5R55W/S

Erratic Transmission Operation

After rebuilding a 5R55W/S model transmission, during the road test you may encounter a flare on the 2–3 shift.

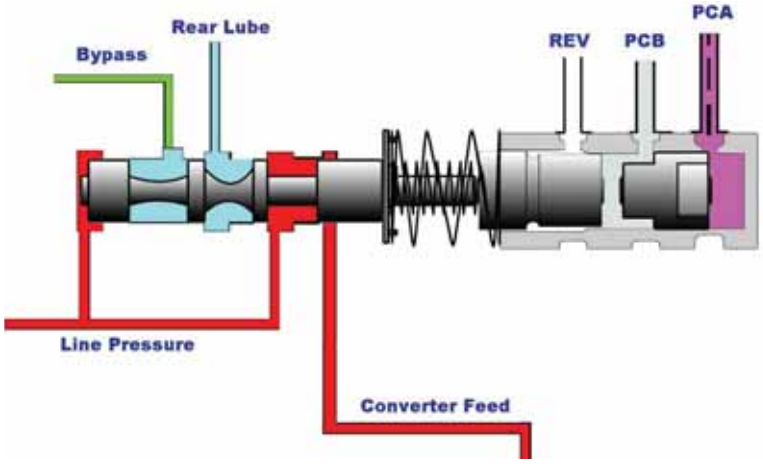
This concern can be caused by a new solenoid pack. Over the years, Ford has made a few changes to these solenoids; changes that can make a slight difference in the pressure they deliver to various systems in the transmission. And it doesn't take much of a pressure variation to alter transmission performance 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. 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).



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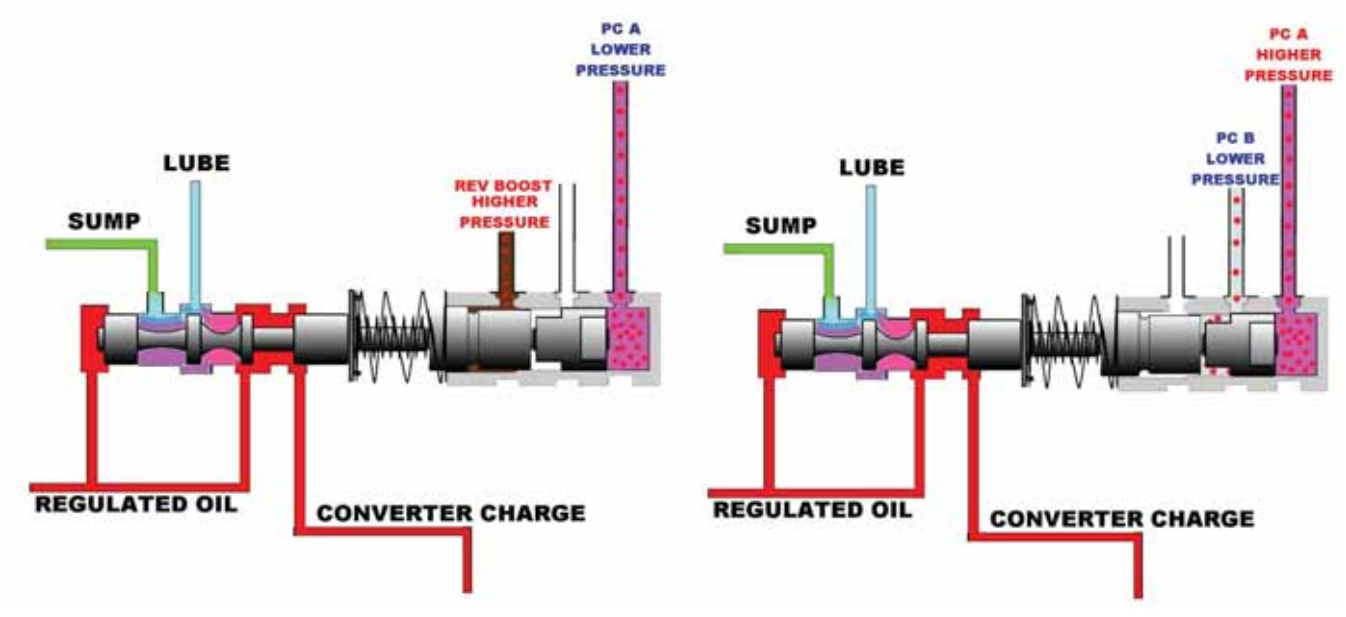
Erratic Transmission Operation (continued)

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 4th, 5th, and manual 4th gears. All of the other solenoids are on-off type shift solenoids.

