

2004 TECHNICAL SEMINAR



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Since 1954*



SUPERIOR SOLUTIONS

Superior introduces the new 4L60E-Late and Chrysler 42/46/47-RE Late Kits to work with late model units — both offer the features of the earlier kits plus the latest innovations.

The 4L60E-Late Shift Correction Package 1998 & up (K4L60E-L)

The 4L60E-L Kit helps to eliminate the following problems: ✓ Code 1870 ✓ Delayed engagements ✓ Slide bump 2nd & 3rd ✓ 3-4 clutch burn-up ✓ Help for worn plates ✓ Provides more lube oil ✓ Regular and Heavy duty applications ✓ Improves overall transmission performance

- Includes PWM PowerValve to correct code 1870 problems and still maintain normal computer strategy of the converter.
- Includes oversized checkballs to give new life to the original worn separator plate.



The Chrysler 42/46/47-RE Late Shift Correction Package 1999 & up (K500-618-L)

The Chrysler 42/46/47-RE Late Shift Correction Package helps eliminate the following problems: ✓ Premature band failure ✓ Inadequate line pressure ✓ Slow engagements ✓ Premature clutch failure ✓ Lower 2-3 shift RPM ✓ Full time lube ✓ Rapid fill manual valve ✓ Regular, Heavy Duty, Gas & Diesel

- The governor control valve limits excess governor pressure caused by increased mainline operating pressure needed for Heavy Duty use.
- Allows building the unit for extreme heavy duty applications without fear of getting governor sensor code 1763
- Works on any earlier RE unit, but most beneficial for 1999 & up unit with the latest computer strategy.



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2004 TECHNICAL SEMINAR



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The

Automatic Transmission Rebuilders Association

2400 Latigo Avenue
Oxnard, CA 93030

Phone: (805) 604-2000 Fax: (805) 604-2005
<http://www.atra.com>

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Dennis Madden
Chief Executive Officer

Welcome to the 2004 ATRA Technical Seminar! As you're probably already aware, this is ATRA's 50th year of serving the automatic transmission industry.

As with any major milestone, this year's anniversary has caused us to examine the changes that have taken place over the last half century. And nowhere are those changes more evident than in this, our annual technical seminar program.

This year — our 50th year — marks another milestone in the evolution of the ATRA technical seminar. Because this year, for the first time, the ATRA seminar manual has been developed and printed in full color!

Having worked on several seminar manuals myself I know what it takes to produce a seminar. Lance Wiggins and the ATRA Technical staff have really pull out all the stops this year; another sign of the new things coming out of the "New" ATRA.

This seminar, along with everything else at ATRA is a group effort, with a lot of effort in the background that nobody ever sees. I could not be more delighted with the staff here at ATRA.

ATRA is changing all the time: with the new items like the 3-year Golden Rule warranty, to give your customer that added peace of mind; point-of-sale items to make your shop look even more professional; Nation-wide advertising and referral services, getting more consumers into ATRA Members' shops. These are just a few of the changes you've seen in the past year, and it's only the beginning.

On behalf of the ATRA staff, and the ATRA Chapters that work so hard to bring you this seminar, welcome.

Sincerely,

A handwritten signature in black ink that reads 'Dennis Madden'.

Dennis Madden,
ATRA, CEO

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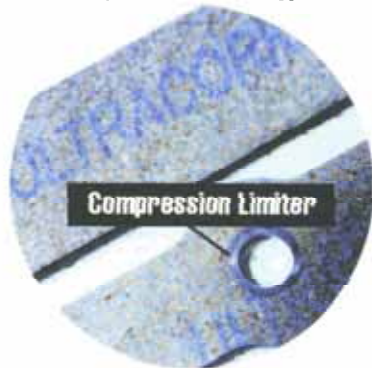
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820339	Chrysler	Torqueflight 6 (904) .090" thick	1.96 ea.	5
820344	Chrysler	Torqueflight 8 (727) .090" thick	1.96 ea.	5
820350	Chrysler	A404, A413, A470	1.38 ea.	5
820351	Chrysler	A404, 413 Sprocket CVR	1.79 ea.	5
820352	Chrysler	404 FWD Gear Box	1.83 ea.	5
820345	Chrysler	A604 Ultradrive Oil Pan	1.93 ea.	5
820353	Chrysler	A604 Diff Oil Pan	1.57 ea.	5
820354	Chrysler	A604 End Cover	1.43 ea.	5
820355	Chrysler	42LE / A606	2.42 ea.	5
820356	Ford	C-6	1.85 ea.	5
820357	Ford	C-4	1.18 ea.	5
820359	Ford	Jatco 3N71B (17 Bolt)	1.98 ea.	5
820360	Ford	AOT, AOD, FIOD	1.78 ea.	5
820361	Ford	ATX Valve Body Cover	2.10 ea.	5
820362	Ford	ATX Oil Pan	1.90 ea.	5
820346	Ford	A4LD W/4 Notches	1.78 ea.	5
820289	Ford	AXOD Oil Pan (1986-96)	3.78 ea.	5
820323	Ford	AXOD Control Cover (1986-96)	2.56 ea.	5
820394	Ford	AX4S Oil Pan (1996 & up)	5.10 ea.	3
820395	Ford	AX4S Control Cover (1996 & up)	4.35 ea.	3
820364	Ford	Probe 4EAT	1.98 ea.	5
820348	Ford	E4OD (1989-95)	3.10 ea.	5
820396	Ford	4R100 (1996 & up)	5.90 ea.	3
820365	Ford	AODE	3.98 ea.	5
820366	Ford	CD4E Main Control CVR	3.58 ea.	5
820367	Ford	AX4N Oil Pan (Early)	3.98 ea.	5
820397	Ford	AX4N Oil Pan (1995 & up)	6.90 ea.	3
820368	Ford	AX4N Main Control CVR (Early)	3.58 ea.	5
820398	Ford	AX4N Main Control Cover (1995 & up)	5.90 ea.	3
820369	GM	Powerglide	1.98 ea.	5
820370	GM	TH-350, 350C, 250, 250C	1.44 ea.	5
820371	GM	TH-400	1.74 ea.	5
820372	GM	TH-180, 180C	1.82 ea.	5
820373	GM	TH-200, 200C	1.62 ea.	5
820374	GM	T-125, 125C	1.86 ea.	5
820375	GM	TH-125, 125C Sprocket CVR	1.50 ea.	5
820376	GM	TH-200-4R	2.18 ea.	5
820377	GM	TH-440 Side Case Cover	2.24 ea.	5
820349	GM	TH700R4	1.50 ea.	5
820378	GM	TH-440-T4 Oil Pan	2.28 ea.	5
820379	GM	4T60E	2.07 ea.	5
820182	GM	4T80E	2.70 ea.	5
820380	Mitsubishi	KM170 Combo	1.69 ea.	5
820381	Mitsubishi	KM 177	3.00 ea.	5
820382	Mitsubishi	F4A33	1.80 ea.	5
820383	Nissan	RL3F01A, RN3F01A FWD	1.90 ea.	5
820384	Nissan	RE4R03A	1.98 ea.	5
820385	Subaru	4 Spd	2.24 ea.	5
820386	Toyota	3 & 4 Spd. A40, A40D	1.60 ea.	5
820387	Toyota	A-340	2.30 ea.	5
820388	Toyota	A-540-E	2.56 ea.	5
820389	Toyota	A540 93-ON	2.54 ea.	5

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Lance Wiggins
Technical Director

This year ATRA is proud to be celebrating its 50th year serving the automatic transmission repair industry. A lot of changes have taken place over five decades of transmission repair, and those changes are coming faster every year.

It's because of those changes that technical training has become an integral part of today's transmission repair industry. It's just not possible anymore to get by with a measure of common sense and a decent technical aptitude. To remain profitable, today's technicians need up-to-date training on an ongoing basis.

To that end, ATRA is pleased to present its 2004 Technical Seminar. Packed with countless hours of research and development, writing, editing, photography and layout, this year's seminar will stand out as one of the most demanding and useful technical training programs ever developed for this industry.

And, for the first time, this year's technical manual has been produced in *full color*. With over 300 pages of up-to-the-minute technical information, the 2004 Technical Seminar Manual will remain a valuable resource long after the seminar is just a memory.

We're confident that you'll find this year's seminar presentation and technical manual both informative and profitable. In fact, we're so sure you'll be satisfied with what you learn in this program, we guarantee it!

So, on behalf of the entire ATRA staff, the international board of directors, and all of the ATRA members worldwide, we'd like to thank you for helping to make our first 50 years memorable. And we're happy to welcome you as we ring in the next half-century of transmission repairs, by taking part in the 50th anniversary edition of the ATRA 2004 Technical Seminar.

A handwritten signature in cursive that reads 'Lance Wiggins'.

ATRA Technical Team (continued)



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Senior Technician
and Seminar Speaker



Steve Garrett
Technical Advisor, Seminar
Speaker, Service Engineer



Bill Brayton
Technical Advisor and
Seminar Speaker



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Pete Huscher
Technical Advisor



Shaun Velasquez
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Frank Pasley
GEARS Magazine

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It's difficult enough getting the seminar book researched, written, pictured, edited, and printed let alone getting it out to the seminar attendees. This is where the ATRA Staff comes in.

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Without the ATRA team, it would be very hard to accomplish the task at hand. Please enjoy the seminar.

Lance Wiggins
ATRA, Technical Director

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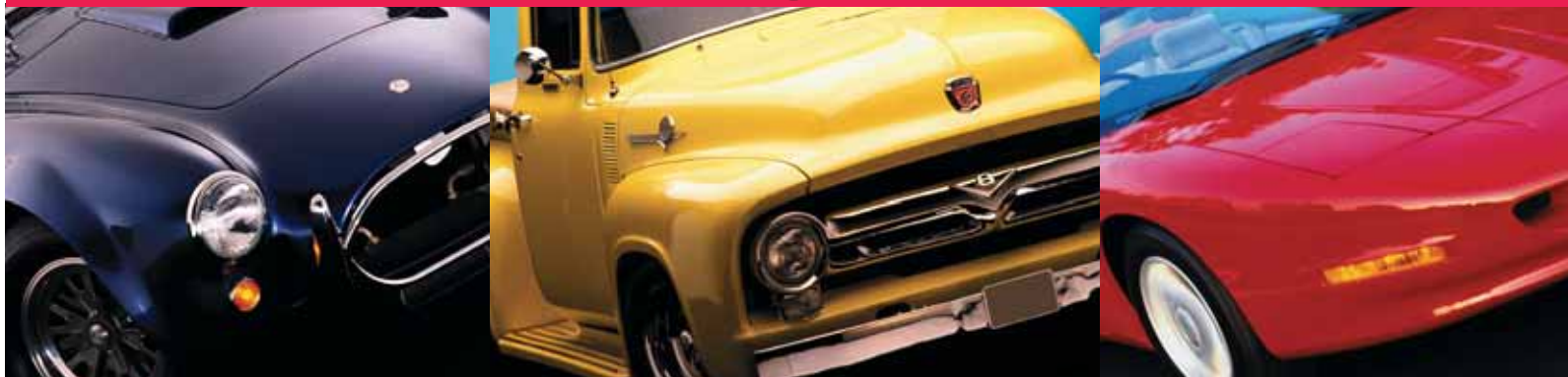


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- 1993-2002 4L60E Internal Wire Harness with Anti-bleed Lock-up Solenoid. (350-0025)
- 2003 4L60E Internal Harness now available. (350-0061)

- A341E Shift Solenoid Kit (52-9021)
- Fits Lexus, Toyota, and Volvo
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- Attached single bracket



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E4OD
 SURE LOCK OD PISTON
 SPIRAL SNAP RING
 KEEPS OVERDRIVE PISTON
 RETAINING RING FROM
 POPPING OUT OF GROOVE



36744-01

E4OD
 PUMP GEARS
 FIXES LOW LINE PRESSURE,
 EXCESSIVE PUMP NOISE



36438AX-01K

AX4N
 BYPASS CLUTCH CONTROL
 SLEEVE & PLUNGER KIT
 FIXES NO TCC APPLY
 & CODE 628



96206-03K

AXODE
 BYPASS CLUTCH CONTROL
 SLEEVE AND PLUNGER VALVE
 FIXES NO TCC APPLY OR
 CODE 628, 741



96206-01K

E4OD
 FRONT LUBE
 DRAINBACK VALVE
 FIXES OVERDRIVE PLANETARY
 FAILURE



36425-01K

4R100
 HEAVY DUTY TRANSMISSION
 RECONDITIONING KIT

- FIXES:
- CODE 62
 - HARSH 1-2
 - TCC FAILURE
 - POOR LINE RISE
 - DELAYED REVERSE
 - LOOSE OD RETAINING RING
 - CLUTCH & BAND FAILURE
 - WRONG GEAR STARTS
 - POOR 2-3, 3-4 SHIFTS
 - EXCESSIVE ENDPLAY
 - OD LUBE FAILURE

Part No. SC-4R100HD

E4OD
 LINE-TO-LUBE
 PRESSURE REGULATOR VALVE
 FIXES CONVERTER OVERHEAT,



36424-04K
 Patent Pending

AXO D & E
 REVERSE BOOST VALVE
 & SLEEVE
 FIXES 1-2 OR 2-3
 FLARE SHIFTS



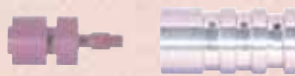
96201-01K

AODE
 OVERDRIVE SERVO PIN
 FIXES OVERDRIVE BAND OR FOR-
 WARD CLUTCH FAILURE



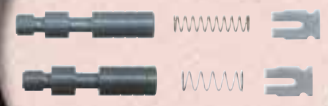
76833E

4R44E
 BOOST VALVE KIT
 FIXES SOFT SHIFTS, DELAYED
 REVERSE



37947-01K

AXODE
 FORWARD CONTROL VALVE
 FIXES NEUTRALS AFTER
 SHIFT TO OVERDRIVE



96201-16K &
 96206-07K

NOTE: Many of these parts fit other applications also

A & P
Transmission
Parts

All

Flexplate Failures

Diagnosing Flexplate Failures

Flexplate cracking on various, engine applications are common. The cracking on these flexplates can be seen either around the crankshaft or torque convert bolt hole patterns. In severe situations, the outer portion is completely separated from the mounting areas.

