



# Service Bulletin

File in Section: 07 - Transmission/Transaxle

Bulletin No.: 03-07-29-004K

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## INFORMATION

**Subject:** Manual Transmission Operating Characteristics

**Models:** 2017 and Prior GM Passenger Cars and Light Duty Trucks  
2009 and Prior Chevrolet and GMC Medium Duty Trucks  
Equipped with Manual Transmission

**Attention:** This Bulletin also applies to any of the above models that may be Export vehicles.

This Bulletin has been revised to add the 2017 Model Year and update the Skip Shift section.  
Please discard Corporate Bulletin Number 03-07-29-004J.

**Important:** Even though this bulletin attempts to cover operating characteristics of manual transmissions, it cannot be all inclusive. Be sure to compare any questionable concerns to a similar vehicle and if possible, with similar mileage.

The purpose of this bulletin is to assist in identifying characteristics of manual transmissions that repair attempts will not change. The following are explanations and examples of conditions that will generally occur in all manual transmissions. All noises will vary between transmissions due to build variation, type of transmission (usually the more heavy duty, the more noise), type of flywheel and clutch, level of insulation, etc.

### Basic Information

Many transmission noises are created by the firing pulses of the engine. Each firing pulse creates a sudden change in angular acceleration at the crankshaft. These changes in speed can be reduced with clutch damper springs and dual mass flywheels. However, some speed variation will make it through to the transmission. This can create noise as the various gears will accel and decel against each other because of required clearances.

### Cold Operation

Manual transmission operation will be affected by temperature because the transmission fluid will be thicker when cold. The thicker fluid will increase the amount of force needed to shift the transmission when cold. The likelihood of gear clash will also increase due to the greater time needed for the synchronizer assembly to perform its function. Therefore when the transmission is cold, or before it has reached operating temperature, quick, hard shifts should be avoided to prevent damage to the transmission.

### Gear Rattle

Rattling (not to be confused with a missed shift type of grinding, also described as a combustion knock type of noise) type noises usually occur while operating the engine at low RPMs (lugging the engine). This can occur while accelerating from a stop (for example, a Corvette) or while operating at low RPMs while under a load (for example, Kodiak in a lower gear and at low engine speed). Vehicles equipped with a dual-mass flywheel (for example, a 3500 HD Sierra with the 6-speed manual and Duramax®) will have reduced noise levels as compared to vehicles without (for example, a 4500 Kodiak with the 6-speed manual and Duramax®). However, dual-mass flywheels do not eliminate all noise.

### Neutral Rattle

There are often concerns of rattle while idling in neutral with the clutch engaged. This is related to the changes in angular acceleration described earlier. This is a light rattle, and once again, vehicles with dual mass flywheels will have reduced noise. If the engine is shut off while idling in neutral with the clutch engaged, the sudden stop of the engine will create a rapid change in angular acceleration that even dual mass flywheels cannot compensate. Because of the mass of all the components, this will create a noise. This type of noise should not be heard if the clutch is released (pedal pushed to the floor).

### Backlash

Backlash noise is created when changing engine or driveline loading. This can occur when accelerating from a stop, coming to a stop, or applying and releasing the throttle (loading and unloading the driveline). This will vary based on vehicle type, build variations, driver input, vehicle loading, etc. and is created from the

necessary clearance between all of the mating gears in the transmission, axle(s) and transfer case (if equipped).

### Shift Effort

Shift effort will vary among different style transmissions and synchronizer designs. Usually the more heavy duty the transmission, the higher the shift effort because of the increased mass of the components. Shift effort can also be higher in cold weather because the fluid will be thicker. Medium duty transmissions will not shift as quickly as a Corvette transmission. To reduce shift effort, do not attempt to rush the shift – allow the synchronizers to work as designed. Shifting harder will only increase the chance of rushing past the synchronizer leading to grinding while shifting.

### Non-Synchronized Gears

Some light duty truck transmissions in 1st gear (creeper-gear) and reverse gears in various transmissions, along with all gears in some medium duty transmissions, may be non-synchronized. This means there is not a mechanism to match input and output shaft speeds to allow for a smooth shift. This function is left up to the driver. This can be noticed if a shift into 1st or reverse is attempted while the vehicle is rolling or before the input shaft stops rotating leading to a gear grind. The grinding can be reduced by coming to a complete stop and pausing for a moment before shifting into the 1st or reverse gear. Some slight grinding can be expected.

In medium duty non-synchronized transmissions, the driver must match input shaft (engine) speed to output shaft (driveshaft) speed with every shift. This can be

accomplished by double clutching, or by using other methods. If the driver is not able to perform this function properly, there will be gear grinding with each improperly completed shift. Driver training may be required to correct this condition.

Clutch brakes are used in medium duty non-synchronized transmissions to allow a shift into gear at a stop. The clutch brake is used to stop the input shaft from spinning, allowing a shift into gear at a stop without grinding. The clutch brake is activated by pressing the clutch pedal all the way to the floor. When the clutch brake is used, it is possible to have a blocked shift with the vehicle stationary. If this occurs, engage the clutch slightly to rotate the input gear to allow the shift. The clutch brake is intended to only be used while at a stop. Care must be taken to not activate the clutch brake while shifting between gears. This could lead to excessive grinding or a blocked or missed shift.

### Skip Shift

Currently, the Cadillac CTS-V, Pontiac GTO, Chevrolet Corvette, Chevrolet Camaro and Chevrolet SS, ALL V8 (other models may follow) equipped with the 6/7-speed manual transmission have a feature referred to as a "skip-shift." This feature only allows a shift from 1st to 4th gear when the indicator lamp is illuminated on the dash. Dealers cannot disable this feature as it was established to help meet fuel economy standards. The conditions for this feature are: engine coolant at normal operating temperature, vehicle speed of 24-31 km/h (15-19 mph), 21% or less throttle being used (refer to Service Information or the Owner Manual for more details.)

