Failsafes to Neutral?

What’s Up with My Allison?

Today’s Allison protection schemes can leave you stranded, but they will protect the transmission from further damage.

The LCT 1000 has, without a doubt, become one of the premier transmissions on the planet. With that said, it can also be quite a challenge to diagnose when it isn’t working right. Through the years I’ve answered countless questions regarding the default actions the LCT 1000 TCM takes when something goes wrong.
Allison engineering has always been on the leading edge when it comes to technology, durability, and giving the customer what they want. The LCT 1000 has undergone several major updates through the years, on both the hardware and software sides of the unit.

The LCT 1000 software was designed to save the transmission if at all possible when a major problem arises. This has led to some unhappy customers when the TCM commands the transmission into neutral because of a failure. Now we can all understand why the customer is upset, since the vehicle may need to be towed to the shop, but most customers aren’t attuned to why they were left stranded.

The software for the LCT 1000 was designed to prevent the customer from damaging the transmission when many of the DTCs set. Operating the unit with certain mechanical and electrical failures can lead to extensive damage to the transmission.

One of the failures we’ve come across the last couple of years relates to problems with the high-side driver circuit. The LCT 1000 TCM uses two high-side drivers to control most of the electrical components within the transmission. The high-side drivers are referred to as high-side driver 1 (HSD1) and high-side driver 2 (HSD2).

High-side driver 1 controls the operation of the torque converter clutch solenoid (TCC) and the line pressure solenoid (G). High-side driver 2 is in charge of shift solenoid 1 (SS1), shift solenoid 2 (SS2), and shift solenoid 3 (SS3).

The high-side drivers control electrical operation by controlling the power side of the circuit for their respective solenoids. The TCM uses an internal monitor circuit, known as a feedback circuit, to determine if an electrical failure is present in the solenoid or its

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circuit. The feedback circuit operates like a built-in voltmeter to allow the TCM to determine if a problem exists.

The TCM monitors the solenoid and circuit when it’s commanded on or off. If the feedback circuit voltages don’t match what’s expected, based on the solenoid commanded position, a DTC will set and the TCM will select the appropriate action.

The high-side drivers use a couple DTCs that can put the transmission in neutral: P0658 and P2670.

**P0658 will set if:**

- High side driver 1 (HSD1) is commanded on.
- Battery voltage is between 9-18 volts.
- Engine is running.
- The TCM detects that HSD1 drops below 6 volts for more than 75ms (indicates a short to ground).
If P0658 sets, the TCM will:

- Command the transmission to neutral or 3rd gear after the shift selector is moved and other conditions are present.
- Inhibit TCC
- Light the MIL

P2670 will set if:

- High-side driver 2 (HSD2) is commanded on.
- Battery voltage is between 9-18 volts.
- Engine is running.
- The TCM detects that HSD2 drops below 6 volts for more than 75ms (indicates a short to ground).

If P2670 sets, the TCM will:

- Command the transmission to neutral after the shift selector is moved and other conditions are present.
- Inhibit modulated main operation
- Freeze adapts
- Inhibit TCC
- Light the MIL

The TCM is over-current protected, so it won’t be damaged when a failure occurs, but the root cause of the failure must be corrected or the TCM will simply reset the DTC and the default actions will recur.

So what causes the DTCs to set? Well, there’s the normal stuff, such as damaged wiring, solenoid electrical issues, or a bad TCM. Another situation is when you have P0658 (actuator supply voltage low) or P2670 (actuator supply voltage B low) set.

Take a look at the solenoid harness and pins. You may find metal particles or contamination bridging the solenoid terminals or between the solenoid terminal and the solenoid housing. Now common sense would dictate that the solenoid, being an electromagnet, would attract metal, but the metal had to come from somewhere.

The source of the metal contamination is generally the bearing located on the end of the P1 sun gear (figure 1). The T3 Torrington bearing may fail due to machining issues with the sun gear. This leads to metal particles in the oil, which can short across solenoid terminals and set the DTC.

To address this issue, Allison released an updated harness that’s designed to bridge the gap between the solenoid pins with plastic, to prevent DTCs from setting due to metal particles in the fluid. The updated harness part number is the same as the previous harness, but the new harness solenoid connectors have plastic dams to prevent this situation (figure 2).

In addition, Allison released updated bearings for the 2008-and-earlier applications. The updated bearings are equipped with hardened races; you can identify them by the blue striping on the bearing race. The bearings were released under the following part numbers:

- 29539501 — T1 and T6
- 29531090 — T2
- 29531095 — T3

Well, that’s about all the time we have for now. So until next time, remember: We were made with two ends: one to sit on and one to think with. The end we use the most will likely determine our success.