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6T40/45 Diagnostics & Fixes

6T40/45 GF6
Global 6 Speed

Presented by: Mike Souza
ATRA Senior
Research Technician

Introduction

The first step to diagnosing and fixing any transmission is to first learn how it works.

Once we understand what does what and when it's supposed to do it, then we can better determine what to check first and what does not need to be checked at all.

If we know what the component is and what it's supposed to do, then we can move forward to diagnosing and fixing the problem.

It's never any fun for the rebuilder to get the transmission on the bench only to find nothing wrong internally.

Transmissions in today's market are more complex and require a more detailed diagnosis prior to being removed from the vehicle. There are so many things on the other side of the flywheel that can effect a transmissions performance than ever before.

The best way to diagnose and test any transmission is to use a dynamometer and every shop has one without realizing it.

The best dyno is the one that has 4 wheels on it that the transmission was attached to when vehicle arrived at your shop.

Dyno

First Things First

Always start by determining if there are any codes present in all modules (write them down).

Even if a code is cleared and hasn't returned *yet* does not mean the problem disappeared. It may take several key cycles before it appears again.

Your aftermarket scan tool may not show any codes present, pending or in history when the year, make and model is entered into the scan tool. This does not mean there are no codes located somewhere in the one of the modules.

The next step would be to double check by scanning the vehicle in the "Generic" or "Global Mode".

If there are any hidden codes that effect fuel economy which would cause engine load issues, they will usually show up using the generic or global mode feature of your scan tool.

Then verify if a sensor function or computer command is working correctly, with what ever data your scan tool can provide.

If, your scan tool cannot provide you with enough information, you will have to verify sensor, computer command, and/or component function with electronic testing tools.

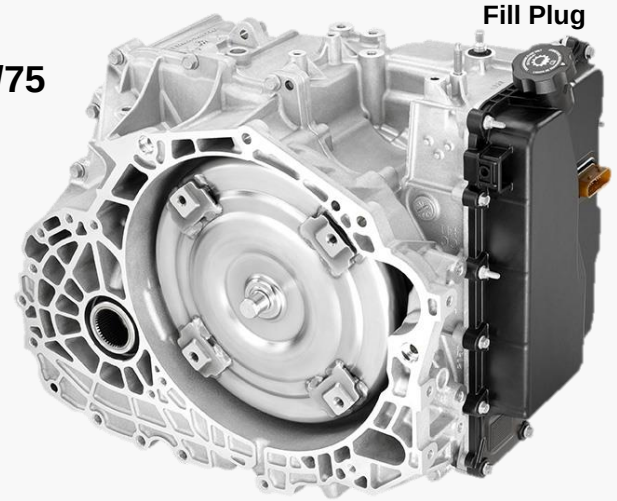
Identification

Always identify what your working with. In this case we need to make sure which unit we are working on.

The easiest way to identify the unit from the outside at a quick glance, is the fill plug. The fill plug on the 6T70/75 is located on the side cover. Where as the fill plug on the 6T40/45 is located near the center of the case. The 6T30 is a bit smaller.

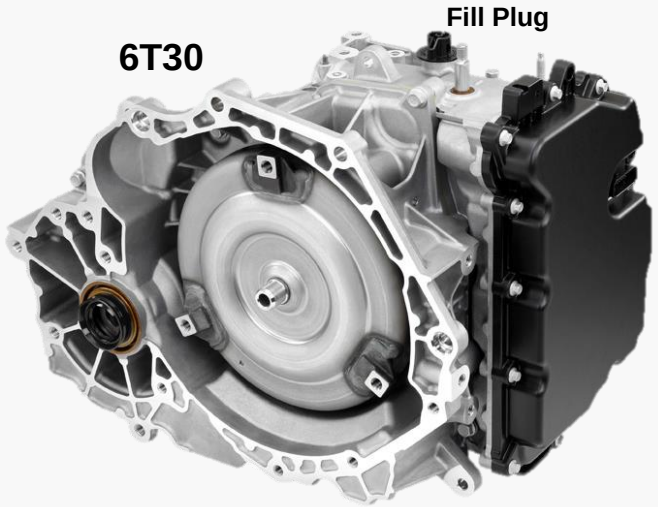
There are several differences between a 6T40/45 GEN I & II, 6T30, 6T41/46 GEN 3 and a 6T70/75 GEN I & II transmission.

6T70/75



6T40/45

6T30

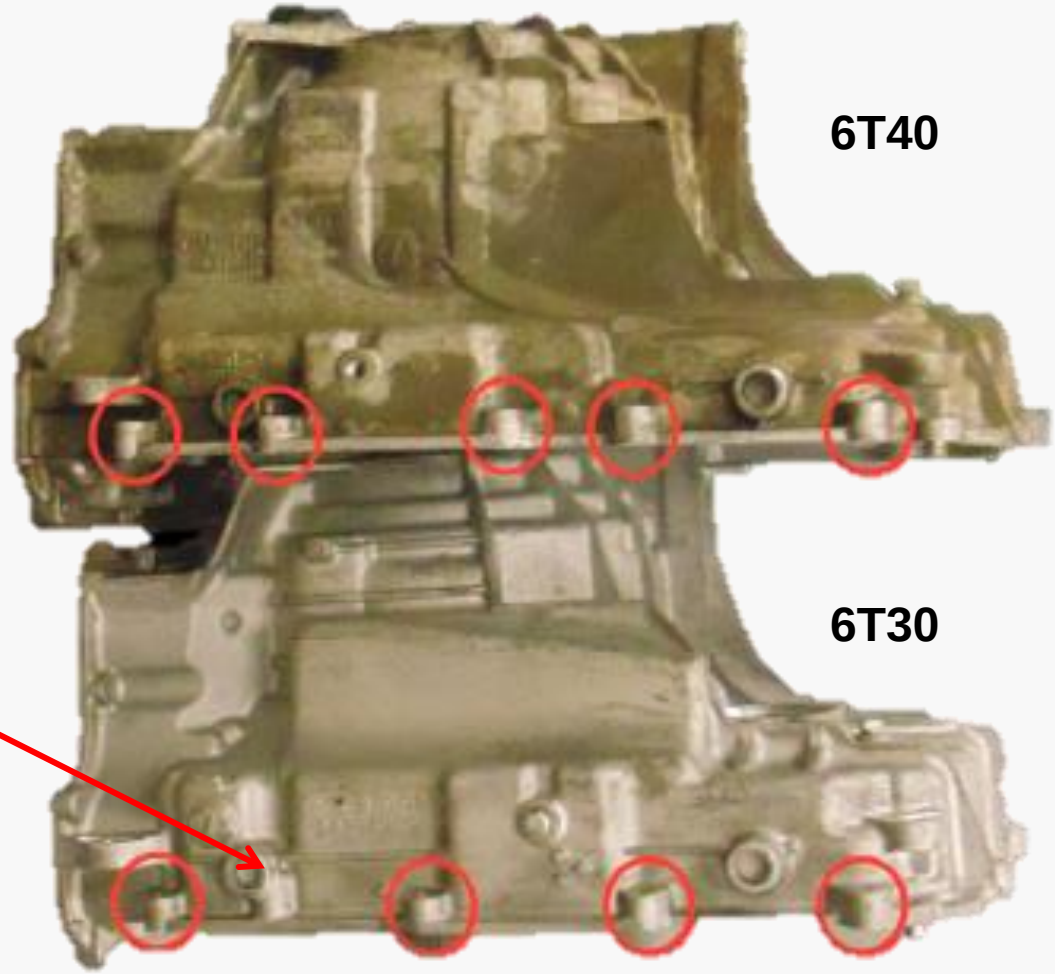


Identification

GM 6T30 (MH9) Family came out in the later part of the 2008 model year outside the U.S. before being used here in the states sometime in 2012.

The earlier part of 2012 we have seen some 6T30 with no bolt at this location just the embossed area for the bolt.

Later models have 5 bolts like the 6T40.



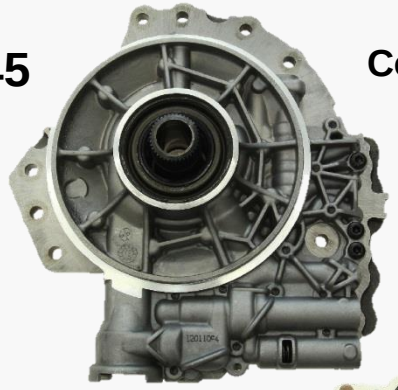
Identification

The 6T30/40/45 is chain driven (like a 4T65E) with a converter driven pump.

Except the 6T41/46 GEN III which uses an off axis chain driven pump like the 6T70/75.

The 6T70/75 is gear driven with an off axis chain driven pump.

6T30/40/45



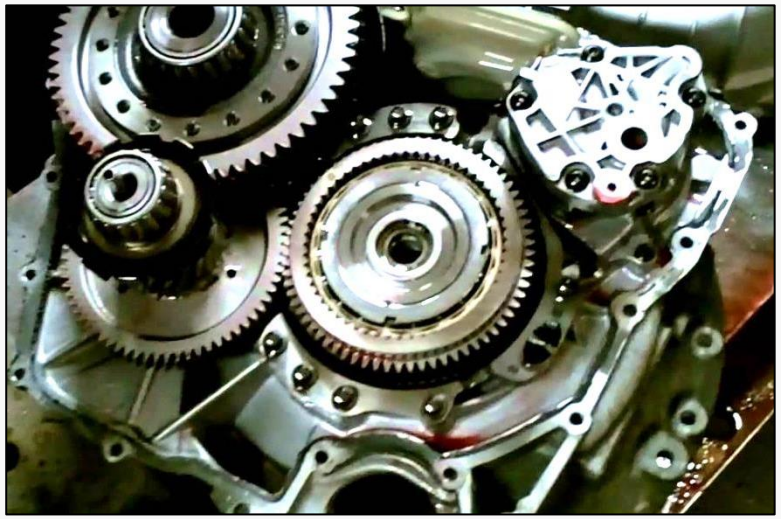
Converter Driven

Chain Driven

6T70/75

Off Axis Chain Driven

Gear Driven



Identification

The ID tag is always the best way to identify what unit you have.

6T45 vs. 6T40

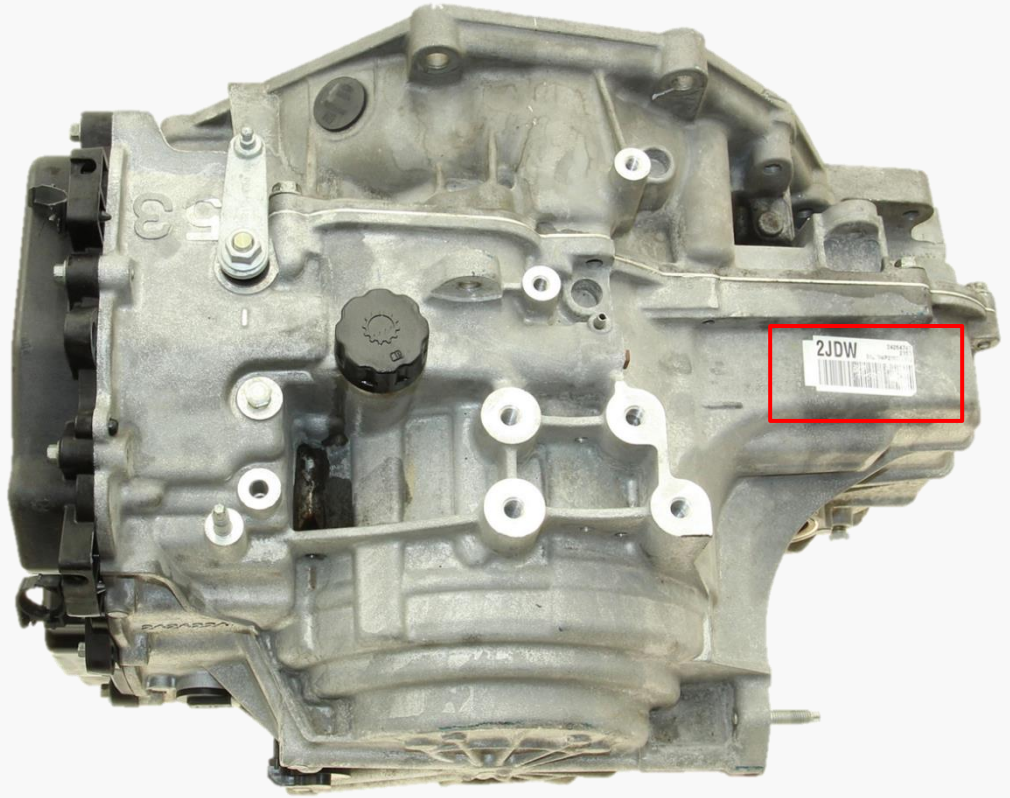
- 1 1/2” Chain instead of a 1” chain
- 5 Pinion Planetary Gear Set
- Heavier ribbed case
- Heavier differential

We have covered parts and software updates in past webinars.

The architecture of the 6T40/45 is similar to the Ford 6F35 with the exception of the TECHM.

Ford has an external TCM.

Very few parts will interchange as a complete assembly.

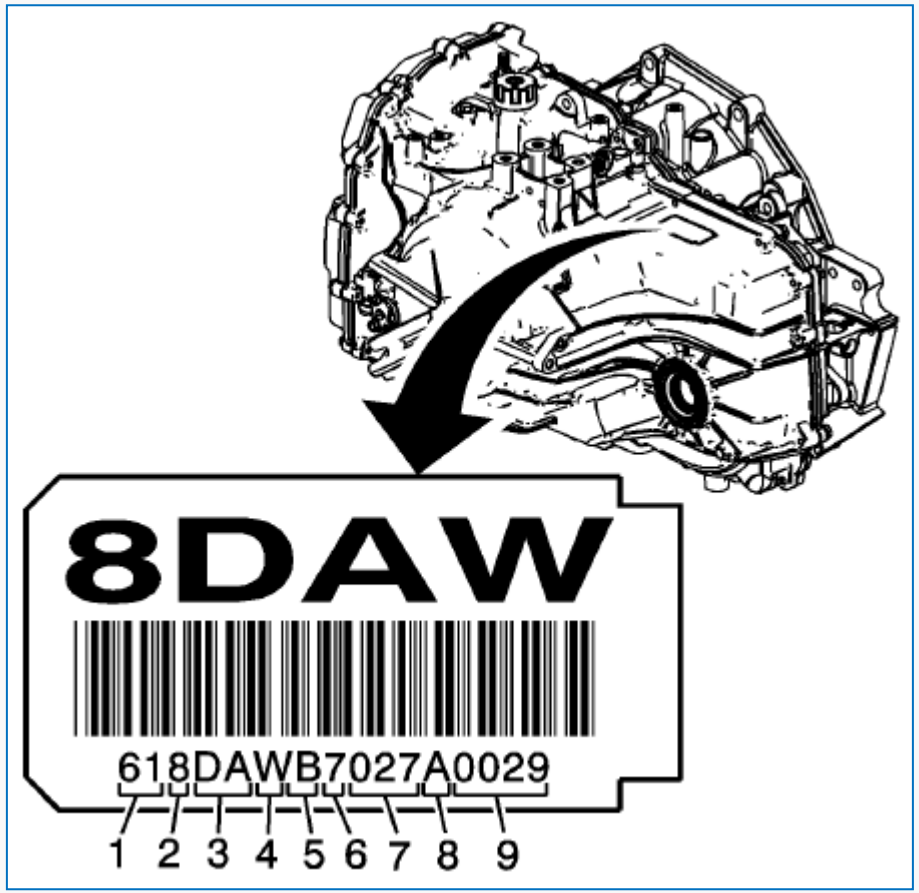


Identification

There will be times when a vehicle gets to your shop that someone else has worked on.

If you look up the RPO code (located in the glove box, spare tire or the glove compartment) you can identify if the correct transmission is in the vehicle .

1. Code for Automatic Transmission
2. Model Year
3. Model for Transmission
4. Transmission Family
5. Source Code for Plant
6. Calendar Year
7. Julian Date
8. Shift/Line (A/B)
9. Numeric sequence starting at 0001 @ 12:01 AM each day

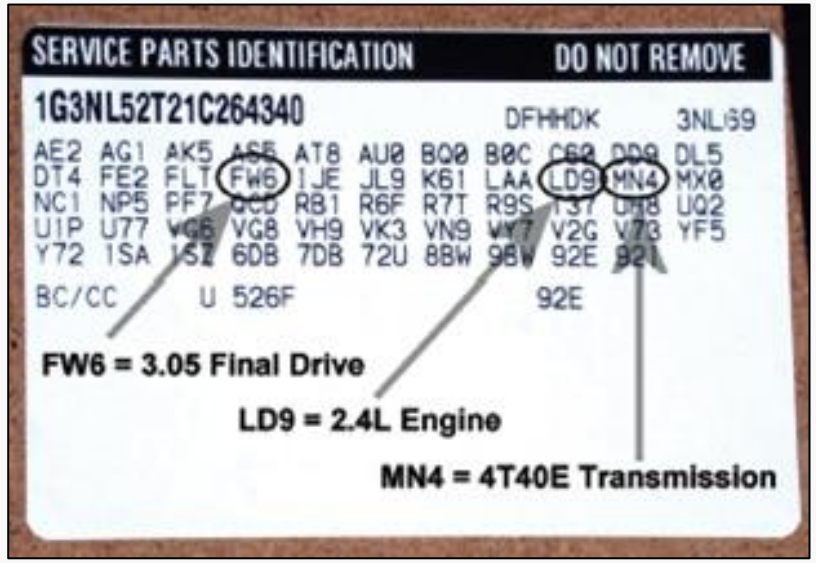


Identification

All automatic transmission applications are identified starting with the letter “M” and then followed by numbers, letters or a combination. All the codes are three digit. Below is a list of the current RPO codes:

6T70 FWD—M7W,MH2
6T70 AWD—M7U,MH4,
6T75—M7V, MY9, MH6
6T30—MH9
6T40—MH8, MHH,MHB
6T45—MH7, MHC
6T50—MHK
6L45—MYA
6L50—MYB
6L80—MYC
6L90—MYD
4ET50 ELEC—MKA
4L60E—M30
4L65E—M32
4L70E—M70
4L60E HYBRID—M33
2ML70 2 MODE—M99
4L80E—MT1

LCT 1000—M74,MX2,MW7
VT20—M83
VT25 FWD—M75
VT25 AWD—M16
4T65E—MN3
4T65EHD—MN7
4T65E AWD—M76
4T65E Advanced Controls—M15
4T40E—MN4
4T45E—MN5
4T80E—MH1



General Information

Fluid Type—Dexron VI

Fluid capacity Valve body cover removal—5.3-7.4 qts (5-7 liters)

Fluid capacity fluid change—4.2-6.3 qts (4-6 liters)

Fluid capacity Overhaul--- 7.4-9.5 qts (7-9 liters)

No dipstick, oil level checked via a plug (most applications)

EC3 236 mm “hyper elliptical” furnace brazed torque converter. Torque converter contains a lip seal that will be damaged if the converter is removed or installed in any position other than “vertical”. Special tools are available J46409

5 Clutches (3 holding, 2 driving) clutch to clutch shifting

1 Diode one way clutch

1 3 Port shift solenoid used (On/Off Design), SS1 normally closed (NC)

6 Variable bleed solenoids, PCS1, PCS2, PCS3, PCS4, PCS5, TCC (changed to variable feed in 2012)

1 Fluid temperature sensor (integral to TECHM)

Gerotor type oil pump, 3 selective gears thicknesses available.

Except the 6T41/46 GEN III which uses an off axis chain driven pump like the 6T70/75.

General Information

A Motorola (Continental) built 32 bit TCM mounted internal to the transmission on the valve body (Referred to as the “control solenoid valve assembly”) The Transmission Electronic Hydraulic Control Module (TECHM) incorporates the TCM, Solenoids, Pressure Switches (eliminated in 2012 GEN2), TFT Sensor and it is bolted to the valve body.

