

## PROPER Terminal Testing AND DIAGNOSIS



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# PROPER Terminal Testing AND DIAGNOSIS

Damage to electrical terminals can lead to inaccurate test results, difficult diagnosis and system failures. When servicing a suspected wire/terminal issue, be sure to check for the following conditions:

- Any signs of connector damage
- Excessive wear to the terminal locking mechanism
- Loose or backed out terminals
- Damaged terminated lead due to improper probing tool use

Most intermittent conditions are caused by a faulty electrical connection or wiring. Look for loose or corroded terminals, poor connections between the male and female terminal at a connector, a terminal not seated all the way into the connector body, and poor terminal-to-wire connections, such as poor crimps and corrosion.

## TERMINAL TOOLS

There are several special tools that can be used for diagnosis, testing and removal of terminals. Keep in mind that the kit and tool numbers may change as they are updated by the supplier.

## TERMINAL TEST PROBES



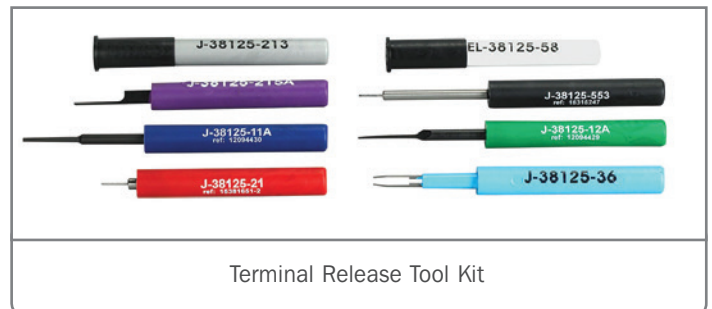
The J-35616-F Terminal Test Probe Kit includes probes that are sized to fit the various terminal sizes and their shapes properly. There are also several smaller kits available.

Terminals are becoming increasingly smaller and more complex in design. Using an improper test kit probe may cause damage to the terminals being probed and result in false readings during a diagnostic procedure. Using an instrument other than the correct probe will, in most cases, cause irreversible damage to the terminal by enlarging or deforming it to the point that it will no longer mate correctly.

**TIP:** Check the Test Adapter and Description Table when selecting the correct test adapter for front probing connectors. Refer to Power and Signal Distribution > Wiring Systems and Power Management > Diagnostic Information and Procedures > Probing Electrical Connectors in the appropriate Service Information.

Do not visually choose the terminal test adapter because some connector terminal cavities may appear larger than the actual terminal in the cavity. Using a larger terminal test adapter will damage the terminal.

## TERMINAL RELEASE TOOLS



The J-38125-580 Terminal Release Tool Kit contains various tools designed to release terminals from the connector. The terminals have a metal arm or tang that locks into the connector body. When the release tool is inserted into the canal, it moves the tang against the terminal, which allows the connector body to be released and moved outward. Tangless terminals are released in a similar fashion with the tool pushing the arm of the connector body to release the terminal.

## SPLICE SLEEVE CRIMPING TOOLS

Splice sleeve crimping tools are part of the process necessary for repairing terminals and connectors. The Service Information

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contains the necessary information for crimp nest selection. Crimp nest selection is determined based on wire size and is critical to splice crimp quality.

## PROPER TERMINAL CONTACT

Test terminal contact at the component and any inline connectors before replacing a component. A poor connection between the male and female mating terminals at a connector may be the result of contamination or deformation.

Contamination may result if the connector halves are improperly connected. Contamination also may be caused by a missing or damaged connector seal, damage to the connector itself, or terminal exposure to moisture and dirt. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion and, eventually, an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can lead to poor terminal contact and an open or intermittently open circuit.

## PROBING ELECTRICAL CONNECTORS

Connectors with 0.50 terminals should not be probed within the female terminal. There is a test point on the connector next to the terminal where testing should be performed.

When front probing a connector, disconnect the connector and insert the appropriate test adapter straight into the terminal on the mating side (front) of the connector. Refer to the appropriate Connector End View in the Service Information to determine the correct test adapter for front probing terminals.

When back probing a connector when instructed in a diagnostic procedure, disconnect the connector and insert the back probe test lead into the back of the terminal, between the terminal and the connector body. Do not back probe sealed connectors.

