

# A Look at the 450-43LE (Aisin Seiki), Part 2

Please note: In the April issue of *GEARS*, Aisin Seiki was spelled incorrectly. The correct spelling is listed above. Our apologies for this error.

Every code represents a perceived failure to the computer.



In the last issue of *Let's Play Ball!*, we talked about some of the unknowns of the 450-43LE. That is, what you don't see in the books. We covered:

- Valve body checkball locations
- Wiring harness and location
- Common valve body problems
- How to retrieve codes
- Solenoid operation and testing

In this issue, we'll get up-close and personal with some of the internal components and the code diagnosis you'll need to know to get this unit out the door... the *first* time. We'll start with how to diagnose this transmission.

### Code Description

The codes on the 450-43LE can be retrieved manually through the diagnostic connector, located under the driver's side of the dash

(refer to the April issue of *GEARS*). These codes are typically two digits (figure 1).

Every code represents a perceived failure to the computer. That doesn't mean that code 11 (VSS Circuit Open) automatically tells you the VSS should be replaced. On the contrary: It may only indicate a loose connection, engine interference, or something as simple as the VSS not being plugged in.

Some codes can lead you in the wrong direction altogether. For example, code 33 is: *Timing solenoid circuit open or shorted* (figure 2). If you

DTC No.	DISPLAY PATTERN	DIAGNOSED CONTENT	REFERENCE
11	ON OFF	Vehicle speed sensor 1 circuit open or shorted (Fitted to transmission)	7A2-9
13		Engine speed sensor circuit open or shorted	7A2-11
15		Automatic transmission fluid thermosensor circuit open	7A2-13
17		Inhibitor switch circuit open or shorted	7A2-15
21		Throttle position sensor circuit open or shorted	7A2-17
24		Vehicle speed sensor 2 circuit open or shorted (Built into speedometer)	7A2-20
31		No.1 shift solenoid (S1) circuit open or shorted	7A2-22
32		No.2 shift solenoid (S2) circuit open or shorted	7A2-24
33		Timing solenoid (ST) circuit open or shorted	7A2-26
34		Lock-up solenoid circuit open or shorted	7A2-28
35		Line pressure solenoid circuit open or shorted	7A2-30
37		Exhaust brake cut system circuit open or shorted	7A2-32
38		Engine warming up cut system circuit open or shorted	7A2-34

Figure 1

retrieved this code, what would you think is wrong? Most folks would automatically assume the solenoid failed — when the problem could just as easily be a shorted or open wire to the solenoid. This is where a solid diagnostic routine is critical for accurate diagnosis, no matter what transmission you're working on. Let's look at this code from two perspectives, first from *after* an overhaul and then a second time from *before* an overhaul.

31		No.1 shift solenoid (S1) circuit open or shorted
32		No.2 shift solenoid (S2) circuit open or shorted
33		Timing solenoid (ST) circuit open or shorted
34		Lock-up solenoid circuit open or shorted

Figure 2

### After Overhaul

Usually there are only two possible causes for a new code that appears after an overhaul:

1. a mechanical problem, such as bad parts, stuck valves, and so on, or...
2. a mistake during the rebuild.

Let's use code 33 in this example. The definition for code 33 indicates the timing solenoid is either open (no voltage drop in the circuit) (figure 3), or shorted to ground. So the first thing that all too many rebuilders will do when this code shows up immediately after an overhaul is replace the solenoid — *without* checking the solenoid first. But when you examine the circuit thor-