The following causes for cracked flexplate failures:

- 1) Out of balance engine or torque converter.
- 2) Bad starter drive can cause teeth or ring gear to wear rapidly or break off. Teeth can also break when engine is running and starter is engaged.
- 3) Failure to torque the flexplate bolts to proper specifications and in proper sequence.
- 4) Some applications may require starter shims to be used. If these shims are not used when the starter is installed, improper alignment could occur and damage to the flywheel will result.
- 5) Poor quality parts.
- 6) Missing Dowel pins.

GM & Ford Transmissions

Electronic Pressure Controlled

- 1) Connect a 0-400 psi gauge to the main line test port.
- 2) Set the parking brake firmly.
- 3) Start the vehicle and place the selector in the overdrive position and record the pressure reading at idle.
- 4) Place your left foot firmly on the brake pedal and with your right foot press accelerator pedal fully and record the pressure.
- 5) Follow steps 3 & 4 in reverse position.

Compare your results to the chart below if your readings are not within specs. You will need to correct the problem before the vehicle is put into service.

Caution – Do not exceed more than 3 seconds on stall test!

Ford

<u>Trans</u>	<u>In OD at Idle</u>	<u>In OD at Stall</u>	<u>In R at Idle</u>	<u>In R at Stall</u>
AXODE/AX4N	45-85	175-220	50-80	260-320
AODE/4R70W	50-80	160-210	80-120	260-320
E4OD/4R100	50-70	160-190	80-110	240-310
4R55E	65-100	190-250	110-165	235-350
CD4E	45-70	160-185	65-80	250-300

General Motors

<u>Trans</u>	<u>In OD at Idle</u>	<u>In OD at Stall</u>	<u>In R at Idle</u>	<u>In R at Stall</u>
4L30E	45-55	145-170	55-70	185-215
4L60E	50-65	160-190	55-70	290-340
4L80E	50-70	150-190	55-75	260-300
4T65E	55-75	190-220	70-85	240-300
4T80E	50-70	230-250	80-95	270-310

These are approximate specifications.

Ford

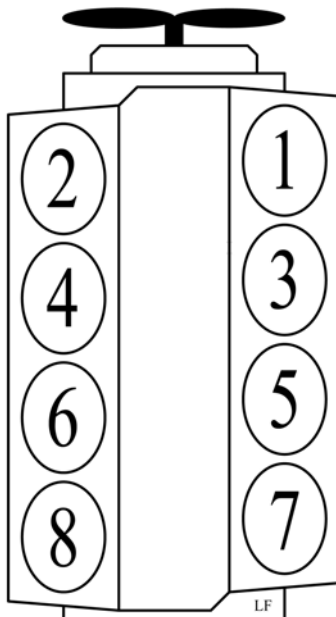
Cylinder Contribution Test

7.3L Diesel Cylinder Contribution Self Test

The Cylinder Contribution Self Test is a functional test of the PCM performed OnDemand with the engine running, A/C off and engine oil temperature above 70°F.

This test will determine if all cylinders are contributing equally to engine performance. The PCM will test all 8 cylinders continuously during the test: The test checks for cylinder-to-cylinder changes in engine rpm, and sets a code if the rpm change is not within a pre-calibrated range.

This test checks for weak injectors or low compression cylinders. A fault must be present at the time of testing for the KOER Cylinder Contribution Self Test to detect a fault, so the engine operating condition at which the idle is the worst will produce the best test results. For automatic transmission vehicles, the best results are reached with the parking brake set and the transmission in DRIVE. If a fault is detected, a Diagnostic Trouble Code (DTC) will be output on the data link at the end of the test when requested by a scan tool. Only a hard fault code (DTC) will be displayed.



Ford

Injector Test

7.3L Diesel Injector Electrical Self Test

Injector Electrical Self Test is a functional test of the PCM performed on demand with the key on and the engine off.

This test determines if the injector circuits and solenoids are electrically operating without fault. All injectors will first buzz (audible feedback of the injector solenoids energizing the injector valves) together for approximately 2 seconds, then each injector will buzz for approximately 1 second in numerical order (1 through 8).

The IDM (Injector Driver Module) stores all historical IDM fault codes; to ensure that the DTC is a hard fault, you must first clear continuous DTCs (be sure to record all IDM fault codes before clearing). After clearing, re-run self test; a fault must be present at the time of testing for the KOEO Injector Electrical Self Test to detect the fault. If a fault is detected, a Diagnostic Trouble Code (DTC) will be the output on the data link at the end of the test when requested by a scan tool. Only a hard fault code (DTC) will be displayed.

Ford

Parameter Identifications and Description

<i>Parameter Identification (PID) List</i>		
Acronym	Description	Measurement Units
4x4L	4x4 Low Switch	ON/OFF
ACCS	Air Conditioning Clutch Status	ON/OFF
AP	Accel Pedal Position Sensor	Volts
ARPMDES	Ancillary Engine Speed Desired	RPM
BARO	Barometric Pressure Sensor	PSI
BARO V	Barometric Pressure Sensor Actual	Volts
BPP_BOO	Brake ON/OFF Switch	ON/OFF
BPA/SW	Brake Pressure Applied	ON/OFF
CCS	Coast Clutch Solenoid	ON/OFF
CCSF	Coast Clutch Solenoid Fault	ON/OFF
CCP/PNP	Clutch Pedal Position/Park Neutral Position Switch	ON/OFF
CPP/TCS	Clutch Pedal Position/TCS	ON/OFF
CRUISE	Cruise Control Mode (Driving)	ON/STNDBY/TAPUP/TAPDN
DTC CNT	Diagnostic Trouble Code Count	DTC No.
EBP	Exhaust Back Pressure	PSI (Absolute)
EBP V	Exhaust Back Pressure Actual	Volts
EOT	Engine Oil Temperature	Degrees C (F)
EOT_V	Engine Oil Temperature Voltage	Volts
EPC*	Electronic Pressure Control	PSI
EPC V	Electronic Pressure Control Actual	Volts
EPR	Exhaust Pressure Regulator	Percent
FLI	Fuel Level Input	Percent
FLI V	Fuel Level Input Actual (Voltage)	Volts
FP	Fuel Pump Control	Duty Cycle (100% = On)
FUEL PW	Fuel Pulse Width	Milliseconds
GEAR	Transmission Gear 4R100 Only (Driving)	Trans. Gear

Ford

Parameter Identifications and Description (continued)

GPC	Glow Plug Control Duty Cycle	Percent
GPC TM	Glow Plug Control Time	Seconds
GPL TM	Glow Plug Lamp Time	Seconds
GPML	Glow Plug Monitoring Left Bank	Amp
GPMR	Glow Plug Monitoring Right Bank	Amp
IAT*	Intake Air Temperature	Degrees
IAT V	Intake Air Temperature Actual	Volts
ICP	Injector Control Pressure Sensor	PSI
ICP V	Injection Control Pressure Actual	Volts
IPR	Injector Control Pressure Regulator	Percent
IVS	Idle Validation Switch	ON/OFF
MAP	Manifold Absolute Pressure Sensor	PSI (Absolute)
MAP_Hz	Manifold Absolute Pressure Frequency	Hertz
MAP_V	Manifold Absolute Pressure Actual	Volts
MAT	Manifold Air Temperature	Degrees
MAT V	Manifold Air Temperature Actual (Voltage)	Volts
MFDES	Mass Fuel Desired	Milligrams
MGP	Manifold Gauge Pressure	PSI
MIL	Malfunction Indicator Light	ON/OFF
OSS	Transmission Output Shaft Speed	RPM
PBA	Parking Brake Applied	ON/OFF
PERDEL 1	Percent Delta Cylinder #1 (Misfire Data)	Percent
PERDEL 2	Percent Delta Cylinder #2 (Misfire Data)	Percent
PERDEL 3	Percent Delta Cylinder #3 (Misfire Data)	Percent
PERDEL 4	Percent Delta Cylinder #4 (Misfire Data)	Percent
PERDEL 5	Percent Delta Cylinder #5 (Misfire Data)	Percent
PERDEL 6	Percent Delta Cylinder #6 (Misfire Data)	Percent
PERDEL 7	Percent Delta Cylinder #7 (Misfire Data)	Percent
PERDEL 8	Percent Delta Cylinder #8 (Misfire Data)	Percent
RPM	Engine Speed	RPM
SCCS	Speed Control Command Switch	Volts
SCCS M	Speed Control Command Switch Mode	Mode

Ford

Parameter Identifications and Description

(continued)

SS1	Shift Solenoid No. 1 — 4R100 Only	ON/OFF
SS2	Shift Solenoid No. 2 — 4R100 Only	ON/OFF
SS1F	Shift Solenoid #1 Output Fault	ON/OFF
SS2F	Shift Solenoid #2 Output Fault	ON/OFF
SS3	Shift Solenoid #3 Commanded ON	ON/OFF
SS3F	Shift Solenoid #3 Output Fault	ON/OFF
TCC	Torque Converter Clutch	ON/OFF/Percent
TCCA	Torque Converter Clutch Primary Circuit Monitor	ON/OFF
TCCF	Torque Converter Clutch Output Fault Detected	ON/OFF
TCCMACT	Torque Converter Modulator Actual	ON/OFF
TCCMCM	Torque Converter Modulator Commanded	ON/OFF
TCIL	Transmission Control Indicator Lamp	ON/OFF
TCILF	Transmission Control Indicator Lamp Out Fault	ON/OFF
TFT	Transmission Fluid Temperature	Degrees
TFT V*	Transmission Fluid Temperature Sensor Actual	Volts
TRANRAT	Transmission Ratio	Ratio
TORQUE	Engine Torque	Lb/Ft
TPREL	Low Idle Throttle Position	V
TR	Transmission Range Sensor Position	PARK, REV, NTRL, OD, DRIVE,
TR D	Transmission Range Sensor Digital Signal	0's/1's
TR V	Transmission Ranger Sensor Actual	Volts
TSS/ISS	Transmission Turbine Input Speed Sensor	RPM
VFDES	Volume Fuel Desired	Cubic Millimeters
VPWR	Vehicle Power Supply	Volts
VREF	Vehicle Reference Voltage	Volts
VS SET	Vehicle Speed Setting	MPH
VSS	Vehicle Speed Sensor	MPH
WGC	Wastegate Control	Duty Cycle

Ford 4X4

(ESOF) Electronic Shift On the Fly (continued)

Stuck in 4X4, Erratic 4X4 Operation

Vehicles between the years of 1995-1999 exhibiting inadvertent 4X4 Hi or Low shift events, 4X4 and/or Low Range indicator flashing or solid or vehicle stuck in 4L after uncommanded shift may be caused by the 4X4 shift motor.

Install a YL1Z-7G360-AA shift motor on vehicles built before 12/99. The YL1Z-7G360-AA shift motor with a grey contact plate cover replaces the prior design F75Z-7G360-AA motor with a blue contact plate cover. Grey-cover shift motors contain improved sense plate material and shift motor terminal upgrades. For vehicles already equipped with the latest style shift motor, refer to the following service procedure for details.

Uncommanded Shift to 4L

Parking Maneuvers/Gear Lever Transitions: Symptoms noted during a lower speed uncommanded shift to 4L event include:

1. Front end binding or hopping while turning
2. Bind feel in drivetrain when backing up and/or turning
3. Audible clunking or grinding noises, and/or
4. Amber low range light illuminated

If the Generic Electronic Module (GEM) receives a false mode switch input during or shortly after the Digital Transmission Range Sensor (DTR) indicates a Neutral range, an uncommanded shift is possible if remaining 4L pre-conditions are met. The pre-conditions (besides transmission in neutral range) include: service brake depressed, and vehicle speed less than 3 mph. A false switch input may also set a P1812 (4-wheel drive mode select circuit failure) or P1815 (4-wheel drive mode select short circuit to ground) DTC in the GEM.

Check mode switch circuits 682 (dark blue) for short to power and 780 (dark blue wire) for ground short, loose connections at inline connectors, and chafes.

Monitor the mode switch "Parameter Identification Display" (PID) 4WD_SW for false readings while slightly pushing in and wiggling the mode switch knob.

Ford 4X4

(ESOF) Electronic Shift On the Fly (continued)

Uncommanded Shift to 4X4 High (continued)

Replace the mode switch if it fails testing, or repair wiring on circuits 682 or 780 if fault indicated. If the tests pass, inspect the build date stamped on the GEM and replace the GEM if the GEM is built prior to 9/98.

Test drive the vehicle for proper 4X4 operation in all modes. Include parking lot maneuvers and transmission gear range lever transitions. Check for DTCs in the GEM. Clear any codes present and cycle ignition.

Road Speed: Reported symptoms for a higher speed uncommanded shift to 4L event include:

1. Rapid deceleration
2. High engine revving possibly accompanied by a P1270 DTC in the PCM
3. Clunk/grind noise
4. Speedometer may spike higher than actual speed.
5. After the initial event, the vehicle may exhibit restricted vehicle top speed without 4X4 indicators illuminated but possible MIL (Malfunction Indicator Lamp) on.

Monitor contact plate A,B,C,D PIDS. (sequentially read starting with plate A then B, then C, finally D). With Mode Switch in;

1. A4WD, plate PIDS should read "OCCO"
2. 4H PIDS should read "COOC"
3. 4L PIDS should read "COCO"

If contact plate PIDS DO NOT correspond to the set 4WD position, check for continuity/shorts/moisture/corrosion in the vehicle side of the transfer case shift motor connector (toward the GEM). Visually inspect all terminals, pins, crimps, and connectors closely. Repair any wiring conditions in the contact plate circuits as necessary.

