

2009

TECHNICAL SEMINAR

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The Automatic Transmission Rebuilders Association

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Dennis Madden

Chief Executive Officer

Congratulations on attending ATRA's 2009 Technical Seminar!

These days, many shops are devoting more of their time to learning marketing and management techniques; concepts and practices designed to help shops bring more customers in the door.

That's important — we can't stay in business without customers. But bringing 'em in the door is only half the job: It doesn't mean a thing unless you have the skills and training to get 'em back out again.

That's what the ATRA Technical Seminar program is all about: It's designed to provide you with the latest information and training, to help you fix today's transmission problems. So you can get 'em out the door again, with their transmissions working like new. Because that's what'll keep 'em coming back... again and again.

So, on behalf of the ATRA staff and the ATRA Chapters that have worked so hard to put this program together, I'd like to welcome you, and thank you for doing your part to keep our industry strong. We hope you have a wonderful day, and a terrific learning experience.

A handwritten signature in black ink, appearing to read "D. Madden", written in a cursive style.

Dennis Madden,
ATRA, CEO



Lance Wiggins
Technical Director

The ATRA technical department is proud to be celebrating another year serving the automatic transmission repair industry. Many changes have taken place over the years, technical training has become an integral part of today's transmission repair industry. To that end, ATRA is pleased to present its 2009 Technical Seminar. Packed with countless hours of research, this year's seminar will stand out as one of the most demanding and useful technical training programs ever developed for this industry.

With over 240 pages of up-to-the-minute technical information, the 2009 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!

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 your continued support.

A handwritten signature in black ink that reads "Lance Wiggins". The signature is stylized with a large, sweeping "L" and a long, horizontal stroke at the end.

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ATRA Technical Director

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Remove Small Burrs and Polish Bores – **FAST!**

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PART # K4F27E



▲ PART # AB100
Covers bore sizes from 1" to 2"

▲ PART # BB100
Covers bore sizes from 1/4" to 1"

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AWF-21B

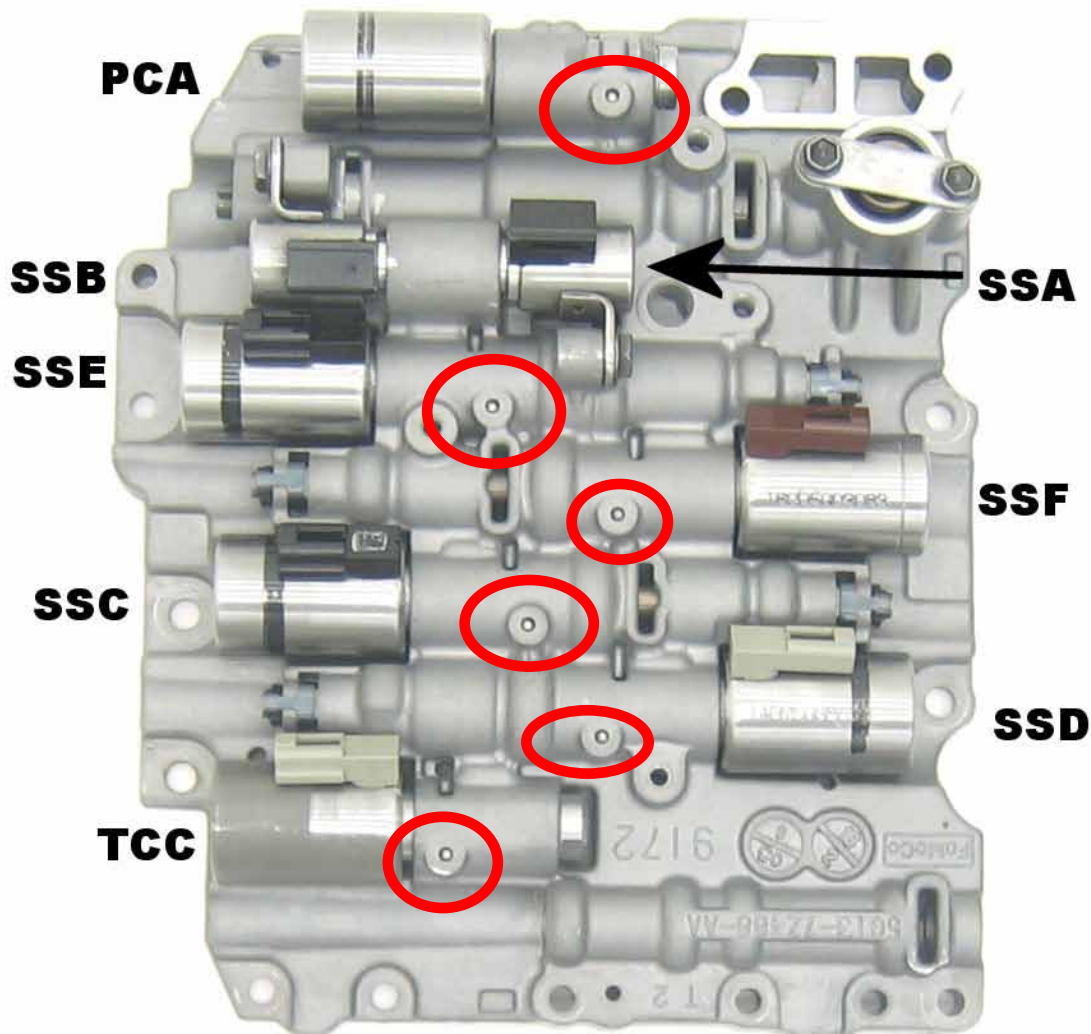
Solenoid Identification and Locations

The Solenoid identifications and locations are important. If the Solenoids are installed into the wrong location, shifting problems, codes, and ratio error will occur.

- SSA and SSB = 11-15 ohms
- SSC, SSD, SSE, TCC and PCA = 5-7 ohms

CAUTION: There are “keepers” throughout this valve body. Pay close attention to your disassembly process and use the following pages for reference. If a pin is lost during your rebuild, a replacement can be made using a needle bearing.

Pin Measurement size 0.932 x 0.118

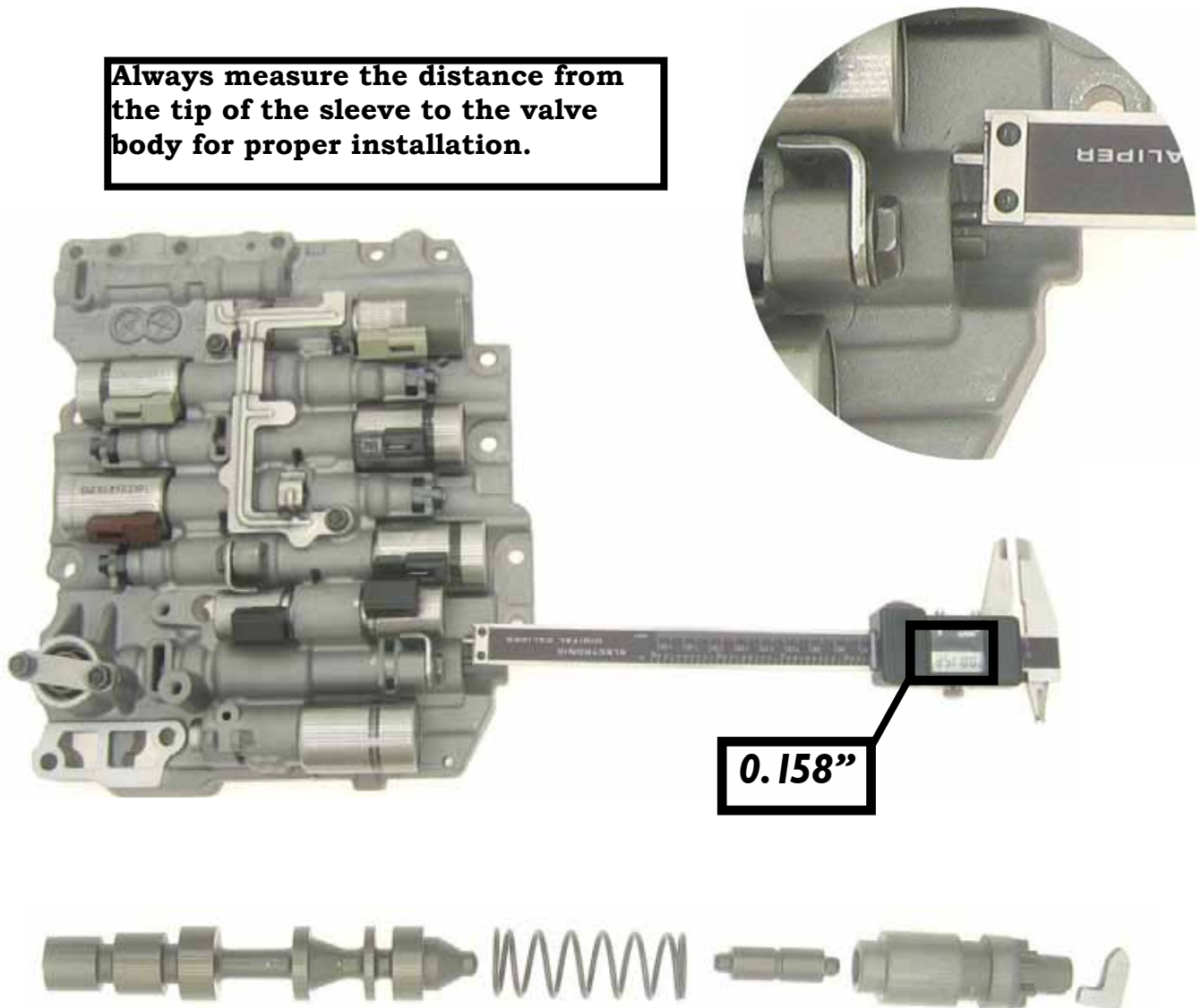


AWF-21B

Pressure Regulator Valve Adjustment

This pressure regulator valve has a stepped sleeve. Always measure the distance from the tip of the sleeve to the valve body for proper installation.

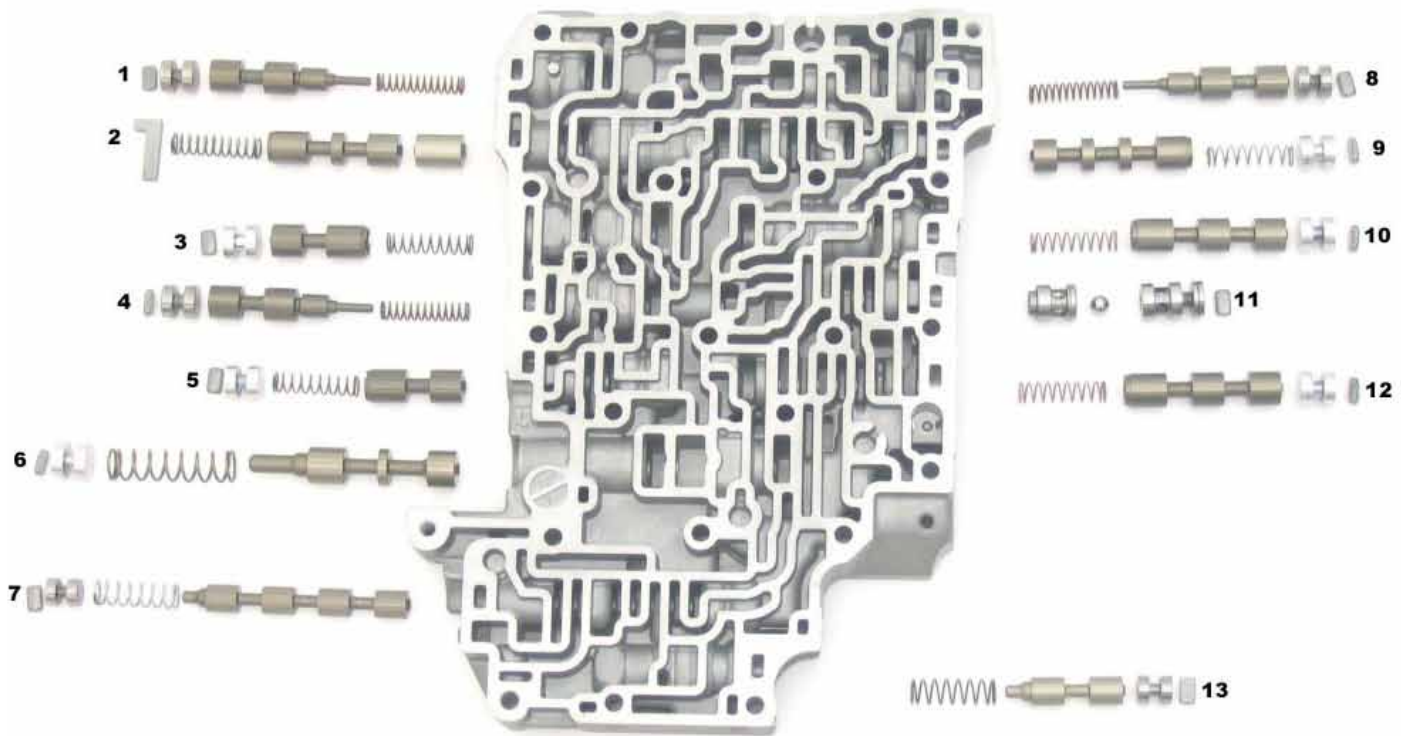
Always measure the distance from the tip of the sleeve to the valve body for proper installation.



