"2004" SEMINAR INFORMATION

INDEX

Ford, Chrysler & Imports

ADVERTISER'S

AUTOMATIC TRANSMISSION SERVICE GROUP
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"What's in Store for 2004" Seminar Information

Introduction

In the previous White "What's in Store for 2004" we began with valuable General Motors information and finished with needful tech for Ford. The Red Manuals picks up again with invaluable tech for Ford and starts up with the RWD and FWD Chrysler units. A look at Chryslers new 42RLE is presented in this manual providing you with enough preliminary information that should a Jeep Liberty find its way into your shop, you are completely prepared to take on the work. This manual ends with introducing the Import section of the seminar. This agenda makes coming to ATSG's "What's in Store for 2004" technical seminar a worth while investment.

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DACCO

ATG

2000 & LATER FORD, LINCOLN MERCURY W/4R70W

CLICKING NOISE IN FIRST GEAR

COMPLAINT: A rattle or clicking sound is coming from the transmission until the 1-2 shift is completed. An odd looking clip may be found on the builder's bench after overhaul.

CAUSE: This may be caused by the intermediate clutch pack rattling in the case when the clutch is released in first gear.

CORRECTION: Install an intermediate clutch anti-rattle clip in the location shown in figures 1 and 2.

SERVICE INFORMATION:

Intermediate Clutch Anti-Rattle Clip.....YL3Z-7A609-AA

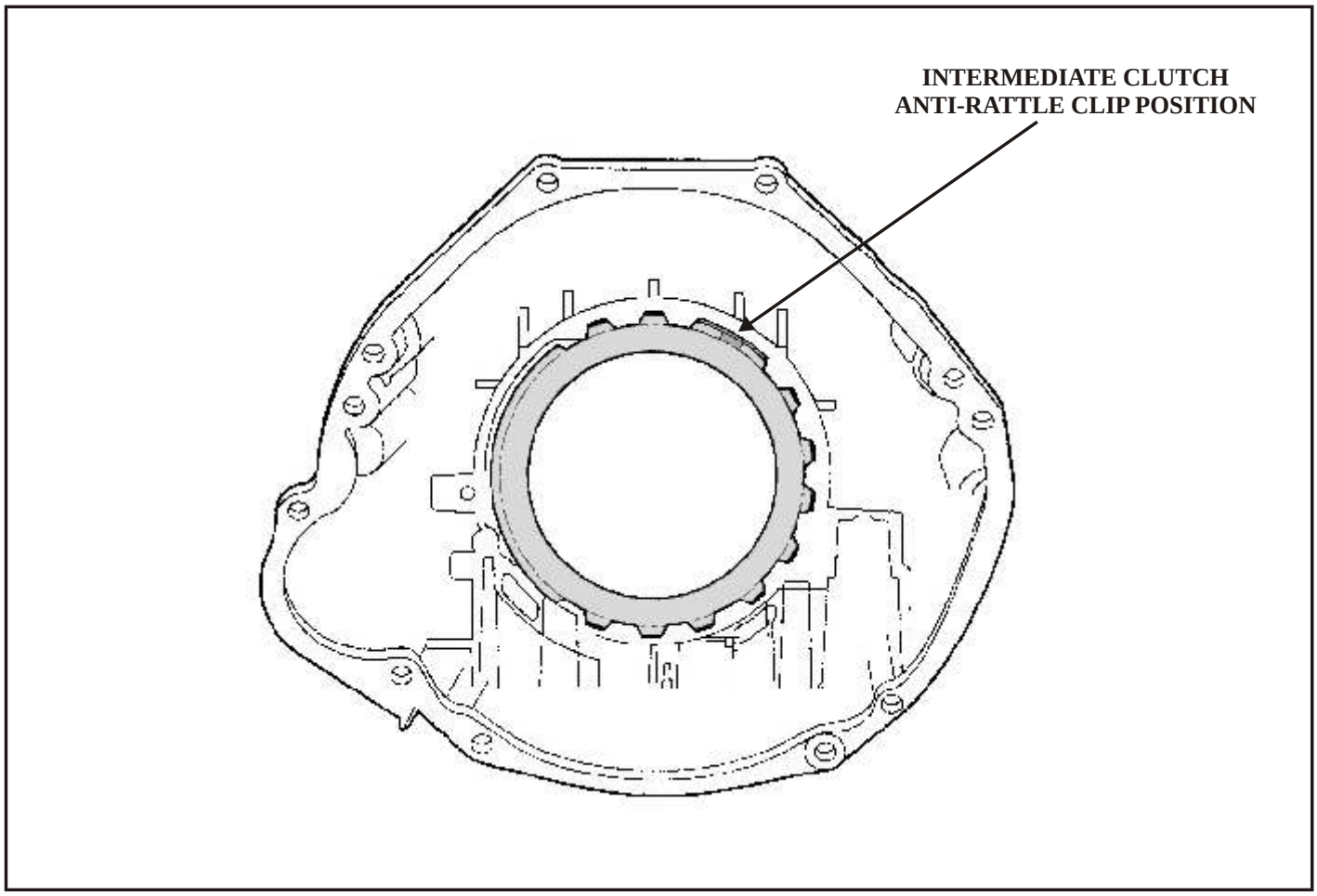


Figure 1

Brown

CLICKING NOISE IN FIRST GEAR

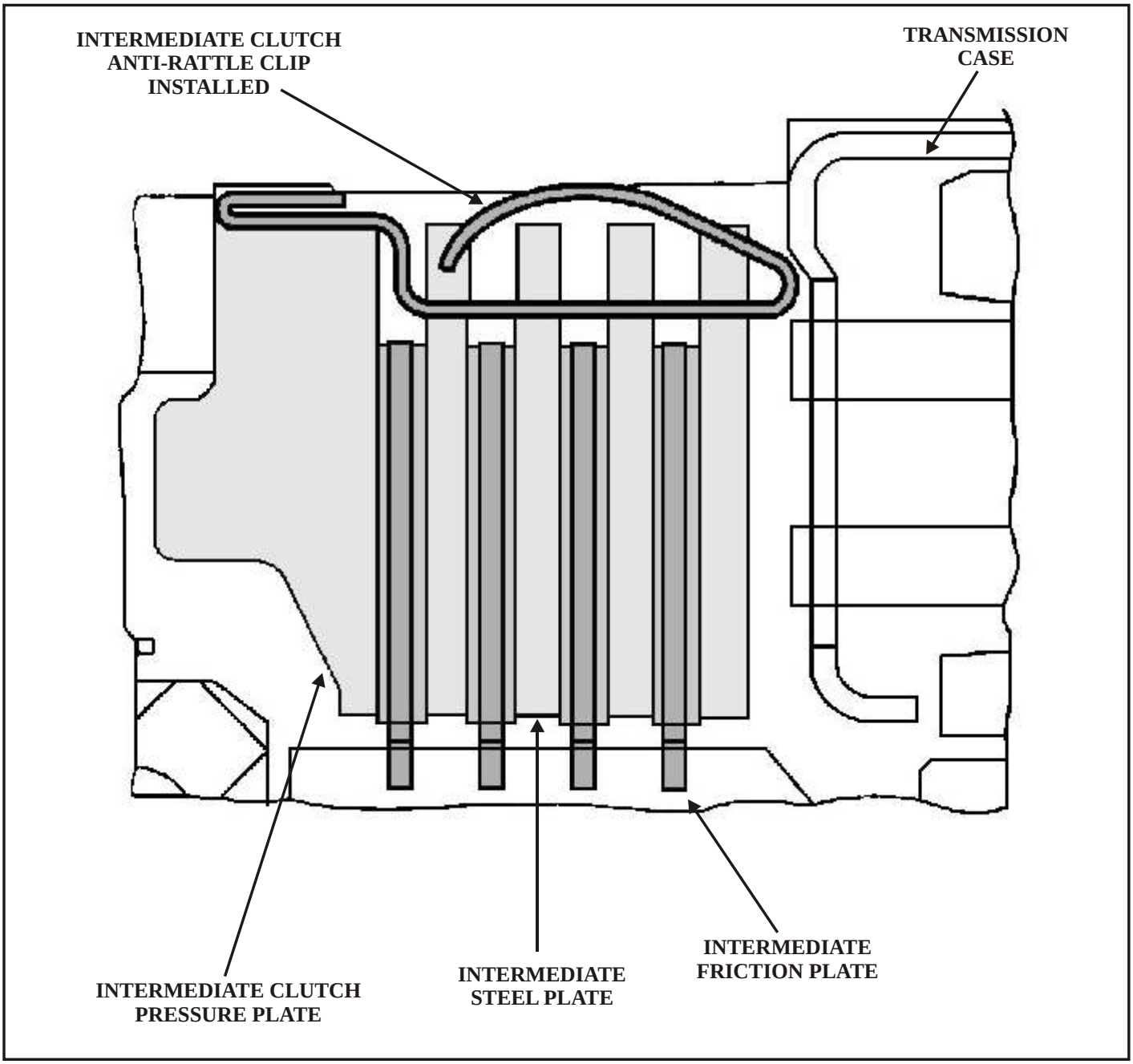


Figure 2

Rockland

FORD 4R70E/4R75E
NEW TURBINE SHAFT SPEED SENSOR

CHANGE: Beginning at the start of production for 2004, Ford Motor Company introduced a new rear drive transmission with the designation 4R70E or 4R75E, as shown in Figure 1. This unit is another version of the current 4R70W unit. There has been a Turbine Shaft Speed (TSS) sensor added in the center of the case, as shown in Figure 1, and aligned with a new sun gear shell, as shown in Figure 2. Another change is the rear ring gear with extended parking lugs that now trigger the output speed sensor, as shown in Figure 3. These new units are found only in F150 and E150 series vehicles for 2004. The 4.6L engine will be equipped with the 4R70E and the 5.4L engine will be equipped with the 4R75E, difference being, hardened planetary carrier in the 4R75E.

REASON: Improved forced downshifts.

PARTS AFFECTED:

(1) TURBINE SHAFT SPEED SENSOR - Has been added to the center of the case on the left hand side of the transmission, as shown in Figure 1.

(2) TRANSMISSION MAIN CASE - Modified to accommodate the added turbine shaft speed sensor, as shown in Figure 1.

(3) SUN GEAR AND SHELL ASSEMBLY - The new Sun Shell Assembly is easily identified by the new rivets that retain the sun shell to the sun gear, as shown in Figure 2. The new sun shell is manufactured from a different material than the previous shell. The new sun shell material is less magnetic than the previous sun shell.

(4) REAR INTERNAL RING GEAR - Now is manufactured with extended parking lugs on the ring gear to trigger the output speed sensor, instead of the previous design with holes in the ring gear, which would also require a strategy change in the PCM. Refer to Figure 3.

INTERCHANGEABILITY:

None of the parts listed above will interchange with the previous design 4R70W parts.

SERVICE INFORMATION:

Turbine Shaft Speed Sensor (Not Yet Available) 3L3Z-7M101-AA
Output Speed Sensor, 1994-2000 (Rectangular Connector) F4AZ-7H103-AA
Output Speed Sensor, 2001-2003 (Square Connector) 1L3Z-7H103-AB
Output Speed Sensor, 2004 Models (.100" Shorter) 3L3Z-7H103-AA

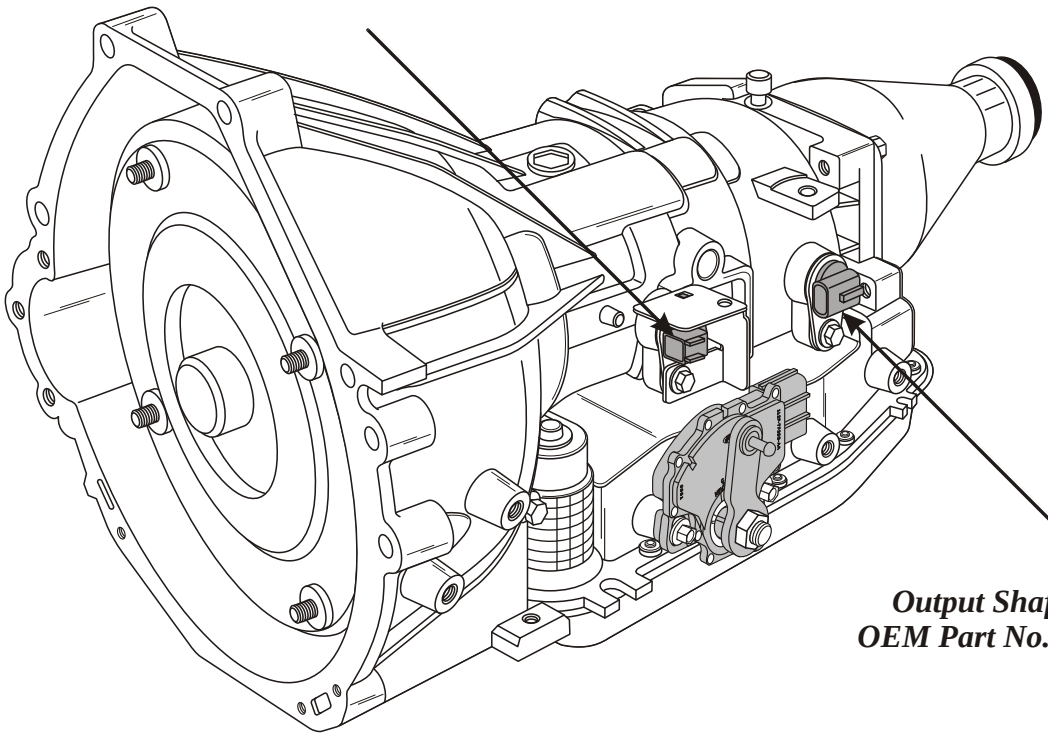
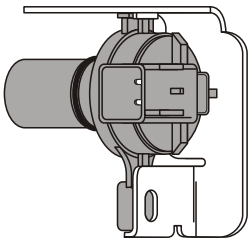


Figure 1

New Turbine Shaft Speed Sensor OEM Part No. 3L3Z-7M101-AA



450-750 Ohms Resistance

New Sun Shell Is Now Riveted To The Sun Gear And Hub

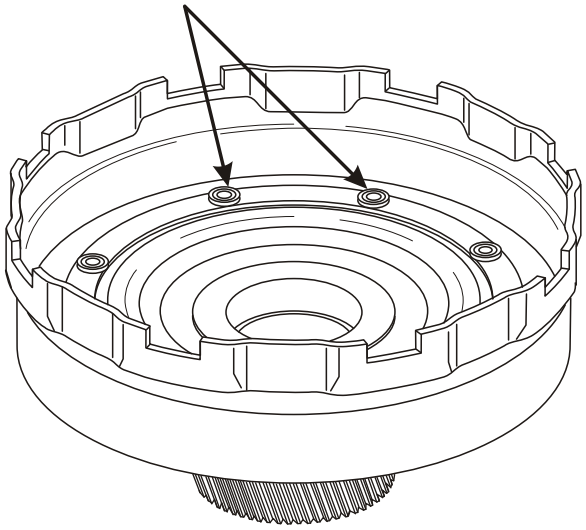


Figure 2

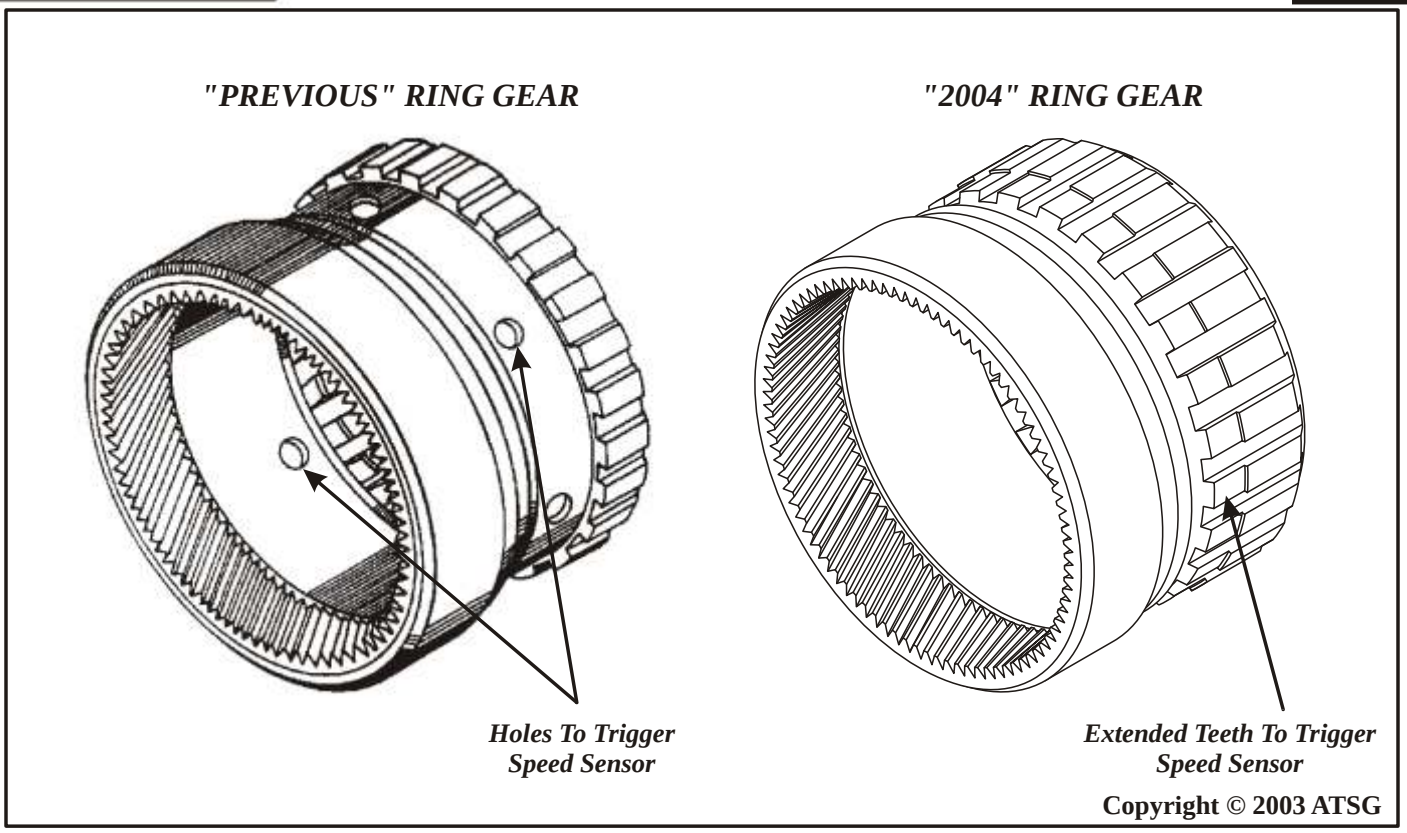

"PREVIOUS" RING GEAR
"2004" RING GEAR
Holes To Trigger Speed Sensor
Extended Teeth To Trigger Speed Sensor
Copyright © 2003 ATSG

Figure 3

FORD MOTOR COMPANY
TRANSMISSION FLUID TEMPERATURE CHARTS

The following charts are being supplied, so that the technician in the shop will have an easy method to translate the readings for Transmission Fluid Temperature as seen through various scan tools. Most scan tool data for TFT is represented in DC Voltage, while most manuals only show Ohms Resistance Charts. Figure 1 will show temperature in Degrees Fahrenheit, Voltage, and Resistance on a K Ohm scale. The Chart in Figure 2 will show temperature in Degrees Celsius, Voltage and Resistance on a K Ohm scale. Figure 3 will show the formula to convert Fahrenheit to Celsius. Figure 4 will show the formula to convert Celsius to Fahrenheit.

TEMPERATURE DEGREES FAHRENHEIT	VOLTAGE	RESISTANCE K OHMS
- 58	5.00	127.575
- 40	4.91	115.229
- 22	4.89	102.884
- 4	4.87	90.539
14	4.42	78.194
32	3.97	65.849
50	3.52	58.750
68	3.06	37.300
86	2.62	24.270
104	2.16	16.150
140	1.35	7.600
158	1.04	5.370
176	0.80	3.840
194	0.61	2.800
212	0.47	2.070
230	0.36	1.550
248	0.28	1.180
267	0.20	0.800
302	0.12	0.540

Figure 1

FORD MOTOR COMPANY
TRANSMISSION FLUID TEMPERATURE CHARTS

TEMPERATURE DEGREES CELSIUS	VOLTAGE	RESISTANCE K OHMS
- 50	5.00	127.575
- 40	4.91	115.229
- 30	4.89	102.884
- 20	4.87	90.539
- 10	4.42	78.194
0	3.97	65.849
10	3.52	58.750
20	3.06	37.300
30	2.62	24.270
40	2.16	16.150
60	1.35	7.600
70	1.04	5.370
80	0.80	3.840
90	0.61	2.800
100	0.47	2.070
110	0.36	1.550
120	0.28	1.180
131	0.20	0.800
160	0.12	0.540

Figure 2

Formula to convert Fahrenheit to Celsius:
Fahrenheit Degrees minus 32 divided by 1.8 equals Celsius Degrees.
Figure 3

Formula to convert Celsius to Fahrenheit:
Celsius Degrees multiplied by 1.8 plus 32 equals Fahrenheit Degrees
Figure 4

FORD EXPLORER; LINCOLN AVIATOR; MERCURY MOUNTAINEER

NEUTRAL TOW AVAILABILITY

CONCERN: Some 1996-2003 Ford Explorers, 2003 Lincoln Aviators and 1997-2003 Mercury Mountaineers are "Neutral Tow" capable.

RESPONSE: Refer to the charts in figures 1 and 2 for "Neutral Tow" capable vehicle applications. Some models will require reprogramming to make "Neutral Tow" active, full instructions come in the kit.

SERVICE INFORMATION:

Neutral Tow Kit.....3L2Z-7H332-AA
Neutral Tow Kit.....1L2Z-7H332-AA
Neutral Tow Kit.....F77Z-7H332-AB
Refer to the charts in figures 1 and 2 for the correct part number application.

NEUTRAL TOW AVAILABILITY CHART

MODEL YEAR	VEHICLE	TRANSMISSION	DRIVELINE	AVAILABILITY	KIT NUMBER
2003	Lincoln Aviator	AUTOMATIC	ALL	NO	————
	Mercury Mountaineer	AUTOMATIC	ALL	NO	————
	Ford Explorer 4 Door	AUTOMATIC	Control Trac 2 Speed - 4X4	YES	1L2Z-7H332-AA
	Ford Explorer 4 Door	AUTOMATIC	4X2	NO	————
	Ford Explorer 4 Door	MANUAL	Control Trac 2 Speed - 4X4	YES	NONE REQUIRED
	Ford Explorer 4 Door	MANUAL	4X2	YES	NONE REQUIRED
	Ford Explorer 2 Door	MANUAL	4X2 4X4	YES	NONE REQUIRED
	Ford Explorer Sport Trac	MANUAL	4X2 4X4	YES	NONE REQUIRED
	Explorer Sport 2 Door	AUTOMATIC	4X4	YES	3L2Z-7H322-AA
	Ford Explorer Sport Trac	AUTOMATIC	4X4	YES	3L2Z-7H322-AA
	Explorer Sport 2 Door	AUTOMATIC	4X2	NO	————
	Ford Explorer Sport Trac	AUTOMATIC	4X2	NO	————
2002	Mercury Mountaineer	AUTOMATIC	ALL	NO	————
	Ford Explorer 4 Door	AUTOMATIC	Control Trac 2 Speed - 4X4	YES	1L2Z-7H332-AA
	Ford Explorer 4 Door	AUTOMATIC	4X2	NO	————
	Ford Explorer 4 Door	MANUAL	Control Trac 2 Speed - 4X4	YES	NONE REQUIRED
	Ford Explorer 4 Door	MANUAL	4X2	YES	NONE REQUIRED
	Explorer Sport 2 Door	MANUAL	4X2 4X4	YES	NONE REQUIRED
	Ford Explorer Sport Trac	MANUAL	4X2 4X4	YES	NONE REQUIRED
	Explorer Sport 2 Door	AUTOMATIC	4X2 4X4	NO	————
	Ford Explorer Sport Trac	AUTOMATIC	4X2 4X4	NO	————

Figure 1

NEUTRAL TOW AVAILABILITY CHART

MODEL YEAR	VEHICLE	TRANSMISSION	DRIVELINE	AVAILABILITY	KIT NUMBER
2001	Mercury Mountaineer	AUTOMATIC	AWD	NO	————
	Mercury Mountaineer	AUTOMATIC	2 Speed - 4X4	YES	F77Z-7H332-AB
	Mercury Mountaineer	AUTOMATIC	4X2	NO	————
	Ford Explorer 4 Door	AUTOMATIC	AWD	NO	————
	Ford Explorer 4 Door	AUTOMATIC	2 Speed - 4X4	YES	F77Z-7H332-AB
	Ford Explorer 4 Door	AUTOMATIC	4X2	NO	————
	Ford Explorer 4 Door	MANUAL	4X4 - 2 Speed	YES	NONE REQUIRED
	Ford Explorer 4 Door	MANUAL	4X2	YES	NONE REQUIRED
	Explorer Sport 2 Door	MANUAL	4X4 4X2	YES	NONE REQUIRED
	Ford Explorer Sport Trac	MANUAL	4X4 4X2	YES	NONE REQUIRED
	Explorer Sport 2 Door	AUTOMATIC	4X4 4X2	NO	————
	Ford Explorer Sport Trac	AUTOMATIC	4X4 4X2	NO	————
1996 Vehicles built after 12/95 To 2000	Mercury Mountaineer	AUTOMATIC	AWD	NO	————
	Mercury Mountaineer	AUTOMATIC	2 Speed - 4X4	YES	F77Z-7H332-AB
	Mercury Mountaineer	AUTOMATIC	4X2	NO	————
	Ford Explorer 4 Door	AUTOMATIC	AWD	NO	————
	Ford Explorer 2 & 4 Door	AUTOMATIC	2 Speed - 4X4	YES	F77Z-7H332-AB
	Ford Explorer 2 & 4 Door	AUTOMATIC	4X2	NO	————
	Ford Explorer 2 & 4 Door	MANUAL	2 Speed - 4X4	YES	NONE REQUIRED
	Ford Explorer 2 & 4 Door	MANUAL	4X2	YES	NONE REQUIRED

Figure 2

FORD WINDSTAR

WINDSTAR PCM GROUND DISTRIBUTION

COMPLAINT: A Windstar may have a complaint of a loss of TCC application. The scan tool indicates that TCC duty cycle ramped up to 50%, then releases harshly followed by the Tachometer and the Temperature Gauge dropping off.
In a relatively short period of time, these systems would return to normal operation only to have the problem return soon after. This would continue to occur in a rhythmic manner.

CAUSE: The **G103** ground is bad and is responsible for the above complaints. ***When*** this ground is located on the unpainted bracket next to the A/C Receiver/Dryer at the passenger side strut tower, condensation from the Receiver/Driver collects on this ground and causes rust and corrosion to form, resulting in a poor ground at this location. The G103 ground serves as ground for the PCM as seen in Figure 1.

CORRECTION: The problem that materializes is this, Ford's factory wiring diagrams as well as some aftermarket sources show this ground location to be mounted on a transmission bell housing stud on the upper front area of the bell housing,, ***on all year models***, as seen in the ground distribution diagram in Figure 1.
This is true if this is a 1995 to 1998 Windstar with either the 3.0L or the 3.8L engine.

1999 and later Windstars with either the 3.0L or the 3.8L engine have this ground located on an unpainted bracket next to the A/C Receiver/Dryer as shown in the ground distribution diagram in figure 1 and the illustration in Figure 2, even though service information states that it is located on the transmission bell housing stud.
This is the source of the confusion. When the technician looks for the **G103** ground at the transmission bell housing stud on a 1999 and later Windstar, none is found.
Once the G103 ground was located, cleaned and reconnected, the above complaints were gone.

A special thanks to Andy Berry of Twin City Automatic Transmissions in Lancaster, N.Y. for sharing his experience with us.

VBX

WINDSTAR PCM GROUND DISTRIBUTION

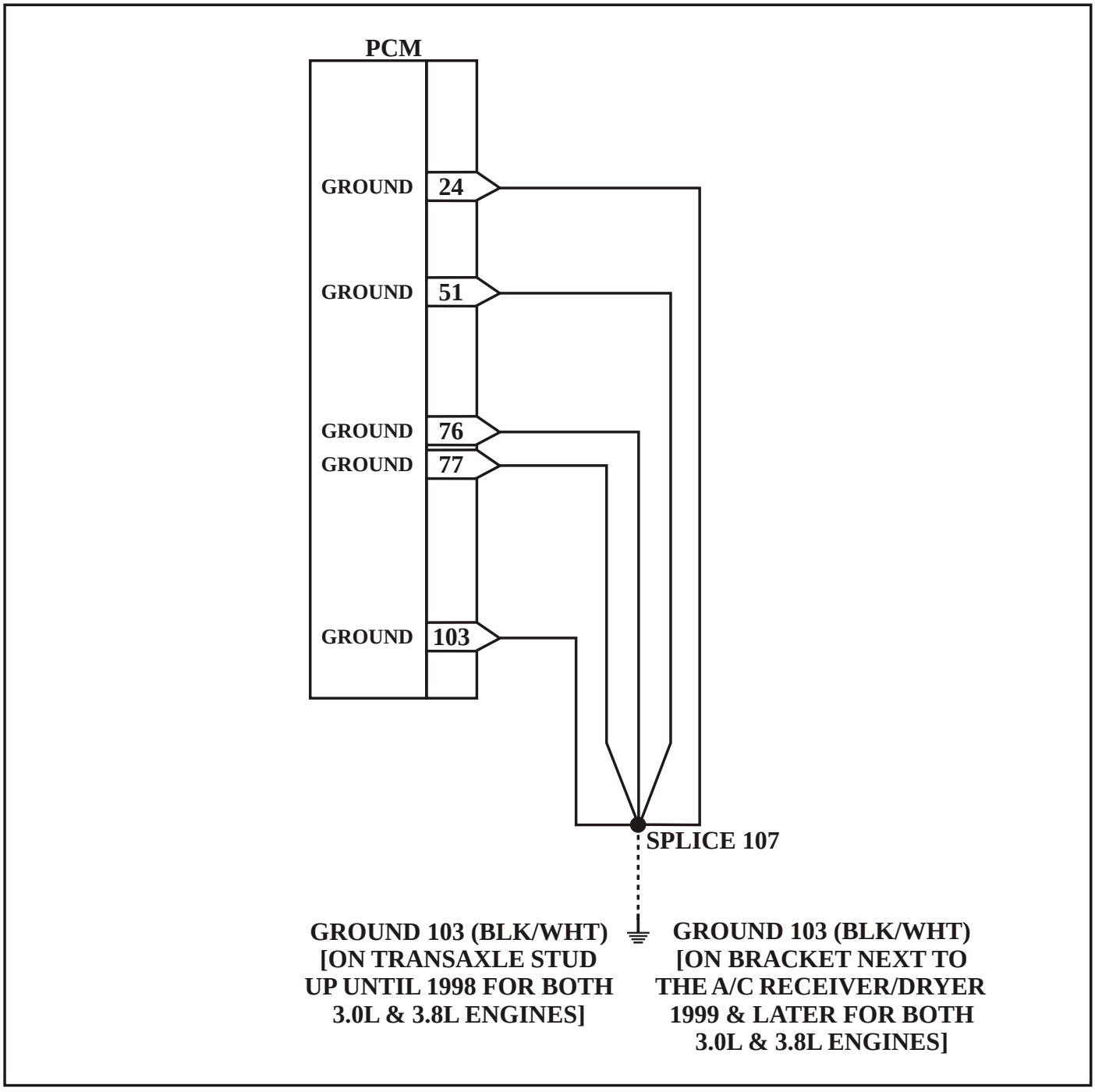


Figure 1

Superior

WINDSTAR PCM GROUND DISTRIBUTION

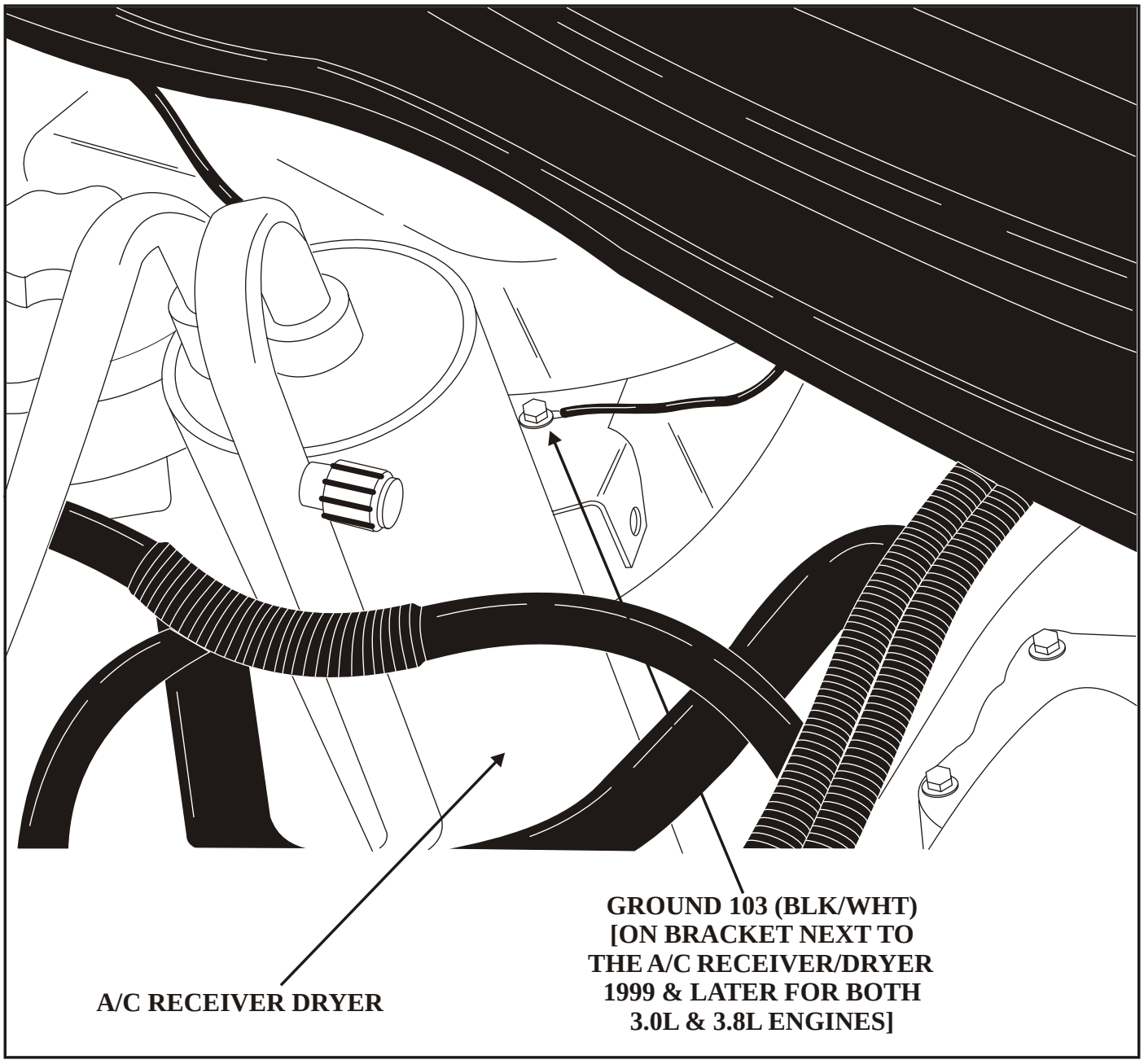


Figure 2

FORD AX4S/AX4N

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

COMPLAINT: **#1.** The previously repaired vehicle in question may exhibit a feeling of surging with a complaint of engine rpm fluctuation during lockup application, followed by a noticeable "bump" at the end of lockup engagement.
Codes P0741 for "TCC Stuck Off", or P1728 for "Converter Slip", or P1744 for "TCC Performance" may be stored. In some instances P0743 for "TCC Solenoid Circuit Fault" may also be stored.

#2. The previously repaired vehicle in question may experience lockup shudder as throttle is increased and the vehicle is placed under load.

CAUSE: **#1.** The incorrect lockup solenoid was installed in the transmission. The lockup solenoid with the ***WHITE*** connector, which has a resistance value of 0.98 to 1.6 ohms, is NOT interchangeable in all applications with the lockup solenoid with the ***BLUE*** connector which has a resistance value of 13 to 24 ohms as shown in Figure 1.
Installing the lockup solenoid with the ***BLUE*** connector on vehicle/transmission combinations that were originally equipped with the lockup solenoid with the ***WHITE*** connector could be responsible for the above complaints with the exception of the P0743 code.
Installing the lockup solenoid with the ***WHITE*** connector on vehicle/ transmission combinations that were originally equipped with the lockup solenoid with the ***BLUE*** connector could be responsible for the P0743 code due to the additional amperage that's allowed to flow through the circuit.

THEORY OF OPERATIONS:
In addition to a change in the solenoids winding, there are also changes in PCM strategy for operating characteristics of the two solenoids.
The low resistance solenoid is duty cycled with a two stage PWM signal. The first stage of pulses begin at a frequency of 66 HERTZ (Hz). The second stage of pulses will increase to control the output pressure of the solenoid as needed to bring the converter clutch slip to zero rpm, (See Figure 2).

The high resistance solenoid employs a different control strategy than the low resistance solenoid control system does.
This solenoid works off of a fixed frequency of 50 HERTZ (Hz), with a standard PWM signal, (See Figure 3), thereby increasing the pulse width in order to bring converter clutch slip to zero rpm. This type of solenoid is designed to run cooler and last longer.

FORD AX4S/AX4N

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

CAUSE *continued:*

#2. The incorrect converter was installed in the vehicle. There are two types of converter used for these vehicle/transmission combinations. The differences in these converters involve the type of converter clutch used inside them.
The use of a single sided clutch type converter in a vehicle that requires a dual clutch converter can cause the above complaint.
The converter clutch can be a single sided clutch, with the clutch bonded to the front cover, and the damper/apply piston shown above it in Figure 4. Or it can be a Dual Modulated, two sided converter clutch with a friction surface bonded to the front and rear sides of a disc suspended between the cover and the apply piston..
The apply piston has four ball and spring dowel pins which align and snap into the cover in order to keep the suspended friction disc centered between the disc and the cover (Refer to Figure 5), and connect to the damper assembly as shown in Figure 6.

CORRECTION: **#1.** Refer to the chart in Figure 7 for the correct solenoid application and usage.
CAUTION: When determining which solenoid to use in a Windstar, refer to the production date on the Vehicle Certification Label located on the driver side door jamb. The reason for this is, the Windstar could have either solenoid within the 1998 model year.

#2. The way to tell which converter you have, whether it is the original or the replacement converter, is to look down into the center of the converter just outside the turbine spline area and see if you have four tabs as seen in figure 8 or two tabs. Two tabs is a single clutch type converter, and four tabs is the dual clutch type.

SERVICE INFORMATION:

#1. Low Resistance, White Connector Lockup Solenoid.....F3DZ-7G136-A
High Resistance, Blue Connector Lockup Solenoid.....F7OZ-7G136-AA

#2. The following vehicle combinations use the Dual Clutch type of converter clutch:
1999-2003 Windstar with 3.8L engine and AX4S transmission.
1996-1997 Taurus/Sable with 3.0L DHOC engine and AX4N transmission.
1995-2001 Lincoln Continental with 4.6L engine and AX4N.

Consult your converter supply company's catalog for assistance in choosing the correct converter.

Special thanks to Scott Kirkendall of Rostra Precision Controls for sharing his expertise with us on solenoid operating characteristics.

Special thanks to Ken Cluck and Leon Keeney of Oregon Converter Company for the converter information and parts for our photos.

