"2002" SEMINAR INFORMATION

"What's New for '2002' Technical Seminar"

INDEX

Imports

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INTRODUCTION

The third and final manual for the "What's New for 2002" seminar continues to present practical information on a variety of Import vehicles beginning with Mercedes. Most shops are still not accepting Import vehicles into the shop place. Understandably so because in some cases these units are a bit more challenging when compared to the BIG 3. This makes it necessary for those shops who take on these jobs to acquire as much information as they can and here is a manual full all for you!

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HONDA A4RA/B4RA/M4RA
FLARED OR HARSH UPSHIFTS

COMPLAINT: Before and/or after overhaul, 1996-1998 vehicles ***only,*** equipped with the A4RA, B4RA or M4RA transaxles may exhibit flared or harsh upshift complaints.

CAUSE: The cause may be, a broken Clutch Pressure Control Valve Spring, located in the secondary valve body, allowing the valve to restrict clutch apply causing the flared shifts, or the pieces of the broken spring stacking on top of each other keeping the valve from stroking, creating the harsh shifts. Refer to Figure 2 for the valve's hydraulic function.

CORRECTION: Locate the Clutch Pressure Control Valve as shown in Figure 1. Remove the Lock nut. Refer to Figure 3 and measure the distance identified as Dimension "A". Record this measurment before removing the adjustable end plug. Remove the Adjustable End Plug and replace the broken spring, available from ***Sonnax***®. Re-install the Adjustable End Plug back to the original depth setting of Dimension "A", ***less .030".***
For example, if the original factory setting was .230", the ***Sonnax***® spring setting should be .200" (.230" minus .030"). Re-install the lock bolt after Dimension "A" is correct.
NOTE: This spring is not currently available from HONDA.

SERVICE INFORMATION:

Clutch Pressure Control Valve Spring, ***Sonnax***® Part Number 88894

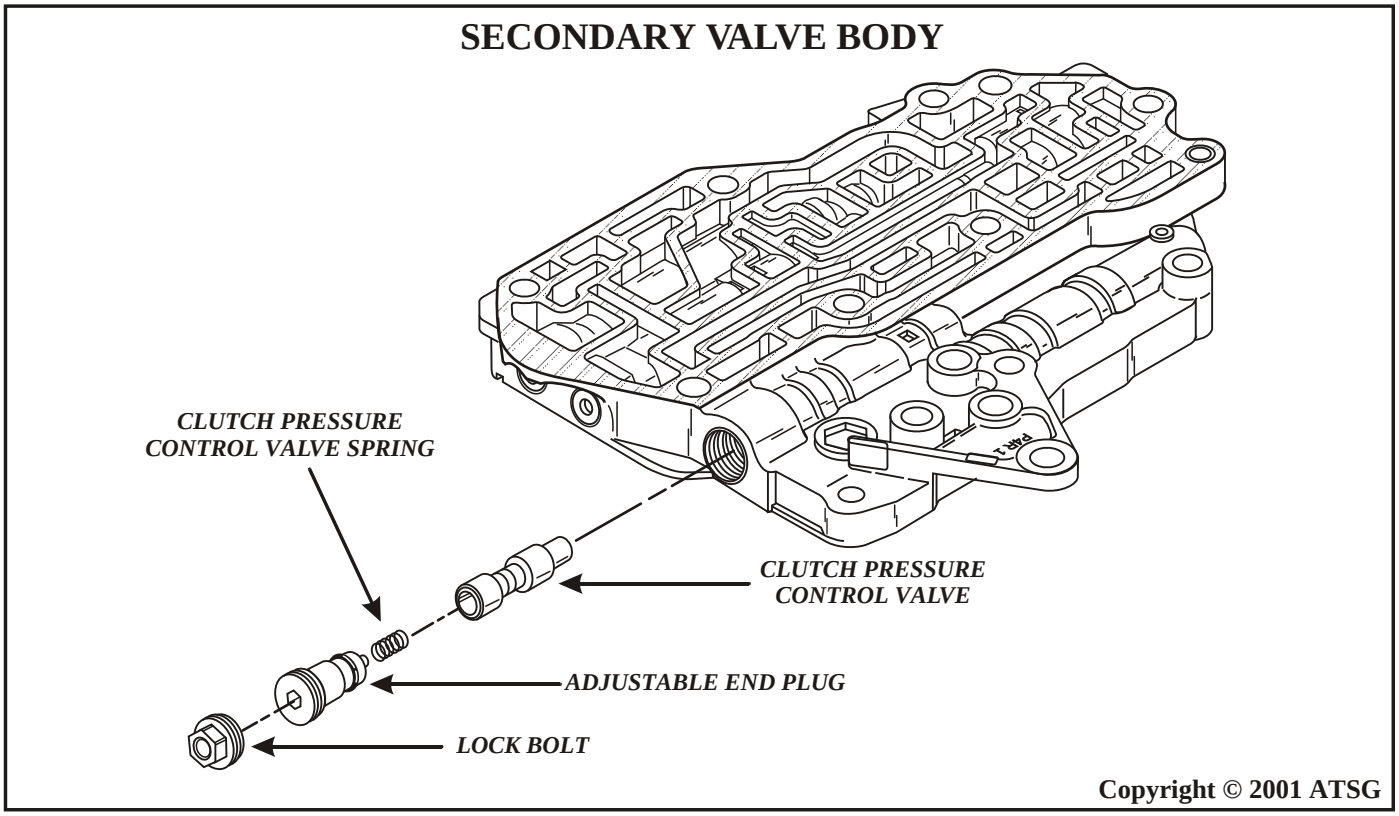
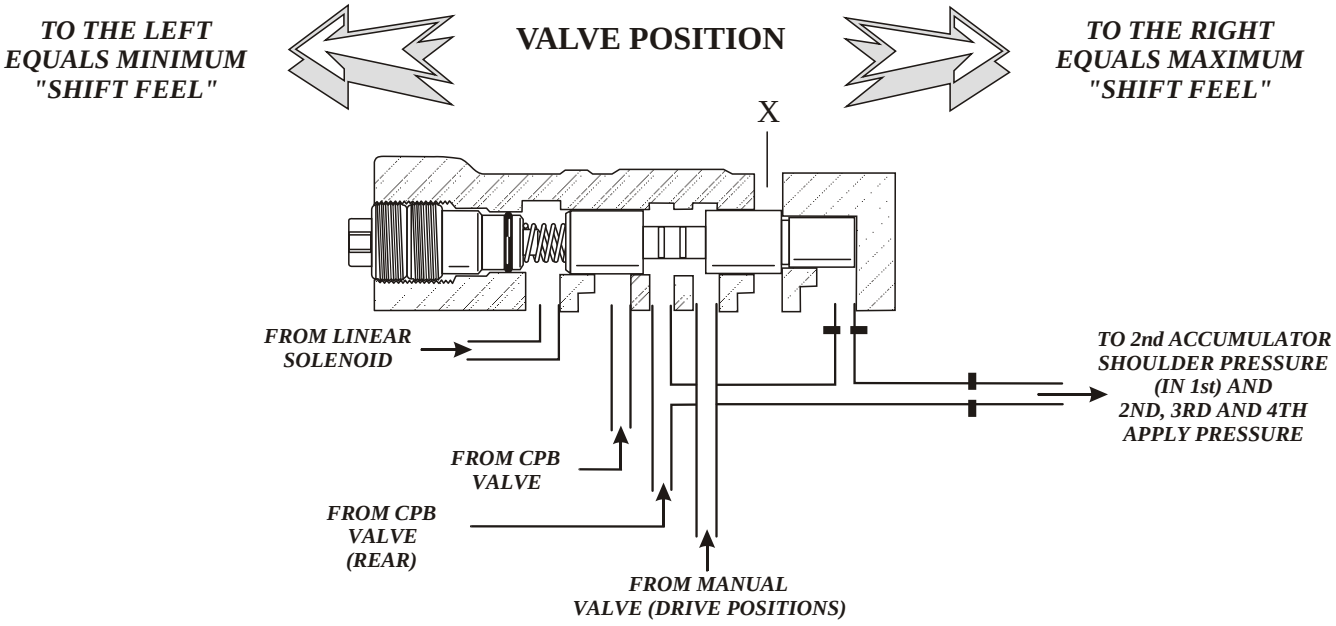


Figure 1

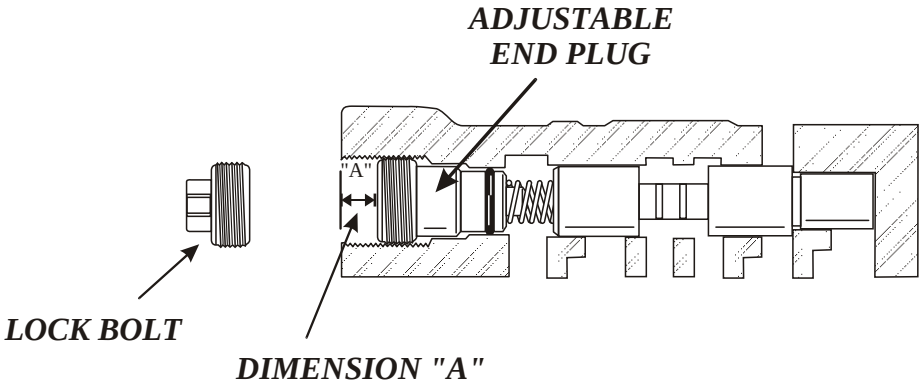
CLUTCH PRESSURE CONTROL VALVE FUNCTION



THE CLUTCH PRESSURE CONTROL VALVE CONTROLS SHIFT FEEL FOR 2nd, 3rd AND 4th BASED ON THE LINEAR SOLENOID, WHICH IS BASICALLY THROTTLE "B" PRESSURE

Figure 2

CLUTCH PRESSURE CONTROL VALVE ADJUSTABLE END PLUG MEASUREMENT



Dimension "A" is the distance between adjustable end plug and the edge of the secondary valve body casting, as shown above. The factory setting for Dimension "A" is approximately .230".

SPECIAL NOTE: When using the Sonnax® replacement spring, the Dimension "A" setting must be .030" less than the original factory setting. For example, if the original factory setting was .230" the Sonnax® spring setting should be .200" (.230" minus .030"). If the original factory setting was not measured, set the Sonnax® spring setting to .195".

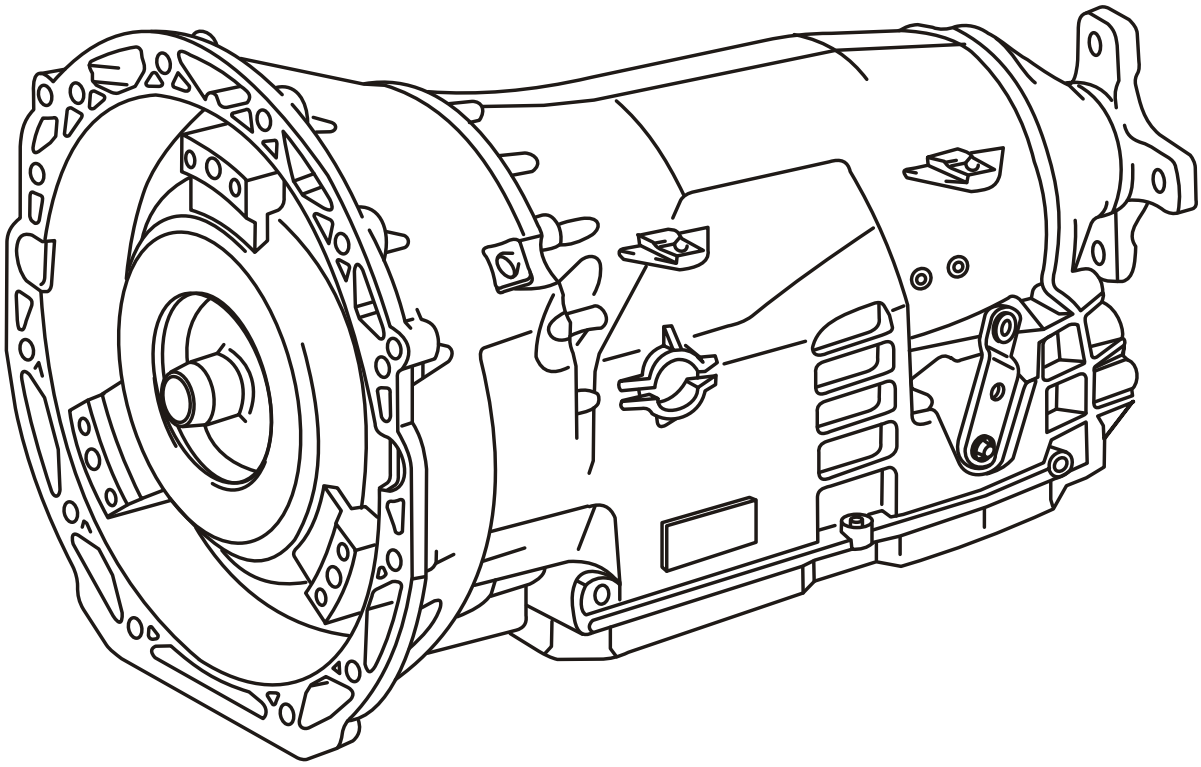
Figure 3

MERCEDES BENZ 722.6

PRELIMINARY INFORMATION

FOUND IN:

1995 - 99 S320	***1997 - 00 C230 & C230K***	***1998 - 02 ML320***
1995 S350	***1997 - 00 C280***	***1999 - 02 CLK430***
1995 - 99 S420	***1997 C36***	***1999 -02 E55 & AMG***
1995 - 02 S500	***1997 E420***	***1999 - 02 ML430***
1995 - 02 S600	***1998 - 00 C43 & AMG***	***2000 - 02 ML55 AMG***
1996 - 97 SL320	***1998 - 02 CL500***	***2000 - 02 S430***
1996 - 02 SL500	***1998 - 02 CL600***	***2001 - 02 C240***
1996 - 00 SL600	***1998 - 02 CLK320***	***2001 - 02 C320***
1996 - 99 E300D	***1998 - 02 E430***	***2001 - 02 CL55 AMG***
1996 - 02 E320	***2000 - 02 E430 w/4-Matic***	***2001 - 02 CLK55 AMG***
1998 - 02 E320 w/4-Matic	***1998 - 00 SLK230***	***2001 - 02 S55 AMG***



The 722.6 automatic transmission is an electronically controlled 5 speed transmission with a lock-up torque converter, 3 compound planetary gear sets, 3 multiple disc clutches, 3 multiple disc brakes and 2 free-wheel clutches, the 5th gear acts as an overdrive gear. The gears are electronically/hydraulically controlled. The Electronic Transmission Controller (ETC) controls transmission operation matching engine performance during the shift phase. The driver can choose between 2 driving programs, "S" for standard driving programs and "W" for winter driving programs.

Figure 1

Refer to Figure 1 for 722.6 Transmission to Vehicle Model Application.

Refer to Figure 2 for Clutch and Band Application Chart.

Refer to Figure 3 for Manual Shift Lever, E/S Mode Selector Switch, Towing Information and Limp Mode Functions.

Refer to Figure 4 for Automatic Transmission Fluid Level check Procedures.

Refer to Figure 5 for Valve Body Conductor Plate Identification.

Refer to Figure 6 and 7 for Solenoid Operation.

Refer to Figures 8 and 9 for Transmission Internal Component Identification.

Refer to Figure 10 for Transmission Range Recognition Switch Information.

Refer to Figure 11 for Transmission Control Module Terminal Identification.

Refer to Figures 12 and 13 for Two Digit Code Descriptions.

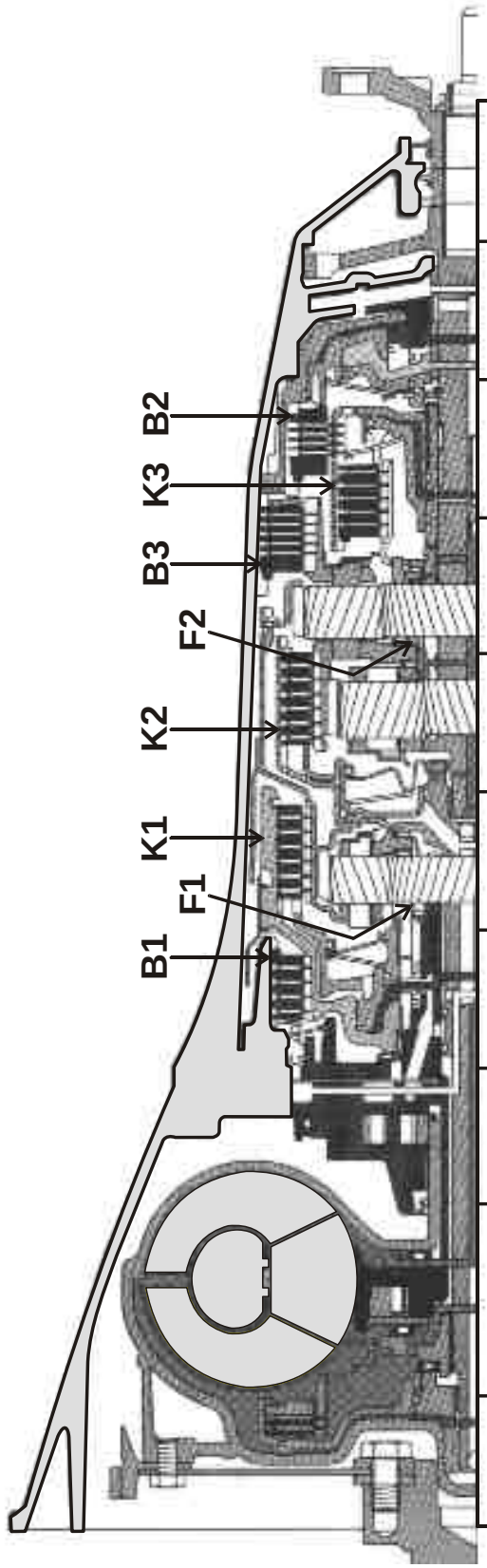
Refer to Figure 14 for OBD-II Code descriptions.

Refer to Figure 15 for Diagnostic Link Connector (DCL) Information.

Refer to Figures 16 and 17 for Valve Body Assembly Identification.

Refer to Figure 18 for Valve Body Checkball and Small Parts Locations.

722.6 CLUTCH AND BAND APPLICATION CHART



GEAR	RATIO	B1	B2	B3	K1	K2	K3	F1	F2
1	3.59	X[3]	X				X[3]	X	X
2	2.19		X		X		X[3]		X
3	1.41		X		X	X			
4	1.00				X	X	X		
5	0.83	X				X	X	X[3]	
N	-	X					X		
R[1]	-3.16	X[3]		X			X	X	
R[2]	-1.93			X	X		X		

1 - Mode Selector Switch in the "S" Position
2 - Mode Selector Switch in the "W" Position
3 - Shift components are required during coasting conditions

Figure 2

SHIFT QUADRANT

P = **Park Pawl Engaged and Engine Start Position**

R = **Reverse**

N = **Neutral...No Power Flow and Engine Start Position**

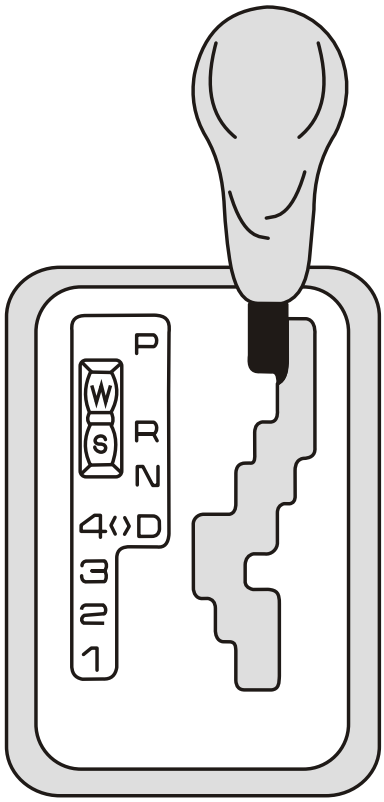
D = **Automatic Shift 1st thru 5th gear.**

4 = **Automatic Shift 1st thru 4th gear. 5th gear is locked out.**

3 = **Automatic Shift 1st thru 3th gear. 4th and 5th gear are locked out.**

2 = **Automatic Shift 1st thru 2th gear. 3rd, 4th and 5th gear are locked out.**

1 = **Low Gear Driving Only**



E/S MODE SELECTOR SWITCH OPERATION:

*"**S**"* = This a Standard driving program with initial take-off in 1st gear.

*"**W**"* = This is a Winter driving program with initial take-off in 2nd gear with the D4 position selected.
In ***Winter Mode*** with the reverse position selected, a -1.93:1 gear ratio is available.
In ***Standard Mode*** with the reverse position selected, a -3.16:1 gear ratio is available.
This is to afford the driver a better chance of removing the vehicle from a stuck condition.

VEHICLE TOWING:
If the vehicle must be flat towed, it should be done with only the "N" position selected for a maximum towing range of 32 miles (50 km) at a maximum speed of 32 mph (50 km/h).

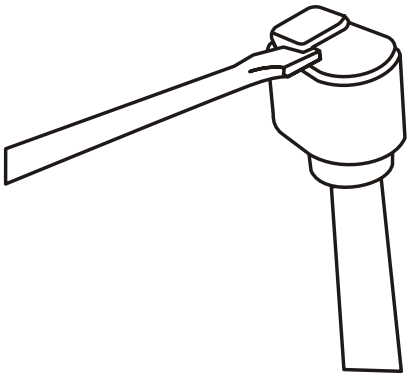
LIMP MODE FUNCTION:
Certain malfunctions will cause the transmission to enter limp mode at which time a diagnostic trouble code will be stored. Should an electrical fault occur, the last selected gear will be the gear the transmission remains in until the vehicle is stopped, the engine is turned off, 10 seconds have passed and the engine is restarted. At this time 2nd gear will be hydraulically available. Should a mechanical/hydraulic fault occur, 3rd gear only will be available. In all situations reverse is also available.
Limp mode remains active until the malfunction is eliminated, or in some cases the key is cycled. In some cases limp mode is canceled because the fault is no longer present.

Figure 3

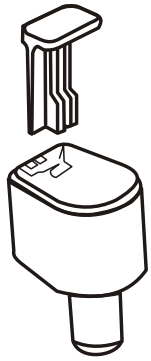
MAINTENANCE:
Recommended Fluid...Mercedes Benz Synthetic Automatic Transmission Fluid...Part Number ***001 989 21 03 10*** or a suitable substitute.

The transmission does NOT come equipped with a dip stick for checking fluid level. The filler tube has a locking plug in it from the factory. When fluid level needs to be checked use a screw driver to pry the lock from the plug and remove the plug as seen below.
Purchase the dip stick from a Mercedes Benz dealer using part number ***140 589 15 21 00*** shown below, and use this **tool** to check fluid level by inserting the dip stick into the filler tube until fully seated, wait 3 seconds, then remove the dip stick and check the fluid level indication on the dip stick.

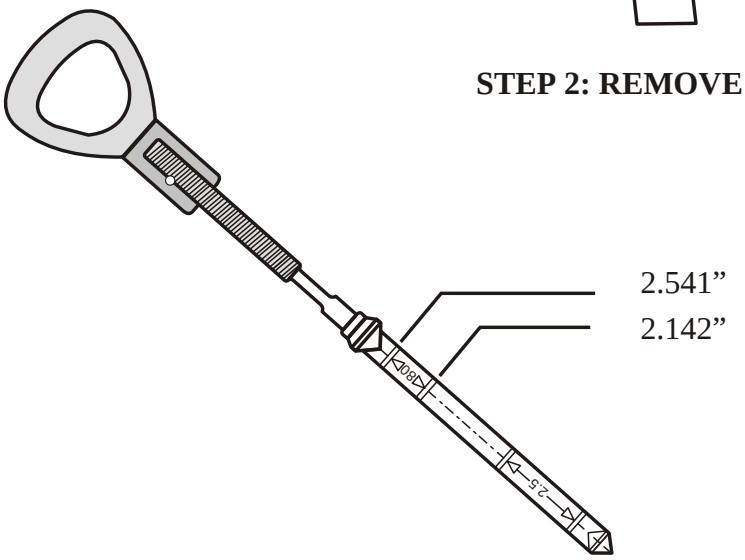
FLUID CHECKING PROCEDURE



STEP 1: REMOVE LOCK WITH A SCREWDRIVER



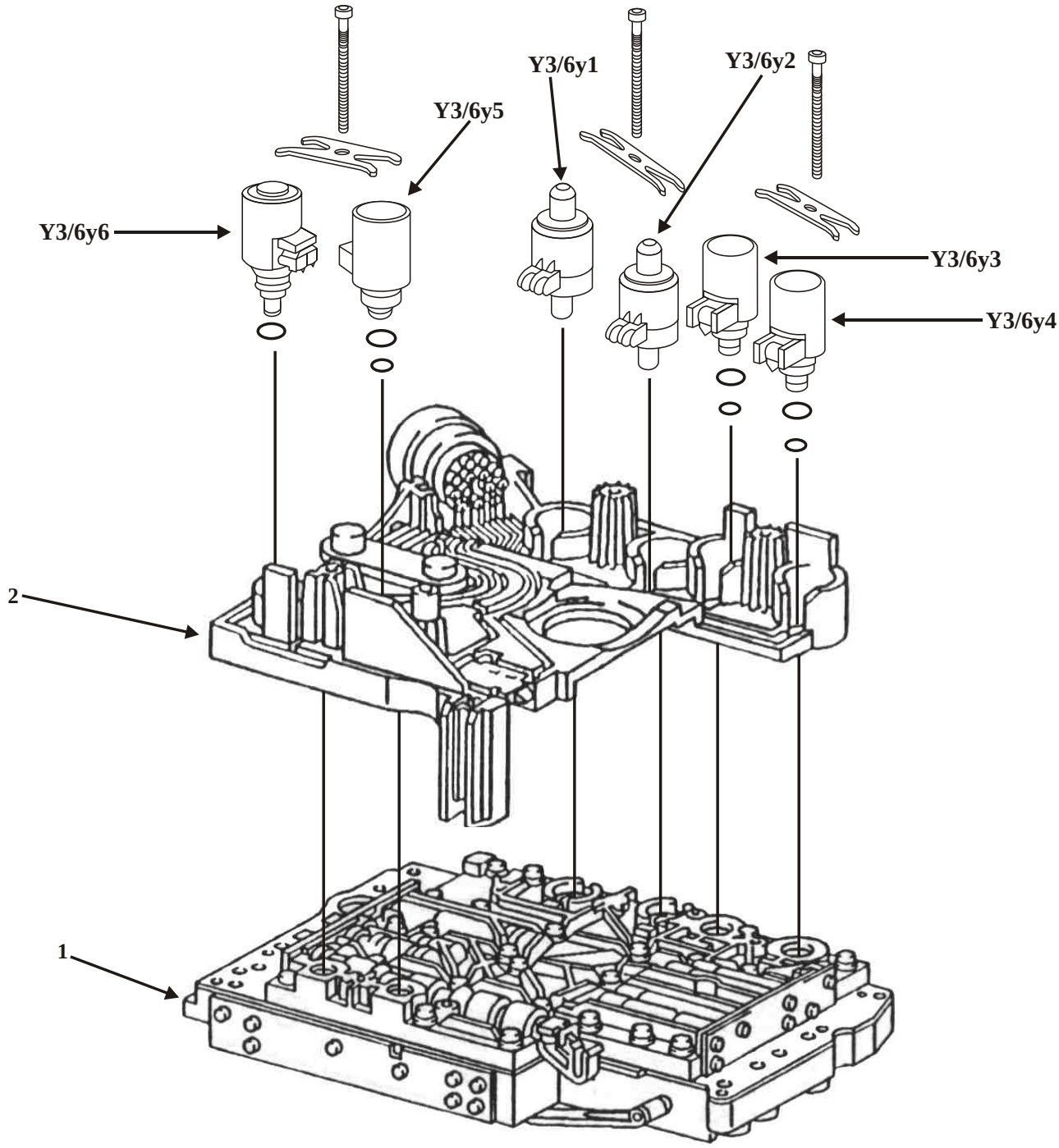
STEP 2: REMOVE PLUG



STEP 3: USE THIS TOOL TO CHECK FLUID LEVEL
PART NUMBER: 140 589 15 21 00

Figure 4

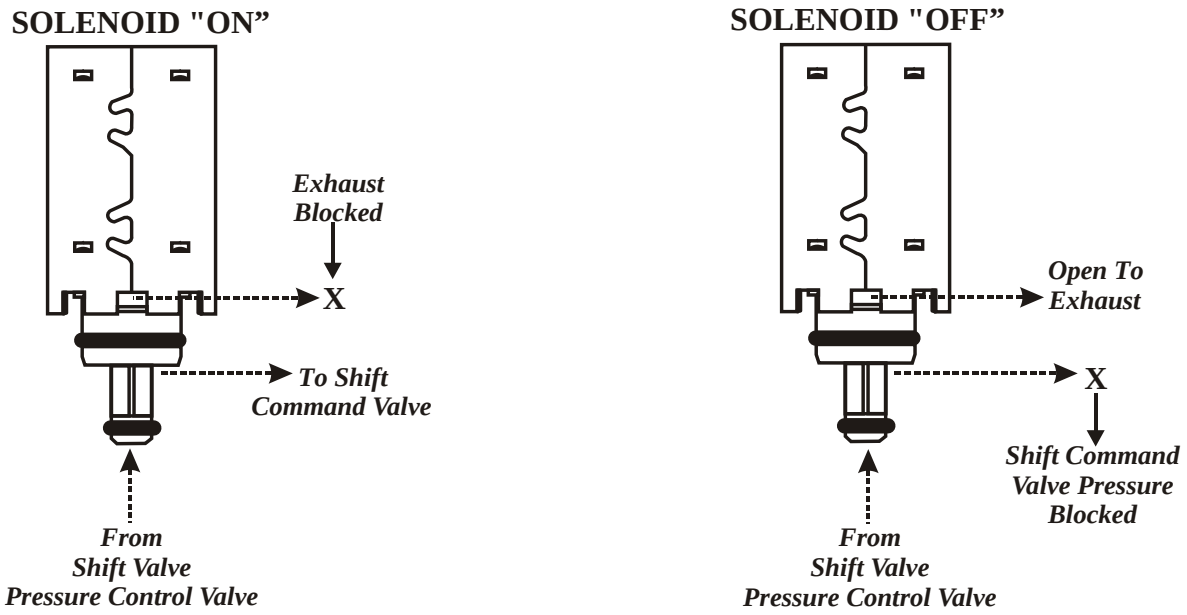
722.6 SOLENOID & CONDUCTOR PLATE IDENTIFICATION



1 - Valve Body Assembly
2 - Valve Body Conductor Plate
Y3/6y6 - Lock-Up PWM Solenoid
Requires 1 "O" Ring
Y3/6y5 - 2-3 Shift Solenoid
Requires 2 "O" Rings
Y3/6y1 - Modulating Pressure Regulating Solenoid
Requires NO "O" Rings
Y3/6y2 - Shift Pressure Regulating Solenoid
Requires NO "O" Rings
Y3/6y3 - 1-2/4-5 Shift Solenoid...Requires 2 "O" Rings
Y3/6y4 - 3-4 Shift Solenoid...Requires 2 "O" Rings

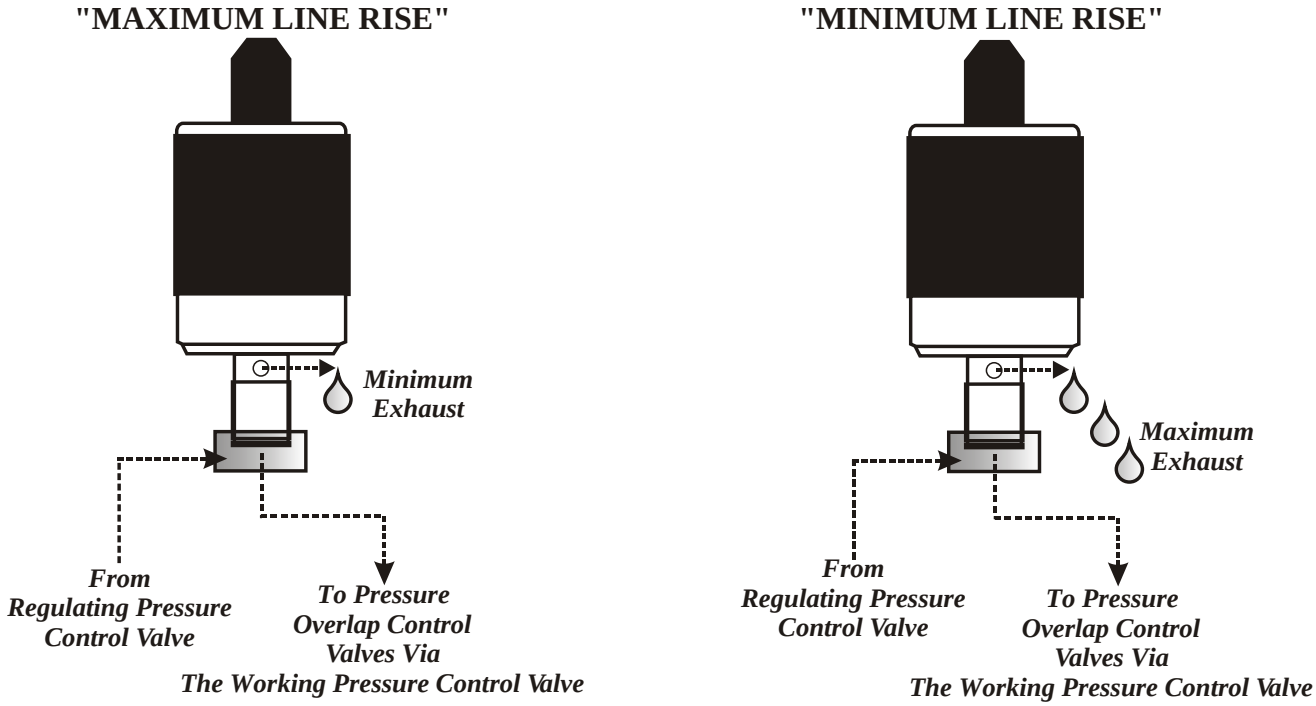
Figure 5

Y3/6y3, Y3/6y4 & Y3/6y5 SHIFT SOLENOID OPERATION



These solenoids are "on/off" normally closed solenoids. When the solenoid is "ON", it opens and transmits shift valve pressure to the corresponding shift command valve. When the solenoid is "OFF", shift command valve pressure is exhausted.

Y3/6y1 MODULATING PRESSURE REGULATING SOLENOID OPERATION

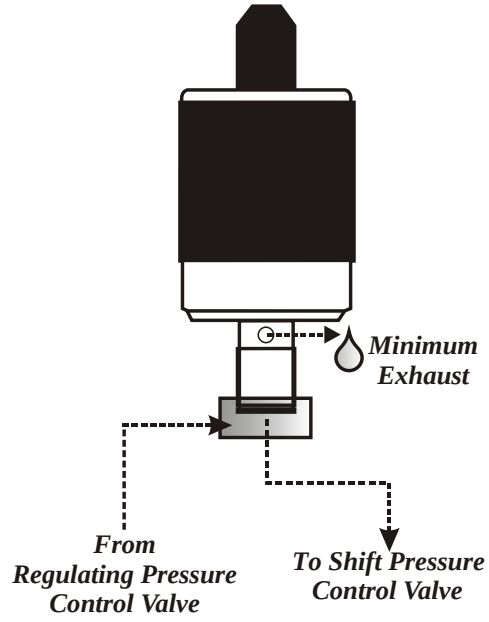


The Y3/6y1 solenoid is the line pressure control solenoid which controls main line pressure rise. This solenoid is a modulated solenoid which is supplied a variable current flow from the TCM. When the solenoid is at minimum exhaust, line pressure is high. When the solenoid is at maximum exhaust, line pressure is low.

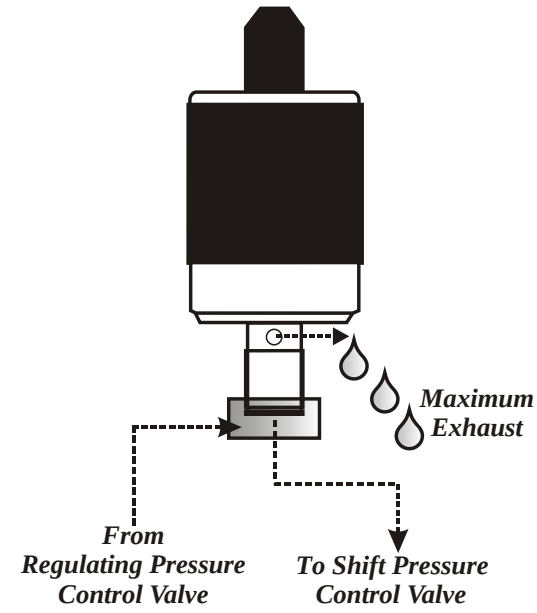
Figure 6

Y3/6y2 SHIFT PRESSURE REGULATING SOLENOID OPERATION

"MAXIMUM CLUTCH PRESSURE"



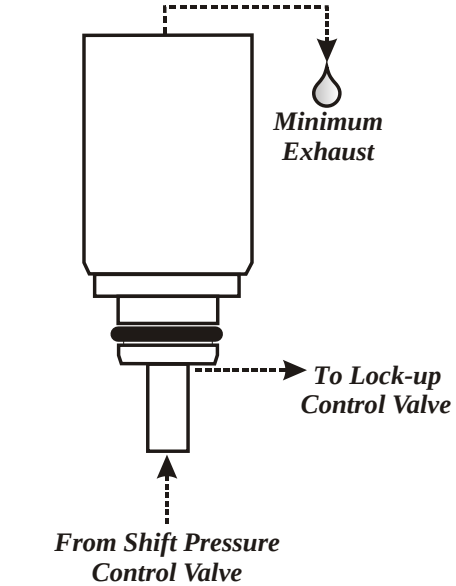
"MINIMUM CLUTCH PRESSURE"



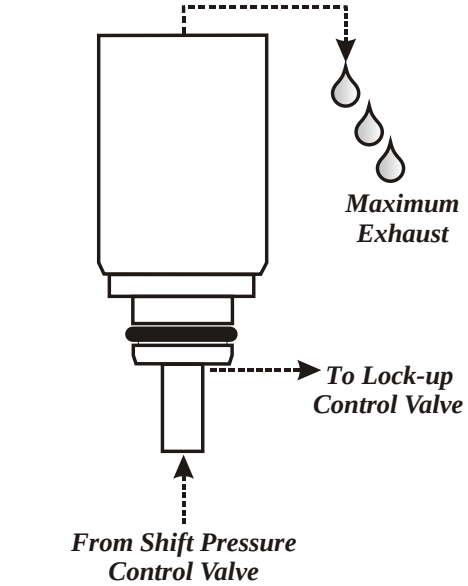
The Y3/6y2 solenoid regulates pressure to all clutches and bands to control the pressure cutback during a shift as well as the clamping force needed to prevent a clutch or band from slipping. This solenoid is a modulated solenoid which is supplied a variable current flow from the TCM. When the solenoid is at minimum exhaust, clutch pressure is high. When the solenoid is at maximum exhaust, clutch pressure is low.

Y3/6y6 SHIFT LOCK-UP PWM SOLENOID OPERATION

"LOCK-UP APPLIED"



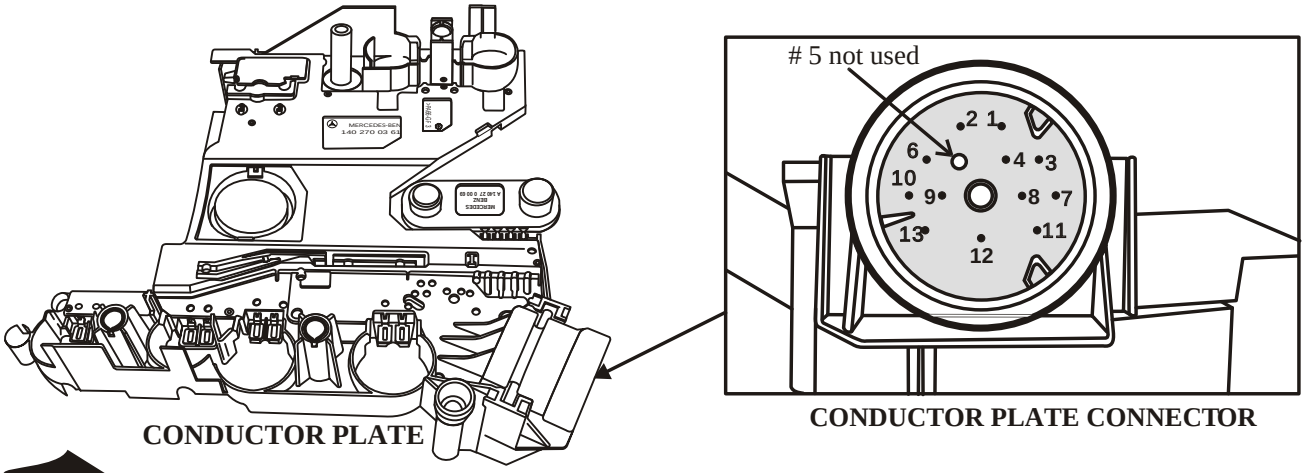
"LOCK-UP RELEASED"



The Y3/6y6 ia a Pulse Width Modulated solenoid that regulates pressure to the lock-up clutch via the lock-up control valve where converter clutch apply pressure is controlled in order to "ramp" the lock-up clutch on and off making for a smooth converter clutch apply and release. When the solenoid is at maximum exhaust, lock-up is released.. When the solenoid is at minimum exhaust, lock-up is fully applied.

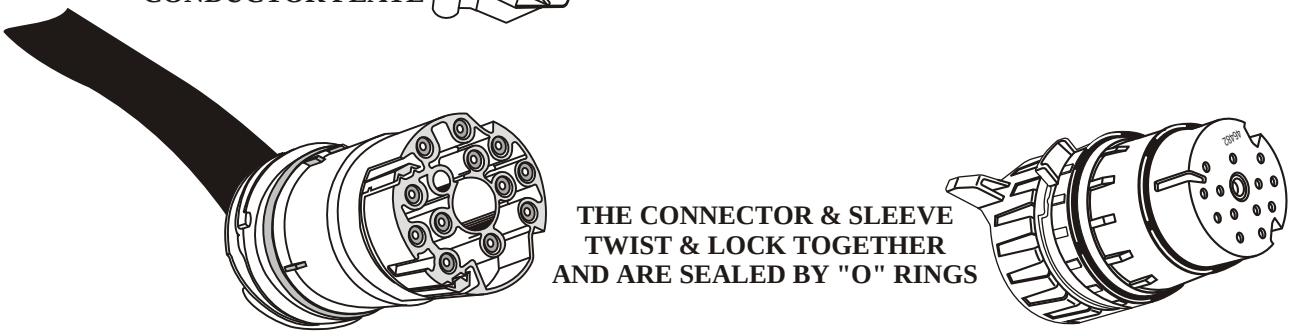
Figure 7

722.6 CONDUCTOR PLATE & INTERNAL COMPONENT SCHEMATIC



CONDUCTOR PLATE

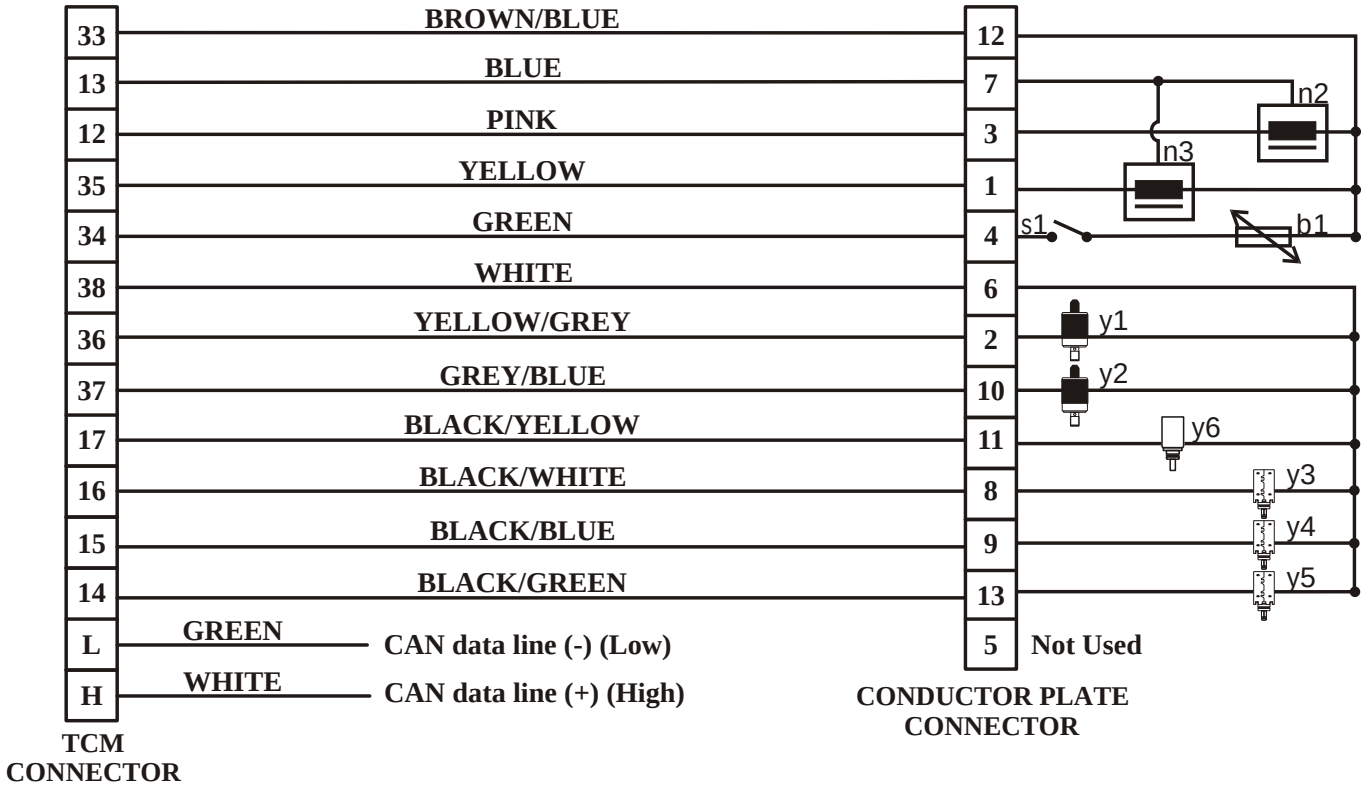
CONDUCTOR PLATE CONNECTOR



THE CONNECTOR & SLEEVE TWIST & LOCK TOGETHER AND ARE SEALED BY "O" RINGS

VEHICLE HARNESS CONNECTOR

VEHICLE CONDUCTOR PLATE CONNECTOR



TCM CONNECTOR

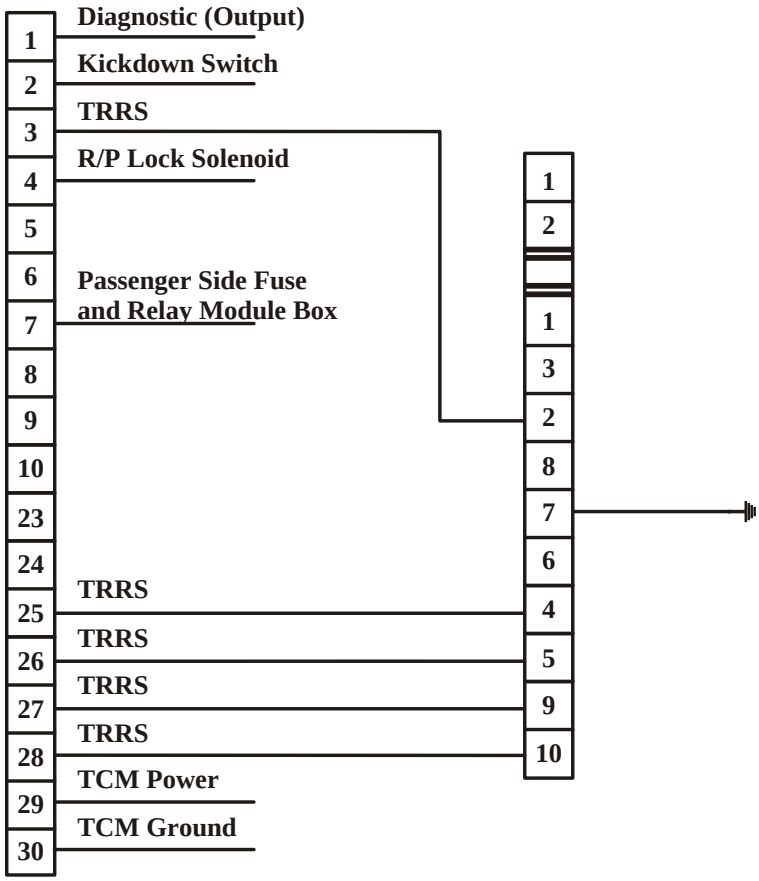
CONDUCTOR PLATE CONNECTOR

Figure 8

722.6 INTERNAL COMPONENT IDENTIFICATION			
TCM TERMINAL #	**CONDUCTOR PLATE TERMINAL #**	**COMPONENT**	**COMPONENT VALUE**
33	12	RPM SENSOR GROUND	.01 VOLTS OR LESS
13	7	RPM SENSOR VOLTAGE SUPPLY	4-8 VOLTS
12	3	RPM SENSOR n2 SIGNAL	VOLTAGE PULSE
35	1	RPM SENSOR n3 SIGNAL	VOLTAGE PULSE
34	4	ATF TEMP SENSOR/STARTER LOCK-OUT	N/A
38	6	SOLENOID VOLTAGE SUPPLY	SYSTEM VOLTAGE
36	2	MODULATED PRESSURE REGULATOR SOLENOID	5.5 OHMS
37	10	SHIFT PRESSURE REGULATOR SOLENOID	5.5 OHMS
17	11	PWM CONVERTER CLUTCH SOLENOID	2.7 OHMS
16	8	1-2/4-5 SHIFT SOLENOID	4.5 OHMS
15	13	3-4 SHIFT SOLENOID	4.5 OHMS
14	13	2-3 SHIFT SOLENOID	4.5 OHMS
———	5	NOT USED	———

Figure 9

TRANSMISSION RANGE RECOGNITION SWITCH (TRRS)

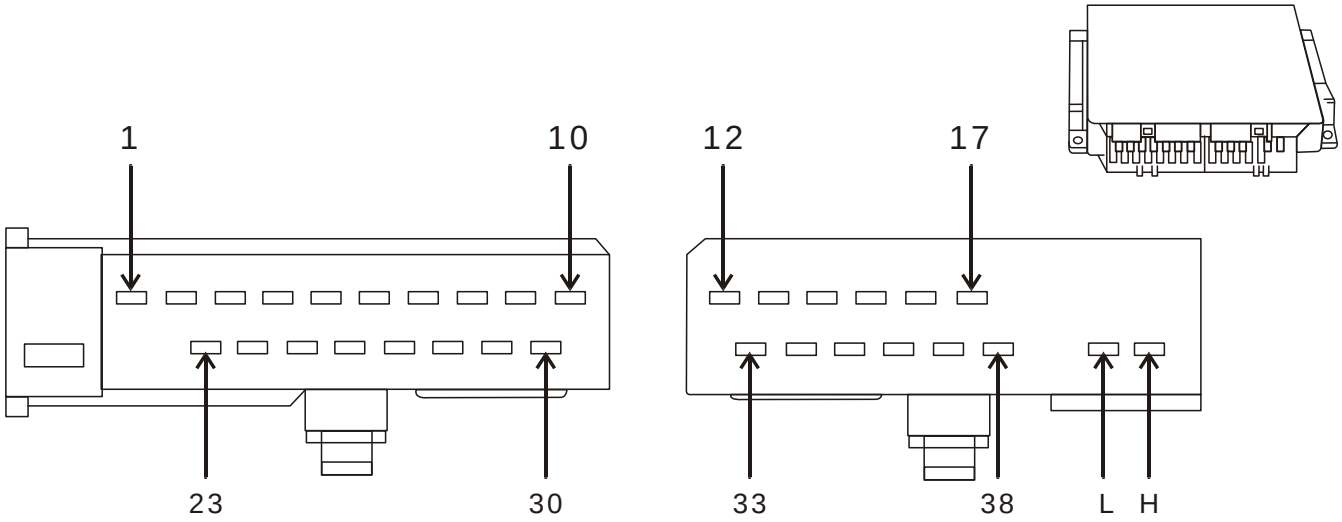


Shifter Position	Approximate Voltage at the TCM Connector Pin No.			
	25	26	27	28
P	10	10	10	0
R	0	10	10	10
N	10	0	10	10
D	0	0	10	0
4	0	0	0	10
3	0	10	0	0
2	10	0	0	0
1	10	10	0	10

Measured with the connector unplugged and the ignition in the "ON" position.