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



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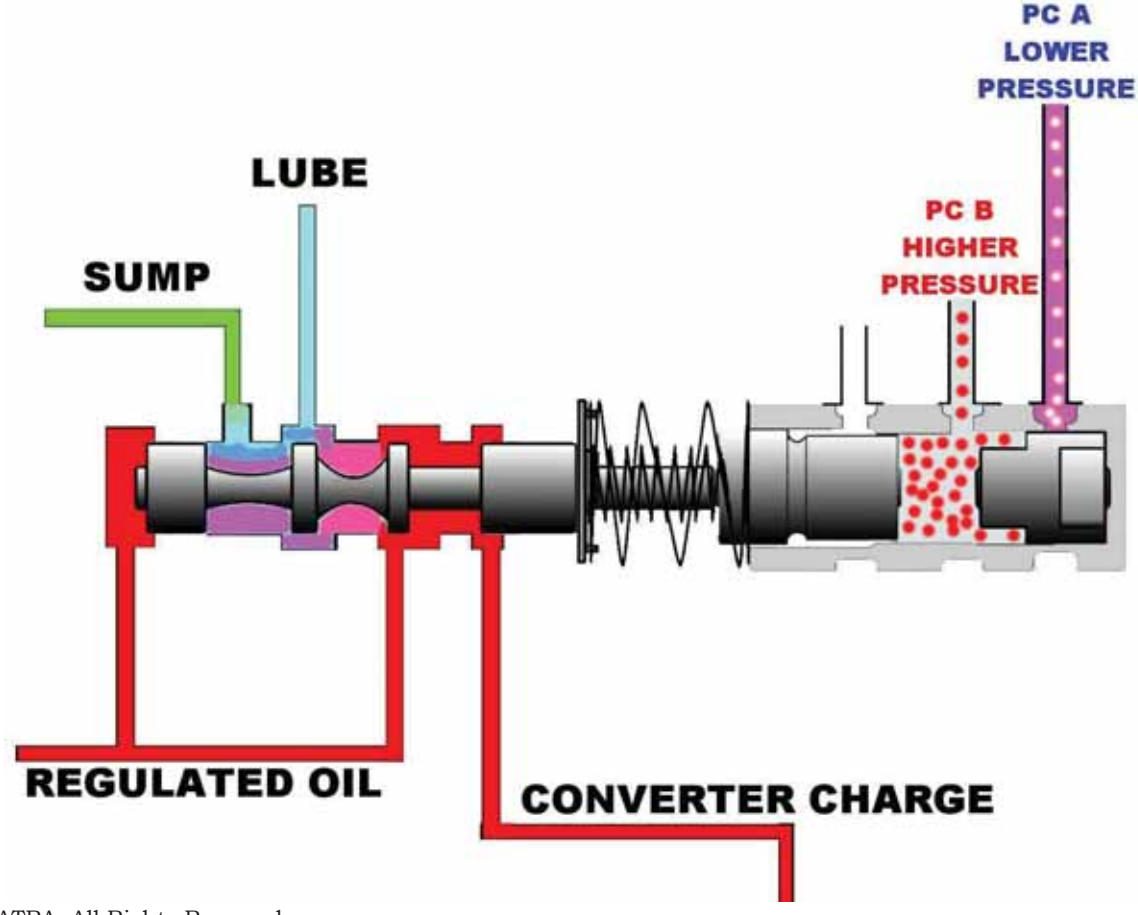
Erratic Transmission Operation (continued)

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.

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.

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.