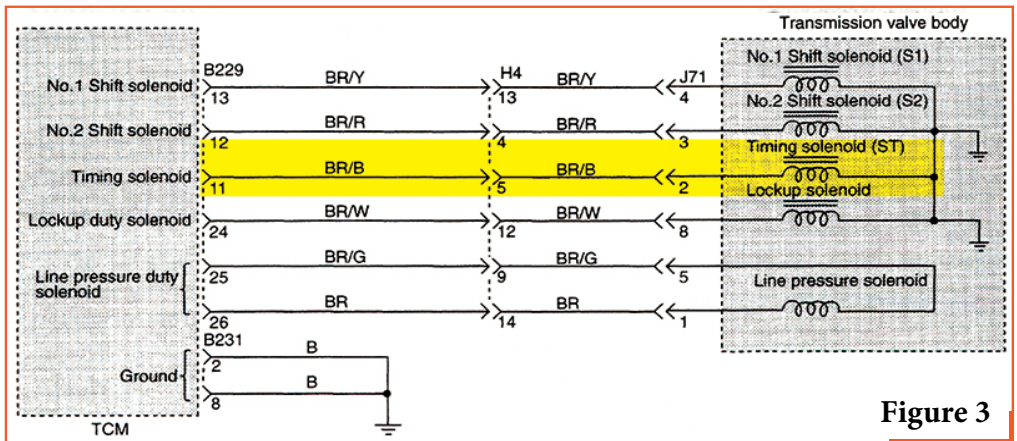


Figure 3

oughly using a standard diagnostic routine, nine times out of ten you won't find anything wrong with the solenoid or its circuit. So it's important to understand the conditions that can cause this code to set.

The timing solenoid is used for the 1-2 upshift, the 2-3 upshift, and the 3-2 downshift. Its purpose is to control the orifice of the 2<sup>nd</sup> brake (B1), which reduces shift shock. The computer uses code 33 to indicate a voltage drop problem in the solenoid circuit. But it also sets this code if the shift occurs too quickly, which could be caused by a sticking timing shift valve. This is where understanding the conditions that

will set a code, and following a logical diagnostic procedure, will help you avoid costly — and unnecessary — solenoid replacements.

### Before Overhaul

Codes that show up before an overhaul should always be checked and the condition repaired — or at least diagnosed — before you even consider opening the transmission for repair. The last thing you want to do is go through the time and expense of an overhaul, only to end up with the same code that you had before. Not to mention the possibility of missing the actual root cause of the code, only to have to pull the unit

