

# Erratic Transmission Operation after 5R55 Rebuild?



by Lance Wiggins  
[members.atra.com](http://members.atra.com)  
[www.atra.com](http://www.atra.com)

**About 26% of the 5R55W/S calls we get on the ATRA HotLine are solenoid replacement fixes. And all of those calls involve a complaint of a harsh 3-2 or flare 2-3; most also end up with a lockup problem. In nearly every case, replacing the solenoid pack corrects the problem.**

You just finished rebuilding a 5R55W/S model transmission. During the road test you notice it has a flare on the 2-3 shift.

What gives? This problem wasn't there before. What could be causing it?

Turns out the new solenoid pack might be to blame. Over the years, Ford has made a few changes to those solenoids; changes that can make a slight difference in the pressure they deliver to various systems in the transmission. And it doesn't take much of a pressure variation to alter transmission performance in a big way.

Here's how the application goes:

2002-03 Ford with 5R55W or S, and 2003 Lincoln with 5R55S — these are the early models, and they require the early design solenoid pack, Ford P/N 1L2Z-7G391-AG.

2004-on Ford with 5R55W or S, and 2004-06 Lincoln with 5R55S — these are the later models, and they require the later design solenoid pack:

- Original design — 4L2Z-7G391-AA
- Updated design — 9L2Z-7G391-A

Ford recommends using only the updated design for these later transmissions.

So it's one solenoid pack for the early units, and a newer, updated solenoid pack for the later ones. Sounds simple enough, doesn't it?

Fortunately the fix is pretty simple: Replace the solenoid pack with the correct one for the vehicle you're working on. Use the part numbers to identify which one you have and which one you should be using.

## Solenoid Operation

To get a handle on the problem with using the wrong solenoid pack, you need to understand how the system uses these solenoids to control the transmission operation.

The pressure regulator setup in the valve body is typical Ford design: It has three boost passages in the boost sleeve.

In the earlier units the three passages were TV, cutback, and reverse boost. In the later units the passages are TV1 (controlled by PCA), TV2 (controlled by PCB), and reverse boost (controlled by the manual valve, figure 1).

In the boost setup, there are two boost valves: one rests against the regulator valve springs, the other is notched on both sides and is used by TV1 and TV2. When PCA applies pressure to the back of the notched boost valve, it works like all other boost valves: It pushes the pressure regulator valve to the high pressure side of the circuit.

The pressure control solenoids — PCA, PCB, and PCC — are variable force solenoids operated by PCM commands. PCA and PCB are the primary solenoids used to raise and lower mainline pressure, based on variations in throttle position. They control pressure boost in all gear ranges from park to manual 1.

PCC controls reverse engagement pressure, and is directly responsible for direct clutch application in overdrive 4<sup>th</sup>, 5<sup>th</sup>, and manual 4<sup>th</sup> gears (Figure 2). All of the other solenoids are on-off type shift solenoids.

The PCM uses PCA and PCB to adjust mainline pressure and move or



# TRAP

## THE RAPTOR

### SWEEPSTAKES

#### AT FORDPARTS.COM...

you'll find the quality parts you need right at your fingertips. Plus, register online now to enter the **TRAP THE RAPTOR SWEEPSTAKES** for a chance to get behind the wheel of a brand-new 2013 Ford F-150 SVT Raptor.

#### TEST YOUR INSTINCTS.

Take on the missing parts challenge every day at FordParts.com. Correct answers get you two entries for the Grand Prize drawing. Guess wrong? No problem. You will still get one entry into the Grand Prize Drawing and, right or wrong, you get a chance to win the weekly prize: a Ford F-150 SVT Raptor die-cast model! Log on today at [FordParts.com/Raptor](http://FordParts.com/Raptor).

No purchase necessary. Legal residents of the 50 U.S. and D.C. 18 years or older. VOID WHERE PROHIBITED. Sweepstakes ends 11/18/12. For official rules, visit FordParts.com. Sponsor: Ford Motor Company, One American Road, Dearborn, MI 48126. 2012 model year shown. Closed course. Professional driver. Obey all laws. Respect the environment. Know your vehicle, the course and required equipment before high-speed off-roading.



