"2006" SEMINAR INFORMATION

INDEX
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"Top Tech Tricks for 2006" Seminar Information

Introduction

Thank you for attending ATSG's "Top Tech Tricks for 2006" technical training seminar. We strive to provide a quality seminar designed to help professionals like your self to stay on top of the trade with information that can be used to fix problems and repair transmissions for years to come. These seminars are presented across the US and Canada with a wide spectrum of technicians attending them so we encourage any suggestions that you may have. It is our interest to see the transmission industry prosper and that begins with getting the right price for a job done once. Getting the right price but doing the job 3 or 4 times hurts both the employee and the employer. Without question, training and information make for great companions in transmission repair. You can submit your suggestions by either e-mail or snail-mail. To send by e-mail, please use atsgsem@atsg.biz or atsgsem@atsgmiami.com. By snail-mail please use the address located at the bottom of the page. Thank you.

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Lubegard

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Rostra

DODGE TRUCKS & VANS WITH RE RWD TRANSMISSIONS

ERRATIC GOVERNOR PRESSURE

COMPLAINT: The vehicle shuttle shifts and when governor pressure is checked it is erratic. The governor pressure sensor voltage, when checked, matches the pressure gauge, it too is erratic. No codes are stored.

CAUSE: The area of the valve body where the governor pressure control solenoid and the governor pressure sensor are located is warped (Refer to Figure 1).
When this area is warped governor pressure from the solenoid to the sensor is leaking causing erratic governor pressure which causes the erratic sensor signal voltage (See Figure 2). This results in oil at the tip of the sensor to vary which causes the sensor to vary the signal voltage. The PCM will react by varying the solenoid operation which will result in erratic governor pressure.

CORRECTION:
Check the crush on the solenoid/sensor gasket which might reveal warpage in this area. Flat sand the solenoid/sensor mounting block as well as that area of the transfer plate section of the valve body (Refer to Figure 3).

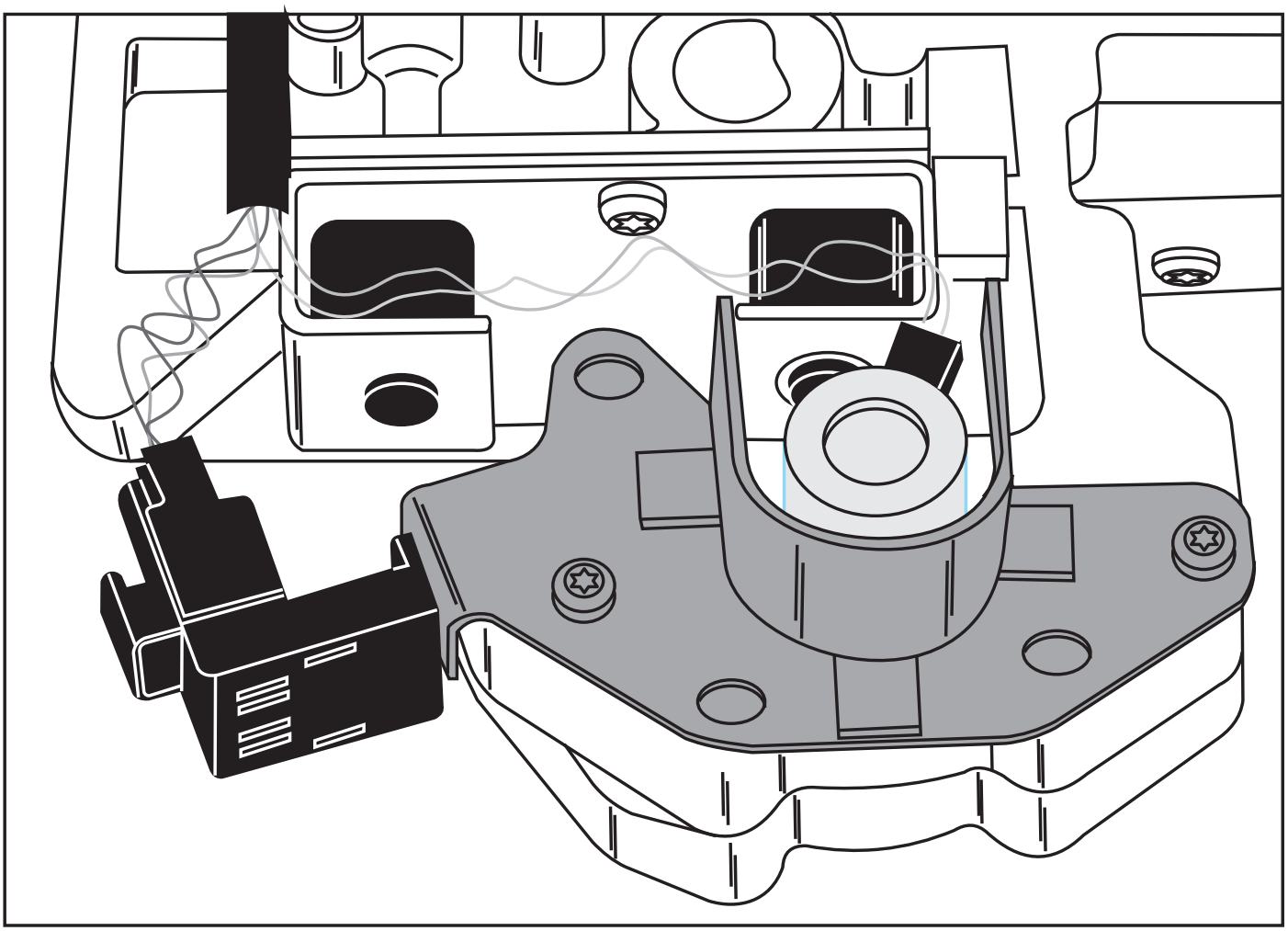


Figure 1

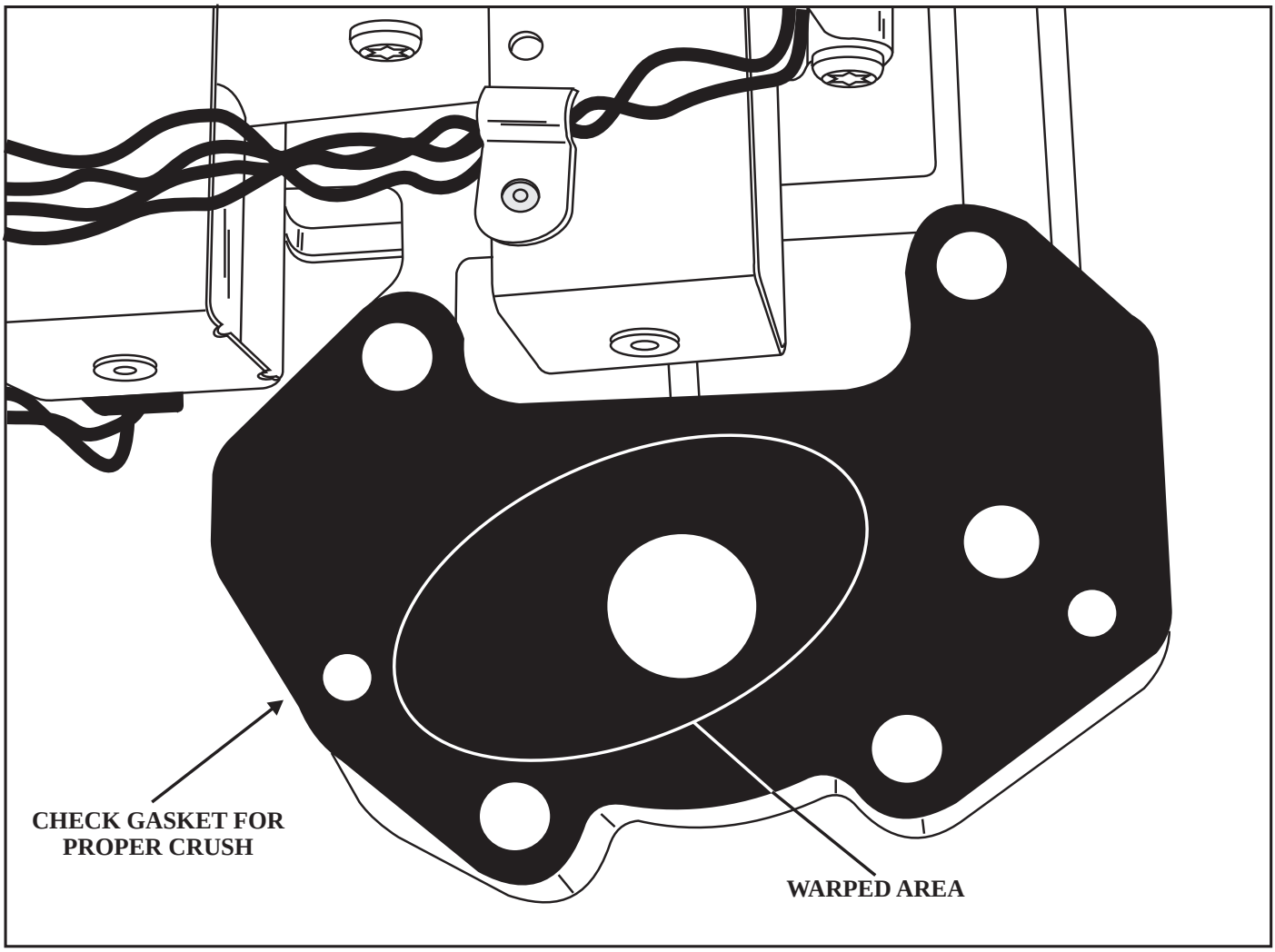


Figure 2

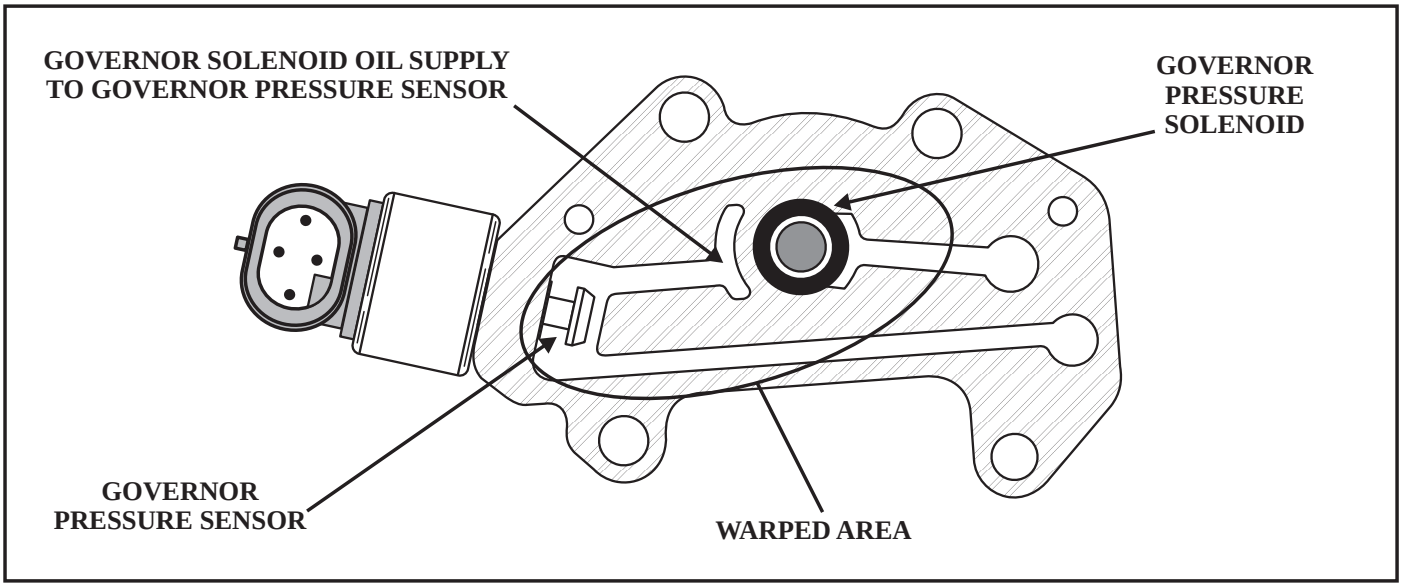


Figure 3

SLIDE

CHRYSLER RE RWD TRANSMISSIONS

IN AND OUT OF LOCKUP

COMPLAINT: Vehicles with the RE RWD transmissions cycling in and out of lockup

CAUSE: Possibly noise on the TPS signal wire.

CORRECTION: There are many causes for electrical noise. We most strongly recommend that you repair the SOURCE of the noise rather than filtering the noise. Often the source can be elusive, or repairing the source expensive. In these cases, the noise may be filtered out of the signal using an L-C type "pi" filter on the TPS signal line. These filters are readily available at any car stereo installation shop, and many retail electronics outlets (Echlin RD-13 or equivilent). It is fairly simple to assemble your own as well.

To build an L-C "pi" filter you will need the following:
.68 µH (micro henry) Choke Coil (Jameco 372103 or equiv)
1 µF (micro farad) Capacitor (Jameco 10867PS or equiv)
4700 µF (micro farad) Capacitor (Jameco 93673PS or equiv)
A box to mount it in (Jameco 18913 or equiv)
1 crimp on Ground Ring (Jameco 302762 or equiv)
2 butt connectors (Jameco 320562 or equiv)
Some wire (12" blue, 12" black, 12" violet)
Some solder
(Optional) enough Epoxy to fill the box

(A complete assembled unit is available from ATSG. Jameco parts may be obtained at http://jameco.com, or your local professional electronics parts store.)

Solder the parts together as shown in the schematic in Fig 1, and the pictorial in Figure 2. Install the filter by cutting the TPS signal wire and feeding that signal through the blue wire in the filter (the 1 µF side to the TPS and the 4700 µF side to the computer), then ground the black ground wire to a good ground (the better the ground, the cleaner the signal) as shown in figure 3.

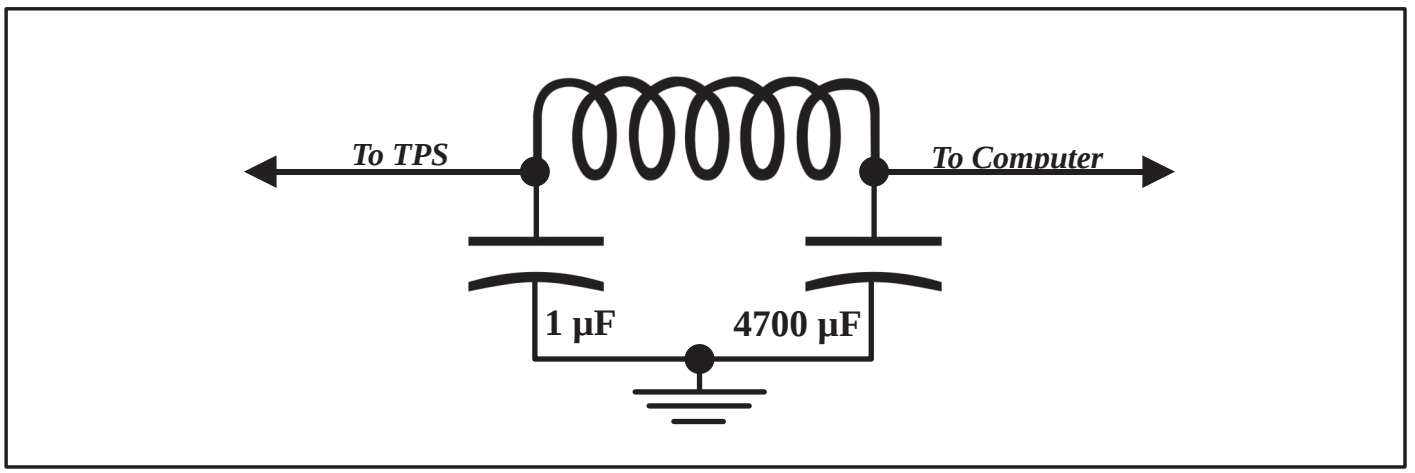


Figure 1

SLIDE

CHRYSLER RE RWD TRANSMISSIONS

IN AND OUT OF LOCKUP

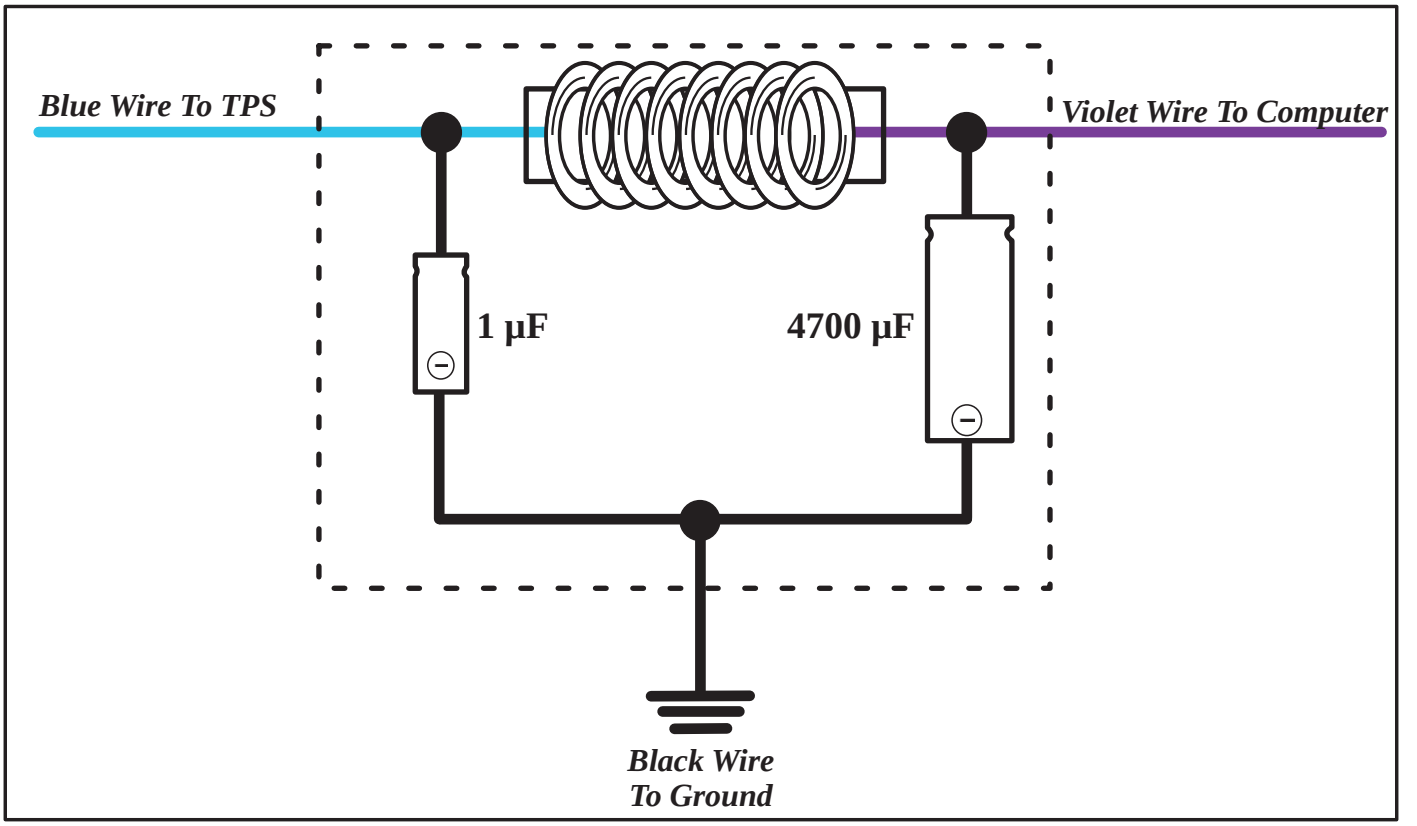


Figure 2

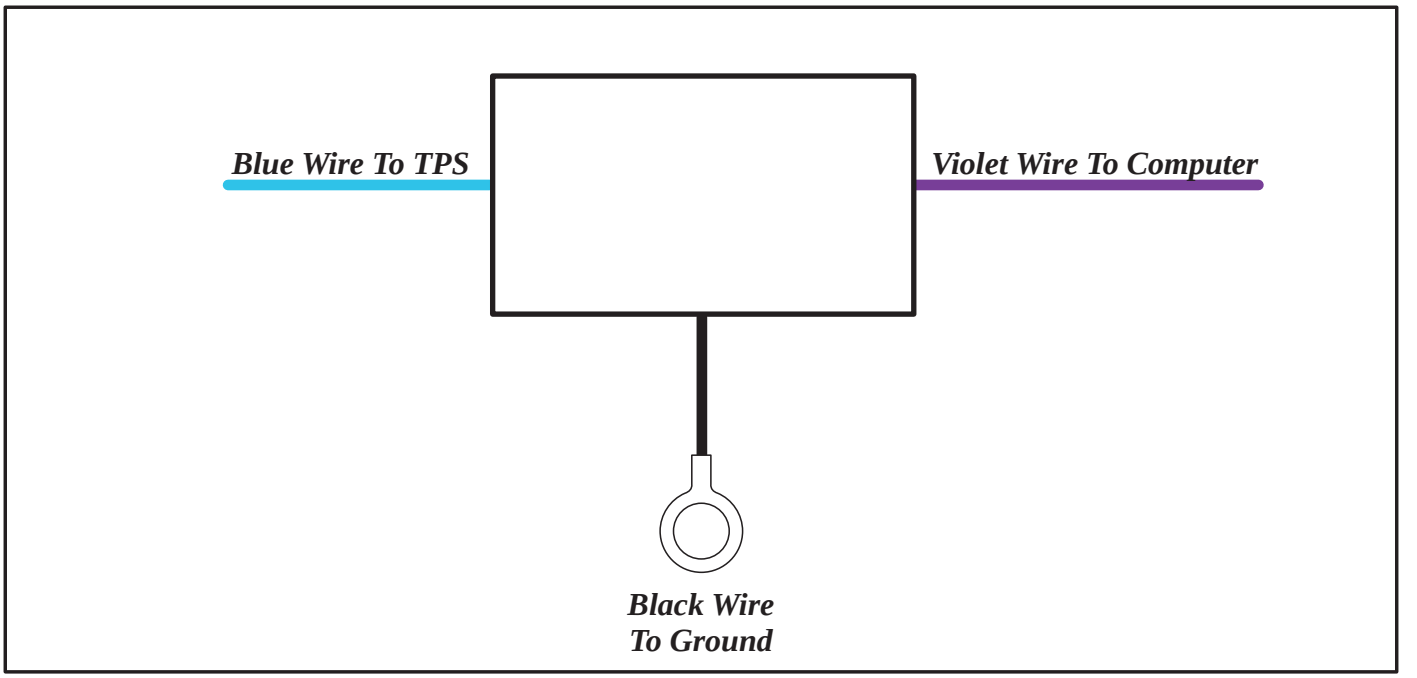


Figure 3

91-93 HONDA ACCORD

"S" OR "D4" LIGHT ALWAYS ON AND STUCK IN HIGH GEAR

COMPLAINT: In vehicles equipped with an "S" or "Sport" light, that light stays lighted all the time. In other vehicles the "D4" light remains lighted all the time. Codes cannot be retrieved. Vehicle is stuck in third gear except when shifter is in manual 2 or manual 1 position, then vehicle is in second gear.

CAUSE: One cause of this problem is a bad computer. A specific logic circuit has fried due to other problems in the power supply section of the computer.

CORRECTION: Repair the affected areas of the computer, or replace the computer.

The repair for this particular problem is fairly easy to do. No proprietary parts are required, so they may all be found at the local electronics store. Only moderate soldering and board repair skills are required. There are 5 parts to replace, one jumper to install, one bridge to install, and two trace cuts to make.

PARTS:

1 220 µF (Micro Farad) 10 WVDC Capacitor
1 330 µF (Micro Farad) 35 WVDC Capacitor
1 33 µF (Micro Farad) 10 WVDC Capacitor
2 15 Ohm 1/2 Watt resistors
1 6 inch #24 jumper wire
Solder

TOOLS:

Soldering Iron
Razor knife or Dental Tool
Screwdriver, Philips
Needle Nose Pliers
Wire Cutters

Optional:
Desoldering tool or iron
Small rotary tool

PROCEDURE:

Step 1: Remove and replace C32 with 330 µF Capacitor (see figure 1)
Step 2: Remove and replace C33 with 33 µF Capacitor (see figure 1)
Step 3: Remove and replace C28 with 220 µF Capacitor (see figure 1)
Step 4: Remove and replace R41 and R42 with 15 Ohm 1/2 Watt resistors (see figure 1)
Step 5: Solder a Jumper wire from the trace where pins 1 and 14 of the main connector are, and the small pad in the middle of the ground plane where R51 is connected. (see figures 2 and 3)
Step 6: Make a solder bridge between the ground plane and the next trace in (which goes to the top of the board, then to R51) (see figures 2 and 3)
Step 7: Make a cut in the trace you just bridges to just above the bridge. (see figures 2 and 3)
Step 8: Make a cut in the trace that starts at D23 (see figures 2 and 3)

90-93 HONDA ACCORD

"S" OR "D4" LIGHT ALWAYS ON AND STUCK IN HIGH GEAR

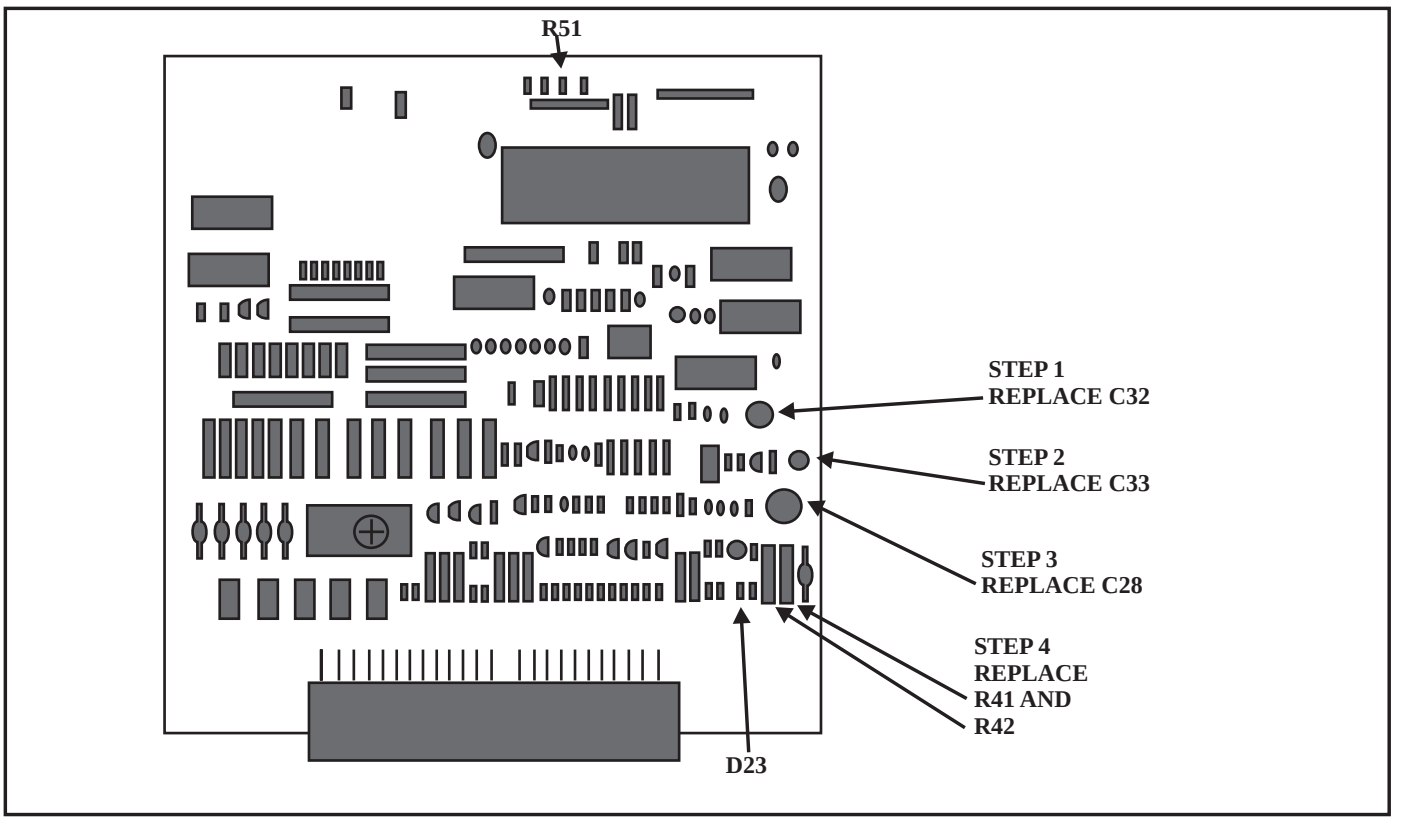
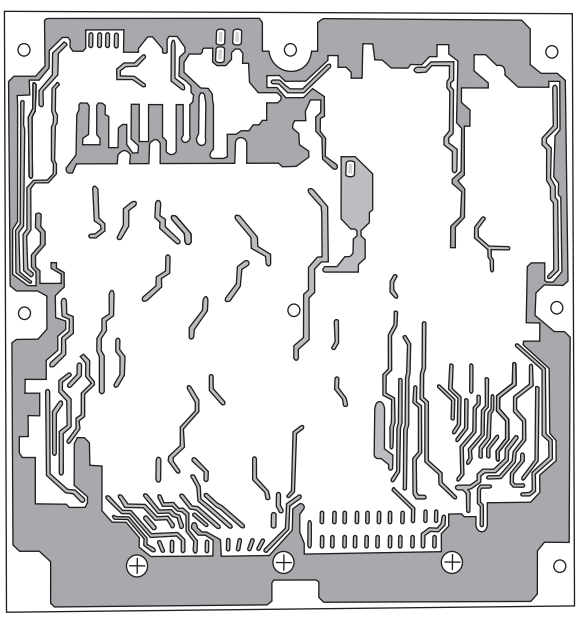


Figure 1



**SOLDER SIDE OF BOARD
BEFORE REPAIRS**

Figure 2

90-93 HONDA ACCORD

"S" OR "D4" LIGHT ALWAYS ON AND STUCK IN HIGH GEAR

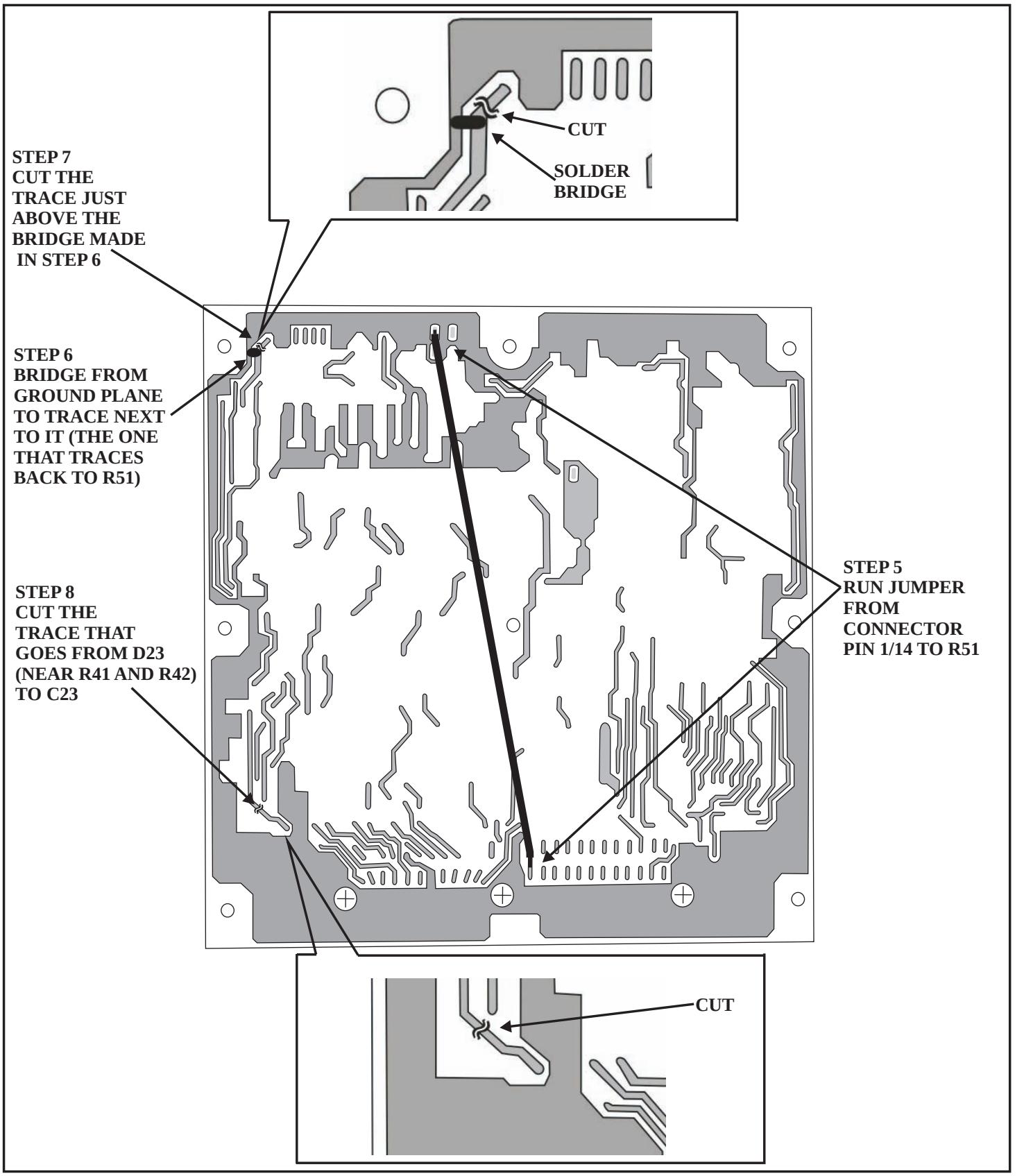


Figure 3

DODGE, CHRYSLER, HYUNDAI & MITSUBISHI

BROKEN PUMP F4A41/42/51 SERIES TRANSAXLE

COMPLAINT: Vehicles equipped with the F4A51 transaxle may exhibit a no move condition. Fluid level may read high and condition is described as good.

CAUSE: The cause may be broken pump gears and or severely damaged pump assembly. Pieces of Low/Reverse spiral cushion wave spring (Figure 1) located on top of the Low/Reverse clutch assembly (Figure 2) may be found lodged between the pump gears (Figure 3). When the filter is cut open, there is a 3 to 4 inch section of filter media that is not crimped along edge of filter halves during assembly. This allows the broken wave spring to enter the pump assembly (Figure 4).

CORRECTION: Replace pump and filter. Some after market filters have been found to have no problems with the filter media assembly.

Update Low/Reverse spiral cushion wave spring to a one piece circular wave spring.

Note: One other issue that plagues this transmission is front seal leak and or damaged pump bushing after rebuild within as little as a few minutes during road test or in a couple of days. The original pump assembly is aligned during manufacturing and there are no leading edges or alignment pins to align the pump. There is an alignment tool available from Sonnax part number #41005-TL (Figure 5). With the alignment tool in place torque the pump bolts to 80 - 85 inch pounds as shown in figure 6.

Do not attempt to align pump with the torque converter. This procedure when attempted has had disastrous results.

The only other alternative method to aligning the pump without the tool would be to assemble the pump body and cover with the bolts finger tight. Place the pump in the rear case half with the transfer gear removed. (Figure 7) Bolt the front case half onto the rear case. Then from the back of the rear case, with a 3/8" extension, swivel adapter and #30 torx bit, tighten the pump bolts. (Figure 8) Remove the pump from the case and torque to the specifications listed above. ***This procedure should only be considered as a last resort if the alignment tool is not available at the time of assembly.***

SERVICE INFORMATION:

