

3000 Series Update

3000/4000 Series **P2789** Diagnostics and Solenoid Valve Body Improvements



Prognostics Transheath Monitor. Description

- How can the TCM (Transmission Control Module) calculate “percent clutch life remaining” ?

The transmission controller (TCM) does calculate the “percent clutch life remaining” by observing the duration of time how long it must activate a solenoid for “clutch fill”, until “synchronous speed” is detected during a shift.

The TCM observes the time (milli-seconds) and the current (milli-ampere) of a solenoid activation.

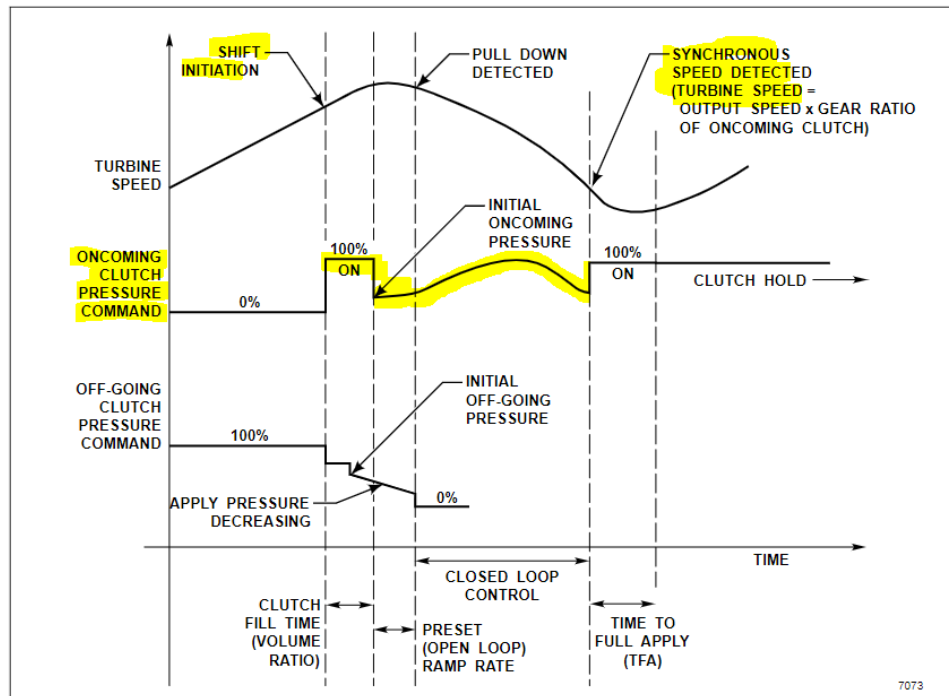


Figure 3-6. Automatic Clutch Application Control

Prognostics Transhealth Monitor. Description (Cont.)

- **When will the Transmission Health Monitor (TM) wrench icon illuminate?**

The Transmission Health Monitor (TM) is part of the Allison Control System Prognostics package. If the free-running-clearance of any clutch exceeds its maximum value, then the TRANS SERVICE indicator (= wrench icon on Allison shift selector) illuminates, informing the operator that there is a need for service.

- The wrench icon stays illuminated during vehicle operation until clutch system service is performed and the TM function can reset itself with the new predicted values. Allison DOC may also be used to reset the TM function in the Action Request screen.

- **When will DTC P2789 come active?**

If the TM function is not reset within several ignition cycles of illuminating the TRANS SERVICE indicator, then the CHECK TRANS – light illuminates, and DTC P2789 comes active.

The TM automatically will reset itself if the function detects that the values for remaining clutch life or predicted free running clearance are back within specification.

DTC P2789 goes inactive when “percent clutch life remaining” is predicted to be more than 16%.



