There have been several vibration conditions on 2014 Silverado 1500 and Sierra 1500 and 2015 Silverado, Tahoe, Suburban, Sierra, and Yukon models that have proved to be difficult to diagnose. These vibrations often occur at speeds of 35–45 mph (56–72 km/h) or 60–70 mph (96–120 km/h) and are felt in either the seat or steering wheel.

For example, one case from the Technical Assistance Center (TAC) was a concern about a vibration experienced at 70 mph and higher on a 2014 Silverado. At the dealership, after Road Force Balancing all tires, the Road Force Variation (RFV) measurements were: LF – 5 lbs., RF – 10 lbs., LR – 16 lbs., and RR – 20 lbs. In addition, the rear shocks were replaced.

A road test by a field service engineer using the CH-51450 Oscilloscope Diagnostic Kit with NVH showed a tire vibration amplitude of 22 mg at 70 mph. The tool’s sensor was placed on the seat track vertically.

Based on this information, the tires were moved from front to back on the same side. This put the highest RFV numbers on the
front and the lowest on the rear of the vehicle. A second road test showed a greatly reduced tire vibration amplitude of 0.804 mg at 69 mph.

Some of the vibration cases may be difficult — but with the right approach and the right tools, a successful diagnosis can be achieved quickly.

**Diagnostic Information**

A variety of helpful information is available in the Service Information.

**Information on Vibration Analysis and Diagnostic** — #PI1354B provides detailed information on vibration analysis and diagnosis for several different conditions. It outlines the recommendations and procedures for diagnosing and repairing vibrations caused by wheels and tires, axle components and propeller shafts. It also includes a vibration diagnostic worksheet to record vibration measurements.

**Vibration Analysis Worksheet** — Bulletin 03-00-91-001G is a vibration analysis worksheet that is to be used when road testing vehicles exhibiting vibration conditions. The worksheet lists the necessary data needed in conjunction with the appropriate testing procedures in the Service Information.

**Information Needed when Calling TAC** — When calling TAC for diagnostic help on vibration conditions, there is some basic diagnostic information needed in order to provide proper direction in repairing a vehicle. Before calling, technicians should use #PIT5345 to understand what is needed on a vibration condition. The measurements listed in the PI should be gathered using the appropriate tools.

**First Steps**

The first step in determining the cause of a vibration is a test drive with the appropriate diagnostic equipment installed on the vehicle. If the correct tools are not used or the proper procedures are not followed, an incorrect diagnosis will result.

- Inspect the truck for any aftermarket equipment installations, such as non-factory tires, lift kits or running boards.
- Mark each tire valve stem location on the tire to check for tire slippage on the rim. After the road test, verify that the tires have not slipped on the rim.
- Use the CH-51450 Oscilloscope Diagnostic Kit with NVH for vibration diagnosis. The oscilloscope kit provides an accurate analysis of vehicle noise, vibration and harshness conditions and uses the display of your laptop computer to present clear, easy-to-read results and actions for repair.
- For seat vibrations, mount the oscilloscope kit sensor to the rear seat bracket.
- For steering wheel vibrations, mount the oscilloscope kit sensor to the steering wheel bracket under the instrument panel.
- Moving the oscilloscope kit sensor from a vertical position to a horizontal position may indicate higher amplitude, which may be beneficial to help in diagnosis.
- Measure the vibration by driving the truck with the transmission in M5 to keep the vehicle from switching in and out of Active Fuel Management (AFM).
- Once the vibration readings have been recorded on a road test, verify the vibration data in the service bay. If using a hoist, the suspension must be at the same trim height as when the vehicle normally sits on the road.

**TIP:** If the vibration can be duplicated on the rack, the test should be performed a second time with the wheel and tire assemblies removed from the vehicle and the wheel nuts installed to retain the brake discs and/or brake drums. If the vibration is eliminated, focus on the wheel and tire assemblies as the source of the vibration. If the vibration is still present, focus on the vehicle driveline as the source of the vibration.