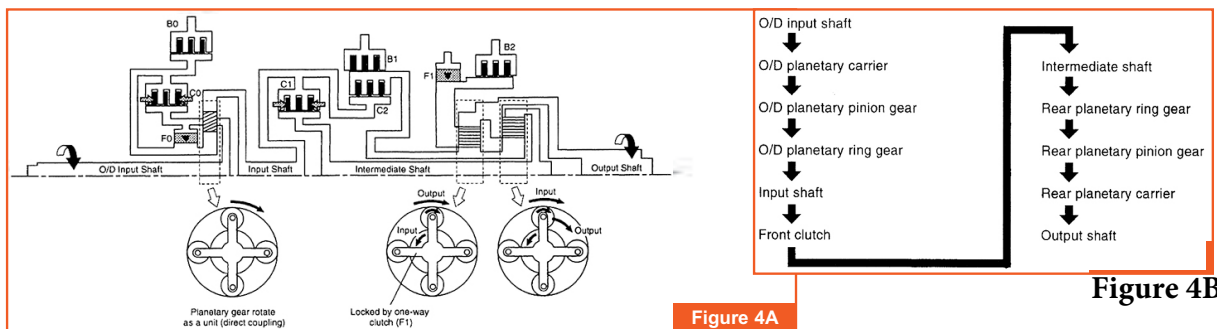


Figure 4A

Figure 4B

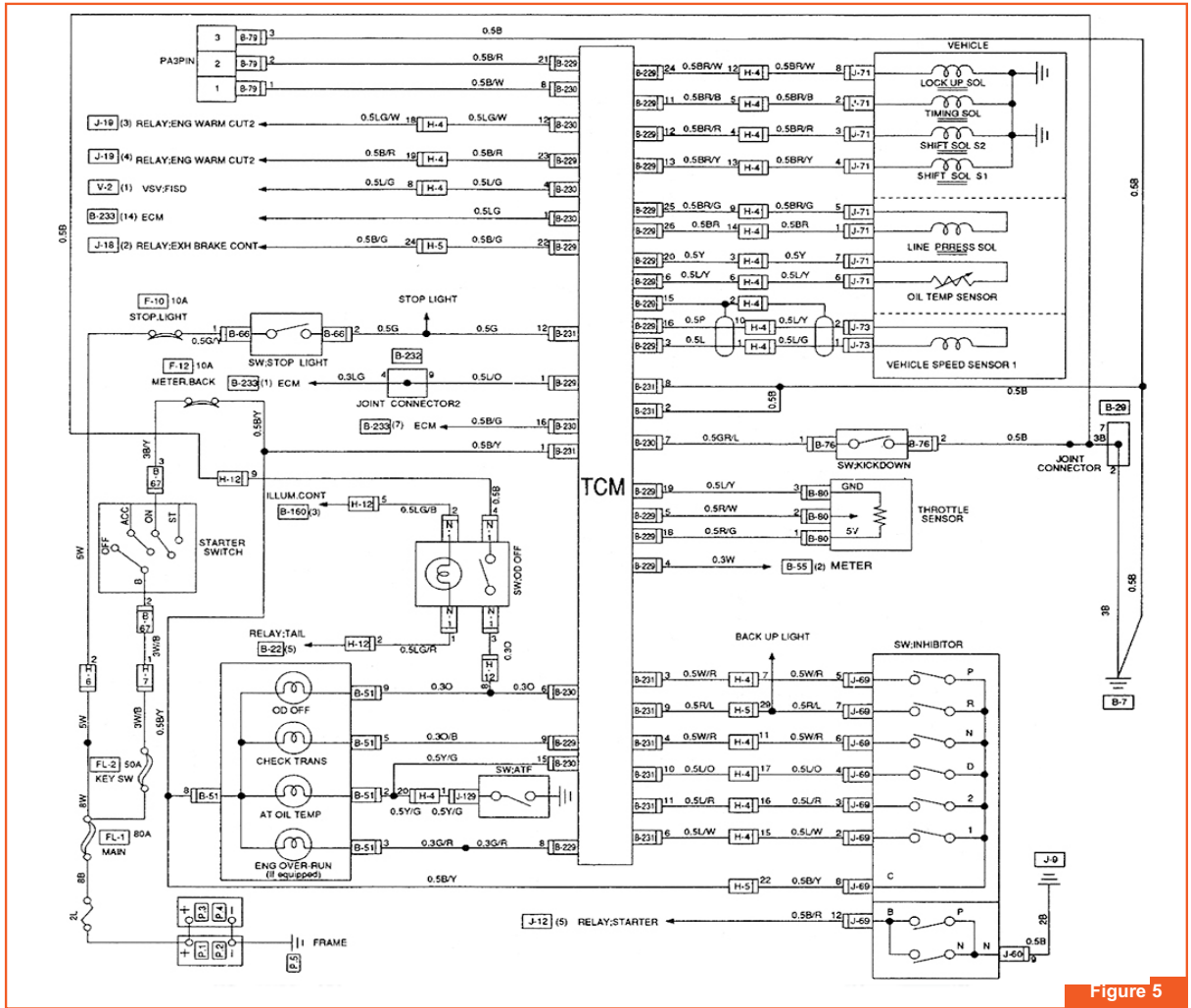


Figure 5

apart again to correct it.

This same code 33 can occur before an overhaul, due to a failed 2<sup>nd</sup> brake system. By understanding how the system operates (Figure 4a and 4b) and sets codes, and using the same diagnostic routine, you can identify the root of the problem faster and easier than using the guess-and-replace method of diagnosis. Remember, the one thing the ECM can't tell you is whether the valve moved. If it did, you know you're going to have to dig down into the transmission. On the other hand, if the valve didn't move, you should at least be able to identify the root cause of the trouble code by performing a standard diagnostic procedure on the solenoid and its control systems.

Performing a diagnostic routine on

the 450-43LE transmission is easy: All of the solenoids except the pressure control solenoid are grounded constantly. The computer energizes them by supplying a power (B+) signal (figure 5).

There are three basic electrical tests you should perform for diagnosing any solenoid: voltage drop, resistance and current draw. From there, where you go will depend on the results of each test. Start with the voltage drop test:

- Backprobe the solenoid feed wire with the positive lead from your digital meter.
- Connect the ground lead to a good ground.
- Set your meter to Volts DC.

Put the vehicle in the proper condi-

tion for the computer to energize the solenoid. You may have to raise the drive wheels and run the vehicle up to a certain speed for this to occur. Then check the voltage to the solenoid: You should see system voltage at the solenoid when it's supposed to energize.