**PARTS**  
FORDPARTS.COM



**WEEKLY PRIZE:**  
Ford Raptor die-cast model

**ANY FORD PART.**  
**ANY TIME.**

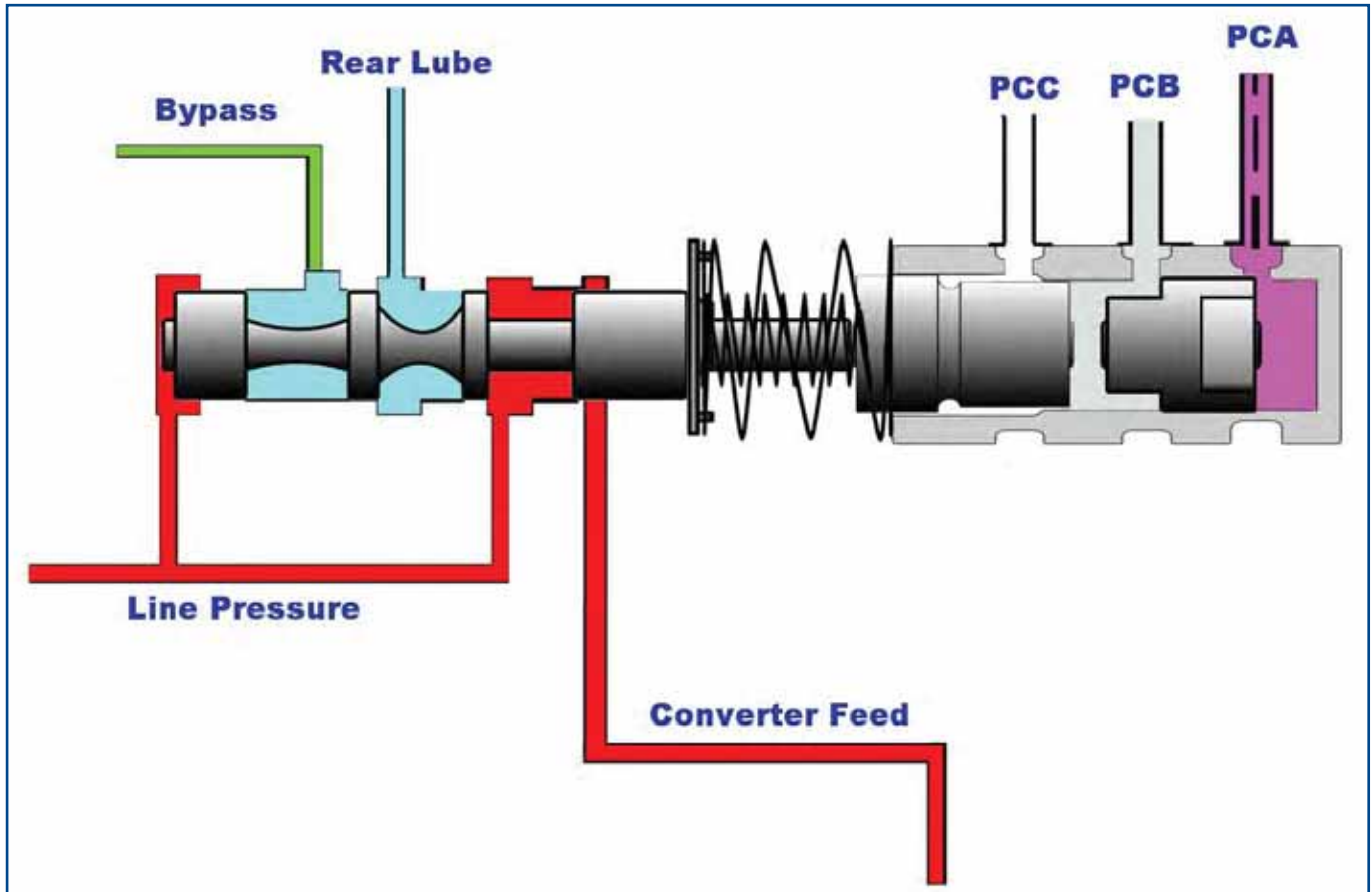


Figure 1

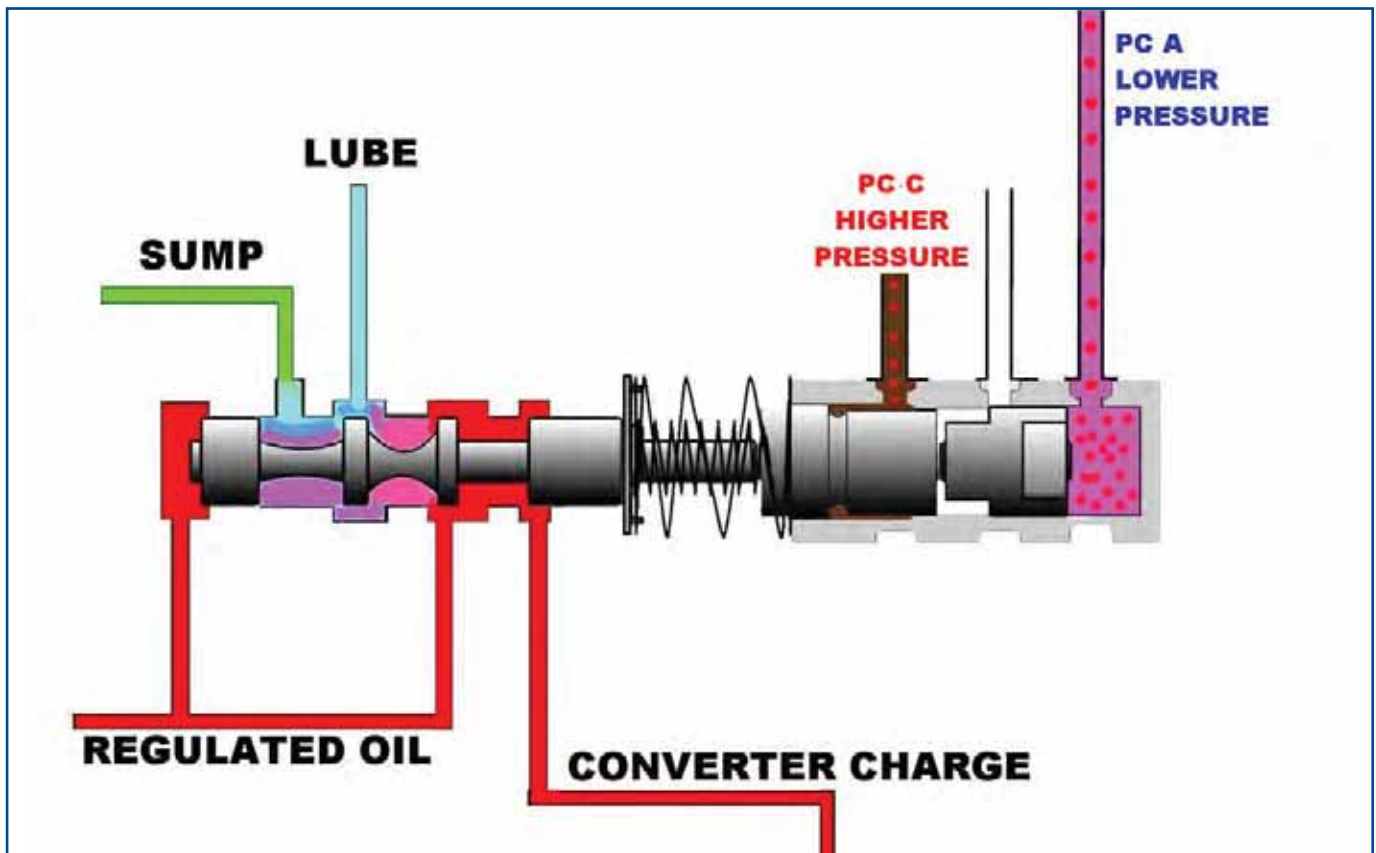
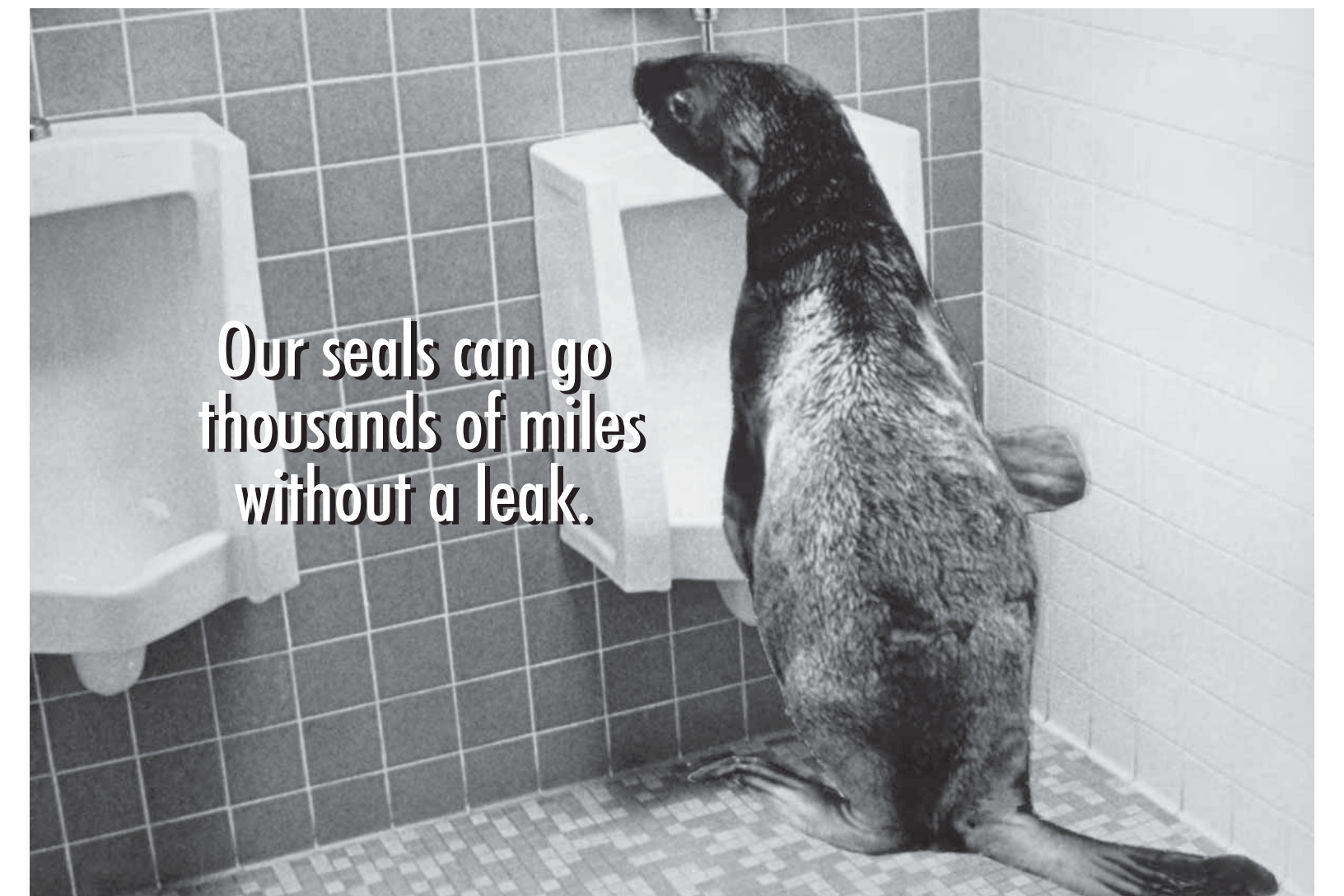


