AN INTRODUCTION TO THE 2020 10 SPEED ALLISON

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The name "Allison" immediately conjures up a picture in the mind of the consumer of transmissions that exemplify quality, durability, and longevity. Allison, as most of you are aware, was a division of General Motors for decades. Even after being split off from GM, the GM/Allison relationship continues to this day.

The Allison applications are thought of as units used in medium and heavy-duty applications. That changed many years ago when the LCT 1000 and LCT 2000 series were introduced into pickup and light truck applications. Dodge with its "Cummins" and Ford with its "Power Stroke" had what they believed were competitive engines to the "Duramax," but the one thing they lacked was the name Allison on the hood of the truck. An awful lot of customers purchased GM trucks simply because they were equipped with an Allison transmission.

Five generations of the 1000/2000 units have been produced as five, six, and even seven speeds in some non-GM applications. Numerous versions of the 1000/2000 series made these transmissions some of the most versatile units ever produced.

With the introduction of the 2020 light truck line up's a new Allison is now available for purchase, a 10 speed known as the 10L1000. The 10L1000 is a fully electronically controlled unit which utilizes an "externally mounted" TCM. The TCM is shared with several other GM transmission applications, which is definitely a move in the right direction.

Internally the 10L1000 is a clutch to clutch shift unit, which may or may not be equipped with PTO. It has four planetaries and six multiple disc clutches (seven clutch packs if it's equipped with a PTO) that are used to provide 11 different gear ratios. The clutches are all named after the gears that they are used to operate, 1-2-8-9-10 Reverse Clutch, 1-2-3-4-5-6 Reverse Clutch, 2-3-4-5-7-9-10 Clutch, 1-3-5-6-7-8-9 Clutch, 4-5-6-7-8-9-10 Reverse Clutch, 1-2-3-4-6-7-8-10 Reverse Clutch and a PTO Clutch (Figure 1). (Note: unlike other GM 10 speed transmissions the 10L1000 doesn't have any one-way clutches)

