

The Causes for, and Diagnosis of, Code P1811



Complaints of harsh upshifts in the 4T65E transaxle, with DTC P1811 and possibly a shudder on acceleration, are frequently symptoms of an underlying line pressure control problem. In this article, we're going to take a look at the causes for these conditions, focusing on understanding and diagnosing the pressure control system.

While the 4T65E transaxle is very similar to the 4T60E, pressure control is one major system that sets these two units apart. Instead of a vacuum modulator, the 4T65E uses a PCM (Powertrain Control Module) controlled Pressure Control Solenoid Valve, for line pressure control. This system enables the PCM to control shift feel, and adapt to different driving conditions, engine load, and variations in manufacturing tolerances and transaxle wear.

Electronic pressure control also

means the PCM can control the feel of engagements, and adjust line pressure during steady state operation to compensate for engine load changes. The PCM can even raise line pressure if it detects a slip, and store that adjustment in memory. This allows the system to keep line pressure to a minimum, so power isn't wasted by the pump having to maintain unnecessary pressure. This increases the overall powertrain efficiency.

A Pressure Control Solenoid Valve and three other valve lineups work together to control line pressure rise.

The PCM controls the solenoid by sending a variable duty cycle signal to the high (positive) side of the solenoid at a fixed frequency of 292.5 Hz. The PCM also provides the low (negative), or ground path (figure 1). The duty cycle percentage, or signal on-time, is used to control the current through the solenoid. A higher duty cycle percentage

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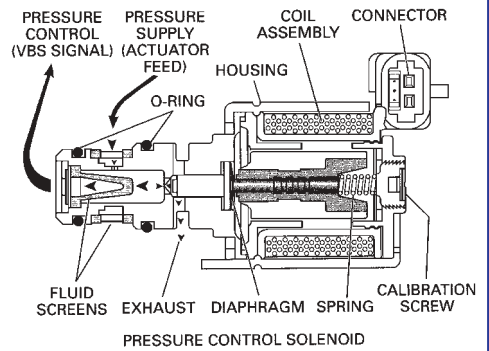


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Actuator Feed oil is fed through a 0.035" orifice, located underneath the screen, in the snout of the Pressure Control Solenoid Valve (figure 3). Magnetic force from the current through the solenoid windings acts on the plunger, which controls how much force is applied to the Pintle Valve. This controls the solenoids rate of exhaust, or bleed, and creates a variable boost signal (VBS), which controls the position of the Torque Signal Regulator Valve, located in the valve body behind the Pressure Control Solenoid Valve

causes increased current through the solenoid, and a lower percentage causes decreased current. The PCM monitors the current and adjusts the duty cycle to maintain the desired average current.

The Pressure Control Solenoid Valve operates on the *feed/bleed* principle. The valve is fed a regulated supply

of actuator feed oil from the Actuator Feed Limit Valve, located in the channel plate (figure 2). The Actuator Feed Limit Valve limits oil pressure feeding the solenoid to a maximum of about 115 PSI to prevent solenoid flooding; that is, to keep it from being fed more oil than it's designed to exhaust.

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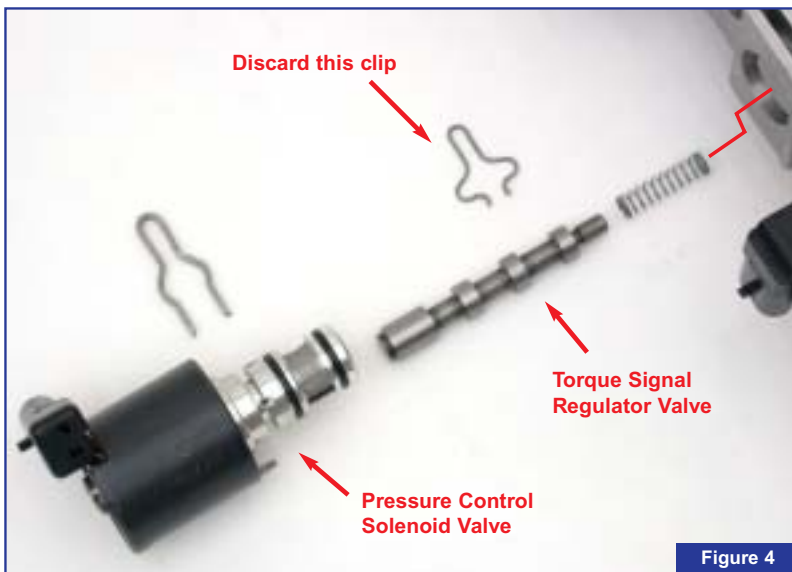
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Any pressure readings that deviate from this chart indicate a line pressure control problem.

