race of the differential bearing.
63. Using a micrometer, measure the thickness of the crushed solder; then add the thickness [0.38 mm (0.015 in.)] of the rubber-coated metal gasket. Select and install a spacer so that the preload of the differential bearing will be the standard value.

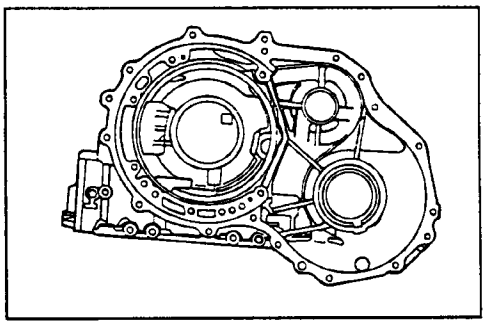
    Standard value : 0.080—0.130 mm (0.003—0.005 in.)



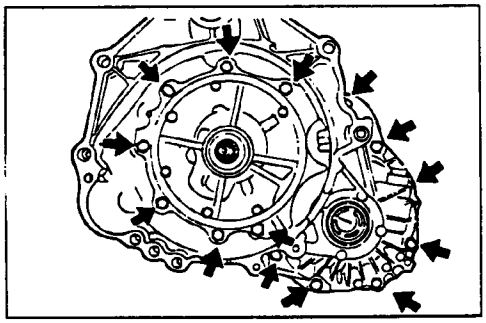
64. Install the outer race to the converter housing.

66. Apply silicone grease to the area shown on the transaxle case flange.
66. Install the rubber coated metal gasket on the transaxle case.

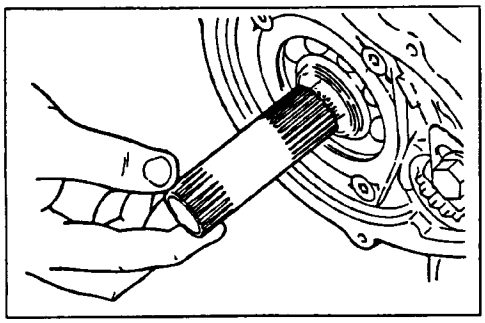
    NOTE
    Do not reuse the gasket.



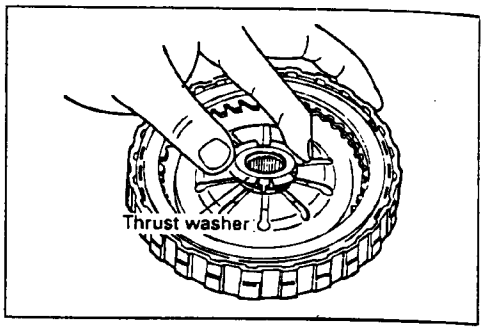
67. Install the converter housing and tighten the 14 bolts to 19—23 Nm (190—230 kg.cm, 14—16 lb.ft).



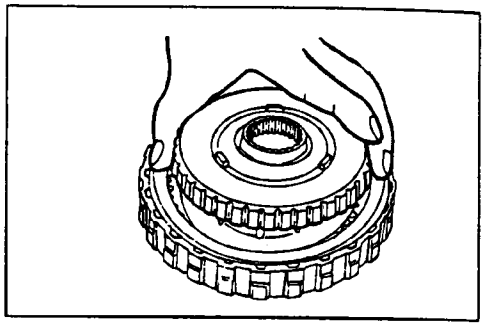
68. Install the end clutch shaft. Be sure to install the side with the longest splines toward the front as shown.



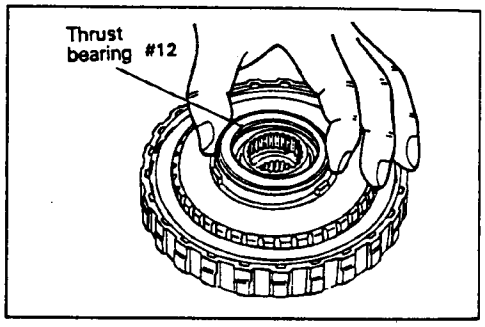
69. Place the thrust washer on the return spring at the end clutch side.



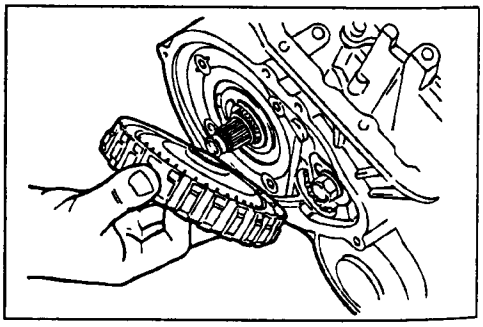
70. Install the end clutch hub to the end clutch.



71. Attach, thrust bearing #12 to the end clutch hub by using petroleum grease.



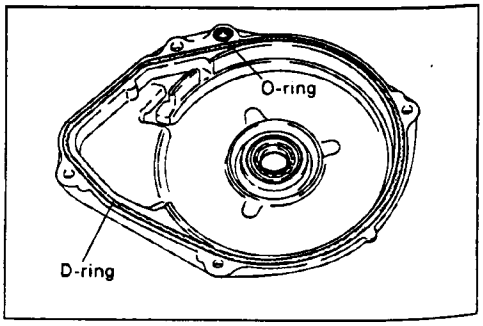
72. Install the end clutch assembly.



73. Install a new O-ring and D-ring on the end clutch cover.

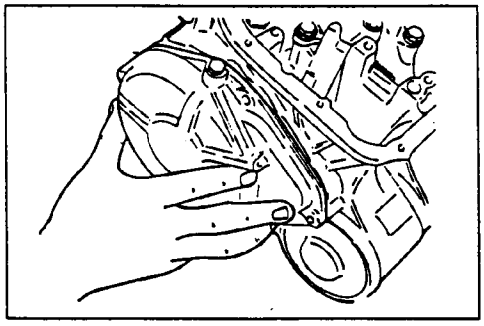
NOTE

1. **Make sure the D-ring is not twisted.**
2. **Apply a sufficient amount of automatic transaxle fluid on the bearing.**

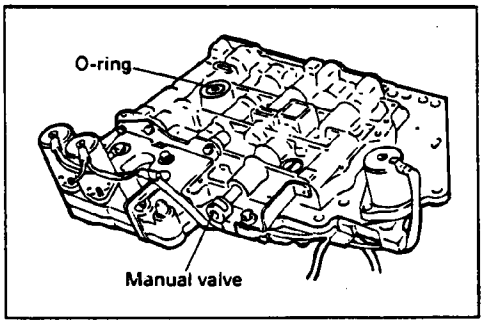


74. Attach the end cover and fasten it with four bolts.

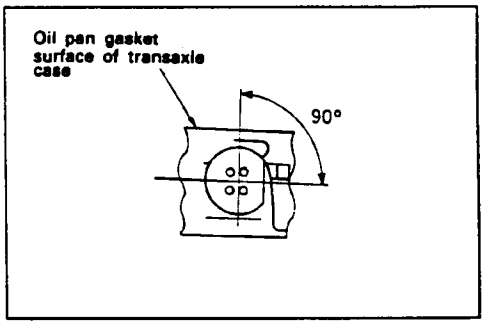
CAUTION
When installing the end cover, be sure the screw hole is correctly aligned. If the end cover is turned (after it is installed) in order to align with the screw hole, the O-ring and/or the D-ring may be twisted as a result.



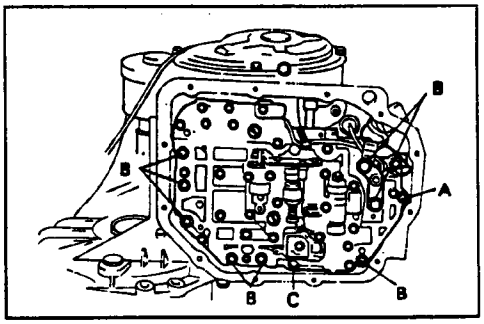
75. Install the O-ring at the center of the top of the valve body assembly (brake oil pressure passage).
76. Install the valve body assembly to the case, fitting the detent plate (manual control shaft) pin in the slot of the manual valve.



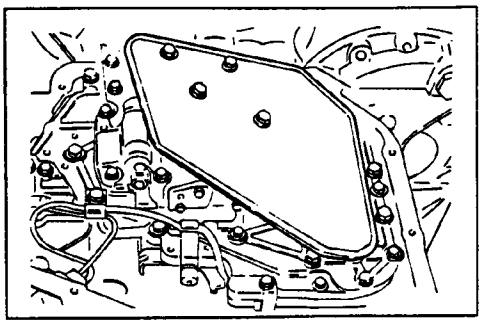
77. Replace the O-ring on the solenoid valve connector.
78. Tilt the solenoid valve connector over from the inner side of the transaxle case to the harness grommet installation hole and install the harness grommet securely. The notch in the harness grommet should be as shown in the illustration.



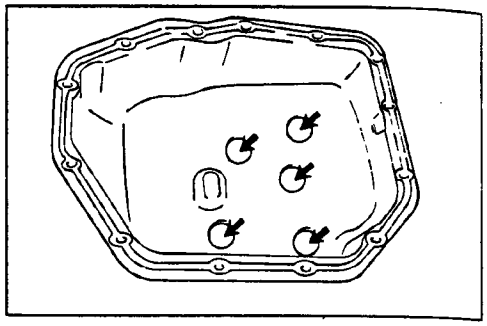
79. Temporarily attach the valve body; then install the oil-temperature sensor from the case hole, and tighten the specified torque [10—12 Nm (100—120 kg.cm, 7.5—8.5 lb.ft)].
    A bolt: 18 mm (0.709 in.) long
    B bolt: 25 mm (0.984 in.) long
    C bolt: 40 mm (1.575 in.) long



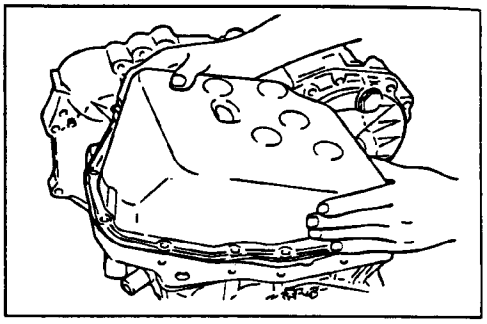
80. Install the oil filter. Tighten the four oil filter mounting bolts to 5—7 Nm (50—70 kg.cm, 4—5 lb.ft).



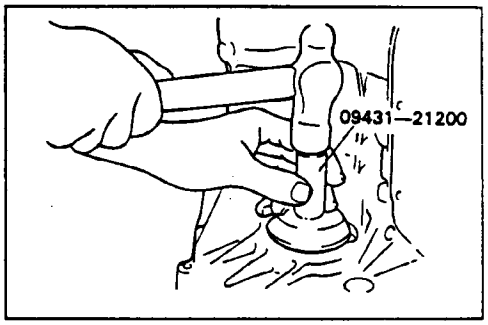
81. Install the five magnets in the depressions provided on the oil pan.



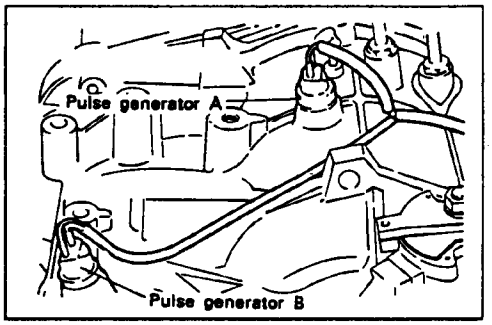
82. Install a new oil pan gasket on the oil pan and tighten the 12 bolts to 10—12 Nm (100—120 kg.cm, 7.5—9 lb.ft).



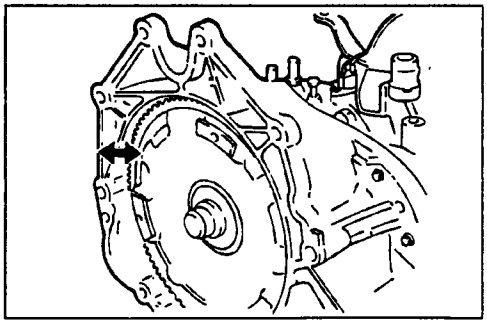
83. Using special tool (09431—21200) drive the two drive shaft oil seals into the transaxle case and converter housing.
84. Install the inhibitor switch and manual lever.
Adjust the inhibitor switch (Refer to GENERAL).



85. Install the pulse generators A and B.

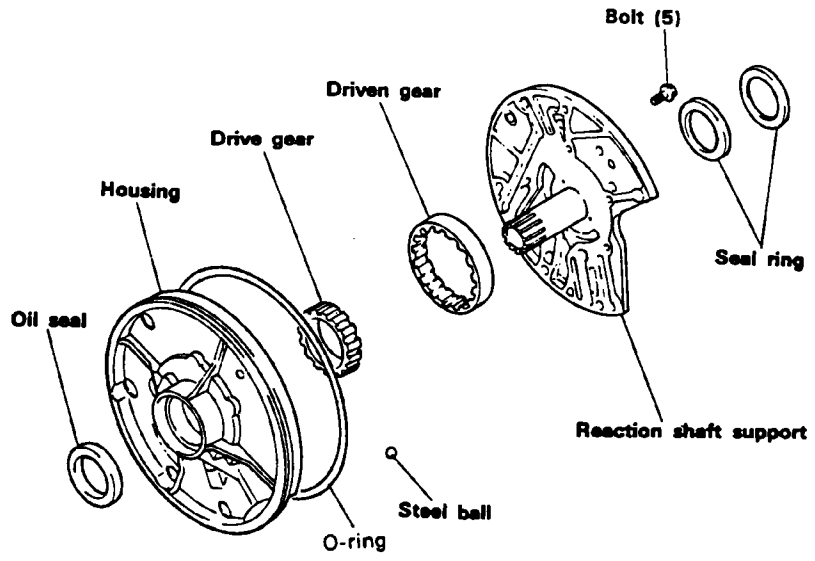


86. After applying automatic transaxle fluid to the outside surface of the oil pump-side of the torque converter, install the torque converter carefully so as not to damage oil seal lip. Make certain that the torque converter is in mesh with the oil pump drive gear.
Measure the distance between the ring gear end and the converter housing end. The torque converter has been properly installed when the measurement is about 12 mm (0.47 in.).



OIL PUMP ASSEMBLY

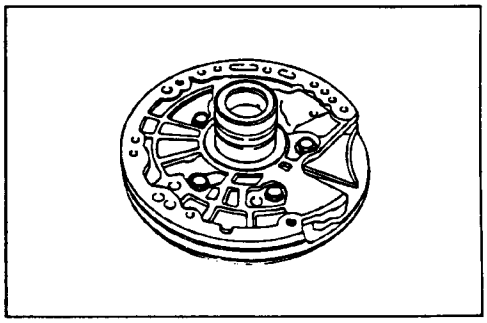
COMPONENTS



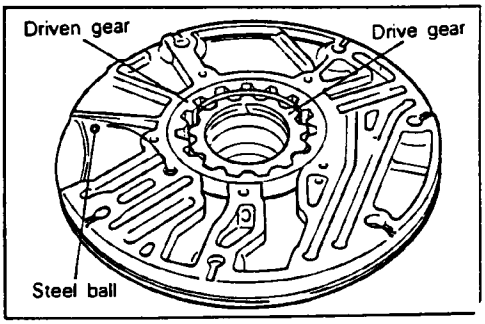
TORQUE : Nm (kg.cm, lb.ft)

DISASSEMBLY

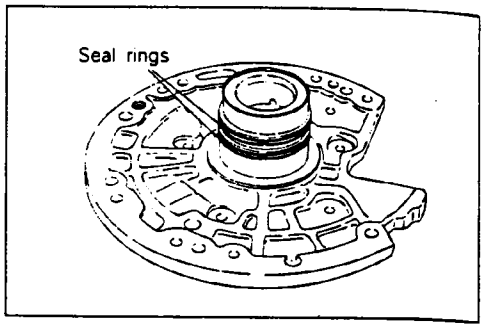
1. Remove the O-ring from oil pump housing.
2. Remove the five bolts and reaction shaft support from the housing.



