

1990 AUTOMATIC TRANSMISSIONS

4L30-E Electronic Controls & Overhaul

APPLICATION

TRANSMISSION APPLICATION

Application	Transmission Model
Trooper II	THM 4L30-E

IDENTIFICATION

Identification plate is located on left hand side of transmission above mode switch. See **Fig. 1** .

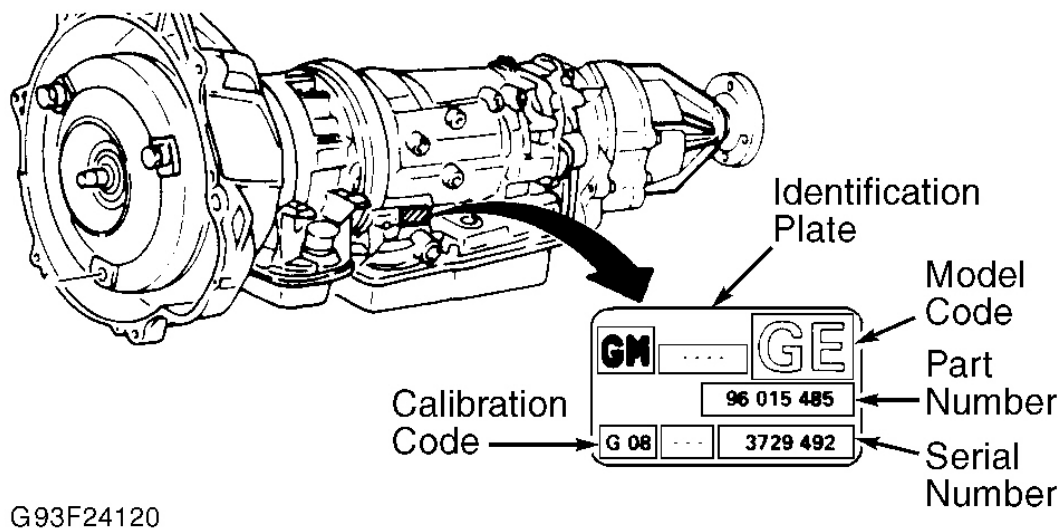
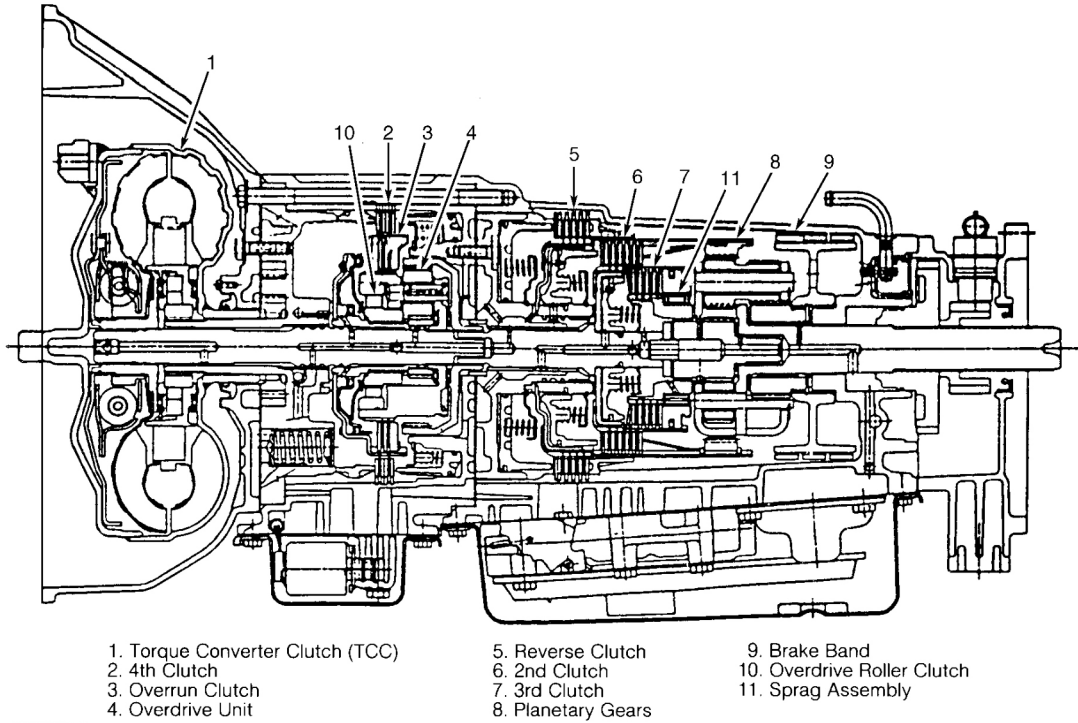


Fig. 1: Locating Transmission Identification Plate
Courtesy of ISUZU MOTOR CO.

DESCRIPTION

Automatic Transmission (TM) consists of a 3-element torque converter and dual shaft electronically controlled transmission which provides 4 forward speeds and one reverse. Torque converter consists of a pump, turbine and stator assembled in a single unit. A Transmission Control Module (TCM) located in driver side firewall is used to control transmission shifts. Input from various sensors located throughout vehicle, determines which shift control solenoid TCM will activate. See **Fig. 2** .

**Fig. 2: Identifying Transmission Component Locations**

Courtesy of ISUZU MOTOR CO.

OPERATION

CONVERTER LOCK-UP CLUTCH

In gear selector "D" and in 2nd, 3rd or 4th, torque converter clutch is activated by information received from sensors. Lock-up is controlled by engine speed, hydraulic pressure and input from TCM.

ECM INPUT SENSORS

Vehicle Speed Sensor (VSS)

VSS senses rotation of output shaft and sends data to TCM. Located on transmission.

Throttle Position Sensor (TPS)

TPS senses extent of throttle valve opening and speed of throttle valve lever motion to open valve and sends data to TCM and ECM. Located on engine.

Brake Switch

Signals TCM when brake pedal is depressed. Located on brake pedal.

Kick Down Switch

Signals TCM when accelerator has been fully depressed. Located on accelerator pedal.

Mode Switch

Signals TCM of select lever position. Located on transmission selector shaft.

Power Drive Switch

Signals TCM of Power Drive selection. Located on center console.

Sump Temperature Sensor

Senses transmission oil temperature and signals TCM.

Coolant Temperature Sensor

Senses engine coolant temperature and signals TCM.

Engine Speed Sensor

Sends signal monitoring engine speed to TCM from IGN module also signals ECM.

Air Conditioner Information Switch

Signals TCM when air conditioner switch is turned on or off

Self-Diagnostic Input

By monitoring ground (GND), location of failure is shown on transmission monitor "CHECK TRANS" by flashing code number.

Barometer Sensor (Optional)

Senses altitude and signals TCM.

Winter Switch

Signals when winter mode is selected and signals TCM. Located on center console.

Shift Solenoid (1-2/3-4, 2-3)

Selects shift point and gear position suited to vehicle running condition on basis of TCM signal.

Band Apply Solenoid

Controls oil flow suited to vehicle operation on basis of TCM signal.

Torque Converter Clutch (TCC) Solenoid

Controls clutch engagement and disengagement based on vehicle operation and TCM signal.

Force Motor (Pressure Regulator Valve)

Adjusts oil pump output to line pressure based on vehicle operation and TCM signal.

Power Drive Lamp

Signals driver whether vehicle is in POWER mode or not.

Winter Drive Mode Lamp

Signals driver whether vehicle is in WINTER DRIVING MODE or not.

TM Monitor Lamp (CHECK TRANS)

Signals driver of a failure in diagnostic system and displays self-diagnosis code.

Diagnostic 1 Connector

Transmits self-diagnosis data to TECH 1 or Tester.

SHIFT CONTROL**Economy Mode**

Normal operation, transmission shifts at normal shift points for optimum performance and economy.

Power Mode

Shift points of power drive mode are shifted at higher speed. Lock-up clutch and overdrive are cancelled when power mode is selected.

Winter Mode

Is used exclusively for starting in 3rd gear in low traction or slippery surfaces. It can be used only in "D" and overrides "PWR/ECO" switch when applied.

TRANSFER

A 2-speed transfer with constant mesh gears which allows smooth shifting between 2 and 4 wheel drive mode. It has synchronized gears between Low and High when actuated by transfer engagement lever.

TCM BACK-UP FUNCTION**Fail-Safe Function**

When a fault occurs in a signal from a sensor, TCM ignores that signal and assumes a pre-programmed value that allows engine to run.

Limp Home

A major system failure occurs which could affect safety or damage transmission under normal vehicle operation, diagnostic system detects fault and overrides TCM. "CHECK TRANS" light flashes to alert driver. Fault should be corrected as soon as possible.

LUBRICATION & ADJUSTMENT

NOTE: See appropriate **SERVICING** article.

ON-VEHICLE SERVICE

DRIVE AXLE SHAFTS

NOTE: See appropriate **AXLE SHAFTS** article in **DRIVELINE/AXLES**.

TROUBLE SHOOTING

NOTE: Prior to starting any testing or diagnosing on transmission, ensure basic electrical connections are in good condition and transmission fluid level is correct. If a fault is recorded and identifiable as an electronic fault, refer to **SELF-DIAGNOSIS** . If a fault is noted but not recorded, conduct a road test and hydraulic pressure test to correctly identify problem. See **PERFORMANCE TESTS** .

NO START

Selector lever not in "P" or "N", selector lever linkage incorrectly adjusted, oil pump seized or converter seized.

NO PARK OR RATCHETING NOISE

Parking pawl return spring weak or parking linkage damaged or incorrectly adjusted.

NO DRIVE

Parking pawl return spring broken.

NEUTRAL - DRIVE DELAY

Oil level low.

SLIPS OR SHUDDERS IN 1ST

Low oil pressure, defective converter, leak in servo apply circuit, misadjusted brake band or defective sprag clutch.

NO REVERSE

Reverse clutch faulty or selector misadjustment.

DRIVES IN NEUTRAL

Selector misadjustment or band adjustment too tight.

NEUTRAL - DRIVE SHIFT HARSH

Band control solenoid stuck or defective.

POOR ACCELERATION

Winter program selected or safety mode activated.

NO 1-2 SHIFT

Selector lever in M1, leak in 2nd clutch or apply circuit (pump hub seal rings) or 1-2/3-4 solenoid or shift valve stuck.

1-2 SHIFT PROBLEM

Leak in 2nd clutch or apply circuit, incorrect pressure to 2nd clutch 1-2 accumulator valve blocked or incorrect throttle signal pressure.

NO 2-3 UPSHIFT

Selector lever in M2 or 2-3 solenoid or shift valve stuck.

2-3 SHIFT PROBLEM

Misadjusted brake band, leak in servo release circuit, leak in 3rd clutch or apply circuit, band control solenoid defective or stuck or incorrect oil pressure.

NO 3-4 UPSHIFT

Selector lever in M3, 1-2/3-4 solenoid or shift valve stuck or leak in 4th clutch or apply circuit.

3-4 SHIFT PROBLEM

Leak in 4th clutch or apply circuit, incorrect oil pressure or overrun clutch not releasing.

NO TCC APPLY

TCC solenoid or TCC valve stuck, leak in TCC signal circuit or leak in TCC apply circuit ("O" ring input shaft).

TCC SHUDDER

Defective converter or incorrect apply pressure.

NO TCC RELEASE

TCC solenoid or TCC valve stuck or release circuit blocked.

NO POWER DRIVE MODE

Electronic fault or tip switch defective.

NO WINTER DRIVE MODE

Electronic fault or tip switch defective.

NO KICKDOWN

Electronic fault or switch defective.

NO DOWNSHIFT

1-2/3-4 or 2-3 shift valves or solenoids stuck.

1-2/2-3/3-4 SHIFTS HIGH OR LOW

Power or Economy mode selection faulty or electronic fault.

NO ENGINE BRAKING IN D3, M3, M2 OR M1

Overrun clutch or apply circuit leak.

TRANSMISSION OVERHEATING

Oil level too high, no converter clutch or excessive load when driving in safety mode or winter mode.

OIL BLOWING OUT OF BREATHER

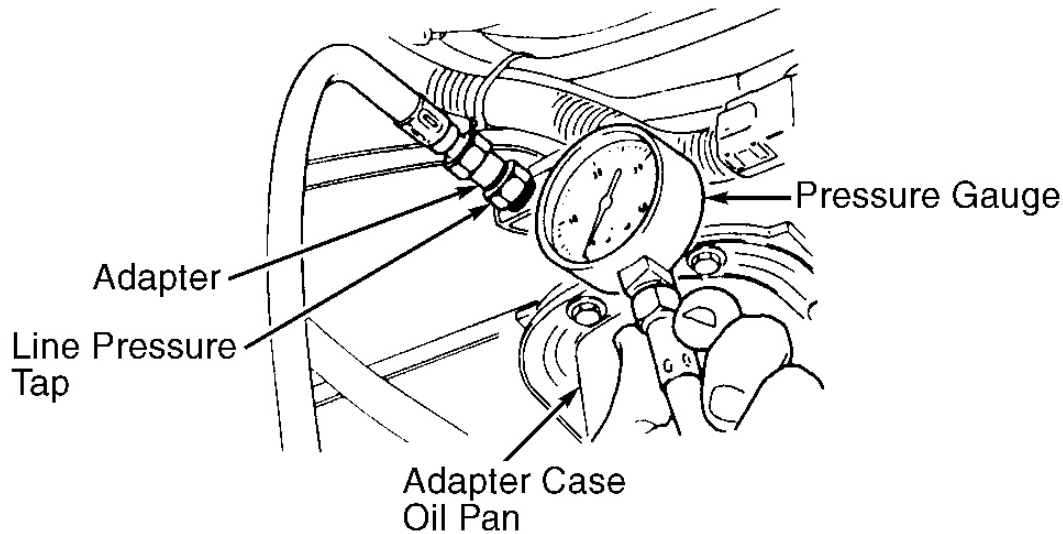
Oil level too high or transmission overheating.

PERFORMANCE TESTS**HYDRAULIC PRESSURE TESTS**

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

1. Install oil pressure gauge and Adapter (J-29770) to connector on converter housing. See **Fig. 3** . Warm engine to operating temperature, set parking brake and fully depress brake pedal. **DO NOT** perform test for more than 5 seconds with engine speed at more than 1500 RPM. Perform test in "D", "1", "2", "3" and reverse. Allow 2 minutes between tests for cooling.
2. Engine idle speed drops when idling in "D", "1", "2", "3" and reverse. Lower engine speed is stall speed. During testing, engine RPM will barely exceed 2100 RPM. See **HYDRAULIC PRESSURE** table.



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Fig. 3: Checking Line Pressure
Courtesy of ISUZU MOTOR CO.

LINE PRESSURE SPECIFICATIONS

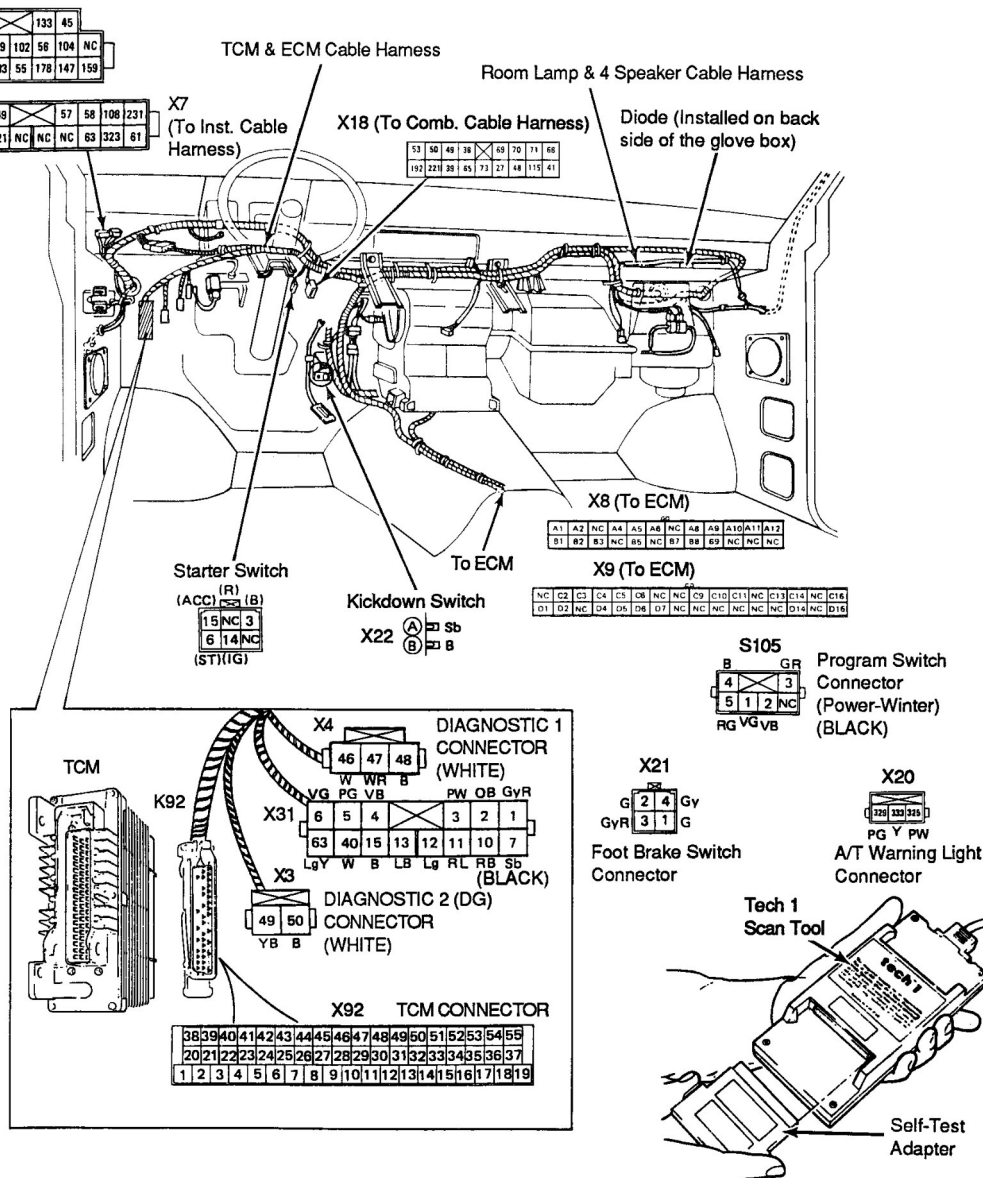
Application & Mode	Lever Position	Line Pressure psi (kPa)	Force Motor Current
Engine Idling			
Normal/Power	"D", "3" & "2"	45.9 (316.4)	0.97 A
Winter	"D"	45.9-52.3 (316.4-360.6)	0.97 A
Normal/Power Winter	"R"	57.9-65.8 (399.2-453.6)	0.97 A
At Stall Speed			
Normal & Power	"D", "3", "2" & "1"	149.4-161.1 (1030.1-1110.7)	0.15 A
Winter	"D"	149.4-161.1 (1030.1-1110.7)	0.15 A
Normal/Power Winter	"R"	186.9-201.5 (1288.6-	0.15 A

1389.3)

SELF-DIAGNOSIS

Automatic transmission has a Transmission Control Module (TCM) which controls clutch lock-up operation and also provides self-diagnosis capabilities. See **Fig. 4**. If a problem is present within system, "CHECK TRANS" light will come on and display self-diagnosis code. Retrieve self-diagnosis code, see **TECH 1 DISPLAY DATA**.

X19 (To Inst. Cable Harness)



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Fig. 4: Identifying Wiring Harnesses & TECH 1 Self-Test Adapter

Courtesy of ISUZU MOTOR CO.

TECH 1 DISPLAY DATA

TECH 1 SCAN TOOL

Provides step-by-step instruction for electronic diagnosis of transmission. When TECH 1 is connected to transmission diagnostic connector, it reads fault codes stored in Transmission Control Module (TCM). Refer to TECH 1 Scan Tool Operator's Manual for operating instructions.

MODE F0: DATA LIST

Provides current actual values of all important sensors and signals in system. For connector views and locations, see **Fig. 4** . For circuit description, see **WIRING DIAGRAMS** . Quick checklist provides summarized steps of electronic functions that can be used after repair of mechanical or hydraulic problem. See **Fig. 5** and **Fig. 6** . For MODE F0: DATA LIST TESTS, see **Fig. 7 -Fig. 28** .

DATA LIST F0 QUICK CHECK

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
01	BATTERY VOLTAGE	Ignition ON	9 V < voltage < 16 V	48, 49
02	TORQUE CONTROL	Not used	—	—
03	PRESS. REG. SOL.	Engine at idle speed Parking brake on	approx. 700 mA	32, 33
04	CALCULAT. PRESS.	Selector lever position "D"	2.5-85 psi (0.2-6.0 kg/cm ²)	
05	SOLENOID 1-2/3-4	Vehicle traveling at a speed of approx. 32 MPH:50 km/h (approx. 44 MPH:70 km/h) Selector lever position "2" ("3")	ACTIVE 12 V	17, 25
06	SOLENOID 2-3	Vehicle traveling at a speed of approx. 6 MPH:10 km/h (approx. 18 MPH:30 km/h) Selector lever position "1" ("2")	ACTIVE 12 V	26, 28
07	BAND APPLY SOL	Engine at idle speed Selector lever position "1"	ACTIVE	34, 35
08	BAND APPLY SOL	Actuation for 1 sec every 15 seconds	approx. 51% DC	
09	TCC SOLENOID	Vehicle traveling at a speed of approx. 50 MPH:80 km/h Selector lever position "D"	ACTIVE 12 V	29, 36

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Fig. 5: Mode F0: Data List Quick Check (1 Of 2)
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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
10	BRAKE SWITCH	Ignition ON Actuate brake	ACTIVE 0 V	—
11	AT INPUT SPEED	Engine at idle speed Selector lever position "N" Engine at idle speed Selector lever position "D"	approx. 800 RPM (Below 1000 RPM) approx. 800 RPM (Below 1000 RPM)	31, 46
12	AT OUTPUT SPEED	—	—	39, 46
13	SELECTOR INFORM.	Ignition ON Shift through all selector lever positions	Dependent on selector lever position: P, R, N, D, 3, 2, 1	56, 82
14	ACTUAL GEAR	Vehicle traveling at a speed of approx. 62 MPH:100 km/h, selector lever position "D"	- 4 -	41
15	SELECTOR PIN A	Ignition ON Selector lever position "P"	ACTIVE 12 V	56, 82
16	SELECTOR PIN B	Ignition ON Selector lever position "R"	ACTIVE 12 V	56, 82
17	SELECTOR PIN C	Ignition ON Selector lever position "D"	ACTIVE 12 V	56, 82
18	SELECTOR PIN G	Ignition ON Selector lever position "P"	ACTIVE 12 V	56, 82
19	TPS SIGNAL	Ignition ON Throttle valve in idle speed position Throttle valve in full load position	0.1 V to 0.96 V 4.9 V or less	21, 22
20	KICKDOWN SWITCH	Ignition ON Depress accelerator to stop	ACTIVE 0 V	77
21	TPS REF. VOLTAGE	Engine at idle speed	5 V	21, 22
22	A/C INFORMAT. SW.	Not used	—	—
23	TRANSM. OIL TEMP.	Engine running	approx. 176°F/80°C 1.02V	65, 66
24	COOLANT TEMP SW.	Ignition ON	ACTIVE 0 V	—
25	WINTER SW. (- D -)	Ignition ON Selector lever position "D" Press "Winter Program" key	ACTIVE 0 V	—
26	PROGRAM SWITCH	Ignition ON Hold down tip switch for the "Sport Program"	ACTIVE 0 V	—

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Fig. 6: Mode F0: Data List Quick Check (2 Of 2)
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Test Step	TECH 1 Display	Notes	Nominal Values	Possible Trouble Codes
01	BATTERY VOLTAGE	Ignition ON	9 V < voltage < 16 V	48, 49
02	TORQUE CONTROL	Not used		
Trouble-Shooting: ● Connect voltmeter to B+ and B- of battery Range: 20 V DC ● Ignition ON > 9.0 V ● Engine runs > 13.0 V > 16.0 V Note: On engines equipped with ECM, the idle speed is automatically increased when the voltage falls below 11.8 V.				
		Nominal Value:	Cause of Fault:	
			● Battery discharged ● Contacts corroded ● Lead interruption between K 92/Ter. 28 and B+ ● Alternator and/or regulator, check ● Alternator and/or regulator, check	

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Fig. 7: Mode F0: Data List - Test Steps 01 & 02
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
03	PRESS. REG. SOL.	Engine at idle speed	approx. 700 mA	32, 33
04	CALCULAT. PRESS.	Parking brake on Selector lever position "D"	0.2–6.0kg/cm ² (2.8–85psi)	
Trouble-shooting: ● Ignition OFF Disconnect plug from control unit K 92 Connect ohmmeter between X 92/Ter.40 and Ter. 41 3.7 – 4.7 Ω - If the value is not attained: Disconnect plug X 38 from transmission intermediate housing (Adapter case) Connect ohmmeter between plug K 92/Ter. 40 and X 38/Ter. B 0 Ω - Connect ohmmeter between plug K 92/Ter. 41 and X 38/Ter. E 0 Ω - Connect ohmmeter between X 38/ Ter. B and ground on transmission ∞ Ω - Connect ohmmeter between X 38/ Ter. E and ground on transmission ∞ Ω Notes: In the emergency program, force motor OFF and the fluid pressure to max. There is no ground to the valves.				
		Nominal Value:	Cause of Fault:	
			● Lead interruption in intermediate housing ● Short circuit in wiring harness to pressure regulator ● Pressure regulator defective ● Control unit K92(TCM) defective ● Lead interruption ● Lead interruption ● Short circuit to ground in intermediate housing ● Short circuit to ground in intermediate housing	

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Fig. 8: Mode F0: Data List - Test Steps 03 & 04
Courtesy of ISUZU MOTOR CO.