If you don't see system voltage, you're dealing with one of three problems:

- Shorted solenoid
- Open circuit or loose connection in the wiring between the computer and the solenoid
- Faulty computer

Next, check the solenoid resistance:

- Key off.
- Unplug the solenoid harness from the transmission.

# “TESTING 1 - 2 - 3 - 4”

# 1



## BENCH TEST TRANSMISSIONS



**Unit Tester** -- This allows the operator to test the hydraulic integrity of the individual components in the transmission.

- With a simple connection, clutch and band operation can be diagnosed.
- Bench testing the transmission can save valuable time by reducing unnecessary installation and removal

# 2



## TEST SOLENOIDS



**Solenoid Tester** -- Experts agree that a solenoid tester is “a must” for any transmission shop, as solenoids represent the “weakest link” in the transmission. Test up to 6 solenoids at a time with this advanced, yet easy-to-use, tester. Choose from manual or automatic test modes.

# 3



## TEST VALVE BODIES

**Valve Body Tester** -- When precise control is a must, you can simulate the toughest driving conditions while testing for suspect areas of the transmission’s electronic, hydraulic and vacuum systems. Tests valve bodies, solenoids and pressure transducers using actual transmission pressures and heated oil.



# 4



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- Connect the positive meter lead to the solenoid terminal on the transmission.
- Connect the negative meter lead to a good ground.
- Set your meter to Ohms.

Your meter should display between 10 and 20 ohms resistance. If you see zero ohms, the solenoid or internal transmission wiring is shorted. If you see infinite resistance, the solenoid or wiring is open.

If the solenoid you're checking is supposed to have extremely low resistance, such as a PWM solenoid, always zero your meter leads before beginning this test.

Finally, check the current draw for the solenoid:

- Switch your meter leads to the 10- or 20-amp sockets on your meter.
- Set your meter to read Amps.
- Connect your meter in series between the solenoid and a good B+ power source.

Assuming a resistance of 10 to 20 ohms, you should have a current draw of 0.6 to 1.2 amps. Zero amps indicates an open in the circuit (or a blown fuse in your meter!); more than about 1.5 amps indicates a shorted or partially shorted solenoid or circuit.

If the solenoid is one that's supposed to have an extremely low resistance, be careful with this test; don't keep the solenoid energized for more than a couple seconds, or you could burn it out during testing.

Don't forget, even if the solenoid checks out good

electrically, it could still fail mechanically. You'll have to perform a complete mechanical function test once you have the solenoid out of the unit.

Now let's take a closer look at the internal components of the 450-43LE.

### Internal Case and Clutches

The 450-43LE is built for torque: The case-held clutches and supporting drums are designed for pulling, pushing and hauling, whatever the load. There

are four shafts in this unit:

1. Overdrive shaft
2. Input Shaft
3. Intermediate Shaft
4. Output Shaft

There are six clutch sets and two one-way clutches in this unit (figure 6).

The construction of the transmission operation is similar to every Aisin transmission (figure 7).

The one-way clutch rotations are

Component name	Symbol	Function
O/D direct clutch	C0	Connects O/D sun gear and O/D carrier.
Front clutch	C1	Transmit the engine torque from the input shaft to the intermediate shaft.
Rear clutch	C2	Transmit the engine torque from the front clutch hub to the front and rear planetary sun gear.
O/D brake	B0	Locks the O/D planetary sun gear.
2nd brake	B1	Locks the front and rear planetary sun gear.
1st & Rev. brake	B2	Locks the front planetary carrier.
O/D one-way clutch	F0	Locks the O/D sun gear and O/D planetary carrier during acceleration in 1st, 2nd or 3rd gear.
One-way clutch No.2	F1	Locks the front planetary carrier during acceleration in 1st gear.
No.1 shift solenoid	S1	The ON/OFF combinations of the two solenoids are used to control the gear position.
No.2 shift solenoid	S2	