Road test at speeds above 10 mph with mode switch in both A4WD and 4H to see if the condition returns. Clear DTCs from GEM (even if no DTCs exist) and cycle the ignition. Clear DTCs from the PCM if a P1270 (engine RPM or vehicle speed limiter reached) code was initially present.

Ford 4X4

(ESOF) Electronic Shift On the Fly (continued)

Uncommanded Shift to 4X4 High (continued)

1. Autolock Strategy (Expedition/Navigator Vehicles Only):

Uncommanded 4H shifts with red 4X4 light on “solid” while driving in Automatic Mode may be a vehicle characteristic if driven off-road or under slippery conditions.

The GEM Autolock strategy commands the transfer case clutch to minimum duty cycle and engages 4H (with mode switch still set to A4WD) to prevent continuous cycling from prematurely wearing the clutch. This is design intent. Excessive tire circumference variations or axles with unmatched gear ratios can result in unexpected Autolock function as well. For more detail check the speed sensor section below.

Once the condition that caused the Autolock strategy to activate is no longer present, the system stays in 4H until the operator cycles the ignition key or sets the mode switch to 4H then back to A4WD.

2. Transfer Case Speed Sensors (Expedition/Navigator Vehicles Only):

If an uncommanded shift to 4H occurs on hi-traction surfaces, check the TRA_FSP (T-case front speed sensor) and TRA_RSP (T-case rear speed sensor) PIDS for excessive speed sensor variation between the front and rear transfer case speed sensors.

If the PIDS show sensor inputs are not within 1-2 mph of each other during steady-state driving with possible DTCs P1836 (T-Case front speed sensor) /P1837 (T-Case rear speed sensor), first verify tire pressures, sizes, circumference within 1/4" among all four tires, and front and rear axle gear ratios for matching.

If the ratios match and tire sizes are okay, check associated circuits and replace the speed sensor(s) or repair the wiring as necessary.

After any repairs, road test while comparing scanner GEM PIDS TRA_FSP and TRA_RSP to PCM VSS signal. Verify all three PIDS match each other within 1-2 mph.

Ford 4X4

(ESOF) Electronic Shift On the Fly (continued)

Uncommanded Shift to 4X4 High (continued)

A false mode switch input on circuits 682 and/or 780 (dark blue wire) could be interpreted by the GEM as operator requesting a 4H shift. Under this condition, the GEM will command shift motor movements to match the false switch input. The red 4X4 indicator light will illuminate just as if the operator moved the switch. If the condition became intermittent, the 4X4 range and also the indicators could switch back and forth between A4WD/2H and 4H.

Check the mode switch circuits between the GEM and dash for chafing, shorts, crimps, and continuity. Repair the wiring if faults found. If the wiring is okay, replace the mode switch itself. After any repair, pull DTCs from the GEM, even if there are no DTCs available. Always go thru the ritual of clearing codes.

Stuck in 4X4 Low at all Times

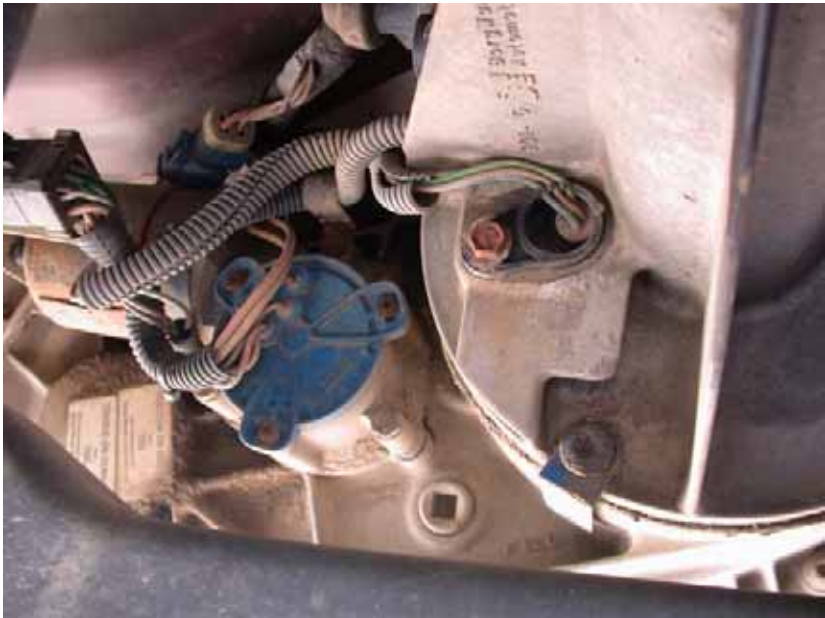
Customers describing an uncommanded shift to 4L shortly after start-up and then unable to shift the transfer case. Associated symptoms could include valid GEM DTCs being erased and false DTCs such as C1107 (4WABS module failure) present. If the transfer case is stuck in 4X4, re-establishing normal shift motor operation is possible by putting the mode switch in 4L with the trans gear lever in neutral, service brake depressed, and vehicle stationary.

A new GEM program has been updated to address this concern, if the GEM needs to be replaced, the new program is already installed in the new GEM.

Ford 4X4

(ESOF) Electronic Shift On the Fly (continued)

Old Number
F75Z-7G360-AA



New Part Number
w/ gray connector
YL1Z-7G360-AA



Transgo AD

AX4S

No Movement

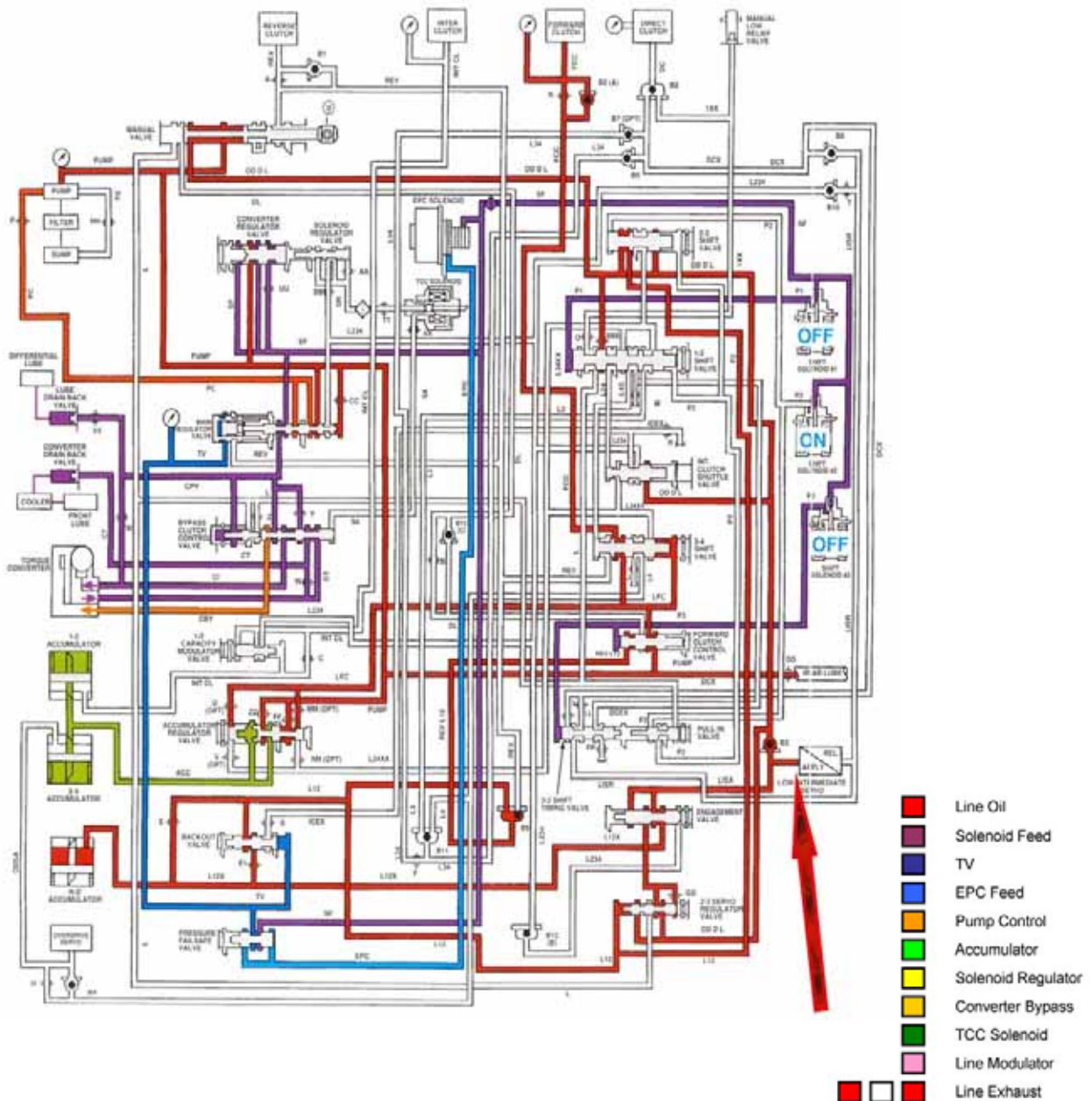
A no movement condition can be caused by the front clip breaking in the Low/Intermediate servo assembly.



AX4S

No Movement (continued)

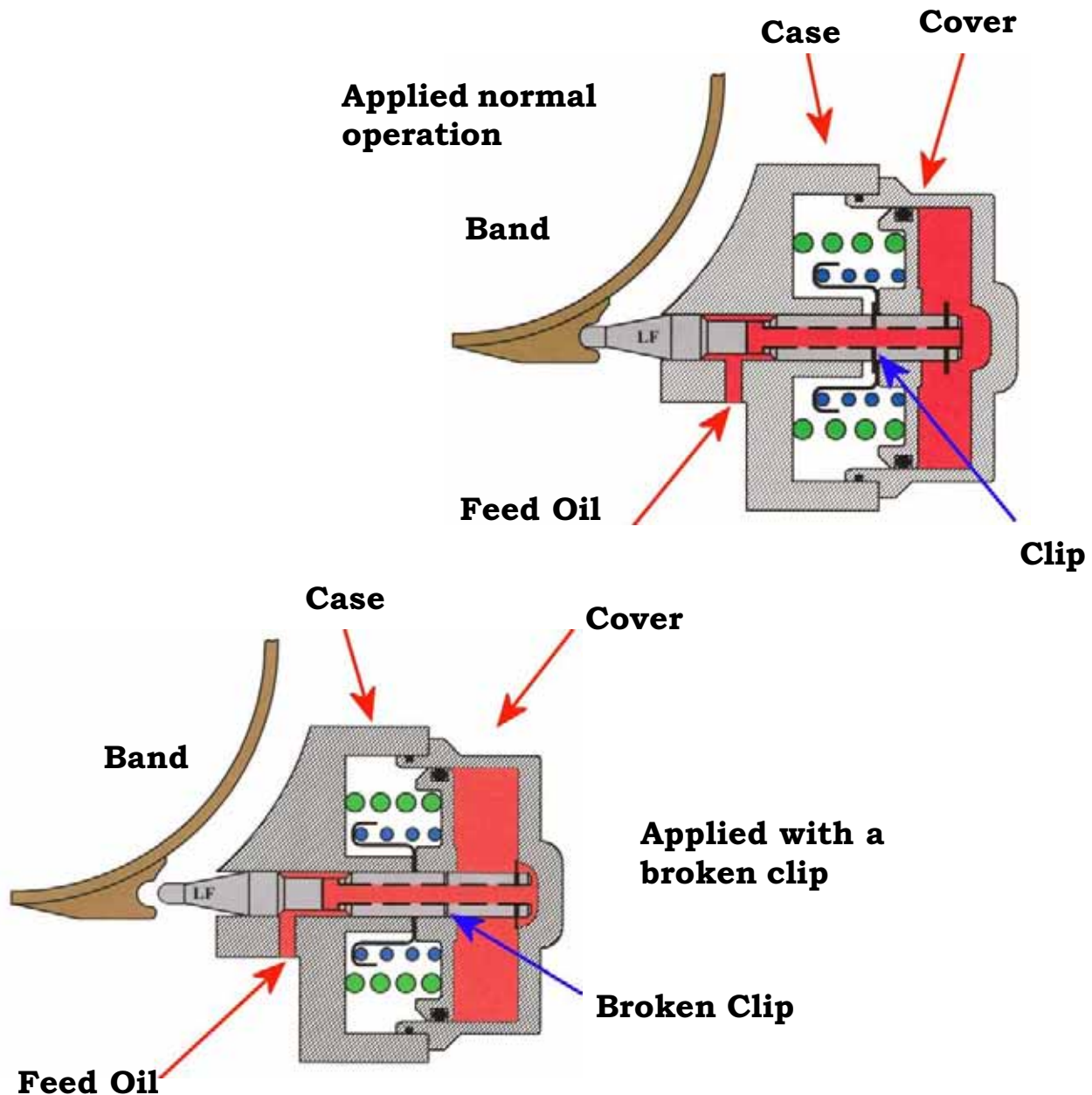
The Low-Intermediate servo is applied in 1st and 2nd drive gear, and is released in 3rd. The hydraulic diagram shows a typical AX4S 1st gear application.



