6T70/6T75: The Future is Now, Part 1

by Steve Garrett

The first in a series of new, GM, 6-speed, front-wheel drive transmissions was introduced for the 2007 model year. The 6T70 and 6T75 entered into the GM lineups with several vehicles such as the Saturn Aura, Pontiac G6, Chevrolet Malibu for the car lines, and the GMC Acadia, Buick Enclave and Saturn Outlook in the truck lines (figure 1).

The 6T70/75 are part of a co-engineering project between GM Powertrain and Ford Motor Company. In addition to the GM applications, Ford has released the transmission as the 6F50 model. Many of the components are shared between the two manufacturers, while others are model specific, such as the case and TCM.

The 6T70/6T75 improved fuel economy by an average of 4%, while performance was improved 8% on average over their 4-speed counterparts. The 6T70/6T75 share the same architecture and most of the parts are the same. The primary difference is the 6T75; a heavy-duty version of the 6T70. The heavy duty parts in the 6T75 include:

- A shot-peened output carrier
- 5 pinion carrier
- Transfer gear is wider
- Differential carrier is heavier duty
- Heavier ribbed case

Specifications

RPO Codes:

- 6T70 car FWD RPO MH2
- 6T70 car AWD RPO MH4
- 6T75 Truck FWD RPO MY9
- 6T75 Truck AWD RPO MH6
- Input torque capacity; 6T70: 280 lb-ft (380 Nm) 6T75 299 lb-ft

Figure 1

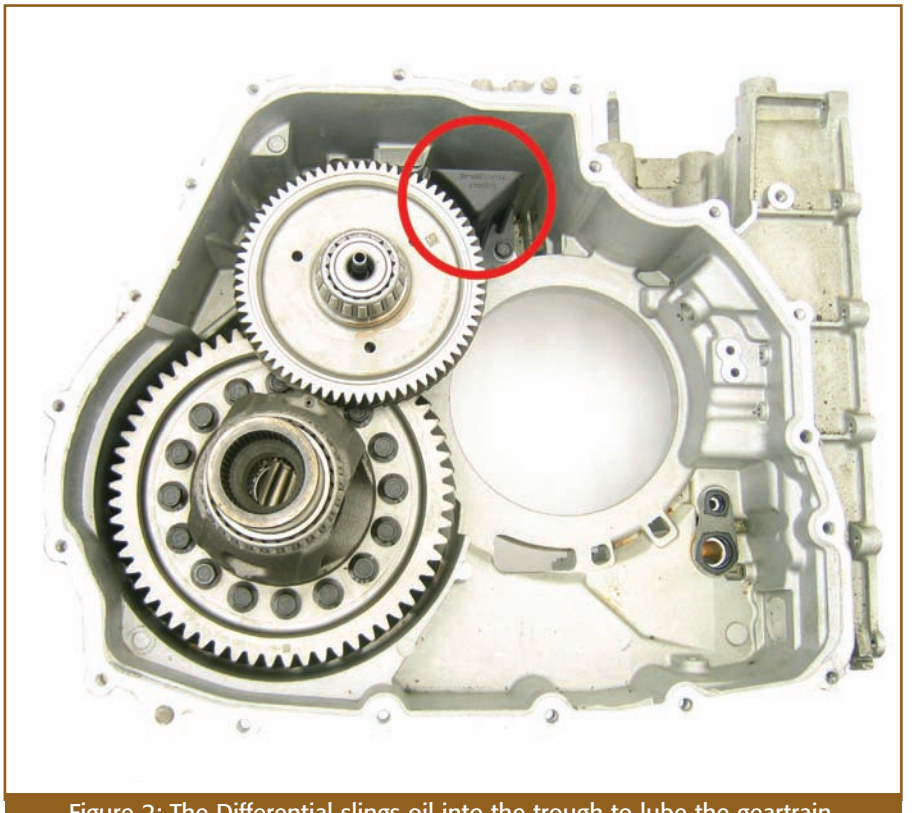

Figure 2: The Differential slings oil into the trough to lube the geartrain.

