

2011 HYDRA-MATIC 6T40 (MH8) SIX-SPEED AUTOMATIC HYDRA-MATIC 6T45 (MH7 FWD, MHC AWD) SIX-SPEED AUTOMATIC

Vehicle Applications

- Buick LaCrosse (MH7)
- Buick Regal (MH7)
- Chevrolet Cruze (MH8)
- Chevrolet Equinox (MH7, MHC)
- Chevrolet Malibu (MH8)
- GMC Terrain (MH7, MHC)

Product Highlights

- Advanced clutch-to-clutch shift operation
- Tuned for quick launch feel and fuel-efficient cruising
- Compact, one-piece case
- Adaptive shift controls
- Hyper-elliptical torque converter saves space
- Maximum engine torque rating of 177 lb.-ft. (240 Nm) – MH8
- Maximum gearbox torque rating 277 lb.-ft. (375 Nm) – MH8
- Maximum engine torque rating of 232 lb.-ft. (315 Nm) – MH7, MHC
- Maximum gearbox torque rating 315 lb.-ft. (425 Nm) – MH7, MHC

Overview

Six-speed automatic transmissions are integral in GM's initiative to offer vehicles with excellent fuel economy, and the Hydra-Matic 6T40/6T45 transmissions are delivering on that promise. Designed for FWD and AWD applications, they are used in many of GM's newest and most popular models, including the Chevrolet Equinox and Buick LaCrosse.

The 6T40 (MH8) and 6T45 (MH7, MHC) are essentially the same transmission, with the 6T45 rated for greater torque capacity. Each is part of GM's family of technologically advanced, fuel-saving six-speed automatics. Shared traits between the versions – and other Hydra-Matic six-speeds – reduce complexity, size and mass, including clutch-to-clutch operation that enables the six-speed to be packaged into approximately the same space as a four-speed automatic. The transmissions also share an overall 6.11:1 gear

ratio spread, which contributes to their signature balance of performance and fuel economy.

Because of the wide ratio spread, first gear is a very high ratio, which provides brisk acceleration from a stop. Sixth gear, however, is an overdrive ratio, which keeps the engine revolutions lower for highway cruising, reducing engine friction losses and optimizing fuel economy.

6T40/6T45 Differences

To support the 6T45's greater torque capacity, it features a 1.25-inch-wide output chain, versus a 1-inch-wide chain in the 6T40; and the input gear set of the 6T45 uses five pinion gears, versus four pinions for the 6T40. The case of the 6T45 is slightly larger and includes a heavier ribbed case for additional strength.

On-Axis Design

Instead of "folding" the transmission around the end of a transversely mounted engine, which has been one of the dominant GM transaxle design conventions, the 6T40/6T45 contains all of the gearing in line with the crankshaft centerline of the engine. The advantages of this layout can translate to a shorter overall vehicle length, more interior room and lower powertrain height.

Clutch-to-Clutch Shift Operation

Three planetary gearsets are used with three stationary clutches and two rotating clutches, which save space compared to freewheeling designs. Freewheeling mechanisms allow perfect timing between shifts, but also take up more space and add more components to the transmission. However, due to the electronic controls, the clutch-to-clutch concept of the 6T40/6T45 delivers the same accurate shift timing.

Gear changes from second to sixth gear ratios are accomplished with a precise clutch-to-clutch action, where the clutch is engaged in one gear at exactly the same time it is released in another. The first-to-second upshift, however, is a freewheeling action, where the second gear clutch engages while the first gear one-way clutch spins freely. This allows a greater degree of smoothness at lower vehicle speeds.

Adaptive Shift Controls

Adaptive shift controls include automatic grade braking, which commands the transmission to remain in a lower gear if the vehicle is decelerating or coasting on a downgrade. This takes advantage of engine braking to prevent unwanted acceleration. This reduces the need for the driver to brake during a hill descent. The control module receives input that monitors brake pedal usage, vehicle acceleration rate, throttle position, and even whether a trailer is connected to the vehicle.

Space-Saving Hyper-Elliptical Torque Converter

The torque converters in the 6T40 (205 mm) and 6T45 (236 mm) use a single-plate lock-up clutch and feature a “hyper-elliptical” oval cross-section shape. This design reduces the thickness of the torque converter, reducing the space it needs and keeping the overall width of the engine and transmission as narrow as possible, for packaging advantages. The single-plate lock-up clutch uses GM’s electronically controlled capacity clutch (ECCC) technology to help dampen engine vibrations and ensure smooth operation.

IX Gear Pump

A compact on-axis, fixed-displacement IX gear-type fluid pump provides hydraulic pressure for shifting and lubrication. The pump features an IX gear (Drive/Driven) with a machined crescent in the pocket, which reduces internal leakage and optimizes hydraulic efficiency. The inlet jet nozzle feature in the IX gear-type pump provides for increased pump suction pressure, which helps optimize noise and vibration characteristics.

Ground and Honed Gears

To minimize gear noise, as well as vibration, the transmissions’ helical gears are ground and honed to ensure exact dimensions and tolerances. With closer tolerances, the gears are less prone to characteristic whining or humming, and the transmissions operate with exceptional quietness.

Unique Input Shaft Bushings

The input shaft requires no machining for grooves to contain fluid seals, which allows the shaft to retain maximum strength for its size and minimize cost.

Maintenance

The 6T40/6T45 is filled for life with DEXRON®-VI premium fluid, which does not require changing under normal use. It was developed to have a more consistent viscosity profile; a more consistent shift performance in extreme conditions; and less degradation over time. The fluid was validated to improve durability and shift stability over the life of the transmission.

Transmission Control Module

A 32-bit transmission control module (TCM) monitors transmission performance and compensates for normal wear in components such as clutch plates, so transmission performance remains consistent for the life of the transmission. The control module also “tests” the components of the transmission following assembly to optimize the interaction of the components.

The TCM is mounted inside the transmission, where temperatures remain mostly constant compared to an external-mounted module. It is small in size, which helps minimize the overall size of the transmission. The transmission and module are assembled together, so no additional connections are necessary during vehicle assembly.

TECHM

The 6T40/6T45’s transmission electronic hydraulic control module (TEHCM – pronounced “TECH-im” by engineers) contains basic software and algorithms shared among all Hydra-Matic six-speed variants, including RWD, FWD and AWD. The module is located inside the transmission, which reduces manufacturing complexity, and requires only vehicle-specification calibration to the core program. The TECHM also enables features such manual shift control and grade logic.

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