AWF-21B

Upper Valve Body Valve Description

Use the following illustrations for reference during your rebuild.

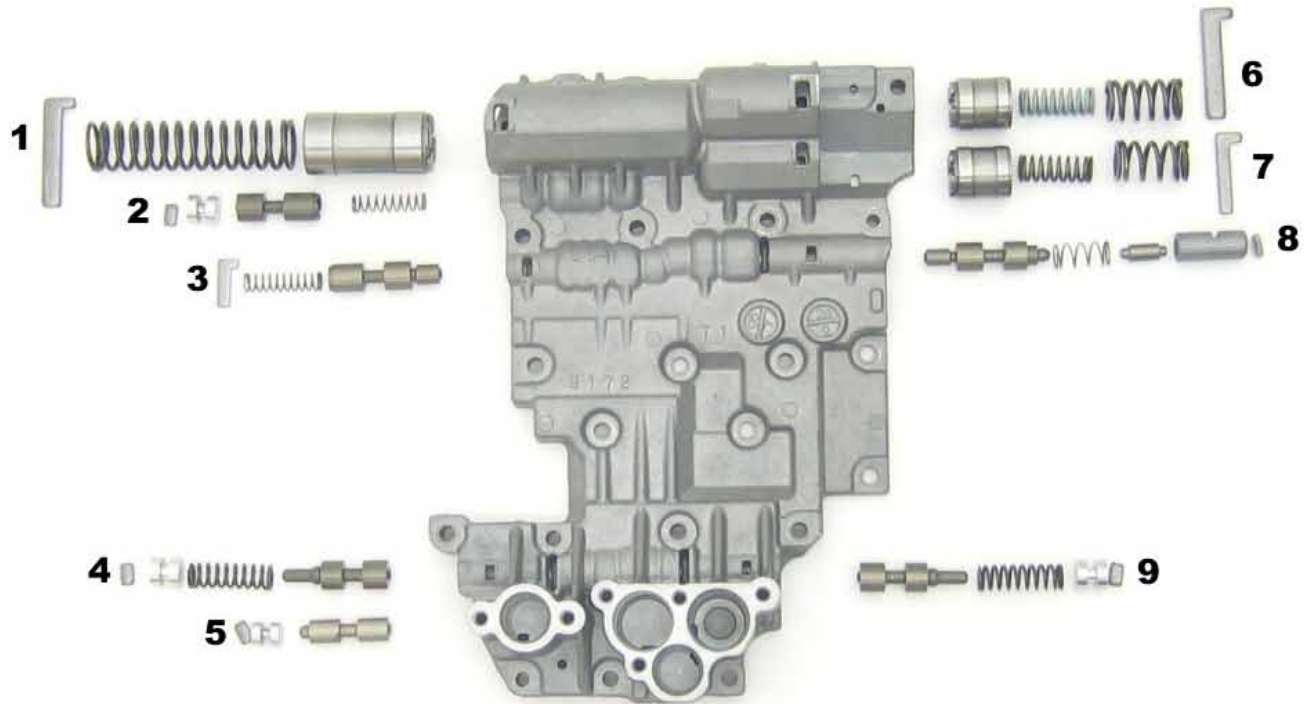


1. TBD
2. C2 Switch Valve
3. TBD
4. TBD
5. TBD
6. Secondary Regulator Valve
7. B2 Control Valve
8. TBD
9. Lock-Up Control Valve
10. C3 Control Valve
11. TBD
12. Servo Control Valve
13. PCA Regulator Valve

AWF-21B

Lower Valve Body Valve Description

Use the following illustrations for reference during your rebuild.



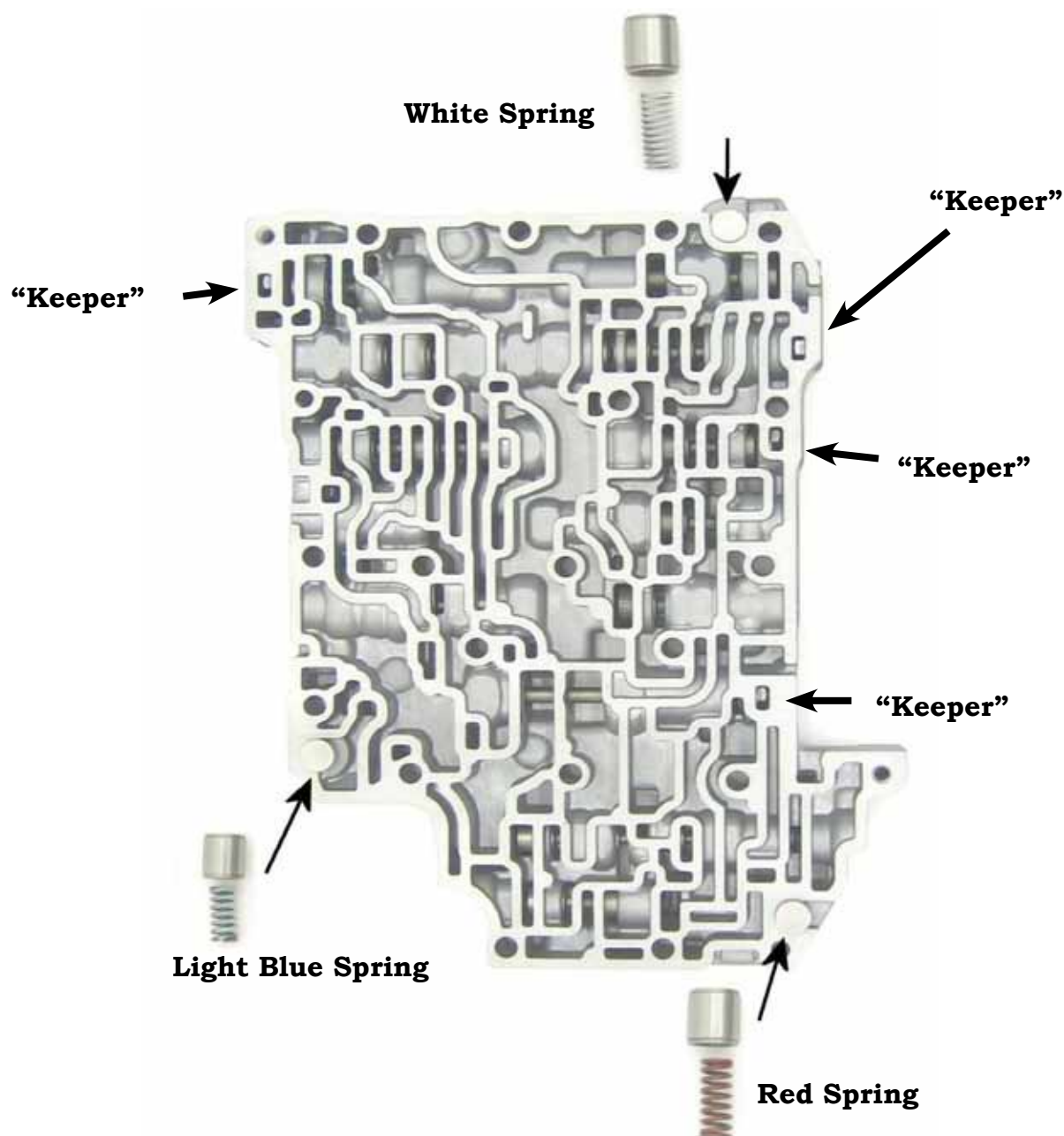
1. TBD
2. C1 Control Valve
3. TBD
4. Solenoid Regulator Valve
5. TBD
6. C1 Accumulator
7. C3 Accumulator
8. Torque Converter Regulator Valve
9. Solenoid Regulator Valve

AWF-21B

Middle Valve Body

Check Valve and Spring Locations ‘Upper Side’

Use the following illustrations for reference during your rebuild.

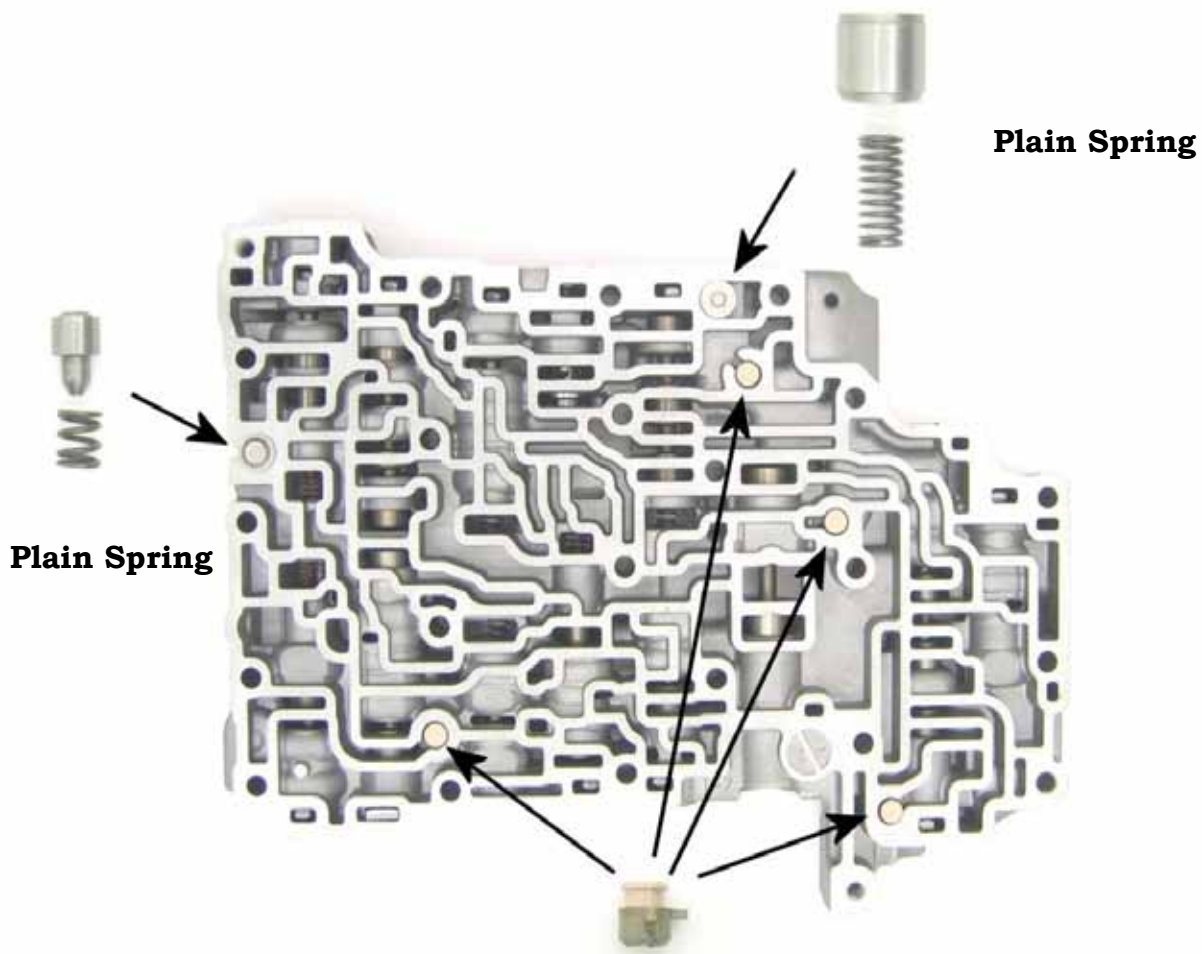


AWF-21B

Middle Valve Body (continued)

Check Valve and Spring Locations 'Lower Side'

Use the following illustrations for reference during your rebuild.