Figure 10

722.6 TCM TERMINAL IDENTIFICATION



TCM TERMINAL #	FUNCTION
1	DIAGNOSTIC OUTPUT
2	KICKDOWN SWITCH
3	WINTER/STANDARD PROGRAM SWITCH
4	R/P LOCK SOLENOID
5-6	NOT USED
7	PASSENGER FUSE & RELAY MODULE BOX
8	NOT USED
9	STOP LAMP INPUT
10	NOT USED
12	RPM SENSOR n2 SIGNAL
13	RPM SENSOR VOLTAGE SUPPLY
14	1-2/4-5 SHIFT SOLENOID
15	3-4 SHIFT SOLENOID
16	2-3 SHIFT SOLENOID
17	PWM LOCK-UP SOLENOID
23-24	NOT USED
25	TRANSMISSION RANGE RECOGNITION SWITCH
26	TRANSMISSION RANGE RECOGNITION SWITCH
27	TRANSMISSION RANGE RECOGNITION SWITCH
28	TRANSMISSION RANGE RECOGNITION SWITCH
29	TRANSMISSION CONTROL MODULE VOLTAGE SUPPLY
30	TRANSMISSION CONTROL MODULE GROUND
33	RPM SENSOR n2 & n3 GROUND
34	ATF TEMPERATURE SENSOR
35	RPM SENSOR n3 SIGNAL
36	MODULATOR PRESSURE REGULATING SOLENOID
37	SHIFT PRESSURE REGULATING SOLENOID
38	SOLENOID VOLTAGE SUPPLY
L	CAN DATA LINE LOW (-)
H	CAN DATA LINE HIGH (+)

Figure 11

BLANK

2 DIGIT DIAGNOSTIC TROUBLE CODES

DIAGNOSTIC TROUBLE CODE	DESCRIPTION	LIMP MODE	AUTO RESET	KEY RESET
2	1-2/4-5 SHIFT SOLENOID	X		
3	2-3 SHIFT SOLENOID	X		
4	3-4 SHIFT SOLENOID	X		
5	PWM LOCK-UP SOLENOID	X		
6	MODULATING PRESSURE REGULATING SOLENOID	X		
7	SHIFT PRESSURE REGULATING SOLENOID	X		
8	R/P LOCKOUT SOLENOID			X
9	STARTER LOCKOUT RELAY MODULE			X
10	SOLENOID VOLTAGE SUPPLY OUT OF RANGE	X		
11	RPM SENSOR VOLTAGE SUPPLY OUT OF RANGE	X		
12	RPM SENSOR n2	X		
13	RPM SENSOR n3	X		
14	NOT USED	–	–	–
15	NOT USED	–	–	–
16	NOT USED	–	–	–
17	NOT USED	–	–	–
18	SELECTOR LEVER POSITION IMPLAUSIBLE	X	X	
19	ATF TEMPERATURE SENSOR	C		
20	STARTER INTERLOCK CONTACT	E		
21	ETC CONTROL MODULE VOLTAGE OUT OF RANGE	X	X	
22	CAN: WHEEL SPEED SENSOR, RIGHT REAR, FAULT	X,A,C	X	
23	CAN: WHEEL SPEED SENSOR, LEFT REAR, FAULT	X,A,C	X	
24	CAN: WHEEL SPEED SENSOR, RIGHT FRONT, FAULT		X	
25	CAN: WHEEL SPEED SENSOR, LEFT FRONT, FAULT		X	
26	CAN: ACCELERATOR PEDAL POSITION IMPLAUSIBLE	B	X	
27	NOT USED	–	–	–
28	CAN: ENGINE RPM IMPLAUSIBLE	B or D	X	
29	CAN: ENGINE TORQUE, RIGHT, IMPLAUSIBLE	B or D	X	
30	CAN: ALTITUDE INFLUENCE FACTOR IMPLAUSIBLE	B	X	
31	NOT USED	–	–	–
32	CAN: ENGINE TORQUE, LEFT, IMPLAUSIBLE	B or D	X	
33	NOT USED	–	–	–
34	NOT USED	–	–	–
35	CAN: ME 1.0, LEFT, INFORMATION DISTORTED	B or D	X	
36	CAN: ME 1.0, RIGHT, INFORMATION DISTORTED	B	X	
36	ENGINE COOLANT TEMPERATURE IMPLAUSIBLE	B	X	
37	CAN: INFORMATION TOTALLY DISTORTED	X,B	X	
38	CAN: ESP INFORMATION DISTORTED	X,B	X	
39	CAN: ME 1.O, RIGHT, INFORMATION DISTORTED	B or D	X	
40-50	NOT USED	–	–	–
51	ENGAGED GEAR IMPLAUSIBLE (TRANS SLIPPING)	3RD ONLY		X
52	COMMAND VALVE STICKING IN PRESSURE POSITION	X		X
53	TORQUE CONVERTER LOCK-UP CLUTCH SLIPPING	NO LOCK-UP		
54	CONFIRMATION OF TRANSMISSION OVERLOAD PROTECTION NOT RECEIVED	–	–	–

Figure 12

2 DIGIT DIAGNOSTIC TROUBLE CODES

DIAGNOSTIC TROUBLE CODE	DESCRIPTION	LIMP MODE	AUTO RESET	KEY RESET
55	GEAR RECOGNITION REPEATEDLY NEGATIVE	X		
56	ETC CONTROL MODULE (EEPROM: INCORRECT CODING	X		
57	ETC CONTROL MODULE (CLOCK)	–	–	–
58	ETC CONTROL MODULE (INTERNAL TEST WATCHDOG)	X		
59	ETC CONTROL MODULE (EXTERNAL TEST WATCHDOG)	X		
60	ETC CONTROL MODULE (INTERNAL FUNCTION WATCHDOG)	F		
61	ETC CONTROL MODULE (EXTERNAL FUNCTION WATCHDOG)	F		
62	ETC CONTROL MODULE (RAM)	X		
63	ETC CONTROL MODULE (ROM)	X		
64	ETC CONTROL MODULE (EEPROM: CRITICAL FUNCTIONS)	X		
65	ETC CONTROL MODULE (EEPROM: NONCRITICAL FUNCTIONS)	B		

IMPORTANT NOTE: DTC's between 2 and 65 are actual errors at the time of code retrieval. DTC's higher than 96 indicate an error that occurred previously.

EXAMPLE: A code 18 that occurred previously would become 18 + 96 and would be displayed as DTC 114.

LIMP MODE (X) = Transmission does not shift, it remains in the same gear as when the fault occurred. After moving shift lever to Park, cycle ignition key Off, wait 10 seconds, restart engine, engaged gear will be 2nd and reverse only. To restore transmission function (***if error is nonexistent***): clear malfunction memory, cycle ignition key OFF and restart engine.

AUTO RESET (X) = Error reaction eliminated after fault condition ends.

KEY RESET (X) = Error reaction eliminated by cycling ignition key OFF/ON.

A = Limp Mode only when faults 22 and 23 occur simultaneously. With implausible signal input, control module faults to preprogrammed fixed substitution value, (L/RR, R/RR = 2500 rpm).

B = With implausible signal input, control module defaults to preprogrammed fixed substitution value.

C = With implausible signal input, control module defaults to variable substitution value (with loss of one rear speed sensor input).

D = With implausible signal input, control module defaults to variable substitution value from other half of engine control.

E = Delayed starting.

F = Error induces control module to reinitialize from beginning (reset).

Figure 13

5 DIGIT DIAGNOSTIC TROUBLE CODES

DIAGNOSTIC TROUBLE CODE	DESCRIPTION
P0100	MAF CIRCUIT FAULT
P0105	MAP CIRCUIT FAULT
P0110	IAT CIRCUIT FAULT
P0115	ECT CIRCUIT FAULT
P0120	THROTTLE POSITION CIRCUIT FAULT
P0500	VSS SENSOR FAULT
P0560	SYSTEM VOLTAGE MALFUNCTION
P0700	TRANSMISSION CONTROL SYSTEM MALFUNCTION
P0702	TRANSMISSION CONTROL SYSTEM ELECTRICAL MALFUNCTION
P0715	TURBINE SPEED SENSOR CIRCUIT FAULT
P0720	OUTPUT SPEED SENSOR CIRCUIT FAULT
P0730	INCORRECT GEAR RATIO
P0740	TORQUE CONVERTER CLUTCH MALFUNCTION
P0743	TORQUE CONVERTER CLUTCH ELECTRICAL CIRCUIT FAULT
P0748	MODULATION/SHIFT PRESSURE REGULATING SOLENOID CIRCUIT FAULT
P0753	1-2/4-5 SHIFT SOLENOID ELECTRICAL CIRCUIT FAULT
P0758	2-3 SHIFT SOLENOID ELECTRICAL CIRCUIT FAULT
P0763	3-4 SHIFT SOLENOID ELECTRICAL CIRCUIT FAULT
P1584	STOP LAMP SWITCH FAULT
P1747	CAN SIGNAL FROM ETC FAILURE

Figure 14

DIAGNOSTIC LINK CONNECTOR (DCL) INFORMATION

There can be 4 different diagnostic connector styles depending on year of production, car model, if the vehicle is equipped with California emissions or if the vehicle is OBD-II compliant.

DLC #1 - This DLC is located in the engine compartment and is a 16 pin diagnostic connector which is used with a "Code Reader" and will produce 2 digit codes.

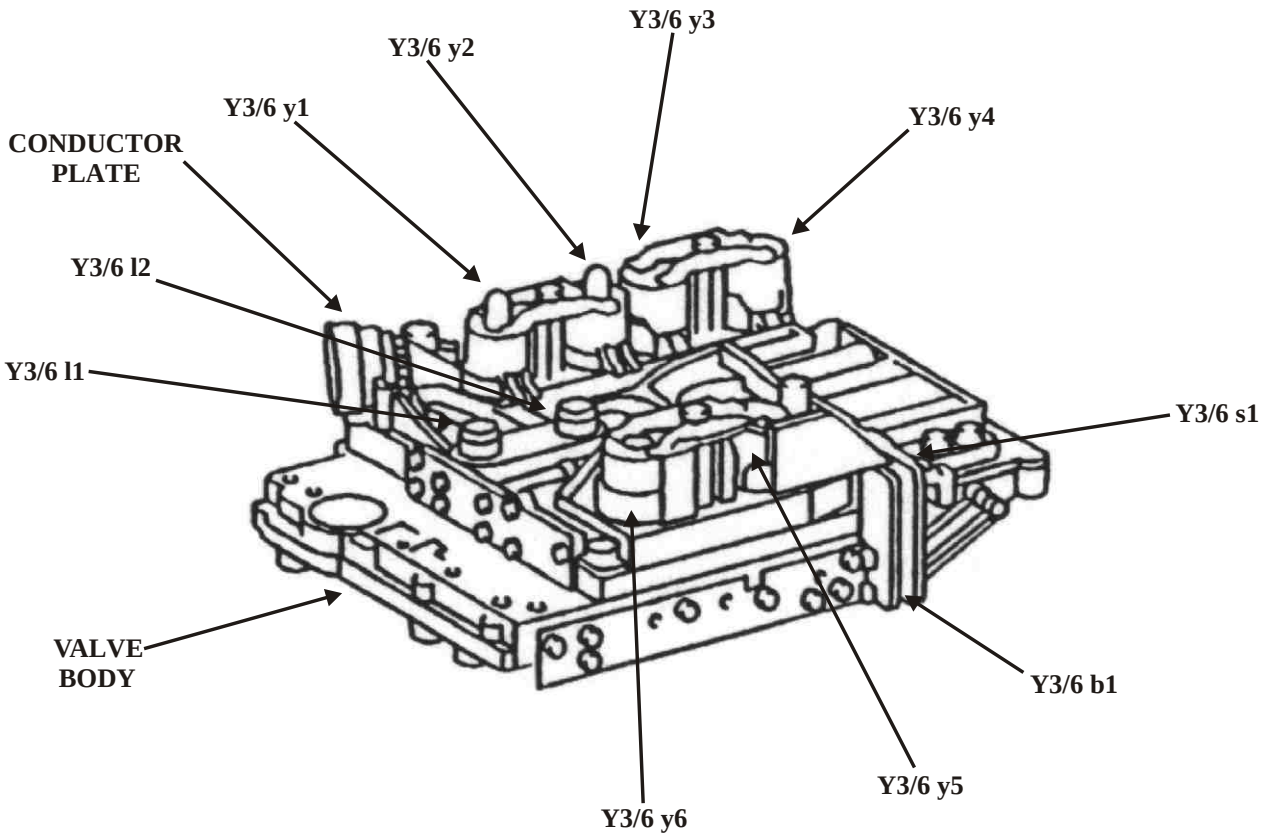
DLC #2 - This DLC is located in the same location as DLC #1 and is very similar in appearance. This DLC has an L.E.D. Lamp with a push button to retrieve 2 digit codes. This style connector is typically used with California emissions.

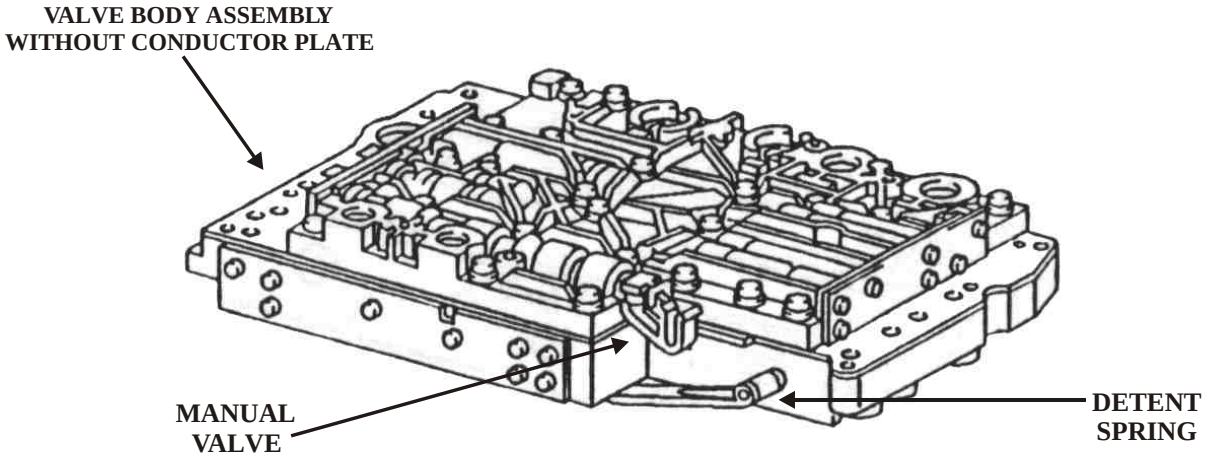
DLC #3 - This DLC is also located in the engine compartment and is a round 38 terminal connector that requires a diagnostic code reader to retrieve 2 digit codes.

DLC #4 - This DLC is the 16 terminal OBD-II connector located under the driver side dash. This will require a scan tool in order to retrieve the typical OBD-II 5 digit codes.

Figure 15

722.6 VALVE BODY ASSEMBLY





Y3/6 y4 - 3-4 SHIFT SOLENOID
Y3/6 y3 - 1-2/4-5 SHIFT SOLENOID
Y3/6 y2 - SHIFT PRESSURE REGULATING SOLENOID
Y3/6 y1 - MODULATING PRESSURE REGULATING SOLENOID
Y3/6 l2 - RPM SENSOR n2
Y3/6 l1 - RPM SENSOR n3
Y3/6 y5 - 2-3 SHIFT SOLENOID
Y3/6 y6 - PWM LOCK-UP SOLENOID
Y3/6 s1 - STARTER LOCKOUT CONTACT
Y3/6 b1 - ATF TEMPERATURE SENSOR

Figure 16

722.6 VALVE BODY ASSEMBLY

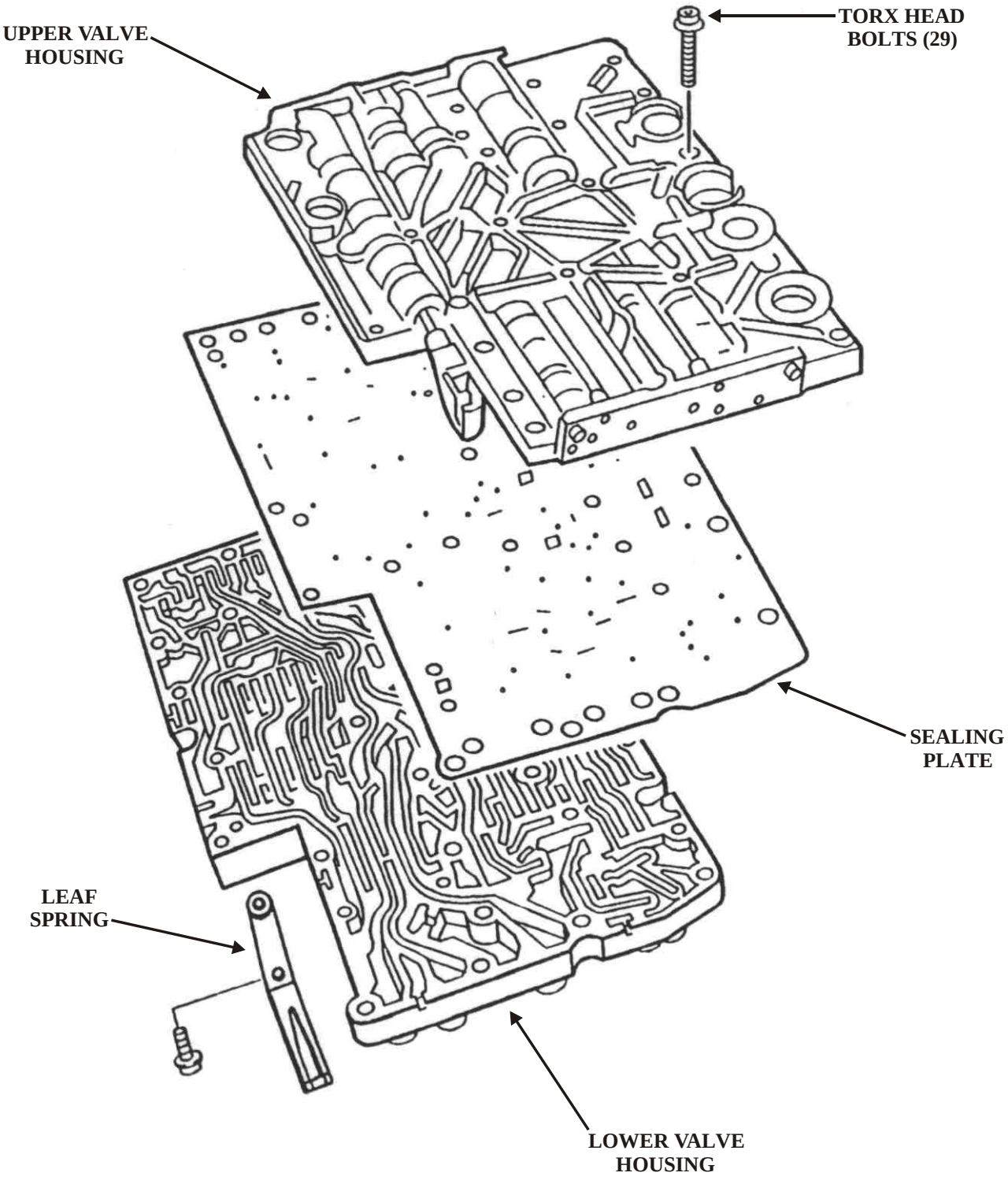


Figure 17

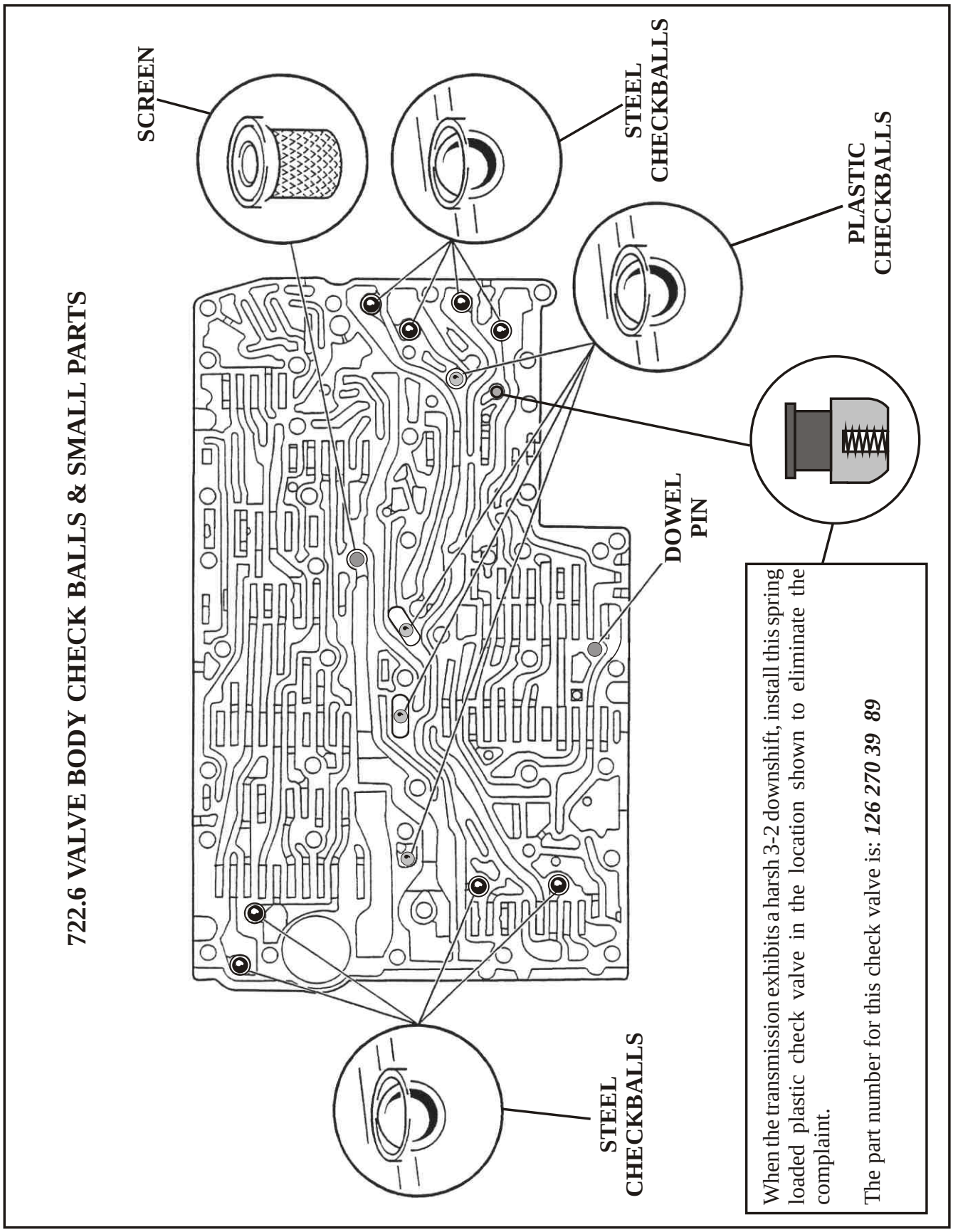


Figure 18

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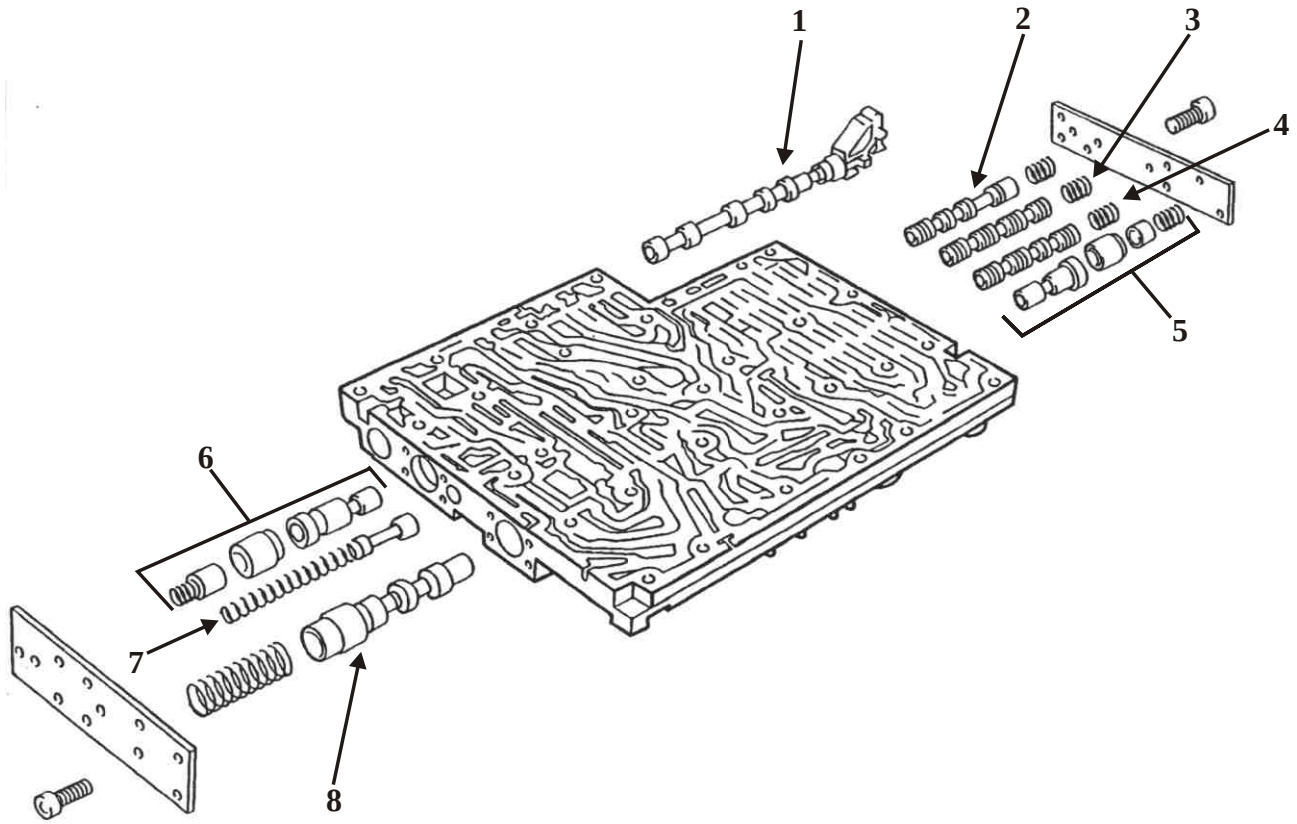
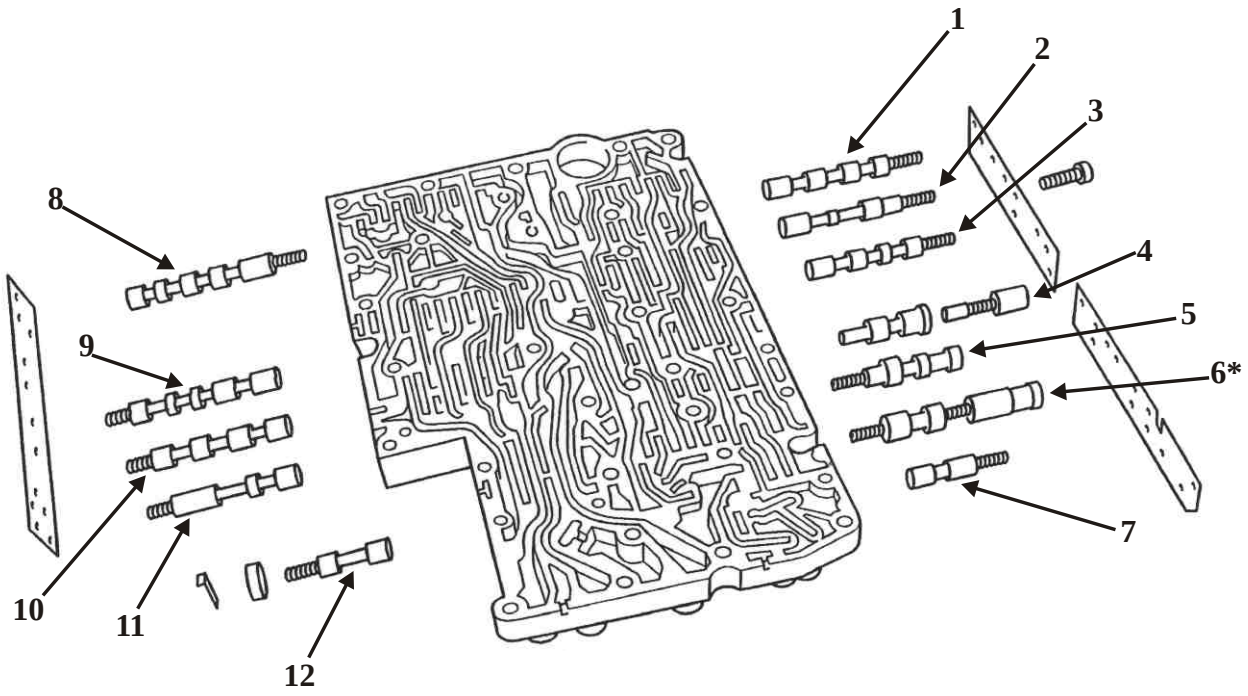
UPPER VALVE HOUSING



1. MANUAL VALVE
2. 3-4 HOLDING PRESSURE SHIFT VALVE
3. 3-4 COMMAND VALVE
4. 3-4 SHIFT PRESSURE SHIFT VALVE
5. 3-4 OVERLAP REGULATING VALVE, SLEEVE & PISTON
6. 2-3 OVERLAP REGULATING VALVE, SLEEVE & PISTON
7. LUBRICATION PRESSURE REGULATING VALVE
8. OPERATING PRESSURE REGULATOR VALVE

Figure 19

LOWER VALVE HOUSING



*The Control Valve Pressure Regulating Valve spring is known to break. This can cause delayed engagement into drive or reverse, a flared 2-3, 3-4 or 4-5 shift and a flared kickdown shift. The spring breaks near the middle of its length and, due to spring design, it screws itself together. Depending on how far the spring has screwed itself together, will determine which of the above complaints you have.
The part number for the O.E. spring is ***140 993 58 01.***
This spring kit can also be obtained from ***Mario Aristides, Independent Transmission Service, call 305-666-3544 or fax 305-666-8238.***
The spring kit from Mario comes in two calibrations: ***Normal Shift Feel...PN 722.6 P/R 25-52mm***
Firm Shift Feel.....PN 722.6 P/R 25-56mm
The kit also comes with shims to adjust shift feel by adding these shims to the valve.

This spring can be replaced without removing the valve body by removing the end plate only with one exception, the springs normal free length is 52.19mm (2.055"). When the spring pieces are laid end to end and it measures **LESS** than 52.19mm (2.055"), the valve body will have to be disassembled in order to find the rest of the broken spring pieces.

1. 1-2/4-5 COMMAND VALVE
2. 1-2/4-5 HOLDING PRESSURE SHIFT VALVE
3. 1-2/4-5 SHIFT PRESSURE SHIFT VALVE
4. 1-2/4-5 OVERLAP REGULATING VALVE, SLEEVE & PISTON
5. SHIFT PRESSURE REGULATING VALVE

*****6. CONTROL VALVE PRESSURE REGULATING VALVE

7. SHIFT VALVE PRESSURE REGULATING VALVE
8. CONVERTER LOCK-UP CLUTCH REGULATING VALVE
9. 2-3 SHIFT PRESSURE SHIFT VALVE
10. 2-3 COMMAND VALVE
11. 2-3 HOLDING PRESSURE SHIFT VALVE
12. B2 SHIFT VALVE

Figure 20

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

COMPLAINT: The vehicle suddenly stopped shifting and remained in whatever the current gear was when one or more Electronic Solenoid or Hall Effect Sensor Diagnostic Trouble Codes (DTC) were set. Once the ignition is cycled, the vehicle exhibits harsh engagements into Reverse and Drive with only 2nd gear in any of the forward gear select positions. Sometimes, when the ignition is cycled off and on again, the transmission begins to operate properly for an unknowing period of time before the complaint repeats itself.

CAUSE: There are several possibilities all of which will cause similar complaints. The item covered in this bulletin are the most frequent causes known at the time of writing this bulletin. They are:

1. A defective valve body conductor plate.
2. Excessive foreign particle build up on the magnetic **n2 and n3 RPM Sensors.**
3. The sheet metal window used to excite the **n3 RPM Sensor** not situated correctly on the K1 clutch drum.
4. Solenoid case sleeve connector, and/or wire fatigue from the transmission to the transmission control module.
5. A defective TCM.

CORRECTION:

1. The valve body conductor plate is similar to, but a much larger version of, that which is seen on Saturn vehicles. It is a circuit board encased in black plastic which snaps down onto the solenoids mounted in the valve body. This conductor plate can be removed and replaced separately as seen in Figure 1. With the valve body in place, tension is placed on a leaf spring which puts pressure on the RPM Sensors to keep them in place as seen in Figure 2.

2. The RPM Sensors are magnetic and can attract foreign material which can interfere with the sensor signals, the source of the contamination will have to be corrected to eliminate this problem The previous design conductor board had open circuitry which could be affected by normal debris. The current design conductor plate has this circuitry covered by plastic to avoid normal debris from interfering with the signals as shown in Figure 3.

3. An erratic **n3** RPM Sensor signal can be caused by a defective K1 clutch drum which has the sheet metal window attached to the K1 drum mis-positioned. When the K1 drum is not defective, the sheet metal window will be centered in the hole in the case which can be seen in Figure 4, once the valve body is removed. When the K1 drum is defective the sheet metal window will be off center of the hole in the case as seen in figure 5. The K1 drum will require replacement when the sheet metal window is off center as shown in figure 6. Figure 7 illustrates the K1 drum with the sheet metal window attached.

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

CORRECTION ***continued:***

4. The solenoid case sleeve connector can develop problems such as terminal fatigue, leakage or wiring problems between the case connector and the TCM.
   In figures 8 and 9 The terminal locations at the case connector and the TCM are shown for all the rpm sensor circuits.
   Since these are Hall Effect Sensors, it will be necessary to check for power, ground and signal.

5. The TCM (Refer to Figure 9) can also cause this complaint, however this would be the last item to condemn as it is unusual for Hall Effect sensor signal problems to be the cause of this complaint.

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

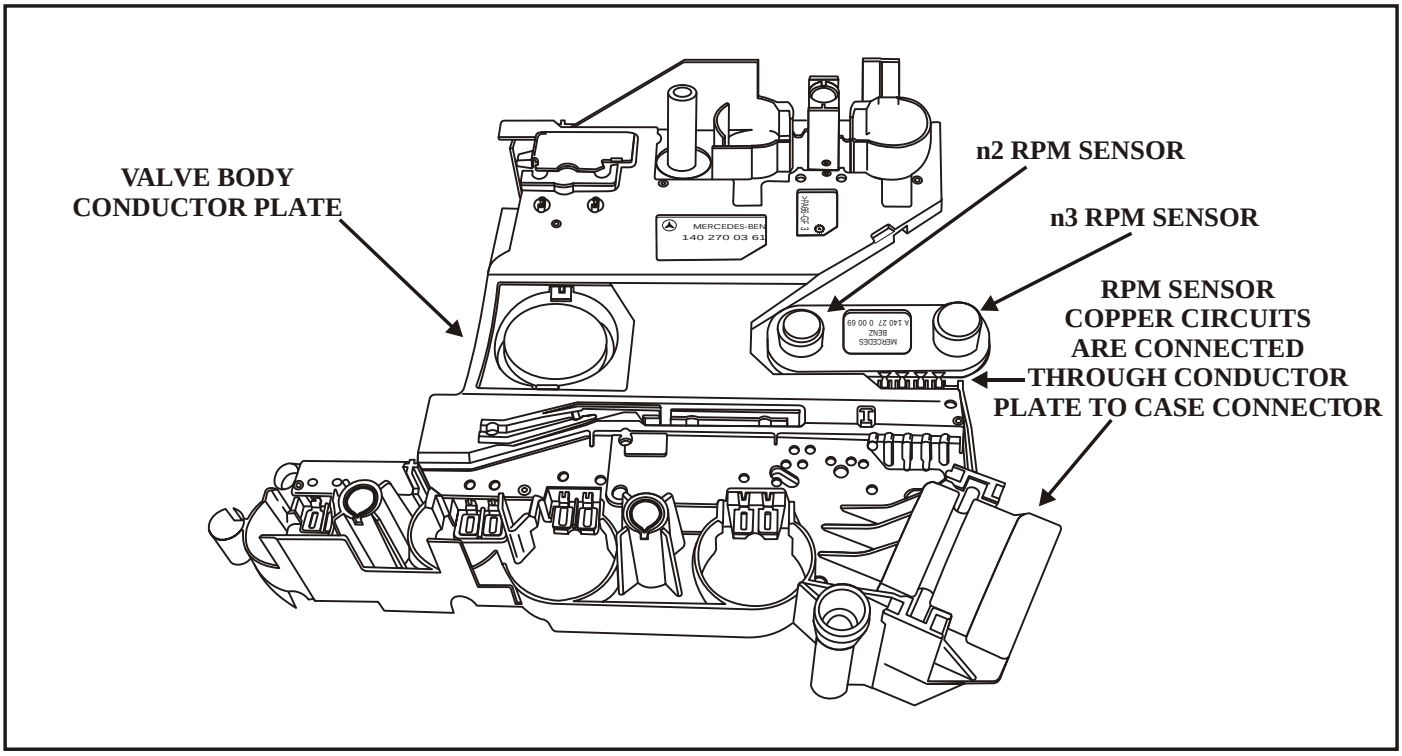


Figure 1

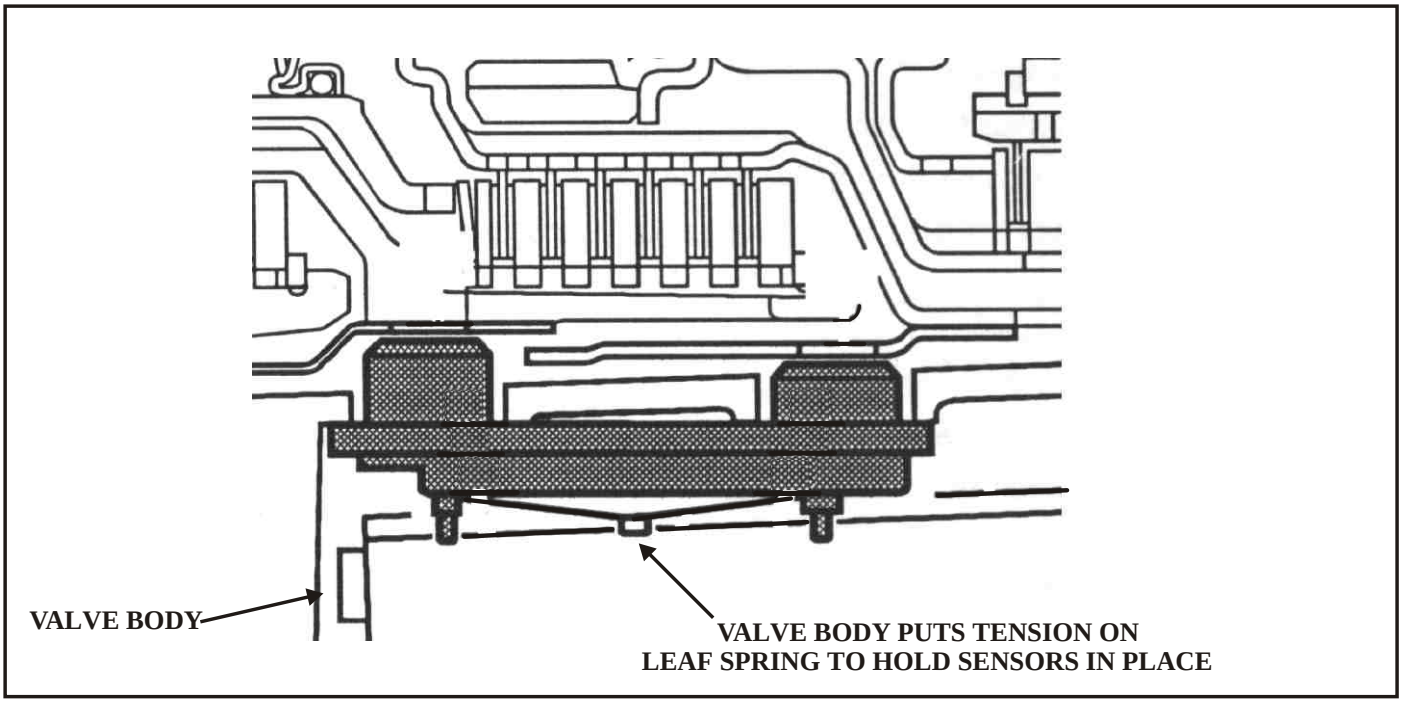
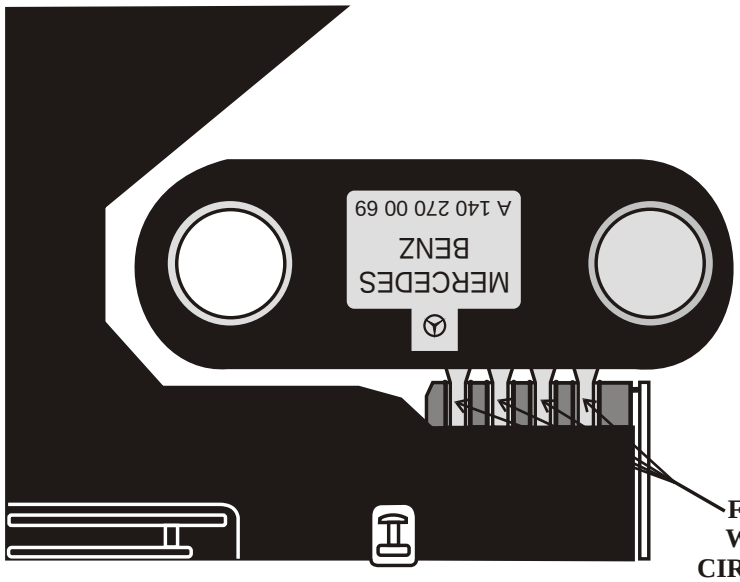


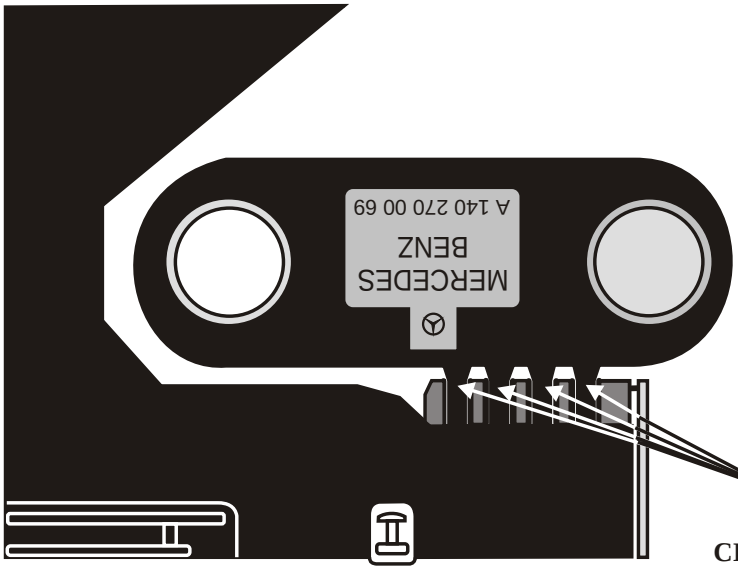
Figure 2

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE



FIRST DESIGN WITH COPPER CIRCUIT EXPOSED



SECOND DESIGN (EXPOSED COPPER CIRCUITRY NOW COVERED)

