



Tech Articles

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Automatic Overdrive Transmissions: 440T4/4T60, 4T60-E, & 4T65-E

440-T4 / 4T60

GM introduced a transverse (front-wheel drive configuration) automatic transmission with overdrive in 1985. It was known as the 440-T4. It was hydraulically shifted and controlled, with the only electronically controlled component being the torque converter clutch solenoid just like the 3-speed automatic (125-C) that was available for the Pontiac Fiero. The 440-T4 differed from the 125-C in one major aspect besides the fact the 440-T4 had an overdrive gear; it also had a vacuum modulator that controlled line pressure. On the 125-C, both line pressure and shift points are controlled by the throttle valve (TV) cable (aka: kickdown cable). The TV cable on the 440-T4 only controls shift points. The individual gear ratios in the 440-T4 are as follows: 1st-2.921, 2nd-1.568, 3rd-1.000, 4th-0.705, Reverse-2.385. The 440-T4 was available with the following differential ratios: 2.84, 3.06, and 3.33. In addition, the 440-T4 could've had the following drive chain sprocket ratios: (drive/driven) 35/35 and 37/33. The drive chain attaches the input shaft to the rest of the transmission clutches, gears, and shafts, so a change in the chain sprocket ratio will impact all gears, which will affect the overall final drive ratio. For example, if you had a 35/35 chain sprocket set, the effective ratio would be 1:1. And the overall final drive ratio of your transmission will be the same as the differential gear ratio. But if you had a 37/33 (drive/driven) chain sprocket set, the effective ratio of the chain would be about 0.892:1. If you had this chain sprocket ratio and a 3.33 ratio differential, the overall final drive ratio of the transmission would be about 2.97:1.

The 440-T4 was offered with the standard GM FWD bell housing bolt pattern, which means it would directly bolt up to both engines that were offered stock in the Fiero. Around the 1990 model year, GM revised their transmission designation system and the 440-T4 became known as the 4T60 (4 forward speeds, T=transverse, 60=Series, based on relative torque capacity). Several improvements were made to the 440-T4/4T60 transmissions over the years before production ceased by the end of the 1993 model year. The 440-T4/4T60 is becoming a popular swap upgrade for the Fiero because it will work with the stock Fiero engine and computer, and will offer not only a performance increase; but will also offer a fuel economy increase over the 3-speed auto that was available for the Fiero originally. Swapping this transmission into a Fiero requires different mounts and axles than the stock Fiero 125-C used, but off-the-shelf parts can be purchased to make this swap work.

I have been able to make the OE-replacement front transmission mount from a 1992 Pontiac Bonneville (3800 vin L) work in Fiero applications, and the OE/stock Fiero rear transmission mount will work on the back of this transmission as long as you have the formed/stamped steel bracket from a donor Bonneville or like-bodied car that bolts to the left-rear of the transmission. Some modification of the bolt holes in the Fiero's cradle may be necessary to ensure proper fitment. As far as CV axles are concerned, the stock CV axles from a 1989 Pontiac 6000 that had the 2.8L V6 (vin W), 4-speed auto trans, and JA1 brake option (light duty brakes), with no ABS should be a direct fit to make this transmission work in a Fiero with the stock Fiero engine. If you have done an engine swap using something other than a stock Fiero engine and have relocated the engine (in relation to its location side to side in the car), these axles may not be the correct length for your swap.

The 440-T4/4T60 was commonly used first in GM cars that had the 3.8L/3800 V6 engines as well as the Cadillac models with V8's, then later with the 2.8L, 3.1L, and 3300 V6. Some Cadillac applications used a viscous converter clutch (VCC) instead of the conventional torque converter clutch all other applications used. The viscous clutches allowed some slippage all the time when applied and GM had several issues with this system. It is advisable to steer clear of the VCC versions of this transmission whenever possible to avoid these potential problems. It is also a good idea to find a 1991 or newer model of this transmission since these typically had the most "fixes" installed at the factory for some bugs and problems the earlier models had. Earlier models of this transmission can be used if the "known" bugs are addressed and fixed by your transmission rebuilder. According to my transmission builder, there was NEVER a heavy-duty version of any 440-T4/4T60 transmission produced.