Figure 2: PCC controls reverse engagement pressure, and is directly responsible for direct clutch application in overdrive 4th, 5th, and manual 4th gears.



Our seals can go  
thousands of miles  
without a leak.

Go with the leader in transmission repair for over 30 years  
and stop leaky seals from compromising your work and reputation.

Some transmission seals just can't hold their fluid like others. To help keep the transmissions you rebuild on the road and out of your shop, make sure you use only parts and kits from one of the most trusted and respected names in transmission repair for over three decades – Precision International. We rely on the same top manufacturers who supply OEMs. We thoroughly inspect each and every incoming parts shipment for proper size, fit, material and appearance. And we constantly monitor OEMs for product changes or updates to eliminate surprises and help keep both of us on top of our game. Even more reassuring, our technical advisory group actually tests our kits out on the most current transmission designs before they go to market. So we often identify and solve potential transmission problems before the OEMs even discover them!

#### The best info and advice in the business

Precision also offers outstanding tech support and assistance, including [www.transmissionkits.com](http://www.transmissionkits.com) – our hot new website with continually updated video seminars from leading transmission expert John Parmenter, question and answer

forums, complete parts information and much more. So you can troubleshoot any problem and offer your customers the very best transmission solutions possible.



It's all part of our quality story and uncompromising commitment to you. After all, the last thing we want is a leaky seal draining your time and money. For more information, give us a call.

[www.transmissionkits.com](http://www.transmissionkits.com)

**PRECISION**<sup>TM</sup>  
INTERNATIONAL



**The Problem Solvers.**

14 Todd Court Extension, Yaphank, NY 11980  
(631) 567-2000 • Fax (631) 567-2640 Toll Free: 800-872-6649  
Florida Office: 6790 Hillsdale Point, Boynton Beach, FL 33437  
(561) 734-2332 • Fax (561) 734-2375  
E-mail: [sales@transmissionkits.com](mailto:sales@transmissionkits.com)  
[www.transmissionkits.com](http://www.transmissionkits.com)



