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SIL 26-WT-23, Rev. A
January 31, 2024
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SUBJECT: P2789 Transmission Clutch Life Expired for C3 and/or C5 Clutch — Troubleshooting and Repair Procedure

MODELS AFFECTED: 3000 Series™ and 4000 Series™ TIDA and TIDB Transmissions with 4th, 5th and 6th Generation Controls

Description of Complaint:

The **Check Transmission** lamp may illuminate along with setting **DTC P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit)** for **C3 and/or C5 only**. The **Wrench Icon** may show on the shift pad. The C3 and C5 clutches may have disproportionately low clutch life when compared to all other clutches in the prognostic tab in Allison DOC®. Refer to [Figure 1](#). Customers may experience shift complaints with delayed and/or harsh downshift related to PCS3 on-coming and off-going clutches. Shift complaints may include downshifts from 2-1 and upshifts from 2-3 and 4-5 on 6-speed models. If you believe the customer complaint exhibits one or more of the symptoms, follow the troubleshooting steps to identify if the solenoid valve body is the cause.



NOTE: If prognostics is not enabled, DTC P2789 will not set. The concern may only present itself with the shift complaints listed above.

Cause:

In high shift density applications, the transmission solenoid valve body can produce a pressure leak through the PCS3 bore caused by wear to the PCS3 valve bore.

Service Channel Procedure:



CAUTION: TCM replacement, Recalibration or Clearing adaptive shifts will erase current Clutch life data. If this has been done, reference the expired Clutch history section below the Transmission Health Monitor for expired clutches for C3 or C5.

The following procedure outlines how to troubleshoot and repair if the issue is related to the solenoid valve body.

1. Review Allison DOC Prognostics Details
 - a. Connect to Allison DOC and confirm that DTC P2789 is active in the failure records and/or that C3 and C5 clutches have disproportionately low clutch lives compared to the other clutches. Refer to [Figure 1](#).

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Please Note: Allison Transmission Service Information Letters are intended for use by professional, trained technicians, not for the “do-it-yourselfer.” They are written to inform those technicians of conditions that may occur on some transmission models (or serial numbers ranges) or to provide information that could assist in the proper servicing of a specific Allison transmission. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, do not assume that the Service Information Letter applies to your transmission, or that your transmission has the condition described. Product evolution and information updates are inevitable. Please see your authorized Allison Transmission service dealer or distributor to understand if your particular transmission may benefit from the information contained within the Service Information Letter.