“I was extremely impressed with the precision of the end product.”

Randy Leptich
Hydranics Driveline Service, Inc.
Plano, Illinois

Electronic Components Benefits

- Sensors: Superior reliability and durability compared to off-shore and OE; eliminate limp mode comebacks
- Solenoids: Corrosion resistant and durable under the most severe operating conditions; reduce risk of solenoid failure

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- Output torque capacity; 6T70: 462 lb-ft (515 Nm)
- Maximum GCVW; 6T70: 4000 lbs 6T75-4850 lbs
- Weight: 216 lbs (98kg)
- Transfer design: 3 axis
- Compact design: 357 mm length, 197 mm width
- Differential and side bearing preloads are adjustable.

Ratios:

- 1st — 4.48:1
- 2nd — 2.87:1
- 3rd — 1.84:1
- 4th — 1.41:1
- 5th — 1.00:1
- 6th — 0.74:1
- REV — 2.88:1
- Final Drive — 2.77:1 or 3.16:1

Additional 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; rebuild: 7.4–9.5 qts (7–9 liters)
- The vent for the transmission is incorporated into the dipstick.
- EC3 246 mm, hyper-elliptical, furnace-brazed torque converter. Torque converter contains a lip seal that may 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/ratchet type, one-way clutch
- 2 shift solenoids; (On/Off design): SS1,SS2
- 6 variable bleed solenoids: PCS1, PCS2, PCS3, PCS4, PCS5, TCC
- A Bosch-built, 32-bit TCM (TEHCM) mounted inside the transmission on the valve body (referred to as the *control solenoid valve assembly*). The TCM (TEHCM) incorporates solenoids, pressure switches, and TFTs, and is bolted to the valve body. A special, spring-loaded bracket is used to force the TCM against a heat sink on the valve body. Failure to install the bracket will cause the TCM to overheat and shut down.
- No shift valves are used.
- Unit uses only one accumulator (4th, 5th, 6th).
- Compensator circuits are used to control clutch release.
- Remote-mounted, off-axis, chain-driven, vane-type oil pump
- Internal Mode Switch (IMS) equipped
- Performance Algorithm Shifting (PAS) programming
- Performance Algorithm Lift foot (PAL) programming
- Sport mode and TAP shift equipped
- Adaptive strategies with fast learn capabilities
- Reverse lockout feature
- Grade braking
- All of the FWD/AWD applications use a *lube trough* to provide lubrication during towing (figure 2). Towing the vehicle with the rear wheels elevated will result in a lube failure due to oil draining out of the lube trough. FWD applications can be dingy-towed and dolly-towed. AWD applications can only be dingy-towed .