Another case example from TAC shows the importance of understanding how to use the right tools. The case was a vibration condition on a 2015 Tahoe felt at 40-50 mph and at 60–70 mph.

Four different tires, a rear driveshaft and a rear differential assembly had been installed to address the vibration condition.

After a road test, the field service engineer determined the primary vibration was a 2nd order tire disturbance.

Tire vibrations were measured with the CH-51450 Oscilloscope Diagnostic Kit. The initial RFV measurements for three tires were 25 lbs., 16 lbs., and 12 lbs. The fourth tire had a measurement of 8 lbs. (1st order disturbance), but also a 2nd order disturbance of 21 lbs.

Reviewing the Hunter GSP9700 Road Force Balancer results for the tire with the 2nd order disturbance showed the 1st order harmonic was below specification, but the 2nd order specification was
The sources of the vibration conditions that may be found on some 2014 Silverado 1500 and Sierra 1500 and 2015 Silverado, Tahoe, Suburban, Sierra, and Yukon models are most often the tires or driveline components, including axles and propeller shafts. These vibrations often occur at speeds of 35–45 mph (56–72 km/h) or 60–70 mph (96–120 km/h and are felt in either the seat or steering wheel.

**TIP:** If the vibration can be duplicated on the rack, the test should be performed a second time with the wheel and tire assemblies removed from the vehicle and the wheel nuts installed to retain the brake discs and/or brake drums. If the vibration is eliminated, focus on the wheel and tire assemblies as the source of the vibration. If the vibration is still present, focus on the vehicle driveline as the source of the vibration.

Some vibrations may be difficult to diagnose even when the vibration can be duplicated. One example from a Technical Assistance Center (TAC) case was a concern about a vibration at 45 mph and higher on a 2014 Silverado 1500 4WD. The vibration was easily duplicated at these speeds. Initial diagnosis focused on a tire vibration.

A road test by a field service engineer using the CH-51450 Oscilloscope Diagnostic Kit with NVH showed a 1st order propshaft vibration with an amplitude of 7.83 mg at 49 mph.

The propshaft was balanced using the oscilloscope, but the condition did not improve.

**TIP:** For vehicles that are out of balance, perform a system balance. Using the two hose clamp method, the best driveline balance results are obtained under 10 g-cm.

Once the rear housing cover was removed, a 0.25–0.28 mm (0.010–0.011 in.) total variation of the backlash of the ring gear was found. The positions of the ring gear were swapped and side shims were installed to bring the backlash down to 0.1–0.12 mm (0.004–0.005 in.). However, the vibration was still present.

**TIP:** If the difference between all the measuring points is within specifications, the backlash at the minimum lash point measured should be 0.08–0.25 mm (0.003–0.010 in) with a preferred backlash of 0.13–0.18 mm (0.005–0.007 in).

The pinion and ring gear was replaced. A second road test showed a vibration amplitude of 0.722 mg at 45 mph.

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21 lbs. It’s important to look at all harmonic measurements when reviewing the road force measurements and not to dismiss a particular tire based on only one measurement. If present, the CH-51450 Oscilloscope Diagnostic Kit tool will display the primary vibration as a 2nd order disturbance. Be sure to use this information and look at the other harmonic measurements on the Hunter GSP9700 Road Force Balancer.

The vibration was corrected by replacing and match-mounting (or vectoring) all four tires. The RFV measurements were 1 lb., 4 lbs., 4 lbs., and 7 lbs. #PI1354B lists a RFV specification of 15 lbs. for light truck tires. This specification is lower than the current specification listed in the Service Information. It should only be used if there is a speed-related tire disturbance. If the RFV of the tire is over the specification, match-mount (vector) the tire on the wheel. If that doesn’t bring down the measurement to within the specification, the tire should be replaced.
Available Training Courses

Tools alone cannot solve vibration conditions. There is not one root cause to many of the conditions and not one single approach to best address the conditions. This is why training is so important to properly address these conditions.