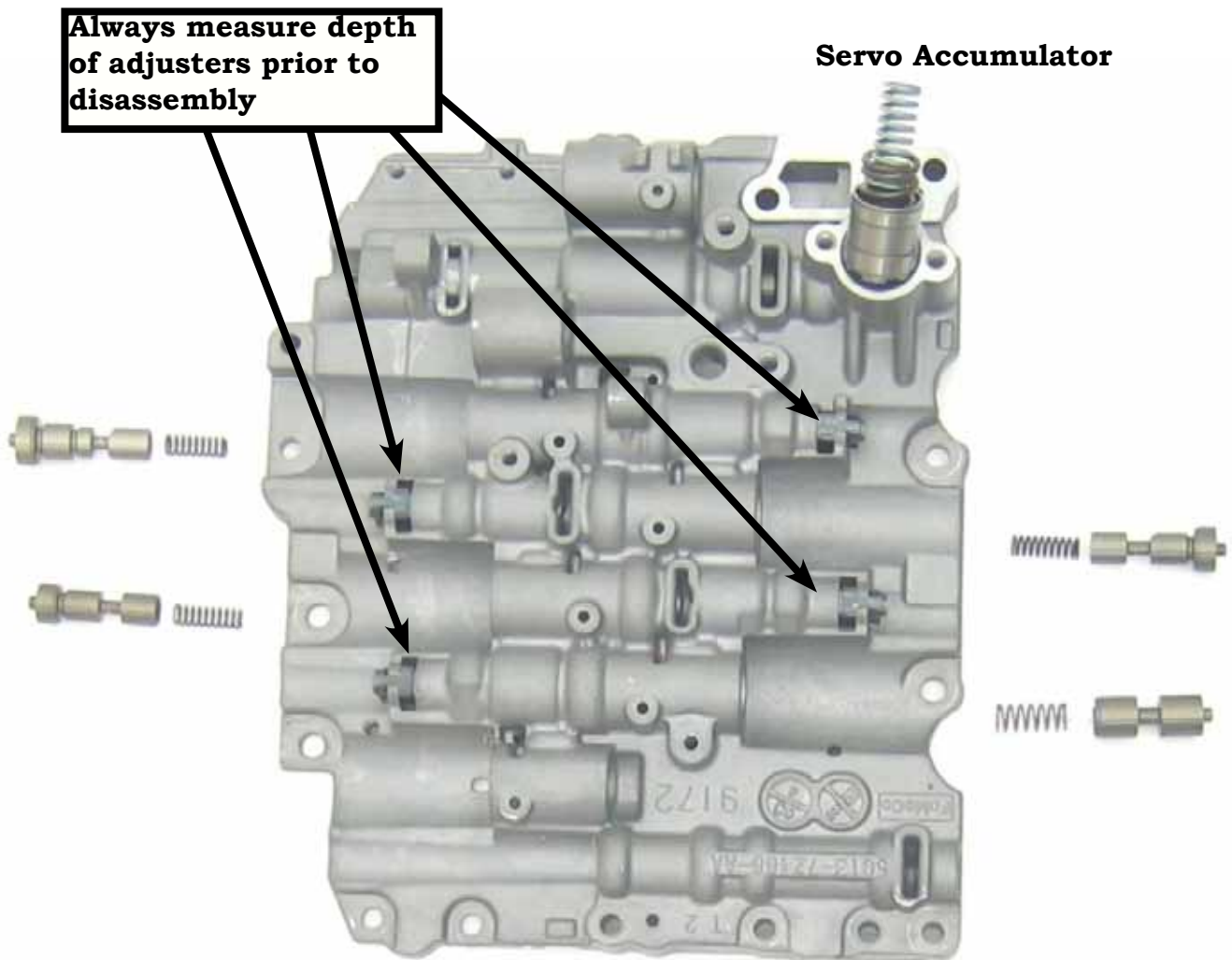


The accumulator check valves are installed with the blue side facing down into the valve body slot.

AWF-21B

Upper Valve Body Top Side

There are no manufacturer specifications for the spring tensioner depths. There are four (4) different valves with this type of layout. Always measure the depth of the tension adjusters prior to disassembly.

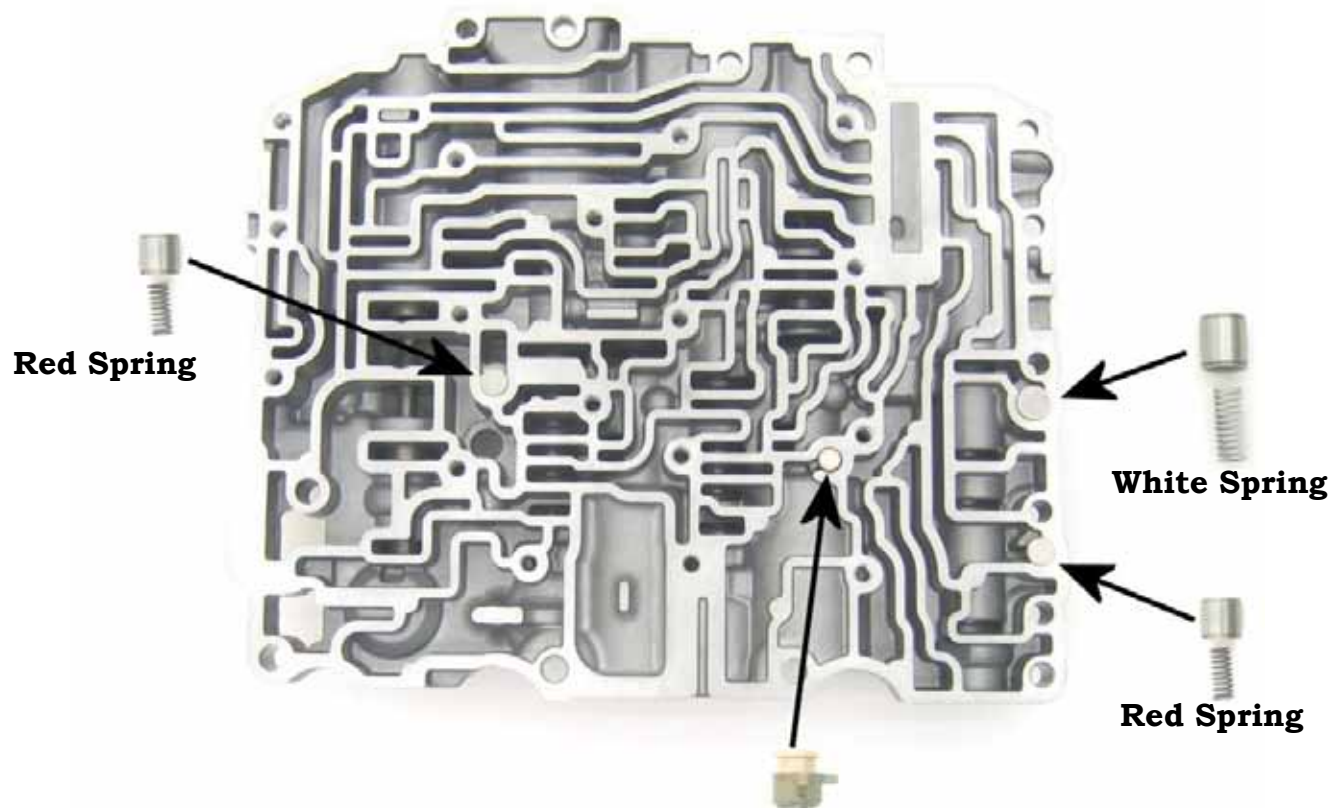


AWF-21B

Upper Valve Body

Check Valve Locations

Use the following illustration for check valves with spring and piston locations. New check valves come in the rebuild kit and should be replaced with every rebuild.



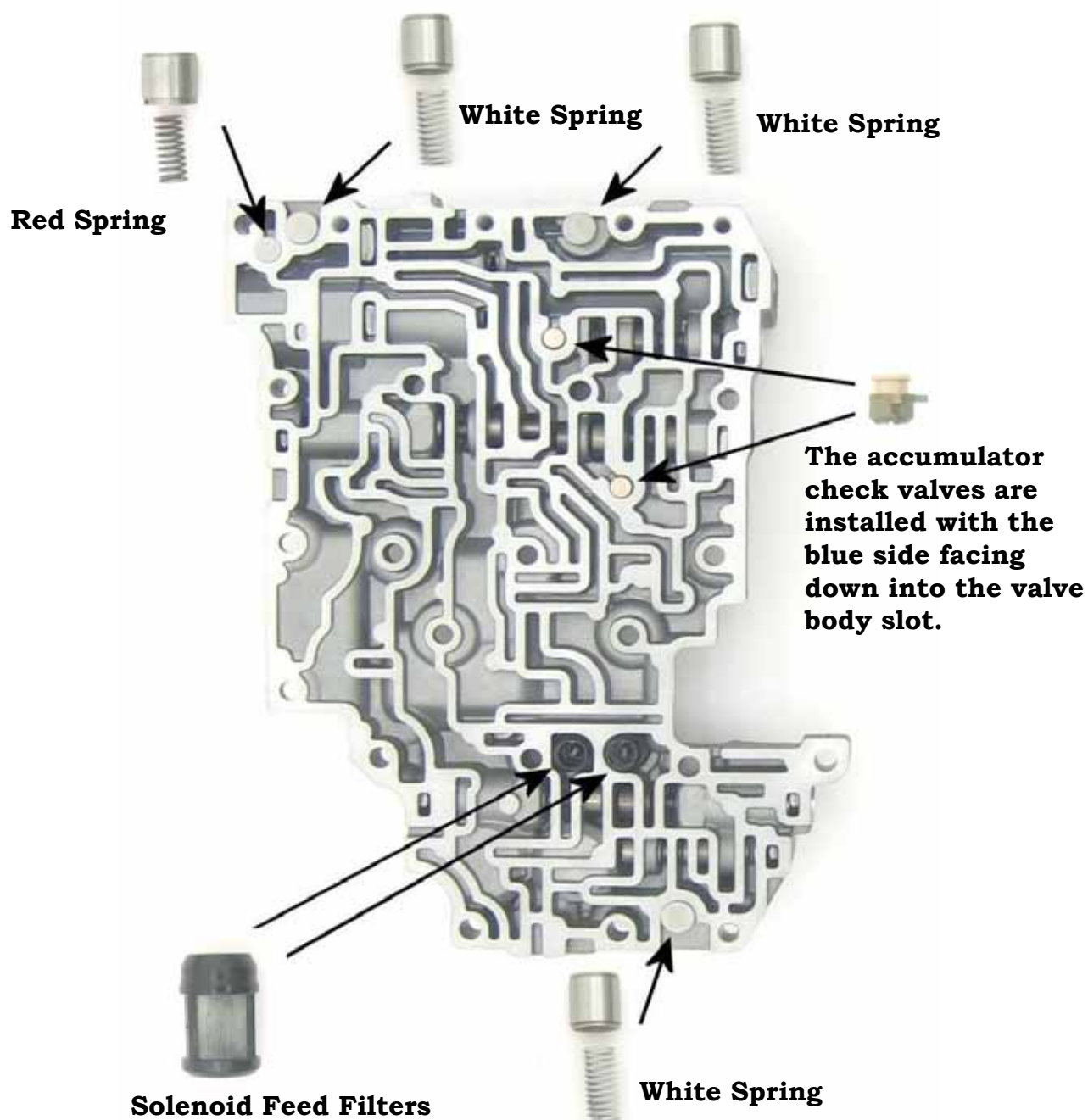
The accumulator check valves are installed with the blue side facing down into the valve body slot.

AWF-21B

Lower Valve Body

Check Valve Locations

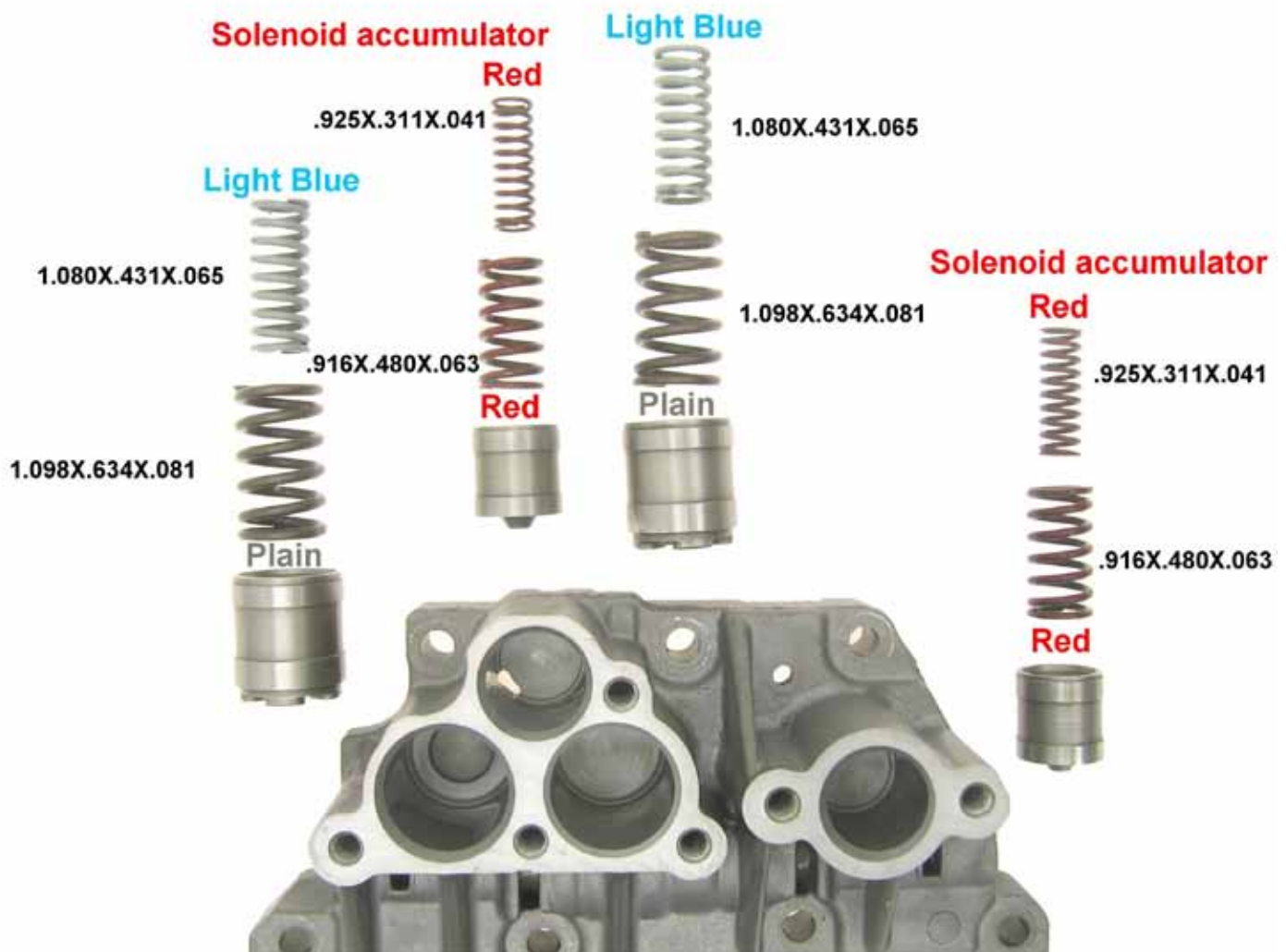
Use the following illustration for check valve with spring and piston locations. New check valves come in the rebuild kit and should be replaced with every rebuild.



