



1999 SEMINAR INFORMATION

"TECH ON TIME FOR '99"

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1999 SEMINAR INFORMATION

"TECH ON TIME FOR '99"

1

INTRODUCTION

Bob Cherrnay has once again orchestrated ATSG's Tech team into another successful seminar year known as "Tech On Time for '99". Valuable and useful information on the cutting edge presented in both Video and Manuals that you can take back to the shop and use the very next business day. This is a DO NOT MISS seminar. Information will be presented on Imports, G.M., Ford and Chrysler vehicles. The information will cover up to date factory changes and interchangeability as well as many corrections to problems the shops are faced with TODAY. This years seminar would not be complete without tips on electrical and scanner checks. So Bob has instructed the ATSG Tech team to weave into this years seminar as many electrical and scanner tips one day could allow. So buckle up and enjoy "Tech On Time for '99".

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

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***Shifting to BRYCO
solenoids is easy as
1-2, 3-4***

BRYC

VOLVO/SAAB AW 50-42LE**REBUILD TIPS**

The AW 50-42LE was introduced in the U.S. for the 1993 model year in the Volvo 850 and the Saab 900 models. This transmission is a fully electronically controlled front wheel drive four speed unit. There is a very little information provided by the OE manufacturers in the way of tear down and assembly, mainly because Volvo and Saab are on a factory exchange program.

The following information is designed to help the rebuild technician avoid various problem areas when confronted by one of these transaxles.

Figure 1 illustrates clutch and band identification as well as a chart that indicates shift solenoid operation and clutch band application.

NOTE: The chart indicates that only Saab has a manual second position, Volvo does not.

Figure 2 illustrates solenoid identification, solenoid location and connector orientation.

CAUTION: Solenoid "A" (SL1) and solenoid "B" (SL2) connectors can be switched. Solenoid "A" connector should be the "**WHITE**" wire connector and solenoid "B" should be the "**BLACK**" wire connector.

Figure 3 shows the correct sprag rotation for the LOW sprag (F2) and figure 4 shows the correct sprag rotation for the INTERMEDIATE sprag (F1), while figure 5 shows the correct sprag rotation for the UNDERDRIVE sprag (F3).

NOTE: The underdrive sprag outer race requires the installation of an anti-clunk spring between the lugs of the outer race and the lugs of the transmission case to avoid a driveline clunk during transmission operation.

Forward clutch (C1) failure is common in this unit, in figure 6, one cause is illustrated. Inspect the forward drum carefully for a fine crack in the weld area as shown in figure 6.

CAUTION: Be sure the Vespel® ring shown in figure 6 is present and in good condition. failure to do so will result in forward drum pilot shaft bearing due to a lack of lube oil.

Another cause of forward clutch failure is shown in figure 7. The early rear cover has an aluminum forward drum support which utilized metal rings. The metal rings would wear the ring lands of the aluminum support resulting in forward clutch failure.

The late cover has a steel support and utilizes Teflon® rings which eliminates the ring land wear problem and the subsequent forward clutch failure.

There are some very important seals located between the main transmission case and the rear cover, and between the main transmission case and the valve body and a very important seal between the main transmission case and the converter housing. All are illustrated in figure 8.

The seals between the main case and the rear cover seal the forward clutch, the direct clutch and provide lube oil to the planetary assembly.

VOLVO/SAAB AW 50-42LE

REBUILD TIPS

The seals between the main transmission case and the valve body seal the low/reverse clutch and provide lube to the transfer gear.

The seal between the main transmission case and the converter housing seal off lube oil to the differential bearings.

The omission of any one of these seals will make the technician very unhappy!

Figure 9 illustrates one of three valves that have an orifice drilled through its spool, in the event the unit had considerable trash in the pan, it imperative these valves be removed and the orifices be cleaned out.

The three valves that have an orifice drilled through the spools are, the *main pressure regulator valve* in the *center valve body*, the *solenoid modulator valve* in the *front valve body* and the *B1 modulator valve* in the *rear valve body*.

The problems would range from line pressure complaints, to late shifts and harsh shifts depending on which valve orifice is clogged.

Figures 10, 11 and 12 illustrates check ball and small parts locations in the valve body sections.

CAUTION: The check ball locations indicated with the spacer plate segments in figure 12 are spacer plate sensitive.

If the spacer plate has only one *small hole* over either location, **DO NOT INSTALL A CHECK BALL.**

If the spacer plate has one *small hole* and one *large hole* over either of these locations, **INSTALL A CHECK BALL.**

NOTE: There are **NO** check balls or small parts in the *FRONT* valve body.

The valve body gaskets for the **VOLVO** and **SAAB** applications are shown in figure 13.

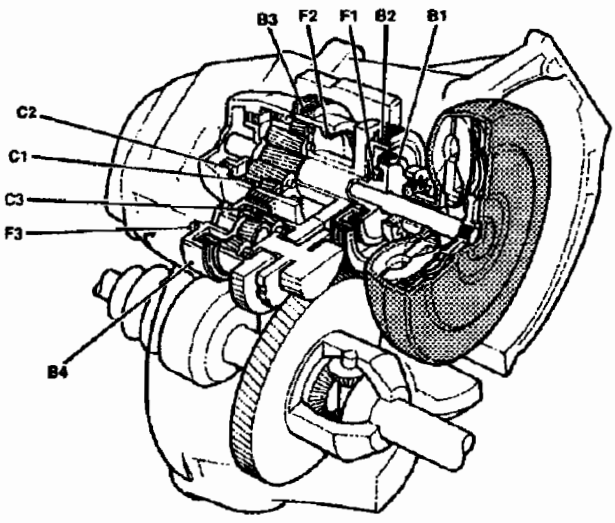
Many thanks to Joe Ganci of BRYCO and Tony Darr of TRANSTEC for their time and generosity in compiling this information.

Many thanks to *Brett Bogan* at **HARDPARTS FOR TRANSMISSIONS** for his time and generosity without whose help would have made the compilation of this material impossible.

VOLVO/SAAB AW 50-42LE

REBUILD TIPS

CLUTCH/BAND APPLICATION CHART



S1 = SHIFT SOLENOID "A"
S2 = SHIFT SOLENOID "B"

C1 = FORWARD CLUTCH
C2 = DIRECT CLUTCH
C3 = UNDERDRIVE CLUTCH

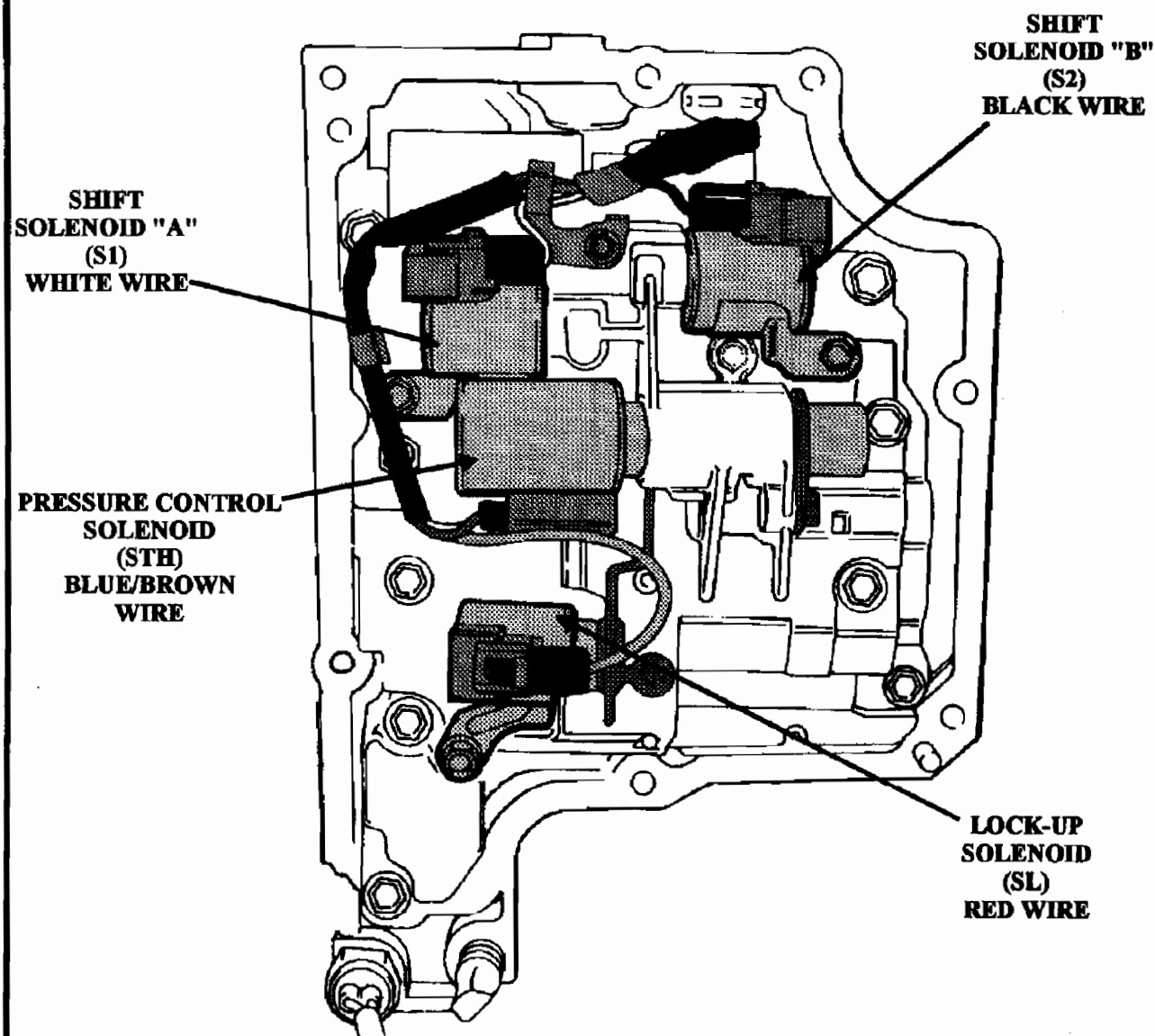
B1 = OVERRUN CLUTCH
B2 = INTERMEDIATE CLUTCH
B3 = LOW & REVERSE CLUTCH
B4 = UNDERDRIVE BRAKE BAND

F1 = INTERMEDIATE SPRAG
F2 = LOW SPRAG
F3 = UNDERDRIVE SPRAG

SHIFT POSITION		S1	S2	C1	C2	C3	B1	B2	B3	B4	F1	F2	F3
P	PARK	OFF	ON							ON			
R	REVERSE <small>UNDER 4 MPH</small> <small>OVER 4 MPH</small>	OFF	ON		ON				ON	ON			
		ON	ON		ON					ON			
N	NEUTRAL	OFF	ON							ON			
D	FIRST	OFF	ON	ON						ON			
	SECOND	ON	ON	ON			ON	ON		ON	ON		ON
	THIRD	ON	OFF	ON		ON	ON	ON			ON		
	FOURTH	OFF	OFF	ON	ON	ON		ON					
3	FIRST	OFF	ON	ON						ON		ON	ON
	SECOND	ON	ON	ON			ON	ON		ON	ON		ON
	THIRD	ON	OFF	ON		ON	ON	ON			ON		
*2	SECOND	ON	ON	ON			ON	ON		ON	ON		ON
	THIRD	ON	OFF	ON		ON	ON	ON			ON		
1	FIRST	OFF	ON	ON					ON	ON		ON	ON
	SECOND	ON	ON	ON			ON	ON		ON	ON		ON

*SAAB ONLY

Figure 1

VOLVO/SAAB AW 50-42LE
REBUILD TIPS**SOLENOID IDENTIFICATION**

CAUTION: SL1 SOLENOID WIRE AND SL2 SOLENOID WIRE CAN BE SWITCHED

Figure 2

VOLVO/SAAB AW 50-42LE

REBUILD TIPS

SPRAG ROTATION

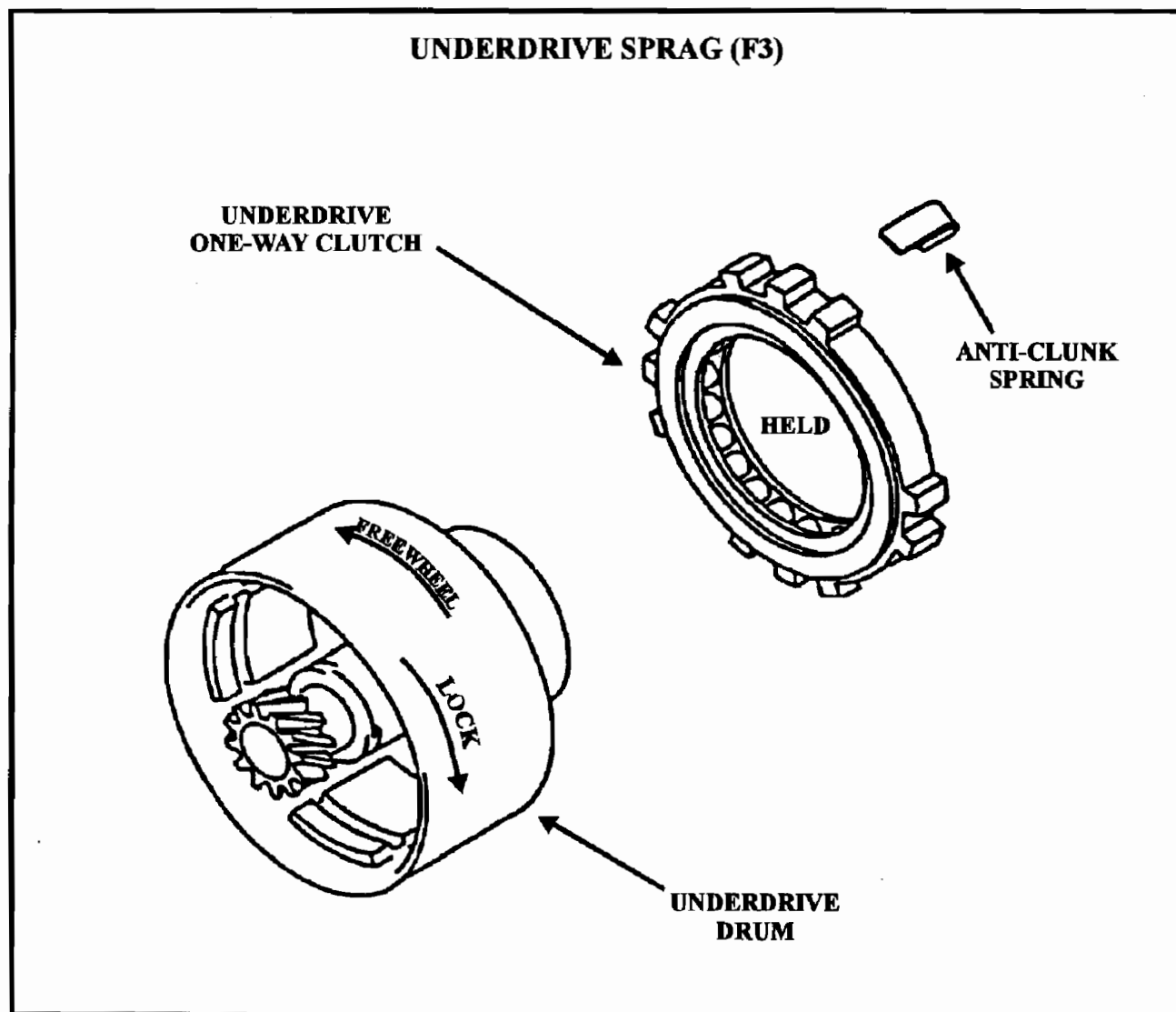


Figure 5

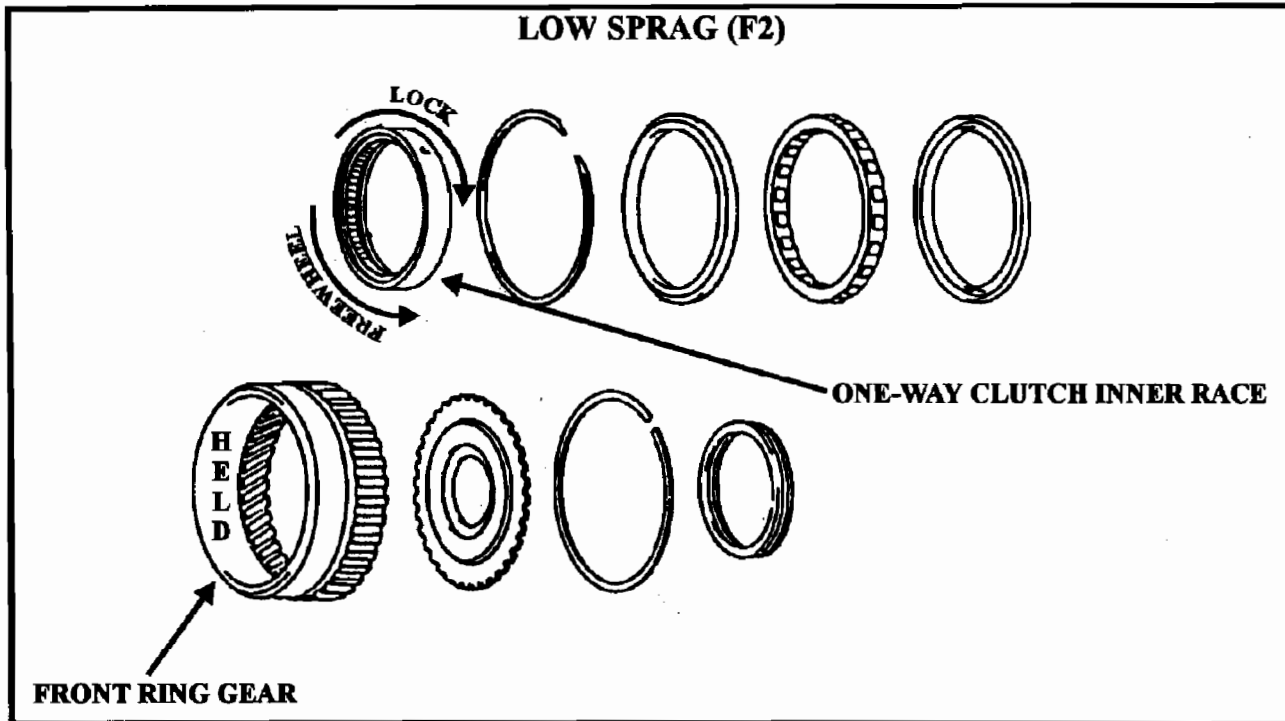
VOLVO/SAAB AW 50-42LE**REBUILD TIPS****SPRAG ROTATION****LOW SPRAG (F2)**

Figure 3

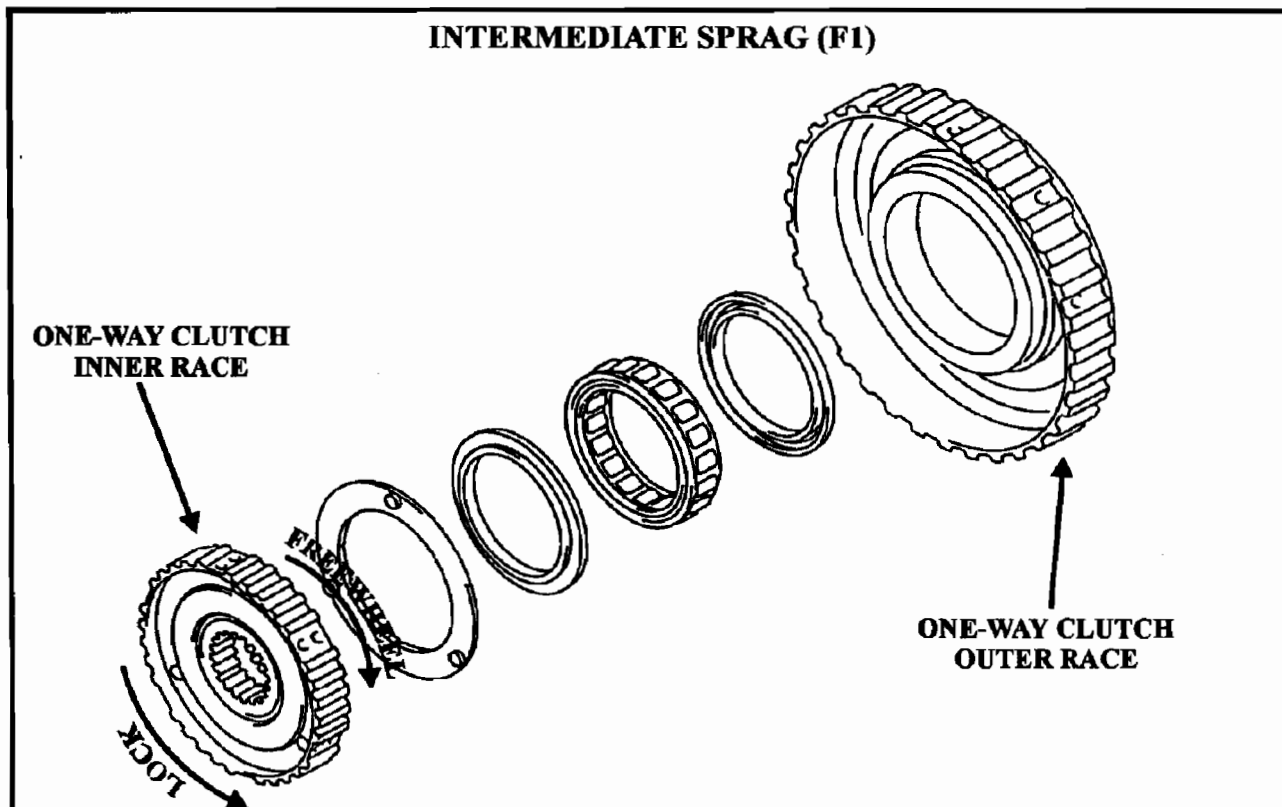
INTERMEDIATE SPRAG (F1)

Figure 4

VOLVO/SAAB AW 50-42LE

REBUILD TIPS

FORWARD CLUTCH FAILURE

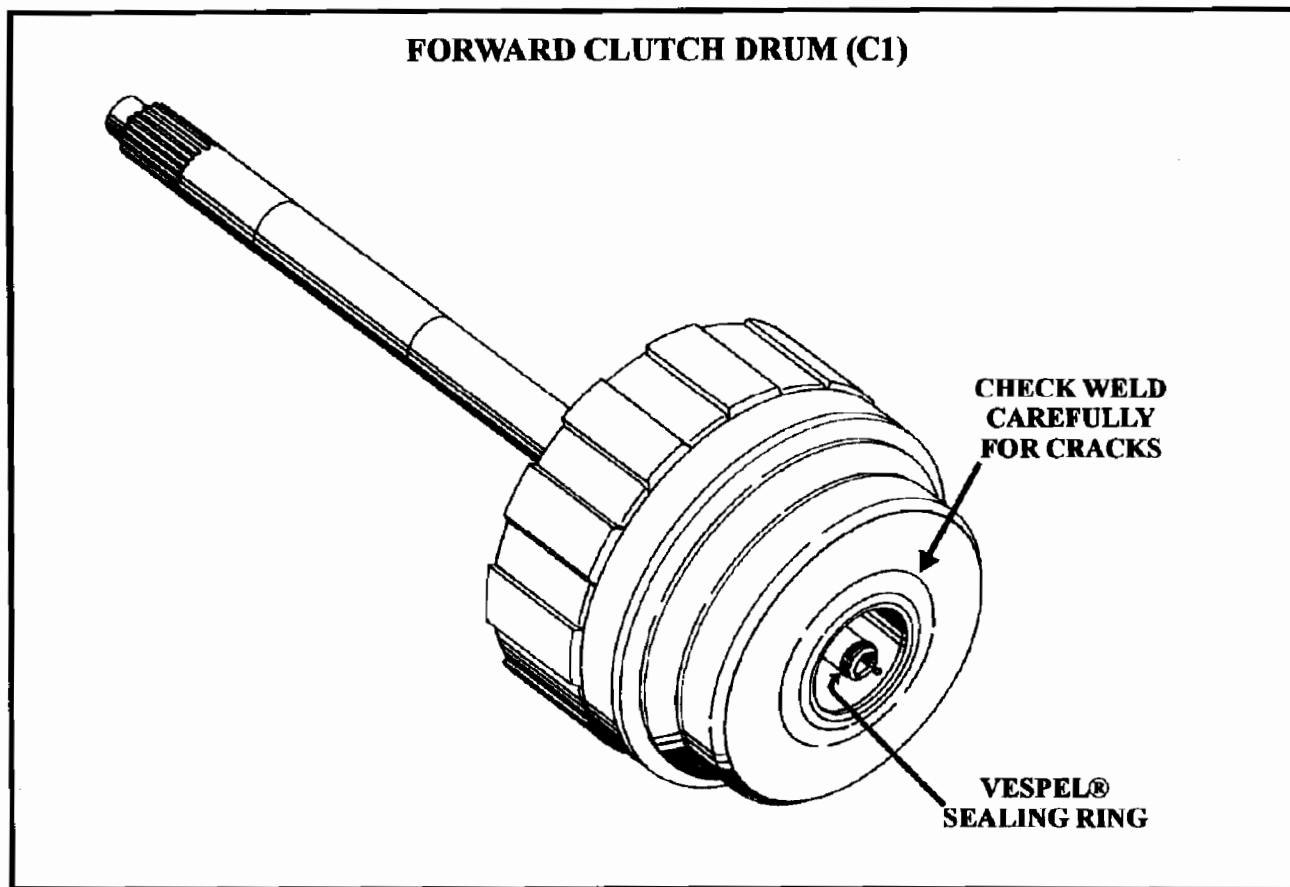


Figure 6

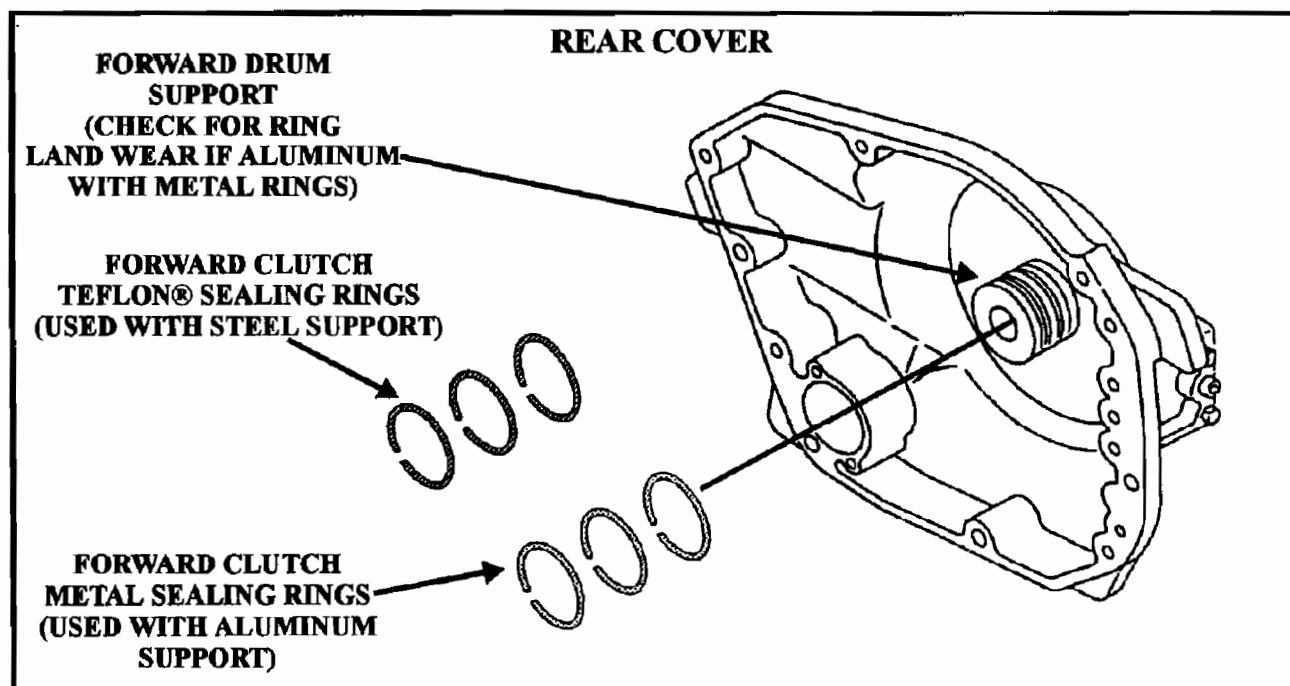
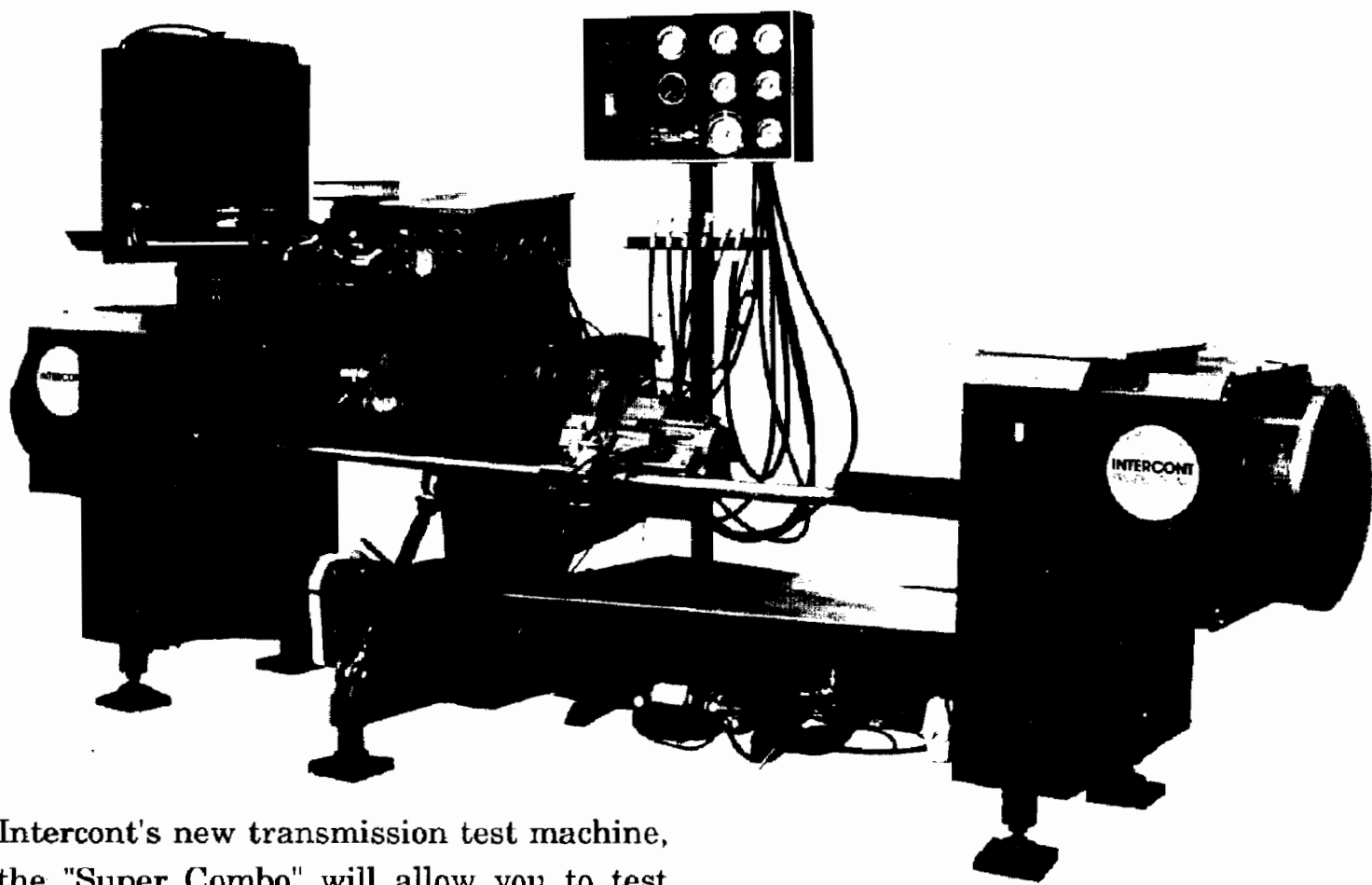


Figure 7

TEST YOURSELF

with Intercont's new Super Combination Transmission Test Machine



Intercont's new transmission test machine, the "Super Combo" will allow you to test virtually every transmission known. With an exclusive 1:1 gear ratio from a gas powered engine, the "Super Combo" is designed to test right hand rotations, rear wheel drive, and even the left hand rotation Honda transmission.

Hand-built by skilled professionals, the "Super Combo", as well as all of Intercont's quality products, is built to withstand day-to-day use for years. At Intercont, we know the problems associated with testing transmission effectively, so we build the solutions.

Call your Intercont sales representative at 1-800-749-3939 for more details about the "Super Combo" or other quality testing and washing equipment.

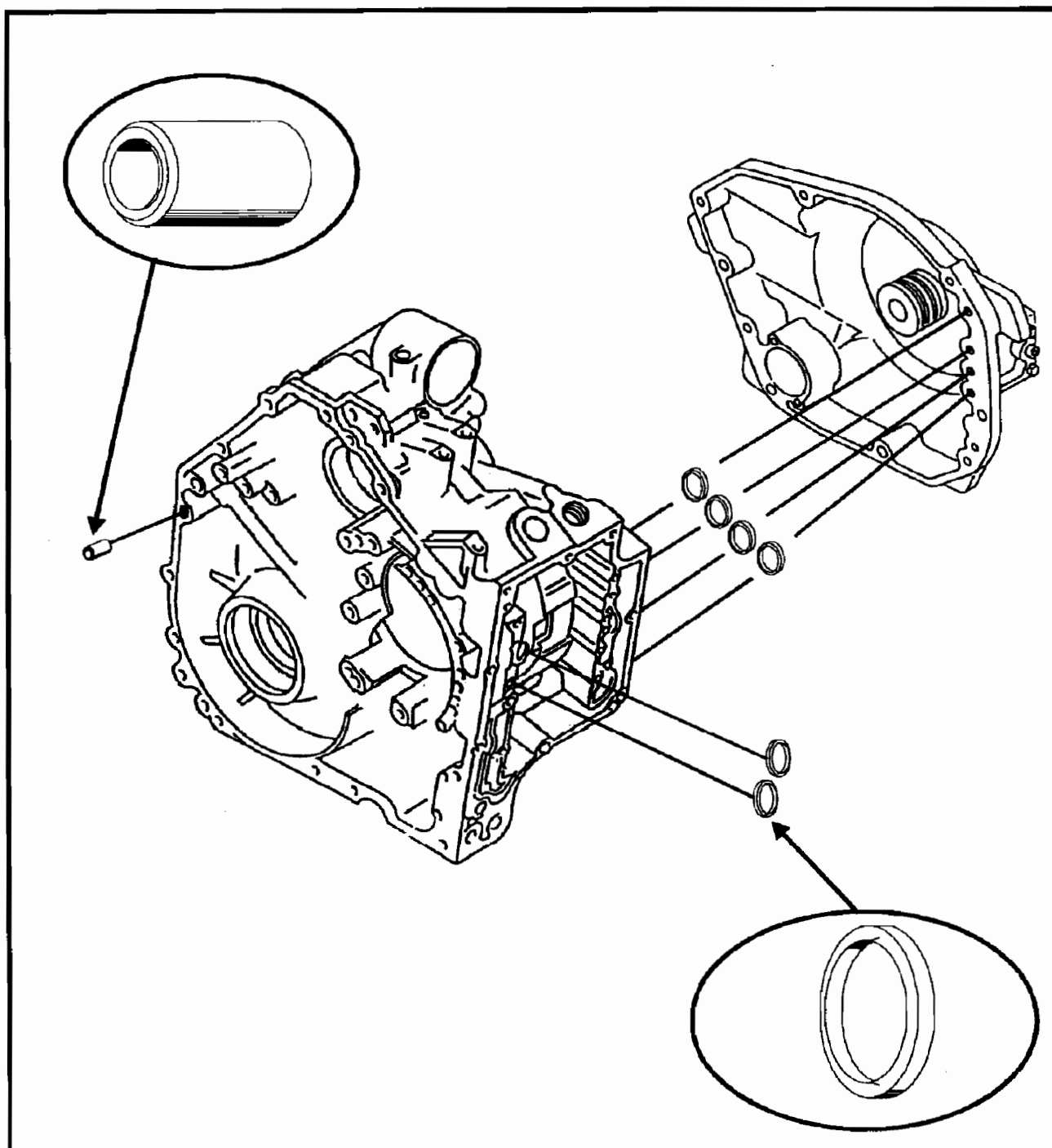
VOLVO/SAAB AW 50-42LE**REBUILD TIPS****IMPORTANT CASE SEALS**

Figure 8

VOLVO/SAAB AW 50-42LE

VALVE BODY

CHECK BALL AND SMALL PARTS LOCATIONS

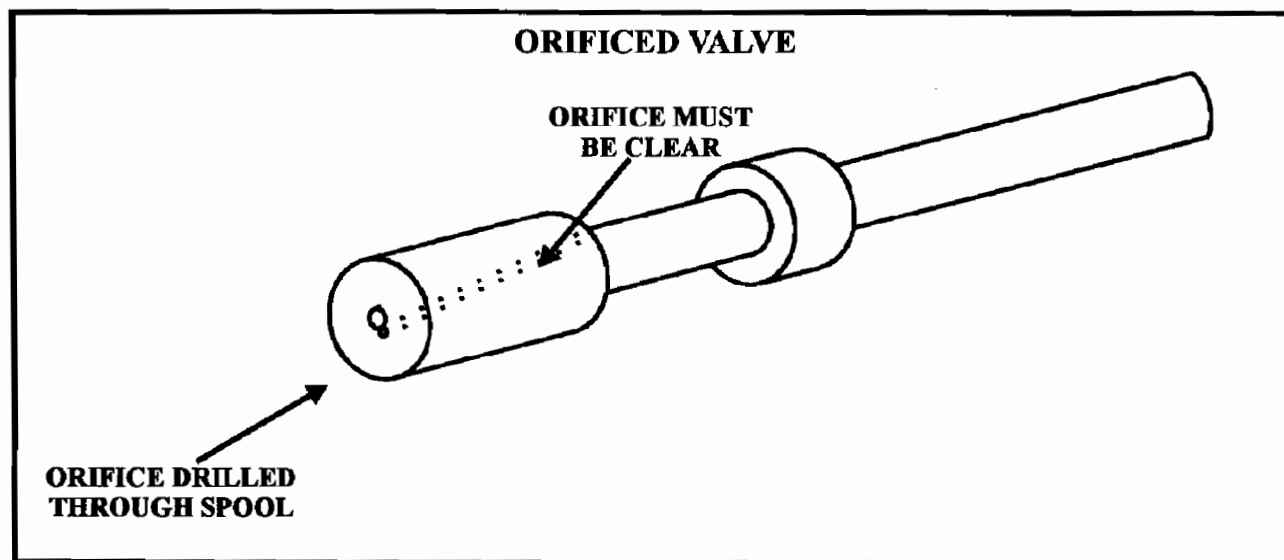


Figure 9

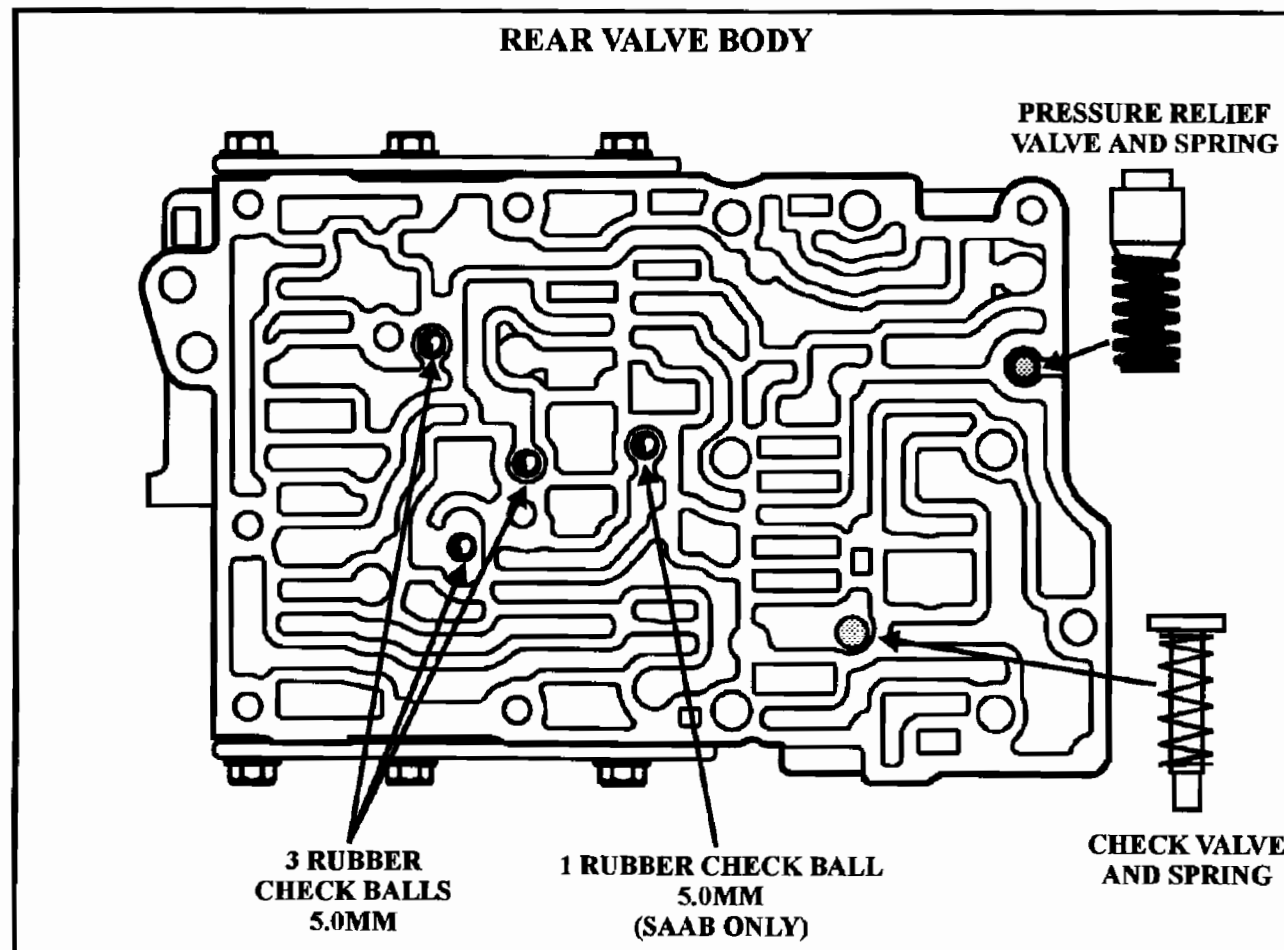


Figure 10

VOLVO/SAAB AW 50-42LE

VALVE BODY

CHECK BALL AND SMALL PARTS LOCATIONS

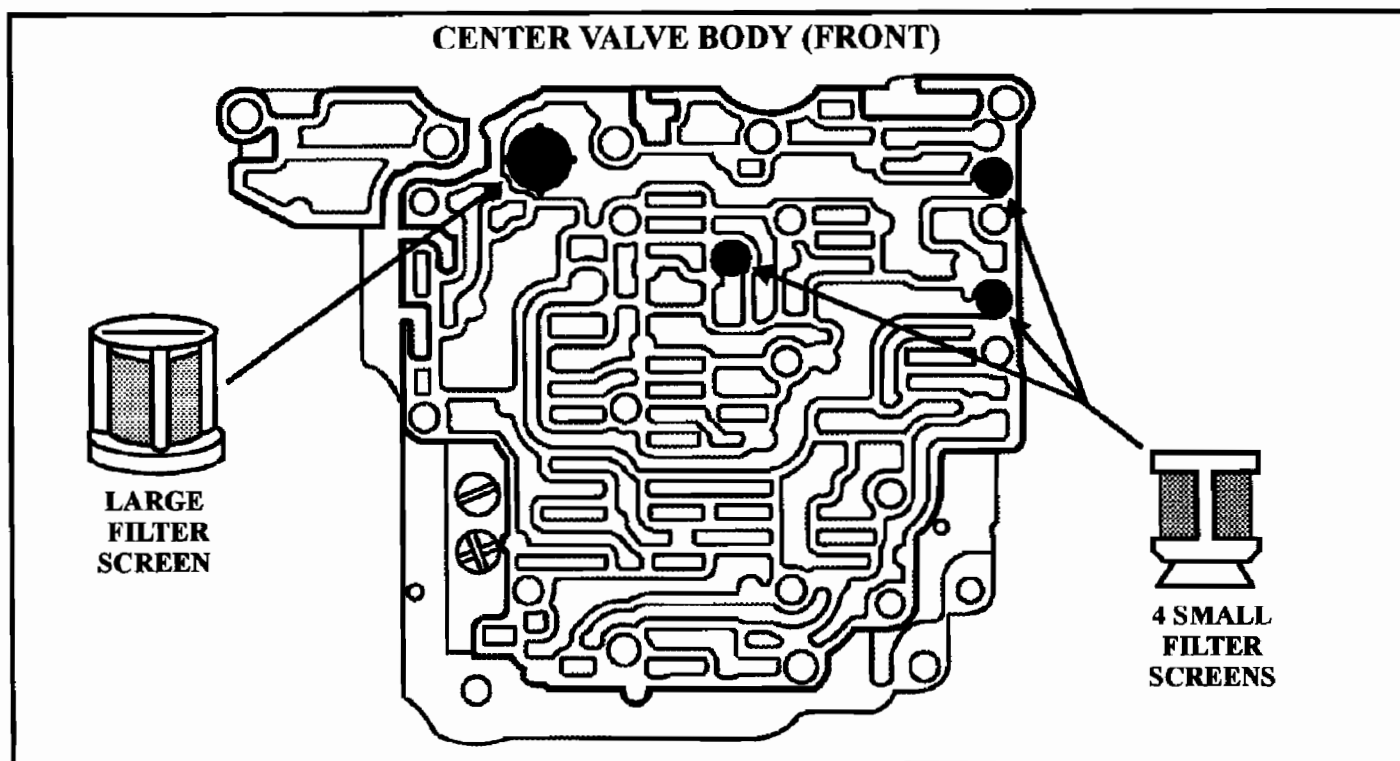


Figure 11

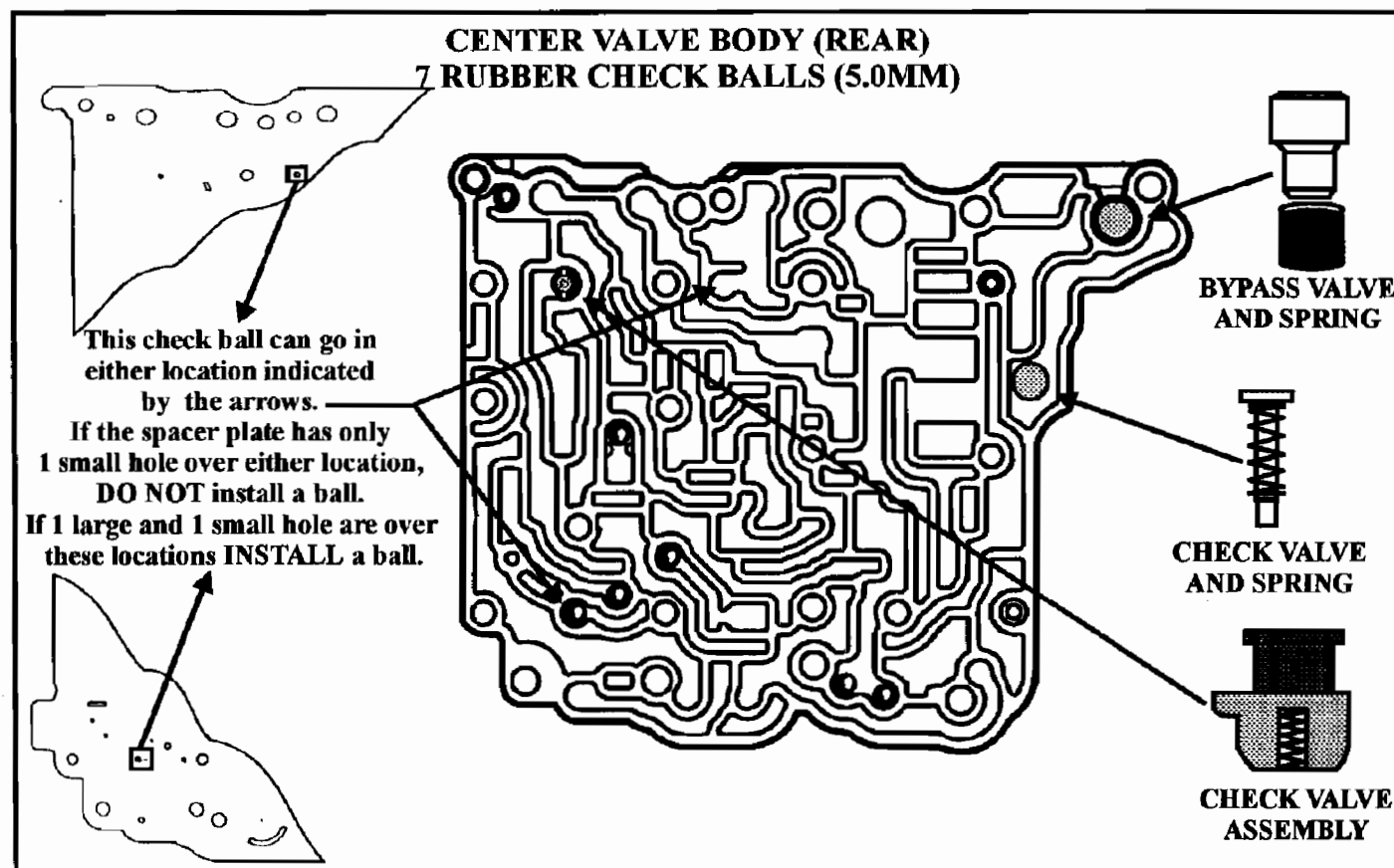


Figure 12

VOLVO/SAAB AW 50-42LE

REBUILD TIPS VALVE BODY GASKETS

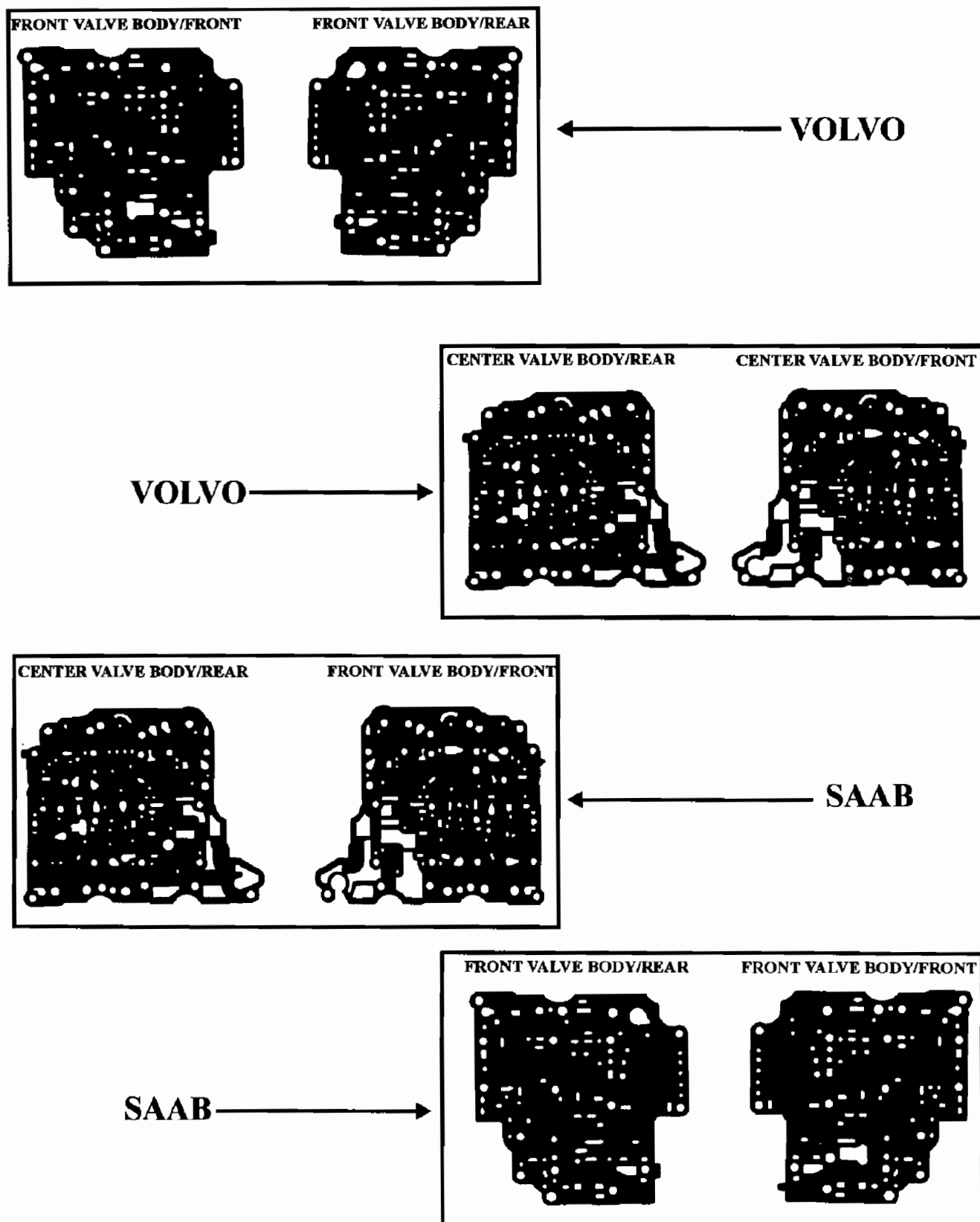


Figure 13

NISSAN RE4F02A PRESSURE PROLBEMS

COMPLAINT: Vehicles equipped with RE4F02A transaxles may exhibit, 1. Soft or flared up-shifts or 2. Extremely harsh up-shifts before or after overhaul.