AX4S

No Movement (continued)

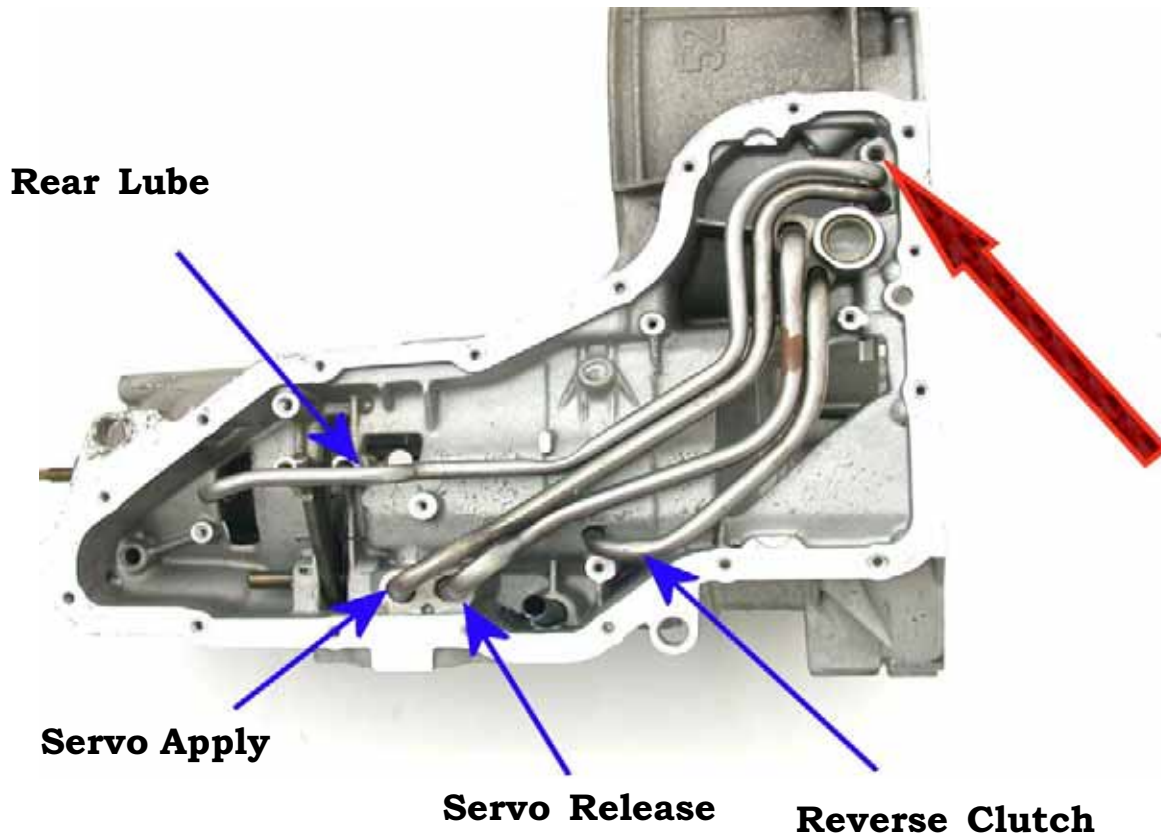
Oil enters the servo through the case and is directed to the top of the servo piston. If the clip is broken the piston will bottom out and the servo apply rod will be stationary and not apply the band.



AX4S

No Rear Lube Tube

All 1999 and newer AX4S transmissions have only four tubes in the bottom of the transmission. A new tube now incorporates the differential speedometer lube transfer tube that was deleted from production.



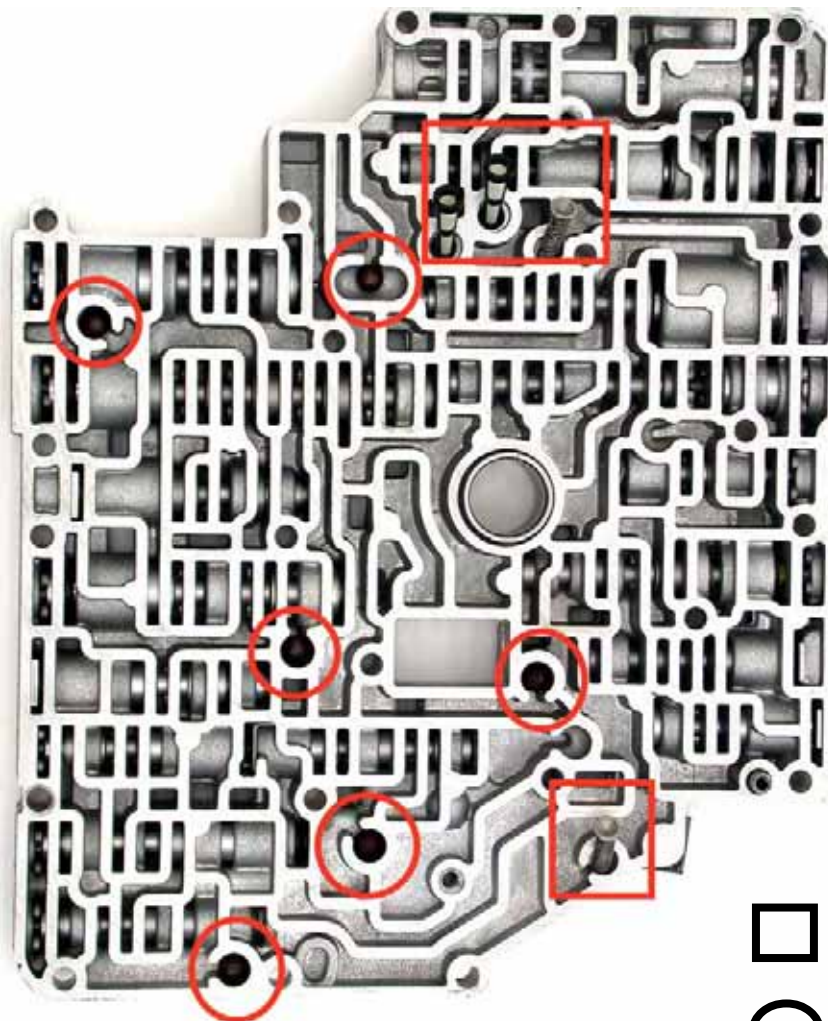
Transtar

AX4S

Valve Body Interchange

1996-1998 Valve Body Assembly

From 1996-1998 all AX4S valve bodies are interchangeable. These valve bodies have six Checkballs and two relief valves.



**1996 and later
Two-Land Converter
Regulator Valve**

 **Relief Valves**

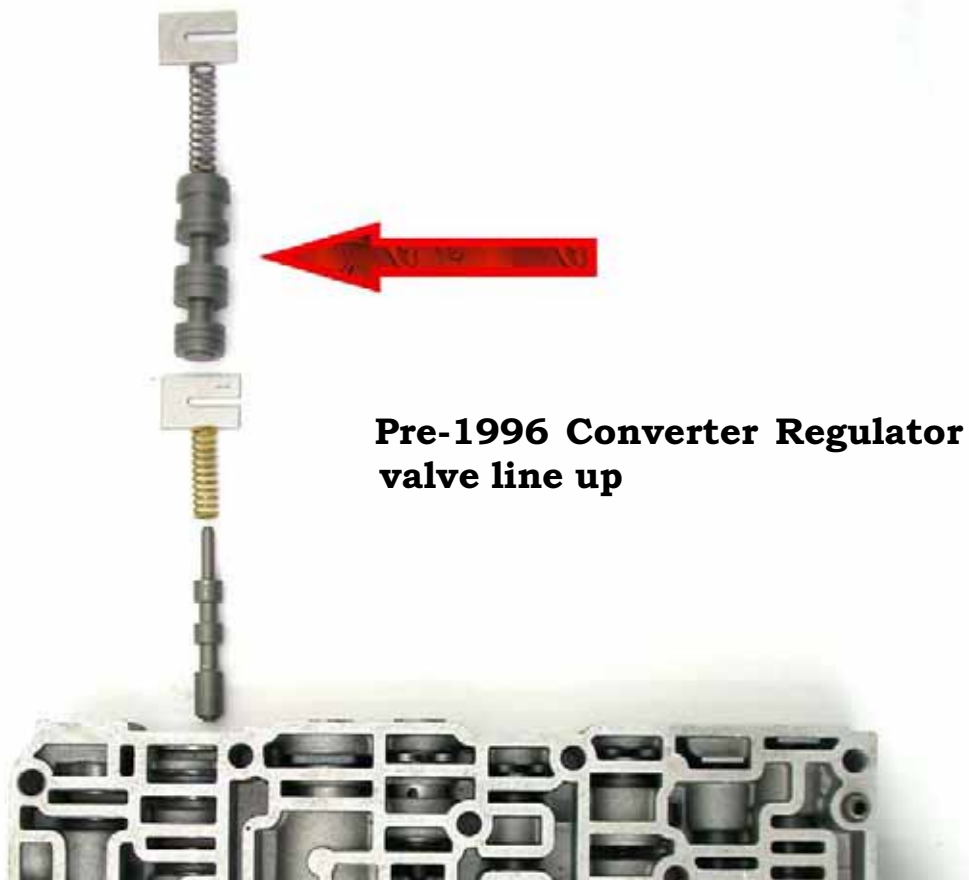
 **Check Balls**

AX4S

Valve Body Interchange (continued)

Pre-1996 Converter Regulator Valve Assembly

The Pre-1996 Converter regulator valve has four lands and is not interchangeable with later valve bodies.



AX4S

Valve Body Interchange (continued)

1996 and Newer Converter Regulator Valve

The 1996-1998 Converter regulator valve has two lands and is not interchangeable with later models



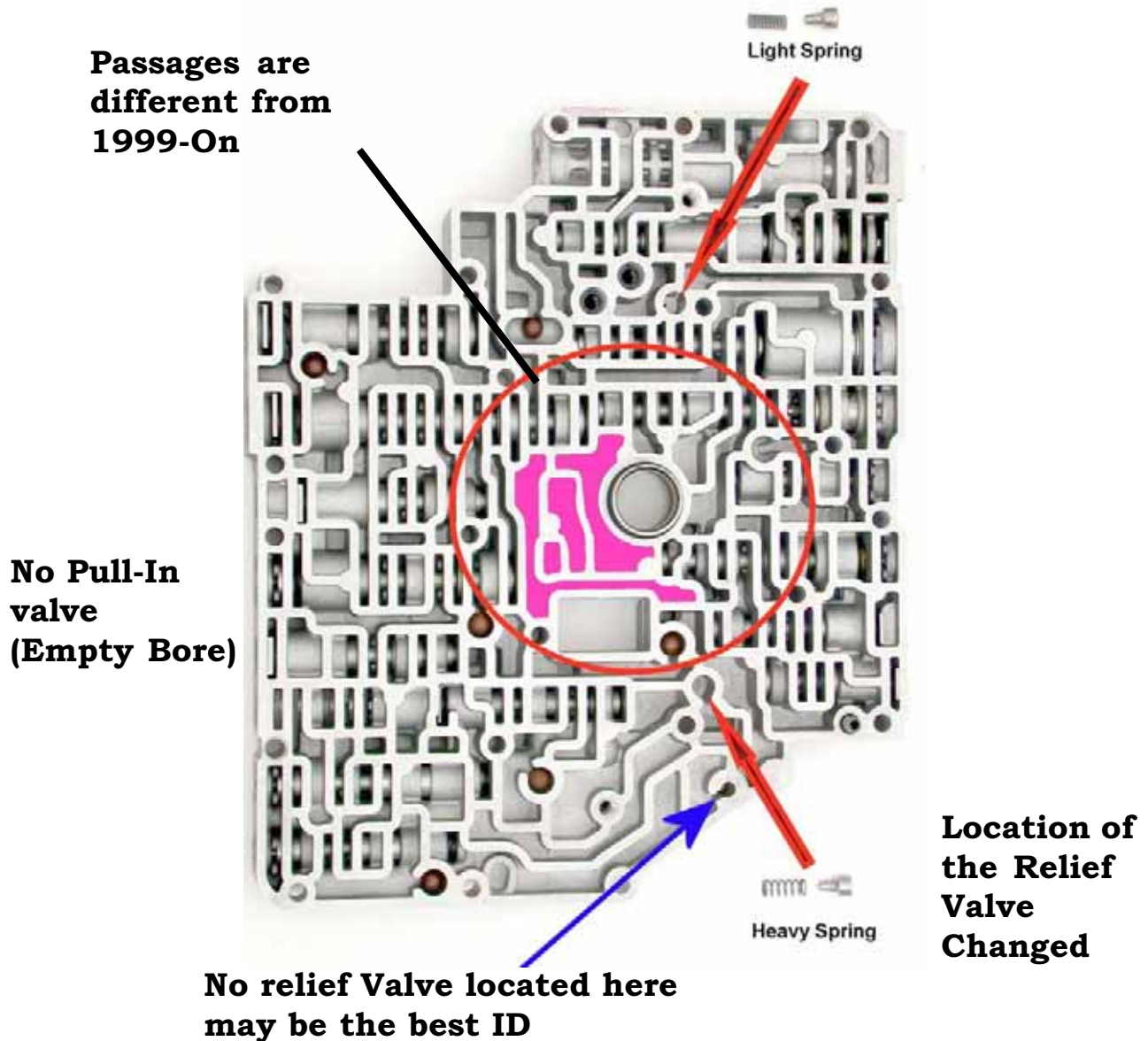
1996 and newer Converter Regulator valve line up



AX4S

Valve Body Interchange (continued)

1999 and Newer Valve Body Assembly



AX4S

Valve Body Interchange (continued)

Separator Plate Codes

Beginning April 19, 1994, the AX4S transaxles contain bonded main control separator plate gaskets. AX4S applications, both the valve body and pump body contain separator plates bonded with gaskets.

If service is required on a main control assembly containing a separator plate with a bonded gasket, service the separator plate with the correct application from the following charts.

