

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

1988-90 AUTOMATIC TRANSMISSIONS

AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

APPLICATION

TRANSMISSION APPLICATION

Application	Transmission Model
Dodge	
1988-89 Raider (4WD)	KM148
1988-89 Ram-50	
2WD	AW372
4WD	KM148
Isuzu	
1989-90 Amigo (TC)	AW03-72L
1988-89 Impulse (JR)	AW03-72L
1988-89 Pickup (TF)	AW03-72L
Mitsubishi	
1988-89 Montero (4WD)	KM148
1988-89 Truck (2WD)	AW372
1988-89 Van/Wagon (2WD)	AW372L
1990 Van/Wagon (2WD)	R4AW2
Volvo	
1988-90 240	AW70
1988-90 740 & 760	AW71

IDENTIFICATION

Transmission number identification for Chrysler and Mitsubishi is indicated on plate at left side of transmission. Identification number for Isuzu is located on torque converter housing. Identification plate for Volvo is located on left side of transmission.

DESCRIPTION

This transmission is a fully automatic 4-speed transmission consisting of 3 multiple-disc clutches, 4 multiple-disc brakes, 3 one-way clutches and 2 planetary gear sets to provide 4 forward ratios and one reverse. KM148 and Isuzu 4WD have a 2-speed transfer case attached. AW70, AW71, AW372L, AW03-72L and R4AW2 use a lock-up converter. See **Fig. 1** .

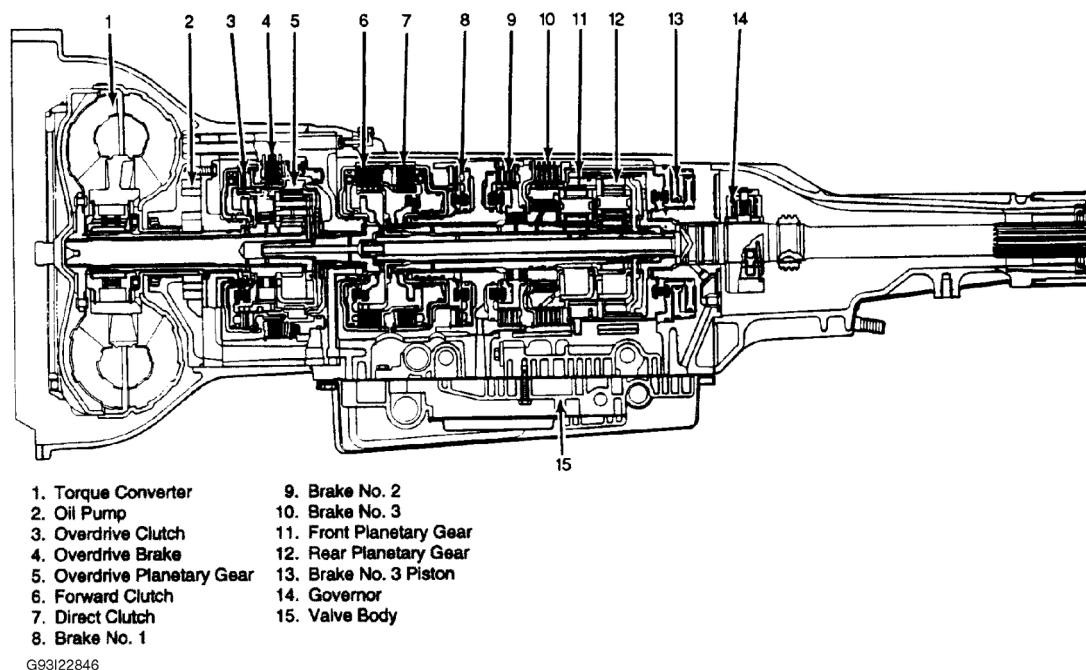


Fig. 1: Cut-Away View Of Automatic Transmission
Courtesy of ISUZU MOTOR CO.

LUBRICATION & ADJUSTMENTS

See appropriate article in TRANSMISSION SERVICING.

ON-VEHICLE SERVICE

INHIBITOR SWITCH ADJUSTMENT

Loosen inhibitor switch bolts and move selector shaft at transmission to "N" position. Align groove in selector shaft and line on inhibitor switch. Hold inhibitor switch in position and tighten bolts.

VALVE BODY ASSEMBLY

Removal

1. Note bolt length and position during disassembly of valve body for ease of reassembly. Remove oil plug and drain oil. Remove oil pan bolts. Remove oil pan and gasket. Remove magnet from oil pan.
2. Remove oil pipes, being careful to avoid deformation. Remove oil screen.
3. Remove bolts attaching valve body assembly. See **Fig. 2** . Lower valve body slightly and remove throttle cable from cam. Remove valve body. Accumulators may be removed by applying compressed air (if necessary).

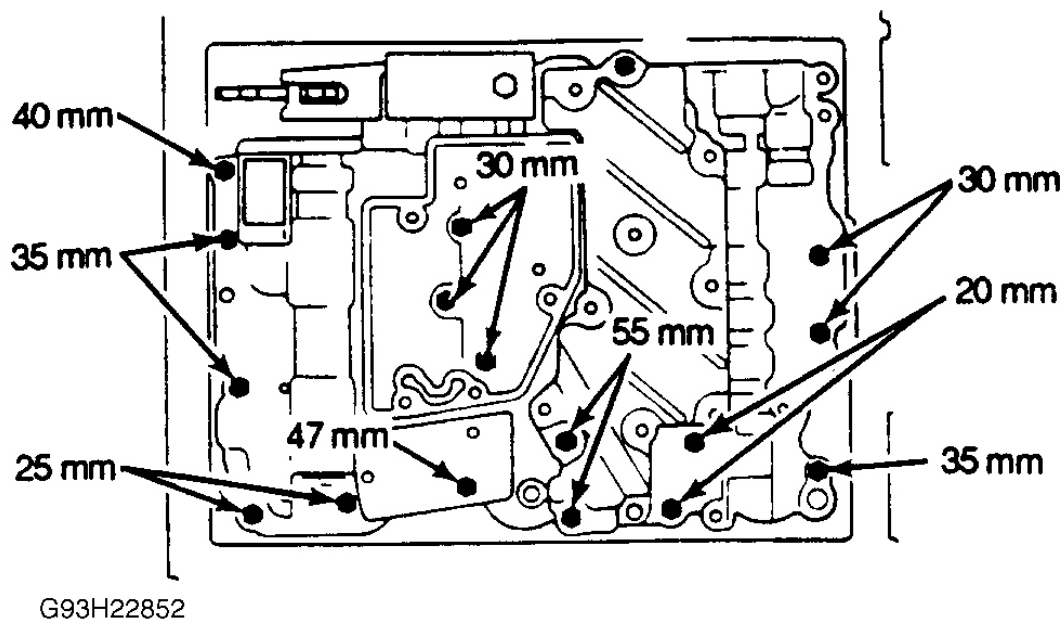


Fig. 2: Identifying Valve Body Bolts (AW71)
 Courtesy of ISUZU MOTOR CO.

Installation

1. Ensure accumulator pistons and springs are installed. Align manual valve with pin on manual valve lever and lift valve body into place. Lower side of valve body and attach throttle cable to cam. Install valve body. Torque bolts for AW372L and R4AW2 to 80 INCH lbs. (9.0 N.m). All others should be 72-108 INCH lbs. (8.1-12.2 N.m).
2. Install oil screen. Torque bolts for AW372L and R4AW2 to 48 INCH lbs. (5.4 N.m). All others should be 43-51 INCH lbs. (4.9-5.8 N.m). Ensure detent spring roller is seated on detent lever. Install oil pipes. Install magnet in oil pan. Install oil pan with new gasket. Torque bolts for AW372L and R4AW2 to 40 INCH lbs. (4.5 N.m). All others should be 35-43 INCH lbs. (3.9-4.9 N.m).

TROUBLE SHOOTING

NOTE: Before performing any trouble shooting, ensure Automatic Transmission Fluid (ATF) is at proper level and at operating temperature.

SYMPTOM DIAGNOSIS

Downshift Out Of Time

Throttle control cable adjustment. Governor malfunction. Line pressure malfunction. Low coast modulator valve malfunction.

No Downshift

All shift valves malfunction. Valve body malfunction. Governor malfunction. Overdrive solenoid or switch malfunction.

2-1 Downshift Too Early

Low coast modulator valve malfunction, pressure too high.

2-1 Downshift Too Late

Low coast modulator valve malfunction, pressure too low.

Harsh Shift During Deceleration

Low line pressure.

Harsh Shift & Noise During Acceleration Or Deceleration

High line pressure. Accumulator or check ball malfunction.

No 1-2 Upshift

Governor malfunction. 1-2 shift valve malfunction.

No 2-3 Upshift

Governor malfunction. 2-3 shift valve malfunction.

No 3-4 Upshift

Governor malfunction. 3-4 shift valve malfunction. Overdrive OFF switch or solenoid malfunction.

Shift Point Improper

Throttle control cable adjustment. Governor malfunction. Line pressure malfunction. Valve body malfunction.

No Braking In "2"

Brake No. 1 malfunction.

No Braking In "L"

Brake No. 3 malfunction.

Vehicle Does Not Hold In "P" Position

Shift linkage out of adjustment. Thrust rod or lock pin malfunction. Parking pawl broken or damaged. Front ring gear in planetary gear damaged or broken.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

Vehicle Does Not Move Forward

Improper ATF level. Throttle cable or range selector improperly adjusted. Valve body operating improperly. Oil pump defective. C0 or C1 clutch inoperative. F0 or F2 one-way clutch defective.

Vehicle Does Not Move In Reverse

Throttle cable or range selector improperly adjusted. Improper ATF level. Low oil pressure. Primary regulator valve stuck. 2-3 shift valve stuck. B3 control valve inoperative. C2 accumulator defective. Center support bolts out. C2 clutch or B3 brake inoperative. P1 or P2 planetary gears inoperative.

CLUTCH & BRAKE BAND APPLICATIONS

CLUTCH & BRAKE BAND APPLICATION — AW372 & KM148 (1988)

Selector Lever Position	O-D OFF Switch	Gear Shift Stage	Gear Ratio	Engine Start	Parking Mechanism	Clutch				Brake				One-Way Clutch				
						C ₀	C ₁	C ₂		B ₀	B ₁	B ₂	B ₃		F ₀	F ₁	F ₂	
								IP	OP				IP	OP				
"P"	—	Neutral	—	OK	X	X								X				
"R"	—	Reverse	2.703	—		X		X	X					X	X	X		
"N"	—	Neutral	—	OK		X												
"D"	ON	1st	2.826	—		X	X									X		X
		2nd	1.493	—		X	X					X				X	X	
		3rd	1.000	—		X	X		X			X				X		
		4th	.688	—			X		X	X		X						
"D"	OFF	1st	2.826	—		X	X									X		X
		2nd	1.493	—		X	X					X				X	X	
		3rd	1.000	—		X	X					X				X		
"2"	—	1st	2.826	—		X	X									X		X
		2nd	1.493	—		X	X					X	X			X	X	
"L"	—	1st	2.826	—		X	X							X	X	X		X

G00052545

Fig. 3: Clutch & Brake Band Application (1988 AW372 & KM148)

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

CLUTCH & BRAKE BAND APPLICATION — AW70 (1988-90), AW71 (1988-90) AW372L (1988-89), AW03-72L & R4AW2 (1990)

Selector Lever Position	Gear	C ₀	B ₀	F ₀	C ₁	C ₂		B ₁	B ₂	B ₃		F ₁	F ₂
						IP	OP			IP	OP		
"P"	Park	X								X	X		
"R"	Reverse	X		X		X	X			X	X		
"N"	Neutral	X											
"D"	1st	X		X	X								X
	2nd	X		X	X				X			X	
	3rd	X		X	X		X		X				
	4th (Overdrive)		X		X		X		X				
"2"	1st	X		X	X								X
	2nd	X		X	X			X	X			X	
"L"	1st	X		X	X					X	X		X

REMARKS: IP = Inner Piston, OP = Outer Piston

G00052546

Fig. 4: Clutch & Brake Band Application (1988-90 AW70, 1988-90 AW71, 1988-89 AW372L & 1990 AW03-72L & R4AW2)

PERFORMANCE TESTS

ROAD TEST

1. Drive vehicle in "D" range 3rd speed, listen for abnormal noise or vibration. Abnormal noise and vibrations are sometimes caused by unbalanced propeller shaft, differential, tires, torque converter, engine, etc. Stop vehicle.
2. Shift to "2" range. Accelerate at half throttle and note shift timing. Check shift timing at full throttle and note shift timing. See **Fig. 5** and **Fig. 6**.
3. Check kickdown in "2" range, verify downshift timing. Stop vehicle.
4. Shift to "L" range and accelerate. Vehicle should not upshift. Stop vehicle.
5. Shift to "R" range. Allow vehicle to roll forward and apply full throttle. While running, lightly depress accelerator pedal to check for slippage. Stop vehicle.
6. With vehicle parked on more than 5 degree incline, shift to "P" range. Release parking brake to check parking pawl engagement.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

SHIFT SPEED SPECIFICATIONS

Application	Selector	Range	MPH
1988-89 Isuzu Impulse (JR) w/ 4ZC1-T Engine at Full Throttle	"D"	1-2 2-3 3-4 4-3 3-2 2-1	30-35 61-68 100-108 95-102 57-64 24-30
	"L"	2-1	22-30
1988-89 Isuzu Impulse (JR) w/ 4ZD1 Engine at Full Throttle	"D"	1-2 2-3 3-4 4-3 3-2 2-1	30-35 61-68 No Upshifting Downshift at 85% Throttle Opening 57-64 24-30
	"L"	2-1	22-30
1988-90 Volvo AW70 w/ 3.73: 1 Final Drive	"D"	1-2	41 ¹
		2-3 3-4 4-3 3-2 2-1	68 ¹ 72 ² 25 ³ 64 ¹ 32 ¹
1988-90 Volvo AW70 w/ 3.91: 1 Final Drive	"D"	1-2	39 ¹
		2-3 3-4 4-3 3-2 2-1	65 ¹ 69 ² 24 ³ 61 ¹ 31 ¹
1988-90 Volvo AW71 w/ 3.73: 1 Final Drive	"D"	1-2	40 ¹
		2-3 3-4 4-3 3-2 2-1	66 ¹ 70 ² 25 ³ 62 ¹ 32 ¹
1988-90 Volvo AW71 w/ 3.91: 1 Final Drive	"D"	1-2	38 ¹
		2-3 3-4 4-3 3-2 2-1	63 ¹ 66 ² 23 ³ 59 ¹ 30 ¹
1988-89 Isuzu Pickup	"D"	1-2 1-2 2-3 2-3 3-2 3-2 2-1 2-1	29 ⁴ 34 ⁵ 58 ⁴ 63 ⁵ 55 ⁴ 63 ⁵ 23 ⁴ 30 ⁵
	"L"	2-1 2-1	25 ⁴ 32 ⁵
1990 Isuzu Pickup w/ 185R14 Tires	"D"	1-2 2-3 3-4 4-3 3-2 2-1	28-32 57-61 — — 53-58 22-29
	"L"	2-1	25-32

¹Throttle 100% open

²Throttle 75% open

³Throttle closed

⁴With P195/75R14 Tires Full Throttle

⁵With P205/75A14 Tires Full Throttle

G00052548

Fig. 5: Shift Speed Specifications Chart

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

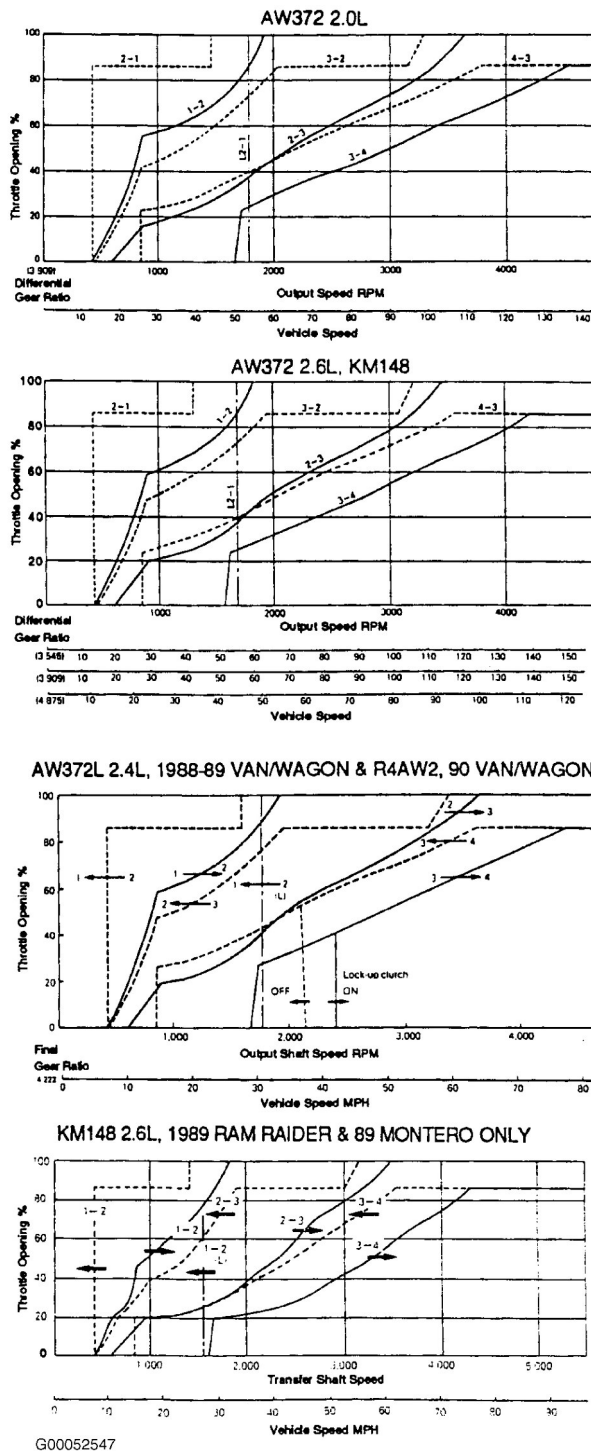


Fig. 6: Shift Pattern Chart
Courtesy of CHRYSLER CORP.

STALL SPEED TEST

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

1. Block rear wheels. Install tachometer. Apply parking and service brakes.
2. Start engine and shift to "D" range. Depress accelerator fully and note engine maximum Revolutions Per Minute (RPM).

NOTE: **DO NOT stall test vehicle for more than 8 seconds.**

3. Repeat stall test in "R" range and note maximum RPM. See **STALL SPEED TEST SPECIFICATIONS** table.

STALL SPEED TEST SPECIFICATIONS

Application	RPM
Chrysler & Mitsubishi	
2.0L Engine	1800-2100
2.4L Engine	2050-2350
2.6L Engine	2100-2400
Isuzu	
1988-89 Impulse (JR)	
4ZD1 Engine	2150-2450
4ZC1-T Engine	2450-2750
1988-90 Pickup & 1989-90 Amigo	2250-2550
Volvo	
1988-90 240	
B21F-MPG Engine	(1) 1800
B21F-LH Engine	(1) 1980
B23F Engine	(1) 2220
B230F Engine	(1) 2000
1988-90 740 & 760	
B21FT Engine	(1) 2050-2550

(1) Stall speed drops by 120 RPM for each 3281 feet (1000 meters) above sea level.

4. If stall speeds in "D" and "R" range are equal but lower than specification:
 - Engine output is low.
 - Stator one-way clutch is faulty.
5. If stall speed in "D" range is higher than specification:
 - Overdrive clutch slipping.
 - Overdrive one-way clutch faulty.
 - Forward clutch slipping.
 - One-way clutch No. 2 faulty.
 - Low line pressure.
6. If stall speed in "R" range is higher than specification:
 - Overdrive clutch slipping.
 - Overdrive one-way clutch faulty.
 - Direct clutch slipping.
 - Brake No. 3 slipping.
 - Low line pressure.

GOVERNOR PRESSURE TEST

1. Place vehicle on a chassis dynamometer. Remove plug from governor pressure port. See **Fig. 7** . Connect oil pressure gauge with adapter and bring gauge inside vehicle.
2. Apply parking brake. Start engine. Release parking brake. Place selector lever in "D" range and note governor pressure at each output shaft RPM. See **GOVERNOR PRESSURE SPECIFICATIONS** table.
3. If governor pressure is not within specification, check for following faults:
 - Line pressure malfunction.
 - Oil leak in governor circuit.
 - Governor malfunction.

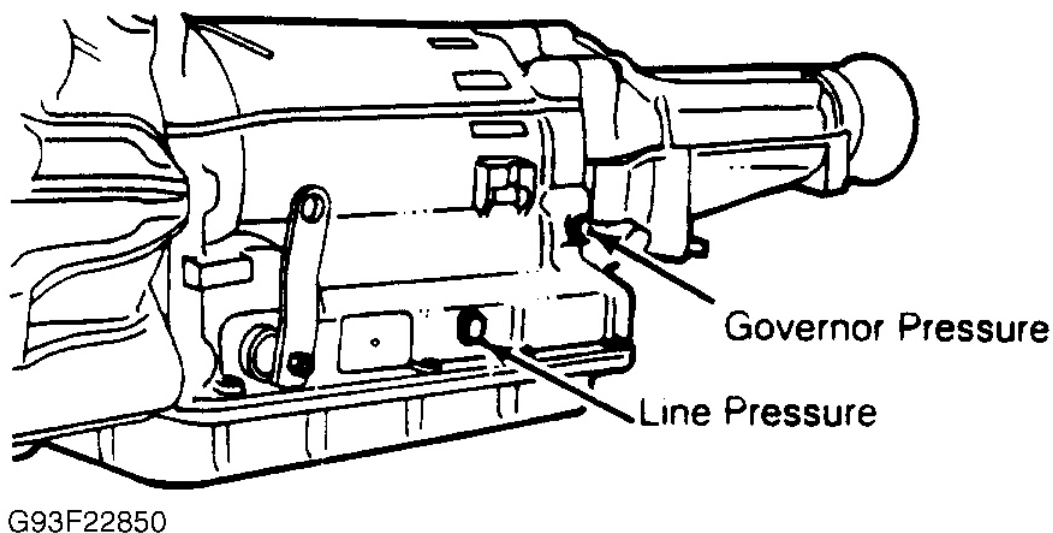


Fig. 7: Locating Pressure Test Ports
 Courtesy of ISUZU MOTOR CO.

GOVERNOR PRESSURE SPECIFICATIONS

Application/Condition	psi (kPa)
1988-90 Chrysler & Mitsubishi (Except Montero & Raider)	
2.0L Engine	
1000 RPM	19-23 (131-150)
2000 RPM	33-38 (228-264)
3000 RPM	54-63 (373-431)
2.4L Engine	
1000 RPM	19-23 (131-160)
2000 RPM	33-39 (228-270)
3000 RPM	55-64 (380-440)
2.6L Engine	
1000 RPM	20-24 (138-165)
2000 RPM	36-41 (248-284)
3000 RPM	58-67 (402-460)
Montero & Raider	
1988	
1000 RPM	20-25 (138-170)
2000 RPM	36-42 (250-290)
3000 RPM	59-68 (410-470)
1989	
1000 RPM	19-24 (131-165)

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

2000 RPM	36-41 (248-281)
3000 RPM	58-62 (400-430)
Isuzu	
1988-89 Impulse	
1000 RPM @ 17 MPH	13-24 (90-165)
2000 RPM @ 34 MPH	30-40 (207-276)
3000 RPM @ 58 MPH	57-74 (390-510)
1988-90 Pickup & 1989-90 Amigo	
1000 RPM @ 17 MPH	17-26 (117-179)
2000 RPM @ 34 MPH	33-43 (228-296)
3000 RPM @ 58 MPH	61-78 (420-538)
1988-90 Volvo	
3.73: 1 Final Drive	
19 MPH	13-21 (90-145)
35 MPH	23-31 (159-214)
67 MPH	58-75 (400-517)
3.91: 1 Final Drive	
18 MPH	13-21 (90-145)
33 MPH	23-31 (159-214)
67 MPH	58-75 (400-517)

LINE PRESSURE TEST

1. Place vehicle on a chassis dynamometer. Remove plug from line pressure port. See **Fig. 7** . Connect oil pressure gauge with adapter and bring gauge inside vehicle.
2. Apply parking brake. Start engine. Place selector lever in "D" range, depress brake with left foot and operate accelerator with right foot to measure line pressure at each RPM.
3. Note pressure at idle and at stall. Repeat same test with selector in "R" range.
4. See **LINE PRESSURE SPECIFICATIONS** table. If pressure is incorrect, adjust throttle control cable. Retest after adjusting.

LINE PRESSURE SPECIFICATIONS

Engine Speed	"D" Range psi (kPa)	"R" Range psi (kPa)
AW372 (1988-89 Truck & Ram-50)		
At Idle	66-77 (452-529)	100-117 (687-804)
At Stall	144-169 (991-1166)	213-270 (1471-1863)
AW372L (1988-89 Van/Wagon), KM148 (1988 Montero & Raider), R4AW2 (1990 Van/Wagon)		
At Idle	67-78 (460-540)	102-119 (700-820)

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

At Stall	146-173 (1010-1190)	218-276 (1500-1900)
KM148 (1989 Montero & Raider)		
At Idle	74-86 (510-590)	112-129 (770-890)
At Stall	157-186 (1080-1280)	228-284 (1570-1960)
A303-72L (1988-89 Isuzu Impulse)		
At Idle	65-77 (448-529)	100-121 (687-834)
At Stall	142-171 (979-1179)	213-270 (1471-1862)
AW03-72L (1988-90 Isuzu Pickup & 1989-90 Amigo)		
At Idle	64-72 (441-496)	97-108 (669-745)
At Stall	144-169 (991-1166)	213-270 (1471-1862)
AW70 (1988-90 Volvo 240)		
At Idle	50-63 (345-434)	71-91 (490-627)
At Stall	137-156 (945-1075)	195-245 (1345-1689)
AW71 (1988-90 Volvo 740 & 760)		
At Idle	65-67 (448-460)	106-117 (730-808)
At Stall	142-205 (979-1413)	213-270 (1471-1863)

5. If line pressure is higher than normal in "D" and "R" range:

- Regulator valve faulty.
- Throttle valve faulty.
- Throttle control cable incorrectly adjusted.

6. Line pressure is lower than normal in "D" and "R" range:

- Oil pump faulty.
- Regulator valve faulty.
- Throttle valve faulty.
- Throttle control cable incorrectly adjusted.
- Overdrive clutch faulty.

7. Line pressure lower than normal in "D" range:

- Large fluid leak in "D" range hydraulic circuit.
- Forward clutch faulty.
- Overdrive clutch faulty.

8. Line pressure lower than normal in "R" range:

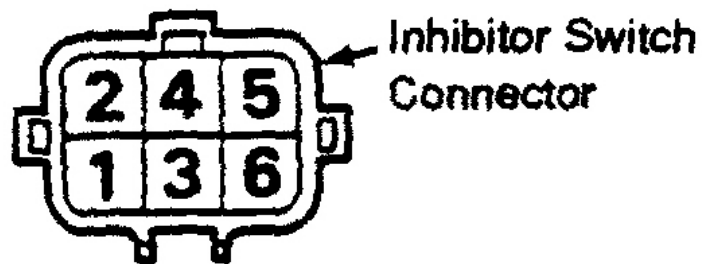
- Large fluid leak in "R" range hydraulic circuit.
- Brake No. 3 faulty.
- Direct clutch faulty.
- Overdrive clutch faulty

COMPONENT TESTS

INHIBITOR SWITCH

Test inhibitor switch by placing transmission selector in each range to be tested. Disconnect wire connector at transmission and connect ohmmeter to terminals which correspond to range to be tested. See **Fig. 8 -Fig. 11** . Adjustment may be necessary. See **INHIBITOR SWITCH ADJUSTMENT** under ON-VEHICLE SERVICE. If incorrect, replace inhibitor switch.

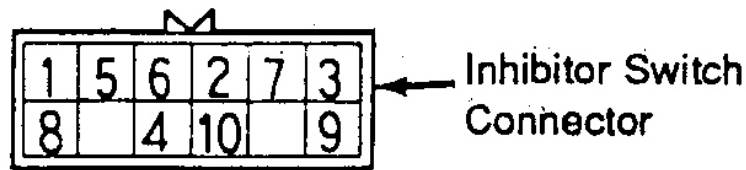
Before testing, warm vehicle to normal operating temperature and check for proper fluid level, condition and adjustment of cable throttle. On 4WD models, transfer case must be in "2H" position.



Terminal Range	5	6	4	3	2	1
P	○ — ○					
R			○ — ○			
N	○ — ○					
D					○ — ○	○ — ○
2					○ — ○	○ — ○
L					○ — ○	○ — ○

G93J22847

Fig. 8: Testing Inhibitor Switch (Isuzu)
 Courtesy of ISUZU MOTOR CO.



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

NOTE

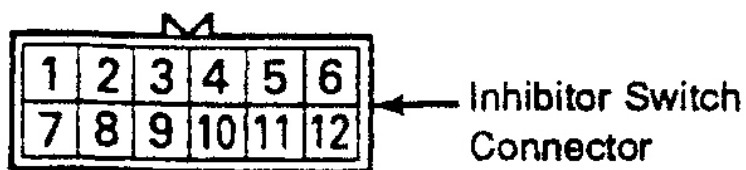
○—○ indicates that there is continuity between the terminals.