Figure 3

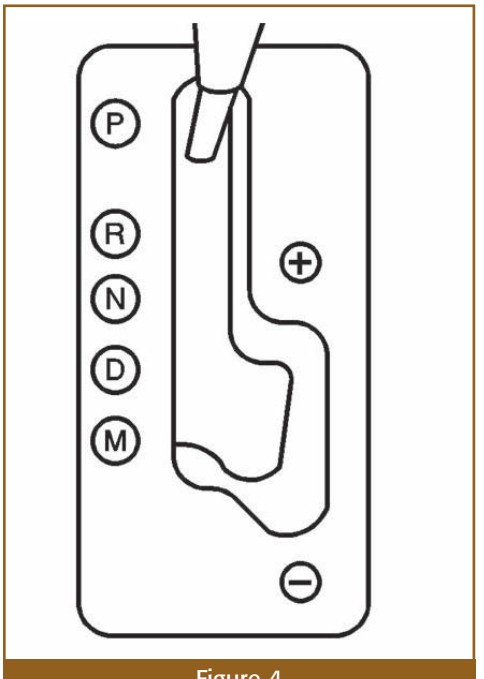

Figure 4

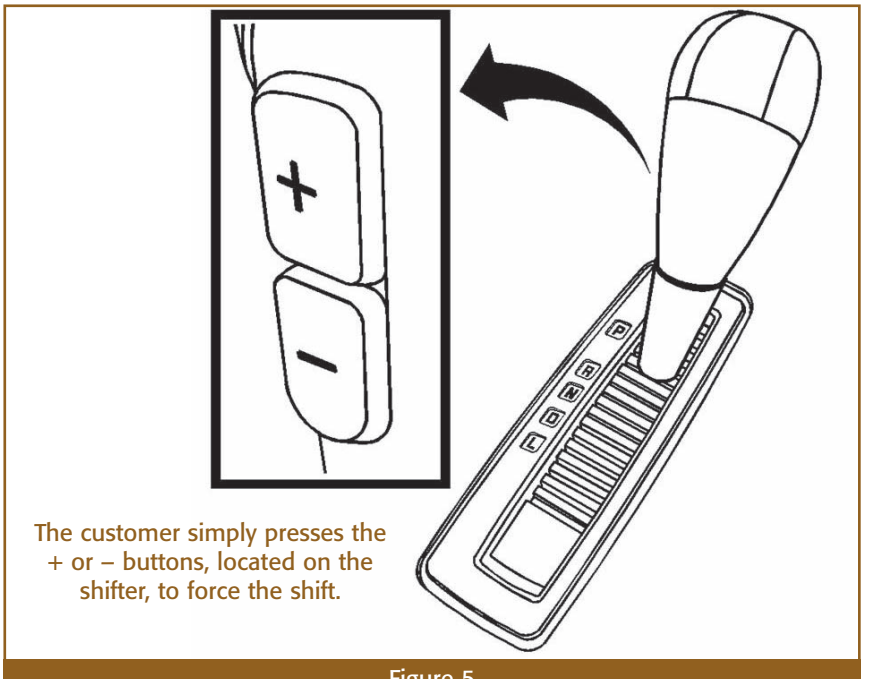

Figure 5

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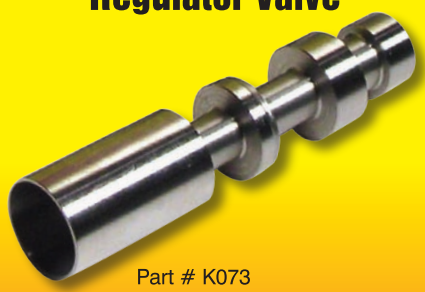

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Customer Features

The 6T70/75 applications use a feature you may have seen on other GM 6-speed and 4-speed applications. The 6T70/75 use the tap shift feature that was first introduced in the 4T40E and 4T65E applications. The tap shift switch style and wiring configurations will vary with the vehicle.

While the commands for a tap up- or tap downshift will vary with application, the basic functions remain the same in all applications. Each system has built-in protection programming to prevent the transmission from downshifting at excessive RPM, which could damage the engine.

In addition, depending on the application, the engine is protected from excessive RPM if the customer locks the shifter in M or L ranges while failing to command an upshift. In this scenario, the unit will either force an upshift at high RPM or the engine will reach fuel cutoff mode. The tap feature can also be used to force