Internal Mode Switch (IMS) equipped

2 wire Hall effect input and output speed sensors

Performance Algorithm Shifting (PAS) programming

Performance Algorithm Lift foot (PAL) programming

Winter mode programming

Sport mode and TAP shift equipped

Adaptive Strategies with fast learn capabilities

Reverse lock out feature

Grade Braking

FWD/AWD applications can be dingy towed but AWD applications cannot be dolly towed. Neither application can be towed with the rear wheels in the air, as would happen when the vehicle is being towed by a tow truck.

How It Works

Now it's time to identify where the component is located and what function it performs whether hydraulic or electronic.

It's nice to have the clutches named for what they control.

Makes it easier to know what's on when.

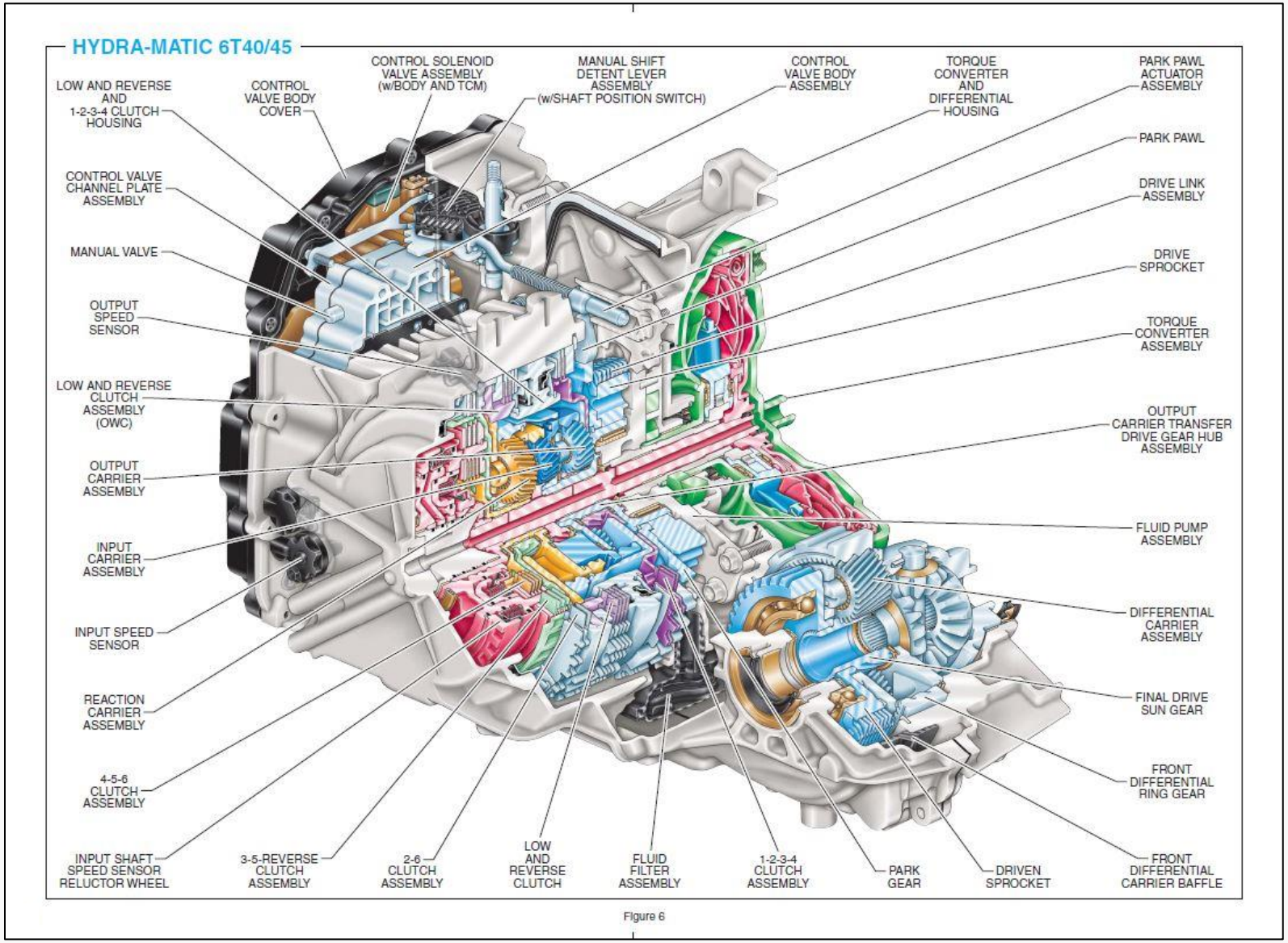


Figure 6

How It Works

There may be times when finding information even in an O.E. manual can be misleading.

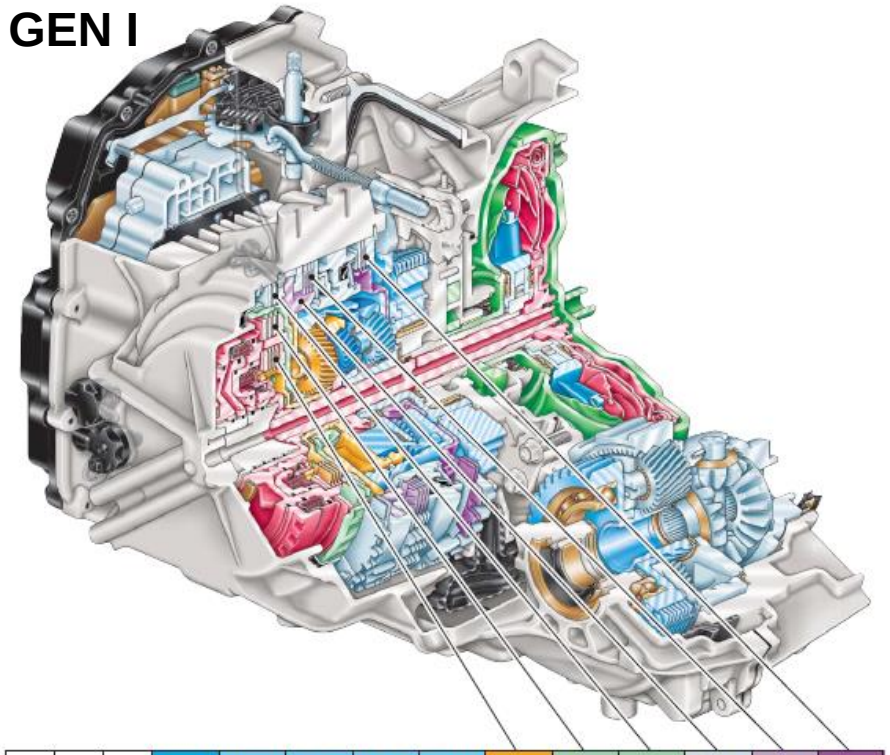
Example: in the GM Tech Guides both GEN I & II the solenoid apply charts show the solenoids as on and off.

If you read the explanation below the chart; when a Pressure Control Solenoid is On (*Mechanically)* its producing pressure when Off no pressure.

RANGE	GEAR	RATIO	SHIFT SOLENOID	1-2-3-4 CL PC SOL 5 N.L.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.H.	LOW REV 4-5-6 CL PC SOL 3 N.H.
PARK	P	—	ON	OFF	OFF	OFF	ON
REV	R	2.940	ON	OFF	OFF	ON	ON
NEU	N	—	ON	OFF	OFF	OFF	ON
D	1st Braking	4.584	ON	ON	OFF	OFF	ON
	1st	4.584	OFF	ON	OFF	OFF	OFF
	2nd	2.964	OFF	ON	ON	OFF	OFF
	3rd	1.912	OFF	ON	OFF	ON	OFF
	4th	1.446	OFF	ON	OFF	OFF	ON
	5th	1.000	OFF	OFF	OFF	ON	ON
	6th	0.746	OFF	OFF	ON	OFF	ON

← N/H

GEN I



RANGE	GEAR	RATIO	SHIFT SOLENOID	1-2-3-4 CL PC SOL 5 N.L.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.H.	LOW REV 4-5-6 CL PC SOL 3 N.H.	4-5-6 CLUTCH	3-5 REVERSE CLUTCH	2-6 CLUTCH	LOW AND REV CL (OWC)	LOW AND REVERSE CLUTCH	1-2-3-4 CLUTCH
PARK	P	—	ON	OFF	OFF	OFF	ON					APPLIED*	
REV	R	2.940	ON	OFF	OFF	ON	ON		APPLIED			APPLIED	
NEU	N	—	ON	OFF	OFF	OFF	ON					APPLIED*	
D	1st Braking	4.584	ON	ON	OFF	OFF	ON				HOLDING†	APPLIED	APPLIED
	1st	4.584	OFF	ON	OFF	OFF	OFF				HOLDING		APPLIED
	2nd	2.964	OFF	ON	ON	OFF	OFF			APPLIED			APPLIED
	3rd	1.912	OFF	ON	OFF	ON	OFF		APPLIED				APPLIED
	4th	1.446	OFF	ON	OFF	OFF	ON	APPLIED					APPLIED
	5th	1.000	OFF	OFF	OFF	ON	ON	APPLIED	APPLIED				
	6th	0.746	OFF	OFF	ON	OFF	ON	APPLIED		APPLIED			

NOTE: EFFECTIVE FINAL DRIVE RATIO – 6T40/45 – 3.17 & 3.87

NOTE: FOR SHIFT SOLENOID, "ON" – SOLENOID ENERGIZED (PRESSURIZED), "OFF" – SOLENOID DE-ENERGIZED (NO PRESSURE).

NOTE: FOR PRESSURE CONTROL (PC) SOLENOIDS, "ON" – PRESSURIZED, "OFF" – NO PRESSURE.

* APPLIED WITH NO LOAD.

† HOLDING BUT INEFFECTIVE.

How It Works

Electronically if a Normally High (NH) solenoid has voltage (amperage) present the pressure would be Low.

When turned off electronically the pressure would be High.

These are solenoid working charts not electronic apply charts.

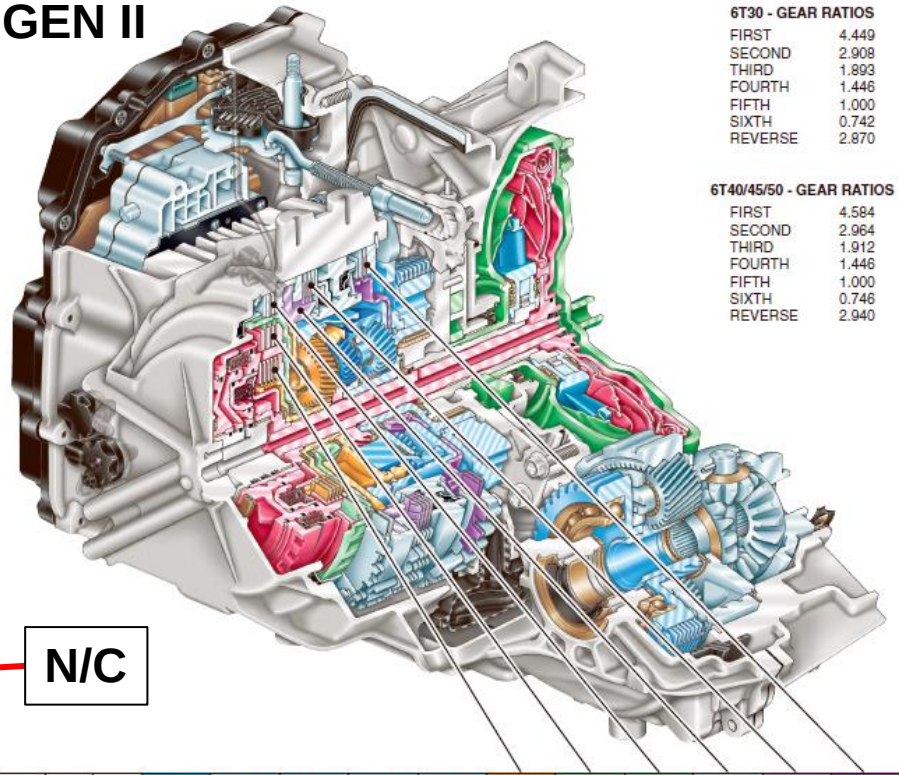
The Shift Solenoid is an On/Off type solenoid and as explained below the chart it is controlled electronically (energized).

This is a normally closed 3 port solenoid.

RANGE	GEAR	RATIO	SHIFT SOLENOID	1-2-3-4 CL PC SOL 5 N.H.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.L.	LOW REV 4-5-6 CL PC SOL 3 N.H.
PARK	P	—	ON	OFF	OFF	OFF	ON
REV	R	2.940	ON	OFF	OFF	ON	ON
NEU	N	—	ON	OFF	OFF	OFF	ON
D	1st Braking	4.584	ON	ON	OFF	OFF	ON
	1st	4.584	OFF	ON	OFF	OFF	OFF
	2nd	2.964	OFF	ON	ON	OFF	OFF
	3rd	1.912	OFF	ON	OFF	ON	OFF
	4th	1.446	OFF	ON	OFF	OFF	ON
	5th	1.000	OFF	OFF	OFF	ON	ON
	6th	0.746	OFF	OFF	ON	OFF	ON

N/C

GEN II



6T30 - GEAR RATIOS

FIRST	4.449
SECOND	2.908
THIRD	1.893
FOURTH	1.446
FIFTH	1.000
SIXTH	0.742
REVERSE	2.870

6T40/45/50 - GEAR RATIOS

FIRST	4.584
SECOND	2.964
THIRD	1.912
FOURTH	1.446
FIFTH	1.000
SIXTH	0.746
REVERSE	2.940

RANGE	GEAR	RATIO	SHIFT SOLENOID	1-2-3-4 CL PC SOL 5 N.H.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.L.	LOW REV 4-5-6 CL PC SOL 3 N.H.	4-5-6 CLUTCH	3-5 REVERSE CLUTCH	2-6 CLUTCH	LOW AND REV CL (OWC)	LOW AND REVERSE CLUTCH	1-2-3-4 CLUTCH
PARK	P	—	ON	OFF	OFF	OFF	ON					APPLIED*	
REV	R	2.940	ON	OFF	OFF	ON	ON		APPLIED			APPLIED	
NEU	N	—	ON	OFF	OFF	OFF	ON					APPLIED*	
D	1st Braking	4.584	ON	ON	OFF	OFF	ON				HOLDING†	APPLIED	APPLIED
	1st	4.584	OFF	ON	OFF	OFF	OFF				HOLDING		APPLIED
	2nd	2.964	OFF	ON	ON	OFF	OFF			APPLIED			APPLIED
	3rd	1.912	OFF	ON	OFF	ON	OFF		APPLIED				APPLIED
	4th	1.446	OFF	ON	OFF	OFF	ON	APPLIED					APPLIED
	5th	1.000	OFF	OFF	OFF	ON	ON	APPLIED	APPLIED				
	6th	0.746	OFF	OFF	ON	OFF	ON	APPLIED		APPLIED			

NOTE: EFFECTIVE FINAL DRIVE RATIO – 6T30: 2.84/3.14/3.37/3.72/4.11 – 6T40/45/50: 2.64/2.89/3.23/3.53/3.87

NOTE: FOR SHIFT SOLENOID, "ON" = SOLENOID ENERGIZED (PRESSURIZED), "OFF" = SOLENOID DE-ENERGIZED (NO PRESSURE).

NOTE: FOR PRESSURE CONTROL (PC) SOLENOIDS, "ON" = PRESSURIZED, "OFF" = NO PRESSURE.

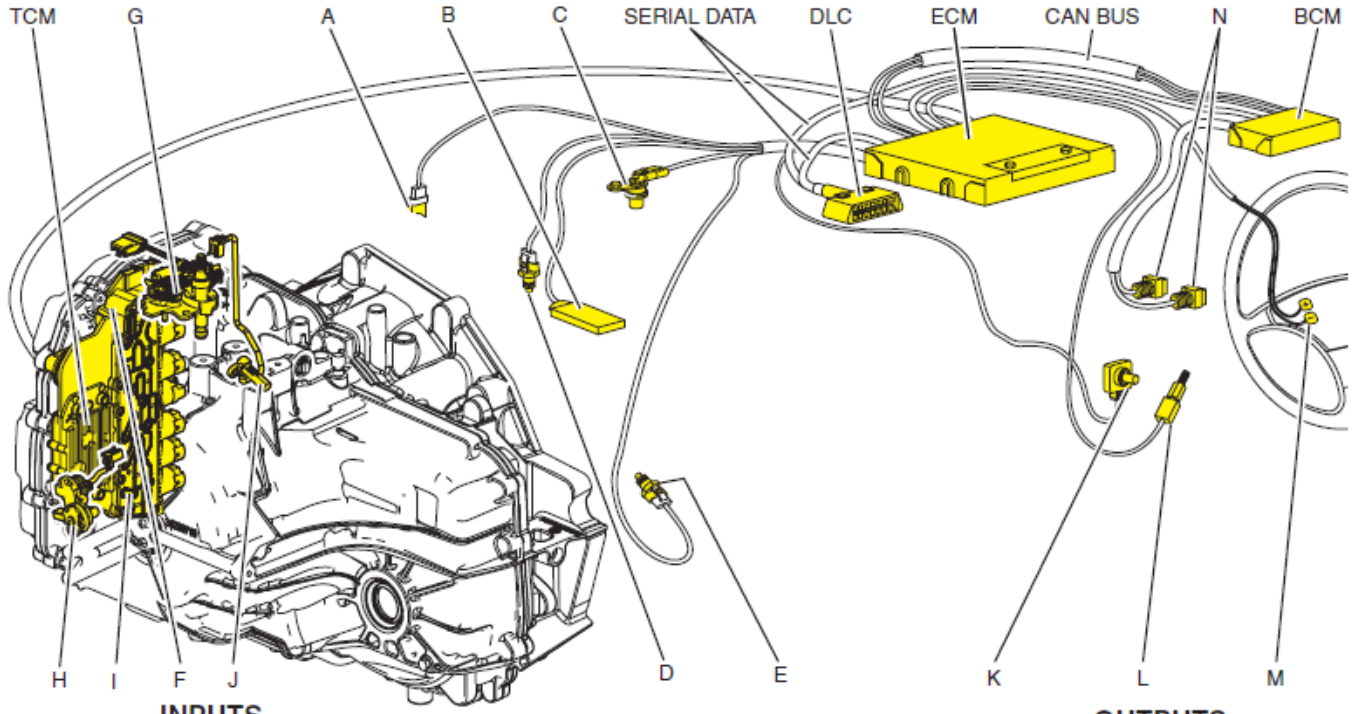
* APPLIED WITH NO LOAD.

† HOLDING BUT INEFFECTIVE.

Knowing what the inputs and output that are involved with the transmission will help with diagnosing.

Codes found in the Body and Electronic Brake and Traction Control Modules may effect transmission performance.

Any engine codes that have a direct effect on engine load will cause the transmission to *not* function properly.



TSB's & Software Updates

Always check for any factory TSB's or Re-flashes before removing the transmission from the vehicle (4 wheel dyno).

Shops have removed a transmission several times to find nothing wrong internally and changed parts to fix a problem. Only to find that the problem could only be fixed by a software update.