Measure the resistance between the back probe test lead and the corresponding terminal on the front of the connector to ensure a good connection was made. If excessive resistance is found, reposition the back probe test lead to ensure good contact between the back probe test lead and the terminal.

Connect the electrical connector with the back probe test lead installed and continue diagnosis.

## TESTING TERMINAL CONTACT IN BUSSED ELECTRICAL CENTERS

Be sure to use the correct test adapter when testing for proper terminal contact of fuses and relays in a busSED electrical center.

First, separate the connector halves and visually inspect for contamination, such as a white or green build-up within the connector body or between terminals, which causes high terminal

resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety, including the terminals, seals, and connector body.

Next, use an equivalent male terminal/terminated lead to verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal if contact is suspect.

## FLAT WIRE CONNECTORS

There are not any serviceable parts for flat wire connectors on the harness side or the component side. To test terminal contact, remove the component and visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.

Also inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Check that all of the terminals are uniform and free of damage or deformation on the component side connector. Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

## TERMINAL FRETTING

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see.

Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Although it may be difficult to see, fretting corrosion looks like small, dark smudges on the contact surface of the terminals.

To correct a fretting condition, disconnect the suspect connector and add dielectric grease/lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Reconnect the connector and wipe away any excess lubricant. The dielectric grease will correct the additional terminal contact resistance due to the fretting corrosion.

**TIP:** Not all connections are susceptible to fretting corrosion. Do not apply dielectric grease to gold-plated terminals, such as squib connectors, coax terminals or high voltage cable connections.

► Thanks to Scott Cartwright and Peter Joslyn



# Tips for INSTALLING LPO ACCESSORY WHEELS

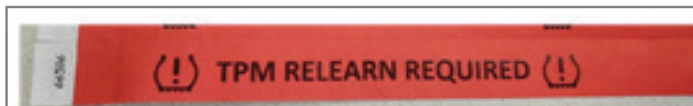
When installing Limited Production Option (LPO) accessory wheel kits sourced from your local ADI, a TPMS (Tire Pressure Monitoring System) learn is required as part of the wheel installation.



LPO wheels

It's important not to miss the learn procedure during the installation process. LPO accessory wheels have a red 'wrist band' tag on one of the wheel spokes as a reminder that a TPMS learn is necessary. Labor for the learn procedure is included as part of the accessory installation procedure.

GM recommends using the EL-52545 TPMS and RF tool to perform the learn procedure.



A red 'wrist band' is a reminder to perform a TPMS learn.

The EL-52545 tool uses TPMS relearn communication to write IDs directly to the Body Control Module (BCM) via the Diagnostic Link Connector (DLC) to help increase the success and quality of re-

learn procedures. As long as the tool is placed by the proper tire, an incorrect sensor cannot be learned, which will greatly reduce the common issue of learning a stray sensor on a near-by vehicle.



Use the EL-52545 tool to perform the learn procedure.

Before delivering the vehicle to the customer, be sure to check that no DTCs are set and that the TPMS lamp on the instrument cluster is not illuminated.

## NEW 2021 SUV SENSORS

The 2021 Tahoe, Suburban, Yukon and Escalade SUVs offer 22-inch accessory wheel and tire sets that require a different TPMS sensor than the sensor used in the 2020 Silverado and Sierra trucks. If the TPMS sensors cannot be learned after installation, be sure the wheel assembly has the correct TPMS sensors.

To identify the correct sensor for these vehicles, look for an identification mark on the sensor body.

2021 Tahoe, Suburban, Yukon and Escalade SUVs use the new Vehicle Intelligence Platform (VIP) electrical architecture. The sensor, PN 84653994, is identified with a "4" printed on the sensor body.

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# Returning LPO Transit Wheels

When GM dealerships (U.S.) order new vehicles with Limited Production Option (LPO) accessory wheel kits, the vehicles will arrive at the dealership equipped with transit wheels. The LPO wheels will be shipped to the dealership parts department to arrive at approximately the same time.

Each transit wheel, which includes a non-saleable steel or aluminum wheel (depending on GM model), tire and Tire Pressure Monitoring System sensor, is mounted to the vehicle during assembly. The transit wheels are designed to be used only during transport from the assembly plant to the dealership prior to installation of the LPO wheels. Transit wheels should never be used for normal on-road operation.