AX4S Pump Separator Plate Application Chart		
#ID	Vehicle	Part Number
#AH	1994-95 3.0L and 3.8L Taurus/Sable	F5DZ-7R167-A
#AH	1994 3.8L Continental	F5DZ-7R167-A
#AH	1994-95 3.2L Taurus SHO	F5DZ-7R167-A
#AH	1995 3.8L Windstar	F5DZ-7R167-A
#51	1995 3.0L Windstar	F58Z-7R167-A
#51	96-97 All Engine Sizes- Taurus, Sable, Windstar	F58Z-7R167-A
#66	1999-UP 3.0L Windstar	XF2Z-7R167-AA

AX4S Valve Body Separator Plate Application Chart		
ID #	Vehicle	Part Number
#58	1995 3.8L Windstar	F58Z-7Z490-A
#43	1995 3.0L Windstar	F58Z-7Z490-B
#31	1994-95 3.2L Taurus SHO	F5DZ-7Z490-B
#40	1994-95 3.0L Taurus/Sable	F5DZ-7Z490-C
#41	1994-95 3.8L Taurus/Sable	F5DZ-7Z490-D
#41	1994 Continental	F5DZ-7Z490-D
#42	1996-97 3.0L Windstar, Taurus, Sable Replaces #63 & #97	F6DZ-7Z490-FB
#47	1996-97 3.8L Windstar	F68Z-7Z490-A
#98	98-Up 3.0L Taurus, 3.0/3.8L Windstar	F88Z-7Z490-AA

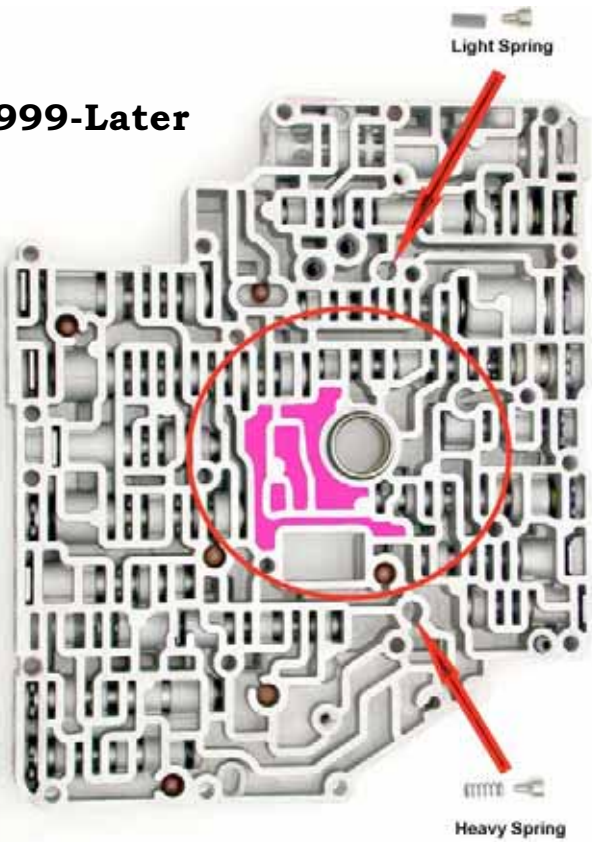
VBX AX4S interchange

AX4S

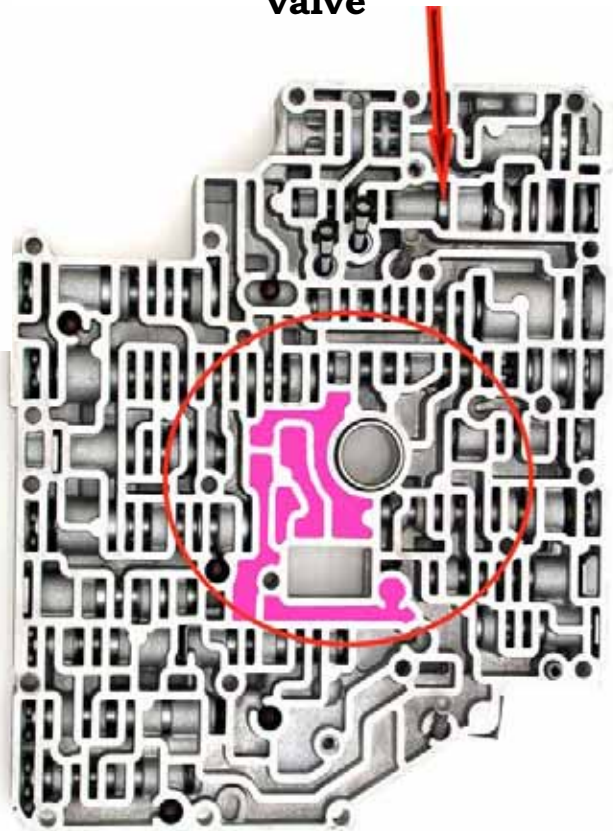
Valve Body Interchange (continued)

Areas of difference

1999-Later



1996-1998
two land
valve

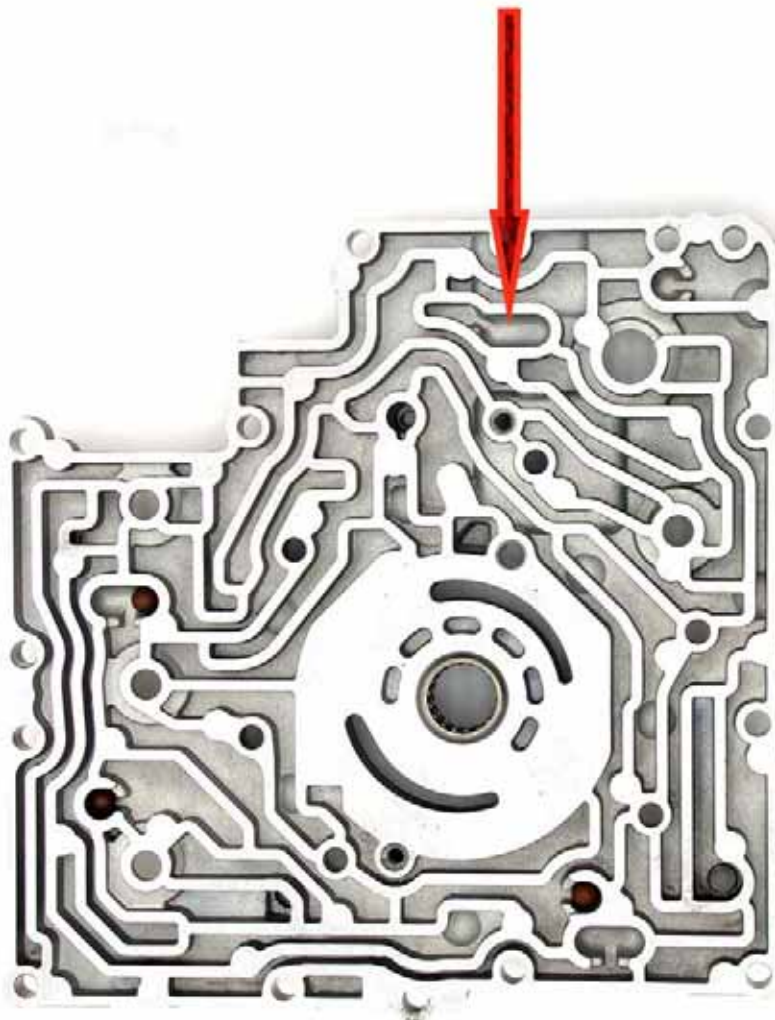


AX4S

Valve Body Interchange (continued)

1999 -On Pump Body Assembly

1999 - On AX4S pump bodies do not have a CB "5" checkball. One easy way to determine if your plate and valve body are correct is the number of holes over the CB "5" checkball bathtub. One hole means no check ball, two holes means a check ball is required.



AX4S and AX4N

EPC Solenoids

The AX4S and AX4N EPC solenoids are interchangeable, they have the same resistance, and connector. The only difference is the bracket, which is removable and can be swapped if necessary. The cost is about \$10 less then the AX4N solenoid.

New part # AX4S
F8DZ-7G383-BB



New part # AX4N
F8DZ-7G383-AB

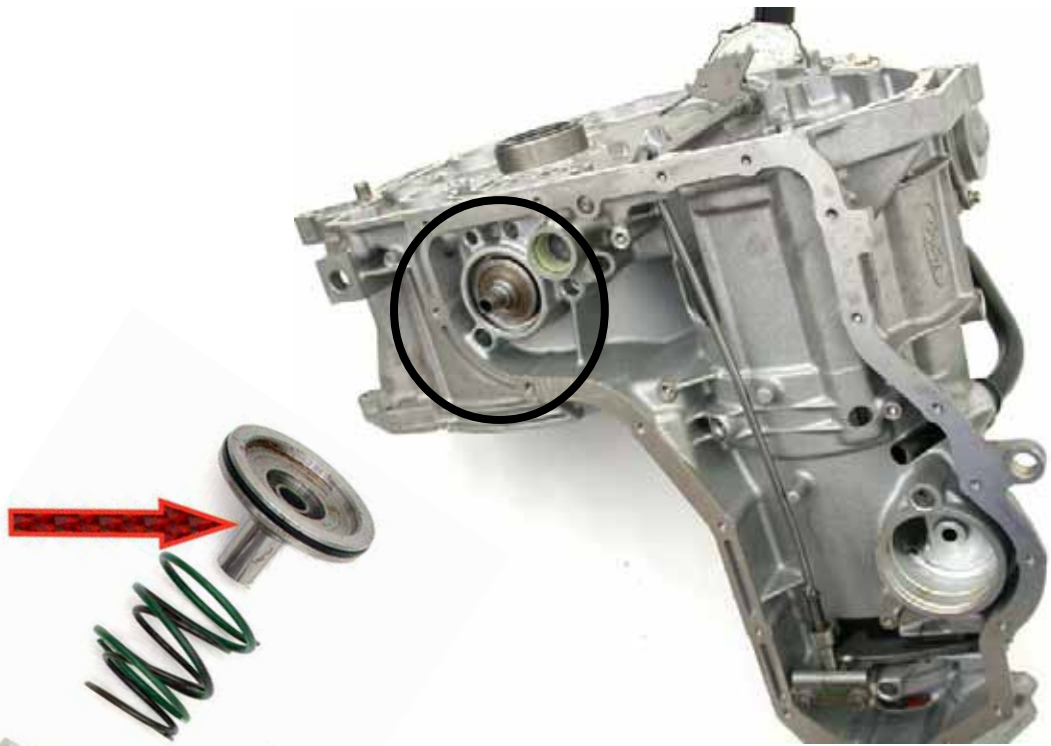


AX4N

Delayed Engagement

A delayed engagement may be caused by a worn or damaged neutral drive accumulator pin. The pin seals the oil between the accumulator and the forward clutch. When the pin is worn or damaged the forward clutch oil pressure is lost.

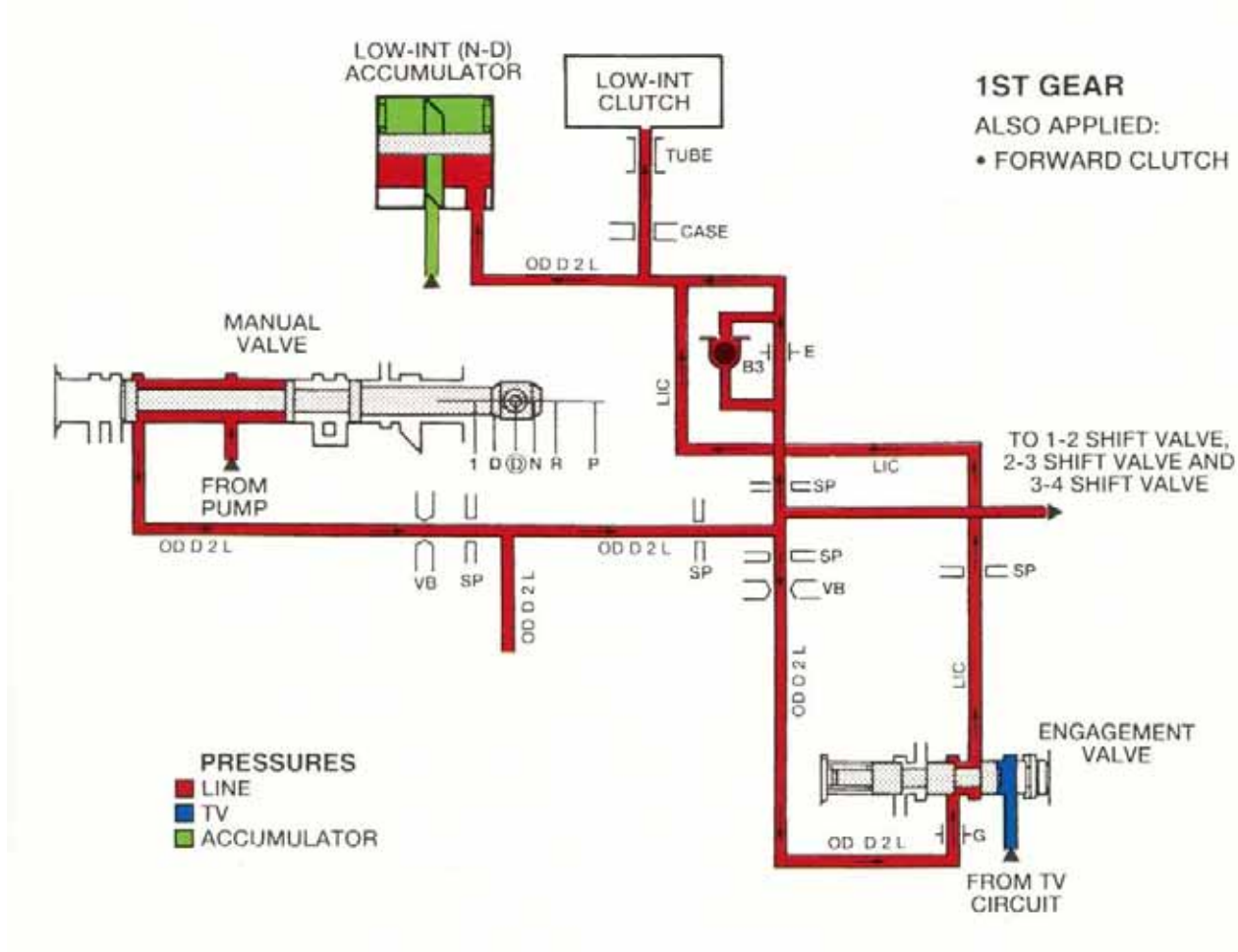
Check for wear here.