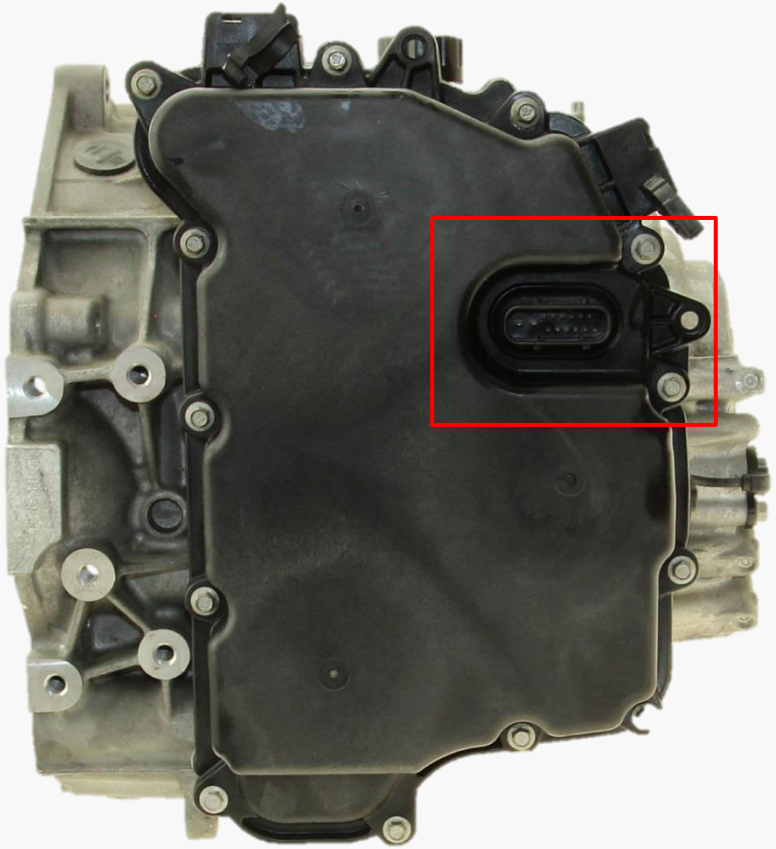
Internal Electronic Component Testing

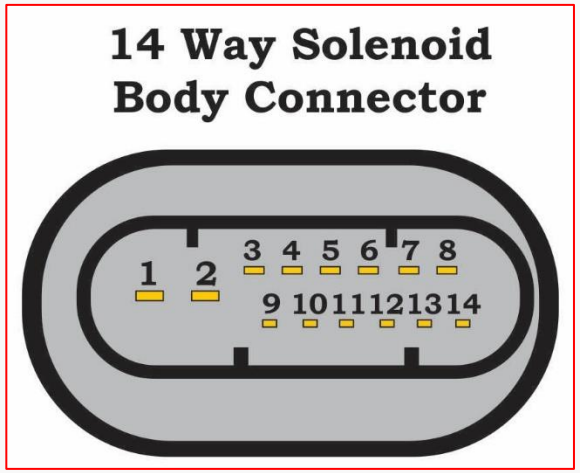
The electronic components are internally connected to the TEHCM.

The only testing here would be for power, ground, brake light, P/N signal and serial data to and to and from the TECHM.

Scan tool data is all we can use to see the solenoid command, Input Speed Sensor (ISS) Output Speed Sensor (OSS) and Internal Mode Switch (IMS) function.

These are best tested in the graphing mode of the scan tool.



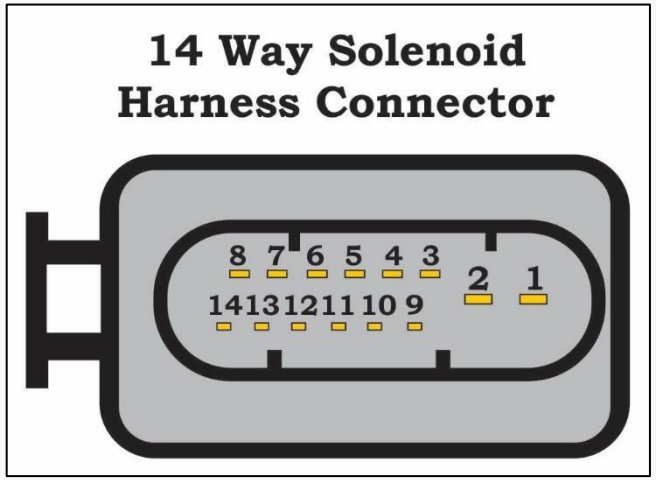


Internal Electronic Component Testing

Here is an example of the harness connector pin identification for a 2010 Chevrolet Cruze with a 1.4L turbo engine.

1 Battery Voltage
2 Ground
3 Park/Neutral Signal
4 Not Used
5 Not Used
6 High Speed GMLAN Serial Data (+)
7 High Speed GMLAN Serial Data (+)
8 High Speed GMLAN Serial Data (-)
9 Not Used
10 Not Used
11 Not Used
12 Ignition Voltage
13 Serial Data
14 High Speed GMLAN Serial Data (-)

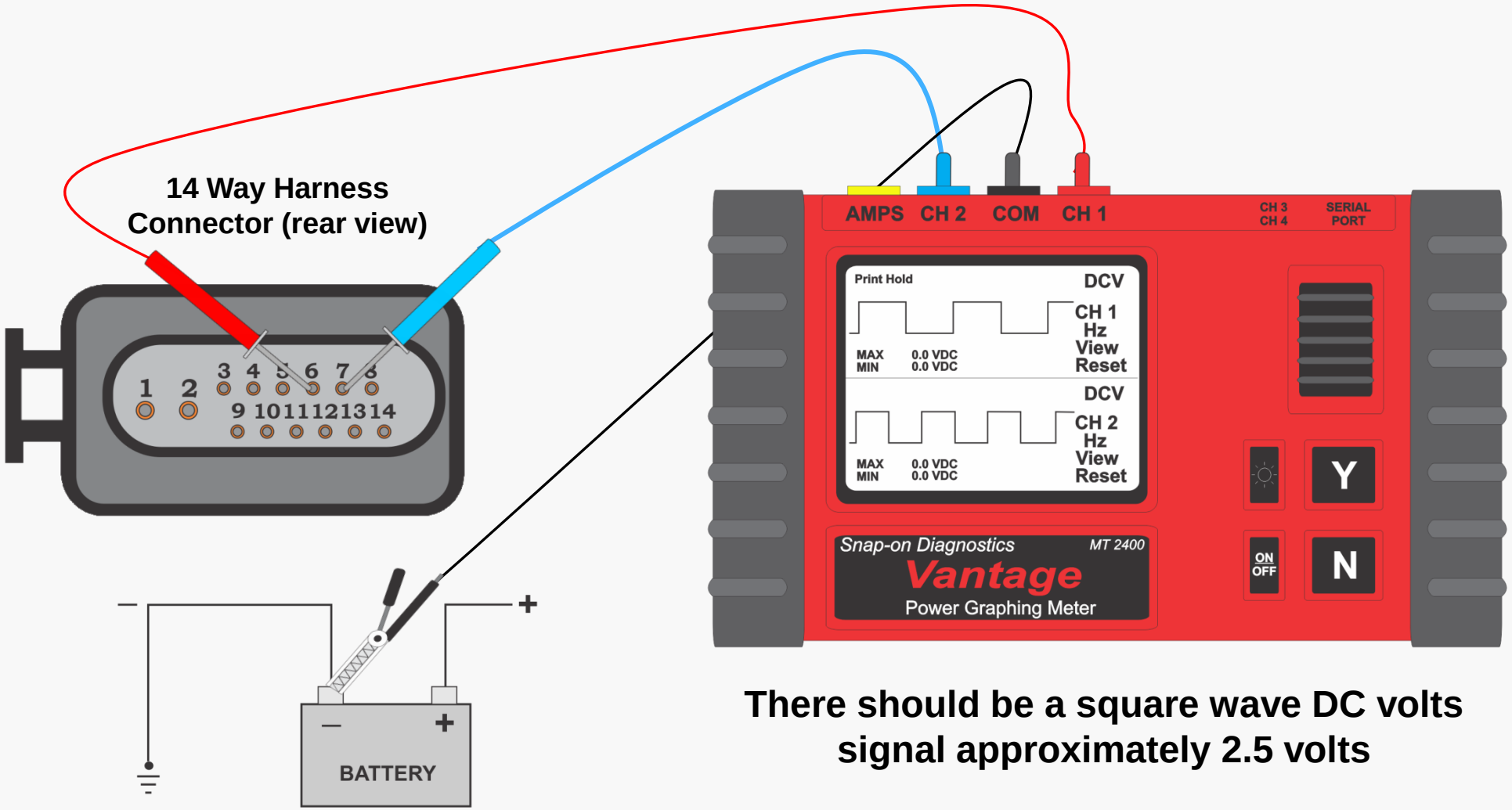
2010 Chevrolet Cruze



Pin ID and location may change with year and model, always verify with factory information.

GMLAN High Speed Serial Data Check

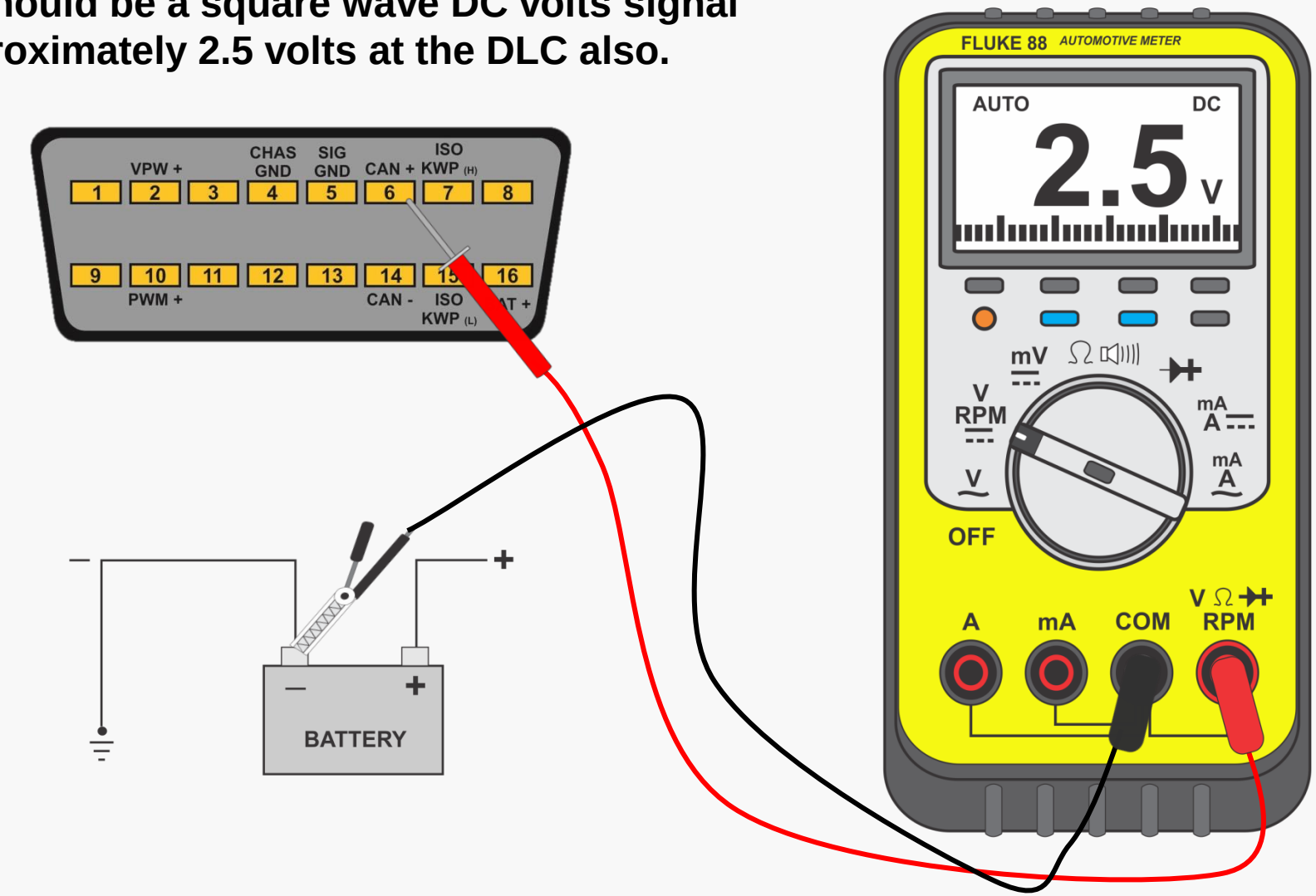
A couple of ways to check problems with data communication. There should be a square wave DC volts signal approximately 2.5 volts (back probed).



There should be a square wave DC volts signal approximately 2.5 volts

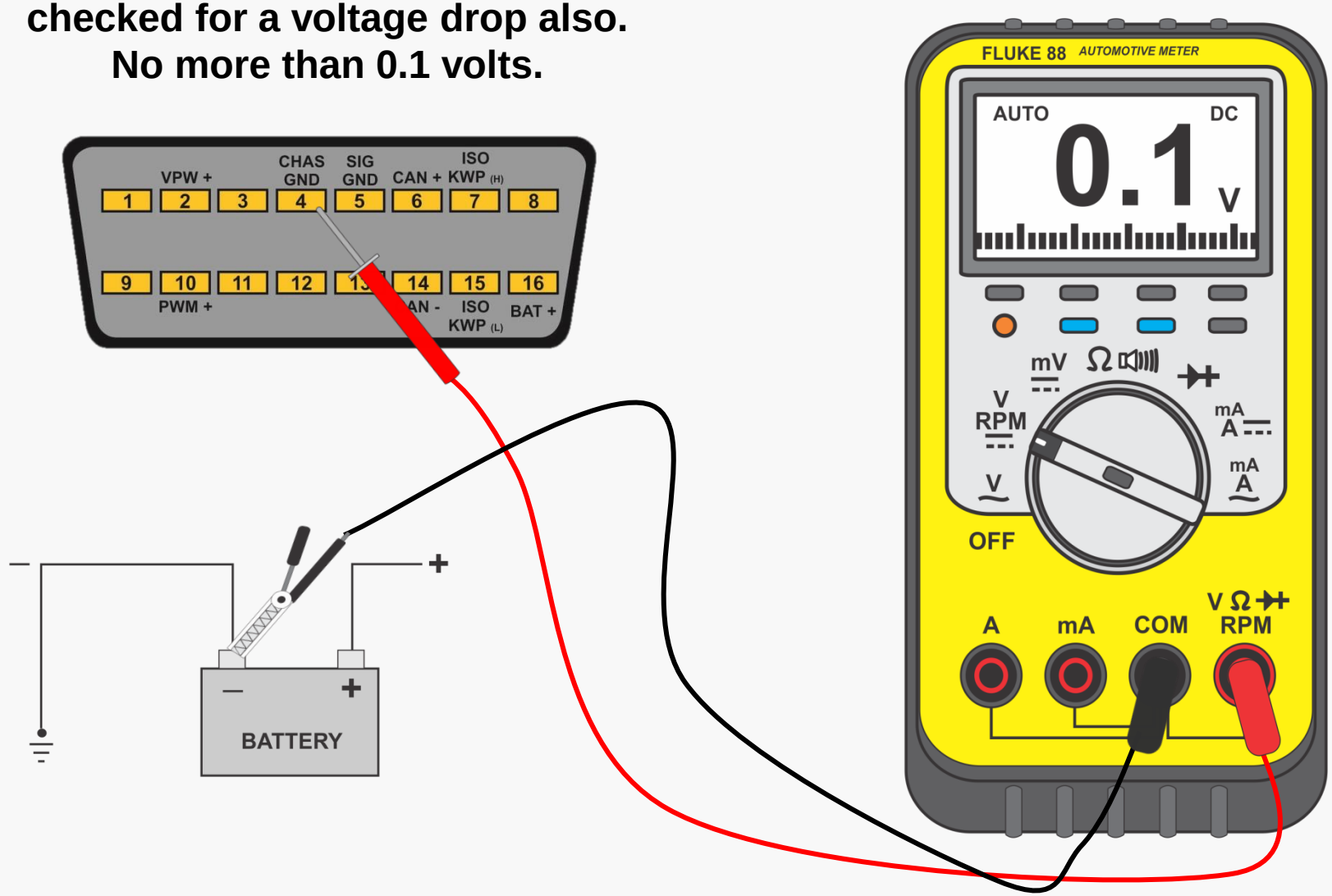
GMLAN High Speed Serial Data Check

There should be a square wave DC volts signal approximately 2.5 volts at the DLC also.



GMLAN High Speed Serial Data Check

The DLC ground circuits pin 4 & 5 should be checked for a voltage drop also.
No more than 0.1 volts.



Internal Electronic Component Testing

The speed sensors are 2 wire “hall effect” style assemblies. The input speed sensor is mounted externally in the case. The wiring runs into the transmission to the TECHM.

The output speed sensor is mounted under the valve body in the case.

The TECHM provides a signal voltage for the sensor operation. As the transmission rotates the sensors will produce a square wave signal.

The TCM will monitor the frequency of the signal to determine the input or output speed.

Input Speed Sensor signals are generated by the rotation of the 3-5-R clutch assemblies and are used to calculate gear ratio and slip rates.

The Output Speed Sensor signal is generated by the rotation of the park gear.

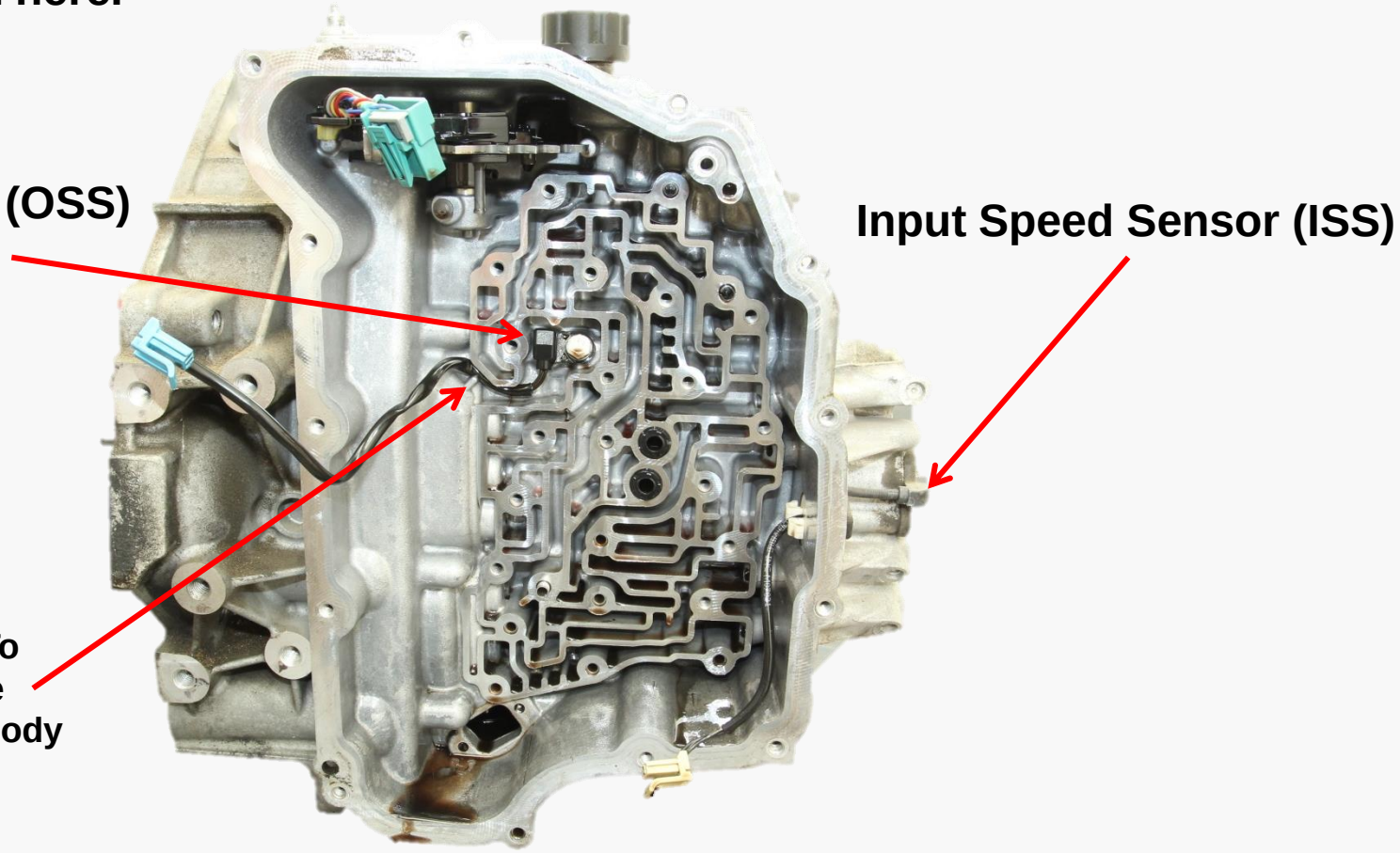
The OSS is used for indicating Vehicle speed for shift pattern control as well as Ratio calculations.