G00052544

Fig. 9: Testing Inhibitor Switch (Mitsubishi Van - 1988-89)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul



Terminal No.	P	R	N	D	2	L
1					○	
2					○	○
3				○		○
4			○	○		○
5		○		○		
6	○	○		○		
7	○	○	○	○		○
9	○	○	○	○	○	○
12	○		○			

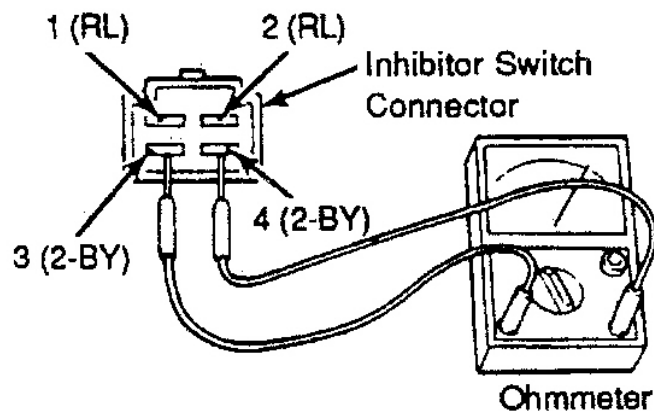
NOTE

○—○ indicates that there is continuity between the terminals.

G00052541

Fig. 10: Testing Inhibitor Switch (Mitsubishi Van - 1990)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



Select lever position \ Terminals	1	2	3	4
P			○—○	
R	○—○			
N			○—○	

NOTE

○—○ indicates that there is continuity between the terminals.

NOTE: For additional electrical circuit information, see WIRING DIAGRAMS at the end of this article.

G00052543

Fig. 11: Testing Inhibitor Switch (Montero & Raider)

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OIL PRESSURE SWITCH

For Isuzu, remove oil pressure switch and connect ohmmeter to terminal and switch body. Continuity should not be present. Apply air pressure of approximately 28 psi (193 kPa). Continuity should be present. See **Fig. 12**.

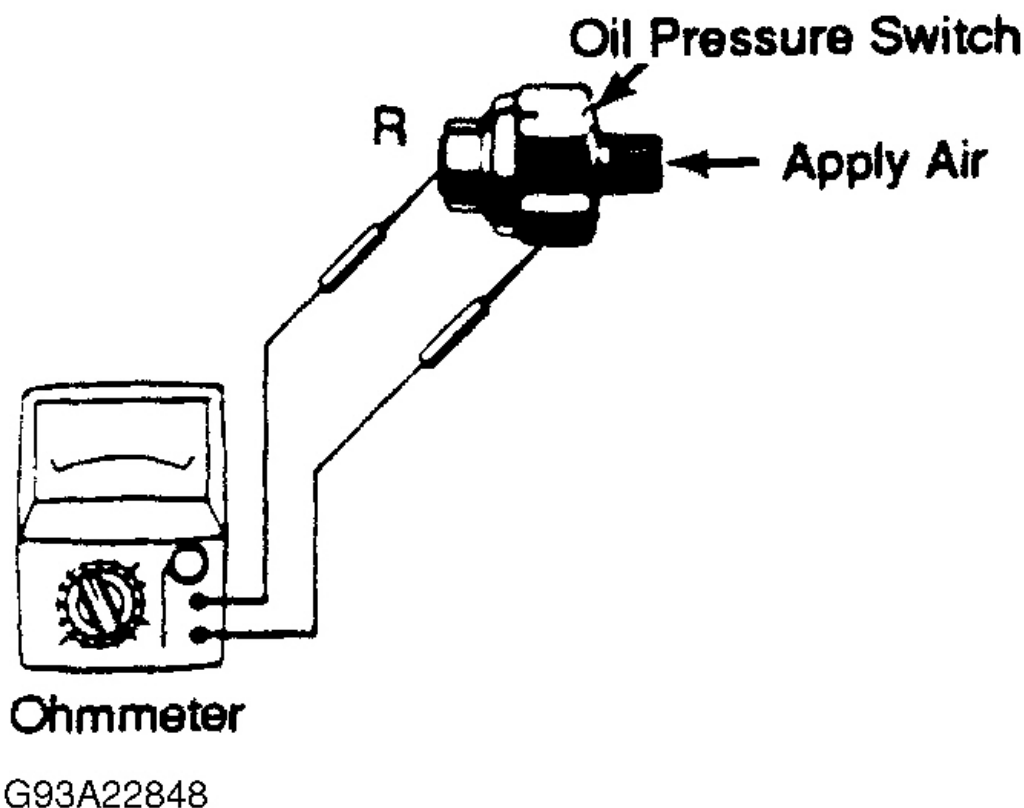
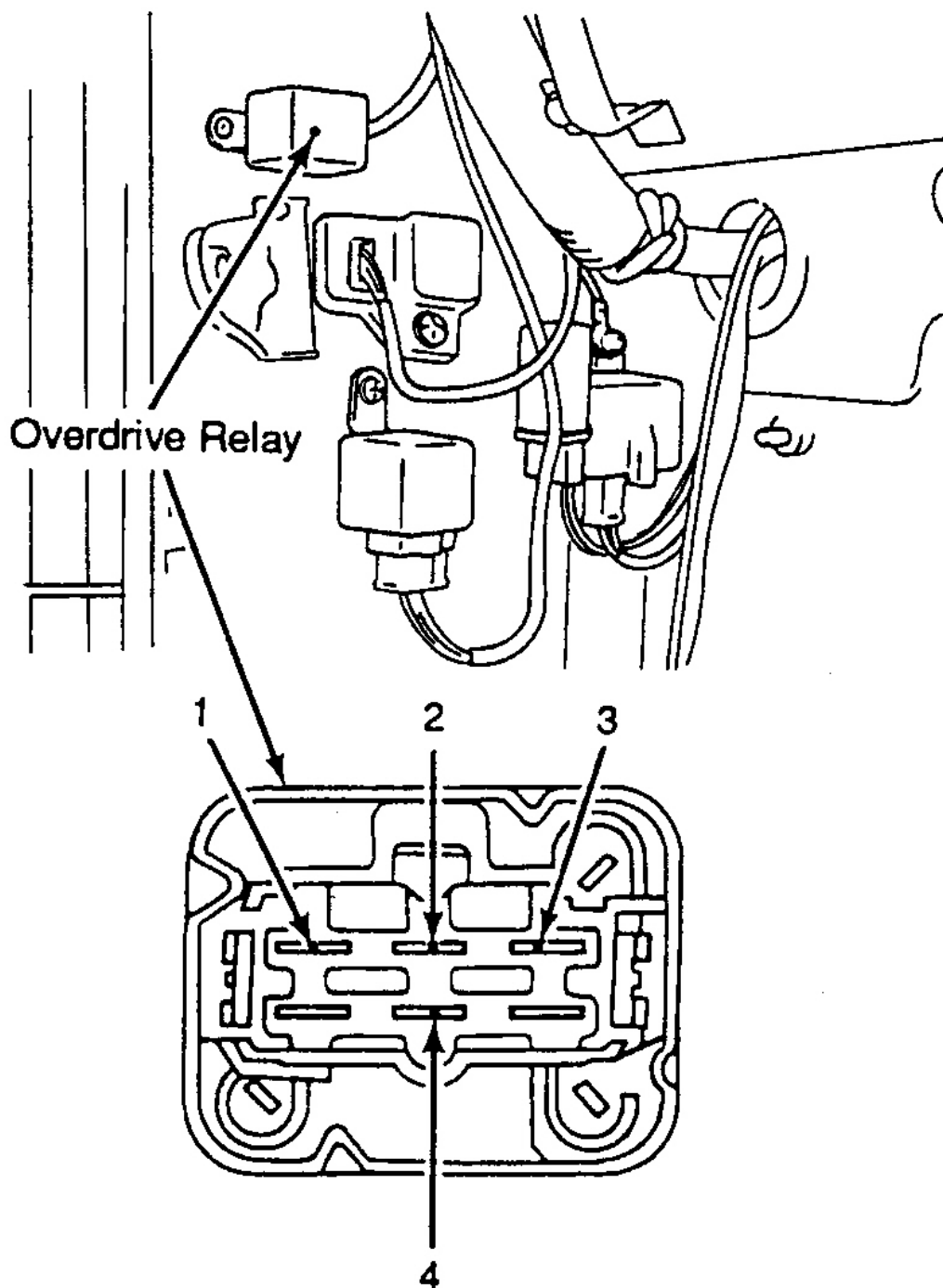


Fig. 12: Testing Oil Pressure Switch (Isuzu)
Courtesy of ISUZU MOTOR CO.

OVERDRIVE RELAY

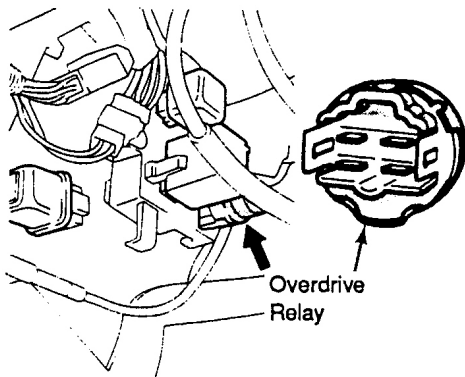
For 1988 Chrysler Ram Raider and 1988 Mitsubishi Montero, remove overdrive relay. Test relay by connecting ohmmeter to terminals No. 5, 1 and 3. Continuity should be present. Connect ohmmeter to terminals No. 2 and 4. Continuity should be present. Connect a battery to terminals No. 2 and 4. Connect ohmmeter across terminals No. 1 and 3. There should not be continuity. See **Fig. 13** .

For 1988-89 Chrysler Ram 50, 1988-89 Mitsubishi truck and 1988-90 Mitsubishi Van, remove overdrive relay for testing. Test overdrive relay by connecting ohmmeter to terminals No. 1 and 3. There should not be continuity. Connect ohmmeter to terminals No. 2 and 4. Continuity should be present. Connect battery to terminals No. 2 and 4. Connect ohmmeter across terminal No. 1 and 3. Continuity should be present. See **Fig. 14** .

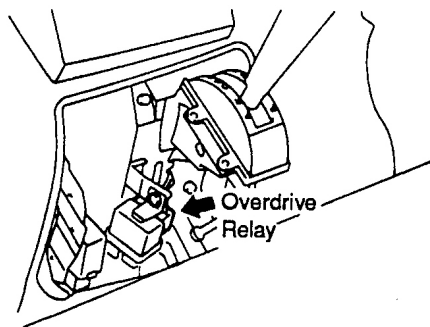


G00052542

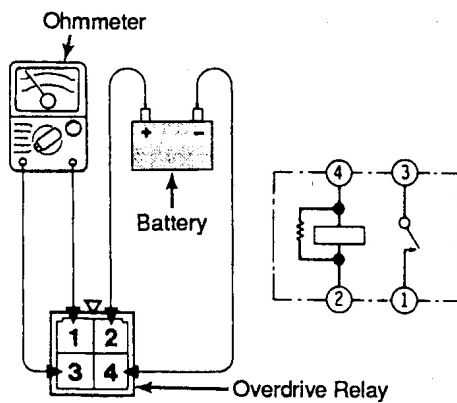
Fig. 13: Testing Overdrive Relay (Montero & Raider)
 Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.



LOCATING OVERDRIVE RELAY
1988-89 CHRYSLER RAM 50 &
1988-89 MITSUBISHI PICK-UP



LOCATING OVERDRIVE RELAY
1988-90 MITSUBISHI VAN



CONNECTING BATTERY & OHMMETER
TO OVERDRIVE RELAY

G00052538

Fig. 14: Testing Overdrive Relay (Pickup & Van)
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OVERDRIVE SOLENOID VALVE

1. For Chrysler and Mitsubishi, disconnect wire connector at overdrive solenoid valve. Connect ohmmeter to overdrive solenoid valve wire and body of overdrive solenoid valve. Standard resistance should be 13 ohms. See **Fig. 15**.
2. For Isuzu, normal condition exists when ohmmeter indicates continuity across terminal and ground. Ensure operating noise (click) is heard when ignition switch is turned to ON position.

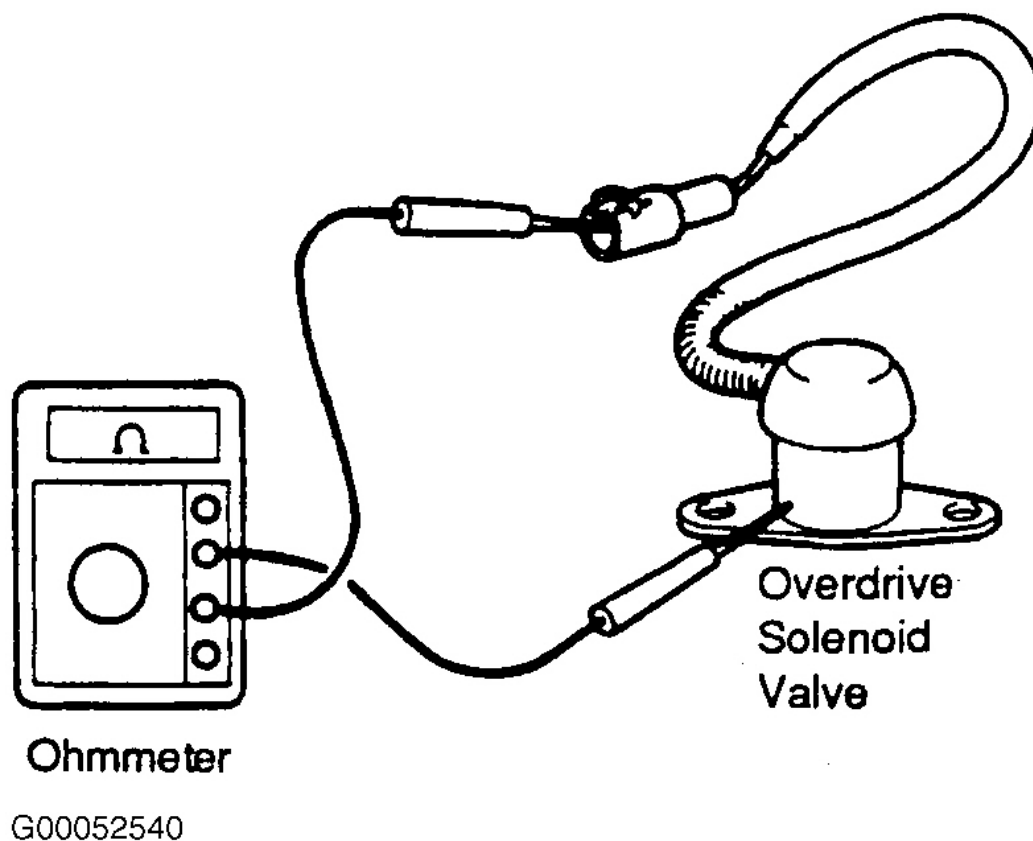
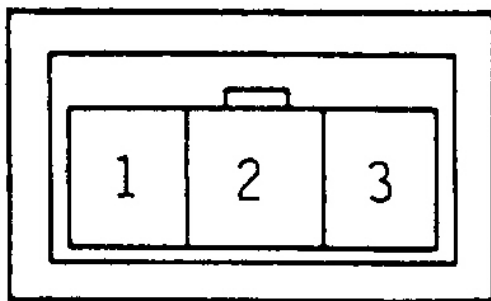


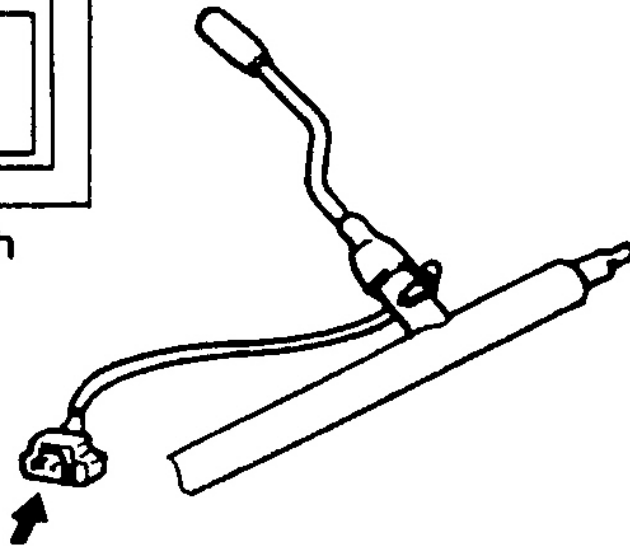
Fig. 15: Testing Overdrive Solenoid Valve
Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

OVERDRIVE SWITCH

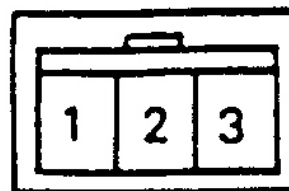
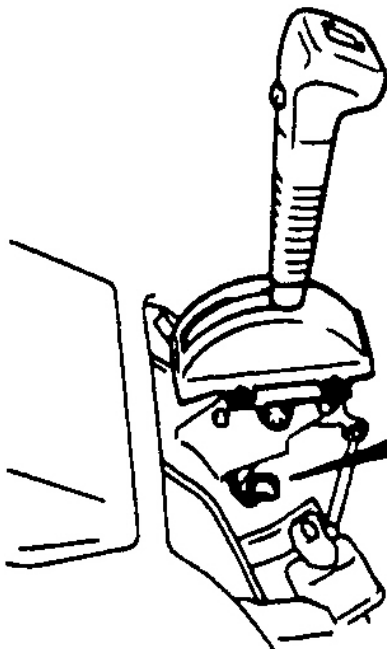
For 1988-89 Chrysler Ram 50, 1988-89 Mitsubishi Truck and 1988-90 Mitsubishi Van testing of overdrive switch, unplug connector at overdrive switch. Connect ohmmeter to terminals No. 1 and 3 with switch not pressed. Continuity should be present. Connect ohmmeter to terminals No. 1 and 2 and depress switch. Continuity should be present. See **Fig. 16**. If switch does not operate as described, replace switch.



Overdrive Switch
Connector



1988-89 CHRYSLER RAM 50 &
1988-89 MITSUBISHI TRUCK



Overdrive Switch
Connector

1988-90 MITSUBISHI VAN

G00052539

Fig. 16: Locating & Testing Overdrive Switch

Courtesy of MITSUBISHI MOTOR SALES OF AMERICA.

REMOVAL & INSTALLATION**TRANSMISSION**

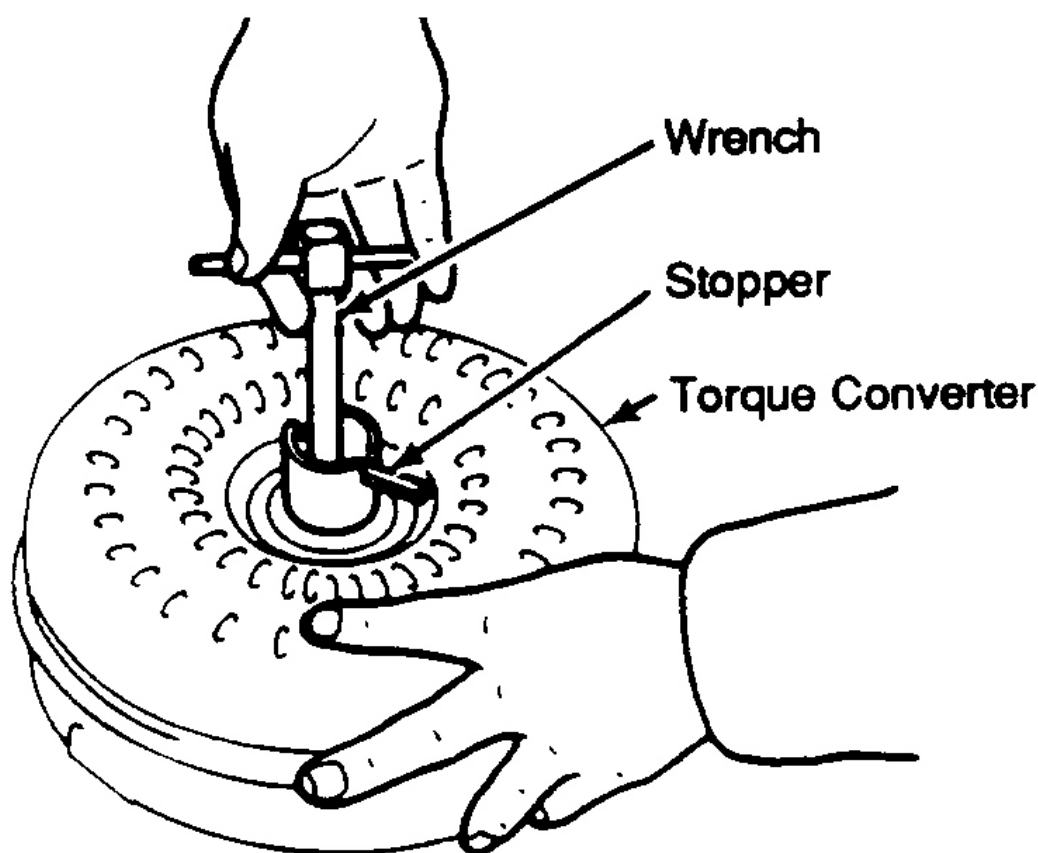
NOTE: For transmission removal procedure, see appropriate **REMOVAL & INSTALLATION** article.

TORQUE CONVERTER

NOTE: Torque converter is a non-serviceable component. If defective, entire unit must be replaced as an assembly.

Inspection

1. For Chrysler and Mitsubishi with AW372L, Isuzu Impulse, Isuzu Pickup and Amigo insert Wrench (MD998218) for Chrysler and Mitsubishi, Wrench (part of kit J-33953) for Isuzu Impulse and Wrench (part of kit J-35467) for Isuzu Pickup and Amigo, into inner race of torque converter one-way clutch. Insert Stopper (MD998219) for Chrysler and Mitsubishi, Stopper (part of kit J-33953) for Isuzu Impulse and Stopper (part of kit J-35467) for Isuzu Pickup and Amigo, so it fits in notch of converter hub and other race of clutch.
2. To test one-way clutch, hold converter and turn wrench. See **Fig. 17** . Clutch should lock when turned counterclockwise and turn freely when turned clockwise. Turning resistance should not exceed 22 INCH lbs. (2.5 N.m). If necessary, clean converter and retest clutch. If converter clutch fails test, replace converter.



G93I22853

Fig. 17: Testing One-Way Clutch
Courtesy of ISUZU MOTOR CO.

TRANSMISSION DISASSEMBLY

1. Clean outside of transmission. Remove transfer case on 4WD models. Remove extension housing and gasket on 2WD models. Remove speedometer driven gear. See **Fig. 18** . Remove torque converter and overdrive solenoid valve. Remove adapter, gasket and governor mounting bolts. Lift governor retaining ring and remove governor assembly and speedometer drive gear. Remove rear cover and gasket. Remove governor strainer from case. Remove inhibitor switch.
2. With oil pan facing down, remove oil pan bolts, oil pan and gasket. Turn transmission with valve body up and remove oil pipes and oil screen. Remove 17 valve body attaching bolts. Lift valve body assembly slowly and remove throttle cable from throttle cam. Remove manual valve lever pin from manual valve groove. Remove valve body. Push throttle cable adapter to disconnect throttle cable from case. Remove accumulator pistons with compressed air. Keep pistons and springs in order. See **Fig. 19** . On AW372L, remove accumulator piston spring from C2.

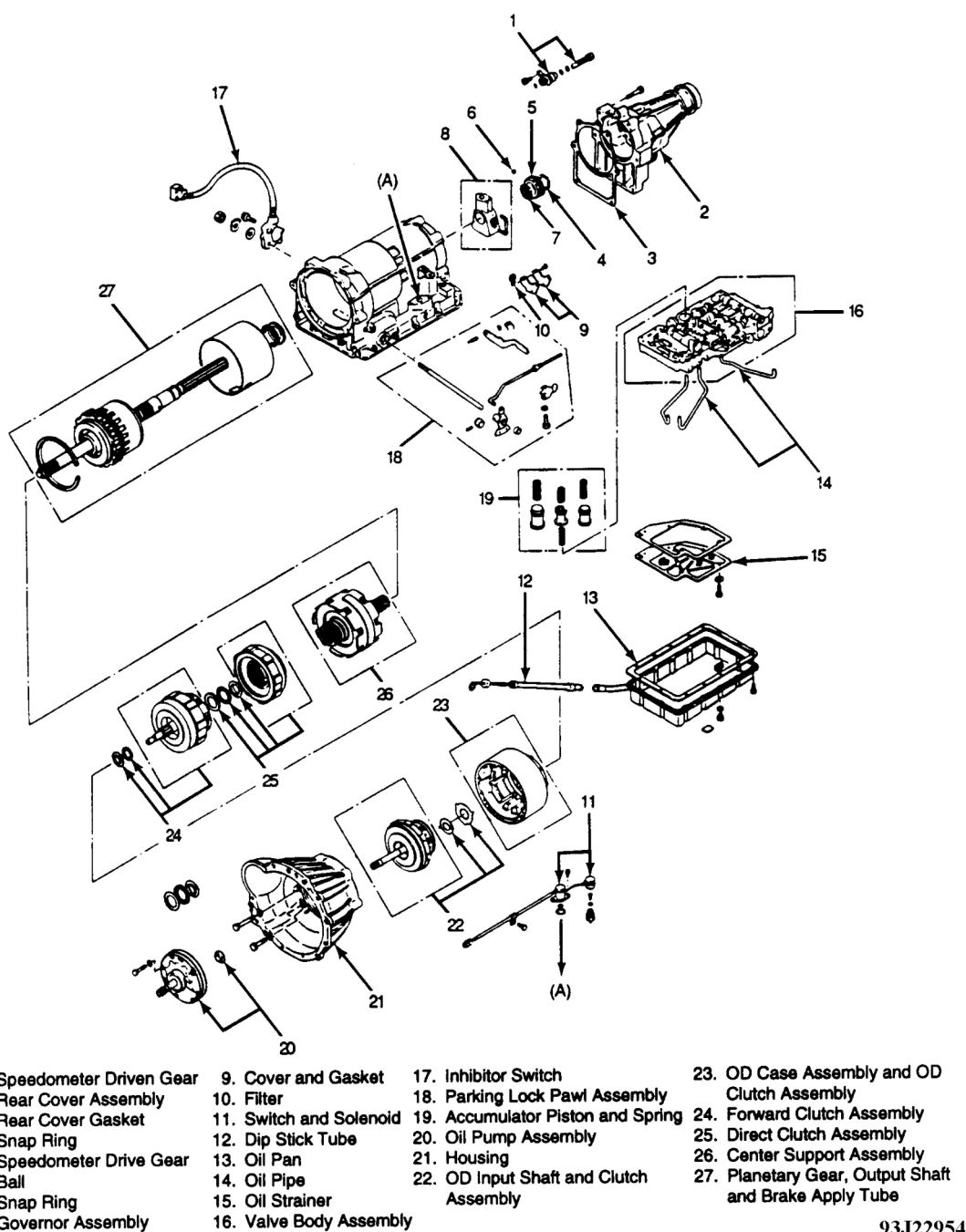
1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

3. Remove cam plate and parking pawl spring. Pull out pivot pin and remove parking pawl. Remove parking rod from manual valve detent lever. See **Fig. 20** .
4. Drive out spring pin in manual valve lever and remove shaft and lever. Remove oil pump attaching bolts. Use Oil Pump Puller (MD998212) for Chrysler and Mitsubishi, Oil Pump Puller (J-25042) for Isuzu or Oil Pump Puller (5071) for Volvo and remove oil pump. Remove converter housing attaching bolts. Holding overdrive input shaft by hand, remove converter housing.
5. On Chrysler and Mitsubishi, use Gauge (MD998217) on overdrive case and measure distance between top of overdrive case and clutch cylinder for reassembly. Isuzu and Volvo do not make this measurement. Remove overdrive input shaft, planetary gear and overdrive clutch assembly from overdrive case. Remove overdrive case assembly.
6. Measure distance between top of case flange and clutch drum for reassembly. Remove forward clutch assembly and direct clutch assembly. Remove 2 center support attaching bolts. Remove center support and sun gear assembly from case. Remove snap ring from front planetary carrier. Pull-out intermediate shaft and remove carrier assembly and No. 3 brake. Remove output shaft thrust bearing and bearing race from case.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul



93J22954

Fig. 18: Exploded View Of Major Transmission Components
Courtesy of ISUZU MOTOR CO.