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

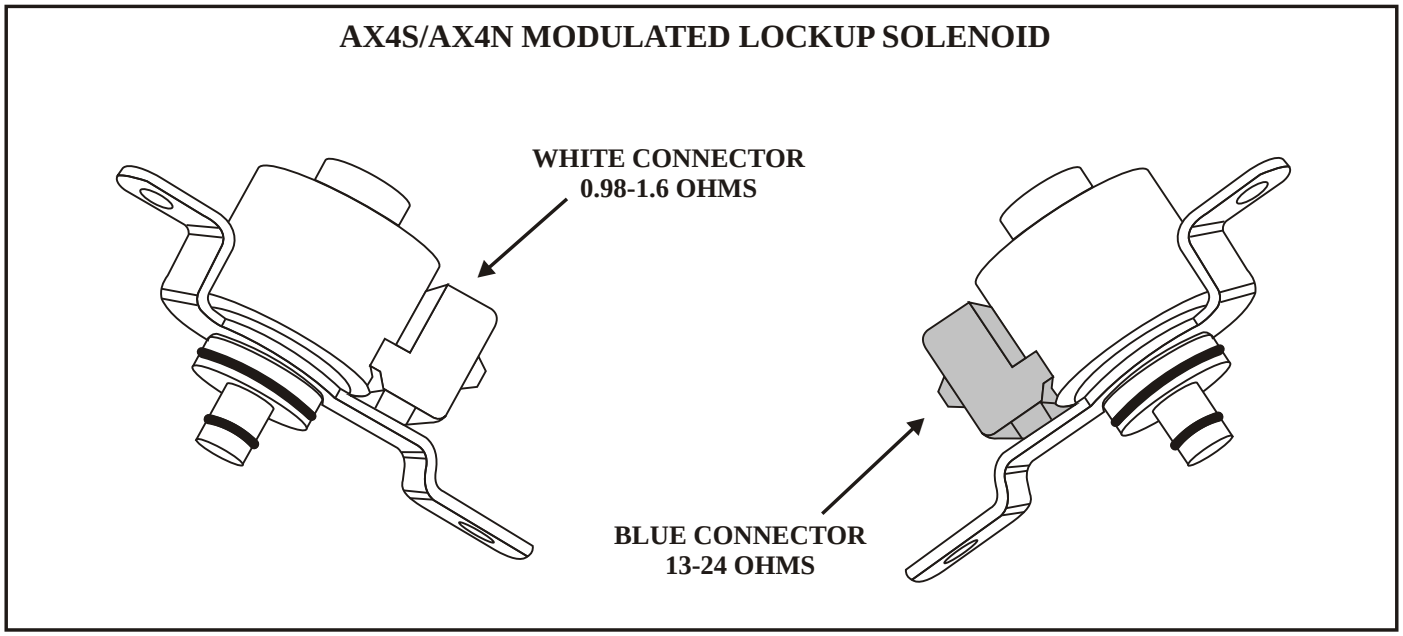


Figure 1

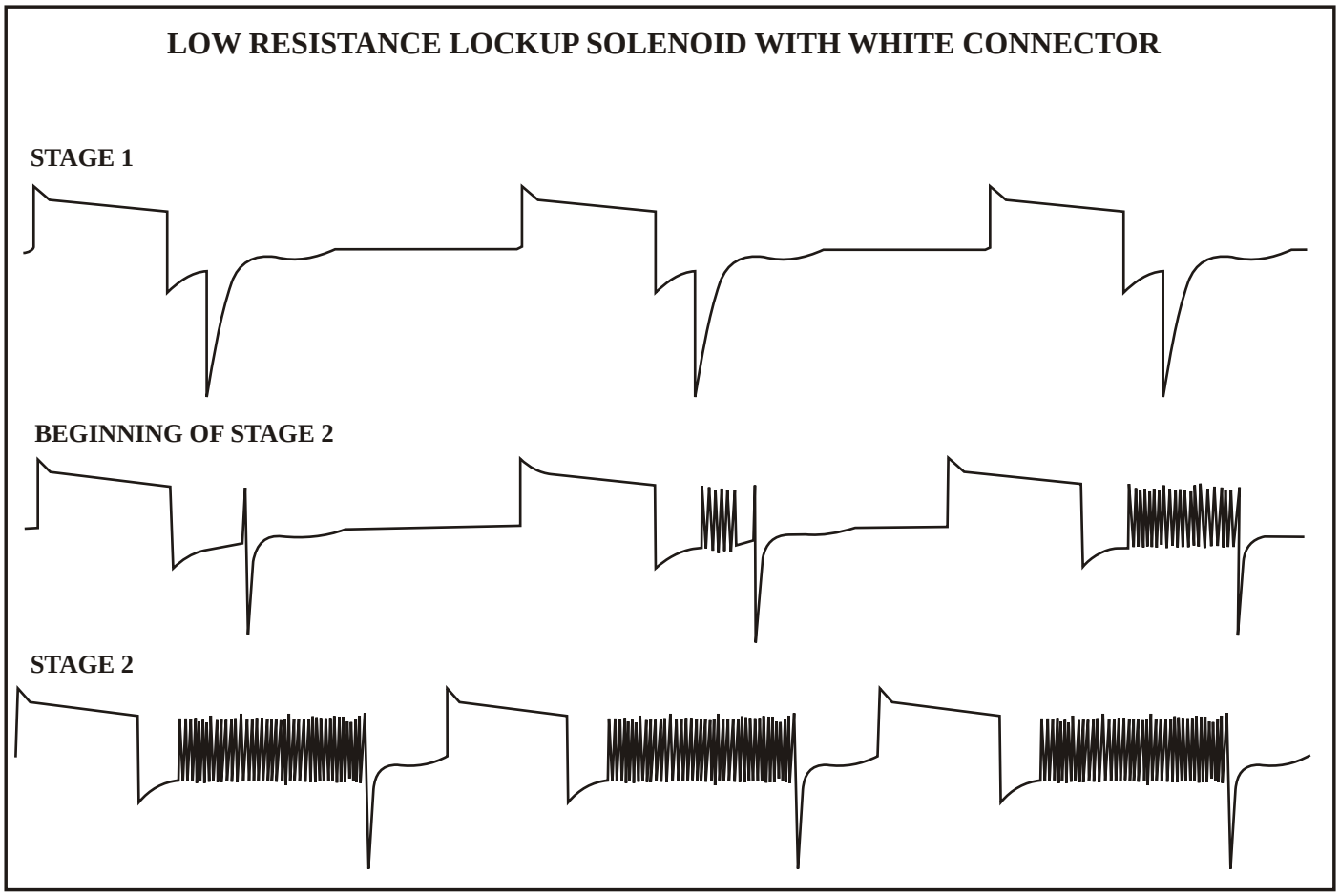
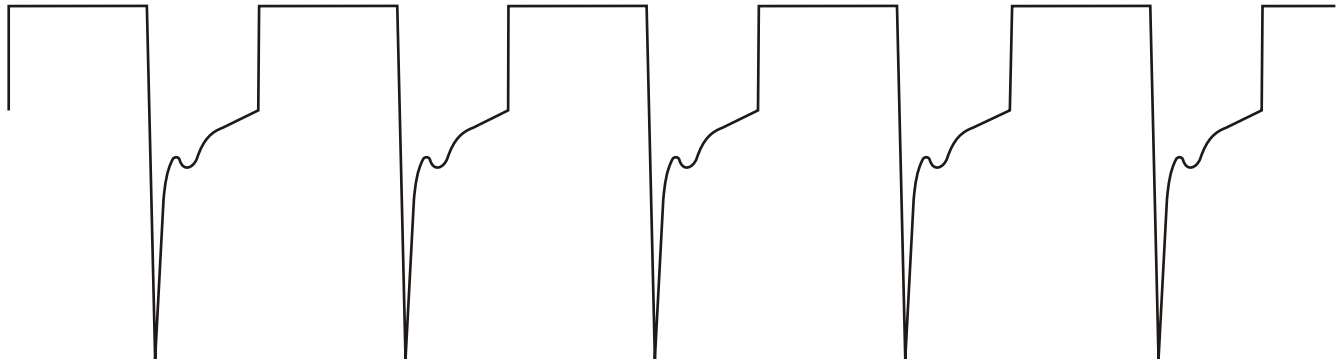


Figure 2

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

HIGH RESISTANCE LOCKUP SOLENOID WITH BLUE CONNECTOR

STAGE 1-66Hz-STANDARD PULSE WIDTH



STAGE 2-INCREASED PULSE WIDTH

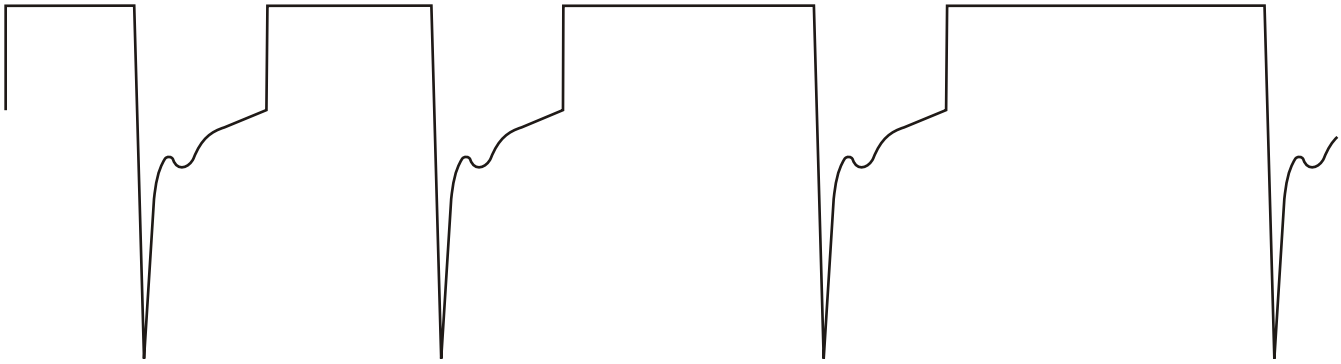


Figure 3

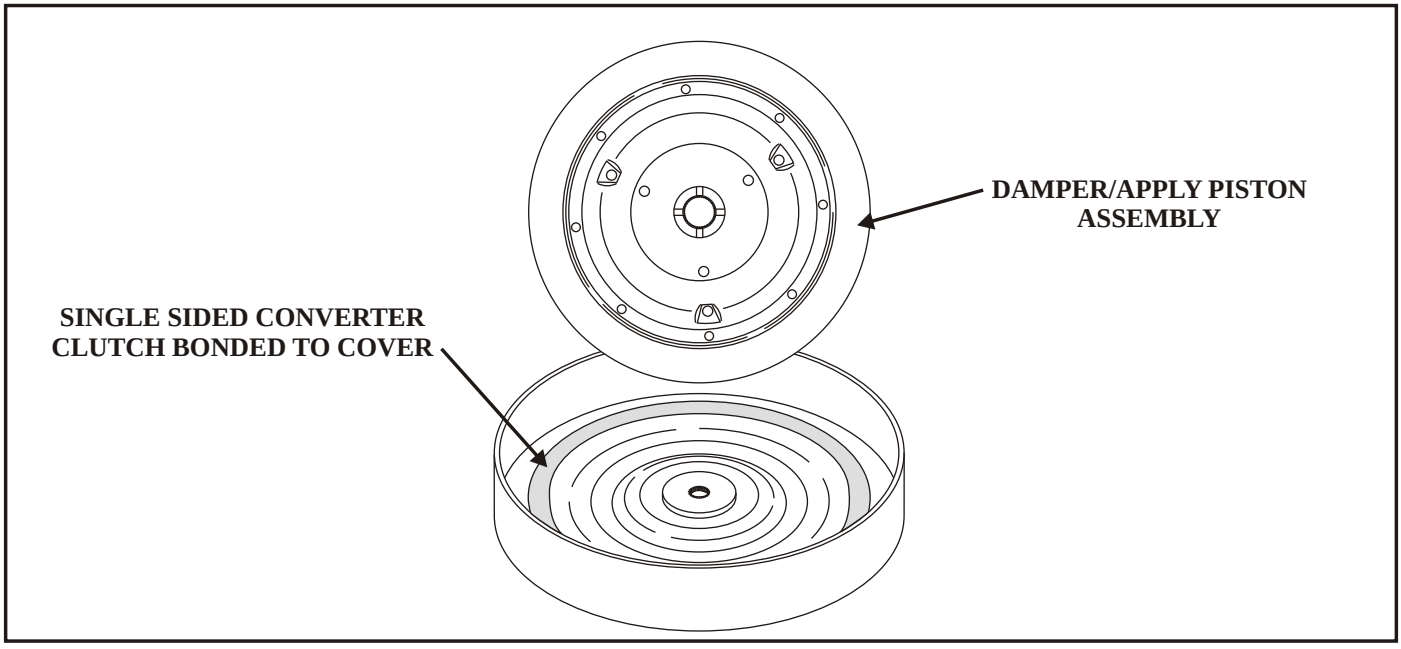


Figure 4

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

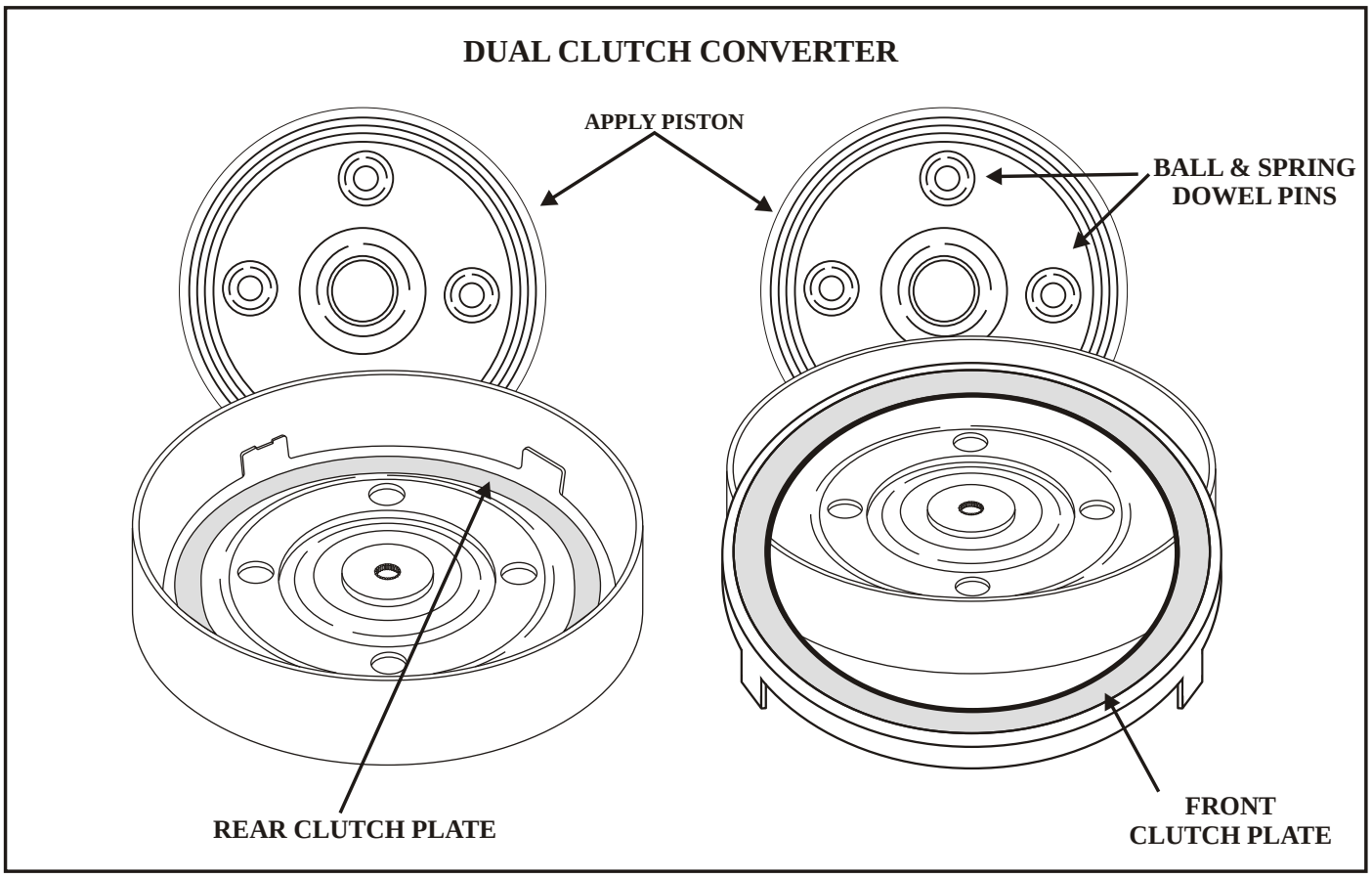


Figure 5

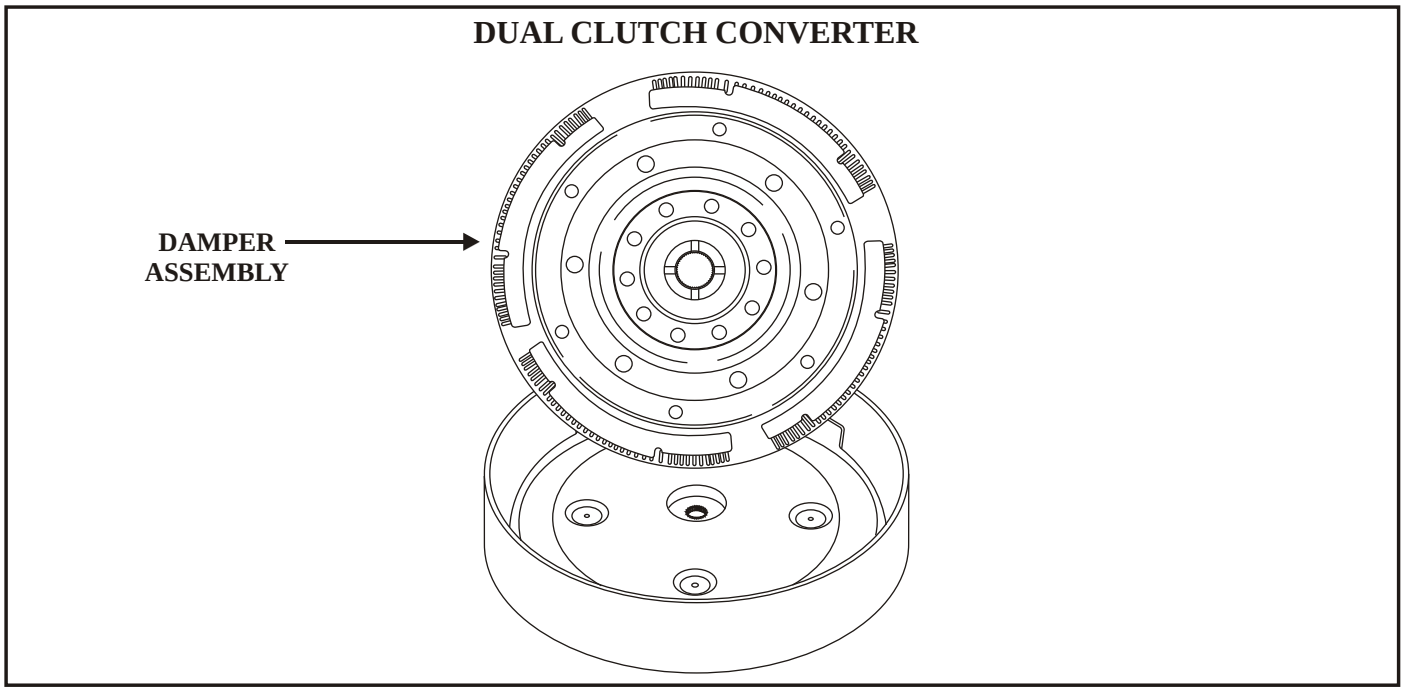


Figure 6

CORRECT LOCKUP SOLENOID & TORQUE CONVERTER USAGE

AX4S/AX4N MODULATED LOCKUP SOLENOID APPLICATION CHART		
CAR MODEL	**MODEL YEAR APPLICATION**	**LOCKUP SOLENOID RESISTANCE**
TAURUS/SABLE	1991	21 - 36 OHMS
CONTINENTAL	1991 - 1996	0.98 - 1.6 OHMS
TAURUS/SABLE	1992 - 1997	
WINDSTAR	1995 THRU 9/8/97	
CONTINENTAL	1997 - 2002	13 - 24 OHMS
TAURUS/SABLE	1998 - 2003	
WINDSTAR	9/9/97 THRU 2003	

Figure 7

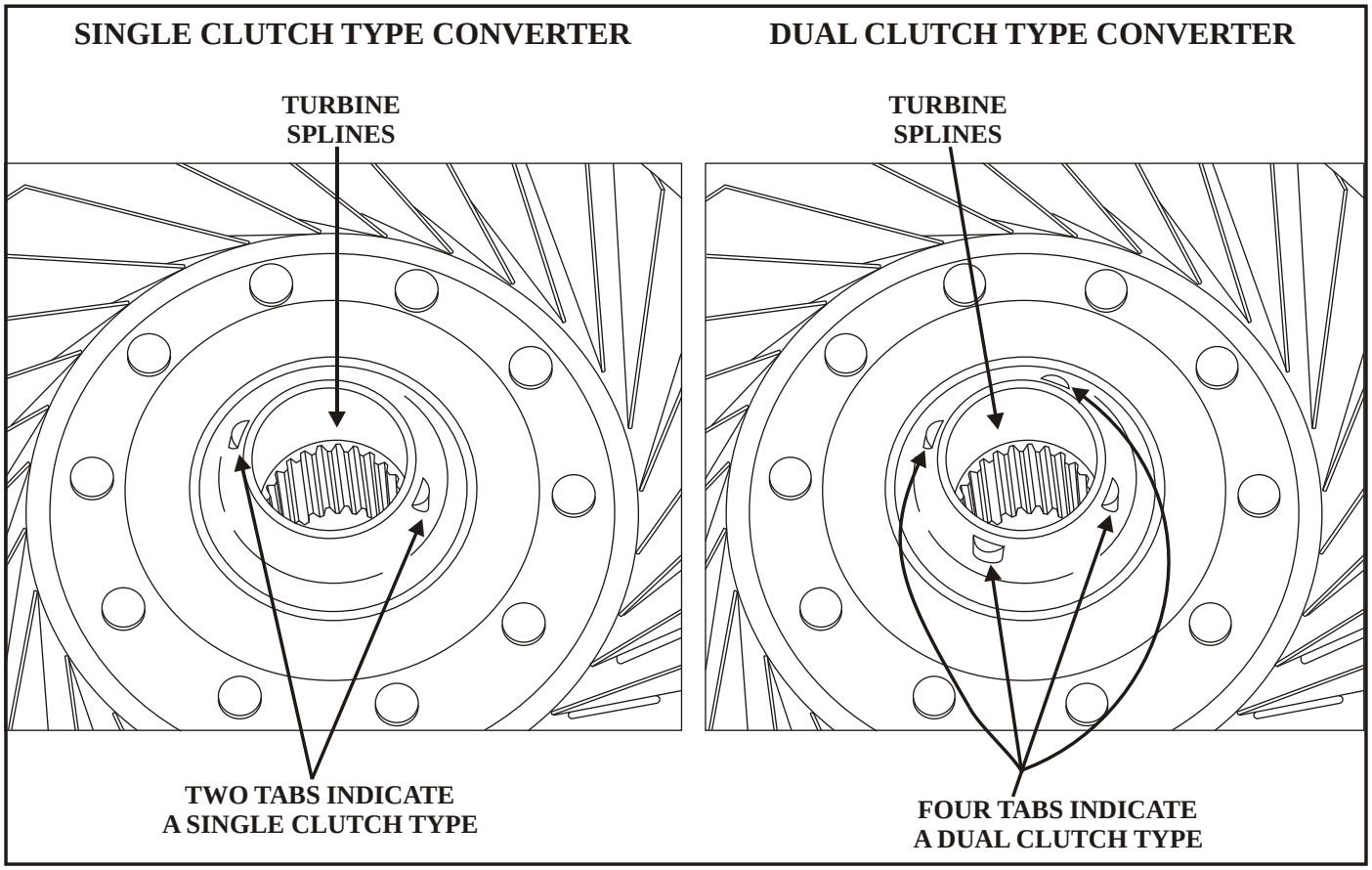


Figure 8

FORD E4OD/4R100

COLUMN MOUNTED MANUAL SHIFT LEVER SAFETY ALERT

COMPLAINT: The complaints will vary, if the vehicle is equipped with a gas or diesel engine, or if it is equipped with electronic throttle control, (drive by wire).
Symptoms are as follows:
· Early shifts
· Loss of power,(1995 and later, drive by wire)
· Poor acceleration, (1995 and later, drive by wire)
· 3-4 shift cycling
· Transmission Control Lamp cycling ON and OFF or inoperative
· Transmission Control Switch inoperative
· Rear Anti-Lock Brake System (RABS) inoperative, ABS warning lamp is illuminated
· Loss of instrumentation, (tach, fuel gauge, etc.)
· Unable to read Self-Test codes, (KOEO, KOER)
Further diagnosis reveals that the #17, (Refer to Figure 1), or #19, (later models) fuse, See Figure 2, in the under dash fuse box is blown.

SAFETYALERT: On vehicles equipped with drive by wire throttle control, the engine will have IDLE RPM ONLY, regardless of pedal movement and ABS operation will be inoperative on all so equipped vehicles.

CAUSE: The wiring for the overdrive cancel switch is incorrectly routed and can come in contact with a steering column cover mounting screw. The most common location for the short to occur is near the shift lever pivot point, the location of which is shown in the illustration in Figure 3.
The resulting short circuit causes the #17 or #19 fuse to blow creating the above listed symptoms and the subsequent safety hazards due to the fact that these fuses power the PCM, which in turn power the electronically controlled throttle system as well as the overdrive cancel switch.

CORRECTION: Remove the shift lever and provide an extra piece of shrink wrap to the problem area, or replace the shift lever with a newly designed lever which has a longer wire harness for the overdrive cancel switch which avoids contact with the steering column cover mounting screw.

SERVICE INFORMATION:

Manual Shift Lever.....F2TZ-7210-F

Ford Factory TSB.....92-22-5

A very special thanks to Ed Lee of Deltrans Transmissions, Newark, DE., who originally wrote this as a magazine article, and to Transmission Digest and Sonnax for the permission to reprint it in its current format.

Rostra

COLUMN MOUNTED MANUAL SHIFT LEVER SAFETY ALERT

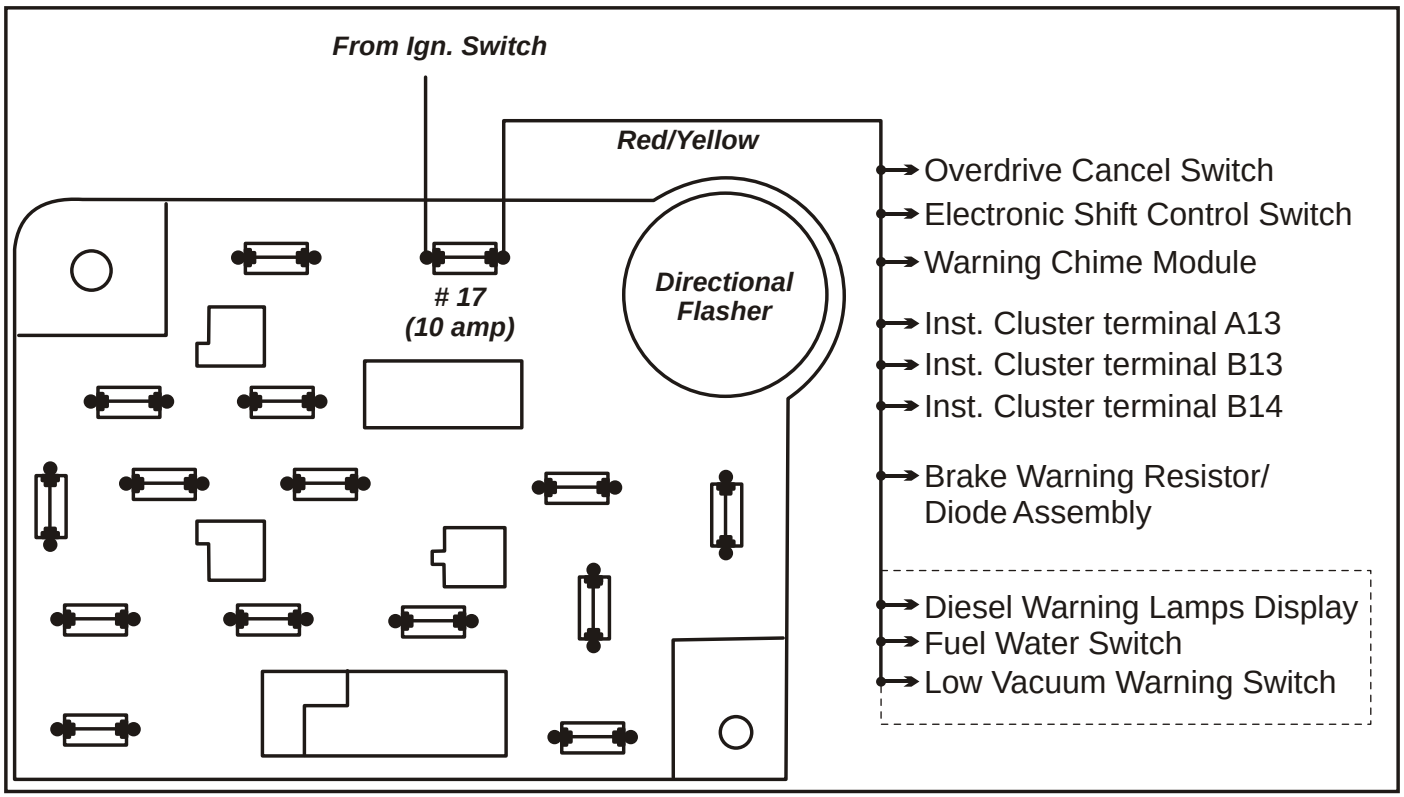


Figure 1

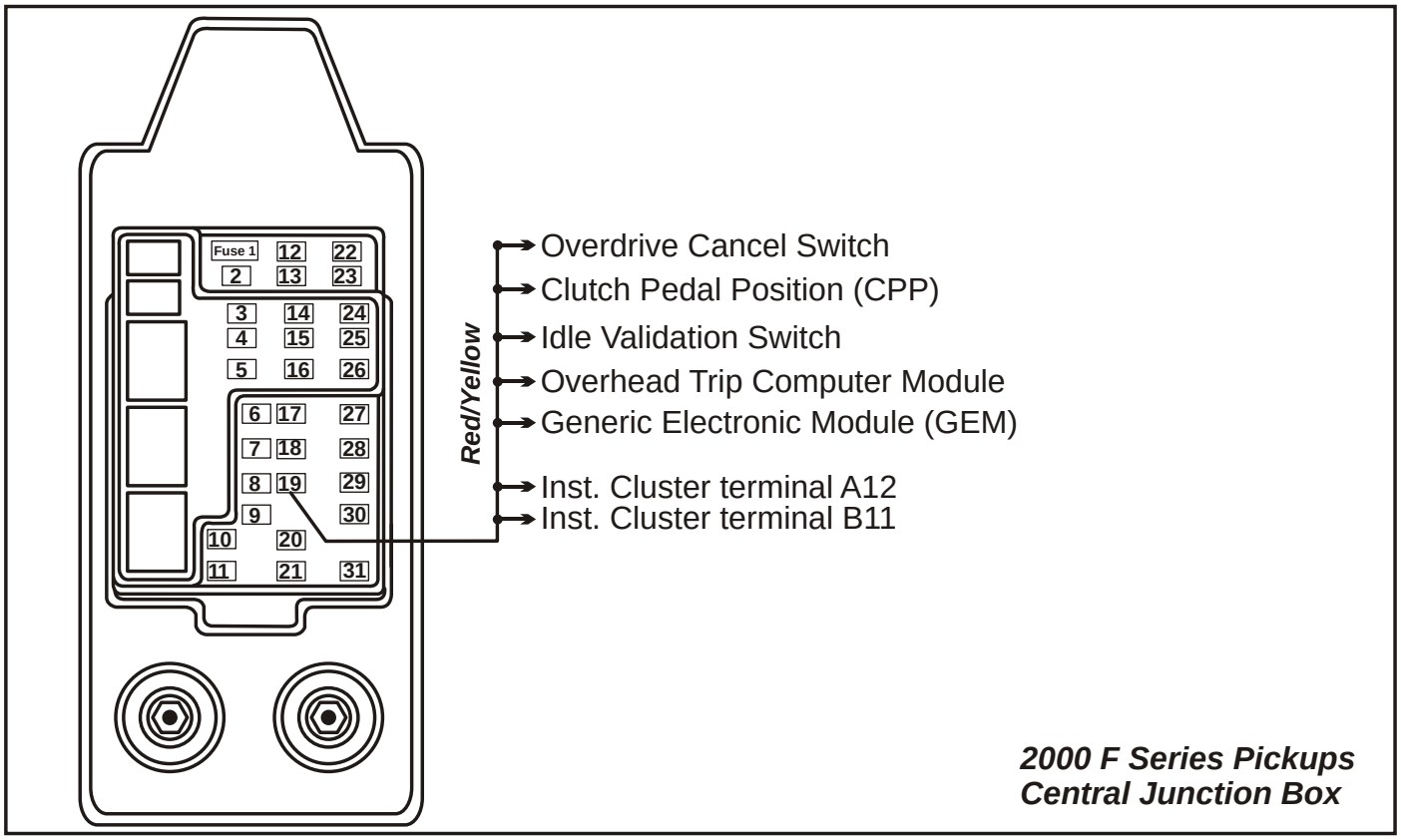


Figure 2

Transgo

TTK

COLUMN MOUNTED MANUAL SHIFT LEVER SAFETY ALERT

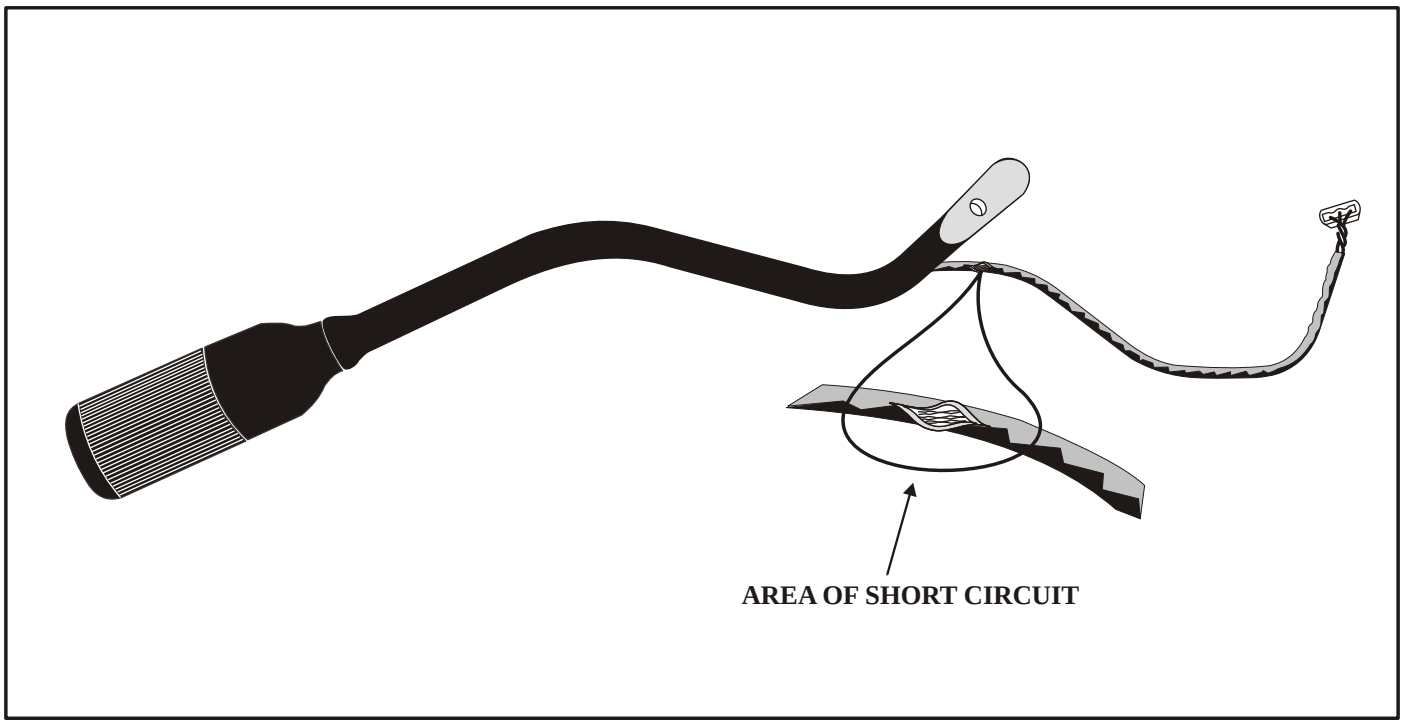


Figure 3

FORD 5R110W *("TorqShift")*
PRELIMINARY INFORMATION

FORD 5R110W *("TorqShift")*

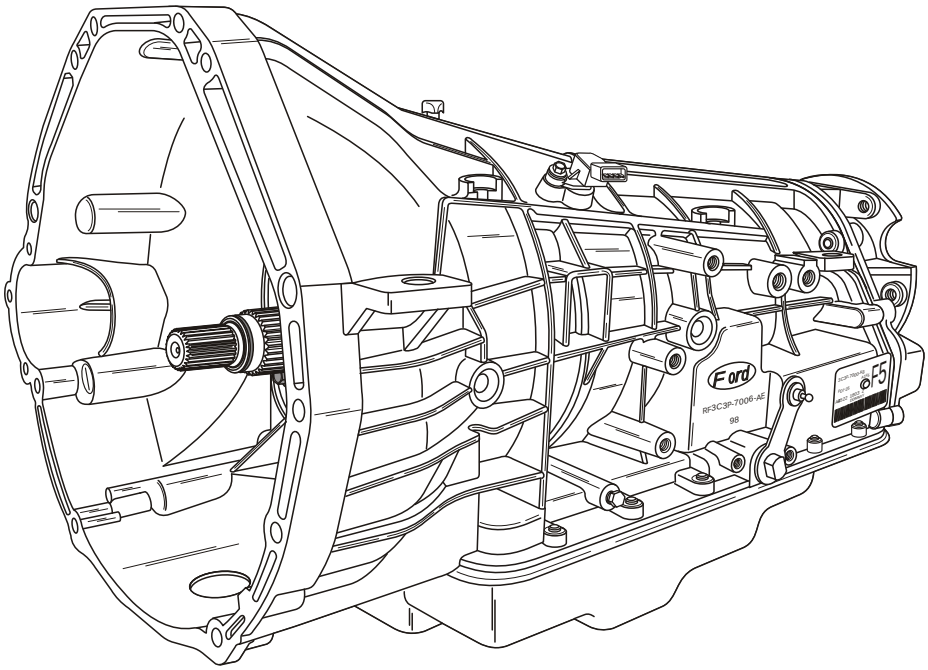


Figure 1

The new Ford 5R110W, referred to by Ford Motor Company as the "TorqShift" transmission, is a redesign of the 4R100 transmission with some previous strategy applied. This unit was introduced in model year 2003 in the F Series Trucks and the Excursion vehicles that are equipped with the new 6.0L diesel engine. The "TorqShift" (5R110W) is a 5 speed, rear wheel drive unit that actually has six forward speeds available, depending on hot or cold mode operation. The gear ratio for 1st gear was lowered from 2.71 to 3.09. For 2nd gear the overdrive clutch is applied to provide a ratio of 2.20. 3rd gear provides a ratio of 1.54, which is the same ratio as the previous second gear. All sound familiar? When in cold mode operation, below -15°C (5°F), determined by the TFT sensor, the overdrive clutch is engaged in 3rd gear to provide a ratio of 1.09 for 4th gear, and the transmission will shift directly into 6th gear (overdrive), which is a ratio of 0.71. In cold mode the transmission shifts 1st gear, 2nd gear, 3rd gear, 4th gear, 6th gear. When in hot mode the transmission will shift 1st gear, 2nd gear, 3rd gear, 5th gear (ratio 1.00), 6th gear. Either way it is still a five speed unit with six forward gear ratios available, depending on cold mode or hot mode of operation.

Continued on next Page

The component application chart for each gear is provided for you in Figure 5, and the identification tag location and description is provided in Figure 4. Notice also in the component application chart that there are two freewheel diodes, one for overdrive and one for first gear, These are actually built into the coast clutch pressure plate and the low/reverse clutch pressure plate. Hopefully Ford has found a way to make this type of freewheel device more durable. They have been on the road for 1 year now and so far, no calls.

ATSG's perception of the 2003 Super Duty vehicle that we test drove was, the shift performance has been greatly improved over the 4R100 transmission. There were no lags between the shifts and every shift was very positive. This was accomplished with a total redesign of the control valve body. There is a solenoid and a pressure switch dedicated to the function of each clutch pack, except the forward clutch, which is controlled by the manual valve. There are no other shuttle valves in the solenoid body. All shifts are controlled by five solenoids. Line pressure and the torque converter clutch each have their own dedicated solenoid. Four of the solenoids, TCC, OD Clutch, Intermediate Clutch and the Low/Reverse Clutch, are ***directly proportional*** which means the pressure output is directly proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 1 amp equals maximum pressure in the oil circuit. Three of the solenoids, Line Pressure, Coast Clutch and Direct Clutch, are ***inversely proportional*** which means the pressure output is inversely proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 0 amp equals maximum pressure in the oil circuit. Refer to Figure 6 for solenoid and switch locations in the solenoid body.

There has also been added to the instrument cluster, a transmission temperature gauge that we think is long over-due. There is also another new feature on this unit called the Tow/Haul Mode (See Figure 3). The Tow/Haul feature was designed to assist the driver when towing a trailer or a heavy load. All transmission gear ranges, including all five forward gears, are available when using the Tow/Haul feature. The Tow/Haul Switch is located on the end of the manual shift lever and is a momentary contact switch. The Tow/Haul Switch provides a signal to the PCM when pressed by the operator, resulting in a change in shift and TCC scheduling. When the Tow/Haul Switch has been turned on, the indicator lamp that is located at the end of the manual shift lever will illuminate "Tow/Haul - ON". When Tow/Haul is activated, upshifts will now occur at a higher vehicle speed, and when decelerating, the downshifts will also occur at a higher vehicle speed, providing some added engine braking. When the switch is pressed again, Tow/Haul will be canceled and the Transmission Control Indicator Lamp (TCIL) will turn off. The PCM controls the operation of the TCIL. The PCM may also flash the TCIL on and off, to alert the driver that a transmission operational error has occured, when certain faults in monitored sensors, solenoids or other transmission components are detected.

The new Ford 5R110W "TorqShift" transmission also uses a new transmission fluid called Mercon®SP, and ***is not interchangeable*** with Mercon® or Mercon®V. The use of any other transmission fluid than Mercon®SP, can result in the transmission failing to operate in a normal manner and/or transmission failure. Ford recommends the transmission fluid and bottom pan filter be changed every 48,000 km (30,000 miles) regardless of normal or special operating conditions.

This transmission is also equipped with a new remote transmission fluid filter, as shown in Figure 18. This filter passes ten percent of the transmission fluid from the transmission through a small orifice into a servicable screw-on filter element. The filtered fluid is then directed back into the rear lube circuit through the large opening in the remote filter manifold. The remote filter in the cooler lines should also be changed at all service intervals. Notice also in Figure 18 that this unit is equipped with an Oil-To-Air (OTA) in front of the radiator. Fords recommends replacing the OTA transmission fluid cooler as part of any overhaul or exchange. Do Not attempt to backflush and clean the OTA transmission fluid cooler.

Everything considered, this writer feels that Ford Motor Company is on to something with this new design 5R110W "TorqShift" transmission along with the very sophisticated electronics.

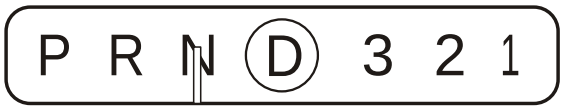
We have provided you with 26 pages of operational and preliminary diagnostic information to assist you in the diagnostic process, when one of these vehicles comes into your shop.

Continued on next Page

Refer to Figure 2 for transmission temperature gage location.
Refer to Figure 3 for Tow/Haul button Location.
Refer to Figure 4 for identification tag location and information.
Refer to Figure 5 for Internal Component Application Chart.
Refer to Figure 6 for internal electronic component locations and identification.
Refer to Figure 7 for illustration of the pressure switches.
Refer to Figure 8 for differences and identification of the seven solenoids.
Refer to Figure 9 for TSS/ISS sensor illustrations and connector information.
Refer to Figure 10 for OSS sensor illustrations and connector information.
Refer to Figure 11 for Transmission Range Sensor duty cycle and connector information.
Refer to Figure 12 for Transmission Fluid Temperature sensor information.
Refer to Figure 13 for transmission case connector pin identification and functions.
Refer to Figure 14 for PCM location, connector pin identification and functions.
Refer to Figure 15 for internal wiring schematic from transmission to PCM.
Refer to Figure 16 for internal electronic component resistance chart.
Refer to Figure 17 for transmission line pressure tests and procedures.
Refer to Figure 18 for remote transmission filter location and cooler information.
Refer to Figure 19 for description of abbreviations (Acronyms)
Refer to Figures 20 through 25 for Diagnostic Trouble Code (DTC) description.

GENERAL TRANSMISSION DESCRIPTION AND OPERATION

The Ford 5R110W "TorqShift" transmission has seven range positions that can be selected with the manual shift lever, P, R, N, (D), 3, 2, 1. Following is a description of each range.



P When the Park position is selected, there is no powerflow through the transmission. The parking pawl is engaged which locks the output shaft to the transmission case. The engine can be started and the ignition key can be removed.

R When the Reverse position is selected, the vehicle can be operated in a rearward direction at a reduced gear ratio.

N When the Neutral position is selected, there is no powerflow through the transmission. The output shaft is not held and is free to turn and the engine can be started. This position can also be selected while vehicle is moving, to restart the engine if that becomes necessary.