(figure 4).

The Torque Signal Regulator Valve takes line pressure and modulates it down to boost pressure, called Torque Signal Pressure (equivalent to EPC pressure in a Ford). Torque Signal Pressure is then fed to the Line Boost Valve, located in the pressure regulator

valve lineup.

The Line Boost Valve acts directly on the Pressure Regulator Valve to boost line pressure. The Pressure Regulator Valve function is the same as that of a 4T60E, or a 700R4, for that matter. It controls the amount of decrease pressure sent to the pump,

depending on the line pressure demand. Decrease pressure reduces pump output by forcing the pump slide back against the pump slide spring, which lowers pump displacement. If the pump slide is already at minimum displacement, then the Pressure Regulator Valve will begin to exhaust line pressure.



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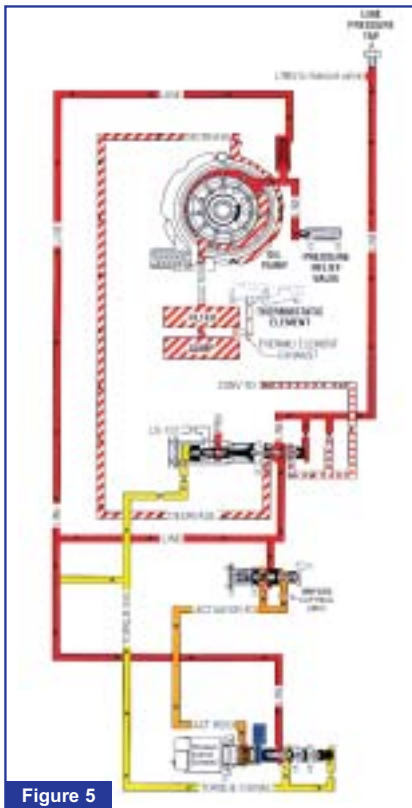


Figure 5

Looking at figure 5:

- The Actuator Feed Limit Valve limits the feed pressure to the Pressure Control Solenoid Valve.
- The Pressure Control Solenoid Valve controls the pressure to the Torque Signal Regulator Valve.
- The Torque Signal Regulator Valve controls the pressure to the Line Boost Valve.
- The Line Boost Valve pushes on the Pressure Regulator Valve to increase line pressure.

Got all that? It's a little more complicated than say, a 4L60E, but there's really only one more valve added to the system: the Torque Signal Regulator Valve.

GM uses an adaptive learn strategy for the 4T65E control system. In this system, the PCM analyzes the time it takes to complete each shift, compares that to a desired time, then stores a value to adjust line pressure for the next time the shift occurs under the same engine load conditions.



Figure 6

These are all calculated pressures; the PCM has no way of monitoring the actual line pressure. The PCM is programmed with a baseline pressure rise curve, and these adjustments represent line pressure that is added to, or subtracted from, the base curve. These line pressure adjustment values are stored in what are called *TAP cells*. TAP stands for Transaxle Adaptive Pressure; a cell is just a fancy name for a memory location.

Transmission operation is broken down into *states*, such as 1st gear steady state, which is cruising or accelerating in 1st gear, or 1-2 shift, which is the state of operation when the 1-2 shift is commanded. For each transmission state, there are TAP cells numbered from 4 to 16, which the PCM can refer to. Each successive TAP cell represents an increase of 12.5 ft-lbs of calculated engine torque output. In other words, when you accelerate hard, the PCM refers to the higher numbered TAP cells (13-16); under moderate acceleration, the PCM refers to the lower numbered TAP cells (4-6). TAP cells can be viewed in scan tool data (figure 6).

DTC P1811 (maximum adapt and long shift) sets when the PCM reaches the maximum adaptive limit of pressure rise that it can command to complete an upshift within a desired time. P1811 is set on the 2nd occurrence of a long shift during one ignition cycle. A *long shift* is defined as an upshift that is 0.65 sec-

onds longer than the *desired* time. When the code sets, the PCM commands maximum line pressure and disables shift adapts. The PCM doesn't light the Malfunction Indicator Lamp when P1811 sets, so the only symptoms you might have are harsh engagements and upshifts.