AWF-21B

Accumulator Piston and Spring Location

Use the following illustration for accumulator valve and spring locations.



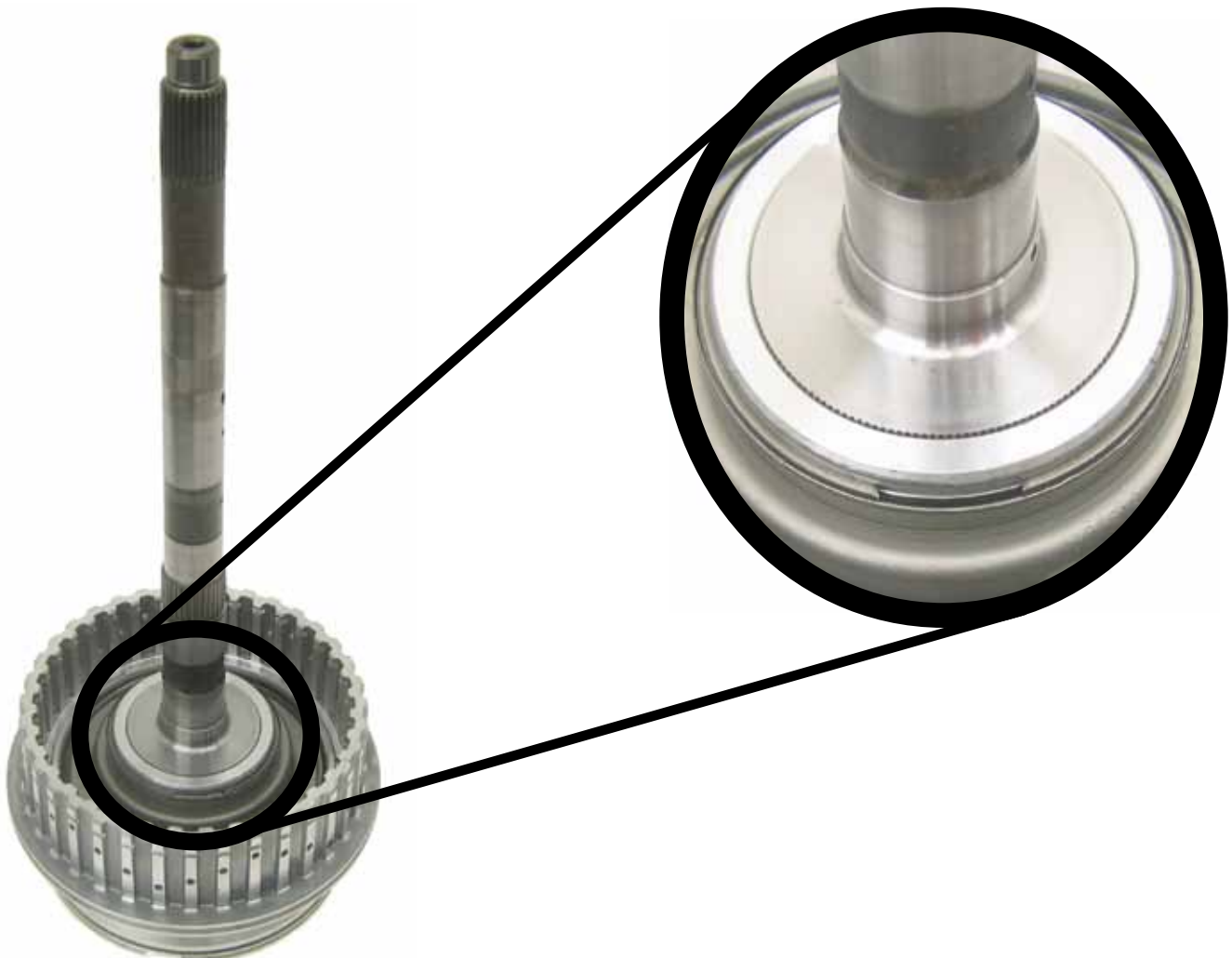
6F50

O/D Piston Return Snap Ring Removal

We used parts from around the shop to take the place of the special tools needed to disassemble and reassemble the 6F50N. To remove the retaining snap ring from the OD clutch piston return spring assembly, you'll need some parts from other transmissions:

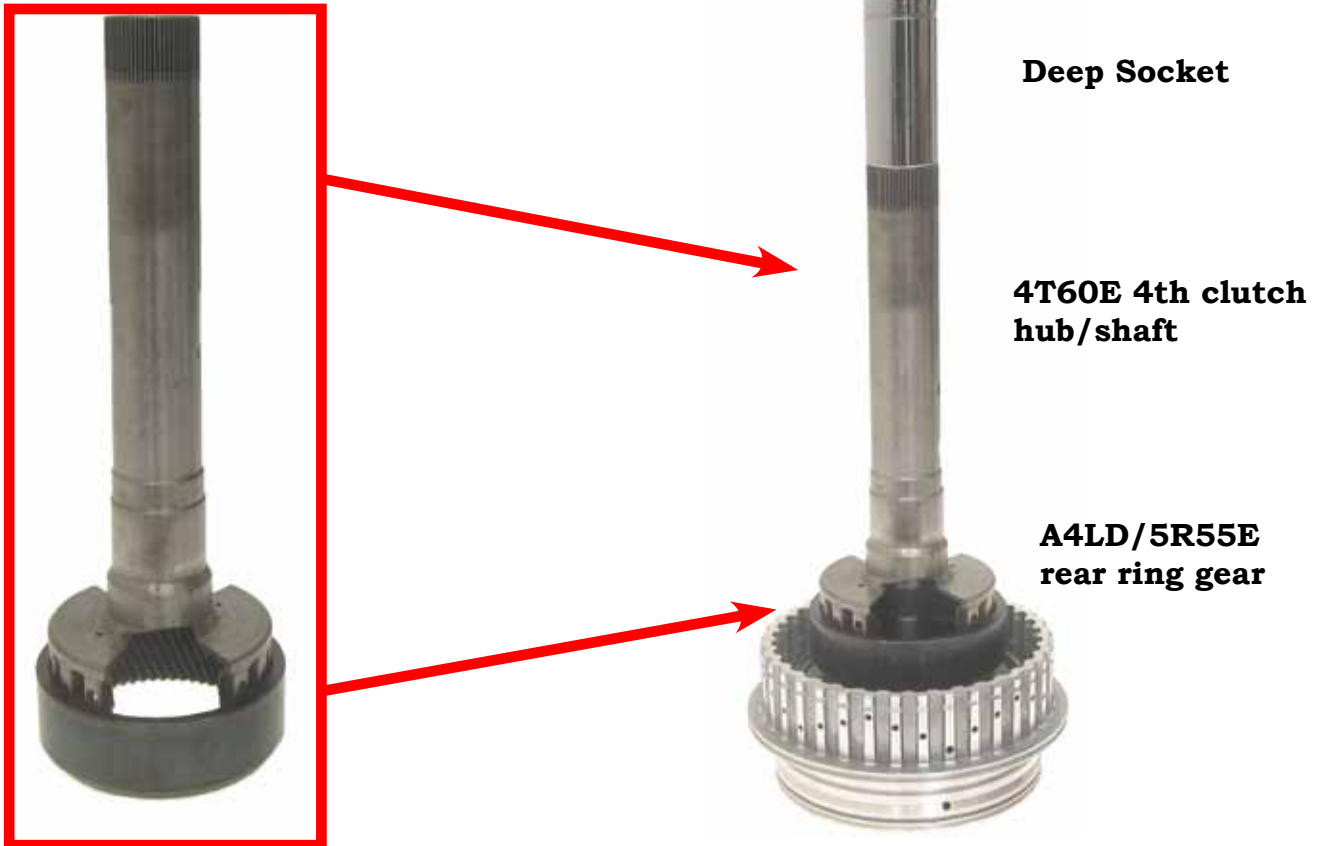
- an A4LD/5R55E rear ring gear (for the low/reverse planet)
- a worn out OD clutch hub/shaft from a 4T60E
- a large deep socket
- a suitable press.

Use a cutting wheel to cut large slots out of the 4th clutch hub/shaft. Place the ring gear on the clutch retainer and slide the 4th clutch hub down onto the ring gear. Use the deep socket as an extension of the hub to be pressed down to remove the ring.

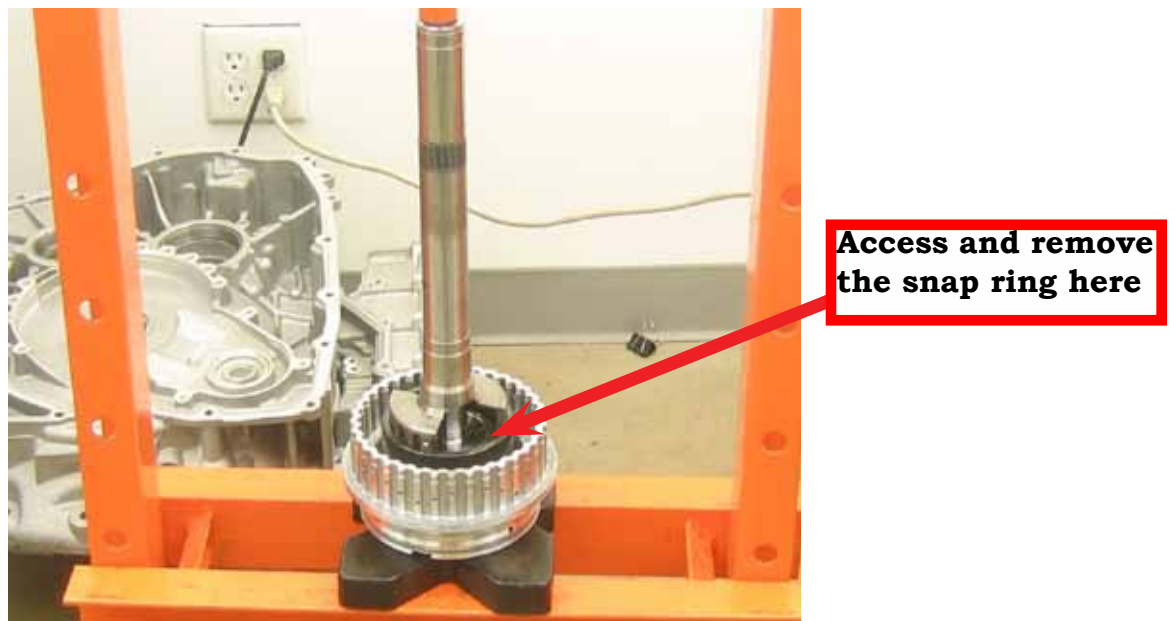


6F50

O/D Piston Return Snap Ring Removal (continued)



Press down on the retainer just enough to access the snap ring



6F50

Direct Clutch Return Snap Ring Removal

To remove and install the direct clutch piston return spring without breaking the tab, use a:

- low/reverse piston from an AW50-42LE or a 4L30E reverse clutch piston
- a bar or 12 inch 3/8 extension.

The 4L30E reverse piston will have to be modified with a cutting wheel to gain access to the snap ring but it is the correct diameter to fit the direct clutch piston.