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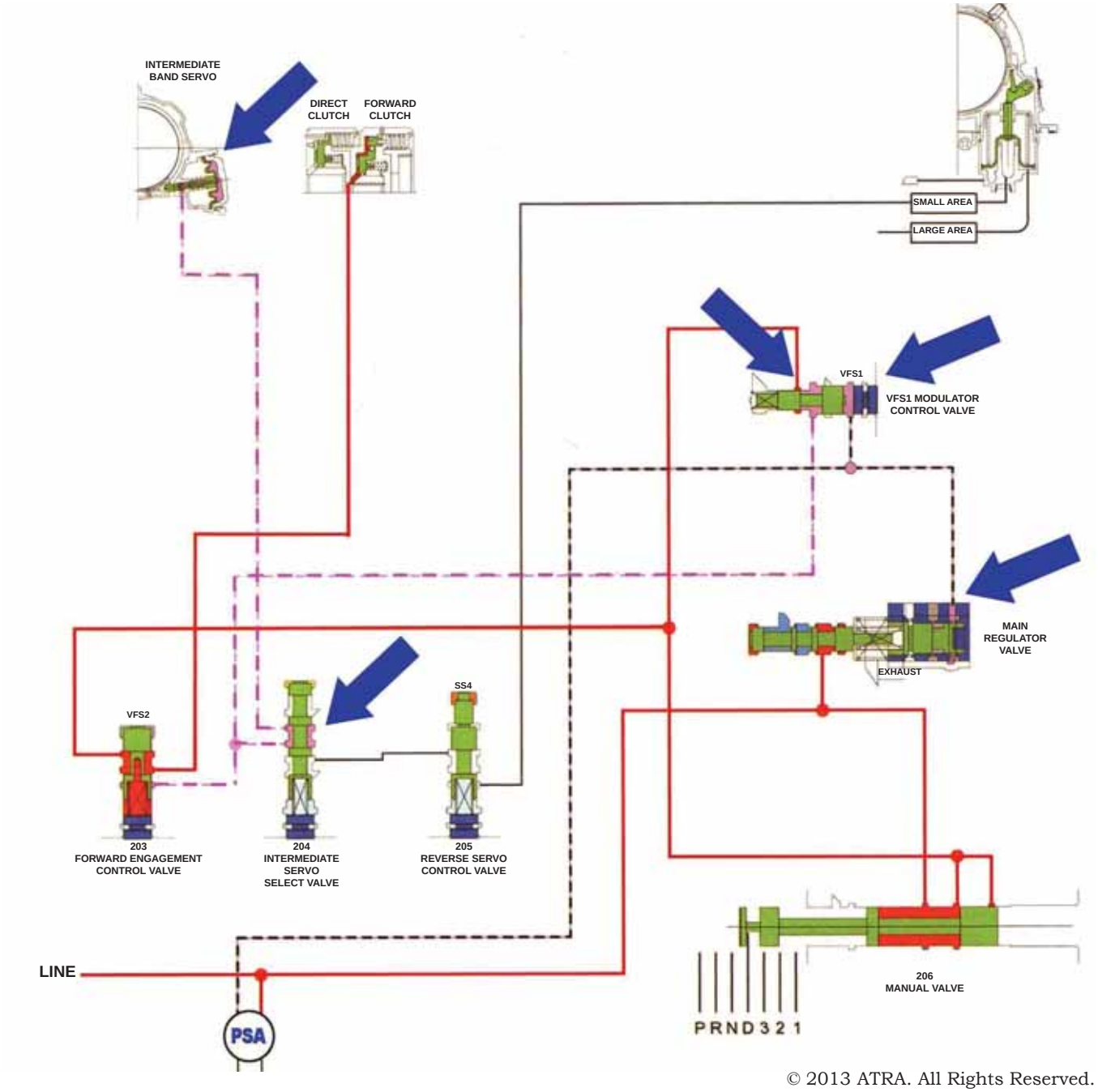
Erratic Transmission Operation (continued)