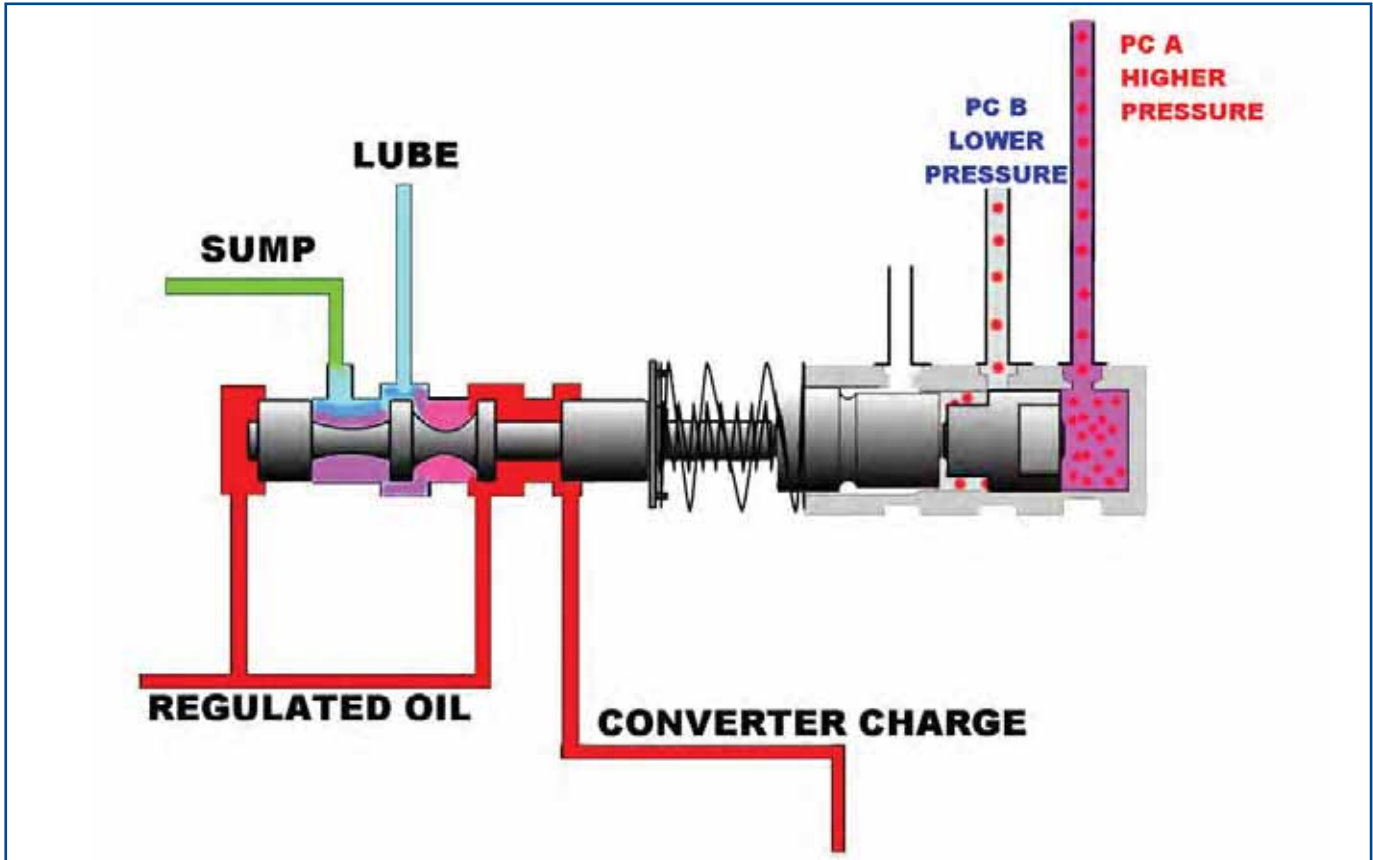


Figure 3: During normal operation the solenoids are pulse width modulated; these modulations have three basic ranges: lower pressure, variable pressure, and higher pressure

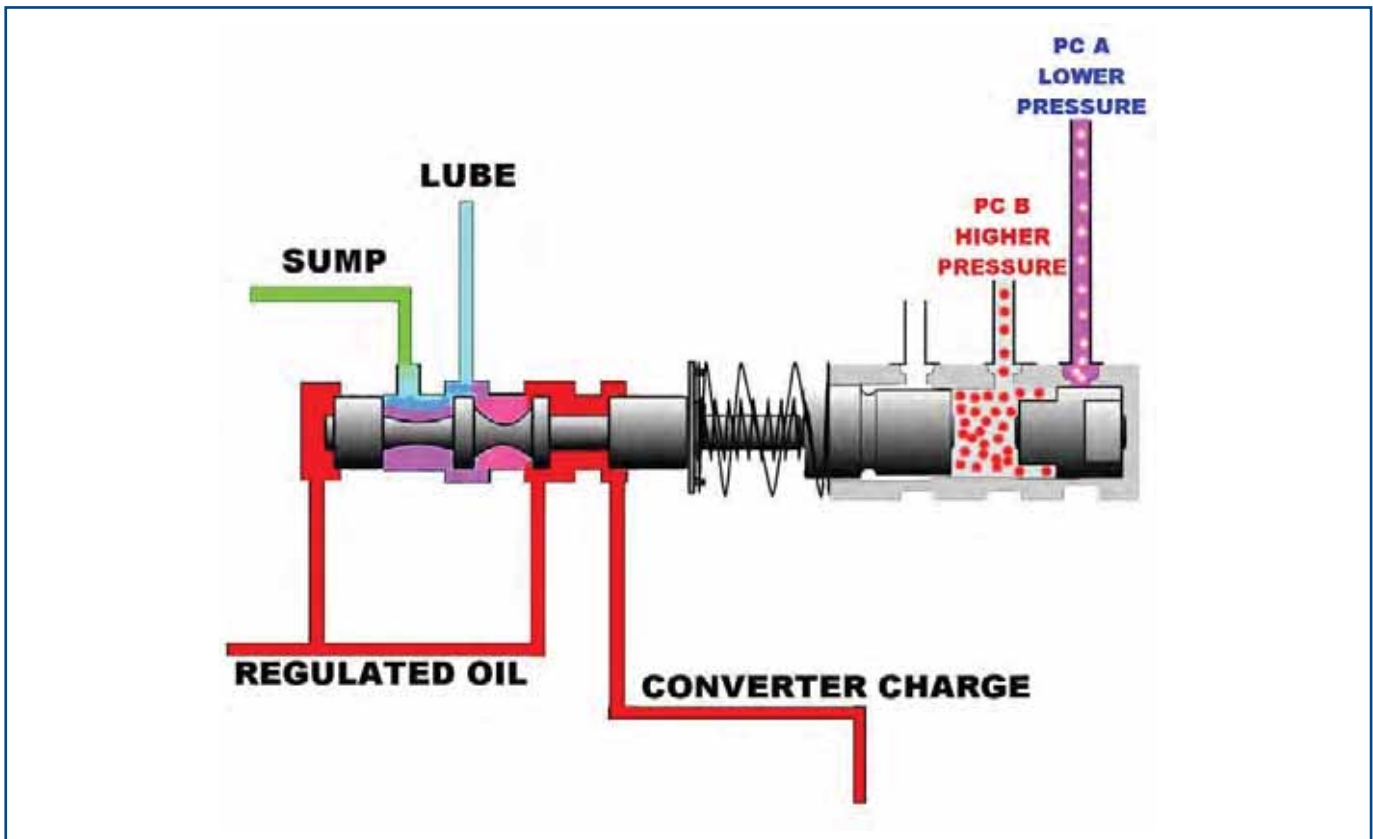


Figure 4: Simply put, when PCA is at higher pressure, PCB is at lower pressure; when PCB is at higher pressure, PCA goes lower pressure. This causes the boost valves to split apart from one another

# Want More?

passion  
solutions reputation  
responsibility knowledge tradition  
competence tools sustainability  
liability support trust  
**more**  
services  
perspectives commitment  
optimization excellence  
strength ability enthusiasm reliability  
partnership respect  
expertise presence quality  
continuity experience  
improvement performance  
innovation confidence  
precision



Do you want more of the latest technology?  
More products to sell? More support,  
training, and profit for your business?

More than just the world's leading clutch  
company, Schaeffler is a leading partner of  
engine, chassis and drivetrain products to  
the automotive vehicle original-equipment  
and replacement parts markets in North  
America.

**If you want MORE, you will want to stop by  
and say hello and check out the latest in  
Powertrain technologies that you will be  
seeing in the years to come.**

Let us show you how we can keep your  
business on the road.