P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit)

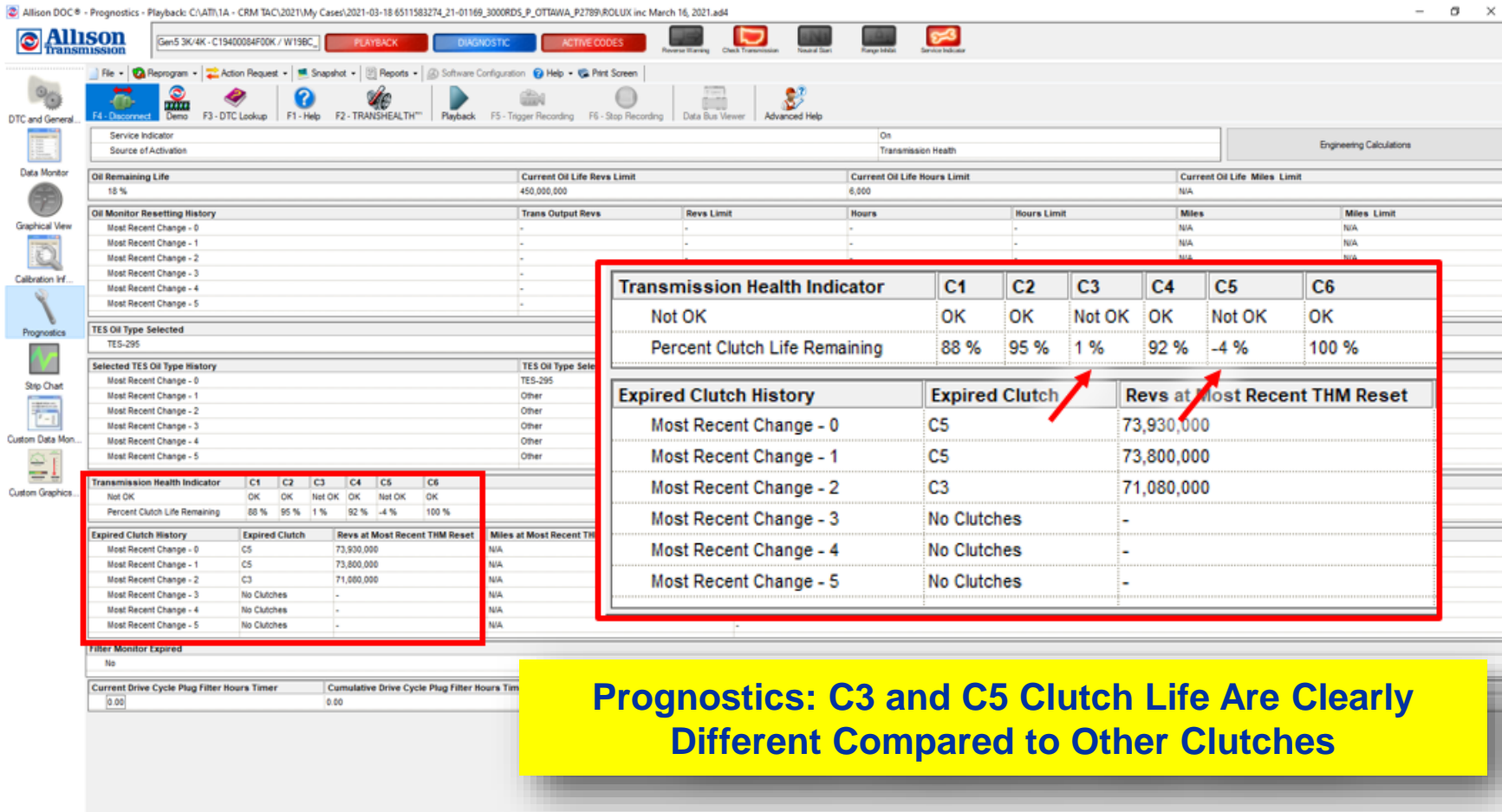
- In high shift density applications, the transmission solenoid valve body can produce a pressure leak through the PCS3 bore, caused by wear to the PCS3 valve bore.
- The very first step for troubleshooting is to check the “remaining clutch life information” in the “Prognostics Information” in Allison DOC.