Figure 3

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

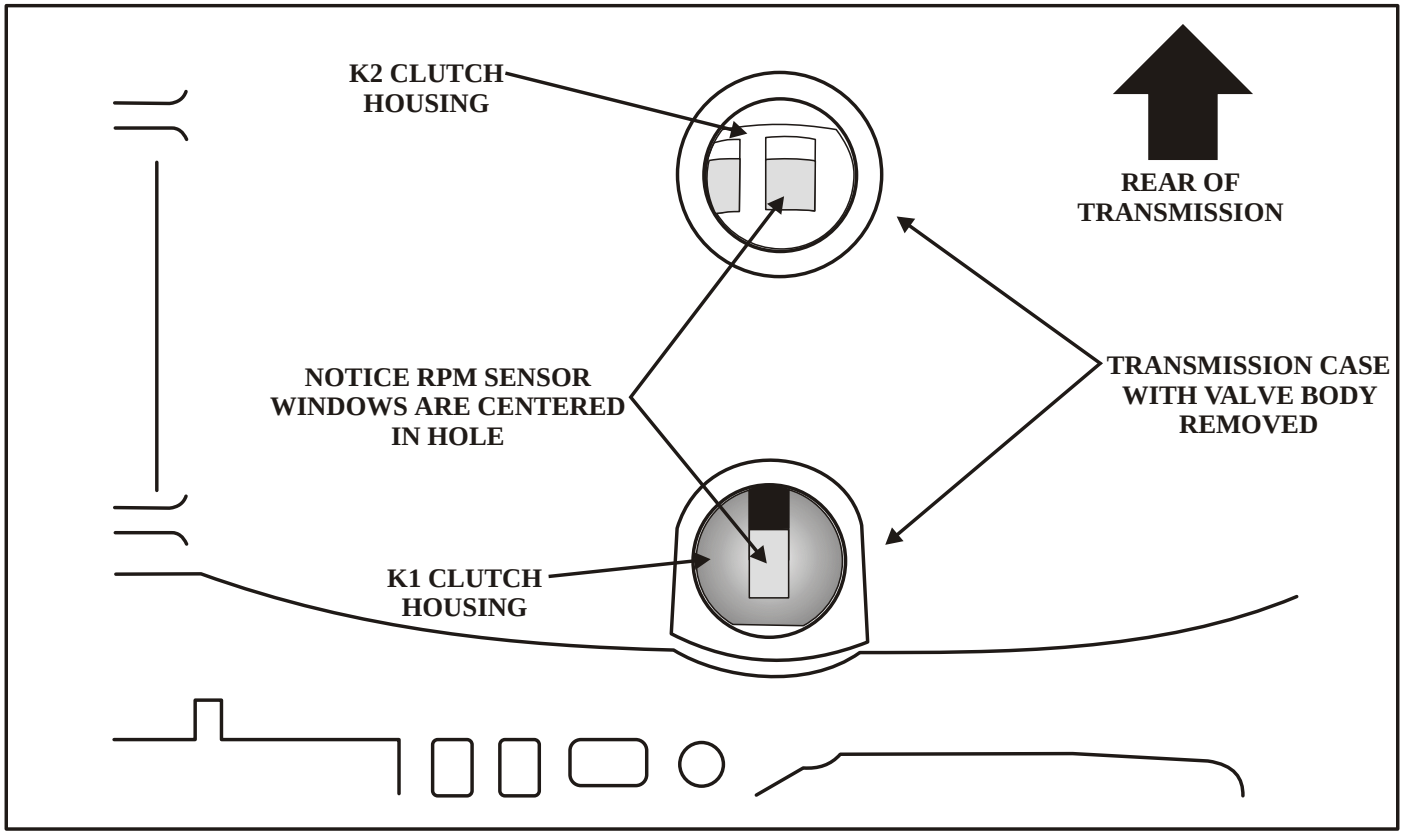


Figure 4

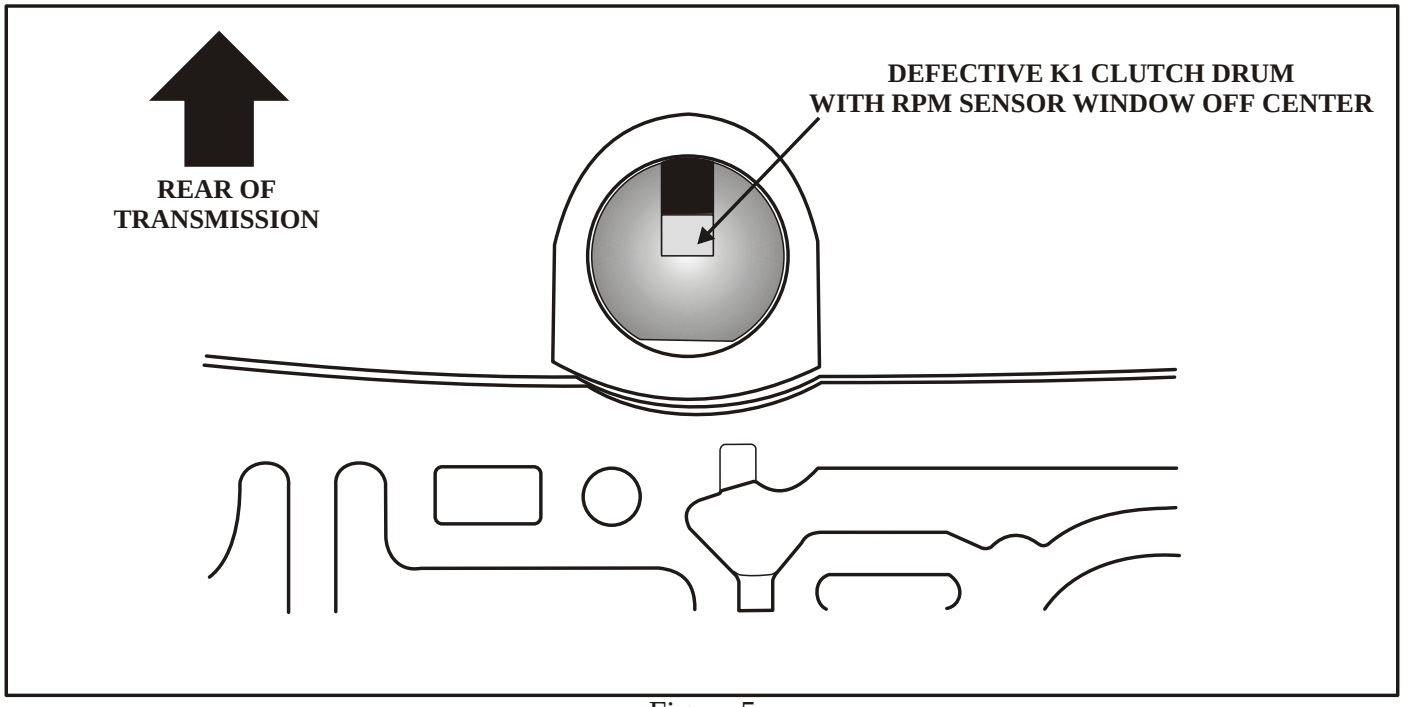


Figure 5

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722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

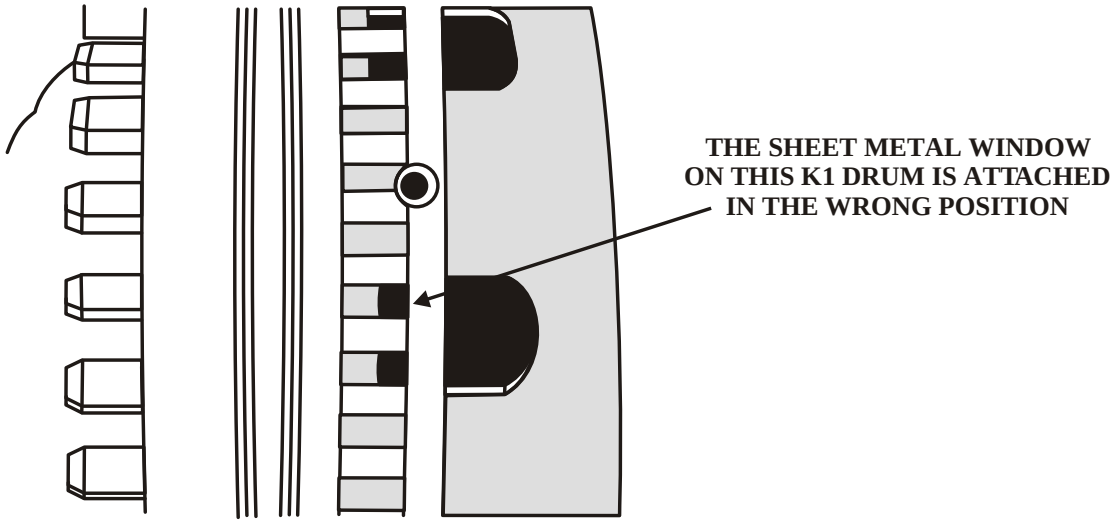


Figure 6

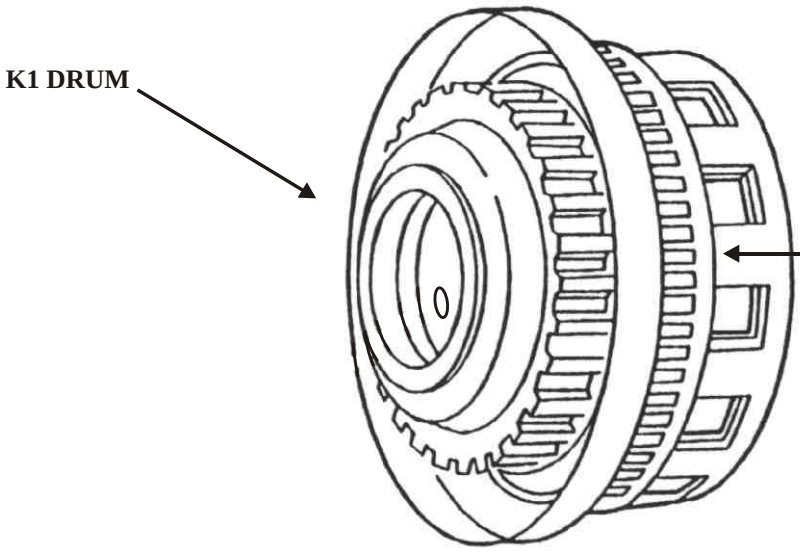


Figure 7

722.6 MERCEDES BENZ

ERRATIC FAIL SAFE

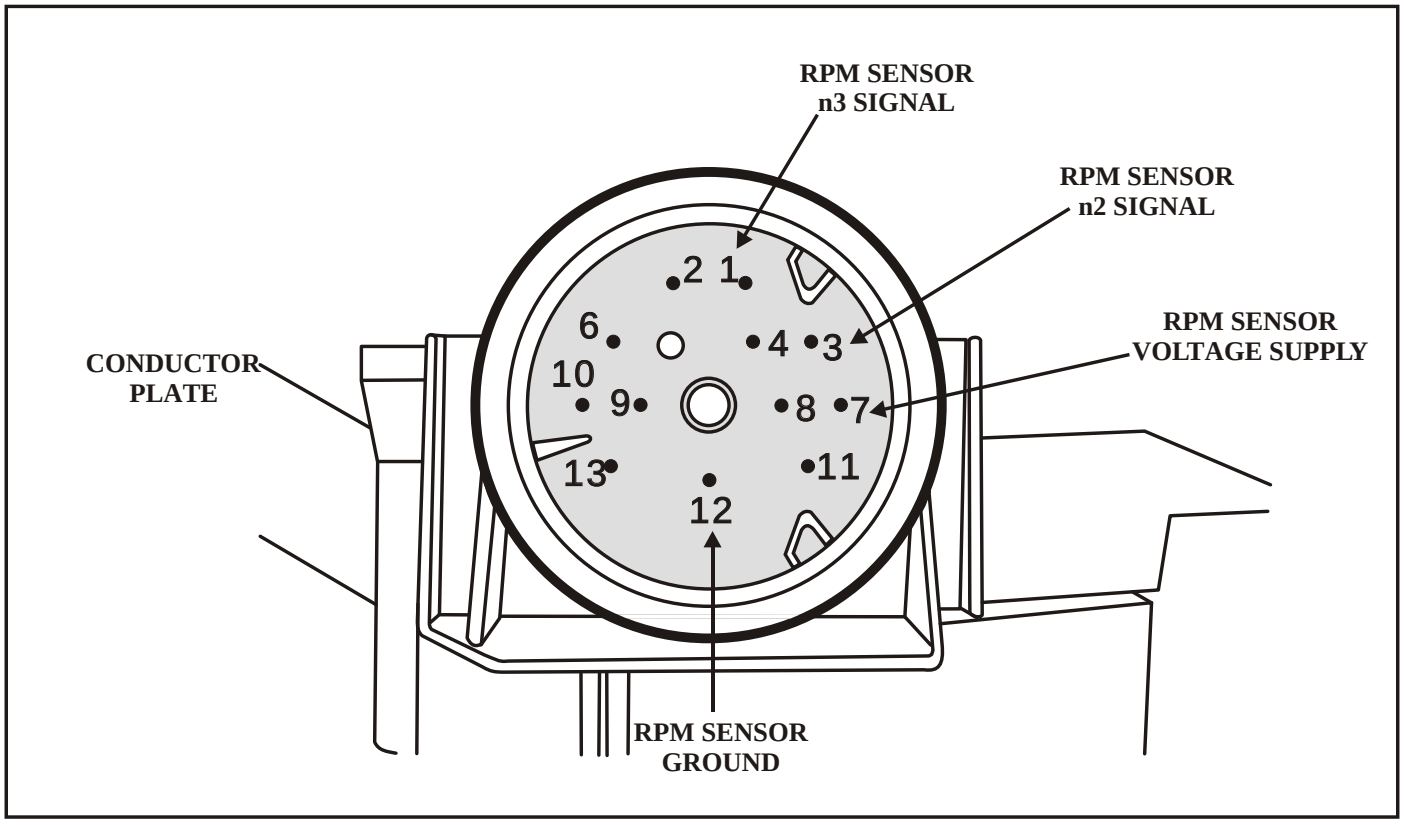


Figure 8

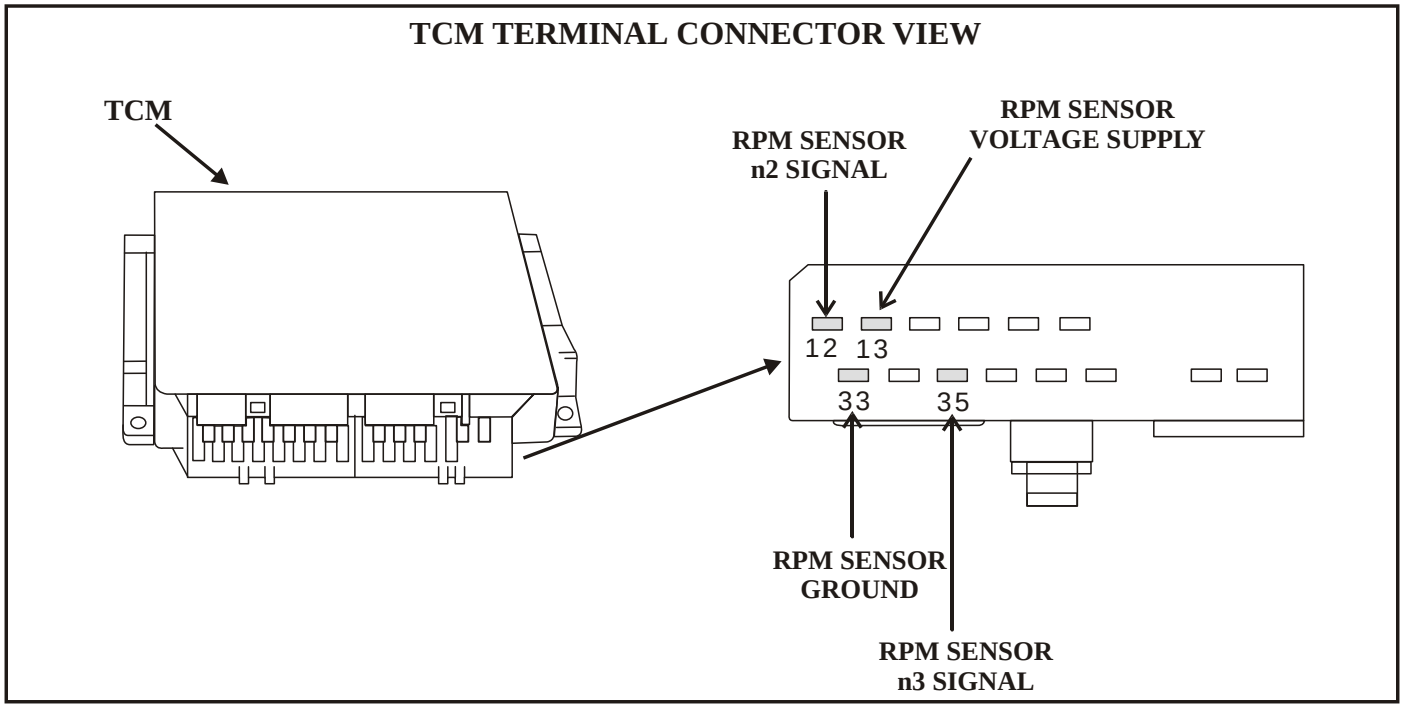


Figure 9

MERCEDES BENZ

LATE SHIFTS

COMPLAINT: All shifts are late, higher gears may not be attainable, preliminary diagnosis indicates that throttle pressure is the cause of the late shift complaint. Adjustment of the throttle cable makes little or no difference.
Those vehicles equipped with a Mode Select Switch, will exhibit the same late shift complaint whether the mode switch is in the "E" Mode or the "S" Mode.

CAUSE: The late shift complaint is due to a constant supply of vacuum to the ***Upshift Delay Vacuum Actuator***

FUNCTION:
Some models come equipped with an upshift delay vacuum actuator which can have one or two vacuum hose connections (Refer to Figure 1) that is designed to control the throttle cable in a way that creates late shifts when the vehicle is cold in order to heat up the catalytic converter faster. (Refer to Figure 2) It also creates late shifts in vehicles equipped with a Mode Selector Switch in order to create a performance shift pattern when the mode switch is in the "S" MODE. (See Figure 3) In the "E" MODE the upshift delay device is used for rapid catalytic converter heating only, while providing a calm shift pattern for normal driving.

CONTROLS:
The vacuum is supplied by one or two switch over valves which are computer controlled on the ground side.
Depending on year, model and the type of emissions requirements, the switch over valves can be controlled by the LH-SFI Control Module, the HFM-SFI Engine Control Module or the PEC Control Module.
Power is supplied to the switch over valves by the upshift delay relay usually located in the under hood fuse box.
Vehicles equipped with the Mode Select Switch activates the upshift delay switch over valve when the mode switch is placed in the "S" Program Mode position in order to create a performance shift program which is canceled in one two ways:
(1) Moving the Mode Select Switch to the "E" Program Mode position which is used for a normal driving pattern.
(2) Engaging kickdown.

INPUTS:
The length of time that the shifts are delayed depend on how much time vacuum is supplied to the upshift delay vacuum actuator. The amount of time vacuum is supplied is dependant on engine temperature, vehicle speed and computer controlled timing. The range of each input is dependant on year, model and the type of control system with which the vehicle is equipped.
(A) Coolant Temperature...32°F to 104°F (0°C to 50°C)
(B) Vehicle Speed...6 MPH to 34 MPH (10 KPH to 52 KPH)
NOTE: These vehicle speed limits are for catalytic converter heating, not "E" MODE driving.
(C) Time...15 to 150 Seconds
(D) Mode Selector Switch set to "E" MODE

MERCEDES BENZ

LATE SHIFTS

CAUSE ***continued:***

VARIATIONS:

Figure 4 shows the upshift delay diagram for vehicles ***without*** "E/S" Mode Select Switch. These systems use one switch over valve and one vacuum hose connection on the upshift delay vacuum actuator for catalytic converter heating only.

Figure 5 shows the upshift delay diagram for vehicles ***with*** Three Way Catalyst Heating (TWC), these systems use two switch over valves and two vacuum hose connections on the upshift delay vacuum actuator, one for upshift delay to heat the catalytic converter quickly and one for "S" Mode delayed shifting.

Figure 6 shows the upshift delay diagram for vehicles ***with*** the Mode Selector Switch, these use one switch over valve and have only one vacuum hose connection on the upshift delay vacuum actuator for catalytic converter heating only.

NOTE: As of production date 7/93, the upshift delay vacuum actuator will be the dual diaphragm type only, if only one vacuum hose is needed, plug the one that is not needed.

CORRECTION: ***DIAGNOSIS:***

(1) Warm engine to normal operating temperature, make certain the mode selector switch, if so equipped, is set to "E" Mode.
(2) Check for vacuum at one or both vacuum hoses, there should not be any.
(3) If there is vacuum present, plug the hose(s) with a check ball(s) to insure it is the upshift delay system causing he late shift complaint and not some other fault.
(4) If it is the upshift delay system causing the late shift complaint, make certain the upshift delay vacuum actuator and all related linkages are not binding.
(5) Check for system voltage supply to and from the relay to the switch over valve(s).
(6) Check for the proper computer controlled ground signal to the switch over valve(s).
(7) Check for proper mode selector switch operation if so equipped.
(8) Check that the upshift delay vacuum actuator adjustments are within specifications.

ADJUSTMENTS:

(1) Remove vacuum hose(s) and supply 12 in. hg. (400 mbar) to upshift delay vacuum actuator.
(2) Pull pressure control cable (T.V.) to a full load stop.
(3) Measure distance "A", shown in figure 7, which is the distance the upshift delay piston protrudes from the housing.
- *(a)* 4 Cylinder Engines _____ .31" (8mm)
- *(b)* 6 Cylinder Engines with 722.3 Transmission _____ .28" (7mm)
- *(c)* 6 Cylinder Engines with 722.4 Transmission _____ .24" (6mm)
- *(d)* 8 Cylinder Engines _____ .24" (6mm)

(4) If upshift delay is working properly, vehicle will take off in 2nd gear and the 2-3 shift will occur above 30 MPH (48 KPH).
(5) If vehicle starts in 1st gear upshift delay is too high.
(6) If the 2-3 shift occurs at less than 30 MPH (48KPH), upshift delay is too low.
(7) Turn adjusting screw shown in figure 7, ***clockwise*** to ***lower*** shift points.
(8) Turn adjusting screw shown in figure 7, ***counterclockwise*** to ***raise*** shift points.
(9) If upshift delay vacuum actuator is being replaced, transfer measurement "B" to new actuator.

MERCEDES BENZ

LATE SHIFTS

CORRECTION *continued:*

***APPLICATION**: The upshift delay device may be found in the following vehicles:*

1989

300CE	124 CHASSIS	L6 3.0L SOHC
300E	124 CHASSIS	L6 3.0L SOHC
300SEL	126 CHASSIS	L6 3.0L SOHC
300TE	124 CHASSIS	L6 3.0L SOHC
420SEL	126 CHASSIS	V8 4.2L SOHC
560SL	107 CHASSIS	V8 5.6L SOHC
560SEC	126 CHASSIS	V8 5.6L SOHC
560SEL	126 CHASSIS	V8 5.6L SOHC

1990

300CE	124 CHASSIS	L6 3.0L DOHC
300D	124 CHASSIS	L5 2.5L SOHC
300E	124 CHASSIS	L6 3.0L SOHC
300E	124 CHASSIS	L6 2.6L SOHC
300E 4-MATIC	124 CHASSIS	L6 3.0L SOHC
300SE	126 CHASSIS	L6 3.0L SOHC
300SEL	126 CHASSIS	L6 3.0L SOHC
300TE	124 CHASSIS	L6 3.0L SOHC
300TE 4-MATIC	124 CHASSIS	L6 3.0L SOHC
420SEL	124 CHASSIS	V8 4.2L SOHC
500SL	129 CHASSIS	V8 5.0L DOHC
500SEC	126 CHASSIS	V8 5.6L SOHC
560SEL	126 CHASSIS	V8 5.6L SOHC

1991

300CE	124 CHASSIS	L6 3.0L DOHC
300D TURBO	124 CHASSIS	L5 2.5L SOHC
300E	124 CHASSIS	L6 2.6L SOHC
300E	124 CHASSIS	L6 3.0L SOHC
300E 4-MATIC	124 CHASSIS	L6 3.0L SOHC
300SE	126 CHASSIS	L6 3.0L SOHC
300SEL	126 CHASSIS	L6 3.0L SOHC
300TE	124 CHASSIS	L6 3.0L SOHC
300TE 4-MATIC	124 CHASSIS	L6 3.0L SOHC
350SD TURBO	126 CHASSIS	L6 3.5L SOHC
350SDL TURBO	126 CHASSIS	L6 3.5L SOHC
420SEL	126 CHASSIS	V8 4.2L SOHC
500SL	129 CHASSIS	V8 5.0L DOHC
560SEC	126 CHASSIS	V8 5.6L SOHC
560SEL	126 CHASSIS	V8 5.6L SOHC

MERCEDES BENZ

LATE SHIFTS

CORRECTION *continued:*

APPLICATION: ***The upshift delay device may be found in the following vehicles:***

1992

300CE	124 CHASSIS	L6 3.0L DOHC
300D TURBO	124 CHASSIS	L5 2.5L SOHC
300E	124 CHASSIS	L6 3.0L SOHC
300E	124 CHASSIS	L6 2.6L SOHC
300E 4-MATIC	124 CHASSIS	L6 3.0L SOHC
300SD TURBO	140 CHASSIS	L6 3.5L SOHC
300TE	124 CHASSIS	L6 3.0L SOHC
300TE 4-MATIC	124 CHASSIS	L6 3.0L SOHC
400E	124 CHASSIS	V8 4.2L DOHC
400SE	140 CHASSIS	V8 4.2L DOHC
500E	124 CHASSIS	V8 5.0L DOHC
500SL	129 CHASSIS	V8 5.0L DOHC
600SEL	140 CHASSIS	V12 6.0L DOHC

1993

300CE	124 CHASSIS	L6 3.2L DOHC
300D	124 CHASSIS	L5 2.5L SOHC
300SD TURBO	140 CHASSIS	L6 3.5L SOHC
300TE	124 CHASSIS	L6 3.2L DOHC
300TE 4-MATIC	124 CHASSIS	L6 3.0L SOHC
300E	124 CHASSIS	L6 2.8L DOHC
300E	124 CHASSIS	L6 3.2L DOHC
300E 4-MATIC	124 CHASSIS	L6 3.0L SOHC
400E	124 CHASSIS	V8 4.2L DOHC
500E	124 CHASSIS	V8 5.0L DOHC
500SL	129 CHASSIS	V8 5.0L DOHC
600SEC	140 CHASSIS	V12 6.0L DOHC
600SEL	140 CHASSIS	V12 6.0L DOHC
600SL	129 CHASSIS	V12 6.0L DOHC

1994

E320 CABRIOLET	124 CHASSIS	L6 3.2L DOHC
E320 COUPE & SEDAN	124 CHASSIS	L6 3.2L DOHC
E320 WAGON	124 CHASSIS	L6 3.2L DOHC
E420	124 CHASSIS	V8 4.2L DOHC
E500	124 CHASSIS	V8 5.0L DOHC
500SL	129 CHASSIS	V8 5.0L DOHC
S600 COUPE	140 CHASSIS	V12 6.0L DOHC
S600 SEDAN	140 CHASSIS	V12 6.0L DOHC
600SL	129 CHASSIS	V12 6.0L DOHC

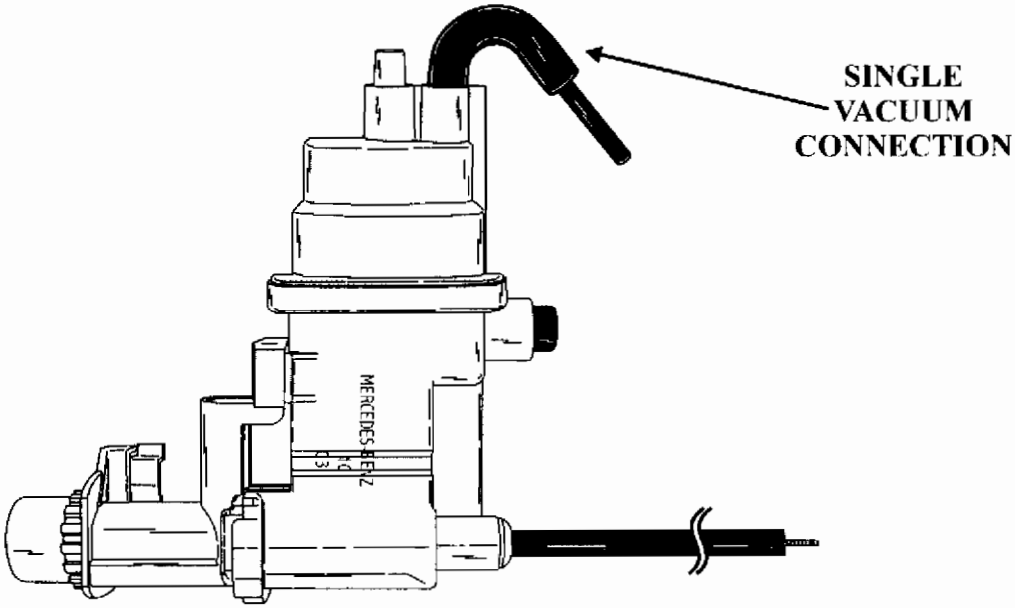
1995

SAME AS 1994 APPLICATIONS WITH THE ADDITION OF:

E300	124 CHASSIS	L6 3.0L DOHC

UPSHIFT DELAY VACUUM ACTUATOR

SINGLE DIAPHRAGM MODEL



DUAL DIAPHRAGM MODEL

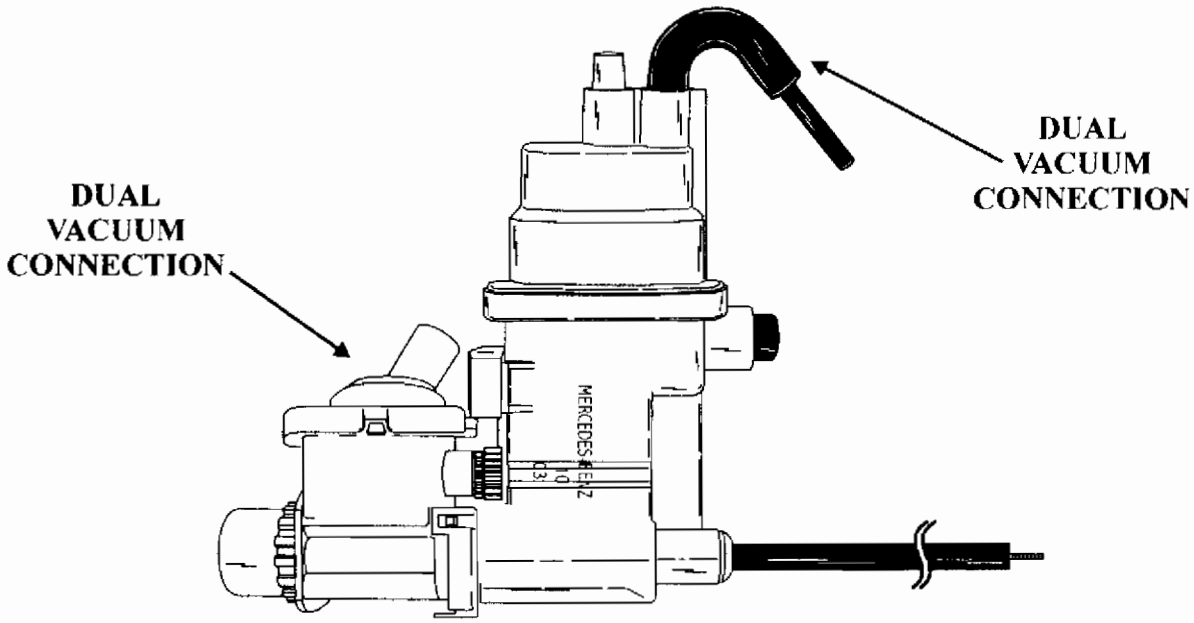


Figure 1

UPSHIFT DELAY VACUUM ACTUATOR

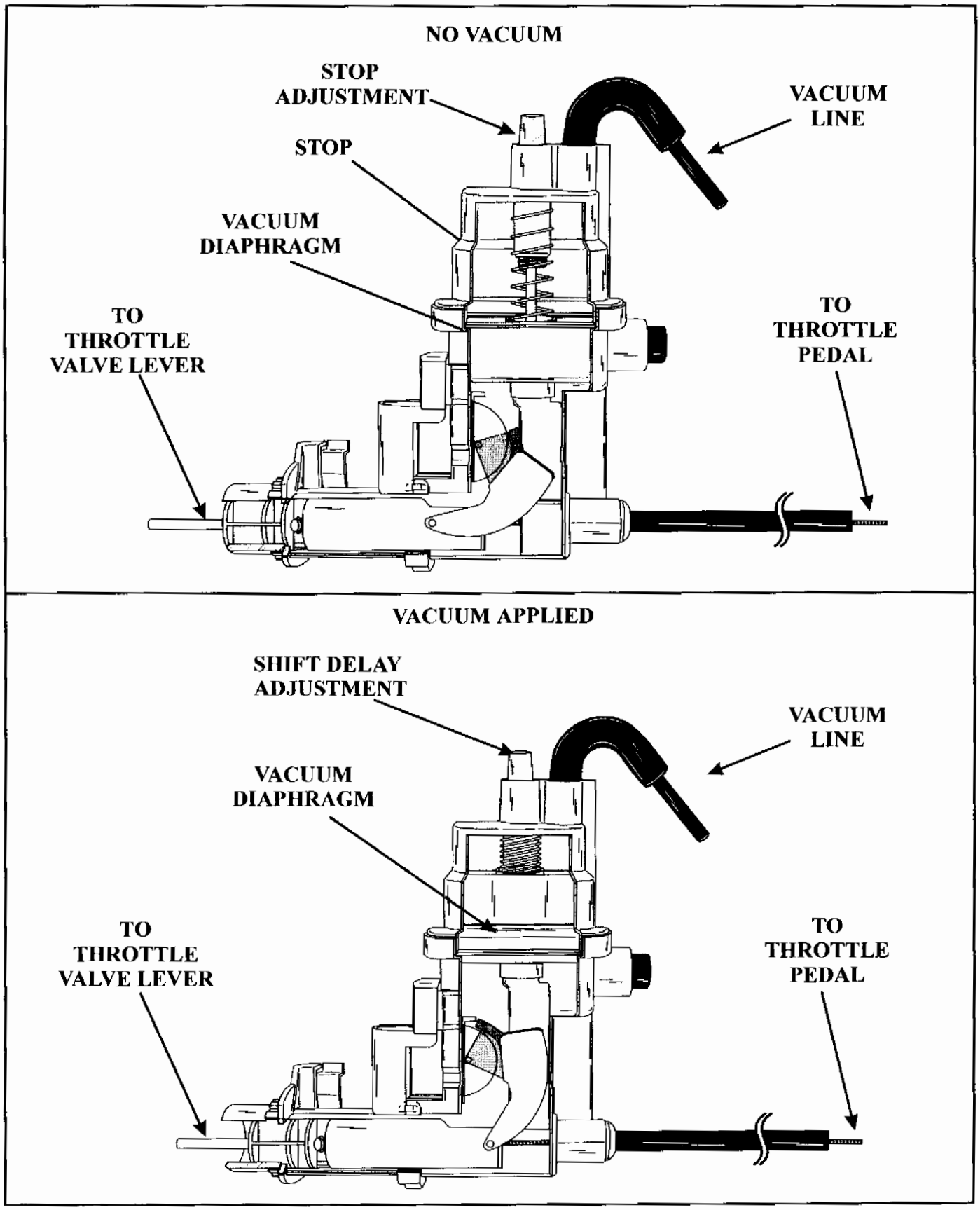


Figure 2

UPSHIFT DELAY VACUUM ACTUATOR

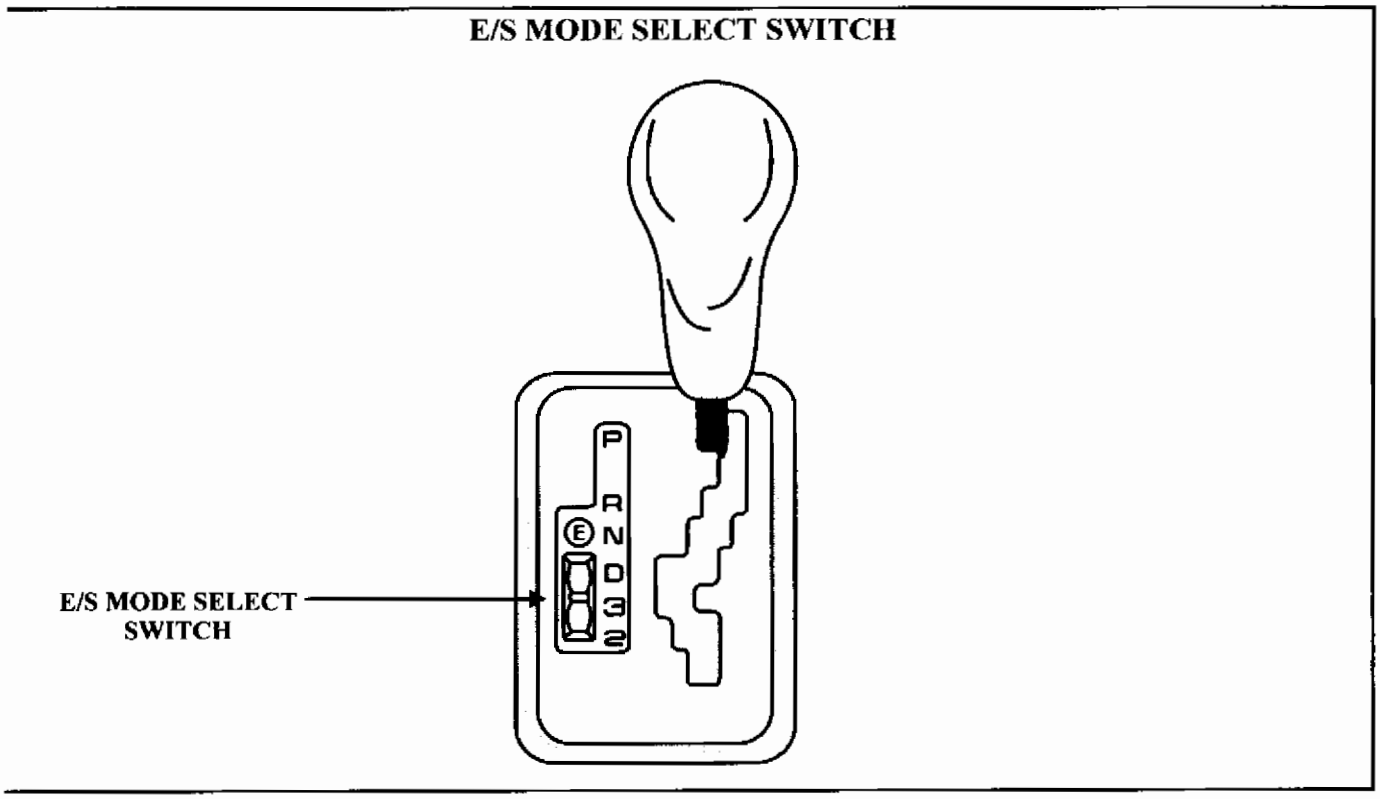


Figure 3

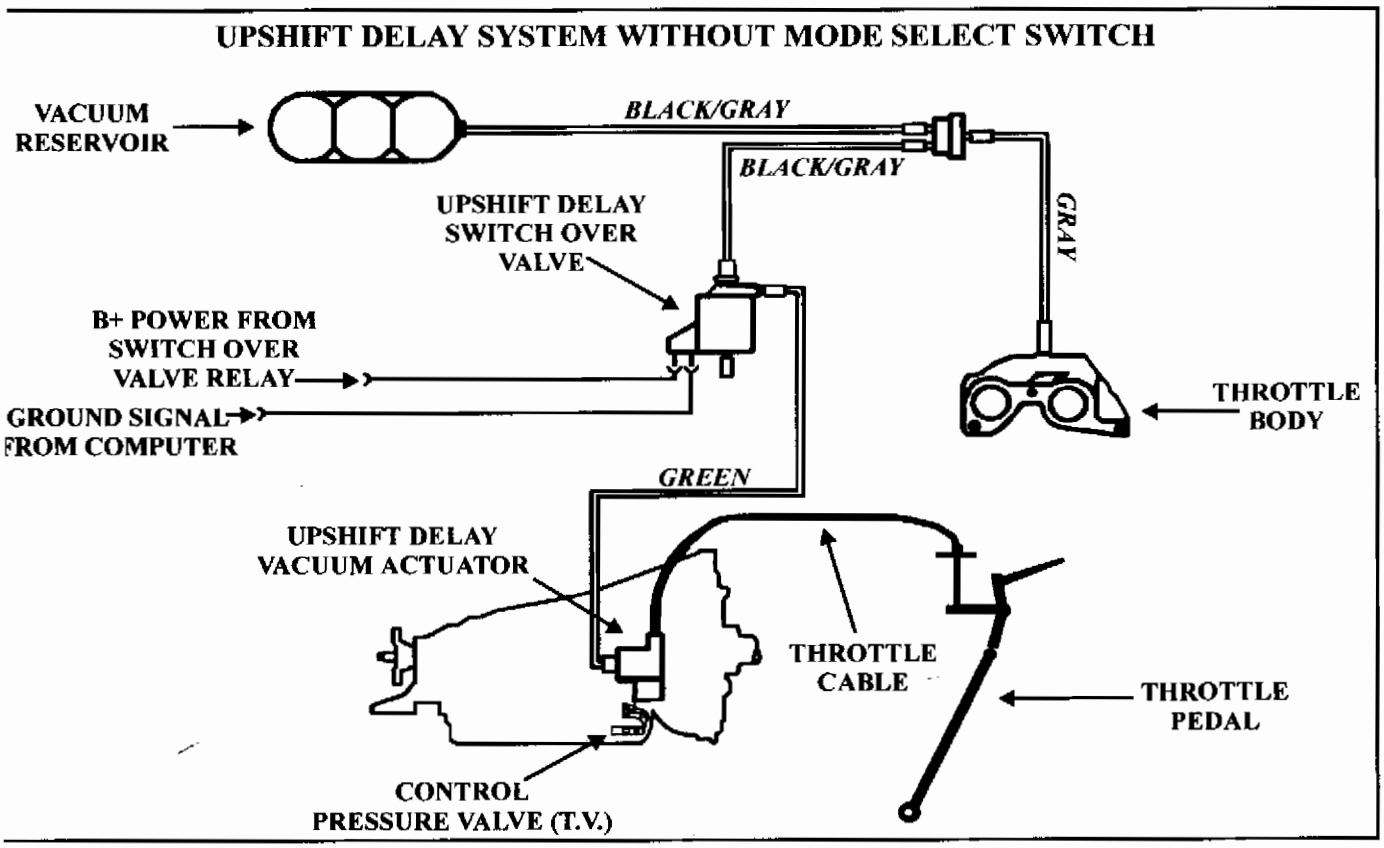


Figure 4

UPSHIFT DELAY VACUUM ACTUATOR

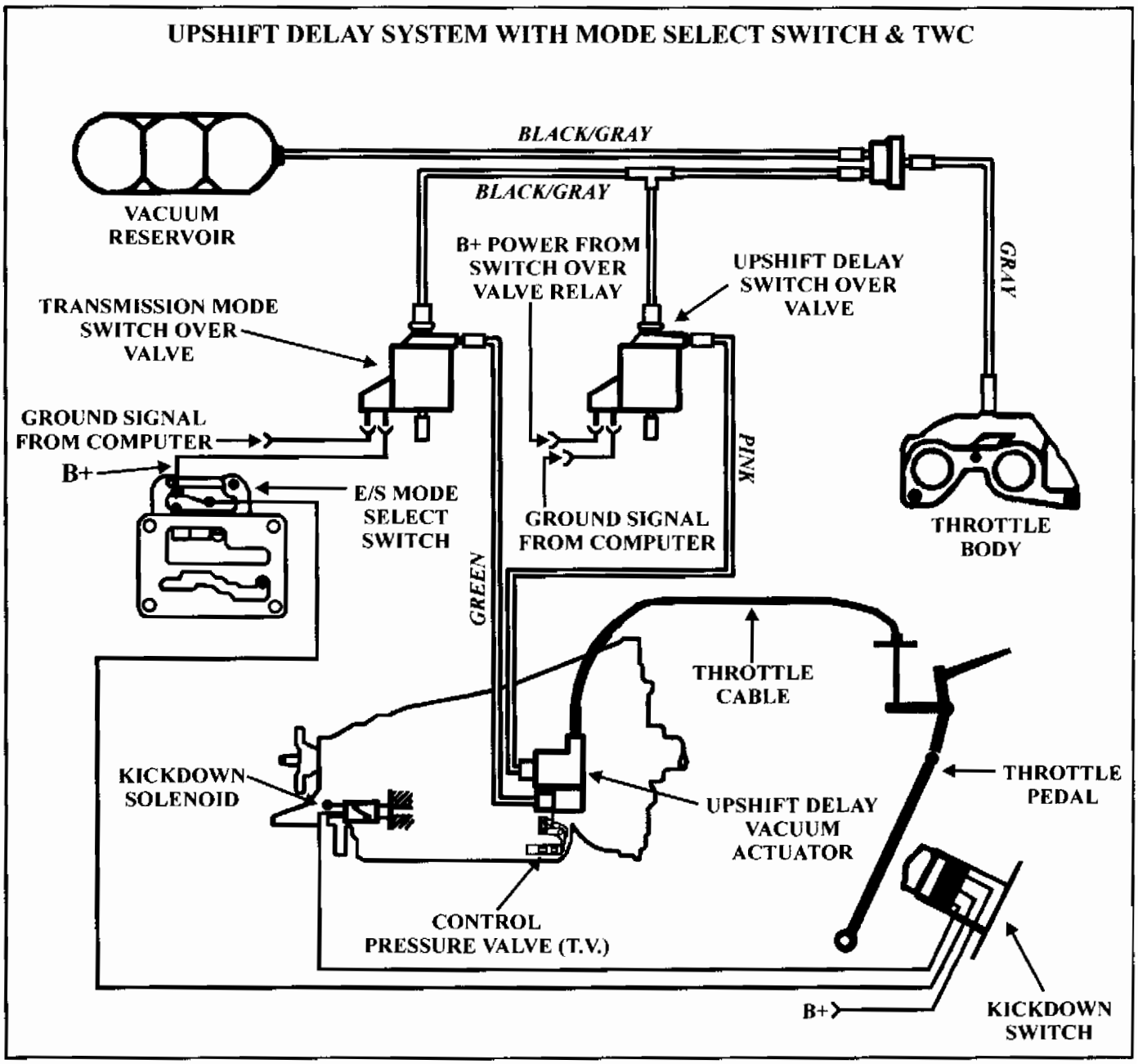


Figure 5

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UPSHIFT DELAY VACUUM ACTUATOR

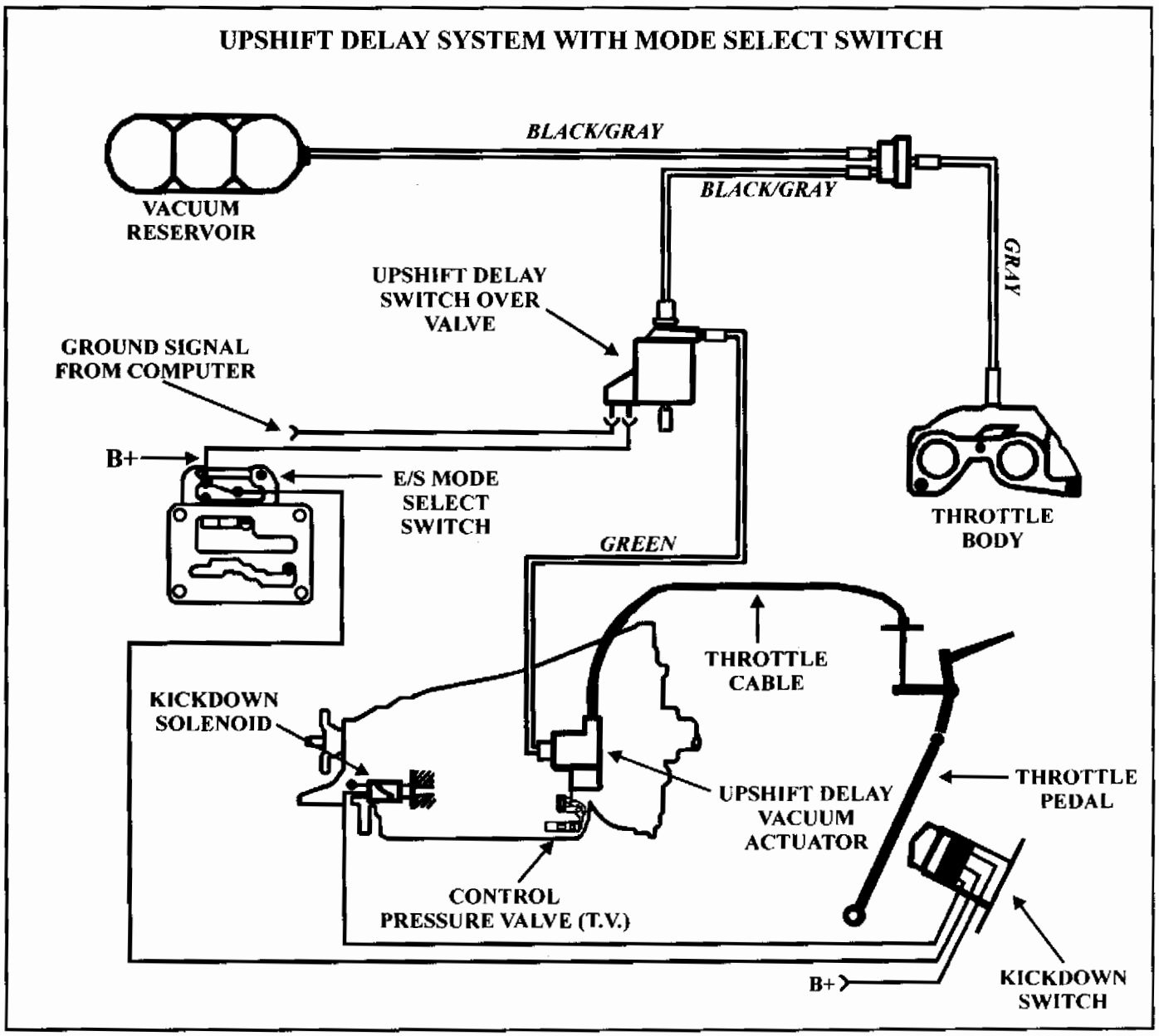

Figure 6

UPSHIFT DELAY VACUUM ACTUATOR ADJUSTMENT

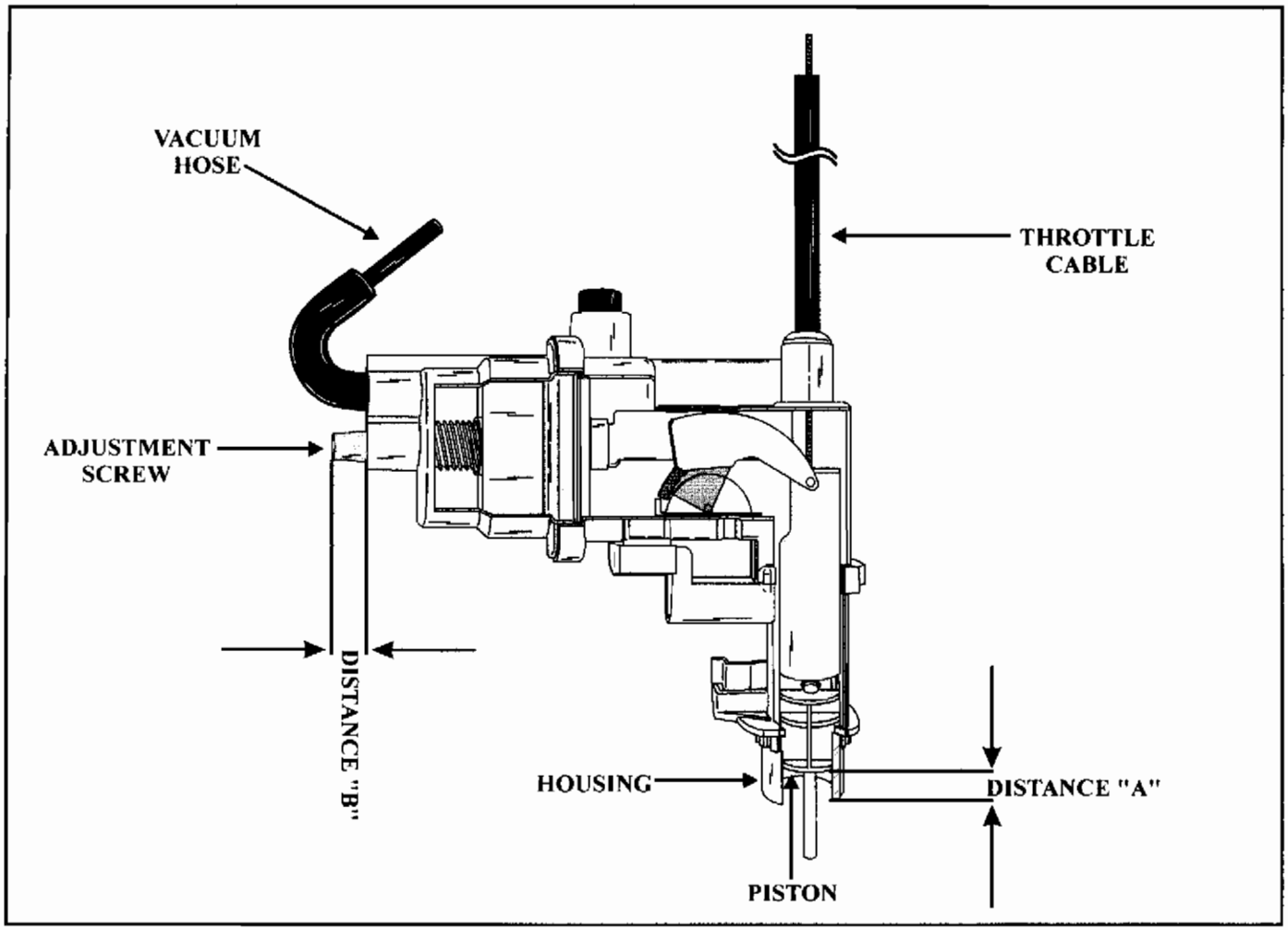

Figure 7

ADJUSTMENTS:

(1) Remove vacuum hose(s) and supply 12 in. hg. (400 mbar) to upshift delay vacuum actuator.
(2) Pull pressure control cable (T.V.) to a full load stop.
(3) Measure distance "A", shown in figure 7, which is the distance the upshift delay piston protrudes from the housing.