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



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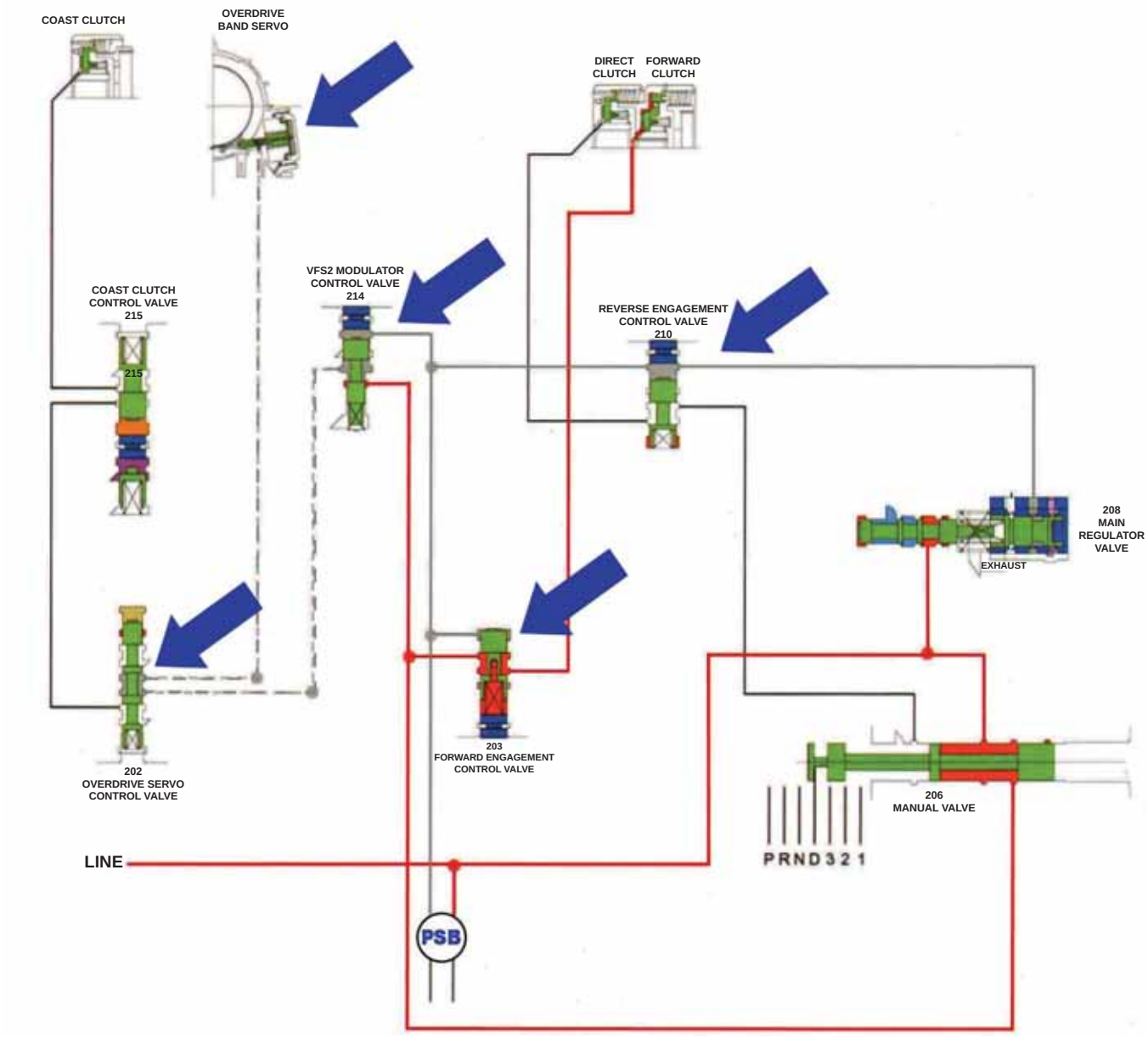
Erratic Transmission Operation (continued)

PCB also controls the VFS2 modulator valve, and forward and reverse engagement valves. 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.