3. Remove the oil pump drive and driven gears from the pump housing.
4. Make reassembly alignment marks on the drive and driven gears.
5. Remove the steel ball from the housing.

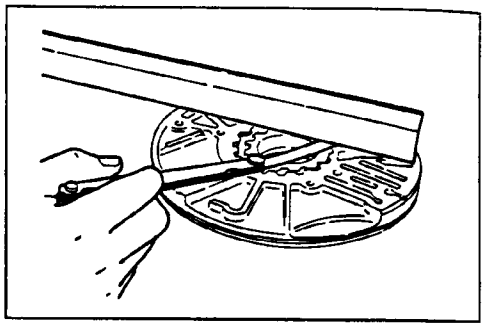


6. Remove the two seal rings from the reaction shaft support.



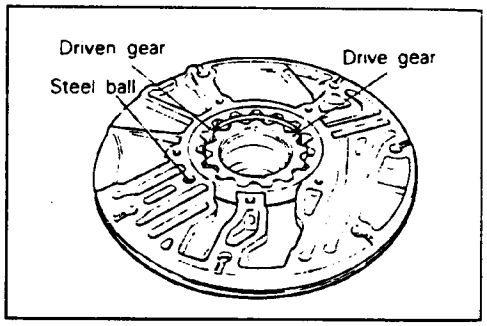
INSPECTION

1. Measure the gear side clearance.
   Drive and driven gear side clearance: 0.01—0.048 mm (0.0004—0.0019 in.)

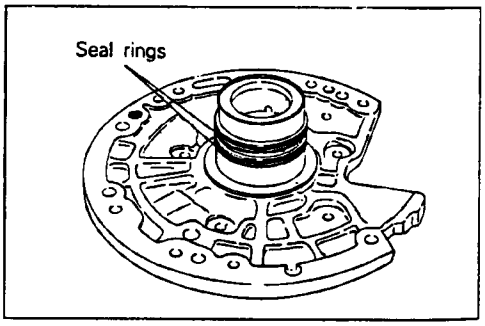


ASSEMBLY

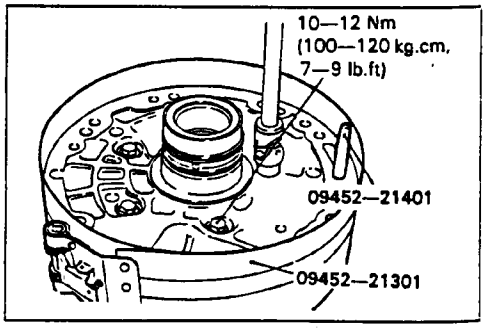
1. After immersing the drive and driven gears in ATF, install them into the pump housing. When reusing the gears, install them with the mating marks properly aligned.
2. Install the steel ball in the hole as shown in the illustration.



3. Install the two seal rings coated with ATF on the reaction shaft support.

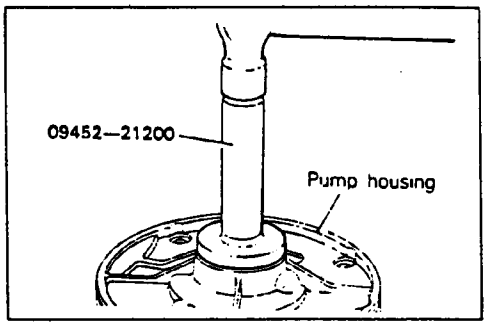


4. Loosely install the reaction shaft support on the pump housing. Tighten the five bolts finger tight.
5. With the reaction shaft support properly positioned on the pump housing using special tools (09452—21401, 09452—21301) tighten the five bolts to 10—12 Nm (100—120 kg.cm, 7—9 lb.ft).
6. Make sure that the oil pump gear turns freely.
7. Install a new O-ring in the groove provided in the circumference of the pump housing and apply petroleum grease to the circumference of the O-ring.



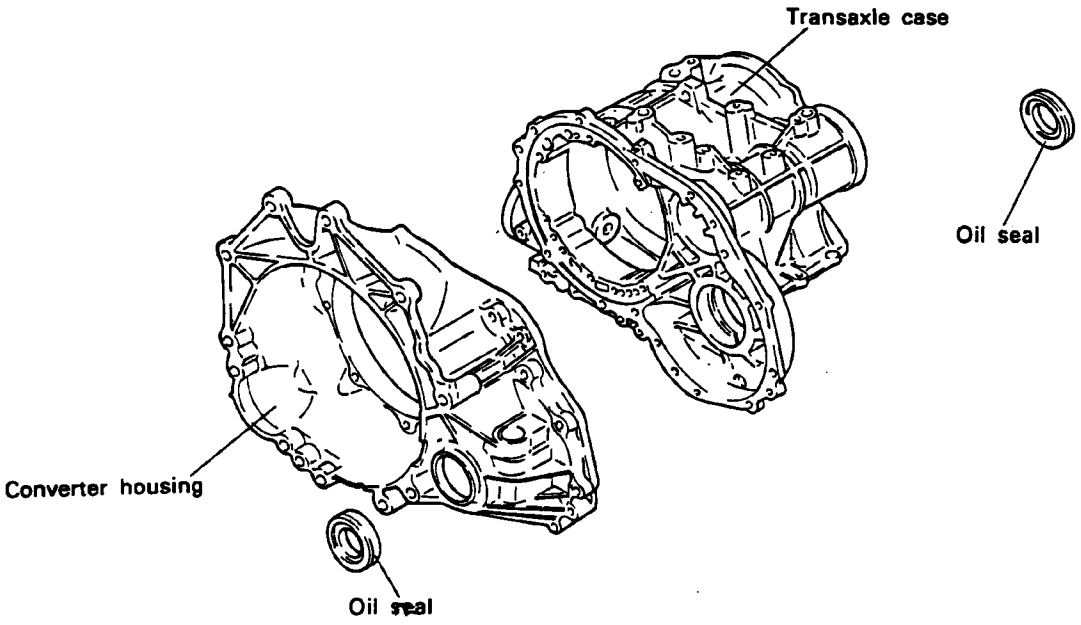
OIL SEAL REPLACEMENT

1. Pry off the pump housing oil seal using a screwdriver.
2. Using special tool (09452—21200) install the oil seal to the pump housing. Apply a thin coat of ATF to the oil seal lip before installation.



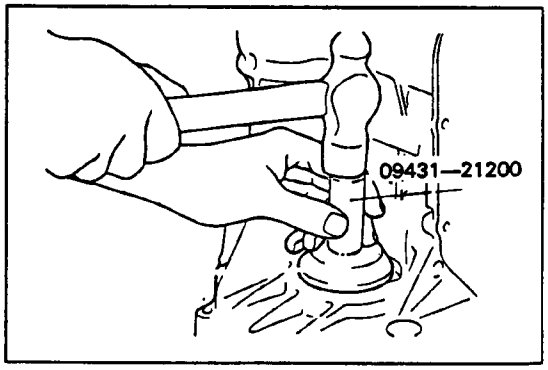
TRANSAXLE CASE ASSEMBLY

COMPONENTS



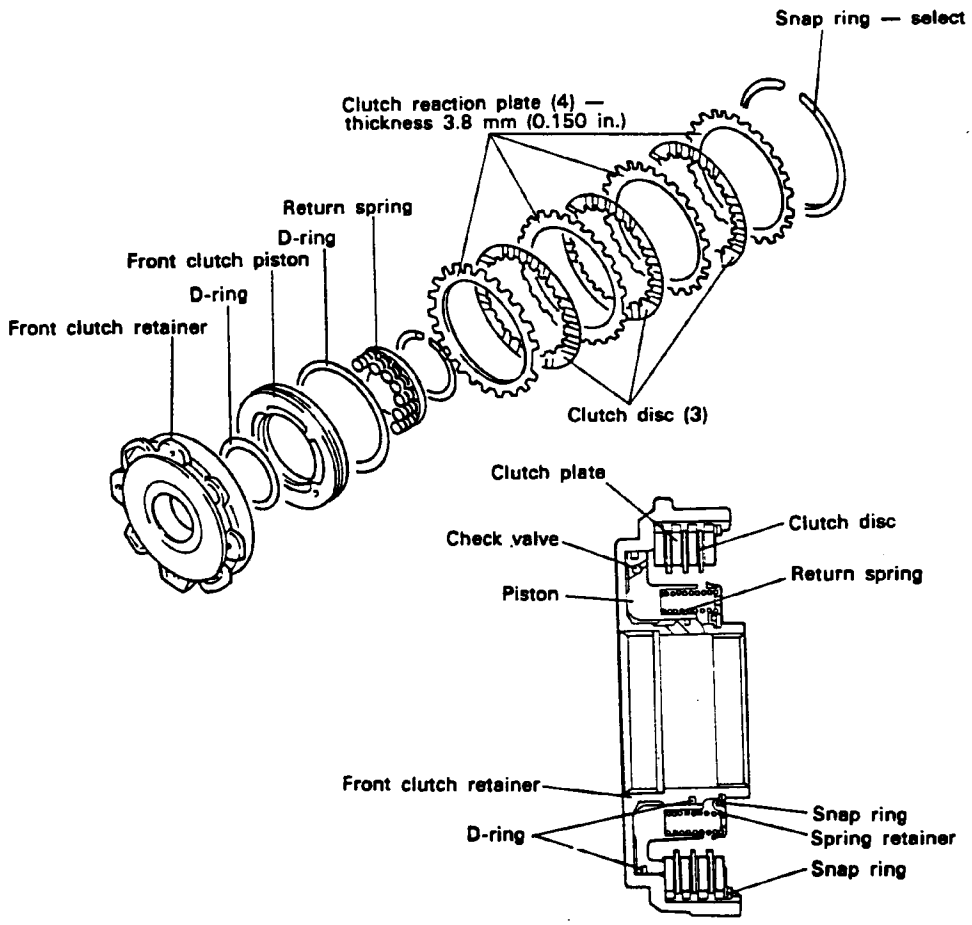
REASSEMBLY

Using special tool (09431—21200), drive the two drive shaft oil seals into the transaxle case.



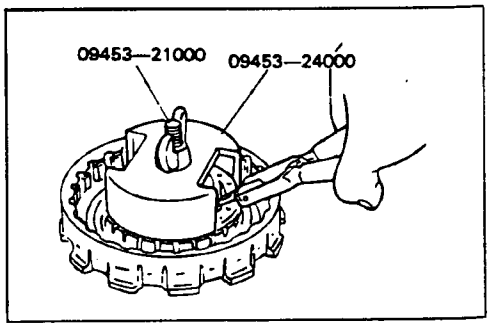
FRONT CLUTCH ASSEMBLY

COMPONENTS



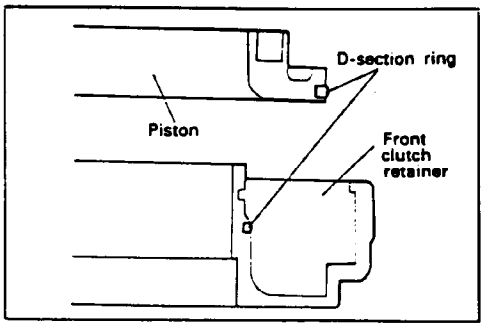
DISASSEMBLY

1. Remove the snap ring from the clutch retainer.
2. Take out the four clutch reaction plates and three clutch discs. If the clutch reaction plates and the clutch discs are to be reused, be sure not to change the installation order or direction.
3. With the return spring compressed using special tool (09453—21000, 09453—24000), remove the snap ring, then the spring retainer and return spring.
4. Remove the piston from the retainer.
5. Remove the D-rings from the inner and outer circumferences of the piston.

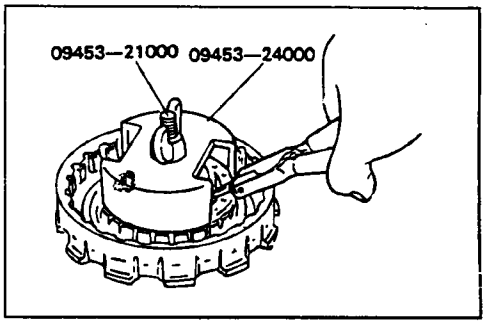


REASSEMBLY

1. Install the D-ring in the groove on the outside surface of the piston with its round side out. Install another D-ring to the front clutch retainer.
2. Apply automatic transaxle fluid to the outside surface of the D-rings, then push the piston into the front clutch retainer by hand.

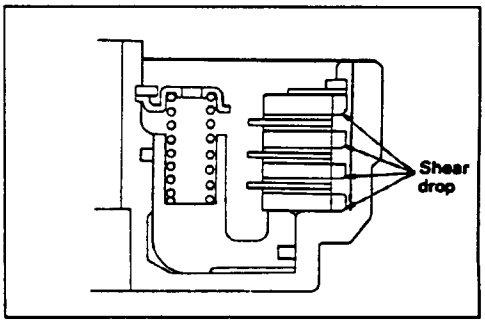


3. Install the return spring and spring retainer.
4. Compress the return spring with special tool (09453—21000, 09453— 24000) and install the snap ring.

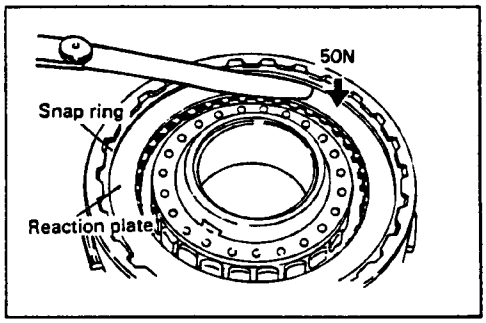


5. Install the four clutch reaction plates and three clutch discs. Prior to their installation, apply automatic transaxle fluid to them.

CAUTION
When new clutch discs are used, they should be immersed in automatic transaxle fluid for a minimum of two hours before installation.