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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
05	SOLENOID 1 – 2/3 – 4	Vehicle travelling at a speed of approx. 50 km/h:32 mph (approx. 70 km/h:44 mph) Selector lever position "2" ("3")	ACTIVE 12 V	17, 25

Trouble-shooting: - Ignition OFF - Disconnect plug from K 92 - Connect ohmmeter between X 92/Ter.48 and Ter. 54 If the value is not attained: - Disconnect plug X 39 from transmission main housing - Connect ohmmeter between plug K 92/Ter. 48 and X 39/Ter. D - Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C - Connect ohmmeter between X 39/Ter. D and ground on transmission - Connect ohmmeter between X 39/Ter. C and ground on transmission	Nominal Value: 17.5–18.5Ω 0 Ω 0 Ω ∞ Ω ∞ Ω	Cause of Fault: - Lead interruption - Short circuit in wiring harness to solenoid valve - Solenoid valve defective - Control unit K 92 defective - Lead interruption - Lead interruption - Short circuit to ground in main housing - Short circuit to ground in main housing
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Solenoid valve	Gear	1.	2.	3.	4.
1 – 2/3 – 4	0 V	12 V	12 V	0 V	

Note: When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12V may be displayed, which does not mean that the respective valves are switched on and "active".

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Fig. 9: Mode F0: Data List - Test Step 05
 Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes												
06	SOLENOID 2 – 3	Vehicle travelling at a speed of approx. 10 km/h:6 mph (approx. 30 km/h:18 mph) Selector lever position "1" ("2")	ACTIVE 12 V	26, 28												
Trouble-shooting: ● Ignition OFF Disconnect plug from K 92 Connect ohmmeter between X 92/Ter.43 and Ter. 54 If the value is not attained: Disconnect plug X 39 from transmission main housing Connect ohmmeter between plug K 92/Ter. 43 and X 39/Ter. A Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C Connect ohmmeter between X 39/Ter. A and ground on transmission Connect ohmmeter between X 39/Ter. C and ground on transmission		Nominal Value: 17.5–18.5Ω 0 Ω 0 Ω ∞ Ω ∞ Ω	Cause of Fault: ● Lead interruption ● Short circuit in wiring harness to solenoid valve ● Solenoid valve defective ● Control unit K 92 defective ● Lead interruption ● Lead interruption ● Short circuit to ground in main housing ● Short circuit to ground in main housing													
<table border="1"> <thead> <tr> <th>Solenoid valve</th> <th>Gear</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>2 – 3</td> <td></td> <td>12 V</td> <td>12 V</td> <td>0 V</td> <td>0 V</td> </tr> </tbody> </table>					Solenoid valve	Gear	1	2	3	4	2 – 3		12 V	12 V	0 V	0 V
Solenoid valve	Gear	1	2	3	4											
2 – 3		12 V	12 V	0 V	0 V											
Note: When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12V may be displayed, which does not mean that the respective valves are switched on and "active".																

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Fig. 10: Mode F0: Data List - Test Step 06
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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
07	BAND APPLY SOL.	Engine at idle speed	ACTIVE	34, 35
08	BAND APPLY SOL.	Selector lever position "1" Actuation for 1 sec. every 15 seconds	approx. 51 % DC	
Trouble-shooting:		Nominal Value:	Cause of Fault:	
● Ignition OFF - Disconnect plug from K 92 - Connect ohmmeter between X 92/Ter. 45 and Ter. 54		10Ω	● Lead interruption ● Short circuit in wiring harness to solenoid valve ● Solenoid valve defective ● Control unit K 92 defective	
If the value is not attained:				
Disconnect plug X 39 from transmission main housing				
Connect ohmmeter between plug K 92/Ter. 45 and X 39/Ter. B		0 Ω	● Lead interruption	
Connect ohmmeter between plug K 92/Ter. 54 and X 39/Ter. C		0 Ω	● Lead interruption	
Connect ohmmeter between X 39/Ter. B and ground on transmission		∞ Ω	● Short circuit to ground in main housing	
Connect ohmmeter between X 39/Ter. C and ground on transmission		∞ Ω	● Short circuit to ground in main housing	
Note: When the control unit switches to Emergency Program, there is no longer ground to the valves. Despite this, 12V may be displayed, which does not mean that the respective valves are switched on and "active".				

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Fig. 11: Mode F0: Data List - Test Steps 07 & 08

Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
09	TCC SOLENOID	Vehicle travelling at a speed of approx. 80 km/h: 50 mph Selector lever position "D"	ACTIVE 12 V	29, 36
Trouble-shooting:				
● Ignition OFF Connect ohmmeter between K 92/Ter. 38 and ground on transmission		17.5–18.5Ω	Cause of Fault: ● Lead interruption ● Short circuit in wiring harness to solenoid valve ● Solenoid valve defective ● Control unit defective	
Disconnect plug X 38 from transmission intermediate housing (Adapter case) Connect ohmmeter between K 92/ Ter. 38 and X 38/Ter. A		0 Ω	● Lead interruption	
Note: The solenoid valve for the converter clutch is switched on in third or fourth gear at a speed of approx. 80 km/h:50 mph.				

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Fig. 12: Mode F0: Data List - Test Step 09

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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
10	BRAKE SWITCH	Ignition ON Actuate brake	ACTIVE 0 V	—
Trouble-shooting: ● Ignition ON Brake not actuated				
		Nominal Value:	Cause of Fault:	
		INACTIVE 12 V	● Fuse No.13 defective ● Lead interruption between fuse No.13 and brake sw. S116/Ter.4	
Bridge brake switch S 116/Ter. 3 and Ter. 4 Bridge brake switch S 116/Ter. 1 and Ter. 2		INACTIVE 12 V Brake lights illuminate	● Brake light switch defective	
● Ignition OFF Connect ohmmeter between S 116/Ter. 4 and X 31/Ter. 1 Disconnect plug from control unit K 92 Connect ohmmeter between X 31/Ter. 1 and K 92/Ter. 39		0 Ω 0 Ω	● Lead interruption ● Lead interruption	

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Fig. 13: Mode F0: Data List - Test Step 10
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
11	AT INPUT SPEED	Engine at idle speed Selector lever position "N" Engine at idle speed Selector lever position "D"	approx. 800 rpm (Below 1000 rpm) approx. 800 rpm (Below 1000 rpm)	31, 46
Trouble-shooting: ● Start engine ● Engine at idle speed Selector lever position "N"				
		Nominal Value:	Cause of Fault:	
		approx 800 rpm (Below 1000 rpm)	● Inductive pulse pick-up defective or lead interruption to TCM or TCM defective. ● Control unit K 92 defective	
● Ignition OFF Disconnect plug from control units K 91(ECM) and K 92(TCM) Connect ohmmeter between K 91/Ter. 85 and K 92/Ter. 11		0 Ω	● Lead interruption	

G00164239

Fig. 14: Mode F0: Data List - Test Step 11
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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
12	AT OUTPUT SPEED			39, 46
Trouble-shooting: ● Ignition OFF Disconnect plug from control unit K 92 Connect ohmmeter between K 92/Ter. 20 and Ter. 14 (range 20 Ω) If the value is not attained: Disconnect plug from pulse pick-up Connect ohmmeter between plug (pulse pick-up) Ter. A and K 92/ Ter. 14 (the same with Ter. B and K 92/Ter. 20)				
		Nominal Value: 3,000Ω(at 25°C) 0 Ω	Cause of Fault: ● Pulse pick-up for output engine speed defective ● K 92 defective ● Lead interruption	

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Fig. 15: Mode F0: Data List - Test Step 12
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
13	SELECTOR INFORM.	Ignition ON Shift through all selector lever positions	Dependent on the selector lever position: P, R, N, D, 3, 2, 1	56, 82

Trouble-shooting:

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Fig. 16: Mode F0: Data List - Test Step 13
Courtesy of ISUZU MOTOR CO.

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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
14	ACTUAL GEAR	Vehicle travelling at a speed of approx. 100 km/h:62 mph Selector lever position "D"	- 4 -	41
Trouble-shooting: Engine at idle speed Put selector lever into selector lever position "1" Engine speed ≤ 3500 rpm Selector lever position "D" "Winter Program" activated Selector lever position "2" Vehicle travelling at a speed of approx. 40 km/h:25 mph Selector lever position "D" Vehicle travelling at a speed of approx. 80 km/h:50 mph				
Nominal Value: 1st gear 3rd gear 2nd gear 4th gear				
Cause of Fault: - Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 06) - Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 14) - Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 11) - Hydraulic fault (see mech./hydraulic checklist, Test Step 05, 11)				

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Fig. 17: Mode F0: Data List - Test Step 14
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
15	SELECTOR PIN A	Ignition ON Selector lever position "P"	ACTIVE 12 V	56, 82

Trouble-shooting:

Ter. A of the selector lever position switch is checked in this Test Step with the help of TECH 1.

● Ignition ON
Selector lever position "P"

Nominal Value: ACTIVE 12 V

Cause of Fault:

- Lead interruption between X 37/Ter. A and selector lever position switch
- Lead interruption between X 37/Ter. A and K 92/Ter. 23
- Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

"R"	"N"	"D"	"3"	"2"	"1"
ACTIVE 12 V	INACT. 0 V	INACT. 0 V	ACTIVE 12 V	ACTIVE 12 V	INACTIVE 0 V

If these values are not attained, the selector lever position switch should be replaced.

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Fig. 18: Mode F0: Data List - Test Step 15
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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
16	SELECTOR PIN B	Ignition ON Selector lever position "R"	ACTIVE 12 V	56, 82

Trouble-shooting:

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Fig. 19: Mode F0: Data List - Test Step 16

Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
17	SELECTOR PIN C	Ignition ON Selector lever position "D"	ACTIVE 12 V	56, 82

Trouble-shooting: **Nominal Value:** **Cause of Fault:**

Ter. C of the selector lever position switch is checked in this Test Step with the help of TECH 1.

● Ignition ON
Selector lever position "D" ACTIVE 12 V
 ● Lead interruption between X 37/Ter. C and selector lever position switch
 ● Lead interruption between X 37/Ter. C and K 92/Ter. 8
 ● Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

If these values are not attained, the selector lever position switch should be replaced.

"P"	"N"	"R"	"3"	"2"	"1"
INACT. 0 V	INACT. 0 V	INACT. 0 V	ACTIVE 12 V	ACTIVE 12 V	ACTIVE 12 V

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Fig. 20: Mode F0: Data List - Test Step 17

Courtesy of ISUZU MOTOR CO.

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
18	SELECTOR PIN G	Ignition ON Selector lever position "P"	ACTIVE 12 V	56, 82

Trouble-shooting: Ter. G of the selector lever position switch is checked in this Test Step with the help of TECH 1.

Nominal Value: ACITVE 12 V

Cause of Fault:

- Ignition ON
Selector lever position "P"
- Lead interruption between X 37/Ter. G and selector lever position switch
- Lead interruption between X 37/Ter. G and K 92/Ter. 33
- Selector lever position switch defective

The following values must be displayed for the remaining selector lever positions:

"R"	"N"	"D"	"3"	"2"	"1"
INACT. 0 V	ACTIVE 12 V	INACT. 0 V	ACTIVE 12 V	INACT. 0 V	ACTIVE 12 V

If these values are not attained, the selector lever position switch should be replaced.

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Fig. 21: Mode F0: Data List - Test Step 18
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
19	TPS SIGNAL	Ignition ON Throttle valve in idle speed position Throttle valve in full load position	0.1 V to 0.96 V 4.9 V or less	21, 22
Trouble-shooting: ● Disconnect plug from throttle position sensor P 34 Connect voltmeter between plug P34/Ter. D2 and Ter. C14 ● Short circuit between signal line Ter. C13 and ground Ter. D2 ● Short circuit to ground on signal line Ter. C13 ● Control unit K 92 defective ● P 34 defective ● Lead interruption between K 92/Ter. 6 and P 34/Ter. C13 ● Lead interruption between K 92/Ter. 16 and P 34/Ter. D2 Nominal Value: 4.9–5.1V Cause of Fault: Bridge Ter. D2 and Ter. C13 at P 34 0.1 V				

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Fig. 22: Mode F0: Data List - Test Step 19
Courtesy of ISUZU MOTOR CO.

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Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
20	KICKDOWN SWITCH	Ignition ON Depress accelerator until stop	ACTIVE 0 V	77
Trouble-shooting: ● Ignition ON Bridge KD switch Ter. A and Ter. B ● Ignition OFF Disconnect plug from control unit K 92 Connect ohmmeter between K 92/Ter. 15 and ground - Connect ohmmeter between X 31/Ter. 7 and ground - Connect ohmmeter between KD switch Ter. B and ground ● Check throttle position sensor according to Test Step 21				
		Nominal Value:	Cause of Fault:	
		INACTIVE 12 V		
		ACTIVE 0 V	● KD switch defective	
		∞ Ω	● Short circuit to ground	
		∞ Ω	● Short circuit to ground	
		0 Ω	● Lead interruption	

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Fig. 23: Mode F0: Data List - Test Step 20
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
21	TPS REF. VOLTAGE	Engine at idle speed	5 V	21, 22
Trouble-shooting: ● Disconnect plug from throttle valve potentiometer Ignition ON Connect voltmeter between plug P 34/Ter. C14 and ground ● Ignition OFF Connect ohmmeter between plug P 34/Ter. D2 and ground				
		Nominal Value:	Cause of Fault:	
		4.9–5.1V	● Lead interruption between K 92/Ter. 24 and plug P 34/Ter. C14 ● Control unit K 92 defective	
		0 Ω	● Lead interruption between K 92/Ter. 16 and plug P 34/Ter. D2 ● Control unit K 92 defective	

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Fig. 24: Mode F0: Data List - Test Step 21
Courtesy of ISUZU MOTOR CO.

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1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
22	A/C INFORMAT. SW.	Not used	_____	_____
23	TRANS. OIL TEMP.	Engine runs	approx. 80 °C/176 °F 1.02 V	65, 66
Trouble-shooting: ● Ignition ON Disconnect plug X 38 Connect voltmeter between plug X 38/Ter. C and D. (TCM side) Bridge Ter. D and Ter. C at plug X 38				
Nominal Value: 5 V to 215 °C/419 °F or 0.01 V				
Cause of Fault: ● Lead interruption between K 92/Ter. 17 and X 38/Ter. D ● Lead interruption between K 92/Ter. 22 and X 38/Ter. C ● Lead interruption between K 92/Ter. 17 and transmission fluid temperature sensor ● Lead interruption between K 92/Ter. 22 and transmission fluid temperature sensor ● Short circuit to ground to transmission ● Transmission fluid temperature sensor defective ● Control unit K 92 defective				

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Fig. 25: Mode F0: Data List - Test Step 22 & 23
 Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
24	COOLANT TEMP. SW.	Ignition ON	ACTIVE 0 V	23
Trouble-shooting: ● Ignition OFF Disconnect plug from K 92 (TCM) and K 91 (ECM) Connect ohmmeter between X 92/Ter. 30 and X 91/Ter. A 7.				
Nominal Value: 0 Ω				
Cause of Fault: ● Lead interruption between X 92/Ter. 30 and X 91/Ter. A 7.				
If the value is not attained: Connect plug X 92 to K 92 (TCM). Ignition ON Connect voltmeter between X 91/Ter. A 7 and ground.				
Nominal Value: 12 V				
Cause of Fault: ● Control unit K 91 defective ● Control unit K 92 defective				

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Fig. 26: Mode F0: Data List - Test Step 24
 Courtesy of ISUZU MOTOR CO.

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
25	WINTER SW. (- D -)	Ignition ON Selector lever position "D" Press "Winter Program" key	ACTIVE 0 V	—
Trouble-shooting: ● Ignition ON Remove switch S 105 Bridge Ter. 328 and Ter. 331 at switch S 105 If the value is not attained: ● Ignition OFF Connect ohmmeter between S 105/ter. 331 and ground Connect ohmmeter between S 105/Ter. 328 and X 31/Ter. 6 Disconnect plug from control unit K 92 Connect ohmmeter between X 31/Ter. 6 and X 92/Ter. 31 After checking above Bridge Ter. 328 and Ter. 331 at switch 105 Checking telltale for the "WINTER" see Actuator Test Test Step 01				
		Nominal Value:	Cause of Fault:	
		ACTIVE 0 V	● Tip switch defective	
		0 Ω	● Lead interruption between S 105/Ter. 328 and ground	
		0 Ω	● Lead interruption between S 105/Ter. 328 and X 31/Ter. 6	
		0 Ω	● Lead interruption between X 31/Ter. 6 and control unit K 92/Ter. 31	
		ACTIVE 0 V	● Control unit K 92 defective	

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Fig. 27: Mode F0: Data List - Test Step 25
Courtesy of ISUZU MOTOR CO.

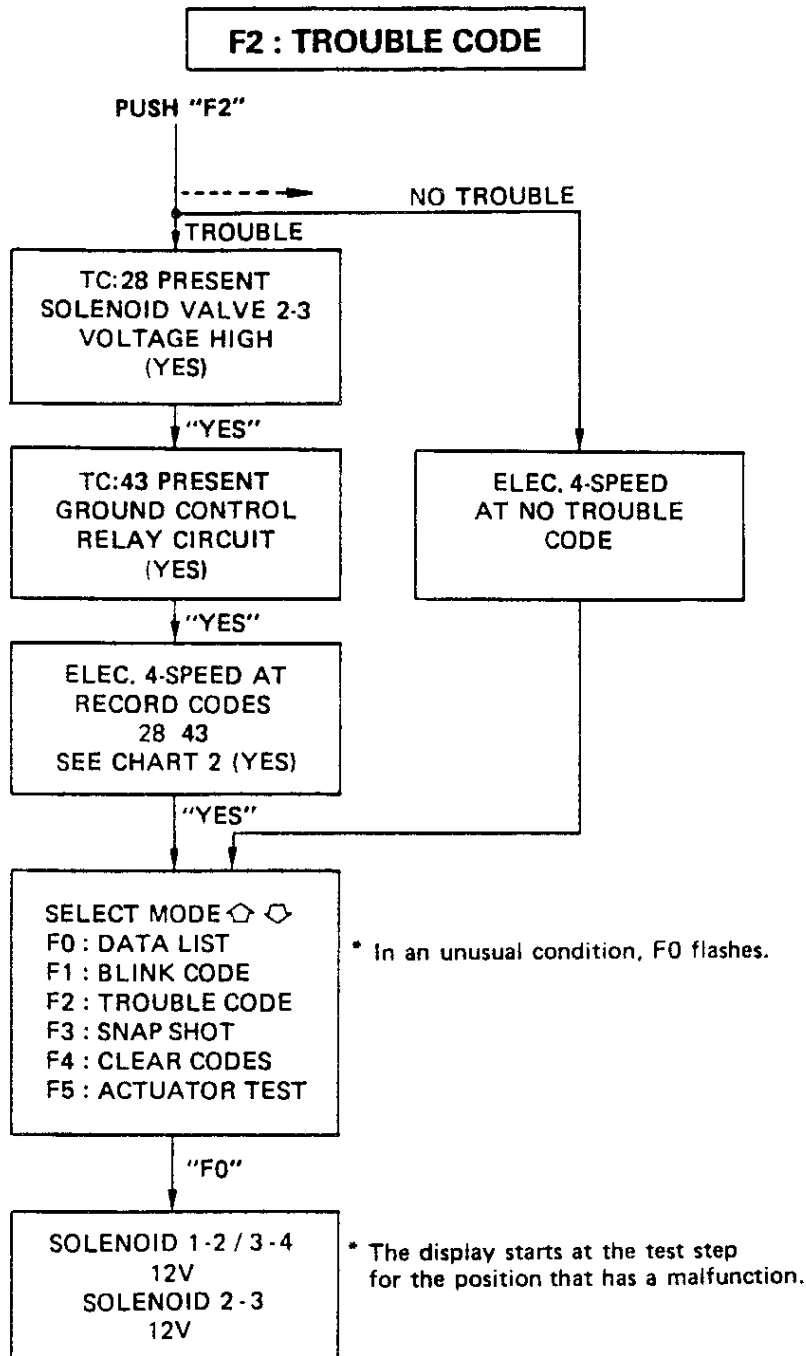
Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
26	PROGRAM SWITCH	Ignition ON Keep tip switch for the "POWER" depressed	ACTIVE 0 V	—
Trouble-shooting: ● Ignition ON Remove switch 105 Bridge Ter. 324 and Ter. 332 at plug S 105 ● Ignition OFF Connect ohmmeter between S 105/Ter. 332 and ground Disconnect plug from control unit K 92 Connect ohmmeter between S 105/Ter. 324 and X 92/Ter. 34 After checking above Bridge Ter. 324 and Ter. 332 at plug S 105 Checking telltale for the "Sport Program" see Actuator Test Test Step				
		Nominal Value:	Cause of Fault: (in case nominal value is not attained)	
		ACTIVE 0 V	● Tip switch defective	
		0 Ω	● Lead interruption between S 105/Ter. 332 and ground	
		0 Ω	● Lead interruption between S 105/Ter. 324 and X 31/Ter. 4	
			● Lead interruption between X 31/Ter. 4 and X 92/Ter. 34	
		ACTIVE 0 V	● Control unit K 92 defective	

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Fig. 28: Mode F0: Data List - Test Step 26
Courtesy of ISUZU MOTOR CO.