CAUSE: The cause may be, 1. No pressure rise or 2. High line pressure at all times.

QUALIFICATION:

Attach a pressure gage to the line pressure port as shown in Figure 1. Start the vehicle and place the selector in the Drive position. Line pressure should indicate 60 psi. at idle and 180 psi. at stall. If line pressure indicates 60 psi. at idle and does not rise at stall, go to Correction **STEP 1**. If line pressure indicates 180 psi. at idle and stall, go to Correction **STEP 2**.

CORRECTION:

STEP 1: Back probe the red wire at the solenoid harness connector as shown in Figure 1. The voltage reading should indicate 1.5-2.5 volts at closed throttle and .5 volts at wide open throttle. If the voltage indicates 1.5-2.5 volts at closed throttle and does not drop to .5 volts at wide open throttle, go to ELECTRONIC CONCERNS for throttle position sensor checks. If the voltage drops but yet the pressure does not rise, go to HYDRAULIC CONCERNS **A:** for transmission related repairs.

STEP 2: Back probe the red wire at the solenoid harness connector as shown in Figure 1. The voltage reading should indicate 1.5-2.5 volts at closed throttle and .5 volts at wide open throttle. If the voltage indicates 1.5-2.5 volts at closed throttle and .5 volts at wide open throttle and the pressure is at maximum at all throttle openings, go to HYDRAULIC CONCERNS **B:** for transmission related repairs. If the voltage indicates .5 volts or less go to ELECTRONIC CONCERNS for throttle position sensor checks. If all throttle position sensor checks are correct, go to Self Diagnostic Sequence as shown in Figure 8. If Judgment flicker "10" is present, follow the flow chart as shown in Figures 9-11.

HYDRAULIC CONCERNS:

A: No pressure rise

- Check Pressure Regulator and Pilot Valve for sticking or binding in their bores as shown in Figure 2.
- Replace the solenoid pack as shown in Figure 3 with NISSAN part number 31940-27X66
- Check the bellhousing for score marks or wear on the slide mating surface as shown in Figure 4. NOTE: If the bellhousing is worn it may need to be replaced or machined.
- Check the slide seal for proper assembly and the pivot pin for wear as shown in Figure 5.

HYDRAULIC CONCERNS CONTINUED:

B: High line pressure

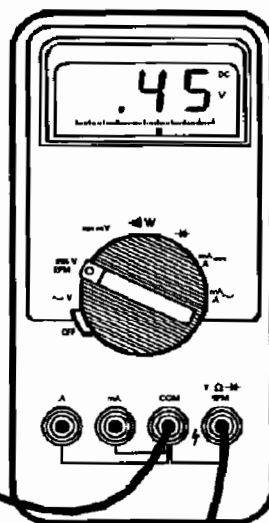
- Check the Pressure Regulator and Pilot Valve for sticking or binding in their bores as shown in Figure 2.
- Replace the solenoid pack as shown in Figure 3 with NISSAN part number 31940-27X66.

ELECTRONIC CONCERNS:

- Refer to Figure 6 to check the signal return voltage as well as the Idle and Full throttle switches that are incorporated in the sensor. NOTE: signal return voltage is an output from the ECM, as shown in Figure 7, and should be checked at the TCU to ensure the signal return voltage is getting to the TCU.
- Perform Self Diagnostic sequence as shown in Figure 8. If a Judgement flicker "10" is present, follow the flow chart as outlined in Figures 9-11. If there are "NO" trouble codes and all judgement flickers are the same length, check the Dropping Resistor as shown in Figure 10 for the proper ohm value for it may be slightly out of range but not enough to store a trouble code.

PRESSURE CONTROL VOLTAGE AND LINE PRESSURE CHECK

THROTTLE OPENING	VOLTAGE	PRESSURE
CLOSED	1.5-2.5 V	65 psi
WIDE OPEN	.50 V	180 psi



NEGATIVE LEAD TO
A GOOD GROUND

PRESSURE GAGE

BACKPROBE THE RED WIRE
AT THE SOLENOID CONNECTOR
WITH POSITIVE LEAD

LINE PRESSURE
PORT

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Figure 1

VALVE BODY CHECK

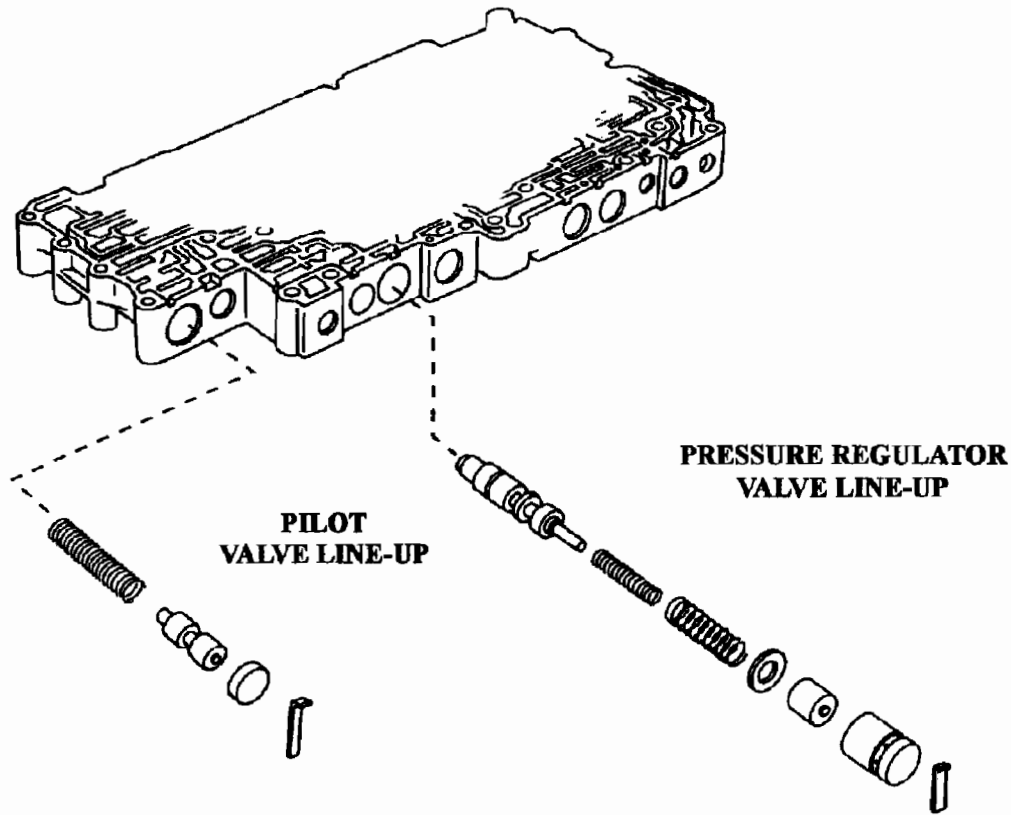
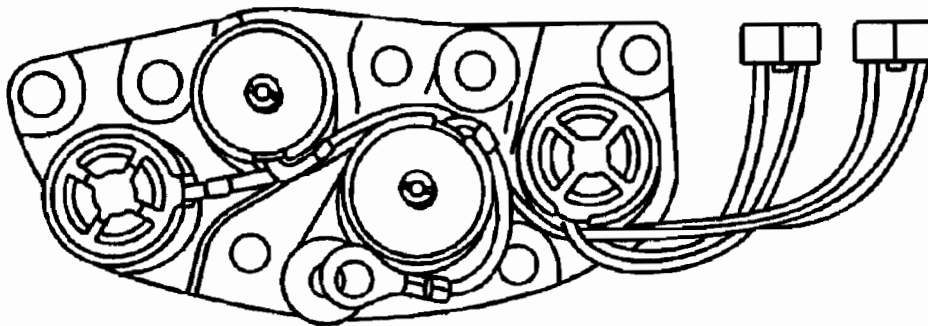


Figure 2

SOLENOID PACK
NISSAN PART NUMBER
31940-27X66

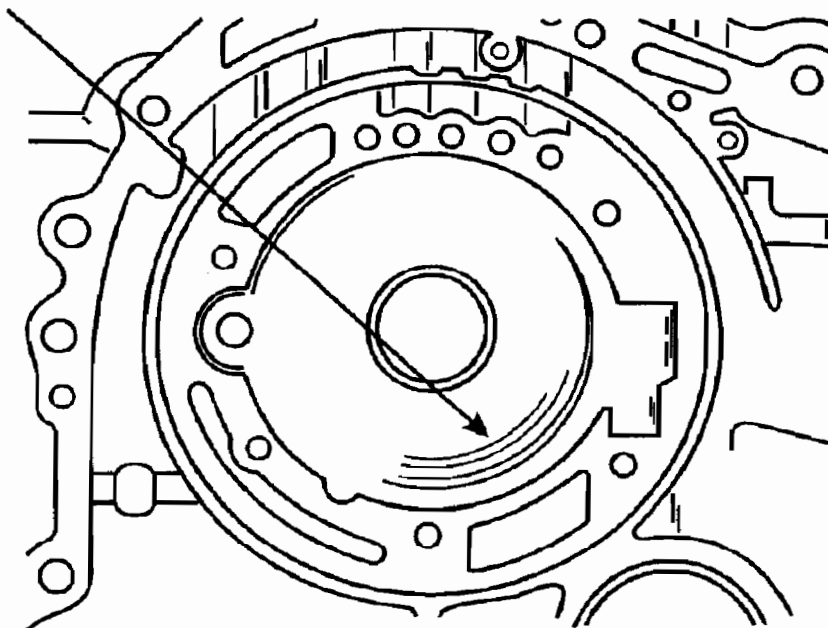


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Figure 3

BELLHOUSING CHECK

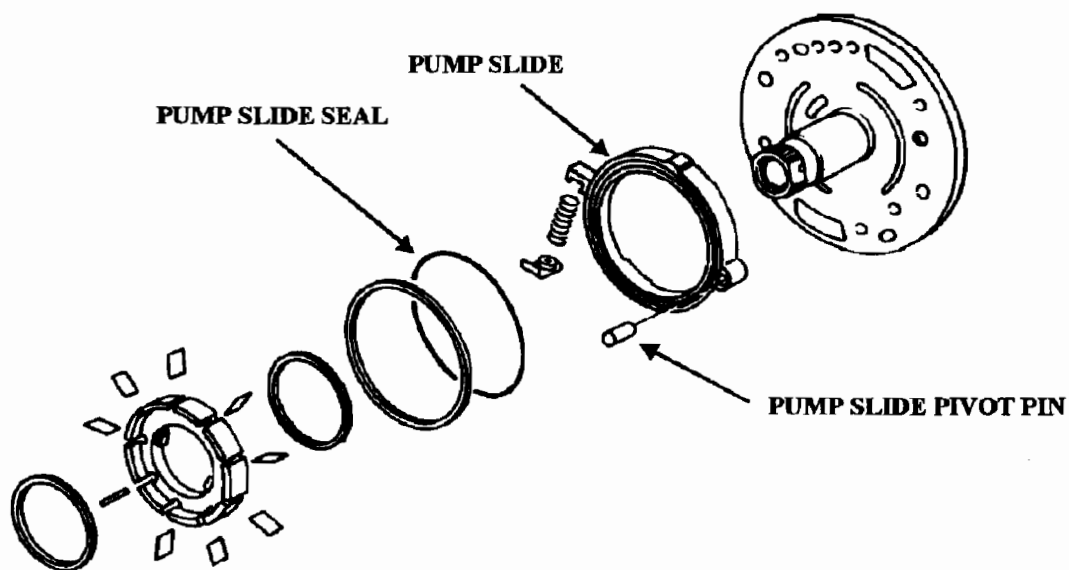
CHECK THE BELLHOUSING FOR SLIDE WEAR AND REPLACE AS NECESSARY



NOTE: WEAR IN THIS AREA MAY CAUSE A LOSS OF PUMP PRESSURE OR MAY CAUSE THE SLIDE TO BIND

Figure 4

PUMP ASSEMBLY CHECK

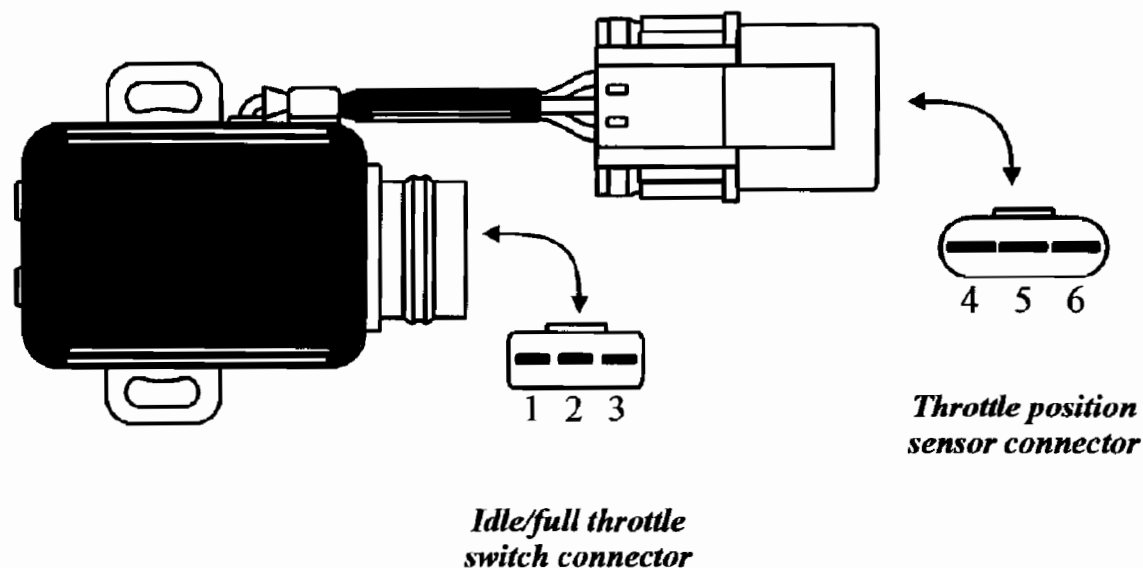


ENSURE THAT THE SLIDE SEAL IS INSTALLED IN THE SLIDE AND CHECK THE PIVOT PIN FOR WEAR

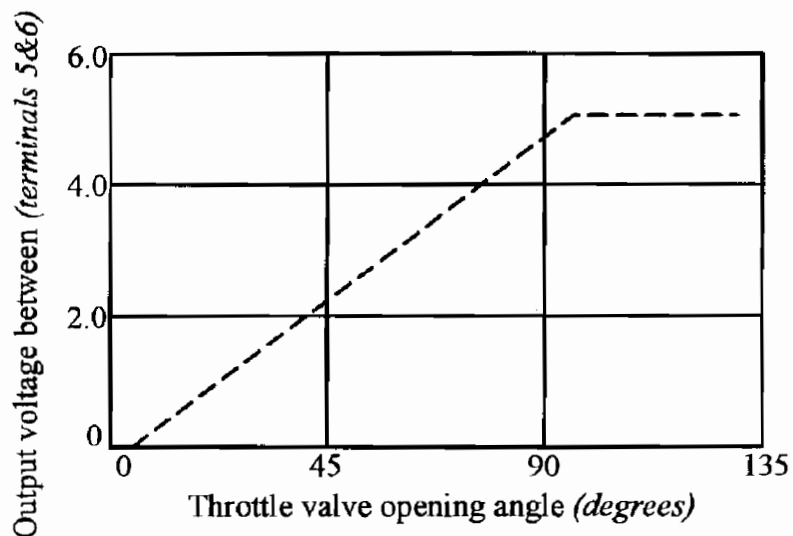
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Figure 5

THROTTLE POSITION SENSOR AND IDLE/FULL THROTTLE SWITCH CHECK

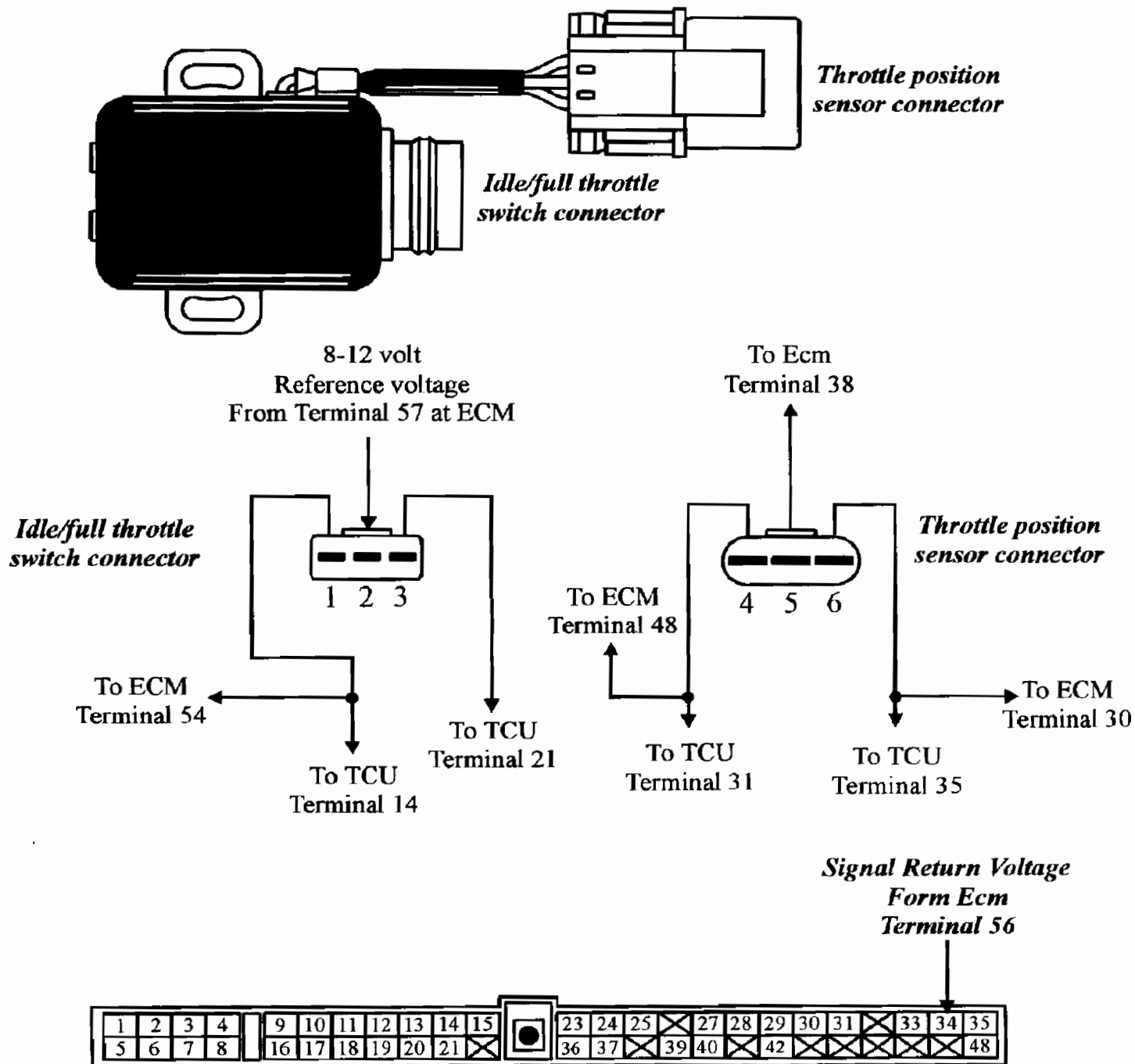


Terminal 1	Idle switch voltage 8-12 volts at idle 0 volts off idle
Terminal 2	Throttle switch reference voltage 8 volts
Terminal 3	Full throttle switch 8-12 volts at WOT 0 volts off WOT
Terminal 4	Throttle position sensor reference voltage 5 volts
Terminal 5	Throttle position sensor signal return voltage varies .3 volts to 5 volts
Terminal 6	Throttle position sensor signal ground less than .1 volts



NOTE: Check the Throttle Position Sensor with the connectors connected back-probing the wire with the ignition "ON"

THROTTLE POSITION SENSOR CIRCUIT DIAGRAM



TRANSMISSION CONTROL UNIT CONNECTOR-VIEW FROM HARNESS SIDE

NOTE: THE TPS SIGNAL RETURN VOLTAGE IS FED FROM ECM TERMINAL 56 TO TCU TERMINAL 34. THEREFORE A BROKEN WIRE MAY CAUSE NO SIGNAL RETURN VOLTAGE AT THE TCU.

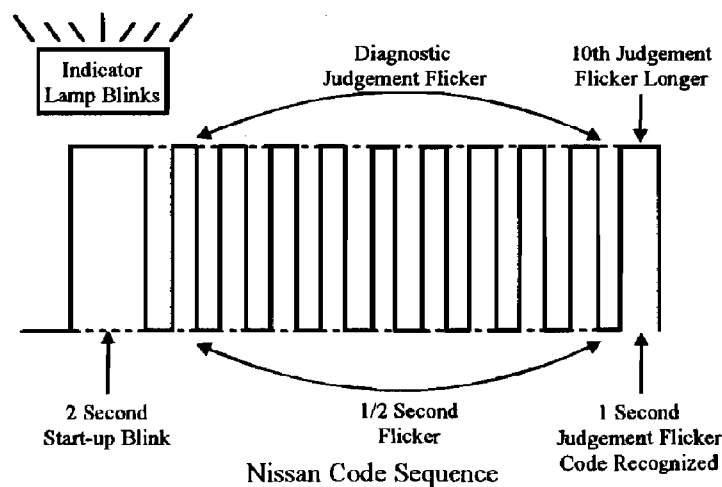
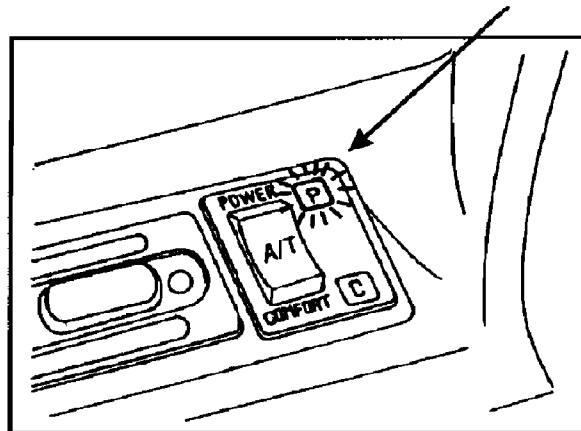
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Figure 7

ELECTRONIC SELF DIAGNOSIS

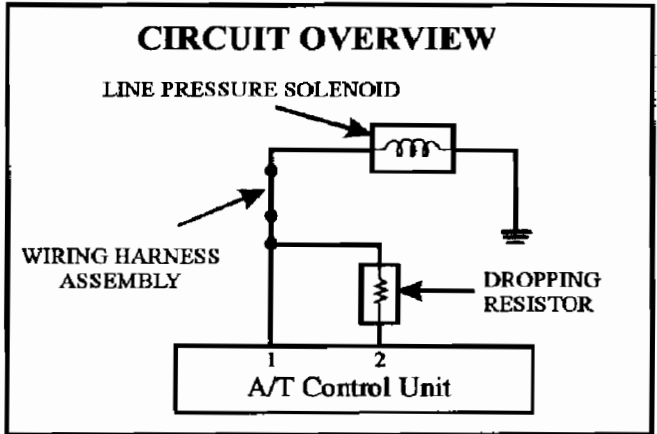
1. Start the engine and warm to operating temperature then shut it off.
2. Set "A/T" select switch to "AUTO."
3. Set the "O.D." cancel switch to "ON."
4. Move the selector to "P."
5. Turn the Ignition switch to "ON."
(Do not start engine)
6. Ensure the "POWER" lamp comes on for 2 seconds.
7. Turn the ignition switch to "OFF."
8. Press and hold the shift lock release button and move the selector to "D."
9. Set the "O.D." cancel switch to "OFF."
10. Turn the ignition switch to "ON."
11. Move the selector to "2."
12. Set the "O.D." cancel switch to "ON."
13. Move the selector to "1."
14. Set the "O.D." cancel switch to "OFF."
15. Depress the accelerator pedal to the floor and release it.
16. Check the "POWER" lamp for codes.

POWER LAMP



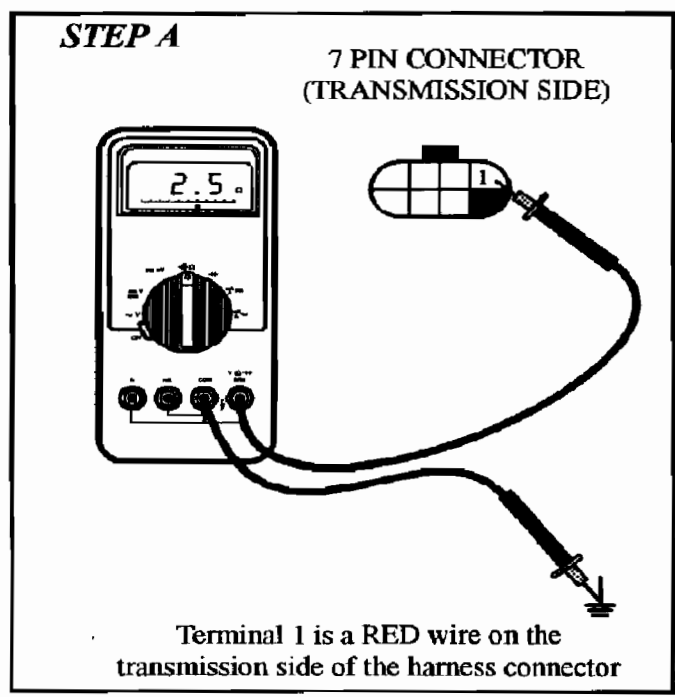
NOTE: THE 10th JUDGEMENT FLICKER IS LONGER THAN THE OTHER 9 FLICKERS. THIS INDICATES A PRESSURE CONTROL SOLENOID CIRCUIT CODE. IF ALL 10 FLICKERS ARE THE SAME LENGTH THAT WOULD INDICATE NO CODES.

JUDGMENT FLICKER "10" LINE PRESSURE CIRCUIT FAULT FLOW CHART



STEP A

7 PIN CONNECTOR
(TRANSMISSION SIDE)



Terminal 1 is a RED wire on the transmission side of the harness connector

STEP A

1. Turn ignition to "OFF" position.
2. Disconnect 7 pin connector, transaxle harness connector, located in front of top pan.
3. Check resistance between terminal 1 (red wire) and Ground.
Resistance: 2.5-5 ohms

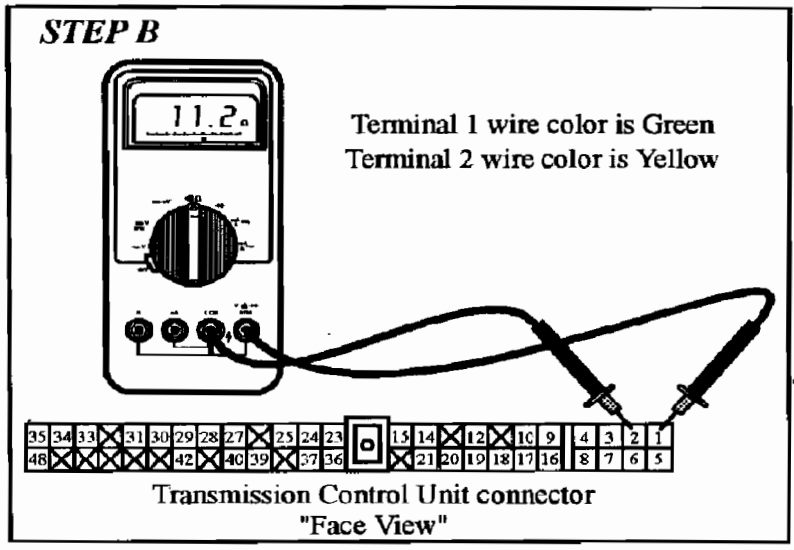
N.G. →

1. Repair internal wire harness.
2. Replace solenoid pack Nissan part No. 31940-27X66

O.K.

STEP B

Terminal 1 wire color is Green
Terminal 2 wire color is Yellow



Transmission Control Unit connector
"Face View"

35	34	33	31	30	29	28	27	25	24	23	13	14	12	10	9	4	3	2	1	
48											21	20	19	18	17	16	8	7	6	5

STEP B

1. Turn Ignition switch to "OFF"
2. Disconnect Transmission Control Unit connector and check resistance between terminals 1 and 2.
Resistance: 11.2-12.8

N.G. → GO TO STEP C

TCU
LOCATION

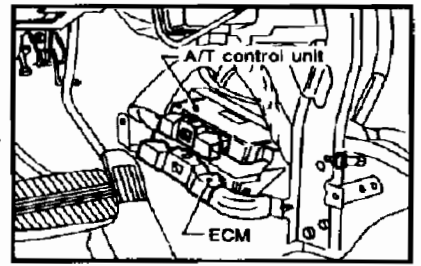


Figure 9

DROPPING RESISTOR CHECK

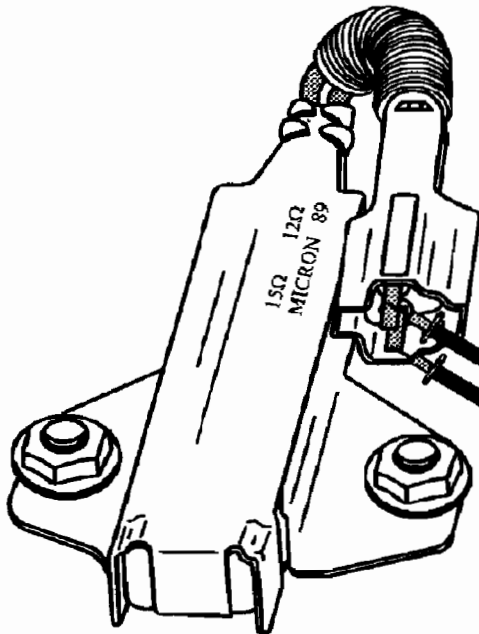
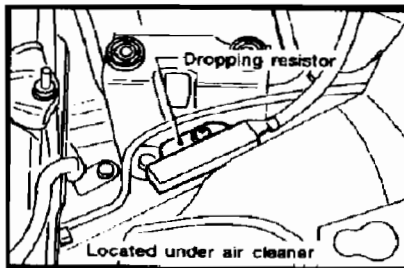
STEP C

Locate the dropping resistor, which is under the air cleaner, and disconnect the 2 pin harness connector. Place ohm meter across the 2 terminals of the dropping resistor. The ohm meter should indicate between 11.2 and 12.7ohms.

O.K. → **GO TO STEP D**

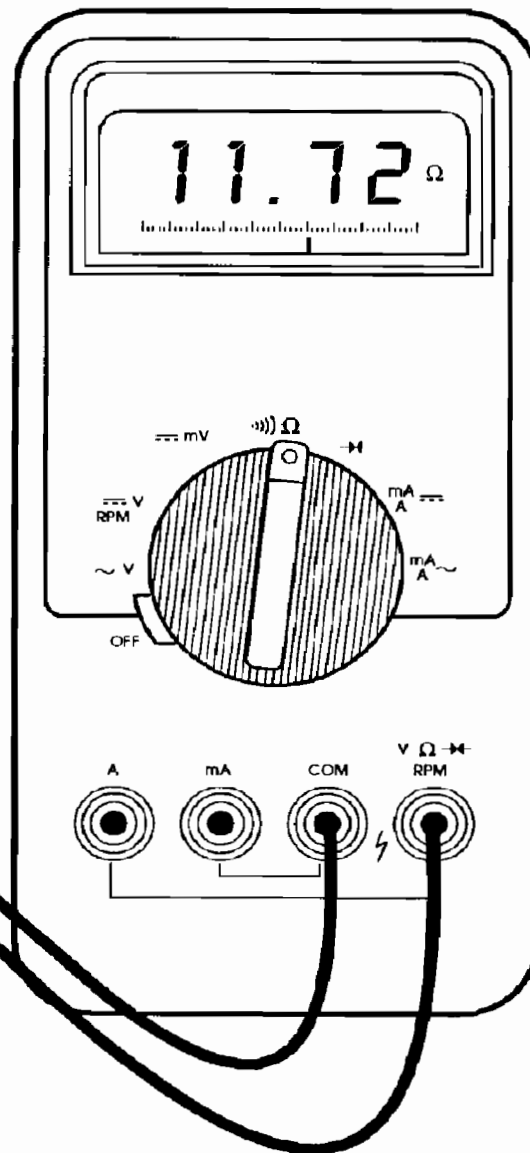
N.G. → **Replace Dropping Resistor**

DROPPING RESISTOR LOCATION



DROPPING RESISTOR

Normal resistance range
between 11.2 - 12.7 Ω Ohms



Honda



Selective Steels

Clutch clearance is critical. Selective Steels enable you to get correct clearance.

Avoid buying many selective pressure plates by using selective steels.

Alto Part No.

58701-2.1

58701A

58711-2.1

58711A

58721-2.1

58721A

78701-2.1

78701A

Application With

105 mm 0.004 Oversize

105 mm 0.009 Undersize

110 mm 0.004 Oversize

110 mm 0.009 Undersize

116 mm 0.004 Oversize

116 mm 0.009 Undersize

120 mm 0.004 Oversize

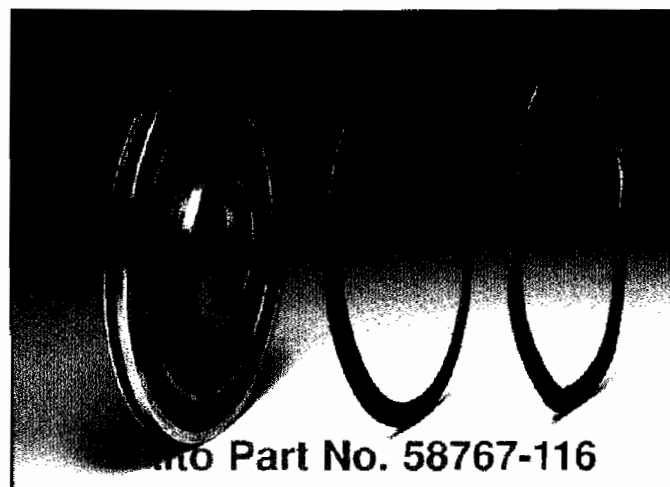
120 mm 0.009 Undersize

Honda Wave Spring

Alto Products Corp. announces the availability of the Honda Repair Wave Spring, part number 58767-116. Used in 1986 - on Honda, Sterling and Acura models with 116MM/4.5 clutch. It is designed to prevent clearance problems that are caused by the Belleville spring cutting into the bottom steel plate.

New!

120 mm Wave Spring. Alto Part No. 78767



Alto Part No. 58767-116

Honda Green Plates

Alto manufactures a line of Honda green plates to improve shift quality.

Alto Part No. Application

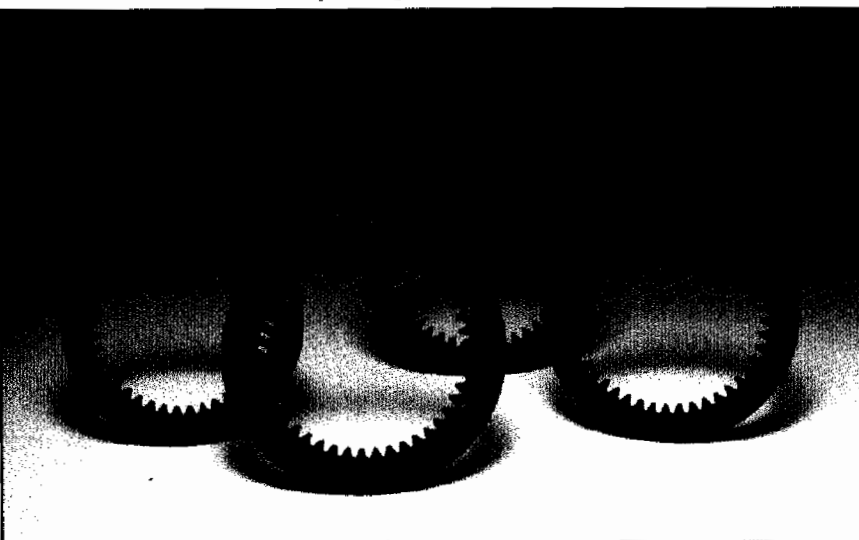
58700G 105 mm Frictions

58710G 110 mm Frictions

58720G 116 mm Frictions

58730G 116 mm Frictions

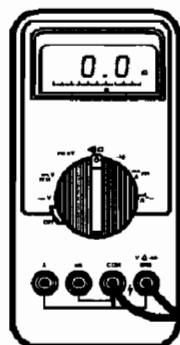
78700G 120 mm Frictions



JUDGMENT FLICKER "10" LINE PRESSURE CIRCUIT FAULT FLOW CHART CONTINUED

STEP D

2 PIN CONNECTOR TO
DROPPING RESISTOR
(COMPUTER SIDE)



35	34	33	X	31	30	29	28	27	X	25	24	23	22	21	20	19	18	17	16	15	14	X	12	X	10	9	8	7	6	5			
48	X	X	X	X	X	X	42	X	40	39	X	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Transmission Control Unit connector
"Face View"

YELLOW
WIRE

STEP D

1. Check harness continuity between terminals 2 at the TCU and terminal 2 at the dropping resistor computer harness side connector.
2. Check and ensure "NO" harness continuity to ground.

N.G.

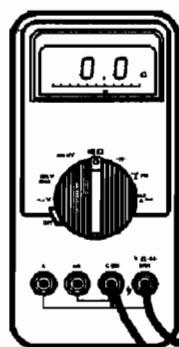
O.K.

1. Repair wire harness as needed.

STEP E

7 PIN CONNECTOR
(COMPUTER SIDE)

2 PIN CONNECTOR TO
DROPPING RESISTOR
(COMPUTER SIDE)



GREEN WIRE

GREEN
WIRE

GREEN WIRE

35	34	33	X	31	30	29	28	27	X	25	24	23	22	21	20	19	18	17	16	15	14	X	12	X	10	9	8	7	6	5		
48	X	X	X	X	X	42	X	40	39	X	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

STEP E

1. Check harness continuity between Terminals 1 at the TCU and Terminal 1 at the 7 pin harness connector (Computer side) and Terminal 1 at the dropping resistor connector (Computer side). All 3 wires colors are GREEN.
2. Check and ensure harness has "NO" continuity to ground.

N.G.

1. Repair wire harness as needed.

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Figure 11

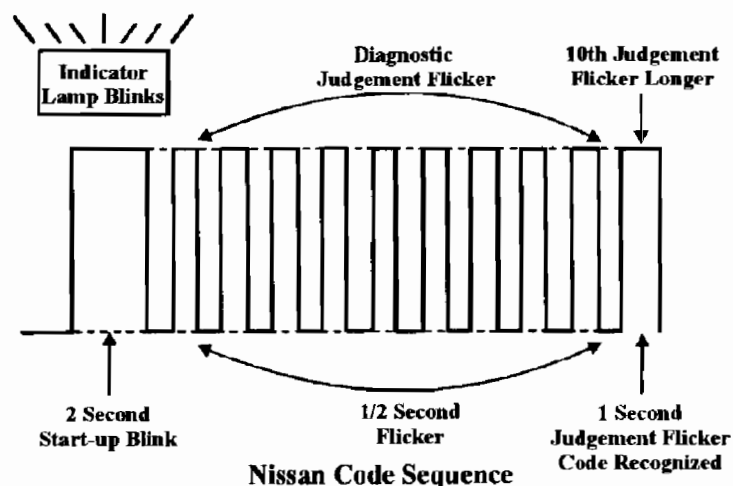
NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

Preliminary to Self Diagnosis:

To obtain codes from these vehicles, the correct self-diagnostic procedure must be used. Also, inputs to the computer, such as the overdrive cancel switch, inhibitor switch, idle/full throttle switches, and power/auto switch, must also be functioning properly. Otherwise, the computer will not recognize that self-diagnosis has been requested. Proper self-diagnostic procedures have been provided in Figures 1 - 8. Look at the procedures and find the correct one for the vehicle. Refer to Figure for code interpretations and definitions.

Self Diagnostic Procedure Fails to Initiate:

If self-diagnosis does not work after using the correct procedure for the vehicle, go to Electrical Check Number One to find out why the self-test does not start. When self diagnosis starts, depending on the vehicle, either the A/T check light, POWER shift light, or the OD cancel light should come on for 2 seconds. This is the start-up indicator. If the light comes on and stays on steady and does not blink (*Quest/Villager only*) or, if the light does not come on for two seconds refer to Electrical Check Number Two. After the light comes on for 2 seconds to signal self-diagnosis start up, the light will blink a total of 10 more times, these blinks are called "Judgement Flickers." If all 10 flickers are the same and last for 1/2 second each, this is the indication that no codes are present. All codes will be represented by a blink of 1 second in duration. In other words, if the light flashes 10 times and the last, or 10th flicker, is a 1 second flash, the code would be Judgement Flicker 10. The chart in Figure 20 will give the judgement flicker meanings and a brief description of each code. When checking Nissan vehicles for no self-diagnosis response, the most common problems have turned out to be a faulty idle/full throttle switch, possibly causing third gear starts, or wiring or connector problems with the inhibitor switch, which could result in first gear starts with no-upshifts. Using this diagnostic procedure should help find the problem quickly and efficiently.



NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

NISSAN PATHFINDER 1988

1. Start the engine, warm to operating temperature, then shut it off.
2. Set the POWER switch to "AUTO."
3. Move the selector lever to "P."
4. Turn the ignition switch to "ON."
(Do not start the engine)
5. Does the "POWER" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
6. Turn the ignition switch to "ACC."
7. Move the selector to "D."
8. Set the POWER switch to "POWER."
9. Turn the ignition switch to "ON."
10. Move selector to "2."
11. Set the POWER switch to "AUTO".
12. Move the selector to "1."
13. Set the POWER switch to "POWER".
14. Depress the accelerator pedal to the floor and release it.
15. Set the POWER switch to "AUTO".
16. Check the "POWER" shift lamp for codes.

Figure 1

NISSAN PATHFINDER 1989-UP

1. Start the engine, warm to operating temperature, then shut it off.
2. Set the POWER switch to "AUTO."
3. Set the "OD" cancel switch to "ON."
4. Move the selector lever to "P."
5. Turn the ignition switch to "ON."
(Do not start the engine)
6. Does the "POWER" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
7. Turn the ignition switch to "ACC."
8. Move the selector lever to "D."
9. Set the "POWER" switch to "POWER."
10. Turn the ignition switch to "ON."
11. Move the selector lever to "2."
12. Set the "POWER" switch to "AUTO."
13. Move the selector to "1."
14. Set the "POWER" switch to "POWER."
15. Depress the accelerator pedal to the floor and release it.
16. Check the "POWER" shift lamp for codes.

Figure 2

NISSAN STANZA AND ALTIMA

1. Start the engine, warm to operating temperature, then shut it off.
2. Set the "OD" cancel switch to "ON."
3. Move the selector lever to "P."
4. Turn the ignition switch to "ON."
(Do not start the engine)
5. Does the "OD" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
6. Turn the ignition switch to "ACC."
7. Move the selector to the "D" range.
8. Set the "OD" cancel switch to "OFF."
9. Turn the ignition switch to "ON."
10. Move the selector to "2."
11. Set the "OD" cancel switch to "ON."
12. Move the selector to "1."
13. Set the "OD" cancel switch to "OFF."
14. Depress the accelerator pedal to the floor and release it.
15. Check "OD" indicator lamp for codes.

Figure 3

NISSAN MAXIMA

1. Start the engine, warm to operating temperature, then shut it off.
2. Set the "A/T" select switch to "AUTO."
3. Set the "OD" cancel switch to "ON."
4. Move the selector lever to "P."
5. Turn the ignition switch to "ON."
(Do not start the engine)
6. Does the "POWER" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
7. Turn the ignition switch to "OFF."
8. Press and hold the shift lock release button and move the selector to the "D" range.
9. Set the "OD" cancel switch to "OFF."
10. Turn the ignition switch to "ON."
11. Move the selector to "2."
12. Set the "OD" cancel switch to "ON."
13. Move the selector to "1."
14. Set the "OD" cancel switch to "OFF."
15. Depress the accelerator pedal to the floor and release it.
16. Check "POWER" indicator lamp for codes.

Figure 4

NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

NISSAN 240SX

1. Start the engine, warm to operating temperature, then shut it off.
2. Set the "OD" cancel switch to "ON."
3. Move the selector lever to "P."
4. Turn the ignition switch to "ON."
(Do not start the engine)
5. Does the "OD" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
6. Turn the ignition switch to "OFF."
7. Press and hold the shift lock release button and move selector to "D."
8. Set the "OD" cancel switch to "OFF."
9. Turn the ignition switch to "ON."
10. Move the selector to "2."
11. Set the "OD" cancel switch to "ON."
12. Move the selector to "1."
13. Set the "OD" cancel switch to "OFF."
14. Depress the accelerator pedal to the floor and release it.
15. Set the "OD" cancel switch to "ON."
16. Check "OD" indicator lamp for codes.

Figure 5

NISSAN 300ZX

1. Start the engine, warm to operating temperature, then shut it off.
2. Turn the ignition switch to "ACC" position.
3. Set the OD cancel switch to "OFF."
4. Move the selector lever to "D."
5. Turn the ignition switch to "ON."
(Do not start the engine).
6. Does the "A/T" check lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
7. Move the selector lever to "2."
8. Set the "OD" cancel switch to "ON."
9. Move the selector to "1."
10. Set the "OD" cancel switch to "OFF."
Depress the accelerator pedal to the floor and release it.
11. Check the "A/T" check lamp for codes.

Figure 6

NISSAN QUEST/ MERCURY VILLAGER

1. Start the engine, warm to operating temperature then shut it off.
2. Move the selector lever to "P."
3. Turn the ignition switch to "ON."
(Do not start the engine)
4. Does the "OD" lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
5. Turn ignition switch to "OFF". Do not turn all the way to the LOCK position.
6. Move the selector to "D."
7. Press the "OD" cancel button in and hold it in.
8. Continue to hold the "OD" button in. Turn the key to the "ON" position, wait for 2 seconds.
9. Continue to hold the "OD" button in. Move selector lever to "2."
10. Release the "OD" cancel button.
11. Press in and release the "OD" cancel button one time.
12. Move selector lever to "1."
13. Press in and release the "OD" cancel button one more time.
14. Depress the accelerator pedal to the floor and release it.

Figure 7

NISSAN SENTRA

1. Start the engine, warm to operating temperature then shut it off.
2. Turn the ignition switch to the "ACC" position.
3. Set the overdrive select switch to the "OFF" position.
4. Move the selector lever to the "D" position.
5. Turn ignition switch to "ON."
(Do not start the engine)
6. Does the "A/T" check lamp come on for 2 seconds? If Yes proceed with self-diagnosis. If No, go to electrical check number one.
7. Move the selector lever to the "2" range.
8. Set the overdrive select switch to the "ON" position.
9. Move selector lever to the "1" position.
10. Set the "OD" cancel switch to "OFF".
11. Depress the accelerator pedal to the floor and release it.
12. Check the "POWER" shift indicator lamp for codes.

Figure 8

NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

ELECTRICAL CHECK NUMBER ONE:

The "OD" light, "POWER" shift indicator light, or the "A/T" check light does not come on for 2 seconds when starting the self-test.

STEP 1:

Locate the A/T control module utilizing the chart provided in Figure 21 then back-probe the connector (see Figure 22 for connector views) and check for correct battery voltage at the terminals shown in Figures 9-10. If the voltage readings are not correct, replace the battery, check the fuses, or repair wires as necessary. If battery voltage is correct, go to Step 2.