The GM Center of Learning has developed several training courses that incorporate the CH-51450 oscilloscope NVH kit for vibration diagnosis.

The following NVH training courses are available:

13042.14D1 – Noise, Vibration and Harshness (NVH) 1 (Virtual Classroom Training; 1.5-hour course): Covers components, characteristics and orders of vibrations. Two diagnostic scenarios are presented: one for a vibration in the seat, which includes performing a road test, and checking for excessive runout on tires and wheels; and a second scenario for a vibration in the steering wheel, which includes performing a road test, making tire calculations, using the road force balancer to measure road force variation and balance the tire and wheel assemblies.

13042.14D2 – Noise, Vibration and Harshness (NVH) 2 (Virtual Classroom Training; 2.0-hour course): Covers NVH diagnosis using the CH-51450 Oscilloscope Diagnostic Tool, reviewing operation, the oscilloscope software, and propshaft balancing using the tool. It also includes a diagnostic scenario of a vibration at 65 mph (105 km/h), performing a road test, vibration analysis – driveline, a service stall test, propeller shaft runout measurement, and driveline system balance adjustment; and a second diagnostic scenario covering difficult to isolate/balance component procedures and performing backlash measurement.

13042.14H – Noise, Vibration and Harshness (NVH) (Hands-On Training; 8.0-hour course): Reviews the basic principles of vibration diagnosis and correction and features exercise sessions in which participants work in pairs at workstations, including vibration analysis road tests. Participants will use the NVH Oscilloscope as well as the EVA tool to diagnose vibration concerns and use the Hunter 9700 Road Force Tire Balancer to properly balance a tire/wheel assembly.

13042.12W – Noise, Vibration and Harshness (NVH) (Web-Based Training; 2.0-hour course): Covers vibration theory and the operation of components that may cause abnormal noise or vibration concerns. It also covers diagnostic techniques such as road tests and test equipment used in diagnosing vibration concerns.

13042.13V – PicoScope Noise, Vibration, and Harshness Diagnostics Overview (Video On Demand; 15-minute course): Provides an introduction to NVH diagnostics with the CH-51450 Oscilloscope Diagnostic Kit, also known as the PicoScope. It covers the kit’s components and their functions as well as operating the tool to diagnose NVH and driveshaft imbalance concerns.

Training and Tools

A recent TAC case on a 2013 Silverado 4WD 4WD illustrates the importance the importance of proper training and the use of the correct tools during diagnosis.

In this case, after considerable time and multiple repairs, including a complete engine replacement, the vehicle was repurchased from the customer after the source of an engine idle vibration could not be found. The vehicle had a rough idle in gear during stops.

Using the CH-51450 Oscilloscope Diagnostic Kit with NVH showed a first order frequency with an amplitude of 5.66 mg at 525 RPM, which was significantly higher than a known good vehicle.

Once the baseline disturbance was measured, isolation of the first order engine disturbance and diagnosis could begin. Systematically, the serpentine belt was removed, and then the transmission torque converter was unbolted, which resulted in a first order engine frequency at an acceptable level.

The normal level of first order engine frequency was achieved by re-indexing the torque converter to the engine flywheel. No parts were required.

For more information about the available training courses covering vibration diagnosis, go to www.centerlearning.com.

Thanks to Chuck Berecz, Dave MacGillis, Jeff Lobb, Charles Mielke and Brad Harder.
Intermittent Service Charging System Message/Battery MIL Illuminated

An intermittent Service Charging System message may be displayed on the Driver Information Center (DIC) and/or the battery Malfunction Indicator Lamp (MIL) may be illuminated on some 2014 Malibu models and 2015 Impala (VIN 1) and Malibu models.

2015 Impala and Malibu

2015 Impala and Malibu models equipped with the 2.5L L4 engine (RPO LKW) built prior to December 1, 2014 may have an illuminated battery MIL and DTCs P2096 (Post Catalyst Fuel Trim System Low) and/or P0621 (Generator L-Terminal Circuit) set as current or history DTCs.