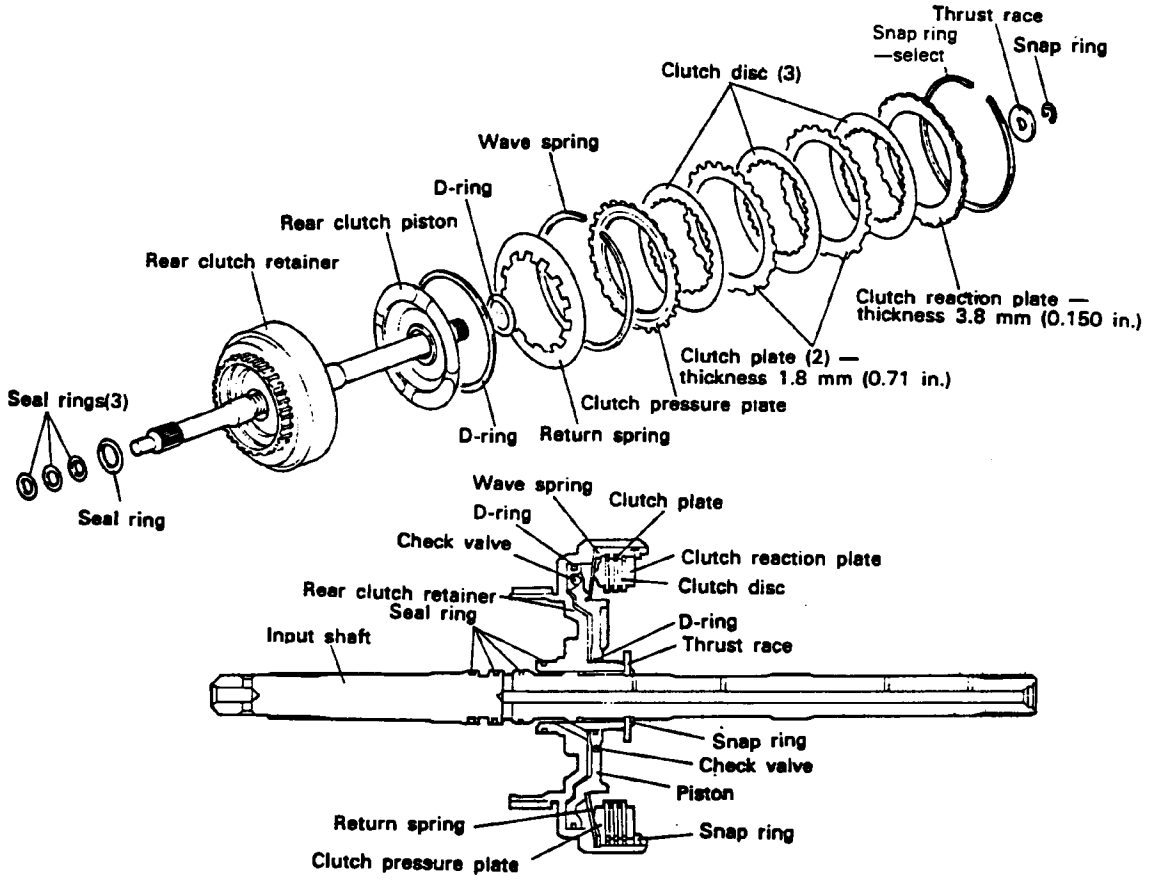


6. After installing the snap ring, check to see if there is a 0.7—0.9 mm (0.028—0.035 in.) clearance between the snap ring and the clutch reaction plate.
   To check clearance, hold the entire circumference of the clutch reaction plate down with 50 N (11 lb.) force. If the clearance is out of specification, adjust by selecting the proper snap ring.



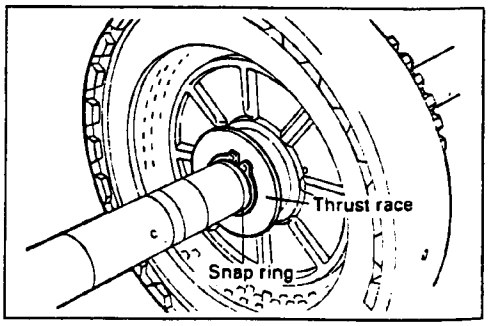
REAR CLUTCH ASSEMBLY

COMPONENTS

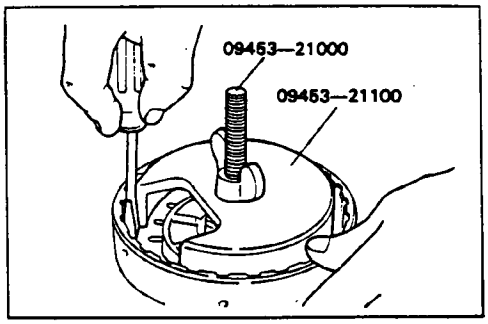


DISASSEMBLY

1. Remove the snap ring and then remove the thrust race.
2. Remove the input shaft from the rear clutch retainer.
3. Remove the snap ring from the clutch retainer.
4. Remove the clutch reaction plate, two clutch plates, three clutch discs and clutch pressure plate from the retainer.



5. Compress the return spring by using the special tool (09453—21100, 09453—21000).
6. Using a screwdriver, remove the wave spring.
7. Remove the return spring and piston.
8. Remove the two D-rings from the piston.

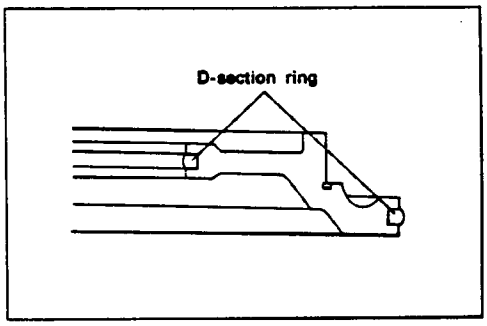


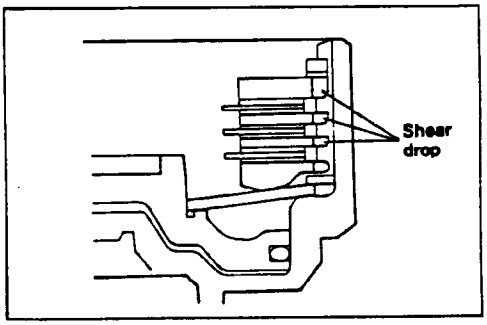
REASSEMBLY

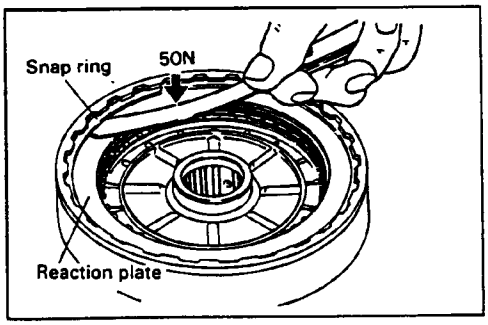
1. Install the D-rings in the grooves on the outside and inside surfaces of the piston.
2. After applying automatic transaxle fluid to the outside surface of the D-rings, push the piston into the rear clutch retainer by hand.
3. Intall the return spring on the piston.
4. Compress the return spring with the snap ring, by pushing down with a screwdriver and position the snap ring in its groove.
5. Install the clutch pressure plate, three clutch discs, two clutch plates and clutch reaction plate to the rear clutch retainer.
   If the reaction plate, clutch plate and clutch disc have been removed, reinstall them in the reverse order of disassembly. Prior to installing, apply automatic transaxle fluid to the plates and discs.

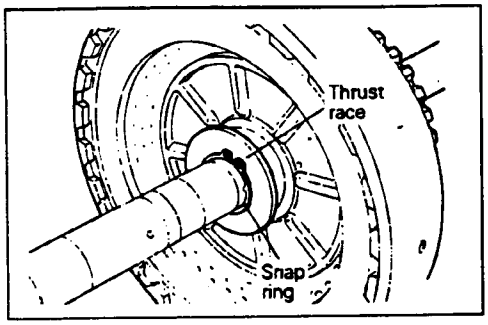
   CAUTION
   When new clutch discs are used, immerse them in automatic transaxle fluid for a minimum of two hours before installation.

6. Install the snap ring. Check that the clearance between the snap ring and the clutch reaction plate is 0.4—0.6 mm (0.016—0.024 in.). To check the clearance, hold the circumference of the clutch reaction plate down with 50 N (11 lb.) force. If the clearane is out of specification, adjust by selecting the proper snap ring. Snap rings are the same as to those for the front clutch.
7. Insert the input shaft into the clutch retainer.
8. Install the thrust race, then the snap ring.
9. Install the three seal rings into the grooves on the input shaft.



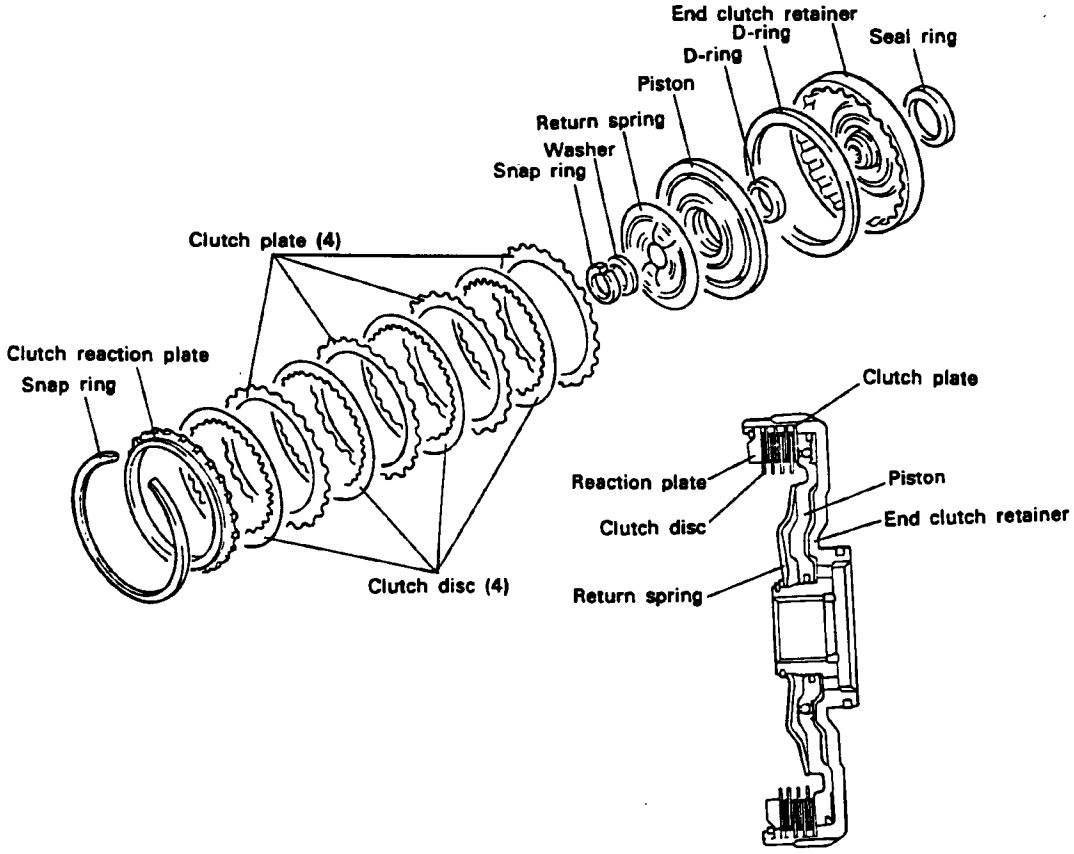






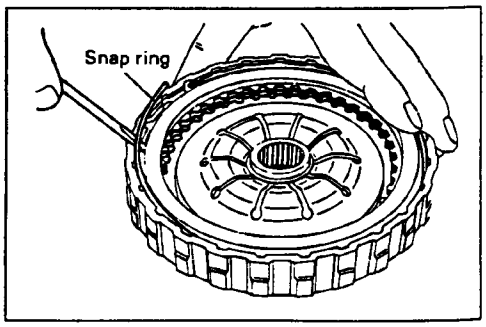
END CLUTCH ASSEMBLY

COMPONENTS

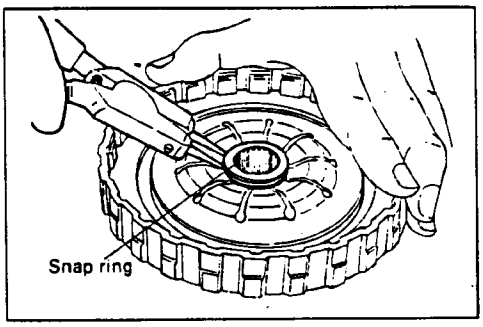


DISASSEMBLY

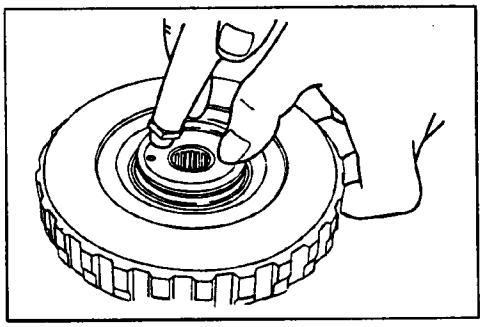
1. Remove the snap ring, and then remove the clutch reaction plate, the clutch disc, and the clutch plate. If the disc and plate are reused, be sure not to change the installation order and direction when they are disassembled.



2. Remove the snap ring by using snap-ring pliers, and then remove the washer and return spring.

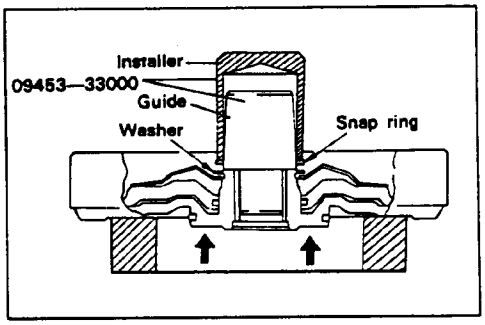


3. Remove the piston. If it is difficult to remove, face the piston side downward, and, with the retainer on a base, blow air through the oil passage on the rear surface.
4. Remove the seal ring from the retainer.
5. Remove the two D-rings and oil seal from the piston.

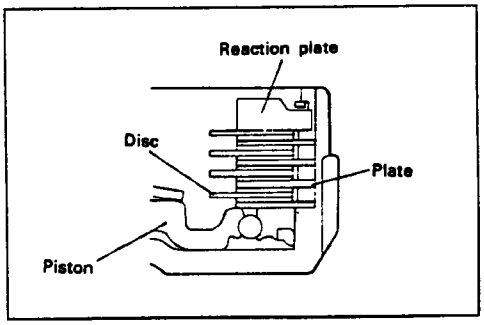


REASSEMBLY

1. Install the D-rings and oil seal in the piston inner and outer grooves.
2. After applying a coating of automatic transaxle fluid to the D-rings outer circumference, manually press the piston into the end clutch retainer.
3. Install the return spring and washer.
4. After fitting a new snap ring into the guide of the special tool snap-ring installer, install the retainer. Push the snap ring as far down on the guide as possible.
   Attach the installer and press until the snap ring enters the groove. Do not press more than necessary. The places indicated by arrows in the illustration (center projections) are not to be supported.

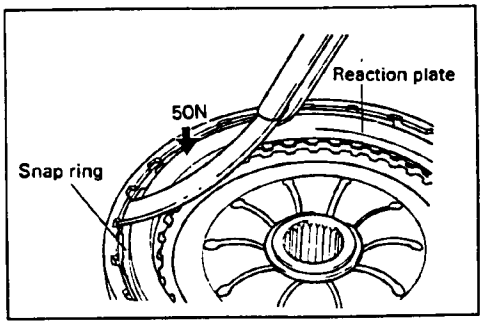


5. Install the clutch plate, clutch disc and reaction plate to the end clutch retainer.
   If the reaction plate, clutch plate and clutch disc are reused, install them in the same order they were disassembled. Apply a coating of automatic transaxle fluid.



