Technical Bulletin # 1251

Transmission: *CD4E*
Subject: *TCC Slip Code Diagnosis*
Application: *Ford, Mercury and Mazda*
Issue Date: *May 2009*

CD4E TCC Slip Code Diagnosis

Once the check engine light illuminates, the transmission will be in failsafe, the PCM will command high line pressure, inhibit lock up apply (until the next key cycle), freeze shift adapts and store code 628, P0741, P1741 or P1744 in memory. If codes are erratic check Turbine Speed Sensor (TSS) function during TCC apply. If the later design (white) turbine speed sensors, is used in place of an early design (black) sensor, will cause erratic converter slip codes and may be difficult to reset if cleared.

Diagnosing torque converter slip codes with the use of Cooler Flow and Torque Converter Turbine pressure information. With the aid of a flow meter, digital graphing meter and pressure gauge, cooler flow diagnosis will help pin point problem areas that cause TCC slip codes. During the road test the flow meter (attached to the return cooler line) will determine the flow volume in gallons per minute (GPM), the graphing meter will display this measurement in hertz (Hz) and a graphing display. Use the information shown in the flow chart (figure 1) to determine normal cooler flow. The graphing display in figure 2 shows the normal change in cooler flow in extreme cold situations.

Step One: verify that the transmission has the correct base line pressure and the proper line rise response to throttle opening. Stall pressure although important is not the main concern, more important is how well the needle on the gauge responds with the travel of the accelerator pedal. With selector in drive the gauge needle and the accelerator pedal should react as if attached to each other. Figure 3 identifies the line pressure tap along with a pressure specification chart.

Step Two: connect the pressure gauge to the CT tap (figure 4) and drive the vehicle. CT is Converter Turbine pressure which enters at the turbine end of stator. CI is Converter Impeller pressure as it leaves at the impeller. CT and CI pressure are affected as the converter bypass valve strokes, and are always present. Use the chart in figure 4 to determine the correct pressure and flow (GPM) in comparison to vehicle speed before and during lockup apply. CT pressure should rise quickly during TCC apply. A slow or quick drop in pressure after TCC apply (15 psi. or more) may be caused by an internal converter leak or a cracked converter clutch piston.

Low Cooler Flow: bypass the radiator and/or external cooler and retest, if flow increases the internal radiator cooler and/or external cooler is restricted. Repair or replace as needed. All external coolers should be replaced after a transmission overhaul due to the debris that cannot be cleared by flushing.

Low CT Pressure: valve body wear (primarily the Bypass Clutch Control valve and bore), worn pump, damaged pump gasket, cracked converter clutch piston or worn transmission bushings. Repair or replace as needed. Several aftermarket valve body repairs are available.

High CT Pressure: check the Pressure Regulator valve and bore, TCC control circuits or restricted cooler. Repair or replace as needed.

Wet Air Test: with the valve body removed, apply air to the CT circuit (figure 5) while blocking the CI orifice this will identify any internal cross leaks that will cause low TCC apply pressure.

Stall Test: Using a shift control devise (TranX, SuperFlow etc.) connected to the transmission case connector with the unit cooled, and a additional solenoid block connected to the computer harness to prevent solenoid codes. Command line pressure to the base idle setting shown in figure 3. Now command 3rd gear (both SS1 & SS2 off) with selector in Drive engine idle at 750 RPM. Disconnecting the harness to command 3rd gear instead of using a shift controller will not allow line pressure control. Command TCC apply for approximately two second, any longer test time may cause torque converter clutch piston over-load or solenoid failure. The engine should near stall on 4 cylinder vehicles or only stumble on 6 cylinder engines immediately during apply indicating that the converter is fine. No or little RPM drop indicates a failed converter, and may also produce a rattling noise during the test. Always verify that there are no TCC solenoid or CT pressure problems before replacing the converter.