(D) The Overdrive position is the normal position for most forward gear operations. The Overdrive position provides automatic upshifts and downshifts, apply and release of the converter clutch, and maximum fuel economy during normal operation.

3 The 3rd Gear position provides third gear start and hold, for improved traction on slippery roads. This position can also be selected at any vehicle speed for improved engine braking. Transmission will not downshift if it will cause an engine overspeed condition.

2 The 2nd Gear position provides second gear start and hold, for improved traction on slippery roads. This position can also be selected at any vehicle speed for improved engine braking. If this position is selected at higher speeds, the transmission will downshift to the next lower gear, and will downshift into second gear after the vehicle decelerates to a vehicle speed that will not create an engine overspeed condition.

1 The Manual Low Gear position provides 1st gear operation only. This position can also be selected at any vehicle speed to provide improved engine braking for descending steep grades. If this position is selected at higher speeds, the transmission will downshift to the next lower gear, and will downshift into first gear after the vehicle decelerates to a vehicle speed that will not create an engine overspeed condition.

Transmission Temperature Gage

There has also been added to the instrument cluster, a transmission temperature gauge that we think is long over-due, and should be on all vehicles.

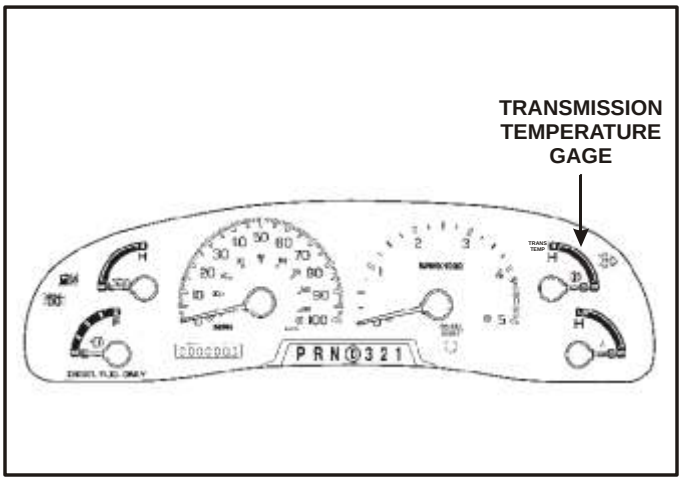


Figure 2

Tow/Haul Feature

The Tow/Haul feature was designed to assist the driver when towing a trailer or a heavy load. All transmission gear ranges, including all five forward gears, are available when using the Tow/Haul feature. The Tow/Haul Switch is located on the end of the manual shift lever, (See Figure 3) and is a momentary contact switch. The Tow/Haul Switch provides a signal to the PCM when pressed by the operator, resulting in a change in shift and TCC scheduling. When the Tow/Haul Switch has been turned on, the indicator lamp that is located at the end of the manual shift lever will illuminate "Tow/Haul - ON". When Tow/Haul is activated, upshifts will now occur at a higher vehicle speed, and when decelerating, the downshifts will also occur at a higher vehicle speed, providing some added engine braking. When the switch is pressed again, Tow/Haul will be cancelled and the Transmission Control Indicator Lamp (TCIL) will turn off. The PCM controls the operation of the TCIL. The PCM may also flash the TCIL on and off, to alert the driver that a transmission operational error has occured, when certain faults in monitored sensors, solenoids or other transmission components are detected.

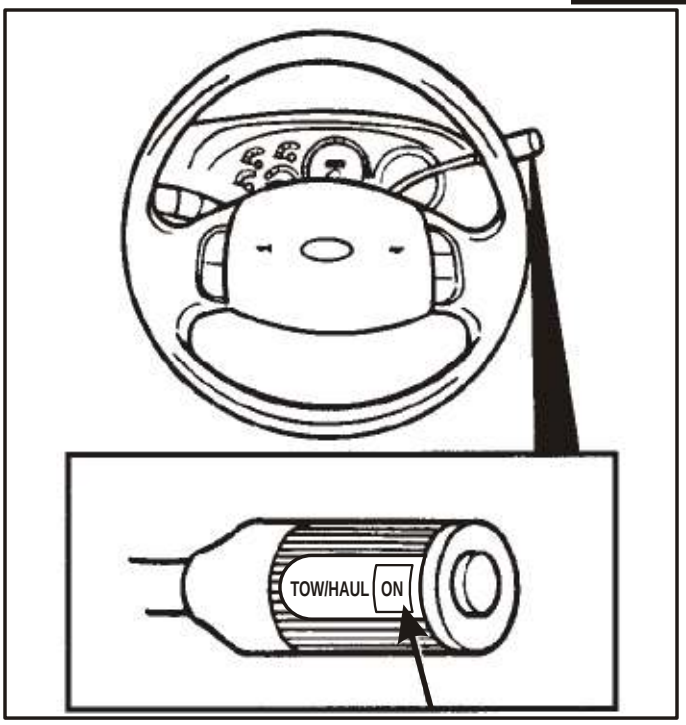


Figure 3

Battery Disconnect, Dead Battery

Any time the battery is disconnected for ***any*** reason, a new PCM has been installed, or the calibration has been reflashed, the adaptive strategy for the "Engagement Schedule" ***must*** be updated.

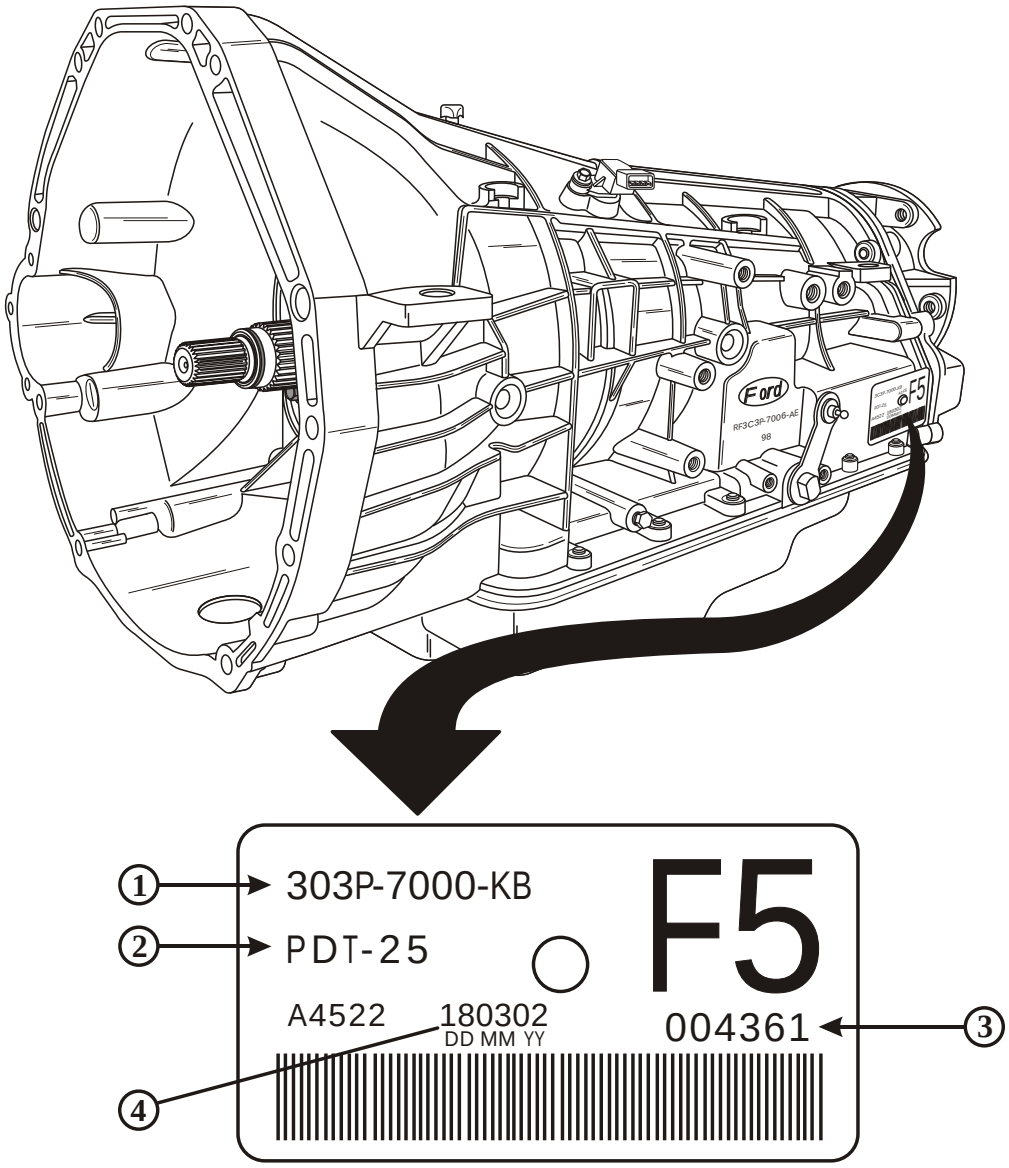
This procedure will prevent the customer from returning with firm or harsh engagement complaints.

Procedure is as follows:

Note: All of the following engagements ***must*** be performed, in order for engagement pressures to correctly adapt with the new calibration.

1. Install diagnostic equipment and monitor TFT.
2. Warm the transmission fluid to 54°C (130°F) as indicated by the TFT.
3. Perform 5 engagements from ***Park to Reverse.*** Each engagement must be five seconds apart.
4. Perform 5 engagements from ***Drive to Reverse.*** Each engagement must be five seconds apart.
5. Perform 5 engagements from ***Reverse to Drive.*** Each engagement must be five seconds apart.
6. Perform 5 engagements from ***Neutral to Drive.*** Each engagement must be five seconds apart.

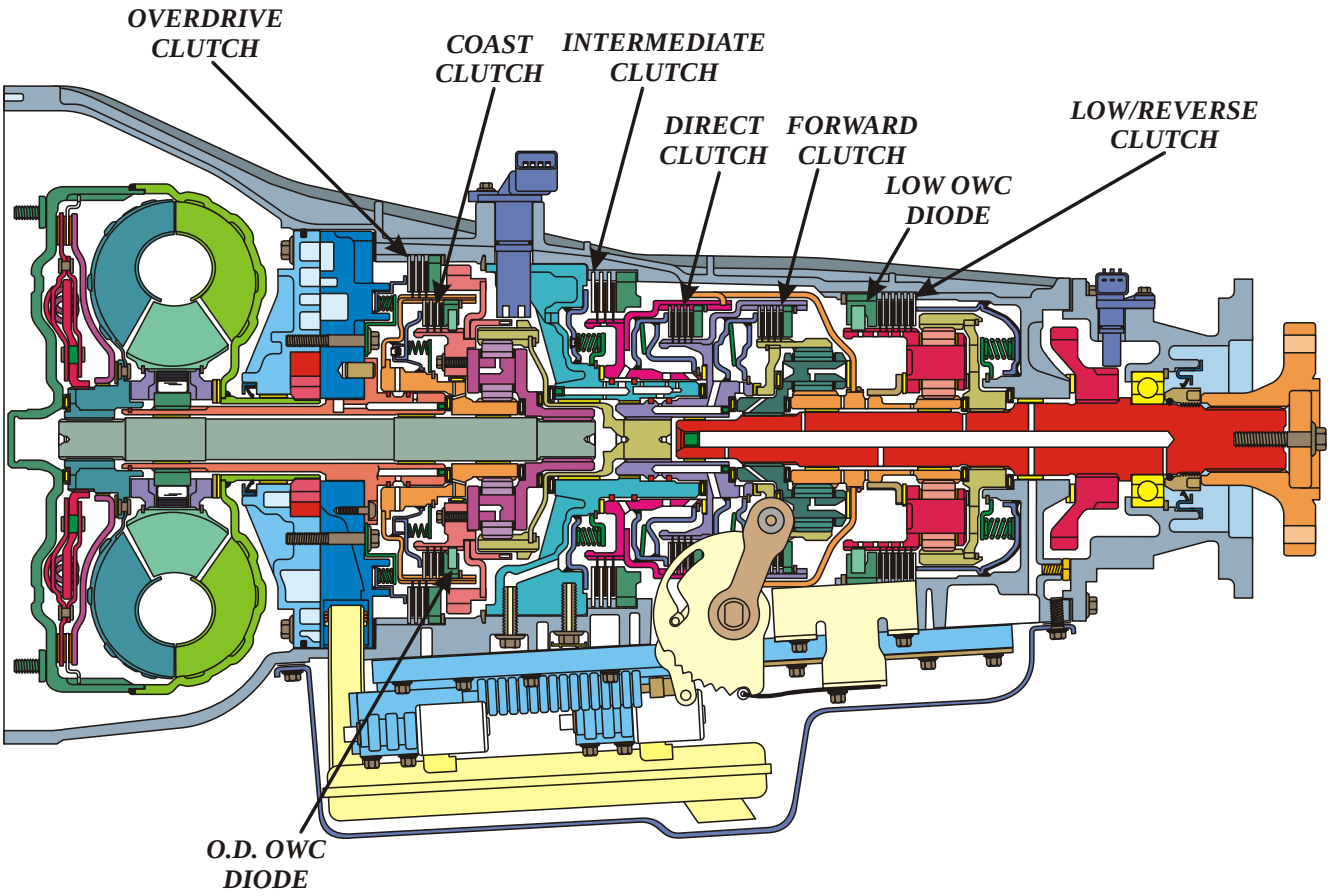
IDENTIFICATION TAG LOCATION AND DESCRIPTION



1	***Assembly Part Number, Prefix And Suffix***
2	***Transmission Model***
3	***Serial Number***
4	***Build Date: DD = Day, MM = Month, YY = Year***

Figure 4

COMPONENT APPLICATION CHART



COMPONENT APPLICATION CHART *WITH TOW/HAUL "OFF"*

Range/Gear	*Fwd. Clutch*	*Int. Clutch*	*Direct Clutch*	*O.D. Clutch*	*Coast Clutch*	*Lo/Rev Clutch*	*O.D. Diode*	*Low Diode*	*Gear Ratio*	*Eng Brake*
Park/Neut						*ON (a) (c)*				
Reverse			*ON (d)*		*ON*	*ON (a)*			*2.88*	
O.D.- 1st	*ON*					*ON (a) (c)*	*HOLD*	*HOLD*	*3.09*	
O.D.- 2nd	*ON*			*ON*			*O/R*	*HOLD*	*2.20*	
O.D.- 3rd	*ON*	*ON*					*HOLD*	*O/R*	*1.54*	
O.D.- 4th (b)	*ON*	*ON*		*ON*			*O/R*	*O/R*	*1.09*	
O.D.- 5th	*ON*		*ON*				*HOLD*	*O/R*	*1.00*	
O.D.- 6th	*ON*		*ON*	*ON*			*O/R*	*O/R*	*0.71*	
Man- 3rd	*ON*	*ON*			*ON*		*HOLD*	*O/R*	*1.54*	*YES*
Man- 2nd	*ON*			*ON*		*ON (a)*	*O/R*	*HOLD*	*2.20*	*YES*
Man- 1st	*ON*				*ON*	*ON (a)*	*HOLD*	*HOLD*	*3.09*	*YES*

(a) PCM Calibration Controlled
(b) Cold Strategy
(c) 30 psi Until 5 kmh (3 mph)
(d) Clutch Applied Through Manual Valve Position

Figure 5

INTERNAL ELECTRONIC COMPONENT LOCATIONS AND IDENTIFICATION

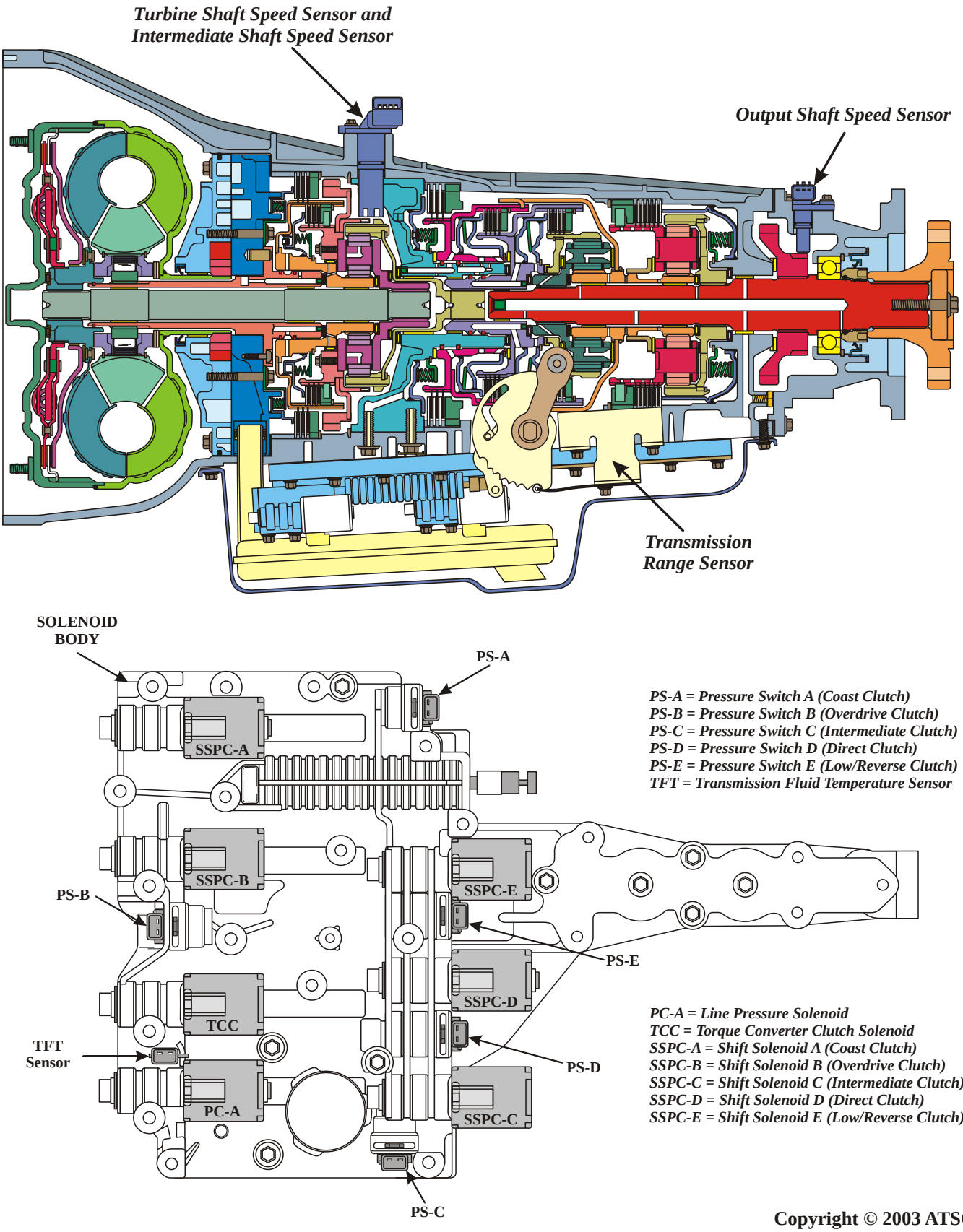


Figure 6

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION

The following provides a brief description of each of the sensors and actuators used by the PCM for proper transmission operation

Powertrain Control Module (PCM)

The operation of the transmission is controlled by the Powertrain Control Module (PCM). Many input sensors provide information to the PCM. The PCM then uses this information to control actuators which determine transmission operation. Refer to Figure 14 for PCM location and connector terminal information and identification.

Engine Coolant Temperature (ECT) Sensor

The engine coolant temperature (ECT) sensor is a thermistor in which resistance changes when the temperature changes. The resistance of the sensor increases as engine temperature decreases and the voltage sent to the PCM increases. The PCM uses this information to help determine TCC operation.

Intake Air Temperature (IAT) Sensor

The intake air temparature (IAT) sensor is a thermistor in which the resistance changes with temperature. The resistance decreases as the intake air temperature increases. The IAT provides air temperature information to the PCM, which is used to help determine transmission line pressure and shift scheduling.

Accelerator Pedal Position (APP) Sensor

The accelerator pedal position (APP) sensor is mounted on the accelerator pedal on 6.0L diesel applications. The APP sensor detects the position of the accelerator pedal and inputs this information, as a voltage to the PCM. The PCM uses APP sensor information to help in determining line pressure, shift scheduling and TCC operation.

Failure of the APP sensor will cause transmission to operate at a higher than normal line pressure to help avoid damage to the transmission. This will result in harsh upshifts and harsh engagements.

Brake Pedal Position (BPP) Switch

The brake pedal position (BPP) switch supplies battery voltage to the PCM, that the brake pedal is applied. The PCM uses this information to release the torque converter clutch, speed control, and auxiliary idle (if equipped).

Tow/Haul Switch

The Tow/Haul Switch is located on the end of the manual shift lever and is a momentary contact switch. The Tow/Haul Switch provides a signal to the PCM when pressed by the operator, resulting in a change in shift and TCC scheduling. When the Tow/Haul Switch has been pressed, the indicator lamp that is located at the end of the manual shift lever will illuminate "Tow/Haul - ON". When the switch is pressed again, Tow/Haul will be cancelled and the TCIL will turn off (See Figure 3).

Transmission Control Indicator Lamp (TCIL)

The TCIL is used along with the Tow/Haul Switch. The TCIL is located near the end of the manual shift lever and will illuminate "Tow/Haul - ON" when the Tow/Haul switch has been pressed. The PCM controls the operation of the TCIL. The PCM may also flash the TCIL on and off, to alert the driver that a transmission operational error has occured, when certain faults in monitored sensors, solenoids or other transmission components are detected (See Figure 3).

4 X 4 Low Switch

The 4X4 Low Switch, located on the dash on the right hand side of the driver, sends a ground signal to the instrument cluster when the vehicle is in 4X4 Low. The PCM then recieves 4X4 Low status from the instrument cluster and adjusts the transmission shift schedule accordingly. Four wheel "High" can be selected while moving at any speed up to 55 MPH.

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Transmission Solenoid Body Assembly

The Solenoid Body Assembly is bolted to the transmission case inside the bottom pan and looks similar to what we have previously referred to as a valve body. The Solenoid Body Assembly contains the following:

- ***Seven Variable Force Solenoids***
- ***Five Normally Closed Pressure Switches***
- ***Transmission Fluid Temperature Sensor***
- ***Manual Shift Valve***
- ***Over-Pressurization Relief Ball***

There is a solenoid and a pressure switch dedicated to the function of each clutch pack, except the forward clutch, as it is controlled by the manual valve. There are no other valves in the solenoid body except for the pressure relief ball and spring. All shifts are controlled by five solenoids. Line pressure and the torque converter clutch each have their own solenoid. Four of the solenoids, TCC, OD Clutch, Intermediate Clutch and the Low/Reverse Clutch, are ***directly proportional*** which means the pressure output is directly proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 1 amp equals maximum pressure in the oil circuit. Three of the solenoids, Line Pressure, Coast Clutch and Direct Clutch, are ***inversely proportional*** which means the pressure output is inversely proportional to the applied DC amps. The current is varied between 0 and 1 amp from the PCM, and 0 amp equals maximum pressure in the oil circuit.

The different design solenoids are keyed differently to prevent mis-assembly in the solenoid body and all are retained with a large "E" clip. The "Natural" colored wire connectors connect to the solenoids. The "Black" colored connectors connect to the pressure switches. There are separate connectors for the TFT sensor and for the TR-P sensor. All of the solenoids except the line pressure solenoid can be serviced without removing the solenoid body from the case. Refer to Figure 6 for location and identification of the solenoids and switches on the solenoid body. Refer to Figure 8 for the differences and how to identify between the direct and inversely proportional solenoids.

Line Pressure Control Solenoid (PC-A)

The Line Pressure Control Solenoid (PC-A) is an ***inversely proportional*** three port solenoid. The pressure output is inversely proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 0 amp equals maximum pressure in the oil circuit. The PC-A Solenoid controls the line pressure oil circuits (See Figure 8)

Torque Converter Clutch (TCC) Solenoid

The Torque Converter Clutch (TCC) Solenoid is a ***directly proportional*** three port solenoid. The pressure output is directly proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 1 amp equals maximum pressure in the oil circuit. The TCC Solenoid controls the apply and release rates of the converter clutch (See Figure 8).

Shift Solenoid Pressure Control Solenoids (SSPC-B, SSPC-C, SSPC-E)

The overdrive (SSPC-B), intermediate (SSPC-C), and low/reverse (SSPC-E) clutches are each controlled by a ***directly proportional*** three port solenoid. The pressure output is directly proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 1 amp equals maximum pressure in the particular clutch oil circuit. The Shift Solenoid controls the apply and release rates of the particular clutch pack (See Figure 8).

Shift Solenoid Pressure Control Solenoids (SSPC-A, SSPC-D)

The coast (SSPC-A), and low/reverse (SSPC-E) clutch packs are each controlled by an ***inversely proportional*** three port solenoid. The pressure output is inversely proportional to the applied DC current supplied through an electronically controlled driver. The current is varied between 0 amp and 1 amp from the PCM, and 0 amp equals maximum pressure in the particular clutch oil circuit. The Shift Solenoid controls the apply and release rates of the particular clutch pack. Refer to Figure 8.

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Pressure Switches
(PS-A, PS-B, PS-C, PS-D, PS-E)

Each of the five shift pressure control solenoids has a corresponding pressure switch, which is normally closed. The pressure switch is designed to open when shift solenoid control pressure exceeds 40 psi. All five of the pressure switches are identical and will interchange in the solenoid body, as shown in Figure 7. Their particular functions are as follows:

PS-A = Coast Clutch
PS-B = Overdrive Clutch
PS-C = Intermediate Clutch
PS-D = Direct Clutch
PS-E = Low/Reverse Clutch

Refer to Figure 6 for their particular locations in the solenoid body.

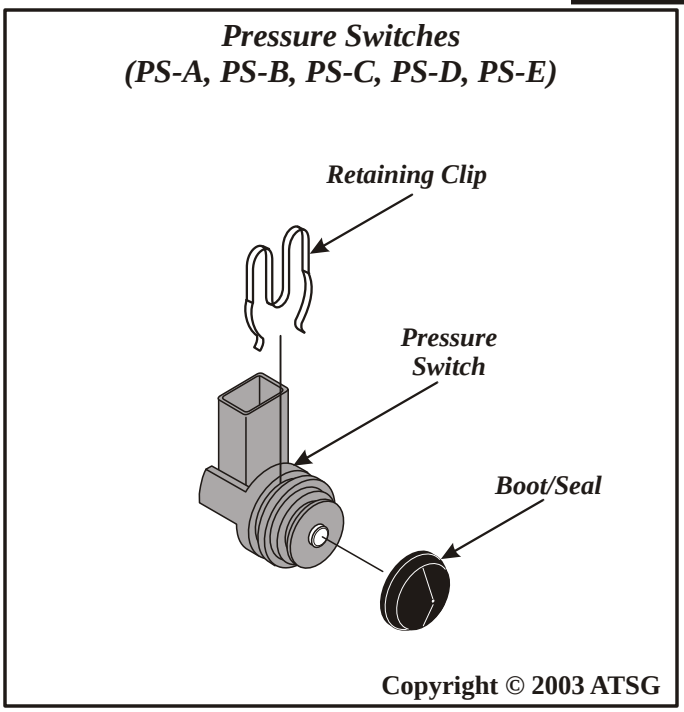


Figure 7

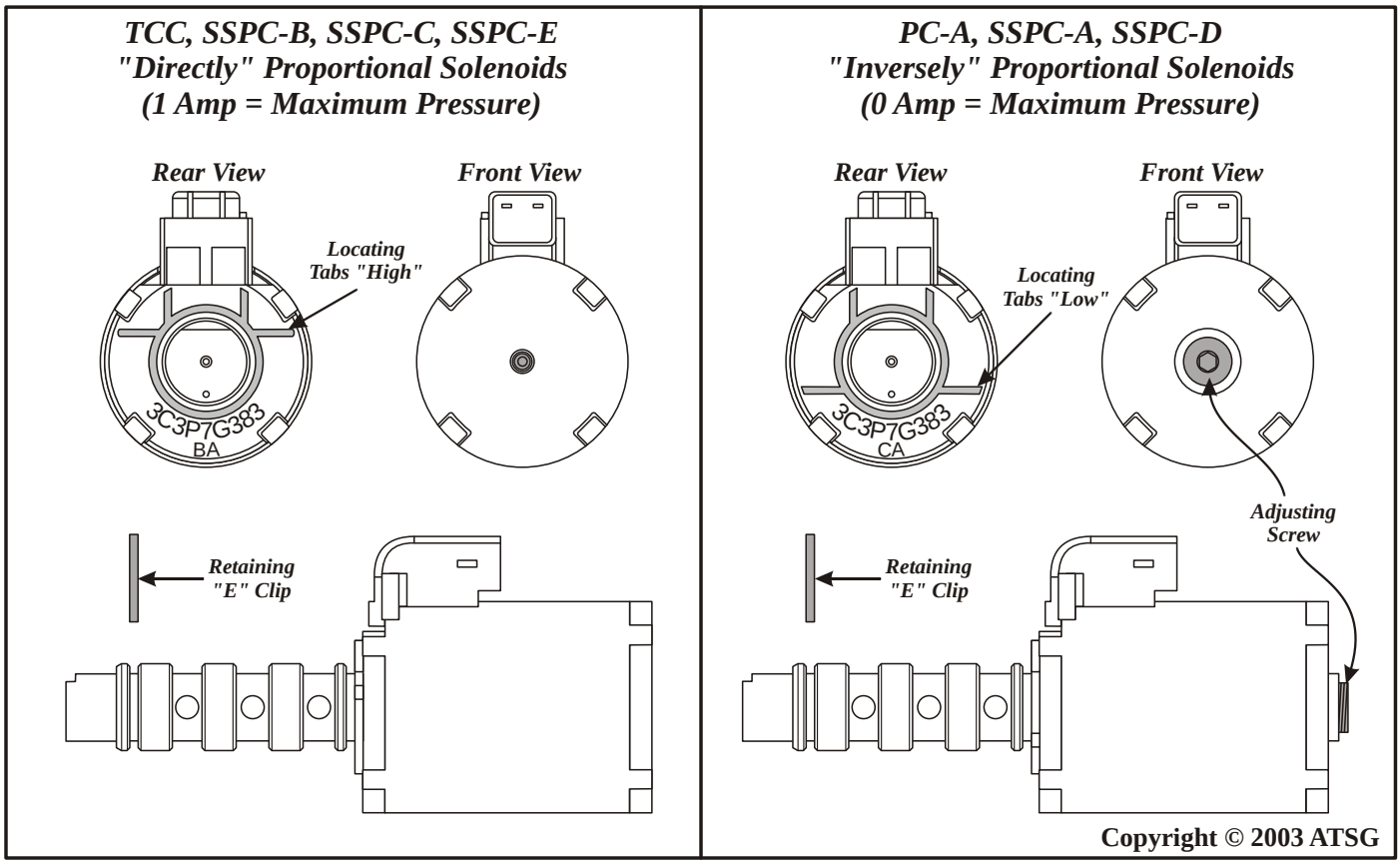


Figure 8

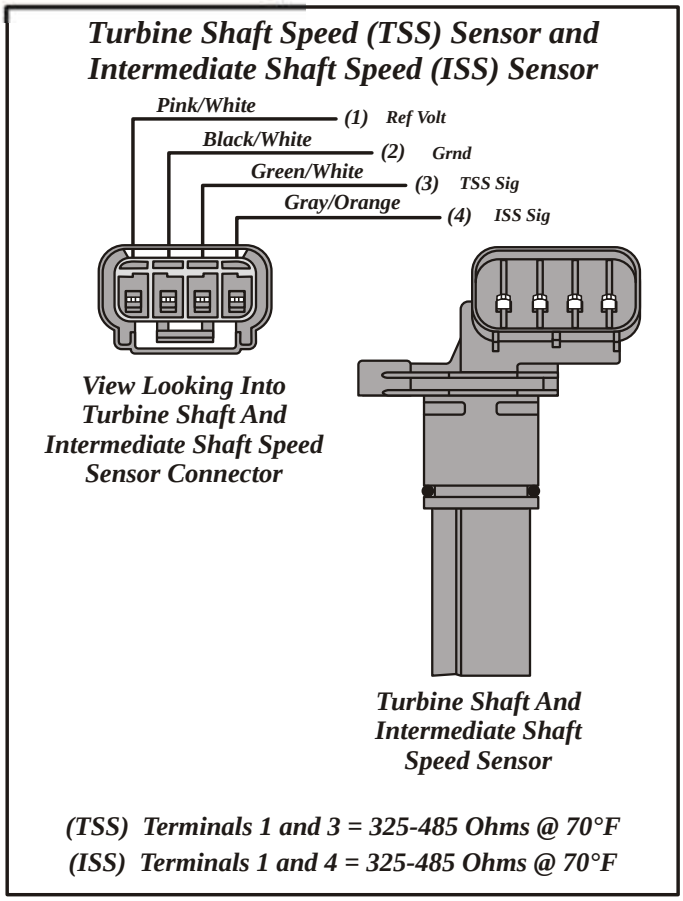


Figure 9

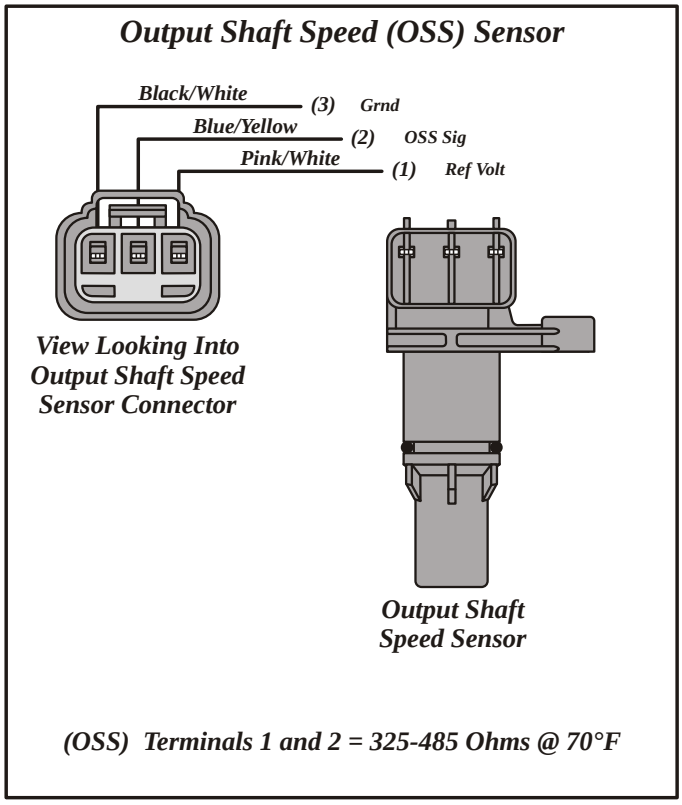


Figure 10

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Turbine Shaft Speed (TSS) Sensor and Intermediate Shaft Speed (ISS) Sensor

The turbine shaft speed (TSS) and intermediate shaft speed (ISS) sensors are hall effect sensors requiring a 12-volt power supply and a ground. In this unit both sensors are incorporated into one housing. The other two terminals at the sensor are for TSS and ISS signals to the PCM. The sensor detects teeth on the coast clutch input hub for TSS signal, and the adjacent overdrive ring gear teeth for the ISS signal. Both sensors read 30 teeth per revolution. The TSS/ISS sensors are mounted externally on the transmission case (See Figure 6). The TSS/ISS sensors input to the PCM is digital and used to determine line pressure, shift timing and TCC operation. Refer to Figure 9 for TSS/ISS sensor illustrations and connector information.

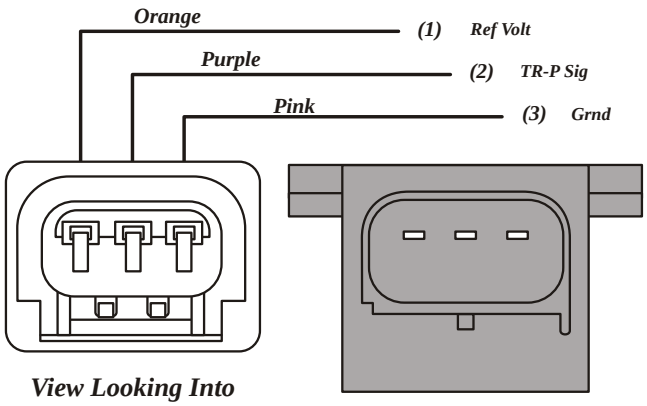
Output Shaft Speed (OSS) Sensor

The transmission output shaft speed (OSS) sensor is located on the extension housing (See Figure 6). The OSS is a hall effect type sensor. The OSS reads a set of gear teeth on the park gear, that are different than the teeth used for the park function. The OSS signal to the PCM is used for vehicle speed signal, shift scheduling and TCC operation. The OSS has bi-directional capability and uses a digital output. Refer to Figure 10 for OSS sensor illustrations and connector information.

Cold Mode/Hot Mode Operation

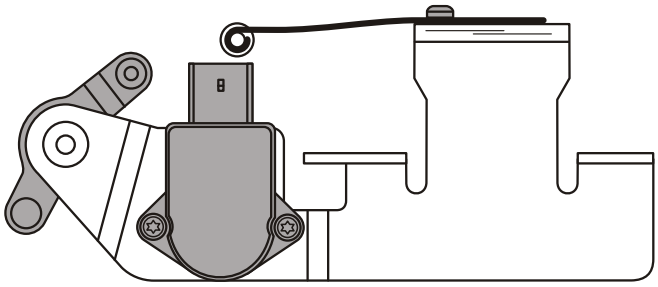
When the transmission is in cold mode operation, below -15°C (5°F), ***determined by the TFT sensor,*** the transmission shifts 1st gear, 2nd gear, 3rd gear, 4th gear (ratio 1.09), 6th gear. When in hot mode the transmission will shift 1st gear, 2nd gear, 3rd gear, 5th gear (ratio 1.00), 6th gear. Either way it is still a five speed unit with six forward gear ratios available, depending on cold mode or hot mode of operation.

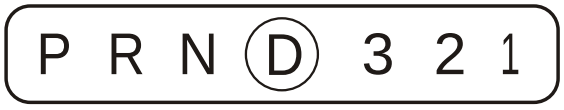
Transmission Range Sensor Assembly



View Looking Into Transmission Range Sensor Connector

View Looking Into Transmission Range Sensor Assembly





TR-P Duty Cycle Chart		
Position	*Min % Duty Cycle*	*Max % Duty Cycle*
P	*7.13*	*22.93*
R	*22.94*	*36.64*
N	*36.65*	*48.55*
D	*48.56*	*58.82*
3	*58.83*	*68.08*
2	*68.09*	*77.96*
1	*77.97*	*90.34*

Figure 11

ELECTRICAL COMPONENT DESCRIPTION AND OPERATION (Cont'd)

Transmission Range (TR-P) Sensor Assembly

The transmission range (TR-P) sensor assembly, shown in Figure 11, is an internally mounted sensor that includes the detent spring, rooster comb lever and bracket, located next to the solenoid body and bolted to the transmission case. The transmission range sensor is non-adjustable and is not serviced independently. The TR-P sensor contains electronic circuitry that provides the PCM a fixed frequency, at a duty cycle, for each of the seven positions of the manual shift lever. Refer to Figure 11 for the duty cycle specifications for the various positions. The PCM uses the TR-P sensor signal for starting in Park and Neutral only, reverse lamp operation, and for line pressure control, shift scheduling and TCC operation.

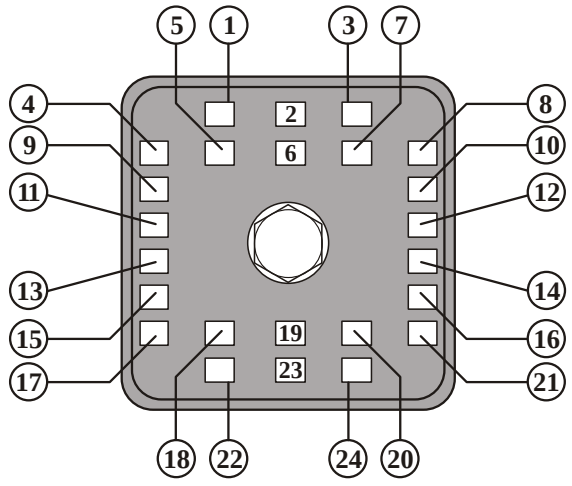
Transmission Fluid Temperature (TFT) Sensor

The transmission fluid temperature (TFT) sensor twist-locks into the solenoid body and is a temperature sensitive device called a thermistor. As the fluid temperature increases, the TFT resistance decreases, as shown in the chart in Figure 12. The PCM uses the TFT signal as an input to determine ***cold and hot temperature shift scheduling*** and for TCC apply and release scheduling.

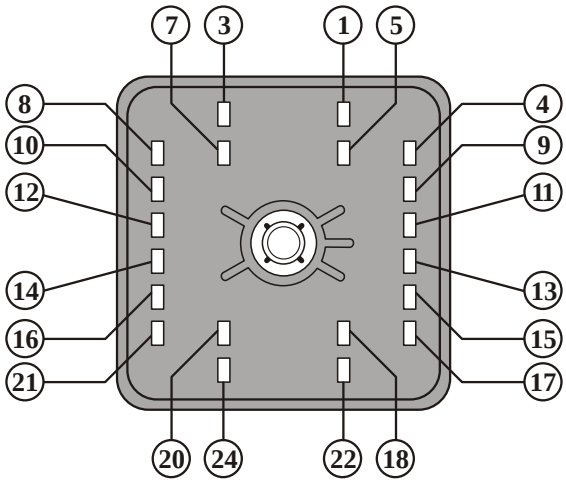
Transmission Fluid Temperature (TOT)		
Degrees C	*Degrees F*	*Resistance (Ohms)*
-40 to -20	*-40 to -4*	*967k to 284k*
-19 to -2	*-3 to 31*	*284k to 100k*
0 to 20	*32 to 68*	*100k to 37k*
21 to 40	*69 to 104*	*37k to 16k*
41 to 70	*105 to 158*	*16k to 5k*
71 to 90	*159 to 194*	*5k to 2.7k*
91 to110	*195 to 230*	*2.7k to 1.5k*
111 to130	*231 to 266*	*1.5k to 0.8k*
131 to150	*267 to 302*	*0.8k to 0.54k*

Figure 12

5R110W TRANSMISSION CASE CONNECTOR PIN FUNCTIONS	
Pin Number	***Description***
1	***Ground signal to Shift Solenoid Pressure Control "E" (SSPC-E)***
3	***Ground signal to Shift Solenoid Pressure Control "B" (SSPC-B)***
4	***Ground signal to Shift Solenoid Pressure Control "D" (SSPC-D)***
5	***Ground signal to Shift Solenoid Pressure Control "C" (SSPC-C)***
7	***VPWR to Pressure Control (PC-A) Solenoid and TCC Solenoid***
8	***Ground signal to Torque Converter Clutch (TCC) Solenoid***
9	***Pressure Switch "C" (PS-C), Intermediate Clutch Signal to PCM***
10	***Ground signal to Pressure Control (PC-A) Solenoid (Line Pressure)***
11	***Pressure Switch "D" (PS-D), Direct Clutch Signal to PCM***
12	***Ground signal to Shift Solenoid Pressure Control "A" (SSPC-A)***
13	***Pressure Switch "E" (PS-E), Low/Reverse Clutch Signal to PCM***
14	***Pressure Switch "A" (PS-A), Coast Clutch Signal to PCM***
15	***Transmission Range - Park (TR-P) Sensor, Signal to PCM***
16	***Pressure Switch "B" (PS-B), Overdrive Clutch Signal to PCM***
17	***Transmission Range - Park (TR-P) Sensor, Ground***
18	***Transmission Fluid Temperature (TFT) Sensor signal to PCM***
20	***VPWR to SSPC-A and SSPC-B Solenoids***
21	***VPWR to Transmission Range - Park (TR-P) Sensor Only***
22	***Pressure Switches and TFT sensor ground***
24	***VPWR to SSPC-C, SSPC-D and SSPC-E Solenoids***
Special Note: Pin Numbers 2, 6, 19, and 23 are not used.	