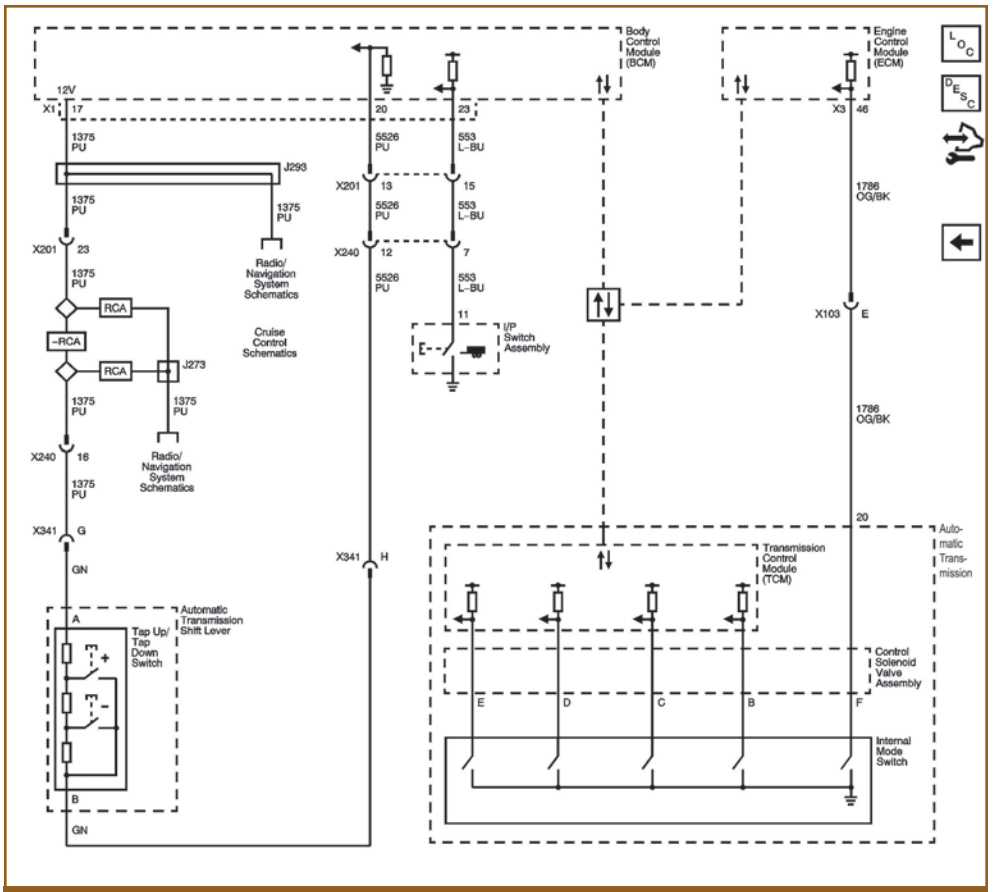

Figure 6

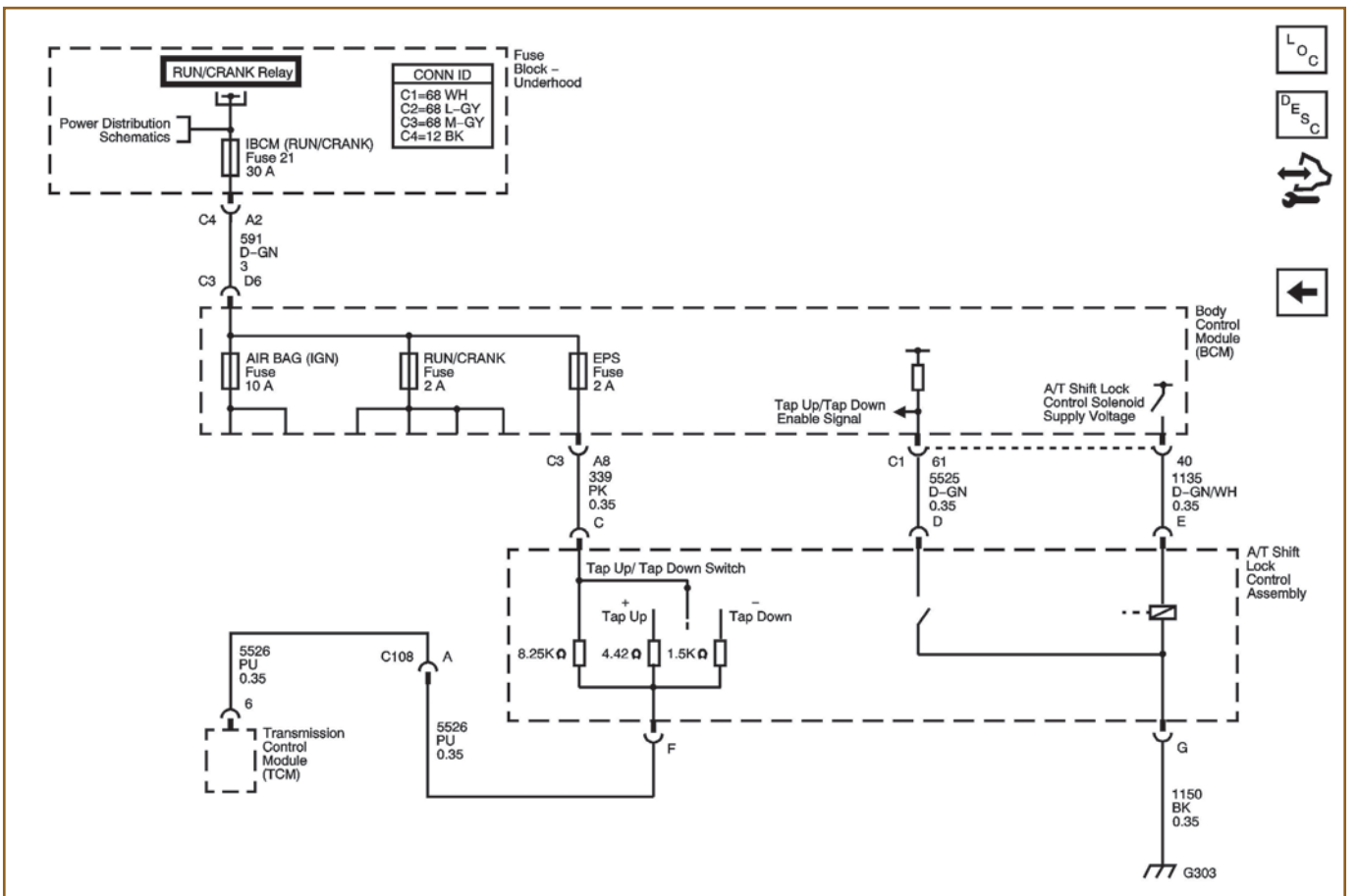

Figure 7

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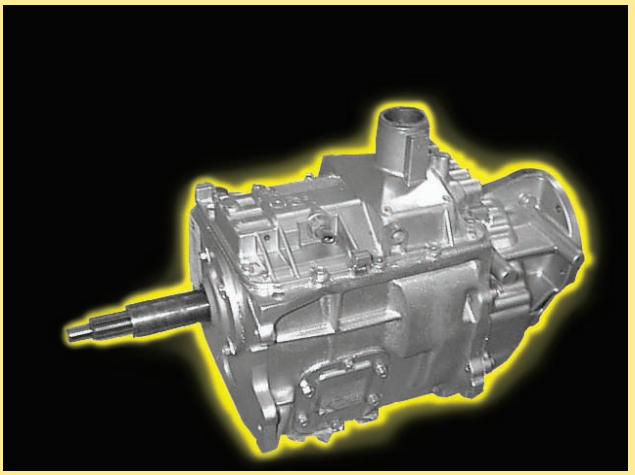

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the vehicle to start in 2nd or 3rd gear from a stop.

The Aura applications have the switches mounted as paddle-type controls on each side of the steering wheel (figure 3). To operate the paddle-type control, the customer pulls the switch toward him or her to force a downshift. Pushing the paddle will force the transmission to upshift. For tap shifting to function, the shift lever must be in the M range.

The G6 applications use a special gate, built into the shifter. The G6 shifter has an M position and another gate for tap shifting. To tap shift the G6 the customer simply moves the shift lever into the M position. From there, the customer can move the shifter toward the + or – gates to force a shift (figure 4).

The Outlook and Acadia use buttons mounted on the shift lever to trigger a tap shift. The shifter must be placed in the L position for tap shifts to function. From there, the customer simply presses the + or – buttons, located on the shifter, to force the shift (figure 5).