Figure 6

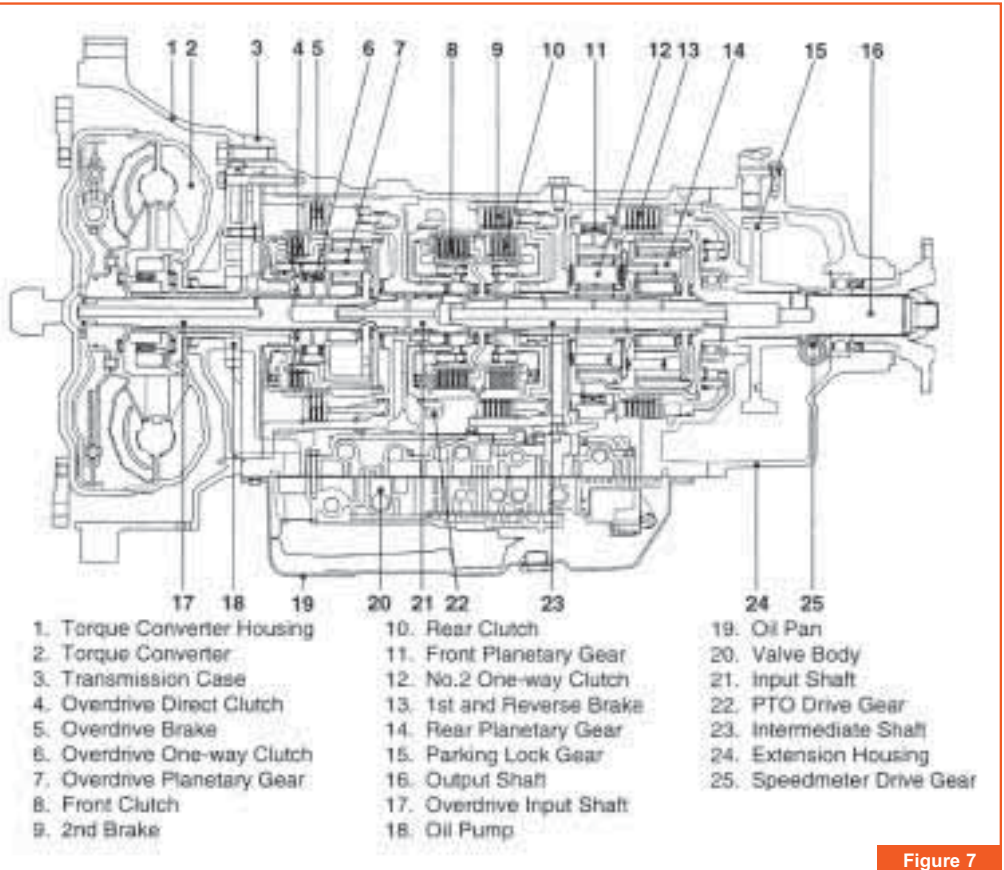
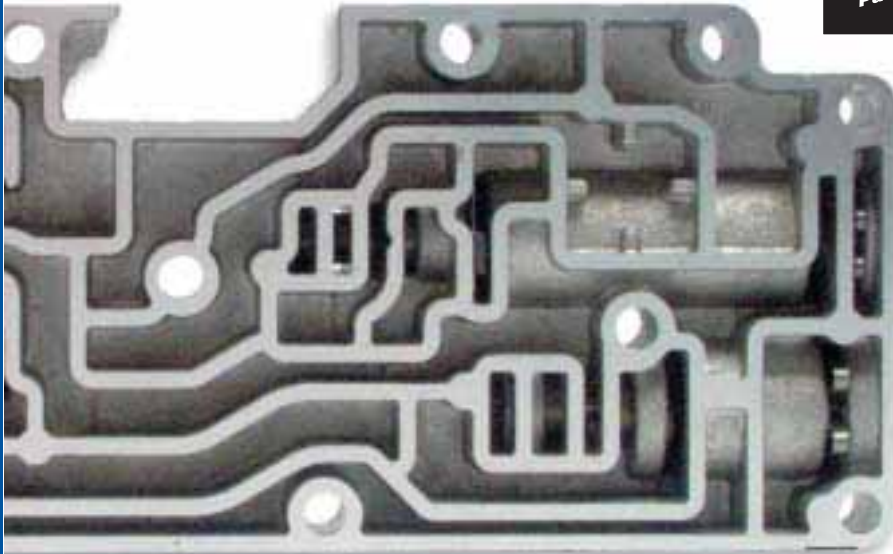