All Models

except 1989-90 240SX

and 1988-95 Pathfinder/Pickup

Terminal 4 and 15 . . . approx. 12.5 volts

Terminal 9 and 15 . . . approx. 12.5 volts

Figure 9

Pathfinder/Pickup 1988-95 240SX 1989-90

Terminal 29 and 31 . . . approx. 12.5 volts

Terminal 30 and 31 . . . approx. 12.5 volts

240SX 1991-95

Terminal 4 and 15 . . . approx. 12.5 volts

Terminal 9 and 15 . . . approx. 12.5 volts

Figure 10

STEP 2:

Go to the A/T control module and check the computer grounds at the terminals shown in Figures 11-12. Replace the grounds or repair wires as necessary. If grounds are ok, go to Step 3.

All Models

except 240SX Pathfinder/Pickup

Terminal 15 and ground01 volts or less

Terminal 48 and ground01 volts or less

Figure 11

Pathfinder/Pickup 1988-95 240SX 1989-90

Terminal 31 and ground01 volts or less

Terminal 32 and ground01 volts or less

240SX 1991-95

Terminal 15 and ground01 volts or less

Terminal 48 and ground01 volts or less

Figure 12

NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

STEP 3:

Inspect the A/T check lamp, POWER shift indicator lamp, or OD cancel lamp circuits. Make sure the bulbs are installed and not burned out. Make sure there is voltage going into the switch and that the ground wires are good.

For more information concerning the lamp circuits, consult the proper factory manual.

ELECTRICAL CHECK NUMBER TWO:

The "OD" light, "POWER" shift indicator light, or the "A/T" check light does not come on for 2 seconds, or, the "OD" light comes on and does not blink (*Quest/Villager only*) after initiating the self test and depressing the accelerator pedal to the floor and releasing it. The inputs used during self diagnosis must be checked to find out if they are inputting into the A/T control unit properly. If the inhibitor switch, idle/full throttle switch, and "OD" switch do not input correctly, the A/T control unit will not recognize that the self-diagnosis procedure has been performed.

STEP 1:

Locate the A/T control module using the chart in Figure 21 and check for correct voltage at the terminals for the idle/full throttle switch shown in Figures 13-14. Replace the idle/full throttle Switch or repair

All Models except 240SX, Pathfinder/Pickup	
Terminal 14 and 15	8 volts or more at idle.
Terminal 14 and 15	1 volt or less at full throttle.
Terminal 21 and 15	8 volts or more full throttle.
Terminal 21 and 15	1 volt or less at idle.

Figure 13

Pathfinder/Pickup 1988-95 240SX 1989-90	
Terminal 4 and 31	8 volts or more at idle.
Terminal 4 and 31	1 volt or less at full throttle.
Terminal 17 and 31	8 volts or more full throttle.
Terminal 17 and 31	1 volt or less at idle.
240SX 1991-1995	
Terminal 14 and 15	8 volts or more at idle.
Terminal 14 and 15	1 volt or less at full throttle.
Terminal 21 and 15	8 volts or more full throttle.
Terminal 21 and 15	1 volt or less at idle.

Figure 14

NISSAN ELECTRICAL DIAGNOSIS

SELF DIAGNOSIS/CODE RETRIEVAL

STEP 2:

Locate the A/T control module and check for correct voltage at the terminals for the inhibitor switch shown in Figures 17-18. Replace the inhibitor switch or repair circuit wires as necessary. If voltage is correct, go to Step 3.

All Models

except 240SX and Pathfinder/Pickup

Terminals 16 and 15 . . . 12 volts selector in "1"
Terminals 17 and 15 . . . 12 volts selector in "2"
Terminals 18 and 15 . . . 12 volts selector in "D"
Terminals 19 and 15 . . . 12 volts selector in "P/N"
Terminals 20 and 15 . . . 12 volts selector in "R"

Figure 17

Pathfinder/Pickup 1988-95 240SX 1989-90

Terminal 1 and 31 . . . 12 volts selector in "2"
Terminal 2 and 31 . . . 12 volts selector in "1"
Terminal 19 and 31 . . . 12 volts selector in "P/N"
Terminal 20 and 31 . . . 12 volts selector in "D"
Terminal 26 and 31 . . . 12 volts selector in "R"

240SX 1991-1995

Terminals 16 and 15 . . . 12 volts selector in "1"
Terminals 17 and 15 . . . 12 volts selector in "2"
Terminals 18 and 15 . . . 12 volts selector in "D"
Terminals 19 and 15 . . . 12 volts selector in "P/N"
Terminals 20 and 15 . . . 12 volts selector in "R"

Figure 18

STEP 3:

Locate the A/T control module and check for correct voltage at the terminals for the OD cancel switch shown in Figures 19-20. Replace the OD cancel switch or repair circuit wires as necessary. If voltage is correct, replace the A/T control unit.

All Models

except 240SX, Q45, and Pathfinder/Pickup

Terminal 39 and 48 . . approx. 12.5 volts "OD" on
Terminal 39 and 48 . . approx. 0.0 volts "OD" off

Figure 19

Pathfinder/Pickup 1988-95 240SX 1989-90

Terminal 9 and 31 . . approx. 12.5 volts "OD" on
Terminal 9 and 31 . . approx. 0.0 volts "OD" off

240SX 1991-1995

Terminal 39 and 48 . . approx. 12.5 volts "OD" on
Terminal 39 and 48 . . approx. 0.0 volts "OD" off

Figure 20

NISSAN ELECTRICAL DIAGNOSIS SELF DIAGNOSIS/CODE RETRIEVAL

JUDGEMENT OF SELF-DIAGNOSIS CODE:

- | | |
|-------------------------------------|---|
| All judgements flickers same . . . | All circuits that can be checked by self diagnosis are functioning. |
| 1st judgement flicker longer . . . | Revolution sensor circuit is shorted or open. |
| 2nd judgement flicker longer . . . | Speed sensor circuit is shorted or open. |
| 3rd judgement flicker longer . . . | Throttle sensor circuit is shorted or open. |
| 4th judgement flicker longer . . . | Shift solenoid "A" circuit is shorted or open. |
| 5th judgement flicker longer . . . | Shift solenoid "B" circuit is shorted or open. |
| 6th judgement flicker longer . . . | Timing solenoid or Overrun solenoid is shorted or open. |
| 7th judgement flicker longer . . . | Lock-up solenoid circuit is shorted or open. |
| 8th judgement flicker longer . . . | ATF temp. sensor is shorted or open, or A/T control unit power source is shorted or open. |
| 9th judgement flicker longer . . . | Engine revolution signal circuit is shorted or open. |
| 10th judgement flicker longer . . . | EPC solenoid circuit is shorted or open. |

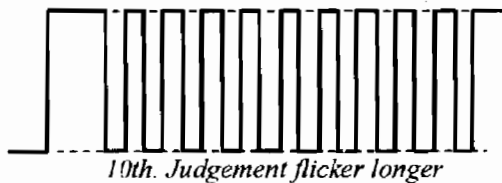
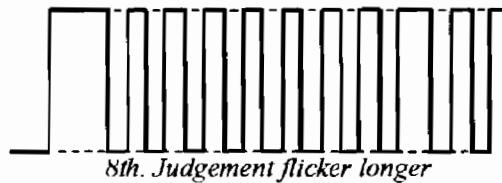
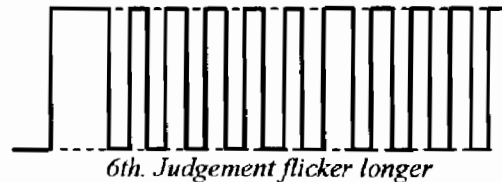
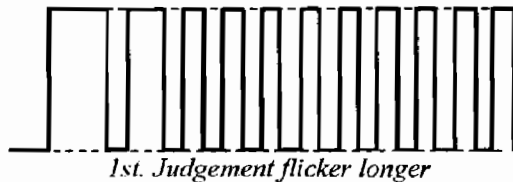
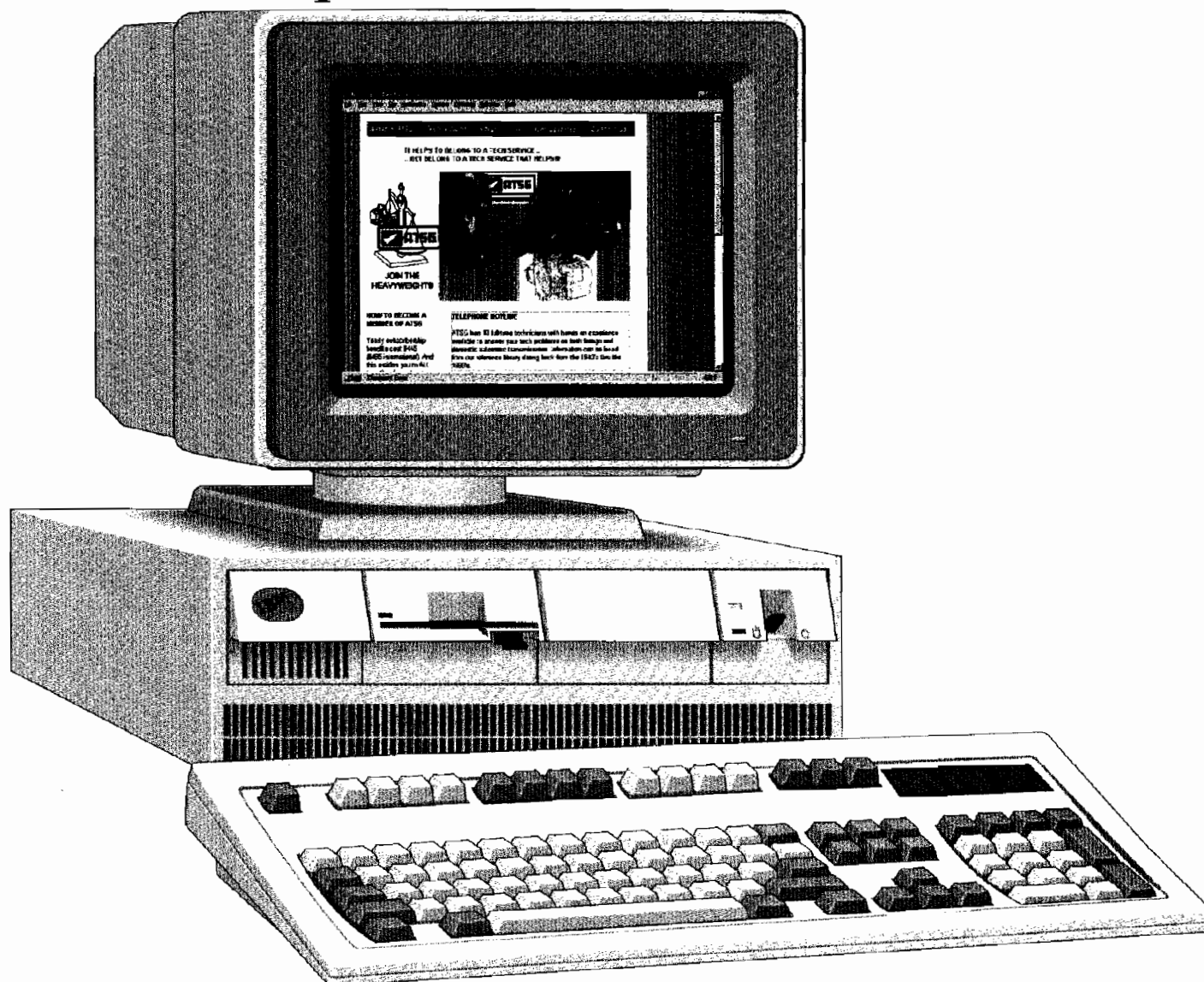


Figure 20



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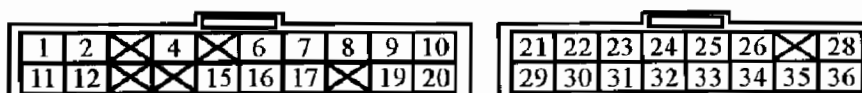
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COMPUTER LOCATION BY MODEL

VEHICLE MODEL	MODEL YEAR/ TRANS TYPE	TRANSMISSION COMPUTER LOCATION
NISSAN ALTIMA	(1993-up) RE4FO4A/V	Resistor is located to the front of the drivers side shock tower, bolted on a bracket close to the fender-well.
NISSAN MAXIMA	(1989-94) RE4FO2A/V* (1992-up) RE4FO4A/V*	Resistor is located on the drivers side of the engine compartment bolted to the fender underneath the air filter box.
NISSAN PATHFINDER	(1988-up) 4x4 RE4RO1A (1990-up) 3.0 RE4RO1A	Two door pathfinder behind rear passenger side trim panel. Four door pathfinder behind trim panel behind passenger rear seat.
NISSAN SENTRA	(1993-94) RE4FO3A	Resistor is located on the driver side of the engine compartment bolted to the side of the shock tower above the wheel.
NISSAN STANZA	(1990-92) RE4FO2A/V	Resistor is located on the drivers side of the engine compartment bolted to the fender underneath the air filter box.
NISSAN QUEST/ VILLAGER	(1993-up) RE4FO4A/V 4F20E	Resistor is located on the drivers side of the engine compartment bolted to the fender just behind the battery.
NISSAN 200SX	(1995-up) 2.0 RE4FO3A	Resistor is located on the driver side of the engine compartment bolted to the side of the shock tower above the wheel.
NISSAN 240SX	1989-98) RE4RO1A	Left front corner of the engine compartment, behind the air cleaner box, near the ignition coil.
NISSAN 300ZX/ 300ZX TWIN TURBO	(1989-96) RE4RO1A/ RE4RO3A	Behind the plastic inner lining above the passenger side front tire. Behind the battery on the passenger side fender-well (95-96 only).
NISSAN PICK-UP	(1988-up) 4x4 RE4RO1A (1990-up) 3.0 RE4RO1A	Underneath the passenger front seat

Figure 21

COMPUTER CONNECTOR VIEWS



Nissan Pathfinder 1988-95 Nissan 240sx 1989-90
TCM connector view from back of harness.



Nissan Pick-up 1992-95
TCM connector view from back of harness.



All other models.
TCM connector view from back of harness.
36* and 42* for models with power/comfort switch.
45* for OBD II models OBD II signal wire.

Figure 22

NISSAN DIAGNOSTIC TROUBLE CODE RETRIEVAL DIAGNOSTIC TEST MODE

The E.C.C.S control module provides two functions for the automatic transmission control system.

FUNCTION 1. To receive a signal from the automatic transmission control unit (A/T control unit) with reference to On Board Diagnostic (OBD) related items in the automatic transmission control system. This signal is sent to the ECM when a malfunction occurs in the corresponding OBD-related part.

FUNCTION 2. To indicate a detected fault by illuminating the Malfunction Indicator Light (MIL on the instrument panel. Various sensors, switches, and solenoids are utilized as inputting devices for this system. The MIL is illuminated in One Trip or Two Trip detection logic when a malfunction is detected by OBD in reference to A/T related sensors, switches, or solenoids.

ONE TRIP DETECTION LOGIC:

If a malfunction is detected during the first test drive, the malfunction will be stored in the ECM memory as a Diagnostic Trouble Code (DTC) or 1st. trip freeze frame data (available with OEM or hand held scan tools) without illuminating the MIL. The A/T control unit does not have this memory capability.

TWO TRIP DETECTION LOGIC:

When a malfunction is detected on two consecutive road tests, the DTC and the freeze frame data are both stored in the ECM memory and the MIL is illuminated to alert the driver of the malfunction.

TROUBLE CODE RETRIEVAL:

Trouble codes may be retrieved using one of two following methods:

1. Trouble codes may be retrieved by use of a hand held scan tool with OBD II capability.
2. Trouble codes may be retrieved by use of the MIL in the Diagnostic Test Mode II

DIAGNOSTIC TEST MODE I:

This mode is basically a bulb check mode for the ECM to ensure the MIL is functioning properly. If a malfunction is present, the MIL will illuminate. If the MIL will not illuminate, the bulb circuit will need to be checked.

DIAGNOSTIC TEST MODE II:

With the ECM in this mode, the DTC and the 1st. trip DTC are shown by the number of blinks of the MIL. The DTC and 1st. trip DTC use the same code number and are displayed at the same time. If the MIL is not lit in the Diagnostic Test Mode I, all blink codes will be 1st. trip DTC's. If only one code is displayed when the MIL illuminates in Diagnostic Test Mode II it is a DTC; if two or more codes are displayed, they may be either DTC's or 1st. trip DTC's. Refer to Figure 1 and the accompanying text for instructions on switching the ECM diagnostic test modes and code interpretation. Refer to Figure 2 for a list of DTC's and their definitions.

NISSAN DIAGNOSTIC TROUBLE CODE RETRIEVAL DIAGNOSTIC TEST MODE

SWITCHING THE ECM DIAGNOSTIC TEST MODES

Turn the ignition switch to "ON". (Do not start the engine.) The ECM should now be in Diagnostic Test Mode I-Bulb check. The MIL should be illuminated. *(If the MIL is not illuminated, either the bulb is bad, or the circuit is shorted or open, or the ECM test mode selector is turned to the counter-clockwise position.)* Starting the vehicle at this point will engage the ECM in Diagnostic Test Mode I. *(Do not start the vehicle at this point to go on to Diagnostic Test Mode II.)* Locate the ECM and insert a screwdriver into the hole in the right rear corner of the control unit and turn the mode selector fully clockwise. The MIL should go "OFF". Wait at least two seconds. Turn the diagnostic test mode selector fully counter-clockwise. The ECM should now be in Diagnostic Test Mode II. Check the MIL for flash sequence and code retrieval. *(If the selector is turned fully clockwise again at this time, the emission-related diagnostic information that is stored in the computer will be erased from the backup memory in the ECM.)* After code retrieval is complete and any malfunctions are corrected, turn the mode selector fully clockwise to erase codes, wait at least two seconds, and turn the mode selector fully counter-clockwise again and road test the vehicle.

Note: Switching modes is not possible with the engine running. If ignition is turned off for more than five seconds during diagnosis, the diagnosis will automatically return to Mode I. Make sure mode selector is in the fully counter-clockwise position whenever driving the vehicle.

TROUBLE CODE RECOGNITION:

Trouble codes in Diagnostic Test Mode II can be identified by deciphering the flashes of the MIL in the dash. As shown in Figure 1 below, there are long flashes, 0.6 seconds in duration, and short flashes, 0.3 seconds in duration with a pause of 0.9 seconds between the long and short flashes, and a pause of 2.1 seconds between codes. The long flashes (0.6 seconds) represent the first two digits in the code, the short flashes represent the last two digits in the code. For example, a long flash followed by a short pause then two shorter flashes would represent a code of 0102. See the chart in Figure 2 for trouble codes and definitions.

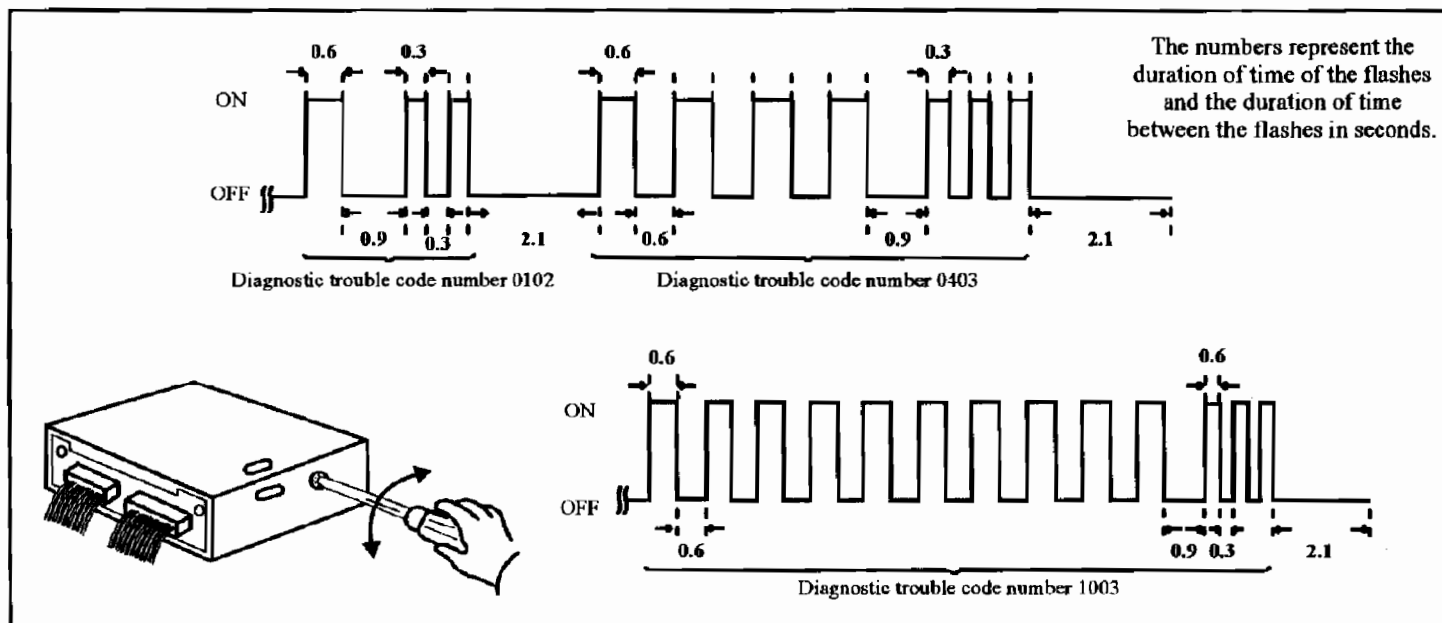


Figure 1

NISSAN DIAGNOSTIC TROUBLE CODE RETRIEVAL DIAGNOSTIC TEST MODE FAULT CODE CHART

OBD II	MIL	DETECTED FAULT	REASON FOR DETECTION
P0705	1101	INHIBITOR SWITCH	A/T control unit receives an invalid signal from the switch based on gear position.
P0710	1208	A/T TEMP SENSOR	A/T control unit receives an excessively high or low voltage from the sensor.
P0720	1102	REVOLUTION SENSOR A/T	A/T control unit does not receive the proper voltage from the revolution sensor.
P0725	1207	ENGINE SPEED SIGNAL	A/T control unit does not receive the proper voltage from the ECM.
P0731	1103	A/T FIRST GEAR SIGNAL	Gear ratio indicates the transmission was not in first gear when commanded.
P0732	1104	A/T SECOND GEAR SIGNAL	Gear ratio indicates the transmission was not in second gear when commanded.
P0733	1105	A/T THIRD GEAR SIGNAL	Gear ratio indicates the transmission was not in third gear when commanded.
P0734	1106	A/T FOURTH GEAR SIGNAL	Gear ratio indicates the transmission was not in fourth gear when commanded.
P0740	1204	TCC SOL. CIRCUIT ERROR	A/T control unit detects high or low amperage on the TCC solenoid circuit.
P0744	1107	A/T LOCK-UP SIGNAL	Gear ratio indicates the transmission was not in lock-up when commanded.
P0745	1205	EPC SOL. CIRCUIT ERROR	A/T control unit detects high or low amperage on the EPC solenoid circuit.
P0750	1108	SOL. "A" CIRCUIT ERROR	A/T control unit detects high or low amperage on the "A" solenoid circuit.
P0755	1201	SOL. "B" CIRCUIT ERROR	A/T control unit detects high or low amperage on the "B" solenoid circuit.
P1705	1206	TPS SENSOR CIRCUIT	A/T control unit does not receive the proper voltage from the throttle sensor.
P1760	1203	O-RUN SOL CIRCUIT ERROR	A/T control unit detects high or low amperage on the over-run solenoid circuit.

Figure 2

NISSAN ELECTRONIC CONTROLLED TRANSMISSIONS HARSH UP-SHIFTS

COMPLAINT: Nissan vehicles, with electronically controlled transmissions, may exhibit harsh upshifts before or after overhaul.

CAUSE: The cause may be, a faulty dropping resistor or a poor connection at the dropping resistor.

CORRECTION: Locate the dropping resistor for your vehicle application as shown in Figure 1. Refer to Figure 2 for the proper ohm check of the dropping resistor. See Figure 3 for the voltage check of the dropping resistor. Replace or repair the connection and dropping resistor as needed.

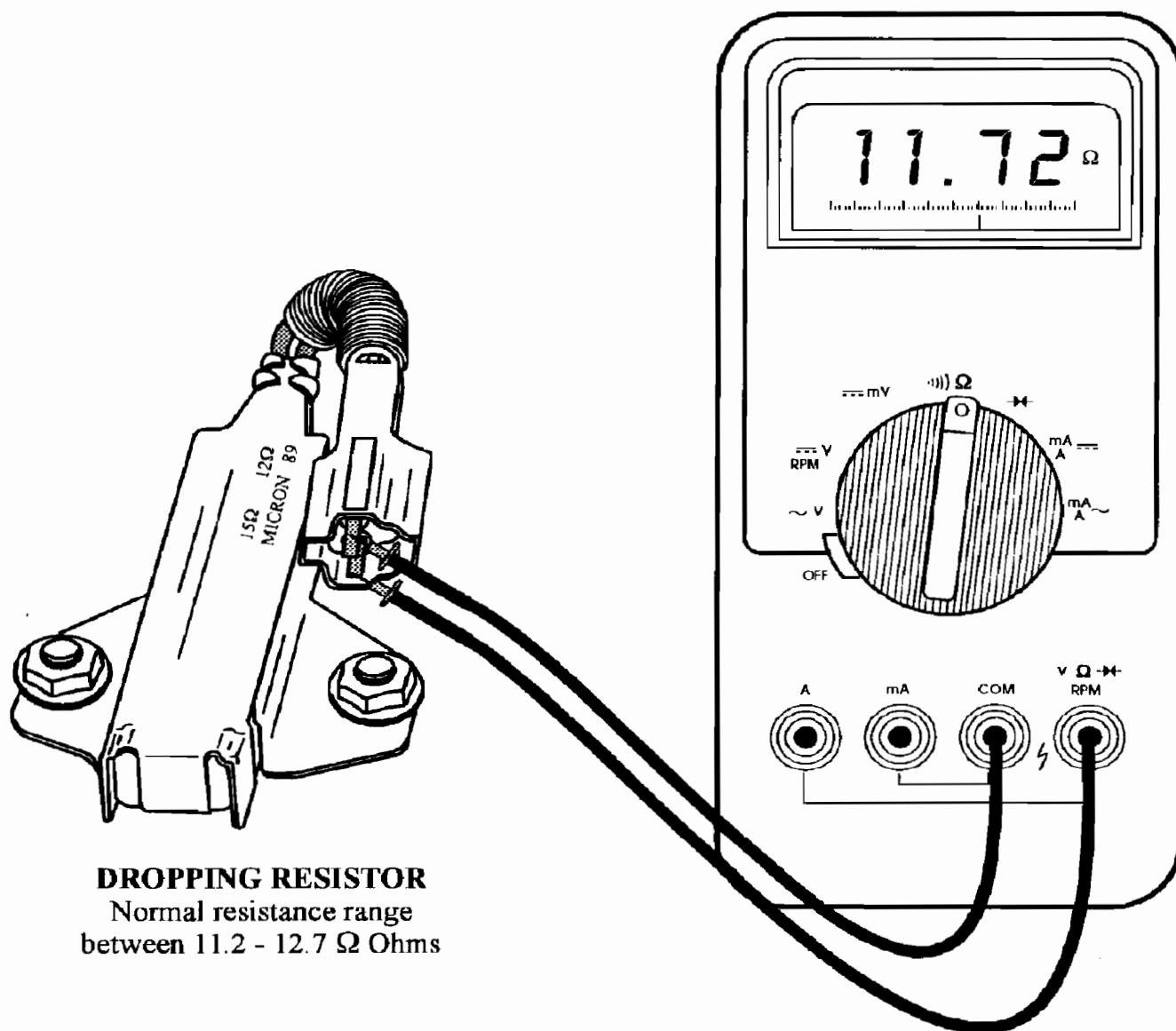
NISSAN DROPPING RESISTOR LOCATIONS

VEHICLE MODEL	MODEL YEAR/ TRANS TYPE	DROPPING RESISTOR LOCATION
NISSAN ALTIMA	(1993-up) RE4FO4A/V	Resistor is located to the front of the drivers side shock tower, bolted on a bracket close to the fender-well.
NISSAN MAXIMA	(1989-94) RE4FO2A/V* (1992-up) RE4FO4A/V*	Resistor is located on the drivers side of the engine compartment bolted to the fender underneath the air filter box.
NISSAN PATHFINDER/ PICK-UP	(1988-up) 4x4 RE4RO1A (1990-up) 3.0 RE4RO1A	Resistor is located on the passenger side of the engine compartment bolted to the fender just behind the battery.
NISSAN SENTRA	(1993-94) RE4FO3A	Resistor is located on the driver side of the engine compartment bolted to the side of the shock tower above the wheel.
NISSAN STANZA	(1990-92) RE4FO2A/V	Resistor is located on the drivers side of the engine compartment bolted to the fender underneath the air filter box.
NISSAN QUEST/ VILLAGER	(1993-up) RE4FO4A/V 4F20E	Resistor is located on the drivers side of the engine compartment bolted to the fender just behind the battery.
NISSAN 200SX	(1995-up) 2.0 RE4FO3A	Resistor is located on the driver side of the engine compartment bolted to the side of the shock tower above the wheel.
NISSAN 240SX	1989-98) RE4RO1A	Left front corner of the engine compartment, behind the air cleaner box, near the ignition coil.
NISSAN 300ZX/ 300ZX TWIN TURBO	(1989-96) RE4RO1A/ RE4RO3A	Behind the plastic inner lining above the passenger side front tire. Behind the battery on the passenger side fender-well (95-96 only).

Figure 1

DROPPING RESISTOR CHECK

Locate the dropping resistor, as shown in the chart in Figure 1, and disconnect the 2 pin harness connector. Place ohm meter across the 2 terminals of the dropping resistor. The ohm meter should indicate between 11.2 and 12.7ohms. Replace as needed.



DROPPING RESISTOR
Normal resistance range
between 11.2 - 12.7 Ω Ohms

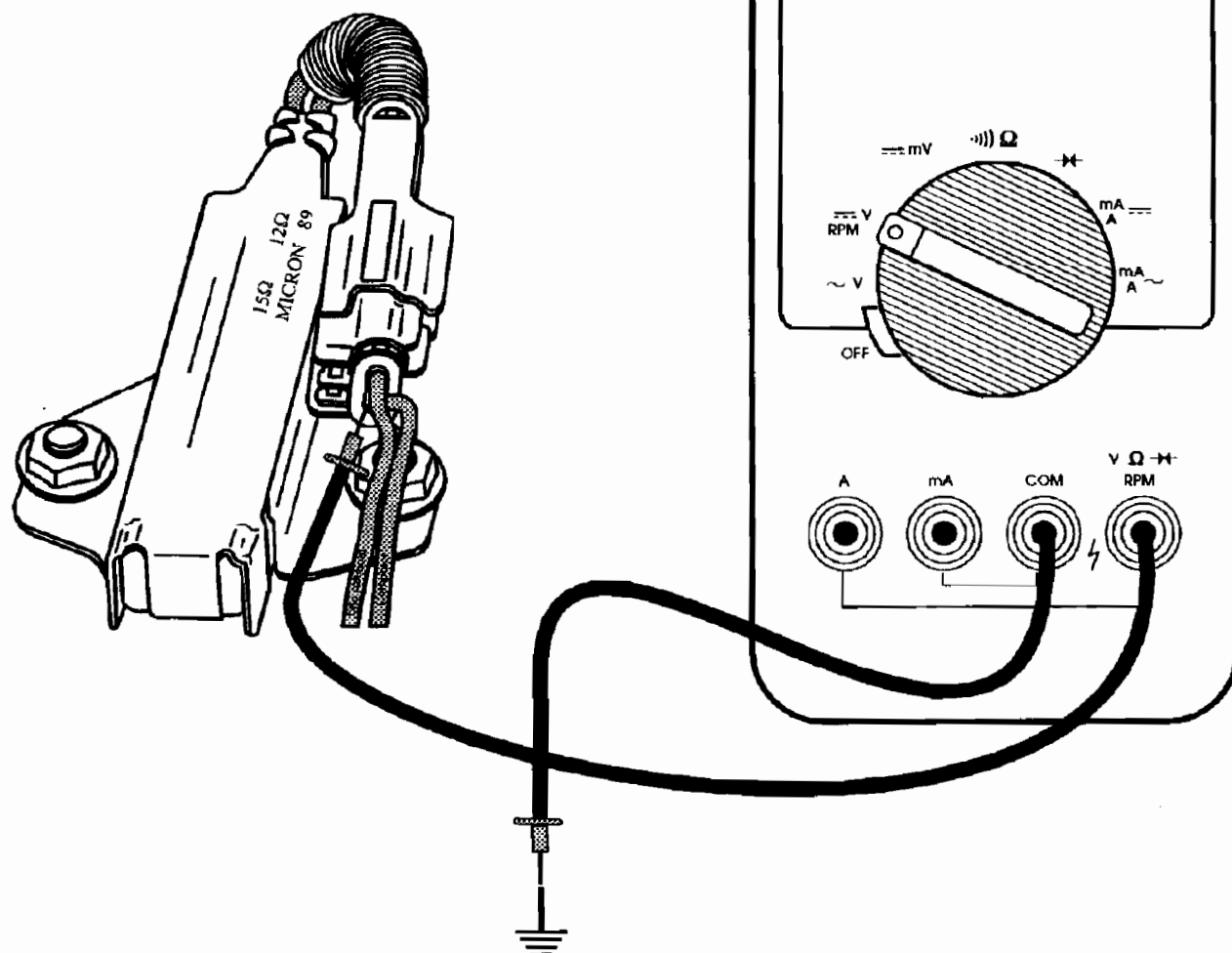
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Figure 2

Automatic Transmission Service Group

DROPPING RESISTOR VOLTAGE CHECK

Locate the dropping resistor according to the chart shown in Figure 1 and carefully back-probe the vehicle harness connector. Attach the red lead of a D.V.O.M. to one of the terminals of the dropping resistor indicated in the figure below, attach the black lead to a good known ground, such as the battery negative terminal. Switch the meter "ON" to the DC volt setting and check voltage. Normal voltage range for the wire coming from the computer is 7-12 volts at closed throttle and .45 volts at full throttle. Normal voltage range for the wire going to the pressure control solenoid is 2.5-3.5 volts at closed throttle and .45 volts at full throttle.



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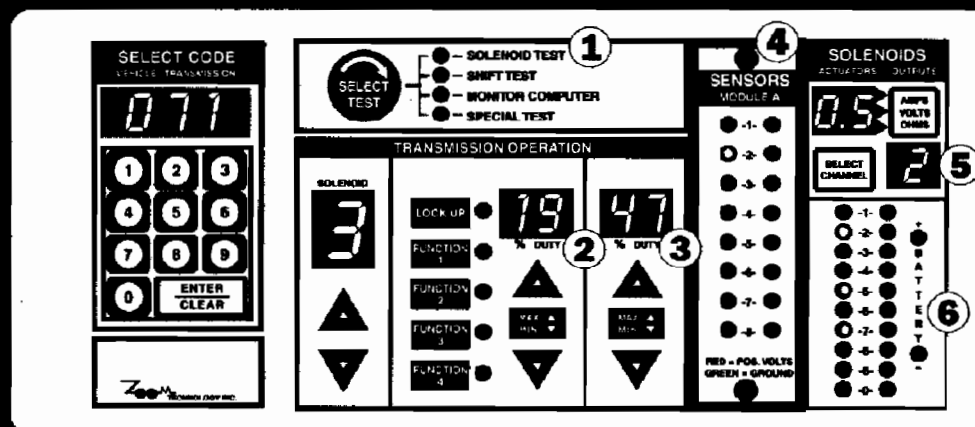
Figure 3

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4. Sensor Monitoring - Temperature sensors, pressure switches, & speed sensors are all accessible through the TranX sensor monitoring system.

5. Integral 10 Channel Multimeter - Nothing else to hook up - just press the channel selector!

MEASURES: SOLENOID RESISTANCES
SOLENOID CURRENT DRAWS
ECU DRIVER CURRENTS
BATTERY VOLTAGE

6. 10 Solenoid Channels - TranX 2000™ can operate transmissions with up to **10 solenoids**. Each channel has a separate bicolor status LED as well as a 2mm test point (break-out).

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NISSAN MAXIMA**ACC VALVE CONNECTOR SWITCHED WITH INHIBITOR SWITCH CONNECTOR
(RE4FO2A EQUIPPED VEHICLES ONLY)**

COMPLAINT: The transmission makes a 1-2 shift only and the reverse lamps do not illuminate. The power lamp does come on for 2 seconds when the ignition is turned on and goes out.
When the correct code call-up procedure is initiated, the power lamp did not respond and engine idle was erratic.

NOTE: These complaints are usually exhibited after engine replacement.

CAUSE: The Auxiliary Air Control Valve (AAC) connector was switched with the Inhibitor Switch connector.

CORRECTION: Reconnect the Inhibitor Switch connector and the AAC Valve connectors to the correct vehicle harness connectors.
The confusion on the part of the technician doing the engine swap is the fact that both of these connectors have the same configuration as shown in figure 1 and both of these connectors are in the same general location of the engine bay as seen in figure 2.

**ACC VALVE CONNECTOR SWITCHED WITH INHIBITOR SWITCH CONNECTOR
(RE4FO2A EQUIPPED VEHICLES ONLY)**

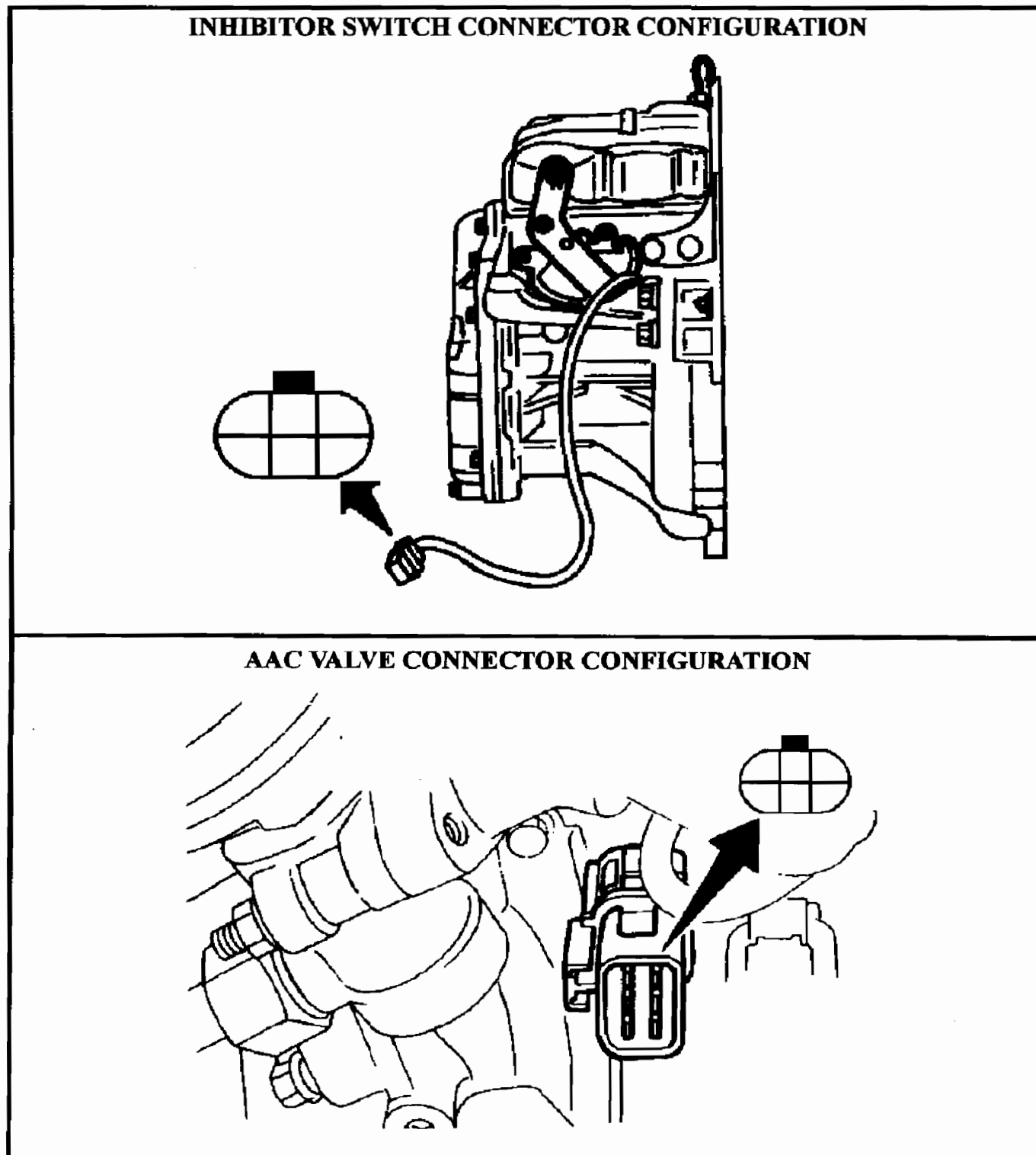


Figure 1

**ACC VALVE CONNECTOR SWITCHED WITH INHIBITOR SWITCH CONNECTOR
(RE4FO2A EQUIPPED VEHICLES ONLY)**

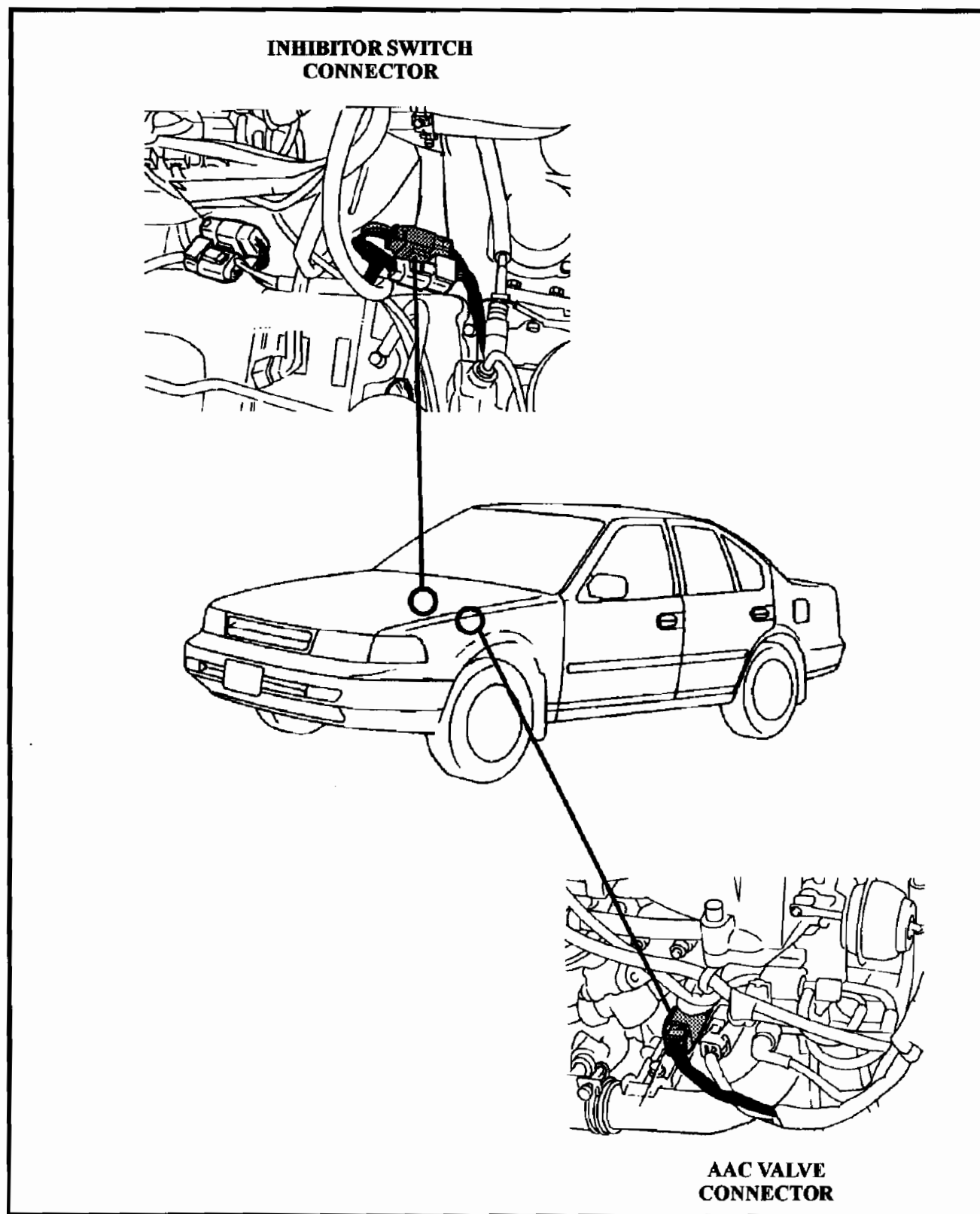


Figure 2

NISSAN 4N71B
INTERMEDIATE SHAFT AND OVERDRIVE
DRUM SUPPORT COMPATABILITY

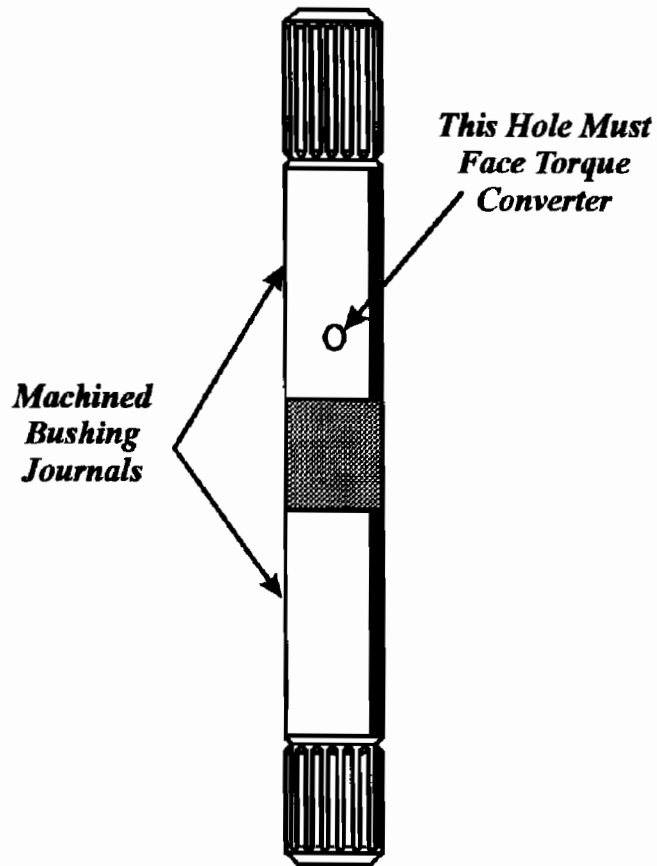
The 4N71B series of transmissions utilizes three different intermediate shafts and two different overdrive drum supports that are not all compatible with one another. The determining factor to decide which O.D. drum support goes with which intermediate shaft is the bushing arrangement in the drum support and goes as follows, and is illustrated in Figures 1, 2 and 3.

Refer to Figure 1, - This intermediate shaft has machined bushing journals on both ends of the shaft and requires two small bushings, one on the front side and one on the rear side in the overdrive drum support, as illustrated in Figure 1. The lube hole in the intermediate shaft ***must*** face the torque converter. Failure to install it properly will result in overdrive planetary failure.

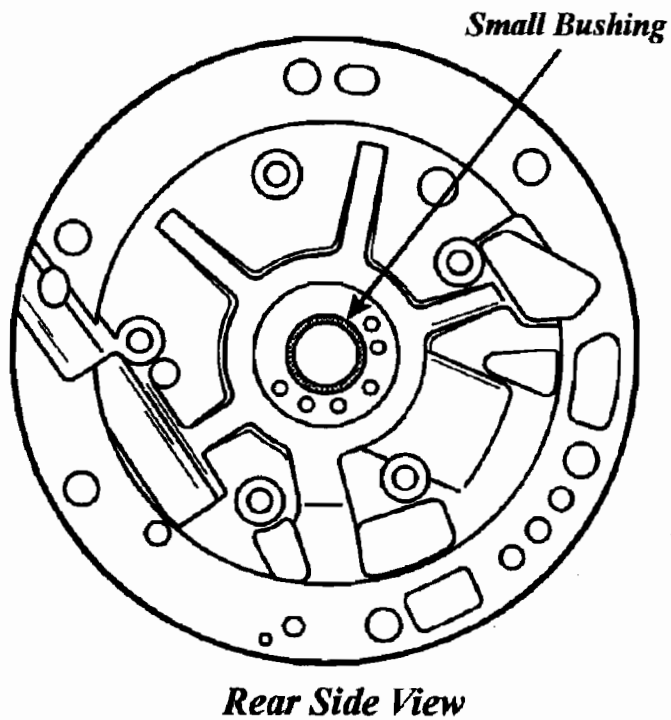
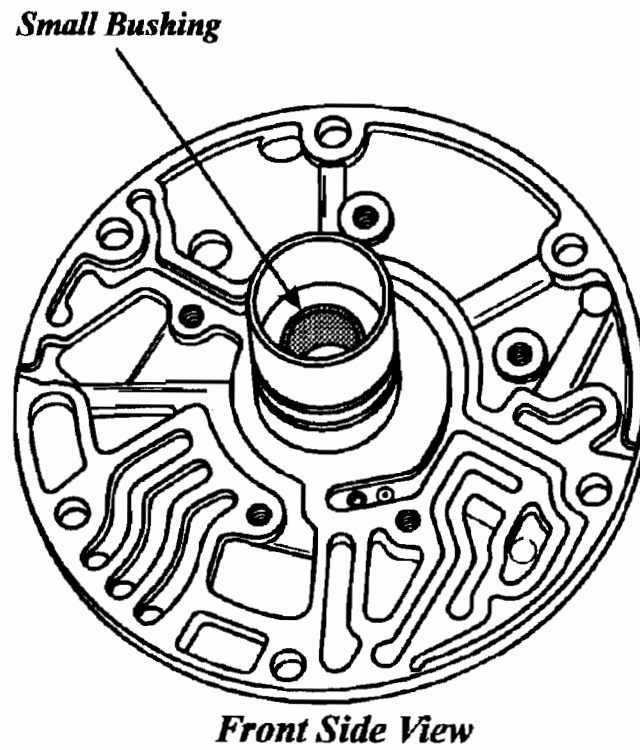
Refer to Figure 2, - This intermediate shaft has a machined bushing journal on only the rear side of the shaft and requires one small bushing on rear side and one large bushing on the front side in the overdrive drum support, as illustrated in Figure 2. The small bushing supports the intermediate shaft and the large bushing supports the overdrive internal ring gear, which in turn supports the front of the shaft. The non-machined end of this intermediate shaft ***must*** face the torque converter.

Refer to Figure 3, - This intermediate shaft has a machined bushing journal on only the rear side of the shaft and requires one small bushing on rear side and one large bushing on the front side in the overdrive drum support, as illustrated in Figure 3. Notice that this intermediate shaft also has a pilot on the rear side of the shaft and is used only in the turbo-charged versions. The small bushing supports the intermediate shaft and the large bushing supports the overdrive internal ring gear, which in turn supports the front of the shaft. The non-machined end of this intermediate shaft ***must*** face the torque converter.