Visit us at the 2012 ATRA Powertrain Show,  
October 27-29, 2012, Booth #631  
Bally's, Las Vegas, Nevada

5370 Wegman Drive • Valley City, OH 44280  
Phone 800 274 5001 • Fax 330 273 3522  
[www.Schaeffler-Aftermarket.us](http://www.Schaeffler-Aftermarket.us)



Certified to  
ISO 9001:2008



**SCHAEFFLER**  
AUTOMOTIVE AFTERMARKET



## Erratic Transmission Operation after 5R55 Rebuild?

modulate other valves. During normal operation the solenoids are pulse width modulated; these modulations have three basic ranges: lower pressure, variable pressure, and higher pressure (Figure 3).

Both solenoids can be on at the same time, but the PCM supplies opposite commands to them: Simply put, when PCA is at higher pressure, PCB is at lower pressure; when PCB is at higher pressure, PCA goes lower pressure. This causes the boost valves to split apart from one another (Figure 4).

These solenoids are used for more than just controlling pressure. PCA is also used for the VFS1 modulator valve (Figure 5). VFS1 pressure applies the intermediate servo in 3<sup>rd</sup> gear, and applies the low/reverse servo in manual 1 and 2.

PCB also controls the VFS2 modulator valve, and forward and reverse engagement valves (Figure 6). The VFS2 pressure indirectly affects the feel of forward engagement and the direct clutch engagement in reverse, and it directly applies the overdrive servo and the coast clutch.