Spring A/T.....2741 A 007

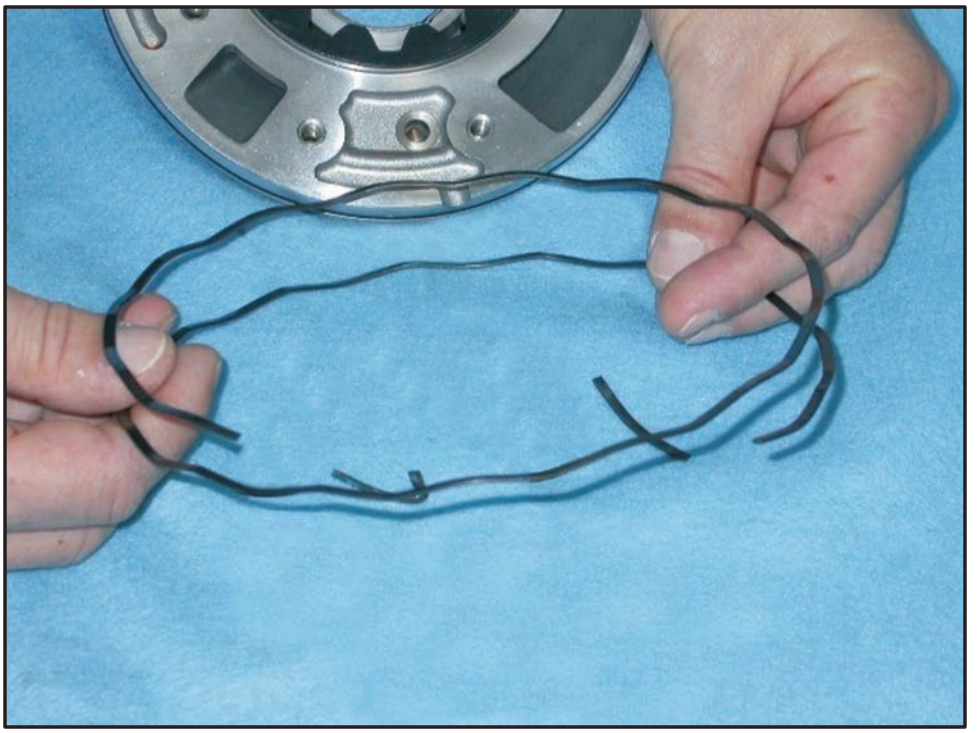


Figure 1

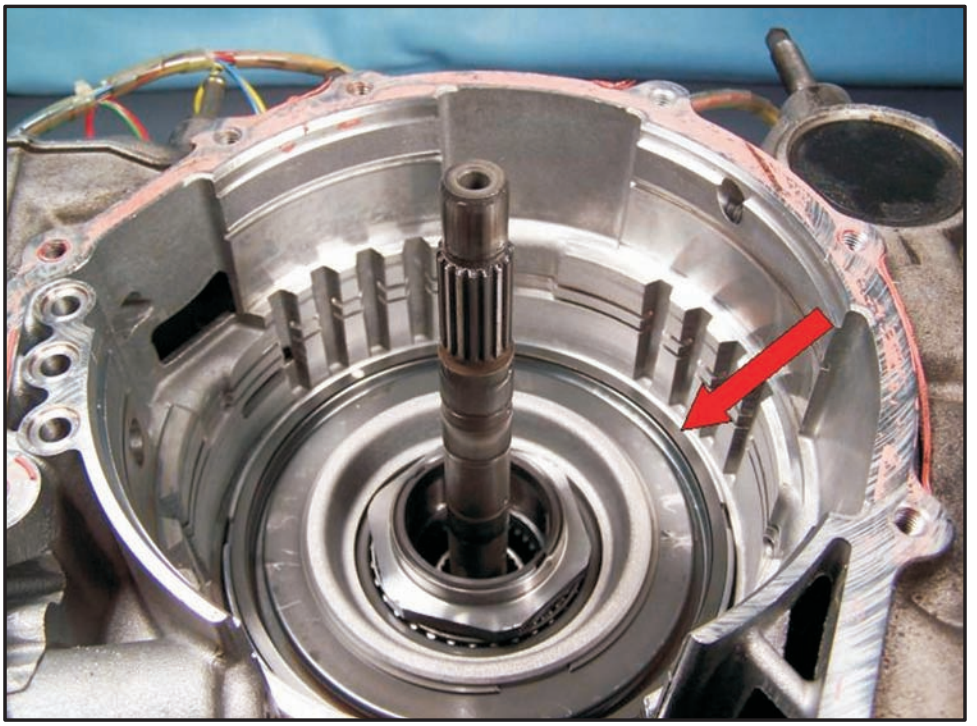


Figure 2

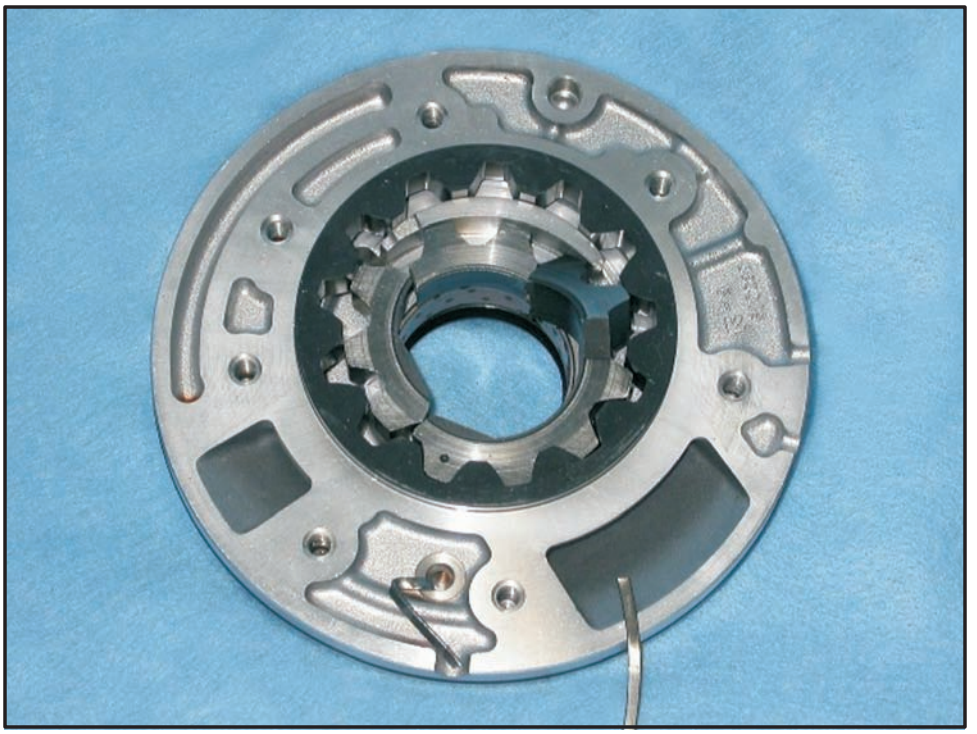


Figure 3

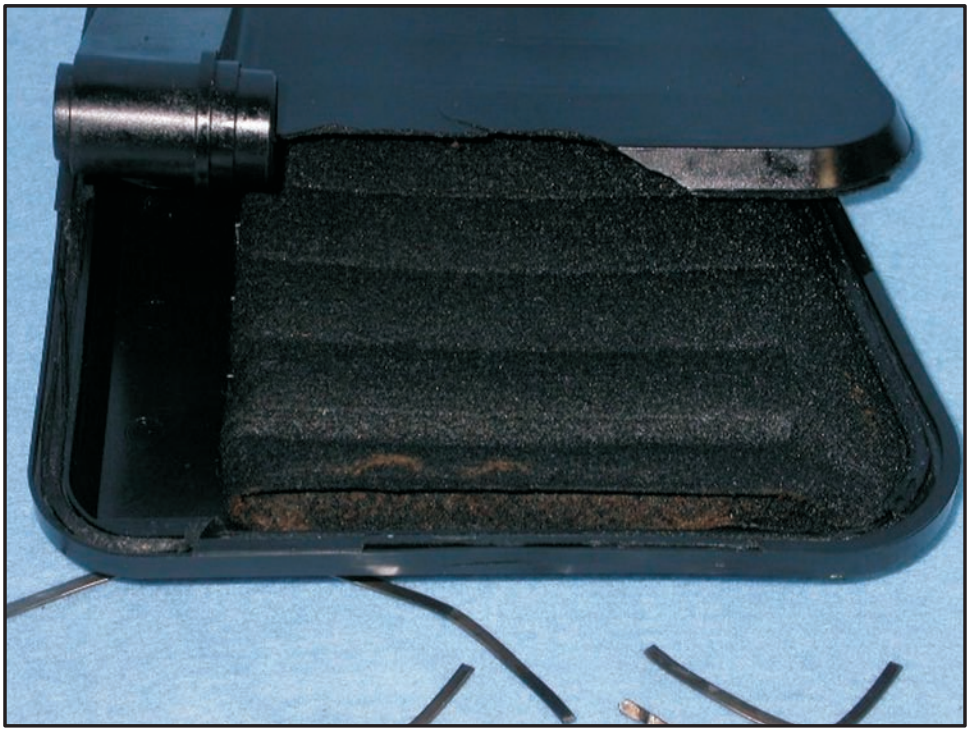


Figure 4

SONNAX® KM PUMP ALIGNMENT TOOL #41005-TL

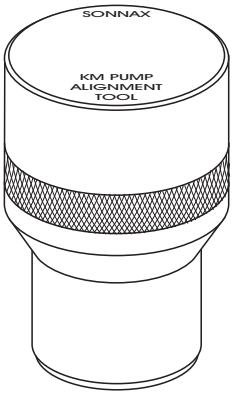


Figure 5

TORQUE COVER TO BODY BOLTS TO 9 NM (80 - 85 IN. LB.) WITH THE ALIGNMENT TOOL IN PLACE

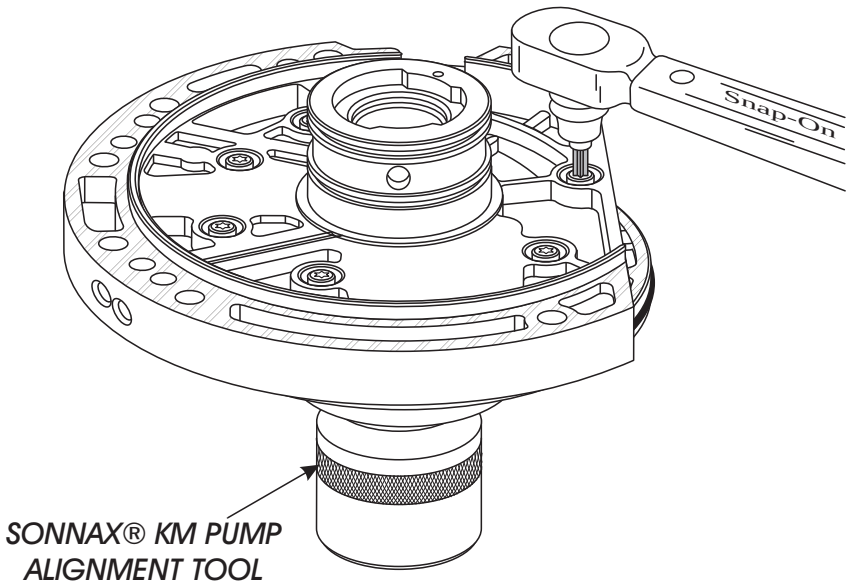


Figure 6

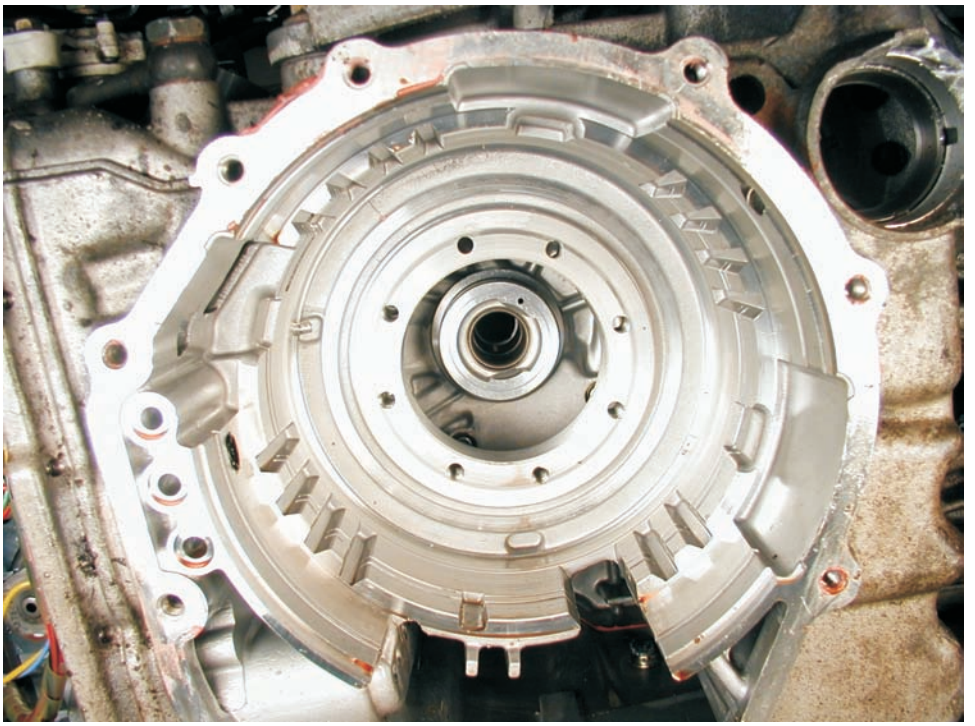


Figure 7

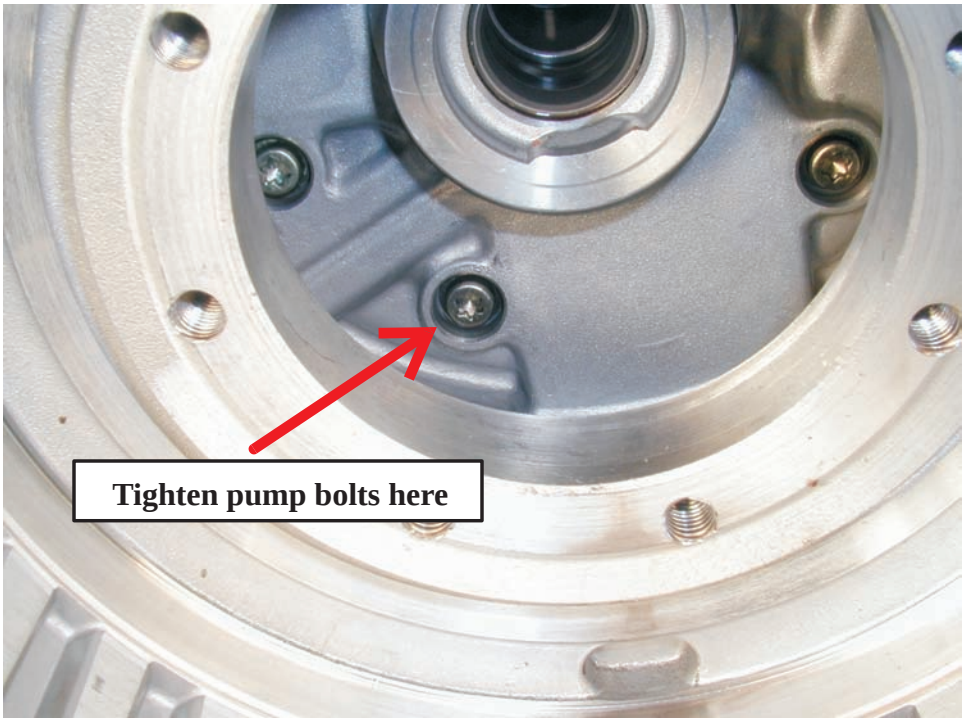


Figure 8

AXIOM

Sonnax

MITSUBISHI F4A40/50 SERIES
ERRATIC SHIFTS AND OR GEAR RATIO ERROR CODES

COMPLAINT: Mitsubishi vehicles equipped with the F4A40/50 series transaxle, may exhibit erratic shifts or Diagnostic Trouble Codes related to gear ratio errors, such as P0732, 2nd gear ratio error P0733 3rd gear ratio error, P0734 4th gear ratio error, after transaxle replacement.

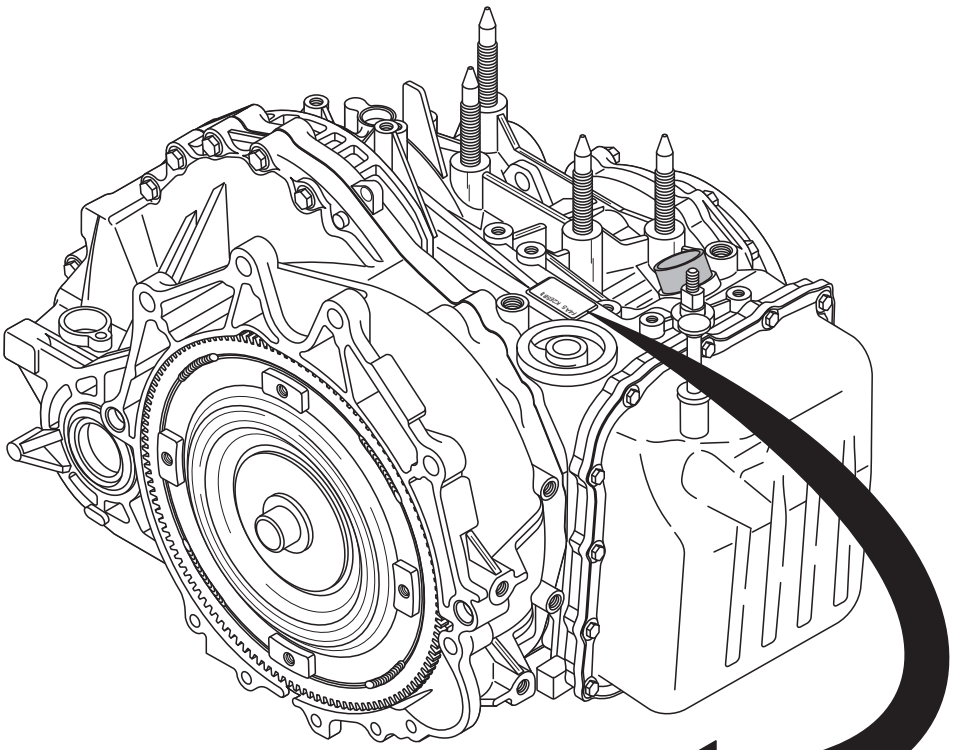
CAUSE: The cause may be, a wrong transaxle, or gear train parts, were installed into the vehicle that contained incorrect ratios that are incompatible with the vehicles computer.

CORRECTION: Refer to Figure 1 to see the location and legend of the of the Identification stamp that is located on the top of the transaxle case, to verify the correct ratios. Refer to Figure 2 for an application chart matching Identification number to vehicle model and year, to ensure the correct ratios are installed into the vehicle.

Parker/Hannifin

Lory’s

GEAR RATIO IDENTIFICATION



F 4 A 51 K 2 E 5 B 1

MANUFACTURING USE ONLY
When the "K" is stamped into the code, this digit will be dropped off.

DESIGN LEVEL
1 = 1st Design
2 = 2nd Design

SPRAG I.D.
A = No Sprag
B = Has Low Sprag

FINAL DRIVE RATIO *

F4A41/42	F4A51
A = N/A	A = 3.269
B = N/A	B = 3.274
C = N/A	C = 3.491
D = N/A	D = 3.497
E = 3.770	E = N/A
F = 3.769	F = N/A
J = 4.041	J = N/A
L = 4.212	L = 4.011
M = 4.042	M = 4.018
N = 4.406	N = N/A
R = 4.625	R = 4.520
T = N/A	T = 4.316
U = 4.407	U = 4.324
W = 4.626	W = N/A

SPEEDO GEAR RATIO **

4 & M = 27/36	5 & N = 28/36
6 & P = 29/36	7 & Q = 30/36
8 & R = 31/36	9 & S = 32/36

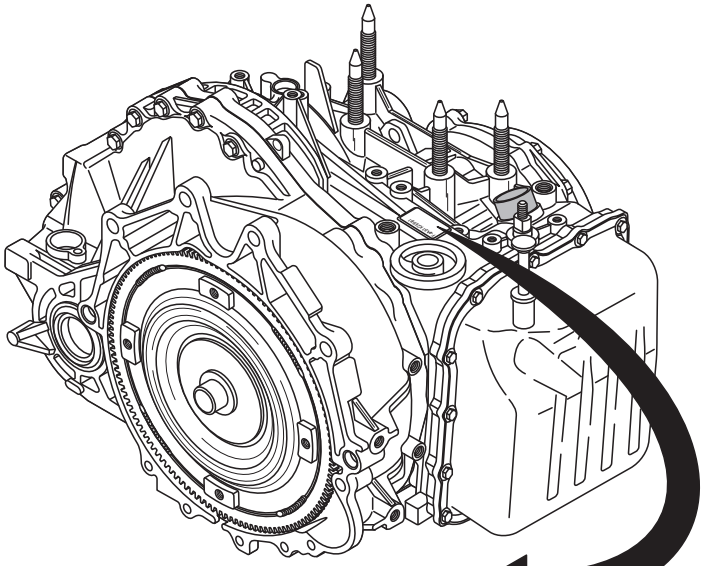
Note: Drive gear is 36 tooth.

** The final drive ratios include the primary transfer gear reduction ratio of 1.196 for the F4A41-42, and 1.119 for the F4A51.*

*** The letter "Z" in the speedo gear position tells us that it is an electronic calculation done by the computer.*

Figure 1

IDENTIFICATION CODE STAMPING LOCATION



F 4 A 51 K 2 E 5 B 1

Drive Axle
F = Front Wheel Drive
R = Rear Wheel Drive

Forward Speeds
4 = Four Speeds
5 = Five Speeds

Transmission Type
A = Automatic
M = Manual

Trans Capacity
41 = Light Duty
42 = Standard Duty
51 = Heavy Duty

Manufacturing Plant
K = Kyoto Works

NOTE: The "K" is not always stamped into all transmission codes.

VEHICLE AND TRANSMISSION APPLICATION CHART				
YEAR	*MODEL*	*ENGINE*	*TRANSMISSION*	*SPRAG*
1997	*Diamante*	*3.5L SOHC*	*F4A51-2-D5A*	*No*
1998-01	*Diamante*	*3.5L SOHC*	*F4A51-2-D5B*	*Yes*
2000-01	*Eclipse*	*2.4L SOHC*	*F4A42-2-M6B*	*Yes*
2000	*Eclipse*	*3.0L SOHC*	*F4A51-2-E6B*	*Yes*
2001	*Eclipse*	*3.0L SOHC*	*F4A51-2-E5B*	*Yes*
1999-01	*Galant*	*2.4L SOHC*	*F4A42-2-M6B*	*Yes*
1999	*Galant*	*3.0L SOHC*	*F4A51-2-D6B*	*Yes*
2000	*Galant*	*3.0L SOHC*	*F4A51-2-E6B*	*Yes*
1997-99	*Mirage*	*1.5L SOHC*	*F4A41-1-M8A*	*No*
1997-98	*Mirage*	*1.8L SOHC*	*F4A42-1-M8A*	*No*
2000	*Mirage*	*1.5L SOHC*	*F4A41-2-M8B*	*Yes*
1999-01	*Mirage*	*1.8L SOHC*	*F4A42-2-M8B*	*Yes*

Figure 2

MITSUBISHI F4A40/50 SERIES

HARSH DRIVE ENGAGEMENT OR 4-3 DOWNHIFT AND OR HARSH OR FLARED 3RD GEAR UPSHIFT

COMPLAINT: Before or after overhaul, vehicles equipped with the F4A40 or F4A50 series transaxles may exhibit a harsh engagement into Drive or a harsh 4-3 downshift or a Flared or Harsh upshift into 3rd gear.

CAUSE: The cause may be, worn sealing ring lands where the Underdrive and or Overdrive Clutch sealing rings ride, creating leakage in the Underdrive or Overdrive Clutch circuit.

CORRECTION: Refer to Figure 1 to identify the Underdrive Clutch Sealing Rings. Using a feeler gage ensure that there is no more than .005" clearance between the sealing ring and the sealing ring lands. Repeat the same process for the Overdrive Clutch Sealing rings as shown in Figure 2. Replace the Pump stator or Rear Cover as necessary. ***NOTE: Refer to Figure 3 and notice the "R-14" that is cast into the Pump Cover/Stator Support and Rear cover. This identify's a new design part which is made out of stronger material reducing ring land wear.***

UNDERDRIVE SEALING RING CLEARANCE CHECK

Special thanks to Bob Nuttall

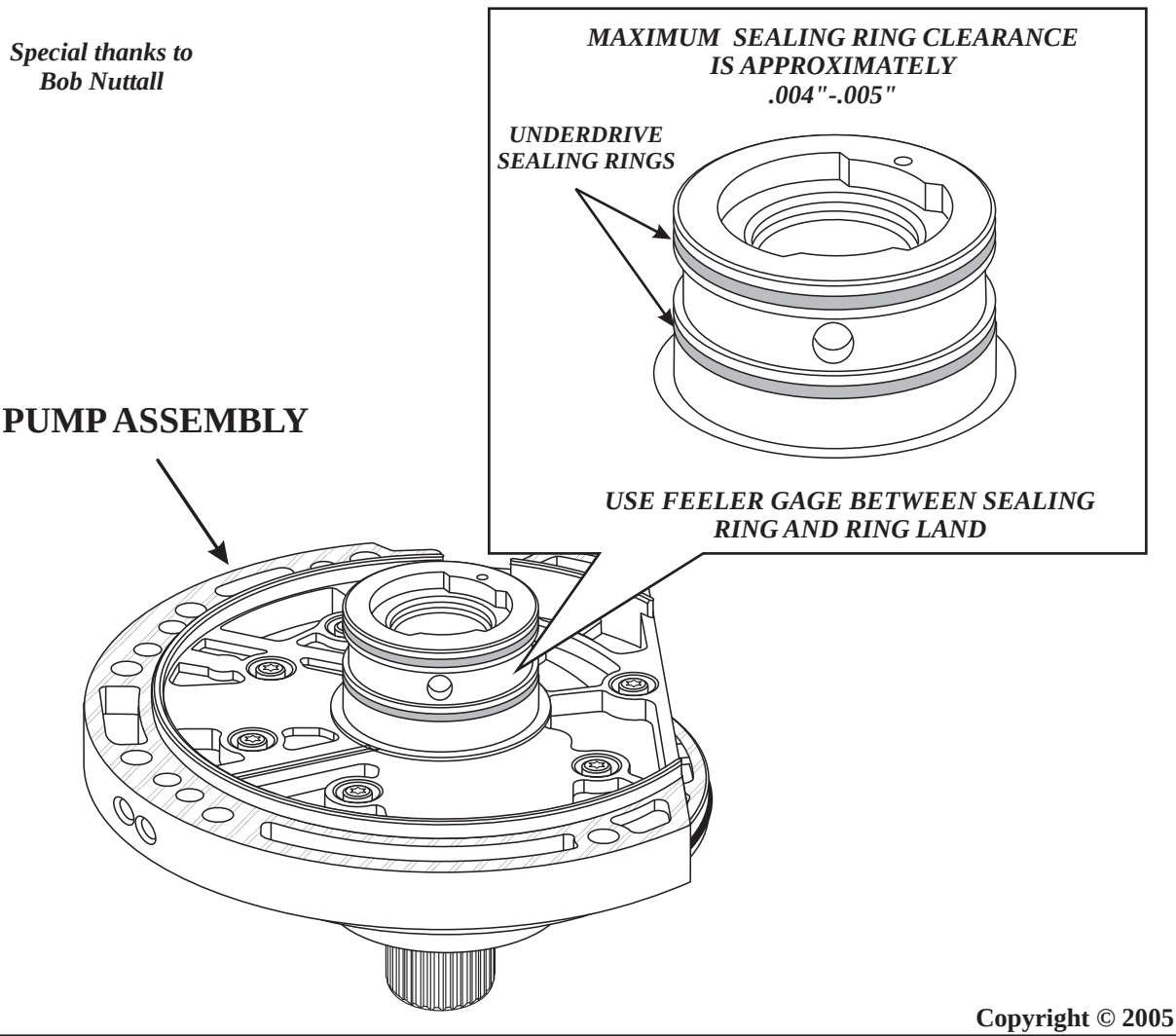


Figure 1

OVERDRIVE SEALING RING CLEARANCE CHECK

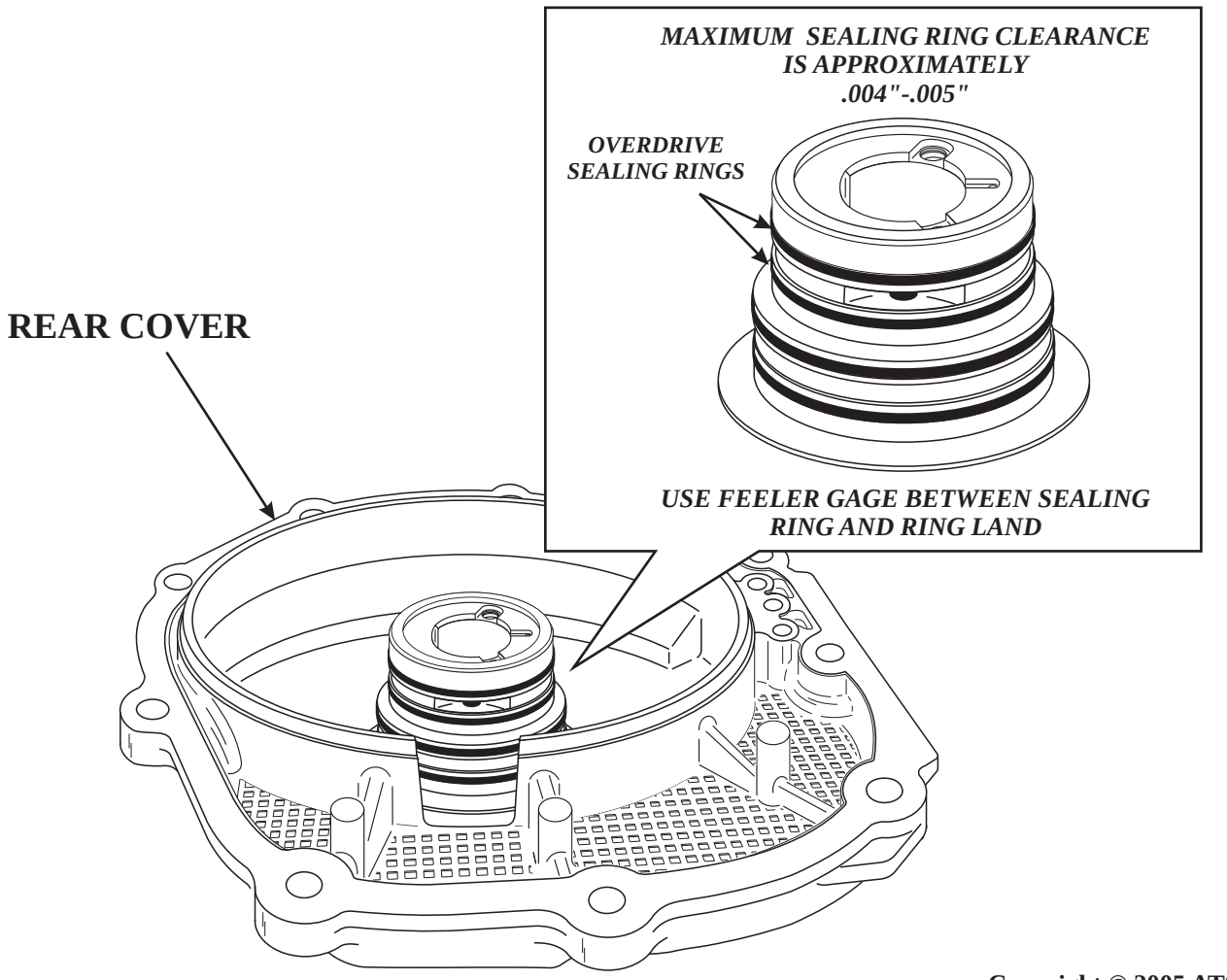
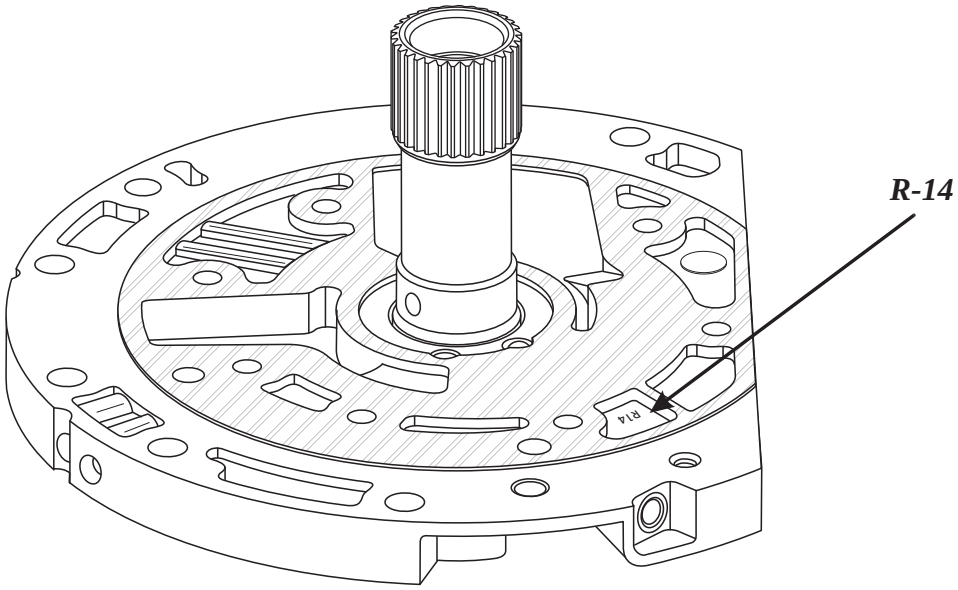


Figure 2

PUMP COVER/STATOR SUPPORT



REAR COVER

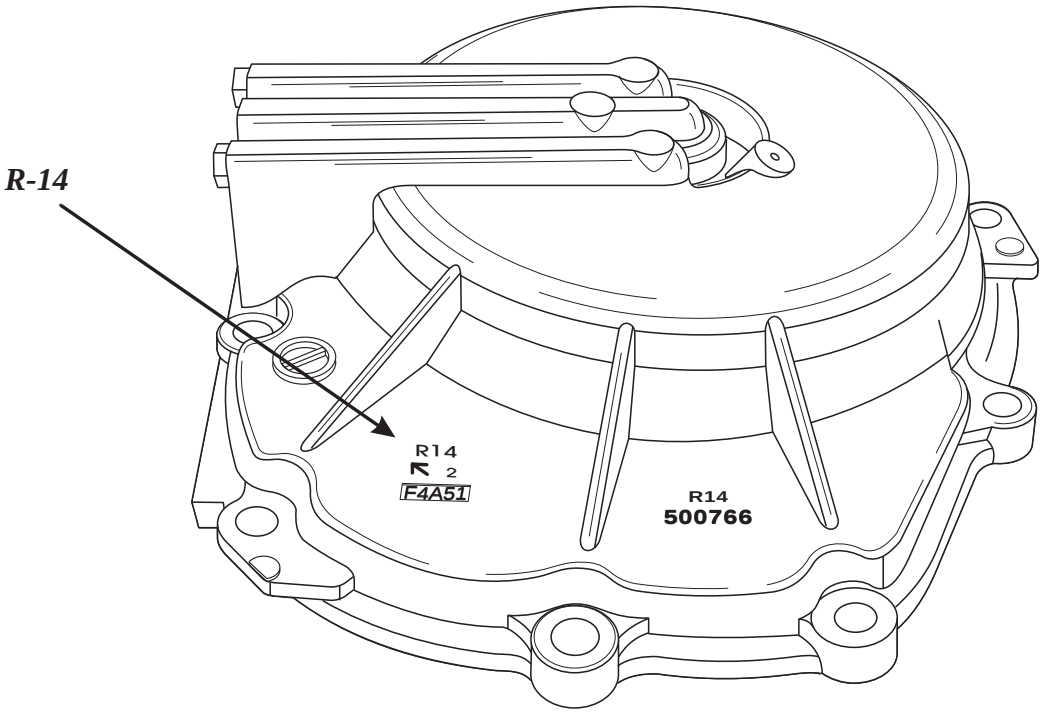


Figure 3

HONDA CIVIC & ACCORD

REVERSE IDLER GEAR ORIENTATION

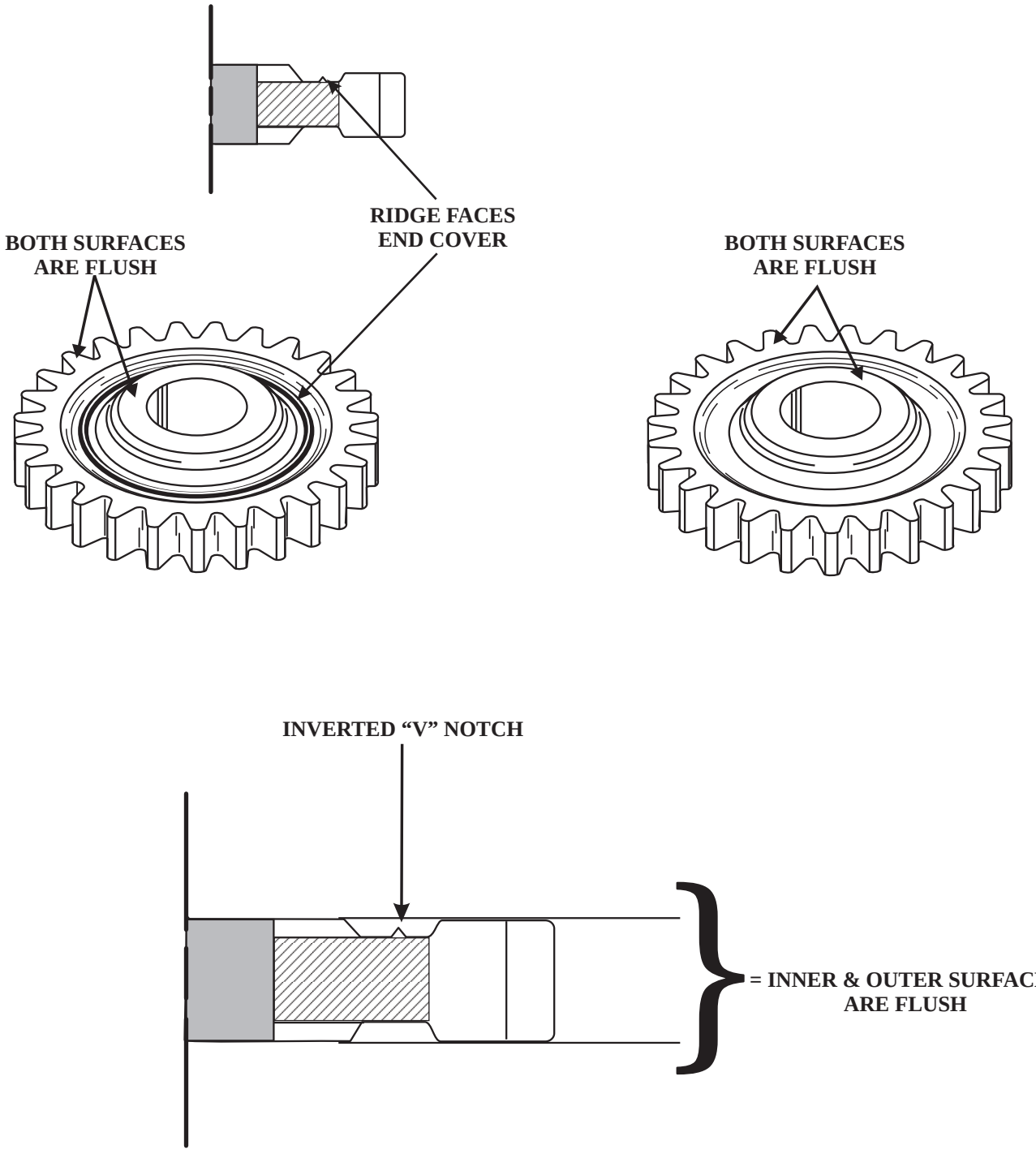
COMPLAINT: The reverse idler gear has been installed upside down which makes it difficult to assemble the case halves. If the case halves do go together, the idler gears will not mesh properly.

CAUSE: When referring to a repair manual the direction of how the gear is to be installed is unclear.

CORRECTION: Civics and Accords three shaft design with four cylinder engines use a reverse idler gear that has to face in a correct direction. The gear shown in Figure 1 for the Civic has a small inverted 'v' groove on one side. This "v" groove faces the end cover, away from the converter.

The gear shown in Figure 2 is for the Accord and is larger in diameter then the Civic gear. It also has an inverted "v" groove which must also face the rear cover, away from the converter.
The measurements shown in Figure 2 should also aid in determining in which direction the gear must be installed.
Notice the center hub on the ACCORD gear is higher on one side than the other which creates an offset configuration.

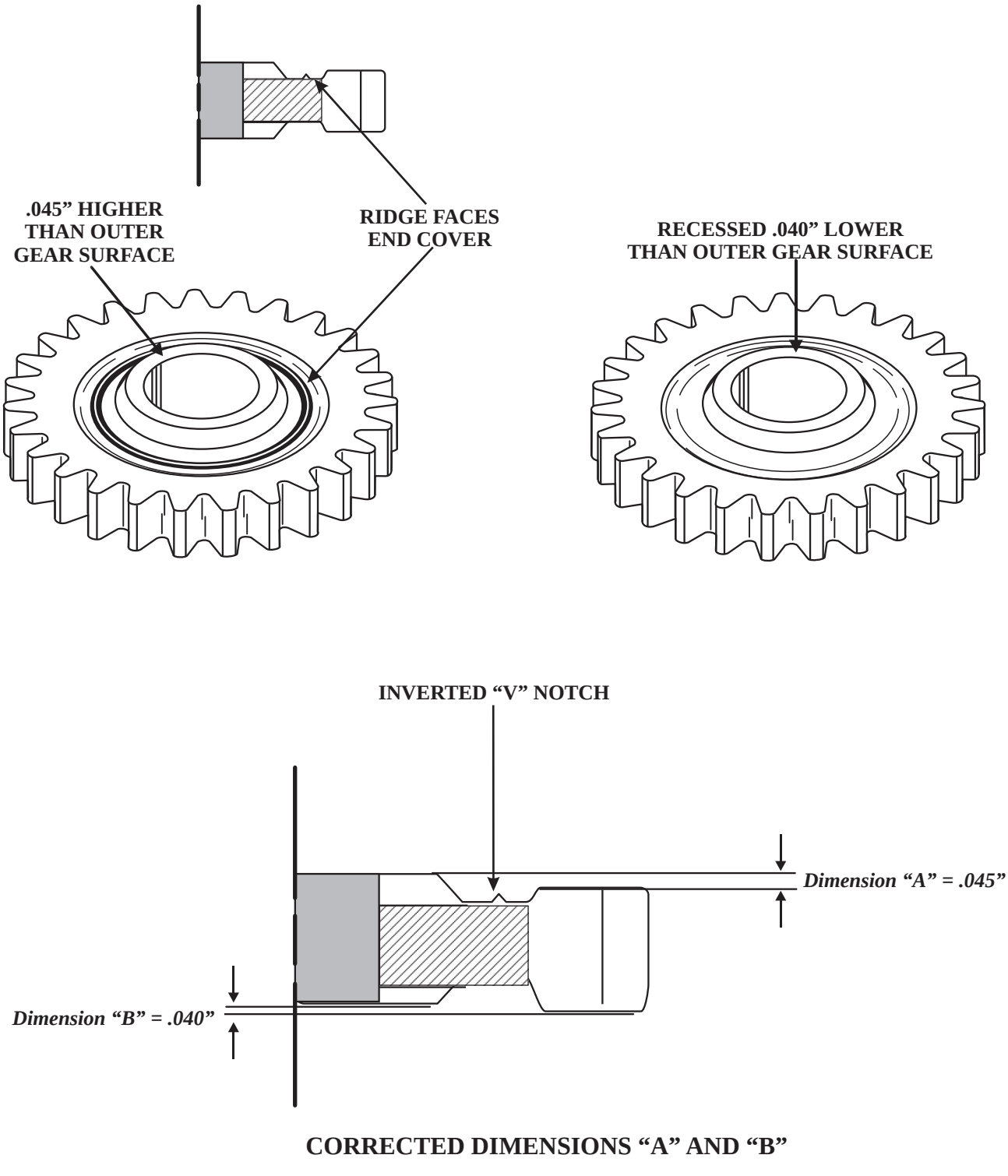
CIVIC REVERSE GEAR



THE "INVERTED "V" NOTCH SHOULD FACE TOWARDS THE REAR COVER TO AVOID GEAR NOISE DUE TO ALREADY ESTABLISHED WEAR PATTERNS.

Figure 1

ACCORD REVERSE GEAR



CORRECTED DIMENSIONS "A" AND "B"

Figure 2

AW55-50SN/AF23/33-5

GEAR RATIOS

The AW55-50SN found in some Volvos and the AF23/33-5 found in the Saturn Vue and the Ion Sedan is a rather unique transmission due to the fact that the first gear ratio is lower than the reverse ratio with fifth gear being 1 to 1 as seen in the chart in Figure 1. The final drive is a low 2.440 ratio which creates lower rpm and less torque.
The AW55-50SN/AF23/33-5 transmission contains three (3) planetary sets, seven (7) multiple disc clutches, one (1) band and two (2) sprag type clutches which are represented in Figures 2 and 3.
The assembled driving and holding components along with the final drive shown in figure 4 are labeled Gear Set 24, which consists of the complete front carrier assembly.
The center and rear planets which are referred to as the front differential drive gear carrier assembly is labeled Gear Set 259. The 1-2 reverse carrier gear assembly is labeled Gear Set 18.
By looking at the arrangement of these components and comparing what element is on by using the clutch application chart in Figure 5 and comparing this information by using the chart in Figure 6, a determination can be made as to which planetary is in low reduction, a lesser reduction, locked in a 1:1 gear ratio or when a gear set is overdriven.
Looking at the chart in Figure 6, what is seen is that in first gear all three planetary sets are in reduction. When a shift into second occurs, only planetary gear set 24 ratios to a lesser reduction. The other two remain the same. So if there was a noise that changed pitch on the 1-2 upshift, it would be planetary gear set 24 that would be suspect.
When a 2-3 shift occurs, only gear set 18 ratios to a lesser reduction. If there was a noise that changed pitch on the 2-3 upshift, it would be the planetary gear set 18 that would be suspect.
When the 3-4 upshift occurs, both planetary gear sets 18 and 259 are locked. Planetary gear set 24 is still in a reduction ratio.
It is when the 4-5 upshift is made that this gear set locks 1:1 putting the transmission into direct drive. This means if a noise changed pitch on the 1-2 upshift and disappeared on the 4-5 upshift, planetary gear set 24 is suspect.