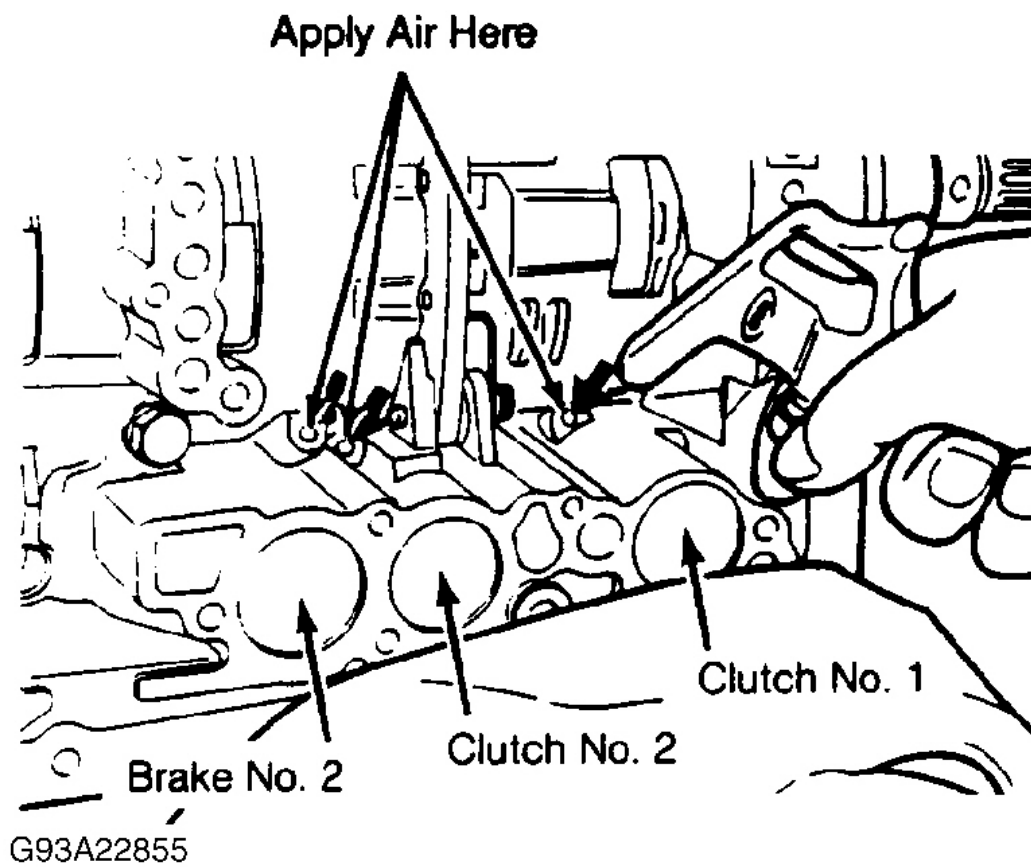
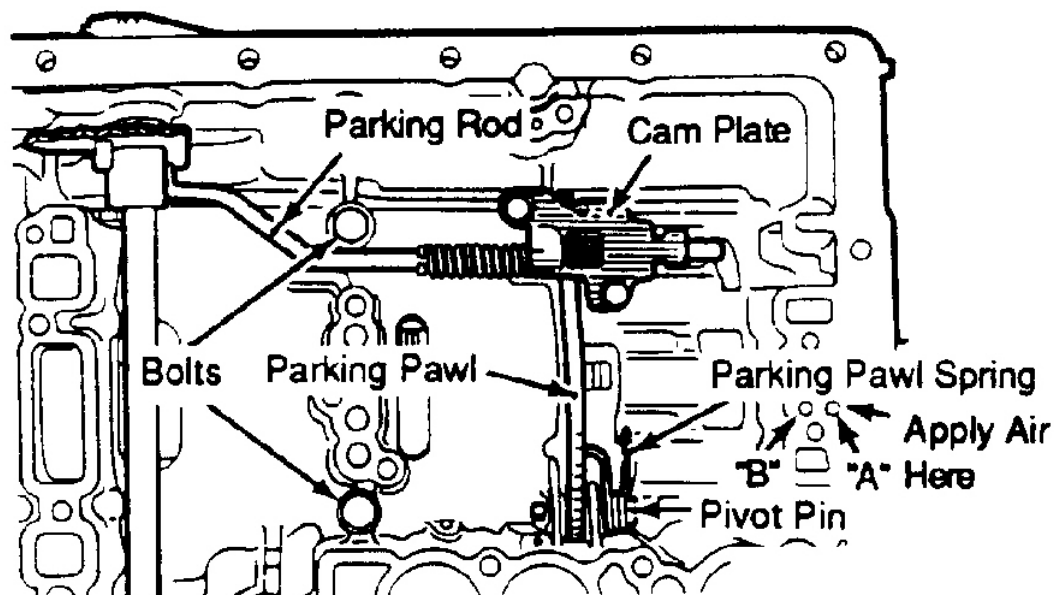


Fig. 19: Removing Accumulator Pistons
Courtesy of ISUZU MOTOR CO.



G93B22856

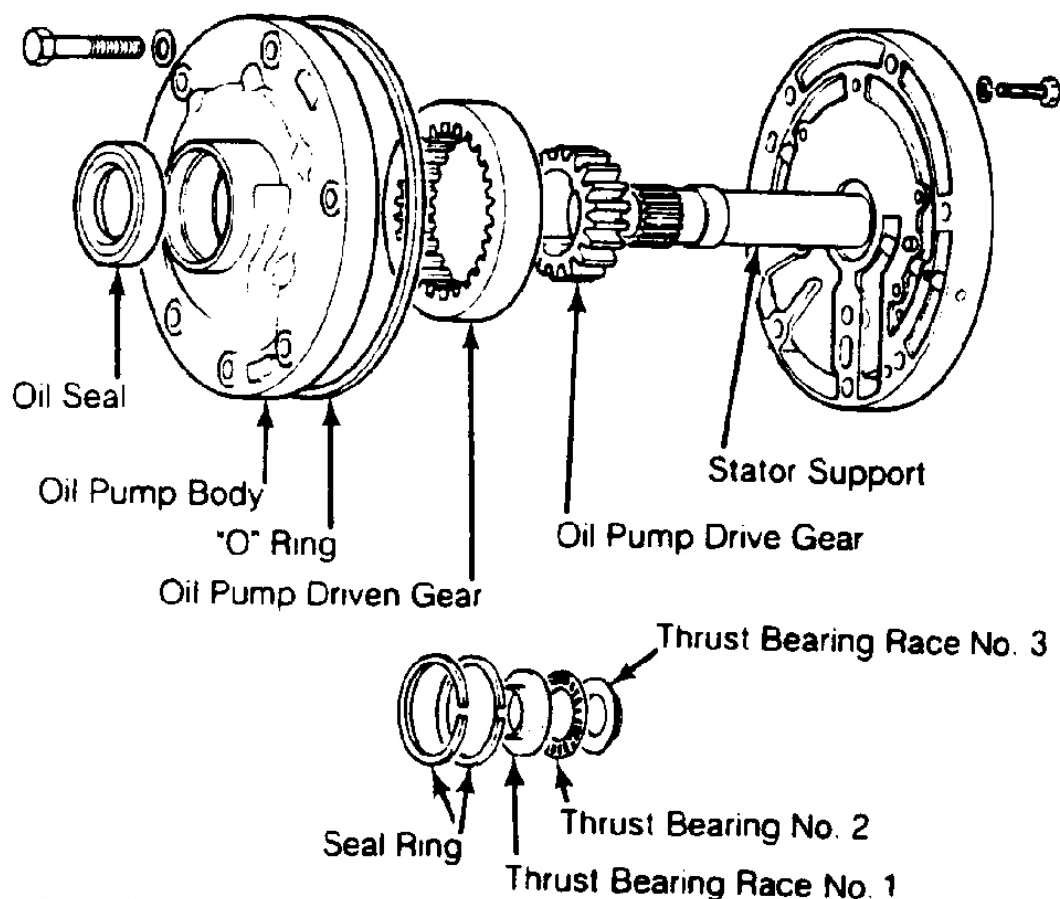
Fig. 20: Removing Parking Pawl
Courtesy of ISUZU MOTOR CO.

COMPONENT DISASSEMBLY & REASSEMBLY

OIL PUMP

Disassembly

Using torque converter as work stand, remove thrust bearing races No. 1 and 3, bearing No. 2 and seal rings from stator support. Remove 6 bolts and stator support. See **Fig. 21**. Remove "O" ring from pump body. Remove oil pump drive gear and driven gear. Identify sides with mating marks for reassembly.



G93C22857

Fig. 21: Exploded View Of Oil Pump
 Courtesy of ISUZU MOTOR CO.

Inspection

1. To check body clearance, push driven gear to one side of body. Measure clearance with a feeler gauge. Clearance should be .0028-.0059" (.070-.150 mm). Tip clearance is measured between drive and driven gear and crescent-shaped part of pump body. Clearance should be .0043-.0055" (.110-.140 mm). Measure side clearance using a straightedge across pump and gears. Clearance should be .0008-.0020" (.020-.050 mm).
2. Inspect front oil seal for cracks, damage or wear. Damage or wear of stator support surface in contact with oil pump gear. Wear of oil pump and stator support bushings. Check for smooth insertion of stator support into torque converter and without abnormal large play. If faulty, replace. Wear or damage of stator support seal ring groove 2nd seal ring. Check thrust bearing and races for wear and damage.

Reassembly

1. Using torque converter as a stand, install drive and driven gear on body. Note identifying marks. Install

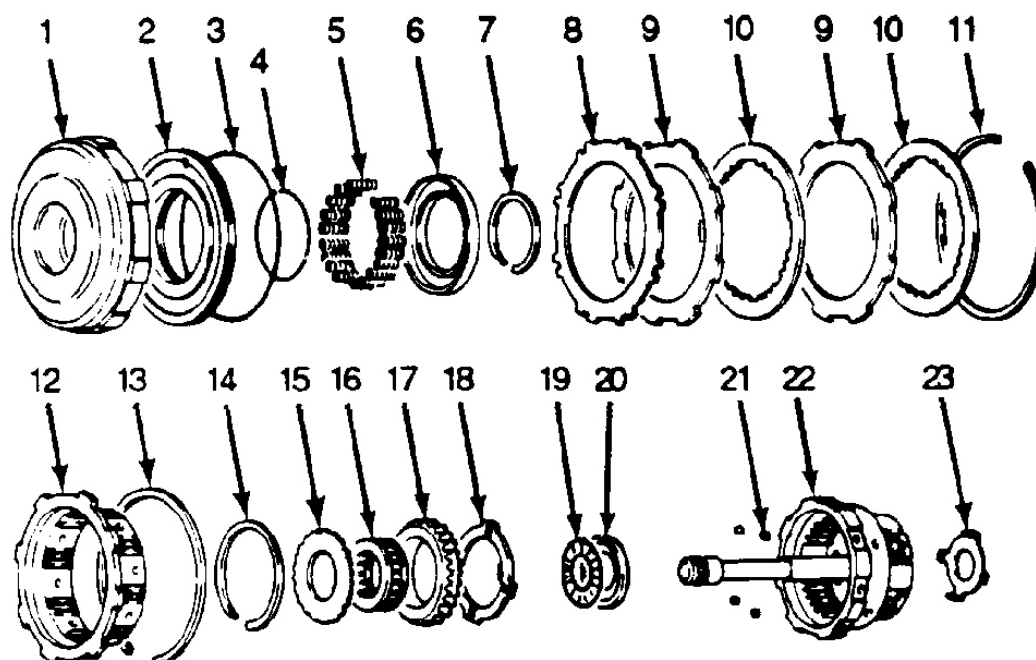
new "O" rings. Install stator support. Install 6 bolts with wave washers. Use Oil Pump Band (MD998335) for Chrysler and Mitsubishi, (J-25280) for Isuzu and (5077) for Volvo, and torque bolts to 53-80 INCH lbs. (6.0-9.0 N.m). Remove oil pump band.

2. Install 2 seal rings, thrust bearing races No. 1 and 3 and bearing No. 2 on stator support. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55**.

OVERDRIVE CLUTCH & PLANETARY GEAR SET

Disassembly

1. Remove snap ring No. 2 and remove overdrive brake hub. Disassemble overdrive planetary gear set and overdrive clutch assembly. See **Fig. 22**.
2. Remove snap ring No. 3, one-way clutch retainer, one-way clutch, one-way clutch outer race, thrust washer, thrust bearing No. 4, bearing race No. 5 and 4 pinion shaft plugs from overdrive planetary gear assembly. Remove thrust washer from front side of overdrive planetary gear.
3. Remove snap ring No. 1 from overdrive clutch assembly. Remove clutch flange, clutch disc and plates. Place Spring Compressor (MD998903) for Chrysler and Mitsubishi, for Isuzu (J-25048) and for Volvo (5072), on spring retainer and compress spring with shop press. Remove snap ring using screwdriver.
4. Remove spring retainer and return springs. Install overdrive clutch cylinder on oil pump. Apply air pressure (14 psi max) to remove piston. Hold piston to keep from flying out. See **Fig. 23**. Remove "O" rings from overdrive clutch piston.

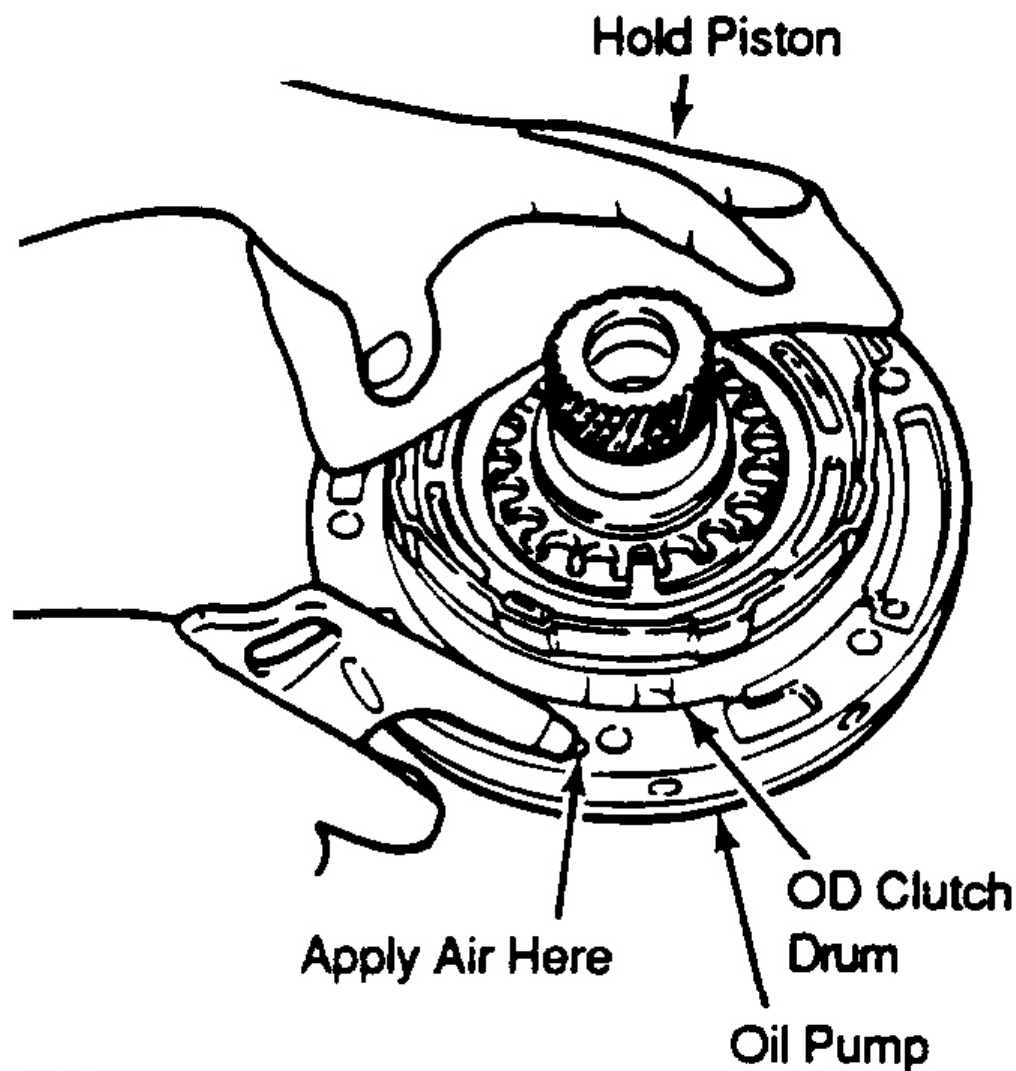


- | | |
|------------------------------|-------------------------------|
| 1. Overdrive Clutch Cylinder | 13. Snap Ring No. 2 |
| 2. Overdrive Clutch Piston | 14. Snap Ring No. 3 |
| 3. "O" Ring | 15. One-Way Clutch Retainer |
| 4. "O" Ring | 16. One-Way Clutch Assembly |
| 5. Return Spring | 17. One-Way Clutch Outer Race |
| 6. Spring Retainer | 18. Thrust Washer |
| 7. Snap Ring | 19. Thrust Bearing No. 4 |
| 8. Cushion Plate | 20. Thrust Bearing Race No. 5 |
| 9. Clutch Plate | 21. Pinion Shaft Plug |
| 10. Clutch Disc** | 22. Overdrive Planetary Gear |
| 11. Snap Ring No. 1 | 23. Thrust Washer |
| 12. Overdrive Brake Hub | |

** Not in Volvo

G93D22858

Fig. 22: Overdrive Clutch & Planetary Gear Set Assembly
Courtesy of ISUZU MOTOR CO.



G93H22860

Fig. 23: Removing OD Clutch Piston & Measuring Piston Travel
Courtesy of ISUZU MOTOR CO.

Inspection

1. Inspect splines, discs, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary).
2. Check return springs. See **OD CLUTCH RETURN SPRING SPECIFICATIONS CHART** table. Replace clutch disc if .083" (2.10 mm) or less in thickness.

OD CLUTCH RETURN SPRING SPECIFICATIONS

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

Application	Free Length In. (mm)
1988-89 Chrysler & Mitsubishi w/AW 372L, KM 148 (1989 Montero & Raider), 1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.594 (15.10)
All Other Chrysler & Mitsubishi	.571-.587 (14.50-14.91)
1988-89 Isuzu Impulse	.574-.579 (14.58-14.70)

Reassembly

1. Install new "O" rings inside and outside piston. Apply ATF and insert piston into overdrive clutch cylinder. Install springs and retainer in clutch cylinder.
2. Place clutch assembly on shop press and compress springs with Spring Compressor (MD998903) for Chrysler and Mitsubishi, for Isuzu (J-25048) and for Volvo (5072). Install snap ring with screwdriver. Measure piston travel by placing OD clutch drum on oil pump and applying 14 psi max air pressure to OD clutch oil passage. See **Fig. 23** . For specifications, see **OD CLUTCH PISTON SPECIFICATIONS** table. For all models, except Isuzu, install clutch plates and discs in clutch cylinder and install snap ring No. 1 (narrower ring). On Isuzu models install cushion plate, clutch plate of .055" (1.40 mm), clutch disc, clutch plate of .070" (1.80 mm), clutch disc, overdrive brake hub and snap ring. Install overdrive brake hub and snap ring No. 2 (wider ring). Volvo measures snap ring-to-retainer plate clearance of .012-.035" (.30-.90 mm).
3. Install pinion shaft plug in shaft portion of overdrive planetary gear set and install thrust bearing race No. 5, bearing No. 4 and thrust washer. See **Fig. 22** . Install thrust washer, directing oil groove to front side.
4. Assemble one-way clutch outer race to one-way clutch assembly. Install assembly in planetary gear. Install one-way clutch retainer and snap ring.
5. Install overdrive planetary gear set on overdrive clutch assembly. Hold clutch cylinder and turn input shaft clockwise to ensure shaft turns smoothly. Turn input shaft counterclockwise to ensure shaft is locked.

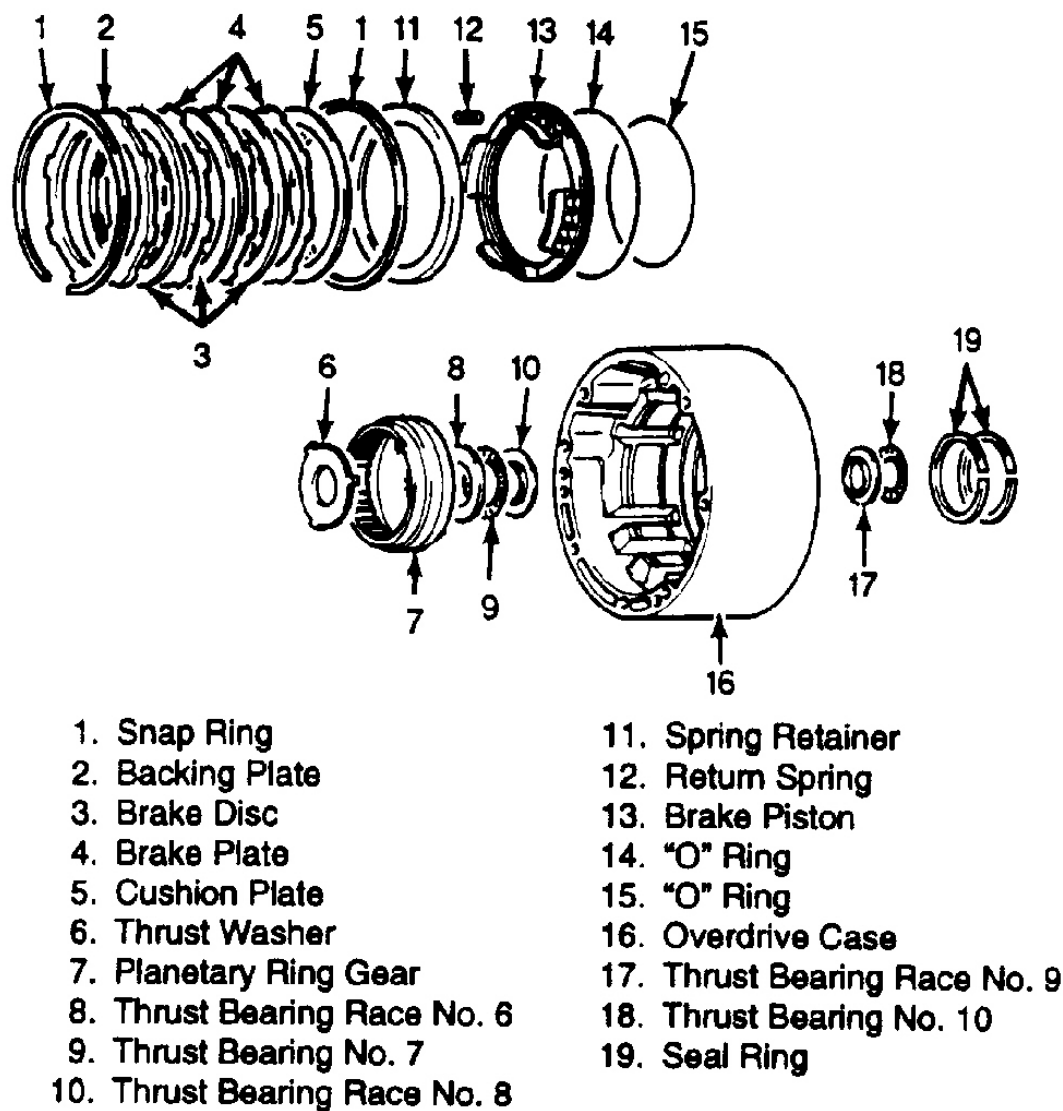
OD CLUTCH PISTON SPECIFICATIONS

Application	Movement In. (mm)
1988-89 Chrysler & Mitsubishi w/AW372L, KM148 (1989 Montero & 1989 Raider) & 1988-89 Isuzu Impulse	.061-.100 (1.56-2.53)
1990 Mitsubishi Van/Wagon (2WD) w/R4AW2	.076-.104 (1.92-2.64)
1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.077-.115 (1.96-2.93)

OVERDRIVE BRAKE

Disassembly

1. Remove snap ring and remove backing plate, brake disc, brake plates, cushion plate, thrust washer, planetary ring gear, thrust bearing No. 7 and bearing races No. 6 and 8 from overdrive case. See **Fig. 24** .
2. Remove snap ring, spring retainer and return spring. Apply air to overdrive case to remove piston. See **Fig. 25** . Remove "O" ring from piston. Remove 2 seal rings, bearing No. 10 and race No. 9 from overdrive case.



G93E22859

Fig. 24: Exploded View Of Overdrive Brake Assembly
 Courtesy of ISUZU MOTOR CO.

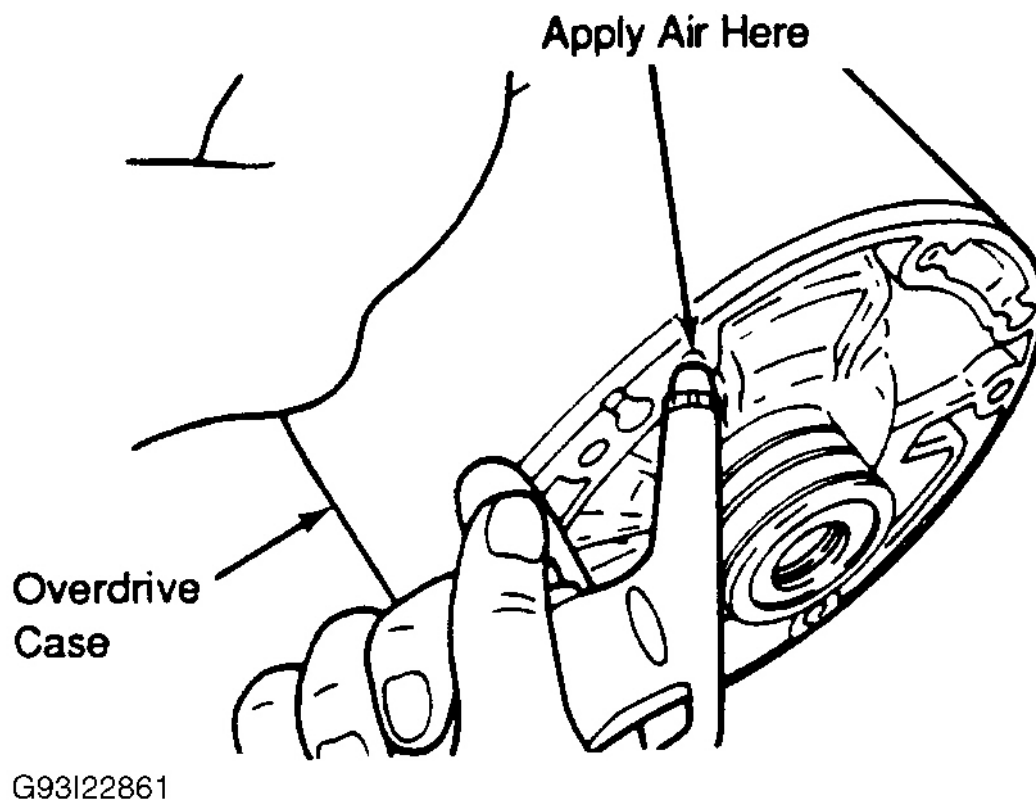


Fig. 25: Removing & Checking Overdrive Brake Piston
Courtesy of ISUZU MOTOR CO.

Inspection

1. Inspect splines, discs, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary). Measure return spring free length. See **OD BRAKE SPRING SPECIFICATION** table. Measure brake disc thickness. For Isuzu, if brake disc thickness is .059" (1.50 mm) or less replace brake disc. On Volvo, if brake disc is .083" (2.10 mm) or less replace brake disc.

OD BRAKE SPRING SPECIFICATION

Application	Free Length In. (mm)
1988-89 Chrysler & Mitsubishi w/AW372L, KM148 (1989 Montero & 1989 Raider)	.635 (16.12)
1988-90 Isuzu Pickup, 1989-90 Isuzu Amigo & All Other Chrysler & Mitsubishi	.618-.635 (15.70-16.12)
1988-89 Isuzu Impulse	.595 (15.10)

Reassembly

1. Install thrust bearing race No. 9, bearing 10 and 2 seal rings on overdrive case. Hook both ends by hand. Install new "O" rings in piston outside and inside grooves. Apply ATF and install piston in case. Install return spring, retainer and snap ring.

CAUTION: Ensure springs are installed correctly and snap ring is fully seated.

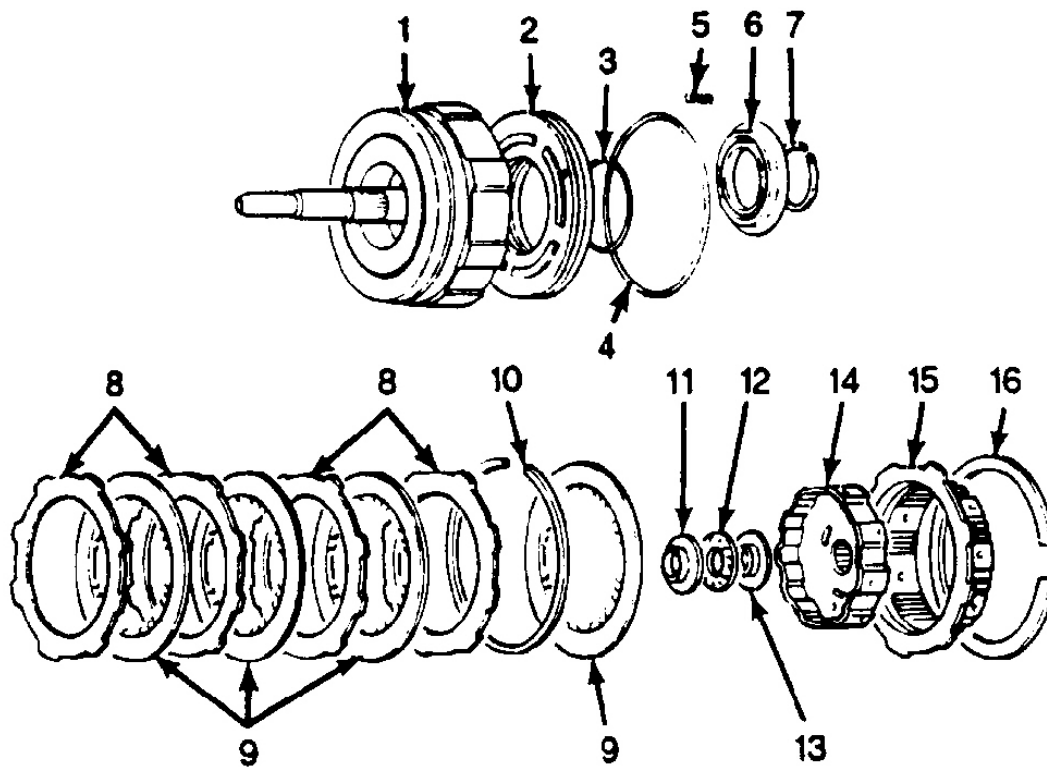
2. Assemble bearing races No. 6 and 8 and bearing No. 7. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55** . Install bearing races, bearing, planetary ring gear and thrust washer in overdrive case.
3. Install concave cushion plate. Alternate brake plates and brake discs, complete assembly with backing plate and snap ring.
4. Measure backing plate-to-snap ring clearance with feeler gauge. See **OD BRAKE SNAP RING-TO-BACKING PLATE SPECIFICATIONS** table. If clearance is larger than specification, replace disc or plates. If clearance is smaller than specification, check for correct assembly.