As part of the transit wheel program, the transit wheel assemblies are to be picked up by the dealership's local ADI for shipment back to the assembly plant. The LPO wheel assemblies include a \$1,500 core charge. Dealerships are required to make the core wheel assemblies available for ADI pick up within 48 hours of delivery of the LPO wheels.

## LPO WHEEL INSTALLATION

During PDI, the core wheels should be removed from the vehicle and the LPO wheels installed. The Tire Pressure Monitoring System sensors also must be relearned. The set of core wheel assemblies should be stacked together and affixed with an orange VIN decal that was sent with the original LPO wheels.



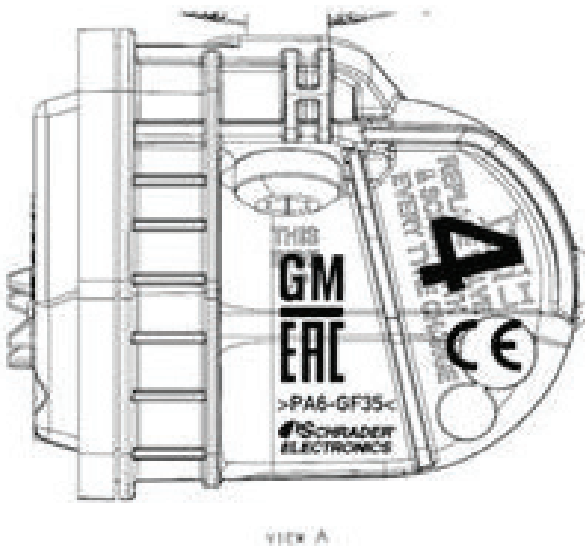
LPO wheels

## CORE PICKUP

The parts department must complete the online return service request for the core wheel assemblies. The required paperwork should be included with the cores upon pickup. Once the core assemblies are inspected and picked up for transport to the ADI, the dealership will be credited the \$1,500 core charge.

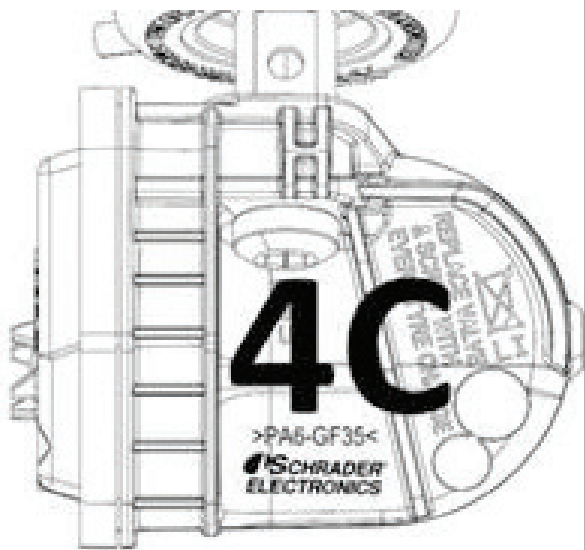
It is the responsibility of the dealership to ensure that the transit wheels are sent back to the ADI.

► Thanks to Tom Holecek



SUV sensors have a “4” on the body.

2020 Silverado and Sierra models use the Global 'A' Architecture electrical system. The sensor, PN 84413357, is identified with a “4C” printed on the sensor body.



Truck sensors have a “4C” on the body.

Both sensor types use the same sensor body, so they look the same. However, they cannot be interchanged. Be sure to look for the correct identification before installing them. The EL-52545 tool will not recognize the 4C sensor from a full-size truck if it is installed on a 2021 SUV model.

► Thanks to Mike Waszczenko



# Camaro 1LE Vinyl Hood Wrap Update

All 2017–2021 Camaro 1LE models feature a vinyl hood wrap that is applied before the cars arrive at the dealership. Several procedures should be followed to clean the hood wrap or, if necessary, to replace the entire hood wrap.

## HOOD WRAP CARE

The 1LE hood wraps are made of a black matte-finished vinyl material. Due to the matte finish, damage can occur if they are not cared for properly. The most common concerns are smudges or stains that are usually the result of fingerprints, improper cleaning practices, and/or products or leaves that remain on the car and create an outline on the vinyl. In some cases, there may be small rips or other physical damage to the wrap.