AX4N

Delayed Engagement (continued)

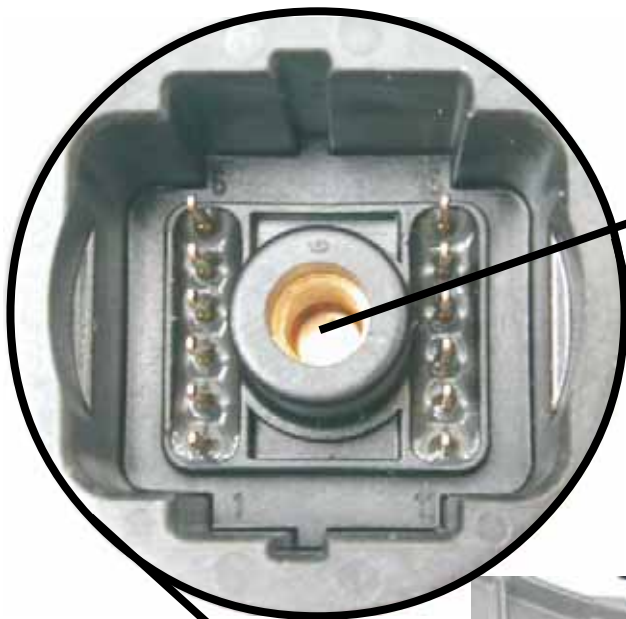
The green oil is modulated pressure from the line modulator valve. It enters the accumulator through the accumulator pin. The Red oil is line oil that comes from the 1-2 shift valve and applies the forward clutch while using the N-D accumulator to cushion the application. If the pin becomes worn it allows the line oil to enter the accumulator regulaotr circuit.



5R55N/W/S

Multiple Solenoid Codes

Multiple codes that won't clear may be caused by a bad or loose connection at the solenoid connector. This concern is especially found after overhaul and during the installation. The bolt on the connector has to bottom out on the solenoid block.



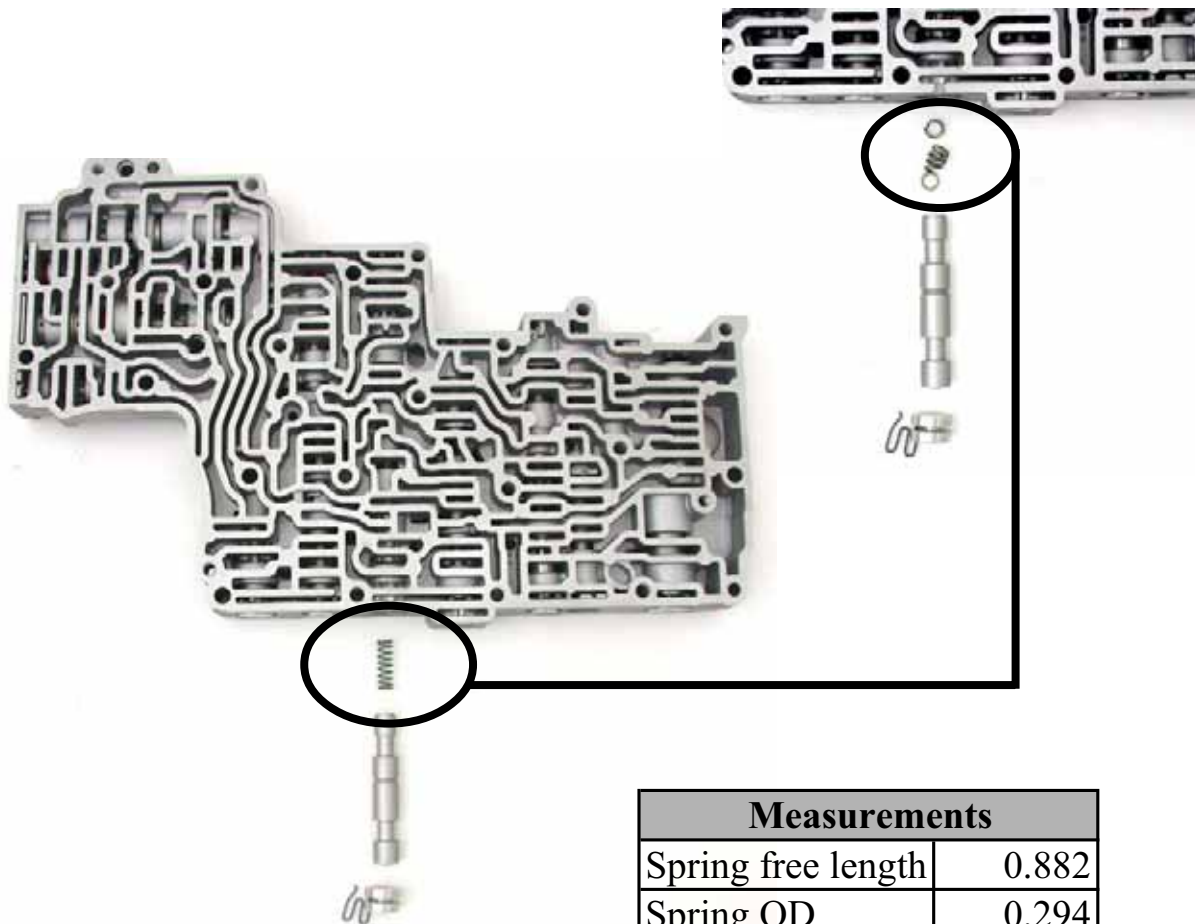
The Depth of the solenoid bolt hole is 0.470”.



5R55N only

No 4th and No 5th

The 4-3 pre-stroke intermediate band control valve spring may break due to the spring being machined incorrectly. Also, a code P0795 (Pressure Control Solenoid C circuit failure or shorted) may be present.

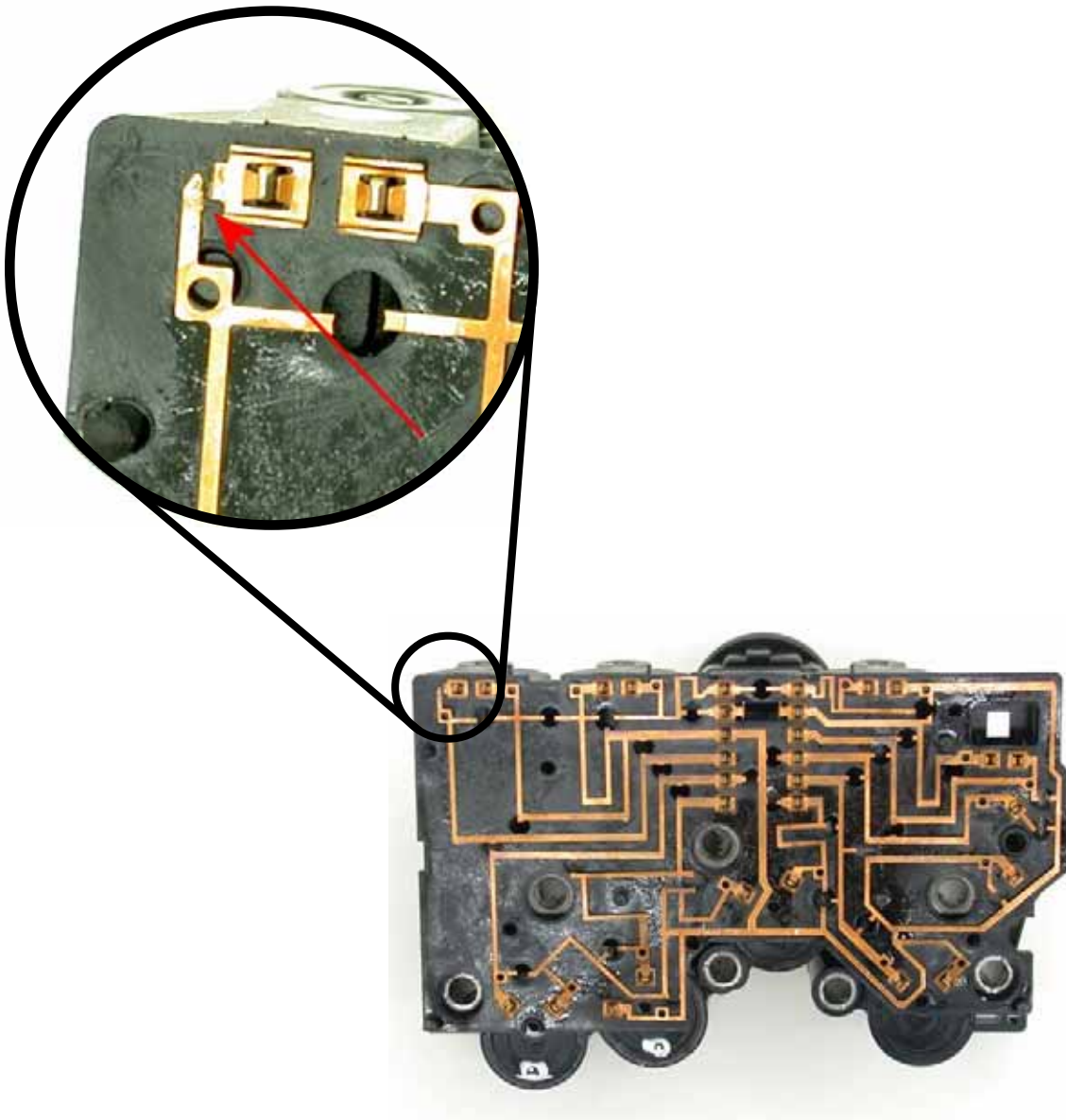


Measurements	
Spring free length	0.882
Spring OD	0.294
Spring wire size	0.034

5R55N/W/S

Solenoid Failure

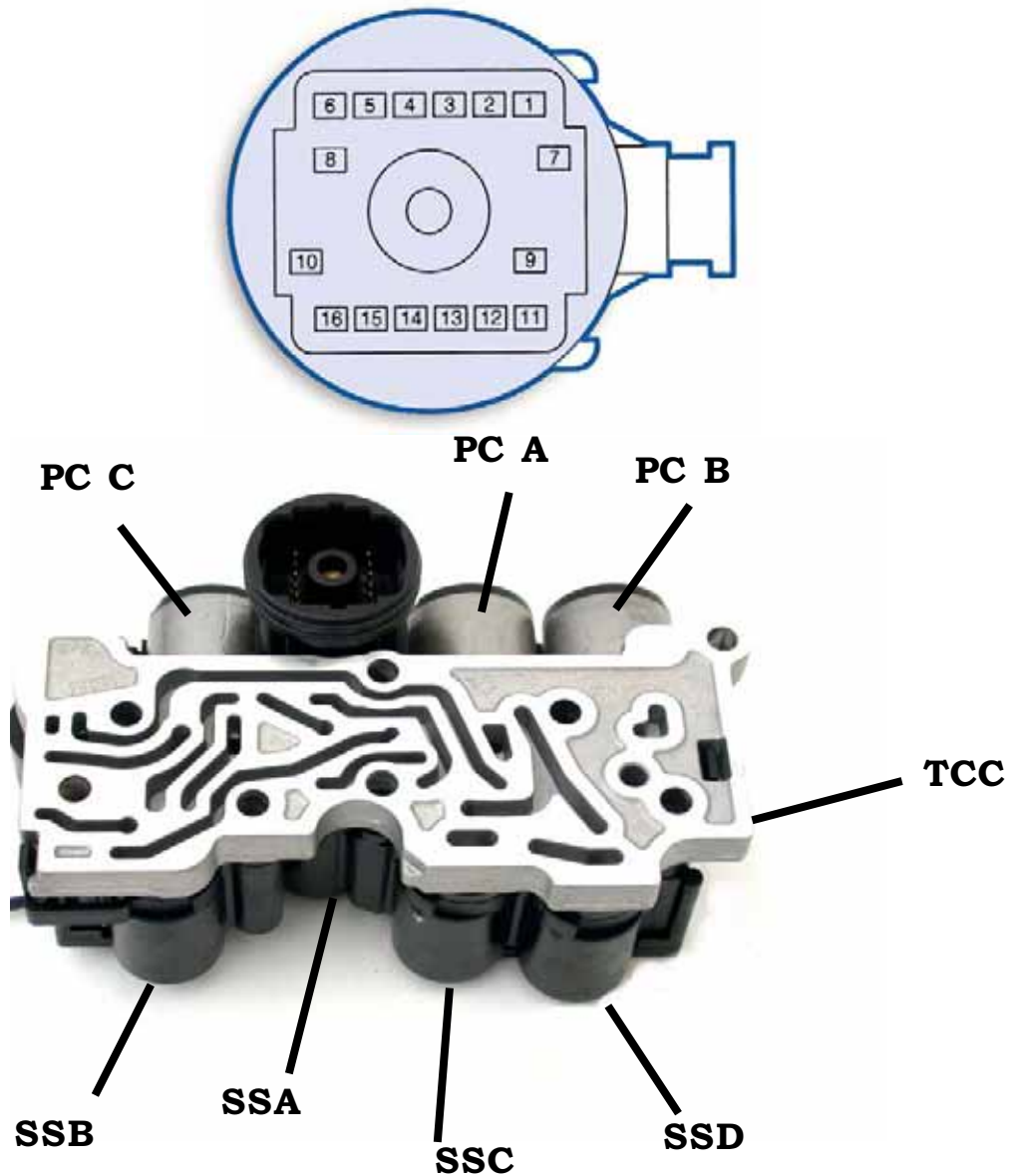
Multiple codes, with gears missing may be caused by a broken solenoid block circuit. This can be caused by the plastic housing rubbing on the circuit board.