MODE F2: TROUBLE CODE

Stored trouble codes are displayed on TECH 1 when F2 is depressed. F2 provides a more detailed definition of the trouble code. See **Fig. 29**.

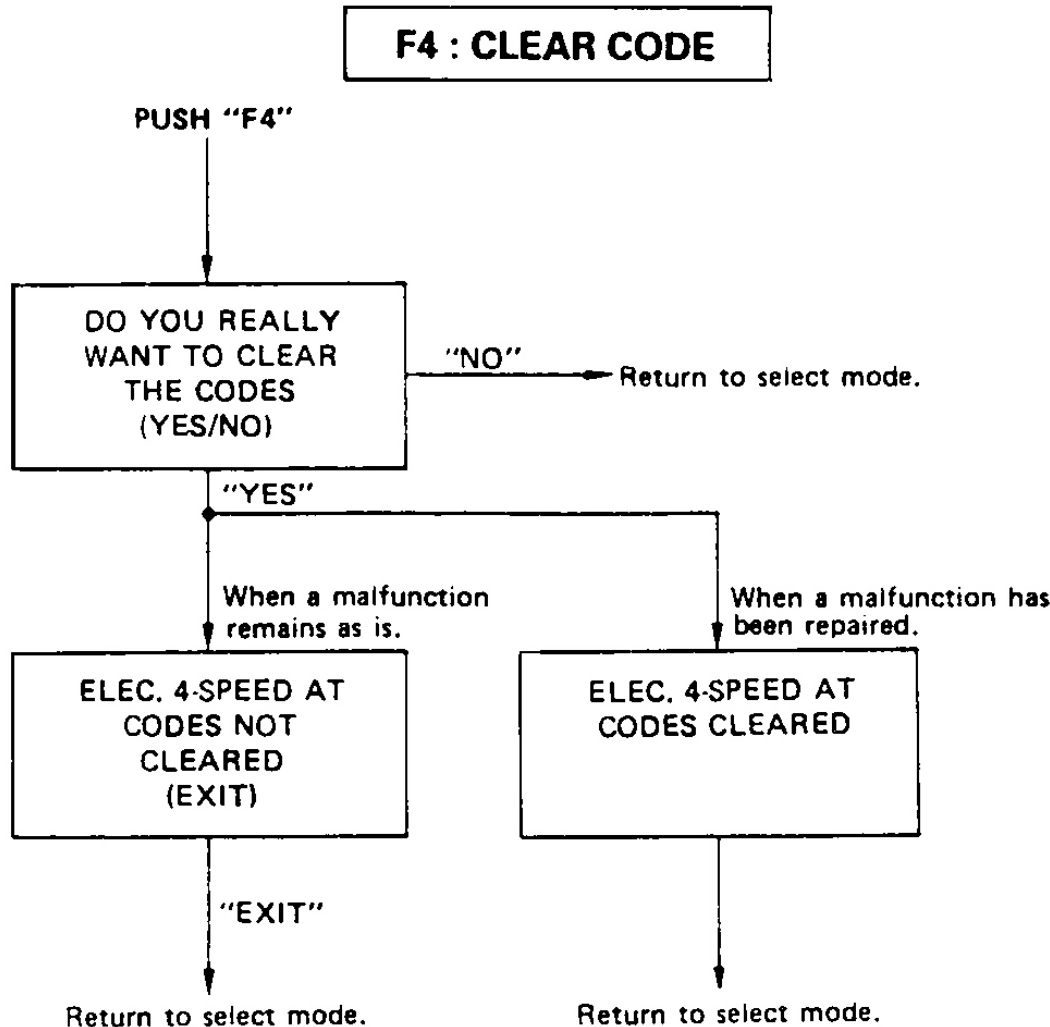


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Fig. 29: Mode F2: Trouble Code Flow Diagram
Courtesy of ISUZU MOTOR CO.

MODE F4: CLEAR CODES

By depressing F4 key, trouble codes in memory can be cleared. See **Fig. 30** .



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Fig. 30: Mode F4: Clear Code Flow Diagram
Courtesy of ISUZU MOTOR CO.

MODE F5: ACTUATOR TEST

Single components can be checked. It provides information about condition and operation of components. Actuator test is a backup to MODE F0: DATA LIST and mechanical/hydraulic check list. In Quick Check List, all TEST STEPS are summarized so that after a mechanical/hydraulic problem, electronics function can be quickly checked. See **Fig. 31** and **Fig. 32** .

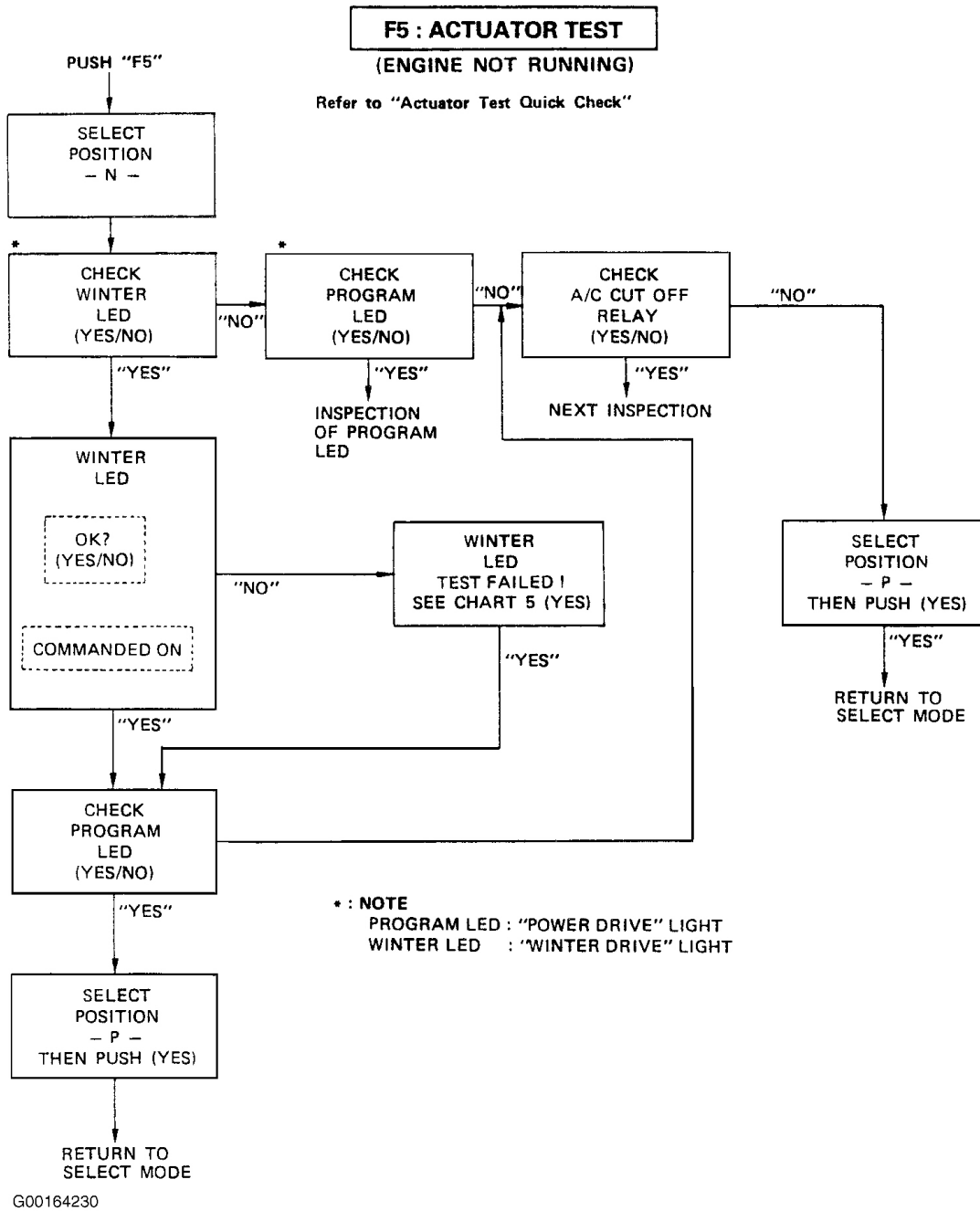


Fig. 31: Mode F5: Actuator Test Flow Diagram
Courtesy of ISUZU MOTOR CO.

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

NOTE: Before performing Actuator Test, selector lever should be placed in "N". Ignition should be switched on.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
01	CHECK WINTER LED? (YES/NO)	After actuation of the "Yes" key, the "Winter Program" telltale illuminates Winter led = Winter drive light	WINTER LED COMMANDED ON	—
02	CHECK PROGRAM LED? (YES/NO)	After actuation of the "Yes" key, the telltale in the instrument panel illuminates Program led = Power drive light	PROGRAM LED COMMANDED ON	—
03	CHECK A/C CUT OFF RELAY? (YES/NO)	Not used	A/C CUT OFF FREQUENCY 1/sec	—
04	CHECK GROUND CONTROL RELAY IN ECU? (YES/NO)	After actuation of the "Yes" key, the solenoid valve ground relay is activated once per second	Relay in control unit activates audibly	43
05	CHECK SOLENOID VALVE 1-2/3-4? (YES/NO)	After actuation of the "Yes" key, the solenoid valve for the 1-2/3-4 shifts is activated once per second	SOLENOID VALVE 1-2/3-4 TEST OKAY!	17, 25
06	CHECK SOLENOID VALVE 2-3? (YES/NO)	After actuation of the "Yes" key, the solenoid valve for the 2-3 shift is activated once per second	SOLENOID VALVE 2-3 TEST OKAY!	26, 28
07	CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE? (YES/NO)	After actuation of the "Yes" key, the solenoid valve for the converter clutch is activated once per second	TORQUE CONVERTER CLUTCH SOL. VALVE TEST OKAY!	29, 36
08	CHECK BAND APPLY SOLENOID? (YES/NO)	After actuation of the "Yes" key, the solenoid valve for the brake band is switched to ACTIVE	BAND APPLY SOLENOID TEST OKAY!	34, 35
09	CHECK TORQUE CONTROL? (YES/NO)	Not used	—	—
10	CHECK PRESS. REGULATOR SOLENOID? (YES/NO)	Engine at idle speed After actuation of the "Yes" key, the pressure regulator is actuated with 1097 mA or 97mA	PRESS. REGULATOR SOLENOID TEST OKAY!	32, 33

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Fig. 32: Mode F5: Actuator Test Quick Check
Courtesy of ISUZU MOTOR CO.

DIAGNOSTIC FLOW CHARTS

CHART 1: RESISTANCE & VOLTAGE CHARTS

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

CHART 1 (RESISTANCE & VOLTAGE CHARTS)

DIAGNOSTIC PLUG ALDL AND VOLTAGE SUPPLY, CHECK

Test Step	Tester	Test			Notes	Nom. Value	Possible Cause of Fault, Trouble Shooting
		of	between				
1	Ohmmeter	Diagnostic 1 Plug : ground	A (GND)	Ground	Ignition OFF	approx. 0 Ω	• Transfer resistance to grounding point too high.
2	Voltmeter Range: 20V DC	Diagnostic 2 Plug : excitation lead	B (DIAG)	Ground	Ignition ON	> 10.5 V	• Battery voltage too low • Lead interruption between X 3/Ter. 49 and K 92/Ter. 25 • Control unit K92 defective
3	Voltmeter Range: 20V DC	Battery voltage supply cable : voltage supply Ter. 30	Cable terminal	Ground	Ignition ON	> 11.5 V	• Battery voltage too low • Battery voltage supply cable defective
4	Voltmeter Range: 20V DC	Diagnostic 1 Plug : data lead	M	Ground	Ignition ON	> 4.0 V	• Battery voltage too low. • Lead interruption between X 4/Ter. 47 and K92/Ter. 13 • Control unit K 92 defective
5	—	"CHECK TRANS." light	—	—	Ignition ON	"CHECK TRANS." light ON	• Fuse No. 13 defective • "CHECK TRANS." light defective • Lead interruption between X 18/Ter. 35 (ORN/BLK) and X 7/Ter. 323 (ORN/BLK) • Lead interruption between X 7/Ter. 323 (ORN/BLK) and X31/Ter. 2 (ORN/BLK) • Lead interruption between X 31/Ter. 2 (ORN/BLK) and K 92/Ter. 29 • Control unit K 92 defective
6	—	TECH 1 Self-test	—	—	See TECH 1 Operator's Manual	—	
NOTE: After Test Steps 7 and 8 any Trouble Codes that may be stored are deleted.							
7	Ohmmeter	Control unit plug K 92: ground	19 (36)	Ground	Ignition OFF Disconnect plug from control unit K 92	approx. 0 Ω	• Transfer resistance to grounding point too high. • Lead interruption between K 92/ Ter. 19 (36) and grounding point • Control unit K 92 defective.
8	Voltmeter Range: 20V DC	Control unit plug K 92: voltage supply Ter. 30	28	Ground	Ignition OFF Disconnect plug from control unit K 92 Ignition ON	> 11.5V	• Battery voltage too low. • Lead interruption between K 92/Ter. 28 and Ter. 30 • Control unit K 92 defective.

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Fig. 33: Diagnostic Plug ALDL & Voltage Supply Check
Courtesy of ISUZU MOTOR CO.

CHART 2: TROUBLE CODES

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

TROUBLE CODES

Trouble Code	Information Sensor Cause of Fault	Remedy Data List F0 Test Step	Trouble Code Storage when ...
17	SOLENOID 1-2/3-4 VOLTAGE LOW	05	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, this can at first be recognized on actuation of the solenoid valve. • The Emergency Program is activated on Fault Recognition.
21	THROTTLE POSIT. SENSOR VOLTAGE HIGH	19 21	• The control unit has a reading of > 4.9V. • With ignition ON the fault is not recognized. • The fault is immediately recognized after starting the engine. • The Emergency Program is activated on Fault Recognition.
22	THROTTLE POSIT. SENSOR VOLTAGE LOW	19 21	• The control unit has a reading of < 60 nV. • With ignition ON the fault is not recognized. • The fault is immediately recognized after starting the engine. • The Emergency Program is activated on Fault Recognition.
23	ENGINE COOLANT SWITCH	24	• Engine warm. • Engine speed > 500 RPM, after 20 min. the TCM reads high voltage. • TCC operation allowed.
25	SOLENOID 1-2/3-4 VOLTAGE HIGH	05	• With ignition ON and after starting the engine, the fault is immediately recognized. • The Emergency Program is activated on Fault Recognition.
26	SOLENOID 2-3 VOLTAGE LOW	06	• With ignition ON and after starting the engine, the fault is immediately recognized. • The Emergency Program is activated on Fault Recognition.
28	SOLENOID 2-3 VOLTAGE HIGH	06	• With ignition ON the fault is not recognized • If the fault appears after starting engine, this can at first be recognized on actuation of the solenoid valve. • The Emergency Program is activated on Fault Recognition.
29	TCC SOLENOID VOLTAGE LOW	09	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, this is first recognized on actuation of the solenoid valve. • The Emergency Program is not activated, despite the blink of the "Check trans." warning light.
31	NO TRANSMISSION INPUT RPM SIGNAL	11	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, it is first recognized with a speed > 18 MPH: 30 km/h and a throttle valve position > 12% • The Emergency Program is activated on Fault Recognition.
32	PRESS. REGULATOR SOLENOID VOLTAGE LOW	03, 04	• With ignition ON the fault is immediately recognized. • The fault appears after starting the engine, it is first recognized. • The Emergency Program is activated on Fault Recognition.
33	PRESS. REGULATOR SOLENOID VOLTAGE HIGH	03, 04	• With ignition ON the fault is immediately recognized. • If the fault appears after starting the engine, it will be recognized. • The Emergency Program is activated on Fault Recognition.
34	BAND APPLY SOLENOID VOLTAGE HIGH	07, 08	• With ignition ON and after starting the engine, the fault is immediately recognized. • The Emergency Program is activated on Fault Recognition.
35	BAND APPLY SOLENOID VOLTAGE LOW	07, 08	• With ignition ON the fault is immediately recognized. • If the fault appears after starting the engine, this can at first be recognized on actuation of the solenoid valve. • The Emergency Program is activated on Fault Recognition.

Fig. 34: Trouble Codes (1 Of 2)
Courtesy of ISUZU MOTOR CO.

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

TROUBLE CODES (Cont.)

Trouble Code	Information Sensor Cause of Fault	Remedy Data List F0 Test Step	Trouble Code Storage when ...
36	TCC SOLENOID VOLTAGE HIGH	09	• With ignition ON the fault is immediately recognized. • If the fault appears after starting the engine, it will only be recognized if the converter clutch is not actuated. • The Emergency Program is not activated on Fault Recognition.
39	NO TRANSMISSION OUTPUT RPM SIGNAL	12	• The fault can be recognized at an engine speed > 3000 RPM in selector lever positions "1", "2", "3" and "D". • The Emergency Program is activated on Fault Recognition.
41	GEAR ERROR HYDRAULIC FAULT	14	• The fault is recognized when the relationship between engine speed and output speed is outside a certain tolerance range. • The Emergency Program is activated on Fault Recognition.
43	GROUND CONTROL RELAY CIRCUIT	03,04,05,06 07,08	• With ignition ON the fault is immediately recognized. • If the fault appears after starting the engine, it is not recognized. • The Emergency Program is activated on Fault Recognition.
46	DOWN SHIFT FAULT	11, 12	• The fault is recognized if, when down shifting, the engine speed rises above a certain value. • The Emergency Program is activated on Fault Recognition.
48	BATTERY VOLTAGE LOW	01	• With ignition ON and after starting the engine, the fault is immediately recognized, if the battery voltage falls below a value of 9.0 V. • The Emergency Program is activated on Fault Recognition.
49	BATTERY VOLTAGE HIGH	01	• With ignition ON and after starting the engine, the fault is immediately recognized, if the battery voltage rises above a value of 16.0 V.
55	REPLACE TCM	—	• With ignition ON and after starting the engine, the fault is recognized after 3 min. • The Emergency Program is activated on Fault Recognition.
56	SELECTOR SWITCH WRONG SIGNAL	13	• In selector lever position "R" a fault is recognized at a speed $v > 62$ MPH: 100 km/h or an output speed $n > 3200$ RPM. • In selector lever positions "N" and "P" a fault is recognized with a throttle valve aperture $TV > 20\%$ and an engine speed $n < 3000$ RPM. • On Fault Recognition, the fault is stored and the Emergency Program is not activated.
65	AT OIL TEMPERAT. SENSOR VOLTAGE HIGH	23	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, it is recognized after a time-span of $t > 20$ sec. • The "Winter Program" can not be activated. • On Fault Recognition, the fault is stored and the Emergency Program is not activated.
66	AT OIL TEMPERAT. SENSOR VOLTAGE LOW	23	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, it is recognized after a time-span of $t > 20$ sec. • The band apply solenoid is turned OFF. • On Fault Recognition the fault is stored and the Emergency Program is not activated.
77	KICKDOWN SWITCH VOLTAGE LOW	20	• With ignition ON the fault is not recognized. • If the fault appears after starting the engine, it is recognized, if the kickdown function is actuated with a throttle valve aperture $TV < 70\%$. • The kickdown function can not be activated. • On Fault Recognition the fault is stored and the Emergency Program is not activated.
82	MODE SWITCH UNDEFINED STATE	13	• With ignition ON and after starting the engine, the fault is immediately recognized. • The Emergency Program is activated on Fault Recognition.

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Fig. 35: Trouble Codes (2 Of 2)
Courtesy of ISUZU MOTOR CO.

CHART 3: TRANSMISSION IDENTIFICATION & DIAGNOSTIC INFORMATION

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Vehicle		Control Unit(TCM)				Transmission		
Type	Engine	Rr axle Ratio	Bosch No.	Code	Isuzu Part No. (GM Part No.)	Calibration code	Isuzu Part No. (GM Part No.)	Model Code
Isuzu/ Trooper	2.8L V6	4.555 4.777	0 260 002 094	IA	8-96015-174-1 (96 015 040)	G 03	8-96015-040-1 (96 015 040)	GA

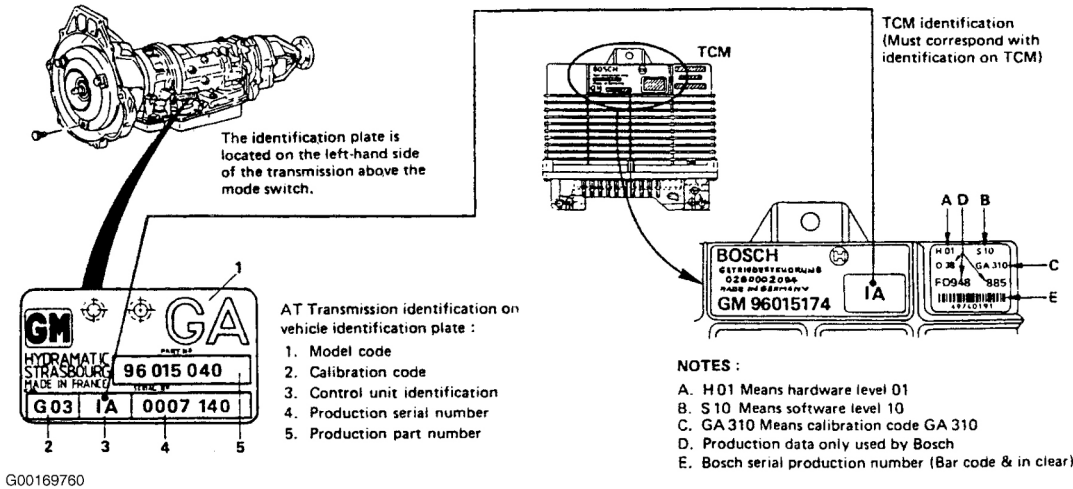


Fig. 36: Transmission Identification & Diagnostic Information
Courtesy of ISUZU MOTOR CO.

CHART 5: ACTUATOR TEST

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
01	WINTER LED TEST FAILED!	see also Data List F0 Test Step 25 Winter led = Winter drive light	_____	_____
Trouble-shooting: ● Ignition ON Disconnect plug from power and winter switch S 105 Connect voltmeter X 20/Ter. 329 and ground Push winter switch				
		0V	Cause of Fault: ● Telltale for "Winter drive light" defective ● Lead interruption between B(+) and X 20/Ter. 333	
Disconnect plug from control unit K 92 Connect ohmmeter between X 92/Ter. 10 and X 20/Ter. 329		0 Ω	Cause of Fault: ● Control unit K 92 defective ● Short circuit between X 92/Ter. 10 and X 20/Ter. 329 ● Lead interruption between X 92/Ter. 10 and X 20/Ter. 329	

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Fig. 37: Actuator Test - Step 01
Courtesy of ISUZU MOTOR CO.