If any suspect damage is found to a hood wrap, the first step is to hand wash the hood using a mild detergent and water. Immediately rinse the vehicle and dry the graphic with a soft squeegee and/or a soft cloth to help restore the graphic's luster. Touchless car washing systems may be used. To avoid water spotting on graphic, always go through the drying cycle.

To remove tar and bugs from the graphic, use a commercial cleaner designed to remove these items, but do not rub vigorously. Immediately wash the hood with a mild detergent and water, rinse with water, and dry.

## REPLACING THE HOOD WRAP

If the hood wrap condition remains after cleaning and a new vinyl wrap is needed, the 1LE hood wrap (Hood Wrap Decal) can be obtained through GM CCA Parts. All 1LE's use the same part

number hood wrap. In order to accommodate any hood vents or heat extractors, it will be necessary to cut holes in the hood wrap.

The 1LE hood wrap must be installed by a certified "wrap" technician. If your dealership/body shop does not have a certified installer, contact Kay Automotive Graphics for information about local certified installers near your dealership. If the repairs are warrantable, photos of the entire car and localized damage to the hood wrap should be taken and submitted as a Field Product Report (in Canada, a Product Information Report).

**TIP:** Labor times have been updated for certain models. Cars equipped with a V8 engine have increased labor times as the dealership, not the wrap technician, is now responsible for removing and reinstalling the hood insert/hood vents on the vehicle.

Refer to Bulletin #20-NA-168 for additional information and part numbers.

► Thanks to Ann Briedis



The hood wrap must be altered to accommodate any hood vents or heat extractors.

# Delayed Transmission Engagement

Some 2018-2019 ATS, CTS, CT6, Corvette; 2018-2020 Express; 2018-2021 Camaro, Colorado, Silverado, Canyon, Savana, Sierra; and 2021 CT4 models equipped with the 8L45 or 8L90 8-speed automatic transmission (RPO M5T, M5N, M5U, M5X, MQD, MQE) may have a delayed engagement condition when the transmission is shifted from Park to Reverse or Park to Drive after the vehicle has been sitting with the engine off. The delayed engagement typically occurs after several hours or, more commonly, overnight.

The condition may seem to be delayed gear engagement, a slipping transmission, or delayed engagement followed by a harsh engagement.



Delayed engagement may occur when the transmission is shifted from Park to Reverse or Park to Drive.

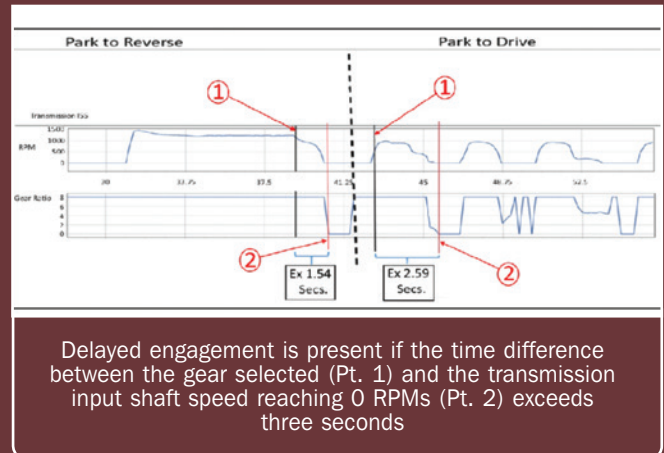
The transmission is designed to allow three seconds to complete a garage shift (shifting from Park to Reverse or Park to Drive). If the engine speed is increased before the transmission has engaged, the garage shift may be harsh.

After the initial shift, transmission operation will be normal for the subsequent engagements. The condition will not occur again until the vehicle sits again with the engine off for several hours or overnight.

## DELAYED ENGAGEMENT TEST

Use GDS2 to monitor engine RPM and the transmission input speed sensor (ISS) prior to starting the engine. Start the engine with the transmission in Park and shift the vehicle from Park to Drive or Park to Reverse with the service brake applied. The ISS should drop to zero within three seconds, which is the clutch engagement time. Recording the GDS2 session log can be useful in diagnosing the condition.

Delayed engagement of Park to Reverse or Park to Drive is present if the time difference between the gear selected (Pt. 1) and the transmission input shaft speed reaching 0 RPMs (Pt. 2) exceeds three seconds.



In most cases, the transmission will engage in three seconds or less, which is considered an acceptable engagement time and no repairs should be attempted.