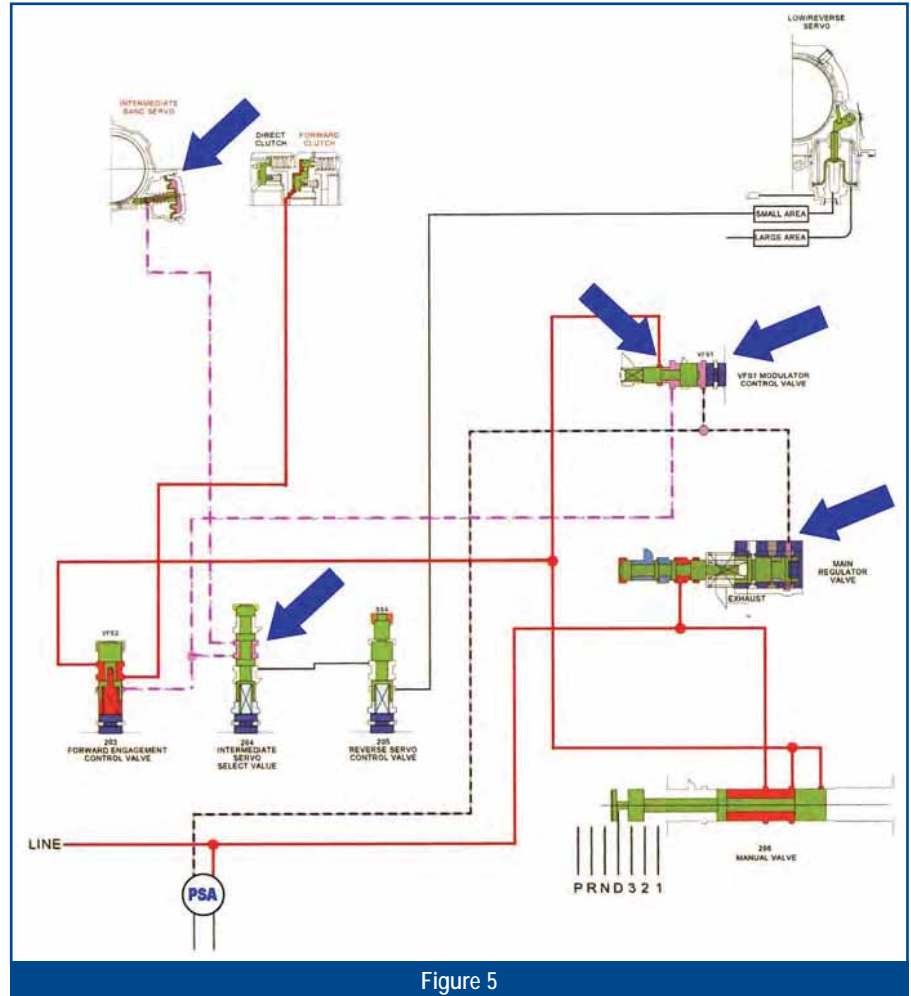


Figure 5

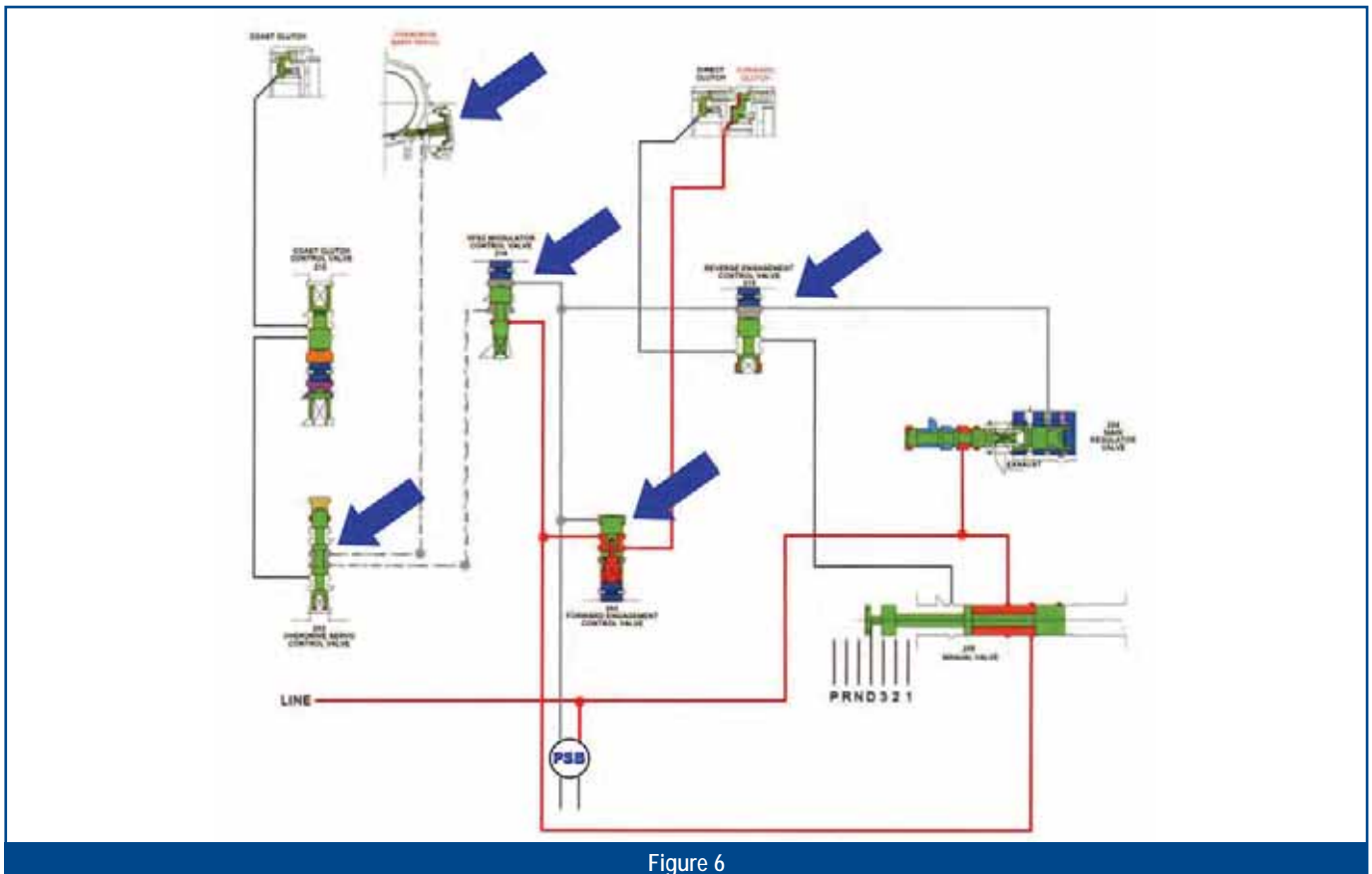


Figure 6



WHEN GETTING IT NOW...  
IS A MUST!



**Hard Parts \* Soft Parts \* Converters**



We offer a wide variety of hard parts, soft parts, and converters to the automotive industry, attested by over 50 years quality customer relations and service in the distribution of automatic transmission parts.



[www.evtparts.com](http://www.evtparts.com)

1155 N. McKinley Ave., Los Angeles, CA 90059 Tel: 323-758-1302 Fax: 323-758-9999

Toll-Free: 866-EVT-PARTS (388-7278) SE HABLA ESPANOL



PCC regulates the reverse pressure modulator and reverse engage-

ment control valves (Figure 7). The solenoid indirectly affects the feel of

the direct clutch engagement in reverse, and directly applies the direct clutch in 4<sup>th</sup> and 5<sup>th</sup> gears.

### How Solenoids Affect Shifts

The solenoids have a direct effect on shift timing and feel. The majority of the problems are either soft, flare shifts or harsh downshifts. Typically the flare shifts are on the 2-3 shift. To understand why, let's look at the applied components.

The forward clutch is applied in all forward gears. From 1<sup>st</sup> to 2<sup>nd</sup> gear the forward clutch and the overdrive servo are applied. This is just like the 5R55E-series transmissions; the forward clutch and overdrive band are applied for 2<sup>nd</sup> gear (Figure 8).

From 2<sup>nd</sup> to 3<sup>rd</sup> gear, the overdrive band releases at the same time the intermediate band applies. This release-and-apply process has to be precise to create a smooth, acceptable shift into 3<sup>rd</sup> gear (Figure 9). A slight timing variation and you can expect a flare or harsh shift.