GEAR	GEAR RATIO
FIRST	4.68
SECOND	2.94
THIRD	1.92
FOURTH	1.30
FIFTH	1.00
REVERSE	3.18
FINAL DRIVE	2.440

Figure 1

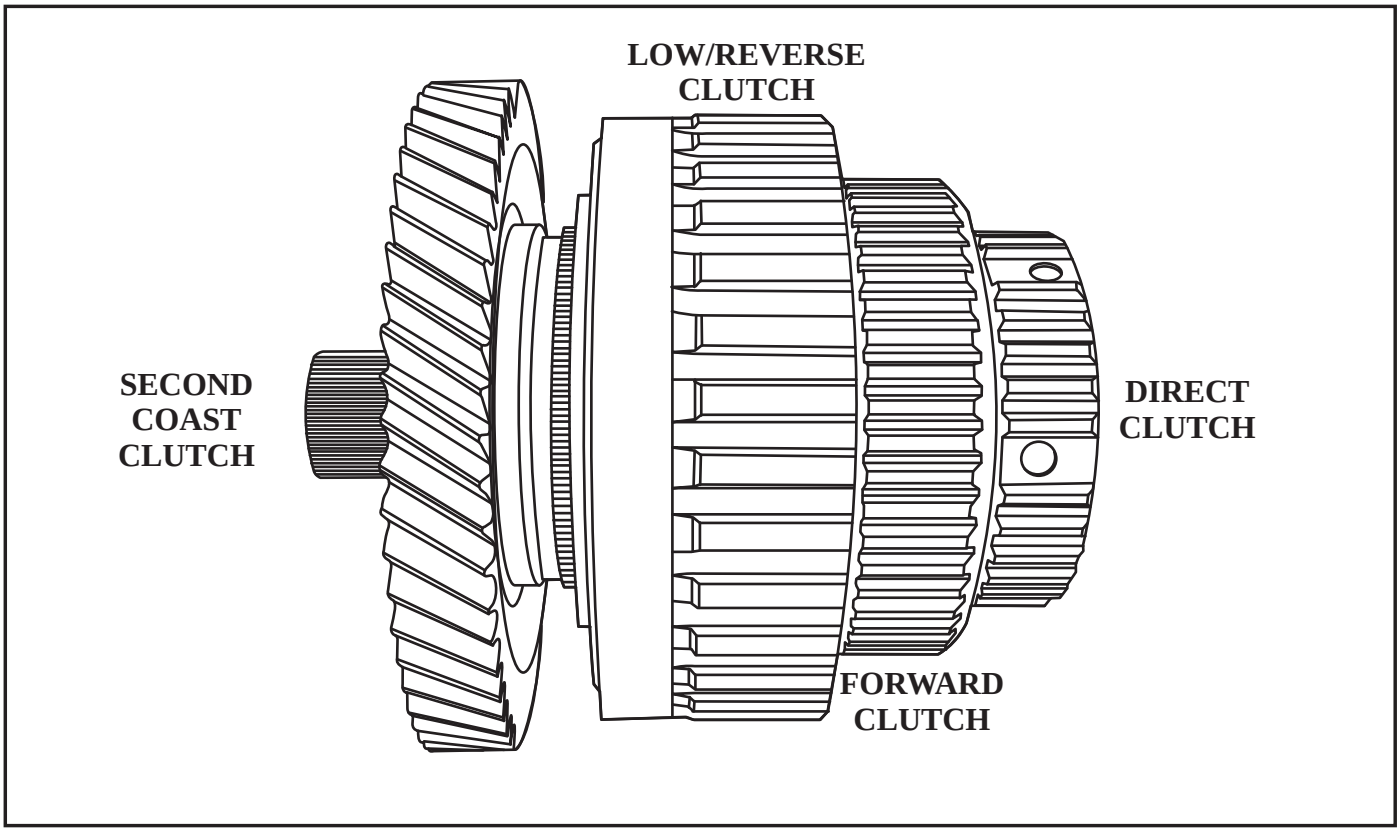


Figure 2

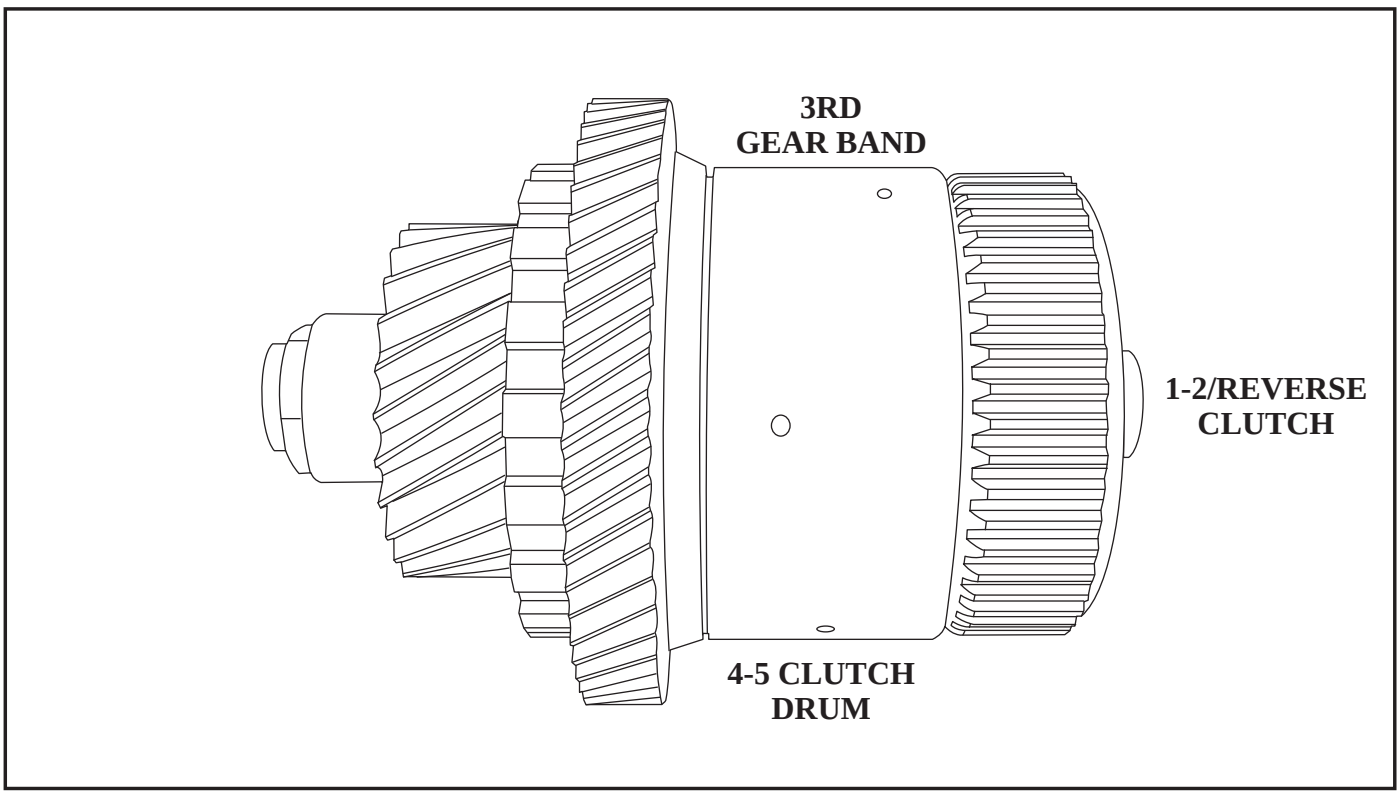


Figure 3

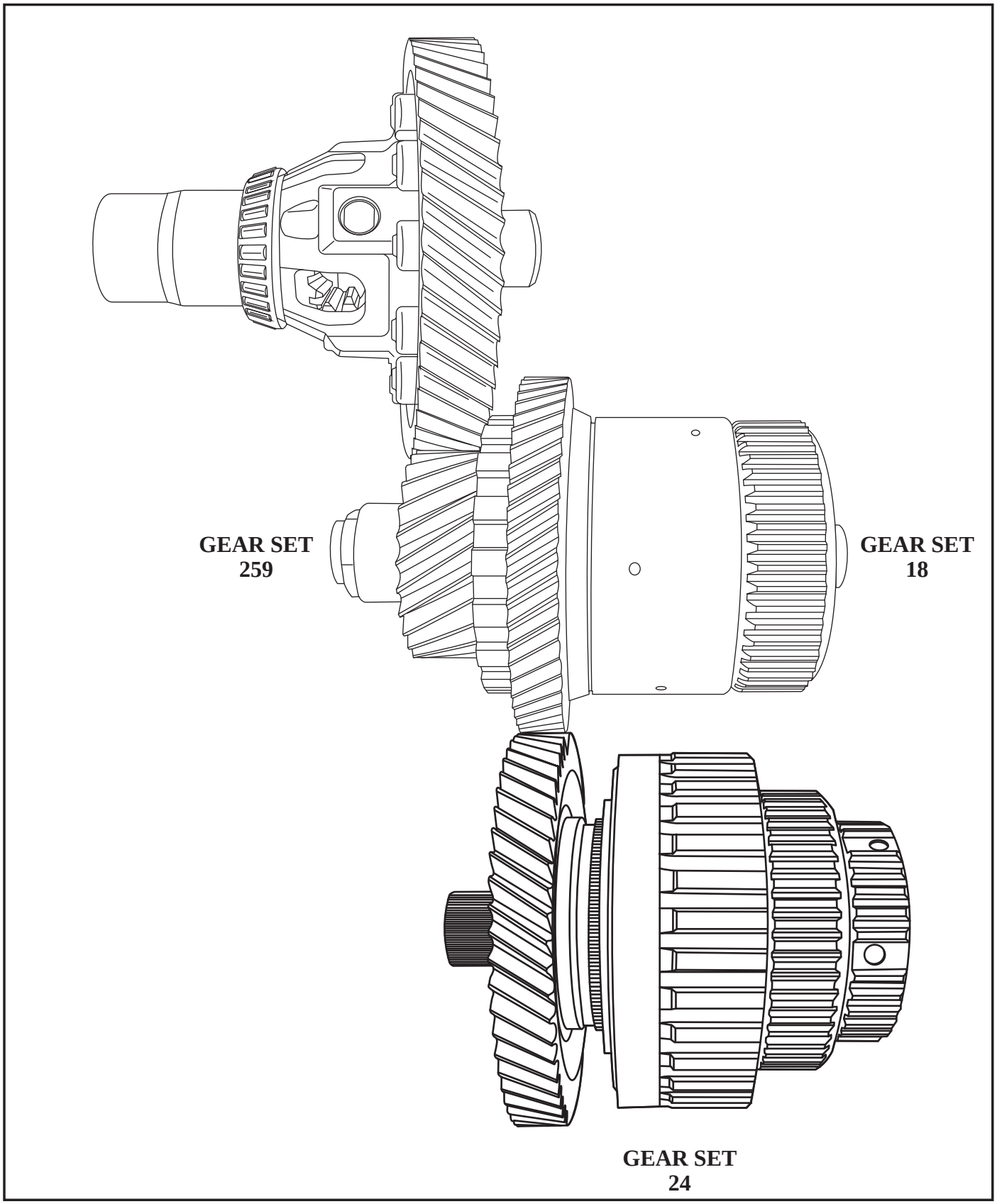
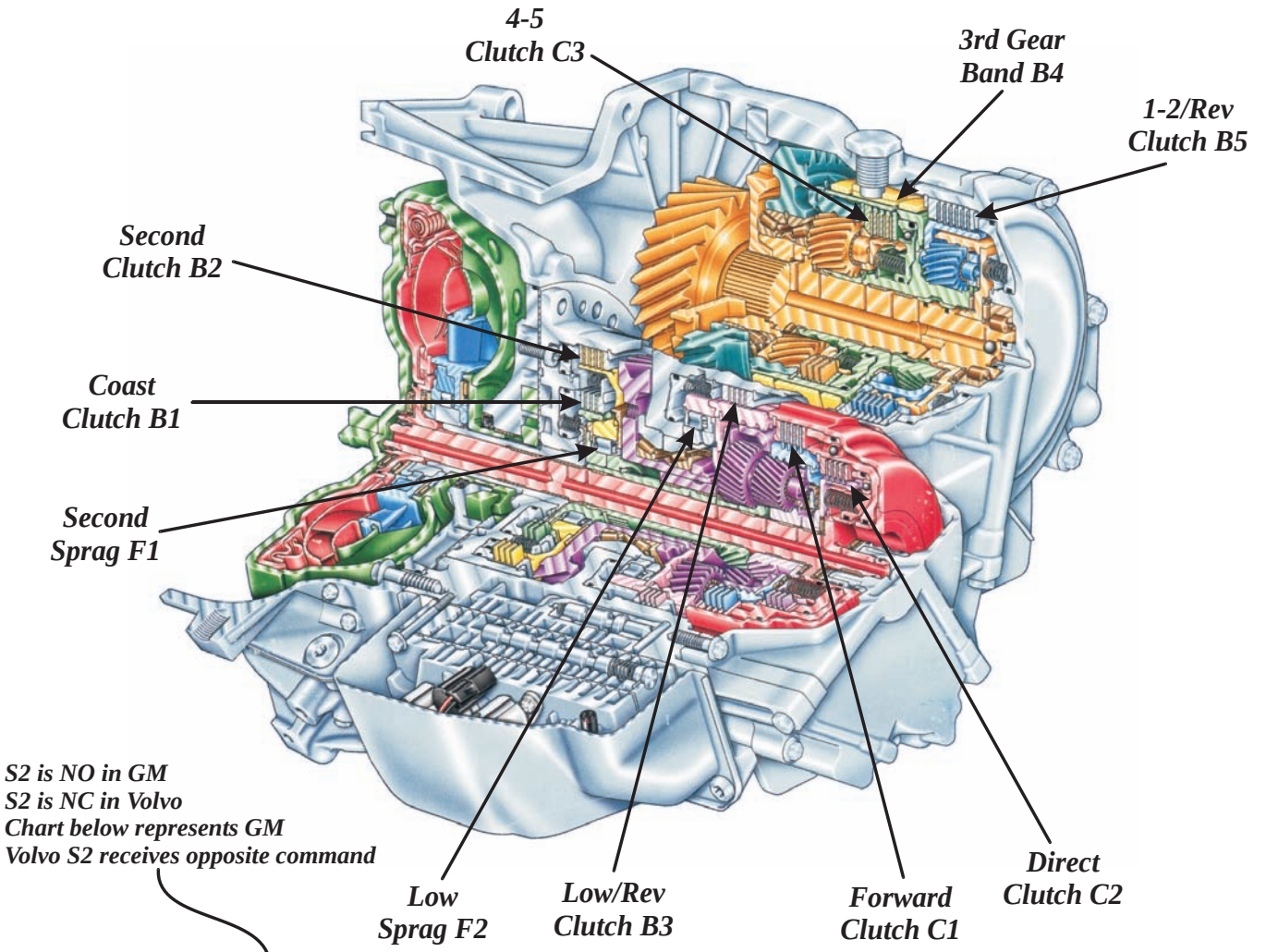


Figure 4

COMPONENT APPLICATION AND SOLENOID CHART



RANGE	GEAR	RATIO	SOL S1	SOL S2	SOL S3	SOL S4	SOL S5	SECOND CLUTCH (B2)	COAST CLUTCH (B1)	SECOND SPRAG (F1)	LOW SPRAG (F2)	LO/REV CLUTCH (B3)	FWD CLUTCH (C1)	DIRECT CLUTCH (C2)	4-5 CLUTCH (C3)	3RD BAND (B4)	1-2/REV CLUTCH (B5)
PARK	P		OFF	OFF	OFF	OFF	OFF										APPLIED
REVERSE	R	3.18	Off*	OFF	On*	OFF	On*					APPLIED		APPLIED			APPLIED
NEUTRAL	N		OFF	OFF	OFF	OFF	OFF										APPLIED
DRIVE	1	4.68	ON	OFF	ON	OFF	OFF				HOLD		APPLIED				APPLIED
	2	2.94	OFF	ON	ON	OFF	OFF	APPLIED	APPLIED	HOLD			APPLIED				APPLIED
	3	1.92	OFF	ON	ON	ON	OFF	APPLIED	APPLIED	HOLD			APPLIED			APPLIED	
	4	1.30	OFF	ON	OFF	ON	OFF	APPLIED	APPLIED	HOLD			APPLIED		APPLIED		
	5	1.00	OFF	OFF	OFF	ON	OFF	APPLIED					APPLIED	APPLIED	APPLIED		
	LIMP	1.00	OFF	OFF	OFF	OFF	OFF	APPLIED					APPLIED	APPLIED	APPLIED		
INTERM	1	4.68	ON	OFF	ON	OFF	OFF				HOLD		APPLIED				APPLIED
	2	2.94	OFF	ON	ON	OFF	OFF	APPLIED	APPLIED	HOLD			APPLIED				APPLIED
	3	1.92	OFF	ON	ON	ON	OFF	APPLIED	APPLIED	HOLD			APPLIED			APPLIED	
LOW	1 E/B	4.68	ON	OFF	ON	OFF	ON				HOLD	APPLIED	APPLIED				APPLIED
	2	2.94	OFF	ON	ON	OFF	OFF	APPLIED	APPLIED	HOLD			APPLIED				APPLIED

* If vehicle speed is above 7km/h (4 mph), the TCM commands the shift solenoids to inhibit reverse

Figure 5

Diagnostic Details

Mechanical

There are 3 planetary gear sets used in the AW55-50SN. They are:

1. The Front Carrier Sun Gear Assembly (24)
2. The Front Differential Drive Gear Carrier Assembly (259)
3. The 1-2 Reverse Carrier Gear Assembly (18)

Planetary Gear Set	First Gear	⟶ Second Gear
24	Reduction	⟶ Changes to a lesser Reduction
259	Reduction	No Change
18	Reduction	No Change

Notes

1 -2 up shift:
Second clutch and second coast clutch apply on 1-2 up shift. Gear set 24 changes ratio. Gear set 259 and 18 remain the same.

Planetary Gear Set	Second Gear	⟶ Third Gear
24	Reduction (L)	No Change
259	Reduction	No Change
18	Reduction	⟶ Changes to a lesser Reduction

2-3 up shift:
1-2/Rev clutch releases and 3rd gear band applies. Only gear set 18 changes ratio. Gear set 24 and 259 remain the same.

Planetary Gear Set	Third Gear	⟶ Fourth Gear
24	Reduction (L)	No Change
259	Reduction	⟶ Change to 1:1
18	Reduction (L)	⟶ Change to 1:1

3-4 up shift:
3rd gear band releases and the 4-5 clutches apply. Gear set 24 remains the same while both gear set 18 and 259 each go to a locked 1:1 ratio.

Planetary Gear Set	Fourth Gear	⟶ Fifth Gear
24	Reduction (L)	⟶ Change to 1:1
259	1:1	No Change 1:1
18	1:1	No Change 1:1

4-5 up shift:
Second coast clutch releases and the direct clutch applies. Gear set 24 goes to a locked 1:1 ratio. With gear set 18 and 259 already locked at 1:1, the gear box is in direct drive.

Figure 6

VOLVO AW55-50SN
NEUTRAL BANG ON TAKE-OFF

COMPLAINT: Some Volvo models equipped with the AW 55-50 SN transaxle, as shown in Figure 1, may exhibit a neutral bang on take-off before or after overhaul.

CAUSE: The cause may be, that when the accelerator pedal is depressed rapidly, the customer may feel a re-engagement of the C1 clutch on take-off because of a Transmission Control Module software issue.

CORRECTION: To correct this complaint, the TCM will have to be reflashed by a Vovlo dealer, which will de-activate or de-sensitize this feature. TCM 012B Neutral Control Flash.

SERVICE INFORMATION:

TCM UPGRADE NUMBER (Volvo).....30677036

Special thanks to Joe at Highland Transmission

AW55-50 SN

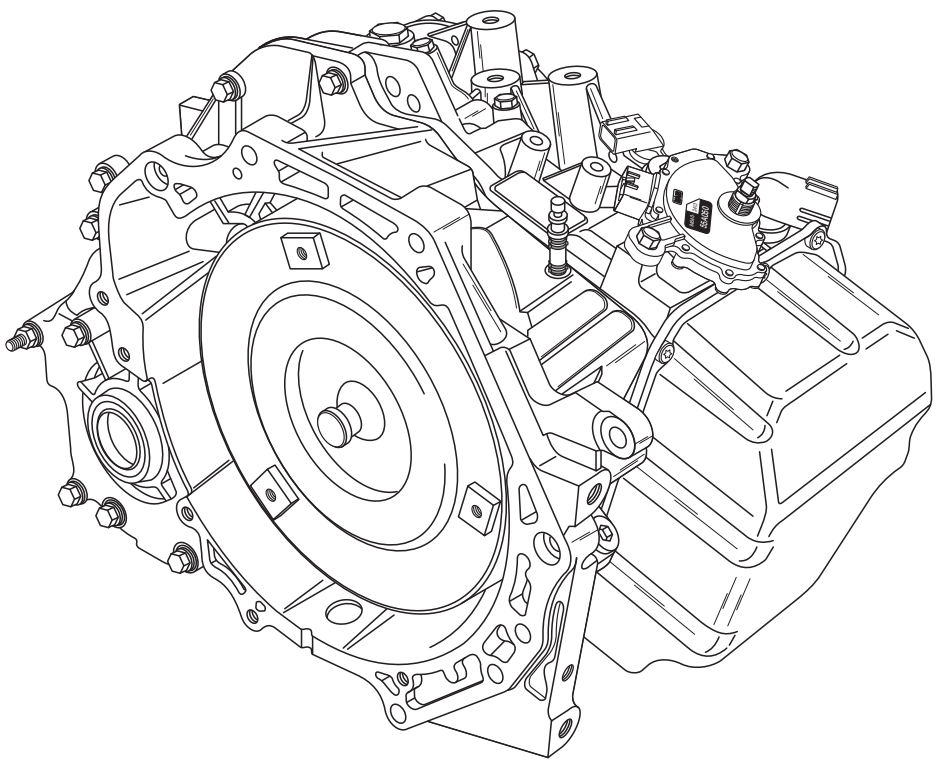


Figure 1

Jaggi

ISUZU TROOPER 4L30-E
TROUBLE CODE 37

COMPLAINT: Some 1994-95 model Isuzu Troopers, equipped with the 4L30-E transmission, may exhibit a Diagnostic Trouble Code 37, Torque Management Serial Line Faulty, before or after overhaul. ***NOTE:*** This DTC will cause "Limp mode."

CAUSE: The cause may be, a wiring or connection problem in between terminal C8 of the B-40 connector at the Transmission Control Module and the C2 terminal of the A28 connector at the Engine Control Module. See Figure 1 for a partial wire schematic and notice that there are two oval dotted lines around the Torque Management Serial Line. These are an indication of ground shields. These ground shields are in place to prevent induced voltage from getting into the Serial Line. These ground shields are also connected to Oxygen Sensors and the Knock Sensor ground circuit, which is connected to Ground Point G106. A DTC 37 can set because of problems in the harness on the Serial Line, or a problem with the shielded wire, or a loose connection at Ground Point G106.

CORRECTION: Locate the ECM and the TCM as shown in Figure 1. Disconnect the connectors from the computers and verify the integrity of the wire between C8 of the TCM and C2 of the ECM. If the wire checks good, refer to Figure 2 and clean the connection at Ground Point G106.

PARTIAL WIRE SCHEMATIC

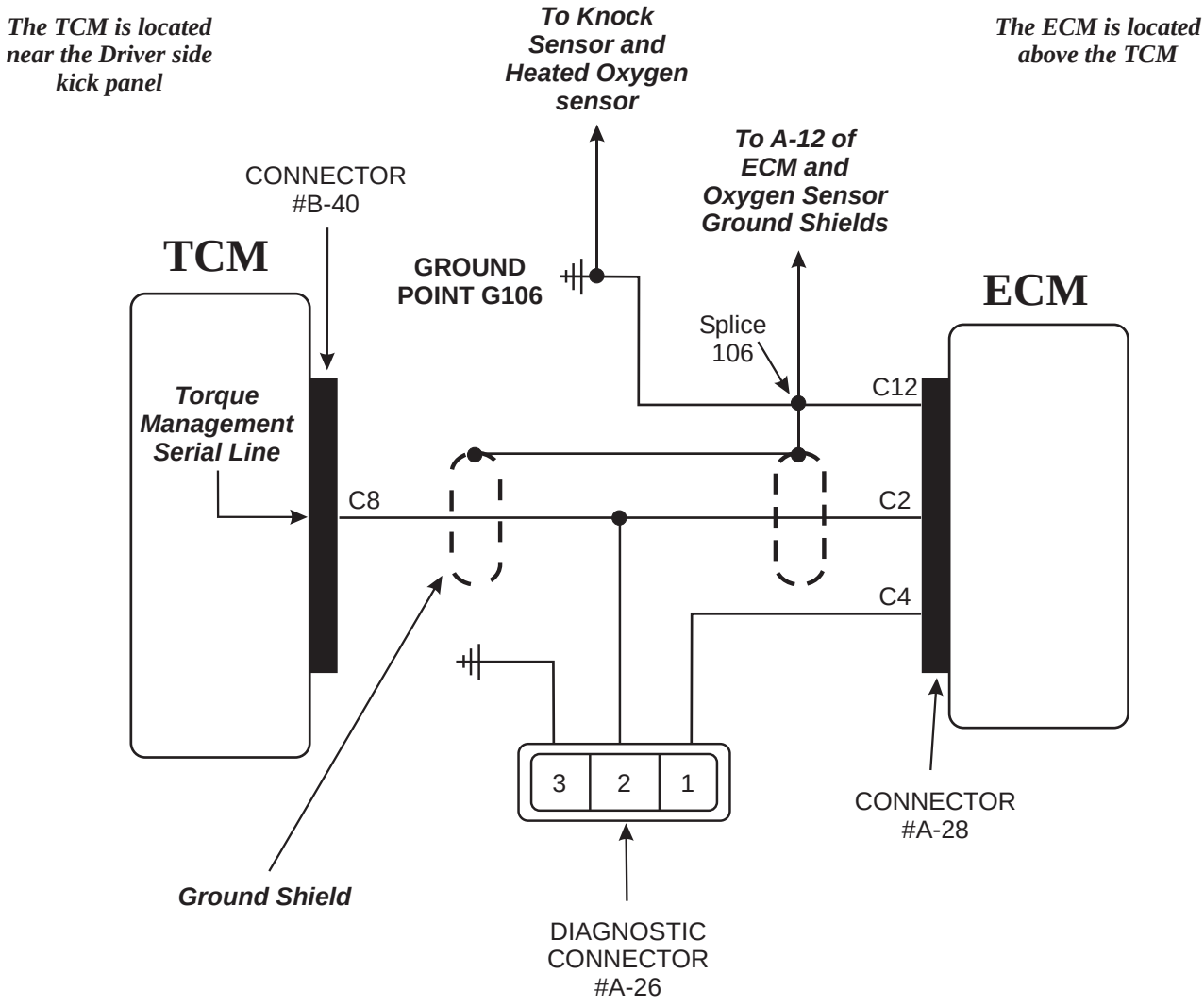


Figure 1

GROUND POINT G106 LOCATION

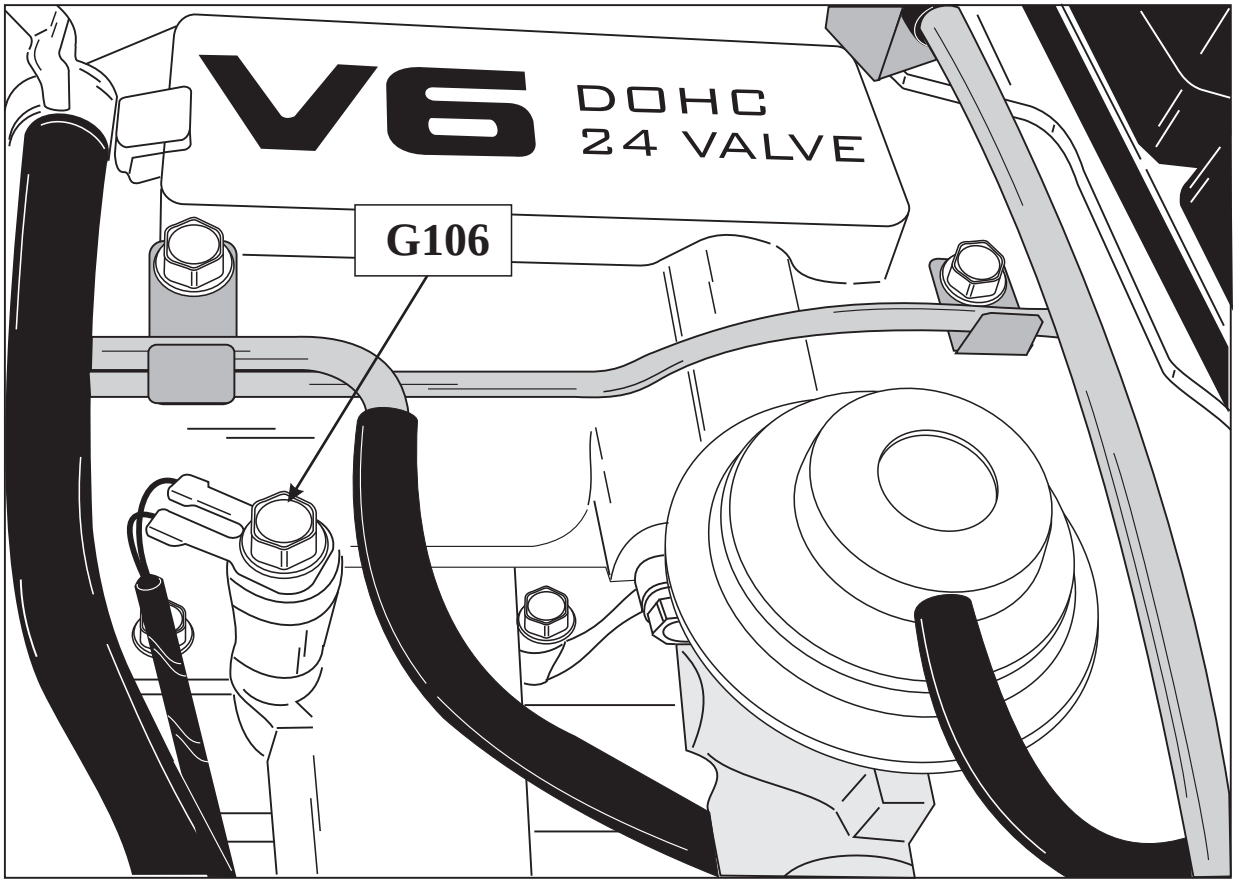


Figure 2

JF506-E

NO REVERSE; SLIPS FORWARD

COMPLAINT: A complaint of a no reverse and barely moves forward after a rebuild or fluid change with Jaguar, Freelander Land Rover and VW vehicles.

CAUSE: One cause may be that the Reduction band anchor bolt (Figure 1) was accidently mistaken for the fill plug. When the bolt was removed the band dropped out of position.

CORRECTION: Some have said they were able to lift the band into position through the servo bore. If this can not be done, the transmission will need to be removed and disassembled to gain access to the band to place it back into it position.

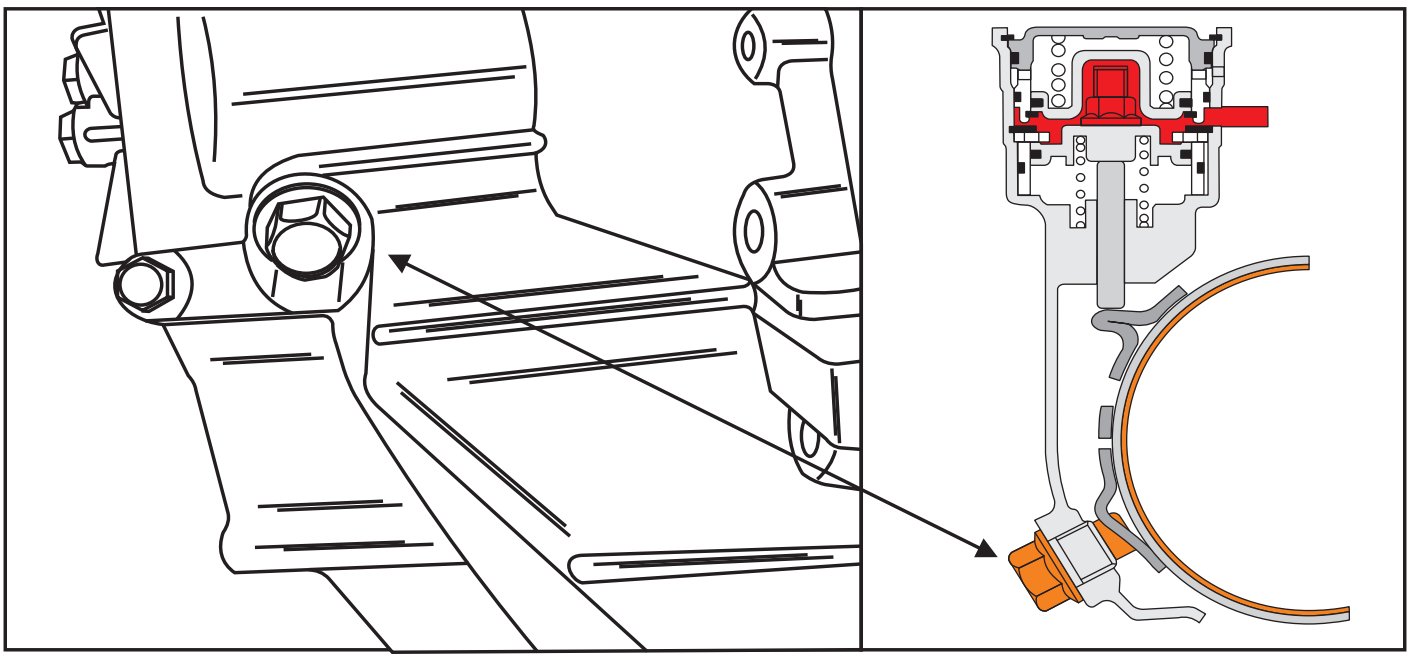


Figure 1

JF506-E

ATF FILL PROCEDURES

COMPLAINT: When the JF506E is found in anything but a Mazda, it will not have a filler tube or dip stick. when the time comes to fill the transmission with ATF, the fill or check plug cannot be found. In some instances, the band anchor is removed in order to fill the transmission, after which the transmission has no reverse movement and slips badly in forward.

CAUSE: The fill and check plugs are not obviously recognizable, in some instances the fill plug looks like a vent.

CORRECTION: When filling the unit, remove the check plug from the bottom of the case (Figure 1) and fill the unit from the fill pipe on top of the side pan (Figure 2). When fluid trickles out of the check plug the transmission is full.

Mazda uses a dipstick with a tube mounted on the differential area of the case.

Jaguar X Type specifies ATF IDEMITSU K 17 (Jatco 3100 PL085) fluid
Land Rover Freelander specifies Texaco N402 fluid
Mazda 6 and MPV specifies ATF MV
VW specifies G052 990 A2 fluid

SERVICE INFORMATION:

Average refill - 4.5 US quarts

ATF FILL PROCEDURES

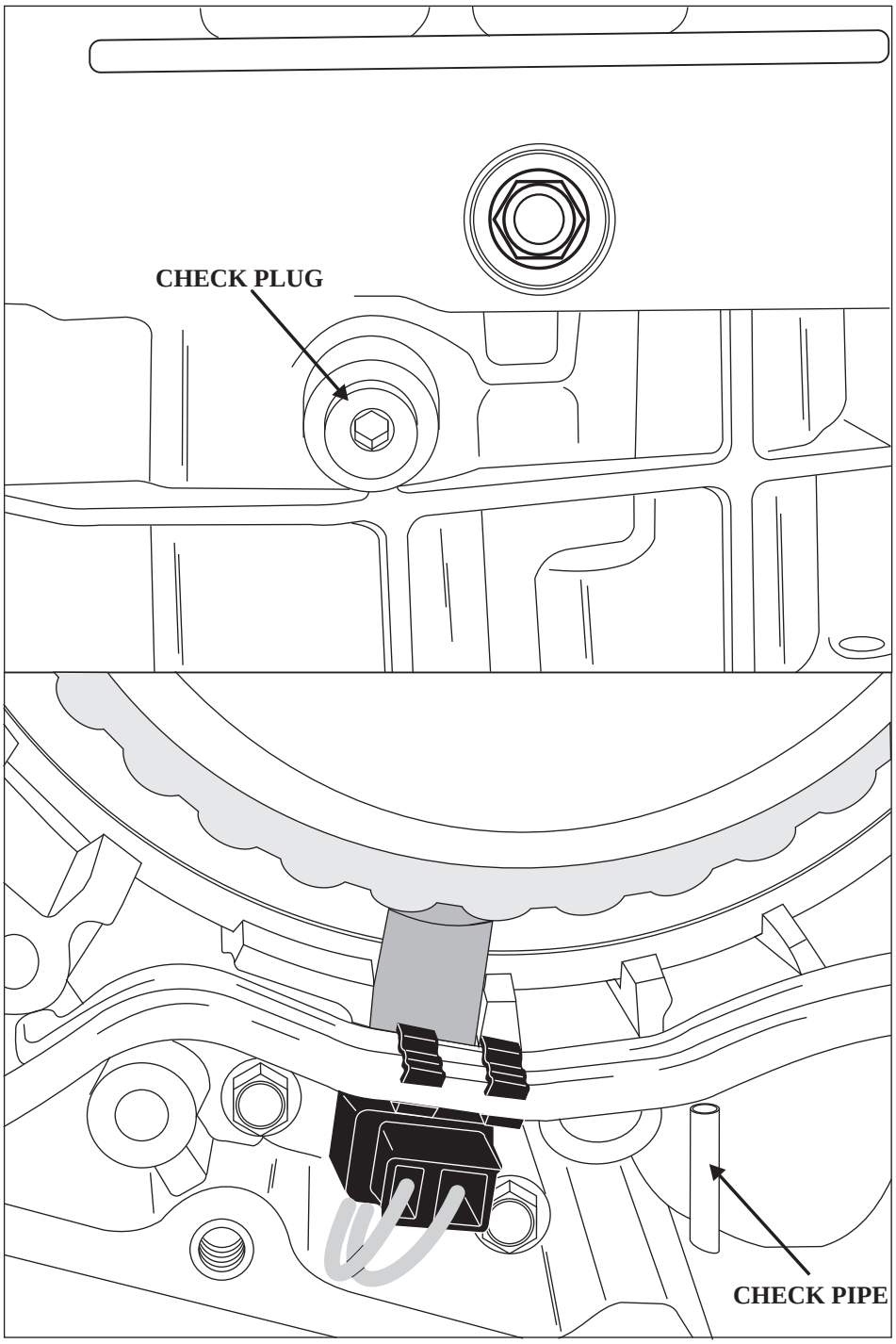


Figure 1

ATF FILL PROCEDURES

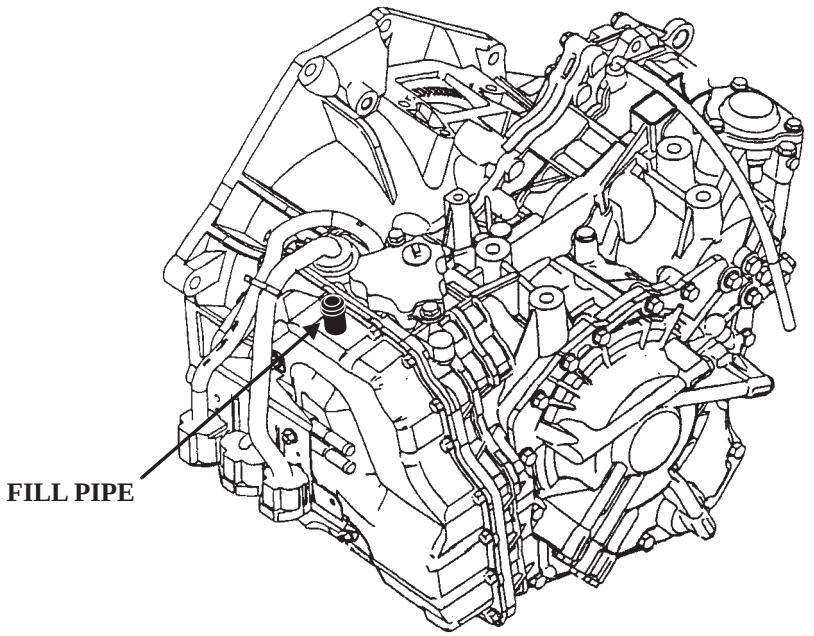


Figure 2

JATCO JF506E

REDUCTION BAND ADJUSTMENT

COMPLAINT: Possible gear ratio error codes are stored. May chatter in forward and reverse.

CAUSE: The Reduction Band is out of adjustment. If total servo apply pin exceeds .187" (4.75mm), the Reduction Band will require adjustment.

CORRECTION: Adjust the Reduction Band as follows:

1. Tighten the band adjusting stud to 70 inch pounds.
2. Back the adjusting stud out 3and 1/2 to 4 turns.
3. Measure the distance shown in Figure 1 with the servo in the released position.
4. Fully compress the servo and take the measurement shown in Figure 2.
5. Subtract one measurement from the other, the total should be between .125" to .187" (3.18mm to 4.75mm).

CAUTION:
Do not allow the band to become dislodged from the band anchor, indexing the band back where it belongs will require splitting the case halves.

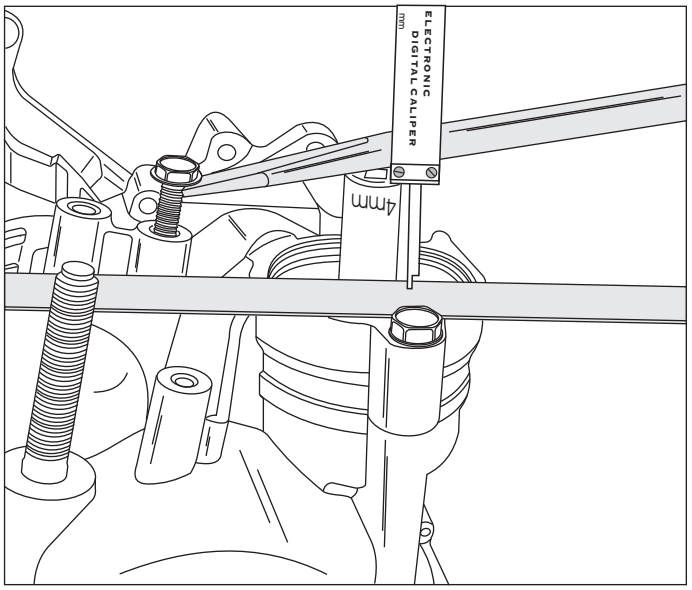


Figure 1

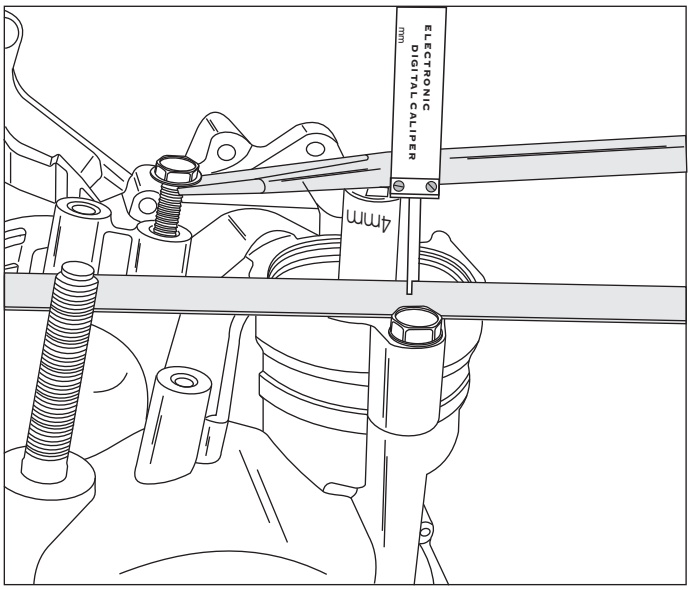


Figure 2

KIA F4E-111
HARSH 1-2 AND OR SOLENOID CIRCUIT FAULTS

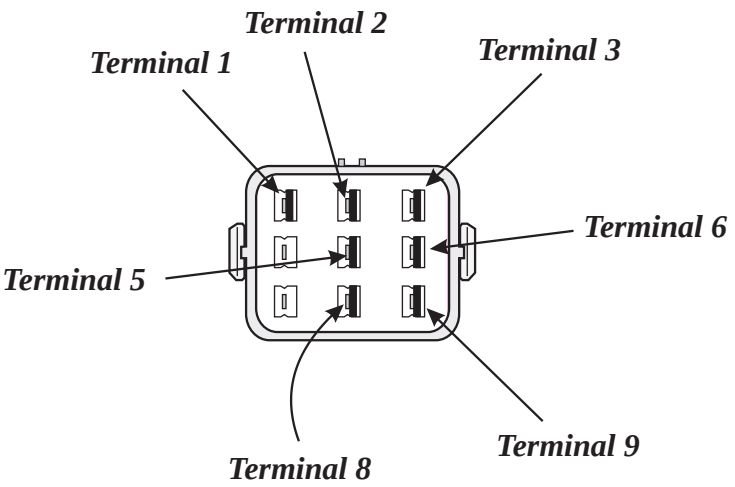
COMPLAINT: 1998 and Up Kia vehicles equipped with the F4E-111 transaxle may exhibit a harsh 1-2 upshift or multiple Solenoid Circuit faults, after overhaul.

CAUSE: The cause may be, that when re-connecting the internal harness to the solenoids on the valve body the Lock-up Solenoid and the Line Pressure Solenoid were hooked up backwards, causing high line pressure and Lock-up on top of the 1-2 shift.