**TIP:** The vehicle should only be evaluated after sitting for a minimum of eight hours but less than 24 hours and at an ambient temperature of 50°F (10°C) or above.

If engagement time exceeds three seconds, attempt to learn the C3 – Drive and C5 Reverse - Clutch using the following steps:

1. Allow the transmission sump temperature to rise between 20° and 30°C (68° and 86°F). Do not apply the accelerator pedal.
2. Perform 20 Park to Reverse shifts or 20 Park to Drive shifts, releasing the brake pedal with each shift and allowing the vehicle to roll 5-10 feet (1.5-3.0 m) per engagement into gear.

If the learn procedure does not correct the condition, disassemble the transmission and inspect the 1-3-5-6-7 Clutch (C3) for a delay into Drive condition and inspect the 4-5-6-7-8 Reverse Clutch (C5) for a delay into Reverse condition. The respective clutch plates and seals should be inspected for wear and/or damage and repaired accordingly.

If the vehicle has less than 2,500 miles (4,000 km), the transmission or valve body has been replaced or a clutch repair has been performed, follow the clutch learn procedure in Bulletin #16-NA-019 to learn the C5 Reverse and C3 Drive Clutch.

For additional information on a delayed transmission engagement condition, refer to Bulletin #20-NA-187.

► Thanks to Mark Gordon



# The Importance of Using the Correct Fasteners

A recent analysis of an air conditioning warranty claim on a 2020 Silverado 1500 with a refrigerant leak led to an unlikely cause. An inspection of the A/C condenser that was replaced showed a stud at the A/C condenser manifold block had been replaced with a different stud that was longer.

The original, correct studs and the new, incorrect stud appeared to be the same length, but the incorrect stud could be driven deeper into the manifold.

When the incorrect stud was driven into the manifold, it bottomed out in the hole and punched through the condenser manifold, causing a slight crack and, eventually, a refrigerant leak.

Any time a fastener is threaded into a component, it's imperative that the fastener used be the correct one for that application. In the past, when components had extra mass and were made of materials such as steel or iron, a fastener that would bottom out in a hole would most likely not result in any damage. Modern vehicle designs today are highly mass-optimized, meaning parts are made of materials that are thinner and lighter and are made for a specific operation. Any unnecessary material has been removed as part of the design process.

It may not be apparent when a stud or bolt runs out of thread and breaks through into a cavity underneath and creates a leak. The leak may not be apparent for hundreds of miles, which leads to a more difficult diagnosis down the road.

The Service Information calls out the importance of using the correct fasteners, tightening sequence, and torque specifications in every threaded joint repair procedure.

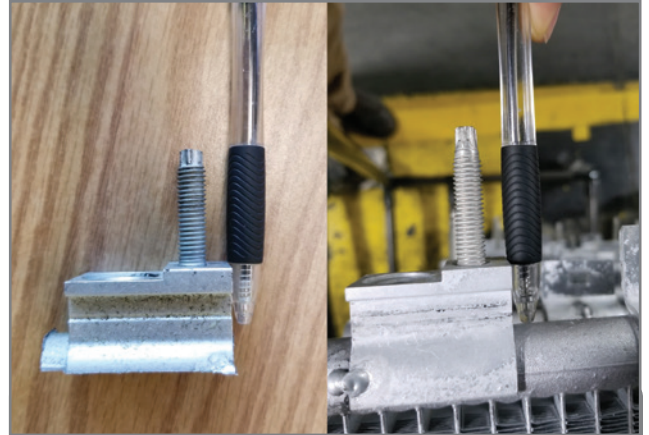
**Caution: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application.**

Do not use paints, lubricants, or corrosion inhibitors on fasteners, or fastener joint surfaces, unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. **Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.** When using fasteners that are threaded directly into plastic, use extreme care not to strip the mating plastic part(s). Use hand tools only, and do not use any kind of impact or power tools. Fastener should be hand tightened, fully seated, and not stripped.