INTERMEDIATE SHAFT



OVERDRIVE DRUM SUPPORT

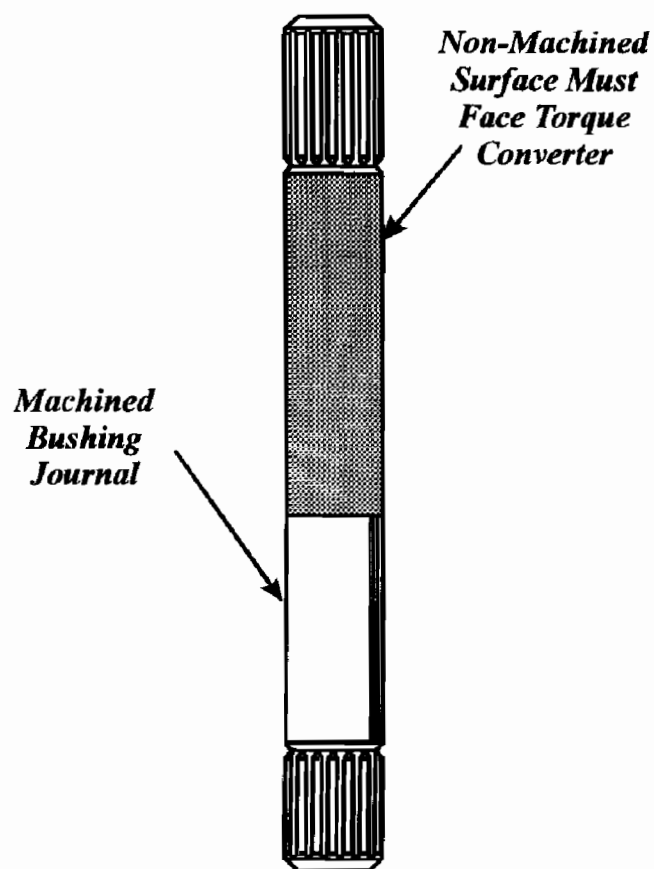


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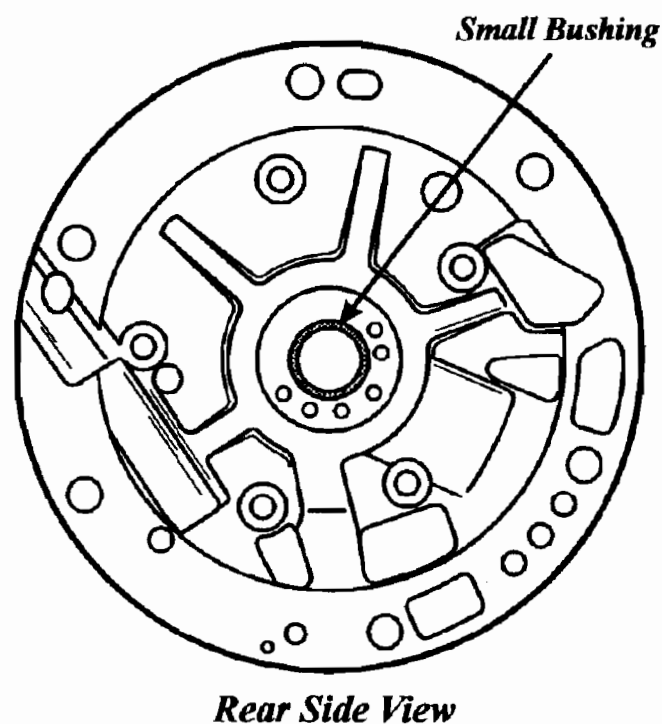
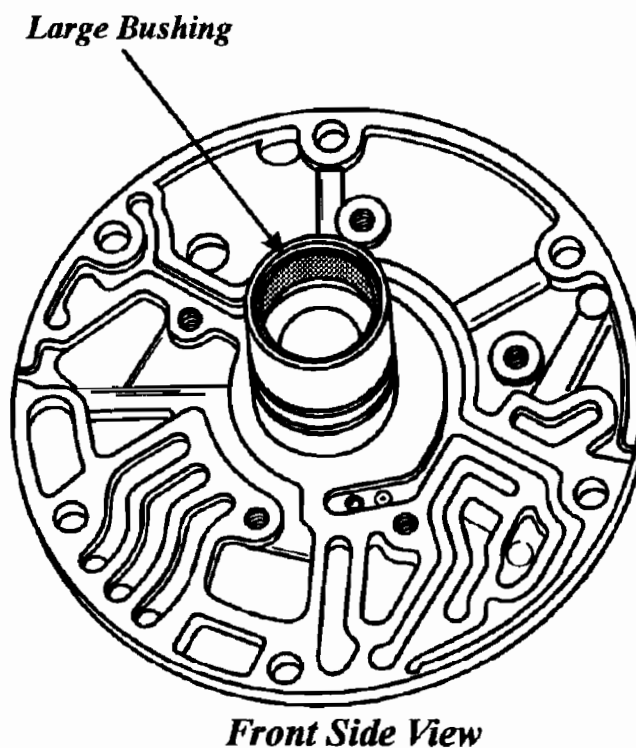
Figure 1

SLIDE

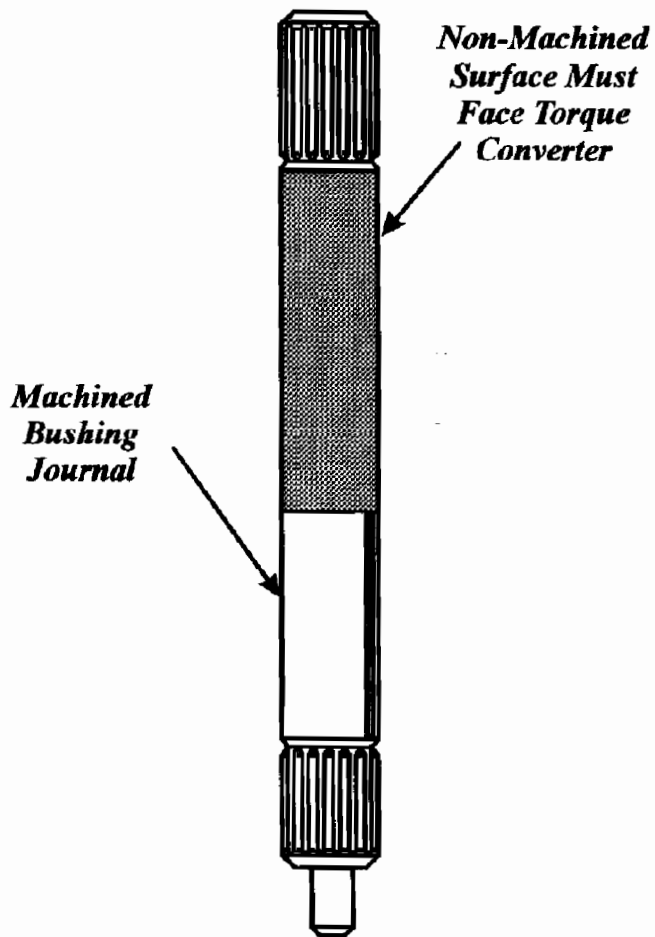
INTERMEDIATE SHAFT



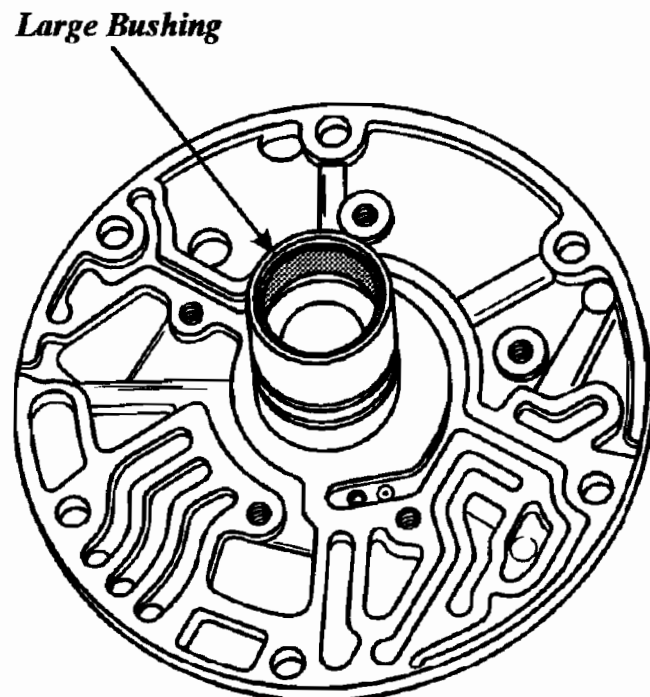
OVERDRIVE DRUM SUPPORT



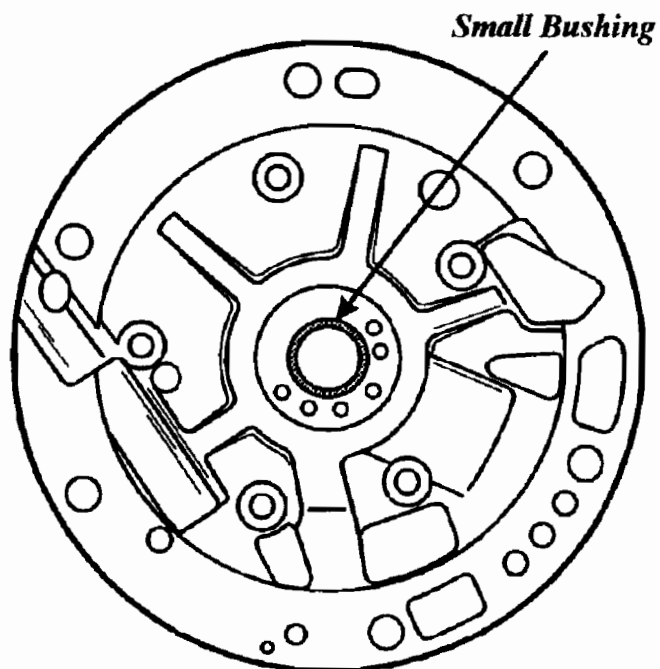
INTERMEDIATE SHAFT



OVERDRIVE DRUM SUPPORT



Front Side View



Rear Side View

Figure 3



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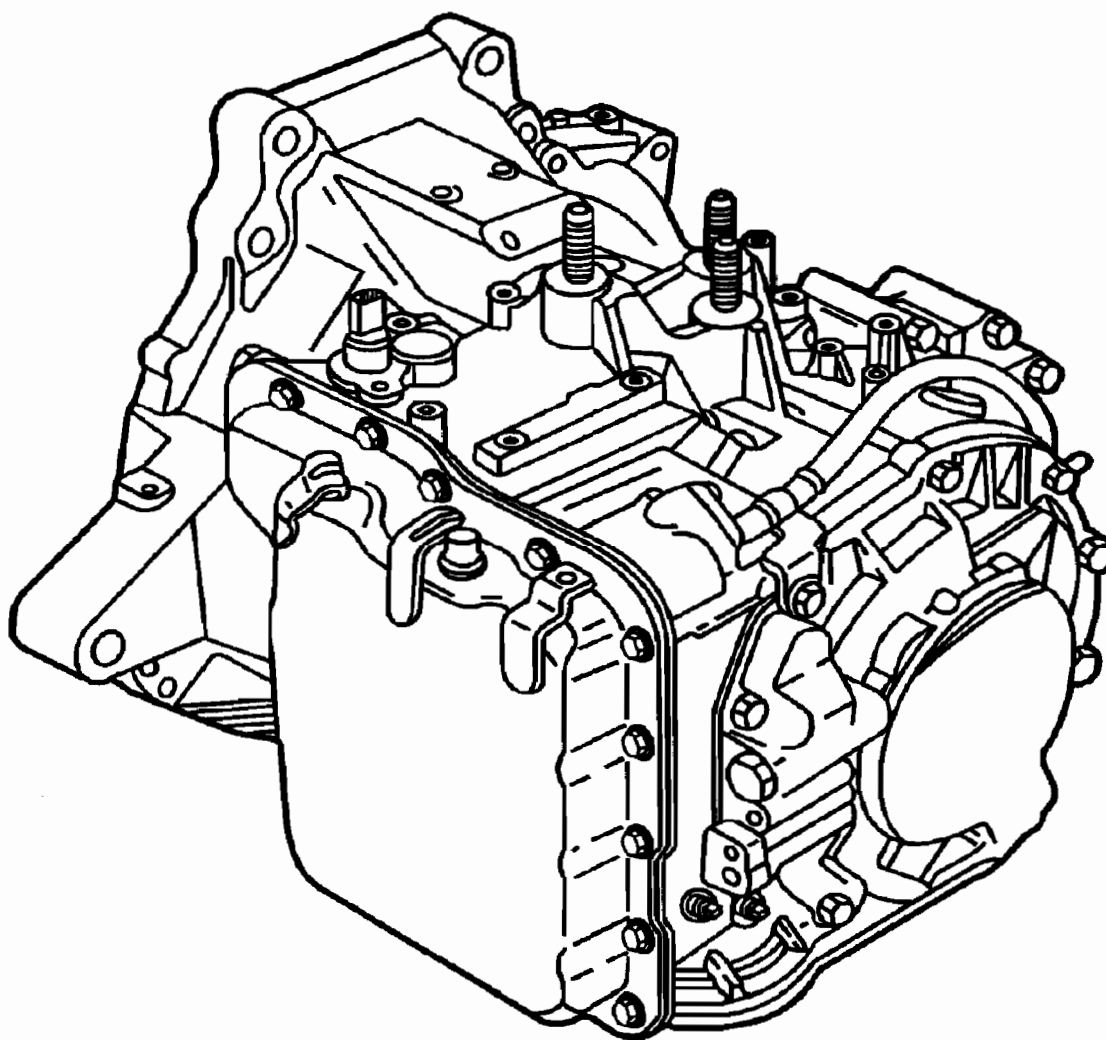
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**MAZDA "G4" SERIES
TRANSAXLE IDENTIFICATION**



IDENTIFYING THE G4 SERIES TRANSMISSIONS

The G4 series transaxle are found in both Ford and Mazda vehicles. There are three distinct categories:

1. G4A-HL
2. G4A-EL
3. GF4A-EL

The breakdown for each is as follows:

G4A-HL - This is an overdrive transaxle that uses a governor for the 1-2 and 2-3 shift. The shift into overdrive is controlled by a cancel solenoid. This means when the solenoid is not energized a shift into fourth gear will take place. Converter clutch apply occurs only when in fourth gear. Line pressure is operated by a throttle cable. This unit was only produced from 1988 to 1989 in the Mazda 323 vehicle.

G4A-EL - This is an overdrive transaxle where all shifts are computer controlled. Line pressure is operated by a throttle cable. This unit was first used in 1987 in Mazda 626 vehicles. Ford began using this transaxle in their 1989 Probe vehicle which is know as the 4EAT transmission. It was also used in Capri vehicles starting in 1991. This transaxle breaks down into 3 specific categories:

1. 1987 2.2L Mazda 626 vehicle **ONLY**
2. 1988-1992 Non Turbo 2.2L vehicles
3. 1988-1992 Turbo & 3.0L V6 vehicles.

GF4A-EL - This is a completely computer controlled transmission. The throttle cable has been eliminated and line pressure is controlled via a solenoid. The converter clutch is applied with the use of a typical ON/OFF solenoid and a PWM solenoid. The PWM solenoid controls the feel of both the apply and release of the T.C.C. This transaxle found its way into both the Ford Probe and Mazda 626 vehicles in 1993.

PARTS INTERCHANGEABILITY

The technician must be aware that a 1987 G4A-EL is a unit that stands completely alone. Most of the parts will not interchange with any other unit.

Most of the gear train inside a G4A-HL will interchange with a 88-92 Non Turbo G4A-EL transaxle with the exception of the final drive components.

The pump shaft, the pump cover, the friction plates and the band in a GF4A-EL transaxle will interchange with the 88-92 Non Turbo G4A-EL.

GEAR RATIOS

These transaxle's all have the same gear box ratios. However, the final drive changes the overall ratio. These ratios are as follows:

- 2.800 : 1 First Gear
- 1.540 : 1 Second Gear
- 1.000 : 1 Third Gear
- 0.700 : 1 Fourth Gear
- 2.333 : 1 Reverse

The following pages contain information on tag identification as well as bell housing case I.D. Mazda I.D. tag information shown in Figure 1, and Ford I.D. tag information shown in Figure 2. The various bell housings and engine sizes are identified as follows:

- G4A-HL - 1988-89 1.6L **(See Figure 3)**
- G4A-EL - 1987 2.2L **(See Figure 4)**
- G4A-EL - 1988-92 2.2L Non Turbo **(See Fig. 5)**
- G4A-EL - 1988-92 2.2L Turbo **(See Figure 5)**
- G4A-EL - 1988-92 3.0L V6 **(See Figure 6)**
- GF4A-EL - 1993 & Up 2.5L **(See Figure 7)**
- GF4A-EL - 1993 Only 2.0L **(See Figure 8)**

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MAZDA G4A-EL Identification

○ JM1GG2215H1156001 ○

1. Manufacturer

M or Y = Mazda

2. Model

GD = MX6, 626

GB, GC, GE, GH, GJ, GK = 626

BG = Protogé

BF, BJ, BK, BL, BW = 323

3. Engine Codes

1987-92: 1 or A

2 or B = 2.2L Non-Turbo

3 or C

4 or D = 2.2L Turbo

1993 & UP: A = 2.5L V6

C = 2.0L

4. Year

H = 1987

J = 1988

K = 1989

L = 1990

M = 1991

N = 1992

P = 1993

R = 1994

1987
I D Number Location

1988 & Up
I D Number Location

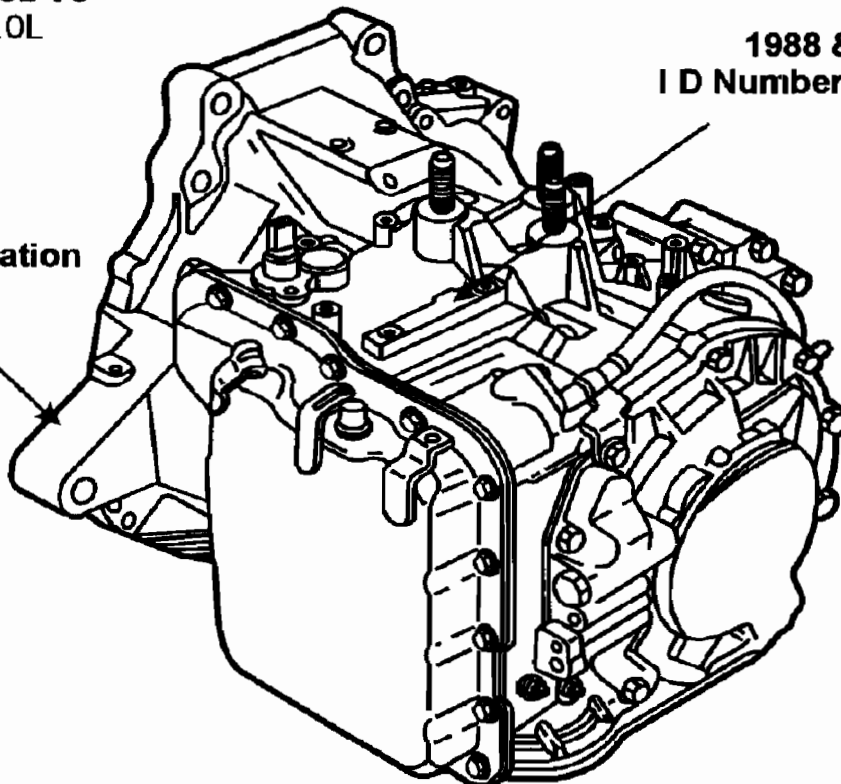


Figure 1

FORD G4A-EL Identification

○ IZCVT20A9P5135996 ○

1. Manufacturer

Z = Ford

2. Model

20 = Probe GL

21 = Probe LX

22 = Probe GT

01, 03 = Capri

3. Engine Codes

A = 2.0L SEFI

B = 2.5L V6 SEFI

C = 2.2L MPFI Turbo

L = 2.2L MPFI Non-Turbo

U = 3.0L V6 MPFI

4. Year

K = 1989

L = 1990

M = 1991

N = 1992

P = 1993

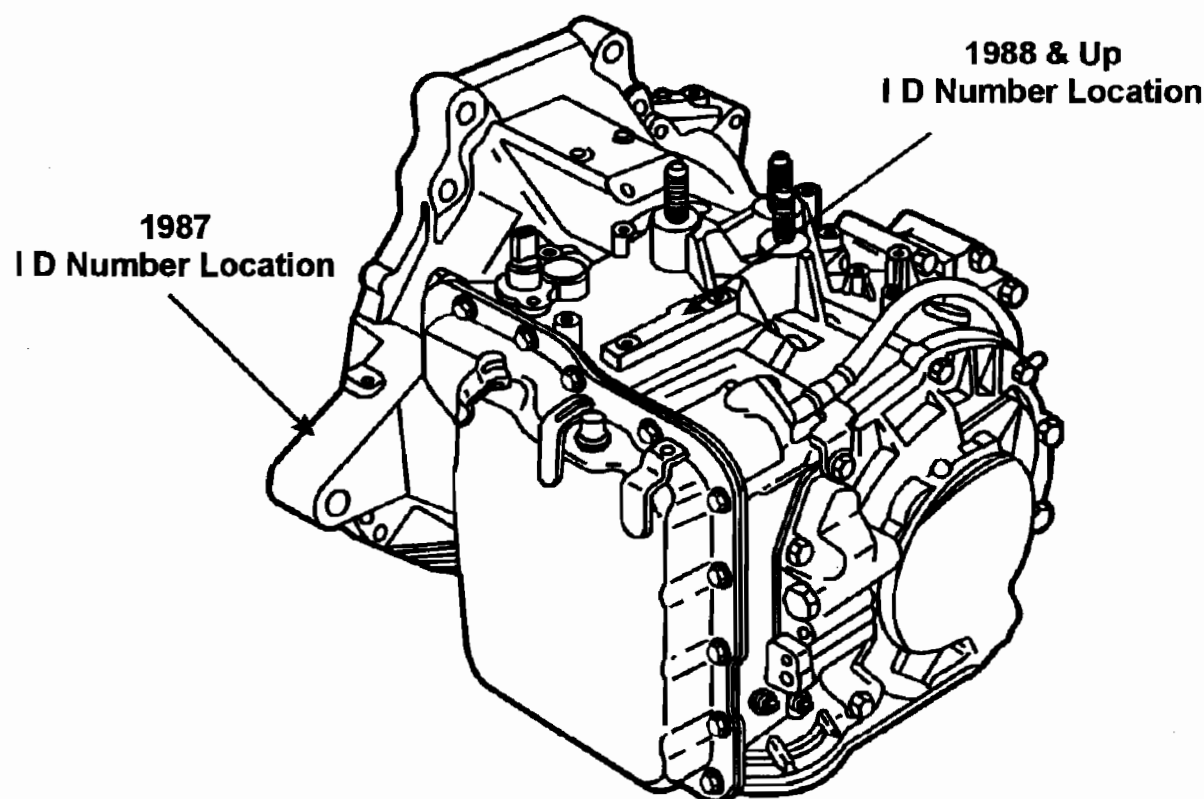
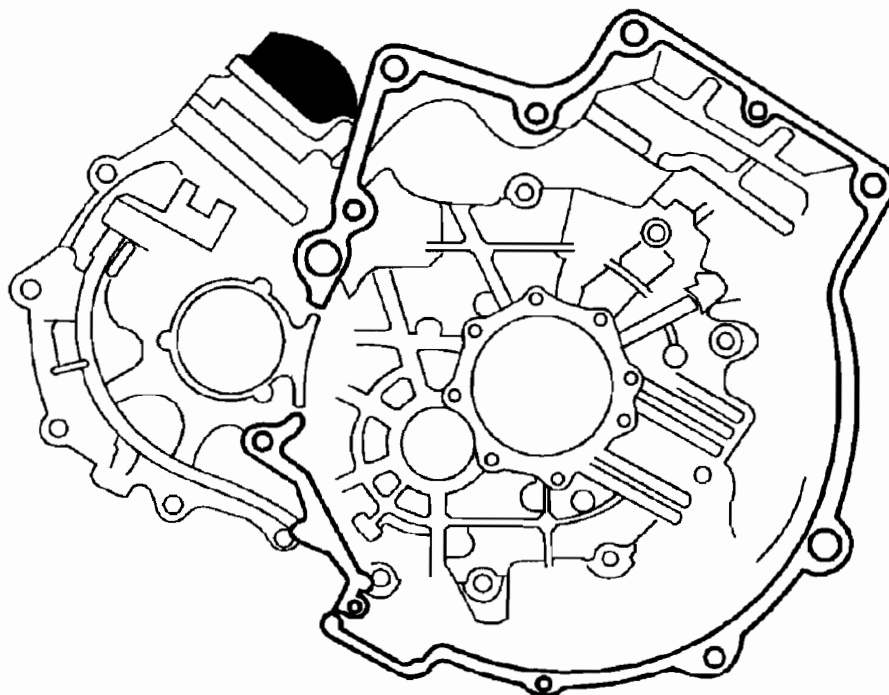


Figure 2

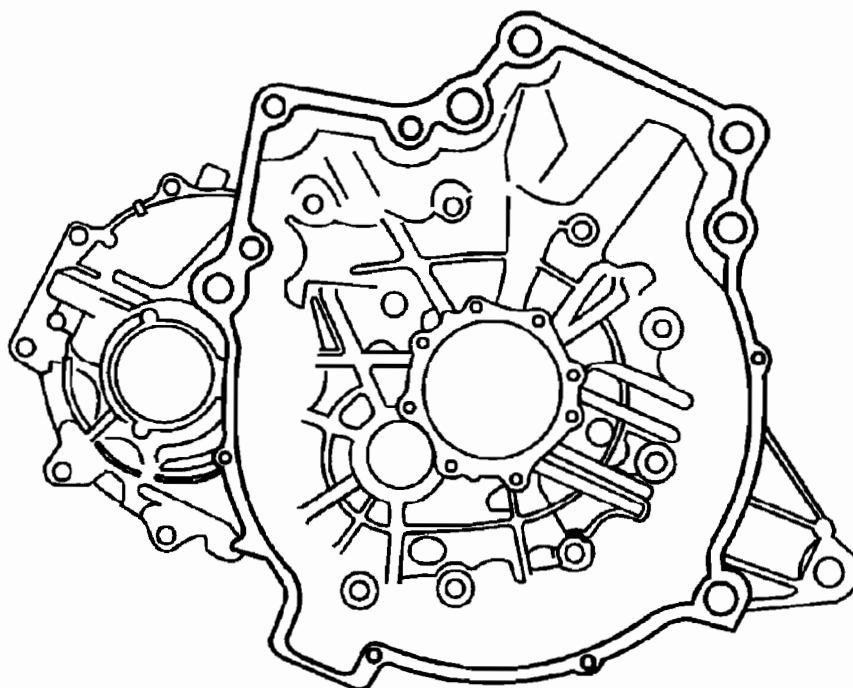
**1988-1989 G4A-HL
1.6L Mazda 323**



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Figure 3

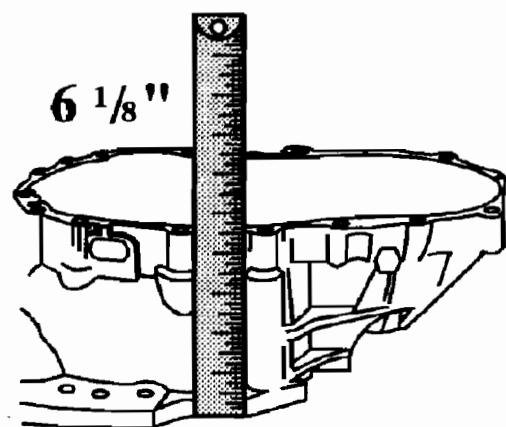
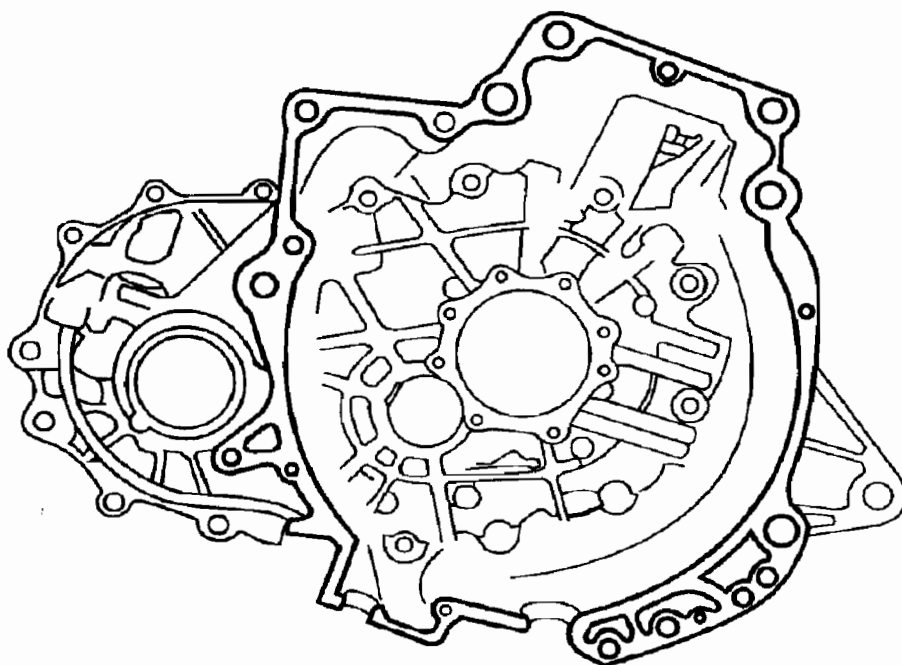
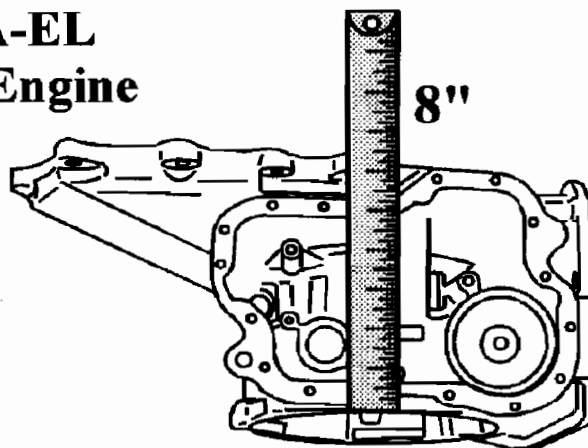
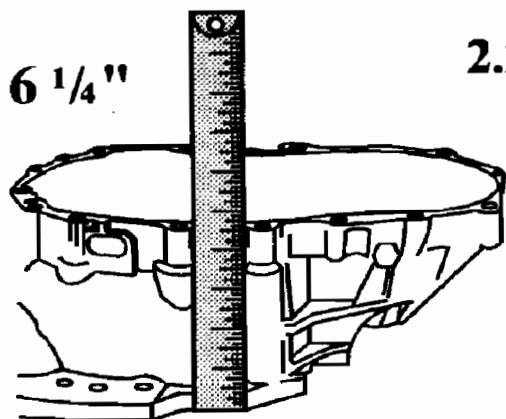
**1987 G4A-EL
2.2L Engine**



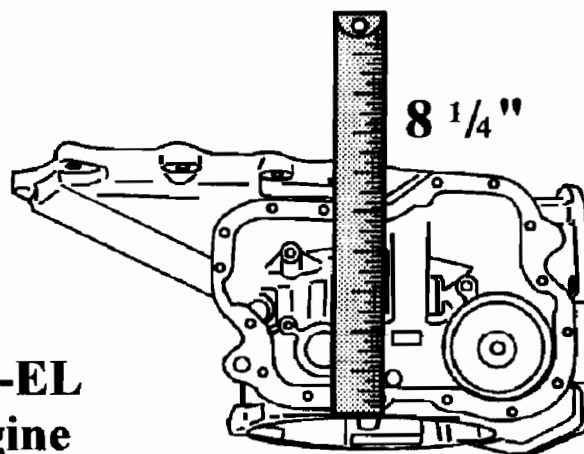
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Figure 4

**1988-1992 G4A-EL
2.2L Non-Turbo Engine**



**1988-1992 G4A-EL
2.2L Turbo Engine**



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Figure 5

SLIDE

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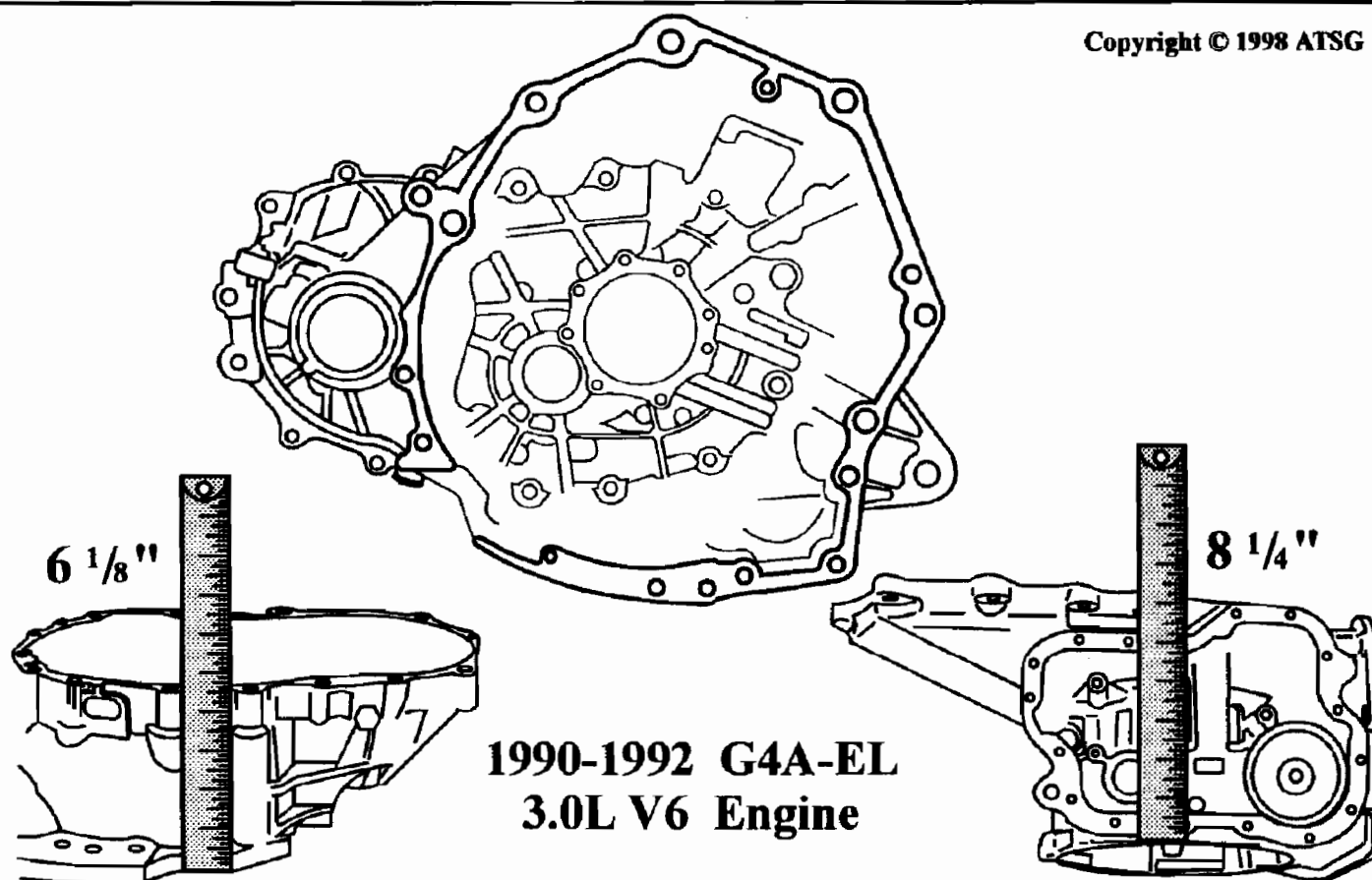
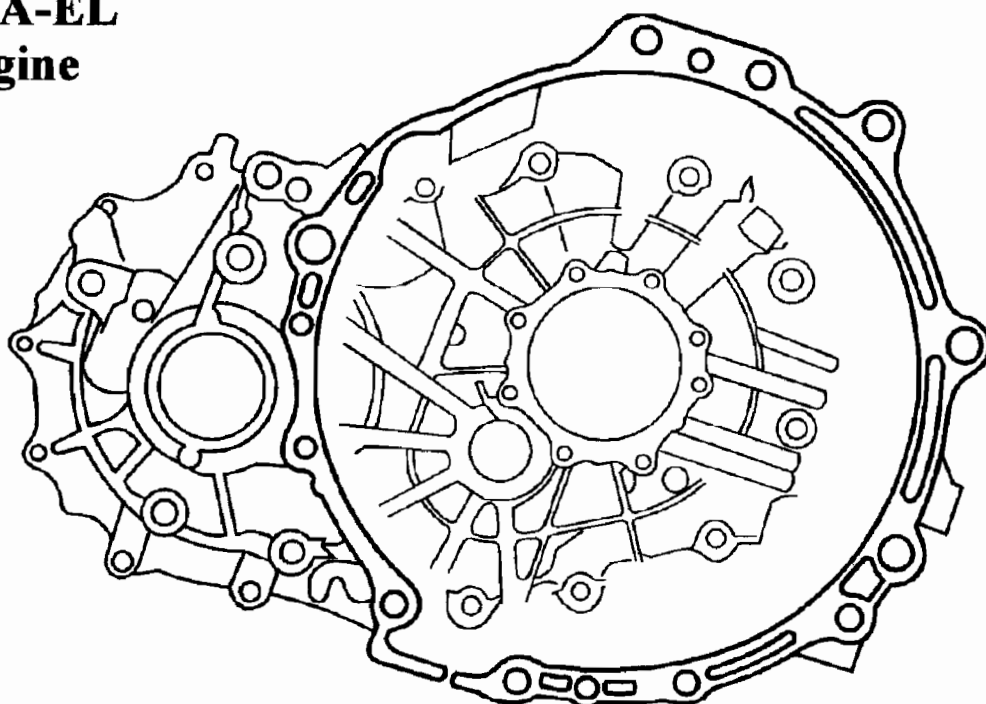


Figure 6

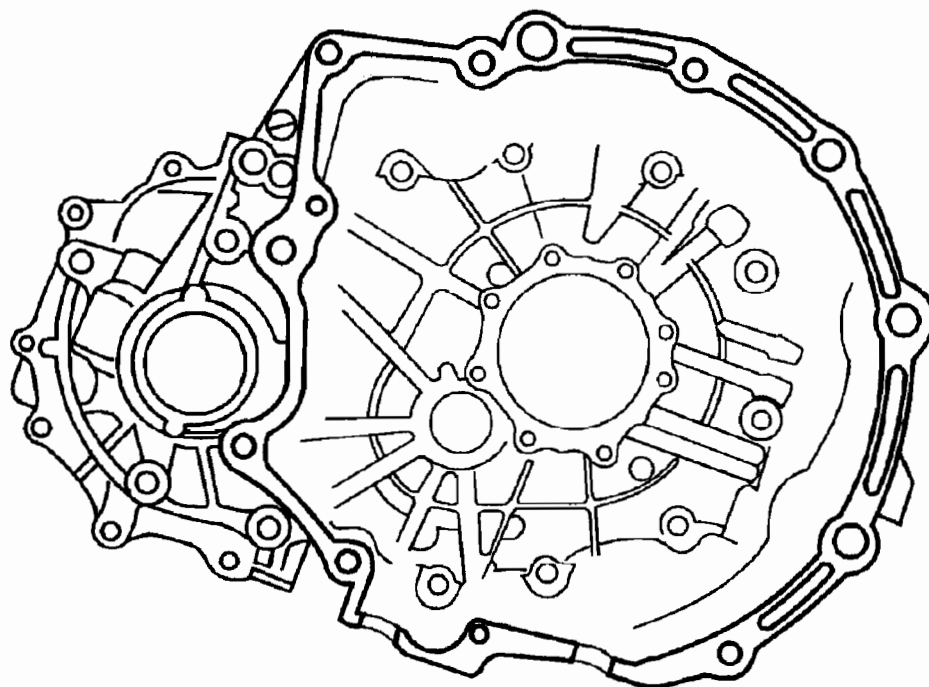
**1993-UP GF4A-EL
2.5L V6 Engine**



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Figure 7

1993-Only GF4A-EL 2.0L Engine



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Figure 8

SLIDE**MAZDA MPV R4A-EL
NO 3-4 UPSHIFT**

COMPLAINT: Mazda MPV vehicles, equipped with R4A-EL transmissions, may exhibit normal upshifts from 1-2 and 2-3 with a NO 4th gear upshift condition before or after overhaul.

CAUSE: The cause may be, a faulty or mis-adjusted inhibitor switch, a faulty Theft Deterrent System or a grounded wire harness leading to the Inhibitor Signal fuse. Mazda shift strategy requires a signal from the inhibitor switch which tells the control unit "Load / No Load input or Park / Neutral position signal. This 12 volt signal is from the ECU and is shared with the TCM, Cruise Control Unit and Instrument Cluster. This voltage is grounded or "0" volts when the vehicle is in the Park or Neutral positions and 12 volts in Reverse, Drive, Manual 2nd and Manual 1st. If the TCM does not see 12 volts when in the Drive position, the TCM will think it is still in Park/Neutral and may not attempt an upshift into 4th gear even though there is a 12 volt input from the inhibitor switch telling the TCM that we have selected Drive.

CORRECTION: Follow the steps listed below and repair or replace as needed.

STEP 1: Probe the positive lead of the voltmeter to either terminal in the back of the inhibitor signal fuse and the negative lead to a known good ground, as shown in Figure 1, and turn the ignition switch *on*.

- The voltmeter should indicate less than 1 volt in the Park and Neutral positions and 12 volts in the Reverse, Drive, Manual 2nd and Manual 1st position. If the volt meter indicates less than 1 volt in all shifter positions go to **STEP 2**.

STEP 2: Remove the Inhibitor Signal fuse, as shown in Figure 2, and probe the positive lead into terminal "B," with ignition switch *on*.

The voltmeter should indicate 12 volts in all shifter positions. If the voltmeter indicates 12 volts in all ranges go to **STEP 3**.

- If the voltmeter does not indicate 12 volts, turn ignition switch *off* and set meter to ohms. Probe terminal "B." If there is continuity to ground, repair the grounded wire or wires leading to the TCM, ECU, Instrument Cluster or Cruise Control unit.
- If there is no continuity to ground, repair the open wire from the ECU to terminal "B" at the interior fuse panel. **NOTE:** The ECU, TCM, Instrument Cluster and Cruise Control wires are spliced together before they reach the Interior Fuse Panel.

STEP 3: Probe the positive lead of the voltmeter, now set to ohms, to terminal "A" in the Interior Fuse Panel with ignition switch off as shown in Figure 3. The ohm meter should indicate continuity in the Park and Neutral positions only and open or "O.L." in all other ranges.

- If it reads continuity in all ranges, disconnect the 3 terminal connector at the inhibitor switch. If it reads "O.L." or open when the connector is disconnected go to **STEP 4**.
- If the meter still indicates continuity, locate the Theft Deterrent System and disconnect the wire leading to the "A" terminal. If there is no Theft Deterrent System, repair the grounded wire from the inhibitor switch to terminal "A."

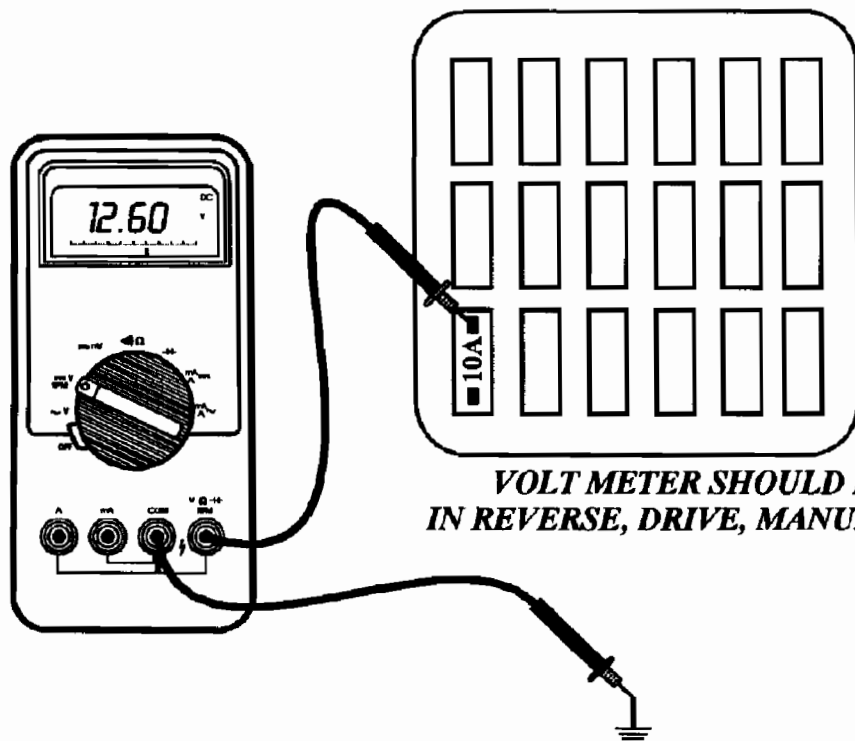
STEP 4: Place ohm meter across terminals 1 and 2 as shown in Figure 4. The ohm meter should indicate continuity in the Park and Neutral positions and "O.L." or open in Reverse, Drive, Manual 2nd and Manual 1 positions. If it indicates continuity in all ranges replace the inhibitor switch. If it indicates continuity in only some of the other ranges check the adjustment as shown in Figure 4.