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1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
02	PROGRAM LED TEST FAILED!	see also Data List F0 Test Step 26	_____	_____
Trouble-shooting: ● Ignition ON Disconnect plug from power and winter switch S 105 Connect voltmeter between X 20/Ter. 325 and ground Push power switch Disconnect plug from control unit K 92 Connect ohmmeter between X 92/Ter. 7 and X 20/Ter. 325				
		Nominal Value: 0 V 0 Ω	Cause of Fault: ● Telltale for "Power drive light" defective ● Lead interruption between B(+) and X 20/Ter. 333 ● Control unit K 92 defective ● Short circuit between X 92/Ter. 7 and X 20/Ter. 325 ● Lead interruption between X 92/Ter. 7 and X 20/Ter. 325	

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Fig. 38: Actuator Test - Step 02
Courtesy of ISUZU MOTOR CO.

Test Step	TECH 1 Display	Notes	Nominal Value	Possible Trouble Codes
03	A/C CUT OFF RELAY TEST FAILED!	Not used	_____	_____
04	GROUND CONTROL RELAY IN ECU TEST FAILED!	_____	_____	43
Trouble-shooting: ● Ignition OFF Disconnect plug from control unit K 92 Connect ohmmeter between control unit K 92/Ter. 54 and Ter. 19 Connect ohmmeter between plug K 92/Ter. 54 and Ter. 48 Connect ohmmeter between plug K 92/Ter. 54 and Ter. 43 Connect ohmmeter between plug K 92/Ter. 54 and Ter. 45 Connect ohmmeter between plug K 92/Ter. 19 and ground				
		Nominal Value: $\infty \Omega$ 17.5 – 18.5 Ω 17.5 – 18.5 Ω 9.5 – 10.5 Ω 0 Ω	Cause of Fault: ● Control unit defective ● Lead interruption (see Data List F0 Test Step 05) ● Lead interruption (see Data List F0 Test Step 06) ● Lead interruption (see Data List F0 Test Step 07, 08) ● Control unit defective ● Lead interruption between K 92/Ter. 19 and ground	

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Fig. 39: Actuator Test - Steps 03 & 04
Courtesy of ISUZU MOTOR CO.

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

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Fig. 41: Actuator Test - Step 10
Courtesy of ISUZU MOTOR CO.

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Fig. 41: Actuator Test - Step 10
Courtesy of ISUZU MOTOR CO.

TRANSMISSION

NOTE: See appropriate **REMOVAL & INSTALLATION** article.

TRANSFER CASE

1. Remove transfer case bolts and separate transfer case assembly from transmission. Remove speedometer driven gear, install Companion Flange Holder (J-37221) and remove companion flange.
2. Remove bolts and separate transfer rear case from transfer case assembly.

TORQUE CONVERTER

NOTE: Torque converter is a non-serviceable unit. If defective it must be replaced as a unit.

TRANSMISSION DISASSEMBLY

1. Install converter strap, Base and Fixture Pin (J-3289) and Holding Tool (J8763-02) onto transmission case. DO NOT overtighten tool as damage could occur to case. Remove converter holding strap and remove, converter assembly. Remove "O" ring from turbine shaft. Remove mode cover and switch. Raise transmission to vertical position and drain fluid through rear extension housing. Turn transmission with main oil pan up horizontal.
2. Remove adapter oil pan and gasket. Disconnect electrical connectors from solenoid. Remove adapter valve body assembly transfer plate and 2 gaskets. Remove wiring harness and 5-pin connector. See **Fig. 42**.
3. Remove main oil pan, magnet and gasket. Remove oil filter, roller and spring assembly and manual detent. Remove harness assembly from band apply solenoid, shift solenoid and main case 4-pin connector. Remove 4-pin connector.

NOTE: Ensure position of link with long end into valve and shortened into range selector.

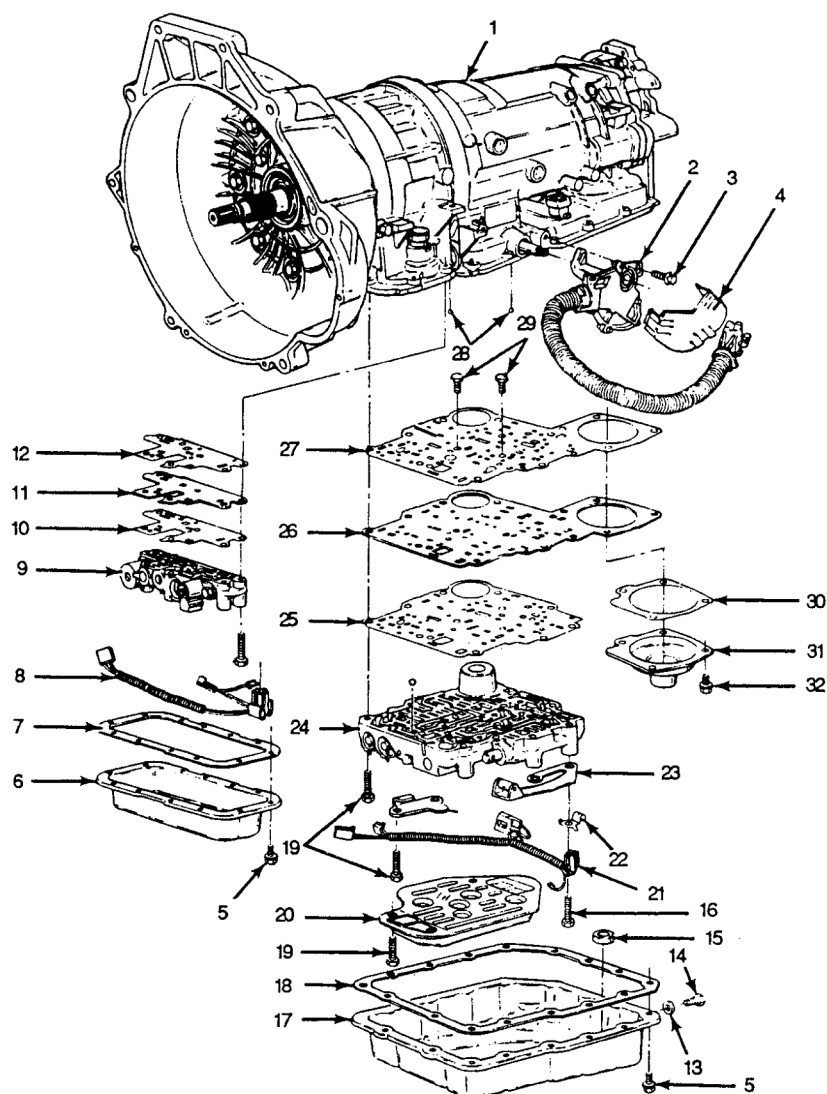
4. Remove servo cover and gasket. Remove valve body bolts and main valve body assembly with manual valve link and transfer plate. Remove gasket transfer plate/main case and 2 check balls.
5. Turn transmission to vertical position to drain fluid. Return to horizontal when drained. Install Servo Piston Spring Compressor (J-23075) with offset to rear of case. Compress servo piston assembly. Remove servo piston retaining snap ring. Remove servo piston assembly and remove tool, servo piston assembly return spring and servo apply rod.
6. Rotate transmission to horizontal with oil pan down. Remove speed sensor and "O" ring. Remove extension housing and retaining ring. Use extra long needle nose pliers to remove speedometer wheel and wheel parking lock.
7. Rotate transmission to vertical, converter housing up. Loosen but DO NOT remove 5 inner bolts. Remove 7 outer, bolts and remove converter housing, oil pump, gasket and selective thrust washer.
8. Remove oil filler tube with "O" ring and seal ring. Remove 4th clutch retainer. Grasp turbine shaft and lift out overrun clutch housing and 4th clutch plates. Remove thrust bearing assembly, overdrive internal gear and thrust washer. Install 4th Clutch Compressor (J-23327 and J-2337-90) on 4th clutch retainer and

spring assembly.

9. Install crossbar on adapter case using 2 converter housing/main case bolts. Compress 4th clutch spring retainer and springs. Release snap ring from groove. Remove clutch compressor, snap ring retainer and spring assembly.
10. Insert 2 converter/main case bolts to hold adapter case while pulling out 4th clutch piston. Remove 4th clutch piston assembly. Remove converter housing/main case bolts.
11. Remove adapter case and center support assembly. Remove selective thrust washer and 2 "O" ring seals from main case.
12. Grasp intermediate shaft, twist and pull out 2nd and 3rd clutch drum assemblies with reverse clutch while holding onto output shaft. Separate 2nd and 3rd clutch assemblies. Remove thrust washer and clutch reversing plate.
13. Remove planetary carrier assembly, thrust washers and bearings. Remove reaction sun gear, brake drum, bearing thrust washer and brake band.

NOTE: **Insert wire into center of spring pin to prevent it from collapsing during removal. Measure spring pin height prior to removal. Use measurement when reinstalling spring pin. Protect machined face of main case.**

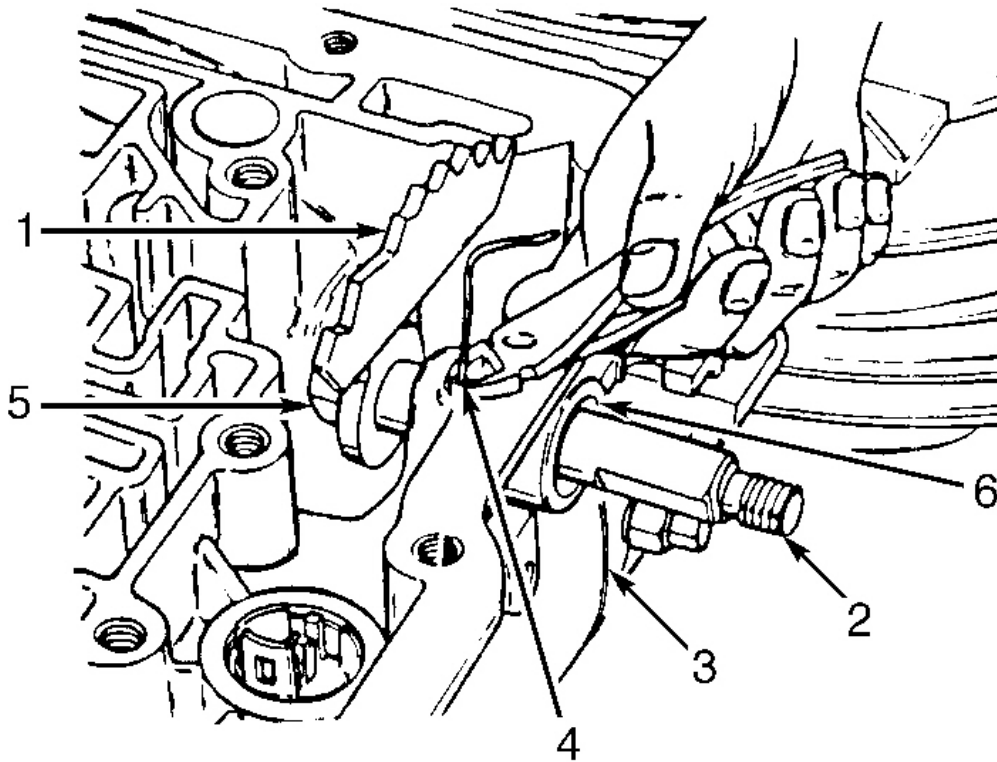
14. Rotate case to horizontal position with valve body side facing up, use cutting pliers and remove spring pin. See **Fig. 43** .
15. Remove parking lock and range selector lever, parking lock, range selector and actuator assembly. Remove selector shaft. Refer to individual **COMPONENT DISASSEMBLY & REASSEMBLY** section for further information.



- | | | |
|---------------------------|-------------------------|-------------------------|
| 1. Transmission Case | 12. Transfer Plate | 23. Detent Arm |
| 2. Mode Switch | 13. Washer | 24. Main Valve Body |
| 3. 10 mm Bolt | 14. Bolt | 25. Valve Body/Transfer |
| 4. Cover | 15. Magnet | Plate Gasket |
| 5. Pan Bolts | 16. Main Oil Pan Bolt | 26. Transfer Plate |
| 6. Adapter Pan | 17. Main Oil Pan | 27. Transfer Plate/Main |
| 7. Adapter Pan Gasket | 18. Main Oil Pan Gasket | Case Gasket |
| 8. Wiring Harness | 19. Oil Filter Bolt | 28. (2) Check Balls |
| 9. Adapter Valve Body | 20. Oil Filter | 29. 11 mm Screws |
| Assembly | 21. Harness W/4 Pin | 30. Servo Gasket |
| 10. Transfer Plate Gasket | Connector | 31. Servo Cover |
| 11. Transfer Plate | 22. Harness Clamp | 32. Servo Cover Bolt |

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Fig. 42: Exploded View of Main Valve Body & Adapter Valve Body
 Courtesy of ISUZU MOTOR CO.



- | | |
|---|-----------------------|
| 1. Parking Lock & Range
Selector Lever | 4. Spring Pin |
| 2. Selector Shaft | 5. Selector Shaft Nut |
| 3. Transmission Case | 6. Shaft Seal |

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Fig. 43: Locating Parking Lock & Range Selector

COMPONENT DISASSEMBLY & REASSEMBLY

PARKING LOCK & RANGE SELECTOR

Disassembly

1. Remove spring pin by using cutting pliers. Prior to removing, insert wire into center of spring pin to prevent it from collapsing during removal. Measure spring pin height prior to removal. Use measurement when reinstalling spring pin and protect machined face of main case. See **Fig. 43**.
2. Remove parking lock and range selector lever nut. Remove parking lock and range selector lever and actuator assembly. Remove selector shaft and selector shaft seal.

Cleaning & Inspection

Inspect shaft for burrs. Remove any burrs and nicks by sanding with an oilstone.

Reassembly

1. Reinstall selector shaft into main case using care not to damage new seal. Ensure spring pin groove is positioned inside case. Refer to step 1 under DISASSEMBLY when reinstalling spring pin. Install actuator assembly.
2. Install parking lock and range selector lever. Torque lever nut to 16 ft. lbs. (22 N.m).

BRAKE DRUM & BAND**Disassembly**

Rotate main case to vertical position extension end facing down. Remove planetary carrier reaction drum and reaction sun gear. Remove brake band assembly. See **Fig. 44**.

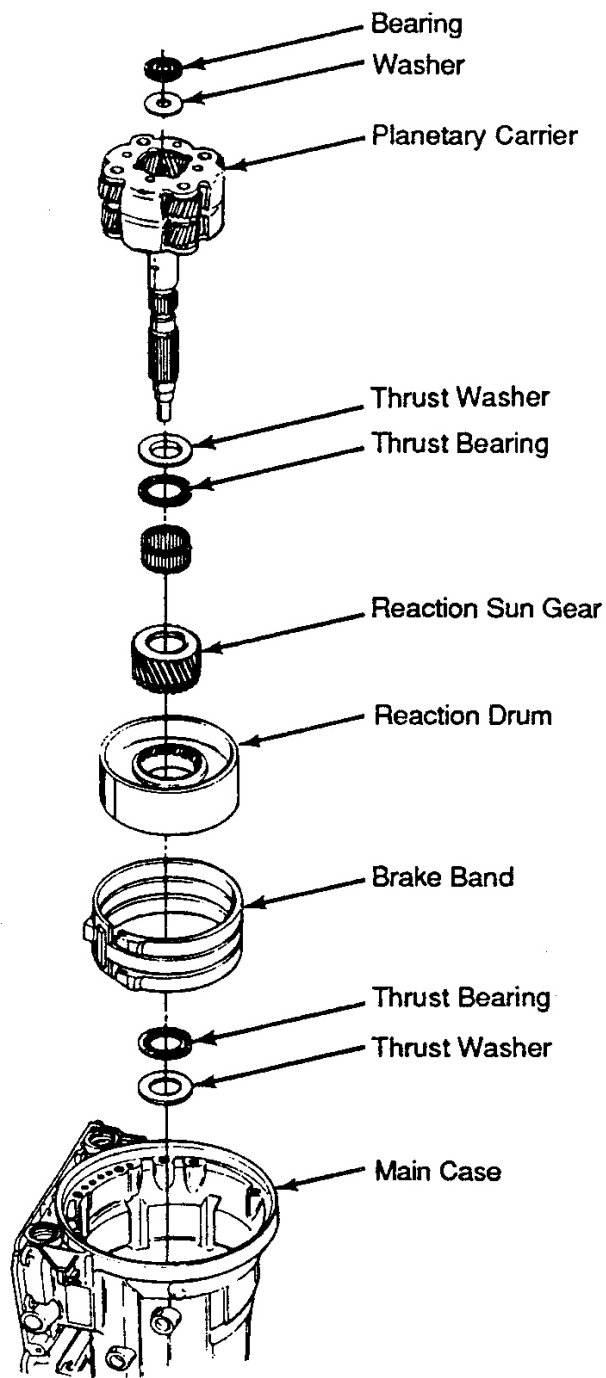
Cleaning & Inspection

Clean assembly with solvent and dry with compressed air. Ensure drum is lubricant free. Inspect for excessive wear or damage. Replace parts (if necessary).

Reassembly

NOTE: **Align servo pin area with servo hole. Case bushing acts as a guide for thrust washer and bearing.**

Install thrust washer and thrust bearing into main case. Install brake band assembly into main case. Install reaction drum and sun gear.



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Fig. 44: Identifying Brake Drum, Band & Planetary Carrier
Courtesy of ISUZU MOTOR CO.

PLANETARY CARRIER

Disassembly

Remove planetary carrier from main case. Prior to disassembly, measure pinion end play clearance with a feeler gauge. Clearance should be .005-.035 (.13-.89 mm). See **Fig. 45** . Disassemble only if necessary.

Cleaning & Inspection

Clean all gears and carrier with cleaning solvent and dry with compressed air. Inspect all gears and shafts for chipped gears, excessive wear and damage. Replace parts (if necessary).

Reassembly

NOTE: **During reassembly of planetary gear, ensure all alignment points are matched up as required.**

1. Each planetary is marked with double points ".." to indicate master tooth space and exactly opposite with single point to indicate master tooth. Markings on planetary carrier consist of double lines which are to be lined up with double points on 2 opposite pinions and single lines, which are to be lined up with single points on other 2 pinions.
2. Line up all 4 pinions and slide ring gear over carrier assembly without allowing pinions to turn, ring gear tooth between double points of planetary pinion is tooth. Count teeth to ensure single points on 2 adjacent pinions are between teeth No. 23 and 24 of ring gear. Ensure ring gear tooth between double points of opposite pinion is tooth No. 46. See **Fig. 45** .
3. Install planetary carrier with ring gear and output shaft assembly. Remove ring gear once planetary carrier is in place. Coat thrust washer and thrust bearing with petroleum jelly to hold them in place.

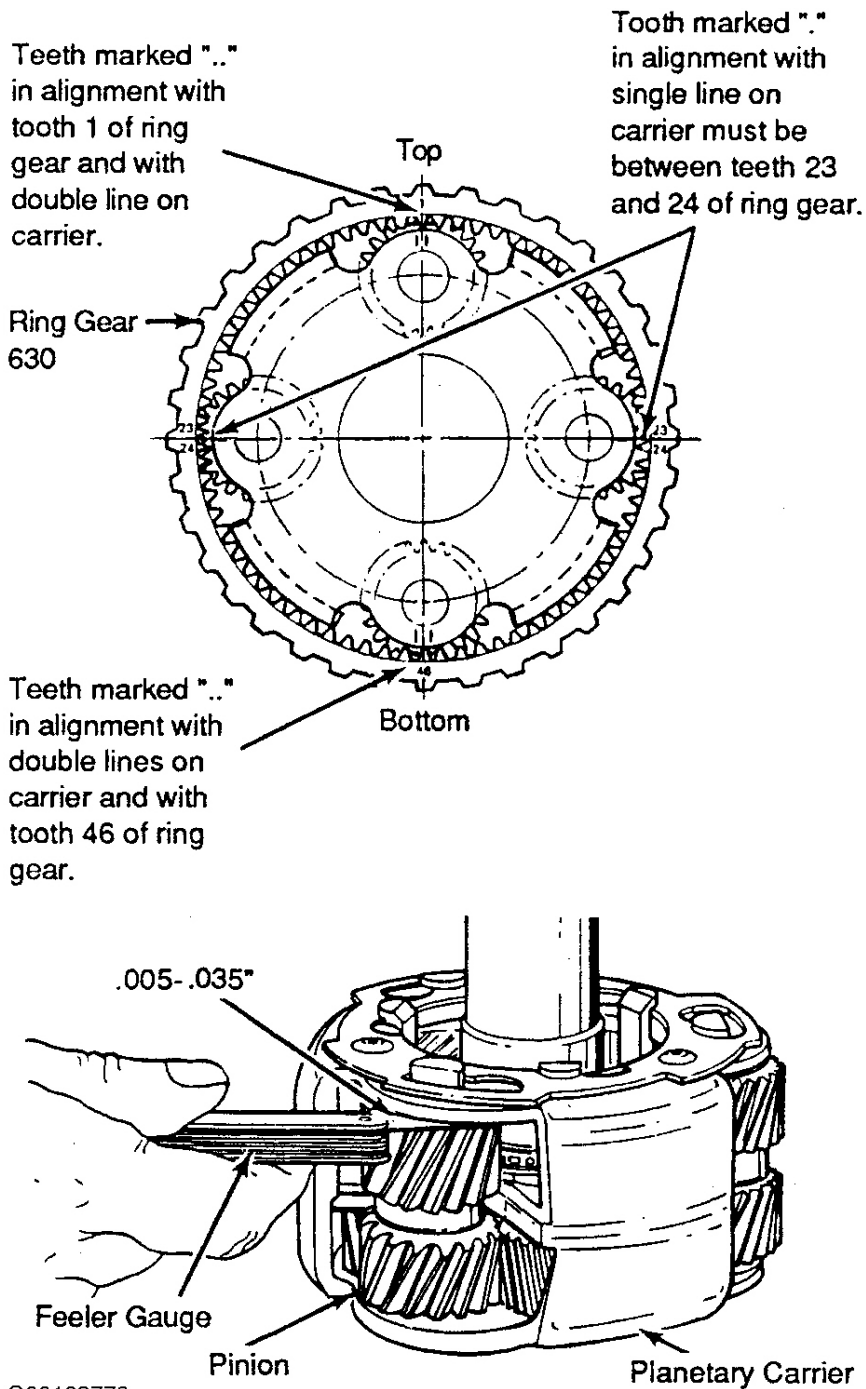
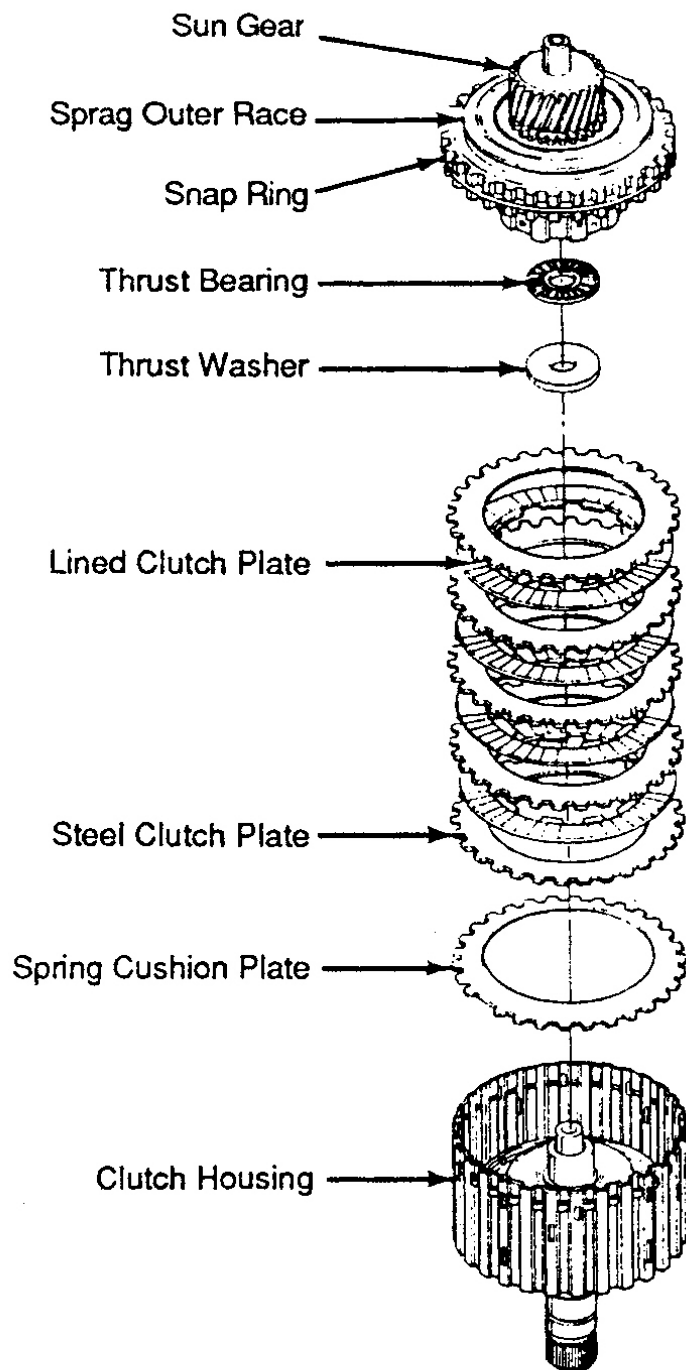


Fig. 45: Identifying Measuring & Alignment Points On Planetary Gear
Courtesy of ISUZU MOTOR CO.