Diagnosis of the speed sensors is accomplished using a signal generator and a scan tool as with the other 6 speed applications.

Internal Electronic Component Testing

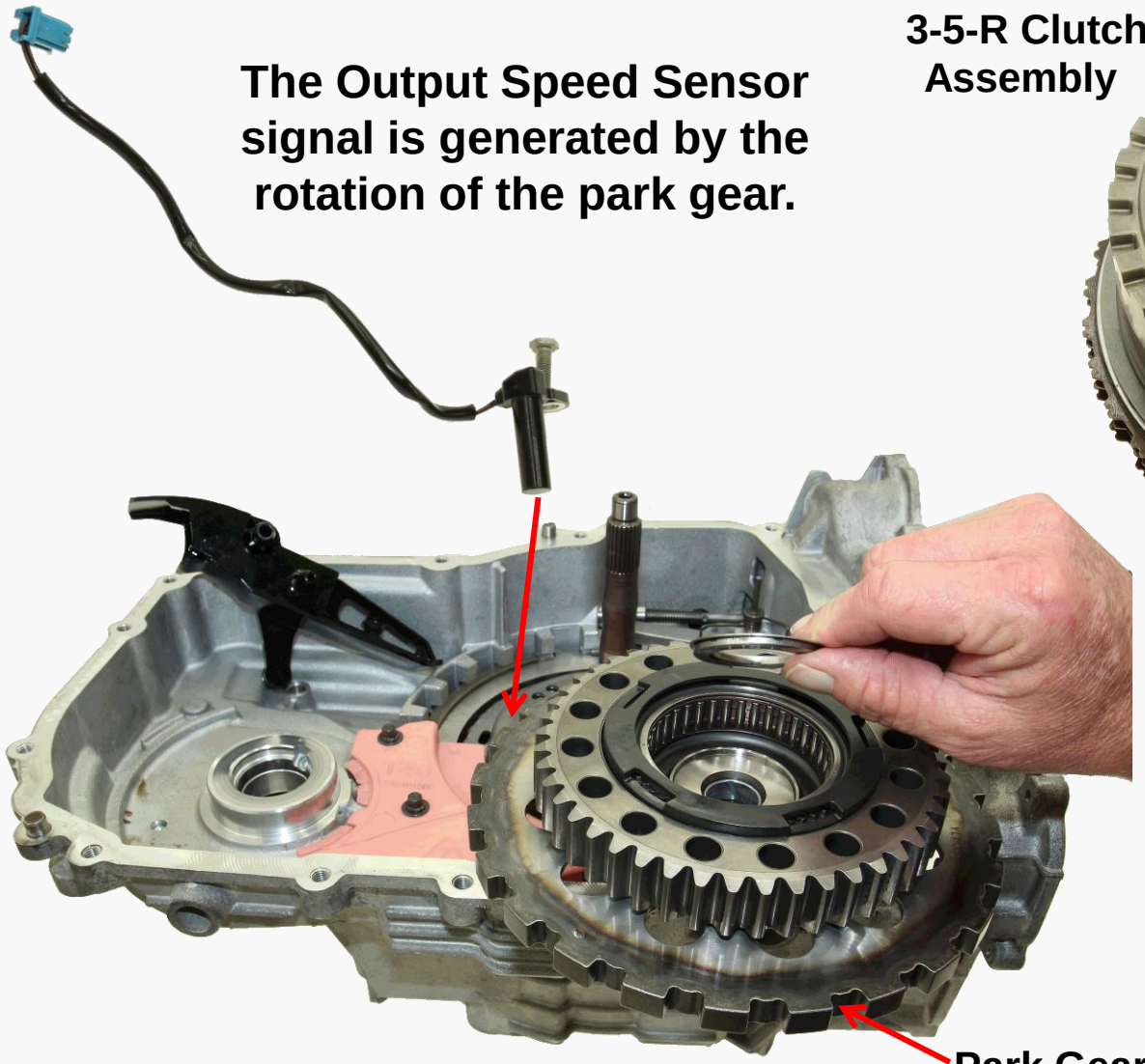
The Input Speed Sensor (ISS) (2 wire Hall effect) is located on the rear cover with the harness routed inside to the TECHM.

The Output Speed Sensor (OSS) (2 wire Hall effect) are located underneath the valve body and TECHM as shown here.



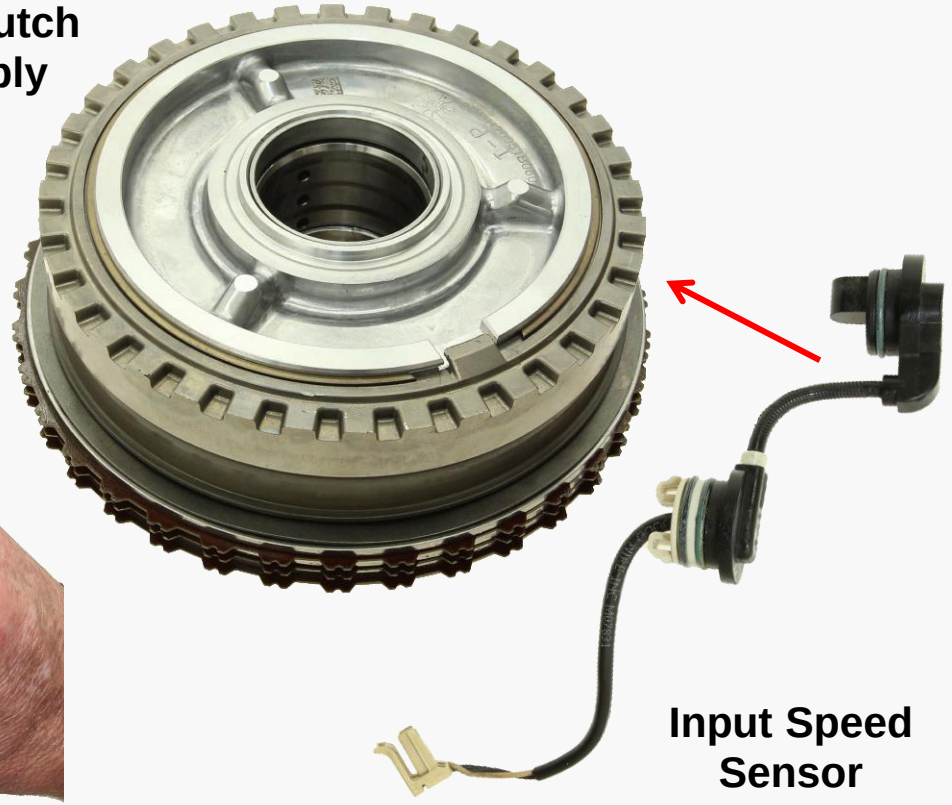
Internal Electronic Component Testing

The Output Speed Sensor signal is generated by the rotation of the park gear.



Park Gear

3-5-R Clutch Assembly



Input Speed Sensor

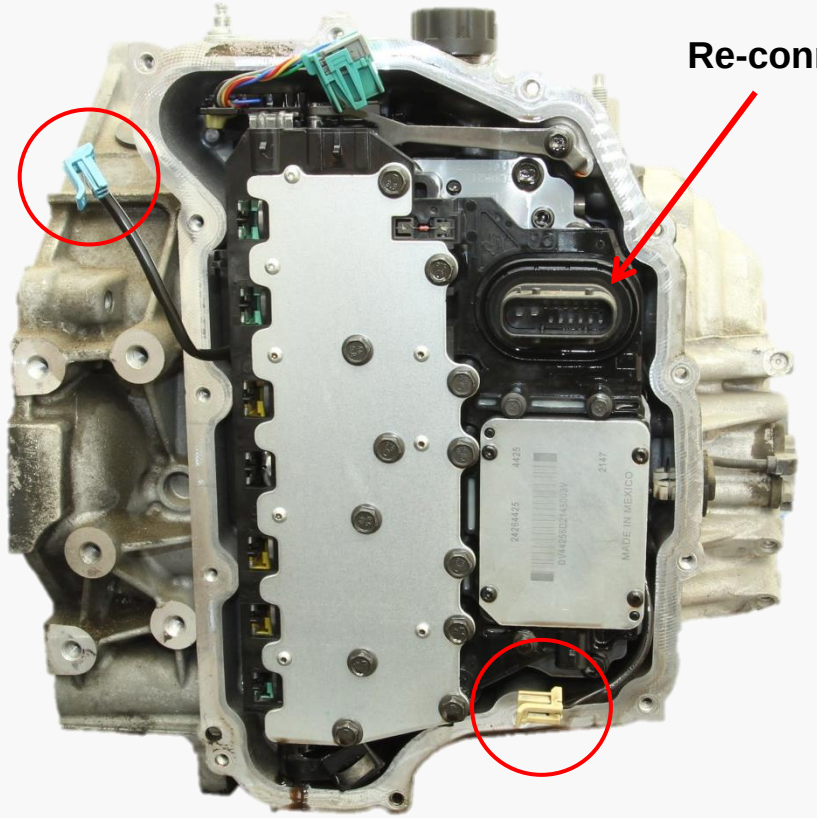
Input Speed Sensor signals are generated by the rotation of the 3-5-R clutch assemblies and are used to calculate gear ratio and slip rates.

Internal Electronic Component Testing

There are some external electronic tests that can be performed before the transmission is removed. A harness off an old speed sensor would be a great tool for this.

The speed sensors can be unplugged and a sensor simulator can provide a signal to the TECHM while the information can be monitored on scan tool data.

Then it can be verified if the TECHM can read the signal.

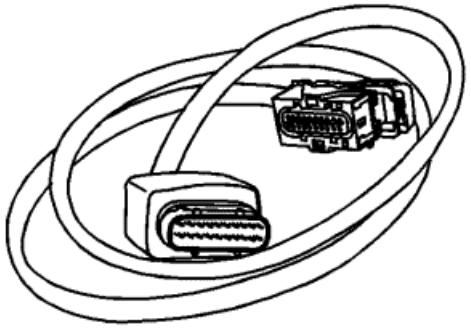


Sensor Simulator

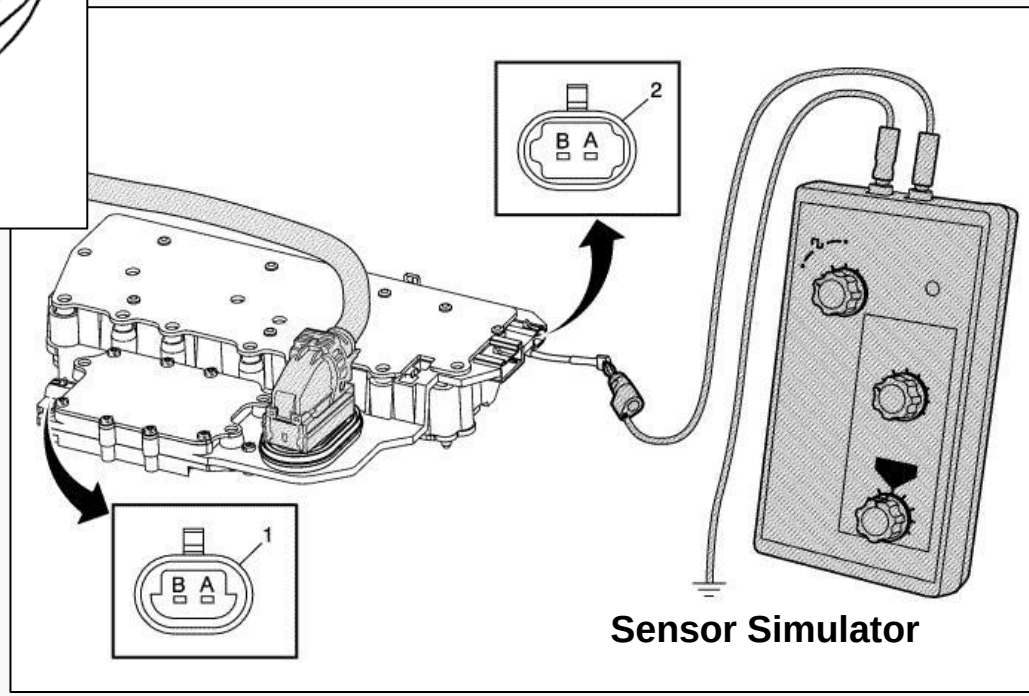
Internal Electronic Component Testing

This process can also be performed on the bench as well with a Kent Moore DT48616-10 adapter cable.

DT48616-10



Solenoid cleaning procedure has been removed from the GM Tech2 in 2009



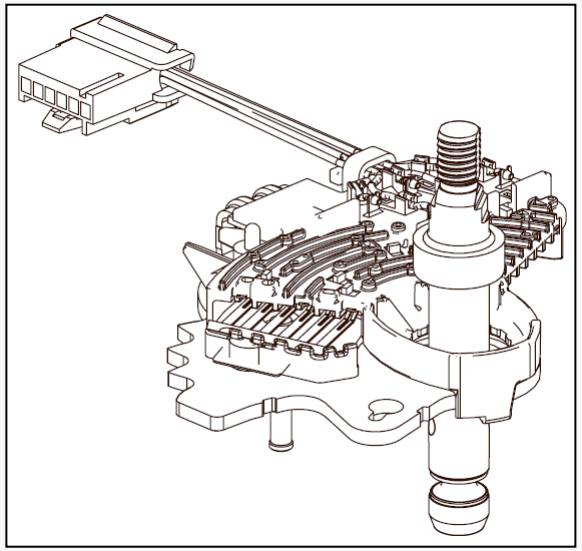
Sensor Simulator

Internal Electronic Component Testing

The 6T40/6T45 Internal Mode Switch is connected mechanically to the manual shaft similar to the 4T65E application.

Electrically the IMS operates similar to other GM IMS applications. The TCM sends a bias voltage to the IMS on 4 circuits, A, B, C, P. Pin N is used for Park/Neutral starting operations and is supplied by the ECM. As the range selector is moved the IMS will ground/unground the circuits or circuit required to indicate the specific manual valve position.

By monitoring the voltage sequence produced, the TCM will be able to identify the range that was selected.



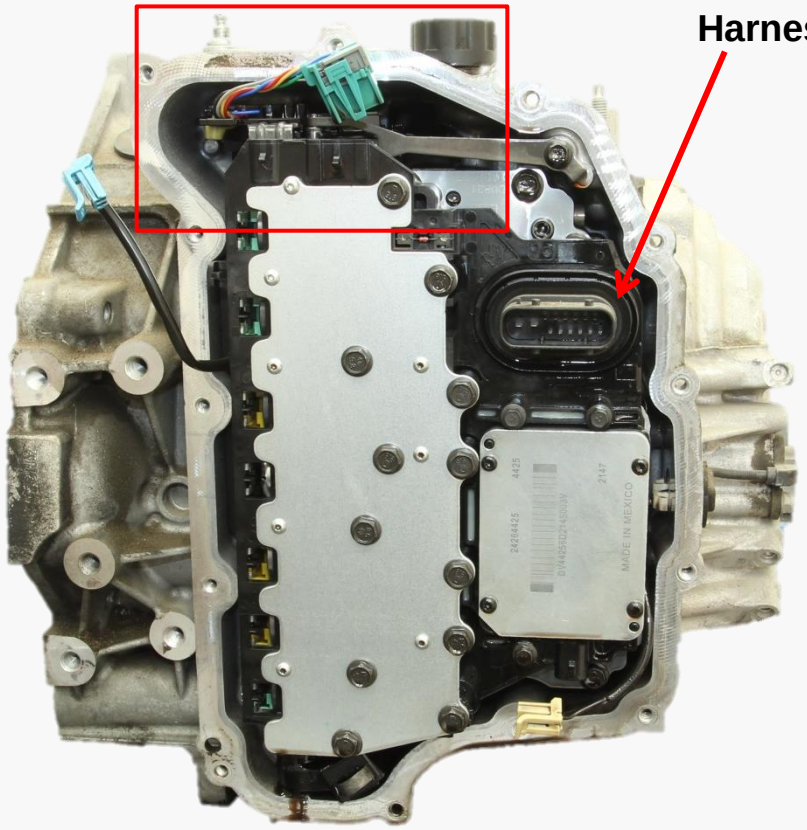
Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park	LOW	HI	HI	LOW
Park/Reverse	LOW	LOW	HI	LOW
Reverse	LOW	LOW	HI	HI
Reverse/Neutral	HI	LOW	HI	HI
Neutral	HI	LOW	HI	LOW
Neutral/Drive 6	HI	LOW	LOW	LOW
Drive 6	HI	LOW	LOW	HI
Drive 6/Drive 4	LOW	LOW	LOW	HI
Drive 4	LOW	LOW	LOW	LOW
Drive 4/Drive 3	LOW	HI	LOW	LOW
Drive 3	LOW	HI	LOW	HI
Drive 3/Drive 2	HI	HI	LOW	HI
Drive 2	HI	HI	LOW	LOW
Open	HI	HI	HI	HI
Invalid	HI	HI	HI	LOW
Invalid	LOW	HI	HI	HI

HI = Source voltage
LOW = 0 volts

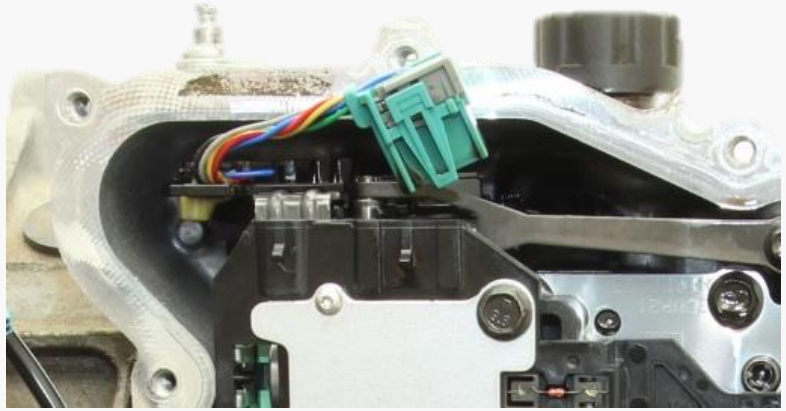
Internal Electronic Component Testing

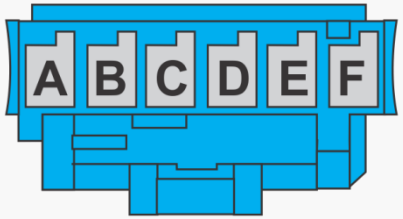
The IMS can also be tested while still in the vehicle.

With the IMS disconnected jump ground the pins on the TECHM while monitoring the scan tool data with the key on engine off (KOEO). The external case harness has to be connected.