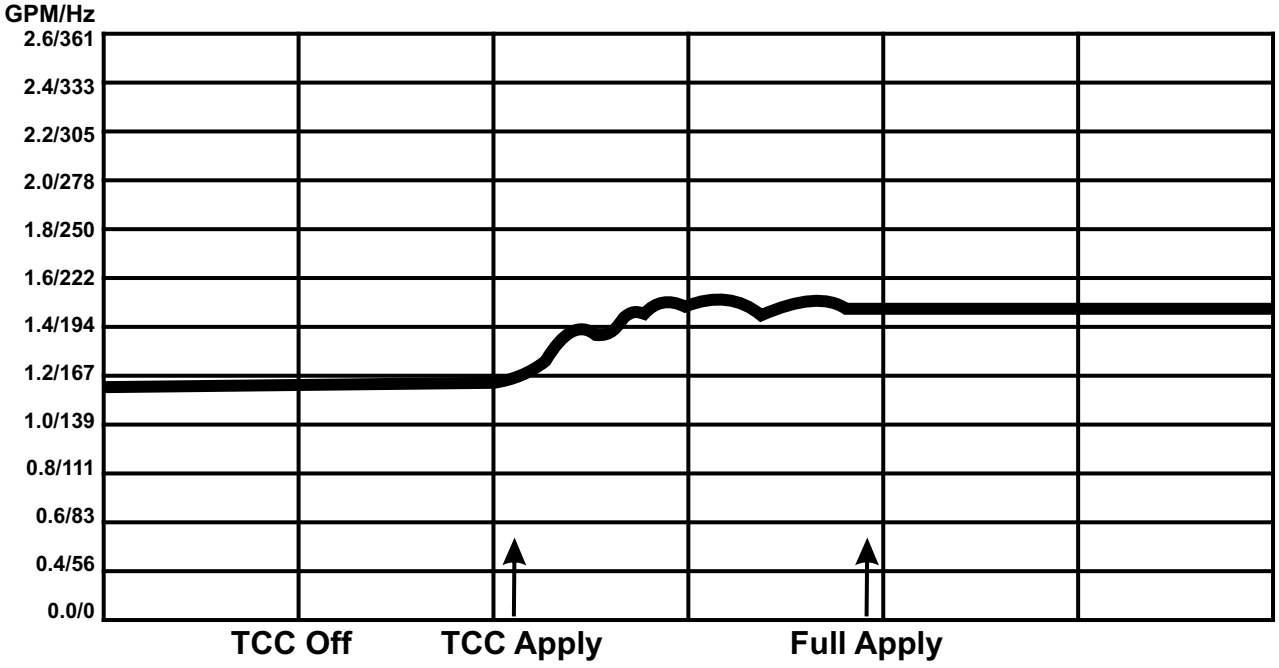
Road Test with Shift Controller: While road testing the vehicle at light acceleration with the transmission at operating temperature , command TCC apply in 3rd gear. There should be a sharp drop in RPM during TCC apply along with engine braking during coast down. Coming to a stop with brake pedal held and 3rd gear still commanded vehicle should stumble or near stall depending on engine size.

Converter Bench Test: Testing the converter on the bench for Turbine Hub wear. Insert a Turbine Shaft into the converter turbine hub raising slightly to prevent blocking the end of the shaft against the converter cover. Pour ATF (figure 7) into the shaft at the bushing end. If the turbine hub is in good condition, oil should drain out of the shaft as fast as it is poured. This test will work with or without a pre-filled converter. If the slots on the turbine hub are worn the oil will fill the shaft and take several seconds to drain depending on the amount of wear. The slots on a turbine hub in good condition should measure between 0.078” to 0.082” as shown in figure 8. Use the 90 degree angle of a scribe with a tip diameter measuring 0.072” to 0.082” to verify turbine slot depth. Insert the scribe into the converter as shown in figure 8. A worn turbine hub will not allow the scribe tip to slide under the hub. While the scribe is inserted under the hub lift the hub up to verify converter end play. The total end play should not exceed 0.050”. Excessive turbine hub wear will restrict converter release oil causing the engine stumble at idle upon transmission engagement and/or set TCC codes.

Note: Excessive transmission bushing wear along with pump surface problems such as warped pump halves, pump plate or excessive pump gear wear will also affect converter pressure.

Special thanks to Sonnax for the technical information provided.