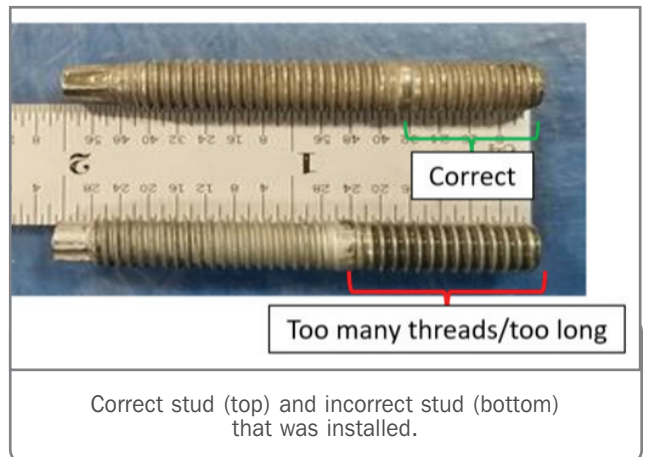
GM Engineering Standards and North American Industries have adopted a portion of the ISO-defined standard metric fastener sizes in order to reduce the number of fastener sizes used while retaining the best thread qualities in each thread size.

Check for the correct fasteners for an application during repairs. Simply choosing fasteners that look similar in size is not a reliable method for identifying the proper fasteners. Always identify the fastener by the part number identified in the repair procedure. Also, always be sure to torque all fasteners to the provided torque specifications.

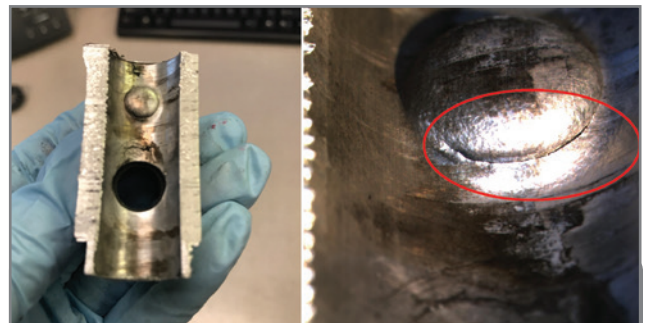
Using the correct fastener in a given location can't be stressed enough when performing repairs on today's modern vehicle designs. Here's an example why.



Incorrect stud (left) and correct stud (right) in the A/C condenser manifold block.



Correct stud (top) and incorrect stud (bottom) that was installed.



Crack leading to refrigerant leak

► Thanks to David MacGillis, Scott Chalmers and Frank Robinson



# Turn Off Transport Mode Before New Vehicle Delivery



Transport Mode is intended for use when shipping new GM models over long distances from the assembly plant. When enabled, it reduces the parasitic electrical load on the battery when the vehicle is parked, which extends the battery stand time up to 70 days without the battery going dead.

Transport Mode is available on 2012-2020 Sonic; 2013-2021 Encore, Spark, Trax; 2014-2020 Impala; 2015-2021 Escalade, Colorado, Silverado, Tahoe, Suburban, Canyon, Sierra, Yukon; 2016-2020 CT6; 2016-2021 Envision, Camaro, Malibu; 2017-2021 XT5, Bolt EV, Acadia; 2018-2021 Equinox, Terrain; 2019-2020 Regal TourX; 2019-2021 XT4, Blazer; 2020-2021 Encore GX, CT4, CT5, XT6, Corvette; and 2021 Trailblazer models.

If Transport Mode is not turned off before vehicle delivery on new GM models, a Transport Mode On message may be displayed on the Driver Information Center and/or the red battery light may be flashing.

## DISABLED SYSTEMS

24 hours after Transport Mode is turned on, with the vehicle off, the key must be used to enter the vehicle, as the following functions will be disabled: Passive Entry, Remote Keyless Entry, Content Theft. On 2016-2021 Escalade, Tahoe, Suburban and Yukon models, the Remote Keyless Entry function remains enabled during Transport Mode, allowing entry without a key. Exit lighting timers function but are reduced.

For new vehicles equipped with Passive Entry/Passive Start (PEPS) that have Transport Mode on, the key fob will operate to enable use of the Engine Start/Stop button, as long as the key fob is inside the vehicle.

The Passive Entry and Remote Keyless Entry functions are restored with the ignition in Run.

## ENTERING A VEHICLE WITH TRANSPORT MODE ON

With Transport Mode on, enter the vehicle using the steps below:

1. Attempt to unlock the vehicle with the key fob.
2. If the vehicle is not responding to the key fob, press the PEPS door handle switch a few times (if equipped) and then attempt to unlock the vehicle with the key fob.
3. If the vehicle is not responding to the key fob, the key must be used to enter the vehicle.
4. Turn the Transport Mode on/off using the vehicle-specific procedure.