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SLIDE

STEP 1

INTERIOR FUSE PANEL



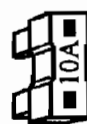
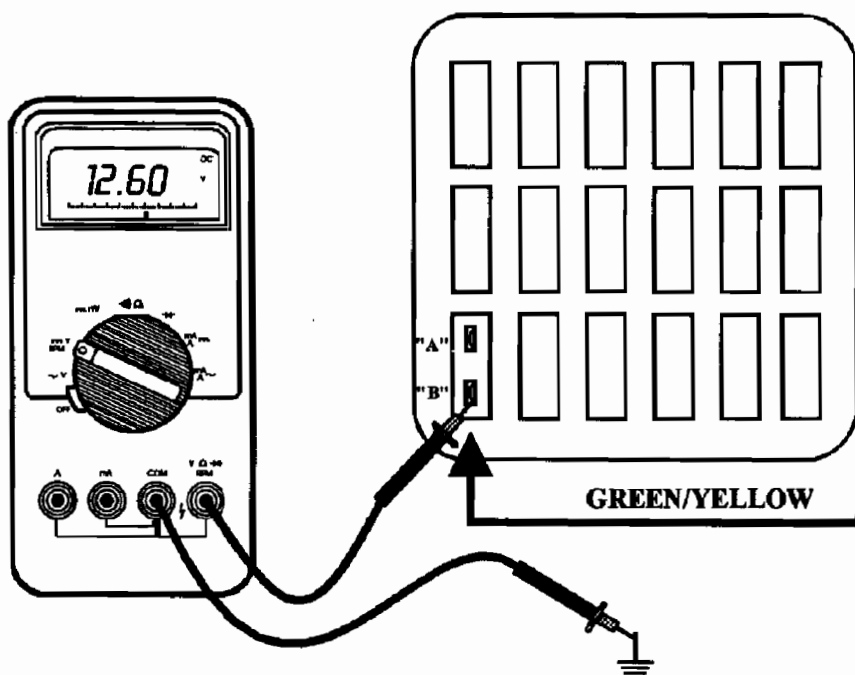
**VOLT METER SHOULD INDICATE 12 VOLTS
IN REVERSE, DRIVE, MANUAL 2nd AND MANUAL 1st**

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Figure 1

STEP 2

INTERIOR FUSE PANEL



**INHIBITOR SIGNAL
FUSE REMOVED**

GREEN/YELLOW

ECU

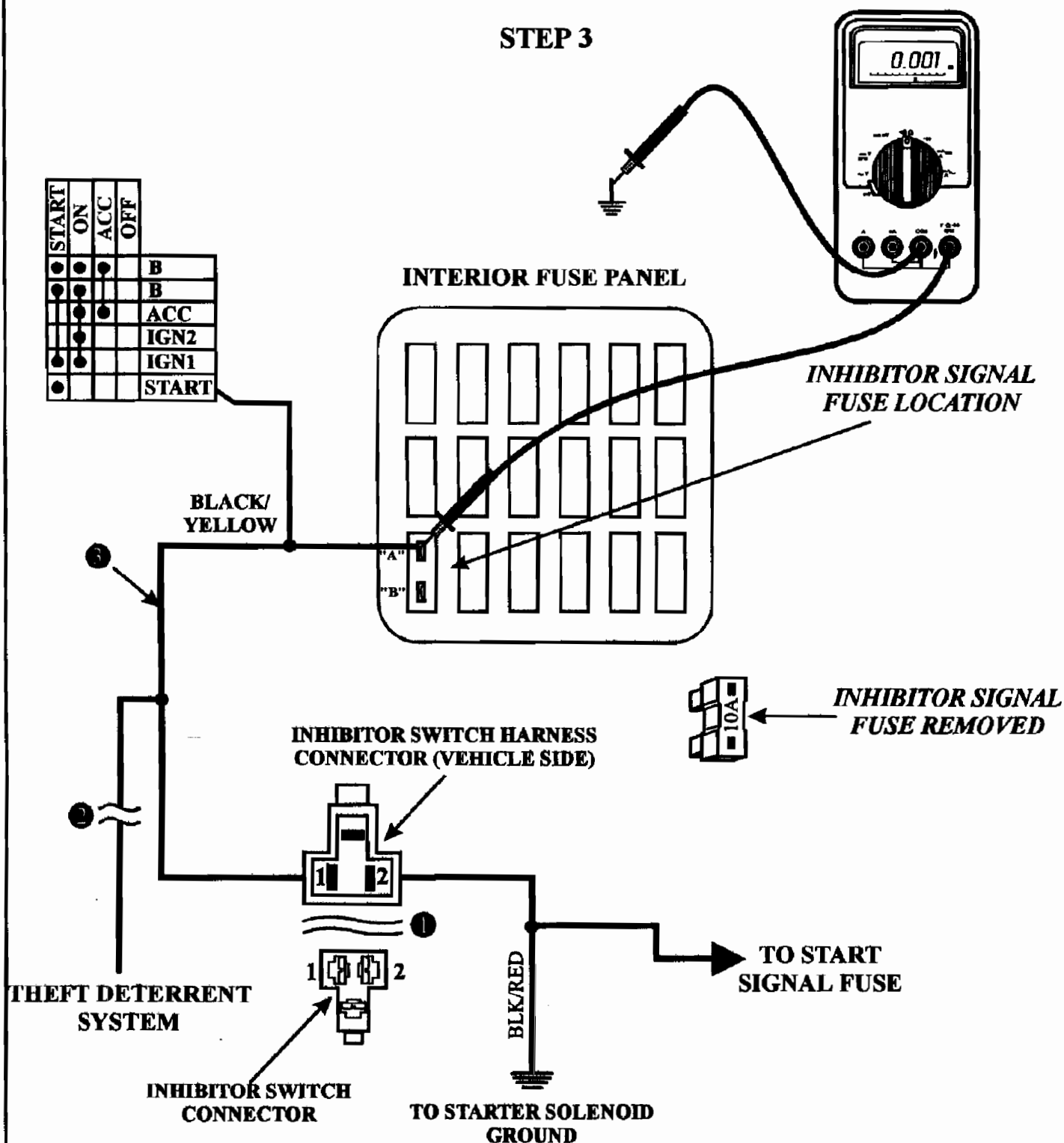
**CRUISE CONTROL UNIT
INSTRUMENT CLUSTER**

TCM

VOLT METER SHOULD INDICATE 12 VOLTS IN ALL RANGES Copyright © 1998 ATSG

Figure 2

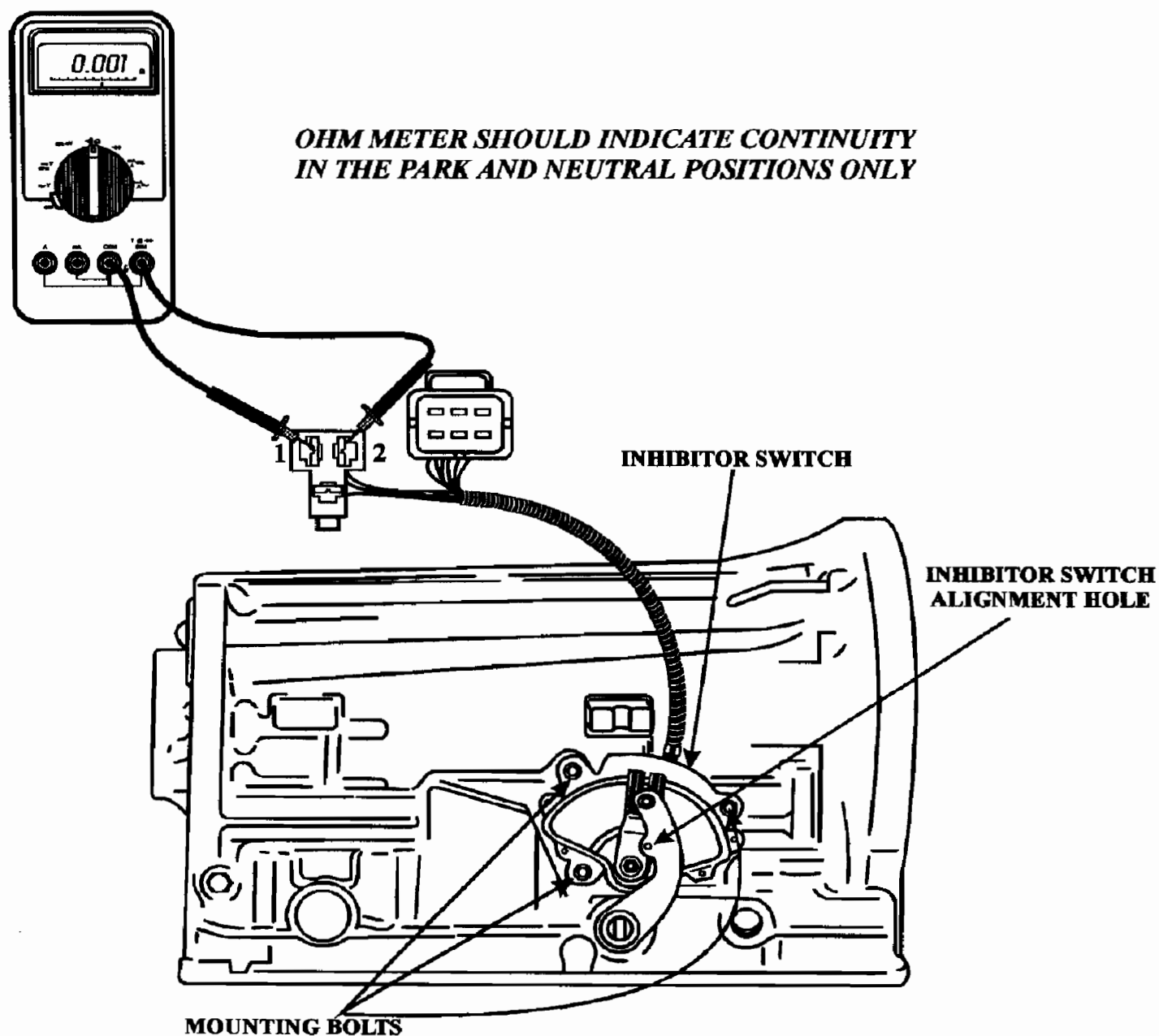
STEP 3



- ① IF CONTINUITY IS INDICATED IN ALL RANGES, DISCONNECT INHIBITOR SWITCH
- ② IF CONTINUITY IS INDICATED IN ALL RANGES, WITH INHIBITOR SWITCH DISCONNECTED, LOCATE THEFT DETERRENT SYSTEM AND DISCONNECT WIRE LEADING TO TERMINAL "A."
- ③ IF CONTINUITY IS INDICATED IN ALL RANGES, WITH INHIBITOR SWITCH DISCONNECTED, AND THEFT DETERRENT SYSTEM DISCONNECTED, REPAIR GROUNDED WIRE.

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Figure 3

SLIDE**STEP 4****INHIBITOR SWITCH ADJUSTMENT**

Place the selector lever in Neutral. Loosen the 3 mounting bolts that attach the inhibitor switch to the case and adjust the inhibitor switch until a 5/32 drill bit will pass through the selector lever, inhibitor switch lever into the inhibitor switch guide hole.

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Figure 4

THM 4L30-E VALVE BODY SCREENS

COMPLAINT: Previously, unavailable valve body screens required that a complete valve body be purchased from Isuzu, which was ridiculous.

CAUSE: Parts personnel were unable to find the part numbers for the screens.

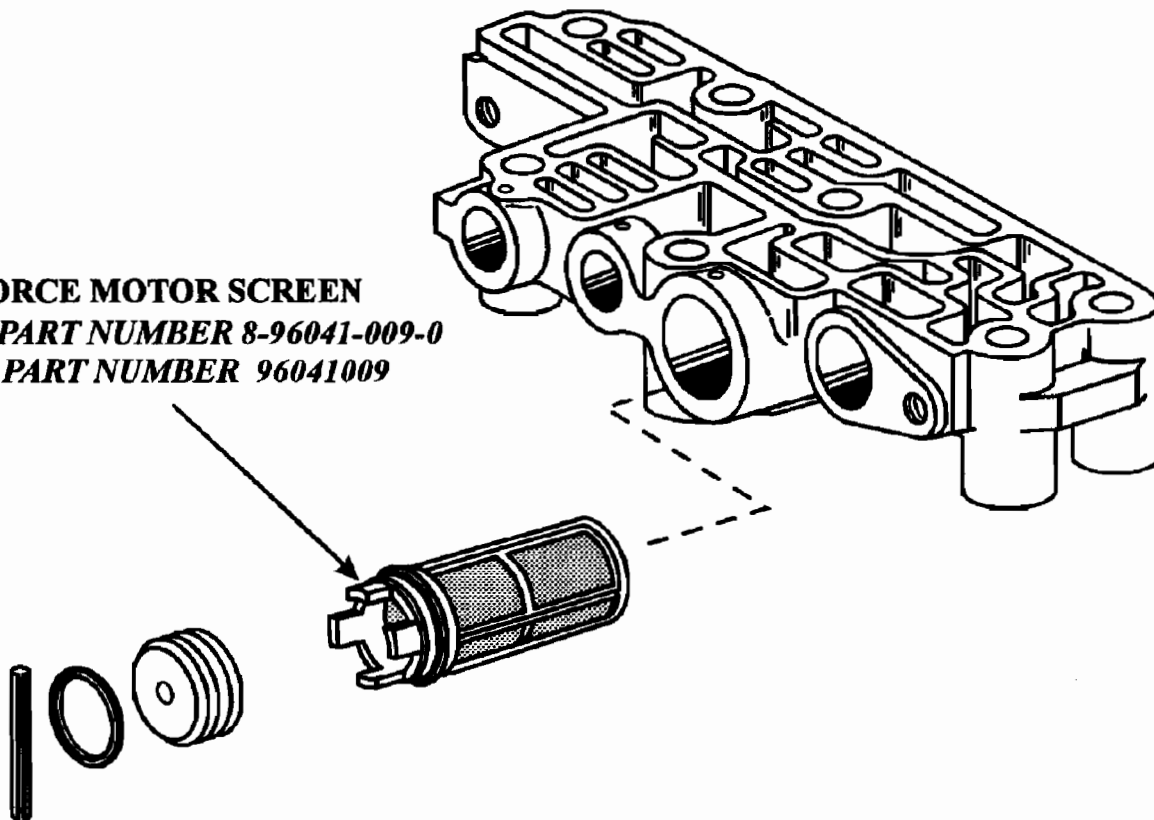
CORRECTION: There are now part numbers available from Isuzu to service the valve body screens individually. Refer to Figure 1 for the location of the Force Motor Screen and Figure 2 for the location of the PWM Band Control Solenoid Screen.

SERVICE INFORMATION:

Force Motor Screen (<i>Isuzu part number</i>).....	8-96041-009-0
PWM Band Control Solenoid Screen (<i>Isuzu part number</i>).....	8-96041-012-0

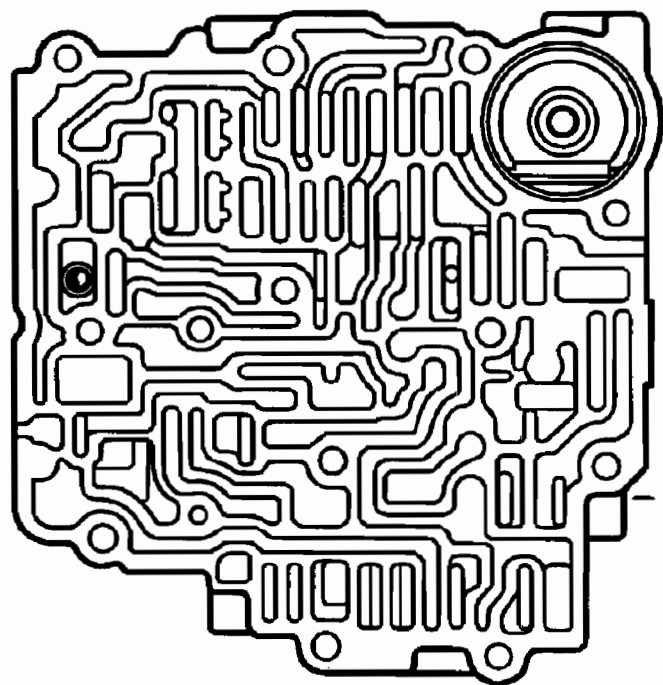
ADAPTER CASE VALVE BODY

FORCE MOTOR SCREEN
ISUZU PART NUMBER 8-96041-009-0
GM PART NUMBER 96041009

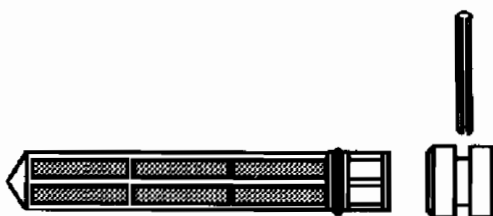


Copyright © 1998 ATSG

Figure 1

MAIN CASE VALVE BODY

**PWM BAND CONTROL
SOLENOID SCREEN**
ISUZU PART NUMBER 8-96041-012-0
GM PART NUMBER 96041012



Copyright © 1998 ATSG

Figure 2

In this business,
consistency counts
more than anything.
and ATC delivers it."

Robby Starnes,
Transmission Headquarters
Fort Worth, Texas

**We
make
you
look
good.**



*"It's a fact of life. Get the wrong part, and you're down for 3 days. You can afford that?
Transmission Headquarters has been working with an ATC company for some 25 years now.
We get the best selection available, and the best service. When I need something in a hurry,
I know I can pick up the phone and talk to the person who makes it happen.
That's consistency. It counts big around here."*

At ATC Distribution Group, we're bringing more
than quality parts at competitive prices.

We're committed to your success.

Because when you look good, we look good.



TOYOTA 140-E / 540-E
HIGH AND/OR LOW LINE PRESSURE

COMPLAINT: Vehicles equipped with 140-E or 540-E transaxles may exhibit insufficient line pressure rise in the Drive ranges and higher than normal pressures in the Reverse range.

CAUSE: The cause may be, the Boost Sleeve in the Pressure Regulator line up severely worn, allowing T.V. pressure to leak into the reverse boost circuit which is open to exhaust at the manual valve, only when the manual valve is in the Drive ranges. When the selector is in the Reverse range, reverse boost oil can now enter the T.V. circuit forcing the Main Regulator valve to create higher than normal pressures.

CORRECTION: Refer to Figure 2 for the location of the boost sleeve in the valve body, and Figure 1 to check the Boost Sleeve for any wear. Replace as necessary with the OEM part numbers listed below.

SERVICE INFORMATION:

- 140-E Boost Sleeve (Toyota NO.).....35417-32010
- 540-E Boost Sleeve (Toyota NO.).....35417-32031

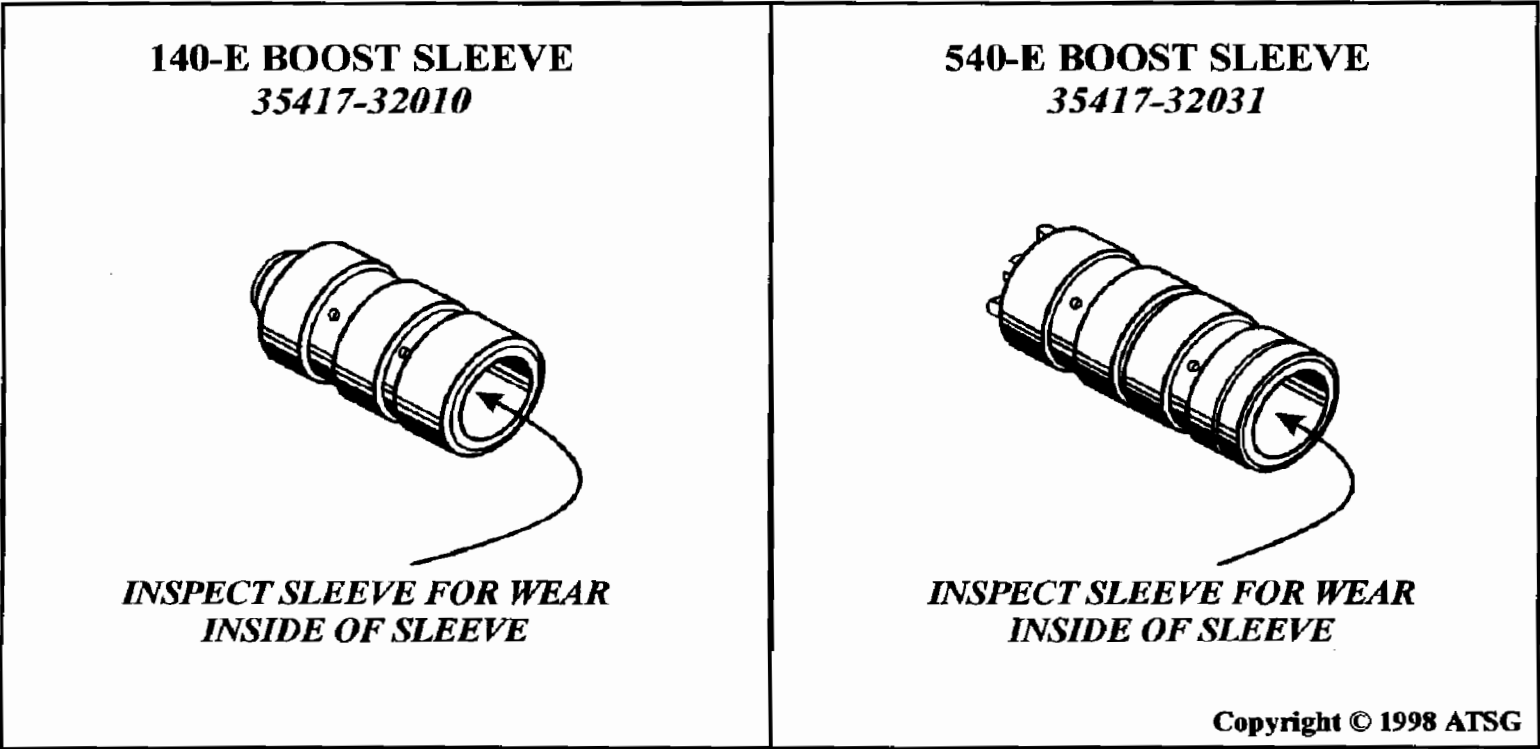
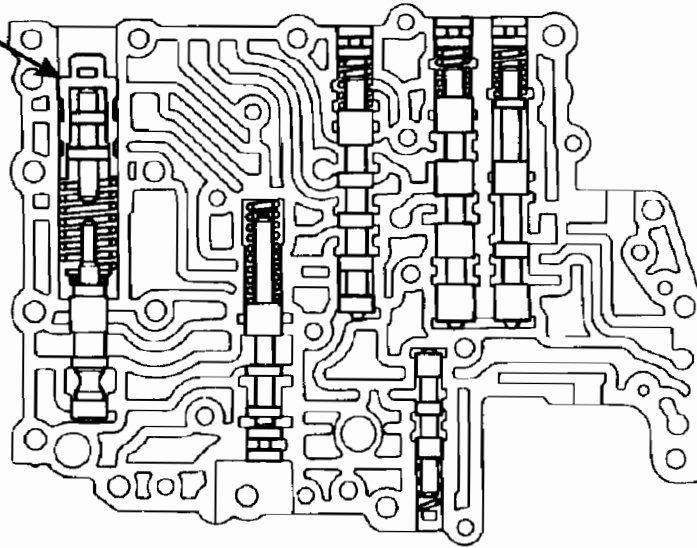


Figure 1

140-E LOWER VALVE BODY

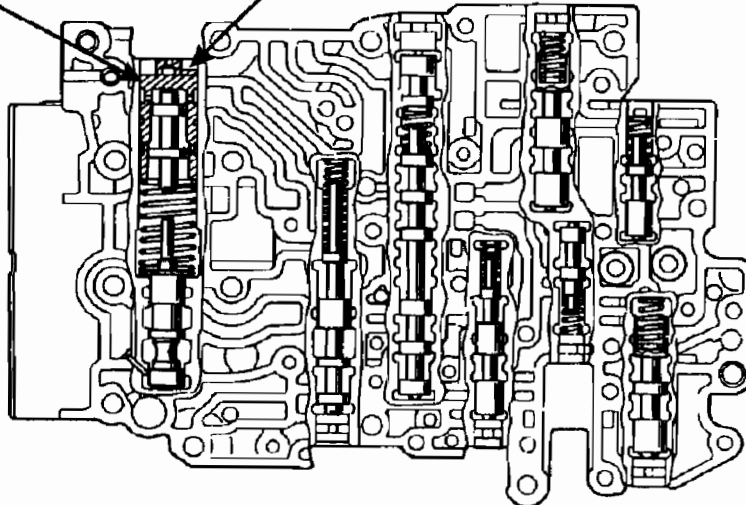
**BOOST SLEEVE
LOCATION**



540-E LOWER VALVE BODY

**BOOST SLEEVE
LOCATION**

**ADJUSTABLE
STEP**



NOTE: THE BOOST SLEEVE ON 540-E HAS AN ADJUSTABLE STEP. ENSURE THAT THE RETAINER IS IN THE SAME LOCATION AS BEFORE.

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Figure 2

TOYOTA 241-H NO 3-4 UPSHIFT

COMPLAINT: 1990-92 Toyota Corolla, equipped with 241-H all wheel drive transmissions, may exhibit a no 3-4 upshift after overhaul.

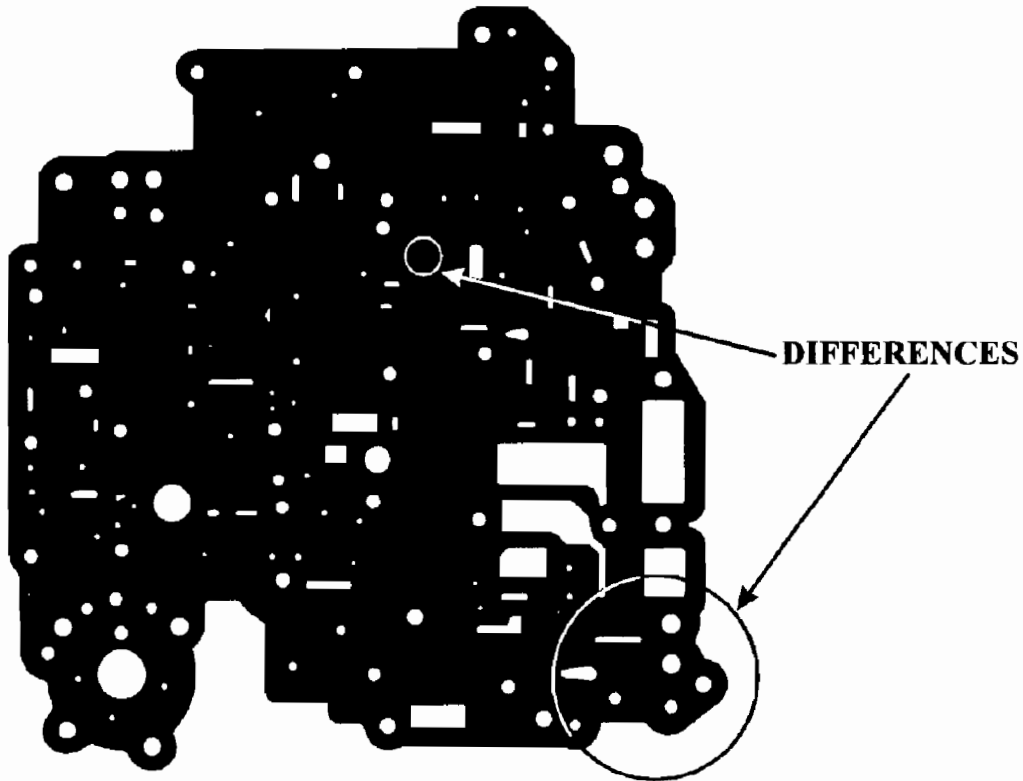
CAUSE: The cause may be, that during overhaul 240-L No.1 and No.2 valve body gaskets were used in place of the 241-H No.1 and No.2 valve body gaskets. The reason is that the two different gaskets sets have subtle differences, as shown in Figures 1 and 2, and the 241-H gaskets *do not* come in current overhaul kits.

CORRECTION: Install the correct No.1 and No.2 valve body gaskets as per the Service Information listed below. Additional part numbers are provided in Service Information for the Transfer case gasket and seal kit and the left axle seal which are not provided in current overhaul kits.

SERVICE INFORMATION:

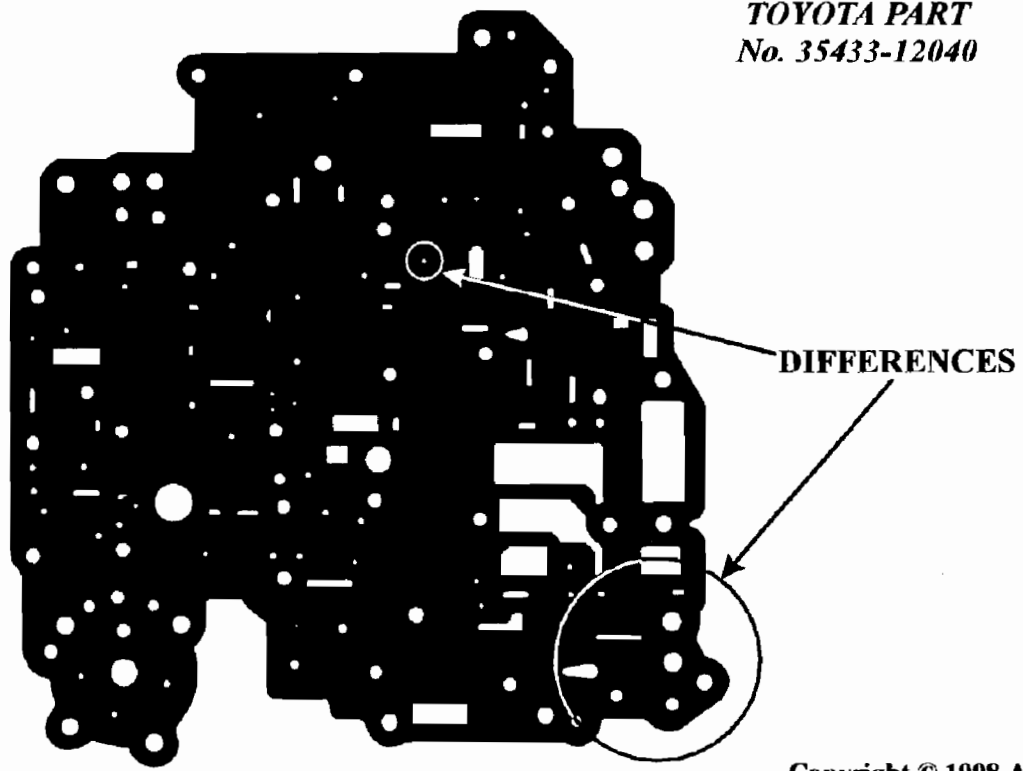
Transfer Case gasket and seal kit (Toyota part number).....	35172-12020
Left axle seal (Toyota part number).....	35172-1220
Valve body gasket No.1 (Toyota part number).....	35433-12040
Valve body gasket No.2 (Toyota part number).....	35434-12020

240 L-No. 1 GASKET



240 H-No. 1 GASKET

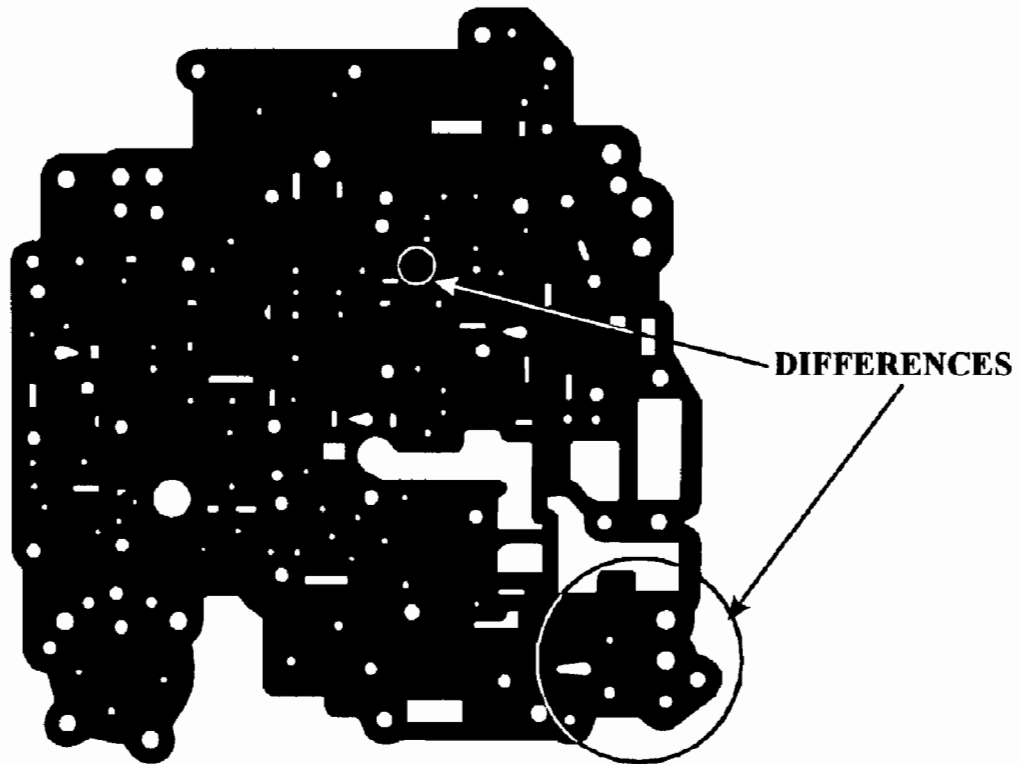
*TOYOTA PART
No. 35433-12040*



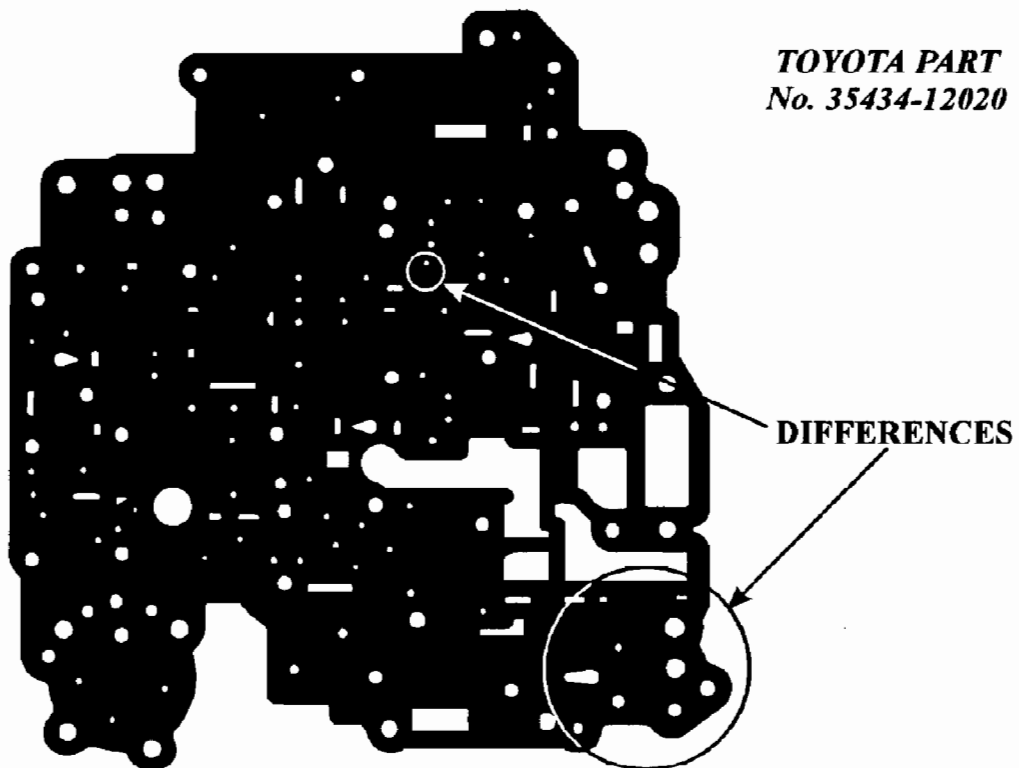
Copyright © 1998 ATSG

Figure 1

240 L-No. 2 GASKET



240 H-No. 2 GASKET



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Figure 2

HONDA M24A

NO REVERSE

COMPLAINT: After overhaul, vehicles equipped with M24A transaxles may exhibit a no Reverse condition.

CAUSE: The cause may be, that the bore plug, which retains the servo control valve in its bore, was assembled backwards exhausting line pressure from the Manual Valve in Reverse.

CORRECTION: Locate the Servo Control Valve, which is in the Secondary Valve Body, and assemble the bore plug correctly as shown in Figure 1.

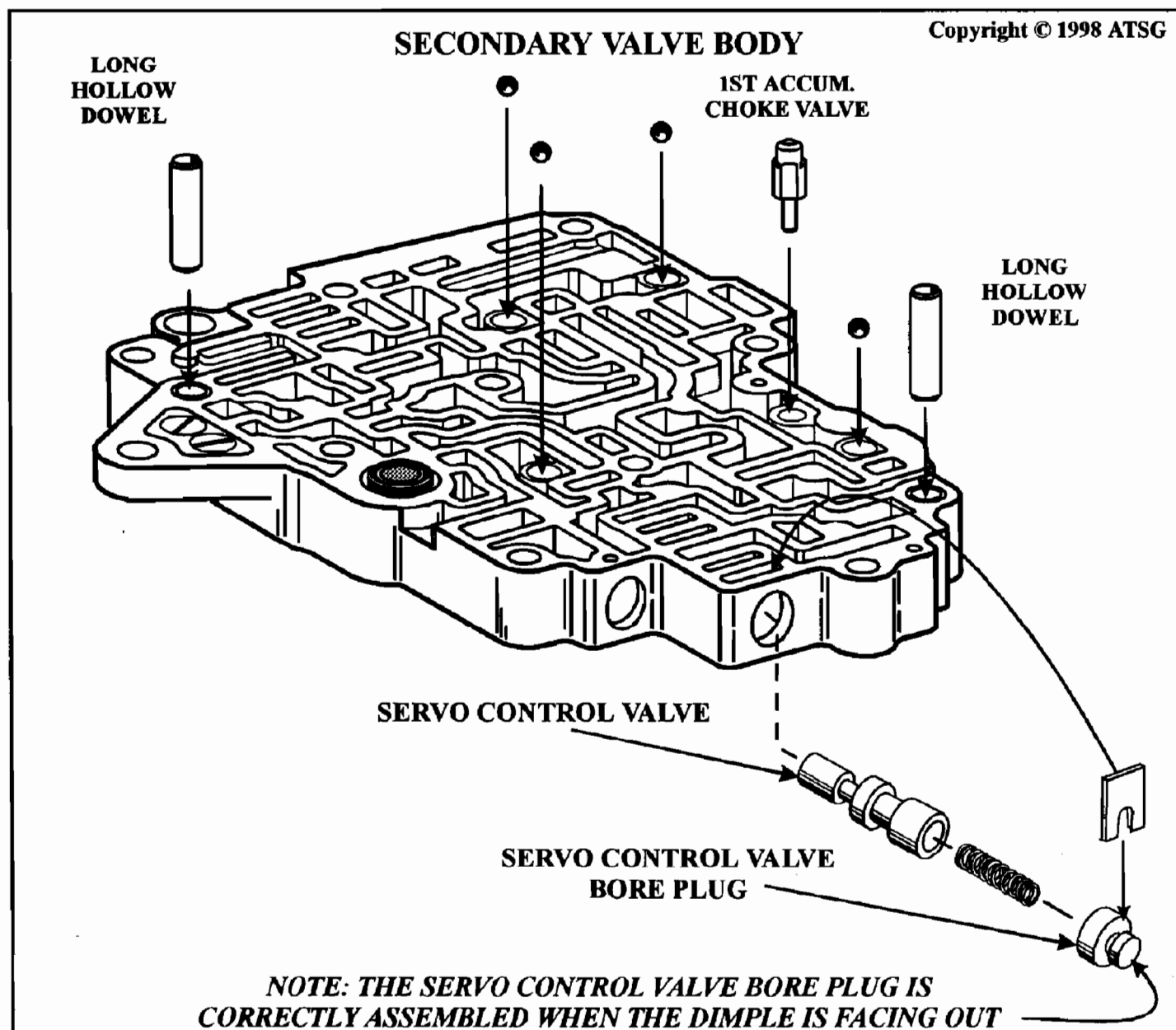


Figure 1

ACURA COMPUTER LOCATIONS

1987-90 ACURA LEGEND COMPUTER LOCATIONS

There is still a great deal of confusion when the need arises to locate the A/T computer in 1987 to 1990 Acura Legends.

In many cases the technician has mistakenly located the engine controller, or is looking for the diagnostic connector to jump or is looking in the wrong area altogether.

There is NO diagnostic connector to jump in the model years 1987 to 1990. If there is an engine code stored, the "CHECK ENGINE" lamp will illuminate.

If there is a transmission code stored, the "S3" lamp will flash steadily regardless of what position the manual shift lever is placed.

If there are no transmission codes stored, the "S3" lamp will illuminate for 2 seconds and then go out after the ignition has been turned on. If there are codes stored, then the "S3" lamp will begin to flash steadily after the ignition is turned on. (Refer to figure 1)

The "S3" lamp is NOT going to give the codes, when it steadily flashes, it's just letting you know there is a code or codes stored.

Now you have to locate the transmission computer and watch the **RED L.E.D.** lamp located on the rear corner of the computer, this **RED L.E.D.** lamp is what is going to flash you the codes that are stored. (Refer to figure 2)

Acura will locate the transmission controller in a different location for a 2 door model, than it's location in a 4 door model. This is especially true for the 1987 model because only the 2 door was equipped with the electronically shifted L5 transaxle, while the sedan was equipped with the hydraulically shifted G4 transaxle. Because of this the 2 door will have both an engine controller and a transmission controller, while the sedan will have an engine controller only.

The G4 transaxle contains a solenoid to control lock-up, this is controlled by the engine controller, which means you may have to know where the engine controller is located.

Figure 3 shows the location of the engine controller for the 1987 Legend 4 door sedan with the G4 transaxle. Figure 4 shows the location of the engine and transmission controllers for the 1987 Legend 2 door coupe.

The engine controllers in '87 to '90 Legends have **TWO L.E.D.** lamps as shown in figure 5. The **RED L.E.D.** is to retrieve engine codes when the check engine lamp is illuminated, the **YELLOW L.E.D.** lamp illuminates when there is an engine idle control problem and has nothing to do with the code retrieval process.

The 2 and 4 door model illustrations have been kept separate to avoid confusion.

NOTE: The transmission controller L.E.D is viewed from under and behind the seat, and the engine controller is viewed from under the front of the seat when it is in that location.

1987-90 ACURA LEGEND COMPUTER LOCATIONS

In figure 6 the engine codes for the 1987 2 and 4 door models are listed, and in figure 7 the transmission codes are listed for the 1987 2 door Legend with the L5 transaxle. Figure 8 shows the engine controller location for the 1988-90 2 door coupe. In figure 9 the location of the engine controller for 1988-90 4 door sedans is shown. Figure 10 lists the engine codes for 1988-90 Legends.

The location of the transmission controller for 1988-90 2 door coupes is illustrated in figure 11 and the location of the transmission controller for the 1988-90 4 door sedans are shown in figure 12. Notice how the transmission and engine controllers are flip flopped under the passenger and driver seats depending whether it is a coupe or a sedan.

Figure 13 lists transmission codes for 1988-89 Legends, and listed in figure 14 are the 1990 Legend transmission codes. Note that the rotating magnet speed sensor was replaced by two pulse generators which changes the code format.

NOTE: If the number of L.E.D. flashes exceed the maximum number of codes listed in the code charts, the computer may be faulty.

When clearing transmission codes, rather than disconnecting the battery and losing the radio theft codes, pull the 7.5 amp Alternator Sense Fuse in the under hood fuse box as seen in figure 15.

When clearing engine codes, pull the 7.5 amp Clock Fuse located in the under dash fuse box as seen in figure 16.

CAUTION: Most of these legends are equipped with sun roofs, when these cars get on in age, the sun roofs begin to leak, when they leak the water collects under the front seats

When diagnosing possible computer or circuit failure, take note of the condition of the carpet under the seats, if it is damp or wet, this could be the reason for the computer or circuit failure.

1987-90 ACURA LEGEND COMPUTER LOCATIONS

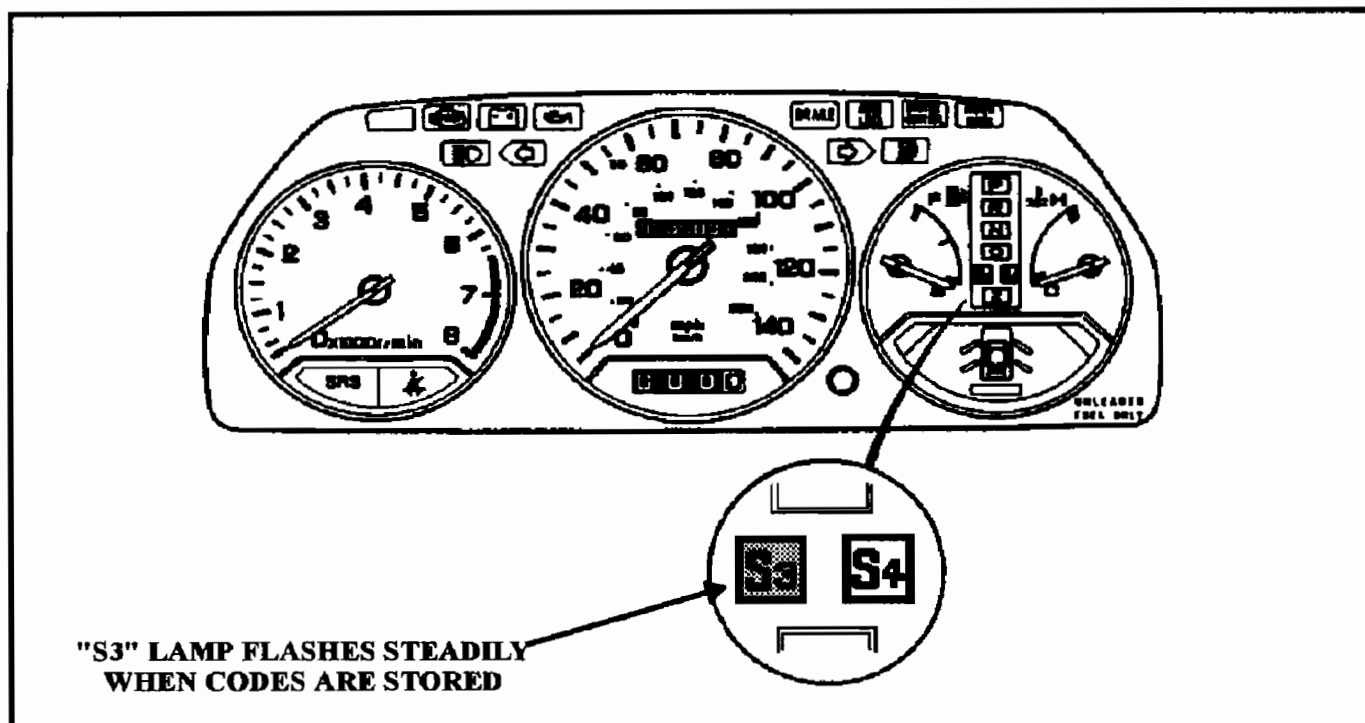


Figure 1

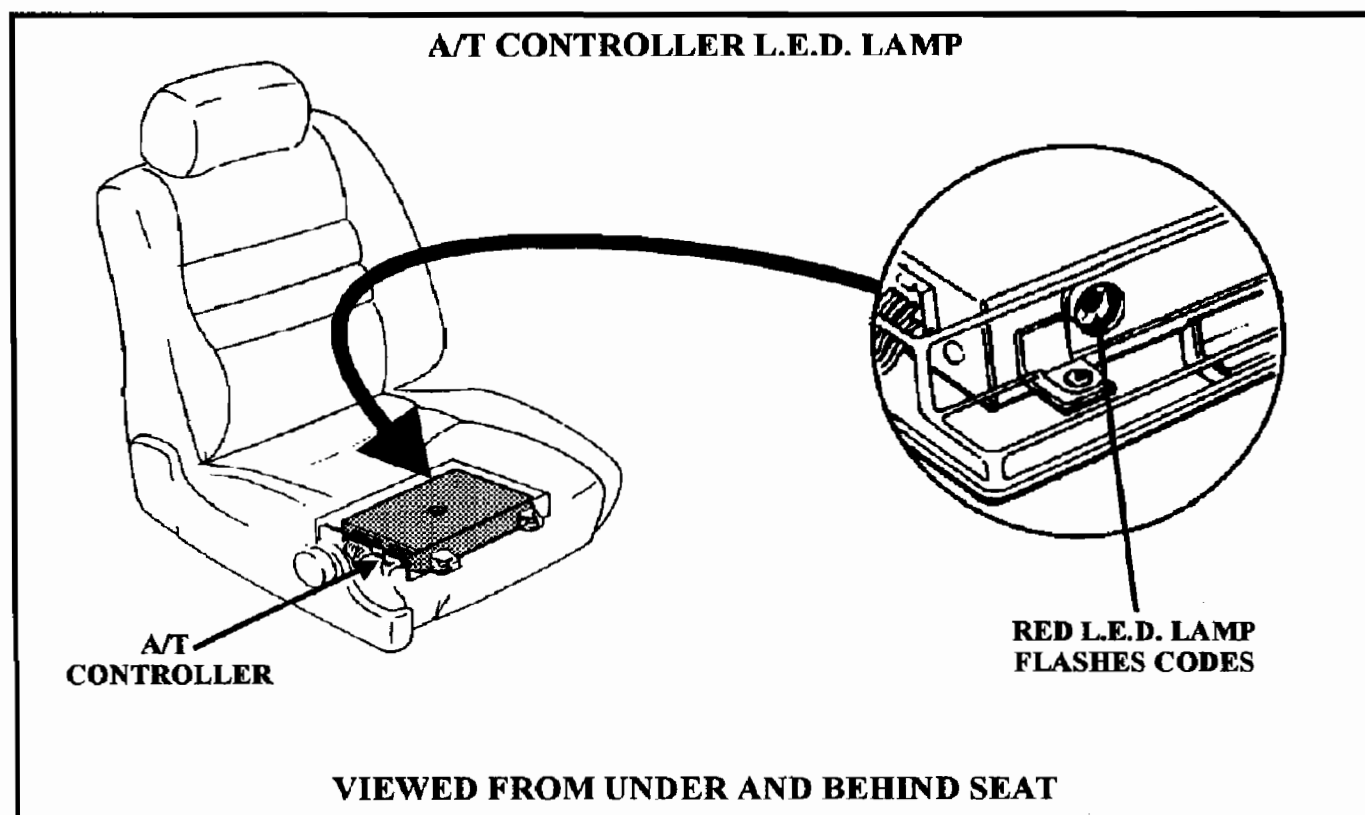
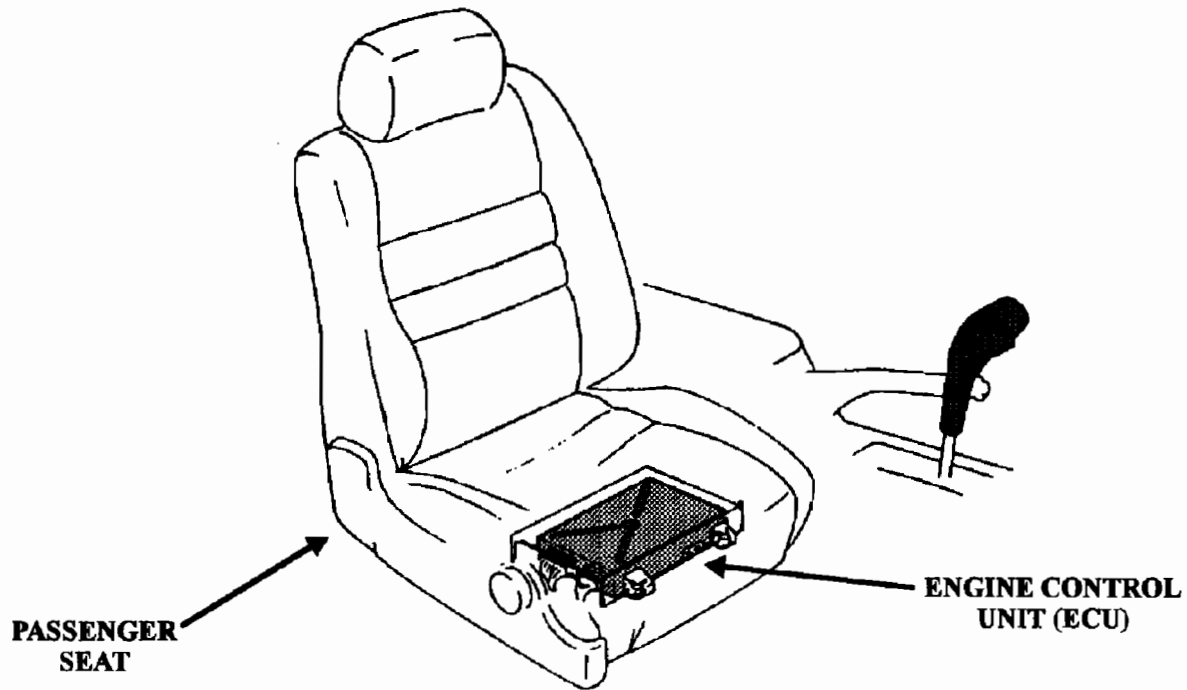
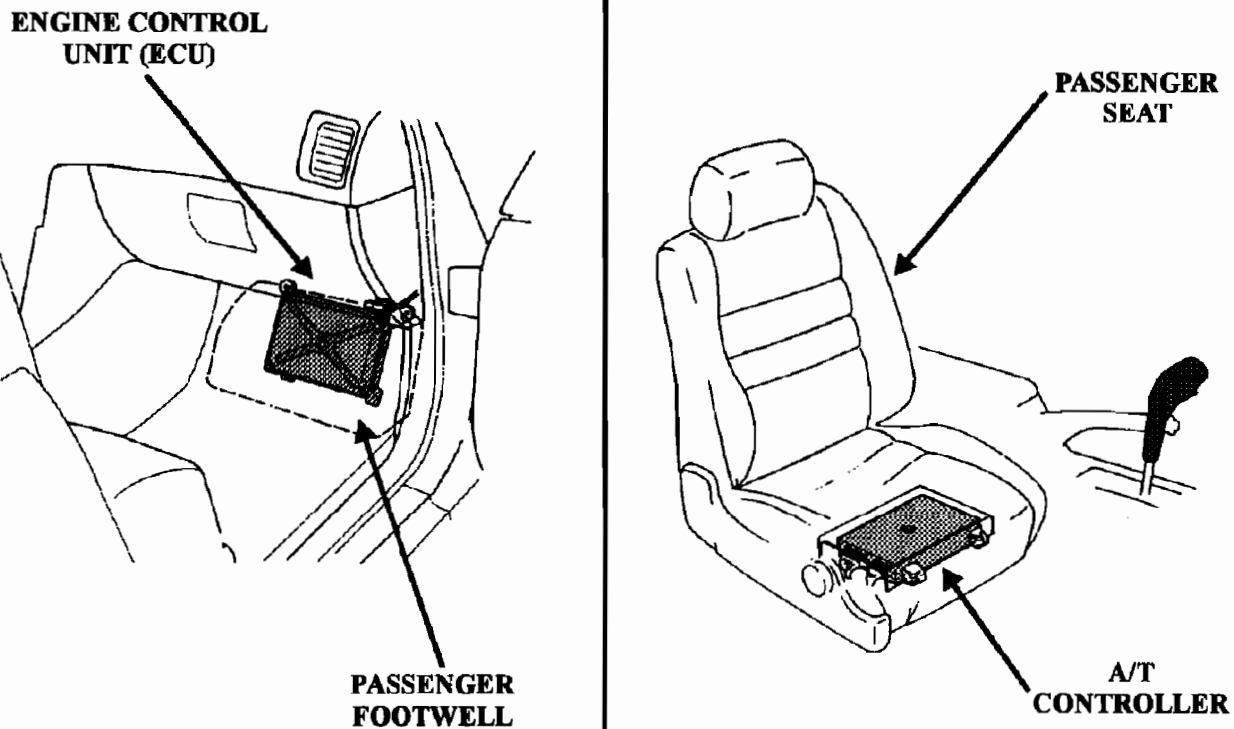