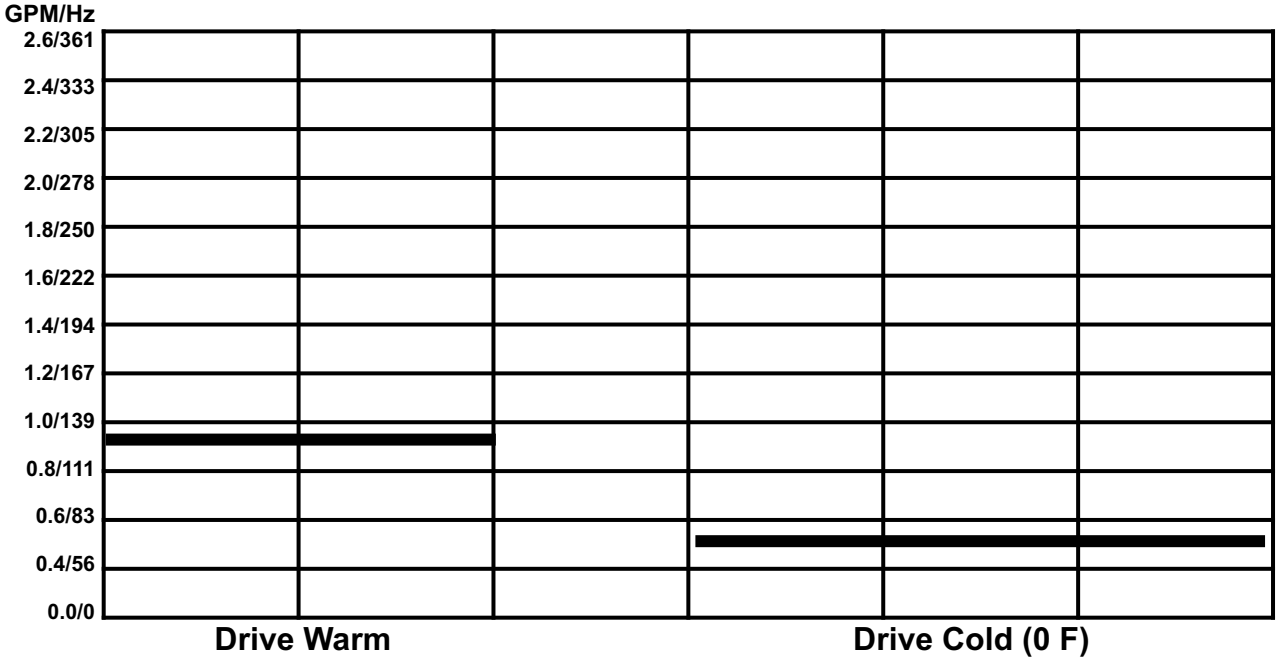
CD4E Normal



PWM duty cycle wave during TCC apply.