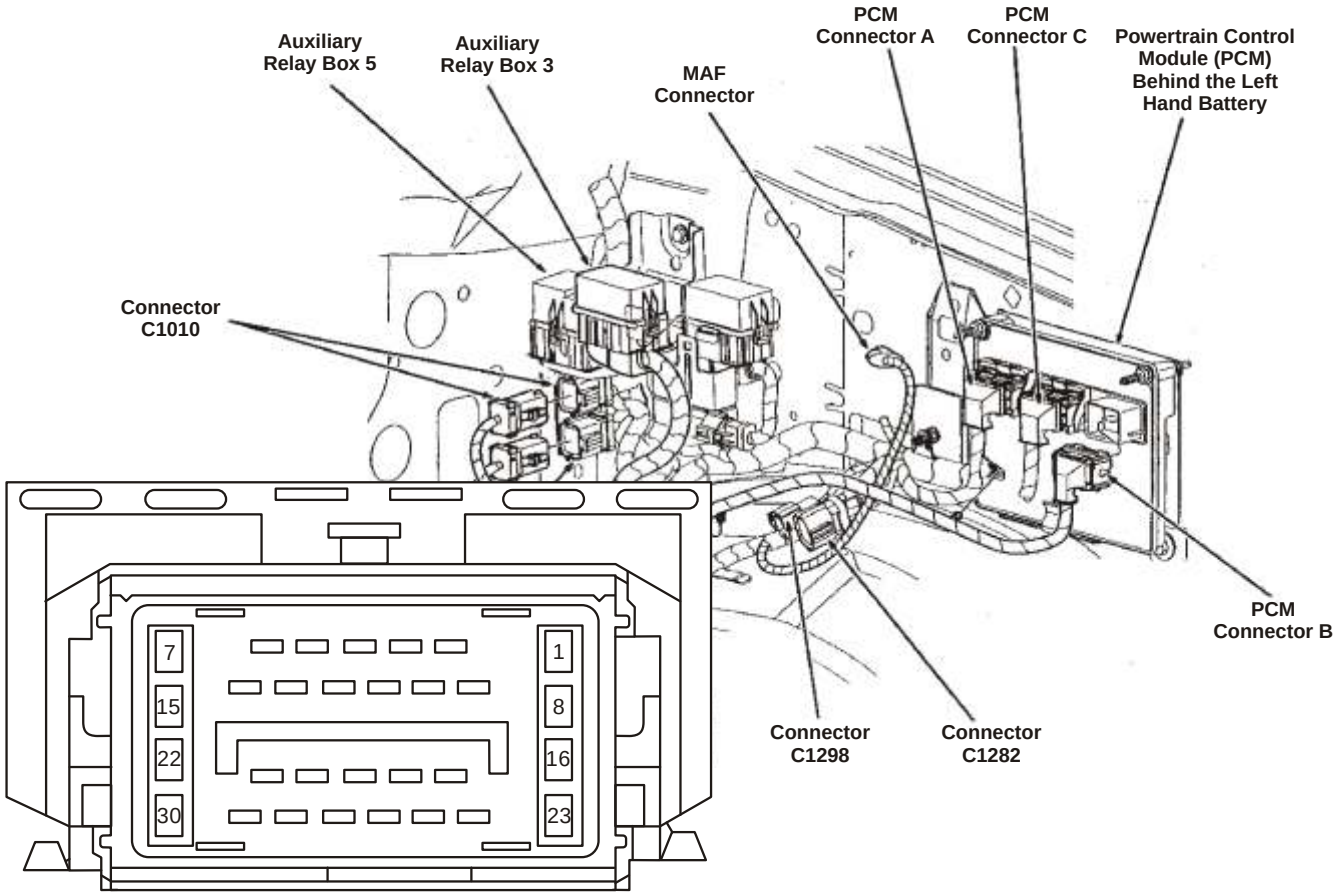
View Looking Into Wire Side Of Vehicle Harness Connector



View Looking Into Face Side Of Vehicle Harness Connector

Figure 13

5R110W PCM CONNECTOR "B" PIN IDENTIFICATION AND FUNCTIONS AND PCM LOCATION



View Looking Into Face Side Of Vehicle PCM Connector "B"

Pin	Wire Color	Circuit Function	Pin	Wire Color	Circuit Function
1	Pink/White	12V Reference Voltage, Speed Sensors and TRP	16		"Not Used"
2	Violet/Yellow	PC-A Pressure Control Solenoid Ground	17	White/Yellow	PS-A Pressure Switch "A" Signal
3	Yellow/Lt Green	Reverse Lamp Relay, Control	18	Dk Blue/Pink	PS-B Pressure Switch "B" Signal
4	Red/White	Transfer Case Neutral Signal	19	Lt Blue/Red	PS-C Pressure Switch "C" Signal
5	White/Lt Green	TCIL, Control (Tow/Haul)	20	White/Red	PS-D Pressure Switch "D" Signal
6		"Not Used"	21	Pink/Lt Blue	PS-E Pressure Switch "E" Signal
7	Yellow/White	12V Power to Solenoids	22	Black/White	Both Speed Sensors and TR-P Ground
8		"Not Used"	23		"Not Used"
9	Orange/Yellow	SSPC-A Shift Solenoid Pressure Control A Ground	24		"Not Used"
10	Violet/Orange	SSPC-B Shift Solenoid Pressure Control B Ground	25	Lt Blue/Yellow	TR-P Transmission Range Sensor Signal
11	Pink/Black	SSPC-C Shift Solenoid Pressure Control C Ground	26	Orange/Black	TFT Transmission Fluid Temp Sensor Signal
12	Black/Lt Green	SSPC-D Shift Solenoid Pressure Control D Ground	27	Gray/Orange	ISS Intermediate Shaft Speed Sensor Signal
13	Dk Blue/White	SSPC-E Shift Solenoid Pressure Control E Ground	28	Dk Blue/Yellow	OSS Output Shaft Speed Sensor Signal
14	Brown/Orange	TCC Torque Converter Clutch Solenoid Ground	29	Green/White	TSS Turbine Shaft Speed Sensor Signal
15		"Not Used"	30	Orange/White	Pressure Switch And TFT Sensor Ground

Figure 14

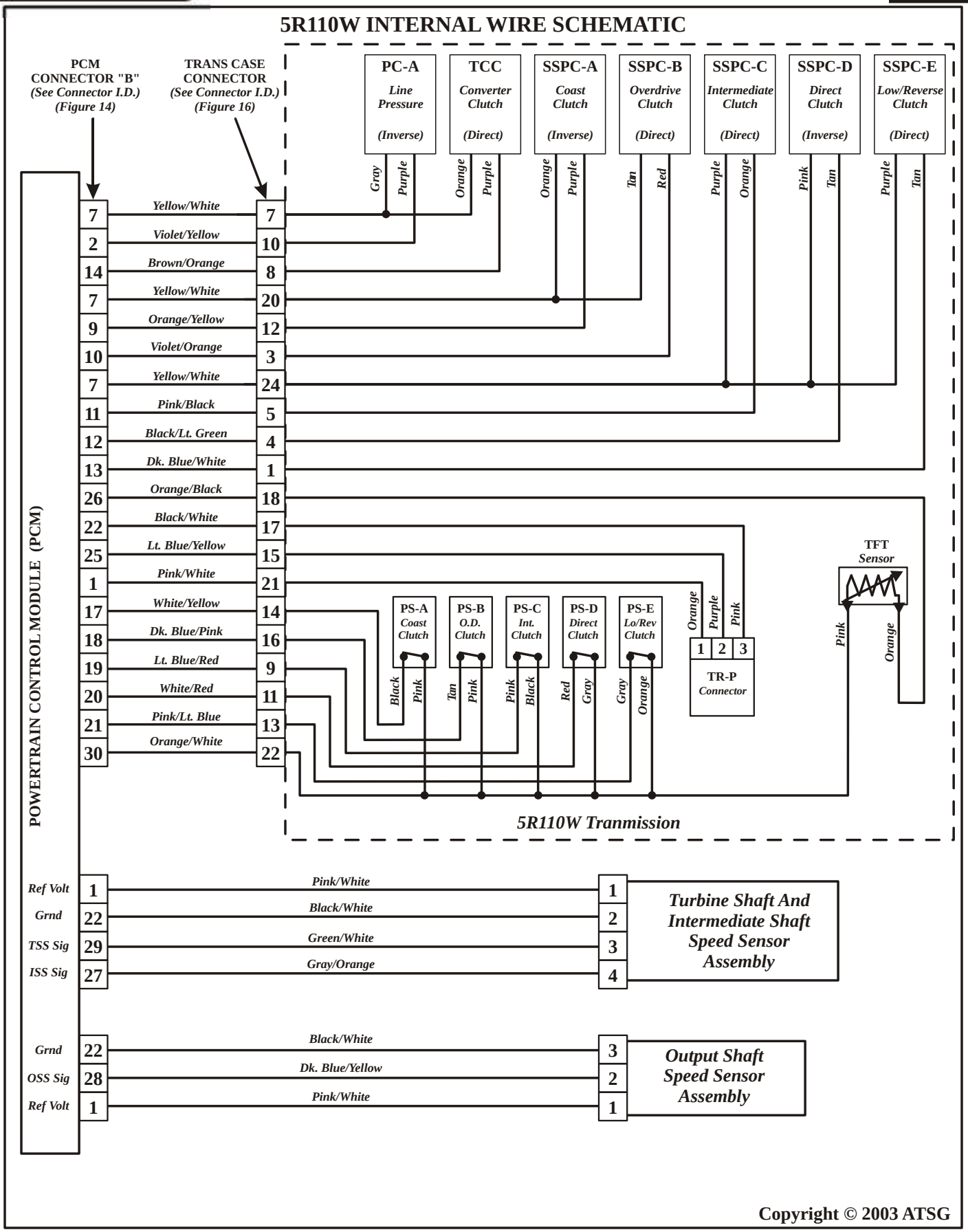
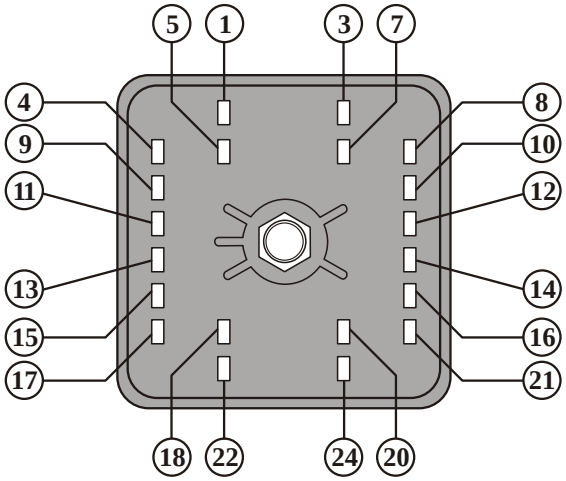


Figure 15

INTERNAL COMPONENT RESISTANCE CHART			
INTERNAL COMPONENT	**CASE CONNECTOR PIN NUMBERS**	**OHMS RESISTANCE**	***** Internal Wire Colors At Component Connector***
SSPC-A Soleniod	*12 and 20*	*4.1 to 4.7 @ 72° F*	*Purple and Orange*
SSPC-B Soleniod	*3 and 20*	*4.1 to 4.7 @ 72° F*	*Red and Tan*
SSPC-C Soleniod	*5 and 24*	*4.1 to 4.7 @ 72° F*	*Orange and Purple*
SSPC-D Soleniod	*4 and 24*	*4.1 to 4.7 @ 72° F*	*Tan and Pink*
SSPC-E Soleniod	*1 and 24*	*4.1 to 4.7 @ 72° F*	*Tan and Purple*
PC-A Solenoid (Early)	*7 and 10*	*4.1 to 4.7 @ 72° F*	*Gray and Purple*
PC-A Solenoid (Late)	*7 and 10*	*5.1 to 5.8 @ 72° F*	*Gray and Purple*
TCC Solenoid	*7 and 8*	*4.1 to 4.7 @ 72° F*	*Purple and Orange*
PS-A	*14 and 22*	*0.5 Ohms @ 72° F*	*Black and Pink*
PS-B	*16 and 22*	*0.5 Ohms @ 72° F*	*Tan and Pink*
PS-C	*9 and 22*	*0.5 Ohms @ 72° F*	*Pink and Black*
PS-D	*11 and 22*	*0.5 Ohms @ 72° F*	*Red and Gray*
PS-E	*13 and 22*	*0.5 Ohms @ 72° F*	*Gray and Orange*
TFT	*18 and 22*	*See Chart Below*	*Orange and Pink*
TSS/ISS Sensor		*See Figure 9*	
OSS Sensor		*See Figure 10*	

***** Wire colors may vary.***

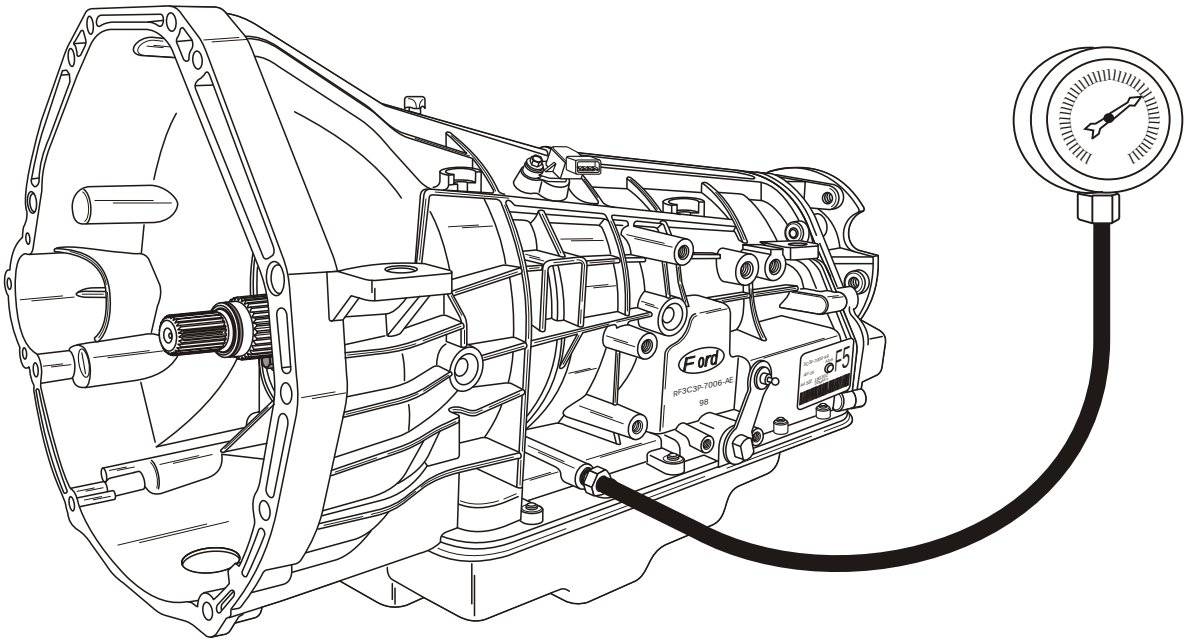


View Looking Into Transmission Case Connector

Transmission Fluid Temperature (TOT)		
Degrees C	*Degrees F*	*Resistance (Ohms)*
-40 to -20	*-40 to -4*	*967k to 284k*
-19 to -2	*-3 to 31*	*284k to 100k*
0 to 20	*32 to 68*	*100k to 37k*
21 to 40	*69 to 104*	*37k to 16k*
41 to 70	*105 to 158*	*16k to 5k*
71 to 90	*159 to 194*	*5k to 2.7k*
91 to110	*195 to 230*	*2.7k to 1.5k*
111 to130	*231 to 266*	*1.5k to 0.8k*
131 to150	*267 to 302*	*0.8k to 0.54k*

Figure 16

LINE PRESSURE TESTS



LINE PRESSURE CHART		
Range	***Idle Speed***	***Stall Speed***
P/N	***50 psi***	———
R	***100 psi***	***320 psi***
(D)	***70 psi***	***320 psi***
3	***80 psi***	***260 psi***
2	***80 psi***	***215 psi***
1	***80 psi***	***270 psi***

All Pressures Listed Are Approximate

PRECAUTIONS:

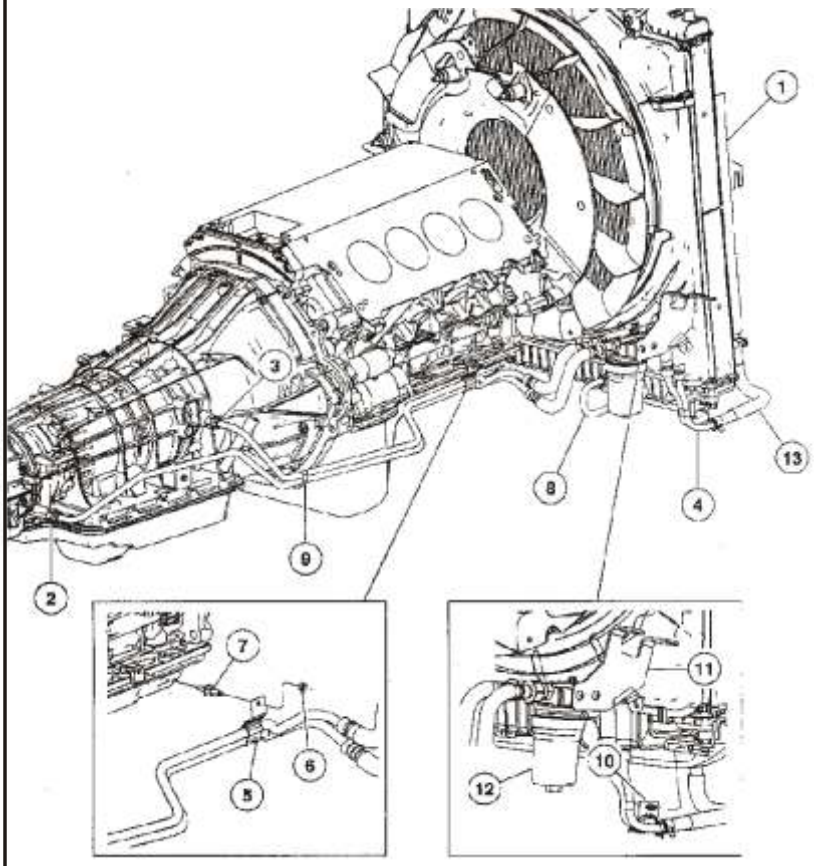
(1) Certain sensor failures may cause high line pressure and Failure Mode Effect Management (FMEM) actions. Ensure that on-board diagnostic and electrical repairs have been carried out first, or test results may be incorrect.

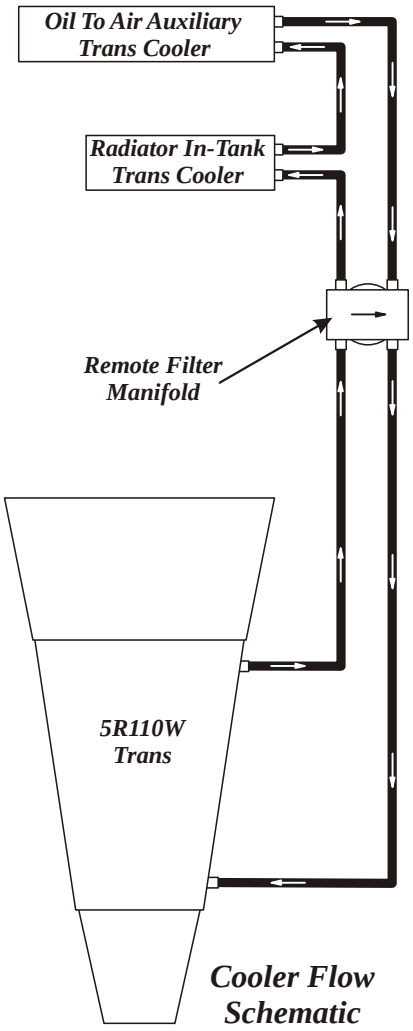
(2) Perform the line pressure test in all ranges prior to performing the Stall Speed Test. If line pressure is low at idle, "Do Not" carry out the Stall Speed Test or additional transmission damage will occur. Do not maintain wide open throttle (WOT) in any range for more than 5 seconds or transmission damage may occur.

(3) Apply the parking brake and block wheels during the line pressure test. Vehicle movement during the test may cause personal injury or damage to the vehicle and equipment.

Figure 17

REMOTE TRANSMISSION FILTER IN COOLER LINES





1 OIL TO AIR TRANSMISSION FLUID AUXILIARY COOLER
2 REAR "FROM COOLER" LINE CASE FITTING
3 FRONT "TO COOLER" LINE CASE FITTING
4 REMOTE FILTER "IN" LINE
5 COOLER LINE BRACKET
6 NUT
7 STUD
8 RADIATOR COOLER "IN" LINE
9 COOLER LINE "C" CLIP
10 COOLER LINE CLIP
11 REMOTE FILTER MANIFOLD BRACKET
12 REMOTE TRANSMISSION FLUID FILTER
13 HOSE ASSEMBLY

Figure 18

Remote Transmission Filter

This transmission is equipped with a remote fluid filter, as shown in Figure 18. This filter passes ten percent of the transmission fluid from the transmission through a small orifice into a servicable screw-on filter element. The filtered fluid is then directed back into the rear lube circuit through the large opening in the remote filter manifold.

CAUTION: The transmission cooler lines must be disconnected prior to flushing out the cooler lines. Do Not attempt to flush the remote filter housing because of the internal orifice.

FORD 5R110W
Abbreviation Description

Abbreviation	*Description*	*Abbreviation*	*Description*
4X4L	4X4 Low Switch	PC-A	Pressure Control Solenoid "A"
ABS	Antilock Brake System	PCM	Powertrain Control Module
A/C	Air Conditioning	PS-A	Pressure Switch "A"
ACCS	Air Conditioning Clutch Status	PS-B	Pressure Switch "B"
APGND	Accelerator Pedal Sensor Ground	PS-C	Pressure Switch "C"
APP	Accelerator Pedal Position Sensor	PS-D	Pressure Switch "D"
BARO	Barometric Pressure Sensor	PS-E	Pressure Switch "E"
BPP	Brake Pedal Position	ROM	Read Only Memory
BUS +	Data Link Connector	RPM	Engine Speed
BUS -	Data Link Connector	SCCS	Speed Control Command Switch
CASE GND	Case Ground	SSPC-A	Shift Solenoid Pressure Control A
CID	Cylinder Identification	SSPC-B	Shift Solenoid Pressure Control B
CMP	Camshaft Position Sensor	SSPC-C	Shift Solenoid Pressure Control C
DLC	Data Link Connector	SSPC-D	Shift Solenoid Pressure Control D
DTC	Diagnostic Trouble Code	SSPC-E	Shift Solenoid Pressure Control E
DTC CNT	Diagnostic Trouble Code Count	TAC	Tachometer Signal
ECT	Engine Coolant Temperature	TCC	Torque Converter Clutch
EOT	Engine Oil Temperature	TCIL	Trans Control Indicator Lamp
FEPS	Flash EPROM Power Supply	TCS	Transmission Control Switch
FUEL PW	Fuel Pulse Width	TFT	Transmission Fluid Temperature
GP	Glow Plug	TR-P	Transmission Range Sensor
GPC	Glow Plug Control Duty Cycle	TP	Throttle Position Sensor
GPL	Glow Plug Lamp	TSS	Turbine Shaft Speed Sensor
IAT	Intake Air Temperature	VPWR	Vehicle Power Supply
ICP	Injector Control Pressure Sensor	VREF	Vehicle Reference Voltage
IPR	Injector Pressure Regulator	VSS	Vehicle Speed Sensor
ISS	Interm. Shaft Speed Sensor	WOT	Wide Open Throttle
IVS	Idle Validation Switch		
KAM	Keep Alive Memory		
KAPWR	Keep Alive Power		
KOEO	Key On Engine Off		
KOER	Key On Engine Running		
MAF	Mass Air Flow Sensor		
OSS	Output Shaft Speed Sensor		

Figure 19

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0102 P0103 P1100 P1101	***Mass Air Flow (MAF) sensor***	**MAF sensor system fails to operate in a normal manner, which may cause a transmission concern.**
P0112	***Intake Air Temperature (IAT) sensor***	**IAT sensor exceeds the scale set for temperature of 254°F.**
P0113	***Intake Air Temperature (IAT) sensor***	**IAT sensor exceeds the scale set for temperature of minus 40°F.**
P0114	***Intake Air Temperature (IAT) sensor***	**IAT sensor higher or lower than expected during KOEO and KOER test.**
P0116	***Engine Coolant Temp (ECT) sensor***	**ECT sensor temperature higher or lower than expected during KOEO or KOER**
P0117	***Engine Coolant Temp (ECT) sensor***	**ECT sensor exceeds the scale set for temperature of 254°F.**
P0118	***Engine Coolant Temp (ECT) sensor***	**ECT sensor exceeds the scale set for temperature of minus 40°F.**
P0121 P0122 P0123 P1120 P1121 P1124 P1125	***Throttle Position (TP) or (APP) sensor***	**(TP) Throttle Position sensor or (APP) Accelerator Pedal Position sensor above or below normal specifications during normal operation.**
P0300 P0308 P0320 P0340 P1351-1364	***(EI) Systems***	**(DI) Distributor Ignition circuit concern or (CKP) Crankshaft Position sensor failure.**
P0500	***Antilock Brake Systems (ABS)***	**PCM detected a loss of VSS signal through SCP link from ABS.**
P0503	***Antilock Brake Systems (ABS)***	**PCM detected an intermittent loss of VSS signal through SCP link from ABS.**
P0706	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal frequency is out of normal range**

Figure 20

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0707	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal duty cycle is below threshold, sensor/circuit elect. malfunction.**
P0708	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor signal duty cycle is above threshold, sensor/circuit elect. malfunction.**
P1705	***Transmission Range (TR-P) Sensor***	**Transmission Range sensor circuit failure, or KOEO or KOER not run in P or N positions.**
P0711	***Trans Fluid Temp (TFT) Sensor***	**PCM has detected no TFT change during operation. Stuck at some normal reading.**
P0712	***Trans Fluid Temp (TFT) Sensor***	**Voltage drop across TFT sensor exceeds scale set for temperature of 315°F.**
P0713	***Trans Fluid Temp (TFT) Sensor***	**Voltage drop across TFT sensor exceeds scale set for temperature of minus 40°F.**
P1711	***Trans Fluid Temp (TFT) Sensor***	**Transmission not operating at normal temperature during On-Board diagnostics.**
P1783	***Trans Fluid Temp (TFT) Sensor***	**Transmission over temp condition indicated.**
P0715	***Turbine Shaft Speed (TSS) Sensor***	**PCM detected a loss of TSS signal during normal operation.**
P0717	***Turbine Shaft Speed (TSS) Sensor***	**PCM has not detected a TSS signal.**
P0718	***Turbine Shaft Speed (TSS) Sensor***	**PCM has detected a noisy TSS signal.**
P0720	***Output Shaft Speed (OSS) Sensor***	**PCM detected a loss of OSS signal during normal operation.**
P0721	***Output Shaft Speed (OSS) Sensor***	**PCM has detected a noisy OSS signal.**
P0722	***Output Shaft Speed (OSS) Sensor***	**PCM has detected no OSS signal.**
P0730	***Clutch Control Solenoid or Internal Problem***	**PCM has detected a gear ratio error.**
P0740	***TCC Solenoid***	**TCC Solenoid, Electrical, Open Circuit.**
P0741	***TCC Solenoid***	**TCC slippage detected during engagement. Mechanical or Hydraulic concern.**

Figure 21

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0742	***TCC Solenoid***	**TCC Solenoid circuit, shorted to ground.**
P0743	***TCC Solenoid***	**TCC Solenoid circuit failure.**
P0744	***TCC Solenoid***	**TCC Solenoid circuit, shorted to power.**
P1744	***TCC Solenoid***	**TCC slippage detected during engagement. Mechanical or Hydraulic concern.**
P0748	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit failure.**
P0960	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit open failure.**
P0962	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit, shorted to ground.**
P0963	***Line Pressure Control (PC-A) Solenoid***	**PC-A Solenoid circuit, shorted to power.**
P0750	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit open failure.**
P0751	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure OFF.**
P0752	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure ON.**
P0753	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit failure.**
P0972	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, or solenoid failure OFF.**
P0973	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, shorted to ground.**
P0974	***SSPC-A Solenoid (Coast Clutch)***	**SSPC-A Solenoid circuit, shorted to power.**
P0755	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit open failure.**
P0756	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure OFF.**
P0757	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure ON.**

Figure 22

Transonline

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0758	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit failure.**
P0975	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid circuit, or solenoid failure OFF.**
P0976	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid, or shorted to ground.**
P0977	***SSPC-B Solenoid (Overdrive Clutch)***	**SSPC-B Solenoid, or shorted to power.**
P0760	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit open failure.**
P0761	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure OFF.**
P0762	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure ON.**
P0978	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid circuit, or solenoid failure OFF.**
P0979	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid, or circuit shorted to ground.**
P0980	***SSPC-C Solenoid (Intermediate Clutch)***	**SSPC-C Solenoid, or circuit shorted to power.**
P0765	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit open failure.**
P0766	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure OFF.**
P0767	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure ON.**
P0768	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit failure.**
P0981	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid circuit, or solenoid failure OFF.**
P0982	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid, or circuit shorted to ground.**
P0983	***SSPC-D Solenoid (Direct Clutch)***	**SSPC-D Solenoid, or circuit shorted to power.**

Figure 23

A & Reds

Lubegard

Lubegard

Alto

5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0770	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit open failure.**
P0771	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure OFF.**
P0772	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure ON.**
P0773	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit failure.**
P0984	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid circuit, or solenoid failure OFF.**
P0985	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid, or circuit shorted to ground.**
P0986	***SSPC-E Solenoid (Low/Reverse Clutch)***	**SSPC-E Solenoid, or circuit shorted to power.**
P0791	***Intermediate Shaft Speed Sensor (ISS)***	**Insufficient input from ISS.**
P0793	***Intermediate Shaft Speed Sensor (ISS)***	**No input from ISS.**
P0794	***Intermediate Shaft Speed Sensor (ISS)***	**ISS signal intermittent.**
P0840	***Pressure Switch A (PS-A)***	**Pressure Switch A circuit error, stuck open or closed, shorted to power or ground.**
P0841	***Pressure Switch A (PS-A)***	**Pressure Switch A circuit error, stuck open or closed, shorted to power or ground.**
P0845	***Pressure Switch B (PS-B)***	**Pressure Switch B circuit error, stuck open or closed, shorted to power or ground.**
P0846	***Pressure Switch B (PS-B)***	**Pressure Switch B circuit error, stuck open or closed, shorted to power or ground.**
P0870	***Pressure Switch C (PS-C)***	**Pressure Switch C circuit error, stuck open or closed, shorted to power or ground.**
P0871	***Pressure Switch C (PS-C)***	**Pressure Switch C circuit error, stuck open or closed, shorted to power or ground.**

Figure 24

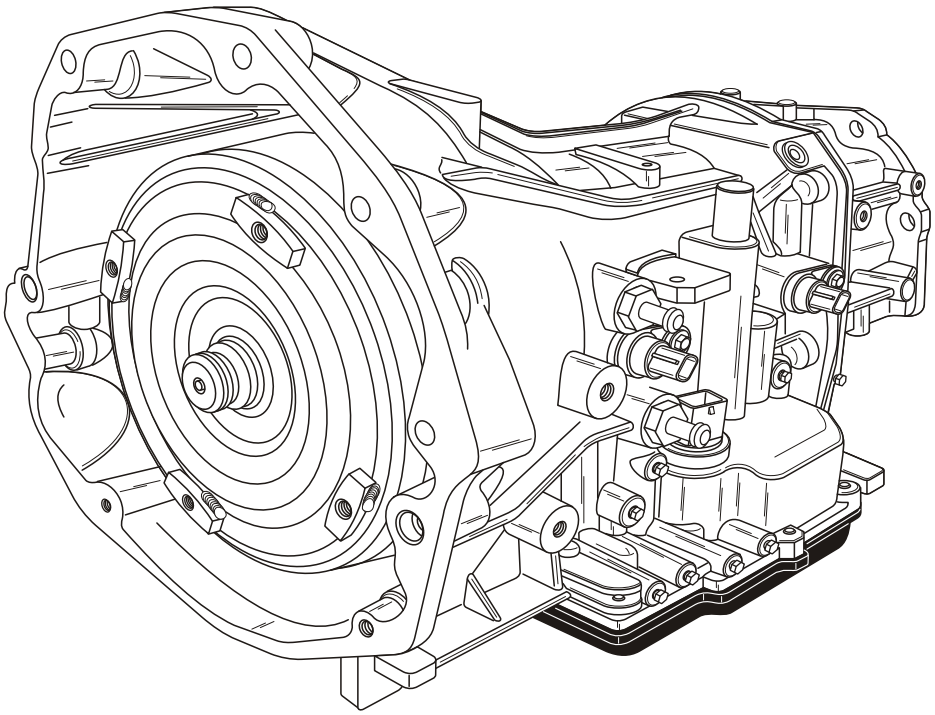
5R110W Diagnostic Trouble Code Chart		
Diagnostic Code	***Symptom***	***Description***
P0875	***Pressure Switch D (PS-D)***	**Pressure Switch D circuit error, stuck open or closed, shorted to power or ground.**
P0876	***Pressure Switch D (PS-D)***	**Pressure Switch D circuit error, stuck open or closed, shorted to power or ground.**
P0987	***Pressure Switch E (PS-E)***	**Pressure Switch E circuit error, stuck open or closed, shorted to power or ground.**
P0988	***Pressure Switch E (PS-E)***	**Pressure Switch E circuit error, stuck open or closed, shorted to power or ground.**
P1124	***Throttle Position (TP) or (APP) sensor***	**Throttle position was not in the correct position for the On-Board diagnostics.**
P1460	***A/C Switch***	**A/C pressure cycling switch error.**
P1572	***Brake Pedal Position (BPP) Switch***	**Brake Pedal Position Switch, circuit failure.**
P1636	***SSx ISIG***	**PCM detected an error with the ISIG chip. Replace the PCM**
P1703	***Brake Pedal Position (BPP) Switch***	**Brake Pedal not cycled during KOER test, or brake ON circuit failure during KOEO.**
P1780	***Transmission Control Switch (TCS)***	**Transmission Control Switch voltage incorrect.**
P1729	***4X4 Low Switch***	**4X4 Low Switch circuit or switch failure.**
P1781	***4X4 Low Switch***	**4X4 Low Switch or circuit, out of self test range.**
P2700	***Coast Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2701	***Overdrive Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2702	***Intermediate Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2703	***Direct Clutch System Error***	**Friction element apply time, range, or functional error detected.**
P2704	***Low/Reverse Clutch System Error***	**Friction element apply time, range, or functional error detected.**

Figure 25

JEEP 42RLE

PRELIMINARY INFORMATION

2003 - Current Jeep Liberty with 3.7L V6 Engine
2003 - Current Jeep Wrangler with 3.7L V6 Engine

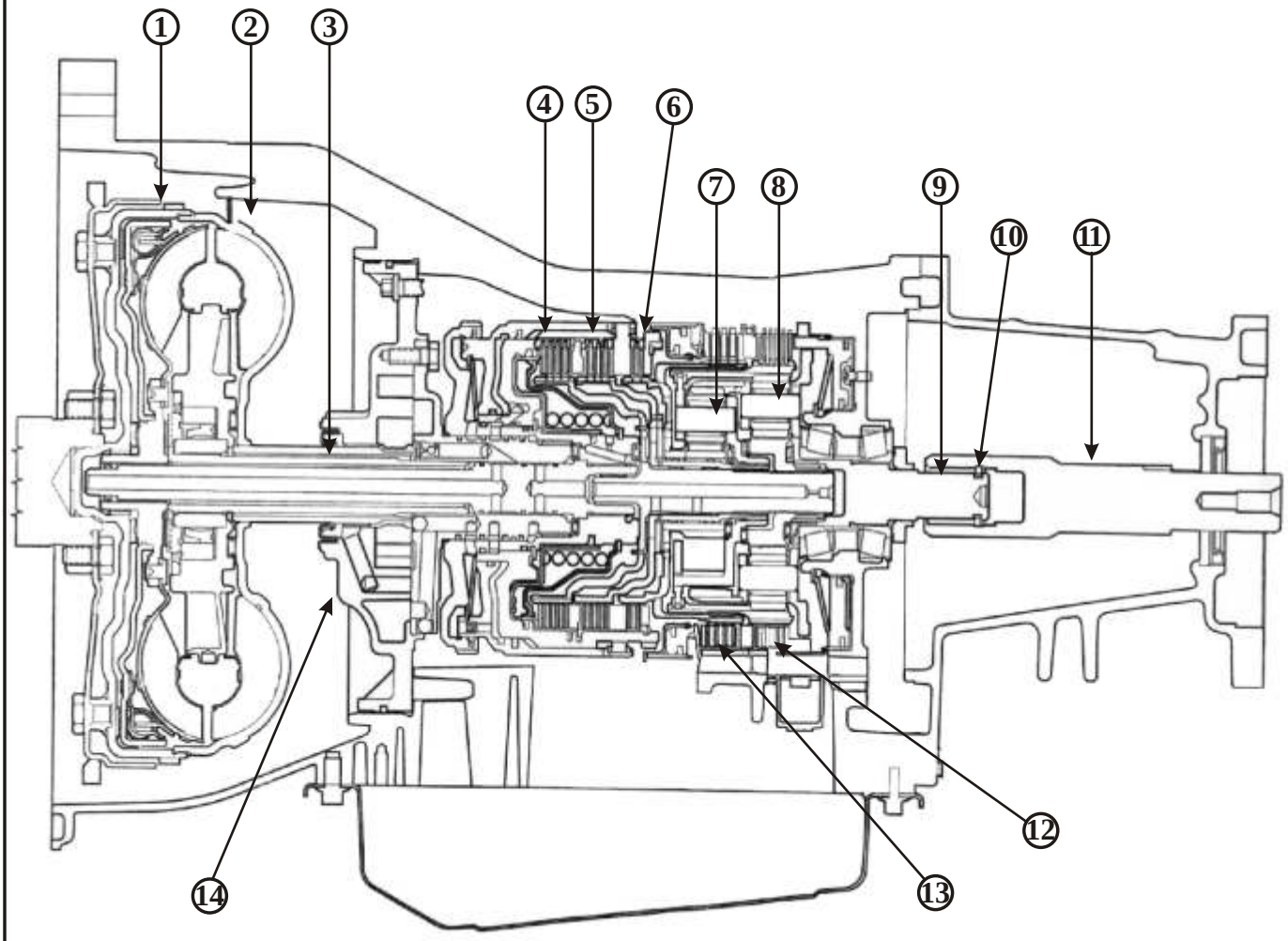


Beginning at the start of production for the 2003 model year, Chrysler Corporation modified the 42LE (606) transmission and turned it into a Rear Wheel Drive called the **42RLE.**
The majority of the transmission's internal parts as well as operating strategy is virtually identical as the 42LE with the exception of the rear drive section and the hypoid style final drive being eliminated. This transmission is available in both 2WD and 4x4 configurations. The gear ratios and clutch application are also the same as the 42LE.