OD BRAKE SNAP RING-TO-BACKING PLATE SPECIFICATIONS

Applications	In. (mm)
1988-89 Chrysler, Mitsubishi w/AW372L, KM148 (1989 Montero & 1989 Raider) R4AW2 & Isuzu	.026-.087 (.65-2.21)
All Other Chrysler, Mitsubishi & 1988-90 Volvo	.013-.063 (.35-1.60)

FORWARD CLUTCH**Disassembly**

1. Using extension housing as a work stand, remove snap ring from clutch cylinder assembly. Remove direct clutch hub, forward clutch hub and clutch disc. Remove thrust bearing No. 12, bearing races No. 11 and 13. See **Fig. 26** .
2. Remove snap ring and clutch plates and disc. For Chrysler and Mitsubishi place clutch cylinder on press bench and compress return spring using Spring Compressor (MD998903). For Isuzu use Spring Compressor (J-25048). For Volvo use Spring Compressor (5072) to compress return springs. Remove snap ring with screwdriver. Remove spring retainer and return springs.
3. Install clutch cylinder in overdrive case to remove piston with compressed air. See **Fig. 27** . Remove "O" ring from piston.



1. Forward Clutch Cylinder Assembly
2. Forward Clutch Piston
3. "O" Ring
4. "O" Ring
5. Clutch Return Spring
6. Spring Retainer
7. Snap Ring
8. Clutch Plate

9. Clutch Disc
10. Snap Ring
11. Thrust Bearing Race No. 11
12. Thrust Bearing No. 12
13. Thrust Bearing Race No. 13
14. Forward Clutch Hub
15. Direct Clutch Hub
16. Snap Ring

G93J22862

Fig. 26: Exploded View Of Forward Clutch Assembly
 Courtesy of ISUZU MOTOR CO.

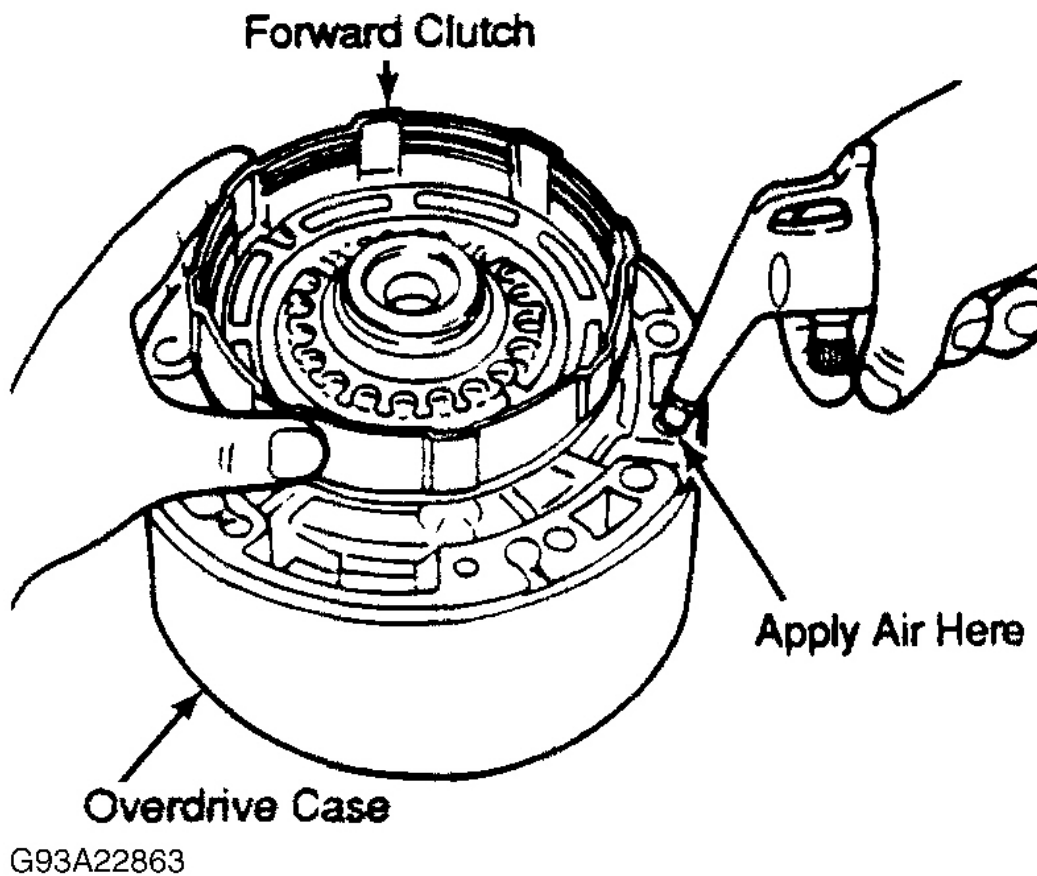


Fig. 27: Removing & Checking Clutch Piston
Courtesy of ISUZU MOTOR CO.

Inspection

1. Inspect splines, disc, plates, bearing seats, bearings, teeth and hubs for wear or damage.
2. Check return springs. Free length should be .594" (15.09 mm) for AW372L, KM148 (1989 Montero, 1989 Ram Raider), R4AW2 and Isuzu. All other Chrysler and Mitsubishi should be .571-.587" (14.50-14.91 mm). Volvo does not measure spring free length. Measure Isuzu and Volvo forward clutch disc friction thickness. If less than .082" (2.10 mm), replace clutch disc. Chrysler and Mitsubishi do not measure clutch disc thickness.

Reassembly

1. Install new "O" rings on piston. Apply ATF and install piston in forward clutch. Install return springs and retainer. For Chrysler and Mitsubishi use Spring Compressor (MD998903) on spring retainer, compress return springs in a shop press. On Isuzu use Spring Compressor (J-25048). On Volvo use Spring Compressor (5072) to compress return springs. On all models install snap ring. For Chrysler and

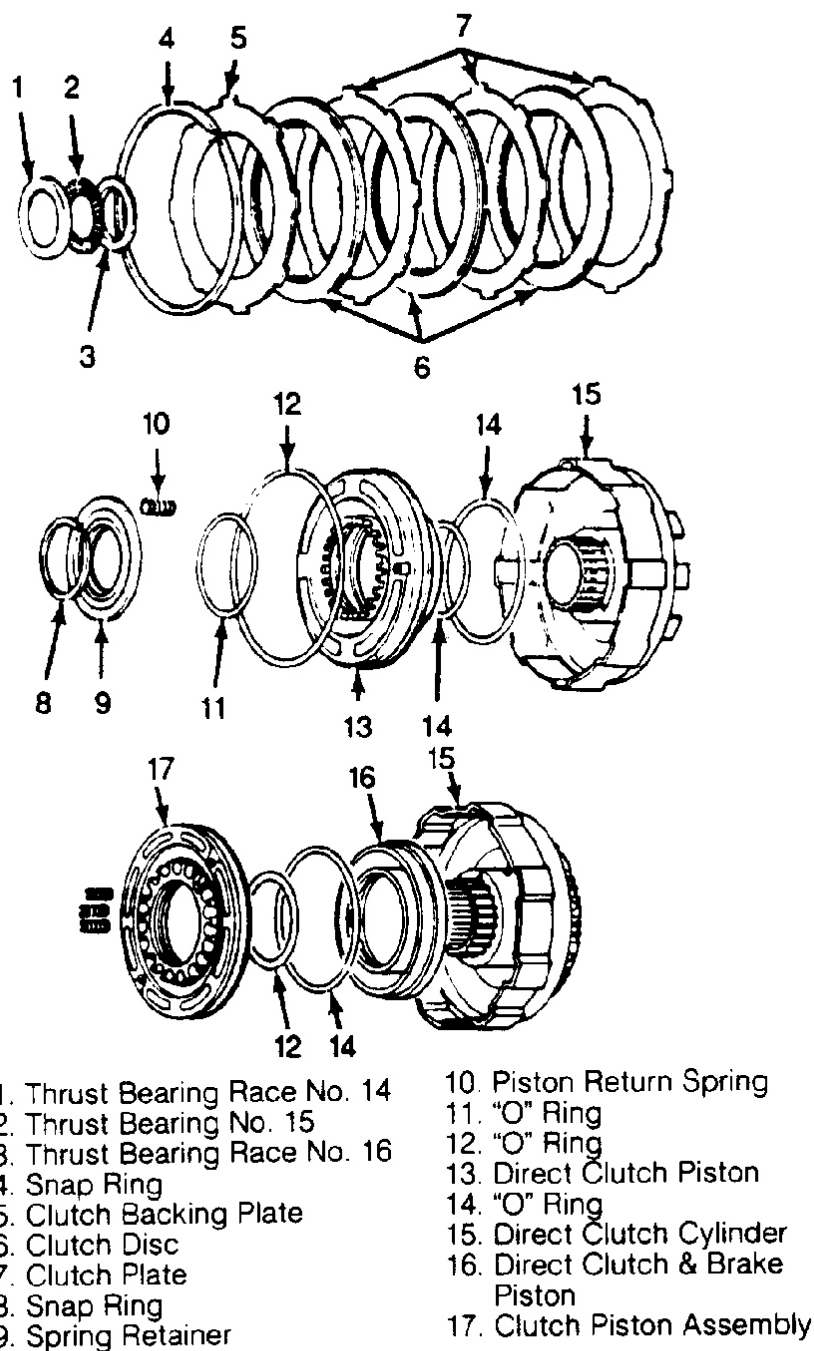
Mitsubishi with AW372L, KM148 (1989 Montero and 1989 Ram Raider), R4AW2, Isuzu Pickup and Amigo, piston travel should be .056-.115" (1.42-2.92 mm). For 1988-89 Isuzu Impulse, piston travel should be .052-.105" (1.32-2.66 mm). Information for Volvo and other Chrysler and Mitsubishi, not available from manufacturer.

2. Apply petroleum jelly to thrust bearing races No. 11 and 13 and bearing No. 12. Install onto input shaft rear end. See **Fig. 55** . Install forward clutch hub in clutch cylinder. Install clutch plates and discs alternately in clutch cylinder. Install snap ring (narrower ring). Install one clutch disc. Install direct clutch hub and snap ring (wider ring). Place forward clutch on overdrive case. Apply air pressure (57-114 psi) to oil passage and check forward clutch for operation and leakage. See **Fig. 27** .

DIRECT CLUTCH

Disassembly

1. Remove thrust bearing races No. 14 and 16 and bearing No. 15. Remove snap ring, clutch backing plate, disc and plates from direct clutch cylinder. See **Fig. 28** . For Chrysler and Mitsubishi, place direct clutch cylinder on press bench and compress piston return springs using Spring Compressor (MD998903). For Isuzu, use Spring Compressor (J-25048) and for Volvo, use Spring Compressor (5072) to compress return springs. For all models, remove snap ring with snap ring pliers.
2. Remove spring retainer and piston return spring. Install clutch cylinder in center support and remove piston with compressed air. See **Fig. 29** . Remove "O" rings.



G93B22864

Fig. 28: Exploded View Of Direct Clutch Assembly
 Courtesy of ISUZU MOTOR CO.

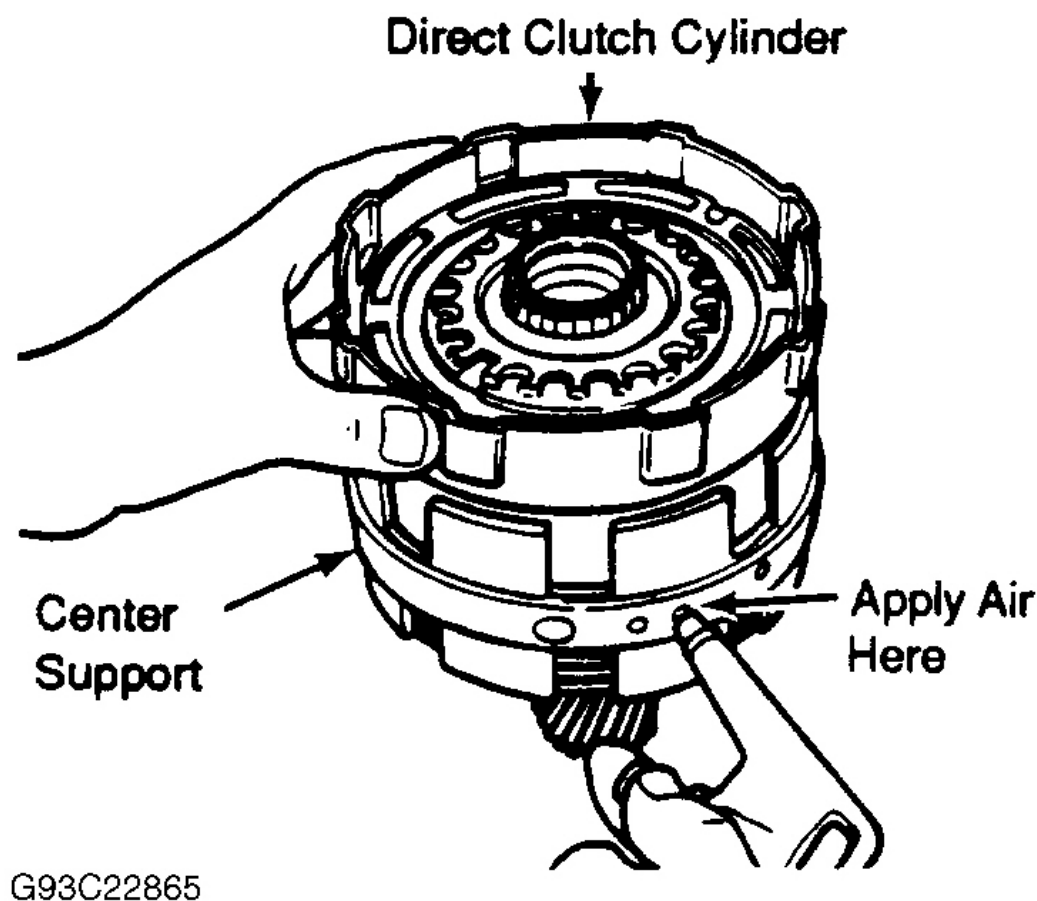


Fig. 29: Removing & Checking Direct Clutch Piston
Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, disc, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary). Measure return springs free length and clutch disc thickness. See **DIRECT CLUTCH SPECIFICATIONS** table.

Reassembly

1. Install new "O" rings on piston. On 1988-89 Isuzu Impulse with 4ZD1 engine install direct clutch and brake piston. On all models, apply ATF and install piston into clutch cylinder. Install return springs and retainer plate. On Chrysler and Mitsubishi, use Spring Compressor (MD998903) and shop press to compress return spring. On Isuzu, use Spring Compressor (J-25048) and for Volvo, use Spring Compressor (5072) to compress return springs. On all models, install spring retainer snap ring.
2. Install clutch discs, plates and backing plate. Backing plate machined ridge should face out. Install snap

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

ring. Install bearing races No. 14 and 16 and bearing No. 15. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55** . On Chrysler, Mitsubishi and Isuzu measure piston travel. For Volvo, measure snap ring-to-backing plate. For specifications, see **DIRECT CLUTCH SPECIFICATIONS** table.

DIRECT CLUTCH SPECIFICATIONS

Application	Dimension
Return Spring Free Length	
1988-90 Chrysler & Mitsubishi w/AW372L, KM148 (1989 Montero, 1989 Raider) & R4AW2	.594 (15.09)
All Other Chrysler & Mitsubishi	.571-.587 (14.50- 14.91)
1988-89 Isuzu Impulse w/4ZD1 Engine	.619-.635 (15.70- 16.12)
1988-89 Isuzu Impulse w/4ZC1-T Engine, 1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.579-.595 (14.70- 15.10)
Clutch Disc Thickness	
1988-89 Isuzu Impulse w/4ZD1 Engine	.071 (1.80)
1988-89 Isuzu Impulse w/4ZC1-T	.079 (2.00)

1990 Mitsubishi Van

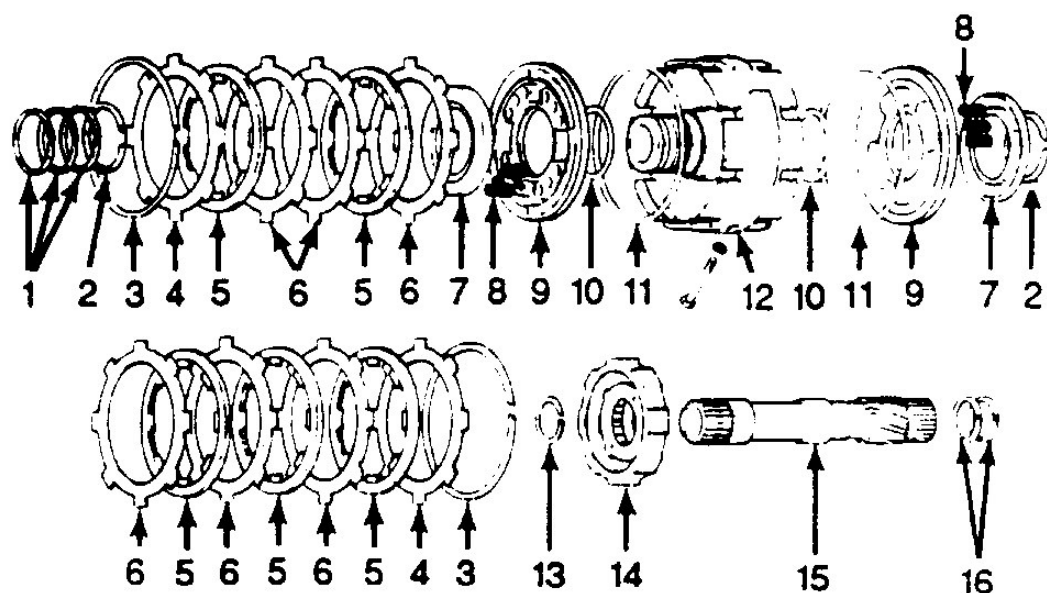
1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

Engine, 1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	
1988-90 Volvo	.083 (2.10)
Clutch Piston Travel	
1988-89 Chrysler & Mitsubishi w/AW372L, KM148 (1989 Montero, 1989 Raider), R4AW2, 1988-89 Isuzu Impulse w/4ZD1 Engine, 1988-89 Isuzu Pickup	.036-.078 (.91-1.99)
1988-89 Isuzu Impulse w/4ZC1-T Engine	.042-.084 (1.06-2.14)
1990 Isuzu Pickup & Amigo	.038-.068 (.80-1.73)
Snap Ring-To-Backing Plate Clearance	
1988-90 Volvo	.012-.048 (.30-1.20)

CENTER SUPPORT**Disassembly (Brake No. 1)**

1. Remove snap ring from front of sun gear. Remove sun gear with one-way clutch from center support. See **Fig. 30**.

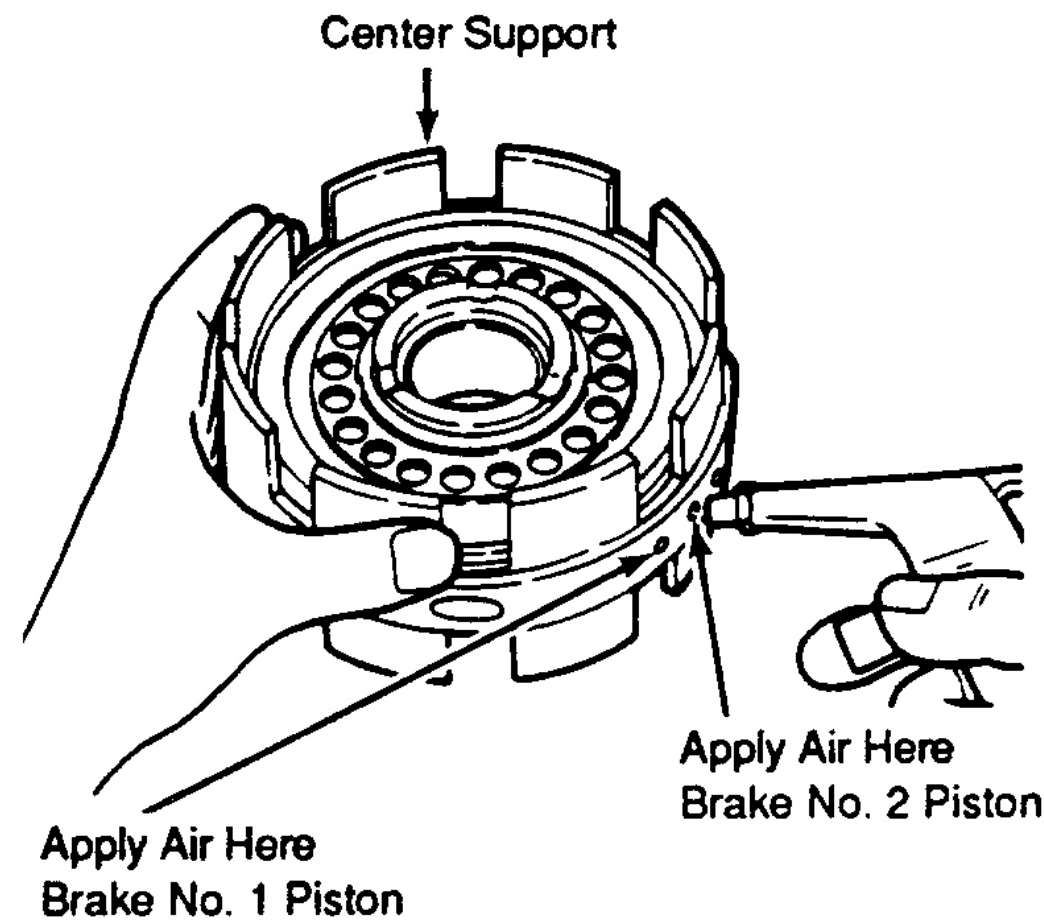
2. Remove snap ring from center support and remove backing plate, clutch disc and plates. For Chrysler and Mitsubishi, using Spring Compressor (MD998903), compress return springs on shop press. For Isuzu, use Spring Compressor (J-25048) and for Volvo, use (5072) to compress return springs. For all models, remove spring retainer snap ring. Remove spring retainer and 12 brake return springs. Remove piston with compressed air (14 psi max). See **Fig. 31**. Remove "O" rings and seal rings.



- | | |
|-------------------------|---|
| 1. Seal Ring | 10. "O" Ring |
| 2. Snap Ring | 11. "O" Ring |
| 3. Snap Ring | 12. Center Support |
| 4. Clutch Backing Plate | 13. Snap Ring |
| 5. Clutch Disc | 14. Brake No. 2 Hub & One-Way Clutch No. 1 Assembly |
| 6. Clutch Plate | 15. Planetary Sun Gear |
| 7. Spring Retainer | 16. Seal Ring |
| 8. Brake Return Spring | |
| 9. Brake Piston | |

G93D22866

Fig. 30: Exploded View Of Center Support Assembly
Courtesy of ISUZU MOTOR CO.



G93E22867

Fig. 31: Removing & Checking Brake No. 1 & 2 Pistons
Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, disc, plates, bearing seats, bearing, teeth and hubs for wear or damage. Replace parts (as necessary). Measure return spring free length. Measure clutch disc thickness. See **CENTER SUPPORT BRAKE NO. 1 SPECIFICATIONS** table.

Reassembly

1. Install 3 seal rings on center support. Install new "O" rings on brake piston. Apply ATF to "O" rings and insert piston in cylinder.
2. Place center support on bench and install 12 brake return springs. Install spring retainer. For Chrysler and Mitsubishi, use Spring Compressor (MD998903) and shop press to compress return springs. For Isuzu,

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

use Spring Compressor (J-25048) and for Volvo, use Spring Compressor (5072) to compress return springs. For all models, install return spring retainer snap ring. Install clutch plates, disc, backing plate and snap ring. For Chrysler, Mitsubishi and Isuzu, measure clutch piston travel by applying air pressure (14 psi max.) to oil passage. See **Fig. 31** . For Volvo, measure snap ring-to-backing plate clearance. See **CENTER SUPPORT BRAKE NO. 1 SPECIFICATIONS** table.

CENTER SUPPORT BRAKE NO. 1 SPECIFICATIONS

Application	In. (mm)
Return Spring	
1988-89 Chrysler & Mitsubishi w/ AW372L, KM148 (1989 Montero, 1989 Raider), R4AW2 & 1988 Isuzu Impulse	.635 (16.12)
1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.675 (17.15)
Clutch Disc	
1988-90 Isuzu & 1988-90 Volvo	.083 (2.10)
Piston Travel	
1988-90 Chrysler & Mitsubishi w AW372L, KM148 (1989 Montero, 1989 Raider) & R4AW2	.031-.068 (.79-1.73)
1988-90 Isuzu (All Models)	.033-.068 (.83-1.73)
Snap Ring-To-Backing Plate Clearance	
1988-90 Volvo	.012-.047 (.30-1.20)

Disassembly (Brake No. 2)

1. Remove snap ring from front of sun gear. Remove sun gear with one-way clutch from center support. See **Fig. 30** .
2. Remove snap ring from center support and remove backing plate, clutch disc and plates. For Chrysler and Mitsubishi, using Spring Compressor (MD998903) compress return spring on shop press and remove snap ring. For Isuzu, use Spring Compressor (J-25048) and for Volvo, use Spring Compressor (5072) and compress return springs to remove snap ring.
3. Remove spring retainer and 12 brake return springs. Remove piston with compressed air. See **Fig. 31** . Remove "O" rings and seal rings.

Inspection

Inspect splines, disc, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary). Measure return spring free length and clutch disc thickness. See **CENTER SUPPORT BRAKE NO. 2 SPECIFICATIONS** table.

Reassembly

1. Install 3 seal rings on center support. Install new "O" rings on brake piston. Apply ATF to "O" rings and insert piston in cylinder. Place center support on bench and install 12 brake return springs. Install spring retainer.
2. For Chrysler and Mitsubishi, using Spring Compressor (MD998903), compress piston return spring on shop press and install snap ring. For Isuzu, use Spring Compressor (J-25048) and for Volvo, use Spring

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

Compressor (5072) to compress return spring and install snap ring. AW372L, KM148 (1989 Montero, 1989 Ram Raider) and R4AW2 piston travel should be .040-.089" (1.02-2.26 mm). Piston travel for other models not available from manufacturer. Install clutch plates, disc, backing plate and snap ring.

NOTE: For 1988-89 Isuzu Impulse with 4ZC1-T Engine, when installing clutch pack, start with clutch plate of .071" (1.80 mm), clutch disc, clutch plate of .118" (3.00 mm), clutch disc and clutch plate of .118" (3.00 mm).

Mount dial indicator feeler on clutch piston. Apply air pressure (57-114 psi) to oil passage to measure clutch piston travel. See **CENTER SUPPORT BRAKE NO. 2 SPECIFICATIONS** table.

CENTER SUPPORT BRAKE NO. 2 SPECIFICATIONS

Application	In. (mm)
Return Spring	
1988-90 Chrysler & Mitsubishi w/ AW372L, KM148 (1989 Montero, 1989 Raider), R4AW2 & 1988-89 Isuzu Impulse	.635 (16.13)
All Other Chrysler & Mitsubishi	.618-.634 (15.70-16.10)
1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.675 (17.15)
Clutch Disc	
1988-89 Isuzu Impulse & 1988-90 Volvo	.083 (2.10)
1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.071 (1.80)
Piston Travel	
1988-90 Chrysler & Mitsubishi w/AW372L, KM148 (1989 Montero, 1989 Raider), R4AW2, 1988-89 Isuzu Impulse, 1988-90 Pickup & 1989-90 Isuzu Amigo	.040-.089 (1.01-2.25)
Snap Ring-To-Backing Plate Clearance	
1988-90 Volvo	.012-.047 (.30-1.20)

Inspection (Sun Gear)

Ensure sun gear turns smoothly when rotated clockwise and locks when rotated counterclockwise. If one-way clutch is faulty, replace brake No. 2 hub and one-way clutch assembly. Inspect splines, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary).

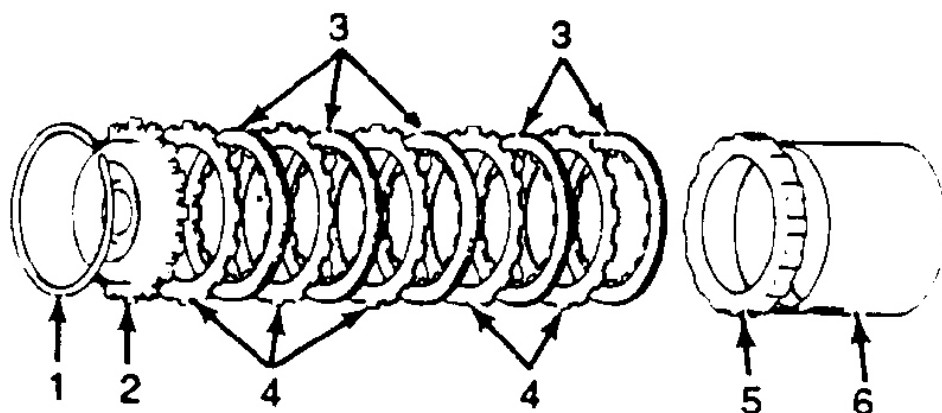
Reassembly

Install 2 seal rings in sun gear grooves. Install sun gear in one-way clutch No. 1 and check rotation.

BRAKE NO. 3

Disassembly

Disassembly of brake No. 3 is performed in **TRANSMISSION DISASSEMBLY**. Remove retaining ring, one-way clutch inner race, No. 3 brake disc, plates, pressure plate and brake apply tube from intermediate shaft. Note component location. See **Fig. 32**.