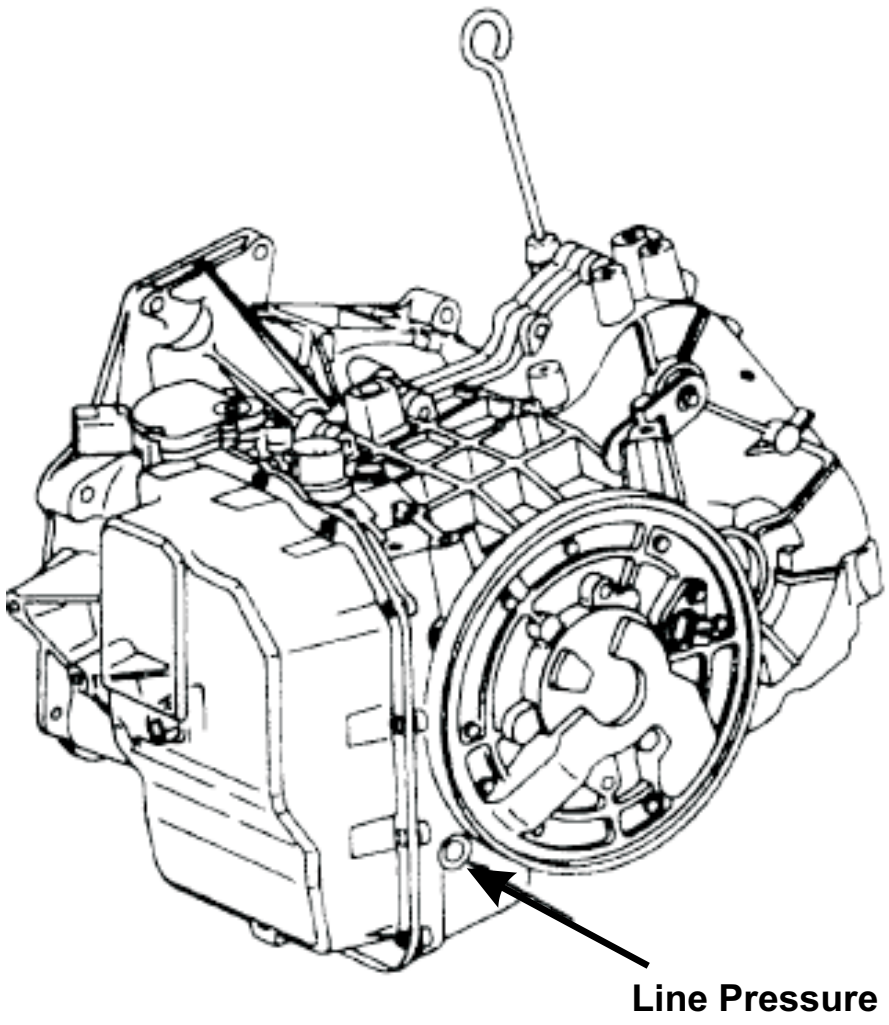
Figure 1

CD4E Normal



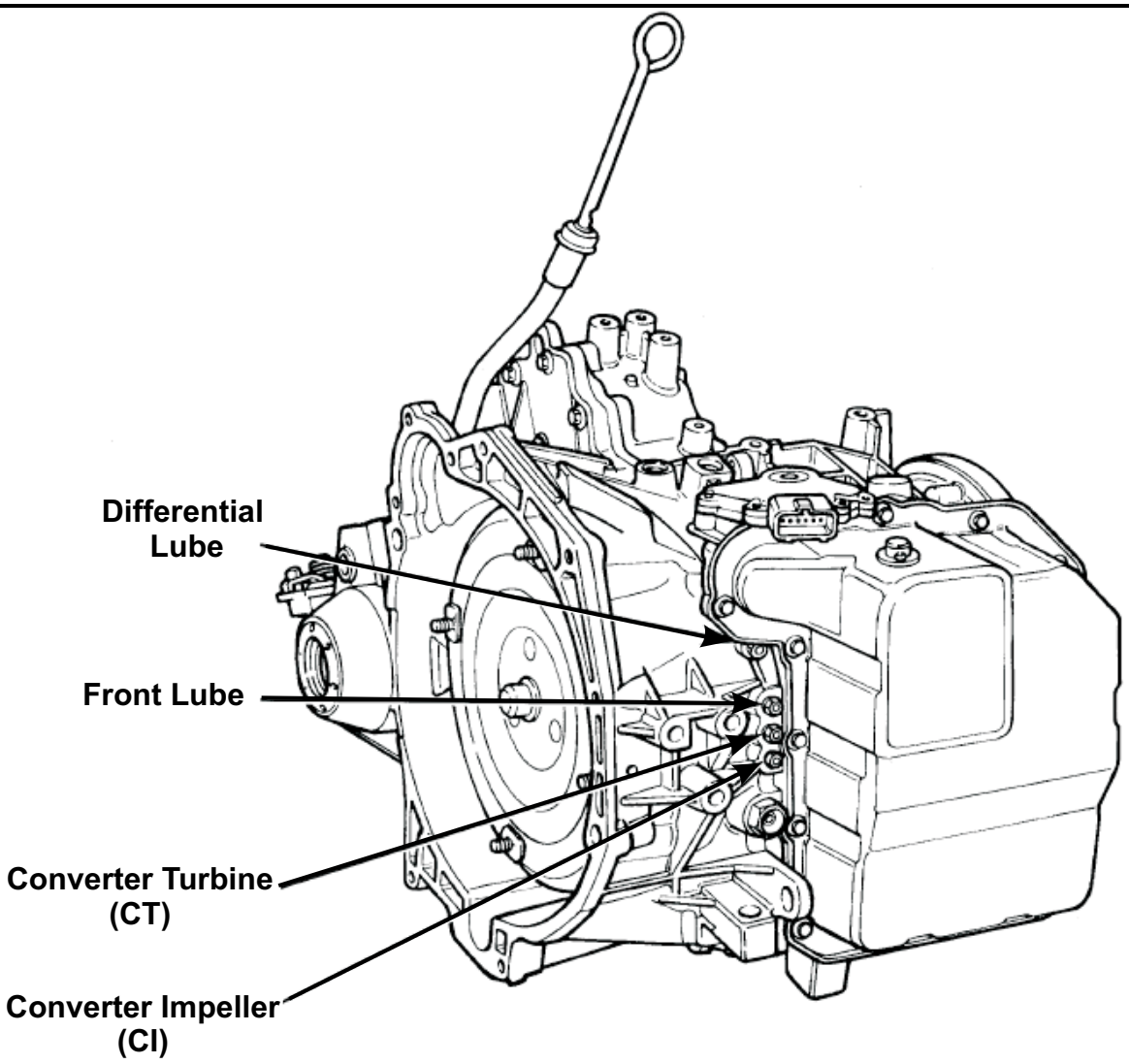
Takes 15 minutes to go from 6.0 Hz to 12 Hz at 8 degrees F.