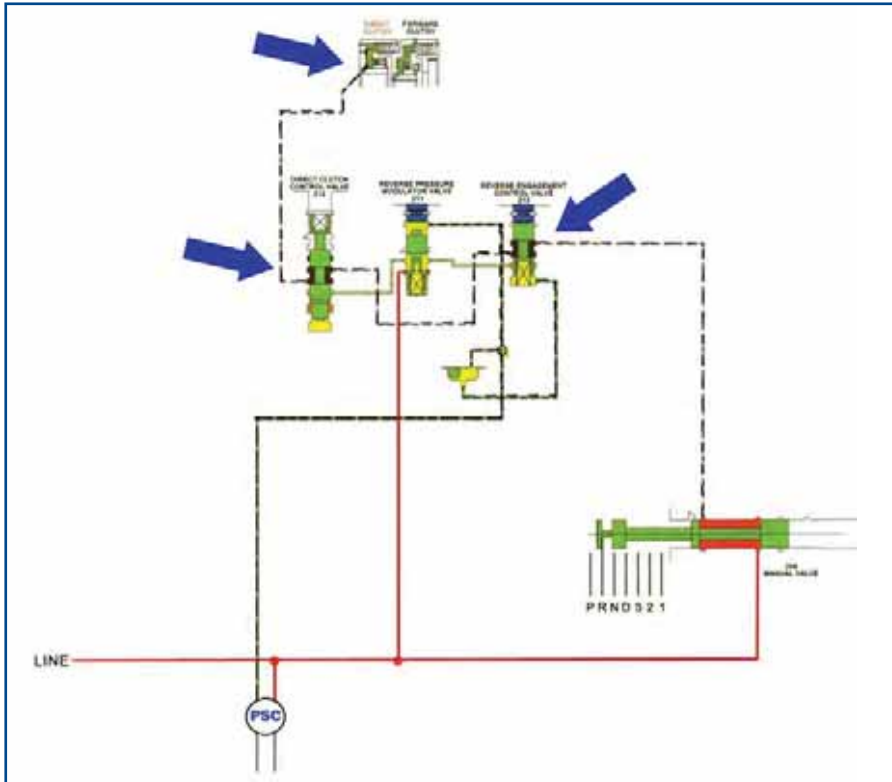


Figure 7

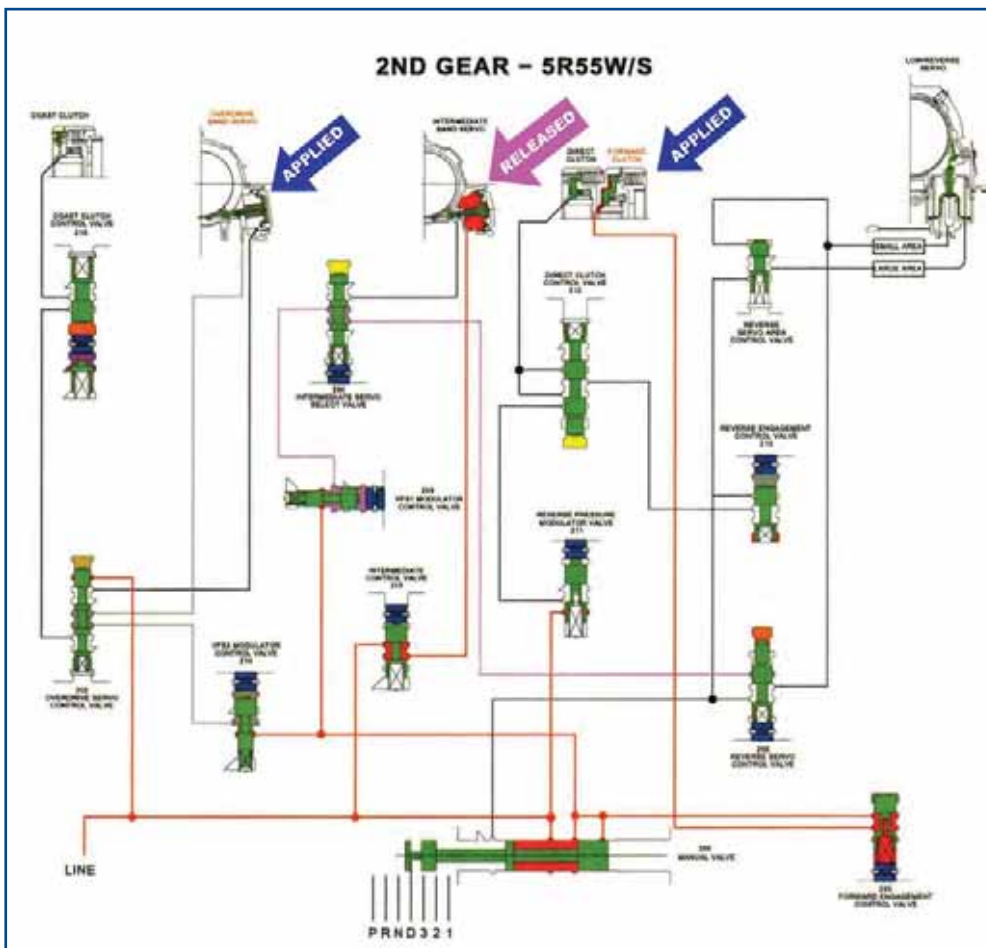


Figure 8

### Solenoid Pack Affects Pressures

So clutch apply timing has to be very precise for this transmission to shift properly and those clutches are being controlled by the solenoids.

But what if one solenoid creates an entirely different pressure than another solenoid from the same computer signal? Turns out that's exactly what happens if you use the wrong solenoid pack.

We ran tests — lots of tests! — and spent countless hours reading hydraulic schematics, measuring valves, and applying the math. Here's what we discovered:

There's a slight difference — but a difference nonetheless — in solenoid output. When we tested the PCA solenoids from the different solenoid packs, we found that at 0.6 amps, there was a 4psi difference (Figure 10).

That doesn't sound like much but it becomes a big deal when it comes to overall pres-



## **FOR QUALIFIED TRANSMISSION SHOPS ONLY**

**WIT offers remanufactured automatic and manual transmissions. Each transmission is fully dyno-tested and includes a 12 month/unlimited mile warranty on parts and workmanship\*. Extended 2 and 3 year warranties on parts and/or labor available\*. WIT also distributes a complete line of quality new, used and remanufactured automatic and standard transmission parts.**

**\*Excludes Commercial and Off-Road Vehicles**

**800.940.0197 • [www.wittrans.com](http://www.wittrans.com)**



***In stock for YOU, not your customers!***

sure in the system. The 4 psi difference equates to about 30 psi of mainline pressure, enough to cause the problems we've been encountering.

About 26% of the 5R55W/S calls we get on the ATRA HotLine are solenoid replacement fixes (Figure 11). And all of those calls involve a complaint of a harsh 3-2 or flare 2-3; most also end up with a lockup problem. In nearly every case, replacing the solenoid pack corrects the problem.

### Other Checks

While a startling number of these calls involve solenoid application problems, there are a few other things you should look at if faced with these complaints:

- Take a close look at the pressure regulator valve setup. Look for wear marks and replace the valve, sleeve, or the entire setup, depending on the wear you discover.
- Examine the overdrive and intermediate servo control valves and plugs. Worn plugs can leak, especially during engagements and shift timing sequences.

The bottom line, make sure you're using the right solenoid pack for the unit you're working on, make sure you thoroughly check the other locations mentioned and those shift problems should just shift away.