CORRECTION: Refer to the solenoid ohm test in Figure 1 and verify that the solenoid ohm value is correct for the specified terminal location. If it is incorrect, refer to Figure 2 for the solenoid location on the valve body and refer to Figure 3 for the internal wire colors, to ensure that the correct connector wire colors are connected. ***Note: The internal wire harness connectors match the solenoid connectors on the O.E. Solenoids only.***

Special thanks to Lory's Transmission Parts

SOLENOID OHM TEST



Solenoid	*Connect to Terminals*	*Resistance Value*
1-2 or A	3 & Ground	13-27 Ohms
2-3 or B	6 & Ground	13-27 Ohms
3-4 or C	9 & Ground	13-27 Ohms
Lock-up	2 & Ground	13-27 Ohms
Pressure Cntrl.	1 & Ground	3 -6 Ohms
Trans Temp.	5 & 8	24 kOhms @ 70°

Figure 1

F4E-111 SOLENOID LOCATIONS ON THE VALVE BODY

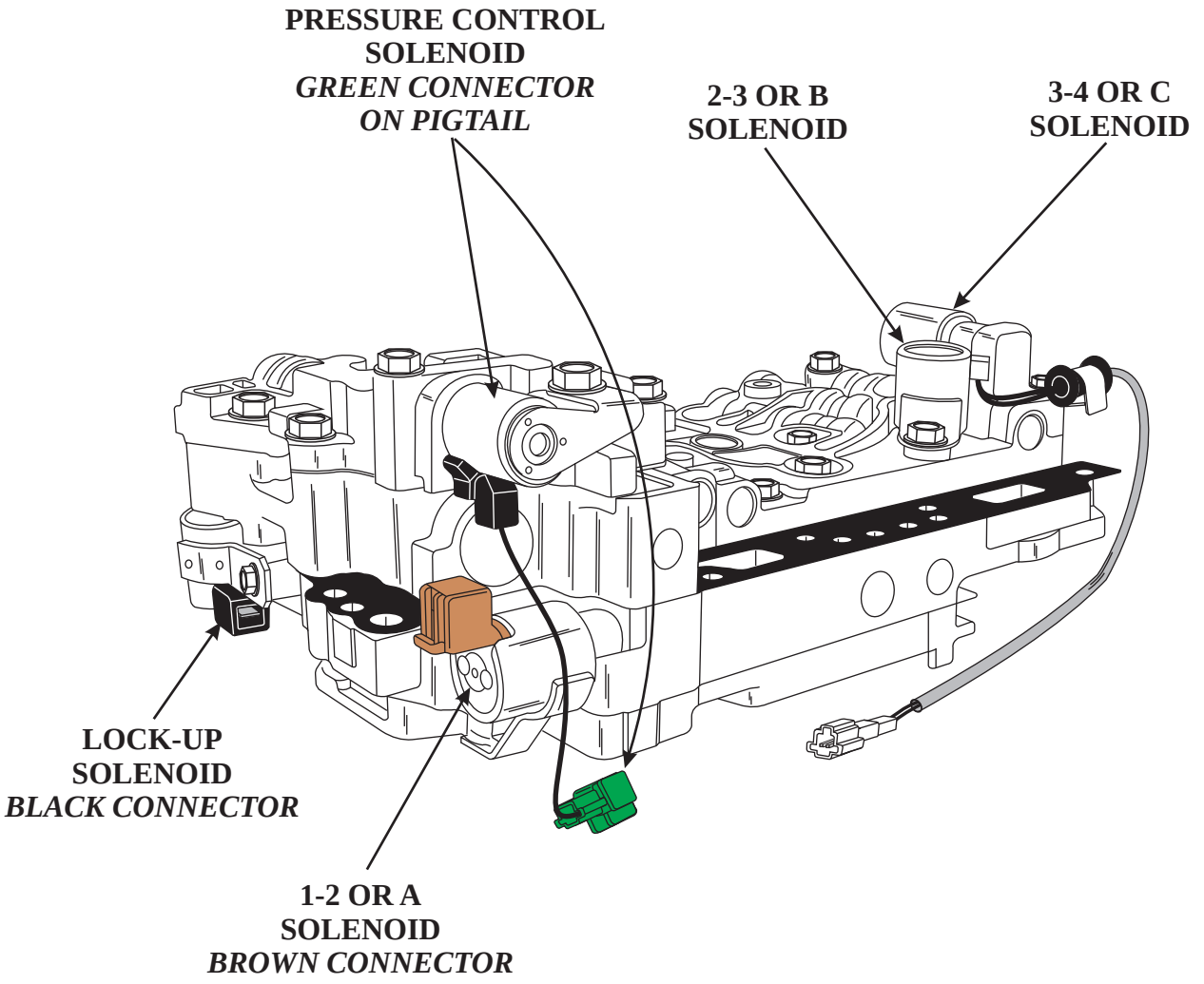


Figure 2

CASE CONNECTOR AND INTERNAL WIRE SCHEMATIC

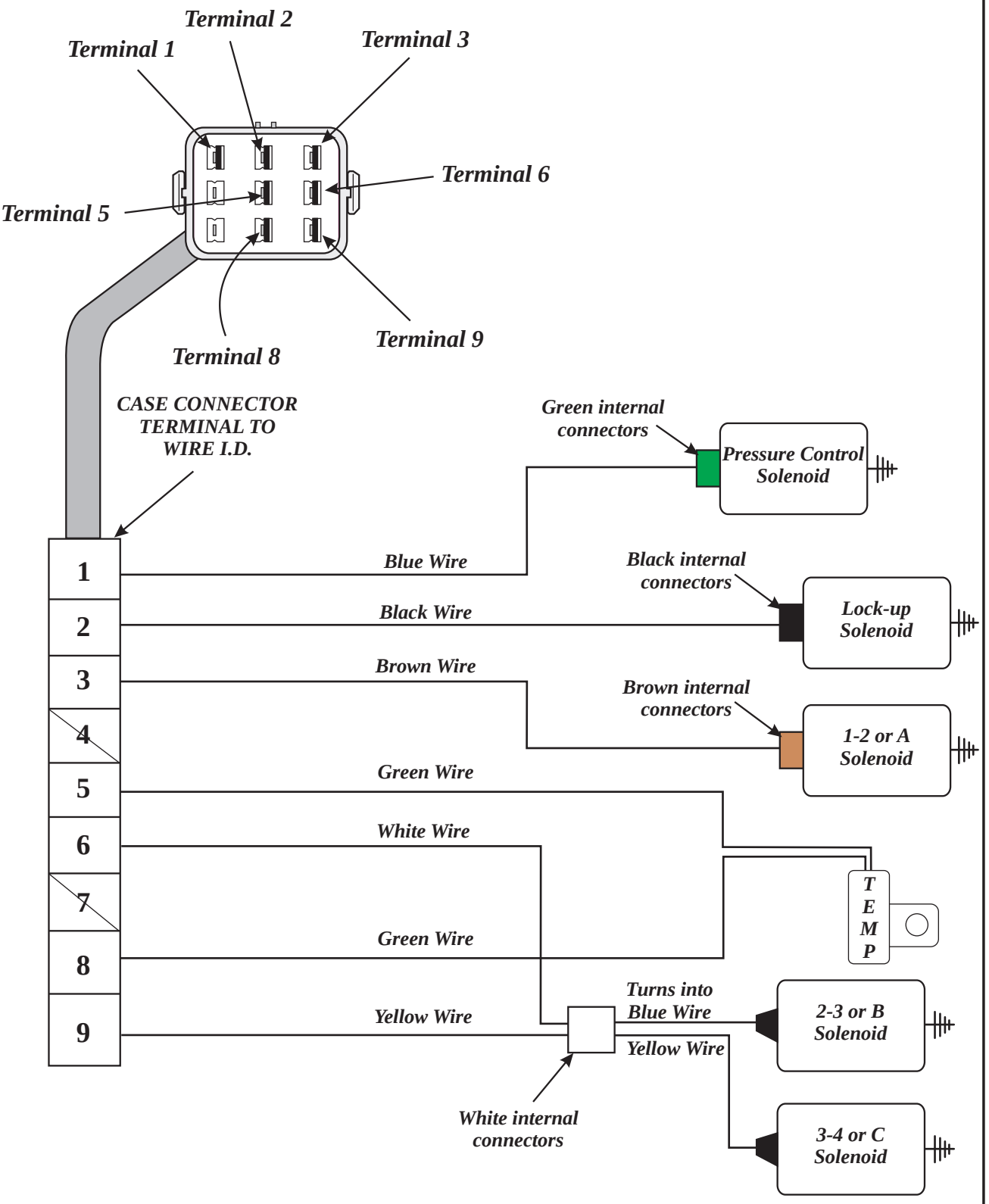


Figure 3

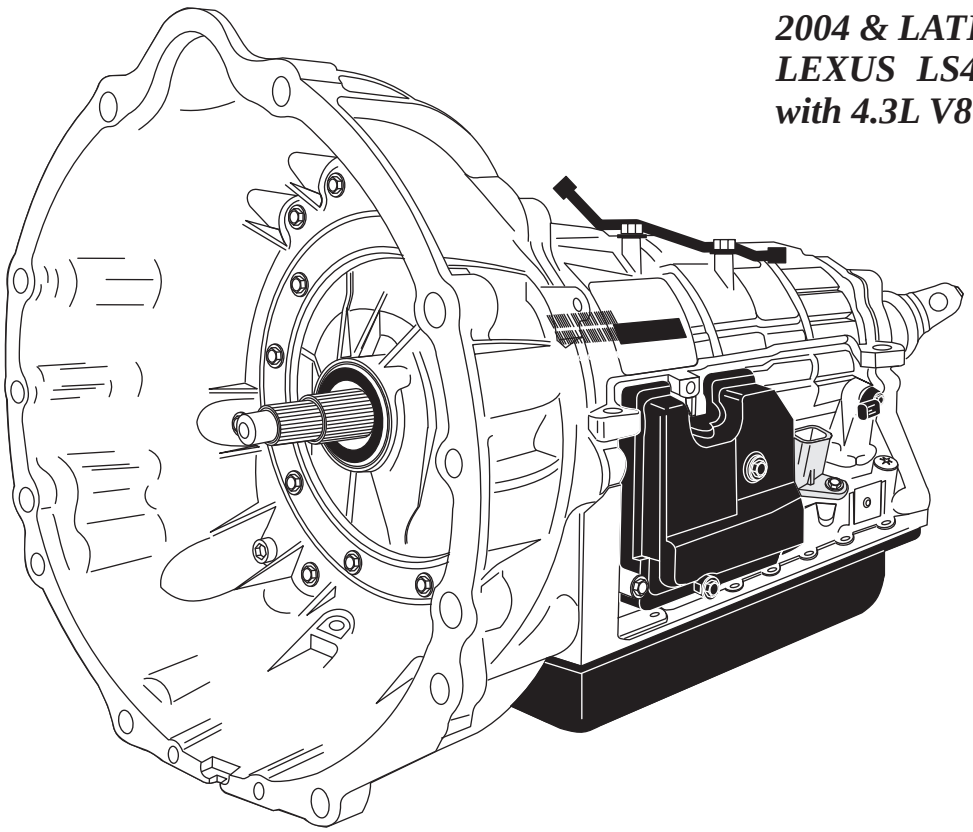
LEXUS A761E

PRELIMINARY INFORMATION

The A761E transmission is Toyota's first automatic six speed transmission. It is said that it is the lightest six speed automatic transmission in the world weighing in at 187 pounds wet. This transmission is currently found in the 2004 and later Lexus LS430 behind its 4.3L, 32 valve V8 engine. It is an enhanced A750E used in the Land Cruiser. Many of the parts used in the A750E are the same in the A761E. The most significant deviation is with the addition of a C4 clutch and F4 sprag inside the C1 clutch drum assembly (See Figures 1 and 2). This addition combines clutch to clutch shifting without any sprag assist between 5th and 6th speeds only.

The computer strategy which operates the transmission is called the ECT-i: Electronically Controlled Transmission with intelligence. The ECT-i uses additional electronic controls to adjust hydraulic pressure gradually for even smoother shifts. The ECT-i computer also has a limited ability to adjust for wear in the transmission and even to learn and respond to a person's driving behavior (based on the resulting engine input conditions).

One strategy of the ECT-i is to partially disengage the C1 (Forward) Clutch during stops to increase fuel efficiency. Another strategy with which fuel efficiency is increased is that fuel cut is maintained during 6th-5th/5th-4th decelerations.



2004 & LATER
LEXUS LS430
with 4.3L V8

LEXUS A761E PRELIMINARY INFORMATION

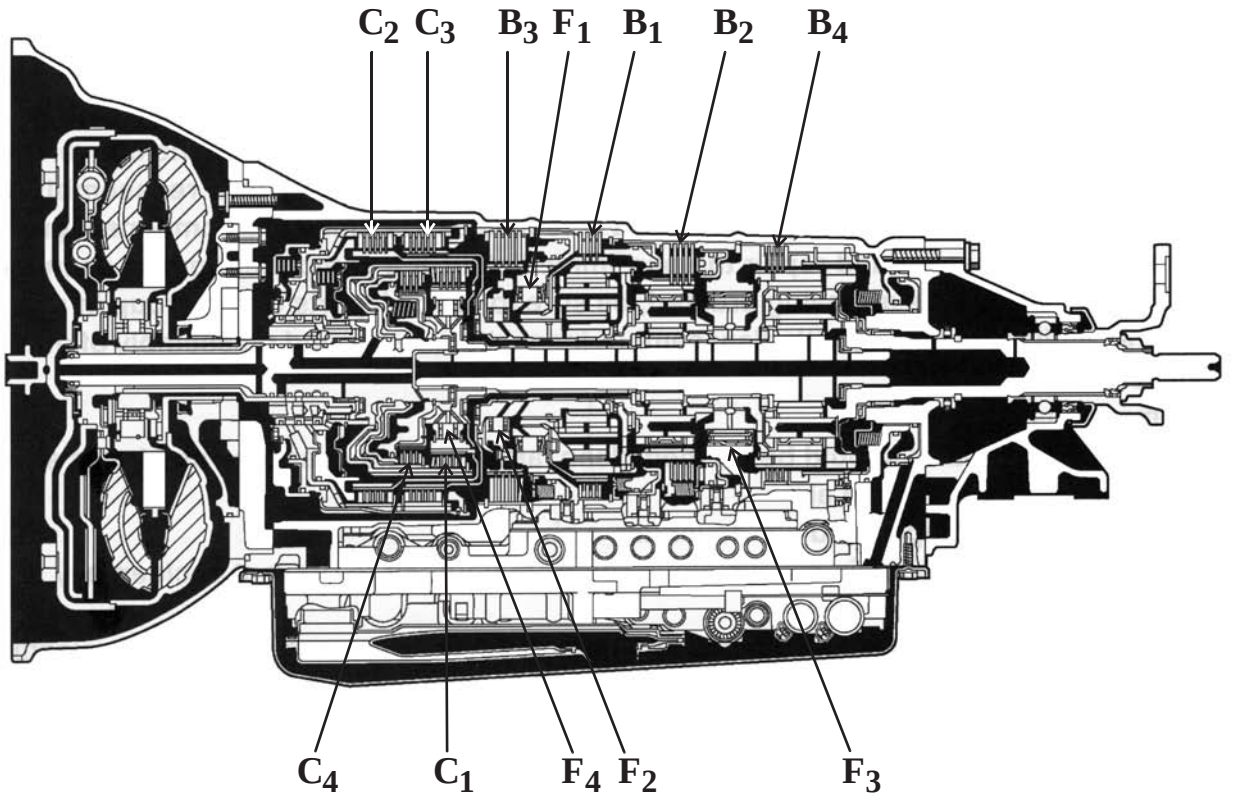
Refer to Figures 1 and 2 for Clutch location, clutch application and solenoid function.
Refer to Figures 3, 4, 5, and 6 for Shift position function.
Refer to Figures 7 and 8 for Mode Switch operation.
Refer to Figures 9 and 10 for solenoid failsafe operation.
Refer to Figure 11 for the basic ECM wiring diagram.
Refer to Figure 12 for internal component resistance values.
Refer to Figures 13, 14 and 15 for diagnostic trouble codes.
Refer to Figure 16 for transmission range sensor continuity checks.
Refer to Figures 17, 18, 19, 20 and 21 for transmission fluid fill procedures.
Refer to Figure 22 for line pressure service port location.
Refer to Figure 23 for valve body bolt locations.
Refer to Figures 24, 25, 26, 27 and 28 for solenoid ID, check ball location and valve identification.
Refer to Figure 29 for accumulator identification.

GEAR RATIOS

First	3.296
Second	1.959
Third	1.348
Fourth	1.000
Fifth	0.726
Sixth	0.582
Reverse	2.951

LEXUS A761E PRELIMINARY INFORMATION

LEXUS A761E APPLICATION CHART



Shift Lever Position		Solenoids								Driving Clutches				Brake Clutches				One-Way Clutches			
		S1	S2	S3	S4	SR	SL1	SL2	SLU	C_1	C_2	C_3	C_4	B_1	B_2	B_3	B_4	F_1	F_2	F_3	F_4
Park			ON	ON		ON		ON													
Reverse			ON	ON		ON		ON				○		○			○	○			
Neutral			ON	ON		ON		ON													
D S (6)	1st		ON	ON		ON		ON		○			○							○	○
	2nd	ON	ON	ON		ON		ON	ON	○			○			○		○	○		○
	3rd	ON		ON		ON		ON	ON	○		○	○			●		○			○
	4th	ON				ON		ON	ON	○	○	●	○			●					○
	5th	ON			ON		ON		ON	●	○	○		○		●					
	6th	ON	ON		ON		ON		ON	●	○			●	○	●					

Figure 1

LEXUS A761E PRELIMINARY INFORMATION

LEXUS A761E APPLICATION CHART...*continued*

Shift Lever Position		Solenoids								Driving Clutches				Brake Clutches				One-Way Clutches			
		S1	S2	S3	S4	SR	SL1	SL2	SLU	C_1	C_2	C_3	C_4	B_1	B_2	B_3	B_4	F_1	F_2	F_3	F_4
S (5)	1st		ON	ON		ON		ON		○			○							○	○
	2nd	ON	ON	ON		ON		ON	ON	○			○			○		○	○		○
	3rd	ON		ON		ON		ON	ON	○		○	○			●		○			○
	4th	ON				ON		ON	ON	○	○	●	○			●					○
	5th	ON			ON		ON		ON	●	○	○		○		●					
S (4)	1st		ON	ON		ON		ON		○			○							○	○
	2nd	ON	ON	ON		ON		ON	ON	○			○			○		○	○		○
	3rd	ON		ON		ON		ON	ON	○		○	○			●		○			○
	4th*	ON				ON		ON	ON	○	○	●	○			●					○
S (3)	1st		ON	ON		ON		ON		○			○							○	○
	2nd	ON	ON	ON		ON		ON	ON	○			○			○		○	○		○
	3rd*	ON		ON		ON			ON	○		○	○	○		●					
S (2)	1st		ON	ON		ON		ON		○			○							○	○
	2nd*	ON	ON	ON	ON	ON			ON	○			○		○	○					
S (1)	1st*		ON	ON		ON				○			○				○				

○ : In operation

● : Applied but ineffective

* : with engine breaking

Figure 2

LEXUS A761E PRELIMINARY INFORMATION

Driving Pattern Select Switch

The Driving Pattern Select Switch located in the center floor console consists of a Park, Reverse, Neutral, Drive and Select Mode Driving position (See Figure 3). A shift lock system is used to minimize the possibility of incorrect operation. This means that you can only shift out of Park when the brake pedal is depressed with the ignition switch in the ON position.

Once the selector lever is placed into the Drive position (Figure 4), the Engine Control Module provides an Artificial Intelligence (AI) shift control strategy.

AI shifting control selects the most suitable shift range automatically according to the driver's operation and driving condition. It judges whether the road is downslope or up-slope by detecting the throttle opening degree or the vehicle speed. It can also detect turns by monitoring wheel speed and will prevent unnecessary upshifting and down shifting. AI can also read the driver's intention by monitoring acceleration and tailor shift time and feel ideal for each driver. AI shift control operates automatically with the selector lever in the "D" position. When it is moved to the "S" position, this function will be canceled (Figure 5).

If the selector lever is placed into the "S" range from the "D" range on the fly (while driving in the AI shift control strategy), the AI strategy will select the proper shift range based upon the driving condition at the time the selector lever was moved. AI will select either the 5th, 4th or 3rd range. Once selected, AI strategy will be canceled.

Once in the "S" position, an upper range can be selected by pushing the shifter forward. Likewise, a lower range can be selected by pulling the shifter down. Once a range is selected and the shifter remains untouched in the "S" position, the transmission will shift between the lowest to the highest range selected (See Figure 6). The ranges are as follows:

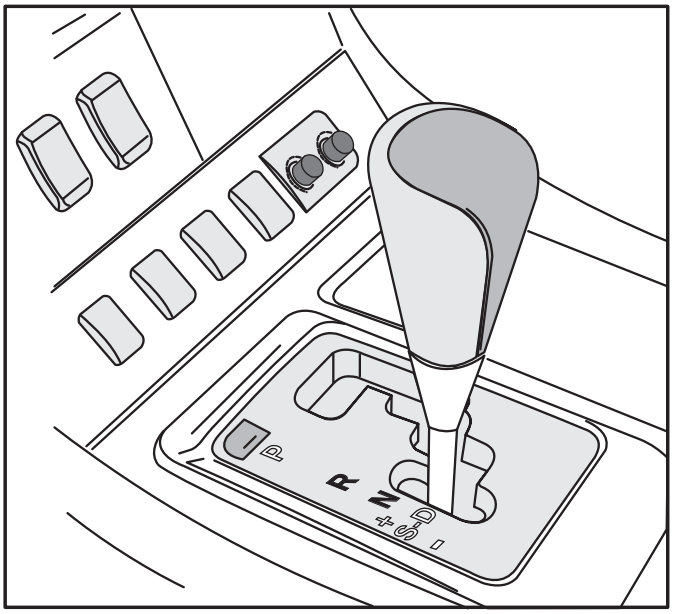


Figure 3

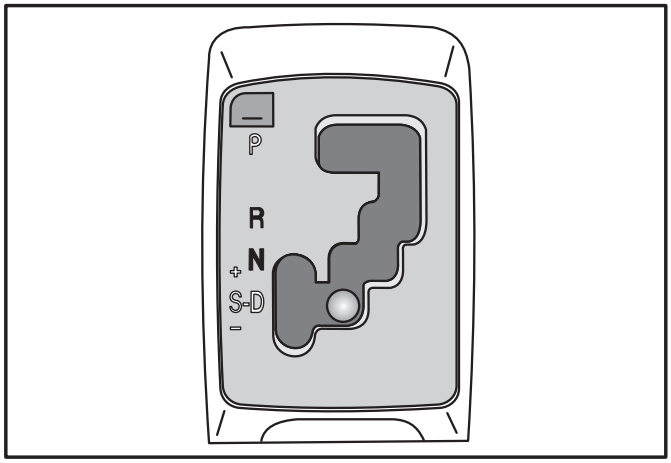


Figure 4

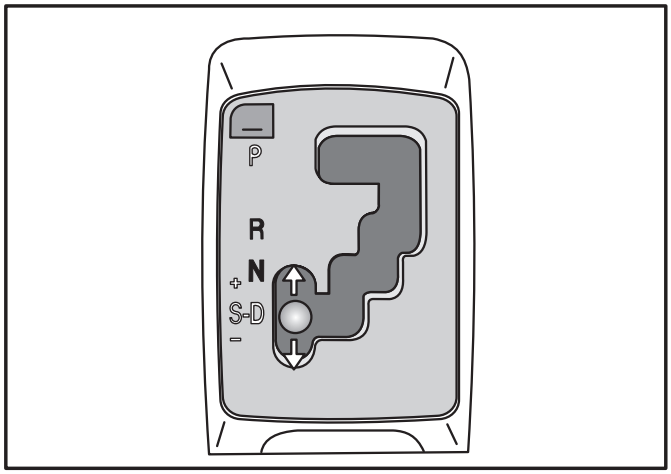


Figure 5

LEXUS A761E PRELIMINARY INFORMATION

"6" (sixth range): The most suitable gear is automatically selected between first and overdrive (sixth) gears according to vehicle speed and driving conditions. This range provides the best in fuel economy and quiet driving.

"5" (fifth range): The most suitable gear is automatically selected between first and fifth gears according to vehicle speed and driving conditions. This range works well for passing a vehicle during high speed driving.

"4" (fourth range): The most suitable gear is automatically selected between first and fourth gears according to vehicle speed and driving conditions. In this range, the system will select the suitable gear during hilly driving or towing conditions.

"3" (third range): The most suitable gear is automatically selected between first and third gears according to vehicle speed and driving conditions. This selection is used if stronger engine braking is needed.

"2" (second range): The most suitable gear is automatically selected between first and second gears according to vehicle speed and driving conditions. This selection is used if stronger engine braking than that of third is needed.

"1" (first range): This gear is fixed regardless of vehicle speed or driving conditions. This range is to be used when maximum engine braking is necessary.

The Do's and Don'ts in the "S" Mode

If you attempt to downshift the transmission when it is not possible to downshift due to high vehicle speed, a warning tone sounds twice.

The maximum speed the vehicle can be held in the first range before manually up-shifting into the second range is 36 mph (59 km/h). The maximum speed second range can be held is 62 mph (100 km/h). The maximum speed third range can be held is 90 mph (146 km/h).

Shift Range Position Indicator Light in the Instrument Cluster

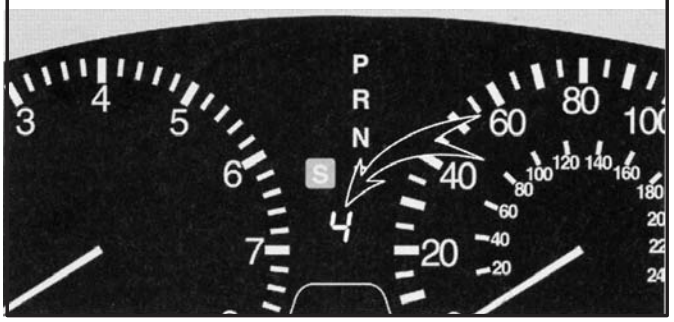


Figure 6

Up-shifts into 5th and 6th gears are prohibited if engine coolant temperature is 131º F (55º C) or less.

Up-shifts into 4th gear is prohibited if the engine coolant temperature is 117º F (47º C) or less.

Lock-Up and Flexible Lock-Up Control

The Engine Control Module controls TCC operation through the high side of the SLU solenoid according to shift position, vehicle speed, throttle opening degree and running conditions. The ECM also steadily keeps applying the lock-up clutch to a delicate slippage to improve the transmission efficiency of the torque converter for increased fuel economy.

Lock-Up Control is prohibited if:
1. The brake pedal is depressed
2. The accelerator pedal is released
3. Engine coolant temperature is 140º F (60º C) or less.

There is no full lock-up function in 1st, 2nd and 3rd gears. This is normal operation.

The Electronic Throttle Control System
The electronic throttle control system always maintains appropriate engine output in relation to the accelerator openings in all driving conditions.

The electronic throttle control system has 3 modes: Normal, Power and Snow modes (See Figure 7).

LEXUS A761E PRELIMINARY INFORMATION

Normal mode: For ordinary driving, this selection provides improved fuel economy.

Power mode: In the Power Mode, the "ECT PWR" light in the instrument cluster is illuminated (Figure 8) and the transmission is shifted at a higher vehicle speed and downshifts more responsively than in the normal mode. This provides for a more powerful acceleration and sporty driving strategy.

***Snow mode*:** For slippery road surfaces such as in snow, the spinning of the rear wheels is controlled appropriately. When selected, the "ECT SNOW" light in the instrument cluster is illuminated.

FAIL-SAFE STRATEGIES
This function minimizes the loss of Electronic Transmission Control (ETC) functions should any malfunction occur with a sensor or solenoid.

DTC or Malfunctioned Part
DTC P0717 Input Speed Sensor (NT)

Fail-Safe Strategy
During an input speed sensor malfunction, shift control occurs through the output speed sensor signal (SP2).

During this malfunction, up-shifts to 5th and 6th, AI Shift Control and Flex Lock-up control are prohibited.

DTC or Malfunctioned Part
DTC P0500 Output Speed Sensor (SP2)

Fail-Safe Strategy
During an output speed sensor malfunction, shift control occurs through the input speed sensor signal (NT) and up-shifts to 5th and 6th, the AI Shift Control and Flex Lock-up control are prohibited.

DTC or Malfunctioned Part
DTC P0710, P0712, P0713 ATF Temp. Sensor

Fail-Safe Strategy
During this malfunction, up-shifts to 5th and 6th and Flex Lock-up control are prohibited.

The Electronic Throttle Control Power - Normal - Snow Modes

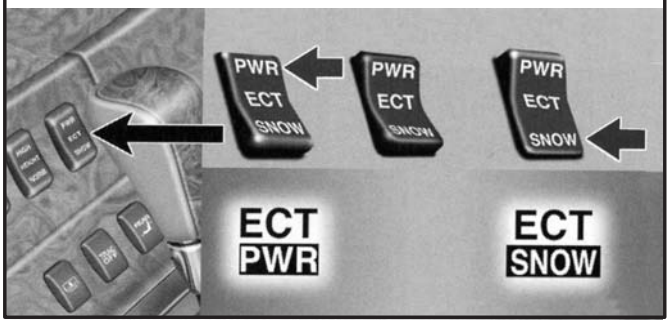


Figure 7

Power and Snow Mode Indicator Lights and MIL Light

Figure 8

DTC or Malfunctioned Part
Shift Solenoids S1, S2, S3, S4 and SR

Fail-Safe Strategy - Solenoid Circuit Failure
The current to the failed solenoid is cut off and control is affected by operating other solenoids. Shift control is affected depending on which solenoids have failed. Various shift patterns related to failed solenoids are presented in a chart as seen in Figures 9 and 10

Fail-Safe Strategy - Solenoid Mechanical Failure
Certain mechanical/performance codes will fail-safe the vehicle to 3rd gear regardless of shift lever position in range 3 or higher. They are:

P0729 - Gear 6 Incorrect Ratio Reverse Sequence
P0751- S1 Performance Failure
P0761 - S3 Performance Failure
P0766 - S4 Performance Failure
P0781 - 1-2 Shift Valve

LEXUS A761E PRELIMINARY INFORMATION

Diagnostic Trouble Code	Actual Gear Shift Command					
	1st	2nd	3rd	4th	5th	6th
P0751	1st*	1st*	3rd	3rd	3rd	3rd
P0761	1st	2nd	3rd	3rd	3rd	3rd
P0766	1st	2nd	3rd	3rd	3rd	3rd
P0781	1st*	1st*	3rd	3rd	3rd	3rd
P0729	1st	2nd	3rd	3rd	3rd	3rd
**Under certain driving conditions*						

DTC or Malfunctioned Part
DTC P0748, P0778 Solenoid SL1 and SL2

Fail-Safe Strategy
During a solenoid SL1 or SL2 malfunction, up-shifts to 5th and 6th gears and Flex Lock-up control are prohibited.

DTC or Malfunctioned Part
DTC P2757, 2759 Solenoid SLU

Fail-Safe Strategy
During a solenoid SLU malfunction, the current to the solenoid is stopped. This stops all lock-up and flex lock-up control and fuel economy decreases.

DTC or Malfunctioned Part
DTC P2714, P2716 Solenoid SLT

Fail-Safe Strategy
During a solenoid SLT malfunction, the current to the solenoid is stopped. This stops line pressure optimal control and firmer shifts are expected.

Fail-Safe Chart For Electrical Solenoid Malfunction

Shift Lever Position	Normal								Shift Solenoid S1 Electrical Malfunction Code P0973, P0974							
	Gear	Shift Solenoid (ECM output)							Gear *2	Shift Solenoid (ECM output)						
		S1	S2	S3	S4	SR	SL1	SL2		S1	S2	S3	S4	SR	SL1	SL2
D, S6	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF	5th	X	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF	N→5th	X	ON→OFF	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON	3rd→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON	1st→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF	3rd (E/B)→4th	X	OFF	ON→OFF	OFF	ON	OFF	ON→OFF
S2	1st	OFF	ON	ON	OFF	ON	OFF	ON	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	OFF	OFF	OFF	1st (E/B)→4th	X	ON→OFF	ON→OFF	OFF	ON	OFF	ON→OFF
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

2* : Actual gear shift (gear position) under fail-safe operation
X : OFF (the ECM stops sending current to a malfunctioning solenoid)
→ : Condition in the electrical malfunction is shown on the left of the arrow
Condition in the fail-safe mode is shown on the right side of the arrow
(E/B) : Engine Braking

Figure 9

LEXUS A761E PRELIMINARY INFORMATION

Shift Lever Position	Shift Solenoid S2 Electrical Malfunction Code P0976, P0977								Shift Solenoid S3 Electrical Malfunction Code P0979, P0980							
	Gear *2	Shift Solenoid (ECM output)							Gear *2	Shift Solenoid (ECM output)						
		S1	S2	S3	S4	SR	SL1	SL2		S1	S2	S3	S4	SR	SL1	SL2
D, S6	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	X	OFF	ON	OFF	ON	OFF	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd	OFF→ON	X	ON	OFF	ON	OFF	ON	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd→3rd (E/B)	OFF→ON	X	ON	OFF	ON	ON→OFF	OFF	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd→3rd (E/B)	ON	X	ON	OFF	ON	ON→OFF	OFF	4th	ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF	4th	ON	OFF	X	OFF	ON	OFF	OFF→ON
S2	3rd→3rd (E/B)	OFF→ON	X	ON	OFF	ON	ON→OFF	OFF	3rd→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	ON
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF	6th→4th	ON	ON→OFF	X	OFF	ON	OFF	OFF→ON
S1	3rd (E/B)	OFF→ON	X	ON	OFF	ON	OFF	OFF	1st (E/B)→4th	OFF→ON	ON→OFF	X	OFF	ON	OFF	OFF→ON

Shift Lever Position	Shift Solenoid S4 Electrical Malfunction Code P0982, P0983								Shift Solenoid SR Electrical Malfunction Code P0985, P0986							
	Gear	Shift Solenoid (ECM output)							Gear *2	Shift Solenoid (ECM output)						
		S1	S2	S3	S4	SR	SL1	SL2		S1	S2	S3	S4	SR	SL1	SL2
D, S6	1st	OFF	ON	ON	X	ON	OFF	ON	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON	4th	ON	OFF	OFF	OFF	X	OFF	ON
	4th	ON	OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON	5th	ON	OFF	OFF	ON	X	ON	OFF
	4th	ON	ON→OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	X	ON	OFF	ON	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON	4th	ON	OFF	OFF	OFF	X	OFF	ON
	4th	ON	OFF	OFF	X	OFF→ON	ON→OFF	OFF→ON	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	X	ON	OFF	ON	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF	3rd	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF	2nd	ON	ON	ON	OFF	X	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF	1st	OFF	ON	ON	OFF	X	OFF	OFF

Figure 10

LEXUS A761E PRELIMINARY INFORMATION

Transmission to ECM Wiring Schematic

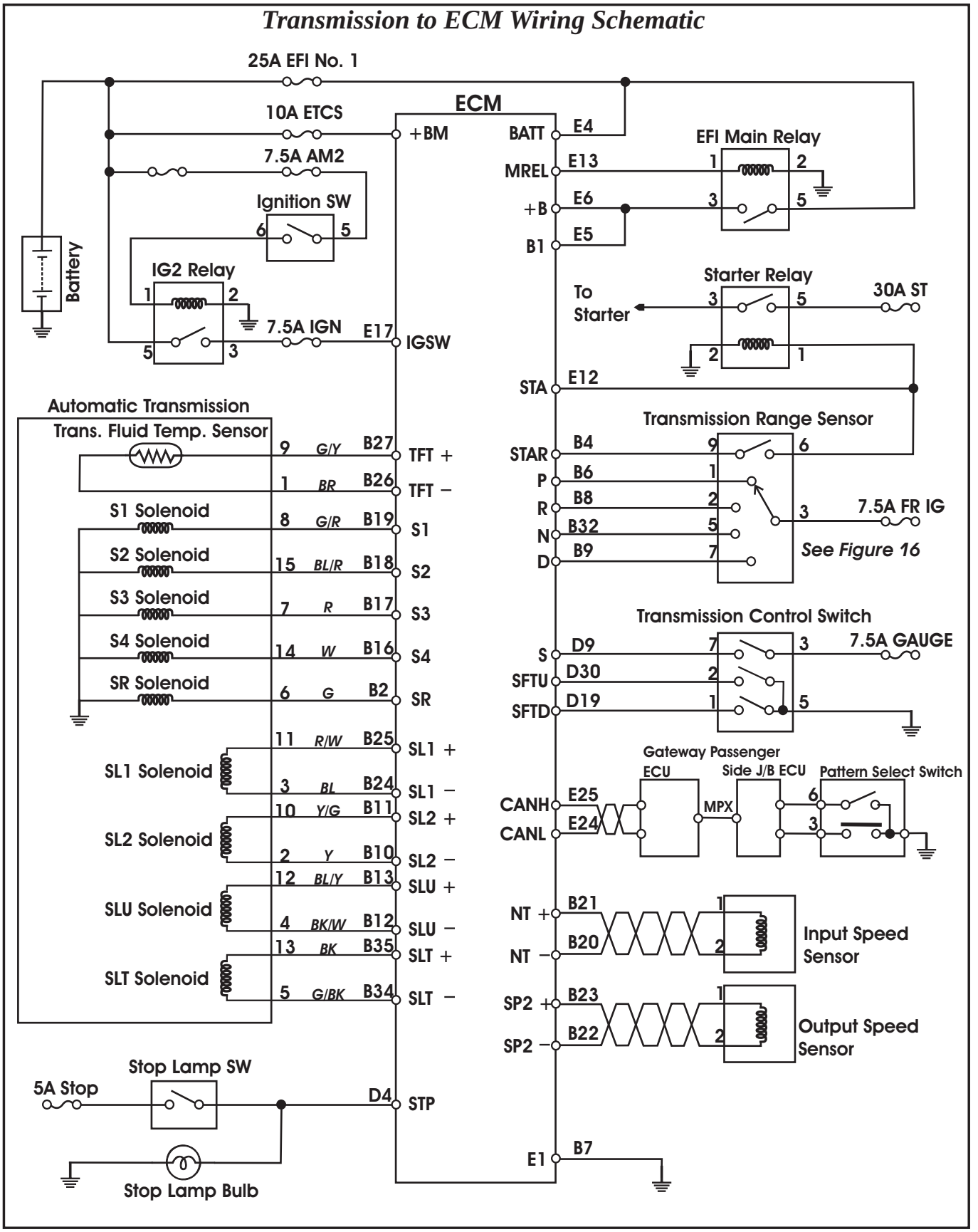
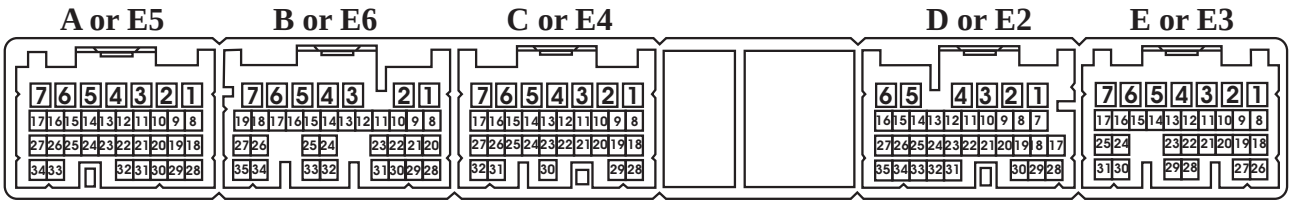


Figure 11

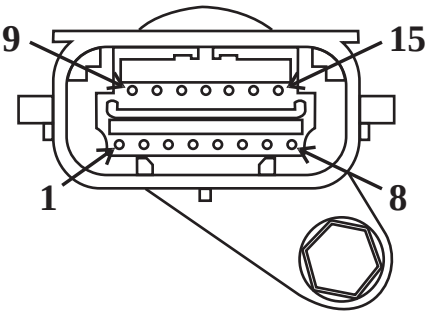
LEXUS A761E PRELIMINARY INFORMATION

Solenoid Resistance Check Chart at the Trans or ECM



ECM Connector and Pin ID

Transmission Case Connector Pin ID



Solenoid Resistance Check at the Transmission Case Connector OR from the ECM Connector "B" (E-6)

Description	*Transmission Case Connector*		*ECM "B"-"E6" Connector*		*Value in Ohms*
Solenoid	**Positive**	**Negative**	**Positive**	**Negative**	**Resistance**
S1	**8**	**Case Ground**	**19**	**7**	**11 - 15**
S2	**15**	**Case Ground**	**18**	**7**	**11 - 15**
S3	**7**	**Case Ground**	**17**	**7**	**11 - 15**
S4	**14**	**Case Ground**	**16**	**7**	**11 - 15**
SR	**6**	**Case Ground**	**2**	**7**	**11 - 15**
SL1	**11**	**3**	**25**	**24**	**5.0 - 5.6**
SL2	**10**	**2**	**11**	**10**	**5.0 - 5.6**
SLU	**12**	**4**	**13**	**12**	**5.0 - 5.6**
SLT	**13**	**5**	**35**	**34**	**5.0 - 5.6**
TFT	**9**	**1**	**27**	**26**	**79k - 156k**

Figure 12

Transmission Digest

European

European

Helc-Axiline

LEXUS A761E PRELIMINARY INFORMATION

Diagnostic Trouble Code Chart

***1 ● Malfunction Indicator Light Illuminated**
***2 ○ Diagnostic Code stored in memory when the ECM detects the condition that caused the code to set**

DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2
P0500	Vehicle Speed Sensor "A"	• Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM	●	○
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0710	Transmission Fluid Temperature Sensor "A" Circuit	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0711	Transmission Fluid Temperature Sensor "A" Performance	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	• Short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	• Open in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM	●	○
P0717	Turbine Speed Sensor Circuit No Signal	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM • Automatic transmission (clutch, brake or gear, etc.)	●	○
P0724	Brake Switch "B" Circuit High	• Short in stop light switch signal circuit • Stop light switch • ECM	●	○
P0729	Gear 6 Incorrect Ratio	• Valve body is blocked up or stuck (reverse sequence valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM	●	○
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	• Shift solenoid valve S1 remains open or closed • Valve body is blocked • No.2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	• Shift solenoid valve S2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○

Figure 13

LEXUS A761E PRELIMINARY INFORMATION

Diagnostic Trouble Code Chart

P0761	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	• Shift solenoid valve S3 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	• Shift solenoid valve S4 remains open or closed • Shift solenoid valve SL2 remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM	●	○
P0781	1–2 Shift (1 –2 Shift Valve)	• Valve body is blocked up or stuck (1–2 shift valve) • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P0850	Park/Neutral Switch Input Circuit	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM	●	○
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM	●	○
P0979	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM	●	○
P0980	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM	●	○
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM	●	○
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM	●	○

Figure 14

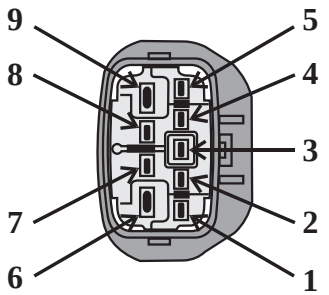
LEXUS A761E PRELIMINARY INFORMATION

Diagnostic Trouble Code Chart

P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM	●	○
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	• Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.) • ECM	●	○
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM	●	○
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low • ECM	●	○
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM	●	○

Figure 15

Transmission Range Sensor Check Chart



PIN ID / GEAR	1	2	3	4	5	6	7	8	9
P	●		●			●			●
R		●	●						
N	●		●			●			●
D, S			●				●		

●—● **Continuity (1 ohm or less) in the gear specified. 10K ohms or greater other than gear specified**

Figure 16

LEXUS A761E PRELIMINARY INFORMATION

Transmission Fluid Check

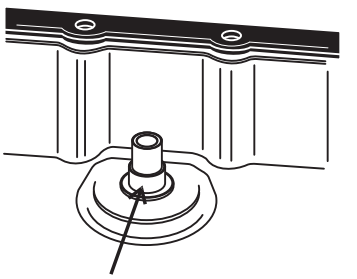
The A761E transmission does not utilize a conventional filler tube and dip stick for checking the fluid level. Looking at the bottom of the pan you will find two plugs one of which is marked as "check" (See Figure 17). The other is a drain plug.

Looking inside the pan in Figure 18, you can see that on the other side of this check plug is a check pipe. Fluid is to be filled until the level is high enough to run over and out of the check pipe.

To fill the transmission, there are two options. The first option which the manufacturer suggests is to remove the case cover from the side of the transmission as seen in Figure 19.

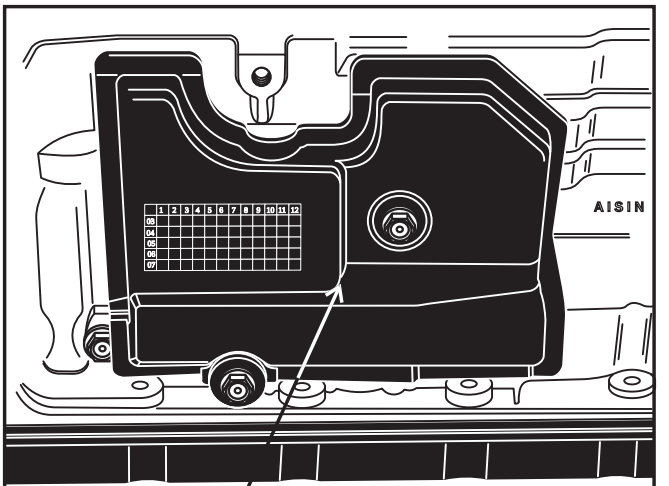
When the cover is removed, a 24mm fill plug becomes accessible (Figure 20). But further back on the same side of the case is another location that can be used to fill the transmission without having to pull this case cover off (Figure 21). This 55 torx head bolt is just below the output shaft speed sensor so care must be taken to not damage the sensor when you access this location.

This transmission utilizes a "WS" designated fluid and on a dry fill it will require 11.5 quarts (10.9L). 3.2 quarts (3.0L) on a drain and refill.