Special Thanks to Frank at Phoenix Remanufactured Transmissions for the use of the 42RLE used in this video portion of ATSG's "What's in Store for 2004" Technical Training Seminar

42RLE PRELIMINARY INFORMATION

42RLE INTERNAL COMPONENTS



1 FLYWHEEL
2 TORQUE CONVERTER
3 INPUT SHAFT
4 UNDERDRIVE CLUTCH
5 OVERDRIVE CLUTCH
6 REVERSE CLUTCH
7 FRONT PLANETARY CARRIER
8 REAR PLANETARY CARRIER
9 PRIMARY OUTPUT SHAFT
10 CIR-CLIP
11 SECONDARY OUTPUT SHAFT
12 LOW/REVERSE CLUTCH
13 2ND/4TH CLUTCH
14 OIL PUMP ASSEMBLY

Figure 1

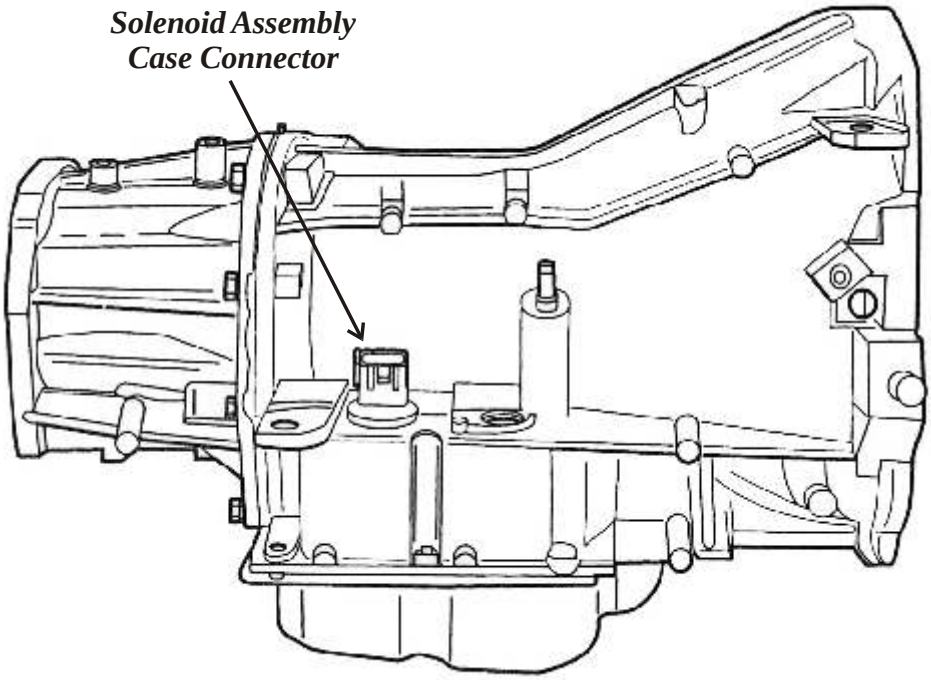
42RLE PRELIMINARY INFORMATION

CLUTCH APPLICATION CHART

Shift Lever Position	INPUT CLUTCHES			HOLDING CLUTCHES	
	Underdrive	Overdrive	Reverse	2/4	Low/Reverse
P - PARK					X
R - REVERSE			X		X
N - NEUTRAL					X
OD - OVERDRIVE First	X				X
Second	X			X	
Third (Direct)	X	X			
Overdrive		X		X	
D - DRIVE* First	X				X
Second	X			X	
Third (Direct)	X	X			
L - LOW* First	X				X
Second	X			X	
Third (Direct)	X	X			
**** The vehicle's upshifts and downshifts speeds are increased when in these selector positions***					

Figure 2

42RLE PRELIMINARY INFORMATION



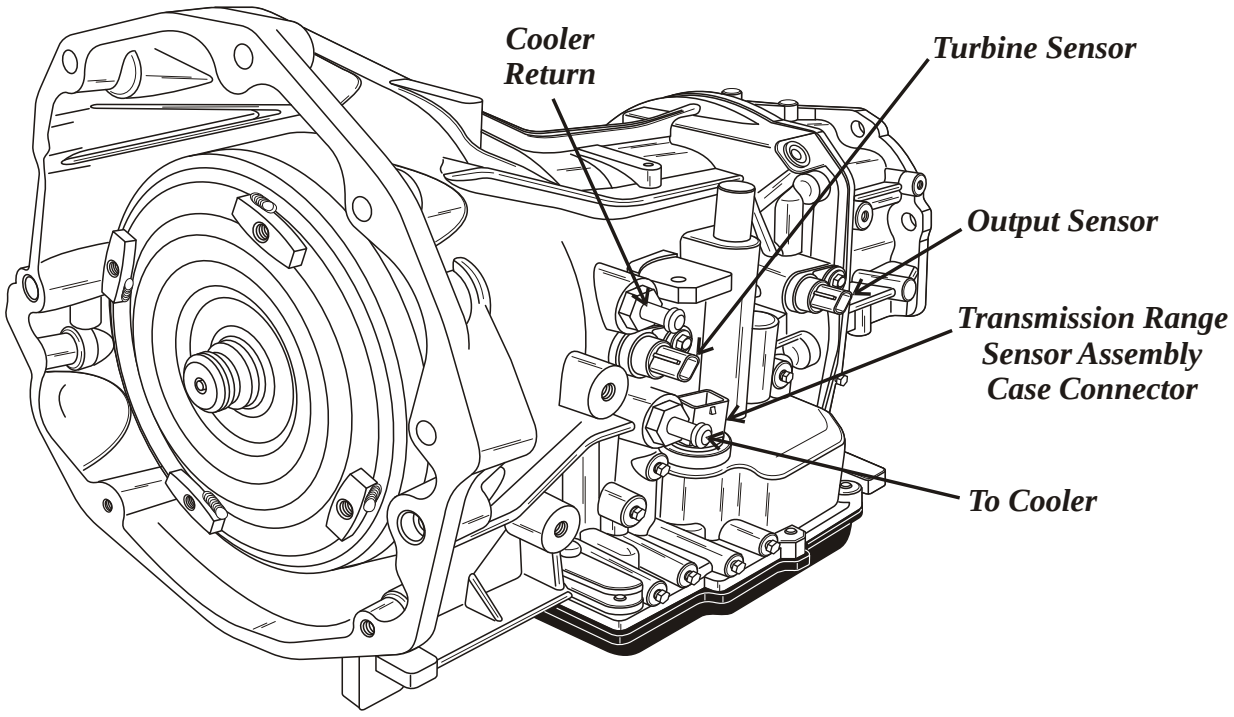
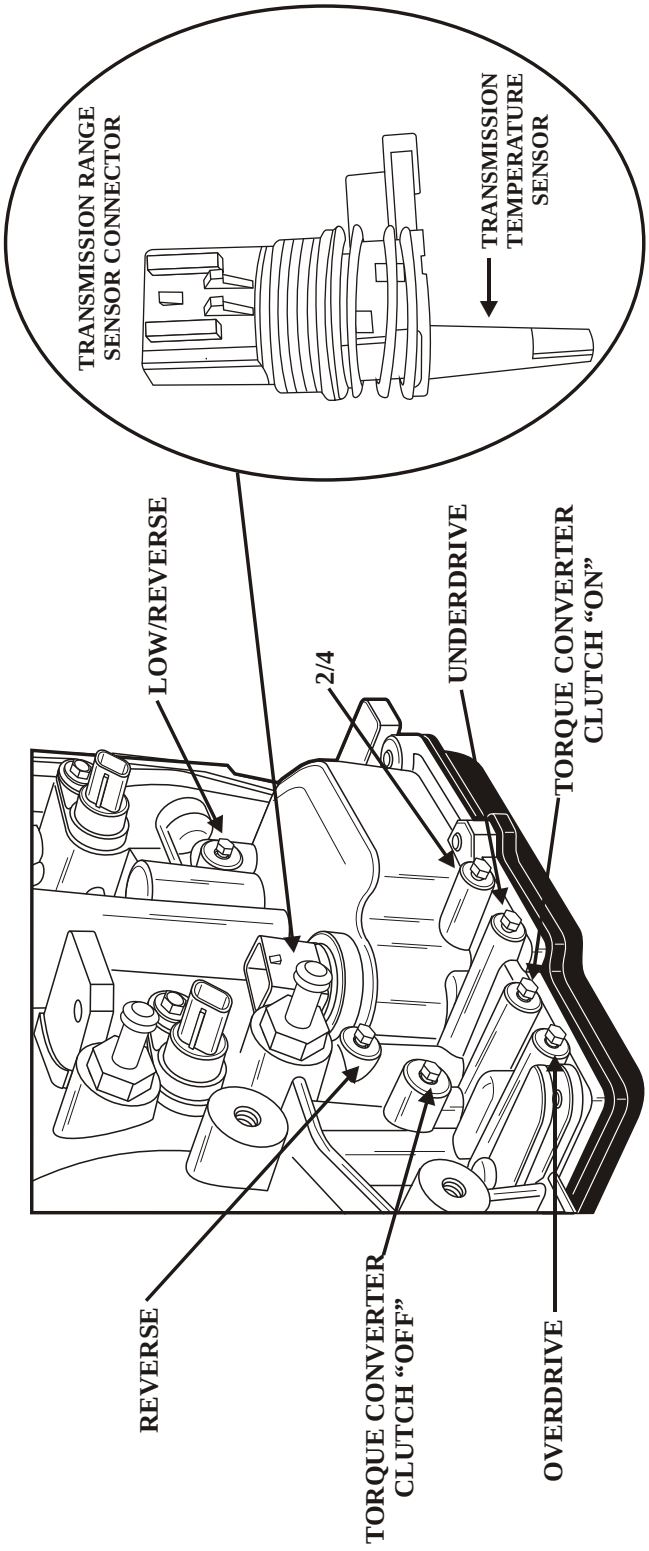


Figure 3

42RLE PRELIMINARY INFORMATION

CLUTCH PRESSURE AND PRESSURE PORT IDENTIFICATION



42RLE CLUTCH PRESSURE CHART

GEAR SELECTOR POSITION	ACTUAL GEAR	UNDERDRIVE CLUTCH	OVERDRIVE CLUTCH	REVERSE CLUTCH	TORQUE CONVERTER CLUTCH "OFF"	TORQUE CONVERTER CLUTCH "ON"	2/4 CLUTCH	LOW/REVERSE CLUTCH
PARK 0 MPH	PARK	0 - 2	0 - 5	0 - 2	60 - 110	45 - 100	0 - 2	115 - 145
REVERSE 0 MPH	REVERSE	0 - 2	0 - 7	165 - 235	50 - 110	35 - 85	0 - 2	165 - 235
NEUTRAL 0 MPH	NEUTRAL	0 - 2	0 - 5	0 - 2	60 - 110	45 - 100	0 - 2	115 - 145
LOW 20 MPH	FIRST	110 - 145	0 - 5	0 - 2	60 - 110	45 - 100	0 - 2	115 - 145
3 30 MPH	SECOND	110 - 145	0 - 5	0 - 2	60 - 110	45 - 100	115 - 145	0 - 2
3 45 MPH	THIRD	75 - 95	75 - 95	0 - 2	60 - 90	45 - 80	0 - 2	0 - 2
OD 30 MPH	FOURTH	0 - 2	75 - 95	0 - 2	60 - 90	45 - 80	75 - 95	0 - 2
OD 50 MPH	FOURTH WITH TCC	0 - 2	75 - 95	0 - 2	0 - 5	60 - 95	75 - 95	0 - 2

Figure 4

42RLE PRELIMINARY INFORMATION

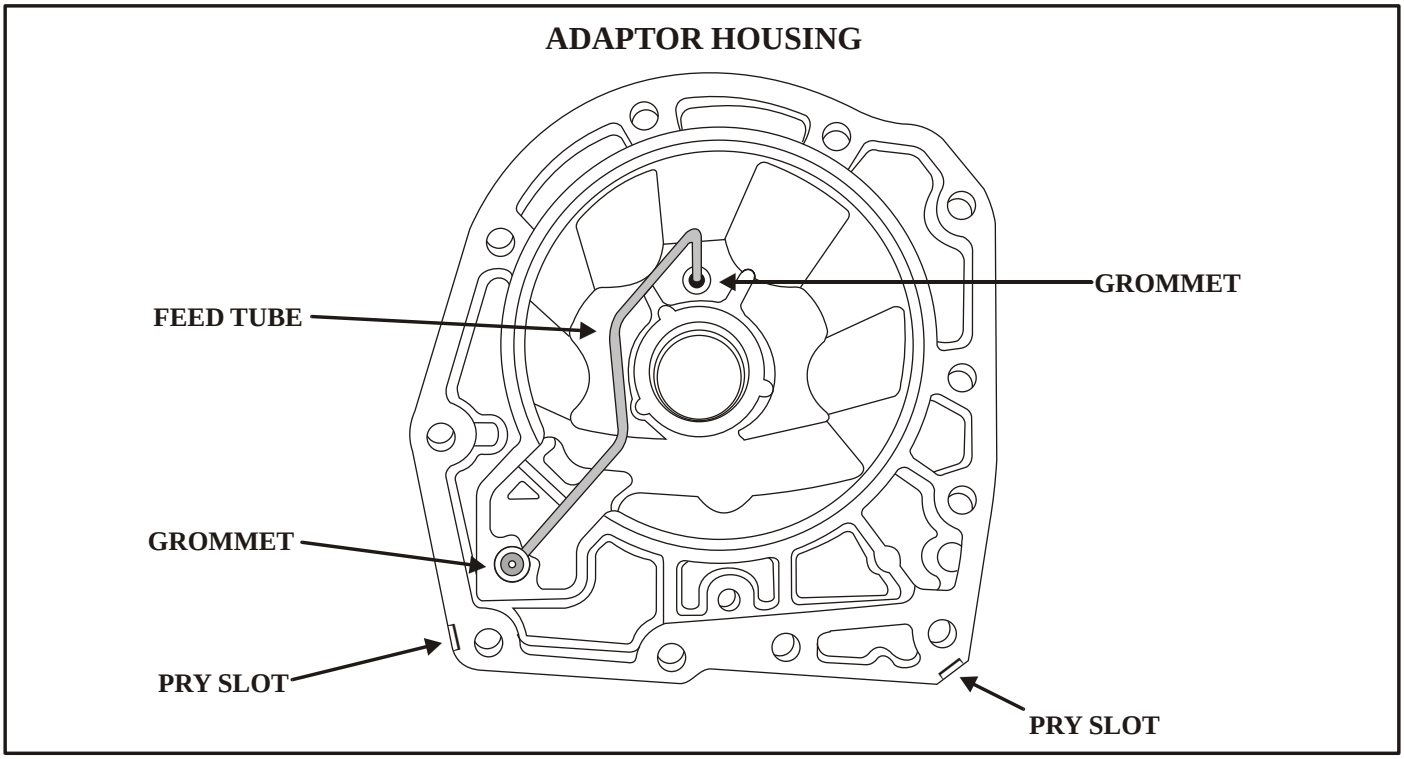


Figure 5

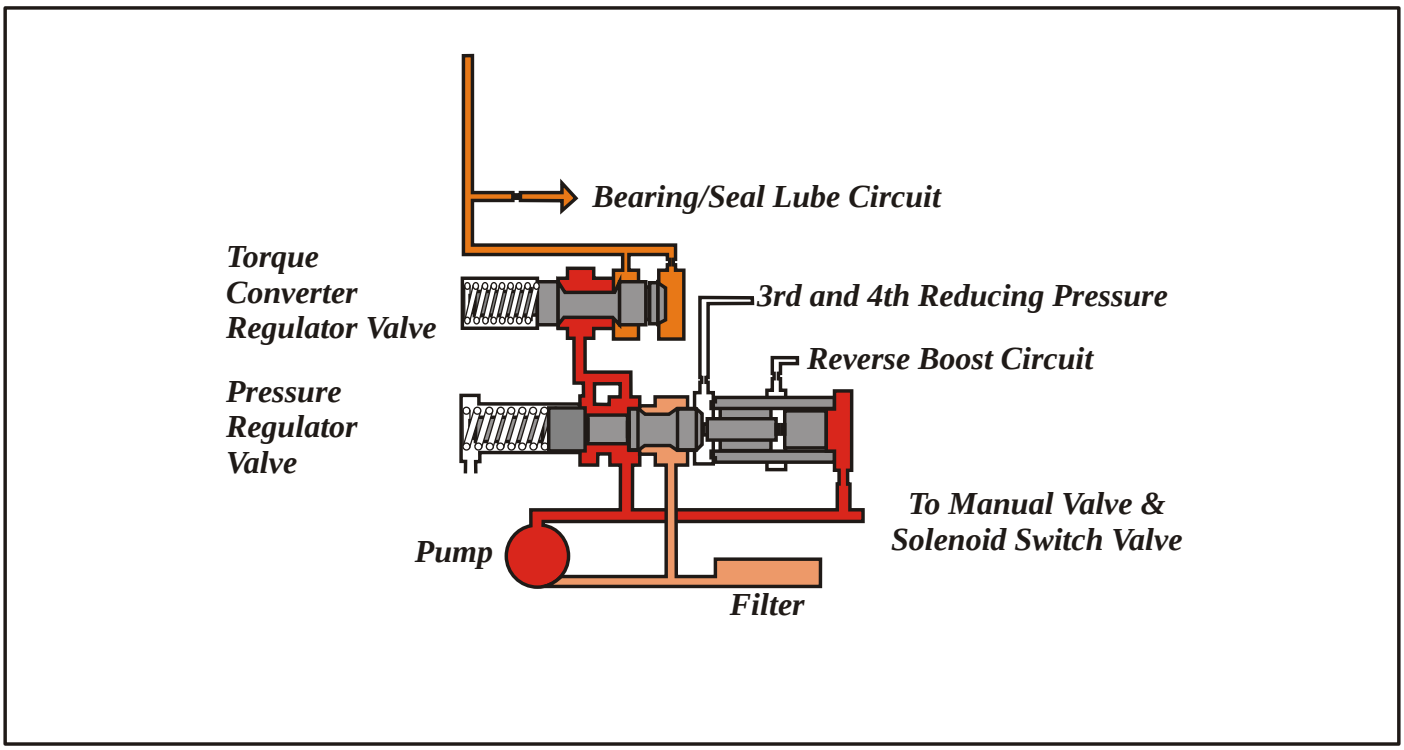


Figure 6

42RLE PRELIMINARY INFORMATION

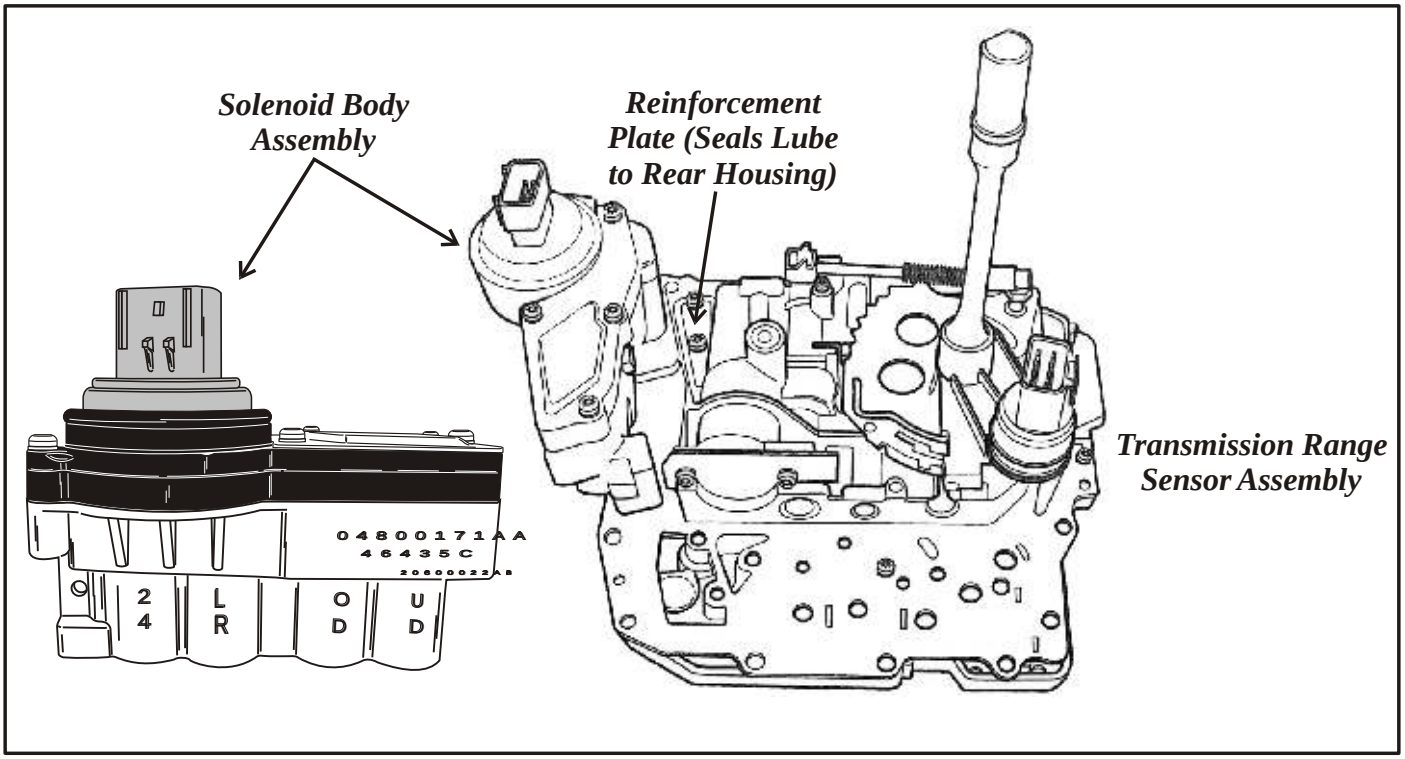
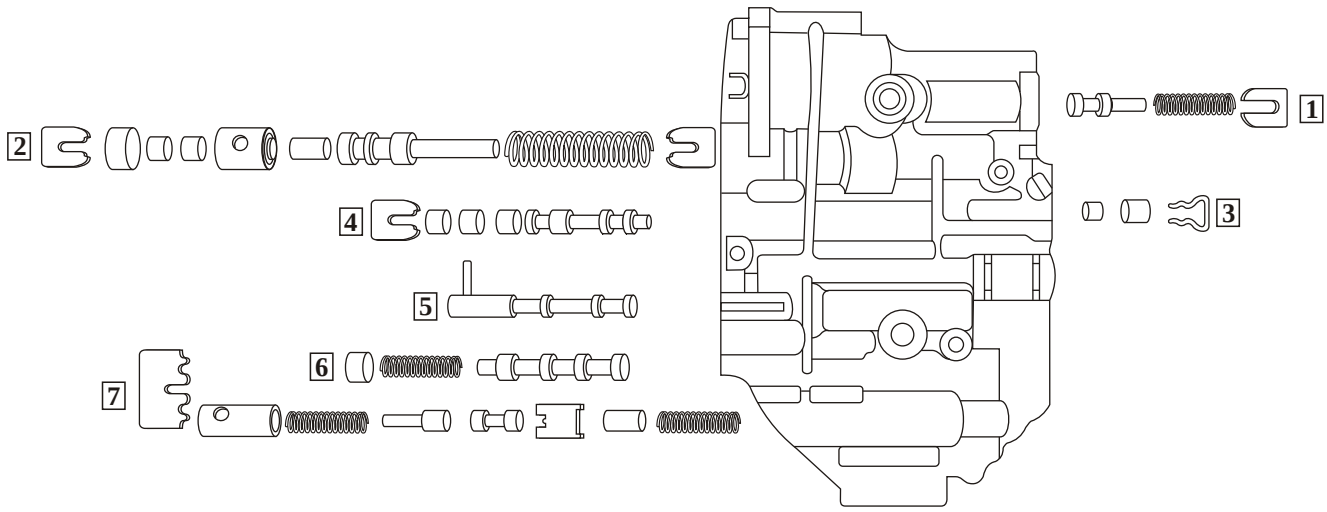


Figure 7

42RLE VALVE IDENTIFICATION

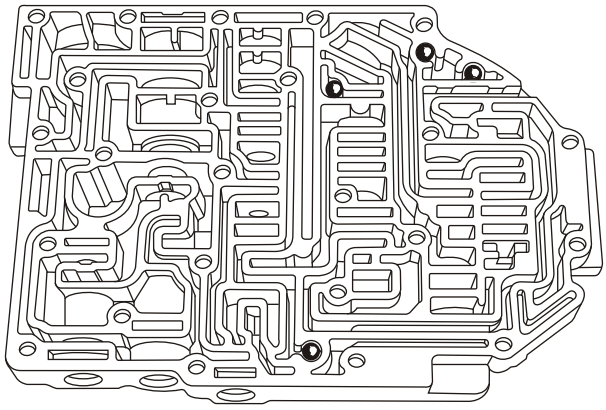


1. TORQUE CONVERTER REGULATOR VALVE
2. PRESSURE REGULATOR VALVE
3. LOW/REVERSE SWITCH VALVE
4. SOLENOID SWITCH VALVE
5. MANUAL VALVE
6. CONVERTER CLUTCH SWITCH VALVE
7. CONVERTER CLUTCH CONTROL VALVE

Figure 8

42RLE PRELIMINARY INFORMATION

42RLE CHECKBALL LOCATIONS



FOUR (4) CHECKBALLS IN VALVE BODY

Installing the thermal valve in the transfer plate

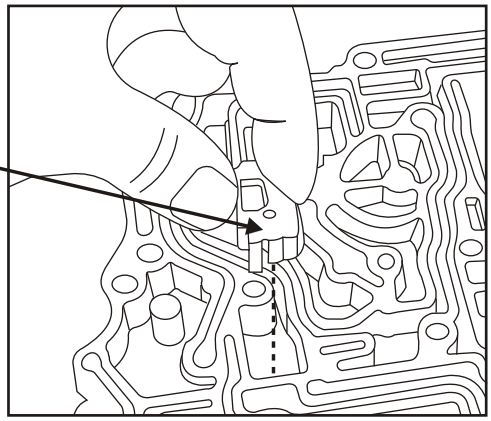
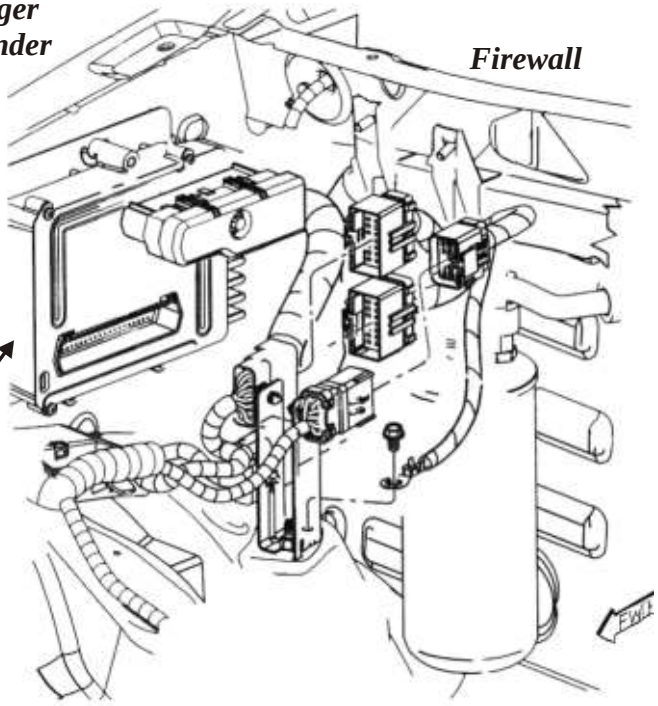


Figure 9

TCM LOCATION

Passenger Side Fender

Firewall

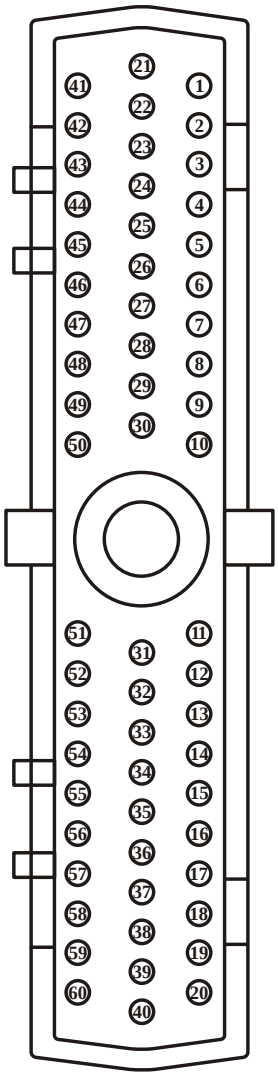


Transmission control module (tcm)

Figure 10

42RLE PRELIMINARY INFORMATION

60-WAY CONNECTOR PIN CAVITY IDENTIFICATION AND FUNCTION



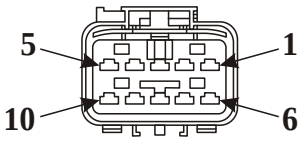
Harness Connector View
Terminal Side

PIN CAVITY	WIRE COLOR	FUNCTION
1	*Lt. Green/Black*	*Transmission Range Sensor T1 Signal*
2	*Tan/Black*	*Back-up Lamp Relay Control*
3	*Violet*	*Transmission Range Sensor T3 Signal*
6	*Gray/Black*	*Crankshaft Position Sensor Signal*
7	*Pink*	*SCI Transmit*
8	*Red*	*Fused Ignition Switch Output (Crank)*
9	*Orange/Black*	*Overdrive Pressure Switch Signal*
10	*Yellow/Dk.Green*	*Torque Management Request*
11	*Dk. Blue*	*Fused Ignition Switch Output (Crank & Run)*
12	*Orange/Dk. Blue*	*Throttle Position Sensor Signal*
13	*Dk. Blue/Black*	*Speed Sensor & TFT Ground*
14	*Lt. Green/White*	*Output Speed Sensor Signal*
15	*Pink*	*Transmission Control Relay Control*
16	*Red*	*Transmission Control Relay Output*
17	*Red*	*Transmission Control Relay Output*
18		
19	*Yellow/Dk. Blue*	*2/4 Clutch Solenoid (ground control)*
20	*Lt. Blue*	*L/R-TCC Clutch Solenoid (ground control)*
28		
29		
30		
36		
37		
38		
39		
40		
41	*White/Pink*	*Transmission Range Sensor (T41) Signal*
42	*Violet/White*	*Transmission Range Sensor (T42) Signal*
43	*Violet/Yellow*	*PCI Bus*
46	*Lt. Green*	*SCI Recieve*
47	*Dk. Blue*	*2/4 Pressure Switch Signal*
48		
49	*Orange/White*	*Overdrive Off Switch Signal*
50	*Dk Green*	*Low/Reverse Pressure Switch Signal*
51	*Black/Lt. Blue*	*Sensor Ground*
52	*Red/Black*	*Input Speed Sensor Signal*
53	*Black*	*Ground*
54	*Violet*	*Transmission Oil Temperature Sensor Signal*
55		
56	*Red/White*	*Fused Battery Keep Alive Voltage*
57	*Black/Yellow*	*Ground*
59	*Pink*	*Underdrive Solenoid (ground control)*
60	*Brown*	*Overdrive Solenoid (ground control)*

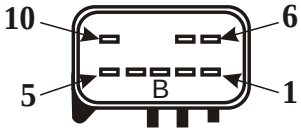
Figure 11

42RLE PRELIMINARY INFORMATION

Harness Connector View



Case Connector View



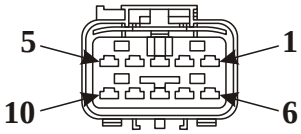
42RLE TRANSMISSION SOLENOID CONNECTOR (10-WAY)		
PIN CAVITY	WIRE COLOR	FUNCTION
1	*Brown*	*Overdrive Solenoid*
2	*Pink*	*Underdrive Solenoid*
3	*Red*	*12 Volt Input from EATX Relay*
4	*Yellow/Dk Blue*	*2/4 Solenoid*
5	*Dk Blue*	*2/4 Pressure Switch*
6	*Orange/Black*	*Overdrive Pressure Switch*
7	*Lt Blue*	*Low/Reverse Solenoid*
8	*Not Used*	*Not Used*
9	*Not Used*	*Not Used*
10	*Dk Green*	*Low/Reverse Pressure Switch*

The resistance of the solenoids and pressure switch resistors remains the same as all previous 41TE and 42LE transaxles:

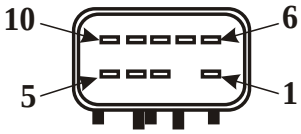
1.5 to 2.5 ohms for the solenoids and
270 to 330 ohms for the resistors

Figure 12

Harness Connector View



Case Connector View



42RLE TRANSMISSION RANGE SENSOR CONNECTOR (10-WAY)		
PIN CAVITY	WIRE COLOR	FUNCTION
1	*Dk Blue/White*	*Fused Ignition Switch Output (Start)*
2	*Not Used*	*Not Used*
3	*Dk Blue/Black*	*Speed Sensor Ground*
4	*Violet*	*Transmission Temperature Sensor Signal*
5	*Black/White*	*Park/Neutral Position Signal*
6	*Violet/Black*	*Back-Up Lamp Feed*
7	*Lt Green/Black*	*Transmission Range Sensor T1 Signal*
8	*Violet*	*Transmission Range Sensor T3 Signal*
9	*Violet/White*	*Transmission Range Sensor T42 Signal*
10	*White/Pink*	*Transmission Range Sensor T41 Signal*

Figure 13

42RLE PRELIMINARY INFORMATION

2003 JEEP LIBERTY WITH 42RLE WIRE DIAGRAM

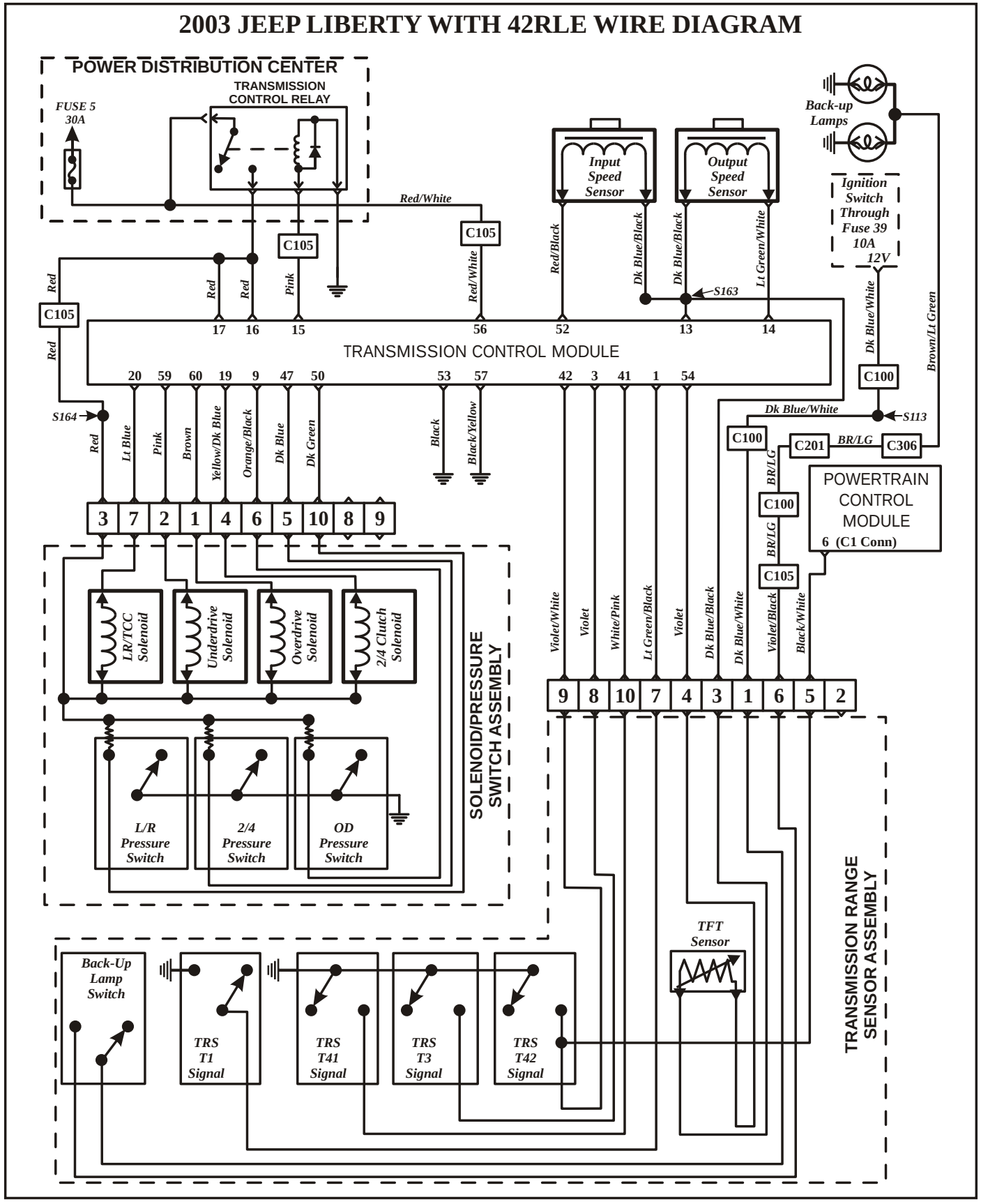


Figure 14

General Electronic Repair

Intermittent Computer Faults

COMPLAINT: Intermittent computer faults caused by motion, vibration, and other mechanical stresses.

CAUSE: One possible cause is a broken trace on the circuit board.

CORRECTION: Locate the break and install a jumper across it.

Some internal computer problems are difficult or impossible to repair, and some are fairly simple. A broken trace on the circuit board may a bit difficult to locate, but it is generally easy to repair. This repair does not require a great deal of soldering skills, but if you are not familiar with soldering at all then this repair is not recommended.

You will need a fairly low power soldering iron (30 Watts or less). Do not even think about attempting this type of repair with large heavy duty soldering equipment. You will also need small cleaning tools, and rosin core (electronic) solder. Acid core solder, the type used in plumbing, may not be used. A good magnifying glass and a small rotary tool may also be helpful.

The first step is to locate the crack. Sometimes these are obvious, and sometimes they are almost invisible. Often applying a bit of pressure will make the crack more visible. Chalk or Powder may help as well.

Once the crack has been found you must clean off the varnish coating around the affected area. Dental tools and a small rotary tool are the best. After all of the varnish has been cleared away apply a fresh coat of solder to the area. Then place a small piece of wire across the crack and reheat to solder that wire into place. A coat of clear nail polish finishes the job.

Remember to observe proper ESD protection while working on the insides of a computer.

Special thanks to B & R Electronics (sales@brelectronic.com)

CHRYSLER RWD TRANSMISSIONS

IMPROVED LINE RISE & THROTTLE RESPONSE

COMPLAINT: It is commonly known that line rise of RWD Chrysler transmissions, i.e. 904, 727, 500/618, all **"PRE"** 1996 RE units is sluggish and in many cases insufficient. This causes technicians to find themselves having to adjust the throttle rod/cable in an attempt to located a happy medium of shift feel and shift timing. Many times the vehicle is delivered with out really achieving the desired shift characteristics.

CAUSE: Decrease pressure supplied to the pressure regulator valve throttle plug which is used to prevent line pressure from exceeding approximately 100 to 120 psi at wide open throttle (See Figure 1).

CORRECTION: By drilling a 0.040" exhaust hole through the exterior casting into the decrease pressure circuit by following the "example" steps below and illustrated in Figure 2, a controlled venting of this oil will allow a more rapid line rise response to throttle opening improving the shift characteristics of the transmission. It also will allow a more desirable top end line pressure reading as well as a slight increase in the converter clutch apply pressure.

Step 1. Measure the overall length of the plug (.480") as seen with the example in Figure 2.
Step 2. Measure the length of the plug minus one shoulder (.430") as seen with the example in Figure 2.
Step 3. The difference between the two readings is .050". By dividing that number in half (0.025") and adding it to the figure acquired in step 2 (0.430"), the depth from the edge of the bore to the decrease circuit can be marked for drilling at approximately 0.0455" also shown in Figure 2.

Note: For 1996 and later vehicles drilling this hole may cause an erroneous code P1763 "Transmission Governor Pressure Sensor Volts Too High." This can be overcome by re-flashing the PCM according to Chrysler bulletin 21-04-00 which re-calibrates the JTEC Powertrain Control Module with new software (calibration change 96Cal18, 97Cal18, 98Cal12, and 99Cal14).

Another option would be to carefully solder a 150 ohm 1/4 watt resistor into the governor sensor signal circuit which will desensitize the P1763 code setting concern. Radio Shack part # 271-1312

IMPROVED LINE RISE & THROTTLE RESPONSE

PARTIAL HYDRAULIC SCHEMATIC OF PRESSURE REGULATOR VALVE "DRIVE" POSITION 1st thru 3rd GEAR

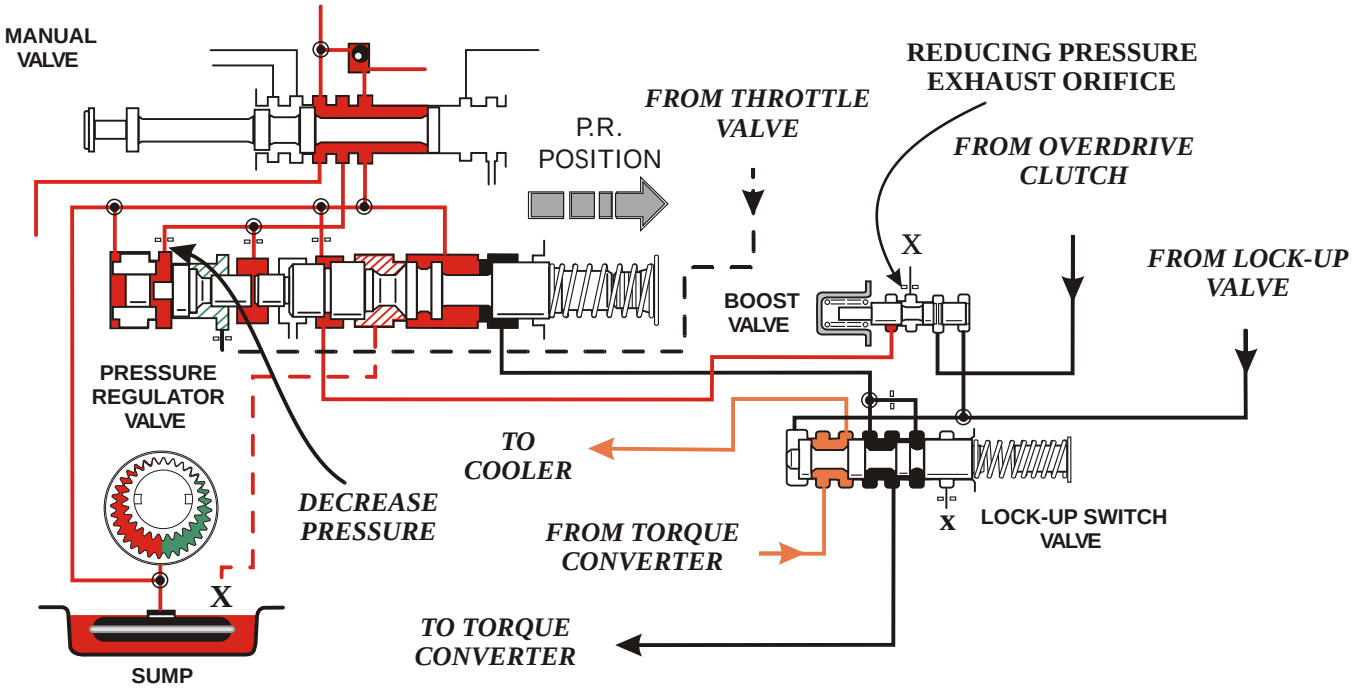


Figure 1

From the example used in the text:

Measure approximately .455" in from the edge of the valve body over the pressure regulator valve throttle plug bore and drill a 0.040" exhaust hole through the casting.

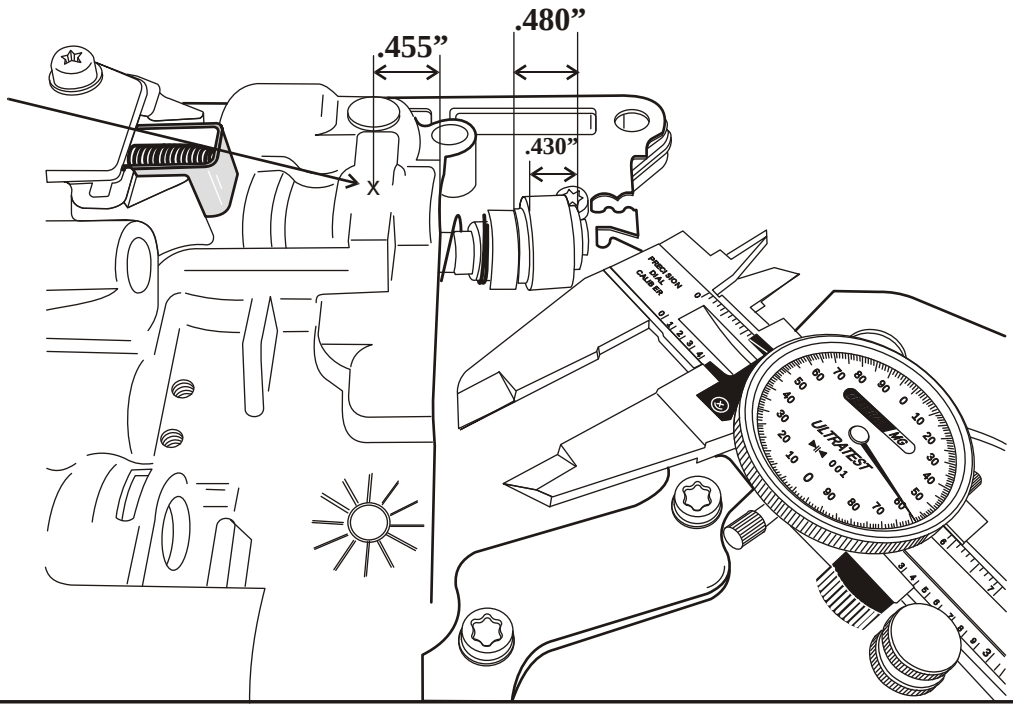


Figure 2

CHRYSLER 46RE/47RE

DIAGNOSTIC TROUBLE CODE P1740

COMPLAINT: Some 2000-2001Ram Vans, Dakotas, Ram Trucks and Durangos, may exhibit a flashing Check Engine Light, caused by a DTC P1740. (P1740 is a Torque Converter Clutch or Overdrive Solenoid Performance fault).

