Clearing Up a Few Points on the F4A/F5A Transaxles

The F4A51 was first introduced in the 1997 Mitsubishi Diamanti; today it appears in many Kia and Hyundai models. It’s also grown into a 5-speed with the addition of an underdrive section, and has transformed into a rear wheel drive unit for several truck and SUV applications. No doubt it’s going to be with us for a long time.

There isn’t a lot of information available on these units. Maybe that’s because it’s so similar to the 41TE, and it’s very simple to work on. After you rebuild one of these units, you could probably do the next hundred with your eyes closed. Very often, the only reason for a rebuild is because the 2C or L/R wave spring broke, destroying the pump, or the rear cover and sealing ring area wears out.

Unfortunately, a quality rebuild or repair doesn’t always result in these units working properly. Remember, your customers expect you to solve their transmission problems, no matter what the cause. This is why it’s so important to understand these units and how they’re supposed to work. That way, you’ll know how to deal with them when they aren’t working. To help you understand these units a little better, here’s a bit of background information on some of the more unusual features of the F4A/F5A units.

Large Steel Checkballs

The first thing to clear up is what the two large steel checkballs are for (figure 1). On most 4-speed transaxles, these two checkballs sit between the valve body and case. Later units and most 5-speeds only use one checkball. They don’t seem to do anything. There are no springs to hold them. All that holds them in place is gravity.

These checkballs allow clutch apply oil to exhaust from the circuit when the clutch is released. When the exhaust pressure drops off, oil stops flowing past the checkball and it seats. This prevents air from getting into the clutch circuit. No doubt the factory engineers didn’t want air getting into the clutch circuits and possibly cause inconsistent shifting.

What would happen if you left the checkballs out? Most likely you’d experience a slight change in shift quality during some conditions, and probably very little change during others.
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While not of critical importance, it’s probably not a wise decision to leave them out, or to add springs behind the checkballs.

**Shift Solenoids**

The next interesting feature concerns the shift solenoids. Each solenoid modulates an individual clutch pack on and off, just like a 41TE. Other than that, there are some big differences:

- Unlike a 41TE, all the shift solenoids are identical.
- These solenoids are *normally open*; they close when energized.
- All 4-speeds have five solenoids — one for each hydraulic circuit.

On the 5-speed units, an additional solenoid controls the reduction band for underdrive. And they borrowed an idea from the 41TE: These units use the low/reverse solenoid to operate the direct clutch in the underdrive section.

**NOTE:** A few Kia models have also added another solenoid to vary mainline pressure. Unfortunately there is no technical information on that solenoid available at this time.

Since the solenoids are the same within each unit, you can swap them around without any problem. And you can put them together during a rebuild, without having to worry about which was which (figure 2).

When cleaning the solenoids, only blow air into the hole closest to the solenoid body or the middle hole. Never blow air into the farthest hole: You’ll end up trapping any dirt or contaminants inside the solenoid.

The most important point to remember about these solenoids is they’re *normally open*; that is, they’re open when turned off and closed when energized. Which means that, when one of these solenoids is commanded off, it’s allowing oil to flow to the clutch; when it’s commanded on (energized), it shuts off the flow of oil. Here’s why this is an important point to keep in mind:

Suppose a unit is having a slow or delayed forward engagement when cold. After it runs for a few minutes, engagements seem fine. To troubleshoot this condition, one of the first tests would be to check apply pressure on the low/reverse and underdrive clutches. You discover the underdrive clutch pressure builds very slowly when cold. Since the pressure does reach working pressure and the delay goes away hot, you naturally suspect a possible solenoid, valve or computer command problem.

To check this problem, you’ll need to connect a graphing meter or oscilloscope to the underdrive clutch solenoid. Don’t waste your time with a DVOM; not even one with a bar graph. Since the command sequence takes place in less than ½ second, a meter won’t be adequate to reveal the duty cycle change (figure 3).

Remember, these solenoids are all normally open, so when you’re in park, the meter will show the underdrive solenoid commanded on 100%. When you select drive, the meter should show the duty cycle command drop to zero. By the time the command has dropped to around 20%, the underdrive clutch should be pretty close to fully engaged.

So back to the car with the delayed cold forward engagement: With a your scope connected to the underdrive solenoid you can see that, when you select drive, the duty cycle remains at 100% for 3 seconds and then drops to zero. After the car warms up for a few minutes, the command signal drops off immediately, and the transmission goes right into gear.
This test proves that the problem isn’t in the solenoid or valve body; it’s a computer system problem. Two reasons have been found to cause this specific problem: Either the neutral switch is out of range, or the computer has some incorrect adaptive strategy stored in memory, and has to be disconnected and allowed to erase its adaptive memory to fix the problem.

**Underdrive Operation**

Another unusual characteristic to keep in mind when you’re troubleshooting a 5-speed transaxle: There are two different shift strategies in use. Some units only hold the underdrive on through 3rd gear; others keep it on through 4th, and only release the underdrive band for 5th gear.

You can tell which one you’re working on by monitoring when the computer energizes the reduction band solenoid:

- If the unit energizes the solenoid for 4th and 5th ranges, the transaxle is only using underdrive for 1st, 2nd and 3rd gears. (figure 4).
- If the unit only energizes the solenoid for 5th gear, the transaxle is using underdrive for 1st through 4th gears.

As with most transmissions, the key to successful diagnosis and repair on the Mitsubishi F4A/F5A is understanding how it works. From there, most problems become simple to track down and repair.

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**AMANTI SHIFT TEST**

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