(a)	4 Cylinder Engines	.31"	(8mm)
(b)	6 Cylinder Engines with 722.3 Transmission	.28"	(7mm)
(c)	6 Cylinder Engines with 722.4 Transmission	.24"	(6mm)
(d)	8 Cylinder Engines	.24"	(6mm)

(4) If upshift delay is working properly, vehicle will take off in 2nd gear and the 2-3 shift will occur above 30 MPH (48 KPH).
(5) If vehicle starts in 1st gear upshift delay is too high.
(6) If the 2-3 shift occurs at less than 30 MPH (48KPH), upshift delay is too low.
(7) Turn adjusting screw shown in figure 7, ***clockwise*** to ***lower*** shift points.
(8) Turn adjusting screw shown in figure 7, ***counterclockwise*** to ***raise*** shift points.
(9) If upshift delay vacuum actuator is being replaced, transfer measurement "B" to new actuator.

BMW - A4S (THM 4L30-E)

DIAGNOSTIC TROUBLE CODE 40

(Pressure Control Solenoid Circuit)

Adapted from BMW's Service Bulletin 24 06 94

COMPLAINT: BMW's A4S transmission is otherwise known as the 4L30-E. This transmission is found in BMW's 3 and 5 series models. In 3 series vehicles the transmission is referred to as the A4S/270R and the 5 series as the A4S/310R indicating torque capacity. Some model vehicles have been producing intermittent pressure control solenoid code 40. If the vehicle is equipped with an AGS version controller E34 the "Trans Program" may be displayed in the matrix (Driver Information Center). If it is equipped with the E36 version controller the transmission fault indicator may be illuminated. Cycling of the ignition switch many times restores the operation back to normal condition.

CAUSE: ***Possible Causes:***

1. A bad ground or power supply to the TCM.
2. A faulty electrical circuit for the pressure control solenoid to the TCM.
3. The parameters engineered into the PROM for the TCM are too sensitive.

CORRECTION: **Step 1.** ***Locate the TCM:***

a. 1992 to 1995 318i & 325i vehicles, the unit can be found in the passenger side engine compartment behind a cover plate as seen in Figure 1.

b. 1991 to 1993 525i vehicles, the unit is behind the passenger side kick panel.

c. 1994 to 1995 525i vehicles, it is the middle unit located in an electrical box in the engine compartment front of passenger side firewall.

Ground Check:

Once the TCM is located, unplug the 55 pin connector and identify pin locations using Figure 2. With the ignition OFF and a DVOM set to ohms, check the ground circuit for continuity from terminal 19 in the vehicle harness connector to ground. If continuity is not observed, provide a permanent ground for wire 19. To ensure that a good ground exists, plug the harness back into the TCM. Start up the vehicle and turn on as many electrical loads as possible. Switching your DVOM to DC volts, place the negative lead to ground and probe wire 19 with the positive lead. Less than 0.3 volts should be observed. Repair ground wire as necessary. Once the ground wire check is acceptable and code 40 persists, perform the following excessive voltage check procedure.

Excessive Voltage Check:

If an alternator is malfunctioning such as intermittent spikes, a code 40 could be produced. With most vehicles, a quick method in checking for this possibility would be to erase the code and run the vehicle with the alternator disconnected. If a chronic solenoid code problem is resolved with a disconnected alternator, the problem area has been located. Another alternative would be to use a DVOM equipped with a "MIN/MAX" option. With the meter attached to the charging system the min/max setting can present any spikes that may occur.

Continued On Next Page

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CORRECTION: (Cont'd From Previous Page)

Excessive Voltage Check: (Cont'd)

Another quick check that should be employed is to see the amount of AC voltage riding on top of the DC signal produced by the alternator. In other words, check the charging system for excessive "ripple". Simply observe the amount of AC voltage that is in the charging system with your DVOM set to AC volts. Most BMW vehicles utilize a Bosch alternator and depending on factors such as model type and the amount of electrical load being placed on the system, an approximate acceptable level of AC voltage would be between 0.3 to 0.6 volts. In a perfect world 0 volts should be observed. Since this is not the case, the most you should allow would be approximately 0.7 to 0.8 AC volts. Anything more is a definite concern.

Caution: With all BMW's, the best way to erase codes is with a scanner. The problem here is that most generic scan tools are not capable of attaching to and erasing codes from BMW computer systems. Disconnecting the battery to erase the codes may seem to be an option, but be prepared to encounter new problems afterwards such as a loss of radio or memorized stations and/or, a loss of memorized seat and mirror positions. But most importantly, you could lose memorized engine control parameters producing a poor running vehicle. ***Disconnecting the battery is not recommended.*** Obviously the best choice would be to use an appropriate scanner.

TCM Voltage Supply:

Once the alternator passes examination, switch the meter to DC volts and check TCM terminal 37 for system voltage. If voltage is not observed, a wiring problem via the ignition switch, and through a fuse will need to be corrected. Once corrected, clear code and drive the vehicle. If code 40 returns, conyinue on to step two.

Step 2. ***Checking solenoid resistance:***

Turn ignition to the OFF position. Using a DVOM set to ohms, check the pressure control solenoid circuit between terminals 40 and 41 at the TCM. Solenoid resistance should be 2 to 6 ohms. If solenoid resistance is out of range, unplug the transmission case connector (See Figure 3), and recheck the pressure control solenoid resistance between terminals 1 and 3 (See Figure 4). If the resistance is still out of range, an inspection of the internal harness and solenoid will need to be performed and repaired. If the resistance is within range from the case connector but does not check correctly at the TCM, wires 40 and 41 at the TCM to the transmission will need to be individually inspected and repaired. If code 40 persists after all previous checks and necessary repairs have been made, continue on to step 3.

Step 3. Replace the EPROM:

It is now time to replace the EPROM inside the TCM. These new EPROM's are very inexpensive and ***they have been re-calibrated.*** The EPROM inside the TCM is year, make and model sensitive. Refer the chart in Figure 5 for the proper EPROM Replacement Part Number.

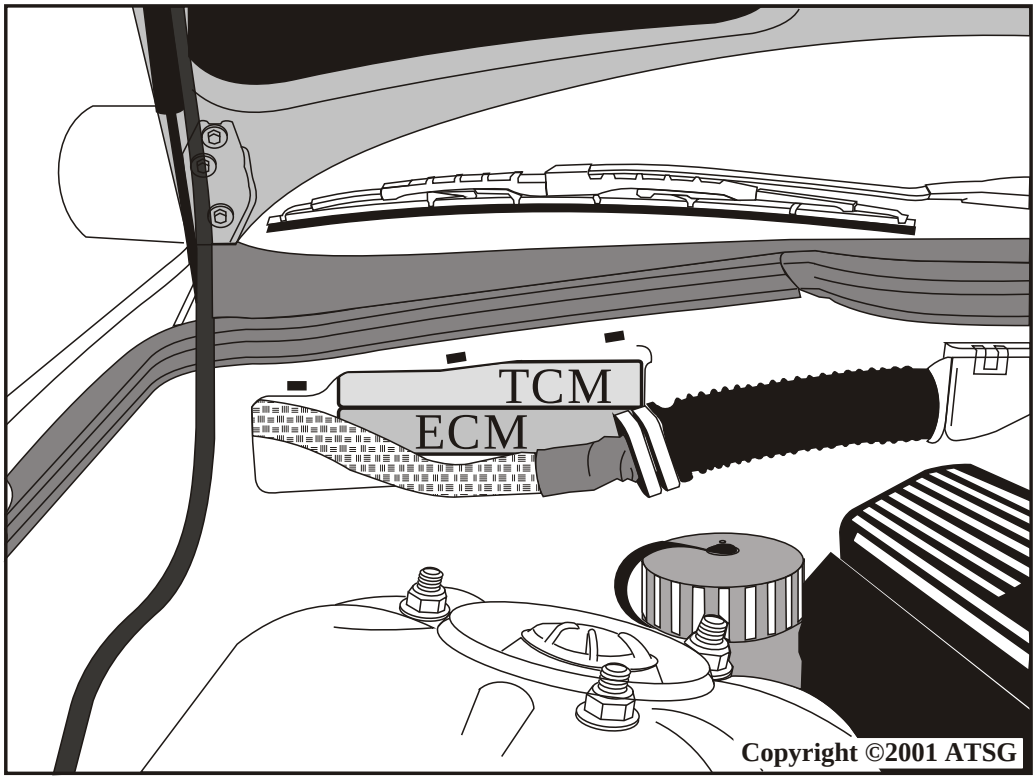


Figure 1

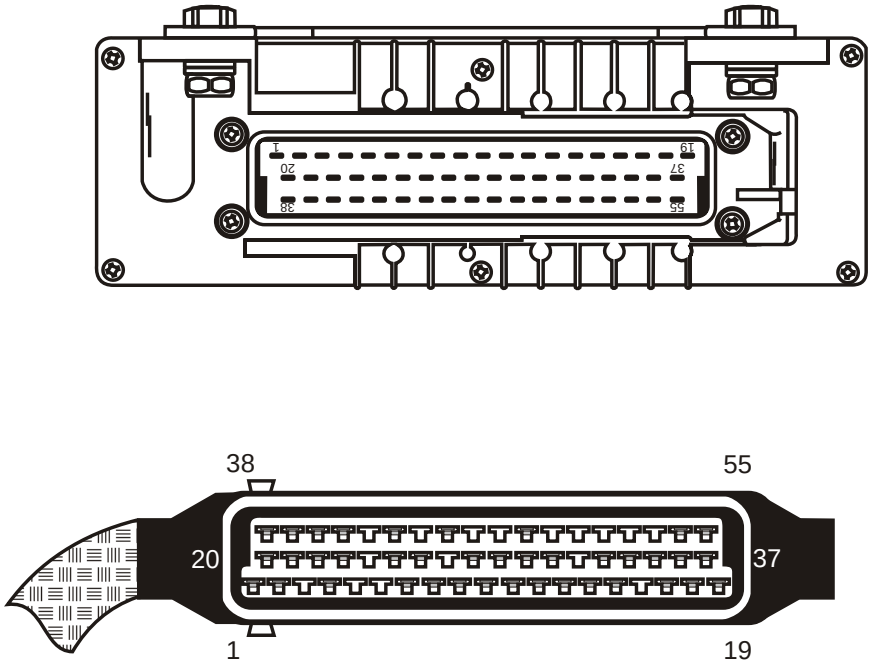


Figure 2

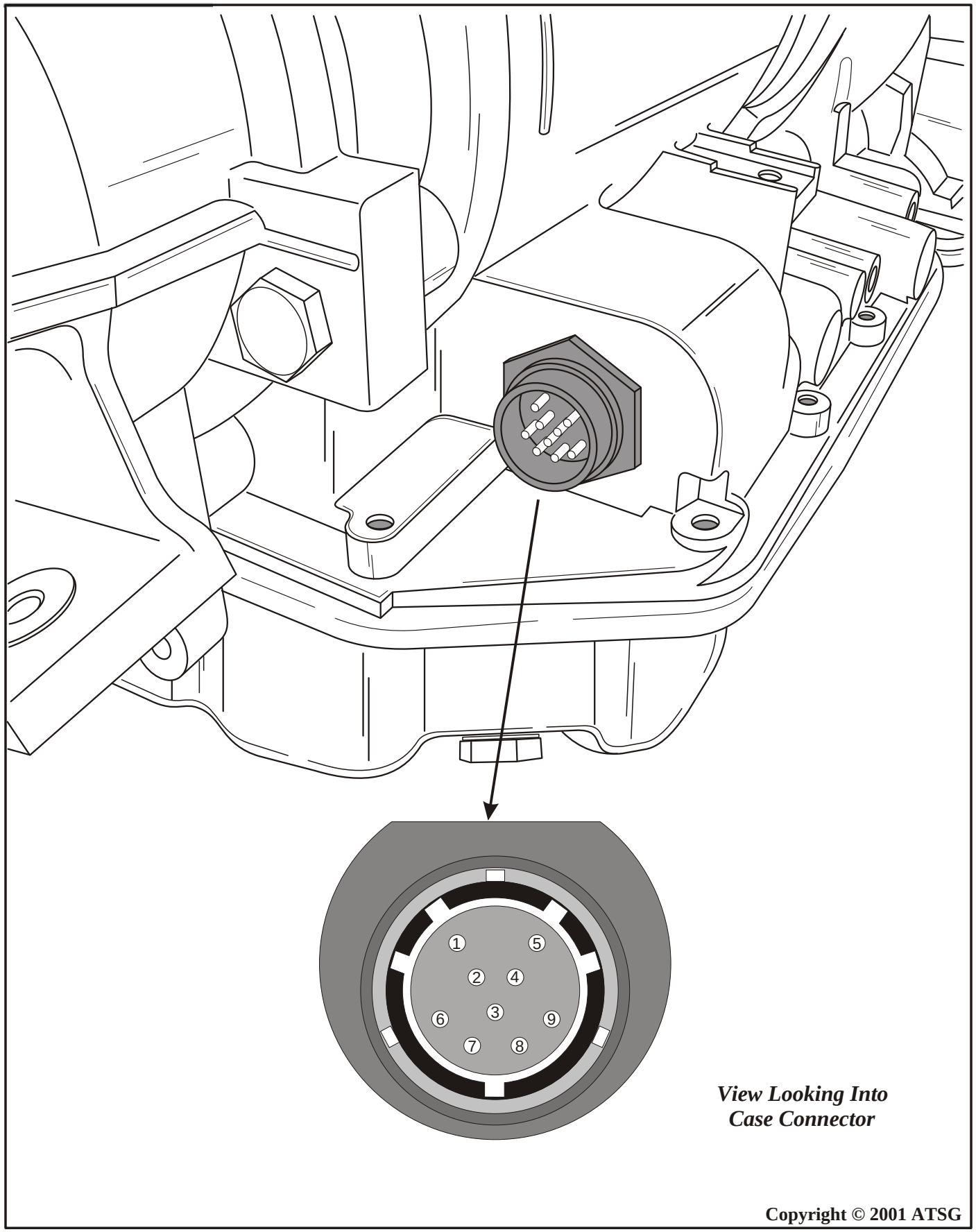
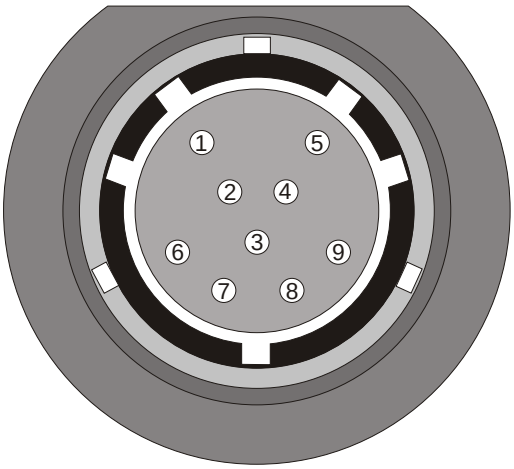
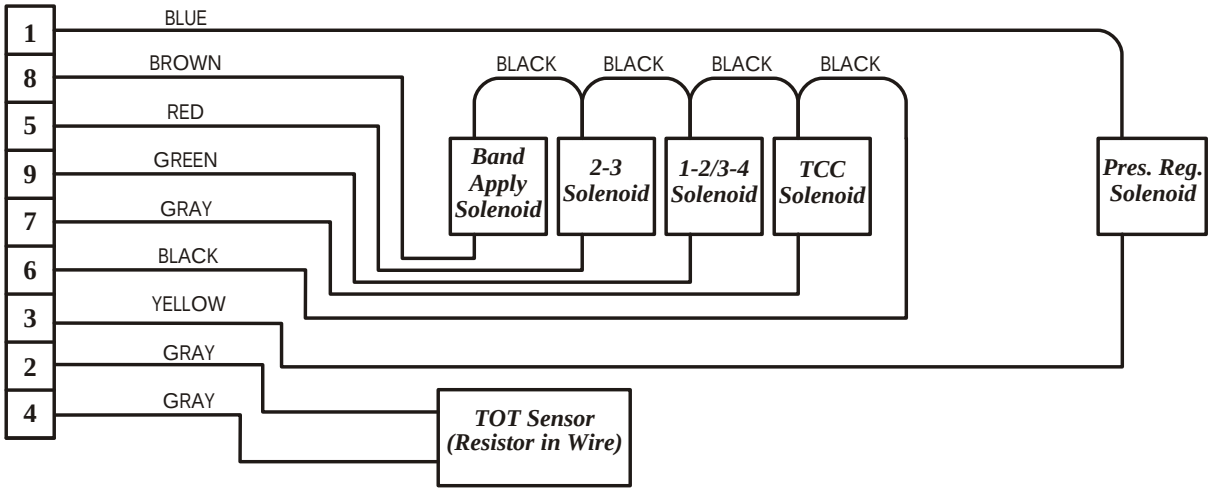


Figure 3

SLIDE
INTERNAL WIRE SCHEMATIC



View Looking Into Case Connector



NOTE: Some internal wire colors may vary.

Solenoid	*Case Connector Pin Numbers* (− +)	*Resistance In Ohms*
Band Apply	*6 and 8*	*9.5 - 10.5*
2-3 Sol.	*6 and 5*	*17.5 - 18.5*
1-2/3-4 Sol.	*6 and 9*	*17.5 - 18.5*
TCC	*6 and 7*	*17.5 - 18.5*
Press. Sol.	*1 and 3*	*3.7 - 4.7*
TOT	*2 and 4*	*20K @ 70ºF*

Figure 4

SERVICE INFORMATION:

Model	*Production Range*	*EPPROM Part Number*
318i (E36)	**9/92 - 4/93**	**01 00 1 469 120**
	5/93 - 12/93	**01 00 1 469 121**
	1/94 - 12/95	**01 00 1 469 811**
325i (E36)	**9/91 - 9/92**	**01 00 1 469 123**
	10/92 - 9/93	**01 00 1 469 124**
	10/93 - 12/95	**01 00 1 469 125**
525i (E34)	**9/91**	**01 00 1 469 126**
	10/91 - 9/92	**01 00 1 469 127**
	10/92 - 9/93	**01 00 1 469 128**
	10/93	**01 00 1 469 129**

Pressure Control Solenoid (All Models) 24 35 1 421 602

Figure 5

NISSAN QUEST
FORD VILLAGER

THIRD GEAR STARTS & HIGH LINE PRESSURE

COMPLAINT: After re-installation of the transmission, the transmission is stuck in third gear, line pressure is at a maximum level and the inhibitor switch circuits do not range correctly. Solenoid codes may also be present.

CAUSE: The F21/F22 ground attachment shown in figure 1 has not been tightened or has been left off. This is the main TCM ground at terminals 15 and 48 of the TCM.
The F21/F22 ground is located in the area of the 2-4 band servo cover and also retains the filler tube mounting bracket. When this ground is lost the above complaints will occur.

CORRECTION: Make certain the F21/F22 ground is attached, tight and clean ***BEFORE the ignition is turned on!***

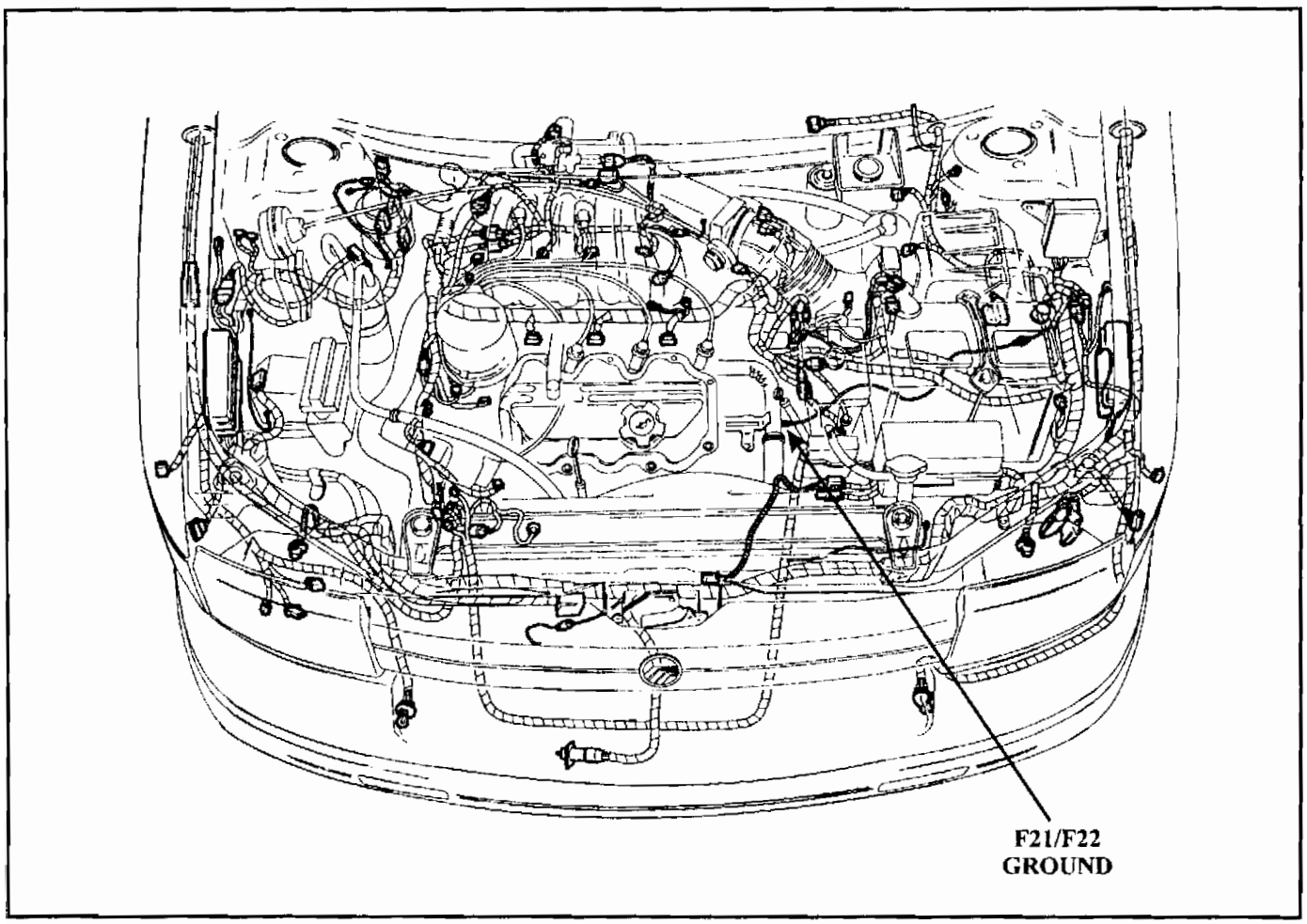


Figure 1

NISSAN

THROTTLE POSITION SENSOR AND IDLE/FULL THROTTLE SWITCH

CHANGE: The Throttle Position Sensor and Idle/Full Throttle Switch assembly has been redesigned at the start of production for the 1996 model year.

PARTS AFFECTED:

(1) The Throttle Position Sensor and Idle/Full Throttle Switch assembly.

(2) The vehicle harness connectors due to terminal reassignment.

INTERCHANGEABILITY:

The current design Throttle Position Sensor and Idle/Full Throttle Switch assembly will not interchange with the previous design.

SERVICE INFORMATION:

TPS part numbers will vary with engine and model application for both front wheel and rear wheel drive vehicles.

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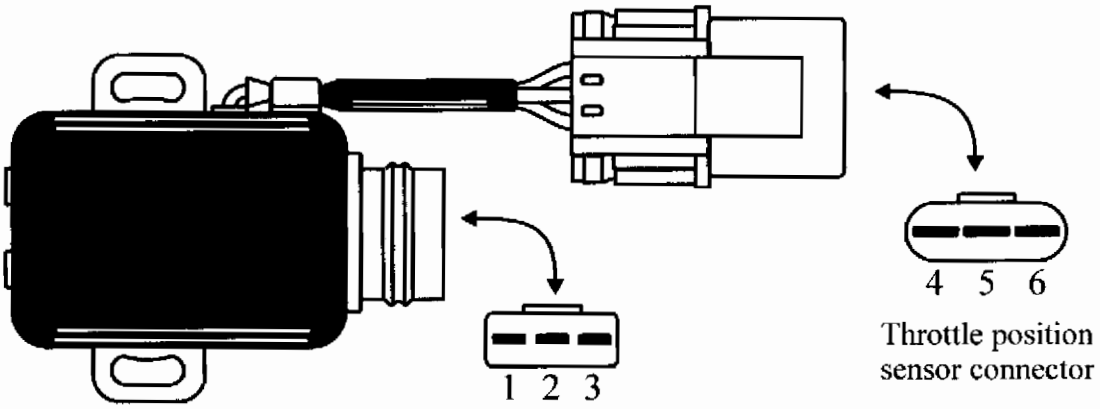
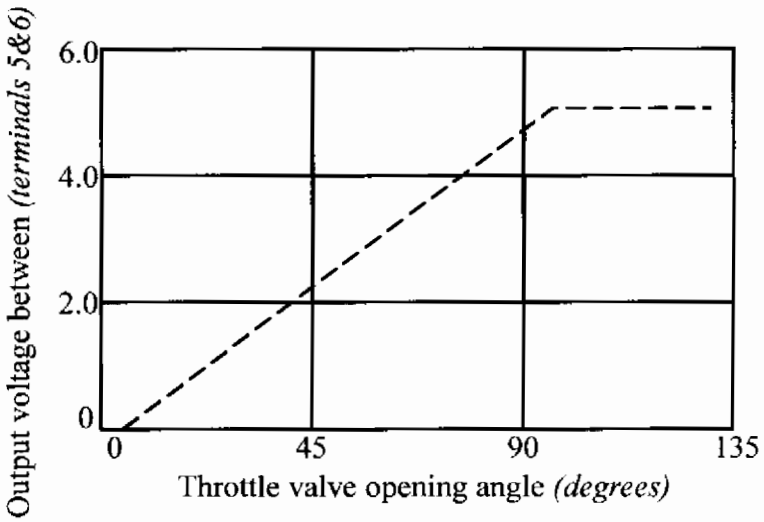
PREVIOUS DESIGN THROTTLE POSITION SENSOR AND IDLE/FULL THROTTLE SWITCH CHECK



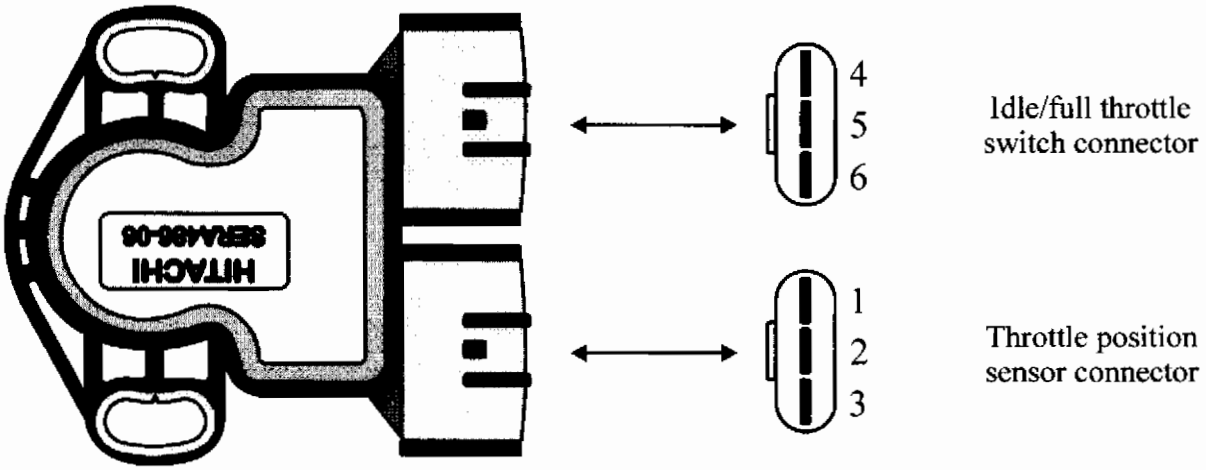
Terminal 1	Idle switch voltage 8-12 volts at idle 0 volts off idle
Terminal 2	Throttle switch reference voltage 8 volts
Terminal 3	Full throttle switch 8-12 volts at WOT 0 volts off WOT
Terminal 4	Throttle position sensor reference voltage 5 volts
Terminal 5	Throttle position sensor signal return voltage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



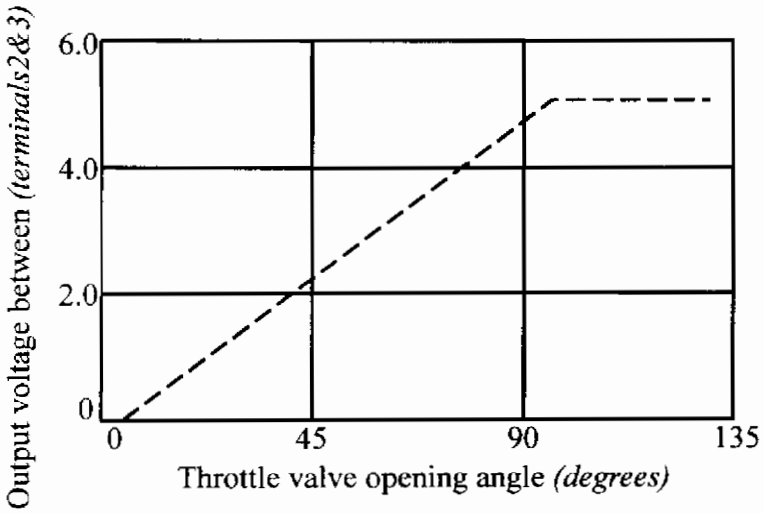
NOTE: Check the Throttle Position Sensor with the connectors connected back-probing the wire with the ignition "ON"

Figure 1

CURRENT DESIGN THROTTLE POSITION SENSOR AND IDLE/FULL THROTTLE SWITCH CHECK



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



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

Figure 2

SUBARU 4EAT
ALL - WHEEL DRIVE

O.E. TRANSFER CLUTCH KITS

COMPLAINT: After overhaul, the vehicle bucks, jerks and binds on turns especially at slower speeds. This is commonly known as ***"tight corner braking".***

CAUSE: Because of differences between friction and steel plates thicknesses, the transfer clutch pack clearance may be set to tight causing the condition known as "tight corner braking".
As a result of this, it is a common procedure to take the vehicle out into the parking lot and perform six or more figure eights to "break in" the transfer clutch pack thereby creating a more proper clearance for the transfer clutch pack and eliminating the above condition.

This "break in" procedure is even supported by **Subaru factory bulletin 16-62-97.**

CORRECTION: Subaru has made available original equipment transfer clutch assemblies through their dealer parts system.
These clutch assemblies are ***"broken in"*** at the time of manufacture and are designed to prevent "tight corner braking" after overhaul.
It is important to keep these clutch assemblies in the order in which they are packaged, then soaked in ATF and then installed as illustrated in figure 1.

NOTE: All 1999 and later models with all-wheel drive 4EAT transmissions and spin-on oil filter are assembled with these updated transfer clutch assemblies.

SERVICE INFORMATION:
The transfer clutch assemblies are ordered according to the thickness of the original transfer clutch pressure plate as shown in the chart in figure 2 as per factory ***TSB 16-64-99.***

SUBARU 4EAT
ALL - WHEEL DRIVE

O.E. TRANSFER CLUTCH KITS

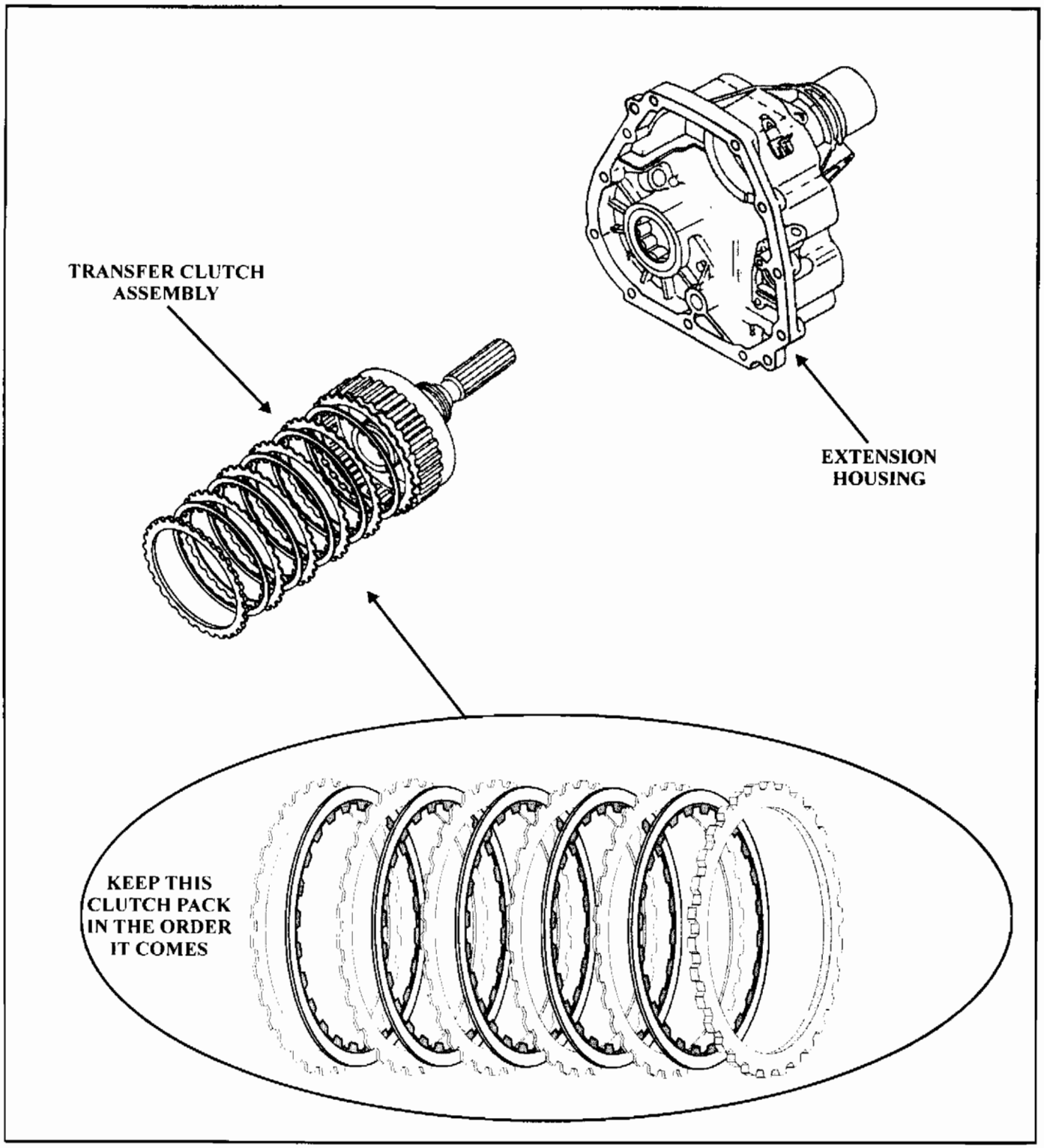


Figure 1

SUBARU 4EAT
ALL - WHEEL DRIVE

O.E. TRANSFER CLUTCH KITS

2.2 & 2.5 NON-TURBO LEGACY, IMPREZZA & FORESTER	
IF ORIGINAL TRANSFER CLUTCH PRESSURE PLATE MEASURES	**ORDER PART #**
3.3MM	31523AA120
3.7MM	31523AA130
4.1MM	31523AA140
4.5MM	31523AA150

1.8 IMPREZA	
IF ORIGINAL TRANSFER CLUTCH PRESSURE PLATE MEASURES	**ORDER PART #**
3.3MM	31523AA080
3.7MM	31523AA090
4.1MM	31523AA100
4.5MM	31523AA110

2.2 TURBO LEGACY & SVX	
IF ORIGINAL TRANSFER CLUTCH PRESSURE PLATE MEASURES	**ORDER PART #**
3.3MM	31523AA160
3.7MM	31523AA170
4.1MM	31523AA180
4.5MM	31523AA190

Figure 2

BLANK

LEXUS 341E

HARSH TCC RELEASE

COMPLAINT: The complaint is often explained as a harsh downshift when in reality, it is a harsh release of the converter clutch.

CAUSE: The number three solenoid is the cause of the problem. This solenoid is responsible for lock-up control modulation pressure.
Inside the solenoid is a valve and a spring, at the tip of the solenoid is an adjustment screw which can adjust TCC feel, the factory setting is 7 turns in.
The spring either breaks or becomes weak causing the valve to stroke to a position causing the above complaint. (Refer to figure 1)
If the spring is broken or weak the valve will rattle when you shake the solenoid.

CORRECTION: If the spring is broken, replace the number three solenoid, the location of the #3 solenoid can be seen in the illustration in figure 2. If the spring is weak, use the adjustment screw in the tip of the solenoid to remove the slack in the valve just enough so it doesn't rattle.

SERVICE INFORMATION:
Number Three Lock-Up Control Pressure Solenoid.....35280-50010

Many thanks to Leon Jacobs from Advance Transmissions, Mauldin, SC

LEXUS 341E

HARSH TCC RELEASE

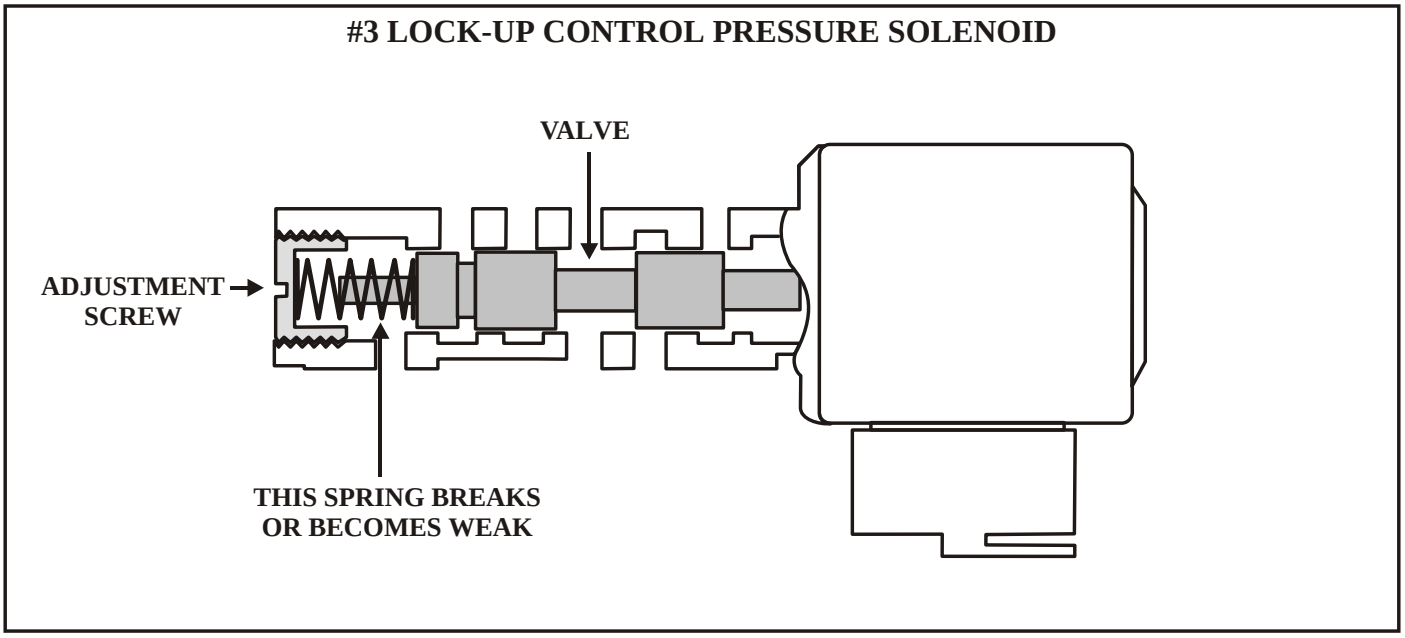


Figure 1

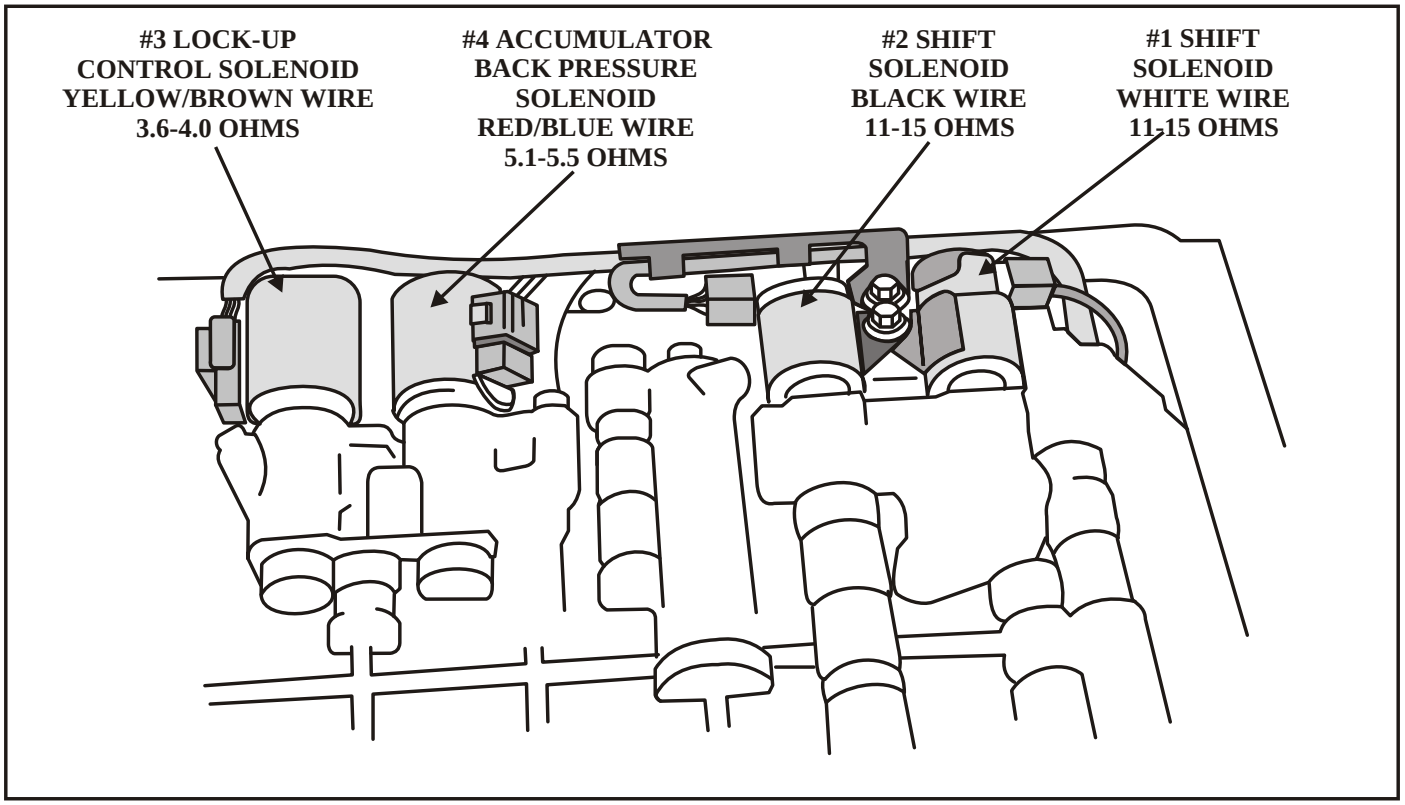


Figure 2

TOYOTA A540E
1993 AND LATER

NO REVERSE

COMPLAINT: After overhaul, the transmission does not move in reverse, all forward gears are good.

CAUSE: The upper valve body shown in figure 1 ***DOES NOT*** require a checkball because the valve body was not cast for a checkball.
During the overhaul process this checkball was omitted from the valve body that ***DOES*** require this checkball as shown in figure 2.

CORRECTION: After completing the diagnostic routine for a no reverse condition, and the diagnostics indicate the absence of this checkball is the cause of the complaint, it is recommended that a complete valve body assembly that contains this check ball is installed.
The reason for this recommendation is due to differences in the upper valve body as shown in figures 1 and 2, as well as a difference in the upper valve body spacer plate as seen in figure 3.
If the upper valve body ***DOES NOT*** require the checkball, the hole indicated in figure 3 will be 1.5MM (.0591") in diameter.
If the upper valve body ***DOES*** require the checkball, the hole indicated also in figure 3 will be 1.7MM (.0669") in diameter.

The main valve body spacer plate can also be used to help determine whether or not the checkball is required and all valve body components are compatible.
The valve body assembly that ***DOES NOT*** require this checkball will have an **"0C"** code stamped in the main spacer plate as shown in figure 4.
The valve body assembly that ***DOES*** require this checkball will have an **"1C"** code stamped in the main spacer plate also shown in figure 4.

Install the checkball in the upper valve body in the location shown in figure 2.

NOTE: This checkball may also be found in the ***A540H ALL-TRAC*** all wheel drive transmission.

SERVICE INFORMATION:

Valve Body Assembly Without Checkball.....35410-33031
Valve Body Assembly With Checkball.....35410-33032
Spacer Plate Kit Without Checkball.....35406-32010
Spacer Plate Kit With Checkball.....04032-32H01
Checkball.....35495-22020
THE UPPER VALVE BODY IS NOT SOLD SEPARATELY.....N/A

An excellent valve body calibration system is available for this transmission in both the Camry and Lexus models from TRANSLAB.....TL-540. Translab can be contacted by calling 626-969-8758.