Figure 2

1987-90 ACURA LEGEND COMPUTER LOCATIONS**1987 4 DOOR SEDAN WITH G4 TRANSAXLE****Figure 3****1987 2 DOOR COUPE WITH L5 TRANSAXLE****Figure 4**

1987-90 ACURA LEGEND COMPUTER LOCATIONS

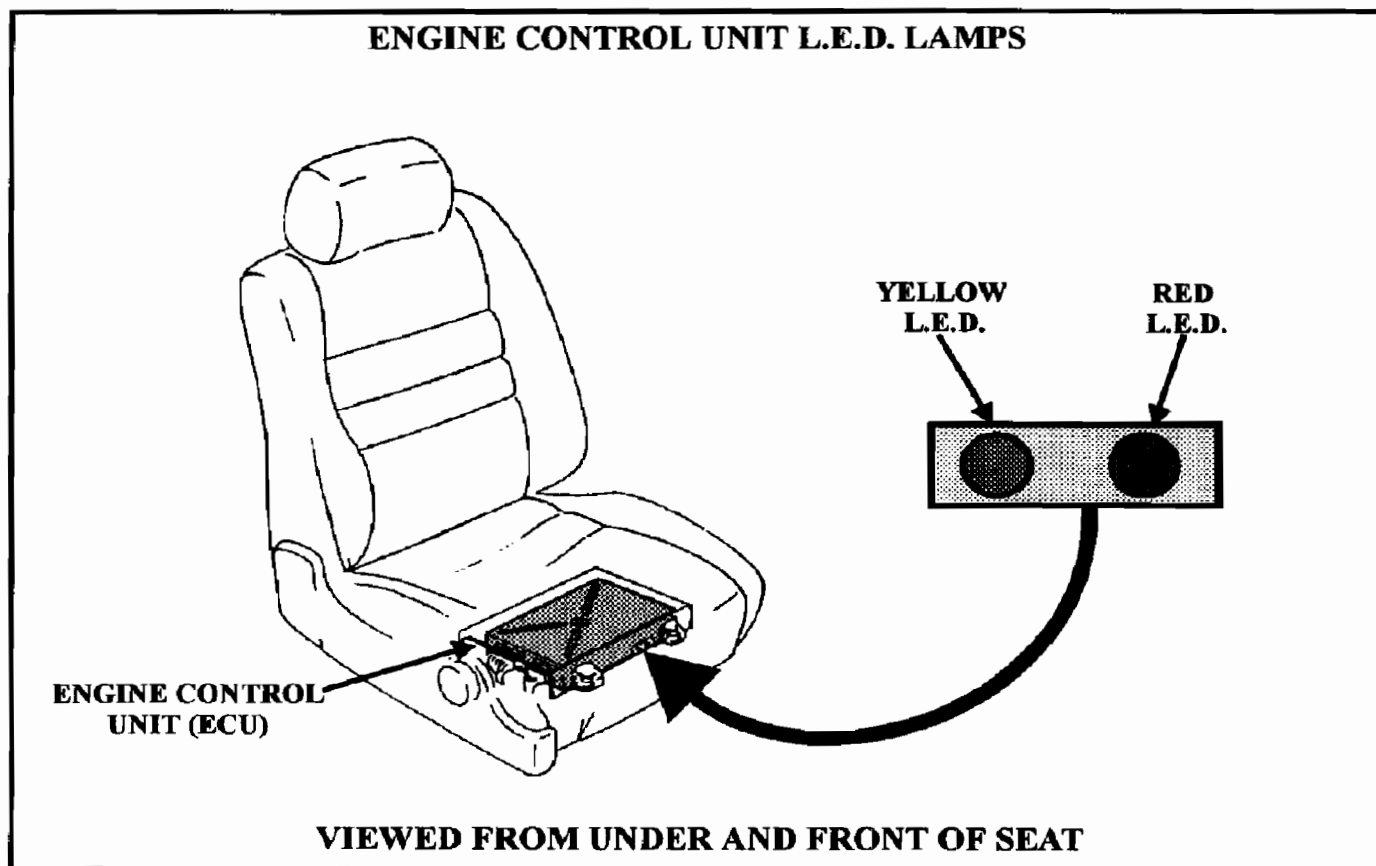


Figure 5

1987 LEGEND ENGINE CODE CHART

RED L.E.D. INDICATOR BLINKS	SYSTEM INDICATED
0	ECU HAS LOST POWER OR IS FAULTY
1	FRONT OXYGEN CONTENT
2	REAR OXYGEN CONTENT
3	MAP SENSOR (ELECTRICAL)
4	CRANK SENSOR
5	MAP SENSOR (MECHANICAL)
6	ENGINE COOLANT TEMPERATURE
7	THROTTLE ANGLE SENSOR
8	TDC POSITION
9	#1 CYLINDER POSITION
10	INTAKE AIR TEMPERATURE
12	EGR SYSTEM
13	ATMOSPHERIC PRESSURE SENSOR
14	ELECTRONIC IDLE CONTROL
15	IGNITION OUTPUT SIGNAL
17	VEHICLE SPEED PULSER
18	IGNITION TIMING ADJUSTMENT

Figure 6

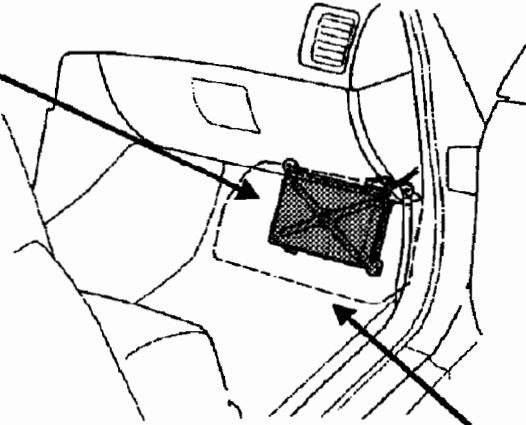
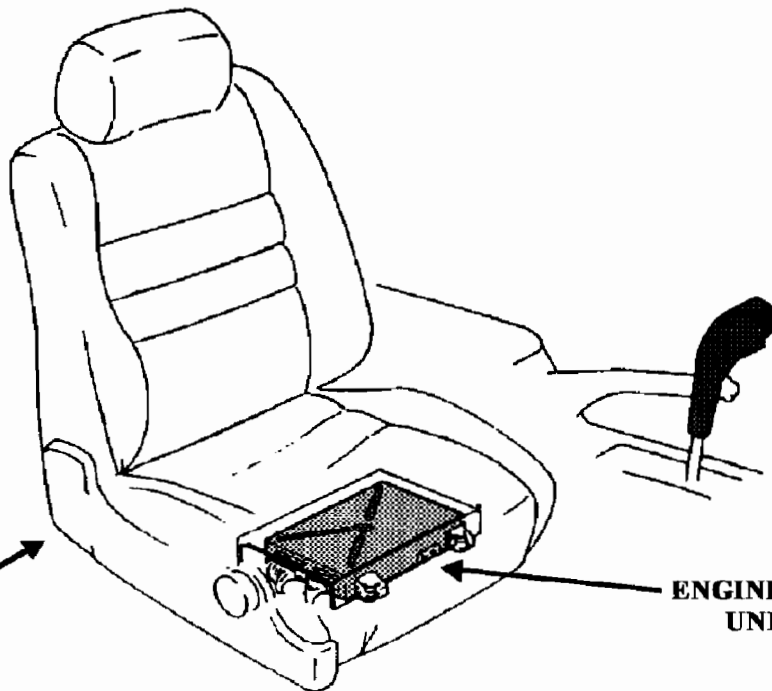
ACURA COMPUTER LOCATIONS

1987 LEGEND COUPE TRANSMISSION CODES

NUMBER OF L.E.D. FLASHES	S3 LAMP CONDITION	SYMPTOM	POSSIBLE CAUSE
0	OFF	<ul style="list-style-type: none"> ·S3 lamp does not come on for 2 seconds when ignition is turned on ·Fails to shift (stuck in 4th gear) 	<ul style="list-style-type: none"> ·Loss of power or ground to A/T control unit ·Short or open in S3 indicator lamp circuit ·Blown S3 indicator lamp
1	FLASHES	<ul style="list-style-type: none"> ·Lock-up clutch does not engage ·Lock-up clutch does not disengage ·Frequent engine stalling 	<ul style="list-style-type: none"> ·Disconnected lock-up solenoid "A" ·Short or open in lock-up solenoid "A" circuit ·Faulty lock-up solenoid "A"
2	FLASHES	<ul style="list-style-type: none"> ·Lock-up clutch does not engage 	<ul style="list-style-type: none"> ·Disconnected lock-up solenoid "B" ·Short or open in lock-up solenoid "B" circuit ·Faulty lock-up solenoid "B"
3	FLASHES or OFF*	<ul style="list-style-type: none"> ·Lock-up clutch does not engage ·Stacked or late shifts 	<ul style="list-style-type: none"> ·Disconnected throttle angle sensor ·Short or open in throttle angle sensor circuit ·Faulty throttle angle sensor
4	FLASHES	<ul style="list-style-type: none"> ·Lock-up clutch does not engage 	<ul style="list-style-type: none"> ·Disconnected speed pulser ·Short or open in speed pulser circuit ·Faulty speed pulser
5	FLASHES	<ul style="list-style-type: none"> ·Fails to shift to first or third gear 	<ul style="list-style-type: none"> ·Short in shift position console switch circuit ·Faulty shift position console switch
6	OFF*	<ul style="list-style-type: none"> ·Fails to shift to first or third gear ·Lock-up clutch does not engage ·Lock-up clutch busyness 	<ul style="list-style-type: none"> ·Open in shift position console switch circuit ·Faulty shift position console switch
7	FLASHES	<ul style="list-style-type: none"> ·Fails to shift to second or third gear 	<ul style="list-style-type: none"> ·Disconnected shift solenoid "A" ·Short or open in shift solenoid "A" circuit ·Faulty shift solenoid "A"
8	FLASHES	<ul style="list-style-type: none"> ·Fails to shift to first or fourth gear 	<ul style="list-style-type: none"> ·Disconnected shift solenoid "B" ·Short or open in shift solenoid "B" circuit ·Faulty shift solenoid "B"
9	FLASHES	<ul style="list-style-type: none"> ·Lock-up clutch does not engage 	<ul style="list-style-type: none"> ·Disconnected A/T speed pulser ·Short or open in A/T speed pulser circuit ·Faulty A/T speed pulser
10	FLASHES	<ul style="list-style-type: none"> ·Lock-up clutch does not engage 	<ul style="list-style-type: none"> ·Disconnected engine coolant temperature sensor ·Short or open in engine coolant temperature circuit ·Faulty engine coolant temperature sensor
11	OFF*	<ul style="list-style-type: none"> ·Lock-up clutch does not disengage 	<ul style="list-style-type: none"> ·Open or short in ignition coil circuit ·Faulty ignition coil

***NOTE:** If symptoms are described for codes 3, 6 and 11, but L.E.D. is not flashing, it will be necessary to recreate symptom, and then recheck L.E.D. while ignition is STILL ON.

Figure 7

ACURA COMPUTER LOCATIONS**1988-90 2 DOOR COUPE WITH L5 TRANSAXLE****ENGINE CONTROL
UNIT (ECU)****PASSENGER
FOOTWELL****Figure 8****1988-90 4 DOOR SEDAN WITH L5 TRANSAXLE****PASSENGER
SEAT****ENGINE CONTROL
UNIT (ECU)****Figure 9**

ACURA COMPUTER LOCATIONS**1988-90 LEGEND ENGINE CODE CHART**

RED L.E.D. INDICATOR BLINKS	SYSTEM INDICATED
0	ECU HAS LOST POWER OR IS FAULTY
1	FRONT OXYGEN CONTENT
2	REAR OXYGEN CONTENT
3	MAP SENSOR (ELECTRICAL)
4	CRANK SENSOR
5	MAP SENSOR (MECHANICAL)
6	ENGINE COOLANT TEMPERATURE
7	THROTTLE ANGLE SENSOR
8	TDC POSITION
9	#1 CYLINDER POSITION
10	INTAKE AIR TEMPERATURE
12	EGR SYSTEM
13	ATMOSPHERIC PRESSURE SENSOR
14	ELECTRONIC IDLE CONTROL
15	IGNITION OUTPUT SIGNAL
17	VEHICLE SPEED PULSER
18	IGNITION TIMING ADJUSTMENT
30	A/T FI SIGNAL A
31	A/T FI SIGNAL B

Figure 10

VSS: Approximate
5 volt pulse should be
seen as the wheels are
rotated slowly.

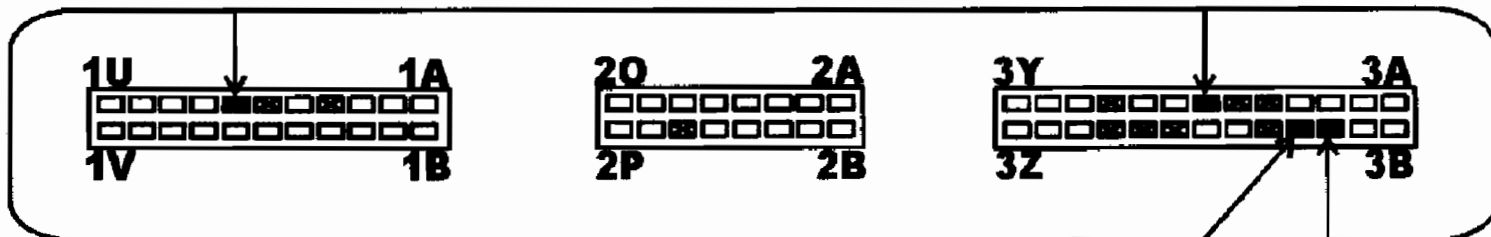
1M

Green/Red

FPRC: System Voltage
should be seen on this
wire unplugged from
the computer.

3M

Green



WIRE SIDE VIEW OF CONNECTORS

3H

Red
PSG-

3F

White
PSG+

PSG: AC voltage should
increase proportionally
with turbine shaft
speed rotation

*Powertrain Control Module
2.0L (KL System)*

Figure 2

ACURA COMPUTER LOCATIONS

1988-89 LEGEND TRANSMISSION CODES

NUMBER OF L.E.D. FLASHES	S3 LAMP CONDITION	SYMPTOM	POSSIBLE CAUSE
0	OFF	<ul style="list-style-type: none"> S3 lamp does not come on for 2 seconds when ignition is turned on Fails to shift (stuck in 4th gear) 	<ul style="list-style-type: none"> Loss of power or ground to A/T control unit Short or open in S3 indicator lamp circuit Blown S3 indicator lamp
1	FLASHES	<ul style="list-style-type: none"> Lock-up clutch does not engage Lock-up clutch does not disengage Frequent engine stalling 	<ul style="list-style-type: none"> Disconnected lock-up solenoid "A" Short or open in lock-up solenoid "A" circuit Faulty lock-up solenoid "A"
2	FLASHES	<ul style="list-style-type: none"> Lock-up clutch does not engage 	<ul style="list-style-type: none"> Disconnected lock-up solenoid "B" Short or open in lock-up solenoid "B" circuit Faulty lock-up solenoid "B"
3	FLASHES or OFF*	<ul style="list-style-type: none"> Lock-up clutch does not engage Stacked or late shifts 	<ul style="list-style-type: none"> Disconnected throttle angle sensor Short or open in throttle angle sensor circuit Faulty throttle angle sensor
4	FLASHES	<ul style="list-style-type: none"> Lock-up clutch does not engage 	<ul style="list-style-type: none"> Disconnected speed pulser Short or open in speed pulser circuit Faulty speed pulser
5	FLASHES	<ul style="list-style-type: none"> Fails to shift to first or third gear 	<ul style="list-style-type: none"> Short in shift position console switch circuit Faulty shift position console switch
6	OFF*	<ul style="list-style-type: none"> Fails to shift to first or third gear Lock-up clutch does not engage Lock-up clutch busyness 	<ul style="list-style-type: none"> Open in shift position console switch circuit Faulty shift position console switch
7	FLASHES	<ul style="list-style-type: none"> Fails to shift to second or third gear 	<ul style="list-style-type: none"> Disconnected shift solenoid "A" Short or open in shift solenoid "A" circuit Faulty shift solenoid "A"
8	FLASHES	<ul style="list-style-type: none"> Fails to shift to first or fourth gear 	<ul style="list-style-type: none"> Disconnected shift solenoid "B" Short or open in shift solenoid "B" circuit Faulty shift solenoid "B"
9	FLASHES	<ul style="list-style-type: none"> Lock-up clutch does not engage 	<ul style="list-style-type: none"> Disconnected A/T speed pulser Short or open in A/T speed pulser circuit Faulty A/T speed pulser
10	FLASHES	<ul style="list-style-type: none"> Lock-up clutch does not engage 	<ul style="list-style-type: none"> Disconnected engine coolant temperature sensor Short or open in engine coolant temperature circuit Faulty engine coolant temperature sensor
11	OFF*	<ul style="list-style-type: none"> Lock-up clutch does not disengage 	<ul style="list-style-type: none"> Open or short in ignition coil circuit Faulty ignition coil
12	OFF	<ul style="list-style-type: none"> Lock-up clutch does not disengage 	<ul style="list-style-type: none"> Short in cooling fan control unit circuit Faulty cooling fan control unit

***NOTE:** If symptoms are described for codes 3, 6 and 11, but L.E.D. is not flashing, it will be necessary to recreate symptom, and then recheck L.E.D. while ignition is STILL ON.

Figure 13

TRANSMISSION FLUID CHECK/FILL PROCEDURES

5HP30 (A5S 560Z)

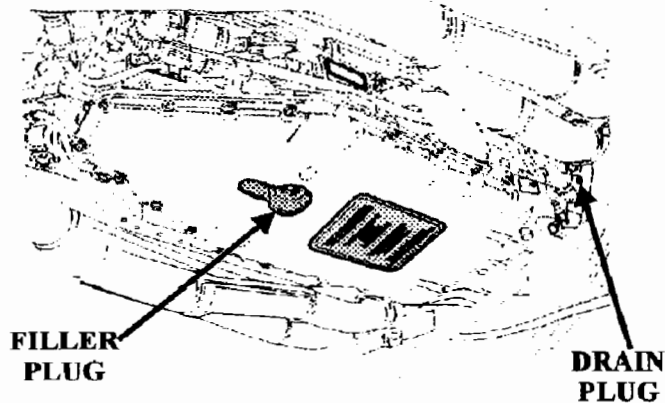


Figure 1

THM R1 (A4A 310R & A4S 270R)

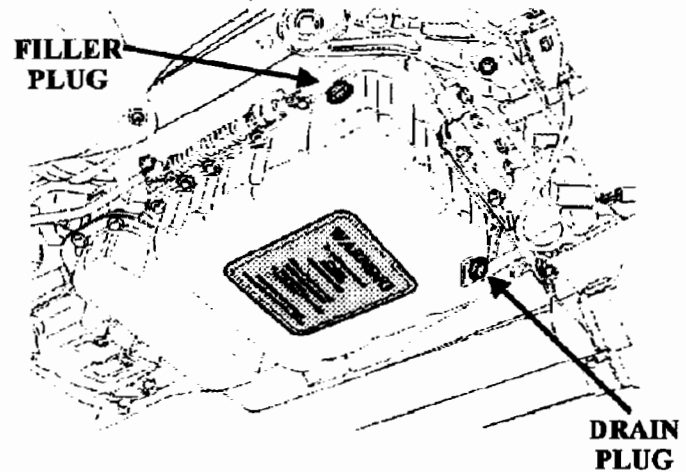


Figure 3

5HP24 (A5S 440Z)

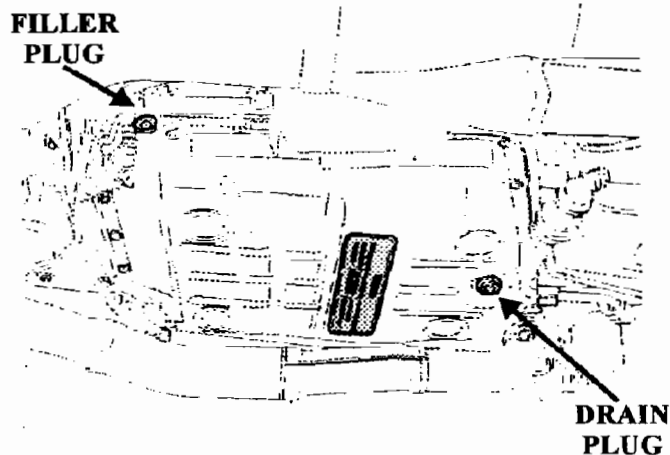


Figure 2

5L40E (A5S 360R)

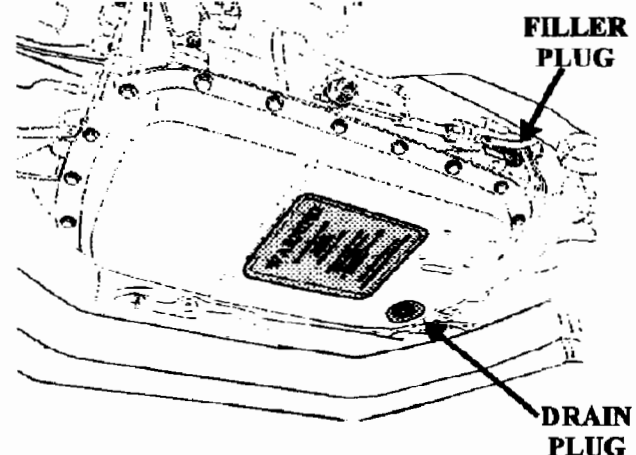


Figure 4

5HP18 (A5S 310Z)

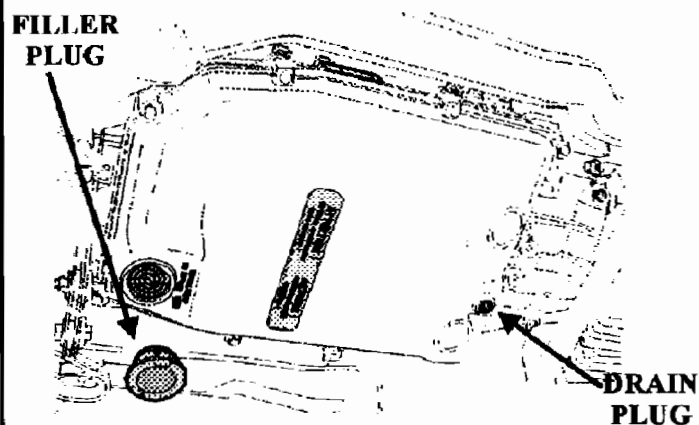


Figure 5

1987-90 ACURA LEGEND COMPUTER LOCATIONS

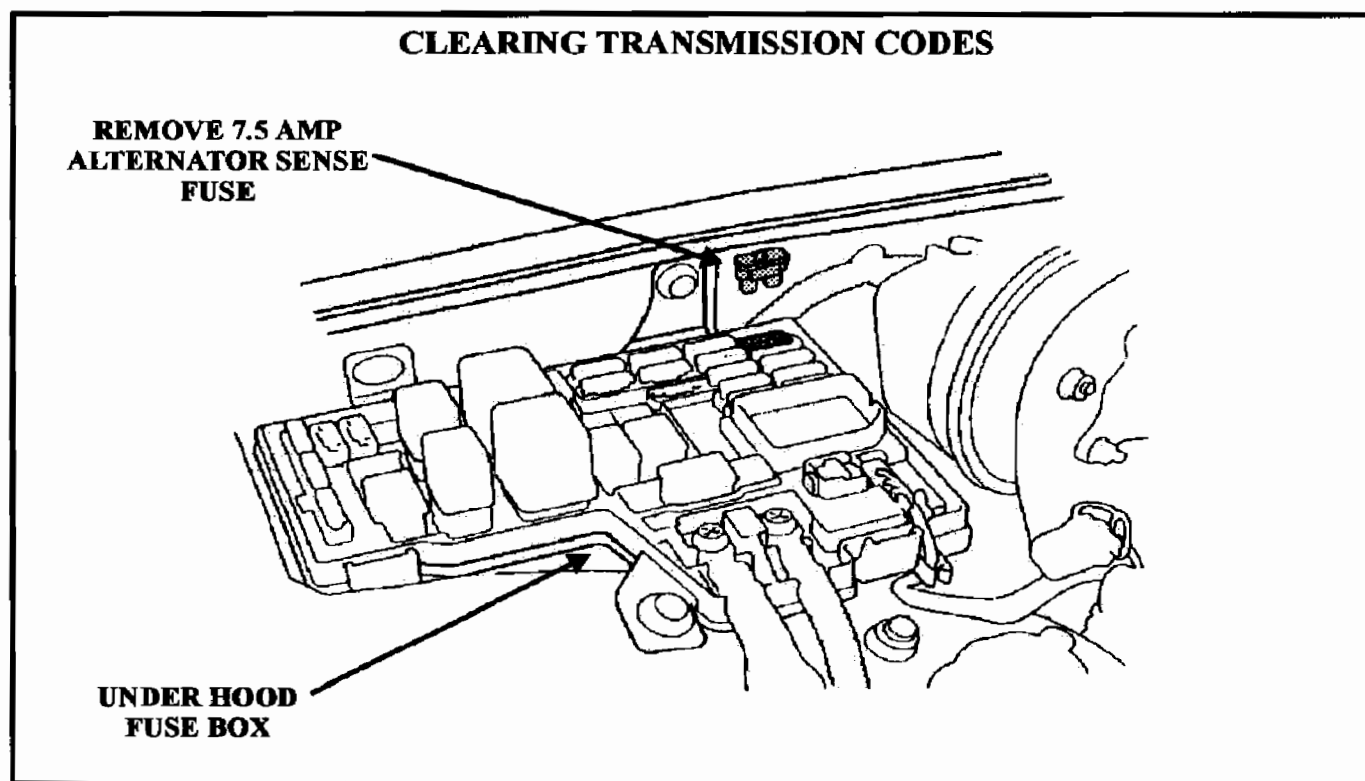


Figure 15

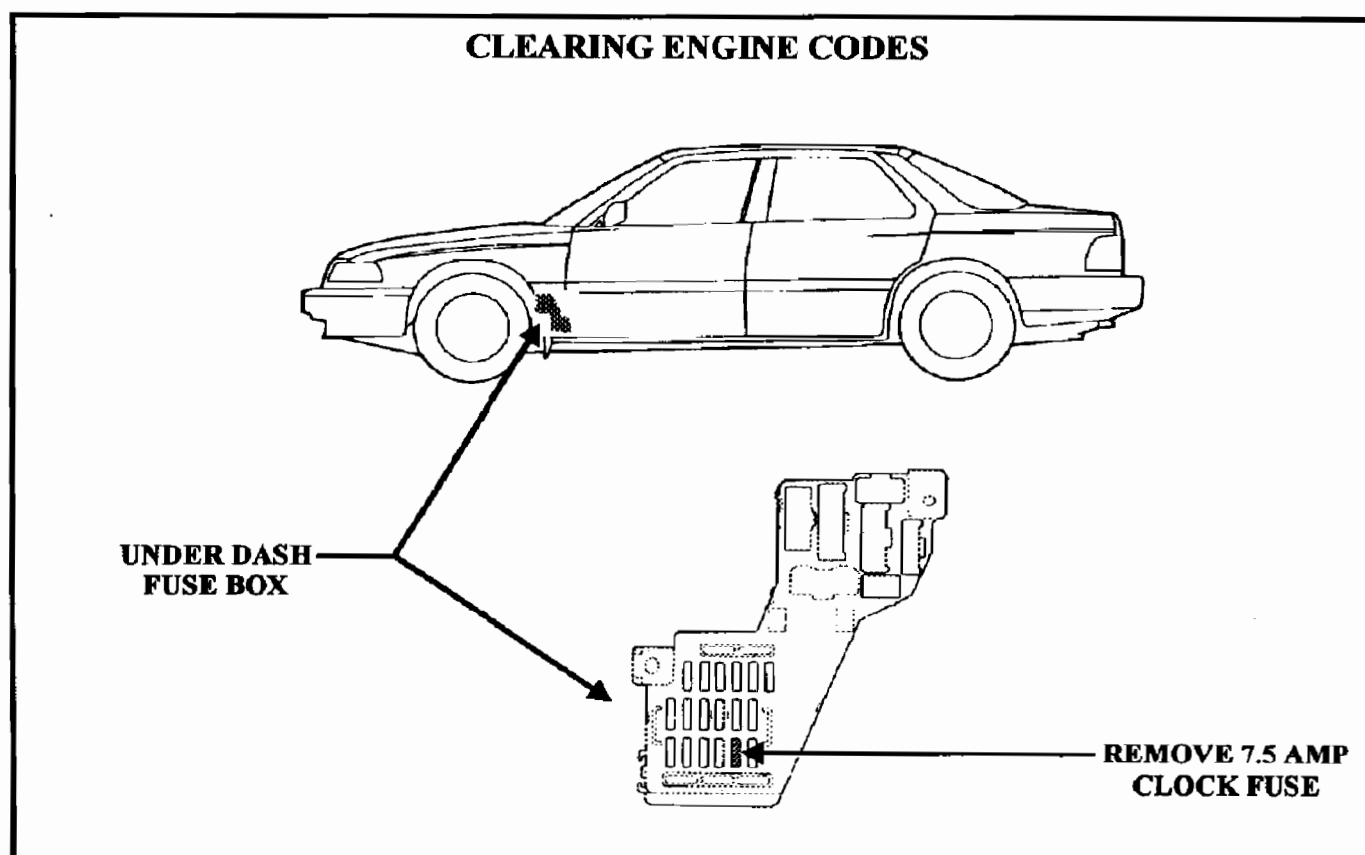
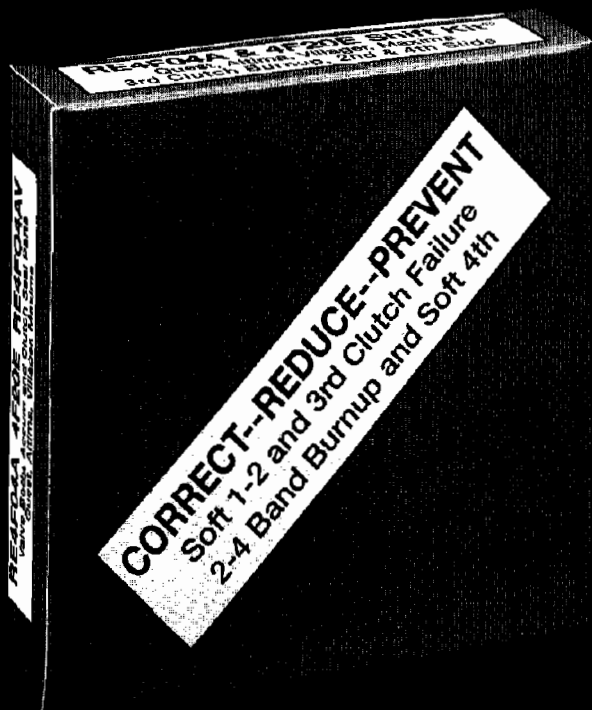


Figure 16



TRANSGO®

RE4F04A/V & 4F20E Shift Kit®



**FOR QUEST, ALTIMA,
VILLAGER AND MAXIMA**

CORRECTS • REDUCES • PREVENTS

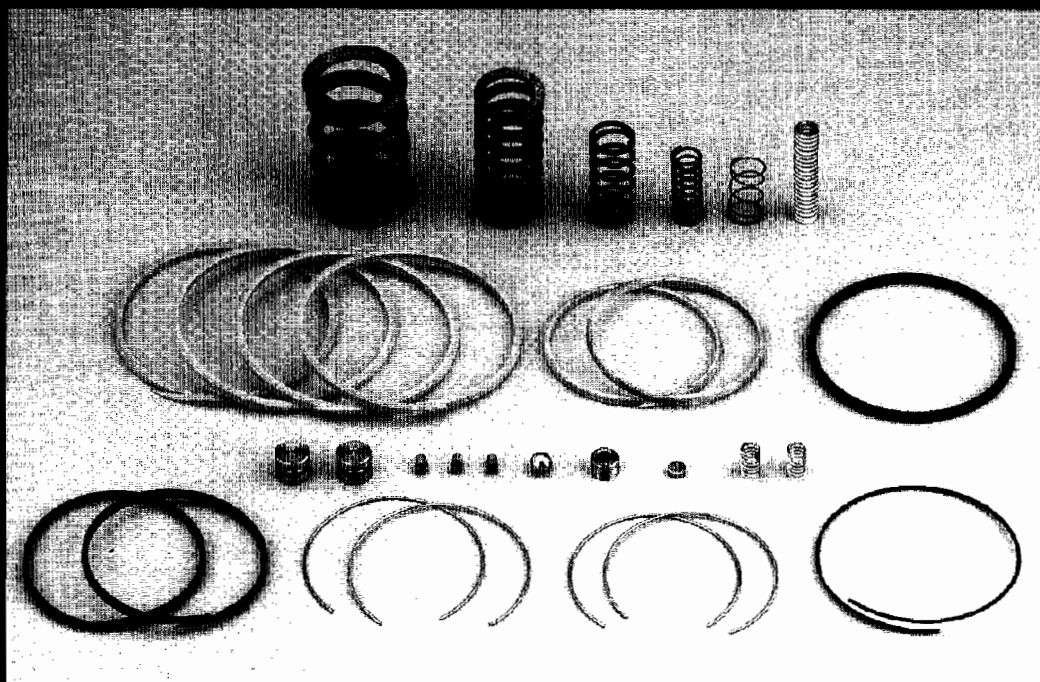
- Soft 1-2, Rough 1-2, No 2nd
- 3rd Clutch Failure/Burnup
- 2nd & 4th Slide-Soft 4th

INCLUDES:

**Valve Body Accumulator & Clutch
Seal Parts**

RE4R01A Shift Kit®

FOR NISSAN, MAZDA, AND 4SP SUBARU



**CORRECTS • REDUCES
PREVENTS**

Direct Clutch (3rd) burnup 2-
3 Cutloose Long soft 3rd.
Planet Burnup--Long, soft or
slide 1-2--band failure--Long
3-4 Lube failure, overheat and
total burnup

INCLUDES:

**Accumulator Springs, Pressure
Regulator Spring, Steel Plugs,
New Cap Plug, Check Ball and
Clutch Seal.**

**HONDA/ACURA PCM REPLACEMENT OR
SUBSTITUTION CONCERNS**

1997 AND LATER HONDA PRELUDE
1998 AND LATER HONDA ACCORD
1998 AND LATER HONDA ODYSSEY
1996 AND LATER ACURA 3.5RL

- COMPLAINT:** The vehicle does not start or run after a replacement or substitute Powertrain Control Module (PCM) has been installed.
- CAUSE:** The above mentioned vehicles are equipped with an anti-theft device known as the immobilizer system.
During engine starting the PCM receives a coded signal from the Immobilizer Control Unit. This signal must match the code stored in the PCM memory. If the signal matches, the PCM functions normally. If the signal does not match, the PCM disables the starting and fuel systems.
- If the PCM is replaced or a substitute PCM is installed, the replacement or substitute PCM will NOT accept the coded signal from the Immobilizer Control Unit which will disable the starter cut relay and the fuel pump and injectors.
- CORRECTION:** There are two procedures to prevent this complaint, one procedure is used when the PCM is replaced, and the other procedure is used when a good known "donor" PCM is substituted.
- REPLACEMENT:** The replacement PCM must be programmed to accept the immobilizer systems coded signal. This can only be performed by an authorized dealer at this time due to the fact that this process is downloaded by manufacturer specific equipment and software.
A password code is also required which is given only to the dealership's service manager.
- SUBSTITUTION:** The "donor" PCMs immobilizer function will have to be disabled. With this function disabled, the PCM does NOT NEED a coded signal from the Immobilizer Control Unit to operate the fuel system.
- Unfortunately this procedure can only be done by an authorized dealer with the proper equipment.
- NOTE:** If the immobilizer code is NOT accepted by the PCM, an immobilizer indicator lamp on the instrument panel will come on for 2 seconds and then will flash continuously.
If the code IS accepted by the PCM the immobilizer indicator lamp will come on for 2 seconds and then go off.

BMW WITH ZF AND GM AUTOMATIC TRANSMISSIONS

TRANSMISSION FLUID CHECK/FILL PROCEDURES

SUBJECT: Procedure for checking and/or adding transmission fluid to BMW vehicles equipped with ZF and GM transmissions.

ISSUE: After servicing or overhaul of the transmission it will be necessary to bring the atf to the proper level.
Unfortunately the transmissions are *not equipped with filler tubes or dip sticks*. They are, however, equipped with check and fill plugs which requires a certain procedure to insure proper atf level and to avoid personal injury.

PROCEDURE: The following is the correct procedure for filling or adding fluid to the 5HP18, 5HP24, 5HP30 and the 4L30E and 5L40E GM transmission which is scheduled to replace the 4L30E and to be in the 300 and 500 series BMW in the near future.

TRANSMISSION CHECK/FILL PROCEDURE

1. Transmission temperature must be between 86° and 122°.
2. The vehicle must be level and in park or neutral. With the engine running, turn the air conditioning "ON". This will increase idle speed and ensure that all oil passages in the transmission are filled.
3. Step on brake firmly, move selector lever through each gear position, pausing briefly in each gear.
4. With engine running and selector lever in "PARK" position, remove the filler plug located on the transmission. If a small stream of oil runs out, the fluid level is correct. (Refer to figures 1 through 5 for fill plug and drain plug locations)
If no oil runs out when the filler plug is removed, the fluid level is too low. Add oil until a small stream runs out.
5. With the engine running, reinstall the filler plug.

NOTE: As of 2/91 the 4L30E is *NOT* equipped with a filler tube.

IMPORTANT: If the transmission you are working on has a "GREEN" identification tag attached to it, that transmission is filled with "LIFETIME" oil. If the tag is "BLACK", the transmission is filled with DEXRON III.

The charts in figure 6 list the transmission/fluid type applications and fill capacities for BMW equipped with ZF transmissions.

The charts in figure 7 list the transmission/fluid type applications and fill capacities for BMW equipped with GM transmissions.

WARNING: ZF claims, if the incorrect oil is used in any of its 5 speed automatic transmissions, converter clutch and internal frictions will be damaged and shift quality will be changed to the point where the AGS computer system will store gear ratio error codes.

TRANSMISSION FLUID CHECK/FILL PROCEDURES

5HP30 (A5S 560Z)

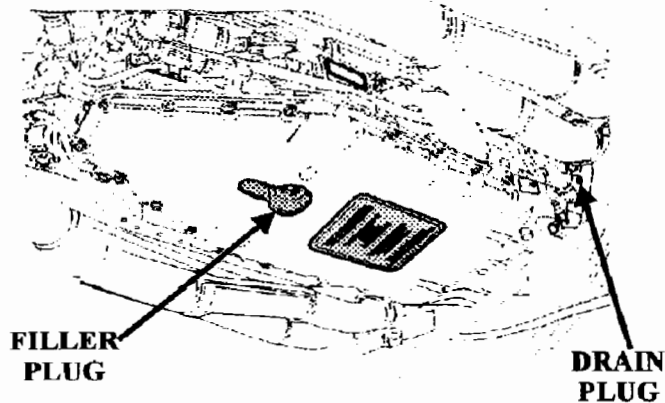


Figure 1

THM R1 (A4A 310R & A4S 270R)

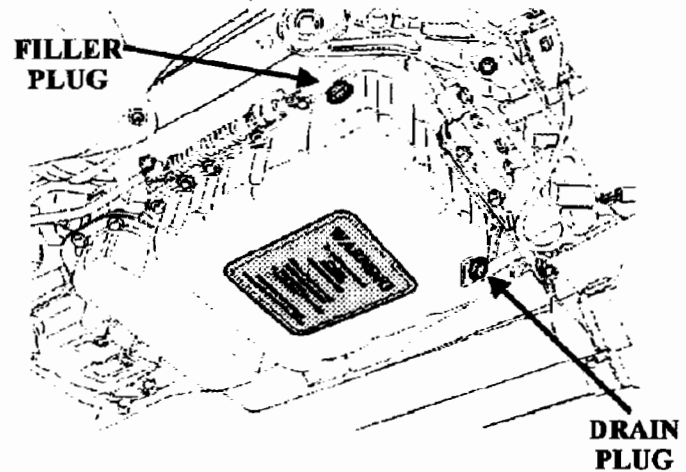


Figure 3

5HP24 (A5S 440Z)

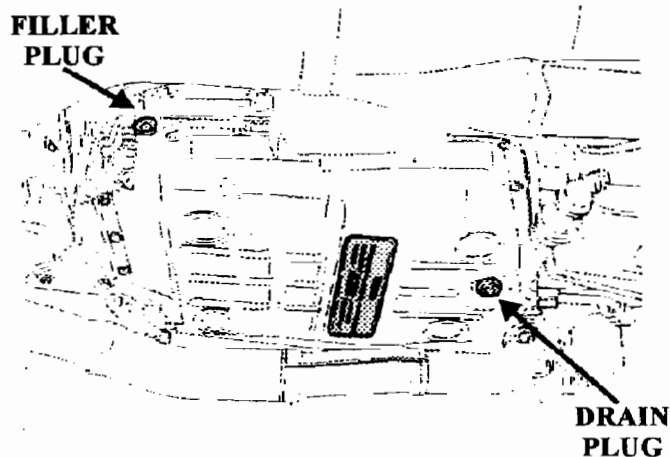


Figure 2

5L40E (A5S 360R)

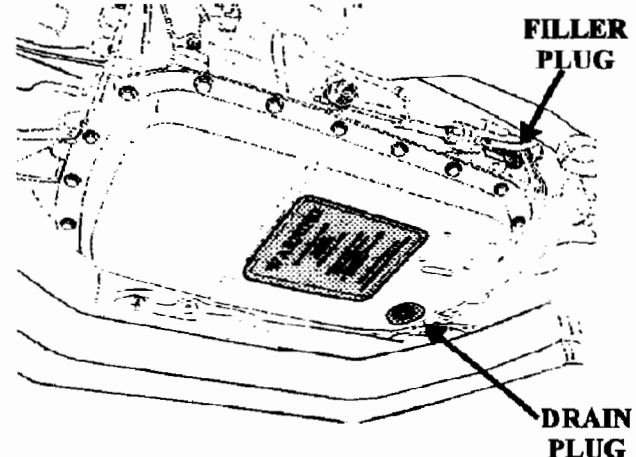


Figure 4

5HP18 (A5S 310Z)

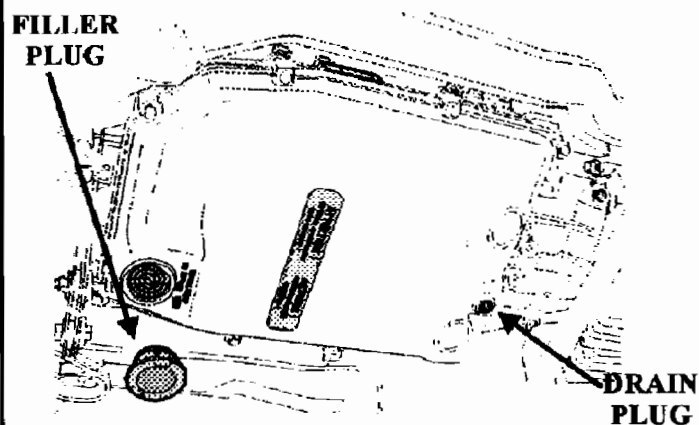


Figure 5

TRANSMISSION FLUID CHECK/FILL PROCEDURES

ZF TRANSMISSION/OIL APPLICATION CHART

BMW MODEL	1992	1993	1994	1995	1996	1997	1998	1999
850Ci								
840Ci								
740i/iL								
540i								
530i/iT								
M3								
750iL								
740i/iL								
540i/iT								

ZF TRANSMISSION FLUID FILL CAPACITY CHART

TRANSMISSION MODEL	WITH TORQUE CONVERTER	WITHOUT TORQUE CONVERTER
5HP18 (A5S 310Z)	8.5 QUARTS (7.8 LITERS)	3.4 QUARTS (3.2 LITERS)
5HP24 (A5S 440Z)	8.6 QUARTS (8.1 LITERS)	3.5 QUARTS (3.3 LITERS)
5HP30 (A5S560Z)	14 QUARTS (13.1 LITERS)	5.9 QUARTS (5.5 LITERS)

Figure 6

TRANSMISSION FLUID CHECK/FILL PROCEDURES

GM TRANSMISSION/OIL APPLICATION CHART

BMW MODEL	1992	1993	1994	1995	1996	1997	1998	1999
525i/iT								
528i/iT								
318i/iS/iC/ti								
325i/iS/iC								
323i/iS/iC								
328i/iS/iC								
323i/iS/iC								
328i/iS								
Z3								

NOTE: The THM R1 designation is the 4L30E transmission.

GM TRANSMISSION FLUID FILL CAPACITY CHART

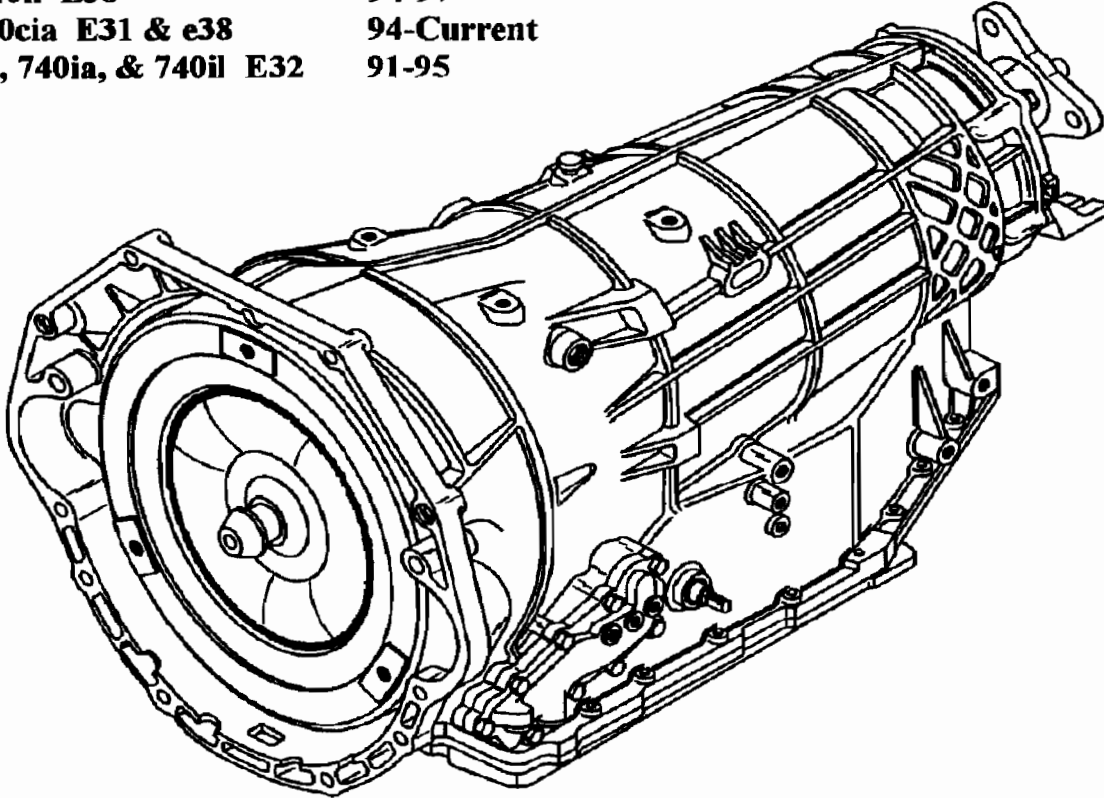
TRANSMISSION MODEL	WITH TORQUE CONVERTER	WITHOUT TORQUE CONVERTER
THM R1 (A4S 270R)	9.3 QUARTS (8.8 LITERS)	3.2 QUARTS (3.0 LITERS)
THM R1 (A4S 310R)	9.3 QUARTS (8.8 LITERS)	3.3 QUARTS (3.1 LITERS)
5L40E (A5S360R)	9.3 QUARTS (8.8 LITERS)	3.3 QUARTS (3.1 LITERS)

Figure 7

BMW ZF-5HP-30

PRELIMINARY INFORMATION

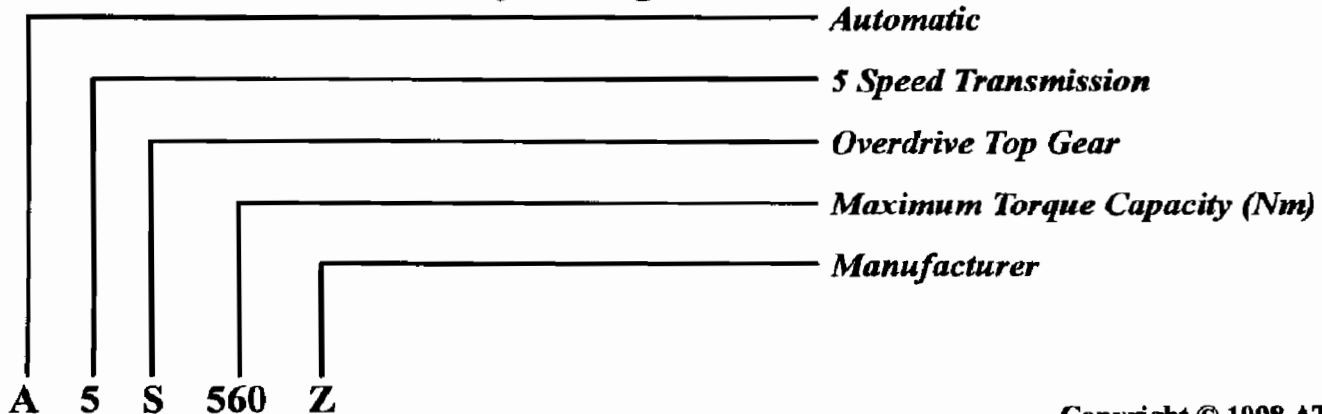
840cia E31	92-96
740ia & 740il E38	94-97
750il & 850cia E31 & e38	94-Current
540ia E34, 740ia, & 740il E32	91-95



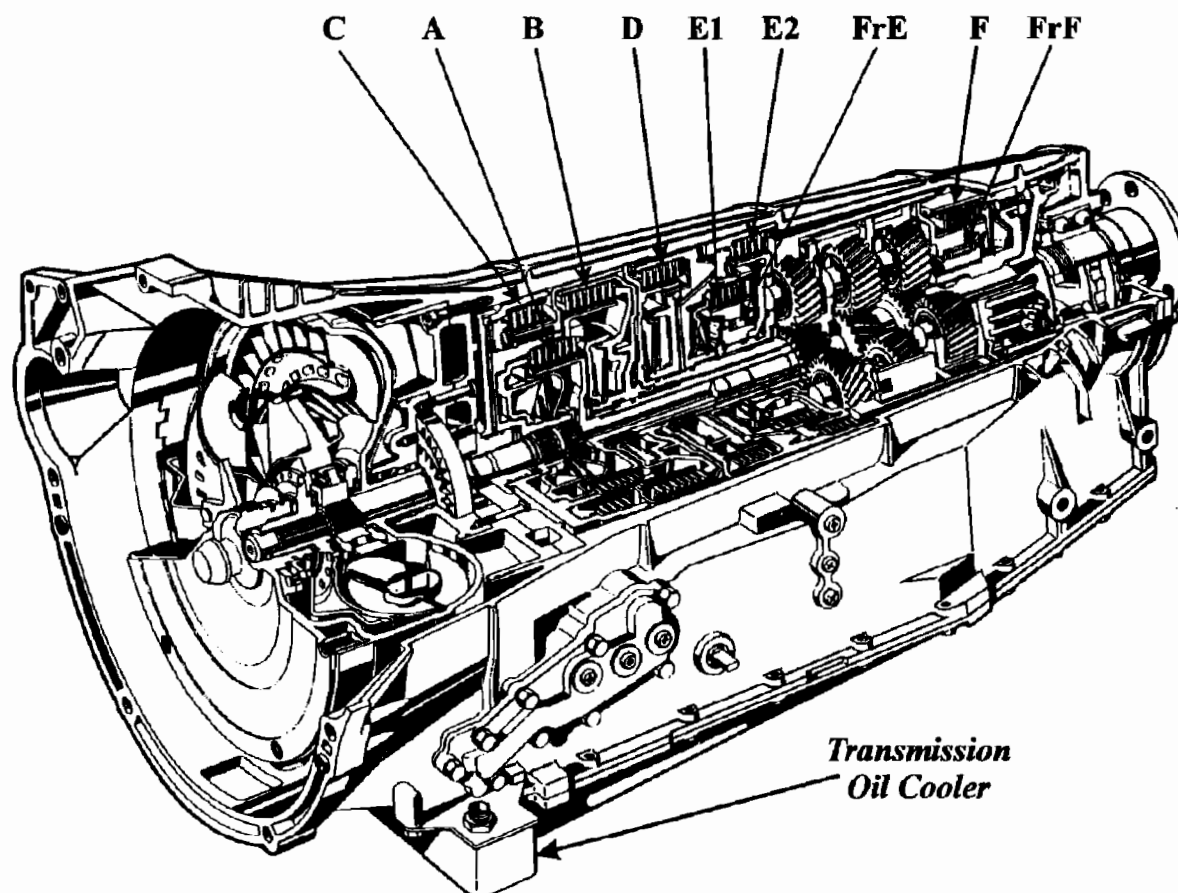
This transmission is manufactured in Germany by ZF and carries the BMW designation A5S 560Z.