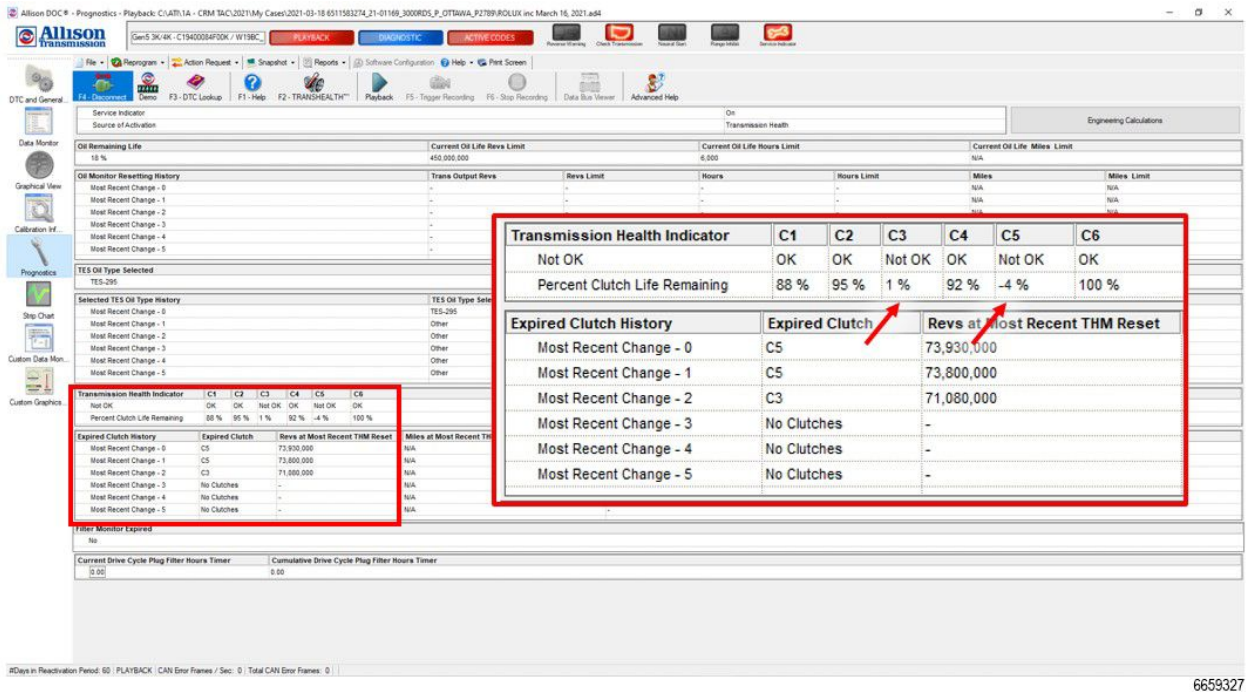


Figure 1. Prognostics Section

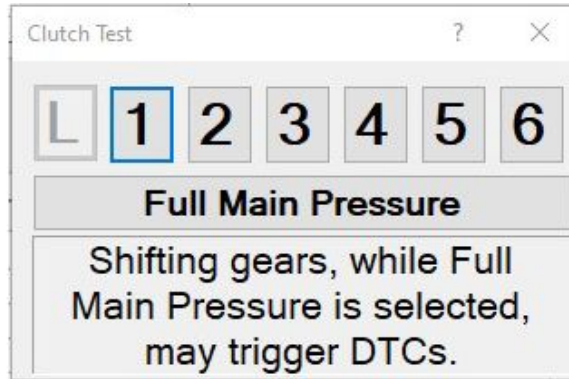
2. Measure Clutch Pressures

- Set parking brake and chock the wheels.
- Install clutch pressure gauges on Main, C3 and C5 diagnostic pressure ports.
- Operate transmission to attain a transmission fluid temperature of 200°F (93°C).



NOTE: It is OK to stall test the unit briefly to attain fluid temperature of 200°F (93°C).

- Connect with Allison DOC.
- Using the Allison shift selector, shift the transmission into **R** (Reverse) range and measure actual main pressure, C3 pressure and C5 pressure with the installed clutch pressure gauges. Record the pressures in the Clutch Pressure Worksheet shown in [Table 1](#).
- Using Allison DOC, select the "Action request" drop down menu then select "Clutch Test Enabled" via Allison DOC, refer to [Figure 2](#). Once in Clutch Test, select 3rd Range and enable "Full Main Pressure". Measure actual main pressure and C3 clutch pressure with the installed gauges. Record the pressures in the Clutch Pressure Worksheet shown in [Table 1](#).



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Figure 2. Clutch Test



NOTE: C5 clutch logic will limit clutch pressure to C5 in neutral and first range. Pressure differential between C5 clutch and main pressure greater than 15 psi in these ranges is acceptable and does not indicate a C5 clutch pressure loss concern. Reference [SIL 06-WT-18](#).

Table 1.