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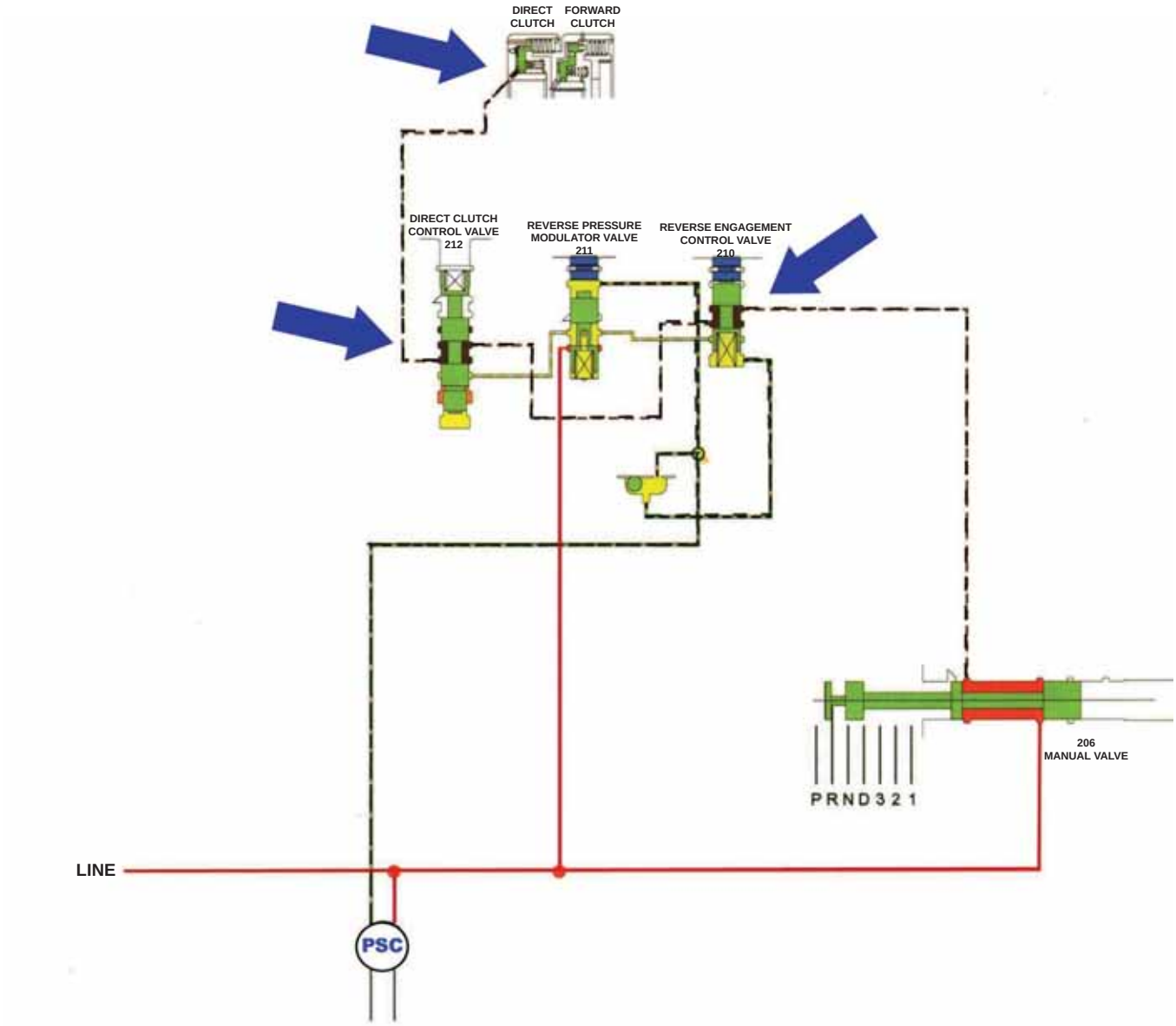
Erratic Transmission Operation (continued)

PCC regulates the reverse pressure modulator and reverse engagement control valves. The solenoid indirectly affects the feel of the direct clutch engagement in reverse, and directly applies the direct clutch in 4th and 5th gears.