Figure 2



Line Pressure Specifications				
Line Pressure	Idle		Stall	
Gear	KPA	PSI	KPA	PSI
Park / Neutral	441 - 524	64 - 76	—	—
Reverse	441 - 524	64 - 76	1786 - 2027	259 - 294
Drive	310 - 365	45 - 63	1158 - 1269	168 - 184
2nd	310 - 365	45 - 63	1158 - 1269	168 - 184
1st	310 - 365	45 - 63	1158 - 1269	168 - 184

Figure 3



CD4E Pressure & Flow Specifications

TEST CONDITION	Line PSI		CT PSI		Front Lube PSI		Cooler Flow GPM	
	Good	Poor	Good	Poor	Good	Poor	Good	Poor
Park (High Idle)	60 - 70	< 45	40 - 50	< 25	12 - 18	< 2	.3 - .5	< .2
Drive (Idle Cool)	50 - 55	< 40 > 80	30 - 35	< 15	10 - 15	< 5	.7 - .8	< .6
D - (Idle Hot)	50 - 55	< 40 > 80	25 - 30	< 15	2 - 4	< 2	.7 - .8	<. 6
D - (WOT Stall)	170 - 195	> 200	60 - 100	< 40 - 100	2 - 5	< 2	1.5	<. 8
D - (Connector Off)	< 200	> 200	60 - 100	> 100	2 - 5	-0-	.7 - 1.2	-0-
D - (40 - 55 mph, TCC Off)	Stable, varies w/Torque & EPC	Drops off or erratic	55 - 85	> 100	1 - 5	-0-	1.5 - 1.7	< 1.0
D - (40 - 55 mph, TCC On)	Stable, varies w/Torque & EPC	Drops, cycles or erratic	85 - 100	< 80	1 - 5	-0-	1.8 - 2.1	no change @ TC
Reverse (Idle Hot) (Stall)	< 55 - 70 275 +/-	< 45 > 300	25 - 35	< 15	2 - 5	0 - .1	.7	< .4