Check/OverflowTube inside pan

Figure 18



Case Cover

Figure 19

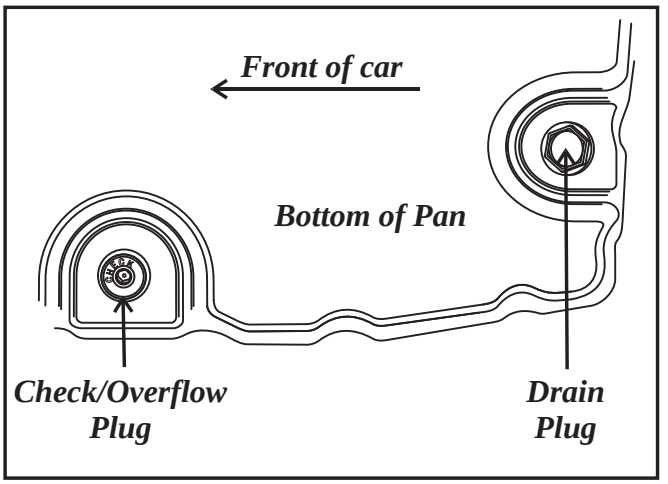
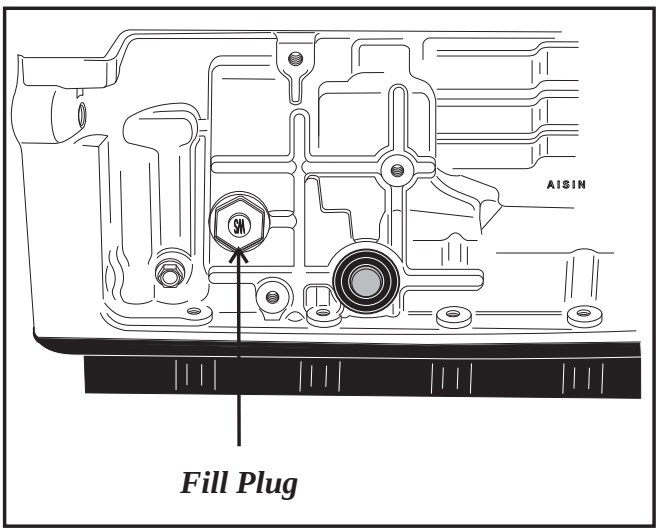


Figure 17



Fill Plug

Figure 20

LEXUS A761E PRELIMINARY INFORMATION

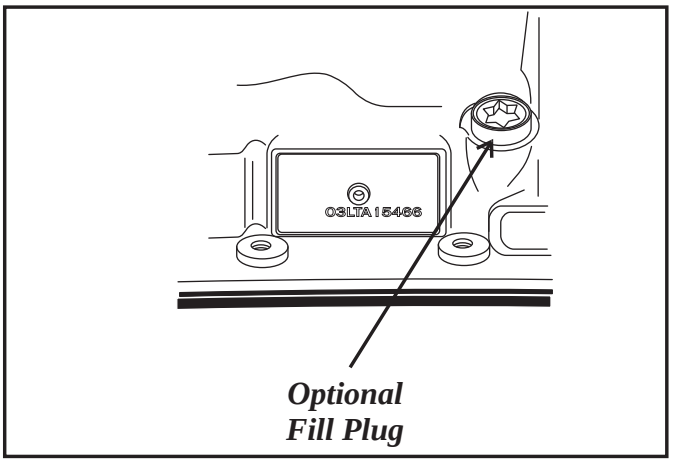


Figure 21

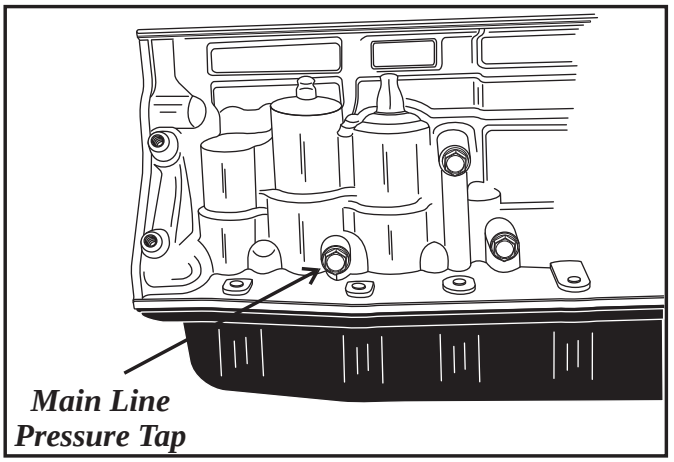


Figure 22

Main Line Pressure Tap

The main line pressure tap can be located on the side of the case as seen in Figure 22. Refer to the accompanying chart for pressure specifications.

RPM	DRIVE	REVERSE
Idle	52-61 psi	70-82 psi
Stall	181-195 psi	213-234 psi

Basic Pressure Diagnostics:

If pressure is high in all ranges and there are no DTC's, suspect a mechanical problem with the SLT solenoid or the pressure regulator valve.

If pressure is low in all ranges, suspect a mechanical problem with the SLT solenoid, the pressure regulator valve, the pump, or filter.

If pressure is low in the "D" position only, suspect a leak in the "D" hydraulic circuit or the C1 clutch.

If pressure is low in the "R" position only, suspect a leak in the "R" hydraulic circuit, the C3 or B4 clutch.

LEXUS A761E PRELIMINARY INFORMATION

Valve Body Removal

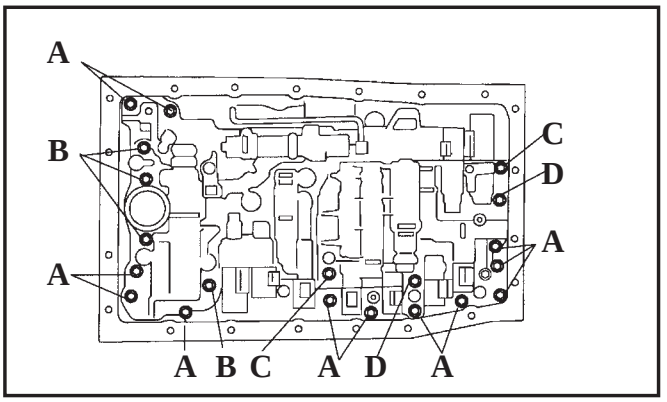


Figure 23

Valve Body Removal continued:

Remove the bolts indicated in figure 23 to remove the valve body. Each bolt is lettered for length identification and position when re-installing the valve body.

A: 0.98" (25 mm)
B: 1.42" (36 mm)
C: 1.77" (45 mm)
D: 1.97" (50 mm)

Valve Body and Solenoids

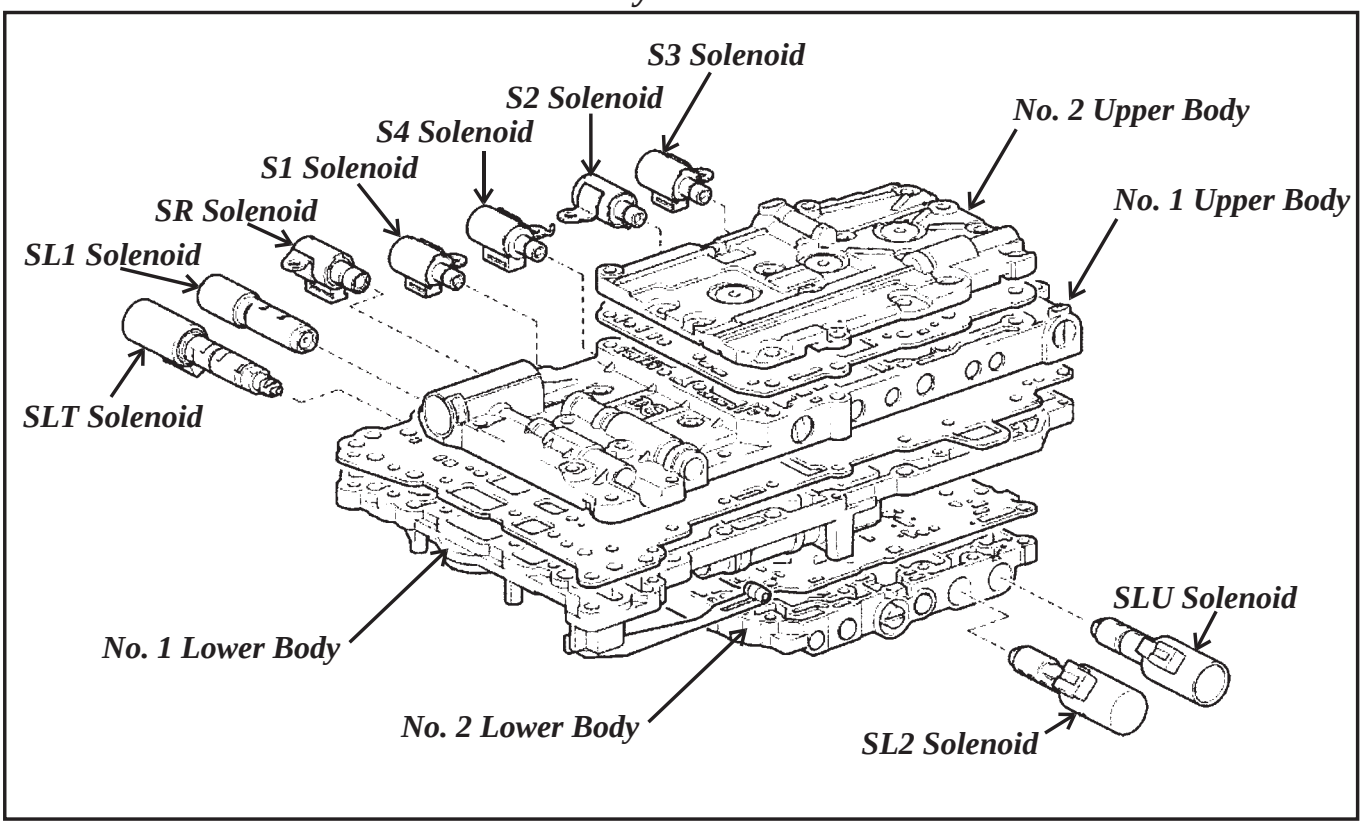
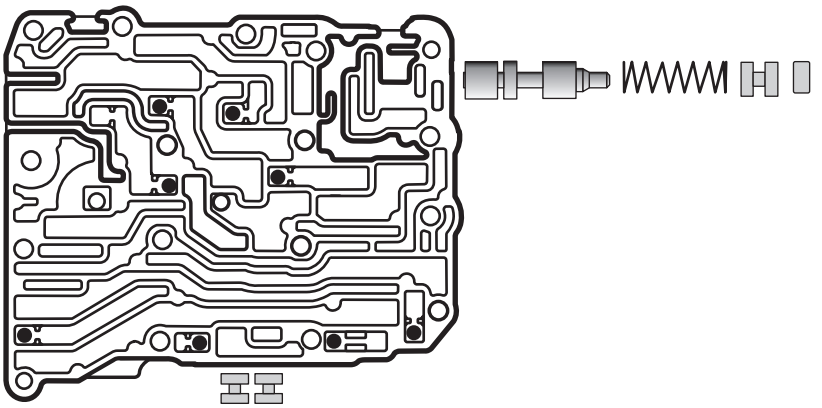


Figure 24

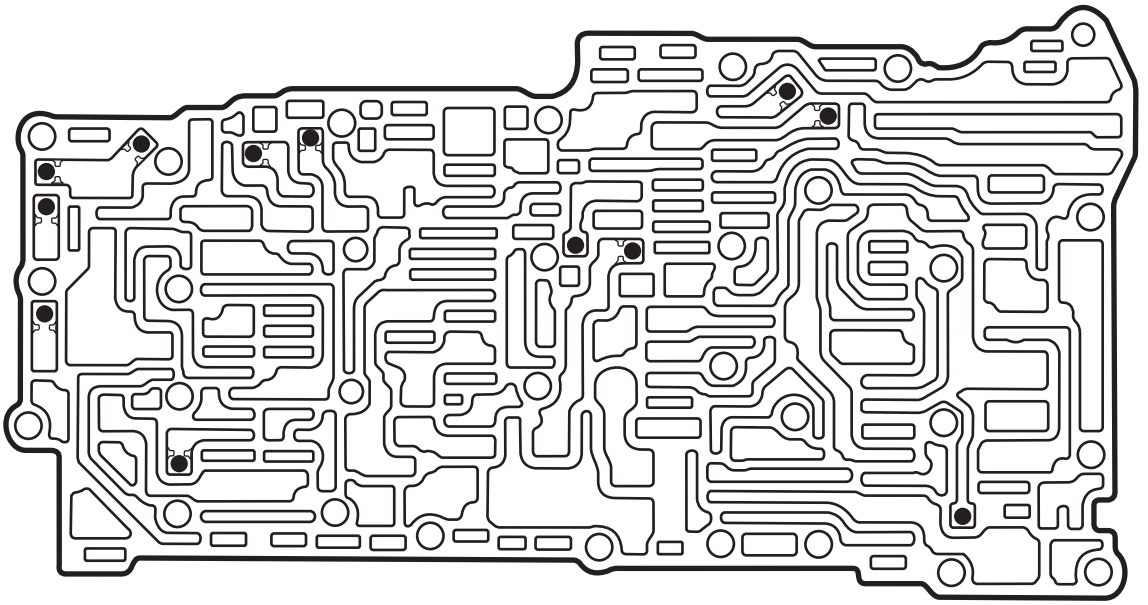
LEXUS A761E PRELIMINARY INFORMATION

Check Ball and Small Parts location

No. 2 Upper Valve Body Check Ball Locations



Check balls Measure:0.215" in diameter



No. 1 Upper Valve Body Check Ball Locations

Figure 25

LEXUS A761E PRELIMINARY INFORMATION

Check Ball and Small Parts location

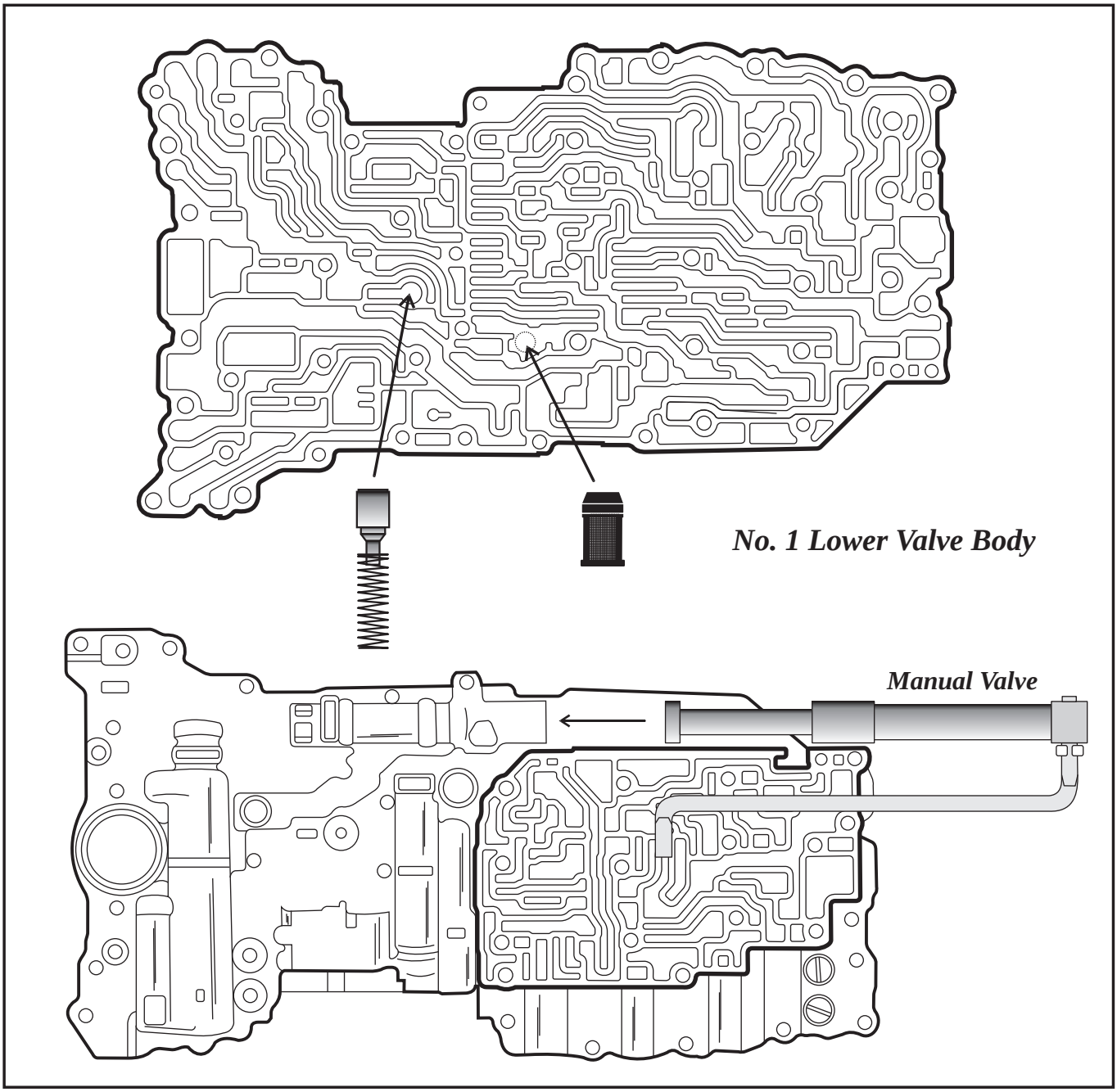


Figure 26

LEXUS A761E PRELIMINARY INFORMATION

No. 1 Upper Valve Body Valve Configuration

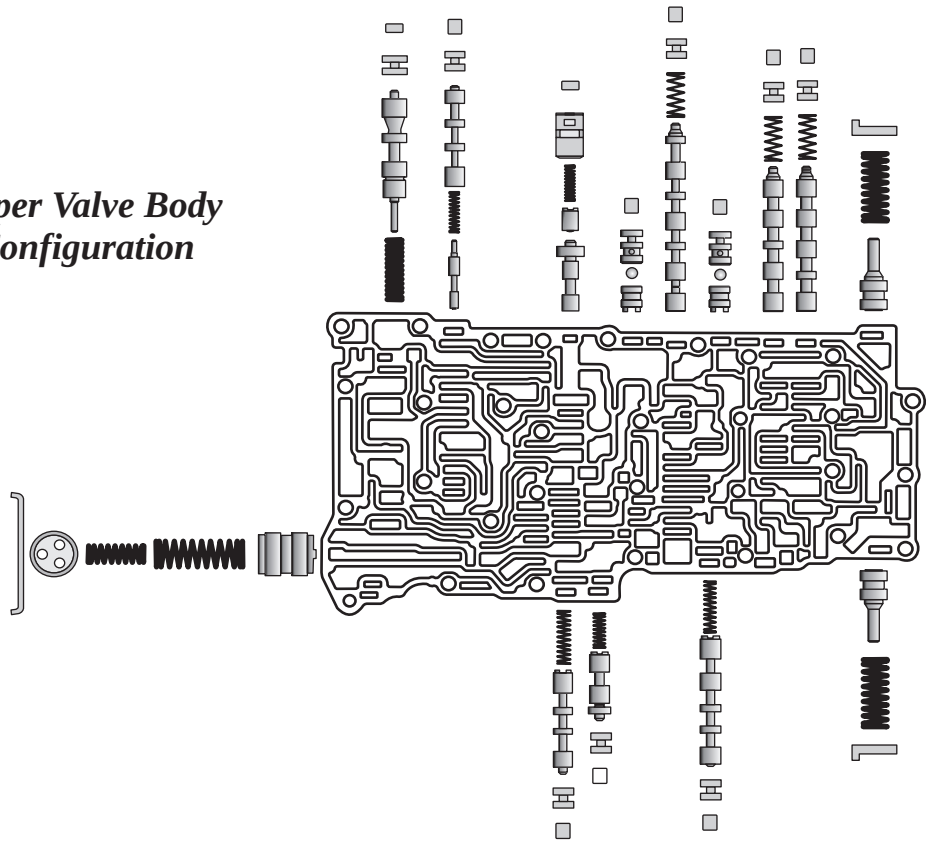
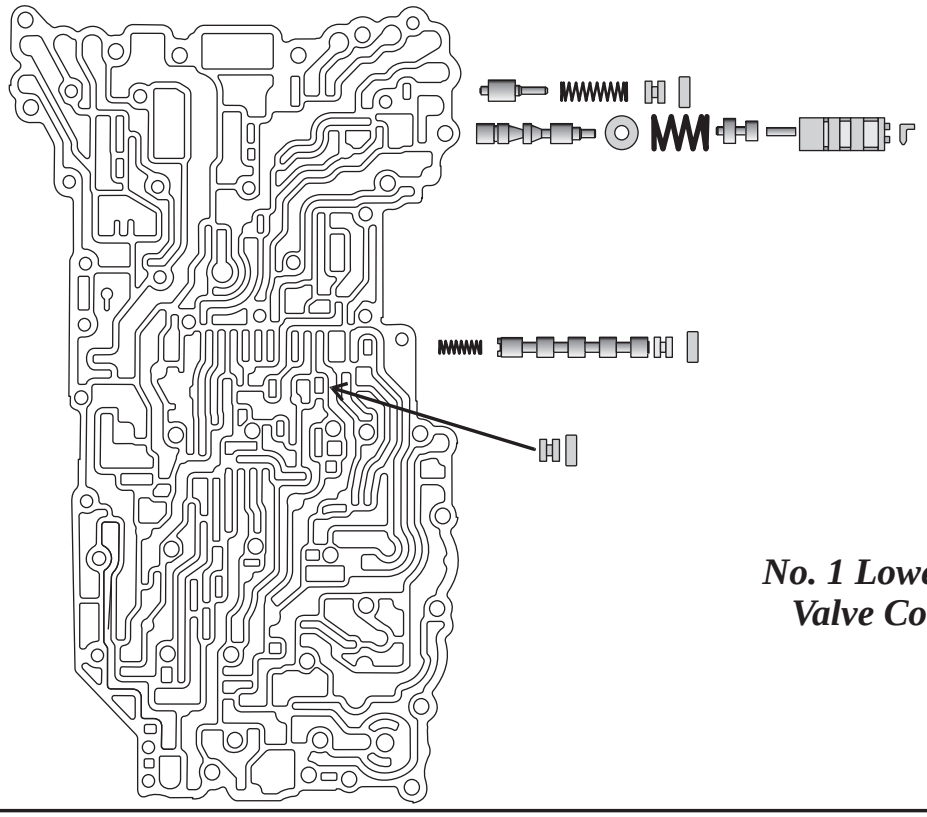


Figure 27

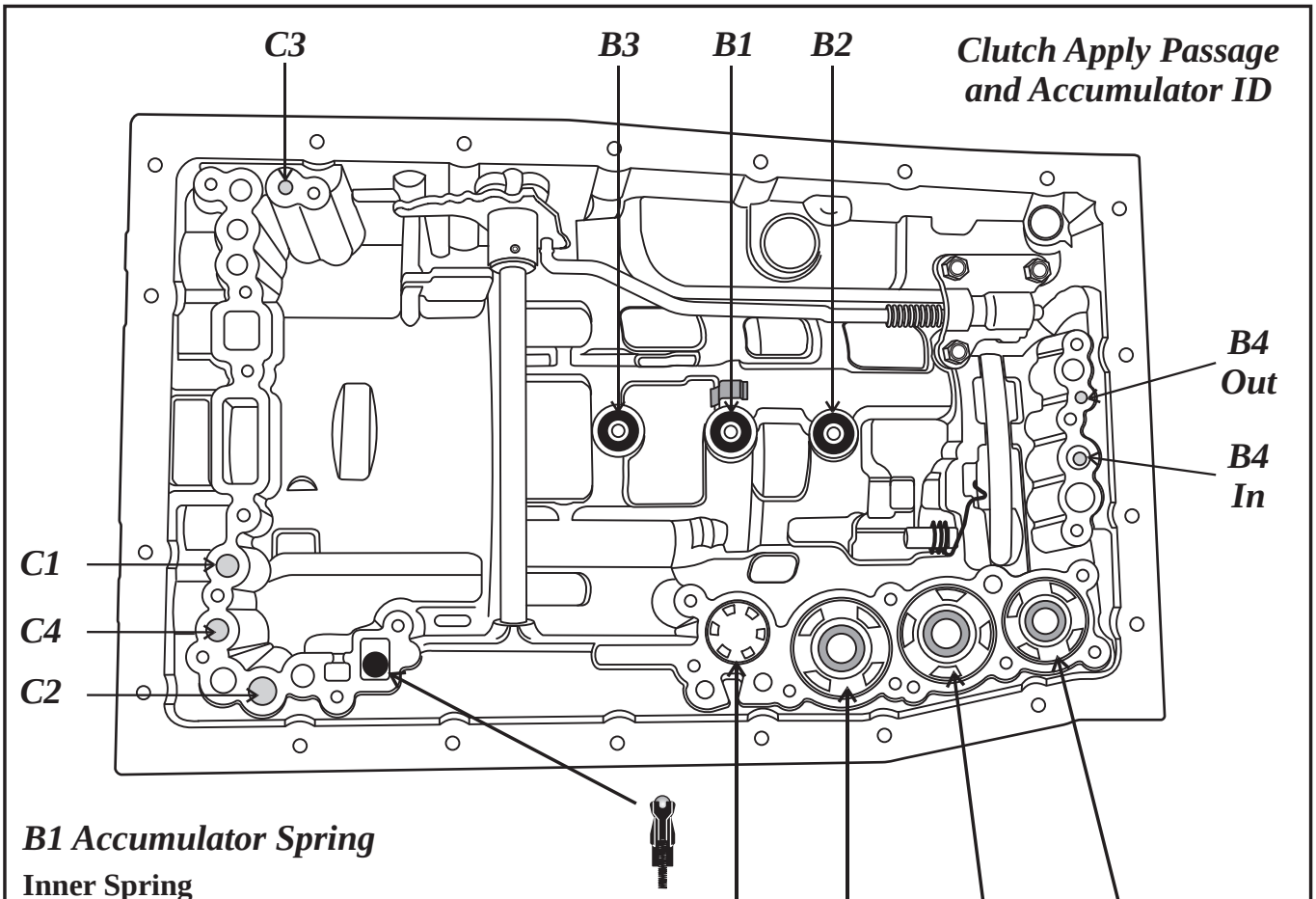


No. 1 Lower Valve Body Valve Configuration

Figure 28

HFT

LEXUS A761E PRELIMINARY INFORMATION



B1 Accumulator Spring

Inner Spring

Free Length	Outer Diameter	Color
1.7099" (44.98 mm)	0.445" (11.30 mm)	Natural

Outer Spring

Free Length	Outer Diameter	Color
1.8252" (46.36 mm)	0.6732" (17.10 mm)	Natural

C3 Accumulator Spring

Inner Spring

Free Length	Outer Diameter	Color
1.732" (44.0 mm)	0.551" (14.00 mm)	Yellow

Outer Spring

Free Length	Outer Diameter	Color
3.0178" (76.65 mm)	0.7913" (20.10 mm)	Natural

B3 Accumulator Spring

Free Length	Outer Diameter	Color
2.539" (64.5 mm)	0.768" (19.5 mm)	Orange

C2 Accumulator Spring

Free Length	Outer Diameter	Color
2.4858" (63.14 mm)	0.6299" (16.0 mm)	Lt. Grey

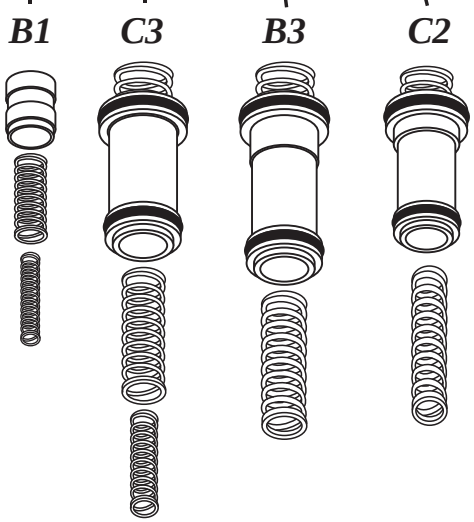


Figure 29

MERCEDES 722.6
VARIETY OF SHIFT AND/OR TCC COMPLAINTS

COMPLAINT: Before or after a rebuild, a 722.6 Mercedes transmission may experience one or more shift complaints such as delayed engagements, flared up shifts, flared kick down shifts, implausible ratio codes, coast downshift clunks, TCC slip codes, no movement in reverse and/or no movement forward. It has been determined that the first design Pressure Regulator Control Valve Spring is not broken and when the unit is removed, all frictions look good.

CAUSE: Low retention of OEM scarf cut sealing rings for the K2 clutch drum on the input shaft as well as the output shaft rings for the K3 clutch drum (See Figure 1). The rings on the input shaft could cause a loss of pressure for the K2 clutch and/or the converter clutch while the rings on the output shaft could lose K3 clutch pressure. The severity of the leak would determine the degree of shift complaints.

It should be noted that the F1 and F2 sprags are also known to slip causing shift complaints and implausible shift errors (gear ratio errors) especially if they are not the later 20 element design.

A defective TCM with M112 and M113 engines has also been known to cause the transmission go to neutral by itself while driving. The transmission may or may not re-engage with a lower vehicle speed and/or ignition cycle. A complaint of an intermittent slipping through all the gears may occur as well as an intermittent lose of engagement after a brief stop. It comes to the shop and the problem is hard to duplicate for customer complaint verification. A code 146 Transmission Slipping may also be stored.

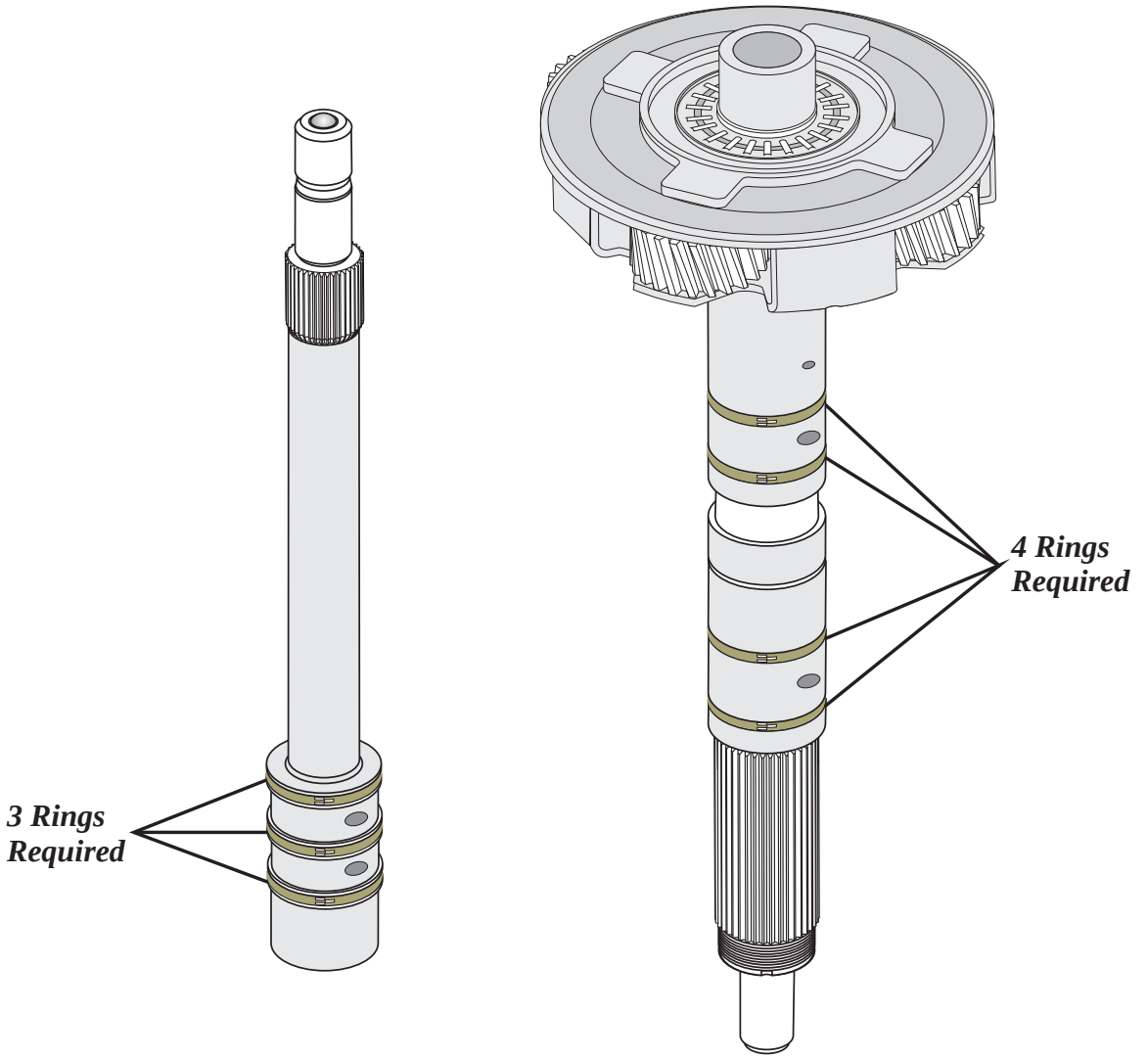
CORRECTION: Since pressure testing with a gauge is not available, it is highly recommended to update the rings to the newer style as seen in figure 1 and replace the sprags, especially if the F1 sprag has 16 elements and the F2 has 14. These are early sprags and are prone to slipping. Both sprags have been updated to 20 elements each (See Figure 2 and 3).

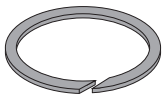
If there are no other apparent reasons for the slipping problem, suspect the TCM.

SERVICE INFORMATION:

Input Shaft Rings (3 required) part number only gets you one ring.....220-272-04-55
Output Shaft Rings (4 required) part number only gets you one ring.....220-272-03-55
F1 20 Element Sprag.....A722-270-00-31
F2 20 Element Sprag.....A 220-270-01-31
TCM/ETC M112*.....026-545-84- 32/26
TCM/ETC M113*.....026-545-73- 32/26
*Mercedes Bulletin 30/99-2 Group 27

MERCEDES 722.6
VARIETY OF SHIFT AND/OR TCC COMPLAINTS





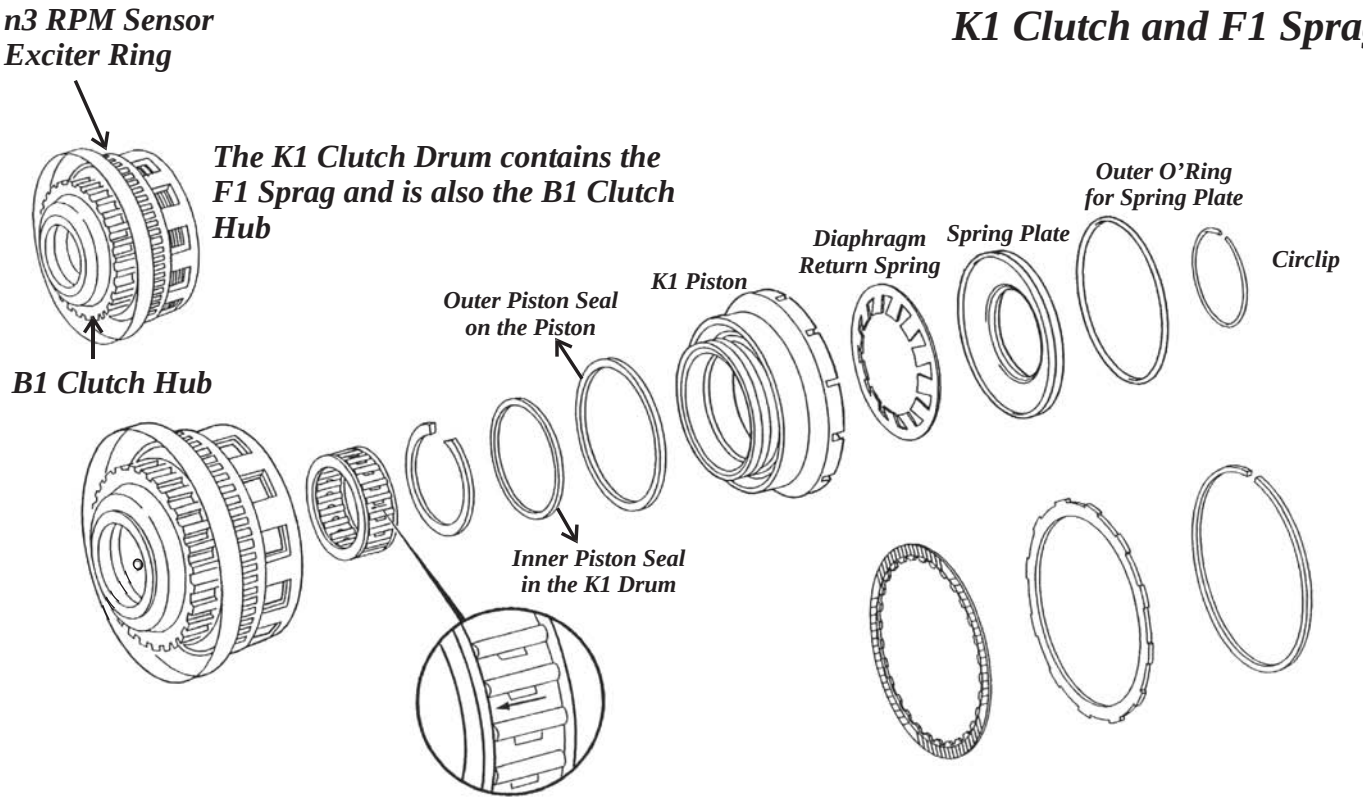
Previous Design
Scarf Cut Ring

New Design
Vespel Style Ring

Special Thanks
to Mario Aristides

Figure 1

K1 Clutch and F1 Sprag



This sprag has been updated from a 16 element sprag to a 20 element sprag. The original plastic sprag body is black while the replacement is brown. Both designs have an arrow embossed into it as indicated above. This arrow points to the pump. When the F1 Sprag is assembled correctly, the K1 clutch drum locks to the clock and freewheels counter clockwise while on the pump tower. The part number for the new sprag is: A 722 270 00 31. The earlier sprag is known to slip causing gear ratio codes.

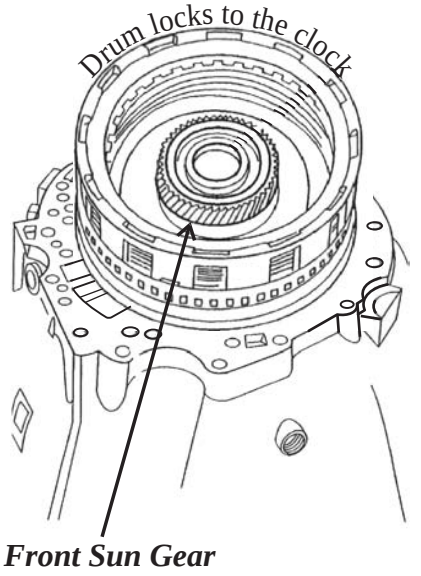
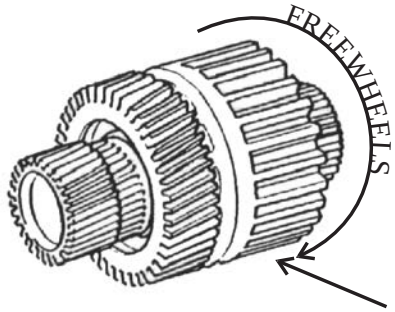


Figure 2

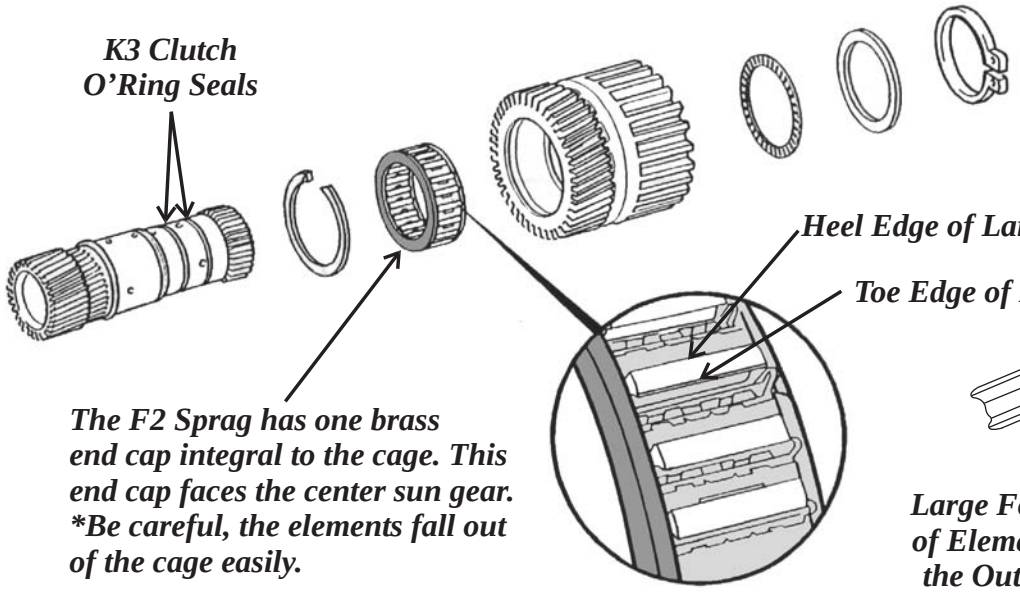
F2 Sprag

HOLD STATIONARY
The Center Sun Gear Shaft which is the F2 Sprag's Inner Race



TURNS COUNTER CLOCKWISE
The Rear Sun Gear and K3 Clutch Hub should turn Counter Clockwise and Lock to the Clock

K3 Clutch O'Ring Seals

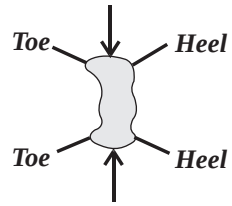


Heel Edge of Large Foot

Toe Edge of Large Foot

*The F2 Sprag has one brass end cap integral to the cage. This end cap faces the center sun gear. *Be careful, the elements fall out of the cage easily.*

Large Foot Edge of Element faces the Outer Race



Small Foot Edge of Element faces the Inner Race

This sprag has been updated from 14 elements to 20. The new 20 element sprag part number is A 220 270 01 31. It is very common to find that some of the elements have fallen out from the retaining cage and laying loose in the package. This does not mean the sprag is defective. It is imperative that you insert the element back into the cage slot correctly. The shorter foot of the element faces the inner race as seen to the right. With the brass cap to the left as seen in the enlarged circled view, the toes face down. The early design sprag is known to slip causing gear ratio codes.

Figure 3

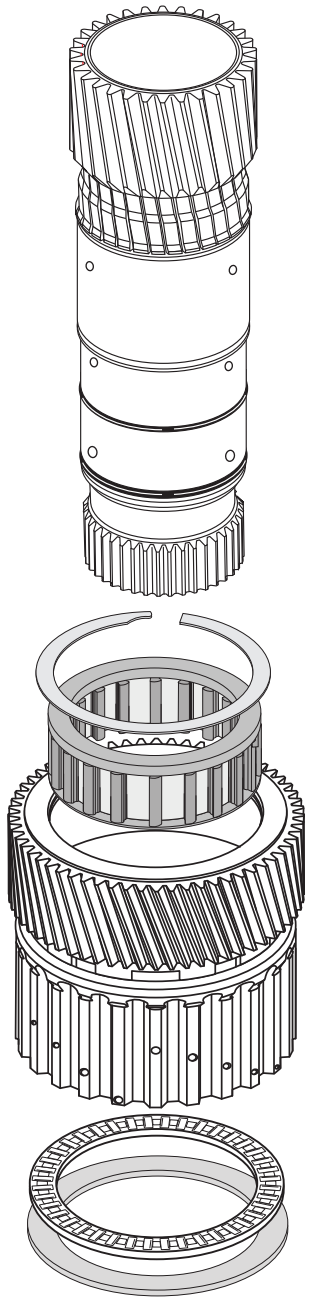
MERCEDES 722.6
K3 HUB AND REAR SUN GEAR ASSEMBLY DIFFICULTIES

COMPLAINT: After a rebuild using a new K3 Clutch Hub, insufficient clearance occurs preventing the installation of the rear snap ring which holds the entire clutch assembly in place on the output shaft.