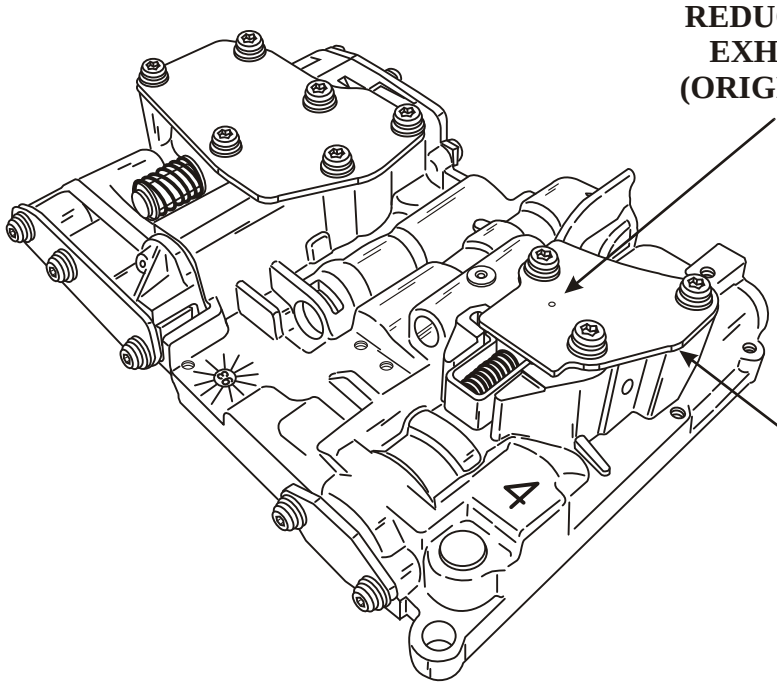
CAUSE: The cause may be, a Reducing Pressure Exhaust orifice that is too small, which delays the pressure increase needed when the Torque Converter Clutch is applied. Refer to Figures 2 and 3 for a partial hydraulic schematics explaining the Boost Valves function.

CORRECTION: Refer to Figure 1 to locate the Reducing Pressure Exhaust Orifice, which is in the Boost Valve Cover Plate. Remove the plate and enlarge the orifice shown to .069."Chrysler also provides a new Boost Valve Cover Plate which will already have the orifice enlarged.

SERVICE INFORMATION:

BOOST VALVE COVER PLATE (Chrysler part no.).....04617012

REDUCING PRESSURE EXHAUST ORIFICE LOCATION

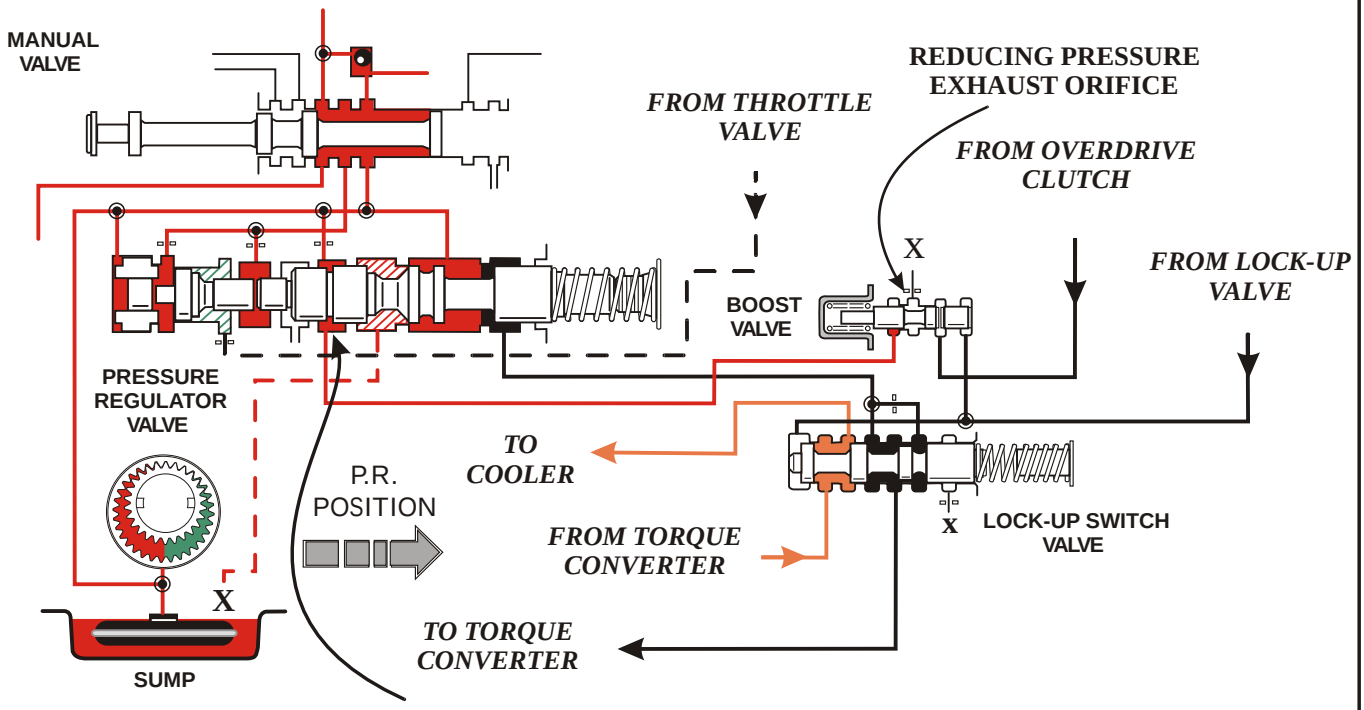


REMOVE THE BOOST VALVE COVER PLATE AND ENLARGE THE REDUCING PRESSURE EXHAUST ORIFICE TO .069"

Figure 1

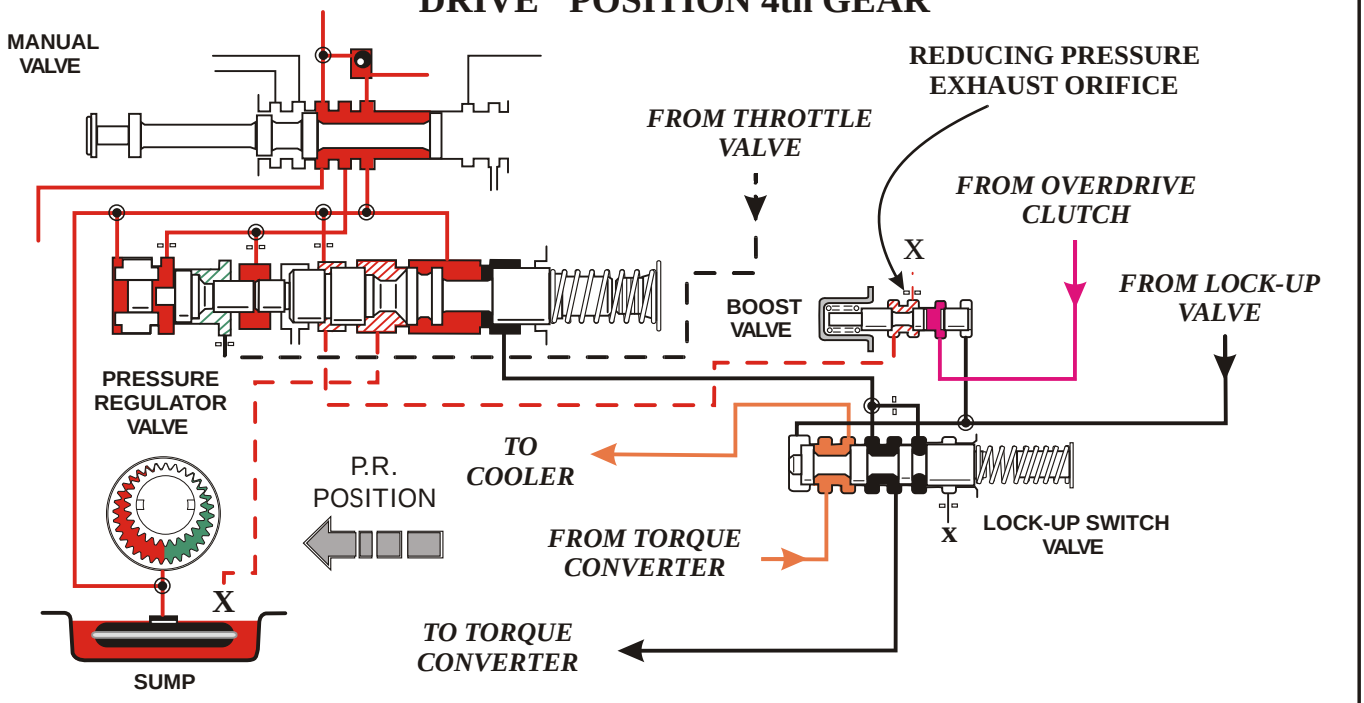
DIAGNOSTIC TROUBLE CODE P1740

PARTIAL HYDRAULIC SCHEMATIC OF PRESSURE REGULATOR VALVE "DRIVE" POSITION 1st thru 3rd GEAR



Summary: Reducing pressure is applied to the 3rd land of the Pressure Regulator Valve which forces the valve to the right reducing line pressure when in 1st 2nd and 3rd gear.

PARTIAL HYDRAULIC SCHEMATIC OF PRESSURE REGULATOR VALVE "DRIVE" POSITION 4th GEAR

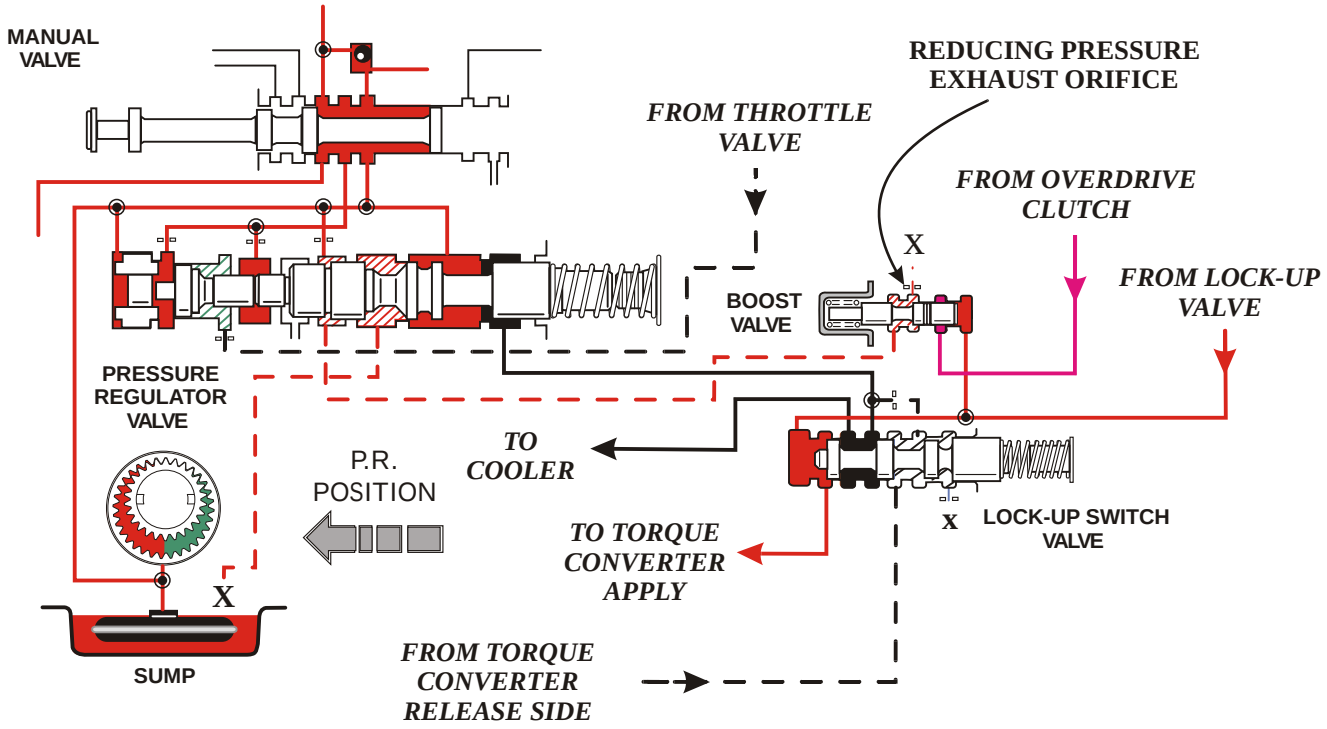


Summary: The Boost Valve is stroked via Overdrive Clutch pressure or Lock-up Signal Pressure from the Lock-up Valve, while in 3rd or 4th gear. This drains the Reducing Pressure from the 3rd land of the Pressure Regulator Valve. This allows the Pressure Regulator Valve to move to the left, increasing Main Line Pressure.

Figure 2

DIAGNOSTIC TROUBLE CODE P1740

PARTIAL HYDRAULIC SCHEMATIC OF PRESSURE REGULATOR VALVE "DRIVE" POSITION 4th GEAR WITH TCC "ON"



Summary: The Boost Valve is stroked via Overdrive Clutch pressure or Lock-up Signal Pressure from the Lock-up Valve, while in 3rd or 4th gear. This drains the Reducing Pressure from the 3rd land of the Pressure Regulator Valve. This allows the Pressure Regulator Valve to move to the left, increasing Main Line Pressure.

NOTE: Increasing the diameter of the Reducing Pressure Exhaust orifice, will allow the Pressure Regulator Valve to stroke to the left at a faster rate which will allow Line Pressure to increase quicker for Torque Converter Clutch application and for the 4th clutch application.

Figure 3

CHRYSLER 47RE
SOFT TCC APPLY

COMPLAINT: Before and/or after rebuild, vehicles equipped with the 47RE transmission may exhibit a soft TCC apply or repeated TCC failure.

CAUSE: One cause may be, TCC release oil not exhausting quickly enough from the front side of the Torque Converter.(See Figure 1)

CORRECTION: Change or modify the narrow slot separator plate(See Figure 2) to the wide slot separator Plate.(See Figure 3)

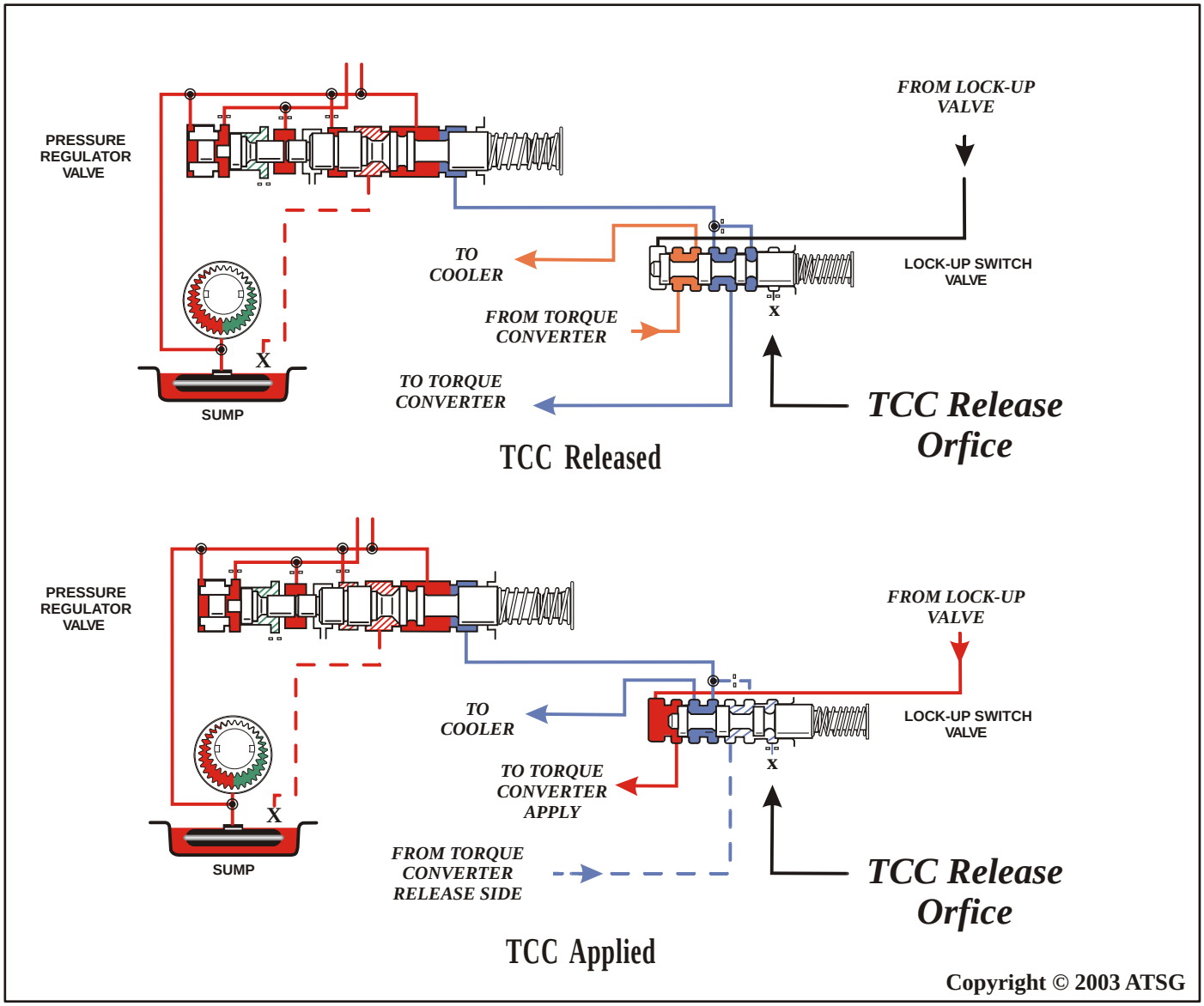


Figure 1

NARROW EXHAUST SLOT

TCC Exhaust Orfice
.118

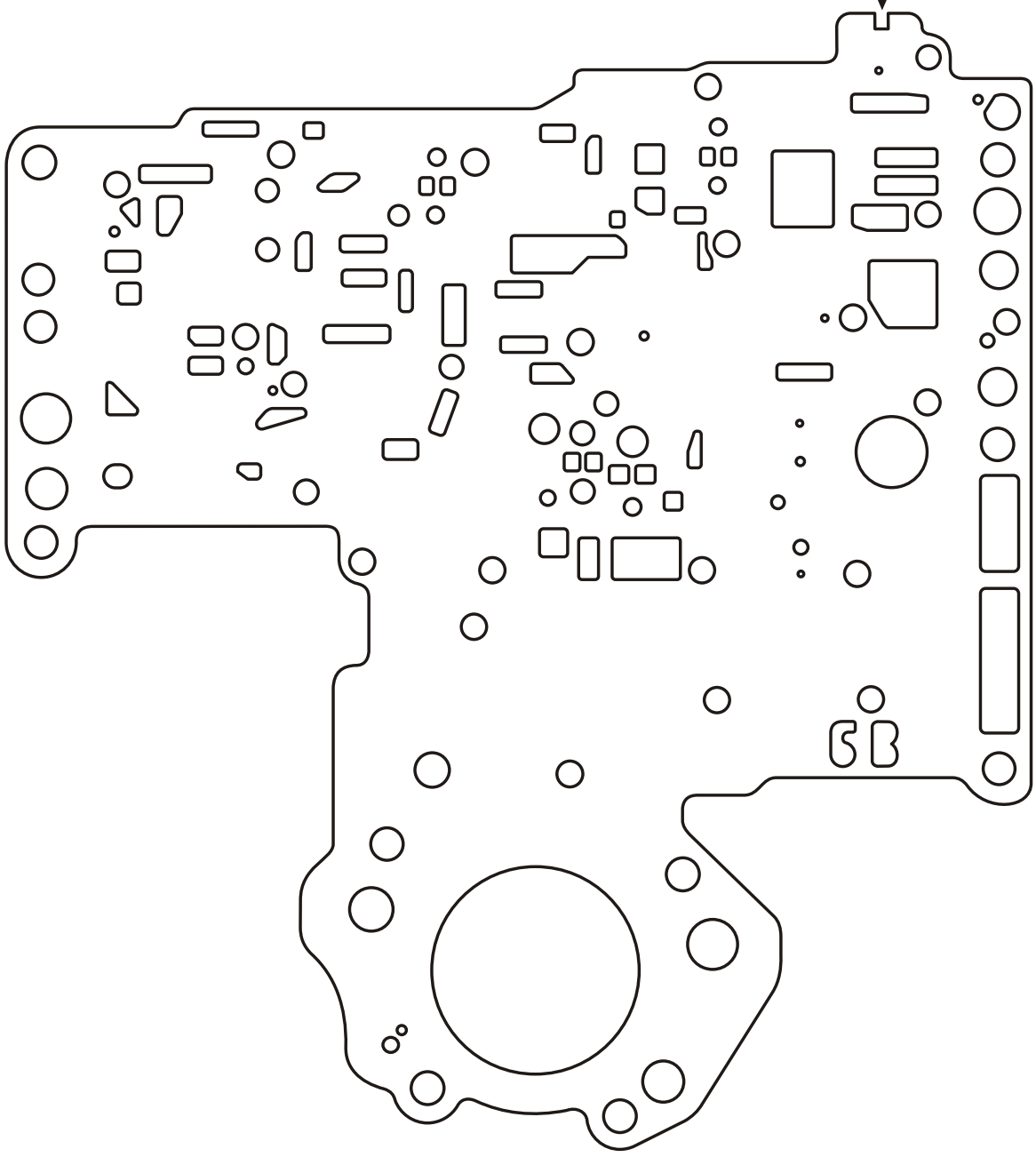


Figure 2

WIDE EXHAUST SLOT

TCC Exhaust Orfice
.243

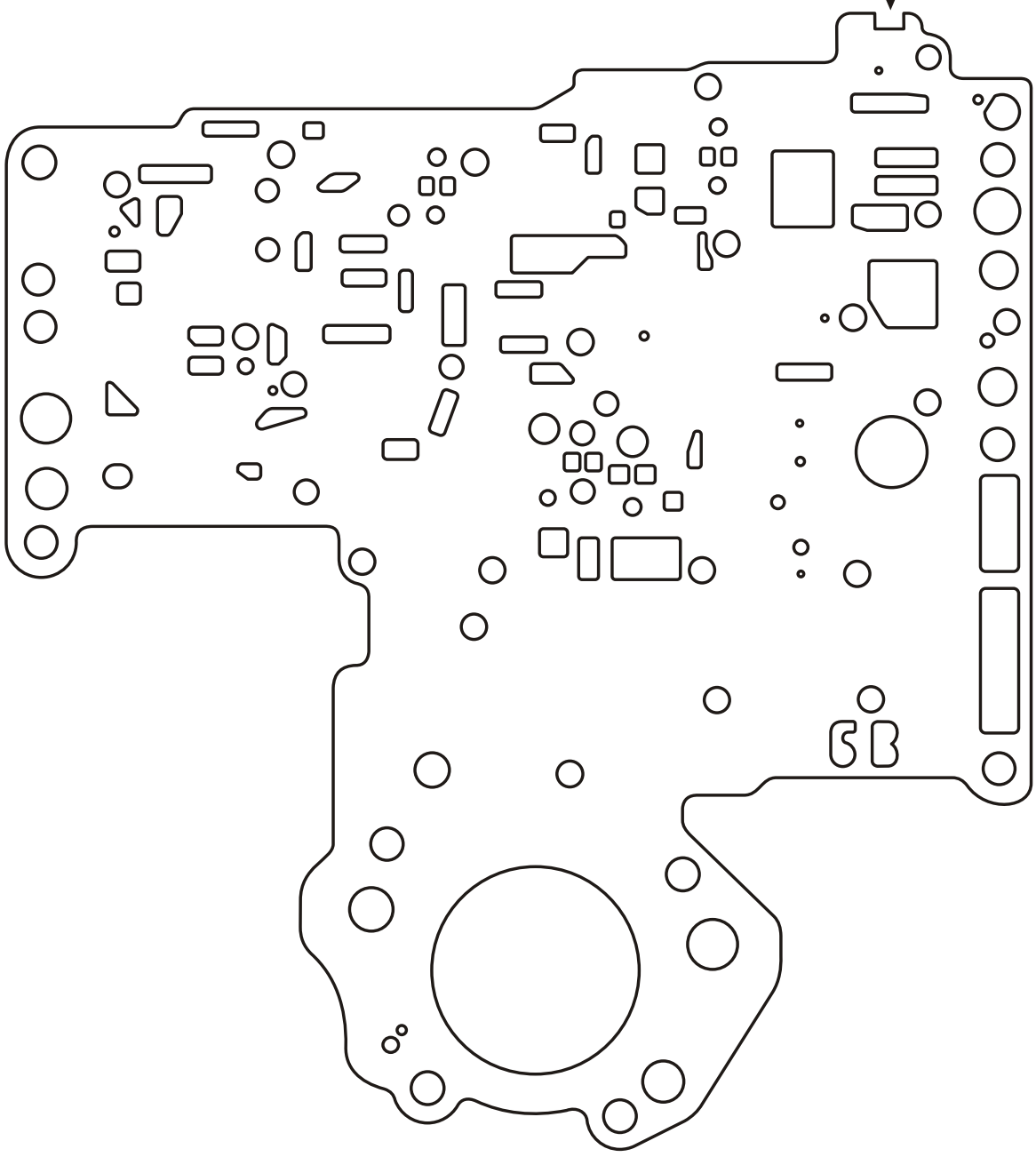


Figure 3

CHRYSLER OR JEEP 42RE-46RE
STALLING IN REVERSE AND/OR PLANETARY FAILURE

COMPLAINT: Before or after overhaul, Chrysler or Jeep vehicles, equipped with the 42RE-46RE transmissions, may exhibit a stalling condition in Reverse or repeated planetary failure.

CAUSE: The cause may be, a restricted Auxillary Transmission Cooler. ***NOTE:*** During the "flushing" process, this may be overlooked because of a "Bypass" tube , as shown in Figure 1, that connects the two cooler lines together, mis-leading the technician into thinking that the Auxillary Transmission Cooler is clear. The Auxillary Transmission Cooler can not be flushed very easily because of its fin type construction, as shown in Figure 2 ***(Note: the Auxillary Cooler has a thermal bypass that does not open until the fluid or cleaning solvent is at temperatures around 100° F)***. This can also cause valves to hang as well as continual clogging of the Governor Solenoid Screen.

CORRECTION: Replace the Auxillary Transmission Cooler as needed.

AUXILLIARY TRANSMISSION COOLER LOCATION

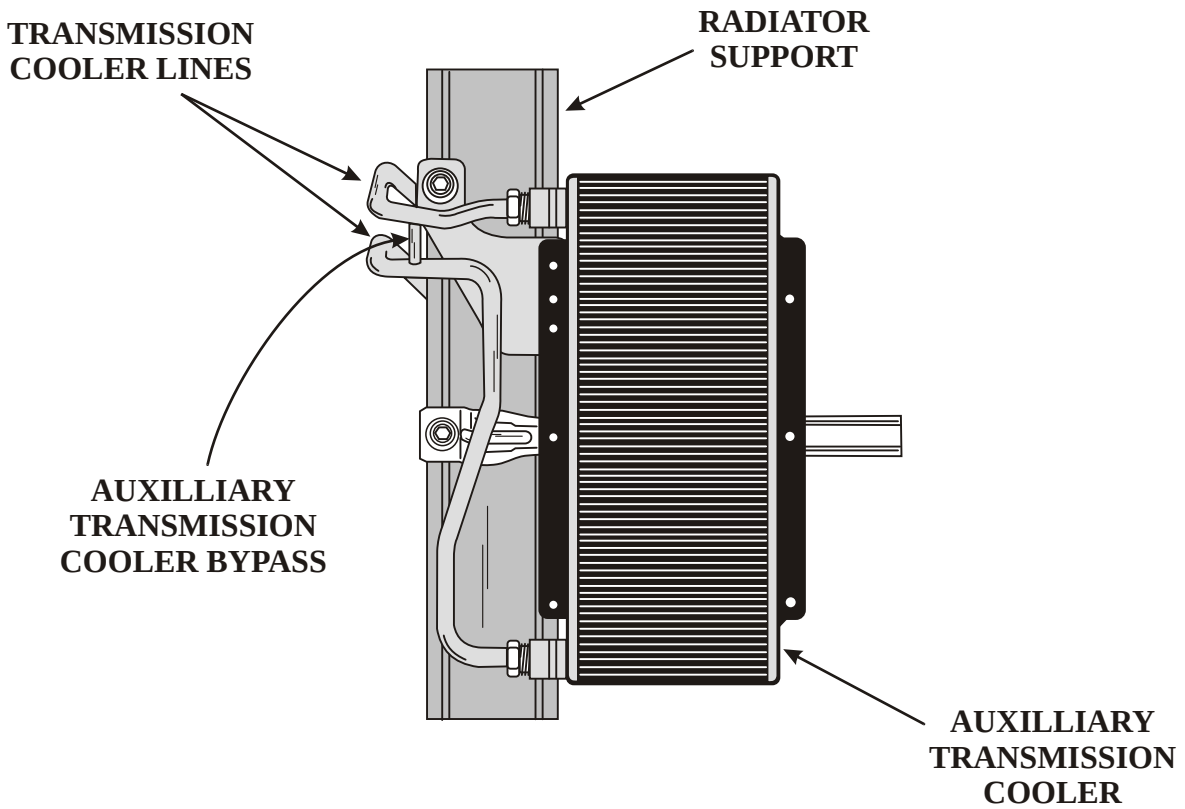
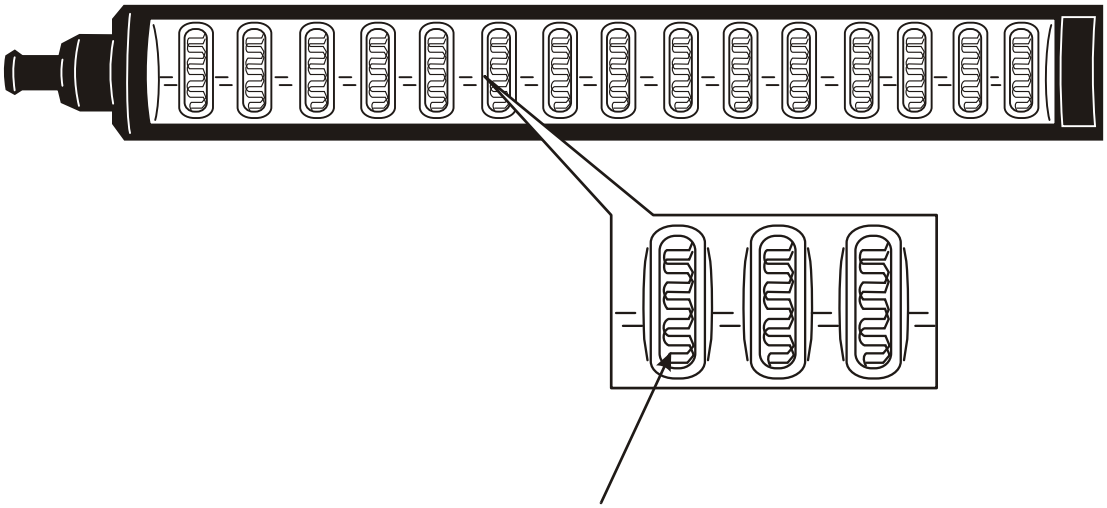


Figure 1

AUXILLIARY TRANSMISSION COOLER CUT-AWAY



THE AUXILLARY TRANSMISSION COOLER HAS A FIN TYPE CONSTRUCTION WHICH MAKES COOLER FLUSHING ALMOST IMPOSSIBLE

Figure 2

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DODGE/JEEP 42-44 RE UNITS

REVISED FRONT BAND ADJUSTMENT SPECIFICATIONS

CHANGE: The front band adjustment specification has been changed from $3^{5/8}$ " to 3 turns after tightening the band adjustment stud to 70 in. lbs. (Refer to Figure 1)

REASON: Improved 1-2 shift quality.

SERVICE INFORMATION:

Factory Service Bulletin.....21-16-98

NOTE: This adjustment pertains to band adjustment studs with SAE (Fine) thread.

ADJUST FRONT BAND TO 3 TURNS

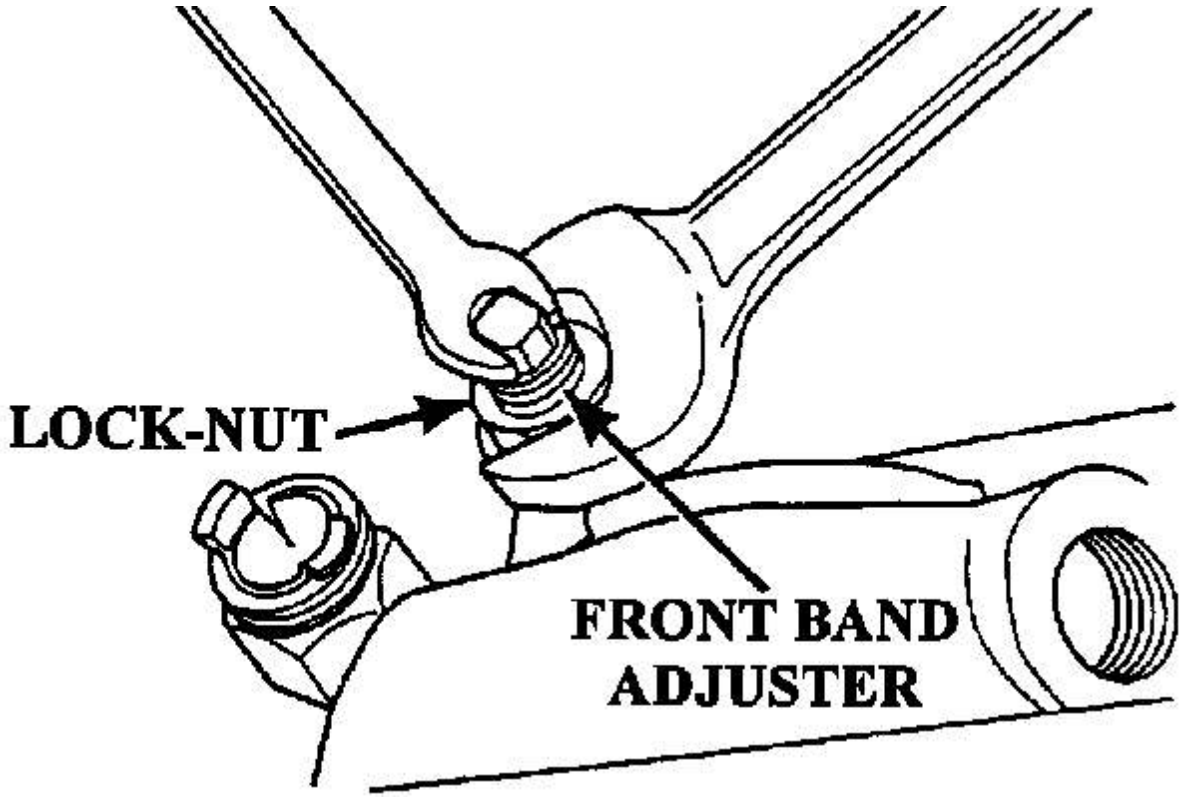


Figure 1

1996 & LATER JEEP & DODGE TRUCKS WITH RE TRANSMISSIONS

FALLING OUT OF 4TH GEAR, THIRD GEAR STARTS & LOSS OF TCC APPLICATION

COMPLAINT: One of these vehicles may come in with complaints of falling out of 4th gear and loss of TCC application. Codes P1763 for "Governor Pressure Sensor Volts to High" or P1492 for "Battery Temperature Sensor Volts to High". In addition, other sensor codes may be stored.
On **DIESEL** applications, the transmission may be stuck in 3rd gear and governor pressure may be 70 psi ***IN PARK.*** When governor pressure sensor signal voltage is checked, the voltmeter indicates **a full 5 volts!** The scan tool may show erratic engine rpm as well.
On **GASOLINE** applications, the engine control system may be out of "Closed Loop". The "Battery Temp Sensor" parameter on ***the scan tool may indicate 350ºF*** and Battery Temp Sensor Volts parameter may indicate little or no voltage even when battery temperature is actually cool and oxygen sensor codes may also be stored.

CAUSE: The above complaints are all caused by a bad internal computer ground, this ground is shared by many components depending on model and engine application.
This ground is located at the ***A4*** terminal in the ***GRAY*** connector at the PCM. On a **DIESEL** application, the Engine RPM Sensor can load up with oil which can cause the A4 ground to go bad resulting in a 5 volt condition on the Governor Pressure Sensor signal wire creating high governor pressure.
The Engine RPM Sensor, Governor Pressure Sensor and the Battery Temp. Sensor all share this ground as well as other engine management sensors as shown in Figure 1.
On a **GASOLINE** application the Governor Pressure Sensor, Battery Temp. Sensor and Oxygen Sensors share this ground as well as other engine management sensors as shown in the wire diagram in Figure 2.

CORRECTION: The Battery Temp. Sensor is used to convey battery temperature to the PCM while the PCM monitors charging system voltage, in order to control battery charging rate. The result of this data is, charging system voltage will be higher at colder temperatures, and is gradually reduced as battery temperature rises.

The Battery Temp. Sensor is located under the battery in the battery tray, (Refer to Figure 3). On diesel equipped vehicles with dual batteries, it is located in the driver's side battery tray.
This location is enough to cause problems due to corrosion. The sensor wire harness travels underneath the battery tray, (See Figure 4), to a 2 terminal connector, (See Figure 5), where the sensor resistance can be checked. Resistance values are, 9,000 (9k) to 11,000 (11k) ohms at 75ºF to 80ºF (25ºC).
Battery Temp. Sensor temperature range is -40ºF to 389ºF (-40ºC to 199ºC).
Battery Temp. Sensor voltage range is 0 to 5.1.
The poorer the ground is, the lower the voltage indicated will be, resulting in a high temperature reading. This sensor works opposite of a normal thermister.

Repair the ground or replace the sensor causing the poor ground.