- | | |
|------------------------------|---------------------|
| 1. Retaining Ring | 4. Clutch Plate |
| 2. One-Way Clutch Inner Race | 5. Pressure Plate |
| 3. Clutch Disc | 6. Brake Apply Tube |

G93F22868

Fig. 32: Exploded View Of Brake No. 3 Assembly
 Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, discs, plates, bearing seats, bearings, teeth and hubs for wear or damage. Measure return spring free length and clutch disc thickness. See **BRAKE NO. 3 SPECIFICATIONS** table. Replace parts (as necessary).

Reassembly

Install brake apply tube and pressure plate facing flat surface toward intermediate shaft. Install No. 3 brake disc, plates, one-way clutch inner race and retaining ring. Reassembly is performed in **TRANSMISSION REASSEMBLY**.

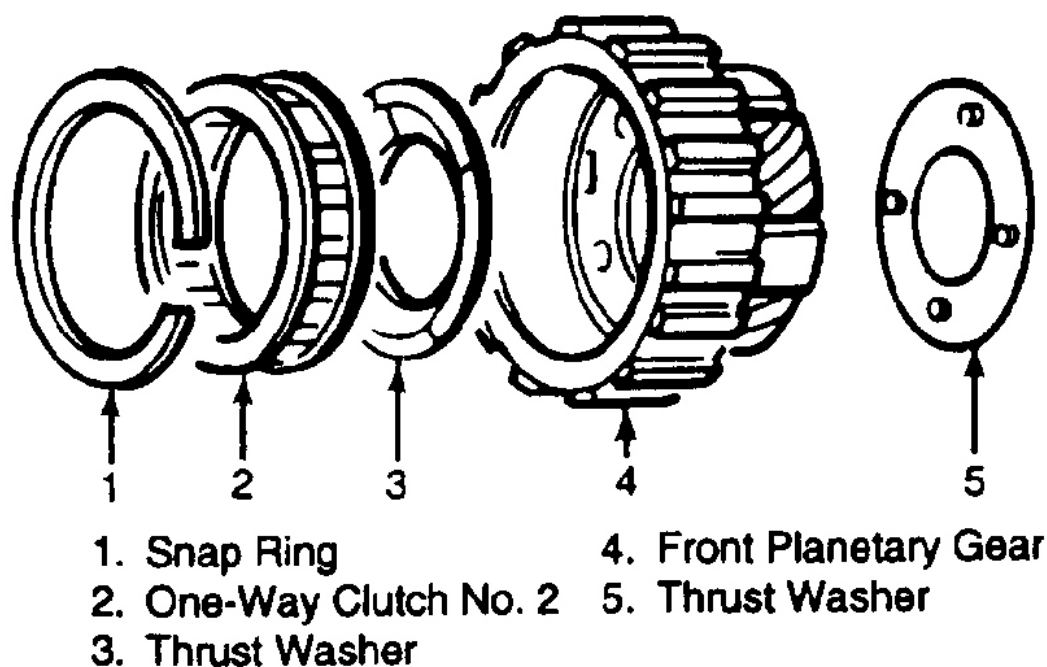
BRAKE NO. 3 SPECIFICATIONS

Application	INCH (mm)
Return Spring Free Length	
1988-89 Isuzu Impulse, 1988-90 Isuzu Pickup & 1989-90 Isuzu Amigo	.619-.635 (15.70-16.12)
Clutch Plate Thickness (Minimum)	
1988-90 Volvo	.083 (2.10)

ONE-WAY CLUTCH NO. 2 & FRONT PLANETARY GEAR SET

Disassembly

Disassemble one-way clutch inner race and front planetary carrier. Remove steel thrust washer from front planetary gear. Remove snap ring, one-way clutch No. 2 assembly and nylon thrust washer. See **Fig. 33**.



G93G22869

Fig. 33: One-Way Clutch No. 2 & Front Planetary Gear Set Assembly
Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, discs, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary). Install one-way clutch inner race on front planetary carrier. Ensure outer race (planetary gear carrier) turns smoothly when rotated counterclockwise and locks clockwise. See **Fig. 34**.

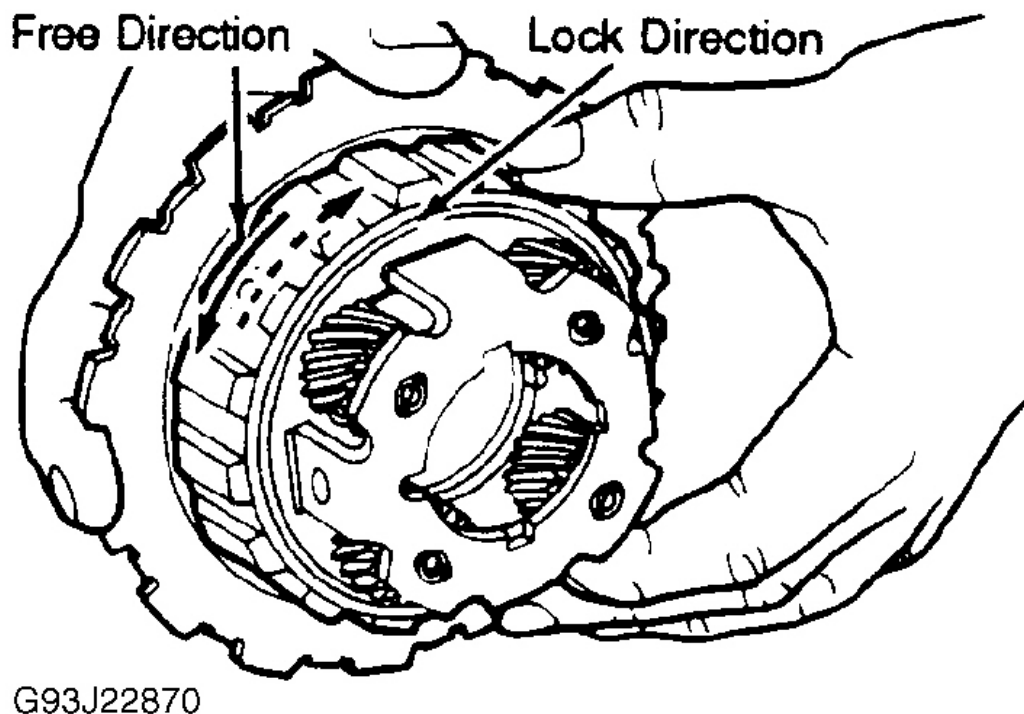


Fig. 34: Checking Operation Of One-Way Clutch
Courtesy of ISUZU MOTOR CO.

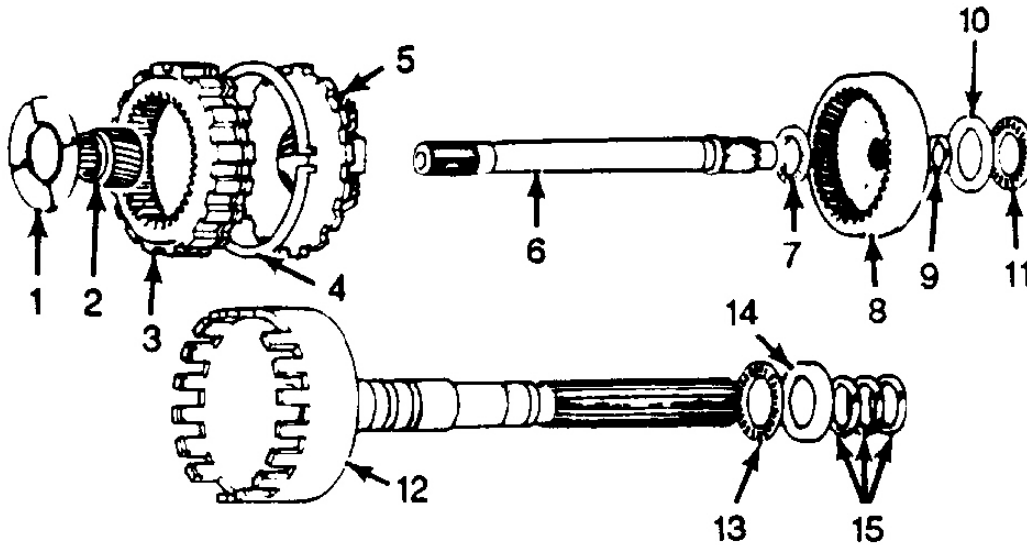
Reassembly

Install nylon thrust washer on front planetary gear. Install 2 end bearings on one-way clutch. Install one-way clutch on front planetary gear. Install snap ring. Apply petroleum jelly to steel thrust washer and install on front planetary gear carrier.

REAR PLANETARY GEAR & OUTPUT SHAFT

Disassembly

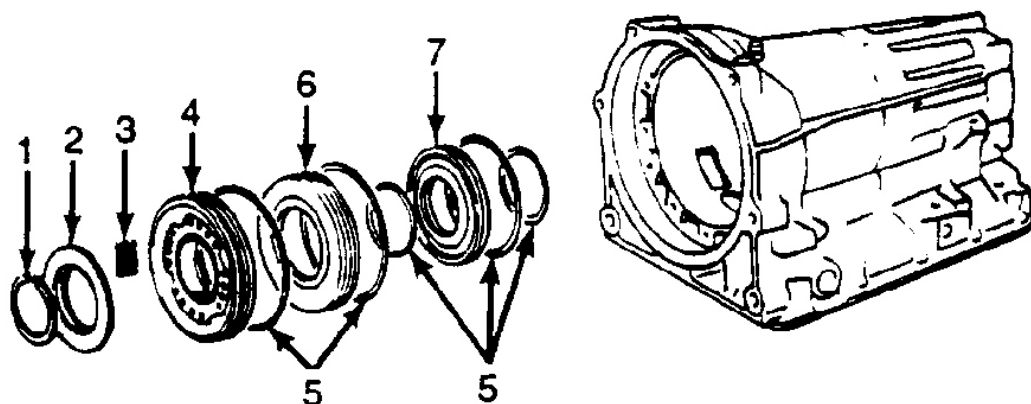
Compress snap ring and remove front planetary ring gear. Remove intermediate shaft from output shaft. See **Fig. 35**. Remove thrust bearing No. 19 and bearing race No. 18. Remove thrust bearing race No. 21 and bearing No. 20 from output shaft. Remove 3 seal rings. Remove thrust washer and sun gear from rear planetary gear. Remove rear planetary gear and thrust bearing No. 17 from intermediate shaft assembly. Invert intermediate shaft and remove retaining ring and rear planetary ring gear.



- | | |
|------------------------------|--------------------------------|
| 1. Thrust Washer | 9. Retaining Ring |
| 2. Planetary Sun Gear | 10. Thrust Bearing Race No. 18 |
| 3. Front Planetary Ring Gear | 11. Thrust Bearing No. 19 |
| 4. Retaining Ring | 12. Output Shaft Assembly |
| 5. Rear Planetary Gear | 13. Thrust Bearing No. 20 |
| 6. Intermediate Shaft | 14. Thrust Bearing Race No. 21 |
| 7. Thrust Bearing No. 17 | 15. Seal Ring |
| 8. Rear Planetary Ring Gear | |

G93A22871

Fig. 35: Exploded View Of Rear Planetary Gear & Output Shaft Assembly
 Courtesy of ISUZU MOTOR CO.



- | | |
|-------------------------------|---------------------------------|
| 1. Snap Ring | 6. Reaction Sleeve |
| 2. Spring Retainer | 7. Brake No. 3 Secondary Piston |
| 3. Piston Return Spring | |
| 4. Brake No. 3 Primary Piston | |
| 5. "O" Ring | |

G93C22873

Fig. 36: Exploded View Of Brake No. 3 Piston Assembly
 Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, bearing seats, bearings, teeth and hubs for wear or damage. Inspect oil passages for clogging. Replace parts (as necessary).

Reassembly

1. Install rear planetary ring gear and retaining ring on intermediate shaft. Invert intermediate shaft and install thrust bearing No. 17, rear planetary gear, sun gear and thrust washer. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55**.
2. Install 3 oil seals, thrust bearing No. 20 and bearing race No. 21 into output shaft. Using extension housing as an assembly stand, install thrust bearing No. 19, bearing race No. 18 and intermediate shaft into output shaft. Install retaining ring on front planetary ring gear and install ring gear on output flange while compressing retaining ring.

BRAKE NO. 3 PISTON

Disassembly

1. For Chrysler and Mitsubishi, use Spring Compressor (MD998903), Retainer (MD998211) and Bolt

(MD998904) to compress springs and remove snap ring. For Isuzu, use Spring Compressor (J-25048) and for Volvo, use Spring Compressor (5073) to compress spring and remove snap ring. See **Fig. 32** , **Fig. 37** and **Fig. 36** . Remove spring retainer and 16 piston return springs.

2. Place transmission case front end down on bench. Place a rag under transmission to protect pistons. Place finger over port "B" and apply 14 psi (97 kPa) of compressed air to port "A" to remove inner and outer pistons and reaction sleeve. Remove primary and secondary pistons from reaction sleeve. Remove "O" rings.

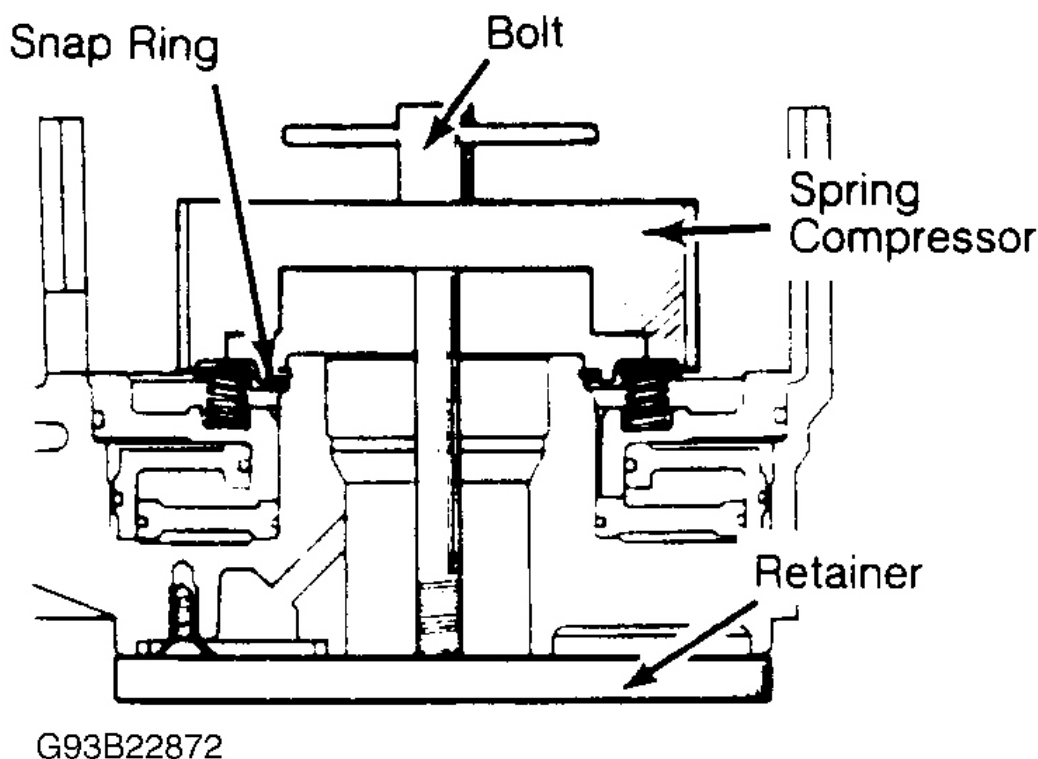


Fig. 37: Using Spring Compressor To Remove Springs & Snap Ring
Courtesy of ISUZU MOTOR CO.

Inspection

Inspect splines, discs, plates, bearing seats, bearings, teeth and hubs for wear or damage. Replace parts (as necessary).

Reassembly

Install new "O" rings on primary and secondary pistons and reaction sleeve. Apply ATF and push primary and secondary pistons into reaction sleeve. Slide pistons and reaction sleeve assembled into cylinder. Apply petroleum jelly to 16 brake return springs and install on primary piston. Install spring retainer. For Chrysler and

Mitsubishi, use Spring Compressor (MD998903), Retainer (MD998211) and Bolt (MD998904) to compress spring and install snap ring. For Isuzu, use Spring Compressor (J-25048) and for Volvo use Spring Compressor (5073) to compress spring and remove snap ring.

VALVE BODY ASSEMBLY

Disassembly (Valve Body Assembly)

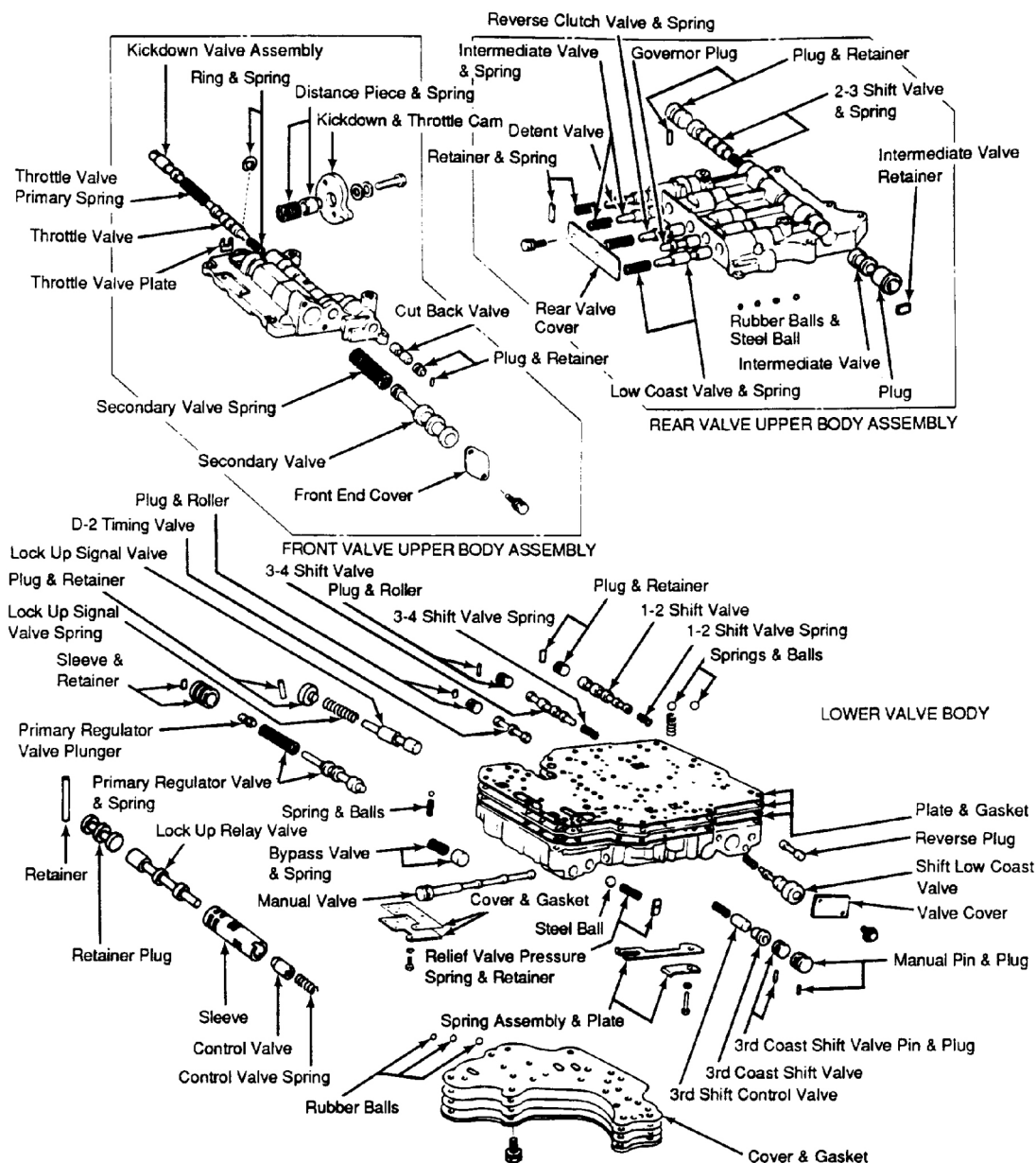
Remove detent spring plate, detent spring and manual valve from valve body assembly. Remove plate from lower valve body. See **Fig. 38** . Turn valve body assembly over and remove 10 bolts from upper front valve body and upper rear valve body. Turn assembly over and remove set bolts from lower valve body. Lift lower valve body and plate as single unit, being careful not to let check valve and balls drop.

Disassembly (Upper Front Body)

1. Remove valve retainer, cut back plug and cut back valve. See **Fig. 39** . Remove one attaching bolt from front valve end cover and loosen other. Slowly rotate cover until secondary regulator valve appears. Hold cover, inside valve is highly spring-loaded. Remove valve, spring, attaching bolt and cover.
2. While turning throttle cam, push down kickdown valve into valve body. Insert cutback valve retainer to hold throttle valve and remove throttle cam spring, throttle cam and sleeve. See **Fig. 40** . Remove cutback valve retainer, kickdown valve and throttle valve primary spring. Remove throttle valve key plate, 4 "E" rings, throttle valve secondary spring and throttle valve. Remove check ball.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

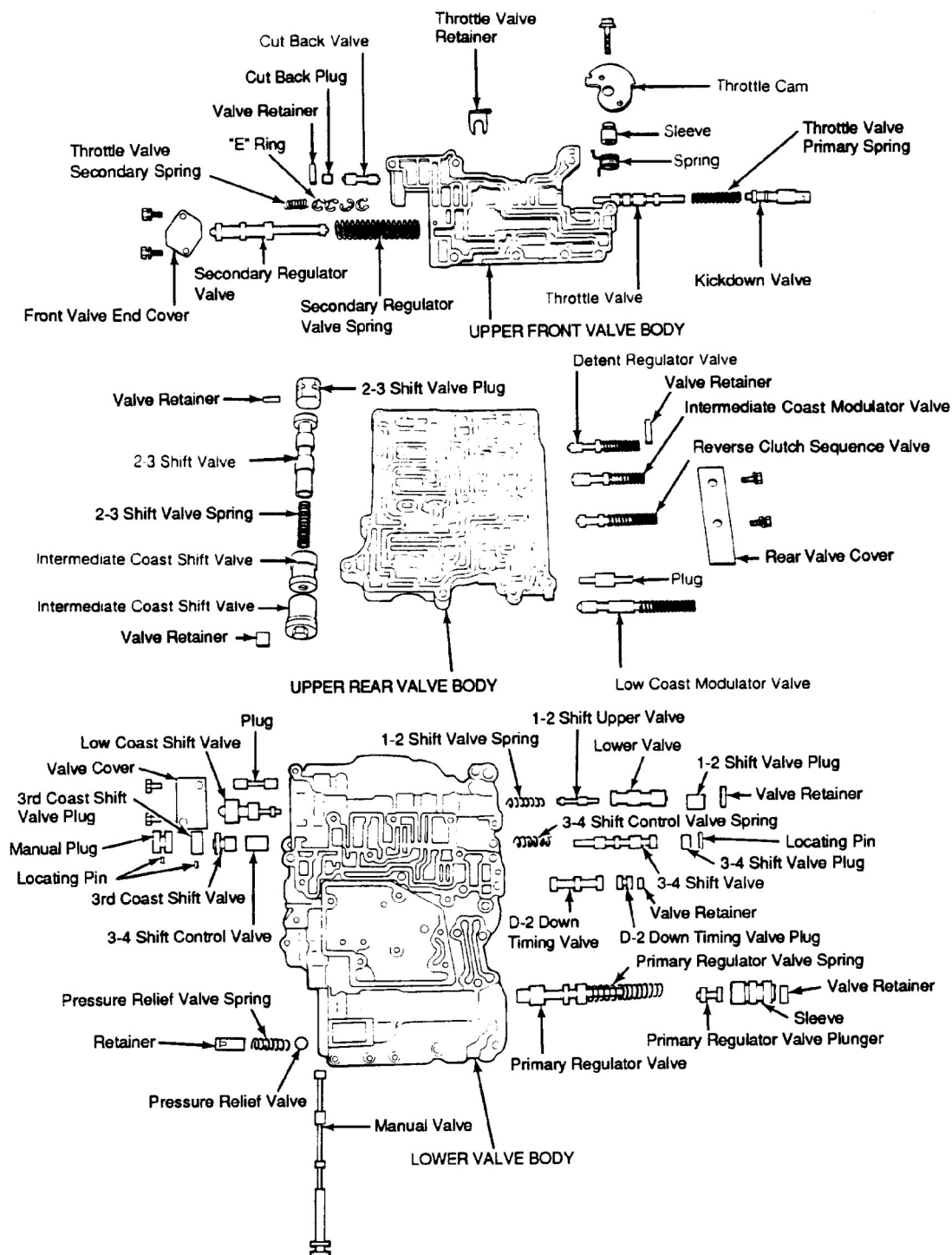


G93D22874

Fig. 38: Exploded View Of Valve Body Assembly
Courtesy of ISUZU MOTOR CO.

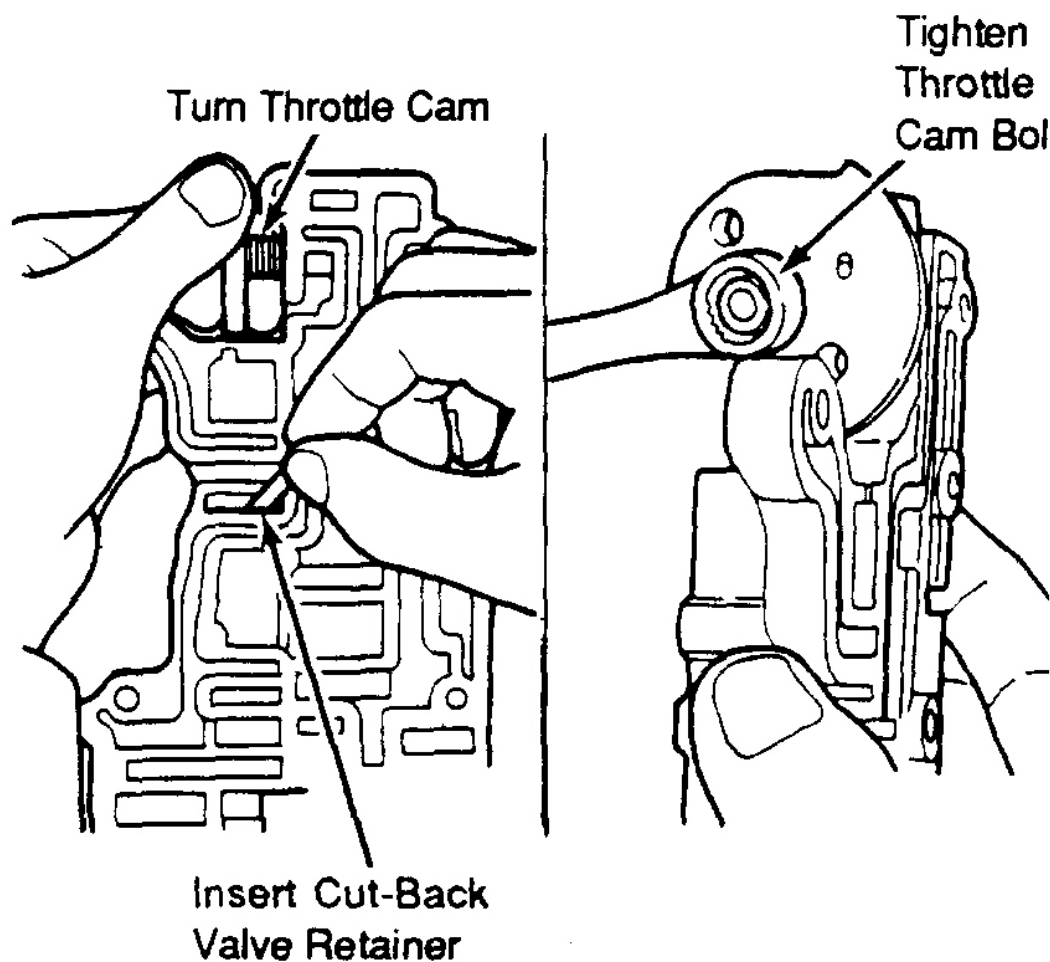
1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul



G93E22875

Fig. 39: Exploded View Of Valve Body Components
Courtesy of ISUZU MOTOR CO.



G93F22876

Fig. 40: Removing Throttle Cam Spring
 Courtesy of ISUZU MOTOR CO.

Inspection

Check valves for damage and wear. Ensure smooth operation of valves in valve body. Inspect oil holes and passages for clogging. Check valve spring for damage, rust and collapsed coils. Measure spring free height and replace if less than specifications in **UPPER FRONT VALVE BODY SPRING SPECIFICATIONS** table.

UPPER FRONT VALVE BODY SPRING SPECIFICATIONS

Application	Color	Free Length In. (mm)
Kickdown Valve ⁽¹⁾	Orange	1.710 (43.43)
Kickdown Valve ⁽²⁾	Purple ⁽³⁾	1.565 (39.75)
Secondary Regulator Valve ⁽⁴⁾	Green	2.806 (71.27)

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

Throttle Valve ⁽¹⁾	None	.757 (19.23)
Throttle Valve ⁽²⁾	None	.864 (21.95)
Throttle Valve ⁽⁴⁾	None	1.693 (43.00)

(1) Applies to AW372 and KM148.

(2) Applies to AW372L and R4AW2.

(3) Applies to R4AW2.

(4) Applies to AW70 and AW71.

Reassembly (Upper Front Body)

1. Install secondary regulator valve spring, secondary regulator valve and front valve end cover. Install throttle valve, throttle valve secondary spring, 4 "E" rings and throttle valve keep plate. Install throttle valve primary spring and kickdown valve.
2. Push kickdown valve and insert cut back valve retainer to hold valve. Install spring with end hooked in hole of cam. Insert sleeve and install throttle cam on valve body. Torque bolt to 51-78 INCH lbs. (5.8-8.8 N.m) for AW372 and KM148. Information for other models not available from manufacturer. Ensure throttle cam turns through full stroke smoothly. Remove cutback valve retainer. Install cut back valve, cut back plug and valve retainer. Install rubber check ball. See [Fig. 41](#) .