The screenshot displays the Allison DOC software interface. The top window shows the DTC-Symptom table with P2789-00 highlighted. The bottom window shows the Prognostics Information section, which includes a table for Transmission Health Indicator and a table for Expired Clutch History.

DTC-Symptom	Active	Historic	Check Trans	Failure Record	Description
P2789-00	Y	Y	Y	Y	Transmission Clutch Life Expired (Clutch Adaptive Learning At Limit)

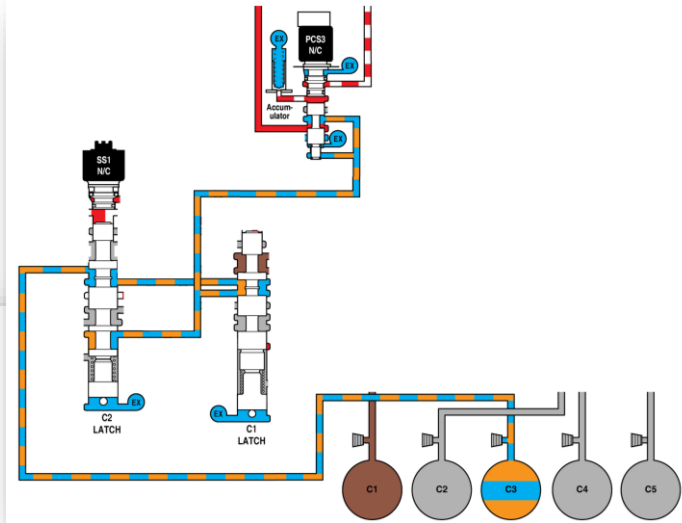
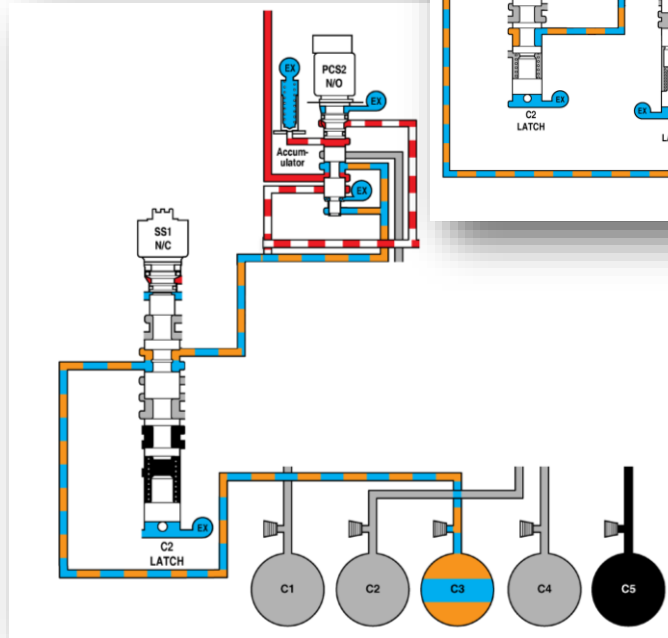
Transmission Health Indicator	C1	C2	C3	C4	C5	C6
Not OK	OK	OK	Not OK	OK	Not OK	OK
Percent Clutch Life Remaining	88 %	95 %	1 %	92 %	-4 %	100 %

Expired Clutch History	Expired Clutch	Revs at Most Recent THM Reset
Most Recent Change - 0	C5	73,930,000
Most Recent Change - 1	C3	73,800,000
Most Recent Change - 2	C5	71,080,000
Most Recent Change - 3	No Clutches	-
Most Recent Change - 4	No Clutches	-
Most Recent Change - 5	No Clutches	-



C3 Clutch Control

- C3 clutch is controlled by PCS3 in the forward ranges.
- C3 clutch is controlled by PCS2 in Reverse.
 - *This enables monitoring C3 clutch circuit pressure loss when being commanded by two separate PCS trim valves.*