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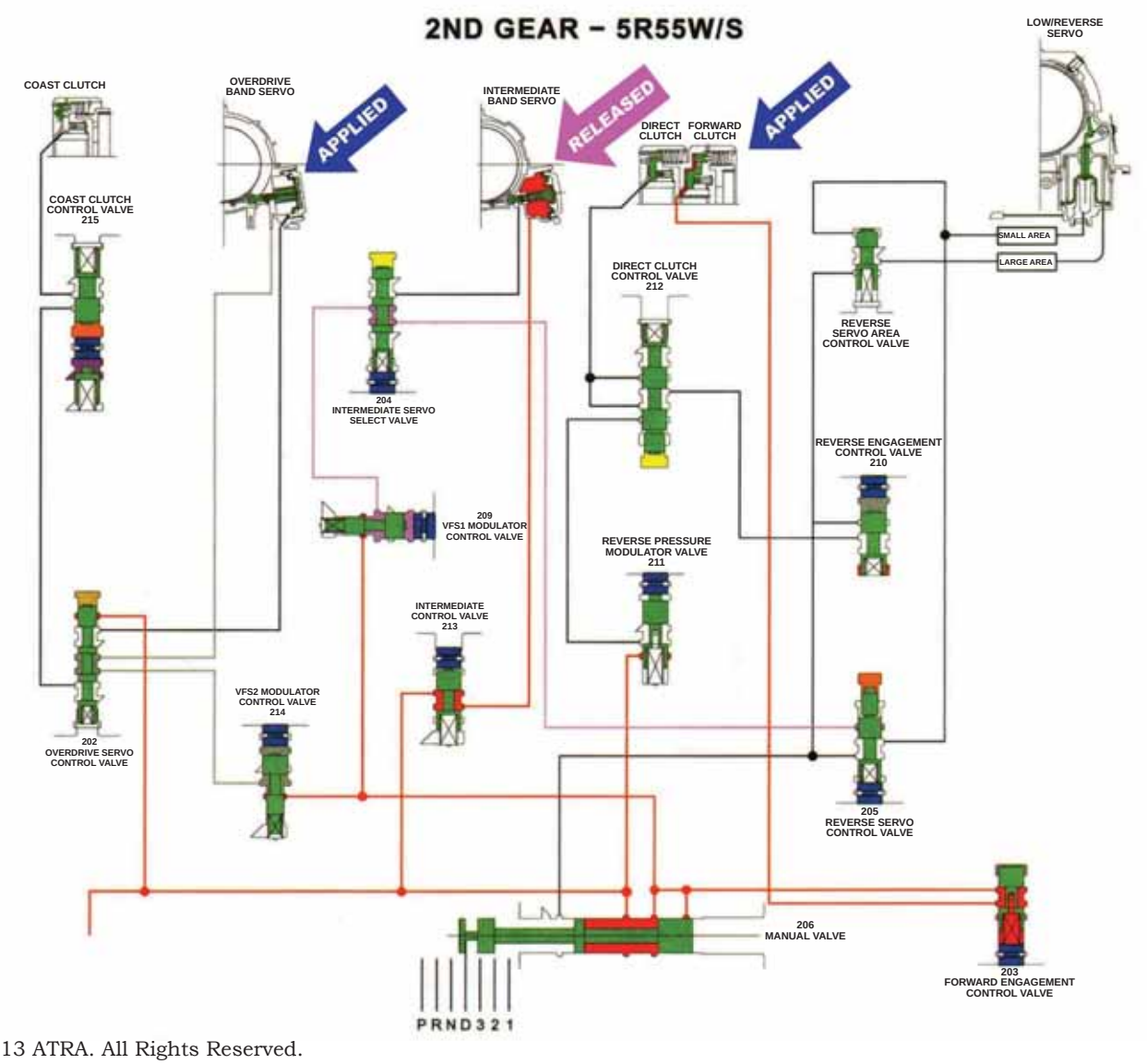
Erratic Transmission Operation (continued)

The forward clutch is applied in all forward gears. From 1st to 2nd 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 2nd gear. From 2nd to 3rd 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 3rd gear. A slight timing variation and you can expect a flare or harsh shift.