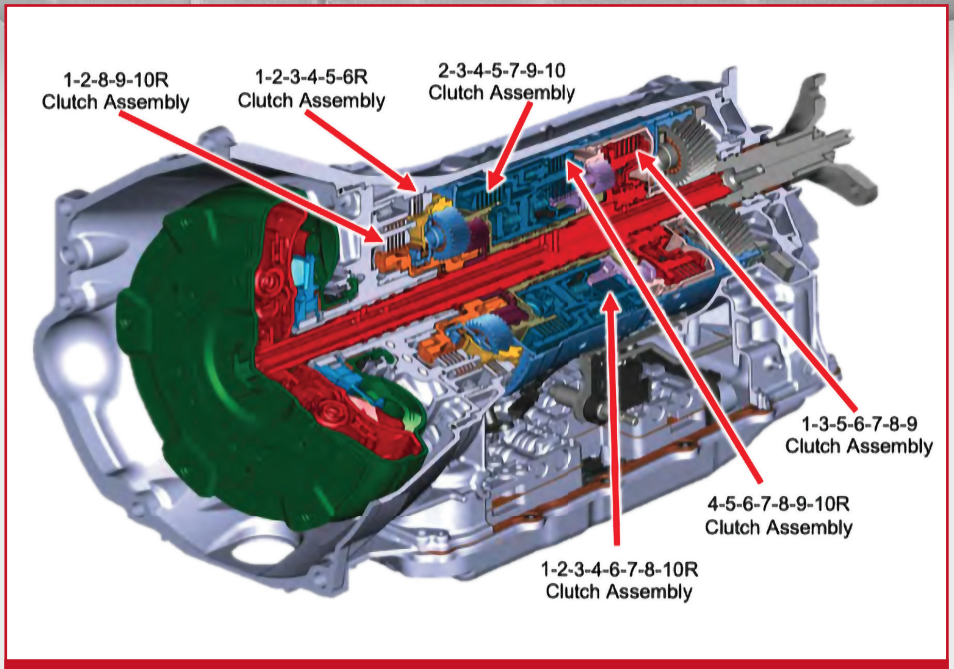


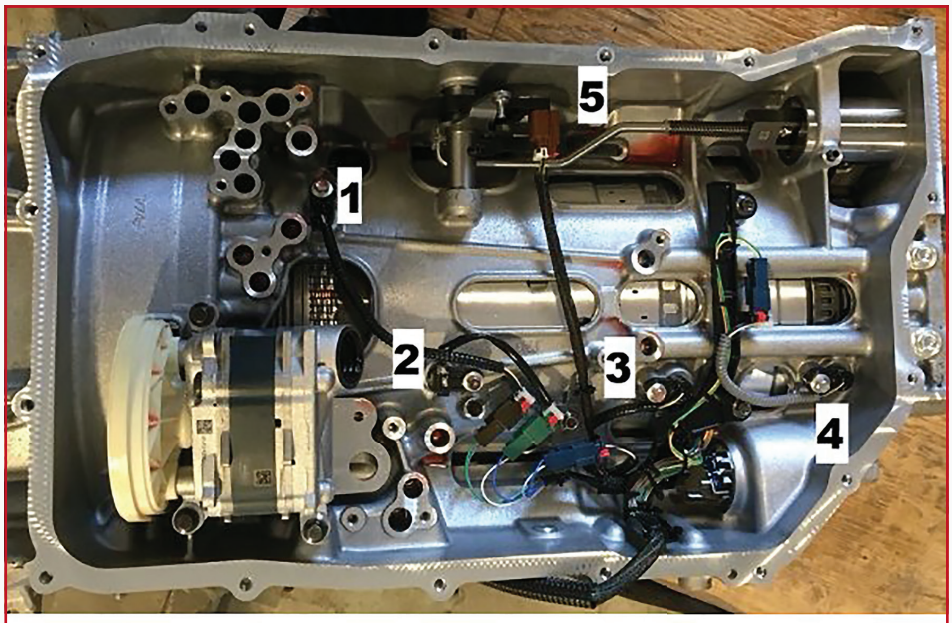
Figure 1

The 10L1000 has four Hall Effect speed sensors and an Internal Mode Switch (IMS, Range sensor) that provide information to the TCM (figure 2).

An off-axis gear-driven variable vane oil pump, a squash design torque converter, and a valve body equipped with linear solenoids are used to control the unit operation (Figure 3).

The fluid used in this application is Dexron ULV. Failure to use ULV fluid may cause shift concerns and possible clutch failure, so it is wise to use the fluid the unit was designed to utilize. In addition, the additive package can settle out of the ULV fluid when it is left on the shelf for long periods of time, so the bottle should be shaken before it is installed into the transmission. These units do not have a dipstick, so the temperature must be between 167°F–176°F (75°C-85°C) before removing the fluid level site plug to check the level.

The PTO on this application is completely different when compared to the LCT applications. The PTO for the 10L1000 uses a different case and is mounted to the side of the transmission gear train. It's driven by a chain and controlled by a clutch and solenoid. The PTO is still used for the same purpose it has always been used for, but it mounts differently as compared to the other Allison applications.



1= Input speed sensor (B14C)
2= Intermediate speed sensor 1 (B14DA)
3= Intermediate speed sensor 2 (B14DB)
4= OSS output speed (B14A)
5= IMS Internal mode switch, Range sensor (B303)

Figure 2

10L1000	Specifications
RPO	MGM, MGU
PTO	Chain Driven option (RPO MGU)
Oil Pump	Off Axis Gear Driven Vane Design
6 Clutches	4 Rotating and 2 Brake Clutches
TCM	T87A Delphi Stand Alone Design
Solenoids (Up to 9 used depending on options)	6 NL Linear Pintle 1 TCC 1 Line Pressure
Gear Ratios	1st=4.54-1, 2nd=2.866-1, 3rd= 2.064-1, 4th=1.719-1, 5th=1.484-1, 6th= 1.260-1, 7th= 1-1, 8th= .85-1, 9th=.687-1,10th= .631-1, Reverse= 4.452-1
Torque Converter	270mm with TCC
Pressure Taps	Line pressure
Fluid	Dexron ULV
Speed Sensors, IMS	Input speed sensor (B14C), Intermediate speed sensor 1 (B14DA), Intermediate speed sensor 2 (B14DB), OSS output speed(B14A) IMS/range sensor (B303)

Figure 3

TRANSMISSION IDENTIFICATION

Like the GM 8-speed, 9-speed, and the other GM 10-speed applications, the 10L1000 uses a Transmission Unique Number (TUN) and a Part Unique Number (PUN) number to match the TCM calibration to the valve body flow rate characteristics. The valve body and solenoids are flow tested as a unit at the plant, and a PUN QR label is etched onto the valve body (Figure 4). This represents the flow values for the valves and solenoids based on their relative positions in the valve body.

The TUN is printed on the transmission case tag and represents which PUN number valve body the transmission is equipped with (Figure 5). As with other GM applications, if the valve body is replaced, the new PUN number will need to be programmed into the TCM. If the transmission is replaced, the new TUN number will need to be programmed into the TCM. Failure to program the updated numbers into the TCM can result in shift related issues that may/may not correct themselves.

Like the other GM applications, the solenoids are only serviced as part of the valve body assembly because of the valve/solenoid flow testing process used.