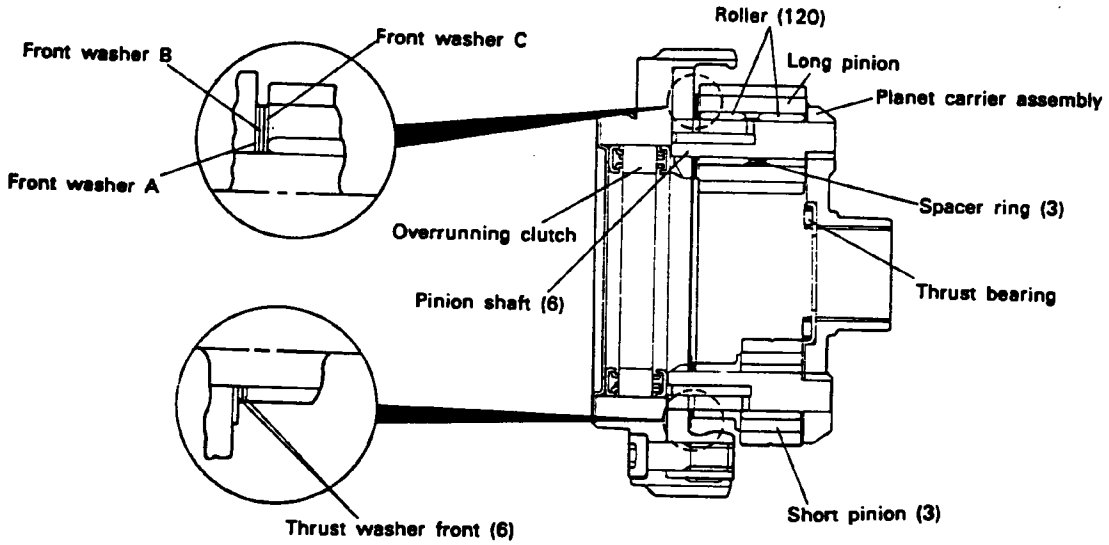
CAUTION
When a new clutch disc is used, soak it in automatic transaxle fluid for a minimum of 2 hours before using it.

6. Install the snap ring. Check to see that the clearance between the snap ring and the clutch reaction plate is 0.6—0.85 mm (0.024—0.033 in.).
   To check the clearance, hold the circumference of the clutch reaction plate down with 50 N (11 lb.) force.
   If the clearance is out of specification, adjust the clearance by selecting the proper snap ring.



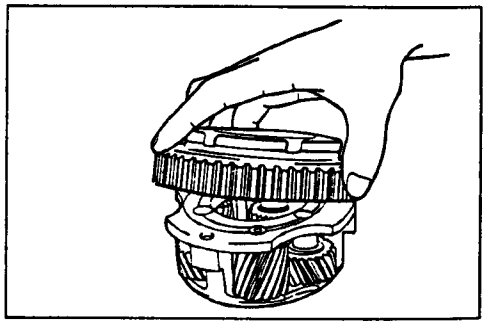
PLANETARY GEAR SET ASSEMBLY

COMPONENTS

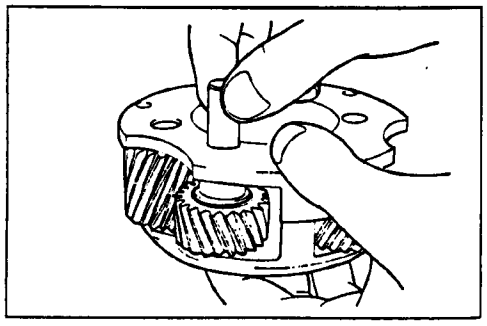


DISASSEMBLY

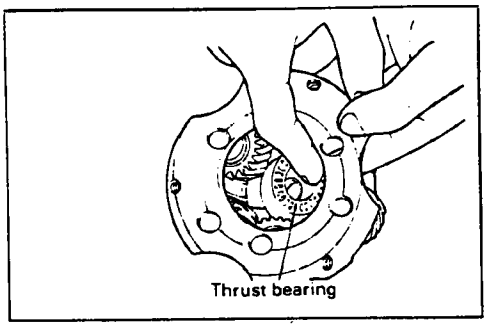
1. Remove the three bolts.
2. Remove the overrunning clutch outer race assembly. Remove the overrunning clutch end plate.



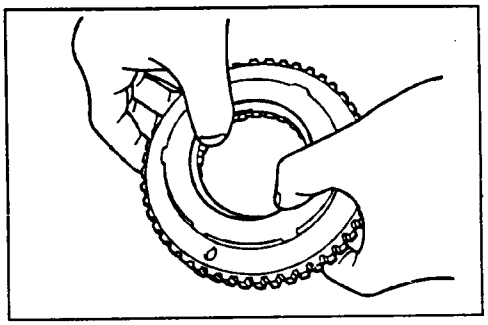
3. Remove one pinion shaft from any of the short pinions.
4. Remove the spacer bushing and the two front thrust washers.
5. Remove only one short pinion. Use care not to drop and lose any of the 17 rollers in the short pinion.



6. Remove the thrust bearing.

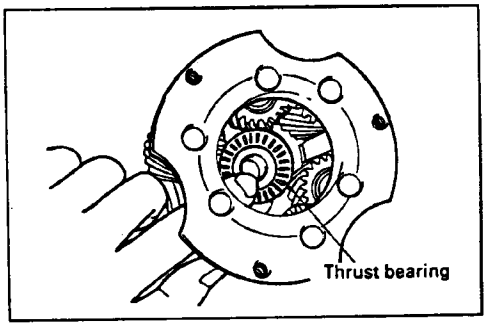


7. Push the overrunning clutch out of the outer race with your fingers.

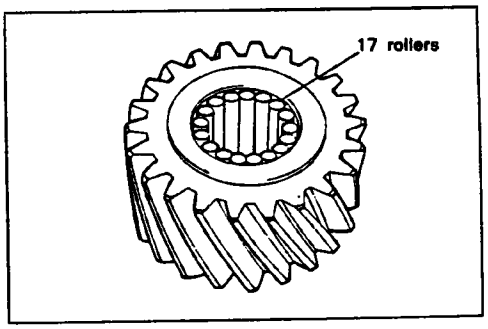


REASSEMBLY

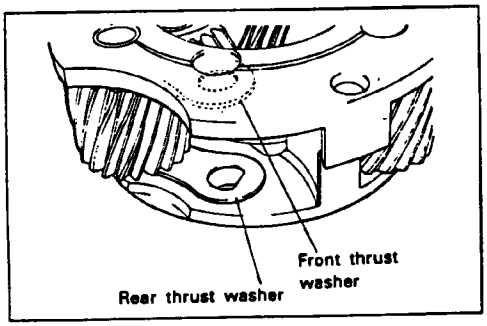
1. Install the thrust bearing to the carrier. Be sure that it fits correctly into carrier.



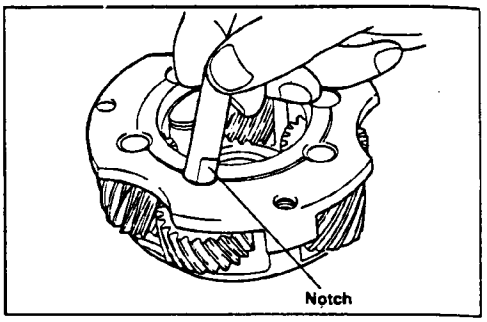
2. Apply a generous amount of petroleum grease to the inside diameter of the short pinion to hold the 17 rollers in place.



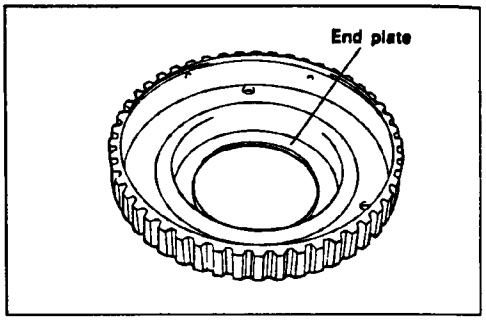
3. Line up the holes in the rear thrust washer and front thrust washer with the shaft of the carrier.
4. Install the short pinion, spacer bushing and two front thrust washers and align the holes. Use care not to allow the rollers to move out of position.



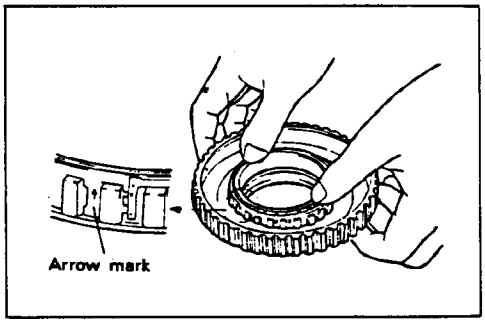
5. Insert the pinion shaft. Be sure that the flattened end of the pinion shaft fits properly into the hole in the rear thrust plate when the pinion shaft is inserted.



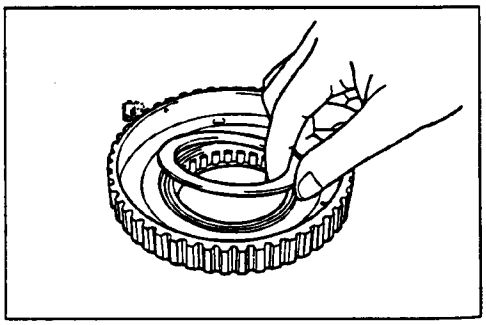
6. Install the end plate to the outer race.



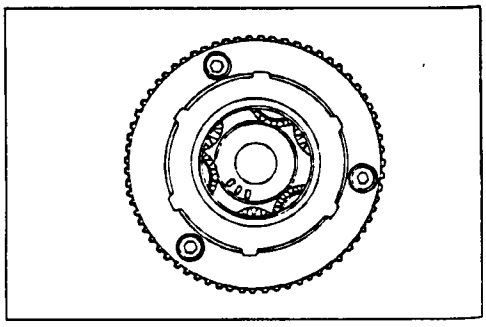
7. Push the overrunning clutch into the outer race. Be sure that the arrow on the outside circumference of the cage is directed upward, as shown in the illustration, when the overrunning clutch is installed.



8. Apply petroleum grease to the overrunning clutch end plate on the retain it to overrunning clutch. Install the end plate to the clutch.

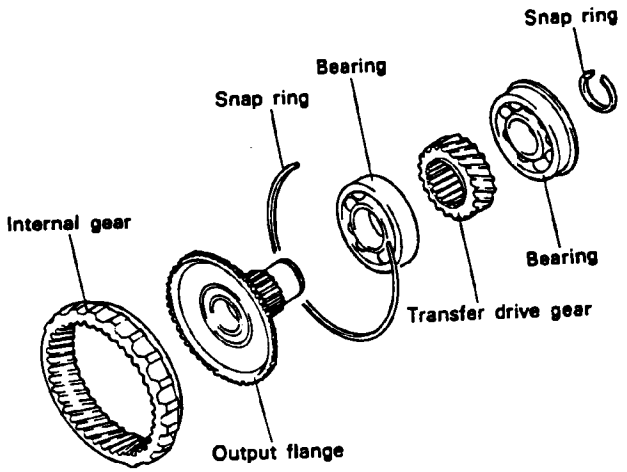


9. Install the overrunning clutch assembly to the carrier and align the box holes.
10. Install the three bolts and tighten to 25 to 35 Nm (250—350 kg.cm, 18—25 lb.ft).



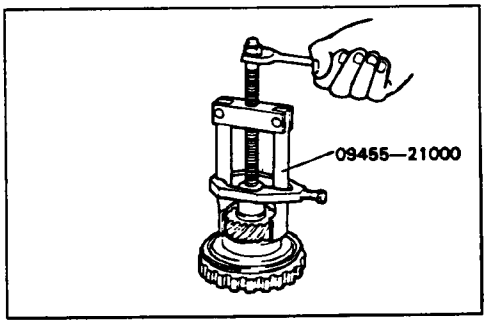
INTERNAL GEAR AND TRANSFER DRIVE GEAR SET ASSEMBLY

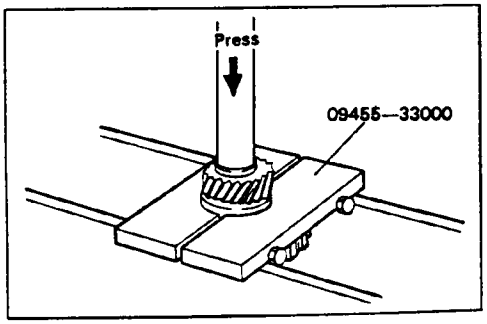
COMPONENTS



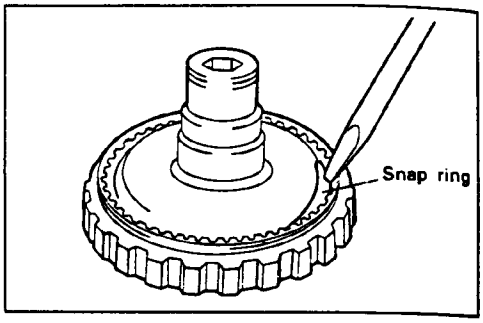
DISASSEMBLY

1. Remove the snap ring from the rear end of the output flange.
2. Using special tools (09455—21000, 09455—33000) bearings (2 pieces) and transfer drive gear from the output flange.





3. Remove the snap ring, and separate the internal gear from the output flange.

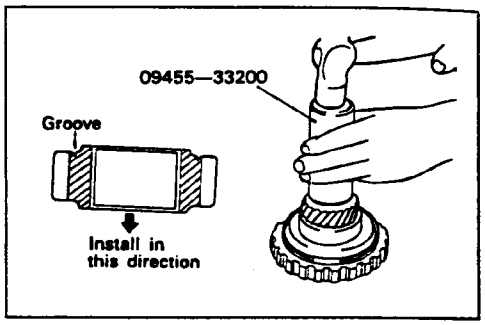


REASSEMBLY

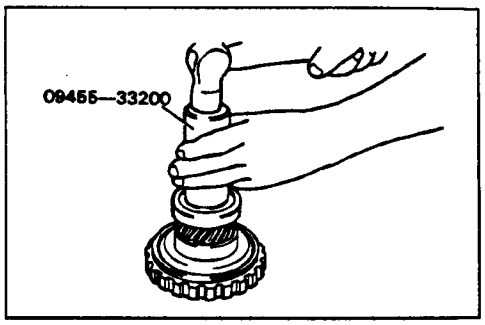
1. Using special tool (09455—33200) press the ball bearing and transfer drive gear onto the output flange.

   CAUTION
   Replace the output flange and transfer drive gear as a set.

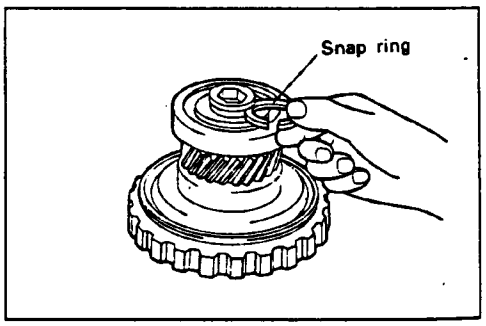
2. Install the transfer drive gear in the proper direction noting the groove in the side surface.