The most common causes for DTC P1811 are:

- Pressure control solenoid failure
- Sediment, debris, or wear in the valve body, causing the torque signal regulator valve to stick or not function properly
- Sediment debris, or wear in valve body, causing the actuator feed limit valve to stick or not function properly
- Line boost valve and sleeve assembly worn or sticking
- PCM calibration

Use the following steps to aid in your diagnosis:

1. Make sure the vehicle has the latest calibration (software, firmware, etc.) installed. 1998 Buick LeSabre and Park Avenue, Oldsmobile Eighty Eight, and Pontiac Bonneville with 3.8L V6 engines (8th VIN character K) have a PCM calibration update to address an insufficient line rise command, which can cause a shudder or



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1998 Calibration Updates

Original Calibration File Number	New Calibration File Number
09361284	09379774
09361294	09379784
09360304	09379794
09361314	09379804
09361324	09379814
09361334	09379824
09361344	09379834
09361354	09379844
09361364	09379854
09361374	09379864
09361384	09379874

Figure 7

Pressure Control Solenoid Valve Current	Approximate Line Pressure
0 amp	243-310 psi
0.1 amp	241-308 psi
0.2 amp	234-305 psi
0.3 amp	225-300 psi
0.4 amp	210-288 psi
0.5 amp	190-276 psi
0.6 amp	170-254 psi
0.7 amp	145-222 psi
0.8 amp	115-178 psi
0.9 amp	82-130 psi
1.0 amp	68-93 psi
1.1 amp	65-80 psi

Figure 8

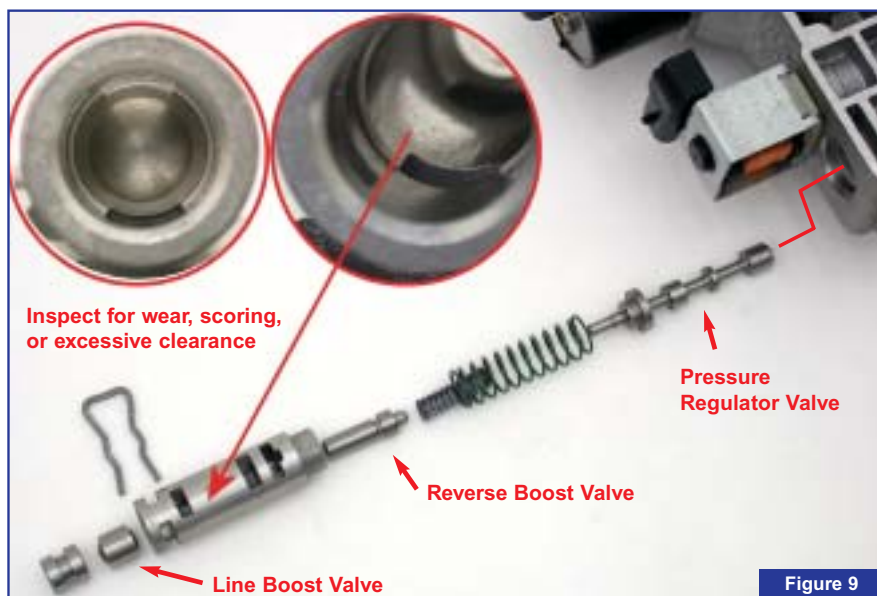


Figure 9

slip during hard throttle acceleration, after slowing down for a stop. The chart in figure 7 lists the original calibration numbers with their respective updates. Check your vehicle's calibration number with a scan tool to verify whether calibration update is needed.

2. Perform a line pressure test: Connecting a 0-300 PSI gauge to the line pressure port, and use a scan tool to control line pressure. Compare the readings to the chart in figure 8.

Keep in mind, the scan tool will only control line pressure in park and neutral.

Any pressure readings that deviate from this chart indicate a line pressure control problem. Without disassembling and inspecting the unit, there's no way to tell for sure what the cause of the failure is. Here's some information to help you decide how to approach the repair:

1. 4T65E pressure control solenoids have a high failure rate, even at relatively low mileage. If the trans is clean and free

from debris, and the vehicle has relatively low mileage (less than 50,000 miles), the pressure control solenoid is very often the cause of the problem. A bad pressure control solenoid can exhibit poor line pressure control in just one area, sometimes in the 80-to-120 PSI range, but work fine in all other areas. Or it can function properly at lower pressure, but not give enough line rise when higher pressures are commanded, causing a slip or shudder under hard acceleration.

2. If the vehicle has considerable mileage (more than 50,000 miles) or there's debris in the pan or filter, look for worn or sticking valves. Pay particular attention to the Torque Signal Regulator Valve and bore (figure 4), the Actuator Feed Limit Valve and bore (figure 2), and the Line Boost Valve and sleeve assembly (figure 9).

Until next time, remember: While transmissions and control systems have become more complicated, the simplest and most often overlooked tests can often save you valuable diagnostic time. Even in this high-tech world of electronics and computers, sometimes you just have to put a gauge on it!



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