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TOYOTA A540E
1993 AND LATER

NO REVERSE

UPPER VALVE BODY - DOES NOT REQUIRE CHECKBALL

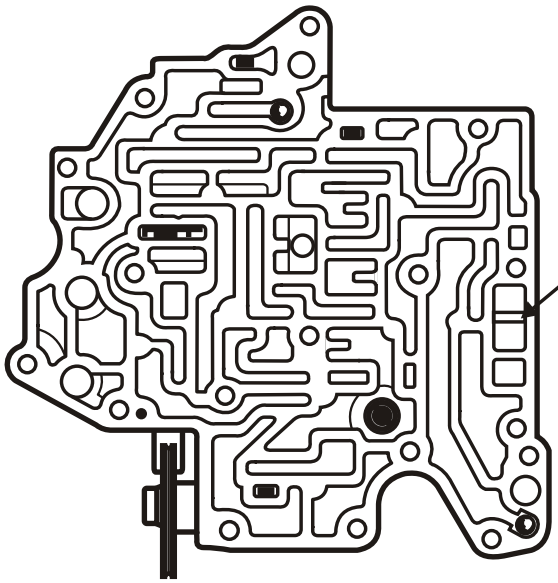


Figure 1

UPPER VALVE BODY - REQUIRES CHECKBALL

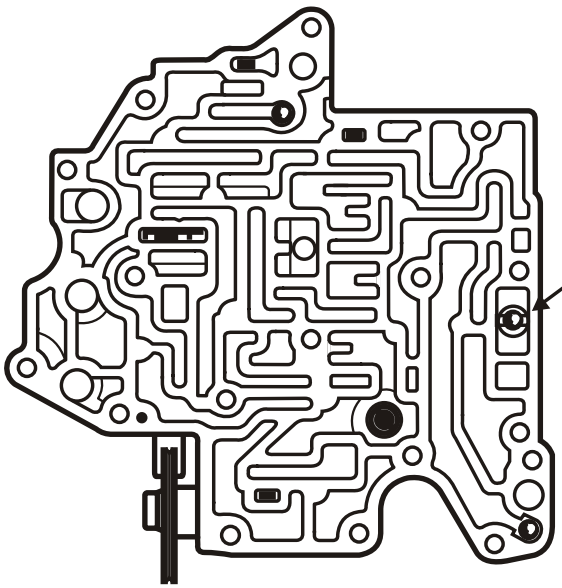


Figure 2

TOYOTA A540E
1993 AND LATER

NO REVERSE

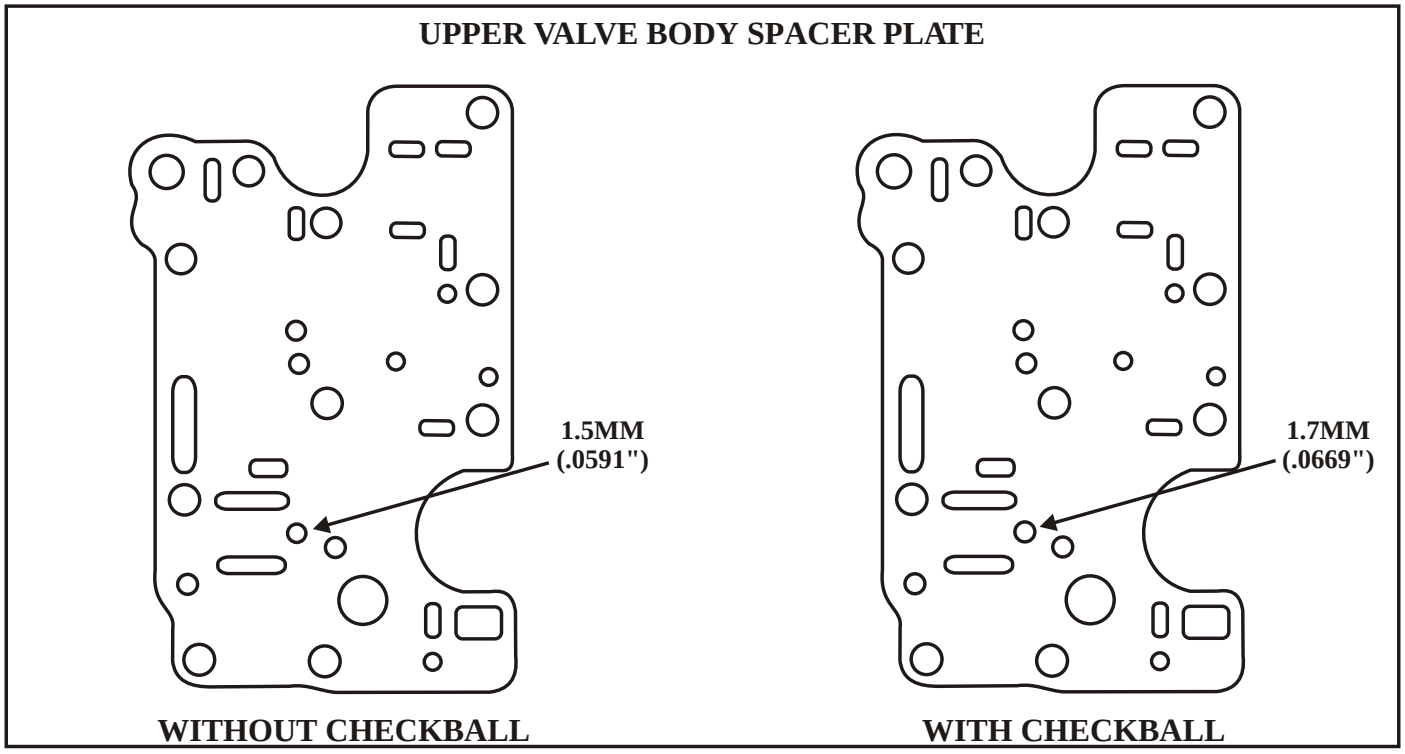


Figure 3

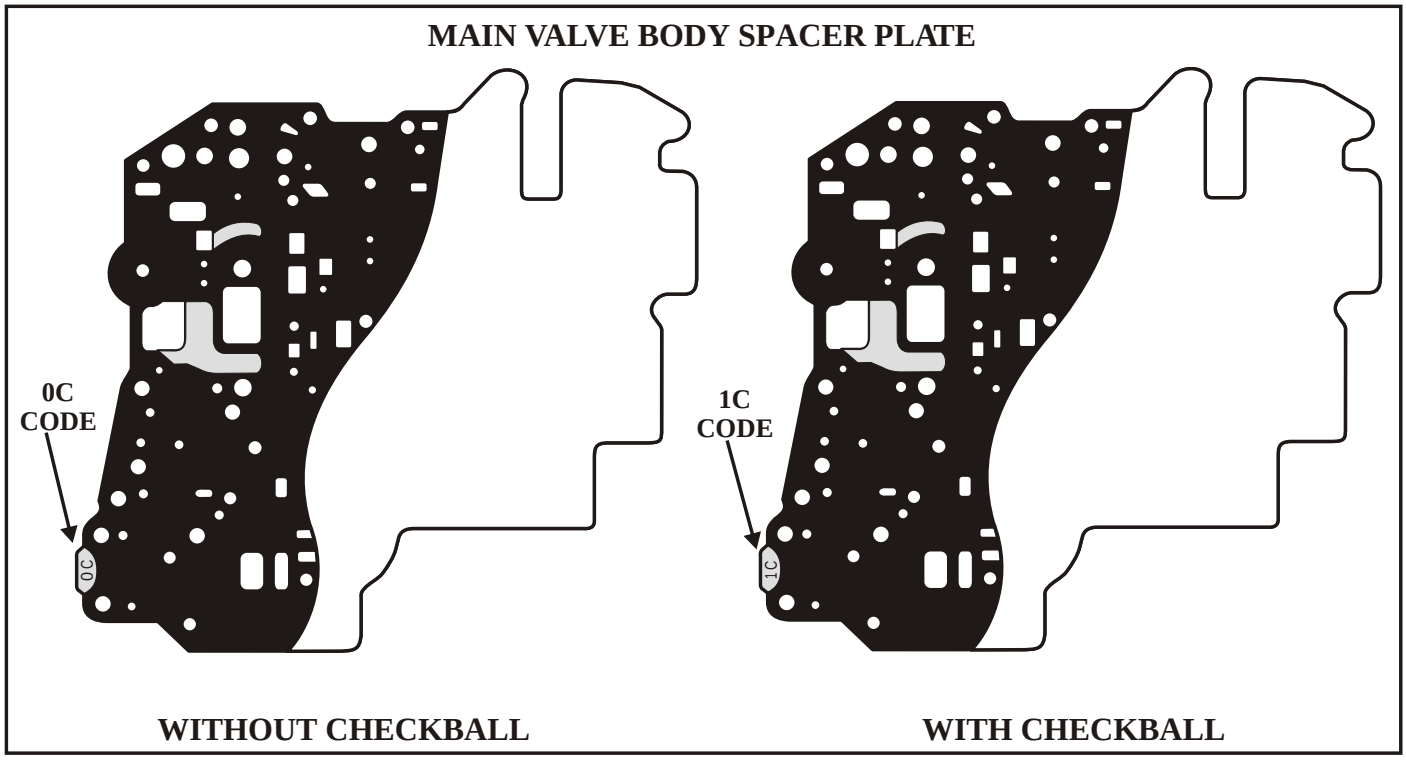


Figure 4

HONDA ACCORD
1998 & LATER WITH BAXA/MAXA TRANSMISSION

DELAY IN REVERSE AND 1-2 BIND-UP
HARSH DRIVE ENGAGEMENT

COMPLAINT: The transmission has been overhauled, and after the transmission is installed back into the vehicle, the transmission delays in reverse and binds up on the 1-2 shift. A harsh engagement into drive will also occur.

CAUSE: During the installation of the transmission the connectors for shift solenoids "B" and "C" were switched with the connectors for A/T Clutch Pressure Control solenoids "A" and "B".
These connectors are identical in configuration (Refer to Figures 2 & 3) which permits the cross connection of these solenoid connectors causing the above complaints.

CORRECTION: When reconnecting these solenoid connectors, use the chart in figure 1 to insure the correct solenoid connections have been made.

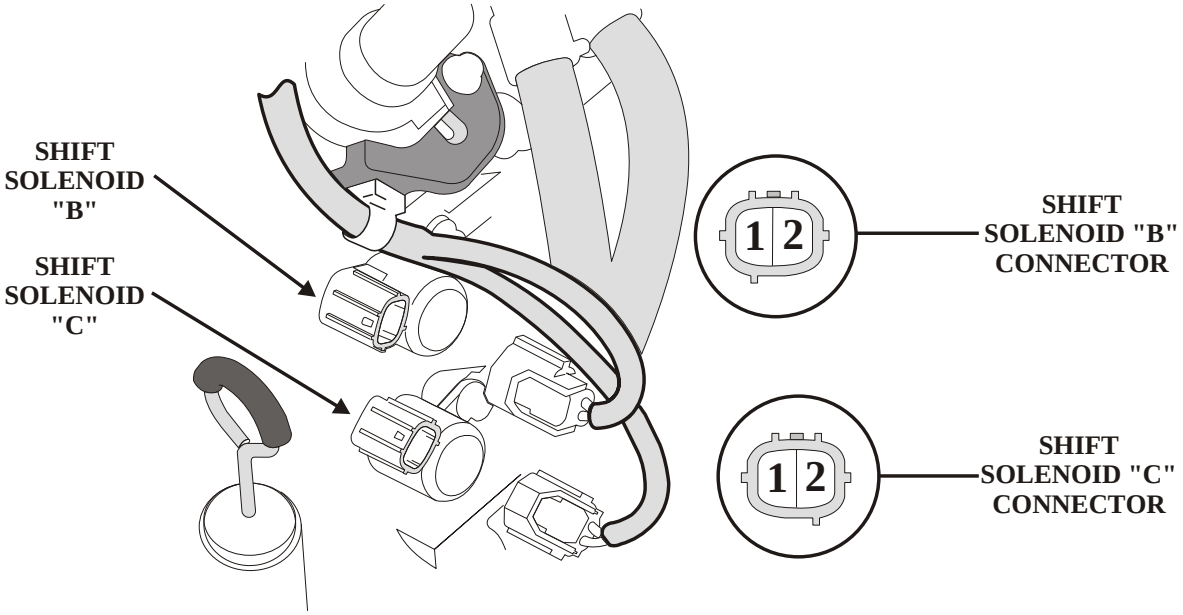
NOTE: There are other Honda/Acura transaxles that are very similar to the BAXA/MAXA, causing the same possibility of cross connecting Shift Solenoid "A" and "B" connectors with A/T Clutch Pressure Control Solenoid connectors, these are listed below:

B7XA.....1998-01 Honda Accord V6
M6HA.....1997-01 Honda Prelude
MDWA.....1997-98 Honda Odyssey/Isuzu Oasis
B7TA/B7YA.....1999-01 Honda Odyssey
M7ZA.....1996-99 Acura 3.0CL
B6VA.....1998-99 Acura 2.3CL
M7WA.....1999-01 Acura 3.2TL

HONDA ACCORD L4 WITH BAXA/MAXA - SOLENOID CONNECTOR WIRE COLORS	
SOLENOID	**CONNECTOR WIRE COLORS**
A/T CLUTCH PRESSURE CONTROL SOLENOID "A"	WHITE AND RED
A/T CLUTCH PRESSURE CONTROL SOLENOID "B"	GREEN AND ORANGE
SHIFT SOLENOID "B"	GREEN/WHITE AND BLACK
SHIFT SOLENOID "C"	GREEN AND BLACK

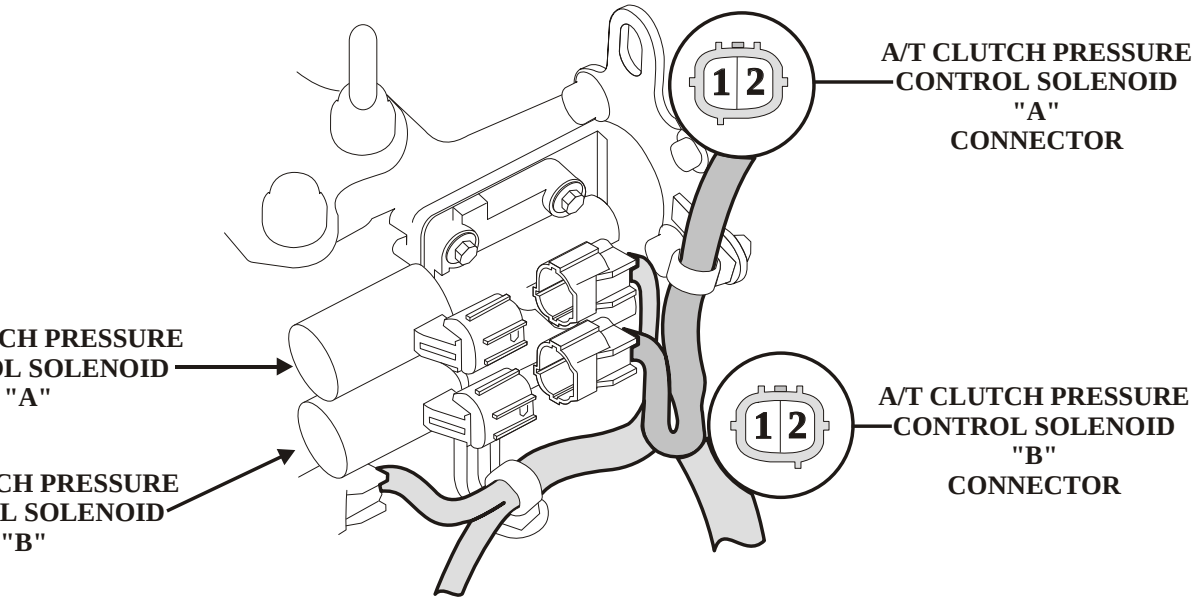
Figure 1

HONDA ACCORD
1998 & LATER WITH BAXA/MAXA TRANSMISSION
DELAY IN REVERSE AND 1-2 BIND-UP
HARSH DRIVE ENGAGEMENT



SHIFT SOLENOIDS "B" & "C" CONNECTORS HAVE SAME CONFIGURATION AS A/T CLUTCH PRESSURE CONTROL SOLENOIDS "A" & "B"

Figure 2



A/T CLUTCH PRESSURE CONTROL SOLENOIDS "A" & "B" CONNECTORS HAVE SAME CONFIGURATION AS SHIFT SOLENOIDS "B" & "C"

Figure 3

VOLKSWAGEN "01M"
PRELIMINARY INFORMATION

The "01M" designated transaxle, shown in Figure 1, first appeared in the 1995 model year and was used in a wide variety of the Volkswagen car lines along with various engine combinations, including the 2.8L V6 engine, as shown in the chart below.

The "01M" transaxle is a 4 speed unit, with 4th gear being overdrive, and is equipped with a clutch in the torque converter. Refer to the chart in Figure 1 for the internal components that are applied in each of the four forward gear ranges. Notice that it has only one freewheel device for 1st gear.

"01M" MODEL USAGE CHART		
Vehicle	***Years***	***Engine Size***
Cabrio	***1995-2001***	***2.0L (L4)***
Beetle	***1998-2001***	***1.8L (L4), 2.0L (L4), 1.9L Diesel***
Golf	***1995-2001***	***1.8L (L4), 2.0L (L4), 1.9L Diesel***
GTI	***1999-2001***	***1.8L (L4), 2.8L (V6)***
Jetta	***1995-2001***	***1.8L (L4), 2.0L (L4), 1.9L Diesel, 2.8L (V6)***
Passat	***1995-1997***	***2.0L (L4), 2.8L (V6)***

The "01M" transaxle is totally electronic controlled and uses a Electronic Control Unit (ECU) to control shift points, apply and release of the torque converter clutch, and line pressure control. This is done using seven solenoids located on the valve body. The solenoid pattern for each gear and the description of operation is provided for you in Figure 2. Electrical signals from various sensors provide information to the ECU about vehicle speed, throttle position, engine coolant temperature, transaxle fluid temperature, gear range selected, converter turbine speed, engine load and engine speed. The ECU uses this information to determine the precise moment to upshift or downshift, apply or release the TCC and what fluid pressures are needed to apply the components.

If for any reason the entire electronic control system of the transaxle becomes disabled, or the ECU detects a problem with one of the various sensors that stores a trouble code, all of the solenoids will be de-energized (Turned OFF). This "Safety Mode" operating state of the solenoids forces the transaxle to operate in 3rd gear when the selector lever is in the "Drive" range. We have provided you with an internal wire schematic and case connector pin identification in Figure 3, and a chart in Figure 4 to check the resistance of the solenoids and fluid temperature sensor. Refer to Figure 5 to check solenoid mechanical operation on the bench.

Figures 6, 7 and 8 will provide you with exploded views of the valve body and all valve body components along with the names of each valve. The names of the valves are ATSG interpretations of the valves functions, not Volkswagens. Figure 9 will provide you with the valve body spring specifications that we observed in the valve body that was used for the illustrations, and may be different in the various models. Refer to Figures 10 and 11 for the checkball locations in this unit and Figure 12 for air checks.

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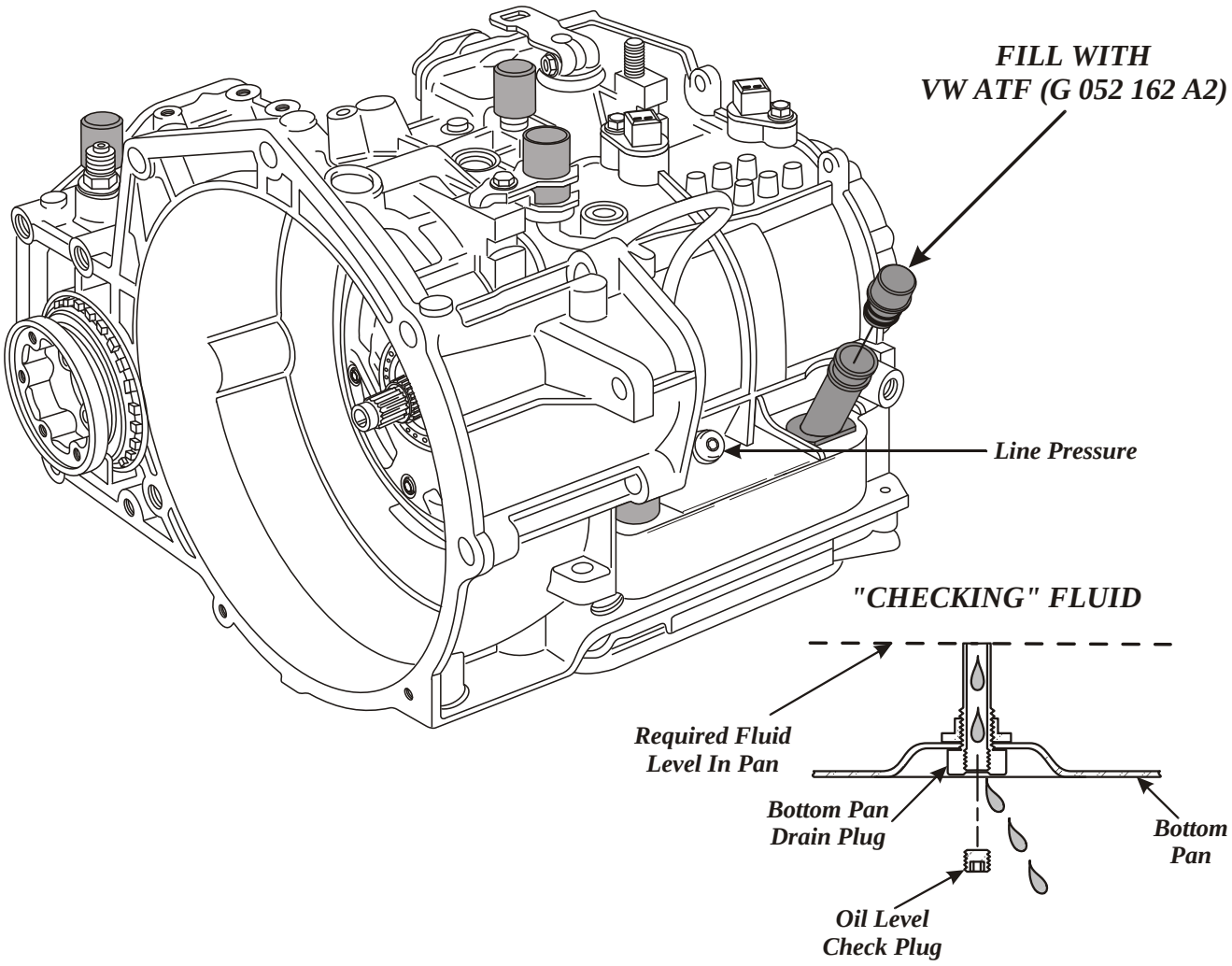
VOLKSWAGEN "01M"



COMPONENT APPLICATION CHART							
RANGE	"K-1" CLUT	"K-2" CLUT	"K-3" CLUT	"B-1" BRAK	"B-2" BRAK	LOW SPRG	CONV CLUT
Park					*ON*		
Reverse		*ON*		*ON*			
Neutral							
Dr-1st	*ON*					*HOLD*	**
Dr-2nd	*ON*				*ON*		**
Dr-3rd	*ON*		*ON*				**
Dr-4th			*ON*		*ON*		**
Man-1st	*ON*			*ON*			
** *Converter Clutch may be on depending on throttle position and vehicle speed.*							

Figure 1

VOLKSWAGON "01M" SOLENOID APPLY CHART							
RANGE SELECTED	EV-1 (N88)	EV-2 (N89)	EV-3 (N90)	EV-4 (N91)	EV-5 (N92)	EV-6 (N93)	EV-7 (N94)
PARK/NEUTRAL	ON		ON			ON***	
REVERSE			ON		ON**	ON***	
DRIVE - 1ST			ON	ON*	ON**	ON***	
DRIVE - 2ND		ON	ON	ON*	ON**	ON***	
DRIVE - 3RD				ON*	ON**	ON***	ON
DRIVE - 4TH	ON	ON		ON*	ON**	ON***	ON

DESCRIPTION OF SOLENOID OPERATION

EV-1 (N88) *This solenoid feeds the K-1 clutch when it is de-energized (Off), and feeds the B-1 brake when it is energized (On), in Park, Neutral and 4th.*

EV-2 (N89) *This solenoid is energized in 2nd and 4th to apply the B-2 brake.*

EV-3 (N90) *This solenoid controls the K-3 clutch*

**EV-4 (N91)* *This PWM solenoid applies the converter clutch when it is energized (On) and is dependent on engine temp, vehicle speed and throttle position.*

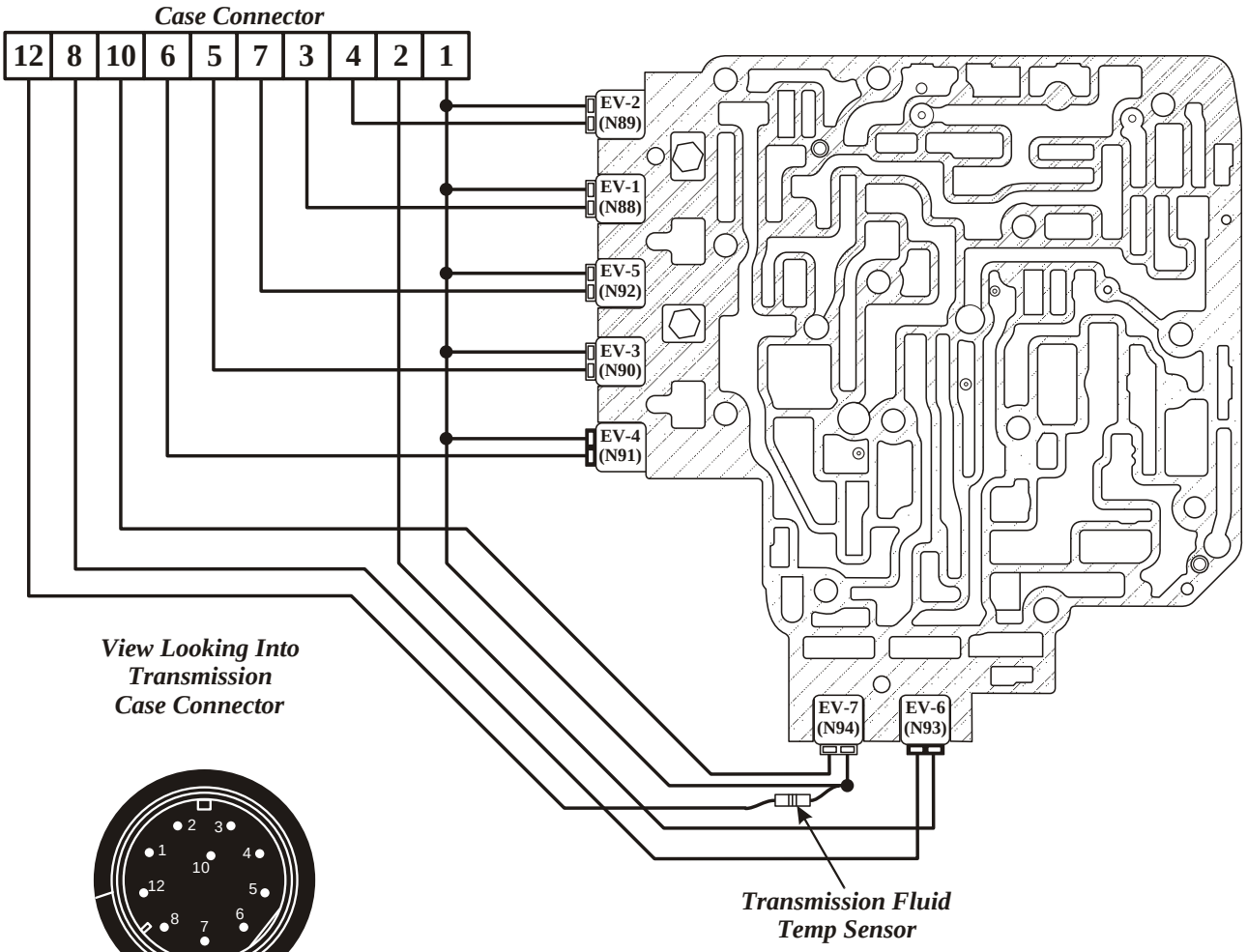
***EV-5 (N92)* *This solenoid is energized (On) during every shift, to drop line pressure, and orifices the apply oil to each clutch pack during the shift to provide smoother shifts. After the shift is completed, the solenoid is de-energized (Off).*

****EV-6 (N93)* *This PWM solenoid controls main line pressure anytime the engine is running. This is a Pulse Width Modulated signal that varies with engine load and throttle position. When the solenoid is de-energized (Off) pressure goes to maximum.*

EV-7 (N94) *This solenoid controls the apply oil to the B-2 brake, to provide smoother shifts into 4th gear. It will also be energized (On) momentarily during the 2-3 shift.*

Figure 2

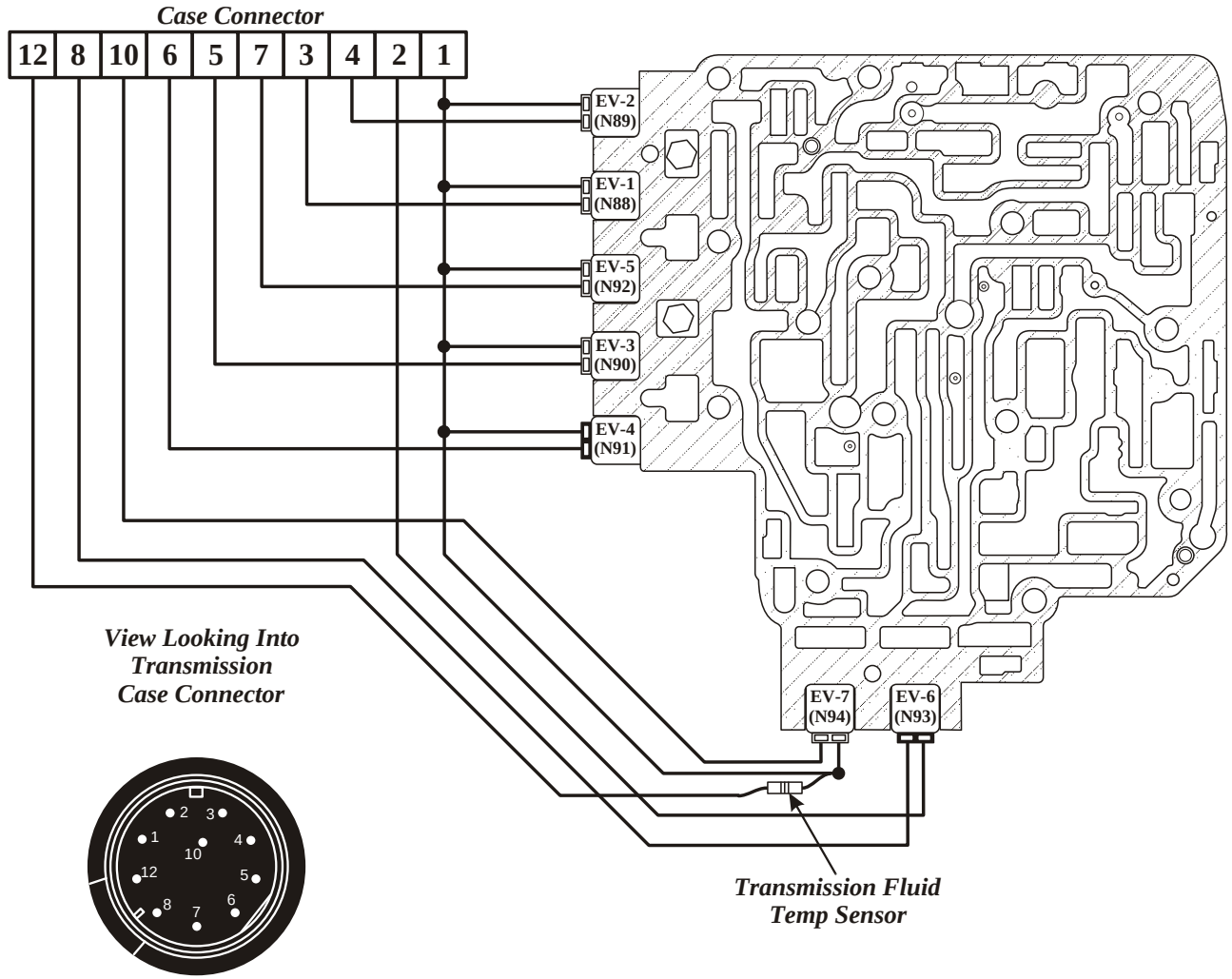
CASE CONNECTOR PIN FUNCTIONS



Pin No.	*Pin Function*
1	*Voltage supply to Solenoids EV-1, 2, 3, 4, 5, 7 and ATF Sensor.*
2	*Voltage supply to Solenoid EV-6.*
3	*Ground signal to Solenoid EV-1.*
4	*Ground signal to Solenoid EV-2.*
5	*Ground signal to Solenoid EV-3.*
6	*Ground signal to Solenoid EV-4.*
7	*Ground signal to Solenoid EV-5.*
8	*Ground signal to Solenoid EV-6.*
10	*Ground signal to Solenoid EV-7.*
12	*Fluid Temp Sensor signal return (Resistor In Ribbon).*

Figure 3

INTERNAL COMPONENT RESISTANCE CHART

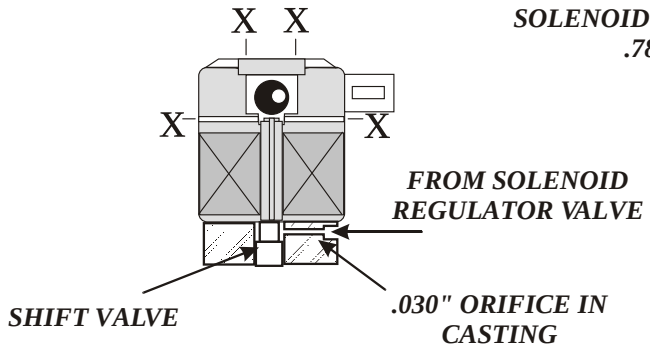


Component	*Pin No's.*	*Resistance @ 20°C (72°F)*
Solenoid EV-1 (N88)	*1 And 3*	*55-65 Ohms*
Solenoid EV-2 (N89)	*1 And 4*	*55-65 Ohms*
Solenoid EV-3 (N90)	*1 And 5*	*55-65 Ohms*
Solenoid EV-4 (N91)	*1 And 6*	*4.5-5.1 Ohms*
Solenoid EV-5 (N92)	*1 And 7*	*55-65 Ohms*
Solenoid EV-6 (N93)	*2 And 8*	*4.5-5.1 Ohms*
Solenoid EV-7 (N94)	*1 And 10*	*55-65 Ohms*
TFT Sensor	*1 And 12*	*190k-200k Ohms*

Figure 4

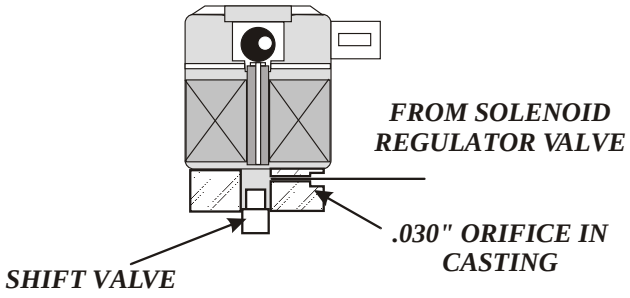
EV1 (N88), EV2 (N89), EV3 (N90), EV5 (N92) AND EV7 (N94) SOLENOID CHECK AND OPERATION

SOLENOID OFF



SOLENOID DIAMETER .785"

SOLENOID ON

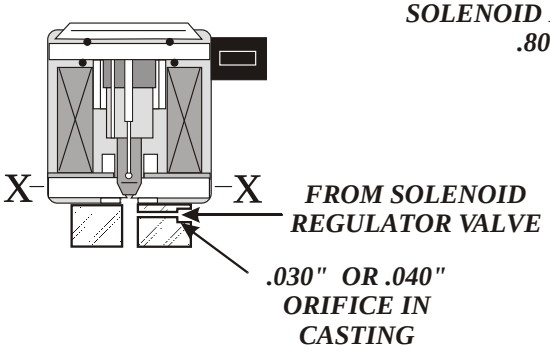


WHEN THE SOLENOID IS "OFF" ORIFICED SOLENOID REGULATOR OIL WILL EXHAUST OUT THE END OF THE SOLENOID

WHEN THE SOLENOID IS "ON" ORIFICED SOLENOID REGULATOR OIL WILL BUILD UP UNDER THE SOLENOID STROKING THE VALVE THAT THE SOLENOID CONTROLS

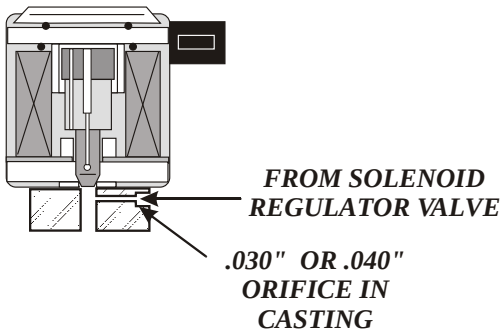
EV4 (N91) AND EV6 (N93) SOLENOID CHECK AND OPERATION

SOLENOID OFF



SOLENOID DIAMETER .800"

SOLENOID ON



WHEN THE SOLENOID IS "OFF" ORIFICED SOLENOID REGULATOR OIL WILL EXHAUST OUT THE SIDE OF THE SOLENOID

WHEN THE SOLENOID IS "ON" ORIFICED SOLENOID REGULATOR OIL WILL BUILD UP UNDER THE SOLENOID STROKING THE VALVE THAT THE SOLENOID CONTROLS

Figure 5

AUDI AND VOLKSWAGEN 01M VALVE BODY

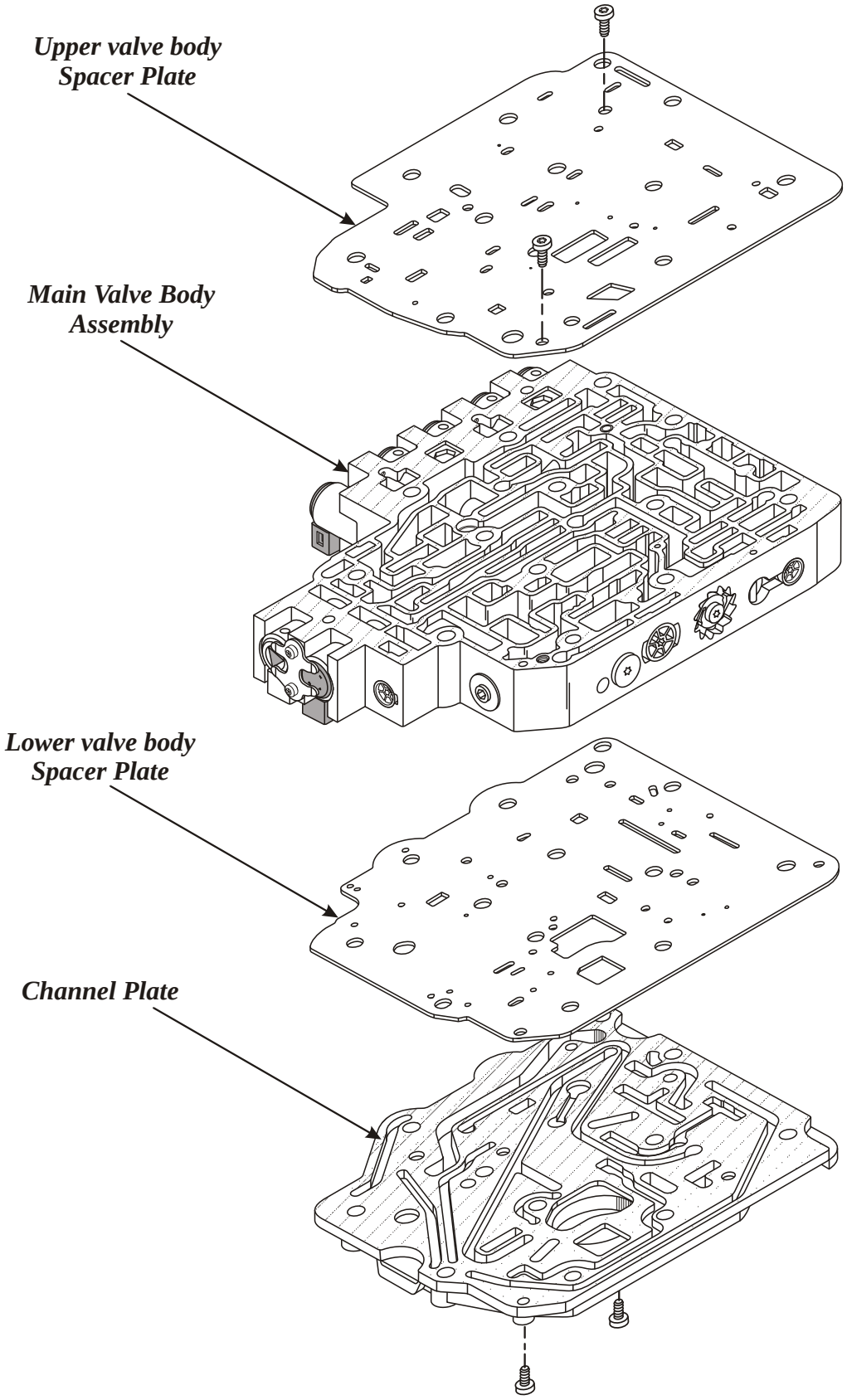


Figure 6

AUDI AND VOLKSWAGEN 01M VALVE BODY
EXPLODED VIEW

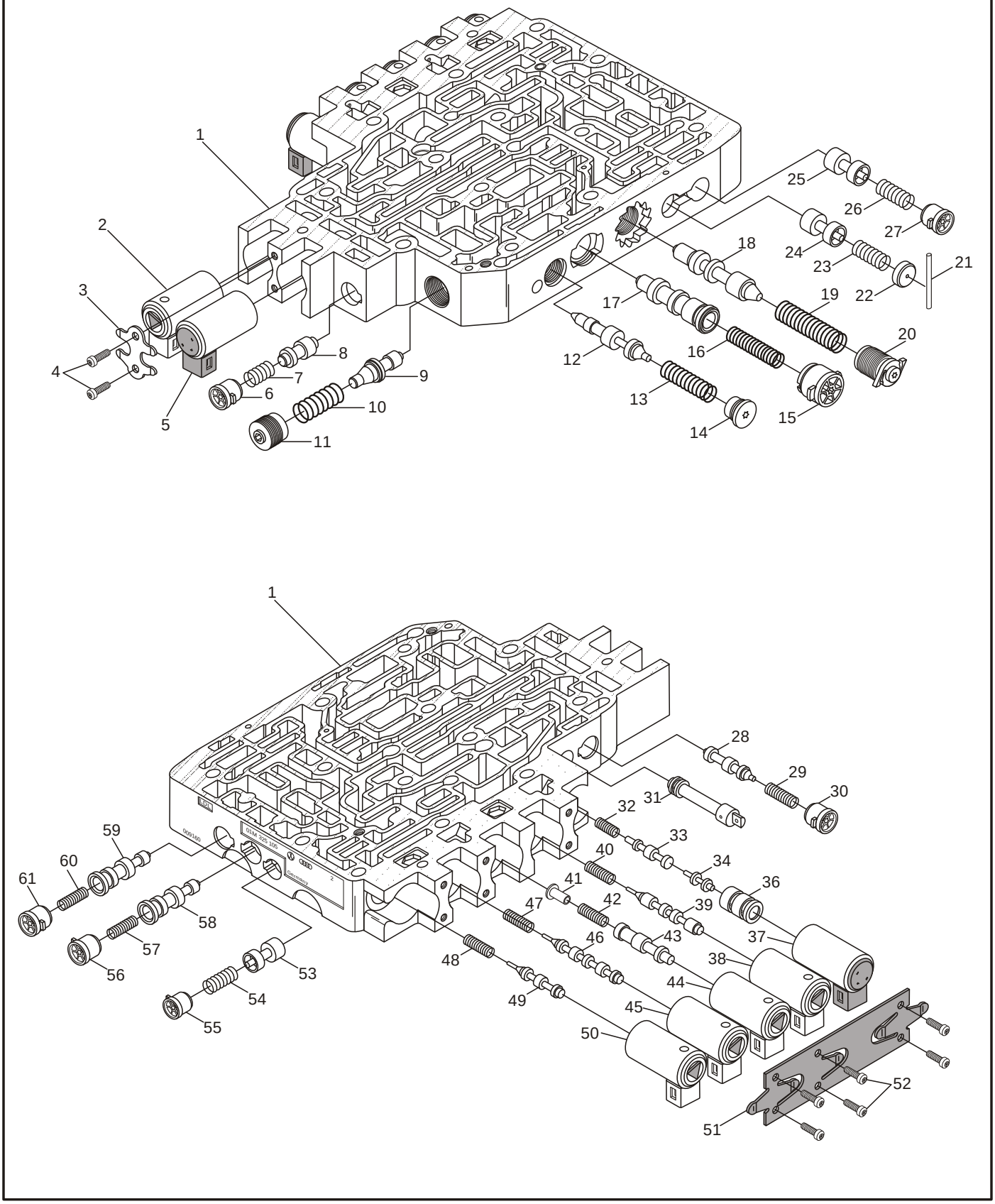


Figure 7

1. MAIN VALVE BODY CASTING
2. EV-7 SOLENOID (N94)
3. SOLENOID RETAINING BRACKET
4. SOLENOID RETAINING BRACKET BOLTS
5. EV-6 SOLENOID (N93)
6. MANUAL 1ST LOCKING VALVE RETAINER (YELLOW)
7. MANUAL 1ST LOCKING VALVE SPRING (SEE SPRING SPEC)
8. MANUAL 1ST LOCKING VALVE
9. SOLENOID REGUL ATOR VALVE
10. SOLENOID REGUL ATOR VALVE SPRING (SEE SPRING SPEC)
11. SOLENOID REGUL ATOR VALVE RETAINER
12. CONVERTER REGUL ATOR VALVE
13. CONVERTER REGUL ATOR VALVE SPRING (SEE SPRING SPEC)
14. CONVERTER REGUL ATOR VALVE RETAINER
15. MAIN PRESSURE REGUL ATOR VALVE RETAINER (BROWN)
16. MAIN PRESSURE REG. VALVE SPRING (SEE SPRING SPEC)
17. MAIN PRESSURE REG ULATOR VALVE
18. BOOST PRESSURE REGULATOR VALVE
19. BOOST PRESSURE REG. VALVE SPRING (SEE SPRING SPEC)
20. BOOST PRESSURE REGUL ATOR RETAINER (ADJUSTABLE)
21. K-3 REGULATOR VALVE RETAINING PIN
22. K-3 REGULATOR VALVE BORE PLUG
23. K-3 REGULATOR VALVE SPRING (SEE SPRING SPEC)
24. K-3 REGULATOR VALVE
25. K-1 REGULATOR VALVE
26. K-1 REGULATOR VALVE SPRING (SEE SPRING SPEC)
27. K-1 REGULATOR VALVE RETAINER (YELLOW)
28. MANUAL 1ST/K-3 LOCKOUT VALVE
29. MANUAL 1ST/K-3 LOCKOUT VALVE SPRING (SEE SPRING SPEC)
30. MANUAL 1ST/K-3 LOCKOUT RETAINER (YELLOW)
31. MANUAL VALVE
32. CONVERTER CLUTCH APPLY VALVE SPRING (SEE SPRING SPEC)
33. CONVERTER CLUTCH APPLY VALVE
34. CONVERTER CLUTCH CONTROL VALVE
36. CONVERTER CLUTCH CONTROL VALVE SLEEVE
37. EV-4 SOLENOID, CONVERTER CLUTCH (N91)
38. EV-3 SOLENOID (N90)
39. K-3 SHIFT VALVE
40. K-3 SHIFT VALVE SPRING (SEE SPRING SPEC)
41. B -1 APPLY VALVE SPRING SEAT
42. B -1 APPLY VALVE SPRING (SEE SPRING SPEC)
43. B -1 APPLY VALVE
44. EV-5 SOLENOID (N92)
45. EV-1 SOLENOID (N88)
46. K-1/B-1 SHIFT VALVE
47. K-1/B-1 SHIFT VALVE SPRING (SEE SPRING SPEC)
48. B -2 SHIFT VALVE SPRING (SEE SPRING SPEC)
49. B -2 SHIFT VALVE
50. EV-2 SOLENOID (N89)
51. SOLENOID RETAINING BRACKET
52. SOLENOID RETAINING BRACKET BOLTS (6)
53. B -2 REGULATOR VALVE
54. B -2 REGULATOR VALVE SPRING (SEE SPRING SPEC)
55. B -2 REGULATOR VALVE RETAINER (BLACK)
56. K-1 CONTROL VALVE RETAINER (BROWN)
57. K-1 CONTROL VALVE SPRING (SEE SPRING SPEC)
58. K-1 CONTROL VALVE
59. 2-3 TIMING VALVE
60. 2-3 TIMING VALVE SPRING (SEE SPRING SPEC)
61. 2-3 TIMING VALVE RETAINER (WHITE)

Figure 8

VOLKSWAGON "01M" SPRING SPECIFICATIONS

Main Valve Body

"Back Side"	*"Front Side"*
SPRING ILLUSTRATION NO. 7: FREE LENGTH = .728" SPRING DIAMETER = .352" WIRE DIAMETER = .029"	SPRING ILLUSTRATION NO. 29: FREE LENGTH = .987" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
SPRING ILLUSTRATION NO. 10: FREE LENGTH = 1.295" SPRING DIAMETER = .454" WIRE DIAMETER = .039"	SPRING ILLUSTRATION NO. 32: FREE LENGTH = .600" SPRING DIAMETER = .219" WIRE DIAMETER = .020"
SPRING ILLUSTRATION NO. 13: FREE LENGTH = 1.235" SPRING DIAMETER = .330" WIRE DIAMETER = .037"	SPRING ILLUSTRATION NO. 40: FREE LENGTH = .973" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
SPRING ILLUSTRATION NO. 16: FREE LENGTH = 1.385" SPRING DIAMETER = .410" WIRE DIAMETER = .035"	SPRING ILLUSTRATION NO. 42: FREE LENGTH = .973" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
SPRING ILLUSTRATION NO. 19: FREE LENGTH = 1.460" SPRING DIAMETER = .357" WIRE DIAMETER = .039"	SPRING ILLUSTRATION NO. 47: FREE LENGTH = .973" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
SPRING ILLUSTRATION NO. 23: FREE LENGTH = 1.090" SPRING DIAMETER = .352" WIRE DIAMETER = .029"	SPRING ILLUSTRATION NO. 48: FREE LENGTH = .973" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
SPRING ILLUSTRATION NO. 26: FREE LENGTH = 1.090" SPRING DIAMETER = .352" WIRE DIAMETER = .029"	SPRING ILLUSTRATION NO. 54: FREE LENGTH = 1.075" SPRING DIAMETER = .352" WIRE DIAMETER = .029"
	SPRING ILLUSTRATION NO. 57: FREE LENGTH = .968" SPRING DIAMETER = .280" WIRE DIAMETER = .027"
	SPRING ILLUSTRATION NO. 60: FREE LENGTH = .915" SPRING DIAMETER = .280" WIRE DIAMETER = .027"