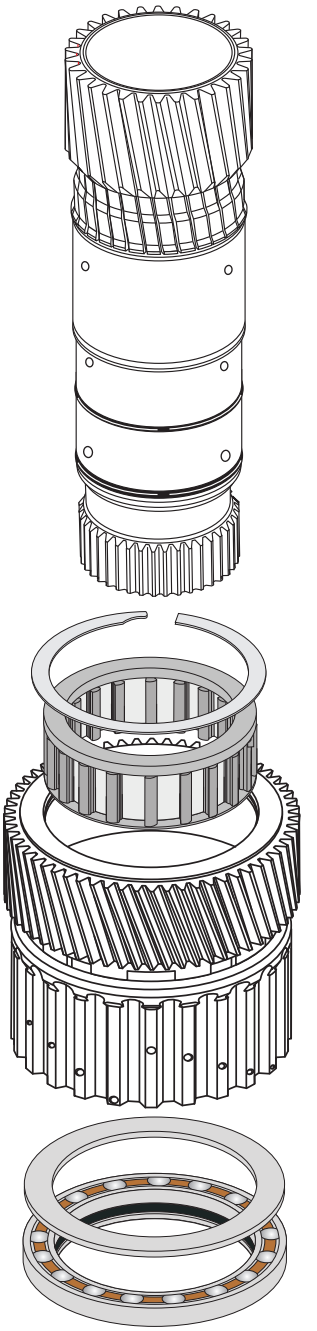
CAUSE: The new design K3 Clutch Hub and Rear Sun Gear have a flat spacer and ball bearing pressed into the hub assembly which replaces the previous design open face needle bearing and washer design (See Figure 1). In many cases, a brand new K3 clutch hub did not have the bearing fully pressed into the hub up against that flat spacer. This prevents the hub from being positioned correctly causing the insufficient clearance for the final retaining snap ring (Figure 2).

CORRECTION: Fully seat the bearing into the K3 Hub Assembly.

MERCEDES 722.6
K3 HUB AND REAR SUN GEAR ASSEMBLY DIFFICULTIES



Previous Design



New Design

Figure 1

MERCEDES 722.6
K3 HUB AND REAR SUN GEAR ASSEMBLY DIFFICULTIES

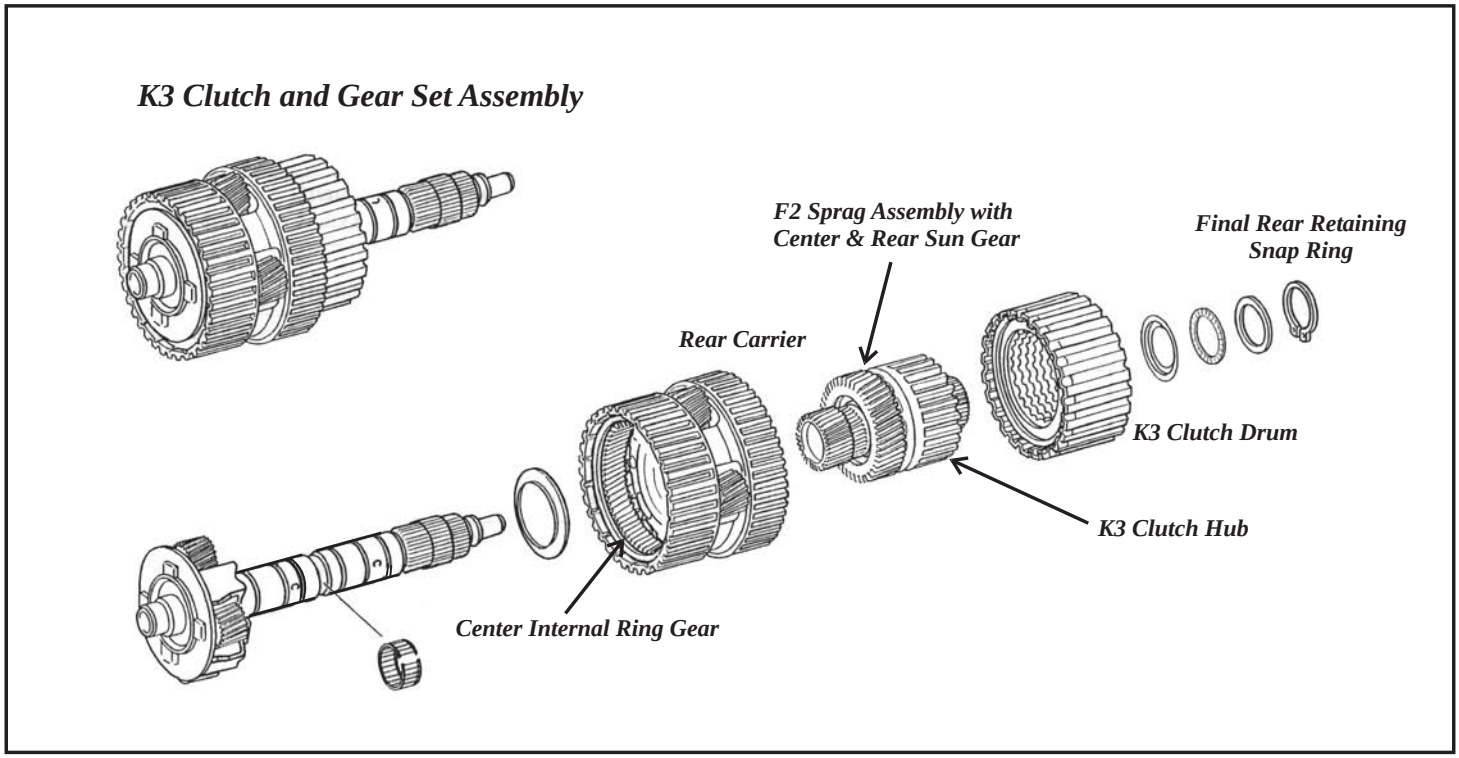


Figure 2

MERCEDES BENZ 722.6 SHIFT GROUPS

PRINCIPLES OF OPERATION

With the 722.6 being a transmission which shifts from clutch to clutch, proper shift overlap is required for it to be a smooth shifting unit. To accomplish this task, there are a number of components and strategies that merge together which allow for adaptation under various driving conditions. To fully appreciate what it takes to make for correct shift timing and shift feel, it is good to look at and understand these components and strategies independently.

HYDRAULICS

One of the difficulties a transmission technician faces when working with a 722.6 transmission is the lack of any pressure taps. Hydraulic pressures are calculated from input signals such as engine torque, engine speed, accelerator pedal position, cruise control request, wheel speed, traction status, kick-down switch, selector lever signal and the program select switch W/S. If pressure taps were available, there would be, basically 8 different pressure categories as you can see listed in Figure 1 with their respective range specifications which were provided by the Daimler Chrysler Academy of Technical Training.

PRESSURE CIRCUITS	PRESSURE VALUES
LINE PRESSURE	60-320 PSI
MODULATING PRESSURE	0-125 PSI
REGULATED SHIFT PRESSURE	0-120 PSI
SHIFT PRESSURE	0-220 PSI
SOLENOID SHIFT "IN" PRESSURE	50-55 PSI
LINE PRESSURE SOLENOID "IN" PRESSURE	120-125 PSI
TORQUE CONVERTER PRESSURE	0-100 PSI
TCC APPLY PRESSURE	0-118 PSI

Figure 1

SHIFT SOLENOIDS

There are three shift solenoids, the 1-2/4-5 (Y3/6y3), the 2-3 (Y3/6y5) and the 3-4 (Y3/6y4). Just by their very names you can determine their functions. Obviously the 1-2/4-5 solenoid is responsible for the 1-2 and 4-5 up-shift as well as their respective downshifts. Then of course you have the 2-3 solenoid for the 2-3 and 3-2 shift while the 3-4 solenoid handles the 3-4 and 4-3 shift. Each of these 3 solenoids are fed with 50 to 55 psi of pressure called "Solenoid Shift Pressure" which is controlled by the Shift Solenoid "In" Pressure Valve.

PRESSURE SOLENOIDS

There are two pressure control solenoids. One is called the Modulating Pressure Regulating Solenoid (Y3/6y1) and the other is the Shift Pressure Regulating Solenoid (Y3/6y2).

The Modulating PR Solenoid regulates pressure between 0 to 125 psi which influences the Pressure Regulator Valve to increase main line pressure (Working Pressure) from a static 60 psi to as high as 320 psi depending upon torque input. This Modulating PR Solenoid oil also influences the 1-2/4-5, 2-3 and 3-4 shift overlap valves so that the shift overlap of a releasing and applying clutch corresponds to torque input.

PRESSURE SOLENOIDS...*continued*
The Shift Pressure Solenoid regulates pressure between 0 to 120 psi which influences the Shift Pressure Regulator Valve for a controlled clutch apply pressure (Shift Pressure) during a shift transition only. This transitional clutch apply pressure (Shift Pressure) starts from a low 0 psi to as high as 220 psi depending upon torque input.

Both of these solenoids are fed with a maximum of 125 psi from the Line Pressure Solenoid "In" Pressure Valve.

SOLENOID SHIFT CHART
As a reminder for those of you who have read past articles on the unique solenoid shift pattern this unit has, from the solenoid shift chart seen in Figure 2, you will notice that shift solenoids 1-2/4-5, 2-3 and 3-4 are toggled "on-to-off" to make there respective shifts. While in gear they remain in the "off" state. This explains how while driving, whatever the gear the transmission was in at the time the computer system observed a fault, that would be the gear the transmission failsafes to. When the vehicle is brought to a stop and the ignition is cycled, the transmission will remain in second gear.

GEAR SHIFTS	SOLENOID				
	1-2/4-5 ⅄	2-3	3-4 ★	MOD PC ⌑	SHIFT PC ◎
FIRST	OFF	OFF	OFF	PWM	OFF
1-2 SHIFT	**ON**	OFF	OFF	PWM	PWM
SECOND	OFF	OFF	OFF	PWM	OFF
2-3 SHIFT	OFF	**ON**	OFF	PWM	PWM
THIRD	OFF	OFF	OFF	PWM	OFF
3-4 SHIFT	OFF	OFF	**ON**	PWM	PWM
FOURTH	OFF	OFF	OFF	PWM	OFF
4-5 SHIFT	**ON**	OFF	OFF	PWM	PWM
FIFTH	OFF	OFF	OFF	PWM	OFF

Additional Solenoid Activity Not Shown:

⅄ 1-2/4-5 Solenoid is pulsed during ignition crank.

★ 3-4 Shift solenoid is pulsed continuously while in Park and during selector lever movement (Garage Shifts).

⌑ a) Pulsed constantly while idling in Park or Neutral at approximately 40% Duty cycle.
b) Voltage observed varied with throttle opening as well as during selector lever movement.

◎ a) Pulsed constantly while idling in Park or Neutral at approximately 33% Duty cycle.
b) Voltage observed varied with throttle opening during each gear shift only.

NOTE: ***The TCC solenoid is not listed here but is pulsed to apply the converter clutch***

Figure 2

SHIFT GROUPS
By viewing the mechanical, hydraulic and electrical operation of a shift, it can be observed that a specific solenoid and a group of valves cause a clutch application change. This is described as a "Shift Group." A shift group has two phases. The transition from one gear to the next is called a "shift phase." Once the shift is complete and the transmission is in gear it is called the "stationary phase." There are a total of three shift groups with which 5 forward speeds are achieved. In a shift phase, a shift solenoid initiates the application of one group of valves to change the clutches required for that shift. During this time the other two groups remain in the stationary phase.

The three shift groups are as follows:

Shift Group K1/B1 (Gear Changes 1-2/4-5)
This group controls the upshift and downshifts 1-2/2-1 and the 4-5/5-4.

· K1 Clutch
· B1 Brake
· 1-2/4-5 Command Valve
· 1-2/4-5 Holding Pressure Shift Valve
· 1-2/4-5 Shift Pressure Shift Valve
· 1-2/4-5 Overlap Valve
· 1-2/4-5 Shift Solenoid (Y3/6y3)

Shift Group K2/K3 (Gear Change 2-3)
This group controls the upshift and downshift 2-3/3-2.

· K2 Clutch
· K3 Clutch
· 2-3 Command Valve
· 2-3 Holding Pressure Shift Valve
· 2-3 Shift Pressure Shift Valve
· 2-3 Overlap Valve
· 2-3 Shift Solenoid (Y3/6y5)

Shift Group K3/B2 (Gear Change 3-4)
This group controls the upshift and downshift 3-4/4-3.

· K3 Clutch
· B2 Brake
· 3-4 Command Valve
· 3-4 Holding Pressure Shift Valve
· 3-4 Shift Pressure Shift Valve
· 3-4 Overlap Valve
· 3-4 Shift Solenoid (Y3/6y4)

COMPUTER STRATEGY
In the beginning of the article under the heading of "Hydraulics," it mentioned how internal transmission pressures are controlled and calculated from various inputs to the TCM. The TCM utilizes these inputs to perform proper shift timing and shift feel under diverse driving conditions through 4 basic adaptation programs. They are: The Driving Style, Shift Time, Fill Pressure and Fill Time.

DRIVING STYLE ADAPTATION
The Driving Style Adaptation is a program ready to adapt to the driving condition as it happens. The TCM is constantly monitoring vehicle speed and throttle opening as well as the rate of change of the throttle as it opens and closes. It also looks at lateral acceleration which is a term for curve recognition. Basically it monitors wheel speeds to determine when and if the vehicle is in a turn. In addition to these inputs it also monitors the frequency of gear changes. As a result, it can quickly adapt to a shift time and feel appropriate for the present condition. This adaptation is not written to memory. It is known as an adaptation that "lives for the moment."

SHIFT TIME ADAPTATION (Shift Overlap Adaptation)
This strategy focuses on the quality of the up-shifts and downshifts while under load and no load conditions. Shift time adaptation gives the TCM the ability to electronically alter the time it takes to go from one gear to another. In other words, the time it takes to disengage one clutch while applying another. Once the TCM has calculated the type of shift that needs to take place, the TCM utilizes the following two strategies to accomplish the task.

FILL PRESSURE ADAPTATION (Apply Pressure Adaptation)
This strategy gives the TCM the ability to control and modify the pressure used to engage a clutch which results in the type of shift feel that will occur.

FILL TIME ADAPTATION (Preload Pressure Adaptation)
This strategy gives the TCM the ability to control the time it takes to fill a clutch drum bringing the clutch pack to a "0" clearance but not yet applying the clutch. This adaptation compensates for wear of the friction plates.

SCANNER DIAGNOSIS

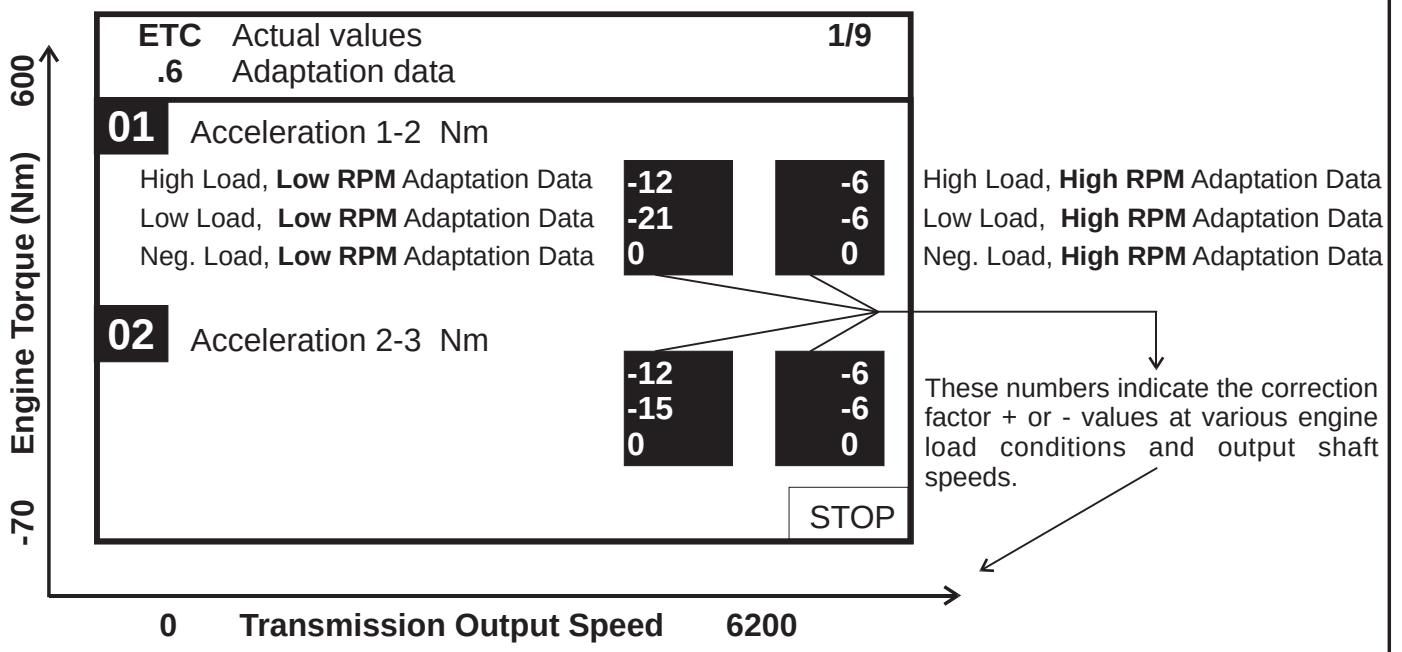
Shift Time Adaptation (Figures 3 & 4)
Specific values are needed to make the Shift Time Adaptation and these values are written to memory enabling the ETC to adapt during the following shift occurrences:

1. Accelerating Up-shift adaptation: Up-shifts that occur under load
2. Deceleration Up-shifts adaptation: Up-shifts that occur under no load
3. Accelerating Down-shifts adaptation: Down-shifts that occur under load
4. Deceleration Down-shifts adaptation: Down-shifts that occur under no load (i.e. coast down shift)

These values are represented in Newton meters (Nm) meaning "Torque." In other words, the strength of the shift. There are no ideal numbers to achieve. For example; if a 1-2 up-shift that occurs under load with an 8 cylinder engine has a 190Nm reading and the shift quality is acceptable, one may consider that the computer is able to handle and overcome the existing clutch clearance or a slight leak in the system without a flare on the shift and possible premature damage to the applying clutch. A 0 number indicates that a clutch pack does not require adaptation or the clutch pack has not yet adapted. However, if an adaptation value is at its maximum value, and the shift is unacceptable, repair work may be required. Additional adaptation cannot be achieved when the following values are reached:

<u>Maximum values in Nm</u>:
8 and 12 cylinder engines have a + or - 210 Nm
6 cylinder engines have a + or - 180 Nm
4 cylinder engines have a + or - 150 Nm

Analyzing Shift Time Adaptation Data as seen on the factory scan tool



Viewing an example of a 1-2 up-shift as seen in a scanner (Figures 3 & 4), the low numbers indicate that a small amount of adaptation was required to optimize the shift. It is the K1 clutch that is applied on the 1-2 up-shift. Therefore, we can conclude that the clutch clearance for the K1 clutch is within specification tolerances. It also indicates that there are no excessive leaks in the circuit as well.

Figure 3

Analyzing Shift Time Adaptation Data as seen on the Snap-on scan tool

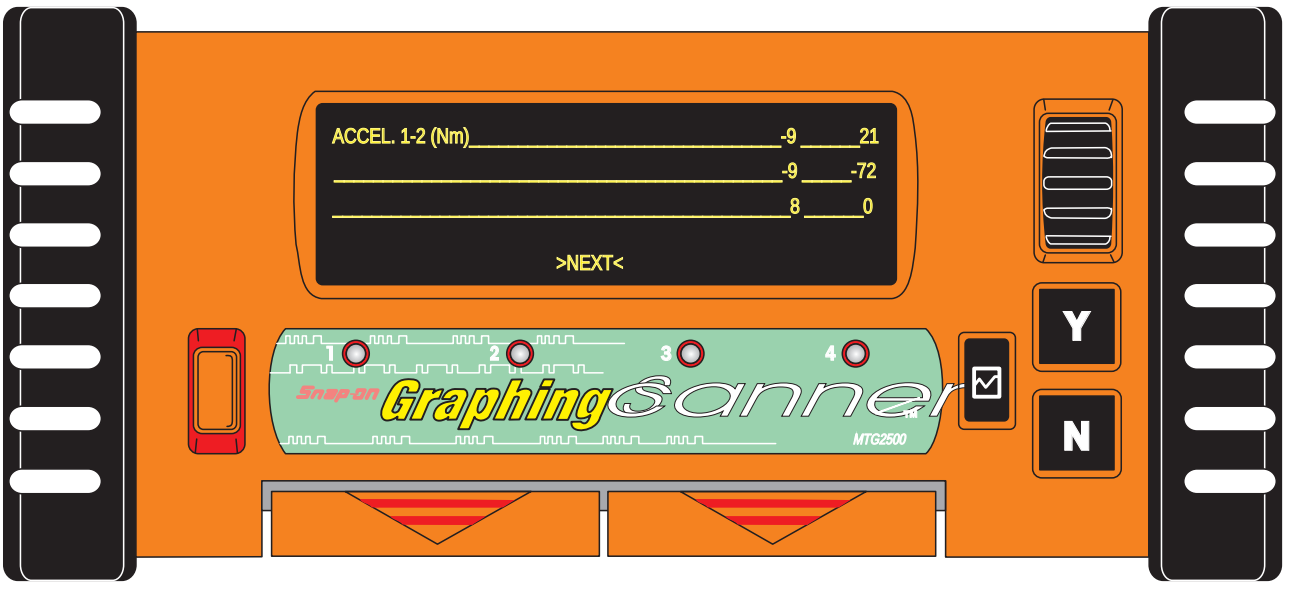


Figure 4

Fill Pressure (Figures 5 & 6)
Fill pressure is measured and presented in millibars (mbar). Higher values indicate that the TCM is increasing fill pressure to produce a firmer shift. Lower values indicate that the TCM is decreasing fill pressure to produce a softer shift. 0 mbar means that either the TCM has not stored an adaptive value, or that the shift member does not require correction. A value at the parameters upper limit, along with poor shift quality, indicates the need for repair.

Analyzing Adaptation for Fill Pressure Data as seen on the factory scan tool

ETC .6	Actual values Adaptation data	
17	Fill pressure 1-2	-400 mbar MAX 1600
18	Fill pressure 2-3	-100 mbar
19	Fill time K1 in 2nd gr.	0 Cycle
20	Fill time K2	0 Cycle
21	Fill time K3	0 Cycle

Figure 5

Analyzing Shift Time Adaptation Data as seen on the Snap-on scan tool

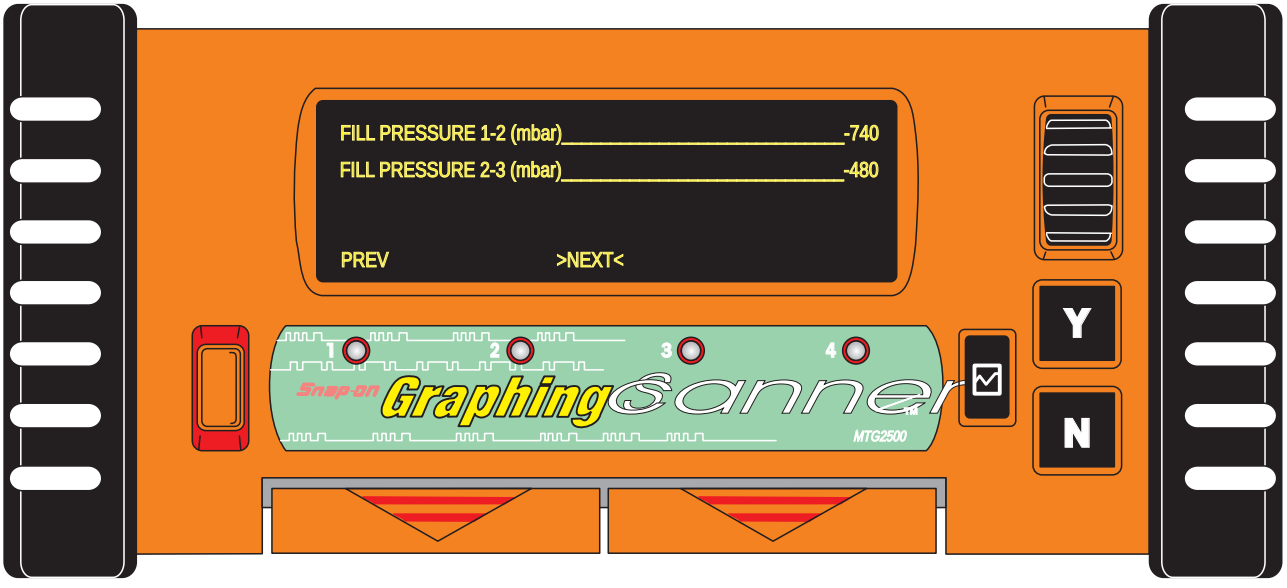


Figure 6

Fill Time (Figures 7 & 8)
Data parameters for Fill Time are displayed in cycles of time. The TCM controls the two pressure solenoids with an amplitude-modulated current. Amplitude means the highest value of a periodically varying quantity. The greater the signal amplitude, or difference between the highs and lows of the signal, the greater the pressure. The TCM can only change signal amplitude once per 20 milliseconds (ms). Each cycle displayed by these data parameters equals one 20-ms period. If the Scanner reports a fill time adaptation of 3 cycles, this means that it took three periods of 20-ms each (60 ms) to alter pressure enough to accomplish the correct application of the shift member. The maximum fill correction time is 15 cycles, or 300 ms. A value of 0 cycles indicates no fill correction was needed.

Analyzing Adaptation for Fill Time Data as seen on the factory scan tool

ETC .6	Actual values Adaptation data		9/9
22	Fill time B1	0 Cycle	
23	Fill time B2	0 Cycle	MAX 15
24	Fill time K1	0 Cycle	

Figure 7

Analyzing Shift Time Adaptation Data as seen on the Snap-on scan tool

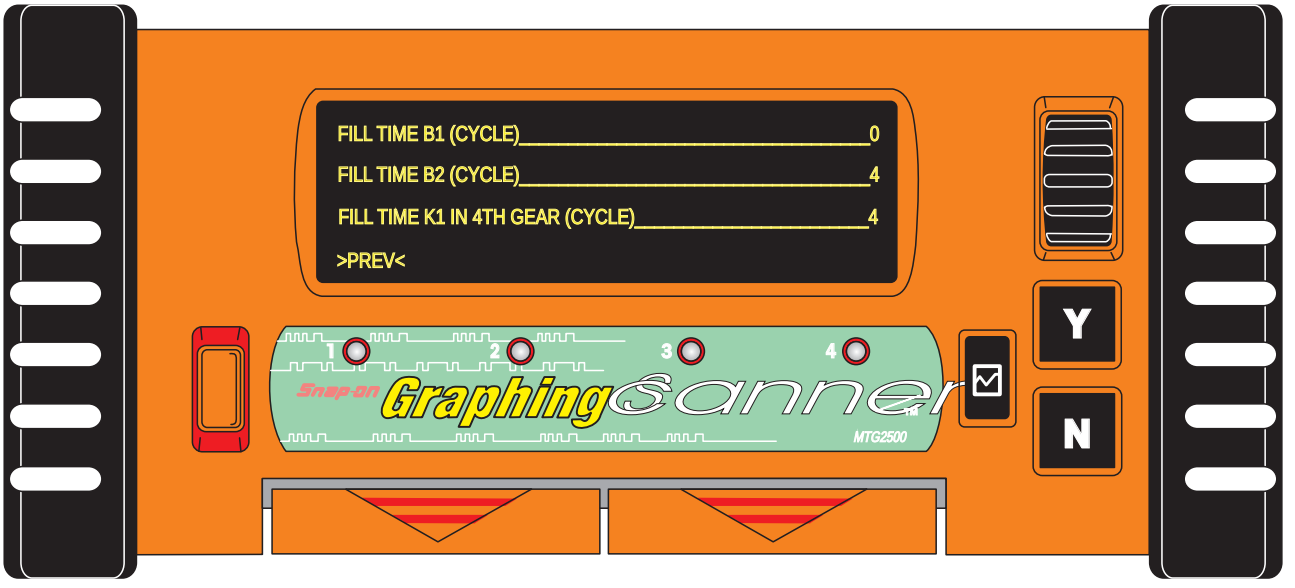
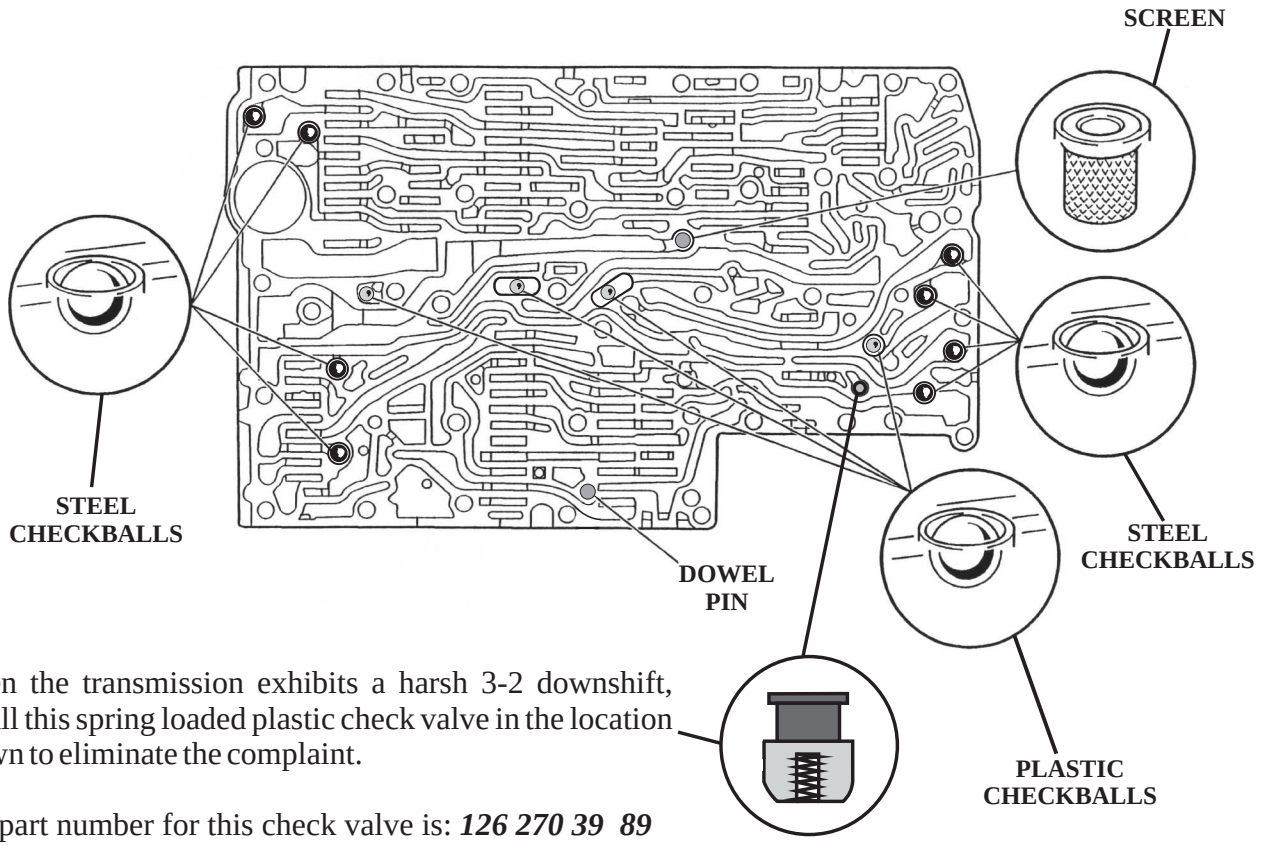


Figure 8

Exhaust Circuits
There is a shift overlap valve in the valve body that controls the decrease in pressing of a releasing clutch. In addition there are check balls which assist in metering the vented pressure (Figure 9).

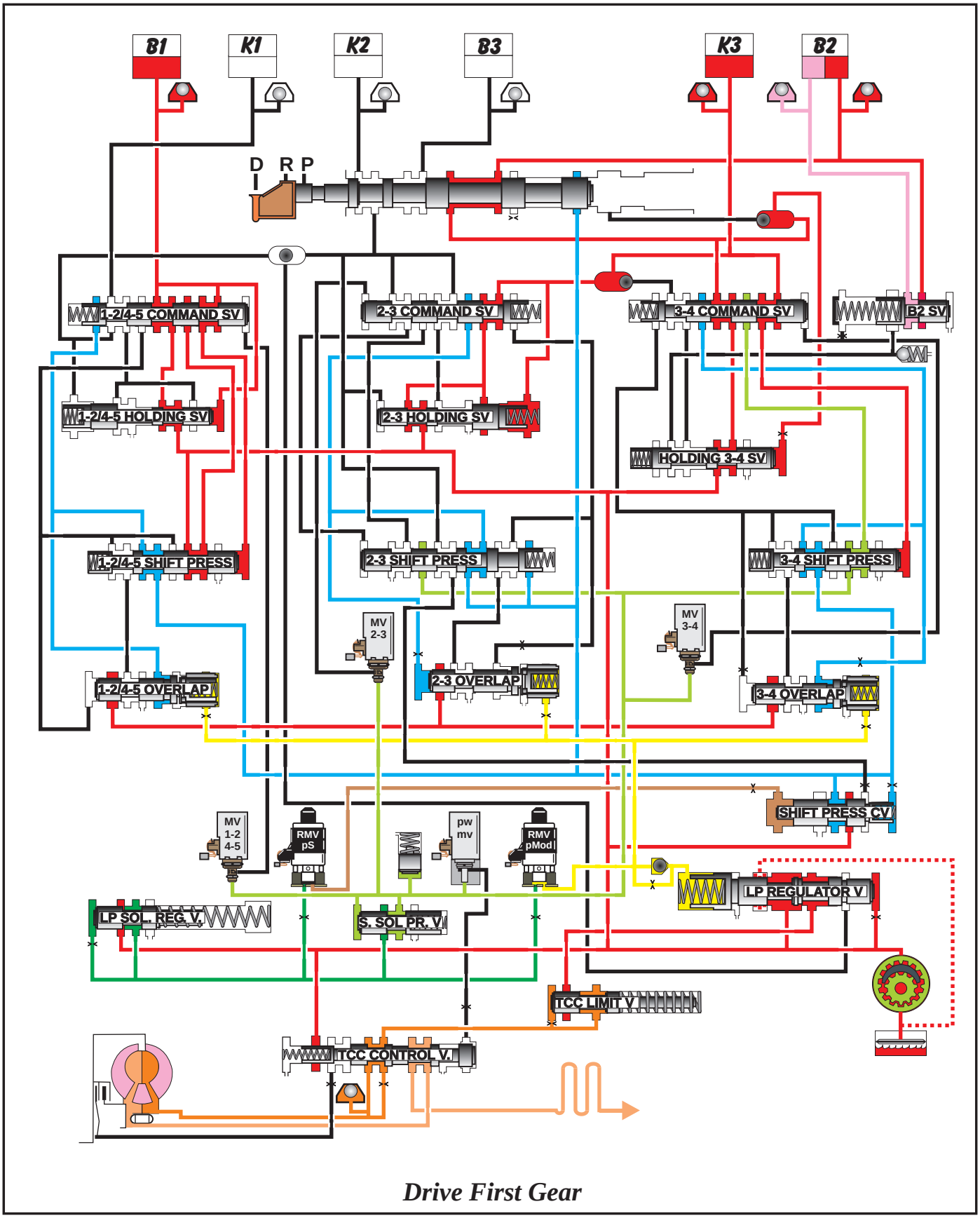
722.6 VALVE BODY CHECK BALL & SMALL PARTS LOCATIONS



When the transmission exhibits a harsh 3-2 downshift, install this spring loaded plastic check valve in the location shown to eliminate the complaint.

The part number for this check valve is: ***126 270 39 89***

Figure 9



Drive First Gear

Figure 10

WESCO

VOLKSWAGEN/AUDI
O1M TRANSAXLE 1995 - 1997 ONLY
NEUTRALIZES INTO 4TH GEAR OR WHILE IN 4TH.

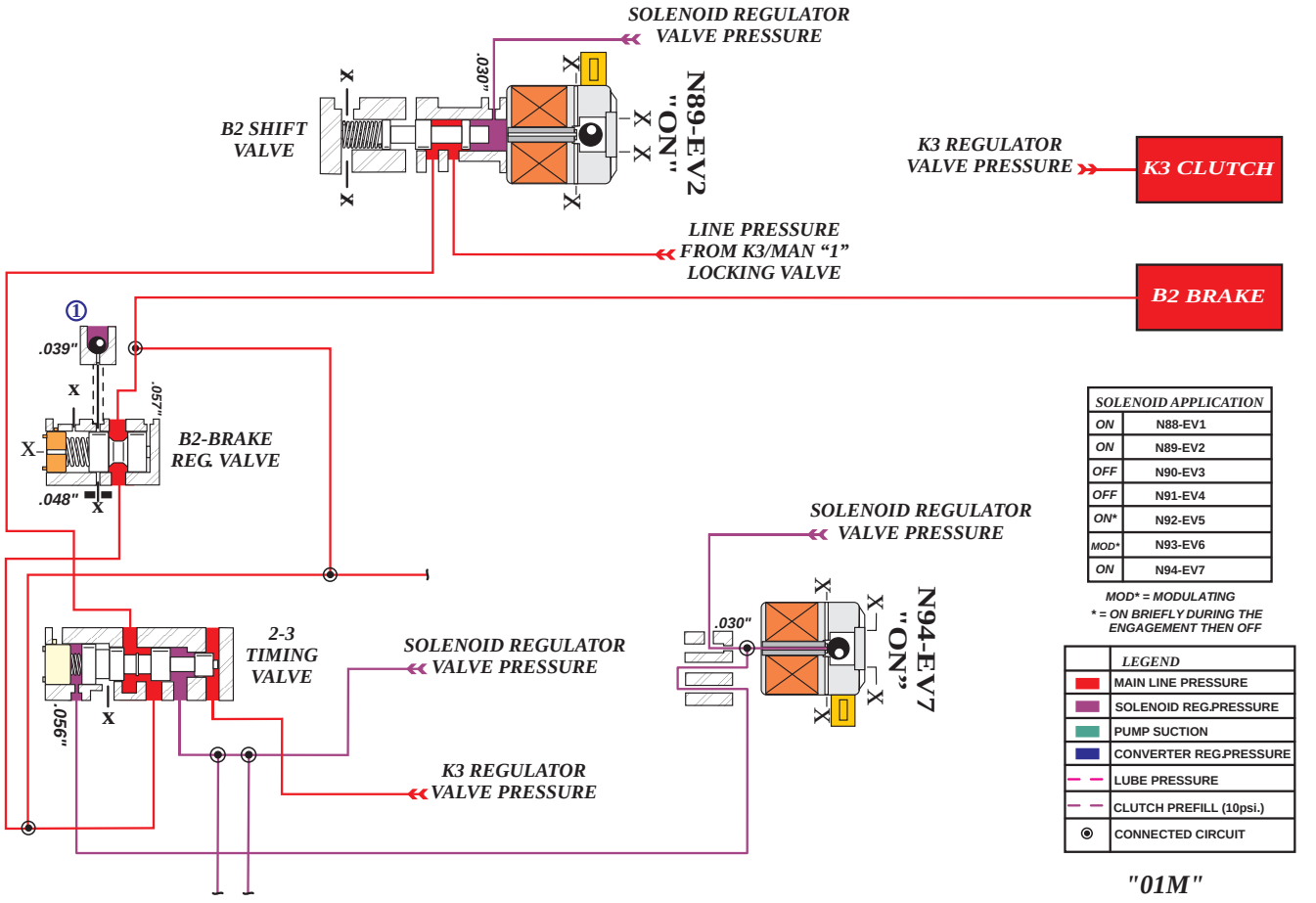
COMPLAINT: A Volkswagen/Audi vehicle with an O1M transaxle exhibits a neutralizing condition either during an upshift into 4th gear, or while driving in 4th gear.

CAUSE: One cause may be a leak at Solenoid Valve EV7, or a cracked or leaking bore plug for the 2-3 Timing Valve. In the Volkswagen/Audi 01M Transaxle model years 1995 through 1997, Solenoid Valve EV7 is energized in both 3rd and 4th gears. The function of Solenoid Valve Ev7 is to control the spring side of the 2-3 Timing Valve. Refer to Figure 1. This illustration shows an intact hydraulic circuit without a leak. Solenoid Regulator Valve pressure is fed to Solenoid Valve EV7. The solenoid is energized and closed by an electrical signal causing pressure to build which is then sent to the spring side of the 2-3 Timing Valve; this assists the spring in keeping the 2-3 Timing Valve in a closed position. Line pressure from the K3/Manual 1 Locking Valve is fed to Solenoid Valve EV2 which is also energized and closed by an electrical signal allowing line pressure to pass through the B2 Shift Valve and be directed to the 2-3 Timing Valve. Once line pressure passes through the 2-3 Timing Valve, it flows to the B2 Regulator Valve and on to apply the B2 Brake.

Refer to Figure 2. This drawing depicts a hydraulic circuit that is leaking either at Solenoid Valve EV7, or the 2-3 Timing Valve bore plug. If the solenoid is open and can't close, or the bore plug is leaking, oil pressure at the spring side of the 2-3Timing Valve won't build up and stop the valve from stroking. If this happens, line pressure from Solenoid Valve EV2 won't be able to pass through the valve and apply the B2 Brake. The resulting condition will be a neutralizing effect because only the K3 clutch will be applied.

CORRECTION: This correction is very simple, and can be done without even removing the valve body. Remove the oil pan and locate the 2-3 Timing Valve. Refer to Figure 3. Twist the plastic bore plug and remove from the valve body, then remove the spring. Make sure the valve isn't sticking and is completely seated in the back of the bore. Find an AXODE checkball and insert the ball into the spring seat of the valve making sure it is inserted all the way. Next cut approximately 1.5 coils off the spring, then reinstall spring and bore plug into the valve body. Put the pan back on, refill with fluid and you're done.