FALLING OUT OF 4TH GEAR & LOSS OF TCC APPLICATION

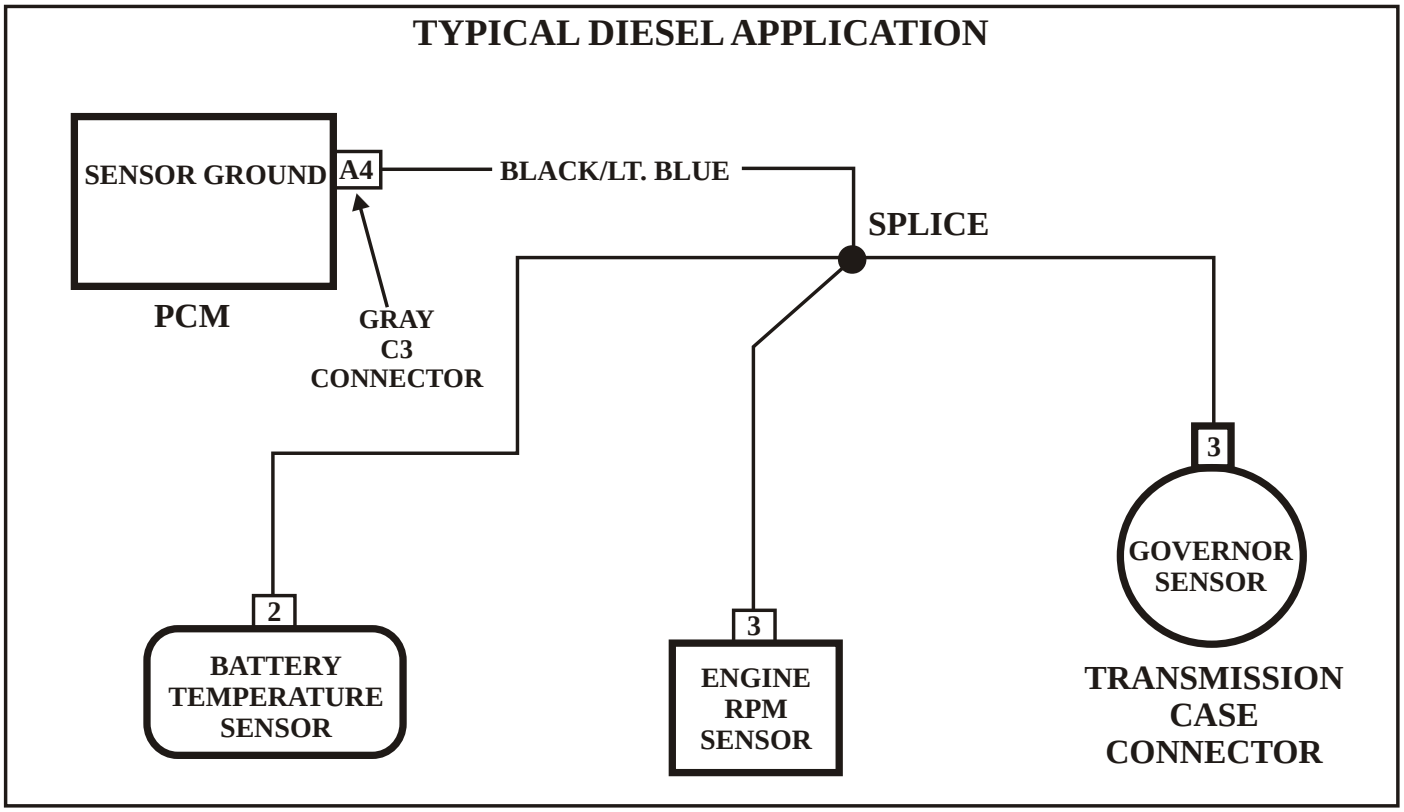


Figure 1

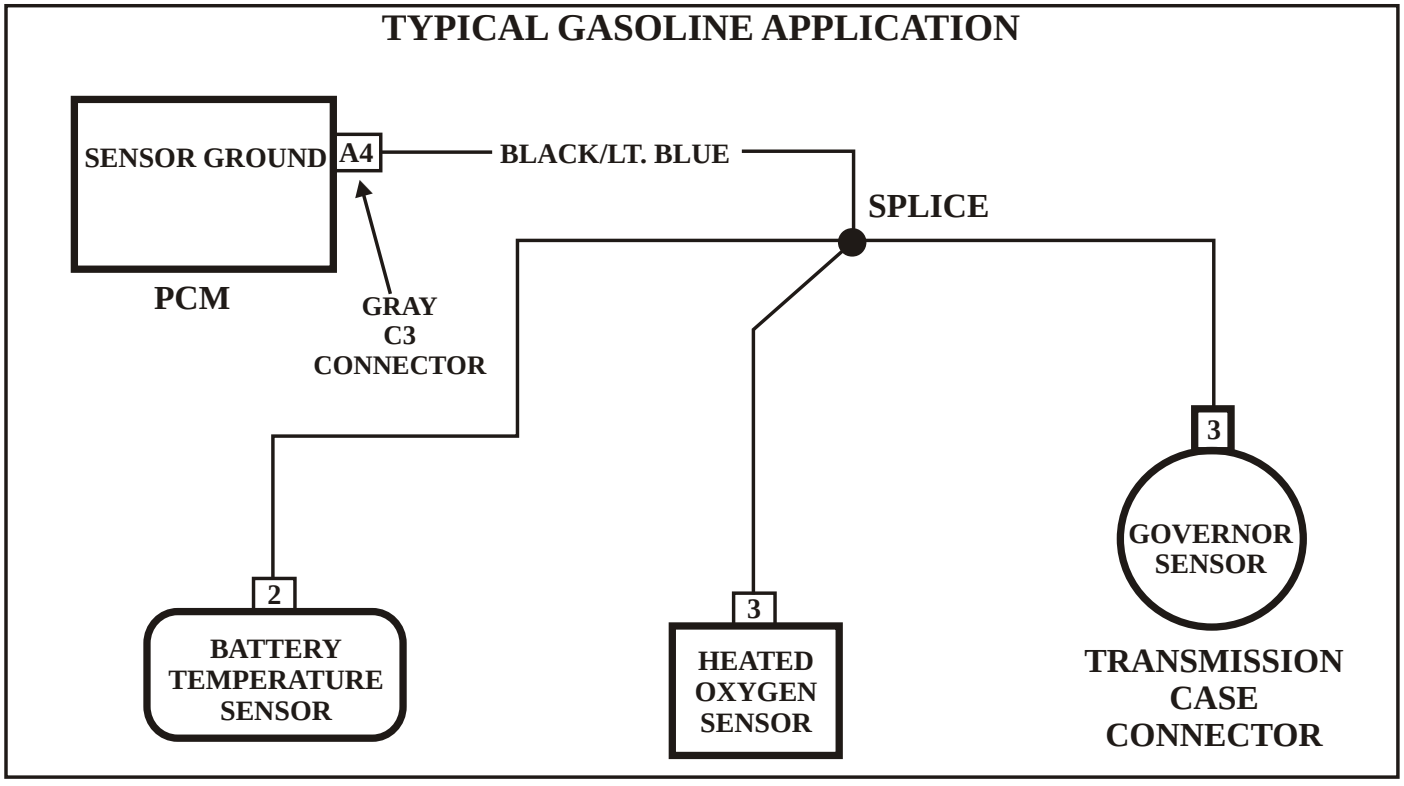


Figure 2

FALLING OUT OF 4TH GEAR & LOSS OF TCC APPLICATION

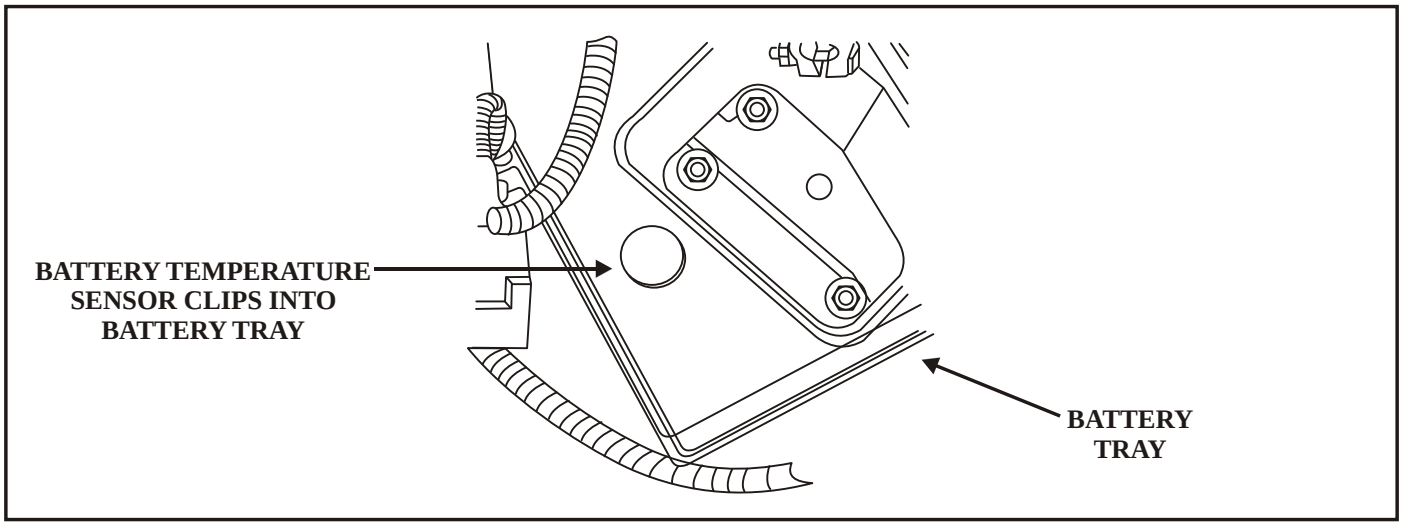


Figure 3

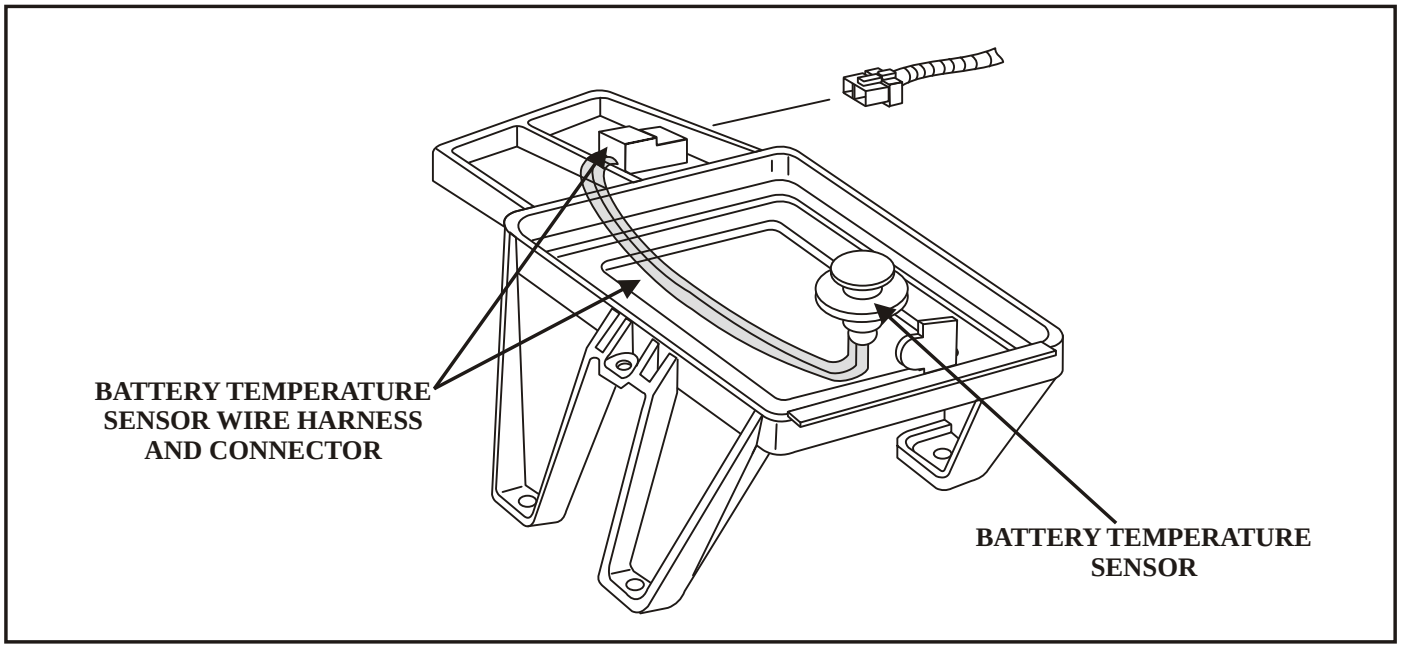


Figure 4

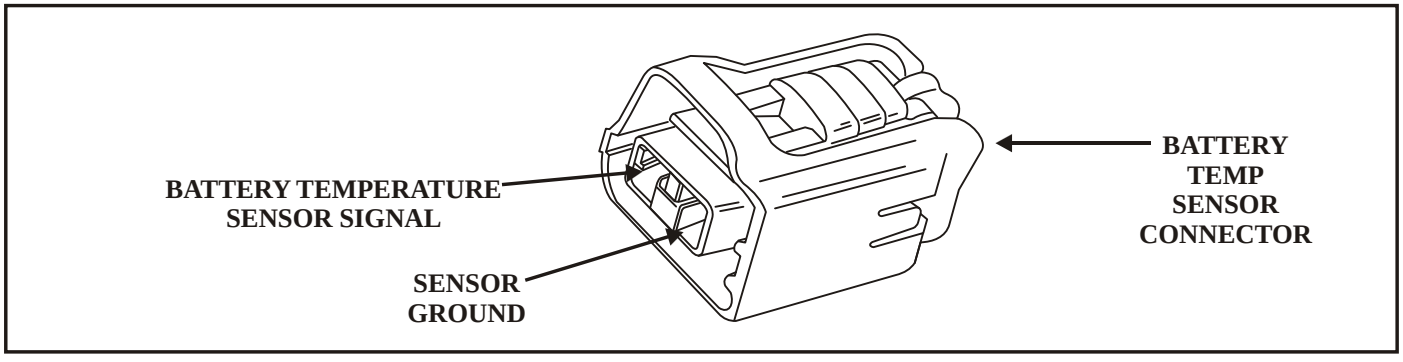


Figure 5

CHRYSLER 42RE/46RE
HARSH REVERSE ENGAGEMENT

COMPLAINT: Some 1999-2000 vehicles equipped with the 42RE/46RE may exhibit a harsh engagement in reverse.

CAUSE: One cause may be, that the number 9 checkball has distorted the separator plate and can no longer seat correctly, allowing excessive apply pressure into the reverse servo apply passage.

CORRECTION: On both 42RE and 46RE the steel number 9 checkball should be replaced with a torlon checkball. (See figure 1) Replace the separator plate on the 42RE (See Figure 2) and the 46RE (See Figure 3). Chrysler has issued a bulletin (21-01-00) for 1999-2000 vehicles equipped with either a 42RE or a 46RE with this complaint.

SERVICE INFORMATION:

TORLON CHECKBALL..... 52118261
42RE SEPARATOR PLATE..... 52118272
46RE SEPARATOR PLATE..... 4617196AB

**TRANSFER PLATE "UPPER SIDE"
CHECKBALL LOCATIONS**

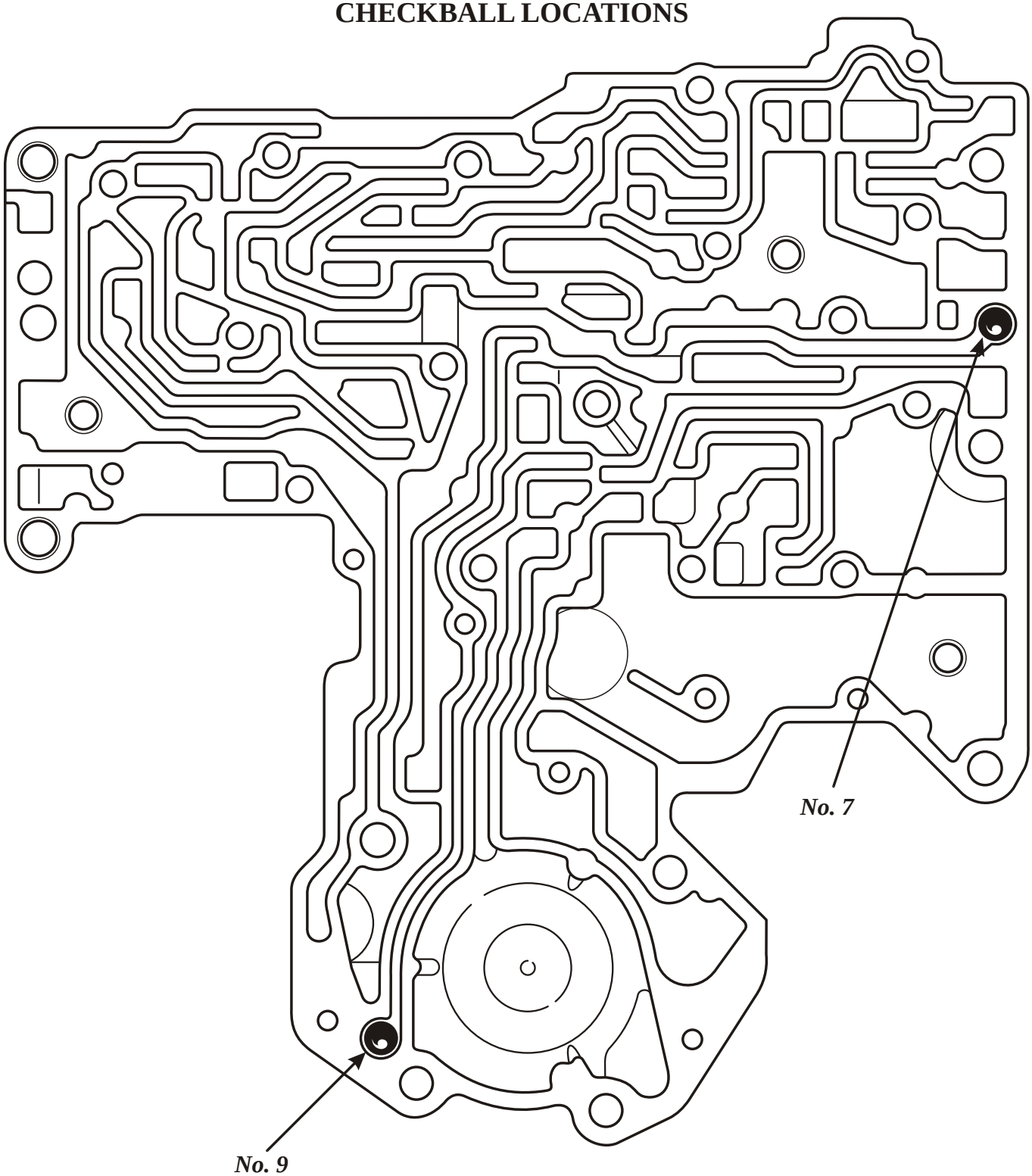


Figure 1

42RE SPACER PLATE

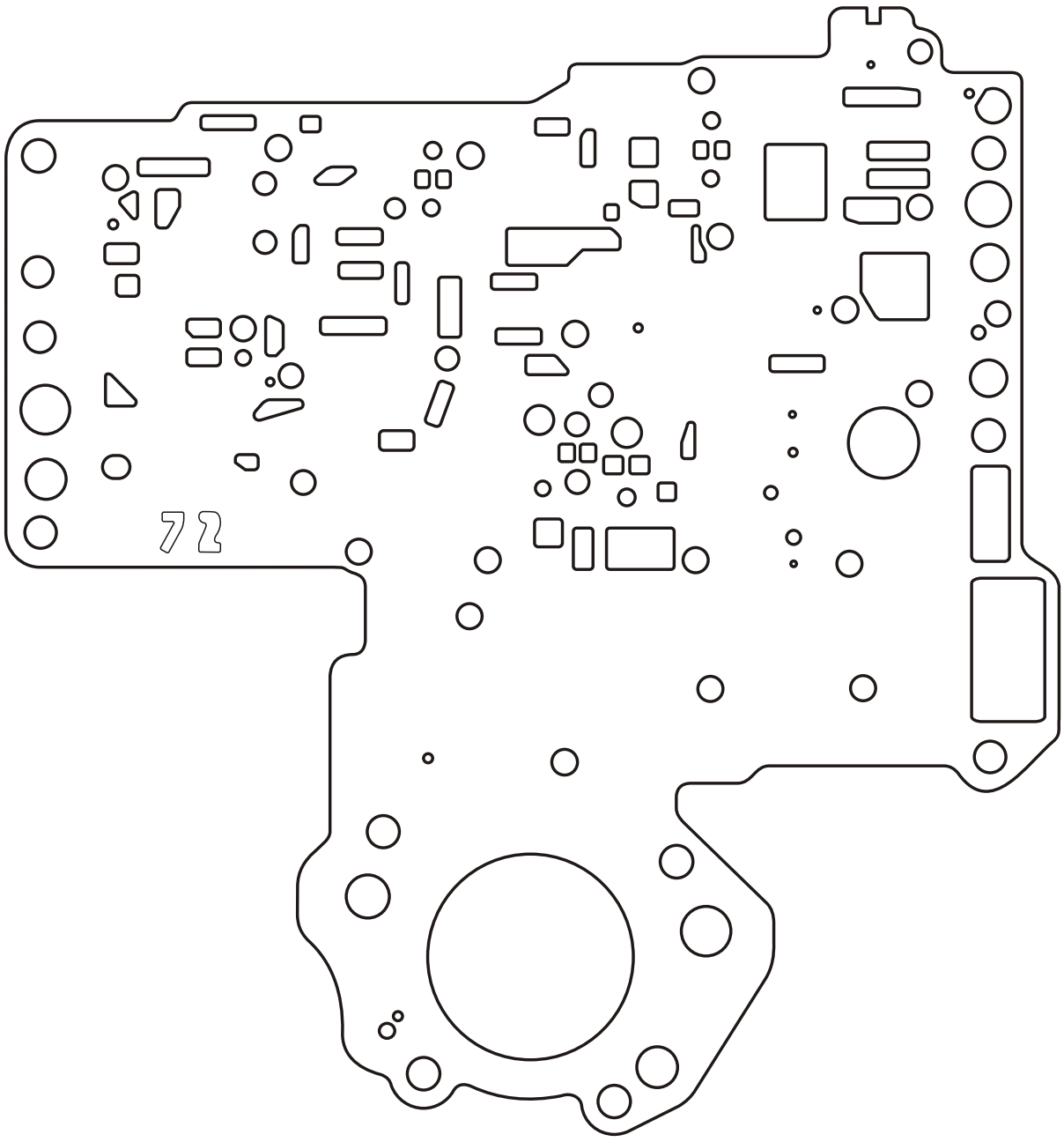


Figure 2

46RE SPACER PLATE

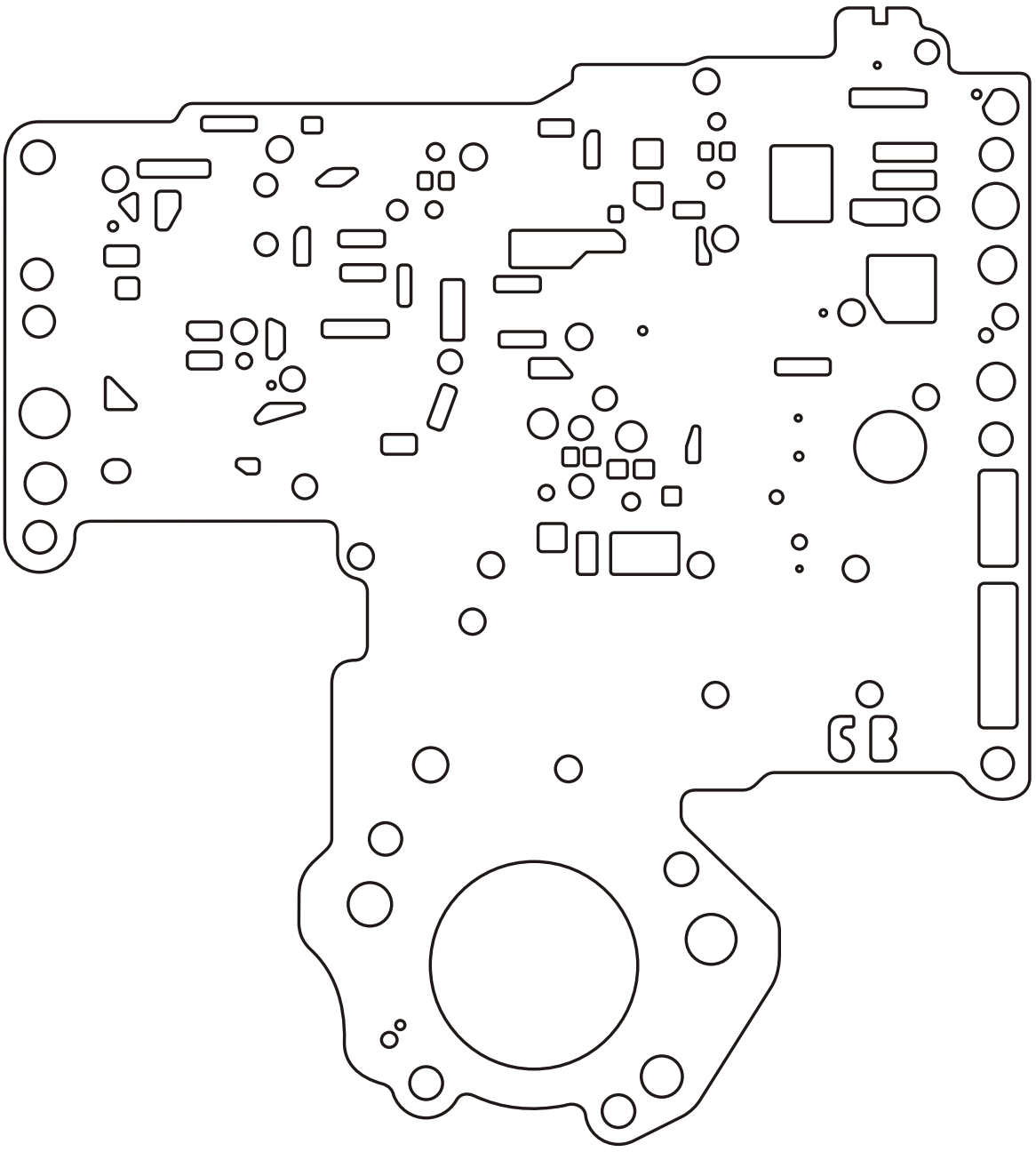


Figure 3

999T

CODE P0740 NO OR INSUFFICIENT RPM DROP DURING TCC

COMPLAINT: 1996 and newer full size V6 Ram Cargo Vans with a 3 speed 999T (904 Torqflite with TCC Solenoid) usually found in fleet services produce a code P0740; " ***No Or Insufficient RPM Drop During TCC***" after overhaul. The converter was changed at the time of rebuild and changed several times again in an attempt to solve the problem. The solenoids, valve body and even the computer has been changed without resolving the problem.

CAUSE: These particular type vehicles use very high stall speed converters (approximately 3000 RPM's in some of them). When a lower stall converter is placed into the vehicle, the computer does not see the required RPM drop at the time the Torque Converter Clutch applies producing the code.

CORRECTION: If the converter does not need to be changed don't change it. If it does need to be changed, insist on having the original converter rebuilt. Going to the dealer to purchase a new converter has also been known to be unproductive.

Note: Usually these Vans have the 4 speed RE unit in them which is why all reference materials only provide 4 speed information. This is your tip that you are working on a special fleet service, no thrills, bells and whistles vehicle. Keep that converter!

Tip: Gary Carne from Freeway Transmissions had several vehicles at one time with this problem as they had an account that used these Commercial Vans which Chrysler does not recognize as a factory option. He had to make converters to solve the problem. He converted a 2.5L 604 10 inch Converter to fit this application.

CHRYSLER FWD CARS & VANS

1993 & LATER VSS SYSTEM DIAGNOSIS

COMPLAINT: The vehicle may have a complaint of, no speedometer operation and may possibly have all the PRNODL lamps illuminated. When attempting to scan the TCM, the scan tool indicates, in the "Modules Responding" screen, that the TCM is not responding.
A scan of the PCM may reveal zero miles per hour and a code P0500 for "Loss Of Vehicle Speed" may be stored.

CAUSE: A Faulty Output Speed Sensor or it's circuit, A loss of power to the TCM at terminal 11, A TCM that has not had the "Pinion Factor" flashed, A faulty TCM, A faulty PCM or a fault in the Electronic Analog Instrument Cluster.

PRINCIPLES OF OPERATION:
The example used here is a 1997 Dodge Caravan with 3.8L engine and 41TE transmission. Referring to the wire diagram in Figure 1, The PCM provides a 5 volt signal from terminal 66 of the PCM to terminal58 of the TCM. As the vehicle begins to move, the TCM provides a square wave signal, using it's internal buffer, to the PCM that is proportional to vehicle speed by pulsing the 5 volt voltage supply between ground and 5 volts. The PCM monitors and interprets this pulse into miles per hour. It is then broadcasted by the PCM over the communication network to all other modules requiring this signal.

CORRECTION: Check the Output Speed Sensor signal at TCM terminals 13 and 14 at the TCM with your meter set on HERTZ (Hz) or with a scope. You should see approximately 2.3Hz @ 10 mph to about 800Hz @ 40 mph, or scan other modules to see if they display vehicle speed.
This would mean the speed sensor and the TCM are not the cause of the problem.
The 5 volt circuit at TCM terminal 58 can also be checked for the toggle between 5 volts and zero. Be sure to turn the wheels very slowly when checking this signal, or the meter display will freeze, leading to an incorrect diagnosis.

Only on vehicles equipped with a Transmission Range Sensor and the TCM being the cause of the loss of VSS signal, all the PRNODL lamps may be illuminated as shown in Figure 2. Before condemning the TCM, supply a direct 12 volt jumper lead to TCM terminal 11. If this cures the problem, replace the ignition switch. ***DO NOT*** leave the jumper lead installed and remove the jumper lead ***BEFORE*** turning the ignition off when this test is complete.
Check to see that the correct pinion factor is installed.
At this point the PCM or the Electronic Analog Instrument cluster may be at fault, diagnostics for these systems are continued on the following page.

CHRYSLER FWD CARS & VANS

1993 & LATER VSS SYSTEM DIAGNOSIS

CORRECTION ***continued:*** Verify power and grounds at the PCM, then perform the self diagnostic routines for the Electronic Analog Instrument Cluster. If code 940 comes up during the instrument cluster tests, the PCM is the probable cause of the previously mentioned complaints.

Electronic Analog Instrument Cluster Self Diagnostic Tests (Refer to Figure 2):

Code Retrieval:
1. Have the ignition "OFF".
2. Press and hold the TRIP and RESET buttons simultaneously.
3. While holding the TRIP and RESET buttons down, turn the ignition "ON".
4. Continue to hold the TRIP and RESET buttons down until the odometer window displays the word "CODE".

If no problem has been detected, a "999" will appear in the odometer window. If a fault is detected, the following is a list of codes that would be displayed in the odometer window:
110 = Cluster Memory Fault
111 = Cluster Calibration Fault
905 = No CCD Bus Message from TCM
921 = Odometer Fault from BCM
940 = No CCD Bus Message from PCM

After the codes have been displayed, the instrument cluster will enter the following 4 sequential test modes:

CHEC - 0 = Dim Test (The instrument cluster lights should dim)
CHEC - 1 = Calibration Test (See Chart Below)
CHEC - 2 = Odometer Test (Each digit should illuminate)
CHEC - 3 = Electronic Transmission Range Indicator Segment Test (Each segment of each digit should illuminate)

CHEC - 1 Calibration Test:
Speedometer
1.....0 MPH
2.....20 MPH
3.....55 MPH
4.....75 MPH
Tachometer
1.....0 RPM
2.....1000 RPM
3.....3000 RPM
4.....6000 RPM

CHRYSLER FWD CARS & VANS

1993 & LATER VSS SYSTEM DIAGNOSIS

CORRECTION ***continued:***

Fuel Gauge

1.....Empty
2.....1/8 Full
3.....1/4 Full
4.....Full

Temperature Gauge

1.....Cool
2.....Low Normal
3.....High Normal
4.....Hot

These checks only determine if the instrument cluster needs to be replaced.

1993 & LATER VSS SYSTEM DIAGNOSIS

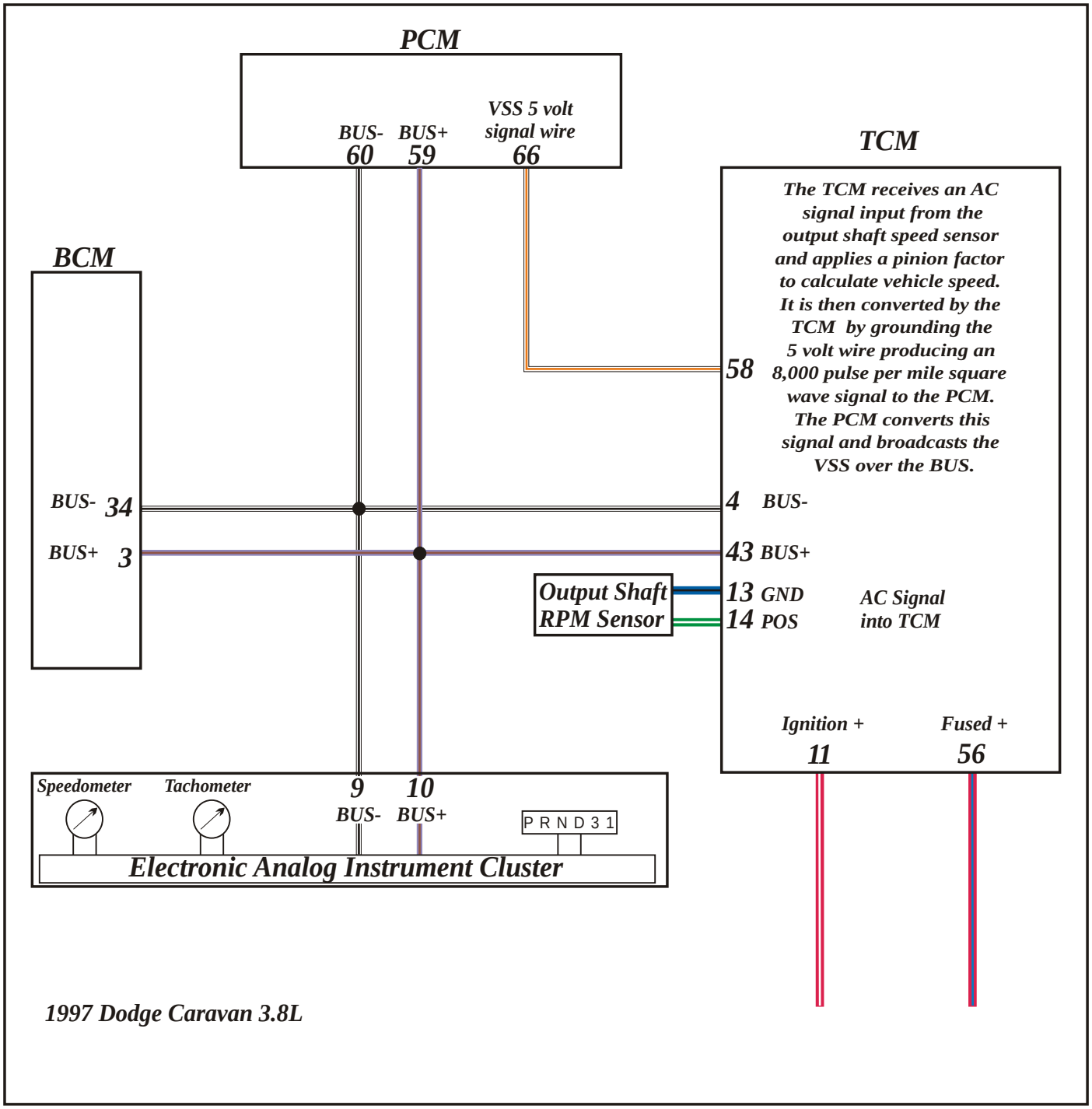


Figure 1

1993 & LATER VSS SYSTEM DIAGNOSIS

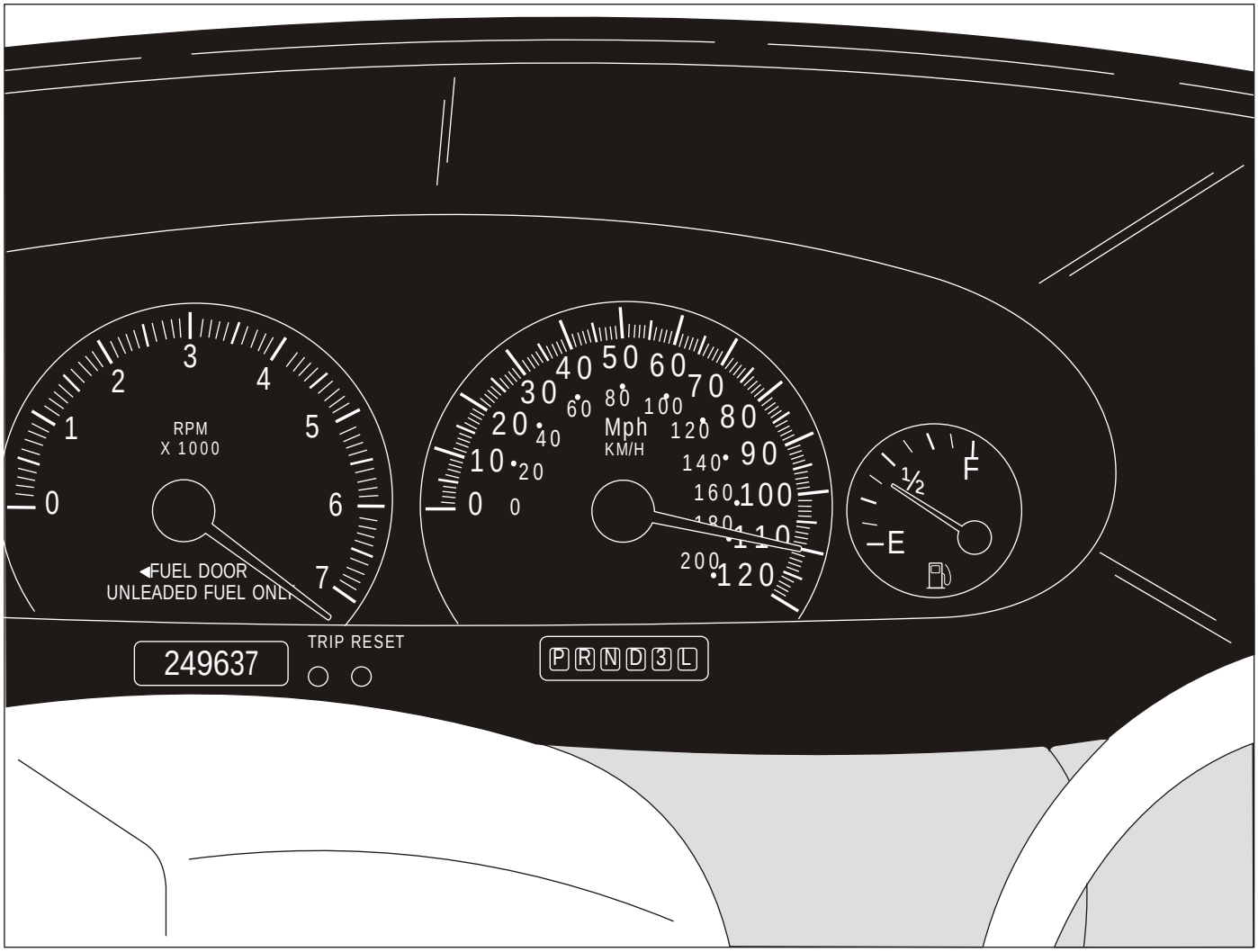


Figure 2

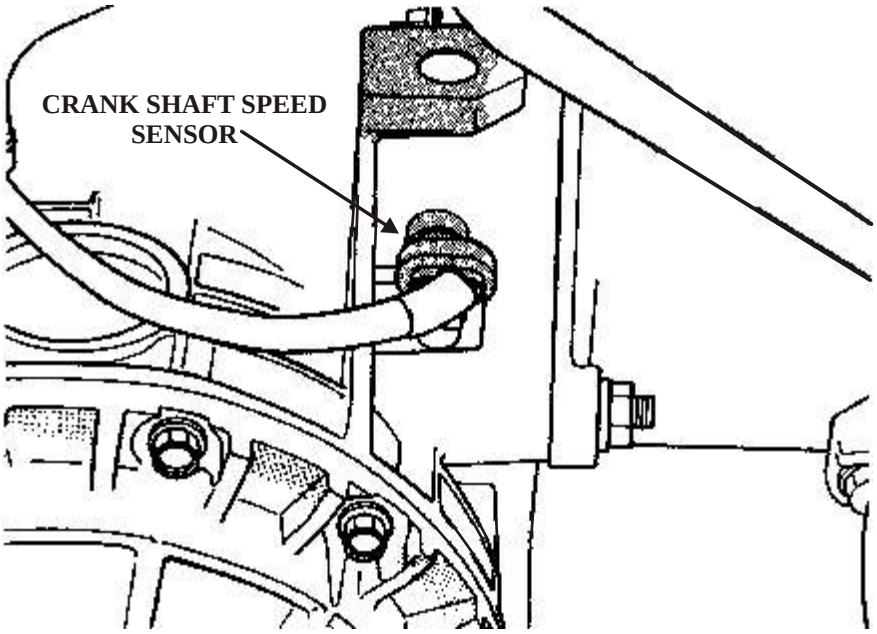
CHRYSLER LH VEHICLES

CODE 1391 INTERMITTENT LOSS OF CRANK OR CAM

COMPLAINT: LH vehicles such as LHS, Concorde, Intrepid, New Yorker and Vision with a 3.5 L engine may experience a code 1391 "Intermittent Loss of Crank or Cam Signal" after the transmission has been replaced. This will be accompanied with a rough running engine which cannot remain at idle for more than 4 to 6 seconds. The vehicle ran smoothly before the needed transmission work was performed. The Crank Shaft and Cam Shaft Speed Sensor were replaced without any success. The Crank Shaft Speed Sensor located in the converter housing (See Figure 1), is not adjustable with 3.5L applications so the sensor exciter ring on the flywheel (See Figure 2) may be suspect. But after an inspection it proves to be good.

CAUSE: One such known cause has been that during the removal or installation process of the transmission, while turning the torque converter, the crankshaft kicked back from compression in the engine causing the timing belt to skip one cog, or the crankshaft was turned opposite to normal engine rotation causing the skip (See Figure 3). This incident had occurred with a vehicle that had 80,000 plus miles. So the belt was worn.

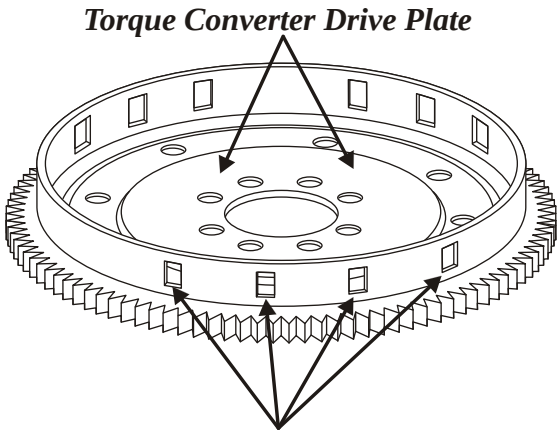
CORRECTION: Re-position or replace the timing belt. .



Special Thanks to:
Mike and Dave McRoberts
from Suburban Transmissions

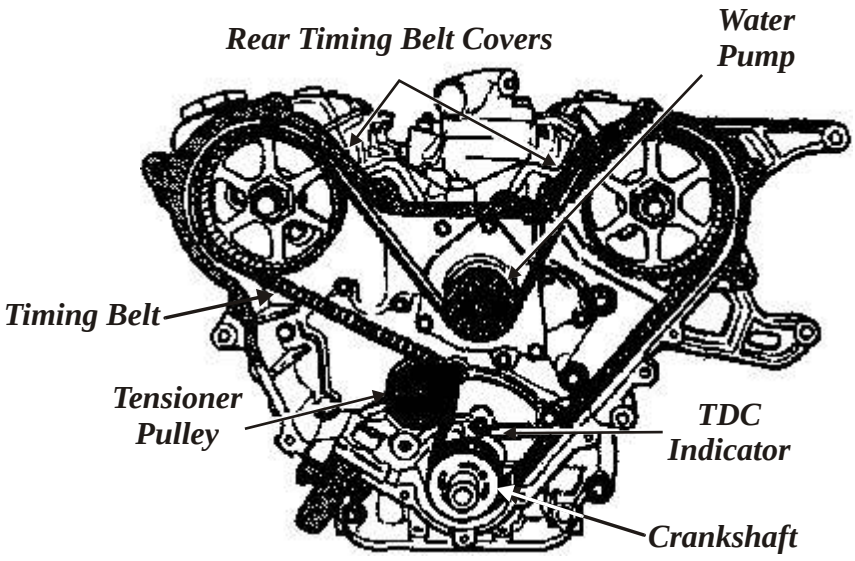
Figure 1

CODE 1391 INTERMITTENT LOSS OF CRANK OR CAM



The crankshaft position sensor detects slots cut into the transmission drive plate (flywheel) extension. There are 3 sets of slots with 4 cuts (windows) in each set totaling 12 windows. Basic timing is set by the position of the last slot in each group. Once the PCM senses that last slot, it determines crankshaft position (which piston will be next at TDC) from the camshaft position sensor input. The 4 pulses generated by the crankshaft position sensor represents the 69º, 49º, 29º and 9º BTDC marks. It may take the PCM one engine revolution to determine crankshaft position.

Figure 2



3.5L LH Body

Figure 3

1998 CHRYSLER JA/JX & LH VEHICLES

CHANGES IN 41TE & 42LE TRANSAXLE PERFORMANCE

COMPLAINT: Certain implemented transaxle operations may be mistakenly diagnosed as transmission problems that may result in wasted time and parts costs.

CAUSE: Transaxle software refinements were implemented beginning with the 1998 model year for Cirrus, Stratus, Breeze, Sebring Convertible, Concorde and Intrepid equipped with the 41TE & 42LE transaxles.

CORRECTION: ***These changes are as follows:***

ALL LISTED MODELS

(1) The 4-3 coast down shift point was moved to a higher speed, this shift will occur at 30 mph. The higher shift point allows the transmission to achieve a lower gear quicker for better performance. Engine braking will be more noticeable due to the coast down shift occurring at a higher speed and engine rpm.

(2) On certain kick down conditions, Converter clutch will be delayed to increase performance especially when making passing maneuvers.
For non-autostck equipped vehicles, after a 4-3 kick down from "D" to "3" (as long as the transmission stays in 3rd gear), there will be approximately a 6 second delay before converter clutch application takes place.
For autostick equipped vehicles, the lockup delay will be approximately 10 seconds.