Main Pressure & Clutch Pressure Test – C3 Clutch Circuit

Test	Input Speed	SET			CHECK						
		Trans Fluid Temperature	Range	Main Pressure kPa/(psi)		Clutches Applied	Controlling Solenoid Valve	PCS Solenoid Valve Commanded Pressure From DOC	Applied Clutch Pressure Record Pressure Observed	Subtract Clutch Pressure from Main Pressure	Allowable Clutch Pressure Loss (Main minus Clutch Pressure)
				Spec	Actual				Actual		Spec
Prior to Solenoid Valve Body Replacement	580-620	At or above 93C/200F	Reverse (a)	Variable Main Pressure - Record Observed Pressure (b)		C3	PCS2				100 (15)
						C5 (c)	PCS3				
Prior to Solenoid Valve Body Replacement	580-620	At or above 93C/200F	3C Full Main Pressure (d)	1700-2000 (245-290) (d)		C1	PCS1				100 (15)
						C3	PCS3				
After Solenoid Valve Body Replacement	580-620	At or above 93C/200F	Reverse (a)	Variable Main Pressure - Record Observed Pressure (b)		C3	PCS2				100 (15)
						C5 (c)	PCS3				
After Solenoid Valve Body Replacement	580-620	At or above 93C/200F	3C Full Main Pressure (d)	1700-2000 (245-290) (d)		C1	PCS1				100 (15)
						C3	PCS3				

See next page

It is very important to perform the test only after attaining 93C/200F Trans Fluid Temp

Notice 06-WT-18 !! too

See next page

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Notice 06-WT-18 !! too

a Test without using Allison DOC clutch test - select range using shift selector. To test applied clutch circuit pressure loss, subtract clutch pressure from observed variable main pressure

b Main pressure reduction controlled by Main Mod solenoid valve

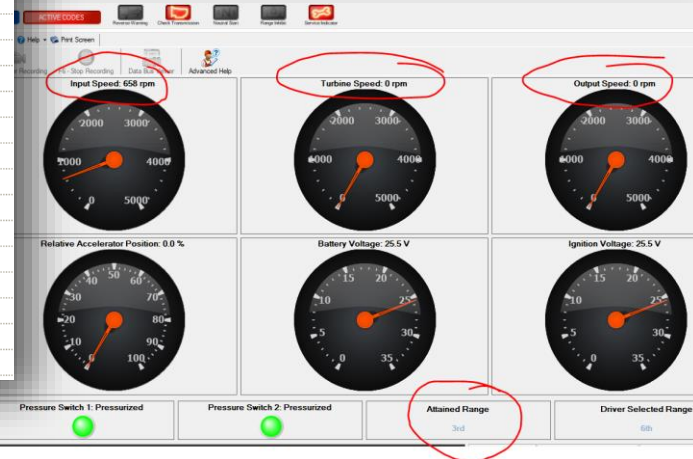
c For software levels C171 and later, C5 Clutch Pressure Limiting Logic is in effect for Neutral and 1st ranges. C5 pressure is commanded lower than main pressure by the PCS3 solenoid valve. Test C5 clutch circuit pressure loss in Reverse range using the shift selector. Subtract C5 pressure from observed main pressure.

d Test Full Main Pressure and individual applied clutch pressure losses using Allison DOC Clutch Test with Full Main Pressure enabled.

If C3 Clutch Circuit pressure loss is acceptable in Reverse, but is excessive in Forward Ranges, the Solenoid Valve Body is likely the cause. If the Solenoid Valve Body is replaced, it is important to perform the same test after replacement to verify the pressure loss issue is resolved.