4T60-E

The 4T60-E was introduced in 1991 and eventually replaced the 4T60. The 4T60-E is electronically shifted (by

way of two computer controlled shift solenoids), thus it does not have a kickdown cable. Because of this, the 4T60-E cannot be used with a stock Fiero engine unless you get some kind of stand-alone transmission controller. The 4T60-E looks very similar to a 440-T4/4T60 transmission, especially if it has the stamped steel side cover (see picture showing vacuum modulator and electrical connector on the front of the transmission). Some 4T60-E's (especially later year models) came with a cast aluminum side cover. The easiest way to tell a 4T60-E apart from the 440-T4/4T60 is the 4T60-E will not have a kickdown cable but it will have a removable differential housing cover. The 440-T4/4T60 has the differential housing cover cast into the rest of the case as one-piece; thus making differential ratio changes in a 440-T4/4T60 difficult, since the entire transmission needs to be disassembled in order to change it. Changing the differential in a 4T60-E is simple in comparison; since all you need to do is remove the differential housing cover and a snap-ring.

The 4T60-E shares the same individual gear ratios as the 440-T4/4T60 transmissions. It was available with 35/35, 37/33, or 33/37 chain sprocket ratios. All model years of the 4T60-E could've had the same differential ratios as the 440-T4/4T60. However, in the 1995 model year, GM experimented with a fine pitch differential gear, which was cut in the opposite direction that was problematic. In the 1996 model year, GM offered a fine pitch with a standard cut direction gear set they used for the final drive that didn't suffer from problems. They used this same fine pitch gear set for the final drives of all 1996-newer 4T60-E's as well as for all 4T65-E's. All fine-pitch final drive gear sets (reverse and standard direction cut) had slightly different ratios than the earlier (regular pitch) design. These ratios are: 2.86, 3.05, and 3.29. 1996 was the only year a heavy-duty version of this transmission was offered. The heavy-duty versions of these transmissions received a larger differential, a roller bearing to support the differential where it rode in the differential housing cover, and a larger spline passenger side CV axle shaft. Non-HD versions had a smaller differential, non-roller differential to housing cover bearing, and used the standard size passenger side CV axle shaft.

Early versions of the 4T60-E only had one torque converter clutch solenoid, and some did not have a transmission fluid temperature sensor. Models that only had one torque converter clutch solenoid relied on an accumulator in the valve body to cushion converter clutch apply. Later models deleted this accumulator and instead used a second torque converter clutch solenoid which was pulse width modulated (PWM) to control the apply and release rate of the converter clutch. Pretty much all 1994-newer 4T60-Es had the PWM TCC solenoid and a fluid temp sensor. It is advisable to use the correct type of Powertrain Control Module (PCM) or stand-alone transmission controller with a 4T60-E that has a PWM TCC solenoid. Earlier PCMs or stand-alone transmission controllers that are not capable of operating the PWM TCC solenoid should not be used with a 4T60-E that has one. If the PWM TCC solenoid is not being operated correctly, the result could be a slipping converter clutch or a very harsh apply rate; either of which can damage the transmission and/or converter.

There were some early 4T60-E's used in Cadillacs that did have the Viscous Converter Clutch system, and these too suffered from some problems the 440T4/4T60's that came with these same converter systems had. So it is advisable to steer clear of these systems if you have the choice. Later on in some applications, GM introduced a new converter clutch control strategy function into their PCMs. This new strategy allowed the converter clutch to slip some at all times vs. earlier strategies, which commanded full lockup (no slip) when the converter clutch was applied. The lining of the torque converter clutch was changed to accommodate for the constant slip strategy. So make sure you match the correct torque converter (and torque converter clutch) to the PCM converter clutch control strategy and version of 4T60-E transmission you are using.

Most all of the 4T60-E's you will find will have the standard GM FWD bell housing bolt patterns. But a few were used with the Quad-4 engines which had their own specific (and different) bell housing bolt patterns; and these won't work with any other engine than a Quad-4. The 4T60-E ceased production after 1999 model year. As far as mounts are concerned, the same transmission mounts that will work with the 440-T4/4T60 transmissions should also work with the 4T60-E transmission. But the 4T60-E transmission is a little longer on the passenger's side than the non-electronic 440-T4/4T60 transmission is. So a shorter passenger's side CV axle will need to be used.

4T65-E

The 4T65-E was first introduced in the 1997 model year and eventually replaced the 4T60-E. The 4T65-E had many more electronic components than the 4T60-E. A computer-controlled pressure control solenoid (force motor) was introduced to control line pressure which replaced the vacuum modulator that the 4T60-E used, an input speed sensor was added, a pressure switch manifold that monitored various gear and converter clutch fluid circuits on the valve body were added, and only one torque converter clutch solenoid was used (and it was PWM). All 4T65-E's came with a cast aluminum side cover, and the electrical connector for these transmissions is located in the top of the side cover which faces the driver's side of the vehicle (see picture). Aside from that, the 4T65-E looks very similar to the 4T60-E and is also very similar, mechanically, to the 4T60-E. All 4T65-E's had the fine pitch final drive gear sets which means only three differential gear ratios were available: 2.86, 3.05, and 3.29. The individual gear ratios the 4T65-E has are the same as what came in the 440-T4/4T60 and 4T60-E. The 4T65-E was available with the same chain sprocket ratios as the 4T60-E. HD versions of this transmission were only offered with the 3800 Series 2 and 3

Supercharged V6 engines as well as the LS4 V8.