Disconnect IMS





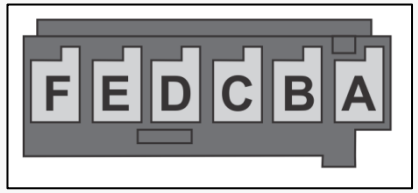
IMS Harness Connector

Internal Electronic Component Testing

Simultaneously supply a ground to the IMS pins in the TECHM and check the chart with scan tool data to confirm proper operation.

A = Ground
B = Mode Switch Signal "P"
C = Mode Switch Signal "C"
D = Mode Switch Signal "B"
E = Mode Switch Signal "A"
F = P/N Start Signal "N" to ECM

TECHM IMS Pins



A harness cut from an old IMS would work great for doing this test.

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park	LOW	HI	HI	LOW
Park/Reverse	LOW	LOW	HI	LOW
Reverse	LOW	LOW	HI	HI
Reverse/Neutral	HI	LOW	HI	HI
Neutral	HI	LOW	HI	LOW
Neutral/Drive 6	HI	LOW	LOW	LOW
Drive 6	HI	LOW	LOW	HI
Drive 6/Drive 4	LOW	LOW	LOW	HI
Drive 4	LOW	LOW	LOW	LOW
Drive 4/Drive 3	LOW	HI	LOW	LOW
Drive 3	LOW	HI	LOW	HI
Drive 3/Drive 2	HI	HI	LOW	HI
Drive 2	HI	HI	LOW	LOW
Open	HI	HI	HI	HI
Invalid	HI	HI	HI	LOW
Invalid	LOW	HI	HI	HI

HI = Source voltage
LOW = 0 volts

Internal Electronic Component Testing

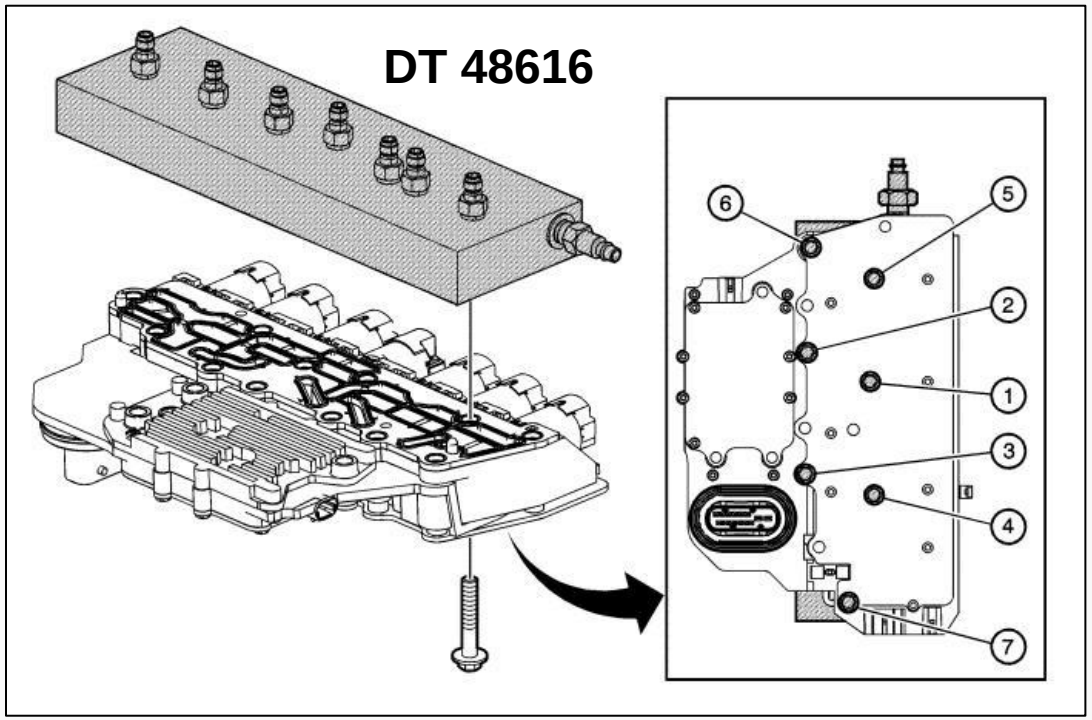
One important test often overlooked during diagnosing a 6T40 with solenoid functional codes present not electrical.

An automated process is available that aids in cleaning debris from the solenoid assembly. A capable scan tool will instruct the TCM (TEHCM) to cycle the solenoids while the system is pressurized to clean the solenoids. The transmission does not need to be disassembled to perform the cleaning process.

Simply follow the instructions on the scan tool to activate the cleaning program. This process should be completed prior to attempting to diagnose the transmission. If the cleaning process is unsuccessful then you should diagnose the concern with Kent Moore DT47825 tool kit.

Internal Electronic Component Testing

This process can also be performed on the bench as well with the Kent Moore DT47825 test tool kit and scan tool.



Kent Moore DT47825

Internal Electronic Component Testing

Remove the Control Solenoid Valve Assembly from the transmission. Install tool DT 48616 onto the Control Solenoid Valve Assembly (5Nm 44 Lb In). Apply regulated shop air (90-100 psi) to the tool. Connect the scan tool to the Control Solenoid Valve Assembly using cable DT48616-10.

Command the solenoid ON/OFF air pressure should be present on the gauge and then it should exhaust as the solenoid is cycled. If the solenoid or valve are malfunctioning the gauge pressure will not change as you cycle the solenoid. If a malfunction is determined to be present, replace the complete Control Solenoid Valve Assembly.

If the solenoid checked OK, install the gauge on another solenoid port and command that solenoid ON/OFF with the scan to repeat the process.

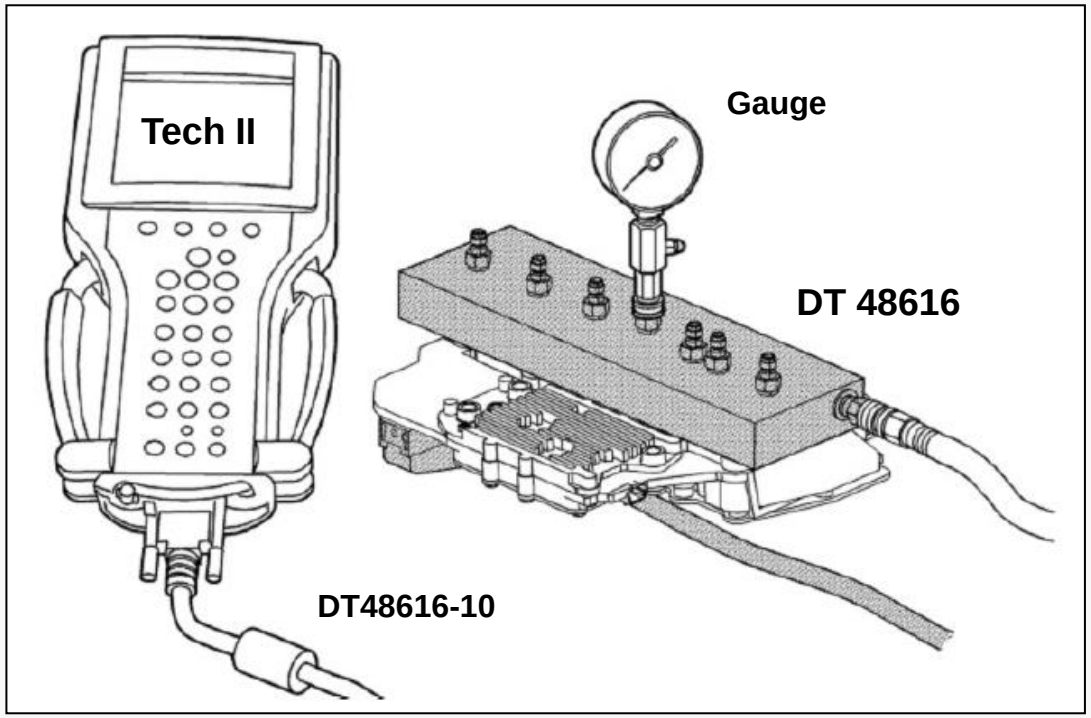
COMPONENT	PORT ON TEST BLOCK	Key On, Engine Off (KOEO) Normal State
PC Solenoid 2, 35R	F	Full PSI flow to gage
PC Solenoid 3, R1/456	G	Full PSI flow to gage
PC Solenoid 4, 2-6	B	No PSI flow to gage
PC Solenoid 5, 1234	C	No PSI flow to gage
Shift Solenoid	D	Full PSI flow to gage
Line Pressure Control Solenoid	A	Full PSI flow to gage
TCC PC Solenoid	E	No PSI flow to gage

Internal Electronic Component Testing

NOTE: The TCM (TEHCM) will normally cycle several of the solenoids ON/OFF to help keep the solenoids and the valves free of debris.

Therefore this cleaning function (Dither) may cause the gauge to flicker when the TCM is cleaning the solenoid you are testing.

Do not operated the solenoids for longer than 2 minutes or damage may occur.



False Solenoid Performance Codes

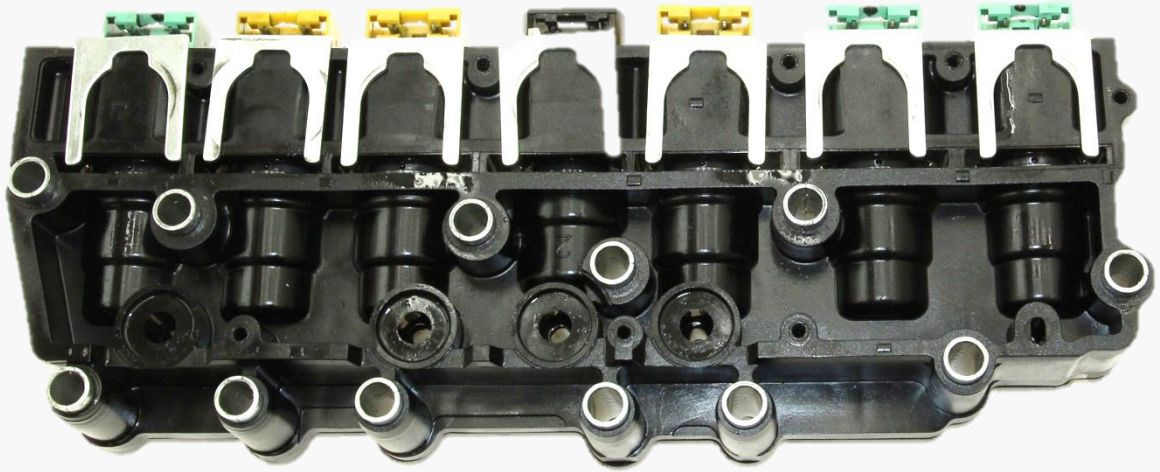
There may be times when there is a solenoid performance code is caused by a problem with the pressure switches found on the GEN I models. Eliminated on GEN II models in 2012.

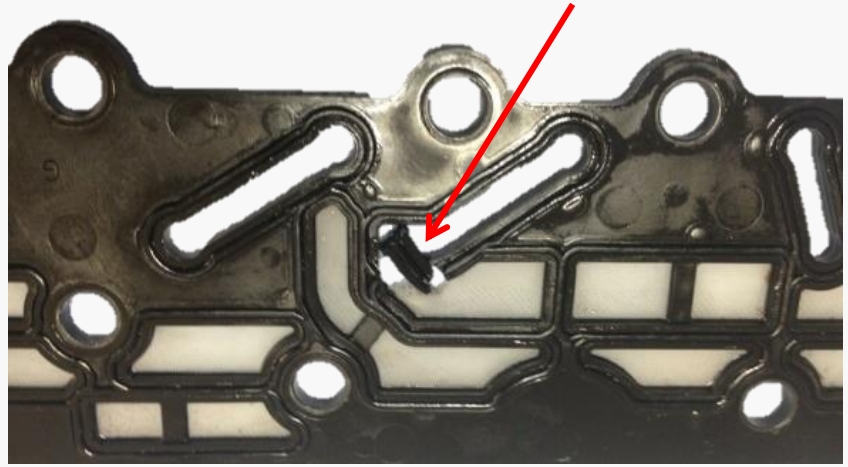
Any solenoid performance code found on any models vehicle can be caused by any type of pressure leak in the clutch circuit controlled by the solenoid in question.

In this case the code was caused by a leak in the pressure switch circuit by a failed solenoid gasket.

The code can also be caused by a failed TECHM.

GEN II





The early gasket will work on all GEN I, II & III models.

False Solenoid Performance Codes

There are repair kits available in the aftermarket for the GEN I pressure switches.

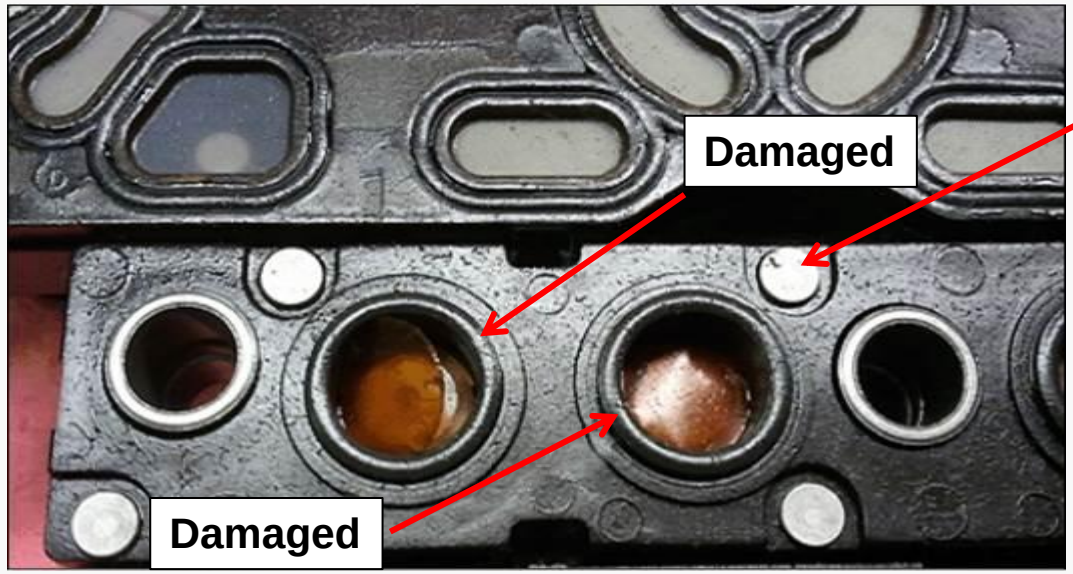
The pressure switches were eliminated in 2012 because of an excessive failure rate.

One issue is the pressure switch retaining rivets become loose.

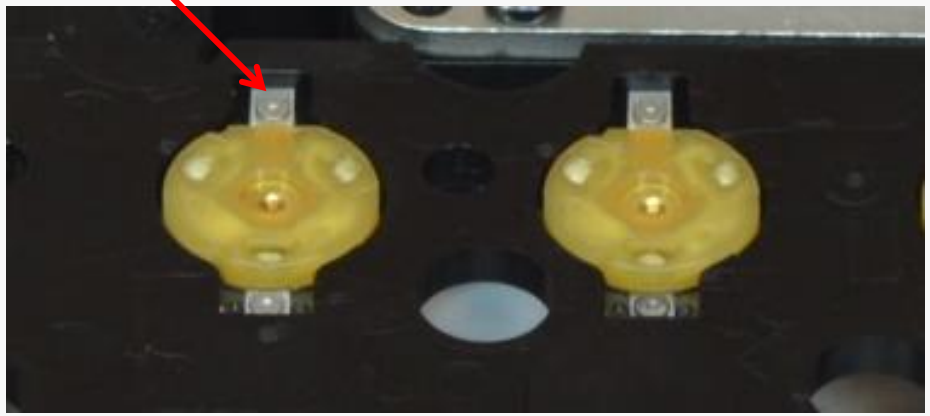
When repair existing pressure switches always check for loose rivets.

Replace switches (part of the TECHM) when necessary.

GEN I

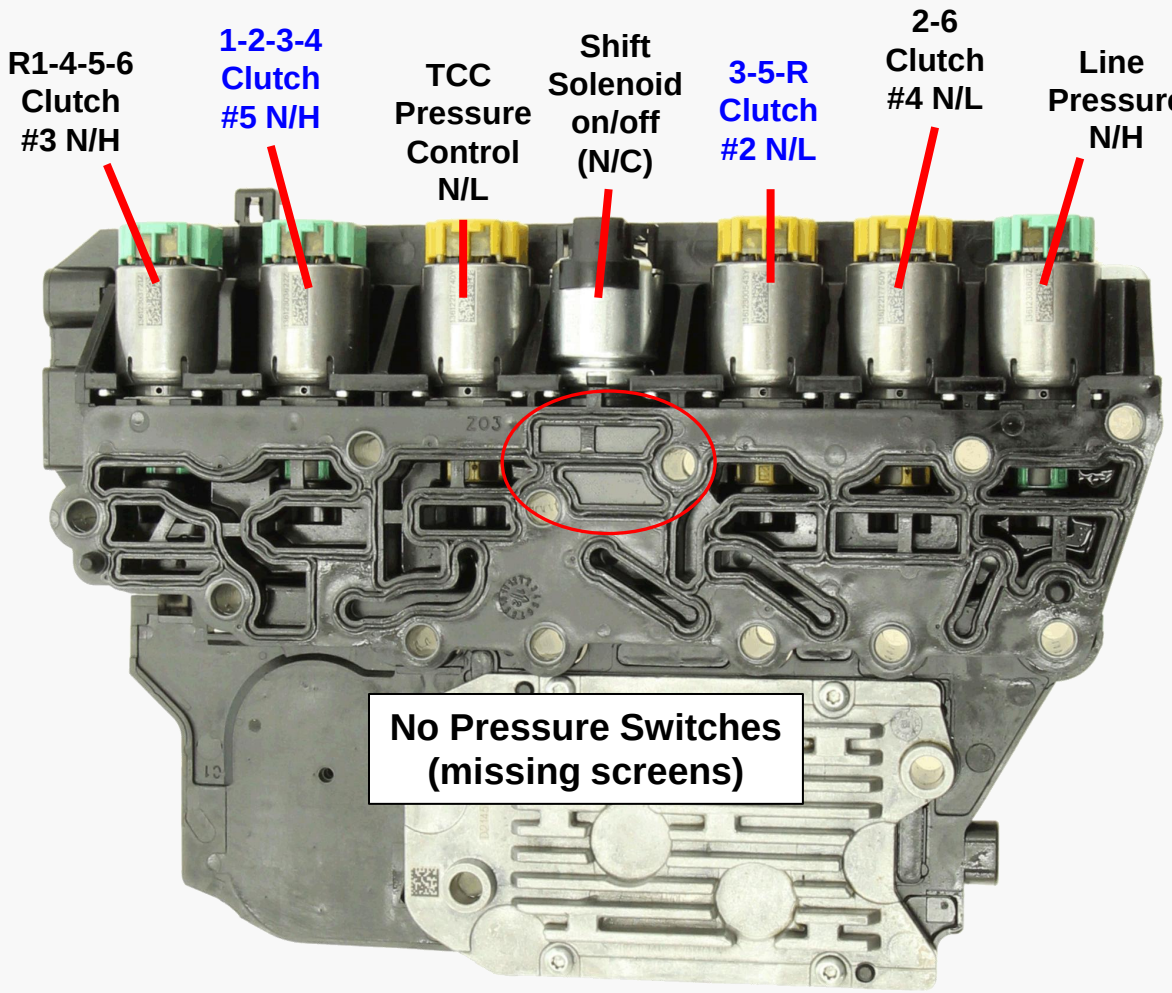


Loose Rivets



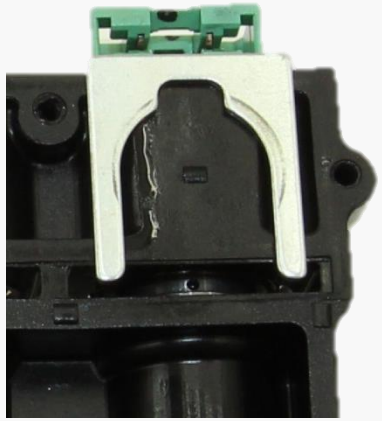
Solenoid Information

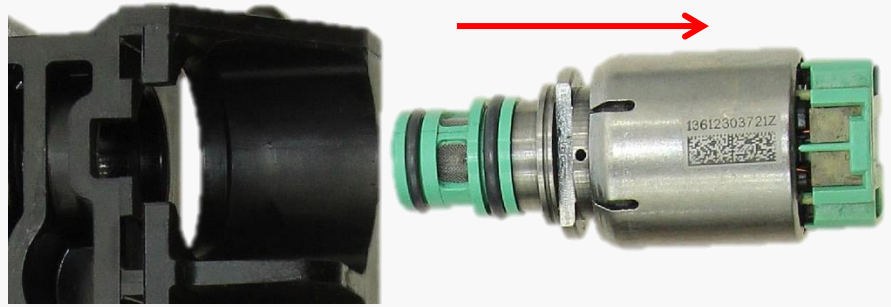
Unlike the Ford version of this transmission (6F35) or the GM 6T70 series, these solenoids <u>can be</u> removed. The solenoids can be checked or moved as a test to another location with the same connector color (normally high or low).