4L30E Reverse Piston
before cut outs have
been made



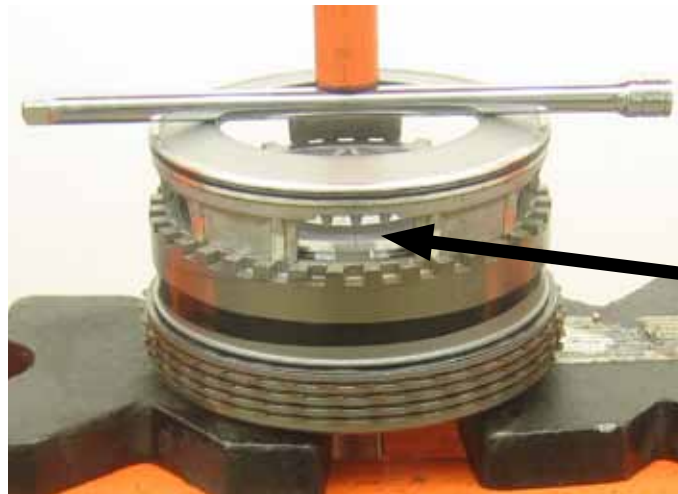
AW50-42LE low/reverse
piston-no modification
necessary

6F50

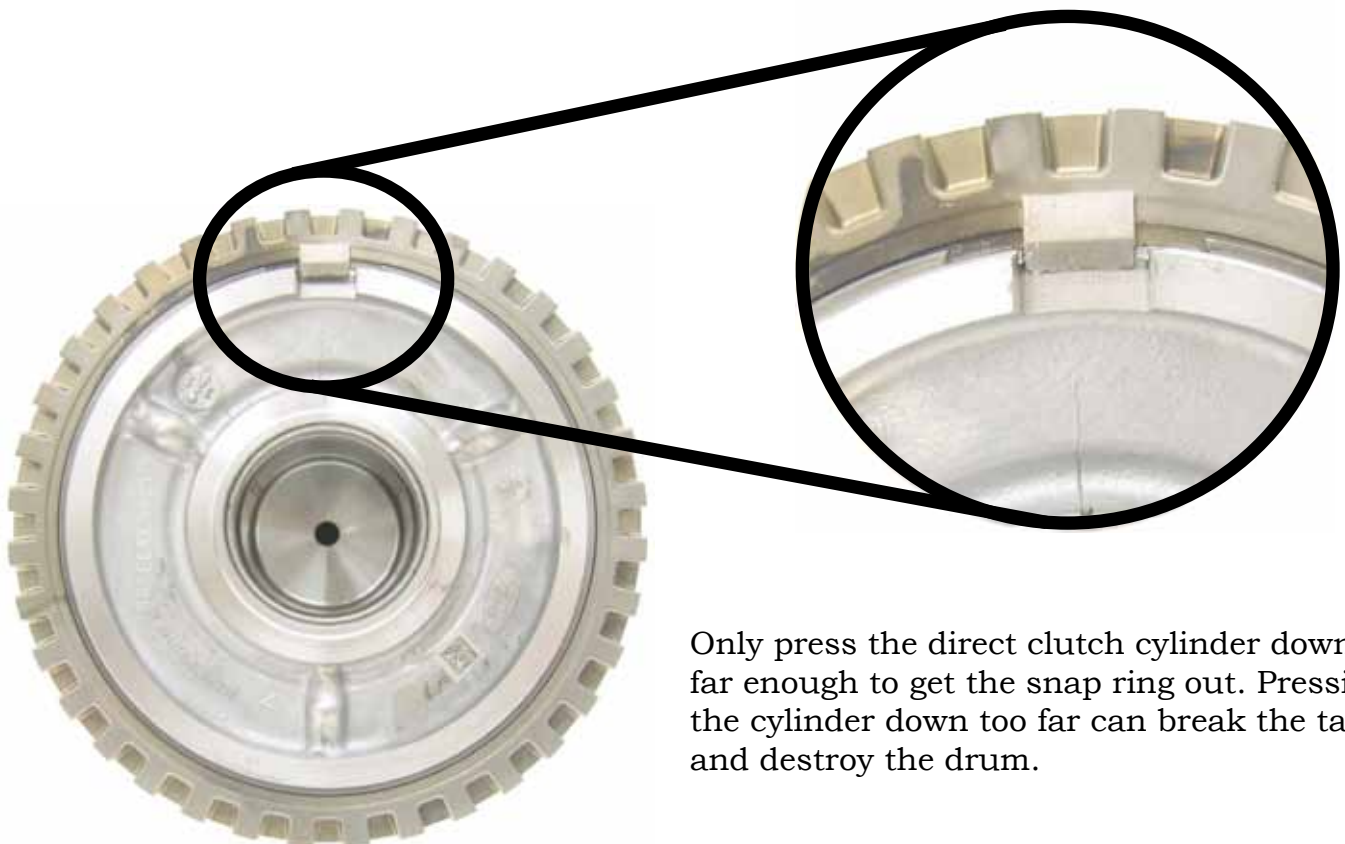
Direct Clutch Return Snap Ring Removal (continued)

The drum is placed in the press and with the bar or extension across the piston to push the piston down evenly.

CAUTION!! Only press the direct clutch cylinder down far enough to get the snap ring out of its groove. Pressing the cylinder down too far can break the tab and the cylinder.



Access the
snap ring
here



Only press the direct clutch cylinder down far enough to get the snap ring out. Pressing the cylinder down too far can break the tab and destroy the drum.

6F50

Intermediate Piston Return Snap Ring Removal

To compress the intermediate clutch spring to remove and install the retaining snap ring, use:

- an E40D/4R100 Sun Shell or RE5R05A Sun Shell (cut two slots opposite of each other)
- a bar to use in the press

Use a cutting wheel or a torch, (much faster) to cut large notches out of the sun shell. These slots allow access to the snap ring. The slots should not be any wider than 4 inches. Any larger and the return springs may get distorted when compressing the spring.



6F50

Reverse Piston Return Snap Ring Removal

To remove or install the reverse clutch return spring use:

- A pair of C clamp vice grips.

Use the C clamp to compress the return spring. Use a screwdriver with a twisting motion to securely hold the snap ring in place. Move around the end cover in this way until the retaining ring is completely seated in the groove.



6F50

Specifications

Material

Item	Specification	Fill Capacity
MERCON® V Automatic Transmission Fluid XT-5-QM (or XT-5-QMC) (US); CXT-5-LM12 (Canada)	MERCON® V	9.5L (10 qt)
Ultra Silicone Sealant TA-29	—	—

General Specifications

Item	Specification
6F50 Transaxle Weight	100 kg (220 lb)

Solenoid Operation Chart

Base Selector Lever Position	PCM Commanded Gear	Shift Solenoid					TCC (VFS) NL
		SSA (VFS) NL (CB 1,2,3,4)	SSB (VFS) NH (3,5,R)	SSC (VFS) NL (CB 2,6)	SSD (VFS) NH (CB L,R/4,5,6)	SSE (On/Off) NC	
P	P	Off	On	Off	Off	On	Off
R	R	Off	Off	Off	Off	On	Off
N	N	Off	On	Off	Off ^a	On ^a	Off
D	1	On	On	Off	Off ^b	On ^c	Off
	2	On	On	On	On	Off	Off
	3	On	Off	Off	On	Off	Off
	4	On	On	Off	Off	Off	On/Off
	5	Off	Off	Off	Off	Off	On/Off
L	6	Off	On	On	Off	Off	On/Off
	L	On	On	Off	Off ^b	On ^c	Off

a Solenoid state will change if vehicle is moving forward with the selector lever in the NEUTRAL position.

b Turns on above 5 km/h (3 mph).

c Turns off above 5 km/h (3 mph).

CB = Clutch brake

NC = Normally closed

NH = Normally high

NL = Normally low

Clutch Application Chart

Gear	Direct (C 3,5,R)	Overdrive (C 4,5,6)	Forward (CB 1,2,3,4)	Low/Reverse (CB L,R)	Inter-mediate (CB 2,6)	One-Way
1st			X	X		X
2nd			X		X	O/R
3rd	X		X			O/R
4th		X	X			O/R
5th	X	X				O/R

6F50

Specifications (continued)

Clutch Application Chart (Continued)

Gear	Direct (C 3,5,R)	Overdrive (C 4,5,6)	Forward (CB 1,2,3,4)	Low/Reverse (CB L,R)	Inter-mediate (CB 2,6)	One-Way
6th		X			X	O/R
Reverse	X			X		

CB = Clutch brake

O/R = Overrunning

Line Pressure Chart

Gear	Line
Pressures at Idle^a	
P	372-413 kPa (54-60 psi)
R	689-724 kPa (100-105 psi)
N	372-413 kPa (54-60 psi)
D	579-600 kPa (84-87 psi)
L	579-600 kPa (84-87 psi)
Pressure at Wide Open Throttle (WOT) Stall^a	
P	372-413 kPa (54-60 psi)
R	1,724-2,068 kPa (250-300 psi)
N	372-413 kPa (54-60 psi)
D	1,655-1,724 kPa (240-250 psi)
L	1,655-1,724 kPa (240-250 psi)

a All pressures are approximate.

Stall Speed Chart

Engine	Stall Speed
3,5L	2,350-2,650

Shift Speeds

Throttle Position	Range	Shift	km/h	mph
Light Throttle	D	1-2	14-19	9-12
	D	2-3	24-31	15-19
	D	3-4	32-40	20-25
	D	4-5	45-56	28-35
	D	5-6	63-80	39-50
Medium Throttle	D	1-2	37-47	23-29
	D	2-3	58-71	36-44
	D	3-4	74-93	46-58
	D	4-5	108-135	67-84
	D	5-6	169-211	105-131
Heavy Throttle	D	1-2	55-69	34-43
	D	2-3	84-105	52-65
	D	3-4	127-158	79-98
	D	4-5	167-208	104-129
	D	5-6	179-222	111-138

Differential Bearing Preload Shim Selection Chart

Part Number	Shim Thickness
7T4Z-4067-A	0.55 mm (0.022 in)
7T4Z-4067-B	0.575 mm (0.023 in)
7T4Z-4067-C	0.6 mm (0.024 in)
7T4Z-4067-D	0.625 mm (0.025 in)
7T4Z-4067-E	0.65 mm (0.026 in)
7T4Z-4067-F	0.675 mm (0.027 in)
7T4Z-4067-G	0.7 mm (0.028 in)
7T4Z-4067-H	0.725 mm (0.029 in)
7T4Z-4067-J	0.75 mm (0.030 in)
7T4Z-4067-K	0.775 mm (0.031 in)
7T4Z-4067-L	0.8 mm (0.032 in)
7T4Z-4067-M	0.825 mm (0.033 in)
7T4Z-4067-N	0.85 mm (0.034 in)
7T4Z-4067-P	0.875 mm (0.034 in)
7T4Z-4067-Q	0.9 mm (0.035 in)
7T4Z-4067-R	0.925 mm (0.036 in)
7T4Z-4067-S	0.95 mm (0.037 in)
7T4Z-4067-T	0.975 mm (0.038 in)

4R70W/4R70/75E

Interchange Information

Anti-Rattle Spring

Ford has come up with a better designed anti rattle spring. The updated spring is a “V” shaped strip of spring steel that won’t eat into the case or center support. This spring will retrofit back all the way to the AOD transmission and is a great case saver for severely worn cases. The part number for the updated spring is 2L3Z-7F277-AA.

Discard



Updated Spring

Part # 2L3Z-7F277-AA



4R70W/4R75E

Interchange Information (continued)

Center Support

To make room for the turbine speed sensor, the 4R70E/75E center support has an extra notch cut out. If you install a 4R70W support in a 4R70E/75E case, the turbine speed sensor will not install all the way into the case.

If you are in a pinch, grinding a notch into the support to make room for the sensor will not pose a problem.

4R70W



4R70E/75E



NOTCH FOR
TURBINE SPEED SENSOR

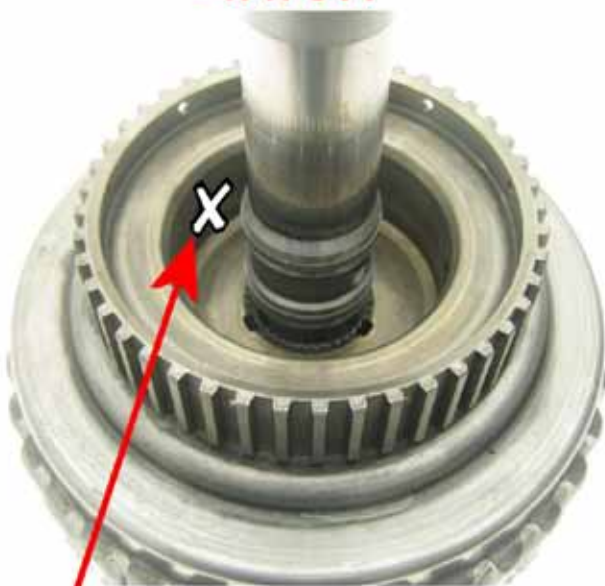
4R70W/4R75E

Interchange Information (continued)

Forward Drum

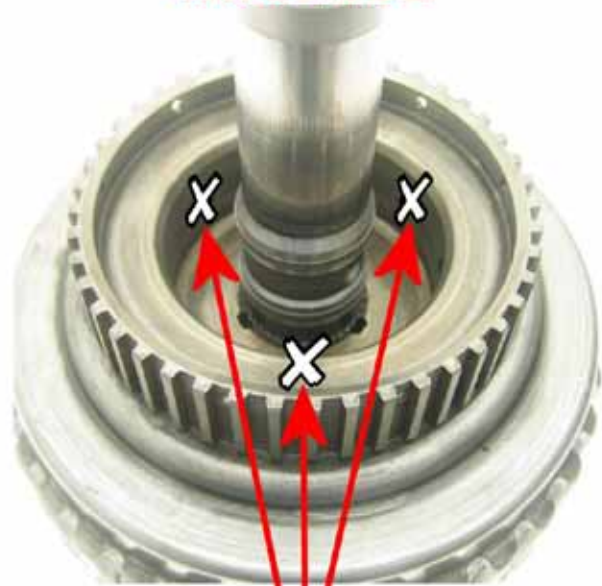
2004-on, forward drums have three clutch apply holes, 120° apart, verses the earlier version having only one. This design change is cosmetic and will not affect forward clutch apply if interchanged. The 4R70/75E drum will fit on all year models.

4R70W



Pre-2004 only has one apply hole

4R70E/75E



2004-on, forward drums have three clutch apply holes

4R70W/4R75E

Interchange Information (continued)

Intermediate Mechanical Diode Sprag

In 2007, Ford introduced a new design mechanical diode. They increased the number of ratchet teeth in the diode which should increase holding strength. At the time of printing this manual, there have been no reports of premature failure.