< = Less Than > = Greater Than

Figure 4

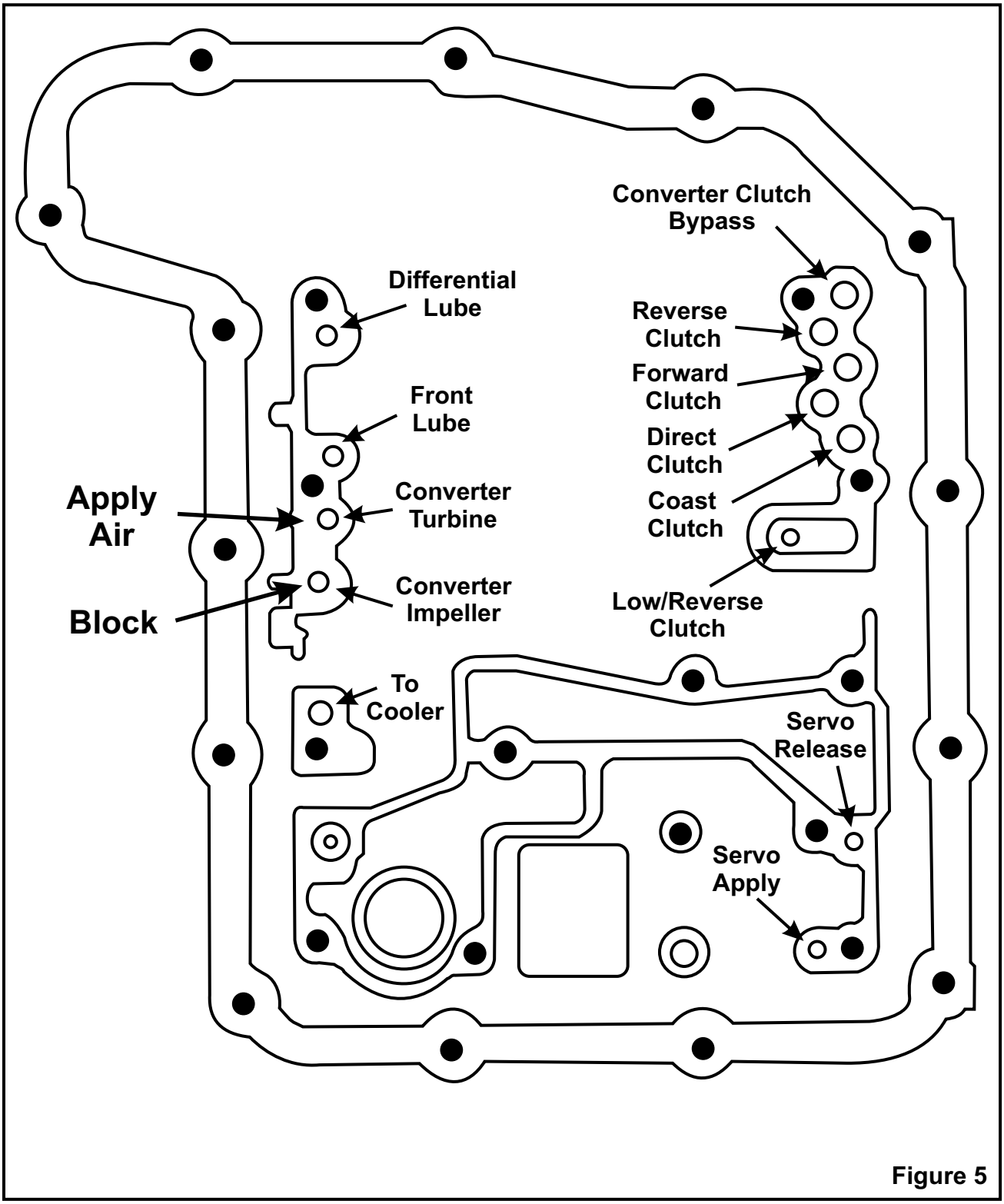


Figure 5