Figure 9

CHANNEL PLATE
CHECKBALL LOCATIONS

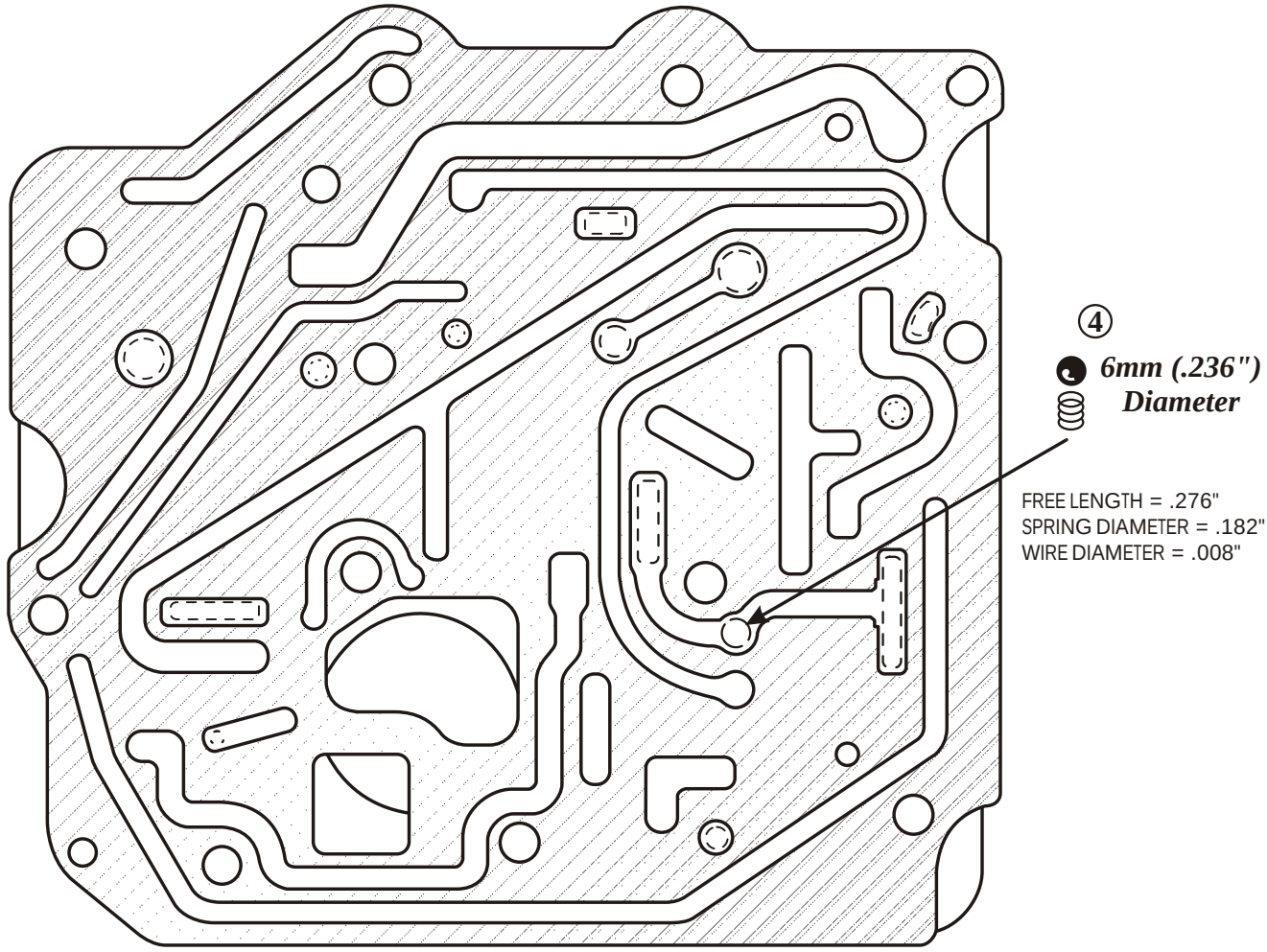


Figure 10

UPPER VALVE BODY
CHECKBALL LOCATIONS

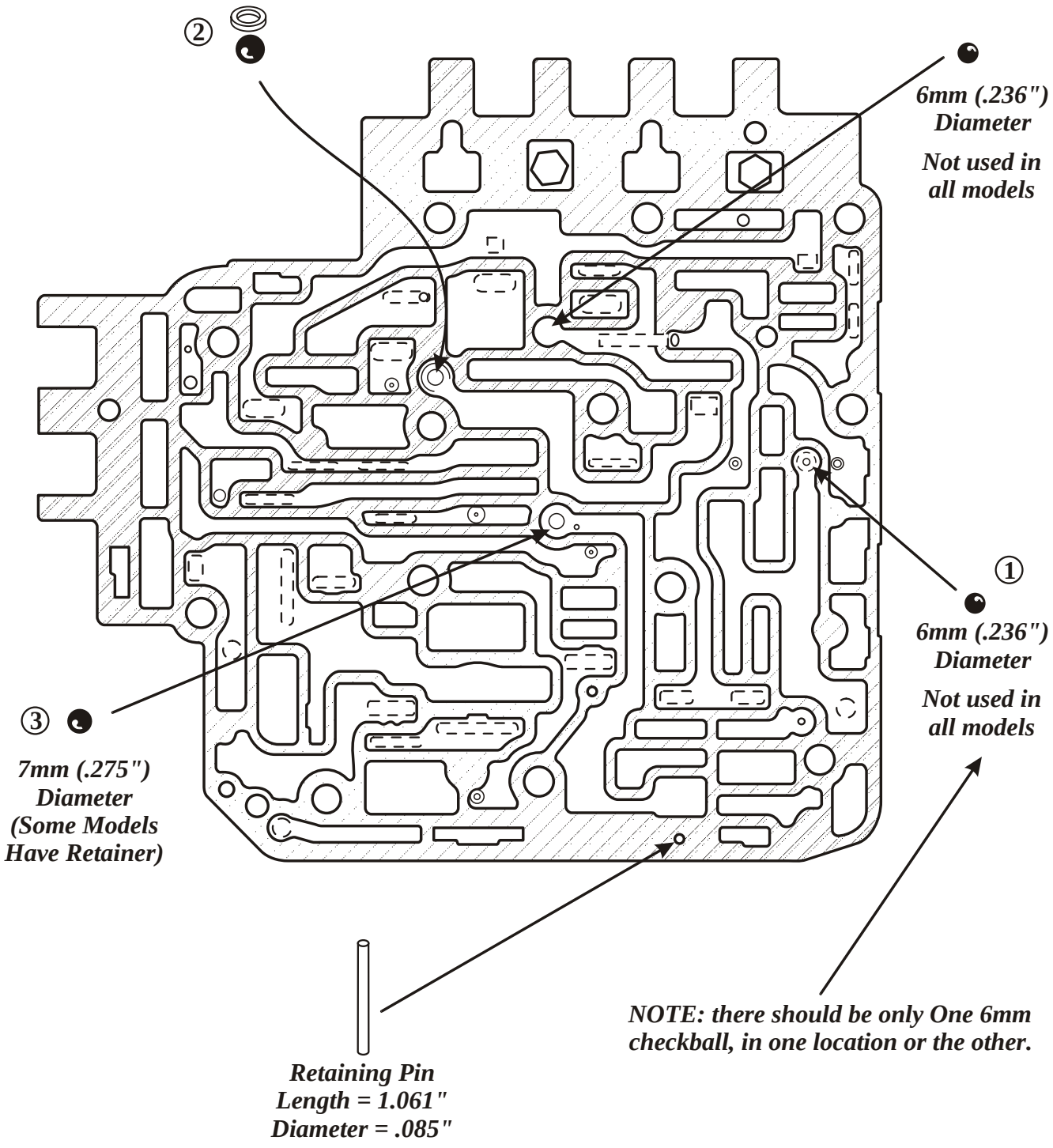


Figure 11

CASE PASSAGES
FOR AIRCHECKS

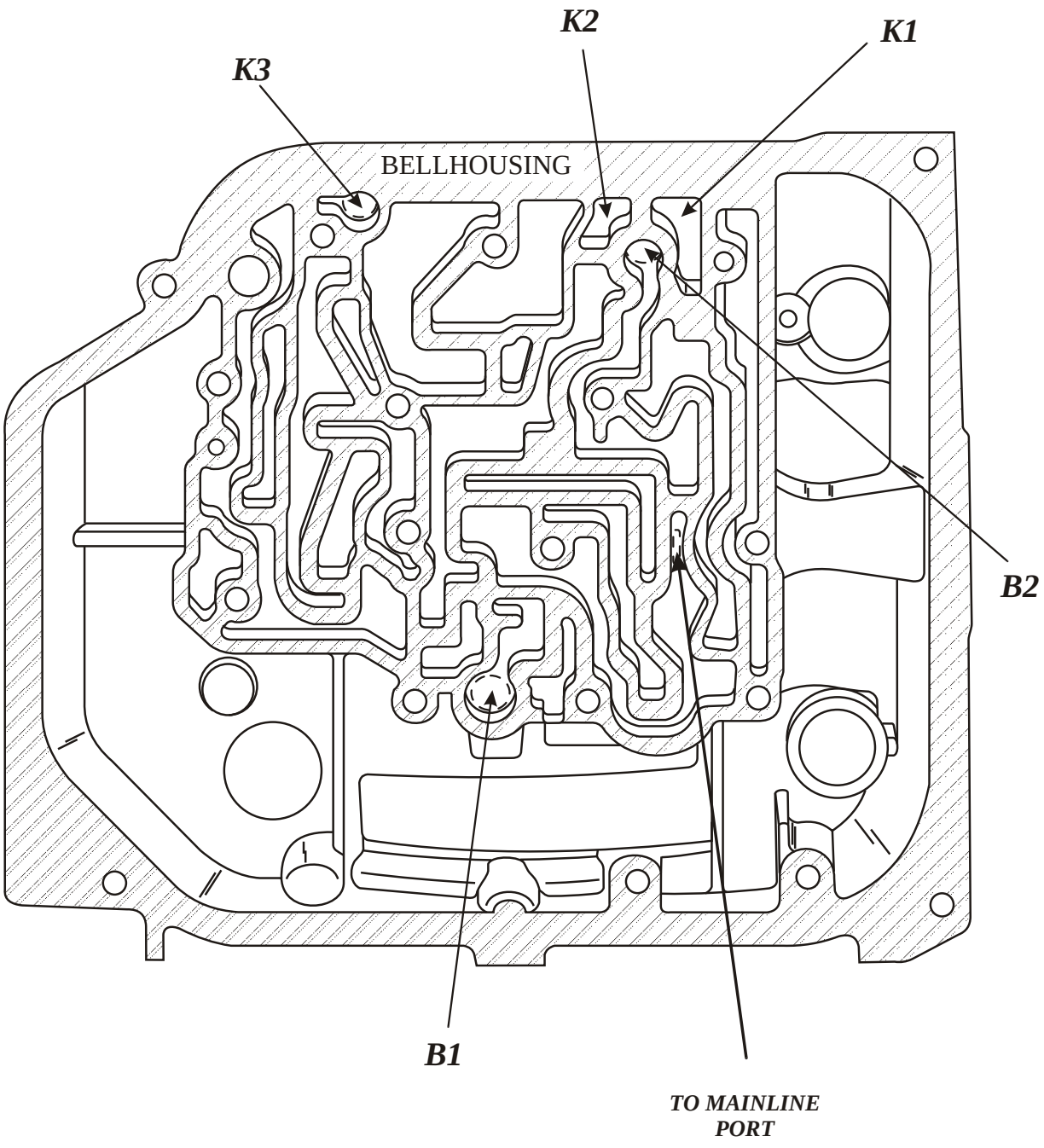


Figure 12

VOLKSWAGEN

1995 -98 MODELS WITH 01M TRANSMISSION

COMPLAINT: The transmission has been overhauled and after the transmission is installed back into the vehicle, the transmission shifts from first to second to neutral.

CAUSE: The 01M transmission has a Transmission Vehicle Speed Sensor and a Vehicle Speed Sensor located in the top of the transmission case as shown in figure 1. The speed sensors are identical in configuration and can therefore be easily switched during the transmission installation process.

CORRECTION: The Transmission Vehicle Speed Sensor has a ***BEIGE CONNECTOR*** and will have a ***RED WIRE*** and a ***GREEN WIRE*** going to it while the Vehicle Speed Sensor has a ***BLACK CONNECTOR*** and will have a ***WHITE WIRE*** and a ***YELLOW WIRE*** going to it, make certain the speed sensors are installed in the locations shown in figure 1.

Also shown in Figure 1 is the ATF requirement and fluid level checking procedures as well as the location of the line pressure service port.

Special thanks to Paul Peteisdorff at Larry's Auto & Truck, Cape Coral, FL.

VOLKSWAGEN

1995 & LATER MODELS WITH 01M TRANSMISSION

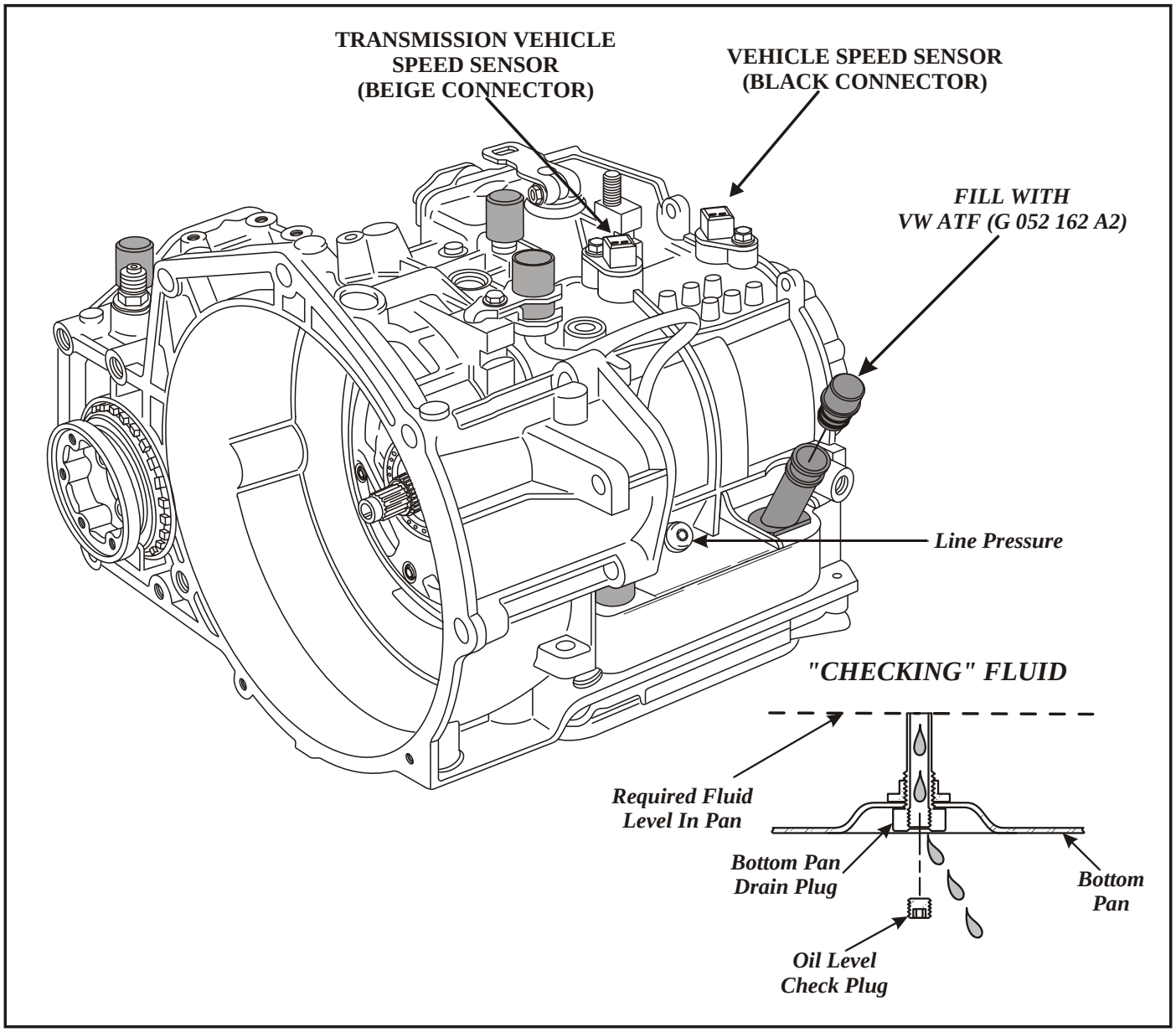


Figure 1

VW/AUDI 096/097

SCHAFFER SHIFTER® MODULE

A module is now available from Schaffer Enterprises that works in conjunction with the Schaffer Shifter to allow the technician to manually operate the VW/AUDI 096/097 transmissions.

Solenoid firing order can be found in the chart in figure 1. The adaptor harness for the module has individual color coded leads which will connect to the transmission pass through connector terminal pins as seen in figure 2.

The module connects to the Schaffer Shifter main unit as shown in figure 3 and can now be used to up and downshift the transmission as well as controlling TCC application and line pressure control.

VW/AUDI SOLENOID APPLICATION CHART

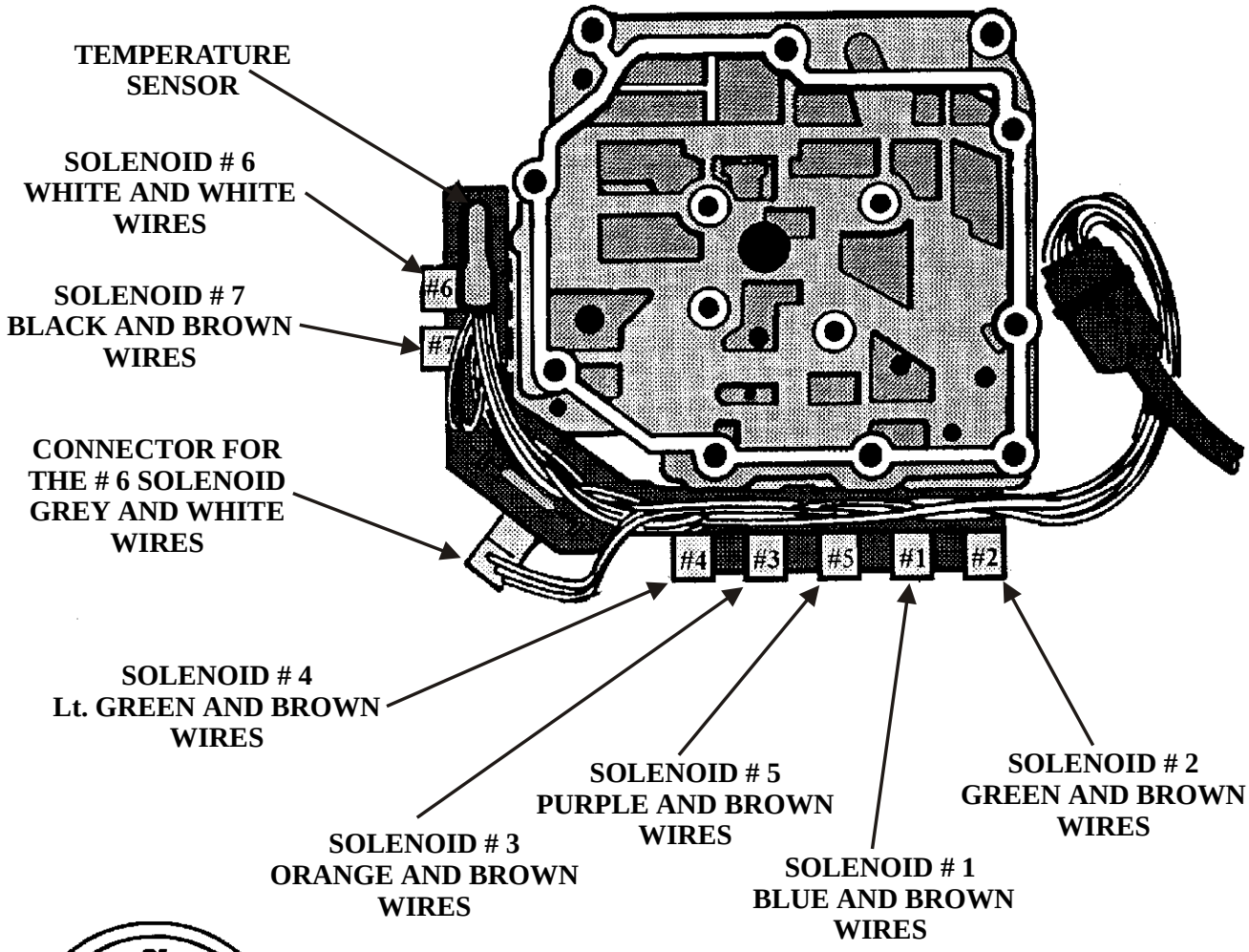
RANGE	GEAR	EV1	EV2	EV3	EV4	EV5	EV6	EV7
P	PARK						EPC	
R	REV					ON-B	EPC	
N	NEU						EPC	
D4	1ST				ON	ON-B	EPC	
	2ND		ON		ON	ON-B	EPC	
	3RD-H					ON-B	EPC	
	3RD-M			ON			EPC	ON-B
	4TH	ON	ON	ON	ON		EPC	ON-B
D3	1ST				ON	ON-B	EPC	
	2ND		ON		ON	ON-B	EPC	
	3RD-H					ON-B	EPC	
	3RD-M			ON			EPC	ON-B
D2	1ST				ON	ON-B	EPC	
	2ND				ON	ON-B	EPC	
L	1ST					ON-B	EPC	

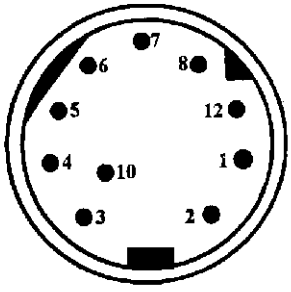
B = BRIEFLY

Figure 1

VW/AUDI 096/097

SCHAFFER SHIFTER® MODULE





TRANSAXLE CONNECTOR PIN NUMBER IDENTIFICATION

1# VOLTAGE SUPPLY TO SOLENOIDS AND ATF SENSOR
2 # VOLTAGE SUPPLY TO #6 SOLENOID
3 # GROUND FOR SOLENOID # 1
4 # GROUND FOR SOLENOID # 2
5 # GROUND FOR SOLENOID # 3
6 # GROUND FOR SOLENOID # 4
7 # GROUND FOR SOLENOID # 5
8 # GROUND FOR SOLENOID # 6
10# GROUND FOR SOLENOID # 7
12# ATF SENSOR SIGNAL RETURN

Figure 2

SCHAFFER SHIFTER® MODULE

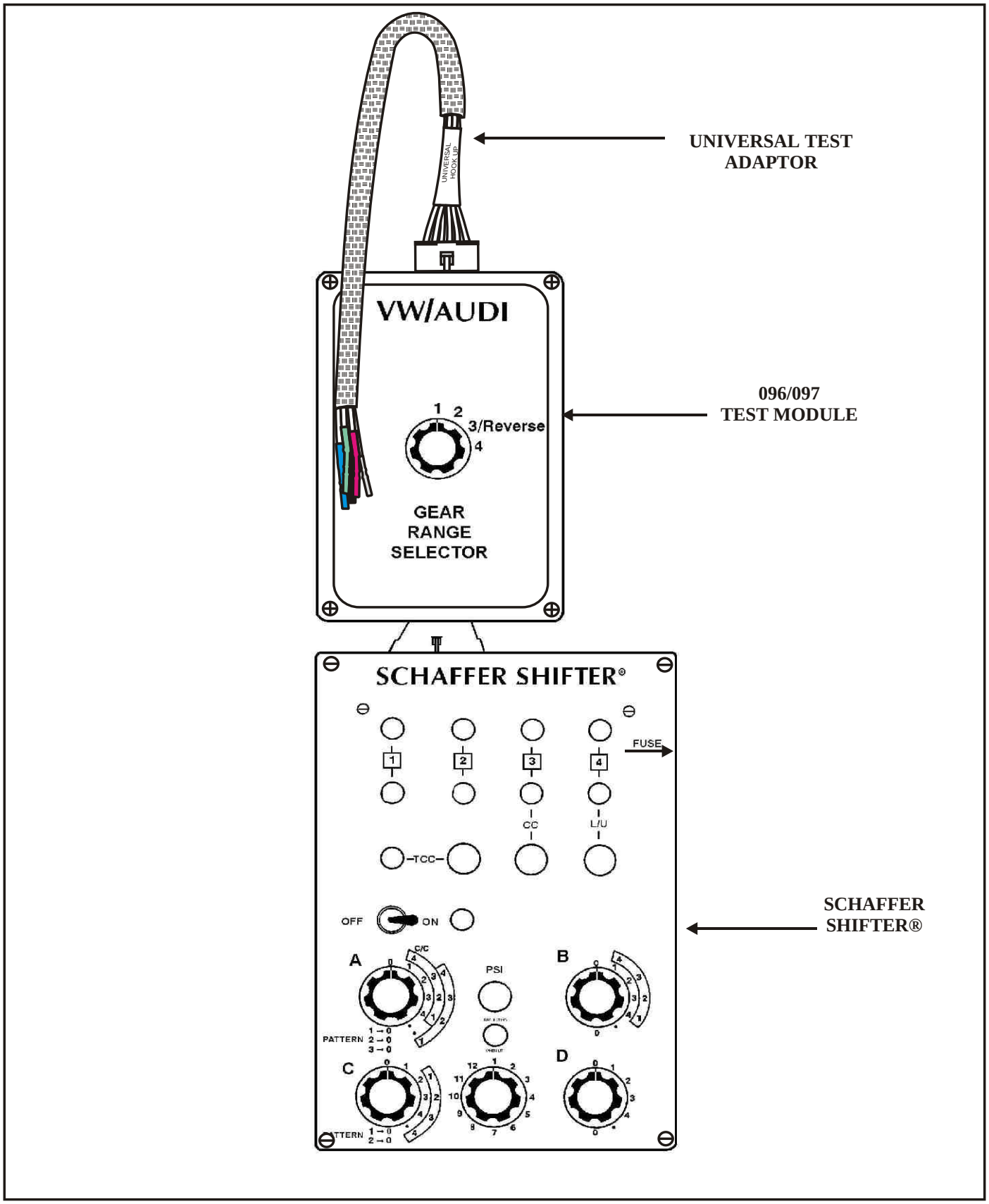


Figure 3

ZF-4HP-18FLE AND ZF-4HP-18FLA
PRELIMINARY INFORMATION

The ZF-4HP-18FLE is mounted longitudinal in the front of the vehicle, and was produced in 2 Wheel Drive models (FLE) and All Wheel Drive (FLA) models, as shown in Figure 1. This unit is totally electronic controlled and is totally different than any 4-HP-18 unit that you are currently familiar with.

ZF-4HP-18FLE And ZF-4HP-18FLA Is Found In The Following Vehicles;

Audi - - - 100 Quatro, A6 1991-1997
Audi - - - A8 1994-1996
Porsche - - - 944 1991-1994

There has been very little pertinent information published on these units. The information in this bulletin has been prepared from an actual transaxle and valve body, and has been formulated to provide you with the preliminary information needed to diagnose and repair electrical and valve body concerns.

Refer to Figure 1 for illustrations of both the 4-HP-18FLE (2WD) and 4-HP-18FLA (AWD) models.

Refer to Figure 2 for internal component resistance charts and connector pin identification.

Refer to Figure 3 for complete wiring schematic with computer terminal identification and transaxle terminal identification, which makes it easier for electrical diagnosis.

Continued on next Page

SPECIAL NOTE:
All nomenclatures in this bulletin are ATSG interpretations, not Audi's nor ZF.

Continued from Previous Page.

Refer to Figure 4 for the solenoid application chart and component application chart.

Refer to Figure 5 for illustration of the complete valve body assembly.

Refer to Figure 6 for exploded view of oil filter and oil filter transfer plate.

Refer to Figure 7 for exploded view of the manual valve body.

Refer to Figure 8 for exploded view of the solenoid body, and notice that it provides you with the factory setting for the adjustment on the pressure regulator valve for EDS-1 solenoid. The Legend for Figure 8 which identifies the solenoid body components and solenoids is found on Page 10.

Refer to Figure 9 for exploded view of the valve body assembly components.

Refer to Figure 10 for exploded detail view of the "Rear Side" of the main valve body. The Legend for Figure 10 which identifies the main valve body components is found on Page 13.

Refer to Figure 11 for exploded detail view of the "Front Side" of the main valve body.

Refer to Figure 12 for valve body spring specifications. The spring dimensions listed in Figure 12 were "Observations" from only one valve body, and may vary from one model to another.

Refer to Figure 13 for Solenoid Body screen and retainer locations, and to Figure 14 for the Manual Valve Body retainer locations.

Refer to Figure 15 for the Main Valve Body "Top Side" retainer locations, check valve and checkball locations, and the locations of the small flat disc orifices.

Refer to Figure 16 for the Main Valve Body "Bottom Side" check valve location, and the location of the small flat disc orifices.

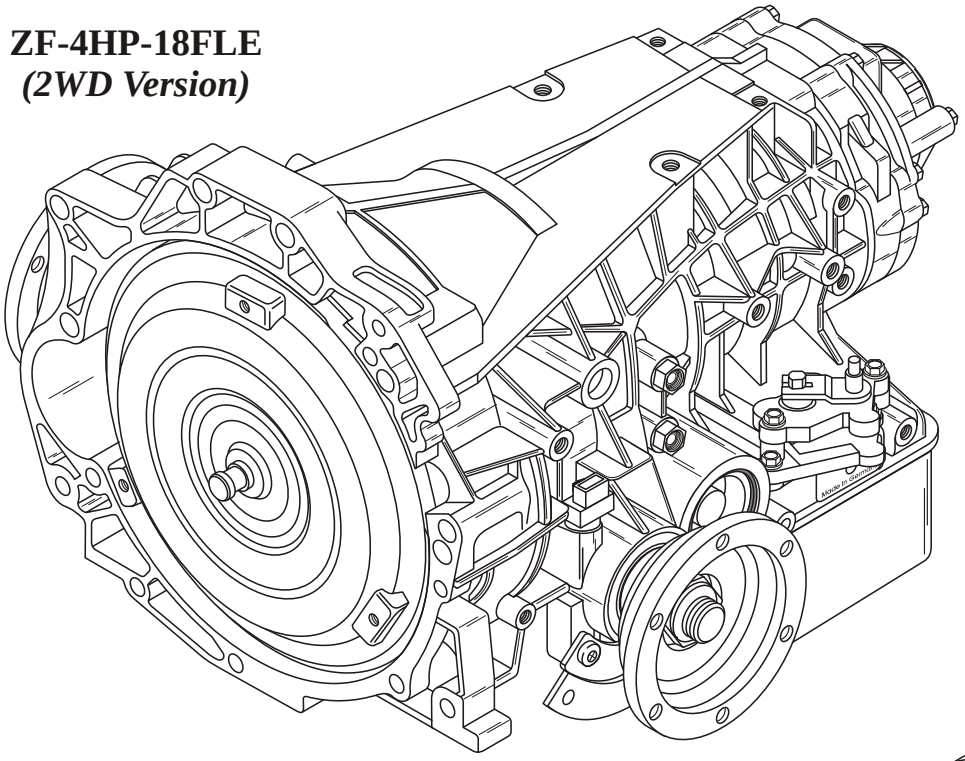
Refer to Figure 17 for location of the small flat disc orifices in the channel plate.

Refer to Figure 18 for the two pressure tap locations on the back of case.

Refer to Figure 19 for Solenoid Operation and air checks.

SPECIAL NOTE:
All nomenclatures in this bulletin are ATSG interpretations, not Audi's nor ZF.

ZF-4HP-18FLE
(2WD Version)



ZF-4HP-18FLA
(AWD Version)

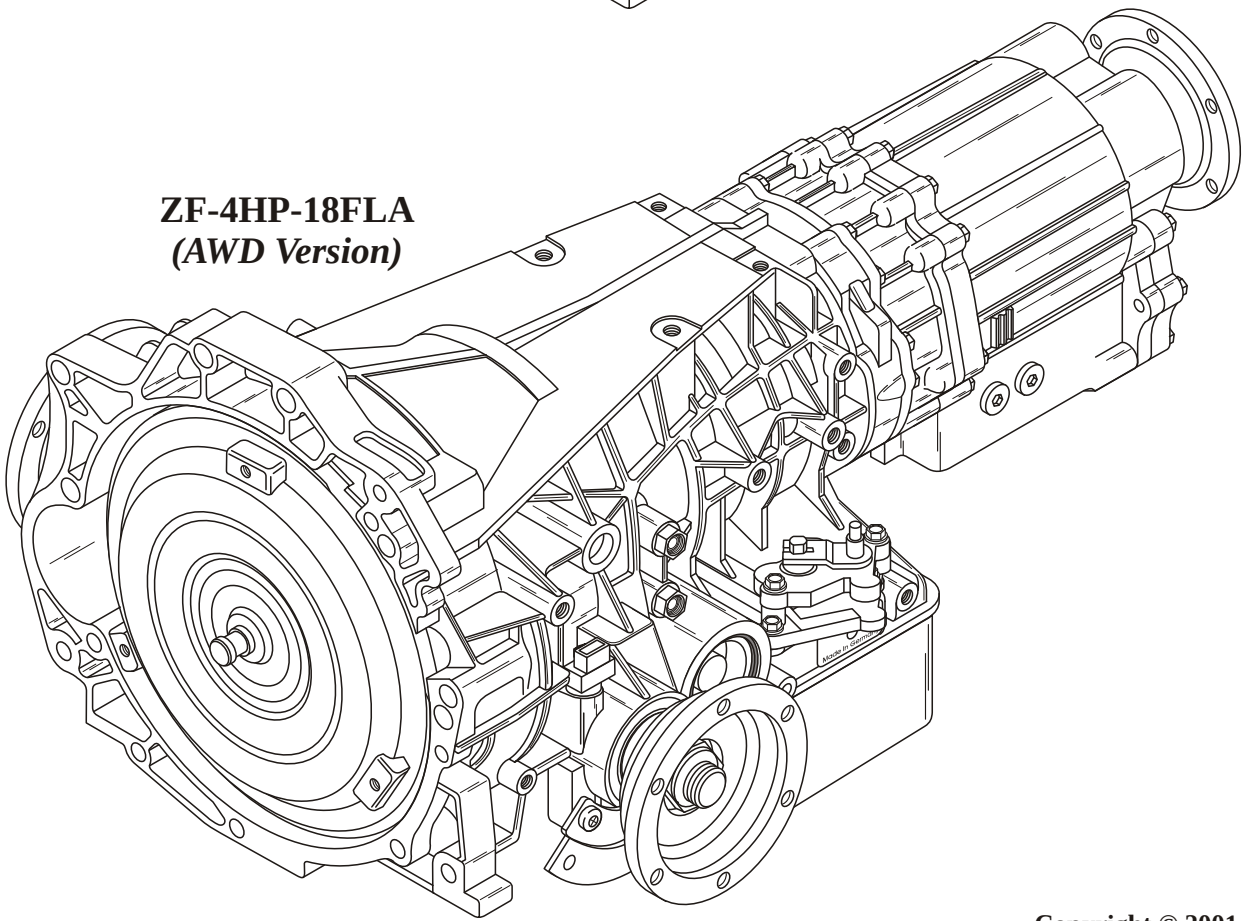
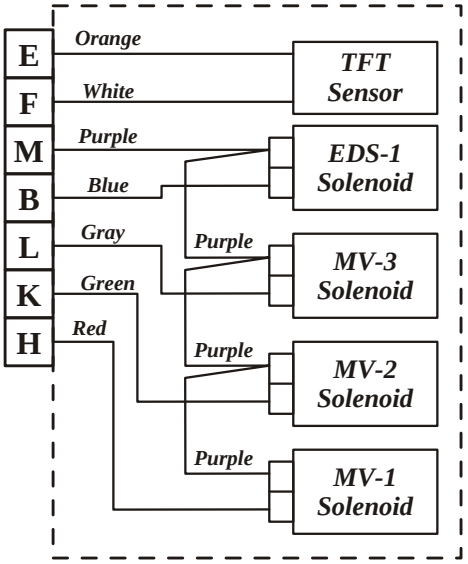


Figure 1

RESISTANCE CHARTS AND TERMINAL IDENTIFICATION

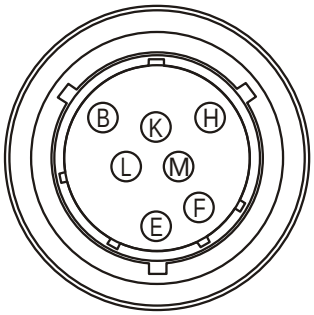
Internal Component	Connector Terminals	Resistance In Ohms
MV-1 Solenoid	M & H	30-40 Ohms @ 68°F (20°C)
MV-2 Solenoid	M & K	30-40 Ohms @ 68°F (20°C)
MV-3 Solenoid	M & L	30-40 Ohms @ 68°F (20°C)
EDS-1 Solenoid	M & B	5-8 Ohms @ 68°F (20°C)
TFT Sensor	E & F	920-960 Ohms @ 68°F (20°C)

SPECIAL NOTE:
Solenoid nomenclatures are ATSG interpretations, not Audi's nor ZF.

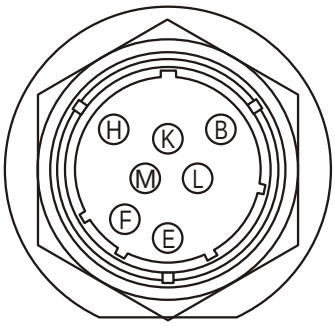


TRANSAXLE SOLENOID CONNECTOR TERMINAL IDENTIFICATION

View Looking Into Vehicle Harness Connector

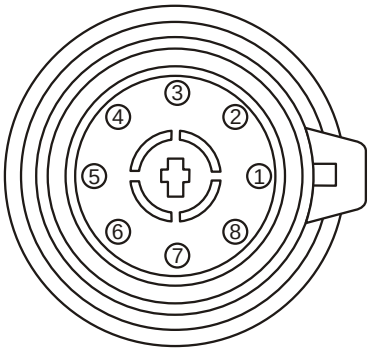


View Looking Into Transaxle Case Connector



TRANSAXLE RANGE SWITCH CONNECTOR TERMINAL IDENTIFICATION

View Looking Into Transaxle Range Switch Vehicle Harness Connector



View Looking Into Transaxle Range Switch Connector

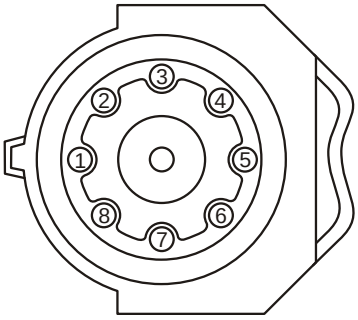


Figure 2

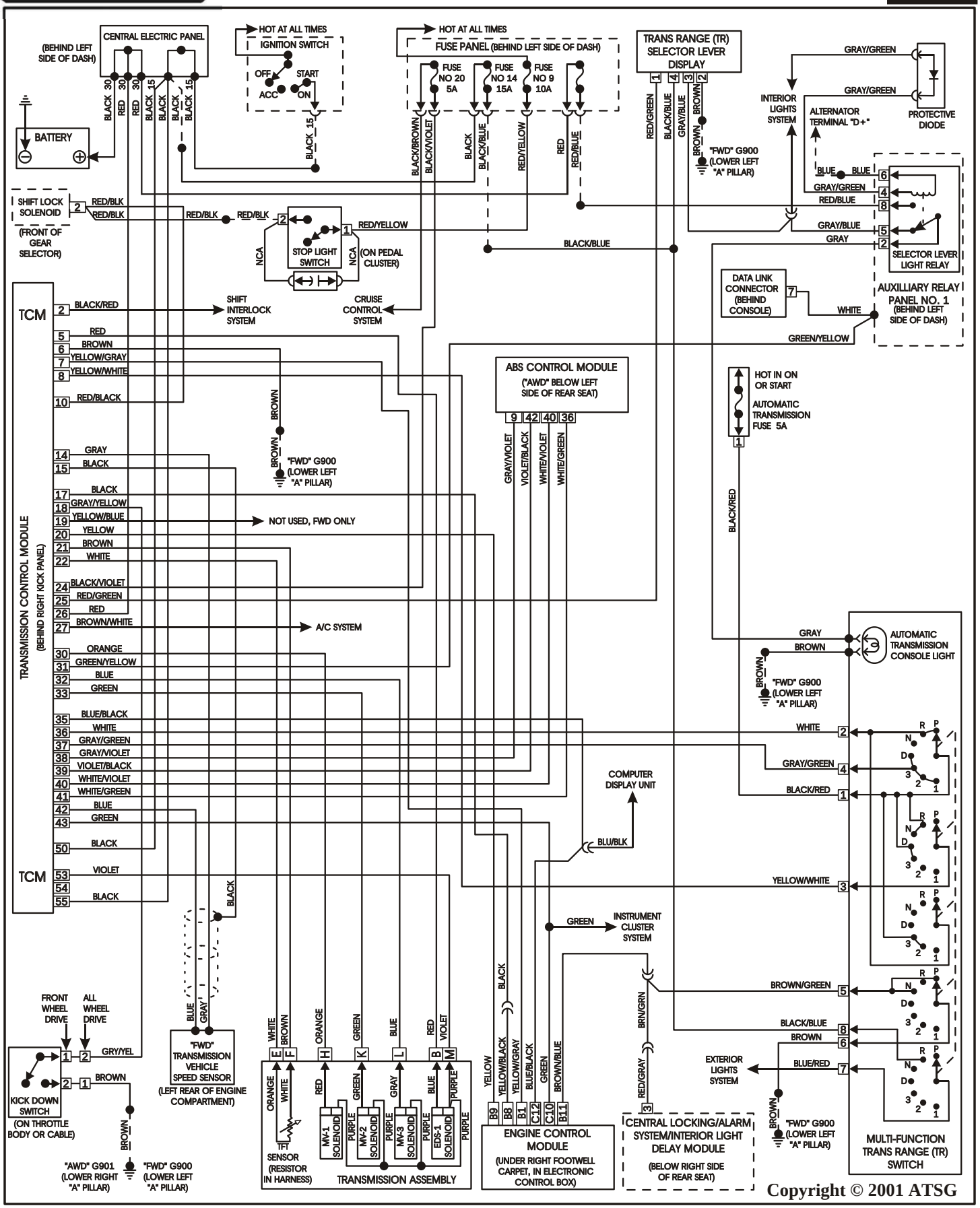

CENTRAL ELECTRIC PANEL
(BEHIND LEFT SIDE OF DASH)
BATTERY
HOT AT ALL TIMES
IGNITION SWITCH
OFF
ACC
START
ON
FUSE PANEL (BEHIND LEFT SIDE OF DASH)
FUSE NO 20 5A
FUSE NO 14 15A
FUSE NO 9 10A
TRANS RANGE (TR) SELECTOR LEVER DISPLAY
"FWD" G900 (LOWER LEFT "A" PILLAR)
INTERIOR LIGHTS SYSTEM
ALTERNATOR TERMINAL "D+"
PROTECTIVE DIODE
SHIFT LOCK SOLENOID
(FRONT OF GEAR SELECTOR)
STOP LIGHT SWITCH
NCA
(ON PEDAL CLUSTER)
SELECTOR LEVER LIGHT RELAY
DATA LINK CONNECTOR (BEHIND CONSOLE)
AUXILLIARY RELAY PANEL NO. 1 (BEHIND LEFT SIDE OF DASH)
TCM
TRANSMISSION CONTROL MODULE (BEHIND RIGHT KICK PANEL)
SHIFT INTERLOCK SYSTEM
CRUISE CONTROL SYSTEM
NOT USED, FWD ONLY
A/C SYSTEM
ABS CONTROL MODULE
("AWD" BELOW LEFT SIDE OF REAR SEAT)
HOT IN ON OR START
AUTOMATIC TRANSMISSION FUSE 5A
AUTOMATIC TRANSMISSION CONSOLE LIGHT
COMPUTER DISPLAY UNIT
INSTRUMENT CLUSTER SYSTEM
EXTERIOR LIGHTS SYSTEM
FRONT WHEEL DRIVE
ALL WHEEL DRIVE
KICK DOWN SWITCH
(ON THROTTLE BODY OR CABLE)
"FWD" TRANSMISSION VEHICLE SPEED SENSOR
(LEFT REAR OF ENGINE COMPARTMENT)
TFT SENSOR (RESISTOR IN HARNESS)
MV-1 SOLENOID
MV-2 SOLENOID
MV-3 SOLENOID
EDS-1 SOLENOID
TRANSMISSION ASSEMBLY
ENGINE CONTROL MODULE
(UNDER RIGHT FOOTWELL CARPET, IN ELECTRONIC CONTROL BOX)
CENTRAL LOCKING/ALARM SYSTEM/INTERIOR LIGHT DELAY MODULE
(BELOW RIGHT SIDE OF REAR SEAT)
MULTI-FUNCTION TRANS RANGE (TR) SWITCH
"AWD" G901 (LOWER RIGHT "A" PILLAR)
"FWD" G900 (LOWER LEFT "A" PILLAR)
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Figure 3

ZF-4HP-18FLE SOLENOID AND COMPONENT APPLICATION CHART

RANGE	MV-1 Sol.	MV-2 Sol.	MV-3 Sol.	EDS-1 Sol.	"A" Clutch	"B" Clutch	2-4 Band	"C" Clutch	"D" Clutch	"E" Clutch
Park/Neut		ON		**						
Reverse		ON	*	**		ON			ON	
Drive-1st			ON	**	ON					
Drive-2nd	ON		ON	**	ON		ON	ON		
Drive-3rd	ON			**	ON			ON		ON
Drive-4th				**			ON	ON		ON
Manual-1st			ON	**	ON				ON	
"Failsafe" ***				Max.	ON		ON	ON		

* ON For Reverse Inhibit Feature.

** Pressure Regulating.

*** Electrical failure while in 4th gear, vehicle remains in 4th gear until engine is turned off. When vehicle is once again started, transaxle will be in "Failsafe" 2nd gear.

SPECIAL NOTE:

Solenoid and Clutch nomenclature are ATSG interpretations, not Audi's nor ZF.