3RD CLUTCH

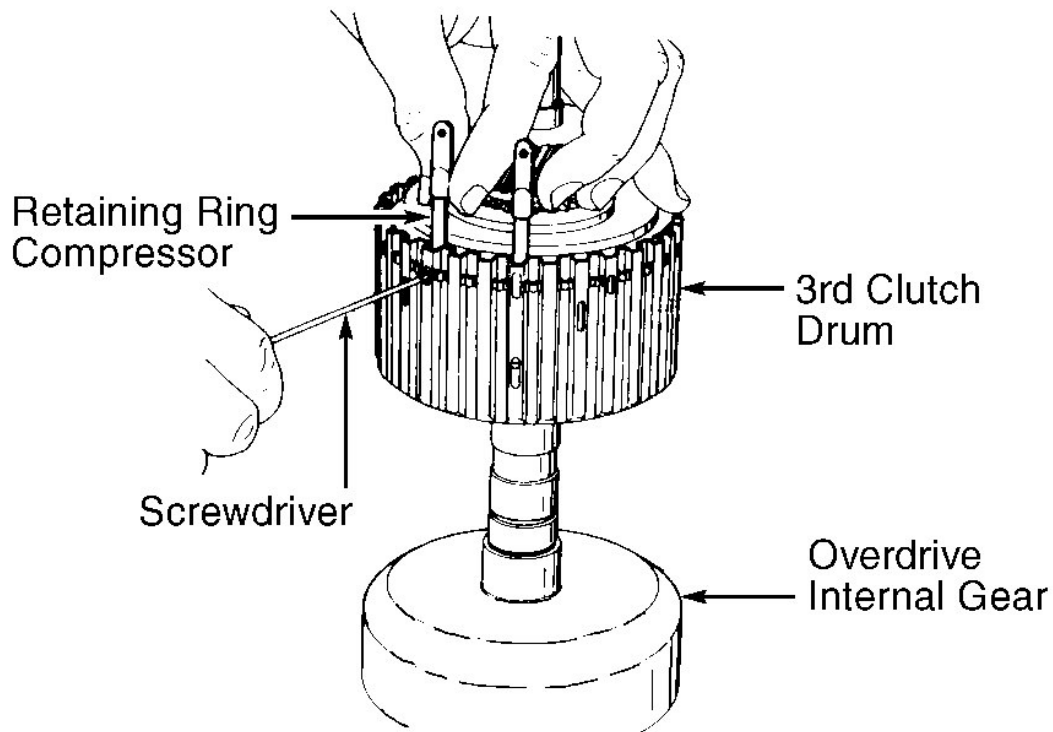
Disassembly

1. Place 3rd clutch housing and intermediate shaft assembly upright using overdrive internal gear as a support. Locate end of sprag retaining ring. Compress near end of sprag using a screwdriver inserted in side slot. Install 3rd Clutch Sprag Retaining Tool (J-38450, 6 pieces), one tool blade between ring and housing, to hold ring clear of groove. See **Fig. 46** and **Fig. 47** . Repeat steps of installing ring retaining tools until all 6 are used.
2. Turn input sun gear assembly until sprag retaining ring clears ring groove. Remove retaining ring tools. Remove sprag race assembly from 3rd clutch drum assembly. Remove thrust bearing and thrust washer.
3. Compress 3rd clutch spring seat using 3rd Clutch Piston Spring Compressor (J-23075) and Compressor Clamp (J-23075-12). To prevent damage to spring seat, DO NOT over compress springs and seats. Remove retaining ring and carefully release spring seat not allowing spring seat to catch in ring groove.
4. Remove tool, retaining ring, spring seat and springs. Remove piston assembly from 3rd clutch housing. Remove all seals. See **Fig. 48** .



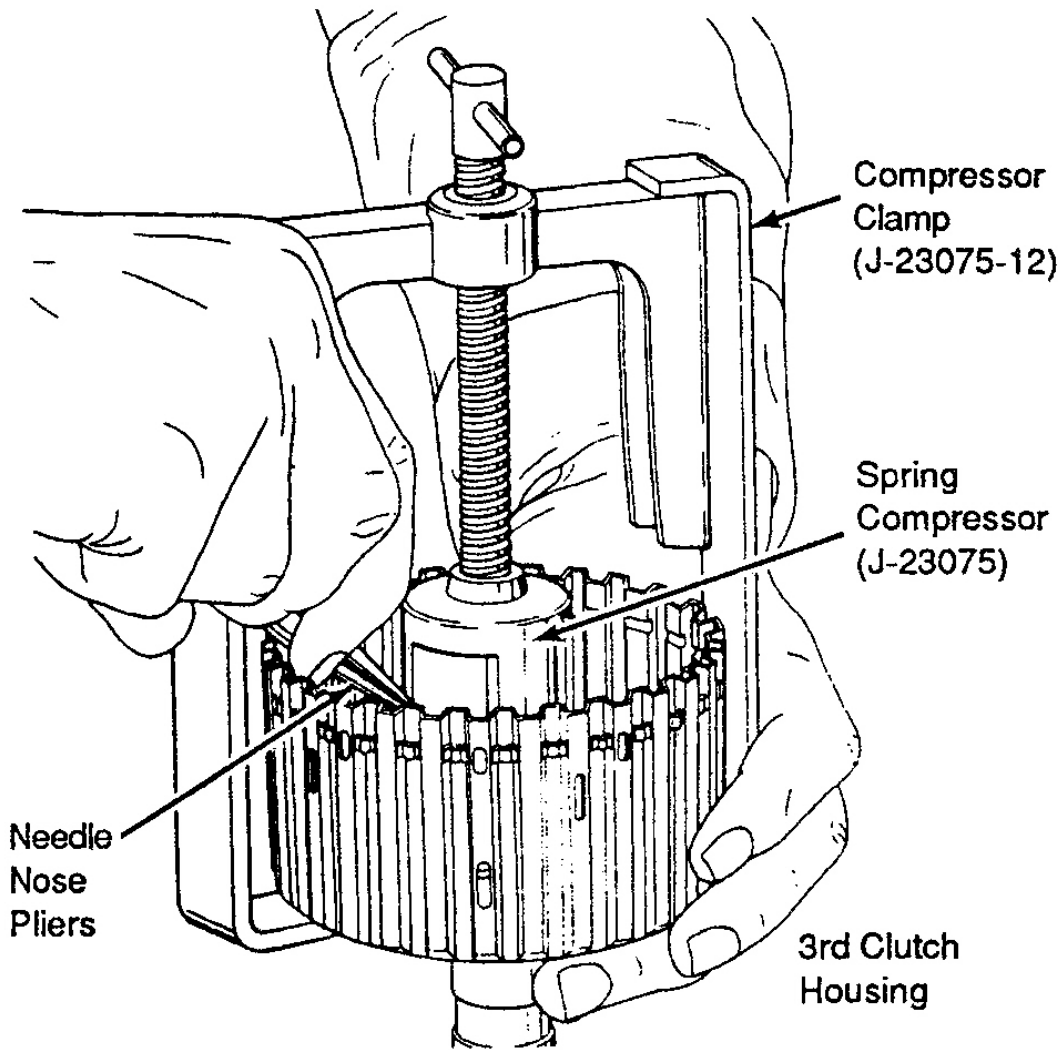
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Fig. 46: Exploded View Of 3rd Clutch & Sprag Unit
 Courtesy of ISUZU MOTOR CO.



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Fig. 47: Installing Retaining Ring Tool
Courtesy of ISUZU MOTOR CO.



G00169775

Fig. 48: Disassembling 3rd Clutch Housing
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect piston and replace if necessary. Shake piston and listen for check ball movement. Replace piston if check ball is missing or falls out.

Reassembly

1. Install new outer seal and retain seal installer in place. Install piston assembly into 3rd clutch drum. Remove seal installer. Install 12 piston springs, spring seat, retaining ring onto spring seat. Install clutch spring compressor, tool and compressor clamp.

2. Compress piston springs using tool. DO NOT let spring seat catch in ring groove as damage could occur to spring seat. DO NOT over compress springs and seat. Install spring seat retaining ring and remove piston spring compressor.

SPRAG UNIT

Disassembly

For disassembly, refer to exploded view of sprag unit. See **Fig. 49** .

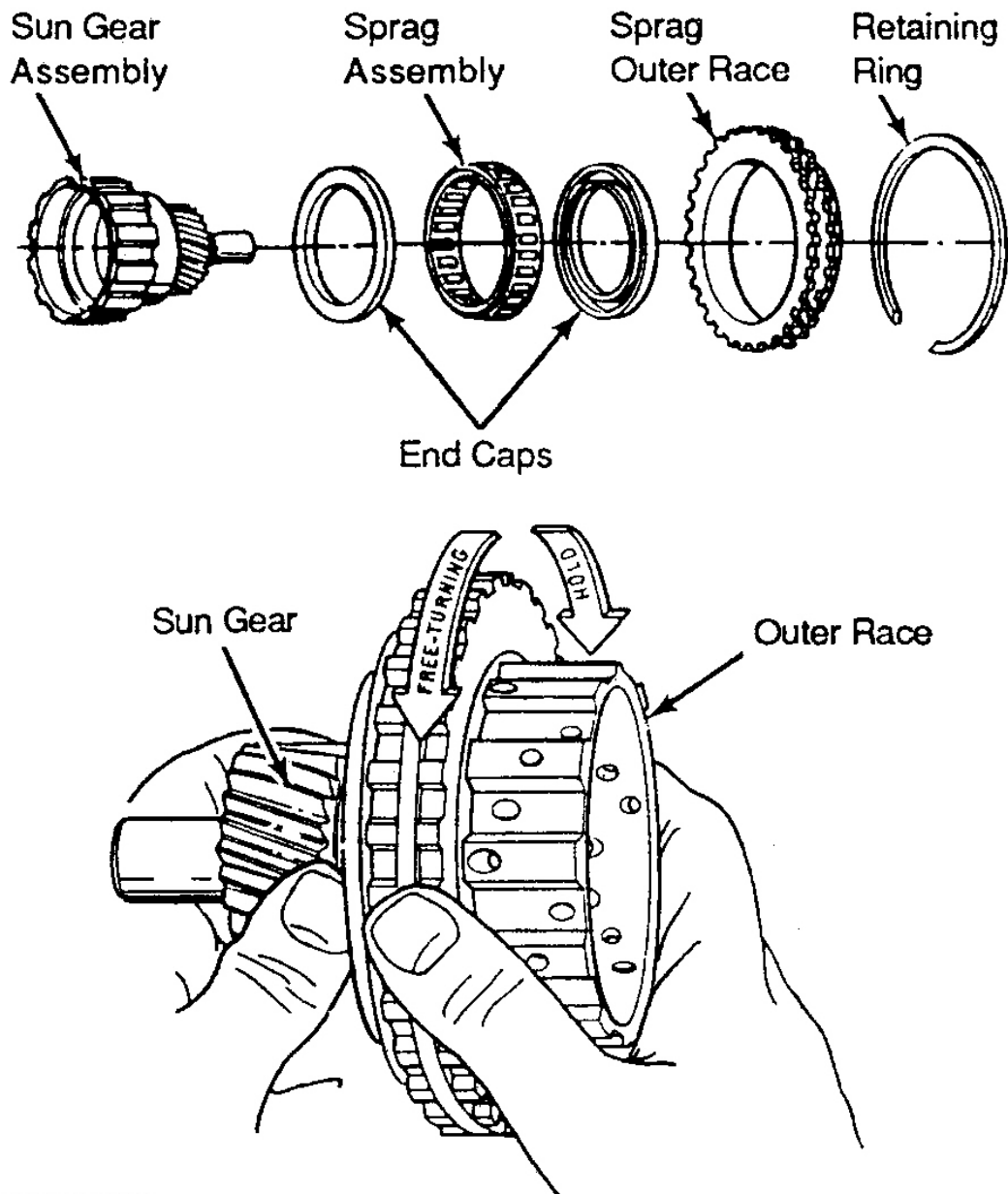
Cleaning & Inspection

NOTE: **Flared shoulder of sprag cage faces sun gear.**

Clean all parts thoroughly in cleaning solvent and dry with compressed air. Inspect all parts for excessive wear or damage, replace parts (if necessary).

Reassembly

1. Place outer sprag race assembly over sprag cage assembly. Place 3rd clutch hub and sun gear assembly on flat surface, with sun gear facing up. Place outer sprag assembly over sun gear assembly.
2. Pushdown and turn input sun gear counterclockwise at the same time. Check correct rotation by holding sun gear in left hand, and turning outer race counterclockwise with right hand. It should turn freely and lock if turned clockwise. See **Fig. 49** .



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Fig. 49: Exploded View Of Sprag Unit & Checking Sprag Rotation
 Courtesy of ISUZU MOTOR CO.

3RD CLUTCH & SPRAG UNIT

Reassembly

1. Place 3rd clutch housing and intermediate shaft assembly upright using overdrive internal gear as support.

Place 3rd clutch spring cushion plate bevel face down. Install 3rd clutch plates into clutch housing. Start with steel clutch plates and alternate with lined plates.

2. Install thrust washer and thrust bearing. Align 3rd clutch inner tangs. Fully engage sprag assembly hub splines into 3rd clutch inner tangs. Rotate outer sprag race to engage into 3rd clutch housing. See **Fig. 49**.
3. Install Retaining Ring Tool (J-38450) at each end of retaining ring. Compress retaining ring with screwdriver opposite of tool blades while pushing down on outer sprag. Engage retaining ring with groove. Remove tool blades.

2ND CLUTCH

Disassembly

1. Remove retaining ring from 2nd clutch drum. Remove ring gear, 2nd retainer ring and spacer. Remove clutch plates and waved plates. See **Fig. 50**.
2. Install 2nd Clutch Spring Compressor (J23327) and compress spring seat. Remove retaining ring and remove tool. Remove seat, springs and 2nd clutch assembly. Remove piston seals.

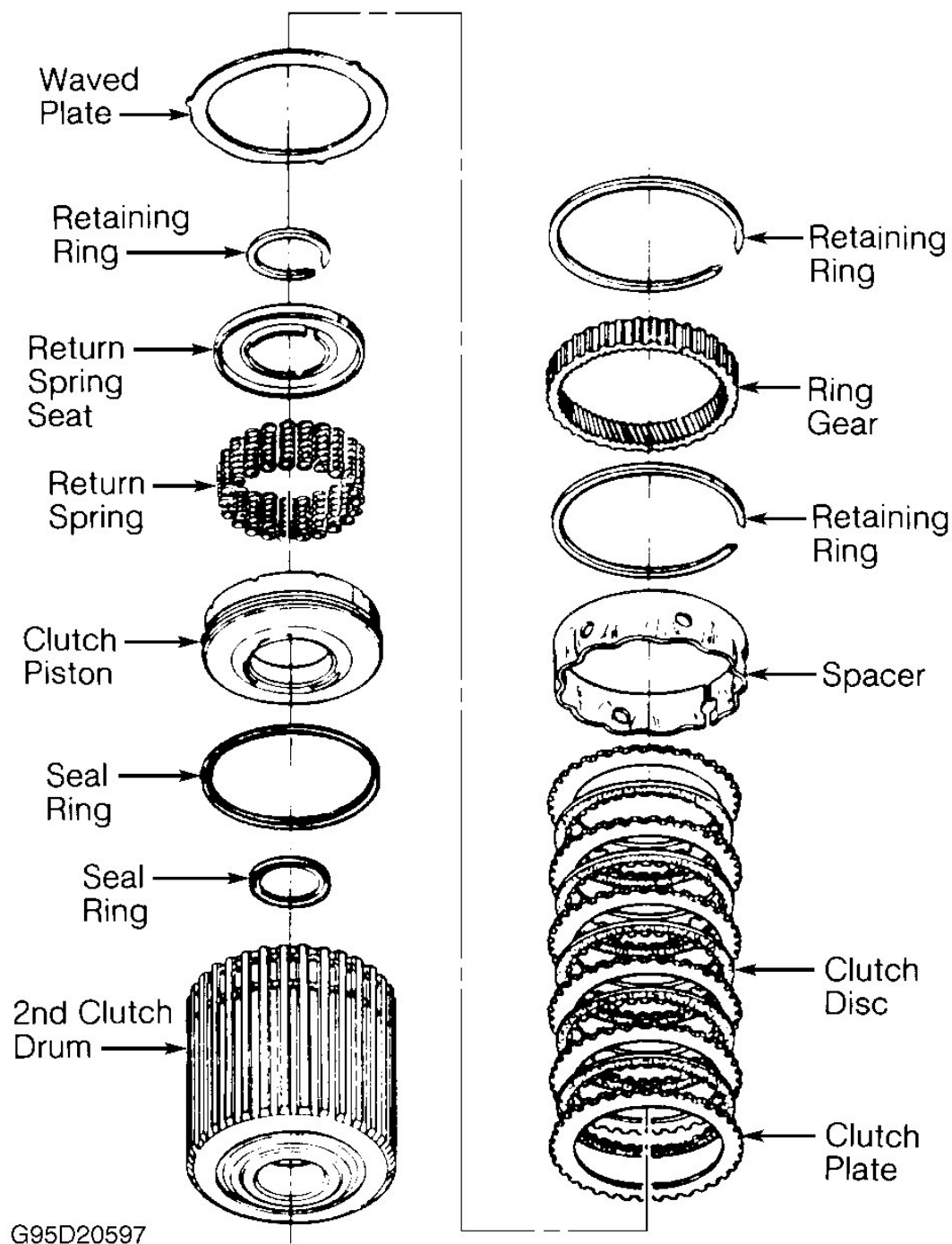


Fig. 50: Exploded View Of 2nd Clutch
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

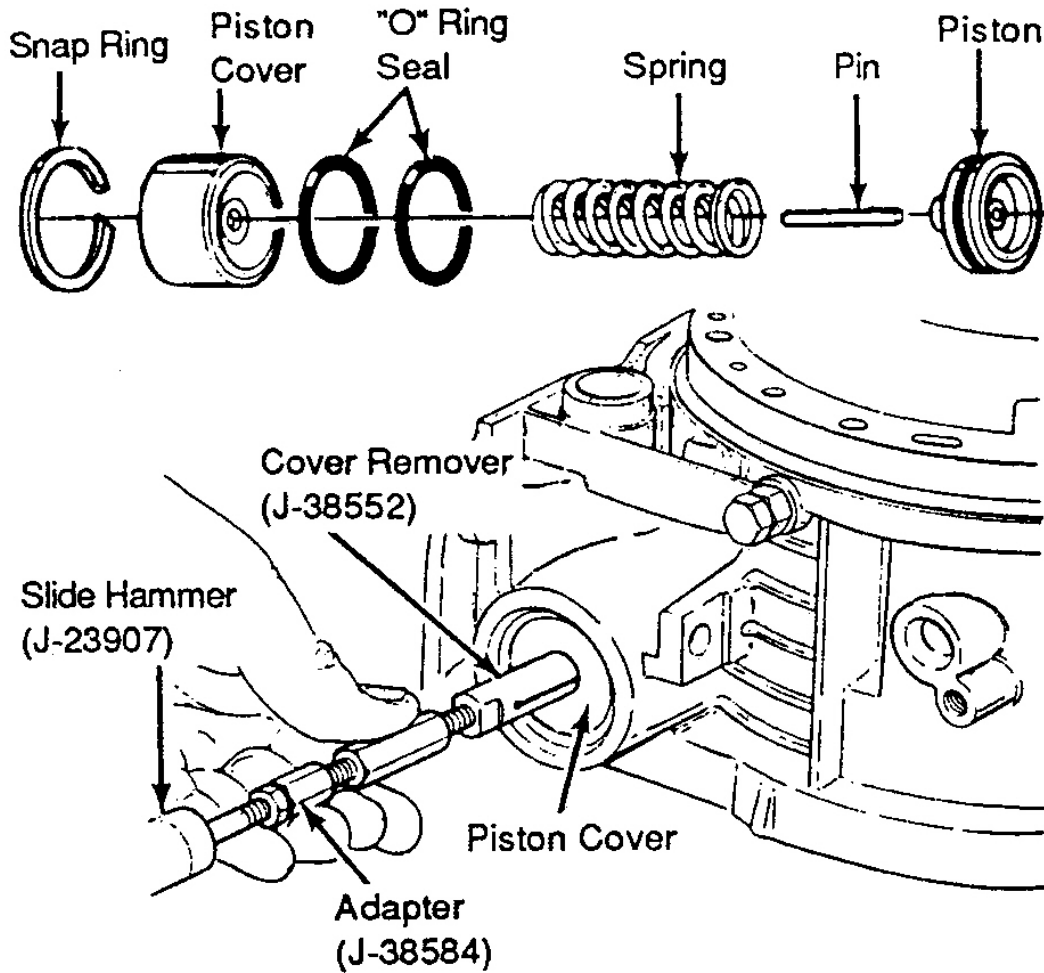
Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for excessive wear and damage. Replace parts (if necessary). Shake piston for ball movement. Replace piston if check ball is missing or falls out. Seal lips must face toward front of transmission.