3. Install the ball bearing with special tool (09455—33200).

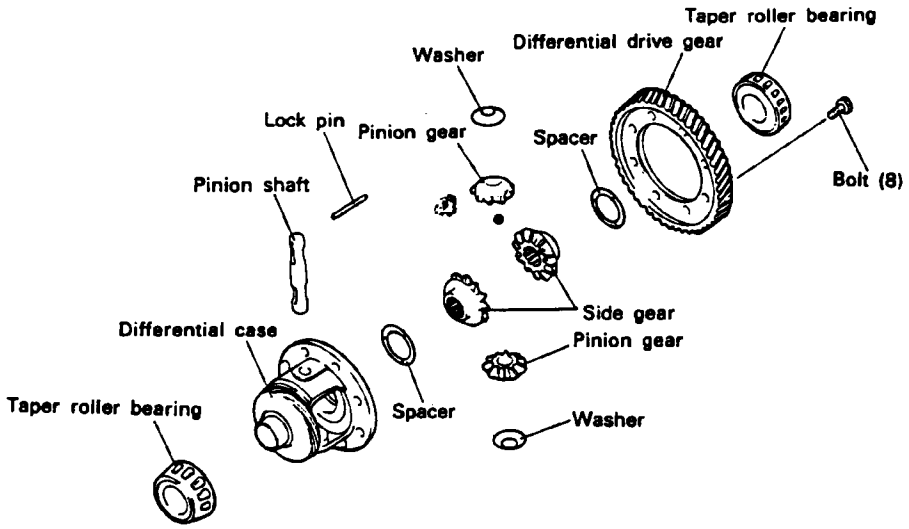


4. Select the thickest snap ring that can be installed in the groove.



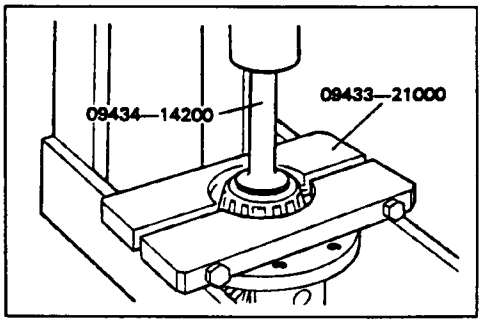
DIFFERENTIAL ASSEMBLY

COMPONENTS

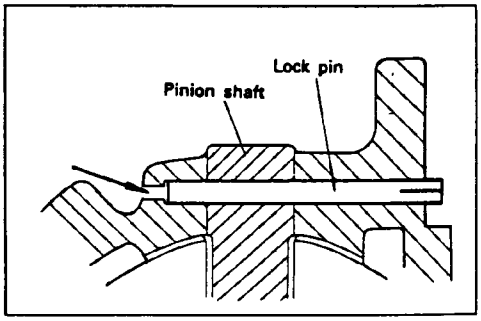


DISASSEMBLY

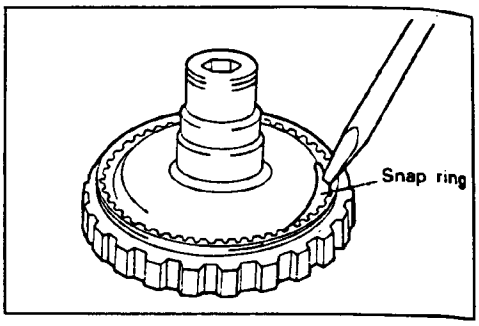
1. Remove the drive gear retaining bolts and remove the drive gear from the differential case.
2. Remove the tapered roller bearing inner race by using the special tools (09433—21000, 09434—14200).



3. Drive out the lock pin with a punch inserted in hole "A".
4. Remove the pinion shaft, pinion gears and washers.
5. Remove the side gears and spacers.
   Seperate the grears and spacers into right and left sides.



3. Remove the snap ring, and separate the internal gear from the output flange.

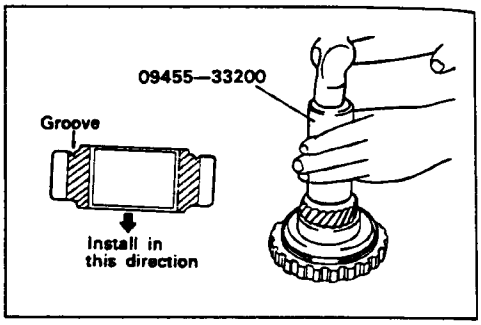


REASSEMBLY

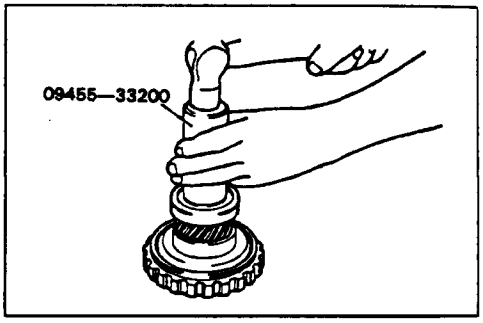
1. Using special tool (09455—33200) press the ball bearing and transfer drive gear onto the output flange.

   CAUTION
   Replace the output flange and transfer drive gear as a set.

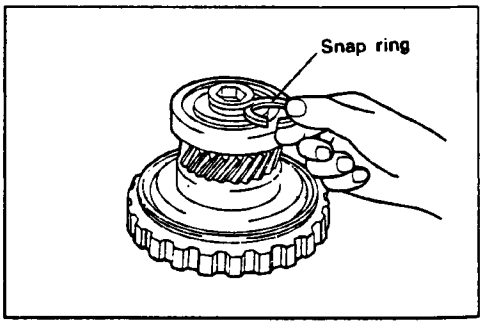
2. Install the transfer drive gear in the proper direction noting the groove in the side surface.



3. Install the ball bearing with special tool (09455—33200).

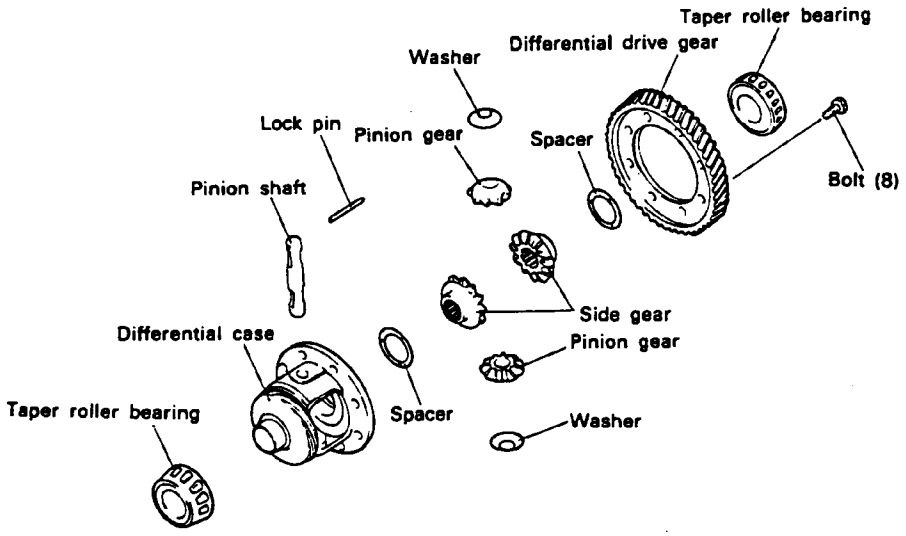


4. Select the thickest snap ring that can be installed in the groove.



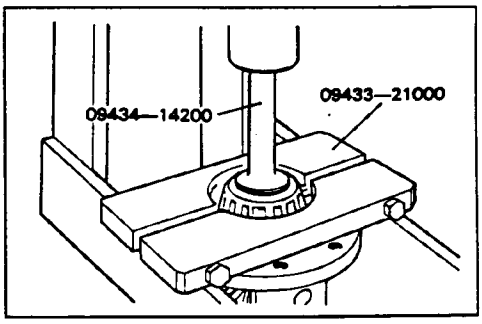
DIFFERENTIAL ASSEMBLY

COMPONENTS

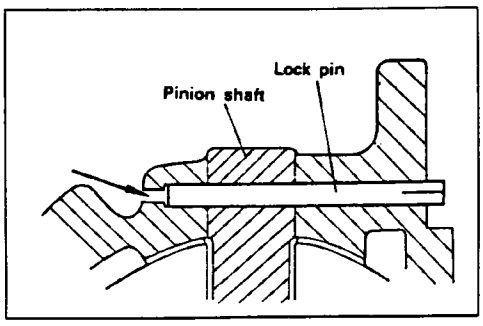


DISASSEMBLY

1. Remove the drive gear retaining bolts and remove the drive gear from the differential case.
2. Remove the tapered roller bearing inner race by using the special tools (09433—21000, 09434—14200).

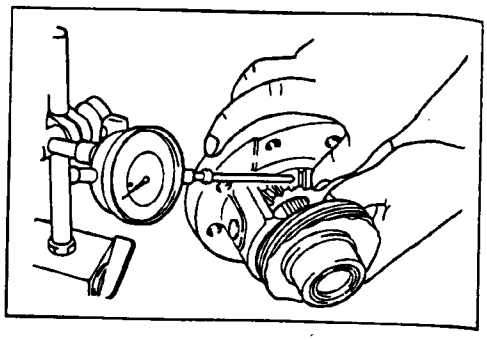


3. Drive out the lock pin with a punch inserted in hole "A".
4. Remove the pinion shaft, pinion gears and washers.
5. Remove the side gears and spacers.
   Seperate the grears and spacers into right and left sides.



REASSEMBLY

1. With the spacers installed on back of the differential side gears, install the gear in the differential case. If you are reusing the parts, install them in their original positions noted during disassembly. If using new differential side gears, install spacers of medium thickness $1.0\ ^{0}_{-0.07}$ mm ($0.039\ ^{0}_{-0.03}$ in.).
2. Install the washers on back of the pinion gears, install the gears in the differential case, and then insert pinion shaft.

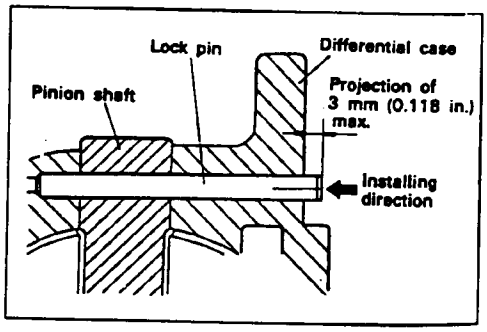


3. Measure the backlash between the side gear and pinion gear. Backlash should be 0.025—0.150 mm (0.0010—0.0059 in.) and the right and left gear pairs should have equal backlash. If the backlash is out of specification, disassemble and reassemble them by using spacers selected for correct backlash.

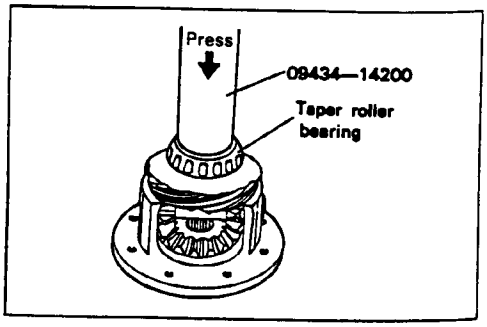
Standard value: 0.025—0.150 mm (0.0010— 0.0059 in.)

Thickness mm (in.)
$1.0\ ^{+0.16}_{+0.09}$ ($0.0394\ ^{+0.0063}_{+0.0035}$)
$1.0\ ^{+0.08}_{+0.01}$ ($0.0394\ ^{+0.0031}_{+0.0004}$)
$1.0\ ^{0}_{-0.07}$ ($0.0394\ ^{0}_{-0.0028}$)
$1.0\ ^{-0.08}_{-0.17}$ ($0.0394\ ^{-0.0031}_{-0.0067}$)
$1.0\ ^{-0.18}_{-0.25}$ ($0.0394\ ^{-0.0071}_{-0.0098}$)

4. Install the pinion shaft lock pin in direction specified in illustration. After installation, check to ensure that projection is less than 3 mm (0.118 in.).

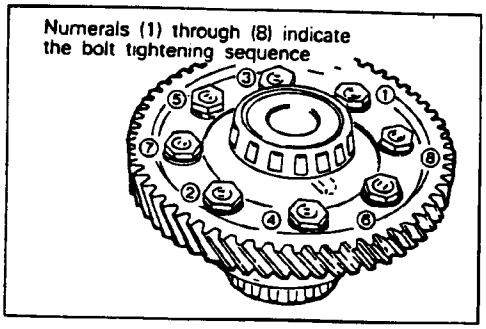


5. Press the tapered roller bearing inner races onto both ends of the differential case. Apply a load to the inner race when pressing in the bearings. Do not apply a load to the outer race.
6. Install the differential drive gear onto the case with special tool (09434—14200).



7. Apply ATF to the bolts and tighten to the specified torque in the sequence shown in the illustration.

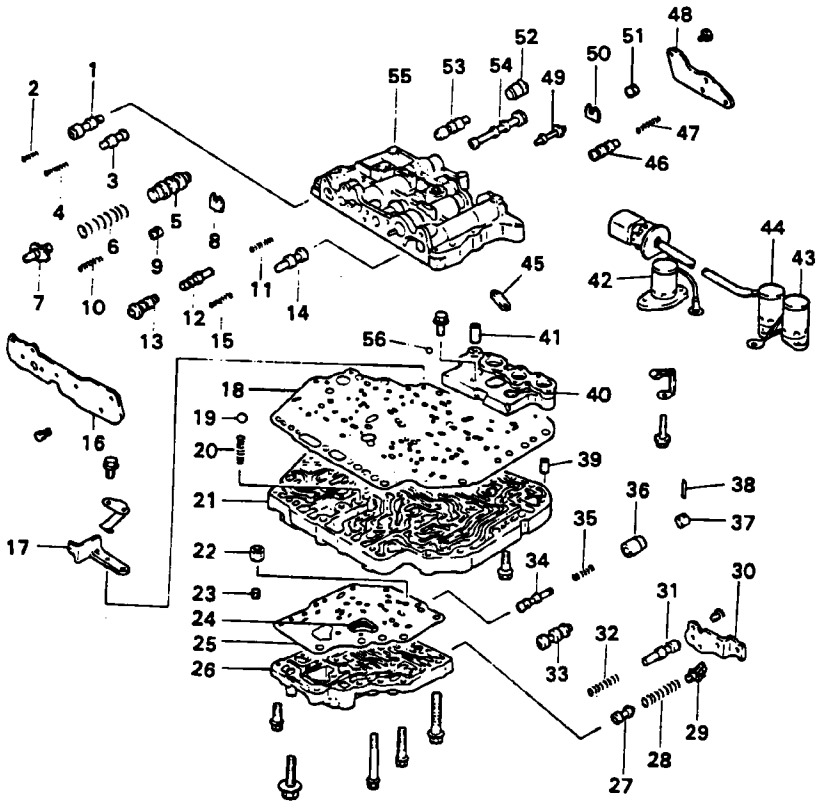
Tightening torque :
130—140 Nm (1,300—1,400 kg.cm, 94—101 lb.ft).