O1M 1995-97 PARTIAL 4TH GEAR HYDRAULIC SCHEMATIC
B2 BRAKE APPLIED

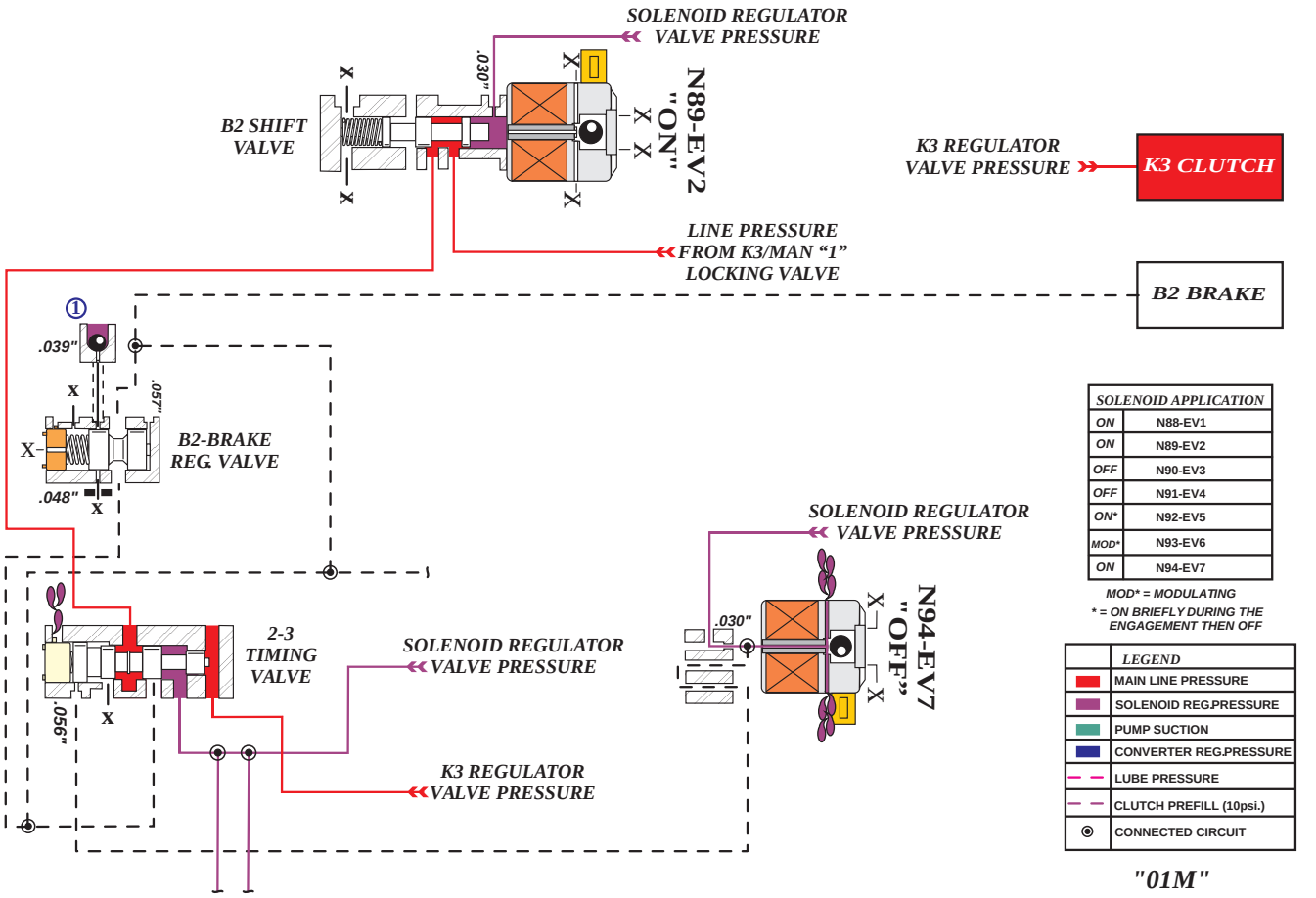


"01M"
95-97

This partial hydraulic schematic shows an intact hydraulic circuit without a leak. Solenoid Regulator Valve pressure is fed to Solenoid Valve EV7. The solenoid is energized and closed by an electrical signal causing pressure to build which is then sent to the spring side of the 2-3 Timing Valve; this assists the spring in keeping the 2-3 timing valve in a closed position. Line pressure from the K3/Manual 1 Locking Valve is fed to Solenoid Valve EV2 which is also energized and closed by an electrical signal allowing line pressure to pass through the valve and then be directed to the 2-3 Timing Valve. Once line pressure passes through the 2-3 Timing Valve, it flows to the B2 Regulator Valve and on to apply the B2 Brake

Figure 1

O1M 1995-97 PARTIAL 4TH GEAR HYDRAULIC SCHEMATIC
B2 BRAKE NOT APPLIED



"01M"
95-97

This partial hydraulic schematic depicts a hydraulic circuit that is leaking either at Solenoid Valve EV7, or the 2-3 Timing Valve bore plug. If the solenoid is open and can't close, or the bore plug is leaking, oil pressure at the spring side of the 2-3 timing valve won't build up and stop the valve from stroking. If this happens, line pressure from Solenoid valve EV2 won't be able to pass through the valve and apply the B2 Brake. The resulting condition will be a neutralizing effect because only the K3 clutch will be applied.

Figure 2

O1M 1995-97 VALVEBODY ILLUSTRATION

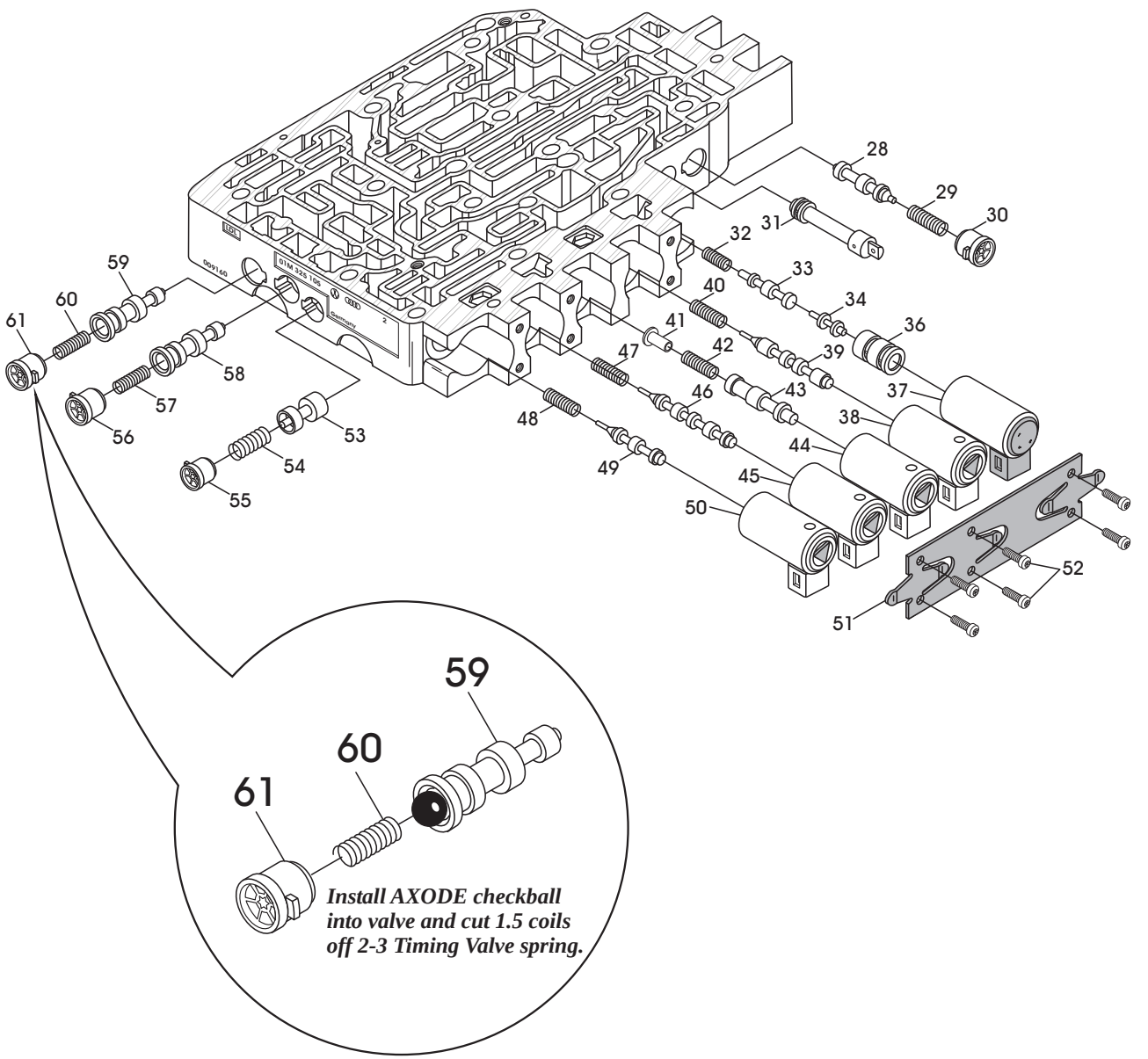


Figure 3

VOLKSWAGEN JETTA

DELAYED DRIVE ENGAGEMENT WHEN COLD

COMPLAINT: A 2002-2003 Volkswagen Jetta equipped with a 2.0L Ultra Low Emission gas engine (engine code AVH) ONLY and the 01M transmission may have a complaint of along delayed engagement into drive when cold.

CAUSE: **This is normal operation!** The computers in the above described vehicles are programmed with"Cold Neutral' strategy. This is done toto reduce emissions.

CORRECTION: **No repair is required!** Other Jetta models with 2.0L engines (engine code AZG), or outside the model years listed above do not use this strategy. In these vehicles, when drive is selected, the K1 clutch is immediately applied which results in immediate engagement.
Vehicle with "Cold Neutral" strategy will prevent K1 clutch application until the brake pedal is released.

"Cold Neutral" control activates only when the following conditions are met:
(1) Engine is running.
(2) ATF temperature is below 104ºF (40ºC).
(3) Brake pedal depressed, brake lamp switch activated.
(4) Accelerator pedal fully released.
(5) Vehicle speed is zero.
(6) Shift lever is moved from Park to Drive for the first time after the ignition switch has been turned ON.

NOTE: In order to verify if the delay is "cold Neutral" control induced, perform the following test:
Shift from Park to Drive, then from Drive to any other gear shift position, then back to Drive. This will deactivate "Cold Neutral" control.
If the delay is still present with "cold Neutral" control deactivated, the transmission may have an internal problem such as a defective K1 molded clutch piston.

SERVICE INFORMATION:
VW Technical Service Bulletin*.....*02-01

VOLKSWAGEN/AUDI
ZF5HP19FL/FLA
NEUTRALS ON TAKEOFF

COMPLAINT: A Volkswagen/Audi vehicle with a ZF5HP19FL/FLA exhibits a neutralizing condition under heavy throttle in 1st gear or 2nd gear. Under light or moderate throttle positions, the vehicle appears to function correctly and up shift ok, however, while under heavy acceleration from either a standstill, or while driving in 1st gear, on an up shift into 2nd gear or while driving in 2nd gear the transmission feels like it goes into neutral. When the transmission is removed from the vehicle and disassembled it is apparent the "G" clutch has been slipping because the frictions are normally quite burned.

CAUSE: One cause may be a ruptured rubber damper plug in the channel plate section of the valve body. The root cause of the burned clutch may not be apparent during initial inspection, especially if the time is not taken to disassemble the valve body. In the channel plate section of the valve body are located three rubber damper plugs. These damper plugs act as accumulators for the pulse-width-modulated solenoids EDS 2, EDS 3, and EDS 4. The damper plugs must be removed from the valve body and carefully inspected. The reason they must be looked at carefully is because of their tendency to "rupture" or "burst". If you experience a similar neutralizing effect during heavy acceleration, EDS 3 damper assembly will be the accumulator plug you want to look at closely. EDS 3 solenoid is pulsed "ON" in reverse, neutral, 1st, and 2nd gear. Refer to Figure 1. This drawing illustrates that modulator pressure is fed to solenoid EDS 3. With the solenoid "ON", modulator pressure flows to the EDS 3 damper plug and then strokes the "G" clutch shift valve and "G" clutch accumulator control valve allowing line pressure to apply the "G" clutch. During heavy acceleration conditions, increased modulator pressure can cause a "rupture" or "burst" hole to occur in the plug and exhaust through the channel plate. When this occurs there will not be sufficient pressure to stroke the "G" clutch shift valve or accumulator control valve which will lead to a partial apply of the "G" clutch and the neutralizing condition.

CORRECTION: Replace the rubber damper assembly, or use the updated aluminum plugs which requires the updated channel plate and spacer plate. Refer to Figure 2 this picture shows the channel plate with the EDS damper plug locations, and also an enlarged view which shows the early style rubber plugs and focuses on the exhaust holes in the channel plate. These rubber damper plugs were used in ZF5HP19 models through 1999. During model year 2000, ZF introduced an updated damper assembly. Figure 4 shows worm track differences in the later channel plate and also an enlarged view which depicts the later style damper pistons and illustrates the bore size difference in the channel plate for the later damper pistons. Refer to Figure 3. This drawing illustrates the same partial hydraulic circuit in Figure 1, ***except,*** it shows the new design EDS 3 accumulator piston. Notice the top of the accumulator piston, there is no orifice like in the previous plug, instead the surface is solid and in the bottom of the plug is a rubber insert that provides the cushion, or accumulation. The solid top obviously prevents rupturing and these new pistons eliminate the problem.

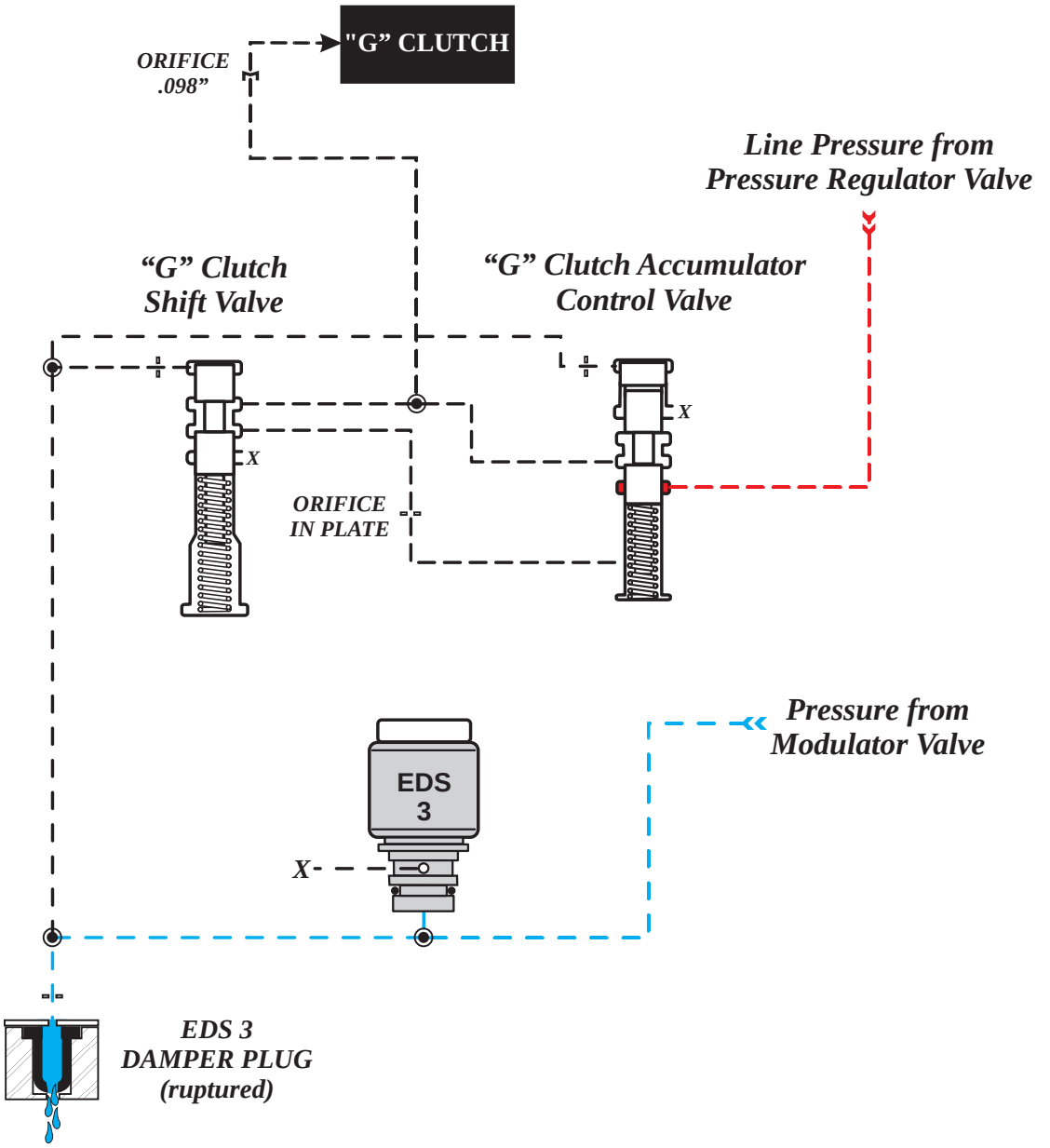
CORRECTION Continued:

Refer to Figure 4. The text in the enlarged view states the accumulator bores in the channel plate are larger in diameter than the early plate. The bores are larger in diameter to accommodate the updated pistons. The diameter of the accumulator plug bore in the early channel plate is approximately .315 inches and houses the rubber damper plug. The outside diameter of the accumulator piston bore in the later channel plate is approximately .471 inches in diameter for the updated piston. Figure 5 shows the early valve body separator plate, and Figure 6 shows the later separator plate. Note the differences in hole size and configuration between the two plates. ***They are not interchangeable***. Therefore, if you have a rubber damper that is ruptured, you will have to use a new rubber damper. If you want to use the later style piston to prevent a future incident, you will need to purchase a new channel plate, separator plate and pistons from a ***ZF-AUTHORIZED*** distributor. Most overhaul kits will come with both the rubber plugs and the newer pistons so if you have an overhaul kit you will only need to purchase the new style separator and channel plate.

SERVICE INFORMATION: ***Pulse Generator Models Only***	**ZF PART #**
SEPARATOR PLATE	1060-327-109
CHANNEL (Duct) PLATE	1060-327-140
PISTONS (3) REQUIRED	1068-227-039

SERVICE INFORMATION: ***Hall Effect Models Only***	**ZF PART #**
SEPARATOR PLATE	1060-327-127
CHANNEL (Duct) PLATE	1060-327-141
PISTONS (3) REQUIRED	1068-227-039

EDS-3 PARTIAL HYDRAULIC DRAWING RUPTURED PLUG



EDS 3 is used to control the engagement of the "G" clutch. This hydraulic circuit drawing shows oil flow with a ruptured EDS 3 Damper.

NOTE: With a ruptured EDS 3 Damper Plug, EDS 3 oil pressure exhausts through the hole in the bottom of the damper plug thereby not accumulating and passing to both Shift Valve "G" and Accumulator Control Valve "G".

Figure 1

EARLY CHANNEL PLATE WITH RUBBER PLUGS

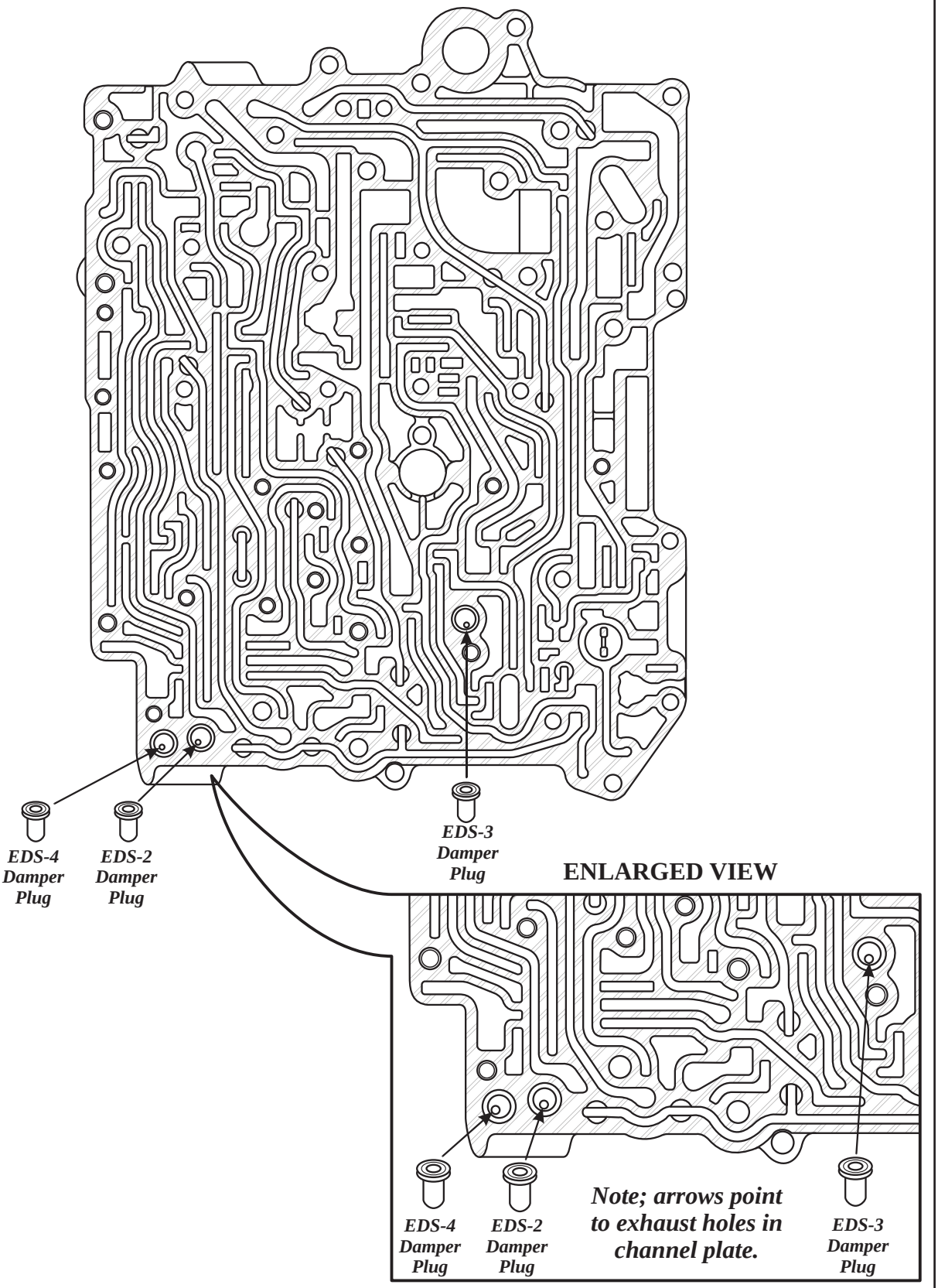
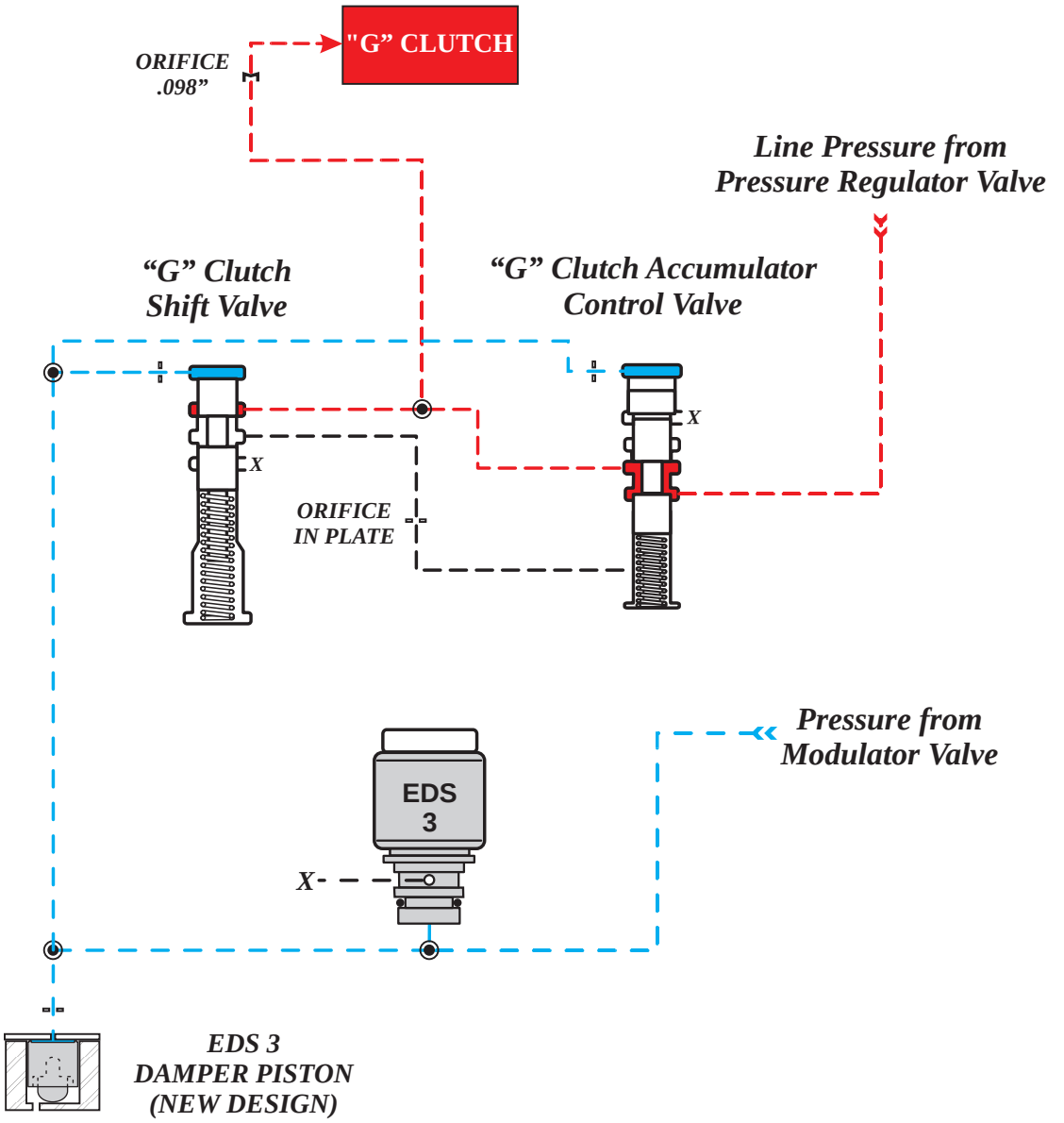


Figure 2

EDS-3 PARTIAL HYDRAULIC NEW DESIGN PISTON



This hydraulic circuit drawing shows oil flow with New Design EDS 3 Damper Piston.

NOTE: With a new design damper piston installed in the valve body, oil pressure only contacts the face of the plug. Since the hole is eliminated in the new plug, it reduces the possibility of the plug rupturing, and normal oil accumulation is achieved.

Figure 3

LATER CHANNEL PLATE WITH ACCUMULATOR PISTONS

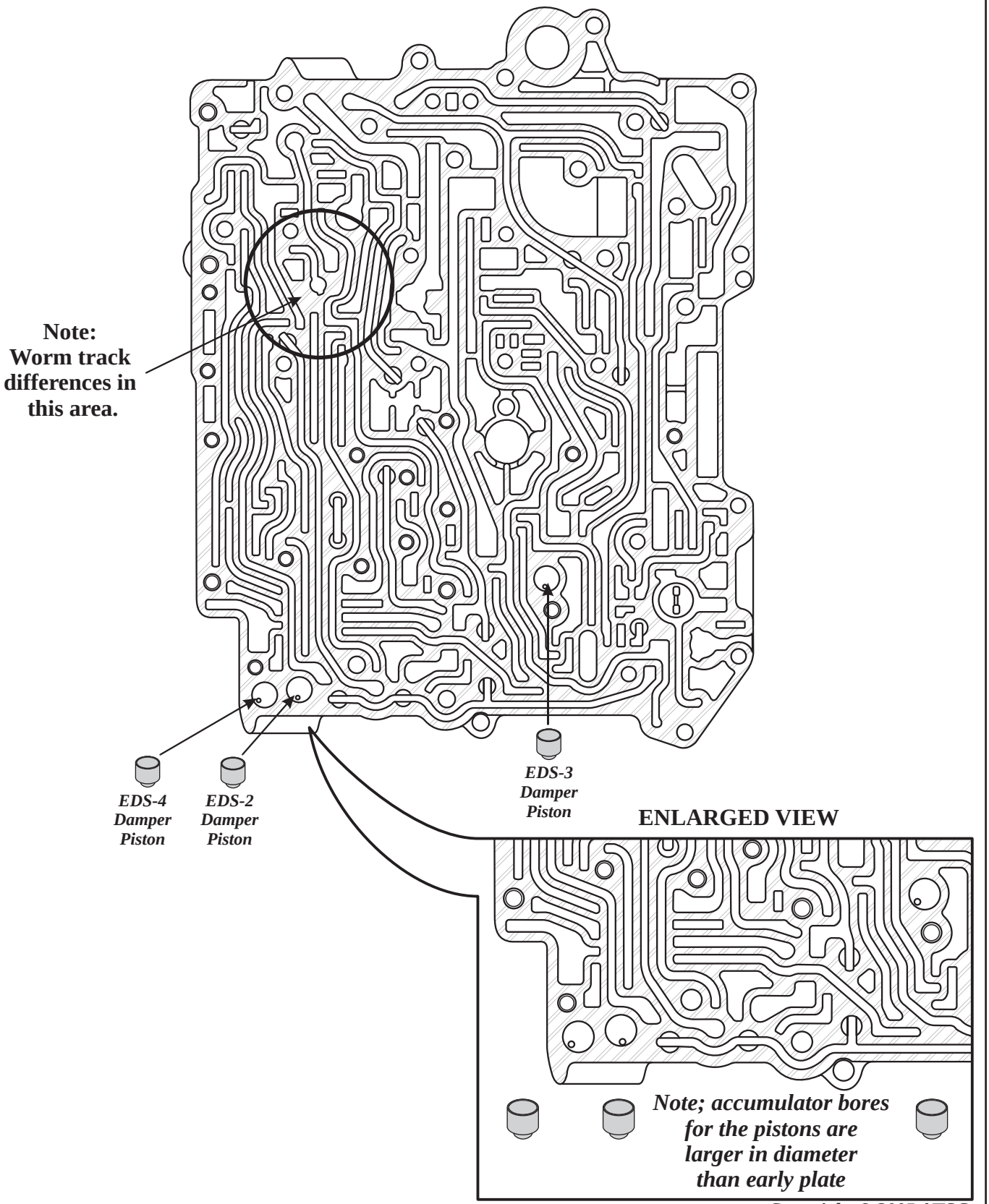
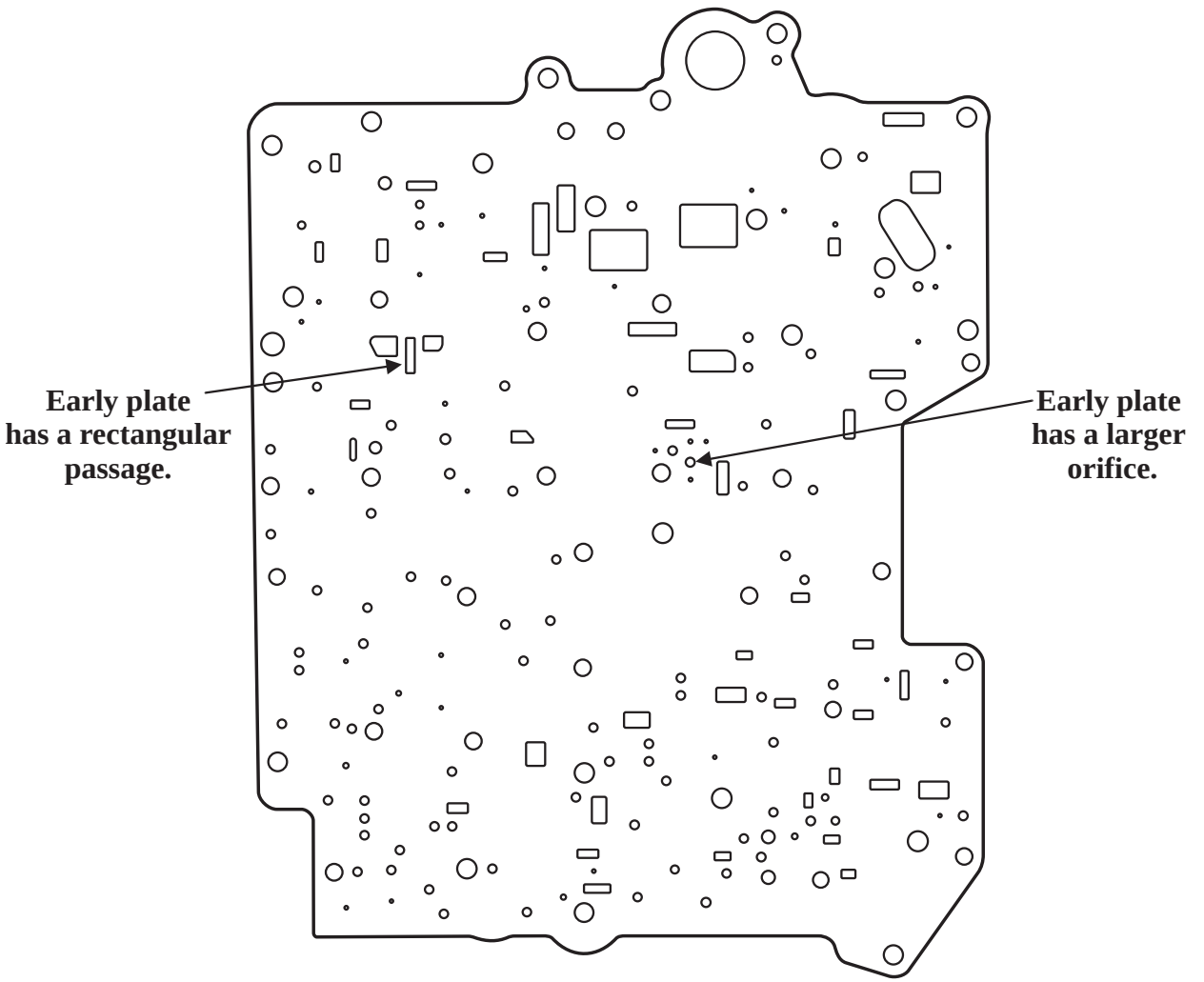


Figure 4

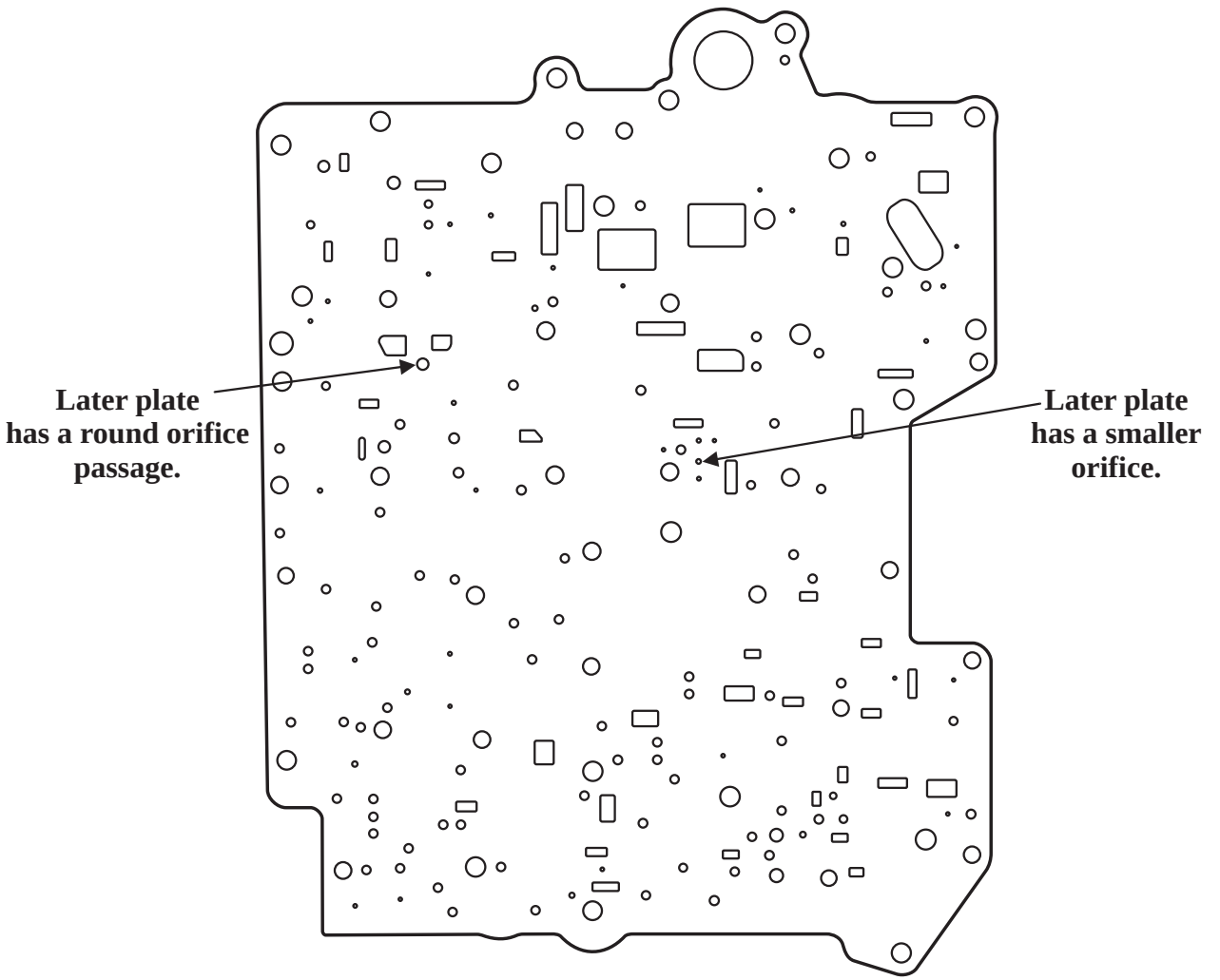
EARLY STYLE
SEPARATOR PLATE



NOTE:
SEPARATOR PLATE
DIFFERENCES

Figure 5

LATER STYLE
SEPARATOR PLATE



NOTE:
SEPARATOR PLATE
DIFFERENCES

Figure 6

VOLKSWAGEN/AUDI
ZF5HP19FL/FLA
PARTS MISMATCH

COMPLAINT: After an overhaul a Volkswagen/Audi vehicle with the ZF5HP19/FLA transaxle exhibits a no shift condition. The vehicle may not up shift at all, or it may make a 1-2 shift then go into a failsafe condition.

CAUSE: One cause may be the wrong transmission installed into the vehicle, or a mismatch of internal parts. ZF has used two different types of Turbine Sensors in the ZF5HP19/FLA. One is a Pulse Generator type, the other a Hall Effect Sensor. It can be difficult to determine which vehicle uses the Pulse Generator and which uses the Hall Effect Sensor type.

CORRECTION: Use the information provided in the following figures to ensure correct transmission application and internal component installation. Refer to Figure 1 for a listing of vehicles that use the Pulse Generator type sensor. Figure 1 also provides an illustration of the transmission identification tag. Refer to Figure 2 for a listing of vehicles that use the Hall Effect Sensor. The Pulse Generator and Hall Effect Sensor are not located in the same area of the transmission. Refer to Figure 3 for internal harness layout and connector id for units using the Pulse Generator. Refer to Figure 4 for internal harness layout and connector id for units using the Hall Effect Sensor. Refer to Figure 5 for location and id of the Pulse Generator, refer to Figure 6 for location and id of the Hall Effect Sensor.

Since the sensors are located in different areas of the transmission, they would naturally have to receive their signal from different component parts in the transmission. The Pulse Generator will produce a signal using the Spider Clutch Bell whereas the Hall Effect Sensor will produce its signal using the Forward Clutch Drum. The Forward Clutch Drum, the Spider Clutch Bell, and the Sun Gear are different and not interchangeable between Pulse Generator and Hall Effect Sensor transmissions. The differences between the Forward Clutch Drum and Spider Clutch Bell are easy to distinguish. The Sun Gear however looks almost identical between both units. The difference is found with the use of a magnet. A magnet will adhere itself to the Sun Gear in a unit that utilizes a Pulse Generator, but a magnet ***will not*** adhere itself to the Sun Gear in a unit that uses the Hall Effect Sensor. That is because the Hall Effect Sensor needs to read though the Sun Gear where it picks up its reading from a magnetic band that is attached to the "A" Clutch Drum. The magnetic band on the"A" Clutch Drum contains 36 small magnets around the outside of the drum. Refer to Figure 7 for identification and description of Forward Clutch Drum, Spider Clutch Bell, and Sun Gear used in Pulse Generator units. Refer to Figure 8 for identification and description of Forward Clutch Drum, Spider Clutch Bell, and Sun Gear used in Hall Effect Sensor units.