PCS Solenoid Valve Commanded Pressure From DOC

File	Reprogram	Action Request	Snapshot	Reports	Software Configuration	Help	Print Screen
F4 - Disconnect	Demo	F3 - DTC Lookup	F1 - Help	F2 - TRANSHEALTH™	Playback	F5 - Trigger Recording	F6 - Stop Recording
Diagnostic Data			Value	Units			
Turbine Speed			0	rpm			
Output Speed			0	rpm			
Attained Range			3rd				
Commanded Range			3rd				
Driver Selected Range			6th				
Shift Selector Range Selected			Position A				
Shift Selector Range Attained			3rd				
On-Coming Clutch Pressure			1600.0	kPa			
Off-Going Clutch Pressure			0.0	kPa			
Pressure Switch 1			Pressurized				
Pressure Switch 2			Pressurized				
TCC PCS Commanded Pressure			0.0	kPa			
Main Mod Solenoid Commanded Pressure			1100.0	kPa			
PCS 1 Commanded Pressure			1600.0	kPa			
PCS 2 Commanded Pressure			0.0	kPa			
PCS 3 Commanded Pressure			1600.0	kPa			
PCS 4 Commanded Pressure			0.0	kPa			
PCS 5 Commanded Pressure			0.0	kPa			
PCS 6 Commanded Pressure			0.0	kPa			
Shift Solenoid 1 Status			On				



Example for a PCS3 problem

Main Pressure & Clutch Pressure Test - C3 Clutch Circuit

Test	SET			CHECK							
	Input Speed	Trans Fluid Temperature	Range	Main Pressure kPa/(psi)		Clutches Applied	Controlling Solenoid Valve	PCS Solenoid Valve Commanded Pressure From DOC	Applied Clutch Pressure Record Pressure Observed	Subtract Clutch Pressure from Main Pressure	Allowable Clutch Pressure Loss (Main minus Clutch Pressure)
				Spec	Actual				Actual		Spec
Prior to Solenoid Valve Body Replacement	580-620	At or above 93C/200F	Reverse (a)	Variable Main Pressure - Record Observed Pressure (b)	1800kPa	C3	PCS2	1600 kPa	1800 kPa	1800 -1800 = 0 kPa	100 (15)
					1800kPa	C5 (c)	PCS3	1600 kPa	1800 kPa	1800 -1800 = 0 kPa	
Prior to Solenoid Valve Body Replacement	580-620	At or above 93C/200F	3C Full Main Pressure (d)	1700-2000 (245-290) (d)	1800kPa	C1	PCS1	1600 kPa	1800 kPa	1800 -1800 = 0 kPa	100 (15)
						C3	PCS3	1600 kPa	1550 kPa	1800 -1500 = 300 kPa	
After Solenoid Valve Body Replacement	580-620	At or above 93C/200F	Reverse (a)	Variable Main Pressure - Record Observed Pressure (b)		C3	PCS2				100 (15)
						C5 (c)	PCS3				
After Solenoid Valve Body Replacement	580-620	At or above 93C/200F	3C Full Main Pressure (d)	1700-2000 (245-290) (d)		C1	PCS1				100 (15)
						C3	PCS3				

a Test without using Allison DOC clutch test - select range using shift selector. To test applied clutch circuit pressure loss, subtract clutch pressure from observed variable main pressure

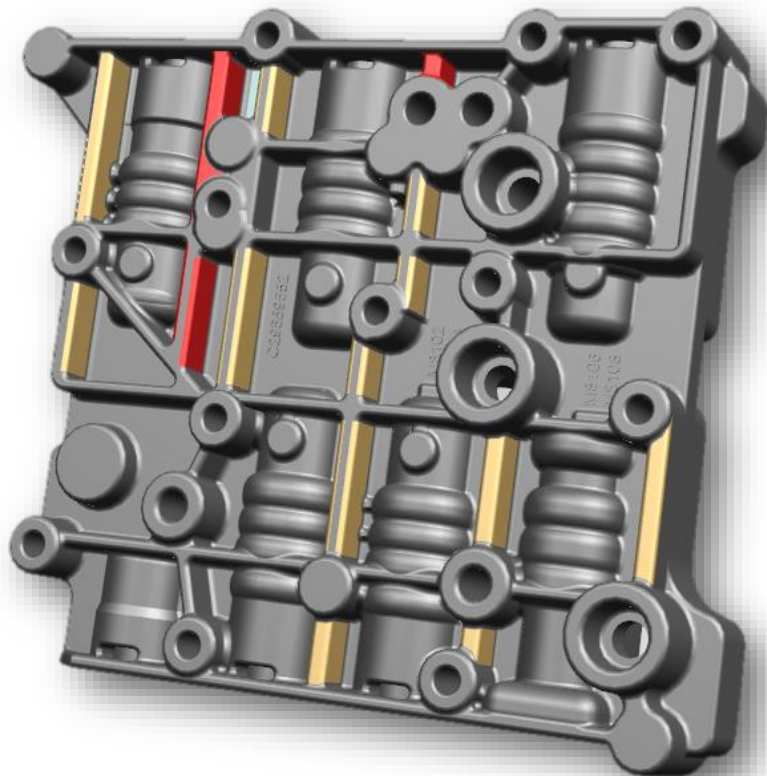
b Main pressure reduction controlled by Main Mod solenoid valve