Figure 7

# The Superior E4OD/4R100 Accumulator Body Repair Kit

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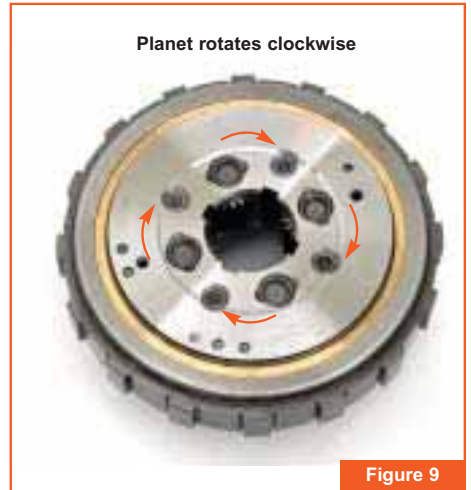
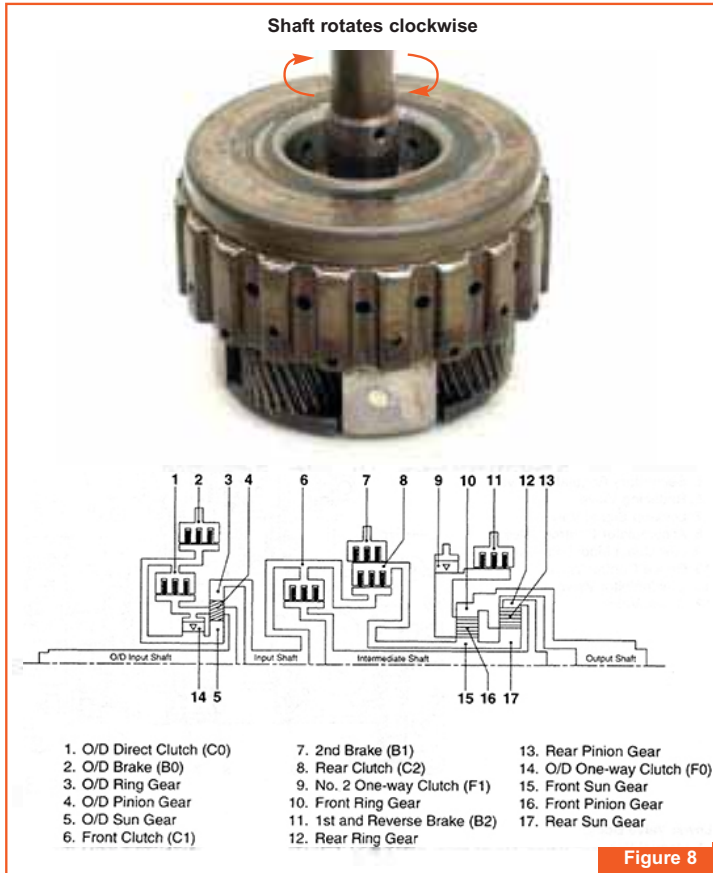
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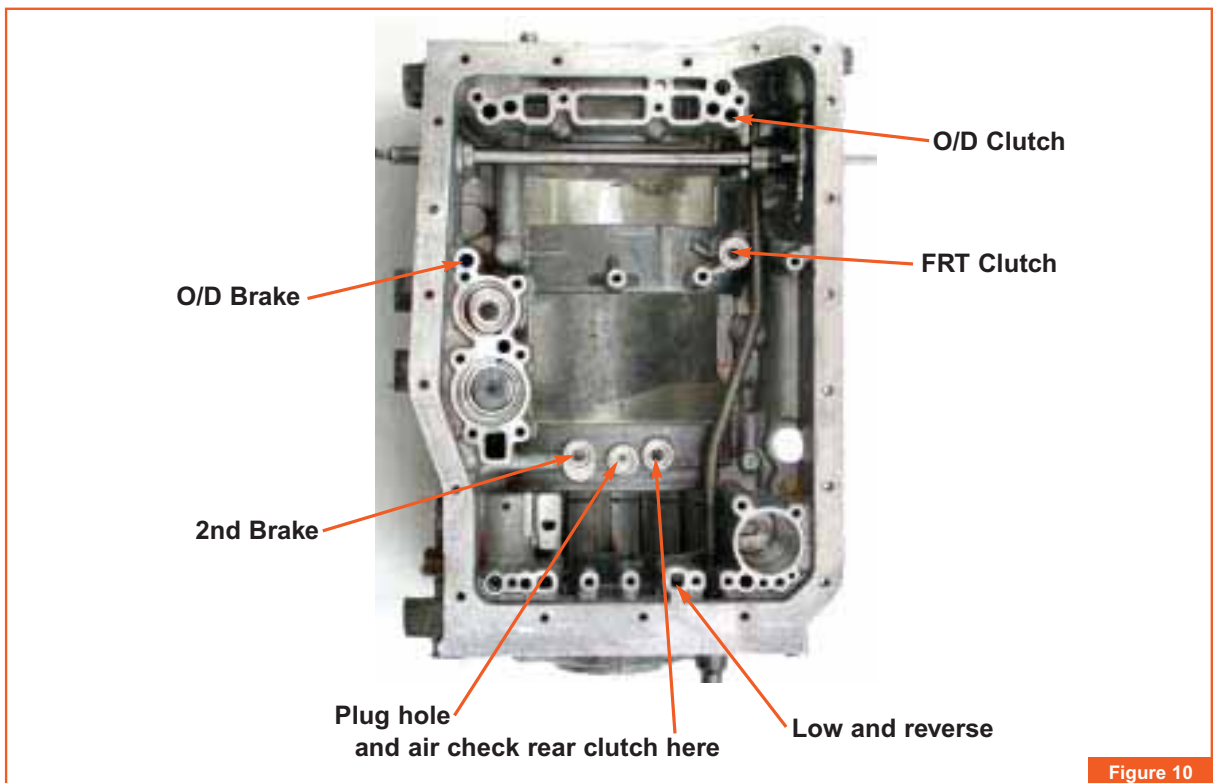