(3) When in the "3" position, converter clutch can be achieved at approximately 42 mph.

2.0L CIRRUS, STRATUS & BREEZE

(1) The amount of throttle needed to achieve low speed kick downs was reduced.

(2) Kick downs into 1st gear can be achieved up to approximately 32 mph.

(3) Wide open throttle 1-2 upshifts have been moved to 6200 rpm and 2-3 wide open throttle upshifts now occur at 6000 rpm.

(4) The speed for a 3-2 kick down has been increased to 62 mph.

2.4/2.5L CIRRUS, STRATUS, BREEZE & SEBRING CONVERTIBLE

(1) The amount of throttle needed to achieve low speed kick downs has been reduced.

AUDI/VOLKSWAGEN 01M/01N

B2 & K1 CLUTCH ASSEMBLY

COMPLAINT: **K1 CLUTCH**

After overhaul the transmission experiences a bind-up on the 3-4 shift and a bind-up in reverse.

B2 CLUTCH

After overhaul the transmission experiences one or more of the following malfunctions, a harsh 1-2 shift, a harsh 3-4 shift, a 3-4 flared shift or a bang on a 3-2 coast down shift.

CAUSE: **K1 CLUTCH**

Mis-assembly of the K1 clutch is responsible for the above complaints.

B2 CLUTCH

Mis-assembly of the B2 Clutch assembly is responsible for the above complaints.

CORRECTION: **K1 CLUTCH**

During the 1995 model year the Phase 2 redesign of the K1 clutch took place. The obvious difference was the K1 drum now did not have a shaft. With the new design, the K1 and the K3 drums had to be pressed apart. Other differences are mainly dimensional. The K1 clutch pack is assembled as follows:

1. After the bottom piston, coil spring assembly, top spring assembly and snap ring have been installed into the drum, install the waved plate.
2. Install the .079" steel plate.
3. Install 1 friction plate and 1 .057" steel plate.
4. Place the K1 clutch hub, large diameter end, down on the bench, See Figure 1.
5. Install the top pressure plate onto the clutch hub.
6. Stack the remaining friction and steel plates onto the clutch hub, ending with a friction plate.
7. Install the 4 plastic clutch retainers, making certain that they snap into their respective holes in the clutch hub. Make certain the top friction plate on the clutch hub is below the tab of the plastic retainers as seen in Figure 1. The retainers for the Phase 2 K1 clutch are .640" tall.
   NOTE: Always replace these plastic retainers with new ones as they will most likely be broken because they are support bushings for the K3 drum.
8. Invert the clutch hub assembly and install it into the K1 drum as seen in Figure 2.
9. Install the snap ring into the groove of the K1 clutch drum working in between the clutch hub and the drum as also shown in Figure 2.

AUDI/VOLKSWAGEN 01M/01N

B2 & K1 CLUTCH ASSEMBLY

CORRECTION ***continued:***

B2 CLUTCH

The B2 clutch assembly was changed in 1998, making assembly of this clutch different than previous Phase 2 models. Referring to Figure 3, assemble the B2 clutch as follows:

1. Begin by placing the B2 clutch support into the case. This support is selective, and will determine how many clutch plates the pack will have. See the chart in Figure 4.
2. Place a .118" thick steel plate, (marked with a #3 on the wide lug), against the B2 clutch support.
3. Install the 3 spring caps into the holes in the steel plate.
4. Stack the clutch pack by beginning with a friction plate and then alternating steel plates and friction plates. The standard thickness of these steel plates is .079"(marked with a #2 on the wide lug), however these steel plates are selective in order to attain proper clutch clearances, see the chart in Figure 5 which is .050" to .060 ". When the last friction plate is installed, ***STOP!***
5. Install the 3 springs into the spring caps.
6. Install the remaining 3 spring caps onto the springs.
7. Install a .118" thick steel plate down against the spring caps.
8. Install the 2 shims on top of the previously installed .118" steel plate.
9. Install the 2 dished plates into the retainer with the first plate "dish up" and the second plate "dish down", (like a clam shell). Crimp the retainer edge slightly, to keep the dished plates in place.
10. Install the dished plate retainer assembly against the shims, with the open end facing up.

K1 CLUTCH ASSEMBLY

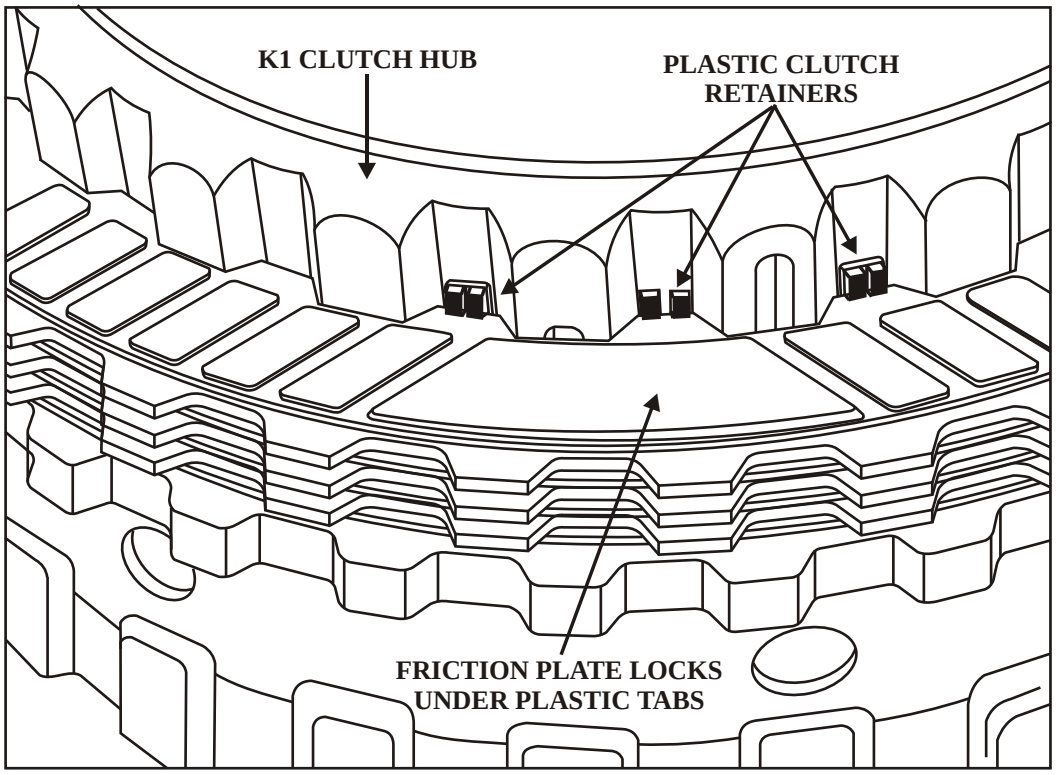


Figure 1

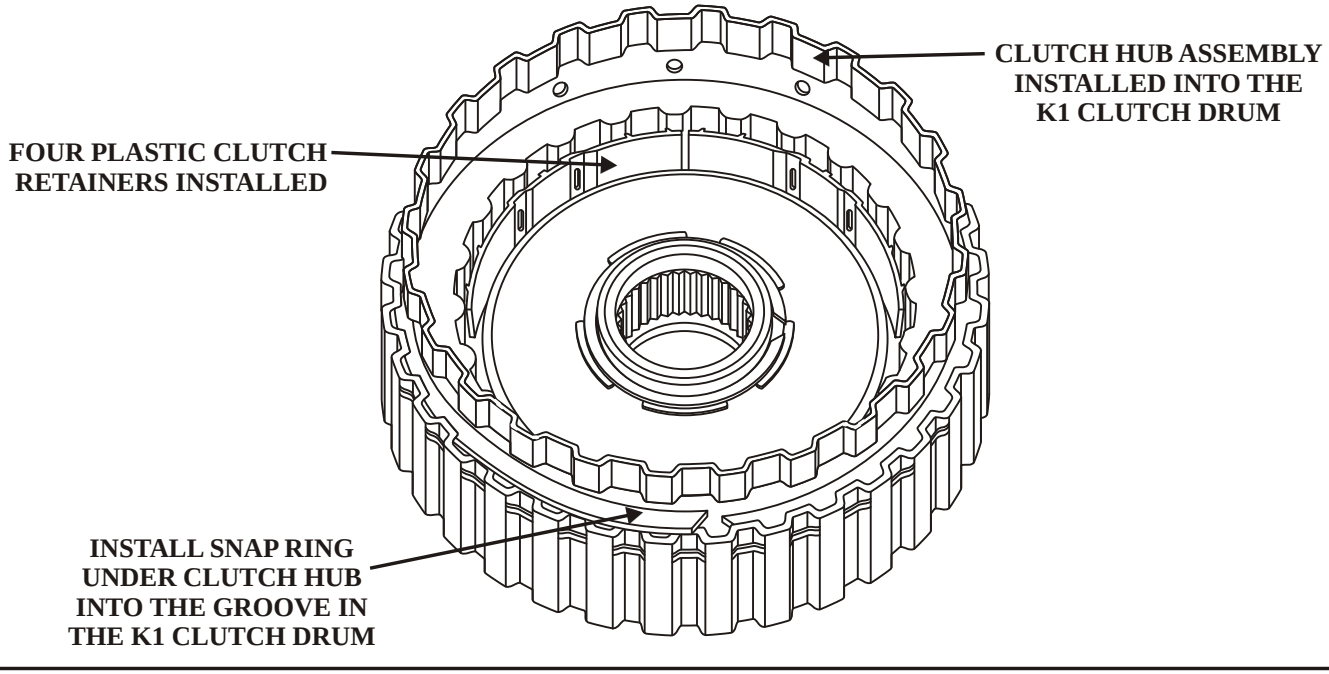


Figure 2

B2 CLUTCH ASSEMBLY

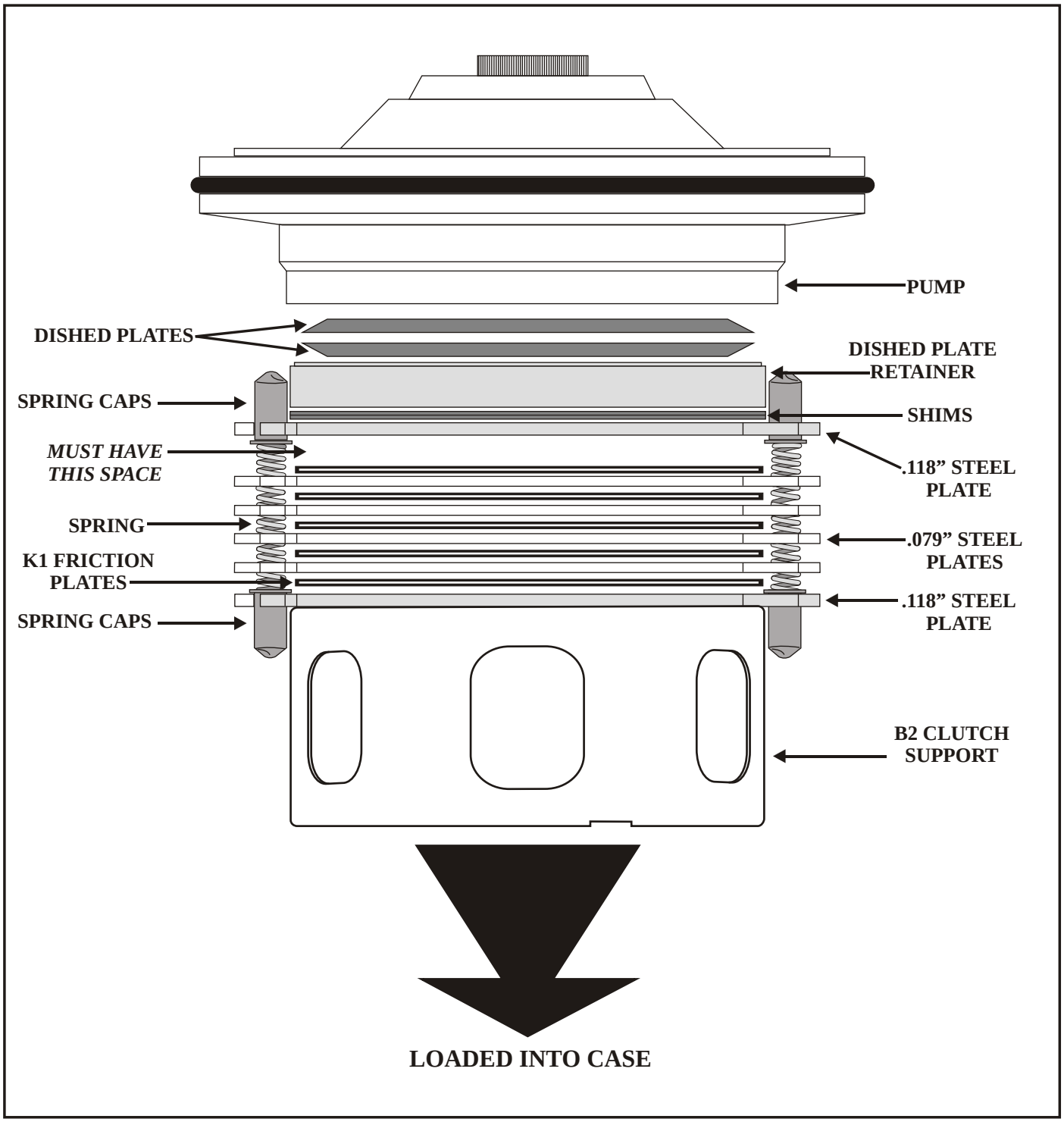


Figure 3

B2 CLUTCH ASSEMBLY

B2 CLUTCH SUPPORT HEIGHT CHART	
2-4 CLUTCH SUPPORT HEIGHT	**CLUTCH QUANTITY**
2.846” (72.29mm)	4
2.701” (68.60mm)	5
2.555” (64.90mm)	6

Figure 4

B2 SELECTIVE STEEL PLATE USAGE CHART	
THICKNESS	**VW PART NUMBER**
.079” (2mm)	097-323-463
.088” (2.25mm)	097-323-463-A
.098” (2.5mm)	097-323-463-B
.108” (2.75mm)	097-323-463-G
.118” (3mm)	097-323-463-C
.128” (3.25mm)	097-323-463-D
.138” (3.5mm)	097-323-463-E
.146” (3.75mm)	097-323-463-F

Figure 5

AUDI/VOLKSWAGEN
SOLENOID CODE INTERPRETATION

COMPLAINT: When a Volkswagen or Audi vehicle is equipped with a ZF Automatic Transmission, and using an aftermarket scan tool for code retrieval indicates a solenoid fault, the scan tool will display the solenoid fault code using VAG nomenclature.

CAUSE: For example, if an Audi A6 equipped with a ZF4HP18FLE stores a 00264 code, the scan tool displays "Electrical fault -N91 or Solenoid 4". This is VAG code nomenclature. ZF refers to this solenoid as EDS-1, but the scan tool does not help to identify which solenoid in the ZF transmission is N-91 or Solenoid 4.

CORRECTION: Refer to the chart in figure 1 for solenoid crossover identification between VAG and ZF nomenclature.

SOLENOID CODE INTERPRETATION

VAG TO ZF SOLENOID VALVE CONVERSION

VEHICLE APPLICATION	SCANNER DISPLAYS / TRANS-MISSION MODEL	ON/OFF SOLENOIDS			PRESSURE REGULATING SOLENOIDS				
		1 or A	2 or B	3 or C	4 or D	5 or E	6 or F	7 or G	8 or H
1991-97 AUDI 100 QUATRO & A6	4HP18FLE/FLA 01F/01K	N-88	N-89	N-90	N-91	N/A	N/A	N/A	N/A
ALL OTHER 1995 & LATER VW/AUDI MODELS	01M/01N/01P	EV-1 N-88	EV-2 N-89	EV-3 N-90	EV-4 N-91	*EV-5 N-92	EV-6 N-93	*EV-7 N-94	N/A
1995 TO PRESENT AUDI A4 & A8 1997 TO PRESENT A6 1996 TO PRESENT VW PASSAT	5HP19FL 01V	MV-1	MV-2	MV-3	EDS-1	EDS-2	EDS-3	EDS-4	N/A
1996 TO PRESENT AUDI A8 AWD	5HP24A 01L	N-88	N-89	N-90	N-215	N-216	N-217	N-218	N-233

Solenoid EV5 & 7 are briefly turned on during a shift to reduce pressure for proper shift feel. Even though they are ON/OFF solenoids, they do regulate shift feel.

Figure 1

VOLKSWAGEN/AUDI

NO MOVEMENT

COMPLAINT: A complaint of "no movement", a"neutral condition" or a hesitation on take-off, may be the customer complaint, especially if it is a new second owner vehicle.

CAUSE: This can be caused by the driver of the vehicle. If the driver applies the brakes at the same time the throttle is depressed, such as in the case of a two footed driver, the above conditions will occur.

CORRECTION: When Volkswagen introduced Electric Throttle Control in 1998, the throttle cable was eliminated, making this a drive by wire system known as "E-GAS" on a VW, or "EPC" on an Audi.
Brake pedal function overrides any throttle operation. Therefore, if the brake and the throttle are depressed at the same time the ETC computer will return engine rpm to idle rpm which is all that will be available. ***No DTC's will be stored. This is a normal reaction of this system due to safety issues.***

To cancel this default action and return to normal throttle operation, release the brake pedal and rapidly apply the accelerator pedal, or release the accelerator pedal and then reapply it.

NOTE: Road test the vehicle with the customer driving and notice the customer's driving habits to determine if two foot operation is the cause of the complaint.

AUDI 100

01F/K/ ZF-4HP-18FLE/FLA DIP STICK

COMPLAINT: When an attempt is made to check the transmission fluid, the filler tube is found, however there is no dip stick found. There is a vent cap in the top of the filler tube, (See Figure 1).

CAUSE: The Audi 100 with the 01F/01K transmission does NOT come with a dip stick.

CORRECTION: The dip stick for this application is considered a tool and must be ordered when needed. There are two (2) different length dip sticks, the "02" for the 01F and the "03" for the 01K, which can be found on the dip stick crown (See Figure 2). Once the dip stick is acquired, which can take several, days, the fluid level can now be checked.

NOTE#1: Due to the fact that the O.E. dip stick is usually not readily available, you may want to make your own. The specifications for the O.E. Dip sticks are shown in Figure 2.

NOTE#2: As of June 1994 production, the filler tube was eliminated and replaced with a check/fill plug located in the pan as seen in Figure 3.

SERVICE INFORMATION:

02 Dip Stick.....01F321431A
03 Dip Stick.....01F321431B

01F/K/ ZF-4HP-18FLE/FLA DIP STICK

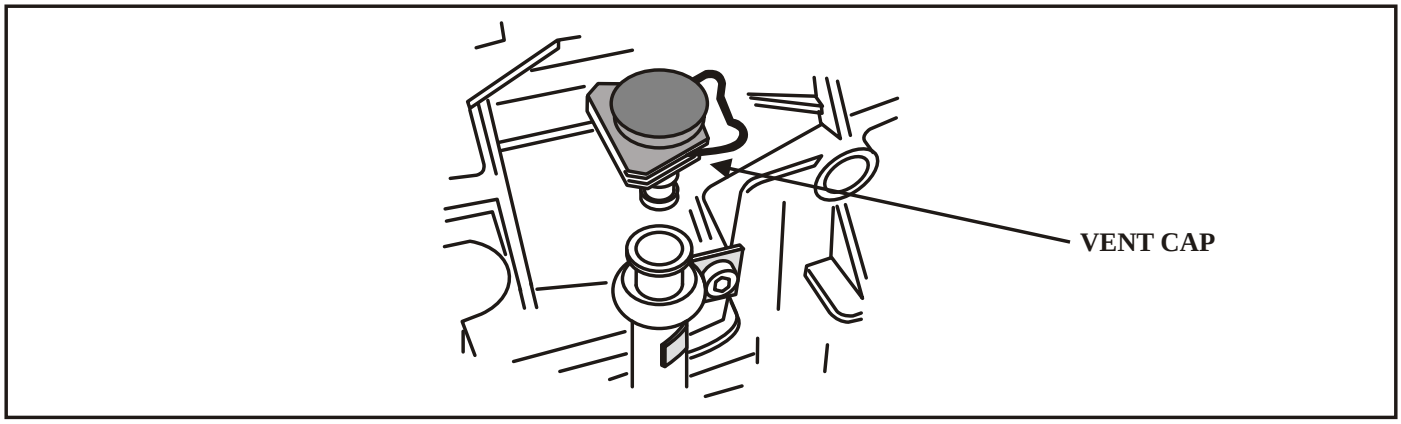


Figure 1

THE LENGTH OF THE STICK FROM THE INSIDE CAP TO THE TIP END IS 24 3/16 INCHES FOR THE 02 STICK AND 13 3/8 INCHES FOR THE 03 STICK.

THE FULL MARK IS 2 5/8 FROM THE TIP END WITH BOTH STICKS.

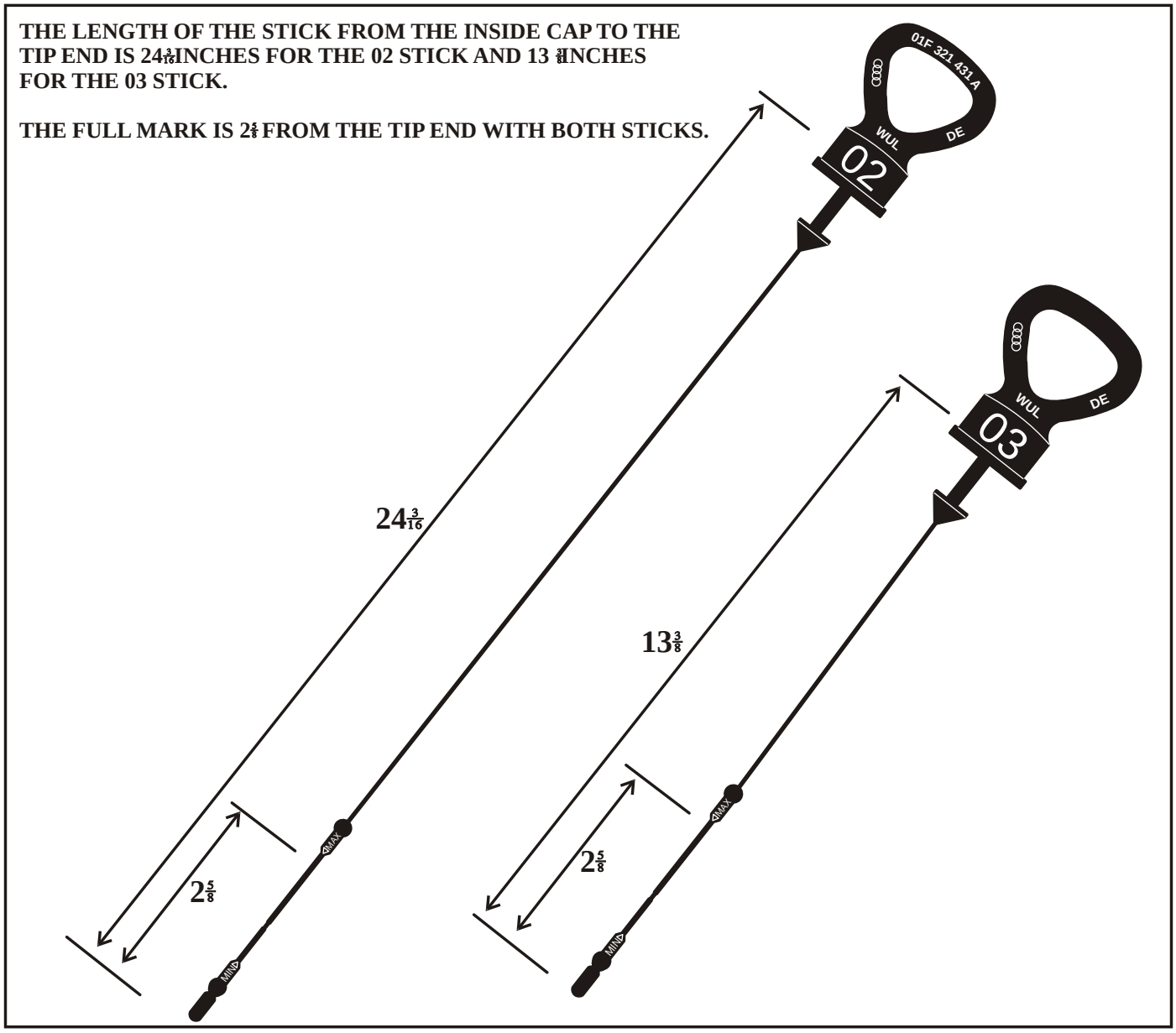


Figure 2

01F/K/ ZF-4HP-18FLE/FLA DIP STICK

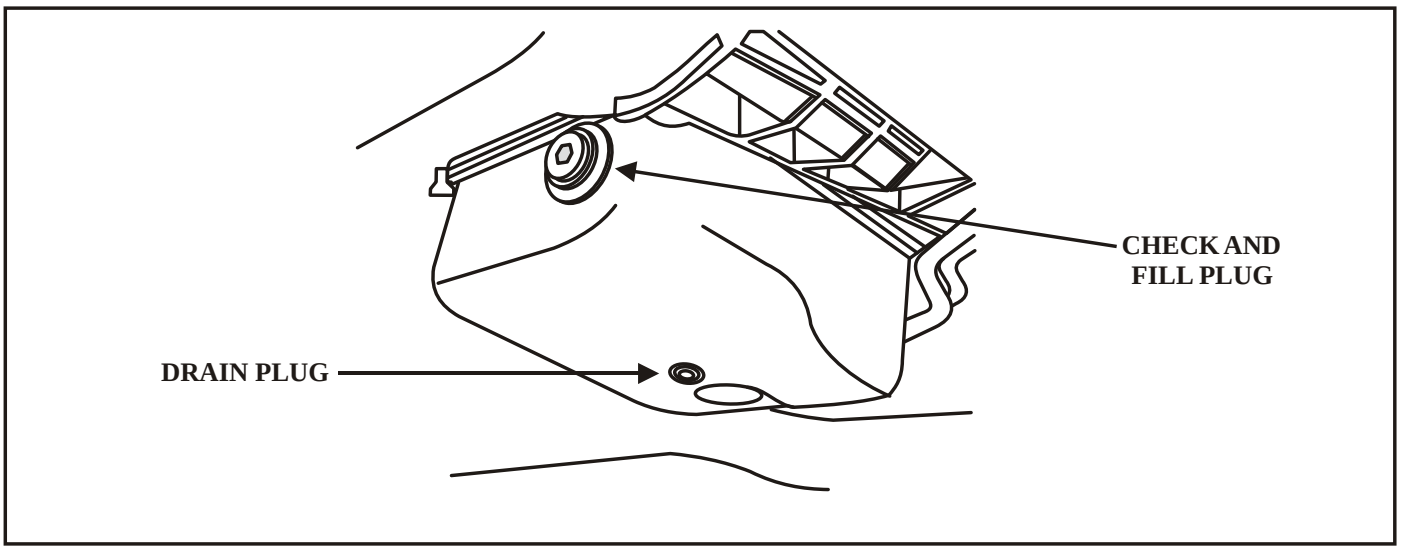


Figure 3

ACURA MODELS WITH INLINE TRANSMISSIONS

DIFFERENTIAL ALIGNMENT

COMPLAINT: The vehicle comes back with a complaint of a vibration at various speeds. Further inspection reveals abnormal wear of the extension shaft located between the transmission and the differential. (Refer to Figure 1)

CAUSE: The 26MM shim located between the differential case and the converter housing, (Refer to Figure 2), was lost during installation of the transmission or differential. The 26MM shim aligns the differential to the transmission so that the extension shaft rotates at centerline.

CORRECTION: Use the following procedure to select the correct thickness 26MM shim:

1. Install the differential assembly alignment dowel pins. (See Figure 3)
2. Using a feeler gauge, measure the space between the transmission converter housing and the differential case as seen in figure 4.
3. Select and install the correct thickness 26MM shim from the chart in figure 5.

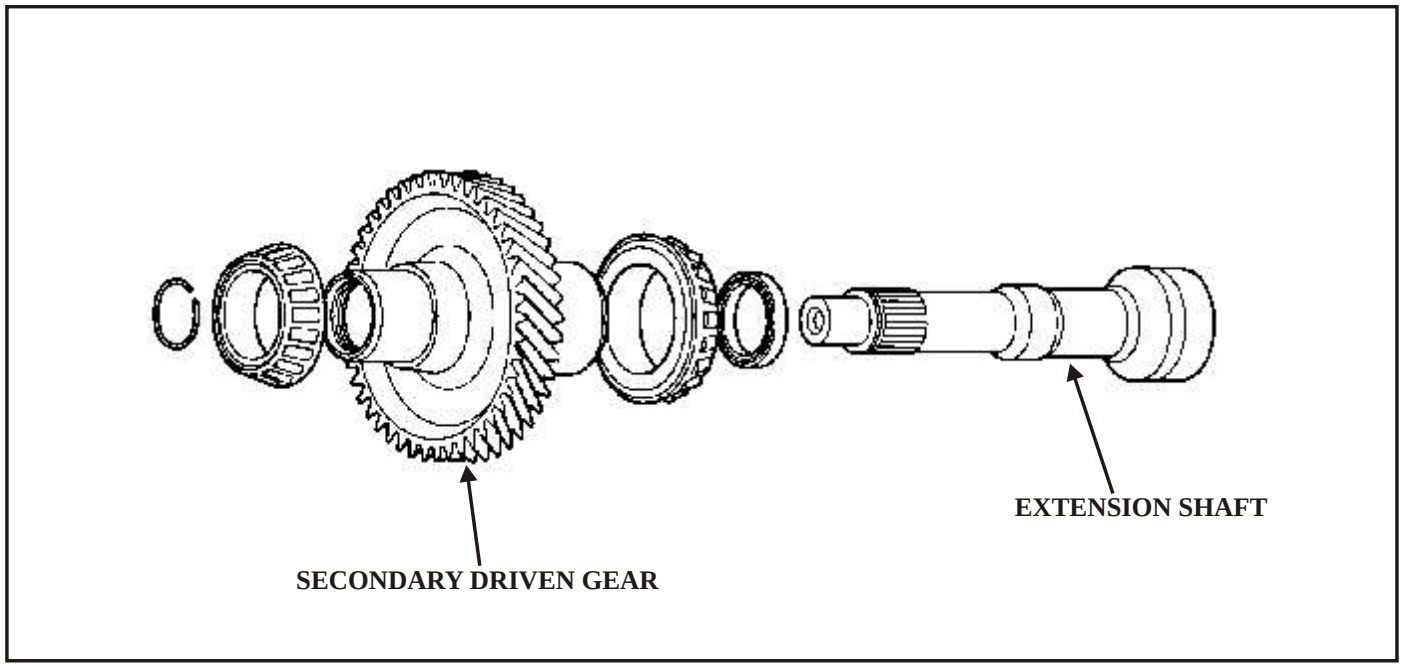


Figure 1

DIFFERENTIAL ALIGNMENT

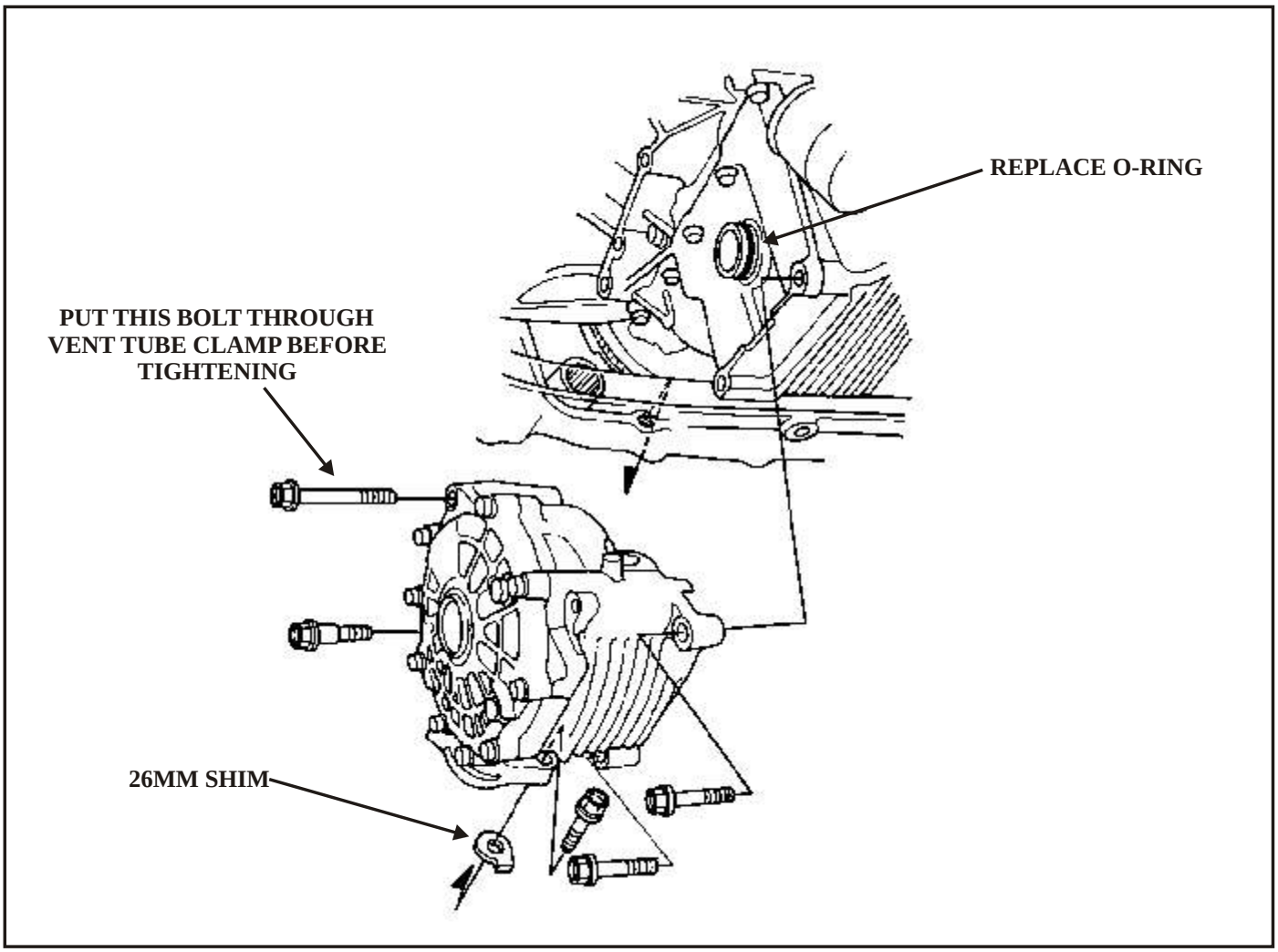


Figure 2

DIFFERENTIAL ALIGNMENT

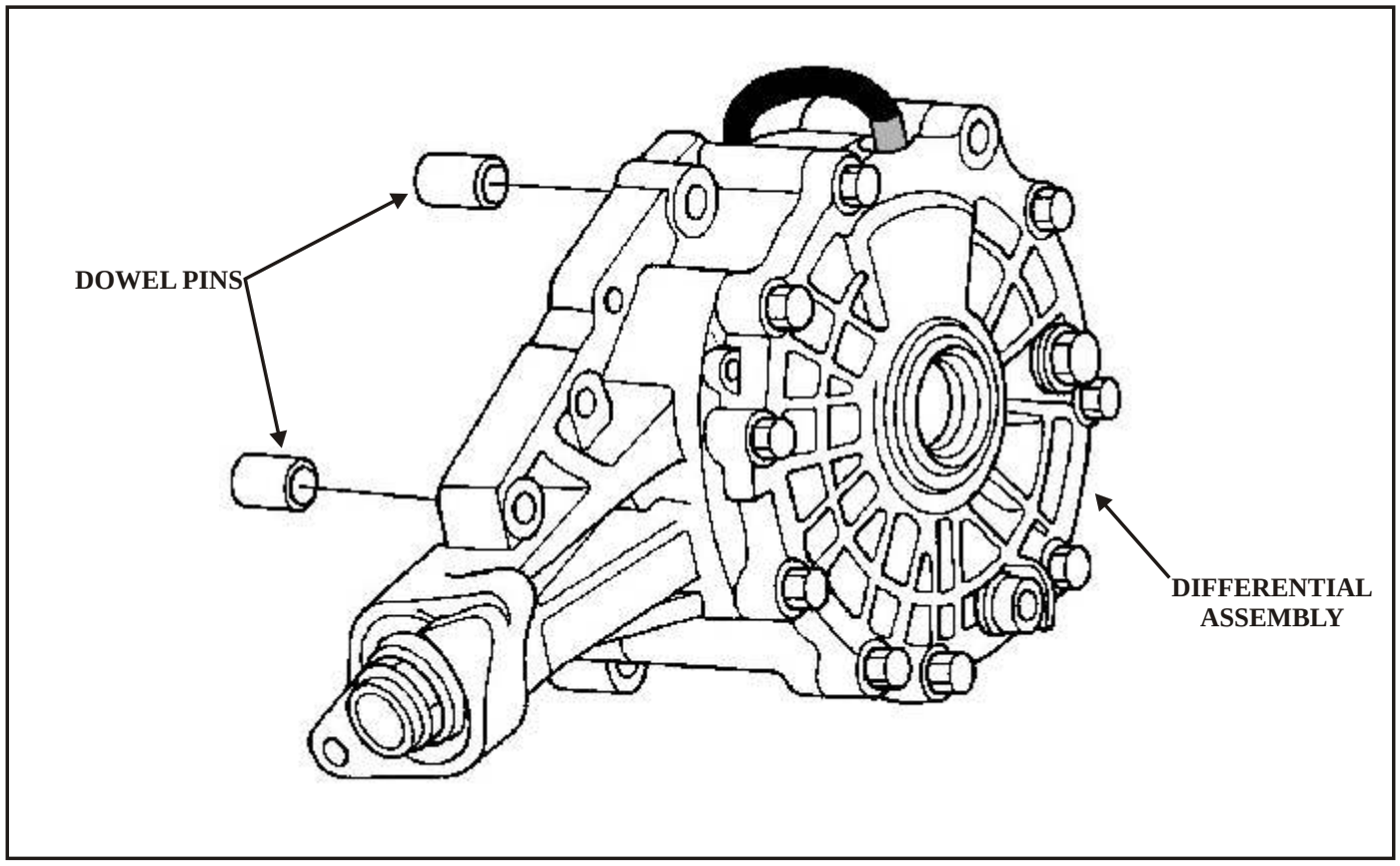


Figure 3

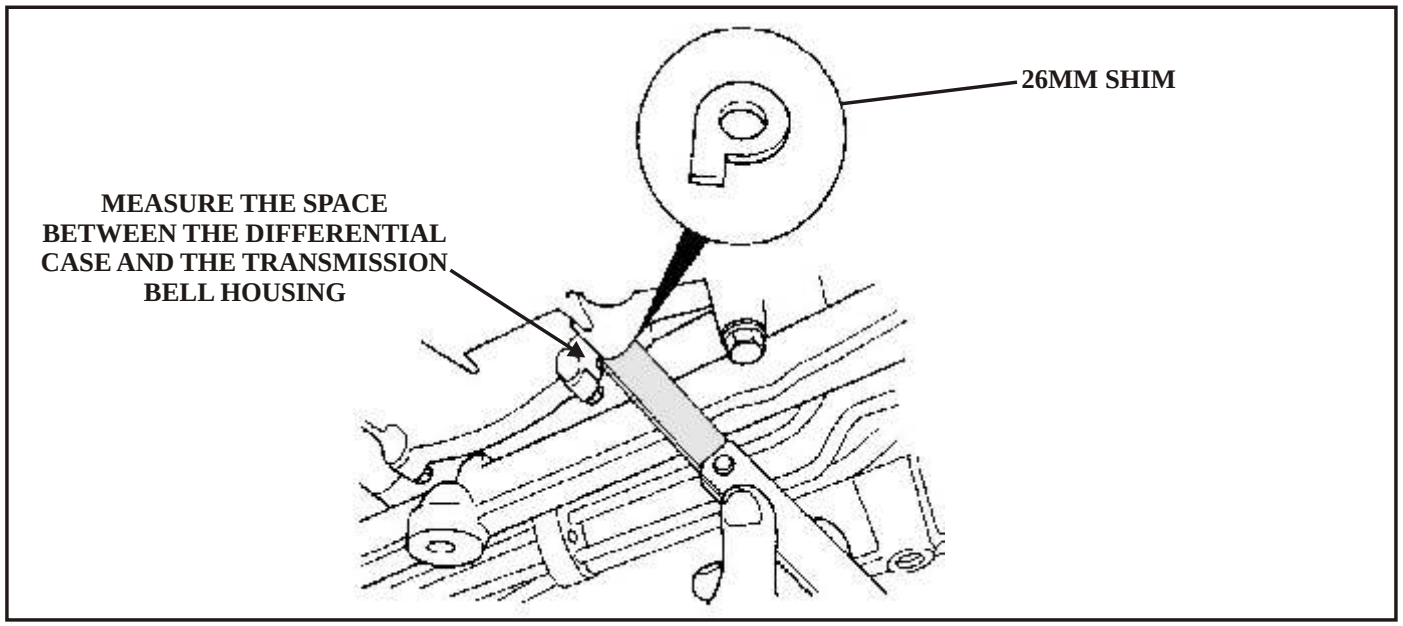


Figure 4

ROSS-TECH

DIFFERENTIAL ALIGNMENT

26MM SHIM SELECTION CHART			
SHIM	**PART NUMBER**	**THICKNESS**	**MEASURMENT**
A	41432-PY4-000	1.9 MM (0.0748 IN)	1.99 - 1.9 MM
B	41433-PY4-000	2.0 MM (0.0787 IN)	2.09 - 2.0 MM
C	41434-PY4-000	2.1 MM (0.0827 IN)	2.19 - 2.1 MM
D	41435-PY4-000	2.2 MM (0.0866 IN)	2.29 - 2.2 MM
E	41436-PY4-000	2.3 MM (0.0906 IN)	2.39 - 2.3 MM
F	41437-PY4-000	2.4 MM (0.0945 IN)	2.49 - 2.4 MM
G	41438-PY4-000	2.5 MM (0.0984 IN)	2.59 - 2.5 MM
H	41439-PY4-000	2.6 MM (0.1024 IN)	2.69 - 2.6 MM
I	41440-PY4-000	2.7 MM (0.1063 IN)	2.79 - 2.7 MM
J	41441-PY4-000	2.8 MM (0.1102 IN)	2.89 - 2.8 MM
K	41442-PY4-000	2.9 MM (0.1142 IN)	2.99 - 2.9 MM
L	41443-PY4-000	3.0 MM (0.1181 IN)	3.09 - 3.0 MM

Figure 5

Transmission Digest
1/2 Page

Raybestos

RN Rebuilders

BC

Techpack