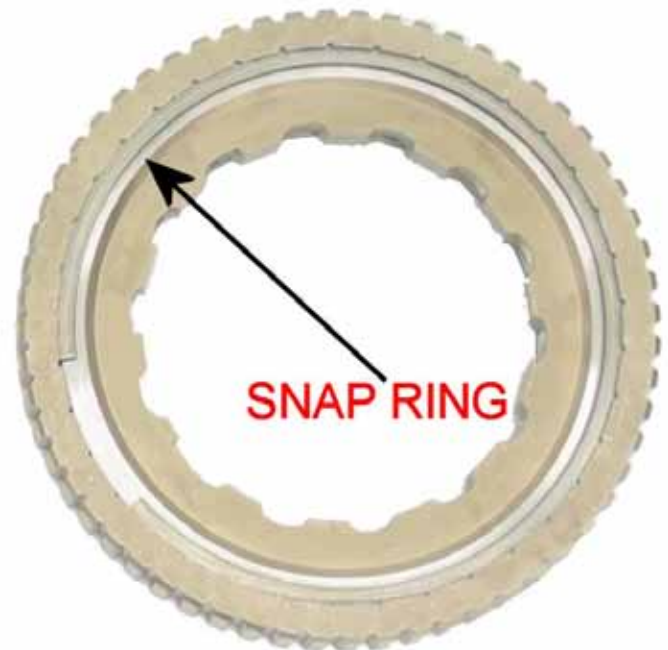
The new diode has a snap ring that holds the element retainer in place instead of the earlier pressed design. Height dimensions have changed slightly where the snap ring rides on the reverse input/OD drum.

The new design diode supersedes the previous design, and when used on any diode-style drum, will increase the clearance between the inner race and the snap ring by about 0.020", this is a normal clearance by design. An aftermarket-designed spiral snap ring should be used in place of the stock snap ring to prevent snap ring failure.

1998-2006



2007-ON



4R70W/4R75E

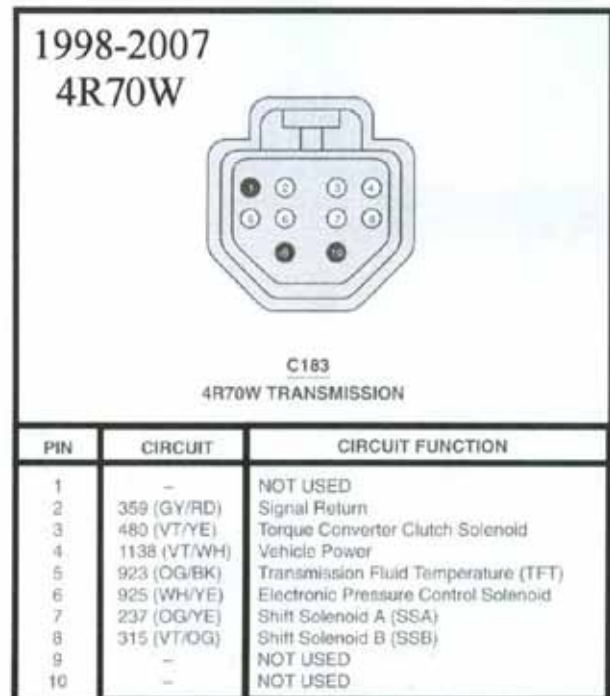
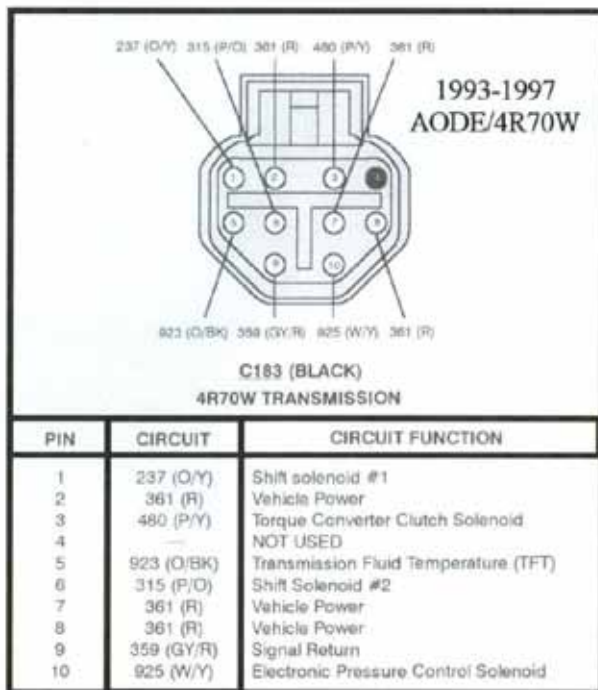
Interchange Information (continued)

Harness Connector Changes

Use the diagrams to make sure you are using the correct connector for your application. The diagrams shown are the vehicle side of the harness. From 1993-1997, the transmission connector is white with soft wiring built into the connector.

From 1998-on, the connector is black in color and uses the separate hard plastic harness. Solenoids will not interchange due to connection differences.

NOTE: Installing the wrong wiring harness can create multiple codes and erratic shifts.



4R70W/4R75E

Interchange Information (continued)

Stator Support

The stator supports are identical in hydraulic design but there is an important difference in the forward sealing ring lands. The 4R70E/75E uses a plastic ring that is much thinner than the 4R70W cast iron design.

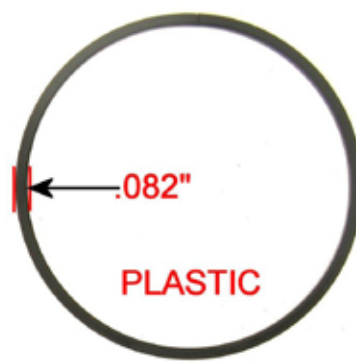
The outer dimensions of the two rings are identical so as long as the correct rings are used, the stator supports can be interchanged.

The other difference is the forward clutch feed hole. Ford changed the machining process for the forward clutch apply hole and turned it into a slot instead of a round hole. This is strictly cosmetic and will have no effect on forward clutch apply if interchanged.

4R70W



4R70E/75E



4R70W



4R70E/75E



4R70W/4R75E

Interchange Information (continued)

Planetary

The planetary gear set is the same ratio and dimensions between the two units. The only difference is how the rear cover is attached. The 4R70E/75E uses a welded design as the older versions use rivets to connect the bottom cover to the top portion of the gear set. That area has never had a real issue and the change is due to an easier manufacturing process. Interchange between years will not pose a problem.

4R70W



4R70E/75E



4R70W/4R75E

Interchange Information (continued)

Sun Shell and Forward Sun Gear

2004 & up sun shells are designed with added strength by utilizing a two piece riveted or a one piece design in the later applications. On both designs, the metal is thicker along the chamfer at the base of the gear which will reduce cracking. Height dimensions from the bottom of the sun gear to the area where the bearing rides has been reduced by .030" to make room for the thicker two piece bearing.

The sun shell, bearing, and forward sun gear must be changed as a set if changing over to a 4R70W or the end play will be incorrect. Ford sells this complete service kit under part # 4L3Z-7D234-AA.

4R70W



4R70E/75E



4R70W/4R75E

Interchange Information (continued)

Sun Shell and Forward Sun Gear (continued)

The sun shell, bearing, and forward sun gear must be changed as a set if changing over to a 4R70W or the end play will be incorrect. Ford sells this complete service kit under part # 4L3Z-7D234-AA.

Thicker two piece bearing.

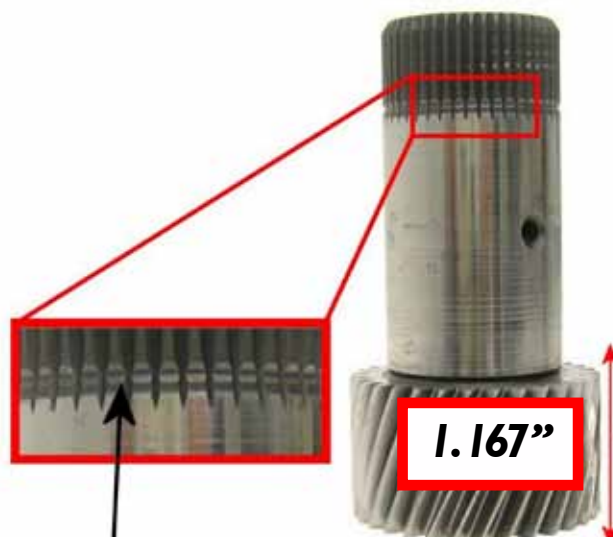


4R70W

4R70E/75E



1.177"



1.167"

ID Groove

4R70W/4R75E

Interchange Information (continued)

Sun Shell and Forward Sun Gear (continued)

The single most important change with the 4R70E/75E sun shell is something you can not see with the naked eye, but will prevent the transmission from leaving your shop. That is the 4R70E/75E sun shell is non-magnetic. In order for the input speed sensor that the 4R70E/75E's now incorporate to work, the sun shell must be non magnetic so that the sensor can pick up the signal from the stamping on the forward drum. Failure to use a non magnetic sun shell will result in harsh or no shifting with possible ratio and input speed sensor codes.

4R70W



4R70E/75E

2004-2005



2006-On



4R70W/4R75E

Interchange Information (continued)

Pump Body

The pump bodies are identical except for the intermediate piston design. The 4R70E/75E uses a bonded rubber piston that is larger in size and will produce more holding power than the aluminum piston design.

A wave style piston return spring in 04-05 models and a one piece in the 06 and up models is utilized on the molded style and cannot retrofit back. The wave style spring requires a seat that sits in the case so that the wave spring does not eat into the aluminum. The later one piece style has a notch that indexes at 12 o'clock in the case and is placed with the springs facing up towards you.

The two different designed pumps can be interchanged from one another without any issues, but as a complete set. You cannot interchange intermediate pistons or springs with one another. If you choose to use a 4R75E pump in place of the early 4R70W, make sure to install the wave spring retainer into the early case or damage to the case will occur. If using the 06-up one piece design spring, no retainer is needed.



4R70W/4R75E

Interchange Information (continued)

Ring Gear

A new designed output speed sensor was incorporated for the 2004 model year. The new sensor uses the exciter ring from the 24 extended parking pawl lugs as where the old sensor uses six (6) holes that are machined around the ring gear.

Mismatching an early ring gear in a late transmission will result in a 75% reduction in the output speed sensor signal and will not let the trans shift out of first gear. Using a late ring gear in an early transmission will produce an output speed signal 400% faster and shift the transmission into fourth gear by the time you hit 10 MPH. No interchange possible.

4R70W



6 RELUCTOR HOLES

4R70E/75E



24 RELUCTOR LUGS

4R70W/4R75E

Interchange Information (continued)

Output Speed Sensor

The Output Speed Sensor changed from the oval connector to the square in 2001. The length is the same as the earlier version up to 2004 when the ring gear changed. Installing the shorter late sensor in 01-03 models could create a weak signal and intermittent OSS codes. Installing the early sensor in an 04 and up will cause damage to the sensor.