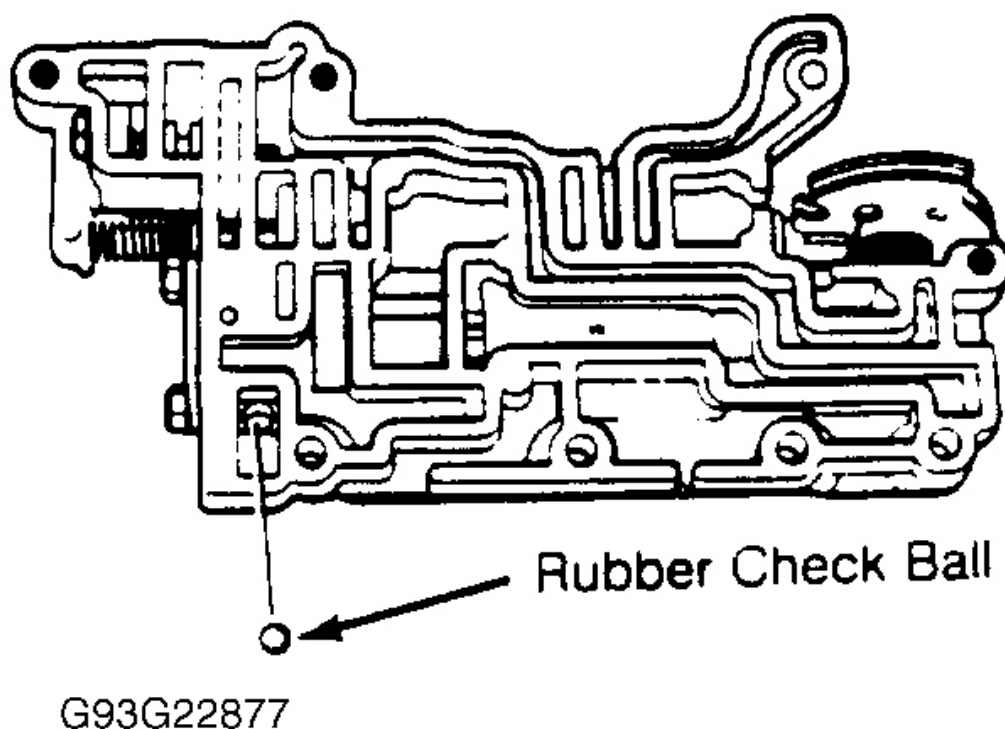


Fig. 41: Locating Check Ball In Upper Front Valve Body
Courtesy of ISUZU MOTOR CO.

UPPER REAR VALVE BODY

Disassembly

1. Remove check balls from upper rear valve body with tweezers. Remove intermediate coast shift valve retainer, plug, valve and spring. Remove 2-3 shift valve retainer, plug and valve. See **Fig. 39**.
2. Remove bolt nearer to low coast modulator valve from rear valve cover. Slightly rotate cover to release low coast modulator valve. Remove spring and low coast modulator valve. Rotate cover further and remove plug, reverse clutch sequence valve and spring. Remove rear valve cover, spring and intermediate modulator valve. Remove detent regulator valve retainer, spring and detent regulator valve.

Inspection

Check valves for damage and wear. Inspect oil holes and passages for clogging. Check valve springs for damage, rust and collapsed coils. Measure spring free height and replace if less than specifications in **UPPER REAR VALVE BODY SPRING SPECIFICATIONS** table.

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

UPPER REAR VALVE BODY SPRING SPECIFICATIONS

Application	Color	Free Length In. (mm)
Detent Regulator Valve ⁽¹⁾	Green	1.198 (30.43)
Detent Regulator Valve ⁽²⁾	Orange ⁽³⁾	1.236 (31.39)
Intermediate Modulator Valve ⁽¹⁾	Green	1.073 (27.25)
Intermediate Modulator Valve Type 1 ⁽⁴⁾	None	1.008 (25.60)
Intermediate Modulator Valve ⁽²⁾	Red ⁽³⁾	1.395 (35.43)
Low Coast Modulator Valve	None	1.667 (42.34)
Low Coast Modulator Valve ⁽⁴⁾	None	1.363 (34.62)
Reverse Clutch Sequence Valve ⁽¹⁾	Yellow	1.327 (33.71)
Reverse Clutch Sequence Valve ⁽²⁾	Red 3	1.478 (37.54)
2-3 Shift Valve	White	1.382 (35.10)
Governor Valve	None	.812 (20.63)

(1) Applies to AW372, KM148 and AW71.

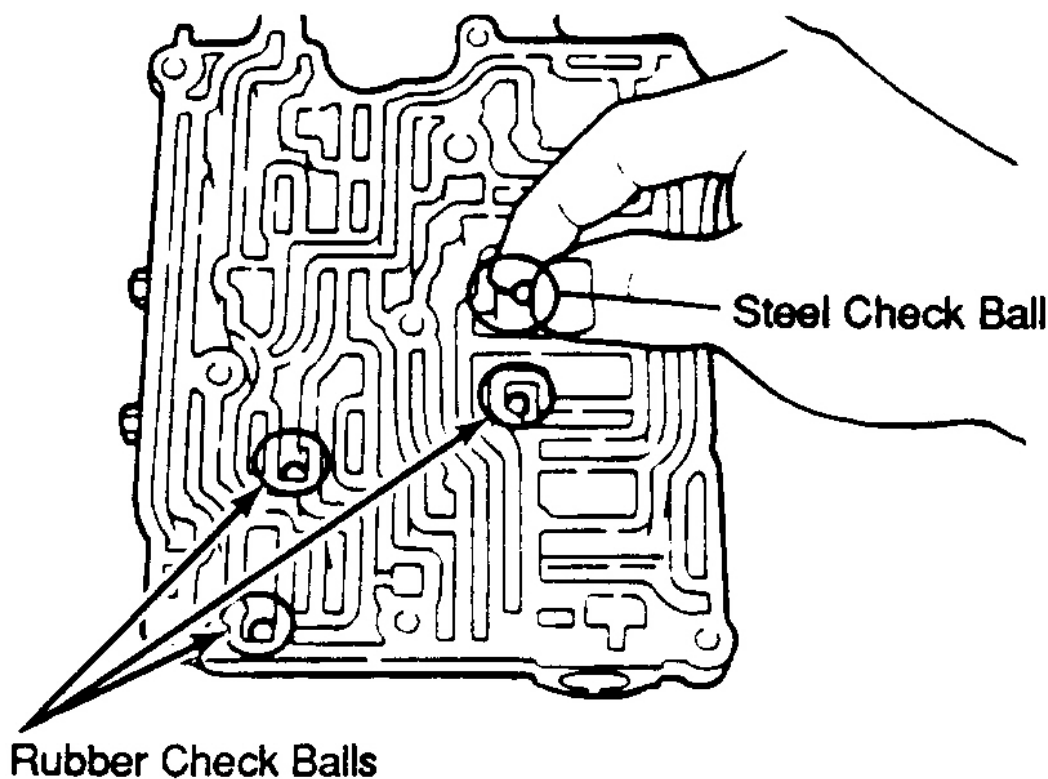
(2) Applies to AW372L, R4AW2, AW70 and AW71.

(3) Applies to R4AW2.

(4) Applies to AW70 and AW71.

Reassembly

1. Install detent regulator valve and spring into bore. Compress spring with large screwdriver and slip retainer over end of spring. Ensure retainer fully covers end of spring.
2. Install intermediate coast modulator valve and spring. Place and temporarily hold rear valve cover by one bolt on hole nearer to intermediate coast modulator valve. Install reverse clutch sequence valve and spring. Install plug. Install low coast modulator valve and spring. Install other bolt and tighten both bolts.
3. Install 2-3 shift valve, plug and valve retainer in valve body. Install 2-3 shift valve spring, intermediate coast shift valve, plug and retainer. Install steel check ball and 3 rubber check balls. See **Fig. 42** .



G93H22878

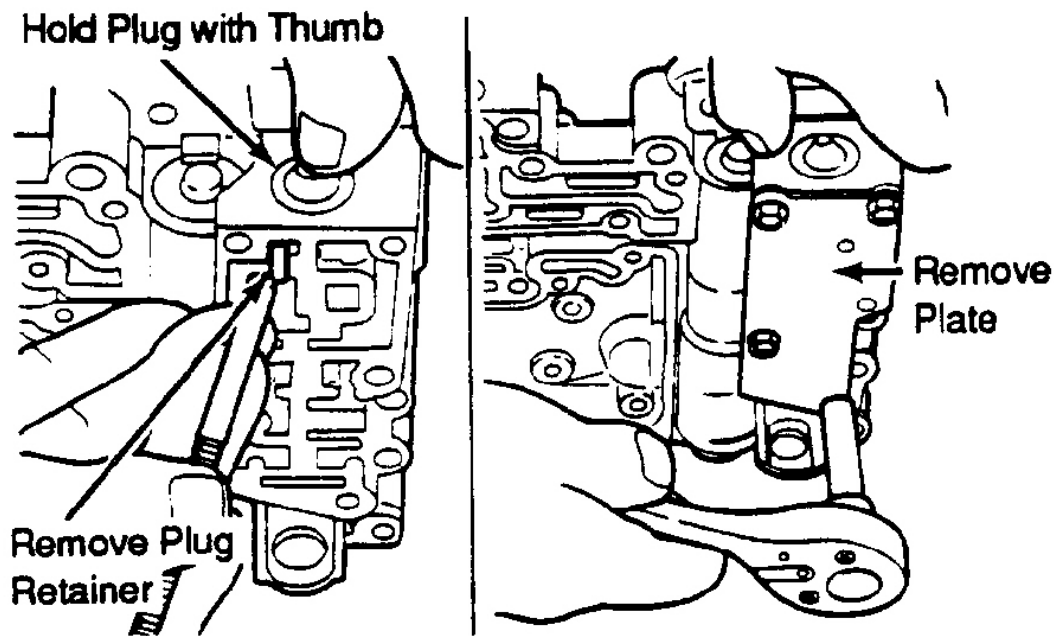
Fig. 42: Locating Check Balls In Upper Rear Valve Body
Courtesy of ISUZU MOTOR CO.

LOWER VALVE BODY

Disassembly

1. Remove lower valve body plate and gaskets. Remove check balls, damping check valve spring, oil cooler by-pass valve and spring. Turn assembly over, remove set bolt, lower body cover, plate and gaskets. See **Fig. 38**.
2. Remove 4 check balls. Keep balls together to prevent misplacement. Remove retainer from pressure relief valve assembly. Remove spring and valve. See **Fig. 39**.
3. On AW03-72L, AW372L and R4AW2 models, remove plate and gasket from lower valve body assembly, See **Fig. 43**. Remove plug retainer, lock-up relay valve plug and sleeve with lock-up relay valve, control valve and spring. See **Fig. 44**.
4. On all models, hold valve retainer with valve body side face down and press in on primary regulator valve sleeve. Remove valve retainer, sleeve, plunger, spring and primary regulator valve. On AW03-72L, AW372L and R4AW2 models, remove locating pin for lock-up signal valve. Remove plug, spring and lock-up signal valve. See **Fig. 44**.

5. On all models, remove valve retainer for D-2 down timing valve. Remove plug and D-2 down timing valve. Remove locating pin for 3-4 shift valve. Remove plug, 3-4 shift valve and spring. Remove valve retainer for 1-2 shift valve. Remove plug and lower valve. On Chrysler and Mitsubishi models, remove 1-2 shift upper valve and spring. On all models, remove low coast shift valve cover. Remove plug, low coast shift valve, manual plug, locating pin, 3rd coast shift valve plug, locating pin, 3rd coast shift valve and 3-4 shift control valve.



G93I22879

Fig. 43: Locating Lock-Up Relay Valve Plate (AW03-72L, AW70L & AW72L)
Courtesy of ISUZU MOTOR CO.

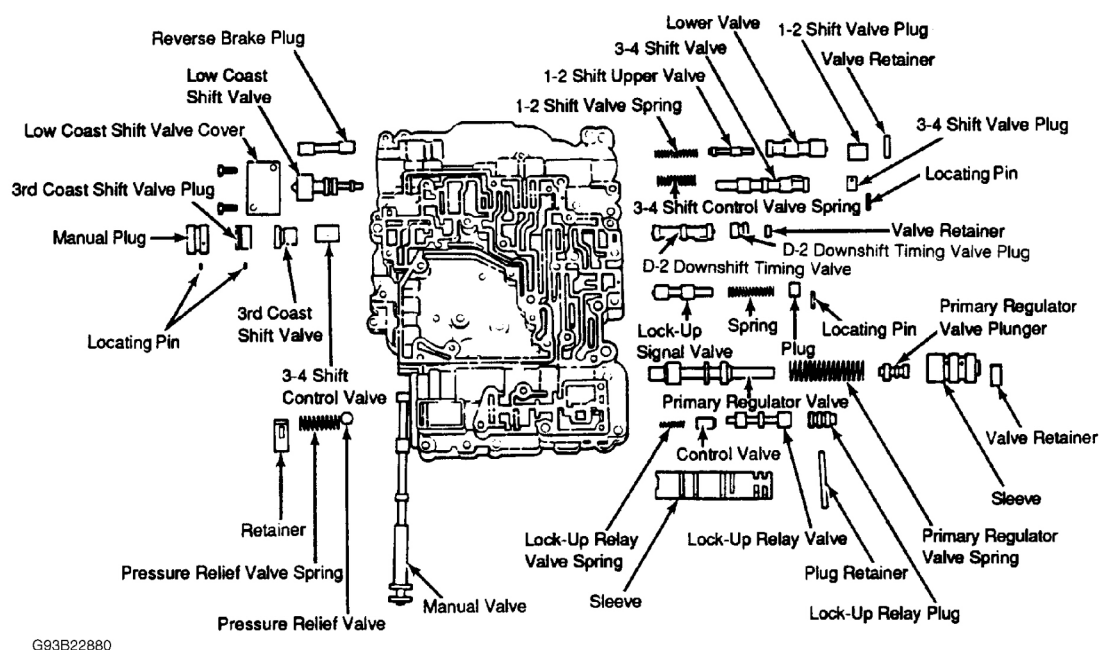


Fig. 44: Exploded View Of Lower Valve Body Assemblies (Isuzu)
 Courtesy of ISUZU MOTOR CO.

Inspection

Check valves for damage and wear. Inspect oil holes and passage for clogging. Check valve springs for damage, rust and collapsed coils. Measure spring free height and replace if less than specifications in **LOWER VALVE BODY SPRING SPECIFICATIONS** table.

LOWER VALVE BODY SPRING SPECIFICATIONS

Application	Color	Free Length In. (mm)
Check Valve ⁽¹⁾	Yellow	1.312 (33.32)
Oil Cooler By-Pass Valve ⁽²⁾	Orange ⁽³⁾	1.138 (28.91)
Lock-Up Relay Valve ⁽²⁾	White ⁽³⁾	.728 (18.49)
Lock-Up Signal Valve ⁽²⁾	White ⁽³⁾	1.784 (45.31)
Pressure Relief Valve	None	1.265 (32.13)
Primary Regulator Valve ⁽⁴⁾	White	2.409 (61.19)
Primary Regulator Valve ⁽³⁾	White	2.174 (55.22)
Primary Regulator Valve ⁽⁵⁾	None	2.886 (73.30)
Primary Regulator Valve Damping	None	.787 (19.99)
1-2 Shift Valve	None	1.363 (34.62)
3-4 Shift Valve	Green	1.385 (35.18)
3-4 Shift Valve ⁽⁵⁾	None	1.491 (37.88)

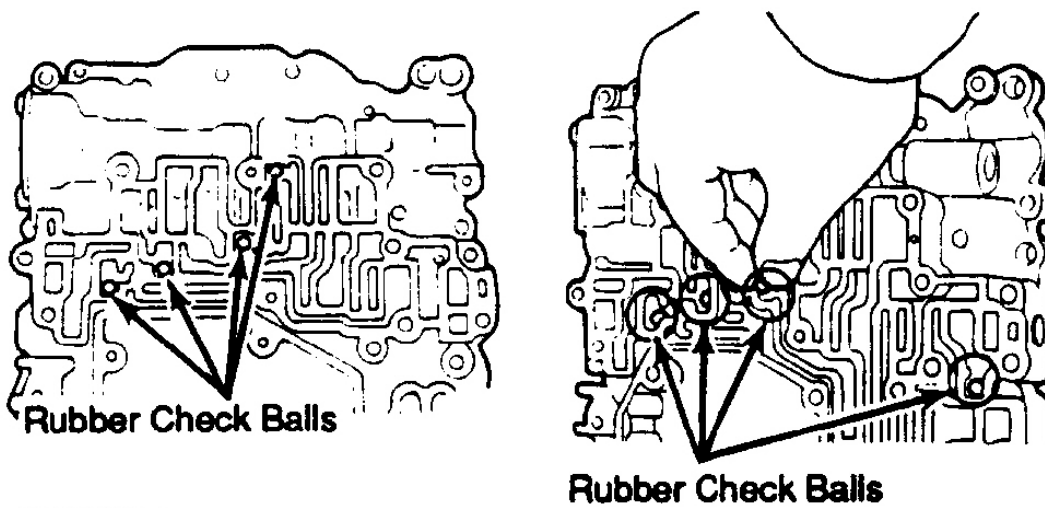
1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

3-4 Shift Valve ⁽⁴⁾	None	1.325 (33.65)
(1) Applies to AW372 and KM148. (2) Applies to AW372L and R4AW2. (3) Applies to R4AW2. (4) Applies to Volvo AW71. (5) Applies to Volvo AW70.		

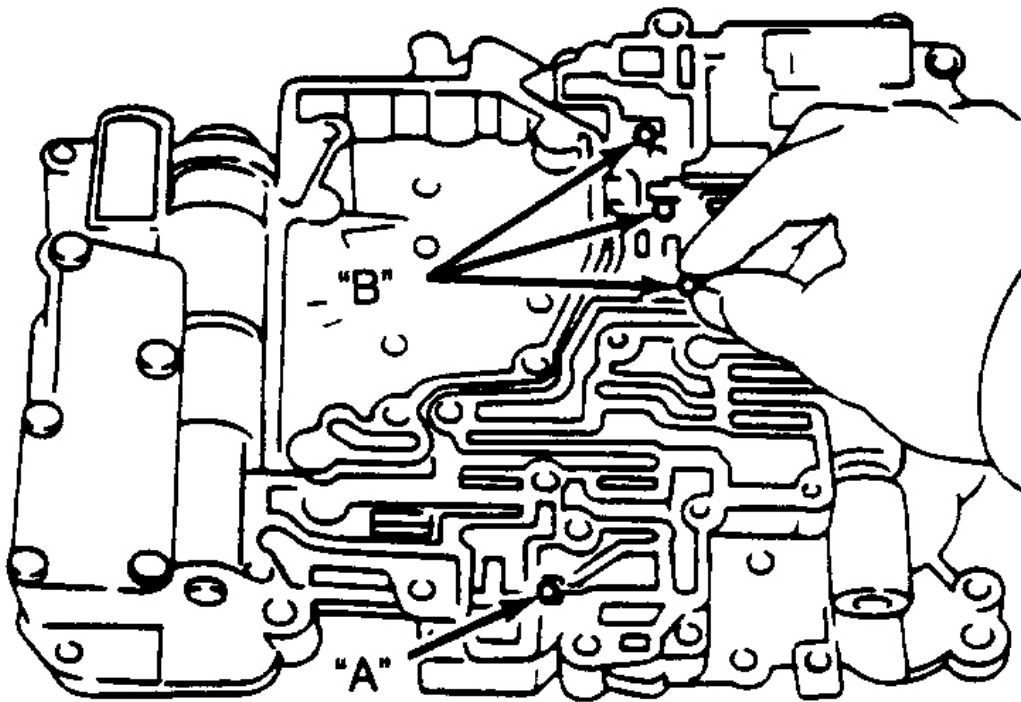
Reassembly

1. Install plug and low coast shift valve, small end first. Install 3-4 shift control valve, cup side first and 3rd coast shift valve, small end first into 3rd coast shift valve plug with thicker face end first. Install locating pin, outer plug and outer plug locating pin. Install low coast shift valve cover.
2. Place valve body on edge and install 1-2 shift valve spring, 1-2 shift upper valve, lower valve, 1-2 shift valve plug and valve retainer. Install 3-4 shift control valve spring, 3-4 shift valve, small end first and 3-4 shift valve plug. Install locating pin of 3-4 shift valve. Install D-2 down timing valve small end first, D-2 down timing valve plug, larger end first and valve retainer. On AW03-72L, AW372L and R4AW2 models, install lock-up signal valve, larger end first, spring, plug, smaller end first and locating pin.
3. On all models, install primary regulator valve, larger end first and primary regulator valve spring. Primary regulator valve must fit flush with valve body. Install primary regulator valve plunger, rounded end first, into primary regulator valve sleeve. Plunger should be recessed inside sleeve. Install sleeve with plunger and valve retainer into valve body.
4. On AW03-72L, AW372L and R4AW2 models, assemble spring, control valve and lock-up relay valve into sleeve. Install sleeve, smaller hollow sleeve top facing upward into bore, in valve body. Install lock-up relay plug and plug retainer. Install plate with gasket and secure with 4 bolts.
5. On all models, install pressure relief valve, pressure relief valve spring and retainer. Install 4 check balls to bottom of lower valve body. See **Fig. 45** . For Isuzu models, note location and size of check balls. See **Fig. 46** .
6. Install upper lower valve body cover gasket, lower valve body cover plate and lower valve body cover gasket, with oval holes for check balls, into lower valve body cover. Install lower valve body cover to lower valve body. Install lower body cover set bolts. Install check balls, damping check ball, spring, oil cooler by-pass valve and spring into top of lower valve body. See **Fig. 47** .



G93C22881

Fig. 45: Locating Check Balls In Bottom Of Lower Valve Body
Courtesy of ISUZU MOTOR CO.

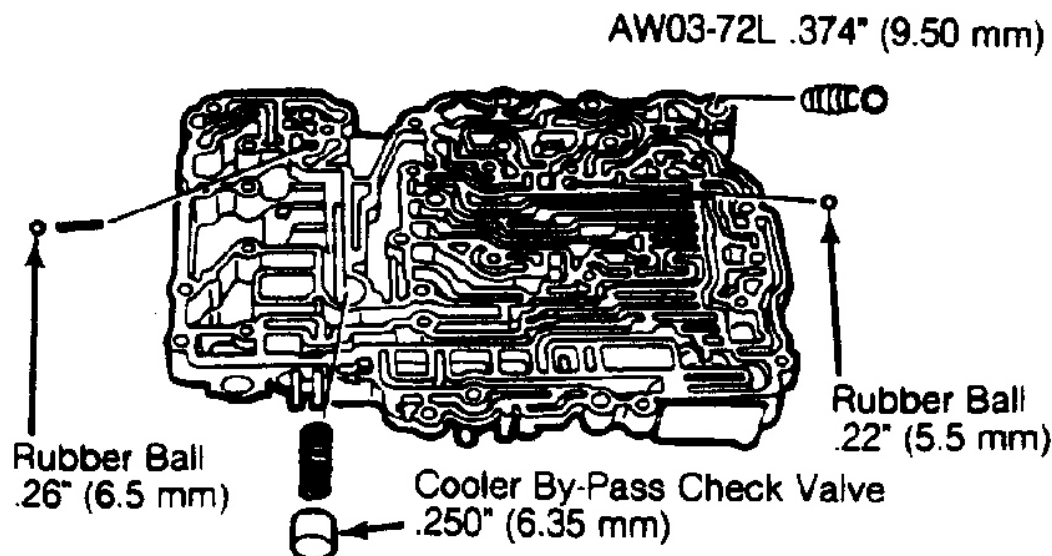


"A": Rubber Check Balls .250" (6.35 mm)

"B": Rubber Check Balls .217" (5.50 mm)

G93D22882

Fig. 46: Check Balls In Lower Valve Body, Bottom Side (Isuzu)
Courtesy of ISUZU MOTOR CO.

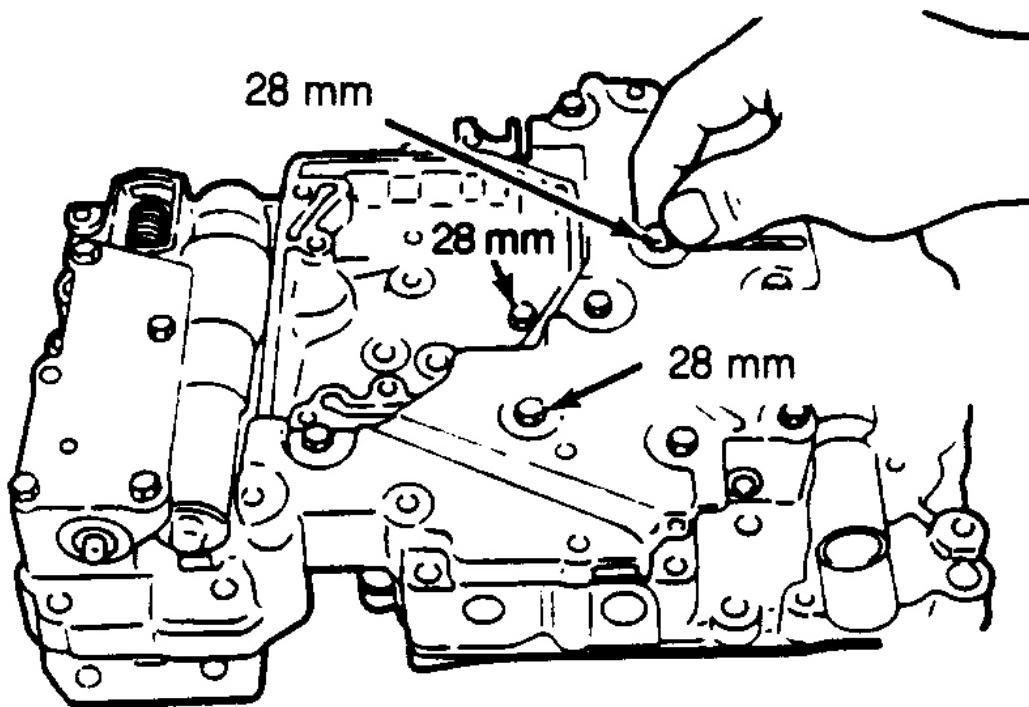


G93E22883

Fig. 47: Locating Check Balls In Top Of Lower Valve Body
 Courtesy of ISUZU MOTOR CO.

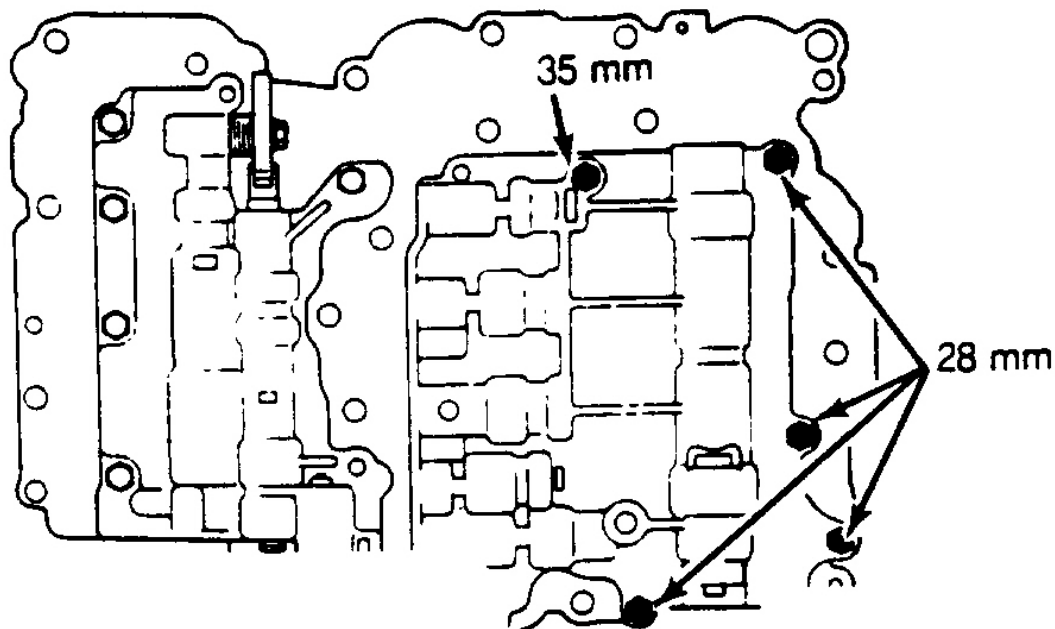
Reassembly (Valve Body Assembly)

1. Install lower valve body gasket on lower valve body. Place separator plate on lower valve body gasket and temporarily install 2 bolts to compress plate against spring loaded check valve. Install valve body gasket on upper rear valve body.
2. Place lower valve body on top of upper rear valve body with right edge aligned and torque 3 bolts from lower valve body side. See **Fig. 48**. On AW03-72L, AW372L and R4AW2 models, torque bolts to 43-51 INCH lbs. (4.9-5.8 N.m). Information for other models not available from manufacturer.
3. Turn valve body assembly over and torque 5 bolts in upper rear valve body. See **Fig. 49**. On AW03-72L, AW372L and R4AW2 models, torque bolts to 43-51 INCH lbs. (4.9-5.8 N.m). Information for other models not available from manufacturer. Remove 2 bolts temporarily installed to compress plate against spring loaded check valve.
4. Place lower and upper rear valve body assembly on top of upper front valve body and torque bolts from lower valve body side. See **Fig. 50**. Torque bolts for AW372L and R4AW2 to 48 INCH lbs. (5.4 N.m), all others should be 43-51 INCH lbs. (4.9-5.8 N.m).
5. Turn valve body over and torque 5 bolts on upper front valve body. See **Fig. 51**. Torque bolts for AW372 and KM148 to 43-51 INCH lbs. (4.9-5.8 N.m). Information for other models not available from manufacturer.
6. Install plate on lower valve body. Install manual valve, detent spring and detent spring plate. See **Fig. 52**. Torque bolts for AW372 and KM148 to 43-51 INCH lbs. (4.9-5.8 N.m). Information for other models not available from manufacturer.