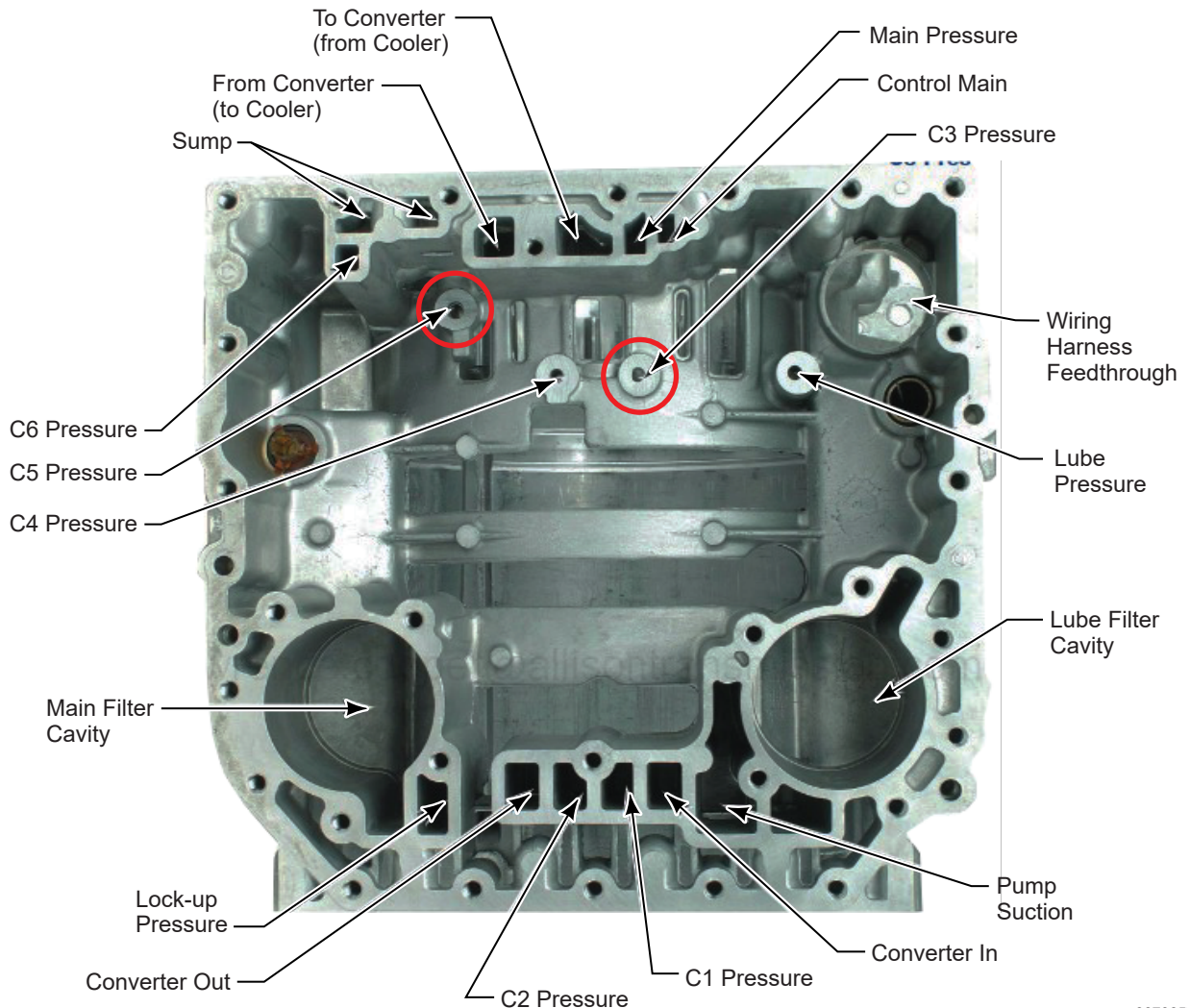
Transmission fluid temperature at or above 93C/200F @ idle and "Full main pressure" in 3rd range		
Prior to Solenoid Valve Body Replacement		
	Reverse (Shift Selector) PCS2 controls C3 clutch	3rd range (Clutch Test Mode "Full main pressure") PCS3 controls C3 clutch
Main Pressure (kPa/psi)	260 PSI	260 PSI
C3 Clutch Pressure (kPa/psi)	240 PSI	240 PSI
C5 Clutch Pressure (kPa/psi)	240 PSI	N/A
Pressure Differential = Main Pressure minus C3 Clutch Pressure	20 PSI	20 PSI

g. Analyze results of clutch pressure test.

- Compare the pressure differences from actual Main pressure and C3 pressure in reverse and third range.
- If pressure loss between Main and C3 is less than 15 psi in Reverse range and less than 15 psi in third range, follow the troubleshooting steps in TS8794 for DTC P2789.
- If pressure loss between Main and C3 is less than 15 psi in Reverse range and greater than 15 psi in third range, complete the following procedures to check piston seal integrity.

3. Piston Seal Integrity Test

Piston seal integrity test can be performed on stationary clutches (C3/C4/C5) via the clutch port on the main case. Refer to [Figure 3](#). The purpose of this test is to check for piston seal leakage, which could also be the cause of low clutch pressure in C3 or C5 clutches.