Earlier versions of the 4T65-E transmission had an external gear position switch (which was part of the neutral safety switch that bolted onto the transmission under where the gear shift cable arm hooks up, just like the 4T60-E had). This switch tells the PCM what position the shifter is in. But around the 1999 model year, GM started offering some of these transmissions with an internal gear position switch (called an Internal Mode Switch, or IMS), which moved this function inside of the transmission. 4T65-E's equipped with an IMS can be used in applications where a 4T65-E that didn't have an IMS were used. You can use a non-IMS equipped 4T65-E in an application where an IMS-equipped transmission was used as long as you install the external gear position switch on the non-IMS transmission and wire it up to the PCM. The IMS wiring passed through the main transmission connector while the external gear position switch had its own connector.

An important and critical design change was introduced in the 2003 model year. GM revised the pressure switch manifold assembly and removed many of the pressure switches from it. Because of this, 2003 and later 4T65-E transmissions are NOT compatible with 2002 and older PCMs. The older PCMs need to see the signals from these internal gear pressure switches in order to properly control the shift adapts and other functions within the PCM. The pressure control solenoid operating strategies were changed as well. It is possible to use a 2002 and older 4T65-E transmission with a 2003 and newer PCM, but some tuning will need to be done to the transmission pressure control tables in the PCM's programming in order to make the transmission operate as desired. 4T65-E's are still being produced to this day. 4T65-E's that were made to be used with the LS4 V8 had a special case that had starter mounting provisions on it, and these cases are unique to LS4 applications in that respect (even though the bell housing bolt pattern remained the same as other V6 and 4-cylinder GM engines).

The mounting holes on the front of the transmission didn't change, but the ones on the rear did. Later versions of this transmission will not have the holes drilled and tapped and will be missing the structural webbing from the casting, which will mean you won't be able to use the Bonneville type bracket on the left-rear of these newer transmissions. As far as CV axles are concerned, all 4T65-E transmissions had a roller bearing in the driver's side output shaft location, which required a different driver's side CV axle tripot end versus what the 4T60-E used. Standard duty 4T65-E's should be able to use the same passenger side CV axle as what can be used with the standard duty 4T60-E's. Like with the 4T60-E HD transmission, the HD version of the 4T65-E requires a bigger passenger's side CV axle tripot end.

Two different diameter torque converters were used in these transmissions. The smaller (245mm) converters were used in standard duty applications. And the larger (258mm) converters were used in all heavy duty and some standard duty applications. In 2004, GM introduced a TAPShift, or Touch Activated Power Shift feature on some of these transmissions (RPO: KB7). These transmissions had different valve bodies and specific PCM (or TCM) programming that allowed the transmission to be shifted manually by pushbutton or paddleshifter controls. The TAPShift feature will only work with the proper PCM, TCM, or stand-alone transmission controller capable of this function. A TAPShift capable 4T65-E can be used with a PCM, TCM, or stand-alone transmission controller that is NOT capable of making the system work. But you should not try using a TAPShift computer system with a 4T65-E that does not have the TAPShift capability. Doing so could result in transmission damage.

As far as overall strength of each of the transmissions discussed in this article is concerned, all three are similar. The 4T60-E is a little stronger than the 440-T4/4T60, and the 4T65-E is a little stronger than the 4T60-E. Of course the HD versions of the 4T60-E and 4T65-E are stronger than the non-HD versions; but again the main difference is in the differential. Of course the most widely aftermarket supported transmission of the three types is the 4T65-E due to the 3800/LS4 marketplace. Finding upgrades specific to the 440-T4/4T60 and 4T60-E has proven to be more difficult. My website has information about CV axles and explains what parts you might be able to use to build your own. I also have some ID tag deciphering information that can help you figure out what that transmission is (and has in it for gearing) that you see sitting on the ground at a salvage yard. This ID tag information is also available in PDA / lite format so it can be easily displayed on mobile devices. Check out: www.gmtuners.com/pda for this version. A wealth of information about the 4T65-E, aftermarket transmission parts, and a performance rebuilding service can be found at: www.tripleedgeperformance.com.

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