Reassembly

1. Install 2nd clutch piston assembly using Piston Installer (J-23080-A). Lubricate seal lip with transmission fluid. Use installer to protect outer piston seal lip. Remove installer. Install 22 piston springs and spring seat on 2nd clutch piston.
2. Place retaining ring onto spring seat. Use Spring Compressor (J-23327) to compress piston springs. DO NOT let spring seat catch in ring groove. Install retaining ring and remove spring compressor. Install waved plates and clutch plates. Start with steel plate and alternate with lined plates.
3. Align 2nd clutch inner tangs. Install spacer with fluted end toward clutch plate. Install retaining ring, ring gear and retaining ring.

4TH CLUTCH, OVERRUN CLUTCH & ADAPTER CASE ASSEMBLY**3-4 ACCUMULATOR PISTON****Disassembly**

Install cover compressor on 2 cast ribs of adapter plate. Compress piston cover with Piston Cover (J-38559) and remove snap ring and cover compressor. Assemble Slide Hammer (J-23907), Adapter (J-38542) and Cover Remover (J-38552) to remove cover. Remove spring, pin and piston assembly. See **Fig. 51** .



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Fig. 51: Exploded View Of 3-4 Accumulator Piston & Cover Removal
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts in cleaning solvent and dry with compressed air. Inspect all parts for excessive wear and damage. Replace parts (if necessary). Replace all piston seals and all "O" rings.

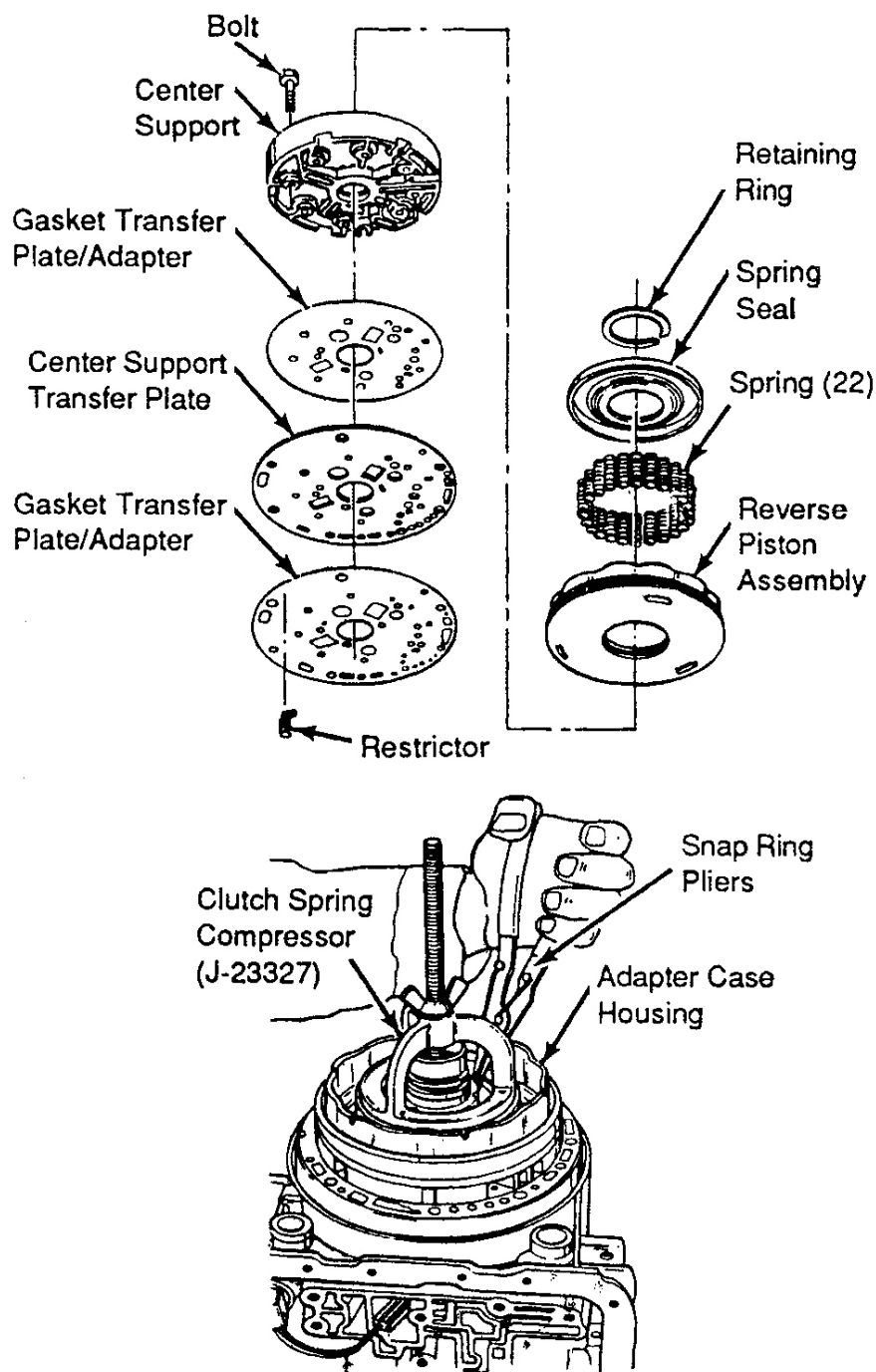
Reassembly

Place piston and "O" ring assembly into Accumulator Piston Fitter (J-38533). Place fitter into adapter case and push piston into position. Remove fitter and install pin, spring and cover. Install Piston Cover Compressor (J-38559), compress cover. Seat snap ring into groove and remove tool.

REVERSE CLUTCH PISTON/CENTER SUPPORT

Disassembly

1. Install Clutch Spring Compressor (J-23327), and compress spring seat. DO NOT over compress springs and seat or damage to spring seat can occur. Remove retaining ring. Release pressure and remove tool. Remove spring seat and 24 springs. Remove piston assembly. See **Fig. 52** .
2. Remove center support outer rubber seal and eight 13-mm bolts. Separate center support from adapter case. Inspect 2 teflon center support seals. Replace seals (if necessary).
3. Remove overrun lock out valve, pin, plug and valve. Remove gasket transfer plate/center support, center support transfer plate, gasket transfer plate, adapter and restrictor.



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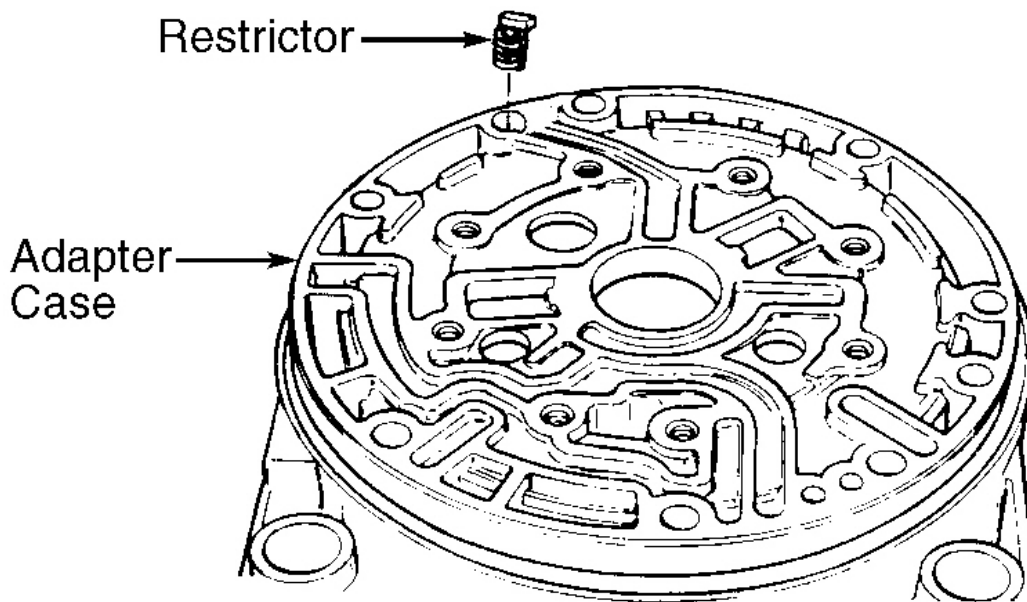
Fig. 52: Exploded View Of Reverse Clutch Piston & Center Support
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Replace all seals (if necessary). Inspect for damage or excessive wear. Replace parts (if necessary).

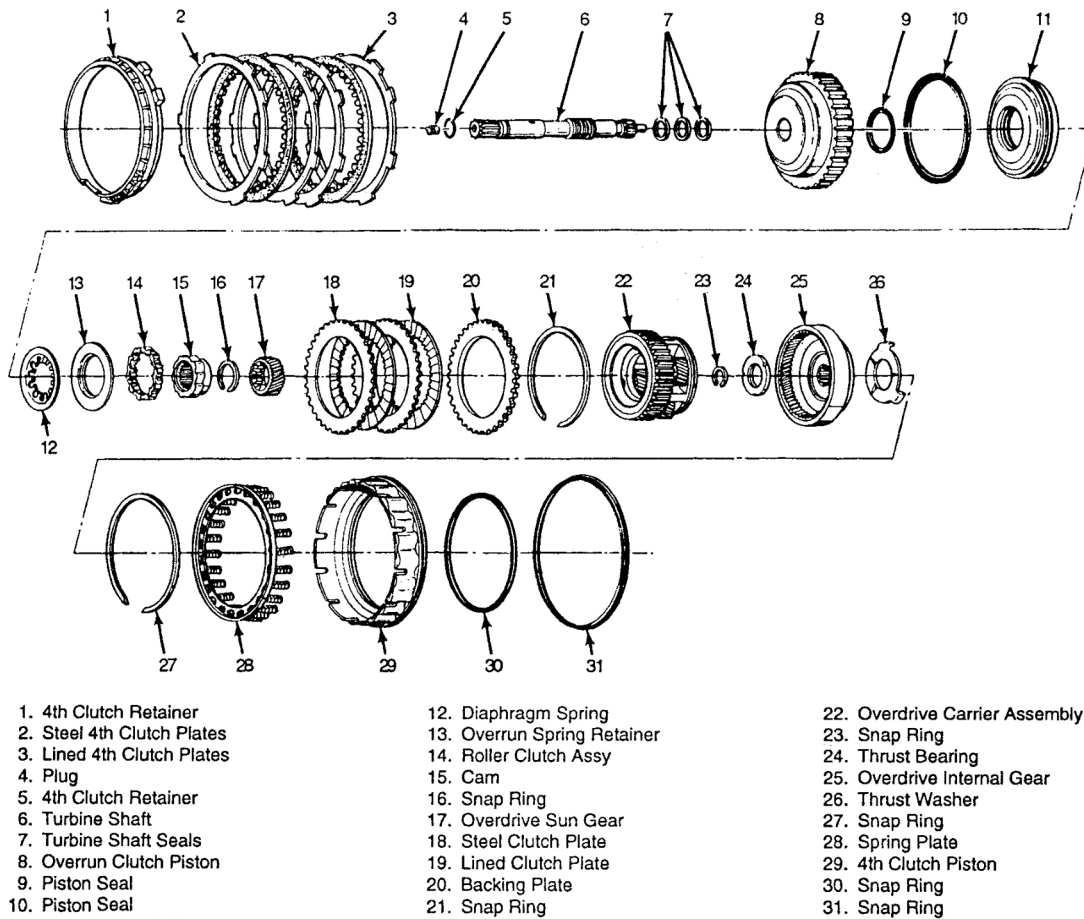
Reassembly

1. Install restrictor in lube overdrive channel in adapter case housing. See **Fig. 53** . Install gasket transfer plate/adapter center support transfer plate, gasket transfer plate/center support. Install overrun lock out valve, valve spring pin and plug. Ensure correct assembly of valve, spring fits over long small diameter.
2. Place center support on adapter case. Install eight 13-mm bolts and torque to 18 ft. lbs. (25 N.m). Install outer seal on adapter case.
3. Install piston into center support. Install 24 springs, spring seat and retaining ring. Install Reverse Clutch Spring Compressor (J-23327) and compress retaining ring and springs. Seat snap ring into groove and remove tool. Install selective washer, seat tangs in slot on center support. Use petrolatum to hold selective washer in place.
4. Install 4th Clutch Piston Fitter (J-38554) on piston and install 4th clutch piston in adapter case. Remove fitter and install retainer and spring assembly. Place snap ring in adapter case.
5. Install 4th Clutch Spring Compressor (J-23327 and J-23327-90). Compress retainer and spring assembly. Seat snap ring in groove and remove compressor. See **Fig. 54** .



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Fig. 53: Installing Restrictor In Adapter Case Housing
 Courtesy of ISUZU MOTOR CO.



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Fig. 54: Exploded View Of Overrun Clutch & Overdrive Carrier
Courtesy of ISUZU MOTOR CO.

OVERRUN CLUTCH

Disassembly

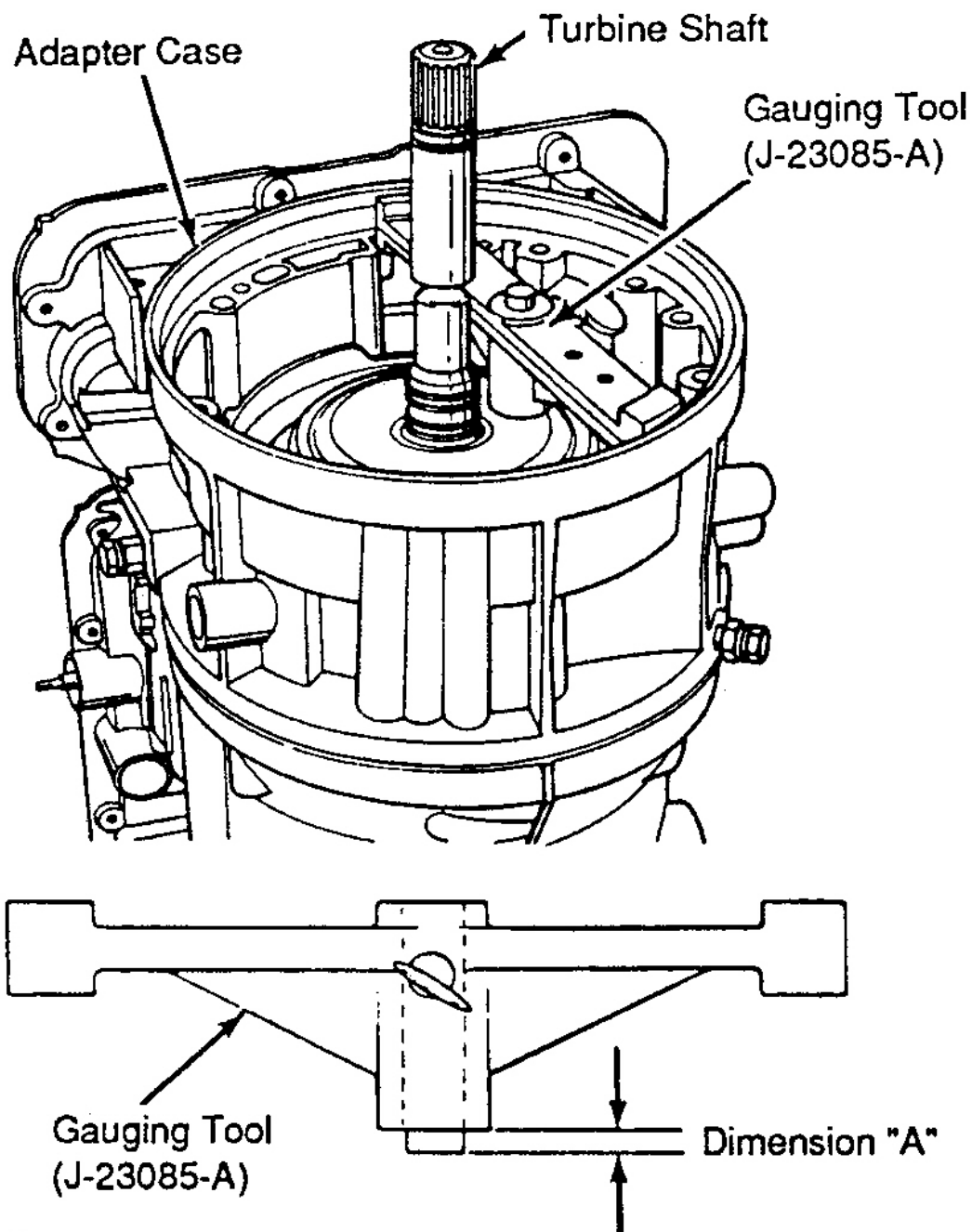
1. Position overrun clutch assembly upright using overdrive internal gear as a support. Remove snap ring, overdrive carrier assembly. Remove sun gear and turbine shaft. Remove snap ring, braking plate and clutch plates.
2. Compress piston return spring with Spring Compressor (J-23327 and J-23327-9). Remove snap ring and spring compressor. Remove overrun roller clutch cam and roller clutch assembly. Remove overrun clutch release spring retainer, diaphragm spring and piston assembly. Measure overdrive carrier assembly with feeler gauge. Pinion end play clearance should be .009-.025" (.24-.64 mm).

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for damage or excessive wear. Replace parts (if necessary).

Reassembly

1. Install 3 turbine shaft seal rings with Seal Installer and Sizer (J38558). Lubricate seal with transmission fluid. Install Overrun Clutch Piston Seal Installer Set (J-3855), Inner and Outer. Install inner tool on hub, preinstall piston into outer seal installer. Install overrun clutch assembly using outer installer while pushing piston into housing. Remove installers.
2. Install diaphragm spring, overrun spring retainer with lip facing upward. Install overrun roller clutch assembly and cam. Place snap ring loosely on spring retainer. Hold Clutch Spring Compressor (J-23327 and J-23327-91) in a vise. Compress piston return spring with compressor.
3. Set snap ring in ring groove and remove compressor. Install overdrive ring gear with countersink pointing downward. Install clutch plates starting with steel plate and alternate with lined plates.
4. Install backing plate, snap ring and align inner overrun clutch tangs. Install assembled overdrive carrier. Turn assembly in counterclockwise direction only until roller clutch enters outer race. Rotate assembly and listen for loose rollers.
5. Install turbine shaft and snap ring. Install thrust washer into adapter case with tangs facing down. Install preassembled overdrive internal gear and thrust bearing assembly onto overrun clutch assembly. Install bearing assembly with black side up. Use petrolatum to keep assembly in place.
6. Install complete overdrive carrier and internal gear assembly into adapter case. Install 4th clutch plates in following sequence, steel plate and lined plate alternately. Steel plates go in with short tang facing toward valve body surface. Install 4th clutch retainer with notch facing up and positioned toward valve surface.
7. Install selective washer gauging tool on adapter case flange and against input shaft. Position inner shaft of tool against thrust surface of overrun clutch housing. Tighten thumbscrew and remove gauging tool. See **Fig. 55**.
8. Measure gap "A", select appropriate washer and set it aside for reassembly. See **SELECTIVE THRUST WASHER** table.



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Fig. 55: Identifying Location Of Dimension "A"
Courtesy of ISUZU MOTOR CO.

SELECTIVE THRUST WASHER

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Dimension "A" In. (mm)	Color
.060-.064 (1.53-1.63)	Yellow
.067-.072 (1.72-1.83)	Red
.075-.079 (1.91-2.01)	Black
.082-.086 (2.10 2.20)	Natural
.090-.094 (2.29-2.39)	Green
.097-.101 (2.48-2.58)	Blue

CONVERTER HOUSING & OIL PUMP ASSEMBLY

Disassembly

1. Remove five 13-mm bolts from converter housing. Remove converter outer seal ring and wear plate. Remove oil pump drive gear and driven gear. Remove converter clutch control valve, pin, plug spring and valve. Remove throttle signal accumulator snap ring seat, spring and piston.
2. Remove boost valve sleeve pin, sleeve and valve. Remove pressure regulator, spring seat, valve spring, spring seat and valve. See **Fig. 56** .



1. Lubricate and preinstall pressure regulator spring seat on valve flat side against shoulder. Install pressure regulator valve, valve and seat assembly. Install spring, spring seat flat side away from spring. Set boost valve into sleeve and install boost valve sleeve assembly and pin.

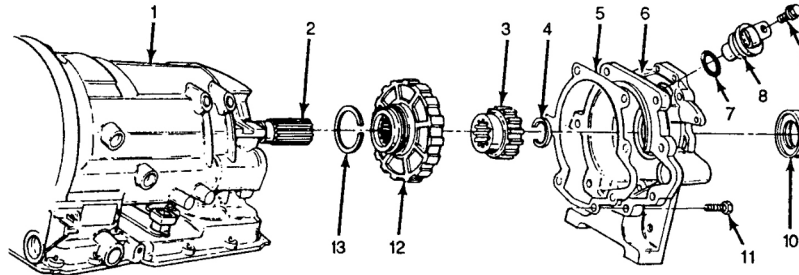
2. Install throttle signal accumulator, piston spring, spring seat with flat side away from spring and snap ring. Install converter clutch control valve, spring, plug and pin. Install driven gear and drive gear.
3. Install wear plate with identification dots facing up. Install seal into converter housing. Torque retainer bolts to 26 INCH lbs. (3 N.m). Place converter housing onto assembled oil pump ensuring alignment with 2 short guide pins in outer bolt holes. Install converter inner 13-mm bolts loosely while centering converter housing using Pump Centering Tool (J-38557).
4. Torque inner 13-mm bolts to 15 ft. lbs. (20 N.m) in a crisscross pattern. Remove centering pin and guide pins. Install outer seal ring gasket and selective washer, hold washer in place with petrolatum. Install converter housing and oil pump assembly onto adapter case.
5. Install seven outer 13-mm bolts and torque to 30 ft. lbs. (40 N.m) in a crisscross pattern. Ensure free rotation of pump using Pump Rotation Tool (J-23082-01). Install Turbine Shaft Puller (J-25022 and J-24773-1) on turbine shaft. Install dial indicator on converter housing case.
6. Pull turbine shaft upwards with puller and measure end play. Standard is .004-.031" (.10-.80 mm). Select correct washer to meet standard. See **SELECTIVE THRUST WASHER** table.

EXTENSION HOUSING ASSEMBLY

Disassembly

For disassembly reference, refer to exploded view of extension housing assembly. See **Fig. 57** .

1. Transmission Housing
2. Output Shaft
3. Speedometer Gear
4. Retaining Ring
5. Extension Housing Gasket
6. Extension Housing
7. "O" Ring
8. Speed Sensor
9. 10 mm Bolt
10. Output Seal
11. 8 mm Bolt
12. Parking Lock Gear
13. Retaining Ring



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Fig. 57: Exploded View Of Extension Housing
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts in solvent and dry with compressed air. Replace all seals. Inspect parts for damage or excessive wear and replace parts (if necessary).

Reassembly

1. Place transmission housing with valve body side down. Install parking gear lock, speedometer wheel and snap ring. Install extension housing and align parking pawl shaft. Install actuator in extension assembly.
2. Install seven 8-mm Torx screws and torque to 24 ft. lbs. (32 N.m). Install speed sensor assembly and 10-mm bolt. Torque bolt to 115 INCH lbs. (13 N.m). Install dial indicator on extension housing and set indicator to zero. Manually push output shaft upwards to measure end play. Standard should be .014-

.031" (.36-.80 mm). If reading exceeds standards, select correct washer. See **SELECTIVE THRUST WASHER** table.