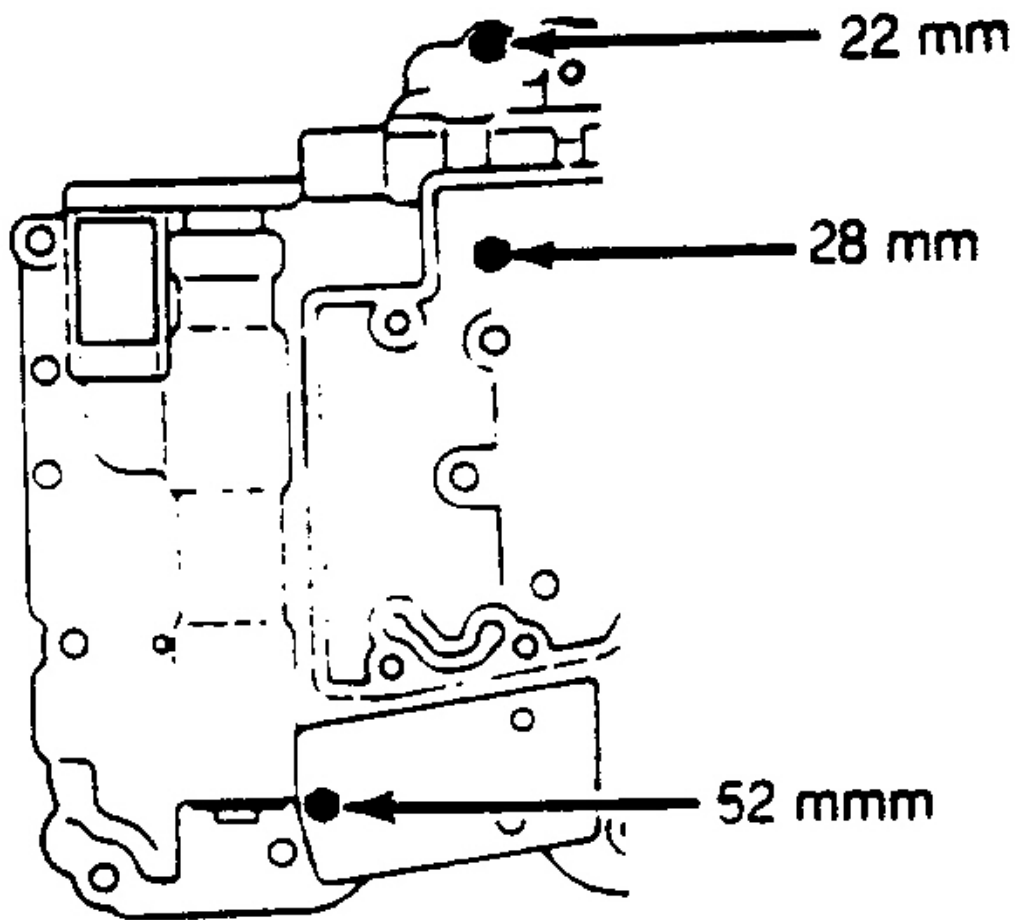
G93F22884

Fig. 48: Identifying Lower-To-Upper Rear Valve Body Bolts
Courtesy of ISUZU MOTOR CO.



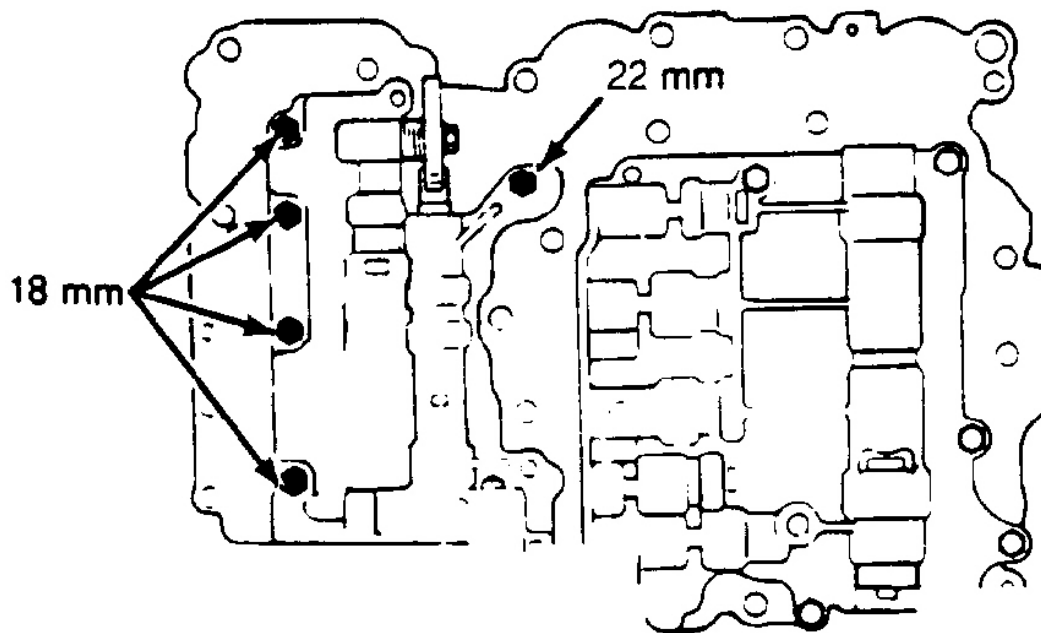
G93G22885

Fig. 49: Identifying Upper Rear Valve Body Bolts
Courtesy of ISUZU MOTOR CO.



G93H22886

Fig. 50: Identifying Lower-To-Upper Front Valve Body Bolts
Courtesy of ISUZU MOTOR CO.



G93I22887

Fig. 51: Identifying Upper Front Valve Body Bolts
Courtesy of ISUZU MOTOR CO.

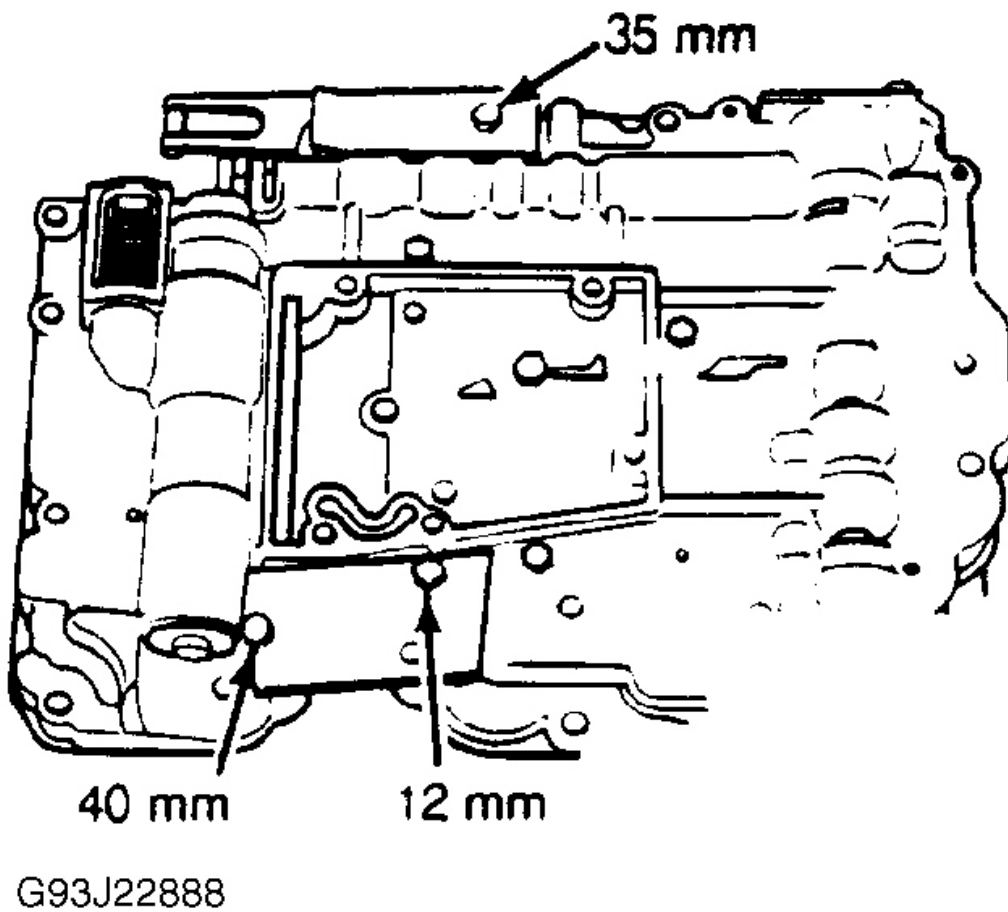


Fig. 52: Identifying Plate & Detent Spring Plate Bolts
Courtesy of ISUZU MOTOR CO.

GOVERNOR

Disassembly

Remove "E" ring. Remove governor weight. Remove governor shaft, secondary weight and springs. Remove governor valve from output shaft hole. Remove retaining ring. See **Fig. 53**.

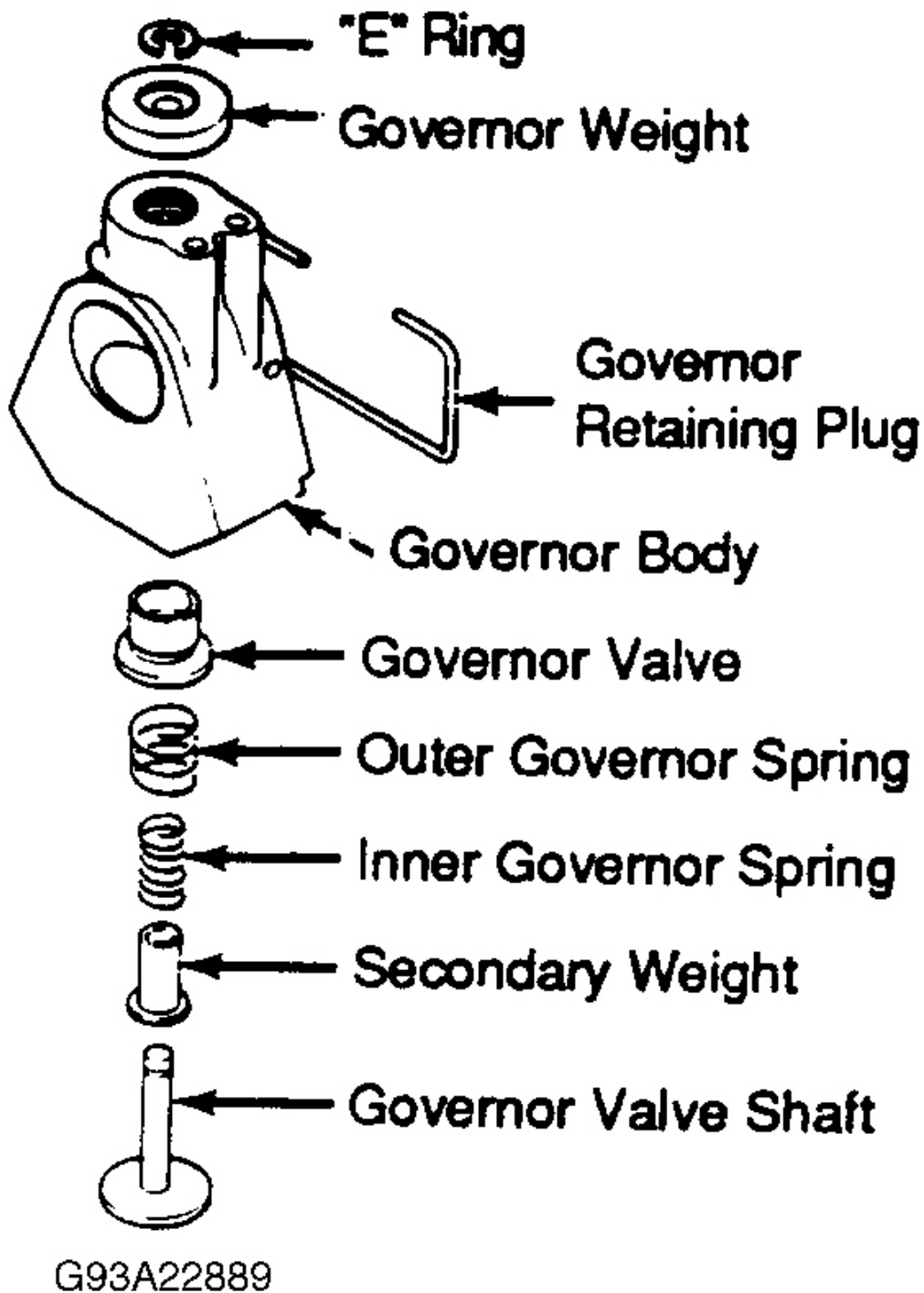


Fig. 53: Exploded View Of Governor

Courtesy of ISUZU MOTOR CO.**Inspection**

Check governor valve and body for wear and damage. Check governor springs. See **GOVERNOR SPRING IDENTIFICATION** table. Table refers to models AW372 and KM148 (1988 Montero, 1988 Ram Raider and 1988-89 Ram 50). Information for other models not available from manufacturer.

GOVERNOR SPRING IDENTIFICATION

Description	2.0L Outer Spring In. (mm)	2.6L Outer Spring In. (mm)	2.0L & 2.6L Inner Spring In. (mm)
Coil Outer Diameter	.608 (15.44)	.604 (15.34)	.455 (11.55)
Free Length	.487 (12.37)	.502 (12.76)	.452 (11.49)
Wire Diameter	.031 (.79)	.034 (.86)	.034 (.86)
Color	Blue	White	White

Reassembly

Install governor retaining ring. Install secondary weight and springs to governor valve shaft. Slide governor valve through bore in governor body. Slide spring and shaft through governor valve. Install governor weight on governor valve shaft. Compress spring with needle-nose pliers and install "E" ring. Ensure "E" ring is fully seated in groove and valve moves smoothly.

TRANSMISSION REASSEMBLY

NOTE: New clutch disc and brake disc should be soaked in ATF for at least 2 hours before assembling.

1. Place transmission case on cylinder. Use cylinder measuring 12" long and 7" in diameter. Cushion cylinder so it does not damage case. Install output shaft thrust bearing race No. 21 and bearing No. 20 in case. See **Fig. 55**. Install brake apply tube in case. Ensure pawl at end of tube is inserted inside piston.
2. Install thrust washer on planetary carrier and seat pawl in notch on carrier. Carefully install rear planetary gear and output shaft assembly in case. DO NOT damage bearing. Install pressure plate in case. Apply petroleum jelly to thrust washer and attach to front planetary gear carrier. Install one-way clutch No. 2 and front planetary gear set assembly in ring gear.
3. Install clutch discs and plates alternately. For AW03-72L, measure installed height of clutch plate from transmission case of .028-.099" (.75-2.50 mm). If incorrect, recheck assembly procedure. See **Fig. 56**. Install sun gear in one-way clutch inner race and install assembly in case. Align one-way clutch inner race with case. See **Fig. 57**. Hold one-way clutch inner race and remove sun gear.
4. Fit sun gear to center support. Install snap ring. Install center support assembly in case, while aligning oil hole and bolt hole with those of body side. Push center support backward and torque bolts alternately in 62 INCH lbs. (7.0 N.m) increments. Torque to 18-20 ft. lbs. (24-27 N.m). Install direct clutch assembly. Ensure direct clutch is fully meshed with center support. When correctly installed, rear clutch should be flush or slightly lower than sun gear shaft. See **Fig. 58**.
5. Apply petroleum jelly to thrust bearing race No. 16 and install over splined end of direct clutch case.

Apply petroleum jelly to thrust bearing No. 15, bearing race No. 14 and install on forward clutch. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55**.

6. Install forward clutch assembly. Ensure forward clutch is installed completely. Using straightedge and vernier calipers, measure depth of forward clutch from transmission case. Clutch depth for AW372, KM148 (1988 Montero, 1988 Ram Raider and 1988-89 Ram 50) should be .06" (1.5 mm). For AW03-72L, forward clutch depth should be .118" (3.00 mm). Information for other models not available from manufacturer. See **Fig. 59**.
7. Apply petroleum jelly to thrust bearing No. 10 and install on forward clutch. Apply petroleum jelly to thrust bearing race No. 9 and install on overdrive case end. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55**. Install Guide (MD998412) for Chrysler and Mitsubishi, Guide Pins (J-33955) for Isuzu and Guide Pins (5241) for Volvo in case. See **Fig. 60**.
8. Install overdrive case into transmission case through 2 guide pins. Ensure index notch is turned down. Install thrust race on overdrive planetary gear. Apply petroleum jelly to thrust washer and install on rear of overdrive planetary carrier. Install overdrive clutch and planetary gear assembly. Ensure overdrive clutch and planetary gear set assembly is seated completely. Measure installed height with straight edge and vernier caliper. Installed height for AW372, AW03-72L, KM148 (1988 Montero, 1988 Ram Raider and 1988-89 Ram 50) should be .08" (2.0 mm). For AW70 and AW71, installed height should be .138" (3.50 mm). Information for other models not available from manufacturer.
9. Install "O" ring on overdrive case and converter housing. Torque 10 mm bolts to 25 ft. lbs. (34 N.m) and 12 mm bolts to 42 ft. lbs. (57 N.m) for AW372L, AW03-72L, AW70, AW71 and R4AW2. All others, torque 10 mm bolts to 20-30 ft. lbs. (27-41 N.m) and 12 mm bolts to 35-49 ft. lbs. (47-66 N.m). See **Fig. 61**.
10. Apply petroleum jelly to thrust bearing race No. 3 and install over overdrive input shaft. Apply petroleum jelly to thrust bearing No. 2, bearing race No. 1 and install on oil pump. Refer to bearing and race positioning diagram for thrust bearing and bearing race position. See **Fig. 55**.
11. Install oil pump through guide bolts. Apply sealer to 5 set bolts and tighten evenly. Using a screwdriver, remove guide and install 2 set bolts with sealant. Torque oil pump bolts for AW372L, AW03-72L, AW70, AW71 and R4AW2 to 16 ft. lbs. (22 N.m). All others should be torqued to 13-18 ft. lbs. (18-24 N.m). Ensure proper operation of clutch and brake pistons by applying compressed air to each clutch and brake oil passage. See **Fig. 62**. Listen for noise from piston movement. If movement is not apparent, disassemble and inspect piston.
12. Install parking rod assembly on manual valve lever. Torque nut to 10-13 ft. lbs. (13.6-17.6 N.m). Insert manual valve lever shaft in case. Install spring pin with slot at right angle to shaft. Ensure spring protrudes to .039" (.99 mm) for AW372, KM148 (1988 Montero, 1988 Ram Raider and 1988-89 Ram 50). Information for other models not available from manufacturer.
13. Place parking pawl in case and install pivot pin and spring. Install cam plate with 2 bolts. Torque to 54-78 INCH. lbs. (6.1-8.8 N.m) for AW372 and KM148. Information for other models not available from manufacturer. Ensure parking rod assembly protrudes from cam plate.
14. Insert throttle cable in case. DO NOT damage "O" ring. Install accumulator pistons and springs from front side. See **Fig. 63**. See **ACCUMULATOR PISTON IDENTIFICATION** and **Fig. 54**.
15. Install throttle cable to throttle cam of valve body assembly. Install 2 or 3 valve body bolts temporarily and place manual valve lever pin in manual valve groove. Install 17 valve body bolts and torque bolts for AW372L and R4AW2 to 80 INCH lbs. (9.0 N.m), all others should be 72-108 INCH lbs. (8.1-12.2 N.m). Install oil screen. Torque bolts for AW372L and R4AW2 to 48 INCH lbs. (5.4 N.m), all others should be 43-51 INCH lbs. (4.9-5.8 N.m). Shift to "L" and "P" to ensure detent spring roller is seated. Install oil

1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

pipe.

ACCUMULATOR SPRING SPECIFICATION

Application	Free Length In. (mm)	OD In. (mm)	Wire Diameter In. (mm)	Ident. Color
No. 1 (B2) Accumulator Spring				
1988-90 Chrysler & Mitsubishi w/2.0L Engine	2.626 (66.70)	.705 (17.91)	.102 (2.59)	—
1988-90 Chrysler & Mitsubishi w/2.4L Engine,				
1989-90 Isuzu Pickup, 1990 Isuzu Amigo, 1988-89				
Isuzu Impulse w/4ZC1-T Engine & 1988-90 Volvo				
w/AW70 Transmission & Governor Code 020, 033	2.625 (66.68)	.683 (17.35)	.110 (2.79)	Red
1988-90 Chrysler & Mitsubishi w/2.6L Engine	2.626 (66.70)	.681 (17.30)	.110 (2.79)	Red
1988-90 Chrysler & Mitsubishi '1				
w/2.6L Engine & 1988-90 Volvo w/AW71	2.625 (66.68)	.803 (20.40)	.126 (3.20)	Light Green
1988-89 Isuzu Impulse w/4ZD1 Upper Spring	1.996 (50.70)	—	.098 (2.50)	Yellow
1988-89 Isuzu Impulse w/4ZD1 Lower Spring	1.213 (35.13)	—	.051 (1.30)	Red
1988-90 Volvo w/AW70 & Governor Code 055	26.91 (68.35)	.705 (17.91)	.102 (2.60)	—
No. 2 (C2)				
1988-90 Chrysler & Mitsubishi w/2.0L Engine	2.409 (61.19)	.605 (16.51)	.098 (2.49)	Yellow
1988-90 Chrysler & Mitsubishi				
w/2.4L Engine, Lower Spring	1.289 (32.74)	.583 (14.81)	.051 (1.30)	Green
1988-90 Chrysler & Mitsubishi				
w/2.4L Engine, Upper Spring	1.702 (43.23)	.545 (13.84)	.079 (2.01)	Red
1988-90 Chrysler & Mitsubishi				
w/2.6L Engine, 1988-90 Isuzu				
Pickup & 1990 Isuzu Amigo	2.173 (55.19)	.646 (16.41)	.091 (2.31)	—
1988-90 Chrysler & Mitsubishi				
w/2.6L Engine, Lower Spring	1.268 (32.21)	.579 (14.71)	.063 (1.60)	Orange
1988-90 Chrysler & Mitsubishi '1				
w/2.6L Engine, 1988-89 Isuzu Impulse				
w/4ZC1-T Engine, Upper Spring	1.715 (43.56)	.563 (14.30)	.071 (1.80)	Blue
1988-89 Isuzu Impulse w/4ZC1-T Engine, Lower Spring	1.213 (30.80)	—	.057 (1.50)	White
1988-89 Isuzu Impulse w/4ZD1 Engine	2.546 (64.68)	—	.106 (2.70)	Green
1988-90 Volvo w/AW70 Transmission	2.410 (61.21)	.651 (16.54)	.098 (2.50)	—
1988-90 Volvo w/AW71 Transmission	2.172 (55.18)	.625 (15.87)	.079 (2.00)	—
No. 3 (C1)				
1988-90 Chrysler & Mitsubishi All Models				
1988-89 Isuzu Impulse All Models				
1988-89 Isuzu Pickup & 1990 Isuzu Amigo	2.547 (64.69)	.689 (17.50)	.079 (2.01)	—
1988-90 Volvo w/AW70 (without 053 Governor)				
& AW71	2.700 (68.56)	.690 (17.53)	.080 (2.03)	—
1988-90 Volvo w/AW70 (with 053 Governor)	2.551 (64.80)	.677 (17.20)	.079 (2.00)	—

G00052550

Fig. 54: Accumulator Spring Specification Table

16. Attach magnet to oil pan. Install oil pan with gasket and torque pan bolts evenly. Torque bolts for AW372L and R4AW2 to 40 INCH lbs. (4.5 N.m), all others should be 35-43 INCH lbs. (3.9-4.9 N.m). Install drain plug. Torque plug to 13-17 ft. lbs. (18-23 N.m). On AW372L and R4AW2, install inhibitor switch. Torque bolt to 36-60 INCH lbs. (4.1-6.8 N.m).
17. Install governor strainer and rear cover with gasket on case. Torque screws to 54-78 INCH lbs. (6.1-8.8 N.m) for AW372 and KM148. Information for other models not available from manufacturer. Install governor and speedometer drive gear on output shaft. Ensure "E" ring is locked in position.
18. Install adapter and gasket. Torque bolt to 20-30 ft. lbs. (27.1-40.7 N.m) for AW372 and KM148. Information for other models not available from manufacturer.
19. Install overdrive solenoid. Torque bolt to 84-144 INCH lbs. (9.5-16.3 N.m) for AW372 and KM148. Information for other models is not available from manufacturer. Install torque converter and measure converter installation distance. See **Fig. 64**. Measurement is 1.060" (27.00 mm) for 1988-90 Mitsubishi van. For 1988-89 Isuzu Impulse, distance is 1.250" (31.36 mm). For 1988-89 Isuzu Pickup and 1989-90 Isuzu Amigo, distance is 1.200" (31.00 mm). For 1988-89 Volvo, distance is .64-.77" (16.2-19.6 mm). All

other models, information is not available.

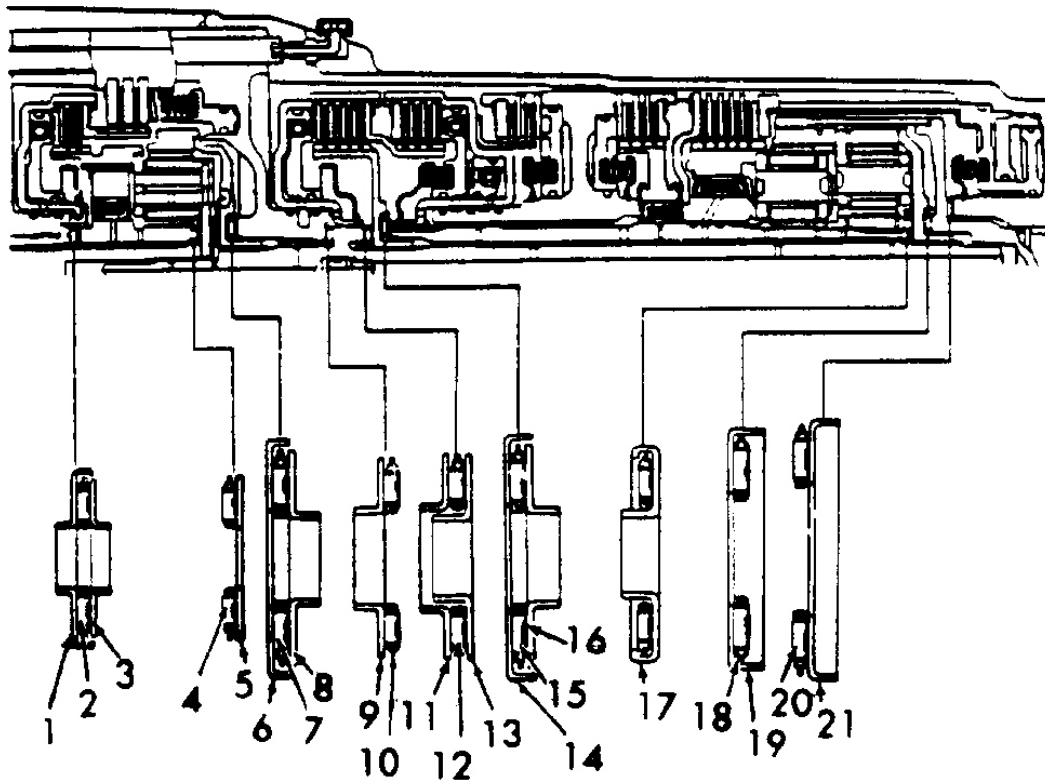
20. Install speedometer driven gear. Install extension housing and gasket on 2WD models. Install transfer case on 4WD models.

ACCUMULATOR PISTON IDENTIFICATION

Piston	OD In. (mm) ⁽¹⁾	⁽²⁾ Length In. (mm)
No. 1 (B2)	1.370 (34.8)	1.909 (48.5)
No. 2 (C2)	1.252 (31.8)	1.772 (45)
No. 3 (C1)	1.252 (31.8)	1.949 (49.5)

(1) Accumulator piston diameter specifications not available from Volvo.

(2) Accumulator piston length specifications not available from Isuzu and Volvo.



G93D22890

Fig. 55: Positioning Thrust Bearings & Bearing Races
Courtesy of ISUZU MOTOR CO.