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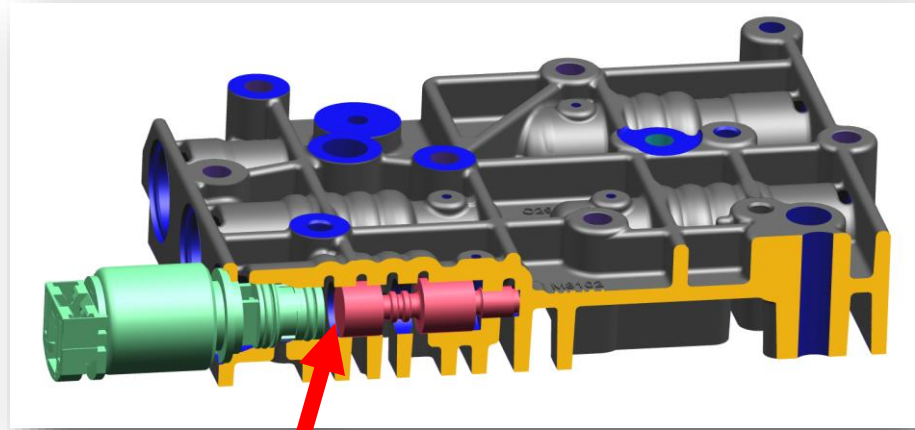
Casting Changes on **new valve body** – External Ribs

- Improved casting
 - *Increased ribbing from 3,5mm to 5,0mm in areas shown*
 - *Improved casting introduced January 2021*
 - *No SIL was published for this!!*