GEN II

Remove Retainer





Available separately from the aftermarket

No Forward Reverse Ok

When this symptom arrives at your shop and the IMS and solenoid signal (command) data looks fine on the scan tool. After checking all the power and grounds to the transmission, the only choice we have is to replace the TECHM.

Well, one did come in with this symptom and the (#5) 1-2-3-4 Clutch Pressure Control solenoid (N/L) was swapped with the (#4) 2-6 Clutch Pressure Control solenoid (N/L).

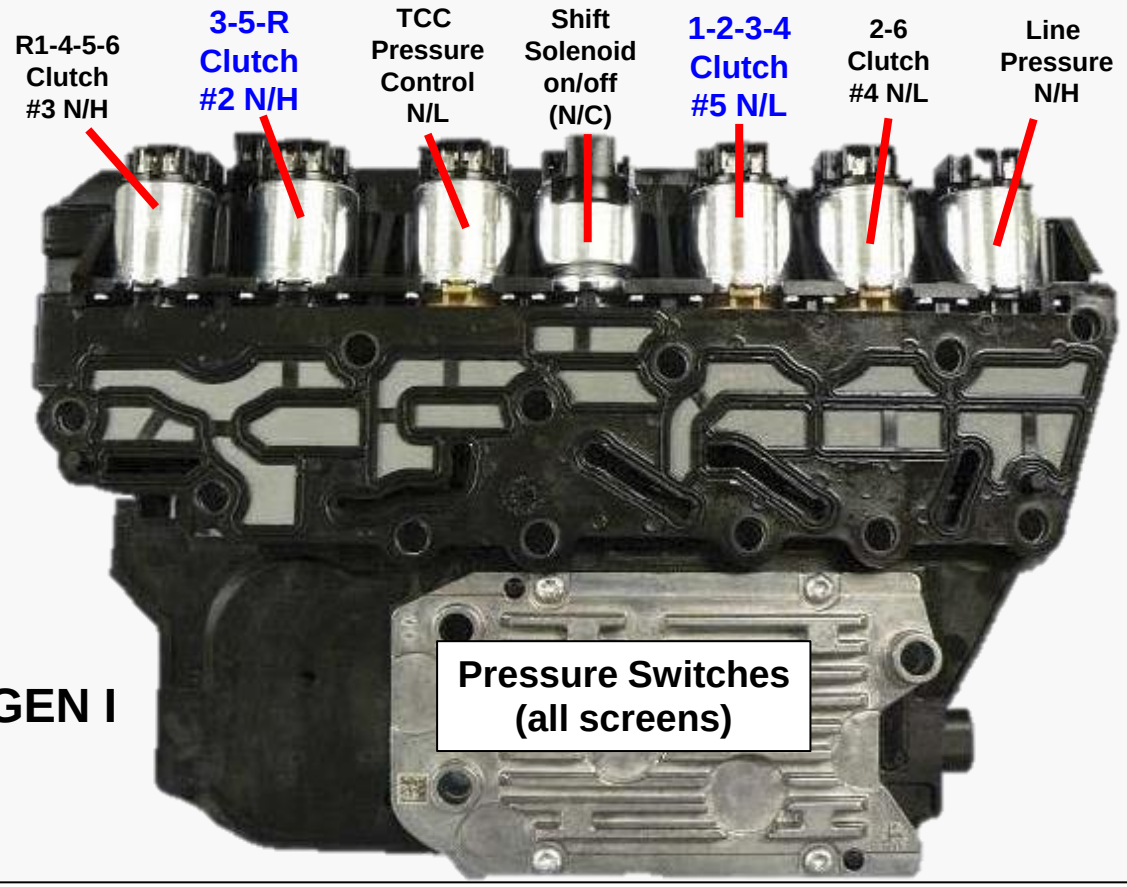
The vehicle then had forward but no 2nd or 6th gear.

With this simple test the end result was to replace the 1-2-3-4 PC Sol. #5.

Saving time and money on a new TECHM.

Note: connector color is just for factory identification of solenoid supplier that made the solenoid for General Motors.

Replacement solenoid connector color may be different.



GEN I

DTCs Set After TEHCM Replacement

After swapping TEHCMs from another application or installing a new or reman TEHCM you may have a DTC P0713/ P06AE set.

The transmission may exhibit numerous other symptoms such as transmission temperature reading -25 to -40 and major operational issues as the 1-2-3-4 and 3-5-R solenoids have changed position from GEN 1 to GEN 2/GEN 3 (shown previously).

Gen 1 and Gen 2 transmissions use the same RPO codes.

The generation of transmission can be determined by inspecting the parts/components (No pressure switches on GEN 2, or by looking at positon #8 of the bar code number stamping on the TCM, Number = GEN 1, Letter = GEN 2)

It can also be determined by using a scan tool while the transmission is still in the vehicle.

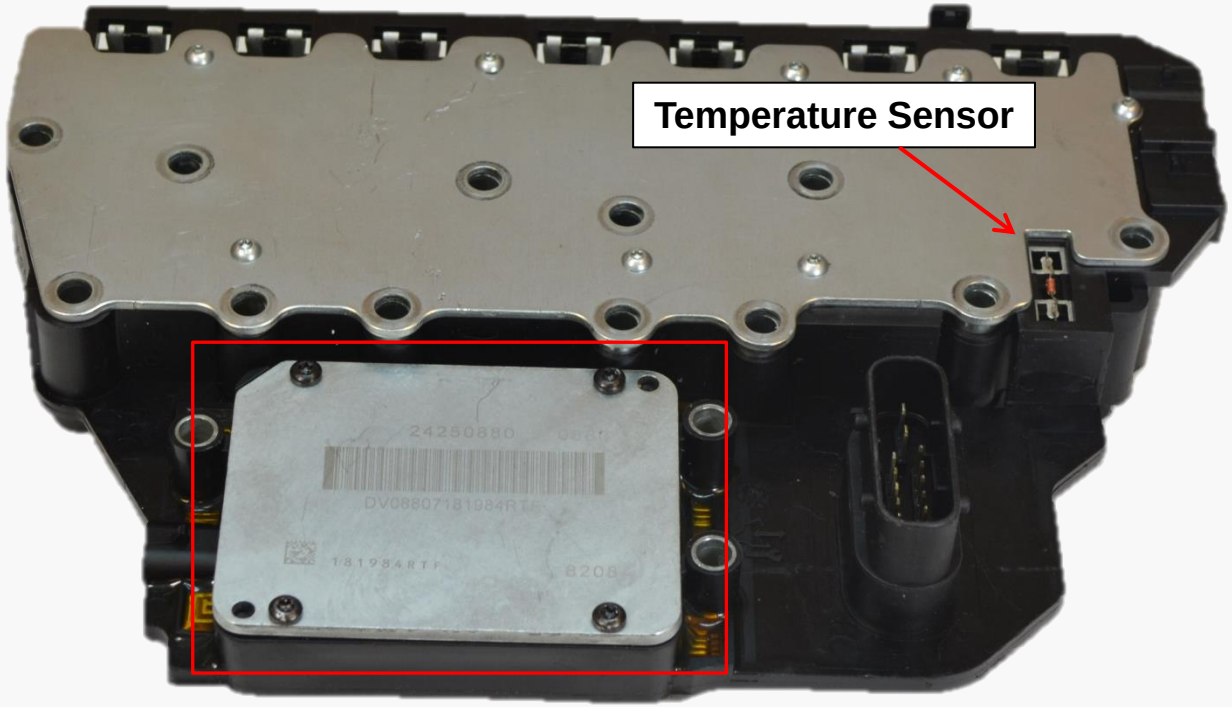
Using your scan tool see if DTC P0842 or any of the other pressure switch DTCs that were previously used are listed as a valid or invalid code.

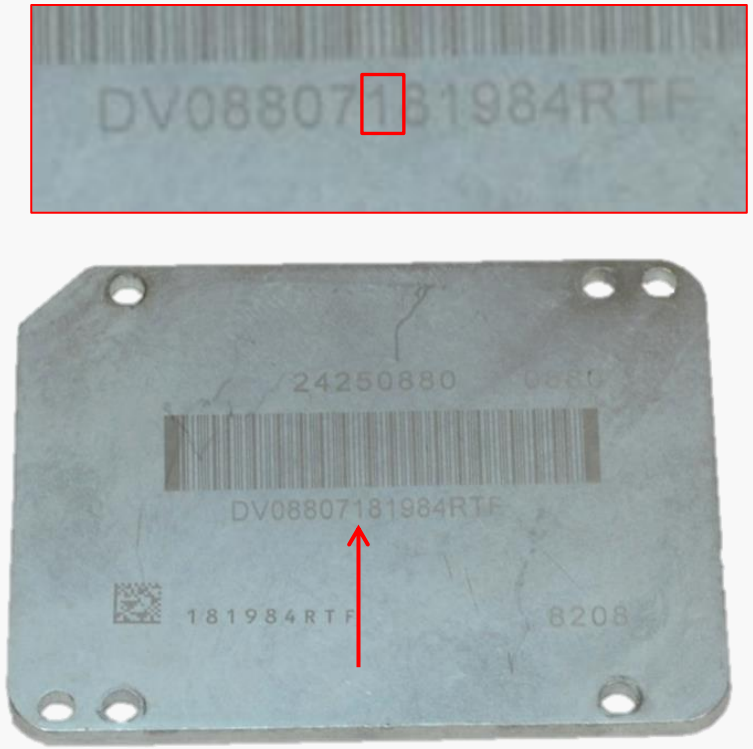
If pressure switch DTCs display as valid, the transmission is a Gen 1. If DTC shows invalid, the transmission is a Gen 2 or GEN 3.

DTCs Set After TEHCM Replacement

GEN I & GEN II TECHM can be Identified by the 8th digit on the cover. If it's a letter it's a GEN I a number it's a GEN II.

GEN I





Valve Body Problems

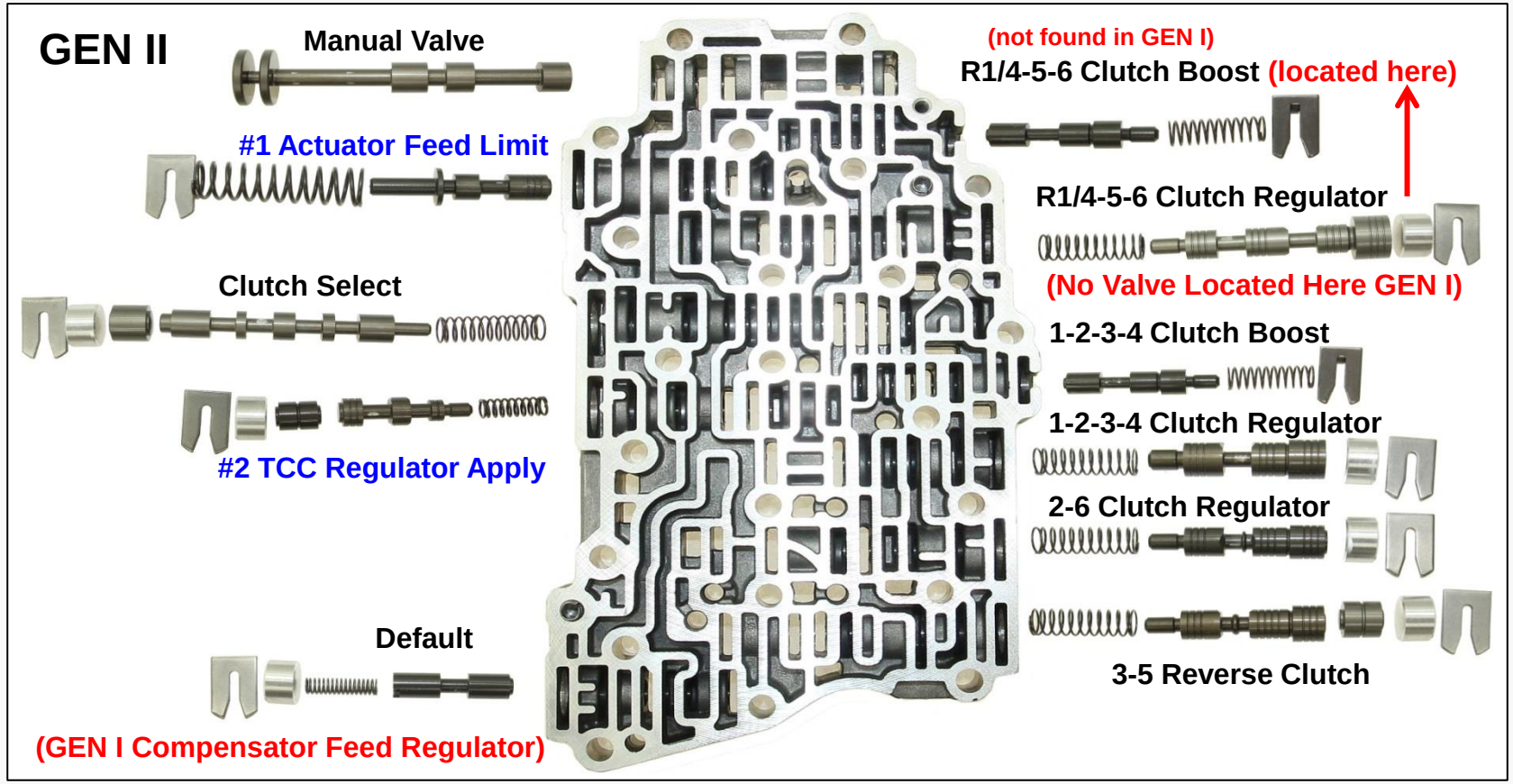
The 3 most common valve or valve bore wear areas are (most transmissions):
1: Actuator Feed Limit
2: TCC Regulator
3: Line Pressure (next page)

In that order.

Always check all valves and bores for wear.

Note:
GEN I valve body only has 10 valves, 1 valve is located in different position while another valve has changed on GEN 2 models.

Hydraulics change in 2012 GEN 2.

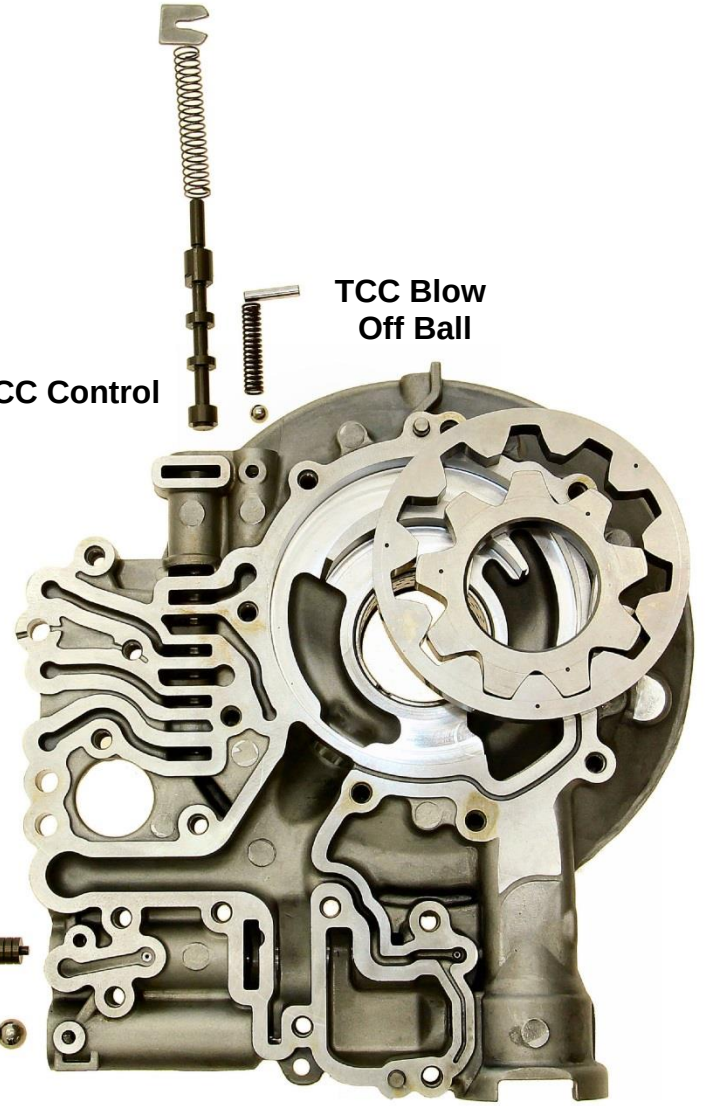


Valve Body Problems

Inspect valves and bores carefully for any damage or wear

GEN I & II

GEN III Off Axis Chain Driven (similar to 6T70)



False Solenoid Performance Codes

A code P2723 Pressure Control Solenoid #5 fault can be caused by a crack found on 1-2-3-4 clutch bonded (molded) apply piston.

Closely look at the piston for any cracks or defects.

These bonded pistons should be changed during overhaul.

1-2-3-4 Clutch Apply Piston Located On This Side (bonded)

Low/Reverse Clutch Apply Piston Located On This Side (bonded)

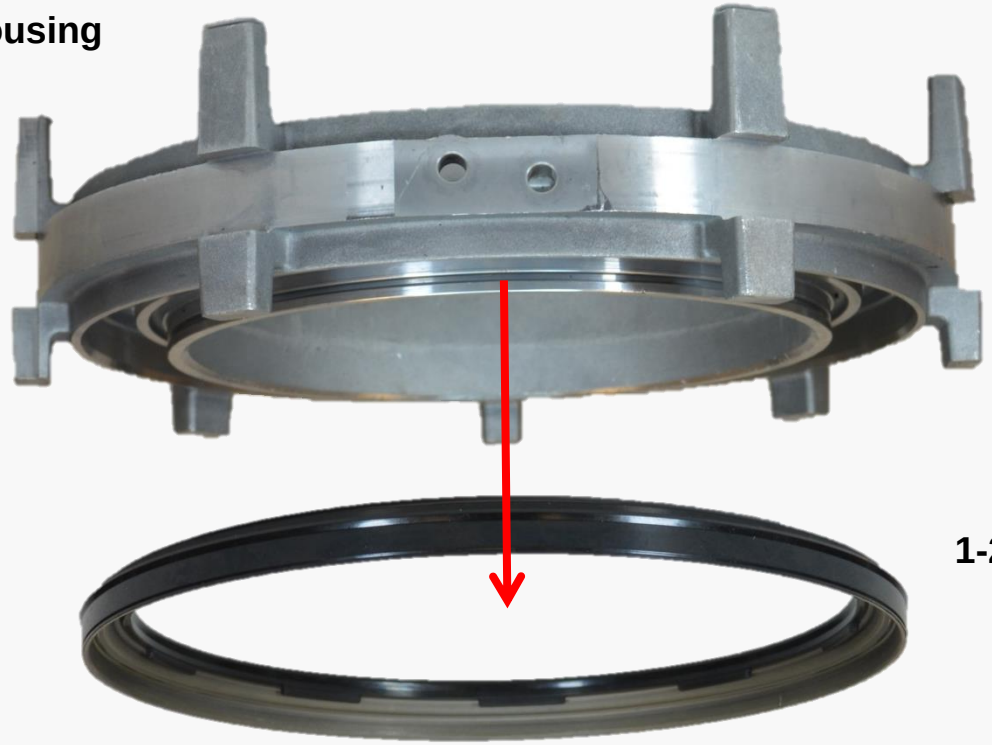
Falling Out Of Gear At A Stop

A vehicle may arrive at your shop with this complaint hot and/or cold.