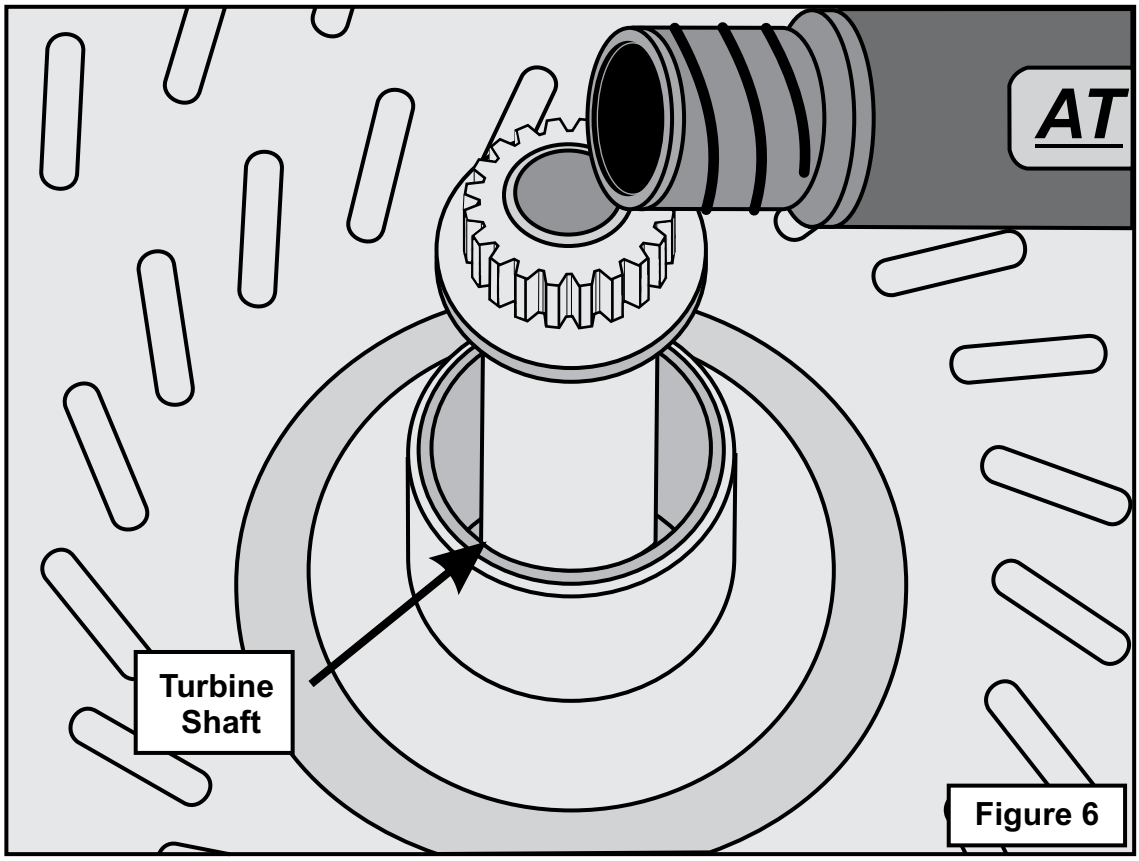


Figure 6

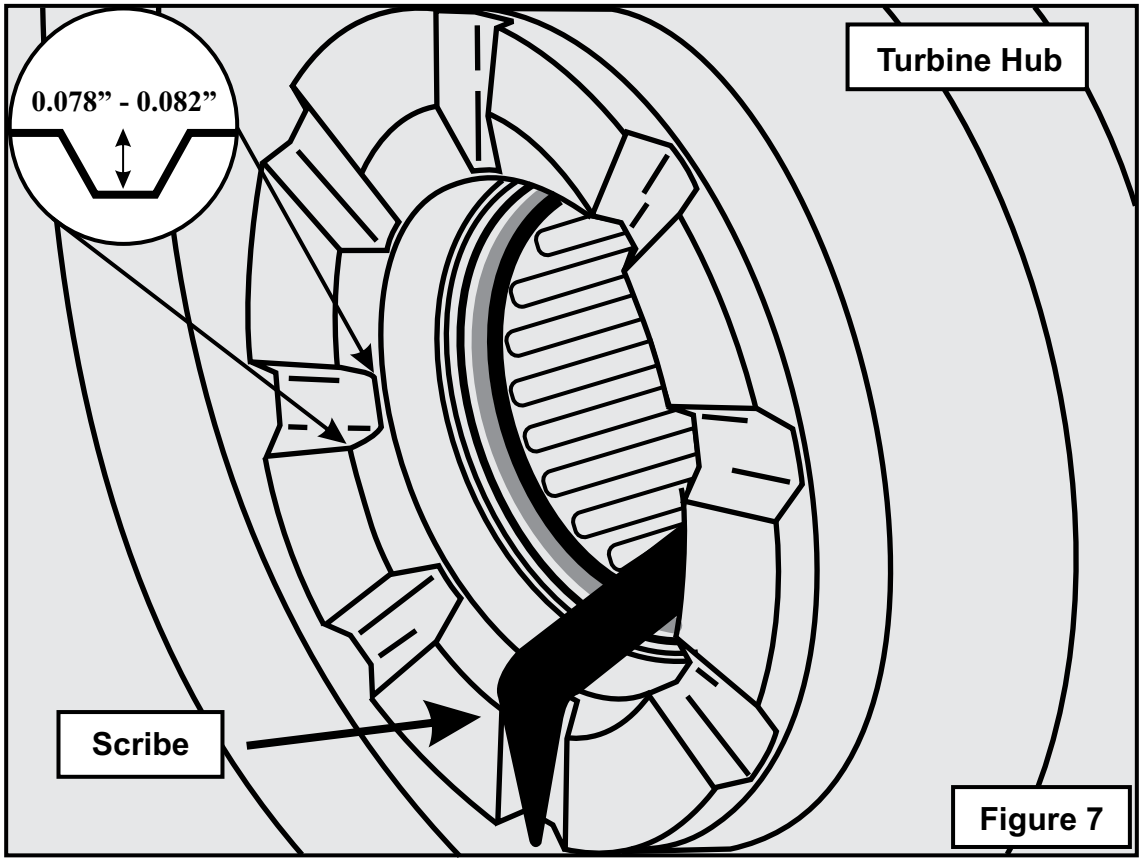


Figure 7