5R55N/W/S

Solenoid ID

When testing the solenoids on the bench, you'll need to use the harness connector illustration on this page.



5R55N/W/S

Solenoid ID (continued)

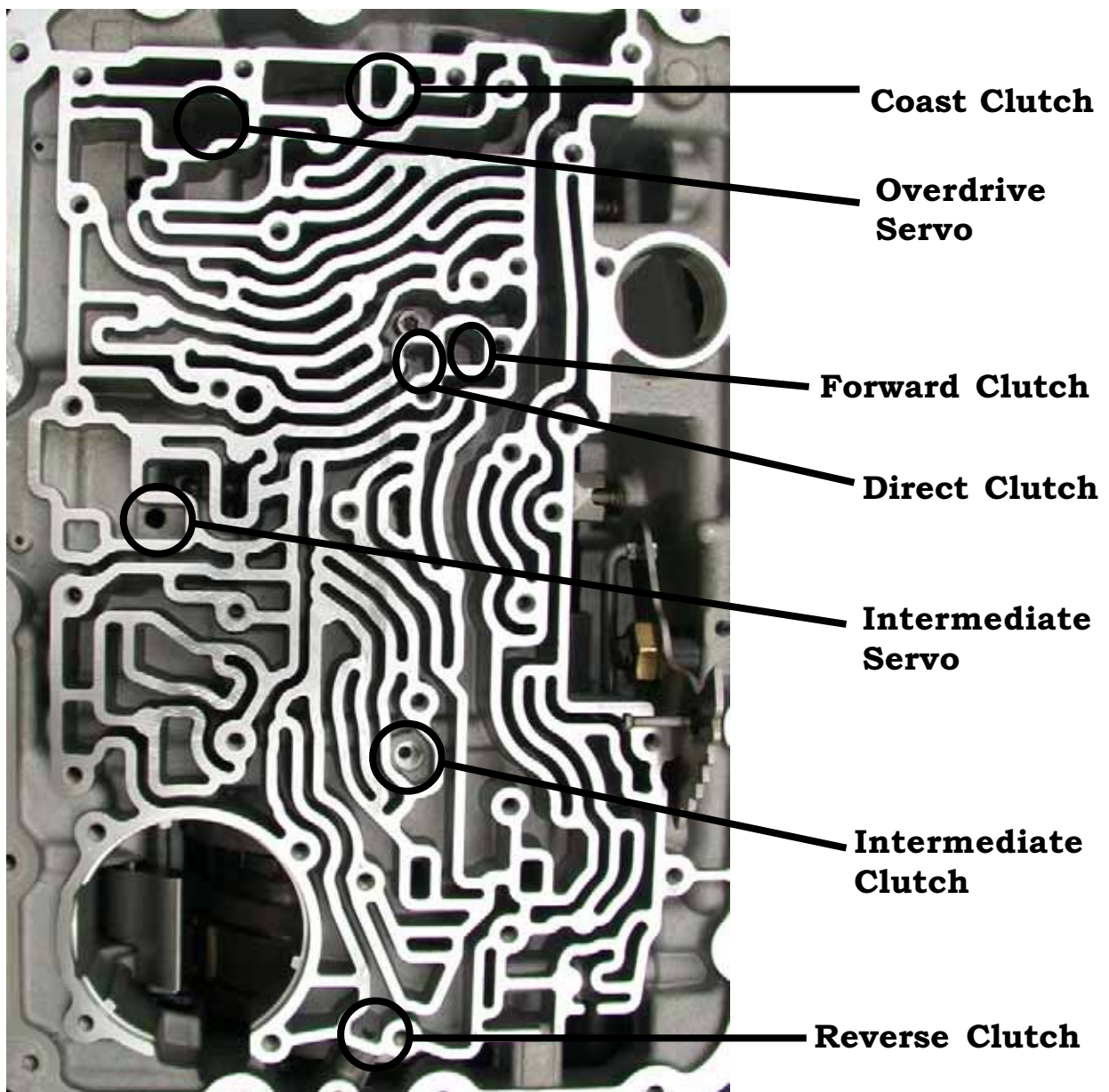
ID	Resistance
PC A	3.3-7.5 ohms
PC B	3.3-7.5 ohms
PC C	3.3-7.5 ohms

ID	Resistance
SSA	16-45 ohms
SSB	16-45 ohms
SSC	16-45 ohms
SSD	16-45 ohms
TCC	9-16 ohms

Pin#	5R55W/S	5R55N
1	PC B	PC A
2	TFT sensor	TFT sensor
3	SS +	SS +
4	PC C	PC B
5	SSD	SSD
6	SSC	SSC
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A
10	N/A	N/A
11	PC A	PC C
12	Sig Return	Sig Return
13	N/A	RP Switch
14	TCC	TCC
15	SSB	SSB
16	SSA	SSA

5R55N

Air Checks



5R55N

Delayed Engagements

Vehicles built prior to 10/17/2000 with the 5R55N transmission may exhibit delayed reverse or drive engagements, harsh upshifts or downshifts, erratic upshifts, or delayed downshifts near 20 mph. This may be caused by the calibration of the Powertrain Control Module (PCM).

If the condition is valid, first repair all Diagnostic Trouble Codes (DTCs) that may be present. If the condition is still present or returns after repair, the PCM must be reprogrammed.

Refer to the following PCM calibration information chart. After reprogramming has been completed, the transmission adaptive strategy for pressure control on engagements must be updated.

1. Install your scanner and monitor the Transmission Fluid Temperature (TFT). Warm the transmission fluid to at least 54°C (130°F) as indicated by the TFT.
2. Perform five (5) engagements from park to reverse. Each engagement must be 5 seconds apart.
3. Perform five (5) engagements from drive to reverse. Each engagement must be 5 seconds apart. Perform five (5) engagements from reverse to drive.
4. Perform five (5) engagements from neutral to drive. Each engagement must be 5 seconds apart.

Calibration Chart

PCM CALIBRATION INFORMATION						
Application	Old Part Number (-12A650-)	Tear Tag	New Part Number (-12A650-)	Old Calibration	New Calibration	NGS/WDS Qualifier
LS - 3.0L, 5R55N	XW4F-JJ	VAV0	XU7Z-TA	9LDA-AAH	9LDA-AAH	WDS B14.3 Release
LS - 3.0L, 5R55N w/SST	XW4F-KH	DYZ0	XU7Z-SA	9LDA-ACG	9LDA-ACG	WDS B14.3 Release
LS - 3.0L, 5R55N	1U7A-JA	MSU1	1U7Z-JB	1LQ16B0507	1LQ16B0507	WDS B14.3 Release
LS - 3.0L, 5R55N w/SST	1U7A-KA	DJY1	1U7Z-KB	1LQ16S0507	1LQ16S0507	WDS B14.3 Release
LS - 3.9L, 5R55N w/SST	1U7A-HA	MFF1	1U7Z-HB	1LQ19S0506	1LQ19S0506	WDS B14.3 Release
LS - 3.9L, 5R55N w/3.31 axle	1U7A-DA	KQI1	1U7Z-DB	1LQ18B0506	1LQ18B0506	WDS B14.3 Release
LS - 3.9L, 5R55N w/3.58 axle	1U7A-GA	KSF1	1U7Z-GB	1LQ19B0506	1LQ19B0506	WDS B14.3 Release
LS - 3.9L, 5R55N 50 States w/SST	1U7A-FA	FMS1	1U7Z-FB	1LQ18S0506	1LQ18S0506	WDS B14.3 Release

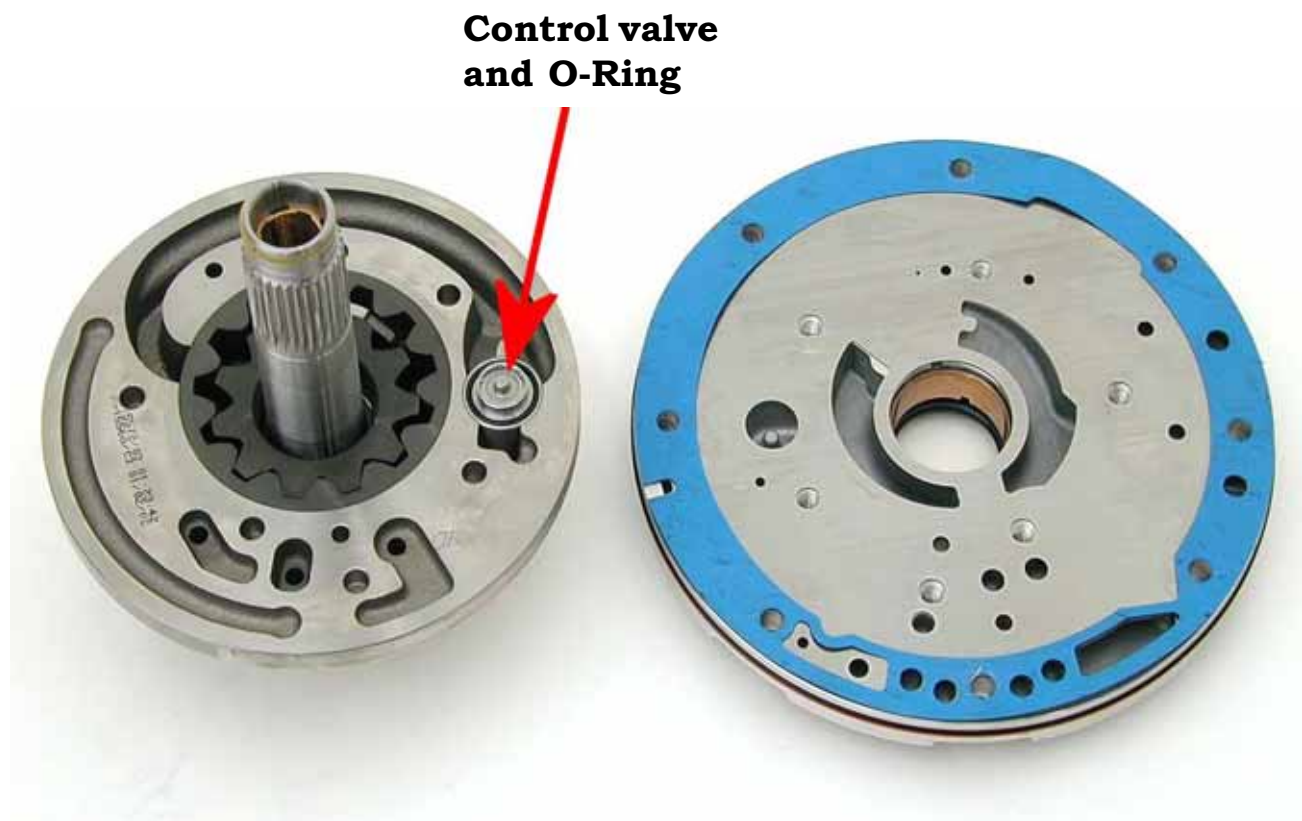
5R55N/W/S

No and/or Slow Engagement

5R55N/W/S Flow Control Valve

A Delayed engagement after sitting when hot or cold may be caused by the flow control valve o-ring missing, destroyed, or the control valve is stuck in the OPEN position.

The flow control valve is used to help control the volume output of the pump.

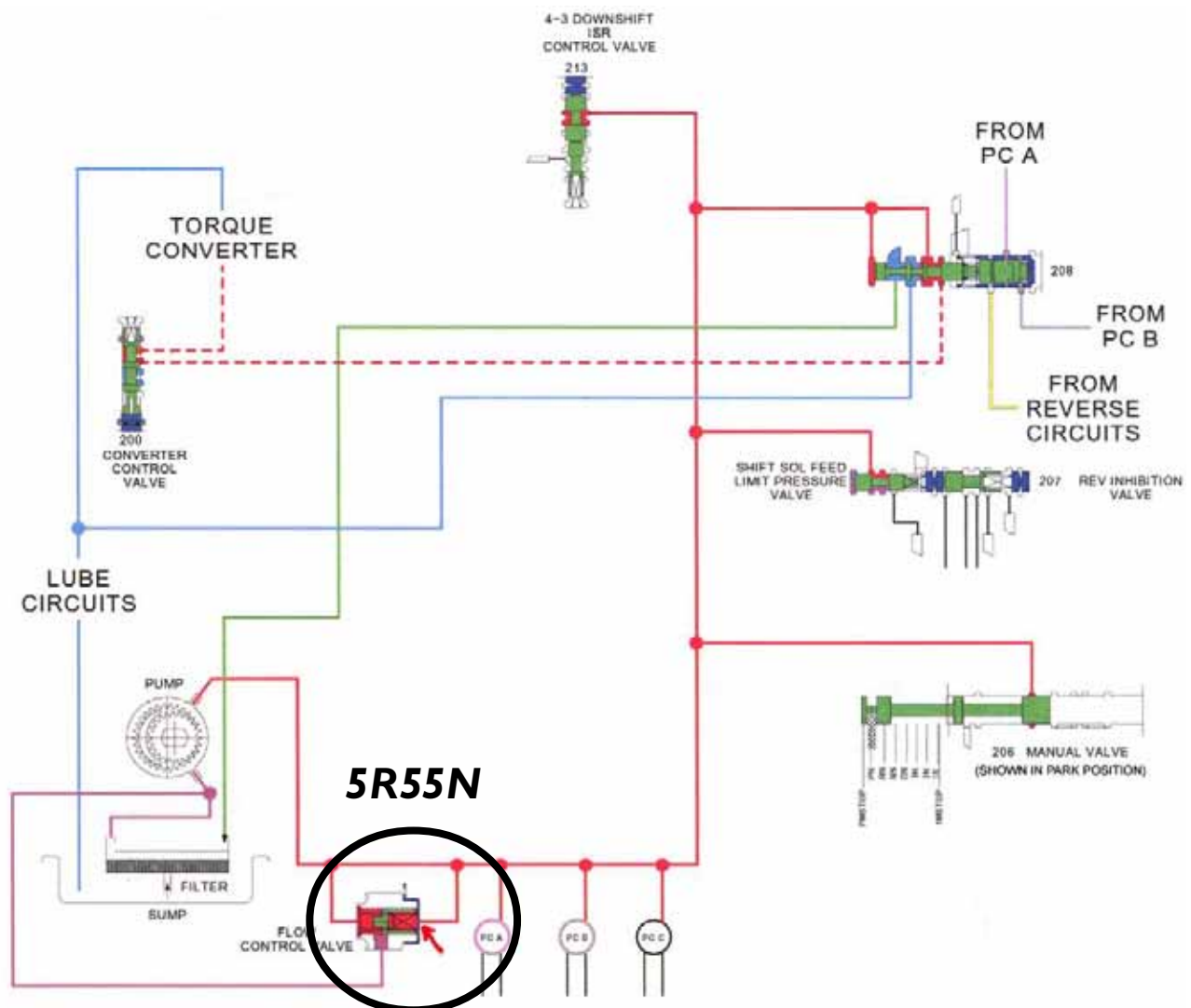


5R55N/W/S

No and/or Slow Engagement (continued)

5R55N/W/S Flow Control Valve

The flow control valve works like a high pressure blow off valve. As main line oil is distributed the flow control valve is used to make sure pressure does not become excessive. If the pressure exceeds the maximum limit, the valve simply opens and allows the oil to drain back into the pump intake.