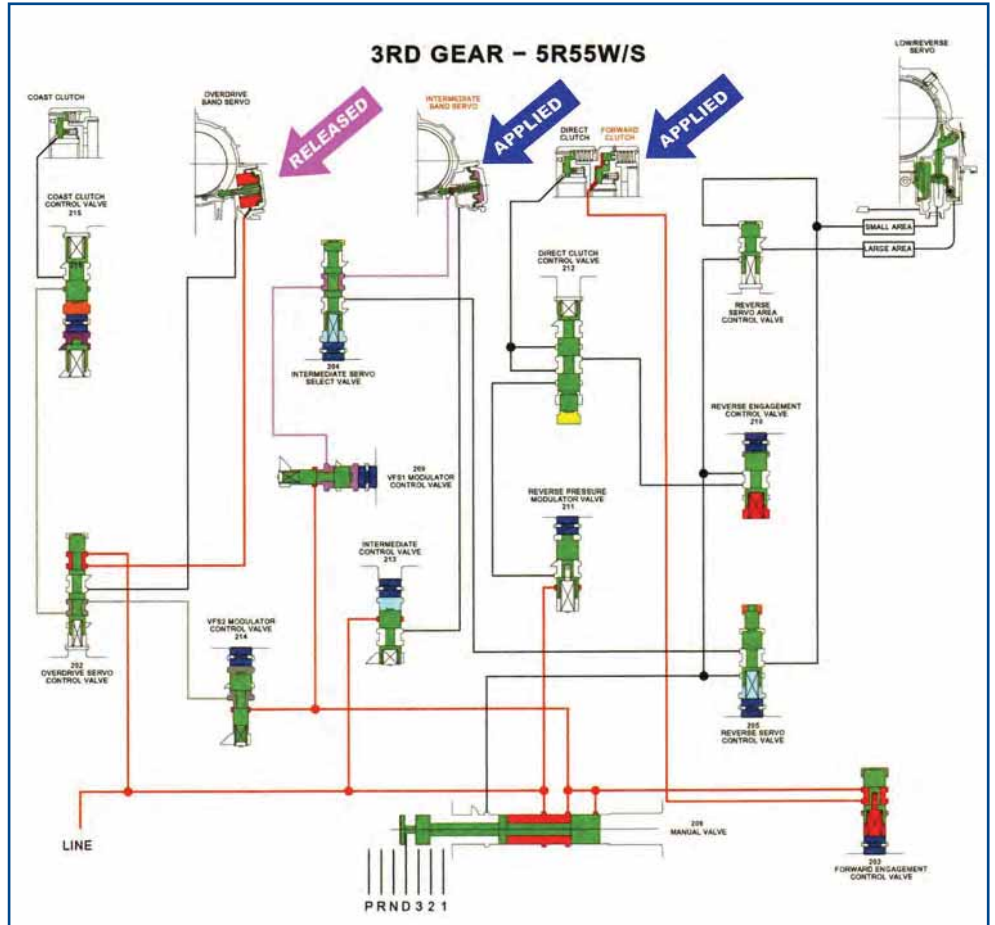


Figure 9

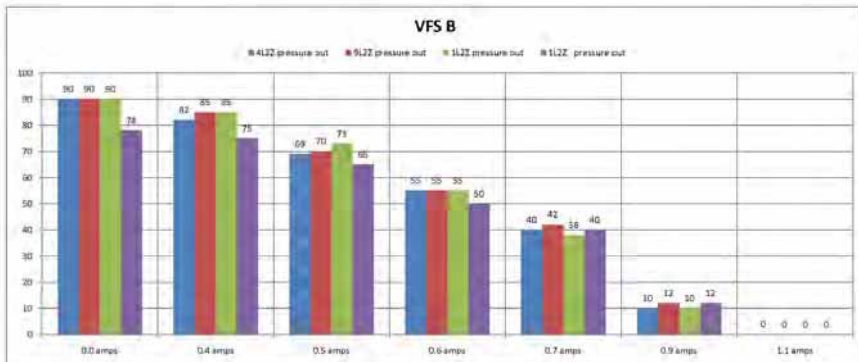
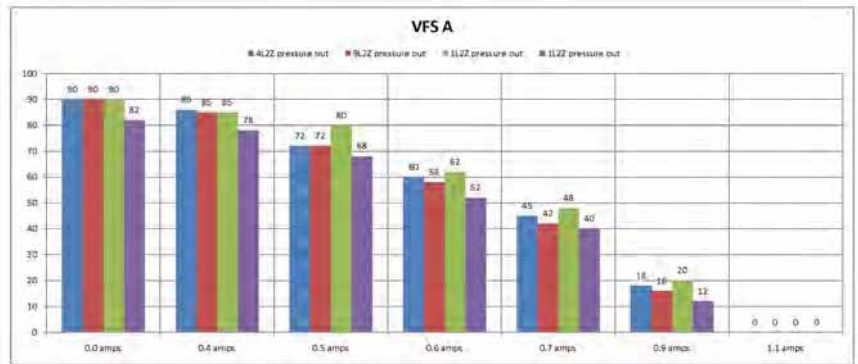


Figure 10

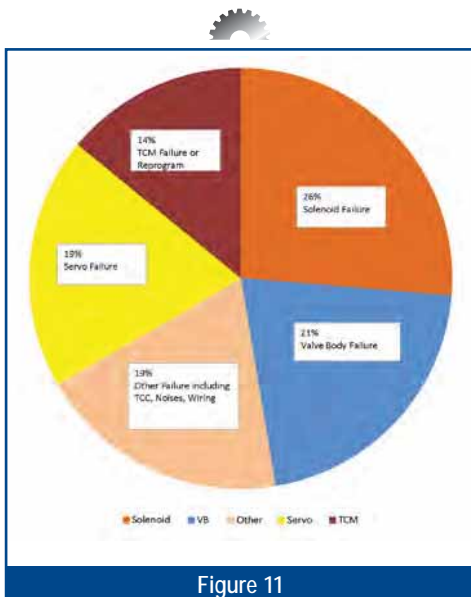


Figure 11



Powertrain  
**expo**  
2012

**BOOTH  
#231**

# SMART BLEND<sup>®</sup>

SYNTHETICS

## YOUR ONE SOURCE FOR QUALITY TRANSMISSION

SUPPLEMENTS, ADDITIVES, LUBRICANTS, CLEANERS & FLUSHES



*“Chemically Superior Technology”*



[www.smartblend.com](http://www.smartblend.com)

For more information call:  
**1-888-422-9099**

# A Proud Tradition of

Here Are The Latest Reasons Why More & More

## What Do You Call Truck/SUV Performance ALL In ONE Box?

**Fairbanks PERFORMANCE**

**PowerTOW**  
Selective Action Package

Turn Your Hard Working Transmission Into A True Performance Unit!

- ✓ Firms Shifts and Increase Holding Power
- ✓ Reduces Clutch Slippage – Less Heat Build-Up
- ✓ Increases Cooler Flow & Upgrade Lubrication Circuits
- ✓ Designed To Be Programmer Friendly
- ✓ Professional Results For Hard Working Tow Rigs

Includes **NEW Separator Plate**

Part# PT4L60-E

At Superior Transmission Parts, Inc., We Call That “**POWERTOW SelectiveAction™**”

### A SUPERIOR Match-Up For All 4T65-E Rebuilds



Part # K098  
(AFL Valve Fix)

Part # K4T65-E

Combine These Two Products For a **SUPERIOR Fix**

### 6F35/6T40 SuperTuff™ Solution



Part # K0100

Repair in car! Quick! Easy!

### The Latest & The Greatest



**Superior Shift Correction™ Packages**  
K500-618, K500-618-L & K48RE

# SUPERIOR Innovation!

Builders Are "Making The Shift To..."™ SUPERIOR

Now you Do have a Choice to be...

# SUPER COOL!

The New 5R55W/N/S Shift Correction Package developed in conjunction with TransLab Engineered & Superior Transmission Parts, Inc. is finally the Simple Solution to this problematic unit!

Due to the factory design of no cooler flow cold, it is extremely temperamental to fill and get a correct level, as well as running extremely hot compared to others without flow control systems. We finally broke thru with our patent pending Sure-Cool™ Full Time Cooler Flow Valve along with enhanced Lube system that nearly Triples the Flow thru the cooler and parts, especially the O.D. Planetary. These Flow Control Upgrades virtually eliminate front Planetary Burn-up due to lack of Poor / No lube. This new system also furnishes a built in cooler bypass system that if the unit is extremely cold (fluid starts to gel) or in the event the cooler is blocked/restricted, flow to the parts still occurs – protecting your investment.



Part # K5R55WNS

## Loose OD Bands?



Part # K0102

# PROBLEM SOLVED!

Introducing Superior's New AOD-E/4R70W/4R75W Adjust-A-Pin™

## COMING SOON!



Superior's New U140-U250 TransLab Engineered Valve Body Upgrade Kit

## SUPERIOR

TRANSMISSION PARTS, INC.™

THE SIMPLE SOLUTION

VISIT OUR NEW INTERACTIVE WEBSITE:  
[www.superiortransmission.com](http://www.superiortransmission.com)

Connect with Superior Transmission Parts on Facebook & Twitter:

 Superior Transmission Parts, Inc.

 [superiortrans1](https://twitter.com/superiortrans1)

Phone: 1-800-451-3115 x207 sales  
International: 850-574-2369 x207 sales