The A5S 560Z is an electronically controlled, five speed automatic transmission with a lock-up clutch type torque converter. Three planetary gear sets (Wilson Gearing), three rotating multiple disc clutches, four multiple disc brake clutches, and two sprag clutches (Freewheels) are used to provide the five forward speeds and reverse.

Key to designation:



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SLIDE
BMW ZF-5HP-30


The oil cooler is a separate unit mounted on the underside of the transmission just ahead of the oil pan. The connections to the transmission oil supply are integrated into the mounting. The two external fittings visible are the supply and return lines for engine coolant. Full flow is maintained through the cooler at all times.

GEAR	"A" CLUT	"B" CLUT	"C" CLUT	"D" CLUT	"E1" CLUT	"E2" CLUT	"F" CLUT	"FrE" SPRAG	"FrF" SPRAG	GEAR RATIO
PARK							ON			
REV			ON	ON			ON			3.68:1
NEUT							ON			
D-1ST	ON								HOLD	3.55:1
D-2ND	ON				ON	ON		HOLD		2.24:1
D-3RD	ON			ON	ON					1.54:1
D-4TH	ON	ON			ON					1.00:1
D-5TH		ON		ON	ON					0.79:1
M-2	ON						ON			

NORMAL OPERATION:

A console mounted tip switch allows the driver to select either the Automatic or Winter mode. The Winter mode is designated by an ice crystal symbol (*) on the program switch. When in the Winter mode, the transmission starts off in 2nd gear and the upshifts are programmed to occur earlier to reduce the torque at the drive wheels and prevent wheel spin. The following chart explains the gear selection and each program mode based on the selector lever position.

SELECTOR LEVER POSITION	PROGRAM MODE	
	AUTOMATIC (A)	WINTER (*)
P	P	P
R	R	R
N	N	N
D	<i>D - Economy Program</i>	<i>D - Starts In 2nd, Early Upshifts 2-5</i>
4	<i>4 - Sport Program Delayed Upshifts 1-4</i>	<i>4 - Starts In 2nd, Early Upshifts 2-4</i>
3	<i>3 - Sport Program Delayed Upshifts 1-3</i>	<i>3 - Starts In 2nd, Early Upshifts 2-3</i>
2	<i>2 - Sport Program Delayed Upshifts 1-2</i>	<i>2 - Locked In 2nd</i>

ADAPTIVE SHIFT CONTROL:

Stop and Go Function:

When the transmission control module detects that the vehicle is being driven in a heavy traffic situation with many stops and starts at very low road speed, it will begin using 2nd gear when pulling away. Starting in 2nd gear and not downshifting to 1st gear when stopping eliminates the feeling of excessive load reversals, and provides a more comfortable driving style in this situation.

Deceleration Rate:

Typically, automatic transmission software programs will upshift to the highest gear possible when driven at a given road speed with no throttle application. The transmission control module on the A5S 560Z monitors the rate of change in throttle position when the throttle is released. If the throttle is released quickly, the transmission will stay in the present gear engaged, in anticipation of the drivers intent to slow down. If the throttle is gradually released, as when approaching desired road speed, the transmission will upshift to the next highest possible gear for that road speed.

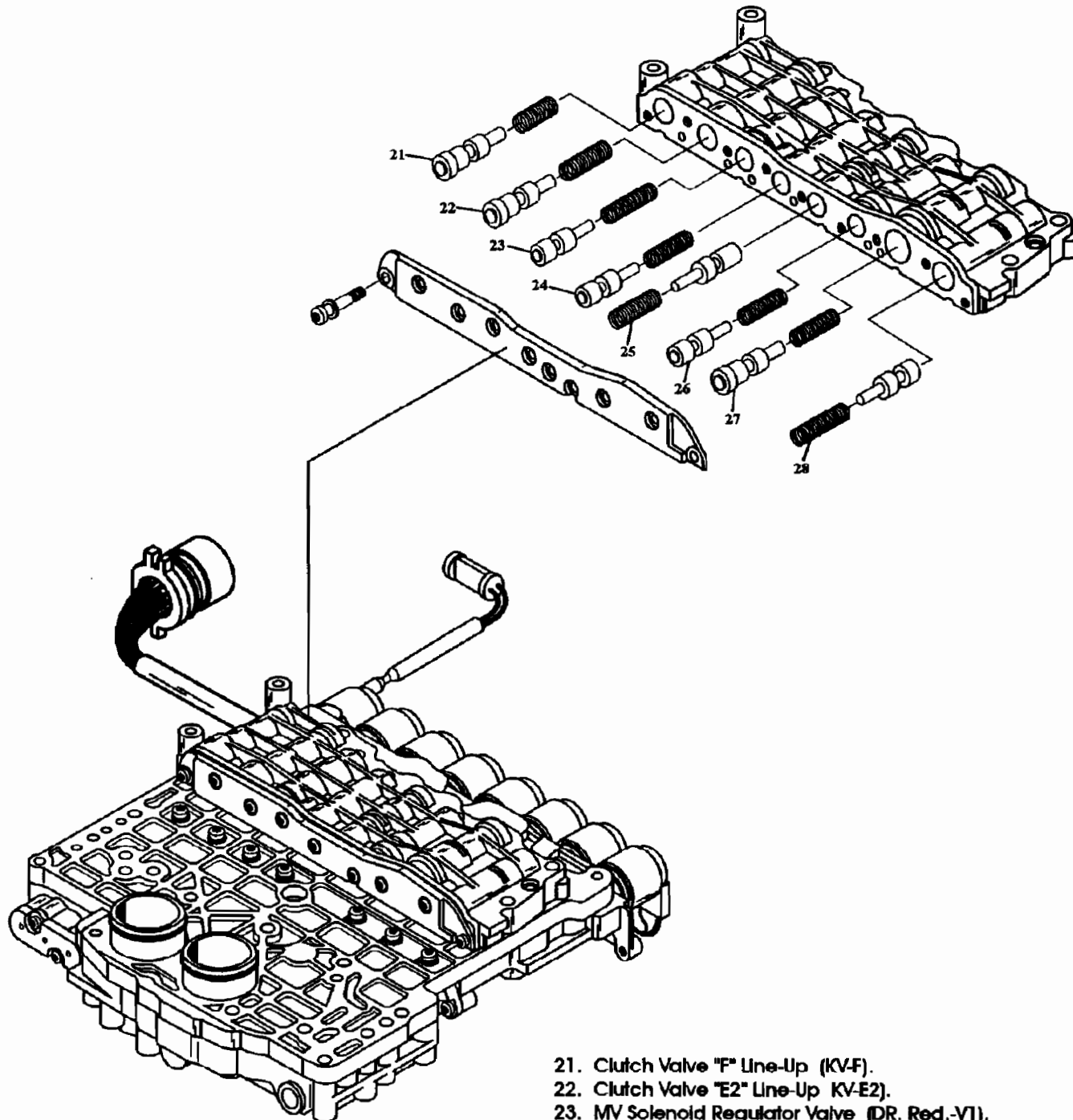
FAILSAFE OPERATION:

When a system fault is detected which would impair normal reliable operation, the transmission control module interrupts the power supply to Pin 12 at the transmission case connector. The transmission control module also alerts the driver of any faults by signaling the vehicles "check control" system. To enable the vehicle to be driven to a repair shop, the following manual gear selections are permitted:

<i>Selector Lever Position</i>	P	R	N	D	4	3	2
<i>Actual Gear Obtained</i>	P	R	N	4	4	4	4

SLIDE

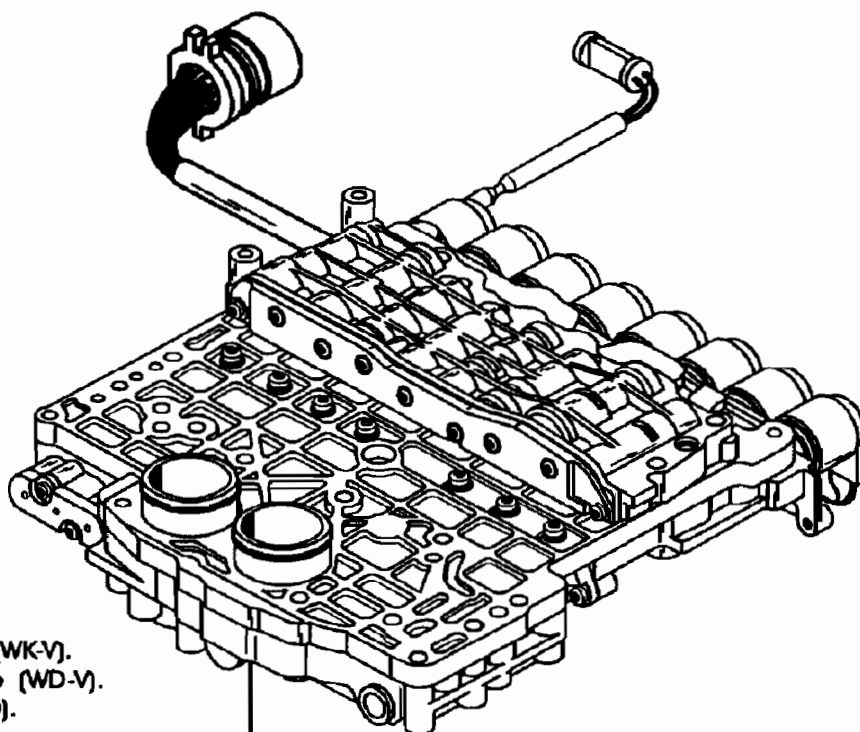
ZF-5HP-30 UPPER REAR VALVE BODY



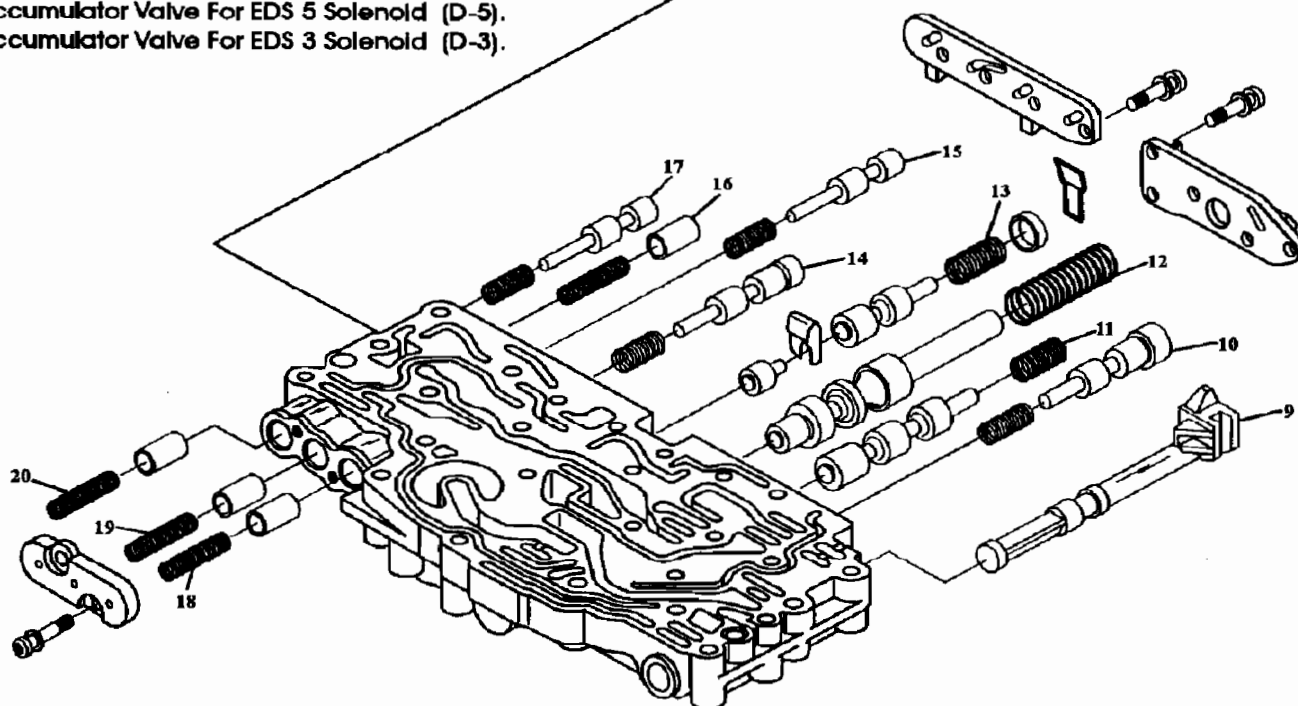
- 21. Clutch Valve "F" Line-Up (KV-F).
- 22. Clutch Valve "E2" Line-Up (KV-E2).
- 23. MV Solenoid Regulator Valve (DR. Red.-V1).
- 24. EDS Solenoid Regulator Valve (DR. Red.-V2).
- 25. Clutch Valve "B" Line-Up (KV-B).
- 26. Clutch Valve "E1" Line-Up (KV-E1).
- 27. Switch Valve For "A" Clutch (ABSCH-V-A).
- 28. Clutch Valve "A" Line-Up (KV-A).

SLIDE

ZF-5HP-30 LOWER FRONT VALVE BODY



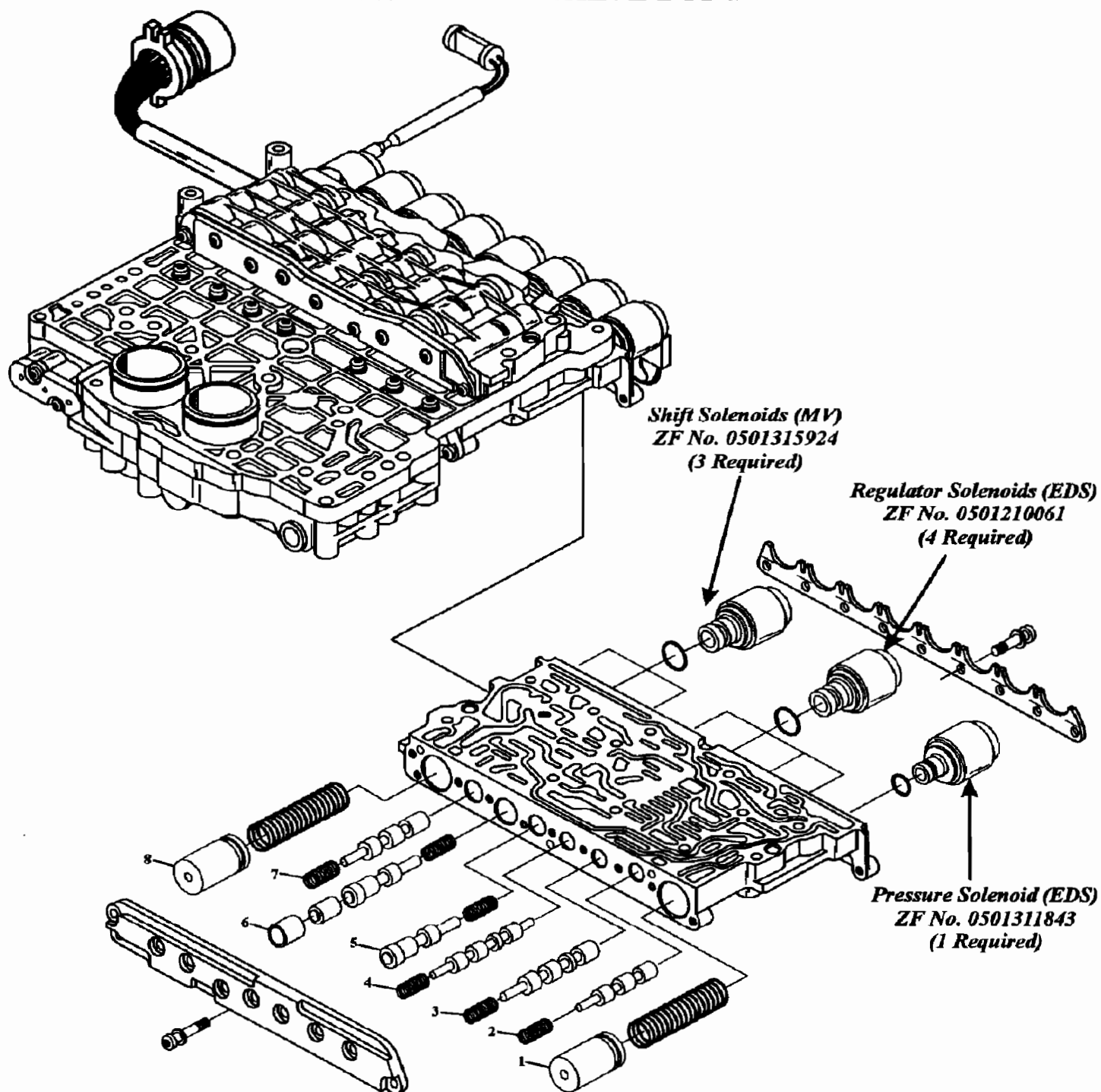
9. Manual Shift Valve (W-S).
10. Converter Clutch Apply Oil Control Valve (WK-V).
11. Converter Clutch Release Oil Control Valve (WD-V).
12. Main Pressure Regulator Valve Line-Up (HD).
13. Lubrication Valve (SCHM-V).
14. Modulating Valve Line-Up (MOD-V).
15. Main Regulator Valve For "B" Clutch (HV-B).
16. Accumulator Valve For EDS 2 Solenoid (D-2).
17. Main Regulator Valve For "D" Clutch (HV-D).
18. Accumulator Valve For EDS 4 Solenoid (D-4).
19. Accumulator Valve For EDS 5 Solenoid (D-5).
20. Accumulator Valve For EDS 3 Solenoid (D-3).



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SLIDE

ZF-5HP-30 LOWER REAR VALVE BODY

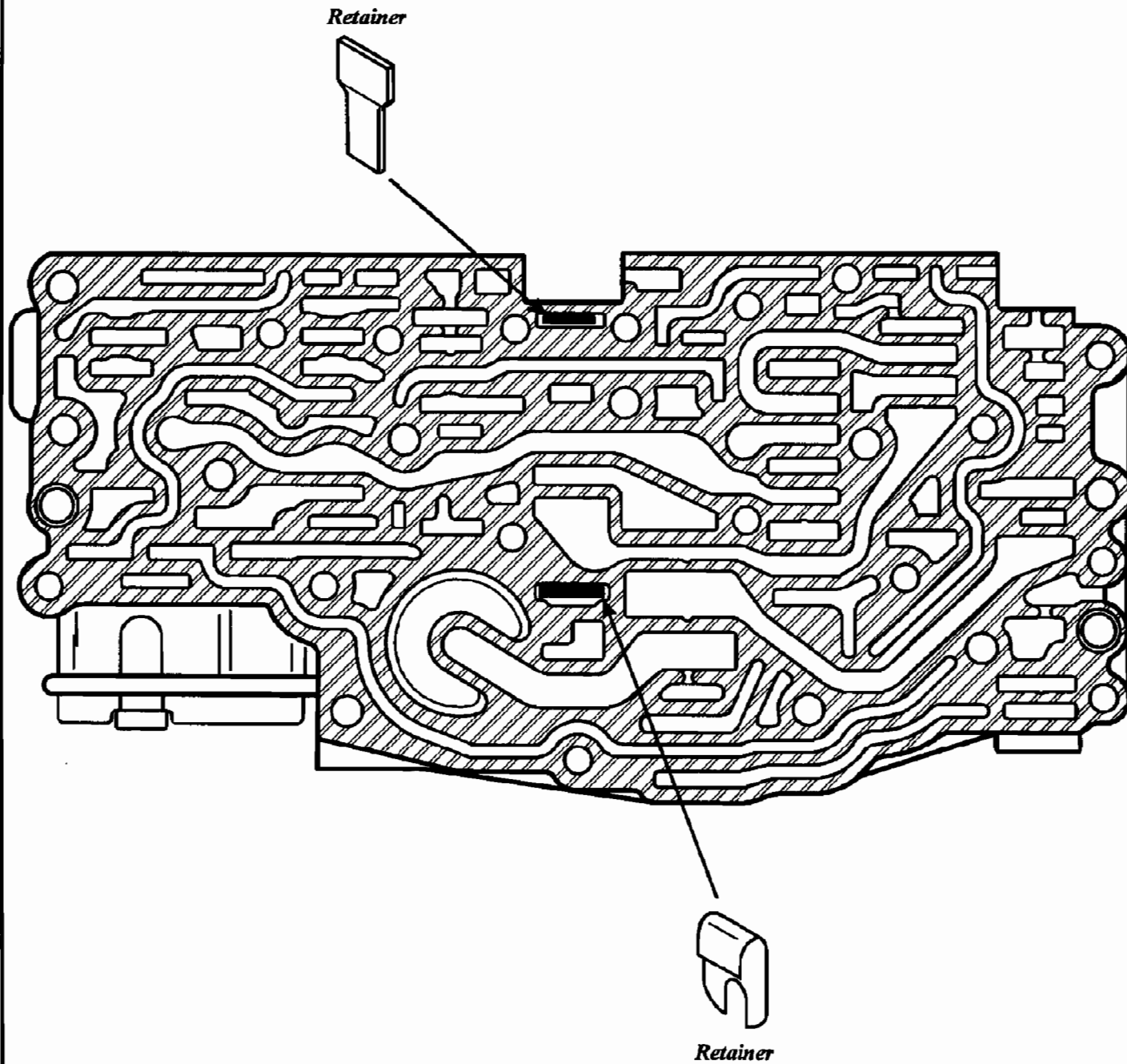


1. "A" Clutch Accumulator Line-Up (D-A).
2. Shift Valve Number 1 (SV-1).
3. Shift Valve Number 2 (SV-2).
4. Shift Valve Number 3 (SV-3).
5. Switch Valve For "D" Clutch (ABSCH-V-D).
6. Clutch Valve "D" Line-Up (KV-D).
7. Reverse Gear Valve Line-Up (RG-V).
8. "C" Clutch Accumulator Line-Up (D-C).

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SLIDE

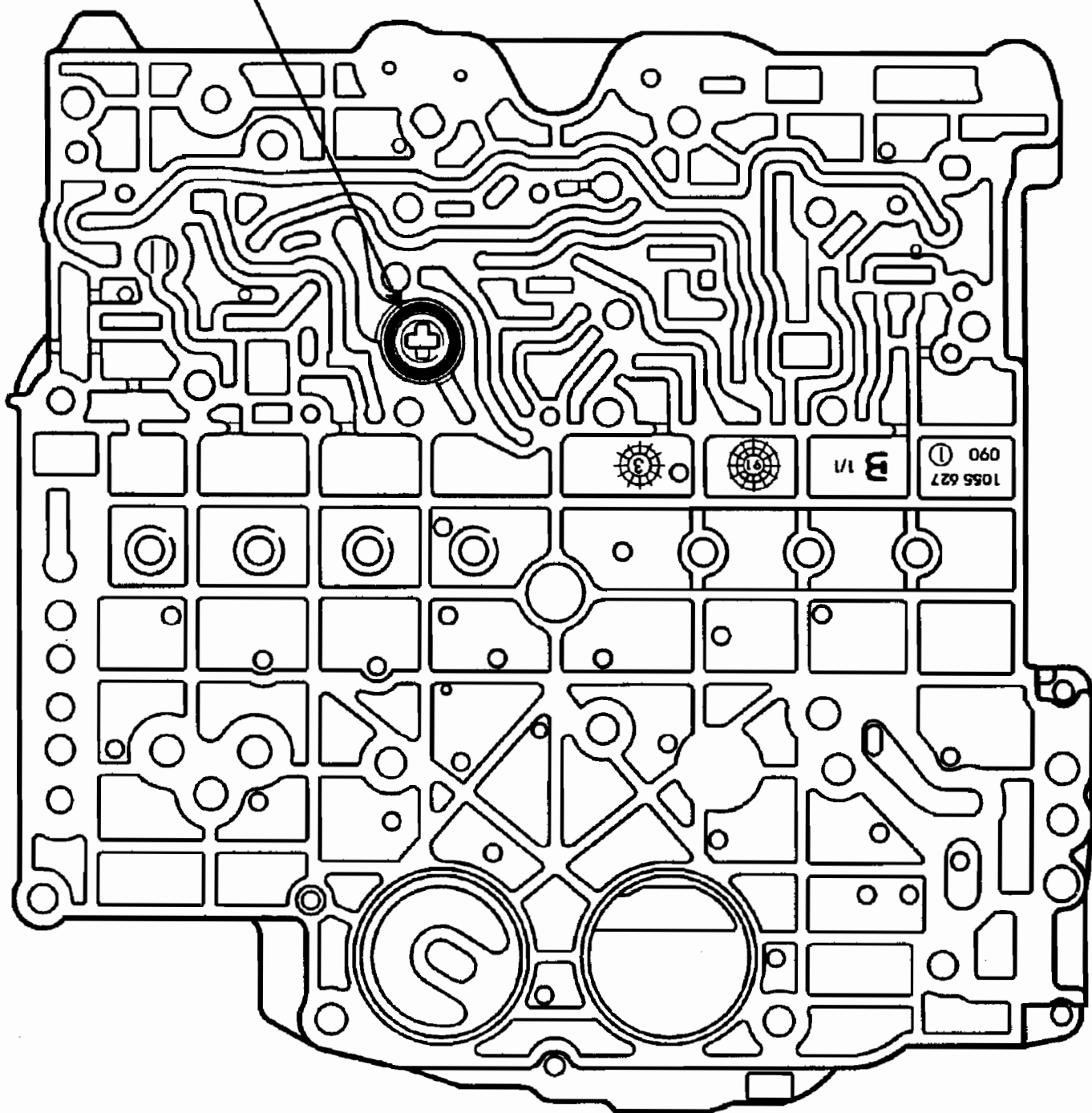
**BMW ZF-5HP-30 RETAINER LOCATIONS
"LOWER FRONT" VALVE BODY**



SLIDE

**ZF-5HP-30 CHANNEL PLATE
UPPER VALVE BODY SIDE**

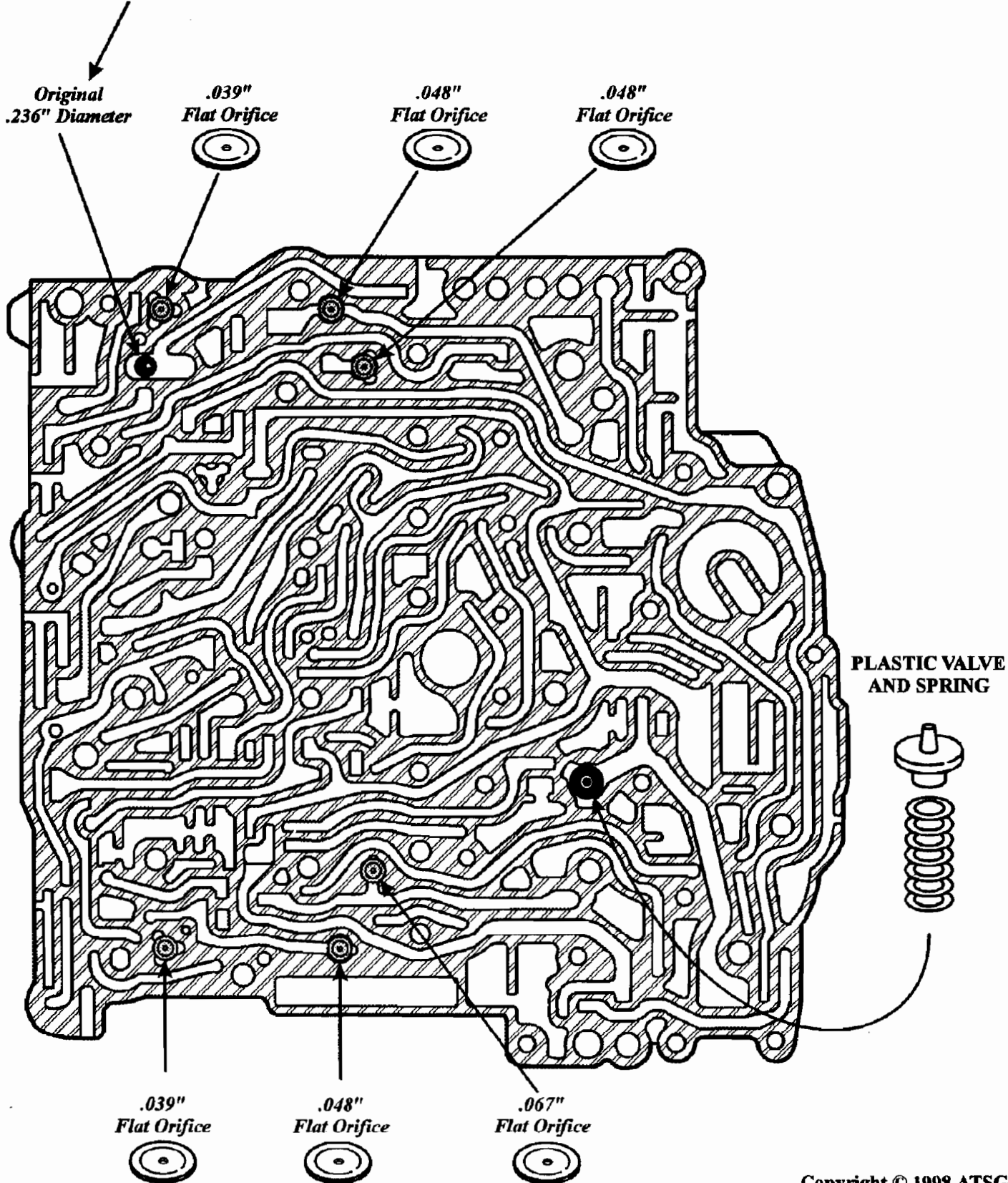
Round Screen



SLIDE

ZF-5HP-30 CHANNEL PLATE LOWER VALVE BODY SIDE

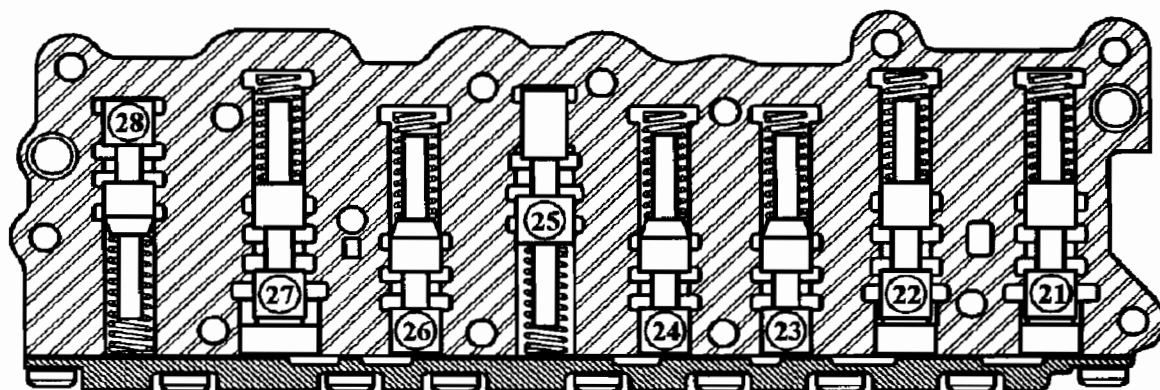
*Replace the original ball with
a plastic .250" (6.35mm) ball.*



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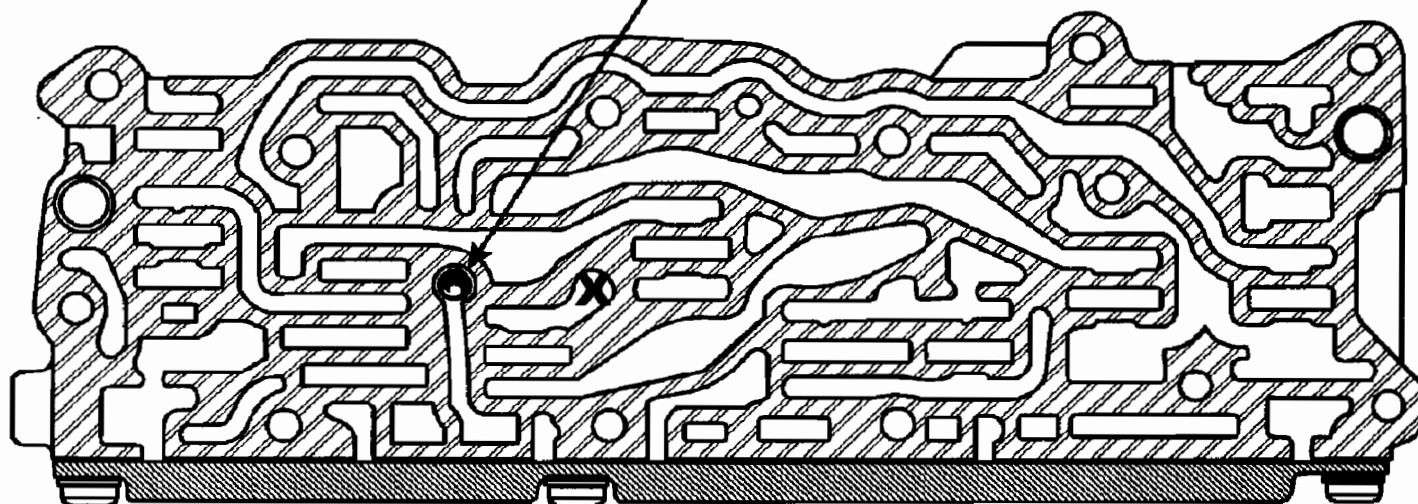
SLIDE

UPPER REAR VALVE BODY

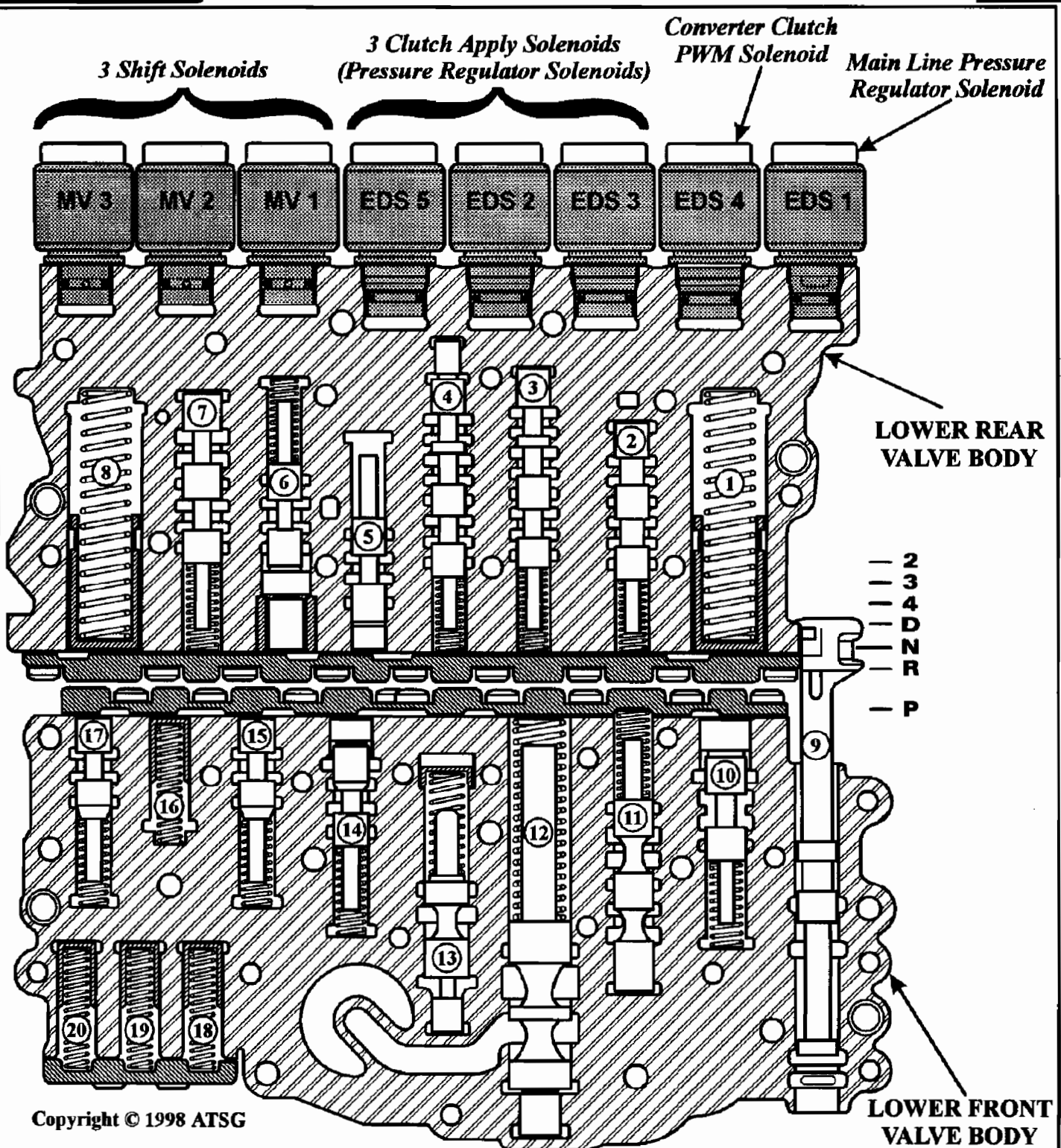


- 21. Clutch Valve "F" Line-Up (KV-F).
- 22. Clutch Valve "E2" Line-Up KV-E2).
- 23. MV Solenoid Regulator Valve (DR. Red.-V1).
- 24. EDS Solenoid Regulator Valve (DR. Red.-V2).
- 25. Clutch Valve "B" Line-Up (KV-B).
- 26. Clutch Valve "E1" Line-Up (KV-E1).
- 27. Switch Valve For "A" Clutch (ABSCH-V-A).
- 28. Clutch Valve "A" Line-Up (KV-A).

*Only One .250" (6.35mm) ball is located here.
Do Not install a ball in the pocket marked X.*



SLIDE



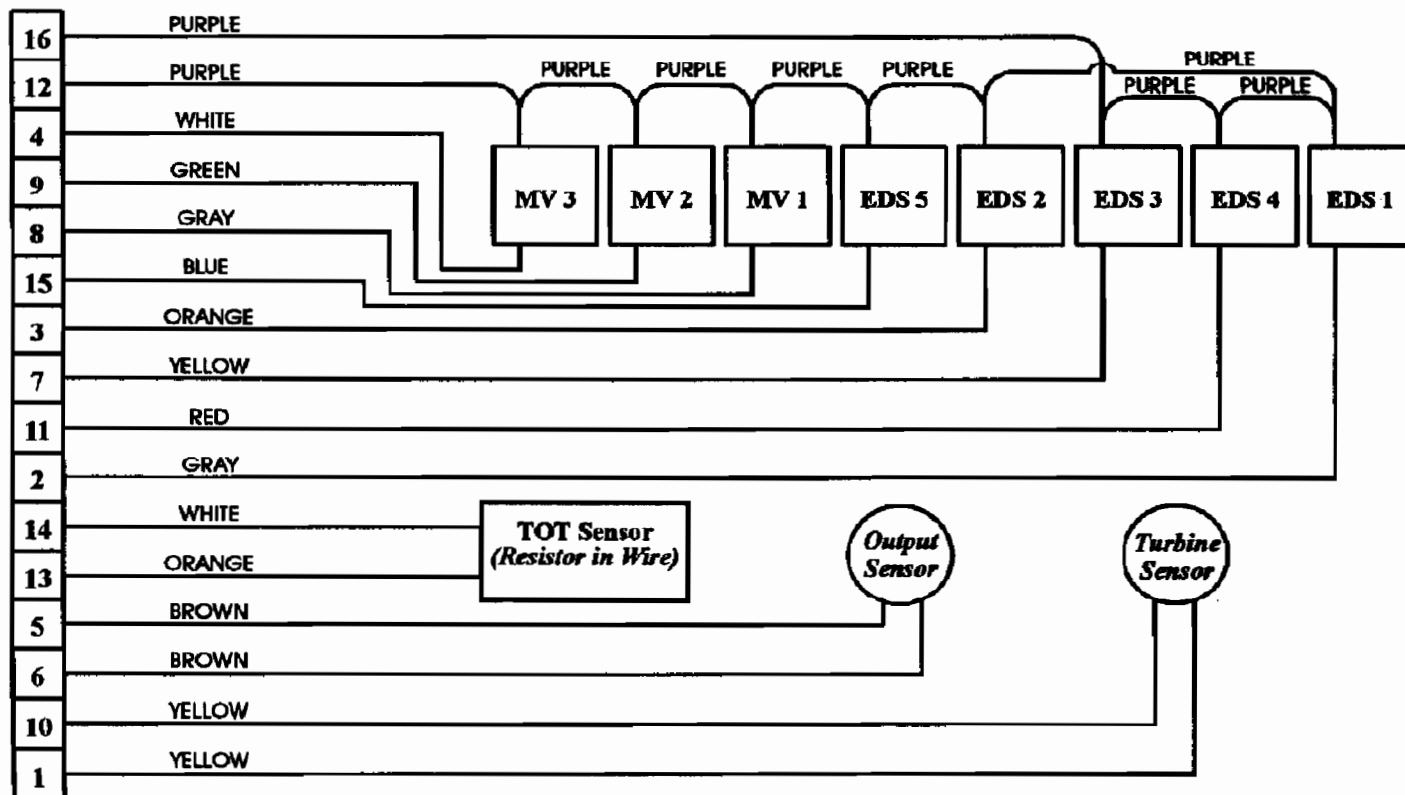
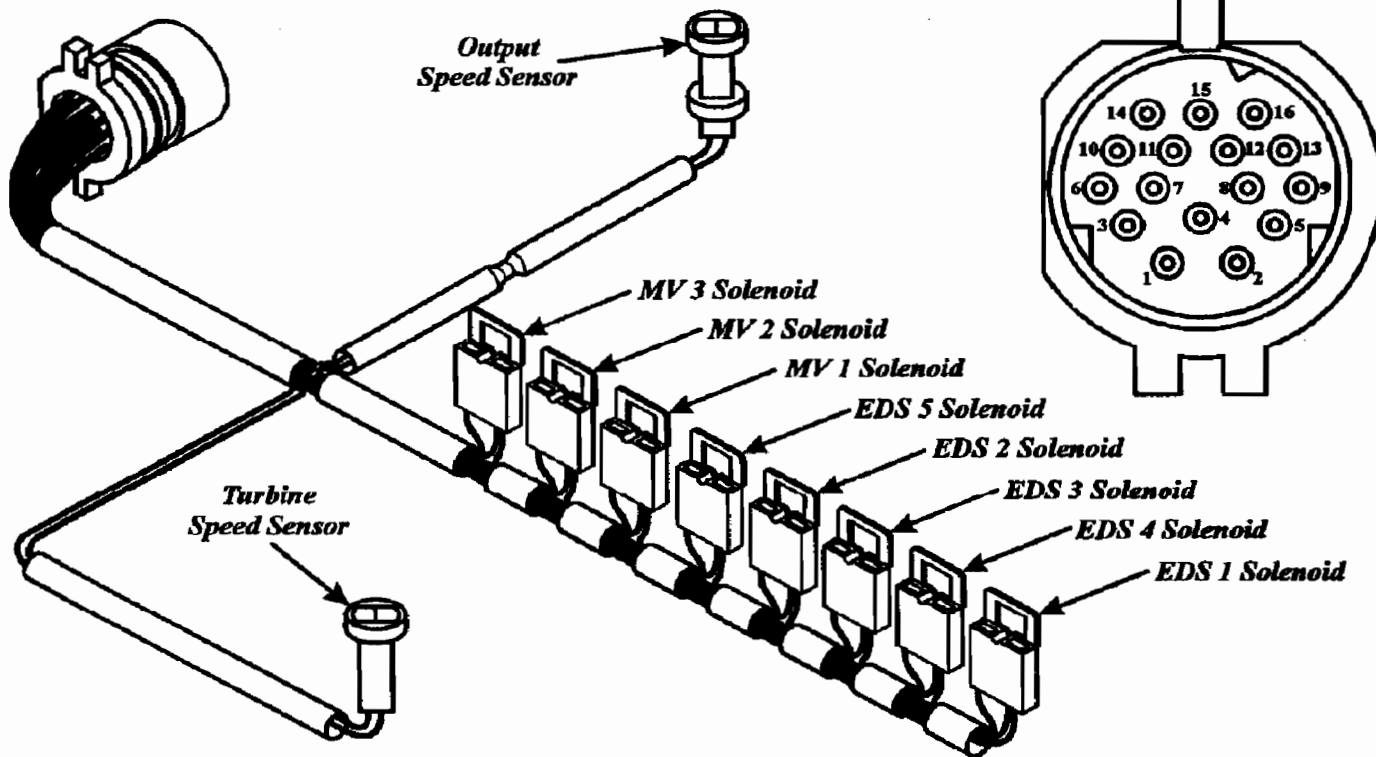
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- | | |
|--|--|
| 1. "A" Clutch Accumulator Line-Up (D-A). | 11. Converter Clutch Release Oil Control Valve (WD-V). |
| 2. Shift Valve Number 1 (SV-1). | 12. Main Pressure Regulator Valve Line-Up (HD). |
| 3. Shift Valve Number 2 (SV-2). | 13. Lubrication Valve (SCHM-V). |
| 4. Shift Valve Number 3 (SV-3). | 14. Modulating Valve Line-Up (MOD-V). |
| 5. Switch Valve For "D" Clutch (ABSCH-V-D). | 15. Main Regulator Valve For "B" Clutch (HV-B). |
| 6. Clutch Valve "D" Line-Up (KV-D). | 16. Accumulator Valve For EDS 2 Solenoid (D-2). |
| 7. Reverse Gear Valve Line-Up (RG-V). | 17. Main Regulator Valve For "D" Clutch (HV-D). |
| 8. "C" Clutch Accumulator Line-Up (D-C). | 18. Accumulator Valve For EDS 4 Solenoid (D-4). |
| 9. Manual Shift Valve (W-S). | 19. Accumulator Valve For EDS 5 Solenoid (D-5). |
| 10. Converter Clutch Apply Oil Control Valve (WK-V). | 20. Accumulator Valve For EDS 3 Solenoid (D-3). |

SLIDE

ZF-5HP-30 INTERNAL WIRE SCHEMATIC

*View Looking Into Case
Connector Setting In The vehicle*



NOTE: Some internal wire colors may vary.