Check the 1-2-3-4 molded (bonded) apply piston seal, it may have shrunk (new or original).

If so there will be no resistance; the piston may just fall into or out of the housing.

1-2-3-4 Clutch / L-R Housing



1-2-3-4 Clutch Apply Piston (Bonded)

Falls Out

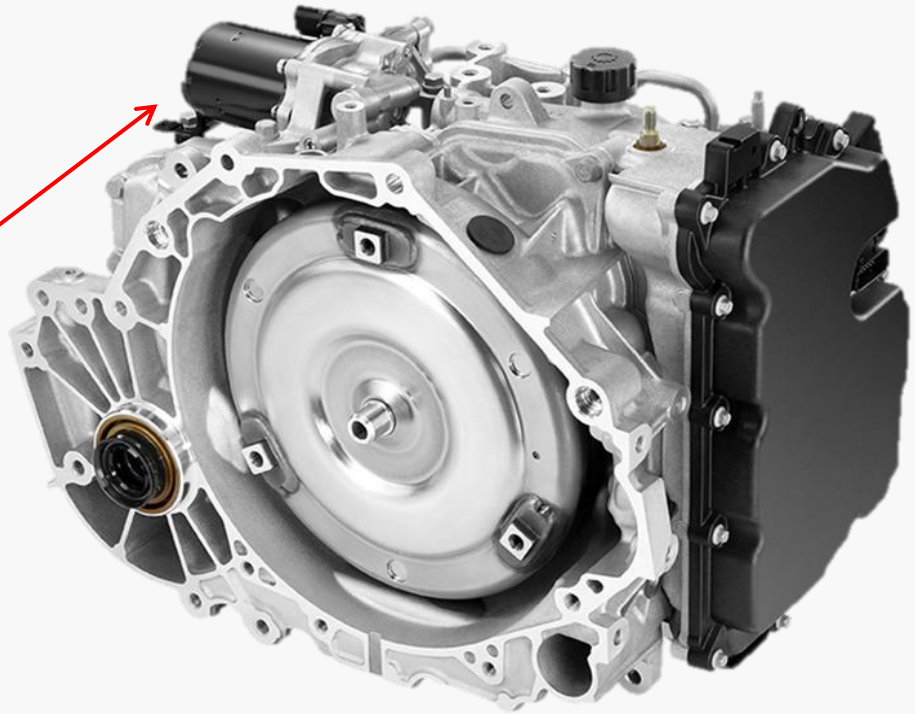
Hybrid (RPO KL9) Start/Stop Feature No Longer Operates After Repairs, No Codes Set

Several different GM applications including the Chevrolet Cruz, Malibu, Cadillac ATS, CTS, CT6, XT5, GMC Acadia and the Buick Encore and Envision may be equipped with a "Hybrid" transmission as well as "Hybrid engine/electrical systems.

On these applications the Battery Sensor Module may lose its memory which disables the Start/Stop feature.

Start / Stop Feature

#2 BAS Hybrid Pump (top of case above differential)



Hybrid (RPO KL9) Start/Stop Feature No Longer Operates After Repairs, No Codes Set

The battery sensor module will need to be relearned for the transmission/vehicle start/stop function to operate correctly.

To relearn the battery sensor module you can:

- **Use a scan tool to relearn the values.**
- **Leave the vehicle set for a minimum of 3 hours after the modules on the vehicle have gone to sleep.**

This process triggers the battery sensor module to relearn its values.

Axle Seal Leaks

Both the GM 6T40 and Ford 6F35 series transmissions have chronic complaints of driver's side axle seal leaks. This is due to an inadequate amount of surface area to support the axle.

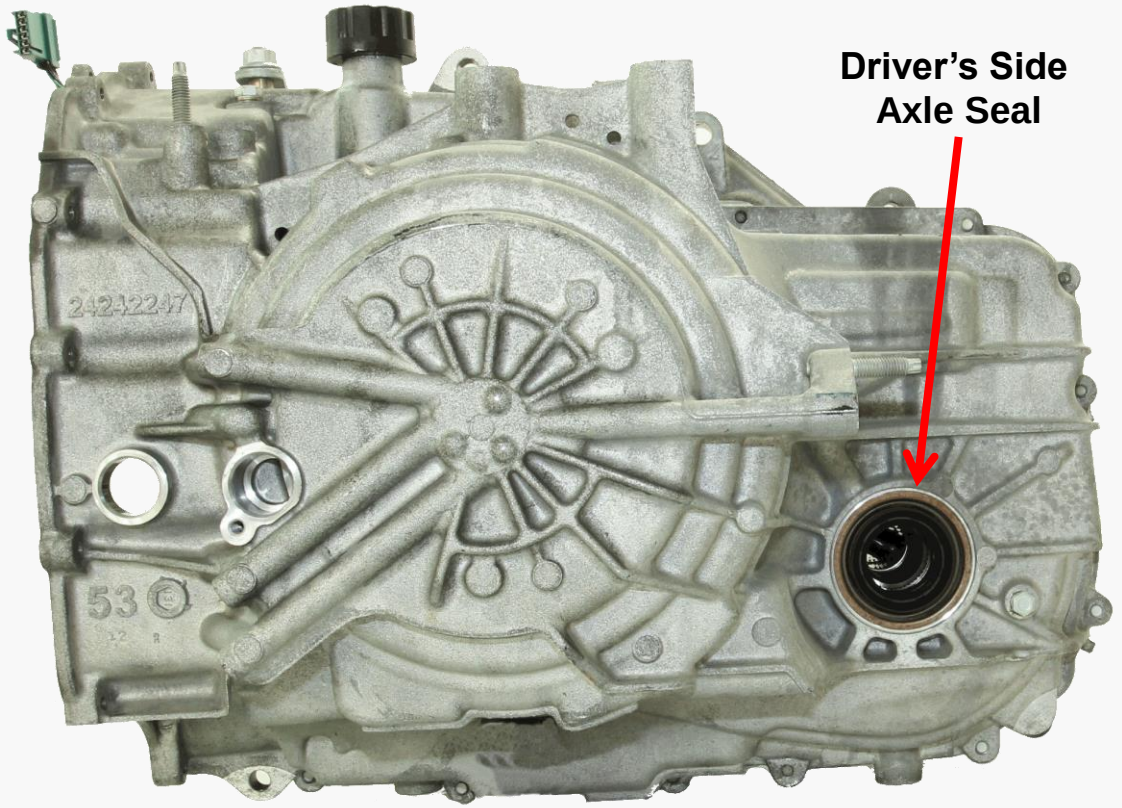
This is caused by a worn axle bushing in the case.

This would normally require the entire transmission to be disassembled to replace the bushings.

There are aftermarket tool kits to perform the repair without removing the transmission.

These kits supply a wider Teflon coated bushing for more support and durability.

The bushing also has a lube cutout for better lubrication.



AWD Final Drive Failure

6T40-6T45-6T50 AWD applications may experience a failure of the final drive gear set and bearings.

Cause/Correction: This concern is typically due to the bolts breaking that are used to attach the final drive components, leading to a catastrophic failure of the final drive and its bearings.

When installing the bolts in the final drive components you may want to consider upgrading them to a higher tensile strength and the bolts should be properly torqued and retained with Loctite.

Line Pressure Test

To check line pressure connect a suitable pressure gauge or transducer to the pressure tap indicated in the illustration found on the next page.

Remove the line pressure test hole plug (tap) and install a pressure gauge.

1. Access the Scan Tool Transmission Output Controls for the Line PC Solenoid.

2. Start the engine.

3. Note: In order to achieve accurate line pressure readings, the following procedure must be performed at least 3 times in order to gather uniform pressure readings. The scan tool is only able to control the line PC solenoid in PARK and NEUTRAL with engine speeds below 1500 RPM. This protects the clutches from extreme high or low line pressures.

4. Use the scan tool to increase and decrease the Line PC Solenoid in increments of approximately 200 kPa (29 psi). The scan tool commands the increment values automatically.

5. Allow the pressure to stabilize between increments.

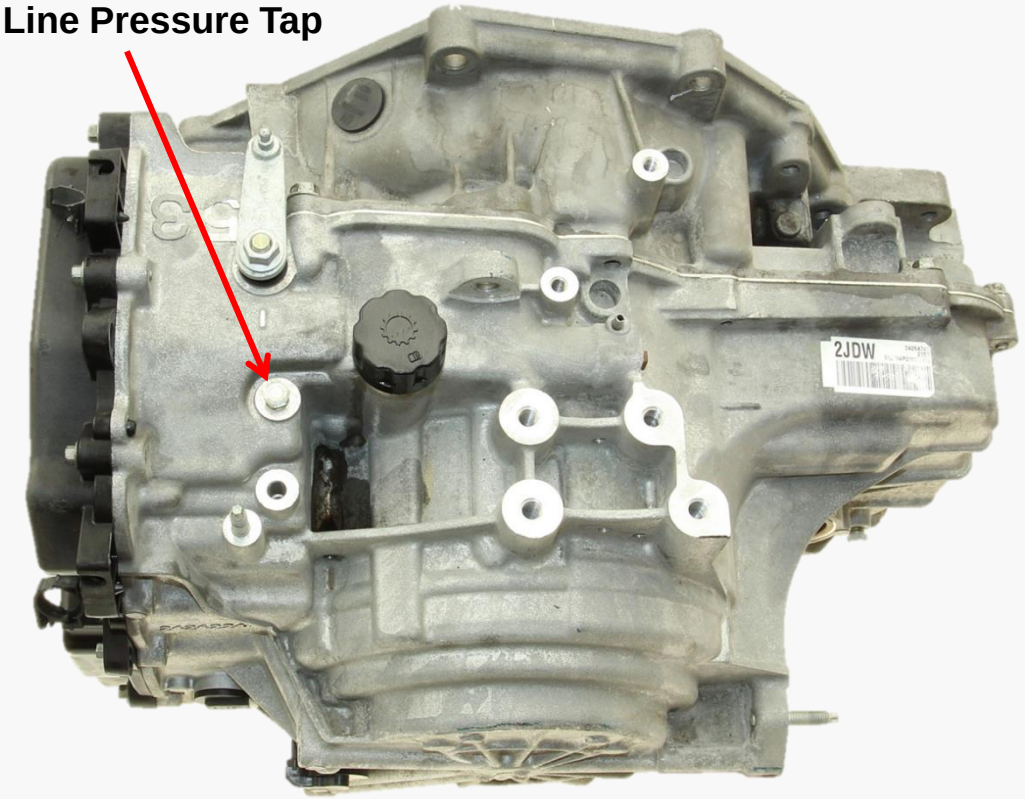
6. Compare the pressure readings on the J 21867: pressure gauge to the actual pressure values in the solenoid valve pressure chart. Refer to Solenoid Valve Pressure.

Line Pressure Test

The line pressure data on the scan tool will read in kPA.

The chart below will show the pressure converted to psi.

Line Pressure Tap



Solenoid Valve Pressure

Line PC Solenoid Valve Pressure

Requested Pressure (kPa)	Actual Pressure	
	Metric	English
None	345-550 kPa	50-80 psi
200	690-900 kPa	100-130 psi
400	1100-1310 kPa	160-190 psi
600	1520-1725 kPa	220-250 psi
800	1860-2070 kPa	270-300 psi
1000	1860-2070 kPa	270-300 psi
1200	1860-2070 kPa	270-300 psi
1400	1860-2070 kPa	270-300 psi
1600	1860-2070 kPa	270-300 psi
1800	1860-2070 kPa	270-300 psi
2000	1860-2070 kPa	270-300 psi

Line Pressure Chart		
Range	Idle	WOT
P	54-60 PSI	54-60 PSI
R	100-105 PSI	250-300 PSI
N	54-60 PSI	54-60 PSI
D	84-87 PSI	240-250 PSI
L	84-87 PSI	240-250 PSI

Overheat When Overfilled, Setting Code P0218

Overfilling will cause the transmission to overheat and set code P0218 Transmission Fluid Over Temperature.

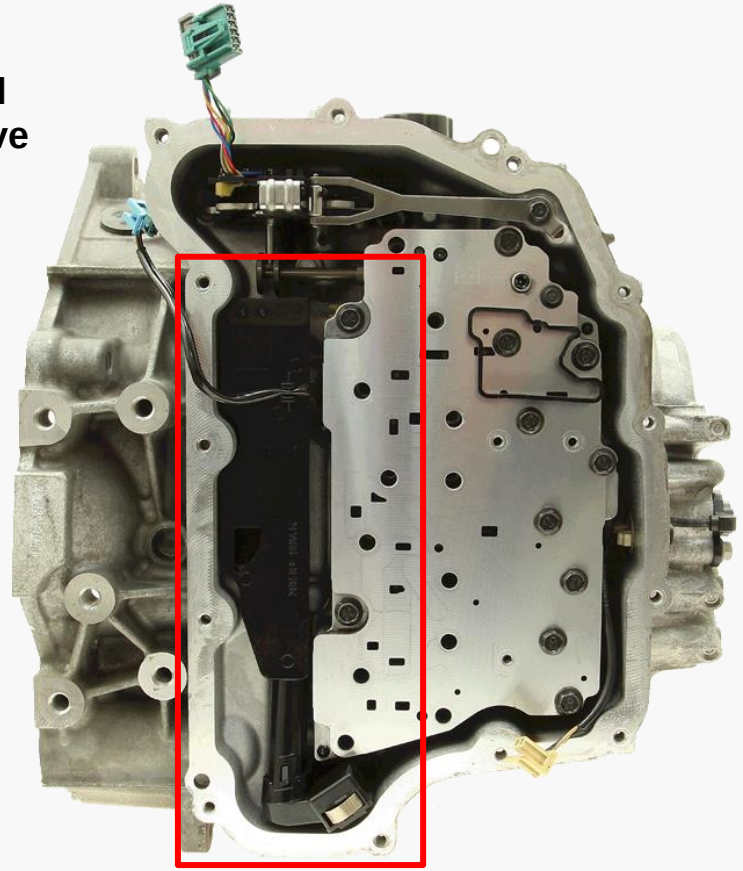
The 6T40/45 utilize a thermal type element to control the oil level in the unit similar to other GM units. Known as a “Fluid Level Control Valve” the unit is basically a thermally controlled stand pipe.

Fluid Level Control Valve is attached to the transmission case, next to the control valve body assembly, and is designed to control the fluid level in the control valve body cover assembly.

The fluid level control valve contains a temperature sensitive strip of metal that reacts to fluid temperature changes and opens or closes a fluid passage.

The maximum fluid level in the control valve body cover area is controlled as fluid overflows the top of the fluid level control valve pipe and drains into the case sump.

Fluid Level Control Valve



Overheat When Overfilled, Setting Code P0218

At temperatures below 60°C (140°F), the thermostatic element allows fluid to drain from the control valve body cover area into the case sump.

As the temperature of the transmission fluid increases, the thermostatic element traps fluid in the control valve body cover area and the fluid level rises.

This level of transmission fluid is required in order to maintain the operation of the hydraulic system in the transmission.

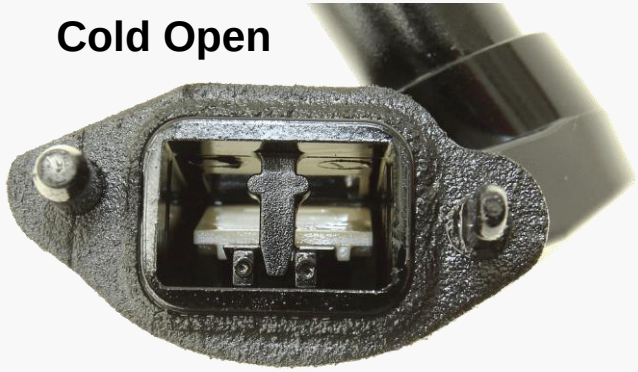
A damaged or loose thermostatic element could cause fluid foaming or incorrect fluid level.

The fluid temperature must be at operating temperature in order to obtain a proper fluid level in the case.

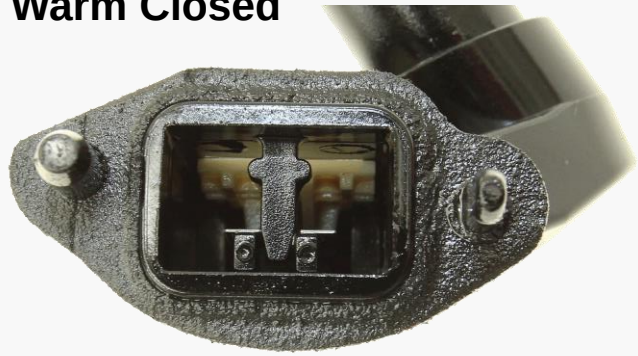
Checking the fluid level with the fluid temperature below operating temperature will result in a high fluid level (over filled).

This will cause the transaxle to over heat setting code P0218 and possibly fluid leaking out of the vent.

Cold Open



Warm Closed



Overheat When Overfilled, Setting Code P0218

It may be easier to fill to the correct level using the Fluid Capacity chart shown below.

If you are changing fluid in these units make sure the unit is cold. If you remove the drain plug in the bottom of the case while still warm only about 50% of the fluid in the unit will drain.

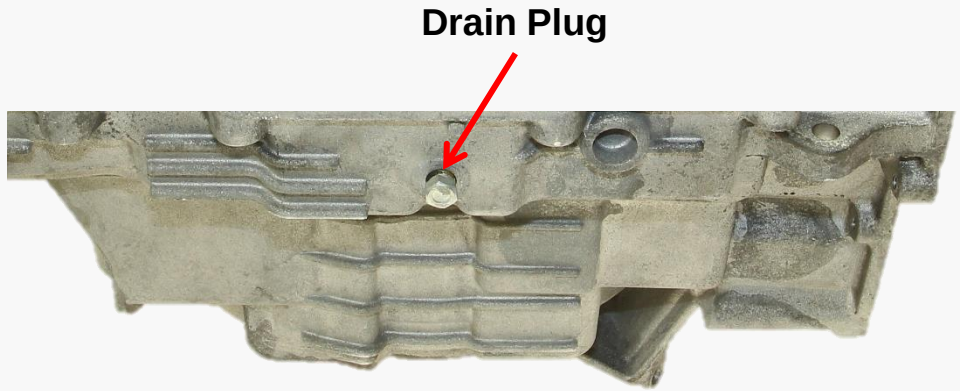
Fluid temp can be checked from the "driver information center" (some models) or by using a scan tool. It is critical that the fluid be at the correct temperature or an overfill or under fill condition may occur.

These units are easily overfilled because the synthetic fluid's expansion rate is very sensitive to temperature giving false level readings.

As little as ½ qt overfull can lead to fluid leaking from the vent. Fluid level is checked with the engine running, fluid temp 85°C-95°C (185°F-203°F), in park, via a plug near the axle seal area in the case.