VALVE BODY ASSEMBLY

COMPONENTS

VALVE BODY ASSEMBLY [KM 177]

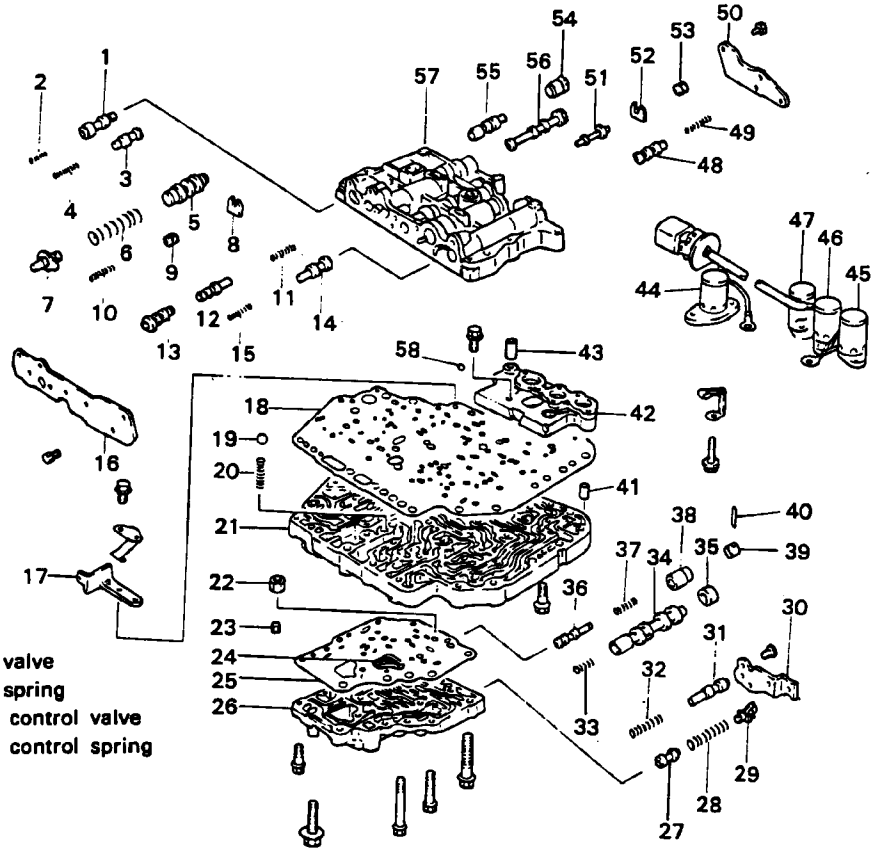


1. Pressure control valve
2. Pressure control spring
3. Torque converter control valve
4. Torque converter control spring
5. Regulator valve
6. Regulator spring
7. Adjusting screw
8. Stopper plate
9. Shift control plug
10. Shift control spring
11. Rear clutch exhaust spring
12. Rear clutch exhaust valve B
13. Rear clutch exhaust valve A
14. 2-3/4-3 shift valve
15. 2-3/4-3 shift spring
16. Front end cover
17. Valve stopper
18. Upper separating plate
19. Steel ball
20. Relief spring
21. Intermediate plate
22. Nut
23. Jet
24. Oil filter
25. Lower separating plate
26. Lower valve body
27. Reducing valve
28. Reducing spring
29. Adjusting screw
30. End cover
31. N-R control valve
32. N-R control spring
33. Plug
34. End clutch valve
35. End clutch spring
36. End clutch plug
37. Stopper
38. Pin
39. Dowel bushing
40. Block
41. Pipe
42. Pressure control solenoid valve
43. Shift control solenoid valve "B"
44. Shift control solenoid valve "A"
45. Plate
46. 1-2 shift valve
47. 1-2 shift spring
48. Rear end cover
49. Shift control valve
50. Stopper plate
51. Shift control plug B
52. N-D control sleeve
53. N-D control valve
54. Manual valve
55. Upper valve body
56. Teflon ball

VALVE BODY

COMPONENTS

VALVE BODY [KM 175]

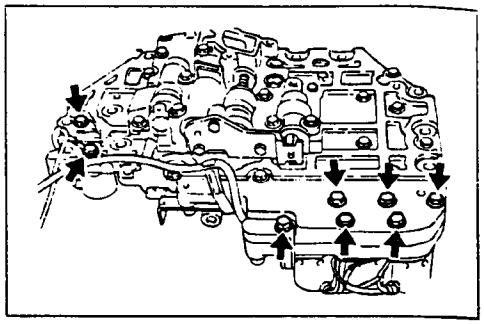


1. Pressure control valve
2. Pressure control spring
3. Torque converter control valve
4. Torque converter control spring
5. Regulator valve
6. Regulator spring
7. Adjusting screw
8. Stopper plate
9. Shift control plate
10. Shift control spring
11. Rear clutch exhaust spring
12. Rear clutch exhaust valve B
13. Rear clutch exhaust valve A
14. 2nd-3rd/4th-3rd shift valve
15. 2nd-3rd/4th-3rd shift valve
16. Front end cover
17. Valve stopper
18. Upper separating plate
19. Steel ball
20. Relief spring.
21. Intarmediate plate
22. Nut
23. Jet
24. Oil filter
25. Lower separating plate
26. Lower valve body
27. Reducing valve
28. Reducing spring
29. Adjusting screw
30. End cover
31. N-R control valve
32. N-4 control spring
33. Damper clutch control spring
34. Damper clutch control valve
35. Damper clutch control sleeve
36. End clutch valve
37. End clutch spring
38. End clutch plug
39. Stopper
40. Pin
41. Dowel bushing
42. Block
43. Pipe
44. Pressure control solenoid valve (PCSV)
45. Shift control solenoid valve B (SCSV-B)
46. Shift control solenoid valve A (SCSV-A)
47. Damper clutch conrol solenoid valve (DCCSV)
48. 1-2 shift valve
49. 1-2 shift spring
50. Rear end cover
51. Shift control cover
52. Stopper plate
53. Shift control plug B
54. N-D control sleeve
55. N-D control valve
56. Manual valve
57. Upper valve body
58. Teflon ball

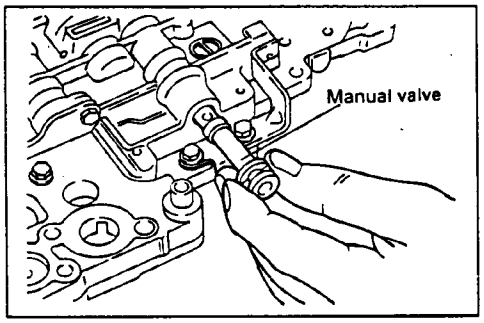
DISASSEMBLY

1. Remove the 3 solenoid valves and plate. **[KM 177]**

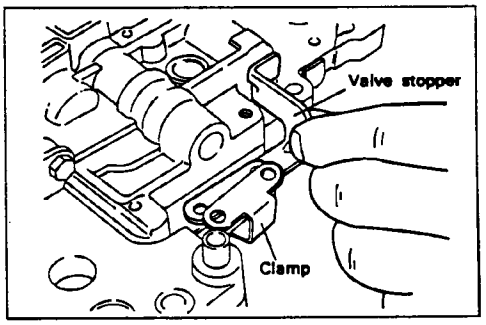
   Remove the 4 solenoid valves. **[KM 175]**



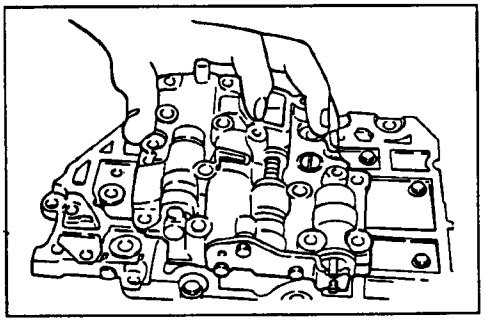
2. Remove the manual valve.



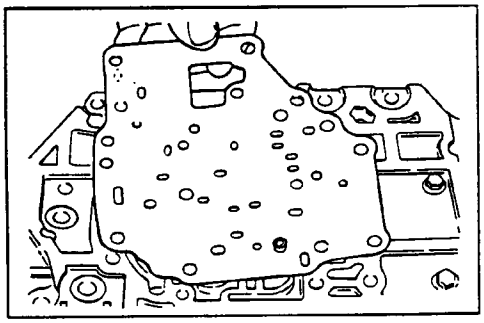
3. Remove the valve stopper and clamp.



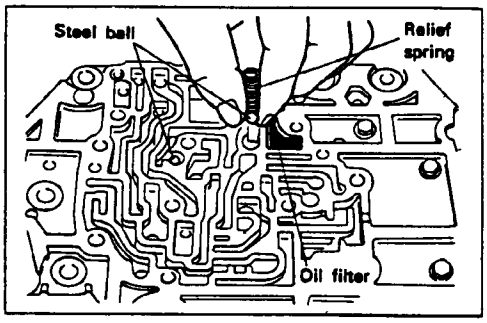
4. Remove the bolts (13), and then remove the lower valve body.



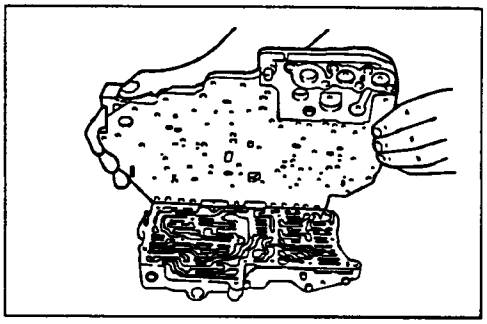
5. Remove the separating plate.



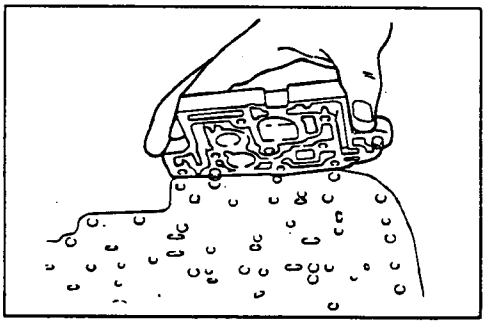
6. Remove the relief spring, two steel balls and the oil filter from the intermediate plate.



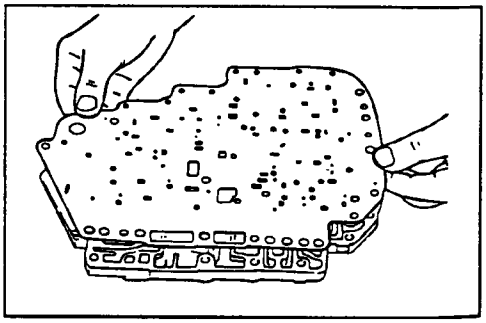
7. Remove the bolts (8), and then remove the intermediate plate and upper separation plate.



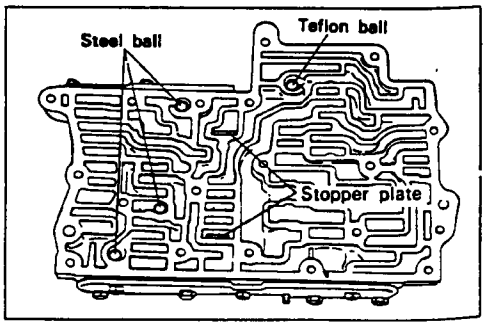
8. Remove the block.



9. Remove the upper separating plate.

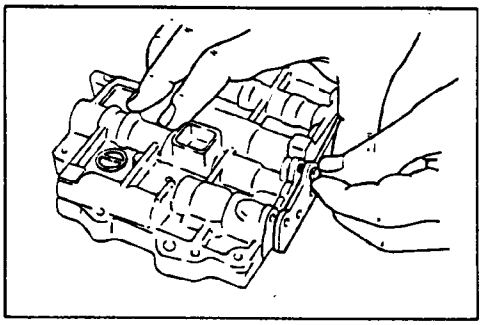


10. Remove, from the upper valve body, the three steel balls, the teflon ball, and the two stopper plates.

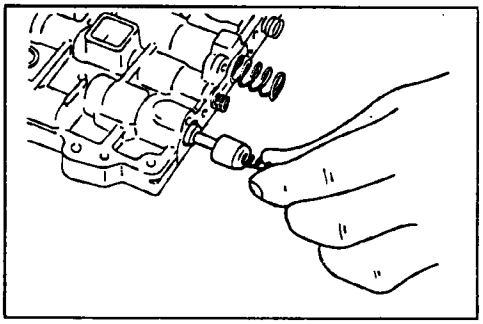


11. Remove, from the upper valve body, the seven bolts; then remove the front end cover and the adjustment screw.

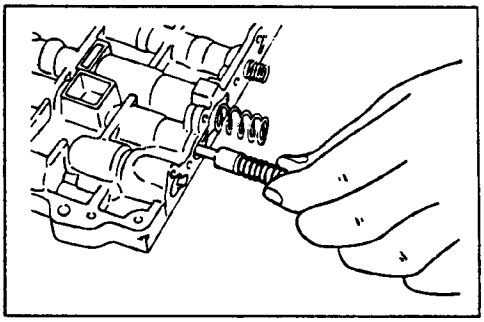
CAUTION
When removing the bolts, be sure to firmly press the front end cover (as shown in the illustration) so as to prevent the spring from causing the adjustment screw to pop out.



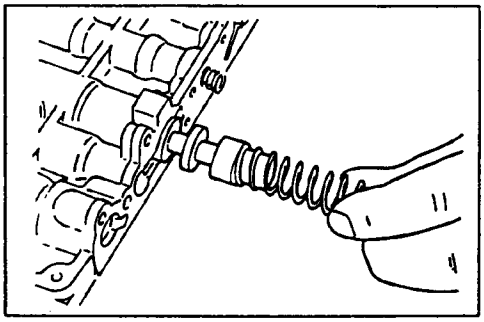
12. Remove the pressure control spring and the pressure control valve.



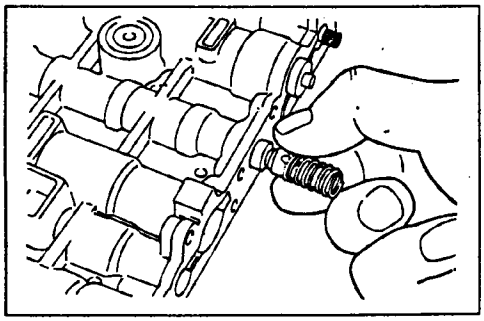
13. Remove the torque converter control spring and the torque converter control valve.



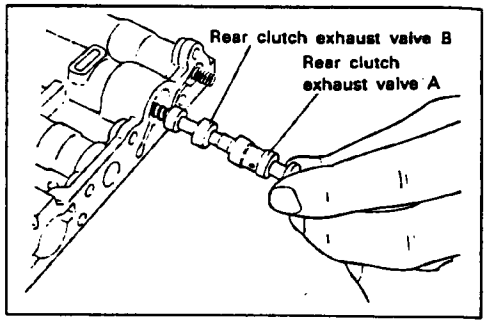
14. Remove the regulator spring and the regulator valve.



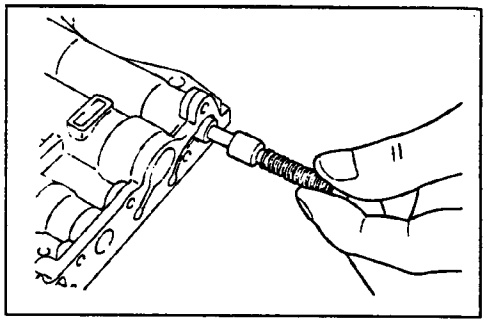
15. Remove the shift-control spring and the shift-control plug A.



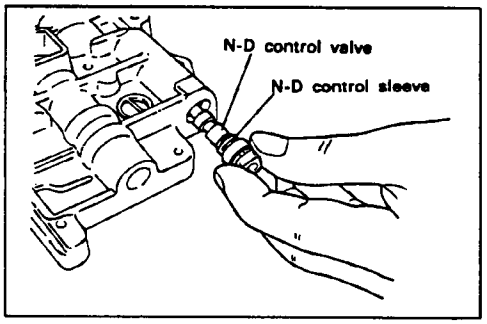
16. Remove the rear clutch exhaust valves A and B, as well as the rear clutch exhaust spring.