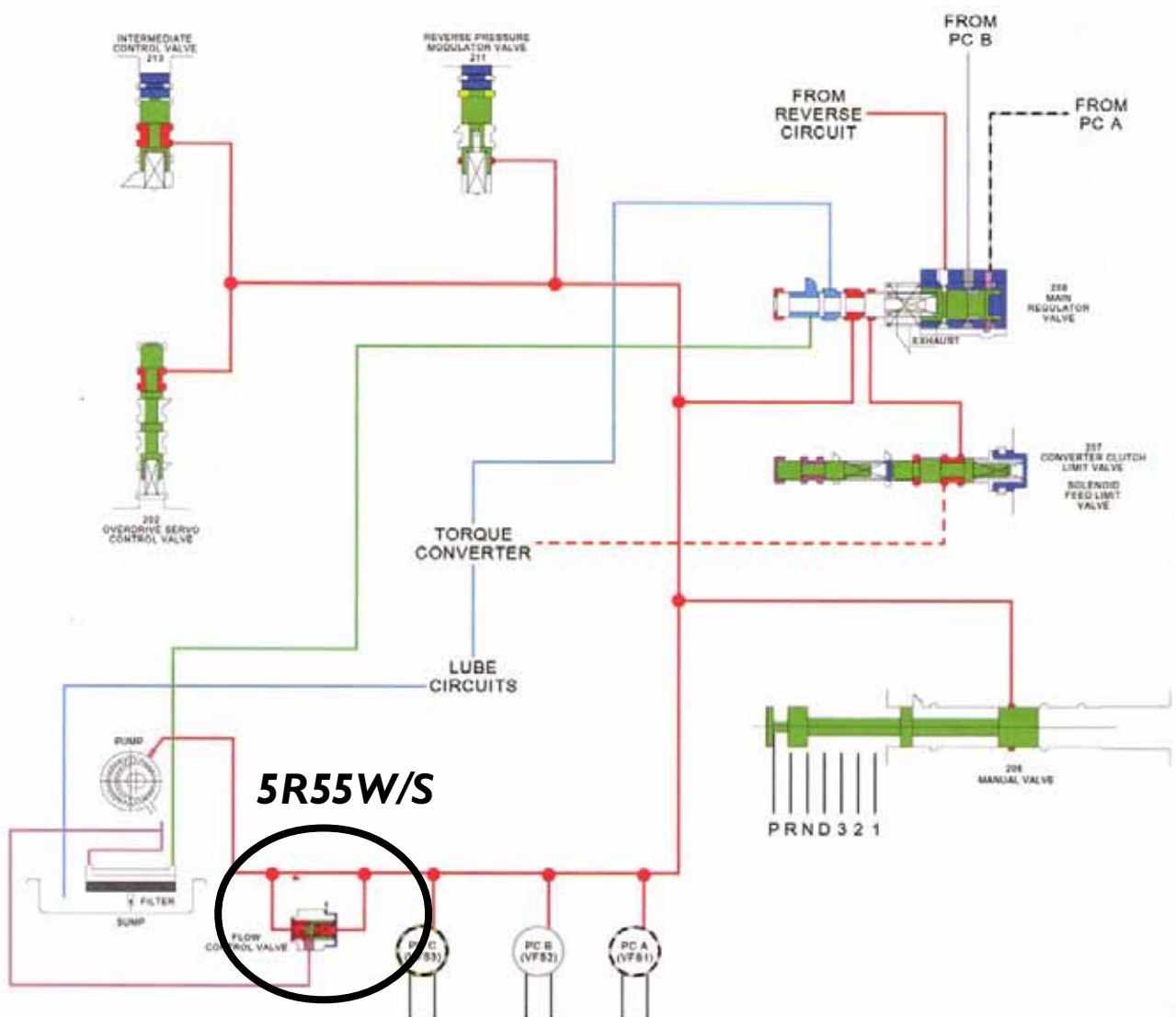


5R55N/W/S

No and/or Slow Engagement (continued)

5R55W/S Flow Control Valve

The flow control valve works like a high pressure blow off valve. As main line oil is distributed, the flow control valve makes sure pressure does not become excessive. If the pressure exceeds the maximum limit, the valve simply opens and allows the oil to drain back into the pump intake.



5R55N/W/S

No and/or Slow Engagement (continued)

Make sure during reassembly that the oil seal is attached to the valve assembly.



E4OD

Failsafe with No Codes

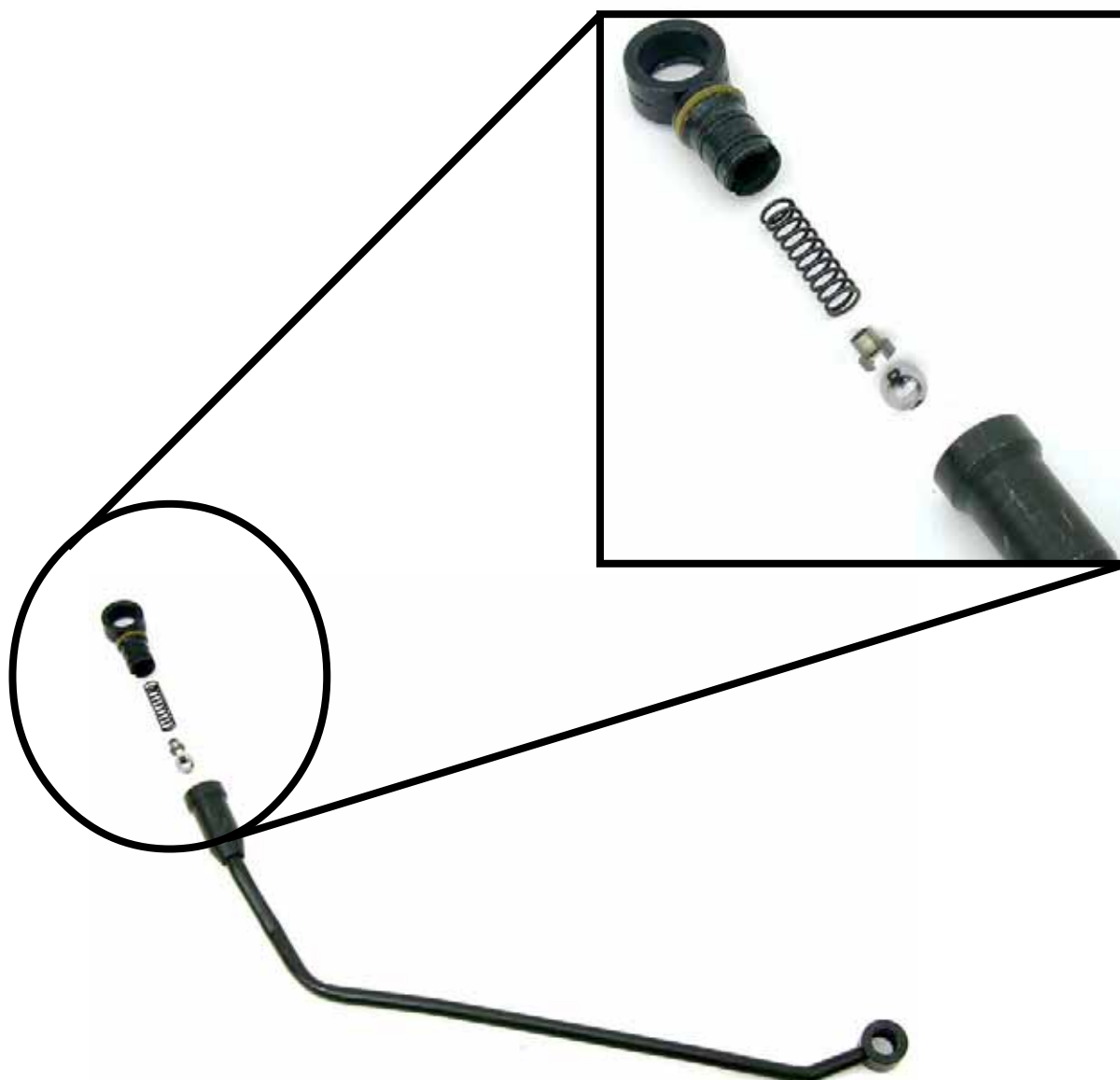
When diagnosing an E4OD in failsafe with no codes, attempt to create a code by disconnecting a solenoid or sensor I.E.: MAF, TPS, MLP, MAP.

Any one of these inputs should cause the check engine light or TCS light to illuminate. If the check engine light or TCS light fails to illuminate suspect a failed PCM. Always go through the normal procedures of checking the PCM powers and grounds before attempting to reprogram the PCM before replacing it.

4R100

Bypass Tube

Dissassembly and re-Assembly of the bypass tube may be necessary due to heavy contamination. Simply pull the top off the cooler fitting adapter while holding the tube, and the sealed fitting will release from the tube assembly.



TorqShift

Lack of Power, Slow Reverse, or Lurching at a Stop

Reprogramming the PCM

A lack of power condition, slow reverse after cold soak, lurching at a stop (zero mph) may be caused by a reprogramming fault. If a complaint of this nature comes in to your shop, monitor the Accelerator Pedal Position sensor and RPM.

The Transmission may think it is getting a false signal from the APP sensor. In some cases the APP sensor is bad causing this false reading. This fault in the programming of the computer is causing the engine to ramp up as if the accelerator were pushed down. This may surprise the customer sitting at a stop and severe damage may occur.

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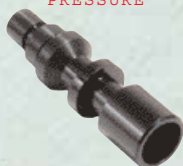
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G4A-EL

OVERSIZED PRESSURE
REGULATOR VALVE
FIXES HARSH SHIFTS & HIGH LINE
PRESSURE



74846-05

A413

GOVERNOR BRACKET
& SPRING KIT
FIXES 2ND GEAR STARTS,
NO UPSHIFTS



32204-03K
Patent Pending

41TE

CONVERTER REGULATOR
VALVE KIT
FIXES CONVERTER SHUDDER
& FAILURE



92835-03K
Patent Pending

KM175

ENDPLAY SHIM & WASHER KIT
FIXES FLARE 2-3 OR 3-2 SHIFT

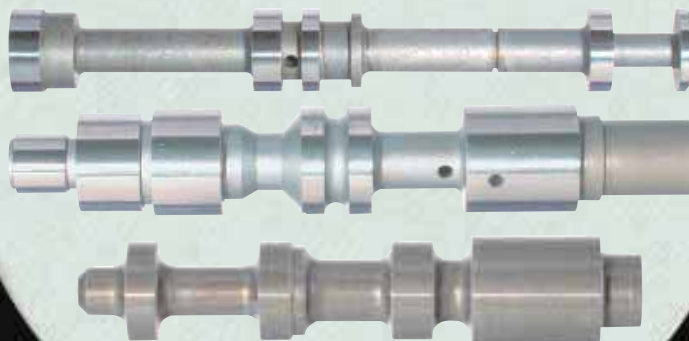


42000-01K

CHRYSLER

RWD 78 & UP

MANUAL VALVE, LUBE REGULATED PR VALVE
& 4 SPOOLED SWITCH VALVE
FIXES DELAYED ENGAGEMENT, LUBE FAILURE, LOCKUP
SHUDDER & OVERHEATED CONVERTER



Part Nos. 22771-09*, 22771A-02K* &
22771A-01
*Patent Pending

41TE

ACCUMULATOR PISTON
& SLEEVE KITS
FIXES 1-2 SHUDDER,
COASTDOWN CLUNK



92834-03K &
-05K

ZF

OVERSIZED PRESSURE
REGULATOR VALVE
FIXES HIGH LINE PRESSURE



85991-01

A4RA

96- 99 HONDA CIVIC
CPC VALVE SPRING
FIXES HARSH UPSHIFTS
& DOWNSHIFTS



88894

4L30-E

BOOST VALVE & SLEEVE KITS
FIXES LOW LINE PRESSURE



54200-01K,
-06K & -012K

42RH/RE

OVERDRIVE SET-UP SHIM KIT
PROVIDES SUFFICIENT SHIMS
TO PROPERLY SET ENDPLAY



12783-01K

42RH/RE

INTERMEDIATE SHAFT PILOT
& END PLUG KIT
FIXES POOR LUBE
OIL CONTROL



22171A-02K

NOTE: Many of these parts fit other applications also