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ZF-5HP-30 SOLENOID APPLICATION CHART

<i>Selector Lever Position</i>	<i>MV 1 Solenoid</i>	<i>MV 2 Solenoid</i>	<i>MV 3 Solenoid</i>	<i>EDS 1 Solenoid</i>	<i>EDS 2 Solenoid</i>	<i>EDS 3 Solenoid</i>	<i>EDS 4 Solenoid</i>	<i>EDS 5 Solenoid</i>	<i>GEAR RATIO</i>
PARK	ON			**					
REVERSE		ON	⊗	**	*-	*		*-	3.68:1
NEUTRAL	ON			**					
D-1ST	ON			**	*-	*-		*-	3.55:1
D-2ND	ON	ON		**		*		*	2.24:1
D-3RD		ON		**	*	*		*	1.54:1
D-4TH		ON		**	*-		-*-	*-	1.00:1
D-5TH			-*	**	*		-*-	*-	0.79:1
Failsafe (4th)	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1.00:1

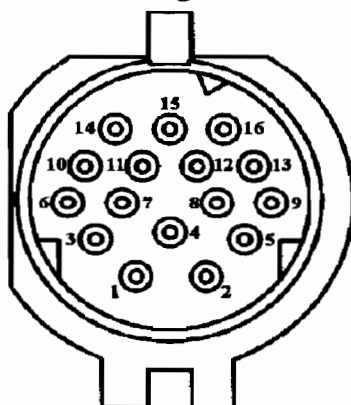
SOLENOID CHART LEGEND

<i>Symbol</i>	<i>Description</i>
ON	<i>MV 1, MV 2 and MV 3 Solenoids are energized by the Electronic Transmission Control unit and have two functions. They are Open or Closed. Energized (On), there is pressure in circuit.</i>
⊗	<i>MV 3 is turned "ON" if reverse is selected at a high vehicle speed, to inhibit reverse engagement.</i>
**	<i>EDS 1 is used for line pressure control only, and operates from 0 to 0.8 amps. When the solenoid is "OFF" (0 amps), pressure is high. EDS 1 pressure is "Lowered" as the solenoid is modulated by the control unit.</i>
*	<i>EDS 2, EDS 3, EDS 4 and EDS 5 Solenoids are also pulse modulated but are exactly the opposite of EDS 1 Solenoid. When these solenoids are "ON" oil pressure in the hydraulic circuit is high, and when they are "OFF" pressure in the hydraulic circuit is low.</i>
-*	<i>Solenoid "OFF" (hydraulic pressure low), then Solenoid "ON" (hydraulic pressure high).</i>
*-	<i>Solenoid "ON" briefly (hydraulic pressure high), then Solenoid "OFF" (hydraulic pressure low). The pressure acts briefly on regulator valves to cushion clutch application.</i>
-*-	<i>EDS 4 Solenoid is used for Torque Converter Clutch apply and release only, and depends on throttle position and vehicle speed as to its application.</i>

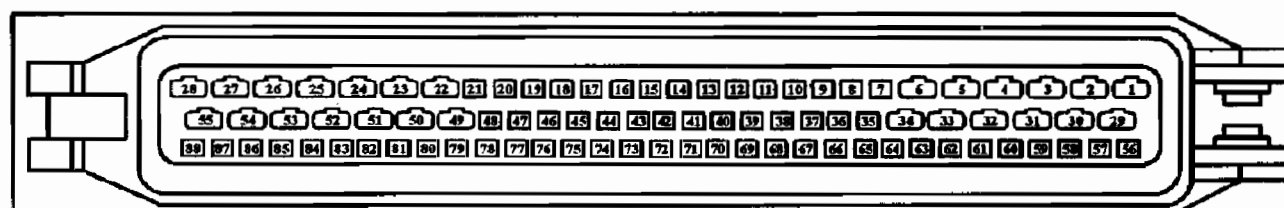
SOLENOID AND SENSOR RESISTANCE CHART

<i>Solenoid</i>	<i>Case Connector</i>	<i>Control Unit Connector</i>	<i>Resistance In Ohms</i>
	<i>Pin Numbers - +</i>	<i>Pin Numbers - +</i>	
MV 1	8 and 12	30 and 52	30 - 34 Ω
MV 2	9 and 12	33 and 52	30 - 34 Ω
MV 3	4 and 12	32 and 52	30 - 34 Ω
EDS 1	2 and 12	5 and 52	5.2 - 6.8 Ω
EDS 2	3 and 12	1 and 52	6.2 - 7.8 Ω
EDS 3	7 and 12	29 and 52	6.2 - 7.8 Ω
EDS 4	11 and 12	4 and 52	6.2 - 7.8 Ω
EDS 5	15 and 12	51 and 52	6.2 - 7.8 Ω
TOT	13 and 14	21 and 22	1000 Ω at 25° C
TSS	1 and 10	44 and 16	292 - 358 Ω
OSS	5 and 6	14 and 42	292 - 358 Ω

*View Looking Into Case
Connector Setting In The vehicle*



Electronic Control Unit Connector Pin Identification



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RETRIEVING FAULT CODES

The BMW Diagnostic Tool is **required** to retrieve the fault codes that are stored in the control unit. The diagnostic tool has the ability to retrieve codes, clear codes and activate individual components, and is adaptable to 3 Series, 5 Series, 7 Series and 8 Series vehicles equipped with 4HP-22/24, 4L30-E, 5HP-18, 5HP-19, and 5HP-30. The BMW Diagnostic Tool can be purchased from:

Mario Aristides Phone - (305) 666-3544, Fax - (305) 666-8238

BMW ZF-5HP-30 FAULT CODE CHART

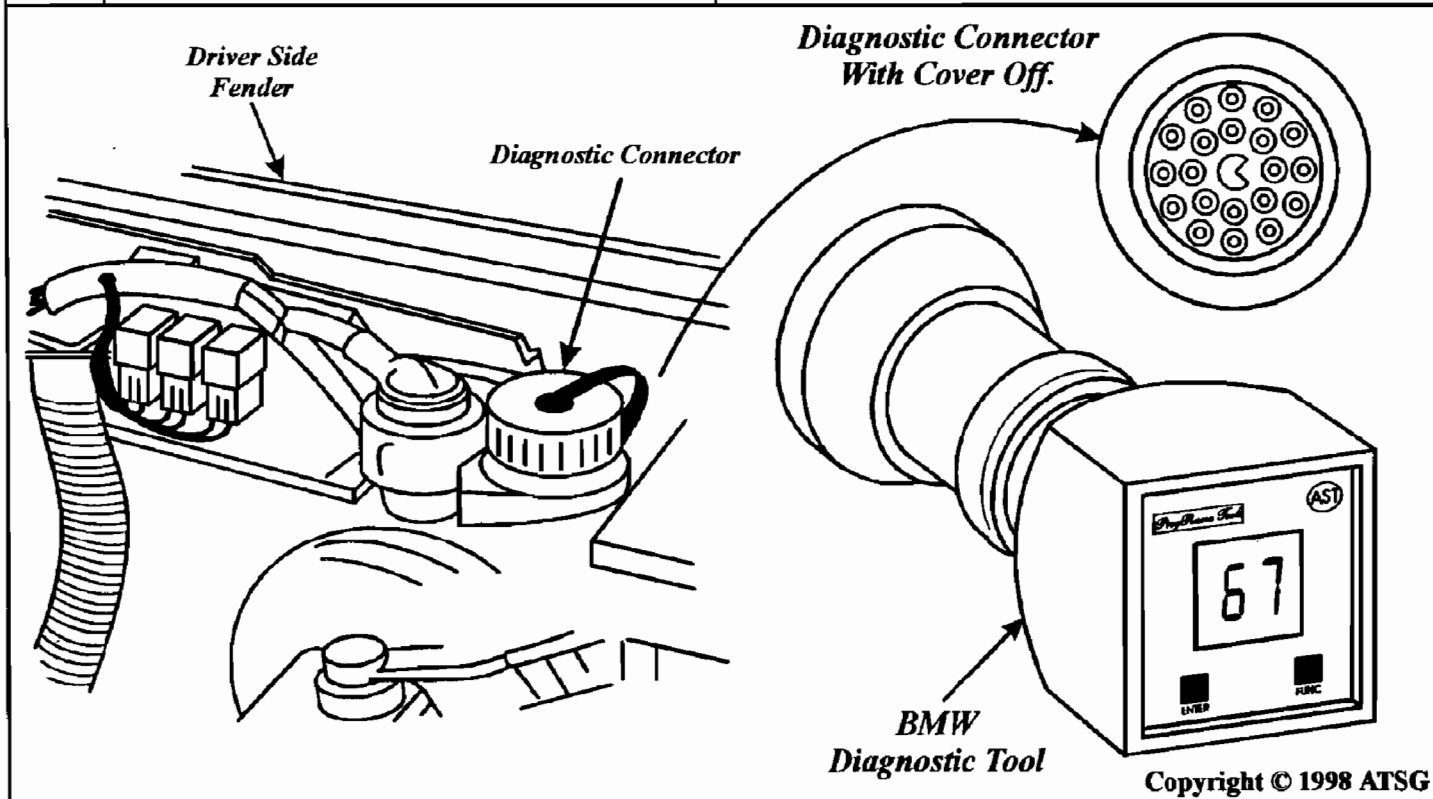
Code	Description	Possible Causes
01	Pressure Regulator, EDS 2 - Pin 1	Questionable signal, or break or short in wiring
02	Park-Neutral Lock Solenoid - Pin 2	Break or short in wiring
04	Pressure Regulator, EDS 4 - Pin 4	Questionable signal, or break or short in wiring
05	Pressure Regulator, EDS 1 - Pin 5	Questionable signal, or break or short in wiring
08	Selector Lever Position L2 - Pin 8	Vehicle acceleration detected while selector lever in P or N position, or engine has been started even though EGS control unit has not detected a selector lever position of P or N
09	Selector Lever Position L3/L4 - Pins 37 and 9	Engine has been started even though EGS control unit has not detected a selector lever position of P or N
0C	Program Selector Switch - Pins 12, 13 and 45	Short in wiring, or more than one program selector switch input is applied to ground
10	Rotational Speed Sensor, Turbocharger Pins 16 and 44	No input, or incorrect engine speed information
12	Kickdown Switch - Pin 18	Questionable signal
13	ASC Monitoring - Pin 19	ASC operation has been detected while selector lever was in Park or Neutral position
16	TOT Sensor - Pins 21 and 22	Resistance of TOT Sensor not within permissible range
1A	Battery Voltage Supply - Pin 26	Break in wiring
1D	Pressure Regulator, EDS 3 - Pin 29	Questionable signal, or break or short in wiring
1E	MV 1 Solenoid - Pin 30	Break or short in wiring, or defective winding in solenoid
20	MV 3 Solenoid - Pin 32	Break or short in wiring, or defective winding in solenoid
21	MV 2 Solenoid - Pin 33	Break or short in wiring, or defective winding in solenoid
24	Selector Lever Position L1 - Pin 36	Break or short in wiring, or defective sensor
2A	Output Speed Sensor signal and Stall Speed signal - Pins 13 and 42	No input, or incorrect engine speed information
33	Pressure Regulator, EDS 5 - Pin 51	Questionable signal, or break or short in wiring
34	Power Supply to transmission - Pin 52	Break or short in wiring

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SLIDE

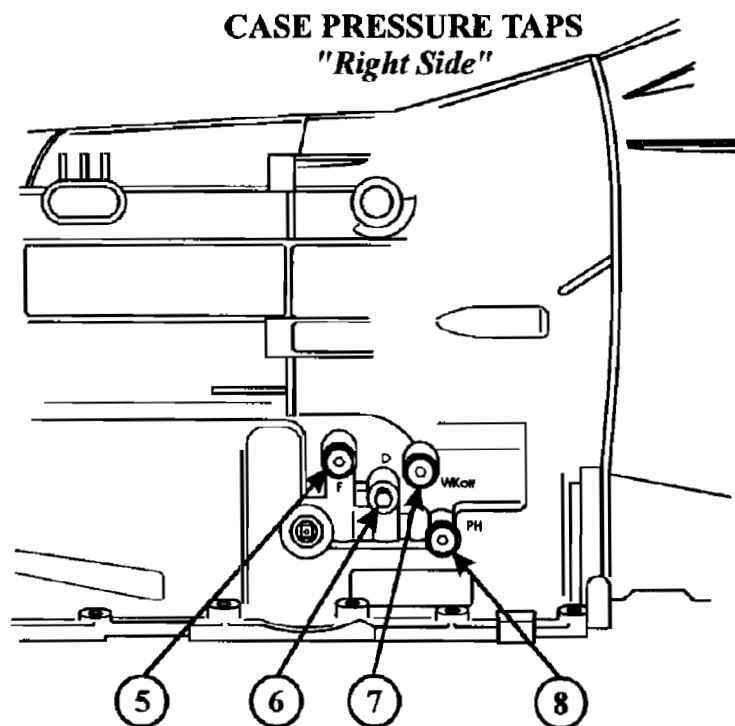
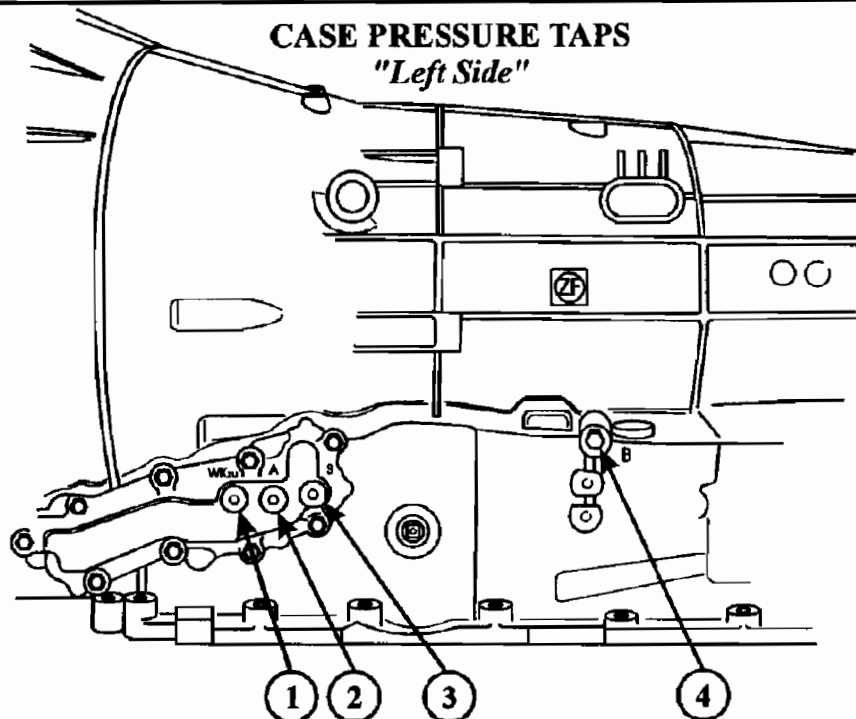
BMW ZF-5HP-30 FAULT CODE CHART

Code	Description	Possible Causes
36	Power Supply - Pin 54	Power Supply less than 9 volts at engine speeds greater than 1600 RPM
64	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
65	EPROM - Checksum	Program memory in Transmission Control Unit faulty
66	Incorrect Program Checksum	Program memory in Transmission Control Unit faulty
67	Transmission Relay - Pin 52	Pickup and dropout times too long
68	Over-revving Lock	Engine RPM greater than 6816 has been detected
69	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
6A	Speed Monitoring	Faulty Speed Sensor signal, or slip in Transmission
96	CAN Timeout 1	CAN signal not sent during initialization (Ignition On)
97	CAN Timeout 2	CAN signal not sent during operation
98	CAN Bus monitoring	Values in CAN RAM are not updated
99	CAN status fault	
9A	CAN throttle valve information	DME detects faulty throttle valve signal
9B	CAN load signal information	DME detects faulty load signal
9C	CAN engine intervention	DME cannot carry out reduction in engine torque desire by the EGS, or DME has different requirements compared to other CAN users
9D	CAN engine temperature info	DME detects faulty engine temperature signal



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SLIDE



1. WKzu = Converter Clutch ON Pressure.
2. A = "A" Clutch Pressure.
3. S = Cooler Pressure.
4. B = "B" Clutch Pressure (Must Drill and Tap for Access).
5. F = "F" Clutch Pressure.
6. D = "D" Clutch Pressure (Must Drill and Tap for Access).
7. WKoff = Converter Clutch OFF Pressure.
8. PH = Line Pressure.

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BMW ZF 5-HP-30 NO REVERSE

COMPLAINT: 1991 and later BMW vehicles equipped with the ZF 5-HP-30 transmission may exhibit a no reverse condition, when selector lever is placed into reverse.

CAUSE: The cause may be, the .236" diameter checkball located in the bathtub in the channel plate has blown through the spacer plate, which will now exhaust "F" clutch (Reverse) oil pressure.

CORRECTION: Install a .250" diameter plastic checkball into the bathtub in the channel plate as shown in Figure 1. The holes in the spacer plate over the bathtub measure .198" and the larger diameter checkball will greatly decrease the probability of this condition occurring again. There is also ample room in the bathtub for the increased diameter checkball to perform its duties. Refer to Figure 1. Figure 2 illustrates the location of the only other checkball in this unit and do not install checkball in the location marked "X".

SPECIAL NOTE: The checkball wearing and blowing through the spacer plate causing the loss of reverse, may also have caused some damage to the "C" Clutch which is also on in reverse. This condition has also been known to create damage to the "A"/"C" Clutch Housing as well. If the clutch housing has been severely damaged, aluminum material will be evidenced in the bottom pan upon inspection.

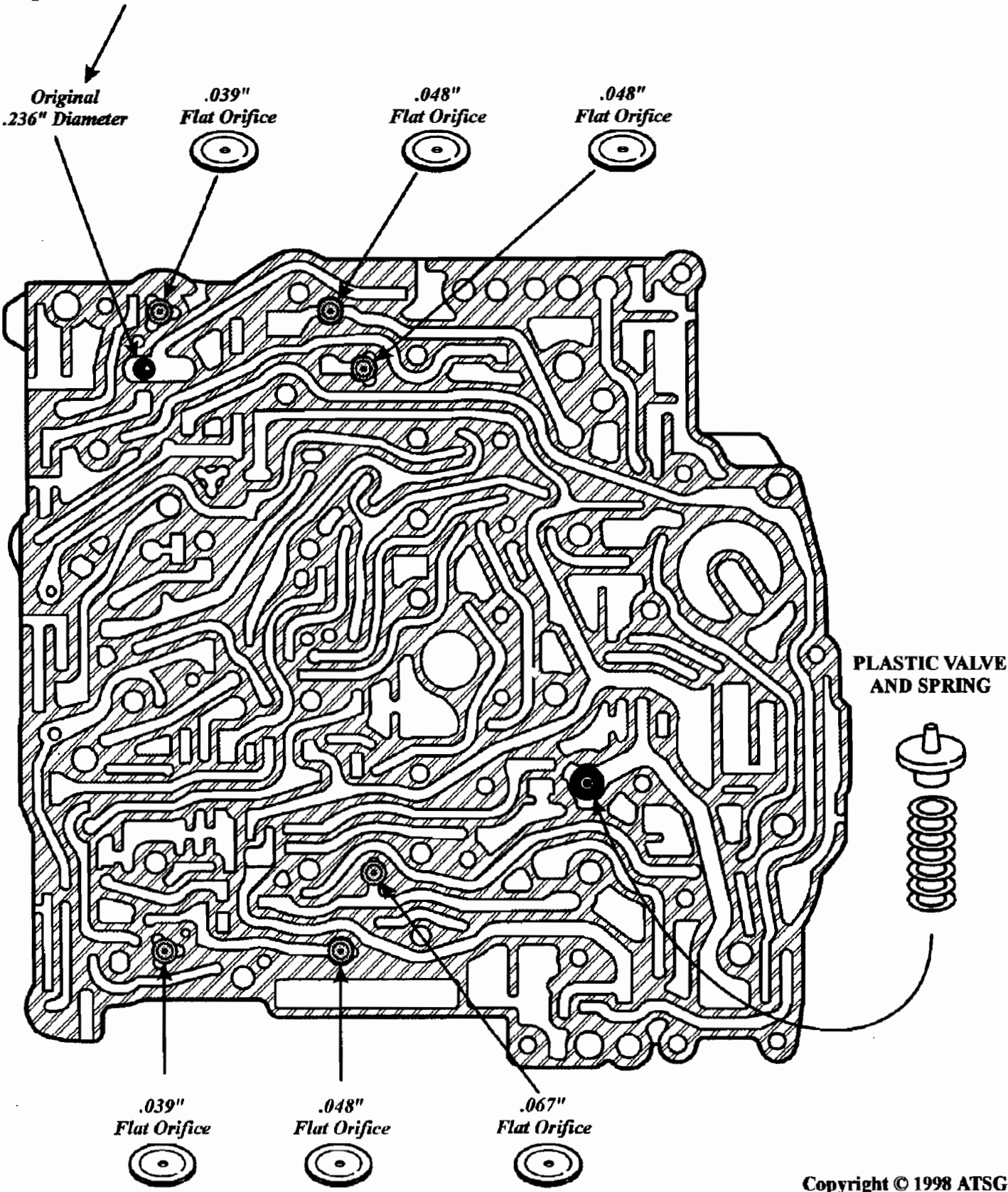
When the unit is removed and the "A"/"C" Clutch Housing is dis-assembled, it is not uncommon for the unit to set for over a week waiting on parts. When re-assembling it is very easy to *mis-assemble* the "B" Clutch Hub on top of the retaining snap ring for the "A" Clutch pack. This mis-assembly will create a neutralizing on the 3-4 upshift, and the Trans light will begin flashing.

Ensure that you assemble the "B" Clutch Hub on top of the "A" Clutch stack, and then install the "A" Clutch Pressure Plate and snap ring, as shown in Figure 3.

SLIDE

**ZF-5HP-30 CHANNEL PLATE
LOWER VALVE BODY SIDE**

*Replace the original ball with
a plastic .250" (6.35mm) ball.*



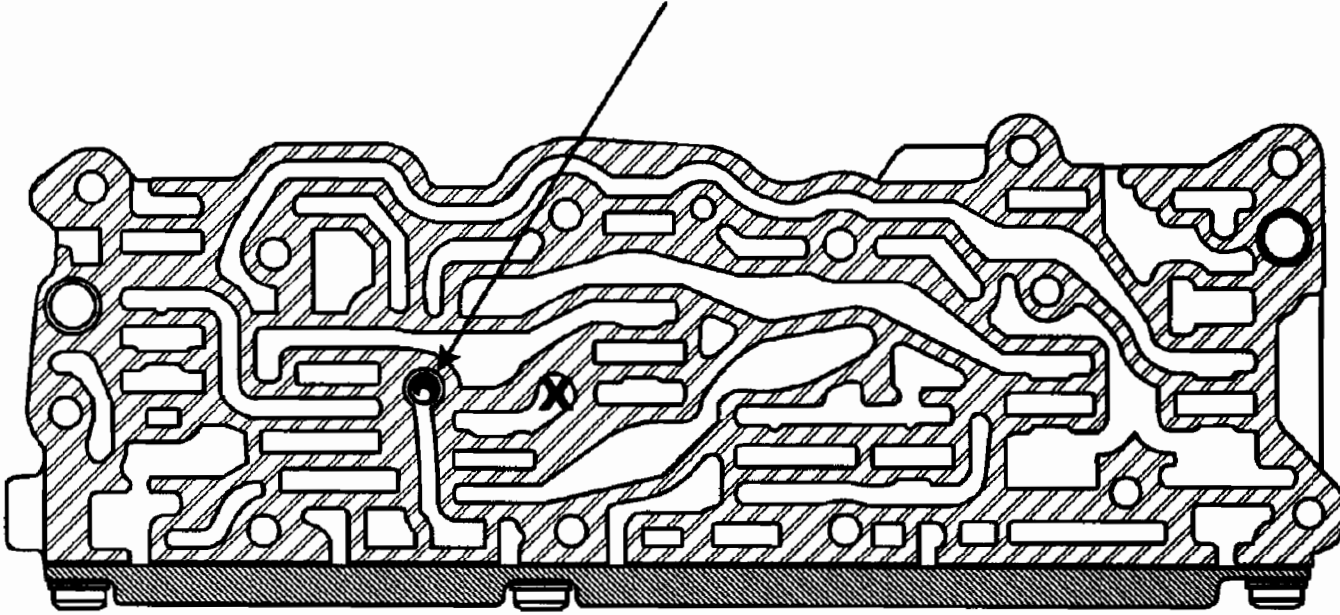
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Figure 1

SLIDE

UPPER REAR VALVE BODY
CHECKBALL LOCATION

*Only One .250" (6.35mm) ball is located here.
Do Not install a ball in the pocket marked X.*

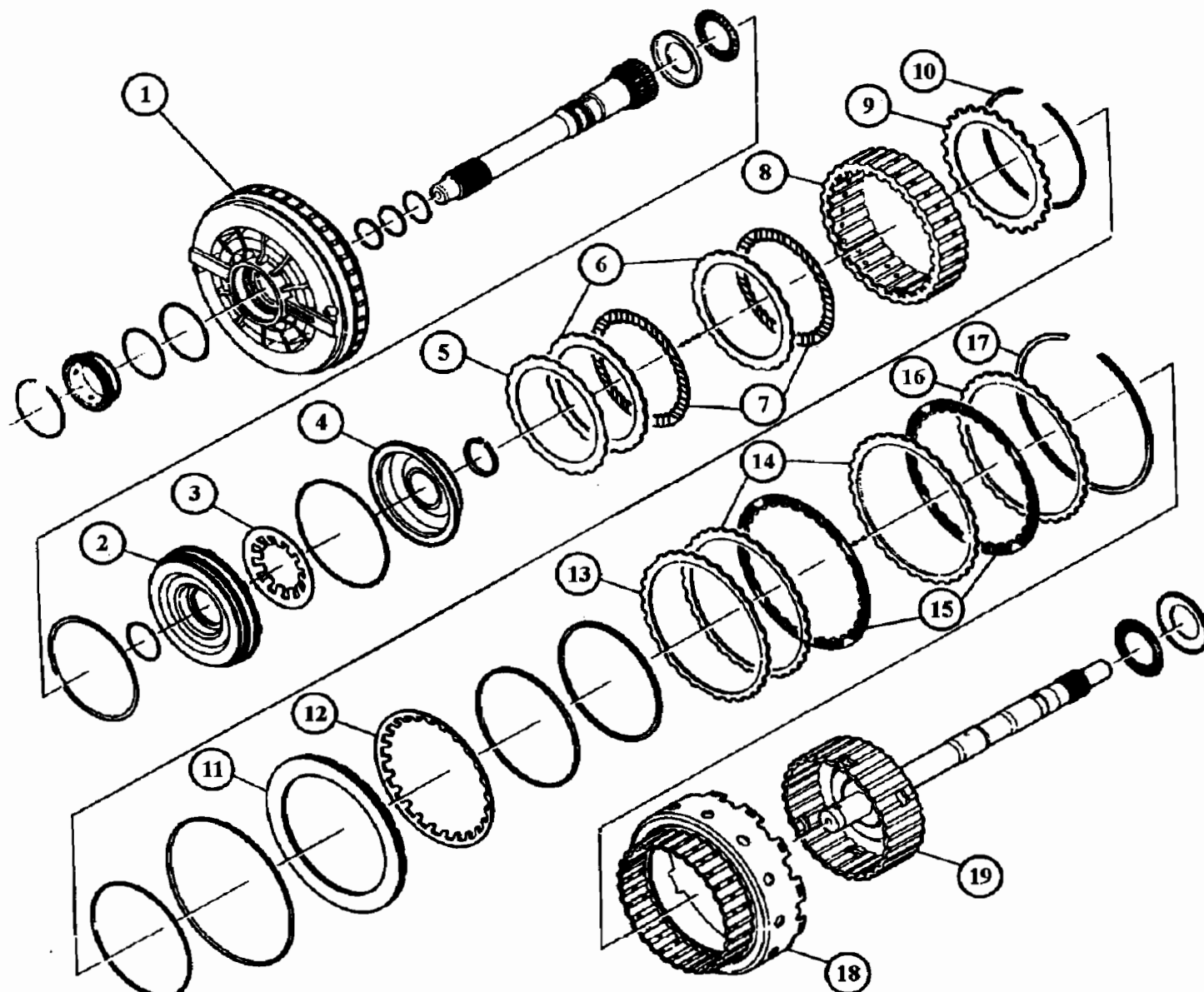


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Figure 2

SLIDE

"A"/"C" CLUTCH HOUSING COMPONENTS



1. "A"/"C" Clutch Housing Assembly
2. "A" Clutch Apply Piston
3. "A" Clutch Bellville Return Spring
4. "A" Clutch Piston Oil Dam
5. "A" Clutch Cushion Plate
6. "A" Clutch Steel Plates (5 Required)
7. "A" Clutch Friction Plates (5 Required)
8. "B" Clutch Hub
9. "A" Clutch Pressure Plate
10. "A" Clutch Pressure Plate Snap Ring

11. "C" Clutch Apply Piston
12. "C" Clutch Apply Piston Return Spring
13. "C" Clutch Cushion Plate
14. "C" Clutch Steel Plates (3 Required)
15. "C" Clutch Friction Plates (3 Required)
16. "C" Clutch Pressure Plate
17. "C" Clutch Pressure Plate Snap Ring
18. "C" Clutch Hub
19. "A" Clutch Hub And Input Shaft

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Figure 3

MERCEDES BENZ 722.4
DELAY OR SLIP ON TAKE-OFF
MOMENTARY BIND-UP IN REVERSE
NO OR FLARED 3-4 SHIFT

COMPLAINT: The transmission will delay during forward engagement, slip on initial take off or exhibit a momentary bind-up condition in reverse. The transmission can also neutralize when coming to a stop and experience a severe re-engagement when stepping back into the throttle. A no or flared 3-4 shift can also occur.

CAUSE: 1984 to 1994 Mercedes Benz 190 models with 722.4 automatic transmission can be equipped with one of **TWO** different sized B2 band servo piston diameters. This means that there are **TWO** different sized servo piston seal diameters. The use of the incorrect servo piston and seal combination can cause the above complaints. (Refer to Figure 1)

CORRECTION: Check the B2 band servo piston casting number in the chart below for proper identification. The seal should rotate freely when installed correctly and the piston should return on its own when installed in the B2 bore.

NOTE: In a previous seminar, we recommended that the edges of the piston seal groove be machined with a 15° chamfer to allow more oil to get under the seal in order to guaranty greater seal expansion. (Refer to Figure 2). If the B2 piston has come from the factory with the 15° chamfer, it will NOT be necessary to perform the above procedure. Since then, we have found an easier solution whether the 15° chamfer exists or not. ***Simply butt cut the servo seal. Place the seal onto the servo piston and install the piston into the bore with the cut in the seal at the 12 o'clock position (See Figure 3).***

Other symptoms that can be produced with 722.3 and 722.4 transmissions when this servo seal not sealing correctly is a temporary neutral condition occurring on a turn when stepping into the throttle during a coast downshift after a 3-4 up shift had occurred.

DIMENSION OF	PISTON CASTING # 201 277 00 38	PISTON CASTING # 201 277 01 38
	PISTON SEAL # 201 277 00 55	PISTON SEAL # 202 277 00 55
SEAL "T" CROSS SECTION	.104"-2.65mm	.136"-3.45mm
PISTON DIAMETER WO/SEAL	2.870"-72.88mm	2.807"-71.30mm
PISTON DIAMETER W/SEAL	2.950"-75.00mm	2.950"-75.00mm

Special thanks to Mario Arisitides

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MERCEDES BENZ 722.4
DELAY OR SLIP ON TAKE-OFF
MOMENTARY BIND-UP IN REVERSE
NO OR FLARED 3-4 SHIFT

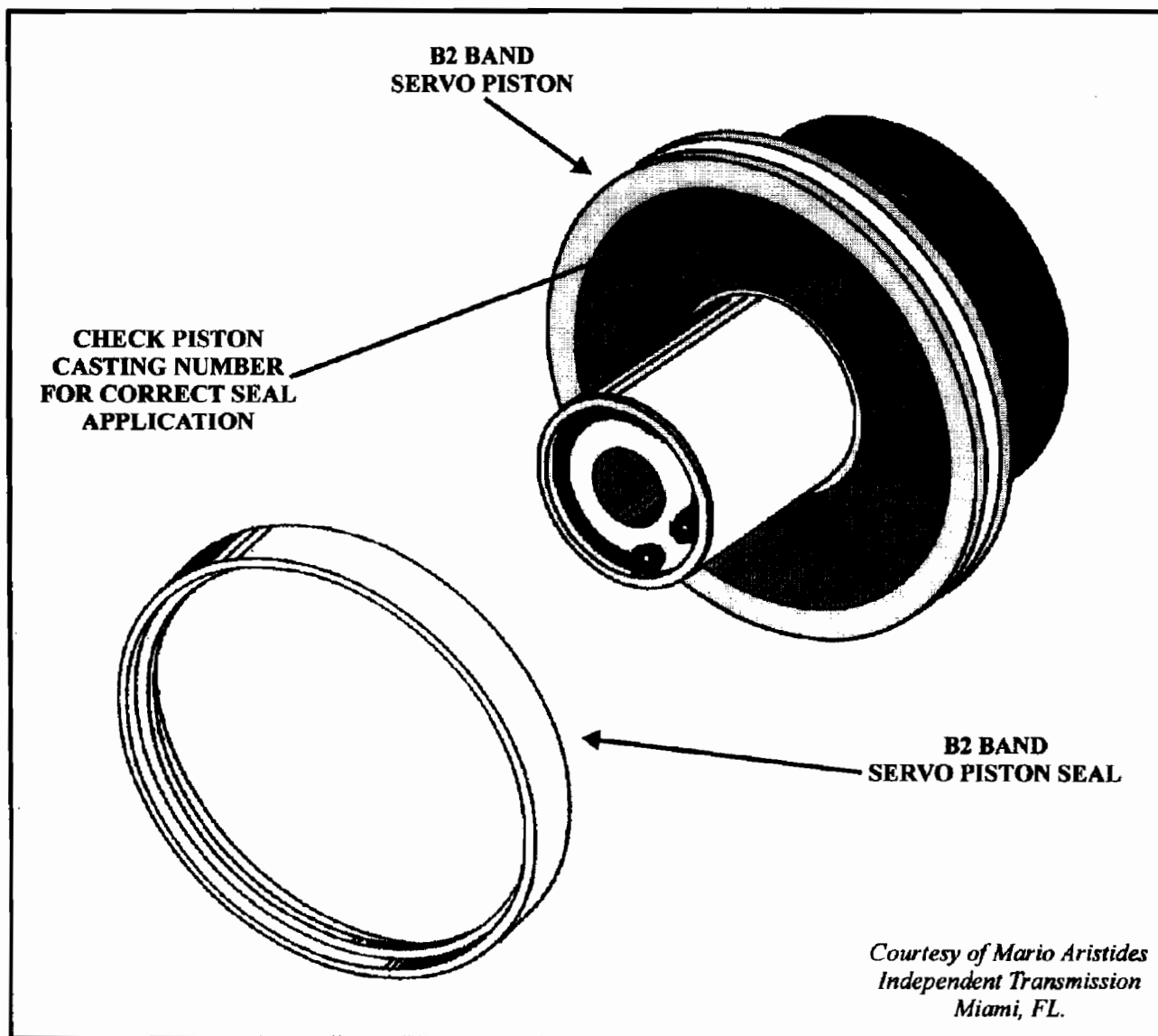


Figure 1

MERCEDES BENZ 722.4

DELAY OR SLIP ON TAKE-OFF
MOMENTARY BIND-UP IN REVERSE
NO OR FLARED 3-4 SHIFT

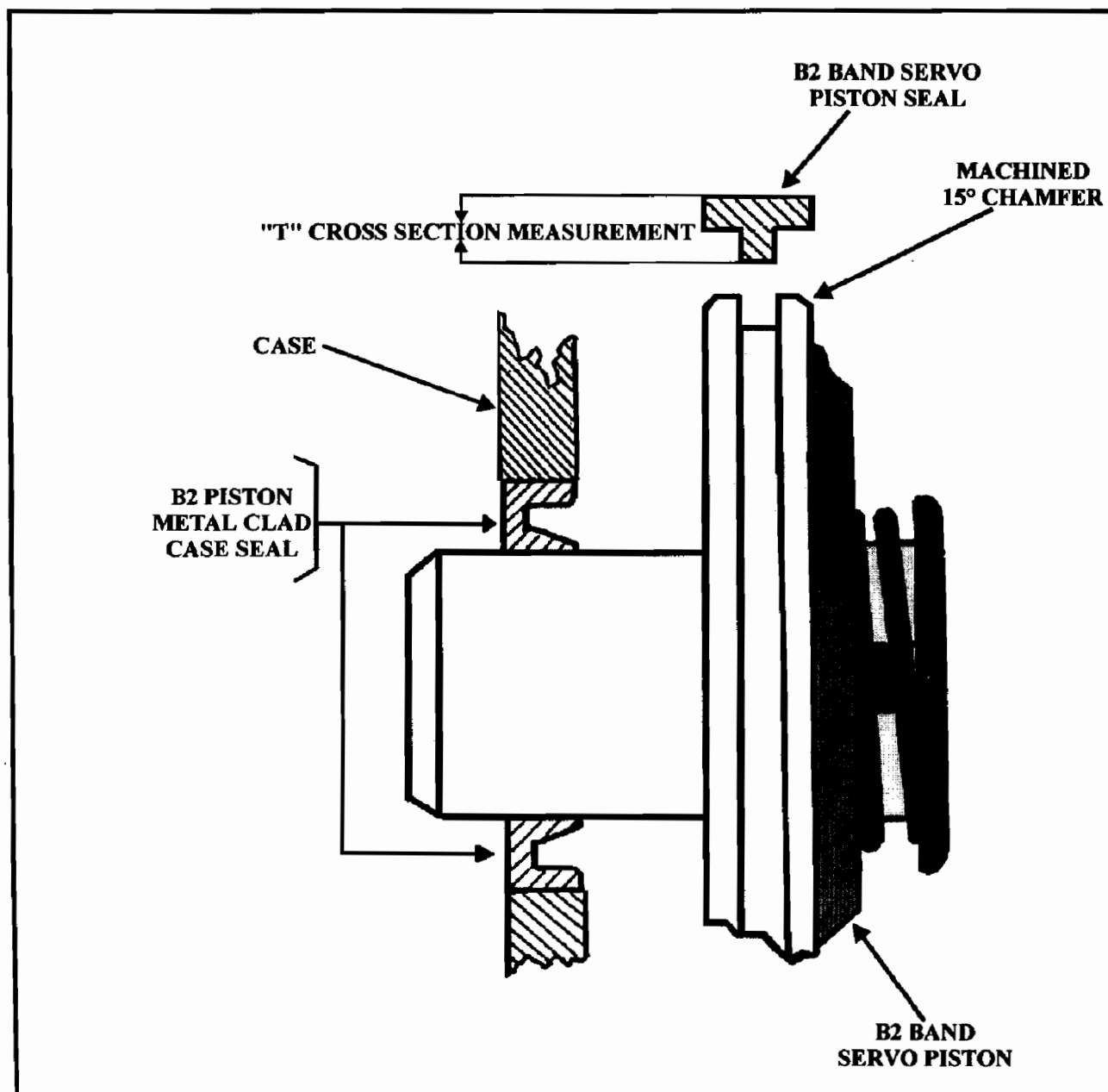
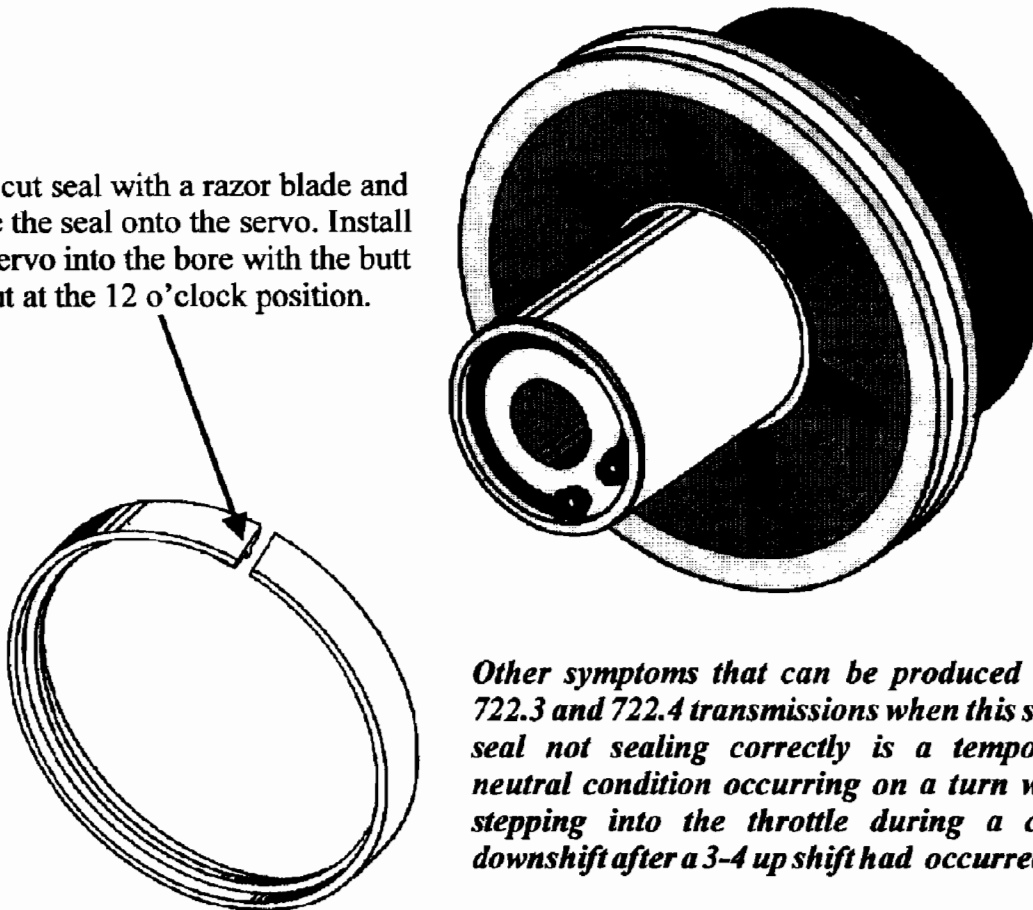


Figure 2

MERCEDES BENZ 722.4
DELAY OR SLIP ON TAKE-OFF
MOMENTARY BIND-UP IN REVERSE
NO OR FLARED 3-4 SHIFT

Butt cut seal with a razor blade and place the seal onto the servo. Install the servo into the bore with the butt cut at the 12 o'clock position.



Other symptoms that can be produced with 722.3 and 722.4 transmissions when this servo seal not sealing correctly is a temporary neutral condition occurring on a turn when stepping into the throttle during a coast downshift after a 3-4 up shift had occurred.

Figure 3

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°Clunk or harsh downshift °No passing gear condition

°Kalibrate & extent or shorten shifting pattern

°TV plunger suck in DR position/No Shifting

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°Broken springs, valves & misc. in valve body

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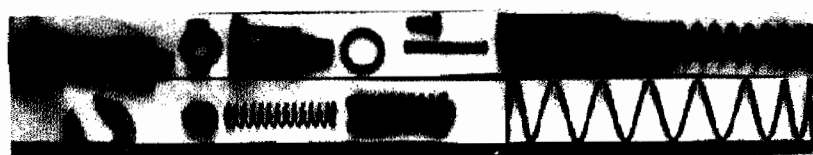
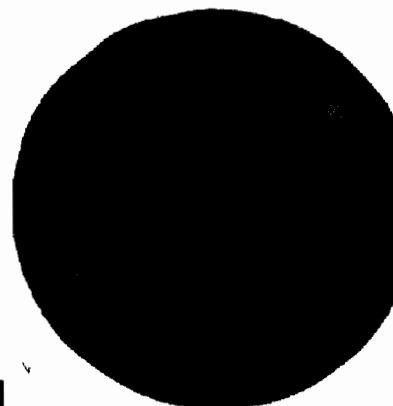
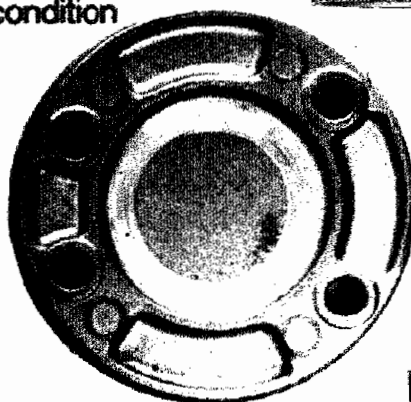
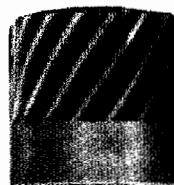
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MERCEDES 722.4**NO UPSHIFTS**

COMPLAINT: 1989 to 1992 Mercedes 190 vehicles with 2.6 litre engines may suddenly develop a no up shift condition. This vehicle normally starts in 2nd gear. With heavy throttle first gear can still be obtained and still make a 1-2 up shift but no shifts thereafter.

CAUSE: The cause may **seem** to be broken governor gears but it is not the actual cause. The gears break when the Rear Pump Check Valve located in the Rear Valve Body (See Figure 1) breaks traveling pieces into the Rear Pump seizing the gears. The rear pump is driven by the governor only when the engine is not running. When the engine is running, hydraulic pressure disengages the rear pump from the governor. This means that the governor gears will break only when the vehicle rolls or is pushed without the engine running. If the rear pump is not inspected for seized gears, the governor gears may be replaced returning all up shifts misleading the technician that the problem has been resolved. Once the vehicle is pushed or it rolls without the engine running, it will be back into the shop with broken governor gears again.

CORRECTION: 1. Replace the rear pump check valve in the valve body (See Figure 1) and both governor gears. Remove all debris from the rear pump ensuring proper gear rotation.

2. A quicker method may be to remove the rear pump entirely (See Figure 2) replacing it with a Retro-fit cover (See Figure 3) and change both governor gears. This would eliminate removing and dis-assembling the valve body to replace the rear pump check valve. However, the removal of the rear pump will eliminate push start capabilities.

SERVICE INFORMATION:

Rear Pump Check Valve.....	126 270 05 89
Governor Drive Gear (Mercedes Part No.)	A 201 274 00 15
Governor Driven Gear (Mercedes Part No.).....	A 201 274 03 15
Retro-Fit Plate to eliminate the rear pump.....	140 277 09 03
Gasket.....	140 277 00 80
All parts may be obtained by Mario Aristides.....	(305) 666-3544

REAR PUMP CHECK VALVE

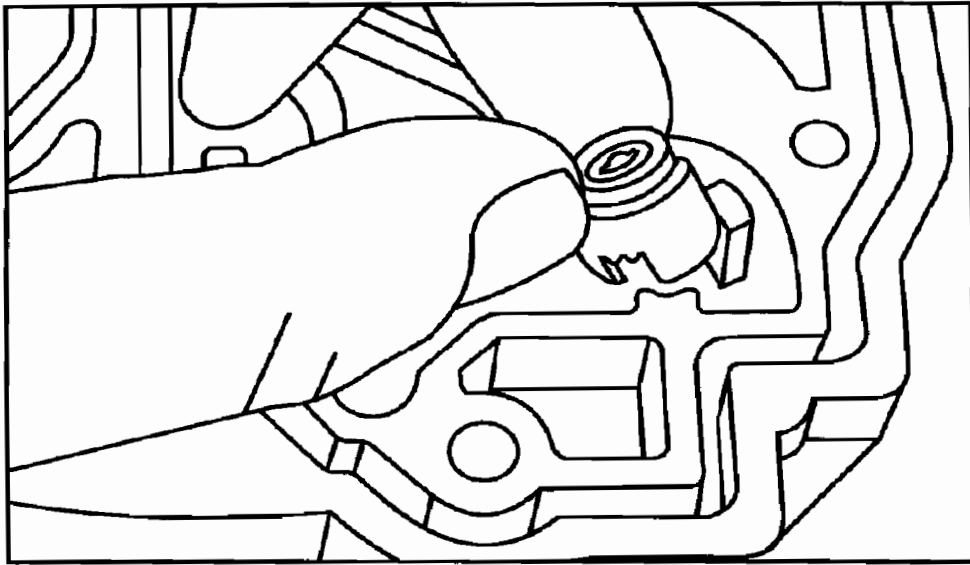
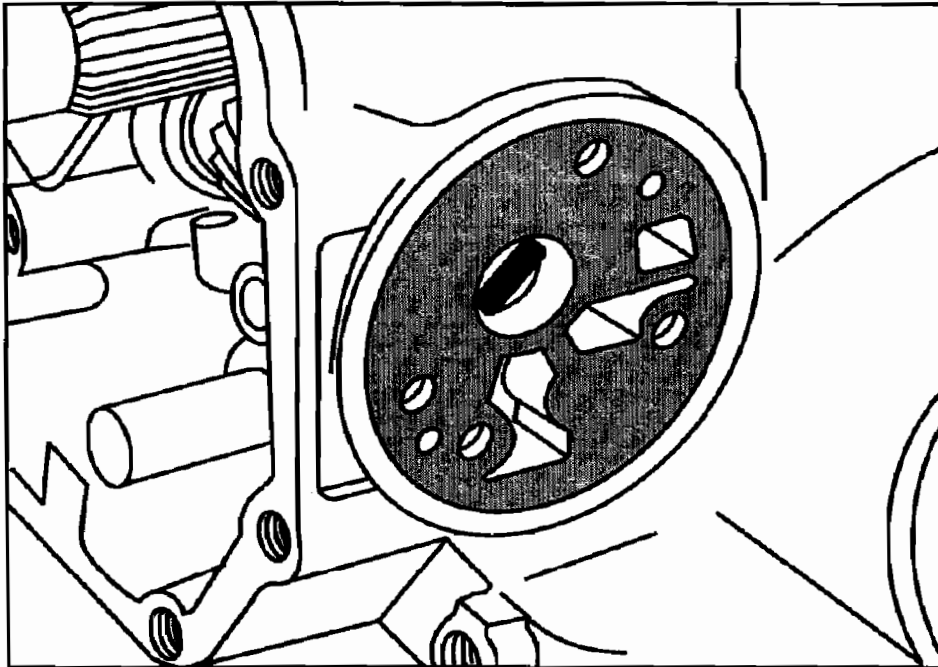


Figure 1

REAR PUMP REMOVED



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Figure 2

RETRO-FIT COVER

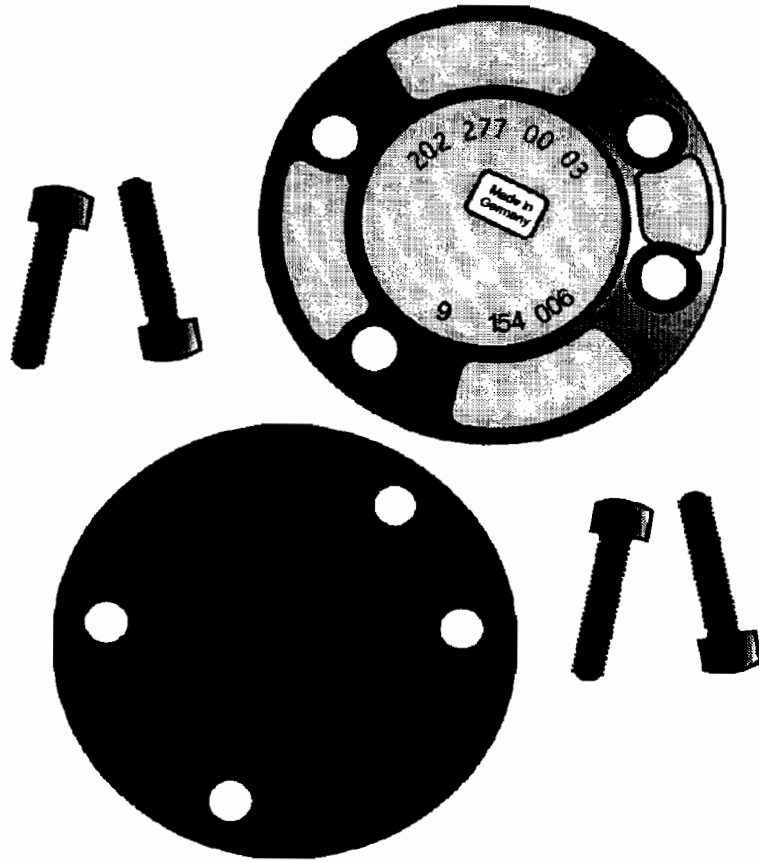


Figure 3