We would like to thank Nat and Drew from Eriksson Industries for their time and assistance in supplying this information

VOLKSWAGEN/AUDI
ZF5HP19FL/FLA
PARTS MISMATCH CONT'D

SERVICE INFORMATION: **ZF Part Number**

PULSE GENERATOR TRANSMISSIONS:

ZF5HP19/FLA Pulse Generator Sensor..... 0501-311-086

ZF5HP19/FLA A Clutch Drum
models 002/012/013/056..... 1056-370-047

ZF5HP19/FLA A Clutch Drum
models 018..... 1056-370-048

ZF5HP19/FLA Spider Clutch Bell..... 1056-232-079

ZF5HP19/FLA Sun Gear..... 1060-232-097

ZF5HP19/FLA Internal Wire Harness 1056-227-046

HALL EFFECT SENSOR TRANSMISSIONS:

ZF5HP19/FLA Hall Effect Sensor..... 0501-210-474

ZF5HP19/FLA A Clutch Drum
models 030/054/073/101 1060-298-020

ZF5HP19/FLA A Clutch Drum
models 035/044/053/063/065/075/087/093/100/103..... 1060-298-021

ZF5HP19/FLA Spider Clutch Bell..... 1050-317-060

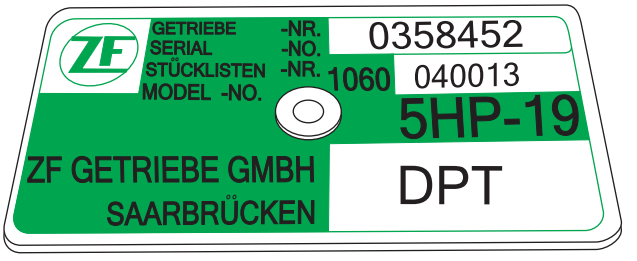
ZF5HP19/FLA Sun Gear
models 054/065/073/101..... 1060-232-041

ZF5HP19/FLA Sun Gear
models 030/035/044/053/063/075/087/093/100/103..... 1060-232-042

ZF5HP19/FLA Internal Wire Harness 1060-227-022

ZF5HP19FL/FLA
PULSE GENERATOR MODELS

MAKE	MODEL	ENG.	YEAR	ZF PART #	CODE	TYPE
AUDI	A4 QUATTRO/AVANT	1.8	1996	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1996	1060-040-002	CJP	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1996	1060-040-012	DRN	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	1997	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1997	1060-040-002	CJP	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1997	1060-040-012	DRN	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	1998	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1998	1060-040-012	DRN	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	1998	1060-040-013	DPT	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	1998	1060-040-036	EKX	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	1999	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	1999	1060-040-012	DRN	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	1999	1060-040-013	DPT	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	1999	1060-040-036	EKX	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	2000	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	2000	1060-040-012	DRN	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	2000	1060-040-013	DPT	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	2000	1060-040-036	EKX	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	2001	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	2001	1060-040-012	DRN	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	2001	1060-040-013	DPT	PULSE GENERATOR
AUDI	A6 QUATTRO	2.8	2001	1060-040-036	EKX	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	1.8	2002	1060-040-018	DTV	PULSE GENERATOR
AUDI	A4 QUATTRO/AVANT	2.8	2002	1060-040-012	DRN	PULSE GENERATOR
VW	PASSAT	2.8	1999	1060-040-012	DRN	PULSE GENERATOR
VW	PASSAT	2.8	2000	1060-040-012	DRN	PULSE GENERATOR
VW	PASSAT	2.8	2001	1060-040-012	DRN	PULSE GENERATOR



TAG IS AN EXAMPLE OF AN
AUDI A6 QUATTRO 2.8 1998 MODEL YEAR
TRANS ID CODE: DPT
PULSE GENERATOR MODEL

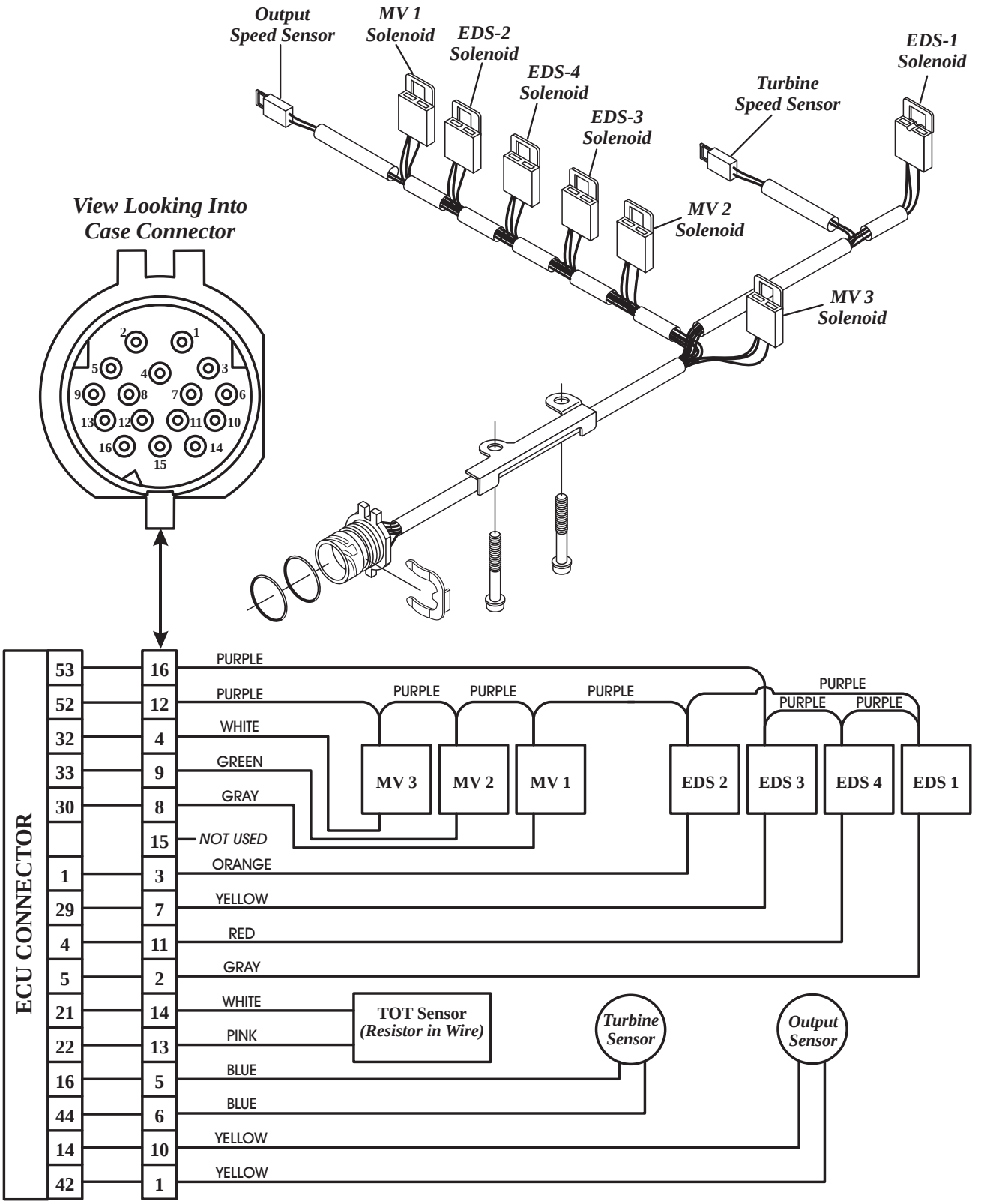
Figure 1

ZF5HP19FL/FLA
HALL EFFECT SENSOR MODELS

MAKE	MODEL	ENG.	YEAR	ZF PART #	CODE	TYPE
AUDI	A6 QUATTRO	2.7	1998	1060-040-044	EMP	HALL EFFECT
AUDI	A6 QUATTRO	2.7	1998	1060-040-063	FAQ	HALL EFFECT
AUDI	A6 QUATTRO	2.8	1998	1060-040-035	EKD	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	1999	1060-040-030	EFQ	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	1999	1060-040-054	FAL	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	2.8	1999	1060-040-035	EKD	HALL EFFECT
AUDI	A6 QUATTRO	2.7	1999	1060-040-044	EMP	HALL EFFECT
AUDI	A6 QUATTRO	2.8	1999	1060-040-035	EKD	HALL EFFECT
AUDI	S4 QUATTRO/AVANT	2.7	1999	1060-040-044	EMP	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2000	1060-040-030	EFQ	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2000	1060-040-054	FAL	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	2.8	2000	1060-040-035	EKD	HALL EFFECT
AUDI	A6 QUATTRO	2.7	2000	1060-040-044	EMP	HALL EFFECT
AUDI	A6 QUATTRO	2.8	2000	1060-040-035	EKD	HALL EFFECT
AUDI	S4 QUATTRO/AVANT	2.7	2000	1060-040-044	EMP	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2001	1060-040-030	EFQ	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2001	1060-040-054	FAL	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	2.8	2001	1060-040-035	EKD	HALL EFFECT
AUDI	A6 QUATTRO	2.7	2001	1060-040-044	EMP	HALL EFFECT
AUDI	A6 QUATTRO	2.8	2001	1060-040-035	EKD	HALL EFFECT
AUDI	A6 ALLROAD QUATTRO	NA	2001	1060-040-093	FXL	HALL EFFECT
AUDI	A6 ALLROAD QUATTRO	2.7	2001	1060-040-053	EYK	HALL EFFECT
AUDI	S4 QUATTRO/AVANT	2.7	2001	1060-040-044	EMP	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2002	1060-040-030	EFQ	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2002	1060-040-054	FAL	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2002	1060-040-073	FEP	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	1.8	2002	1060-040-101	GBF	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	2.8	2002	1060-040-035	EKD	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	3.0	2002	1060-040-087	FEQ	HALL EFFECT
AUDI	A4 QUATTRO/AVANT	3.0	2002	1060-040-103	GBJ	HALL EFFECT
AUDI	A6 QUATTRO	3.0	2002	1060-040-075	FEJ	HALL EFFECT
AUDI	S4 QUATTRO/AVANT	2.7	2002	1060-040-044	EMP	HALL EFFECT
VW	PASSAT	2.8	1999	1060-040-035	EKD	HALL EFFECT
VW	PASSAT	2.8	2000	1060-040-035	EKD	HALL EFFECT
VW	PASSAT	2.8	2001	1060-040-035	EKD	HALL EFFECT
VW	PASSAT	4.0	2001	1060-040-100	GAK	HALL EFFECT

Figure 2

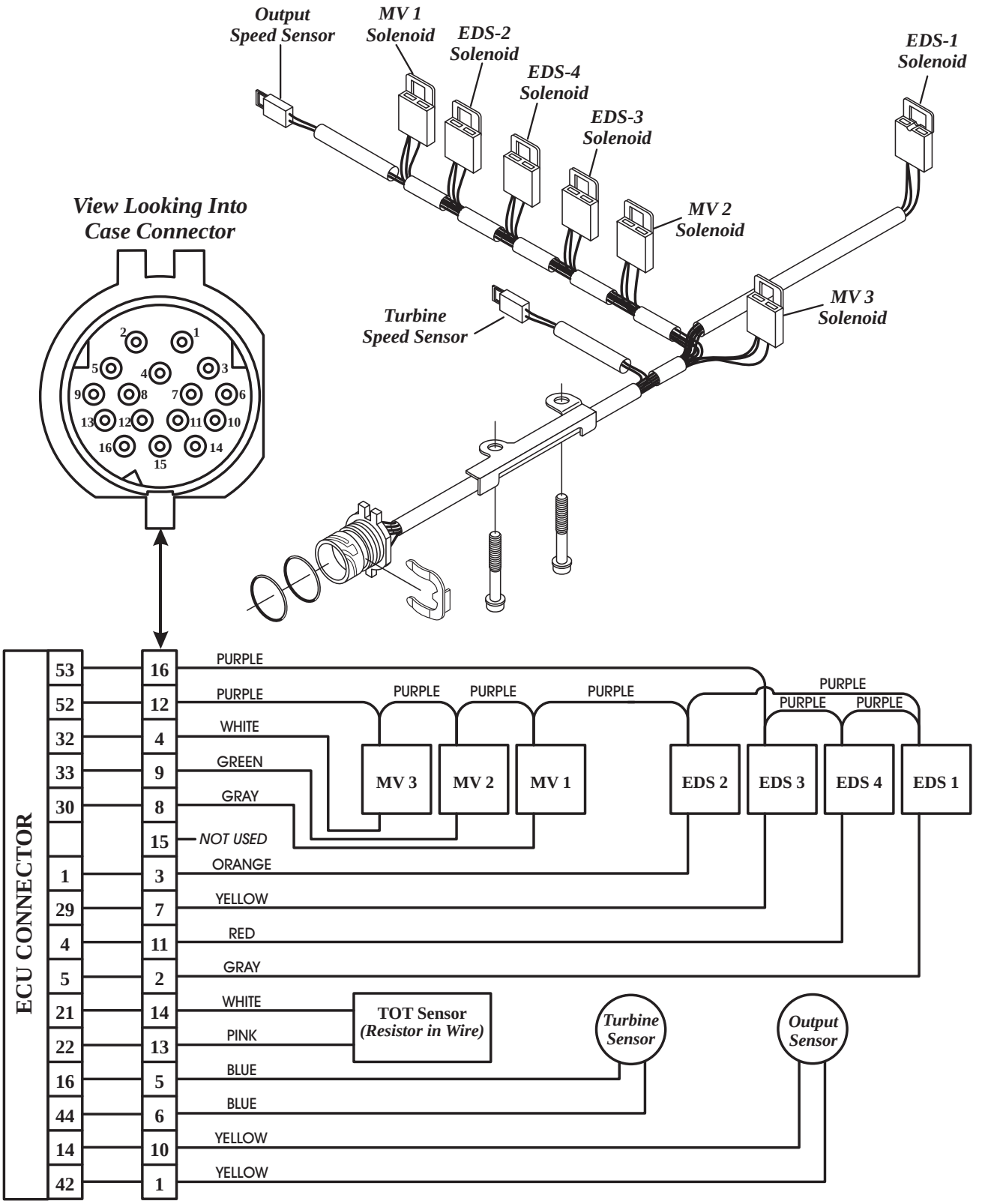
ZF-5HP-19FL/FLA INTERNAL WIRE SCHEMATIC FOR PULSE GENERATOR UNITS



NOTE: Some internal wire colors may vary.

Figure 3

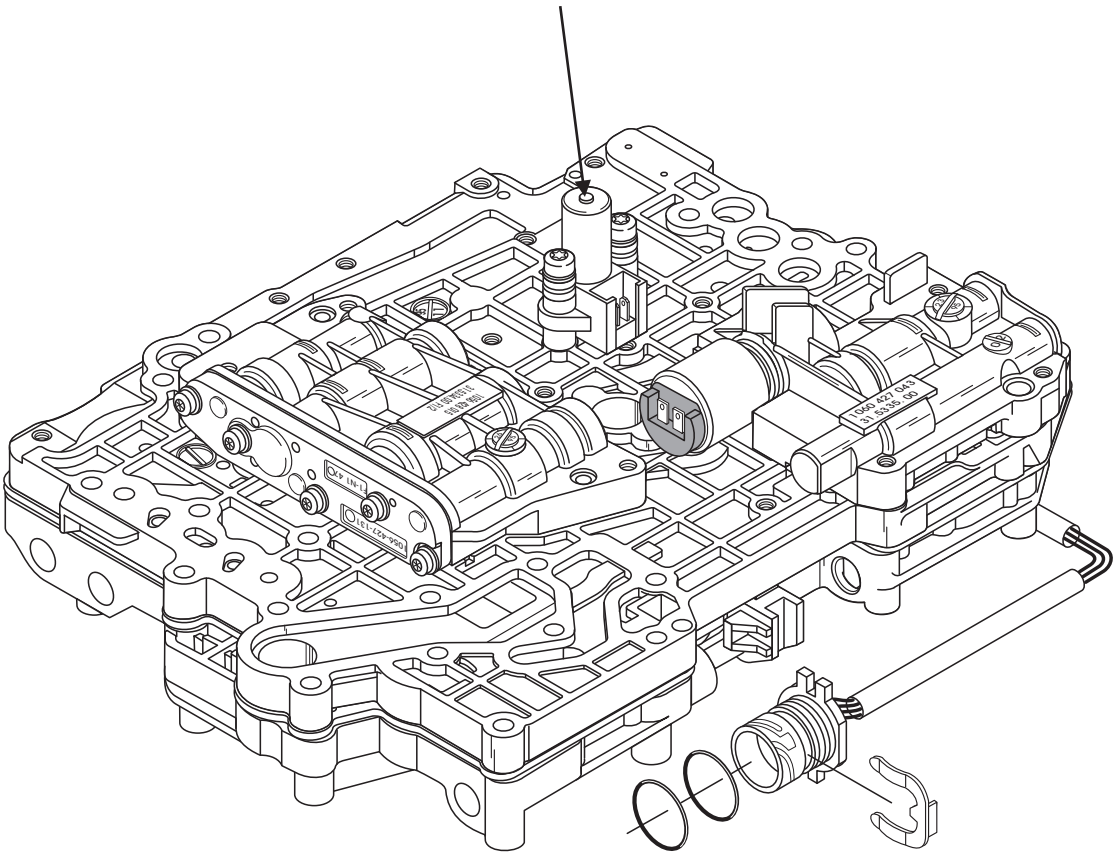
ZF-5HP-19FL/FLA INTERNAL WIRE SCHEMATIC FOR HALL EFFECT SENSOR UNITS



NOTE: Some internal wire colors may vary.

Figure 4

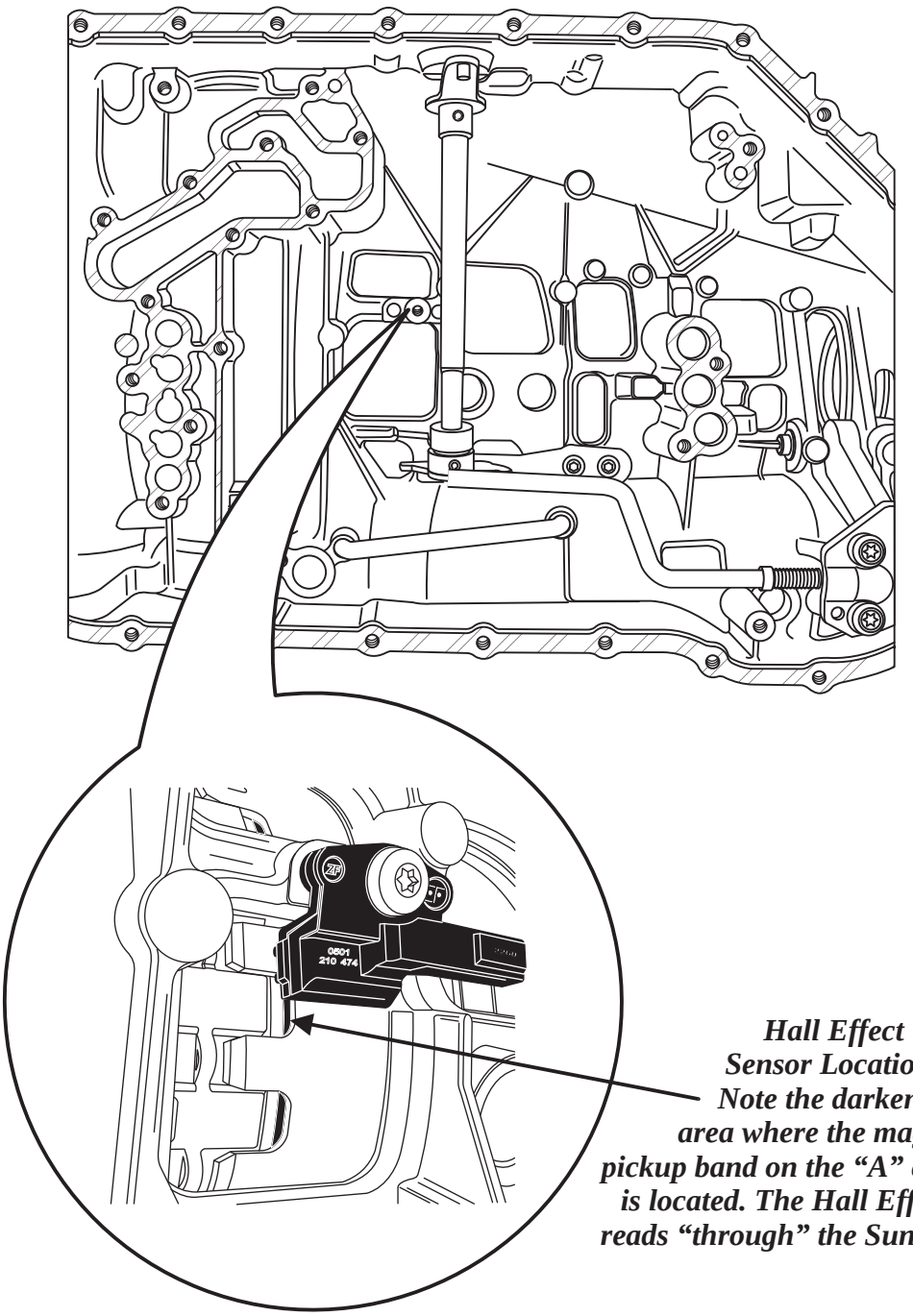
ZF-5HP-19FL/FLA
UPPER FRONT VALVE BODY
PULSE GENERATOR
TURBINE SENSOR LOCATION



THE TURBINE SENSOR ON PULSE GENERATOR MODELS IS LOCATED ON THE VALVE BODY, AND GETS IT'S READING FROM THE SPIDER CLUTCH BELL THIS SENSOR MEASURES PLANETARY SPEED. ON PULSE GENERATOR MODELS THERE IS NO TURBINE SPEED READING IN 1ST GEAR.

Figure 5

ZF-5HP-19FL/FLA
HALL EFFECT SENSOR
TURBINE SENSOR LOCATION



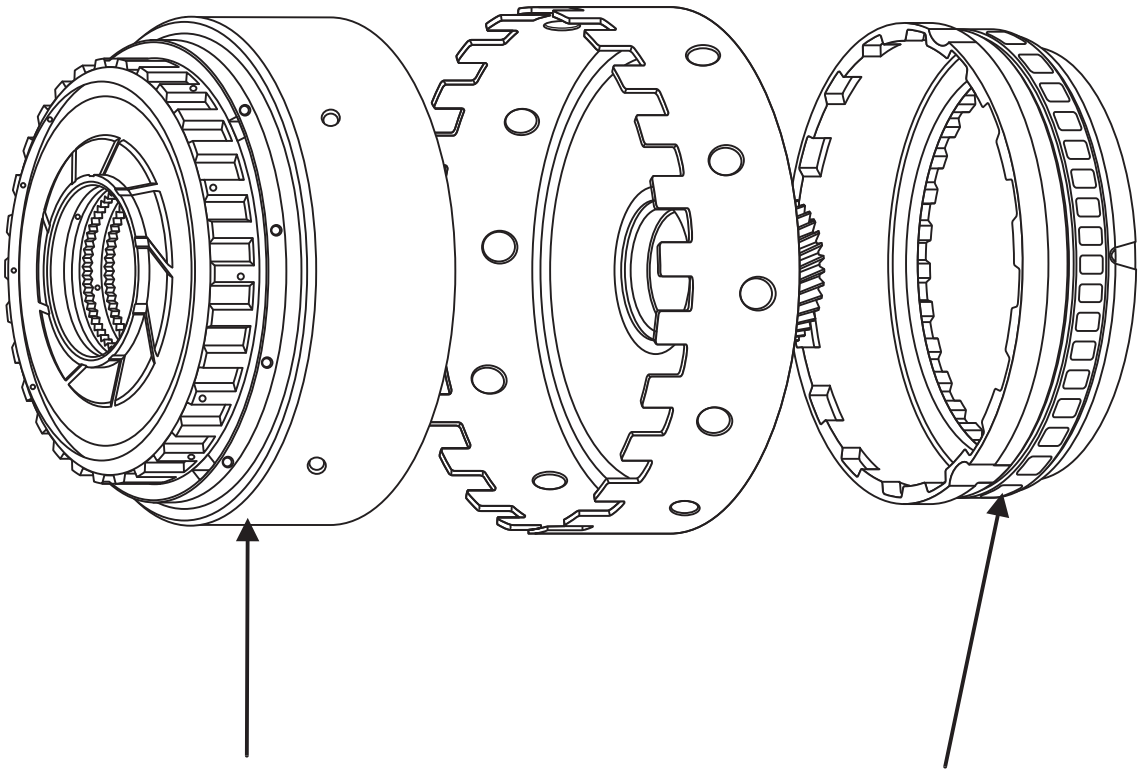
Hall Effect Sensor Location: Note the darkened area where the magnetic pickup band on the "A" clutch drum is located. The Hall Effect Sensor reads "through" the Sun Gear Shell.

THE TURBINE SENSOR ON HALL EFFECT SENSOR MODELS IS BOLTED TO THE TRANSMISSION CASE, AND GETS IT'S READING FROM THE BLACK MAGNETIC PICKUP BAND ON THE FORWARD CLUTCH DRUM WHICH MEASURES "A" CLUTCH DRUM SPEED. THIS SENSOR MEASURES ACTUAL INPUT SPEED.

Figure 6

ZF5HP19FL/FLA
PULSE GENERATOR UNITS
"A" CLUTCH DRUM, SUN GEAR, SPIDER CLUTCH BELL

The Sun Gear for Pulse Generator models will attract a magnet. This Sun Gear is designed for use in Pulse Generator transmissions only.



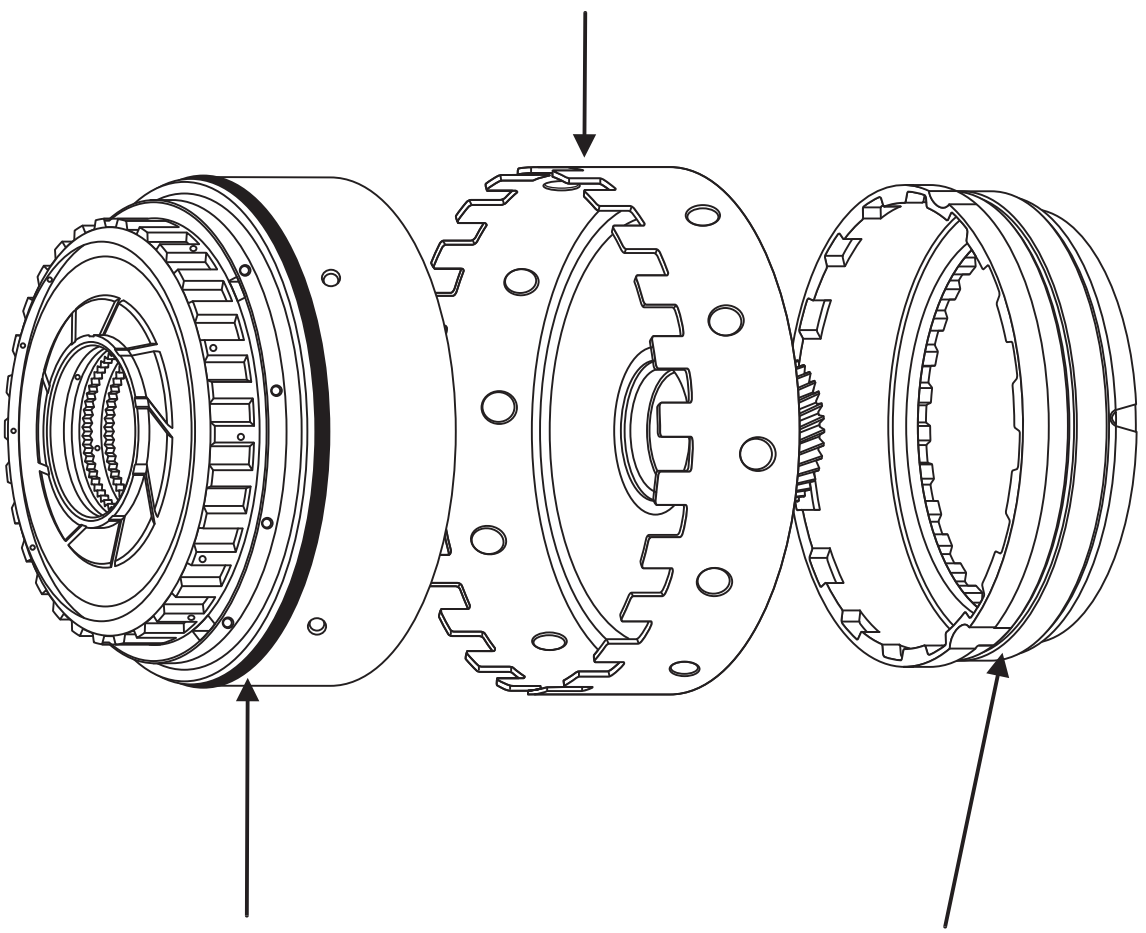
"A" Clutch Drum for Pulse Generator models does not have magnetic band around outside of clutch drum. This drum is designed for use in Pulse Generator transmissions only.

The Spider Clutch Bell for Pulse Generator models has a metal sleeve installed around the outside of the hub where the Pulse Generator gets its reading. This hub is designed for use in Pulse Generator transmissions only.

Figure 7

ZF5HP19FL/FLA
HALL EFFECT SENSOR UNITS
"A" CLUTCH DRUM, SUN GEAR, SPIDER CLUTCH BELL

The Sun Gear for Hall Effect Sensor models will not attract a magnet. This Sun Gear is designed for use in Hall Effect Sensor transmissions only.



The "A" Clutch Drum for Hall Effect Sensor models has a magnetic band around outside of clutch drum. The Hall Effect Sensor reads through the Sun Gear and picks up a pulse from the magnetic pickup band around the drum. The black magnetic band contains 36 small magnets around the outside of the drum. This drum is designed for use in Hall Effect Sensor transmissions only.

The Spider Clutch Bell for Hall Effect Sensor models does not have the metal sleeve installed around the outside of the hub. This hub is designed for use in Hall Effect Sensor transmissions only.

Figure 8

VOLKSWAGEN/AUDI
ZF5HP19FL/FLA
NO REVERSE

COMPLAINT: Volkswagen and Audi vehicles equipped with the ZV5HP19FL/FLA may exhibit a no Reverse condition before or after overhaul.

CAUSE: The cause may be, a broken D clutch housing, as shown in Figure 2, causing no application of the D clutch which is the Low Reverse Clutch.

CORRECTION: Replace the D clutch housing with the correct part number, based on the tag number located in Figure 1.

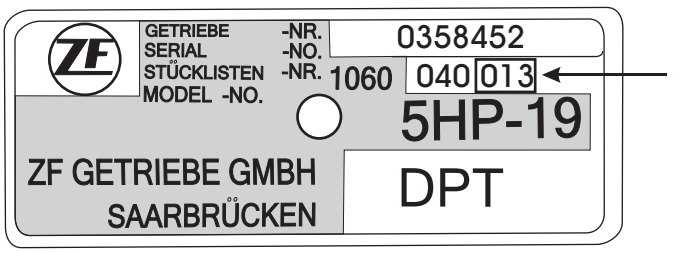
SERVICE INFORMATION:

D CLUTCH HOUSING 1060 373 002
Used in models 002, 012, 013, 036
D CLUTCH HOUSING.....1060 373 003
Used in models 018, 030, 054, 073, 101
D CLUTCH HOUSING.....1060 373 014
Used in models 035, 044, 053, 063, 065, 075, 087, 093, 100, 103

NOTE: Use Figure 1 for reference as to what model you are working on. The part numbers listed above are for ZF distributers only and will not be recognized by car dealers.

Special thanks to Dino at Lee Miles

TAG AND MODEL IDENTIFICATION



The last three digits on the tag will identify the part number needed listed in Service Information for the correct D clutch housing

The part number for the D clutch housing according to the tag identification shown above is 1060 373 002

Figure 1

D CLUTCH HOUSING

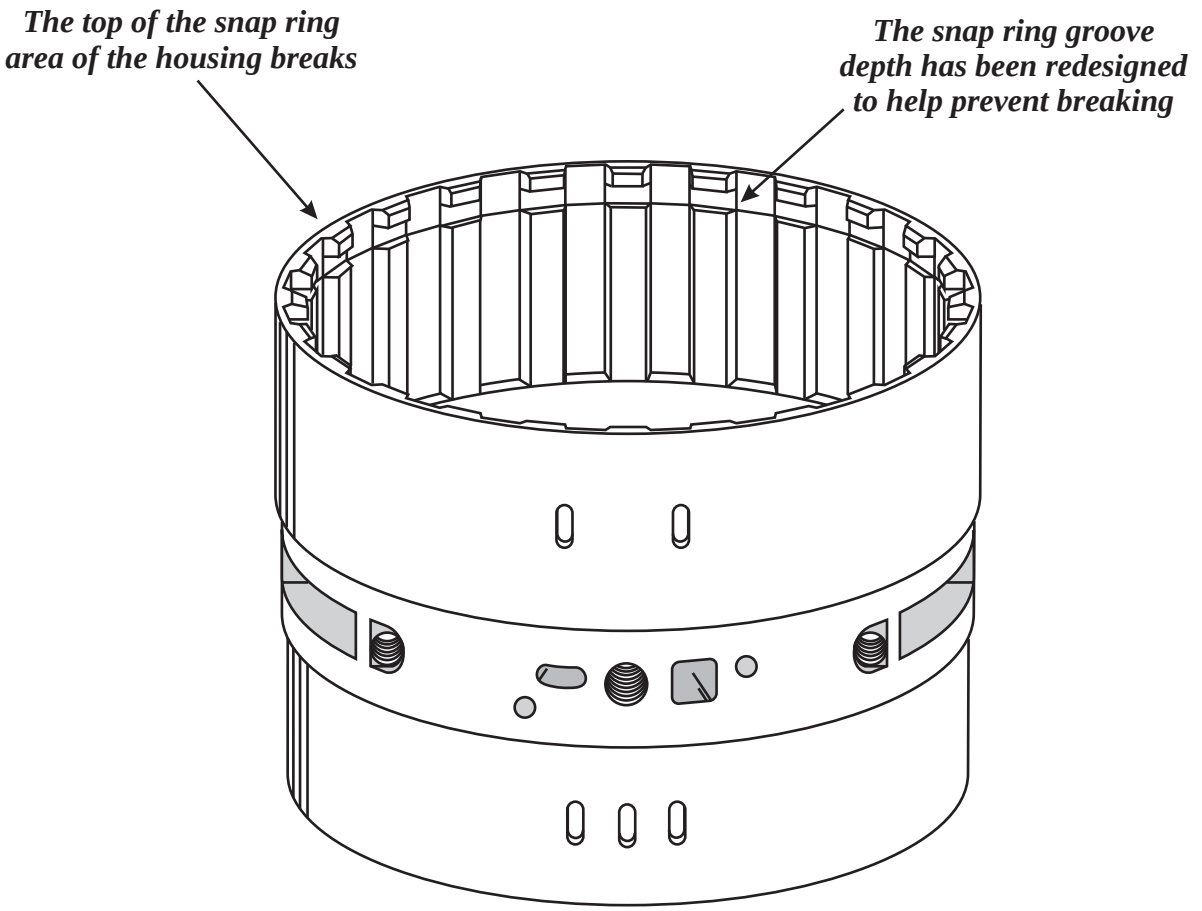


Figure 2

ZF5HP24

"E" CLUTCH FEED PIPE DAMAGE

COMPLAINT: The vehicle with a ZF5HP24 comes into the shop with a complaint of harsh shifts, both up and down. A scan of the TCM shows no codes stored and the transmission is not in limp mode. However the transmission control system has defaulted to maximum line pressure.

CAUSE: The "E" clutch feed pipe has made contact with the valve body casting and has had a hole rubbed through the pipe, (Refer to Figures 1 and 2).

CORRECTION: It would seem that the valve body covers enough of the hole to prevent the leak from becoming bad enough to allow clutch slippage which would result in a gear ratio error code being stored as well as limp mode.
It is important to insure that the feed pipe fits tightly in the case to prevent contact with the valve body. It would also help to remove some of the valve body casting, in the ribbed area, to insure enough clearance between the pipe and the valve body.
Either repair the pipe as shown in Figure 3 if the pipe is unavailable or purchase a new feed pipe using the part number listed below under service information from an authorized ZF distributor.

SERVICE INFORMATION:
"E" Clutch Feed Pipe.....(ZF Part Number) 1058301021

Many thanks to Mr. Bart Schillings at Bart Transmission & Turbo Shop in Heerlen Buzzpr, The Netherlands for sharing his experience with us and a special thanks for the photos.

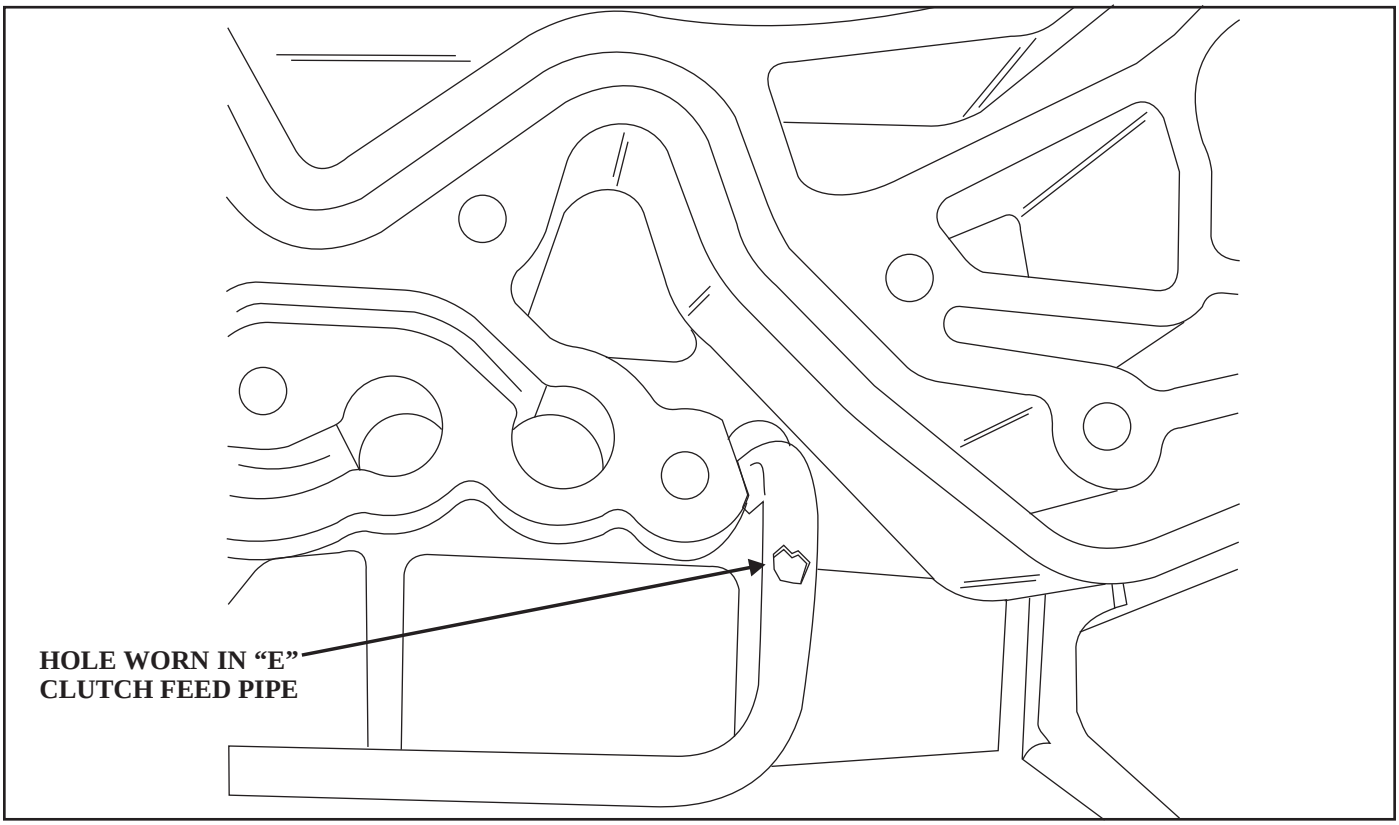


Figure 1

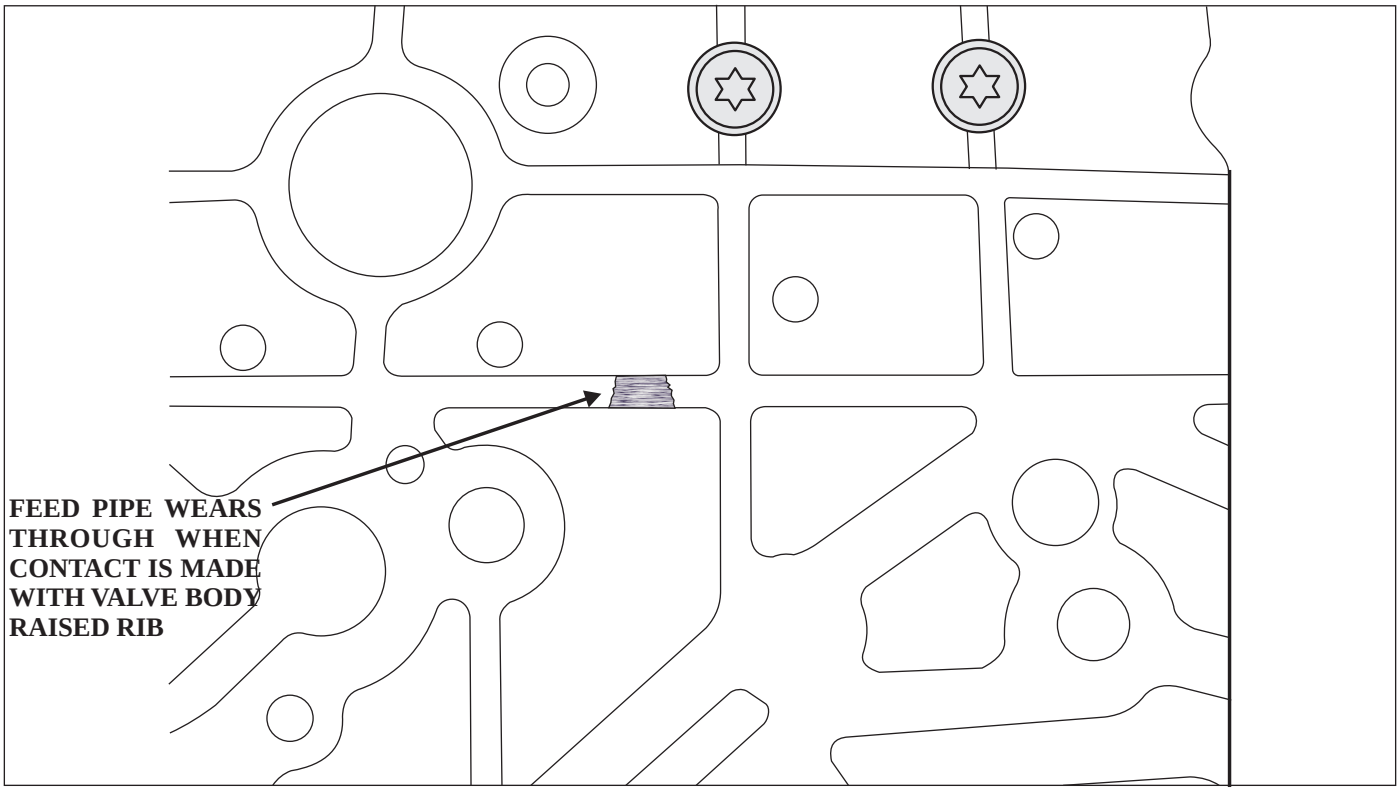


Figure 2

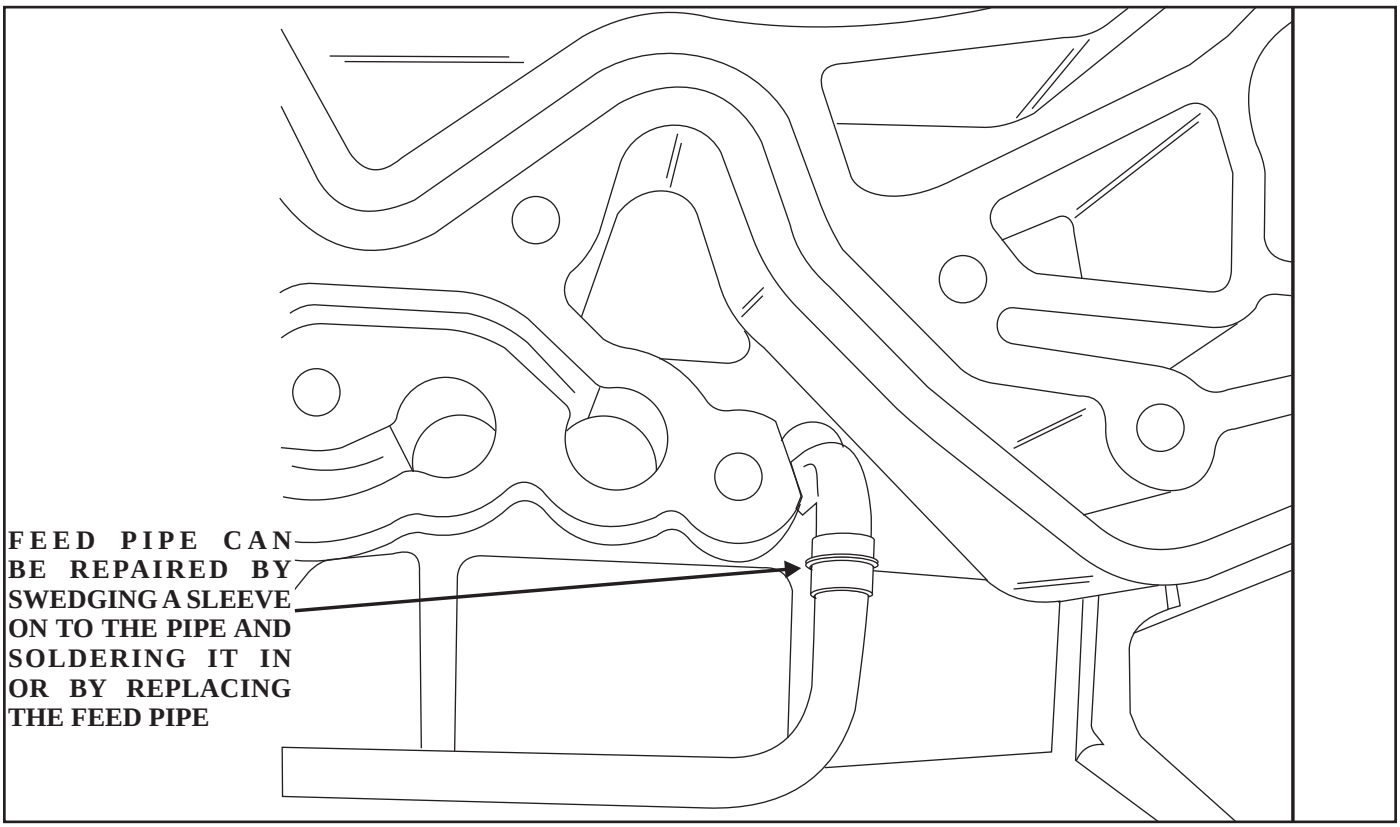


Figure 3

AVI

Raybestos

TTXE

BC

Techpak