Supplier Process Control

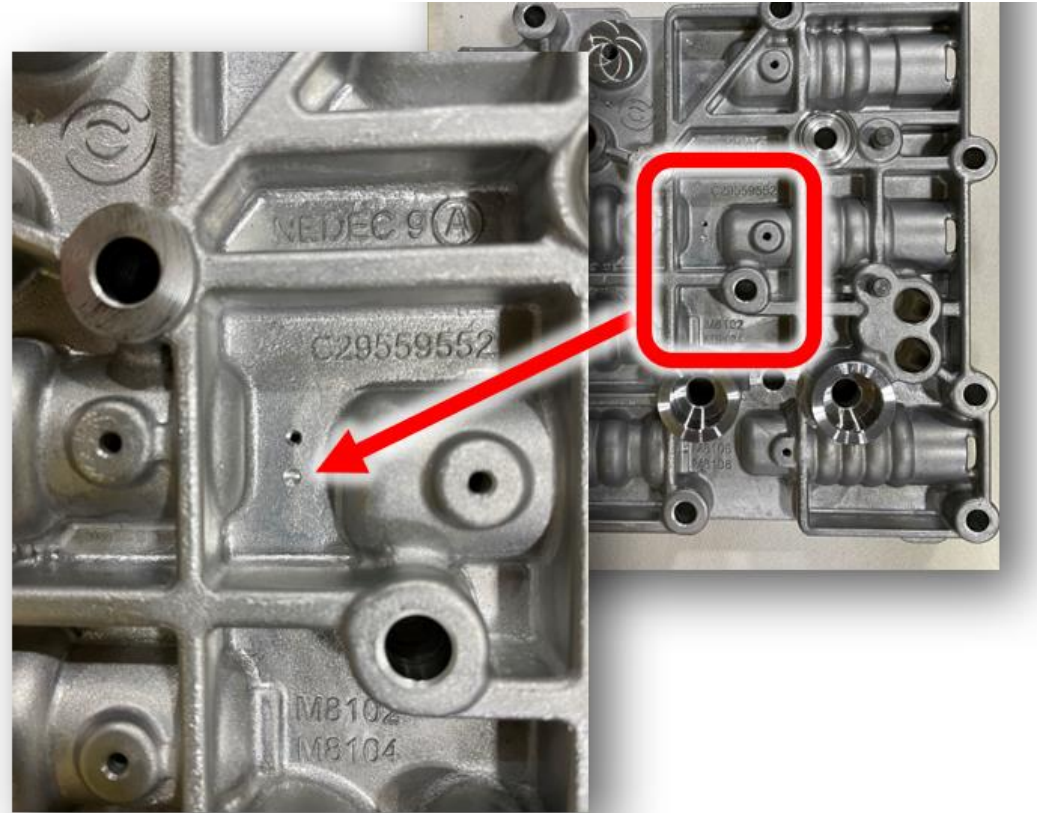
- Improved inspection method at manufacturer plant implemented in October 2020.
- “100% air gauge inspection” of critical diameter in PCS trim valve bores.
 - *Bore adjacent to solenoid valve.*



**Critical Bore
PCS3 (Typical)**

Supplier Process Control

- “100% air gauge inspection” of critical diameter in PCS trim bores.
 - **Identification mark (Drill Point)** on all “100% air gauge inspected valve bodies”.



TID-B Aluminum Hauptventilblock

(Engl.: Main Valve Body)

Geänderter Schraubenanzug:

M6: 10 – 13 Nm (wie bisher)

jedoch Anzug in 3 Stufen und Anzugsreihenfolge (Bild):

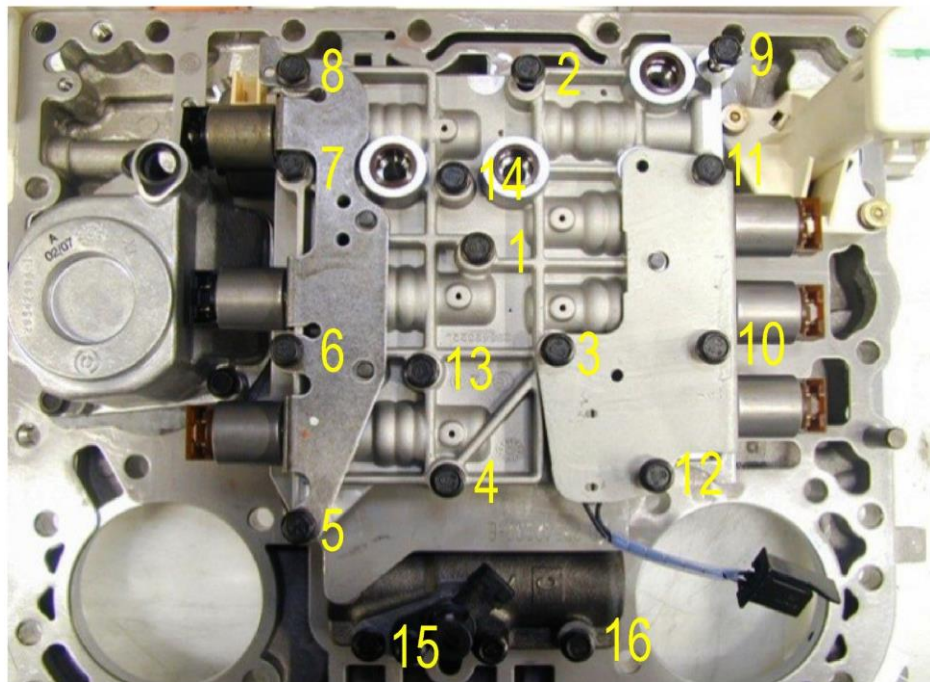
Stufe 1: Fingerfest.