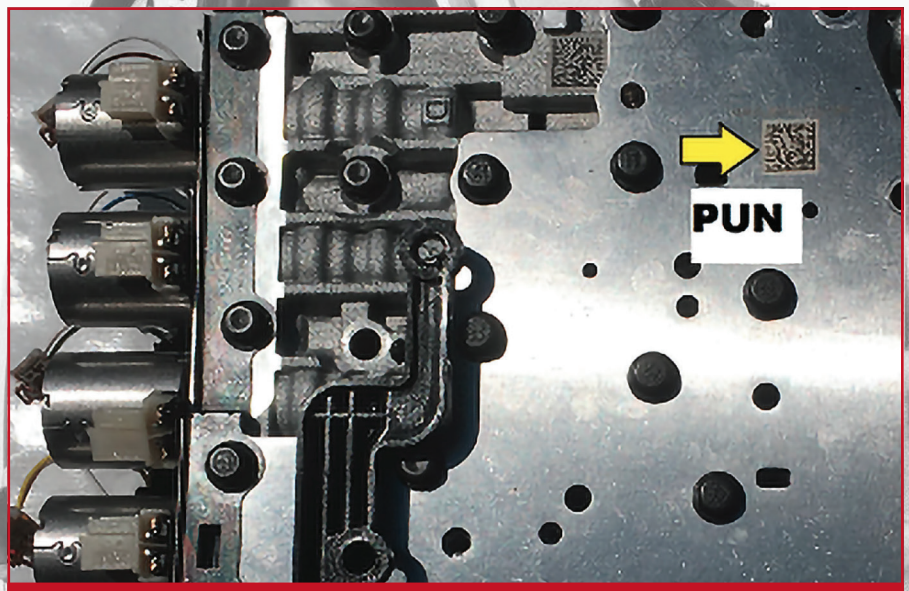


Figure 4

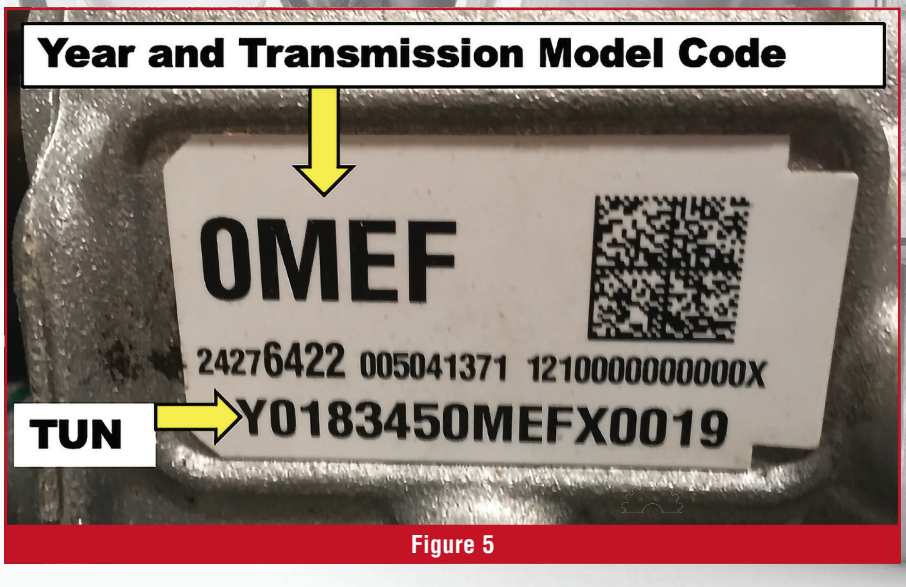


Figure 5

FLUID TEMPERATURE SENSOR, SPEED SENSORS AND IMS

There are four speed sensors used on the 10L1000 application. The sensors are two-wire Hall Effect designs which are fed 9.0 volts from the TCM. The sensors' output voltage is a square wave. The TCM counts the frequency to determine the component rotational speed.

The IMS/Range sensor is mounted internally. The IMS output operates like the GM 9-speed and numerous Ford applications. The output is in a duty cycle format. The IMS uses two sensors, sensor 1 and sensor 2 (Figure 6).

The key to understanding this type of sensor arrangement is to add the value of sensor 1 and sensor 2. The sum of their values should be 100%.

The transmission fluid temperature sensor is attached to the valve body and operates like most TFT sensors.

Transmission Range	Sensor 1	Sensor 2
Park	12-18%	82-88%
Reverse	41-47%	53-59%
Neutral	55-61%	39-45%
Drive	69-75%	24-30%
M/1	82-88%	12-18%

Figure 6

It is a negative temperature coefficient design which is fed 5 volts by the TCM.

A couple of other points on this unit, it is heavy, about 360 lbs, so care must be taken when working with the unit and its components. In addition, the transmission holding fixture looks like the same one used on the THM 350/400/700R4/4L60E/4L80E, but it is not. The case is much larger, so the fixture will not be wide enough to fit across the case. You'll need to invest in some new tools.

It is always exciting when a new unit hits the market, and this transmission is no exception. I hope to see all of you in Nashville at the ATRA Powertrain Expo. If you want to learn more about this unit, I will be doing a class on it at expo this year, so until then, remember, "Life is like a bicycle. You don't fall off until you stop pedaling."