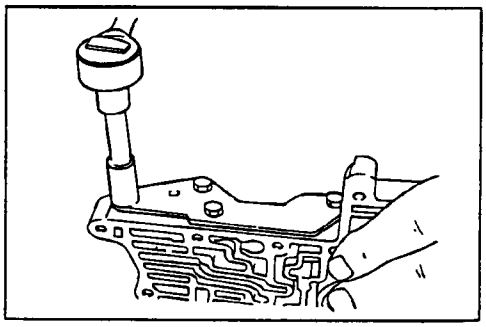
17. Remove the 2-3/4-3 shift spring and the shift valve.



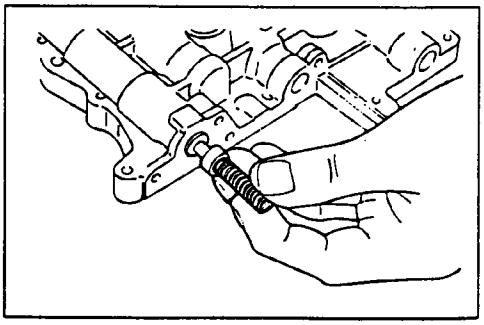
18. Remove, from the rear side of the upper valve body, the N-D control sleeve and the N-D control valve.



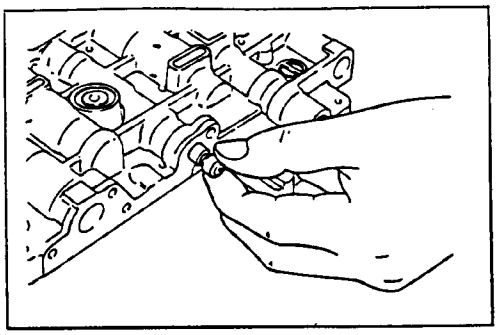
19. Remove the four bolts, and then remove the rear end cover.



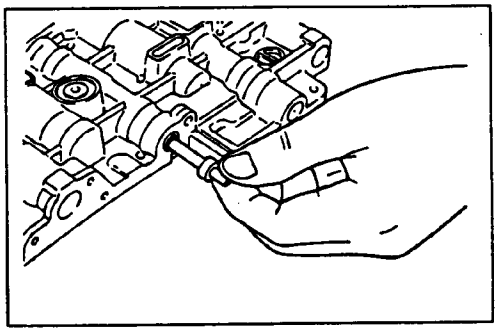
20. Remove the 1-2 shift spring and the 1-2 shift valve.



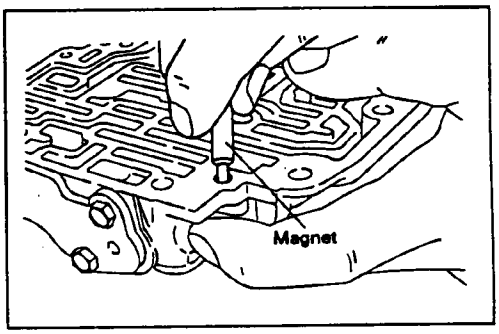
21. Remove the shift-control plug B.



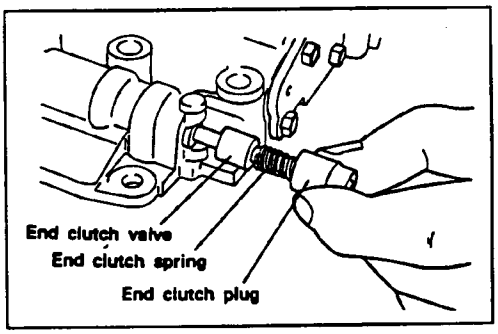
22. Remove the shift-control valve.



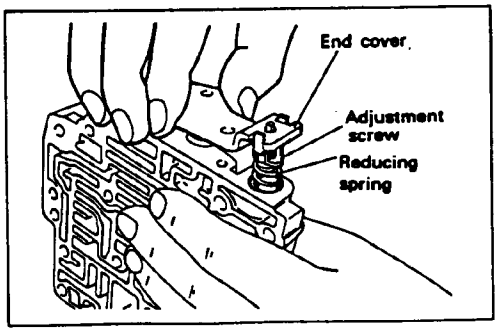
23. Using a magnet or a similar tool, extract the pin from the lower valve body, and then remove the stopper.



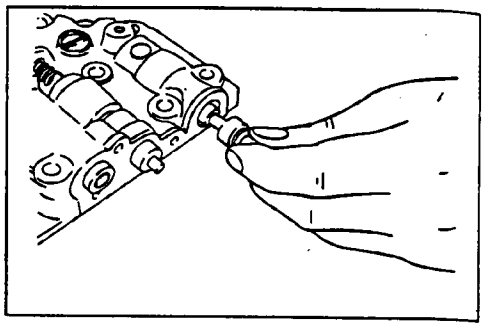
24. Remove the end clutch valve plug, end clutch spring, and end clutch valve.



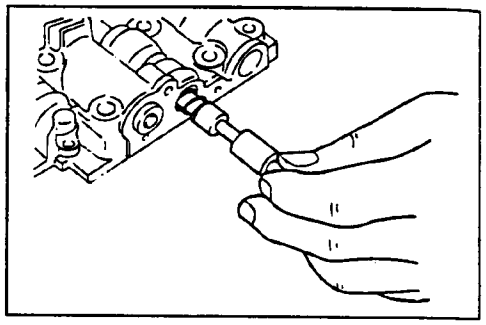
25. Remove the three bolts from the lower valve body, and then remove the end cover, adjustment screw, and reducing spring.



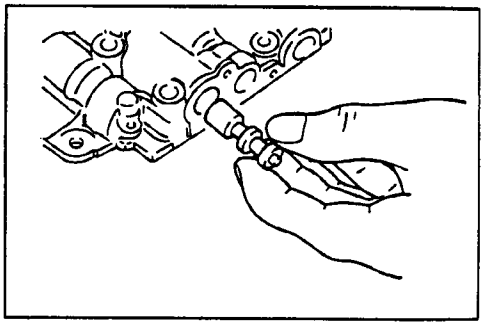
26. Remove the reducing valve.



27. Remove the N-R control valve and the N-R control spring.

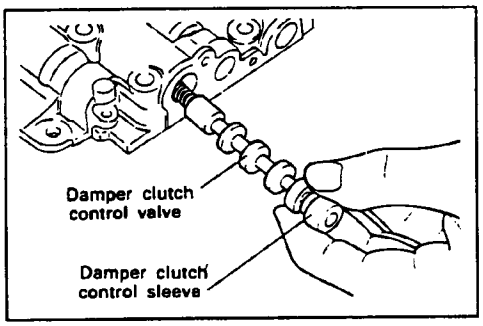


28. Remove the plug.



VALVE BODY ASSEMBLY [KM 177]

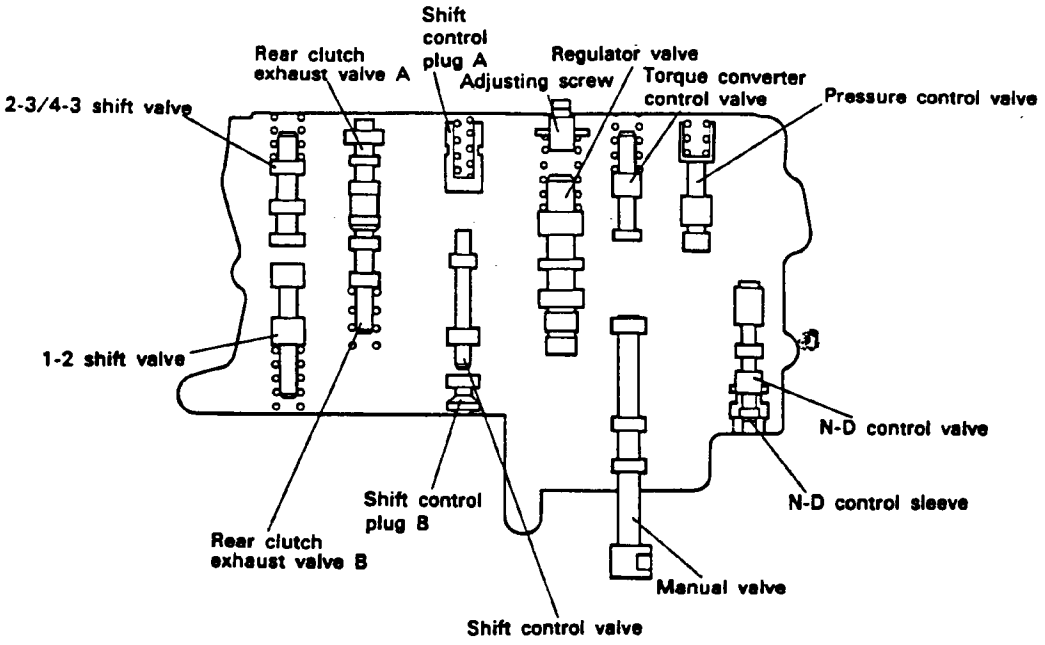
28. Remove the damper clutch control sleeve, damper clutch control valve, and damper clutch control spring.



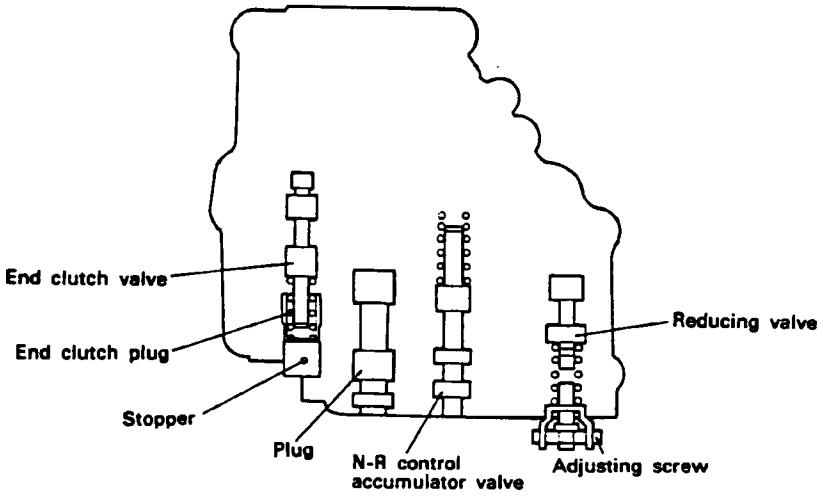
VALVE BODY [KM 175]

VALVE INSTALLATION POSITIONS

Upper Valve Body

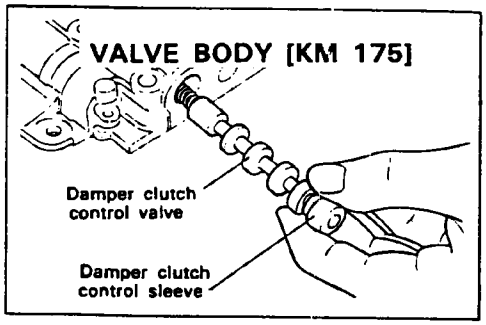


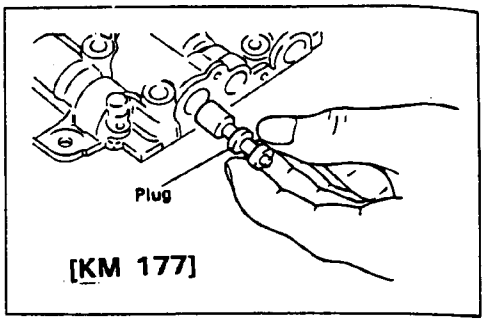
Lower Valve Body



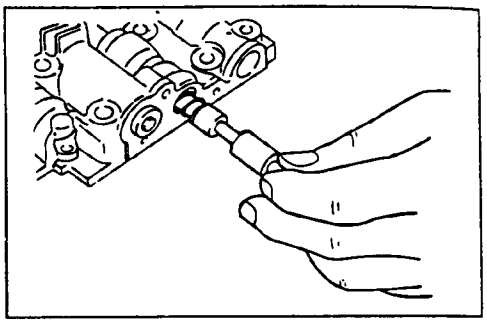
REASSEMBLY

1. Install the plug.



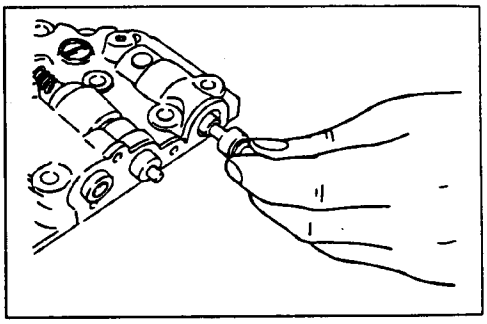


Install to the lower valve body, the damper clutch control spring, damper clutch control valve, and damper clutch control sleeve.

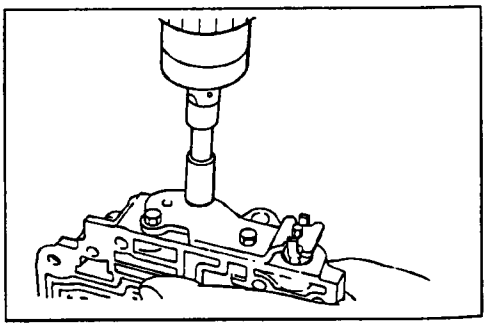


2. Install the N-R control spring and the N-R control valve.

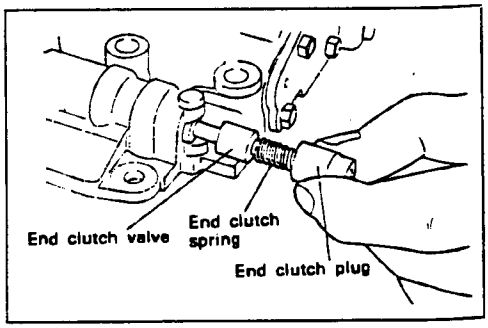
3. Install the reducing valve.



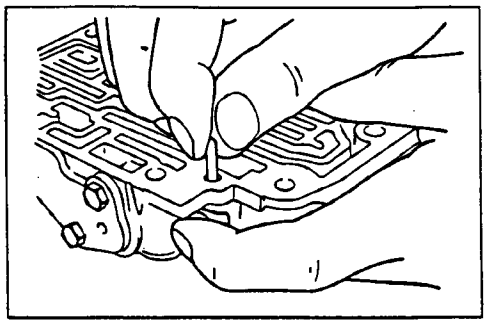
4. Install the reducing spring, adjustment screw, and end cover; then, tighten the bolts to the specified torque.



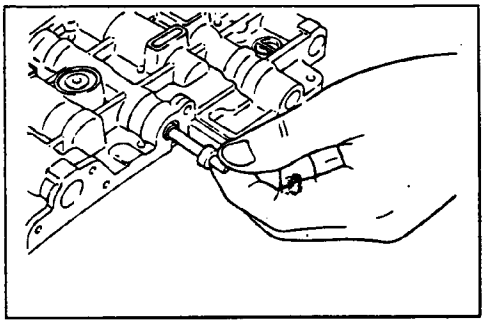
5. Install the end clutch valve, end clutch spring, and the end clutch plug.