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Figure 3. Main Housing Clutch Pressure Ports

- Drain transmission fluid and save in a clean container for reuse.
- Remove the control valve module and perform a piston seal integrity test.
- Check C3 and C5 piston seals by fully applying air pressure with a rubber tipped blow gun with shop air pressure at 120 psi or higher to the corresponding pressure port on the main case.



NOTE: A shop rag should be used to protect against oil blowback while applying and releasing air pressure.

- d. Listen for a solid clunk and minimal air leakage. Some air leakage may occur. If the piston seal is leaking, you will hear an air rushing noise and no movement of the clutch plates, indicating that the piston seal has failed.



NOTE: C3, C4 and C5 piston should have a similar sound. If one piston sounds different than the other pistons, it may indicate that there is a leak.

- e. If a piston seal leak is determined, repair the piston seal. This will require transmission removal for repair.
- f. If no piston seal leak is present, continue with the repair procedures to install a new solenoid valve body and grooved trim valves.

4. Repair Procedure

Suggested Parts List:

- Body Assembly, Solenoid Valve And Pin (Qty 1)
- Valve, Lockup Trim. Refer to [SIL 06-WT-22](#). (Qty 1)
- Valve, Clutch Trim. Refer to [SIL 06-WT-22](#). (Qty 4)
- Control Module Seal and Gasket Kit (Qty 1)

Refer to 3000 Series Service Manual (SM4013) and/or 4000 Series manual (SM4014) for complete Control Valve Module rebuild instructions.

- Place Control Module on workbench.
- Remove Solenoid Valve Body.
- Remove solenoids and discard PCS1, PCS2, PCS3, PCS4 and TCC trim valves and springs.
- Install new grooved trim valves per [SIL 06-WT-22](#) and new trim springs into a new Solenoid Valve Body.
- Remove and inspect the diagnostic valve from the original Solenoid Valve Body. If there are no visible signs of damage, transfer the diagnostic valve to the new Solenoid Valve Body. (If there are visible signs of issue, or the valve does not freely float into the new Solenoid Valve Body, replace the diagnostic valve.)
- Install the Solenoids, Solenoid retainers, PS1 switch assembly and new Chimney seals onto the new Solenoid Valve Body.
- Install the Solenoid Valve Body to the Main Valve Body. Torque to the pattern shown in [Figure 4](#). Follow the 3-step torque sequence listed below.