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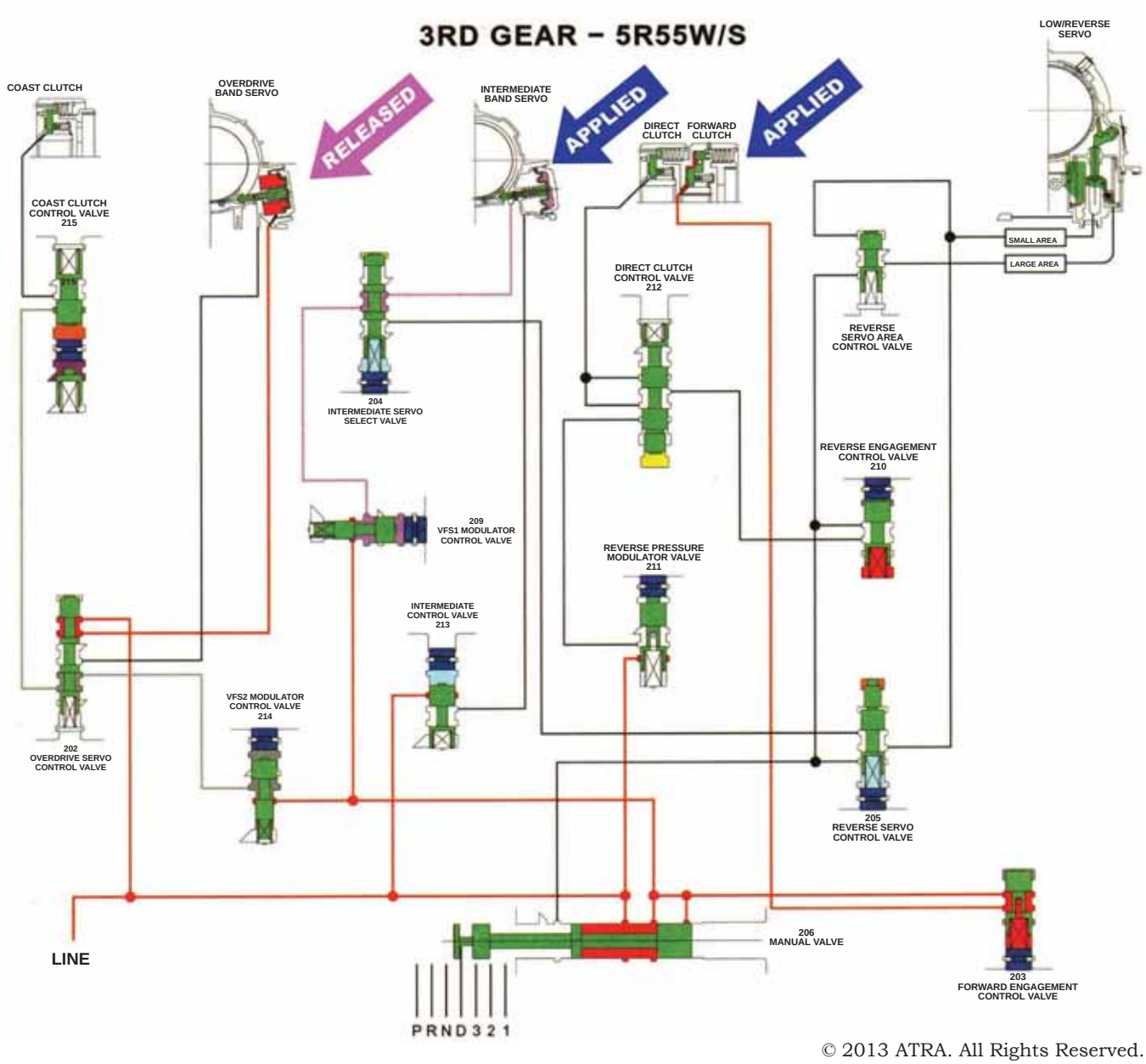
Erratic Transmission Operation (continued)

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.



5R55W/S

Erratic Transmission Operation (continued)

After many tests and countless hours reading hydraulic schematics, measuring valves, and applying the math. 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 4 psi difference.

That doesn't sound like much but it becomes a big deal when it comes to overall pressure in the system. The 4 psi difference equates to about 30 psi of mainline pressure, enough to cause the problems we've been encountering. In nearly every case, replacing the solenoid pack corrects the problem.