Stufe 2: 5-7 Nm

Stufe 3: Endanzug 10-13 Nm

SM4013EN, Rev. Feb. 2019

SM4014EN, Rev. April 2019



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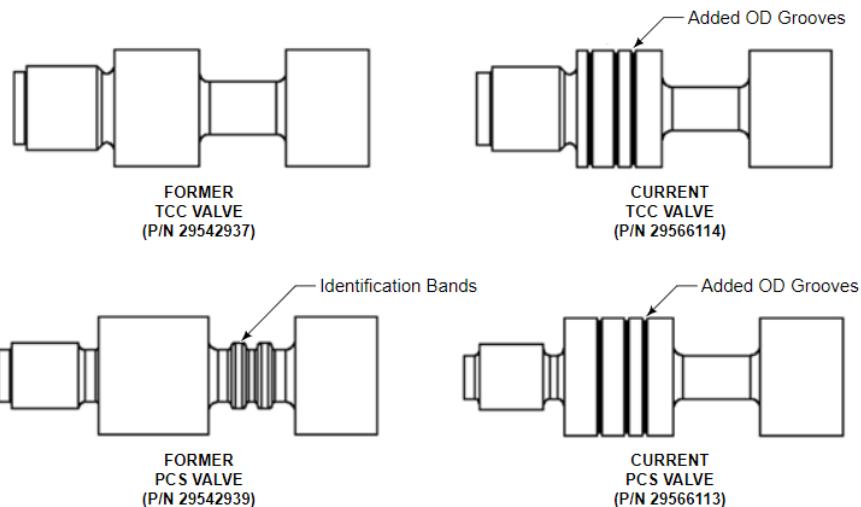
Trim Valve Redesign (Balance Grooves)

- 3000/4000 trim valves, PCS1-4 and TCC, were redesigned as a continuous product improvement
- Implemented balance grooves to reduce side loading and lengthen life of solenoid valve body
- Changes for both the TCC Valve and PCS Valve are completely forward and backward compatible with existing transmissions
- Reference SIL 06-WT-22

Note: When replacing a solenoid valve body for PCS valve pressure loss, replace all trim valves with updated grooved trim valves

Trim Valve Redesign Part Numbers and Identification

- Reference SIL 06-WT-22



Part Name	Usage	Former P/N	Current P/N
TCC Valve	TCC/Lockup – All TIDA & TIDB	29542937	29566114
PCS Valve	PCS 1, 2, 3, 4 – All TIDA & TIDB	29542939	29566113

Performance Monitoring

- When troubleshooting Prognostics related DTCs P088A/B, P2789 in TIDB transmissions:
 - *When clutch circuit pressure loss in the TCC/Lockup circuit **or** in the PCS clutch circuits indicates a problem in the Solenoid Valve Body (SVB), it is important to inspect the suspect SVB for the presence of:*
 - *5.0 mm ribs*
 - *Drill point indicating the part was air gage inspected at the supplier*
 - *Grooved PCS/TCC valves*

Performance Monitoring

- It is important to re-check pressure loss after Solenoid-Valve-Body (SVB) replacement to verify the pressure loss issue has been resolved successfully.
 - *Always attain 93C/200F Trans Fluid Temp when testing*
 - *If pressure loss indicates a problem in the SVB, and if the SVB has 5.0 mm ribs, grooved valves, and the 100% inspection drill point, notify your Training Manager and/or Allison representative.*

Reference:

- *P088A Transmission Filter Maintenance Alert*
- *P088B Transmission Filter Maintenance Required*
- *P2789 Transmission Clutch Life Expired
(Clutch Adaptive Learning at Limit)*
- **SIL 26-WT-23 !!!**
- **SIL 06-WT-22 !!!**