based on the rotation of the engine: The over-drive one-way clutch freewheels clockwise when the input shaft is rotated clockwise (figure 8). The low one-way clutch is connected to the case and the planetary rotates clockwise (figure 9).

To air check the transmission, apply air to the feed holes at the case (figure 10).

### Internal Valve Body

The valve body is the last thing on the agenda... and the item that's overlooked most







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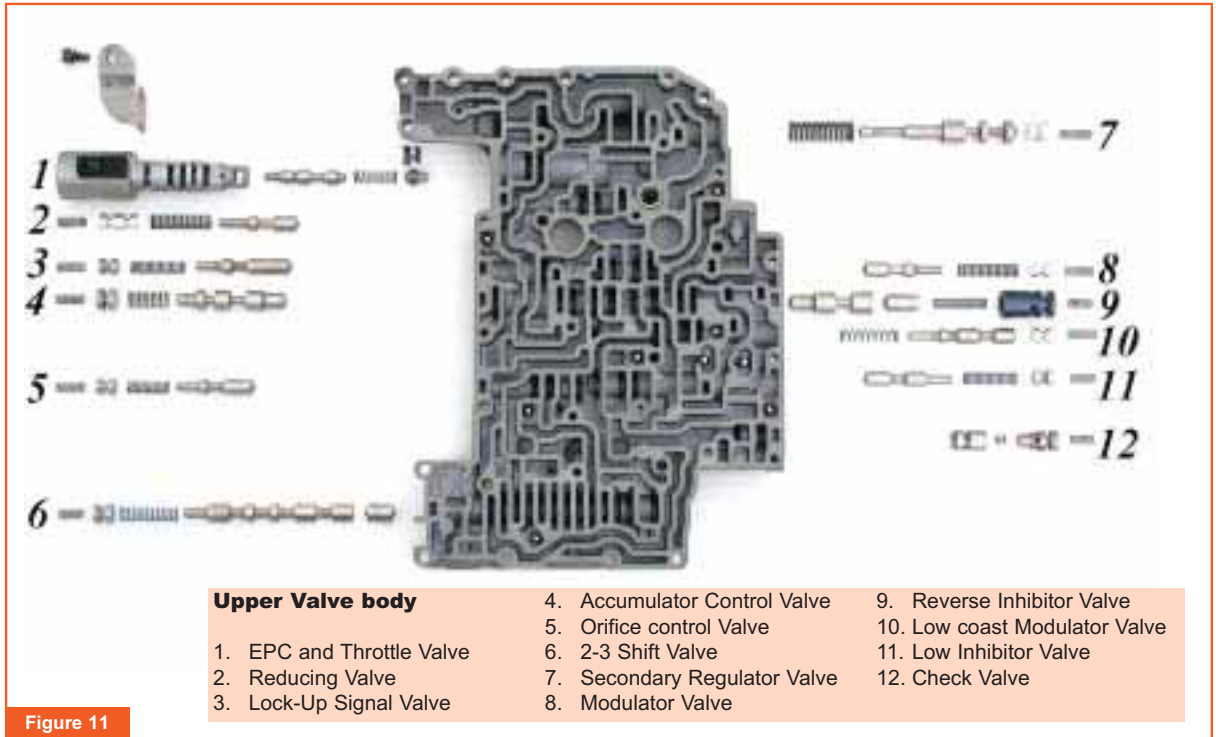