Figure 4

ZF-4HP-18FLA/E VALVE BODY COMPLETE

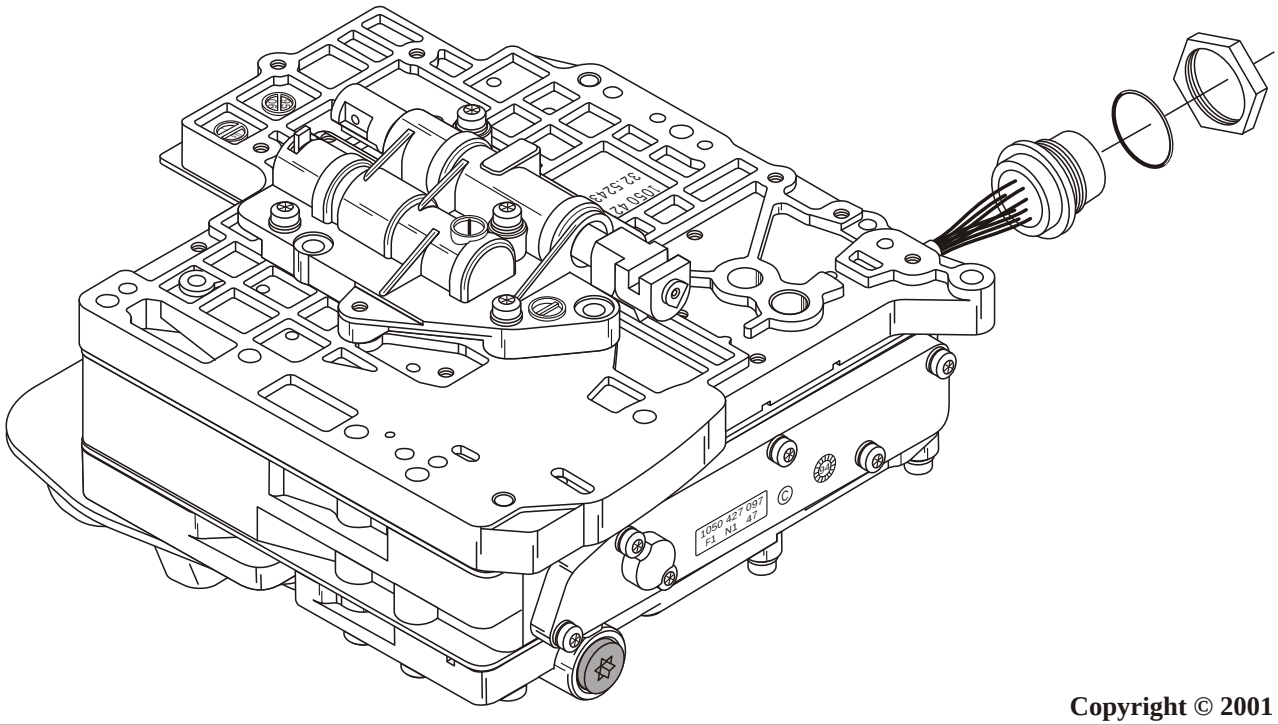
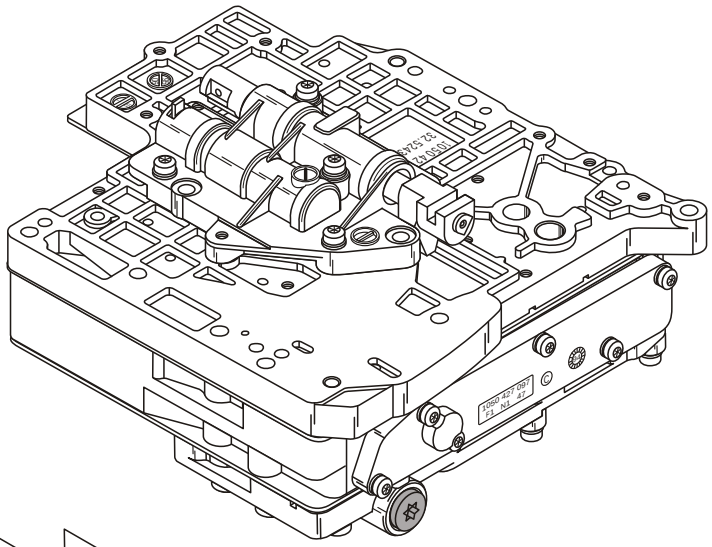
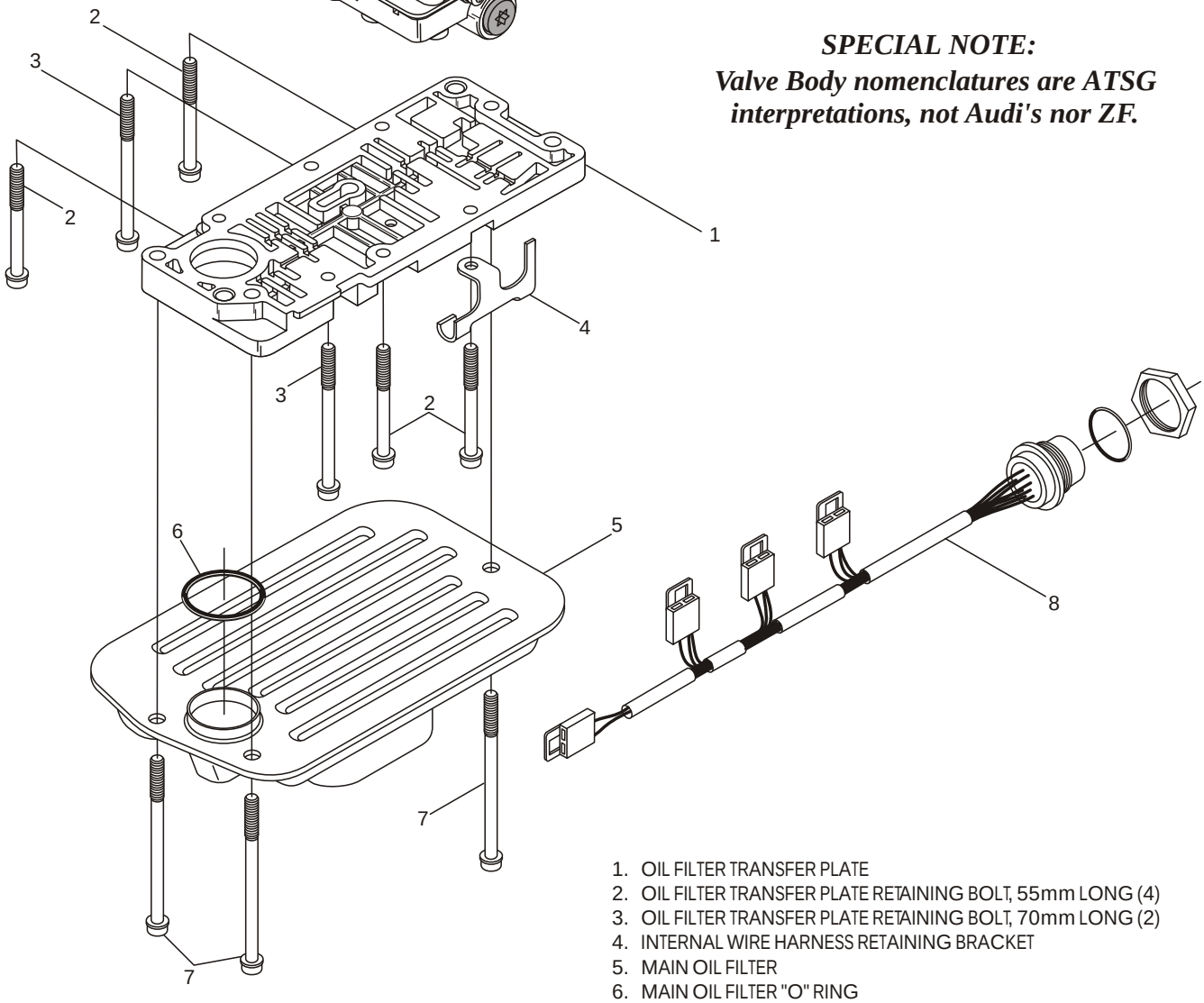


Figure 5

ZF-4HP-18FLA/E OIL FILTER AND FILTER TRANSFER PLATE



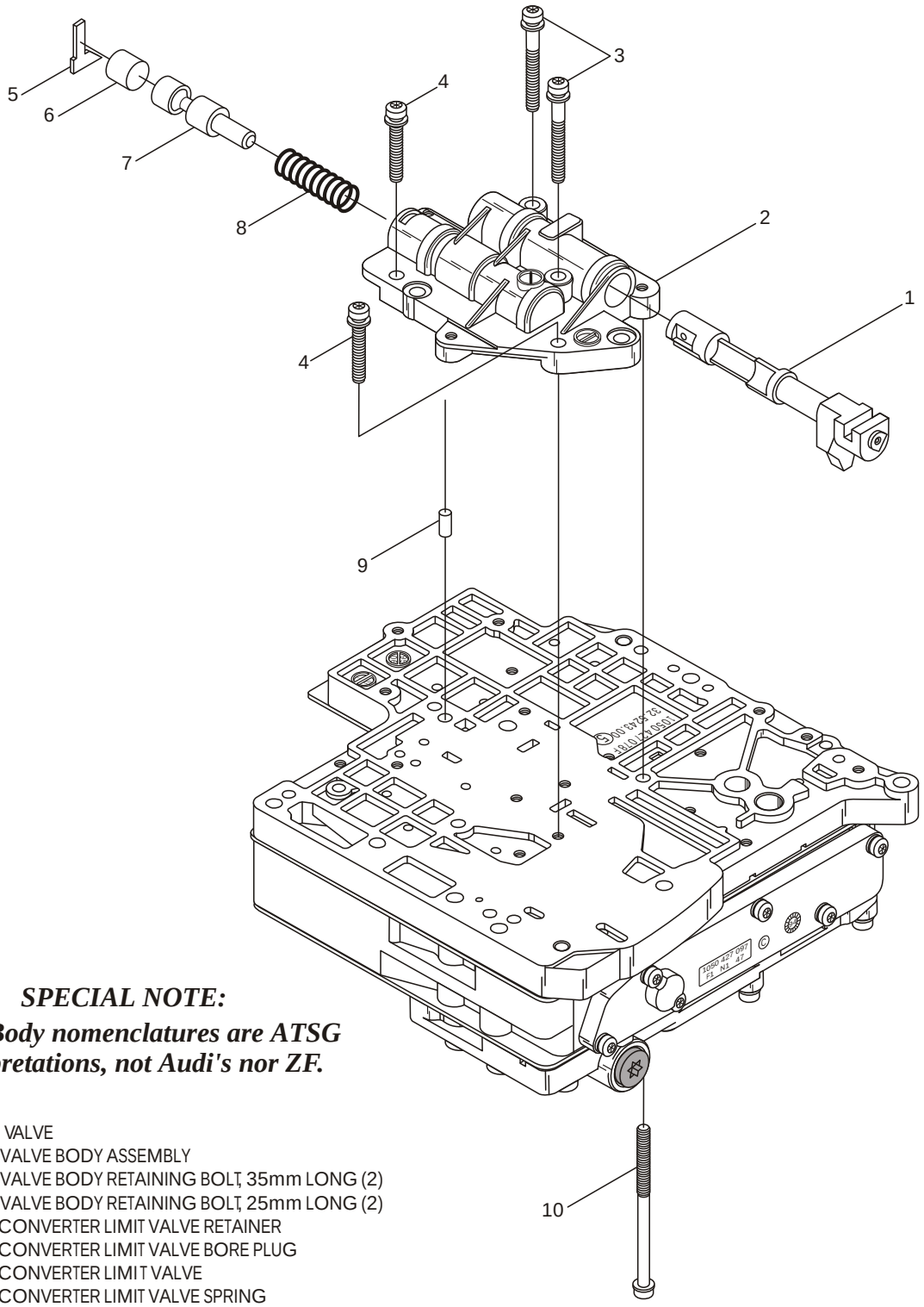


SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

1. OIL FILTER TRANSFER PLATE
2. OIL FILTER TRANSFER PLATE RETAINING BOLT, 55mm LONG (4)
3. OIL FILTER TRANSFER PLATE RETAINING BOLT, 70mm LONG (2)
4. INTERNAL WIRE HARNESS RETAINING BRACKET
5. MAIN OIL FILTER
6. MAIN OIL FILTER "O" RING
7. FILTER AND VALVE BODY ASSEMBLY TO CASE RETAINING BOLTS

Figure 6

ZF-4HP-18FLA/E MANUAL VALVE BODY



SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

1. MANUAL VALVE
2. MANUAL VALVE BODY ASSEMBLY
3. MANUAL VALVE BODY RETAINING BOLT, 35mm LONG (2)
4. MANUAL VALVE BODY RETAINING BOLT, 25mm LONG (2)
5. TORQUE CONVERTER LIMIT VALVE RETAINER
6. TORQUE CONVERTER LIMIT VALVE BORE PLUG
7. TORQUE CONVERTER LIMIT VALVE
8. TORQUE CONVERTER LIMIT VALVE SPRING
9. ALIGNMENT DOWEL PIN, .235" DIAMETER, .612" LONG
10. LOWER PLATE/MANUAL VALVE BODY BOLT, 65mm LONG (1)

Figure 7

BLANK

ZF-4HP-18FLA/E SOLENOID VALVE BODY

SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

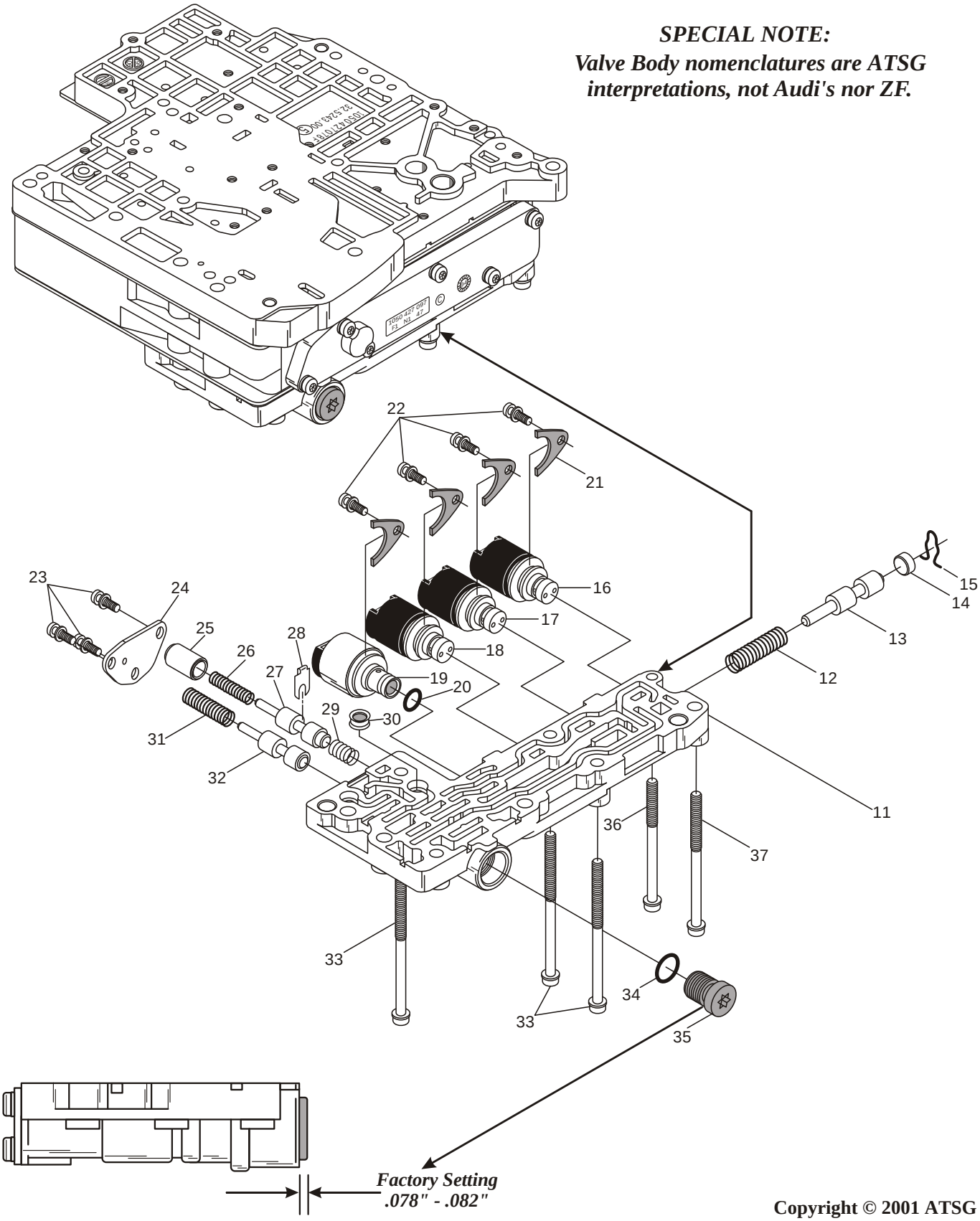


Figure 8

11. SOLENOID VALVE BODY CASTING
12. PRESSURE REGULATOR VALVE SPRING, MV-1 THRU MV-3 SOLENOIDS
13. PRESSURE REGULATOR VALVE, MV-1 THRU MV-3 SOLENOIDS
14. PRESSURE REGULATOR VALVE BORE PLUG, MV-1 THRU MV-3 SOLENOIDS
15. PRESSURE REGULATOR VALVE RETAINING CLIP, MV-1 THRU MV-3 SOLENOIDS
16. MV-1 SOLENOID, OEM PART NUMBER 0501 313 500 (SHIFT CONTROL)
17. MV-2 SOLENOID, OEM PART NUMBER 0501 313 500 (SHIFT CONTROL)
18. MV-3 SOLENOID, OEM PART NUMBER 0501 313 500 (SHIFT CONTROL)
19. EDS-1 SOLENOID, OEM PART NUMBER 0501 311 843 (LINE PRESSURE)
20. EDS-1 SOLENOID "O" RING
21. SOLENOID RETAINING BRACKET (4 REQUIRED)
22. SOLENOID RETAINING BRACKET BOLT, 12mm LONG (4 REQUIRED)
23. RETAINING PLATE BOLT, 12mm LONG (3 REQUIRED)
24. SOLENOID BODY RETAINING PLATE
25. MODULATING VALVE PLUNGER
26. MODULATING VALVE SPRING
27. MODULATING VALVE
28. MODULATING VALVE RETAINING CLIP
29. MODULATING VALVE BALANCE SPRING
30. EDS-1 SOLENOID SCREEN
31. PRESSURE REGULATOR VALVE SPRING, FOR EDS-1 SOLENOID
32. PRESSURE REGULATOR VALVE, FOR EDS-1 SOLENOID
33. SOLENOID VALVE BODY RETAINING BOLT, 70mm LONG (3 REQUIRED)
34. MODULATING VALVE ADJUSTING SCREW "O" RING
35. MODULATING VALVE ADJUSTING SCREW
36. SOLENOID VALVE BODY RETAINING BOLT, 60mm LONG (1 REQUIRED)
37. SOLENOID VALVE BODY RETAINING BOLT, 65mm LONG (1 REQUIRED)

SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

Figure 8 LEGEND

ZF-4HP-18FLA/E COMPONENT ASSEMBLY

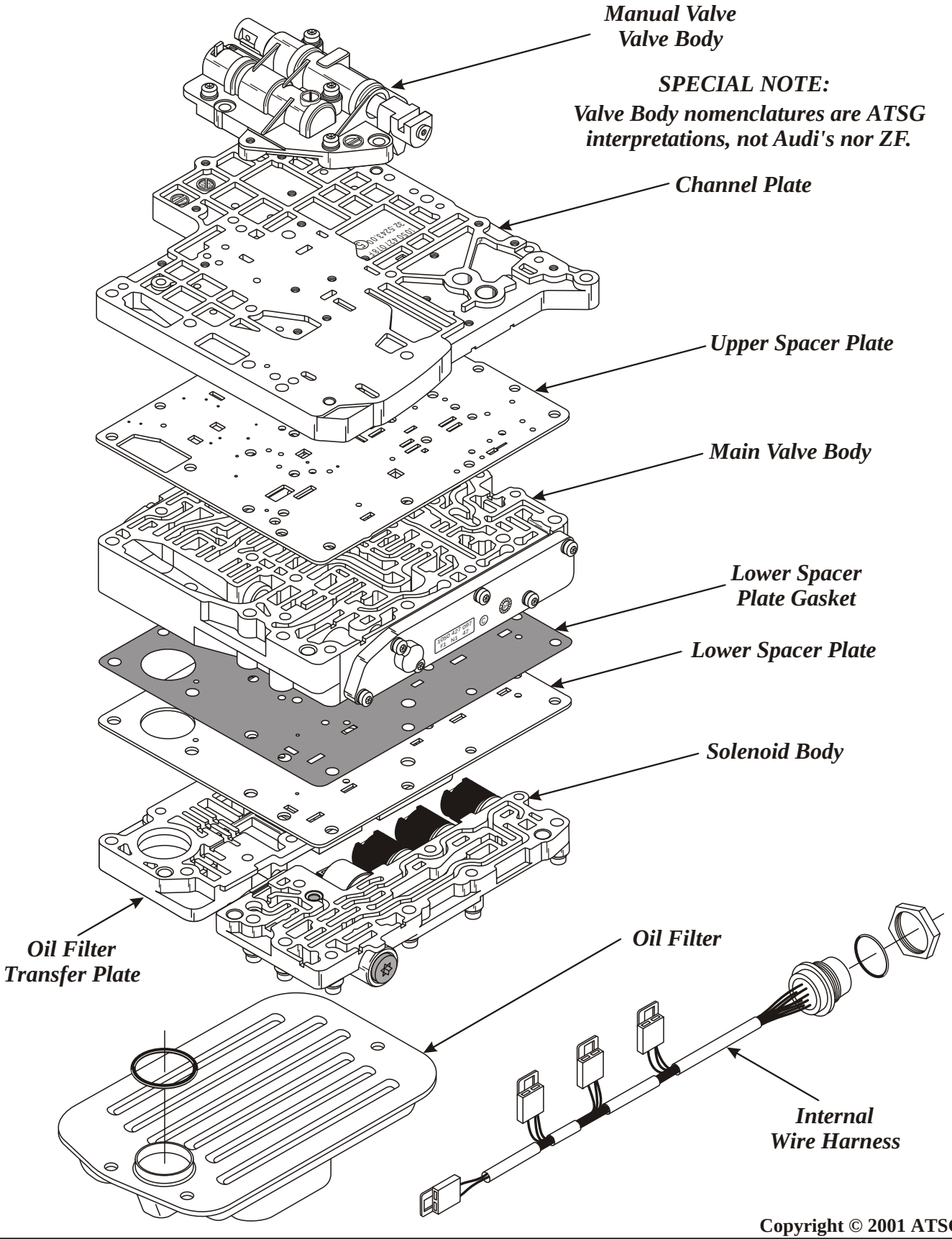
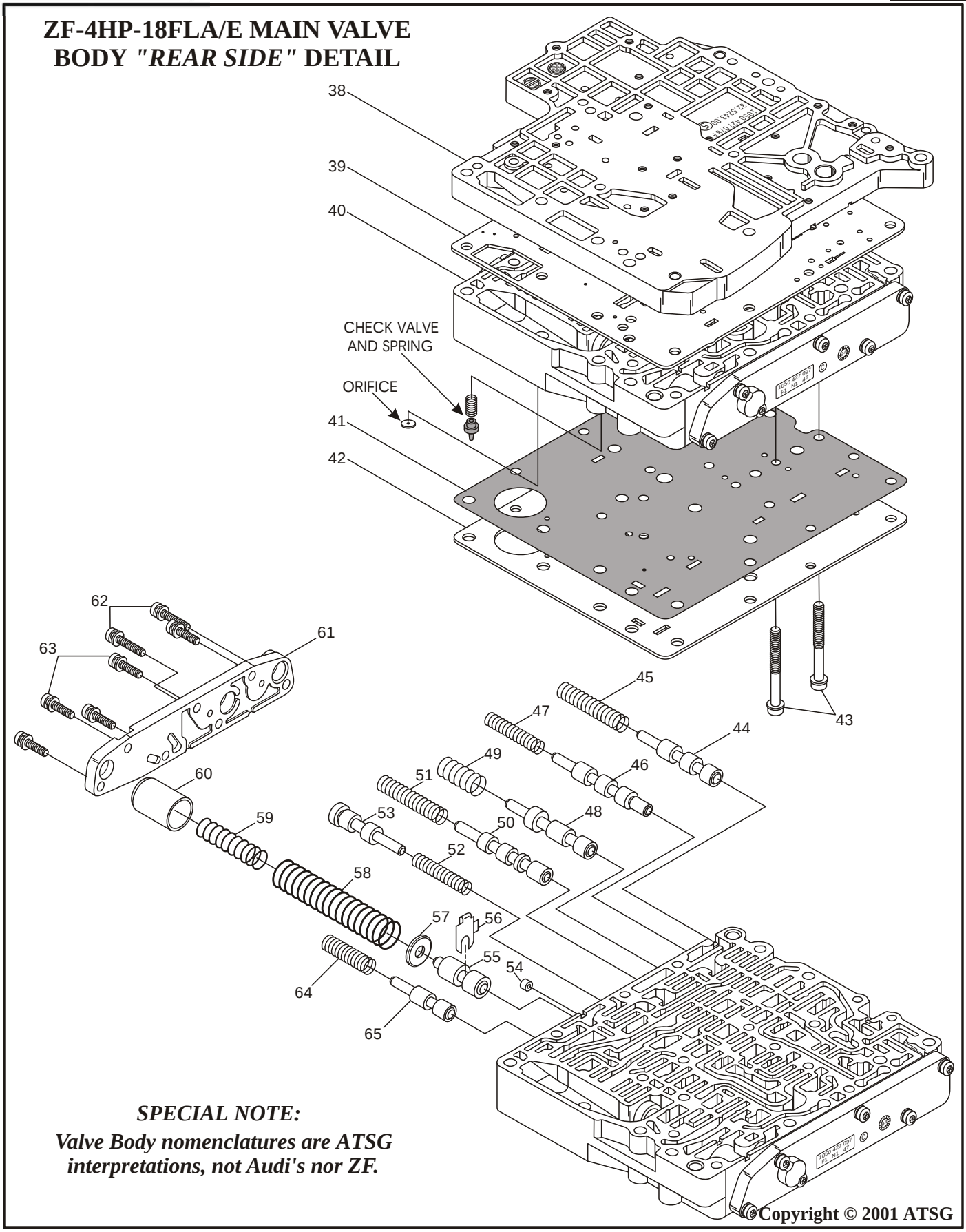


Figure 9

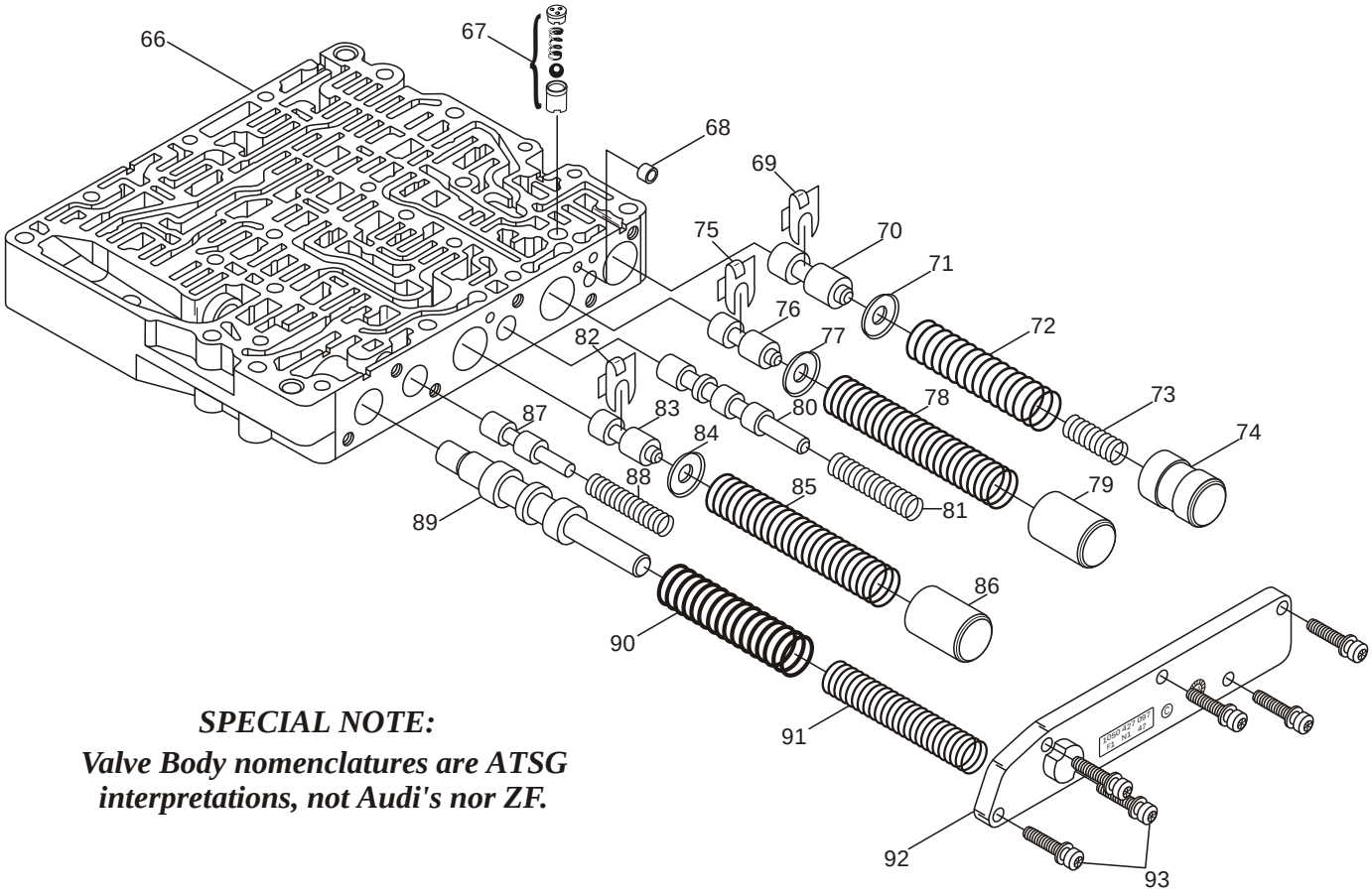
ZF-4HP-18FLA/E MAIN VALVE BODY *"REAR SIDE"* DETAIL



SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

Figure 10

ZF-4HP-18FLA/E MAIN VALVE BODY *"FRONT SIDE"* DETAIL



SPECIAL NOTE:
Valve Body nomenclatures are ATSG interpretations, not Audi's nor ZF.

38. CHANNEL PLATE ASSEMBLY
39. UPPER SPACER PLATE
40. MAIN VALVE BODY ASSEMBLY
41. MAIN VALVE BODY TO LOWER SPACER PLATE GASKET
42. LOWER SPACER PLATE
43. SPACER PLATE TO CHANNEL PLATE BOLT, 50mm LONG (2)
44. SHIFT VALVE NUMBER ONE
45. SHIFT VALVE NUMBER ONE SPRING
46. SHIFT VALVE NUMBER TWO
47. SHIFT VALVE NUMBER TWO SPRING
48. SAFETY MODE VALVE
49. SAFETY MODE VALVE SPRING
50. SHIFT VALVE NUMBER THREE
51. SHIFT VALVE NUMBER THREE SPRING
52. 3-4 TRACTION VALVE SPRING
53. 3-4 TRACTION VALVE
54. .060" ORIFICED CUP PLUG IN VALVE BODY CASTING
55. "A" CLUTCH ACCUMULATOR VALVE
56. "A" CLUTCH ACCUMULATOR VALVE RETAINER
57. "A" CLUTCH ACCUMULATOR VALVE SPRING SEAT
58. "A" CLUTCH ACCUMULATOR OUTER SPRING
59. "A" CLUTCH ACCUMULATOR INNER SPRING
60. "A" CLUTCH ACCUMULATOR PLUNGER
61. REAR SIDE VALVE RETAINING COVER
62. REAR SIDE COVER RETAINING SCREWS, 22mm LONG (2)
63. REAR SIDE COVER RETAINING SCREWS, 18mm LONG (5)
64. "C" CLUTCH TRACTION VALVE SPRING
65. "C" CLUTCH TRACTION VALVE
66. MAIN VALVE BODY CASTING
67. "D" CLUTCH ONE-WAY CHECK VALVE, (.020" ORIFICE)
68. .070" ORIFICED CUP PLUG IN VALVE BODY CASTING
69. "D" CLUTCH ACCUMULATOR VALVE RETAINER
70. "D" CLUTCH ACCUMULATOR VALVE
71. "D" CLUTCH ACCUMULATOR VALVE SPRING SEAT
72. "D" CLUTCH ACCUMULATOR OUTER SPRING
73. "D" CLUTCH ACCUMULATOR INNER SPRING
74. "D" CLUTCH ACCUMULATOR PLUNGER
75. "C" CLUTCH ACCUMULATOR VALVE RETAINER
76. "C" CLUTCH ACCUMULATOR VALVE
77. "C" CLUTCH ACCUMULATOR VALVE SPRING SEAT
78. "C" CLUTCH ACCUMULATOR SPRING
79. "C" CLUTCH ACCUMULATOR PLUNGER
80. 1ST AND REVERSE VALVE
81. 1ST AND REVERSE VALVE SPRING
82. "E" CLUTCH ACCUMULATOR VALVE RETAINER
83. "E" CLUTCH ACCUMULATOR VALVE
84. "E" CLUTCH ACCUMULATOR VALVE SPRING SEAT
85. "E" CLUTCH ACCUMULATOR SPRING
86. "E" CLUTCH ACCUMULATOR PLUNGER
87. 4-3 TRACTION VALVE
88. 4-3 TRACTION VALVE SPRING
89. MAIN LINE PRESSURE REGULATOR VALVE
90. MAIN LINE PRESSURE REGULATOR VALVE OUTER SPRING
91. MAIN LINE PRESSURE REGULATOR VALVE INNER SPRING
92. FRONT SIDE VALVE RETAINING COVER
93. FRONT SIDE COVER RETAINING SCREWS, 18mm LONG (6)

Figure 11

ZF 4HP-18FLA/E SPRING SPECIFICATIONS

Manual Valve Body	*Solenoid Valve Body*	*Main Valve Body "Back Side"*	*Main Valve Body "Front Side"*
SPRING ILLUSTRATION NO. 8 FREE LENGTH = 1.618" SPRING DIAMETER = .495" WIRE DIAMETER = .062"	SPRING ILLUSTRATION NO. 11 FREE LENGTH = 1.688" SPRING DIAMETER = .375" WIRE DIAMETER = .042"	SPRING ILLUSTRATION NO. 45: FREE LENGTH = 1.865" SPRING DIAMETER = .382" WIRE DIAMETER = .035"	SPRING ILLUSTRATION NO. 72: FREE LENGTH = 2.860" SPRING DIAMETER = .612" WIRE DIAMETER = .048"
	SPRING ILLUSTRATION NO. 26 FREE LENGTH = 1.475" SPRING DIAMETER = .320" WIRE DIAMETER = .042"	SPRING ILLUSTRATION NO. 47: FREE LENGTH = 1.595" SPRING DIAMETER = .365" WIRE DIAMETER = .031"	SPRING ILLUSTRATION NO. 73: FREE LENGTH = 1.589" SPRING DIAMETER = .429" WIRE DIAMETER = .035"
	SPRING ILLUSTRATION NO. 29 FREE LENGTH = .760" SPRING DIAMETER = .370" WIRE DIAMETER = .028"	SPRING ILLUSTRATION NO. 49: FREE LENGTH = 1.194" SPRING DIAMETER = .443" WIRE DIAMETER = .031"	SPRING ILLUSTRATION NO. 78: FREE LENGTH = 3.530" SPRING DIAMETER = .575" WIRE DIAMETER = .039"
	SPRING ILLUSTRATION NO. 31 FREE LENGTH = 1.530" SPRING DIAMETER = .340" WIRE DIAMETER = .042"	SPRING ILLUSTRATION NO. 51: FREE LENGTH = 1.832" SPRING DIAMETER = .364" WIRE DIAMETER = .031"	SPRING ILLUSTRATION NO. 81: FREE LENGTH = 1.815" SPRING DIAMETER = .365" WIRE DIAMETER = .031"
		SPRING ILLUSTRATION NO. 52: FREE LENGTH = 1.289" SPRING DIAMETER = .298" WIRE DIAMETER = .027"	SPRING ILLUSTRATION NO. 85: FREE LENGTH = 3.530" SPRING DIAMETER = .575" WIRE DIAMETER = .039"
		SPRING ILLUSTRATION NO. 58: FREE LENGTH = 3.216" SPRING DIAMETER = .590" WIRE DIAMETER = .042"	SPRING ILLUSTRATION NO. 88: FREE LENGTH = 1.712" SPRING DIAMETER = .361" WIRE DIAMETER = .031"
		SPRING ILLUSTRATION NO. 59: FREE LENGTH = 1.592" SPRING DIAMETER = .432" WIRE DIAMETER = .035"	SPRING ILLUSTRATION NO. 90: FREE LENGTH = 2.909" SPRING DIAMETER = .605" WIRE DIAMETER = .066"
		SPRING ILLUSTRATION NO. 64: FREE LENGTH = 1.514" SPRING DIAMETER = .363" WIRE DIAMETER = .038"	SPRING ILLUSTRATION NO. 91: FREE LENGTH = 3.612" SPRING DIAMETER = .445" WIRE DIAMETER = .042"

Special Note:

The spring dimensions listed above were "Observations" from only one valve body, and may vary from one model to another.

Figure 12

SOLENOID BODY RETAINER AND SCREEN LOCATIONS

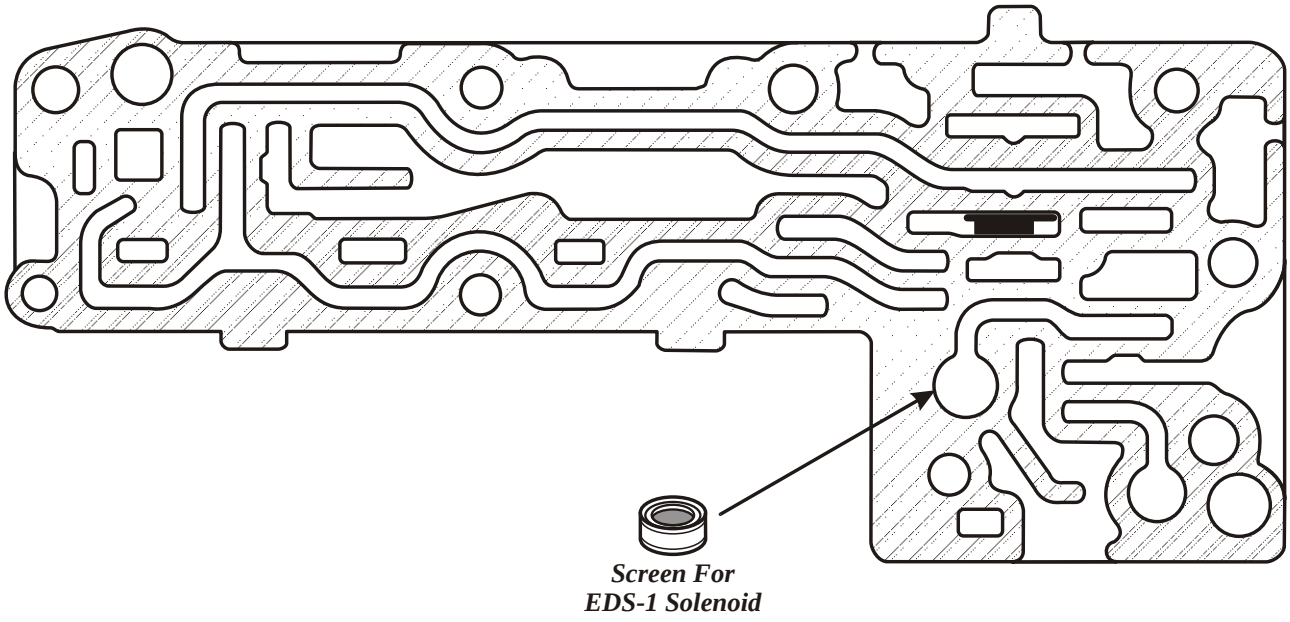


Figure 13

MANUAL VALVE BODY RETAINER LOCATIONS

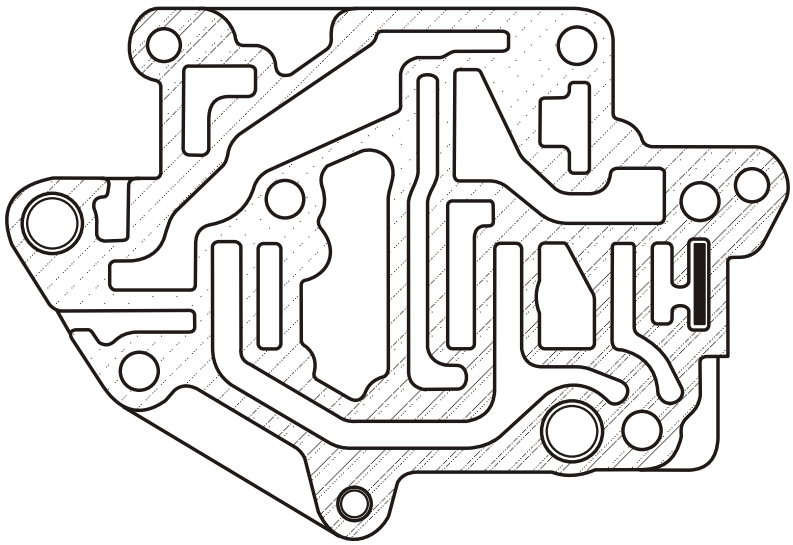


Figure 14

MAIN VALVE BODY BODY *"TOP SIDE"* RETAINER AND ORIFICE LOCATIONS

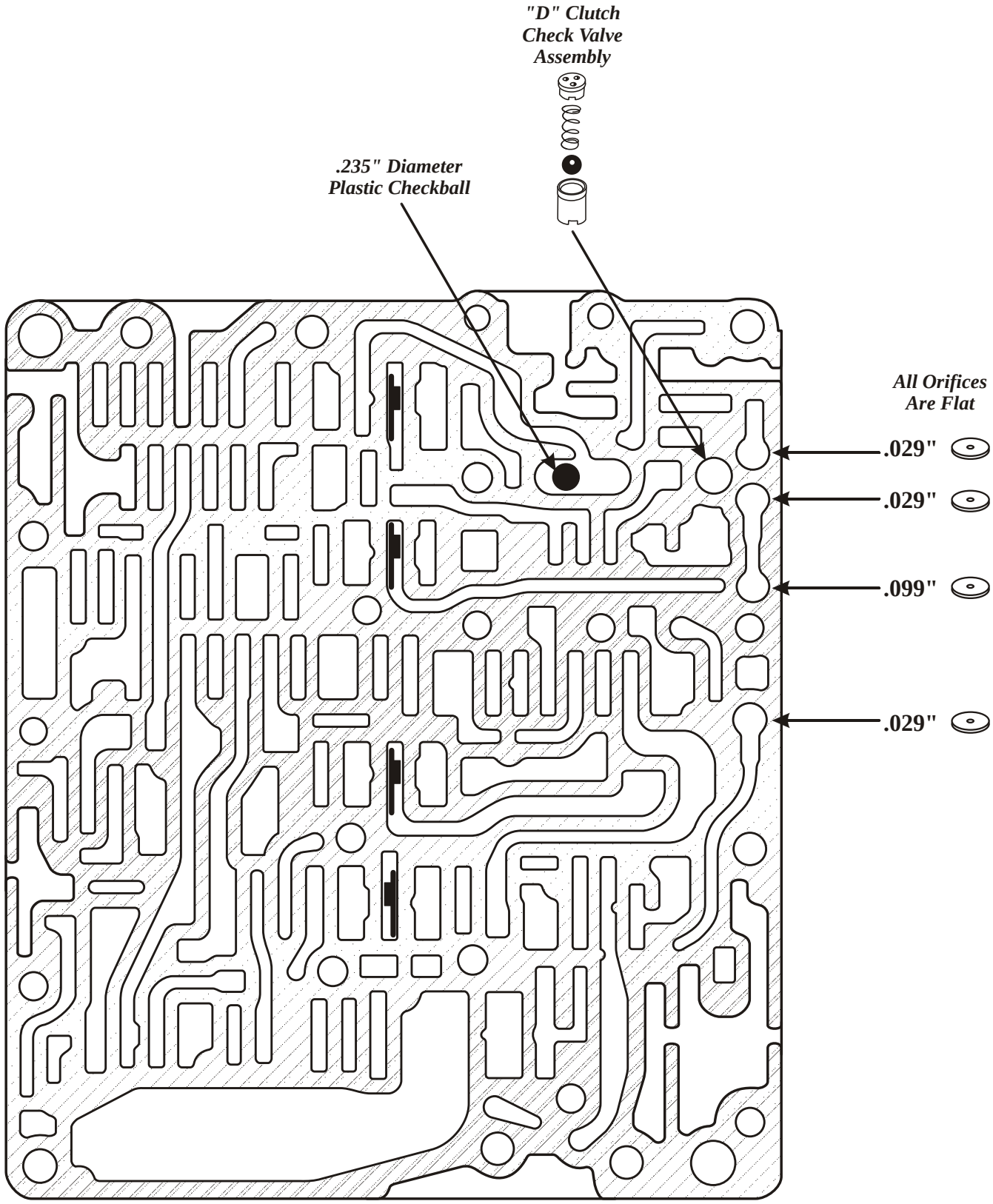


Figure 15

MAIN VALVE BODY BODY *"BOTTOM SIDE"* VALVE AND ORIFICE LOCATIONS

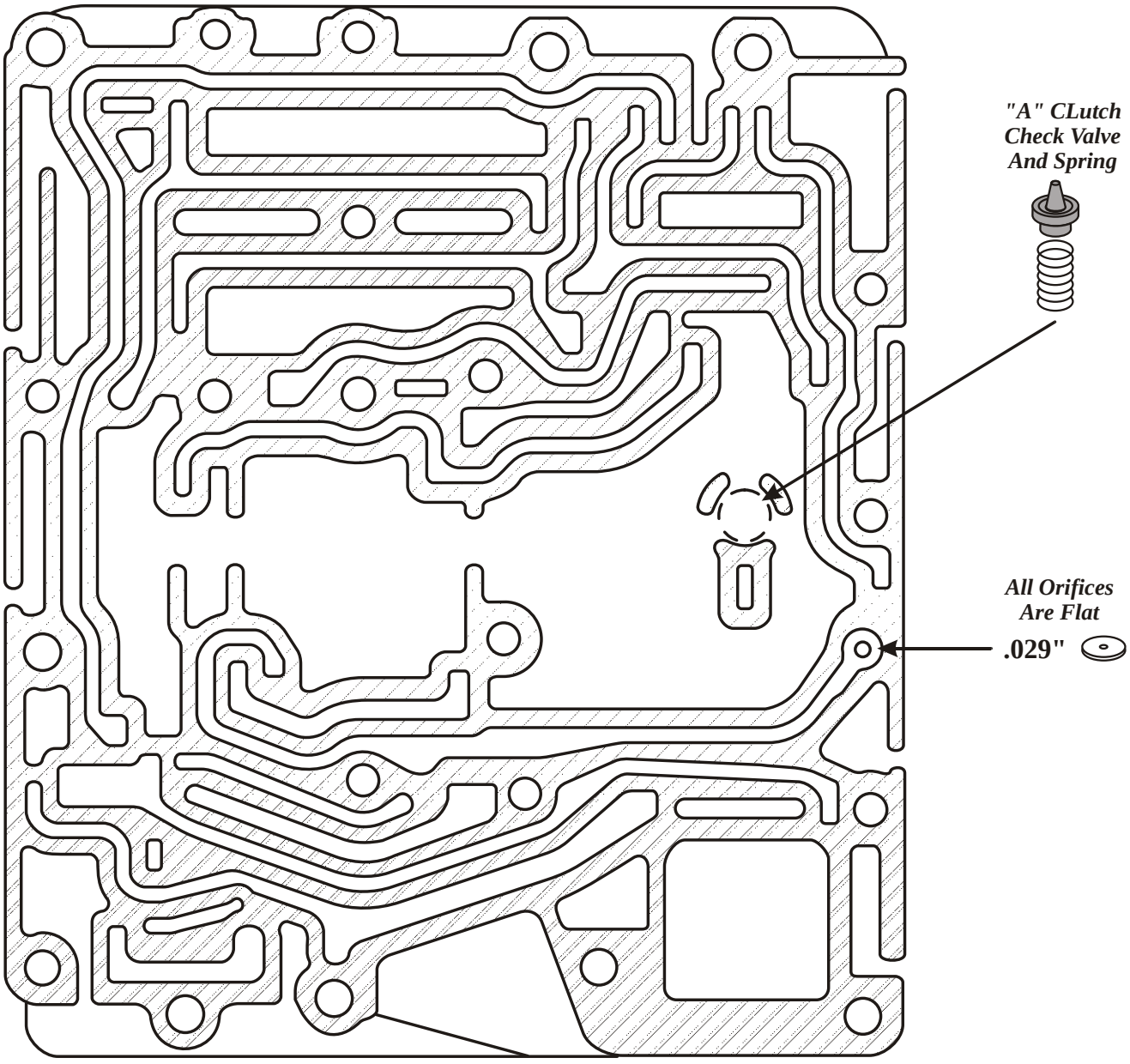


Figure 16

CHANNEL PLATE ORIFICE LOCATIONS

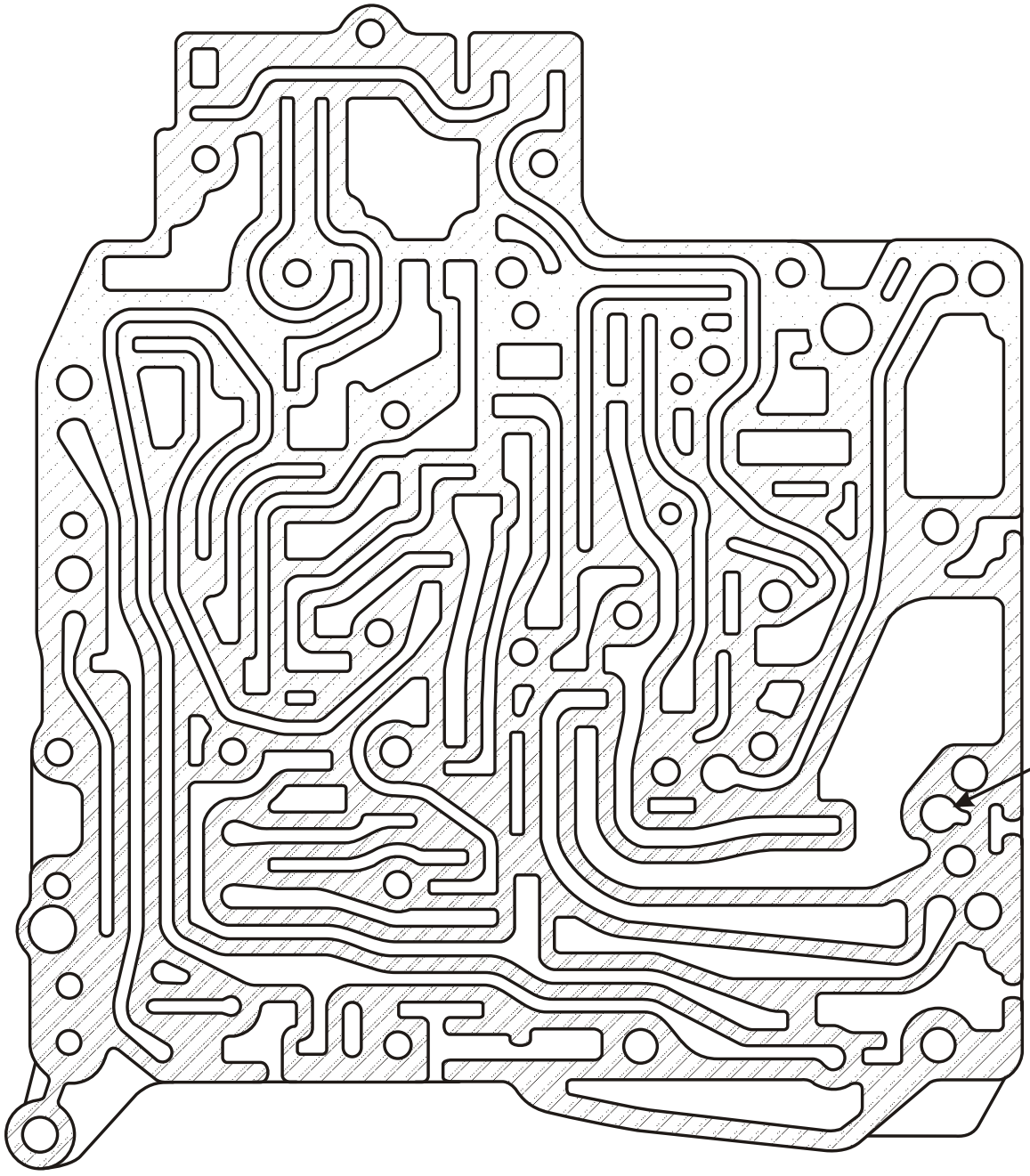


Figure 17

PRESSURE TAP LOCATIONS

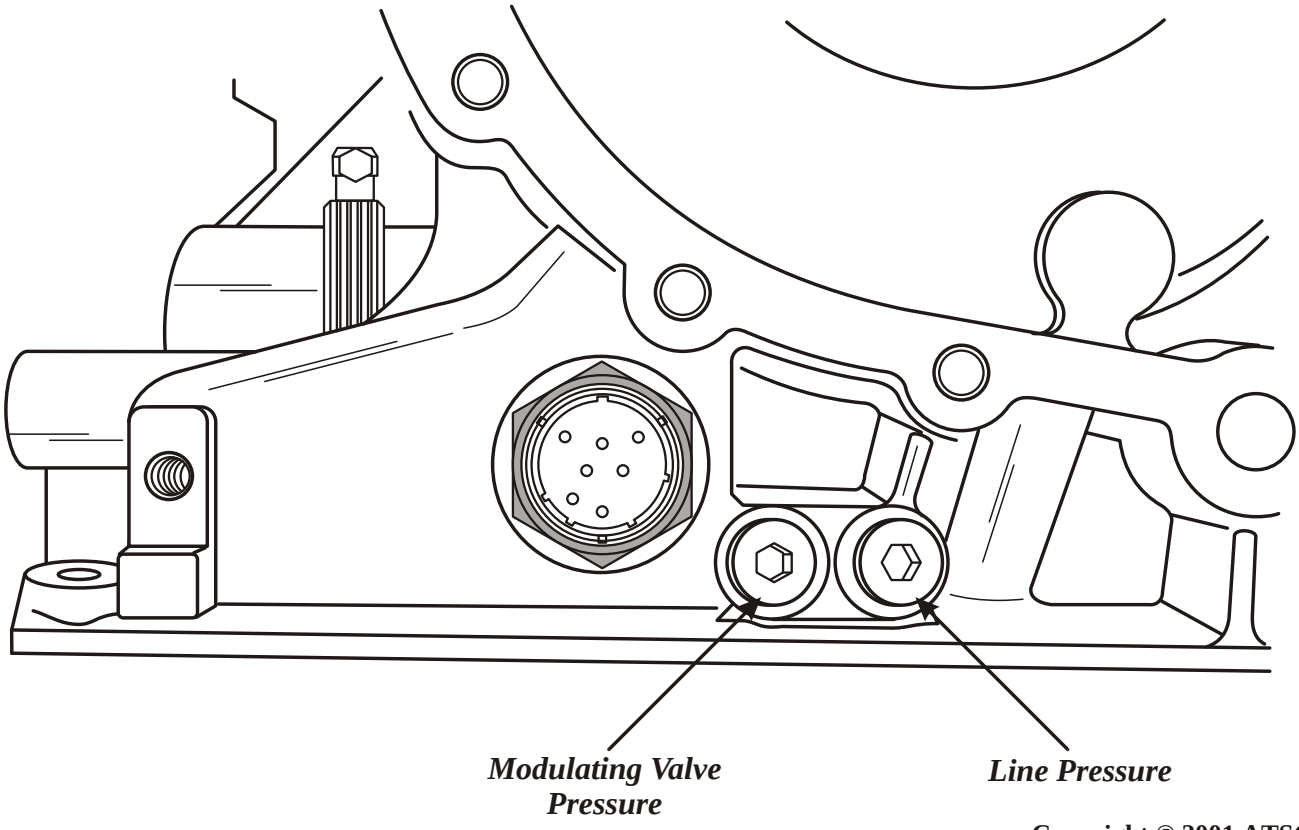


Figure 18

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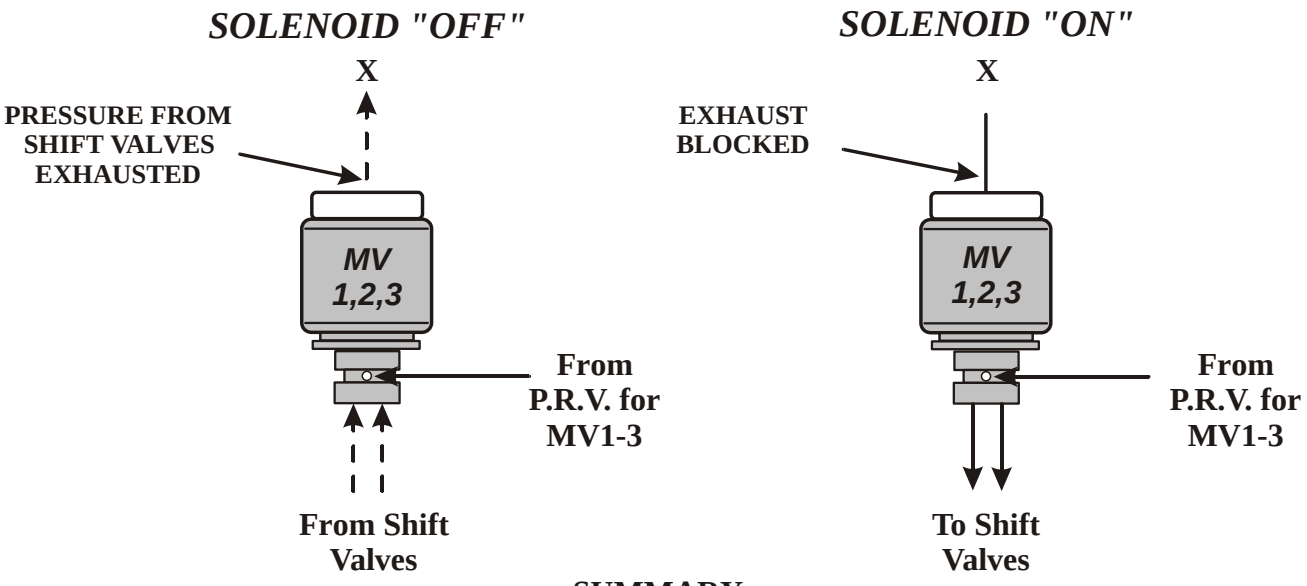
MV1, 2 AND 3

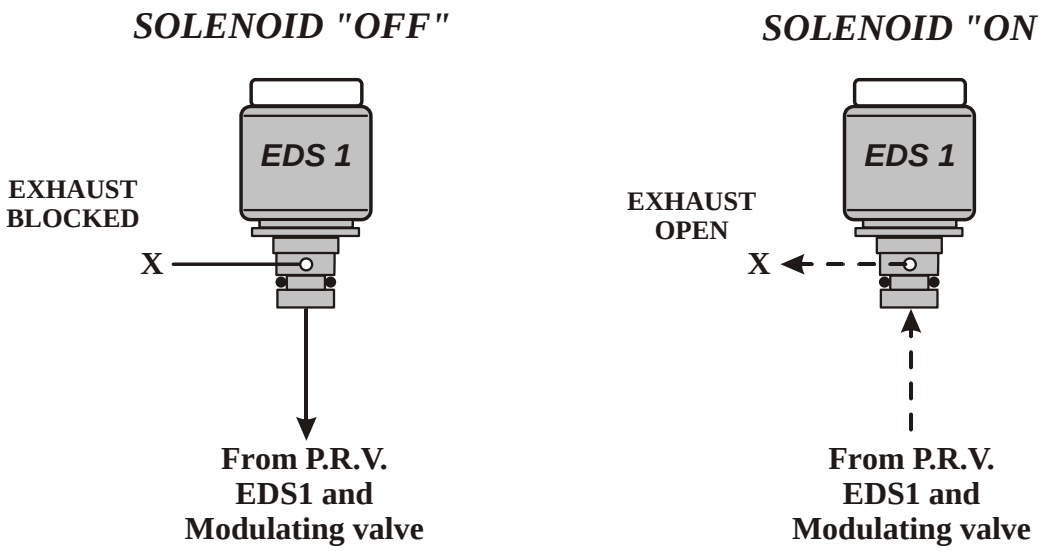


SUMMARY:

When MV 1, 2 or 3 is "OFF" Solenoid reducing pressure, from the Pressure Reducing Valve for MV1-3, is blocked by the solenoid and oil pressure from SV 1, 2, 3, the Safety Mode valve and the 1st and Reverse valve is exhausted at the rear of the solenoid.