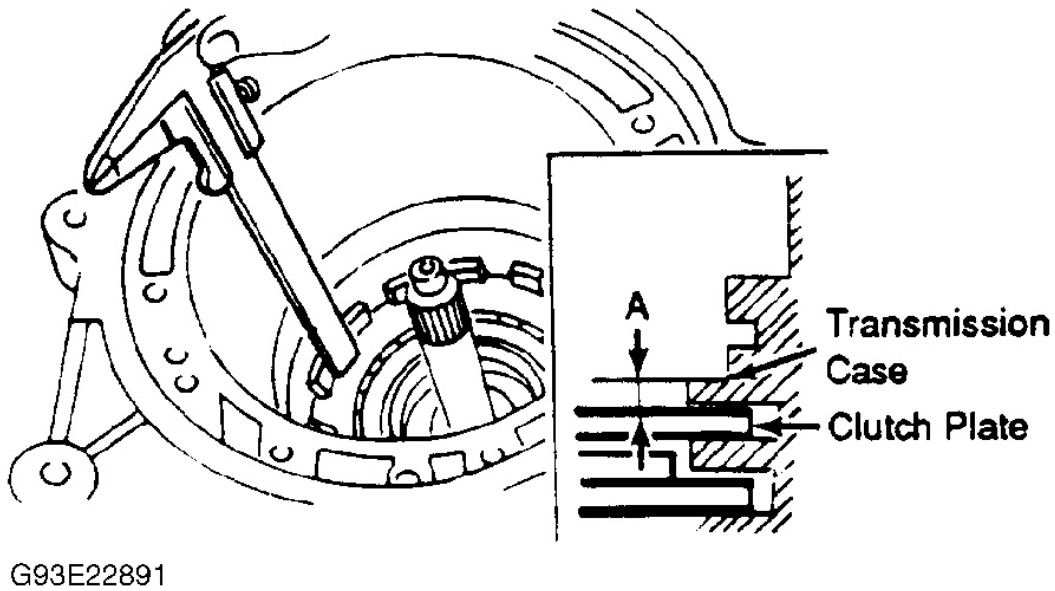
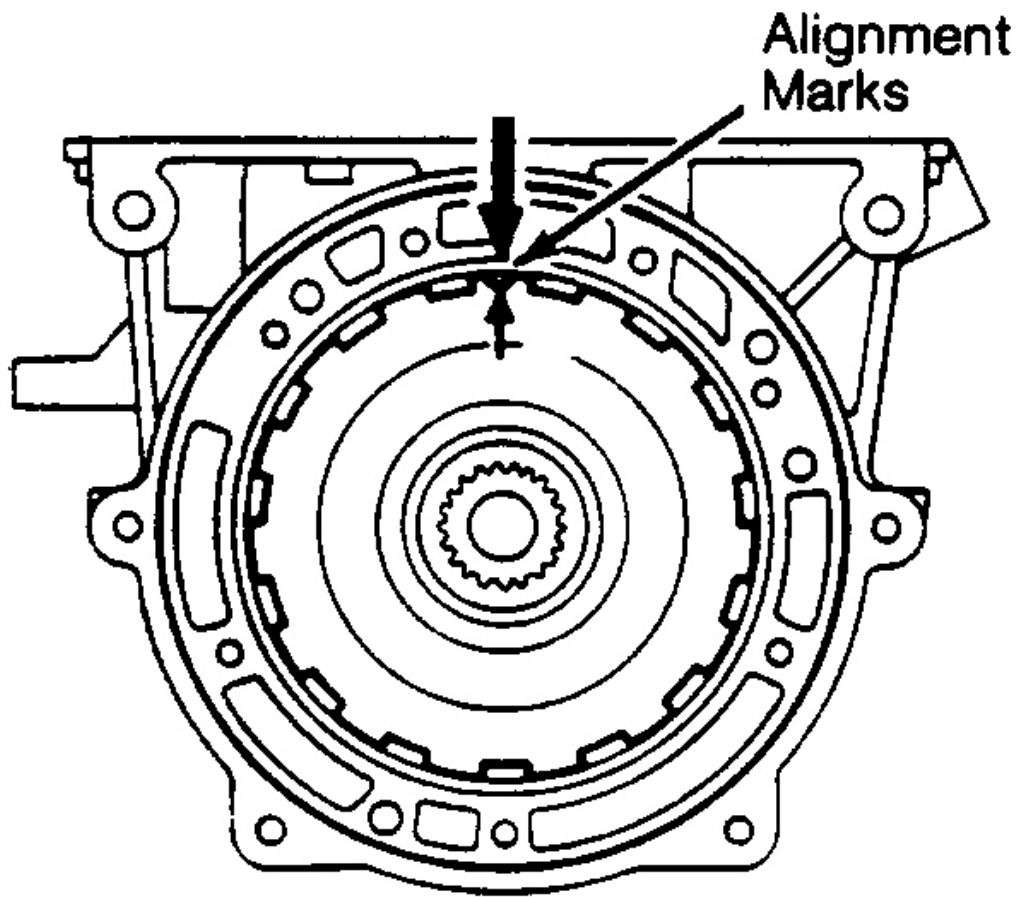


Fig. 56: Measuring Low & Reverse Brake Clutch Plate Clearance
Courtesy of ISUZU MOTOR CO.



G93F22892

Fig. 57: Aligning One-Way Clutch Inner Race
Courtesy of ISUZU MOTOR CO.

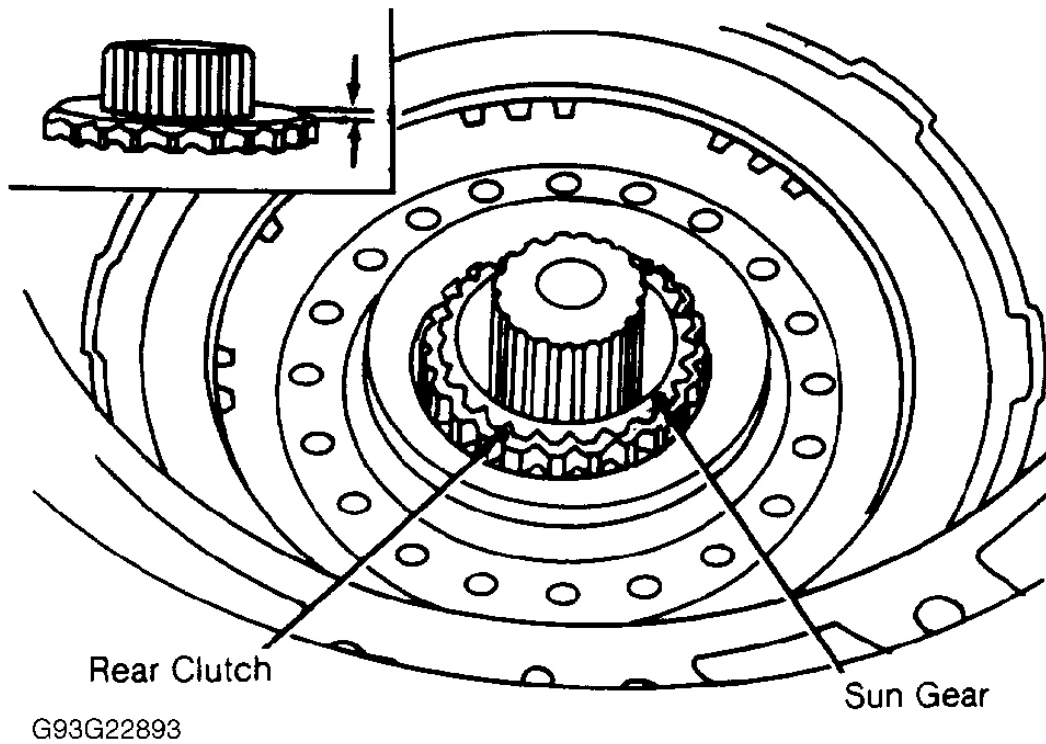


Fig. 58: Checking Rear Clutch Installation
Courtesy of ISUZU MOTOR CO.

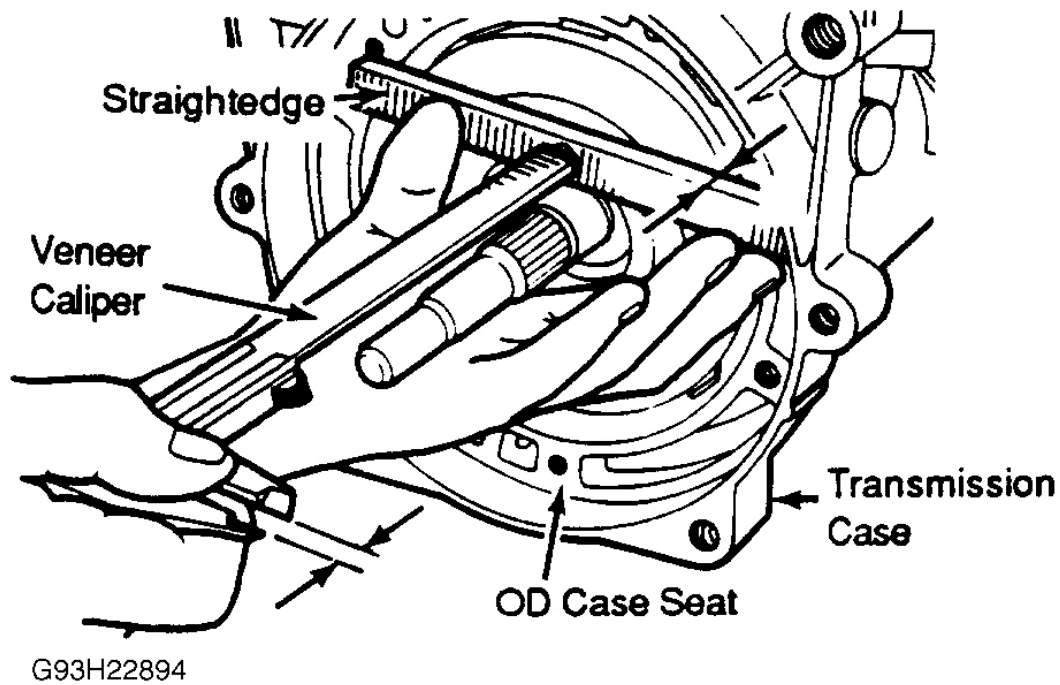


Fig. 59: Measuring Forward Clutch Depth
Courtesy of ISUZU MOTOR CO.

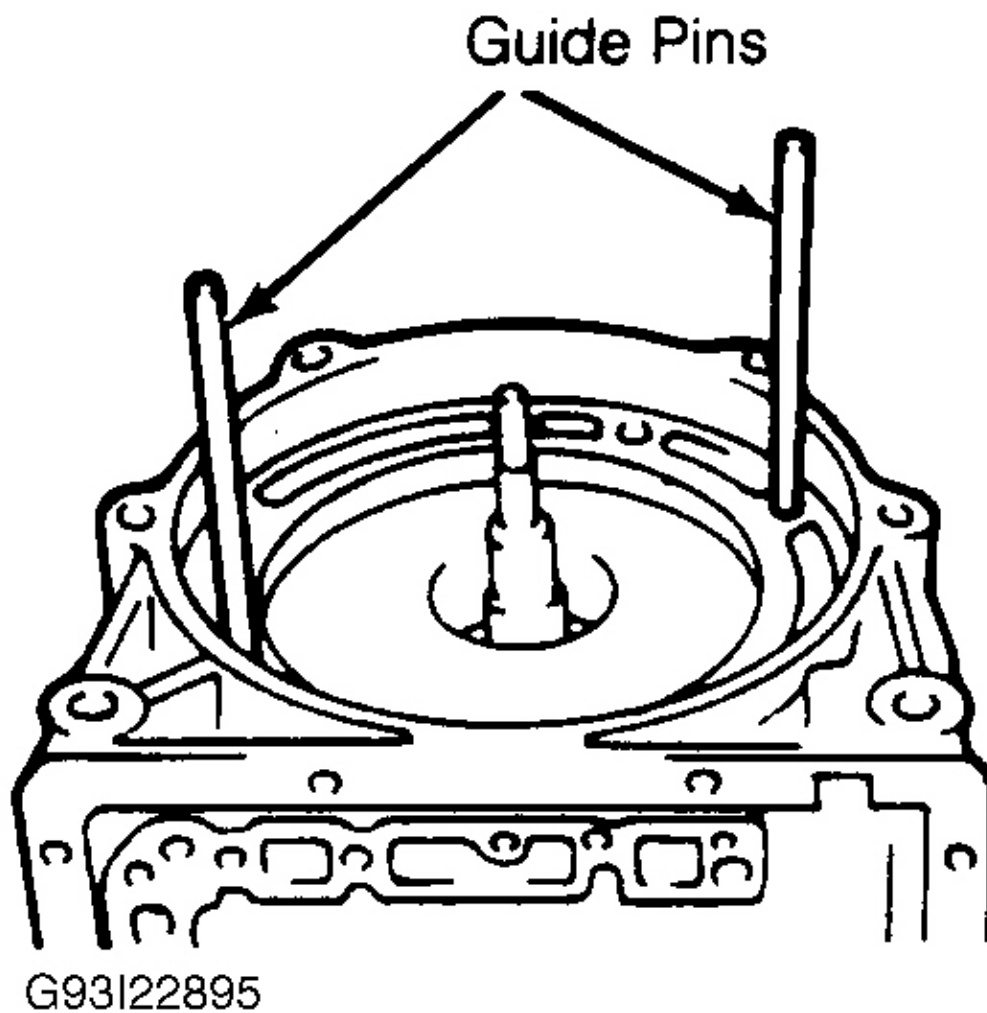
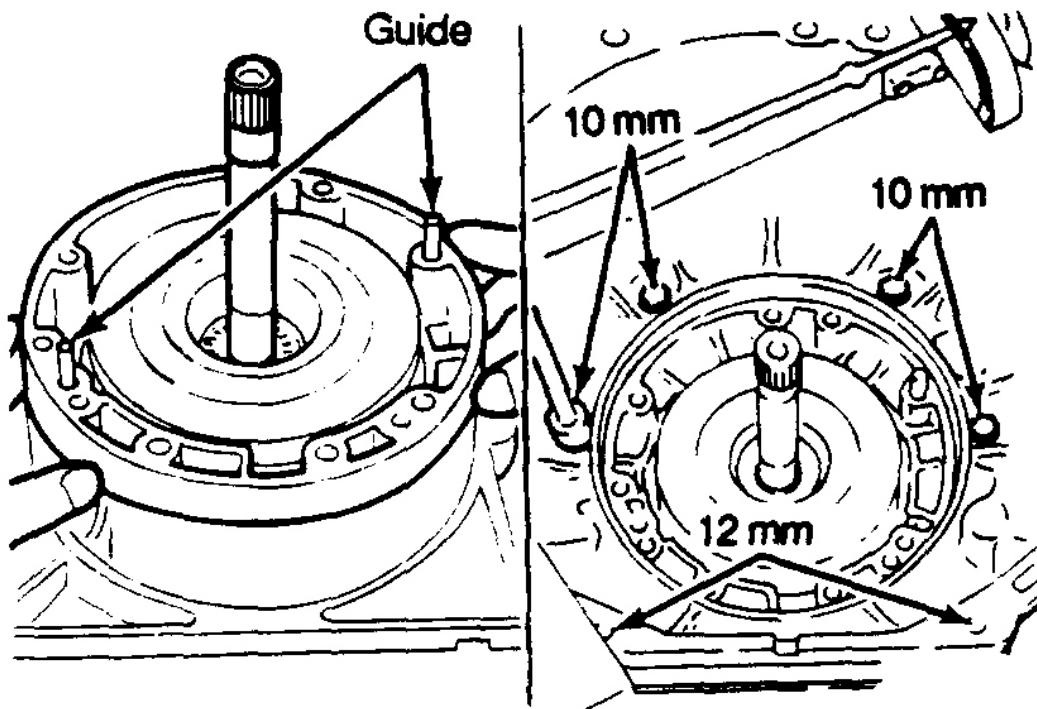


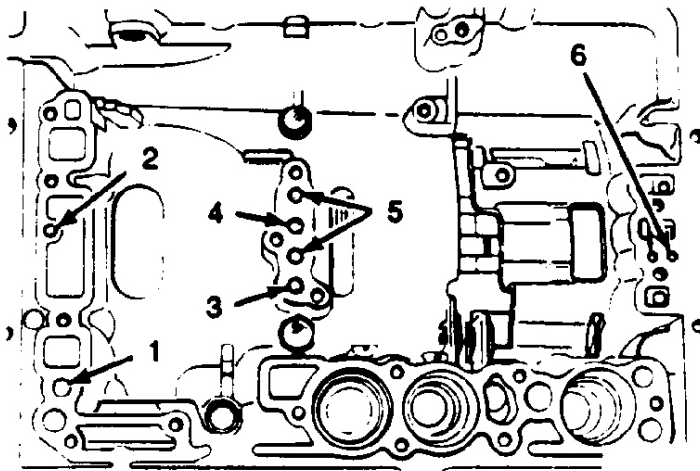
Fig. 60: Installing OD Case On Alignment Guide Pins
Courtesy of ISUZU MOTOR CO.



G93J22896

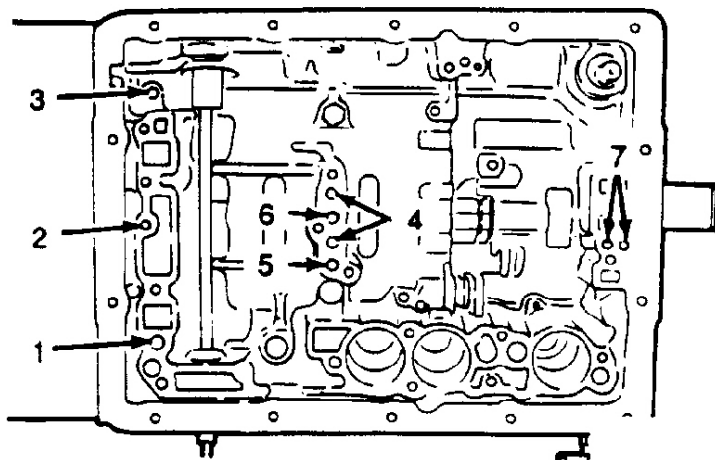
Fig. 61: Identifying Converter Housing Bolts
 Courtesy of ISUZU MOTOR CO.

AW71



- | | |
|---------------------|------------------|
| 1. Overdrive Clutch | 4. Brake No. 2 |
| 2. Forward Clutch | 5. Direct Clutch |
| 3. Brake No. 1 | 6. Brake No. 3 |

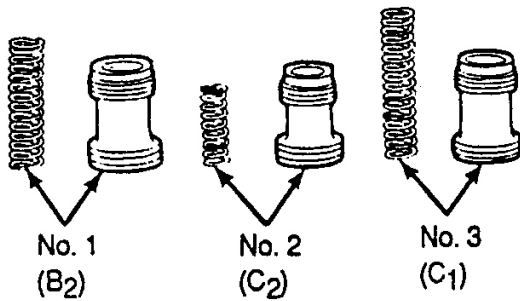
AW03-72L, AW70L & AW72L



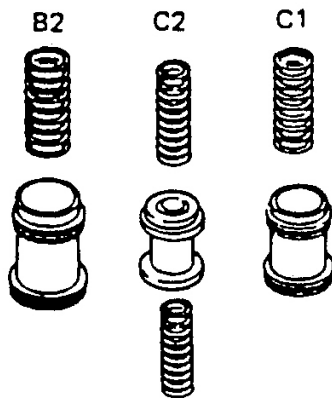
- | | |
|---------------------|----------------|
| 1. Overdrive Clutch | 5. Brake No. 1 |
| 2. Overdrive Brake | 6. Brake No. 2 |
| 3. Forward Clutch | 7. Brake No. 3 |
| 4. Direct Clutch | |

G93A22897

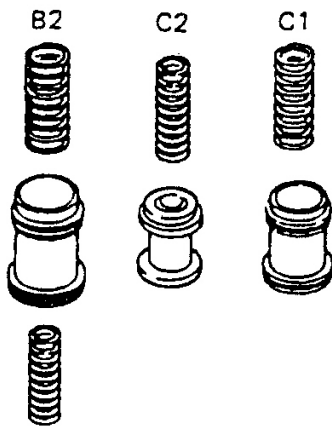
Fig. 62: Identifying Circuit Pressure Ports
Courtesy of ISUZU MOTOR CO.



CHRYSLER, ISUZU PICKUP
MITSUBISHI & VOLVO



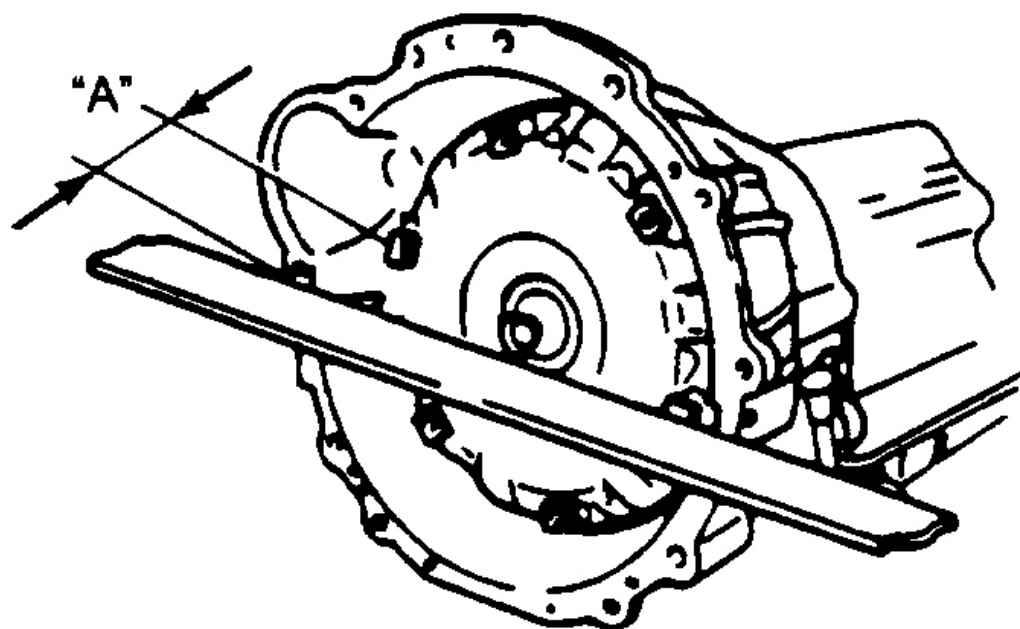
ISUZU IMPULSE WITH 4ZC1-T ENGINE



ISUZU IMPULSE WITH 4ZD1 ENGINE

G00052549

Fig. 63: Identifying Accumulator Pistons & Springs
Courtesy of DAIMLERCHRYSLER CORP.



G93B22898

Fig. 64: Measuring Installation Distance
 Courtesy of ISUZU MOTOR CO.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Adapter Attaching Bolts	
AW372 & KM148	20-30 (27-40)
Center Support Attaching Bolts	
AW372 & KM148	18-20 (24-27)
AW372L, AW03-72L, AW70, AW71 & R4AW2	19 (26)
Converter Housing Attaching Bolts	
AW372 & KM148	
10 mm	20-30 (27-40)
12 mm	35-49 (47-66)
AW372L, AW03-72L, AW70, AW71 & R4AW2	
10 mm	25 (34)
12 mm	42 (57)
Engine-To-Transmission Mounting Bolt	32-41 (43-55)

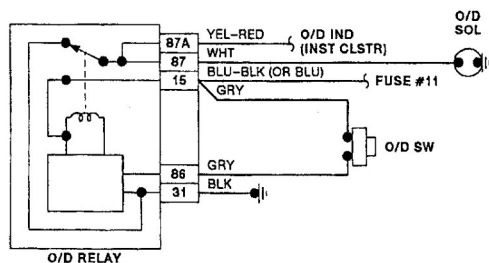
1990 Mitsubishi Van

1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul

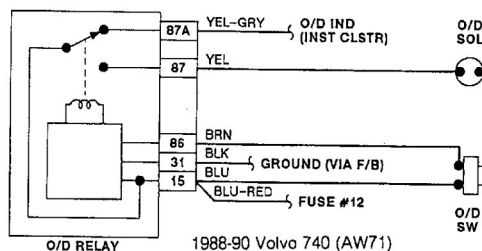
Hydraulic Lines	15-21 (20-29)
Manual Lever Nut	10-13 (14-18)
Oil Drain Plug	13-17 (18-23)
Oil Pump Assembly Attaching Bolts	
AW372 & KM148	13-18 (18-24)
AW372L, AW03-72L, AW70, AW71 & R4AW2	16 (22)
Torque Converter	
AW372L & R4AW2	25-30 (34-40)
INCH Lbs. (N.m)	
Bellhousing Cover Bolt	52-84 (5.9-9.5)
Inhibitor Switch	
AW372L & R4AW2	36-60 (4.1-6.8)
Lower-To-Upper Valve Body	
AW372L & R4AW2	48 (5.4)
Oil Pan Bolts	
AW372 & KM148	35-43 (3.9-4.9)
AW372L, AW03-72L, AW70, AW71 & R4AW2	40 (4.5)
Oil Pump Body & Cover Bolt	53-80 (6.0-9.0)
Oil Screen Bolts	
AW372 & KM148	43-51 (4.9-5.8)
AW372L, AW03-72L, AW70, AW71 & R4AW2	48 (5.4)
Overdrive Solenoid Valve Bolt	
AW372 & KM148	84-144 (9.5-16.3)
Parking Cam Plate Bolt	
AW372 & KM148	54-78 (6.1-8.8)
Pressure Service Port Plug	54-78 (6.1-8.8)
Rear Cover Plate Attaching Screw	
AW372 & KM148	54-78 (6.1-8.8)
Throttle Cam Attaching Bolt	
AW372 & KM148	51-78 (5.8-8.8)
Valve Body Attaching Bolts	
AW372 & KM148	72-108 (8.1-12.2)
AW372L, AW03-72L, AW70, AW71 & R4AW2	80 (9.0)
Valve Body Bolts	
AW372 & KM148	43-51 (4.9-5.8)

WIRING DIAGRAMS

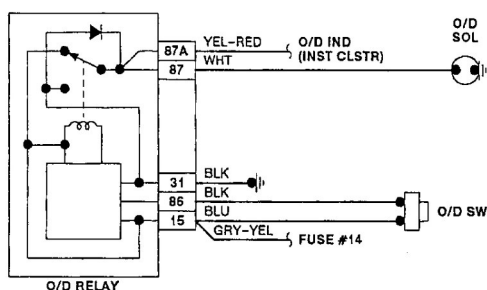
WIRING DIAGRAMS



1988-90 Volvo 240 (AW70)



1988-90 Volvo 740 (AW71)



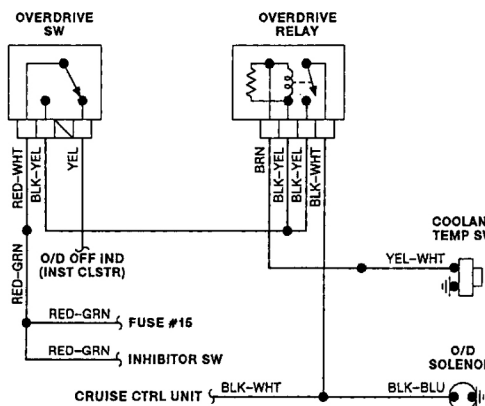
1988-90 Volvo 760 (AW71)

G00052551

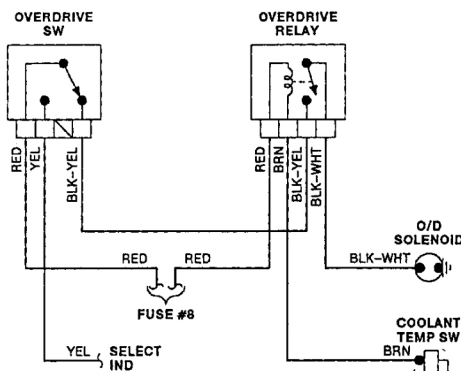
Fig. 65: Transmission Control Schematic (1988-90 Volvo)

1990 Mitsubishi Van

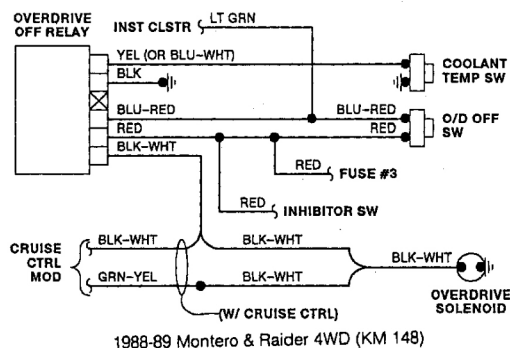
1988-90 AUTOMATIC TRANSMISSIONS AW70, AW71, AW372 Series, KM148 & R4AW2 Diagnosis & Overhaul



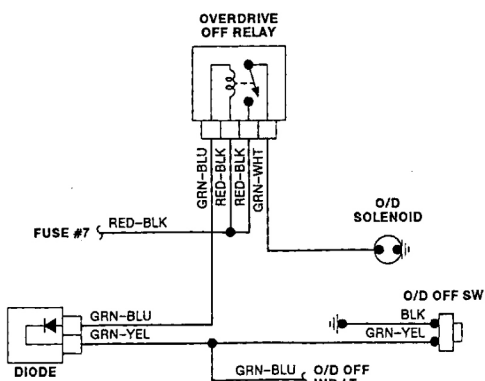
1988-90 Mitsubishi Van/Wagon (AW372/R4AW2)



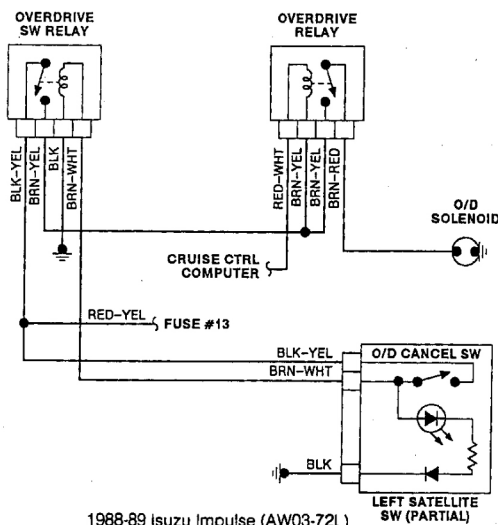
1988-89 Pickup, Ram 50 2WD & 4WD (AW372 & KM148)



1988-89 Montero & Raider 4WD (KM 148)



1988-89 Isuzu Pickup (AW03-72L)



1988-89 Isuzu Impulse (AW03-72L)

G00052552

Fig. 66: Transmission Control Schematic (1988-90 Chrysler, Mitsubishi & Isuzu)