When the brake is applied, the shift selector lever will be allowed to move out of the park position (figure 8).

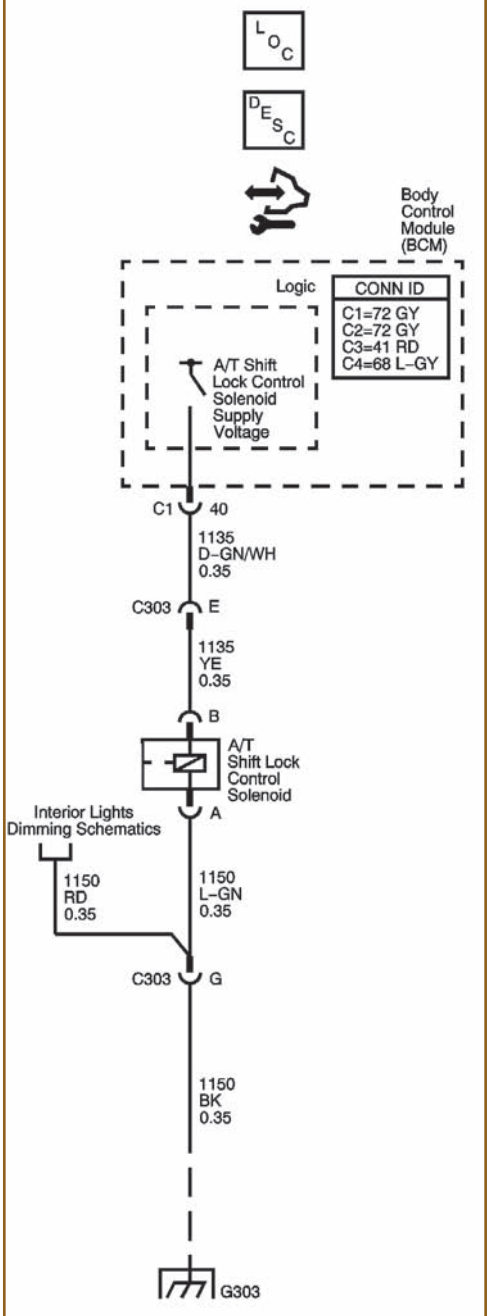

Figure 8

Tap Shift Electrical Operation

The tap switch assemblies contain two switch contacts and three fixed resistors. One resistor is used for diagnostic purposes while the other resistors signal the body control module (BCM) or the transmission control module (TCM) regarding the up- or downshift command, depending on the application.

The BCM or TCM monitors the voltage drop across the resistors to determine whether the customer is commanding an upshift or downshift. During a tap upshift, the voltage is dropped across a 1.5k-ohm resistor while a downshift command will force the voltage to drop across a 4.42k-ohm resistor (figures 6 and 7).

Figure 9

Shift Interlock System

Like other GM vehicles, the 6T70/75 applications use a Brake/Transmission Shift Interlock (BTSI) system. A solenoid controls the transmission manual linkage.

To move the selector out of park, the driver must step on the brake pedal. The BCM monitors the brake switch input. When the brake is applied, the shift selector lever will be allowed to move out of the park position (figure 8).

Fluid Level and Filter Service

Fluid level is checked with a dipstick on the 6T70/75. As with other GM 6-speed models, Dexron VI is the required fluid.

Fluid level is very sensitive on these units, so be sure to have the fluid at the proper temperature (180º–200ºF; 82º–93ºC).

The filter isn't designed to be serviced during a fluid change. Unlike other applications, the 6T70/75 filter is sandwiched between the case halves so it isn't easily accessed (figure 9). Fluid change intervals are 100,000 miles for normal service and 50,000 miles for severe-duty service.

The manufacturers are sure to expand the use of the 6T70 and 6T75 in the years to come. In the next segment, we'll look at how the electronics systems operate in these units. Until then, remember: "Life is like riding a bicycle; you don't fall off until you stop pedaling."