SERVO PISTON

Disassembly

Install Servo Piston Compressor (J-23075) with offset to rear of case. Compress servo piston assembly. Remove servo piston retaining ring and slowly release servo piston assembly. Remove tool, servo piston assembly, return spring and servo apply rod.

Cleaning & Inspection

Clean all parts in cleaning solvent and dry with compressed air. Inspect all parts for excessive wear and damage. Replace parts (if necessary).

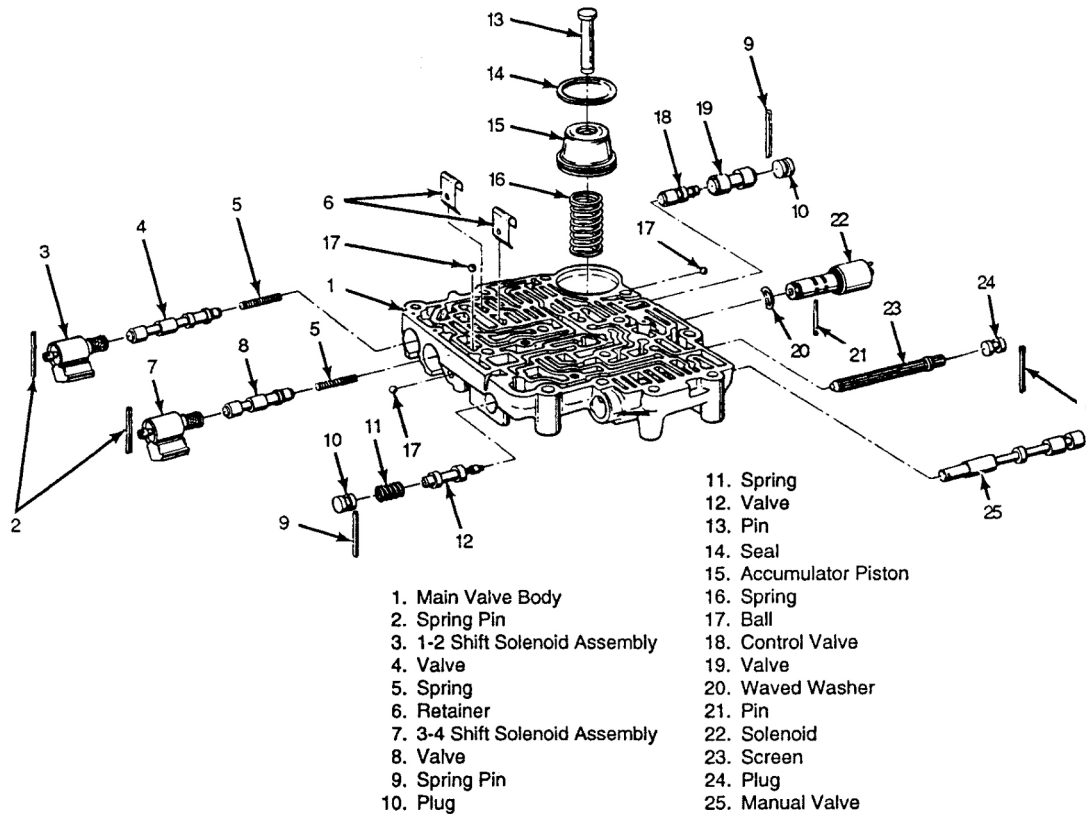
Reassembly

1. Ensure brake band is properly positioned, rotate output shaft as necessary. Install apply rod, round end toward band, return spring and piston assembly. Install servo spring compressor with offset to rear of case.
2. Compress servo piston seal ring using Servo Piston Fitter (J-37428) while tightening tool bolt. Install servo piston retaining ring and remove tool. Adjust brake band by torquing servo adjusting bolt to 40 INCH lbs. (4.5 N.m). Ensure lock nut is loose and back off bolt 5 turns exactly.
3. Hold piston sleeve with wrench and torque lock nut to 14 ft. lbs. (18.5 N.m). Ensure adjusting bolt does not turn.

MAIN VALVE BODY

Disassembly

1. Remove solenoids by pulling on metal tip. DO NOT grasp connector housing. Remove gasket transfer plate/main case and two 11-mm bolts. Remove transfer plate gasket transfer plate/valve body, check ball and manual valve. See [Fig. 58](#) .
2. Push in band solenoid to compress waved washer and remove pin. Remove spring pin and remove 1-2/3-4 shift solenoid, retainer, valve and spring. Remove 2-3 shift solenoid by removing spring pin with .12" (3.0 mm) punch. Remove retainer valve and spring.
3. Remove low control valve, spring pin, plug and spring. Remove screen assembly band control spring pin, plug and screen. Remove 1-2 accumulator cover, spring pin, plug, valve and control valve.



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Fig. 58: Exploded View Of Main Valve Body
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts in cleaning solvent and dry with compressed air. Inspect parts for excessive wear and damage. Replace parts (if necessary). Replace all gaskets and seals.

Reassembly

1. Install 1-2 accumulator control valve plug and spring. Install screen assembly plug and pin. Install low pressure control valve, spring, plug and spring pin. Install 2-3 shift, spring, valve, retainer solenoid assembly and spring pin.
2. Install 1-2/3-4 shift valve, retainer, solenoid- assembly and spring pin. Install band control solenoid waved washer, solenoid and pin. Install manual valve and check ball.
3. Install gasket valve body/transfer plate, transfer plate using 2 guide pins. Install two 11-mm bolts and torque to 115 INCH lbs. (13 N.m). Install gasket transfer plate and main case valve body. Install check balls into main valve body.

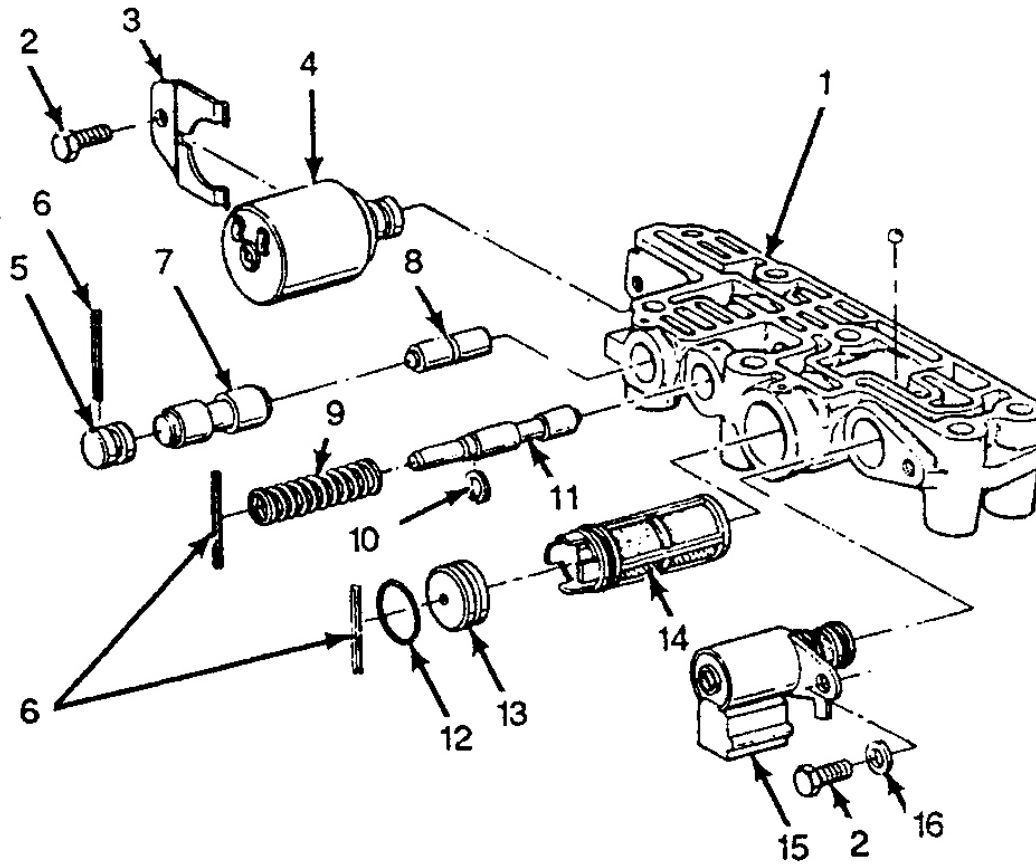
NOTE: Manual valve must be extended as short end of manual valve link is connected to range selector lever. Long end of link goes into valve.

4. Install electrical 4-pin connector/main case and wiring harness. Install 2 Guide Pins for Valve Body/Main Case (J-25025-B), in main valve case. Install assembled valve body assembly and manual valve link.
5. Install seven 13-mm bolts and torque to 15 ft. lbs. (20 N.m). Remove 2 guide pins. Connect electrical harness to band control and shift solenoid. Install roller and spring assembly with clip and torque two 13-mm bolts to 15 ft. lbs. (20 N.m).
6. Install servo cover gasket, cover and four 13-mm bolts and torque bolt to 18 ft. lbs. (25 N.m). Install oil filter and torque three 13-mm bolts to 15 ft. lbs. (20 N.m).

ADAPTER CASE VALVE BODY

Disassembly

1. Remove valve body from main case. Remove converter clutch solenoid, 11-mm bolt, washer and solenoid assembly with 2 "O" rings. Remove force motor, 11-mm bolt retainer and solenoid. See **Fig. 59** .
2. Remove 3-4 accumulator valve, spring plug and control valve. Remove feed limit valve spring pin, spring and retainer pin. Remove force motor screen assembly, spring pin plug and "O" ring. Use 5-mm bolt to remove plug.



- | | |
|-------------------------|-------------------------------|
| 1. Valve Body | 9. Feed Limit Spring |
| 2. 11 mm Bolt | 10. Retainer Ring |
| 3. Retainer | 11. Feed Limit Valve |
| 4. Solenoid Force Motor | 12. "O" Ring |
| 5. Plug | 13. Plug |
| 6. Pin | 14. Screen Assembly |
| 7. Accumulator Valve | 15. Converter Clutch Solenoid |
| 8. Control Valve | 16. Washer |

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Fig. 59: Exploded View Of Adapter Case Valve Body
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for excessive wear and damage. Replace parts (if necessary). Replace all gaskets, seals and "O" rings.

Reassembly

1. Install force motor screen, plug, "O" ring and spring pin. Install feed limit valve, retainer ring, spring and spring pin. Install 3-4 accumulator valve, control valve, spring and pin.
2. Install force motor solenoid, retainer and 11-mm bolt. Torque bolt to 89 INCH lbs. (10 N.m). Install solenoids with terminals facing case surface.

TRANSMISSION REASSEMBLY

1. Install new seal in selector shaft opening in main case. Install selector shaft ensuring spring pin is positioned inside case. DO NOT push pin flush with main case surface, leave enough pin height for removal. Install actuator assembly, parking lock and range selector. Install 17-mm nut on selector shaft and torque to 12 ft. lbs. (17 N.m).
2. Install thrust washer and thrust bearing in main case. Install assembled brake drum and band into main case. Ensuring servo pin area with servo hole. Install reaction drum and reaction sun gear. Install thrust washer and thrust bearing.
3. Install planetary carrier with ring gear and output shaft assembly. Ensure pinion end play clearance is .005-.035 (.13-.89 mm). Remove ring gear on planetary carrier is in place. Install thrust washer and thrust bearing and hold in place with petrolatum.
4. Install assembled 2nd and 3rd clutch with sprag into main case. Twist output shaft and clutch assemblies. Install Gauging Tool and Spacer Ring (J-2308-A) on main case. Measure reverse clutch plate by compressing steel plates, lined plates and waved plates using 16 lbs. (70 N) of pressure. Measure compressed plates total height. See **SELECTIVE PRESSURE PLATE** table. Install correct plate. Install selective pressure plate, with lip side up, tang facing valve body face. Install clutch plates, starting with steel plate and alternate with lined plates. Install waved clutch plate with center tang facing valve body side.
5. Install Gauging Tool and Spacer Ring (J-23085A) on case flange and against intermediate shaft. Position inner shaft of gauging tool against thrust surface of 2nd clutch hub. Tighten thumb screw, remove tool. Fit spacer ring on inner shaft of tool. Measure gap "A" and select correct washer. See **SELECTIVE THRUST WASHER** table. Set selected washer aside. See **Fig. 55**.
6. Install 3-4 accumulator piston into main case using Accumulator Piston Fitter (J-38553) to insert piston. Remove fitter and install Accumulator Piston Cover Compressor (J-38559) and install cover. Install snap ring and remove tool.
7. Install assembled center support and selected washer into main case. Install 2 Guide Pins (J-38588) into main case and install adapter case on main case. Remove guide pins. Install 4th Clutch Piston Fitter (J-38554) and install 4th clutch piston into adapter case. Remove fitter, install retainer, spring assembly and place snap ring in adapter case.
8. Install 4th Clutch Spring Compressor (J-23327 and J-23327-90) and compress retainer and spring. Seat snap ring and remove compressor. Install assembled overrun clutch into adapter case. Install assembled overdrive carrier on turbine shaft and secure with retaining ring.
9. Install assembled overdrive assembly and internal gear assembly into adapter case. Install 4th clutch plates in following order, steel, lined, steel, lined and steel. Steel plates go in with short tang facing toward valve body surface.
10. Install Selective Washer Gauging Tool (J-23085-H) on main case flange. Position inner shaft of tool against thrust surface of overrun clutch housing. Tighten thumb screw and remove tool. Measure gap "A"

and, select correct washer. See **SELECTIVE THRUST WASHER** table. Set selected washer aside.

11. Installed lubricated pressure regulator spring seat on valve flat side against shoulder. Install pressure regulator valve and assemble with spring seat flat side away from spring. Install boost valve, sleeve into pressure regulator spring and secure with pin.
12. Install and assemble throttle signal accumulator, install spring seat with flat side away from spring and snap ring into oil pump housing. Install and assemble converter clutch center valve into oil pump housing. Install driven gear and drive gear.
13. Install wear plate with identification dots facing upward. Install new seal on converter housing. Install converter housing onto assembled oil pump, lining up housing using 2 Short Guide Pins (J-38588). Center converter housing using Centering Tool (J-38557). Torque inner 13-mm bolts to 15 ft. lbs. (20 N.m) in crisscross pattern. Remove centering tool and guide pins. Install gasket and selected washer.
14. Install assembled converter housing and oil pump assembly to adapter case. Install and torque seven outer 13-mm bolts to 30 ft. lbs. (40 N.m) in crisscross pattern. Ensure free rotation of pump using Pump Rotation Tool (J-23082-1).
15. Install Turbine Shaft Puller (J-25022) and Turbine Shaft Puller (J-2477-3) onto output shaft. Install dial indicator and set to zero. Pull turbine shaft upwards to measure end play. End play should be .004-.031" (.10-.80 mm). Remove dial indicator and puller tool. If end play is not correct repeat selective washer selection measurement.
16. Install parking gear, seal, speedometer gear and snap ring on output shaft. Install extension housing with gasket. Align parking pawl shaft and actuator assembly into extension assembly. Torque seven 8-mm Torx screws to 24 ft. lbs. (32 N.m).
17. Install speed sensor and torque 10-mm bolt to 115 INCH lbs. (13 N.m). Install dial indicator on extension housing and set to zero. Manually push output shaft upwards. End play should be .014-.031" (.36-.80 mm). If end play is not correct repeat selective washer measurement selection.
18. Ensure brake band is correctly positioned, rotate output shaft if necessary. Install Servo Piston Fitter (KM689) into servo bore. Install tool with offset to rear of case. Compress servo piston seal ring with fitter while tightening tool screw. Install piston servo retaining ring. Remove fitter tool.
19. Adjust brake band by tightening servo adjusting screw to 40 INCH lbs. (4.5 N.m). Ensure lock nut is loose, back off screw 5 turns exactly. Hold piston sleeve with wrench and torque lock nut to 14 ft. lbs. (18.5 N.m). Ensure adjusting screw does not turn.
20. Install assembled transfer plate onto main valve body. Torque two 11-mm bolts to 115 INCH lbs. (13 N.m). Install 2 check balls into main valve body. Install electrical 4-pin connector/main case and wiring harness. Install 2 Body/Main Case Guide Pins (J-25025-B). Install assembled main valve body assembly and manual valve link.
21. Manual valve link must be extended as short end of manual valve link is connected to range selector lever. Long end of link goes into valve. Install seven 13-mm bolts and torque to 15 ft. lbs. (20 N.m) and remove 2 guide pins.
22. Connect harness to band control and shift solenoids. Assemble roller and spring assembly with clip. Install two 13-mm bolts and torque to 15 ft. lbs. (20 N.m). Install servo cover and gasket and torque four 13-mm bolts to 18 ft. lbs. (25 N.m). Install oil filter and torque three 13-mm bolts to 15 ft. lbs. (20 N.m).
23. Install oil pan gasket, magnet and oil pan and torque sixteen 10-mm bolts to 97 INCH lbs. (11 N.m). Install oil pan drain plug and washer, torque plug to 18 ft. lbs. (25 N.m).
24. Installed assembled adapter case valve body and electrical 5-pin connector. Install seven 13-mm bolts and torque to 15 ft. lbs. (20 N.m). Connect harness assembly to converter clutch solenoid and force motor.

1990 Isuzu Trooper LS

1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul

Install oil pan and gasket. Torque twelve 20-mm bolts to 97 INCH lbs. (11 N.m).

25. Install oil filler tube with seal ring and torque to 89 INCH lbs. (10 N.m). Install mode switch and shield and two 10-mm bolts. Adjust setting tool and torque to 115 INCH lbs. (13 N.m).
26. Install "O" ring on turbine shaft and install torque converter assembly. Spin converter to ensure proper fit. Install converter safety hold.

SELECTIVE PRESSURE PLATE

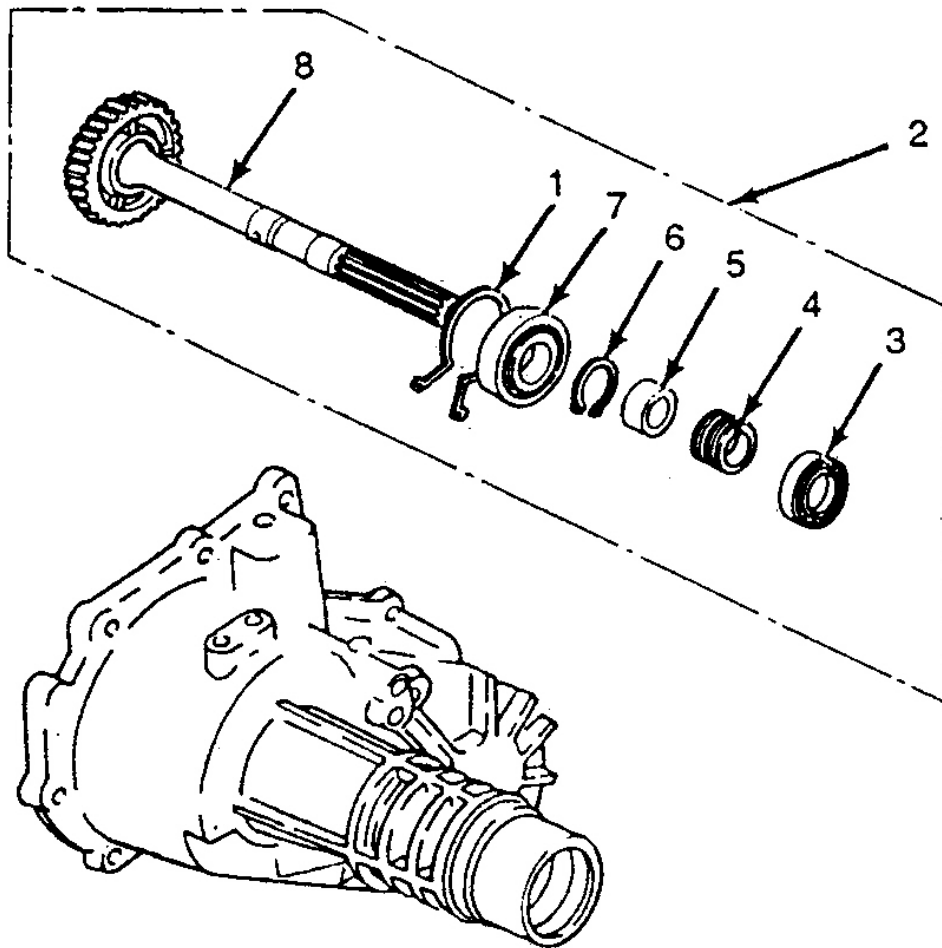
Part No.	Height In. (mm)
8-96014-622-0 Marked "622"	.927-.938 (23.54-23.82)
8-96014-623-0 Marked "623"	.915-.926 (23.25-23.53)
8-96014-624-0 Marked "624"	.904-.914 (22.96-23.24)
8-96014-625-0 Marked "625"	.893-.903 (22.67-22.95)
8-96014-626-0 Marked "626"	.882-.892 (22.40-22.66)

TRANSFER CASE

TRANSFER REAR CASE

Disassembly

For disassembly reference, refer to exploded view of transfer rear case assembly. See **Fig. 60** . Remove snap ring and rear output shaft. Remove rear cover oil seal.



- | | |
|-------------------------------|----------------------|
| 1. Bearing Snap Ring | 5. Collar |
| 2. Rear Output Shaft Assembly | 6. Bearing Snap Ring |
| 3. Ball Bearing | 7. Ball Bearing |
| 4. Speedometer Drive Gear | 8. Rear Output Shaft |

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Fig. 60: Exploded View Of Transfer Rear Case Assembly
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for excessive wear. Replace parts (if necessary). See **CLEARANCE & MEASUREMENT** table.