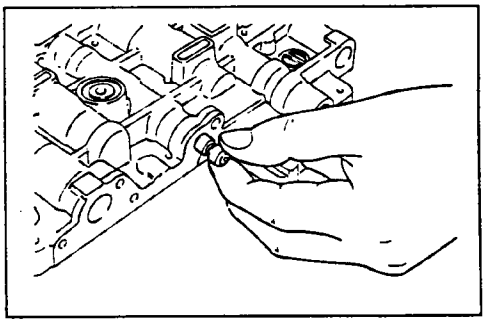
6. Install the stopper and secure it by using the push-in pin.



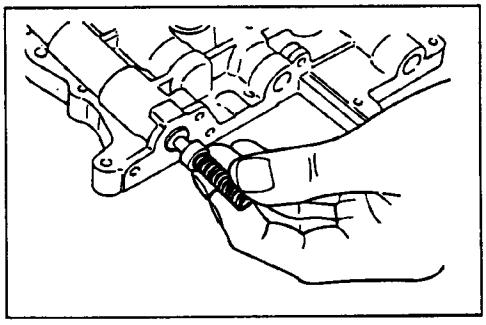
7. Install the shift-control valve to the upper valve body.



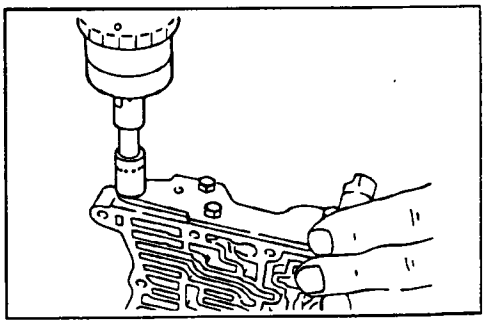
8. Install the shift-control plug.



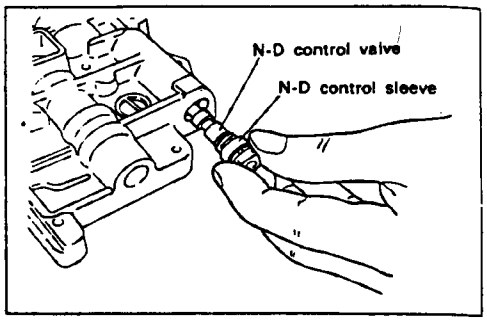
9. Install the 1-2 shift valve and 1-2 shift spring.



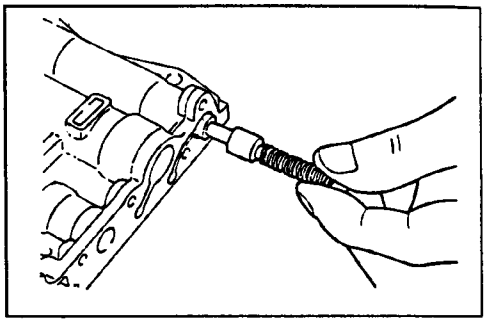
10. Install the rear end cover; then, tighten the bolts to the specified torque.



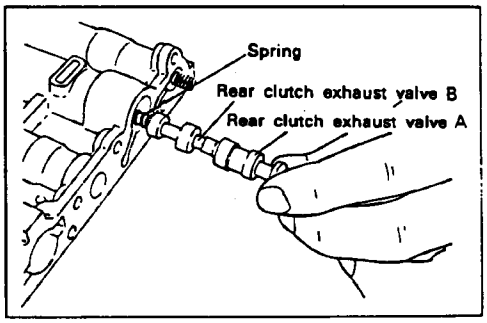
11. Install the N-D control valve and the N-D control sleeve.



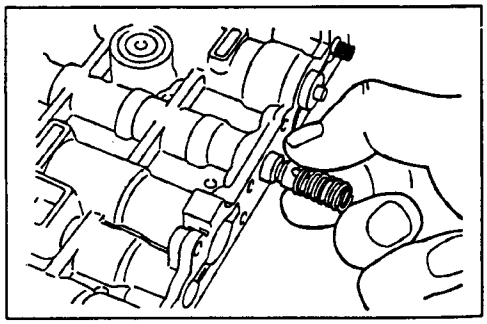
12. Install the 2-3/4-3 shift valve and the 2-3/4-3 shift spring.



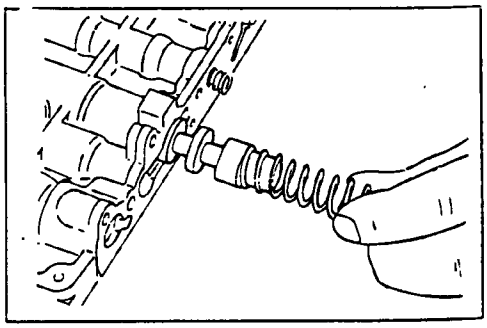
13. Install the rear clutch exhaust spring and the rear clutch exhaust valves A and B.



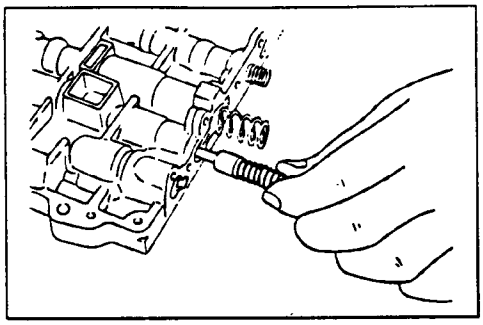
14. Install the shift-control plug and the shift control spring.



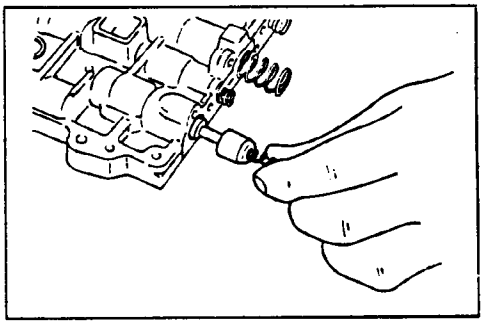
15. Install the regulator valve and the regulator spring.



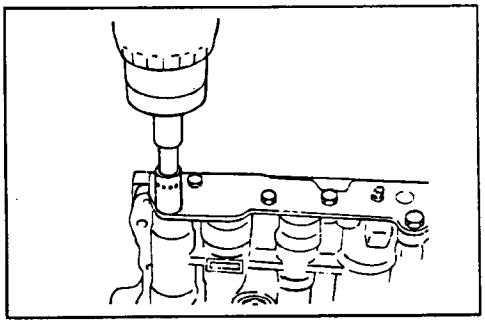
16. Install the torque converter control valve and the torque converter control spring.



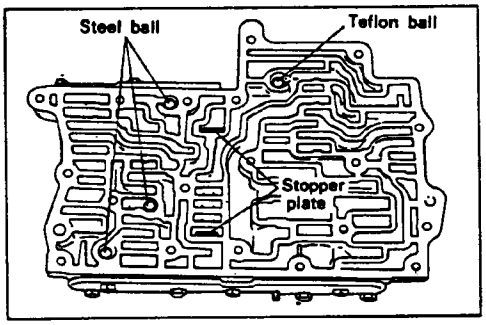
17. Install the pressure control valve and the pressure control spring.



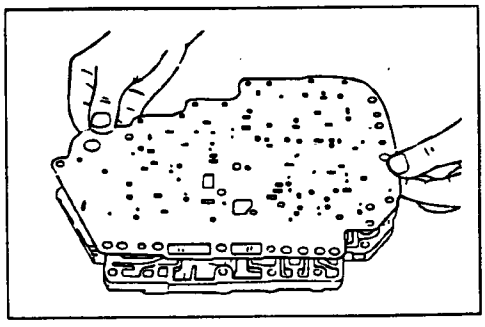
18. Install the adjustment screw and front end cover; then, tighten the bolts to the specified torque.



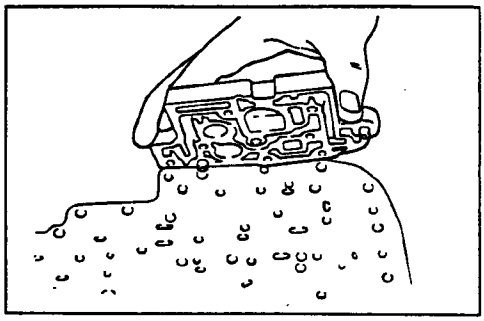
19. Install, to the upper valve body, the three steel balls, the teflon ball, and the stopper plate.



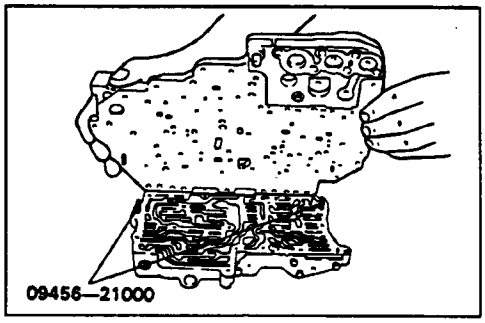
20. Install the upper separating plate.



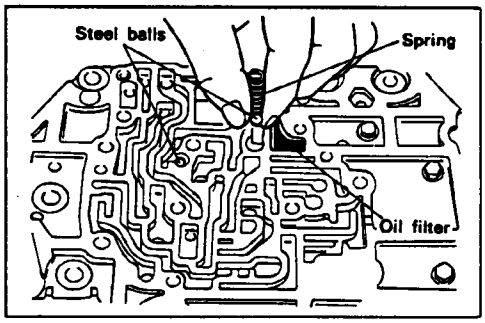
21. Install the block.



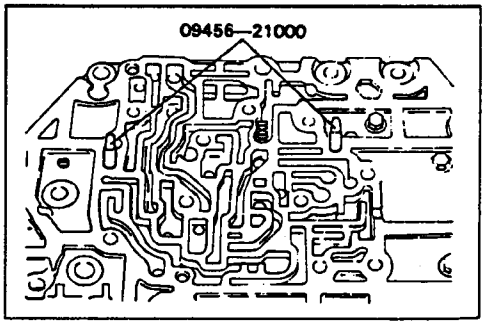
22. Install the special tool (09456—21000) then, after securing the upper separating plate and the intermediate plate by the eight installation bolts, remove the special tool.



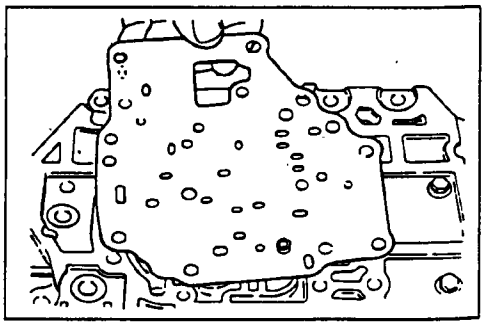
23. Install the oil filter, the two steel balls, and the spring to the intermediate plate.



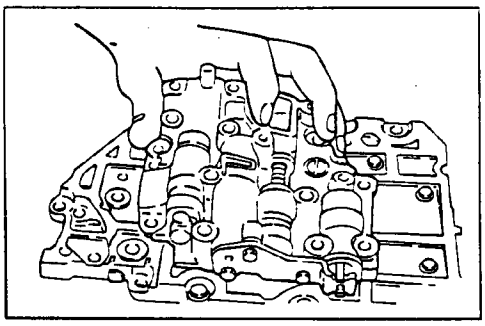
24. Install the special tool (09456—21000) to the intermediate plate.



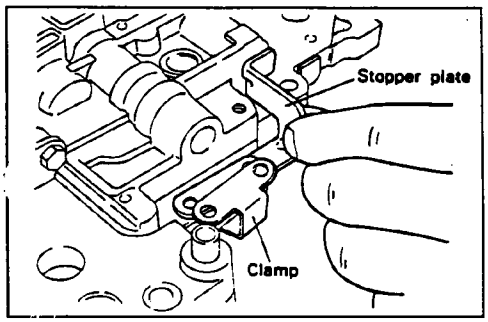
25. Install the separating plate.



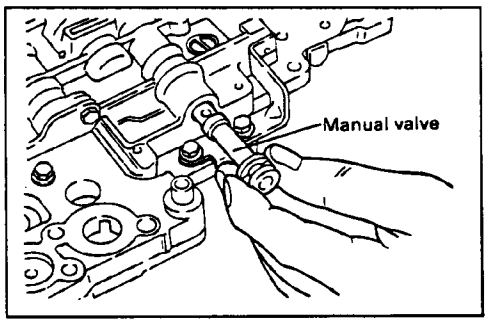
26. After securing the lower valve body using the 13 installation bolts, remove the special tool.



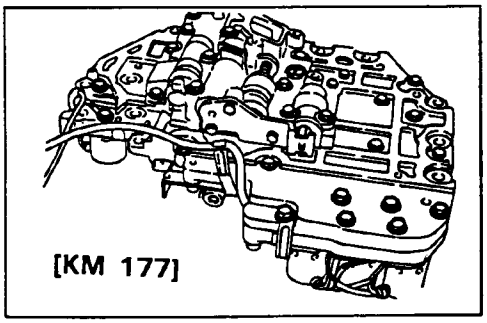
27. Install the valve stopper and clamp.



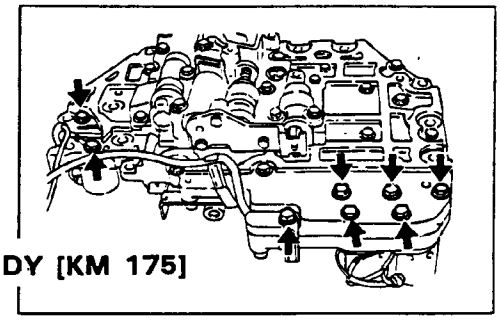
28. Install the manual valve.



29. Secure the 3 solenoid valves and plate with the mounting bolts.



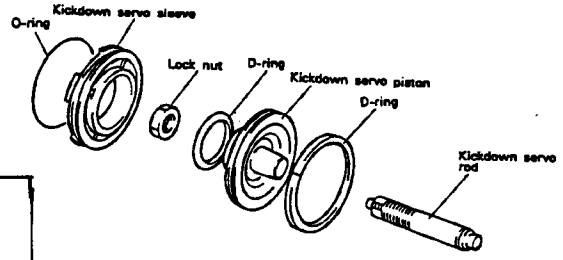
29. Secure the four solenoid valves by the installation bolts.



VALVE BODY [KM 175]

KICKDOWN SERVO ASSEMBLY

COMPONENTS

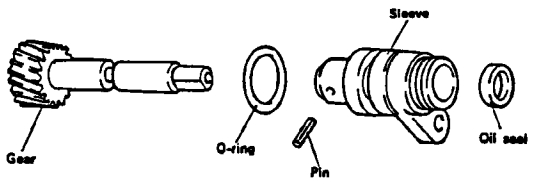


REASSEMBLY

1. Install the rod and nut to the kickdown servo piston.
2. Install two new D-rings (one large and one small) around the circumference of the piston, and then apply a small amount of ATF to the D-rings.
3. Combine the kickdown servo piston and the sleeve.
4. Install a new O-ring around the circumference of the sleeve, and then apply a small amount of ATF to the O-ring.

SPEEDOMETER SLEEVE ASSEMBLY

COMPONENTS



REASSEMBLY

1. Install a new oil seal to the shaft part of the gear, and coat a small amount of ATF onto the oil seal.
2. Insert the gear into the sleeve, and align the pin hole and the groove of the gear's shaft.
3. Tap a new spring pin into the sleeve. When tapping it in, be sure that the slit is not at the gear side.
4. Install a new O-ring into the outer groove of the sleeve, and then apply a coating of a small amount of ATF to the outer circumference of the O-ring.