If the Service Information diagnostic instructions for these DTCs does not lead to a root cause, update the ECM software. An updated software calibration has been released. Reprogram the K20 ECM using the Service Programming System (SPS) with the latest calibrations available on TIS2Web.

2014 Malibu

On some 2014 Malibu models equipped with the 2.5L L4 engine (RPO LKW, KL9), an intermittent Service Charging System message may be displayed on the DIC and/or the Battery MIL may be illuminated. This condition may be noticed during an Auto Stop event.

If the diagnostics for DTC P0621 (Generator L-Terminal Circuit) is performed according to the appropriate Service Information and no fault is found to be present or DTC P0621 is set in history, contact the GM Technical Assistance Center for further assistance.

Thanks to Christopher Crumb

Appearance of Stowed Folding Top Side Rails

When lowering the folding top on 2011–2015 Camaro convertible models, the side rails, commonly referred to as the “deer legs,” may remain a bit higher than the stowage compartment. It may be necessary to push gently on the side rails to get them low enough to install the tonneau cover.

This is a normal characteristic for these vehicles, especially for models with a new folding top. The movement of the side rails will improve over time as the material is cycled multiple times, but depending on many other factors (such as number of cycles and temperature) a slight protrusion of the side rails above the side of the body may be noticed.

The appearance of the side rails when the top is folded does not affect the quality or longevity of the folding top. Applying a slight amount of downward pressure to the rails will fully stow them.

Thanks to Matt Bierlein
Steering Wheel Rattle Sound

There may be a slight rattle, click or tick sound at the steering wheel area on some 2015 Colorado and Canyon models. Applying slight pressure, such as by resting your hand, on the center of the steering wheel may quiet the noise.

Do not replace any parts for this condition at this time. Engineering is investigating this condition. More information will be released when a repair is available.

(Thanks to Charles Hensley)

Incorrect Song Information Displayed

When listening to a connected iPod® in some 2015 LaCrosse, Regal, ATS, CTS, SRX, XTS, Corvette, Impala, Silverado 1500, Sierra 1500; and 2015 1/2 model year Escalade models, Silverado HD, Suburban, Tahoe, Sierra HD, and Yukon Models (only Utilities and HD Pickup Trucks equipped with RPO AVF – Effective Point Control, 2015 1/2 M.Y.), the first song will still display when the next song in the list on the device is playing.

Press the Next button to display the next song in the list on the connected device.

This condition can be remedied by pressing the Next button while the device is playing. This will enable the system to properly display the song information for the rest of the drive cycle. Engineering is currently looking into this condition and more information will be released when available.

(Thanks to Dan Deline and Hassan Abdallah)

Hard to Close Rear Door

The rear door may be hard to close on some 2015 Colorado and Canyon extended cab models. The Rear Door Ajar message may be displayed on the Driver Information Center (DIC) and there may be a rattle noise from the lower rear door area.

These conditions may be caused by the rear door lower striker being out of position. First, verify which door is causing the conditions and also verify front door adjustment.

Next, loosen the two bolts on the lower rear striker and adjust the striker. After adjustment, tighten the two bolts to 24 Y (18 lb.-ft.). Verify that the door properly closes fully.

(Thanks to Charles Hensley)

False DTC Set in HMI Module

On some 2014 LaCrosse models built on or before August 26th, 2013; and 2015 LaCrosse, Colorado (RPO IO4) and Canyon (RPO IO4) models, a false DTC B124B sym04 (USB 1 Circuit – Open) may be set in the Human Machine Interface (HMI) module.

Do not replace any components due to this code.

2014 Models

For 2014 models, reprogram the HMI module with the latest calibrations in TIS2Web, which were released on September 9, 2013 to address this condition.

2015 Models

For 2015 models, Engineering is currently working on new calibrations to correct this condition. Presently, ignore DTC B124B sym04 until the new calibrations are available.

TIP: This is not a USB programming event.

(Thanks to Ryan Dorland and Hassan Abdallah)
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