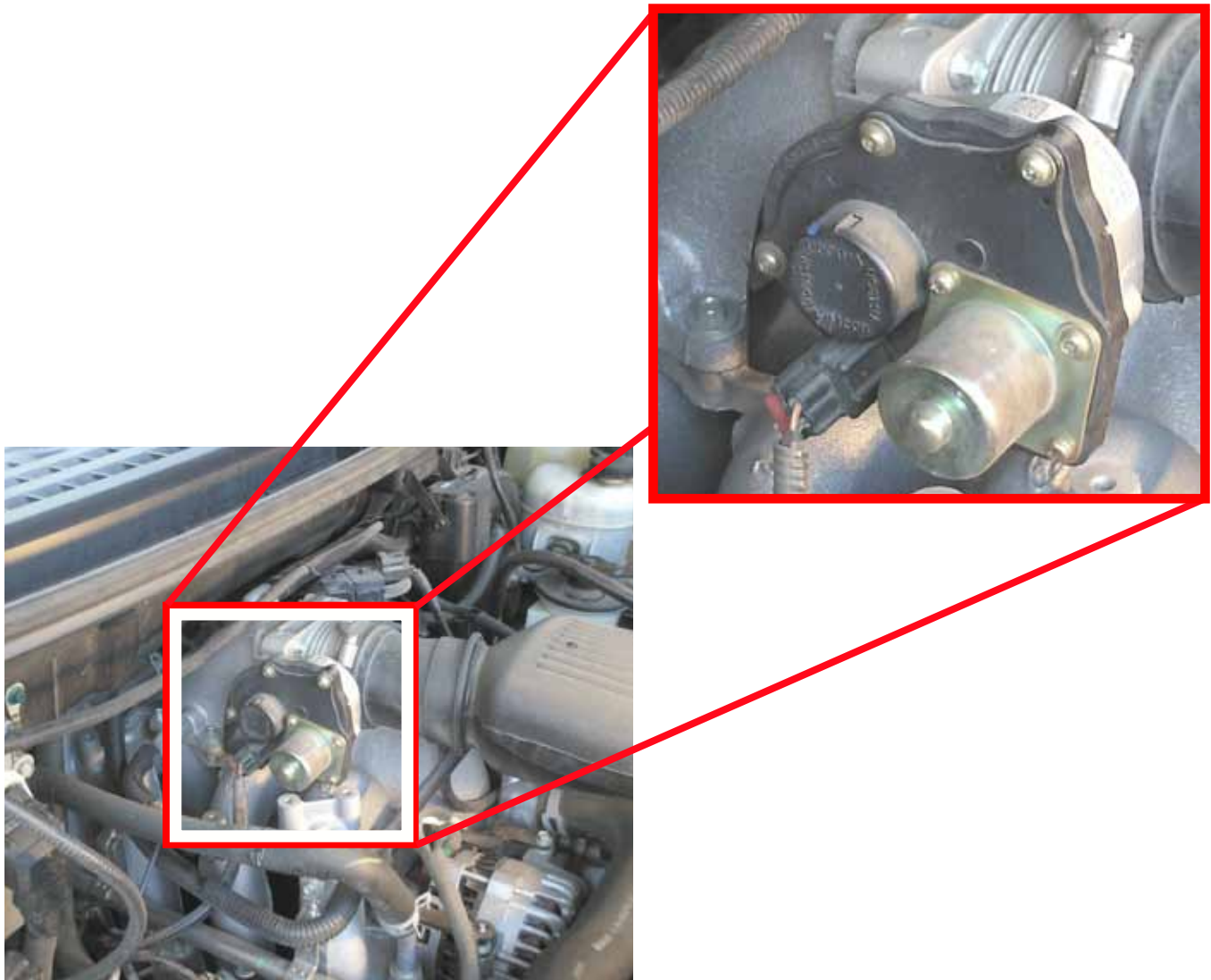
4R70W/4R75E

DTC P2106

Throttle Actuator Control (TAC) System-Forced limited Power

The Torque Based Throttle Control system is a “Drive by Wire” throttle system that uses the Mass Air Flow (MAF), Accelerator Pedal Position Sensor (APPS), Crank Position Sensor (CKP), Turbine Speed Sensor (TSS), and Output Speed Sensor (OSS) to calculate load and determine the correct throttle opening for the condition in which the vehicle is driving in.

If the incorrect sun shell is installed or if there is a Turbine Speed Sensor failure, P2106 will set. Keep in mind that a malfunction with any other of the above mentioned sensors along with a mechanically stuck throttle or throttle actuator can set this code as well.



Torqshift

Low/Reverse Planetary Gear Set Interchange

Starting in late 2008 Ford introduced a new planetary gear set. This planet has the Low/Reverse sprag and the Low/Reverse clutches built onto the planet assembly.

On late model units 2008 and up, if the Low/Reverse clutches are burnt or worn out the whole planet assembly must be replaced. The planet can be purchased from the dealer as an assembly.

The alternative is to use the earlier Low/Reverse clutches and steels, Planetary, and Sprag assembly. The early Low/Reverse clutch pack only has a five (5) clutch pack stack-up. You must use six (6) clutch fibers and six (6) steels to complete the interchange.

Early Pre-2008 Low/Reverse planet with separate clutches and sprag assembly



Late 2008-up Low/Reverse planet with integral clutches and sprag assembly



Torqshift

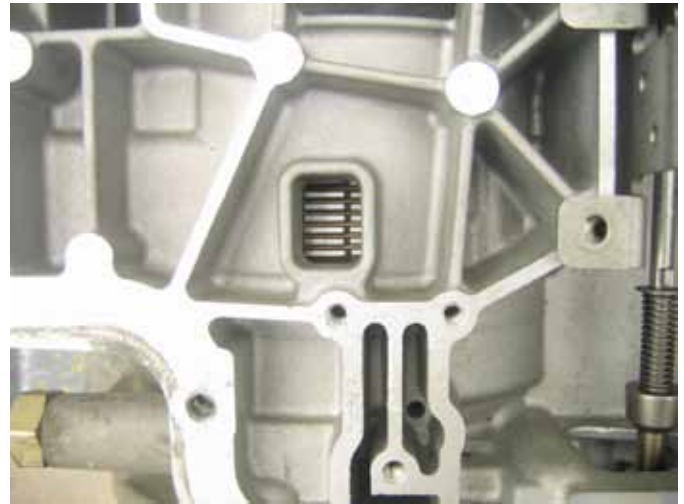
Low/Reverse Planetary Gear Set Interchange (continued)

The clutches have been stacked up and the planets placed in the same case. The late and the early planet/clutch assemblies have the exact same clearance and can be interchanged between years.

**Early pre-2008 planet with 5 frictions.
May be upgraded to 6 frictions**



**Late 2008-up planet with 6 frictions
can be interchanged with earlier pre-2008 parts**



Early pre-2008 planet assembled in the case



Late Planet 2008-up assembled in the case



Ford All

Erratic Speedometer Reading while Sitting Still

Speedometer reading while sitting still, possible speedometer codes P0500, P0503 VSS intermittent.

These symptoms and codes can be very difficult and time consuming to diagnose. Often times the cause is EMI. The top causes of EMI are:

1. Bad alternator (disconnect)
2. Defective grounds on the controller
3. Erratic TSS or ISS signals (due to bad grounds)
4. High power electrical devices (after market amplifiers-boom boxes)
5. Check ignition wave form for irregularities.
6. Added resistance from faulty spark plugs

Isolate the conditions in both KOEO or KEOR?

Disconnect devices one at a time, disconnecting all devices at the same time may work but won't isolate the issue.



Disconnect the alternator as a quick check for EMI.

Ford All

Erratic Speedometer Reading while Sitting Still (continued)

Loose grounds contribute to EMI inside the controller. When diagnosing erratic speed sensor readings, check and verified all grounds are clean and tight before any other tests are done.

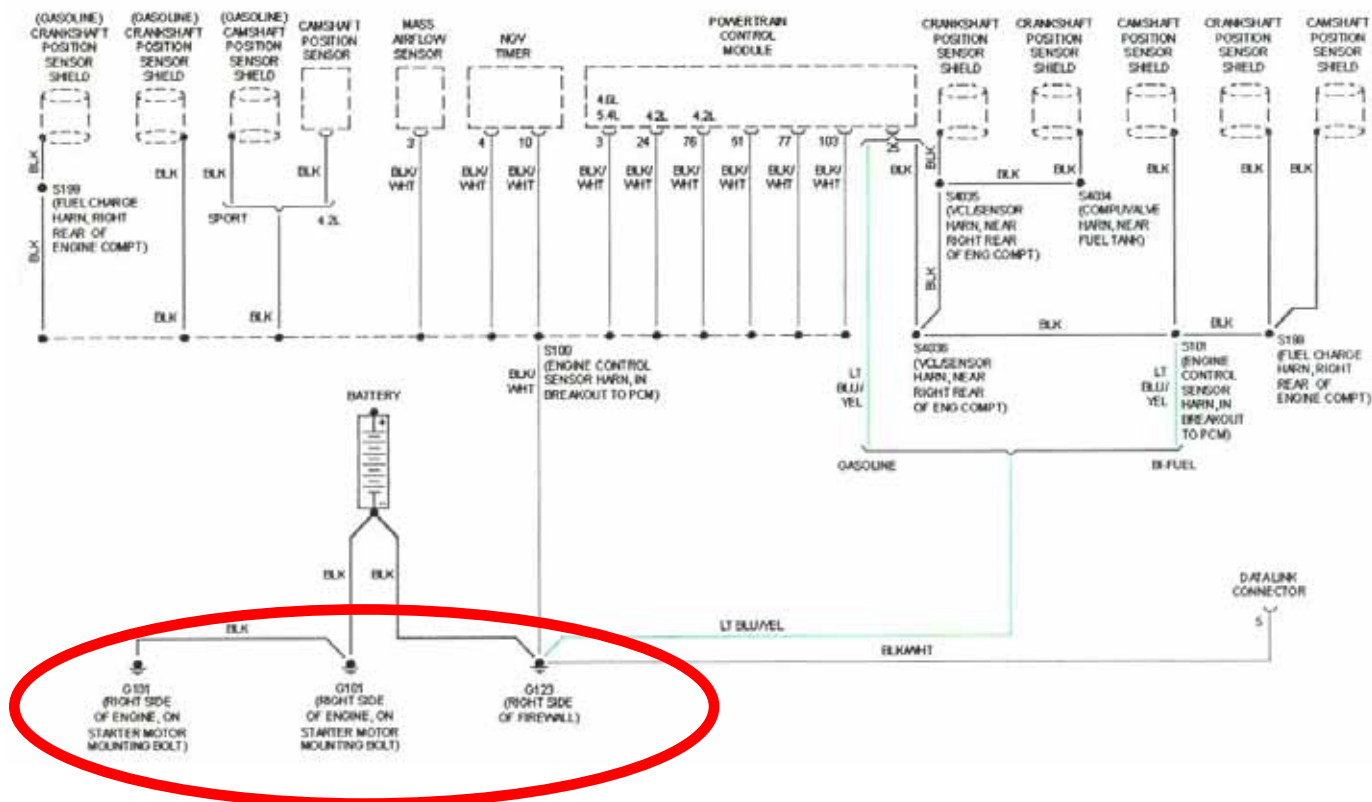
Check those grounds!



Ford All

Erratic Speedometer Reading while Sitting Still (continued)

F-150 Schematic



Main computer grounds

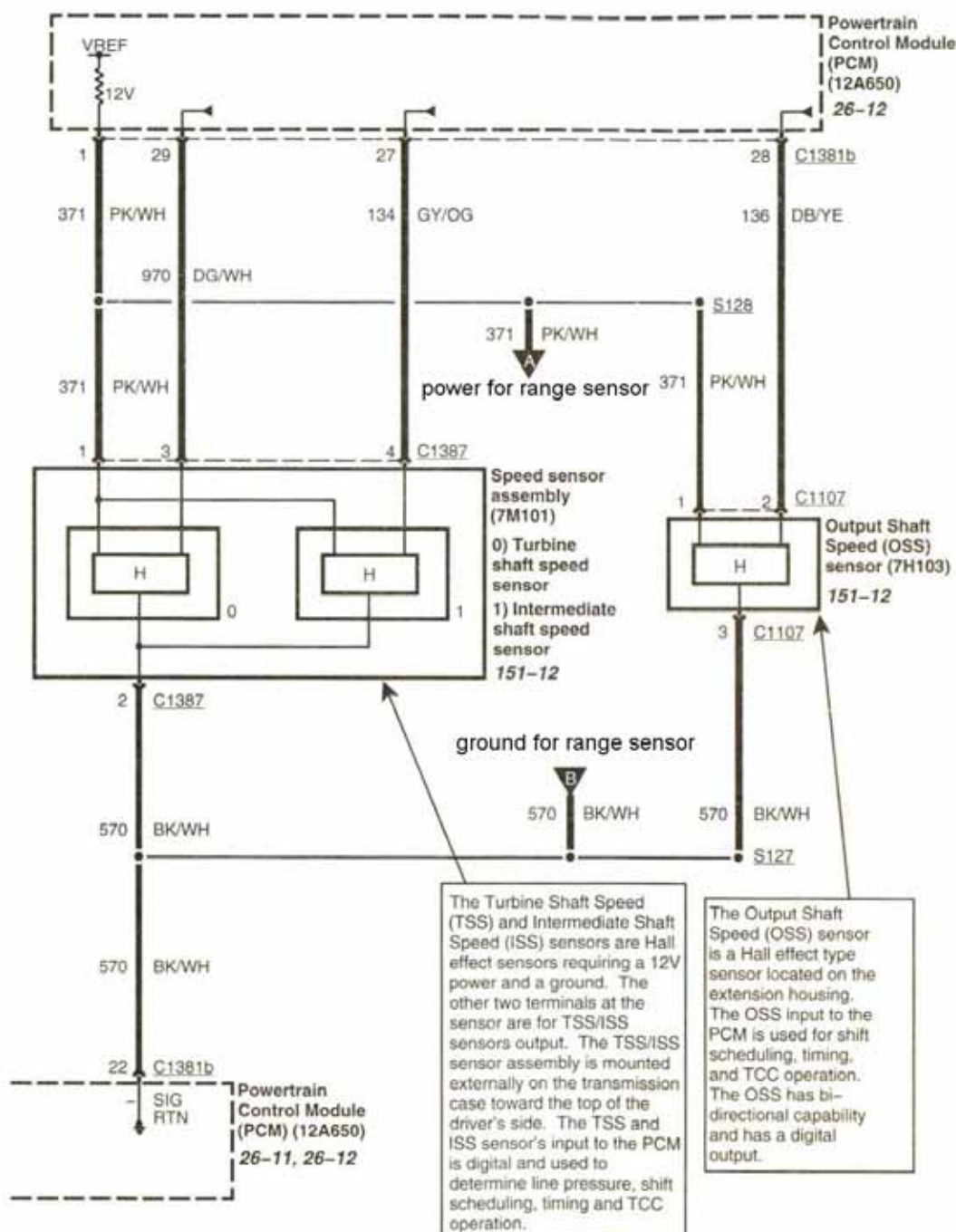


Ford All

Erratic Speedometer Reading while Sitting Still (continued)

Erratic VSS signals to the PCM can be caused by EMI getting into the PCM. When erratic speedometer concerns are present always inspect the TSS or ISS wiring.