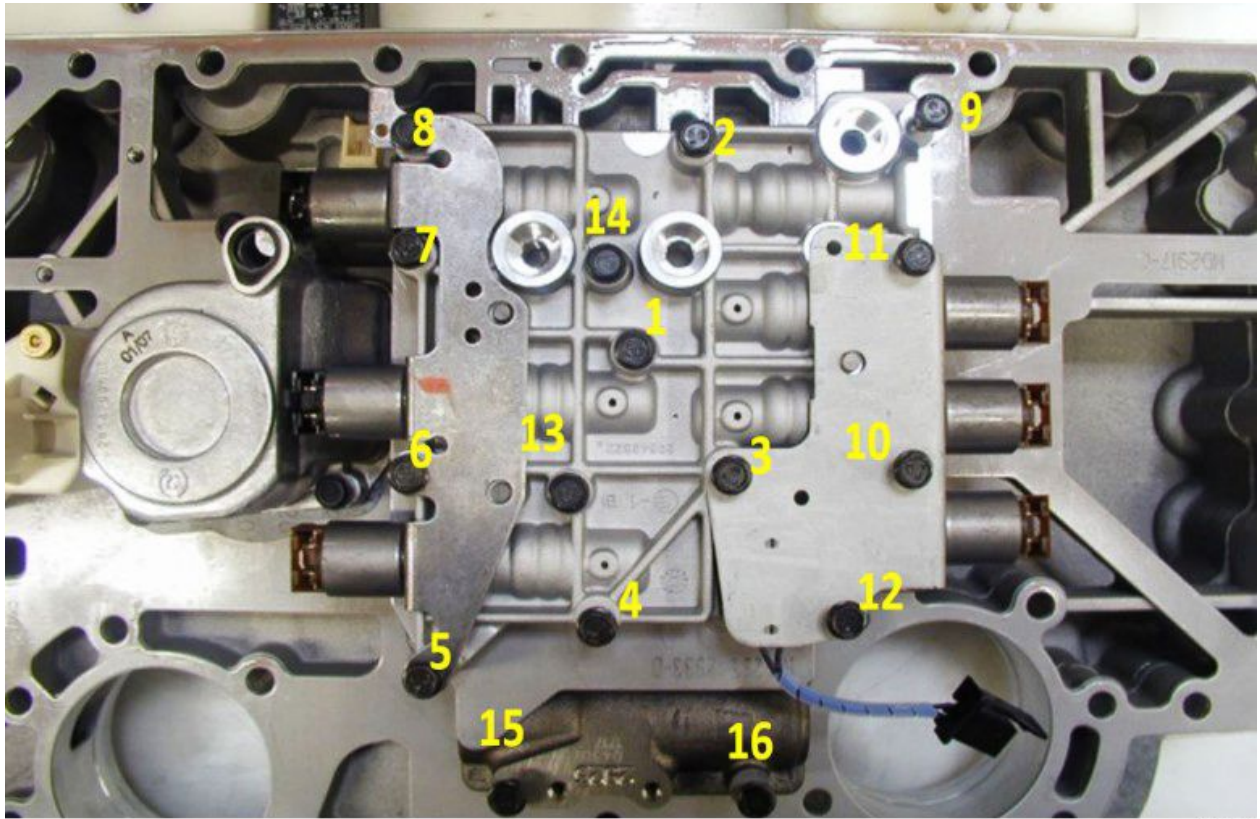


Figure 4. Main Valve Body Torque Sequence

Position	Part Number	Specification
1-12	11515310	M6 x 1.0 x 95
13, 14	11516059	M6 x 1.0 x 45
15, 16	11515309	M6 x 1.0 x 60

Solenoid Valve Body – Torque Sequence

1. Start with the center of the bolt pattern (1) and work outward in a circular sequence. Get all bolts started, finger tight.
2. Continuing to work from center outward, tighten bolts to 50 percent of nominal torque, 5-6 N·m (3-5 lb ft).
3. Continuing to work from center outward, to a final torque of 10-13 N·m (7-10 lb ft).
- h. Reinstall Control Valve Module with new case to control valve module gasket.
- i. Torque Control Valve Module to 51-61 N·m (38-45 lb ft).
- j. Refill transmission with fluid.
- k. Install clutch pressure gauges on Main, C3 and C5 diagnostic pressure ports.
- l. Start engine, check for leaks and adjust fluid level as needed.

- m. Operate transmission to attain a transmission fluid temperature of 200°F (93°C).
- n. Follow pressure check procedures from Step 2 to confirm that the pressure differential has been resolved. Once repairs are complete, clutch pressure differences should not exceed 15 psi versus main pressure.

Transmission fluid temperature at or above 93C/200F @ idle and "Full main pressure" in 3rd range		
After Solenoid Valve Body Replacement		
	Reverse (Shift Selector) PCS2 controls C3 clutch	3rd range (Clutch Test Mode "Full main pressure") PCS3 controls C3 clutch
Main Pressure (kPa/psi)	260 PSI	260 PSI
C3 Clutch Pressure (kPa/psi)	255 PSI	255 PSI
C5 Clutch Pressure (kPa/psi)	255 PSI	N/A
Pressure Differential = Main Pressure minus C3 Clutch Pressure	5 PSI	5 PSI

5. Complete Repair

- a. Once repair is complete, use Allison DOC to select the "Action request" drop down menu then select "Reset Adaptive Shift Parameters".
- b. Select the "Prognostics" tab and verify Transmission Health Indicator – Percent Clutch life remaining is 100% for all clutches. Refer to [Figure 5](#).

Transmission Health Indicator	C1	C2	C3	C4	C5	C6
OK	OK	OK	OK	OK	OK	OK
Percent Clutch Life Remaining	100 %	100 %	100 %	100 %	100 %	100 %

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Figure 5. Prognostics Information

- c. Test drive to adapt shifts and confirm DTCs and shift complaints, if any, have been resolved.