6T40/6T45	
Valve Body Cover Removal	5.0-7.0 liters (5.3-7.4 quarts)
Fluid Change - Drain Plug	4.0-6.0 liters (4.2- 6.3 quarts)
Overhaul	8.0-8.5 liters (8.5-9.0 quarts)

NOTE: All capacities are approximate. When adding, be sure to fill to the approximate level. Recheck fluid level after filling.



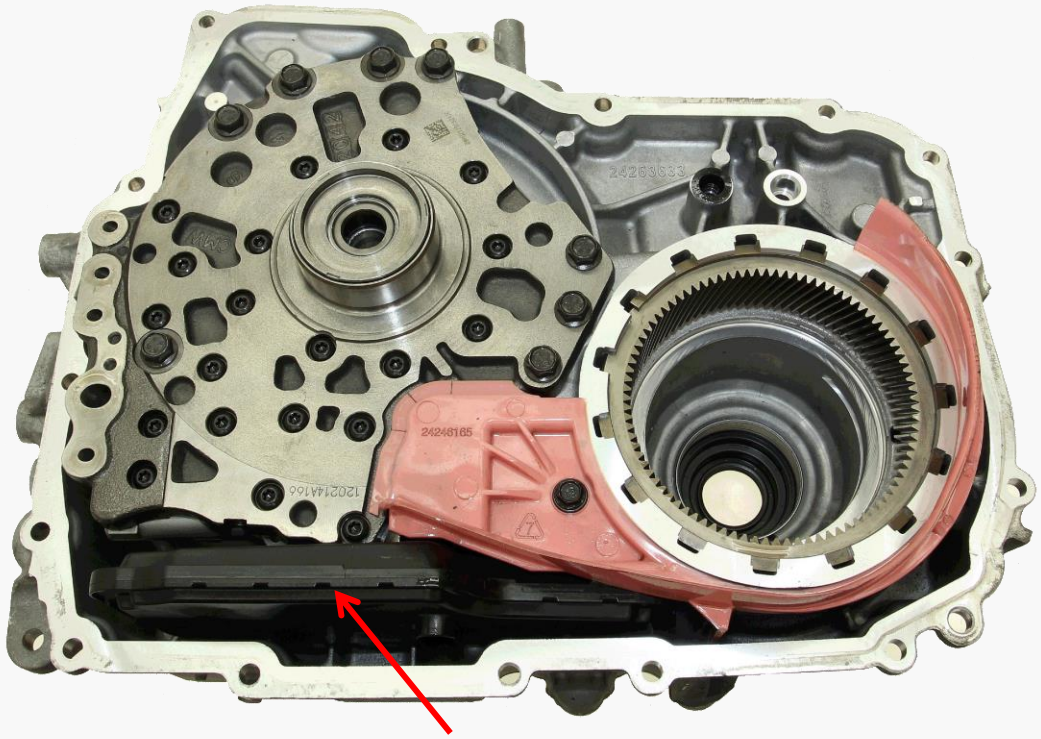
Overheat When Overfilled, Setting Code P0218

Take special care when filling these transaxles with fluid.

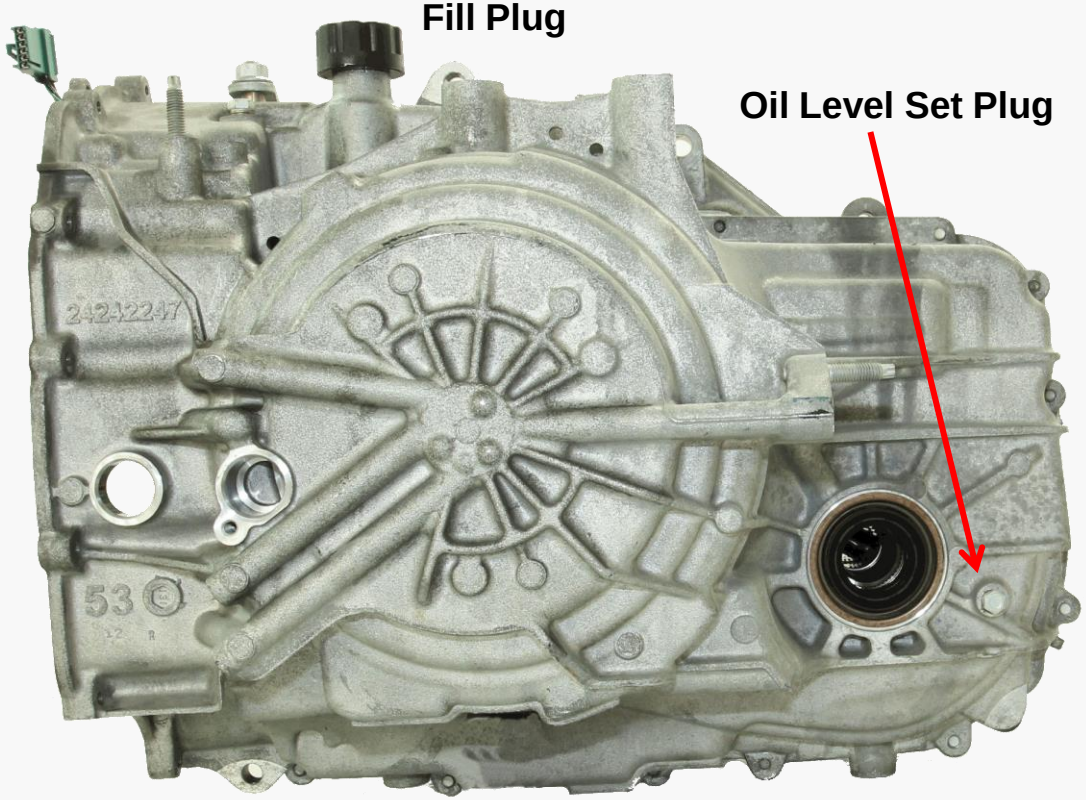
The DEX6 synthetic fluid expansion rate is very sensitive to temperature.

Keep in mind that the main transmission filter is internal to the unit, located in the sump.

As you can see the case would have to be separated to service this filter.



Main Filter in Sump



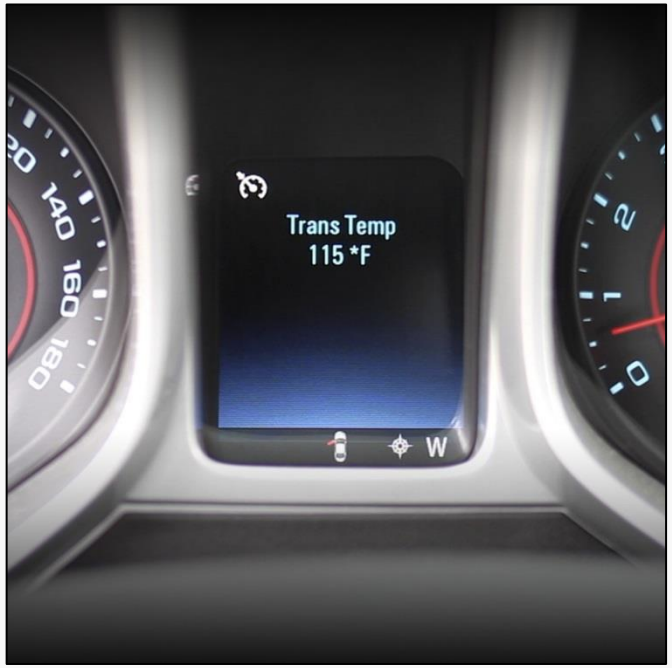
Fill Plug

Oil Level Set Plug

Overheat When Overfilled, Setting Code P0218

Fluid temp can be checked from the “driver information center” (some models).

If equipped the procedure can be found in the owners manual.



No Movement After Reflash

When reflashing some GM vehicles with an aftermarket scan tool the transmission will not engage. It may remain in neutral until the scan tool is removed.

Note: This has also been known to happen on other GM 6 speed units as well.

The actual reprogramming procedure for a GM vehicle goes as follows:

1. **Check the calibration history of the vehicle. Go to the GM web page at https://tis2web.service.gm.com/tis2web and see what latest program is for the vehicle using the vehicle's VIN number. If the programming has been updated to correct a problem, it will be listed on the website**
2. **Connect your PC to the Tech 2 scan tool (or aftermarket scan tool/laptop software) with a RS232 cable pass-thru device.**
3. **Start the GM recalibration software program on your PC and enter the vehicle application information (year, make, model, etc.).**
4. **Connect the Tech 2 scan tool to the diagnostic connector on the vehicle (located under the dash near the steering column).**
5. **Switch the Tech 2 scan tool on and wait for the Start Screen.**
6. **Validate the vehicle VIN number.**
7. **Choose the operating system, engine, fuel system, speedometer or transmission.**

No Movement After Reflash

8. Select “normal reprogramming” or “VCI” (special modifications).

9. Choose the update bulletin/recalibration number from the menu.

10. Start the transfer of data. The reprogramming procedure takes about three minutes, and can be done with the computer in or out of the vehicle. The PC screen will display a blue progress bar as the software is uploading to the vehicle.

Note: The GM setup will not allow the same calibration to be reinstalled over itself. Only an updated calibration can be loaded into the vehicle computer.

11. When the software has finished loading, the message “PROGRAMMING COMPLETE” will appear. But there is no message to disconnect the scan tool and when left connected the transmission will remain in neutral.

12. The scan tool can now be disconnected from the vehicle (turn ignition off first), and any subsequent relearning procedures that may be needed such as the crankshaft position variation relearn procedure can now be performed to finish the update.

Transmission Adaptive Values Learn

Transmission Adaptive Values Learn is a procedure for 6 speed automatic transmissions in which a series of tests are run to allow the transmission control module (TCM) to learn individual clutch characteristics.

Once the clutch data is learned, Transmission Adaptive Values Learn translates it into the adaptive data cells, which the TCM uses for clutch control during shifts.

The scan tool provides initiation of the Transmission Adaptive Values Learn procedure.

This procedure is to be used following transmission repair.

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle.

Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- **Transmission internal service/overhaul**
- **Valve body repair or replacement**
- **Control solenoid valve assembly replacement**
- **TCM software/calibration update**
- **Any service in response to a shift quality concern**

Transmission Adaptive Values Learn

Ensure the following conditions are met before performing the Transmission Adaptive Values Learn procedure:

- **Drive wheels are blocked**
- **Parking brake is applied**
- **Service brake is applied**
- **Zero percent throttle and no external engine RPM control**
- **Transmission fluid temperature (TFT) is between 70 - 100°C (158 - 212°F)**
- **Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches.**

1. **Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:**

- **Module Diagnosis**
- **Transmission Control Module**
- **Configurations/Reset Functions**
- **Transmission Adaptive Values Learn**

If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn may abort and the process may need to be started again from the beginning.

Transmission Adaptive Values Learn

2. Use the scan tool to perform the Transmission Adaptive Values Learn procedure.

As the procedure is being performed, the scan tool data display will provide operator instructions.

Follow the scan tool instructions, as required.

3. Once the procedure is complete, shut OFF the engine and power down the TCM. You will lose communication to the scan tool.

4. Restart the engine. This will complete the Transmission Adaptive Values Learn procedure.

Note: When the Transmission Adaptive Values Learn procedure is completed, the transmission may remain in a neutral state.

Turn the ignition off and remove the scan tool.

After Installing A Different Unit Or TECHM

Many shops don't want the expense or hassle with programming (Flashing) or reprogramming (Re-flashing) the various modules on today's vehicles. Unfortunately more issues are being addressed via software updates.

A new solution to the market place is the RAP (Remote Assisted Programming).

RAP is a tool and service available from Drew Technologies of Ann Arbor Michigan. It is currently available directly from Drew Technologies as well as some of your parts suppliers.

After Installing A Different Unit Or TECHM

The premise is simple; you lease a RAP system for a period of time to program or reprogram a module for ford, GM and/or Nissan.

After hooking up the kit, you will call Drew Technologies and they will connect to your vehicle via the INTERNET and download the correct software for you for a nominal charge.

The RAP kit includes:

- **A built in windows PC**
- **J2534 reprogramming equipment, DLC connection**
- **A battery maintainer, connected via jumper cables to the vehicle**
- **Wi-Fi INTERNET modem**
- **OEM calibration subscriptions**

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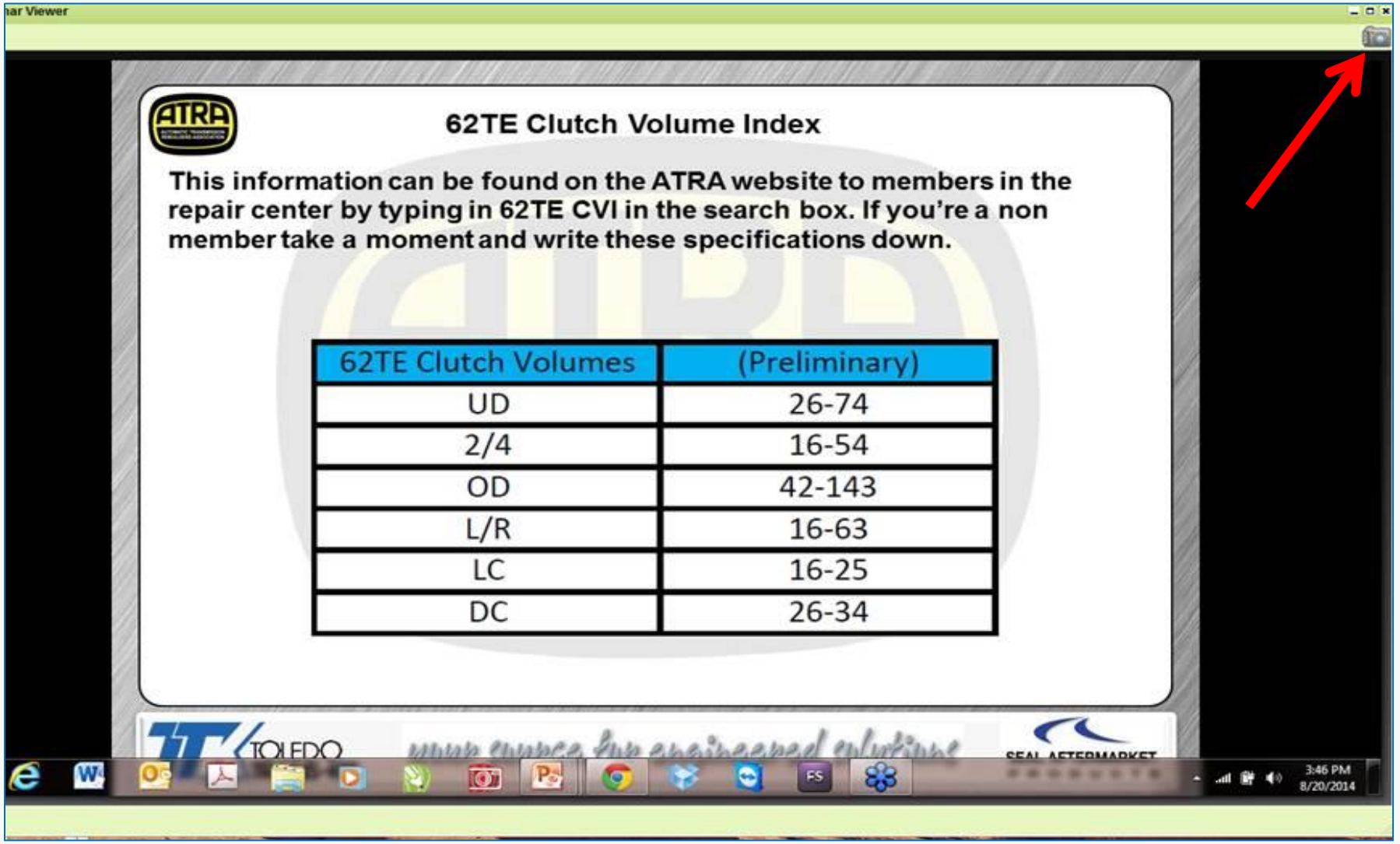

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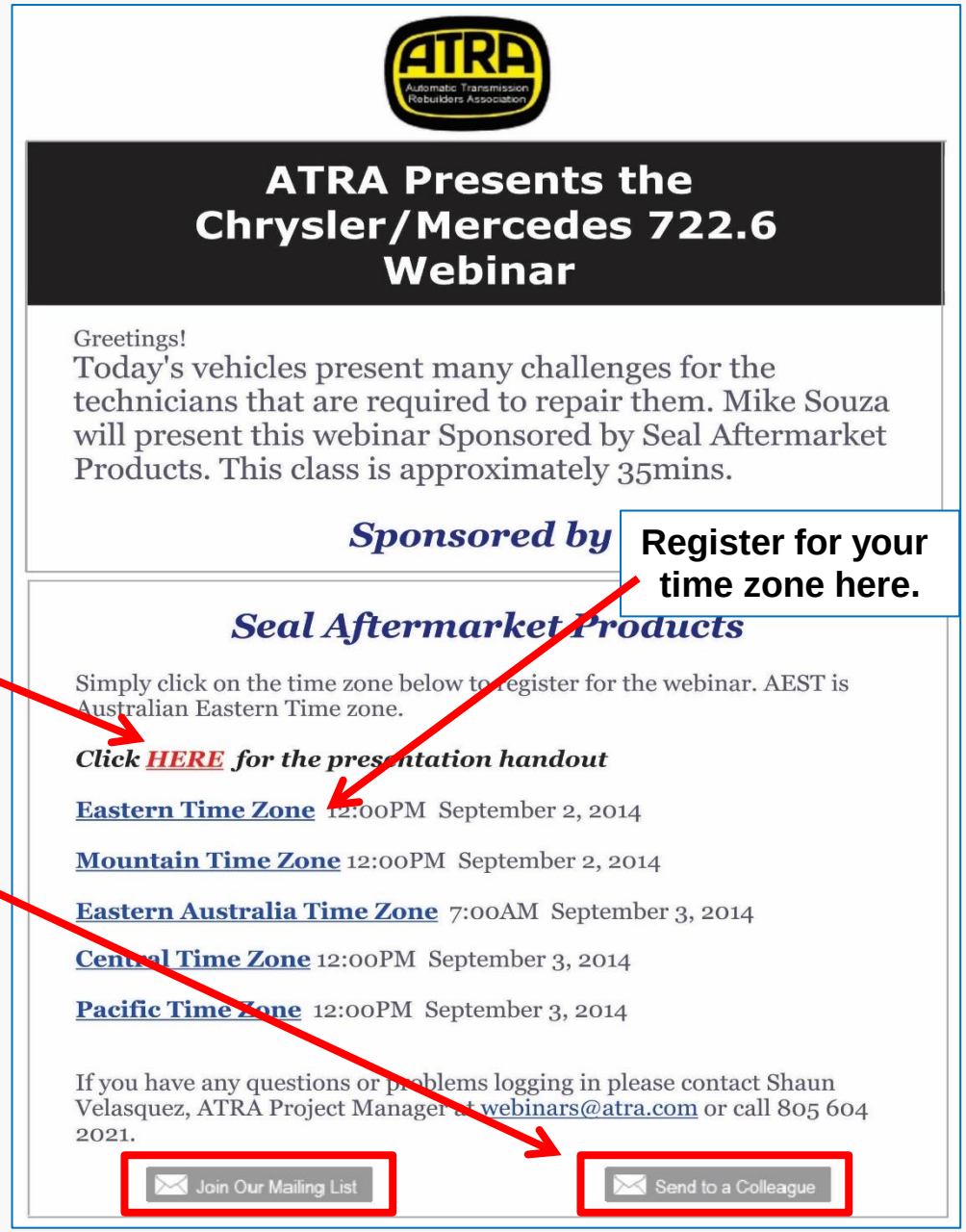

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