When MV 1, 2 or 3 is "ON" Solenoid reducing pressure, from the Pressure Reducing Valve for MV1-3, is connected to SV 1, 2, 3, the Safety Mode valve and the 1st and Reverse valve stroking the valves.

EDS 1



SUMMARY:

When EDS 1 solenoid is "OFF," solenoid reducing pressure, from Pressure Reducing Valve for EDS1, is high to the Modulating valve which creates high line and accumulator back pressure.

When EDS 1 solenoid is "ON," solenoid reducing pressure, from Pressure Reducing Valve for EDS1, is low to the Modulating valve which creates low line and accumulator back pressure.

Figure 19

ZF INDUSTRIES

O.E. VALVE BODY RECONDITIONING KITS

ZF Industries has made available to the after market, original equipment valve body reconditioning kits. These kits include most of the valve springs, orifice plugs, small parts as well as pressure regulator and manual valves.

Currently, the kits available, are for the ZF5HP18 and the ZF5HP30.

(1) ZF5HP18:

Refer to Figure 1 for Upper Front Valve Body reconditioning parts identification.

Refer to Figure 2 for Lower Rear Valve Body reconditioning parts identification.

Refer to Figure 3 for Lower Front Valve Body reconditioning parts identification.

Refer to the chart in Figure 4 for the correct orifice usage in the channel plate section of the valve body.

Refer to Figure 5 for Valve Body Channel Plate reconditioning parts identification.

(2) ZF5HP30:

Refer to Figure 6 for Upper Rear Valve Body reconditioning parts identification.

Refer to Figure 7 for Lower Front Valve Body reconditioning parts identification.

Refer to Figure 8 for Lower Rear Valve Body reconditioning parts identification.

NOTE: Some springs and orifice plugs are dependant on valve body production numbers. The location of this number is found on the Lower Rear Valve Body as shown in figure 8.

Refer to Figure 9 for the Upper Valve Body Side of the Channel Plate reconditioning parts identification.

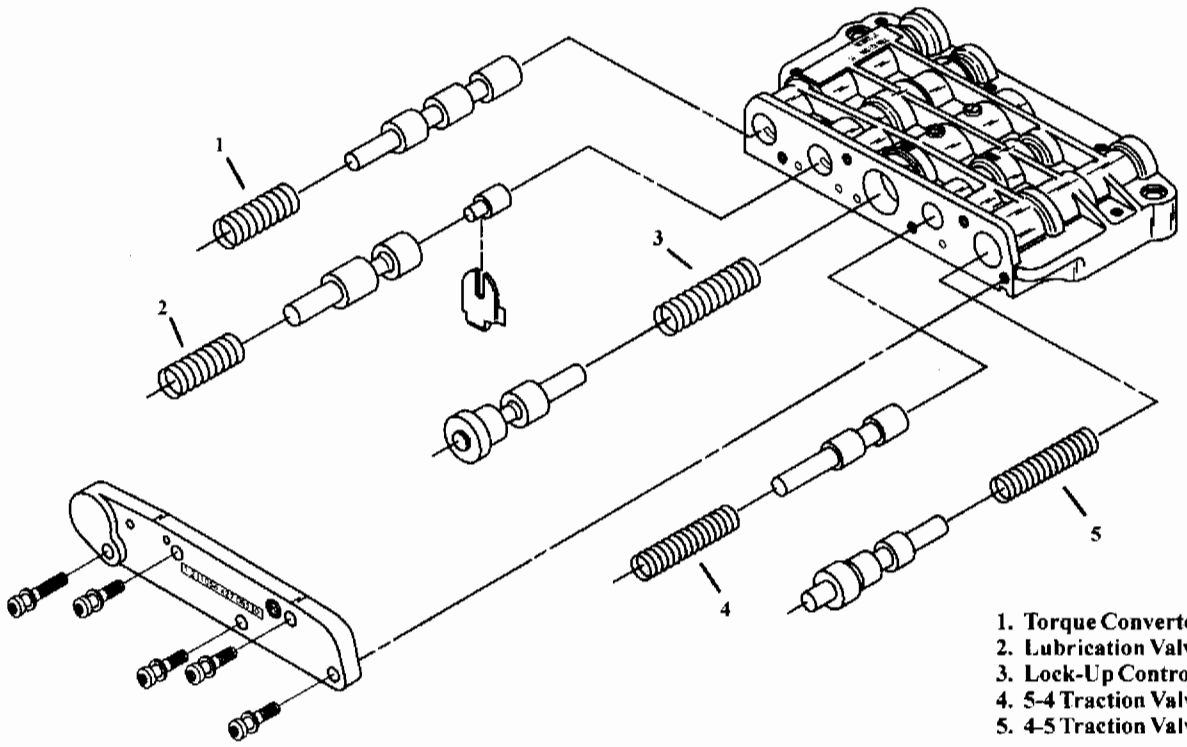
Refer to Figure 10 for the Valve Body Channel Plate reconditioning parts identification.

NOTE: Valve body production numbers are also required for correct valve body gasket usage.
Valve Body Gasket Set "A" is for use with #312 valve body and lower.
Valve Body Gasket Set "B" is for use with #316 valve body and higher.

SERVICE INFORMATION:
ZF5HP18 VALVE BODY RECONDITIONING KIT.....5HP18VBK
ZF5HP30 VALVE BODY RECONDITIONING KIT.....5HP30VBK

ZF5HP18 VALVE BODY KIT CONTENTS

UPPER FRONT VALVE BODY

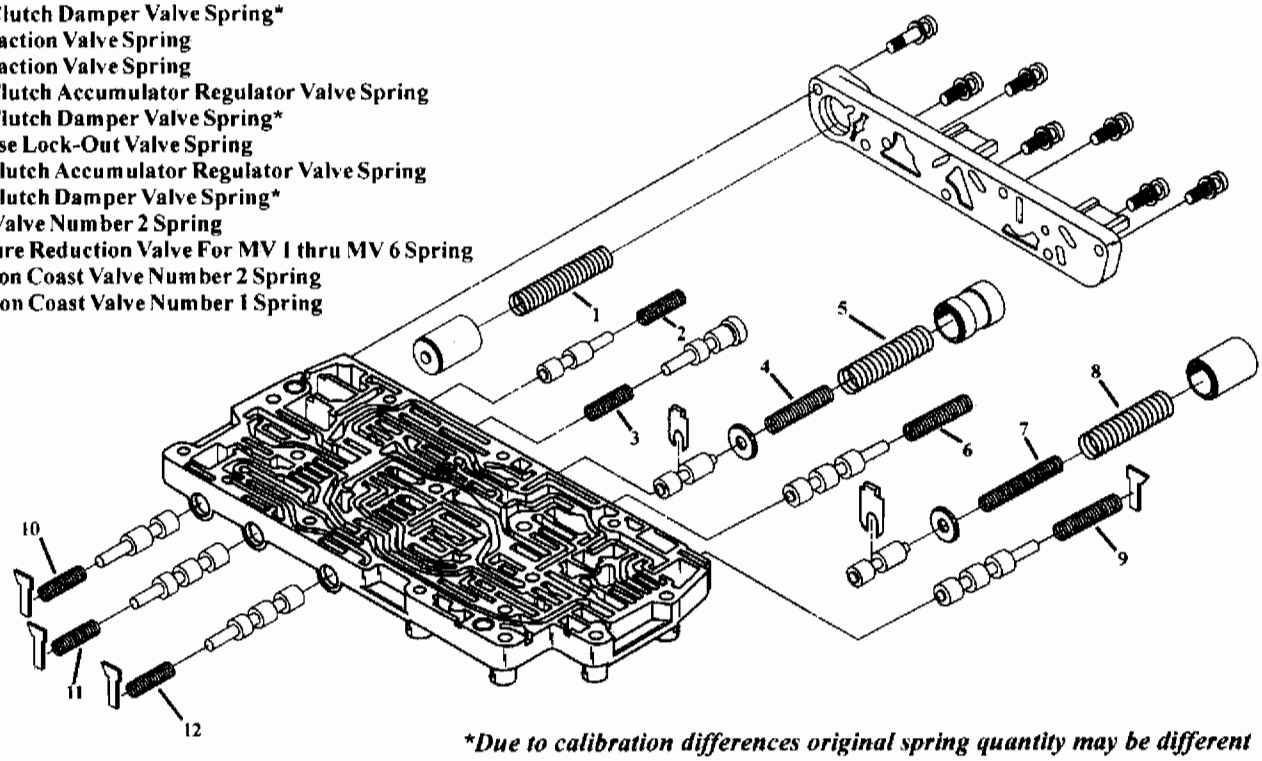


1. Torque Converter Valve Spring
2. Lubrication Valve Train Spring
3. Lock-Up Control Valve Spring
4. 5-4 Traction Valve Spring
5. 4-5 Traction Valve Spring

Figure 1

LOWER REAR VALVE BODY

1. "G" Clutch Damper Valve Spring*
2. 3-2 Traction Valve Spring
3. 2-3 Traction Valve Spring
4. "D" Clutch Accumulator Regulator Valve Spring
5. "D" Clutch Damper Valve Spring*
6. Reverse Lock-Out Valve Spring
7. "F" Clutch Accumulator Regulator Valve Spring
8. "F" Clutch Damper Valve Spring*
9. Shift Valve Number 2 Spring
10. Pressure Reduction Valve For MV 1 thru MV 6 Spring
11. Traction Coast Valve Number 2 Spring
12. Traction Coast Valve Number 1 Spring

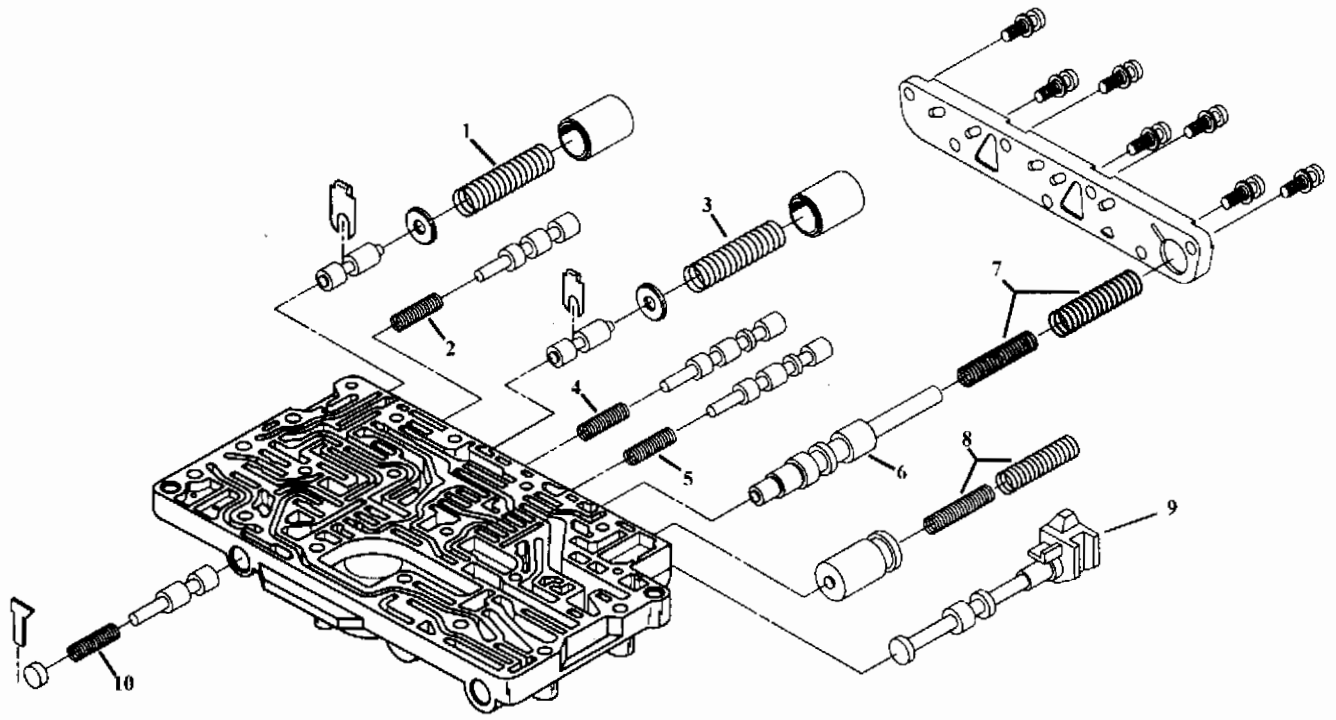


Due to calibration differences original spring quantity may be different

Figure 2

ZF5HP18 VALVE BODY KIT CONTENTS

LOWER FRONT VALVE BODY



1. "C2" Band Damper Valve Spring*
2. Shift Valve Number 4 Spring
3. "E" Clutch Damper Valve Spring*
4. Shift Valve Number 3 Spring
5. Shift Valve Number 1 Spring
6. Main Line Pressure Regulator Valve
7. Main Line Pressure Regulator Valve Springs
8. "A" Clutch Damper Valve Spring*
9. Manual Valve
10. "C1" Clutch Regulator And Damper Valve Spring

**Due to calibration differences original spring quantity may be different*

Figure 3

CHANNEL PLATE ORIFICE IDENTIFICATION		
ORIFICE SIZE (MM)	**ORIGINAL COLOR**	**V. B. KIT COLOR**
1.0	BLACK	BROWN
1.2	TAN	PURPLE
1.7	BLACK	YELLOW
1.9	TAN	GREEN

Figure 4

ZF5HP18 VALVE BODY KIT CONTENTS

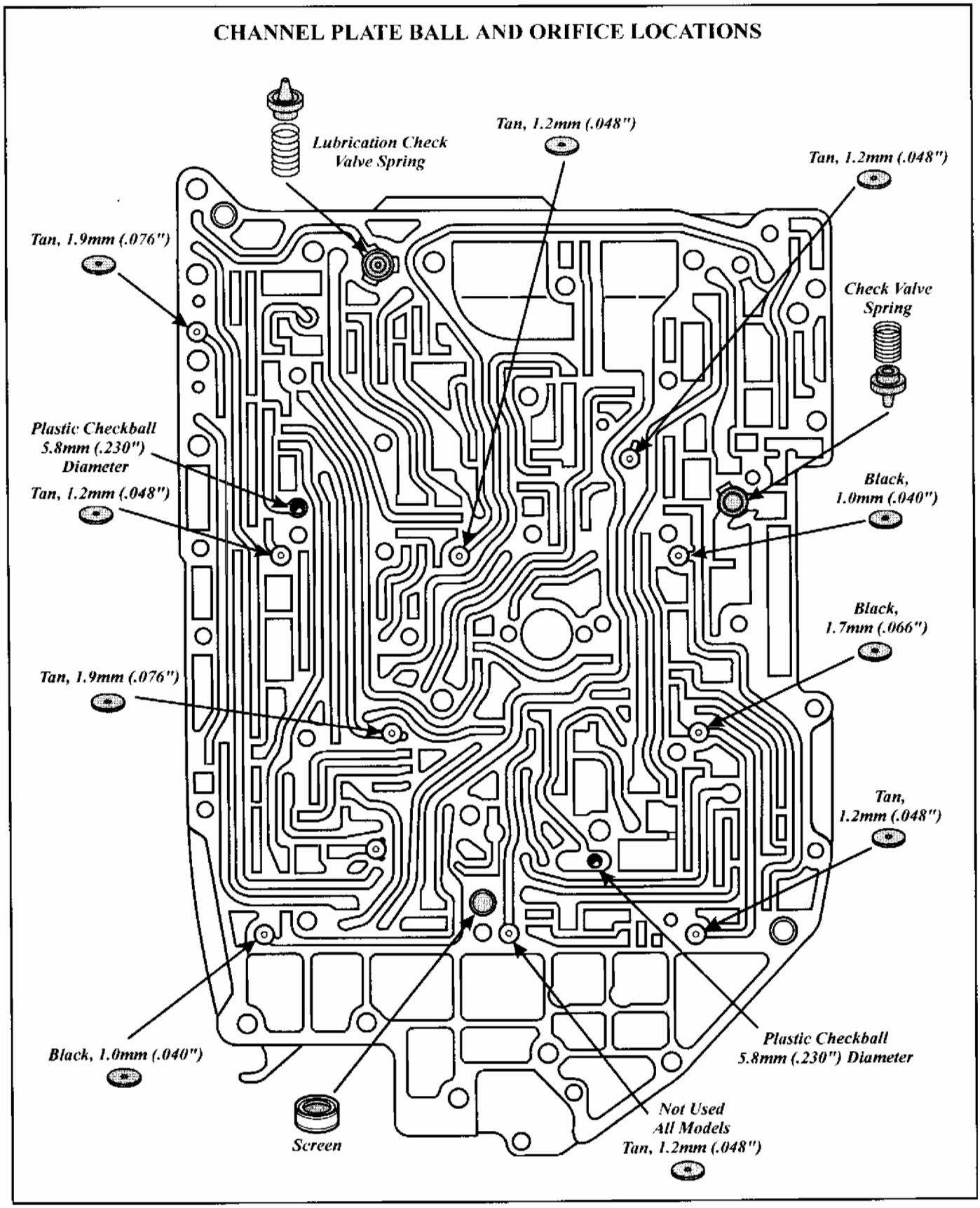
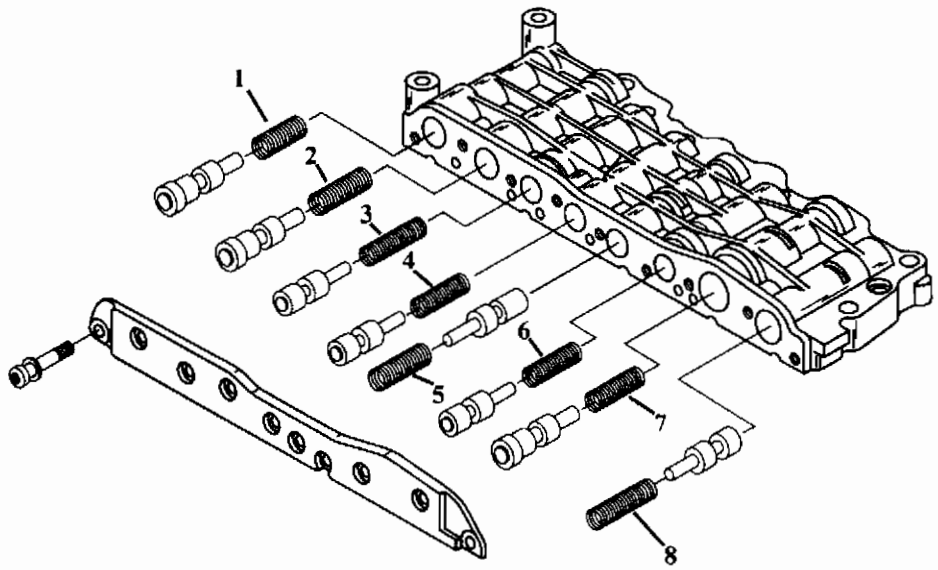


Figure 5

ZF5HP30 VALVE BODY KIT CONTENTS

UPPER REAR VALVE BODY



1. Clutch Valve "F" Spring
2. Clutch Valve "E2" Spring
3. MV Solenoid Regulator Valve Spring
4. EDS Solenoid Regulator Valve Spring
5. Clutch Valve "B" Spring
6. Clutch Valve "E1" Spring
7. Switch Valve For "A" Clutch Spring
8. Clutch Valve "A" Spring
9. 6.35mm (.250") Checkball

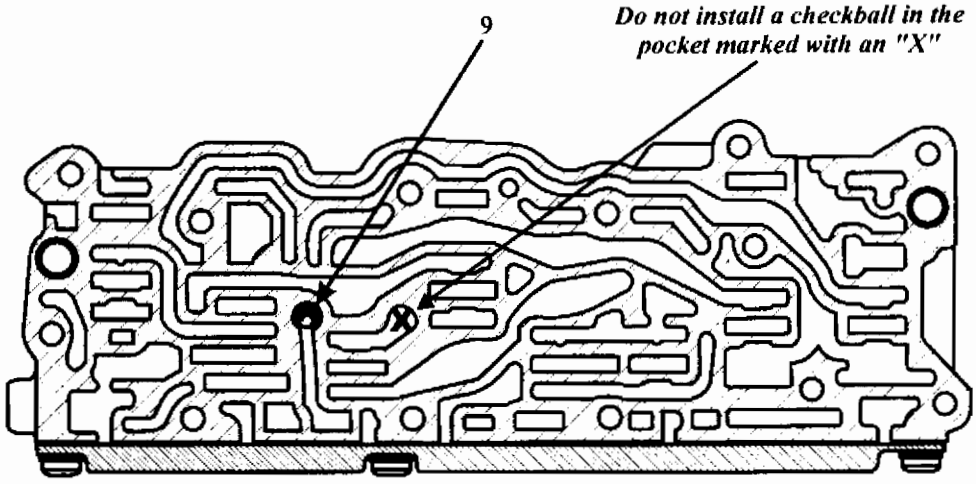


Figure 6

ZF5HP30 VALVE BODY KIT CONTENTS

LOWER FRONT VALVE BODY

1. Manual Shift Valve
2. Converter Clutch Apply Oil Control Valve Spring
3. Converter Clutch Release Oil Control Valve Spring
4. Main Pressure Regulator Valve
5. Main Pressure Regulator Valve Spring
*6. Lubrication Valve Spring "A" (For valve body #309 & under)
Lubrication Valve spring "B" (For valve body #312 & up)
7. Modulating Valve Spring
8. Main Regulator Valve For "B" Clutch Spring
9. Accumulator Valve For EDS 2 Solenoid Spring
10. Main Regulator Valve For "D" Clutch Spring
11. Accumulator Valve For EDS 4 Solenoid Spring
12. Accumulator Valve For EDS 5 Solenoid Spring
13. Accumulator Valve For EDS 3 Solenoid Spring

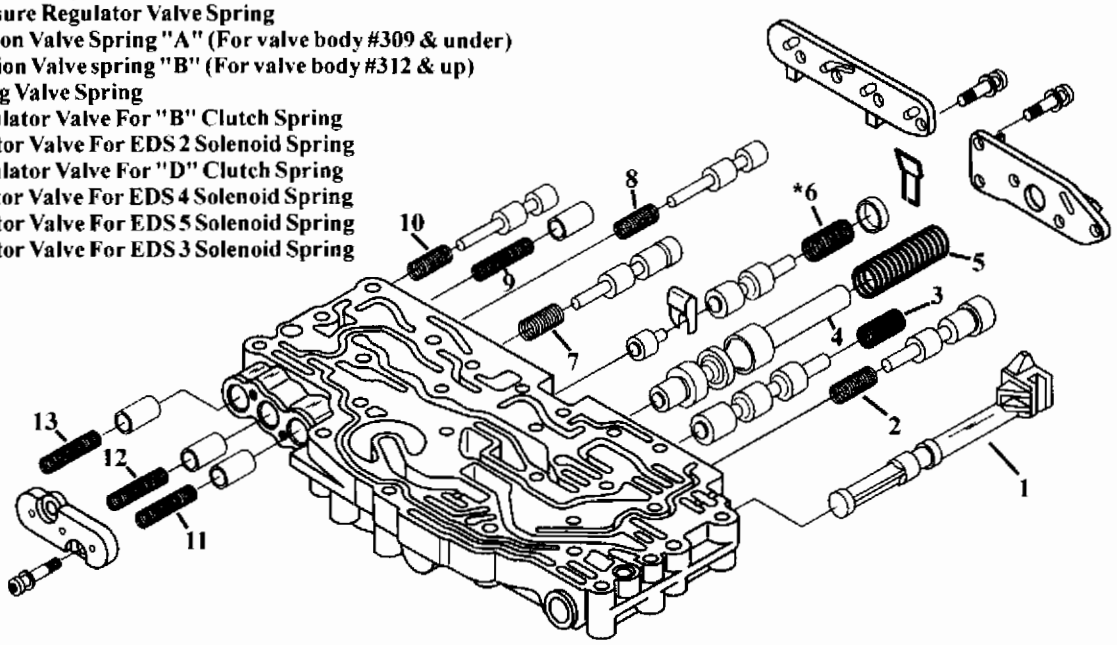
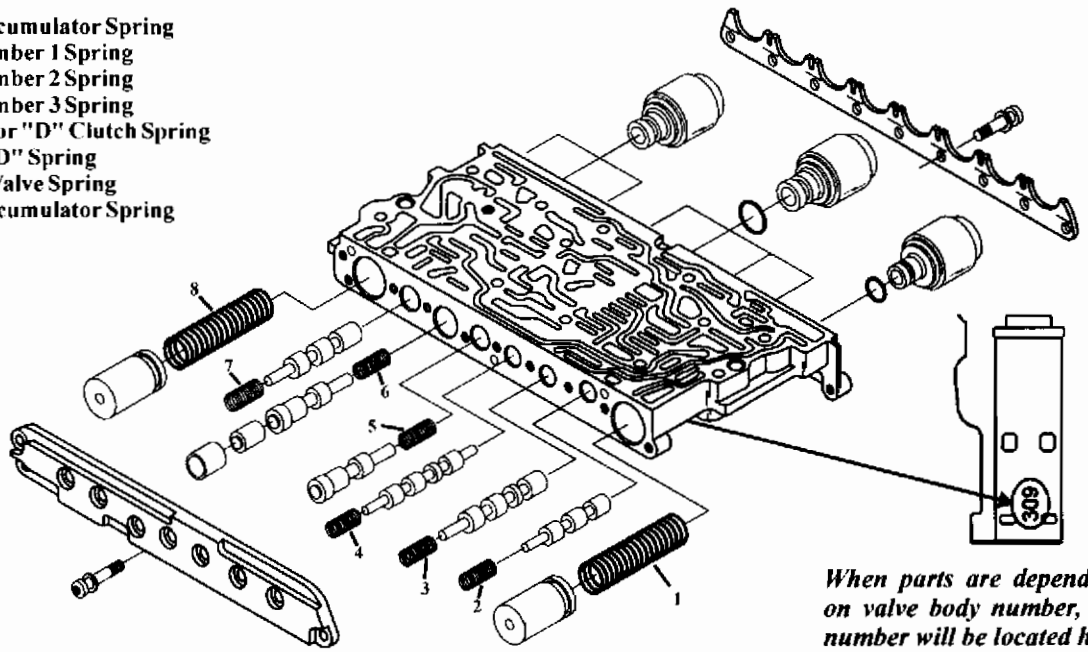


Figure 7

LOWER REAR VALVE BODY

1. "A" Clutch Accumulator Spring
2. Shift Valve Number 1 Spring
3. Shift Valve Number 2 Spring
4. Shift Valve Number 3 Spring
5. Switch Valve For "D" Clutch Spring
6. Clutch Valve "D" Spring
7. Reverse Gear Valve Spring
8. "C" Clutch Accumulator Spring



When parts are dependant on valve body number, the number will be located here on this valve body section.

Figure 8

ZF5HP30 VALVE BODY KIT CONTENTS

CHANNEL PLATE
UPPER VALVE BODY SIDE

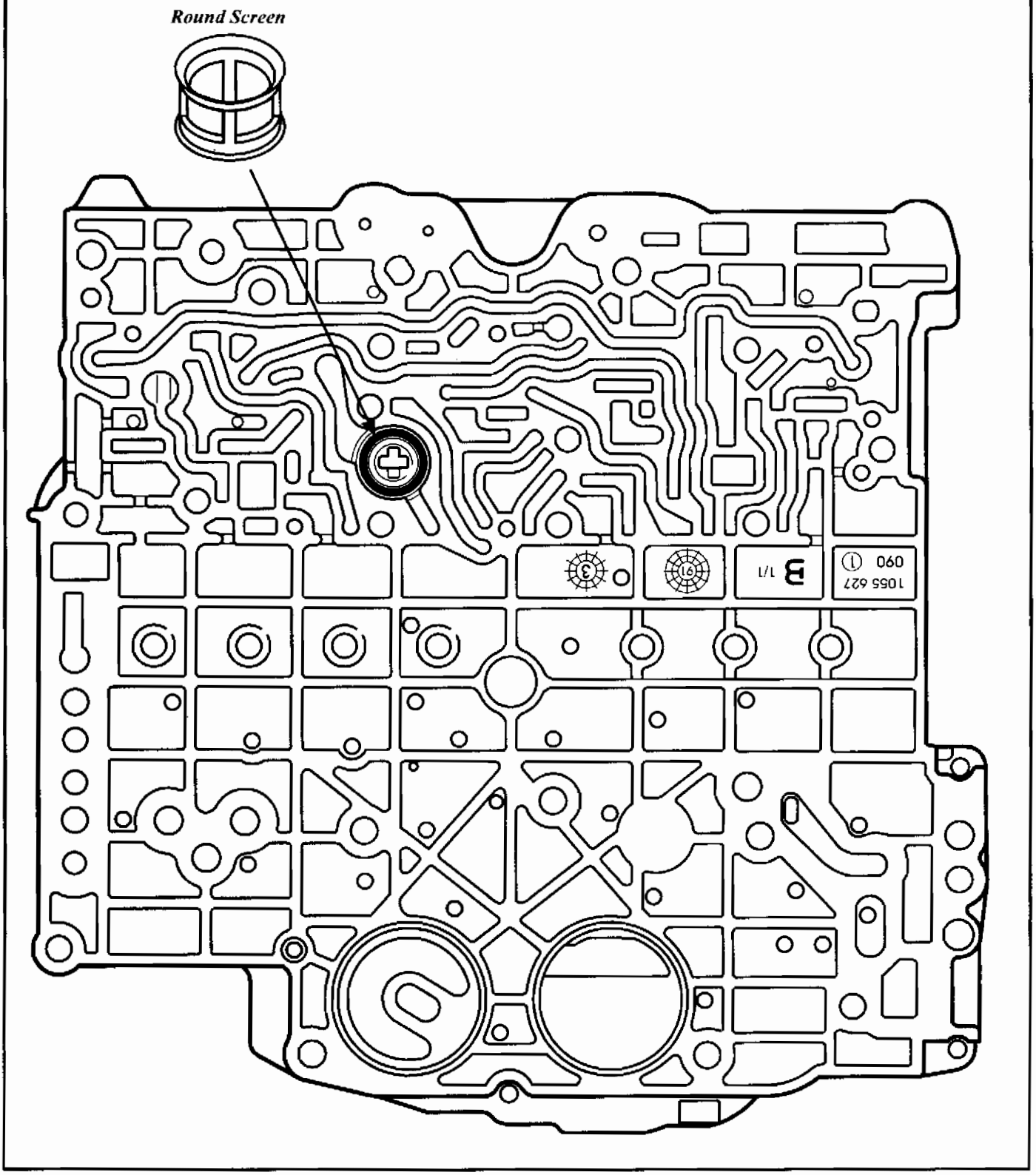


Figure 9

ZF5HP30 VALVE BODY KIT CONTENTS

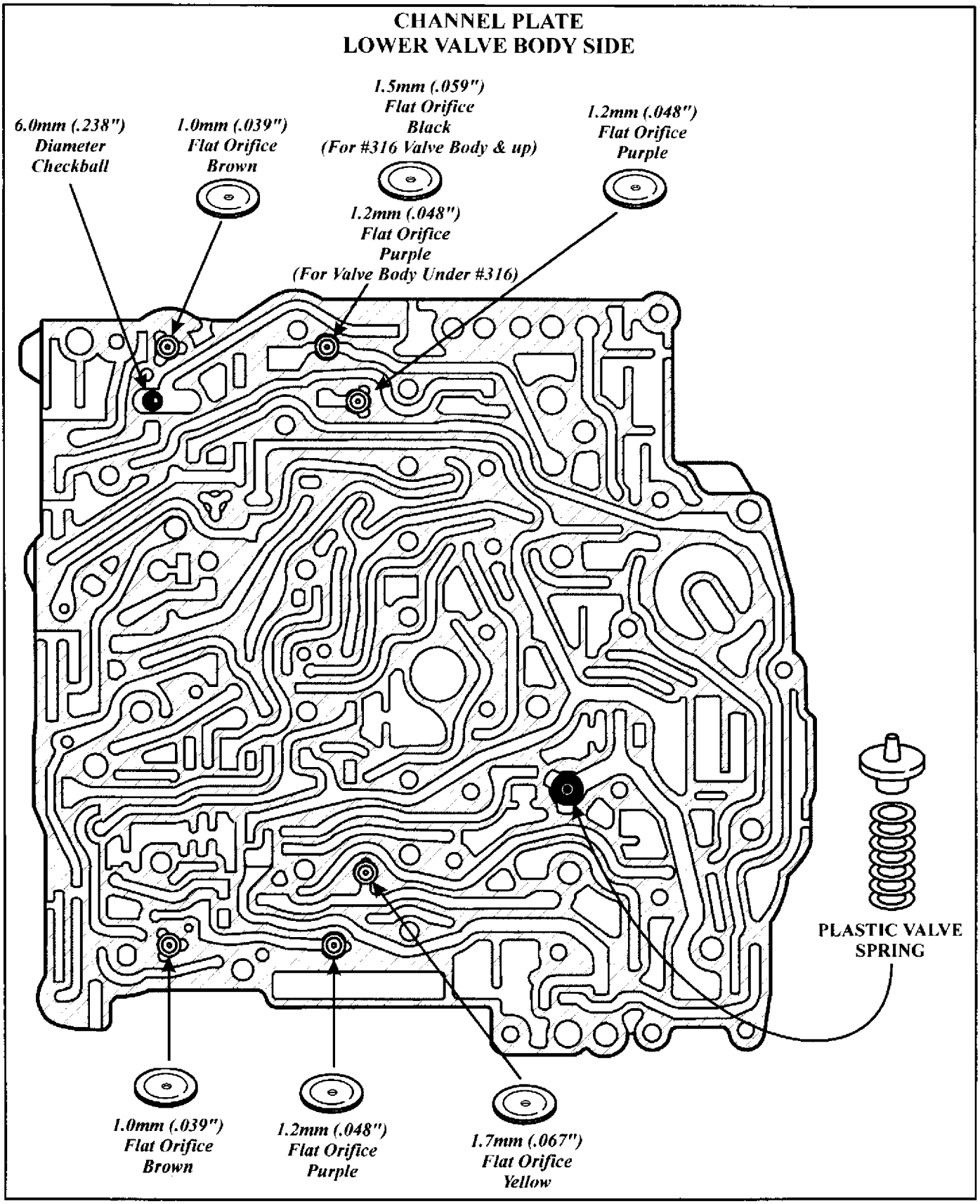


Figure 10

BLANK

Mitsubishi, Chrysler, Hyundai KM, F4A, W4A, A4F Units

No Reverse from Park or Neutral, Good Reverse from Drive

COMPLAINT: Going from Park or Neutral into reverse results in Neutral condition, but going from any forward range quickly into reverse gets a good reverse.

CAUSE: The computer is receiving a signal on Pulse Generator B (transmission output). This indicates to the computer that the vehicle is in motion, and it inhibits reverse. If the computer is erroneously getting the signal for Pulse Generator A (Transmission Input) on the wires for Pulse Generator B it will cause this condition. In Park and Neutral it is normal for there to be a signal on Pulse Generator A. In any forward range, when stopped, the input shaft is being held still so there is no signal on pulse generator A, so there is no erroneous signal on the computers Pulse Generator B wires.

CORRECTION: First confirm this is the problem. Unplug the Pulse Generators. If you now have good reverse then this is the problem.

Next, make sure the pulse generators are in the correct holes (See Figure 1). Pulse Generator A will always have either solid green wires, or a clear plastic cover. Pulse Generator B will have green wires with a black stripe, or a black plastic cover.

Pulse Generator B ALWAYS goes over the Pinion gear, by the differential. Pulse Generator A is located in the End Clutch Cover in most units and up by the cooling lines in some older units.

If the Pulse Generators are in the right holes, make sure they connect to the right wires in the vehicle wiring harness (See Figure 2). In ALL models the white wire and the black wire in the vehicle harness connect to Pulse Generator A at pins 1 and 2. The other two wires in the harness may be different colors for different vehicles, but they connect to Pulse Generator B at pins 3 and 4.

If everthing is connected correctly, make sure they are not connected to each other. Unplug the pulse generators and use an Ohmmeter to check the resistance between pin 1 and pin 3. This should be an open circuit. If your Ohmmeter gets any reading at all then replace the pulse generators. Readings as high as 2 MegOhms (Two Million Ohms) have caused this problem, so make sure your meter is set to its highest range.

Next, uplug the computer and check the resistance between all of the wires in the harness. Check from Pin 1 to Pin 2, then 1 to 3, then 1 to 4, then 2 to 3, then 2 to 4, then 3 to 4. They should all read open circuit. If any resistance is shown, repair the short circuit in the harness.

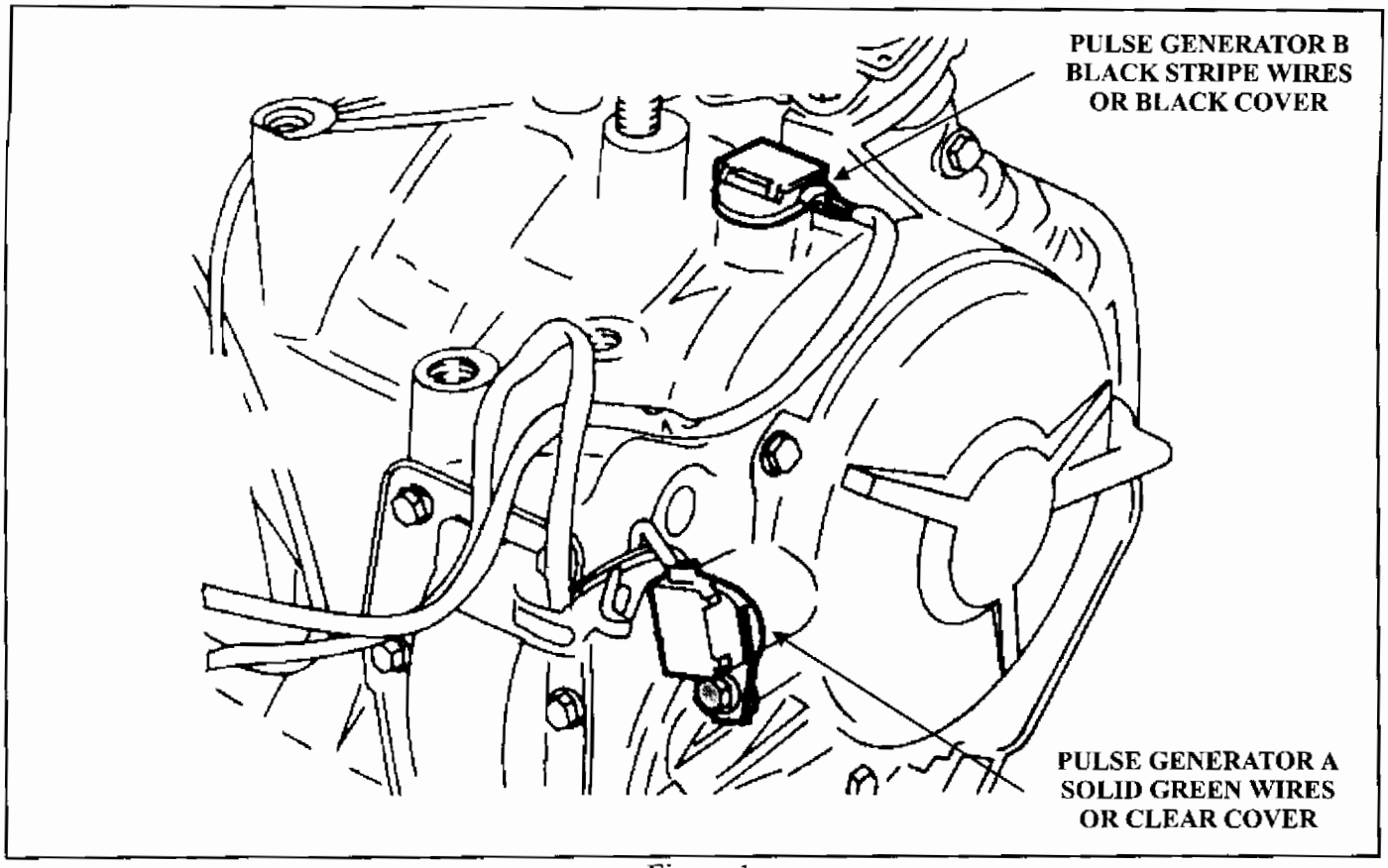


Figure 1

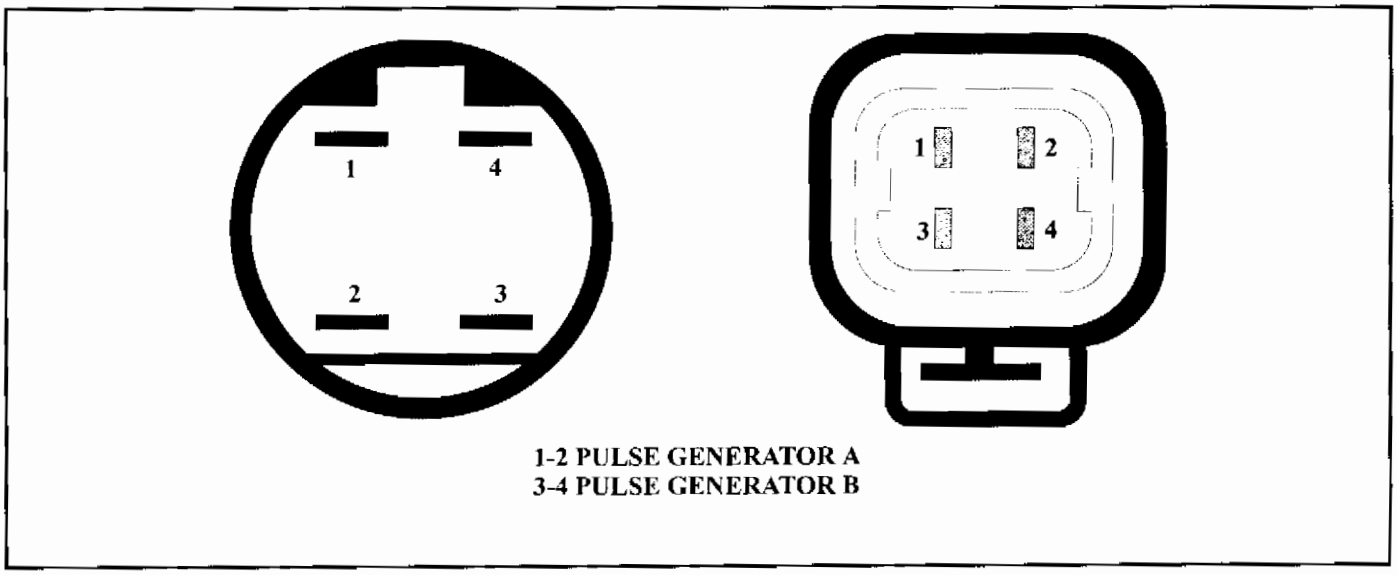


Figure 2