2004 F-250 5.4L



Ford All

Erratic Speedometer Reading while Sitting Still (continued)

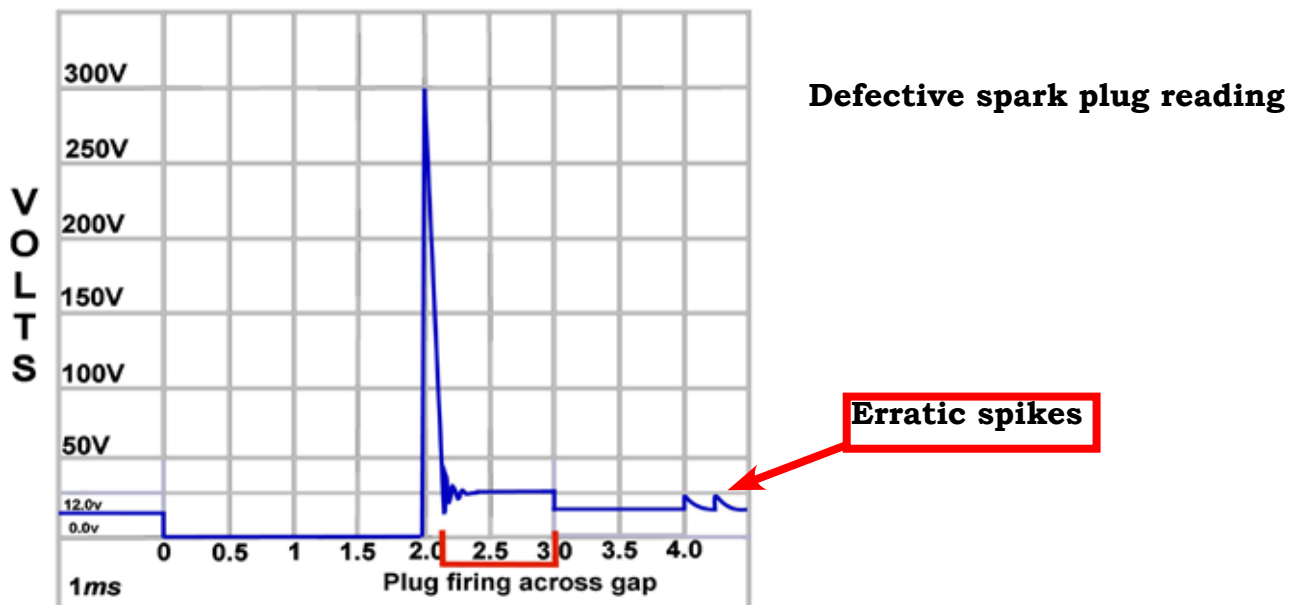
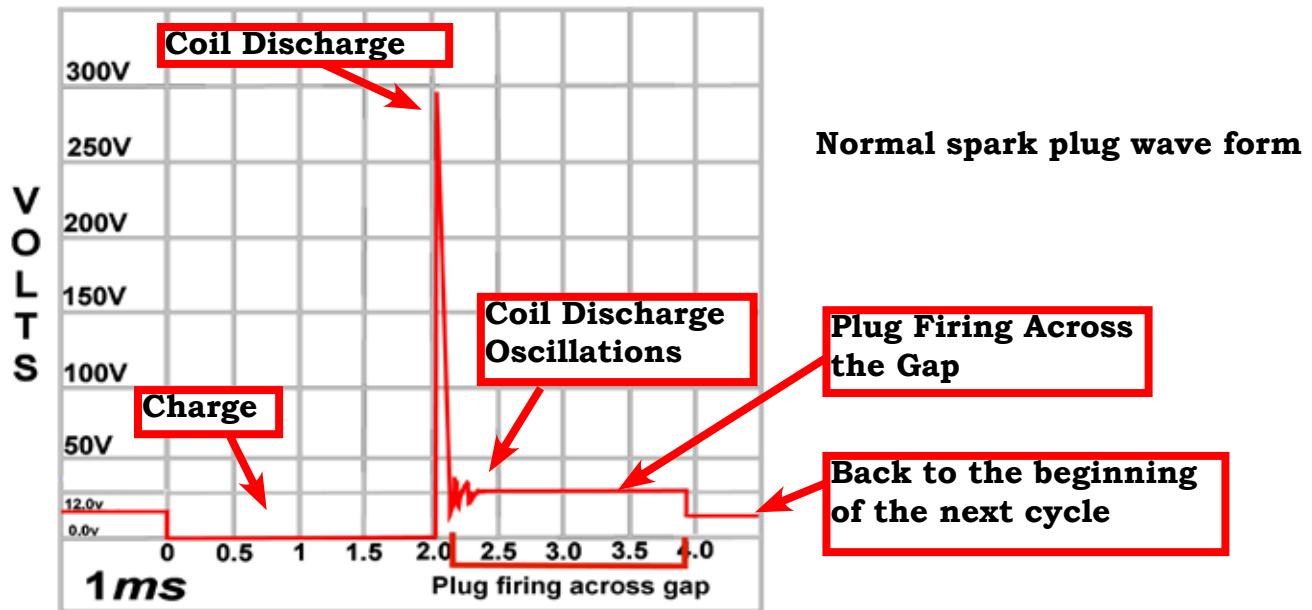
Improperly installed stereo amps, stereo heads, speakers, or other accessories can be a source of EMI. Simply power down the device in question and retest.



Ford All

Erratic Speedometer Reading while Sitting Still (continued)

Ignition wave forms can also be a good way to track down EMI. Ford's Coil Over Plug (COP) coils are controlled directly by the PCM. If there is excessive inductive voltage from the spark plug firing it could cause EMI. This can interfere with other signals inside the PCM including the VSS.



Ford All

Erratic Speedometer Reading while Sitting Still (continued)

Worn plugs from a 2004 Ford F250 with approximately 39,000 miles, typically these plugs are recommended for replacement at or around the 60,000 mile mark.

“ A special Thank You to Roger Perry at Lake Sumter Transmissions for the spark plugs”

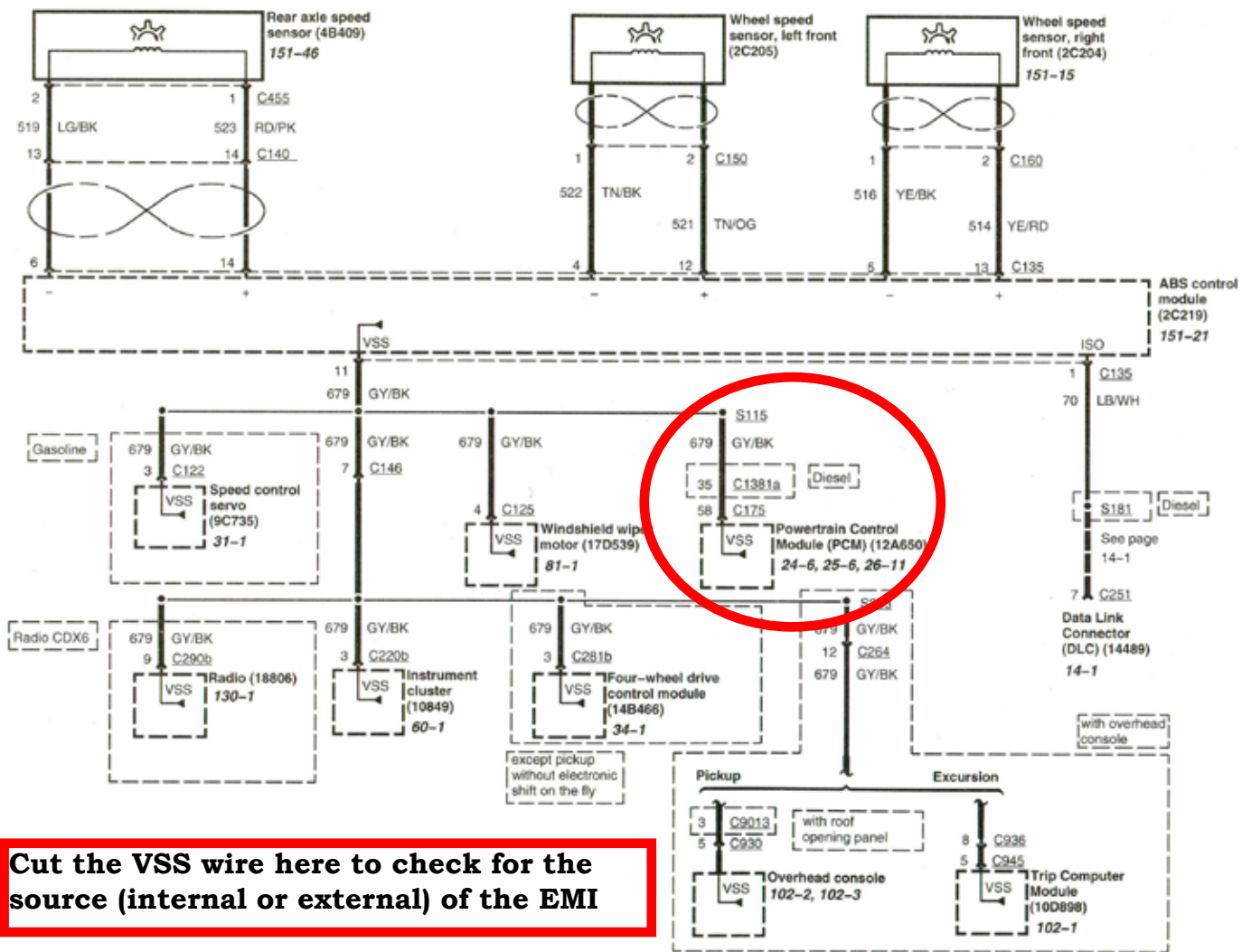


Ford All

Erratic Speedometer Reading while Sitting Still (continued)

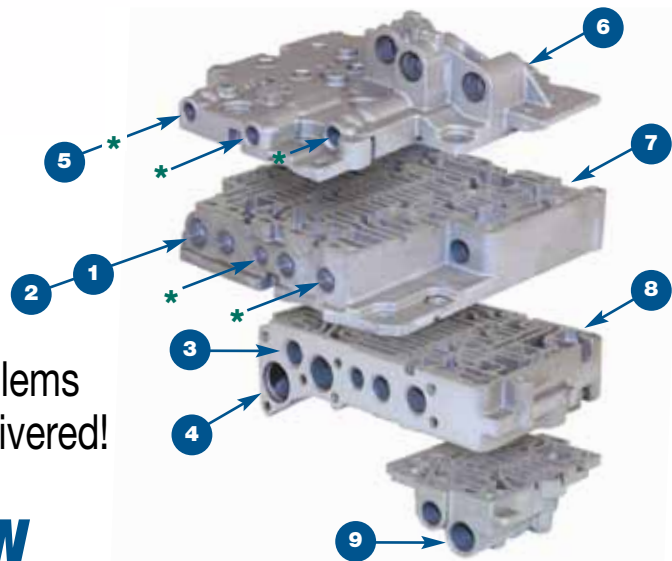
This is a schematic of a 2004 F250 with ABS. Testing for EMI can be done at pin 58. The wire will have to be cut as close to the computer as possible and still make a complete connection after we are done testing.

After the wire is cut check for DC Hz on both ends of the wire. Typically if the problem is worn spark plugs there will be DC Hz coming OUT of the PCM and nothing going into the PCM while the engine is running and the transmission is in park,












Sonnax Delivers 9 Solutions for Aisin Warner 55-50SN

You asked us to help you solve these problems with the AW 55-50SN valve body & we delivered!



PROBLEM

SOLUTION

<ul style="list-style-type: none"> • Delayed engagements • Harsh reverse • TCC slip or engine stall 	1 Oversized Pressure Regulator Valve & Boost Valve Kit  59947-12K <small>F-59947-TL12 Tool Kit & VB-FIX Fixture Required</small>
<ul style="list-style-type: none"> • Slip in reverse • Poor upshift 	2 Main Boost Valve & Sleeve Kit  59947-07K
<ul style="list-style-type: none"> • Overheating of fluid, bushings and converter • Harsh reverse engagement 	3 Secondary Regulator Valve & Spring Kit  59947-16K <small>F-59947-TL16 Tool Kit & VB-FIX Fixture Required</small>
<ul style="list-style-type: none"> • Delayed forward engagements • Low line, lube and converter pressure 	4 LPC Accumulator Piston Kit  59947-LPC
<ul style="list-style-type: none"> • Delayed forward engagements • 2-3 upshift flare • Low SLT pressure 	5 O-Ringed End Plug Kit  59947-21K
<ul style="list-style-type: none"> • TCC slip or RPM surge • Low SLT pressure • Delayed engagements 	6 Solenoid Modulator Valve Capsule Kit  59947-09K
<ul style="list-style-type: none"> • No TCC apply • Loss of solenoid modulator oil pressure 	7 Solenoid Relay Valve & Sleeve Kit  59947-05K
<ul style="list-style-type: none"> • No TCC apply • TCC cycle or RPM fluctuation 	8 Lockup Relay Control Valve & Sleeve Kit  59947-01K
<ul style="list-style-type: none"> • Excess TCC slippage • Harsh downshifts or converter does not release 	9 Lockup Control Valve & Sleeve Kit  59947-03K



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