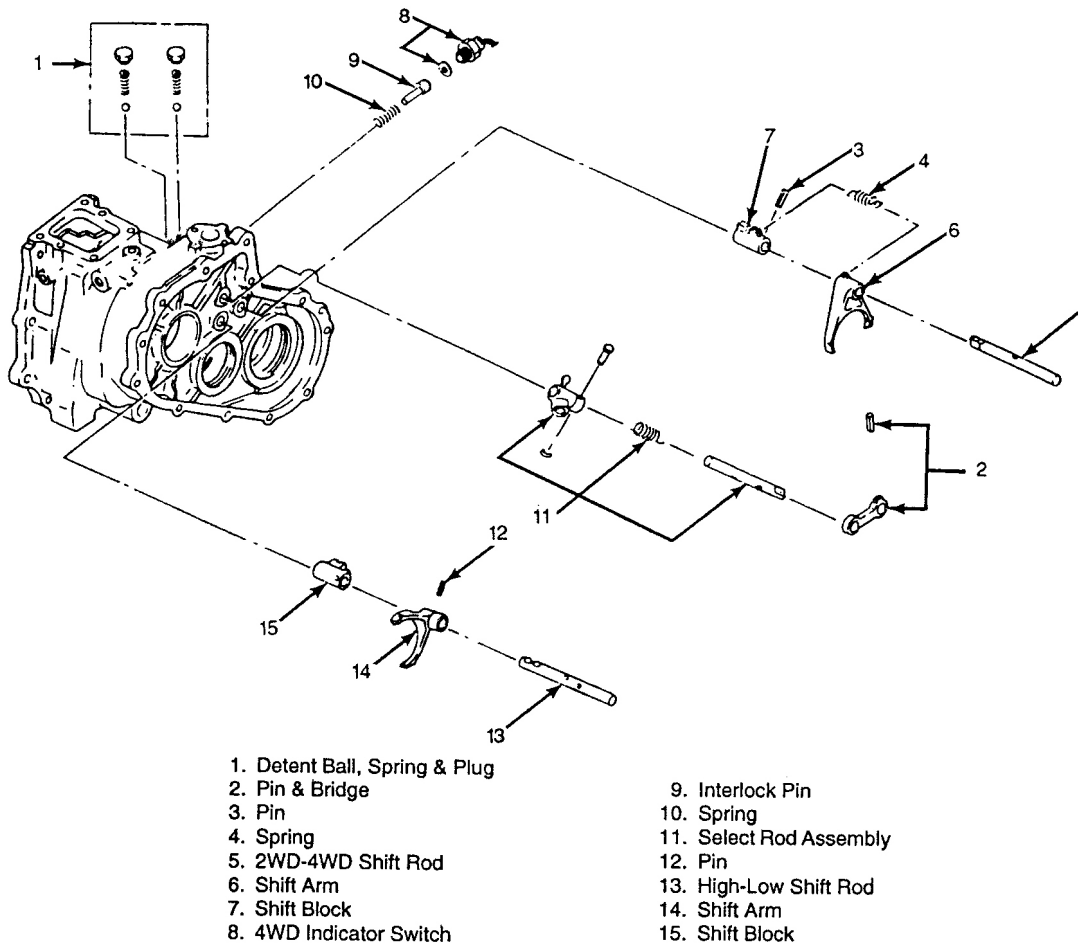
Reassembly

Use Roller Bearing Installer (J-37223) to seat roller bearing into rear output shaft. Install rear cover oil seal and install rear output shaft into housing. Install rear output shaft snap ring.

TRANSFER SHIFT ARM ASSEMBLY

Disassembly

Use pin punch to remove spring from bridge and remove bridge. Engage 2WD/4WD sleeve with front output gear. Remove spring pin and 2WD/4WD shift rod. Remove interlock with magnetic tool. Use a pin punch to remove pin and remove high-low shift rod from transfer case. See **Fig. 61**.



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Fig. 61: Exploded View Of Shift Arm Assembly
Courtesy of ISUZU MOTOR CO.

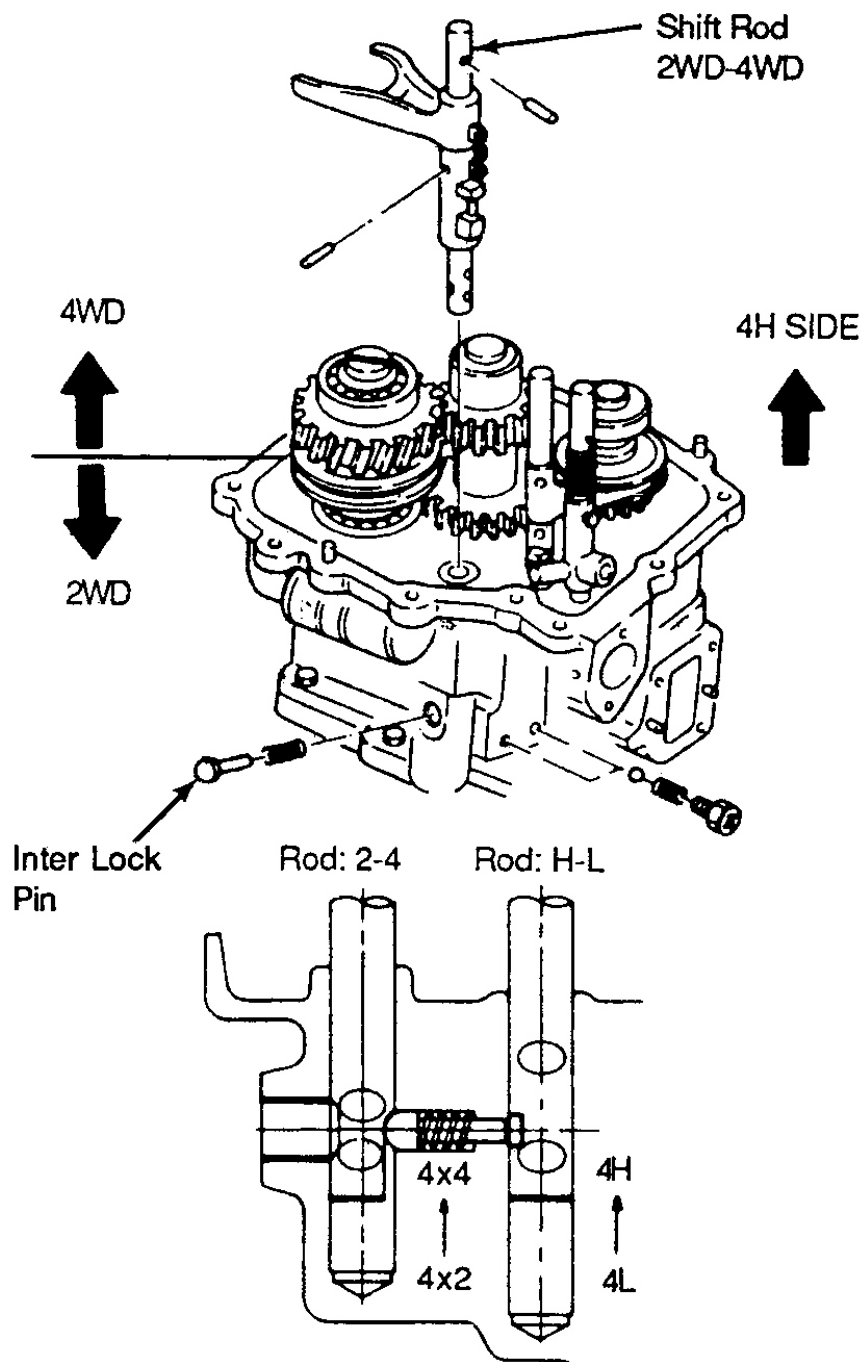
Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for excessive wear. Replace parts (if necessary). See **CLEARANCE & MEASUREMENT** and **DETENT SPRING SPECIFICATIONS**

tables.

Reassembly

1. Install shift blocks and arm on high-low shift rod. Engage high-low sleeve with 4H side up and install spring pin to shift block.
2. Engage high-low synchronizer with 4H side up and install interlock pin. Install 2WD/4WD shift rod with interlock pin pushed in. Install 4WD indicator switch and torque to 29 ft. lbs. (39 N.m).
3. Engage 2WD/4WD sleeve with 4WD side up and install spring pin. Install detent ball spring and plug. Torque plug to 10-17 ft. lbs. (14-23 N.m). See **Fig. 62** .



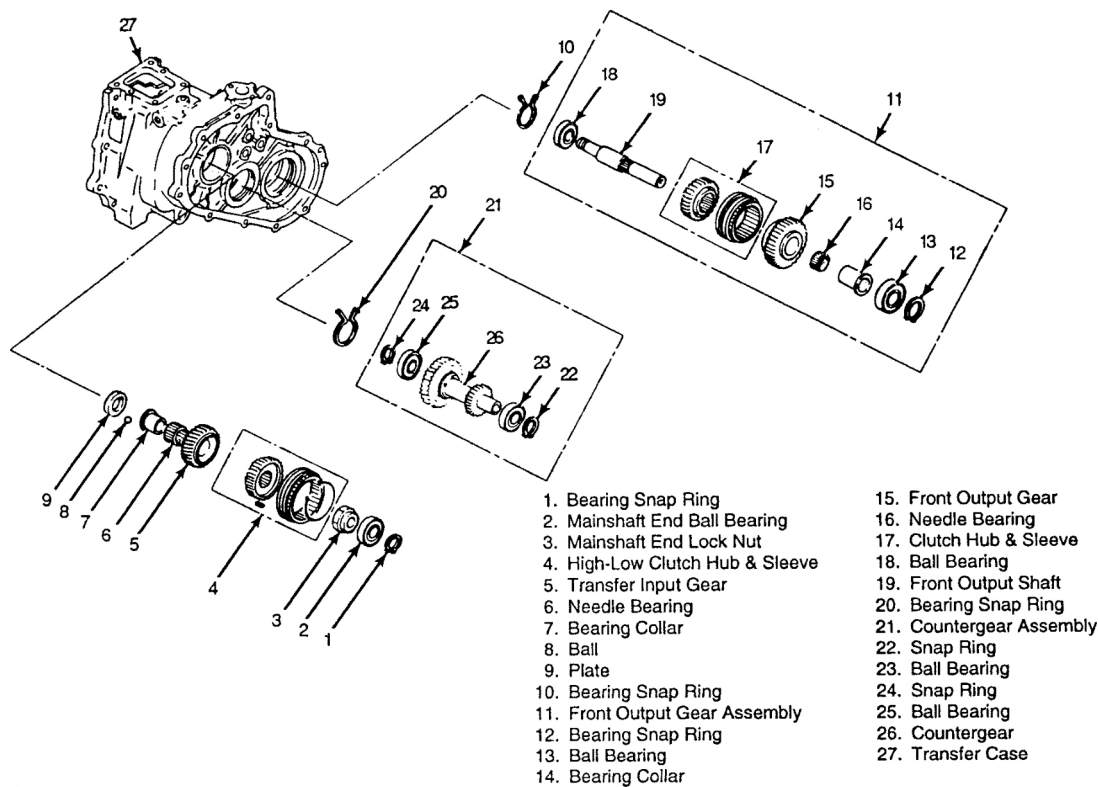
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Fig. 62: Installing Shift Arm Fork & Shift Rod
Courtesy of ISUZU MOTOR CO.

TRANSFER CASE

Disassembly

1. Use snap ring pliers to remove snap ring and remove mainshaft end roller bearing with Bearing Remover (J-32717). Engage 3rd top synchronizer with 3rd gear, and low-2nd, synchronizer with low gear. Remove lock nut with Lock Nut Wrench (J-32719).
2. Use a puller to remove high-low clutch hub and sleeve and transfer input gear. Pry off bearing collar. Remove snap ring and remove front output gear assembly by tapping off with a plastic mallet. Install front output gear in press and press out roller bearing with Bearing Remover (J-22912-01). Remove snap rings prior to pressing out roller bearings. See **Fig. 63**.
3. Remove and replace transfer case main oil seal with Oil Seal Installer (J-38592). Apply engine oil to seal lip. Remove and replace transfer case front output shaft oil seal with Oil Seal Installer (J-38594). Apply engine oil to seal lip.



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Fig. 63: Exploded View Of Transfer Case Assembly
Courtesy of ISUZU MOTOR CO.

Cleaning & Inspection

Clean all parts with cleaning solvent and dry with compressed air. Inspect all parts for excessive wear. Replace parts (if necessary). See **CLEARANCE & MEASUREMENT** table.

Reassembly

1. Assemble and install counter gear assembly into transfer case. Press needle bearing and collar together with front output gear with Bearing Installer (J-22912-01) onto front output shaft. Install snap ring selected from OUTPUT SHAFT SNAP RING table.
2. Turn high-low clutch hub face toward side of sleeve with small groove on outer circumference. Clutch hub groove must be aligned with key groove of sleeve. See **Fig. 64**.
3. Use Lock Nut Wrench (J-37219) to torque mainshaft end lock nut to 94-108 (127-146 N.m). Stake lock nut. Use Ball Bearing Installer (J-37223) to seat mainshaft end roller bearing.
4. Apply liquid gasket to transfer rear case flange and mating surface. Shift high-low synchronizer to 4H. Turn select rod counterclockwise so select block notch will lock into 2WD-4WD block. When cases are fitted together, cutaway portion of select rod end will align with rear case stopper. Torque case bolts to 21-32 ft. lbs. (28-44 N.m).
5. Use Companion Flange Holder (J-37221) and torque front companion flange to 100 ft. lbs. (136 N.m) and torque rear companion flange to 133 ft. lbs. (180 N.m).

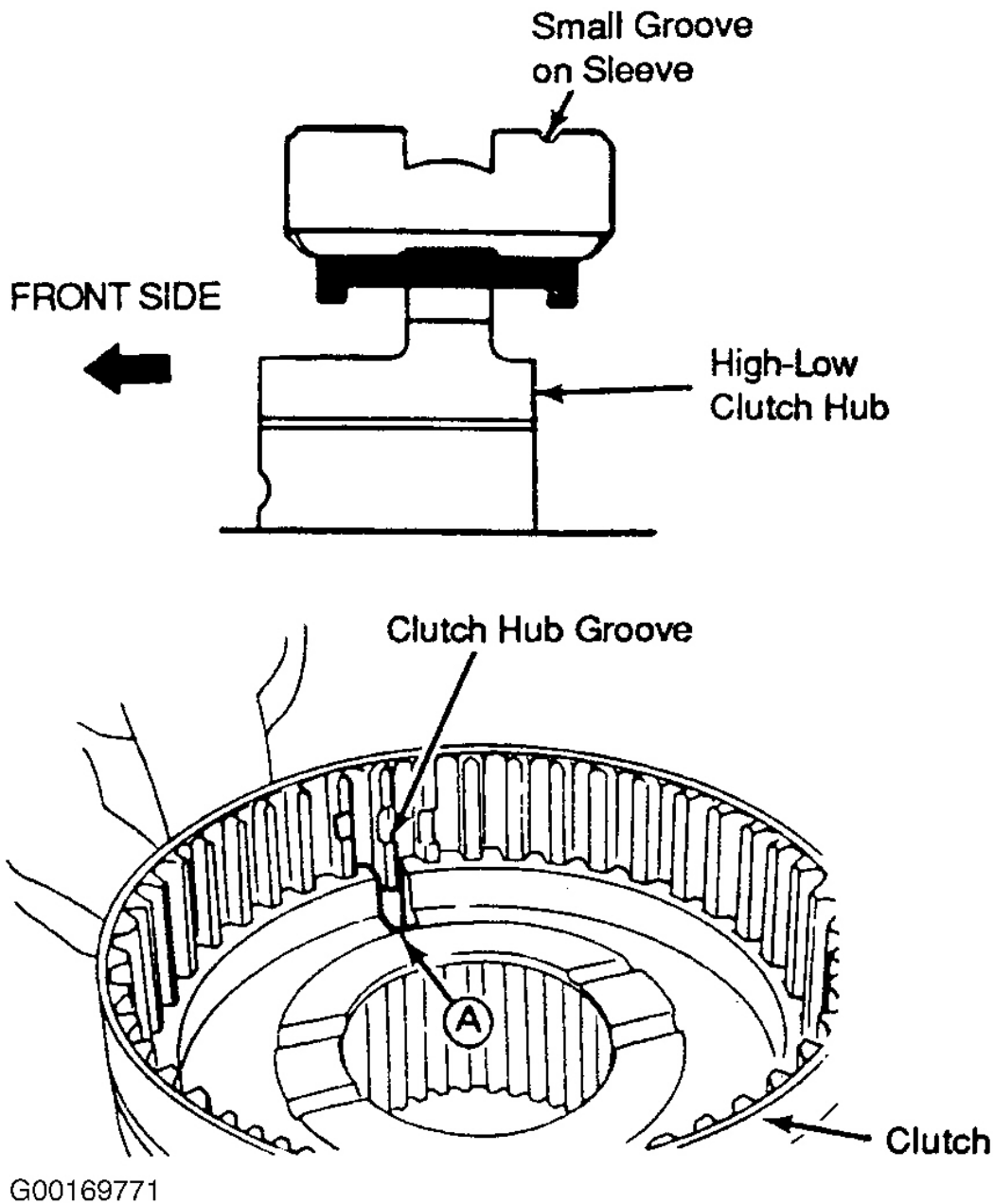


Fig. 64: Identifying High-Low Clutch Hub Groove & Sleeve
 Courtesy of ISUZU MOTOR CO.

CLEARANCE & MEASUREMENT

Component	Standard In. (mm)	Limit In. (mm)
Shift Arm Thickness	.378-.388 (9.60-9.85)	.354 (9.00)
Transfer Clutch Hub & Insert	.0035-.0120 (.090-.310)	.016 (.40)

1990 Isuzu Trooper LS**1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul**

Clearance		
Mainshaft Runout		.0019 (.050)
Gear inside Diameter	1.889-1.890 (48.00-48.01)	1.893 (48.10)
Transfer Clutch Hub Spline Play	0-.0039 (0-.100)	.0079 (.200)
Roller Bearing Free Play		.0079 (.200)

DETENT SPRING SPECIFICATIONS

Application	Specification
Detent Spring Free Length	
Detent Ball	
Standard	1.01" (25.6 mm)
Limit	.98" (25.0 mm)
Interlock Pin	
Standard	.626" (15.90 mm)
Limit	.603" (15.30 mm)
Detent Spring Tension	
Detent Ball	
Compression Length	.807" (20.50 mm)
Compression Tension	14.60-16.80 Lbs. (6.6-6.7 Kg)
Interlock Pin	
Compression Length	.453" (11.50 mm)
Compression Tension	2.20 Lbs. (1.0 Kg)

OUTPUT SHAFT SNAP RING

Application	Specification In. (mm)
Bearing & Snap Ring Clearance	0-.0039 (0-.100)
Snap Ring Color Coding	
White	.061 (1.55)
Yellow	.063 (1.60)
Blue	.065 (1.65)
Pink	.067 (1.70)
Green	.069 (1.75)
Brown	.071 (1.80)
Red	.073 (1.85)
Orange	.075 (1.90)

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Application	Ft. Lbs (N.m)
Adapter Case Valve Body Bolt	15 (20)

1990 Isuzu Trooper LS**1990 AUTOMATIC TRANSMISSIONS 4L30-E Electronic Controls & Overhaul**

Adapter Case Harness Bolts	15 (20)
Center Support Bolt	18 (25)
Converter Inner 13-mm Bolts	15 (20)
Converter Outer 13-mm Bolts	30 (40)
Extension Housing Torx Bolt	24 (32)
Front Companion Flange	100 (136)
Main Valve Body Bolts	15 (20)
Manual Valve Link Bolts	15 (20)
Oil Filter Bolt	15 (20)
Oil Drain Plug	18 (25)
Parking Lock & Range Selector Lever Nut	16 (22)
Piston Sleeve Lock Nut	14 (18.5)
Rear Companion Flange	133 (180)
Roller & Spring Assembly Bolt	15 (20)
Selector Shaft 17-mm Nut	13 (17)
Servo Adjusting Bolt Lock Nut	14 (18.5)
Servo Cover Bolts	18 (25)
Transfer Case Bolts	21-33 (28-44)
Transfer Detent Bolts	10-17 (14-23)
Transfer Mainshaft Lock Nut	94-108 (127-146)
Transfer 4WD Indicator Switch	29 (39)
INCH Lbs. (N.m)	
Converter Housing Seal Retainer Bolt	27 (3)
Force Motor Solenoid Bolt	89 (10)
Mode Switch Bolt	115 (13)
Oil Pan Bolts	97 (11)
Oil Filler Tube	89 (10)
Servo Adjusting Bolt	40 (4.5)
Speed Sensor Bolt	115 (13)
Transfer Plate	115 (13)

WIRING DIAGRAMS

1990 Isuzu Trooper LS

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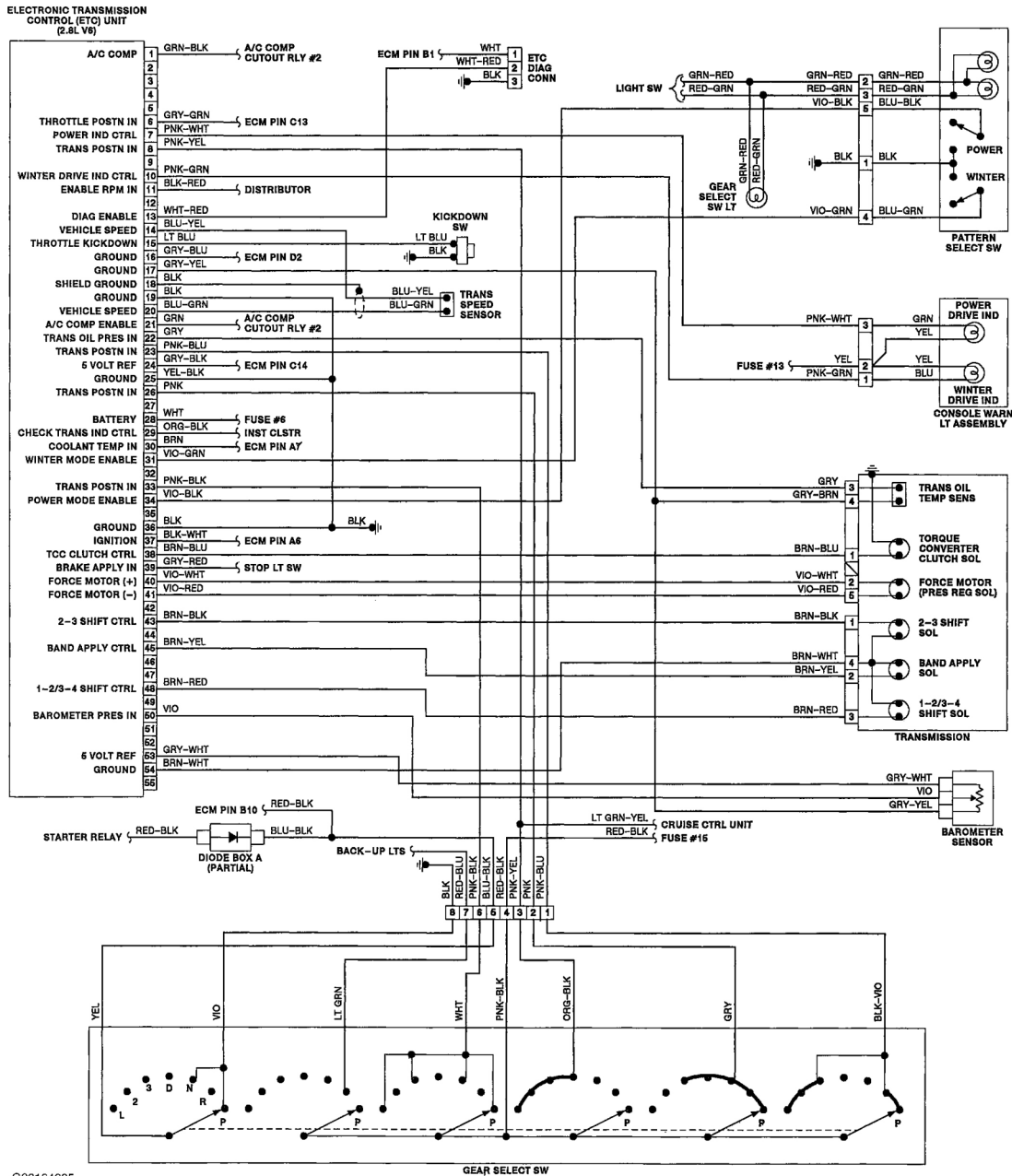


Fig. 65: Transmission Electronic Control System wiring Diagram (1990 Trooper)
 Courtesy of ISUZU MOTOR CO.