## TURNING OFF TRANSPORT MODE

Transport Mode should be left on while the vehicle is in dealership inventory. In addition, a customer may want to use Transport Mode if the vehicle is going to be stored. The method to turn Transport Mode off or on again is the same.

For the procedure to turn Transport Mode off/on for a specific GM model, refer to Bulletin #20-NA-157.

Turning off Transport Mode on vehicles that are shipped from the assembly plant with the feature on is included in the normal PDI process time.

► Thanks to Mike Waszczenko

# DTC P0708 Set in the Transmission Control Module

Some 2020 CT4, Camaro, Escalade, Tahoe, Suburban, Yukon, Silverado 1500, Sierra 1500, Express, and Savana models equipped with an 8L45, 8L90, 10L60, 10L80, or 10L90 automatic transmission (RPO M5M, MF6, MI1, MI2, MI4, M5U, MQD, MQB, MQE) may have an illuminated Check Engine MIL and DTC P0708 (Transmission Range Sensor 1 Circuit High Voltage) set in the Transmission Control Module (TCM).

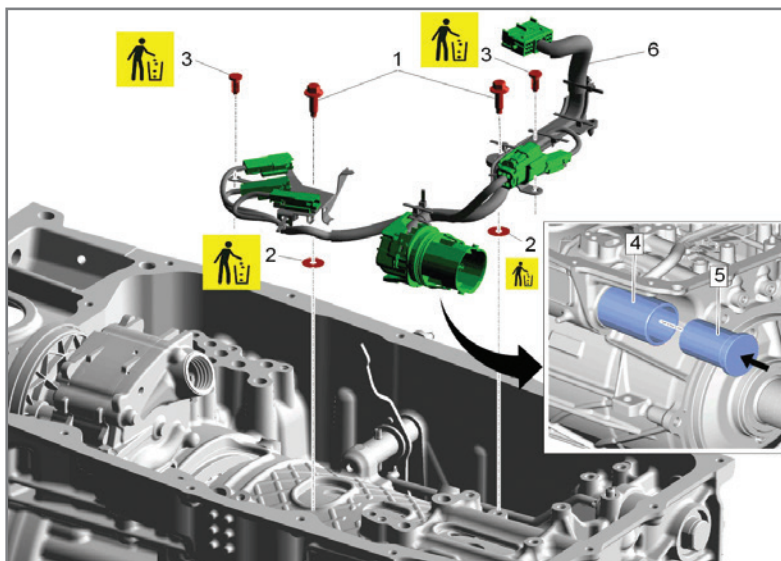
If these conditions are present, ask the customer if the engine has been cranking slowly or not cranking at all while attempting to start the vehicle. In addition, review the freeze frame data in GDS2 for DTC P0708 to determine if the system voltage was low when the code set.

If the system voltage was low in the freeze frame data or there is a concern with starting the vehicle, charge the battery and perform a battery test. If the battery fails the battery test, replace the battery, clear the DTC and test drive the vehicle. If the code does not reset, no further repairs are needed.

If no concerns were found with the battery, monitor the transmission range sensor data range, which should read between 7 – 93%. After driving the vehicle to get the transmission fluid temperature up to operating temperature, check to see if the transmission range sensor reading is between 7 – 93%.

If the transmission range sensor reading is not between 7 – 93%, disconnect and reconnect the pass-through to engine harness connector. If the condition returns after reconnecting, replace the transmission pass-through internal harness.

► Thanks to Terry Neuendorf and Mark Gordon



Automatic transmission pass-through wiring harness on the 2020 CT4.

## TECH LINK

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**Publisher:**  
Michael O'Hare  
GM Customer Care and Aftersales

**Editor:**  
Lisa G. Scott  
GM Customer Care and Aftersales

**Technical Editor:**  
Mark Spencer  
mspencer@gpstrategies.com

**Production Manager:**  
Marie Meredith

**Creative Design:**  
5by5 Design LLC  
dkelly@5by5dzn.com

**Write to:**  
TechLink  
PO Box 500, Troy, MI 48007-0500

**GM TechLink on the Web:**  
GM GlobalConnect

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