Figure 11

often. When disassembling the valve bodies (figures 11 and 12), there are small pins that *will* fall out without you noticing, so pay close attention to where they belong.

The 450-43LE transmission is big and bulky, but don't let it beat you in to submission. This transmission will be around for a long time and the more you know about it,

the better off you'll be ... and *that's the game!*

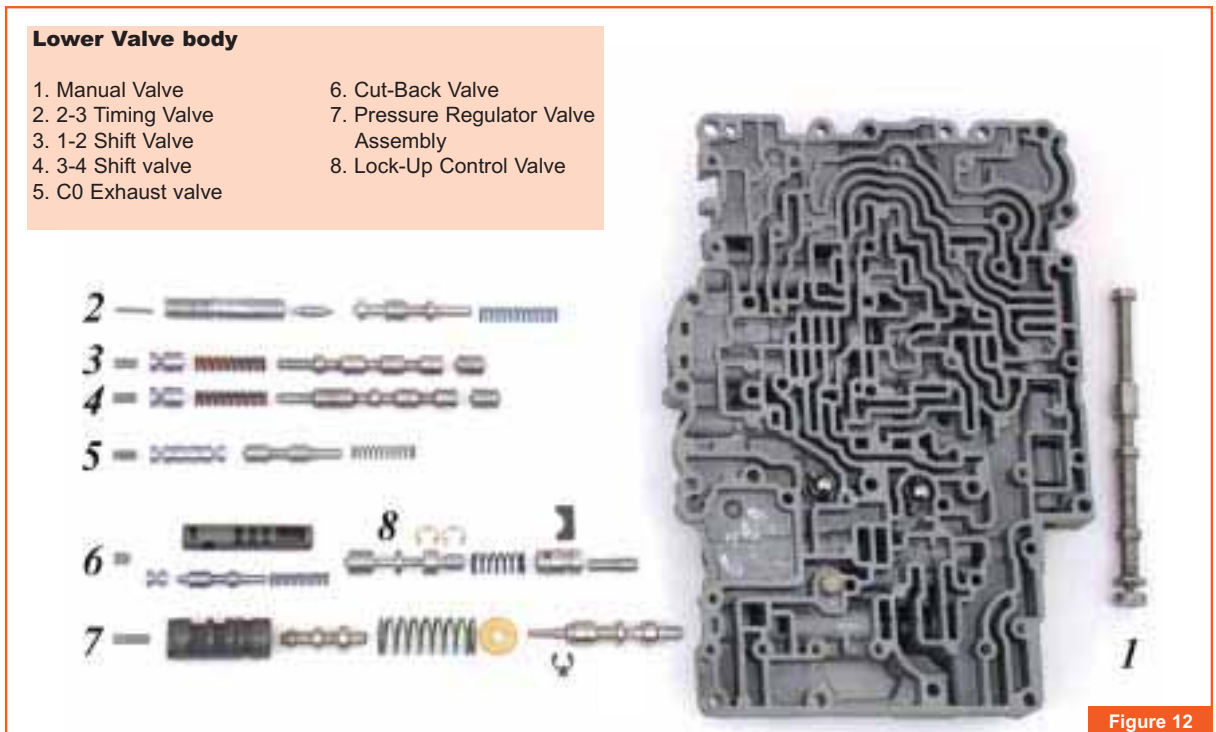


Figure 12